



CITY OF PORTLAND

July 20, 2000

Randy Tome
Cad-Cam Associates
41 Hutchins Drive
Portland, ME 04103

re: 41 Hutchins Drive Parking Lot Construction

Dear Mr. Tome:

On June 21, 2000 the Portland Planning Authority approved the site plan application for the parking lot construction at 41 Hutchins Drive. .

The proposed site plan was found to be in conformance with the Site Plan Ordinance of the Land Use Code.

Please note the following provisions and requirements for all site plan approvals:

1. A performance guarantee covering the site improvements as well as an inspection fee payment of 1.7% of the guarantee amount must be submitted to and approved by the Planning Division and Public Works prior to the recording of the subdivision plat. The subdivision approval is valid for three (3) years.
2. The site plan approval will be deemed to have expired unless work in the development has commenced within one (1) year of the approval or within a time period agreed upon in writing by the City and the applicant. Requests to extend approvals must be received before the expiration date.
3. A defect guarantee, consisting of 10% of the performance guarantee, must be posted before the performance guarantee will be released.
4. Prior to construction, a preconstruction meeting shall be held at the project site with the contractor, development review coordinator, Public Work's representative and owner to review the construction schedule and critical aspects of the site work. At that time, the site/building contractor shall provide three (3) copies of a detailed construction schedule to the attending City representatives. It shall be the contractor's responsibility to arrange a mutually agreeable time for the preconstruction meeting.

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5. If work will occur within the public right-of-way such as utilities, curb, sidewalk and driveway construction, a street opening permit(s) is required for your site. Please contact Carol Merritt at 874-8300, ext. 8828. (Only excavators licensed by the City of Portland are eligible.)

The Development Review Coordinator (who is located at DeLuca Hoffman at 775-1121) must be notified five (5) working days prior to date required for final site inspection. Please make allowances for completion of site plan requirements determined to be incomplete or defective during the inspection. This is essential as all site plan requirements must be completed and approved by the Development Review Coordinator prior to issuance of a Certificate of Occupancy. Please schedule any property closing with these requirements in mind.

If there are any questions, please contact the Planning Staff.

Sincerely,



Joseph E. Gray, Jr.
Director of Planning and Urban Development

cc: Alexander Jaegerman, Chief Planner
✓ Sarah Hopkins, Senior Planner
P. Samuel Hoffses, Building Inspector
Marge Schmuckal, Zoning Administrator
Tony Lombardo, Project Engineer
Development Review Coordinator
William Bray, Director of Public Works
Nancy Knauber, Associate Engineer
Jeff Tarling, City Arborist
Penny Littell, Associate Corporation Counsel
Lt. Gaylen McDougall, Fire Prevention
Inspection Department
Lee Urban, Director of Economic Development
Don Hall, Appraiser, Assessor's Office
Susan Doughty, Assessor's Office
Approval Letter File

**CITY OF PORTLAND, MAINE
DEVELOPMENT REVIEW APPLICATION
PLANNING DEPARTMENT PROCESSING FORM**

20000105

I. D. Number

Cad-Cam Associates

Applicant
41 Hutchins Drive, Portland, ME 04103
 Applicant's Mailing Address
SAA
 Consultant/Agent

6/9/00

Application Date
Hutchins Drive
 Project Name/Description

Applicant or Agent Daytime Telephone, Fax

41 Hutchins Dr, Portland Maine 04103
 Address of Proposed Site
238A-A-001
 Assessor's Reference: Chart-Block-Lot

Proposed Development (check all that apply): New Building Building Addition Change Of Use Residential
 Office Retail Manufacturing Warehouse/Distribution Parking Lot Other (specify) **32 space addition**

Proposed Building square Feet or # of Units 6.65 Acreage of Site 11 Zoning I1

Check Review Required:

Site Plan (major/minor) Subdivision # of lots PAD Review 14-403 Streets Review
 Flood Hazard Shoreland Historic Preservation DEP Local Certification
 Zoning Conditional Use (ZBA/PB) Zoning Variance Other

