Appendix E:
Popes Head Creek Stormwater Management (SWMM) RUNOFF and TRANSPORT Model

1 Purpose

The purpose for developing the Popes Head Creek SWMM RUNOFF and TRANSPORT model is to represent current watershed conditions; including flow, imperviousness, and load, as well as future conditions used as a baseline by which additional stormwater management facilities may be evaluated.

2 Assumptions and Parameters

All SWMM RUNOFF and TRANSPORT model inputs were developed following the guidance detailed in *Technical Memorandum No. 3: Stormwater and GIS Interface Guidelines* (CDM June 2003, herein referred to as TM3). In instances where TM3 did not provide specific guidance, the method used to develop model inputs is described in this section. The calibrated parameters used in the model are listed in Tables 5.1 to 5.5 of Section 5.

2.1 Driveways and Directly Connected Impervious Area (DCIA)

For the purpose of this model, Popes Head Creek watershed was divided into four basins and 58 subbasins. Impervious area for the watershed was delineated from Fairfax County's GIS coverages of buildings, roads, and parking lots; however driveways were not included in the county data. This source of imperviousness was determined by evaluating existing county GIS layers to calculate driveway areas for typical single family residences in the three residential land use coverages.

The average driveway length for homes categorized as estate residential was calculated as 240 feet. The 40-foot length of driveway closest to the home was calculated as 20 feet wide, while the width of the remaining 200 feet was calculated as10 feet (one car width).

In areas of low and medium density residential land use, a driveway width of 20 feet (two car widths) was calculated. In low density residential areas, the length of driveway was calculated as 90 feet while in medium density residential areas driveway length was 50 feet.

Using these dimensions, a driveway area was assigned to each single-family residence in the watershed according to land use. Per TM3, 50 percent of the single family residence area and 100 percent of the driveway area was considered to be directly connected impervious area (DCIA). These impervious areas, along with the DCIA from roads, parking lots, and sidewalks were summed to determine the overall percent imperviousness for current conditions in each subbasin.

2.2 Future Land Use and Imperviousness

Based on Fairfax County's GIS coverages, including that which assigns a future land use condition to each parcel, future conditions were evaluated within the watershed according to TM3 guidelines. However, there were several instances for vacant and underdeveloped parcels where future land use appeared to be less impervious than what is seen in current conditions. Where such backsliding occurred, future land use was assigned according to the more dense classification, whether it was current (GENCLU) or planned (GENPLU) land use. To provide validation to this methodology, a comprehensive review was performed on each of the parcels that appeared to be backsliding. This review included communication with the county and an evaluation of the realistic expectations of these parcels (i.e., a parcel in a downzoned residential area was unlikely to be re-zoned to allow development at a greater density).

2.3 Stormwater Management Facilities

Stormwater management (SWM) facilities were included in the model following guidance provided in TM3. Whether the facility provided only peak-shaving or both peak-shaving and water quality BMPs was determined by the year the facility was developed. It was assumed that SWM facilities with no assigned date of development were peak-shaving facilities.

The storage and outflow relationship for each SWM facility was defined such that peak flows under current conditions and future land use were equal to the peak flows for the two-year and 10-year design storms under undeveloped conditions. The rainfall intensities for the two-year and 10-year storms were taken from Fairfax County’s Department of Public Works and Environmental Services Public Facilities Manual (2001). Storage volume for each facility was calculated according to the Northern Virginia Planning District Commission’s (NVPDC) Northern Virginia BMP Handbook, which was then used to determine the 48-hour drawdown rate (NVPDC 1992).

For SWM facilities providing water quality BMPs, removal efficiencies provided in TM3 were used. These values were supplemented with literature values to develop a complete list of removal efficiencies for each pollutant in both wet and dry ponds (Atlanta Regional Commission 2001; UWRRC 2004). To incorporate SWM facilities in the SWMM model, land use categories were created to represent wet and dry ponds. Within these categories, average pollutant removal efficiencies were assigned to the BMPs serving each subbasin. This method produces the same effect as TRANSPORT Quality Dividers in earlier versions of SWMM.

Future landuse was applied in the model to investigate potential watershed loadings from as-planned build-out perspective. Given the scale and uncertainty of how the change from current to future (or planned) landuse is to occur and the site-specific nature of SWM facilities (size/location/function), theoretical BMPs were not included in the model for examining future landuse. While new or redevelopment would result in SWM/BMP facilities being incorporated per site development, this level of site-specific future development was not incorporated into the model.

2.4 Rainfall Data

Three year, continuous simulations were run using rainfall data from the Upper Cub gage (T1080) managed by the county's Sewer Line Maintenance Division. Upper Cub was chosen because its proximity to Popes Head Creek. Rainfall data from 1996-1998 were used for model calibration. As specified in TM3, these years were chosen as they represent wet, dry, and average annual rainfall conditions as well as provide a range of storms appropriate for water quality modeling. The model was verified using rainfall data from a separate period, 1999-2001, as suggested in TM3.

2.5 Water Quality Parameters

All water quality inputs used in the model follow guidance provided in *Development of SWMM Water Quality Inputs for Fairfax County, Virginia* (LTI 2004). This includes pollutant buildup and washoff parameters as well as baseflow pollutant concentrations.

2.6 Dry Weather Flow

Surface water data collected by U.S. Geological Survey (USGS) were used to develop a dry weather flow rate for the watershed. Streamflow data collected from 1996 to 1998 at gages in Northern Virginia with similar imperviousness and drainage area to that of the Popes Head Creek watershed were chosen. Wet-weather periods (over 0.1 inches of rain) were removed from the data to calculate an average dry weather flow rate for each gage. These values were averaged and scaled based on drainage area to develop a dry weather flow rate for Popes Head Creek of 13 cfs (0.7 cfs per square mile). This baseflow was distributed by area amongst the 58 subbasins.

3 Calibration and Verification

3.1 Flow Calibration

The model was calibrated following procedures detailed in TM3 and using USGS streamflow data from gages in Fairfax County and Northern Virginia collected from 1996 to 1998. Flow values were plotted as a function of the drainage area to compare modeled flow to the USGS data. Impervious and pervious storage depth parameters, infiltration parameters, and slopes for every subbasin were adjusted until modeled flow for Popes Head Creek was within the range of monitored flow in the region. A comparison of average flows over the simulation period is shown as a function of drainage area in Figure 3.1. Flow duration curves, normalized by drainage area, were also compared to determine whether the model responded appropriately in both the height and duration of wet weather flows, as shown in Figure 3.2. Seasonal, annual, and total flow volumes from the Popes Head Creek model were also compared to USGS gage data, normalized by drainage area, and fell within the range of monitored values.

