CALUMET AREA
HYDROLOGIC MASTER PLAN

VOLUME IV

CONTROL STRUCTURE ASSESSMENT & IMPROVEMENT RECOMMENDATIONS

CALUMET AREA
CITY OF CHICAGO, COOK COUNTY, ILLINOIS

PREPARED FOR:

CHICAGO DEPARTMENT OF ENVIRONMENT
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AUGUST 2006

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Disclaimer: Due to ongoing activities within the study area, the information contained within this report may become obsolete after modifications by others. The information contained in this report is accurate as of August 2006.

1.0 EXECUTIVE SUMMARY

This report specifically addresses the assessment of the storm water control structures and the development of recommendations for improvements. These tasks are known as Task 301 and Task 302 of the Calumet Area Hydrologic Master Plan (HMP). All site specific aerial photographs used within Volume IV are dated 2004.

The assessment of the control structures is summarized in the following table. Improvements shall be implemented as funding is available, with priority given to structures that have high blockage potential (Indian Ridge Marsh North and Big Marsh), inadequate discharge capacity (Big Marsh and Conservation Area), or no functional control structure present (Heron Pond and Indian Ridge Marsh South). All structures shall be maintained at least annually.

Structure #	Functional	Adjustable	Adequate Discharge Capacity	Blockage Potential	Improvement Recommendations	EOPCC*	Priority
#1 – Deadstick Pond Outlet	Y	Y	Y	Low	Clear outfall channel and stabilize with rip-rap	$8,500	
#2 – Heron Pond Outlet	N/A	N/A	Y	Low	Construct concrete weir	$15,600	Y
#3 –IRM North Outlet	Y	N	Y	High	Inspect Culvert	$2,500	Y
					Rehabilitate 24” culvert: Cured-in-Place Liner……… or Pull in Place 20” HDPE	$31,500 $47,500	Y
					Replace manhole with water level control structure	$9,500	Y
					Install beaver leveler	$2,500	
#5 – Big Marsh Outlet	Y	Y	N	High	Construct secondary outlet	$27,000	Y
#7 – Coke Plant to IRM North	Y	N	Y	Low	None	N/A	
#8 – Railroad Marsh to Big Marsh	Y	N	Y	Low	None	N/A	
#14 – Coke Plant to Big Marsh	Y	N	Y	Low	None	N/A	
#15 – Conservation Area Outlet	Y	Y	N	Low	Rip-rap stabilization	$3,800	
					Construct secondary outlet	$14,000	Y
#17 –IRM South Outlet	N/A	N/A	Y	Low	Construct concrete weir	$15,600	Y

Table: Control Structure Assessment Summary.

*Costs do not include engineering design or permitting fees.

Significant concerns have been raised regarding the culvert connecting Indian Ridge Marsh North and Indian Ridge Marsh South under 122nd Street. The culvert is a corrugated metal pipe that dates to the 1920's and has had historical blockage issues. If the culvert were to fail, Indian Ridge Marsh North would overflow onto Torrance Avenue, a major thoroughfare through the Calumet Area.

Heron Pond and Indian Ridge Marsh South do not have functional control structures, but are regulated by outlet channels. Adjustable control structures would be beneficial for these areas to allow additional control of the normal pool elevations, especially for the heron population at Heron Pond.

2.0 INTRODUCTION

This report specifically addresses the assessment of the storm water control structures and the development of recommendations for improvements. These tasks are known as Task 301 and Task 302 of the Calumet Area Hydrologic Master Plan (HMP).

The control structure assessment will include a review of the following:

- Is the structure currently functioning as originally designed?
- Is the structure adjustable to allow for variable normal water levels in the upstream marsh or pond?
- Does the structure have the potential for blockage?
- What is the suggested maintenance plan?
- Does the structure have sufficient discharge capacity to safely release stormwater for the maximum design rainfall event (100-year, 24-hour)?

The control structure assessment will be limited to the structures in the following list. Culverts associated with IDOT Pump Station #27 and Pullman Creek are not included in the assessment, as they do not actively control water levels in a marsh or pond.

- Structure #1 – Deadstick Pond Outlet to Calumet River
- Structure #2 – Heron Pond Outlet to Calumet River
- Structure #3 – Indian Ridge Marsh North Outlet to Indian Ridge Marsh South
- Structure #5 – Big Marsh Outlet to Lake Calumet
- Structure #7 – Coke Plant to Indian Ridge Marsh North
- Structure #8 – Norfolk Southern Railroad Marsh to Big Marsh
- Structure #14 – Coke Plant to Big Marsh
- Structure #15 – Conservation Area to Lake Calumet
- Structure #17 – Indian Ridge Marsh South to Calumet River

3.0 HYDROLOGIC ASSESSMENT

As part of the control structure assessment, V3 developed planning level hydrologic models to estimate the peak discharge rate and high water level in each of the marshes and ponds. Due to the complex interaction of flow between Big Marsh, areas south and west of the Coke Plant, and Indian Ridge Marsh, V3 utilized the unsteady-state model XP-SWMM to perform the hydrologic assessment. XP-SWMM is a proprietary dynamic model that is built from the U.S.

Environmental Protection Agency Storm Water Management Model (SWMM) for complex urban stormwater modeling. XP-SWMM allows for the simultaneous analysis of discharge and storage at constant time intervals throughout the rainfall event. Hydrology following SCS TR-20 methodology is performed in the RUNOFF module, while dynamic unsteady-state flow routing is performed in the EXTRAN module. The models also allow for future expansion to include surface-groundwater interaction and water quality analysis.

Runoff for each of the marshes and ponds is estimated in the RUNOFF module for the 100-year, 24-hour rainfall event using Bulletin 70 rainfall data and the third-quartile Huff distribution. Tributary drainage areas developed in Task 102 were utilized in the assessment. A runoff curve number of 92 was assumed for each of the marshes and ponds, providing a reasonable balance between industrial, wetlands, and open water land uses. Time of concentration values were approximated to be 0.50 or 1.00 hours, depending on the amount of tributary drainage area and length of flow path.

Runoff hydrographs developed in the RUNOFF module were routed through the control structures in the EXTRAN module to develop peak discharges and high water elevations. Stage-storage relationships for the analysis were estimated using open water areas identified on DOE mapping supported by V3 survey. Stage-discharge relationships developed in Task 202 were also utilized to assess the control structure hydraulics. The analyses assumed a constant tailwater elevation of 581.0 in Lake Calumet and stop log configurations similar to when the control structures were inspected.

Results of the hydrologic assessment are included in Appendix 1 and summarized below in Table 1. A drawdown time of 7 days or less for the 100 year, 24 hour rainfall event was considered to be acceptable, although shorter drawdown periods may be required for certain types of vegetation.

Structure #	100yr Inflow (cfs)	100yr Outflow (cfs)	100yr HWL	Overflow El.	Drawdown Time[1]
#1 – Deadstick Pond Outlet	73	7	586.9	588.5	7 days
#2 – Heron Pond Outlet	84	57	585.6	N/A	3 days
#3 – IRM North Outlet	153	18	584.2	584.8	5 days
#5 – Big Marsh Outlet	288	6	584.3	588.9	> 28 days
#7 – Coke Plant to IRM North	100	54	587.6	588.5	2 days
#8 – Railroad Marsh to Big Marsh	201	33	587.8	590.0	> 28 days[2]
#14 – Coke Plant to Big Marsh	100	3	587.6	587.5	2 days
#15 - Conservation Area Outlet	204	12	582.6	585.5	> 28 days
#17 – IRM South Outlet	55	34	581.5	N/A	3 days

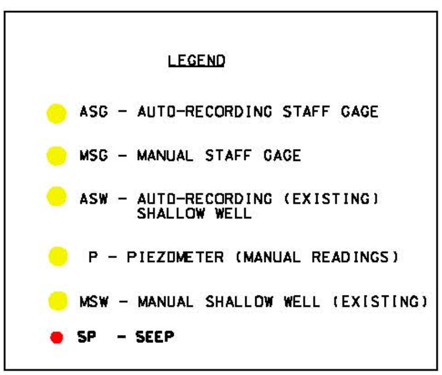
Table 1: Hydrologic Assessment Summary.

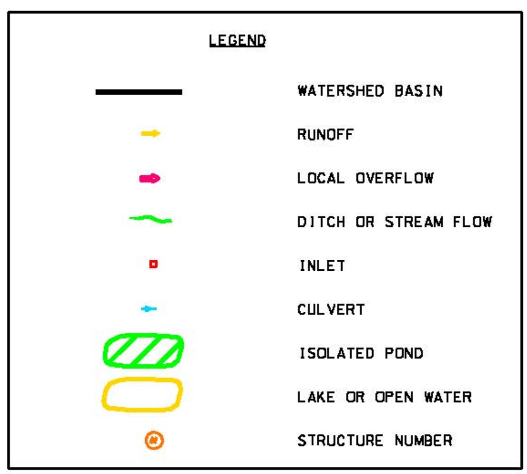
[1] This value represents the drawdown time to 10% of the storage volume remaining in the basin.
[2] Due to downstream restriction at Big Marsh outlet.

4.0 OUTLET CONTROL STRUCTURE ASSESSMENT AND IMPROVEMENT RECOMMENDATIONS

4.1 Structure #1 – Deadstick Pond to Calumet River

Structure #1 regulates the discharge from Deadstick Pond to the Calumet River. The structure consists of a rectangular concrete box structure, roughly 34" x 42" in plan. The structure has an opening with adjustable stop logs on the north wall facing the pond. The opening is approximately 34" wide, and the existing top of the stop logs is approximately 75.5" below the top of the structure. The stop logs function as a weir to hold water in the pond at elevations below the crest of the stop logs. A rectangular metal grate is located on the roof (rim) of the structure to collect flow during extreme events. Once flow enters the structure, it is conveyed to the river through an 18" corrugated metal pipe (CMP). By inspection of the structure, it appears that the stop logs are utilized to set the normal water level of Deadstick Pond. Above the crest of the stop planks, the planks will provide minimal restriction to the flow of water into the structure. Under this condition, the pond elevation is then controlled by the capacity of the outlet pipe and the tailwater condition at the pipe outfall.





*Refer to legend for all site specific maps.

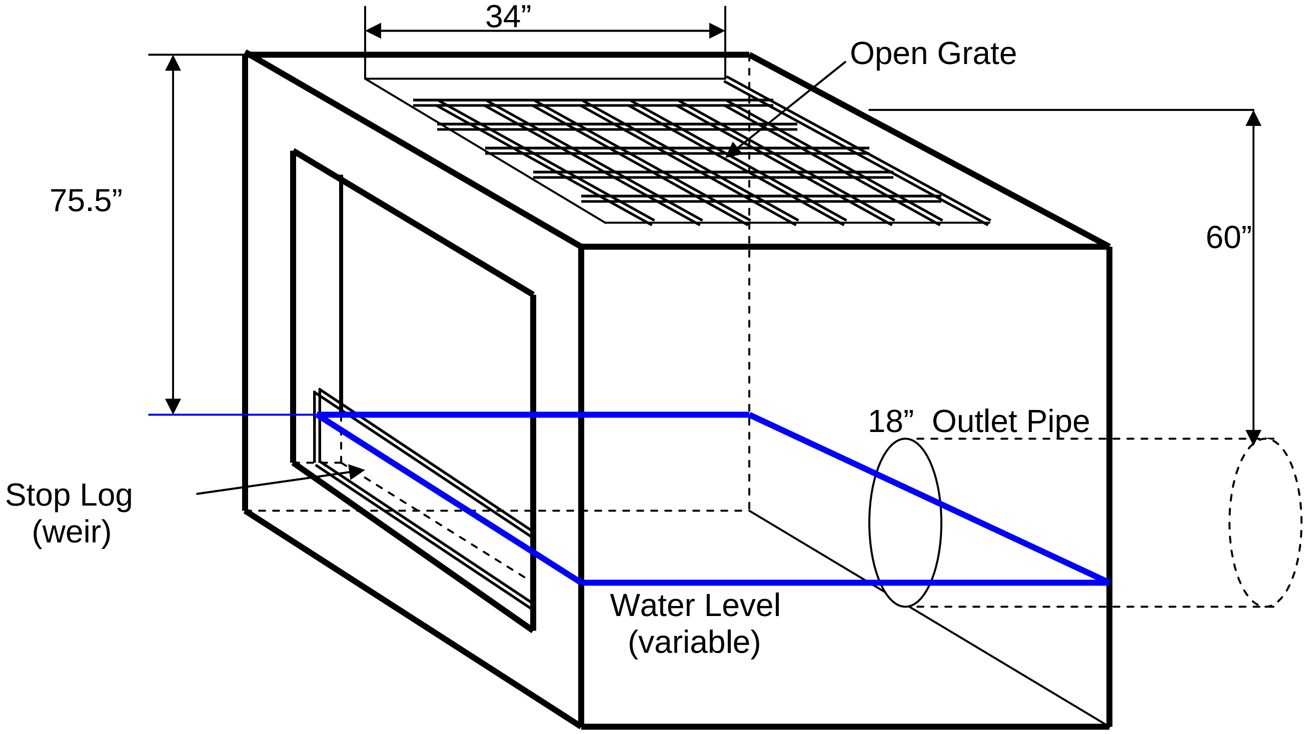


Figure 1: Structure #1 Hydraulic Geometry.

<u>Control Structure Assessment</u>

Function: The control structure appears to function as designed.

Adjustable: The control structure is adjustable by placement of stop logs in the side opening.

Discharge Capacity: Acceptable - The control structure safely releases runoff for the extreme rainfall event at a reasonable drawdown time without overtopping.

Potential for Blockage: Due to the large openings in the structure, the potential for blockage at this control structure appears low.

Improvement Recommendations:

1. Clear outfall channel between 18” pipe and Calumet River. Stabilize with rip-rap. Engineer’s Opinion of Probable Construction Cost = $8,500.

Maintenance Plan: Remove accumulated debris annually.

Figure 2: Structure #1 - Looking East.

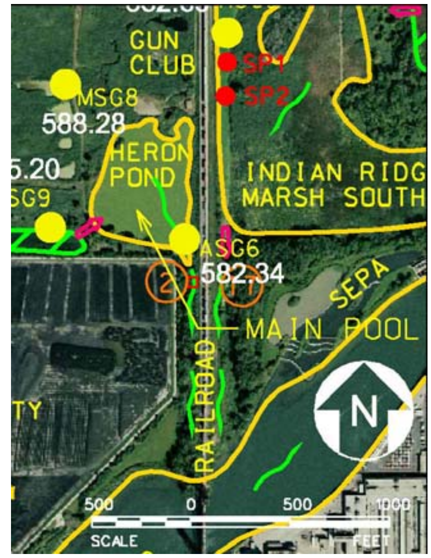
Figure 3: Structure #1 - Approach Channel.

Figure 4: Structure #1 - Inside View.

Figure 5: Structure #1 - Outlet Pipe and Channel.

4.2 Structure #2 – Heron Pond to Calumet River

This control structure consists of a rudimentary man-made weir and open channel connecting Heron Pond to the Calumet River. The weir is approximately 5 feet wide and is made of grass clippings and debris approximately 12 inches deep. It appears that the clippings were placed in order to elevate the normal water level of the pond. Above the weir crest, the grass clippings and debris will not significantly restrict the rate of discharge exiting the pond. In this situation, the pond elevation is controlled by the discharge rate and capacity of the open channel connecting the weir to the Calumet River.



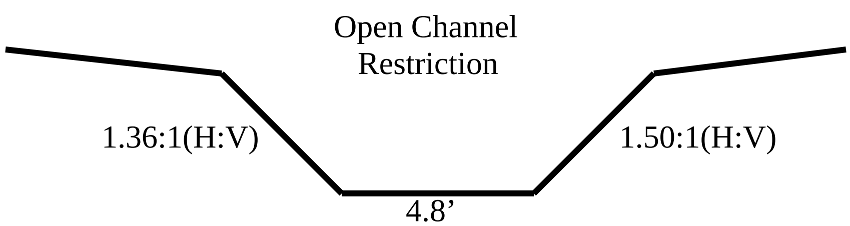


Figure 6: Structure #2 Hydraulic Geometry.

<u>Control Structure Assessment</u>
Function: N/A – No permanent control structure is present.
Adjustable: N/A – No permanent control structure is present.
Discharge Capacity: N/A – No permanent control structure is present.
Potential for Blockage: N/A – No permanent control structure is present.
Improvement Recommendations:

1. Construct concrete weir with stop logs at pond outlet to control discharge. Stabilize with rip-rap. Engineer's Opinion of Probable Construction Cost = $15,600.

Maintenance Plan: Remove accumulated debris annually.

Figure 7: Structure #2 – Weir Constructed of Grass and Debris.

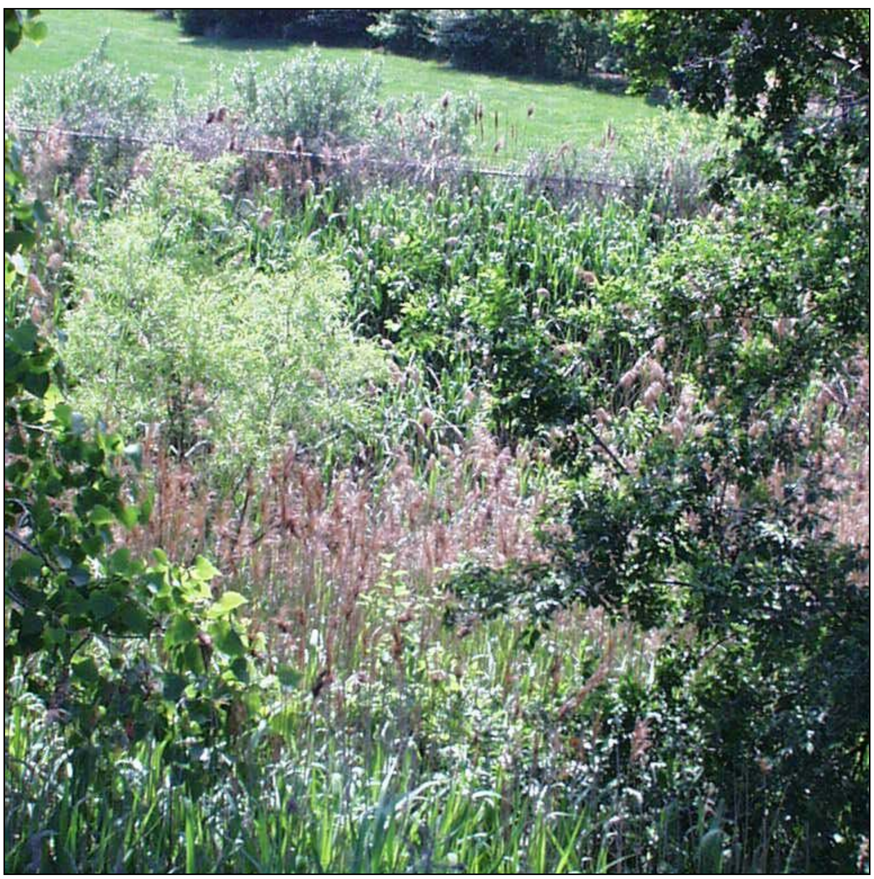
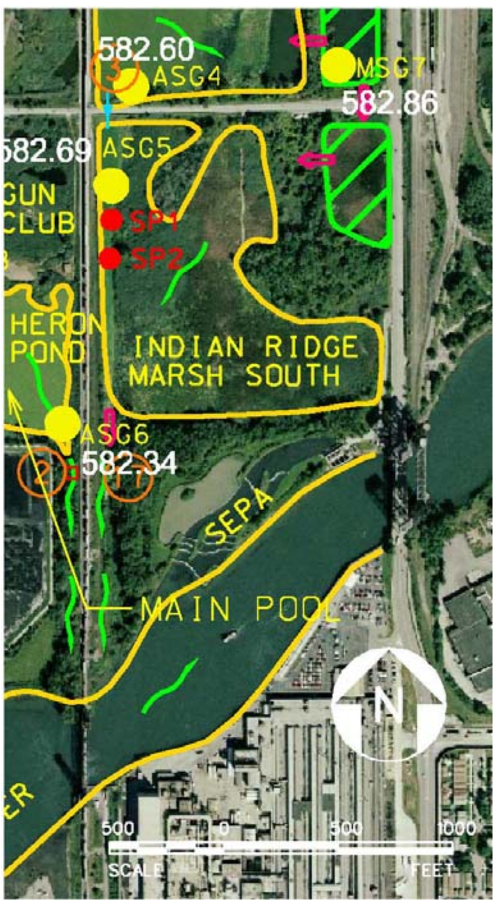
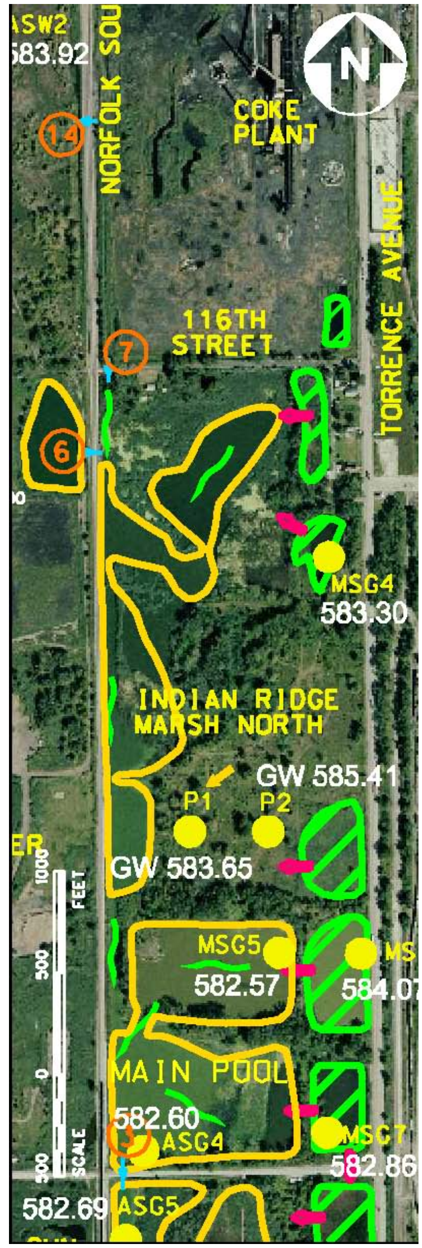


Figure 8: Structure #2 – Outlet Channel (Overgrown Condition).

4.3 Structure #3 – Indian Ridge Marsh North to Indian Ridge Marsh South

Structure #3 consists of an inlet box and attached culvert connecting Indian Ridge Marsh North and Indian Ridge Marsh South under 122nd Street. The inlet consists of a concrete manhole with a 4' diameter open grate. The rim elevation of the grate is the lowest point of entry into the structure, and therefore sets the normal water level for Indian Ridge Marsh North. The outlet pipe consists of a single 24" corrugated metal pipe (CMP). Under most events, the water level in Indian Ridge Marsh North appears to be controlled by the open grate through either weir or orifice flow conditions, depending on the water depth above the grate. Under high water conditions, either in Indian Ridge Marsh North or by high tailwater conditions in Indian Ridge Marsh South where the outlet CMP is submerged, the outlet pipe will operate under pressure flow and will impact the stage-discharge relationship for the structure.





Control Structure Assessment

Function: The control structure appears to function as designed.

Adjustable: The control structure is not adjustable.

Discharge Capacity: Acceptable - The control structure safely releases runoff for the extreme rainfall event at a reasonable drawdown time without overtopping.

Potential for Blockage: The control structure has a high potential for blockage along the fence and at the manhole grate, which serves as the only point of entry for discharge. The structure has historically been blocked by beaver activity.

Improvement Recommendations:

1. Inspect 24" culvert to determine suitable remediation measures. Engineer's Opinion of Probable Construction Cost = $2,500.

2a. Rehabilitate 24" culvert (cured-in-place liner). Engineer's Opinion of Probable Construction Cost = $26,250.

2b. Rehabilitate 24" culvert (pull-in-place 20" HDPE). Engineer's Opinion of Probable Construction Cost = $38,000.

3. Replace manhole with water level control structure with side flow entrance and stop logs for variable upstream water level control. Engineer's Opinion of Probable Construction Cost = $9,500.

4. Install Beaver Leveler. Engineer's Opinion of Probable Construction Cost = $2,500.

Maintenance Plan: Remove accumulated debris annually, especially on grate and fence.

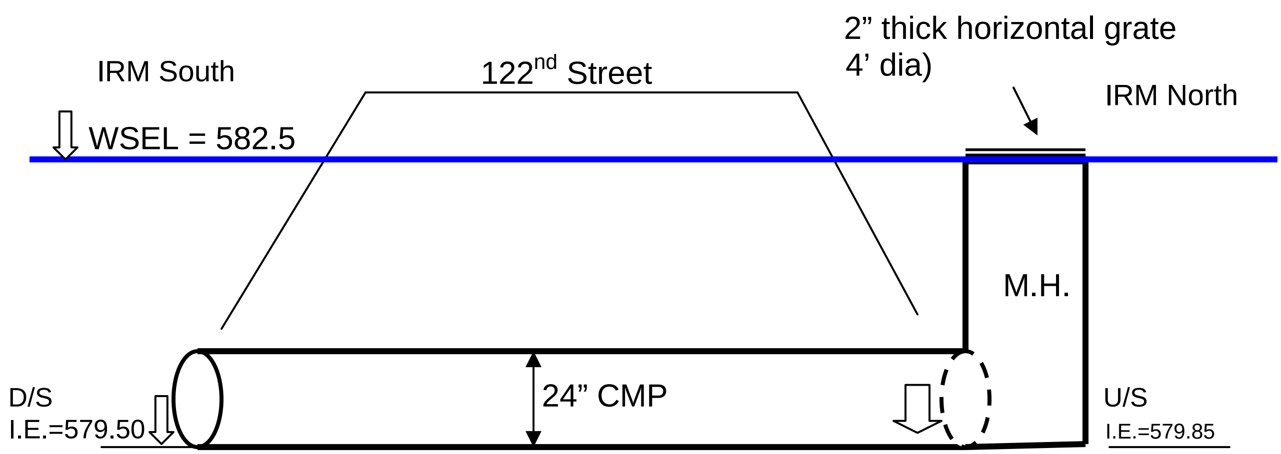
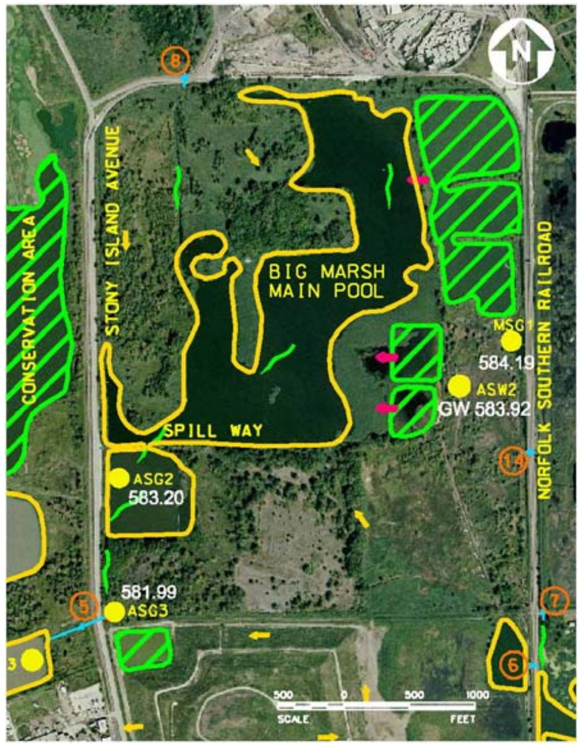


Figure 9: Structure #3 Hydraulic Geometry.

Figure 10: Structure #3 - Looking North.

Figure 11: Structure #3 - Obstructed Grate.

4.4 Structure #5 – Big Marsh to Lake Calumet



Structure #5 consists of a rectangular concrete drop inlet with twin 30" diameter outlet pipes connecting Big Marsh to Lake Calumet. The structure is approximately 5'x7' measured in plan. The northeast wall facing Big Marsh has an opening with an adjustable stop plank to control the normal water elevation in Big Marsh (similar to Structure #1). The opening is approximately 1'-10" wide by 12" tall with the stop plank blocking the lower 3" of the opening. Inside the structure there is a 6" thick concrete wall to wall deck with a 2' diameter orifice. Twin 30" diameter outlet pipes leading to Lake Calumet connect to the structure approximately 4'-6" below the orifice and concrete deck.

When the water level in Big Marsh is above the stop plank crest, the wall opening will provide minimal restriction to incoming flow until the structure is submerged. Under low flow conditions, flow control is provided by the wall opening and the concrete deck orifice. Under high flow or high tailwater conditions in Lake Calumet, the wall opening, the concrete deck orifice, and the outlet pipes will each impact the stage-discharge relationship for the structure.

