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Technical Memo 4

SUBJECT: Hydraulic Report – DRAFT
Hampton Creek Wetland Areas
City of Portage, Kalamazoo County, Michigan

DATE: December 3, 2019 PROJECT NO.: 181663

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Introduction

The Hampton Creek Bog, a 76-acre wetland bog with an another approximately 9 acres of open water, is located northeast of the West Center Avenue/US-131 intersection and has been subject to sustained abnormally high water levels. The high water levels can be attributed to a sustained high groundwater table, significant stormwater runoff volumes, and the lack of a natural stormwater outlet from the bog. A typical characteristic of bogs is that they do not have a natural stormwater outlet. The surrounding contributing watershed to the Hampton Creek Bog is fully developed and includes residential, commercial, recreational, and highway areas which contribute to excess stormwater runoff levels. The result of these conditions is flooding impacts to residential homes and flooding of the Moors Golf Club. This hydrologic/hydraulic analysis evaluated whether a proposed stormwater outlet from the Hampton Creek Bog would result in adverse flooding to downstream receiving waters. The project area is shown in Figure 1.

Proposed Outlet

In general, site topography within the project area slopes down to the south toward Portage Creek, which is approximately 0.25 mile south of the Hampton Creek Bog. Portage Creek was identified as a natural outlet for the Hampton Creek Bog, although it was recognized that the proposed stormwater outfall may discharge stormwater to Portage Creek and increase peak flood discharge rates if not properly managed. The proposed stormwater outlet would need to mitigate any potential increases to the peak discharge of the creek during storm events to prevent any increases to flooding and impacts to stream stability.

In addition to the hydraulic impacts, the proposed outlet must address potential environmental impacts to the Portage Creek Wetland.

Hydrology

Three separate watersheds were delineated for the hydraulic model and include the Hampton Creek Bog, Greenspire Bog, and Portage Creek at the entrance to Hampton Lake; they are shown in Figure 2. Drainage areas were delineated by utilizing two-foot contours developed from U.S. Geological Survey Lidar surface data and storm sewer layers for the City of Portage. Depressional areas were field verified and removed from the contributing drainage areas in the model as appropriate.

The Natural Resources Conservation Service (NRCS) TR-20 hydrology model was used within HydroCAD to estimate peak runoff and develop runoff hydrographs. The 2-, 10-, 50-, and 100-year, 24-hour storm events were evaluated. The rainfall depths taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 point precipitation frequency estimates were utilized for rainfall totals and are presented in Table 1.

Table 1 – Atlas 14 Point Precipitation Rainfall Totals

Average Recurrence Interval (years)	Rainfall Total (inches)
2	2.60
10	3.69
50	5.28
100	6.08

The MSE-3 rainfall distribution and Michigan unit hydrograph were used for the storm data and runoff criteria. Runoff curve numbers (RCNs) were developed by delineating existing land uses from an aerial photograph and the NRCS Web Soil Survey. The times of concentration (tocs) for the Hampton Creek Bog, Greenspire Bog, and Portage Creek watersheds were determined utilizing the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Computing Flood Discharges for Small Ungauged Watersheds method. The RCN and toc calculations are shown in Appendix 1.

An existing hydrologic model was previous prepared by EGLE for Portage Creek as part of the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS). A flood flow request was obtained from EGLE for Portage Creek at the Hampton Lake inlet as shown in Appendix 2, and was prepared for FEMA's study of Portage Creek. The Portage Creek contributing drainage area was delineated to be within 0.09 square mile of EGLE's study and therefore, the HydroCAD hydrology model was calibrated to EGLE's and the FIS's 100-year, 24-hour flood flow value of 40 cubic feet per second. The rainfall data used for the calibration was taken from Bulletin 71, Rainfall Frequency Atlas of the Midwest, and the NRCS Type II rainfall distribution was utilized.

The RCN was adjusted as necessary to calibrate the model. Fishbeck calculated an RCN of 49 and adjusted the value in HydroCAD to a value of 65. The lower RCN calculated by Fishbeck may be attributed to much of the crop land reverting to open good land since EGLE's analysis was completed. Portage Creek's watershed is generally

characterized as having a hydrologic soil group of A. The RCN for crops with Hydrologic Soil Group A is 65 and therefore, the adjustment of the RCN in the HydroCAD model to 65 is appropriate. The hydrology model was then updated to the NOAA Atlas 14 rainfall data and MSE-3 rainfall distribution.

Hydraulic Model

The HydroCAD model incorporates the hydrology model and the ability to route the various storm events through the bogs as storage areas, outlet control structures, and the limestone infiltration basin.

The proposed outlet consists of a restricted riser structure at the south end of the Hampton Creek Bog, which then discharges through an enclosed storm sewer and outfall into the north end of the Greenspire Bog near an existing storm sewer outfall. A small weir and open ditch will serve as the outlet from the south end of the Greenspire Bog within the Gourdneck State Game Area. The open ditch will then be collected into an enclosed storm sewer that discharges into a limestone infiltration bed. The limestone infiltration bed will be located in an upland ridge between the Greenspire Bog and the Portage Creek Wetland. It will infiltrate the stormwater into the ridge's naturally occurring sandy soils. The stone infiltration bed will have an overflow pipe that will discharge to the Portage Creek Wetland. The route of the stormwater outlet is shown in Figure 3.

The overflow elevations of the Hampton Creek Bog and Greenspire Bog were determined by Fishbeck's hydraulics engineer and wetland specialist. Indicators such as ordinary high-water marks, soils, and plant communities were evaluated to determine the normal high-water elevations within the bogs. Two locations on opposite sides of each wetland (four total) were evaluated to set the high-water elevations. Stakes were placed at the apparent high-water elevation at each location. The stake locations and elevations were surveyed by Fishbeck surveyors. The normal high-water elevations are:

- Hampton Creek Bog – 872.44 feet
- Greenspire Bog – 868.07 feet

Overflow elevations at the outlets for the two bogs were set at the normal high-water levels. The storage reservoirs that represent the bogs were modeled such that the bottom of the reservoirs are at the normal high-water level.

The overflow pipe will discharge excess water to an outfall constructed at the base of the hillside adjacent to the Portage Creek Wetland.

The limestone infiltration bed serves to mitigate water quality concerns by infiltrating the more frequent storm events. Also, the infiltration system mitigates the potential migration of invasive species to downstream receptors by trapping seeds and other propagules. When larger, more infrequent events do occur and the stormwater overflows to the Portage Creek Wetland, it is routed through the limestone infiltration bed prior to overland discharge to reduce the acidity of the bog water before entering the Portage Creek Wetland complex. The soil at the proposed infiltration bed location is identified by NRCS as sprinks loamy sand. An infiltration rate of 3.5 inches per hour was used for the limestone infiltration basin, resulting in an infiltration rate of 0.3 cubic feet per second. The infiltration calculations for the limestone storage basin are shown in Appendix 3.

The discharge through the Portage Creek Wetland to Portage Creek was simulated by a 60-foot-wide channel with a relatively high Manning's value of 0.10, representative of the dense brush within the wetland.

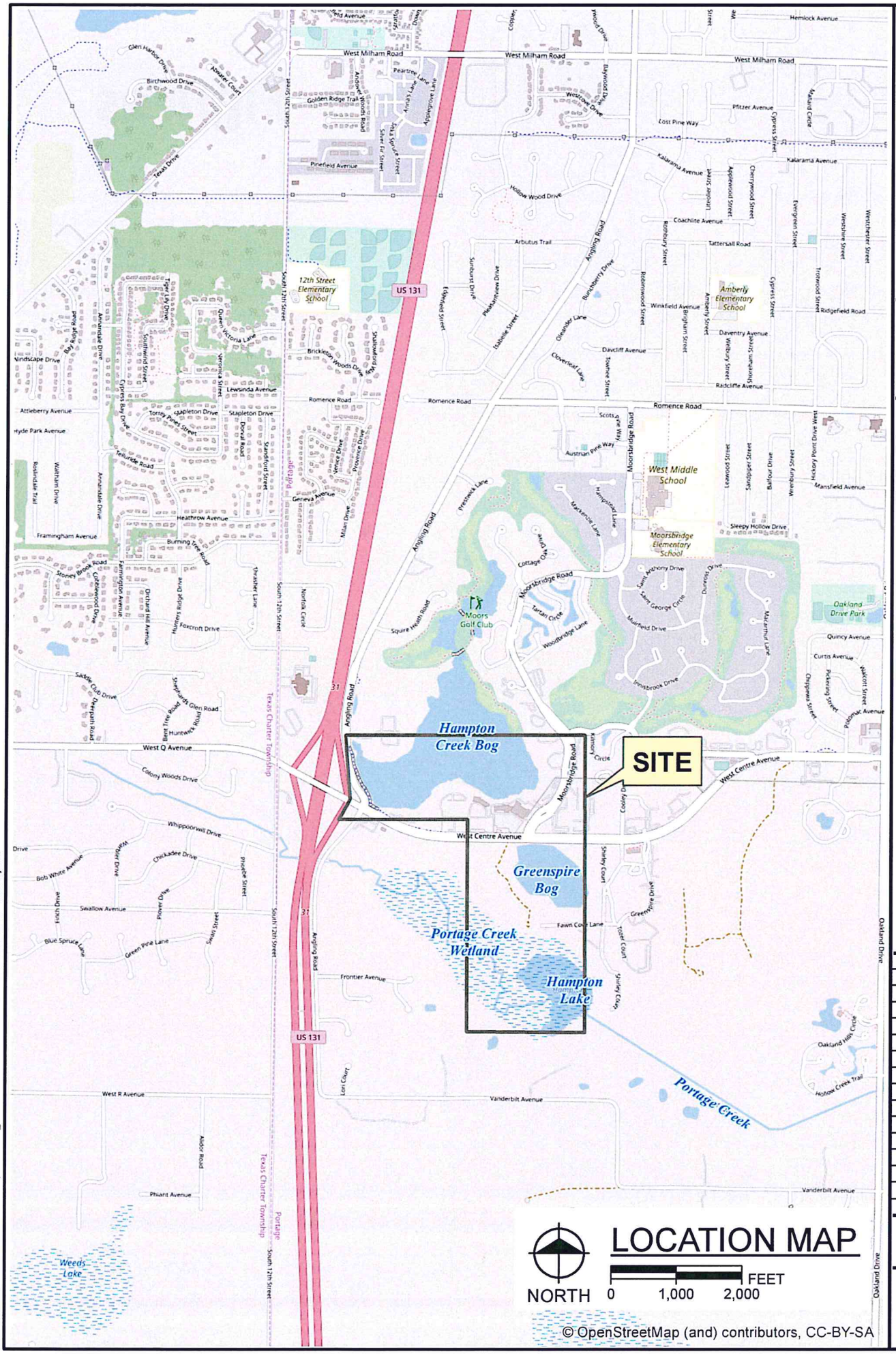
The model developed a composite hydrograph for Portage Creek at the entrance to Hampton Lake to evaluate the flood flow impacts to the creek from the proposed stormwater outlet discharge. The hydraulic model demonstrated that the proposed outlet would not begin discharging to the Portage Creek Wetland until after the peak flood flows from the Portage Creek watershed have been routed through the project area. Therefore, the

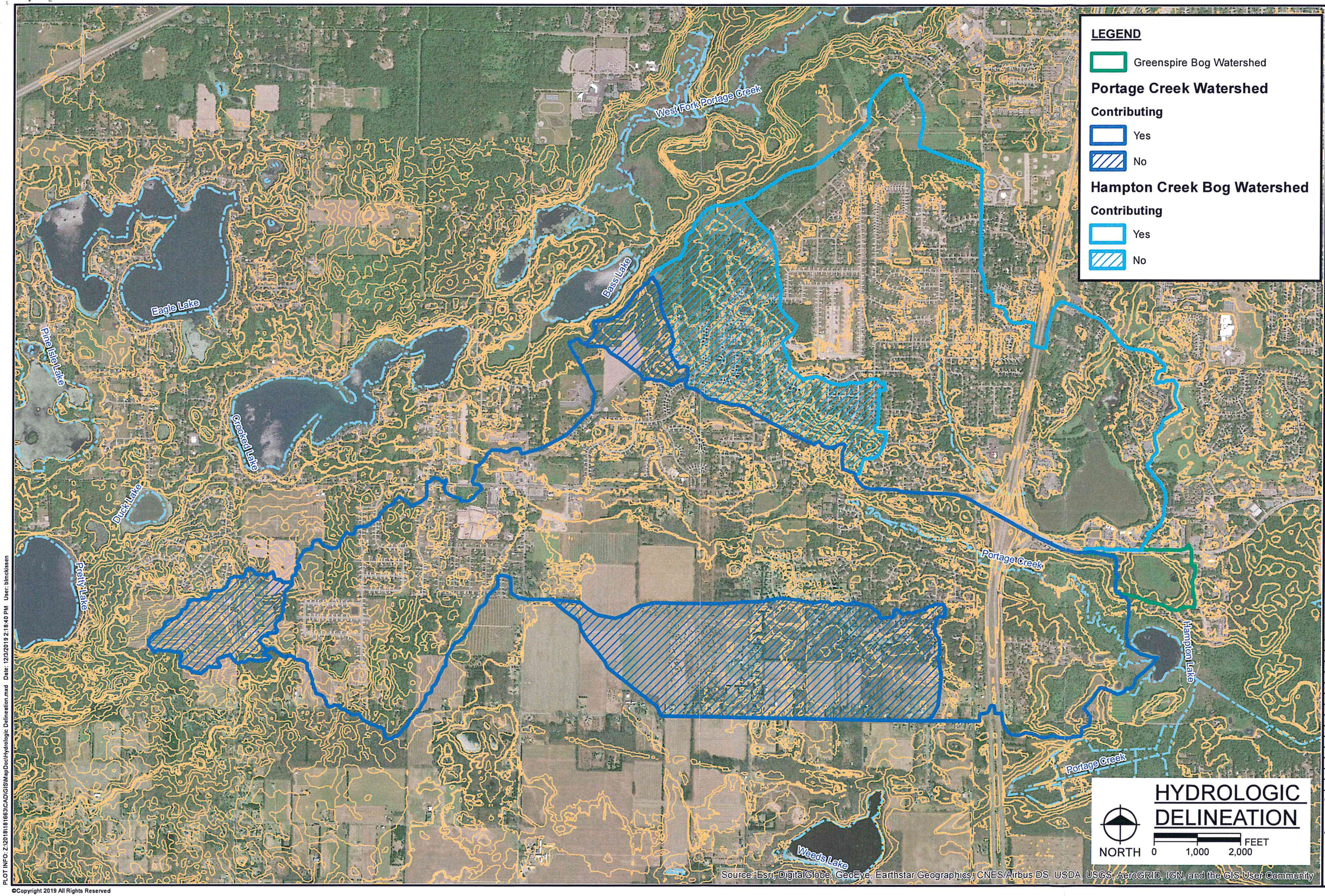
proposed outlet will not increase flood flows within Portage Creek. The HydroCAD model results are presented in Appendix 4.

Summary

The proposed stormwater system will serve to mitigate increases in peak discharges of Portage Creek by restricting discharge from the Hampton Creek Bog and proposed infiltration system located prior to the outfall at the Portage Creek Wetland.

Figures


SITE
Hampton Creek Bog
Greenspire Bog
Portage Creek Wetland
Hampton Lake
Portage Creek
Weeds Lake
West Middle School
Moorsbridge Elementary School
12th Street Elementary School
Amberly Elementary School
Moors Golf Club
Oakland Drive Park
US 131
West Milham Road
Romence Road
West Centre Avenue
Angling Road
Moorsbridge Road
South 12th Street
Texas Charter Township
Portage
Oakland Drive
Vanderbilt Avenue
Frontier Avenue
West Q Avenue
West R Avenue
Pfitzer Avenue
Kalarama Avenue
Hollow Wood Drive
Coachlite Avenue
Tattersall Road
Ridgefield Road
Mansfield Avenue
Sleepy Hollow Drive
Quincy Avenue
Curtis Avenue
Pinefield Avenue
Lost Pine Way
Hemlock Avenue
Arbutus Trail
Daventry Avenue
Radcliffe Avenue
Davcliff Avenue
Austrian Pine Way
Scots Pine Way
Prestwick Lane
Mackenzie Lane
Hampstead Lane
Cottage Grove
Tartan Circle
Woodbridge Lane
Murfield Drive
Privatbrook Drive
Saint Anthony Drive
Saint George Circle
Dunross Drive
Macarthur Lane
Squire Heath Road
Kilmory Circle
Colony Drive
Shirley Court
Greenspire Drive
Fawn Court Lane
Tosef Court
Shirley Close
Oakland Hills Circle
Hollow Creek Trail
Lori Court
Colony Woods Drive
Whippoorwill Drive
Swallow Avenue
Blue Spruce Lane
Green Pine Lane
Phiant Avenue
Audor Road
Stoney Brook Road
Framingham Avenue
Heathrow Avenue
Burning Tree Road
Foxcroft Drive
Saddle Club Drive
Sherwood Glen Road
Bent Tree Road
Huntwick Road
Oakpath Road
Orchard Hill Avenue
Hunters Ridge Drive
Thrasher Lane
Norfolk Circle
Cobblestone Drive
Venice Drive
Provence Drive
Milan Drive
Geneva Avenue
Brickston Woods Drive
Golden Ridge Trail
Peartree Lane
Silver Fir Street
Andover Woods Road
Glen Harbor Drive
Birchwood Drive
Alcatraz Court
Texas Drive
Windscape Drive
Bay Ridge Road
Admirable Drive
Cypress Bay Drive
Southwind Street
Queen Victoria Lane
Veronica Street
Lewsinda Avenue
Stapleton Drive
Torrey Pines Street
Donal Road
Stamford Street
Telluride Road
Roslindale Trail
Waltham Drive
Attleberry Avenue
Hyde Park Avenue
Westwood Drive
Birchwood Drive
Pfitzer Avenue
Cypress Street
Mallard Circle
Kalarama Avenue
Applewood Street
Cherrywood Street
Evergreen Street
Westshire Street
Westchester Street
Coachlite Avenue
Tattersall Road
Ridgefield Road
Rosebury Street
Ridenwood Street
Winkfield Avenue
Amberly Street
Cypress Street
Daventry Avenue
Wellbury Street
Radcliffe Avenue
Davcliff Avenue
Trotwood Street
Clovernead Lane
Sunburst Drive
Pleasantview Drive
Isabelle Street
Edgewood Street
Alexander Lane
Burchberry Drive
Angling Road
Lowell Street
Lowell Street
Lowell Street



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City of Portage
Kalamazoo County, Michigan

Hampton Creek Wetland Area
Surface Water Evaluation

HYDROLOGIC DELINEATION

PROJECT NO.
181663

FIGURE NO.
2

PLOT INFO: Z:\2018\181663\CAD\GIS\MapDoc\Hydrologic Delineation.mxd Date: 12/3/2019 2:18:40 PM User: blmckissen

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PLOT INFO: Z:\2018\181663\CAD\GIS\MapDoc\Environmental Summary Memo\FIG02_Stormwater Outlets.mxd Date: 11/12/2019 12:09:11 PM User: acschwallier



City of Portage

Kalamazoo County, Michigan

Hampton Creek Wetland Area Evaluation

FIGURE NO. 2

PROJECT NO. 181663

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fteh

Appendix 1

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Brush-F	Brush-F	A	A	201705.8792	Brush-F	0.3%	35	0.1	35	0.1
Brush-F	Brush-F	A	A	57200.39763	Brush-F	0.1%	35	0.0	35	0.0
Brush-F	Brush-F	A	A	45753.71815	Brush-F	0.1%	35	0.0	35	0.0
Commercial Improved	Commercial Improved	A	A	167333.1828	Commercial	0.2%	89	0.2	89	0.2
Commercial Improved	Commercial Improved	A	A	118946.5153	Commercial	0.2%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	30911.03173	Commercial	0.0%	89	0.0	89	0.0
Commercial Improved	Commercial Improved	A	A	40359.59466	Commercial	0.1%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	75268.72589	Commercial	0.1%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	48230.77737	Commercial	0.1%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	6736.050276	Commercial	0.0%	89	0.0	89	0.0
Commercial Improved	Commercial Improved	A	A	139744.7348	Commercial	0.2%	89	0.2	89	0.2
Commercial Improved	Commercial Improved	A	A	142855.5211	Commercial	0.2%	89	0.2	89	0.2
Commercial Improved	Commercial Improved	A	A	149452.3017	Commercial	0.2%	89	0.2	89	0.2
Commercial Improved	Commercial Improved	A	A	244709.0865	Commercial	0.3%	89	0.3	89	0.3
Commercial Improved	Commercial Improved	A	A	116461.5501	Commercial	0.2%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	85321.24634	Commercial	0.1%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	29916.1255	Commercial	0.0%	89	0.0	89	0.0
Commercial Improved	Commercial Improved	A	A	18592.32785	Commercial	0.0%	89	0.0	89	0.0
Commercial Improved	Commercial Improved	A	A	171089.8503	Commercial	0.2%	89	0.2	89	0.2
Commercial Improved	Commercial Improved	A	A	223768.4207	Commercial	0.3%	89	0.3	89	0.3
Commercial Improved	Commercial Improved	A	A	545826.941	Commercial	0.8%	89	0.7	89	0.7
Commercial Improved	Commercial Improved	A	A	44580.18652	Commercial	0.1%	89	0.1	89	0.1
Commercial Improved	Commercial Improved	A	A	790.7773596	Commercial	0.0%	89	0.0	89	0.0
Commercial Improved	Commercial Improved	A	D	31903.7432	Commercial	0.0%	89	0.0	95	0.0
Commercial Improved	Commercial Improved	A	D	33863.79895	Commercial	0.0%	89	0.0	95	0.0
Crop-Contoured	Crop-Contoured	A	A	307335.4581	Cropland	0.4%	67	0.3	67	0.3
Crop-Contoured	Crop-Contoured	A	A	56094.69419	Cropland	0.1%	67	0.1	67	0.1
Crop-Contoured	Crop-Contoured	A	A	72983.90445	Cropland	0.1%	67	0.1	67	0.1
Impervious	Impervious	A	A	221269.342	Paved	0.3%	98	0.3	98	0.3
Impervious	Impervious	A	A	4119077.844	Paved	5.8%	98	5.7	98	5.7
Impervious	Impervious	A	A	168702.7168	Paved	0.2%	98	0.2	98	0.2
Impervious	Impervious	A	A	24424.00863	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	A	A	13498.00176	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	A	A	23889.53247	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	A	A	78850.06919	Paved	0.1%	98	0.1	98	0.1
Impervious	Impervious	A	A	102339.6705	Paved	0.1%	98	0.1	98	0.1
Impervious	Impervious	A	A	61627.18759	Paved	0.1%	98	0.1	98	0.1
Impervious	Impervious	A	A	467935.136	Paved	0.7%	98	0.6	98	0.6
Impervious	Impervious	A	A	117394.1754	Paved	0.2%	98	0.2	98	0.2
Impervious	Impervious	A	A	33646.40443	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	A	A	18241.24221	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	A	A	42085.95277	Paved	0.1%	98	0.1	98	0.1
Impervious	Impervious	A	D	4178.272937	Paved	0.0%	98	0.0	98	0.0
Impervious	Impervious	C	C	15800.14796	Paved	0.0%	98	0.0	98	0.0
Open-F	Open-F	A	A	88289.22949	Open-F	0.1%	49	0.1	49	0.1
Open-F	Open-F	A	A	49156.009	Open-F	0.1%	49	0.0	49	0.0
Open-F	Open-F	A	A	28257.96643	Open-F	0.0%	49	0.0	49	0.0
Open-G	Open-G	A	A	56153.51437	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	23126.87088	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	15502.41707	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	2243.082866	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	75938.79818	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	41893.22488	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	13863.31424	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	68300.17156	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	22509.0523	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	183456.0235	Open-G	0.3%	39	0.1	39	0.1
Open-G	Open-G	A	A	42888.5734	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	241302.6944	Open-G	0.3%	39	0.1	39	0.1
Open-G	Open-G	A	A	386895.8084	Open-G	0.5%	39	0.2	39	0.2
Open-G	Open-G	A	A	52469.09057	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	1518677.874	Open-G	2.1%	39	0.8	39	0.8
Open-G	Open-G	A	A	17235.22886	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	185636.857	Open-G	0.3%	39	0.1	39	0.1
Open-G	Open-G	A	A	154261.0432	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	13557.2174	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	75914.94264	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	60441.82374	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	137657.0187	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	38864.63491	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	194426.1008	Open-G	0.3%	39	0.1	39	0.1
Open-G	Open-G	A	A	10970.88931	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	27580.51437	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	11123.32314	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	2532.009851	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	17819.0491	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	4568.509411	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	24757.632	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	66176.7356	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	212576.5284	Open-G	0.3%	39	0.1	39	0.1

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Open-G	Open-G	A	A	463898.1645	Open-G	0.7%	39	0.3	39	0.3
Open-G	Open-G	A	A	94338.60727	Open-G	0.1%	39	0.1	39	0.1
Open-G	Open-G	A	A	5888.018613	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	3639.880955	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	82638.68594	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	585924.916	Open-G	0.8%	39	0.3	39	0.3
Open-G	Open-G	A	A	16685.37652	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	68286.58399	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	4235.593879	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	12012.26493	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	22967.18983	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	25924.05767	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	91235.94453	Open-G	0.1%	39	0.1	39	0.1
Open-G	Open-G	A	A	29894.4531	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	21895.28582	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	26965.36037	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	22106.27135	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	28564.91983	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	129641.2138	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	22732.20757	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	38572.02942	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	39367.66492	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	79841.1778	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	103975.8301	Open-G	0.1%	39	0.1	39	0.1
Open-G	Open-G	A	A	55275.87525	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	76.04742666	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	3965.461189	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	1510.643286	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	239610.5435	Open-G	0.3%	39	0.1	39	0.1
Open-G	Open-G	A	A	106126.2008	Open-G	0.1%	39	0.1	39	0.1
Open-G	Open-G	A	A	12509.19137	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	69529.82492	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	53396.63183	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	39914.83818	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	118930.4761	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	53830.72607	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	75633.26177	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	68464.16228	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	20055.24973	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	15391.41954	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	58309.19743	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	176483.4286	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	285707.6937	Open-G	0.4%	39	0.2	39	0.2
Open-G	Open-G	A	A	342149.6663	Open-G	0.5%	39	0.2	39	0.2
Open-G	Open-G	A	A	81295.52267	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	344377.9658	Open-G	0.5%	39	0.2	39	0.2
Open-G	Open-G	A	A	43380.27128	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	139846.2169	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	59972.59666	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	129447.4241	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	338050.3573	Open-G	0.5%	39	0.2	39	0.2
Open-G	Open-G	A	A	553.7433184	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	21536.05423	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	41354.74691	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	675.0752685	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	12797.74929	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	26439.25724	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	40498.52654	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	24613.48069	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	3687.537546	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	3670.154811	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	55834.49141	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	28803.28772	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	1293.996904	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	51767.82301	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	44188.82064	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	46792.95225	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	3866.194288	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	913.8198134	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	253608.1053	Open-G	0.4%	39	0.1	39	0.1
Open-G	Open-G	A	A	3545.007994	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	116789.6359	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	37937.47621	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	41181.39873	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	40714.12879	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	43082.15754	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	99105.61007	Open-G	0.1%	39	0.1	39	0.1
Open-G	Open-G	A	A	60077.90405	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	110945.5013	Open-G	0.2%	39	0.1	39	0.1
Open-G	Open-G	A	A	35302.81456	Open-G	0.0%	39	0.0	39	0.0

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Open-G	Open-G	A	A	952.5367769	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	48191.55559	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	65860.57678	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	40468.84599	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	52617.2824	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	28095.23533	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	11786.03621	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	9401.659682	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	556.9258776	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	42477.39783	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	3453.833889	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	22770.09296	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	59337.2882	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	59926.0679	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	52561.49638	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	13250.55817	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	29612.69782	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	1774.332112	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	5699.200987	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	36289.81384	Open-G	0.1%	39	0.0	39	0.0
Open-G	Open-G	A	A	717.945533	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	2.425583565	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	17.43257129	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	182.4646834	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	35.45153016	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	A	1032.896438	Open-G	0.0%	39	0.0	39	0.0
Open-G	Open-G	A	D	600176.0679	Open-G	0.8%	39	0.3	80	0.7
Open-G	Open-G	A	D	44598.50908	Open-G	0.1%	39	0.0	80	0.1
Open-G	Open-G	B	B	375556.1047	Open-G	0.5%	61	0.3	61	0.3
Open-G	Open-G	B	B	10609.03738	Open-G	0.0%	61	0.0	61	0.0
Open-G	Open-G	B	B	4326.113215	Open-G	0.0%	61	0.0	61	0.0
Open-G	Open-G	C	C	35399.39665	Open-G	0.0%	74	0.0	74	0.0
Pasture-G	Pasture-G	A	A	457353.4141	Pasture-G	0.6%	39	0.3	39	0.3
Pasture-G	Pasture-G	C	C	249976.4676	Pasture-G	0.4%	74	0.3	74	0.3
Multi-fam	Multi-fam	A	A	87842.90861	Multi-fam	0.1%	77	0.1	77	0.1
Multi-fam	Multi-fam	A	A	124105.1416	Multi-fam	0.2%	77	0.1	77	0.1
Multi-fam	Multi-fam	A	A	42513.80385	Multi-fam	0.1%	77	0.0	77	0.0
Multi-fam	Multi-fam	A	A	20248.89488	Multi-fam	0.0%	77	0.0	77	0.0
Multi-fam	Multi-fam	A	A	73498.89408	Multi-fam	0.1%	77	0.1	77	0.1
Multi-fam	Multi-fam	A	A	80274.71547	Multi-fam	0.1%	77	0.1	77	0.1
Multi-fam	Multi-fam	A	A	52385.65243	Multi-fam	0.1%	77	0.1	77	0.1
Multi-fam	Multi-fam	A	A	2.425583565	Multi-fam	0.0%	77	0.0	77	0.0
Res25	Res25	A	A	25087.85693	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	3813.552583	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	55.10000276	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	10645.67595	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	86971.19104	Res25	0.1%	61	0.1	61	0.1
Res25	Res25	A	A	137980.4874	Res25	0.2%	61	0.1	61	0.1
Res25	Res25	A	A	459577.3051	Res25	0.6%	61	0.4	61	0.4
Res25	Res25	A	A	227785.2499	Res25	0.3%	61	0.2	61	0.2
Res25	Res25	A	A	29542.25061	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	16800.39747	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	151311.4384	Res25	0.2%	61	0.1	61	0.1
Res25	Res25	A	A	170795.9255	Res25	0.2%	61	0.1	61	0.1
Res25	Res25	A	A	43413.26085	Res25	0.1%	61	0.0	61	0.0
Res25	Res25	A	A	89835.07534	Res25	0.1%	61	0.1	61	0.1
Res25	Res25	A	A	145586.113	Res25	0.2%	61	0.1	61	0.1
Res25	Res25	A	A	86240.59967	Res25	0.1%	61	0.1	61	0.1
Res25	Res25	A	A	399222.3509	Res25	0.6%	61	0.3	61	0.3
Res25	Res25	A	A	423788.5395	Res25	0.6%	61	0.4	61	0.4
Res25	Res25	A	A	105245.8127	Res25	0.1%	61	0.1	61	0.1
Res25	Res25	A	A	225800.6489	Res25	0.3%	61	0.2	61	0.2
Res25	Res25	A	A	11507.5389	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	A	136626.2954	Res25	0.2%	61	0.1	61	0.1
Res25	Res25	A	A	456313.2421	Res25	0.6%	61	0.4	61	0.4
Res25	Res25	A	A	348789.3719	Res25	0.5%	61	0.3	61	0.3
Res25	Res25	A	A	34333.38838	Res25	0.0%	61	0.0	61	0.0
Res25	Res25	A	D	19089.51596	Res25	0.0%	61	0.0	87	0.0
Res33	Res33	A	A	13790.067	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	2287.256182	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	236.3073444	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	95104.65431	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	210842.0738	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	479.2241905	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	21826.14614	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	49302.77403	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	8400.090629	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	248290.3711	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	83889.7936	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	57985.18696	Res33	0.1%	57	0.0	57	0.0

Project: Portage/Hampton Creek Wetland
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Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Res33	Res33	A	A	425015.7038	Res33	0.6%	57	0.3	57	0.3
Res33	Res33	A	A	167573.7524	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	105903.7961	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	460549.9046	Res33	0.6%	57	0.4	57	0.4
Res33	Res33	A	A	171753.6051	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	951137.2681	Res33	1.3%	57	0.8	57	0.8
Res33	Res33	A	A	399178.4425	Res33	0.6%	57	0.3	57	0.3
Res33	Res33	A	A	382822.5735	Res33	0.5%	57	0.3	57	0.3
Res33	Res33	A	A	141501.0426	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	303210.1752	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	125201.1671	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	477800.6487	Res33	0.7%	57	0.4	57	0.4
Res33	Res33	A	A	207557.6531	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	16962.22966	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	53903.57415	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	636216.7669	Res33	0.9%	57	0.5	57	0.5
Res33	Res33	A	A	255532.3634	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	294816.4626	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	406575.5694	Res33	0.6%	57	0.3	57	0.3
Res33	Res33	A	A	174342.0468	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	293311.2452	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	90129.71078	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	254742.9707	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	283838.1069	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	121818.3686	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	80827.02864	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	91724.46501	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	279103.8788	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	190196.5898	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	156101.5377	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	125948.5176	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	10387.52402	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	357346.7012	Res33	0.5%	57	0.3	57	0.3
Res33	Res33	A	A	121938.6034	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	80013.78618	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	495083.2365	Res33	0.7%	57	0.4	57	0.4
Res33	Res33	A	A	512595.6164	Res33	0.7%	57	0.4	57	0.4
Res33	Res33	A	A	53207.51044	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	150567.267	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	160154.6087	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	198806.2839	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	123116.2618	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	426.7678148	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	58857.61183	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	123018.3621	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	52145.97011	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	226228.6597	Res33	0.3%	57	0.2	57	0.2
Res33	Res33	A	A	89800.46072	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	23228.22133	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	288853.5442	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	16382.44646	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	160562.2213	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	281493.1043	Res33	0.4%	57	0.2	57	0.2
Res33	Res33	A	A	145386.051	Res33	0.2%	57	0.1	57	0.1
Res33	Res33	A	A	50182.31272	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	7894.28702	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	39333.46347	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	5272.642169	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	60784.81108	Res33	0.1%	57	0.0	57	0.0
Res33	Res33	A	A	69932.68275	Res33	0.1%	57	0.1	57	0.1
Res33	Res33	A	A	10.37760723	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	17.43257129	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	A	A	35.45153016	Res33	0.0%	57	0.0	57	0.0
Res33	Res33	B	B	43550.65045	Res33	0.1%	72	0.0	72	0.0
Res50	Res50	A	A	94021.88435	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	370100.9452	Res50	0.5%	54	0.3	54	0.3
Res50	Res50	A	A	125537.6868	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	102640.6827	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	115135.1641	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	77041.26211	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	79048.79105	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	26869.64248	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	27457.14751	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	23938.38845	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	467550.9108	Res50	0.7%	54	0.4	54	0.4
Res50	Res50	A	A	674074.7179	Res50	0.9%	54	0.5	54	0.5
Res50	Res50	A	A	467171.9831	Res50	0.7%	54	0.4	54	0.4
Res50	Res50	A	A	129396.8544	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	727260.4578	Res50	1.0%	54	0.6	54	0.6
Res50	Res50	A	A	473953.6117	Res50	0.7%	54	0.4	54	0.4

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Res50	Res50	A	A	27431.17517	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	110185.3093	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	627227.7933	Res50	0.9%	54	0.5	54	0.5
Res50	Res50	A	A	350051.7561	Res50	0.5%	54	0.3	54	0.3
Res50	Res50	A	A	160439.0064	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	1217389.412	Res50	1.7%	54	0.9	54	0.9
Res50	Res50	A	A	499125.9198	Res50	0.7%	54	0.4	54	0.4
Res50	Res50	A	A	80173.06422	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	349828.6163	Res50	0.5%	54	0.3	54	0.3
Res50	Res50	A	A	200718.8068	Res50	0.3%	54	0.2	54	0.2
Res50	Res50	A	A	233586.9394	Res50	0.3%	54	0.2	54	0.2
Res50	Res50	A	A	313563.385	Res50	0.4%	54	0.2	54	0.2
Res50	Res50	A	A	64719.92184	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	614058.8732	Res50	0.9%	54	0.5	54	0.5
Res50	Res50	A	A	82871.19469	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	75174.17722	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	55495.36383	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	617518.7437	Res50	0.9%	54	0.5	54	0.5
Res50	Res50	A	A	49672.88683	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	29188.23314	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	36325.42627	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	149826.8588	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	229063.6647	Res50	0.3%	54	0.2	54	0.2
Res50	Res50	A	A	162559.5287	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	330851.4294	Res50	0.5%	54	0.3	54	0.3
Res50	Res50	A	A	414828.2819	Res50	0.6%	54	0.3	54	0.3
Res50	Res50	A	A	237797.1528	Res50	0.3%	54	0.2	54	0.2
Res50	Res50	A	A	97261.07707	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	249649.4295	Res50	0.4%	54	0.2	54	0.2
Res50	Res50	A	A	3449.723076	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	86816.33626	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	69263.31478	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	45404.39953	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	36463.18506	Res50	0.1%	54	0.0	54	0.0
Res50	Res50	A	A	139136.707	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	23474.49241	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	114954.9651	Res50	0.2%	54	0.1	54	0.1
Res50	Res50	A	A	13629.78854	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	184165.3146	Res50	0.3%	54	0.1	54	0.1
Res50	Res50	A	A	60.45564404	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	78062.37621	Res50	0.1%	54	0.1	54	0.1
Res50	Res50	A	A	182.4646834	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	A	A	1032.896438	Res50	0.0%	54	0.0	54	0.0
Res50	Res50	C	C	64881.64119	Res50	0.1%	80	0.1	80	0.1
Res100	Res100	A	A	103221.3961	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	166859.6282	Res100	0.2%	51	0.1	51	0.1
Res100	Res100	A	A	31844.57808	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	40363.48923	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	21452.87295	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	74143.32024	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	33774.86194	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	36713.22906	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	64486.1934	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	252602.2438	Res100	0.4%	51	0.2	51	0.2
Res100	Res100	A	A	293413.5023	Res100	0.4%	51	0.2	51	0.2
Res100	Res100	A	A	236595.0534	Res100	0.3%	51	0.2	51	0.2
Res100	Res100	A	A	123850.3036	Res100	0.2%	51	0.1	51	0.1
Res100	Res100	A	A	42098.88873	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	52187.80095	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	201933.0214	Res100	0.3%	51	0.1	51	0.1
Res100	Res100	A	A	143575.4496	Res100	0.2%	51	0.1	51	0.1
Res100	Res100	A	A	82798.43118	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	30469.59628	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	330934.6334	Res100	0.5%	51	0.2	51	0.2
Res100	Res100	A	A	84866.86325	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	208565.6557	Res100	0.3%	51	0.1	51	0.1
Res100	Res100	A	A	31.48032908	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	44315.56341	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	47993.23914	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	98168.7541	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	78127.61437	Res100	0.1%	51	0.1	51	0.1
Res100	Res100	A	A	353071.3688	Res100	0.5%	51	0.3	51	0.3
Res100	Res100	A	A	20897.14561	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	61408.24213	Res100	0.1%	51	0.0	51	0.0
Res100	Res100	A	A	3089.29516	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	4079.219057	Res100	0.0%	51	0.0	51	0.0
Res100	Res100	A	A	205284.3382	Res100	0.3%	51	0.1	51	0.1
Res100	Res100	A	A	148864.6812	Res100	0.2%	51	0.1	51	0.1
Res100	Res100	A	D	54207.78466	Res100	0.1%	51	0.0	84	0.1
Res200	Res200	A	A	69643.66768	Res200	0.1%	46	0.0	46	0.0