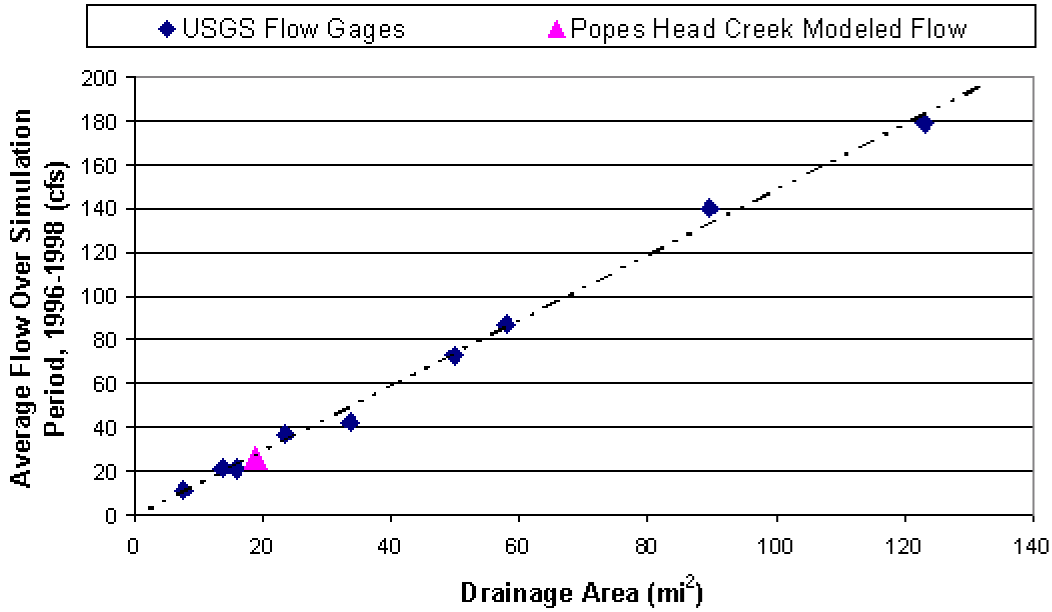

Figure 3.1. Calibrated Average Flow for Popes Head Creek

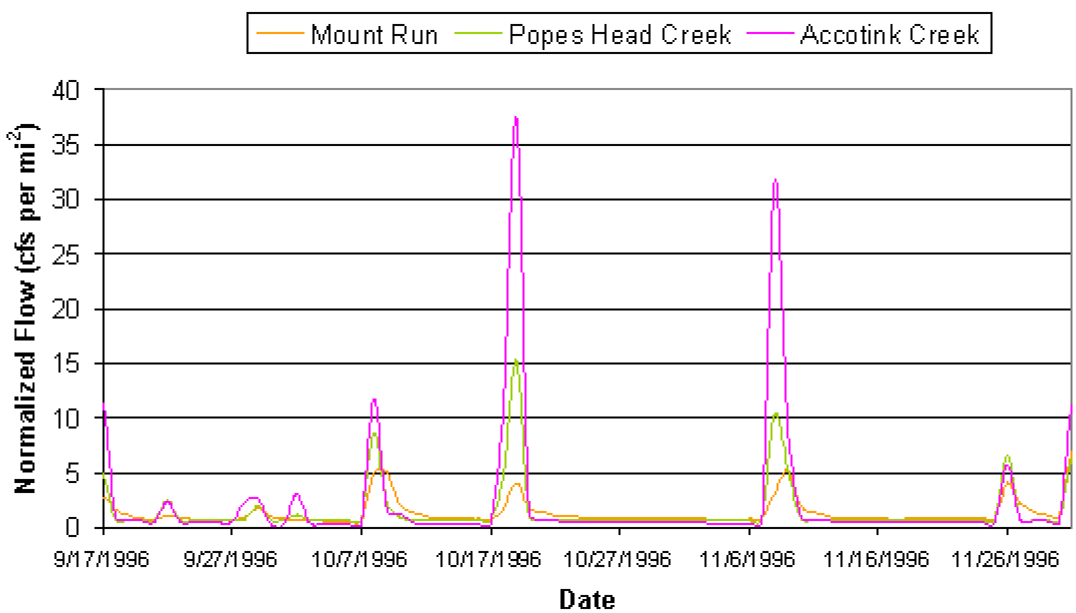

Figure 3.2. Calibrated Normalized Flow Duration Curves for Popes Head Creek

3.2 Water Quality Calibration

Virginia Department of Environmental Quality (VA DEQ) water quality data, collected from 1996 to 1998 at a station outside Clifton, VA (Station ID# 1APOE002.00) was used for calibration of water quality parameters. Using this data, dry weather flow concentrations specific to Popes Head Creek were calculated. For some pollutants, baseflow concentrations in Popes Head Creek were lower than those determined for all of Fairfax County. Lower imperviousness and the downzoned status of much of the watershed contribute to these lower concentrations. Baseflow concentrations for the Popes Head

Creek model were set to the specific values determined from VA DEQ data in this watershed to better represent local stream conditions. The baseflow concentrations used are given in Table 3.1.

Table 3.1. Pollutant Concentrations Associated with Baseflow Conditions in Popes Head Creek

Pollutant	Baseflow Concentration
BOD5	1.0 mg/L
COD	9.0 mg/L
TSS	1.5 mg/L
TDS	102 mg/L
TP	0.1mg/L
TKN	0.3 mg/L
TN	0.7mg/L
TCD	0.004 mg/L
TCU	0.005 mg/L
TPB	0.003 mg/L
TZN	0.018 mg/L
DP	0.05 mg/L

3.3 Verification of the Hydrology Model

Verification was performed as described in Section 4.11 of TM3. The years 1999 to 2001 provided the continuous, multi-year period used for verification of the hydrology model. Modeled seasonal, annual, and total flow volumes were compared to USGS gage data, normalized by drainage area. Volumes for Popes Head Creek fell within the range of monitored values as shown in Figure 3.3 and Figure 3.4. Average flows over this time period were also compared as a function of drainage area. For this comparison, illustrated in Figure 3.5, model results were again comparable to USGS monitored flow rates.