A 2' diameter grate is located on the roof of the structure for access and overflow collection.

<u>Control Structure Assessment</u>

Function: The control structure appears to function as designed.

Adjustable: The control structure is adjustable by placement of stop logs in the side opening.

Discharge Capacity: Not Acceptable - The control structure requires an excessive amount of time to release runoff for the extreme rainfall event.

Potential for Blockage: The existing structure is full of debris demonstrating a high potential for blockage.

Improvement Recommendations:

1. Construct secondary control structure adjacent to Stony Island Avenue between the spillway and the outlet channel to the existing control structure. Connect the control structures with a HDPE storm sewer running parallel to Stony Island Avenue. Remove debris and the concrete deck from the existing control structure. Engineer's Opinion of Probable Construction Cost = $27,000.

Maintenance Plan: Remove accumulated debris annually.

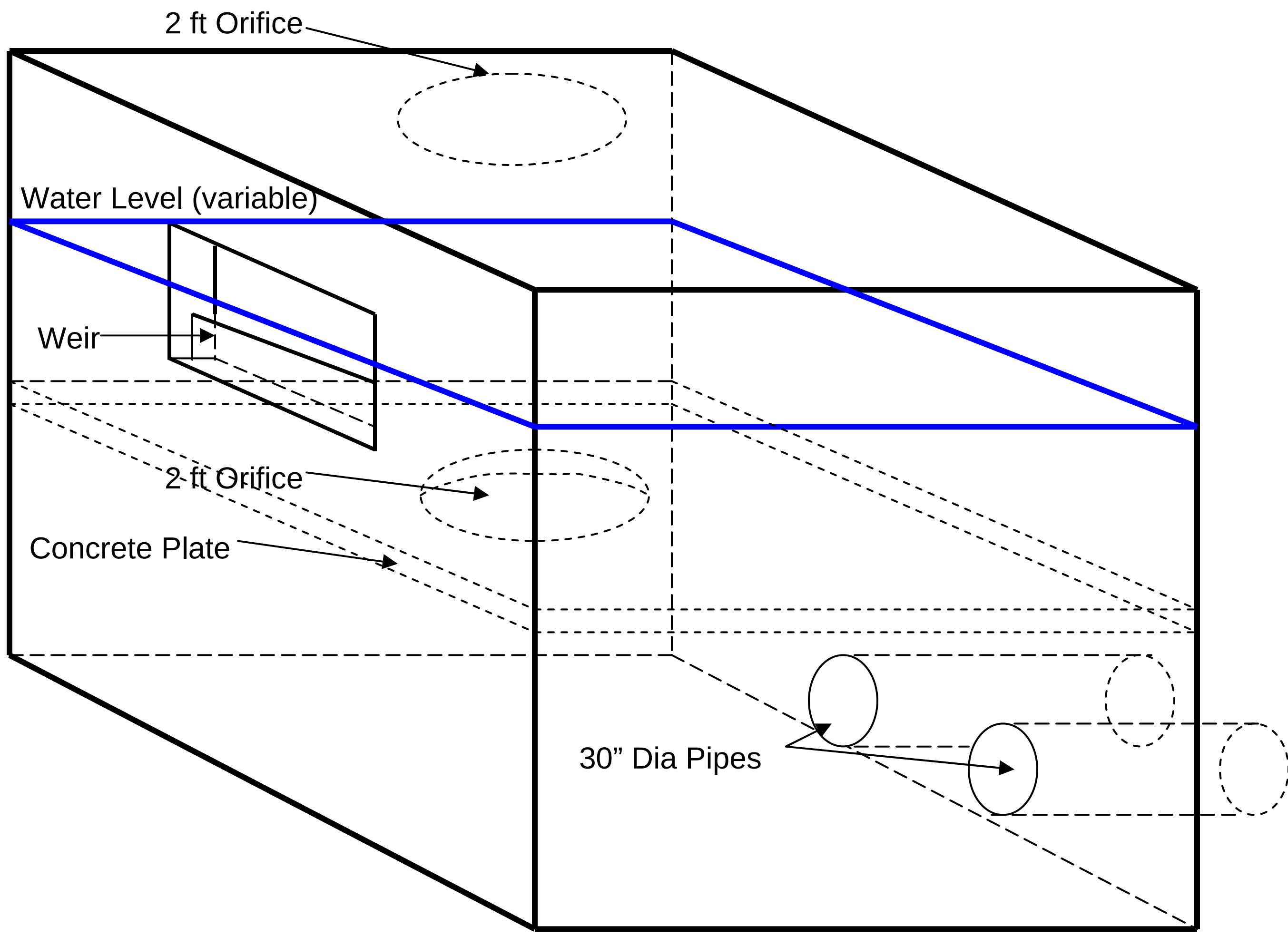


Figure 12: Structure #5 Hydraulic Geometry.

Figure 13: Structure # 5 – Looking North.

Figure 14: Structure #5 – Looking Inside Structure.

4.5 Structure #7 – Coke Plant to Indian Ridge Marsh North

Structure #7 consists of a single 36" diameter corrugated metal pipe (CMP) culvert connecting the Coke Plant to Indian Ridge Marsh North. Stage-discharge relationships were developed for this structure based upon the surveyed geometry shown in Figure 15.

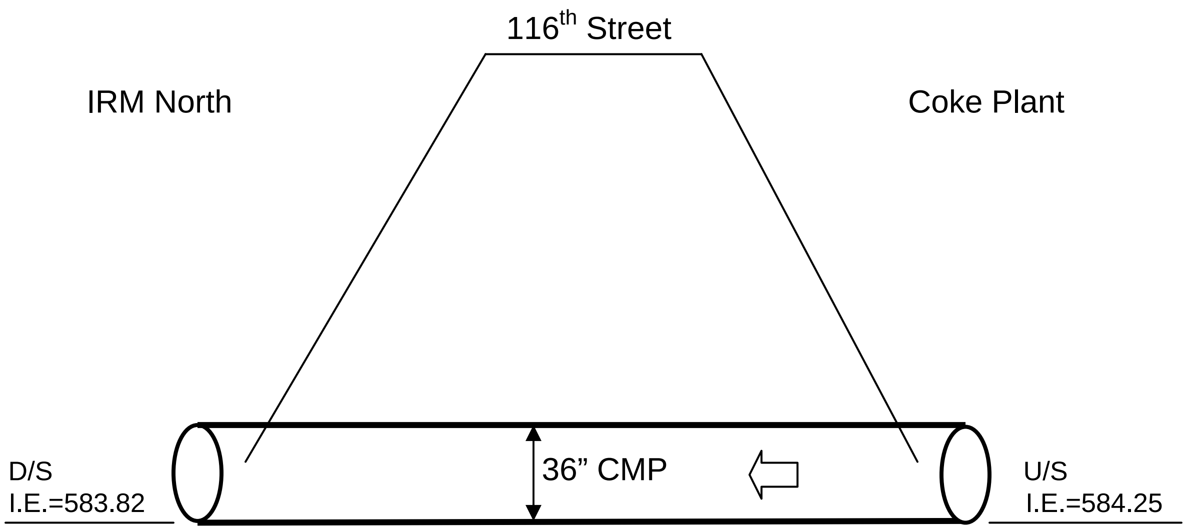


Figure 15: Structure #7 Hydraulic Geometry.

<u>Control Structure Assessment</u>
Function: The control structure appears to function as designed.
Adjustable: The control structure is not adjustable.
Discharge Capacity: Acceptable – The control structure safely releases runoff for the extreme rainfall event at a reasonable drawdown time without overtopping.
Potential for Blockage: The control structure has a low potential for blockage at the inlet and outlet.
Improvement Recommendations: None.
Maintenance Plan: Remove accumulated debris annually.

4.6 Structure #8 – Norfolk Southern Railroad Marsh to Big Marsh

Structure #8 consists of a single 24" diameter culvert connecting the Norfolk Southern Railroad Marsh to Big Marsh. Stage-discharge relationships were developed for this structure based upon the surveyed geometry shown in Figure 16.

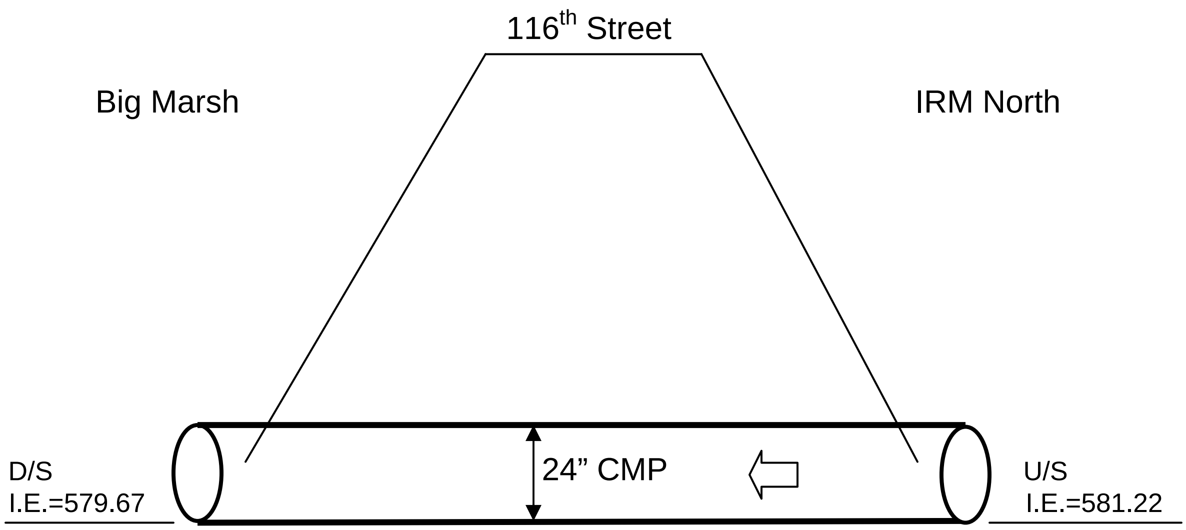


Figure 16: Structure #8 Hydraulic Geometry.

<u>Control Structure Assessment</u>

Function: The control structure appears to function as designed.

Adjustable: The control structure is not adjustable.

Discharge Capacity: Acceptable - Release of runoff from the control structure is retarded by the slow drawdown of Big Marsh. Upon installation of a secondary outlet structure at Big Marsh, this control structure should safely release runoff from the Railroad Marsh for the extreme rainfall event at a reasonable drawdown time without overtopping.

Potential for Blockage: The control structure has a low potential for blockage at the inlet and outlet.

Improvement Recommendations: None.

Maintenance Plan: Remove accumulated debris annually.

4.7 Structure #14 – Coke Plant to Big Marsh

Structure #14 consists of a single 12" diameter culvert that regulates discharge from the Coke Plant to Big Marsh. Stage-discharge relationships were developed for this structure based upon the surveyed geometry shown in Figure 17.

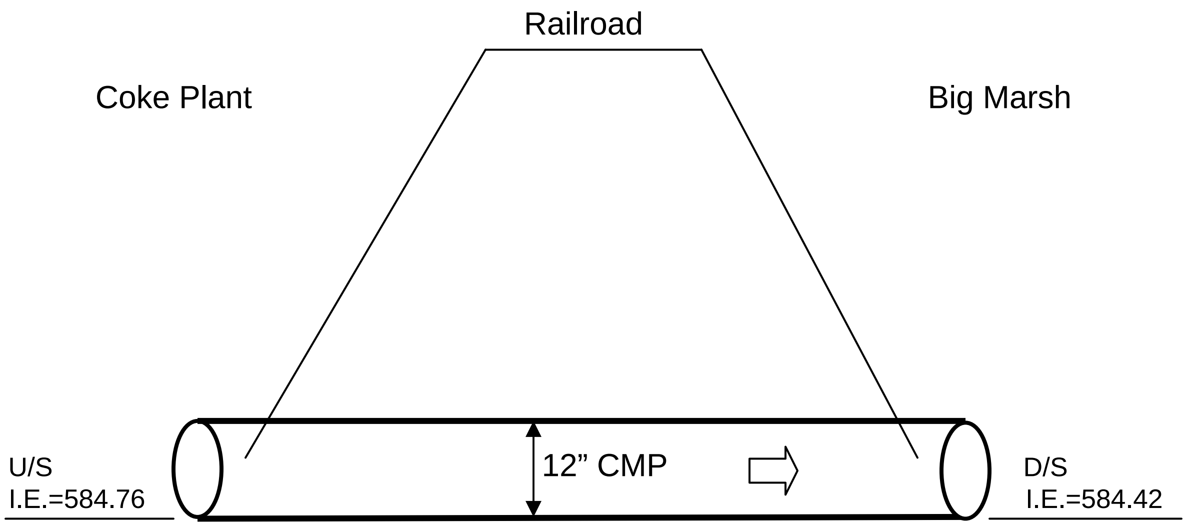
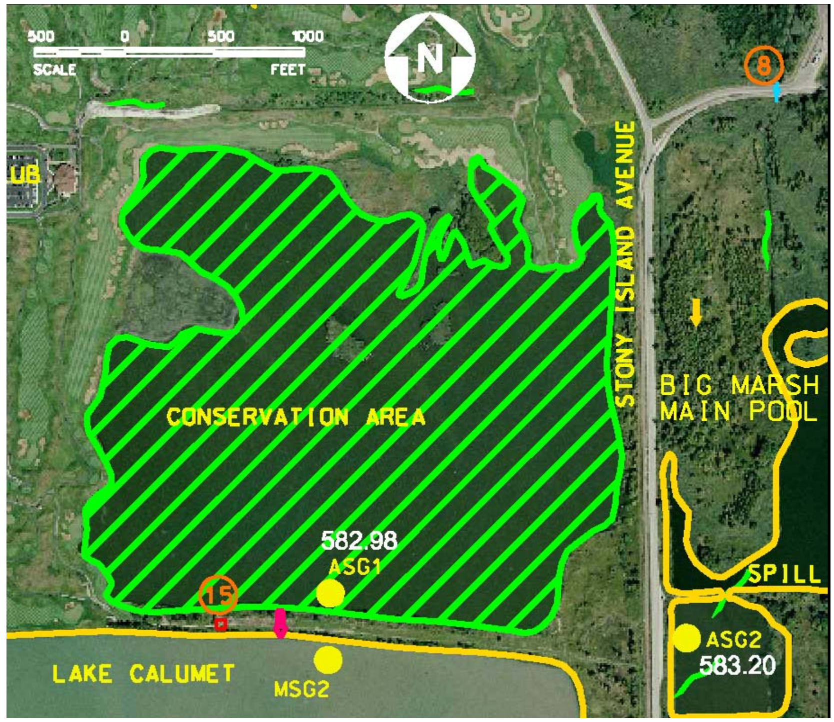


Figure 17: Structure #14 Hydraulic Geometry.

<u>Control Structure Assessment</u>
Function: The control structure appears to function as designed.
Adjustable: The control structure is not adjustable.
Discharge Capacity: Acceptable - The hydrologic assessment indicates that flow from the extreme rainfall event will overtop the railroad embankment. However, this may be due to the conservative estimate of drainage area that is tributary to the Coke Plant wetlands from Task 102. A secondary outlet should not be installed under the railroad unless field monitoring verifies the potential for runoff to overtop the embankment.
Potential for Blockage: The control structure has a low potential for blockage at the inlet and outlet.
Improvement Recommendations: None.
Maintenance Plan: Remove accumulated debris annually.

4.8 Structure #15 – Conservation Area to Lake Calumet

Structure #15 consists of two ductile iron pipe culverts 24" and 18" in diameter, which control discharge from the Conservation Area to Lake Calumet. Stop logs are provided on both pipes for control of upstream water surface elevations.



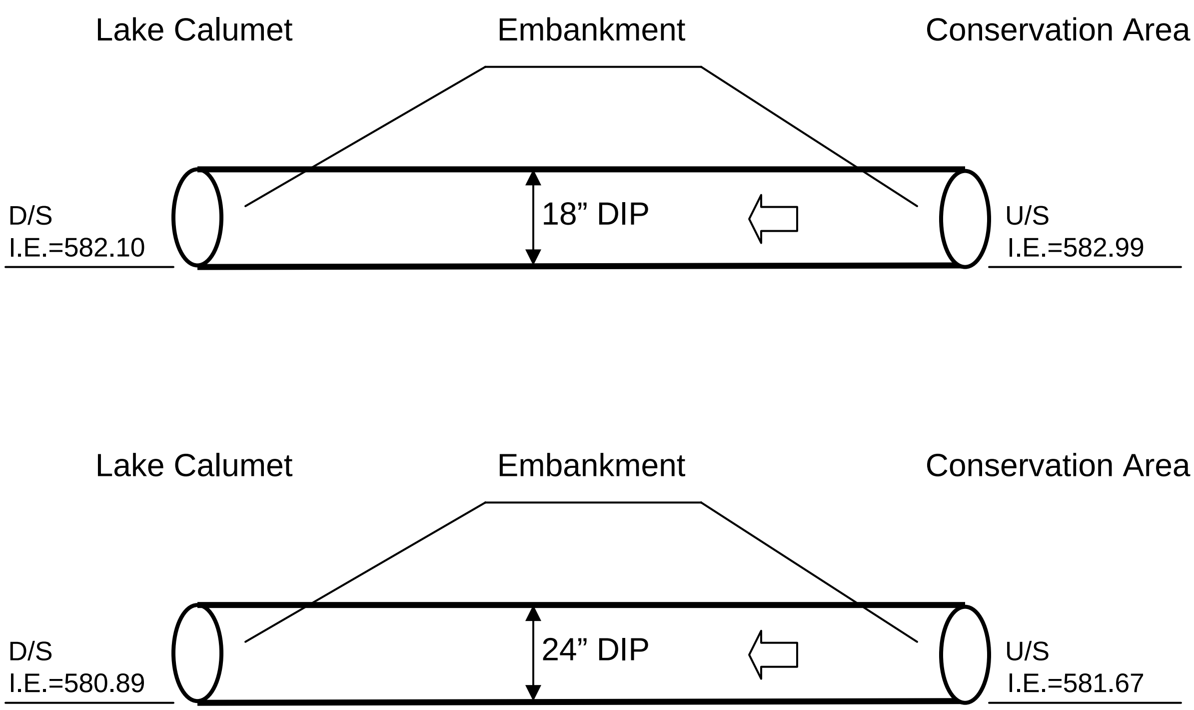


Figure 18: Structure #15 Hydraulic Geometry.

Control Structure Assessment

Function: The control structure appears to function as designed.

Adjustable: The control structure is adjustable by placement of stop logs on both pipes.

Discharge Capacity: Not Acceptable - The control structure requires over 28 days to release runoff for the extreme rainfall event.

Potential for Blockage: The control structure has a low potential for blockage at the inlet and outlet.

Improvement Recommendations:

1. Stabilize inlet and outlet with rip-rap. Engineer's Opinion of Probable Construction Cost = $3,800.
2. Construct secondary outlet for additional stormwater discharge during extreme events. Engineer's Opinion of Probable Construction Cost = $14,000.

Maintenance Plan: Remove accumulated debris annually.

Figure 19: Structure #15 - Looking North.

Figure 20: Structure #15 - Looking South.

Figure 21: Structure #15.

4.9 Structure #17 – Indian Ridge Marsh South to Calumet River

Structure #17 consists of an open channel connecting Indian Ridge Marsh South to the Calumet River.

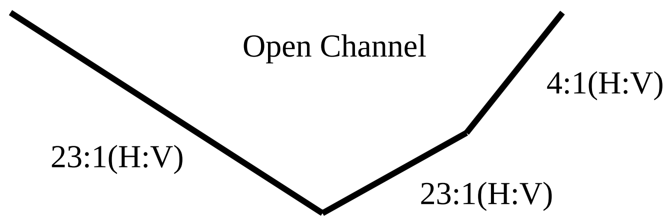


Figure 22: Structure #17 Hydraulic Geometry.

Control Structure Assessment
Function: N/A – No permanent control structure is present.
Adjustable: N/A – No permanent control structure is present.
Discharge Capacity: N/A – No permanent control structure is present.
Potential for Blockage: N/A – No permanent control structure is present.
Improvement Recommendations:

1. Construct concrete weir with stop logs at marsh outlet to control discharge. Stabilize with rip-rap. Engineer's Opinion of Probable Construction Cost = $15,600.

Maintenance Plan: Remove accumulated debris annually.

Figure 23: Structure #17 - Downstream End Looking North.

Figure 24: Structure #17 - Looking South From 122nd Street.

5.0 ASSESSMENT SUMMARY

The assessment of EMA control structures is summarized in Table 2. Improvements shall be implemented as funding is available with priority given to structures that have high blockage potential (North IRM and Big Marsh), inadequate discharge capacity (Big Marsh and Conservation Area), or no functional control structure (Heron Pond and South IRM). All structures shall be maintained at least annually.

Structure #	Functional	Adjustable	Adequate Discharge Capacity	Blockage Potential	Improvement Recommendations	EOPCC*	Priority
#1 – Deadstick Pond Outlet	Y	Y	Y	Low	Clear outfall channel and stabilize with rip-rap	$8,500	
#2 – Heron Pond Outlet	N/A	N/A	Y	Low	Construct concrete weir	$15,600	Y
#3 – IRM North Outlet	Y	N	Y	High	Inspect Culvert	$2,500	Y
					Rehabilitate 24" culvert: Cured-in-Place Liner……… or Pull in Place 20" HDPE	$31,500 $47,500	Y
					Replace manhole with water level control structure	$9,500	Y
					Install beaver leveler	$2,500	
#5 – Big Marsh Outlet	Y	Y	N	High	Construct secondary outlet	$27,000	Y
#7 – Coke Plant to IRM North	Y	N	Y	Low	None	N/A	
#8 – Railroad Marsh to Big Marsh	Y	N	Y	Low	None	N/A	
#14 – Coke Plant to Big Marsh	Y	N	Y	Low	None	N/A	
#15 – Conservation Area Outlet	Y	Y	N	Low	Rip-rap stabilization	$3,800	
					Construct secondary outlet	$14,000	Y
#17 – IRM South Outlet	N/A	N/A	Y	Low	Construct concrete weir	$15,600	Y

Table 2: Control Structure Assessment Summary.

*Costs do not include engineering design or permitting fees.

GLOSSARY

Automatic Staff Gage (ASG) : Apparatus installed to collect sufrace water elevations of water bodies at 15 minute intervals.

Anoxic : Water that contains little to no dissolved oxygen.

Conveyance Capacity : The maximum amount of water that can be transported downstream by a pipe or channel.

Discharge : The rate of water flowing out of a site.

Dredging : Process of removing sediment accumulation from lake and river bottoms.

Equality Formation : Tongues of glacial lake deposits that consist of silts, clays and sands.

Evapotranspiration : Proportion of waterbudget that is returned to the air through evaporation and transpiration (plant uptake).

Glacio-fluvial : Sediment or lithified sequence deposited from meltwater streams flowing from or within glaciers.

Glacio-lacustrine : Sediment or lithified sequence deposited within a glacial lake.

Gradient : Slope of a surface, generally pertaining to groundwater surfaces in these texts.

Headwater : The depth of water at the upstream end of a control structure or pipe.

HEC-RAS : Hydraulic Engineering Center – River Analysis System. A computation program widely used for developing water surface profiles for streams and ditches.

Hummock : Micro-topographic mounds that usually form from soil consolidation and poor surface water drainage.

Hydraulics : The determination of water surface elevations through relationships of flow and physical geography.

Hydrology : The determination of stormwater runoff rates and volumes for a study area based on rainfall data and physical geography.

Hydroperiod : A simulated or measured time duration of water elevations.

Infiltration : The downward movement of water through pores or small openings in soil or rock.

Inudation : Standing surface water.

Manual Staff Gage (MSG) : Apparatus installed within surface water body to visually observe surface water elevations (observations conducted once per month).

*All words are not necessarily referred to in text.

Mottles : Soil discolorations usually caused by chemical interactions between water and chemicals/minerals within the soil.

Orifice : A control structure ; a small opening, usually in a metal plate or wall, used to restrict the amount of water discharging from a site.

Permeability : The capacity of rock or sediment for transmitting fluid flow under unequal pressure.

Piezometer : A well installed into the ground that penetrates an underground water bearing unit – in which the groundwater elevation can be monitored along with its associated head.

Reduction : The removal of oxygen from soil or water.

Slag : Iron and steel manufacturing by-product. Waste material resulting from the impurities of mineral ore and ash from coke.

Stage-Discharge Rating Curve : A curve illustrating discharge rates for water leaving a site at given stages or elevations.

Seep : A location where groundwater discharges to the surface.

Stop Logs : Removable planks used to block water from leaving a site. The top stop log will set the normal pool level for a basin.

Stormwater Control Structure : A device, usually an orifice or a weir, used to regulate water discharge from a site.

Stratigraphy : The arrangement of rock and or soil types in chronologic order of sequence.

Submerged : Located entirely underwater.

Tailwater : The depth of water at the downstream end of a control structure or pipe.

Watershed : The area the drains to a similar point location or water body.

Weir : A control structure that prevents discharge from a site until the headwater exceeds the overflow elevation.

*All words are not necessarily referred to in text.

