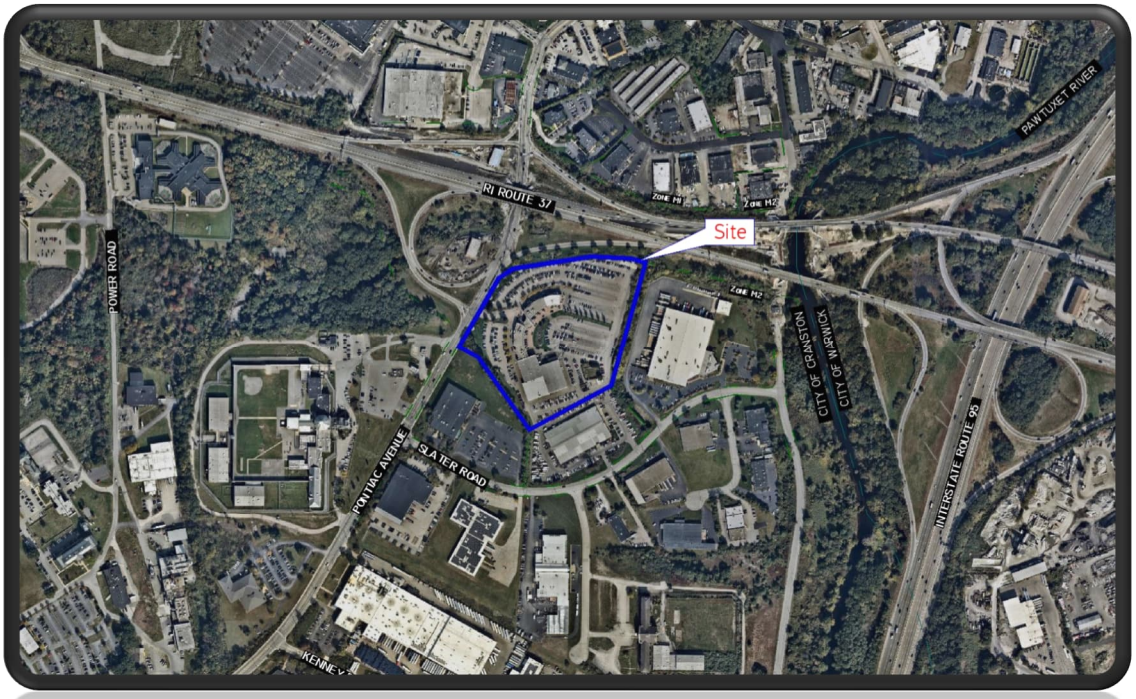
DiPrete Engineering

Stormwater Management Report



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STATE OF RHODE ISLAND
No. 14100
REGISTERED PROFESSIONAL ENGINEER
CIVIL

Tasca Building Expansion

Located in Cranston, RI

Applicant: Tasca Enterprise, Inc.

08-01-2022

Revised 10-04-2022

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Executive Summary

On behalf of the Client, we are submitting drainage calculations for the proposed development at the Tasca Automotive Facility at 1300 Pontiac Avenue. The site is located on Assessors' Plat 13 Lot 76 in Cranston, Rhode Island. The site exists today as almost entirely pavement and buildings. The client proposes to demolish a portion of the existing parking lot, construct a new building expansion and reconfigure parking.

The post development stormwater will be treated for water quality using Best Management Practices (BMPs). The Site has been designed to meet the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM).

Under the RISDISM, the site is considered a redevelopment site since the existing site is over 40% impervious. The site provides in excess of the required 50% water quality treatment. The site meets the RISDISM through various BMPs. These practices include a Contech Jellyfish Filter stormwater system.

This report details how the site will show a minor increase in stormwater runoff volumes from pre-development to post-development conditions, and how the proposed BMPs will provide water quality treatment for stormwater runoff.

Pre-development conditions versus post-development conditions for each watershed are summarized below:

Subwatershed (design point)	1.2" Peak Flow		1-yr Peak Flow		10-yr Peak Flow		25-yr Peak Flow		100-yr Peak Flow	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.28	0.29	0.52	0.57	1.29	1.23	1.62	1.68	2.47	2.52
DP-2:	1.27	1.26	2.66	2.61	5.71	5.48	7.35	7.09	10.89	10.59
Totals:	1.55	1.55	3.18	3.18	7.00	6.71	8.97	8.77	13.36	13.11

All flows in cubic feet per second (cfs)

Subwatershed (design point)	1.2" Volume		1-yr Volume		10-yr Volume		25-yr Volume		100-yr Volume	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.021	0.022	0.037	0.041	0.089	0.094	0.118	0.124	0.184	0.190
DP-2:	0.095	0.094	0.190	0.202	0.420	0.424	0.549	0.551	0.832	0.830
Totals:	0.116	0.116	0.227	0.243	0.509	0.518	0.667	0.675	1.016	1.014

All volumes in acre-feet (af)

APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY

PROJECT NAME **1300 Pontiac Avenue**	**(RIDEM USE ONLY)** **STW/WQC File #:** **Date Received:**
TOWN **Cranston**	
BRIEF PROJECT DESCRIPTION: Building expansion/addition and parking reconfiguration of existing car dealership.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] submit four separately bound documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to Suggestions to Promote Brevity**.**

Note**: All stormwater construction projects must create a Stormwater Management Plan (SMP). However, not every element listed below is required per the** RIDEM Stormwater Rules **and the** RIPDES Construction General Permit (CGP)**. This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ Residential	☒ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☐ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ Other (specify):				

SITE INFORMATION

☒ Vicinity Map

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)

☐ **Groundwater**	☒ **Surface Water**	☒ **MS4**
☐ GAA	☐ Isolated Wetland	☒ RIDOT
☐ GA	☒ Named Waterbody	☐ RIDOT Alteration Permit is Approved
☒ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☐ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

☐ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Pawtuxet River	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0006017R-03	☐ 4th order stream of pond 50 acres or more		
☐ TMDL for: N/A	☐ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☐ 303(d) list – Impairment(s) for:	☐ Contributes to shellfishing grounds		

[1] Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date: 6/29/2022	☐ Minutes Attached
☐ Municipal Master Plan Approval	Approval Date:	☐ Minutes Attached
☐ Subdivision Suitability Required	Approval #:	
☐ Previous Enforcement Action has been taken on the property	Enforcement #:	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☒ Delineated from FEMA Maps	
NOTE: Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional	
☐ Calculated by Professional Engineer	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):
	Amount of Cut (CY):
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway	
☐ Floodplain storage capacity is impacted	
☒ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION -N/A
☐ CRMC Assent required
☐ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
☐ Sea level rise mitigation has been designed into this project

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:			
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)			
	☐ Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations))		**RIDEM CONTACT:**
	☐ Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials)		
	☒ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities		**SITE ID#**: SR-07-1317
		☐ CERCLIS/Superfund (NPL)	
		☐ State Hazardous Waste Site (SHWS)	
		☒ Environmental Land Usage Restriction (ELUR)	SR-07-1317
		☐ Leaking Underground Storage Tank (LUST)	
		☐ Closed Landfill	
Note: If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSMM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration**.**			
2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:			
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php		
	☐ Auto Fueling Facility (e.g., gas station)		
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

	☐ Road Salt Storage and Loading Areas (exposed to rainwater)	
	☐ Outdoor Storage and Loading/Unloading of Hazardous Substances	
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☐ The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C)	Activities: Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain:	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☒ Pre Construction Impervious Area		
	☒ Total Pre-Construction Impervious Area (**TIA**) 9.5 ac +/-	
	☒ Total Site Area (**TSA**): 12.52 ac	
	☐ Jurisdictional Wetlands (**JW**) 0	
	☐ Conservation Land (**CL**) 0	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) = 12.52	
	☐ (**TIA**) / (**SS**) = 0.76	☒ (**TIA**) / (**SS**) >**0.4**?
☒ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)

This section may be deleted if not required.

Note: A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:

- Town requires … (state the specific local requirement)
- Meets Town's dimensional requirement of …
- Not practical for site because …
- Applying for waiver/variance to achieve this (pending/approved/denied)
- Applying for wavier/variance to seek relief from this (pending/approved/denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS	**IF NOT IMPLEMENTED, EXPLAIN HERE**
☐ Sensitive resource areas and site constraints are identified (required) ☐ Local development regulations have been reviewed (required) ☐ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction ☐ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C ☐ As much natural vegetation and pre-development hydrology as possible has been maintained	

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☐ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies ☐ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☐ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) ☐ Development sites and building envelopes have been positioned outside of floodplains ☐ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☐ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) ☐ Other (describe):	
C) MINIMIZE CLEARING AND GRADING ☐ Site clearing has been restricted to minimum area needed for building footprints, development activities, construction access, and safety. ☐ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☐ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) ☐ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) ☐ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) ☐ Reduced building footprint: Explain approach: ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) ☐ Reduced parking lot area: Explain approach ☐ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. ☐ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) ☐ Other (describe):	
E) DISCONNECT IMPERVIOUS AREA ☐ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☐ Other (describe):	
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☐ Small-scale BMPs have been designated to treat runoff as close as possible to the source	

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☐ Low-maintenance landscaping has been proposed using native species and cultivars ☐ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☐ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots	
H) RESTORE STREAMS/WETLANDS ☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☐ Removal of invasive species ☐ Other	

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☐	☒	The project has been designed to meet the groundwater recharge standard.
☒	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
☒	☐	Your waiver request has been explained in the Narrative, if applicable.
☒	☐	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☐	☒	If "Yes," has approval for infiltration by the OLRSMM Site Project Manager, per Part 1, Minimum Standard 8, been requested?

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)
(Add or Subtract Rows as Necessary)

Design Point	**Impervious Area Treated (sq ft)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)**	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
			Portion of Re_v directed to a QPA (cu ft)		
DP-1: West	11,500	575	0	575	0
DP-2: East	50,050	2,503	0	2,503	0
TOTALS:	61,550	3,078	0	3,078*	0

Notes:
1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):

*See Stormwater Report for redevelopment calculations

WATER QUALITY – MINIMUM STANDARD 3		
YES	**NO**	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☒	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☒	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☐	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☐	☒	Does this project propose an increase of impervious cover to a receiving water body with impairments? If "Yes," please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water.
☐	☒	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
☐	☒	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☒	☐	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer.
☐	☒	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe:

TABLE 3-1: Summary of Water Quality (see RICR 8.9)

Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-1: West	11,500	480	0	480	0
DP-2: East	50,050	2,086	0	2,086	2,639
DP-3:					
DP-4:					
TOTALS:	61,550	2,566	0	2,566*	2,639

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):

*See Stormwater Report for redevelopment calculations

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	**NO**	
☒	☐	Is this standard waived? If "Yes," please indicate one or more of the reasons below:
		☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. ☐ The project is a small facility with impervious cover of less than or equal to 1 acre. ☐ The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (Note: LID design strategies can greatly reduce the peak discharge rate). ☒ Redevelopment Site
☒	☐	Conveyance and natural channel protection for the site have been met. If "No,' explain why:

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1:					
DP-2:					
DP-3:					
DP-4:					
TOTALS:					
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☐ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).				
☐ YES ☒ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☒ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.). Stormwater Report					

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☒	☐	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
		☒	Redevelopment Site
☒	☐	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☒	RIDOT – existing outfall, no permit required
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.			
		Indicate below which model was used for your analysis. ☐ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.):	
☐	☒	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☐	☒	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☐	☒	Are the off-site areas shown on the subwatershed maps?	
☒	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☐	☐	Calculate the following:	
		☐	Area of disturbance within the sub-watershed (areas) 1.648 acres
		☐	Impervious cover (%) 85%
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☒	☐	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1: West	0.28	0.29	0.52	0.57	1.29	1.23	2.47	2.52
DP-2: East	1.27	1.26	2.66	2.61	5.71	5.48	10.89	10.59
TOTALS:	1.55	1.55	3.18	3.18	7.00	6.71	13.36	13.11

** Utilize modified curve number method or split pervious /impervious method in HydroCAD.

Note: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	**Name of report/document, page numbers, appendices, etc.**
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Stormwater Report
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Stormwater Report
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Stormwater Report
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Stormwater Report

Table 5-2 Summary of Best Management Practices											
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/ NA)	Re_v	WQ_v	CP_v (Y/N/ NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/ No	Technical Justification (Design Report page number)	Distance Provided
JF	2	Jellyfish	N	N	Y	N	N	I	Y	N/A	N/A
		TOTALS:									

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**						
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
2	JF	Proprietary Device	N/A	N/A	N/A	N/A	N/A	A	N/A

* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☐	☐	☒	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
☐	☐	☒	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☒	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, "Acceptable BMPs for Use at LUHPPLs." Please list BMPs:
☐	☐	☒	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☒	☐	☐	Have you provided a **separately-bound** document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).	
			If "No," include a document with your submittal that addresses the following elements of an SESC Plan:	
			☐	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☐	Provide Natural Buffers and Maintain Existing Vegetation
			☐	Minimize Area of Disturbance
			☐	Minimize the Disturbance of Steep Slopes
			☐	Preserve Topsoil
			☐	Stabilize Soils
			☐	Protect Storm Drain Inlets
			☐	Protect Storm Drain Outlets
			☐	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☐	Establish Perimeter Controls and Sediment Barriers
			☐	Divert or Manage Run-On from Up-Gradient Areas
			☐	Properly Design Constructed Stormwater Conveyance Channels
			☐	Retain Sediment On-Site
			☐	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☐	Apply Construction Activity Pollution Prevention Control Measures
			☐	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☐	Qualified SESC Plan Preparer's Information and Certification
			☐	Operator's Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
			☐	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☒	☐	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them:

☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		
☐	☒	Designated snow stockpile locations?
☒	☐	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☒	☐	Regular sweeping? Please describe:
☒	☐	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☐	☒		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☐	☒		Mapped seasonal high-water-table test pit locations
☐	☒		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☐	☒		Mapped bedrock outcrops adjacent to any infiltration BMP
☐	☒		Soils were logged by a:
		☐	DEM-licensed Class IV soil evaluator Name:
		☐	RI-registered P.E. Name:

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (Acres)**	**Existing Impervious (Acres)**	**Proposed Impervious (Acres)**
DP-1: West	MS4 & RI0006017R-03	0.315	0.252	0.264
DP-2: East	RI0006017R-03	1.333	1.157	1.148
TOTALS:	RI0006017R-03	1.648	1.409	1.412

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	**NO**	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☒	☐	Location and field-verified boundaries of resource protection areas such as: ► freshwater and coastal wetlands, including lakes and ponds ► coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☒	☐	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: ► Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2; ► Design water surface elevations (applicable storms); ► Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ► Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ► Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain; ► Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☐	☒	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☐	☒	Mapping of any OLRSMM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ► Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ► Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.); ► Cross sections of roadways, with edge details such as curbs and sidewalks; ► Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

1.0 Project Description

The purpose of this report is to specify a Stormwater Management System to be implemented in the redevelopment project at the Tasca Automotive Facility on Pontiac Avenue. The site totals 12.52 acres and is located on Assessor's Plat 13 Lot 76 in Cranston, Rhode Island. The site is located east of Pontiac Avenue and south of Lincoln Avenue Freeway (Route 37).

The proposed development will include a new building expansion and parking reconfiguration to the existing car dealership. The site is currently serviced by public water and sewer and the proposed building additions will tie into the existing services. Water is provided by Providence Water and sewer service is provided by Veolia Water.

The stormwater quality will be improved by utilizing Best Management Practices (BMPs) as established by the RISDISM for the treatment of stormwater runoff from the proposed development. BMPs will consist of Contech Jellyfish Filter stormwater systems. These systems have been designed to meet the RIDEM Stormwater Design and Installations Standards Manual.

2.0 Site Conditions

2.1 SOILS

There are the following soil types within the analyzed area of the Site as mapped by the NRCS USDA Soil Conservation service:

Soil Symbol	Description	Hydrologic Group
UD	Udorthents-Urban land complex	A

The onsite soils are Urban Land which does not of a Hydrologic Group. According to the NRCS Web Soil Survey, soils surrounding the site include HkA - Hinckley loamy sand and UD - Udorthents – Urban Land Complex. HkA is Hydrologic Group A soil. Hydrologic Group A has been used for modeling the site.

The NRCS Web Soil Survey can be found in Appendix A2.1.

2.2 EXISTING SITE CONDITIONS

Currently the site is predominately impervious. There are multiple buildings with significant amount of asphalt. Stormwater from the western portion of the site is captured by an existing onsite drainage network and treated by a Vortechs unit before being discharged under Route 37 to the north to a tributary stream of the Pawtuxet River. Stormwater from the eastern portion of the site is captured by an existing onsite drainage network and is treated/detained by a Vortechs unit and underground detention system. Overflows from the system discharge to the east towards the Pawtuxet River. All stormwater from the site ultimately discharges to the Pawtuxet River. The Pawtuxet River is a 5th order stream which discharges to the Providence River.

2.3 POST SITE CONDITIONS

The proposed drainage analysis uses stormwater management systems to control and treat runoff from the proposed development. The following BMP's are used on site and have been designed to include the following elements:

- Jellyfish® Filter
    - Stormwater Treatment system by Contech Engineered Solutions
    - RIDEM approved Proprietary Device for WQ treatment.
    - Internal bypass to route larger storms directly to existing peak mitigation systems.

The above elements will used to meet the design standards of the Rhode Island Stormwater Design and Installation Standard. The primary goal of increasing water quality treatment is accomplished by providing water quality BMPs.

3.0 Minimum Standards

The site has been designed to meet the minimum standards as outlined in the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM). The following sections outline how the site meets and exceeds the minimum required standards.

3.1 Minimum Standard 1: LID Site Planning and Design Strategies

This project is considered a redevelopment project; therefore, this standard does not apply. See "Appendix A: Stormwater Management Checklist" from the RISDISM provided at the beginning of this report.

3.2 Minimum Standard 2: Groundwater Recharge

See Table 2-1 of the Appendix A checklist for a summary of recharge values. See Appendix A3.2 for the water quality storm HydroCAD analysis. The water quality storm is calculated in HydroCAD using the 'calculate separate Pervious/Impervious runoff' option.

Infiltration is not being proposed for this project due to the Environmental Land Usage Restriction (ELUR) on the property (Site ID SR-07-1317). The ELUR appears to be from a previous use of the property and is unclear if it is still active. Out of an abundance of caution, infiltration is not proposed; therefore the recharge requirement will not be met.

3.3 Minimum Standard 3: Water Quality

All stormwater is treated through an approved BMP before being discharged. The proposed treatment BMP has been designed to meet or exceed water quality requirements. The Jellyfish filter has been approved by RIDEM for water quality treatment as it removes bacteria and pathogens along with metals and nutrients from stormwater during runoff events. The addition of the proposed BMP will reduce the impacts of the development.

Per the RIDISM, redevelopment sites are required to provide water quality management for at least 50% of the redevelopment area. Below is a summary of the pre- and post-development impervious areas within the limit of disturbance to calculate the required water quality treatment for this site.

Redevelopment Water Quality Calculations:

Design Point	Existing Impervious (acres)	Proposed Impervious (acres)	Impervious Increase (acres)	Impervious Area Requiring WQ* (acres)	Total WQ Required (cu-ft)
DP 1: West	0.252	0.264	0.012	0.138	480
DP 2: East	1.157	1.148	-0.009	0.570	2,086
Total Site	1.409	1.676	0.267	0.708	2,569

* The required area for WQ treatment is calculated by taking 50% of the existing impervious area plus the impervious area decrease. This calculation provides 50% WQ for all existing impervious and 100% WQ for any new impervious.

The required area for water quality treatment is provided by the Jellyfish Filter treatment system. This system captures a total of 0.727 acres of impervious which exceeded the required area.

3.4 Minimum Standard 4: Conveyance and Natural Channel Protection

3.4.1 Drainage Network Design Parameters:

A. PIPES

- All drainage pipes are HDPE or equivalent unless otherwise noted.
- Manning's coefficient = 0.012 for HDPE Pipe
- Diameters & lengths as specified
- The 100-year design storm is utilized for the drainage pipe design to ensure that the drainage system contains and channels water to the BMP areas as shown on the plans.
- The rational method has been used for the closed drainage system.

B. STRUCTURES

- Catch basins – Pre-cast concrete with 3' sump unless otherwise noted and inverts as specified
- Manholes – Pre-cast concrete with inverts as specified.

3.4.2 Channel Protection Volume:

This project is considered a redevelopment project; therefore, this standard does not apply.

3.5 Minimum Standard 5: Overbank Flood Protection & Downstream Analysis

3.5.1 Method of Analysis

USDA Soil Conservation Service Method as defined by Technical Release No. 20 (TR-20) determines Stormwater runoff rate and volume. Type III rainfall distribution is utilized. Time of concentration is determined using Technical Release No 55 (TR-55) methodology, through the computer program *HydroCAD ver. 10.0* by HydroCAD Software Solutions LLC.

3.5.2 Design Storm

Analysis of 1-year, 10-year, 25-year, and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the Rhode Island Stormwater Design and Installation Standards Manual, Table 3-1 for Providence County.

1 year =	2.7 inches
10 year =	4.9 inches
25 year =	6.1 inches
100 year=	8.7 inches

3.5.3 Design Point Breakdown

The site is analyzed as 2 watershed areas. In the pre-development stage, there are 2 subcatchments. In the post-development stage, there are 3 subcatchments. The watershed contributing to Design Point 1 shows a slight increase in runoff post-development; however, the watershed contributing to Design Point 2 shows a slight decrease in runoff post-development that demonstrates total runoff rates and volumes less than or equal to the same pre-development area. It should be noted that the below analysis is limited to the limit of physical disturbance for simplicity of the calculations. These sub watersheds are only portions of larger watersheds within the existing development. Information from the original design of the property can be found in Appendix B which contains the Stormwater Management Report from the original development.

A description of each watershed and associated subcatchments are summarized as follows, for cover types see color watershed maps located at the end of this report. Numbers in parentheses ( ) indicate the HydroCAD Node Number.

Design Point 1:
Subcatchment Pre-1 (10) flows to Design Point DP-1 (11). Pre-1 (10) consists of the northern portion of the project area including parking lot and landscape areas with runoff collected by catch basins and pipes discharging to a Vortechs unit before flowing to DP-1 (11) which is an existing culvert under Route 37.

Subcatchment Post-1 (100) flows to Design Point DP-1 (101). Post-1 (100) consists of the northern portion of the project area including parking lot and landscape areas with runoff collected by catch basins and pipes discharging to DP-1 (101) similar to existing conditions.

Design Point 2:
Subcatchment Pre-2 (20) flows to Design Point DP-2 (21). Pre-2 (20) consists of the eastern portion of the project area including parking lot and landscape areas with runoff collected by catch basins and pipes discharging to DP-2 (21) an existing subsurface stormwater system located below the existing parking lot.

Subcatchment Post-2 (200) flows to Design Point DP-2 (203). Post-200 (200) consists of the eastern portion of the project area including parking lot and landscape areas with runoff collected by catch basins and pipes discharging to DP-2 (203) similar to existing conditions.

Subcatchment Post-3 (201) consists of sub-areas of Post-2 (200). Post-3 (201) area is captured and treated by a Jellyfish Filter stormwater system (202 that connects to the existing drainage network and flows to the existing treatment system.

Below is a summary of the hydrologic parameters for the pre and post development sub-areas:

	Area (acres)	CN	Tc (min)
Pre-1 (10)	0.315	86	6.0
Pre-2 (20)	1.333	90	6.0
Post-1 (100)	0.315	88	6.0
Post-2 (200)	0.607	80	6.0
Post-3 (201)	0.727	98	6.0

3.5.4 Q_p BMP Calculations

The section includes the Sizing Table for the Jellyfish Filter stormwater system by RIDEM. The below chart is taken from the RIDEM Re-Certification letter for a Jellyfish Filter, revised May 25, 2022. The following models have been selected based on the impervious catchment area and water quality flow rates.

Table 1: Sizing Table – Rhode Island Approved Jellyfish Filters (54" Cartridges)

Jellyfish Filter Model #	Approximate Impervious Catchment Area (ac)	Water Quality Flow Rate (cfs)
JF 4-2-1	0.37	0.45
JF 6-3-1	0.51	0.62
Node 202 JF 6-6-1	0.96	1.16
JF 8-6-2	1.03	1.25
JF 8-10-2	1.62	1.96
JF 10-11-3	1.84	2.23
JF 10-19-4	3.09	3.74
JF 12-20-5	3.32	4.01
JF 12-27-5	4.35	5.26

See attached HydroCAD for catchment areas and flow rates.

3.5.5 Downstream Analysis

A downstream analysis is not required for this project. The flows from the development do not impact the watershed or any of the downstream culverts.

3.5.6 Overbank Flood Protection Conclusion

The tables below present a summary of the pre development flows vs. the mitigated post development flows.

Subwatershed (design point)	1.2" Peak Flow		1-yr Peak Flow		10-yr Peak Flow		25-yr Peak Flow		100-yr Peak Flow	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.28	0.29	0.52	0.57	1.29	1.23	1.62	1.68	2.47	2.52
DP-2:	1.27	1.26	2.66	2.61	5.71	5.48	7.35	7.09	10.89	10.59
Totals:	1.55	1.55	3.18	3.18	7.00	6.71	8.97	8.77	13.36	13.11

All flows in cubic feet per second (cfs)

Subwatershed (design point)	1.2" Volume		1-yr Volume		10-yr Volume		25-yr Volume		100-yr Volume	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.021	0.022	0.037	0.041	0.089	0.094	0.118	0.124	0.184	0.190
DP-2:	0.095	0.094	0.190	0.202	0.420	0.424	0.549	0.551	0.832	0.830
Totals:	0.116	0.116	0.227	0.243	0.509	0.518	0.667	0.675	1.016	1.014

All volumes in acre-feet (af)

Based on the information provided in the original Stormwater Management Report (found in Appendix B) the total watershed areas that discharge to these two design points is approximately 12.21 acres with 8.96 acres of impervious area. The proposed expansion will only increase the impervious area by 0.003 acres. Comparing the pre- and post-development flow rates from the original development, there are decreases in flow rates following the development. The additional volumes seen from this current development fall well within the range of decreases originally seen and can be considered negligible compared to the site and design points as a whole.

3.6 Minimum Standard 6: Redevelopment and Infill Projects.

This site is a redevelopment project. See Minimum Standard 6 in the Appendix A checklist.

3.7 Minimum Standard 7: Pollution Prevention

A Soil Erosion and Sediment Control Plan (SESC) for this development can be found under a separate document. See the Soil Erosion and Sediment Control Plan for the development prepared by DiPrete Engineering. The SESC contains information for construction pollution prevention. For post construction pollution prevention see the Operations and Maintenance (O&M) document prepared for this development by DiPrete Engineering.

3.8 Minimum Standard 8: Land Uses with High Potential Pollutant Loads (LUHPPLs)

The site is not considered LUHPPL.

3.9 Minimum Standard 9: Illicit Discharges

There are no proposed Illicit Discharges on site. The site will be serviced by public water and sewer.

3.10 Minimum Standard 10: Construction Activity Soil Erosion, Runoff and Sedimentation and Pollution Prevention Control Measure Requirements

See the SESC for this development prepared by DiPrete Engineering.

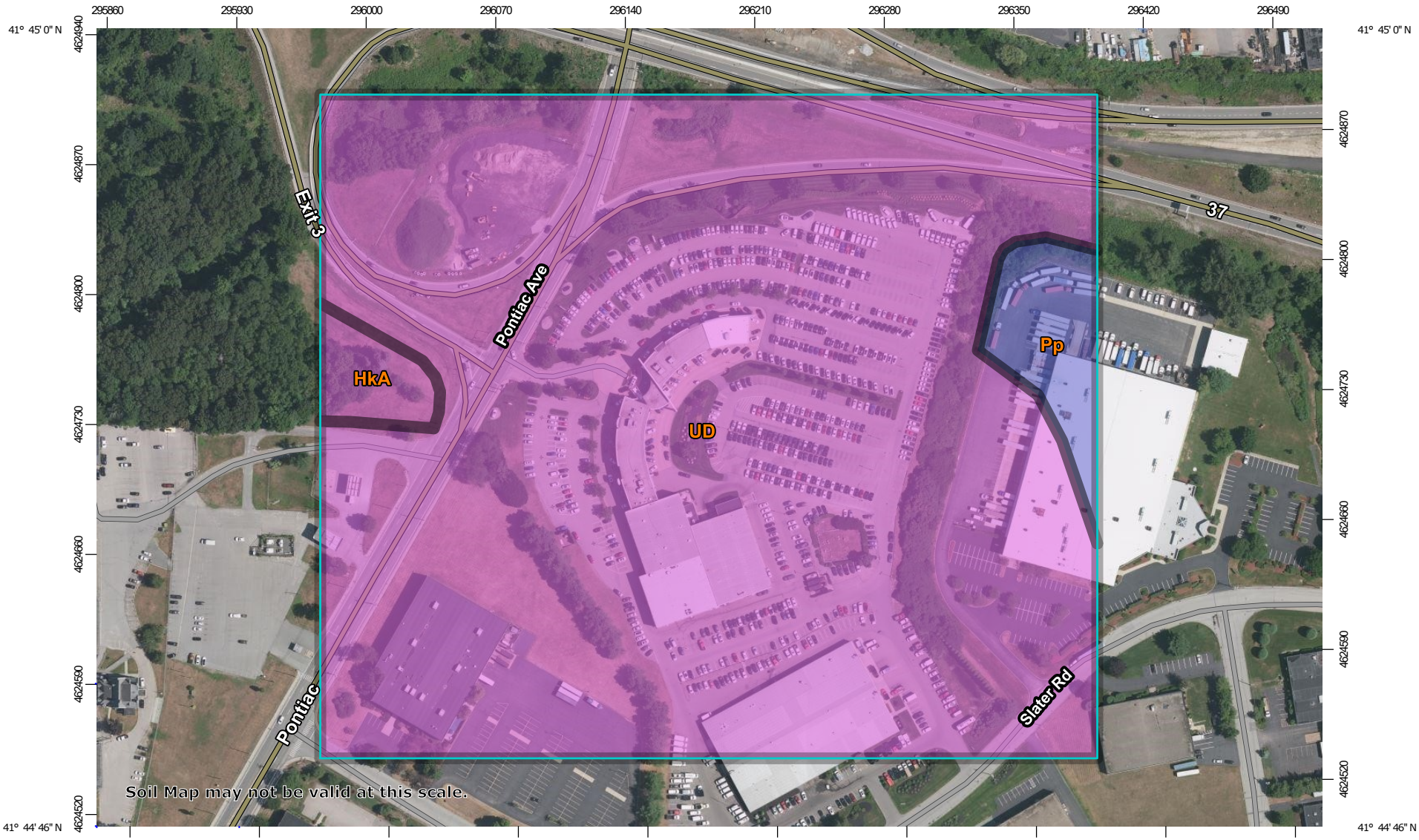
3.11 Minimum Standard 11: Stormwater Management System Operation and Maintenance

See the O&M for this development prepared by DiPrete Engineering.

Appendix A

A2.1 NRCS Web Soil Survey

Hydrologic Soil Group—State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
(1300 Pontiac Avenue Cranston, Rhode Island)



Map Scale: 1:3,030 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 21, Sep 3, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 24, 2020—Jul 18, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HkA	Hinckley loamy sand, 0 to 3 percent slopes	A	0.7	2.0%
Pp	Pootatuck fine sandy loam	B	1.4	3.8%
UD	Udorthents-Urban land complex	A	35.1	94.2%
Totals for Area of Interest			**37.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

A3.2 Water Quality HydroCAD Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: Pre-1 Runoff Area=0.315 ac 80.06% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=39/98 Runoff=0.28 cfs 0.021 af

Subcatchment 20: Pre-2 Runoff Area=1.333 ac 86.78% Impervious Runoff Depth=0.86"
Tc=6.0 min CN=39/98 Runoff=1.27 cfs 0.095 af

Link 11: DP-1 Inflow=0.28 cfs 0.021 af
Primary=0.28 cfs 0.021 af

Link 22: DP-2 Inflow=1.27 cfs 0.095 af
Primary=1.27 cfs 0.095 af

Link 23: DP Total Inflow=1.54 cfs 0.116 af
Primary=1.54 cfs 0.116 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: Post-1 Runoff Area=0.314 ac 83.86% Impervious Runoff Depth=0.83"
Tc=6.0 min CN=39/98 Runoff=0.29 cfs 0.022 af

Subcatchment 200: Post-2 Runoff Area=0.607 ac 69.51% Impervious Runoff Depth=0.69"
Tc=6.0 min CN=39/98 Runoff=0.46 cfs 0.035 af

Subcatchment 201: Post-3 Runoff Area=0.727 ac 99.97% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=39/98 Runoff=0.80 cfs 0.060 af

Pond 202: Jellyfish Peak Elev=47.10' Inflow=0.80 cfs 0.060 af
15.00" Round Culvert n=0.012 L=19.9' S=0.0302 '/' Outflow=0.80 cfs 0.060 af

Link 101: DP-1 (West) Inflow=0.29 cfs 0.022 af
Primary=0.29 cfs 0.022 af

Link 203: DP-2 (East) Inflow=1.26 cfs 0.094 af
Primary=1.26 cfs 0.094 af

Link 204: DP Total Inflow=1.55 cfs 0.116 af
Primary=1.55 cfs 0.116 af

A3.3 Drainage Network Hydraulic Calculations

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Tasca Building Expansion
Project Number: 0645-001

25-Year Storm
Date: 10/03/2022

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
10	19.93	15	3.00%	5.2	12.13	9.5	46.08	46.68
9	67.05	15	1.70%	5.2	9.13	7.7	47.18	48.32
8	52.73	15	5.00%	5.2	15.66	11.5	48.32	50.95
5	98.08	12	2.00%	1.0	5.46	5.2	51.77	53.73
7	105.06	12	1.00%	2.2	3.86	5.1	51.77	52.82
6	98.09	12	1.00%	1.7	3.86	4.7	52.82	53.80

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Tasca Building Expansion 100-Year Storm
Project Number: 0645-001 Date: 10/03/2022

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
10	19.93	15	3.00%	6.6	12.13	10.1	46.08	46.68
9	67.05	15	1.70%	6.7	9.13	8.1	47.18	48.32
8	52.73	15	5.00%	6.7	15.66	12.3	48.32	50.95
5	98.08	12	2.00%	1.2	5.46	5.6	51.77	53.73
7	105.06	12	1.00%	2.8	3.86	5.4	51.77	52.82
6	98.09	12	1.00%	2.2	3.86	5.0	52.82	53.80

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Tasca Building Expansion — 100-Year Storm
Project Number: 0645-001 — Date: 10/03/2022

HGL at Structure

Structure	Rim Elevation (ft)	HGL Elevation (ft)	Rim-HGL (ft)
14	51.24	0.00	N/A
10	51.69	47.34	4.35
9	52.85	49.11	3.74
6	58.02	51.53	6.50
5	57.97	54.05	3.92
8	58.10	54.30	3.80
7	58.00	54.90	3.10

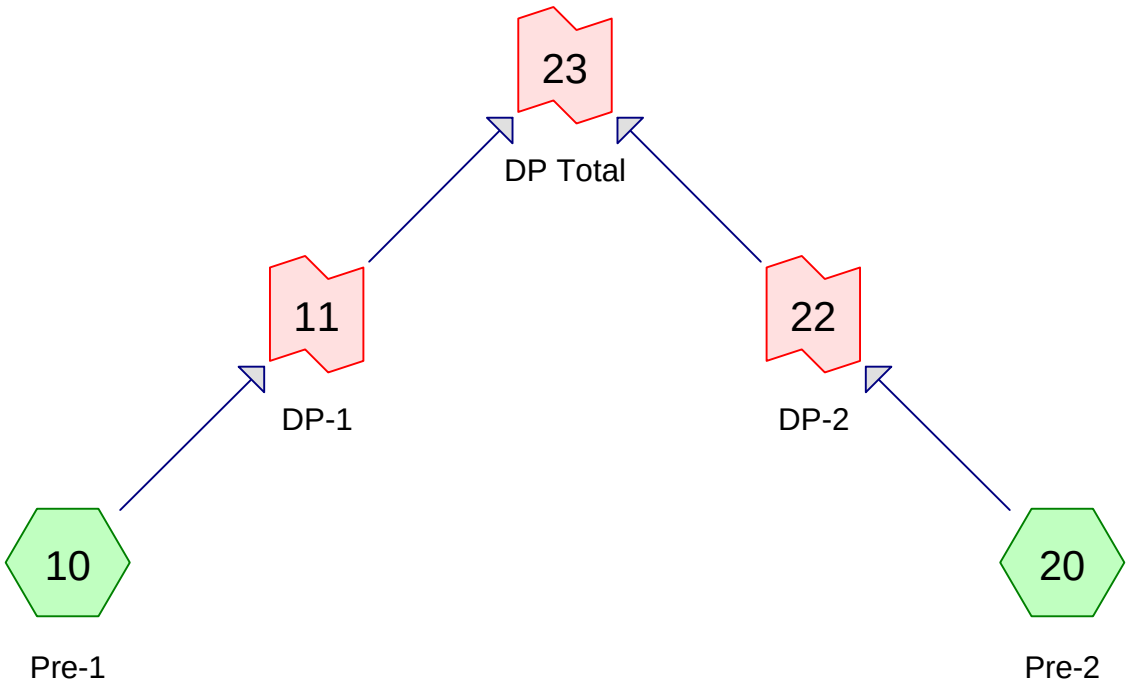
DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Tasca Building Expansion
Project Number: 0645-001

10-Year Storm
Date: 10/03/2022

Structure	Area	Inlet Time	Intensity	Runoff C	Q=Cia	Q Carry over	Q Captured	Q Bypassed	Bypass Structure	Inlet Type	Curb Opening	Curb Opening	Grate Length	Grate Width	Depth	Spread
	(sf)	(min)	(in/hr)	(C)	(cfs)	(cfs)	(cfs)	(cfs)			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
7	9,491	6	6.94	0.9	1.37	0	1.37	0.00	---	Grate inlet	---	---	2	2	0.19	5.985
8	3,085	6	6.938	0.9	0.45	0	0.45	0.00	---	Grate inlet	---	---	2	2	0.095	4.154
5	5,467	6	6.938	0.89	0.78	0	0.78	0.00	---	Grate inlet	---	---	2	2	0.134	4.592
6	12,503	6	6.938	0.9	1.81	0	1.81	0.00	---	Grate inlet	---	---	2	2	0.226	7.15

A3.5.4.1 HydroCAD Node Diagram

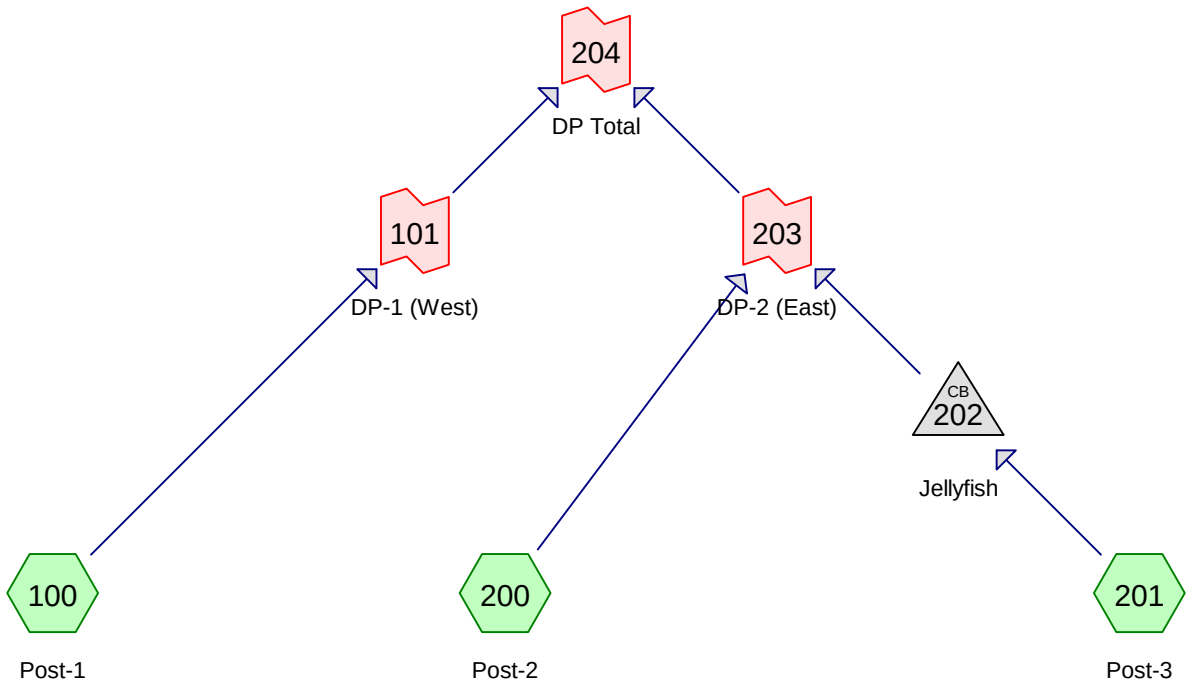


Subcat Reach Pond Link

Routing Diagram for 0645-001-EHCD-INHS
Prepared by DiPrete Engineering, Printed 9/19/2022
HydroCAD® 10.10-4b s/n 01125 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.239	39	>75% Grass cover, Good, HSG A (10, 20)
1.409	98	Impervious, HSG A (10, 20)
1.648	**89**	**TOTAL AREA**



Subcat Reach Pond Link

Routing Diagram for 0645-001-PHCD-INHS
Prepared by DiPrete Engineering, Printed 9/19/2022
HydroCAD® 10.10-4b s/n 01125 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.236	39	>75% Grass cover, Good, HSG A (100, 200, 201)
1.142	98	Impervious, HSG A (100, 200, 201)
0.270	98	Roofs, HSG A (201)
1.648	**90**	**TOTAL AREA**

A3.5.4.2 HydroCAD 1-Year Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: Pre-1 Runoff Area=0.315 ac 80.06% Impervious Runoff Depth=1.41"
Tc=6.0 min CN=86 Runoff=0.52 cfs 0.037 af

Subcatchment 20: Pre-2 Runoff Area=1.333 ac 86.78% Impervious Runoff Depth=1.71"
Tc=6.0 min CN=90 Runoff=2.66 cfs 0.190 af

Link 11: DP-1 Inflow=0.52 cfs 0.037 af
Primary=0.52 cfs 0.037 af

Link 22: DP-2 Inflow=2.66 cfs 0.190 af
Primary=2.66 cfs 0.190 af

Link 23: DP Total Inflow=3.18 cfs 0.227 af
Primary=3.18 cfs 0.227 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: Post-1 Runoff Area=0.314 ac 83.86% Impervious Runoff Depth=1.55"
Tc=6.0 min CN=88 Runoff=0.57 cfs 0.041 af

Subcatchment 200: Post-2 Runoff Area=0.607 ac 69.51% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=80 Runoff=0.71 cfs 0.052 af

Subcatchment 201: Post-3 Runoff Area=0.727 ac 99.97% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=1.90 cfs 0.150 af

Pond 202: Jellyfish Peak Elev=47.36' Inflow=1.90 cfs 0.150 af
15.00" Round Culvert n=0.012 L=19.9' S=0.0302 '/' Outflow=1.90 cfs 0.150 af

Link 101: DP-1 (West) Inflow=0.57 cfs 0.041 af
Primary=0.57 cfs 0.041 af

Link 203: DP-2 (East) Inflow=2.61 cfs 0.202 af
Primary=2.61 cfs 0.202 af

Link 204: DP Total Inflow=3.18 cfs 0.242 af
Primary=3.18 cfs 0.242 af

A3.5.4.3 HydroCAD 10-Year Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: Pre-1 Runoff Area=0.315 ac 80.06% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=86 Runoff=1.23 cfs 0.089 af

Subcatchment 20: Pre-2 Runoff Area=1.333 ac 86.78% Impervious Runoff Depth=3.78"
Tc=6.0 min CN=90 Runoff=5.71 cfs 0.420 af

Link 11: DP-1 Inflow=1.23 cfs 0.089 af
Primary=1.23 cfs 0.089 af

Link 22: DP-2 Inflow=5.71 cfs 0.420 af
Primary=5.71 cfs 0.420 af

Link 23: DP Total Inflow=6.94 cfs 0.508 af
Primary=6.94 cfs 0.508 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: Post-1 Runoff Area=0.314 ac 83.86% Impervious Runoff Depth=3.57"
Tc=6.0 min CN=88 Runoff=1.29 cfs 0.094 af

Subcatchment 200: Post-2 Runoff Area=0.607 ac 69.51% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=80 Runoff=2.00 cfs 0.142 af

Subcatchment 201: Post-3 Runoff Area=0.727 ac 99.97% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=3.48 cfs 0.282 af

Pond 202: Jellyfish Peak Elev=47.66' Inflow=3.48 cfs 0.282 af
15.00" Round Culvert n=0.012 L=19.9' S=0.0302 '/' Outflow=3.48 cfs 0.282 af

Link 101: DP-1 (West) Inflow=1.29 cfs 0.094 af
Primary=1.29 cfs 0.094 af

Link 203: DP-2 (East) Inflow=5.48 cfs 0.424 af
Primary=5.48 cfs 0.424 af

Link 204: DP Total Inflow=6.77 cfs 0.518 af
Primary=6.77 cfs 0.518 af

A3.5.4.4 HydroCAD 25-Year Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: Pre-1 Runoff Area=0.315 ac 80.06% Impervious Runoff Depth=4.50"
Tc=6.0 min CN=86 Runoff=1.62 cfs 0.118 af

Subcatchment 20: Pre-2 Runoff Area=1.333 ac 86.78% Impervious Runoff Depth=4.94"
Tc=6.0 min CN=90 Runoff=7.35 cfs 0.549 af

Link 11: DP-1 Inflow=1.62 cfs 0.118 af
Primary=1.62 cfs 0.118 af

Link 22: DP-2 Inflow=7.35 cfs 0.549 af
Primary=7.35 cfs 0.549 af

Link 23: DP Total Inflow=8.98 cfs 0.667 af
Primary=8.98 cfs 0.667 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: Post-1 Runoff Area=0.314 ac 83.86% Impervious Runoff Depth=4.72"
Tc=6.0 min CN=88 Runoff=1.68 cfs 0.124 af

Subcatchment 200: Post-2 Runoff Area=0.607 ac 69.51% Impervious Runoff Depth=3.87"
Tc=6.0 min CN=80 Runoff=2.74 cfs 0.196 af

Subcatchment 201: Post-3 Runoff Area=0.727 ac 99.97% Impervious Runoff Depth=5.86"
Tc=6.0 min CN=98 Runoff=4.35 cfs 0.355 af

Pond 202: Jellyfish Peak Elev=47.84' Inflow=4.35 cfs 0.355 af
15.00" Round Culvert n=0.012 L=19.9' S=0.0302 '/' Outflow=4.35 cfs 0.355 af

Link 101: DP-1 (West) Inflow=1.68 cfs 0.124 af
Primary=1.68 cfs 0.124 af

Link 203: DP-2 (East) Inflow=7.09 cfs 0.551 af
Primary=7.09 cfs 0.551 af

Link 204: DP Total Inflow=8.76 cfs 0.674 af
Primary=8.76 cfs 0.674 af

A3.5.4.5 HydroCAD 100-Year Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: Pre-1 Runoff Area=0.315 ac 80.06% Impervious Runoff Depth=7.01"
Tc=6.0 min CN=86 Runoff=2.47 cfs 0.184 af

Subcatchment 20: Pre-2 Runoff Area=1.333 ac 86.78% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=90 Runoff=10.89 cfs 0.832 af

Link 11: DP-1 Inflow=2.47 cfs 0.184 af
Primary=2.47 cfs 0.184 af

Link 22: DP-2 Inflow=10.89 cfs 0.832 af
Primary=10.89 cfs 0.832 af

Link 23: DP Total Inflow=13.36 cfs 1.017 af
Primary=13.36 cfs 1.017 af

Summary for Subcatchment 10: Pre-1

Runoff = 2.47 cfs @ 12.08 hrs, Volume= 0.184 af, Depth= 7.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.063	39	>75% Grass cover, Good, HSG A
0.252	98	Impervious, HSG A
0.315	86	Weighted Average
0.063	39	19.94% Pervious Area
0.252	98	80.06% Impervious Area

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

Summary for Subcatchment 20: Pre-2

Runoff = 10.89 cfs @ 12.08 hrs, Volume= 0.832 af, Depth= 7.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.176	39	>75% Grass cover, Good, HSG A
1.157	98	Impervious, HSG A
1.333	90	Weighted Average
0.176	39	13.22% Pervious Area
1.157	98	86.78% Impervious Area

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

Summary for Link 11: DP-1

Inflow Area = 0.315 ac, 80.06% Impervious, Inflow Depth = 7.01" for 100-Year event
Inflow = 2.47 cfs @ 12.08 hrs, Volume= 0.184 af
Primary = 2.47 cfs @ 12.08 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 22: DP-2

Inflow Area = 1.333 ac, 86.78% Impervious, Inflow Depth = 7.50" for 100-Year event
Inflow = 10.89 cfs @ 12.08 hrs, Volume= 0.832 af
Primary = 10.89 cfs @ 12.08 hrs, Volume= 0.832 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 23: DP Total

Inflow Area = 1.648 ac, 85.49% Impervious, Inflow Depth = 7.40" for 100-Year event
Inflow = 13.36 cfs @ 12.08 hrs, Volume= 1.017 af
Primary = 13.36 cfs @ 12.08 hrs, Volume= 1.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: Post-1 Runoff Area=0.314 ac 83.86% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=88 Runoff=2.52 cfs 0.190 af

Subcatchment 200: Post-2 Runoff Area=0.607 ac 69.51% Impervious Runoff Depth=6.28"
Tc=6.0 min CN=80 Runoff=4.38 cfs 0.318 af

Subcatchment 201: Post-3 Runoff Area=0.727 ac 99.97% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=98 Runoff=6.21 cfs 0.512 af

Pond 202: Jellyfish Peak Elev=48.41' Inflow=6.21 cfs 0.512 af
15.00" Round Culvert n=0.012 L=19.9' S=0.0302 '/' Outflow=6.21 cfs 0.512 af

Link 101: DP-1 (West) Inflow=2.52 cfs 0.190 af
Primary=2.52 cfs 0.190 af

Link 203: DP-2 (East) Inflow=10.59 cfs 0.830 af
Primary=10.59 cfs 0.830 af

Link 204: DP Total Inflow=13.11 cfs 1.020 af
Primary=13.11 cfs 1.020 af

Summary for Subcatchment 100: Post-1

Runoff = 2.52 cfs @ 12.08 hrs, Volume= 0.190 af, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.051	39	>75% Grass cover, Good, HSG A
0.264	98	Impervious, HSG A
0.314	88	Weighted Average
0.051	39	16.14% Pervious Area
0.264	98	83.86% Impervious Area

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

Summary for Subcatchment 200: Post-2

Runoff = 4.38 cfs @ 12.09 hrs, Volume= 0.318 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.185	39	>75% Grass cover, Good, HSG A
0.422	98	Impervious, HSG A
0.607	80	Weighted Average
0.185	39	30.49% Pervious Area
0.422	98	69.51% Impervious Area

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

Summary for Subcatchment 201: Post-3

Runoff = 6.21 cfs @ 12.08 hrs, Volume= 0.512 af, Depth= 8.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.457	98	Impervious, HSG A
0.270	98	Roofs, HSG A
0.727	98	Weighted Average
0.000	39	0.03% Pervious Area
0.727	98	99.97% Impervious Area

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

Summary for Pond 202: Jellyfish

Inflow Area = 0.727 ac, 99.97% Impervious, Inflow Depth = 8.46" for 100-Year event
Inflow = 6.21 cfs @ 12.08 hrs, Volume= 0.512 af
Outflow = 6.21 cfs @ 12.08 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.0 min
Primary = 6.21 cfs @ 12.08 hrs, Volume= 0.512 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 48.41' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	46.68'	**15.00" Round Culvert** L= 19.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 46.68' / 46.08' S= 0.0302 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=6.20 cfs @ 12.08 hrs HW=48.41' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 6.20 cfs @ 5.05 fps)

Summary for Link 101: DP-1 (West)

Inflow Area = 0.314 ac, 83.86% Impervious, Inflow Depth = 7.25" for 100-Year event
Inflow = 2.52 cfs @ 12.08 hrs, Volume= 0.190 af
Primary = 2.52 cfs @ 12.08 hrs, Volume= 0.190 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 203: DP-2 (East)

Inflow Area = 1.333 ac, 86.11% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 10.59 cfs @ 12.08 hrs, Volume= 0.830 af
Primary = 10.59 cfs @ 12.08 hrs, Volume= 0.830 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 204: DP Total

Inflow Area = 1.648 ac, 85.68% Impervious, Inflow Depth = 7.43" for 100-Year event
Inflow = 13.11 cfs @ 12.08 hrs, Volume= 1.020 af
Primary = 13.11 cfs @ 12.08 hrs, Volume= 1.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Appendix B Stormwater Report – January 2001

Stormwater Management Report
&
Soil Erosion and Sediment Control

for

TASCA FORD – LINCOLN - MERCURY

on

A/P 13 – Lot 76 - Pontiac Avenue

in

Cranston, Rhode Island

January, 2001

Prepared for:

Tasca Enterprises Inc.
c/o Robert Tasca III
200 Fall River Avenue
Seekonk, Massachusetts 02771

Prepared by:

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75 Sockanosset Crossroad
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Cranston, Rhode Island 02920

Table of Contents

1.0 Project Description

The purpose of this report is to specify an "Erosion and Sediment Control Plan" and a "Stormwater Management System" to be implemented in the construction and maintenance of the Pontiac Avenue Site. The Site covers 14.83 acres and is located east of Pontiac Avenue in the City of Cranston, RI (See Figure 1). The parcel is found Lot 76 on Assessors Plat 13.