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Res200	Res200	A	A	144879.9056	Res200	0.2%	46	0.1	46	0.1
Res200	Res200	A	A	93154.34042	Res200	0.1%	46	0.1	46	0.1
Res200	Res200	A	A	95342.76921	Res200	0.1%	46	0.1	46	0.1
Res200	Res200	A	A	72806.68408	Res200	0.1%	46	0.0	46	0.0
Res200	Res200	A	A	37977.81618	Res200	0.1%	46	0.0	46	0.0
Res200	Res200	A	A	127658.2464	Res200	0.2%	46	0.1	46	0.1
Res200	Res200	A	A	48200.91981	Res200	0.1%	46	0.0	46	0.0
Res200	Res200	A	A	83267.21654	Res200	0.1%	46	0.1	46	0.1
Swamp Veg	Swamp Veg	A	A	7255.15828	Swamp	0.0%	78	0.0	78	0.0
Swamp Veg	Swamp Veg	A	A	6345.179233	Swamp	0.0%	78	0.0	78	0.0
Swamp Veg	Swamp Veg	A	A	57027.81122	Swamp	0.1%	78	0.1	78	0.1
Swamp Veg	Swamp Veg	A	A	35721.30186	Swamp	0.1%	78	0.0	78	0.0
Swamp Veg	Swamp Veg	A	A	1044.692052	Swamp	0.0%	78	0.0	78	0.0
Swamp Veg	Swamp Veg	A	D	2737828.779	Swamp	3.9%	78	3.0	78	3.0
Swamp Veg	Swamp Veg	B	B	2599.103042	Swamp	0.0%	78	0.0	78	0.0
Water	Water	A	A	55158.73557	Lakes	0.1%	100	0.1	100	0.1
Water	Water	A	A	25476.63592	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	223000.0263	Lakes	0.3%	100	0.3	100	0.3
Water	Water	A	A	37709.17029	Lakes	0.1%	100	0.1	100	0.1
Water	Water	A	A	67938.48845	Lakes	0.1%	100	0.1	100	0.1
Water	Water	A	A	10897.76612	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	31864.79909	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	4547.714568	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	11257.59683	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	5060.122147	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	1483.719846	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	8030.492887	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	809.2445159	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	943.4341983	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	A	7039.17291	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	D	110.4088228	Lakes	0.0%	100	0.0	100	0.0
Water	Water	A	D	37222.75626	Lakes	0.1%	100	0.1	100	0.1
Water	Water	A	A	9381.794142	Lakes	0.0%	100	0.0	100	0.0
Woods-G	Woods-G	A	A	443.3211381	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	2078.403994	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	348451.1834	Forest-G	0.5%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	258446.48	Forest-G	0.4%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	6527.939668	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	508071.6131	Forest-G	0.7%	30	0.2	30	0.2
Woods-G	Woods-G	A	A	76041.19425	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	53330.41397	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	295007.3666	Forest-G	0.4%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	2143324.91	Forest-G	3.0%	30	0.9	30	0.9
Woods-G	Woods-G	A	A	524517.6381	Forest-G	0.7%	30	0.2	30	0.2
Woods-G	Woods-G	A	A	322354.0935	Forest-G	0.5%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	3576796.422	Forest-G	5.0%	30	1.5	30	1.5
Woods-G	Woods-G	A	A	72755.78942	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	23141.5016	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	6510.625871	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	188272.7452	Forest-G	0.3%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	287401.5944	Forest-G	0.4%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	38662.65807	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	121325.0102	Forest-G	0.2%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	16833.29825	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	226135.3145	Forest-G	0.3%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	103393.8057	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	79241.91378	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	64964.04735	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	105845.4384	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	11770.65182	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	24201.15073	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	1029.539921	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	5603.727097	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	68015.69233	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	33564.55415	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	88945.25461	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	32600.87972	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	60550.83952	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	41606.3095	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	16015.68113	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	45920.76164	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	30166.76004	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	26936.12232	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	117275.2083	Forest-G	0.2%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	31017.86832	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	192299.5162	Forest-G	0.3%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	266692.0638	Forest-G	0.4%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	59969.47363	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	129591.5568	Forest-G	0.2%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	33722.00642	Forest-G	0.0%	30	0.0	30	0.0

Project: Portage/Hampton Creek Wetland
Project Number: 181663

Sub-area name: 1
Number of areas: 1
Total area [ft^2]: 71010668.20
Minimum Weighted RCN: 55
Maximum Weighted RCN: 55

Class	Category	Hydrologic Soil Group		Area [ft^2]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
Woods-G	Woods-G	A	A	19688.9772	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	120595.5693	Forest-G	0.2%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	90963.20692	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	45760.65172	Forest-G	0.1%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	14505.19837	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	368.047976	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	229007.159	Forest-G	0.3%	30	0.1	30	0.1
Woods-G	Woods-G	A	A	5610.560807	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	331.218427	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	A	10.37760723	Forest-G	0.0%	30	0.0	30	0.0
Woods-G	Woods-G	A	D	619.1269412	Forest-G	0.0%	30	0.0	77	0.0
Woods-G	Woods-G	A	D	48626.98361	Forest-G	0.1%	30	0.0	77	0.1
Woods-G	Woods-G	A	D	5619.733752	Forest-G	0.0%	30	0.0	77	0.0
Woods-G	Woods-G	B	B	86462.69237	Forest-G	0.1%	55	0.1	55	0.1
Woods-G	Woods-G	C	C	418230.4373	Forest-G	0.6%	70	0.4	70	0.4
Woods-G	Woods-G	C	C	2947.006418	Forest-G	0.0%	70	0.0	70	0.0

Project: Hampton Creek Wetlands
Project Number: 181663

Sub-area name: Overland Flow to Greenspire Bog
Number of areas: 7
Total area [ac]: 52.81
Minimum Weighted RCN: 56
Maximum Weighted RCN: 56

Class	Category	Hydrologic Soil Group		Area [sf]	Land Use Codes	% total area	Minimum RCN		Maximum RCN	
		First	Second				RCN	Partial RCN	RCN	Partial RCN
	Forest - A	A	A	1009558		43.9%	25	11.0	25	11.0
	Forest - D	D	D	92230		4.0%	77	3.1	77	3.1
	Open - A	A	A	37709		1.6%	38	0.6	38	0.6
	Open - D	D	D	4420		0.2%	80	0.2	80	0.2
	Swamp	D	D	790261		34.4%	78	26.8	78	26.8
	Res < 1/4 - A	A	A	137353		6.0%	77	4.6	77	4.6
	Pavement	A	A	229076		10.0%	98	9.8	98	9.8

Project: Hampton Creek Wetlands
Project Number: 181663

Sub-area name: Portage Creek at Hampton Lake
Number of areas: 17
Total area [ac]: 2155.51
Minimum Weighted RCN: 48
Maximum Weighted RCN: 49

Class	Category	Hydrologic Soil Group		Area [sf]	Minimum RCN		Maximum RCN	
					RCN	Partial RCN	RCN	Partial RCN
	Water	--	--	736514	100	0.8	100	0.8
	Pavement	--	--	1340029	98	1.4	98	1.4
	Commercial	A	A	2356858	89	2.2	89	2.2
	Crop	A/D	A/D	4980	67	0.0	88	0.0
	Crop	A	A	4999381	67	3.6	67	3.6
Good	Forest	A/D	A/D	2259651	30	0.7	79	1.9
Good	Forest	A	A	18186435	30	5.8	30	5.8
Fair	Open	A	A	771238	49	0.4	49	0.4
Good	Open	A	A	26626088	39	11.1	39	11.1
Good	Open	A/D	A/D	639586	39	0.3	80	0.5
	Res 1	A	A	5203344	51	2.8	51	2.8
	Res 1	A/D	A/D	96831	51	0.1	51	0.1
	Res 1/2	A/D	A/D	161713	54	0.1	85	0.1
	Res 1/2	A	A	23390536	54	13.5	54	13.5
	Res 1/3	A	A	4012023	57	2.4	57	2.4
	Wetland	A/D	A/D	3101115	85	2.8	85	2.8
	Industrial	A	A	7665	81	0.0	81	0.0

Project: Hampton Creek Wetland Areas Flood Mitigation
Project Number: 181663

Sub-area name:

Direct flow to Hampton Creek Bog

Unadjusted Time of Concentration [hr]:

2.53

Flow Type codes

SF	Sheet flow - overland flow
W	Waterway - well defined swale w/o blue line on USGS topo map
ST	Small Triubary - stream which appears as solid or dashed blue line on USGS map
P	Pipe Flow (Manning's equation flowing full)

Time of Concentration Table

Segment Name	Segment length [ft]	Start Elevation [ft]	End Elevation [ft]	Flow Type Code	Slope	Coefficient	Velocity [ft/s]	Section flow time [hr]	Include in tc
Trib 1	667	942	936	ST	0.008996	2.10	1.99	0.09	1
Trib 2	441	936	928	ST	0.018141	2.10	2.83	0.04	1
Trib 3	791	928	924	ST	0.005057	2.10	1.49	0.15	1
Trib 4	1508	924	922	ST	0.001326	2.10	0.76	0.55	1
Trib 5	2391	922	914	ST	0.003346	2.10	1.21	0.55	1
Trib 6	1459	914	908	ST	0.004112	2.10	1.35	0.30	1
Trib 7	623	908	900	ST	0.012841	2.10	2.38	0.07	1
Trib 8	1096	900	892	ST	0.007299	2.10	1.79	0.17	1
Trib 9	1458	892	882	ST	0.006859	2.10	1.74	0.23	1
Trib 10	418	882	878	ST	0.009569	2.10	2.05	0.06	1
Trib 11	982	878	876	ST	0.002037	2.10	0.95	0.29	1
Trib 12	286	876	872	ST	0.013986	2.10	2.48	0.03	1

Project: Hampton Creek Wetland Areas Flood Mitigation
Project Number: 181663

Sub-area name:

Direct flow to Greenspire Bog

Unadjusted Time of Concentration [hr]:

0.45

Flow Type codes

SF	Sheet flow - overland flow
W	Waterway - well defined swale w/o blue line on USGS topo map
ST	Small Triubary - stream which appears as solid or dashed blue line on USGS map
P	Pipe Flow (Manning's equation flowing full)

Time of Concentration Table

Segment Name	Segment length [ft]	Start Elevation [ft]	End Elevation [ft]	Flow Type Code	Slope	Coefficient	Velocity [ft/s]	Section flow time [hr]	Include in tc
Sheet 1	26	902	901	SF	0.038462	0.48	0.94	0.01	1
Pipe 1	1570			P	0.000000	#N/A	3	0.15	1
Trib 1	914	869.9	868.07	ST	0.002002	2.10	0.94	0.27	1
Trib 2	93	868.07	867.8	ST	0.002903	2.10	1.13	0.02	1
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0

Project: Hampton Creek Wetland Areas Flood Mitigation
Project Number: 181663

Sub-area name:

Portage Creek at Hampton Lake Inlet

Unadjusted Time of Concentration [hr]:

12.22

Flow Type codes

SF	Sheet flow - overland flow
W	Waterway - well defined swale w/o blue line on USGS topo map
ST	Small Triubary - stream which appears as solid or dashed blue line on USGS map
P	Pipe Flow

Time of Concentration Table

Segment Name	Segment length [ft]	Start Elevation [ft]	End Elevation [ft]	Flow Type Code	Slope	Coefficient	Velocity [ft/s]	Section flow time [hr]	Include in tc
Sheet 1	300	946	932.334	SF	0.045553	0.48	1.02	0.08	1
Waterway 1	6253.31	932.334	908.363	W	0.003833	1.20	0.74	2.34	1
Waterway 2	11878.31	908.363	878.351	W	0.002527	1.20	0.60	5.47	1
Trib 1	3404.4	878.351	870.348	ST	0.002351	2.10	1.02	0.93	1
Pipe Flow 1	77.99	870.348	868.347	P	0.025657	0.01	12.00	0.00	1
Trib 2	686.13	868.347	867	ST	0.001963	2.10	0.93	0.20	1
Pipe Flow 2	466.27	867	864.346	P	0.005692	0.01	12.00	0.01	1
Trib 3	8869.72	864.346	852.341	ST	0.001353	2.10	0.77	3.19	1
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0
					--	--	--	0.00	0

Appendix 2

Discharge Information

Watercourse: PORTAGE CREEK
Location: Hampton Lake Inlet
Basin Name: 17 - Kalamazoo
County: Kalamazoo
Township: City of Portage
Quad Name: Schoolcraft NW
Quad ID: V20NW
Requested By: FEMA
Request Type: FIS
File Number: FIS-39-24

Drainage Area: 5.2 mi^2
Contributing Area: 3.2 mi^2
Tn/Rng/Sec: 03S11W/19
Latitude: 42.19074297
Longitude: -85.63264508

Received Date: 4/13/2007
Issued Date: 4/13/2007
Reference Number:

Discharge Frequencies:

10%: 30 cfs
2%: 35 cfs
1%: 40 cfs
0.5%: 45 cfs
0.2%: 50 cfs

Volume Frequencies:

1%:
0.5%:

Access to the Flood Flow Database is provided as a service to allow you to check the status of your flood flow requests or to view discharges from previous requests for preliminary design purposes. The discharges values are only valid for the original requestor and for one year after the original request date. To obtain discharge information from the Hydrologic Studies Program, a flood flow discharge request form may be submitted electronically to the DEQ. A written or email response to your request will be returned to you and must accompany your permit application.

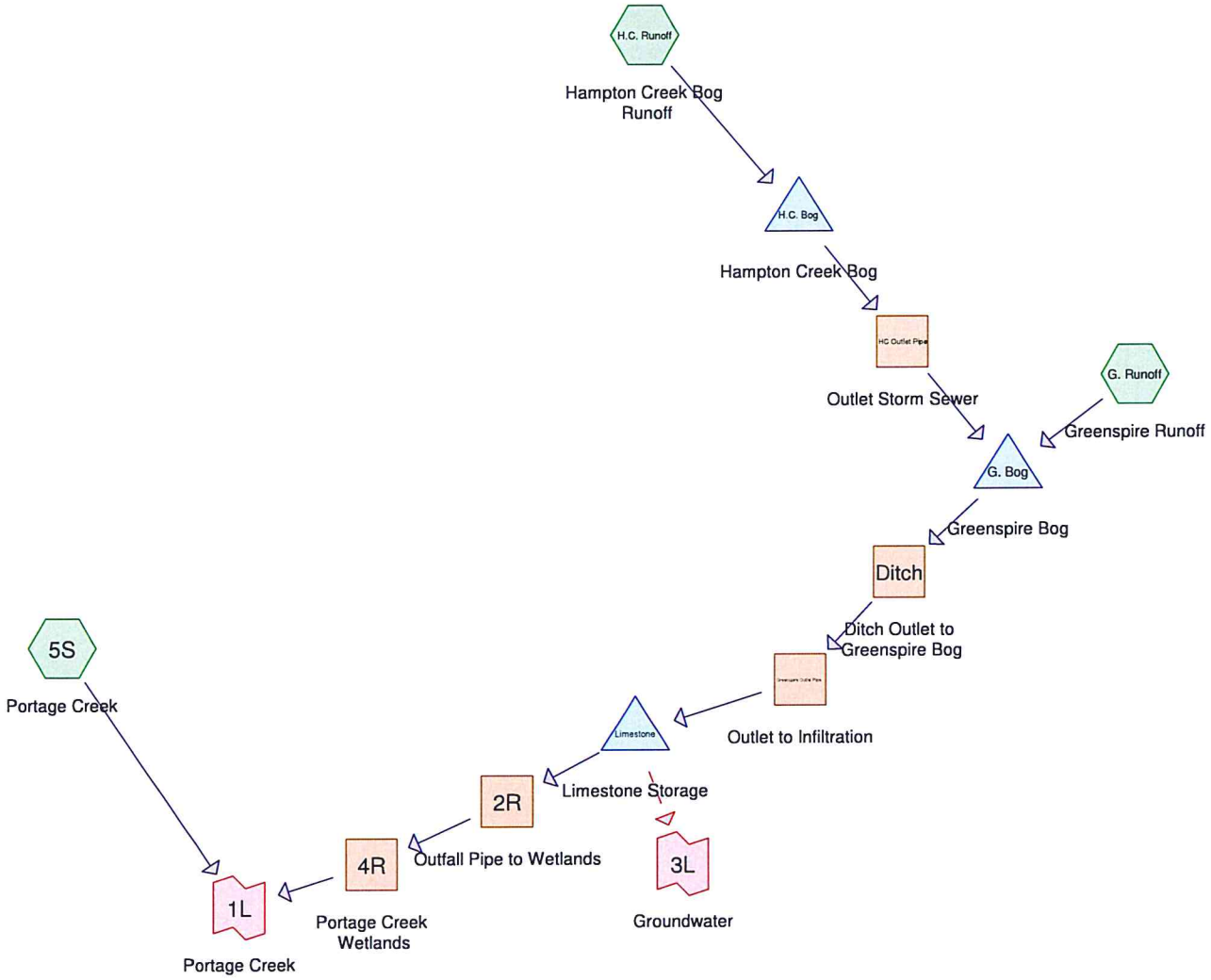
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Appendix 3

Infiltration Calculation

Basin Name	Inf. Rate [in/hr]	Inf. Rate [ft/hr]	Inf. Rate [ft/sec]	Length of Basin	Width of Basin	Inf. Area [sf]	Inf. Rate [ft/s]	Infiltration Flow Rate [cfs]
Limestone Storage	3.5	0.29	0.00008	75	50	3750	0.000081	0.30

Appendix 4



Subcat Reach Pond Link

Routing Diagram for Hampton Creek Wetlands
Prepared by Fishbeck, Thompson, Carr & Huber Inc., Printed 12/3/2019
HydroCAD® 10.00-25 s/n 08536 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2,441.000	65	(5S)
53.000	56	Combined CN - see spreadsheet (G. Runoff)
1,247.000	55	Total Area w/ Weighted CN (H.C. Runoff)
3,741.000	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
3,741.000	Other	5S, G. Runoff, H.C. Runoff
3,741.000		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchr Numbers
0.000	0.000	0.000	0.000	2,441.000	2,441.000		5
0.000	0.000	0.000	0.000	53.000	53.000	Combined CN - see spreadsheet	S
0.000	0.000	0.000	0.000	1,247.000	1,247.000	Total Area w/ Weighted CN	H. C. Runoff
0.000	**0.000**	**0.000**	**0.000**	**3,741.000**	**3,741.000**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	In (
1	2R	863.00	862.00	30.0	0.0333	0.013	12.0	0.0	
2	Greenspire Outlet Pipe	867.80	867.00	149.0	0.0054	0.024	24.0	0.0	
3	HC Outlet Pipe	872.44	869.90	915.0	0.0028	0.013	24.0	0.0	
4	Limestone	866.00	865.50	20.0	0.0250	0.013	12.0	0.0	

Time span=0.00-720.00 hrs, dt=0.05 hrs, 14401 points
Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 5S: Portage Creek Runoff Area=2,441.000 ac 0.00% Impervious Runoff Depth=2.41"
Tc=7,332.0 min CN=65 Runoff=40.41 cfs 490.164 af

Subcatchment G. Runoff: Greenspire Runoff Area=53.000 ac 0.00% Impervious Runoff Depth=1.64"
Tc=27.0 min CN=56 Runoff=61.04 cfs 7.260 af

Subcatchment H.C. Runoff: Hampton Runoff Area=1,247.000 ac 0.00% Impervious Runoff Depth=1.56"
Tc=151.8 min CN=55 Runoff=391.10 cfs 162.523 af

Reach 2R: Outfall Pipe to Wetlands Avg. Flow Depth=0.15' Max Vel=4.28 fps Inflow=0.32 cfs 10.456 af
12.0" Round Pipe n=0.013 L=30.0' S=0.0333 '/' Capacity=6.50 cfs Outflow=0.32 cfs 10.456 af

Reach 4R: Portage Creek Wetlands Avg. Flow Depth=0.03' Max Vel=0.15 fps Inflow=0.32 cfs 10.456 af
n=0.100 L=630.0' S=0.0095 '/' Capacity=85.13 cfs Outflow=0.32 cfs 10.430 af

Reach Ditch: Ditch Outlet to Avg. Flow Depth=0.27' Max Vel=0.61 fps Inflow=0.75 cfs 41.376 af
n=0.050 L=95.0' S=0.0028 '/' Capacity=68.30 cfs Outflow=0.75 cfs 41.374 af

Reach Greenspire Outlet Pipe: Outlet Avg. Flow Depth=0.39' Max Vel=1.73 fps Inflow=0.75 cfs 41.374 af
24.0" Round Pipe n=0.024 L=149.0' S=0.0054 '/' Capacity=8.98 cfs Outflow=0.75 cfs 41.372 af

Reach HC Outlet Pipe: Outlet Storm Avg. Flow Depth=0.34' Max Vel=2.13 fps Inflow=0.76 cfs 40.986 af
24.0" Round Pipe n=0.013 L=915.0' S=0.0028 '/' Capacity=11.92 cfs Outflow=0.76 cfs 40.979 af

Pond G. Bog: Greenspire Bog Peak Elev=868.44' Storage=323,784 cf Inflow=61.04 cfs 48.240 af
Outflow=0.75 cfs 41.376 af

Pond H.C. Bog: Hampton Creek Bog Peak Elev=873.95' Storage=7,042,145 cf Inflow=391.10 cfs 162.523 af
Outflow=0.76 cfs 40.986 af

Pond Limestone: Limestone Storage Peak Elev=866.28' Storage=7.641 af Inflow=0.75 cfs 41.372 af
Primary=0.32 cfs 10.456 af Secondary=0.40 cfs 23.370 af Outflow=0.72 cfs 33.827 af

Link 1L: Portage Creek Inflow=40.41 cfs 500.594 af
Primary=40.41 cfs 500.594 af

Link 3L: Groundwater Inflow=0.40 cfs 23.370 af
Primary=0.40 cfs 23.370 af

Total Runoff Area = 3,741.000 ac Runoff Volume = 659.948 af Average Runoff Depth = 2.12"
100.00% Pervious = 3,741.000 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 5S: Portage Creek

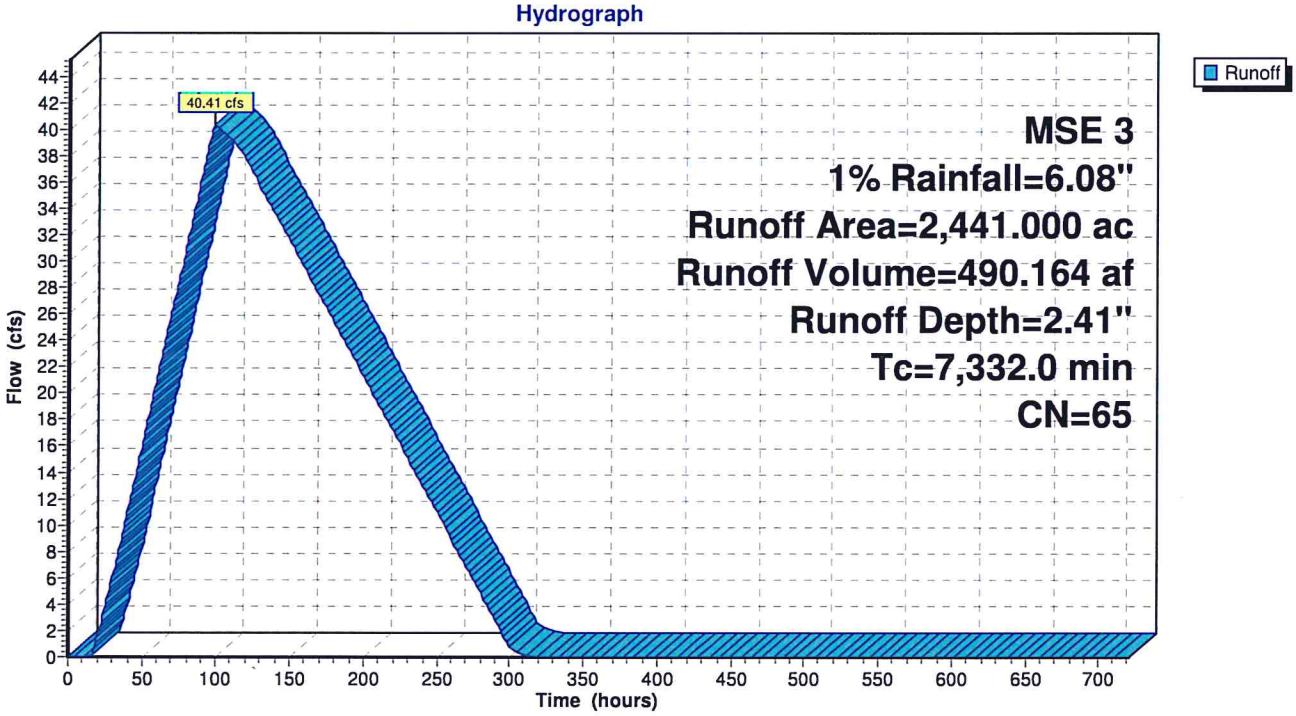
Runoff = 40.41 cfs @ 97.79 hrs, Volume= 490.164 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 1% Rainfall=6.08"

	Area (ac)	CN	Description
*	2,441.000	65	
	2,441.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7,332.0					**Direct Entry,**

Subcatchment 5S: Portage Creek



Summary for Subcatchment G. Runoff: Greenspire Runoff

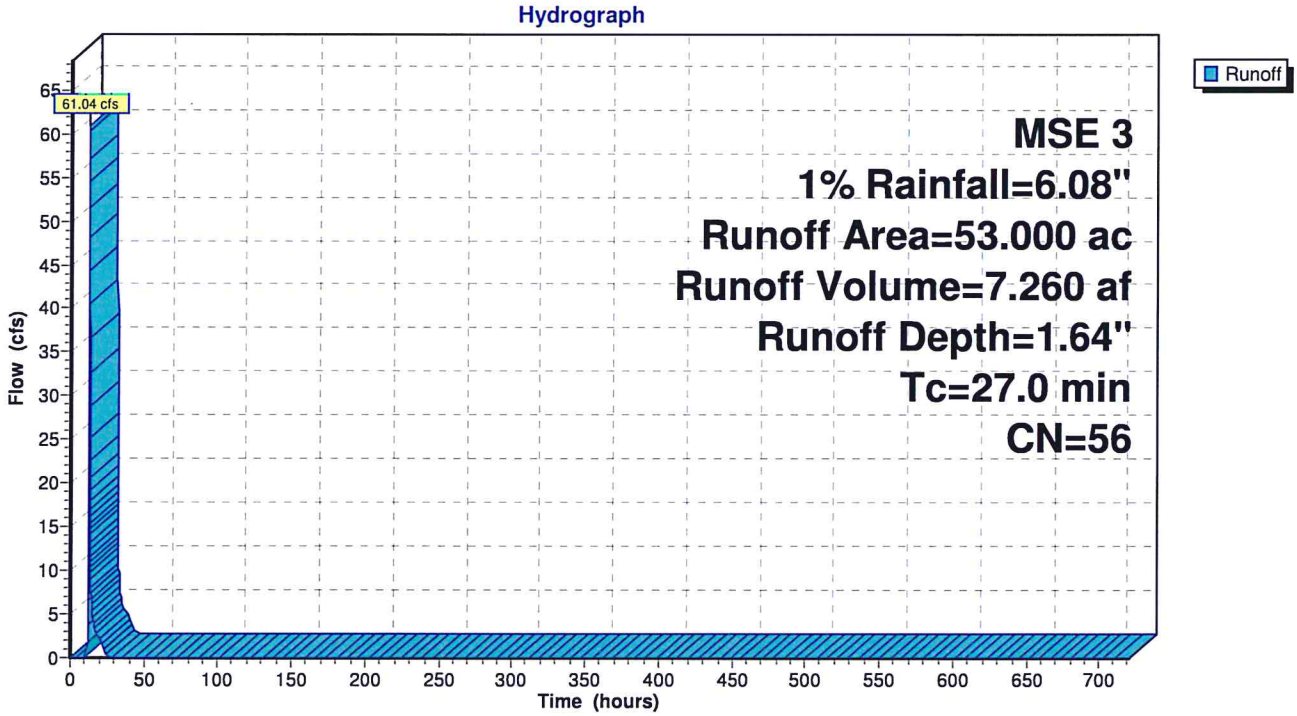
Runoff = 61.04 cfs @ 12.50 hrs, Volume= 7.260 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 1% Rainfall=6.08"

	Area (ac)	CN	Description
*	53.000	56	Combined CN - see spreadsheet
	53.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					**Direct Entry,**

Subcatchment G. Runoff: Greenspire Runoff



Summary for Subcatchment H.C. Runoff: Hampton Creek Bog Runoff

Calculations completed in spreadsheets.

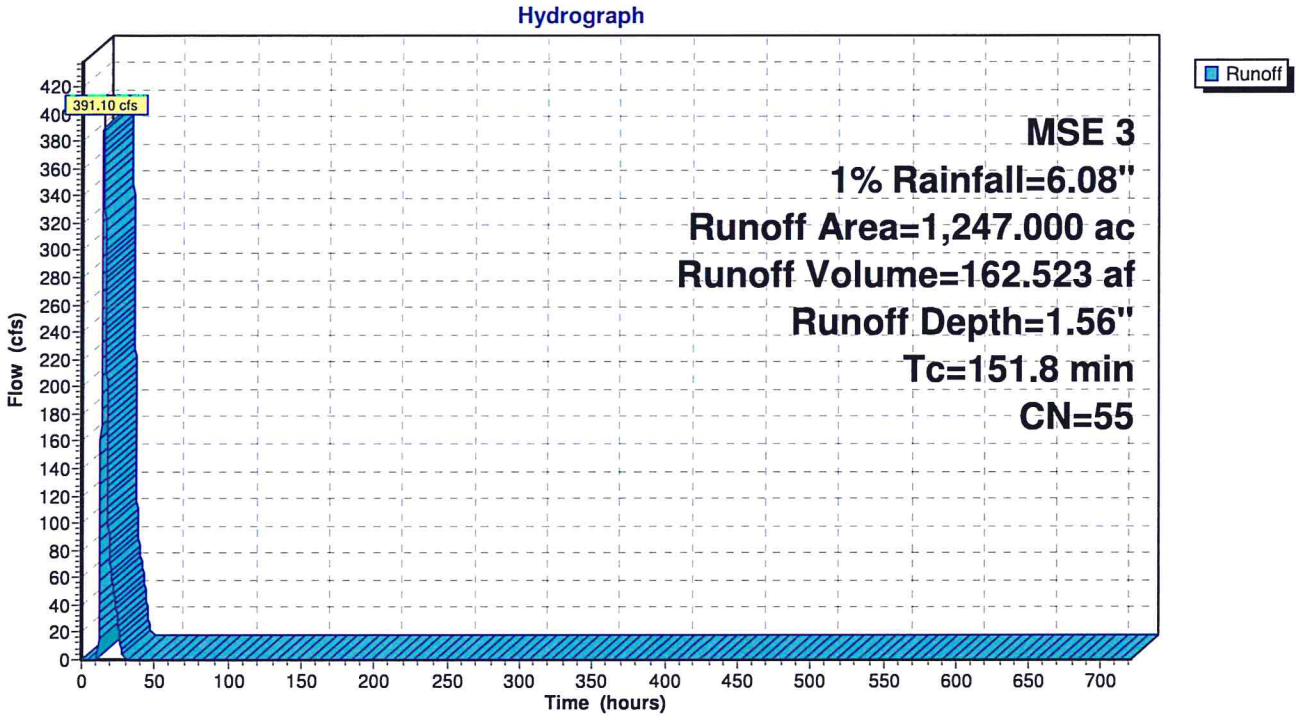
Runoff = 391.10 cfs @ 14.50 hrs, Volume= 162.523 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 1% Rainfall=6.08"

	Area (ac)	CN	Description
*	1,247.000	55	Total Area w/ Weighted CN
	1,247.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
151.8					**Direct Entry,**

Subcatchment H.C. Runoff: Hampton Creek Bog Runoff



Summary for Reach 2R: Outfall Pipe to Wetlands

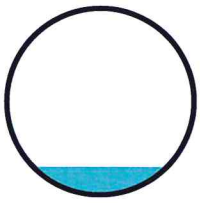
[52] Hint: Inlet/Outlet conditions not evaluated

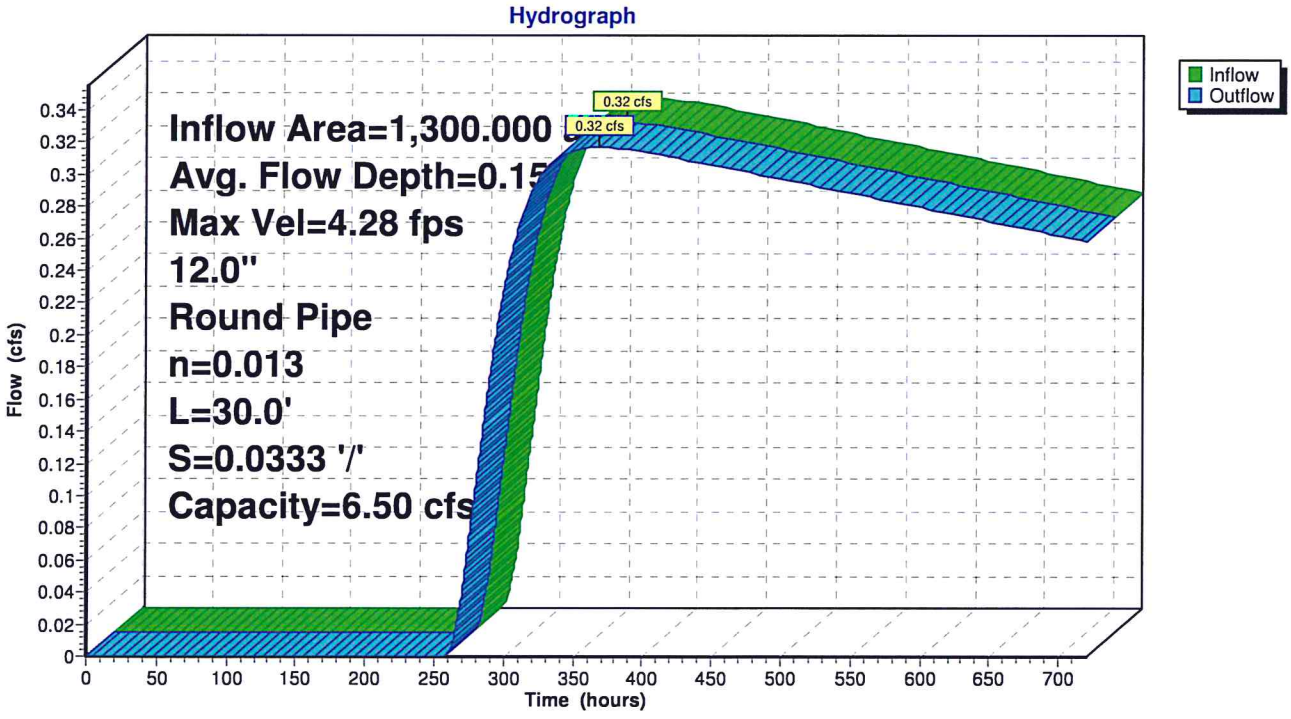
Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.10" for 1% event
Inflow = 0.32 cfs @ 367.36 hrs, Volume= 10.456 af
Outflow = 0.32 cfs @ 367.37 hrs, Volume= 10.456 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.05 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 367.37 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.50 cfs

12.0" Round Pipe
n= 0.013
Length= 30.0' Slope= 0.0333 '/'
Inlet Invert= 863.00', Outlet Invert= 862.00'





Summary for Reach 4R: Portage Creek Wetlands

[61] Hint: Exceeded Reach 2R outlet invert by 0.03' @ 368.05 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.10" for 1% event
Inflow = 0.32 cfs @ 367.37 hrs, Volume= 10.456 af
Outflow = 0.32 cfs @ 368.06 hrs, Volume= 10.430 af, Atten= 0%, Lag= 41.4 min