APPENDIX I:

HYDROLOGIC ANALYSES

SWMM Version 9.12 Copyright (c) XP Software	**Lake Calumet Area - Deadstick Pond** **Hydraulic Analysis** Licenced To: V3 [42-910-0200]	11/22/05 Page 1/1

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\Dead\model.XP

          *===============================================*
          |                    xpswmm                     |
          |     Storm and Wastewater Management Model     |
          |           Interface Version: 10.0             |
          |              Engine Version: 10.03            |
          |===============================================|
          |                                               |
          |                 Developed by                  |
          |                                               |
          |                 XP Software                   |
          |                                               |
          |===============================================|
          |      XP Software       February, 2006         |
          |       Data File Version --->    11.7          |
          |       Serial Number: 42-1000-0200             |
          |               V3 Consultants                  |
          *===============================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 JIN.US
 Output File to Layer #     1 E:\1998\98216\98216HMP\xp\dead\template.int

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                      0.0000        1        2
 $perv                              0.0000        0        4
 $oldegg                            0.0000        0        7
 $as                                0.0000        0       11
 $noflat                            0.0000        0       21
 $oldomega                          0.0000        0       24
 $oldvol                            0.0000        1       28
 $implicit                          0.0000        1       29
 $oldhot                            0.0000        1       31
 $oldscs                            0.0000        0       33
 $flood                             0.0000        1       40
 $nokeys                            0.0000        0       42
 $pzero                             0.0000        0       55
 $oldvol2                           0.0000        2       59
 $storage2                          0.0000        3       62
 $oldhot1                           0.0000        1       63
 $pumpwt                            0.0000        1       70
 $ecloss                            0.0000        1       77
 $exout                             0.0000        0       97
 $spatial = 0.90                    0.9000        5      124
 $djref = -1.0                     -0.1000        3      143
 $weirlen = 50                     50.0000        1      153
 $oldbnd                            0.0000        1      154
 $nogrelev                          0.0000        1      161
 $ncmid                             0.0000        0      164
 $new_nl_97                         0.0000        2      290
 $best97                            0.0000        1      294
 $newbound                          0.0000        1      295
 USE_ORF_EQN                        0.0000        1      304
 $q_tol = 0.01                      0.0001        1      316
 $new_storage                       0.0000        1      322
 $old_iteration                     0.0000        1      333
 $minlen=30.0                      30.0000        1      346
 $review_elevation                  0.0000        1      383
 $use_half_volume                   0.0000        1      385
 $min_ts = 0.5                      0.5000        1      407
 $design_restart = on               0.0000        1      412
 $zero_value=1.e-05                 0.0000        1      415
 $relax_depth = on                  0.0000        1      427
 $saveallpts = on                   0.0000        1      434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
 | by the model for this simulation.                         |
 *===========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     1
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ)............     0
  Runoff Land Uses per Subcatchment (NLU)............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........     0
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..     1
  Number of Pumps in Extran (NEP).....................     0
  Number of Orifices in Extran (NEO)..................     0
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
  Number of Extran Weirs (NEW)........................     0
  Number of scs hydrograph points.....................  1825
  Number of Extran printout locations (NPO)...........     0
  Number of Tide elements in Extran (NTE).............     0
  Number of Natural channels (NNC)....................     0
  Number of Storage junctions in Extran (NVSE)........     0
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     0
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)...............     1
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............     1
  Number of Plugs in a Storage Treatment Unit.........     1


 #######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated January,2005 by XP Software         #

 *===========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                 |
 |  These are the more important tables in the output file. |
 |  You can use your editor to find the table numbers,       |
 |  for example: search for Table R3 to check continuity.    |
 |  This output file can be imported into a Word Processor   |
 |  and printed on US letter or A4 paper using portrait      |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                           |
 | Table R1  - Physical Hydrology Data                       |
 | Table R2  - Infiltration data                             |
 | Table R3  - Raingage and Infiltration Database Names      |
 | Table R4  - Groundwater Data                              |
 | Table R5  - Continuity Check for Surface Water            |
 | Table R6  - Continuity Check for Channels/Pipes           |
 | Table R7  - Continuity Check for Subsurface Water         |
 | Table R8  - Infiltration/Inflow Continuity Check          |
 | Table R9  - Summary Statistics for Subcatchments          |
 | Table R10 - Sensitivity anlysis for Subcatchments         |
 *===========================================================*

                    Lake Calumet Area - Deadstick Pond
                    SCS Hydrology - Huff Dist - 100YR - 24HR
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................            0
 Number of rain gages - NRGAG....................            1
 Quality is not simulated - KWALTY...............            0
 Read evaporation data on line(s) F1 (F2) - IVAP..           1
 Hour of day at start of storm - NHR.............            0
 Minute of hour at start of storm - NMN..........            0
 Time TZERO at start of storm (hours)............        0.000
 Use U.S. Customary units for most I/O - METRIC...           0
 Runoff input print control...                               0
 Runoff graph plot control....                               1
 Runoff output print control..                               0
 Limit number of groundwater convergence messages to     10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)         0

 Print land use load percentages -LANDUPR (0=no, 1=yes)      0
 Month, day, year of start of storm is:              1/ 1/2000
 Wet time step length (seconds).......                    60.0
 Dry time step length (seconds).......                 86400.0
 Wet/Dry time step length (seconds)...                    60.0
 Simulation length is......                               30.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ............................................  0.01000
```

```
Raingage #...............................          1
KTYPE  - Rainfall input type.............          0
NHISTO - Total number of rainfall values..        20
KINC   - Rainfall values(pairs) per line..        10
KPRINT - Print rainfall(0-Yes,1-No).......         0
KTIME  - Precipitation time units
0 --> Minutes  1 --> Hours................         0
KPREP  - Precipitation unit type
0 --> Intensity  1 --> Volume............          1
KTHIS - Variable rainfall intervals
0 --> No, > 1 --> Yes.....................         0
THISTO - Rainfall time interval...........     72.00
TZRAIN - Starting time(KTIME units).......      0.00
```

```
######################################
# Rainfall input summary from Runoff #
######################################
```

Total rainfall for gage #   1 is   7.5800 inches

```
#############################
#        Data Group F1      #
# Evaporation Rate (in/day) #
#############################
```

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV	DEC.
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
###################################################
#  Table R1.  S U B C A T C H M E N T   D A T A   #
#             Physical Hydrology Data             #
###################################################
```

Subcatchment Number	Name	Channel or inlet	Width (ft)	Area (ac)	Per-cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs -sion Storge Imprv	Deprs -sion Strge Perv	Prcnt Zero Deten -tion
1	DStick#1	DStick	100.00	90.000	0.00	0.010	0.020	0.020	0.000	0.000	0.00

```
#######################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                              #
#                     Infiltration or Time of Concentration Data                                      #
#                                                                                                     #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)         Infl #3(#7)              Infl #4(#8)  #
# SCS                   ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction  #
# SBUH                  ->   Comp CN          Time Conc                  N/A                      N/A  #
# Green Ampt            ->   Suction          Hydr Cond           Initial MD                      N/A  #
# Horton                ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume  #
# Proportional          ->  Constant                N/A                  N/A                      N/A  #
# Initial/Cont Loss     ->   Initial         Continuing                  N/A                      N/A  #
# Initial/Proportional ->   Initial           Constant                  N/A                      N/A  #
# Laurenson Parameters ->   B Value       Pervious "n"      Impervious Cont                 Exponent  #
# Rational Formula      -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance  #
#                                 (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)             #
#                     Rational Formula Tc Method: 1 = Constant                                        #
#                                                 2 = Friend's Equation                               #
#                                                 3 = Kinematic Wave                                  #
#                                                 4 = Alameda Method                                  #
#                                                 5 = Izzard's Formula                                #
#                                                 6 = Kerby's Equation                                #
#                                                 7 = Kirpich's Equation                              #
#                                                 8 = Bransby Williams Equation                       #
#                                                 9 = Federal Aviation Authority Equation             #
#######################################################################################################
```

Subcatchment Number	Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	DStick#1	92.0000	0.5000	484.0000	0.2000				

```
############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################
```

Subcatchment Number	Name	Gage No	Infiltration Type	Routing Type	Rainfall Database Name	Infiltration Database Name
1	DStick#1	1	SCS Method	SCS curvilinear	NE IL 100yr 24hr	

```
Total Number of Subcatchments...            1
Total Tributary Area (acres)....        90.00
Impervious Area (acres).........         0.00
Pervious Area (acres)...........        90.00
Total Width (feet)..............       100.00
Impervious Area (%)............          0.00
```

```
 ###################################################
 #         S U B C A T C H M E N T   D A T A       #
 #   Default, Ratio values for subcatchment data   #
 #   Used with the calibrate node in the runoff.   #
 # 1 - width     2 - area       3 - impervious %   #
 # 4 - slope     5 - imp "n"    6 - perv "n"       #
 # 7 - imp ds    8 - perv ds    9 - 1st infil      #
 #10 - 2nd infil              11 - 3rd infil      #
 ###################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio      1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************


    Inlet
DStick         No Tributary Channel/Pipes
               Tributary Subareas........ DStick#1


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


************************************************
*  Quality Simulation not included in this run *
************************************************




***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....        1   *
***************************************************

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


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

Final Date (Mo/Day/Year)   =            1/ 2/2000
Total number of time steps =                 1800
Final Julian Date          =              2000002
Final time of day          =               21600. seconds.
Final time of day          =                 6.00   hours.
Final running time         =              30.0000   hours.
Final running time         =               1.2500    days.

****************************************************
*     Extrapolation Summary for Watersheds         *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments.       *
* # Steps ==> Total Number of Extrapolated Steps   *
* # Calls ==> Total Number of OVERLND Calls        *
****************************************************

Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
-------------  -------  -------- -------------  -------  --------
DStick#1            0         0


#########################################################
# Rainfall input summary from Runoff Continuity Check   #
#########################################################

 Total rainfall read for gage #         1 is       7.5800 in
 Total rainfall duration for gage #     1 is      1440.00 minutes

 ************************************************************
 * Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
 *       Any continuity error can be fixed by lowering the  *
 *       wet and transition time step. The transition time  *
 *       should not be much greater than the wet time step. *
 ************************************************************
                                                            Inches over
                                                cubic feet    Total Basin
 Total Precipitation (Rain plus Snow)          2.476386E+06      7.580
 Total Infiltration                            3.110539E+05      0.952
 Total Evaporation                             0.000000E+00      0.000
 Surface Runoff from Watersheds                2.177840E+06      6.666
 Total Water remaining in Surface Storage      0.000000E+00      0.000
 Infiltration over the Pervious Area...        3.110539E+05      0.952
                      --------
 Infiltration + Evaporation +
```

```
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........               2.488894E+06      7.618
Total Precipitation + Initial Storage.               2.476386E+06      7.580


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  *
***************************************
Percent Continuity Error..............                              -0.5051


****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                                Inches over
                                                      cubic feet    Total Basin
Initial Channel/Pipe Storage................         0.000000E+00      0.000
Final Channel/Pipe Storage..................         0.000000E+00      0.000
Surface Runoff from Watersheds..............         2.177840E+06      6.666
Groundwater Subsurface Inflow or Diversion..         0.000000E+00      0.000
Evaporation Loss from Channels..............         0.000000E+00      0.000
Groundwater Flow Diverted Out of Network....         0.000000E+00      0.000
Channel/Pipe/Inlet Outflow..................         2.177840E+06      6.666
Initial Storage + Inflow....................         2.177840E+06      6.666
Final Storage + Outflow + Diverted GW.......         2.177840E+06      6.666
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error....................                       0.0000

        ##################################################
        # Table R9. Summary Statistics for Subcatchments #
        ##################################################

Note: Total Runoff Depth includes pervious & impervious area
      Pervious and Impervious Runoff Depth is only the runoff from those two areas.


Subcatchment...........         DStick#1
Area (acres)...........         90.00000
Percent Impervious.....          0.00000
Total Rainfall (in)....          7.58000
Max Intensity (in/hr)..          0.82500
Pervious Area
-------------
Total Runoff Depth (in)          6.66618
Total Losses (in)......          0.91382
Remaining Depth (in)...          0.00000
Peak Runoff Rate (cfs).         73.47870
Total Impervious Area
---------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area with depression storage
---------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area without depression storage
------------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Total Area
----------
Total Runoff Depth (in)          6.66618
Peak Runoff Rate (cfs).         73.47870
Unit Runoff (in/hr)....          0.81643
Rational Formula
----------------
Pervious Tc. (mins)....          0.00000
Perv. Intensity (in/hr)          0.00000
Pervious C ............          0.00000
Impervious Tc. (mins)..          0.00000
Imp. Intensity (in/hr).          0.00000
Impervious C ..........          0.00000
Partial Area (Ha)......          0.00000
Partial Area Tc........          0.00000
Partial Area Intensity.          0.00000

1
         1.000 |=========|=========|=========|=========|=========|=========|=========|=========|=========|=========|
```

```
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                   ####                                                            |
         0.800 =                                   #  #                                                            =
               |                                   #  #                                                            |
               |                                ####  #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
         0.600 =                                #     #                                                            =
               |                                #     #                                                            |
               |                                #     ####                                                         |
 RAINFALL      |                                #        #                                                         |
               |                                #        #                                                         |
    IN         |                                #        #                                                         |
               |                                #        #                                                         |
  IN/HR        |                                #        #                                                         |
               |                             ####        #                                                         |
               |                             #           #                                                         |
         0.400 =                             #           #                                                         =
               |                          ####           ####                                                      |
               |                          #                 #                                                      |
               |                          #                 #                                                      |
               |                       ####                 #                                                      |
               |                       #                    #                                                      |
               |                       #                    #                                                      |
               |              ##########                    ####                                                   |
               |              #                                #                                                   |
               |              #                                #                                                   |
         0.200 ####  ##########                                #  ####  ####                                       =
               #  ####                                         ####  #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     ####  #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
         0.000 #=========|=========|=========|=========|=========|=========#=========|=========|=========|=========|
              0.0       4.0       8.0      12.0      16.0      20.0      24.0      28.0      32.0      36.0      40.0

                LOCATION NO. : 1                   TIME IN HOURS

                 RAINFALL HYETOGRAPH
```

RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: FLOW SUM

RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: INFILTRA

```
===> Runoff simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\Dead\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\Dead\model-r.out

*=============================================================*
|             SWMM Simulation Date and Time Summary           |
*=============================================================*
| Starting Date... August     18, 2006  Time...    9:42:38:63  |
|   Ending Date... August     18, 2006  Time...    9:42:45:43  |
|  Elapsed Time...    0.11333 minutes or      6.80000 seconds  |
*=============================================================*
```

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\Dead\model.XP

          *==============================================*
          |                    xpswmm                    |
          |     Storm and Wastewater Management Model    |
          |           Interface Version: 10.0            |
          |              Engine Version: 10.03           |
          |==============================================|
          |                                              |
          |                  Developed by                |
          |                                              |
          |                  XP Software                 |
          |                                              |
          |==============================================|
          |      XP Software       February, 2006        |
          |       Data File Version --->    11.7         |
          |       Serial Number: 42-1000-0200            |
          |               V3 Consultants                 |
          *==============================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 E:\1998\98216\98216HMP\xp\dead\template.INT
 Output File to Layer #     1 JOT.US

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                        0.0000         1         2
 $perv                                0.0000         0         4
 $oldegg                              0.0000         0         7
 $as                                  0.0000         0        11
 $noflat                              0.0000         0        21
 $oldomega                            0.0000         0        24
 $oldvol                              0.0000         1        28
 $implicit                            0.0000         1        29
 $oldhot                              0.0000         1        31
 $oldscs                              0.0000         0        33
 $flood                               0.0000         1        40
 $nokeys                              0.0000         0        42
 $pzero                               0.0000         0        55
 $oldvol2                             0.0000         2        59
 $storage2                            0.0000         3        62
 $oldhot1                             0.0000         1        63
 $pumpwt                              0.0000         1        70
 $ecloss                              0.0000         1        77
 $exout                               0.0000         0        97
 $spatial = 0.90                      0.9000         5       124
 $djref = -1.0                       -0.1000         3       143
 $weirlen = 50                       50.0000         1       153
 $oldbnd                              0.0000         1       154
 $nogrelev                            0.0000         1       161
 $ncmid                               0.0000         0       164
 $new_nl_97                           0.0000         2       290
 $best97                              0.0000         1       294
 $newbound                            0.0000         1       295
 USE_ORF_EQN                          0.0000         1       304
 $q_tol = 0.01                        0.0001         1       316
 $new_storage                         0.0000         1       322
 $old_iteration                       0.0000         1       333
 $minlen=30.0                        30.0000         1       346
 $review_elevation                    0.0000         1       383
 $use_half_volume                     0.0000         1       385
 $min_ts = 0.5                        0.5000         1       407
 $design_restart = on                 0.0000         1       412
 $zero_value=1.e-05                   0.0000         1       415
 $relax_depth = on                    0.0000         1       427
 $saveallpts = on                     0.0000         1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
| by the model for this simulation.                        |
*==========================================================*

 Number of Subcatchments in the Runoff Block (NW)....     0
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ).............     0
 Runoff Land Uses per Subcatchment (NLU).............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........     2
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     2
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     1
 Number of Extran Weirs (NEW)........................     0
 Number of scs hydrograph points.....................     1
 Number of Extran printout locations (NPO)...........     0
 Number of Tide elements in Extran (NTE).............     1
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     1
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     3
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     2
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     1
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     2
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the HYDRAULIC Layer(Block) of SWMM #
#    Last Updated June,2005 by XP Software            #

    Lake Calumet Area - Deadstick Pond
    Hydraulic Analysis


*===========================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE               |
|   These are the more important tables in the output file. |
|   You can use your editor to find the table numbers,      |
|   for example: search for Table E20 to check continuity.  |
|   This output file can be imported into a Word Processor  |
|   and printed on US letter or A4 paper using portrait     |
|   mode, courier font, a size of 8 pt. and margins of 0.75 |
|                                                           |
| Table E1   - Basic Conduit Data                           |
| Table E2   - Conduit Factor Data                          |
| Table E3a  - Junction Data                                |
| Table E3b  - Junction Data                                |
| Table E4   - Conduit Connectivity Data                    |
| Table E4a  - Dry Weather Flow Data                        |
| Table E4b  - Real Time Control Data                       |
| Table E5   - Junction Time Step Limitation Summary        |
| Table E5a  - Conduit Explicit Condition Summary           |
| Table E6   - Final Model Condition                        |
| Table E7   - Iteration Summary                            |
| Table E8   - Junction Time Step Limitation Summary        |
| Table E9   - Junction  Summary  Statistics                |
| Table E10  - Conduit   Summary  Statistics                |
| Table E11  - Area assumptions used in the analysis        |
| Table E12  - Mean conduit information                     |
| Table E13  - Channel losses(H) and culvert info           |
| Table E13a - Culvert Analysis Classification              |
| Table E14  - Natural Channel Overbank Flow Information    |
| Table E14a - Natural Channel Encroachment Information     |
| Table E14b - Floodplain Mapping                           |
| Table E15  - Spreadsheet Info List                        |
| Table E15a - Spreadsheet Reach List                       |
| Table E16  - New Conduit Output Section                   |
| Table E17  - Pump Operation                               |
| Table E18  - Junction Continuity Error                    |
| Table E19  - Junction Inflow & Outflow Listing            |
| Table E20  - Junction Flooding and Volume List            |
| Table E21  - Continuity balance at simulation end         |
| Table E22  - Model Judgement Section                      |
*==========================================================*

Time Control from Hydraulics Job Control
Year.........    2000 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................    241920
Length of integration step is......     10.00 seconds
```

```
Simulation length..................    672.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........         1
Intermediate printout intervals of.       500 cycles
Intermediate printout intervals of.     83.33 minutes
Summary printout intervals of......       500 cycles
Summary printout time interval of..     83.33 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      0.00 hours

Iteration variables: Flow Tolerance.   0.00010
                     Head Tolerance.   0.00005
    Minimum depth (m or ft).........   0.00001
    Underrelaxation parameter.......   0.85000
    Time weighting parameter........   0.85000
    Conduit roughness factor........   1.00000
    Flow adjustment factor..........   1.00000
    Initial Condition Smoothing.....         0
    Courant Time Step Factor........   1.00000
    Default Expansion/Contraction K.   0.00000
    Default Entrance/Exit K.........   0.00000
    Routing Method..................   EPA-SWMM Enhanced Explicit (ISOL=1)
Default surface area of junctions...     13.00 square feet.
Minimum Junction/Conduit Depth......   0.00001 feet.
Ponding Area Coefficient............   5000.00
Ponding Area Exponent...............    1.0000
Minimum Orifice Length..............    100.00 feet.
NJSW input hydrograph junctions.....     0
     or user defined hydrographs....

 =====================================================
 Input Information from Internal Rating Curve Str1.1
 =====================================================
```

Point No.	Data Column # 1	Data Column # 2	Data Column # 3	Data Column # 4
1	0.000	0.000	0.000	0.000
2	0.250	0.000	1.000	0.000
3	0.390	0.000	2.000	0.000
4	0.500	0.000	3.000	0.000
5	0.590	0.000	4.000	0.000
6	0.680	0.000	5.000	0.000
7	0.750	0.000	6.000	0.000
8	1.840	0.000	7.000	0.000
9	2.860	0.000	9.000	0.000
10	3.270	0.000	9.300	0.000
11	3.720	0.000	24.700	0.000

```
*=================================================*
|          Table E1 - Conduit Data                |
*=================================================*
```

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes
1	Str1.1	100.0000	Closd Cnd	0.0000	0.0140	3.7200	3.7200	

```
Total length of all conduits ....       100.0000 feet

*==================================================*
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length  |
| in the output file all it means is that the       |
| program will lower the internal time step to      |
| satisfy this condition (explicit condition).      |
| You control the actual internal time step by      |
| using the minimum courant time step factor in the |
| HYDRAULICS job control.  The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection.    |
| You have further control by using the modify      |
| conduit option in the HYDRAULICS Job Control.     |
*==================================================*
```

Conduit Name	Courant Ratio
Str1.1	0.00

```
*==================*
|  Conduit Volume  |
*==================*

Full pipe or full open conduit volume
Input full depth volume............    0.0000E+00 cubic feet


*==================================================*
|           Table E3a - Junction Data              |
*==================================================*

Inp         Junction     Ground     Crown    Invert    Qinst  Initial  Interface
```

Num	Name	Elevation	Elevation	Elevation	cfs	Depth-ft	Flow (%)
1	DStick	600.0000	589.0000	585.2800	0.0000	0.0000	100.0000
2	DSOut	600.0000	589.0000	581.0000	0.0000	0.0000	100.0000

Table E3b - Junction Data

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Pavement Slope
1	DStick	123.8888	392.2867	No Ponding	Normal		0	0.0000
2	DSOut	123.6240	373.9254	No Ponding	Normal		0	0.0000

Table E4 - Conduit Connectivity

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	Str1.1	DStick	DSOut	585.2800	585.2800	No Design

Storage Junction Data

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)	DEPTH STARTS FROM
DStick	Stage/Area	1.132560E+06	16.671283E+06	600.0000	Node Invert

Variable storage data for node | DStick

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	585.2800	0.0000	1132560.000	0.0000	26.0000	0.0000
2	585.4050	0.1250	1132560.000	141570.0000	26.0000	3.2500
3	585.5300	0.2500	1132560.000	283140.0000	26.0000	6.5000
4	585.6550	0.3750	1132560.000	424710.0000	26.0000	9.7500
5	585.7800	0.5000	1132560.000	566280.0000	26.0000	13.0000
6	585.9050	0.6250	1132560.000	707850.0000	26.0000	16.2500
7	586.0300	0.7500	1132560.000	849420.0000	26.0000	19.5000
8	586.1550	0.8750	1132560.000	990990.0000	26.0000	22.7500
9	586.2800	1.0000	1132560.000	1.132560E+06	26.0000	26.0000
10	586.7800	1.5000	1132560.000	1.698840E+06	26.0000	39.0000
11	587.2800	2.0000	1132560.000	2.265120E+06	26.0000	52.0000
12	587.7800	2.5000	1132560.000	2.831400E+06	26.0000	65.0000
13	588.2800	3.0000	1132560.000	3.397680E+06	26.0000	78.0000
14	588.7800	3.5000	1132560.000	3.963960E+06	26.0000	91.0000
15	589.2800	4.0000	1132560.000	4.530240E+06	26.0000	104.0000
16	589.7800	4.5000	1132560.000	5.096520E+06	26.0000	117.0000
17	590.2800	5.0000	1132560.000	5.662800E+06	26.0000	130.0000
18	600.0000	14.7200	1132560.000	16.671283E+06	26.0000	382.7200

FREE OUTFALL DATA (DATA GROUP I1)
BOUNDARY CONDITION ON DATA GROUP J1

Outfall at Junction....DSOut has boundary condition number... 1

INTERNAL CONNECTIVITY INFORMATION

CONDUIT	JUNCTION	JUNCTION
FREE # 1	DSOut	BOUNDARY

Boundary Condition Information
Data Groups J1-J4

BC NUMBER.. 1 Control water surface elevation is.. 581.00 feet.

###
Header information from interface file:
###

Title from first computational layer:
Lake Calumet Area - Deadstick Pond
SCS Hydrology - Huff Dist - 100YR - 24HR

```
Title from immediately preceding computational layer
Lake Calumet Area - Deadstick Pond
SCS Hydrology - Huff Dist - 100YR - 24HR

Name of preceding layer:................        Runoff Layer
Initial Julian date (IDATEZ)......................   2000001
Initial time of day in seconds (TZERO)...........       0.0
No. Transfered input locations....................         1
No. Transfered pollutants.........................         0
Size of total catchment area (acres).............     90.00

#################################################
# Element numbers of interface inlet locations: #
#################################################

DStick

Conversion factor to cfs for flow units on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was.. 2000001    0.0000 hours
Start date/time of the simulation was.. 2000001    0.0000 hours
Same date/time found in interface file and model

*===================================================*
|             XP Note Field Summary                 |
*===================================================*


###################################################
#           Surcharge Iteration Summary           #
###################################################

Maximum number of iterations in a time step.....        1
Total number of iterations in the simulation....   483840
Average number of iterations per time step......     2.00
Surcharge iterations during the simulation......        0
Maximum surcharge flow error during simulation.. 0.00E+00 cfs
Total number of time steps during simulation....   241920


***************************************************
*         CONDUIT COURANT CONDITION SUMMARY       *
* TIME IN MINUTES DELT > COURANT TIME STEP        *
***************************************************
* SEE BELOW FOR EXPLANATION OF COURANT TIME STEP. *
***************************************************

 CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)CONDUIT #  TIME(MN)
 ---------  --------  ---------  --------  ---------  -----------------  --------
Str1.1          0.00

************************************************
*         CONDUIT COURANT CONDITION SUMMARY    *
************************************************
* COURANT   =            CONDUIT LENGTH        *
* TIME STEP = -------------------------------- *
*             VELOCITY + SQRT(GRVT*AREA/WIDTH) *
************************************************
* AVERAGE COURANT CONDITION TIME STEP(SECONDS) *
************************************************

 CONDUIT # TIME(SEC)  CONDUIT # TIME(SEC)  CONDUIT # TIME(SEC)CONDUIT # TIME(SEC)
 ---------  --------  ---------  --------  ---------  -----------------  --------
Str1.1         10.00

*=====================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS       |
| The Maximum area is only the area of the node, it   |
| does not include the area of the surrounding conduits|
*=====================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr. Min.	Feet of Surcharge at Max Elevation	Freeboard of node feet	Maximum Junction Area ft^2	Maximum Gutter Depth feet	Maximum Gutter Width feet	Maximum Gutter Velocity ft/s
DStick	600.0000	589.0000	586.9209	24 28	0.0000	13.0791	1132573.0	0.0000	0.0000	0.0000
DSOut	600.0000	589.0000	584.7200	0 57	0.0000	15.2800	13.0000	0.0000	0.0000	0.0000

```
*=====================================================*
|        Table E10 - CONDUIT SUMMARY STATISTICS       |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the  |
| downstream boundary conditions.                     |
|                                                     |
| * denotes an open conduit that has been overtopped  |
|   this is a potential source of severe errors       |
*=====================================================*

                          Conduit  Maximum  Maximum    Time      Maximum    Time   Ratio of    Maximum Water      Ratio
```

Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Vertical Depth (in)	Computed Flow (cfs)	of Occurence Hr.	of Occurence Min.	Computed Velocity (ft/s)	of Occurence Hr.	of Occurence Min.	Max. to Design Flow	Elev at Pipe Ends Upstream (ft)	Elev at Pipe Ends Dwnstrm (ft)	d/D US	d/D DS
Str1.1	0.0000	0.0000	44.6400	6.8173	24	28	0.0000	0	0	0.0000	586.9209	584.7200	0.441	-.151
FREE # 1	Undefnd	Undefnd	Undefn	6.8173	24	28								

```
*==================================================*
| Table E11.  Area assumptions used in the analysis|
| Subcritical and Critical flow assumptions from   |
|    Subroutine Head.  See Figure 17-1 in the      |
|         manual for further information.          |
*==================================================*
```

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
Str1.1	80640.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

```
*===========================================*
| Table E12. Mean Conduit Flow Information  |
*===========================================*
```

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
Str1.1	0.9001	2177546.7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FREE # 1	0.9001	2177546.7						

```
*=============================================================*
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn).          |
| Use this section for culvert comparisons                    |
*=============================================================*
```

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
Str1.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow

```
*=======================================================*
| Table E13a. CULVERT ANALYSIS CLASSIFICATION,          |
| and the time the culvert was in a particular          |
| classification during the simulation.  The time is   |
| in minutes.  The Dynamic Wave Equation is used for    |
| all conduit analysis but the culvert flow classification |
| condition is based on the HW and TW depths.           |
*=======================================================*
```

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
Str1.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None

```
*====================================*
|    Kinematic Wave Approximations    |
|  Time in Minutes for Each Condition |
*====================================*
```

Conduit Name	Duration of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
Str1.1	0.0000	0.0000	0.0000	0.0000

```
*=========================================================*
|     Table E15 - SPREADSHEET INFO LIST                   |
| Conduit Flow and Junction Depth Information for use in  |
| spreadsheets.  The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the        |
| maximum of a subset of all the time steps in the run.   |
| Note: These flows are only the flows in a single barrel.|
*=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Str1.1	6.8173	2177546.702	0.0000	0.0000	##	DStick	585.2800	586.9209
FREE # 1	6.8173	2177546.702	0.0000	0.0000	##	DSOut	581.0000	584.7200

```
*===================================================*
|     Table E15a - SPREADSHEET REACH LIST            |
| Peak flow and Total Flow listed by Reach or those  |
|      conduits or diversions having the same        |
|      upstream and downstream nodes.                |
*===================================================*
```

Upstream   Downstream   Maximum   Total

Node	Node	Flow (cfs)	Flow (ft^3)

```
########################################################
# Table E16. New Conduit Information Section           #
#            Conduit Invert (IE) Elevation and Conduit  #
#            Maximum Water Surface (WS) Elevations      #
########################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
Str1.1	DStick	DSOut	585.2800	585.2800	586.9209	584.7200	Closd Cnd

```
*=============================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96  |
|                                                                             |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume              |
|                     -----------------------------------------------         |
|                     Total Flow + (Beginning Volume + Ending Volume)/2       |
|                                                                             |
|  Net Flow   = Node Inflow - Node Outflow                                    |
|  Total Flow = absolute (Inflow + Outflow)                                   |
|  Intermediate column is a judgement on the node continuity error.           |
|                                                                             |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent    |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent    |
|  Terrible > 50  percent                                                     |
*=============================================================================*
```

Junction Name	<------Continuity Error -------> Volume	% of Node	% of Inflow	Remaining Volume	Beginning Volume	Net Flow Thru Node	Total Flow Thru Node	Failed to Converge
DStick	-264.0139	-0.0061	0.0121	293.3487	0.0000	29.3349	4355386.749	0
DSOut	0.0005	0.0000	0.0000	0.0000	0.0005	0.0000	4355093.405	0

The total continuity error was -264.01   cubic feet
The remaining total volume was   293.35   cubic feet
Your mean node continuity error was   Excellent
Your worst node continuity error was Excellent

```
*=================================================*
|  Table E19 - Junction Inflow & Outflow Listing    |
|              Units are either ft^3 or m^3         |
|              depending on the units in your model.|
*=================================================*
```