The Site is proposed to have one new building constructed for the use as an auto dealership. Public sewer and water will service the site.

This report will specify measures to minimize soil erosion associated with construction and earthwork and to control sediments. In addition, this report will present a stormwater management system that will result in a zero percent net increase of runoff from the proposed site for up to a 100-year frequency rainfall event. The stormwater management system utilizes several types of best management practices intended to control peak discharge rates as well as to improve water quality of the runoff before discharge. The guidelines outlined in the State of Rhode Island Stormwater Design and Installation Standards Manual and US Soil Conservation Service Soil Erosion and Sediment Control Handbook were followed in the site design and preparation of this report.

2.0 Existing Site Conditions

The majority of the Site is open and cleared with the topsoil removed, resulting in a gravel surface covering most of the Site. There are several isolated areas of vegetation and stockpiles of the excavated topsoil. A chain link fence surrounds the entire perimeter of the Site. There is an existing building with large bay doors. The building was formerly used for as storage facility for Rhode Island Department of Transportation.

The Site consists of two watersheds, the first drains northerly to a culvert that drains under the on-ramp to Route 37 eastbound; the second watershed drains easterly to the Pawtuxet River.

There is no 100-year floodplain on the parcel as per the FEMA Insurance Rate Map.

3.0 Adjacent Areas

The proposed development is bounded to the west by Pontiac Avenue and to the north by Route 37. To the south and east is an industrial park. All construction is confined to the Site. There will be no offsite disturbances due to the development.

4.0 Soils

The soil type located on the Site is Udorthentis (Ud). The soil on site has been classified as a C soil with slopes of 0-8%.

5.0 Critical Areas

The Site is located near an intermittent stream less than 10 feet wide and an area subject to flooding. There will be no adverse impact to either of these natural features.

6.0 Erosion and Sediment Control Measures, Permanent Stabilization and Maintenance

The erosion, sediment, stabilization and runoff control will be accomplished by the use of the following during and after construction:

- Establishment of temporary and permanent vegetative cover
- Non-structural measures
- Structural measures

6.1 ESTABLISHMENT OF VEGETATIVE COVER

6.1.1 Slopes shall not be left unattended or exposed for excessive periods of time such as the inactive winter season.

6.1.2 All existing gravel areas not utilized for driveway access are to be loamed and seeded.

6.1.3 The topsoil shall have a sandy loam texture relatively free of subsoil material, stones, roots, lumps of soil, tree limbs, trash or construction debris and shall conform with Rhode Island's Standard Specification, M.20.

6.1.4 The seeding design mix shall be comprised of the following:

Type	LBS/AC
Creeping Red Fescue	75
Kentucky Blue Grass	15
Colonial Bent Grass	5
Perennial Rye Grass	5

Early spring or late summer seeding is recommended. Lime and fertilization as required by soil testing to compliment or upgrade existing conditions. The seed mix shall be inoculated within 24 hours and before mixing and planting.

6.1.5 Temporary treatments shall consist of North American Green erosion control blankets such as S150 or approved equal. They shall be incorporated into the work as warranted or as ordered by the engineer. Hay or straw applications shall be in the amount of 2 tons/acre.

6.1.6 All hay bales or temporary protection shall remain in place until an acceptable stand of grass or approved ground cover is established.

6.1.7 All fill shall be thoroughly compacted upon placement in strict conformance with the Rhode Island Standard Specification for Road and Bridge Section 202.

6.1.8 Stockpiles of topsoil shall not be located near waterways. They shall have side slopes no greater than 2:1 and shall be temporarily seeded and/or stabilized.

6.1.9 The construction superintendent shall have overall responsibility for plan implementation and for seeing that the appropriate workers are aware of the provisions of the plan. The contractor must repair and/or reseed any areas that do not develop within the period of one year and shall do so at no additional expense.

6.1.10 All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Permanently seeded areas shall be protected during establishment with mulch. All seeded areas will be checked regularly to see that a good stand is maintained. Areas shall be fertilized and reseeded as necessary.

6.1.11 Reference the "Rhode Island Soil Erosion and Sedimentation Control Handbook" prepared by the USDA Soil Conservation Service 1989 as a guide.

6.1.12 Maximum graded slope within the Site is to be 3:1.

6.2 NON-STRUCTURAL MEASURES

6.2.1 Construction traffic shall be limited to access roads, drainage easements and areas to be graded.

6.2.2 A stone stabilization pad is located at the site entrance to reduce the tracking or flowing of sediment onto the public right of way.

6.2.3 The contractor shall maintain the entrance. The maintenance shall include top dressing with additional stone or additional length as conditions demand or as directed by the engineer. All sediments spilled, dropped, washed, or tracked onto the public right of way must be removed immediately by the contractor.

6.2.4 Topsoil shall be stripped from areas to be graded and stockpiled for later use. Stockpile location shall be subject to approval by the project engineer. A sediment barrier should surround all topsoil stockpiles.

6.2.5 Hay bales or silt fence shall be installed downstream outside the limits of any proposed construction as shown on the site plans and prior to the commencement of the proposed alteration.

6.2.6 The contractor shall maintain Hay bales. Inspection shall be made after each storm event and repaired or replaced as warranted. The contractor shall clean the accumulated sediment if half of the original height of the bales become filled in with sediment.

6.2.7 The contractor shall check the hay bales or silt fence weekly for undermining or deterioration.

6.2.8 The construction superintendent shall have overall responsibility for plan implementation of non-structural measures and for seeing that appropriate workers are aware of the provisions of the plan.

6.2.9 Reference the "Rhode Island Soil Erosion and Sediment Control Handbook" prepared by the USDA Soil Conservation Service 1989, as a guide.

6.3 STRUCTURAL MEASURES

6.3.1 Runoff water quality is improved utilizing oversized catch basins modified to promote sediment and oil removal prior to discharging to the underground detention system.

6.3.2 A permanent cover shall be established in accordance with the vegetative cover provisions. The seeding shall extend to at least the design top width of the BMP's and include any other areas disturbed by construction activities. Activities shall be confined to within the limit of work as shown on the plans.

6.3.3 Vigorous vegetation shall be maintained by applying lime and fertilizer. Bare or eroded areas shall be immediately repaired and reseeded by the contractor.

6.3.4 The contractor is responsible for maintenance and inspection of the underground detention area up to a year after completion of construction. The owner is responsible thereafter.

6.3.5 The contractor shall be responsible for maintaining the sedimentation basins during construction and the detention area up to the acceptance by the owner. The owner shall be responsible thereafter for the detention area and drainage system. The owner shall inspect the catch basins and detention area semiannually and after major storms.

6.3.6 The construction superintendent shall have the overall responsibility for structural measures implementation and for seeing that appropriate workers are aware of the provisions of the plan.

6.3.7 Reference the "Rhode Island Soil Erosion and Sediment Control Handbook" prepared by USDA Soil Conservation Service 1989, as a guide.

6.4 MAINTENANCE: SHORT TERM / LONG TERM

6.4.1 All disturbed slopes and newly created or currently exposed shall be seeded, protected, and maintained by the contractor following final grading and construction. The contractor shall check regularly all seeded areas to see that a good stand is maintained.

6.4.2 The contractor must repair or reseed any areas that do not develop within the period of one year and shall do so at no additional expense.

6.4.3 All haybales, temporary treatments (hay, straw, etc.), and temporary protection shall be maintained by the contractor throughout construction and shall remain in place until an acceptable stand of grass or approved ground cover is established.

6.4.4 The contractor shall maintain all topsoil stockpiles and sediment barriers throughout construction. Extreme care shall be taken to ensure that sediments do not spill over the sediment barrier.

6.4.5 The contractor shall check the haybales or silt fence on a weekly basis and after each storm for undermining or deterioration. The contractor shall repair or replace the haybales as necessary. The contractor shall clean the accumulated sediment if half of the original height of the bales become filled in with sediments.

6.4.6 The contractor shall maintain the stone stabilization pad at the site entrance. The maintenance shall include top dressing with additional stone or additional length as conditions demand or as directed by the engineer. All sediments spilled, dropped, washed, or tracked on the public right of way must be removed immediately by the contractor.

6.4.7 The contractor is responsible for maintenance and inspection of the detention area during and up to a year after completion of construction. Maintenance shall include removing sediments and trapped oil from the modified catch basins maintaining the pipe outfall location as needed.

6.4.8 The contractor shall maintain the drainage system throughout construction. The accumulated sediments in the catch basins shall be removed and drainage pipes flushed by the contractor at the end of construction.

6.4.9 The owner is responsible for the long-term maintenance of the detention area and catch basins. The drainage system shall be checked semi-annually. Maintenance shall include removing sediments and trapped oil from the modified catch basins and maintaining the pipe outfall location as needed. Biannual sweeping of the parking lot and driveway is recommended to coincide with fall cleanup from leaves and spring cleanup from sanding activities.

6.4.10 The construction superintendent shall have overall responsibility for the maintenance program during the construction phase. The superintendent shall see that the appropriate workers are aware of the provisions of the plan.

6.4.11 After the first year and acceptance by the owner, the owner shall have overall responsibility for implementing the maintenance program.

7.0 Stormwater Management Considerations

7.1 ANALYSIS

7.1.1 Design Storm

Analysis of 2 year, 10 year, 25 year, and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the U.S. Weather Bureau, for the Warwick, Rhode Island area.

2 year	=	3.0 inches
10 year	=	4.8 inches
25 year	=	5.6 inches
100 year	=	7.0 inches

7.1.2 Method of Analysis

USDA Soil Conservation Service Method as defined by Technical Release No 20 determines Stormwater runoff rate and volume. (TR-20). Type III rainfall distribution is utilized. The computer program *HydroCAD* by Applied Microcomputer Systems is used.

7.1.3 Watershed Subcatchments

The site is analyzed as one watershed draining northwest and west toward the perennial stream, wetlands, and ASSF.

The proposed construction development results in zero net increase in runoff for 2 year, 10 year, 25 year, and 100-year frequency storms.

The following subcatchment are utilized in the analysis

Subcatchment 1: Existing Conditions

Area	=	5.82 acres
CN	=	88
Tc	=	6.8 min

Subcatchment 2: Existing Conditions

Area	=	8.81 acres
CN	=	88
Tc	=	12.3 min.

Subcatchment 3: Proposed Conditions / Uncontrolled

Area	=	1.40 acres
CN	=	61
Tc	=	5.9 min.

Subcatchment 4: Proposed Conditions / To Pond

Area	=	8.55 acres
CN	=	90
Tc	=	14.1 min.

Subcatchment 5: Proposed Conditions / Uncontrolled

Area	=	1.02 acres
CN	=	61
Tc	=	8.4 min.

Subcatchment 6: Proposed Conditions to Culvert

Area	=	3.66 acres
CN	=	89
Tc	=	4.5 min.

7.1.4 Sequence of Analysis

2-year, 10-year, 25-year, 100-year Hydrology Analysis:

Existing Conditions:

Subcatchment 1 = Western Watershed
Subcatchment 2 = Eastern Watershed

Proposed Conditions:

Route Subcatchment 4 to Underground Detention Area = Pond 1
Combine Pond 1 + Subcatchment 3 = Proposed Conditions runoff for Eastern Watershed

Combine Subcatchment 5 + Subcatchment 6 = Proposed Conditions for Western Watershed

Proposed Conditions Western Watershed <= Existing Conditions Western Watershed

Proposed Conditions Eastern Watershed <= Existing Conditions Eastern Watershed

7.2 CONCLUSION

The results of the hydrology analysis demonstrate a net decrease in stormwater runoff from existing conditions to proposed conditions for the proposed development.

Western Watershed

Storm	(Subcatchment 1) Q-Pre (cfs)	(Subcatchment 5 + Subcatchment 6) Q-Post (cfs)	Net Change in Q (cfs)
2-Year	13.79	0.35 + 9.77 = 10.12	-3.67
10-Year	22.62	1.23 + 15.78 = 17.01	-5.61
25-Year	27.32	1.80 + 18.98 = 20.78	-6.54
100-Year	35.52	2.90 + 24.55 = 27.45	-8.07

Eastern Watershed

Storm	(Subcatchment 2) Q-Pre (cfs)	(Pond 1 + Subcatchment 3) Q-Post (cfs)	Net Change in Q (cfs)
2-Year	17.51	16.28 + 0.53 = 16.78	-0.73
10-Year	28.75	24.76 + 1.85 = 26.61	-2.14
25-Year	34.75	29.01 + 2.70 = 31.71	-3.04
100-Year	45.20	39.99 + 4.34 = 44.33	-0.87

The above results demonstrate that there is zero net increase in stormwater runoff rate discharge off site from pre-development to post-development conditions for the Site. This analysis ensures that no increase in runoff rate will result to the adjacent area.

Runoff discharge is conveyed by overland flow.

8.0 Sequence and Staging of Land Disturbing Activities

8.1 Survey and stake the drainage structures, foundation corners, underground detention area, and the limit of work and sedimentation barriers.

8.2 Place sedimentation barriers (hay bales or silt fence) as shown on the plans and staked out in the field. In no case is the limit of work to extend beyond the sedimentation barriers.

8.3 Begin foundation, parking, and drainage work (clearing and grubbing, excavating and grading, etc.) Topsoil to be stripped and stockpiled in approved areas. The stockpiles are to be protected by a row of sedimentation barrier and covered or temporarily seeded.

8.4 Install utilities, foundation, curbing, and underground detention area. Protect underground detention area from all runoff until all disturbed areas are stabilized and parking lot is paved. Immediately place the erosion controls at the discharge points and seed the basins and disturbed areas.

8.5 Begin parking area paving, sidewalk, etc.

8.6 Begin landscaping while building is under construction.

8.7 Finish building, landscaping, and permanent stabilization. Sweep the parking area to remove all sediments.

8.8 Clean the catch basins of sediments as needed and divert stormwater to the underground detention area.

8.9 Remove all temporary soil erosion and sedimentation control measures following vegetative establishment of all disturbed areas.

9.0

SUPPORTING DOCUMENTATION

9.1

WATERSHED ANALYSIS

HydroCAD®

STORMWATER MODELING SYSTEM

Version 5

Owner's Manual

Software & Manual Copyright © 1986-1998 Applied Microcomputer Systems

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Applied Microcomputer Systems
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http://www.hydrocad.net

6182 rev. 6/12/98

2-YEAR STORM EVENT

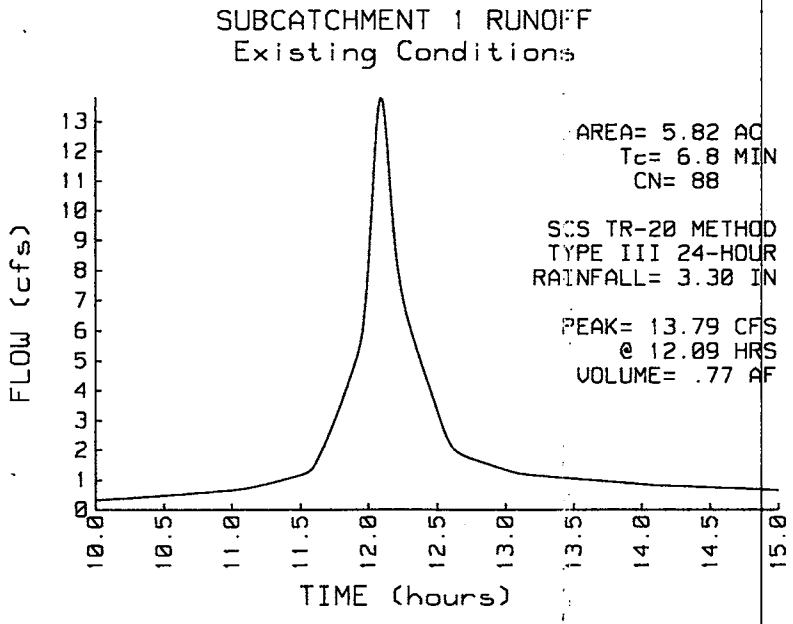
SUBCATCHMENT 1 **Existing Conditions**

PEAK= 13.79 CFS @ 12.09 HRS, VOLUME= .77 AF

ACRES	CN	
2.36	98	Impervious
.67	60	Open space / good
2.79	86	Gravel / Disturbed Areas
5.82	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:1a-1b**	1.8
Grass: Short n=.15 L=34' P2=3.3 in s=.15 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1b-1c**	.2
Unpaved Kv=16.1345 L=73' s=.14 '/' V=6.04 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1c-1d**	3.2
Paved Kv=20.3282 L=392' s=.01 '/' V=2.03 fps		
CHANNEL FLOW	**Segment ID:1d-1e**	1.6
a=.1 sq-ft Pw=10' r=.01'		
s=.0692 '/' n=.008 V=2.27 fps	L=213' Capacity=.2 cfs	
	Total Length= 712 ft	Total Tc= 6.8



SUBCATCHMENT 1 RUNOFF PEAK= 13.79 CFS @ 12.09 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.33	.33	.33	.34	.34	.34	.34	.34	.35	.35
10.10	.35	.35	.36	.36	.36	.36	.37	.37	.37	.38
10.20	.38	.38	.38	.39	.39	.39	.40	.40	.40	.41
10.30	.41	.41	.41	.42	.42	.42	.43	.43	.43	.44
10.40	.44	.44	.45	.45	.45	.46	.46	.46	.47	.47
10.50	.47	.48	.48	.48	.49	.49	.49	.50	.50	.50
10.60	.51	.51	.51	.52	.52	.52	.53	.53	.54	.54
10.70	.54	.55	.55	.55	.56	.56	.57	.57	.57	.58
10.80	.58	.58	.59	.59	.60	.60	.60	.61	.61	.61
10.90	.62	.62	.63	.63	.63	.64	.64	.65	.65	.65
11.00	.66	.66	.67	.67	.67	.68	.68	.69	.70	.70
11.10	.71	.72	.73	.74	.75	.76	.77	.78	.79	.80
11.20	.81	.82	.83	.84	.85	.86	.88	.89	.90	.91
11.30	.92	.93	.95	.96	.97	.98	1.00	1.01	1.02	1.03
11.40	1.04	1.06	1.07	1.08	1.10	1.11	1.12	1.13	1.15	1.16
11.50	1.17	1.19	1.20	1.22	1.23	1.26	1.28	1.32	1.36	1.42
11.60	1.48	1.55	1.62	1.71	1.79	1.89	1.98	2.08	2.18	2.29
11.70	2.39	2.50	2.61	2.72	2.84	2.95	3.07	3.19	3.31	3.43
11.80	3.56	3.68	3.81	3.94	4.07	4.20	4.33	4.47	4.60	4.74
11.90	4.88	5.02	5.16	5.32	5.51	5.74	6.03	6.41	6.87	7.42
12.00	8.08	8.81	9.61	10.46	11.30	12.09	12.77	13.29	13.64	13.79
12.10	13.74	13.52	13.13	12.62	12.04	11.41	10.77	10.16	9.60	9.09
12.20	8.64	8.25	7.91	7.62	7.36	7.12	6.91	6.71	6.53	6.35
12.30	6.19	6.03	5.87	5.72	5.57	5.43	5.29	5.14	5.00	4.86
12.40	4.72	4.59	4.45	4.31	4.17	4.03	3.90	3.76	3.62	3.48
12.50	3.34	3.20	3.06	2.93	2.79	2.66	2.54	2.43	2.34	2.25
12.60	2.18	2.12	2.06	2.02	1.98	1.94	1.91	1.89	1.86	1.84
12.70	1.82	1.80	1.78	1.76	1.75	1.73	1.71	1.70	1.68	1.67
12.80	1.65	1.63	1.62	1.61	1.59	1.58	1.56	1.55	1.53	1.52
12.90	1.50	1.49	1.47	1.46	1.44	1.43	1.41	1.40	1.39	1.37
13.00	1.36	1.34	1.33	1.31	1.30	1.28	1.27	1.26	1.25	1.24
13.10	1.23	1.22	1.21	1.21	1.20	1.20	1.19	1.19	1.18	1.18
13.20	1.17	1.17	1.16	1.16	1.16	1.15	1.15	1.14	1.14	1.14
13.30	1.13	1.13	1.12	1.12	1.12	1.11	1.11	1.11	1.10	1.10
13.40	1.09	1.09	1.09	1.08	1.08	1.08	1.07	1.07	1.06	1.06
13.50	1.06	1.05	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.02
13.60	1.02	1.01	1.01	1.01	1.00	1.00	1.00	.99	.99	.98
13.70	.98	.98	.97	.97	.97	.96	.96	.95	.95	.95
13.80	.94	.94	.93	.93	.93	.92	.92	.91	.91	.91
13.90	.90	.90	.90	.89	.89	.88	.88	.88	.87	.87
14.00	.86	.86	.86	.85	.85	.84	.84	.84	.83	.83
14.10	.83	.83	.82	.82	.82	.82	.81	.81	.81	.81
14.20	.81	.80	.80	.80	.80	.80	.80	.79	.79	.79
14.30	.79	.79	.78	.78	.78	.78	.78	.77	.77	.77
14.40	.77	.77	.77	.76	.76	.76	.76	.76	.75	.75
14.50	.75	.75	.75	.75	.74	.74	.74	.74	.74	.73
14.60	.73	.73	.73	.73	.72	.72	.72	.72	.72	.72
14.70	.71	.71	.71	.71	.71	.70	.70	.70	.70	.70
14.80	.69	.69	.69	.69	.69	.69	.68	.68	.68	.68
14.90	.68	.67	.67	.67	.67	.67	.66	.66	.66	.66
15.00	.66									

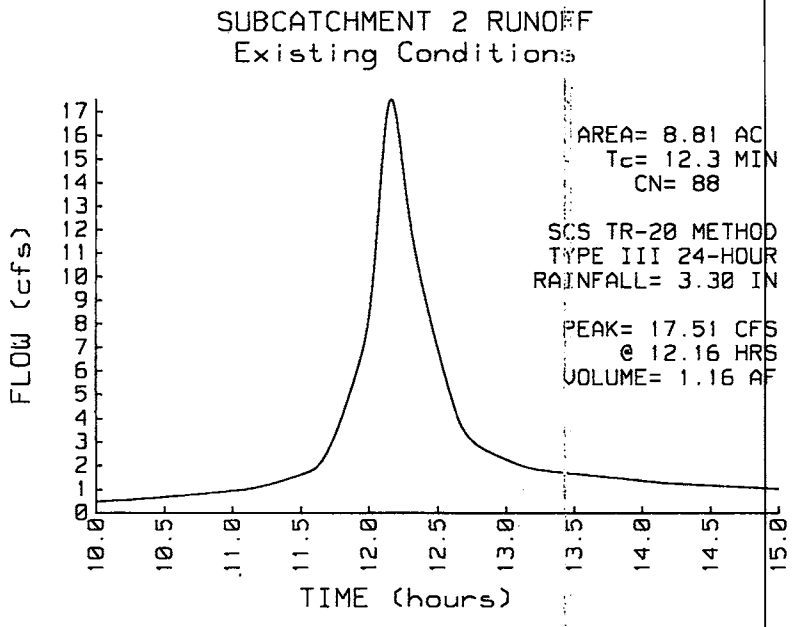
SUBCATCHMENT 2 **Existing Conditions**

PEAK= 17.51 CFS @ 12.16 HRS, VOLUME= 1.16 AF

ACRES	CN	
1.24	98	Impervious
.18	60	Woods Fair
7.29	87	Gravel / Disturbed Areas
.10	61	open space / good
8.81	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:2a-2b**	8.2
Grass: Short n=.15 L=110' P2=3.3 in s=.036 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2b-2c**	.3
Unpaved Kv=16.1345 L=182' s=.31 '/' V=8.98 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2c-2d**	1.4
Unpaved Kv=16.1345 L=182' s=.018 '/' V=2.16 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2d-2e**	2.4
Unpaved Kv=16.1345 L=399' s=.03 '/' V=2.79 fps		
	Total Length= 873 ft	Total Tc= 12.3



SUBCATCHMENT 2 RUNOFF PEAK= 17.51 CFS @ 12.16 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.47	.48	.48	.48	.49	.49	.49	.49	.50	.50
10.10	.50	.51	.51	.51	.52	.52	.52	.53	.53	.53
10.20	.54	.54	.55	.55	.55	.56	.56	.57	.57	.58
10.30	.58	.59	.59	.59	.60	.60	.61	.61	.62	.62
10.40	.63	.63	.64	.64	.64	.65	.65	.66	.66	.67
10.50	.67	.68	.68	.69	.69	.70	.70	.71	.71	.72
10.60	.72	.73	.73	.74	.75	.75	.76	.76	.77	.77
10.70	.78	.78	.79	.79	.80	.80	.81	.81	.82	.82
10.80	.83	.84	.84	.85	.85	.86	.86	.87	.88	.88
10.90	.89	.89	.90	.90	.91	.92	.92	.93	.93	.94
11.00	.95	.95	.96	.96	.97	.98	.98	.99	.99	1.00
11.10	1.01	1.02	1.02	1.03	1.04	1.05	1.06	1.07	1.09	1.10
11.20	1.11	1.12	1.14	1.15	1.17	1.18	1.19	1.21	1.23	1.24
11.30	1.26	1.27	1.29	1.31	1.32	1.34	1.36	1.38	1.39	1.41
11.40	1.43	1.45	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60
11.50	1.61	1.63	1.65	1.67	1.69	1.71	1.74	1.76	1.79	1.82
11.60	1.86	1.90	1.95	2.01	2.07	2.14	2.22	2.31	2.41	2.51
11.70	2.62	2.73	2.85	2.98	3.11	3.25	3.40	3.54	3.69	3.85
11.80	4.00	4.17	4.33	4.50	4.67	4.84	5.02	5.20	5.38	5.57
11.90	5.76	5.94	6.14	6.34	6.54	6.77	7.00	7.26	7.56	7.89
12.00	8.28	8.73	9.24	9.83	10.48	11.19	11.95	12.74	13.54	14.34
12.10	15.08	15.76	16.36	16.82	17.19	17.41	17.50	17.49	17.33	17.09
12.20	16.78	16.37	15.93	15.48	14.98	14.51	14.03	13.57	13.14	12.71
12.30	12.32	11.96	11.60	11.28	10.97	10.66	10.38	10.09	9.82	9.57
12.40	9.30	9.05	8.81	8.56	8.33	8.10	7.86	7.64	7.41	7.18
12.50	6.97	6.74	6.52	6.30	6.08	5.87	5.66	5.44	5.24	5.04
12.60	4.85	4.67	4.49	4.32	4.17	4.02	3.89	3.76	3.65	3.55
12.70	3.45	3.36	3.29	3.21	3.15	3.09	3.03	2.98	2.93	2.88
12.80	2.84	2.80	2.76	2.73	2.69	2.66	2.62	2.59	2.56	2.53
12.90	2.50	2.48	2.45	2.42	2.40	2.37	2.35	2.32	2.30	2.28
13.00	2.25	2.23	2.20	2.18	2.16	2.13	2.11	2.09	2.07	2.04
13.10	2.03	2.00	1.99	1.97	1.95	1.93	1.92	1.90	1.89	1.88
13.20	1.87	1.86	1.84	1.83	1.83	1.82	1.81	1.80	1.79	1.78
13.30	1.78	1.77	1.76	1.75	1.75	1.74	1.73	1.73	1.72	1.71
13.40	1.71	1.70	1.70	1.69	1.68	1.68	1.67	1.67	1.66	1.66
13.50	1.65	1.64	1.64	1.63	1.63	1.62	1.61	1.61	1.60	1.60
13.60	1.59	1.58	1.58	1.57	1.57	1.56	1.56	1.55	1.55	1.54
13.70	1.53	1.53	1.52	1.52	1.51	1.50	1.50	1.49	1.49	1.48
13.80	1.47	1.47	1.46	1.46	1.45	1.45	1.44	1.43	1.43	1.42
13.90	1.42	1.41	1.41	1.40	1.39	1.39	1.38	1.38	1.37	1.36
14.00	1.36	1.35	1.35	1.34	1.33	1.33	1.32	1.32	1.31	1.31
14.10	1.30	1.29	1.29	1.28	1.28	1.27	1.27	1.27	1.26	1.26
14.20	1.25	1.25	1.25	1.24	1.24	1.24	1.23	1.23	1.23	1.22
14.30	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20	1.19	1.19
14.40	1.19	1.19	1.18	1.18	1.18	1.17	1.17	1.17	1.17	1.16
14.50	1.16	1.16	1.16	1.15	1.15	1.15	1.14	1.14	1.14	1.13
14.60	1.13	1.13	1.13	1.12	1.12	1.12	1.12	1.11	1.11	1.11
14.70	1.10	1.10	1.10	1.09	1.09	1.09	1.09	1.08	1.08	1.08
14.80	1.08	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.05	1.05
14.90	1.05	1.04	1.04	1.04	1.04	1.03	1.03	1.03	1.02	1.02
15.00	1.02									

SUBCATCHMENT 3 **Proposed Conditions uncontrolled**

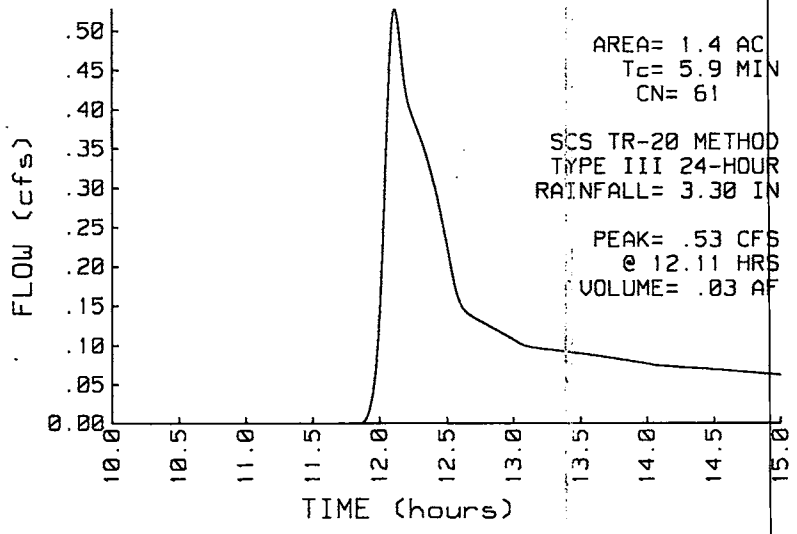
PEAK= .53 CFS @ 12.11 HRS, VOLUME= .03 AF

ACRES	CN	
1.40	61	Grass / good

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**3A - 3B**	1.9
Grass: Short n=.15 L=65' P2=3.3 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**3B - 3C**	4.0
Unpaved Kv=16.1345 L=550' s=.02 '/' V=2.28 fps		
	Total Length= 615 ft	Total Tc= 5.9

SUBCATCHMENT 3 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 3 RUNOFF PEAK= .53 CFS @ 12.11 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.90	.01	.01	.01	.02	.03	.04	.05	.07	.09	.11
12.00	.14	.18	.22	.26	.31	.36	.41	.45	.48	.51
12.10	.52	.53	.53	.52	.50	.49	.47	.45	.44	.43
12.20	.42	.41	.40	.40	.39	.39	.38	.38	.37	.37
12.30	.36	.36	.35	.35	.34	.34	.33	.33	.32	.31
12.40	.31	.30	.29	.28	.28	.27	.26	.25	.24	.23
12.50	.23	.22	.21	.20	.19	.18	.17	.17	.16	.16
12.60	.15	.15	.15	.15	.14	.14	.14	.14	.14	.14
12.70	.14	.14	.13	.13	.13	.13	.13	.13	.13	.13
12.80	.13	.13	.13	.12	.12	.12	.12	.12	.12	.12
12.90	.12	.12	.12	.11	.11	.11	.11	.11	.11	.11
13.00	.11	.11	.11	.10	.10	.10	.10	.10	.10	.10
13.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
13.20	.10	.10	.10	.10	.10	.10	.10	.10	.10	.09
13.30	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
13.40	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
13.50	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
13.60	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
13.70	.09	.09	.08	.08	.08	.08	.08	.08	.08	.08
13.80	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
13.90	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
14.00	.08	.08	.08	.08	.08	.08	.08	.08	.07	.07
14.10	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.20	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.30	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.40	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.50	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.60	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.70	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14.80	.07	.07	.07	.07	.06	.06	.06	.06	.06	.06
14.90	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
15.00	.06									

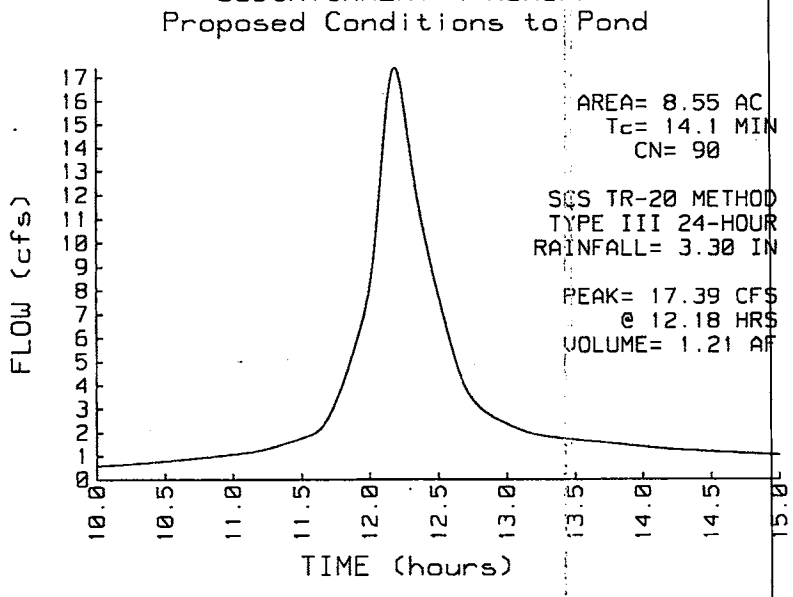
SUBCATCHMENT 4 **Proposed Conditions to Pond**

PEAK= 17.39 CFS @ 12.18 HRS, VOLUME= 1.21 AF

ACRES	CN	
6.36	98	Impervious - Buildings, Pavement
2.19	67	Lawn - Good
8.55	90	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:4a-4b**	12.2
Grass: Short n=.15 L=95' P2=3.3 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	0.0
Unpaved Kv=16.1345 L=32' s=.5 '/' V=11.41 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	.4
Paved Kv=20.3282 L=61' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**Segment ID:4d-4e**	.5
180" Diameter a=176.71 sq-ft Pw=47.1' r=3.75'		
s=.005 '/' n=.009 V=28.18 fps L=818' Capacity=4979.9 cfs		
CIRCULAR CHANNEL	**Segment ID:4e-4f**	1.0
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.005 '/' n=.009 V=7.35 fps L=444' Capacity=23.1 cfs		
	Total Length= 1450 ft Total Tc=	14.1



SUBCATCHMENT 4 RUNOFF PEAK= 17.39 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.58	.58	.58	.59	.59	.59	.60	.60	.60	.60
10.10	.61	.61	.61	.62	.62	.62	.63	.63	.64	.64
10.20	.64	.65	.65	.66	.66	.66	.67	.67	.68	.68
10.30	.69	.69	.70	.70	.71	.71	.72	.72	.73	.73
10.40	.74	.74	.75	.75	.76	.76	.77	.77	.78	.78
10.50	.79	.79	.80	.80	.81	.81	.82	.82	.83	.83
10.60	.84	.85	.85	.86	.86	.87	.87	.88	.88	.89
10.70	.90	.90	.91	.91	.92	.92	.93	.93	.94	.95
10.80	.95	.96	.96	.97	.98	.98	.99	.99	1.00	1.01
10.90	1.01	1.02	1.02	1.03	1.04	1.04	1.05	1.05	1.06	1.06
11.00	1.07	1.08	1.08	1.09	1.10	1.10	1.11	1.12	1.12	1.13
11.10	1.14	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22
11.20	1.23	1.25	1.26	1.27	1.29	1.30	1.32	1.33	1.35	1.37
11.30	1.38	1.40	1.42	1.43	1.45	1.47	1.49	1.50	1.52	1.54
11.40	1.56	1.58	1.60	1.61	1.63	1.65	1.67	1.69	1.71	1.73
11.50	1.75	1.77	1.79	1.81	1.83	1.85	1.88	1.90	1.93	1.96
11.60	1.99	2.03	2.07	2.12	2.17	2.23	2.31	2.38	2.46	2.56
11.70	2.66	2.76	2.87	2.99	3.12	3.25	3.39	3.53	3.68	3.83
11.80	3.99	4.14	4.31	4.48	4.64	4.82	5.00	5.17	5.36	5.55
11.90	5.73	5.92	6.12	6.31	6.52	6.73	6.95	7.20	7.47	7.76
12.00	8.09	8.46	8.89	9.37	9.91	10.51	11.14	11.83	12.54	13.26
12.10	13.98	14.67	15.31	15.89	16.39	16.78	17.09	17.31	17.38	17.38
12.20	17.31	17.10	16.85	16.56	16.18	15.79	15.38	14.95	14.51	14.09
12.30	13.68	13.27	12.89	12.52	12.16	11.83	11.51	11.19	10.90	10.62
12.40	10.33	10.06	9.79	9.52	9.27	9.02	8.76	8.52	8.28	8.04
12.50	7.80	7.57	7.33	7.10	6.87	6.65	6.42	6.20	5.98	5.76
12.60	5.56	5.36	5.16	4.98	4.80	4.63	4.47	4.32	4.18	4.04
12.70	3.92	3.81	3.70	3.61	3.51	3.43	3.35	3.28	3.21	3.15
12.80	3.09	3.03	2.99	2.94	2.89	2.85	2.81	2.77	2.73	2.70
12.90	2.66	2.63	2.60	2.56	2.53	2.51	2.48	2.45	2.42	2.39
13.00	2.36	2.34	2.31	2.29	2.26	2.24	2.21	2.19	2.17	2.14
13.10	2.12	2.10	2.08	2.06	2.04	2.02	2.00	1.98	1.97	1.95
13.20	1.94	1.92	1.91	1.90	1.89	1.87	1.86	1.85	1.84	1.84
13.30	1.83	1.82	1.81	1.80	1.79	1.79	1.78	1.77	1.76	1.76
13.40	1.75	1.74	1.74	1.73	1.72	1.72	1.71	1.70	1.70	1.69
13.50	1.68	1.68	1.67	1.67	1.66	1.66	1.65	1.64	1.64	1.63
13.60	1.62	1.62	1.61	1.61	1.60	1.59	1.59	1.58	1.58	1.57
13.70	1.57	1.56	1.55	1.55	1.54	1.53	1.53	1.52	1.52	1.51
13.80	1.51	1.50	1.49	1.49	1.48	1.48	1.47	1.46	1.46	1.45
13.90	1.45	1.44	1.44	1.43	1.42	1.42	1.41	1.40	1.40	1.39
14.00	1.39	1.38	1.38	1.37	1.36	1.36	1.35	1.34	1.34	1.33
14.10	1.33	1.32	1.32	1.31	1.31	1.30	1.29	1.29	1.29	1.28
14.20	1.28	1.27	1.27	1.26	1.26	1.26	1.25	1.25	1.25	1.24
14.30	1.24	1.24	1.23	1.23	1.23	1.22	1.22	1.22	1.21	1.21
14.40	1.21	1.20	1.20	1.20	1.19	1.19	1.19	1.19	1.18	1.18
14.50	1.18	1.17	1.17	1.17	1.17	1.16	1.16	1.16	1.15	1.15
14.60	1.15	1.15	1.14	1.14	1.14	1.13	1.13	1.13	1.13	1.12
14.70	1.12	1.12	1.11	1.11	1.11	1.10	1.10	1.10	1.10	1.09
14.80	1.09	1.09	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.07
14.90	1.06	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.04	1.04
15.00	1.03									

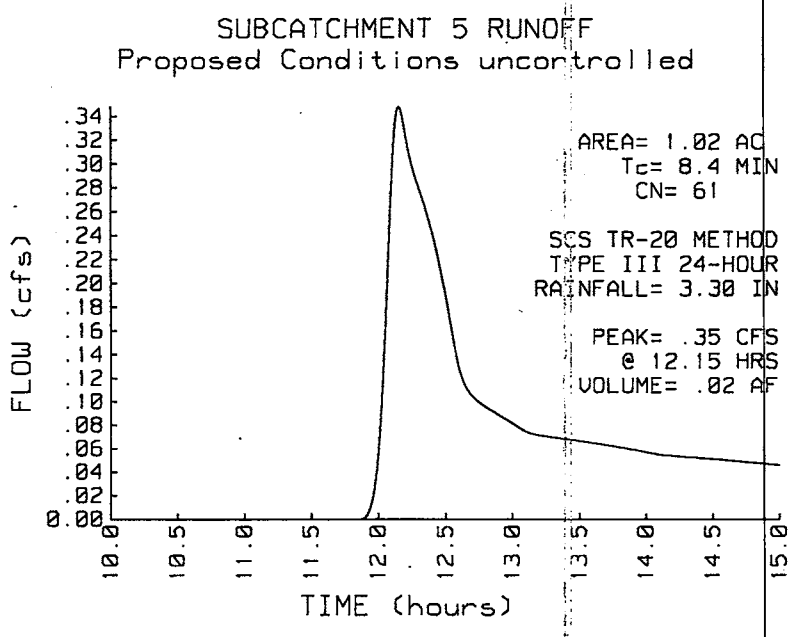
SUBCATCHMENT 5 **Proposed Conditions uncontrolled**

PEAK= .35 CFS @ 12.15 HRS, VOLUME= .02 AF

ACRES	CN	
1.02	61	Lawn / Good (B soil)

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**5A - 5B**	6.7
Grass: Short n=.15 L=100' P2=3.3 in s=.05 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**5B - 5C**	1.7
Unpaved Kv=16.1345 L=360' s=.05 '/' V=3.6 fps		
	Total Length= 460 ft	Total Tc= 8.4



SUBCATCHMENT 5 RUNOFF PEAK= .35 CFS @ 12.15 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.90	0.00	0.00	0.00	.01	.01	.01	.02	.02	.03	.04
12.00	.05	.07	.09	.11	.13	.16	.19	.22	.24	.27
12.10	.29	.31	.33	.34	.35	.35	.35	.34	.34	.33
12.20	.32	.32	.31	.31	.30	.30	.29	.29	.29	.28
12.30	.28	.28	.27	.27	.27	.26	.26	.25	.25	.25
12.40	.24	.24	.23	.23	.22	.22	.21	.21	.20	.19
12.50	.19	.18	.18	.17	.16	.16	.15	.14	.14	.13
12.60	.13	.13	.12	.12	.12	.11	.11	.11	.11	.11
12.70	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
12.80	.10	.09	.09	.09	.09	.09	.09	.09	.09	.09
12.90	.09	.09	.09	.09	.09	.08	.08	.08	.08	.08
13.00	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
13.10	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
13.20	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
13.30	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
13.40	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
13.50	.07	.07	.07	.07	.07	.07	.07	.07	.07	.06
13.60	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
13.70	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
13.80	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
13.90	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
14.00	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
14.10	.06	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.20	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.30	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.40	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.50	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.60	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.70	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.80	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
14.90	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
15.00	.05									

SUBCATCHMENT 6 **PROPOSED CONDITIONS TO CULVERT**

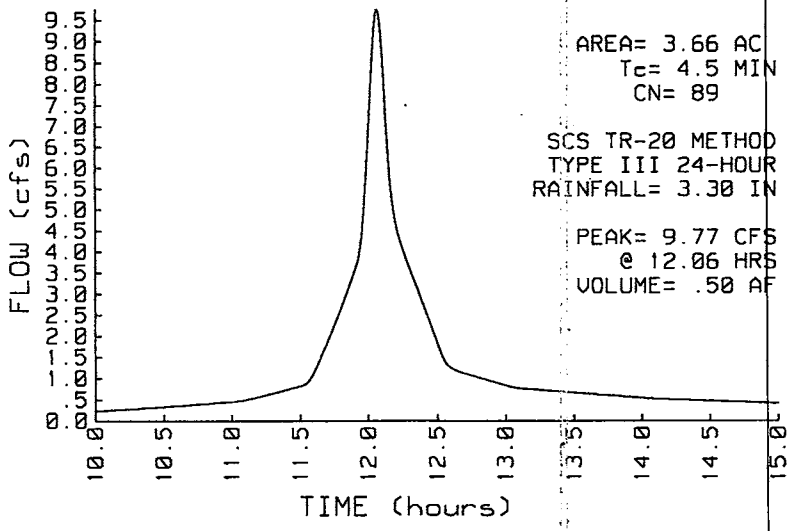
PEAK= 9.77 CFS @ 12.06 HRS, VOLUME= .50 AF

ACRES	CN	
2.60	98	IMPERVIOUS
1.06	67	LAWN AREA
3.66	89	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.30 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**6A - 6B**	2.3
Grass: Short n=.15 L=60' P2=3.3 in s=.26 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**6B - 6C**	.7
Paved Kv=20.3282 L=116' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**6C - 6D**	1.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.005 '/' n=.009 V=6.07 fps L=453' Capacity=10.7 cfs		
CIRCULAR CHANNEL	**6D - 6E**	.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.011 '/' n=.009 V=9.01 fps L=100' Capacity=15.9 cfs		
CIRCULAR CHANNEL	**6E - 6F**	.1
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.008 '/' n=.009 V=9.3 fps L=46' Capacity=29.2 cfs		
	Total Length= 775 ft Total Tc=	4.5

SUBCATCHMENT 6 RUNOFF
PROPOSED CONDITIONS TO CULVERT



SUBCATCHMENT 6 RUNOFF PEAK= 9.77 CFS @ 12.06 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.24	.24	.24	.24	.24	.24	.25	.25	.25	.25
10.10	.25	.26	.26	.26	.26	.26	.26	.27	.27	.27
10.20	.27	.27	.28	.28	.28	.28	.29	.29	.29	.29
10.30	.29	.30	.30	.30	.30	.30	.31	.31	.31	.31
10.40	.31	.32	.32	.32	.32	.33	.33	.33	.33	.33
10.50	.34	.34	.34	.34	.35	.35	.35	.35	.36	.36
10.60	.36	.36	.36	.37	.37	.37	.37	.38	.38	.38
10.70	.38	.39	.39	.39	.39	.40	.40	.40	.40	.41
10.80	.41	.41	.41	.42	.42	.42	.42	.43	.43	.43
10.90	.43	.44	.44	.44	.44	.45	.45	.45	.45	.46
11.00	.46	.46	.46	.47	.47	.47	.48	.48	.49	.50
11.10	.50	.51	.52	.52	.53	.54	.55	.55	.56	.57
11.20	.58	.58	.59	.60	.61	.61	.62	.63	.64	.65
11.30	.65	.66	.67	.68	.69	.69	.70	.71	.72	.73
11.40	.74	.74	.75	.76	.77	.78	.79	.80	.80	.81
11.50	.82	.83	.84	.85	.87	.90	.94	.98	1.03	1.09
11.60	1.15	1.21	1.28	1.34	1.41	1.48	1.56	1.63	1.70	1.78
11.70	1.85	1.93	2.01	2.09	2.16	2.25	2.33	2.41	2.49	2.57
11.80	2.66	2.74	2.83	2.92	3.00	3.09	3.18	3.27	3.36	3.46
11.90	3.55	3.65	3.75	3.89	4.08	4.36	4.72	5.17	5.69	6.27
12.00	6.89	7.55	8.21	8.82	9.32	9.64	9.76	9.69	9.46	9.10
12.10	8.64	8.12	7.56	7.00	6.46	5.99	5.60	5.28	5.03	4.83
12.20	4.66	4.51	4.38	4.27	4.16	4.06	3.96	3.87	3.78	3.69
12.30	3.60	3.52	3.43	3.34	3.26	3.17	3.08	3.00	2.91	2.82
12.40	2.73	2.64	2.55	2.47	2.38	2.29	2.20	2.11	2.02	1.93
12.50	1.83	1.74	1.65	1.57	1.49	1.43	1.37	1.33	1.29	1.27
12.60	1.25	1.23	1.21	1.20	1.18	1.17	1.16	1.15	1.14	1.13
12.70	1.12	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.05	1.04
12.80	1.03	1.02	1.01	1.00	.99	.98	.97	.96	.95	.94
12.90	.93	.92	.91	.90	.90	.89	.88	.87	.86	.85
13.00	.84	.83	.82	.81	.80	.79	.79	.78	.78	.77
13.10	.77	.77	.76	.76	.76	.76	.75	.75	.75	.75
13.20	.74	.74	.74	.74	.73	.73	.73	.73	.72	.72
13.30	.72	.72	.71	.71	.71	.71	.70	.70	.70	.70
13.40	.69	.69	.69	.69	.68	.68	.68	.68	.67	.67
13.50	.67	.67	.67	.66	.66	.66	.66	.65	.65	.65
13.60	.65	.64	.64	.64	.64	.63	.63	.63	.63	.62
13.70	.62	.62	.62	.61	.61	.61	.61	.60	.60	.60
13.80	.60	.59	.59	.59	.59	.58	.58	.58	.58	.57
13.90	.57	.57	.57	.56	.56	.56	.56	.55	.55	.55
14.00	.55	.54	.54	.54	.54	.53	.53	.53	.53	.53
14.10	.53	.52	.52	.52	.52	.52	.52	.52	.52	.51
14.20	.51	.51	.51	.51	.51	.51	.51	.50	.50	.50
14.30	.50	.50	.50	.50	.50	.49	.49	.49	.49	.49
14.40	.49	.49	.49	.49	.48	.48	.48	.48	.48	.48
14.50	.48	.48	.47	.47	.47	.47	.47	.47	.47	.47
14.60	.46	.46	.46	.46	.46	.46	.46	.46	.46	.45
14.70	.45	.45	.45	.45	.45	.45	.45	.44	.44	.44
14.80	.44	.44	.44	.44	.44	.43	.43	.43	.43	.43
14.90	.43	.43	.43	.42	.42	.42	.42	.42	.42	.42
15.00	.42									