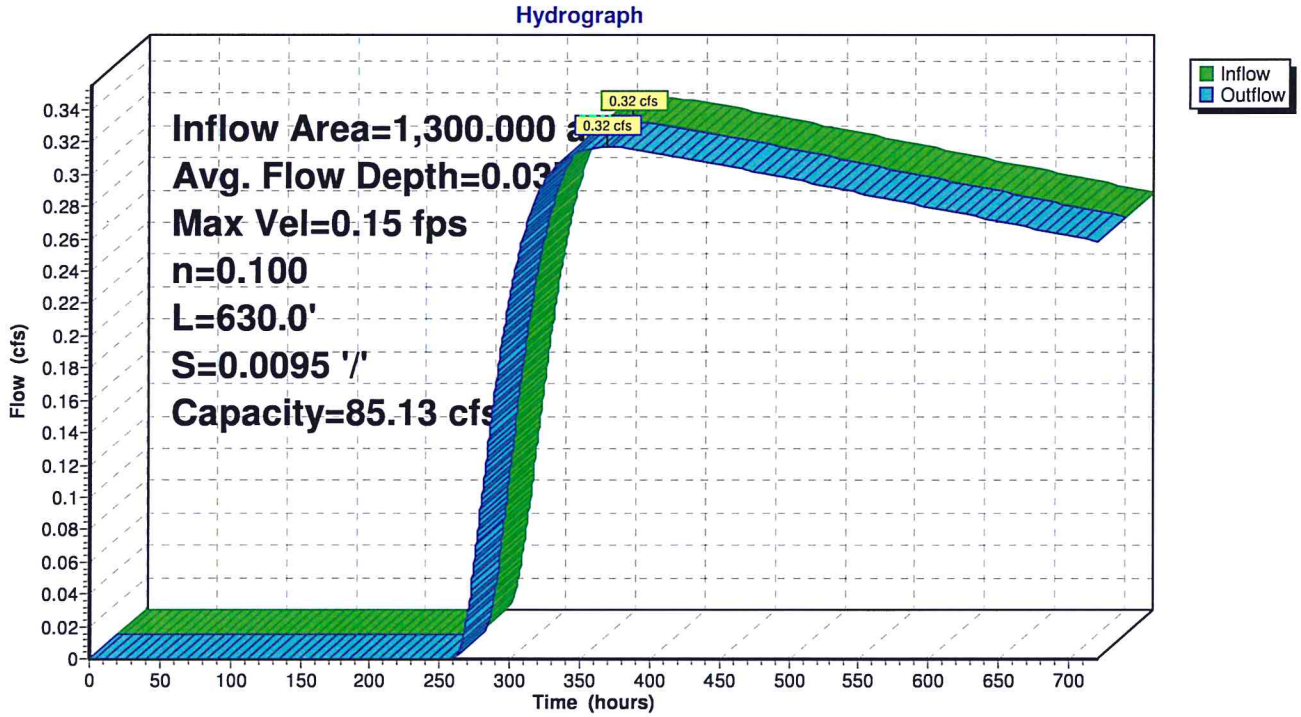
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.15 fps, Min. Travel Time= 68.0 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 72.9 min

Peak Storage= 1,293 cf @ 368.06 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 60.0 sf, Capacity= 85.13 cfs

60.00' x 1.00' deep channel, n= 0.100
Length= 630.0' Slope= 0.0095 '/'
Inlet Invert= 862.00', Outlet Invert= 856.00'



Reach 4R: Portage Creek Wetlands



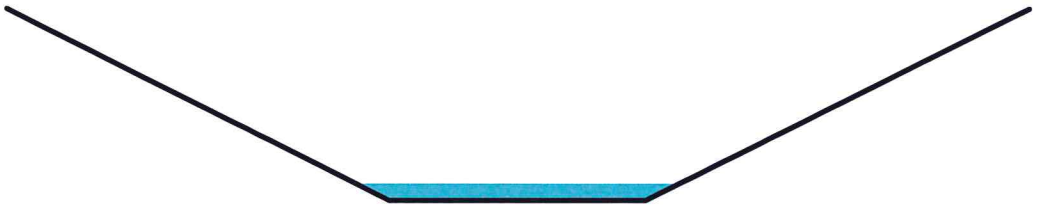
Summary for Reach Ditch: Ditch Outlet to Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.38" for 1% event
Inflow = 0.75 cfs @ 139.63 hrs, Volume= 41.376 af
Outflow = 0.75 cfs @ 139.65 hrs, Volume= 41.374 af, Atten= 0%, Lag= 1.7 min

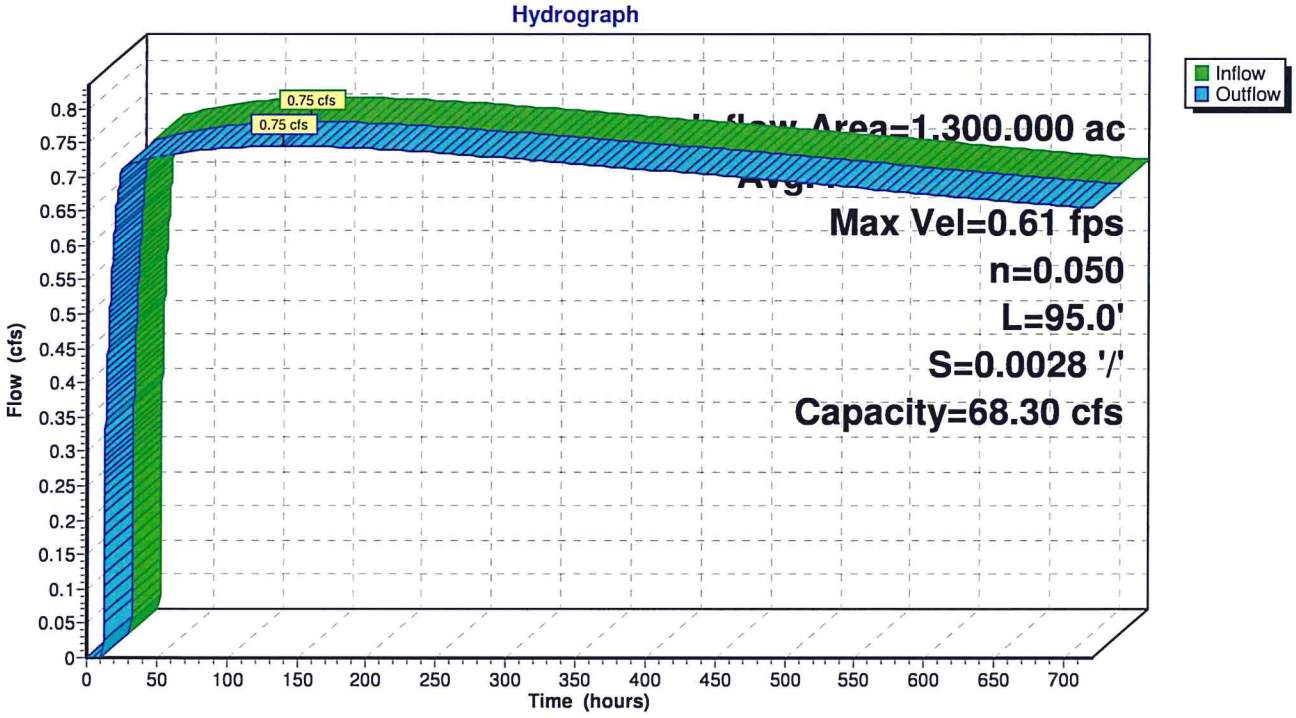
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.61 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 2.7 min

Peak Storage= 117 cf @ 139.65 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 68.30 cfs

4.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 95.0' Slope= 0.0028 '/'
Inlet Invert= 868.07', Outlet Invert= 867.80'



Reach Ditch: Ditch Outlet to Greenspire Bog



Summary for Reach Greenspire Outlet Pipe: Outlet to Infiltration

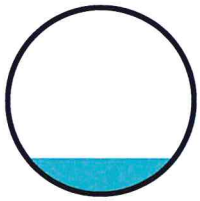
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach Ditch OUTLET depth by 0.12' @ 139.75 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.38" for 1% event
Inflow = 0.75 cfs @ 139.65 hrs, Volume= 41.374 af
Outflow = 0.75 cfs @ 139.67 hrs, Volume= 41.372 af, Atten= 0%, Lag= 1.0 min

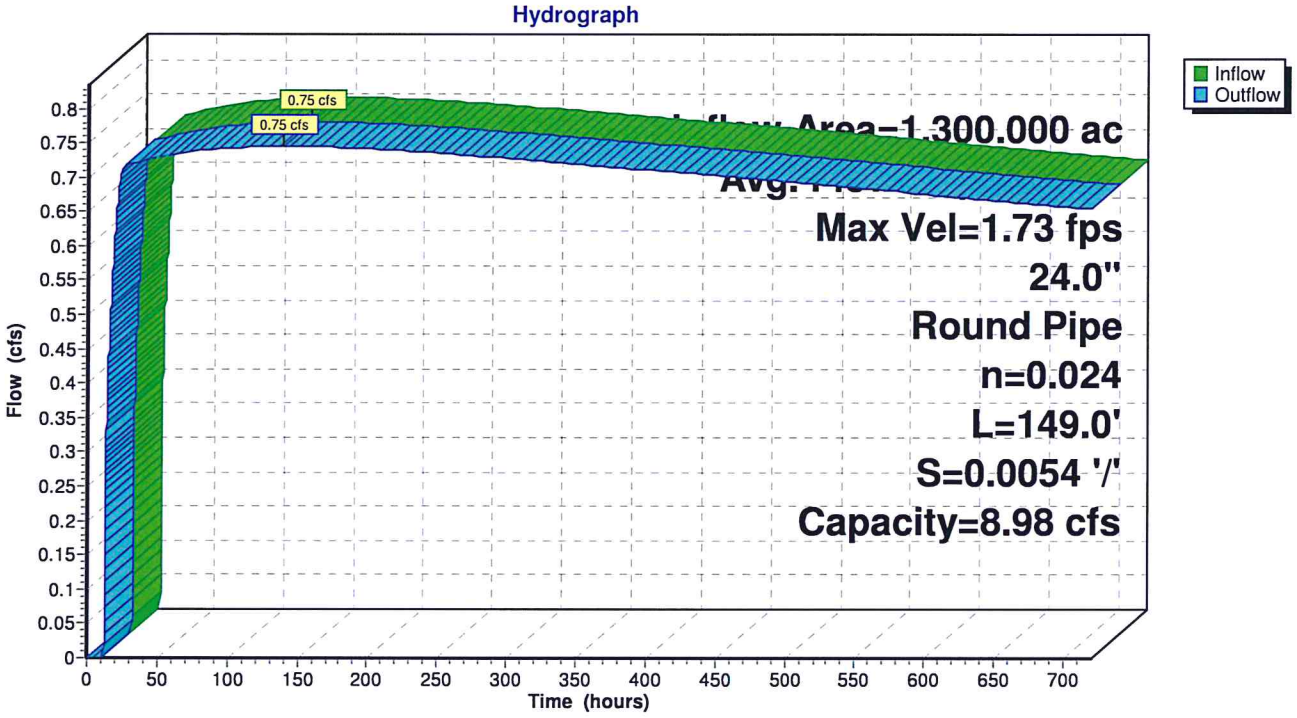
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 1.5 min

Peak Storage= 64 cf @ 139.67 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 8.98 cfs

24.0" Round Pipe
n= 0.024
Length= 149.0' Slope= 0.0054 '/'
Inlet Invert= 867.80', Outlet Invert= 867.00'



Reach Greenspire Outlet Pipe: Outlet to Infiltration



Summary for Reach HC Outlet Pipe: Outlet Storm Sewer

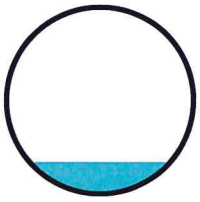
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth > 0.39" for 1% event
Inflow = 0.76 cfs @ 28.93 hrs, Volume= 40.986 af
Outflow = 0.76 cfs @ 29.02 hrs, Volume= 40.979 af, Atten= 0%, Lag= 5.3 min

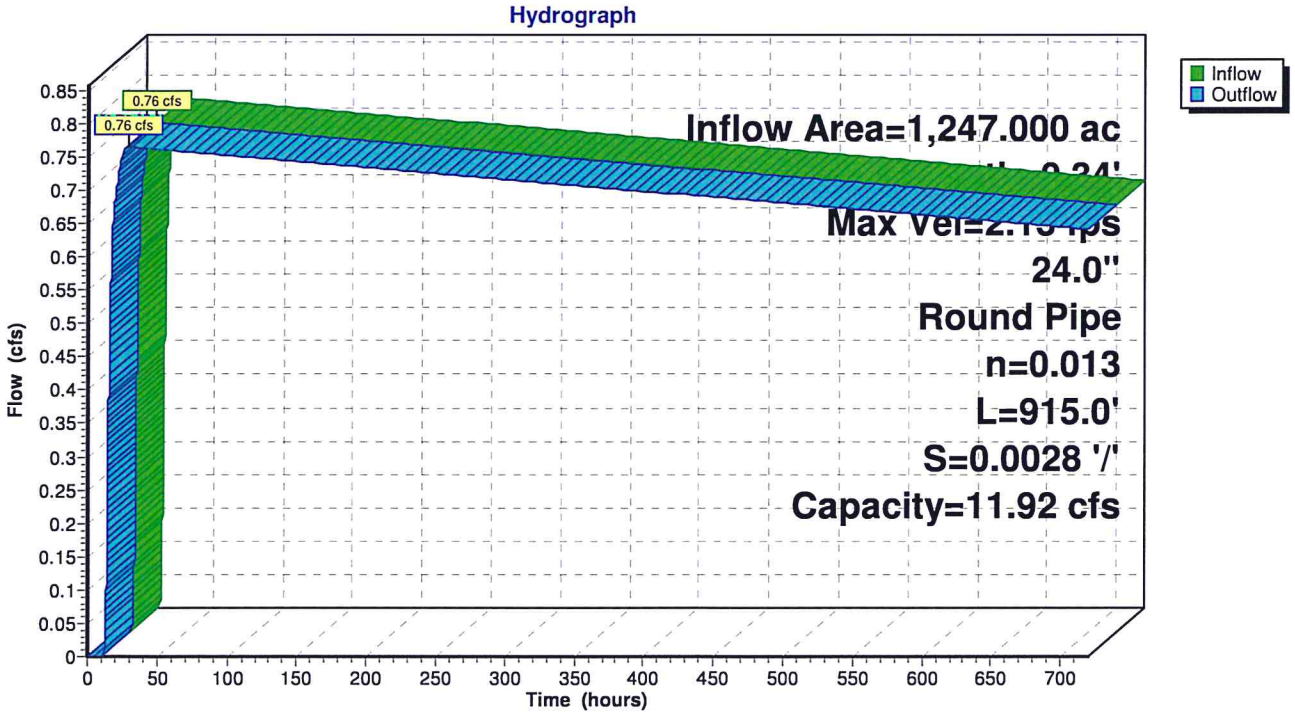
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 2.07 fps, Avg. Travel Time= 7.4 min

Peak Storage= 329 cf @ 29.02 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 11.92 cfs

24.0" Round Pipe
n= 0.013
Length= 915.0' Slope= 0.0028 '/'
Inlet Invert= 872.44', Outlet Invert= 869.90'



Reach HC Outlet Pipe: Outlet Storm Sewer



Summary for Pond G. Bog: Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.45" for 1% event
Inflow = 61.04 cfs @ 12.50 hrs, Volume= 48.240 af
Outflow = 0.75 cfs @ 139.63 hrs, Volume= 41.376 af, Atten= 99%, Lag= 7,627.5 min
Primary = 0.75 cfs @ 139.63 hrs, Volume= 41.376 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 868.44' @ 139.65 hrs Surf.Area= 894,697 sf Storage= 323,784 cf

Plug-Flow detention time= 6,745.9 min calculated for 41.376 af (86% of inflow)
Center-of-Mass det. time= 3,260.0 min (21,607.9 - 18,347.8)

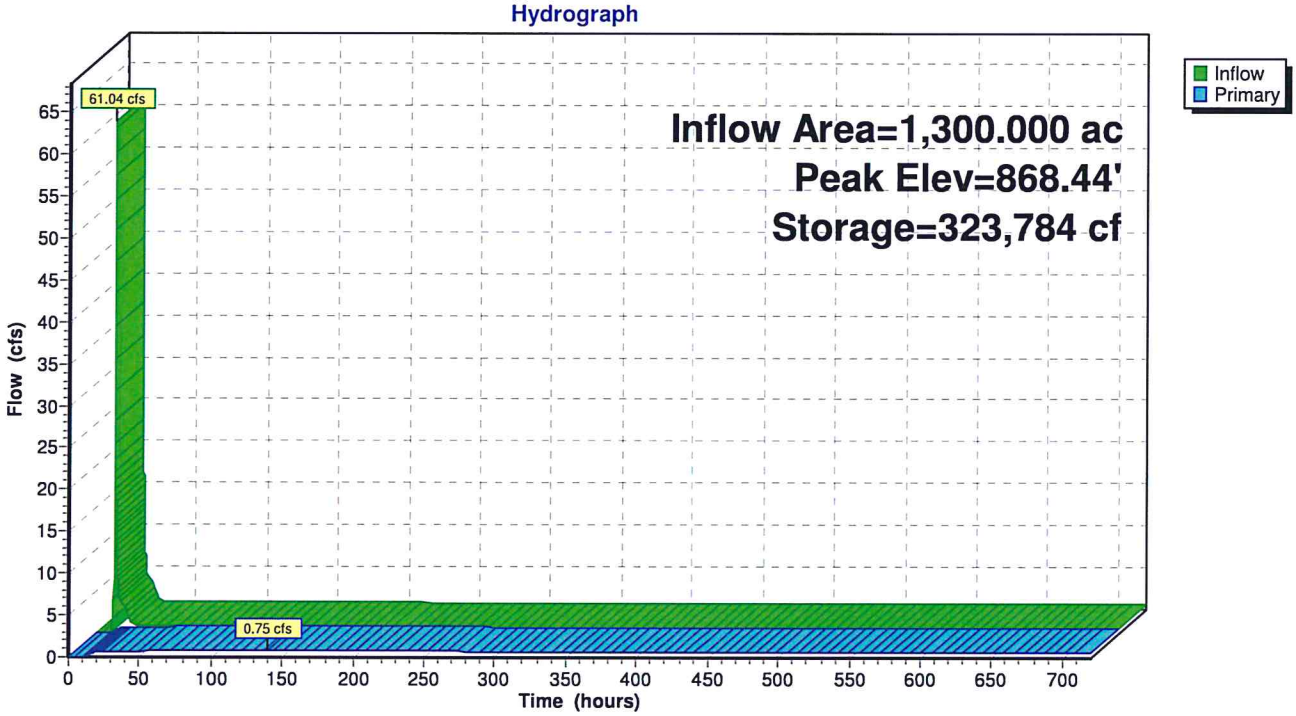
Volume	Invert	Avail.Storage	Storage Description
#1	868.07'	3,748,127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
868.07	874,883	0	0
870.00	979,381	1,789,365	1,789,365
872.00	979,381	1,958,762	3,748,127

Device	Routing	Invert	Outlet Devices
#1	Primary	868.07'	**2.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.75 cfs @ 139.63 hrs HW=868.44' TW=868.34' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.75 cfs @ 1.02 fps)

Pond G. Bog: Greenspire Bog



Summary for Pond H.C. Bog: Hampton Creek Bog

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth = 1.56" for 1% event
Inflow = 391.10 cfs @ 14.50 hrs, Volume= 162.523 af
Outflow = 0.76 cfs @ 28.93 hrs, Volume= 40.986 af, Atten= 100%, Lag= 866.0 min
Primary = 0.76 cfs @ 28.93 hrs, Volume= 40.986 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 873.95' @ 28.94 hrs Surf.Area= 4,671,840 sf Storage= 7,042,145 cf

Plug-Flow detention time= 20,619.0 min calculated for 40.983 af (25% of inflow)
Center-of-Mass det. time= 20,447.7 min (21,442.4 - 994.6)

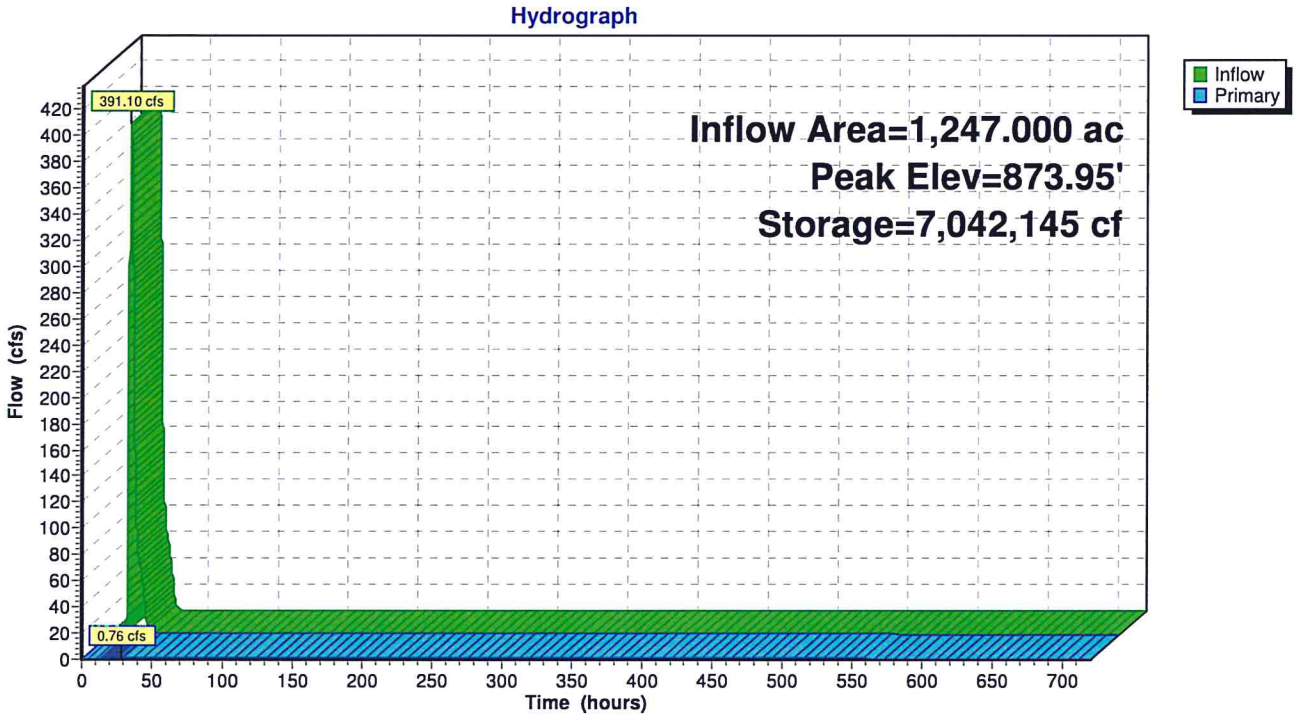
Volume	Invert	Avail.Storage	Storage Description
#1	872.44'	16,631,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
872.44	4,671,840	0	0
876.00	4,671,840	16,631,750	16,631,750

Device	Routing	Invert	Outlet Devices
#1	Primary	872.44'	**1.5" Vert. Orifice/Grate X 12.00** C= 0.600

Primary OutFlow Max=0.77 cfs @ 28.93 hrs HW=873.95' TW=872.78' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.77 cfs @ 5.19 fps)

Pond H.C. Bog: Hampton Creek Bog



Summary for Pond Limestone: Limestone Storage

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.38" for 1% event
Inflow = 0.75 cfs @ 139.67 hrs, Volume= 41.372 af
Outflow = 0.72 cfs @ 367.36 hrs, Volume= 33.827 af, Atten= 4%, Lag= 13,661.6 min
Primary = 0.32 cfs @ 367.36 hrs, Volume= 10.456 af
Secondary = 0.40 cfs @ 23.10 hrs, Volume= 23.370 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 866.28' @ 367.36 hrs Surf.Area= 8.517 ac Storage= 7.641 af

Plug-Flow detention time= 6,693.8 min calculated for 33.824 af (82% of inflow)
Center-of-Mass det. time= 2,798.8 min (24,408.8 - 21,610.0)

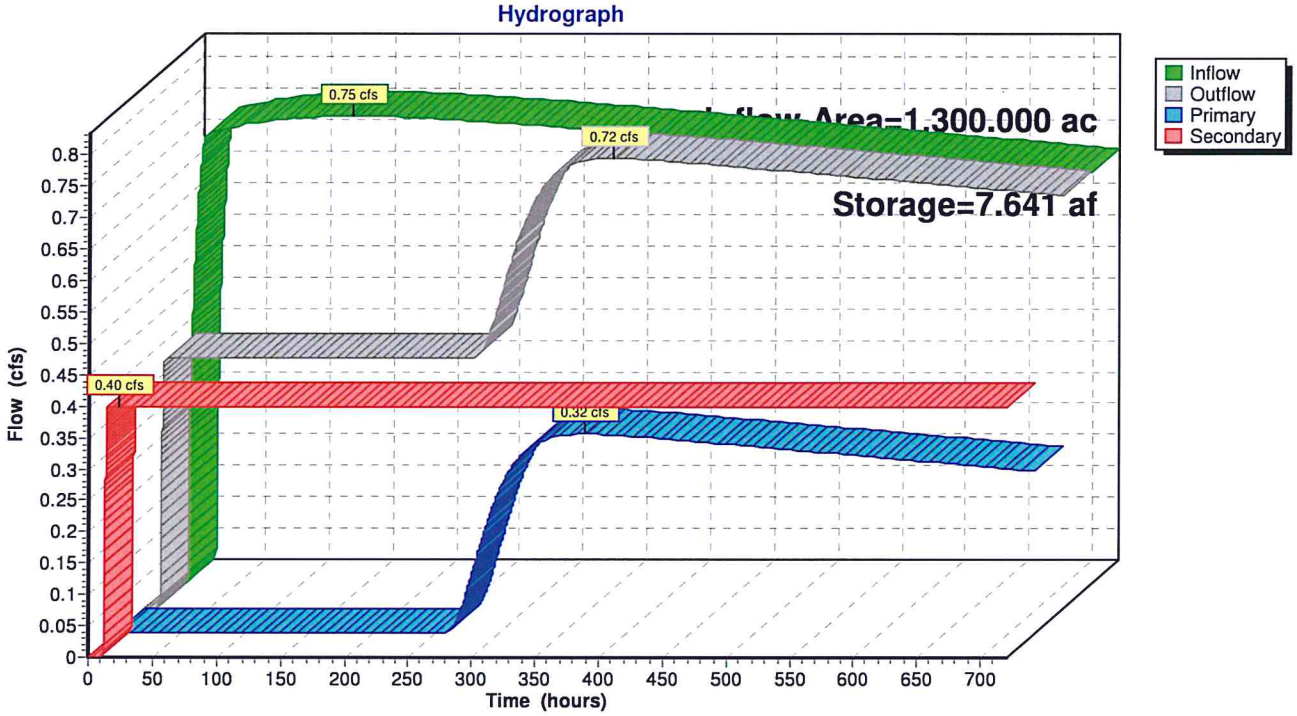
Volume	Invert	Avail.Storage	Storage Description
#1	864.00'	13.579 af	**600.00'W x 600.00'L x 4.00'H Prismatoid Z=2.0** 33.947 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Secondary	864.00'	**0.40 cfs Exfiltration at all elevations**
#2	Primary	866.00'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 367.36 hrs HW=866.28' TW=863.15' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.32 cfs @ 1.79 fps)

Secondary OutFlow Max=0.40 cfs @ 23.10 hrs HW=864.04' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Pond Limestone: Limestone Storage

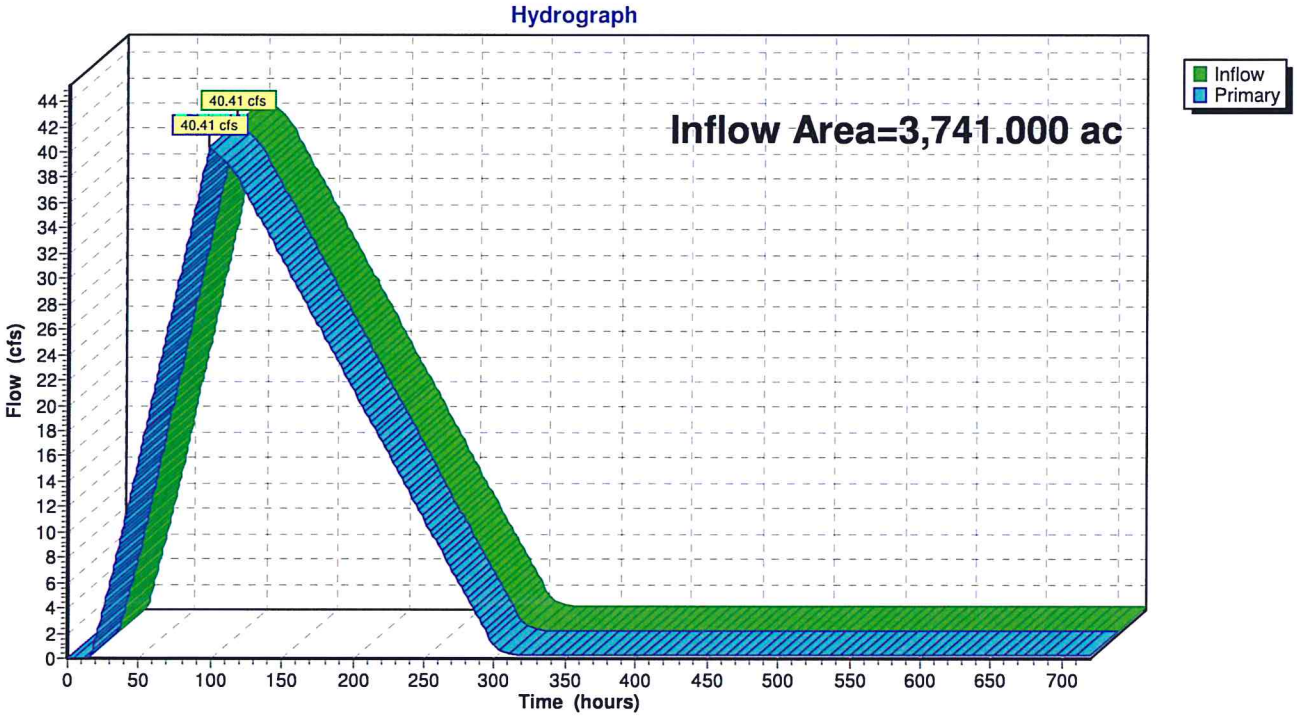


Summary for Link 1L: Portage Creek

Inflow Area = 3,741.000 ac, 0.00% Impervious, Inflow Depth > 1.61" for 1% event
Inflow = 40.41 cfs @ 97.79 hrs, Volume= 500.594 af
Primary = 40.41 cfs @ 97.79 hrs, Volume= 500.594 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 1L: Portage Creek

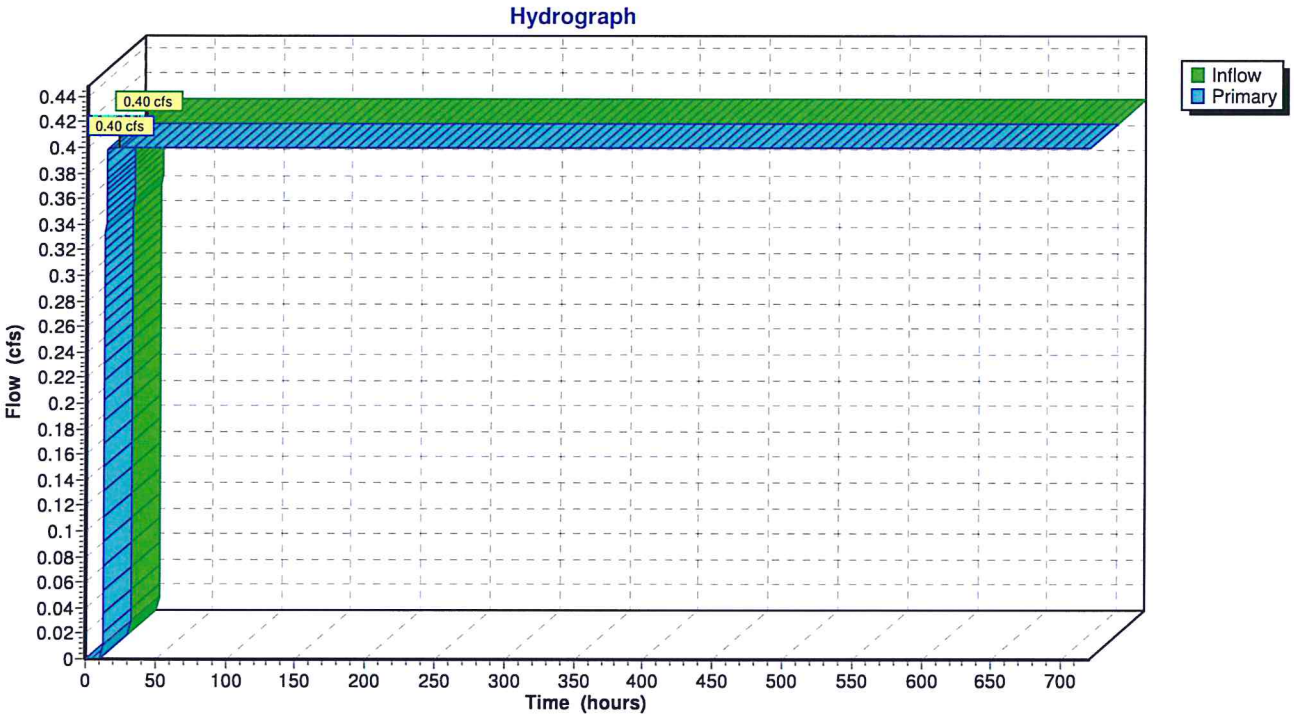


Summary for Link 3L: Groundwater

Inflow = 0.40 cfs @ 23.10 hrs, Volume= 23.370 af
Primary = 0.40 cfs @ 23.10 hrs, Volume= 23.370 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 3L: Groundwater



Time span=0.00-720.00 hrs, dt=0.05 hrs, 14401 points
Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 5S: Portage Creek Runoff Area=2,441.000 ac 0.00% Impervious Runoff Depth=0.85"
Tc=7,332.0 min CN=65 Runoff=14.21 cfs 173.671 af

Subcatchment G. Runoff: Greenspire Runoff Area=53.000 ac 0.00% Impervious Runoff Depth=0.45"
Tc=27.0 min CN=56 Runoff=12.33 cfs 1.987 af

Subcatchment H.C. Runoff: Hampton Runoff Area=1,247.000 ac 0.00% Impervious Runoff Depth=0.41"
Tc=151.8 min CN=55 Runoff=88.22 cfs 42.818 af

Reach 2R: Outfall Pipe to Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.013 L=30.0' S=0.0333 '/' Capacity=6.50 cfs Outflow=0.00 cfs 0.000 af

Reach 4R: Portage Creek Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=630.0' S=0.0095 '/' Capacity=85.13 cfs Outflow=0.00 cfs 0.000 af

Reach Ditch: Ditch Outlet to Avg. Flow Depth=0.14' Max Vel=0.41 fps Inflow=0.25 cfs 13.088 af
n=0.050 L=95.0' S=0.0028 '/' Capacity=68.30 cfs Outflow=0.25 cfs 13.087 af

Reach Greenspire Outlet Pipe: Outlet Avg. Flow Depth=0.23' Max Vel=1.26 fps Inflow=0.25 cfs 13.087 af
24.0" Round Pipe n=0.024 L=149.0' S=0.0054 '/' Capacity=8.98 cfs Outflow=0.25 cfs 13.087 af

Reach HC Outlet Pipe: Outlet Storm Avg. Flow Depth=0.22' Max Vel=1.61 fps Inflow=0.30 cfs 14.547 af
24.0" Round Pipe n=0.013 L=915.0' S=0.0028 '/' Capacity=11.92 cfs Outflow=0.30 cfs 14.544 af

Pond G. Bog: Greenspire Bog Peak Elev=868.26' Storage=165,464 cf Inflow=12.33 cfs 16.532 af
Outflow=0.25 cfs 13.088 af

Pond H.C. Bog: Hampton Creek Bog Peak Elev=872.84' Storage=1,852,148 cf Inflow=88.22 cfs 42.818 af
Outflow=0.30 cfs 14.547 af

Pond Limestone: Limestone Storage Peak Elev=864.00' Storage=0.000 af Inflow=0.25 cfs 13.087 af
Primary=0.00 cfs 0.000 af Secondary=0.25 cfs 13.087 af Outflow=0.25 cfs 13.087 af

Link 1L: Portage Creek Inflow=14.21 cfs 173.671 af
Primary=14.21 cfs 173.671 af

Link 3L: Groundwater Inflow=0.25 cfs 13.087 af
Primary=0.25 cfs 13.087 af

Total Runoff Area = 3,741.000 ac Runoff Volume = 218.476 af Average Runoff Depth = 0.70"
100.00% Pervious = 3,741.000 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 5S: Portage Creek

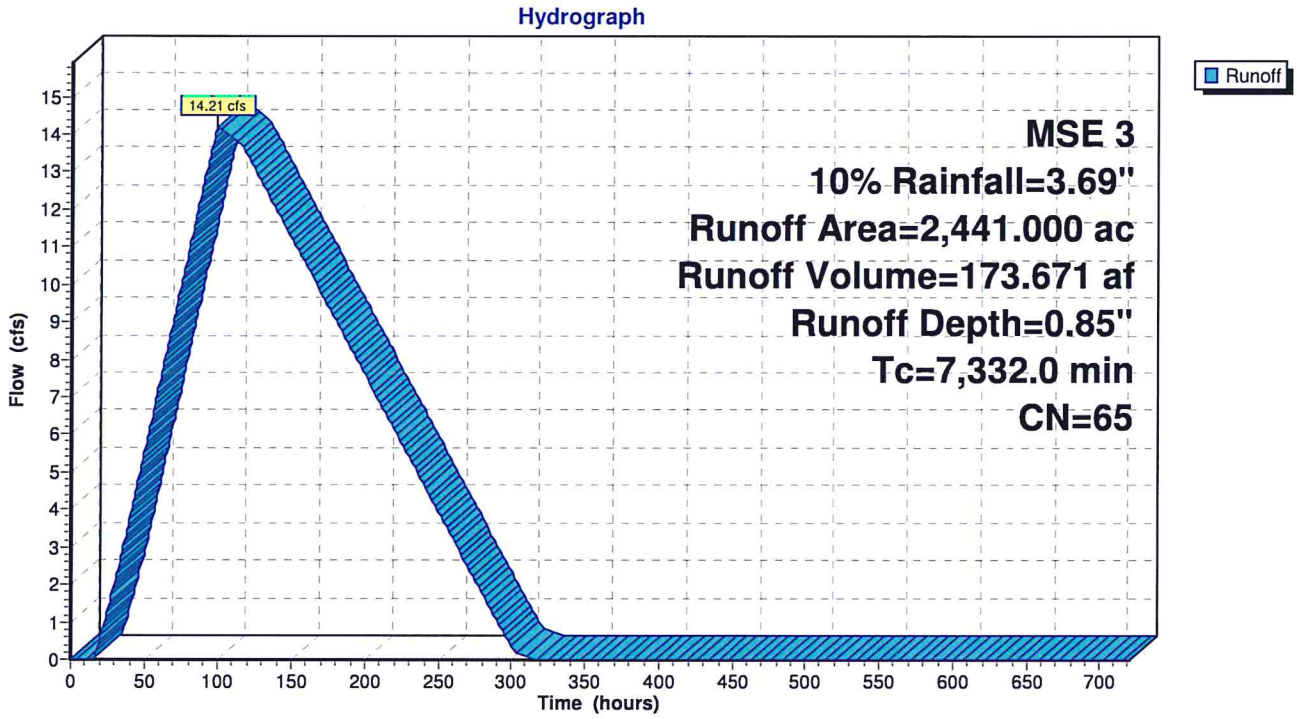
Runoff = 14.21 cfs @ 97.80 hrs, Volume= 173.671 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 10% Rainfall=3.69"

	Area (ac)	CN	Description
*	2,441.000	65	
	2,441.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7,332.0					**Direct Entry,**

Subcatchment 5S: Portage Creek



Summary for Subcatchment G. Runoff: Greenspire Runoff

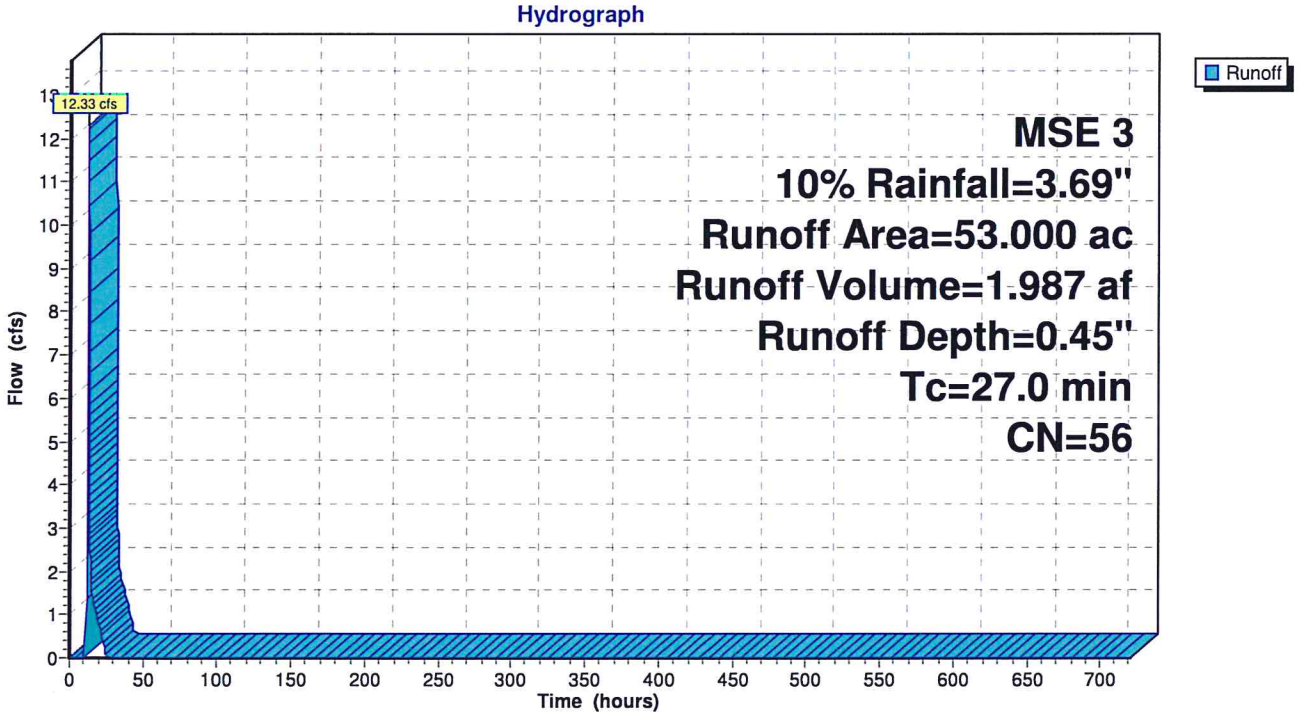
Runoff = 12.33 cfs @ 12.63 hrs, Volume= 1.987 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 10% Rainfall=3.69"

	Area (ac)	CN	Description
*	53.000	56	Combined CN - see spreadsheet
	53.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					**Direct Entry,**

Subcatchment G. Runoff: Greenspire Runoff



Summary for Subcatchment H.C. Runoff: Hampton Creek Bog Runoff

Calculations completed in spreadsheets.