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Outflow from Node	Evaporation from Node	Inflow from 2D Layer
DStick	0.0000	0.0000	2.1778E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DSOut	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.1775E+06	0.0000	0.0000

```
*=====================================================*
| Table E20 - Junction Flooding and Volume Listing.   |
|             The maximum volume is the total volume  |
|             in the node including the volume in the |
|             flooded storage area. This is the max   |
|             volume at any time. The volume in the   |
|             flooded storage area is the total volume|
|             above the ground elevation, where the   |
|             flooded pond storage area starts.       |
| The fourth column is instantaneous, the fifth is the|
| sum of the flooded volume over the entire simulation|
| Units are either ft^3 or m^3 depending on the units.|
*=====================================================*
```

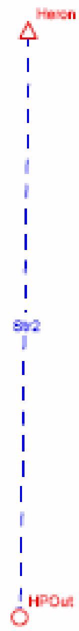
Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
DStick	0.0000	0.0000	0.0000	0.0000	0.0000
DSOut	0.0000	0.0000	0.0000	0.0000	0.0000

```
*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits..........         1 Number of Simulated Conduits......         2
Number of Natural Channels........         0 Number of Junctions...............         2
Number of Storage Junctions.......         1 Number of Weirs...................         0
Number of Orifices................         0 Number of Pumps...................         0
Number of Free Outfalls...........         1 Number of Tide Gate Outfalls......         0
```

```
*=========================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*=========================================================*
```

The Conduit with the largest average change was..Str1.1   with   0.000 percent
The Junction with the largest average change was.DSOut   with   0.000 percent
The Conduit with the largest sinuosity was.......Str1.1   with   0.000

```
*==================================================================*
| Table E21. Continuity balance at the end of the simulation        |
|           Junction Inflow, Outflow or Street Flooding              |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
*==================================================================*

      Inflow         Inflow      Average
      Junction   Volume,ft^3   Inflow, cfs
---------------  ------------  -------------
        DStick   2.17784E+06        0.9002
         DSOut    -2.178E+06       -0.9001

      Outflow      Outflow         Average
      Junction  Volume,ft^3    Outflow, cfs
---------------  ------------   ------------
         DSOut   2.17755E+06        0.9001


*====================================================*
| Initial system volume        =        0.0005 Cu Ft |
| Total system inflow volume   =   2.177840E+06 Cu Ft |
| Inflow + Initial volume      =   2.177840E+06 Cu Ft |
*====================================================*
| Total system outflow         =   2.177547E+06 Cu Ft |
| Volume left in system        =       293.3487 Cu Ft |
| Evaporation                  =        0.0000 Cu Ft |
| Outflow + Final Volume       =   2.177840E+06 Cu Ft |
*====================================================*

*==============================================*
| Total Model Continuity Error                 |
| Error in Continuity, Percent =        0.0000 |
| Error in Continuity, ft^3    =        -0.005 |
| + Error means a continuity loss, - a gain    |
*==============================================*

###################################################
# Table E22. Numerical Model judgement section    #
###################################################

Your overall error was                                       0.0000 percent
Worst nodal error was in node DStick           with        -0.0061 percent
Of the total inflow this loss was                            0.0121 percent
Your overall continuity error was                  Excellent
                                                  Excellent Efficiency
Efficiency of the simulation                       0.00
Most Number of Non Convergences at one Node        0.
Total Number Non Convergences at all Nodes         0.
Total Number of Nodes with Non Convergences        0.

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\Dead\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\Dead\model-e.out

*=============================================================*
|            SWMM Simulation Date and Time Summary            |
*=============================================================*
| Starting Date... August     18, 2006  Time...    9:42:59:27  |
|   Ending Date... August     18, 2006  Time...    9:52: 6:49  |
|  Elapsed Time...    9.12033 minutes or    547.22000 seconds  |
*=============================================================*
```



SWMM Version 9.12 Copyright (c) XP Software	**Lake Calumet Area - Heron Pond** **Hydraulic Analysis** Licenced To: V3 [42-910-0200]	11/22/05 Page 1/1

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\Heron\model.XP

          *================================================*
          |                   xpswmm                       |
          |     Storm and Wastewater Management Model      |
          |           Interface Version: 10.0              |
          |              Engine Version: 10.03             |
          |================================================|
          |                                                |
          |                 Developed by                   |
          |                                                |
          |                 XP Software                    |
          |                                                |
          |================================================|
          |      XP Software       February, 2006          |
          |       Data File Version --->    11.7           |
          |       Serial Number: 42-1000-0200              |
          |               V3 Consultants                   |
          *================================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 JIN.US
 Output File to Layer #     1 E:\1998\98216\98216HMP\xp\Heron\template.int

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                       0.0000         1         2
 $perv                               0.0000         0         4
 $oldegg                             0.0000         0         7
 $as                                 0.0000         0        11
 $noflat                             0.0000         0        21
 $oldomega                           0.0000         0        24
 $oldvol                             0.0000         1        28
 $implicit                           0.0000         1        29
 $oldhot                             0.0000         1        31
 $oldscs                             0.0000         0        33
 $flood                              0.0000         1        40
 $nokeys                             0.0000         0        42
 $pzero                              0.0000         0        55
 $oldvol2                            0.0000         2        59
 $storage2                           0.0000         3        62
 $oldhot1                            0.0000         1        63
 $pumpwt                             0.0000         1        70
 $ecloss                             0.0000         1        77
 $exout                              0.0000         0        97
 $spatial = 0.90                     0.9000         5       124
 $djref = -1.0                      -0.1000         3       143
 $weirlen = 50                      50.0000         1       153
 $oldbnd                             0.0000         1       154
 $nogrelev                           0.0000         1       161
 $ncmid                              0.0000         0       164
 $new_nl_97                          0.0000         2       290
 $best97                             0.0000         1       294
 $newbound                           0.0000         1       295
 USE_ORF_EQN                         0.0000         1       304
 $q_tol = 0.01                       0.0001         1       316
 $new_storage                        0.0000         1       322
 $old_iteration                      0.0000         1       333
 $minlen=30.0                       30.0000         1       346
 $review_elevation                   0.0000         1       383
 $use_half_volume                    0.0000         1       385
 $min_ts = 0.5                       0.5000         1       407
 $design_restart = on                0.0000         1       412
 $zero_value=1.e-05                  0.0000         1       415
 $relax_depth = on                   0.0000         1       427
 $saveallpts = on                    0.0000         1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
 | by the model for this simulation.                        |
 *==========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     1
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ)............     0
  Runoff Land Uses per Subcatchment (NLU)............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........     0
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..     1
  Number of Pumps in Extran (NEP)....................     0
  Number of Orifices in Extran (NEO).................     0
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
  Number of Extran Weirs (NEW).......................     0
  Number of scs hydrograph points....................  1825
  Number of Extran printout locations (NPO)...........     0
  Number of Tide elements in Extran (NTE)............     0
  Number of Natural channels (NNC)...................     0
  Number of Storage junctions in Extran (NVSE)........     0
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     0
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)..............     1
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............     1
  Number of Plugs in a Storage Treatment Unit.........     1


 #######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated January,2005 by XP Software         #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                |
 |  These are the more important tables in the output file. |
 |  You can use your editor to find the table numbers,      |
 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                    Lake Calumet Area - Heron Pond
                    SCS Hydrology - Huff Dist - 100YR - 24HR
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................            0
 Number of rain gages - NRGAG....................            1
 Quality is not simulated - KWALTY...............            0
 Read evaporation data on line(s) F1 (F2) - IVAP..           1
 Hour of day at start of storm - NHR.............            0
 Minute of hour at start of storm - NMN..........            0
 Time TZERO at start of storm (hours)............        0.000
 Use U.S. Customary units for most I/O - METRIC...           0
 Runoff input print control...                               0
 Runoff graph plot control....                               1
 Runoff output print control..                               0
 Limit number of groundwater convergence messages to     10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)         0

 Print land use load percentages -LANDUPR (0=no, 1=yes)      0
 Month, day, year of start of storm is:                 1/ 1/2000
 Wet time step length (seconds).......                    60.0
 Dry time step length (seconds).......                 86400.0
 Wet/Dry time step length (seconds)...                    60.0
 Simulation length is......                               30.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ............................................  0.01000
```

```
 Raingage #..............................          1
 KTYPE  - Rainfall input type.............         0
 NHISTO - Total number of rainfall values..       20
 KINC   - Rainfall values(pairs) per line..       10
 KPRINT - Print rainfall(0-Yes,1-No).......        0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours...............         0
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume............         1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes....................         0
 THISTO - Rainfall time interval..........     72.00
 TZRAIN - Starting time(KTIME units).......     0.00


######################################
# Rainfall input summary from Runoff #
######################################

 Total rainfall for gage #     1 is    7.5800 inches

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

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000


  ###################################################
  #  Table R1.  S U B C A T C H M E N T  D A T A    #
  #             Physical Hydrology Data             #
  ###################################################

                                                                       Deprs Deprs Prcnt
                                                         Per-          -sion -sion  Zero
      Subcatchment           Channel      Width    Area    cent  Slope  "n"   "n"  Storge Strge Deten
  Number          Name        or inlet      (ft)    (ac)   Imperv ft/ft Imprv  Perv Imprv  Perv -tion
  ====== =============== ================ ======== ========   ====== ===== ===== ===== ===== ===== =====
     1          Heron#1            Heron 100.00    105.00      0.00 0.010 0.020 0.020 0.000 0.000  0.00

#############################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                    #
#                     Infiltration or Time of Concentration Data                            #
#                                                                                           #
# Infiltration Type      Infl #1(#5)      Infl #2(#6)       Infl #3(#7)          Infl #4(#8)  #
# SCS                  ->   Comp CN         Time Conc        Shape Factor      Depth or Fraction  #
# SBUH                 ->   Comp CN         Time Conc                 N/A                 N/A  #
# Green Ampt           ->   Suction         Hydr Cond          Initial MD                 N/A  #
# Horton               ->  Max Rate          Min Rate   Decay Rate (1/sec)     Max. Infilt. Volume  #
# Proportional         ->  Constant               N/A                 N/A                 N/A  #
# Initial/Cont Loss    ->   Initial        Continuing                 N/A                 N/A  #
# Initial/Proportional ->   Initial          Constant                 N/A                 N/A  #
# Laurenson Parameters ->   B Value      Pervious "n"     Impervious Cont            Exponent  #
# Rational Formula     -> Tc Method  Flow Path Length     Flow Path Slope  Roughness or Retardance  #
#                             (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)       #
#                      Rational Formula Tc Method: 1 = Constant                             #
#                                                  2 = Friend's Equation                    #
#                                                  3 = Kinematic Wave                       #
#                                                  4 = Alameda Method                       #
#                                                  5 = Izzard's Formula                     #
#                                                  6 = Kerby's Equation                     #
#                                                  7 = Kirpich's Equation                   #
#                                                  8 = Bransby Williams Equation            #
#                                                  9 = Federal Aviation Authority Equation  #
#############################################################################################

    Subcatchment           Infl      Infl      Infl      Infl      Infl      Infl      Infl      Infl
  Number     Name           # 1       # 2       # 3       # 4       # 5       # 6       # 7       # 8
  ===============       ========= ========= ========= ========= ========= ========= ========= =========
    1         Heron#1    92.0000    1.0000  484.0000    0.2000


############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################

     Subcatchment         Gage  Infiltration       Routing              Rainfall          Infiltration
  Number          Name     No       Type            Type             Database Name       Database Name
  ====== =============== ======= ============ ==================== ==================== ====================
     1          Heron#1      1   SCS Method       SCS curvilinear     NE IL 100yr 24hr

 Total Number of Subcatchments...             1
 Total Tributary Area (acres)....        105.00
 Impervious Area (acres).........          0.00
 Pervious Area (acres)...........        105.00
 Total Width (feet)..............        100.00
 Impervious Area (%).............          0.00
```

```
 ###################################################
 #         S U B C A T C H M E N T   D A T A       #
 #   Default, Ratio values for subcatchment data   #
 #   Used with the calibrate node in the runoff.   #
 # 1 - width     2 - area       3 - impervious %   #
 # 4 - slope     5 - imp "n"    6 - perv "n"       #
 # 7 - imp ds    8 - perv ds    9 - 1st infil      #
 #10 - 2nd infil               11 - 3rd infil      #
 ###################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio      1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************


    Inlet
Heron          No Tributary Channel/Pipes
               Tributary Subareas........ Heron#1


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


************************************************
*  Quality Simulation not included in this run *
************************************************




***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....       1   *
***************************************************

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


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

Final Date (Mo/Day/Year)   =            1/ 2/2000
Total number of time steps =                 1800
Final Julian Date          =              2000002
Final time of day          =               21600. seconds.
Final time of day          =                 6.00   hours.
Final running time         =              30.0000   hours.
Final running time         =               1.2500    days.

****************************************************
*     Extrapolation Summary for Watersheds         *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments.       *
* # Steps ==> Total Number of Extrapolated Steps   *
* # Calls ==> Total Number of OVERLND Calls        *
****************************************************

Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
-------------  -------  -------- -------------  -------  --------
Heron#1             0         0


#########################################################
# Rainfall input summary from Runoff Continuity Check   #
#########################################################

Total rainfall read for gage #         1 is       7.5800 in
Total rainfall duration for gage #     1 is      1440.00 minutes

************************************************************
* Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
*       Any continuity error can be fixed by lowering the  *
*       wet and transition time step. The transition time  *
*       should not be much greater than the wet time step. *
************************************************************
                                                            Inches over
                                                cubic feet    Total Basin
Total Precipitation (Rain plus Snow)           2.889117E+06      7.580
Total Infiltration                             3.628962E+05      0.952
Total Evaporation                              0.000000E+00      0.000
Surface Runoff from Watersheds                 2.540813E+06      6.666
Total Water remaining in Surface Storage       0.000000E+00      0.000
Infiltration over the Pervious Area...         3.628962E+05      0.952
                      --------
Infiltration + Evaporation +
```

```
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........              2.903710E+06      7.618
Total Precipitation + Initial Storage.              2.889117E+06      7.580


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  *
***************************************
Percent Continuity Error..............                              -0.5051


****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                                Inches over
                                                     cubic feet    Total Basin
Initial Channel/Pipe Storage................        0.000000E+00      0.000
Final Channel/Pipe Storage..................        0.000000E+00      0.000
Surface Runoff from Watersheds..............        2.540813E+06      6.666
Groundwater Subsurface Inflow or Diversion..        0.000000E+00      0.000
Evaporation Loss from Channels..............        0.000000E+00      0.000
Groundwater Flow Diverted Out of Network....        0.000000E+00      0.000
Channel/Pipe/Inlet Outflow..................        2.540813E+06      6.666
Initial Storage + Inflow....................        2.540813E+06      6.666
Final Storage + Outflow + Diverted GW.......        2.540813E+06      6.666
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error....................                         0.0000

        ##################################################
        # Table R9. Summary Statistics for Subcatchments #
        ##################################################

Note: Total Runoff Depth includes pervious & impervious area
      Pervious and Impervious Runoff Depth is only the runoff from those two areas.


Subcatchment...........          Heron#1
Area (acres)...........        105.00000
Percent Impervious.....          0.00000
Total Rainfall (in)....          7.58000
Max Intensity (in/hr)..          0.82500
Pervious Area
-------------
Total Runoff Depth (in)          6.66618
Total Losses (in)......          0.91382
Remaining Depth (in)...          0.00000
Peak Runoff Rate (cfs).         84.30856
Total Impervious Area
---------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area with depression storage
---------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area without depression storage
------------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Total Area
----------
Total Runoff Depth (in)          6.66618
Peak Runoff Rate (cfs).         84.30856
Unit Runoff (in/hr)....          0.80294
Rational Formula
----------------
Pervious Tc. (mins)....          0.00000
Perv. Intensity (in/hr)          0.00000
Pervious C ............          0.00000
Impervious Tc. (mins)..          0.00000
Imp. Intensity (in/hr).          0.00000
Impervious C ..........          0.00000
Partial Area (Ha)......          0.00000
Partial Area Tc........          0.00000
Partial Area Intensity.          0.00000

1
          1.000 |=========|=========|=========|=========|=========|=========|=========|=========|=========|=========|
```

```
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                   ####                                                            |
         0.800 =                                   #  #                                                            =
               |                                   #  #                                                            |
               |                                ####  #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
         0.600 =                                #     #                                                            =
               |                                #     #                                                            |
               |                                #     ####                                                         |
 RAINFALL      |                                #        #                                                         |
               |                                #        #                                                         |
    IN         |                                #        #                                                         |
               |                                #        #                                                         |
  IN/HR        |                                #        #                                                         |
               |                             ####        #                                                         |
               |                             #           #                                                         |
         0.400 =                             #           #                                                         =
               |                          ####           ####                                                      |
               |                          #                 #                                                      |
               |                          #                 #                                                      |
               |                       ####                 #                                                      |
               |                       #                    #                                                      |
               |                       #                    #                                                      |
               |              ##########                    ####                                                   |
               |              #                                #                                                   |
               |              #                                #                                                   |
         0.200 ####  ##########                                #  ####  ####                                       =
               #  ####                                         ####  #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     ####  #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
         0.000 #=========|=========|=========|=========|=========|=========|=========#=========|=========|=========|=========|
              0.0       4.0       8.0      12.0      16.0      20.0      24.0      28.0      32.0      36.0      40.0

                LOCATION NO. : 1                   TIME IN HOURS

                 RAINFALL HYETOGRAPH

RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: FLOW SUM


RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: INFILTRA

===> Runoff simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\Heron\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\Heron\model-r.out

*===============================================================*
|            SWMM Simulation Date and Time Summary              |
*===============================================================*
| Starting Date... August     18, 2006  Time...    9:53: 8: 7   |
|   Ending Date... August     18, 2006  Time...    9:53:14:82   |
|  Elapsed Time...    0.11250 minutes or      6.75000 seconds   |
*===============================================================*
```

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\Heron\model.XP

          *================================================*
          |                    xpswmm                      |
          |     Storm and Wastewater Management Model      |
          |           Interface Version: 10.0              |
          |              Engine Version: 10.03             |
          |================================================|
          |                                                |
          |                  Developed by                  |
          |                                                |
          |                  XP Software                   |
          |                                                |
          |================================================|
          |      XP Software       February, 2006          |
          |       Data File Version --->    11.7           |
          |       Serial Number: 42-1000-0200              |
          |               V3 Consultants                   |
          *================================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 E:\1998\98216\98216HMP\xp\Heron\template.INT
 Output File to Layer #     1 JOT.US

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                       0.0000         1         2
 $perv                               0.0000         0         4
 $oldegg                             0.0000         0         7
 $as                                 0.0000         0        11
 $noflat                             0.0000         0        21
 $oldomega                           0.0000         0        24
 $oldvol                             0.0000         1        28
 $implicit                           0.0000         1        29
 $oldhot                             0.0000         1        31
 $oldscs                             0.0000         0        33
 $flood                              0.0000         1        40
 $nokeys                             0.0000         0        42
 $pzero                              0.0000         0        55
 $oldvol2                            0.0000         2        59
 $storage2                           0.0000         3        62
 $oldhot1                            0.0000         1        63
 $pumpwt                             0.0000         1        70
 $ecloss                             0.0000         1        77
 $exout                              0.0000         0        97
 $spatial = 0.90                     0.9000         5       124
 $djref = -1.0                      -0.1000         3       143
 $weirlen = 50                      50.0000         1       153
 $oldbnd                             0.0000         1       154
 $nogrelev                           0.0000         1       161
 $ncmid                              0.0000         0       164
 $new_nl_97                          0.0000         2       290
 $best97                             0.0000         1       294
 $newbound                           0.0000         1       295
 USE_ORF_EQN                         0.0000         1       304
 $q_tol = 0.01                       0.0001         1       316
 $new_storage                        0.0000         1       322
 $old_iteration                      0.0000         1       333
 $minlen=30.0                       30.0000         1       346
 $review_elevation                   0.0000         1       383
 $use_half_volume                    0.0000         1       385
 $min_ts = 0.5                       0.5000         1       407
 $design_restart = on                0.0000         1       412
 $zero_value=1.e-05                  0.0000         1       415
 $relax_depth = on                   0.0000         1       427
 $saveallpts = on                    0.0000         1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
| by the model for this simulation.                         |
*===========================================================*

 Number of Subcatchments in the Runoff Block (NW)....     0
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ).............     0
 Runoff Land Uses per Subcatchment (NLU).............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........     2
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     2
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     1
 Number of Extran Weirs (NEW)........................     0
 Number of scs hydrograph points.....................     1
 Number of Extran printout locations (NPO)...........     0
 Number of Tide elements in Extran (NTE).............     1
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     1
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     3
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     2
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     1
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     2
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the HYDRAULIC Layer(Block) of SWMM #
#    Last Updated June,2005 by XP Software            #

    Lake Calumet Area - Heron Pond
    Hydraulic Analysis


*============================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE                |
|   These are the more important tables in the output file.  |
|   You can use your editor to find the table numbers,       |
|   for example: search for Table E20 to check continuity.   |
|   This output file can be imported into a Word Processor   |
|   and printed on US letter or A4 paper using portrait      |
|   mode, courier font, a size of 8 pt. and margins of 0.75  |
|                                                            |
| Table E1   - Basic Conduit Data                            |
| Table E2   - Conduit Factor Data                           |
| Table E3a  - Junction Data                                 |
| Table E3b  - Junction Data                                 |
| Table E4   - Conduit Connectivity Data                     |
| Table E4a  - Dry Weather Flow Data                         |
| Table E4b  - Real Time Control Data                        |
| Table E5   - Junction Time Step Limitation Summary         |
| Table E5a  - Conduit Explicit Condition Summary            |
| Table E6   - Final Model Condition                         |
| Table E7   - Iteration Summary                             |
| Table E8   - Junction Time Step Limitation Summary         |
| Table E9   - Junction  Summary  Statistics                 |
| Table E10  - Conduit   Summary  Statistics                 |
| Table E11  - Area assumptions used in the analysis         |
| Table E12  - Mean conduit information                      |
| Table E13  - Channel losses(H) and culvert info            |
| Table E13a - Culvert Analysis Classification               |
| Table E14  - Natural Channel Overbank Flow Information     |
| Table E14a - Natural Channel Encroachment Information      |
| Table E14b - Floodplain Mapping                            |
| Table E15  - Spreadsheet Info List                         |
| Table E15a - Spreadsheet Reach List                        |
| Table E16  - New Conduit Output Section                    |
| Table E17  - Pump Operation                                |
| Table E18  - Junction Continuity Error                     |
| Table E19  - Junction Inflow & Outflow Listing             |
| Table E20  - Junction Flooding and Volume List             |
| Table E21  - Continuity balance at simulation end          |
| Table E22  - Model Judgement Section                       |
*===========================================================*

Time Control from Hydraulics Job Control
Year.........    2000 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................    120960
Length of integration step is......     10.00 seconds
```

```
Simulation length..................    336.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........         1
Intermediate printout intervals of.       500 cycles
Intermediate printout intervals of.     83.33 minutes
Summary printout intervals of......       500 cycles
Summary printout time interval of..     83.33 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      0.00 hours

Iteration variables: Flow Tolerance.   0.00010
                     Head Tolerance.   0.00005
    Minimum depth (m or ft).........   0.00001
    Underrelaxation parameter.......   0.85000
    Time weighting parameter........   0.85000
    Conduit roughness factor........   1.00000
    Flow adjustment factor..........   1.00000
    Initial Condition Smoothing.....         0
    Courant Time Step Factor........   1.00000
    Default Expansion/Contraction K.   0.00000
    Default Entrance/Exit K.........   0.00000
    Routing Method..................   EPA-SWMM Enhanced Explicit (ISOL=1)
Default surface area of junctions...     13.00 square feet.
Minimum Junction/Conduit Depth......   0.00001 feet.
Ponding Area Coefficient............   5000.00
Ponding Area Exponent...............    1.0000
Minimum Orifice Length..............    100.00 feet.
NJSW input hydrograph junctions.....     0
     or user defined hydrographs....
```

```
*==================================================*
|          Table E1 - Conduit Data                 |
*==================================================*
```

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	
1	Str2.1	1075.0000	Trapezoid	42.0800	0.1000	4.8000	4.0000	1.3600	1.5000

Total length of all conduits .... 1075.0000 feet

```
*===================================================*
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length  |
| in the output file all it means is that the       |
| program will lower the internal time step to      |
| satisfy this condition (explicit condition).      |
| You control the actual internal time step by      |
| using the minimum courant time step factor in the |
| HYDRAULICS job control.  The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection.    |
| You have further control by using the modify      |
| conduit option in the HYDRAULICS Job Control.     |
*===================================================*
```

Conduit Name	Courant Ratio
Str2.1	0.08

```
*==================*
|  Conduit Volume  |
*==================*
```

Full pipe or full open conduit volume
Input full depth volume............ 4.5236E+04 cubic feet

```
*===================================================*
|           Table E3a - Junction Data               |
*===================================================*
```

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cfs	Initial Depth-ft	Interface Flow (%)
1	Heron	600.0000	586.0000	582.0000	0.0000	0.0000	100.0000
2	HPOut	600.0000	581.0000	577.0000	0.0000	0.0000	100.0000

```
*===================================================*
|           Table E3b - Junction Data               |
*===================================================*
```

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Pavement Slope
1	Heron	123.8617	392.2867	No Ponding	Normal		0	0.0000
2	HPOut	123.5969	373.9254	No Ponding	Normal		0	0.0000

```
*===================================================*
|           Table E4 - Conduit Connectivity         |
```

==

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	Str2.1	Heron	HPOut	582.0000	577.0000	No Design

==
| Storage Junction Data |
==

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)	DEPTH STARTS FROM
Heron	Stage/Area	283140.0000	5.096520E+06	600.0000	Node Invert

=================================
| Variable storage data for node | Heron
=================================

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	582.0000	0.0000	283140.0000	0.0000	6.5000	0.0000
2	582.1250	0.1250	283140.0000	35392.5000	6.5000	0.8125
3	582.2500	0.2500	283140.0000	70785.0000	6.5000	1.6250
4	582.3750	0.3750	283140.0000	106177.5000	6.5000	2.4375
5	582.5000	0.5000	283140.0000	141570.0000	6.5000	3.2500
6	582.6250	0.6250	283140.0000	176962.5000	6.5000	4.0625
7	582.7500	0.7500	283140.0000	212355.0000	6.5000	4.8750
8	582.8750	0.8750	283140.0000	247747.5000	6.5000	5.6875
9	583.0000	1.0000	283140.0000	283140.0000	6.5000	6.5000
10	583.5000	1.5000	283140.0000	424710.0000	6.5000	9.7500
11	584.0000	2.0000	283140.0000	566280.0000	6.5000	13.0000
12	584.5000	2.5000	283140.0000	707850.0000	6.5000	16.2500
13	585.0000	3.0000	283140.0000	849420.0000	6.5000	19.5000
14	585.5000	3.5000	283140.0000	990990.0000	6.5000	22.7500
15	586.0000	4.0000	283140.0000	1.132560E+06	6.5000	26.0000
16	586.5000	4.5000	283140.0000	1.274130E+06	6.5000	29.2500
17	587.0000	5.0000	283140.0000	1.415700E+06	6.5000	32.5000
18	600.0000	18.0000	283140.0000	5.096520E+06	6.5000	117.0000

===
| FREE OUTFALL DATA (DATA GROUP I1) |
| BOUNDARY CONDITION ON DATA GROUP J1 |
===

Outfall at Junction....HPOut has boundary condition number... 1

===
| INTERNAL CONNECTIVITY INFORMATION |
===

CONDUIT	JUNCTION	JUNCTION
FREE # 1	HPOut	BOUNDARY

==
| Boundary Condition Information |
| Data Groups J1-J4 |
==

BC NUMBER.. 1 Control water surface elevation is.. 581.00 feet.