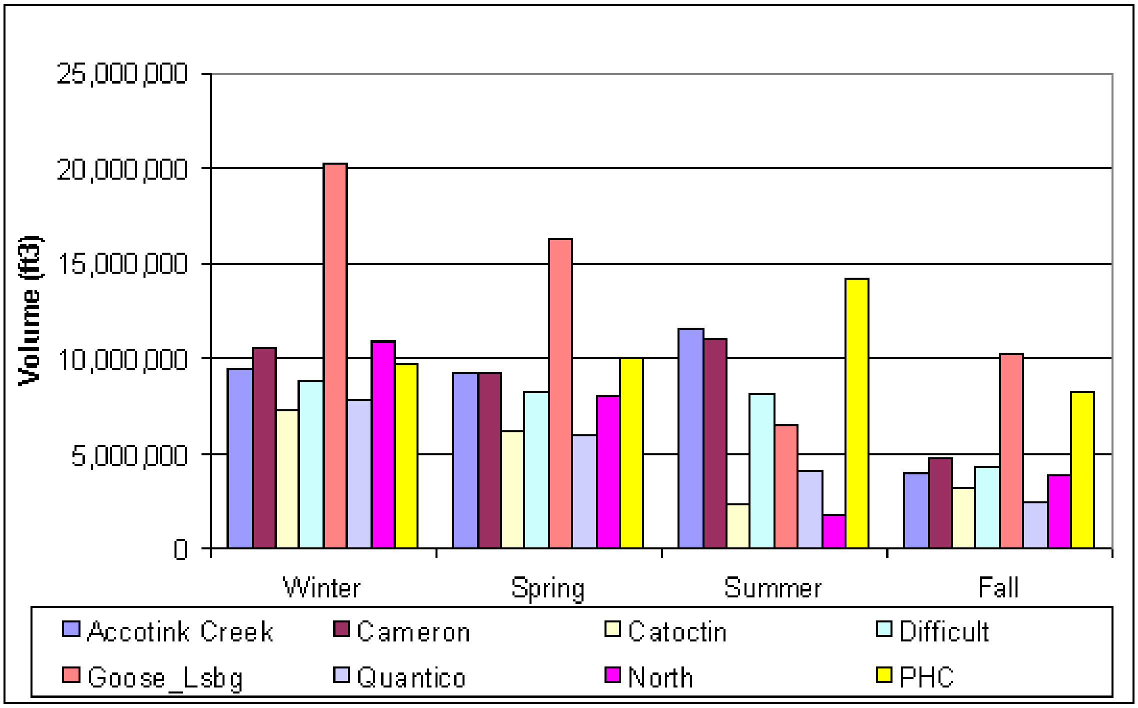

Figure 3.3. Comparison of Normalized Seasonal Volumes from 1999 to 2001 for model verification

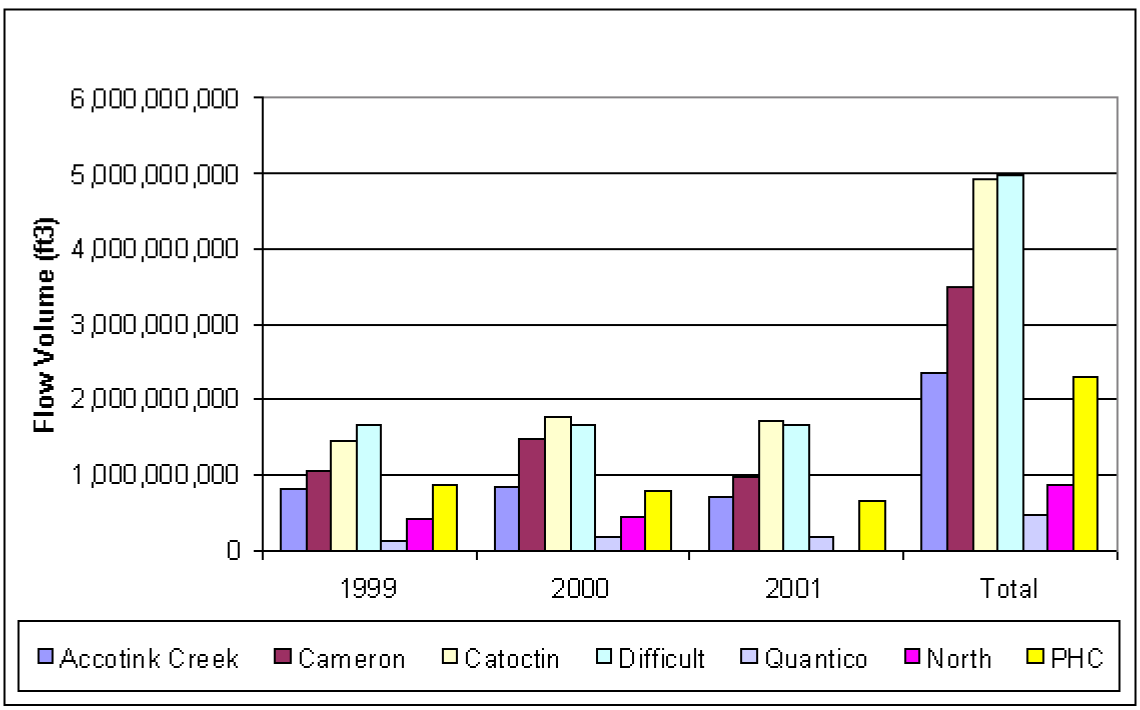

Figure 3.4. Comparison of Annual and Total Volumes from 1999 to 2001 for model verification

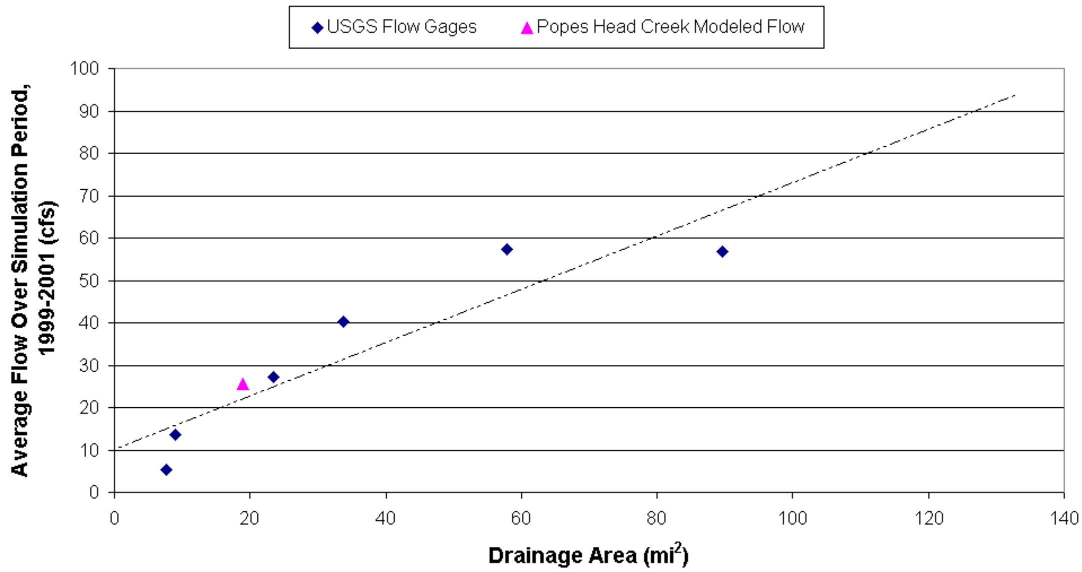

Figure 3.5. Average stream flow from 1999 to 2001 as a function of drainage area for model verification

3.4 Verification of the Water Quality Model

Pollutant loading rates were calculated from the Popes Head Creek model and compared to loading rates reported in literature to verify the water quality parameters. Pollutant loading rates from recent studies within the region are provided for comparison in Table 3.2.