POND 1 **Detention Basin**

Qin = 17.39 CFS @ 12.18 HRS, VOLUME= 1.21 AF
Qout= 16.28 CFS @ 12.24 HRS, VOLUME= 1.20 AF, ATTEN= 6%, LAG= 3.2 MIN

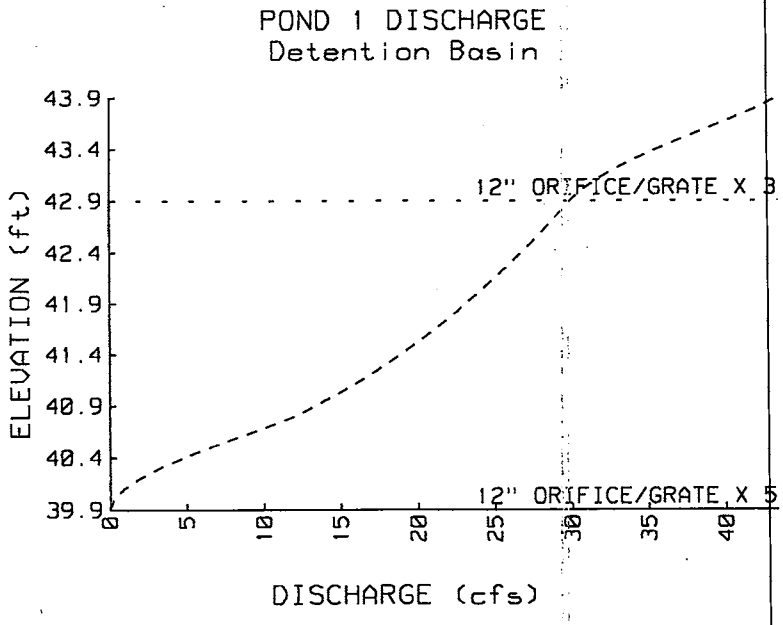
ELEVATION (FT)	INC.STOR (CF)	CUM.STOR (CF)
39.9	0	0
40.9	2338	2338
41.9	2689	5027
42.9	2689	7716
43.9	2338	10054

STOR-IND METHOD
PEAK STORAGE = 2990 CF
PEAK ELEVATION= 41.1 FT
FLOOD ELEVATION= 43.9 FT
START ELEVATION= 39.9 FT
SPAN= 10-15 HRS, dt=.01 HRS
Tdet= 4.6 MIN (1.2 AF)

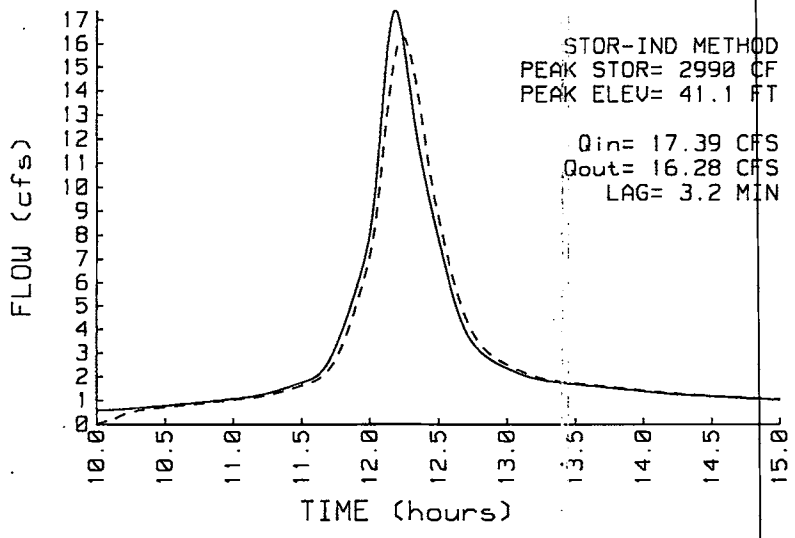
#	ROUTE	INVERT	OUTLET DEVICES
1	P	42.9'	**12" ORIFICE/GRATE X 3**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
2	P	39.9'	**12" ORIFICE/GRATE X 5**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)

POND 1 TOTAL DISCHARGE (CFS) vs ELEVATION

FEET	0.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
39.9	0.00	.22	.85	1.85	3.16	4.72	6.49	8.36	10.25	12.02
40.9	13.36	14.64	15.81	16.90	17.93	18.90	19.82	20.70	21.55	22.36
41.9	23.15	23.91	24.64	25.36	26.05	26.73	27.39	28.03	28.66	29.28
42.9	29.88	30.61	31.57	32.73	34.08	35.57	37.17	38.82	40.48	42.06
43.9	43.38									



POND 1 INFLOW & OUTFLOW
Detention Basin



POND 1 INFLOW PEAK= 17.39 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.58	.58	.58	.59	.59	.59	.60	.60	.60	.60
10.10	.61	.61	.61	.62	.62	.62	.63	.63	.64	.64
10.20	.64	.65	.65	.66	.66	.66	.67	.67	.68	.68
10.30	.69	.69	.70	.70	.71	.71	.72	.72	.73	.73
10.40	.74	.74	.75	.75	.76	.76	.77	.77	.78	.78
10.50	.79	.79	.80	.80	.81	.81	.82	.82	.83	.83
10.60	.84	.85	.85	.86	.86	.87	.87	.88	.88	.89
10.70	.90	.90	.91	.91	.92	.92	.93	.93	.94	.95
10.80	.95	.96	.96	.97	.98	.98	.99	.99	1.00	1.01
10.90	1.01	1.02	1.02	1.03	1.04	1.04	1.05	1.05	1.06	1.06
11.00	1.07	1.08	1.08	1.09	1.10	1.10	1.11	1.12	1.12	1.13
11.10	1.14	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22
11.20	1.23	1.25	1.26	1.27	1.29	1.30	1.32	1.33	1.35	1.37
11.30	1.38	1.40	1.42	1.43	1.45	1.47	1.49	1.50	1.52	1.54
11.40	1.56	1.58	1.60	1.61	1.63	1.65	1.67	1.69	1.71	1.73
11.50	1.75	1.77	1.79	1.81	1.83	1.85	1.88	1.90	1.93	1.96
11.60	1.99	2.03	2.07	2.12	2.17	2.23	2.31	2.38	2.46	2.56
11.70	2.66	2.76	2.87	2.99	3.12	3.25	3.39	3.53	3.68	3.83
11.80	3.99	4.14	4.31	4.48	4.64	4.82	5.00	5.17	5.36	5.55
11.90	5.73	5.92	6.12	6.31	6.52	6.73	6.95	7.20	7.47	7.76
12.00	8.09	8.46	8.89	9.37	9.91	10.51	11.14	11.83	12.54	13.26
12.10	13.98	14.67	15.31	15.89	16.39	16.78	17.09	17.31	17.38	17.38
12.20	17.31	17.10	16.85	16.56	16.18	15.79	15.38	14.95	14.51	14.09
12.30	13.68	13.27	12.89	12.52	12.16	11.83	11.51	11.19	10.90	10.62
12.40	10.33	10.06	9.79	9.52	9.27	9.02	8.76	8.52	8.28	8.04
12.50	7.80	7.57	7.33	7.10	6.87	6.65	6.42	6.20	5.98	5.76
12.60	5.56	5.36	5.16	4.98	4.80	4.63	4.47	4.32	4.18	4.04
12.70	3.92	3.81	3.70	3.61	3.51	3.43	3.35	3.28	3.21	3.15
12.80	3.09	3.03	2.99	2.94	2.89	2.85	2.81	2.77	2.73	2.70
12.90	2.66	2.63	2.60	2.56	2.53	2.51	2.48	2.45	2.42	2.39
13.00	2.36	2.34	2.31	2.29	2.26	2.24	2.21	2.19	2.17	2.14
13.10	2.12	2.10	2.08	2.06	2.04	2.02	2.00	1.98	1.97	1.95
13.20	1.94	1.92	1.91	1.90	1.89	1.87	1.86	1.85	1.84	1.84
13.30	1.83	1.82	1.81	1.80	1.79	1.79	1.78	1.77	1.76	1.76
13.40	1.75	1.74	1.74	1.73	1.72	1.72	1.71	1.70	1.70	1.69
13.50	1.68	1.68	1.67	1.67	1.66	1.66	1.65	1.64	1.64	1.63
13.60	1.62	1.62	1.61	1.61	1.60	1.59	1.59	1.58	1.58	1.57
13.70	1.57	1.56	1.55	1.55	1.54	1.53	1.53	1.52	1.52	1.51
13.80	1.51	1.50	1.49	1.49	1.48	1.48	1.47	1.46	1.46	1.45
13.90	1.45	1.44	1.44	1.43	1.42	1.42	1.41	1.40	1.40	1.39
14.00	1.39	1.38	1.38	1.37	1.36	1.36	1.35	1.34	1.34	1.33
14.10	1.33	1.32	1.32	1.31	1.31	1.30	1.29	1.29	1.29	1.28
14.20	1.28	1.27	1.27	1.26	1.26	1.26	1.25	1.25	1.25	1.24
14.30	1.24	1.24	1.23	1.23	1.23	1.22	1.22	1.22	1.21	1.21
14.40	1.21	1.20	1.20	1.20	1.19	1.19	1.19	1.19	1.18	1.18
14.50	1.18	1.17	1.17	1.17	1.17	1.16	1.16	1.16	1.15	1.15
14.60	1.15	1.15	1.14	1.14	1.14	1.13	1.13	1.13	1.13	1.12
14.70	1.12	1.12	1.11	1.11	1.11	1.10	1.10	1.10	1.10	1.09
14.80	1.09	1.09	1.08	1.08	1.08	1.08	1.07	1.07	1.07	1.07
14.90	1.06	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.04	1.04
15.00	1.03									

POND 1 TOTAL OUTFLOW PEAK= 16.28 CFS @ 12.24 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.01	.03	.05	.06	.08	.10	.12	.13	.15	.16
10.10	.18	.19	.21	.22	.26	.29	.32	.35	.38	.40
10.20	.42	.44	.46	.48	.50	.51	.53	.54	.55	.56
10.30	.58	.59	.60	.61	.61	.62	.63	.64	.65	.65
10.40	.66	.67	.68	.68	.69	.70	.70	.71	.71	.72
10.50	.73	.73	.74	.74	.75	.76	.76	.77	.77	.78
10.60	.78	.79	.79	.80	.81	.81	.82	.82	.83	.83
10.70	.84	.84	.85	.86	.87	.87	.88	.89	.90	.90
10.80	.91	.92	.92	.93	.93	.94	.95	.95	.96	.97
10.90	.97	.98	.98	.99	1.00	1.00	1.01	1.01	1.02	1.03
11.00	1.03	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.08	1.09
11.10	1.09	1.10	1.11	1.11	1.12	1.13	1.14	1.14	1.15	1.16
11.20	1.17	1.18	1.19	1.20	1.21	1.22	1.24	1.25	1.26	1.28
11.30	1.29	1.30	1.32	1.33	1.35	1.36	1.38	1.40	1.41	1.43
11.40	1.45	1.46	1.48	1.50	1.52	1.54	1.55	1.57	1.59	1.61
11.50	1.63	1.65	1.67	1.69	1.71	1.72	1.74	1.77	1.79	1.81
11.60	1.83	1.86	1.90	1.93	1.97	2.01	2.06	2.11	2.17	2.23
11.70	2.30	2.38	2.46	2.54	2.64	2.74	2.84	2.96	3.08	3.21
11.80	3.36	3.51	3.66	3.82	3.98	4.14	4.31	4.48	4.65	4.83
11.90	5.02	5.22	5.41	5.60	5.79	5.99	6.20	6.41	6.64	6.88
12.00	7.14	7.43	7.74	8.09	8.48	8.92	9.41	9.93	10.49	11.07
12.10	11.68	12.25	12.76	13.29	13.75	14.20	14.63	15.01	15.35	15.64
12.20	15.89	16.07	16.19	16.26	16.28	16.24	16.15	16.01	15.84	15.62
12.30	15.36	15.09	14.80	14.48	14.14	13.80	13.47	13.09	12.71	12.34
12.40	11.98	11.55	11.16	10.80	10.47	10.14	9.83	9.52	9.24	8.96
12.50	8.70	8.44	8.19	7.94	7.70	7.46	7.23	7.00	6.77	6.54
12.60	6.33	6.12	5.92	5.71	5.52	5.32	5.14	4.96	4.79	4.64
12.70	4.50	4.36	4.23	4.11	3.99	3.88	3.77	3.67	3.58	3.50
12.80	3.42	3.34	3.27	3.20	3.14	3.09	3.04	3.00	2.95	2.91
12.90	2.87	2.83	2.79	2.75	2.71	2.68	2.64	2.61	2.58	2.55
13.00	2.52	2.49	2.46	2.43	2.40	2.37	2.35	2.32	2.29	2.27
13.10	2.24	2.22	2.19	2.17	2.15	2.13	2.10	2.08	2.06	2.04
13.20	2.03	2.01	1.99	1.97	1.96	1.94	1.93	1.92	1.91	1.89
13.30	1.88	1.87	1.86	1.85	1.84	1.83	1.83	1.82	1.81	1.81
13.40	1.80	1.79	1.78	1.78	1.77	1.76	1.76	1.75	1.74	1.74
13.50	1.73	1.72	1.72	1.71	1.70	1.70	1.69	1.68	1.68	1.67
13.60	1.67	1.66	1.65	1.65	1.64	1.63	1.63	1.62	1.62	1.61
13.70	1.60	1.60	1.59	1.59	1.58	1.57	1.57	1.56	1.56	1.55
13.80	1.54	1.54	1.53	1.53	1.52	1.52	1.51	1.50	1.50	1.49
13.90	1.49	1.48	1.47	1.47	1.46	1.46	1.45	1.44	1.44	1.43
14.00	1.43	1.42	1.41	1.41	1.40	1.40	1.39	1.38	1.38	1.37
14.10	1.37	1.36	1.35	1.35	1.34	1.34	1.33	1.33	1.32	1.32
14.20	1.31	1.30	1.30	1.30	1.29	1.29	1.28	1.28	1.27	1.27
14.30	1.26	1.26	1.26	1.25	1.25	1.25	1.24	1.24	1.24	1.23
14.40	1.23	1.23	1.22	1.22	1.22	1.21	1.21	1.21	1.20	1.20
14.50	1.20	1.19	1.19	1.19	1.19	1.18	1.18	1.18	1.17	1.17
14.60	1.17	1.16	1.16	1.16	1.16	1.15	1.15	1.15	1.14	1.14
14.70	1.14	1.14	1.13	1.13	1.13	1.12	1.12	1.12	1.12	1.11
14.80	1.11	1.11	1.10	1.10	1.10	1.10	1.09	1.09	1.09	1.08
14.90	1.08	1.08	1.07	1.07	1.07	1.07	1.06	1.06	1.06	1.05
15.00	1.05									

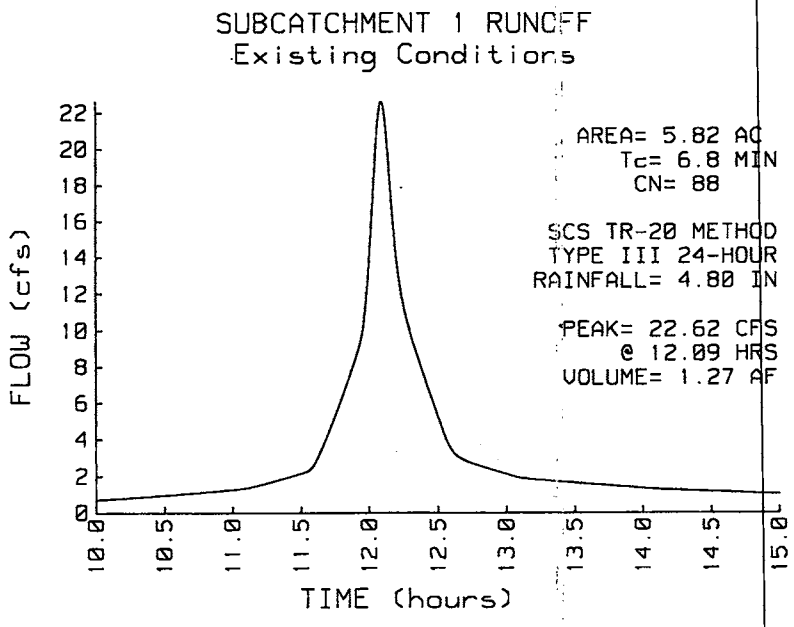
10-YEAR STORM EVENT

SUBCATCHMENT 1 **Existing Conditions**

PEAK= 22.62 CFS @ 12.09 HRS, VOLUME= 1.27 AF

ACRES	CN		SCS TR-20 METHOD
2.36	98	Impervious	TYPE III 24-HOUR
.67	60	Open space / good	RAINFALL= 4.80 IN
2.79	86	Gravel / Disturbed Areas	SPAN= 10-15 HRS, dt=.01 HRS
5.82	88		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:1a-1b**	1.8
Grass: Short n=.15 L=34' P2=3.3 in s=.15 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1b-1c**	.2
Unpaved Kv=16.1345 L=73' s=.14 '/' V=6.04 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1c-1d**	3.2
Paved Kv=20.3282 L=392' s=.01 '/' V=2.03 fps		
CHANNEL FLOW	**Segment ID:1d-1e**	1.6
a=.1 sq-ft Pw=10' r=.01'		
s=.0692 '/' n=.008 V=2.27 fps	L=213' Capacity=.2 cfs	
	Total Length= 712 ft Total Tc=	6.8



SUBCATCHMENT 1 RUNOFF PEAK= 22.62 CFS @ 12.09 HOURS

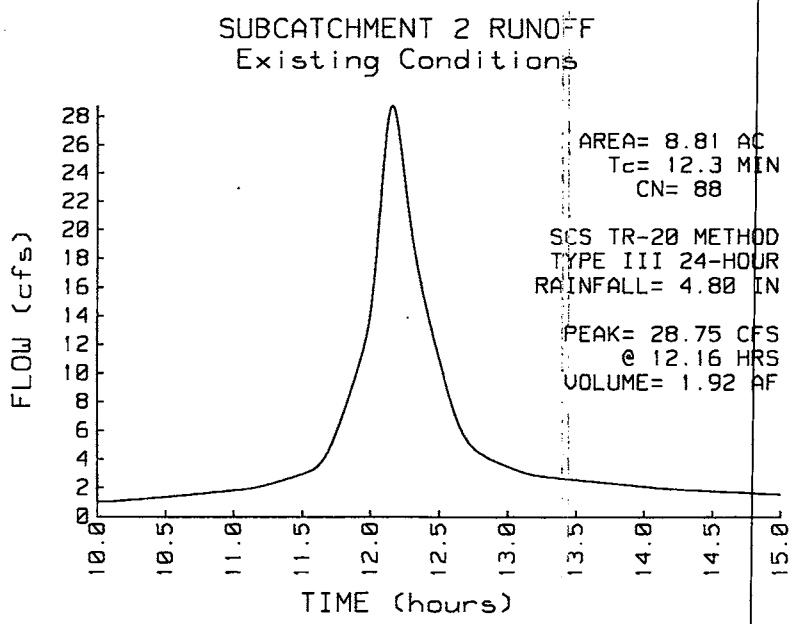
HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.71	.71	.71	.71	.72	.72	.72	.73	.73	.74
10.10	.74	.75	.75	.75	.76	.76	.77	.77	.78	.78
10.20	.79	.79	.80	.81	.81	.82	.82	.83	.83	.84
10.30	.84	.85	.85	.86	.87	.87	.88	.88	.89	.89
10.40	.90	.90	.91	.92	.92	.93	.93	.94	.94	.95
10.50	.96	.96	.97	.97	.98	.99	.99	1.00	1.00	1.01
10.60	1.01	1.02	1.03	1.03	1.04	1.04	1.05	1.06	1.06	1.07
10.70	1.07	1.08	1.09	1.09	1.10	1.10	1.11	1.12	1.12	1.13
10.80	1.14	1.14	1.15	1.15	1.16	1.17	1.17	1.18	1.19	1.19
10.90	1.20	1.20	1.21	1.22	1.22	1.23	1.24	1.24	1.25	1.26
11.00	1.26	1.27	1.28	1.28	1.29	1.30	1.31	1.31	1.33	1.34
11.10	1.35	1.37	1.38	1.40	1.41	1.43	1.45	1.47	1.49	1.50
11.20	1.52	1.54	1.56	1.58	1.60	1.62	1.64	1.66	1.68	1.70
11.30	1.72	1.74	1.76	1.78	1.81	1.83	1.85	1.87	1.89	1.91
11.40	1.93	1.95	1.97	2.00	2.02	2.04	2.06	2.08	2.10	2.13
11.50	2.15	2.17	2.19	2.22	2.25	2.29	2.33	2.39	2.47	2.57
11.60	2.67	2.80	2.93	3.08	3.23	3.39	3.56	3.73	3.91	4.09
11.70	4.27	4.46	4.65	4.84	5.03	5.23	5.43	5.63	5.83	6.04
11.80	6.24	6.45	6.66	6.87	7.08	7.30	7.51	7.73	7.95	8.17
11.90	8.39	8.62	8.85	9.10	9.41	9.77	10.24	10.85	11.60	12.51
12.00	13.57	14.76	16.06	17.43	18.77	20.03	21.10	21.90	22.42	22.62
12.10	22.48	22.07	21.41	20.53	19.55	18.50	17.43	16.43	15.49	14.65
12.20	13.91	13.27	12.70	12.22	11.79	11.39	11.05	10.72	10.41	10.13
12.30	9.85	9.59	9.34	9.09	8.85	8.61	8.38	8.15	7.92	7.70
12.40	7.47	7.25	7.03	6.80	6.59	6.36	6.14	5.93	5.70	5.48
12.50	5.26	5.04	4.82	4.61	4.39	4.19	4.00	3.82	3.67	3.54
12.60	3.42	3.32	3.24	3.17	3.10	3.05	3.00	2.96	2.92	2.88
12.70	2.85	2.82	2.79	2.76	2.73	2.71	2.68	2.66	2.63	2.61
12.80	2.58	2.56	2.54	2.51	2.49	2.47	2.44	2.42	2.40	2.37
12.90	2.35	2.33	2.30	2.28	2.26	2.23	2.21	2.19	2.16	2.14
13.00	2.12	2.09	2.07	2.05	2.02	2.00	1.98	1.96	1.95	1.93
13.10	1.92	1.90	1.89	1.88	1.87	1.86	1.86	1.85	1.84	1.83
13.20	1.83	1.82	1.81	1.81	1.80	1.79	1.79	1.78	1.78	1.77
13.30	1.76	1.76	1.75	1.75	1.74	1.73	1.73	1.72	1.72	1.71
13.40	1.70	1.70	1.69	1.68	1.68	1.67	1.67	1.66	1.66	1.65
13.50	1.64	1.64	1.63	1.63	1.62	1.61	1.61	1.60	1.59	1.59
13.60	1.58	1.58	1.57	1.56	1.56	1.55	1.55	1.54	1.53	1.53
13.70	1.52	1.52	1.51	1.50	1.50	1.49	1.48	1.48	1.47	1.47
13.80	1.46	1.45	1.45	1.44	1.44	1.43	1.42	1.42	1.41	1.41
13.90	1.40	1.39	1.39	1.38	1.38	1.37	1.36	1.36	1.35	1.34
14.00	1.34	1.33	1.33	1.32	1.31	1.31	1.30	1.30	1.29	1.29
14.10	1.28	1.28	1.28	1.27	1.27	1.26	1.26	1.26	1.25	1.25
14.20	1.25	1.25	1.24	1.24	1.24	1.23	1.23	1.23	1.22	1.22
14.30	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20	1.20	1.19
14.40	1.19	1.19	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.16
14.50	1.16	1.16	1.15	1.15	1.15	1.15	1.14	1.14	1.14	1.13
14.60	1.13	1.13	1.12	1.12	1.12	1.12	1.11	1.11	1.11	1.10
14.70	1.10	1.10	1.10	1.09	1.09	1.09	1.08	1.08	1.08	1.07
14.80	1.07	1.07	1.07	1.06	1.06	1.06	1.05	1.05	1.05	1.05
14.90	1.04	1.04	1.04	1.03	1.03	1.03	1.03	1.02	1.02	1.02
15.00	1.01									

SUBCATCHMENT 2 **Existing Conditions**

PEAK= 28.75 CFS @ 12.16 HRS, VOLUME= 1.92 AF

ACRES	CN		SCS TR-20 METHOD
1.24	98	Impervious	TYPE III 24-HOUR
.18	60	Woods Fair	RAINFALL= 4.80 IN
7.29	87	Gravel / Disturbed Areas	SPAN= 10-15 HRS, dt=.01 HRS
.10	61	open space / good	
8.81	88		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:2a-2b**	8.2
Grass: Short n=.15 L=110' P2=3.3 in s=.036 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2b-2c**	.3
Unpaved Kv=16.1345 L=182' s=.31 '/' V=8.98 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2c-2d**	1.4
Unpaved Kv=16.1345 L=182' s=.018 '/' V=2.16 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2d-2e**	2.4
Unpaved Kv=16.1345 L=399' s=.03 '/' V=2.79 fps		
	Total Length= 873 ft Total Tc=	12.3



SUBCATCHMENT 2 RUNOFF PEAK= 28.75 CFS @ 12.16 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.03	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.07	1.07
10.10	1.08	1.08	1.09	1.09	1.10	1.10	1.11	1.12	1.12	1.13
10.20	1.14	1.14	1.15	1.16	1.16	1.17	1.18	1.19	1.20	1.20
10.30	1.21	1.22	1.23	1.23	1.24	1.25	1.26	1.27	1.27	1.28
10.40	1.29	1.30	1.31	1.32	1.32	1.33	1.34	1.35	1.36	1.36
10.50	1.37	1.38	1.39	1.40	1.41	1.42	1.43	1.43	1.44	1.45
10.60	1.46	1.47	1.48	1.49	1.50	1.50	1.51	1.52	1.53	1.54
10.70	1.55	1.56	1.57	1.58	1.58	1.60	1.60	1.61	1.62	1.63
10.80	1.64	1.65	1.66	1.67	1.68	1.69	1.70	1.70	1.71	1.73
10.90	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.80	1.81	1.82
11.00	1.83	1.84	1.85	1.86	1.87	1.88	1.89	1.90	1.91	1.92
11.10	1.93	1.95	1.96	1.98	1.99	2.01	2.03	2.04	2.07	2.09
11.20	2.11	2.13	2.16	2.18	2.21	2.23	2.26	2.29	2.31	2.34
11.30	2.37	2.39	2.42	2.45	2.48	2.51	2.54	2.57	2.60	2.63
11.40	2.66	2.69	2.72	2.76	2.79	2.82	2.85	2.88	2.91	2.95
11.50	2.98	3.01	3.04	3.07	3.11	3.15	3.18	3.23	3.27	3.33
11.60	3.40	3.47	3.55	3.65	3.76	3.89	4.03	4.18	4.35	4.52
11.70	4.71	4.92	5.12	5.35	5.58	5.82	6.07	6.31	6.57	6.84
11.80	7.10	7.38	7.66	7.94	8.23	8.52	8.81	9.12	9.42	9.72
11.90	10.04	10.34	10.67	10.99	11.32	11.69	12.07	12.48	12.97	13.50
12.00	14.13	14.86	15.69	16.65	17.70	18.84	20.08	21.35	22.63	23.90
12.10	25.07	26.14	27.07	27.78	28.34	28.65	28.74	28.69	28.38	27.94
12.20	27.40	26.68	25.94	25.16	24.32	23.52	22.72	21.94	21.22	20.52
12.30	19.86	19.25	18.66	18.12	17.60	17.08	16.62	16.15	15.69	15.28
12.40	14.84	14.43	14.04	13.63	13.25	12.87	12.48	12.13	11.75	11.39
12.50	11.04	10.67	10.32	9.97	9.61	9.28	8.94	8.59	8.28	7.95
12.60	7.64	7.36	7.07	6.81	6.57	6.33	6.12	5.92	5.74	5.58
12.70	5.42	5.28	5.16	5.04	4.94	4.85	4.75	4.67	4.59	4.52
12.80	4.46	4.39	4.33	4.27	4.21	4.16	4.11	4.06	4.01	3.97
12.90	3.92	3.88	3.83	3.79	3.75	3.71	3.67	3.63	3.59	3.56
13.00	3.52	3.48	3.45	3.40	3.37	3.33	3.30	3.26	3.23	3.19
13.10	3.16	3.13	3.10	3.07	3.04	3.02	3.00	2.97	2.95	2.93
13.20	2.91	2.90	2.88	2.86	2.85	2.83	2.82	2.81	2.79	2.78
13.30	2.77	2.76	2.75	2.73	2.72	2.71	2.70	2.69	2.68	2.67
13.40	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59	2.59	2.58
13.50	2.56	2.56	2.55	2.54	2.53	2.52	2.51	2.50	2.49	2.48
13.60	2.47	2.46	2.46	2.45	2.44	2.43	2.42	2.41	2.40	2.39
13.70	2.38	2.37	2.36	2.36	2.34	2.34	2.33	2.32	2.31	2.30
13.80	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.23	2.21	2.21
13.90	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12	2.11
14.00	2.11	2.10	2.09	2.08	2.07	2.06	2.05	2.04	2.03	2.02
14.10	2.01	2.01	2.00	1.99	1.98	1.97	1.97	1.96	1.95	1.95
14.20	1.94	1.93	1.93	1.92	1.92	1.91	1.91	1.90	1.90	1.89
14.30	1.89	1.88	1.88	1.87	1.87	1.86	1.86	1.85	1.85	1.84
14.40	1.84	1.84	1.83	1.82	1.82	1.82	1.81	1.81	1.80	1.80
14.50	1.79	1.79	1.79	1.78	1.78	1.77	1.77	1.76	1.76	1.75
14.60	1.75	1.75	1.74	1.74	1.73	1.73	1.72	1.72	1.71	1.71
14.70	1.70	1.70	1.70	1.69	1.69	1.68	1.68	1.68	1.67	1.67
14.80	1.66	1.66	1.65	1.65	1.64	1.64	1.63	1.63	1.63	1.62
14.90	1.62	1.61	1.61	1.60	1.60	1.59	1.59	1.58	1.58	1.58
15.00	1.57									

SUBCATCHMENT 3 **Proposed Conditions uncontrolled**

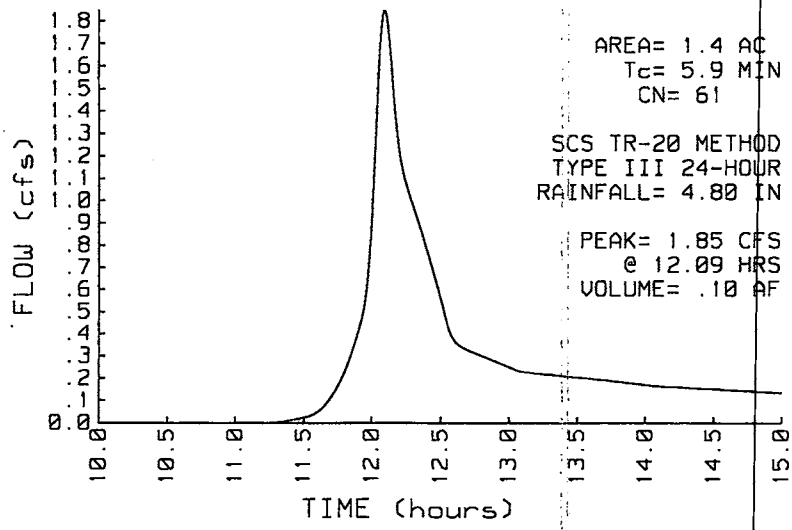
PEAK= 1.85 CFS @ 12.09 HRS, VOLUME= .10 AF

ACRES	CN	
1.40	61	Grass / good

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.80 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**3A - 3B**	1.9
Grass: Short n=.15 L=65' P2=3.3 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**3B - 3C**	4.0
Unpaved Kv=16.1345 L=550' s=.02 '/' V=2.28 fps		
	Total Length= 615 ft Total Tc=	5.9

SUBCATCHMENT 3 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 3 RUNOFF PEAK= 1.85 CFS @ 12.09 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.30	0.00	0.00	0.00	0.00	.01	.01	.01	.01	.01	.01
11.40	.01	.01	.01	.02	.02	.02	.02	.02	.02	.02
11.50	.02	.03	.03	.03	.03	.03	.03	.04	.04	.04
11.60	.05	.05	.06	.06	.07	.07	.08	.09	.10	.10
11.70	.11	.12	.13	.14	.15	.16	.17	.19	.20	.21
11.80	.23	.24	.26	.27	.29	.31	.33	.35	.37	.39
11.90	.41	.43	.45	.48	.51	.55	.60	.66	.73	.82
12.00	.93	1.04	1.17	1.31	1.45	1.58	1.68	1.77	1.82	1.85
12.10	1.84	1.81	1.76	1.69	1.61	1.53	1.45	1.38	1.31	1.26
12.20	1.22	1.18	1.15	1.12	1.09	1.07	1.05	1.03	1.01	.99
12.30	.97	.95	.93	.91	.90	.88	.86	.84	.82	.80
12.40	.78	.76	.74	.71	.69	.67	.65	.63	.60	.58
12.50	.56	.53	.51	.49	.46	.44	.42	.41	.39	.38
12.60	.37	.36	.36	.35	.35	.34	.34	.33	.33	.33
12.70	.33	.32	.32	.32	.32	.31	.31	.31	.31	.30
12.80	.30	.30	.30	.29	.29	.29	.29	.28	.28	.28
12.90	.28	.27	.27	.27	.27	.26	.26	.26	.26	.25
13.00	.25	.25	.25	.24	.24	.24	.24	.23	.23	.23
13.10	.23	.23	.23	.23	.23	.23	.22	.22	.22	.22
13.20	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22
13.30	.22	.22	.22	.21	.21	.21	.21	.21	.21	.21
13.40	.21	.21	.21	.21	.21	.21	.21	.21	.21	.20
13.50	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
13.60	.20	.20	.20	.20	.20	.19	.19	.19	.19	.19
13.70	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
13.80	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18
13.90	.18	.18	.18	.18	.18	.17	.17	.17	.17	.17
14.00	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
14.10	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
14.20	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
14.30	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
14.40	.16	.15	.15	.15	.15	.15	.15	.15	.15	.15
14.50	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
14.60	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
14.70	.15	.14	.14	.14	.14	.14	.14	.14	.14	.14
14.80	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
14.90	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
15.00	.13									

SUBCATCHMENT 4 **Proposed Conditions to Pond**

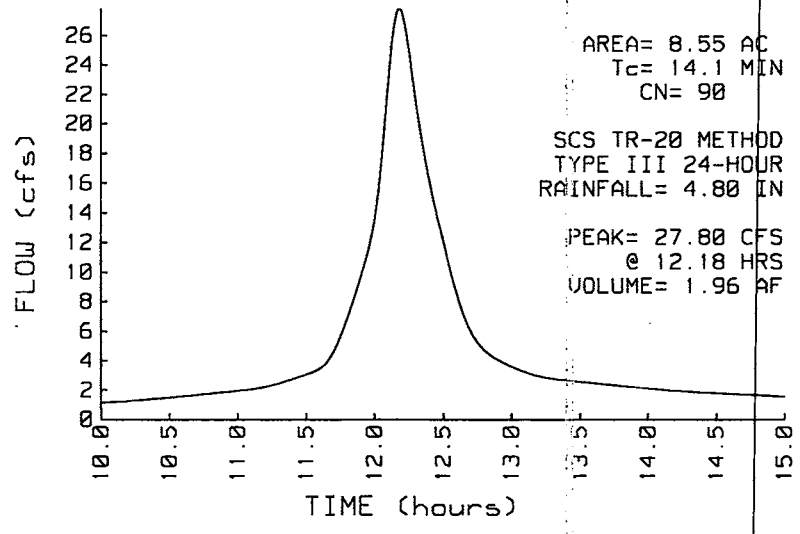
PEAK= 27.80 CFS @ 12.18 HRS, VOLUME= 1.96 AF

ACRES	CN	
6.36	98	Impervious - Buildings, Pavement
2.19	67	Lawn - Good
8.55	90	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.80 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:4a-4b**	12.2
Grass: Short n=.15 L=95' P2=3.3 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	0.0
Unpaved Kv=16.1345 L=32' s=.5 '/' V=11.41 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	.4
Paved Kv=20.3282 L=61' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**Segment ID:4d-4e**	.5
180" Diameter a=176.71 sq-ft Pw=47.1' r=3.75'		
s=.005 '/' n=.009 V=28.18 fps L=818' Capacity=4979.9 cfs		
CIRCULAR CHANNEL	**Segment ID:4e-4f**	1.0
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.005 '/' n=.009 V=7.35 fps L=444' Capacity=23.1 cfs		
	Total Length= 1450 ft	Total Tc= 14.1

SUBCATCHMENT 4 RUNOFF
Proposed Conditions to Pond



SUBCATCHMENT 4 RUNOFF PEAK= 27.80 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.15	1.15	1.16	1.16	1.17	1.17	1.18	1.18	1.19	1.19
10.10	1.20	1.20	1.21	1.21	1.22	1.22	1.23	1.24	1.24	1.25
10.20	1.26	1.26	1.27	1.28	1.28	1.29	1.30	1.31	1.31	1.32
10.30	1.33	1.34	1.35	1.35	1.36	1.37	1.38	1.39	1.39	1.40
10.40	1.41	1.42	1.43	1.44	1.45	1.45	1.46	1.47	1.48	1.49
10.50	1.50	1.51	1.51	1.52	1.53	1.54	1.55	1.56	1.57	1.58
10.60	1.59	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67
10.70	1.68	1.68	1.69	1.70	1.71	1.72	1.73	1.74	1.75	1.76
10.80	1.77	1.78	1.79	1.80	1.80	1.82	1.82	1.83	1.84	1.85
10.90	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.95
11.00	1.96	1.97	1.98	1.99	2.00	2.01	2.02	2.03	2.04	2.05
11.10	2.06	2.07	2.08	2.10	2.11	2.13	2.15	2.16	2.18	2.20
11.20	2.22	2.24	2.26	2.29	2.31	2.33	2.36	2.39	2.41	2.44
11.30	2.47	2.49	2.53	2.55	2.58	2.61	2.64	2.67	2.70	2.73
11.40	2.76	2.79	2.83	2.85	2.89	2.92	2.95	2.98	3.02	3.05
11.50	3.08	3.11	3.14	3.18	3.21	3.25	3.28	3.33	3.37	3.42
11.60	3.47	3.54	3.60	3.69	3.78	3.88	4.00	4.13	4.26	4.42
11.70	4.58	4.76	4.95	5.15	5.36	5.58	5.81	6.04	6.29	6.54
11.80	6.80	7.06	7.33	7.60	7.88	8.17	8.45	8.74	9.04	9.34
11.90	9.64	9.95	10.26	10.57	10.90	11.24	11.59	11.97	12.40	12.86
12.00	13.38	13.98	14.65	15.40	16.26	17.20	18.20	19.28	20.39	21.52
12.10	22.64	23.71	24.70	25.59	26.36	26.95	27.40	27.72	27.80	27.76
12.20	27.62	27.25	26.82	26.32	25.70	25.04	24.38	23.66	22.95	22.27
12.30	21.59	20.92	20.31	19.71	19.12	18.59	18.07	17.56	17.09	16.63
12.40	16.16	15.73	15.31	14.87	14.46	14.07	13.66	13.27	12.90	12.51
12.50	12.13	11.77	11.40	11.02	10.67	10.32	9.95	9.62	9.28	8.93
12.60	8.61	8.30	7.99	7.70	7.42	7.15	6.91	6.68	6.45	6.25
12.70	6.06	5.88	5.71	5.57	5.42	5.29	5.17	5.06	4.95	4.86
12.80	4.76	4.67	4.60	4.52	4.45	4.38	4.32	4.26	4.20	4.15
12.90	4.09	4.04	3.99	3.94	3.89	3.85	3.80	3.76	3.72	3.68
13.00	3.63	3.59	3.55	3.51	3.48	3.44	3.40	3.36	3.32	3.29
13.10	3.25	3.22	3.18	3.15	3.12	3.09	3.06	3.04	3.01	2.99
13.20	2.97	2.95	2.92	2.91	2.89	2.87	2.86	2.84	2.82	2.81
13.30	2.80	2.78	2.77	2.76	2.75	2.73	2.73	2.71	2.70	2.69
13.40	2.68	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59
13.50	2.58	2.57	2.56	2.55	2.54	2.53	2.52	2.51	2.50	2.49
13.60	2.48	2.48	2.47	2.46	2.45	2.44	2.43	2.42	2.41	2.40
13.70	2.39	2.38	2.37	2.37	2.36	2.34	2.34	2.33	2.32	2.31
13.80	2.30	2.29	2.28	2.27	2.26	2.25	2.25	2.23	2.23	2.22
13.90	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.13
14.00	2.11	2.11	2.10	2.09	2.08	2.07	2.06	2.05	2.04	2.03
14.10	2.02	2.02	2.01	2.00	1.99	1.98	1.97	1.97	1.96	1.95
14.20	1.95	1.94	1.93	1.93	1.92	1.91	1.91	1.90	1.90	1.89
14.30	1.89	1.88	1.88	1.87	1.87	1.86	1.86	1.85	1.85	1.84
14.40	1.84	1.83	1.83	1.82	1.82	1.82	1.81	1.80	1.80	1.80
14.50	1.79	1.79	1.78	1.78	1.77	1.77	1.76	1.76	1.76	1.75
14.60	1.75	1.74	1.74	1.73	1.73	1.73	1.72	1.72	1.71	1.71
14.70	1.70	1.70	1.69	1.69	1.69	1.68	1.68	1.67	1.67	1.66
14.80	1.66	1.65	1.65	1.65	1.64	1.64	1.63	1.63	1.62	1.62
14.90	1.61	1.61	1.61	1.60	1.60	1.59	1.59	1.58	1.58	1.58
15.00	1.57									

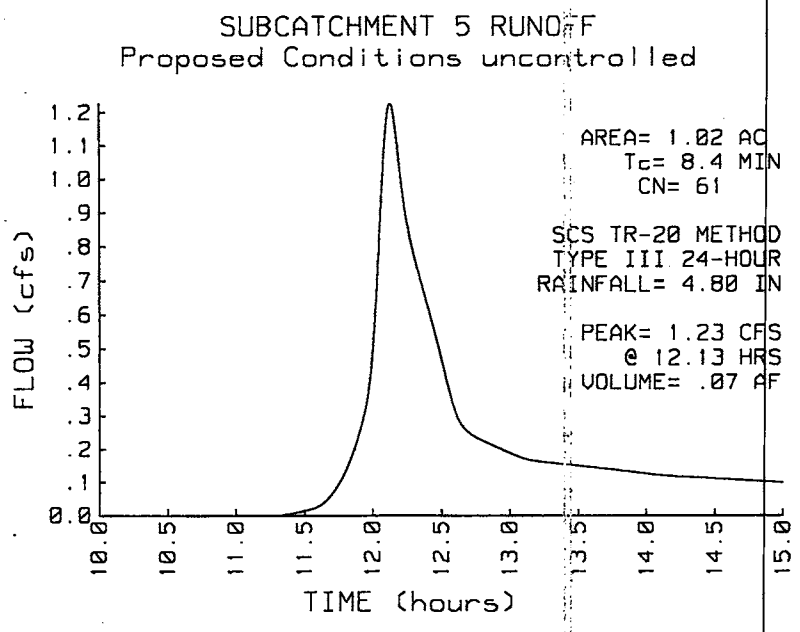
SUBCATCHMENT 5 **Proposed Conditions uncontrolled**

PEAK= 1.23 CFS @ 12.13 HRS, VOLUME= .07 AF

ACRES	CN	
1.02	61	Lawn / Good (B soil)

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.80 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**5A - 5B**	6.7
Grass: Short n=.15 L=100' P2=3.3 in s=.05 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**5B - 5C**	1.7
Unpaved Kv=16.1345 L=360' s=.05 '/' V=3.61 fps		
	Total Length= 460 ft	Total Tc= 8.4



SUBCATCHMENT 5 RUNOFF PEAK= 1.23 CFS @ 12.13 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.01
11.40	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
11.50	.01	.02	.02	.02	.02	.02	.02	.02	.02	.03
11.60	.03	.03	.03	.03	.04	.04	.04	.05	.05	.06
11.70	.06	.07	.07	.08	.09	.09	.10	.11	.12	.12
11.80	.13	.14	.15	.16	.17	.18	.19	.21	.22	.23
11.90	.24	.26	.27	.29	.31	.33	.35	.37	.41	.45
12.00	.49	.55	.61	.68	.76	.84	.92	.99	1.07	1.12
12.10	1.17	1.21	1.22	1.23	1.22	1.20	1.17	1.13	1.09	1.05
12.20	1.02	.98	.95	.92	.89	.87	.85	.83	.81	.79
12.30	.77	.76	.74	.73	.71	.70	.68	.67	.65	.64
12.40	.62	.61	.59	.58	.56	.55	.53	.52	.50	.48
12.50	.47	.45	.43	.42	.40	.39	.37	.35	.34	.33
12.60	.32	.30	.30	.29	.28	.27	.27	.26	.26	.26
12.70	.25	.25	.25	.24	.24	.24	.24	.23	.23	.23
12.80	.23	.23	.22	.22	.22	.22	.22	.21	.21	.21
12.90	.21	.21	.20	.20	.20	.20	.20	.20	.19	.19
13.00	.19	.19	.19	.18	.18	.18	.18	.18	.18	.17
13.10	.17	.17	.17	.17	.17	.17	.17	.17	.17	.16
13.20	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
13.30	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
13.40	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
13.50	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
13.60	.15	.15	.15	.14	.14	.14	.14	.14	.14	.14
13.70	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
13.80	.14	.14	.14	.13	.13	.13	.13	.13	.13	.13
13.90	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13
14.00	.13	.13	.13	.12	.12	.12	.12	.12	.12	.12
14.10	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
14.20	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
14.30	.12	.12	.12	.12	.12	.11	.11	.11	.11	.11
14.40	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
14.50	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
14.60	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
14.70	.11	.11	.11	.11	.11	.11	.11	.11	.10	.10
14.80	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
14.90	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
15.00	.10									

SUBCATCHMENT 6 **PROPOSED CONDITIONS TO CULVERT**

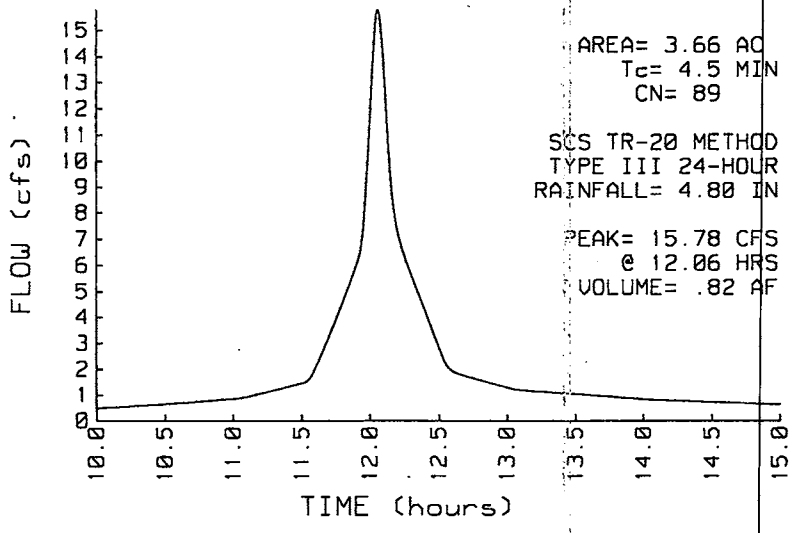
PEAK= 15.78 CFS @ 12.06 HRS, VOLUME= .82 AF

ACRES	CN	
2.60	98	IMPERVIOUS
1.06	67	LAWN AREA
3.66	89	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.80 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**6A - 6B**	2.3
Grass: Short n=.15 L=60' P2=3.3 in s=.26 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**6B - 6C**	.7
Paved Kv=20.3282 L=116' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**6C - 6D**	1.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.005 '/' n=.009 V=6.07 fps L=453' Capacity=10.7 cfs		
CIRCULAR CHANNEL	**6D - 6E**	.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.011 '/' n=.009 V=9.01 fps L=100' Capacity=15.9 cfs		
CIRCULAR CHANNEL	**6E - 6F**	.1
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.008 '/' n=.009 V=9.3 fps L=46' Capacity=29.2 cfs		
	Total Length= 775 ft Total Tc=	4.5