###
Header information from interface file:
###

Title from first computational layer:
Lake Calumet Area - Heron Pond
SCS Hydrology - Huff Dist - 100YR - 24HR

Title from immediately preceding computational layer
Lake Calumet Area - Heron Pond
SCS Hydrology - Huff Dist - 100YR - 24HR

```
Name of preceding layer:................        Runoff Layer
Initial Julian date (IDATEZ).....................   2000001
Initial time of day in seconds (TZERO)...........       0.0
No. Transfered input locations...................         1
No. Transfered pollutants........................         0
Size of total catchment area (acres).............    105.00
```

###
Element numbers of interface inlet locations:
###

Heron

Conversion factor to cfs for flow units on interface file. Multiply by: 1.00000

######## Important Information ########
Start date/time of interface file was.. 2000001   0.0000 hours
Start date/time of the simulation was.. 2000001   0.0000 hours
Same date/time found in interface file and model

```
*==================================================*
|             XP Note Field Summary                |
*==================================================*
```

```
###################################################
#           Surcharge Iteration Summary           #
###################################################
```

Maximum number of iterations in a time step.....   1
Total number of iterations in the simulation....   241920
Average number of iterations per time step......   2.00
Surcharge iterations during the simulation......   0
Maximum surcharge flow error during simulation.. 0.00E+00 cfs
Total number of time steps during simulation....   120960

```
***************************************************
*        CONDUIT COURANT CONDITION SUMMARY        *
* TIME IN MINUTES DELT > COURANT TIME STEP        *
***************************************************
* SEE BELOW FOR EXPLANATION OF COURANT TIME STEP. *
***************************************************
```

CONDUIT #	TIME(MN)	CONDUIT #	TIME(MN)	CONDUIT #	TIME(MN)	CONDUIT #	TIME(MN)
Str2.1	0.00						

```
************************************************
*        CONDUIT COURANT CONDITION SUMMARY    *
************************************************
* COURANT   =            CONDUIT LENGTH        *
* TIME STEP = -------------------------------- *
*            VELOCITY + SQRT(GRVT*AREA/WIDTH) *
************************************************
* AVERAGE COURANT CONDITION TIME STEP(SECONDS) *
************************************************
```

CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)
Str2.1	132.18						

```
*=====================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS       |
| The Maximum area is only the area of the node, it   |
| does not include the area of the surrounding conduits|
*=====================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Feet of Surcharge at Max Elevation	Freeboard of node feet	Maximum Junction Area ft^2	Maximum Gutter Depth feet	Maximum Gutter Width feet	Maximum Gutter Velocity ft/s
Heron	600.0000	586.0000	585.5577	17	21	0.0000	14.4423	291372.04	0.0000	0.0000	0.0000
HPOut	600.0000	581.0000	581.0000	0	0	0.0000	19.0000	17131.029	0.0000	0.0000	0.0000

```
*=====================================================*
|        Table E10 - CONDUIT SUMMARY STATISTICS       |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the  |
| downstream boundary conditions.                     |
|                                                     |
| * denotes an open conduit that has been overtopped  |
|   this is a potential source of severe errors       |
*=====================================================*
```

Conduit Name	Design Flow (cfs)	Conduit Design Velocity (ft/s)	Maximum Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Water Elev at Pipe Ends Upstream (ft)	Dwnstrm (ft)	Ratio d/D US	DS	
Str2.1	73.0665	1.7364	48.0000	57.3956	17	21	1.4858	17	21	0.7855	585.5577	581.0000	0.889	1.000	*
FREE # 1	Undefnd	Undefnd	Undefn	57.3956	17	21									

```
*================================================*
| Table E11.  Area assumptions used in the analysis|
| Subcritical and Critical flow assumptions from   |
|    Subroutine Head.  See Figure 17-1 in the      |
|         manual for further information.          |
*================================================*
```

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)

Str2.1	147.6667	40172.3333	0.0000	0.0000	2.1428	38.6283	0.0000

Table E12. Mean Conduit Flow Information

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
Str2.1	2.0956	2534896.2	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
FREE # 1	2.0956	2534896.2						

Table E13. Channel losses(H), headwater depth (HW), tailwater depth (TW), critical and normal depth (Yc and Yn).
Use this section for culvert comparisons

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
Str2.1	56.4585	0.0000	3.8222	1.4024	3.5289	585.5291	581.0000	Max Flow

Table E13a. CULVERT ANALYSIS CLASSIFICATION,
and the time the culvert was in a particular
classification during the simulation. The time is
in minutes. The Dynamic Wave Equation is used for
all conduit analysis but the culvert flow classification
condition is based on the HW and TW depths.

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
Str2.1	0.0000	20099.000	0.0000	0.0000	0.0000	0.1667	0.0000	0.0000	None

Kinematic Wave Approximations
Time in Minutes for Each Condition

Conduit Name	Duration of Normal Flow	Slope Criteria	Super- Critical	Roll Waves
Str2.1	20086.1667	0.0000	0.0000	0.0000

Table E15 - SPREADSHEET INFO LIST
Conduit Flow and Junction Depth Information for use in
spreadsheets. The maximum values in this table are the
true maximum values because they sample every time step.
The values in the review results may only be the
maximum of a subset of all the time steps in the run.
Note: These flows are only the flows in a single barrel.

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Str2.1	57.3956	2534896.201	1.4858	0.0000	##	Heron	582.0000	585.5577
FREE # 1	57.3956	2534896.201	0.0000	0.0000	##	HPOut	577.0000	581.0000

Table E15a - SPREADSHEET REACH LIST
Peak flow and Total Flow listed by Reach or those
conduits or diversions having the same
upstream and downstream nodes.

Upstream Node	Downstream Node	Maximum Flow (cfs)	Total Flow (ft^3)

Table E16. New Conduit Information Section
Conduit Invert (IE) Elevation and Conduit
Maximum Water Surface (WS) Elevations

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
Str2.1	Heron	HPOut	582.0000	577.0000	585.5577	581.0000	Trapezoid

Table E18 - Junction Continuity Error. Division by Volume added 11/96

$$\text{Continuity Error} = \frac{\text{Net Flow + Beginning Volume - Ending Volume}}{\text{Total Flow + (Beginning Volume + Ending Volume)/2}}$$

```
|                                                                            |
|  Net Flow   = Node Inflow - Node Outflow                                   |
|  Total Flow = absolute (Inflow + Outflow)                                  |
|  Intermediate column is a judgement on the node continuity error.          |
|                                                                            |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent   |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent   |
|  Terrible > 50  percent                                                    |
*============================================================================*
```

Junction Name	Continuity Error Volume	Continuity Error % of Node	Continuity Error % of Inflow	Remaining Volume	Beginning Volume	Net Flow Thru Node	Total Flow Thru Node	Failed to Converge
Heron	-16576.1897	-0.3260	0.6524	17167.9121	0.0000	591.7224	5075709.588	0
HPOut	-11335.7281	-0.2233	0.4461	11335.7335	0.0054	0.0000	5069792.402	0

The total continuity error was -27912.   cubic feet
The remaining total volume was   28504.   cubic feet
Your mean node continuity error was   Excellent
Your worst node continuity error was Excellent

```
*==================================================*
|  Table E19 - Junction Inflow & Outflow Listing    |
|             Units are either ft^3 or m^3          |
|             depending on the units in your model.|
*==================================================*
```

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Outflow from Node	Evaporation from Node	Inflow from 2D Layer
Heron	0.0000	0.0000	2.5408E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HPOut	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.5349E+06	0.0000	0.0000

```
*=====================================================*
| Table E20 - Junction Flooding and Volume Listing.   |
|             The maximum volume is the total volume  |
|             in the node including the volume in the |
|             flooded storage area. This is the max   |
|             volume at any time. The volume in the   |
|             flooded storage area is the total volume|
|             above the ground elevation, where the   |
|             flooded pond storage area starts.       |
| The fourth column is instantaneous, the fifth is the|
| sum of the flooded volume over the entire simulation|
| Units are either ft^3 or m^3 depending on the units.|
*=====================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
Heron	0.0000	0.0000	0.0000	0.0000	0.0000
HPOut	0.0000	0.0000	0.0000	0.0000	0.0000

```
*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits..........         1 Number of Simulated Conduits......         2
Number of Natural Channels........         0 Number of Junctions..............         2
Number of Storage Junctions.......         1 Number of Weirs..................         0
Number of Orifices................         0 Number of Pumps..................         0
Number of Free Outfalls...........         1 Number of Tide Gate Outfalls......         0
```

```
*=========================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*=========================================================*
```

The Conduit with the largest average change was..Str2.1   with   0.000 percent
The Junction with the largest average change was.HPOut   with   0.001 percent
The Conduit with the largest sinuosity was.......Str2.1   with   0.000

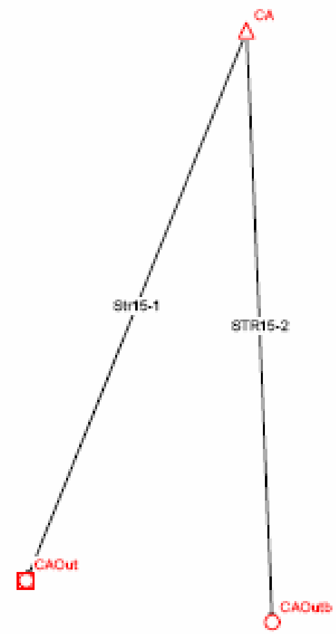
```
*===================================================================*
| Table E21. Continuity balance at the end of the simulation        |
|            Junction Inflow, Outflow or Street Flooding            |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
*===================================================================*
```

Inflow Junction	Inflow Volume,ft^3	Average Inflow, cfs
Heron	2.54081E+06	2.1005
HPOut	-2.535E+06	-2.0956

Outflow Junction	Outflow Volume,ft^3	Average Outflow, cfs
HPOut	2.53490E+06	2.0956

```
*====================================================*
| Initial system volume        =         0.0054 Cu Ft |
```

```
| Total system inflow volume   =   2.540813E+06 Cu Ft |
| Inflow + Initial volume      =   2.540813E+06 Cu Ft |
*=====================================================*
| Total system outflow         =   2.534896E+06 Cu Ft |
| Volume left in system        =     28503.6456 Cu Ft |
| Evaporation                  =         0.0000 Cu Ft |
| Outflow + Final Volume       =   2.563400E+06 Cu Ft |
*=====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -0.8889 |
| Error in Continuity, ft^3    =     -22586.454 |
| + Error means a continuity loss, - a gain     |
*================================================*

###################################################
# Table E22. Numerical Model judgement section    #
###################################################

Your overall error was                                      -0.8889 percent
Worst nodal error was in node Heron            with        -0.3266 percent
Of the total inflow this loss was                            0.6524 percent
Your overall continuity error was                  Excellent
                                                  Excellent Efficiency
Efficiency of the simulation                       0.00
Most Number of Non Convergences at one Node        0.
Total Number Non Convergences at all Nodes         0.
Total Number of Nodes with Non Convergences        0.

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\Heron\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\Heron\model-e.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... August     18, 2006  Time...    9:53:21:74  |
|   Ending Date... August     18, 2006  Time...    9:57:54:10  |
|  Elapsed Time...    4.53933 minutes or    272.36000 seconds  |
*==============================================================*
```



SWMM Version 9.12 Copyright (c) XP Software	**Lake Calumet Area - Conservation Area** **Hydraulic Analysis** Licenced To: V3 [42-910-0200]	11/22/05 Page 1/1

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\CA\model.XP

          *=============================================*
          |                   xpswmm                    |
          |     Storm and Wastewater Management Model   |
          |           Interface Version: 10.0           |
          |              Engine Version: 10.03          |
          |=============================================|
          |                                             |
          |                 Developed by                |
          |                                             |
          |                 XP Software                 |
          |                                             |
          |=============================================|
          |      XP Software       February, 2006       |
          |       Data File Version --->    11.7        |
          |       Serial Number: 42-1000-0200           |
          |               V3 Consultants                |
          *=============================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*====================================================*
|       Input and Output file names by Layer         |
*====================================================*

 Input File  to Layer #     1 JIN.US
 Output File to Layer #     1 E:\1998\98216\98216HMP\xp\ca\template.int

*==========================================================*
|   Special command line arguments in XP-SWMM2000. This     |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*==========================================================*

 $powerstation                        0.0000         1         2
 $perv                                0.0000         0         4
 $oldegg                              0.0000         0         7
 $as                                  0.0000         0        11
 $noflat                              0.0000         0        21
 $oldomega                            0.0000         0        24
 $oldvol                              0.0000         1        28
 $implicit                            0.0000         1        29
 $oldhot                              0.0000         1        31
 $oldscs                              0.0000         0        33
 $flood                               0.0000         1        40
 $nokeys                              0.0000         0        42
 $pzero                               0.0000         0        55
 $oldvol2                             0.0000         2        59
 $storage2                            0.0000         3        62
 $oldhot1                             0.0000         1        63
 $pumpwt                              0.0000         1        70
 $ecloss                              0.0000         1        77
 $exout                               0.0000         0        97
 $spatial = 0.90                      0.9000         5       124
 $djref = -1.0                       -0.1000         3       143
 $weirlen = 50                       50.0000         1       153
 $oldbnd                              0.0000         1       154
 $nogrelev                            0.0000         1       161
 $ncmid                               0.0000         0       164
 $new_nl_97                           0.0000         2       290
 $best97                              0.0000         1       294
 $newbound                            0.0000         1       295
 USE_ORF_EQN                          0.0000         1       304
 $q_tol = 0.01                        0.0001         1       316
 $new_storage                         0.0000         1       322
 $old_iteration                       0.0000         1       333
 $minlen=30.0                        30.0000         1       346
 $review_elevation                    0.0000         1       383
 $use_half_volume                     0.0000         1       385
 $min_ts = 0.5                        0.5000         1       407
 $design_restart = on                 0.0000         1       412
 $zero_value=1.e-05                   0.0000         1       415
 $relax_depth = on                    0.0000         1       427
 $saveallpts = on                     0.0000         1       434

 *=========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
 | by the model for this simulation.                        |
 *==========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     1
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ)............     0
  Runoff Land Uses per Subcatchment (NLU)............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........     0
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..     1
  Number of Pumps in Extran (NEP)....................     0
  Number of Orifices in Extran (NEO).................     0
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
  Number of Extran Weirs (NEW).......................     0
  Number of scs hydrograph points....................  1825
  Number of Extran printout locations (NPO)...........     0
  Number of Tide elements in Extran (NTE)............     0
  Number of Natural channels (NNC)...................     0
  Number of Storage junctions in Extran (NVSE)........     0
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     0
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)..............     1
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............     1
  Number of Plugs in a Storage Treatment Unit.........     1


 #######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated January,2005 by XP Software         #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                |
 |  These are the more important tables in the output file. |
 |  You can use your editor to find the table numbers,      |
 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                    Lake Calumet Area - Conservation Area
                    SCS Hydrology - Huff Dist - 100YR - 24HR
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................            0
 Number of rain gages - NRGAG....................            1
 Quality is not simulated - KWALTY...............            0
 Read evaporation data on line(s) F1 (F2) - IVAP..           1
 Hour of day at start of storm - NHR.............            0
 Minute of hour at start of storm - NMN..........            0
 Time TZERO at start of storm (hours)............        0.000
 Use U.S. Customary units for most I/O - METRIC...           0
 Runoff input print control...                               0
 Runoff graph plot control....                               1
 Runoff output print control..                               0
 Limit number of groundwater convergence messages to     10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)         0

 Print land use load percentages -LANDUPR (0=no, 1=yes)      0
 Month, day, year of start of storm is:              1/ 1/2000
 Wet time step length (seconds).......                    60.0
 Dry time step length (seconds).......                 86400.0
 Wet/Dry time step length (seconds)...                    60.0
 Simulation length is......                               30.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = .............................................  0.01000
```

```
 Raingage #..............................          1
 KTYPE  - Rainfall input type............          0
 NHISTO - Total number of rainfall values..       20
 KINC   - Rainfall values(pairs) per line..       10
 KPRINT - Print rainfall(0-Yes,1-No).......        0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours...............         0
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume............         1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes....................         0
 THISTO - Rainfall time interval..........     72.00
 TZRAIN - Starting time(KTIME units).......     0.00


######################################
# Rainfall input summary from Runoff #
######################################

 Total rainfall for gage #     1 is    7.5800 inches

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

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000


  ###################################################
  #  Table R1.  S U B C A T C H M E N T  D A T A   #
  #            Physical Hydrology Data             #
  ###################################################

                                                                         Deprs Deprs Prcnt
                                                             Per-        -sion -sion  Zero
      Subcatchment           Channel      Width    Area      cent  Slope  "n"   "n"  Storge Strge Deten
  Number         Name        or inlet      (ft)    (ac)     Imperv ft/ft Imprv  Perv Imprv  Perv -tion
  ====== =============== ================ ======== ========   ====== ===== ===== ===== ===== ===== =====
      1            CA#1              CA 100.00    250.00      0.00 0.010 0.020 0.020 0.000 0.000  0.00

#########################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                #
#                     Infiltration or Time of Concentration Data                                       #
#                                                                                                       #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)         Infl #3(#7)             Infl #4(#8)  #
# SCS                   ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction  #
# SBUH                  ->   Comp CN          Time Conc                  N/A                     N/A  #
# Green Ampt            ->   Suction          Hydr Cond           Initial MD                     N/A  #
# Horton                ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume  #
# Proportional          ->  Constant                N/A                  N/A                     N/A  #
# Initial/Cont Loss     ->   Initial         Continuing                  N/A                     N/A  #
# Initial/Proportional ->   Initial           Constant                  N/A                     N/A  #
# Laurenson Parameters ->   B Value       Pervious "n"      Impervious Cont                Exponent  #
# Rational Formula      -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance  #
#                           (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                   #
#                     Rational Formula Tc Method: 1 = Constant                                         #
#                                                 2 = Friend's Equation                                #
#                                                 3 = Kinematic Wave                                   #
#                                                 4 = Alameda Method                                   #
#                                                 5 = Izzard's Formula                                 #
#                                                 6 = Kerby's Equation                                 #
#                                                 7 = Kirpich's Equation                               #
#                                                 8 = Bransby Williams Equation                        #
#                                                 9 = Federal Aviation Authority Equation              #
#########################################################################################################

    Subcatchment           Infl      Infl      Infl      Infl      Infl      Infl      Infl      Infl
  Number     Name           # 1       # 2       # 3       # 4       # 5       # 6       # 7       # 8
  ===============       ========= ========= ========= ========= ========= ========= ========= =========
    1            CA#1    92.0000    0.5000  484.0000    0.2000


############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################

     Subcatchment         Gage  Infiltration       Routing               Rainfall          Infiltration
  Number         Name      No       Type            Type              Database Name       Database Name
  ====== =============== ======= ============ ==================== ==================== ====================
      1            CA#1      1   SCS Method       SCS curvilinear     NE IL 100yr 24hr

 Total Number of Subcatchments...             1
 Total Tributary Area (acres)....        250.00
 Impervious Area (acres).........          0.00
 Pervious Area (acres)...........        250.00
 Total Width (feet)..............        100.00
 Impervious Area (%).............          0.00
```

```
 ###################################################
 #         S U B C A T C H M E N T   D A T A       #
 #   Default, Ratio values for subcatchment data   #
 #   Used with the calibrate node in the runoff.   #
 # 1 - width     2 - area       3 - impervious %   #
 # 4 - slope     5 - imp "n"    6 - perv "n"       #
 # 7 - imp ds    8 - perv ds    9 - 1st infil      #
 #10 - 2nd infil              11 - 3rd infil      #
 ###################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio      1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************


    Inlet
CA             No Tributary Channel/Pipes
               Tributary Subareas........ CA#1


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

************************************************
*  Quality Simulation not included in this run *
************************************************




***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....        1   *
***************************************************

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


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

Final Date (Mo/Day/Year)   =            1/ 2/2000
Total number of time steps =                 1800
Final Julian Date          =              2000002
Final time of day          =               21600. seconds.
Final time of day          =                 6.00   hours.
Final running time         =              30.0000   hours.
Final running time         =               1.2500    days.

****************************************************
*     Extrapolation Summary for Watersheds         *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments.       *
* # Steps ==> Total Number of Extrapolated Steps   *
* # Calls ==> Total Number of OVERLND Calls        *
****************************************************

Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
-------------  -------  -------- -------------  -------  --------
CA#1                 0         0


#########################################################
# Rainfall input summary from Runoff Continuity Check   #
#########################################################

 Total rainfall read for gage #         1 is       7.5800 in
 Total rainfall duration for gage #     1 is      1440.00 minutes

 ************************************************************
 * Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
 *       Any continuity error can be fixed by lowering the  *
 *       wet and transition time step. The transition time  *
 *       should not be much greater than the wet time step. *
 ************************************************************
                                                                Inches over
                                                    cubic feet    Total Basin
 Total Precipitation (Rain plus Snow)              6.878850E+06      7.580
 Total Infiltration                                8.640385E+05      0.952
 Total Evaporation                                 0.000000E+00      0.000
 Surface Runoff from Watersheds                    6.049556E+06      6.666
 Total Water remaining in Surface Storage          0.000000E+00      0.000
 Infiltration over the Pervious Area...            8.640385E+05      0.952
                      --------
 Infiltration + Evaporation +
```

```
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........               6.913594E+06      7.618
Total Precipitation + Initial Storage.               6.878850E+06      7.580


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  *
***************************************
Percent Continuity Error..............                                -0.5051


****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                                    Inches over
                                                      cubic feet    Total Basin
Initial Channel/Pipe Storage................         0.000000E+00      0.000
Final Channel/Pipe Storage..................         0.000000E+00      0.000
Surface Runoff from Watersheds..............         6.049556E+06      6.666
Groundwater Subsurface Inflow or Diversion..         0.000000E+00      0.000
Evaporation Loss from Channels..............         0.000000E+00      0.000
Groundwater Flow Diverted Out of Network....         0.000000E+00      0.000
Channel/Pipe/Inlet Outflow..................         6.049556E+06      6.666
Initial Storage + Inflow....................         6.049556E+06      6.666
Final Storage + Outflow + Diverted GW.......         6.049556E+06      6.666
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error...................                          0.0000

        ##################################################
        # Table R9. Summary Statistics for Subcatchments #
        ##################################################

Note: Total Runoff Depth includes pervious & impervious area
      Pervious and Impervious Runoff Depth is only the runoff from those two areas.


Subcatchment...........             CA#1
Area (acres)...........        250.00000
Percent Impervious.....          0.00000
Total Rainfall (in)....          7.58000
Max Intensity (in/hr)..          0.82500
Pervious Area
-------------
Total Runoff Depth (in)          6.66618
Total Losses (in)......          0.91382
Remaining Depth (in)...          0.00000
Peak Runoff Rate (cfs).        204.10750
Total Impervious Area
---------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area with depression storage
---------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Impervious Area without depression storage
------------------------------------------
Total Runoff Depth (in)          0.00000
Peak Runoff Rate (cfs).          0.00000
Total Area
----------
Total Runoff Depth (in)          6.66618
Peak Runoff Rate (cfs).        204.10750
Unit Runoff (in/hr)....          0.81643
Rational Formula
----------------
Pervious Tc. (mins)....          0.00000
Perv. Intensity (in/hr)          0.00000
Pervious C ............          0.00000
Impervious Tc. (mins)..          0.00000
Imp. Intensity (in/hr).          0.00000
Impervious C ..........          0.00000
Partial Area (Ha)......          0.00000
Partial Area Tc........          0.00000
Partial Area Intensity.          0.00000

1
         1.000 |=========|=========|=========|=========|=========|=========|=========|=========|=========|=========|
```

```
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                   ####                                                            |
         0.800 =                                   #  #                                                            =
               |                                   #  #                                                            |
               |                                ####  #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
         0.600 =                                #     #                                                            =
               |                                #     #                                                            |
               |                                #     ####                                                         |
 RAINFALL      |                                #        #                                                         |
               |                                #        #                                                         |
    IN         |                                #        #                                                         |
               |                                #        #                                                         |
  IN/HR        |                                #        #                                                         |
               |                             ####        #                                                         |
               |                             #           #                                                         |
         0.400 =                             #           #                                                         =
               |                          ####           ####                                                      |
               |                          #                 #                                                      |
               |                          #                 #                                                      |
               |                       ####                 #                                                      |
               |                       #                    #                                                      |
               |                       #                    #                                                      |
               |              ##########                    ####                                                   |
               |              #                                #                                                   |
               |              #                                #                                                   |
         0.200 ####  ##########                                #  ####  ####                                       =
               #  ####                                         ####  #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     ####  #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
         0.000 #=========|=========|=========|=========|=========|=========#=========|=========|=========|=========|
              0.0       4.0       8.0      12.0      16.0      20.0      24.0      28.0      32.0      36.0      40.0

                LOCATION NO. : 1                   TIME IN HOURS

                 RAINFALL HYETOGRAPH
```

RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: FLOW SUM

RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: INFILTRA

```
===> Runoff simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\CA\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\CA\model-r.out

*=============================================================*
|             SWMM Simulation Date and Time Summary           |
*=============================================================*
| Starting Date... August     18, 2006  Time...    9:31:12:63  |
|   Ending Date... August     18, 2006  Time...    9:31:19:88  |
|  Elapsed Time...    0.12083 minutes or      7.25000 seconds  |
*=============================================================*
```

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\CA\model.XP

          *==============================================*
          |                    xpswmm                    |
          |     Storm and Wastewater Management Model    |
          |           Interface Version: 10.0            |
          |              Engine Version: 10.03           |
          |==============================================|
          |                                              |
          |                 Developed by                 |
          |                                              |
          |                 XP Software                  |
          |                                              |
          |==============================================|
          |      XP Software       February, 2006        |
          |       Data File Version --->    11.7         |
          |       Serial Number: 42-1000-0200            |
          |               V3 Consultants                 |
          *==============================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*====================================================*
|       Input and Output file names by Layer         |
*====================================================*

 Input File  to Layer #     1 E:\1998\98216\98216HMP\xp\ca\template.INT
 Output File to Layer #     1 JOT.US

*============================================================*
|   Special command line arguments in XP-SWMM2000. This     |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*============================================================*

 $powerstation                       0.0000         1         2
 $perv                               0.0000         0         4
 $oldegg                             0.0000         0         7
 $as                                 0.0000         0        11
 $noflat                             0.0000         0        21
 $oldomega                           0.0000         0        24
 $oldvol                             0.0000         1        28
 $implicit                           0.0000         1        29
 $oldhot                             0.0000         1        31
 $oldscs                             0.0000         0        33
 $flood                              0.0000         1        40
 $nokeys                             0.0000         0        42
 $pzero                              0.0000         0        55
 $oldvol2                            0.0000         2        59
 $storage2                           0.0000         3        62
 $oldhot1                            0.0000         1        63
 $pumpwt                             0.0000         1        70
 $ecloss                             0.0000         1        77
 $exout                              0.0000         0        97
 $spatial = 0.90                     0.9000         5       124
 $djref = -1.0                      -0.1000         3       143
 $weirlen = 50                      50.0000         1       153
 $oldbnd                             0.0000         1       154
 $nogrelev                           0.0000         1       161
 $ncmid                              0.0000         0       164
 $new_nl_97                          0.0000         2       290
 $best97                             0.0000         1       294
 $newbound                           0.0000         1       295
 USE_ORF_EQN                         0.0000         1       304
 $q_tol = 0.01                       0.0001         1       316
 $new_storage                        0.0000         1       322
 $old_iteration                      0.0000         1       333
 MINLEN=30.0                        30.0000         1       346
 $review_elevation                   0.0000         1       383
 $use_half_volume                    0.0000         1       385
 $min_ts = 0.5                       0.5000         1       407
 $design_restart = on                0.0000         1       412
 $zero_value=1.e-05                  0.0000         1       415
 $relax_depth = on                   0.0000         1       427
 $saveallpts = on                    0.0000         1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
| by the model for this simulation.                          |
*============================================================*

 Number of Subcatchments in the Runoff Block (NW)....     0
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ).............     0
 Runoff Land Uses per Subcatchment (NLU).............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........     4
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     4
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     2
 Number of Extran Weirs (NEW)........................     0
 Number of scs hydrograph points.....................     1
 Number of Extran printout locations (NPO)...........     0
 Number of Tide elements in Extran (NTE).............     2
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     1
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     3
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     4
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     1
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     4
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the HYDRAULIC Layer(Block) of SWMM #
#    Last Updated June,2005 by XP Software            #

    Lake Calumet Area - Conservation Area
    Hydraulic Analysis


*=============================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE                 |
|   These are the more important tables in the output file.   |
|   You can use your editor to find the table numbers,        |
|   for example: search for Table E20 to check continuity.    |
|   This output file can be imported into a Word Processor    |
|   and printed on US letter or A4 paper using portrait       |
|   mode, courier font, a size of 8 pt. and margins of 0.75   |
|                                                             |
| Table E1   - Basic Conduit Data                             |
| Table E2   - Conduit Factor Data                            |
| Table E3a  - Junction Data                                  |
| Table E3b  - Junction Data                                  |
| Table E4   - Conduit Connectivity Data                      |
| Table E4a  - Dry Weather Flow Data                          |
| Table E4b  - Real Time Control Data                         |
| Table E5   - Junction Time Step Limitation Summary          |
| Table E5a  - Conduit Explicit Condition Summary             |
| Table E6   - Final Model Condition                          |
| Table E7   - Iteration Summary                              |
| Table E8   - Junction Time Step Limitation Summary          |
| Table E9   - Junction  Summary  Statistics                  |
| Table E10  - Conduit   Summary  Statistics                  |
| Table E11  - Area assumptions used in the analysis          |
| Table E12  - Mean conduit information                       |
| Table E13  - Channel losses(H) and culvert info             |
| Table E13a - Culvert Analysis Classification                |
| Table E14  - Natural Channel Overbank Flow Information      |
| Table E14a - Natural Channel Encroachment Information       |
| Table E14b - Floodplain Mapping                             |
| Table E15  - Spreadsheet Info List                          |
| Table E15a - Spreadsheet Reach List                         |
| Table E16  - New Conduit Output Section                     |
| Table E17  - Pump Operation                                 |
| Table E18  - Junction Continuity Error                      |
| Table E19  - Junction Inflow & Outflow Listing              |
| Table E20  - Junction Flooding and Volume List              |
| Table E21  - Continuity balance at simulation end           |
| Table E22  - Model Judgement Section                        |
*============================================================*

Time Control from Hydraulics Job Control
Year.........    2000 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................    241920
Length of integration step is......     10.00 seconds
```

Simulation length.................. 672.00 hours
Do not create equiv. pipes(NEQUAL). 0
Use U.S. customary units for I/O... 0
Printing starts in cycle........... 1
Intermediate printout intervals of. 500 cycles
Intermediate printout intervals of. 83.33 minutes
Summary printout intervals of...... 500 cycles
Summary printout time interval of.. 83.33 minutes
Hot start file parameter (REDO).... 0
Initial time....................... 0.00 hours

Iteration variables: Flow Tolerance. 0.00010
Head Tolerance. 0.00005
Minimum depth (m or ft)......... 0.00001
Underrelaxation parameter....... 0.85000
Time weighting parameter........ 0.85000
Conduit roughness factor........ 1.00000
Flow adjustment factor.......... 1.00000
Initial Condition Smoothing..... 0
Courant Time Step Factor........ 1.00000
Default Expansion/Contraction K. 0.00000
Default Entrance/Exit K......... 0.00000
Routing Method.................. EPA-SWMM Enhanced Explicit (ISOL=1)
Default surface area of junctions... 13.00 square feet.
Minimum Junction/Conduit Depth...... 0.00001 feet.
Ponding Area Coefficient............ 5000.00
Ponding Area Exponent............... 1.0000
Minimum Orifice Length.............. 100.00 feet.
NJSW input hydrograph junctions..... 0
or user defined hydrographs....