Table 3.2. Comparison of Area TN, TP, and TSS Loading Rates (lb/ac/yr) to Model Results

Chesapeake Bay Potomac WSM Loading Rate (Palone, 1997)			
	TN	TP	TSS
Forest	3	0.05	-
Pasture	9.34	0.61	-
Urban	11.44	0.67	-
Cropland	21.13	1.84	-
Occoquan Watershed (OWML, 1998)			
	TN	TP	TSS
Occoquan Basin	8	0.55	281
Values for Popes Head Creek			
	TN	TP	TSS
	3.8	0.2	19

4 Results

The fully calibrated model was used to evaluate the impact of future development within the watershed on flow rates, velocity, and water quality. Increased flows, velocity, and pollutant loadings were assessed for the three main tributaries (East Fork, Piney Branch, and Castle Creek) as well as the entire watershed. For the tributaries, reported values were taken from the mouth of the tributary before they merge with Popes Head Creek. For the entire watershed, reported values were taken from the main channel as it flows out of basin PH30. Values for peak flow, peak velocity, and pollutant loading rates under current and future conditions for these four main areas are given in Table 4.1 including the percent increase for each value.

Table 4.1. Increase in Flow, Velocity, and Pollutant Loading Rates that Result in Moving from Current to Future Land Use Conditions

	Current Conditions	Future Conditions	Percent Difference
Mouth of East Fork (EFOUT)			
Peak Flow over simulation period (cfs)	257	257	0%
Peak Velocity over simulation period (ft/s)	4.13	4.13	0%
Total Loads (tons/year)			
Biological Oxygen Demand (BOD)	12.6	13.6	8%
Chemical Oxygen Demand (COD)	76.3	82.0	7%
Total Suspended Solids (TSS)	58.6	61.7	5%
Total Dissolved Solids (TDS)	124	129	4%
Dissolved Phosphorus (DP)	0.117	0.125	7%
Total Phosphorus (TP)	0.346	0.365	5%
Total Kjeldahl Nitrogen (TKN)	1.756	1.888	8%
Total Nitrogen (TN)	2.937	3.113	6%
Total Cadmium (TCd)	0.001	0.001	0%
Total Copper (TCu)	0.024	0.026	8%
Total Lead (TPb)	0.004	0.004	0%
Total Zinc (TZn)	0.118	0.127	7%
Mouth of Piney Branch (PIOUT)			
Peak Flow over simulation period (cfs)	402	414	3%
Peak Velocity over simulation period (ft/s)	3.63	3.67	1%
Total Loads (tons/year)			
BOD	28.0	29.5	5%
COD	165.5	173.4	5%
TSS	88.5	93.8	6%
TDS	468	473	1%
DP	0.286	0.300	5%
TP	0.852	0.896	5%
TKN	3.989	4.163	4%
TN	6.586	6.833	4%
TCd	0.004	0.005	1%
TCu	0.042	0.044	4%
TPb	0.018	0.019	2%
TZn	0.182	0.190	4%
Mouth of Castle Creek (CCOUT)			
Peak Flow over simulation period (cfs)	271	271	0%
Peak Velocity over simulation period (ft/s)	4.26	4.26	0%
Total Loads (tons/year)			
BOD	8.2	8.7	6%
COD	49.8	52.4	5%
TSS	21.7	23.1	7%
TDS	183	185	1%

DP	0.093	0.099	6%
TP	0.270	0.287	6%
TKN	1.243	1.300	5%
TN	2.105	2.177	3%
TCd	0.002	0.002	2%
TCu	0.014	0.014	3%
TPb	0.008	0.008	3%
TZn	0.055	0.057	4%
Mouth of Popes Head Creek (OUT)			
Peak Flow over simulation period (cfs)	871	906	4%
Peak Velocity over simulation period (ft/s)	5.84	5.90	1%
Total Loads (tons/year)			
BOD	88.4	96.5	9%
COD	529.0	570.7	8%
TSS	281.4	313.4	11%
TDS	1,687	1,721	2%
DP	0.891	0.958	7%
TP	2.632	2.821	7%
TKN	12.988	13.961	7%
TN	22.238	23.730	7%
TCd	0.016	0.016	1%
TCu	0.151	0.163	8%
TPb	0.064	0.066	4%
TZn	0.652	0.717	10%

5 Final Input Parameters

Table 5.1 Conduit Inputs to SWMM

Name	Inlet Node	Outlet Node	Length (ft)	Slope (%)	Manning N	Inlet Height (ft)	Outlet Height (ft)	Init. Flow (cfs)	Type	Max Depth (ft)	Bottom Width (ft)	Left Slope (ft/ft)	Right Slope (ft/ft)
CC02	05CC	03CC	4537	1.32	0.08	0	0	0	TRAPEZOIDAL	2.69	6.96	0.06	0.24
CC04	04CC	03CC	2792	1.25	0.09	0	0	0	TRAPEZOIDAL	1.55	4.65	0.96	1.84
CC05	03CC	02CC	4400	0.59	0.07	0	0	0	TRAPEZOIDAL	4.31	8.68	0.07	1.04
CC07	02CC	01CC	2773	0.72	0.07	0	0	0	TRAPEZOIDAL	4.41	12.4	0.73	0.18
CCOUT	01CC	5	1	0.00	0.07	0	0	0	TRAPEZOIDAL	4.41	12.4	0.73	0.18
EF02	04EF	03EF	2414	1.20	0.05	0	0	0	TRAPEZOIDAL	6.19	5.03	1.69	0.28
EF03	03EF	02EF	3654	0.93	0.06	0	0	0	TRAPEZOIDAL	5.03	11.3	0.15	0.1
EF04	02EF	01EF	3842	0.55	0.07	0	0	0	TRAPEZOIDAL	4.7	7.9	0.41	1.86
EFOUT	01EF	14	1	0.00	0.07	0	0	0	TRAPEZOIDAL	4.7	7.9	0.41	1.86
PH03	17	16	2481	0.64	0.08	0	0	0	TRAPEZOIDAL	3.94	15.15	0.69	1.18
PH05	16	15	2948	0.54	0.08	0	0	0	TRAPEZOIDAL	4.96	15.45	1.76	0.99
PH07	15	14	2660	0.64	0.07	0	0	0	TRAPEZOIDAL	2.78	9.82	0.61	1.07
PH08	14	13	2401	0.42	0.07	0	0	0	TRAPEZOIDAL	5.08	17.85	0.4	1.35
PH09	13	12	3248	0.43	0.07	0	0	0	TRAPEZOIDAL	7.48	18.85	1.15	0.41
PH10	12	11	3197	0.41	0.07	0	0	0	TRAPEZOIDAL	6.76	16.32	0.8	0.7
PH12	01Bc	11	4757	1.28	0.07	0	0	0	TRAPEZOIDAL	3.17	9.05	2.98	0.29
PH13	11	10	3301	0.24	0.07	0	0	0	TRAPEZOIDAL	6.2	27.86	1.43	0.16
PH16	01Bb	10	4579	0.76	0.07	0	0	0	TRAPEZOIDAL	4.19	7.77	0.12	4.21
PH17	10	9	1914	0.47	0.07	0	0	0	TRAPEZOIDAL	5.19	12.24	1.12	0.22
PH18	9	8	5041	0.30	0.07	0	0	0	TRAPEZOIDAL	5.78	31.42	0.17	0.25