SUBCATCHMENT 6 RUNOFF
PROPOSED CONDITIONS TO CULVERT



SUBCATCHMENT 6 RUNOFF PEAK= 15.78 CFS @ 12.06 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.49	.49	.49	.49	.49	.50	.50	.50	.51	.51
10.10	.51	.51	.52	.52	.52	.53	.53	.54	.54	.54
10.20	.55	.55	.55	.56	.56	.56	.57	.57	.57	.58
10.30	.58	.58	.59	.59	.60	.60	.60	.61	.61	.61
10.40	.62	.62	.62	.63	.63	.64	.64	.64	.65	.65
10.50	.65	.66	.66	.67	.67	.67	.68	.68	.69	.69
10.60	.69	.70	.70	.70	.71	.71	.72	.72	.72	.73
10.70	.73	.74	.74	.74	.75	.75	.76	.76	.76	.77
10.80	.77	.78	.78	.78	.79	.79	.80	.80	.80	.81
10.90	.81	.82	.82	.82	.83	.83	.84	.84	.85	.85
11.00	.85	.86	.86	.87	.87	.88	.89	.90	.91	.92
11.10	.93	.94	.95	.96	.98	.99	1.00	1.01	1.03	1.04
11.20	1.05	1.07	1.08	1.09	1.11	1.12	1.13	1.15	1.16	1.17
11.30	1.19	1.20	1.21	1.23	1.24	1.25	1.27	1.28	1.30	1.31
11.40	1.32	1.34	1.35	1.36	1.38	1.39	1.41	1.42	1.44	1.45
11.50	1.46	1.48	1.50	1.52	1.55	1.60	1.66	1.73	1.82	1.92
11.60	2.02	2.13	2.24	2.36	2.48	2.60	2.72	2.84	2.97	3.09
11.70	3.22	3.35	3.48	3.61	3.74	3.87	4.01	4.14	4.27	4.41
11.80	4.55	4.68	4.82	4.96	5.10	5.24	5.38	5.53	5.67	5.81
11.90	5.96	6.11	6.28	6.49	6.80	7.24	7.83	8.55	9.39	10.32
12.00	11.32	12.36	13.41	14.37	15.14	15.62	15.78	15.63	15.22	14.61
12.10	13.86	13.00	12.08	11.16	10.29	9.53	8.89	8.38	7.97	7.64
12.20	7.36	7.13	6.92	6.73	6.56	6.39	6.24	6.09	5.94	5.80
12.30	5.66	5.52	5.38	5.24	5.10	4.96	4.83	4.69	4.55	4.41
12.40	4.27	4.13	3.99	3.85	3.71	3.57	3.42	3.28	3.14	3.00
12.50	2.86	2.72	2.58	2.44	2.32	2.22	2.13	2.07	2.01	1.97
12.60	1.94	1.91	1.88	1.86	1.84	1.82	1.80	1.79	1.77	1.76
12.70	1.74	1.73	1.71	1.70	1.68	1.67	1.65	1.64	1.62	1.61
12.80	1.59	1.58	1.56	1.55	1.53	1.52	1.50	1.49	1.47	1.46
12.90	1.44	1.43	1.41	1.40	1.39	1.37	1.36	1.34	1.33	1.31
13.00	1.30	1.28	1.27	1.25	1.24	1.23	1.22	1.21	1.20	1.20
13.10	1.19	1.19	1.18	1.18	1.17	1.17	1.16	1.16	1.16	1.15
13.20	1.15	1.14	1.14	1.14	1.13	1.13	1.12	1.12	1.12	1.11
13.30	1.11	1.11	1.10	1.10	1.09	1.09	1.09	1.08	1.08	1.07
13.40	1.07	1.07	1.06	1.06	1.06	1.05	1.05	1.04	1.04	1.04
13.50	1.03	1.03	1.02	1.02	1.02	1.01	1.01	1.01	1.00	1.00
13.60	.99	.99	.99	.98	.98	.97	.97	.97	.96	.96
13.70	.95	.95	.95	.94	.94	.94	.93	.93	.92	.92
13.80	.92	.91	.91	.90	.90	.90	.89	.89	.88	.88
13.90	.88	.87	.87	.87	.86	.86	.85	.85	.85	.84
14.00	.84	.83	.83	.83	.82	.82	.82	.81	.81	.81
14.10	.81	.80	.80	.80	.80	.80	.79	.79	.79	.79
14.20	.79	.79	.78	.78	.78	.78	.78	.77	.77	.77
14.30	.77	.77	.76	.76	.76	.76	.76	.76	.75	.75
14.40	.75	.75	.75	.74	.74	.74	.74	.74	.73	.73
14.50	.73	.73	.73	.73	.72	.72	.72	.72	.72	.71
14.60	.71	.71	.71	.71	.71	.70	.70	.70	.70	.70
14.70	.69	.69	.69	.69	.69	.68	.68	.68	.68	.68
14.80	.67	.67	.67	.67	.67	.67	.66	.66	.66	.66
14.90	.66	.65	.65	.65	.65	.65	.64	.64	.64	.64
15.00	.64									

POND 1 **Detention Basin**

Qin = 27.80 CFS @ 12.18 HRS, VOLUME= 1.96 AF
Qout= 24.76 CFS @ 12.25 HRS, VOLUME= 1.94 AF, ATTEN= 11%, LAG= 4.4 MIN

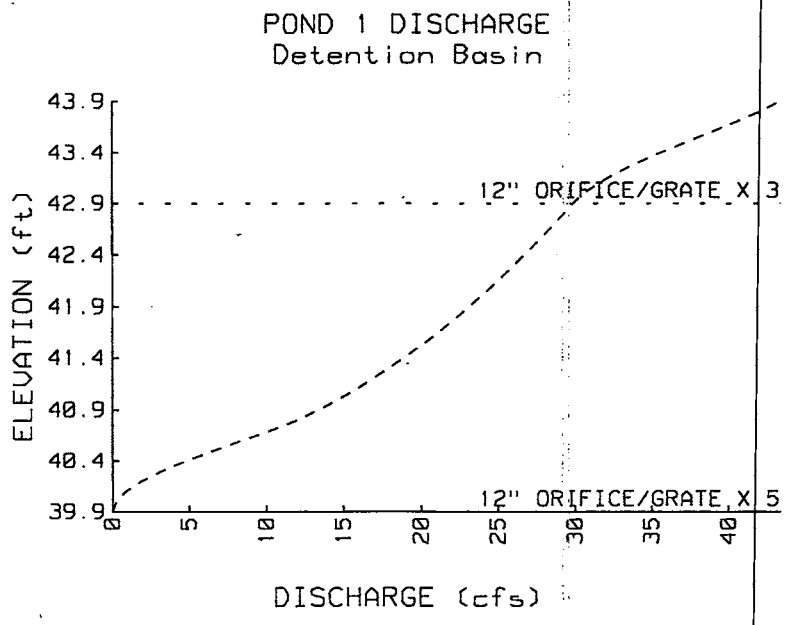
ELEVATION (FT)	INC.STOR (CF)	CUM.STOR (CF)
39.9	0	0
40.9	2338	2338
41.9	2689	5027
42.9	2689	7716
43.9	2338	10054

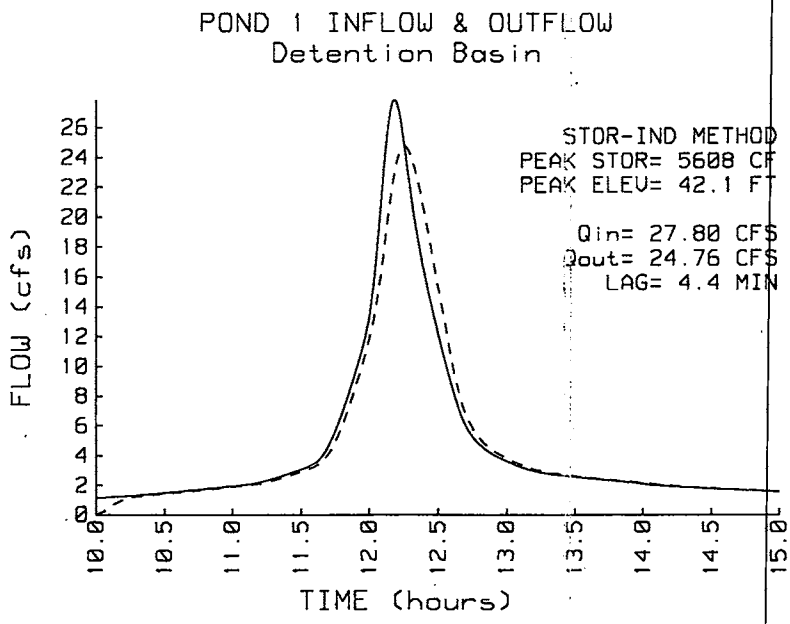
STOR-IND METHOD
PEAK STORAGE = 5608 CF
PEAK ELEVATION= 42.1 FT
FLOOD ELEVATION= 43.9 FT
START ELEVATION= 39.9 FT
SPAN= 10-15 HRS, dt=.01 HRS
Tdet= 4.2 MIN (1.94 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	42.9'	**12" ORIFICE/GRATE X 3**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
2	P	39.9'	**12" ORIFICE/GRATE X 5**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)

POND 1 TOTAL DISCHARGE (CFS) vs ELEVATION

FEET	0.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
39.9	0.00	.22	.85	1.85	3.16	4.72	6.49	8.36	10.25	12.02
40.9	13.36	14.64	15.81	16.90	17.93	18.90	19.82	20.70	21.55	22.36
41.9	23.15	23.91	24.64	25.36	26.05	26.73	27.39	28.03	28.66	29.28
42.9	29.88	30.61	31.57	32.73	34.08	35.57	37.17	38.82	40.48	42.06
43.9	43.38									




POND 1 INFLOW & OUTFLOW
Detention Basin
STOR-IND METHOD
PEAK STOR= 5608 CF
PEAK ELEV= 42.1 FT
Qin= 27.80 CFS
Qout= 24.76 CFS
LAG= 4.4 MIN
FLOW (cfs)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
TIME (hours)

POND 1 INFLOW PEAK= 27.80 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.15	1.15	1.16	1.16	1.17	1.17	1.18	1.18	1.19	1.19
10.10	1.20	1.20	1.21	1.21	1.22	1.22	1.23	1.24	1.24	1.25
10.20	1.26	1.26	1.27	1.28	1.28	1.29	1.30	1.31	1.31	1.32
10.30	1.33	1.34	1.35	1.35	1.36	1.37	1.38	1.39	1.39	1.40
10.40	1.41	1.42	1.43	1.44	1.45	1.45	1.46	1.47	1.48	1.49
10.50	1.50	1.51	1.51	1.52	1.53	1.54	1.55	1.56	1.57	1.58
10.60	1.59	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67
10.70	1.68	1.68	1.69	1.70	1.71	1.72	1.73	1.74	1.75	1.76
10.80	1.77	1.78	1.79	1.80	1.80	1.82	1.82	1.83	1.84	1.85
10.90	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.95
11.00	1.96	1.97	1.98	1.99	2.00	2.01	2.02	2.03	2.04	2.05
11.10	2.06	2.07	2.08	2.10	2.11	2.13	2.15	2.16	2.18	2.20
11.20	2.22	2.24	2.26	2.29	2.31	2.33	2.36	2.39	2.41	2.44
11.30	2.47	2.49	2.53	2.55	2.58	2.61	2.64	2.67	2.70	2.73
11.40	2.76	2.79	2.83	2.85	2.89	2.92	2.95	2.98	3.02	3.05
11.50	3.08	3.11	3.14	3.18	3.21	3.25	3.28	3.33	3.37	3.42
11.60	3.47	3.54	3.60	3.69	3.78	3.88	4.00	4.13	4.26	4.42
11.70	4.58	4.76	4.95	5.15	5.36	5.58	5.81	6.04	6.29	6.54
11.80	6.80	7.06	7.33	7.60	7.88	8.17	8.45	8.74	9.04	9.34
11.90	9.64	9.95	10.26	10.57	10.90	11.24	11.59	11.97	12.40	12.86
12.00	13.38	13.98	14.65	15.40	16.26	17.20	18.20	19.28	20.39	21.52
12.10	22.64	23.71	24.70	25.59	26.36	26.95	27.40	27.72	27.80	27.76
12.20	27.62	27.25	26.82	26.32	25.70	25.04	24.38	23.66	22.95	22.27
12.30	21.59	20.92	20.31	19.71	19.12	18.59	18.07	17.56	17.09	16.63
12.40	16.16	15.73	15.31	14.87	14.46	14.07	13.66	13.27	12.90	12.51
12.50	12.13	11.77	11.40	11.02	10.67	10.32	9.95	9.62	9.28	8.93
12.60	8.61	8.30	7.99	7.70	7.42	7.15	6.91	6.68	6.45	6.25
12.70	6.06	5.88	5.71	5.57	5.42	5.29	5.17	5.06	4.95	4.86
12.80	4.76	4.67	4.60	4.52	4.45	4.38	4.32	4.26	4.20	4.15
12.90	4.09	4.04	3.99	3.94	3.89	3.85	3.80	3.76	3.72	3.68
13.00	3.63	3.59	3.55	3.51	3.48	3.44	3.40	3.36	3.32	3.29
13.10	3.25	3.22	3.18	3.15	3.12	3.09	3.06	3.04	3.01	2.99
13.20	2.97	2.95	2.92	2.91	2.89	2.87	2.86	2.84	2.82	2.81
13.30	2.80	2.78	2.77	2.76	2.75	2.73	2.73	2.71	2.70	2.69
13.40	2.68	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59
13.50	2.58	2.57	2.56	2.55	2.54	2.53	2.52	2.51	2.50	2.49
13.60	2.48	2.48	2.47	2.46	2.45	2.44	2.43	2.42	2.41	2.40
13.70	2.39	2.38	2.37	2.37	2.36	2.34	2.34	2.33	2.32	2.31
13.80	2.30	2.29	2.28	2.27	2.26	2.25	2.25	2.23	2.23	2.22
13.90	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.13
14.00	2.11	2.11	2.10	2.09	2.08	2.07	2.06	2.05	2.04	2.03
14.10	2.02	2.02	2.01	2.00	1.99	1.98	1.97	1.97	1.96	1.95
14.20	1.95	1.94	1.93	1.93	1.92	1.91	1.91	1.90	1.90	1.89
14.30	1.89	1.88	1.88	1.87	1.87	1.86	1.86	1.85	1.85	1.84
14.40	1.84	1.83	1.83	1.82	1.82	1.82	1.81	1.80	1.80	1.80
14.50	1.79	1.79	1.78	1.78	1.77	1.77	1.76	1.76	1.76	1.75
14.60	1.75	1.74	1.74	1.73	1.73	1.73	1.72	1.72	1.71	1.71
14.70	1.70	1.70	1.69	1.69	1.69	1.68	1.68	1.67	1.67	1.66
14.80	1.66	1.65	1.65	1.65	1.64	1.64	1.63	1.63	1.62	1.62
14.90	1.61	1.61	1.61	1.60	1.60	1.59	1.59	1.58	1.58	1.58
15.00	1.57									

POND 1 TOTAL OUTFLOW PEAK= 24.76 CFS @ 12.25 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.02	.06	.09	.13	.16	.20	.25	.33	.41	.48
10.10	.55	.61	.66	.72	.76	.80	.84	.90	.94	.99
10.20	1.03	1.06	1.09	1.11	1.14	1.16	1.18	1.20	1.21	1.23
10.30	1.24	1.25	1.27	1.28	1.29	1.30	1.31	1.32	1.33	1.34
10.40	1.35	1.36	1.37	1.38	1.39	1.40	1.40	1.41	1.42	1.43
10.50	1.44	1.45	1.46	1.47	1.47	1.48	1.49	1.50	1.51	1.52
10.60	1.53	1.54	1.54	1.55	1.56	1.57	1.58	1.59	1.60	1.61
10.70	1.62	1.63	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70
10.80	1.71	1.72	1.73	1.74	1.74	1.75	1.76	1.77	1.78	1.79
10.90	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88	1.89
11.00	1.90	1.92	1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00
11.10	2.01	2.02	2.03	2.04	2.05	2.06	2.08	2.09	2.11	2.12
11.20	2.14	2.15	2.17	2.19	2.21	2.23	2.25	2.28	2.30	2.32
11.30	2.35	2.37	2.40	2.42	2.45	2.48	2.50	2.53	2.56	2.59
11.40	2.62	2.65	2.68	2.71	2.74	2.77	2.80	2.83	2.86	2.89
11.50	2.92	2.95	2.99	3.02	3.05	3.08	3.12	3.15	3.19	3.24
11.60	3.28	3.33	3.38	3.44	3.50	3.57	3.65	3.74	3.84	3.95
11.70	4.07	4.20	4.34	4.49	4.66	4.84	5.04	5.25	5.47	5.70
11.80	5.93	6.17	6.41	6.67	6.94	7.22	7.49	7.77	8.05	8.34
11.90	8.63	8.93	9.23	9.53	9.83	10.15	10.46	10.77	11.11	11.47
12.00	11.87	12.24	12.63	13.08	13.56	14.06	14.63	15.23	15.89	16.58
12.10	17.31	18.05	18.80	19.55	20.27	20.97	21.64	22.25	22.80	23.29
12.20	23.72	24.07	24.35	24.56	24.69	24.76	24.75	24.68	24.56	24.37
12.30	24.14	23.87	23.56	23.21	22.84	22.44	22.02	21.58	21.13	20.67
12.40	20.19	19.71	19.23	18.74	18.24	17.75	17.25	16.75	16.25	15.77
12.50	15.27	14.78	14.29	13.81	13.34	12.80	12.30	11.78	11.22	10.71
12.60	10.25	9.79	9.37	8.98	8.62	8.28	7.97	7.67	7.39	7.13
12.70	6.88	6.65	6.44	6.25	6.07	5.90	5.74	5.59	5.45	5.32
12.80	5.20	5.08	4.98	4.88	4.78	4.70	4.62	4.55	4.48	4.42
12.90	4.35	4.29	4.23	4.17	4.12	4.07	4.01	3.96	3.92	3.87
13.00	3.82	3.78	3.73	3.69	3.65	3.61	3.57	3.53	3.49	3.45
13.10	3.41	3.37	3.33	3.30	3.26	3.23	3.20	3.17	3.14	3.11
13.20	3.09	3.07	3.04	3.02	3.00	2.98	2.95	2.94	2.92	2.90
13.30	2.88	2.86	2.85	2.83	2.82	2.80	2.79	2.78	2.76	2.75
13.40	2.74	2.73	2.72	2.70	2.69	2.68	2.67	2.66	2.65	2.64
13.50	2.63	2.62	2.61	2.60	2.59	2.58	2.57	2.56	2.55	2.54
13.60	2.53	2.52	2.51	2.50	2.49	2.48	2.48	2.47	2.46	2.45
13.70	2.44	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.36	2.35
13.80	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26
13.90	2.25	2.24	2.23	2.23	2.22	2.21	2.20	2.19	2.18	2.17
14.00	2.16	2.15	2.14	2.13	2.12	2.11	2.11	2.10	2.09	2.08
14.10	2.07	2.06	2.05	2.04	2.03	2.02	2.02	2.01	2.00	1.99
14.20	1.98	1.98	1.97	1.96	1.95	1.95	1.94	1.93	1.93	1.92
14.30	1.92	1.91	1.90	1.90	1.89	1.89	1.88	1.88	1.87	1.87
14.40	1.86	1.86	1.85	1.85	1.84	1.84	1.84	1.83	1.83	1.82
14.50	1.82	1.82	1.81	1.81	1.80	1.80	1.79	1.79	1.79	1.78
14.60	1.78	1.77	1.77	1.76	1.76	1.75	1.75	1.75	1.74	1.74
14.70	1.73	1.73	1.72	1.72	1.71	1.71	1.71	1.70	1.70	1.69
14.80	1.69	1.68	1.68	1.67	1.67	1.67	1.66	1.66	1.65	1.65
14.90	1.64	1.64	1.63	1.63	1.63	1.62	1.62	1.61	1.61	1.60
15.00	1.60									

25-YEAR STORM EVENT

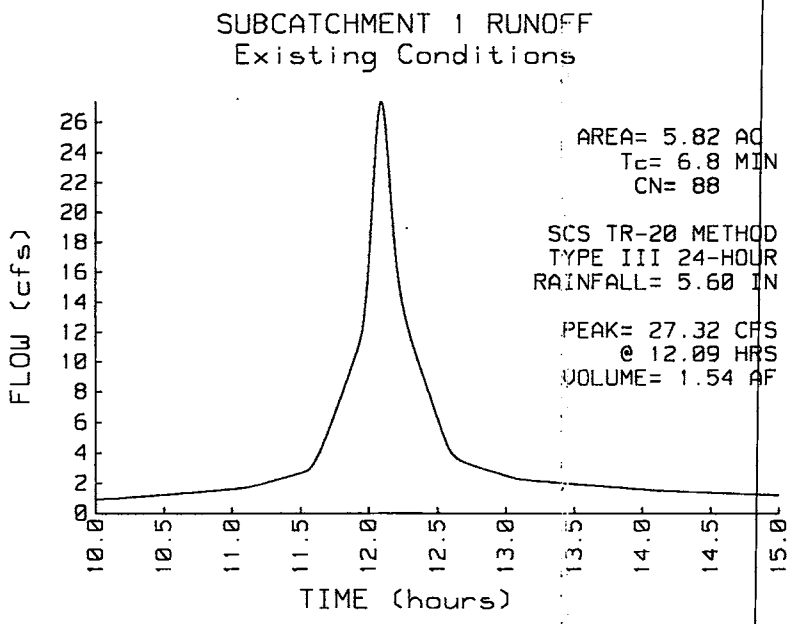
SUBCATCHMENT 1 **Existing Conditions**

PEAK= 27.32 CFS @ 12.09 HRS, VOLUME= 1.54 AF

ACRES	CN	
2.36	98	Impervious
.67	60	Open space / good
2.79	86	Gravel / Disturbed Areas
5.82	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.60 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:1a-1b**	1.8
Grass: Short n=.15 L=34' P2=3.3 in s=.15 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1b-1c**	.2
Unpaved Kv=16.1345 L=73' s=.14 '/' V=6.04 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1c-1d**	3.2
Paved Kv=20.3282 L=392' s=.01 '/' V=2.03 fps		
CHANNEL FLOW	**Segment ID:1d-1e**	1.6
a=.1 sq-ft Pw=10' r=.01'		
s=.0692 '/' n=.008 V=2.27 fps	L=213' Capacity=.2 cfs	
	Total Length= 712 ft	Total Tc= 6.8



SUBCATCHMENT 1 RUNOFF PEAK= 27.32 CFS @ 12.09 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.92	.93	.93	.93	.94	.94	.95	.95	.96	.96
10.10	.97	.97	.98	.98	.99	1.00	1.00	1.01	1.01	1.02
10.20	1.03	1.03	1.04	1.05	1.05	1.06	1.07	1.07	1.08	1.09
10.30	1.09	1.10	1.11	1.11	1.12	1.13	1.13	1.14	1.15	1.15
10.40	1.16	1.17	1.17	1.18	1.19	1.20	1.20	1.21	1.22	1.22
10.50	1.23	1.24	1.25	1.25	1.26	1.27	1.27	1.28	1.29	1.29
10.60	1.30	1.31	1.32	1.32	1.33	1.34	1.35	1.35	1.36	1.37
10.70	1.38	1.38	1.39	1.40	1.40	1.41	1.42	1.43	1.43	1.44
10.80	1.45	1.46	1.46	1.47	1.48	1.49	1.49	1.50	1.51	1.52
10.90	1.53	1.53	1.54	1.55	1.56	1.56	1.57	1.58	1.59	1.59
11.00	1.60	1.61	1.62	1.63	1.63	1.64	1.65	1.67	1.68	1.69
11.10	1.71	1.73	1.75	1.77	1.79	1.81	1.83	1.85	1.88	1.90
11.20	1.92	1.95	1.97	2.00	2.02	2.04	2.07	2.09	2.12	2.14
11.30	2.17	2.19	2.22	2.24	2.27	2.29	2.32	2.35	2.37	2.40
11.40	2.42	2.45	2.47	2.50	2.53	2.55	2.58	2.61	2.63	2.66
11.50	2.69	2.71	2.74	2.77	2.81	2.85	2.91	2.99	3.08	3.20
11.60	3.33	3.48	3.65	3.83	4.02	4.22	4.42	4.64	4.85	5.07
11.70	5.30	5.53	5.76	6.00	6.23	6.47	6.71	6.96	7.20	7.45
11.80	7.70	7.95	8.21	8.46	8.71	8.98	9.23	9.49	9.76	10.02
11.90	10.29	10.56	10.84	11.14	11.50	11.94	12.51	13.25	14.15	15.25
12.00	16.53	17.95	19.52	21.16	22.77	24.27	25.55	26.50	27.11	27.32
12.10	27.14	26.63	25.81	24.75	23.55	22.27	20.98	19.76	18.63	17.60
12.20	16.71	15.93	15.25	14.66	14.14	13.66	13.24	12.84	12.47	12.13
12.30	11.79	11.47	11.17	10.87	10.58	10.30	10.02	9.74	9.47	9.19
12.40	8.92	8.66	8.39	8.12	7.86	7.60	7.33	7.07	6.81	6.54
12.50	6.28	6.02	5.75	5.49	5.24	4.99	4.77	4.56	4.38	4.22
12.60	4.08	3.96	3.86	3.77	3.70	3.64	3.58	3.53	3.48	3.44
12.70	3.40	3.36	3.32	3.29	3.26	3.22	3.19	3.16	3.13	3.11
12.80	3.08	3.05	3.02	2.99	2.96	2.94	2.91	2.88	2.85	2.83
12.90	2.80	2.77	2.74	2.71	2.69	2.66	2.63	2.60	2.57	2.55
13.00	2.52	2.49	2.46	2.44	2.41	2.38	2.36	2.34	2.31	2.30
13.10	2.28	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18
13.20	2.17	2.16	2.16	2.15	2.14	2.13	2.13	2.12	2.11	2.10
13.30	2.10	2.09	2.08	2.08	2.07	2.06	2.05	2.05	2.04	2.03
13.40	2.02	2.02	2.01	2.00	2.00	1.99	1.98	1.97	1.97	1.96
13.50	1.95	1.95	1.94	1.93	1.92	1.92	1.91	1.90	1.89	1.89
13.60	1.88	1.87	1.87	1.86	1.85	1.84	1.84	1.83	1.82	1.82
13.70	1.81	1.80	1.79	1.79	1.78	1.77	1.76	1.76	1.75	1.74
13.80	1.74	1.73	1.72	1.71	1.71	1.70	1.69	1.68	1.68	1.67
13.90	1.66	1.65	1.65	1.64	1.63	1.63	1.62	1.61	1.60	1.60
14.00	1.59	1.58	1.57	1.57	1.56	1.55	1.55	1.54	1.53	1.53
14.10	1.52	1.52	1.51	1.51	1.50	1.50	1.50	1.49	1.49	1.49
14.20	1.48	1.48	1.47	1.47	1.47	1.46	1.46	1.46	1.45	1.45
14.30	1.45	1.44	1.44	1.44	1.43	1.43	1.43	1.42	1.42	1.42
14.40	1.41	1.41	1.40	1.40	1.40	1.39	1.39	1.39	1.38	1.38
14.50	1.38	1.37	1.37	1.37	1.36	1.36	1.36	1.35	1.35	1.34
14.60	1.34	1.34	1.33	1.33	1.33	1.32	1.32	1.32	1.31	1.31
14.70	1.31	1.30	1.30	1.30	1.29	1.29	1.29	1.28	1.28	1.27
14.80	1.27	1.27	1.26	1.26	1.26	1.25	1.25	1.25	1.24	1.24
14.90	1.24	1.23	1.23	1.23	1.22	1.22	1.22	1.21	1.21	1.20
15.00	1.20									

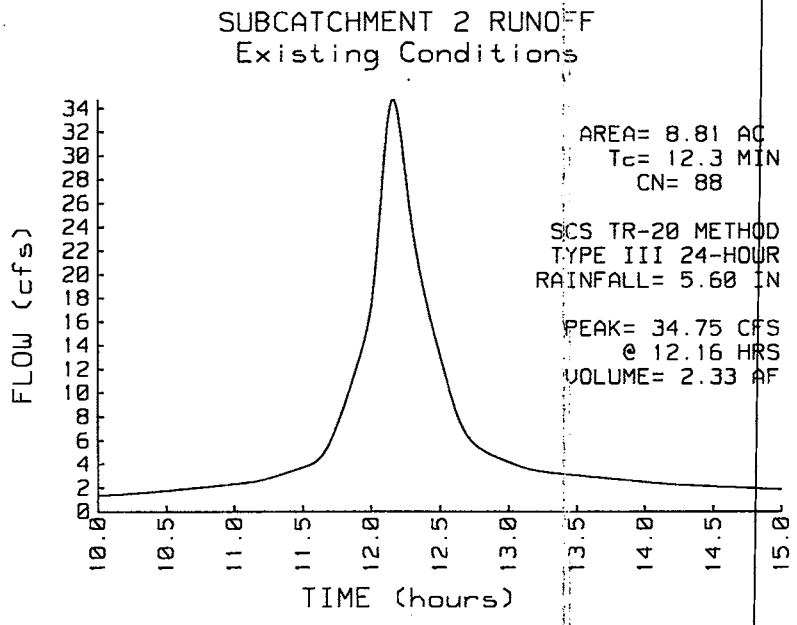
SUBCATCHMENT 2 **Existing Conditions**

PEAK= 34.75 CFS @ 12.16 HRS, VOLUME= 2.33 AF

ACRES	CN	
1.24	98	Impervious
.18	60	Woods Fair
7.29	87	Gravel / Disturbed Areas
.10	61	open space / good
8.81	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.60 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:2a-2b**	8.2
Grass: Short n=.15 L=110' P2=3.3 in s=.036 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2b-2c**	.3
Unpaved Kv=16.1345 L=182' s=.31 '/' V=8.98 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2c-2d**	1.4
Unpaved Kv=16.1345 L=182' s=.018 '/' V=2.16 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2d-2e**	2.4
Unpaved Kv=16.1345 L=399' s=.03 '/' V=2.79 fps		
	Total Length= 873 ft Total Tc=	12.3



SUBCATCHMENT 2 RUNOFF PEAK= 34.75 CFS @ 12.16 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.35	1.35	1.36	1.37	1.37	1.38	1.38	1.39	1.39	1.40
10.10	1.41	1.41	1.42	1.43	1.43	1.44	1.45	1.46	1.47	1.47
10.20	1.48	1.49	1.50	1.51	1.52	1.53	1.54	1.54	1.55	1.56
10.30	1.57	1.58	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66
10.40	1.67	1.68	1.69	1.70	1.71	1.72	1.73	1.74	1.75	1.76
10.50	1.77	1.78	1.79	1.81	1.82	1.83	1.84	1.85	1.86	1.87
10.60	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.96	1.97	1.98
10.70	1.99	2.00	2.01	2.02	2.03	2.04	2.05	2.06	2.08	2.09
10.80	2.10	2.11	2.12	2.13	2.14	2.15	2.17	2.18	2.19	2.20
10.90	2.21	2.22	2.23	2.24	2.26	2.27	2.28	2.29	2.30	2.31
11.00	2.33	2.34	2.35	2.36	2.37	2.39	2.40	2.41	2.42	2.44
11.10	2.45	2.47	2.48	2.50	2.52	2.54	2.57	2.59	2.61	2.64
11.20	2.67	2.70	2.72	2.75	2.79	2.82	2.85	2.88	2.91	2.95
11.30	2.99	3.02	3.06	3.09	3.12	3.16	3.20	3.23	3.27	3.31
11.40	3.35	3.39	3.42	3.46	3.50	3.53	3.58	3.61	3.65	3.69
11.50	3.73	3.77	3.81	3.85	3.89	3.94	3.98	4.04	4.09	4.16
11.60	4.24	4.33	4.44	4.56	4.69	4.85	5.02	5.21	5.41	5.63
11.70	5.87	6.11	6.37	6.65	6.93	7.22	7.53	7.83	8.15	8.47
11.80	8.80	9.13	9.48	9.81	10.17	10.52	10.88	11.25	11.61	11.98
11.90	12.36	12.73	13.12	13.51	13.91	14.35	14.81	15.31	15.89	16.53
12.00	17.29	18.17	19.16	20.31	21.58	22.96	24.44	25.96	27.50	29.02
12.10	30.42	31.70	32.81	33.64	34.29	34.65	34.75	34.66	34.27	33.72
12.20	33.05	32.18	31.27	30.32	29.29	28.32	27.35	26.40	25.52	24.66
12.30	23.86	23.13	22.40	21.75	21.12	20.49	19.93	19.36	18.81	18.31
12.40	17.78	17.28	16.81	16.31	15.86	15.40	14.93	14.50	14.06	13.61
12.50	13.20	12.75	12.33	11.92	11.49	11.08	10.67	10.26	9.88	9.50
12.60	9.13	8.78	8.44	8.13	7.83	7.55	7.30	7.06	6.84	6.65
12.70	6.46	6.30	6.15	6.01	5.89	5.78	5.66	5.57	5.48	5.39
12.80	5.31	5.23	5.16	5.09	5.02	4.96	4.90	4.83	4.78	4.72
12.90	4.67	4.62	4.57	4.52	4.47	4.42	4.37	4.33	4.28	4.24
13.00	4.19	4.14	4.10	4.05	4.01	3.97	3.92	3.88	3.84	3.80
13.10	3.76	3.72	3.69	3.66	3.62	3.59	3.56	3.53	3.51	3.49
13.20	3.46	3.44	3.42	3.40	3.39	3.37	3.35	3.34	3.32	3.31
13.30	3.29	3.28	3.27	3.25	3.24	3.23	3.21	3.20	3.19	3.17
13.40	3.17	3.15	3.14	3.13	3.12	3.11	3.10	3.08	3.07	3.06
13.50	3.05	3.04	3.03	3.02	3.01	2.99	2.98	2.97	2.96	2.95
13.60	2.94	2.93	2.92	2.91	2.90	2.89	2.87	2.86	2.85	2.84
13.70	2.83	2.82	2.81	2.80	2.79	2.77	2.77	2.75	2.74	2.73
13.80	2.72	2.71	2.70	2.69	2.68	2.66	2.65	2.64	2.63	2.62
13.90	2.61	2.60	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.51
14.00	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.40
14.10	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.33	2.32	2.31
14.20	2.30	2.30	2.29	2.28	2.28	2.27	2.26	2.26	2.25	2.24
14.30	2.24	2.23	2.23	2.22	2.22	2.21	2.21	2.20	2.19	2.19
14.40	2.18	2.18	2.17	2.17	2.16	2.16	2.15	2.15	2.14	2.13
14.50	2.13	2.12	2.12	2.11	2.11	2.10	2.10	2.09	2.09	2.08
14.60	2.08	2.07	2.06	2.06	2.05	2.05	2.05	2.04	2.03	2.03
14.70	2.02	2.02	2.01	2.01	2.00	2.00	1.99	1.99	1.98	1.98
14.80	1.97	1.96	1.96	1.95	1.95	1.94	1.94	1.93	1.93	1.92
14.90	1.92	1.91	1.91	1.90	1.90	1.89	1.89	1.88	1.87	1.87
15.00	1.86									

SUBCATCHMENT 3 **Proposed Conditions uncontrolled**

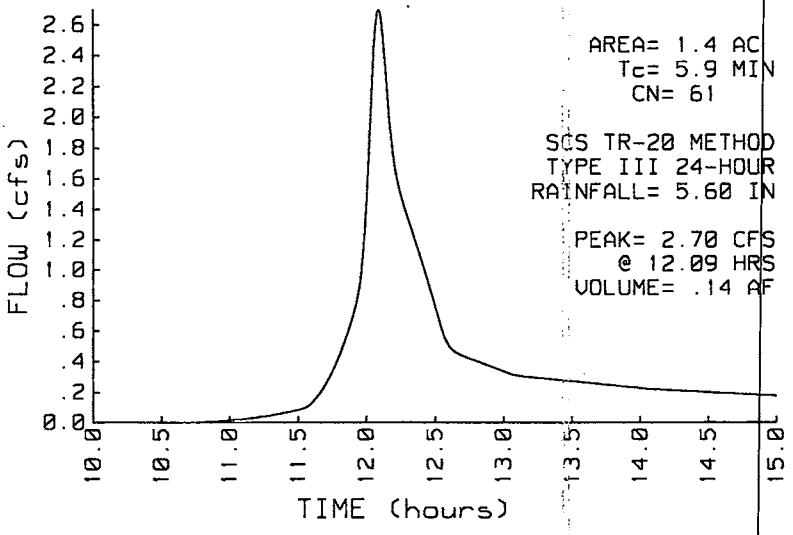
PEAK= 2.70 CFS @ 12.09 HRS, VOLUME= .14 AF

ACRES	CN	
1.40	61	Grass / good

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.60 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**3A - 3B**	1.9
Grass: Short n=.15 L=65' P2=3.3 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**3B - 3C**	4.0
Unpaved Kv=16.1345 L=550' s=.02 '/' V=2.28 fps		
	Total Length= 615 ft	Total Tc= 5.9

SUBCATCHMENT 3 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 3 RUNOFF PEAK= 2.70 CFS @ 12.09 HOURS

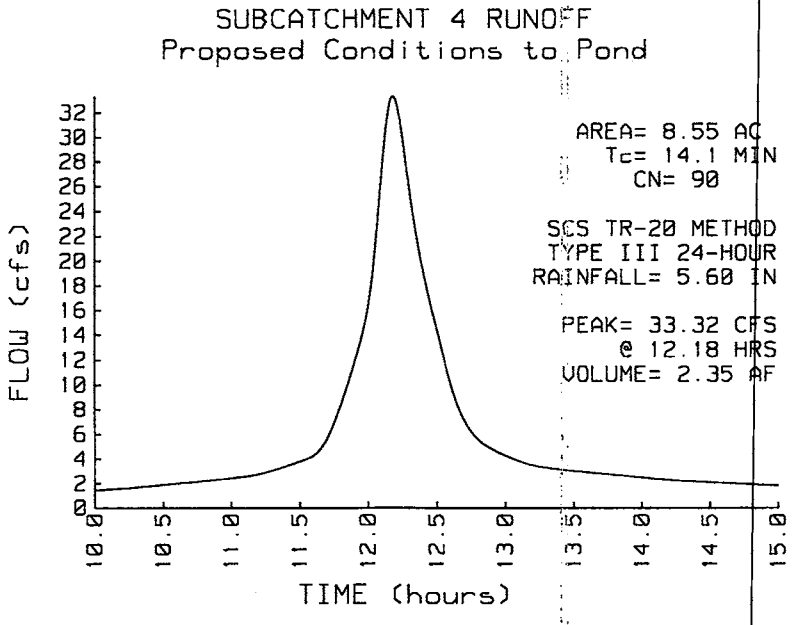
HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	.01	.01	.01	.01
10.90	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
11.00	.01	.02	.02	.02	.02	.02	.02	.02	.02	.02
11.10	.02	.02	.03	.03	.03	.03	.03	.03	.03	.03
11.20	.03	.04	.04	.04	.04	.04	.04	.04	.05	.05
11.30	.05	.05	.05	.05	.05	.06	.06	.06	.06	.06
11.40	.07	.07	.07	.07	.07	.08	.08	.08	.08	.08
11.50	.09	.09	.09	.09	.10	.10	.10	.11	.11	.12
11.60	.13	.14	.15	.16	.17	.18	.19	.21	.22	.23
11.70	.25	.26	.28	.30	.31	.33	.35	.37	.39	.41
11.80	.43	.45	.48	.50	.53	.55	.58	.61	.63	.66
11.90	.69	.72	.76	.79	.84	.89	.96	1.05	1.16	1.29
12.00	1.44	1.61	1.80	1.99	2.18	2.36	2.50	2.61	2.68	2.70
12.10	2.68	2.62	2.53	2.43	2.31	2.18	2.06	1.95	1.86	1.78
12.20	1.71	1.65	1.60	1.56	1.52	1.49	1.46	1.43	1.40	1.37
12.30	1.34	1.31	1.28	1.26	1.23	1.20	1.17	1.15	1.12	1.09
12.40	1.06	1.03	1.00	.97	.94	.91	.88	.85	.82	.79
12.50	.75	.72	.69	.66	.63	.60	.57	.55	.53	.52
12.60	.50	.49	.48	.47	.47	.46	.46	.45	.45	.44
12.70	.44	.43	.43	.43	.42	.42	.42	.41	.41	.41
12.80	.40	.40	.40	.39	.39	.39	.38	.38	.38	.37
12.90	.37	.37	.36	.36	.36	.35	.35	.35	.34	.34
13.00	.34	.33	.33	.33	.32	.32	.32	.31	.31	.31
13.10	.31	.31	.30	.30	.30	.30	.30	.30	.30	.30
13.20	.30	.30	.29	.29	.29	.29	.29	.29	.29	.29
13.30	.29	.29	.29	.29	.28	.28	.28	.28	.28	.28
13.40	.28	.28	.28	.28	.28	.28	.27	.27	.27	.27
13.50	.27	.27	.27	.27	.27	.27	.27	.27	.26	.26
13.60	.26	.26	.26	.26	.26	.26	.26	.26	.26	.25
13.70	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25
13.80	.24	.24	.24	.24	.24	.24	.24	.24	.24	.24
13.90	.24	.23	.23	.23	.23	.23	.23	.23	.23	.23
14.00	.23	.22	.22	.22	.22	.22	.22	.22	.22	.22
14.10	.22	.22	.22	.22	.22	.22	.21	.21	.21	.21
14.20	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
14.30	.21	.21	.21	.21	.21	.21	.21	.21	.21	.20
14.40	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
14.50	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
14.60	.20	.19	.19	.19	.19	.19	.19	.19	.19	.19
14.70	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
14.80	.19	.19	.19	.18	.18	.18	.18	.18	.18	.18
14.90	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18
15.00	.18									

SUBCATCHMENT 4 **Proposed Conditions to Pond**

PEAK= 33.32 CFS @ 12.18 HRS, VOLUME= 2.35 AF

ACRES	CN		
6.36	98	Impervious - Buildings, Pavement	SCS TR-20 METHOD
2.19	67	Lawn - Good	TYPE III 24-HOUR
			RAINFALL= 5.60 IN
8.55	90		SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:4a-4b**	12.2
Grass: Short n=.15 L=95' P2=3.3 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	0.0
Unpaved Kv=16.1345 L=32' s=.5 '/' V=11.41 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	.4
Paved Kv=20.3282 L=61' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**Segment ID:4d-4e**	.5
180" Diameter a=176.71 sq-ft Pw=47.1' r=3.75'		
s=.005 '/' n=.009 V=28.18 fps L=818' Capacity=4979.9 cfs		
CIRCULAR CHANNEL	**Segment ID:4e-4f**	1.0
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.005 '/' n=.009 V=7.35 fps L=444' Capacity=23.1 cfs		
	Total Length= 1450 ft Total Tc=	14.1



SUBCATCHMENT 4 RUNOFF PEAK= 33.32 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.47	1.48	1.48	1.49	1.50	1.50	1.51	1.51	1.52	1.52
10.10	1.53	1.54	1.54	1.55	1.56	1.56	1.57	1.58	1.58	1.59
10.20	1.60	1.61	1.62	1.63	1.63	1.64	1.65	1.66	1.67	1.68
10.30	1.69	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.77	1.78
10.40	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88
10.50	1.89	1.90	1.91	1.92	1.94	1.95	1.96	1.97	1.98	1.99
10.60	2.00	2.01	2.02	2.03	2.04	2.05	2.07	2.08	2.09	2.10
10.70	2.11	2.12	2.13	2.14	2.15	2.16	2.18	2.18	2.20	2.21
10.80	2.22	2.23	2.24	2.25	2.26	2.28	2.29	2.30	2.31	2.32
10.90	2.33	2.34	2.36	2.36	2.38	2.39	2.40	2.41	2.42	2.43
11.00	2.45	2.46	2.47	2.48	2.49	2.50	2.52	2.53	2.54	2.55
11.10	2.57	2.58	2.60	2.62	2.63	2.65	2.67	2.69	2.71	2.74
11.20	2.76	2.79	2.81	2.84	2.87	2.90	2.93	2.96	2.99	3.03
11.30	3.06	3.09	3.13	3.17	3.20	3.24	3.27	3.31	3.35	3.38
11.40	3.42	3.46	3.50	3.53	3.57	3.61	3.65	3.69	3.73	3.76
11.50	3.80	3.84	3.88	3.92	3.96	4.01	4.05	4.10	4.15	4.21
11.60	4.28	4.35	4.43	4.54	4.65	4.77	4.91	5.07	5.24	5.43
11.70	5.63	5.84	6.07	6.32	6.57	6.83	7.12	7.40	7.69	8.00
11.80	8.31	8.63	8.96	9.29	9.62	9.97	10.31	10.66	11.02	11.38
11.90	11.73	12.11	12.48	12.85	13.24	13.65	14.07	14.53	15.04	15.58
12.00	16.20	16.92	17.73	18.62	19.65	20.77	21.96	23.25	24.57	25.91
12.10	27.25	28.52	29.69	30.75	31.66	32.35	32.88	33.25	33.32	33.27
12.20	33.08	32.63	32.10	31.50	30.74	29.94	29.14	28.28	27.41	26.59
12.30	25.77	24.97	24.23	23.51	22.81	22.17	21.54	20.93	20.36	19.81
12.40	19.25	18.73	18.22	17.70	17.21	16.74	16.25	15.78	15.34	14.87
12.50	14.42	13.99	13.54	13.10	12.68	12.25	11.82	11.42	11.01	10.60
12.60	10.23	9.85	9.48	9.14	8.81	8.49	8.20	7.92	7.65	7.41
12.70	7.19	6.97	6.77	6.60	6.43	6.27	6.13	6.00	5.87	5.76
12.80	5.65	5.54	5.45	5.36	5.27	5.20	5.12	5.04	4.98	4.92
12.90	4.85	4.79	4.73	4.67	4.61	4.56	4.51	4.45	4.41	4.35
13.00	4.30	4.26	4.21	4.16	4.12	4.07	4.02	3.98	3.94	3.89
13.10	3.85	3.81	3.77	3.73	3.70	3.66	3.63	3.60	3.57	3.54
13.20	3.51	3.49	3.46	3.44	3.42	3.40	3.38	3.36	3.34	3.33
13.30	3.31	3.29	3.28	3.27	3.25	3.24	3.22	3.21	3.20	3.18
13.40	3.17	3.16	3.15	3.13	3.12	3.11	3.10	3.08	3.07	3.06
13.50	3.05	3.04	3.03	3.01	3.01	3.00	2.98	2.97	2.96	2.95
13.60	2.94	2.93	2.92	2.90	2.90	2.88	2.87	2.86	2.85	2.84
13.70	2.83	2.82	2.80	2.80	2.79	2.77	2.76	2.75	2.74	2.73
13.80	2.72	2.71	2.70	2.69	2.67	2.66	2.66	2.64	2.63	2.62
13.90	2.61	2.60	2.59	2.58	2.56	2.56	2.54	2.53	2.52	2.51
14.00	2.50	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40
14.10	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.33	2.32	2.31
14.20	2.30	2.29	2.28	2.28	2.27	2.26	2.26	2.25	2.24	2.24
14.30	2.23	2.22	2.22	2.21	2.21	2.20	2.20	2.19	2.18	2.18
14.40	2.17	2.16	2.16	2.16	2.15	2.14	2.14	2.13	2.13	2.12
14.50	2.12	2.11	2.11	2.10	2.10	2.09	2.08	2.08	2.08	2.07
14.60	2.06	2.06	2.05	2.05	2.04	2.04	2.03	2.03	2.02	2.02
14.70	2.01	2.01	2.00	2.00	1.99	1.98	1.98	1.98	1.97	1.96
14.80	1.96	1.95	1.95	1.94	1.94	1.93	1.93	1.92	1.92	1.91
14.90	1.91	1.90	1.90	1.89	1.88	1.88	1.88	1.87	1.86	1.86
15.00	1.85									

SUBCATCHMENT 5 **Proposed Conditions uncontrolled**

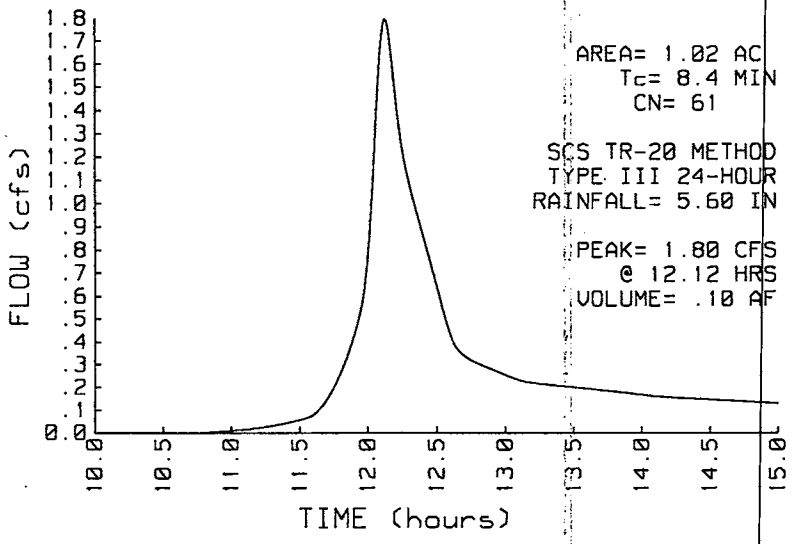
PEAK= 1.80 CFS @ 12.12 HRS, VOLUME= .10 AF

ACRES	CN	
1.02	61	Lawn / Good (B soil)

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.60 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**5A - 5B**	6.7
Grass: Short n=.15 L=100' P2=3.3 in s=.05 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**5B - 5C**	1.7
Unpaved Kv=16.1345 L=360' s=.05 '/' V=3.61 fps		
	Total Length= 460 ft	Total Tc= 8.4