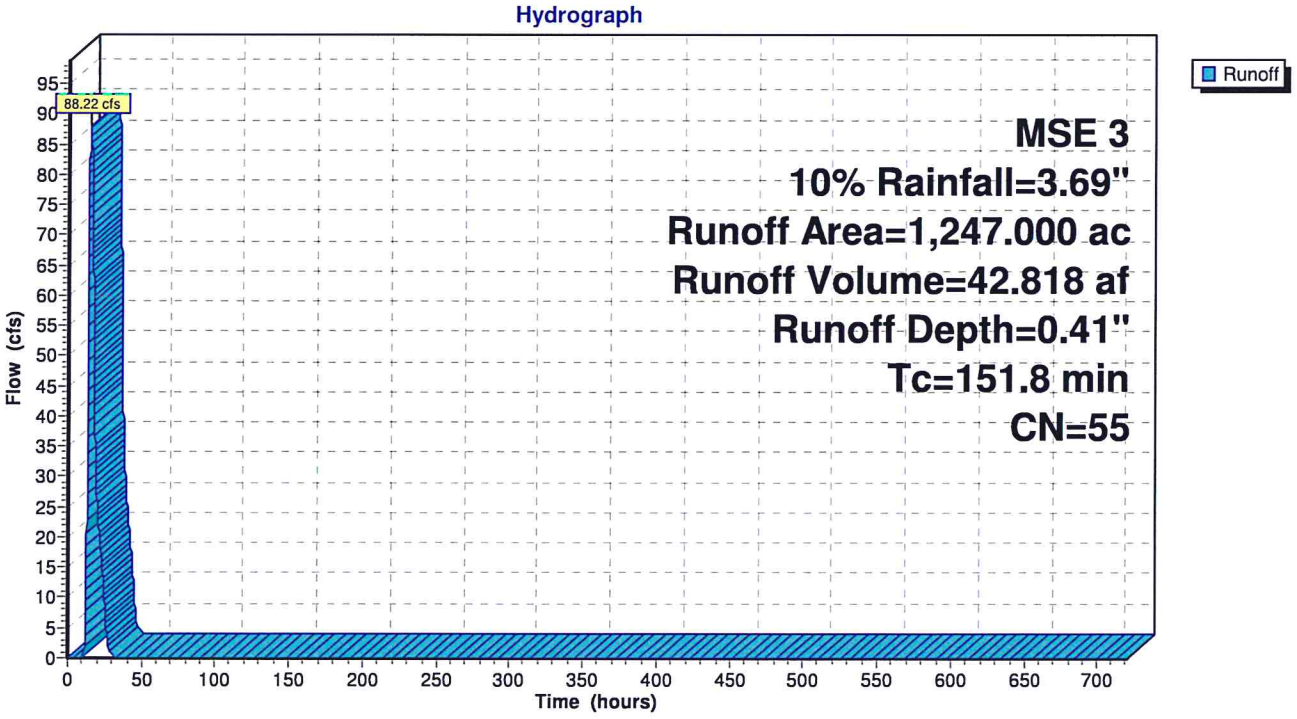
Runoff = 88.22 cfs @ 14.87 hrs, Volume= 42.818 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 10% Rainfall=3.69"

	Area (ac)	CN	Description
*	1,247.000	55	Total Area w/ Weighted CN
	1,247.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
151.8					**Direct Entry,**

Subcatchment H.C. Runoff: Hampton Creek Bog Runoff



Summary for Reach 2R: Outfall Pipe to Wetlands

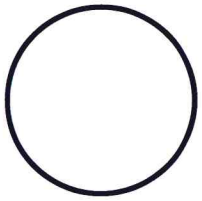
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10% event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

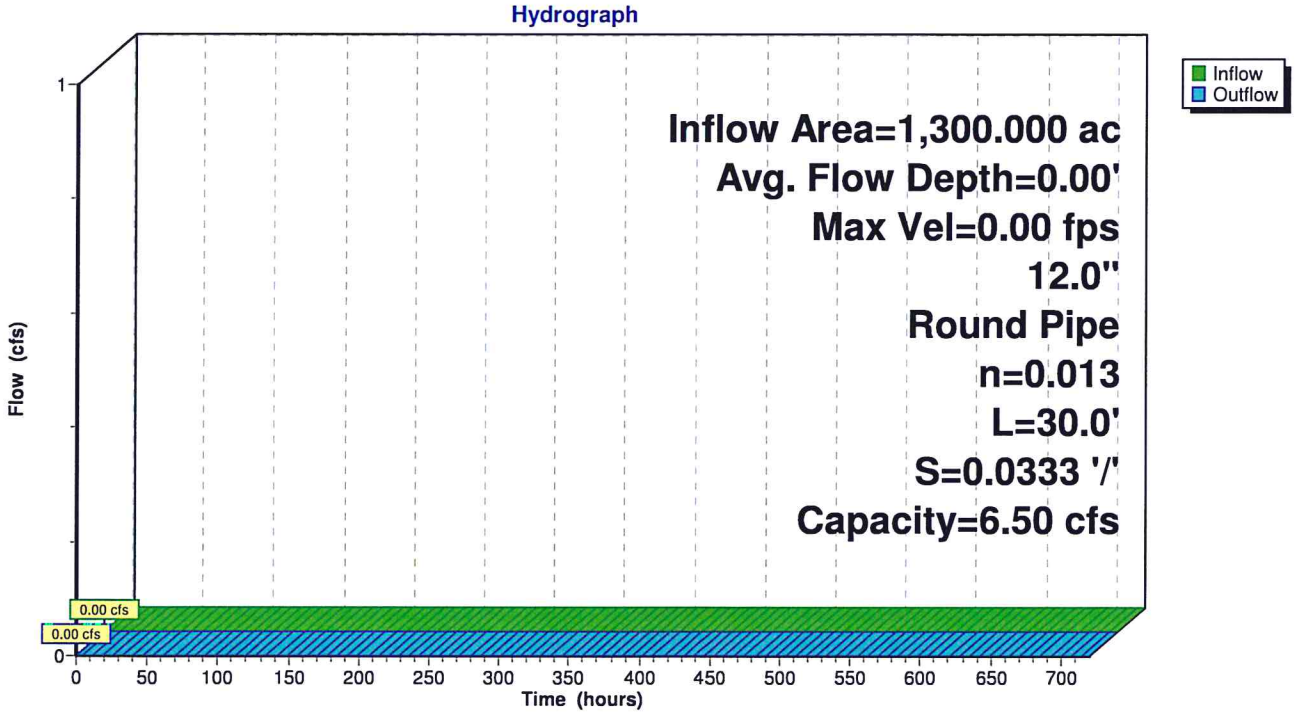
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.50 cfs

12.0" Round Pipe
n= 0.013
Length= 30.0' Slope= 0.0333 '/'
Inlet Invert= 863.00', Outlet Invert= 862.00'



Reach 2R: Outfall Pipe to Wetlands



Summary for Reach 4R: Portage Creek Wetlands

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10% event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

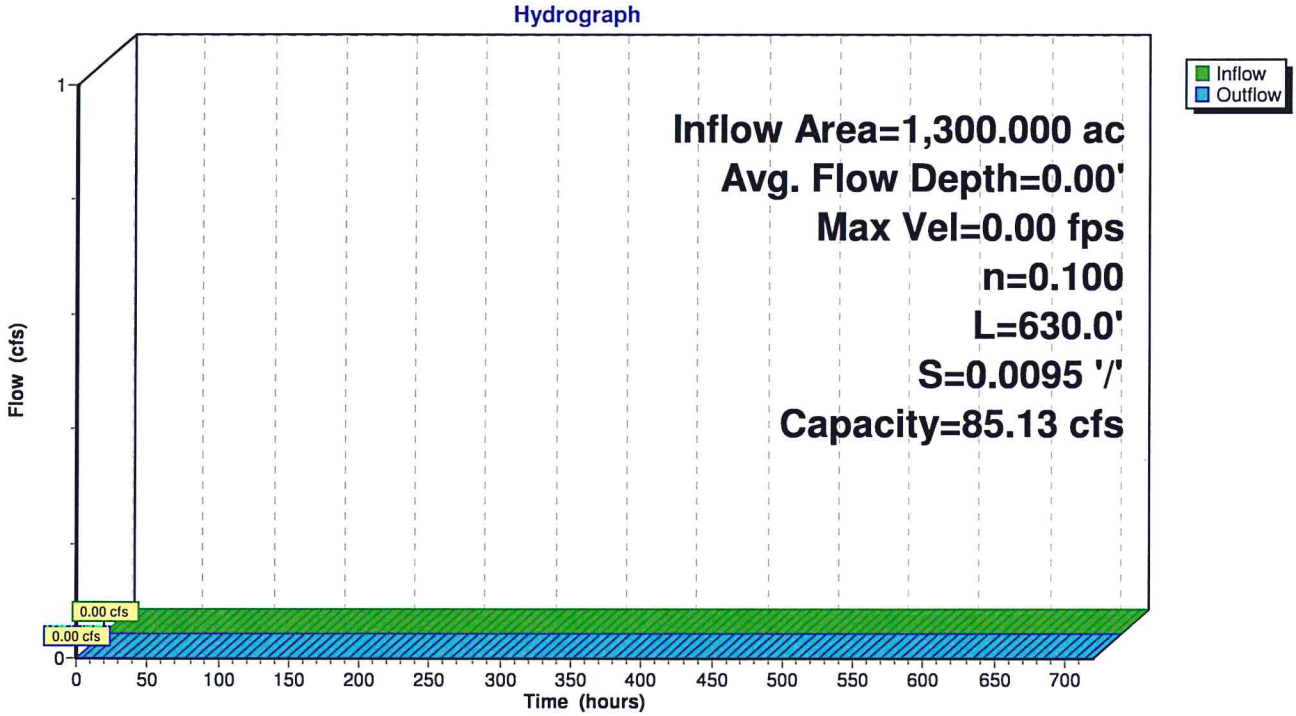
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 60.0 sf, Capacity= 85.13 cfs

60.00' x 1.00' deep channel, n= 0.100
Length= 630.0' Slope= 0.0095 '/'
Inlet Invert= 862.00', Outlet Invert= 856.00'



Reach 4R: Portage Creek Wetlands



Summary for Reach Ditch: Ditch Outlet to Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10% event
Inflow = 0.25 cfs @ 340.16 hrs, Volume= 13.088 af
Outflow = 0.25 cfs @ 340.20 hrs, Volume= 13.087 af, Atten= 0%, Lag= 2.5 min

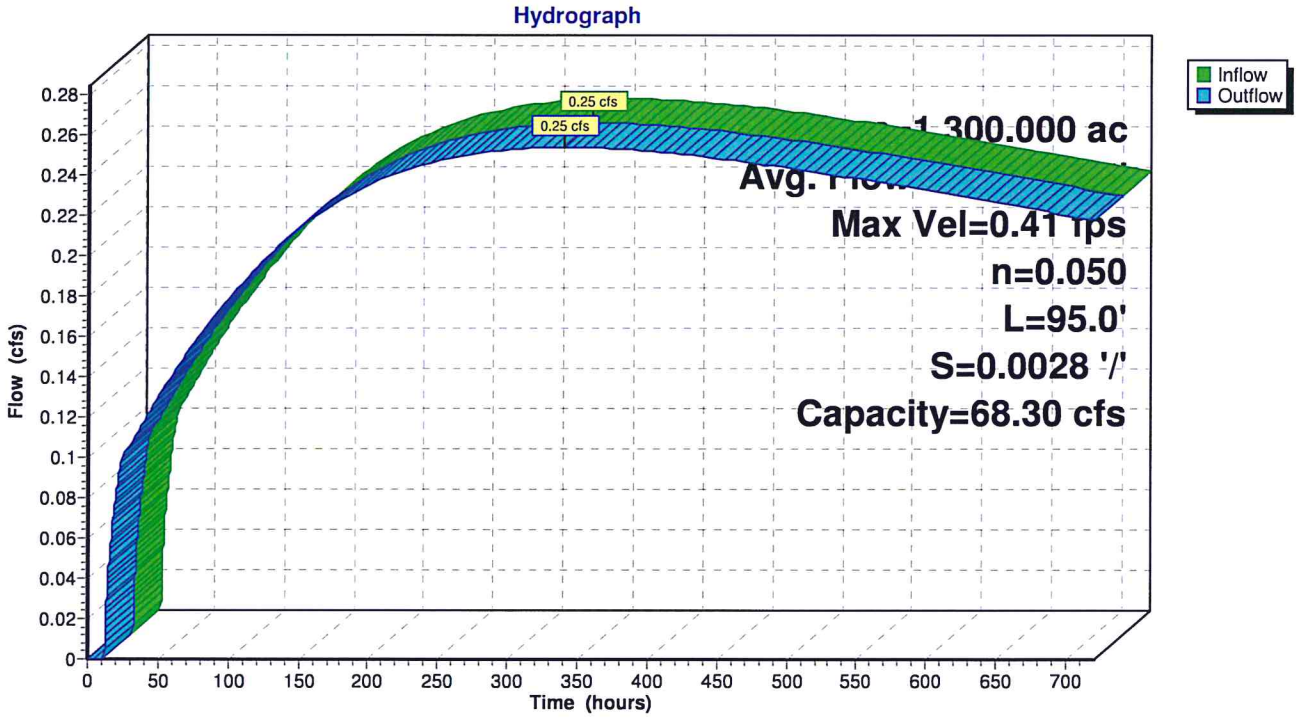
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 4.0 min

Peak Storage= 58 cf @ 340.20 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 68.30 cfs

4.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 95.0' Slope= 0.0028 '/'
Inlet Invert= 868.07', Outlet Invert= 867.80'



Reach Ditch: Ditch Outlet to Greenspire Bog



Summary for Reach Greenspire Outlet Pipe: Outlet to Infiltration

[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach Ditch OUTLET depth by 0.09' @ 340.30 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10% event
Inflow = 0.25 cfs @ 340.20 hrs, Volume= 13.087 af
Outflow = 0.25 cfs @ 340.22 hrs, Volume= 13.087 af, Atten= 0%, Lag= 1.4 min

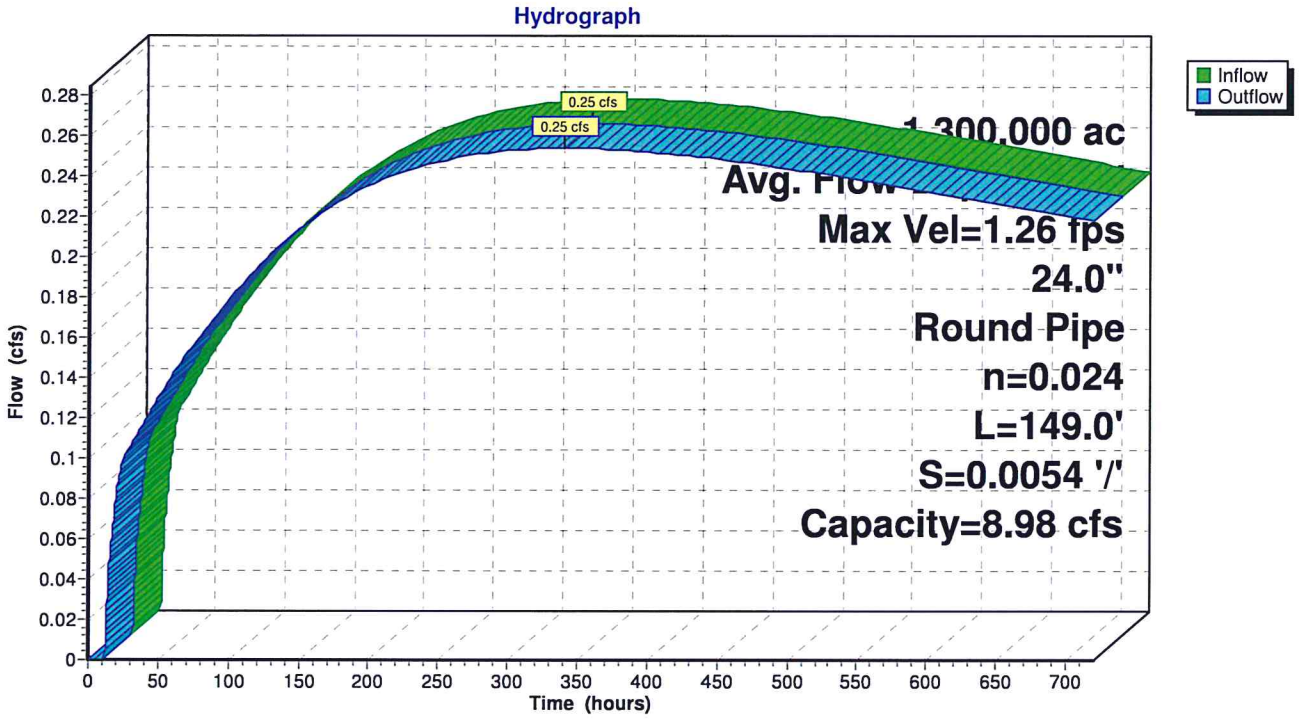
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 2.1 min

Peak Storage= 30 cf @ 340.22 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 8.98 cfs

24.0" Round Pipe
n= 0.024
Length= 149.0' Slope= 0.0054 '/'
Inlet Invert= 867.80', Outlet Invert= 867.00'



Reach Greenspire Outlet Pipe: Outlet to Infiltration



Summary for Reach HC Outlet Pipe: Outlet Storm Sewer

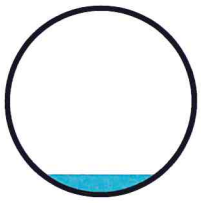
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth > 0.14" for 10% event
Inflow = 0.30 cfs @ 28.87 hrs, Volume= 14.547 af
Outflow = 0.30 cfs @ 29.00 hrs, Volume= 14.544 af, Atten= 0%, Lag= 7.7 min

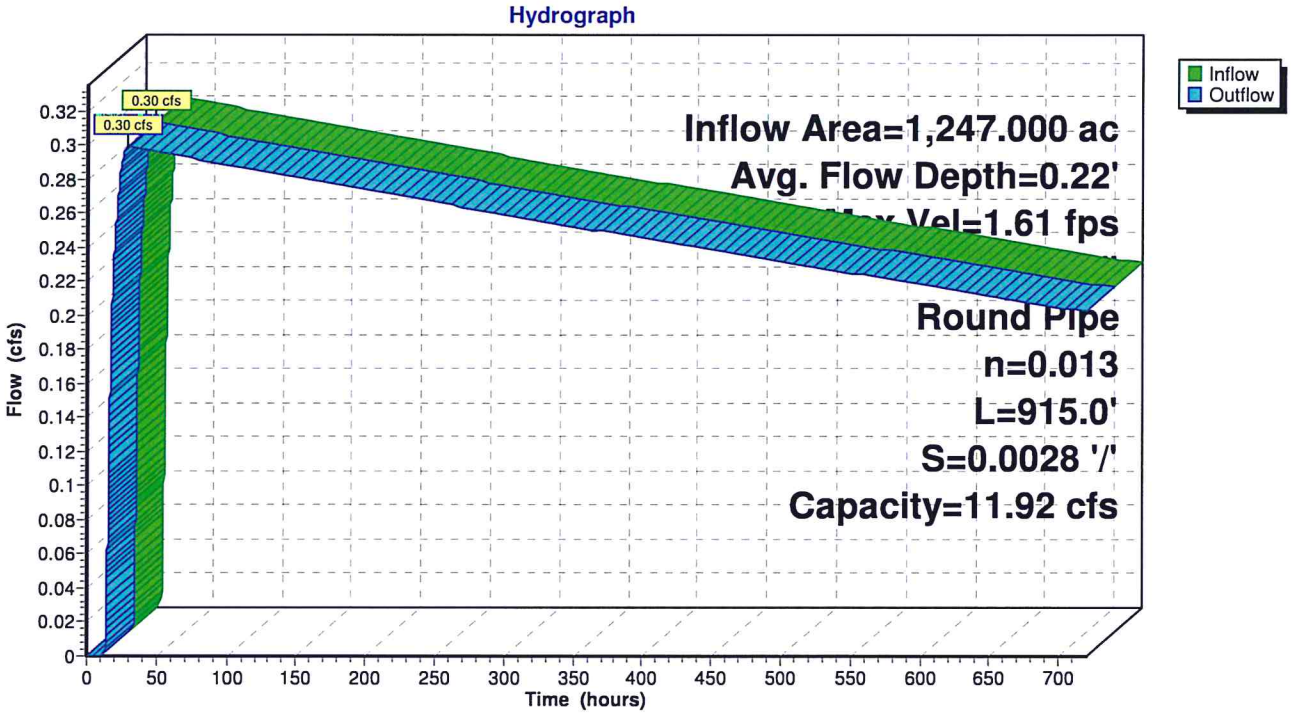
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 9.5 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 10.0 min

Peak Storage= 170 cf @ 29.00 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 11.92 cfs

24.0" Round Pipe
n= 0.013
Length= 915.0' Slope= 0.0028 '/'
Inlet Invert= 872.44', Outlet Invert= 869.90'



Reach HC Outlet Pipe: Outlet Storm Sewer



Summary for Pond G. Bog: Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.15" for 10% event
Inflow = 12.33 cfs @ 12.63 hrs, Volume= 16.532 af
Outflow = 0.25 cfs @ 340.16 hrs, Volume= 13.088 af, Atten= 98%, Lag= 19,651.6 min
Primary = 0.25 cfs @ 340.16 hrs, Volume= 13.088 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 868.26' @ 340.20 hrs Surf.Area= 885,064 sf Storage= 165,464 cf

Plug-Flow detention time= 9,756.4 min calculated for 13.088 af (79% of inflow)
Center-of-Mass det. time= 4,778.7 min (23,135.2 - 18,356.5)

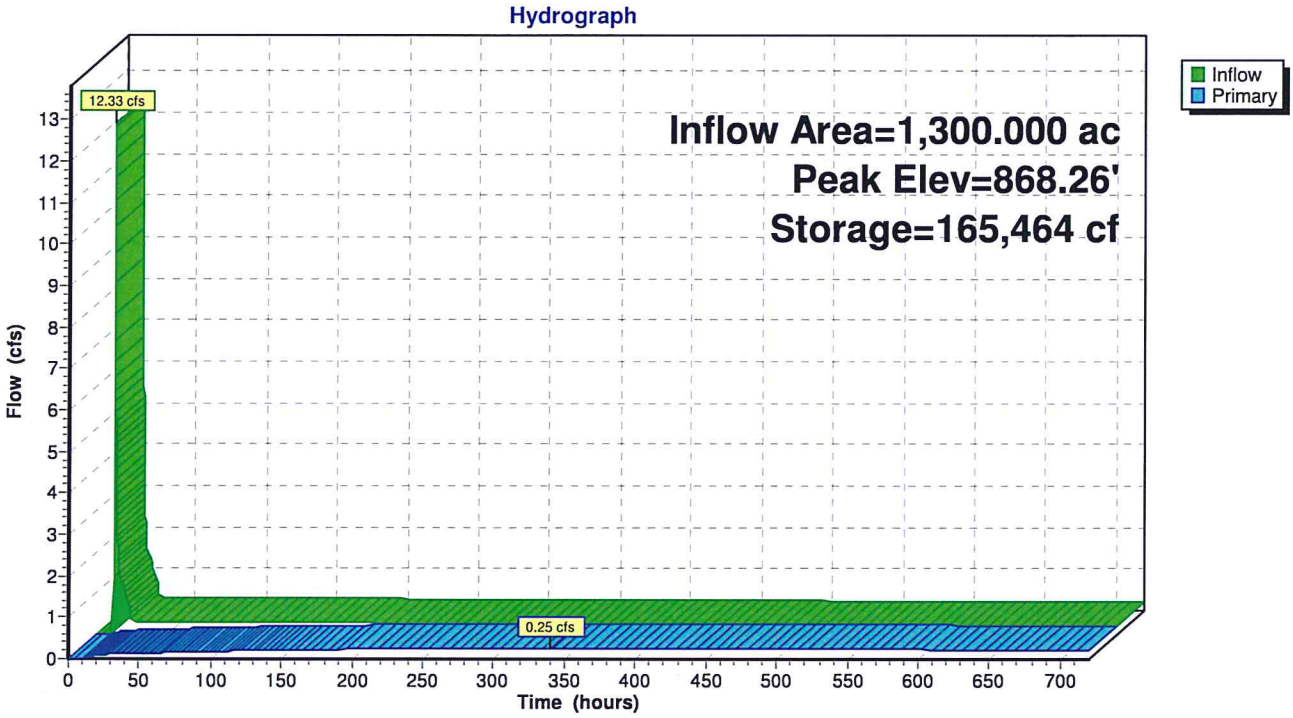
Volume	Invert	Avail.Storage	Storage Description
#1	868.07'	3,748,127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
868.07	874,883	0	0
870.00	979,381	1,789,365	1,789,365
872.00	979,381	1,958,762	3,748,127

Device	Routing	Invert	Outlet Devices
#1	Primary	868.07'	**2.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.25 cfs @ 340.16 hrs HW=868.26' TW=868.21' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.67 fps)

Pond G. Bog: Greenspire Bog



Summary for Pond H.C. Bog: Hampton Creek Bog

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth = 0.41" for 10% event
Inflow = 88.22 cfs @ 14.87 hrs, Volume= 42.818 af
Outflow = 0.30 cfs @ 28.87 hrs, Volume= 14.547 af, Atten= 100%, Lag= 840.3 min
Primary = 0.30 cfs @ 28.87 hrs, Volume= 14.547 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 872.84' @ 28.92 hrs Surf.Area= 4,671,840 sf Storage= 1,852,148 cf

Plug-Flow detention time= 19,877.3 min calculated for 14.546 af (34% of inflow)
Center-of-Mass det. time= 19,700.1 min (20,736.3 - 1,036.2)

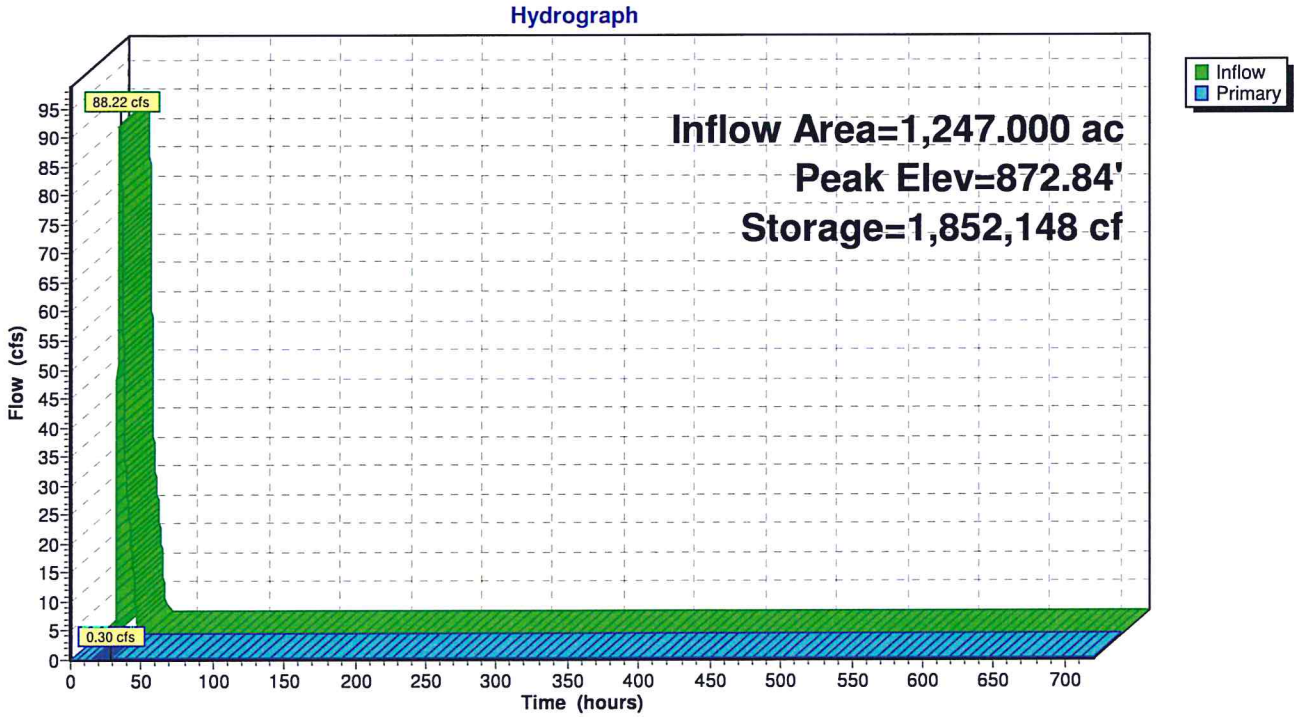
Volume	Invert	Avail.Storage	Storage Description
#1	872.44'	16,631,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
872.44	4,671,840	0	0
876.00	4,671,840	16,631,750	16,631,750

Device	Routing	Invert	Outlet Devices
#1	Primary	872.44'	**1.5" Vert. Orifice/Grate X 12.00** C= 0.600

Primary OutFlow Max=0.30 cfs @ 28.87 hrs HW=872.84' TW=872.66' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.30 cfs @ 2.03 fps)

Pond H.C. Bog: Hampton Creek Bog



Summary for Pond Limestone: Limestone Storage

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10% event
Inflow = 0.25 cfs @ 340.22 hrs, Volume= 13.087 af
Outflow = 0.25 cfs @ 340.24 hrs, Volume= 13.087 af, Atten= 0%, Lag= 1.3 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.25 cfs @ 340.24 hrs, Volume= 13.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 864.00' @ 334.60 hrs Surf.Area= 8.264 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (23,138.4 - 23,138.4)

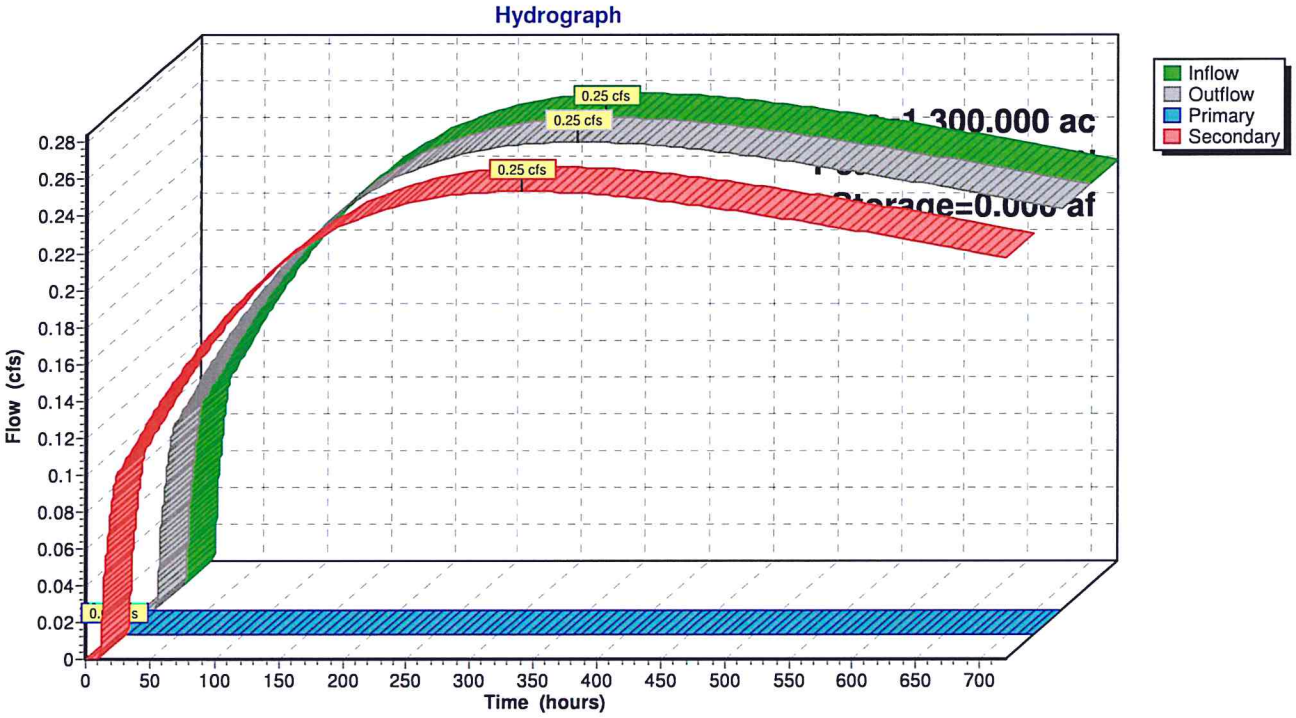
Volume	Invert	Avail.Storage	Storage Description
#1	864.00'	13.579 af	**600.00'W x 600.00'L x 4.00'H Prismatoid Z=2.0** 33.947 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Secondary	864.00'	**0.40 cfs Exfiltration at all elevations**
#2	Primary	866.00'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=864.00' TW=863.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.40 cfs @ 340.24 hrs HW=864.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Pond Limestone: Limestone Storage