PH20	02Ba	01Ba	6776	0.84	0.07	0	0	0	TRAPEZOIDAL	2.68	4.55	2.8	0.22
PH21	01Ba	8	1796	0.61	0.07	0	0	0	TRAPEZOIDAL	1.81	4.37	0.32	1.04
PH22	8	7	5697	0.30	0.07	0	0	0	TRAPEZOIDAL	6.88	28.51	1.01	0.8
PH23	7	6	1357	0.66	0.06	0	0	0	TRAPEZOIDAL	6.17	6.14	0.41	0.36
PH25	6	5	3997	0.18	0.08	0	0	0	TRAPEZOIDAL	6.23	17.34	0.32	2.16
PH26	5	4	3857	0.41	0.08	0	0	0	TRAPEZOIDAL	6.21	18.88	0.73	2.05
PH27	4	3	3575	0.31	0.07	0	0	0	TRAPEZOIDAL	6.21	34.6	0.68	0.56
PH29	3	2	2296	0.35	0.07	0	0	0	TRAPEZOIDAL	6.21	38.28	0.74	0.53
PH30	2	1	3352	0.57	0.07	0	0	0	TRAPEZOIDAL	23.9	14.18	0.38	0.77
OUT	1	0	1	0.00	0.07	0	0	0	TRAPEZOIDAL	23.9	14.18	0.38	0.77
PI03	11PI	10PI	1323	0.68	0.08	0	0	0	TRAPEZOIDAL	2.33	7.68	1.95	0.99
PI05	10PI	09PI	2405	0.54	0.07	0	0	0	TRAPEZOIDAL	2.2	6.59	0.73	3.05
PI06	09PI	08PI	407	1.72	0.07	0	0	0	TRAPEZOIDAL	2.95	10.98	0.52	0.24
PI08	08PI	07PI	2322	0.65	0.08	0	0	0	TRAPEZOIDAL	4.99	12.35	1.18	0.39
PI09	07PI	05PI	4726	0.66	0.08	0	0	0	TRAPEZOIDAL	3.96	14.55	0.59	0.75
PI11	06PI	05PI	2372	1.52	0.08	0	0	0	TRAPEZOIDAL	2.79	9.43	0.52	0.09
PI12	05PI	04PI	3288	1.22	0.06	0	0	0	TRAPEZOIDAL	7.2	8.33	0.41	0.14
PI13	04PI	03PI	916	0.55	0.06	0	0	0	TRAPEZOIDAL	4.38	28.45	0.72	0.75
PI15	03PI	02PI	2063	0.34	0.07	0	0	0	TRAPEZOIDAL	3.77	26.23	0.77	1.14
PI17	02PI	01PI	3931	0.41	0.08	0	0	0	TRAPEZOIDAL	3.77	31.49	1.45	0.33
PIOUT	01PI	9	1	0.00	0.08	0	0	0	TRAPEZOIDAL	3.77	31.49	1.45	0.33

NOTE: Conduits 1ft. long were inserted for reporting purposes.

Table 5.2. OUTLET Inputs to SWMM.