==
| Table E1 - Conduit Data |
==

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes
1	Str15-1	36.0000	Circular	3.1416	0.0150	2.0000	2.0000	
2	STR15-2	30.0000	Circular	1.7671	0.0150	1.5000	1.5000	

Total length of all conduits .... 66.0000 feet

==
| Table E2 - Conduit Factor Data |
==

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Flow Routing
Str15-1	1.0000	0.5000	0.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave
STR15-2	1.0000	0.5000	0.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave

==
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length |
| in the output file all it means is that the |
| program will lower the internal time step to |
| satisfy this condition (explicit condition). |
| You control the actual internal time step by |
| using the minimum courant time step factor in the |
| HYDRAULICS job control. The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection. |
| You have further control by using the modify |
| conduit option in the HYDRAULICS Job Control. |
==

Conduit Name	Courant Ratio	
Str15-1	2.23	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
STR15-2	2.32	===> Warning ! (sqrt(wave celerity)*time step/conduit length)

==================
| Conduit Volume |
==================

Full pipe or full open conduit volume
Input full depth volume............ 1.6611E+02 cubic feet

==
| Table E3a - Junction Data |
==

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cfs	Initial Depth-ft	Interface Flow (%)
1	CA	600.0000	584.4900	581.6700	0.0000	0.0000	100.0000
2	CAOut	600.0000	582.8900	580.8900	0.0000	0.0000	100.0000
3	CAOutb	600.0000	583.6000	582.1000	0.0000	0.0000	100.0000

==
| Table E3b - Junction Data |
==

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Pavement Slope
1	CA	130.7507	391.7333	No Ponding	Normal		0	0.0000
2	CAOut	123.6240	373.9254	No Ponding	Normal		0	0.0000
3	CAOutb	131.5872	372.5748	No Ponding	Normal		0	0.0000

==
| Table E4 - Conduit Connectivity |
==

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	Str15-1	CA	CAOut	581.6700	580.8900	No Design
2	STR15-2	CA	CAOutb	582.9900	582.1000	No Design

===
| Storage Junction Data |
===

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)	DEPTH STARTS FROM
CA	Stage/Area	6.446880E+06	118.171310E+06	600.0000	Node Invert

==================================
| Variable storage data for node | CA
==================================

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	581.6700	0.0000	6446880.000	0.0000	148.0000	0.0000
2	581.7950	0.1250	6446880.000	805860.0000	148.0000	18.5000
3	581.9200	0.2500	6446880.000	1.611720E+06	148.0000	37.0000
4	582.0450	0.3750	6446880.000	2.417580E+06	148.0000	55.5000
5	582.1700	0.5000	6446880.000	3.223440E+06	148.0000	74.0000
6	582.2950	0.6250	6446880.000	4.029300E+06	148.0000	92.5000
7	582.4200	0.7500	6446880.000	4.835160E+06	148.0000	111.0000
8	582.5450	0.8750	6446880.000	5.641020E+06	148.0000	129.5000
9	582.6700	1.0000	6446880.000	6.446880E+06	148.0000	148.0000
10	583.1700	1.5000	6446880.000	9.670320E+06	148.0000	222.0000
11	583.6700	2.0000	6446880.000	12.893760E+06	148.0000	296.0000
12	584.1700	2.5000	6446880.000	16.117200E+06	148.0000	370.0000
13	584.6700	3.0000	6446880.000	19.340640E+06	148.0000	444.0000
14	585.1700	3.5000	6446880.000	22.564080E+06	148.0000	518.0000
15	585.6700	4.0000	6446880.000	25.787520E+06	148.0000	592.0000
16	586.1700	4.5000	6446880.000	29.010960E+06	148.0000	666.0000
17	586.6700	5.0000	6446880.000	32.234400E+06	148.0000	740.0000
18	600.0000	18.3300	6446880.000	118.171310E+06	148.0000	2712.8400

===
| FREE OUTFALL DATA (DATA GROUP I1) |
| BOUNDARY CONDITION ON DATA GROUP J1 |
===

Outfall at Junction....CAOut has boundary condition number... 1
Outfall at Junction....CAOutb has boundary condition number... 2

===
| INTERNAL CONNECTIVITY INFORMATION |
===

CONDUIT	JUNCTION	JUNCTION
FREE # 1	CAOut	BOUNDARY
FREE # 2	CAOutb	BOUNDARY

==
| Boundary Condition Information |
| Data Groups J1-J4 |
==

BC NUMBER.. 1 Control water surface elevation is.. 581.00 feet.
BC NUMBER.. 2 Control water surface elevation is.. 581.00 feet.

##
Header information from interface file:
##

Title from first computational layer:
Lake Calumet Area - Conservation Area
SCS Hydrology - Huff Dist - 100YR - 24HR

```
 Title from immediately preceding computational layer
 Lake Calumet Area - Conservation Area
 SCS Hydrology - Huff Dist - 100YR - 24HR

 Name of preceding layer:................        Runoff Layer
 Initial Julian date (IDATEZ)......................   2000001
 Initial time of day in seconds (TZERO)............       0.0
 No. Transfered input locations....................         1
 No. Transfered pollutants.........................         0
 Size of total catchment area (acres).............    250.00

 #################################################
 # Element numbers of interface inlet locations: #
 #################################################

 CA

 Conversion factor to cfs for flow units on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was.. 2000001    0.0000 hours
Start date/time of the simulation was.. 2000001    0.0000 hours
Same date/time found in interface file and model

 *===================================================*
 |             XP Note Field Summary                 |
 *===================================================*


 ###################################################
 #           Surcharge Iteration Summary           #
 ###################################################

 Maximum number of iterations in a time step.....        1
 Total number of iterations in the simulation....   483840
 Average number of iterations per time step......     2.00
 Surcharge iterations during the simulation......        0
 Maximum surcharge flow error during simulation.. 0.00E+00 cfs
 Total number of time steps during simulation....   241920



 ***************************************************
 *         CONDUIT COURANT CONDITION SUMMARY       *
 * TIME IN MINUTES DELT > COURANT TIME STEP        *
 ***************************************************
 * SEE BELOW FOR EXPLANATION OF COURANT TIME STEP. *
 ***************************************************

  CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)CONDUIT #  TIME(MN)
  ---------  --------  ---------  --------  ---------  -----------------  --------
 Str15-1     39902.33 STR15-2         0.00

 ************************************************
 *         CONDUIT COURANT CONDITION SUMMARY    *
 ************************************************
 * COURANT   =            CONDUIT LENGTH        *
 * TIME STEP = -------------------------------- *
 *             VELOCITY + SQRT(GRVT*AREA/WIDTH) *
 ************************************************
 * AVERAGE COURANT CONDITION TIME STEP(SECONDS) *
 ************************************************

  CONDUIT # TIME(SEC)  CONDUIT # TIME(SEC)  CONDUIT # TIME(SEC)CONDUIT # TIME(SEC)
  ---------  --------  ---------  --------  ---------  -----------------  --------
 Str15-1         5.02 STR15-2        10.00

 *=====================================================*
 |        Table E9 - JUNCTION SUMMARY STATISTICS       |
 | The Maximum area is only the area of the node, it   |
 | does not include the area of the surrounding conduits|
 *=====================================================*

                            Uppermost   Maximum     Time       Feet of             Maximum   Maximum   Maximum   Maximum
                     Ground PipeCrown  Junction      of       Surcharge  Freeboard Junction    Gutter    Gutter    Gutter
       Junction   Elevation Elevation Elevation   Occurence     at Max   of node     Area      Depth     Width  Velocity
           Name        feet      feet      feet   Hr. Min.   Elevation      feet     ft^2       feet      feet      ft/s
 ---------------   ---------  --------  --------   ---------   ---------  --------  -------- --------- --------- ---------
             CA    600.0000  584.4900  582.5539     24   34       0.0000   17.4461 6446928.8    0.0000    0.0000    0.0000
          CAOut    600.0000  582.8900  581.7731     24   34       0.0000   18.2269   84.5005    0.0000    0.0000    0.0000
         CAOutb    600.0000  583.6000  582.1000      0    0       0.0000   17.9000   13.0003    0.0000    0.0000    0.0000

 *=====================================================*
 |        Table E10 - CONDUIT SUMMARY STATISTICS       |
 | Note: The peak flow may be less than the design flow |
 | and the conduit may still surcharge because of the  |
 | downstream boundary conditions.                     |
 |                                                     |
 | * denotes an open conduit that has been overtopped  |
 |   this is a potential source of severe errors       |
 *=====================================================*

                          Conduit  Maximum  Maximum    Time      Maximum    Time   Ratio of    Maximum Water      Ratio
```

Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Vertical Depth (in)	Computed Flow (cfs)	of Occurence Hr.	Min.	Computed Velocity (ft/s)	of Occurence Hr.	Min.	Max. to Design Flow	Elev at Pipe Ends Upstream (ft)	Dwnstrm (ft)	d/D US	DS
Str15-1	28.8594	9.1862	24.0000	11.6209	24	34	8.6847	24	33	0.4027	582.5539	581.7730	0.442	0.442
STR15-2	15.6803	8.8733	18.0000	0.0000	0	0	0.0000	0	0	0.0000	582.1000	582.1000	.0000	.0000
FREE # 1	Undefnd	Undefnd	Undefn	11.6209	24	34								
FREE # 2	Undefnd	Undefnd	Undefn	0.0000	0	0								

==
| Table E11. Area assumptions used in the analysis|
| Subcritical and Critical flow assumptions from |
| Subroutine Head. See Figure 17-1 in the |
| manual for further information. |
==

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
Str15-1	144.3333	80495.6667	0.0000	0.0000	0.4600	1.3381	0.0000
STR15-2	80640.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

===
| Table E12. Mean Conduit Flow Information |
===

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
Str15-1	2.0961	5070984.2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STR15-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FREE # 1	2.0961	5070984.2						
FREE # 2	0.0000	0.0000						

==
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn). |
| Use this section for culvert comparisons |
==

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
Str15-1	11.2617	0.5706	0.7767	1.2039	0.8675	582.5402	581.7571	Max Flow
STR15-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow

===
| Table E13a. CULVERT ANALYSIS CLASSIFICATION, |
| and the time the culvert was in a particular |
| classification during the simulation. The time is |
| in minutes. The Dynamic Wave Equation is used for |
| all conduit analysis but the culvert flow classification |
| condition is based on the HW and TW depths. |
===

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
Str15-1	0.0000	0.0000	0.0000	403.8333	0.0000	0.0000	39761.167	0.0000	None
STR15-2	0.0000	0.0000	0.0000	40165.000	0.0000	0.0000	0.0000	0.0000	None

=====================================
| Kinematic Wave Approximations |
| Time in Minutes for Each Condition |
=====================================

Conduit Name	Duration of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
Str15-1	499.0000	0.0000	0.0000	0.0000
STR15-2	0.0000	0.0000	0.0000	0.0000

===
| Table E15 - SPREADSHEET INFO LIST |
| Conduit Flow and Junction Depth Information for use in |
| spreadsheets. The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the |
| maximum of a subset of all the time steps in the run. |
| Note: These flows are only the flows in a single barrel.|
===

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Str15-1	11.6209	5070984.212	8.6847	0.0000	##	CA	581.6700	582.5539
STR15-2	0.0000	0.0000	0.0000	0.0000	##	CAOut	580.8900	581.7731
FREE # 1	11.6209	5070984.212	0.0000	0.0000	##	CAOutb	582.1000	582.1000

FREE # 2	0.0000	0.0000	0.0000	0.0000 ##

===
| Table E15a - SPREADSHEET REACH LIST |
| Peak flow and Total Flow listed by Reach or those conduits or diversions having the same upstream and downstream nodes. |
===

Upstream Node	Downstream Node	Maximum Flow (cfs)	Total Flow (ft^3)

##
Table E16. New Conduit Information Section
Conduit Invert (IE) Elevation and Conduit
Maximum Water Surface (WS) Elevations
##

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
Str15-1	CA	CAOut	581.6700	580.8900	582.5539	581.7730	Circular
STR15-2	CA	CAOutb	582.9900	582.1000	582.1000	582.1000	Circular

==
| Table E19 - Junction Inflow & Outflow Listing |
| Units are either ft^3 or m^3 depending on the units in your model. |
==

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Outflow from Node	Evaporation from Node	Inflow from 2D Layer
CA	0.0000	0.0000	6.0496E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CAOut	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	5.0710E+06	0.0000	0.0000

===
| Table E20 - Junction Flooding and Volume Listing. |
| The maximum volume is the total volume in the node including the volume in the flooded storage area. This is the max volume at any time. The volume in the flooded storage area is the total volume above the ground elevation, where the flooded pond storage area starts. |
| The fourth column is instantaneous, the fifth is the sum of the flooded volume over the entire simulation |
| Units are either ft^3 or m^3 depending on the units. |
===

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
CA	0.0000	0.0000	0.0000	0.0000	0.0000
CAOut	0.0000	0.0000	0.0000	0.0000	0.0000
CAOutb	0.0000	0.0000	0.0000	0.0000	0.0000

==================================
| Simulation Specific Information |
==================================

Number of Input Conduits..........	2	Number of Simulated Conduits......	4
Number of Natural Channels........	0	Number of Junctions..............	3
Number of Storage Junctions.......	1	Number of Weirs..................	0
Number of Orifices................	0	Number of Pumps..................	0
Number of Free Outfalls...........	2	Number of Tide Gate Outfalls......	0

==
| Average % Change in Junction or Conduit is defined as: |
| Conduit % Change ==> 100.0 (Q(n+1) - Q(n)) / Qfull |
| Junction % Change ==> 100.0 (Y(n+1) - Y(n)) / Yfull |
==

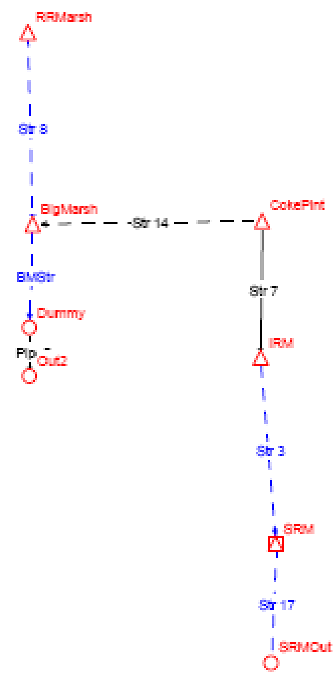
The Conduit with the largest average change was..Str15-1 with 0.000 percent
The Junction with the largest average change was.CAOut with 0.000 percent
The Conduit with the largest sinuosity was.......Str15-1 with 0.000

==
| Table E21. Continuity balance at the end of the simulation |
| Junction Inflow, Outflow or Street Flooding |
| Error = Inflow + Initial Volume - Outflow - Final Volume |
==

Inflow Junction	Inflow Volume,ft^3	Average Inflow, cfs
CA	6.04956E+06	2.5006
CAOut	-5.071E+06	-2.0961

Outflow Outflow Average

```
       Junction  Volume,ft^3    Outflow, cfs
---------------  ------------   ------------
          CAOut   5.07098E+06         2.0961


*=====================================================*
| Initial system volume        =         0.0003 Cu Ft |
| Total system inflow volume   =   6.049556E+06 Cu Ft |
| Inflow + Initial volume      =   6.049556E+06 Cu Ft |
*=====================================================*
| Total system outflow         =   5.070984E+06 Cu Ft |
| Volume left in system        =    978574.6463 Cu Ft |
| Evaporation                  =         0.0000 Cu Ft |
| Outflow + Final Volume       =   6.049559E+06 Cu Ft |
*=====================================================*

*===============================================*
| Total Model Continuity Error                  |
| Error in Continuity, Percent =        -0.0001 |
| Error in Continuity, ft^3    =         -3.174 |
| + Error means a continuity loss, - a gain     |
*===============================================*

###################################################
# Table E22. Numerical Model judgement section    #
###################################################

Your overall error was                                    -0.0001 percent
Worst nodal error was in node CA               with        -7.9197 percent
Of the total inflow this loss was                         14.5583 percent
Your overall continuity error was                  Excellent
                                                  Excellent Efficiency
Efficiency of the simulation                       0.00
Most Number of Non Convergences at one Node        0.
Total Number Non Convergences at all Nodes         0.
Total Number of Nodes with Non Convergences        0.

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\CA\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\CA\model-e.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... August     18, 2006  Time...    9:31:51:97  |
|   Ending Date... August     18, 2006  Time...    9:41:11:81  |
|  Elapsed Time...    9.33067 minutes or    559.84000 seconds  |
*==============================================================*
```



SWMM Version 9.12 Copyright (c) XP Software	Lake Calumet Area - Indian Ridge and Big Marshes Hydraulic Analysis Licenced To: V3 [42-910-0200]	11/30/05 Page 1/1

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\marsh\model.XP

          *================================================*
          |                    xpswmm                      |
          |     Storm and Wastewater Management Model     |
          |           Interface Version: 10.0              |
          |              Engine Version: 10.03             |
          |================================================|
          |                                                |
          |                  Developed by                  |
          |                                                |
          |                  XP Software                   |
          |                                                |
          |================================================|
          |      XP Software       February, 2006          |
          |       Data File Version --->    11.7           |
          |       Serial Number: 42-1000-0200              |
          |               V3 Consultants                   |
          *================================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 JIN.US
 Output File to Layer #     1 E:\1998\98216\98216HMP\xp\Cluster\template.int

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                       0.0000         1         2
 $perv                               0.0000         0         4
 $oldegg                             0.0000         0         7
 $as                                 0.0000         0        11
 $noflat                             0.0000         0        21
 $oldomega                           0.0000         0        24
 $oldvol                             0.0000         1        28
 $implicit                           0.0000         1        29
 $oldhot                             0.0000         1        31
 $oldscs                             0.0000         0        33
 $flood                              0.0000         1        40
 $nokeys                             0.0000         0        42
 $pzero                              0.0000         0        55
 $oldvol2                            0.0000         2        59
 $storage2                           0.0000         3        62
 $oldhot1                            0.0000         1        63
 $pumpwt                             0.0000         1        70
 $ecloss                             0.0000         1        77
 $exout                              0.0000         0        97
 $spatial = 0.90                     0.9000         5       124
 $djref = -1.0                      -0.1000         3       143
 $weirlen = 50                      50.0000         1       153
 $oldbnd                             0.0000         1       154
 $nogrelev                           0.0000         1       161
 $ncmid                              0.0000         0       164
 $new_nl_97                          0.0000         2       290
 $best97                             0.0000         1       294
 $newbound                           0.0000         1       295
 USE_ORF_EQN                         0.0000         1       304
 $q_tol = 0.01                       0.0001         1       316
 $new_storage                        0.0000         1       322
 $old_iteration                      0.0000         1       333
 $minlen=30.0                       30.0000         1       346
 $review_elevation                   0.0000         1       383
 $use_half_volume                    0.0000         1       385
 $min_ts = 0.5                       0.5000         1       407
 $design_restart = on                0.0000         1       412
 $zero_value=1.e-05                  0.0000         1       415
 $relax_depth = on                   0.0000         1       427
 $saveallpts = on                    0.0000         1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
 | by the model for this simulation.                         |
 *===========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     5
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ)............     0
  Runoff Land Uses per Subcatchment (NLU)............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........     0
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..     5
  Number of Pumps in Extran (NEP)....................     0
  Number of Orifices in Extran (NEO).................     0
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
  Number of Extran Weirs (NEW).......................     0
  Number of scs hydrograph points....................  1825
  Number of Extran printout locations (NPO)..........     0
  Number of Tide elements in Extran (NTE)............     0
  Number of Natural channels (NNC)...................     0
  Number of Storage junctions in Extran (NVSE)........     0
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     0
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)..............     5
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............     5
  Number of Plugs in a Storage Treatment Unit.........     1


 #######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated January,2005 by XP Software         #

 *===========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                 |
 |  These are the more important tables in the output file.  |
 |  You can use your editor to find the table numbers,       |
 |  for example: search for Table R3 to check continuity.    |
 |  This output file can be imported into a Word Processor   |
 |  and printed on US letter or A4 paper using portrait      |
 |  mode, courier font, a size of 8 pt. and margins of 0.75  |
 |                                                           |
 | Table R1  - Physical Hydrology Data                       |
 | Table R2  - Infiltration data                             |
 | Table R3  - Raingage and Infiltration Database Names      |
 | Table R4  - Groundwater Data                              |
 | Table R5  - Continuity Check for Surface Water            |
 | Table R6  - Continuity Check for Channels/Pipes           |
 | Table R7  - Continuity Check for Subsurface Water         |
 | Table R8  - Infiltration/Inflow Continuity Check          |
 | Table R9  - Summary Statistics for Subcatchments          |
 | Table R10 - Sensitivity anlysis for Subcatchments         |
 *===========================================================*

                    Lake Calumet Area - Indian Ridge and Big Marshes w/ Cluster Site Addition
                    SCS Hydrology - Huff Dist - 100YR - 24HR
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................            0
 Number of rain gages - NRGAG....................            1
 Quality is not simulated - KWALTY...............            0
 Read evaporation data on line(s) F1 (F2) - IVAP..           1
 Hour of day at start of storm - NHR.............            0
 Minute of hour at start of storm - NMN..........            0
 Time TZERO at start of storm (hours)............        0.000
 Use U.S. Customary units for most I/O - METRIC...           0
 Runoff input print control...                               0
 Runoff graph plot control....                               1
 Runoff output print control..                               0
 Limit number of groundwater convergence messages to     10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)         0

 Print land use load percentages -LANDUPR (0=no, 1=yes)      0
 Month, day, year of start of storm is:              1/ 1/2000
 Wet time step length (seconds).......                    60.0
 Dry time step length (seconds).......                 86400.0
 Wet/Dry time step length (seconds)...                    60.0
 Simulation length is......                               30.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ............................................  0.01000
```

```
Raingage #...............................          1
KTYPE  - Rainfall input type.............          0
NHISTO - Total number of rainfall values..        20
KINC   - Rainfall values(pairs) per line..        10
KPRINT - Print rainfall(0-Yes,1-No).......         0
KTIME  - Precipitation time units
0 --> Minutes  1 --> Hours................         0
KPREP  - Precipitation unit type
0 --> Intensity  1 --> Volume............          1
KTHIS - Variable rainfall intervals
0 --> No, > 1 --> Yes.....................         0
THISTO - Rainfall time interval...........     72.00
TZRAIN - Starting time(KTIME units).......      0.00
```

```
######################################
# Rainfall input summary from Runoff #
######################################
```

Total rainfall for gage #   1 is   7.5800 inches

```
#############################
#        Data Group F1      #
# Evaporation Rate (in/day) #
#############################
```

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV	DEC.
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
###################################################
#  Table R1.  S U B C A T C H M E N T   D A T A   #
#             Physical Hydrology Data             #
###################################################
```

Number	Subcatchment Name	Channel or inlet	Width (ft)	Area (ac)	Per- cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs -sion Storge Imprv	Deprs -sion Strge Perv	Prcnt Zero Deten -tion
1	RRMarsh#1	RRMarsh	100.00	250.00	0.00	0.010	0.020	0.020	0.000	0.000	0.00
2	CokePlnt#1	CokePlnt	100.00	124.00	0.00	0.010	0.020	0.020	0.000	0.000	0.00
3	IRM-N#1	IRM-N	100.00	123.00	0.00	0.010	0.020	0.020	0.000	0.000	0.00
4	IRM-S#1	IRM-S	100.00	47.000	0.00	0.010	0.020	0.020	0.000	0.000	0.00
5	BigMarsh#1	BigMarsh	100.00	314.00	0.00	0.010	0.020	0.020	0.000	0.000	0.00

```
#########################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                #
#                     Infiltration or Time of Concentration Data                                        #
#                                                                                                       #
# Infiltration Type       Infl #1(#5)       Infl #2(#6)          Infl #3(#7)             Infl #4(#8)  #
# SCS                  ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction  #
# SBUH                 ->   Comp CN          Time Conc                  N/A                      N/A  #
# Green Ampt           ->   Suction          Hydr Cond           Initial MD                      N/A  #
# Horton               ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume  #
# Proportional         ->  Constant                N/A                  N/A                      N/A  #
# Initial/Cont Loss    ->   Initial         Continuing                  N/A                      N/A  #
# Initial/Proportional ->   Initial           Constant                  N/A                      N/A  #
# Laurenson Parameters ->   B Value       Pervious "n"      Impervious Cont                 Exponent  #
# Rational Formula     -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance  #
#                              (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                  #
#                      Rational Formula Tc Method: 1 = Constant                                         #
#                                                  2 = Friend's Equation                                #
#                                                  3 = Kinematic Wave                                   #
#                                                  4 = Alameda Method                                   #
#                                                  5 = Izzard's Formula                                 #
#                                                  6 = Kerby's Equation                                 #
#                                                  7 = Kirpich's Equation                               #
#                                                  8 = Bransby Williams Equation                        #
#                                                  9 = Federal Aviation Authority Equation              #
#########################################################################################################
```

Subcatchment Number	Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	RRMarsh#1	92.0000	1.0000	484.0000	0.2000				
2	CokePlnt#1	92.0000	1.0000	484.0000	0.2000				
3	IRM-N#1	92.0000	1.0000	484.0000	0.2000				
4	IRM-S#1	92.0000	1.0000	484.0000	0.2000				
5	BigMarsh#1	92.0000	1.0000	484.0000	0.2000				

```
############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################
```