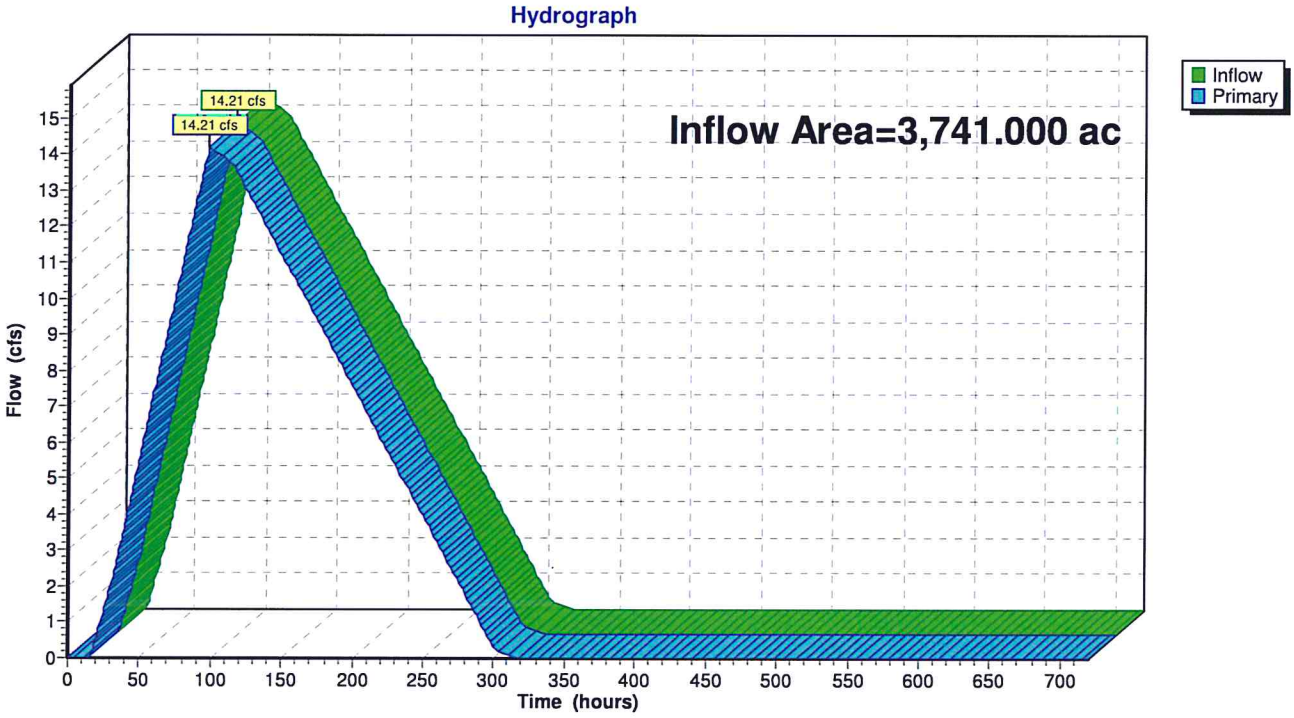


Summary for Link 1L: Portage Creek

Inflow Area = 3,741.000 ac, 0.00% Impervious, Inflow Depth = 0.56" for 10% event
Inflow = 14.21 cfs @ 97.80 hrs, Volume= 173.671 af
Primary = 14.21 cfs @ 97.80 hrs, Volume= 173.671 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 1L: Portage Creek

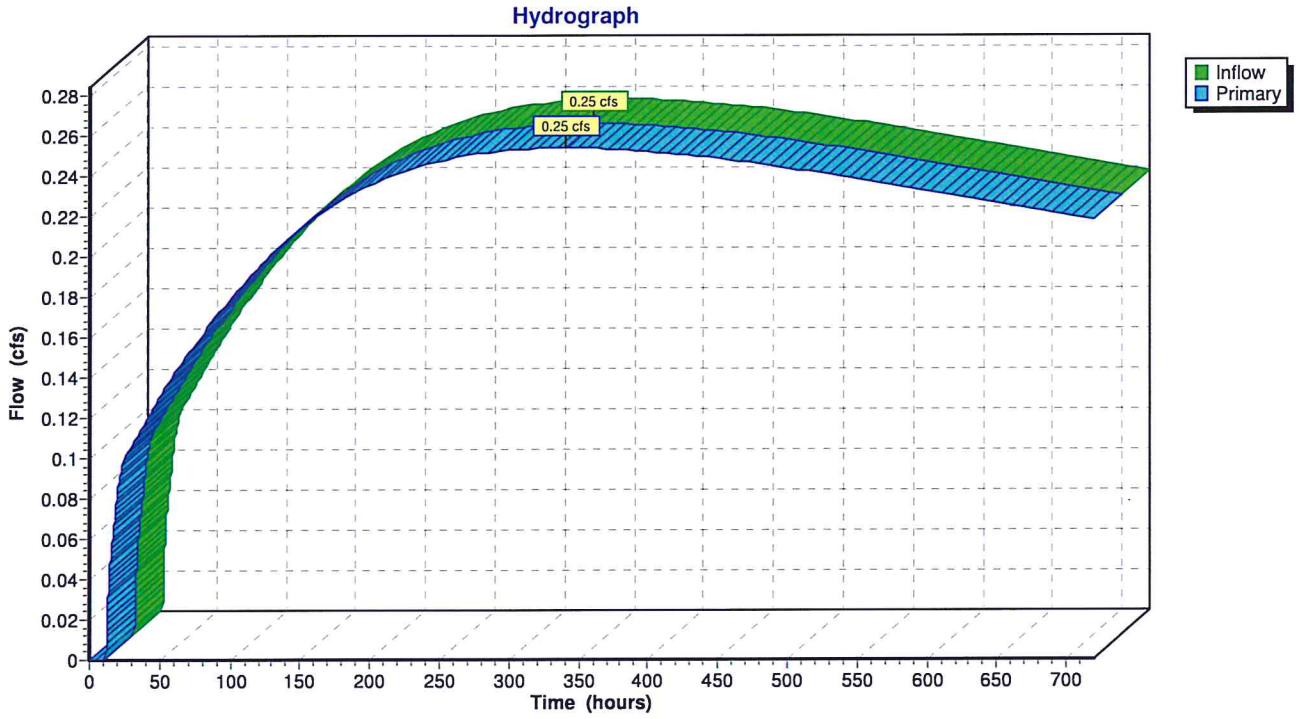


Summary for Link 3L: Groundwater

Inflow = 0.25 cfs @ 340.24 hrs, Volume= 13.087 af
Primary = 0.25 cfs @ 340.24 hrs, Volume= 13.087 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 3L: Groundwater



Time span=0.00-720.00 hrs, dt=0.05 hrs, 14401 points
Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 5S: Portage Creek Runoff Area=2,441.000 ac 0.00% Impervious Runoff Depth=0.34"
Tc=7,332.0 min CN=65 Runoff=5.53 cfs 68.312 af

Subcatchment G. Runoff: Greenspire Runoff Area=53.000 ac 0.00% Impervious Runoff Depth=0.12"
Tc=27.0 min CN=56 Runoff=1.86 cfs 0.526 af

Subcatchment H.C. Runoff: Hampton Runoff Area=1,247.000 ac 0.00% Impervious Runoff Depth=0.10"
Tc=151.8 min CN=55 Runoff=17.48 cfs 10.551 af

Reach 2R: Outfall Pipe to Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.013 L=30.0' S=0.0333 '/' Capacity=6.50 cfs Outflow=0.00 cfs 0.000 af

Reach 4R: Portage Creek Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=630.0' S=0.0095 '/' Capacity=85.13 cfs Outflow=0.00 cfs 0.000 af

Reach Ditch: Ditch Outlet to Greenspire Avg. Flow Depth=0.04' Max Vel=0.20 fps Inflow=0.03 cfs 1.713 af
n=0.050 L=95.0' S=0.0028 '/' Capacity=68.30 cfs Outflow=0.03 cfs 1.712 af

Reach Greenspire Outlet Pipe: Outlet to Avg. Flow Depth=0.09' Max Vel=0.69 fps Inflow=0.03 cfs 1.712 af
24.0" Round Pipe n=0.024 L=149.0' S=0.0054 '/' Capacity=8.98 cfs Outflow=0.03 cfs 1.712 af

Reach HC Outlet Pipe: Outlet Storm Avg. Flow Depth=0.09' Max Vel=0.93 fps Inflow=0.05 cfs 2.206 af
24.0" Round Pipe n=0.013 L=915.0' S=0.0028 '/' Capacity=11.92 cfs Outflow=0.05 cfs 2.205 af

Pond G. Bog: Greenspire Bog Peak Elev=868.12' Storage=45,585 cf Inflow=1.86 cfs 2.731 af
Outflow=0.03 cfs 1.713 af

Pond H.C. Bog: Hampton Creek Bog Peak Elev=872.54' Storage=457,966 cf Inflow=17.48 cfs 10.551 af
Outflow=0.05 cfs 2.206 af

Pond Limestone: Limestone Storage Peak Elev=864.00' Storage=0.000 af Inflow=0.03 cfs 1.712 af
Primary=0.00 cfs 0.000 af Secondary=0.03 cfs 1.712 af Outflow=0.03 cfs 1.712 af

Link 1L: Portage Creek Inflow=5.53 cfs 68.312 af
Primary=5.53 cfs 68.312 af

Link 3L: Groundwater Inflow=0.03 cfs 1.712 af
Primary=0.03 cfs 1.712 af

Total Runoff Area = 3,741.000 ac Runoff Volume = 79.389 af Average Runoff Depth = 0.25"
100.00% Pervious = 3,741.000 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 5S: Portage Creek

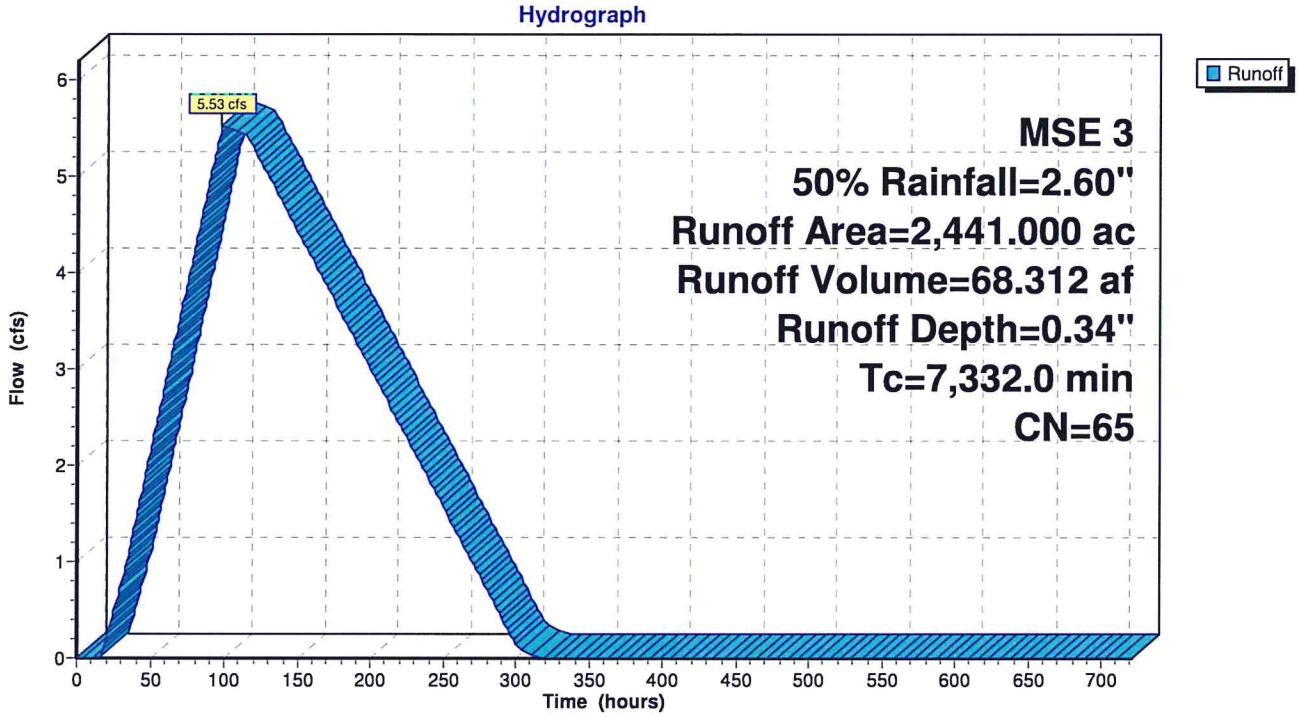
Runoff = 5.53 cfs @ 97.81 hrs, Volume= 68.312 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 50% Rainfall=2.60"

	Area (ac)	CN	Description
*	2,441.000	65	
	2,441.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7,332.0					**Direct Entry,**

Subcatchment 5S: Portage Creek



Summary for Subcatchment G. Runoff: Greenspire Runoff

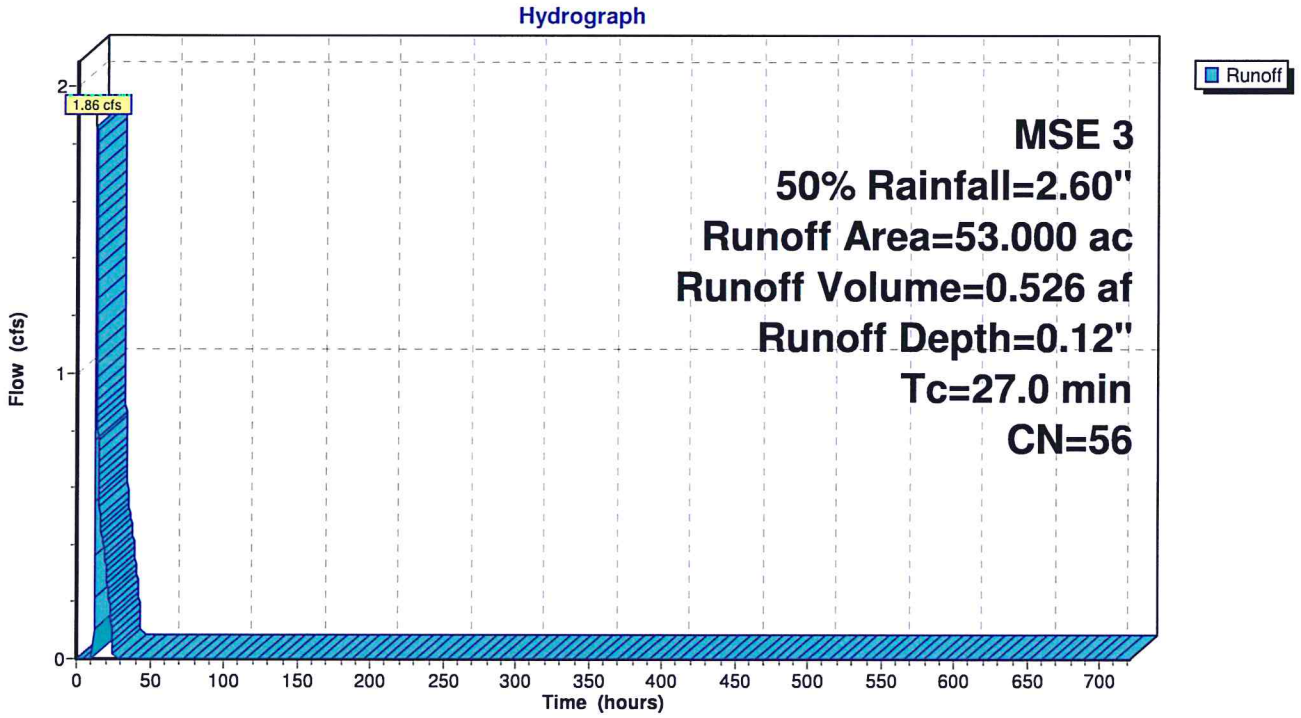
Runoff = 1.86 cfs @ 12.99 hrs, Volume= 0.526 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 50% Rainfall=2.60"

	Area (ac)	CN	Description
*	53.000	56	Combined CN - see spreadsheet
	53.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					**Direct Entry,**

Subcatchment G. Runoff: Greenspire Runoff



Summary for Subcatchment H.C. Runoff: Hampton Creek Bog Runoff

Calculations completed in spreadsheets.

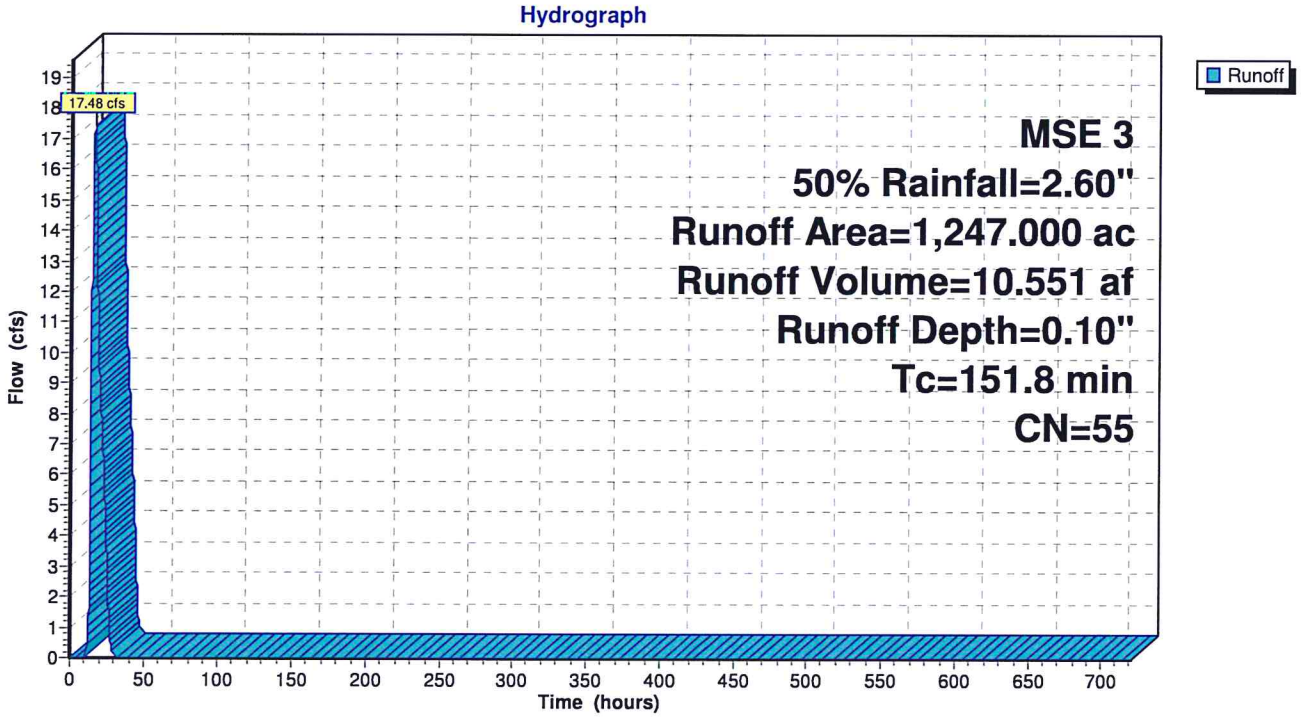
Runoff = 17.48 cfs @ 15.90 hrs, Volume= 10.551 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 50% Rainfall=2.60"

	Area (ac)	CN	Description
*	1,247.000	55	Total Area w/ Weighted CN
	1,247.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
151.8					**Direct Entry,**

Subcatchment H.C. Runoff: Hampton Creek Bog Runoff



Summary for Reach 2R: Outfall Pipe to Wetlands

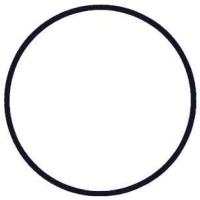
[52] Hint: Inlet/Outlet conditions not evaluated

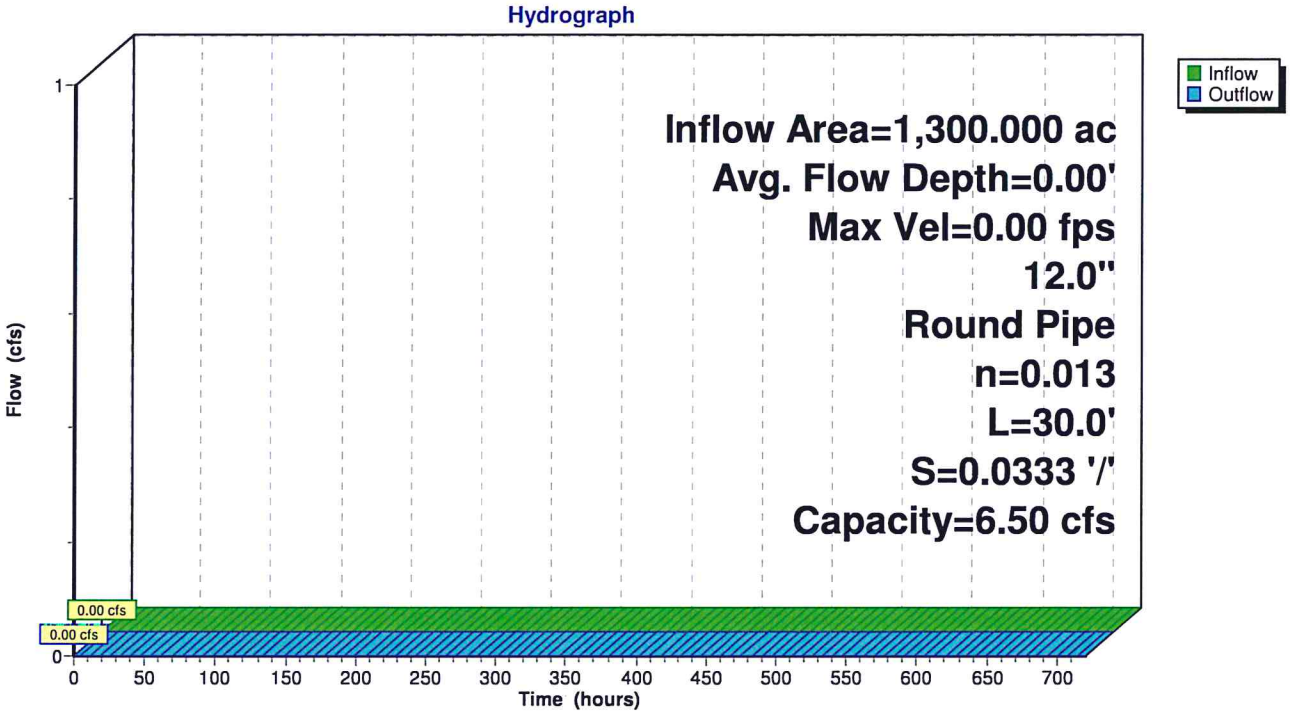
Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth = 0.00" for 50% event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.50 cfs

12.0" Round Pipe
n= 0.013
Length= 30.0' Slope= 0.0333 '/'
Inlet Invert= 863.00', Outlet Invert= 862.00'





Summary for Reach 4R: Portage Creek Wetlands

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth = 0.00" for 50% event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

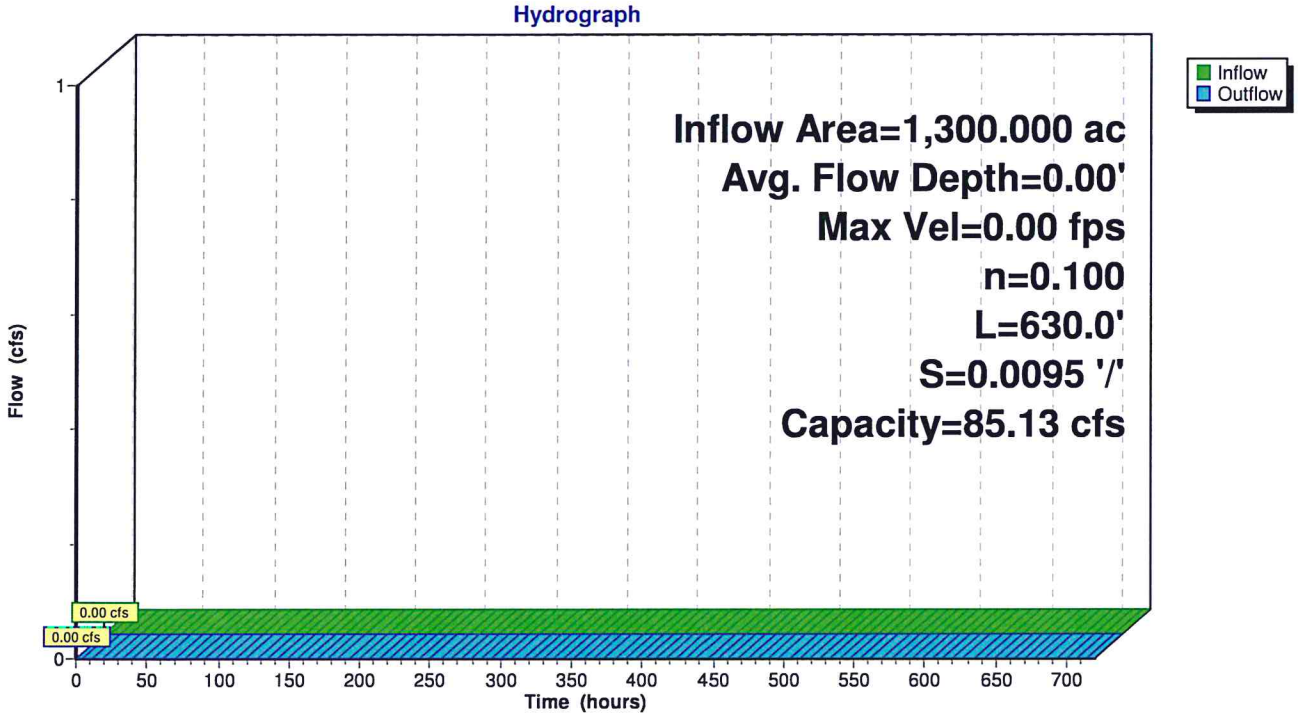
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 60.0 sf, Capacity= 85.13 cfs

60.00' x 1.00' deep channel, n= 0.100
Length= 630.0' Slope= 0.0095 '/'
Inlet Invert= 862.00', Outlet Invert= 856.00'



Reach 4R: Portage Creek Wetlands



Summary for Reach Ditch: Ditch Outlet to Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.02" for 50% event
Inflow = 0.03 cfs @ 501.44 hrs, Volume= 1.713 af
Outflow = 0.03 cfs @ 501.52 hrs, Volume= 1.712 af, Atten= 0%, Lag= 4.9 min

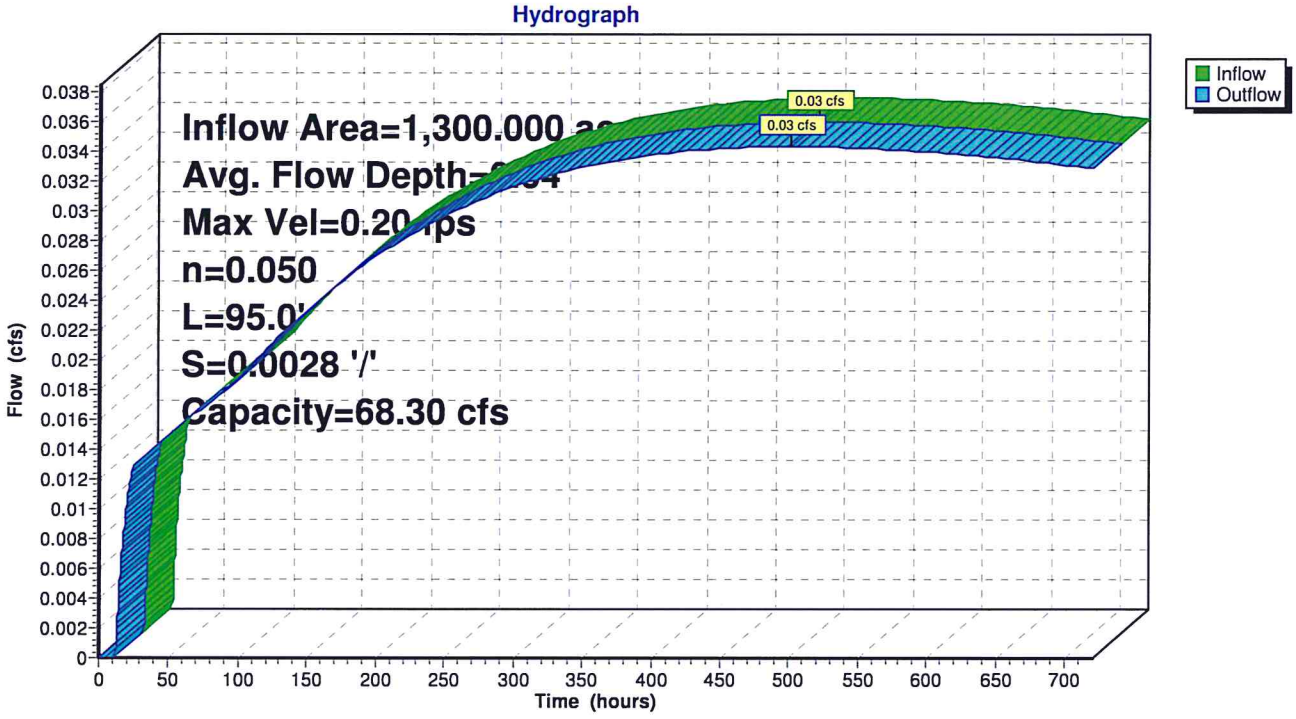
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.20 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.19 fps, Avg. Travel Time= 8.5 min

Peak Storage= 16 cf @ 501.52 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 68.30 cfs

4.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 95.0' Slope= 0.0028 '/'
Inlet Invert= 868.07', Outlet Invert= 867.80'



Reach Ditch: Ditch Outlet to Greenspire Bog



Summary for Reach Greenspire Outlet Pipe: Outlet to Infiltration

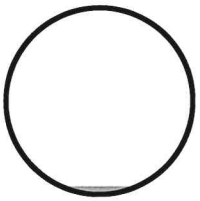
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach Ditch OUTLET depth by 0.05' @ 501.65 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.02" for 50% event
Inflow = 0.03 cfs @ 501.52 hrs, Volume= 1.712 af
Outflow = 0.03 cfs @ 501.56 hrs, Volume= 1.712 af, Atten= 0%, Lag= 2.5 min

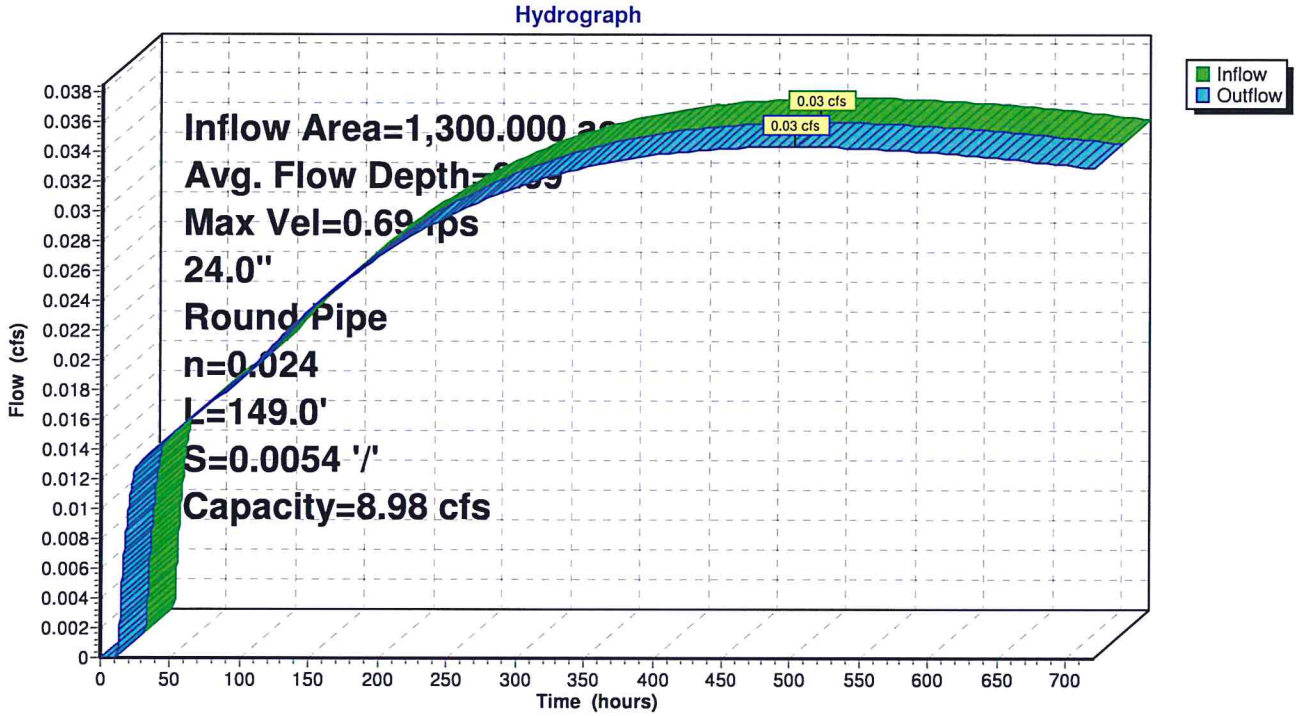
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.69 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 3.8 min

Peak Storage= 7 cf @ 501.56 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 8.98 cfs

24.0" Round Pipe
n= 0.024
Length= 149.0' Slope= 0.0054 '/'
Inlet Invert= 867.80', Outlet Invert= 867.00'



Reach Greenspire Outlet Pipe: Outlet to Infiltration



Summary for Reach HC Outlet Pipe: Outlet Storm Sewer

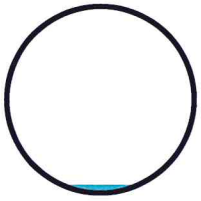
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth > 0.02" for 50% event
Inflow = 0.05 cfs @ 29.07 hrs, Volume= 2.206 af
Outflow = 0.05 cfs @ 29.32 hrs, Volume= 2.205 af, Atten= 0%, Lag= 14.9 min

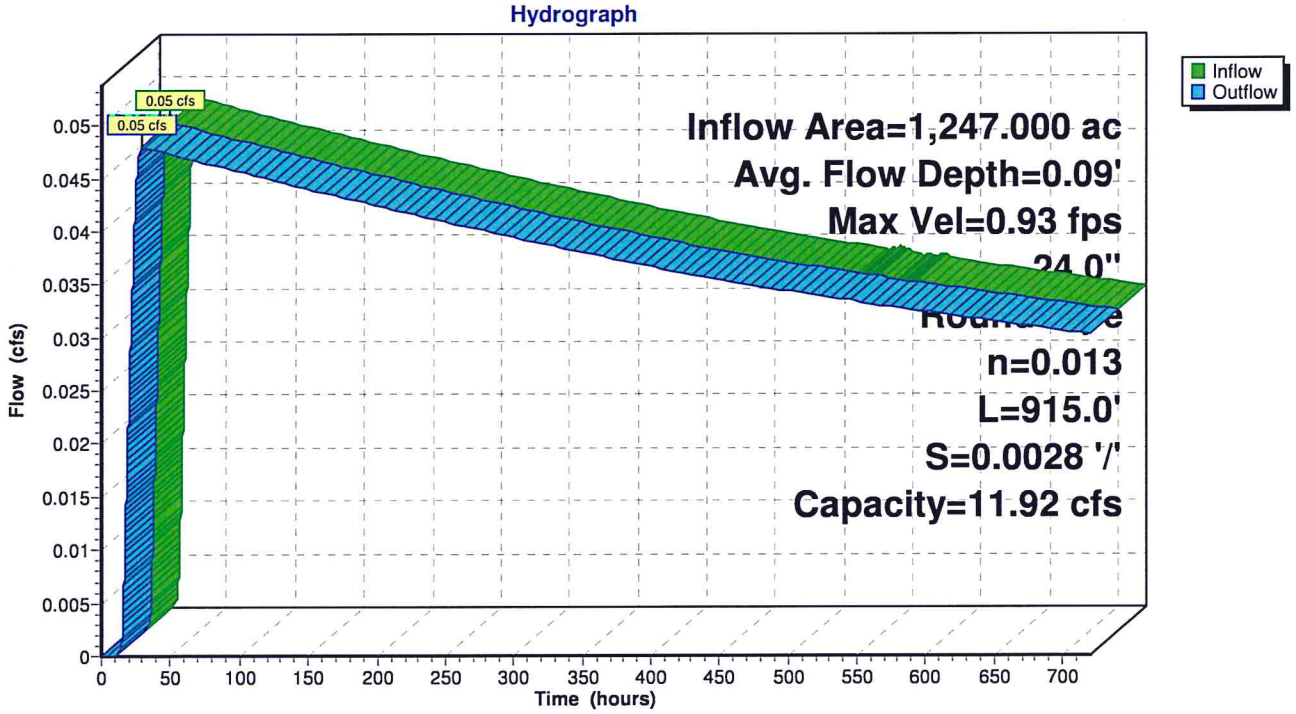
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.93 fps, Min. Travel Time= 16.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 17.7 min

Peak Storage= 47 cf @ 29.32 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 11.92 cfs

24.0" Round Pipe
n= 0.013
Length= 915.0' Slope= 0.0028 '/'
Inlet Invert= 872.44', Outlet Invert= 869.90'



Reach HC Outlet Pipe: Outlet Storm Sewer



Summary for Pond G. Bog: Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.03" for 50% event
Inflow = 1.86 cfs @ 12.99 hrs, Volume= 2.731 af
Outflow = 0.03 cfs @ 501.44 hrs, Volume= 1.713 af, Atten= 98%, Lag= 29,306.6 min
Primary = 0.03 cfs @ 501.44 hrs, Volume= 1.713 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 868.12' @ 501.50 hrs Surf.Area= 877,700 sf Storage= 45,585 cf

Plug-Flow detention time= 16,510.6 min calculated for 1.713 af (63% of inflow)
Center-of-Mass det. time= 7,549.0 min (24,323.4 - 16,774.3)