Name	Inlet Node	Outlet Node	Outflow Height (ft)	Discharge Curve	Qcoeff/ Qtable	Flap Gate	Flow v. Head Curve											
							H1 (ft)	Q1 (cfs)	H2 (ft)	Q2 (cfs)	H3 (ft)	Q3 (cfs)	H4 (ft)	Q4 (cfs)	H5 (ft)	Q5 (cfs)	H6 (ft)	Q6 (cfs)
L_CC03A	S_CC03A	04CC	0	TABULAR	CC03A	NO	0.1	0.01	1.9	0.01	2	4.91	7.2	4.91	7.3	6.55	9.6	6.55
L_CC03B	S_CC03B	04CC	0	TABULAR	CC03B	NO	0.1	0.01	0.3	0.01	0.4	0.73	1.1	0.73	1.2	0.97	1.4	0.97
L_EF01A	S_EF01A	04EF	0	TABULAR	EF01A	NO	0.1	0.02	2.6	0.02	2.7	6.83	10.1	6.83	10.2	9.11	13.4	9.11
L_EF01B	S_EF01B	04EF	0	TABULAR	EF01B	NO	0.1	0.01	2.1	0.01	2.2	5.53	8.1	5.53	8.2	7.37	10.8	7.37
L_EF02B	S_EF02B	03EF	0	TABULAR	EF02B	NO	0.1	0.01	0.2	0.01	0.3	0.52	0.8	0.52	0.9	0.69	1	0.69
L_EF03A	S_EF03A	02EF	0	TABULAR	EF03A	NO	0.1	0.06	9.8	0.06	9.9	25.65	37.7	25.65	37.8	34.22	50.2	34.22
L_EF04A	S_EF04A	01EF	0	TABULAR	EF04A	NO	0.1	0.05	8.5	0.05	8.6	22.32	32.8	22.32	32.9	29.78	43.7	29.78
L_PH01B	S_PH01B	17	0	TABULAR	PH01B	NO	0.1	0.02	2.8	0.02	2.9	7.38	10.9	7.38	11	9.85	14.5	9.85
L_PH03A	S_PH03A	16	0	TABULAR	PH03A	NO	0.1	0.01	1.4	0.01	1.5	3.6	5.3	3.6	5.4	4.81	7.1	4.81
L_PH03B	S_PH03B	16	0	TABULAR	PH03B	NO	0.1	0.01	0.4	0.01	0.5	0.94	1.4	0.94	1.5	1.26	1.8	1.26
L_PH04A	S_PH04A	16	0	TABULAR	PH04A	NO	0.1	0.02	3.1	0.02	3.2	8.11	11.9	8.11	12	10.82	15.9	10.82
L_PH04B	S_PH04B	16	0	TABULAR	PH04B	NO	0.1	0.01	1.5	0.01	1.6	4.05	6	4.05	6.1	5.4	7.9	5.4
L_PH06B	S_PH06B	15	0	TABULAR	PH06B	NO	0.1	0.01	2.3	0.01	2.4	5.89	8.7	5.89	8.8	7.86	11.5	7.86
L_PH09B	S_PH09B	12	0	TABULAR	PH09B	NO	0.1	0.01	1.5	0.01	1.6	3.87	5.7	3.87	5.8	5.16	7.6	5.16
L_PH11A	S_PH11A	01Bc	0	TABULAR	PH11A	NO	0.1	0.01	0.9	0.01	1	2.3	3.4	2.3	3.5	3.07	4.5	3.07
L_PH14B	S_PH14B	01Bb	0	TABULAR	PH14B	NO	0.1	0.02	4.1	0.02	4.2	10.84	15.9	10.84	16	14.45	21.2	14.45
L_PH15B	S_PH15B	01Bb	0	TABULAR	PH15B	NO	0.1	0.01	1.8	0.01	1.9	4.79	7.1	4.79	7.2	6.39	9.4	6.39
L_PH19A	S_PH19A	02Ba	0	TABULAR	PH19A	NO	0.1	0.01	0.3	0.01	0.4	0.84	1.2	0.84	1.3	1.13	1.7	1.13
L_PH22A	S_PH22A	7	0	TABULAR	PH22A	NO	0.1	0.01	0.5	0.01	0.6	1.41	2.1	1.41	2.2	1.88	2.8	1.88
L_PH26B	S_PH26B	4	0	TABULAR	PH26B	NO	0.1	0.01	0.5	0.01	0.6	1.3	1.9	1.3	2	1.74	2.6	1.74
L_PH27A	S_PH27A	3	0	TABULAR	PH27A	NO	0.1	0.08	14.2	0.08	14.3	37.27	54.8	37.27	54.9	49.71	73	49.71
L_PH28B	S_PH28B	3	0	TABULAR	PH28B	NO	0.1	0.01	1.4	0.01	1.5	3.64	5.4	3.64	5.5	4.86	7.1	4.86
L_PH29A	S_PH29A	2	0	TABULAR	PH29A	NO	0.1	0.08	13.9	0.08	14	36.33	53.5	36.33	53.6	48.46	71.1	48.46
L_PI01A	S_PI01A	11PI	0	TABULAR	PI01A	NO	0.1	0.01	0.7	0.01	0.8	1.85	2.7	1.85	2.8	2.47	3.6	2.47
L_PI01B	S_PI01B	11PI	0	TABULAR	PI01B	NO	0.1	0.04	6.3	0.04	6.4	16.46	24.2	16.46	24.3	21.96	32.2	21.96
L_PI02A	S_PI02A	11PI	0	TABULAR	PI02A	NO	0.1	0.02	4.2	0.02	4.3	10.95	16.1	10.95	16.2	14.6	21.4	14.6
L_PI02B	S_PI02B	11PI	0	TABULAR	PI02B	NO	0.1	0.03	5	0.03	5.1	13.08	19.2	13.08	19.3	17.45	25.6	17.45
L_PI03A	S_PI03A	10PI	0	TABULAR	PI03A	NO	0.1	0.02	2.8	0.02	2.9	7.41	10.9	7.41	11	9.88	14.5	9.88
L_PI04A	S_PI04A	10PI	0	TABULAR	PI04A	NO	0.1	0.01	0.6	0.01	0.7	1.57	2.3	1.57	2.4	2.1	3.1	2.1
L_PI05A	S_PI05A	09PI	0	TABULAR	PI05A	NO	0.1	0.01	1.3	0.01	1.4	3.51	5.2	3.51	5.3	4.68	6.9	4.68
L_PI08B	S_PI08B	07PI	0	TABULAR	PI08B	NO	0.1	0.01	0.9	0.01	1	2.39	3.5	2.39	3.6	3.19	4.7	3.19
L_PI13A	S_PI13A	03PI	0	TABULAR	PI13A	NO	0.1	0.01	0.7	0.01	0.8	1.96	2.9	1.96	3	2.61	3.8	2.61
L_PI13B	S_PI13B	03PI	0	TABULAR	PI13B	NO	0.1	0.01	0.2	0.01	0.3	0.42	0.6	0.42	0.7	0.56	0.8	0.56
L_PI14B	S_PI14B	03PI	0	TABULAR	PI14B	NO	0.1	0.04	6.4	0.04	6.5	16.66	24.5	16.66	24.6	22.22	32.6	22.22
L_PI15A	S_PI15A	02PI	0	TABULAR	PI15A	NO	0.1	0.01	0.9	0.01	1	2.38	3.5	2.38	3.6	3.18	4.7	3.18
L_PI15B	S_PI15B	02PI	0	TABULAR	PI15B	NO	0.1	0.01	1.7	0.01	1.8	4.46	6.6	4.46	6.7	5.94	8.7	5.94

NOTE: OUTLETS are structures that perform peak-shaving by restricting outflow according to a flow vs. head curve. OUTLETs are named for the subcatchment where peak-shaving controls are in place.