SUBCATCHMENT 5 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 5 RUNOFF PEAK= 1.80 CFS @ 12.12 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.90	0.00	0.00	.01	.01	.01	.01	.01	.01	.01	.01
11.00	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
11.10	.01	.02	.02	.02	.02	.02	.02	.02	.02	.02
11.20	.02	.02	.02	.02	.03	.03	.03	.03	.03	.03
11.30	.03	.03	.03	.03	.04	.04	.04	.04	.04	.04
11.40	.04	.04	.05	.05	.05	.05	.05	.05	.05	.06
11.50	.06	.06	.06	.06	.06	.06	.07	.07	.07	.08
11.60	.08	.08	.09	.09	.10	.11	.11	.12	.13	.14
11.70	.15	.16	.17	.18	.19	.20	.21	.22	.23	.25
11.80	.26	.28	.29	.31	.32	.34	.36	.37	.39	.41
11.90	.43	.45	.47	.49	.52	.55	.58	.62	.66	.72
12.00	.79	.87	.96	1.06	1.17	1.28	1.39	1.50	1.60	1.67
12.10	1.74	1.77	1.80	1.79	1.77	1.73	1.68	1.63	1.57	1.51
12.20	1.45	1.39	1.34	1.30	1.26	1.22	1.19	1.16	1.13	1.10
12.30	1.08	1.05	1.03	1.01	.99	.96	.94	.92	.90	.88
12.40	.86	.84	.81	.79	.77	.75	.73	.71	.68	.66
12.50	.64	.61	.59	.57	.55	.52	.50	.48	.46	.44
12.60	.43	.41	.40	.39	.38	.37	.36	.36	.35	.34
12.70	.34	.34	.33	.33	.32	.32	.32	.31	.31	.31
12.80	.31	.30	.30	.30	.29	.29	.29	.29	.28	.28
12.90	.28	.28	.27	.27	.27	.27	.26	.26	.26	.26
13.00	.25	.25	.25	.25	.24	.24	.24	.24	.23	.23
13.10	.23	.23	.23	.23	.23	.22	.22	.22	.22	.22
13.20	.22	.22	.22	.22	.22	.22	.22	.21	.21	.21
13.30	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
13.40	.21	.21	.21	.20	.20	.20	.20	.20	.20	.20
13.50	.20	.20	.20	.20	.20	.20	.20	.20	.20	.19
13.60	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
13.70	.19	.19	.19	.19	.18	.18	.18	.18	.18	.18
13.80	.18	.18	.18	.18	.18	.18	.18	.18	.18	.17
13.90	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
14.00	.17	.17	.17	.17	.16	.16	.16	.16	.16	.16
14.10	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
14.20	.16	.16	.16	.16	.16	.15	.15	.15	.15	.15
14.30	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
14.40	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
14.50	.15	.15	.15	.15	.15	.15	.14	.14	.14	.14
14.60	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
14.70	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
14.80	.14	.14	.14	.14	.14	.14	.13	.13	.13	.13
14.90	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13
15.00	.13									

SUBCATCHMENT 6 **PROPOSED CONDITIONS TO CULVERT**

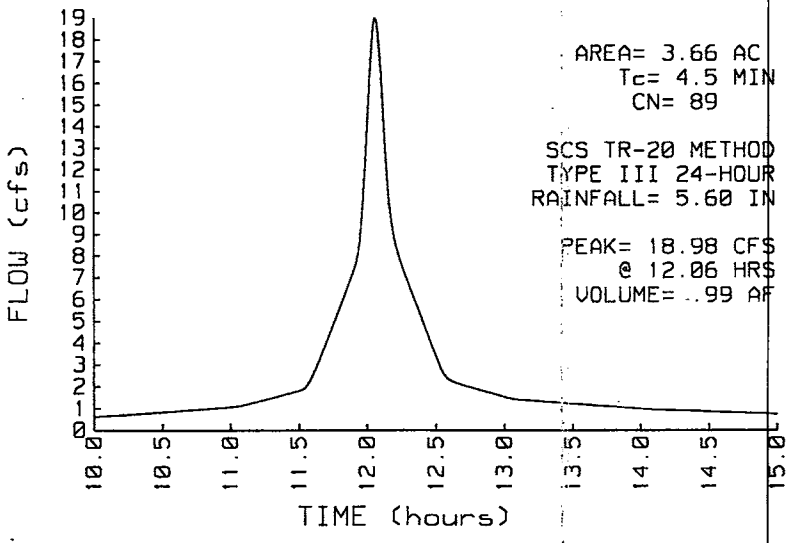
PEAK= 18.98 CFS @ 12.06 HRS, VOLUME= .99 AF

ACRES	CN	
2.60	98	IMPERVIOUS
1.06	67	LAWN AREA
3.66	89	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.60 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**6A - 6B**	2.3
Grass: Short n=.15 L=60' P2=3.3 in s=.26 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**6B - 6C**	.7
Paved Kv=20.3282 L=116' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**6C - 6D**	1.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.005 '/' n=.009 V=6.07 fps L=453' Capacity=10.7 cfs		
CIRCULAR CHANNEL	**6D - 6E**	.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.011 '/' n=.009 V=9.01 fps L=100' Capacity=15.9 cfs		
CIRCULAR CHANNEL	**6E - 6F**	.1
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.008 '/' n=.009 V=9.3 fps L=46' Capacity=29.2 cfs		
	Total Length= 775 ft Total Tc=	4.5

SUBCATCHMENT 6 RUNOFF
PROPOSED CONDITIONS TO CULVERT



SUBCATCHMENT 6 RUNOFF PEAK= 18.98 CFS @ 12.06 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.63	.63	.63	.64	.64	.64	.64	.65	.65	.66
10.10	.66	.66	.67	.67	.68	.68	.68	.69	.69	.70
10.20	.70	.70	.71	.71	.72	.72	.73	.73	.74	.74
10.30	.74	.75	.75	.76	.76	.77	.77	.77	.78	.78
10.40	.79	.79	.80	.80	.81	.81	.82	.82	.82	.83
10.50	.83	.84	.84	.85	.85	.86	.86	.87	.87	.88
10.60	.88	.88	.89	.89	.90	.90	.91	.91	.92	.92
10.70	.93	.93	.94	.94	.95	.95	.96	.96	.96	.97
10.80	.97	.98	.98	.99	.99	1.00	1.00	1.01	1.01	1.02
10.90	1.02	1.03	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.07
11.00	1.07	1.08	1.08	1.09	1.10	1.10	1.11	1.12	1.14	1.15
11.10	1.16	1.18	1.19	1.21	1.22	1.24	1.25	1.27	1.28	1.30
11.20	1.32	1.33	1.35	1.36	1.38	1.40	1.41	1.43	1.45	1.46
11.30	1.48	1.49	1.51	1.53	1.54	1.56	1.58	1.59	1.61	1.63
11.40	1.64	1.66	1.68	1.70	1.71	1.73	1.75	1.76	1.78	1.80
11.50	1.82	1.83	1.85	1.88	1.92	1.97	2.05	2.14	2.25	2.37
11.60	2.50	2.63	2.77	2.91	3.06	3.20	3.35	3.50	3.66	3.81
11.70	3.96	4.12	4.28	4.43	4.59	4.75	4.91	5.07	5.24	5.40
11.80	5.56	5.73	5.89	6.06	6.23	6.40	6.57	6.74	6.91	7.08
11.90	7.25	7.43	7.63	7.89	8.26	8.79	9.49	10.36	11.37	12.49
12.00	13.68	14.93	16.18	17.33	18.24	18.80	18.98	18.79	18.28	17.54
12.10	16.62	15.59	14.48	13.37	12.32	11.40	10.64	10.02	9.53	9.13
12.20	8.80	8.51	8.26	8.03	7.82	7.63	7.44	7.26	7.09	6.91
12.30	6.74	6.58	6.41	6.24	6.08	5.91	5.75	5.58	5.41	5.25
12.40	5.08	4.91	4.75	4.58	4.41	4.24	4.07	3.90	3.74	3.57
12.50	3.40	3.23	3.06	2.90	2.76	2.64	2.54	2.45	2.39	2.34
12.60	2.30	2.27	2.24	2.21	2.19	2.16	2.14	2.12	2.11	2.09
12.70	2.07	2.05	2.03	2.01	2.00	1.98	1.96	1.94	1.93	1.91
12.80	1.89	1.87	1.86	1.84	1.82	1.80	1.79	1.77	1.75	1.73
12.90	1.72	1.70	1.68	1.66	1.64	1.63	1.61	1.59	1.57	1.56
13.00	1.54	1.52	1.50	1.49	1.47	1.46	1.44	1.43	1.43	1.42
13.10	1.41	1.41	1.40	1.40	1.39	1.38	1.38	1.38	1.37	1.37
13.20	1.36	1.36	1.35	1.35	1.34	1.34	1.33	1.33	1.32	1.32
13.30	1.32	1.31	1.31	1.30	1.30	1.29	1.29	1.28	1.28	1.27
13.40	1.27	1.27	1.26	1.26	1.25	1.25	1.24	1.24	1.23	1.23
13.50	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.19	1.19	1.18
13.60	1.18	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.14	1.14
13.70	1.13	1.13	1.12	1.12	1.11	1.11	1.10	1.10	1.09	1.09
13.80	1.09	1.08	1.08	1.07	1.07	1.06	1.06	1.05	1.05	1.04
13.90	1.04	1.03	1.03	1.02	1.02	1.02	1.01	1.01	1.00	1.00
14.00	.99	.99	.98	.98	.97	.97	.97	.96	.96	.96
14.10	.96	.95	.95	.95	.95	.94	.94	.94	.94	.93
14.20	.93	.93	.93	.93	.92	.92	.92	.92	.91	.91
14.30	.91	.91	.91	.90	.90	.90	.90	.89	.89	.89
14.40	.89	.89	.88	.88	.88	.88	.87	.87	.87	.87
14.50	.87	.86	.86	.86	.86	.85	.85	.85	.85	.85
14.60	.84	.84	.84	.84	.83	.83	.83	.83	.83	.82
14.70	.82	.82	.82	.81	.81	.81	.81	.81	.80	.80
14.80	.80	.80	.79	.79	.79	.79	.79	.78	.78	.78
14.90	.78	.77	.77	.77	.77	.77	.76	.76	.76	.76
15.00	.75									

POND 1 **Detention Basin**

Qin = 33.32 CFS @ 12.18 HRS, VOLUME= 2.35 AF
Qout= 29.01 CFS @ 12.26 HRS, VOLUME= 2.34 AF, ATTEN= 13%, LAG= 4.9 MIN

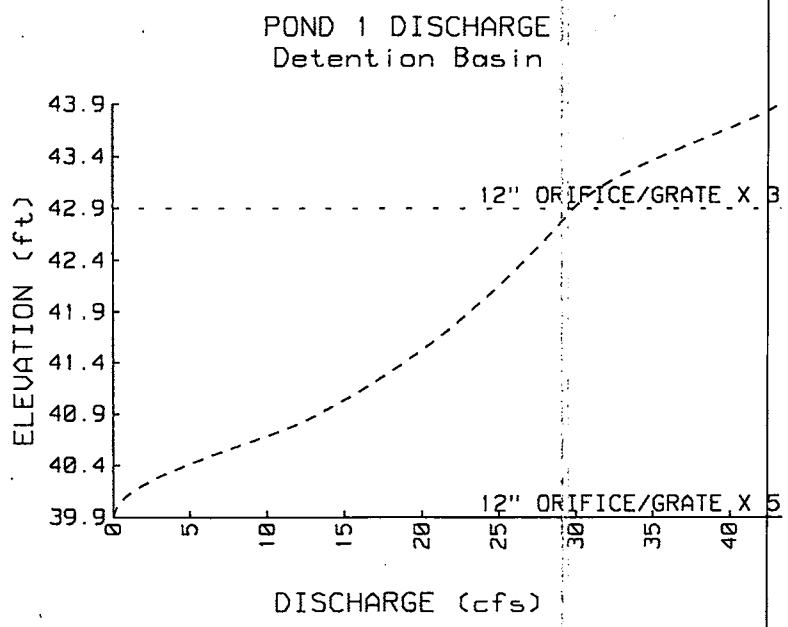
ELEVATION (FT)	INC.STOR (CF)	CUM.STOR (CF)
39.9	0	0
40.9	2338	2338
41.9	2689	5027
42.9	2689	7716
43.9	2338	10054

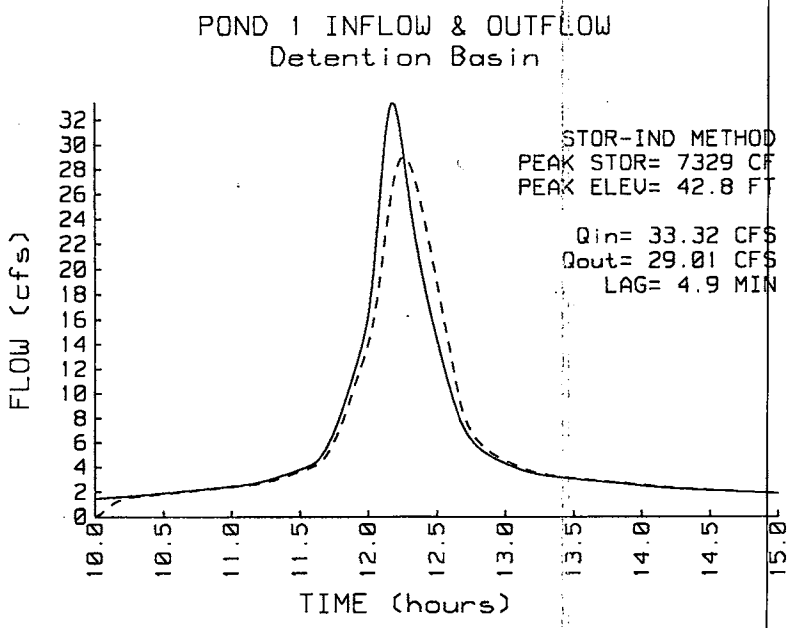
STOR-IND METHOD
PEAK STORAGE = 7329 CF
PEAK ELEVATION= 42.8 FT
FLOOD ELEVATION= 43.9 FT
START ELEVATION= 39.9 FT
SPAN= 10-15 HRS, dt=.01 HRS
Tdet= 4.1 MIN (2.34 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	42.9'	**12" ORIFICE/GRATE X 3**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
2	P	39.9'	**12" ORIFICE/GRATE X 5**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)

POND 1 TOTAL DISCHARGE (CFS) vs ELEVATION

FEET	0.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
39.9	0.00	.22	.85	1.85	3.16	4.72	6.49	8.36	10.25	12.02
40.9	13.36	14.64	15.81	16.90	17.93	18.90	19.82	20.70	21.55	22.36
41.9	23.15	23.91	24.64	25.36	26.05	26.73	27.39	28.03	28.66	29.28
42.9	29.88	30.61	31.57	32.73	34.08	35.57	37.17	38.82	40.48	42.06
43.9	43.38									




POND 1 INFLOW & OUTFLOW
Detention Basin
STOR-IND METHOD
PEAK STOR= 7329 CF
PEAK ELEV= 42.8 FT
Qin= 33.32 CFS
Qout= 29.01 CFS
LAG= 4.9 MIN
FLOW (cfs)
TIME (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0

POND 1 INFLOW PEAK= 33.32 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.47	1.48	1.48	1.49	1.50	1.50	1.51	1.51	1.52	1.52
10.10	1.53	1.54	1.54	1.55	1.56	1.56	1.57	1.58	1.58	1.59
10.20	1.60	1.61	1.62	1.63	1.63	1.64	1.65	1.66	1.67	1.68
10.30	1.69	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.77	1.78
10.40	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88
10.50	1.89	1.90	1.91	1.92	1.94	1.95	1.96	1.97	1.98	1.99
10.60	2.00	2.01	2.02	2.03	2.04	2.05	2.07	2.08	2.09	2.10
10.70	2.11	2.12	2.13	2.14	2.15	2.16	2.18	2.18	2.20	2.21
10.80	2.22	2.23	2.24	2.25	2.26	2.28	2.29	2.30	2.31	2.32
10.90	2.33	2.34	2.36	2.36	2.38	2.39	2.40	2.41	2.42	2.43
11.00	2.45	2.46	2.47	2.48	2.49	2.50	2.52	2.53	2.54	2.55
11.10	2.57	2.58	2.60	2.62	2.63	2.65	2.67	2.69	2.71	2.74
11.20	2.76	2.79	2.81	2.84	2.87	2.90	2.93	2.96	2.99	3.03
11.30	3.06	3.09	3.13	3.17	3.20	3.24	3.27	3.31	3.35	3.38
11.40	3.42	3.46	3.50	3.53	3.57	3.61	3.65	3.69	3.73	3.76
11.50	3.80	3.84	3.88	3.92	3.96	4.01	4.05	4.10	4.15	4.21
11.60	4.28	4.35	4.43	4.54	4.65	4.77	4.91	5.07	5.24	5.43
11.70	5.63	5.84	6.07	6.32	6.57	6.83	7.12	7.40	7.69	8.00
11.80	8.31	8.63	8.96	9.29	9.62	9.97	10.31	10.66	11.02	11.38
11.90	11.73	12.11	12.48	12.85	13.24	13.65	14.07	14.53	15.04	15.58
12.00	16.20	16.92	17.73	18.62	19.65	20.77	21.96	23.25	24.57	25.91
12.10	27.25	28.52	29.69	30.75	31.66	32.35	32.88	33.25	33.32	33.27
12.20	33.08	32.63	32.10	31.50	30.74	29.94	29.14	28.28	27.41	26.59
12.30	25.77	24.97	24.23	23.51	22.81	22.17	21.54	20.93	20.36	19.81
12.40	19.25	18.73	18.22	17.70	17.21	16.74	16.25	15.78	15.34	14.87
12.50	14.42	13.99	13.54	13.10	12.68	12.25	11.82	11.42	11.01	10.60
12.60	10.23	9.85	9.48	9.14	8.81	8.49	8.20	7.92	7.65	7.41
12.70	7.19	6.97	6.77	6.60	6.43	6.27	6.13	6.00	5.87	5.76
12.80	5.65	5.54	5.45	5.36	5.27	5.20	5.12	5.04	4.98	4.92
12.90	4.85	4.79	4.73	4.67	4.61	4.56	4.51	4.45	4.41	4.35
13.00	4.30	4.26	4.21	4.16	4.12	4.07	4.02	3.98	3.94	3.89
13.10	3.85	3.81	3.77	3.73	3.70	3.66	3.63	3.60	3.57	3.54
13.20	3.51	3.49	3.46	3.44	3.42	3.40	3.38	3.36	3.34	3.33
13.30	3.31	3.29	3.28	3.27	3.25	3.24	3.22	3.21	3.20	3.18
13.40	3.17	3.16	3.15	3.13	3.12	3.11	3.10	3.08	3.07	3.06
13.50	3.05	3.04	3.03	3.01	3.01	3.00	2.98	2.97	2.96	2.95
13.60	2.94	2.93	2.92	2.90	2.90	2.88	2.87	2.86	2.85	2.84
13.70	2.83	2.82	2.80	2.80	2.79	2.77	2.76	2.75	2.74	2.73
13.80	2.72	2.71	2.70	2.69	2.67	2.66	2.66	2.64	2.63	2.62
13.90	2.61	2.60	2.59	2.58	2.56	2.56	2.54	2.53	2.52	2.51
14.00	2.50	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40
14.10	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.33	2.32	2.31
14.20	2.30	2.29	2.28	2.28	2.27	2.26	2.26	2.25	2.24	2.24
14.30	2.23	2.22	2.22	2.21	2.21	2.20	2.20	2.19	2.18	2.18
14.40	2.17	2.16	2.16	2.16	2.15	2.14	2.14	2.13	2.13	2.12
14.50	2.12	2.11	2.11	2.10	2.10	2.09	2.08	2.08	2.08	2.07
14.60	2.06	2.06	2.05	2.05	2.04	2.04	2.03	2.03	2.02	2.02
14.70	2.01	2.01	2.00	2.00	1.99	1.98	1.98	1.98	1.97	1.96
14.80	1.96	1.95	1.95	1.94	1.94	1.93	1.93	1.92	1.92	1.91
14.90	1.91	1.90	1.90	1.89	1.88	1.88	1.88	1.87	1.86	1.86
15.00	1.85									

POND 1 TOTAL OUTFLOW PEAK= 29.01 CFS @ 12.26 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.02	.07	.12	.17	.21	.31	.42	.52	.61	.70
10.10	.77	.84	.94	1.03	1.10	1.17	1.22	1.27	1.32	1.36
10.20	1.39	1.42	1.45	1.47	1.50	1.52	1.54	1.55	1.57	1.58
10.30	1.60	1.61	1.63	1.64	1.65	1.66	1.67	1.69	1.70	1.71
10.40	1.72	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.80	1.81
10.50	1.82	1.83	1.85	1.86	1.87	1.88	1.90	1.91	1.92	1.93
10.60	1.94	1.95	1.97	1.98	1.99	2.00	2.01	2.02	2.03	2.04
10.70	2.05	2.06	2.08	2.09	2.10	2.11	2.12	2.13	2.14	2.15
10.80	2.16	2.18	2.19	2.20	2.21	2.22	2.23	2.24	2.25	2.26
10.90	2.28	2.29	2.30	2.31	2.32	2.33	2.34	2.36	2.37	2.38
11.00	2.39	2.40	2.41	2.42	2.44	2.45	2.46	2.47	2.48	2.49
11.10	2.51	2.52	2.53	2.55	2.56	2.57	2.59	2.61	2.62	2.64
11.20	2.66	2.68	2.70	2.73	2.75	2.78	2.80	2.83	2.86	2.88
11.30	2.91	2.94	2.98	3.01	3.04	3.07	3.11	3.14	3.18	3.22
11.40	3.26	3.30	3.33	3.37	3.41	3.45	3.49	3.53	3.57	3.60
11.50	3.64	3.68	3.72	3.76	3.80	3.84	3.88	3.92	3.97	4.01
11.60	4.06	4.12	4.18	4.24	4.32	4.40	4.50	4.60	4.72	4.87
11.70	5.02	5.19	5.38	5.57	5.78	6.00	6.23	6.48	6.75	7.02
11.80	7.31	7.60	7.90	8.21	8.53	8.85	9.18	9.51	9.85	10.19
11.90	10.52	10.86	11.20	11.55	11.91	12.22	12.53	12.86	13.22	13.57
12.00	13.94	14.35	14.81	15.30	15.85	16.45	17.10	17.81	18.56	19.35
12.10	20.18	21.02	21.88	22.73	23.56	24.36	25.12	25.84	26.49	27.07
12.20	27.58	28.02	28.37	28.65	28.84	28.96	29.01	28.98	28.89	28.74
12.30	28.54	28.28	27.98	27.64	27.27	26.87	26.43	25.98	25.51	25.02
12.40	24.51	23.99	23.46	22.92	22.38	21.82	21.26	20.70	20.13	19.56
12.50	18.98	18.41	17.83	17.25	16.68	16.11	15.54	14.97	14.40	13.84
12.60	13.29	12.68	12.11	11.47	10.87	10.34	9.84	9.38	8.98	8.61
12.70	8.28	7.98	7.70	7.44	7.21	6.99	6.79	6.61	6.44	6.29
12.80	6.15	6.02	5.89	5.78	5.67	5.56	5.47	5.38	5.29	5.21
12.90	5.13	5.05	4.98	4.92	4.85	4.79	4.73	4.67	4.62	4.57
13.00	4.52	4.47	4.42	4.37	4.32	4.27	4.22	4.17	4.13	4.08
13.10	4.04	3.99	3.95	3.91	3.86	3.82	3.79	3.75	3.71	3.68
13.20	3.65	3.61	3.58	3.56	3.53	3.50	3.48	3.46	3.43	3.41
13.30	3.39	3.37	3.35	3.34	3.32	3.30	3.29	3.27	3.26	3.24
13.40	3.23	3.21	3.20	3.19	3.17	3.16	3.15	3.14	3.13	3.12
13.50	3.11	3.09	3.08	3.07	3.06	3.05	3.04	3.03	3.02	3.00
13.60	2.99	2.98	2.97	2.96	2.95	2.94	2.93	2.92	2.91	2.89
13.70	2.88	2.87	2.86	2.85	2.84	2.83	2.82	2.81	2.80	2.78
13.80	2.77	2.76	2.75	2.74	2.73	2.72	2.71	2.70	2.69	2.67
13.90	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59	2.58	2.57
14.00	2.55	2.54	2.53	2.52	2.51	2.50	2.49	2.48	2.47	2.46
14.10	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.36	2.35
14.20	2.34	2.34	2.33	2.32	2.31	2.30	2.29	2.29	2.28	2.27
14.30	2.26	2.26	2.25	2.24	2.24	2.23	2.23	2.22	2.21	2.21
14.40	2.20	2.20	2.19	2.18	2.18	2.17	2.17	2.16	2.16	2.15
14.50	2.14	2.14	2.13	2.13	2.12	2.12	2.11	2.11	2.10	2.10
14.60	2.09	2.09	2.08	2.07	2.07	2.06	2.06	2.05	2.05	2.04
14.70	2.04	2.03	2.03	2.02	2.02	2.01	2.01	2.00	2.00	1.99
14.80	1.98	1.98	1.97	1.97	1.96	1.96	1.95	1.95	1.94	1.94
14.90	1.93	1.93	1.92	1.92	1.91	1.91	1.90	1.90	1.89	1.88
15.00	1.88									

100-YEAR STORM EVENT

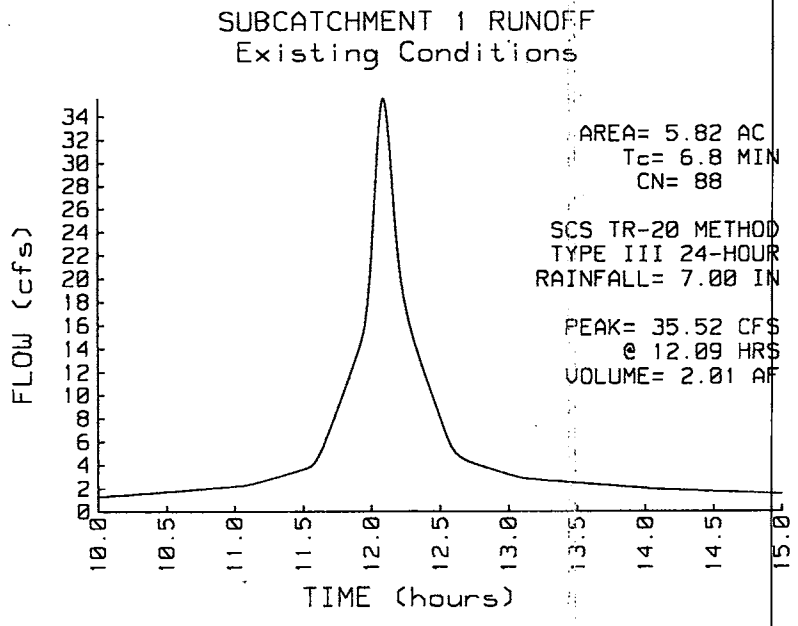
SUBCATCHMENT 1 **Existing Conditions**

PEAK= 35.52 CFS @ 12.09 HRS, VOLUME= 2.01 AF

ACRES	CN	
2.36	98	Impervious
.67	60	Open space / good
2.79	86	Gravel / Disturbed Areas
5.82	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:1a-1b**	1.8
Grass: Short n=.15 L=34' P2=3.3 in s=.15 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1b-1c**	.2
Unpaved Kv=16.1345 L=73' s=.14 '/' V=6.04 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:1c-1d**	3.2
Paved Kv=20.3282 L=392' s=.01 '/' V=2.03 fps		
CHANNEL FLOW	**Segment ID:1d-1e**	1.6
a=.1 sq-ft Pw=10' r=.01'		
s=.0692 '/' n=.008 V=2.27 fps	L=213' Capacity=.2 cfs	
	Total Length= 712 ft	Total Tc= 6.8



SUBCATCHMENT 1 RUNOFF PEAK= 35.52 CFS @ 12.09 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.32	1.33	1.33	1.34	1.34	1.35	1.35	1.36	1.36	1.37
10.10	1.38	1.38	1.39	1.40	1.41	1.42	1.42	1.43	1.44	1.45
10.20	1.46	1.47	1.48	1.48	1.49	1.50	1.51	1.52	1.53	1.54
10.30	1.54	1.55	1.56	1.57	1.58	1.59	1.60	1.61	1.62	1.63
10.40	1.64	1.64	1.65	1.66	1.67	1.68	1.69	1.70	1.71	1.72
10.50	1.73	1.74	1.75	1.75	1.76	1.77	1.78	1.79	1.80	1.81
10.60	1.82	1.83	1.84	1.85	1.86	1.87	1.88	1.89	1.90	1.91
10.70	1.92	1.92	1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00
10.80	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09	2.10
10.90	2.11	2.12	2.13	2.14	2.15	2.16	2.17	2.18	2.19	2.20
11.00	2.21	2.22	2.23	2.24	2.25	2.26	2.27	2.29	2.31	2.33
11.10	2.35	2.37	2.40	2.42	2.45	2.48	2.51	2.54	2.57	2.60
11.20	2.63	2.66	2.70	2.73	2.76	2.79	2.83	2.86	2.89	2.92
11.30	2.96	2.99	3.02	3.06	3.09	3.12	3.16	3.19	3.23	3.26
11.40	3.29	3.33	3.36	3.39	3.43	3.46	3.50	3.53	3.57	3.60
11.50	3.64	3.67	3.71	3.75	3.79	3.86	3.93	4.03	4.16	4.32
11.60	4.49	4.70	4.92	5.16	5.41	5.68	5.95	6.23	6.52	6.81
11.70	7.11	7.41	7.72	8.03	8.34	8.65	8.97	9.29	9.61	9.94
11.80	10.26	10.59	10.92	11.25	11.58	11.92	12.25	12.59	12.94	13.27
11.90	13.61	13.97	14.32	14.71	15.17	15.74	16.48	17.43	18.60	20.02
12.00	21.68	23.53	25.55	27.67	29.74	31.67	33.31	34.51	35.27	35.52
12.10	35.25	34.57	33.48	32.08	30.51	28.83	27.14	25.55	24.07	22.74
12.20	21.58	20.56	19.67	18.91	18.22	17.60	17.05	16.53	16.05	15.60
12.30	15.17	14.75	14.36	13.98	13.59	13.23	12.86	12.50	12.15	11.80
12.40	11.45	11.11	10.76	10.42	10.08	9.74	9.40	9.07	8.72	8.38
12.50	8.05	7.71	7.37	7.04	6.71	6.39	6.11	5.84	5.60	5.40
12.60	5.22	5.07	4.94	4.83	4.74	4.65	4.58	4.51	4.45	4.40
12.70	4.34	4.30	4.25	4.21	4.17	4.12	4.08	4.05	4.01	3.97
12.80	3.93	3.90	3.86	3.83	3.79	3.75	3.72	3.68	3.65	3.61
12.90	3.57	3.54	3.50	3.47	3.43	3.40	3.36	3.33	3.29	3.25
13.00	3.22	3.18	3.15	3.11	3.08	3.04	3.01	2.98	2.96	2.93
13.10	2.91	2.89	2.87	2.86	2.84	2.83	2.82	2.81	2.80	2.78
13.20	2.77	2.76	2.75	2.74	2.73	2.72	2.71	2.71	2.69	2.69
13.30	2.68	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59
13.40	2.58	2.57	2.57	2.56	2.55	2.54	2.53	2.52	2.51	2.50
13.50	2.49	2.48	2.47	2.46	2.45	2.44	2.44	2.43	2.42	2.41
13.60	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.31
13.70	2.30	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22
13.80	2.21	2.20	2.19	2.18	2.17	2.16	2.16	2.15	2.14	2.13
13.90	2.12	2.11	2.10	2.09	2.08	2.07	2.06	2.05	2.04	2.03
14.00	2.02	2.02	2.01	2.00	1.99	1.98	1.97	1.96	1.95	1.95
14.10	1.94	1.93	1.93	1.92	1.92	1.91	1.91	1.90	1.90	1.89
14.20	1.89	1.88	1.88	1.87	1.87	1.86	1.86	1.86	1.85	1.85
14.30	1.84	1.84	1.83	1.83	1.82	1.82	1.82	1.81	1.81	1.80
14.40	1.80	1.79	1.79	1.78	1.78	1.78	1.77	1.77	1.76	1.76
14.50	1.75	1.75	1.74	1.74	1.74	1.73	1.73	1.72	1.72	1.71
14.60	1.71	1.70	1.70	1.69	1.69	1.69	1.68	1.68	1.67	1.67
14.70	1.66	1.66	1.65	1.65	1.64	1.64	1.64	1.63	1.63	1.62
14.80	1.62	1.61	1.61	1.60	1.60	1.60	1.59	1.59	1.58	1.58
14.90	1.57	1.57	1.56	1.56	1.55	1.55	1.55	1.54	1.54	1.53
15.00	1.53									

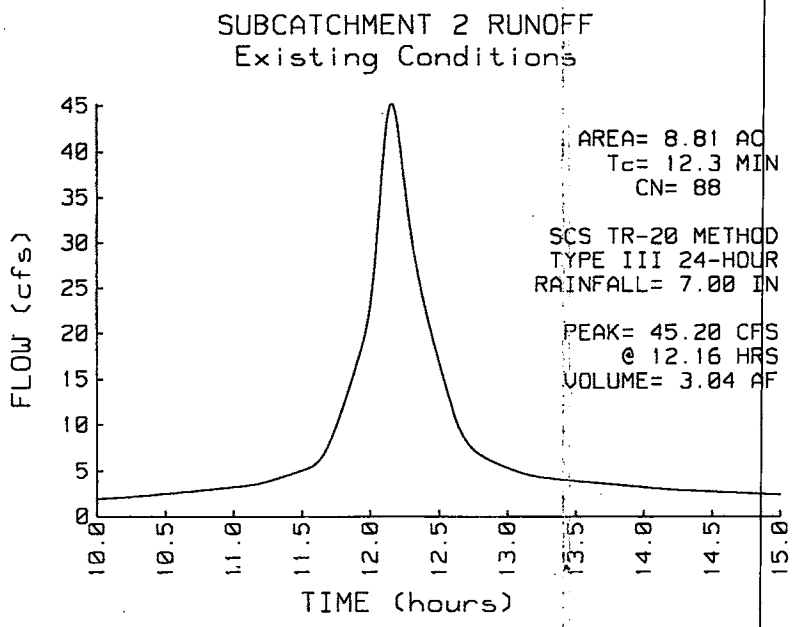
SUBCATCHMENT 2 **Existing Conditions**

PEAK= 45.20 CFS @ 12.16 HRS, VOLUME= 3.04 AF

ACRES	CN	
1.24	98	Impervious
.18	60	Woods Fair
7.29	87	Gravel / Disturbed Areas
.10	61	open space / good
8.81	88	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:2a-2b**	8.2
Grass: Short n=.15 L=110' P2=3.3 in s=.036 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2b-2c**	.3
Unpaved Kv=16.1345 L=182' s=.31 '/' V=8.98 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2c-2d**	1.4
Unpaved Kv=16.1345 L=182' s=.018 '/' V=2.16 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:2d-2e**	2.4
Unpaved Kv=16.1345 L=399' s=.03 '/' V=2.79 fps		
	Total Length= 873 ft	Total Tc= 12.3



SUBCATCHMENT 2 RUNOFF PEAK= 45.20 CFS @ 12.16 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	1.93	1.94	1.95	1.96	1.97	1.97	1.98	1.99	1.99	2.00
10.10	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09	2.10
10.20	2.11	2.12	2.13	2.15	2.16	2.17	2.18	2.19	2.21	2.22
10.30	2.23	2.24	2.26	2.27	2.28	2.29	2.31	2.32	2.33	2.35
10.40	2.36	2.37	2.39	2.40	2.41	2.43	2.44	2.46	2.47	2.48
10.50	2.50	2.51	2.52	2.54	2.55	2.57	2.58	2.59	2.61	2.62
10.60	2.63	2.65	2.66	2.68	2.69	2.71	2.72	2.74	2.75	2.76
10.70	2.78	2.79	2.81	2.82	2.83	2.85	2.86	2.88	2.89	2.90
10.80	2.92	2.94	2.95	2.97	2.98	2.99	3.01	3.02	3.04	3.05
10.90	3.07	3.08	3.10	3.11	3.13	3.14	3.15	3.17	3.18	3.20
11.00	3.22	3.23	3.25	3.26	3.27	3.29	3.31	3.32	3.34	3.36
11.10	3.38	3.40	3.42	3.44	3.47	3.50	3.53	3.56	3.59	3.63
11.20	3.66	3.70	3.74	3.78	3.82	3.86	3.90	3.95	3.99	4.04
11.30	4.08	4.13	4.18	4.22	4.27	4.32	4.36	4.41	4.46	4.51
11.40	4.56	4.61	4.66	4.71	4.76	4.81	4.86	4.91	4.96	5.02
11.50	5.06	5.12	5.17	5.22	5.28	5.33	5.39	5.47	5.54	5.63
11.60	5.74	5.85	6.00	6.16	6.34	6.55	6.77	7.02	7.30	7.58
11.70	7.90	8.23	8.57	8.94	9.31	9.69	10.10	10.50	10.92	11.35
11.80	11.77	12.22	12.67	13.11	13.58	14.04	14.50	14.99	15.46	15.94
11.90	16.44	16.91	17.42	17.93	18.44	19.01	19.60	20.25	21.00	21.83
12.00	22.82	23.95	25.24	26.73	28.36	30.14	32.05	34.02	36.00	37.95
12.10	39.74	41.38	42.80	43.86	44.67	45.11	45.20	45.07	44.53	43.79
12.20	42.90	41.75	40.55	39.29	37.95	36.67	35.39	34.15	33.00	31.88
12.30	30.83	29.86	28.92	28.06	27.24	26.42	25.69	24.95	24.23	23.57
12.40	22.88	22.24	21.62	20.98	20.39	19.80	19.19	18.64	18.06	17.48
12.50	16.94	16.37	15.83	15.29	14.74	14.22	13.69	13.16	12.67	12.18
12.60	11.70	11.26	10.82	10.42	10.04	9.67	9.35	9.05	8.76	8.52
12.70	8.28	8.07	7.88	7.69	7.54	7.39	7.25	7.13	7.01	6.89
12.80	6.79	6.69	6.59	6.51	6.42	6.34	6.26	6.18	6.11	6.04
12.90	5.97	5.91	5.84	5.77	5.71	5.65	5.59	5.53	5.47	5.41
13.00	5.35	5.29	5.24	5.18	5.13	5.07	5.01	4.96	4.91	4.85
13.10	4.81	4.76	4.71	4.67	4.63	4.59	4.55	4.51	4.49	4.45
13.20	4.42	4.40	4.37	4.35	4.33	4.30	4.28	4.26	4.24	4.22
13.30	4.20	4.18	4.17	4.15	4.13	4.12	4.10	4.09	4.07	4.05
13.40	4.04	4.02	4.01	4.00	3.98	3.96	3.95	3.93	3.92	3.91
13.50	3.89	3.88	3.86	3.85	3.84	3.82	3.81	3.79	3.78	3.77
13.60	3.75	3.73	3.72	3.71	3.69	3.68	3.66	3.65	3.64	3.62
13.70	3.61	3.59	3.58	3.57	3.55	3.54	3.53	3.51	3.50	3.48
13.80	3.47	3.46	3.44	3.42	3.41	3.40	3.38	3.37	3.35	3.34
13.90	3.33	3.31	3.30	3.28	3.27	3.26	3.24	3.23	3.21	3.20
14.00	3.19	3.17	3.16	3.14	3.13	3.11	3.10	3.09	3.07	3.06
14.10	3.04	3.03	3.02	3.01	3.00	2.98	2.97	2.97	2.95	2.94
14.20	2.93	2.92	2.92	2.91	2.90	2.89	2.88	2.87	2.87	2.86
14.30	2.85	2.84	2.84	2.83	2.82	2.81	2.81	2.80	2.79	2.79
14.40	2.78	2.77	2.77	2.76	2.75	2.74	2.74	2.73	2.72	2.72
14.50	2.71	2.70	2.70	2.69	2.68	2.68	2.67	2.66	2.66	2.65
14.60	2.64	2.64	2.63	2.62	2.62	2.61	2.60	2.59	2.59	2.58
14.70	2.57	2.57	2.56	2.55	2.55	2.54	2.53	2.53	2.52	2.51
14.80	2.51	2.50	2.49	2.49	2.48	2.47	2.47	2.46	2.45	2.44
14.90	2.44	2.43	2.42	2.42	2.41	2.40	2.40	2.39	2.38	2.38
15.00	2.37									

SUBCATCHMENT 3 **Proposed Conditions uncontrolled**

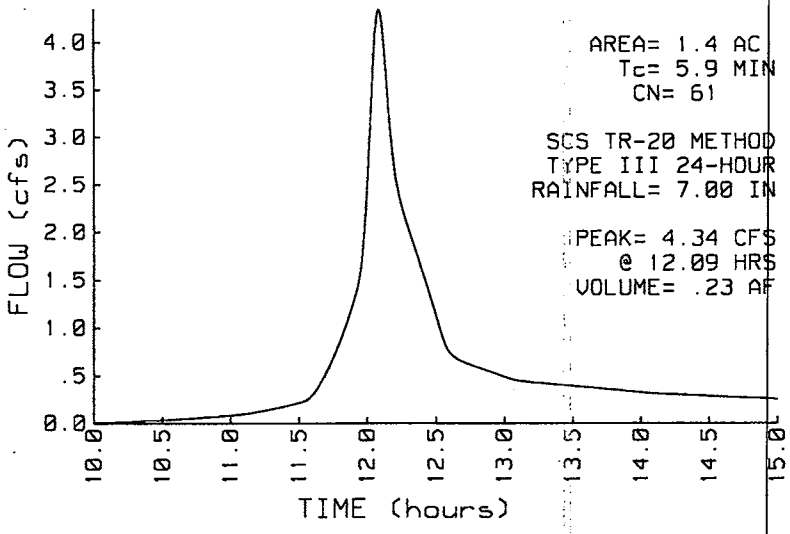
PEAK= 4.34 CFS @ 12.09 HRS, VOLUME= .23 AF

ACRES	CN	
1.40	61	Grass / good

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**3A - 3B**	1.9
Grass: Short n=.15 L=65' P2=3.3 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**3B - 3C**	4.0
Unpaved Kv=16.1345 L=550' s=.02 '/' V=2.28 fps		
	Total Length= 615 ft	Total Tc= 5.9

SUBCATCHMENT 3 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 3 RUNOFF PEAK= 4.34 CFS @ 12.09 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	.01	.01	.01	.01
10.10	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
10.20	.01	.01	.01	.02	.02	.02	.02	.02	.02	.02
10.30	.02	.02	.02	.02	.02	.02	.02	.02	.03	.03
10.40	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
10.50	.03	.04	.04	.04	.04	.04	.04	.04	.04	.04
10.60	.04	.04	.05	.05	.05	.05	.05	.05	.05	.05
10.70	.05	.05	.05	.06	.06	.06	.06	.06	.06	.06
10.80	.06	.06	.07	.07	.07	.07	.07	.07	.07	.07
10.90	.07	.07	.08	.08	.08	.08	.08	.08	.08	.08
11.00	.09	.09	.09	.09	.09	.09	.09	.09	.10	.10
11.10	.10	.10	.10	.11	.11	.11	.11	.12	.12	.12
11.20	.12	.13	.13	.13	.13	.14	.14	.14	.14	.15
11.30	.15	.15	.16	.16	.16	.16	.17	.17	.17	.18
11.40	.18	.18	.19	.19	.19	.20	.20	.20	.21	.21
11.50	.22	.22	.22	.23	.23	.24	.25	.26	.27	.28
11.60	.30	.32	.34	.36	.38	.40	.43	.45	.48	.50
11.70	.53	.56	.59	.62	.65	.68	.71	.74	.78	.81
11.80	.85	.89	.93	.96	1.01	1.05	1.09	1.13	1.18	1.22
11.90	1.27	1.32	1.37	1.42	1.49	1.58	1.69	1.84	2.01	2.22
12.00	2.46	2.73	3.02	3.32	3.62	3.88	4.10	4.25	4.33	4.34
12.10	4.29	4.18	4.02	3.84	3.63	3.43	3.23	3.05	2.89	2.76
12.20	2.65	2.55	2.47	2.40	2.34	2.28	2.23	2.17	2.13	2.08
12.30	2.03	1.99	1.94	1.90	1.86	1.81	1.77	1.73	1.68	1.64
12.40	1.59	1.55	1.50	1.46	1.41	1.36	1.32	1.27	1.22	1.17
12.50	1.12	1.08	1.03	.98	.93	.89	.85	.82	.79	.76
12.60	.74	.73	.71	.70	.69	.68	.67	.67	.66	.65
12.70	.65	.64	.64	.63	.63	.62	.62	.61	.61	.60
12.80	.60	.59	.59	.58	.58	.57	.56	.56	.55	.55
12.90	.54	.54	.53	.53	.52	.52	.51	.51	.50	.50
13.00	.49	.49	.48	.48	.47	.47	.46	.46	.46	.45
13.10	.45	.45	.45	.44	.44	.44	.44	.44	.44	.43
13.20	.43	.43	.43	.43	.43	.43	.43	.42	.42	.42
13.30	.42	.42	.42	.42	.42	.41	.41	.41	.41	.41
13.40	.41	.41	.41	.40	.40	.40	.40	.40	.40	.40
13.50	.39	.39	.39	.39	.39	.39	.39	.39	.38	.38
13.60	.38	.38	.38	.38	.38	.37	.37	.37	.37	.37
13.70	.37	.37	.37	.36	.36	.36	.36	.36	.36	.36
13.80	.35	.35	.35	.35	.35	.35	.35	.34	.34	.34
13.90	.34	.34	.34	.34	.34	.33	.33	.33	.33	.33
14.00	.33	.33	.32	.32	.32	.32	.32	.32	.32	.32
14.10	.31	.31	.31	.31	.31	.31	.31	.31	.31	.31
14.20	.31	.31	.31	.31	.30	.30	.30	.30	.30	.30
14.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.29
14.40	.29	.29	.29	.29	.29	.29	.29	.29	.29	.29
14.50	.29	.29	.29	.29	.28	.28	.28	.28	.28	.28
14.60	.28	.28	.28	.28	.28	.28	.28	.28	.28	.27
14.70	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27
14.80	.27	.27	.27	.27	.26	.26	.26	.26	.26	.26
14.90	.26	.26	.26	.26	.26	.26	.26	.26	.25	.25
15.00	.25									

SUBCATCHMENT 4 **Proposed Conditions to Pond**

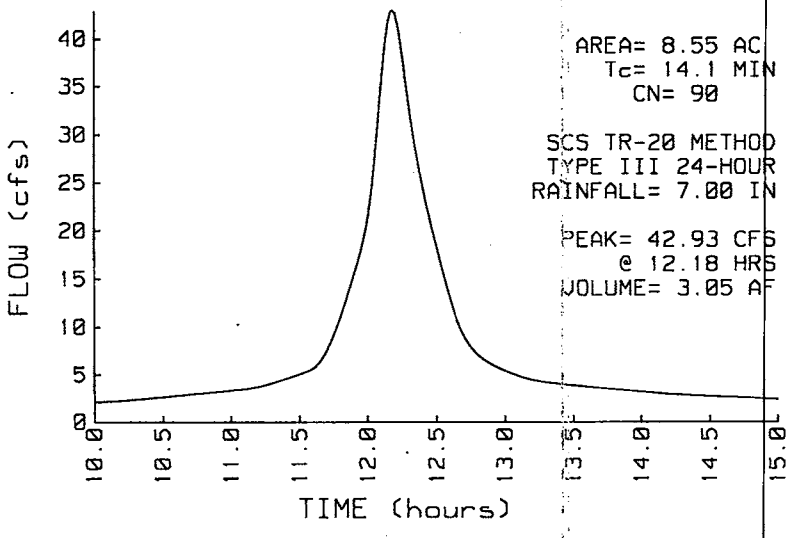
PEAK= 42.93 CFS @ 12.18 HRS, VOLUME= 3.05 AF

ACRES	CN	
6.36	98	Impervious - Buildings, Pavement
2.19	67	Lawn - Good
8.55	90	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:4a-4b**	12.2
Grass: Short n=.15 L=95' P2=3.3 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	0.0
Unpaved Kv=16.1345 L=32' s=.5 '/' V=11.41 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:4c-4d**	.4
Paved Kv=20.3282 L=61' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**Segment ID:4d-4e**	.5
180" Diameter a=176.71 sq-ft Pw=47.1' r=3.75'		
s=.005 '/' n=.009 V=28.18 fps L=818' Capacity=4979.9 cfs		
CIRCULAR CHANNEL	**Segment ID:4e-4f**	1.0
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.005 '/' n=.009 V=7.35 fps L=444' Capacity=23.1 cfs		
	Total Length= 1450 ft Total Tc=	14.1