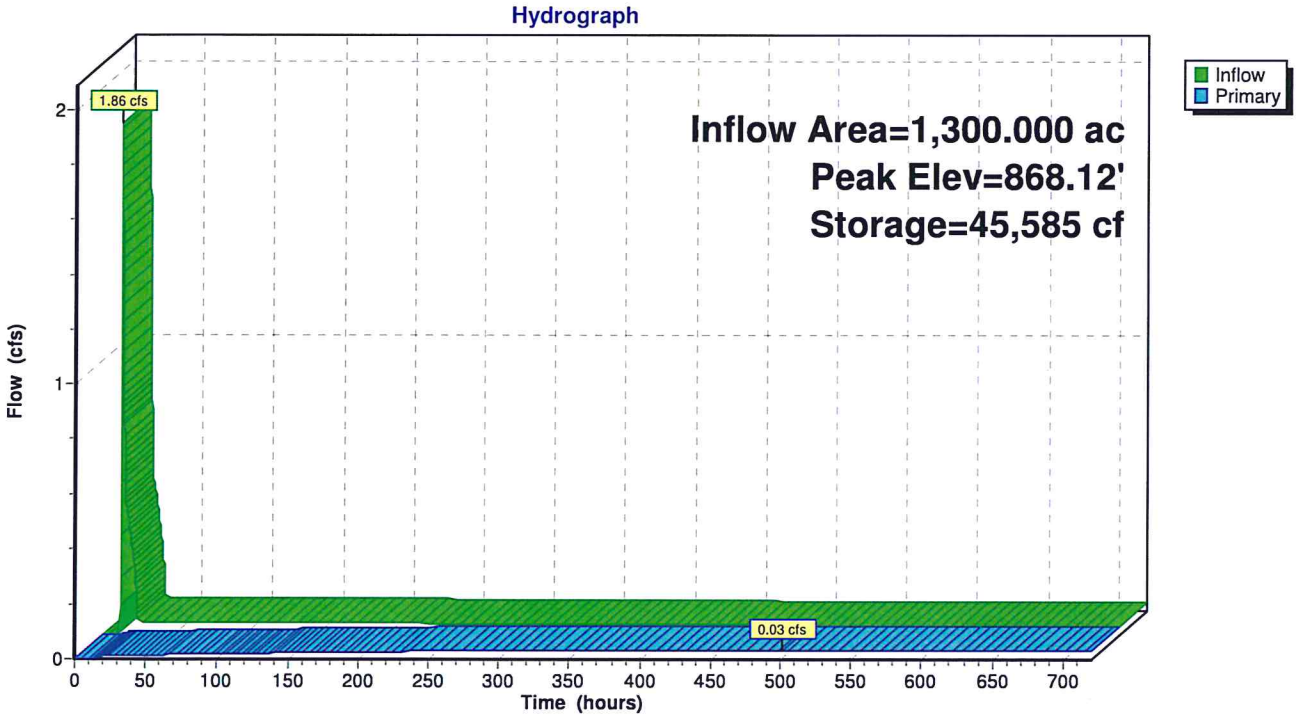
Volume	Invert	Avail.Storage	Storage Description
#1	868.07'	3,748,127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
868.07	874,883	0	0
870.00	979,381	1,789,365	1,789,365
872.00	979,381	1,958,762	3,748,127

Device	Routing	Invert	Outlet Devices
#1	Primary	868.07'	**2.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.03 cfs @ 501.44 hrs HW=868.12' TW=868.11' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.33 fps)

Pond G. Bog: Greenspire Bog



Summary for Pond H.C. Bog: Hampton Creek Bog

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=146)

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth = 0.10" for 50% event
Inflow = 17.48 cfs @ 15.90 hrs, Volume= 10.551 af
Outflow = 0.05 cfs @ 29.07 hrs, Volume= 2.206 af, Atten= 100%, Lag= 790.3 min
Primary = 0.05 cfs @ 29.07 hrs, Volume= 2.206 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 872.54' @ 29.31 hrs Surf.Area= 4,671,840 sf Storage= 457,966 cf

Plug-Flow detention time= 19,665.8 min calculated for 2.206 af (21% of inflow)
Center-of-Mass det. time= 19,432.1 min (20,536.4 - 1,104.3)

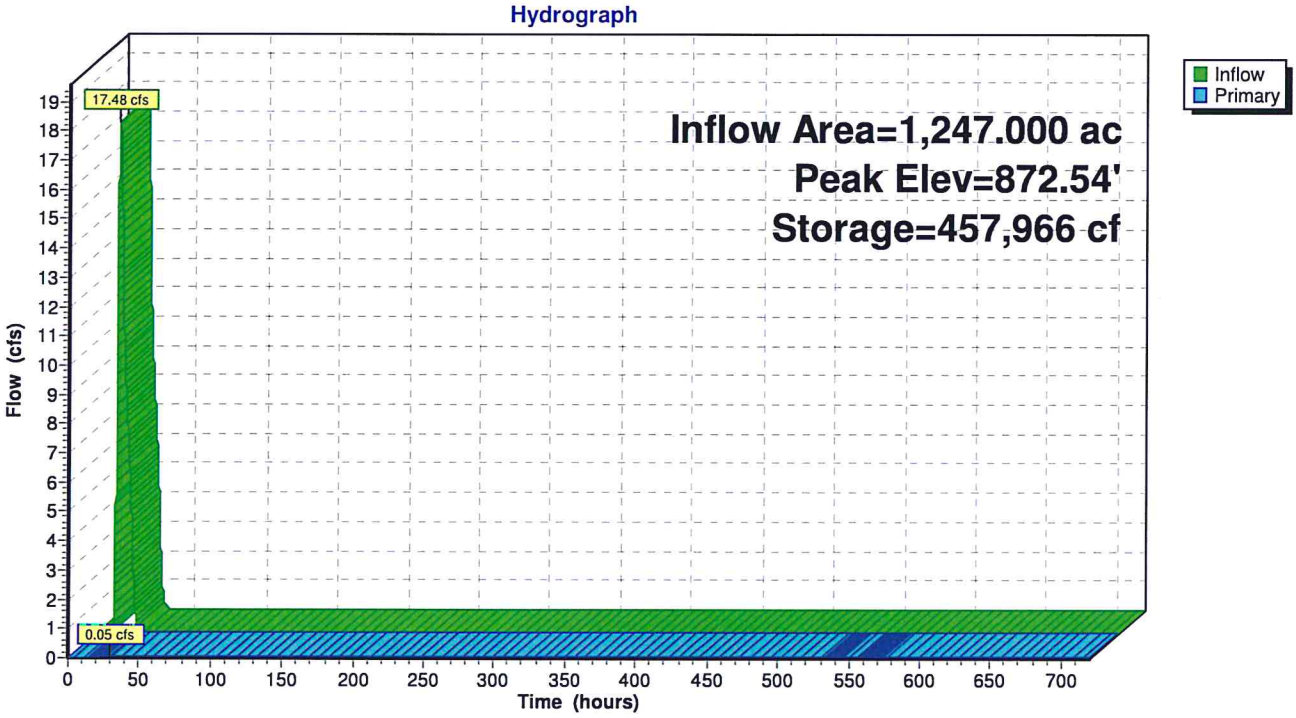
Volume	Invert	Avail.Storage	Storage Description
#1	872.44'	16,631,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
872.44	4,671,840	0	0
876.00	4,671,840	16,631,750	16,631,750

Device	Routing	Invert	Outlet Devices
#1	Primary	872.44'	**1.5" Vert. Orifice/Grate X 12.00** C= 0.600

Primary OutFlow Max=0.05 cfs @ 29.07 hrs HW=872.54' TW=872.53' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.39 fps)

Pond H.C. Bog: Hampton Creek Bog



Summary for Pond Limestone: Limestone Storage

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.02" for 50% event
Inflow = 0.03 cfs @ 501.56 hrs, Volume= 1.712 af
Outflow = 0.03 cfs @ 501.55 hrs, Volume= 1.712 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.03 cfs @ 501.55 hrs, Volume= 1.712 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 864.00' @ 0.00 hrs Surf.Area= 8.264 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

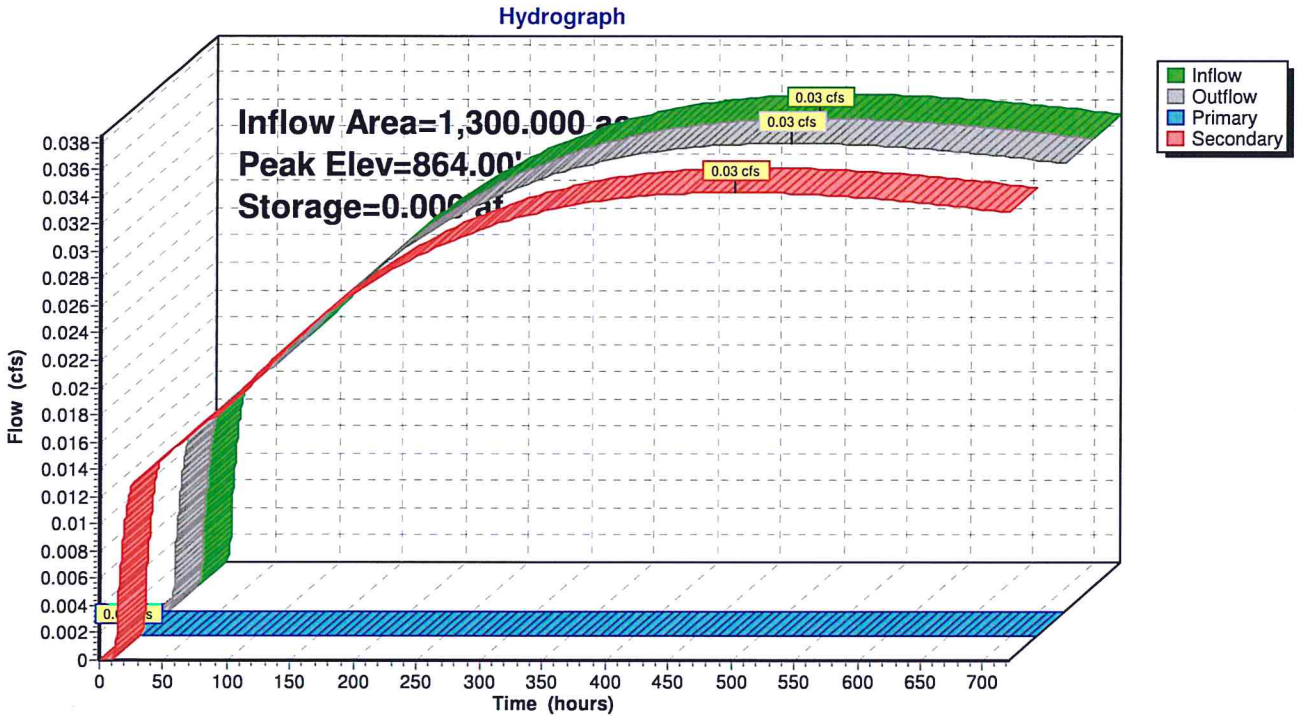
Volume	Invert	Avail.Storage	Storage Description
#1	864.00'	13.579 af	**600.00'W x 600.00'L x 4.00'H Prismatoid Z=2.0** 33.947 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Secondary	864.00'	**0.40 cfs Exfiltration at all elevations**
#2	Primary	866.00'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=864.00' TW=863.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 501.55 hrs HW=864.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.40 cfs potential flow)

Pond Limestone: Limestone Storage

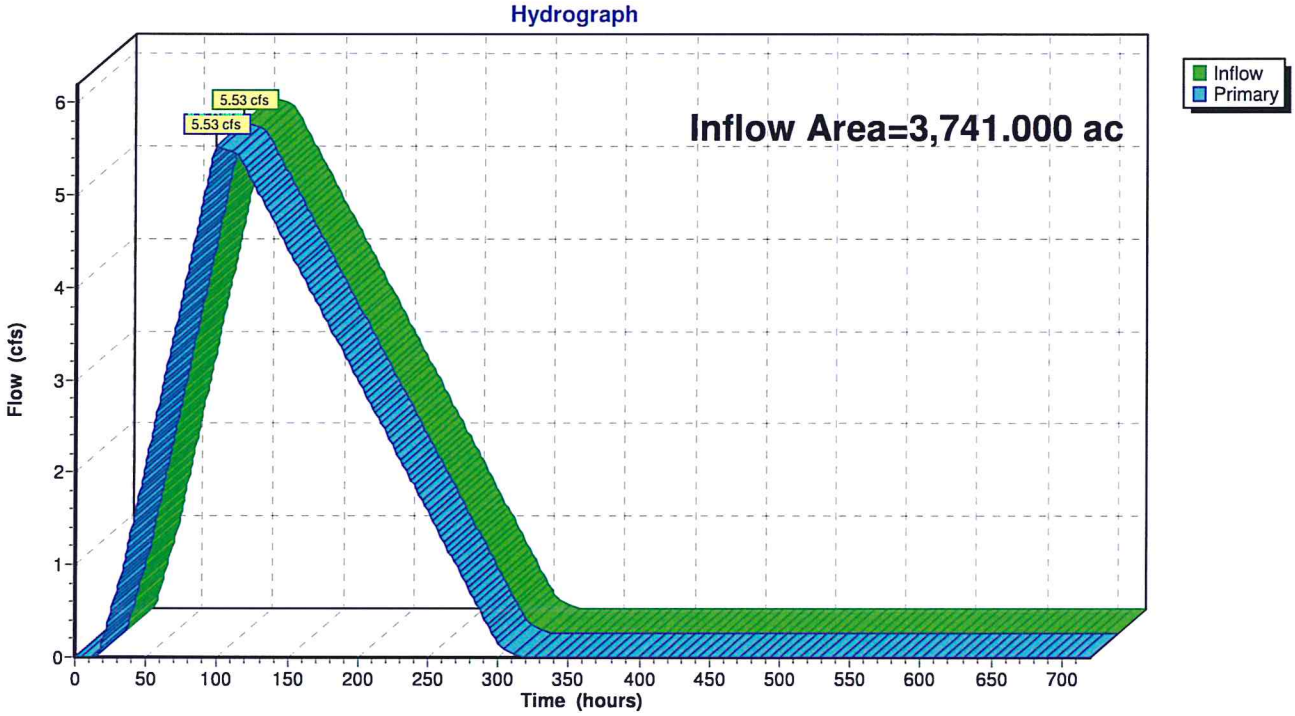


Summary for Link 1L: Portage Creek

Inflow Area = 3,741.000 ac, 0.00% Impervious, Inflow Depth = 0.22" for 50% event
Inflow = 5.53 cfs @ 97.81 hrs, Volume= 68.312 af
Primary = 5.53 cfs @ 97.81 hrs, Volume= 68.312 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 1L: Portage Creek

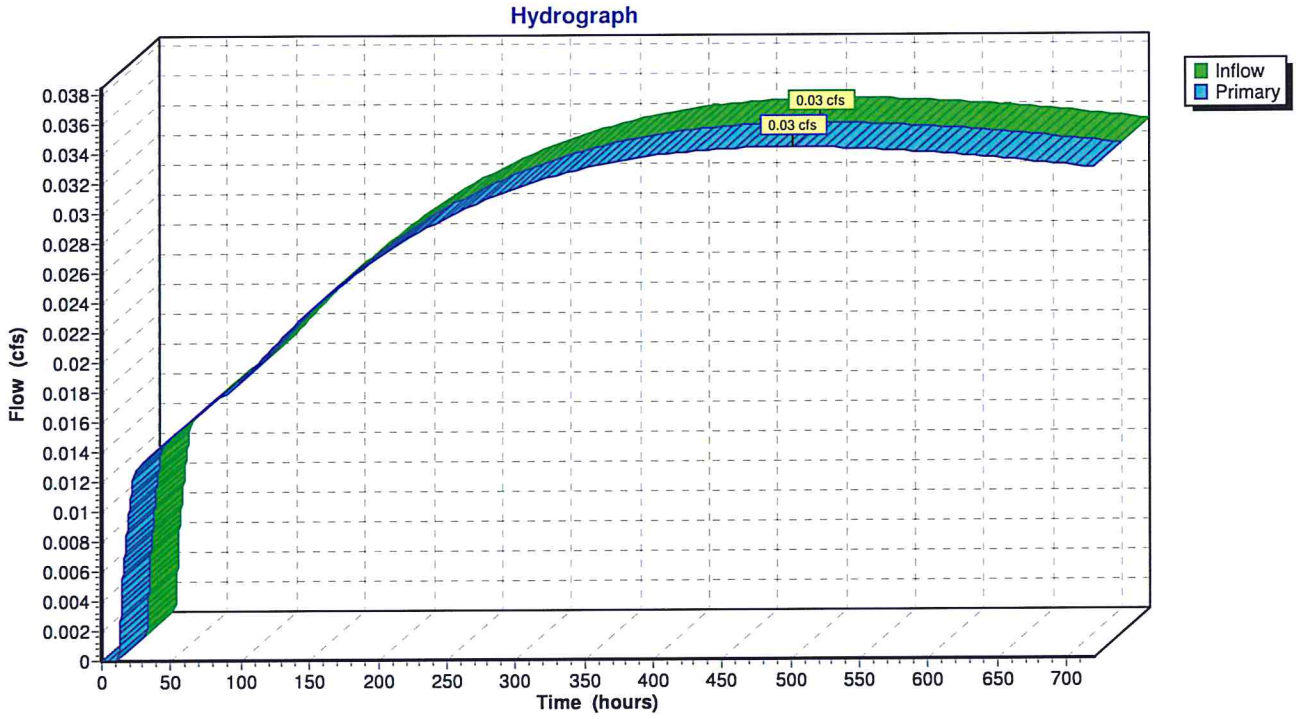


Summary for Link 3L: Groundwater

Inflow	=	0.03 cfs @ 501.55 hrs, Volume=	1.712 af
Primary	=	0.03 cfs @ 501.55 hrs, Volume=	1.712 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 3L: Groundwater



Time span=0.00-720.00 hrs, dt=0.05 hrs, 14401 points
Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 5S: Portage Creek Runoff Area=2,441.000 ac 0.00% Impervious Runoff Depth=2.46"
Tc=7,332.0 min CN=65 Runoff=40.76 cfs 500.603 af

Subcatchment G. Runoff: Greenspire Runoff Area=53.000 ac 0.00% Impervious Runoff Depth=1.69"
Tc=27.0 min CN=56 Runoff=58.20 cfs 7.445 af

Subcatchment H.C. Runoff: Hampton Runoff Area=1,247.000 ac 0.00% Impervious Runoff Depth=1.60"
Tc=151.8 min CN=55 Runoff=346.67 cfs 166.759 af

Reach 2R: Outfall Pipe to Wetlands Avg. Flow Depth=0.15' Max Vel=4.34 fps Inflow=0.33 cfs 11.220 af
12.0" Round Pipe n=0.013 L=30.0' S=0.0333 '/' Capacity=6.50 cfs Outflow=0.33 cfs 11.220 af

Reach 4R: Portage Creek Wetlands Avg. Flow Depth=0.04' Max Vel=0.16 fps Inflow=0.33 cfs 11.220 af
n=0.100 L=630.0' S=0.0095 '/' Capacity=85.13 cfs Outflow=0.33 cfs 11.193 af

Reach Ditch: Ditch Outlet to Avg. Flow Depth=0.27' Max Vel=0.61 fps Inflow=0.76 cfs 42.155 af
n=0.050 L=95.0' S=0.0028 '/' Capacity=68.30 cfs Outflow=0.76 cfs 42.153 af

Reach Greenspire Outlet Pipe: Outlet Avg. Flow Depth=0.39' Max Vel=1.74 fps Inflow=0.76 cfs 42.153 af
24.0" Round Pipe n=0.024 L=149.0' S=0.0054 '/' Capacity=8.98 cfs Outflow=0.76 cfs 42.152 af

Reach HC Outlet Pipe: Outlet Storm Avg. Flow Depth=0.35' Max Vel=2.14 fps Inflow=0.78 cfs 41.656 af
24.0" Round Pipe n=0.013 L=915.0' S=0.0028 '/' Capacity=11.92 cfs Outflow=0.78 cfs 41.649 af

Pond G. Bog: Greenspire Bog Peak Elev=868.44' Storage=328,301 cf Inflow=58.20 cfs 49.095 af
Outflow=0.76 cfs 42.155 af

Pond H.C. Bog: Hampton Creek Bog Peak Elev=873.99' Storage=7,226,157 cf Inflow=346.67 cfs 166.759 af
Outflow=0.78 cfs 41.656 af

Pond Limestone: Limestone Storage Peak Elev=866.28' Storage=7.663 af Inflow=0.76 cfs 42.152 af
Primary=0.33 cfs 11.220 af Secondary=0.40 cfs 23.366 af Outflow=0.73 cfs 34.586 af

Link 1L: Portage Creek Inflow=40.76 cfs 511.796 af
Primary=40.76 cfs 511.796 af

Link 3L: Groundwater Inflow=0.40 cfs 23.366 af
Primary=0.40 cfs 23.366 af

Total Runoff Area = 3,741.000 ac Runoff Volume = 674.808 af Average Runoff Depth = 2.16"
100.00% Pervious = 3,741.000 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 5S: Portage Creek

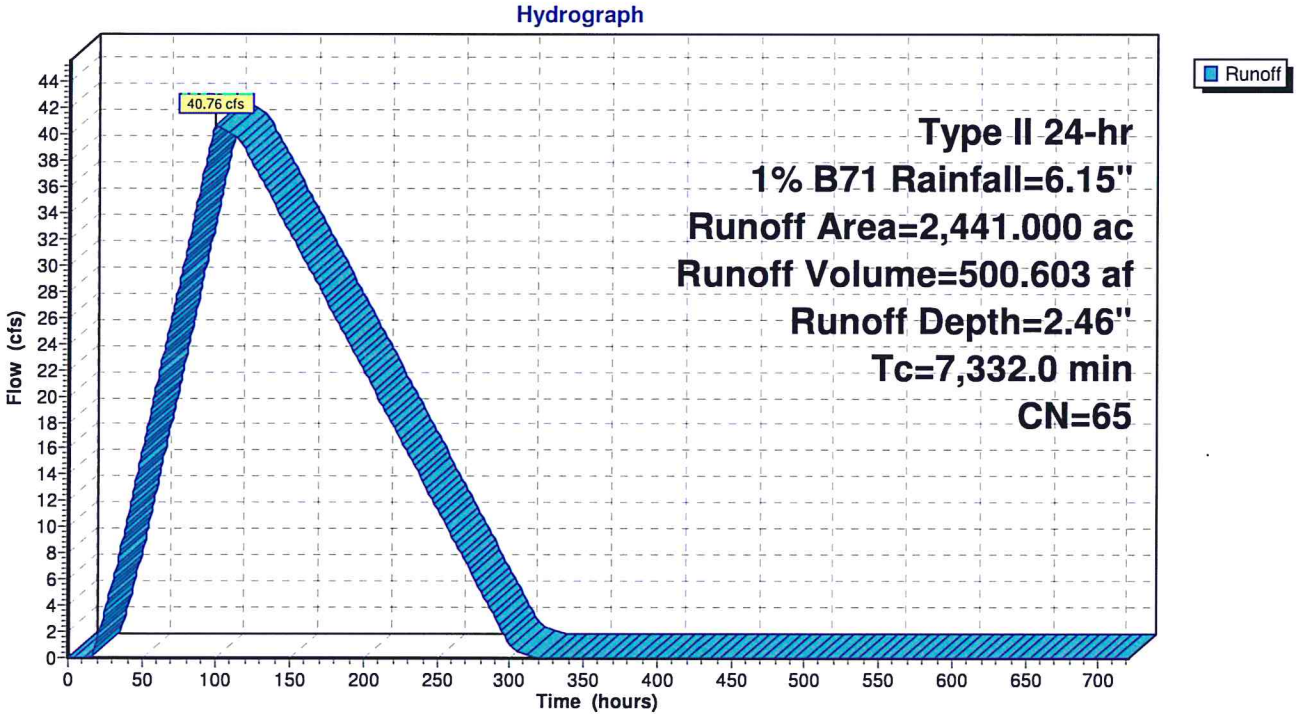
Runoff = 40.76 cfs @ 97.80 hrs, Volume= 500.603 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Type II 24-hr 1% B71 Rainfall=6.15"

	Area (ac)	CN	Description
*	2,441.000	65	
	2,441.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7,332.0					**Direct Entry,**

Subcatchment 5S: Portage Creek



Summary for Subcatchment G. Runoff: Greenspire Runoff

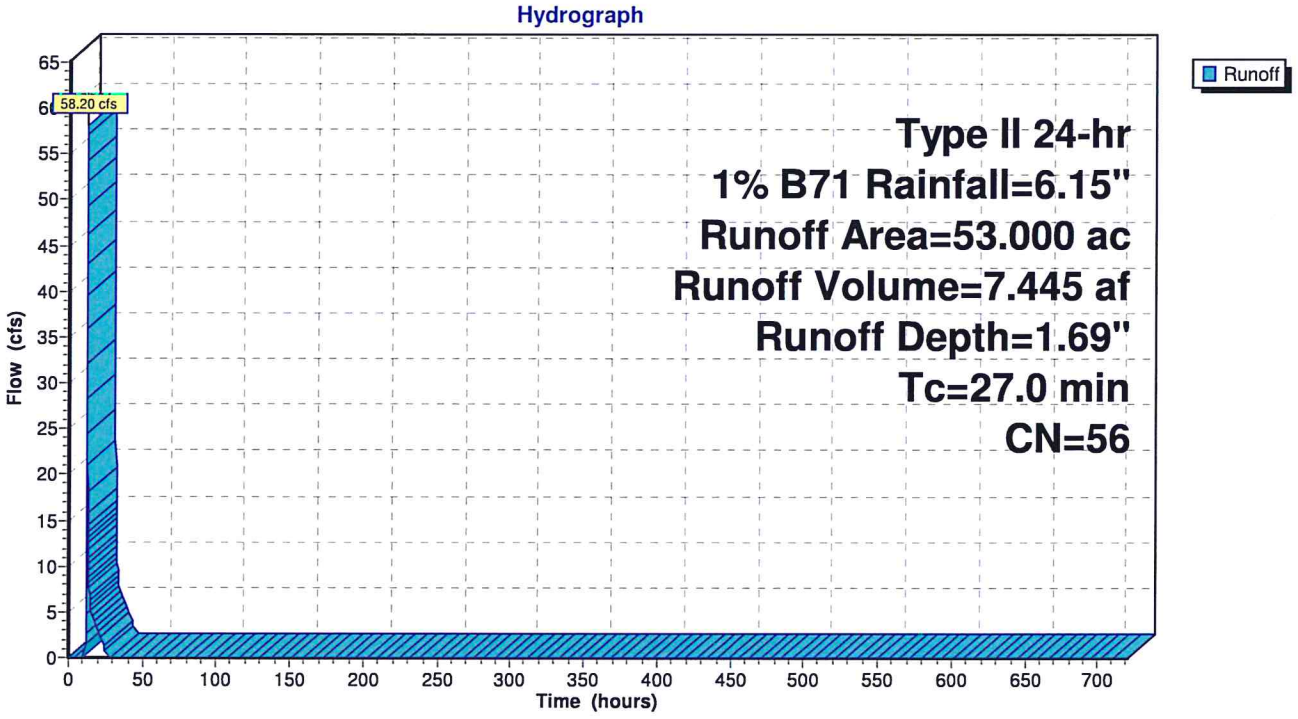
Runoff = 58.20 cfs @ 12.28 hrs, Volume= 7.445 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Type II 24-hr 1% B71 Rainfall=6.15"

	Area (ac)	CN	Description
*	53.000	56	Combined CN - see spreadsheet
	53.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					**Direct Entry,**

Subcatchment G. Runoff: Greenspire Runoff



Summary for Subcatchment H.C. Runoff: Hampton Creek Bog Runoff

Calculations completed in spreadsheets.

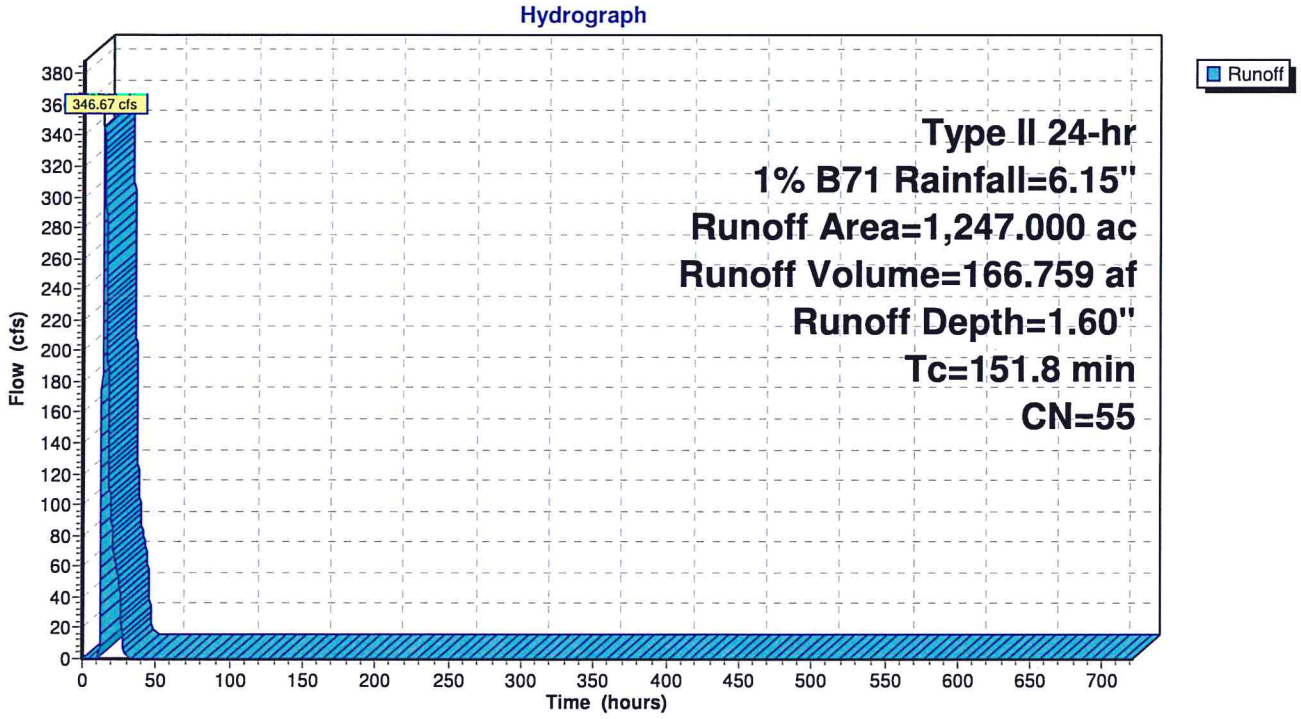
Runoff = 346.67 cfs @ 14.20 hrs, Volume= 166.759 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Type II 24-hr 1% B71 Rainfall=6.15"

	Area (ac)	CN	Description
*	1,247.000	55	Total Area w/ Weighted CN
	1,247.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
151.8					**Direct Entry,**

Subcatchment H.C. Runoff: Hampton Creek Bog Runoff



Summary for Reach 2R: Outfall Pipe to Wetlands

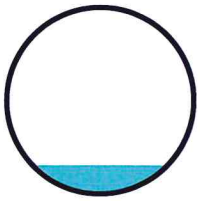
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.10" for 1% B71 event
Inflow = 0.33 cfs @ 355.03 hrs, Volume= 11.220 af
Outflow = 0.33 cfs @ 355.04 hrs, Volume= 11.220 af, Atten= 0%, Lag= 0.1 min

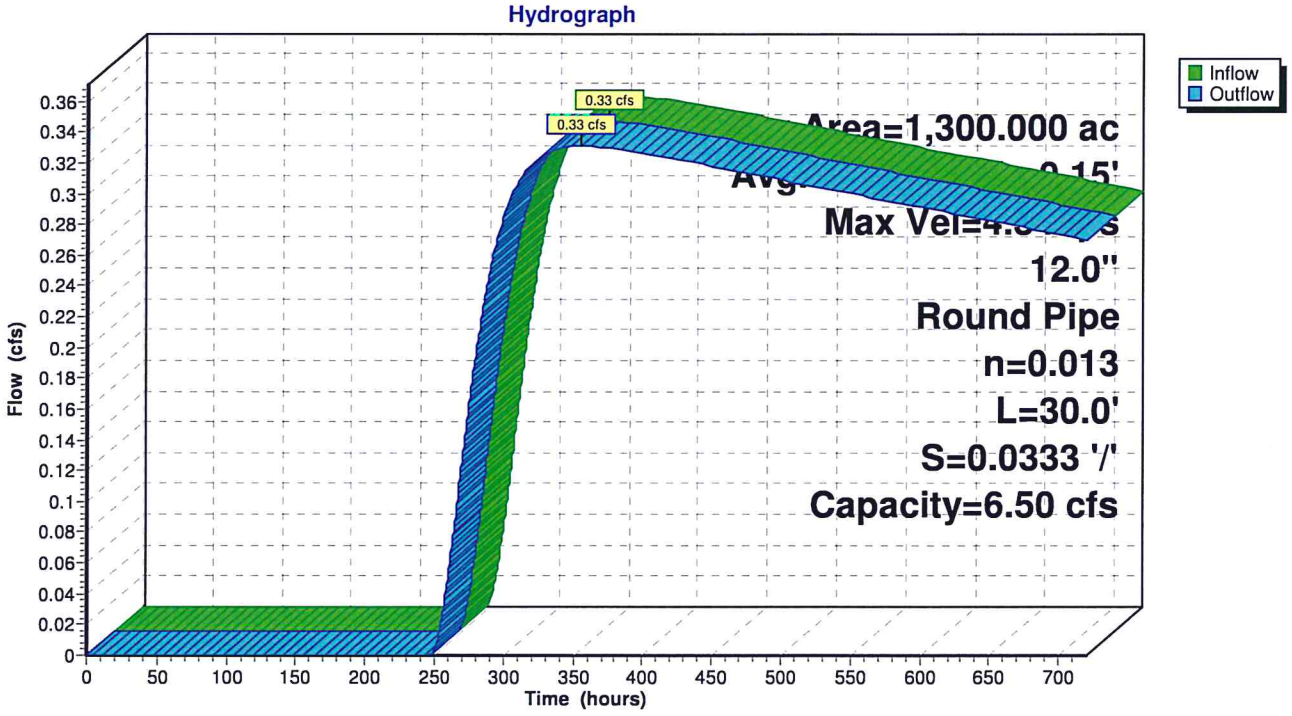
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.34 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.11 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 355.04 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.50 cfs

12.0" Round Pipe
n= 0.013
Length= 30.0' Slope= 0.0333 '/'
Inlet Invert= 863.00', Outlet Invert= 862.00'



Reach 2R: Outfall Pipe to Wetlands



Summary for Reach 4R: Portage Creek Wetlands

[61] Hint: Exceeded Reach 2R outlet invert by 0.04' @ 355.75 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.10" for 1% B71 event
Inflow = 0.33 cfs @ 355.04 hrs, Volume= 11.220 af
Outflow = 0.33 cfs @ 355.73 hrs, Volume= 11.193 af, Atten= 0%, Lag= 41.4 min

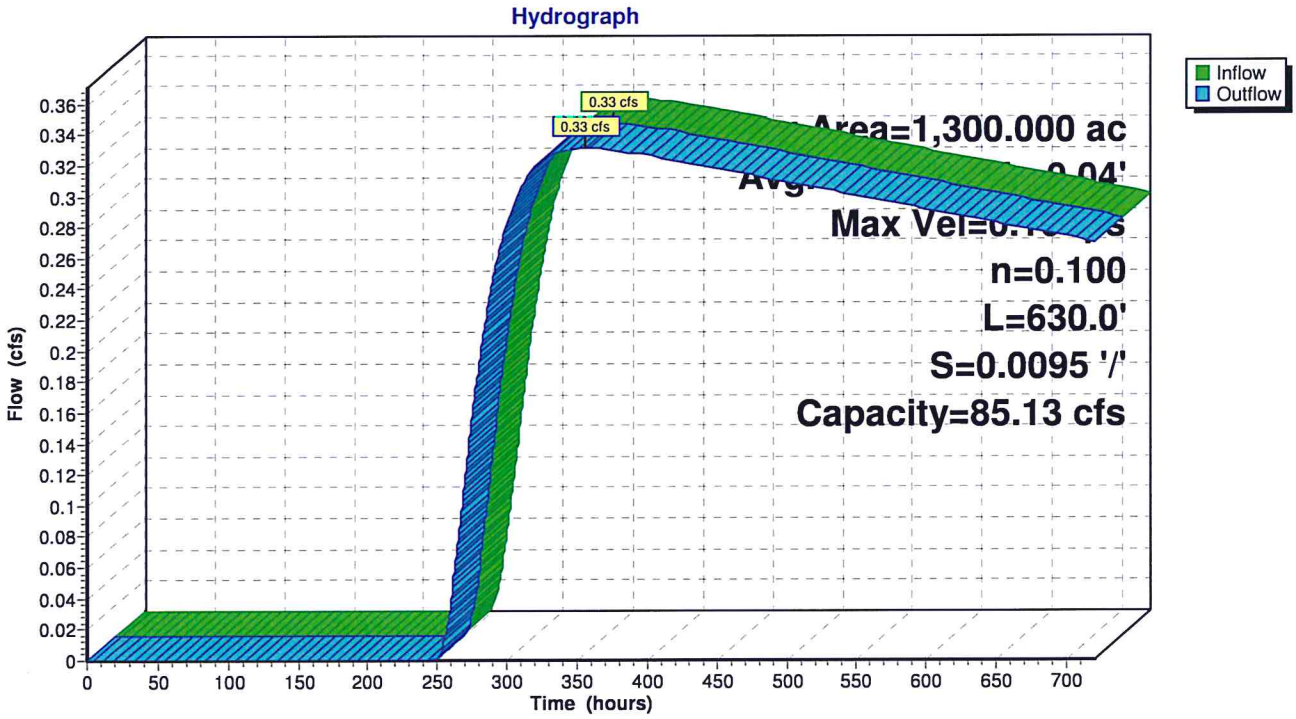
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.16 fps, Min. Travel Time= 66.8 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 71.5 min

Peak Storage= 1,328 cf @ 355.73 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 60.0 sf, Capacity= 85.13 cfs

60.00' x 1.00' deep channel, n= 0.100
Length= 630.0' Slope= 0.0095 '/'
Inlet Invert= 862.00', Outlet Invert= 856.00'



Reach 4R: Portage Creek Wetlands



Summary for Reach Ditch: Ditch Outlet to Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.39" for 1% B71 event
Inflow = 0.76 cfs @ 111.27 hrs, Volume= 42.155 af
Outflow = 0.76 cfs @ 111.30 hrs, Volume= 42.153 af, Atten= 0%, Lag= 1.7 min