Subcatchment Number	Name	Gage No	Infiltration Type	Routing Type	Rainfall Database Name	Infiltration Database Name
1	RRMarsh#1	1	SCS Method	SCS curvilinear	NE IL 100yr 24hr	
2	CokePlnt#1	1	SCS Method	SCS curvilinear	NE IL 100yr 24hr	

```
     3         IRM-N#1      1   SCS Method       SCS curvilinear     NE IL 100yr 24hr
     4         IRM-S#1      1   SCS Method       SCS curvilinear     NE IL 100yr 24hr
     5      BigMarsh#1      1   SCS Method       SCS curvilinear     NE IL 100yr 24hr

Total Number of Subcatchments...             5
Total Tributary Area (acres)....        858.00
Impervious Area (acres).........          0.00
Pervious Area (acres)...........        858.00
Total Width (feet)..............        500.00
Impervious Area (%).............          0.00


 ###################################################
 #         S U B C A T C H M E N T  D A T A        #
 #   Default, Ratio values for subcatchment data   #
 #   Used with the calibrate node in the runoff.   #
 # 1 - width     2 - area       3 - impervious %   #
 # 4 - slope     5 - imp "n"    6 - perv "n"       #
 # 7 - imp ds    8 - perv ds    9 - 1st infil      #
 #10 - 2nd infil              11 - 3rd infil      #
 ###################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio       1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************


    Inlet
RRMarsh        No Tributary Channel/Pipes
               Tributary Subareas........ RRMarsh#1
CokePlnt       No Tributary Channel/Pipes
               Tributary Subareas........ CokePlnt#1
IRM-N          No Tributary Channel/Pipes
               Tributary Subareas........ IRM-N#1
IRM-S          No Tributary Channel/Pipes
               Tributary Subareas........ IRM-S#1
BigMarsh       No Tributary Channel/Pipes
               Tributary Subareas........ BigMarsh#1


***********************************************************
* Hydrographs will be stored for the following   5 INLETS *
***********************************************************
RRMarsh   CokePlnt  IRM-N     IRM-S     BigMarsh


************************************************
*  Quality Simulation not included in this run *
************************************************




***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....       1   *
***************************************************

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


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

Final Date (Mo/Day/Year)   =            1/ 2/2000
Total number of time steps =                 1800
Final Julian Date          =              2000002
Final time of day          =               21600. seconds.
Final time of day          =                 6.00   hours.
Final running time         =              30.0000   hours.
Final running time         =               1.2500    days.

****************************************************
*     Extrapolation Summary for Watersheds         *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments.       *
* # Steps ==> Total Number of Extrapolated Steps   *
* # Calls ==> Total Number of OVERLND Calls        *
****************************************************

Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
-------------  -------  -------- -------------  -------  --------
RRMarsh#1            0         0 CokePlnt#1           0         0 IRM-N#1             0         0
IRM-S#1              0         0 BigMarsh#1           0         0


#########################################################
# Rainfall input summary from Runoff Continuity Check   #
```

```
#########################################################

 Total rainfall read for gage #         1 is       7.5800 in
 Total rainfall duration for gage #     1 is      1440.00 minutes

 ************************************************************
 * Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
 *       Any continuity error can be fixed by lowering the  *
 *       wet and transition time step. The transition time  *
 *       should not be much greater than the wet time step. *
 ************************************************************
                                                                  Inches over
                                                    cubic feet    Total Basin
 Total Precipitation (Rain plus Snow)              2.360821E+07      7.580
 Total Infiltration                                2.965380E+06      0.952
 Total Evaporation                                 0.000000E+00      0.000
 Surface Runoff from Watersheds                    2.076208E+07      6.666
 Total Water remaining in Surface Storage          0.000000E+00      0.000
 Infiltration over the Pervious Area...            2.965380E+06      0.952
                       --------
 Infiltration + Evaporation +
 Surface Runoff + Snow removal +
 Water remaining in Surface Storage +
 Water remaining in Snow Cover.........            2.372746E+07      7.618
 Total Precipitation + Initial Storage.            2.360821E+07      7.580


 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  *
 ***************************************
 Percent Continuity Error...............                            -0.5051


 ****************************************************
 * Table R6. Continuity Check for Channel/Pipes     *
 *           You should have zero continuity error  *
 *           if you are not using runoff hydraulics *
 ****************************************************
                                                                  Inches over
                                                    cubic feet    Total Basin
 Initial Channel/Pipe Storage................      0.000000E+00      0.000
 Final Channel/Pipe Storage..................      0.000000E+00      0.000
 Surface Runoff from Watersheds..............      2.076208E+07      6.666
 Groundwater Subsurface Inflow or Diversion..      0.000000E+00      0.000
 Evaporation Loss from Channels..............      0.000000E+00      0.000
 Groundwater Flow Diverted Out of Network....      0.000000E+00      0.000
 Channel/Pipe/Inlet Outflow..................      2.076208E+07      6.666
 Initial Storage + Inflow....................      2.076208E+07      6.666
 Final Storage + Outflow + Diverted GW.......      2.076208E+07      6.666
 ********************************************
 * Final Storage + Outflow + Evaporation  - *
 * Watershed Runoff - Groundwater Inflow  - *
 *     Initial Channel/Pipe Storage         *
 *     ---------------------------------   *
 *  Final Storage + Outflow  + Evaporation  *
 ********************************************
 Percent Continuity Error....................                      0.0000

         ##################################################
         # Table R9. Summary Statistics for Subcatchments #
         ##################################################

 Note: Total Runoff Depth includes pervious & impervious area
       Pervious and Impervious Runoff Depth is only the runoff from those two areas.

 Subcatchment...........      RRMarsh#1       CokePlnt#1          IRM-N#1          IRM-S#1       BigMarsh#1
 Area (acres)...........      250.00000        124.00000        123.00000         47.00000        314.00000
 Percent Impervious.....        0.00000          0.00000          0.00000          0.00000          0.00000
 Total Rainfall (in)....        7.58000          7.58000          7.58000          7.58000          7.58000
 Max Intensity (in/hr)..        0.82500          0.82500          0.82500          0.82500          0.82500
 Pervious Area
 -------------
 Total Runoff Depth (in)        6.66618          6.66618          6.66618          6.66618          6.66618
 Total Losses (in)......        0.91382          0.91382          0.91382          0.91382          0.91382
 Remaining Depth (in)...        0.00000          0.00000          0.00000          0.00000          0.00000
 Peak Runoff Rate (cfs).      200.73466         99.56439         98.76145         37.73812        252.12274
 Total Impervious Area
 ---------------------
 Total Runoff Depth (in)        0.00000          0.00000          0.00000          0.00000          0.00000
 Peak Runoff Rate (cfs).        0.00000          0.00000          0.00000          0.00000          0.00000
 Impervious Area with depression storage
 ---------------------------------------
 Total Runoff Depth (in)        0.00000          0.00000          0.00000          0.00000          0.00000
 Peak Runoff Rate (cfs).        0.00000          0.00000          0.00000          0.00000          0.00000
 Impervious Area without depression storage
 ------------------------------------------
```

```
Total Runoff Depth (in)          0.00000          0.00000          0.00000          0.00000          0.00000
Peak Runoff Rate (cfs).          0.00000          0.00000          0.00000          0.00000          0.00000
Total Area
----------
Total Runoff Depth (in)          6.66618          6.66618          6.66618          6.66618          6.66618
Peak Runoff Rate (cfs).        200.73466         99.56439         98.76145         37.73812        252.12274
Unit Runoff (in/hr)....          0.80294          0.80294          0.80294          0.80294          0.80294
Rational Formula
----------------
Pervious Tc. (mins)....          0.00000          0.00000          0.00000          0.00000          0.00000
Perv. Intensity (in/hr)          0.00000          0.00000          0.00000          0.00000          0.00000
Pervious C ............          0.00000          0.00000          0.00000          0.00000          0.00000
Impervious Tc. (mins)..          0.00000          0.00000          0.00000          0.00000          0.00000
Imp. Intensity (in/hr).          0.00000          0.00000          0.00000          0.00000          0.00000
Impervious C ..........          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area (Ha)......          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area Tc........          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area Intensity.          0.00000          0.00000          0.00000          0.00000          0.00000

1
         1.000 |=========|=========|=========|=========|=========|=========|=========|=========|=========|=========|
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                                                                                   |
               |                                   ####                                                            |
         0.800 =                                   #  #                                                            =
               |                                   #  #                                                            |
               |                                ####  #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
               |                                #     #                                                            |
         0.600 =                                #     #                                                            =
               |                                #     #                                                            |
               |                                #     ####                                                         |
 RAINFALL      |                                #        #                                                         |
               |                                #        #                                                         |
    IN         |                                #        #                                                         |
               |                                #        #                                                         |
  IN/HR        |                                #        #                                                         |
               |                             ####        #                                                         |
               |                             #           #                                                         |
         0.400 =                             #           #                                                         =
               |                          ####           ####                                                      |
               |                          #                 #                                                      |
               |                          #                 #                                                      |
               |                       ####                 #                                                      |
               |                       #                    #                                                      |
               |                       #                    #                                                      |
               |              ##########                    ####                                                   |
               |              #                                #                                                   |
               |              #                                #                                                   |
         0.200 ####  ##########                                #  ####  ####                                       =
               #  ####                                         ####  #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     #  #  #                                       |
               #                                                     ####  #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
               #                                                           #                                       |
         0.000 #=========|=========|=========|=========|=========|=========#=========|=========|=========|=========|
              0.0       4.0       8.0      12.0      16.0      20.0      24.0      28.0      32.0      36.0      40.0

                LOCATION NO. : 1                   TIME IN HOURS

                 RAINFALL HYETOGRAPH


RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: FLOW SUM


RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: INFILTRA

===> Runoff simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\marsh\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\marsh\model-r.out

*===============================================================*
|             SWMM Simulation Date and Time Summary             |
*===============================================================*
| Starting Date... August     18, 2006  Time...    9:58:16:40  |
|   Ending Date... August     18, 2006  Time...    9:58:24:10  |
|  Elapsed Time...    0.12833 minutes or      7.70000 seconds  |
*===============================================================*
```

```
Current Directory:   C:\PROGRA~1\XPS\XP-SWMM
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE
 Input File : E:\1998\98216\98216HMP\xp\marsh\model.XP

          *================================================*
          |                    xpswmm                      |
          |     Storm and Wastewater Management Model      |
          |           Interface Version: 10.0              |
          |              Engine Version: 10.03             |
          |================================================|
          |                                                |
          |                 Developed by                   |
          |                                                |
          |                 XP Software                    |
          |                                                |
          |================================================|
          |      XP Software       February, 2006          |
          |       Data File Version --->    11.7           |
          |       Serial Number: 42-1000-0200              |
          |               V3 Consultants                   |
          *================================================*

Engine Name: C:\PROGRA~1\XPS\XP-SWMM\SWMMEN~1.EXE


*=====================================================*
|       Input and Output file names by Layer          |
*=====================================================*

 Input File  to Layer #     1 E:\1998\98216\98216HMP\xp\Cluster\template.int
 Output File to Layer #     1 JOT.US

*============================================================*
|   Special command line arguments in XP-SWMM2000. This      |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                           |
|                                                            |
|   Note: the cfg file should be in the subdirectory swmxp   |
|         or defined by the set variable in the xpswm.bat    |
|         file.  Some examples of the command lines possible|
|         are shown below:                                   |
|                                                            |
|   swmmd swmmcom.cfg                                        |
|   swmmd my.cfg                                             |
|   swmmd nokeys nconv5 perv extranwq                        |
*============================================================*

 $powerstation                        0.0000        1         2
 $perv                                0.0000        0         4
 $oldegg                              0.0000        0         7
 $as                                  0.0000        0        11
 $noflat                              0.0000        0        21
 $oldomega                            0.0000        0        24
 $oldvol                              0.0000        1        28
 $implicit                            0.0000        1        29
 $oldhot                              0.0000        1        31
 $oldscs                              0.0000        0        33
 $flood                               0.0000        1        40
 $nokeys                              0.0000        0        42
 $pzero                               0.0000        0        55
 $oldvol2                             0.0000        2        59
 $storage2                            0.0000        3        62
 $oldhot1                             0.0000        1        63
 $pumpwt                              0.0000        1        70
 $ecloss                              0.0000        1        77
 $exout                               0.0000        0        97
 $spatial = 0.90                      0.9000        5       124
 $djref = -1.0                       -0.1000        3       143
 $weirlen = 50                       50.0000        1       153
 $oldbnd                              0.0000        1       154
 $nogrelev                            0.0000        1       161
 $ncmid                               0.0000        0       164
 $new_nl_97                           0.0000        2       290
 $best97                              0.0000        1       294
 $newbound                            0.0000        1       295
 USE_ORF_EQN                          0.0000        1       304
 $q_tol = 0.01                        0.0001        1       316
 $new_storage                         0.0000        1       322
 $old_iteration                       0.0000        1       333
 $minlen=30.0                        30.0000        1       346
 $review_elevation                    0.0000        1       383
 $use_half_volume                     0.0000        1       385
 $min_ts = 0.5                        0.5000        1       407
 $design_restart = on                 0.0000        1       412
 $zero_value=1.e-05                   0.0000        1       415
 $relax_depth = on                    0.0000        1       427
 $saveallpts = on                     0.0000        1       434

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
```

```
| by the model for this simulation.                          |
*============================================================*

 Number of Subcatchments in the Runoff Block (NW)....     0
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ)............     0
 Runoff Land Uses per Subcatchment (NLU)............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........    11
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..    11
 Number of Pumps in Extran (NEP)....................     0
 Number of Orifices in Extran (NEO).................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     2
 Number of Extran Weirs (NEW).......................     2
 Number of scs hydrograph points....................     1
 Number of Extran printout locations (NPO)..........     0
 Number of Tide elements in Extran (NTE)............     2
 Number of Natural channels (NNC)...................     0
 Number of Storage junctions in Extran (NVSE)........     5
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     5
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)..............    11
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)..........     1
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)...........    11
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the HYDRAULIC Layer(Block) of SWMM #
#    Last Updated June,2005 by XP Software            #

    Lake Calumet Area - Indian Ridge and Big Marshes w/ Cluster Site Additi
    Hydraulic Analysis


*=============================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE                 |
|  These are the more important tables in the output file.    |
|  You can use your editor to find the table numbers,         |
|  for example: search for Table E20 to check continuity.     |
|  This output file can be imported into a Word Processor     |
|  and printed on US letter or A4 paper using portrait        |
|  mode, courier font, a size of 8 pt. and margins of 0.75    |
|                                                             |
| Table E1   - Basic Conduit Data                             |
| Table E2   - Conduit Factor Data                            |
| Table E3a  - Junction Data                                  |
| Table E3b  - Junction Data                                  |
| Table E4   - Conduit Connectivity Data                      |
| Table E4a  - Dry Weather Flow Data                          |
| Table E4b  - Real Time Control Data                         |
| Table E5   - Junction Time Step Limitation Summary          |
| Table E5a  - Conduit Explicit Condition Summary             |
| Table E6   - Final Model Condition                          |
| Table E7   - Iteration Summary                              |
| Table E8   - Junction Time Step Limitation Summary          |
| Table E9   - Junction  Summary  Statistics                  |
| Table E10  - Conduit   Summary  Statistics                  |
| Table E11  - Area assumptions used in the analysis          |
| Table E12  - Mean conduit information                       |
| Table E13  - Channel losses(H) and culvert info             |
| Table E13a - Culvert Analysis Classification                |
| Table E14  - Natural Channel Overbank Flow Information      |
| Table E14a - Natural Channel Encroachment Information       |
| Table E14b - Floodplain Mapping                             |
| Table E15  - Spreadsheet Info List                          |
| Table E15a - Spreadsheet Reach List                         |
| Table E16  - New Conduit Output Section                     |
| Table E17  - Pump Operation                                 |
| Table E18  - Junction Continuity Error                      |
| Table E19  - Junction Inflow & Outflow Listing              |
| Table E20  - Junction Flooding and Volume List              |
| Table E21  - Continuity balance at simulation end           |
| Table E22  - Model Judgement Section                        |
*============================================================*

Time Control from Hydraulics Job Control
Year.........    2000 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................    233280
Length of integration step is......     10.00 seconds
```

Simulation length.................. 648.00 hours
Do not create equiv. pipes(NEQUAL). 0
Use U.S. customary units for I/O... 0
Printing starts in cycle........... 1
Intermediate printout intervals of. 500 cycles
Intermediate printout intervals of. 83.33 minutes
Summary printout intervals of...... 500 cycles
Summary printout time interval of.. 83.33 minutes
Hot start file parameter (REDO).... 0
Initial time....................... 0.00 hours

Iteration variables: Flow Tolerance. 0.00010
Head Tolerance. 0.00005
Minimum depth (m or ft)......... 0.00001
Underrelaxation parameter....... 0.85000
Time weighting parameter........ 0.85000
Conduit roughness factor........ 1.00000
Flow adjustment factor.......... 1.00000
Initial Condition Smoothing..... 0
Courant Time Step Factor........ 1.00000
Default Expansion/Contraction K. 0.00000
Default Entrance/Exit K......... 0.00000
Routing Method.................. EPA-SWMM Enhanced Explicit (ISOL=1)
Default surface area of junctions... 13.00 square feet.
Minimum Junction/Conduit Depth...... 0.00001 feet.
Ponding Area Coefficient............ 5000.00
Ponding Area Exponent............... 1.0000
Minimum Orifice Length.............. 100.00 feet.
NJSW input hydrograph junctions..... 0
or user defined hydrographs....

===
Flap Gate Conduit Information
Positive Flap Gate - Flow only allowed from the upstream
to the downstream junction
Negative Flap Gate - Flow only allowed from the
downstream to the upstream junction
===

Conduit	Type of Flap Gate
Pipe5	Positive Flap Gate

Input Information from Internal Rating Curve Str 3.1

Point No.	Data Column # 1	Data Column # 2	Data Column # 3	Data Column # 4
1	0.000	0.000	0.000	0.000
2	0.270	0.000	5.000	0.000
3	0.420	0.000	10.000	0.000
4	1.140	0.000	15.000	0.000
5	2.170	0.000	20.000	0.000

Input Information from Internal Rating Curve S5

Point No.	Data Column # 1	Data Column # 2	Data Column # 3	Data Column # 4
1	0.000	0.000	0.000	0.000
2	1.330	0.000	0.010	0.000
3	1.510	0.000	2.000	0.000
4	2.190	0.000	4.000	0.000
5	2.670	0.000	5.000	0.000
6	3.260	0.000	6.000	0.000
7	4.750	0.000	8.000	0.000
8	6.670	0.000	10.000	0.000
9	9.020	0.000	12.000	0.000
10	9.230	0.000	12.160	0.000
11	10.350	0.000	323.150	0.000

===
| Table E1 - Conduit Data |
===

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	
1	Str 7	60.0000	Circular	7.0686	0.0240	3.0000	3.0000		
2	Pipe5	425.0000	Circular	4.9087	0.0240	2.5000	2.5000		
3	Culv 8	86.0000	Circular	3.1416	0.0240	2.0000	2.0000		
4	Chnl 17	650.0000	Trapezoid	368.0000	0.1000	0.0100	4.0000	23.0000	23.0000
5	Str14	85.0000	Circular	0.7854	0.0240	1.0000	1.0000		
6	Str 3.1	100.0000	Closd Cnd	0.0000	0.0140	2.1700	2.1700		
7	S5	100.0000	Closd Cnd	0.0000	0.0140	10.3500	10.3500		

Total length of all conduits .... 1506.0000 feet

===
| Table E2 - Conduit Factor Data |

==

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Flow Routing
Str 7	1.0000	0.5000	0.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave
Pipe5	2.0000	0.5000	1.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave
Culv 8	1.0000	0.5000	0.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave
Str14	1.0000	0.5000	0.0000	0.0000	0.8500	1.0000	0.0000	Standard - Dynamic Wave

```
*==================================================*
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length  |
| in the output file all it means is that the       |
| program will lower the internal time step to      |
| satisfy this condition (explicit condition).      |
| You control the actual internal time step by      |
| using the minimum courant time step factor in the |
| HYDRAULICS job control.  The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection.    |
| You have further control by using the modify      |
| conduit option in the HYDRAULICS Job Control.     |
*==================================================*
```

Conduit Name	Courant Ratio	
Str 7	1.64	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Pipe5	0.21	
Culv 8	0.93	
Chnl 17	0.12	
Str14	0.67	
Str 3.1	0.00	
S5	0.00	

==================
| Conduit Volume |
==================

Full pipe or full open conduit volume
Input full depth volume........... 2.4205E+05 cubic feet

==
| Table E3a - Junction Data |
==

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cfs	Initial Depth-ft	Interface Flow (%)
1	RRMarsh	600.0000	583.2200	581.2200	0.0000	0.0000	100.0000
2	BigMarsh	600.0000	590.0200	579.6700	0.0000	1.3300	100.0000
3	CokePlnt	600.0000	587.2500	584.2500	0.0000	0.5100	100.0000
4	IRM-N	600.0000	586.8200	582.5200	0.0000	0.0000	100.0000
5	IRM-S	600.0000	584.6900	580.0000	0.0000	1.0000	100.0000
6	SRMOut	600.0000	582.0000	578.0000	0.0000	0.0000	100.0000
7	Dummy	600.0000	590.0200	575.9900	0.0000	5.0100	100.0000
8	Out2	600.0000	577.5000	575.0000	0.0000	6.0000	100.0000

==
| Table E3b - Junction Data |
==

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Slope
1	RRMarsh	86.7778	481.8666	No Ponding	Normal		0	0.0000
2	BigMarsh	87.6667	448.0000	No Ponding	Normal		0	0.0000
3	CokePlnt	128.1112	448.5333	No Ponding	Normal		0	0.0000
4	IRM-N	127.6911	424.3653	No Ponding	Normal		0	0.0000
5	IRM-S	130.3578	391.5654	No Ponding	Normal		0	0.0000
6	SRMOut	129.6667	370.4000	No Ponding	Normal		0	0.0000
7	Dummy	87.0977	429.6836	No Ponding	Normal		0	0.0000
8	Out2	87.0849	421.1011	No Ponding	Normal		0	0.0000

==
| Table E4 - Conduit Connectivity |
==

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	Str 7	CokePlnt	IRM-N	584.2500	583.8200	No Design
2	Pipe5	Dummy	Out2	575.9900	575.0000	No Design
3	Culv 8	RRMarsh	BigMarsh	581.2200	579.6700	No Design
4	Chnl 17	IRM-S	SRMOut	580.0000	578.0000	No Design
5	Str14	CokePlnt	BigMarsh	584.7600	584.4200	No Design
6	Str 3.1	IRM-N	IRM-S	582.5200	582.5200	No Design
7	S5	BigMarsh	Dummy	579.6700	579.6700	No Design

Storage Junction Data

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)	DEPTH STARTS FROM
RRMarsh	Stage/Area	5.445000E+06	69.859860E+06	600.0000	Node Invert
BigMarsh	Stage/Area	5.445000E+06	102.310628E+06	600.0000	Node Invert
CokePlnt	Stage/Area	392040.0000	5.760339E+06	600.0000	Node Invert
IRM-N	Stage/Area	4.268880E+06	70.413733E+06	600.0000	Node Invert
IRM-S	Stage/Area	827640.0000	16.552800E+06	600.0000	Node Invert

Variable storage data for node | RRMarsh

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	581.2200	0.0000	435.6000	0.0000	0.0100	0.0000
2	581.9575	0.7375	435.6000	321.2550	0.0100	0.0074
3	582.6950	1.4750	435.6000	642.5100	0.0100	0.0147
4	583.4325	2.2125	435.6000	963.7650	0.0100	0.0221
5	584.1700	2.9500	435.6000	1285.0200	0.0100	0.0295
6	584.9075	3.6875	435.6000	1606.2750	0.0100	0.0369
7	585.6450	4.4250	435.6000	1927.5300	0.0100	0.0443
8	586.3825	5.1625	435.6000	2248.7850	0.0100	0.0516
9	587.1200	5.9000	435.6000	2570.0400	0.0100	0.0590
10	587.1325	5.9125	681006.1500	5481.1449	15.6337	0.1258
11	587.1450	5.9250	1361576.700	18004.1322	31.2575	0.4133
12	587.1575	5.9375	2042147.250	39134.2119	46.8813	0.8984
13	587.1700	5.9500	2722717.800	68812.8398	62.5050	1.5797
14	587.1825	5.9625	3403288.350	107021.3752	78.1287	2.4569
15	587.1950	5.9750	4083858.900	153751.4714	93.7525	3.5296
16	587.2075	5.9875	4764429.450	208998.6651	109.3762	4.7979
17	587.2200	6.0000	5445000.000	272760.2888	125.0000	6.2617
18	587.3450	6.1250	5445000.000	953385.2888	125.0000	21.8867
19	587.4700	6.2500	5445000.000	1.634010E+06	125.0000	37.5117
20	587.5950	6.3750	5445000.000	2.314635E+06	125.0000	53.1367
21	587.7200	6.5000	5445000.000	2.995260E+06	125.0000	68.7617
22	587.8450	6.6250	5445000.000	3.675885E+06	125.0000	84.3867
23	587.9700	6.7500	5445000.000	4.356510E+06	125.0000	100.0117
24	588.0950	6.8750	5445000.000	5.037135E+06	125.0000	115.6367
25	588.2200	7.0000	5445000.000	5.717760E+06	125.0000	131.2617
26	600.0000	18.7800	5445000.000	69.859860E+06	125.0000	1603.7617

Variable storage data for node | BigMarsh

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	579.6700	0.0000	3267000.000	0.0000	75.0000	0.0000
2	579.9612	0.2913	3267000.000	951513.7500	75.0000	21.8438
3	580.2525	0.5825	3267000.000	1.903028E+06	75.0000	43.6875
4	580.5437	0.8738	3267000.000	2.854541E+06	75.0000	65.5312
5	580.8350	1.1650	3267000.000	3.806055E+06	75.0000	87.3750
6	581.1262	1.4563	3267000.000	4.757569E+06	75.0000	109.2188
7	581.4175	1.7475	3267000.000	5.709083E+06	75.0000	131.0625
8	581.7088	2.0388	3267000.000	6.660596E+06	75.0000	152.9063
9	582.0000	2.3300	3267000.000	7.612110E+06	75.0000	174.7500
10	582.2500	2.5800	3468465.000	8.453918E+06	79.6250	194.0752
11	582.5000	2.8300	3669930.000	9.346098E+06	84.2500	214.5569
12	582.7500	3.0800	3871395.000	10.288652E+06	88.8750	236.1949
13	583.0000	3.3300	4072860.000	11.281577E+06	93.5000	258.9894
14	583.2500	3.5800	4274325.000	12.324874E+06	98.1250	282.9402
15	583.5000	3.8300	4475790.000	13.418542E+06	102.7500	308.0473
16	583.7500	4.0800	4677255.000	14.562580E+06	107.3750	334.3108
17	584.0000	4.3300	4878720.000	15.756989E+06	112.0000	361.7307
18	584.2500	4.5800	4949505.000	16.985506E+06	113.6250	389.9336
19	584.5000	4.8300	5020290.000	18.231720E+06	115.2500	418.5427
20	584.7500	5.0800	5091075.000	19.495630E+06	116.8750	447.5581
21	585.0000	5.3300	5161860.000	20.777237E+06	118.5000	476.9797
22	585.2500	5.5800	5232645.000	22.076540E+06	120.1250	506.8076
23	585.5000	5.8300	5303430.000	23.393539E+06	121.7500	537.0418
24	585.7500	6.0800	5374215.000	24.728235E+06	123.3750	567.6822
25	586.0000	6.3300	5445000.000	26.080628E+06	125.0000	598.7288
26	600.0000	20.3300	5445000.000	102.310628E+06	125.0000	2348.7288

Variable storage data for node | CokePlnt

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	584.2500	0.0000	435.6000	0.0000	0.0100	0.0000
2	584.3750	0.1250	22161.1500	1070.9892	0.5088	0.0246
3	584.5000	0.2500	43886.7000	5122.4084	1.0075	0.1176
4	584.6250	0.3750	65612.2500	11920.7405	1.5062	0.2737
5	584.7500	0.5000	87337.8000	21447.8093	2.0050	0.4924
6	584.8750	0.6250	109063.3500	33697.7704	2.5038	0.7736
7	585.0000	0.7500	130788.9000	48667.9951	3.0025	1.1173
8	585.1250	0.8750	152514.4500	66357.0741	3.5013	1.5233

9	585.2500	1.0000	174240.0000	86764.1636	4.0000	1.9918
10	585.3750	1.1250	201465.0000	110225.1488	4.6250	2.5304
11	585.5000	1.2500	228690.0000	137091.8693	5.2500	3.1472
12	585.6250	1.3750	255915.0000	167363.7370	5.8750	3.8421
13	585.7500	1.5000	283140.0000	201040.3424	6.5000	4.6153
14	585.8750	1.6250	310365.0000	238121.3892	7.1250	5.4665
15	586.0000	1.7500	337590.0000	278606.6557	7.7500	6.3959
16	586.1250	1.8750	364815.0000	322495.9721	8.3750	7.4035
17	586.2500	2.0000	392040.0000	369789.2050	9.0000	8.4892
18	586.3750	2.1250	392040.0000	418794.2050	9.0000	9.6142
19	586.5000	2.2500	392040.0000	467799.2050	9.0000	10.7392
20	586.6250	2.3750	392040.0000	516804.2050	9.0000	11.8642
21	586.7500	2.5000	392040.0000	565809.2050	9.0000	12.9892
22	586.8750	2.6250	392040.0000	614814.2050	9.0000	14.1142
23	587.0000	2.7500	392040.0000	663819.2050	9.0000	15.2392
24	587.1250	2.8750	392040.0000	712824.2050	9.0000	16.3642
25	587.2500	3.0000	392040.0000	761829.2050	9.0000	17.4892
26	587.3750	3.1250	392040.0000	810834.2050	9.0000	18.6142
27	587.5000	3.2500	392040.0000	859839.2050	9.0000	19.7392
28	587.6250	3.3750	392040.0000	908844.2050	9.0000	20.8642
29	587.7500	3.5000	392040.0000	957849.2050	9.0000	21.9892
30	587.8750	3.6250	392040.0000	1.006854E+06	9.0000	23.1142
31	588.0000	3.7500	392040.0000	1.055859E+06	9.0000	24.2392
32	588.1250	3.8750	392040.0000	1.104864E+06	9.0000	25.3642
33	588.2500	4.0000	392040.0000	1.153869E+06	9.0000	26.4892
34	600.0000	15.7500	392040.0000	5.760339E+06	9.0000	132.2392