SUBCATCHMENT 4 RUNOFF
Proposed Conditions to Pond



SUBCATCHMENT 4 RUNOFF PEAK= 42.93 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	2.05	2.06	2.07	2.07	2.08	2.09	2.10	2.11	2.11	2.12
10.10	2.13	2.14	2.14	2.15	2.16	2.17	2.18	2.19	2.20	2.21
10.20	2.22	2.23	2.24	2.25	2.26	2.28	2.29	2.30	2.31	2.32
10.30	2.33	2.35	2.36	2.37	2.39	2.40	2.41	2.42	2.44	2.45
10.40	2.46	2.48	2.49	2.50	2.52	2.53	2.54	2.56	2.57	2.58
10.50	2.60	2.61	2.63	2.64	2.66	2.67	2.68	2.70	2.71	2.72
10.60	2.74	2.75	2.76	2.78	2.79	2.81	2.82	2.84	2.85	2.86
10.70	2.88	2.89	2.91	2.92	2.93	2.95	2.96	2.98	2.99	3.01
10.80	3.02	3.03	3.05	3.06	3.08	3.09	3.11	3.12	3.14	3.15
10.90	3.16	3.18	3.19	3.21	3.22	3.24	3.25	3.27	3.28	3.29
11.00	3.31	3.33	3.34	3.35	3.37	3.38	3.40	3.42	3.43	3.45
11.10	3.47	3.48	3.50	3.53	3.55	3.57	3.60	3.63	3.65	3.68
11.20	3.72	3.75	3.78	3.82	3.86	3.90	3.94	3.98	4.02	4.07
11.30	4.11	4.15	4.20	4.24	4.29	4.34	4.38	4.43	4.48	4.53
11.40	4.57	4.62	4.67	4.72	4.77	4.82	4.87	4.92	4.97	5.02
11.50	5.07	5.13	5.17	5.22	5.28	5.33	5.39	5.46	5.53	5.60
11.60	5.69	5.79	5.89	6.03	6.17	6.33	6.52	6.72	6.94	7.19
11.70	7.46	7.73	8.04	8.36	8.68	9.03	9.40	9.77	10.16	10.56
11.80	10.96	11.37	11.80	12.23	12.66	13.11	13.56	14.00	14.47	14.94
11.90	15.39	15.88	16.36	16.83	17.33	17.86	18.39	18.99	19.64	20.34
12.00	21.13	22.05	23.09	24.23	25.54	26.98	28.50	30.15	31.85	33.56
12.10	35.27	36.88	38.37	39.72	40.87	41.74	42.40	42.86	42.93	42.84
12.20	42.58	41.99	41.29	40.50	39.50	38.47	37.42	36.30	35.18	34.11
12.30	33.05	32.01	31.06	30.12	29.21	28.38	27.58	26.78	26.05	25.34
12.40	24.61	23.94	23.29	22.62	21.99	21.38	20.75	20.15	19.58	18.98
12.50	18.39	17.84	17.27	16.70	16.17	15.62	15.07	14.56	14.04	13.51
12.60	13.03	12.55	12.08	11.64	11.22	10.81	10.44	10.08	9.74	9.43
12.70	9.15	8.87	8.62	8.40	8.18	7.98	7.80	7.63	7.46	7.32
12.80	7.18	7.04	6.93	6.82	6.70	6.61	6.51	6.41	6.33	6.25
12.90	6.16	6.08	6.01	5.93	5.86	5.80	5.73	5.66	5.60	5.53
13.00	5.46	5.41	5.35	5.28	5.23	5.17	5.11	5.05	5.00	4.94
13.10	4.89	4.84	4.79	4.74	4.70	4.65	4.61	4.57	4.53	4.49
13.20	4.46	4.43	4.39	4.37	4.34	4.31	4.29	4.27	4.24	4.22
13.30	4.20	4.18	4.16	4.15	4.12	4.11	4.09	4.07	4.05	4.04
13.40	4.02	4.01	3.99	3.98	3.96	3.95	3.93	3.91	3.90	3.89
13.50	3.87	3.86	3.84	3.82	3.81	3.80	3.78	3.77	3.76	3.74
13.60	3.73	3.72	3.70	3.68	3.67	3.66	3.64	3.63	3.62	3.60
13.70	3.59	3.57	3.56	3.55	3.53	3.52	3.50	3.49	3.47	3.46
13.80	3.45	3.43	3.42	3.41	3.39	3.38	3.37	3.35	3.34	3.32
13.90	3.31	3.29	3.28	3.27	3.25	3.24	3.23	3.21	3.20	3.18
14.00	3.17	3.16	3.14	3.13	3.11	3.10	3.08	3.07	3.06	3.04
14.10	3.03	3.02	3.01	2.99	2.98	2.97	2.96	2.95	2.94	2.92
14.20	2.91	2.90	2.89	2.89	2.88	2.87	2.86	2.85	2.84	2.83
14.30	2.83	2.82	2.81	2.80	2.79	2.79	2.78	2.77	2.76	2.76
14.40	2.75	2.74	2.74	2.73	2.72	2.72	2.71	2.70	2.70	2.69
14.50	2.68	2.68	2.67	2.66	2.65	2.65	2.64	2.63	2.63	2.62
14.60	2.61	2.61	2.60	2.59	2.59	2.58	2.57	2.57	2.56	2.55
14.70	2.55	2.54	2.53	2.53	2.52	2.51	2.51	2.50	2.49	2.49
14.80	2.48	2.47	2.47	2.46	2.45	2.45	2.44	2.43	2.43	2.42
14.90	2.41	2.41	2.40	2.39	2.39	2.38	2.37	2.37	2.36	2.35
15.00	2.35									

SUBCATCHMENT 5 **Proposed Conditions uncontrolled**

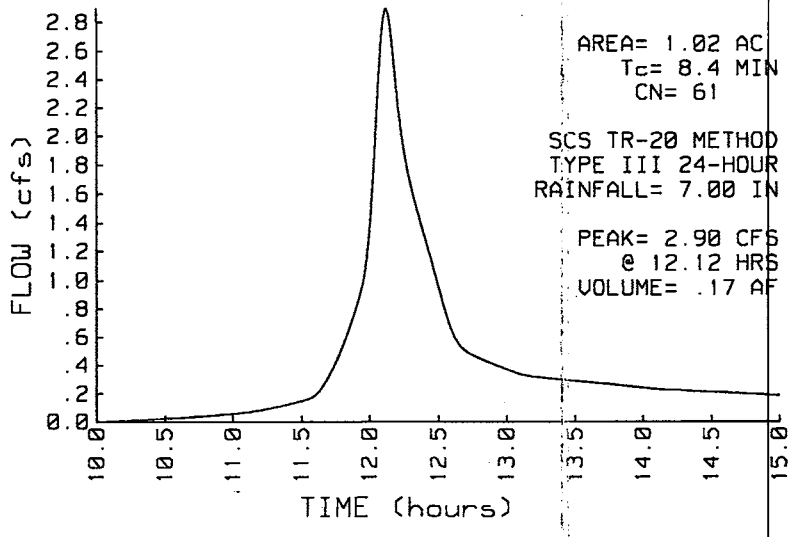
PEAK= 2.90 CFS @ 12.12 HRS, VOLUME= .17 AF

ACRES	CN	
1.02	61	Lawn / Good (B soil)

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**5A - 5B**	6.7
Grass: Short n=.15 L=100' P2=3.3 in s=.05 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**5B - 5C**	1.7
Unpaved Kv=16.1345 L=360' s=.05 '/' V=3.61 fps		
	Total Length= 460 ft	Total Tc= 8.4

SUBCATCHMENT 5 RUNOFF
Proposed Conditions uncontrolled



SUBCATCHMENT 5 RUNOFF PEAK= 2.90 CFS @ 12.12 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.10	0.00	0.00	0.00	.01	.01	.01	.01	.01	.01	.01
10.20	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
10.30	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
10.40	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
10.50	.02	.02	.02	.03	.03	.03	.03	.03	.03	.03
10.60	.03	.03	.03	.03	.03	.03	.03	.03	.03	.04
10.70	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
10.80	.04	.04	.04	.05	.05	.05	.05	.05	.05	.05
10.90	.05	.05	.05	.05	.05	.05	.06	.06	.06	.06
11.00	.06	.06	.06	.06	.06	.06	.06	.07	.07	.07
11.10	.07	.07	.07	.07	.07	.08	.08	.08	.08	.08
11.20	.08	.08	.09	.09	.09	.09	.09	.10	.10	.10
11.30	.10	.10	.11	.11	.11	.11	.11	.12	.12	.12
11.40	.12	.13	.13	.13	.13	.13	.14	.14	.14	.14
11.50	.15	.15	.15	.16	.16	.16	.17	.17	.18	.18
11.60	.19	.20	.21	.22	.23	.24	.26	.27	.29	.30
11.70	.32	.34	.36	.38	.40	.42	.44	.46	.48	.50
11.80	.53	.55	.58	.60	.63	.66	.69	.71	.74	.77
11.90	.80	.84	.87	.90	.94	.99	1.04	1.10	1.17	1.26
12.00	1.37	1.50	1.64	1.80	1.97	2.15	2.32	2.48	2.63	2.74
12.10	2.83	2.88	2.90	2.88	2.84	2.76	2.68	2.58	2.47	2.37
12.20	2.27	2.18	2.10	2.02	1.95	1.89	1.83	1.78	1.74	1.69
12.30	1.65	1.61	1.57	1.53	1.50	1.46	1.43	1.39	1.36	1.33
12.40	1.29	1.26	1.23	1.19	1.16	1.12	1.09	1.06	1.02	.99
12.50	.95	.92	.88	.85	.81	.78	.75	.72	.69	.66
12.60	.63	.61	.59	.58	.56	.55	.54	.53	.52	.51
12.70	.50	.50	.49	.48	.48	.47	.47	.46	.46	.45
12.80	.45	.45	.44	.44	.43	.43	.43	.42	.42	.41
12.90	.41	.41	.40	.40	.40	.39	.39	.38	.38	.38
13.00	.37	.37	.37	.36	.36	.35	.35	.35	.34	.34
13.10	.34	.34	.33	.33	.33	.33	.33	.32	.32	.32
13.20	.32	.32	.32	.32	.32	.32	.31	.31	.31	.31
13.30	.31	.31	.31	.31	.31	.31	.30	.30	.30	.30
13.40	.30	.30	.30	.30	.30	.30	.30	.29	.29	.29
13.50	.29	.29	.29	.29	.29	.29	.29	.28	.28	.28
13.60	.28	.28	.28	.28	.28	.28	.28	.28	.27	.27
13.70	.27	.27	.27	.27	.27	.27	.27	.26	.26	.26
13.80	.26	.26	.26	.26	.26	.26	.26	.26	.25	.25
13.90	.25	.25	.25	.25	.25	.25	.25	.24	.24	.24
14.00	.24	.24	.24	.24	.24	.24	.24	.23	.23	.23
14.10	.23	.23	.23	.23	.23	.23	.23	.23	.23	.23
14.20	.23	.23	.22	.22	.22	.22	.22	.22	.22	.22
14.30	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22
14.40	.22	.22	.22	.21	.21	.21	.21	.21	.21	.21
14.50	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
14.60	.21	.21	.21	.20	.20	.20	.20	.20	.20	.20
14.70	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
14.80	.20	.20	.20	.20	.19	.19	.19	.19	.19	.19
14.90	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
15.00	.19									

SUBCATCHMENT 6 **PROPOSED CONDITIONS TO CULVERT**

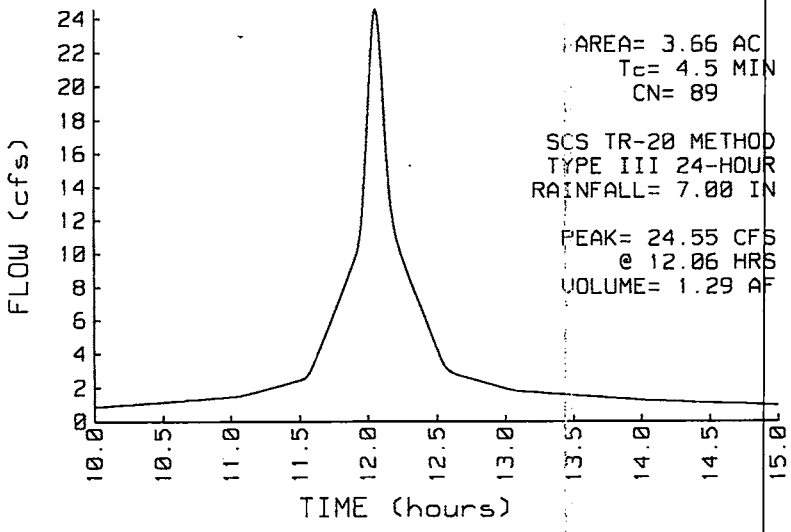
PEAK= 24.55 CFS @ 12.06 HRS, VOLUME= 1.29 AF

ACRES	CN	
2.60	98	IMPERVIOUS
1.06	67	LAWN AREA
3.66	89	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 7.00 IN
SPAN= 10-15 HRS, dt=.01 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**6A - 6B**	2.3
Grass: Short n=.15 L=60' P2=3.3 in s=.26 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**6B - 6C**	.7
Paved Kv=20.3282 L=116' s=.02 '/' V=2.87 fps		
CIRCULAR CHANNEL	**6C - 6D**	1.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.005 '/' n=.009 V=6.07 fps L=453' Capacity=10.7 cfs		
CIRCULAR CHANNEL	**6D - 6E**	.2
18" Diameter a=1.77 sq-ft Pw=4.7' r=.375'		
s=.011 '/' n=.009 V=9.01 fps L=100' Capacity=15.9 cfs		
CIRCULAR CHANNEL	**6E - 6F**	.1
24" Diameter a=3.14 sq-ft Pw=6.3' r=.5'		
s=.008 '/' n=.009 V=9.3 fps L=46' Capacity=29.2 cfs		
	Total Length= 775 ft Total Tc=	4.5

SUBCATCHMENT 6 RUNOFF
PROPOSED CONDITIONS TO CULVERT



SUBCATCHMENT 6 RUNOFF PEAK= 24.55 CFS @ 12.06 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.88	.89	.89	.89	.90	.90	.90	.91	.91	.92
10.10	.92	.93	.94	.94	.95	.95	.96	.96	.97	.97
10.20	.98	.99	.99	1.00	1.00	1.01	1.01	1.02	1.03	1.03
10.30	1.04	1.04	1.05	1.05	1.06	1.07	1.07	1.08	1.08	1.09
10.40	1.09	1.10	1.11	1.11	1.12	1.12	1.13	1.14	1.14	1.15
10.50	1.15	1.16	1.17	1.17	1.18	1.18	1.19	1.20	1.20	1.21
10.60	1.21	1.22	1.23	1.23	1.24	1.24	1.25	1.26	1.26	1.27
10.70	1.27	1.28	1.29	1.29	1.30	1.30	1.31	1.32	1.32	1.33
10.80	1.34	1.34	1.35	1.35	1.36	1.37	1.37	1.38	1.39	1.39
10.90	1.40	1.40	1.41	1.42	1.42	1.43	1.44	1.44	1.45	1.45
11.00	1.46	1.47	1.47	1.48	1.49	1.50	1.51	1.53	1.54	1.56
11.10	1.58	1.60	1.62	1.64	1.66	1.68	1.70	1.72	1.74	1.76
11.20	1.78	1.80	1.82	1.85	1.87	1.89	1.91	1.93	1.95	1.97
11.30	1.99	2.02	2.04	2.06	2.08	2.10	2.12	2.15	2.17	2.19
11.40	2.21	2.23	2.26	2.28	2.30	2.32	2.34	2.37	2.39	2.41
11.50	2.43	2.46	2.48	2.52	2.57	2.64	2.74	2.86	3.01	3.17
11.60	3.33	3.51	3.70	3.88	4.07	4.27	4.46	4.66	4.86	5.06
11.70	5.27	5.47	5.67	5.88	6.09	6.29	6.50	6.71	6.92	7.13
11.80	7.34	7.56	7.77	7.99	8.20	8.42	8.63	8.85	9.07	9.29
11.90	9.51	9.74	9.99	10.32	10.80	11.48	12.39	13.51	14.81	16.25
12.00	17.79	19.40	21.00	22.47	23.63	24.34	24.54	24.27	23.60	22.62
12.10	21.43	20.08	18.65	17.21	15.85	14.66	13.67	12.87	12.24	11.72
12.20	11.29	10.92	10.59	10.30	10.03	9.77	9.53	9.30	9.07	8.85
12.30	8.63	8.41	8.20	7.99	7.77	7.56	7.35	7.13	6.92	6.71
12.40	6.49	6.28	6.06	5.85	5.63	5.42	5.20	4.98	4.77	4.55
12.50	4.34	4.12	3.91	3.71	3.52	3.36	3.23	3.13	3.05	2.99
12.60	2.93	2.89	2.85	2.82	2.79	2.76	2.73	2.71	2.68	2.66
12.70	2.64	2.61	2.59	2.57	2.55	2.52	2.50	2.48	2.46	2.43
12.80	2.41	2.39	2.37	2.34	2.32	2.30	2.28	2.25	2.23	2.21
12.90	2.18	2.16	2.14	2.12	2.09	2.07	2.05	2.03	2.00	1.98
13.00	1.96	1.94	1.91	1.89	1.87	1.85	1.84	1.83	1.82	1.81
13.10	1.80	1.79	1.78	1.78	1.77	1.76	1.76	1.75	1.74	1.74
13.20	1.73	1.73	1.72	1.71	1.71	1.70	1.70	1.69	1.69	1.68
13.30	1.67	1.67	1.66	1.66	1.65	1.64	1.64	1.63	1.63	1.62
13.40	1.62	1.61	1.60	1.60	1.59	1.59	1.58	1.57	1.57	1.56
13.50	1.56	1.55	1.54	1.54	1.53	1.53	1.52	1.52	1.51	1.50
13.60	1.50	1.49	1.49	1.48	1.47	1.47	1.46	1.46	1.45	1.44
13.70	1.44	1.43	1.43	1.42	1.41	1.41	1.40	1.40	1.39	1.39
13.80	1.38	1.37	1.37	1.36	1.36	1.35	1.34	1.34	1.33	1.33
13.90	1.32	1.31	1.31	1.30	1.30	1.29	1.28	1.28	1.27	1.27
14.00	1.26	1.25	1.25	1.24	1.24	1.23	1.23	1.22	1.22	1.22
14.10	1.21	1.21	1.21	1.20	1.20	1.20	1.20	1.19	1.19	1.19
14.20	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.16	1.16	1.16
14.30	1.16	1.15	1.15	1.15	1.14	1.14	1.14	1.14	1.13	1.13
14.40	1.13	1.12	1.12	1.12	1.12	1.11	1.11	1.11	1.10	1.10
14.50	1.10	1.10	1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.07
14.60	1.07	1.07	1.06	1.06	1.06	1.06	1.05	1.05	1.05	1.04
14.70	1.04	1.04	1.04	1.03	1.03	1.03	1.03	1.02	1.02	1.02
14.80	1.01	1.01	1.01	1.01	1.00	1.00	1.00	.99	.99	.99
14.90	.99	.98	.98	.98	.97	.97	.97	.97	.96	.96
15.00	.96									

POND 1 **Detention Basin**

Qin = 42.93 CFS @ 12.18 HRS, VOLUME= 3.05 AF
Qout= 39.99 CFS @ 12.24 HRS, VOLUME= 3.03 AF, ATTEN= 7%, LAG= 3.4 MIN

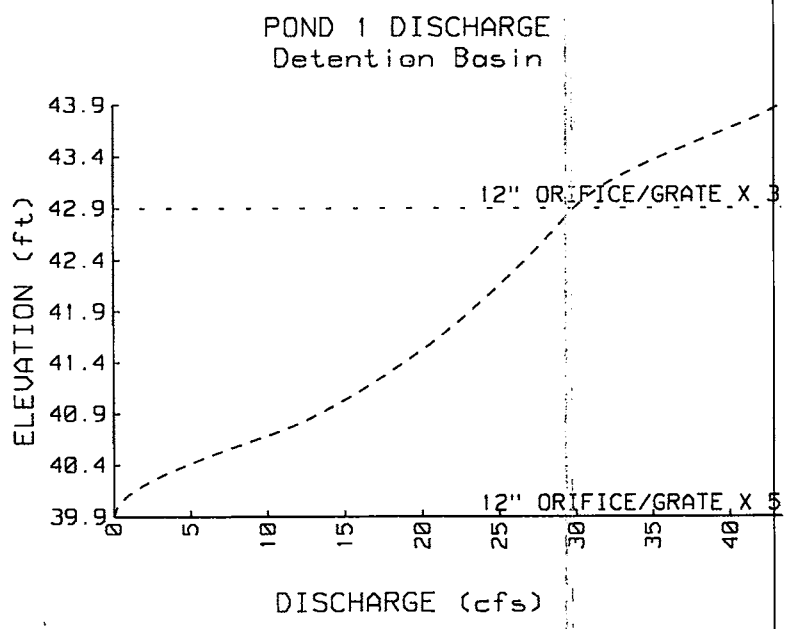
ELEVATION (FT)	INC.STOR (CF)	CUM.STOR (CF)
39.9	0	0
40.9	2338	2338
41.9	2689	5027
42.9	2689	7716
43.9	2338	10054

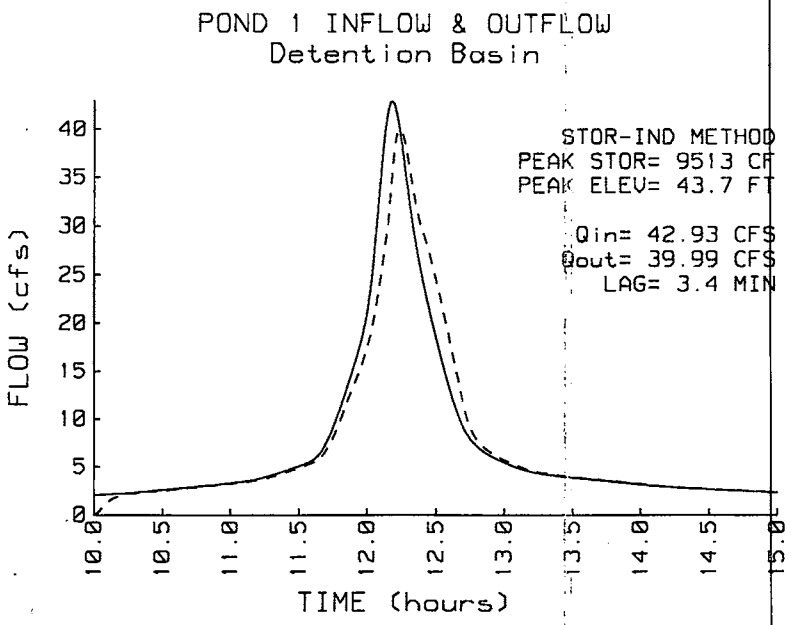
STOR-IND METHOD
PEAK STORAGE = 9513 CF
PEAK ELEVATION= 43.7 FT
FLOOD ELEVATION= 43.9 FT
START ELEVATION= 39.9 FT
SPAN= 10-15 HRS, dt=.01 HRS
Tdet= 4 MIN (3.02 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	42.9'	**12" ORIFICE/GRATE X 3**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
2	P	39.9'	**12" ORIFICE/GRATE X 5**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)

POND 1 TOTAL DISCHARGE (CFS) vs ELEVATION

FEET	0.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
39.9	0.00	.22	.85	1.85	3.16	4.72	6.49	8.36	10.25	12.02
40.9	13.36	14.64	15.81	16.90	17.93	18.90	19.82	20.70	21.55	22.36
41.9	23.15	23.91	24.64	25.36	26.05	26.73	27.39	28.03	28.66	29.28
42.9	29.88	30.61	31.57	32.73	34.08	35.57	37.17	38.82	40.48	42.06
43.9	43.38									




POND 1 INFLOW & OUTFLOW
Detention Basin
STOR-IND METHOD
PEAK STOR= 9513 CF
PEAK ELEV= 43.7 FT
Qin= 42.93 CFS
Qout= 39.99 CFS
LAG= 3.4 MIN
FLOW (cfs)
0
5
10
15
20
25
30
35
40
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
TIME (hours)

POND 1 INFLOW PEAK= 42.93 CFS @ 12.18 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	2.05	2.06	2.07	2.07	2.08	2.09	2.10	2.11	2.11	2.12
10.10	2.13	2.14	2.14	2.15	2.16	2.17	2.18	2.19	2.20	2.21
10.20	2.22	2.23	2.24	2.25	2.26	2.28	2.29	2.30	2.31	2.32
10.30	2.33	2.35	2.36	2.37	2.39	2.40	2.41	2.42	2.44	2.45
10.40	2.46	2.48	2.49	2.50	2.52	2.53	2.54	2.56	2.57	2.58
10.50	2.60	2.61	2.63	2.64	2.66	2.67	2.68	2.70	2.71	2.72
10.60	2.74	2.75	2.76	2.78	2.79	2.81	2.82	2.84	2.85	2.86
10.70	2.88	2.89	2.91	2.92	2.93	2.95	2.96	2.98	2.99	3.01
10.80	3.02	3.03	3.05	3.06	3.08	3.09	3.11	3.12	3.14	3.15
10.90	3.16	3.18	3.19	3.21	3.22	3.24	3.25	3.27	3.28	3.29
11.00	3.31	3.33	3.34	3.35	3.37	3.38	3.40	3.42	3.43	3.45
11.10	3.47	3.48	3.50	3.53	3.55	3.57	3.60	3.63	3.65	3.68
11.20	3.72	3.75	3.78	3.82	3.86	3.90	3.94	3.98	4.02	4.07
11.30	4.11	4.15	4.20	4.24	4.29	4.34	4.38	4.43	4.48	4.53
11.40	4.57	4.62	4.67	4.72	4.77	4.82	4.87	4.92	4.97	5.02
11.50	5.07	5.13	5.17	5.22	5.28	5.33	5.39	5.46	5.53	5.60
11.60	5.69	5.79	5.89	6.03	6.17	6.33	6.52	6.72	6.94	7.19
11.70	7.46	7.73	8.04	8.36	8.68	9.03	9.40	9.77	10.16	10.56
11.80	10.96	11.37	11.80	12.23	12.66	13.11	13.56	14.00	14.47	14.94
11.90	15.39	15.88	16.36	16.83	17.33	17.86	18.39	18.99	19.64	20.34
12.00	21.13	22.05	23.09	24.23	25.54	26.98	28.50	30.15	31.85	33.56
12.10	35.27	36.88	38.37	39.72	40.87	41.74	42.40	42.86	42.93	42.84
12.20	42.58	41.99	41.29	40.50	39.50	38.47	37.42	36.30	35.18	34.11
12.30	33.05	32.01	31.06	30.12	29.21	28.38	27.58	26.78	26.05	25.34
12.40	24.61	23.94	23.29	22.62	21.99	21.38	20.75	20.15	19.58	18.98
12.50	18.39	17.84	17.27	16.70	16.17	15.62	15.07	14.56	14.04	13.51
12.60	13.03	12.55	12.08	11.64	11.22	10.81	10.44	10.08	9.74	9.43
12.70	9.15	8.87	8.62	8.40	8.18	7.98	7.80	7.63	7.46	7.32
12.80	7.18	7.04	6.93	6.82	6.70	6.61	6.51	6.41	6.33	6.25
12.90	6.16	6.08	6.01	5.93	5.86	5.80	5.73	5.66	5.60	5.53
13.00	5.46	5.41	5.35	5.28	5.23	5.17	5.11	5.05	5.00	4.94
13.10	4.89	4.84	4.79	4.74	4.70	4.65	4.61	4.57	4.53	4.49
13.20	4.46	4.43	4.39	4.37	4.34	4.31	4.29	4.27	4.24	4.22
13.30	4.20	4.18	4.16	4.15	4.12	4.11	4.09	4.07	4.05	4.04
13.40	4.02	4.01	3.99	3.98	3.96	3.95	3.93	3.91	3.90	3.89
13.50	3.87	3.86	3.84	3.82	3.81	3.80	3.78	3.77	3.76	3.74
13.60	3.73	3.72	3.70	3.68	3.67	3.66	3.64	3.63	3.62	3.60
13.70	3.59	3.57	3.56	3.55	3.53	3.52	3.50	3.49	3.47	3.46
13.80	3.45	3.43	3.42	3.41	3.39	3.38	3.37	3.35	3.34	3.32
13.90	3.31	3.29	3.28	3.27	3.25	3.24	3.23	3.21	3.20	3.18
14.00	3.17	3.16	3.14	3.13	3.11	3.10	3.08	3.07	3.06	3.04
14.10	3.03	3.02	3.01	2.99	2.98	2.97	2.96	2.95	2.94	2.92
14.20	2.91	2.90	2.89	2.89	2.88	2.87	2.86	2.85	2.84	2.83
14.30	2.83	2.82	2.81	2.80	2.79	2.79	2.78	2.77	2.76	2.76
14.40	2.75	2.74	2.74	2.73	2.72	2.72	2.71	2.70	2.70	2.69
14.50	2.68	2.68	2.67	2.66	2.65	2.65	2.64	2.63	2.63	2.62
14.60	2.61	2.61	2.60	2.59	2.59	2.58	2.57	2.57	2.56	2.55
14.70	2.55	2.54	2.53	2.53	2.52	2.51	2.51	2.50	2.49	2.49
14.80	2.48	2.47	2.47	2.46	2.45	2.45	2.44	2.43	2.43	2.42
14.90	2.41	2.41	2.40	2.39	2.39	2.38	2.37	2.37	2.36	2.35
15.00	2.35									

POND 1 TOTAL OUTFLOW PEAK= 39.99 CFS @ 12.24 HOURS

HOUR	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
10.00	.03	.10	.17	.25	.42	.57	.71	.84	1.02	1.17
10.10	1.31	1.43	1.53	1.62	1.69	1.76	1.82	1.88	1.94	1.99
10.20	2.03	2.06	2.10	2.12	2.15	2.17	2.19	2.21	2.23	2.24
10.30	2.26	2.27	2.29	2.30	2.32	2.33	2.35	2.36	2.37	2.39
10.40	2.40	2.41	2.43	2.44	2.45	2.47	2.48	2.49	2.51	2.52
10.50	2.53	2.55	2.56	2.57	2.59	2.60	2.61	2.63	2.64	2.66
10.60	2.67	2.68	2.70	2.71	2.72	2.74	2.75	2.77	2.78	2.79
10.70	2.81	2.82	2.84	2.85	2.86	2.88	2.89	2.91	2.92	2.94
10.80	2.95	2.96	2.98	2.99	3.01	3.02	3.04	3.05	3.06	3.08
10.90	3.09	3.11	3.12	3.14	3.15	3.17	3.18	3.20	3.22	3.23
11.00	3.25	3.26	3.28	3.29	3.31	3.32	3.34	3.35	3.37	3.38
11.10	3.40	3.42	3.43	3.45	3.47	3.49	3.51	3.53	3.55	3.58
11.20	3.60	3.63	3.66	3.69	3.72	3.76	3.79	3.83	3.86	3.90
11.30	3.94	3.98	4.02	4.07	4.11	4.15	4.20	4.24	4.29	4.33
11.40	4.38	4.43	4.48	4.52	4.57	4.62	4.67	4.72	4.77	4.83
11.50	4.88	4.93	4.98	5.03	5.09	5.14	5.19	5.25	5.31	5.37
11.60	5.43	5.51	5.59	5.67	5.78	5.89	6.02	6.16	6.32	6.50
11.70	6.71	6.93	7.17	7.43	7.71	8.00	8.30	8.63	8.97	9.32
11.80	9.69	10.06	10.44	10.82	11.21	11.61	12.02	12.35	12.71	13.08
11.90	13.45	13.80	14.16	14.54	14.92	15.31	15.72	16.13	16.56	17.02
12.00	17.50	18.02	18.58	19.18	19.84	20.56	21.33	22.17	23.06	23.99
12.10	24.96	25.96	26.97	27.97	28.97	29.95	31.42	33.30	35.20	36.86
12.20	38.18	39.11	39.68	39.95	39.96	39.74	39.34	38.78	38.09	37.31
12.30	36.49	35.62	34.78	33.93	33.13	32.37	31.64	31.02	30.44	29.93
12.40	29.54	29.12	28.69	28.22	27.74	27.23	26.71	26.17	25.61	25.04
12.50	24.46	23.86	23.25	22.63	22.00	21.36	20.72	20.06	19.40	18.74
12.60	18.07	17.40	16.74	16.07	15.41	14.77	14.13	13.52	12.88	12.26
12.70	11.61	10.99	10.45	9.97	9.54	9.17	8.85	8.56	8.30	8.07
12.80	7.86	7.68	7.50	7.34	7.20	7.06	6.93	6.81	6.70	6.60
12.90	6.50	6.41	6.32	6.24	6.16	6.08	6.00	5.93	5.86	5.79
13.00	5.72	5.65	5.59	5.52	5.46	5.40	5.33	5.27	5.21	5.16
13.10	5.10	5.04	4.99	4.93	4.88	4.83	4.78	4.74	4.70	4.66
13.20	4.62	4.58	4.54	4.51	4.48	4.44	4.41	4.38	4.36	4.33
13.30	4.31	4.28	4.26	4.23	4.21	4.19	4.17	4.15	4.13	4.12
13.40	4.10	4.08	4.06	4.05	4.03	4.01	4.00	3.98	3.96	3.95
13.50	3.93	3.92	3.90	3.89	3.87	3.86	3.84	3.83	3.82	3.80
13.60	3.79	3.77	3.76	3.74	3.73	3.72	3.70	3.69	3.67	3.66
13.70	3.65	3.63	3.62	3.60	3.59	3.58	3.56	3.55	3.53	3.52
13.80	3.51	3.49	3.48	3.46	3.45	3.44	3.42	3.41	3.39	3.38
13.90	3.37	3.35	3.34	3.32	3.31	3.30	3.28	3.27	3.25	3.24
14.00	3.23	3.21	3.20	3.19	3.17	3.16	3.15	3.13	3.12	3.11
14.10	3.10	3.08	3.07	3.06	3.04	3.03	3.02	3.01	2.99	2.98
14.20	2.97	2.96	2.95	2.94	2.93	2.92	2.91	2.90	2.89	2.88
14.30	2.87	2.86	2.85	2.84	2.84	2.83	2.82	2.81	2.80	2.80
14.40	2.79	2.78	2.77	2.77	2.76	2.75	2.74	2.74	2.73	2.72
14.50	2.72	2.71	2.70	2.70	2.69	2.68	2.68	2.67	2.66	2.65
14.60	2.65	2.64	2.63	2.63	2.62	2.61	2.61	2.60	2.59	2.59
14.70	2.58	2.57	2.57	2.56	2.55	2.55	2.54	2.53	2.53	2.52
14.80	2.51	2.51	2.50	2.49	2.49	2.48	2.47	2.47	2.46	2.45
14.90	2.45	2.44	2.43	2.43	2.42	2.41	2.41	2.40	2.39	2.39
15.00	2.38									

9.2

DRAINAGE NETWORK DESIGN

DRAINAGE NETWORK DESIGN - RATIONAL METHOD

9.2.1 Design Parameters

A. PIPES

- All drainage pipes are ADS N-12 or Hancor Hi-Q unless otherwise noted.
- ADS Manning's coefficient = 0.009
- Diameters & lengths as specified

B. STRUCTURES

- Catch basins – Precast concrete with 3' sump unless otherwise noted and inverts as specified

- Manholes – Precast concrete with inverts as specified.

C. DESIGN STORM - 100 YEAR

- Drainage system to contain & channel water to the underground detention areas shown on Sheet 5 of 10 - Utility Plan

9.2.2 Design layout - see Sheet 5 of 10 - Utility Plan for drainage structure locations, and drainage pipe numbering used in design calculations.

9.2.3 Catch Basin Inlet Capacity

9.2.3.1 All design data and calculated values are shown on Drainage Network spreadsheet

9.2.3.2 Sample calculations; following is a set of sample calculations for catch basin #1.

C= Composite curve A= Area

Area to be drained:	Impervious	=	0.51 Ac. (C = 0.90)
	Unimproved	=	0.01 Ac. (C = 0.20)
	Total area	=	0.52 Ac. (C = 0.89)

Time of concentration (Tc) = 6 min (Figure C2)
Rainfall Intensity (i) = 5.9 in/hr (Figure C3)
Q= (Aci) = 0.52 x 0.89 x 5.97 in/hr = 2.73 CFS

Capacity of grate in sump condition
Depth of water = 0.30' (assuming catch basin rim is in a sump and depth of water above rim during the 100-year storm is approximately 0.15')
P = 2 w + l = (2)(2)+4 = 8 (2' x 2' grates with curb) from fig. C5 inlet capacity = 4 CFS
For a double catch basin grate (2'x4' w/ no curb), P = 12 from fig. C5 double CB inlet capacity = 6 CFS

Double catch basin grates are provided at catch basin's 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 13, 14, 15, 18 and 19

9.2.4 Pipe Capacity Design

The outlet pipe capacity discharging from the underground detention area is sized to ensure the 100-year storm outflow safely discharges from the systems.

For underground detention area
The slope of the outlet pipe = 0.010
The diameter of the outlet pipe is 30"
The 100-year storm flow out of the detention facility is 39.99 CFS.

The outlet pipe capacity is estimated using Manning's equation.

$Q_f = 1.49/n\ AR^{2/3}\ S^{1/2}$

$Q_f = (1.49 / 0.009) \times (4.909) \times (.625)^{2/3} \times (0.010)^{1/2} = 59.32$ CFS

$V_f = Q_f/A = 59.32 / 4.909 = 12.08$ ft/s

$Q/Q_f = 39.99 / 59.32 = 0.67$ from fig. C4 $V/Vf = 1.07$

$V = 0.34\ (3.48) = 12.93$ ft/s

The outlet pipe capacity exceeds the 100-year storm outflow and is therefore adequately sized.

Drainage Design

Project: Tasca Town Dealership

Date: 9-Nov-00

Manning's Coefficient= 0.009

Design Storm = 100 Year

PIPE	PIPE DIAM. (IN.)	SLOPE	Qp (CFS)	TOTAL AREA (AC.)	IMP. AREA (AC.)	PERV. AREA (AC.)	C WEIGHTED	i 100 (IN/HR)	DELTA Q (CFS)	SUM Q (CFS)	CAPACITY (Q/Qf)	V/Vp	Vp (FT/S)	V (FT/S)
CB-3 to CB-4	12	0.005	3.65	0.416	0.309	0.107	0.781	5.94	1.93	1.93	0.53	1.01	4.65	4.70
CB-4 to DMH-2	12	0.005	3.65	0.234	0.116	0.118	0.620	5.58	0.81	2.74	0.75	1.10	4.65	5.09
ROOF-1 to DMH-2	12	0.005	3.65	0.477	0.477	0.000	0.950	7.79	3.53	3.53	0.97	1.14	4.65	5.28
DMH-2 to CB-5	18	0.005	10.76	-	-	-	-	-	-	6.27	0.58	1.04	6.09	6.31
CB-5 to CB-6	18	0.005	10.76	0.844	0.719	0.125	0.854	6.14	4.43	10.70	0.99	1.14	6.09	6.92
ROOF-2 to CB-6	12	0.005	3.65	0.348	0.348	0.000	0.951	7.79	2.58	2.58	0.71	1.08	4.65	5.03
CB-6 to CB-8	18	0.008	13.61	0.157	0.157	0.000	0.950	7.79	1.16	14.43	1.06	1.12	7.70	8.65
CB-7 to CB-8	12	0.025	8.16	0.528	0.388	0.140	0.778	7.79	3.20	3.20	0.39	0.94	10.39	9.74
CB-8 to CB-9	24	0.005	23.17	0.701	0.561	0.140	0.820	7.45	4.28	21.92	0.95	1.13	7.37	8.37
CB-9 to CB-11	24	0.006	25.38	0.580	0.540	0.040	0.905	6.14	3.22	25.14	0.99	1.14	8.08	9.18
CB-10 to CB-11	12	0.022	7.65	0.362	0.125	0.237	0.525	5.28	1.00	1.00	0.13	0.69	9.74	6.72
CB-11 to CB-12	30	0.005	42.01	0.730	0.450	0.280	0.700	4.77	2.44	28.58	0.68	1.12	8.56	9.60
CB-12 to CB-13	30	0.005	42.01	0.460	0.420	0.040	0.893	5.94	2.44	31.02	0.74	1.13	8.56	9.68
CB-13 to DMH-3	30	0.005	42.01	0.460	0.460	0.000	0.950	7.79	3.40	34.42	0.82	1.11	8.56	9.53
CB-14 to CB-15	12	0.025	8.16	0.370	0.370	0.000	0.950	7.79	2.74	2.74	0.34	0.90	10.39	9.34
CB-15 to DMH-3	18	0.005	10.76	0.920	0.920	0.000	0.950	7.79	6.81	9.55	0.89	1.13	6.09	6.86
CB-1 to CB-2	12	0.006	4.00	1.020	0.630	0.390	0.710	4.45	3.22	3.22	0.81	1.11	5.09	5.65
ROOF-4 to CB-2	12	0.005	3.65	0.219	0.219	0.000	0.950	7.79	1.62	1.62	0.44	0.97	4.65	4.50
CB-2 to CB-21	18	0.005	10.76	0.230	0.230	0.000	0.950	7.79	1.70	6.55	0.61	0.47	13.70	6.37
CB-21 to CB-16	18	0.005	10.76	0.290	0.260	0.030	0.890	7.79	2.01	8.56	0.80	1.11	6.09	6.74
ROOF-3 to CB-16	12	0.005	3.65	0.168	0.168	0.000	0.952	7.79	1.25	1.25	0.34	0.90	4.65	4.20
CB-16 to CB-17	18	0.005	10.76	0.110	0.110	0.000	0.950	7.79	0.81	10.62	0.99	1.14	6.09	6.92
CB-17 to CB-20	18	0.011	15.96	0.174	0.174	0.000	0.942	8.63	1.41	12.03	0.75	0.76	9.03	9.90
CB-18 to CB-20	12	0.025	8.16	0.520	0.490	0.030	0.920	7.79	3.73	3.53	0.43	0.87	10.39	9.99
CB-19 to CB-20	12	0.005	3.65	0.316	0.316	0.000	0.950	8.18	2.46	2.46	0.67	0.98	4.65	4.98
CB-20 to DMH-7	24	0.008	29.31	-	-	-	-	-	-	18.02	0.61	1.05	9.33	9.79
DMH-7 to FES	24	0.008	29.31	-	-	-	-	-	-	18.02	0.61	1.05	9.33	9.79

DiPrete Engineering Associates, Inc.

75 SOCKANOSSET CROSSROAD
CRANSTON, RI 02920
TEL (401) 943-1000
FAX (401) 464-6006

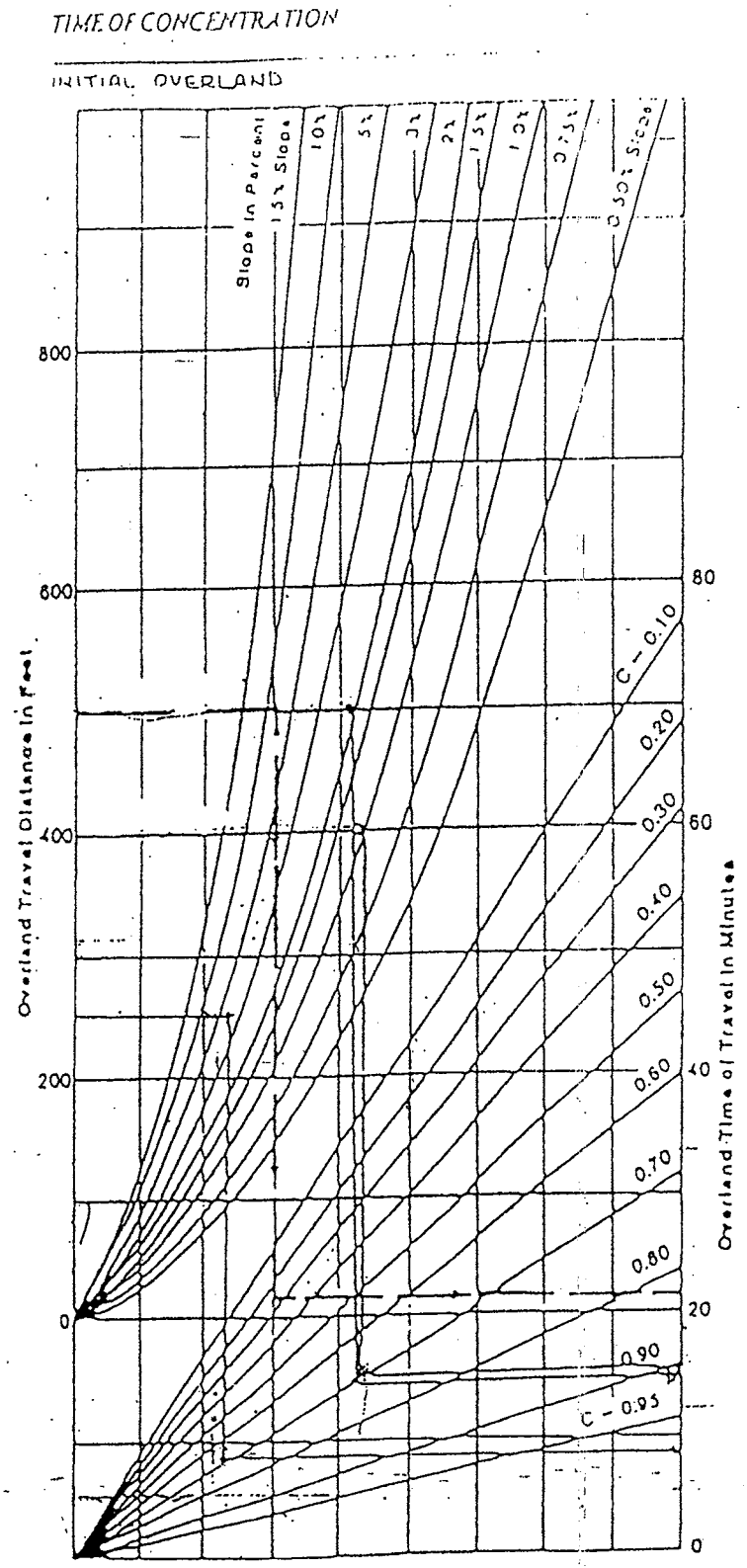
PROJECT NUMBER _____
SHEET NO. ____ OF ____
CALCULATED BY: _____
DATE: _____
CHECKED BY: _____
PROJECT: _____

RATIONAL METHOD – RAINFALL DURATION / INTENSITY

100 – YEAR FREQUENCY STORM

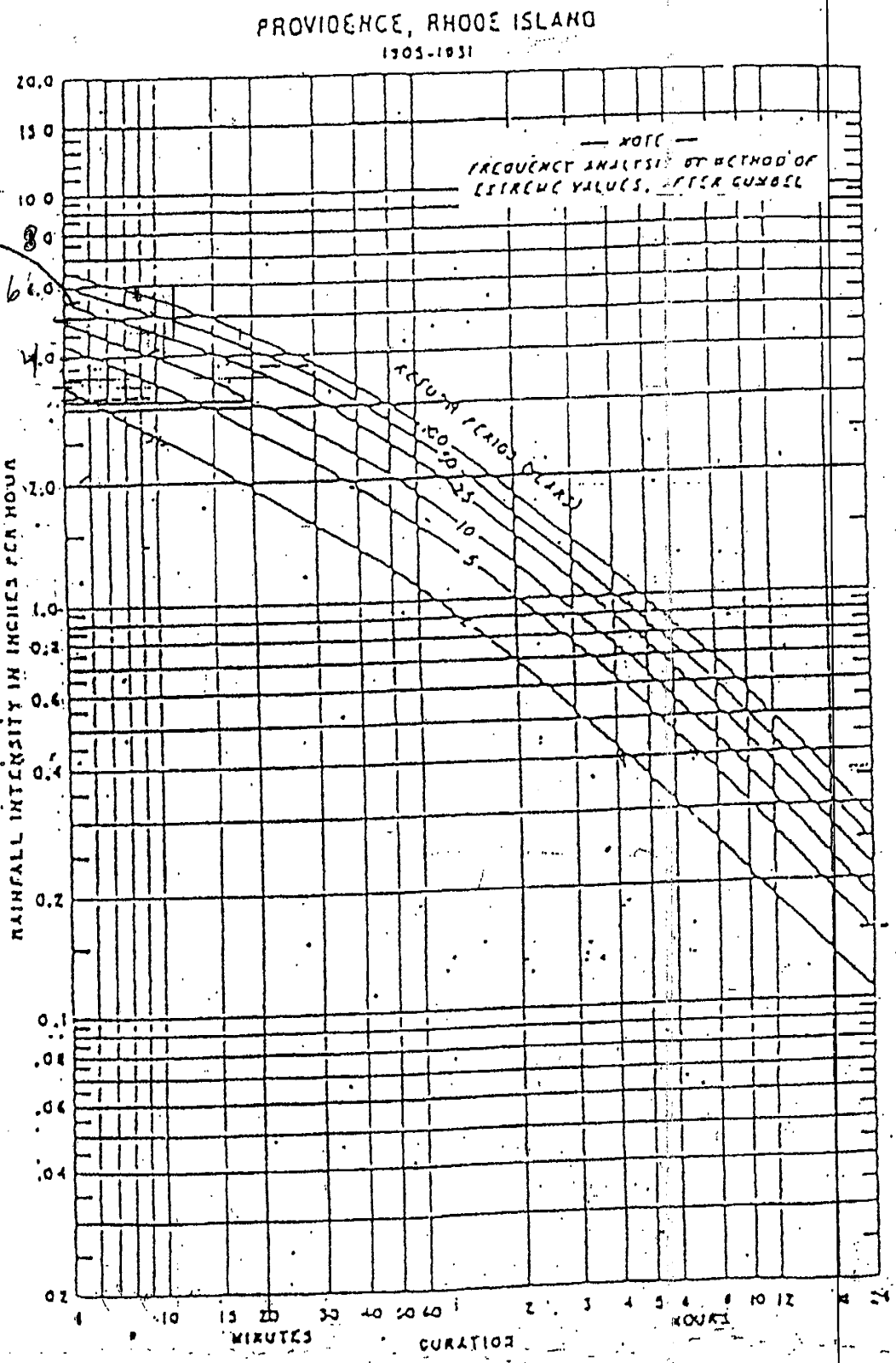
Duration (minutes)	Calculated Rainfall Intensity (inches/hr)	Given Rainfall Intensity (inches/hr)	
1.	9.71		
2.	9.13		
3.	8.63		
4.	8.18		
5.	7.79	7.80	% DIFFERENCE= .07
6.	7.45		
7.	7.13		
8.	6.85		
9.	6.59		
10.	6.36	6.36	% DIFFERENCE= .06
11.	6.14		
12.	5.94		
13.	5.76		
14.	5.58		
15.	5.43	5.40	% DIFFERENCE= .47
16.	5.28		
17.	5.14		
18.	5.01		
19.	4.88		
20.	4.77		
21.	4.66		
22.	4.55		
23.	4.45		
24.	4.36		
25.	4.27		
26.	4.19		
27.	4.11		
28.	4.03		
29.	3.96		
30.	3.88	3.92	% DIFFERENCE= .90
31.	3.82		
32.	3.75		
33.	3.69		
34.	3.63		
35.	3.57		
36.	3.52		
37.	3.46		
38.	3.41		
39.	3.36		
40.	3.31		
41.	3.27		
42.	3.22		
43.	3.18		
44.	3.14		
45.	3.10		
46.	3.06		
47.	3.02		
48.	2.98		
49.	2.95		
50.	2.91		
51.	2.88		
52.	2.84		
53.	2.81		
54.	2.78		
55.	2.75		
56.	2.72		
57.	2.69		
58.	2.66		
59.	2.64		
60.	2.61	2.60	% DIFFERENCE= .33

FIGURE C2


TIME OF CONCENTRATION
INITIAL OVERLAND
Slope in Percent
10%
5%
3%
2%
1.5%
1%
0.75%
0.50% Slope
800
600
400
200
0
Overland Travel Distance in Feet
C = 0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
C = 0.95
80
60
40
20
0
Overland Time of Travel in Minutes

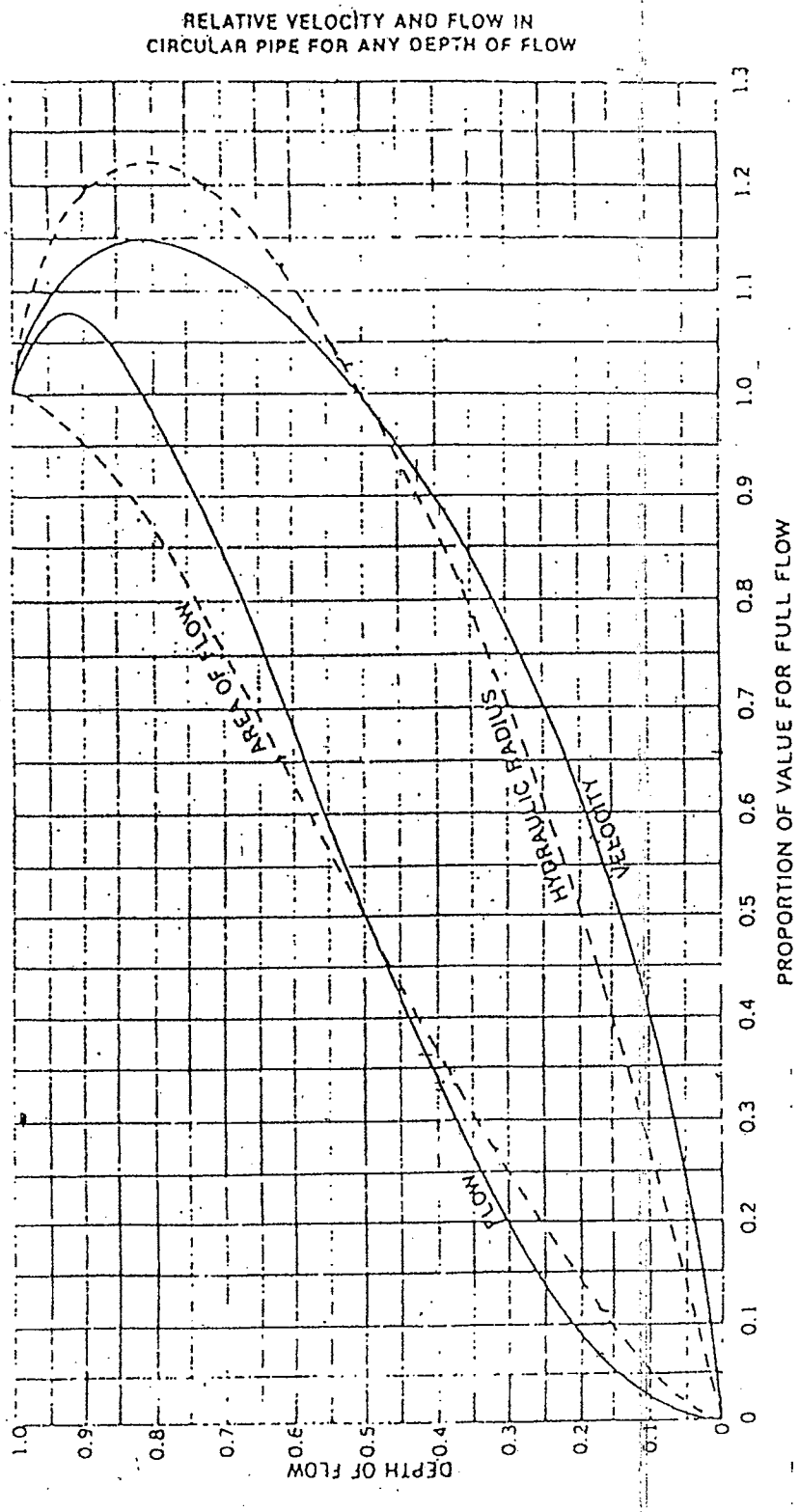
D4

FIGURE C3 1



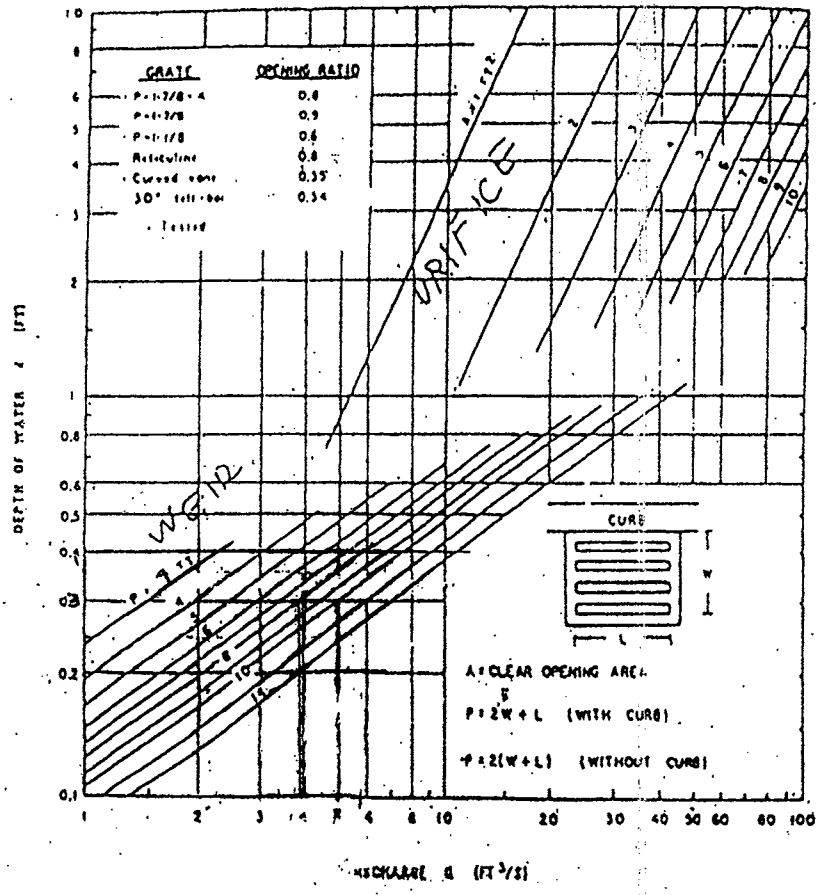
254 YR

FIGURE C4


RELATIVE VELOCITY AND FLOW IN
CIRCULAR PIPE FOR ANY DEPTH OF FLOW
PROPORTION OF VALUE FOR FULL FLOW
DEPTH OF FLOW
FLOW
AREA OF FLOW
HYDRAULIC RADIUS
VELOCITY
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3

D 6

FIGURE C5



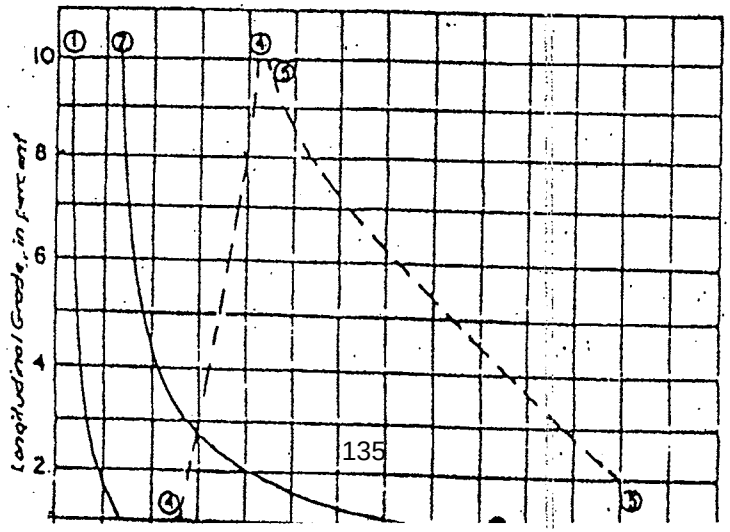
INLET CAPACITY

AT 95 PERCENT CAPTURE OF GUTTER FLOW

Mannings n = 0.013 Cross slope .0417 ft. per ft.