Table 5.3. Subcatchment Inputs to SWMM

	Rainfall	General Properties							Mannings		Storage Depth			Routing	Horton Infiltration				
	Raingage	Outlet	Area	Current Imperv	Future Imperv	Width	Slope	Length	N-Imperv	N-Perv	S-Imperv	S-Perv	pctZERO	RouteTo	MaxRate	MinRate	Decay	Regen	MaxInfil
Name			(ac)	(%)	(%)	(ft)	(%)				(in)	(in)	(%)		(in/hr)	(in/hr)	(1/sec)		(in)
CC01C	1	05CC	220	4	7	4792	3	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC02C	1	03CC	275	2	7	7802	3.36	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC03A	1	S_CC03A	6	5	8	163	4.31	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC03B	1	S_CC03B	1	0	10	24	4.31	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC03C	1	04CC	232	9	10	6308	4.31	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC04C	1	03CC	136	5	7	3214	5.46	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC05C	1	02CC	157	5	7	7015	5.81	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC06C	1	02CC	359	5	7	5486	1.63	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
CC07C	1	01CC	91	5	7	4657	8.45	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF01A	1	S_EF01A	8	33	51	192	2.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF01B	1	S_EF01B	7	0	20	155	2.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF01C	1	04EF	181	40	40	4137	2.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF02B	1	S_EF02B	1	11	11	19	3.67	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF02C	1	03EF	147	13	33	4387	3.67	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF03A	1	S_EF03A	31	0	1	938	3.1	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF03C	1	02EF	149	22	22	4434	3.1	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF04A	1	S_EF04A	27	28	66	340	3.93	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
EF04C	1	01EF	297	7	7	3701	3.93	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH01B	1	S_PH01B	9	67	68	146	2.15	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH01C	1	17	269	17	19	4350	2.15	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH02C	1	17	271	37	37	4679	1.2	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH03A	1	S_PH03A	4	2	7	103	4.98	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH03B	1	S_PH03B	1	0	20	27	4.98	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH03C	1	16	130	7	23	3028	4.98	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH04A	1	S_PH04A	10	1	7	139	1.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH04B	1	S_PH04B	5	0	7	70	1.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH04C	1	16	154	8	8	2171	1.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH05C	1	15	133	10	10	4616	5.24	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH06B	1	S_PH06B	7	0	7	90	2.14	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH06C	1	15	333	8	8	4144	2.14	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH07A	1	14	0	0	7	500	0.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH07C	1	14	103	9	9	5300	5.48	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH08C	1	13	134	7	14	4370	3.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH09B	1	S_PH09B	5	20	70	105	4.19	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH09C	1	12	235	7	15	5196	4.19	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH10C	1	11	274	10	10	4357	6.2	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH11A	1	S_PH11A	3	0	7	40	1.1	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH11C	1	01Bc	243	10	10	3417	1.1	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH12C	1	11	103	4	20	5003	7.56	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH13C	1	10	85	5	7	4961	8.13	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH14B	1	S_PH14B	13	40	51	231	2.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH14C	1	01Bb	168	20	25	2926	2.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH15B	1	S_PH15B	6	0	70	97	2.46	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH15C	1	01Bb	275	20	20	4569	2.46	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH16C	1	10	136	9	13	6099	6.58	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH17C	1	9	52	7	10	3538	8.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH18C	1	8	183	4	9	7735	5.21	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH19A	1	S_PH19A	1	0	10	21	3.32	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH19C	1	02Ba	237	9	9	4733	3.32	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH20A	1	01Ba	0	0	10	500	0.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH20C	1	01Ba	178	8	9	10000	4.69	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH21C	1	8	172	3	7	3003	3.6	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0

Table 5.3 (cont). Subcatchment Inputs to SWMM

	Rainfall		General Properties						Mannings		Storage Depth			Routing	Horton Infiltration				
	Raingage	Outlet	Area	Current Imperv	Future Imperv	Width	Slope	Length	N-Imperv	N-Perv	S-Imperv	S-Perv	pctZERO	RouteTo	MaxRate	MinRate	Decay	Regen	MaxInfil
Name			(ac)	(%)	(%)	(ft)	(%)				(in)	(in)	(%)		(in/hr)	(in/hr)	(1/sec)		(in)
PH22A	1	S_PH22A	2	4	10	47	4.6	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH22C	1	7	355	3	9	9711	4.6	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH23C	1	6	225	4	7	2565	6.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH24C	1	6	205	5	7	3890	5.3	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH25C	1	5	312	4	8	4805	4.05	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH26B	1	S_PH26B	2	36	46	31	3.23	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH26C	1	4	290	9	11	5561	3.23	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH27A	1	S_PH27A	46	2	41	744	6.59	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH27C	1	3	251	4	5	4098	6.59	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH28B	1	S_PH28B	4	5	7	59	3.24	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH28C	1	3	347	4	5	4574	3.24	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH29A	1	S_PH29A	44	0	41	1147	8.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH29C	1	2	85	1	1	2179	8.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PH30C	1	1	324	3	3	4602	7.42	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI01A	1	S_PI01A	2	7	7	39	0.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI01B	1	S_PI01B	20	46	46	351	0.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI01C	1	11PI	251	23	27	4360	0.8	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI02A	1	S_PI02A	13	0	10	322	1.22	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI02B	1	S_PI02B	16	71	80	385	1.22	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI02C	1	11PI	135	36	36	3229	1.22	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI03A	1	S_PI03A	9	0	1	263	3.05	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI03C	1	10PI	54	14	14	1565	3.05	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI04A	1	S_PI04A	2	0	5	33	0.96	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI04C	1	10PI	291	8	9	4975	0.96	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI05A	1	S_PI05A	4	0	1	240	3.6	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI05C	1	09PI	61	9	9	3394	3.6	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI06B	1	08PI	0	0	7	500	0.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI06C	1	08PI	229	5	7	3066	0.69	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI07C	1	08PI	310	15	15	5307	1.16	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI08B	1	S_PI08B	3	43	70	32	1.18	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI08C	1	07PI	313	10	10	3466	1.18	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI09C	1	05PI	165	6	7	7506	2.91	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI10C	1	06PI	299	8	18	5871	1.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI11C	1	05PI	214	4	11	4705	2.46	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI12C	1	04PI	101	4	7	5732	6.2	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI13A	1	S_PI13A	2	0	1	58	2.89	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI13B	1	S_PI13B	1	0	7	13	2.89	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI13C	1	03PI	98	6	7	2382	2.89	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI14B	1	S_PI14B	20	0	7	378	2.62	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI14C	1	03PI	141	8	10	2614	2.62	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI15A	1	S_PI15A	3	0	7	82	3.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI15B	1	S_PI15B	5	0	7	153	3.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI15C	1	02PI	123	7	8	3446	3.01	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI16A	1	02PI	0	0	1	500	0.5	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI16C	1	02PI	318	6	10	4076	1.79	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0
PI17C	1	01PI	185	6	7	7204	5.19	0	0.015	0.4	0.01	0.02	100	OUTLET	2.17	0.034	0.0009	0.001	0

Table 5.3 (cont). Subcatchment Inputs to SWMM

Current Land Use Categories																							
OS (%)	ESR (%)	LDR (%)	MDR (%)	HDR (%)	LIC (%)	HIC (%)	IND (%)	OS_w (%)	ESR_w (%)	LDR_w (%)	MDR_w (%)	HDR_w (%)	LIC_w (%)	HIC_w (%)	IND_w (%)	OS_d (%)	ESR_d (%)	LDR_d (%)	MDR_d (%)	HDR_d (%)	LIC_d (%)	HIC_d (%)	IND_d (%)
0	91	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	82	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
0	63	32	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	93	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	93	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	74	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
0	0	0	28	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
0	0	22	7	0	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	6	53	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	86	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	44	12	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	8	0	0	0	14	0	0	18
15	33	9	24	12	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	2	0	88	0	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
0	36	4	9	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
0	82	17	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	45	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
0	82	15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	50	42	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	76	13	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
0	77	10	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	85	11	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	77	1	1	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	54	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	11	51	0
0	46	24	3	0	11	2	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
0	29	59	5	0	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	41	50	2	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	67	11	1	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	89	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	52	43	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	43	55	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	87	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5.3 (cont). Subcatchment Inputs to SWMM