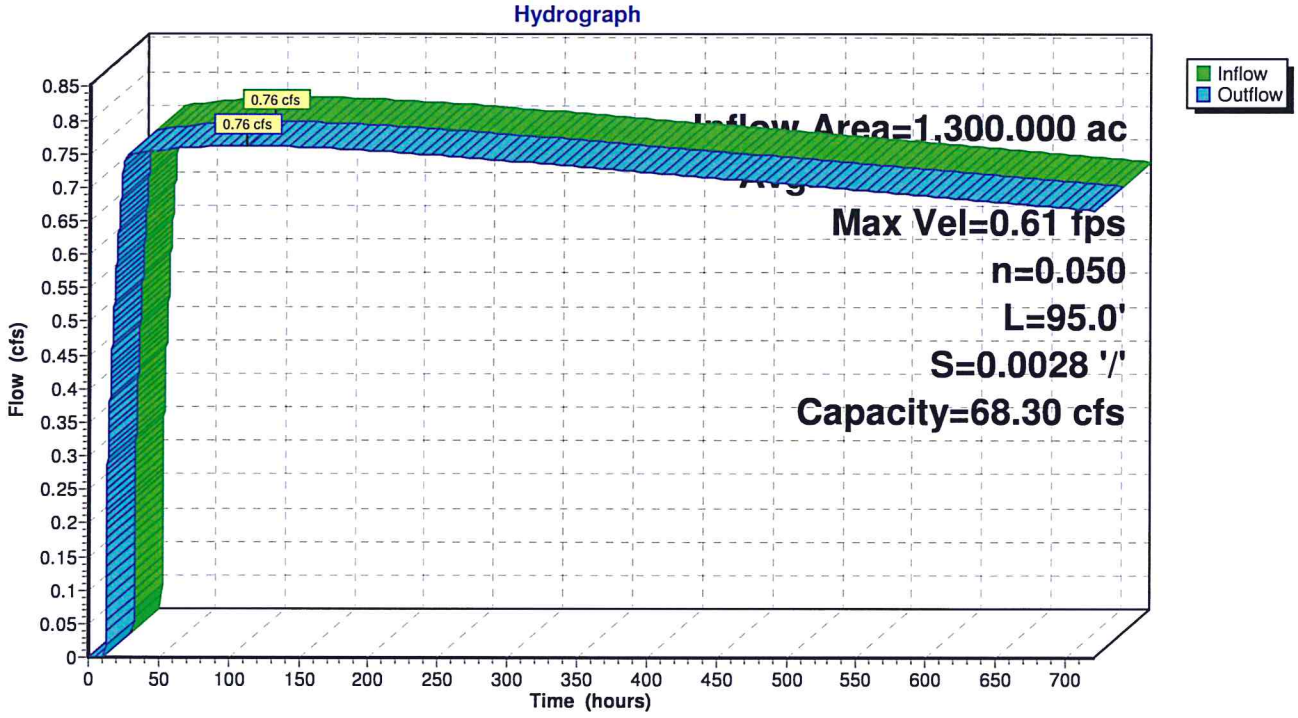
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.61 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 2.6 min

Peak Storage= 119 cf @ 111.30 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 68.30 cfs

4.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 95.0' Slope= 0.0028 '/'
Inlet Invert= 868.07', Outlet Invert= 867.80'



Reach Ditch: Ditch Outlet to Greenspire Bog



Summary for Reach Greenspire Outlet Pipe: Outlet to Infiltration

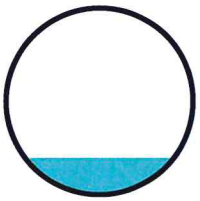
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach Ditch OUTLET depth by 0.12' @ 111.40 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.39" for 1% B71 event
Inflow = 0.76 cfs @ 111.30 hrs, Volume= 42.153 af
Outflow = 0.76 cfs @ 111.32 hrs, Volume= 42.152 af, Atten= 0%, Lag= 1.0 min

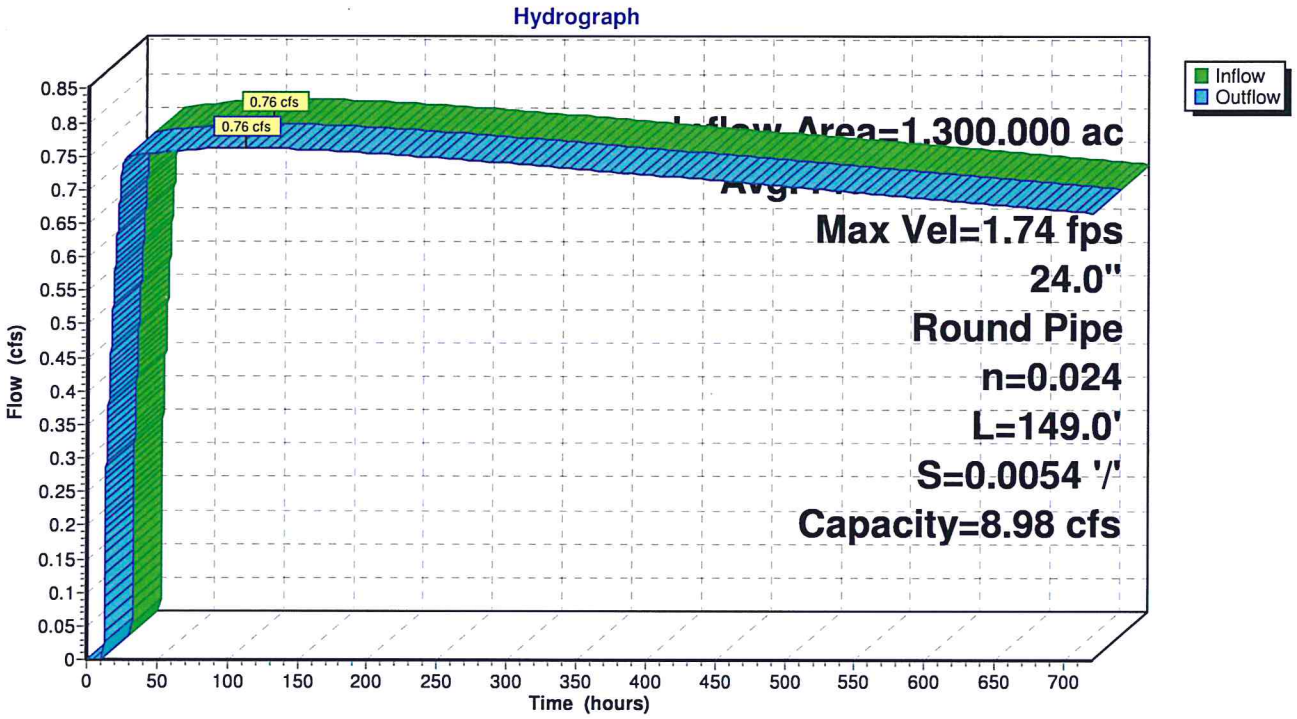
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.74 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.71 fps, Avg. Travel Time= 1.5 min

Peak Storage= 65 cf @ 111.32 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 8.98 cfs

24.0" Round Pipe
n= 0.024
Length= 149.0' Slope= 0.0054 '/'
Inlet Invert= 867.80', Outlet Invert= 867.00'



Reach Greenspire Outlet Pipe: Outlet to Infiltration



Summary for Reach HC Outlet Pipe: Outlet Storm Sewer

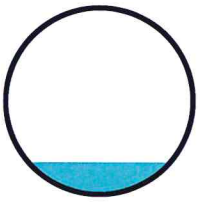
[52] Hint: Inlet/Outlet conditions not evaluated

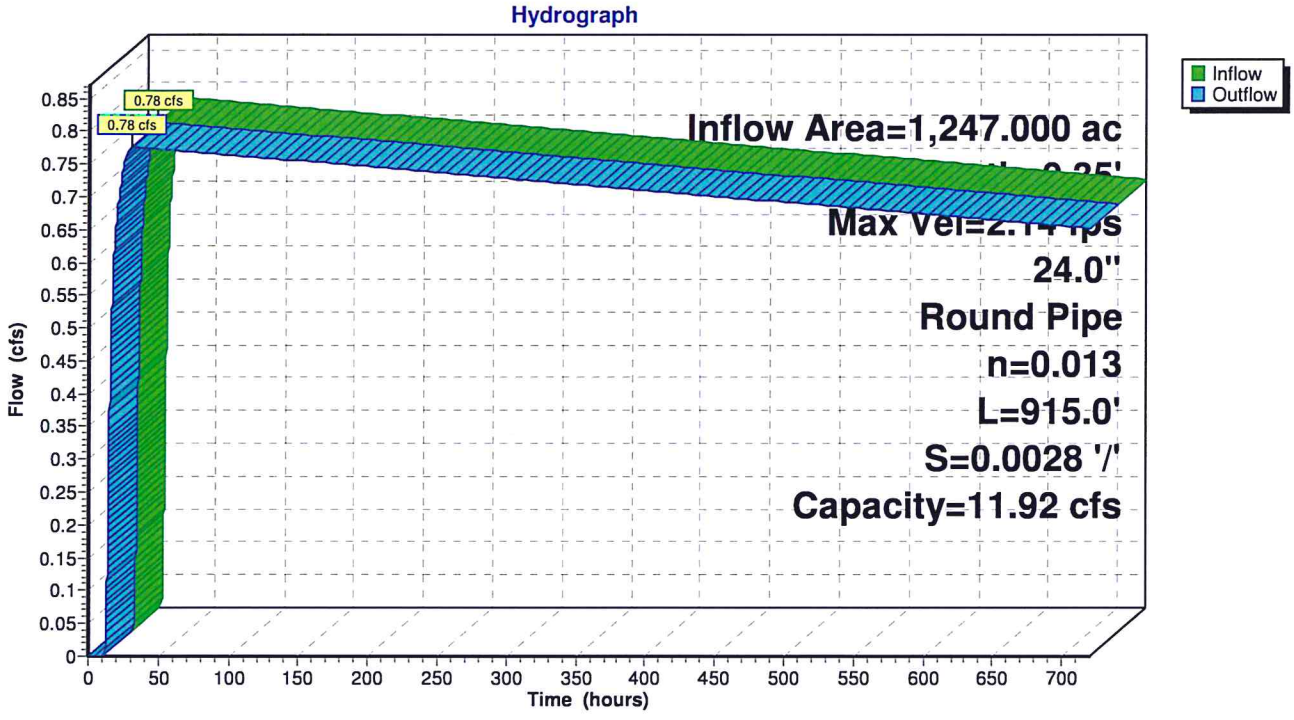
Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth > 0.40" for 1% B71 event
Inflow = 0.78 cfs @ 29.44 hrs, Volume= 41.656 af
Outflow = 0.78 cfs @ 29.53 hrs, Volume= 41.649 af, Atten= 0%, Lag= 5.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.14 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 7.3 min

Peak Storage= 332 cf @ 29.53 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 11.92 cfs

24.0" Round Pipe
n= 0.013
Length= 915.0' Slope= 0.0028 '/'
Inlet Invert= 872.44', Outlet Invert= 869.90'





Summary for Pond G. Bog: Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.45" for 1% B71 event
Inflow = 58.20 cfs @ 12.28 hrs, Volume= 49.095 af
Outflow = 0.76 cfs @ 111.27 hrs, Volume= 42.155 af, Atten= 99%, Lag= 5,939.6 min
Primary = 0.76 cfs @ 111.27 hrs, Volume= 42.155 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 868.44' @ 111.30 hrs Surf.Area= 894,970 sf Storage= 328,301 cf

Plug-Flow detention time= 6,702.0 min calculated for 42.153 af (86% of inflow)
Center-of-Mass det. time= 3,238.4 min (21,585.9 - 18,347.4)

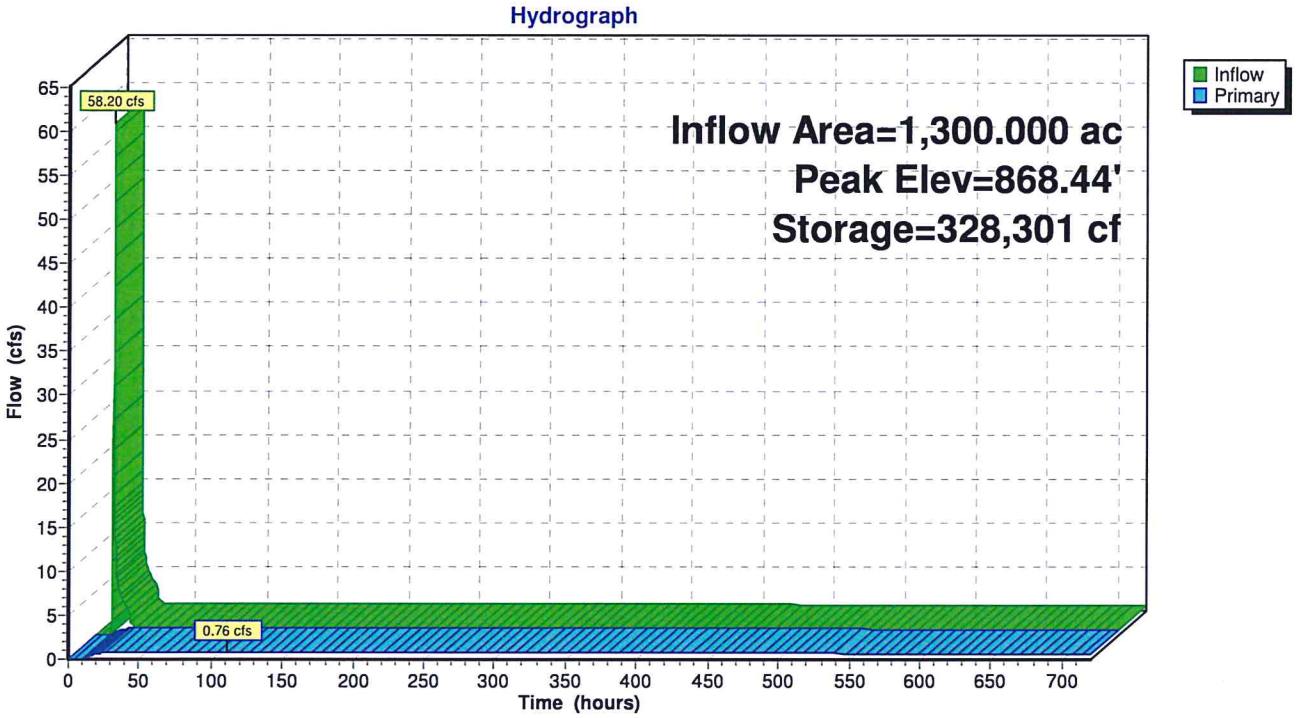
Volume	Invert	Avail.Storage	Storage Description
#1	868.07'	3,748,127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
868.07	874,883	0	0
870.00	979,381	1,789,365	1,789,365
872.00	979,381	1,958,762	3,748,127

Device	Routing	Invert	Outlet Devices
#1	Primary	868.07'	**2.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.76 cfs @ 111.27 hrs HW=868.44' TW=868.34' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.76 cfs @ 1.03 fps)

Pond G. Bog: Greenspire Bog



Summary for Pond H.C. Bog: Hampton Creek Bog

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth = 1.60" for 1% B71 event
Inflow = 346.67 cfs @ 14.20 hrs, Volume= 166.759 af
Outflow = 0.78 cfs @ 29.44 hrs, Volume= 41.656 af, Atten= 100%, Lag= 914.8 min
Primary = 0.78 cfs @ 29.44 hrs, Volume= 41.656 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 873.99' @ 29.45 hrs Surf.Area= 4,671,840 sf Storage= 7,226,157 cf

Plug-Flow detention time= 20,644.9 min calculated for 41.656 af (25% of inflow)
Center-of-Mass det. time= 20,434.8 min (21,464.0 - 1,029.2)

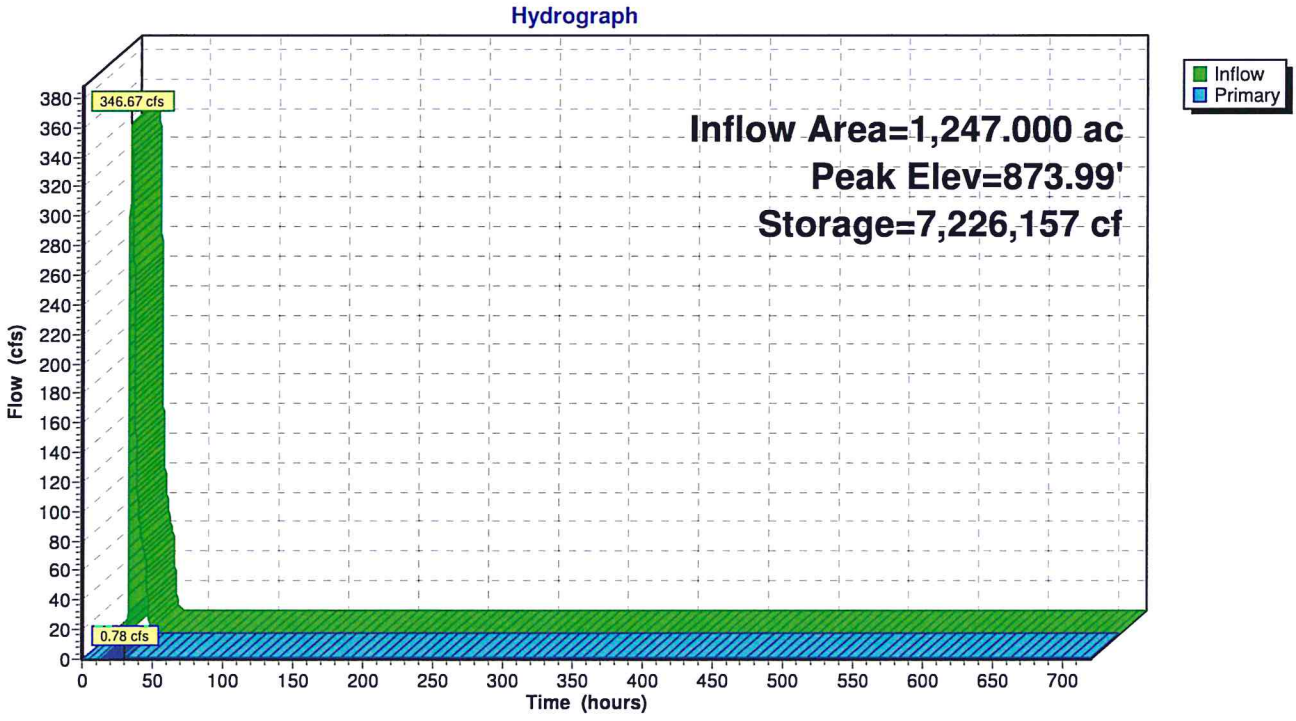
Volume	Invert	Avail.Storage	Storage Description
#1	872.44'	16,631,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
872.44	4,671,840	0	0
876.00	4,671,840	16,631,750	16,631,750

Device	Routing	Invert	Outlet Devices
#1	Primary	872.44'	**1.5" Vert. Orifice/Grate X 12.00** C= 0.600

Primary OutFlow Max=0.78 cfs @ 29.44 hrs HW=873.99' TW=872.79' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 0.78 cfs @ 5.28 fps)

Pond H.C. Bog: Hampton Creek Bog



Summary for Pond Limestone: Limestone Storage

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.39" for 1% B71 event
Inflow = 0.76 cfs @ 111.32 hrs, Volume= 42.152 af
Outflow = 0.73 cfs @ 355.03 hrs, Volume= 34.586 af, Atten= 4%, Lag= 14,623.1 min
Primary = 0.33 cfs @ 355.03 hrs, Volume= 11.220 af
Secondary = 0.40 cfs @ 23.95 hrs, Volume= 23.366 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 866.28' @ 355.03 hrs Surf.Area= 8.518 ac Storage= 7.663 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2,823.7 min (24,411.7 - 21,588.0)

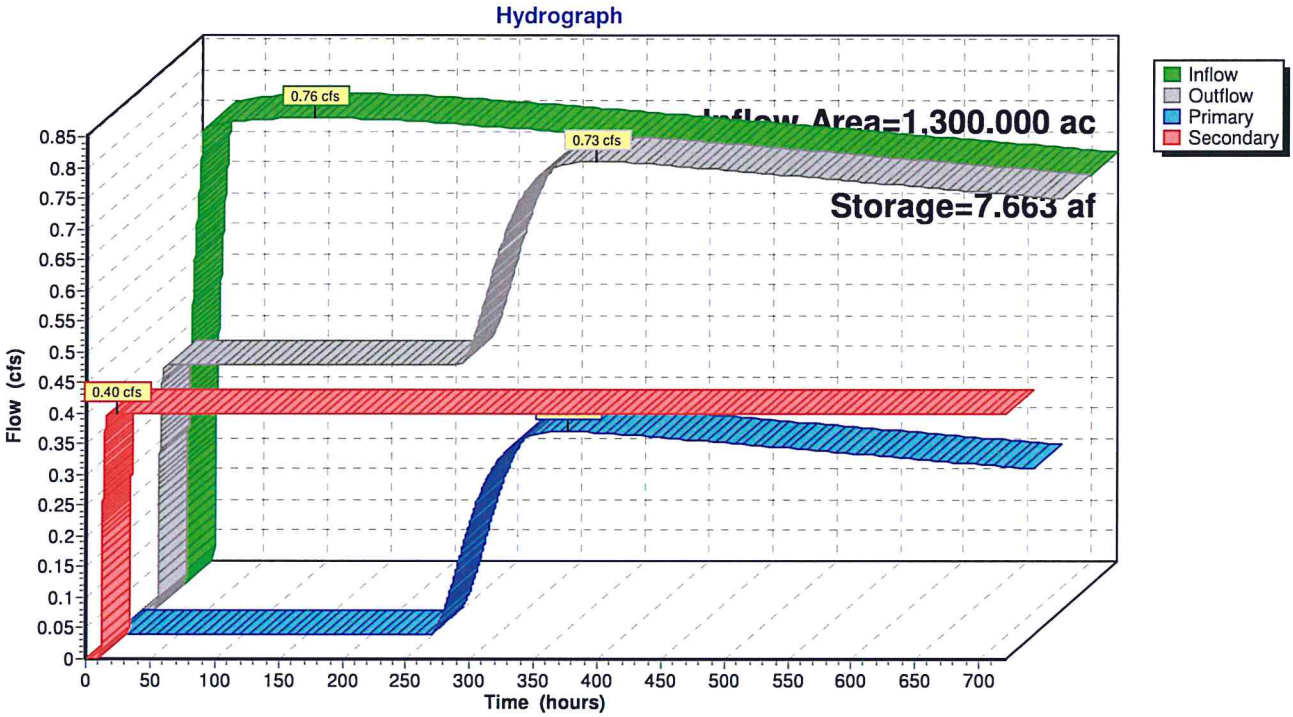
Volume	Invert	Avail.Storage	Storage Description
#1	864.00'	13.579 af	**600.00'W x 600.00'L x 4.00'H Prismatoid Z=2.0** 33.947 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Secondary	864.00'	**0.40 cfs Exfiltration at all elevations**
#2	Primary	866.00'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 355.03 hrs HW=866.28' TW=863.15' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.33 cfs @ 1.81 fps)

Secondary OutFlow Max=0.40 cfs @ 23.95 hrs HW=864.04' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Pond Limestone: Limestone Storage

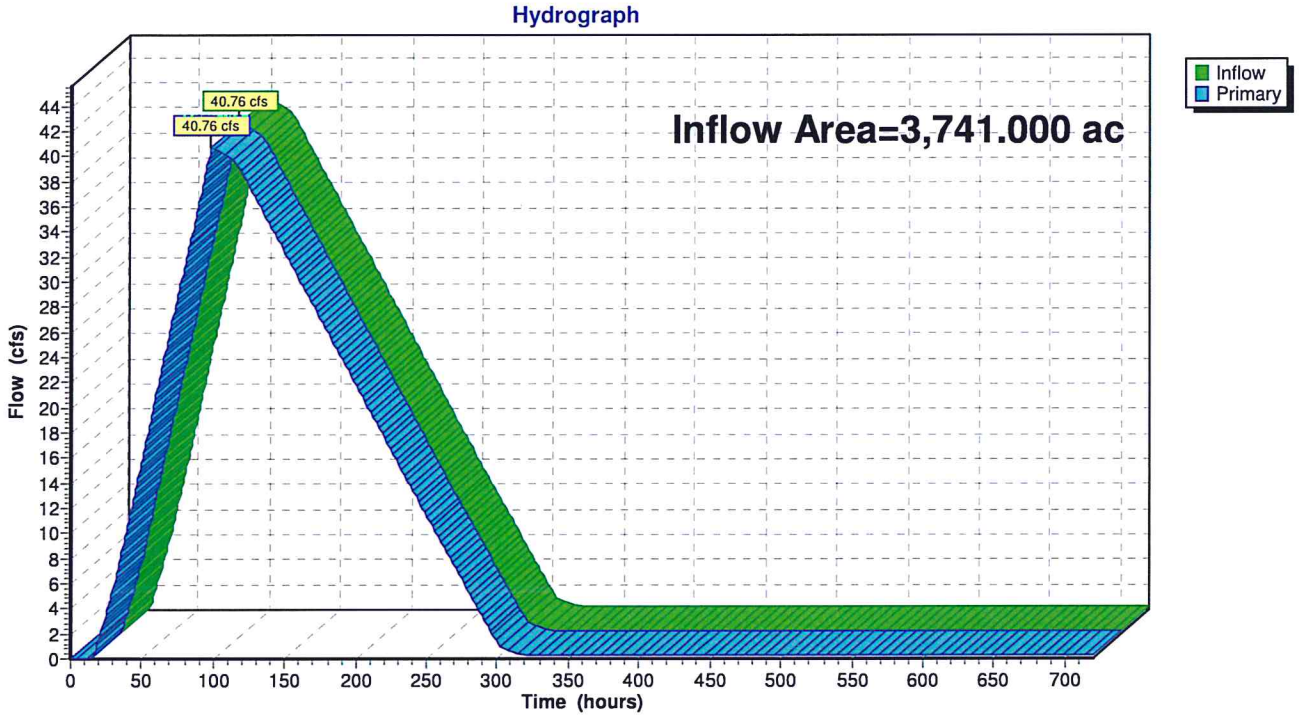


Summary for Link 1L: Portage Creek

Inflow Area = 3,741.000 ac, 0.00% Impervious, Inflow Depth > 1.64" for 1% B71 event
Inflow = 40.76 cfs @ 97.80 hrs, Volume= 511.796 af
Primary = 40.76 cfs @ 97.80 hrs, Volume= 511.796 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 1L: Portage Creek

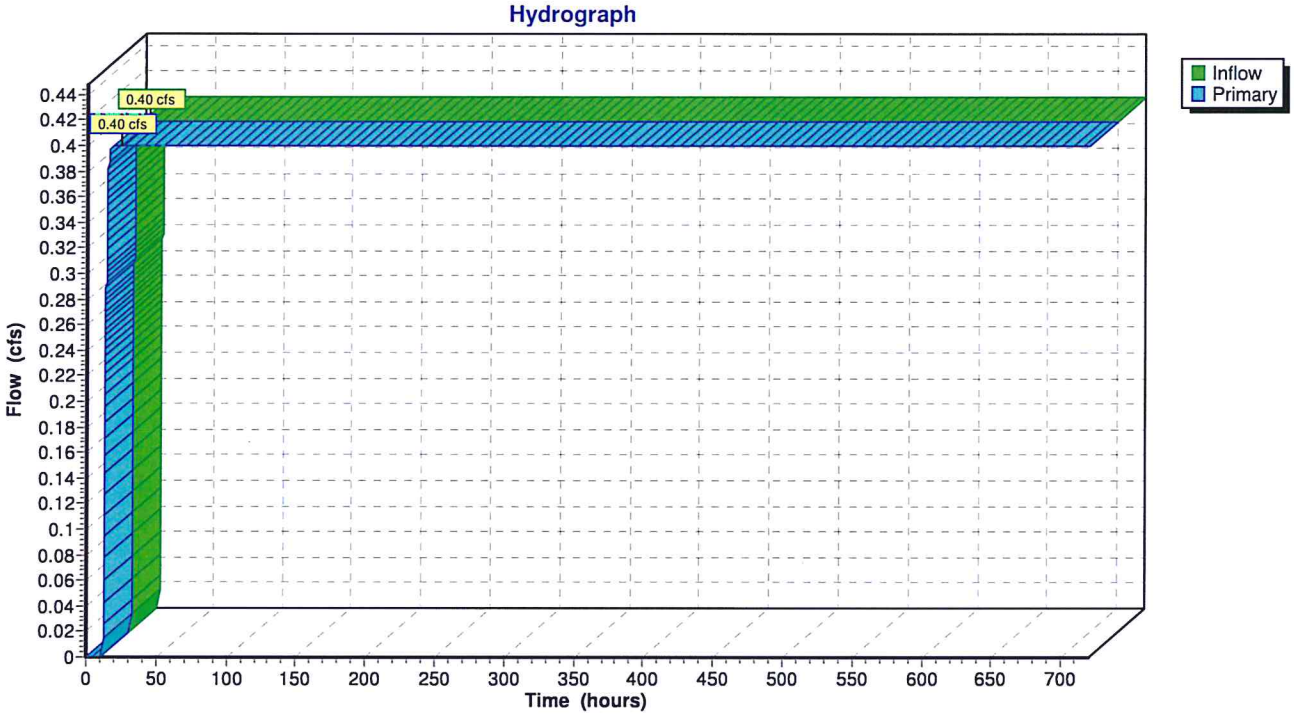


Summary for Link 3L: Groundwater

Inflow	=	0.40 cfs @	23.95 hrs, Volume=	23.366 af
Primary	=	0.40 cfs @	23.95 hrs, Volume=	23.366 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 3L: Groundwater



Time span=0.00-720.00 hrs, dt=0.05 hrs, 14401 points
Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 5S: Portage Creek Runoff Area=2,441.000 ac 0.00% Impervious Runoff Depth=1.84"
Tc=7,332.0 min CN=65 Runoff=30.85 cfs 374.807 af

Subcatchment G. Runoff: Greenspire Runoff Area=53.000 ac 0.00% Impervious Runoff Depth=1.19"
Tc=27.0 min CN=56 Runoff=41.76 cfs 5.252 af

Subcatchment H.C. Runoff: Hampton Runoff Area=1,247.000 ac 0.00% Impervious Runoff Depth=1.12"
Tc=151.8 min CN=55 Runoff=271.50 cfs 116.664 af

Reach 2R: Outfall Pipe to Wetlands Avg. Flow Depth=0.10' Max Vel=3.26 fps Inflow=0.13 cfs 1.510 af
12.0" Round Pipe n=0.013 L=30.0' S=0.0333 '/' Capacity=6.50 cfs Outflow=0.13 cfs 1.510 af

Reach 4R: Portage Creek Wetlands Avg. Flow Depth=0.02' Max Vel=0.11 fps Inflow=0.13 cfs 1.510 af
n=0.100 L=630.0' S=0.0095 '/' Capacity=85.13 cfs Outflow=0.13 cfs 1.493 af

Reach Ditch: Ditch Outlet to Avg. Flow Depth=0.23' Max Vel=0.56 fps Inflow=0.58 cfs 32.094 af
n=0.050 L=95.0' S=0.0028 '/' Capacity=68.30 cfs Outflow=0.58 cfs 32.092 af

Reach Greenspire Outlet Pipe: Outlet Avg. Flow Depth=0.35' Max Vel=1.61 fps Inflow=0.58 cfs 32.092 af
24.0" Round Pipe n=0.024 L=149.0' S=0.0054 '/' Capacity=8.98 cfs Outflow=0.58 cfs 32.090 af

Reach HC Outlet Pipe: Outlet Storm Avg. Flow Depth=0.31' Max Vel=2.00 fps Inflow=0.62 cfs 32.775 af
24.0" Round Pipe n=0.013 L=915.0' S=0.0028 '/' Capacity=11.92 cfs Outflow=0.62 cfs 32.770 af

Pond G. Bog: Greenspire Bog Peak Elev=868.39' Storage=278,702 cf Inflow=41.76 cfs 38.022 af
Outflow=0.58 cfs 32.094 af

Pond H.C. Bog: Hampton Creek Bog Peak Elev=873.52' Storage=5,052,108 cf Inflow=271.50 cfs 116.664 af
Outflow=0.62 cfs 32.775 af

Pond Limestone: Limestone Storage Peak Elev=866.17' Storage=7.285 af Inflow=0.58 cfs 32.090 af
Primary=0.13 cfs 1.510 af Secondary=0.40 cfs 23.310 af Outflow=0.53 cfs 24.820 af

Link 1L: Portage Creek Inflow=30.85 cfs 376.299 af
Primary=30.85 cfs 376.299 af

Link 3L: Groundwater Inflow=0.40 cfs 23.310 af
Primary=0.40 cfs 23.310 af

Total Runoff Area = 3,741.000 ac Runoff Volume = 496.723 af Average Runoff Depth = 1.59"
100.00% Pervious = 3,741.000 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 5S: Portage Creek

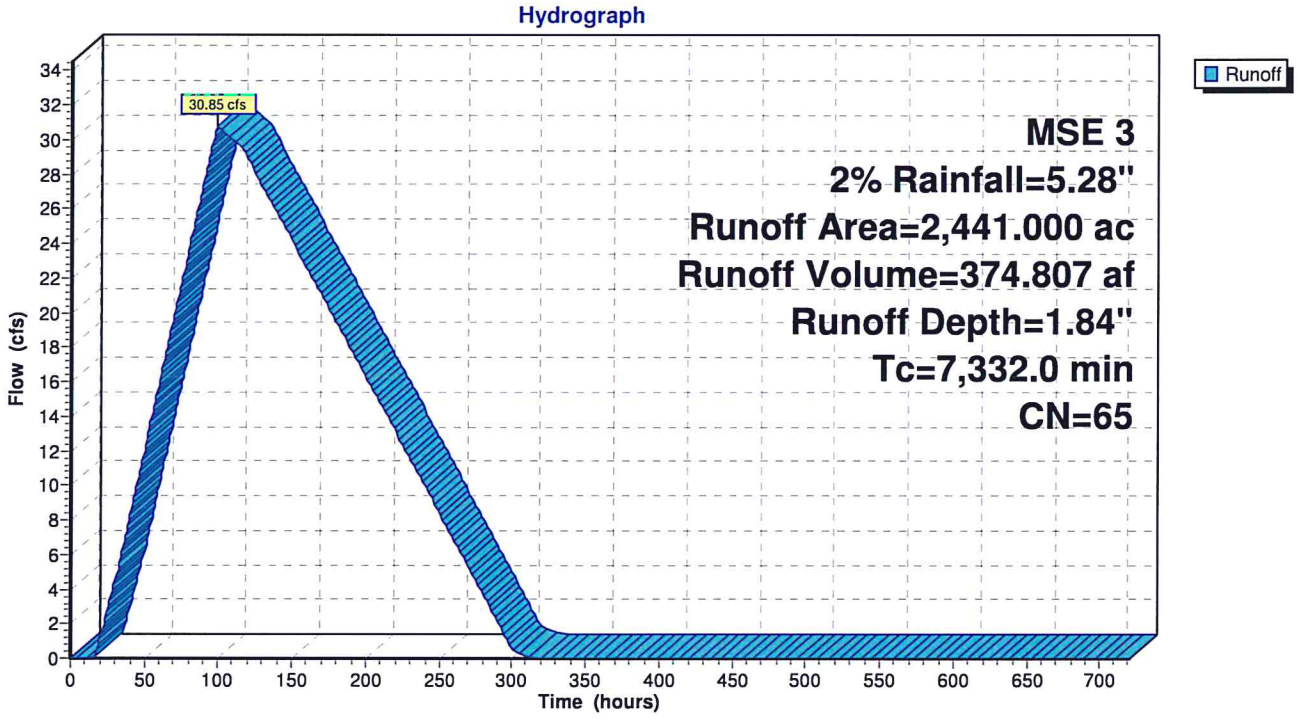
Runoff = 30.85 cfs @ 97.79 hrs, Volume= 374.807 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 2% Rainfall=5.28"

	Area (ac)	CN	Description
*	2,441.000	65	
	2,441.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7,332.0					**Direct Entry,**

Subcatchment 5S: Portage Creek



Summary for Subcatchment G. Runoff: Greenspire Runoff

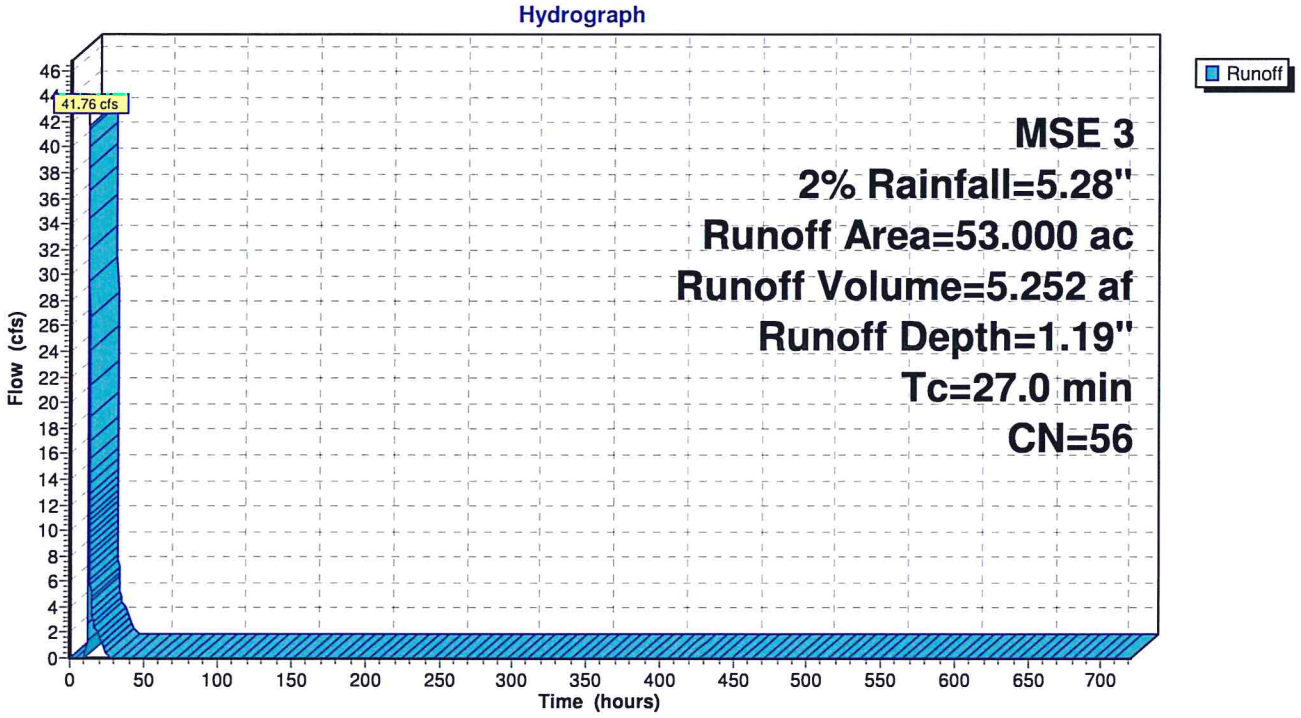
Runoff = 41.76 cfs @ 12.53 hrs, Volume= 5.252 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 2% Rainfall=5.28"

	Area (ac)	CN	Description
*	53.000	56	Combined CN - see spreadsheet
	53.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					**Direct Entry,**

Subcatchment G. Runoff: Greenspire Runoff



Summary for Subcatchment H.C. Runoff: Hampton Creek Bog Runoff

Calculations completed in spreadsheets.