Curve ① Curb Opening, no depression, L = 10 ft
Curve ② Curb Opening, 2½ inch depression, L = 10 ft

→ Curve ③ Grate, no depression, W = 2.5 ft, L = 2.5 ft
Curve ④ Grate, 2½ inch depression, W = 2.5 ft, L = 2.5 ft



9.3

WATER QUALITY

Water Quality

Water quality of stormwater runoff is improved with Vortechs Stormwater Treatment Systems.

The Vortechs Stormwater Treatment Systems is designed to treat stormwater prior to entering the underground detention facility and prior to discharge to the area subject to storm flow.

The parking and driveway areas should also be swept at least twice yearly to remove sand and leaves that may enter the drainage system. Fall and spring sweeping are required to coincide with fall leave cleanup and spring sand pickup from winter sanding activities.

Due to the Site constraints, a "traditional" water quality basin design incorporating 1" of rainfall over the contributing impervious area is not deemed feasible at this Site. IN order to provide 80% total suspended solids (TSS) removal necessary for stormwater quality improvements required by RIDEM Stormwater Design & Installation Standards Manual, the Vortechs Stormwater Treatment System is proposed in conjunction with other technologies to treat stormwater in excess of 80% TSS removal prior to discharging to the Pawtuxet River.

The Vortechs Stormwater Treatment System is sized based on the impervious drainage area draining to the device as well as the design level (% sediment removal) required based on the sensitivity of the area.

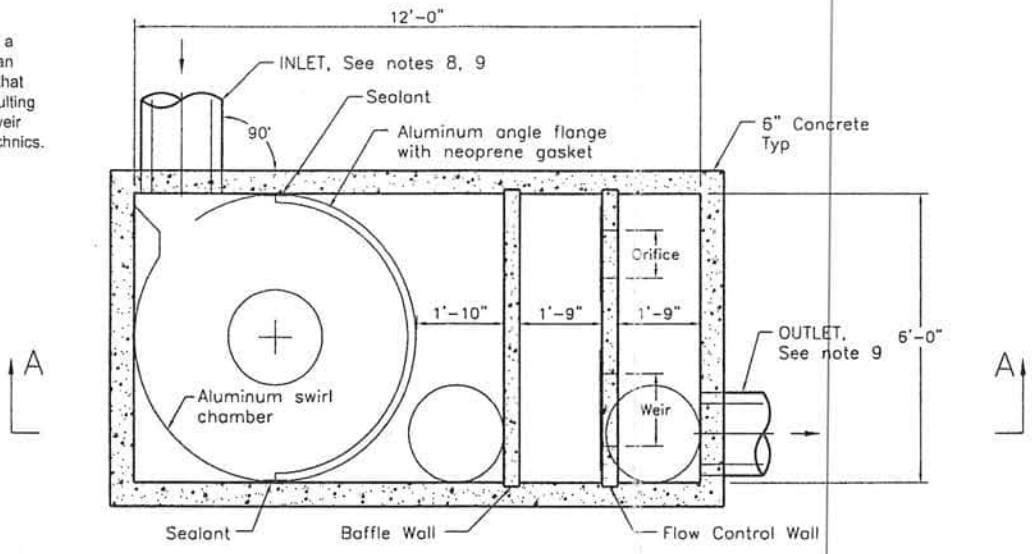
9.3.1

VORTECS STORMWATER TREATMENT SYSTEMS

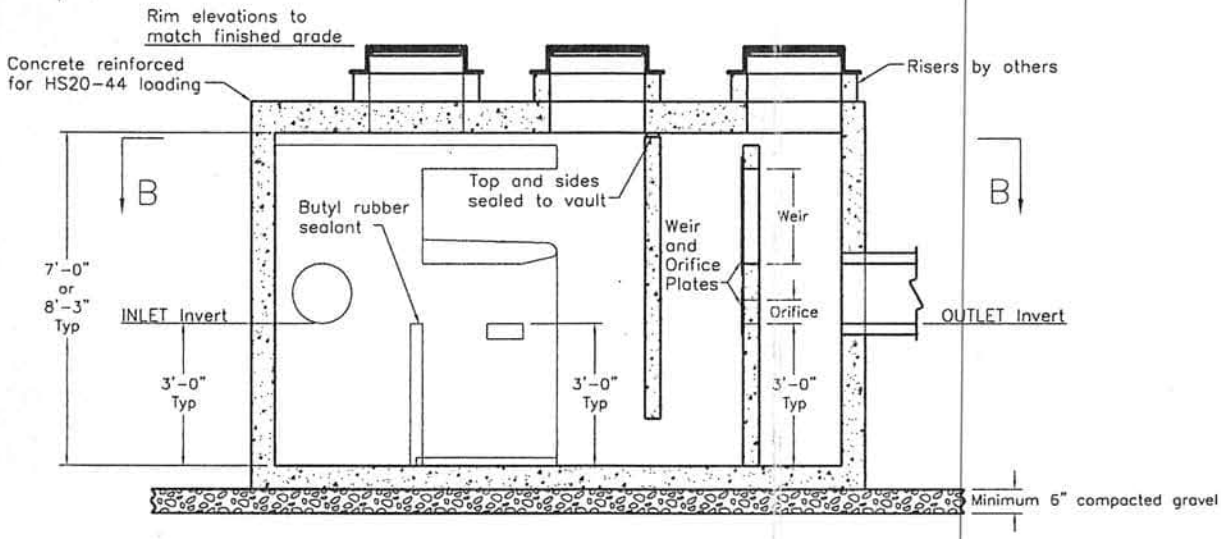
9.3.1.1

VORTECS MODEL 4000 SPECIFICATIONS

NOTE:
Vortechs Systems installed in a bypass configuration require an upstream diversion structure that shall be detailed by the Consulting Engineer with elevation and weir width data provided by Vortechnics.



PLAN VIEW B – B



SECTION A – A

NOTES:
1. Stormwater Treatment System (SWTS) shall have:
   Peak treatment capacity: 6 cfs
   Sediment storage: 2.5 cu yd
   Sediment chamber dia: 6' min
2. SWTS shall be contained in one rectangular structure
3. SWTS shall remove 80% of annual TSS loading
4. SWTS shall retain floatables and trapped sediment up to and including peak treatment capacity
5. SWTS inverts in and out shall be at the same elevation
6. SWTS shall not be compromised by effects of downstream tailwater
7. SWTS shall have no internal components that obstruct maintenance access
8. Inlet pipe must be perpendicular to the structure
9. Pipe orientation may vary; see site plan for size and location
10. Purchaser shall not be responsible for assembly of unit
11. Manhole frames and perforated covers supplied with system, not installed
12. Purchaser to prepare excavation and provide lifting equipment
13. Contact Vortechnics @ (207) 878-3662 Ext. 123 for ordering information

This CADD file is for the purpose of specifying stormwater treatment equipment to be furnished by Vortechnics, Inc. and may only be transferred to other documents exactly as provided by Vortechnics. Title block information, excluding the Vortechnics logo and the Vortechs ™Stormwater Treatment System designation and patent number, may be deleted if necessary. Revisions to any part of this CADD file without prior coordination with Vortechnics shall be considered unauthorized use of proprietary information.

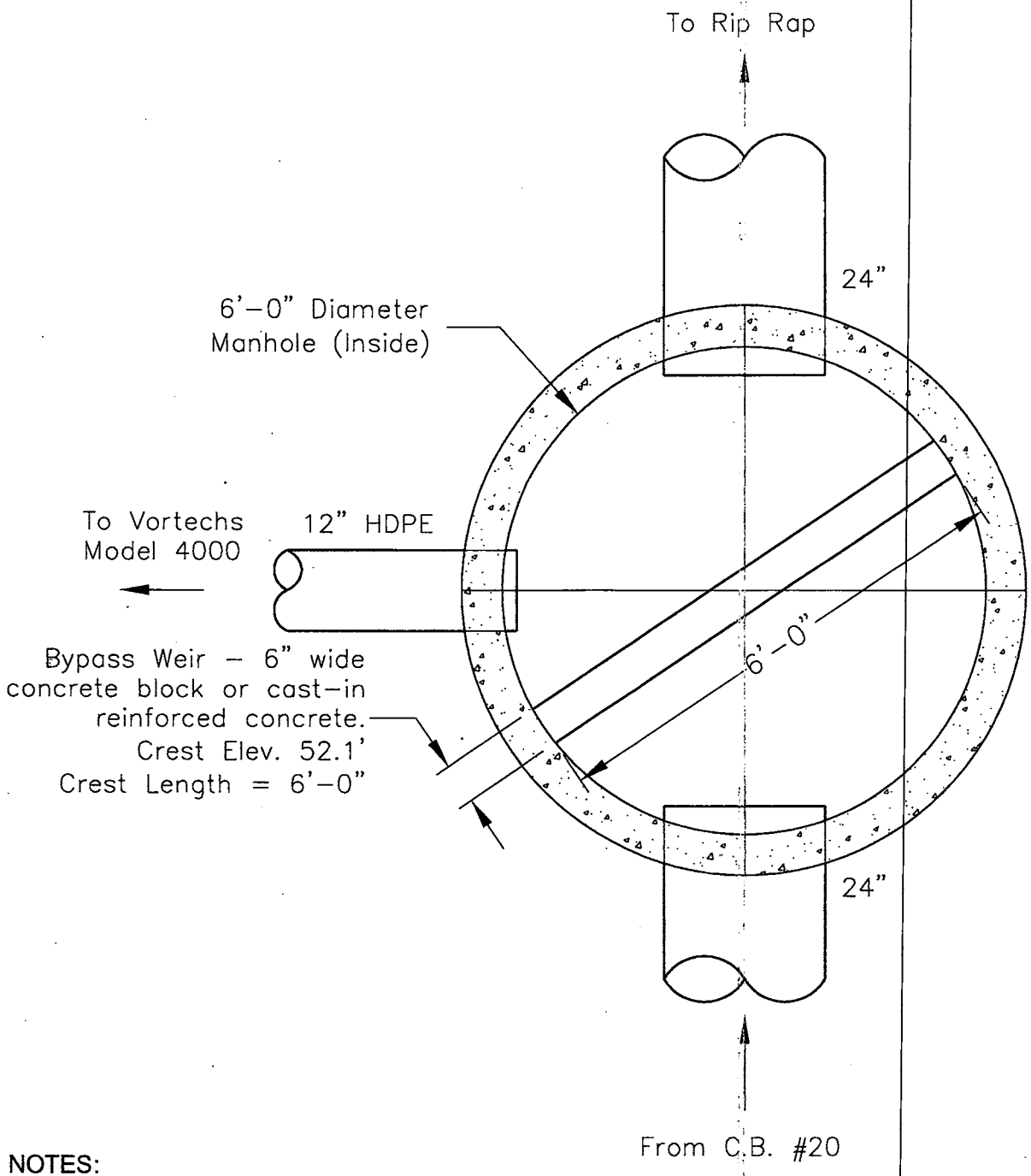
Vortechnics™
41 Evergreen Drive
Portland, ME 04103
Tel.: 207-878-3662
Fax: 207-878-8507

STANDARD DETAIL
STORMWATER TREATMENT SYSTEM
VORTECHS™ MODEL 4000

U.S. PATENT No. 5,759,415

PROPRIETARY INFORMATION – NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATE:	SCALE:	FILE NAME:	DRAWN BY:	CHECKED BY:
10/14/99	1/4" = 1'-0"	STD4K	AP/NDG	KJM



NOTES:

1. Bypass Structure shall be manufactured in accordance with all applicable local standards.

2. The Bypass Weir has been designed with a minimal length. If precaster molds are locally available that make fabrication of a larger structure more economical, Vortechnics must be advised so the weir crest length and elevation can be recalculated.

FOR INFORMATIONAL PURPOSES ONLY
NOT INTENDED AS A CONSTRUCTION DOCUMENT
-NOT SUPPLIED BY VORTECHNICS-

Vortechnics™
41 Evergreen Drive
Portland, ME 04103
Tel.: 207-878-3662
Fax: 207-878-8507

PROPOSED BYPASS STRUCTURE for VORTECHS™ STORMWATER TREATMENT SYSTEM No. 2 TASCA LINCOLN-MERCURY, CRANSTON, RI

DATE:	SCALE:	FILE NAME:	DRAWN BY:	CHECKED BY:
02/09/01	None	1885BP2	ASB	NDG

SECTION 02721

STORMWATER TREATMENT SYSTEM

PART 1.00 GENERAL

1.01 DESCRIPTION

A. Work included:

The Contractor, and/or a manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required and install all precast concrete stormwater treatment systems and appurtenances in accordance with the Drawings and these specifications.

B. Related work described elsewhere:

1. Unit Masonry
2. Miscellaneous Metals
3. Waterproofing

1.02 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.

C. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days when tested in 3 inch diameter

by 6 inch long cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.03 SUBMITTALS

A. Shop Drawings

The Contractor shall be provided with dimensional drawings and, when specified, utilize these drawings as the basis for preparation of shop drawings showing details for construction, reinforcing, joints and any cast-in-place appurtenances. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Design calculations and shop drawings shall be certified by a Professional Engineer retained by the system manufacturer or contractor and licensed in the state where the system is to be installed. Shop drawings shall be prepared at a scale of not less than 1/4" per foot. Six (6) hard copies of said shop drawings shall be submitted to the Engineer for review and approval.

B. Affidavit on patent infringement

The Contractor shall submit to the Engineer, prior to installation of the stormwater treatment system, an affidavit regarding patent infringement rights stating that any suit or claim against the Owner due to alleged infringement rights shall be defended by the Contractor who will bear all the costs, expenses and attorney's fees incurred thereof.

PART 2.00 PRODUCTS

2.01 MATERIALS AND DESIGN

A. Concrete for precast stormwater treatment systems shall conform to ASTM Designation C 857 and C 858 and meet the following additional requirements:

1. The wall thickness shall not be less than 6 inches or as shown on the dimensional drawings. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 loading requirements as determined by a Licensed Professional Engineer.

2. Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C990.

3. Cement shall be Type III Portland cement conforming to ASTM Designation C 150.

4. Pipe openings shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C595M, and shall be sized to accept pipes of the specified size(s) and material(s).

5. Internal metal components shall be aluminum alloy 5052-H32 in accordance with ASTM B209.

6. Brick or masonry used to build the manhole frame to grade shall conform to ASTM Designation C32 or ASTM Designation C 139 and the Masonry Section of these Specifications.

7. Casting for manhole frames and covers shall be in accordance with The Miscellaneous Metals Section of these Specifications.

8. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi or until 5 days after fabrication and/or repair, whichever is the longer.

9. A butimen sealant in conformance with ASTM C990 shall be utilized in affixing the aluminum swirl chamber to the concrete vault.

2.02 PERFORMANCE

The stormwater treatment system(s) shall adhere to the following performance specifications at the specified design flows, and storage capacities.

The stormwater treatment system shall include a circular aluminum "swirl chamber" (or "grit chamber") with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates. The swirl chamber diameter shall not be less than 6.0 feet, neglecting the chamber wall thickness.

The stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re-entrainment of trapped floating contaminants.

The stormwater treatment system shall be capable of removing 80% of the Total Suspended Solids (TSS). The stormwater treatment system shall have the design treatment capacity of 6.0 cfs, and shall not resuspend trapped sediments or re-entrain floating contaminants at flow rates up to and including the specified "Design Treatment Capacity".

The stormwater treatment system shall have usable sediment storage capacity of not less than 2.5 cubic yards. The system shall be designed such that the pump-out volume is less than ½ of the total system volume. The system shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

A water-lock feature shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance. There shall be no appurtenances or restrictions within these chambers.

The stormwater treatment system manufacturer shall furnish documentation which supports all product performance claims and features, storage capacities and maintenance requirements.

Stormwater treatment systems shall be completely housed within one structure.

2.03 MANUFACTURER

Each stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff.

The stormwater treatment system shall be a Model 4000 Vortechs System as manufactured by Vortechnics, Inc., 41 Evergreen Drive, Portland, Maine 04103, phone: 207-878-3662, fax: 207-878-8507; as protected under U.S. Patent #5,759,415.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. Each Stormwater Treatment System shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

B. Place the precast base unit on a granular subbase of minimum thickness of six inches after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-levelled.

C. Prior to setting subsequent sections place butimen sealant in conformance with ASTM C990 along the construction joint in the section that is already in place.

D. After setting the base and wall or riser sections install the circular swirl chamber wall by bolting the swirl chamber to the side walls at the three (3) tangent points

and at the 3-inch wide inlet tab using HILTI brand concrete anchors or equivalent 1/2-inch diameter by 2-3/4" minimum length at heights of approximately three inches (3") off the floor and at the mid-height of the completed trap (at locations of pre-drilled holes in aluminum components). Seal the bottom edge of the swirl chamber to the trap floor with the supplied aluminum angle flange. Adhere ¼" thick by 1" wide neoprene sponge material to the flange with half of it's width on the horizontal leg of the flange and half of it's width on the vertical leg. The aluminum angle flange shall be affixed to the floor with a minimum 3/8" diameter by 2-3/4" drop in wedge anchor at the location of the predrilled holes. Affix the swirl chamber to the flange with hex head ¼" x 1-1/2" zinc coated self- tapping screws at the location of the predrilled holes. Seal the vault sidewalls to the outside of the swirl chamber from the floor to the same height as the inlet pipe invert using butyl mastic or approved equal.

E. Prior to setting the precast roof section, butimen sealant equal to ASTM C990 shall be placed along the top of the baffle wall, using more than one layer of mastic if necessary, to a thickness at least one inch (1") greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. After placement of the roof section has compressed the butyl mastic sealant in the gap, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. Also apply non-shrink grout to the joints at the side edges of the baffle wall.

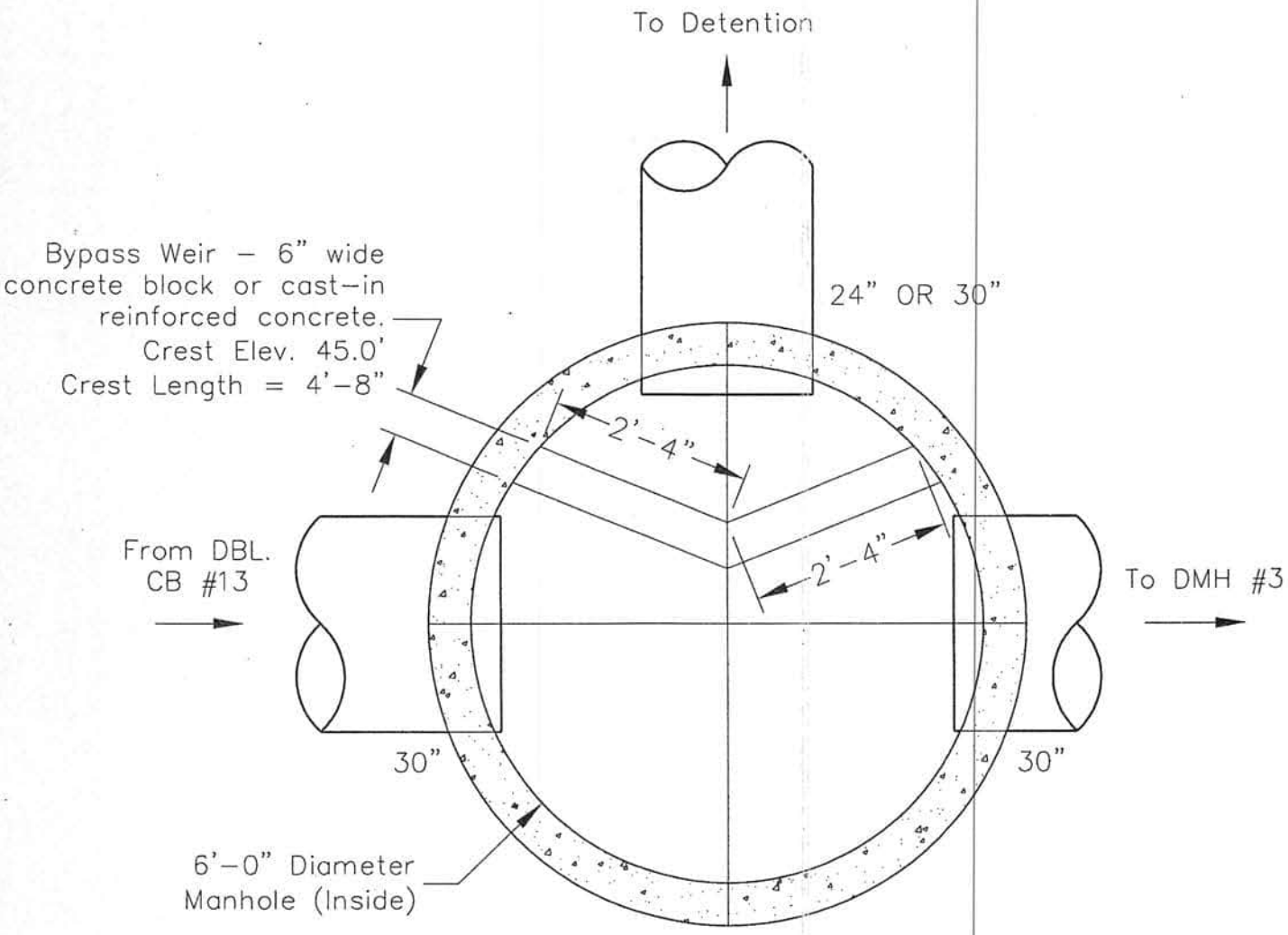
F. After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a 1/4 inch maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6" lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C891 "Standard Practice For Installation of Underground Precast Utility Structures".

G. Plug holes in the concrete sections made for handling or other purposes with a nonshrink grout or by using grout in combination with concrete plugs.

H. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

9.3.1.2

VORTECS MODEL 9000 SPECIFICATIONS



NOTES:

1. Bypass Structure shall be manufactured in accordance with all applicable local standards.

2. The Bypass Weir has been designed with a minimal length. If precaster molds are locally available that make fabrication of a larger structure more economical, Vortechnics must be advised so the weir crest length and elevation can be recalculated.

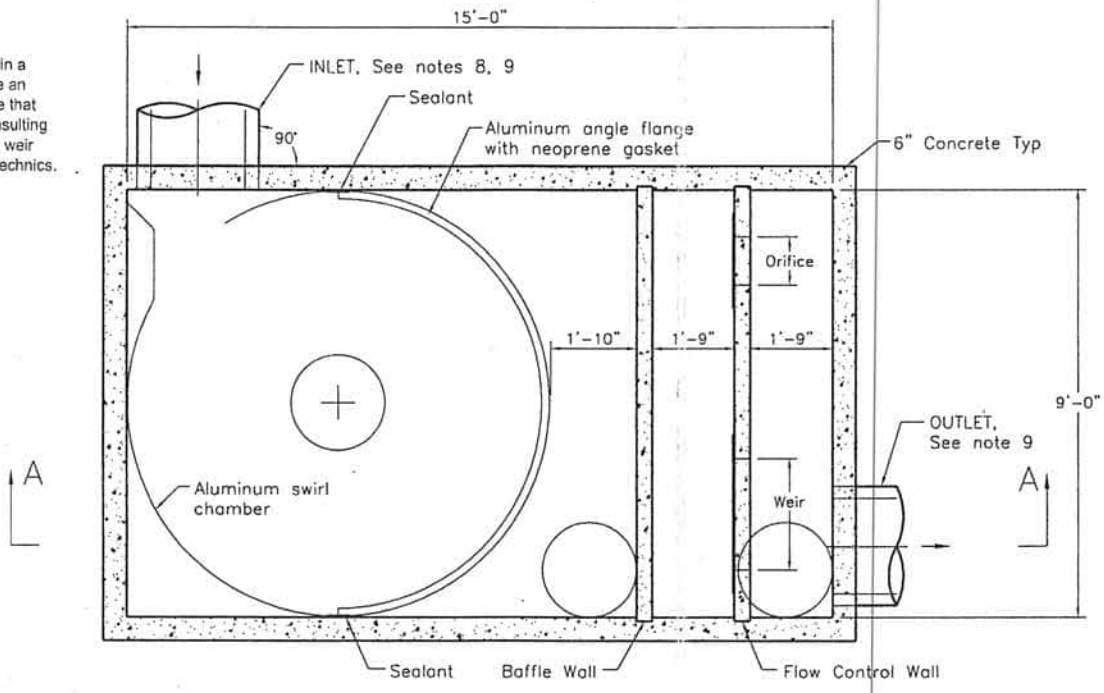
FOR INFORMATIONAL PURPOSES ONLY
NOT INTENDED AS A CONSTRUCTION DOCUMENT
-NOT SUPPLIED BY VORTECHNICS-

Vortechnics™
41 Evergreen Drive
Portland, ME 04103
Tel.: 207-878-3662
Fax: 207-878-8507

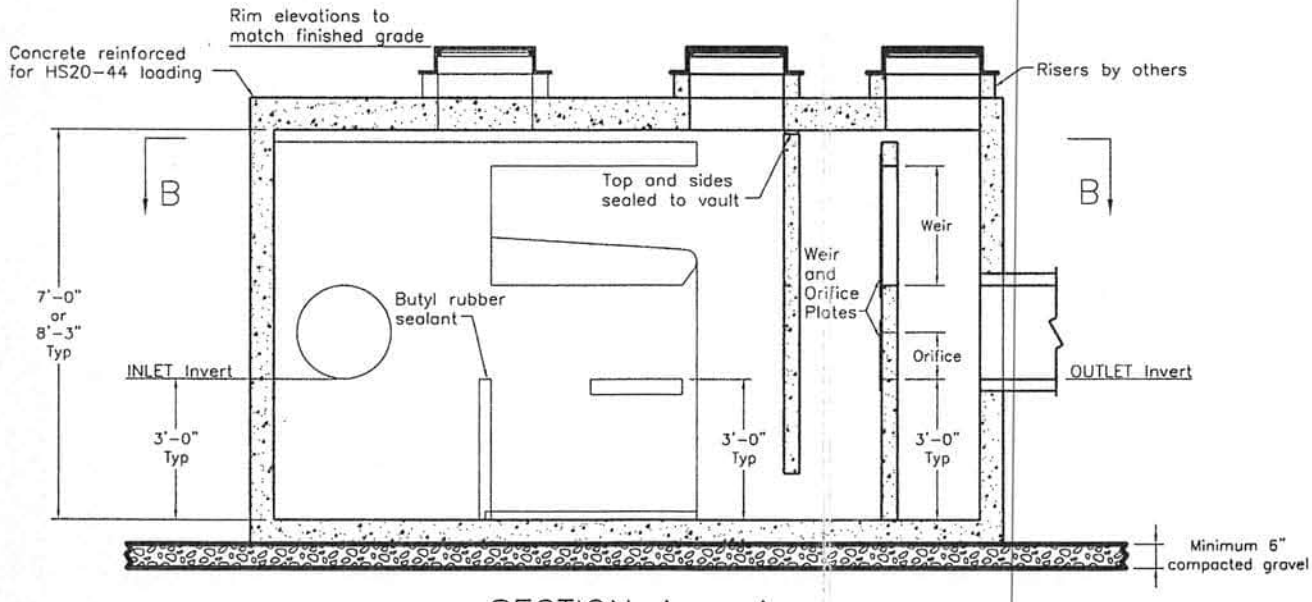
PROPOSED BYPASS STRUCTURE for VORTECHS ™ STORMWATER TREATMENT SYSTEM No. 1 TASCA LINCOLN-MERCURY, CRANSTON, RI

DATE:	SCALE:	FILE NAME:	DRAWN BY:	CHECKED BY:
02/09/01	None	1885BP1	ASB	NDG

NOTE:
Vortechs Systems installed in a bypass configuration require an upstream diversion structure that shall be detailed by the Consulting Engineer with elevation and weir width data provided by Vortechnics.



PLAN VIEW B – B



SECTION A – A

NOTES:
1. Stormwater Treatment System (SWTS) shall have:
   Peak treatment capacity: 14 cfs
   Sediment storage: 4.75 cu yd
   Sediment chamber dia: 9' min
2. SWTS shall be contained in one rectangular structure
3. SWTS shall remove 80% of annual TSS loading
4. SWTS shall retain floatables and trapped sediment up to and including peak treatment capacity
5. SWTS inverts in and out shall be at the same elevation
6. SWTS shall not be compromised by effects of downstream tailwater
7. SWTS shall have no internal components that obstruct maintenance access
8. Inlet pipe must be perpendicular to the structure
9. Pipe orientation may vary; see site plan for size and location
10. Purchaser shall not be responsible for assembly of unit
11. Manhole frames and perforated covers supplied with system, not installed
12. Purchaser to prepare excavation and provide lifting equipment
13. Contact Vortechnics @ (207) 878-3662 Ext. 123 for ordering information

This CADD file is for the purpose of specifying stormwater treatment equipment to be furnished by Vortechnics, Inc. and may only be transferred to other documents exactly as provided by Vortechnics. Title block information, excluding the Vortechnics logo and the Vortechs ™Stormwater Treatment System designation and patent number, may be deleted if necessary. Revisions to any part of this CADD file without prior coordination with Vortechnics shall be considered unauthorized use of proprietary information.

Vortechnics™
41 Evergreen Drive
Portland, ME 04103
Tel.: 207-878-3662
Fax: 207-878-8507

STANDARD DETAIL
STORMWATER TREATMENT SYSTEM
VORTECHS™ MODEL 9000

U.S. PATENT No. 5,759,415

PROPRIETARY INFORMATION – NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATE:	10/14/99	SCALE:	1/4" = 1'-0"	FILE NAME:	STD9K	DRAWN BY:	AP/NDG	CHECKED BY:	KJM

SECTION 02721

STORMWATER TREATMENT SYSTEM

PART 1.00 GENERAL

1.01 DESCRIPTION

A. Work included:

The Contractor, and/or a manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required and install all precast concrete stormwater treatment systems and appurtenances in accordance with the Drawings and these specifications.

B. Related work described elsewhere:

1. Unit Masonry
2. Miscellaneous Metals
3. Waterproofing

1.02 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.

C. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days when tested in 3 inch diameter

by 6 inch long cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.03 SUBMITTALS

A. Shop Drawings

The Contractor shall be provided with dimensional drawings and, when specified, utilize these drawings as the basis for preparation of shop drawings showing details for construction, reinforcing, joints and any cast-in-place appurtenances. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Design calculations and shop drawings shall be certified by a Professional Engineer retained by the system manufacturer or contractor and licensed in the state where the system is to be installed. Shop drawings shall be prepared at a scale of not less than 1/4" per foot. Six (6) hard copies of said shop drawings shall be submitted to the Engineer for review and approval.

B. Affidavit on patent infringement

The Contractor shall submit to the Engineer, prior to installation of the stormwater treatment system, an affidavit regarding patent infringement rights stating that any suit or claim against the Owner due to alleged infringement rights shall be defended by the Contractor who will bear all the costs, expenses and attorney's fees incurred thereof.

PART 2.00 PRODUCTS

2.01 MATERIALS AND DESIGN

A. Concrete for precast stormwater treatment systems shall conform to ASTM Designation C 857 and C 858 and meet the following additional requirements:

1. The wall thickness shall not be less than 6 inches or as shown on the dimensional drawings. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 loading requirements as determined by a Licensed Professional Engineer.

2. Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C990.

3. Cement shall be Type III Portland cement conforming to ASTM Designation C 150.

4. Pipe openings shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C595M, and shall be sized to accept pipes of the specified size(s) and material(s).

5. Internal metal components shall be aluminum alloy 5052-H32 in accordance with ASTM B209.

6. Brick or masonry used to build the manhole frame to grade shall conform to ASTM Designation C32 or ASTM Designation C 139 and the Masonry Section of these Specifications.

7. Casting for manhole frames and covers shall be in accordance with The Miscellaneous Metals Section of these Specifications.

8. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi or until 5 days after fabrication and/or repair, whichever is the longer.

9. A butimen sealant in conformance with ASTM C990 shall be utilized in affixing the aluminum swirl chamber to the concrete vault.

2.02 PERFORMANCE

The stormwater treatment system(s) shall adhere to the following performance specifications at the specified design flows, and storage capacities.

The stormwater treatment system shall include a circular aluminum "swirl chamber" (or "grit chamber") with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates. The swirl chamber diameter shall not be less than 9.0 feet, neglecting the chamber wall thickness.

The stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re-entrainment of trapped floating contaminants.

The stormwater treatment system shall be capable of removing 80% of the Total Suspended Solids (TSS). The stormwater treatment system shall have the design treatment capacity of 14.0 cfs, and shall not resuspend trapped sediments or re-entrain floating contaminants at flow rates up to and including the specified "Design Treatment Capacity".

The stormwater treatment system shall have usable sediment storage capacity of not less than 4.75 cubic yards. The system shall be designed such that the pump-out volume is less than ½ of the total system volume. The system shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

A water-lock feature shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance. There shall be no appurtenances or restrictions within these chambers.

The stormwater treatment system manufacturer shall furnish documentation which supports all product performance claims and features, storage capacities and maintenance requirements.

Stormwater treatment systems shall be completely housed within one structure.

2.03 MANUFACTURER

Each stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff.

The stormwater treatment system shall be a model 9000 Vortechs System as manufactured by Vortechnics, Inc., 41 Evergreen Drive, Portland, Maine 04103, phone: 207-878-3662, fax: 207-878-8507; as protected under U.S. Patent #5,759,415.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. Each Stormwater Treatment System shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

B. Place the precast base unit on a granular subbase of minimum thickness of six inches after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-levelled.

C. Prior to setting subsequent sections place butimen sealant in conformance with ASTM C990 along the construction joint in the section that is already in place.

D. After setting the base and wall or riser sections install the circular swirl chamber wall by bolting the swirl chamber to the side walls at the three (3) tangent points and at the 3-inch wide inlet tab using HILTI brand concrete anchors or equivalent 1/2-inch diameter by 2-3/4" minimum length at heights of approximately three inches (3") off the floor and at the mid-height of the completed trap (at locations of pre-drilled holes in aluminum components). Seal the bottom edge of the swirl chamber to the trap floor with the supplied aluminum angle flange. Adhere ¼" thick by 1" wide neoprene sponge material to the flange with half of it's width on the horizontal leg of the flange and half of it's width on the vertical leg. The aluminum angle flange shall be affixed to the floor with a minimum 3/8" diameter by 2-3/4" drop in wedge anchor at the location of the predrilled holes. Affix the swirl chamber to the flange with hex head ¼" x 1-1/2" zinc coated self- tapping screws at the location of the predrilled holes. Seal the vault sidewalls to the outside of the swirl chamber from the floor to the same height as the inlet pipe invert using butyl mastic or approved equal.

E. Prior to setting the precast roof section, butimen sealant equal to ASTM C990 shall be placed along the top of the baffle wall, using more than one layer of mastic if necessary, to a thickness at least one inch (1") greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. After placement of the roof section has compressed the butyl mastic sealant in the gap, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. Also apply non-shrink grout to the joints at the side edges of the baffle wall.

F. After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a 1/4 inch maximum tolerance allowed. Backfill in a careful

manner, bringing the fill up in 6" lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C891 "Standard Practice For Installation of Underground Precast Utility Structures".

G. Plug holes in the concrete sections made for handling or other purposes with a nonshrink grout or by using grout in combination with concrete plugs.

H. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

9.3.1.3

TECHNICAL DESIGN MANUAL

Vortechnics

ENGINEERED PRODUCTS
FOR STORMWATER TREATMENT

Vortechs™ System

Technical Design Manual

Including:

- Design
- Operation
- Maintenance
- Laboratory & Field Testing Data

02/19/01

Vortechs™
STORMWATER TREATMENT SYSTEM

DESIGN AND OPERATION

Basic Operation

The Vortechs System is sized on the basis of removing both sediment and floating pollutants from stormwater runoff. When the system is operating at its peak design capacity, the maximum service rate will be approximately 100 gallons-per-minute per square foot of grit chamber area (gpm/sf). The Vortechs System has been tested for flows up to and including this maximum rate and has been shown to produce positive removal efficiencies throughout this range.

The Vortechs System will provide a net annual removal efficiency in excess of 80% removal of Total Suspended Solids as they are typically encountered in runoff from urban environments. The Vortechs System will also effectively capture and contain floatables in stormwater runoff.

The tangential inlet creates a swirling motion that directs settleable solids into a pile towards the center of the grit chamber. Sediment is caught in the swirling flow path and settles back onto the pile after the storm event is over. Floatables entrapment is achieved by sizing the low flow control to create a rise in the water level in the tank that is sufficient to just submerge the inlet pipe in the 2-month storm.

The Vortechs System is designed to create a backwater condition within the system in order to maximize removal efficiencies. The amount of backwater varies and is determined by the Vortechnics staff. To prevent flooding, the final design of the system incorporates all site conditions.

Design Process

During the Vortechs System design process consideration is given to both the physical constraints of the site and the site-specific flows. Each system is designed differently based on these characteristics, and the internal flow controls are specifically designed to accommodate the expected flows.

The site engineer provides the Vortechs System rim and invert elevations, pipe sizes, design flow rate, and design storm recurrence interval. Another consideration is whether the system is in an on-line or off-line (i.e. bypassed) configuration. If regulatory authorities allow treatment of storm flows less than the conveyance capacity of the piping system, it may be possible to provide a Vortechs System in an off-line configuration which will result in a cost savings without a significant reduction in pollutant removal efficiency.

Sizing the System

Each system is custom designed based on the design conditions provided. The weir, orifice, sump depth, and height of tank will vary depending on the site conditions and performance

requirements. The rim and invert elevations will impact the overall height of the unit, the sump depth, and the placement of the weir and orifice. Also affecting the placement of the weir and orifice is the pipe size, the orientation of the internal walls, and the potential for tailwater. The flow rates determine the size of the weir, orifice, and the baffle opening.

Size: The size of the system depends on whether or not the system is on-line or off-line. An on-line system will be chosen such that the design flow rate is equal to or less then the Vortechs rated design flow. For an off-line system, the 2-month flow rate is determined and the model number is chosen based on the grit chamber area such that 24 gpm/sf of flow is realized through the chamber.

Sump: Typically a three-foot sump depth is provided in Vortechs Systems. This depth is most common since it provides ample sediment storage and keeps the excavation depth to a minimum. However, because each Vortechs System is custom designed, the individual sump depths may vary to balance maintenance costs with capital costs.

Orifice: The function of the orifice is to raise the water level in the Vortechs System. This increases the area of the flow in the pipe, which decreases the velocity of the water flowing into the system. A reduction in turbulence is realized at the inlet; this aids in keeping the trapped sediment and floatables contained. In addition, the rise in water level causes the floatables to rise above the inlet and away from the baffle opening, thus preventing the floatables from becoming re-entrained and pulled under the baffle wall. The orifice is designed to pass a flow approximately equal to that of a 2-month storm event.

Weir: Any event greater than the 2-month event causes the water level in the Vortechs System to rise to the upper flow control, submerging the inlet. The upper flow control is normally a Cippoletti weir. A Cippoletti weir is a trapezoidal weir with 4 to 1 sloping sides. Like the orifice, the weir also causes the water level in the system to rise, which promotes sediment and floatable removal. As the water rises, the volume of water in the system increases, thus stabilizing the detention time and allowing sediment to settle out. The swirl is maintained by allowing continuous flow through the system via the weir and orifice. For an on-line system, the weir is sized to pass the design flow rate. If there is an external bypass or diversion structure, the weir is sized for the system flow rate minus the orifice flow.

Baffle: The baffle opening is designed to maintain a velocity such that re-entrainment of floatables and re-suspension of sediment is minimized. The baffle opening is at least 6 inches to ensure against clogging. The largest opening of 15 inches is chosen to maximize the distance between the floatable layer and the baffle opening. This keeps the floatables trapped and maintains the oil storage volume. In most applications, the flow under the baffle wall is approximately 1.0 foot per second.

Bypass: For systems in an off-line configuration, a weir crest length and elevation is calculated for the diversion structure that will be installed upstream of the specified Vortechs System. The goal is to achieve a water surface elevation during the 100-year storm that is at the same elevation as the top of the Vortechs Cippoletti weir. The area of flow over the bypass weir is calculated based on the 100-year flow. From this area, the height of flow is solved for a given

weir length. Since the area of flow remains constant, the height of flow over the weir varies with the bypass weir length. See ***Technical Bulletin 3A*** for more information.

Flow Control Calculations

The calculation for the 2-month storm is as follows:

$$\text{2-month storm}^1 = Q_{2\text{-MO}} \approx \frac{Q_{25\text{-YR}}}{8} \approx \frac{Q_{10\text{-YR}}}{7} \approx \frac{Q_{5\text{-YR}}}{6} \approx \frac{Q_{2\text{-YR}}}{5}$$

The orifice flow control is then sized by solving for the area in the following equation:

$$\text{Flow through orifice} = Q_{2\text{-MO}} = C * A * (2gh)^{0.5}$$

Where C = Orifice contraction coefficient = 0.56 (based on Vortechnics laboratory testing)
A = Orifice flow area, ft^2 (calculated by Vortechnics technical staff)
h = Design head, ft (equal to the inlet pipe diameter)

A Cippoletti weir configuration is used as the high flow control. In a bypass situation, it is designed for the rated system design flow minus the orifice flow. In an on-line configuration, the weir is conservatively designed for the design flow rate.

The weir flow control is sized by solving for the crest length and head in the following equation:

$$\text{Flow through weir} = Q_{weir} = CL(H)^{1.5}$$

Where C = Cippoletti Weir coefficient = 3.37 (based on Vortechnics laboratory testing)
H = Available head, ft (height of weir)
L = Design weir crest length, ft (calculated by Vortechnics technical staff)

Vortechnics performs a technical review of the sizing and location of each proposed system to determine that the system(s) have been designed and located correctly for each specific application.

Bypass Calculations

The bypass is designed to carry a flow over its weir equal to the 100-year flow minus the Vortechs rated system design flow. The following equation is used to calculate the height of flow over the bypass weir.

$$\text{Flow over bypass weir} = Q_{bypass} = CL_{byweir}(H)^{1.5}$$

Where C = Discharge coefficient = 3.3 for rectangular weir
H = Depth of flow over bypass weir crest, ft
L_{byweir} = Length of bypass weir crest, ft

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[1] ***Technical Bulletin No. 3***

The bypass weir crest elevation is then calculated to be the elevation at the top of the Cippoletti weir minus the height of flow.

MAINTENANCE

The Vortechs System requires minimal routine maintenance. However, it is important that the system be inspected at regular intervals and cleaned when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and it is easily performed. In the first year of operation, frequent inspections of the accumulated sediment volume within the aluminum grit chamber are necessary to establish an appropriate maintenance plan. Vortechnics recommends seasonal inspections during the first year. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. After the first year, the inspection schedule should be reviewed and modified according to experience. It is very useful to keep a record of each inspection. A simple form for doing so is provided.

The Vortechs System only needs to be cleaned when inspection reveals that it is nearly full; specifically, when sediment depth has accumulated to within six inches of the dry-weather water level. This determination can be made by taking 2 measurements with a stadia rod or similar measuring device: one measurement is the distance from the manhole opening to the top of the sediment pile and the other is the distance from the manhole opening to the water surface. If the difference between the two measurements is less than six inches the system should be cleaned out. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

In Vortechs installations where the risk of large petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Oil or gas that accumulates on a more routine basis should be removed when an appreciable layer has been captured.

Cleaning

Cleanout of the Vortechs System with a vacuum truck is generally the most effective and convenient method. Cleanout should not occur within 6 hours of a rain event to allow the entire collection system to drain down. Properly maintained Vortechs Systems will only require evacuation of the grit chamber portion of the system, in which case only the manhole cover nearest to the system inlet need be opened to remove water and contaminants. However, all chambers should be checked to ensure the integrity of the system. In installations where a "clamshell" is being utilized for solids removal, prior to removing the grit, absorbent pads or

pillows can be placed in the oil chamber to remove floating contaminants. Once this is done, sediment may then be easily removed with the clamshell.