==================================
| Variable storage data for node | IRM-N
==================================

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	582.5200	0.0000	2613600.000	0.0000	60.0000	0.0000
2	582.7437	0.2238	2640825.000	587836.1666	60.6250	13.4949
3	582.9675	0.4475	2668050.000	1.181764E+06	61.2500	27.1296
4	583.1912	0.6713	2695275.000	1.781783E+06	61.8750	40.9041
5	583.4150	0.8950	2722500.000	2.387894E+06	62.5000	54.8185
6	583.6387	1.1187	2749725.000	3.000097E+06	63.1250	68.8728
7	583.8625	1.3425	2776950.000	3.618391E+06	63.7500	83.0668
8	584.0862	1.5663	2804175.000	4.242777E+06	64.3750	97.4008
9	584.3100	1.7900	2831400.000	4.873255E+06	65.0000	111.8745
10	584.5600	2.0400	3011085.000	5.603450E+06	69.1250	128.6375
11	584.8100	2.2900	3190770.000	6.378574E+06	73.2500	146.4319
12	585.0600	2.5400	3370455.000	7.198624E+06	77.3750	165.2577
13	585.3100	2.7900	3550140.000	8.063601E+06	81.5000	185.1148
14	585.5600	3.0400	3729825.000	8.973505E+06	85.6250	206.0033
15	585.8100	3.2900	3909510.000	9.928333E+06	89.7500	227.9232
16	586.0600	3.5400	4089195.000	10.928087E+06	93.8750	250.8744
17	586.3100	3.7900	4268880.000	11.972766E+06	98.0000	274.8569
18	600.0000	17.4800	4268880.000	70.413733E+06	98.0000	1616.4769

==================================
| Variable storage data for node | IRM-S
==================================

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	580.0000	0.0000	827640.0000	0.0000	19.0000	0.0000
2	580.1250	0.1250	827640.0000	103455.0000	19.0000	2.3750
3	580.2500	0.2500	827640.0000	206910.0000	19.0000	4.7500
4	580.3750	0.3750	827640.0000	310365.0000	19.0000	7.1250
5	580.5000	0.5000	827640.0000	413820.0000	19.0000	9.5000
6	580.6250	0.6250	827640.0000	517275.0000	19.0000	11.8750
7	580.7500	0.7500	827640.0000	620730.0000	19.0000	14.2500
8	580.8750	0.8750	827640.0000	724185.0000	19.0000	16.6250
9	581.0000	1.0000	827640.0000	827640.0000	19.0000	19.0000
10	581.1250	1.1250	827640.0000	931095.0000	19.0000	21.3750
11	581.2500	1.2500	827640.0000	1.034550E+06	19.0000	23.7500
12	581.3750	1.3750	827640.0000	1.138005E+06	19.0000	26.1250
13	581.5000	1.5000	827640.0000	1.241460E+06	19.0000	28.5000
14	581.6250	1.6250	827640.0000	1.344915E+06	19.0000	30.8750
15	581.7500	1.7500	827640.0000	1.448370E+06	19.0000	33.2500
16	581.8750	1.8750	827640.0000	1.551825E+06	19.0000	35.6250
17	582.0000	2.0000	827640.0000	1.655280E+06	19.0000	38.0000
18	600.0000	20.0000	827640.0000	16.552800E+06	19.0000	380.0000

===
| Weir Data |
===

Weir Name	From Junction	To Junction	Type	Crest Height(ft)	Weir Top(ft)	Weir Length(ft)	Discharge Coefficient	Weir Power
Weir 8	RRMarsh	BigMarsh	1	8.78	18.78	100.00	2.6000	1.5000
Weir 14	CokePlnt	BigMarsh	1	3.25	15.75	100.00	2.6000	1.5000

==
| FREE OUTFALL DATA (DATA GROUP I1) |
| BOUNDARY CONDITION ON DATA GROUP J1 |
==

Outfall at Junction....SRMOut has boundary condition number... 1

```
Outfall at Junction....Out2            has boundary condition number...        2

*=============================================*
|              Weir Outfall Data              |
|      Boundary Condition on data group J1    |
*=============================================*


*================================================*
|        INTERNAL CONNECTIVITY INFORMATION       |
*================================================*

         CONDUIT         JUNCTION         JUNCTION
---------------- ---------------- ----------------
          Weir 8          RRMarsh         BigMarsh
         Weir 14         CokePlnt         BigMarsh
        FREE # 1           SRMOut         BOUNDARY
        FREE # 2             Out2         BOUNDARY

*===================================================*
|        Boundary Condition Information             |
|                 Data Groups J1-J4                 |
*===================================================*


BC NUMBER..         1 Control water surface elevation is..    581.00 feet.
BC NUMBER..         2 Control water surface elevation is..    581.00 feet.

###########################################
# Header information from interface file: #
###########################################

Title from first computational layer:
Lake Calumet Area - Indian Ridge and Big Marshes w/ Cluster Site Addition
SCS Hydrology - Huff Dist - 100YR - 24HR

Title from immediately preceding computational layer
Lake Calumet Area - Indian Ridge and Big Marshes w/ Cluster Site Addition
SCS Hydrology - Huff Dist - 100YR - 24HR

Name of preceding layer:................        Runoff Layer
Initial Julian date (IDATEZ)......................   2000001
Initial time of day in seconds (TZERO)...........       0.0
No. Transfered input locations...................         5
No. Transfered pollutants........................         0
Size of total catchment area (acres).............    858.00

#################################################
# Element numbers of interface inlet locations: #
#################################################

RRMarsh          CokePlnt         IRM-N            IRM-S            BigMarsh

Conversion factor to cfs for flow units on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was.. 2000001    0.0000 hours
Start date/time of the simulation was.. 2000001    0.0000 hours
Same date/time found in interface file and model

*===================================================*
|             XP Note Field Summary                 |
*===================================================*



###################################################
#           Surcharge Iteration Summary           #
###################################################

Maximum number of iterations in a time step.....        1
Total number of iterations in the simulation....   466560
Average number of iterations per time step......     2.00
Surcharge iterations during the simulation......        0
Maximum surcharge flow error during simulation.. 0.00E+00 cfs
Total number of time steps during simulation....   233280


***************************************************
*         CONDUIT COURANT CONDITION SUMMARY       *
* TIME IN MINUTES DELT > COURANT TIME STEP        *
***************************************************
* SEE BELOW FOR EXPLANATION OF COURANT TIME STEP. *
***************************************************

 CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)  CONDUIT #  TIME(MN)CONDUIT #  TIME(MN)
 ---------  --------  ---------  --------  ---------  ----------------  --------
Str 7       2110.50 Pipe5           0.00 Culv 8      38767.50 Chnl 17         0.00
Str14       1081.33 Str 3.1         0.00 S5              0.00
```

```
***********************************************
*        CONDUIT COURANT CONDITION SUMMARY    *
***********************************************
* COURANT   =            CONDUIT LENGTH       *
* TIME STEP = ------------------------------- *
*           VELOCITY + SQRT(GRVT*AREA/WIDTH) *
***********************************************
* AVERAGE COURANT CONDITION TIME STEP(SECONDS) *
***********************************************
```

CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)	CONDUIT #	TIME(SEC)
Str 7	14.36	Pipe5	28.71	Culv 8	7.61	Chnl 17	102.08
Str14	10.24	Str 3.1	10.00	S5	10.00		

Table E9 - JUNCTION SUMMARY STATISTICS

The Maximum area is only the area of the node, it does not include the area of the surrounding conduits

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Feet of Surcharge at Max Elevation	Freeboard of node feet	Maximum Junction Area ft^2	Maximum Gutter Depth feet	Maximum Gutter Width feet	Maximum Gutter Velocity ft/s
RRMarsh	600.0000	583.2200	587.8385	24	48	4.6185	12.1615	5445013.0	0.0000	0.0000	0.0000
BigMarsh	600.0000	590.0200	584.3115	66	26	0.0000	15.6885	4966922.6	0.0000	0.0000	0.0000
CokePlnt	600.0000	587.2500	587.6260	17	17	0.3760	12.3740	392139.42	0.0000	0.0000	0.0000
IRM-N	600.0000	586.8200	584.2084	27	12	0.0000	15.7916	2819054.6	0.0000	0.0000	0.0000
IRM-S	600.0000	584.6900	581.4813	18	16	0.0000	18.5187	855477.33	0.0000	0.0000	0.0000
SRMOut	600.0000	582.0000	581.0000	0	0	0.0000	19.0000	78366.886	0.0000	0.0000	0.0000
Dummy	600.0000	590.0200	582.2775	16	0	0.0000	17.7225	230.9629	0.0000	0.0000	0.0000
Out2	600.0000	577.5000	581.0000	0	0	3.5000	19.0000	117.0984	0.0000	0.0000	0.0000

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

* denotes an open conduit that has been overtopped this is a potential source of severe errors

Conduit Name	Design Flow (cfs)	Conduit Design Velocity (ft/s)	Maximum Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Water Elev at Pipe Ends Upstream (ft)	Dwnstrm (ft)	Ratio d/D US	DS
Str 7	30.5848	4.3269	36.0000	54.6465	17	17	8.0691	17	17	1.7867	587.6260	586.1798	1.125	0.787
Pipe5	10.7231	2.1845	30.0000	6.5968	16	1	1.3439	16	1	0.6152	582.9087	581.0000	2.767	2.400
Culv 8	16.4508	5.2365	24.0000	33.1305	7	10	11.1462	7	10	2.0139	587.8385	584.3115	3.309	2.321
Chnl 17	481.1965	1.3076	48.0000	34.0430	18	17	0.2644	18	17	0.0707	581.4813	581.0000	0.370	0.750
Str14	1.2205	1.5540	12.0000	3.2161	17	17	4.2838	17	17	2.6349	587.6260	585.1823	2.866	0.762
Str 3.1	0.0000	0.0000	26.0400	17.6623	27	12	0.0000	0	0	0.0000	584.2084	581.4813	0.778	-.479
S5	0.0000	0.0000	124.2000	5.6254	66	26	0.0000	0	0	0.0000	584.3115	582.2775	0.448	0.252
Weir 8	Undefnd	Undefnd	Undefn	0.0000	0	0								
Weir 14	Undefnd	Undefnd	Undefn	11.6351	17	17								
FREE # 1	Undefnd	Undefnd	Undefn	34.0430	18	17								
FREE # 2	Undefnd	Undefnd	Undefn	6.5968	16	1								

Table E11. Area assumptions used in the analysis Subcritical and Critical flow assumptions from Subroutine Head. See Figure 17-1 in the manual for further information.

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
Str 7	0.0000	0.0000	0.0000	77760.0000	0.9019	6.7723	0.0000
Pipe5	0.0000	77760.0000	0.0000	0.0000	0.6250	4.9087	0.0000
Culv 8	125.3333	77634.6667	0.0000	0.0000	0.5975	3.1416	0.0000
Chnl 17	0.0000	77760.0000	0.0000	0.0000	1.1194	128.7548	0.0000
Str14	73843.3333	0.0000	0.0000	3916.6667	0.2853	0.7507	0.0000
Str 3.1	77760.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S5	0.0000	77760.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table E12. Mean Conduit Flow Information

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
Str 7	1.1876	2770484.3	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Pipe5	3.7637	8779937.3	0.0790	0.0000	0.0000	0.0000	0.0000	0.0000
Culv 8	2.5762	6009863.6	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000
Chnl 17	2.9510	6884181.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Str14	0.0837	195289.49	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000

Str 3.1	2.4635	5746865.0	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
S5	3.7637	8779904.2	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Weir 8	0.0000	0.0000						
Weir 14	0.0247	57662.336						
FREE # 1	2.9510	6884181.5						
FREE # 2	3.7637	8779937.3						

Table E13. Channel losses(H), headwater depth (HW), tailwater depth (TW), critical and normal depth (Yc and Yn). Use this section for culvert comparisons

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
Str 7	52.0556	0.3350	1.1744	2.3442	3.0000	587.4758	586.1235	Max Flow
Pipe5	5.8633	0.0004	0.2960	0.8005	1.3187	582.6081	581.0000	Max Flow
Culv 8	32.2190	0.7171	5.9906	1.8852	2.0000	587.1875	581.2756	Max Flow
Chnl 17	33.2335	0.0000	0.1706	0.6610	1.4659	581.4679	581.0000	Max Flow
Str14	3.1068	0.0925	2.2712	0.7551	1.0000	587.4758	585.1694	Max Flow
Str 3.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
S5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow

Table E13a. CULVERT ANALYSIS CLASSIFICATION, and the time the culvert was in a particular classification during the simulation. The time is in minutes. The Dynamic Wave Equation is used for all conduit analysis but the culvert flow classification condition is based on the HW and TW depths.

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
Str 7	5256.1667	0.0000	0.0000	33482.667	0.0000	0.0000	0.0000	0.0000	None
Pipe5	0.0000	0.0000	0.0000	0.0000	38349.500	389.3333	0.0000	0.0000	None
Culv 8	194.6667	0.0000	0.0000	0.1667	38154.667	0.0000	389.3333	0.0000	None
Chnl 17	0.0000	38738.833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Str14	1168.0000	0.0000	36792.167	0.0000	0.0000	0.0000	778.6667	0.0000	None
Str 3.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None

Kinematic Wave Approximations
Time in Minutes for Each Condition

Conduit Name	Duration of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
Str 7	0.0000	0.0000	0.0000	0.0000
Pipe5	0.0000	0.0000	0.0000	0.0000
Culv 8	101.1667	0.0000	0.0000	0.0000
Chnl 17	4111.5000	0.0000	0.0000	0.0000
Str14	0.0000	0.0000	0.0000	0.0000
Str 3.1	0.0000	0.0000	0.0000	0.0000
S5	0.0000	0.0000	0.0000	0.0000

Table E15 - SPREADSHEET INFO LIST
Conduit Flow and Junction Depth Information for use in spreadsheets. The maximum values in this table are the true maximum values because they sample every time step. The values in the review results may only be the maximum of a subset of all the time steps in the run. Note: These flows are only the flows in a single barrel.

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Str 7	54.6465	2770484.330	8.0691	0.0000	##	RRMarsh	581.2200	587.8385
Pipe5	6.5968	8779937.336	1.3439	0.0000	##	BigMarsh	579.6700	584.3115
Culv 8	33.1305	6009863.580	11.1462	0.0000	##	CokePlnt	584.2500	587.6260
Chnl 17	34.0430	6884181.506	0.2644	0.0000	##	IRM-N	582.5200	584.2084
Str14	3.2161	195289.4903	4.2838	0.0000	##	IRM-S	580.0000	581.4813
Str 3.1	17.6623	5746865.038	0.0000	0.0000	##	SRMOut	578.0000	581.0000
S5	5.6254	8779904.202	0.0000	0.0000	##	Dummy	575.9900	582.2775
Weir 8	0.0000	0.0000	0.0000	0.0000	##	Out2	575.0000	581.0000
Weir 14	11.6351	57662.3360	0.0000	0.0000	##			
FREE # 1	34.0430	6884181.506	0.0000	0.0000	##			
FREE # 2	6.5968	8779937.336	0.0000	0.0000	##			

Table E15a - SPREADSHEET REACH LIST
Peak flow and Total Flow listed by Reach or those conduits or diversions having the same upstream and downstream nodes.

Upstream Node	Downstream Node	Maximum Flow (cfs)	Total Flow (ft^3)

```
#########################################################
# Table E16. New Conduit Information Section            #
#           Conduit Invert (IE) Elevation and Conduit   #
#           Maximum Water Surface (WS) Elevations       #
#########################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
Str 7	CokePlnt	IRM-N	584.2500	583.8200	587.6260	586.1798	Circular
Pipe5	Dummy	Out2	575.9900	575.0000	582.9087	581.0000	Circular
Culv 8	RRMarsh	BigMarsh	581.2200	579.6700	587.8385	584.3115	Circular
Chnl 17	IRM-S	SRMOut	580.0000	578.0000	581.4813	581.0000	Trapezoid
Str14	CokePlnt	BigMarsh	584.7600	584.4200	587.6260	585.1823	Circular
Str 3.1	IRM-N	IRM-S	582.5200	582.5200	584.2084	581.4813	Closd Cnd
S5	BigMarsh	Dummy	579.6700	579.6700	584.3115	582.2775	Closd Cnd

```
*==================================================*
|  Table E19 - Junction Inflow & Outflow Listing    |
|            Units are either ft^3 or m^3           |
|            depending on the units in your model.|
*==================================================*
```

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Outflow from Node	Evaporation from Node	Inflow from 2D Layer
RRMarsh	0.0000	0.0000	6.0496E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BigMarsh	0.0000	0.0000	7.5982E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CokePlnt	0.0000	0.0000	3.0006E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
IRM-N	0.0000	0.0000	2.9764E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
IRM-S	0.0000	0.0000	1.1373E+06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SRMOut	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.8842E+06	0.0000	0.0000
Out2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	8.7799E+06	0.0000	0.0000

```
*=====================================================*
| Table E20 - Junction Flooding and Volume Listing.   |
|             The maximum volume is the total volume  |
|             in the node including the volume in the |
|             flooded storage area. This is the max   |
|             volume at any time. The volume in the   |
|             flooded storage area is the total volume|
|             above the ground elevation, where the   |
|             flooded pond storage area starts.       |
| The fourth column is instantaneous, the fifth is the|
| sum of the flooded volume over the entire simulation|
| Units are either ft^3 or m^3 depending on the units.|
*=====================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
RRMarsh	0.0000	0.0000	0.0000	0.0000	0.0000
BigMarsh	0.0000	0.0000	0.0000	0.0000	0.0000
CokePlnt	0.0000	0.0000	0.0000	0.0000	0.0000
IRM-N	0.0000	0.0000	0.0000	0.0000	0.0000
IRM-S	0.0000	0.0000	0.0000	0.0000	0.0000
SRMOut	0.0000	0.0000	0.0000	0.0000	0.0000
Dummy	0.0000	0.0000	0.0000	0.0000	0.0000
Out2	38880.0000	0.0000	0.0000	0.0000	0.0000

```
*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits..........         7 Number of Simulated Conduits......        11
Number of Natural Channels........         0 Number of Junctions...............         8
Number of Storage Junctions.......         5 Number of Weirs...................         2
Number of Orifices................         0 Number of Pumps...................         0
Number of Free Outfalls...........         2 Number of Tide Gate Outfalls......         0
```

```
*=======================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*=======================================================*

The Conduit with the largest average change was..Pipe5      with     0.079 percent
The Junction with the largest average change was.Dummy      with     0.214 percent
The Conduit with the largest sinuosity was.......Str 7      with     0.000
```

```
*==================================================================*
| Table E21. Continuity balance at the end of the simulation        |
|           Junction Inflow, Outflow or Street Flooding             |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
*==================================================================*
```

```
       Inflow          Inflow       Average
       Junction   Volume,ft^3   Inflow, cfs
---------------  ------------  -------------
        RRMarsh   6.04956E+06         2.5933
       BigMarsh   7.59824E+06         3.2571
       CokePlnt   3.00058E+06         1.2863
          IRM-N   2.97638E+06         1.2759
          IRM-S   1.13732E+06         0.4875
         SRMOut    -6.884E+06        -2.9510
           Out2    -8.780E+06        -3.7637

       Outflow      Outflow          Average
       Junction  Volume,ft^3    Outflow, cfs
---------------  ------------   ------------
         SRMOut   6.88418E+06         2.9510
           Out2   8.77994E+06         3.7637


*=======================================================*
| Initial system volume        =   5.199960E+06 Cu Ft |
| Total system inflow volume   =  20.762075E+06 Cu Ft |
| Inflow + Initial volume      =  25.962035E+06 Cu Ft |
*=======================================================*
| Total system outflow         =  15.664119E+06 Cu Ft |
| Volume left in system        =  10.333320E+06 Cu Ft |
| Evaporation                  =         0.0000 Cu Ft |
| Outflow + Final Volume       =  25.997439E+06 Cu Ft |
*=======================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -0.1364 |
| Error in Continuity, ft^3    =     -35403.952 |
| + Error means a continuity loss, - a gain     |
*================================================*

###################################################
# Table E22. Numerical Model judgement section    #
###################################################

Your overall error was                                         -0.1364 percent
Worst nodal error was in node BigMarsh         with       -18.4371 percent
Of the total inflow this loss was                             22.0349 percent
Your overall continuity error was                  Excellent
                                                  Excellent Efficiency
Efficiency of the simulation                       0.00
Most Number of Non Convergences at one Node        0.
Total Number Non Convergences at all Nodes         0.
Total Number of Nodes with Non Convergences        0.

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP\xp\marsh\model.DAT
===> Your output file was named : E:\1998\98216\98216HMP\xp\marsh\model-e.out

*================================================================*
|             SWMM Simulation Date and Time Summary            |
*================================================================*
| Starting Date... August     18, 2006  Time...    9:58:40:85  |
|   Ending Date... August     18, 2006  Time...   10: 5:16:12  |
|  Elapsed Time...    6.58783 minutes or    395.27000 seconds  |
*================================================================*
```

APPENDIX II:

ENGINEER'S OPINIONS OF
PROBABLE CONSTRUCTION COSTS

Calumet Area Hydrologic Improvements
Engineer's Opinion of Probable Construction Cost

Structure 1: **Perform 50 LF of Channel Clearing (Includes selective clearing only no grading) and Install 10 SY of RR-4 Rip Rap**

Item	Description	Quantity	Unit	Unit Price	Total
100	Selective Clearing Crew	12	HOUR	$ 300.00	$ 3,600.00
200	Chip & Dispose of Vegetative Debris	4	LOAD	$ 250.00	$ 1,000.00
300	Purchase and Transport Rip Rap (RR-4)	11	TON	$ 35.00	$ 385.00
400	Mobilize 963 Loader	1	EA	$ 500.00	$ 500.00
500	Place Rip Rap and Geo-Fabric w/ 963 Loader	8	HOUR	$ 236.00	$ 1,888.00
600	Contingency	15%	LUMPSUM	$ 7,373.00	$ 1,105.95
	Total				**$ 8,478.95**

Structure 2: **Install Concrete Weir 25' Long per specifications provided**

Item	Description	Quantity	Unit	Unit Price	Total
700	Mobilize Excavator & Bobcat	1	EA	$ 500.00	$ 500.00
800	Weir Excavation Crew (Mini-Excavator 1 Laborer)	8	HOUR	$ 216.00	$ 1,728.00
900	Structural Concrete Installed	9.3	CY	$ 700.00	$ 6,510.00
1000	Backfill and fine grade area w/ Bobcat	4	HOUR	$ 105.00	$ 420.00
1100	Seeding / Landscape Restoration	0.7	AC	$ 3,000.00	$ 2,100.00
1200	Purchase and Transport Rip Rap (RR-4)	11	TON	$ 35.00	$ 385.00
1300	Place Rip Rap and Geo-Fabric w/ 963 Loader	8	HOUR	$ 236.00	$ 1,888.00
1400	Contingency	15%	LUMPSUM	$ 13,531.00	$ 2,029.65
	Total				**$ 15,560.65**

Structure 3: **Inspect 24" Culvert**

Item	Description	Quantity	Unit	Unit Price	Total
1500	Televise and clean culvert	1	LUMPSUM	$ 2,500.00	$ 2,500.00
2100	Contingency	0%	LUMPSUM	$ 2,500.00	$ -
	Total				**$ 2,500.00**

Structure 3: **Rehabilitate 24" CMP with cured in place liner**

Item	Description	Quantity	Unit	Unit Price	Total
1500	24" CMP Lining (Inc. Mobilization)	120	LF	$ 175.00	$ 21,000.00
2100	Contingency	50%	LUMPSUM	$ 21,000.00	$ 10,500.00
	Total				**$ 31,500.00**

Structure 3: **Rehabilitate 24" CMP with pulled in place 20" HDPE**

Item	Description	Quantity	Unit	Unit Price	Total
1500	20" HDPE Pulled in Place	95	LF	$ 400.00	$ 38,000.00
2100	Contingency	25%	LUMPSUM	$ 38,000.00	$ 9,500.00
	Total				**$ 47,500.00**

Structure 3: **Replace existing 48" Manhole with 72" Inline Water Control Structure and Install 24" RCP Flared End Section**

Item	Description	Quantity	Unit	Unit Price	Total
1500	Mobilize 325 Excavator	1	EA	$ 500.00	$ 500.00
1600	Remove Existing 48" Manhole	1	EA	$ 1,200.00	$ 1,200.00
1700	Install 6' Diameter Water Ctrl Structure	1	EA	$ 2,900.00	$ 2,900.00
1800	Install 24" RCP FES w/ Grate and Rip Rap	1	EA	$ 2,500.00	$ 2,500.00
1900	Backfill and fine grade area w/ Bobcat	4	HOUR	$ 105.00	$ 420.00
2000	Seeding / Landscape Restoration	0.25	AC	$ 3,000.00	$ 750.00
2100	Contingency	15%	LUMPSUM	$ 8,270.00	$ 1,240.50
	Total				**$ 9,510.50**

Note: Engineering Design Fees Not Included.

Calumet Area Hydrologic Improvements
Engineer's Opinion of Probable Construction Cost

Structure 5: **Construct 4' x 10' Slope Box w/ Stop Logs and Install 10 LF of 24" HDPE Pipe**

Item	Description	Quantity	Unit	Unit Price	Total
2200	Mobilize 325 Excavator	1	EA	$ 500.00	$ 500.00
2300	Construct Cast in Place Slope Box (4'x10')	1	EA	$ 5,100.00	$ 5,100.00
2400	Install 24" HDPE Pipe No TBF	600	LF	$ 25.00	$ 15,000.00
2500	Backfill and Fine Grade area w/ Bobcat or Loader	6	HR	$ 105.00	$ 630.00
2600	Seeding / Restoration	0.75	AC	$ 3,000.00	$ 2,250.00
2700	Contingency	15%	LUMPSUM	$ 23,480.00	$ 3,522.00
	Total				**$ 27,002.00**

Structure 15: **Install 25 SY Rip Rap (RR-4)**

Item	Description	Quantity	Unit	Unit Price	Total
5200	Mobilize 325 Excavator	1	EA	$ 500.00	$ 500.00
5300	Purchase and Transport Rip Rap (RR-4)	25	TON	$ 35.00	$ 875.00
5400	Place Rip Rap and Geo-Fabric w/ 325 Excavator	8	HOUR	$ 236.00	$ 1,888.00
5500	Contingency	15%	LUMPSUM	$ 3,263.00	$ 489.45
	Total				**$ 3,752.45**

Structure 15: **Construct 4' x 4' Slope Box w/ Stop Logs and Install 10 LF of 24" HDPE Pipe**

Item	Description	Quantity	Unit	Unit Price	Total
5600	Mobilize 325 Excavator	1	EA	$ 500.00	$ 500.00
5700	Construct Cast in Place Slope Box (4'x10')	1	EA	$ 4,500.00	$ 4,500.00
5800	Install 24" HDPE Pipe No TBF	50	LF	$ 23.00	$ 1,150.00
5900	Backfill and Fine Grade area w/ Bobcat or Loader	6	HR	$ 105.00	$ 630.00
6000	Seeding / Restoration	0.75	AC	$ 3,000.00	$ 2,250.00
6100	Contingency	15%	LUMPSUM	$ 9,030.00	$ 1,354.50
	Total				**$ 10,384.50**

Structure 17: **Install Concrete Weir 25' Long per specifications provided**

Item	Description	Quantity	Unit	Unit Price	Total
6200	Mobilize Excavator & Bobcat	1	EA	$ 500.00	$ 500.00
6300	Weir Excavation Crew (Mini-Excavator 1 Laborer)	8	HOUR	$ 216.00	$ 1,728.00
6400	Structural Concrete Installed	9.3	CY	$ 700.00	$ 6,510.00
6500	Backfill and fine grade area w/ Bobcat	4	HOUR	$ 105.00	$ 420.00
6600	Seeding / Landscape Restoration	0.7	AC	$ 3,000.00	$ 2,100.00
6700	Purchase and Transport Rip Rap (RR-4)	11	TON	$ 35.00	$ 385.00
6800	Place Rip Rap and Geo-Fabric w/ 963 Loader	8	HOUR	$ 236.00	$ 1,888.00
6900	Contingency	15%	LUMPSUM	$ 13,531.00	$ 2,029.65
	Total				**$ 15,560.65**

Note: Engineering Design Fees Not Included.