Current Land Use Categories																							
OS (%)	ESR (%)	LDR (%)	MDR (%)	HDR (%)	LIC (%)	HIC (%)	IND (%)	OS_w (%)	ESR_w (%)	LDR_w (%)	MDR_w (%)	HDR_w (%)	LIC_w (%)	HIC_w (%)	IND_w (%)	OS_d (%)	ESR_d (%)	LDR_d (%)	MDR_d (%)	HDR_d (%)	LIC_d (%)	HIC_d (%)	IND_d (%)
0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	91	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	91	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	88	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	89	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	61	0	0
0	53	34	3	0	7	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	73	17	1	0	4	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	94	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	86	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	58	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	6	45	0
1	9	49	16	5	0	18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	42	0
12	17	49	8	0	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	21	42	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	22	55	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	15	40	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	67	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	51	30	2	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
0	89	9	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	96	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	50	31	3	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	70	19	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
3	84	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	23	0	0	0	0	0	0
0	60	28	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
3	68	26	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	62	8	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	60	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5.3 (cont). Subcatchment Inputs to SWMM

Future Land Use Categories																							
OS (%)	ESR (%)	LDR (%)	MDR (%)	HDR (%)	LIC (%)	HIC (%)	IND (%)	OS_w (%)	ESR_w (%)	LDR_w (%)	MDR_w (%)	HDR_w (%)	LIC_w (%)	HIC_w (%)	IND_w (%)	OS_d (%)	ESR_d (%)	LDR_d (%)	MDR_d (%)	HDR_d (%)	LIC_d (%)	HIC_d (%)	IND_d (%)
0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	91	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	91	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	88	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	89	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	61	0	0
0	53	34	3	0	7	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	73	17	1	0	4	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	94	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	86	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	58	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	6	45	0
1	9	49	16	5	0	18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	42	0
12	17	49	8	0	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	21	42	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	22	55	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	15	40	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	67	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	51	30	2	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
0	89	9	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	96	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	50	31	3	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	70	19	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
3	84	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
0	60	28	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
3	68	26	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	62	8	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	60	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5.4. Junction Inputs to SWMM

Name	Invert Elev. (ft)	Max. Depth (ft)	Init. Depth (ft)	Surcharge Depth (ft)	Ponded Area (sq ft)
0	130	0	0	0	0
1	130	0	0	0	0
2	149	0	0	0	0
3	157	0	0	0	0
4	168	0	0	0	0
5	184	0	0	0	0
6	191	0	0	0	0
7	200	0	0	0	0
8	217	0	0	0	0
9	232	0	0	0	0
10	241	0	0	0	0
11	249	0	0	0	0
12	262	0	0	0	0
13	276	0	0	0	0
14	286	0	0	0	0
15	303	0	0	0	0
16	319	0	0	0	0
17	335	0	0	0	0
01CC	184	0	0	0	0
02CC	204	0	0	0	0
03CC	230	0	0	0	0
04CC	265	0	0	0	0
05CC	290	0	0	0	0
01EF	286	0	0	0	0
02EF	307	0	0	0	0
03EF	341	0	0	0	0
04EF	370	0	0	0	0
01PI	232	0	0	0	0
02PI	248	0	0	0	0
03PI	255	0	0	0	0
04PI	260	0	0	0	0
05PI	300	0	0	0	0
06PI	336	0	0	0	0
07PI	331	0	0	0	0
08PI	346	0	0	0	0
09PI	353	0	0	0	0
10PI	366	0	0	0	0
11PI	375	0	0	0	0
01Ba	228	0	0	0	0
02Ba	285	0	0	0	0
01Bb	276	0	0	0	0
01Bc	310	0	0	0	0

Table 5.5. STORAGE Inputs to SWMM.

Name	Invert Elev. (ft)	Max. Depth (ft)	Init. Depth (ft)	Shape Curve	Geometry Coeff.	Exponent
S_CC03A	270	9.6	0	FUNCTIONAL	1000	0
S_CC03B	270	1.4	0	FUNCTIONAL	1000	0
S_EF01A	375	13.4	0	FUNCTIONAL	1000	0
S_EF01B	375	10.8	0	FUNCTIONAL	1000	0
S_EF02B	346	1	0	FUNCTIONAL	1000	0
S_EF03A	312	50.2	0	FUNCTIONAL	1000	0
S_EF04A	291	43.7	0	FUNCTIONAL	1000	0
S_PH01B	340	14.5	0	FUNCTIONAL	1000	0
S_PH03A	324	7.1	0	FUNCTIONAL	1000	0
S_PH03B	324	1.8	0	FUNCTIONAL	1000	0
S_PH04A	324	15.9	0	FUNCTIONAL	1000	0
S_PH04B	324	7.9	0	FUNCTIONAL	1000	0
S_PH06B	308	11.5	0	FUNCTIONAL	1000	0
S_PH09B	267	7.6	0	FUNCTIONAL	1000	0
S_PH11A	315	4.5	0	FUNCTIONAL	1000	0
S_PH14B	281	21.2	0	FUNCTIONAL	1000	0
S_PH15B	281	9.4	0	FUNCTIONAL	1000	0
S_PH19A	290	1.7	0	FUNCTIONAL	1000	0
S_PH22A	205	2.8	0	FUNCTIONAL	1000	0
S_PH26B	173	2.6	0	FUNCTIONAL	1000	0
S_PH27A	162	73	0	FUNCTIONAL	1000	0
S_PH28B	162	7.1	0	FUNCTIONAL	1000	0
S_PH29A	154	71.1	0	FUNCTIONAL	1000	0
S_PI01A	380	3.6	0	FUNCTIONAL	1000	0
S_PI01B	380	32.2	0	FUNCTIONAL	1000	0
S_PI02A	380	21.4	0	FUNCTIONAL	1000	0
S_PI02B	380	25.6	0	FUNCTIONAL	1000	0
S_PI03A	371	14.5	0	FUNCTIONAL	1000	0
S_PI04A	371	3.1	0	FUNCTIONAL	1000	0
S_PI05A	358	6.9	0	FUNCTIONAL	1000	0
S_PI08B	336	4.7	0	FUNCTIONAL	1000	0
S_PI13A	260	3.8	0	FUNCTIONAL	1000	0
S_PI13B	260	0.8	0	FUNCTIONAL	1000	0
S_PI14B	260	32.6	0	FUNCTIONAL	1000	0
S_PI15A	253	4.7	0	FUNCTIONAL	1000	0
S_PI15B	253	8.7	0	FUNCTIONAL	1000	0

NOTE: STORAGE units are nodes that receive runoff from subcatchments with peak-shaving controls in place. Outflows from these units are controlled by OUTLETS. STORAGE unit names contain the name of the subcatchment whose runoff they receive and store

6 References

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