In some cases, it may be necessary to pump out all chambers. An important maintenance feature built into Vortechs Systems is that floatables remain trapped after a cleaning. A pocket of water between the grit chamber and the outlet panel keeps the bottom of the baffle submerged, so that all floatables remain trapped when the system begins to fill up again. Therefore, in the event of cleaning other chambers it is imperative that the grit chamber be drained first. Manhole covers should be securely seated following cleaning activities, to ensure that surface runoff does not leak into the unit from above.

Vortechs™
STORMWATER TREATMENT SYSTEM

Inspection & Maintenance Log

Model:			Location:		
Date	**Water Depth to Sediment** [1]	**Floatable Layer Thickness** [2] (approx)	**Maintenance Performed**	**Maintenance Personnel**	**Comments**

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement is the distance from the manhole opening to the top of the sediment pile and the other is the distance from the manhole opening to the water surface. If the difference between the two measurements is less than six inches the system should be cleaned out.

2. The system should be cleaned out if the floating layer of trapped debris is 3-6" in depth.

Vortechs™
STORMWATER TREATMENT SYSTEM

Inspection & Maintenance Log

Model: 5000			Location: Anywhere		
Date	**Water Depth to Sediment** [1]	**Floatable Layer Thickness** [2] (approx)	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
4/10/96	30"	0"	N/A	B. Johnson	Installed
8/15/96	26"	sheen	None	S. Riley	
11/15/96	22"	sheen	None	B. Johnson	
1/15/97	16"	sheen	None	B. Johnson	
2/15/97	7"	1"	Clean-out scheduled	S. Riley	3 snowstorms
2/18/97	30"	0"	System cleaned w/ Vactor truck	S. Riley	Cleaned
3/15/97	28"	Sheen		S. Riley	swept parking lot
4/15/97	27"	0.5"	Placed oil-absorbent material in system	B. Johnson	
5/16/97	23"	0"	Replaced oil-absorbent material w/new	B. Johnson	

SAMPLE

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement is the distance from the manhole opening to the top of the sediment pile and the other is the distance from the manhole opening to the water surface. If the difference between the two measurements is less than six inches the system should be cleaned out.

2. The system should be cleaned out if the floating layer of trapped debris is 3-6" in depth.

Vortechs™
STORMWATER TREATMENT SYSTEM

LABORATORY
AND
FIELD TESTING DATA

For the Vortechs Stormwater Treatment System

Vortechs™
STORMWATER TREATMENT SYSTEM

Introduction

Laboratory and Field Testing

Vortechnics is an established leader in the stormwater treatment industry, marketing the Vortechs Stormwater Treatment System as a technology capable of achieving an 80% net TSS removal efficiency. Extensive testing in both the laboratory and in the field has produced a comprehensive set of data describing the relationship between flow rate, particle size, and removal efficiency.

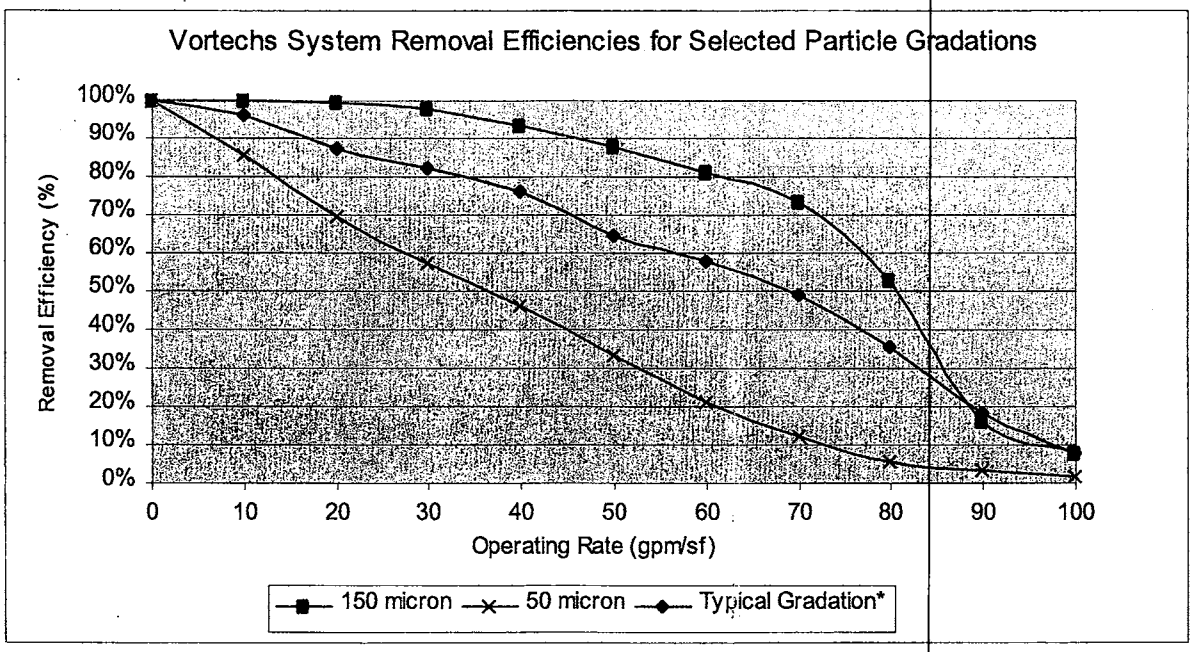
Sections 1 and 2 are the results of laboratory and field testing, respectively. Section 1 shows the detailed results of full-scale testing with a Vortechs Model 2000 at Vortechnics' laboratory in Portland, Maine. Section 2 includes the results of recently completed field tests of a Vortechs System Model 11000 at the DeLorme Mapping Company in Yarmouth, Maine.

Vortechs™
STORMWATER TREATMENT SYSTEM

Section 1

Laboratory Testing

Vortechs Stormwater Treatment System Performance



* See Table 1

These performance curves are based on laboratory tests using a full scale Vortechs System Model 2000. The testing protocol used is described on the following pages. The 150-micron curve demonstrates the results of tests using particles that passed through a 100-mesh sieve and were retained on a 150-mesh sieve. The 50-micron curve is based on tests of particles passing through a 200-mesh sieve and retained on a 400-mesh sieve. A slurry representing an average stormwater sediment gradation, with the particle size gradation shown in Table 1, was also tested in our laboratory.

As the graph clearly shows, Vortechs Systems maintain positive total suspended solids (TSS) removal efficiencies over the full range of operating rates, allowing the system to effectively treat all runoff from large infrequent design storms as well as runoff from the more frequent low intensity storms. Precast Vortechs Systems are designed to treat peak flows from 1.6 cfs up to 25 cfs without bypassing. Peak flows that exceed rated treatment capacities can be conveyed around the system with an external bypass. Internal bypasses can be configured to direct low flows from the last chamber of the Vortechs System to polishing treatment when more stringent water quality standards are imposed. In all configurations, high removal efficiencies are achieved during the lower intensity storms, which constitute the majority of annual rainfall volume.

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Laboratory Quality Control Brief

The following protocol summarizes standard operating procedures for Total Suspended Solids (TSS) testing in the Vortechnics Laboratory. These guidelines were followed in the creation of the preceding performance curves.

Sediment Source

Sediment samples are sorted according to ASTM Special Technical Publication 477 B, which establishes sieve analysis procedures. U.S. Standard Sieves in a Gilson SS-15 sieve shaker are used to separate particles to the various fractions required for our tests. To ensure uniformity of those fractions, an unsorted sample is sieved until less than 1% of that sample passes through the sieve in one minute. All sediment recovered after a test is dried and resieved before reuse. Unless otherwise specified, mineral sediments with a density of 2.65 g/cm^3 are used.

The following table describes the particle size distribution of samples tested by Vortechnics to represent TSS Loading in typical urban runoff.

Table 1

Particle Size Distribution	Percentage of Sample Make-up
< 63 μm	42%
63 – 75 μm	4%
75 – 100 μm	9%
100 – 150 μm	7%
150 – 250 μm	11%
> 250 μm	27%

Calibration and Flow Regulation

Calibration is accomplished by calculating the head at the baffle wall that is required to produce a given flow rate through the orifice and the weir in the flow control wall. Flow is regulated by a 12-inch butterfly valve located upstream of the Vortechs System. Observing the head in the Vortechs System and adjusting the regulating valve accordingly sets the flow rate. At no time during the test will the valve be opened more than 13° per minute. It is important to change the flow rate as slowly as possible in order to simulate field conditions. Before any samples are collected, the valve must remain fixed for a period equal to half of the detention time so that

flow equalizes throughout the system. Each test group is generally planned such that flow rates increase incrementally in consecutive tests.

Sediment Metering

All sediment is injected into the inlet pipe via a 1/4" flexible hose using a Watson Marlow 5058 peristaltic metering pump. For TSS tests, a known gradation of sediment and water are combined in approximately a 1/2 pound/gallon ratio in a holding tank and homogenized by a mixing propeller powered by a 1/3 horsepower motor. The mixer is activated at least 5 minutes before testing commences and runs continuously throughout the test. The metering pump is activated for a period of time equal to at least half of the detention time of the Vortechs System at the test flow rate, before the first influent sample is taken. The pump must run continuously until the last effluent sample is taken.

Sample Collection

All influent samples are taken from a 6-inch gate valve located upstream of the Vortechs System. A collection bin housing a 500-milliliter sample container is positioned beneath the valve. Five seconds before each sample is taken the valve is quickly opened and closed to eliminate any interference from particles that have settled in the low velocity region of the gate. This eliminates artificially high influent readings. The time that the influent sample was taken is recorded and the corresponding effluent sample is collected after a period of time equal to the detention time. Effluent grab samples are collected at the discharge pipe, by sweeping the mouth of a 500-mL bottle through the exiting flow stream. Samples are annotated and refrigerated until they can be analyzed.

Sample Analysis

TSS samples are analyzed in the Vortechnics laboratory, following EPA method 160.2, a gravimetric method for total nonfilterable solids dried at 102^0C. Volume measurements are accurate to 0.6 mL using a 500-mL graduated cylinder. Mass measurements, are made with an Acculab V-1 analytical balance with a readability of 0.001g. Filter pore size is 1.5 μm.

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Vortechs Stormwater Treatment System

Interim Field Testing Report

DeLorme Publishing Company
Yarmouth, Maine

March 2000

Vortechs™
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Introduction

This paper will report on the Vortechs System Monitoring Program at the DeLorme Publishing Company in Yarmouth, Maine. It is an interim report as the project will continue for one year of which seven months have been completed, spanning 20 storms from May to November 1999. A two-month 'trial run' was conducted at the end of 1998, without the benefit of a flow meter. The monitoring program was designed to expand upon the information gathered in the 'trial run' by adding a flow meter to monitor flow through the Model 11000 Vortechs System on the site, thereby making calculations of event mean concentrations (EMCs) possible for each storm and for the period. The data contained in this report is the most current and most significant part of Vortechnics' ongoing field data collection program.

Description of the Study

Prior to this study, Vortechnics developed an extensive body of laboratory data to document total suspended solids (TSS) removal efficiency. This data provided a basis for the optimal sizing of Vortechs Systems to achieve sufficient removal of TSS to meet the current prevailing standards of performance. One purpose of this study was to confirm that performance predicted in the laboratory would, in fact, be accomplished by a correctly sized system in the field.

A secondary purpose of the study was to subject Vortechnics rigorous laboratory and field testing to third party review. The Vortechs System has been approved for use by a diverse array of regulatory agencies on hundreds of projects from coast to coast, but there has not been, to date, a third party review of Vortechnics field testing data to re-confirm that the goals of those agencies are consistently met by the Vortechs System.

The 1999 study has proceeded in accordance with a protocol that was the result of a collaborative effort and includes several unique features as well as some features common to other protocols from similar testing programs. Salient items include:

- the use of automatic Isco model 6700 samplers and one Isco model 4250 flow meter with a low profile area-velocity sensor and one Isco 674 rain gauge
- automatic samplers were deployed to take flow weighted composite samples directly from the inlet and the outlet of the treatment system[2]
- comparison of samples obtained automatically with those obtained manually to confirm that the automatic samplers are pulling representative samples (see Figure 1 in the Project Narrative)

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2 Deployment in these locations would change if the system was installed with a bypass structure to divert high peak flows. In such cases the sampling points would be upstream of the bypass and downstream of the junction of treated and untreated flows. This is referred to as testing the entire treatment system (including bypassed flows) as opposed to testing the treatment facility (excluding bypassed flow). Where there is no bypass they are one and the same.

- the use of event mean concentrations (EMCs) of the influent and effluent through the treatment system to calculate operating efficiency in each storm
- the use of a flow-weighted average of EMCs over the period of study to calculate the influent TSS and effluent TSS as a 'period mean concentration' (PMC) and the overall operating efficiency for the period
- since prevailing standards generally are intended to require some stated level of performance on "an average annual basis", the number of storms to be monitored will be the number of storms sampled over a one-year period.
- Samples were handled and analyzed for TSS concentration according to Standard Method 2540 D

Description of the Site

The study site is the headquarters of DeLorme Publishing, Inc. in Yarmouth, Maine. The building, driveway, parking lot and ancillary facilities were constructed, with all necessary permits, in 1996. DeLorme is best known as a publisher of maps and the building houses a retail map store and the world's largest (42-foot diameter) rotating globe as well as its production facilities. The map store and globe draw a large number of tourists and it is not unusual for the 300-space, 4-acre parking lot to be filled to capacity with passenger cars and tour buses. Besides this parking lot, DeLorme owns some landscaped area that is tributary to the stormwater treatment system and there also exists a culvert that drains an off-site highway access ramp. The total of these unpaved tributary areas is estimated at about 3 acres; the (Rational Method) runoff coefficient associated with the same area is estimated to be about 0.40.

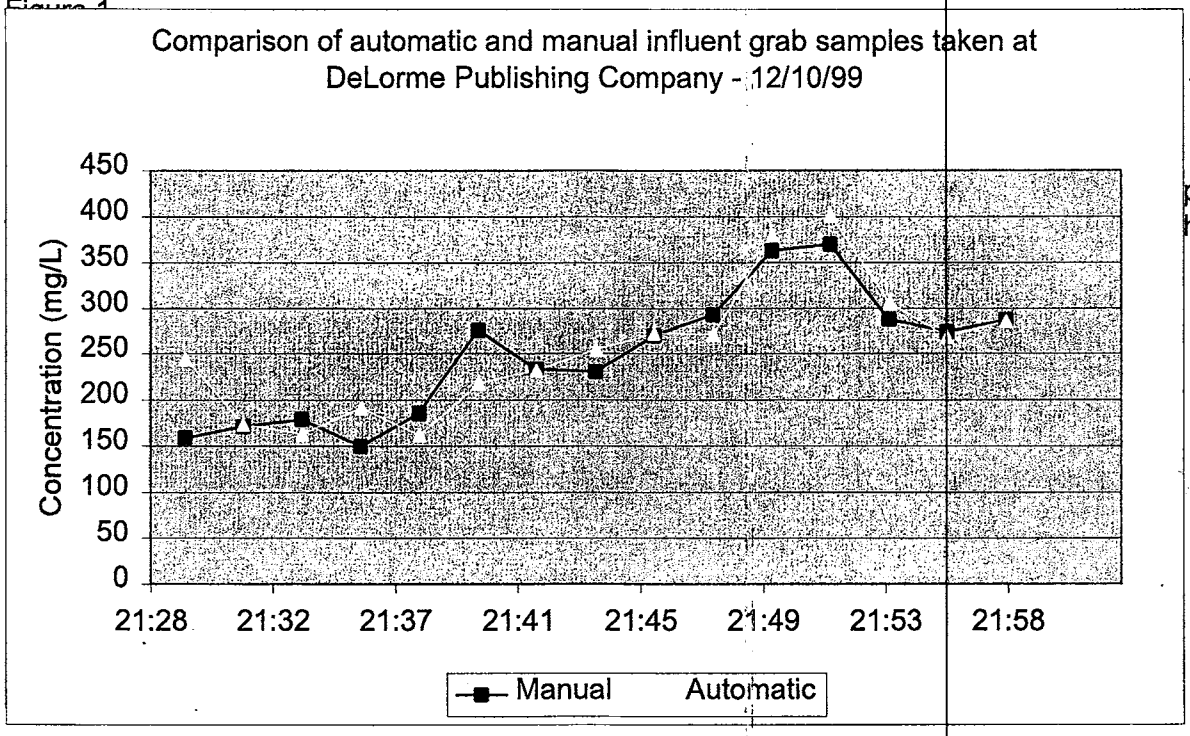
Project Narrative

In December of 1998, following the 2-month trial run, the automatic samplers were removed at the request of DeLorme to accommodate Winter snow removal operations. The samplers were re-installed in May of 1999. Just before the samplers were re-installed, the entire parking lot had been swept. Presumably the sweeping operation removed a large amount of sediment that might otherwise have been trapped by the Vortechs System. As it was, the first rainfall event that was sampled exhibited a very low influent event mean TSS concentration of 65.9 milligrams per liter (mg/l). Not surprisingly the removal efficiency calculated for that event was very low.

Another issue impacting the study in its early stages was the extraordinarily dry weather that lasted all summer. However, the long "antecedent dry periods" produced high influent concentrations, in some cases, which did provide opportunities to evaluate performance during periods of critical need for treatment.

As called for by the protocol, several checks were performed on the "representativeness" of the samples collected by the automatic samplers. This was done by carefully grabbing a manual sample from the flow stream and then comparing it to the automatic sample that was taken simultaneously by the Isco sampler. These checks exhibited correlations between the manual and automatic samples that were fair to good at the outset and which have been steadily improved upon. The strainer deployment at the influent end revealed somewhat less consistent correlation and was modified as the study progressed. Figure 1 is a plot of the very good correlation between the manual and automatic samplers that was obtained from the deployment configuration that was ultimately found to be the best. This configuration is to suspend the perforated strainer at the end of the suction tube from the sampler; the point where it is suspended is directly "in front of" (that is downstream of) the inlet pipe invert. It is noteworthy that, in the calibration shown, the net difference between the concentrations measured by the automatic and manual samples was just 1.3%.

Figure 1



than site, flow perly hose final

Results

The net removal efficiency for the 20-storm, 7-month period was approximately 80%. See Table 1 for details.

This study is continuing through the Winter to assess the impact of the cold climate on both the hydrology and the sediment loadings.

Conclusion

The Vortechs System on this site is designed to remove 80% of the net annual TSS load for an average year based on local rainfall intensity distribution data, site size and laboratory tests that document the removal efficiency of silica based solids over a range of operating rates.[3] Vortechnics, Inc. generally uses the removal efficiency of 50 micron sediment in the laboratory as basis for predicting system performance in the field. The fact that the system achieved an observed removal efficiency so close to the goal is evidence that the sizing methodology is a reasonably accurate way to predict field performance.

[3] See Technical Bulletins 1-4 in Vortechnics Technical Design Manual for additional information on laboratory testing, sizing and design criteria.

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STORMWATER TREATMENT SYSTEM

Phase 2 - DeLorme Publishing Company
Summary Statistics

Storm #	Storm Date	Total P (in)	Subsamples # Taken	Influent EMC (mg/L)	Effluent EMC (mg/L)	Runoff Sampled (ft^3)	Influent EMC x Sampled Volume (mg)	Effluent EMC x Sampled Volume (mg)
1	5/24/1999	0.30	28	65.9	50.3	21000	1384432	1055514
2	6/24/1999	0.52	17	1010.7	149.2	6375	6443467	950925
3	6/28/1999	0.32	12	1364.9	63.6	4500	6142012	286282
4	7/6/1999	0.32	13	857.6	49.4	9750	8361551	481290
5	7/18/1999	0.53	11	367.6	145.9	8250	3033088	1203980
6	7/24/1999	0.46	18	533.2	57.8	6750	3599066	389818
7	8/7/1999	0.55	30	43	31	11250	483750	348750
8	8/14/1999	0.75	40	1088.8	52.0	15000	16331909	779528
9	8/29/1999	0.1	6	37.2	33.6	2250	83591	75503
10	9/7/1999	0.17	12	61.0	38.0	4500	274500	171000
11	9/15/1999	5.45	123	88.8	59.1	15600	1385238	922672
12	9/30/1999	0.48	40	111.6	47.3	4000	446465	189024
13	10/4/1999	0.53	70	46.2	19.8	7000	323108	138453
14	10/9/1999	0.13	12	69.2	14.7	2400	166178	35294
15	10/14/1999	0.43	40	33.1	12.6	8000	265010	100435
16	10/23/1999	1.91	40	164.1	93.2	8000	1313022	745550
17	11/2/1999	1.02	80	233.6	102.4	16000	3737052	1638485
18	11/11/1999	0.27	33	93.3	25.5	6600	615609	168445
19	11/14/1999	0.25	32	57.4	21.0	6400	367624	134293
20	11/20/1999	0.30	37	188.4	70.3	7400	1394504	520000
					Column Sum --->	171025	56151176	10335241

Net Period Removal Efficiency	**81.59%**
Net Influent Period Mean Concentration (PMC)	**328.3**
Net Effluent Period Mean Concentration (PMC)	**60.4**

Table 1

9.3.2 Other Water Quality BMP'S

Vegetated Buffer and ASSF: The existing ASSF traveling north from the proposed discharge location and east toward the Pawtuxet River where the ASSF ultimately drains will provide additional water quality improvements. The benefits of this ASSF area as follows, trapping sediments and other settable pollutants, allowing for plant uptake of soluble components, assisting in de-nitrification of nitrate-nitrogen, and facilitating the infiltration of run-off water.

Street Sweeping: A biannual street sweeping program to be implemented in the fall and in the spring is recommended to minimize the amount of sediments that enter the drainage system. This will allow any sediments accumulated on the roads following winter travel and sanding to be removed as well as provide a second cleaning immediately prior to the winter season. According tot the Massachusetts Department of Environmental Protection Stormwater Manual, this will reduce TSS in storm water by 10%. When used in conjunction with the Vortechs units and other BMP's, the TSS is further reduced.

9.4

OUTLET PROTECTION

Outlet Protection

A riprap apron is proposed in order to prevent scour at the stormwater outlet and to minimize the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Calculations for the Underground Detention Area are shown below:

Qf = 59.32 CFS
Q (100 year storm) = 39.99 CFS
Q/Q_f = 0.67

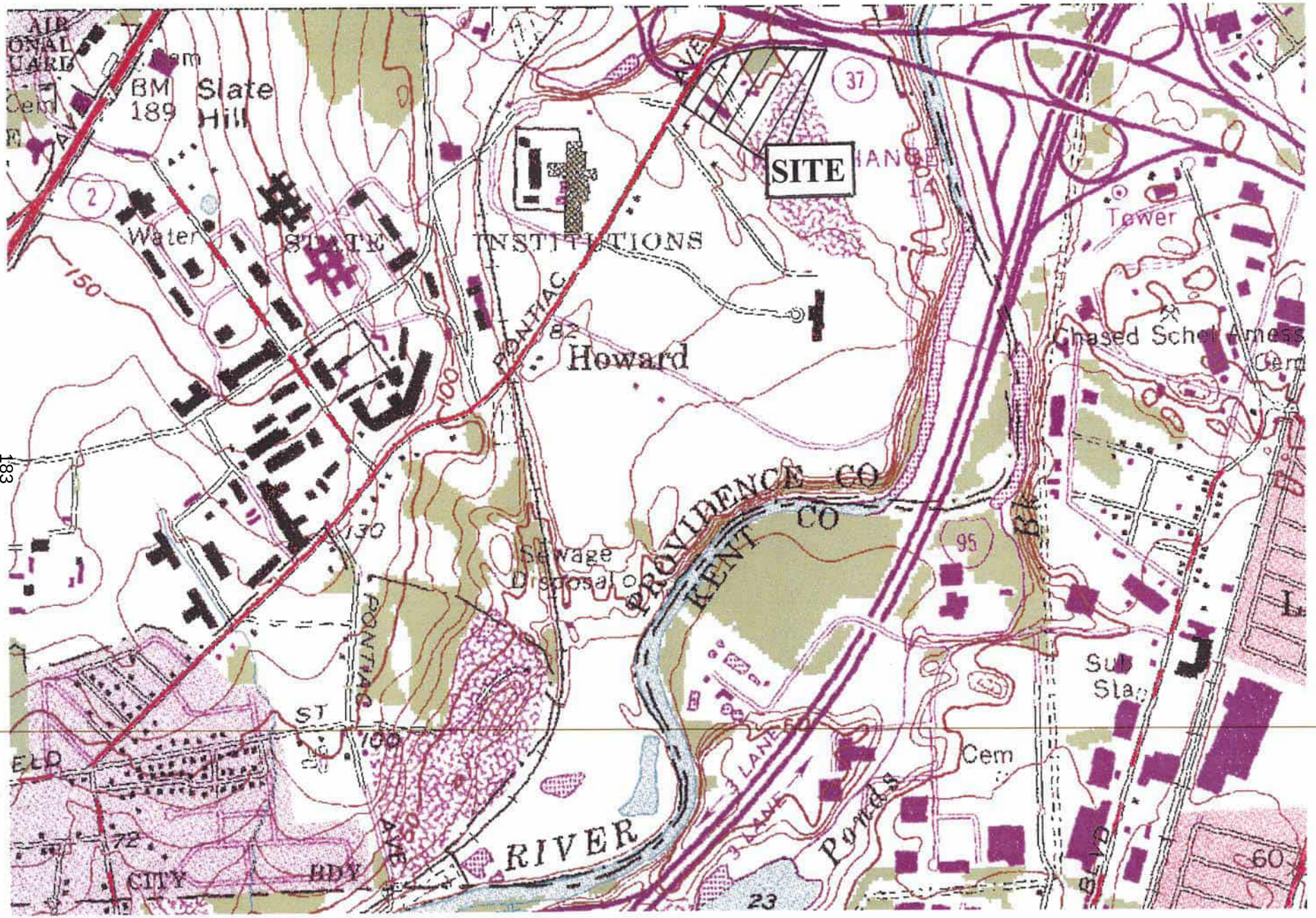
$La = 1.7Q/do^{3/2} + 8\ do = 1.7(39.99) / (2.5)^{3/2} + 8(2.5)$
$= 37.2'$ (use 37')

$W = 3\ do + 0.4\ La = 3(2.5) + 0.4(37.2)$
$= 22.4'$ (use 23')

Class 'A' rip rap is adequate

9.5

U.S.G.S. TOPOGRAPHICAL MAP

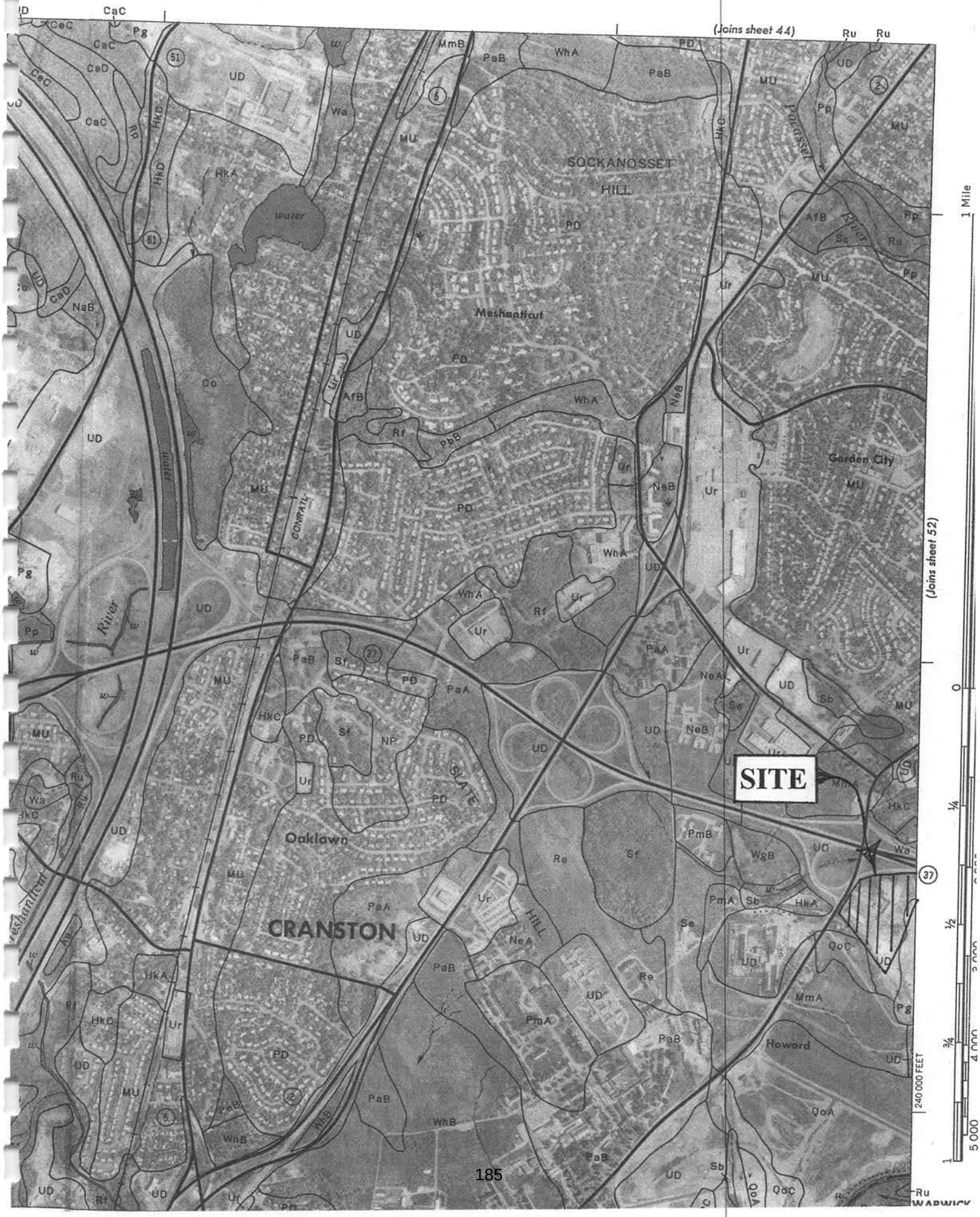


U.S.G.S. TOPOGRAPHICAL MAP

9.6

SOIL SURVEY OF RHODE ISLAND SOIL MAP

SLAND — SHEET NUMBER 51




N
1 mile
5 000 Feet
Scale 1:15 840
(Joins sheet 51)
1 000
2 000
3 000
4 000
5 000
240 000 FEET
515 000 FEET
(Joins sheet 60)
SITE
CRANSTON
Auburn
Garden City
Norwood
Lincoln Park
Blackamore Pond
Fenner Pond
Cranberry Bog
Sand Pond
Pawtuxet River
Providence Cnt
INTERCHANGE 14
INTERCHANGE 15
AMTRAK
MU
UD
Ur
Pp
Ru
Du
Se
Sb
Ss
Pg
Aa
Co
Wa
WgB
HkA
HkC
HkD
MmA
MmB
QoA
QoC
Do

9.7

SOIL SURVEY OF RHODE ISLAND SOIL DESCRIPTIONS

This soil is suited to woodland wildlife habitat and openland wildlife habitat. It is poorly suited to wetland wildlife habitat because of a lack of adequate water in the summer. Capability subclass IIw; woodland group 3o.

UAB—Udipsamments, undulating. This unit consists of sand dunes and depressional or level, sandy areas that have been stabilized by vegetation (fig. 6). The areas are along beaches, are long and narrow, and mostly range from 5 to 75 acres. The areas of this unit that are subject to foot and vehicular traffic have less than 10 percent of the surface covered by vegetation, but in undisturbed areas vegetation covers about 65 percent of the surface.

Included with this unit in mapping are areas, up to 10 acres in size, of Beaches and Matunuck mucky peat (fig. 7). Included areas make up about 2 percent of this map unit.

The permeability of this soil is very rapid. Available water capacity is very low, and runoff is very slow.

Most areas of this soil are used for summer recreation activities or for community development purposes such as summer cottages and parking lots.

The soil is not suited to trees or most other uses. The major limitations are droughtiness and position on the landscape. Capability subclass and woodland group not assigned.

UBE—Udorthents, very steep. This unit consists of well drained to excessively drained soils along mainly the southern edge of Block Island adjacent to Block Island Sound in the Mohegan Bluff area. Wind, waves, and rain have eroded these soils and undercut areas on bluffs. Areas are long and narrow and mostly range from 10 to 200 acres. This unit consists of about 50 percent Udorthents, 20 percent steep, severely eroded areas without vegetation, 15 percent Beaches, and 15 percent other soils.

Included with this unit in mapping are areas, up to 10 acres in size, of excessively drained Gloucester and Hinckley soils and well drained to moderately well drained Bridgehampton soils.

This unit is used for summer recreation activities such as sunbathing, surf fishing, and hiking. The unit is unsuited or poorly suited to most other uses because of slope, position on the landscape, erosion, and exposure to winds and salt spray. Capability subclass and woodland group not assigned.

UD—Udorthents-Urban land complex. This complex consists of moderately well drained to excessively drained soils that have been disturbed by cutting or filling, and areas that are covered by buildings and pavement. The areas are mostly larger than 5 acres. The complex is about 70 percent Udorthents, 20 percent Urban land, and 10 percent other soils. Most areas of these components are so intermingled that is was not practical to map them separately.

Udorthents are in areas that have been cut to a depth of 2 feet or more or are on areas with more than 2 feet of fill. Udorthents consist primarily of moderately coarse textured soil material and a few small areas of medium textured material.

Included with this complex in mapping are areas, up to 10 acres in size, of undisturbed soils. Also included are a few areas that are entirely Udorthents.

Most cut areas were used as a source of fill material, but in some areas cuts were made in order to level sites for buildings, recreational facilities, and roads. Most of the filled areas were built up and leveled for urban development. In some areas fill has been used to build up recreational areas and highways.

The permeability and stability of this unit are variable. The unit requires onsite investigation and evaluation for most uses. Capability subclass and woodland group not assigned.

Ur—Urban land. These areas consist mostly of sites for buildings, paved roads, and parking lots. Most areas are in intensely built-up portions of Providence and Newport Counties. The areas are mostly rectangular and range from 5 to 100 acres. Slopes range from 0 to 10 percent but are dominantly 0 to 5 percent.

Included with this unit in mapping are small, intermingled areas of Udorthents; somewhat excessively drained Merrimac soils; well drained Canton, Charlton, and Newport soils; and moderately well drained Pittstown, Sudbury, and Sutton soils. Included areas make up about 15 percent of this map unit.

Areas of this unit require onsite investigation and evaluation for most land use decisions. Capability subclass and woodland group not assigned.

Wa—Walpole sandy loam. This nearly level, poorly drained soil is in depressions and small drainageways of terraces and outwash plains. Areas are irregular in shape and range mostly from 2 to 70 acres.

Typically the surface layer is very dark brown sandy loam about 7 inches thick. The subsoil is light brownish gray, mottled sandy loam 12 inches thick. The substratum is dark yellowish brown and grayish brown, mottled gravelly sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of moderately well drained Sudbury soils and very poorly drained Scarboro soils. Also included are a few small areas with a surface layer of silt loam. Included areas make up about 10 percent of this map unit.

The permeability of this soil is moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. Available water capacity is moderate, and runoff is slow. This soil has a seasonal high water table at a depth of about 6 inches from late fall through

9.8

RAINFALL FREQUENCY VALUES' FOR CT-RI-MA

RAINFALL FREQUENCY VALUES FOR CT-RI-MA
With 24-Hr. Storm Duration

INCHES OF RAINFALL

Frequency	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Connecticut							
Fairfield	2.7	3.3	4.3	5.0	5.7	6.4	7.2
Hartford	2.6	3.2	4.1	4.7	5.5	6.2	6.9
Litchfield	2.6	3.2	4.1	4.7	5.5	6.2	7.0
Middlesex	2.7	3.3	4.2	5.0	5.0	6.3	7.1
New Haven	2.7	3.3	4.2	5.0	5.6	6.3	7.1
New London	2.7	3.4	4.3	5.0	5.7	6.3	7.1
Tolland	2.6	3.2	4.1	4.8	5.5	6.2	6.9
Windham	2.6	3.2	4.2	4.8	5.5	6.2	6.9
Rhode Island							
Northern	2.7	3.3	4.2	4.8	5.6	6.2	7.0
Eastern	2.7	3.4	4.3	4.9	5.7	6.3	7.1
Southern	2.7	3.4	4.4	5.0	5.8	6.4	7.2
Massachusetts							
Barnstable	2.5	3.6	4.5	4.8	5.7	6.4	7.1
Berkshire	2.5	2.9	3.8	4.4	5.1	5.9	6.4
Bristol	2.5	3.4	4.3	4.8	5.6	6.3	7.0
Dukes	2.5	3.6	4.6	4.9	5.8	6.5	7.2
Essex	2.5	3.1	3.9	4.5	5.4	5.9	6.5
Franklin	2.5	2.9	3.8	4.3	5.1	5.8	6.2
Hampden	2.5	3.0	4.0	4.6	5.3	6.0	6.5
Hampshire	2.5	3.0	3.9	4.5	5.2	5.9	6.4
Middlesex	2.5	3.1	4.0	4.5	5.3	5.9	6.5
Nantucket	2.5	3.6	4.6	4.9	5.8	6.5	7.2
Norfolk	2.5	3.2	4.1	4.7	5.5	6.1	6.7
Plymouth	2.5	3.4	4.3	4.7	5.6	6.2	7.0
Suffolk	2.5	3.2	4.0	4.6	5.5	6.0	6.6
Worcester	2.5	3.0	4.0	4.5	5.3	5.9	6.5

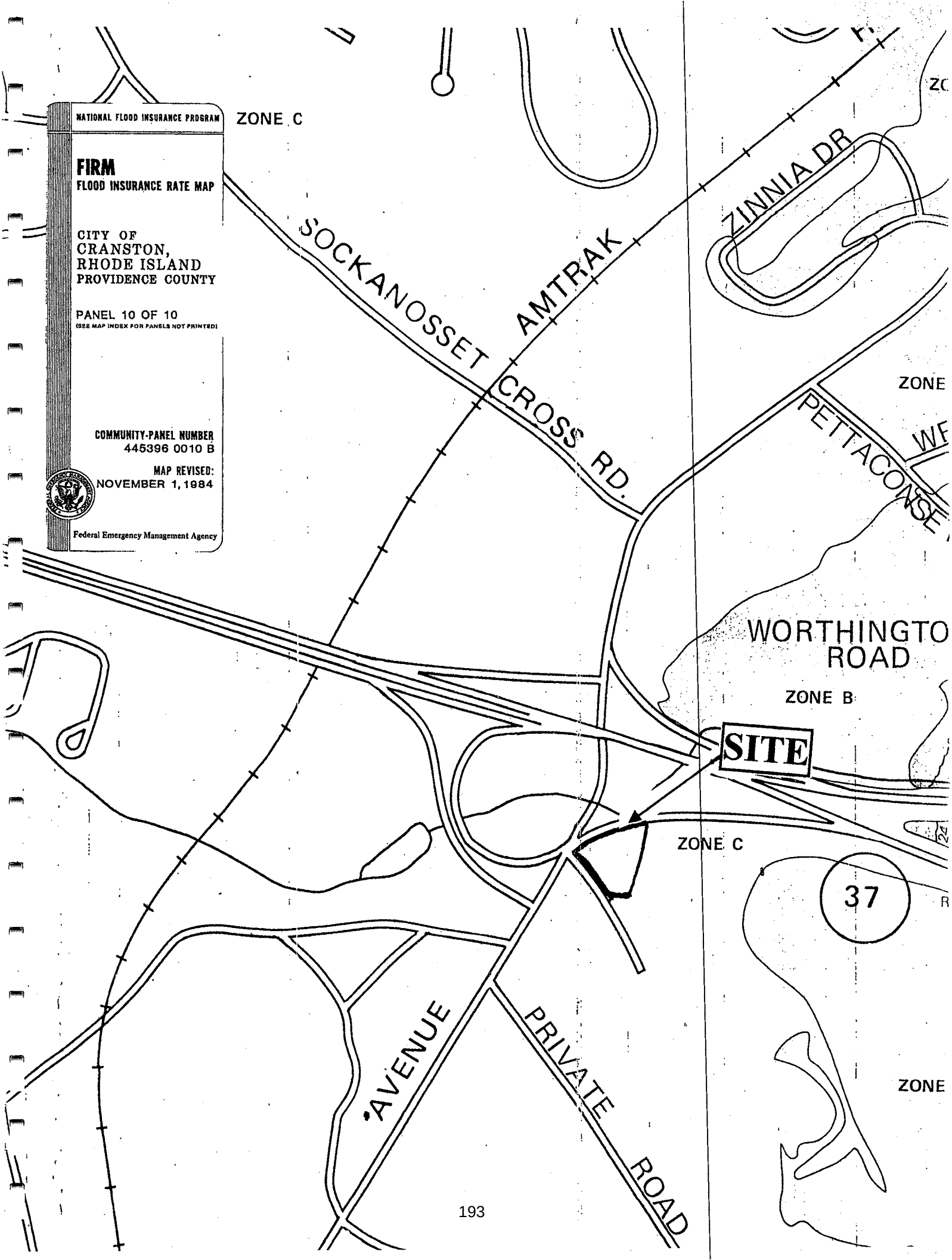
Reference: U.S. Department of Commerce and Weather Bureau T.P. 40, May 1961.

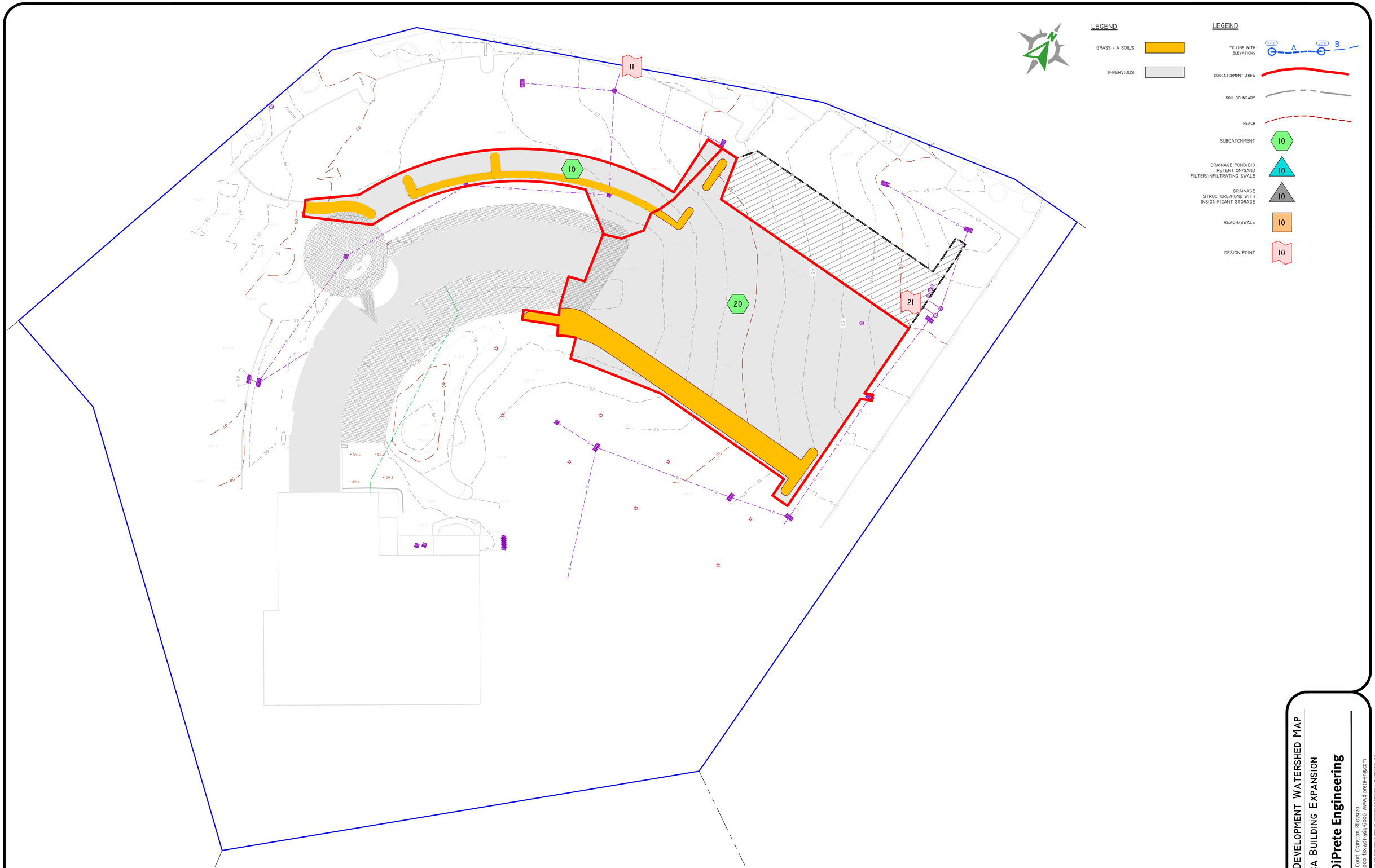
9.9

FLOOD PLAIN MAP

Flood Plain

There is no FEMA 100-year flood plain on the Site in the areas proposed for development as shown on the F.E.M.A. Flood Insurance Rate Map for the City of Cranston Community Panel 445396-0010B, dated November 1, 1984.


NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
CRANSTON,
RHODE ISLAND
PROVIDENCE COUNTY
PANEL 10 OF 10
(SEE MAP INDEX FOR PANELS NOT PRINTED)
COMMUNITY-PANEL NUMBER
445396 0010 B
MAP REVISED:
NOVEMBER 1, 1984
Federal Emergency Management Agency
ZONE C
SOCKANOSSET CROSS RD.
AMTRAK
ZINNIA DR
ZONE
PETTACONSE
WORTHINGTO
ROAD
ZONE B
SITE
ZONE C
37
AVENUE
PRIVATE ROAD
ZONE



LEGEND

GRASS - A SOILS

IMPERVIOUS

LEGEND

TC LINE WITH ELEVATIONS

SUBCATCHMENT AREA

SOIL BOUNDARY

REACH

SUBCATCHMENT 10

DRAINAGE POND/BIO RETENTION/SAND FILTER/INFILTRATING SWALE 10

DRAINAGE STRUCTURE/POND WITH INSIGNIFICANT STORAGE 10

REACH/SWALE 10

DESIGN POINT 10

SCALE: 1"=40'

0 20' 40' 80'

Pre-Development Watershed Map

Tasca Building Expansion

DiPrete Engineering
Two Stafford Court Cranston, RI 02920
tel 401-943-1000 fax 401-464-6006 www.diprete-eng.com

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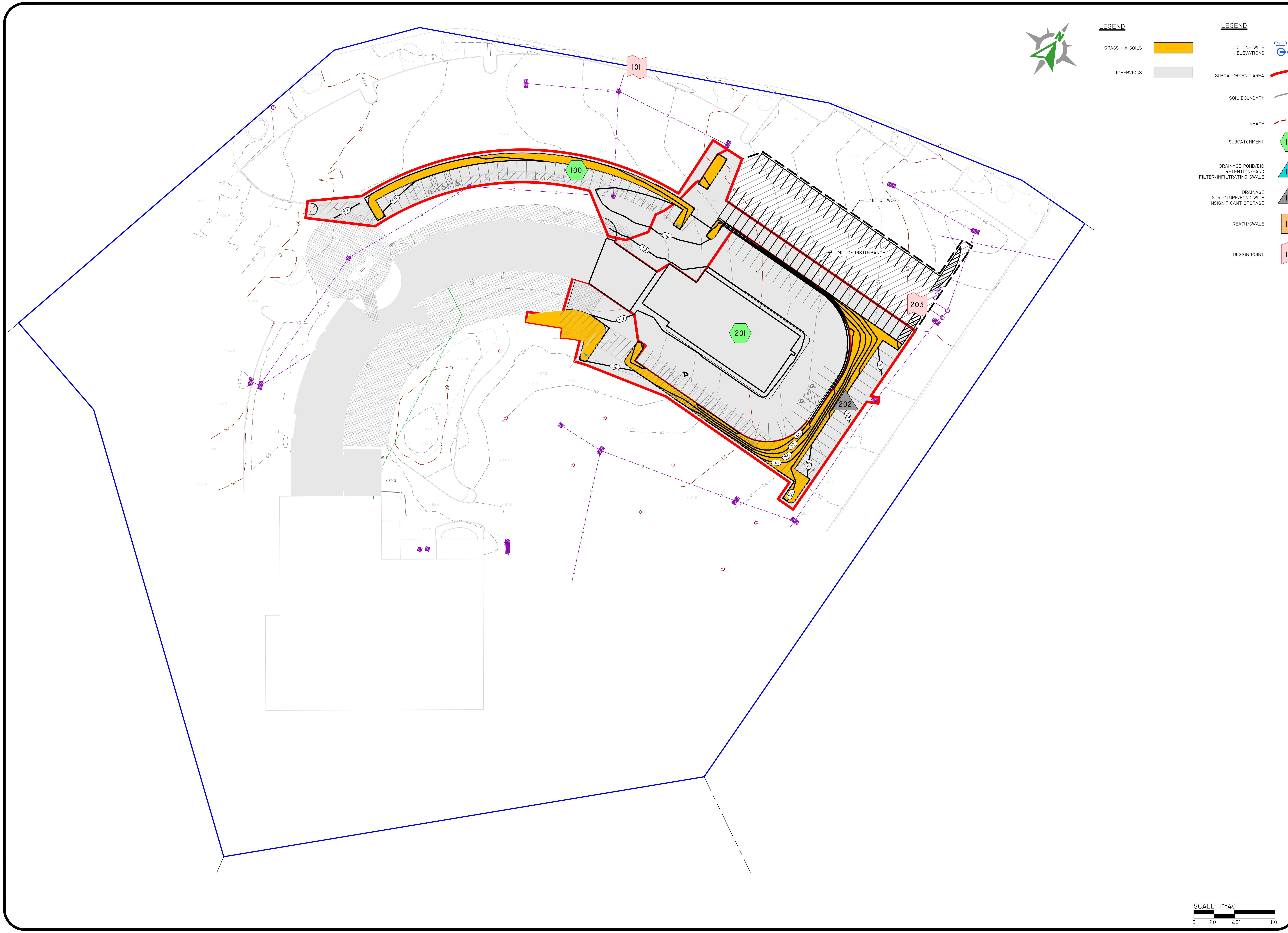
\\DEASTORAGE.P.DEMAIN\PROJECTS\10643-001 PONTIAC AVENUE TASCA\AUTOCAD DRAWINGS\10643-001-WMP.DWG Plotted: 9/19/2022



Post-Development Watershed Map

Tasca Building Expansion

DiPrete Engineering
Two Stafford Court Cranston, RI 02920
tel 401-943-1000 fax 401-464-6006 www.diprete-eng.com

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