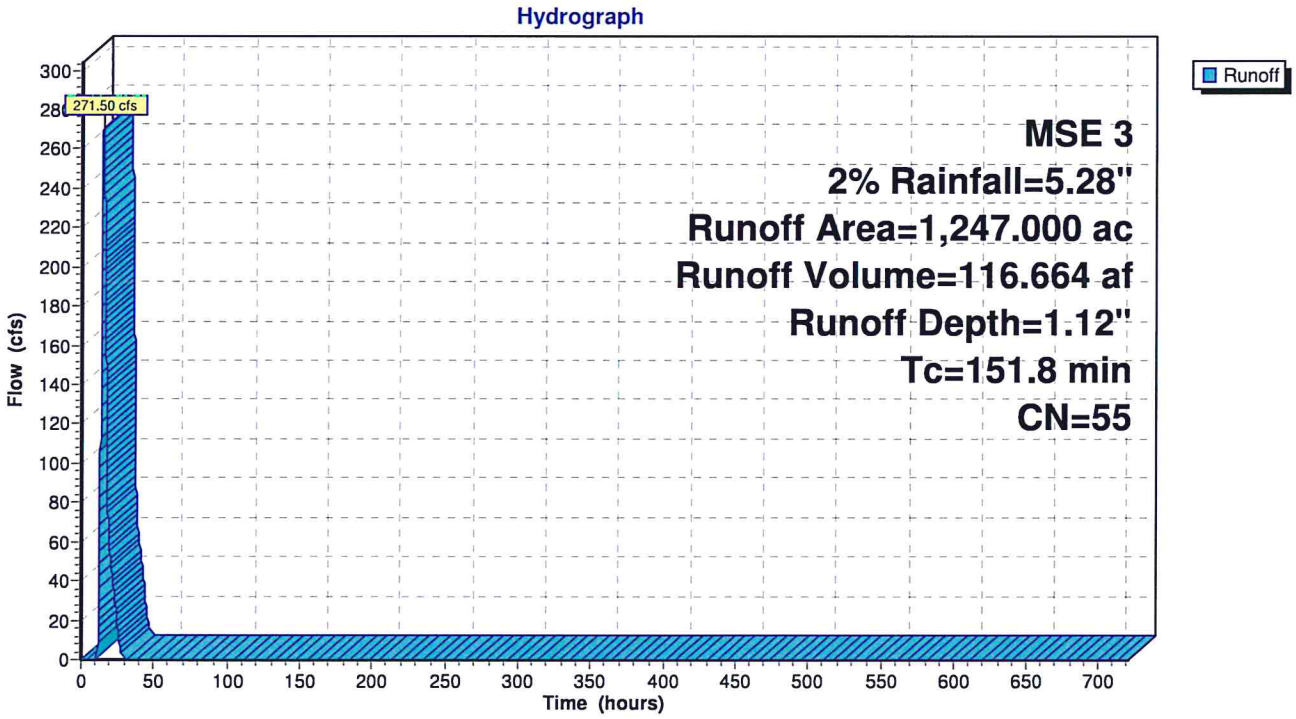
Runoff = 271.50 cfs @ 14.52 hrs, Volume= 116.664 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=Michigan-369, Weighted-CN, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
MSE 3 2% Rainfall=5.28"

	Area (ac)	CN	Description
*	1,247.000	55	Total Area w/ Weighted CN
	1,247.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
151.8					**Direct Entry,**

Subcatchment H.C. Runoff: Hampton Creek Bog Runoff



Summary for Reach 2R: Outfall Pipe to Wetlands

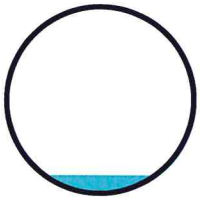
[52] Hint: Inlet/Outlet conditions not evaluated

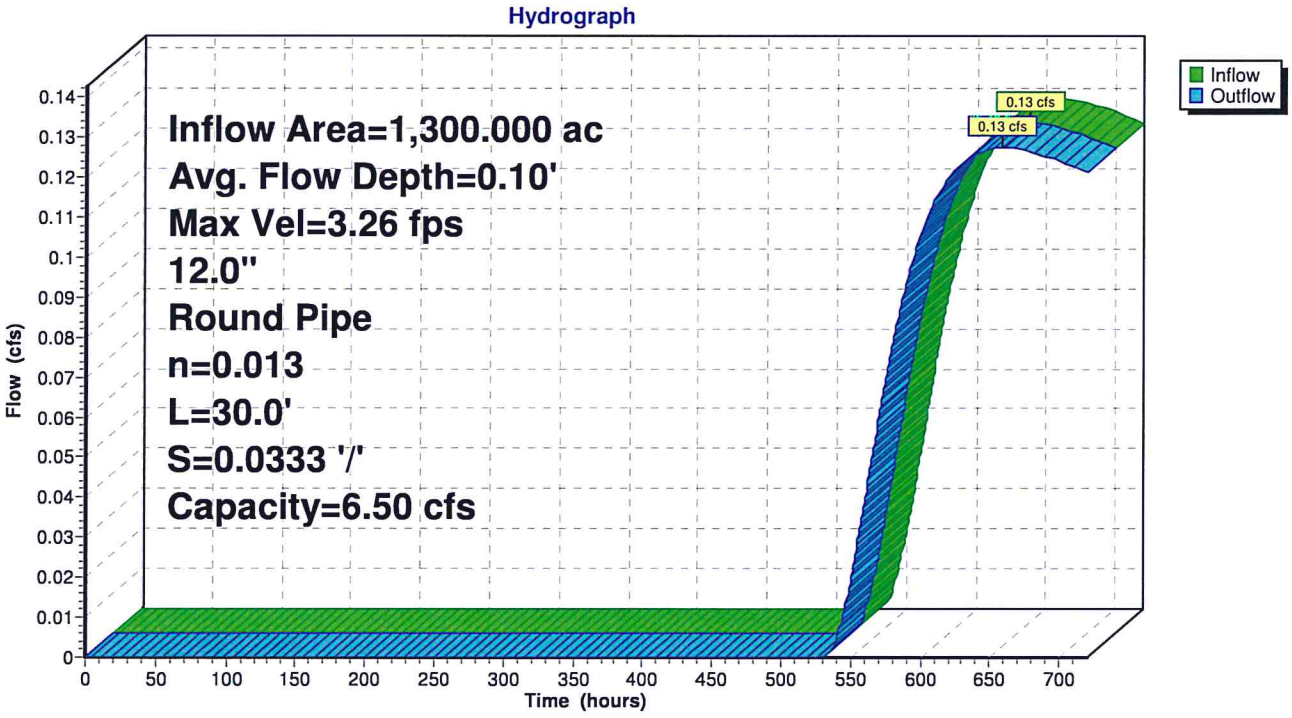
Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.01" for 2% event
Inflow = 0.13 cfs @ 658.71 hrs, Volume= 1.510 af
Outflow = 0.13 cfs @ 658.71 hrs, Volume= 1.510 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.88 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 658.71 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.50 cfs

12.0" Round Pipe
n= 0.013
Length= 30.0' Slope= 0.0333 '/'
Inlet Invert= 863.00', Outlet Invert= 862.00'





Summary for Reach 4R: Portage Creek Wetlands

[61] Hint: Exceeded Reach 2R outlet invert by 0.02' @ 659.95 hrs

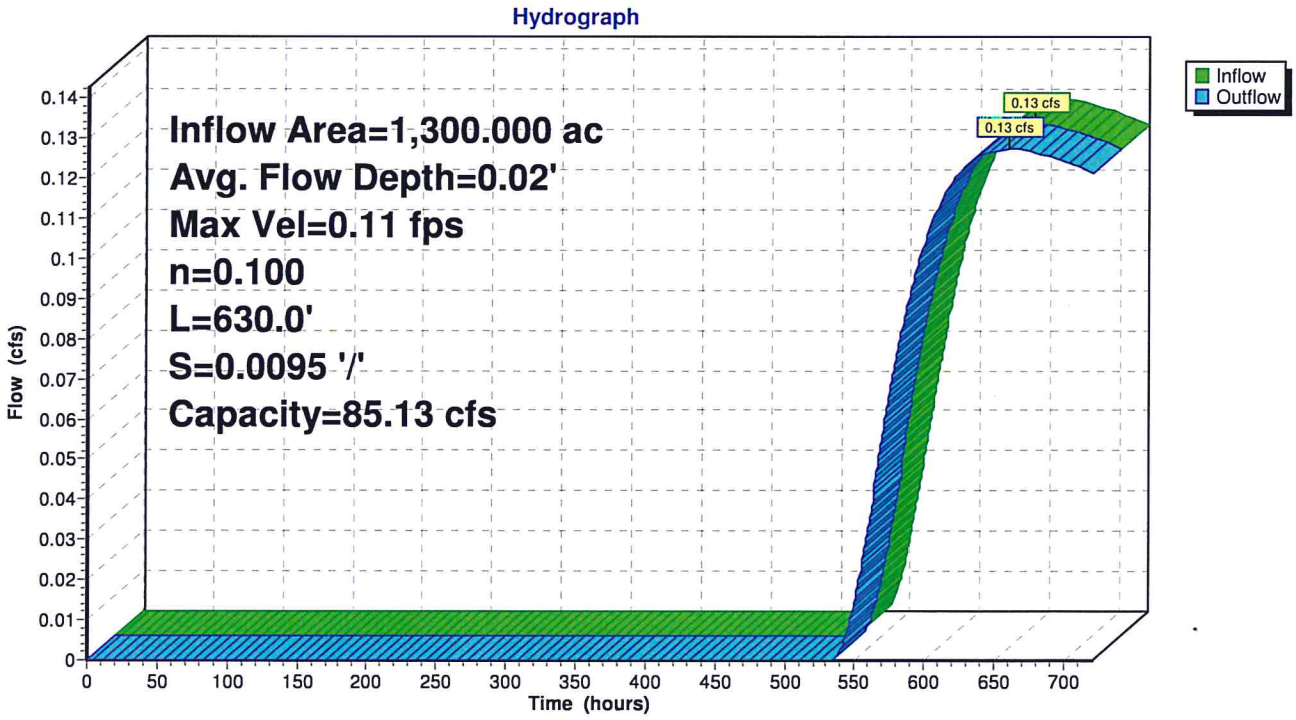
Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.01" for 2% event
Inflow = 0.13 cfs @ 658.71 hrs, Volume= 1.510 af
Outflow = 0.13 cfs @ 659.93 hrs, Volume= 1.493 af, Atten= 0%, Lag= 73.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.11 fps, Min. Travel Time= 98.5 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 109.5 min

Peak Storage= 753 cf @ 659.93 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 1.00' Flow Area= 60.0 sf, Capacity= 85.13 cfs

60.00' x 1.00' deep channel, n= 0.100
Length= 630.0' Slope= 0.0095 '/'
Inlet Invert= 862.00', Outlet Invert= 856.00'

Reach 4R: Portage Creek Wetlands



Summary for Reach Ditch: Ditch Outlet to Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.30" for 2% event
Inflow = 0.58 cfs @ 245.03 hrs, Volume= 32.094 af
Outflow = 0.58 cfs @ 245.07 hrs, Volume= 32.092 af, Atten= 0%, Lag= 1.9 min

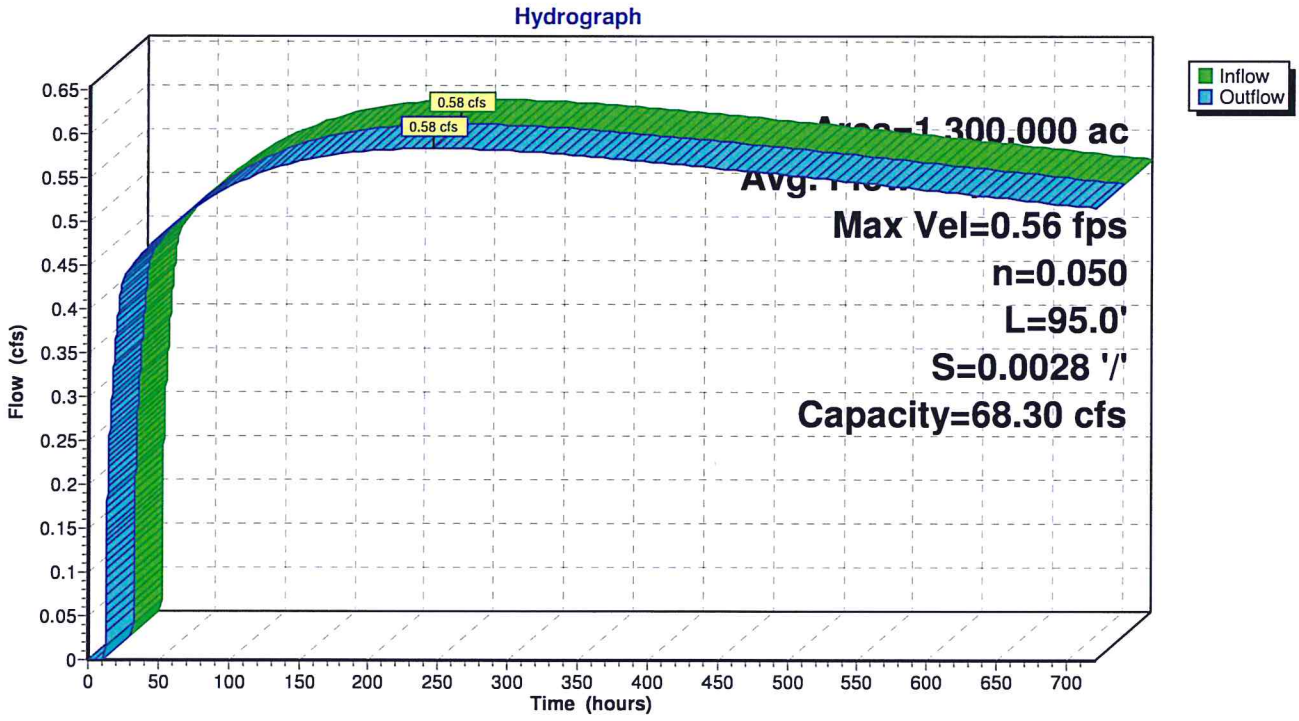
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.56 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 2.9 min

Peak Storage= 100 cf @ 245.07 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 68.30 cfs

4.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 95.0' Slope= 0.0028 '/'
Inlet Invert= 868.07', Outlet Invert= 867.80'



Reach Ditch: Ditch Outlet to Greenspire Bog



Summary for Reach Greenspire Outlet Pipe: Outlet to Infiltration

[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach Ditch OUTLET depth by 0.11' @ 245.20 hrs

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.30" for 2% event
Inflow = 0.58 cfs @ 245.07 hrs, Volume= 32.092 af
Outflow = 0.58 cfs @ 245.08 hrs, Volume= 32.090 af, Atten= 0%, Lag= 1.1 min

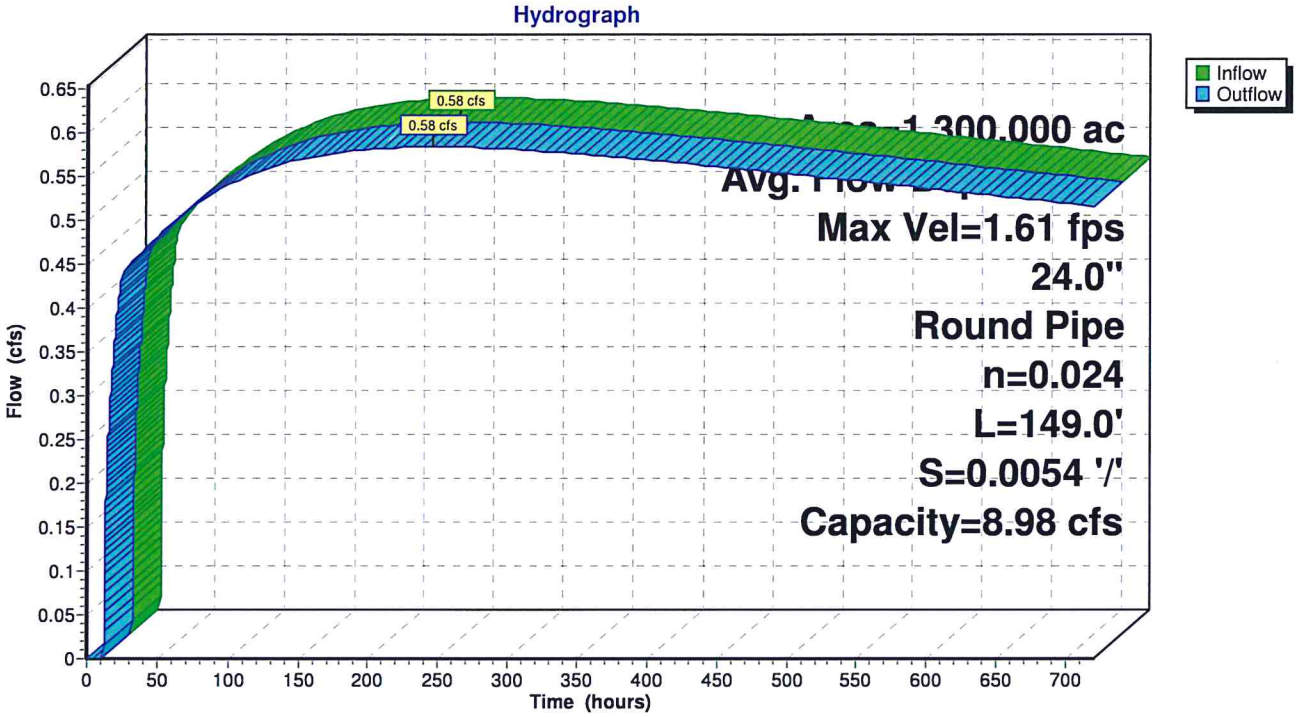
Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.58 fps, Avg. Travel Time= 1.6 min

Peak Storage= 54 cf @ 245.08 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 8.98 cfs

24.0" Round Pipe
n= 0.024
Length= 149.0' Slope= 0.0054 '/'
Inlet Invert= 867.80', Outlet Invert= 867.00'



Reach Greenspire Outlet Pipe: Outlet to Infiltration



Summary for Reach HC Outlet Pipe: Outlet Storm Sewer

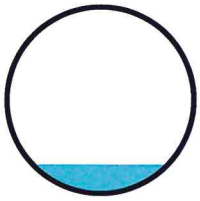
[52] Hint: Inlet/Outlet conditions not evaluated

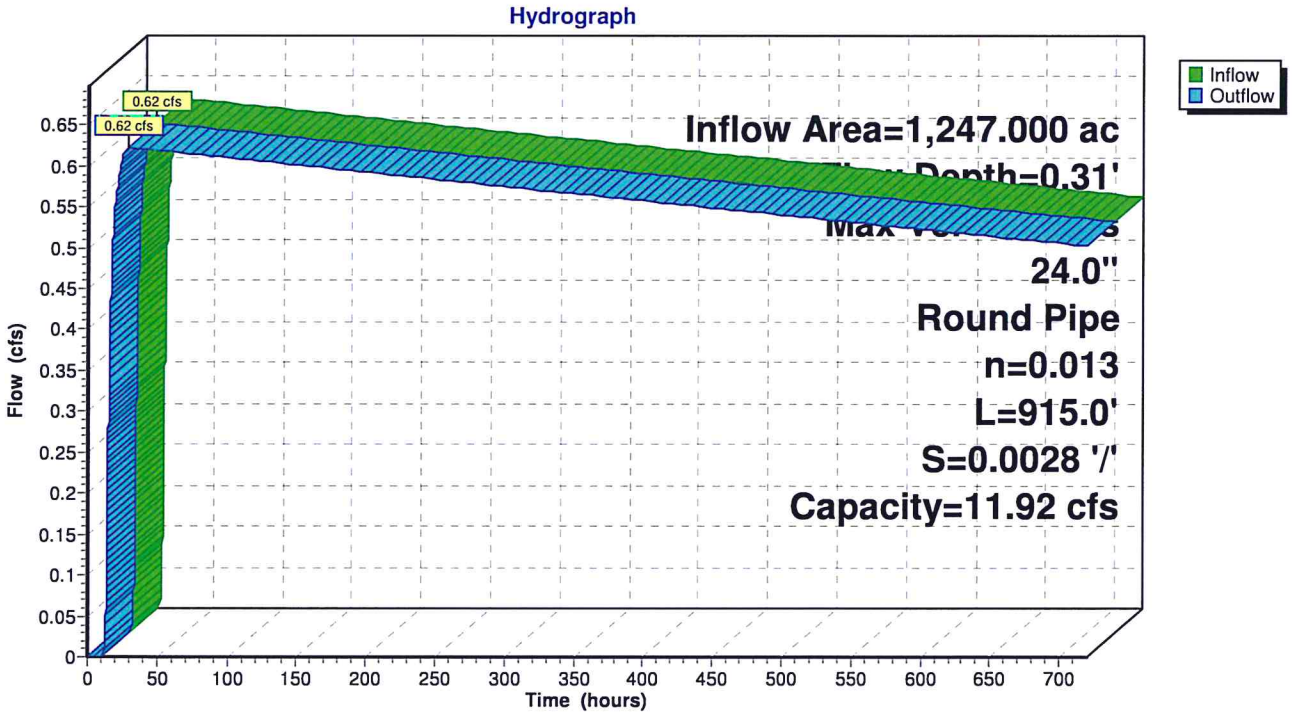
Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth > 0.32" for 2% event
Inflow = 0.62 cfs @ 28.90 hrs, Volume= 32.775 af
Outflow = 0.62 cfs @ 29.00 hrs, Volume= 32.770 af, Atten= 0%, Lag= 5.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 7.6 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 7.9 min

Peak Storage= 284 cf @ 29.00 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 11.92 cfs

24.0" Round Pipe
n= 0.013
Length= 915.0' Slope= 0.0028 '/'
Inlet Invert= 872.44', Outlet Invert= 869.90'





Summary for Pond G. Bog: Greenspire Bog

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.35" for 2% event
Inflow = 41.76 cfs @ 12.53 hrs, Volume= 38.022 af
Outflow = 0.58 cfs @ 245.03 hrs, Volume= 32.094 af, Atten= 99%, Lag= 13,950.4 min
Primary = 0.58 cfs @ 245.03 hrs, Volume= 32.094 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 868.39' @ 245.07 hrs Surf.Area= 891,964 sf Storage= 278,702 cf

Plug-Flow detention time= 7,351.4 min calculated for 32.094 af (84% of inflow)
Center-of-Mass det. time= 3,566.5 min (22,061.4 - 18,494.9)

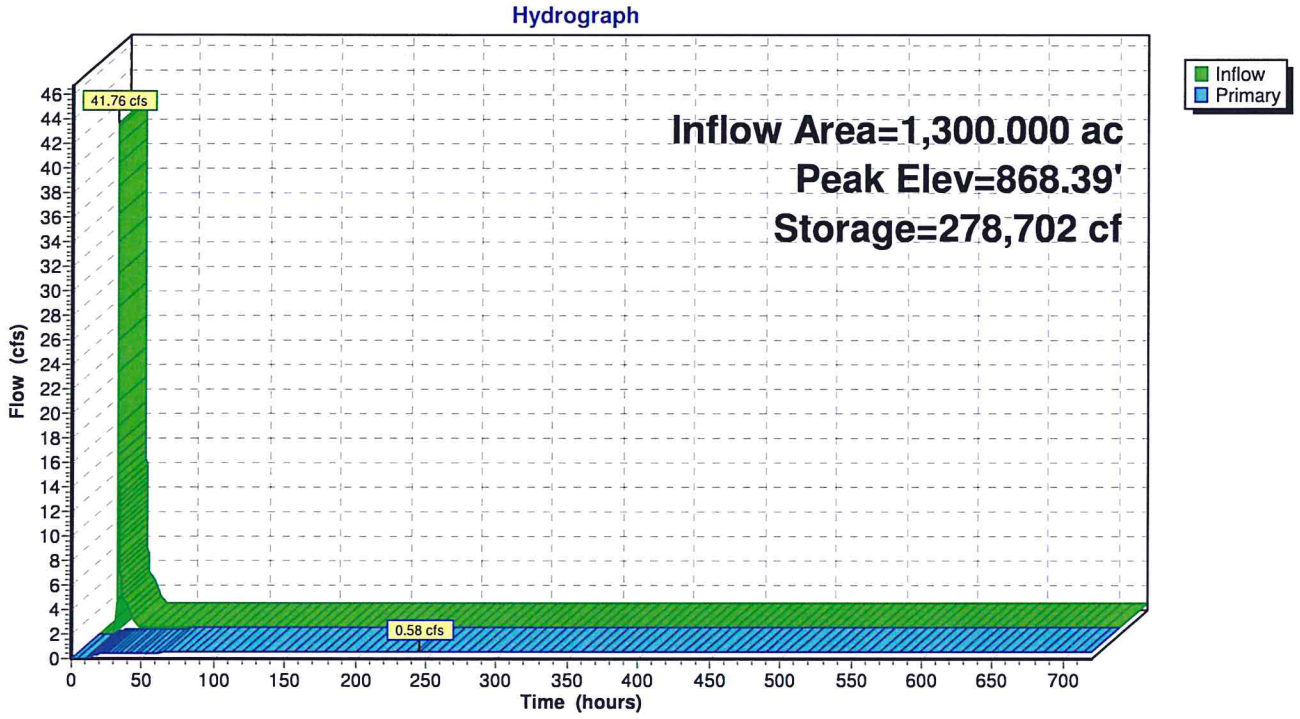
Volume	Invert	Avail.Storage	Storage Description
#1	868.07'	3,748,127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
868.07	874,883	0	0
870.00	979,381	1,789,365	1,789,365
872.00	979,381	1,958,762	3,748,127

Device	Routing	Invert	Outlet Devices
#1	Primary	868.07'	**2.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.58 cfs @ 245.03 hrs HW=868.39' TW=868.30' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.58 cfs @ 0.93 fps)

Pond G. Bog: Greenspire Bog



Summary for Pond H.C. Bog: Hampton Creek Bog

Inflow Area = 1,247.000 ac, 0.00% Impervious, Inflow Depth = 1.12" for 2% event
Inflow = 271.50 cfs @ 14.52 hrs, Volume= 116.664 af
Outflow = 0.62 cfs @ 28.90 hrs, Volume= 32.775 af, Atten= 100%, Lag= 863.1 min
Primary = 0.62 cfs @ 28.90 hrs, Volume= 32.775 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 873.52' @ 28.92 hrs Surf.Area= 4,671,840 sf Storage= 5,052,108 cf

Plug-Flow detention time= 20,483.7 min calculated for 32.773 af (28% of inflow)
Center-of-Mass det. time= 20,312.5 min (21,315.9 - 1,003.4)

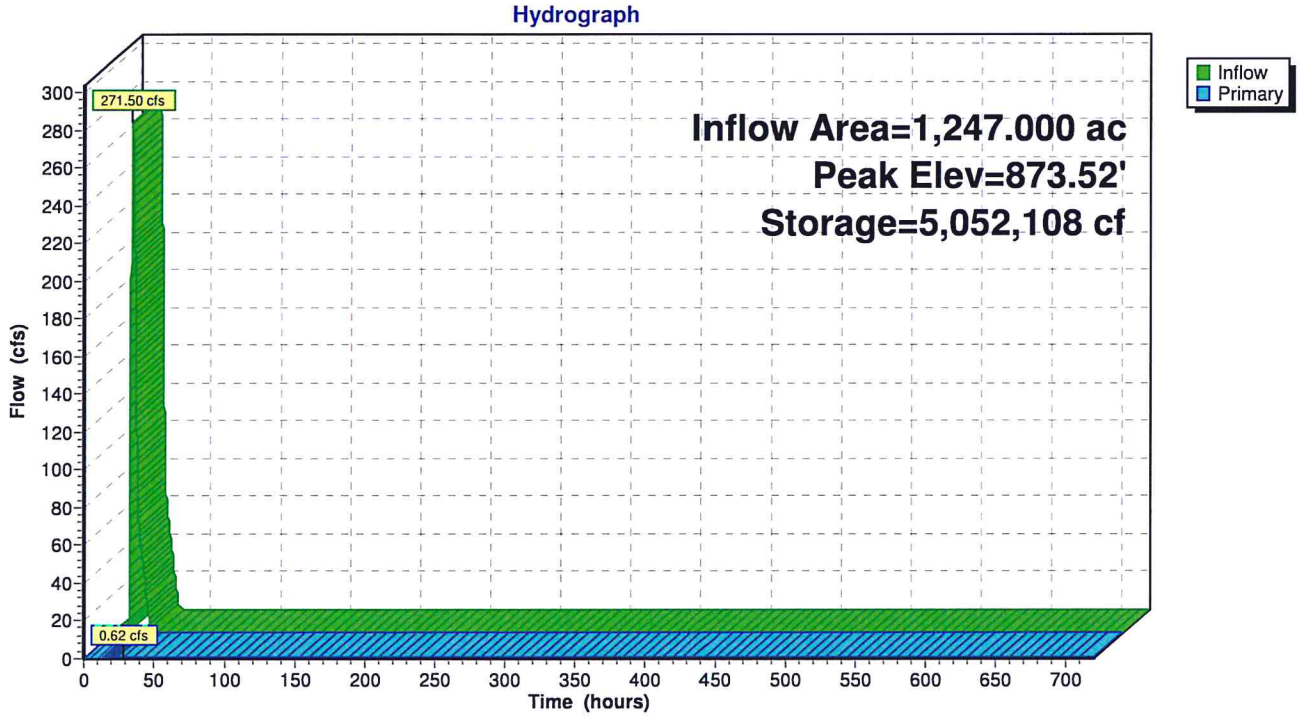
Volume	Invert	Avail.Storage	Storage Description
#1	872.44'	16,631,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
872.44	4,671,840	0	0
876.00	4,671,840	16,631,750	16,631,750

Device	Routing	Invert	Outlet Devices
#1	Primary	872.44'	**1.5" Vert. Orifice/Grate X 12.00** C= 0.600

Primary OutFlow Max=0.62 cfs @ 28.90 hrs HW=873.52' TW=872.75' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 0.62 cfs @ 4.23 fps)

Pond H.C. Bog: Hampton Creek Bog



Summary for Pond Limestone: Limestone Storage

Inflow Area = 1,300.000 ac, 0.00% Impervious, Inflow Depth > 0.30" for 2% event
Inflow = 0.58 cfs @ 245.08 hrs, Volume= 32.090 af
Outflow = 0.53 cfs @ 658.71 hrs, Volume= 24.820 af, Atten= 10%, Lag= 24,817.5 min
Primary = 0.13 cfs @ 658.71 hrs, Volume= 1.510 af
Secondary = 0.40 cfs @ 49.20 hrs, Volume= 23.310 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs
Peak Elev= 866.17' @ 658.71 hrs Surf.Area= 8.506 ac Storage= 7.285 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 997.3 min (23,061.1 - 22,063.7)

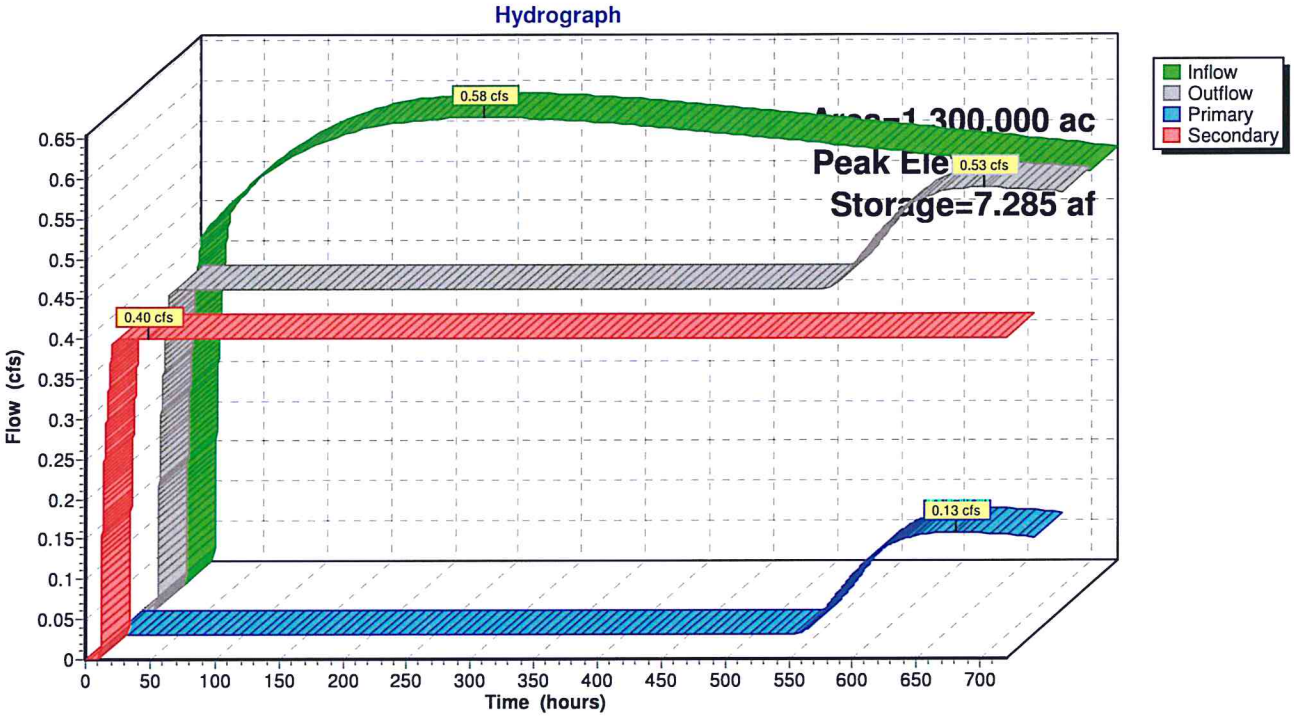
Volume	Invert	Avail.Storage	Storage Description
#1	864.00'	13.579 af	**600.00'W x 600.00'L x 4.00'H Prismatoid Z=2.0** 33.947 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Secondary	864.00'	**0.40 cfs Exfiltration at all elevations**
#2	Primary	866.00'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 658.71 hrs HW=866.17' TW=863.10' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.13 cfs @ 1.41 fps)

Secondary OutFlow Max=0.40 cfs @ 49.20 hrs HW=864.04' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Pond Limestone: Limestone Storage

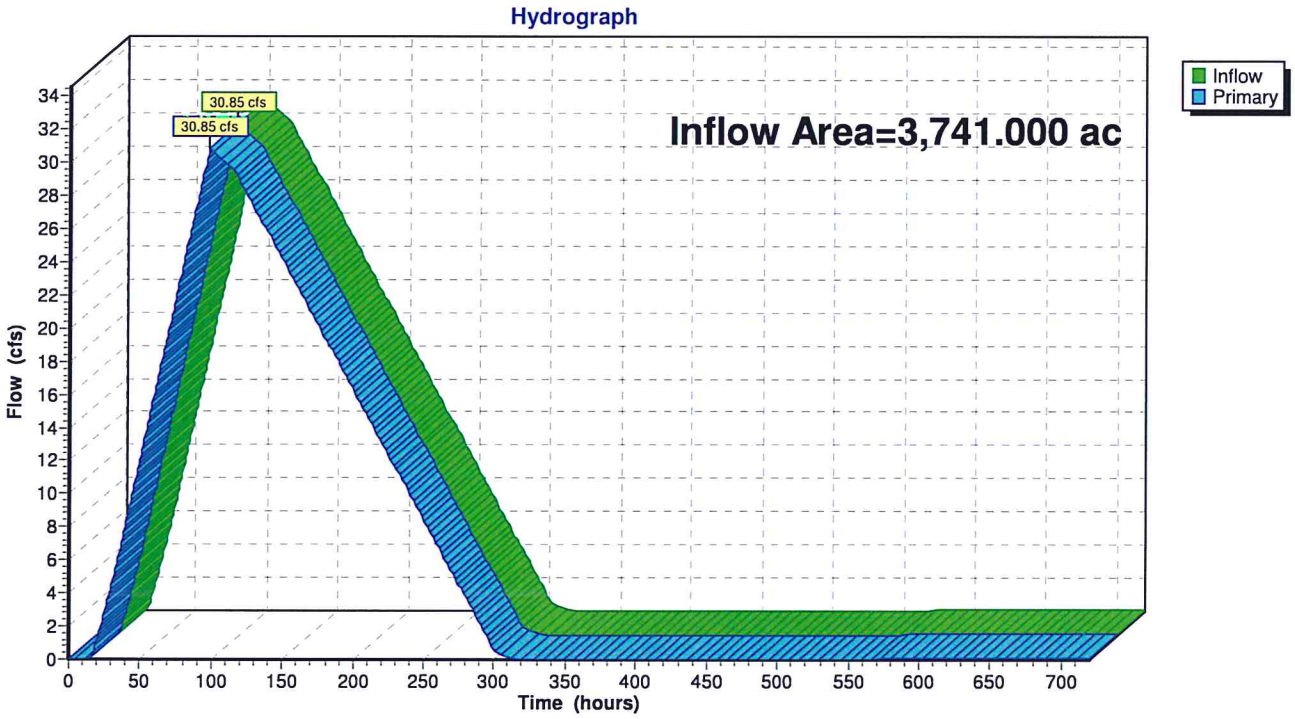


Summary for Link 1L: Portage Creek

Inflow Area = 3,741.000 ac, 0.00% Impervious, Inflow Depth > 1.21" for 2% event
Inflow = 30.85 cfs @ 97.79 hrs, Volume= 376.299 af
Primary = 30.85 cfs @ 97.79 hrs, Volume= 376.299 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 1L: Portage Creek



Summary for Link 3L: Groundwater

Inflow = 0.40 cfs @ 49.20 hrs, Volume= 23.310 af
Primary = 0.40 cfs @ 49.20 hrs, Volume= 23.310 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-720.00 hrs, dt= 0.05 hrs

Link 3L: Groundwater