Fees Paid: Site Plan \$400.00 Subdivisio Engineer Review Date 6/9/00

Planning Approval Status:

Reviewer sarah

Approved Approved w/Conditions See Attached Denied

Approval Date 6/21/00 Approval Expiration 6/21/01 Extension to Additional Sheets Attached

OK to Issue Building Permi sarah 7/20/00
 signature date

Performance Guarantee Required* Not Required

* No building permit may be issued until a performance guarantee has been submitted as indicated below

<input checked="" type="checkbox"/> Performance Guarantee Accepted	<u>7/20/00</u> date	<u>\$17,000.00</u> amount	<u>7/1/01</u> expiration date
<input checked="" type="checkbox"/> Inspection Fee Paid	<u>7/20/00</u> date	<u>\$300.00</u> amount	
<input type="checkbox"/> Building Permit Issue	<u> </u> date		
<input type="checkbox"/> Performance Guarantee Reduced	<u> </u> date	<u> </u> remaining balance	<u> </u> signature
<input type="checkbox"/> Temporary Certificate of Occupancy	<u> </u> date	<input type="checkbox"/> Conditions (See Attached)	
<input type="checkbox"/> Final Inspection	<u> </u> date	<u> </u> signature	
<input type="checkbox"/> Certificate Of Occupancy	<u> </u> date		
<input type="checkbox"/> Performance Guarantee Released	<u> </u> date	<u> </u> signature	
<input type="checkbox"/> Defect Guarantee Submitted	<u> </u> submitted date	<u> </u> amount	<u> </u> expiration date
<input type="checkbox"/> Defect Guarantee Released	<u> </u> date	<u> </u> signature	

Planning & Urban Development

Alexander Jaegerman
Planning Director

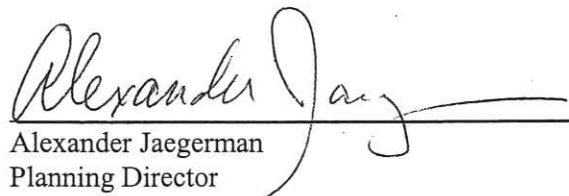


CITY OF PORTLAND

TO: Duane Kline, Finance Department
FROM: Alexander Jaegerman, Planning Director
DATE: February 14, 2002
SUBJECT: Release of Defect Guarantee
CadCam Parking Lot; #41 Hutchins Drive
ID# (2000-0105) Lead CBL # (239AA002)

Please release the Escrow Account #710-0000-229-40-01 in the amount of \$1,700.00 for the Parking Lot located at 41 Hutchins Drive.

Approved:


Alexander Jaegerman
Planning Director

cc: Sarah Hopkins, Development Review Services Manager
✓ Jay Reynolds, Development Review Coordinator
Code Enforcement

D:\PLAN\CORRESP\DRC\FORMS\41HUTCHINSDEFECTRELEASE.DOC

July 10, 2000

Sarah Greene Hopkins, Senior Planner
City of Portland
389 Congress Street
Portland, Maine 04101

RE: Performance Guarantee, Minor Development for CAD-CAM Associates-Parking Lot Addition,
Hutchins Drive

Dear Sarah:

On behalf of the applicant, CAD-CAM Associates, we submit the following enclosures: Cost Estimate of Improvements to be Covered by Performance Guarantee, hereinafter referred to as Cost Estimate; Performance Guarantee; and a check for Engineering and Inspection Fees.

As you stated, the improvements to be covered in the Performance Guarantee include the detention pond; grading activities; and sedimentation and erosion controls. As you will see in our Cost Estimate, we have included all of the items you identified as necessary. The unit costs reflect current costs and are taken from recently awarded construction projects.

The enclosed Performance Guarantee in the form of a letter of credit from Peoples Heritage Bank is for the aggregate amount of \$16,900.00. We anticipate that the Performance Guarantee will be released upon completion of the project, on or before September 14, 2000. At that time, Woodard & Curran will provide the City a Defect Guarantee in the amount of 10% of the Performance Guarantee. We understand the Defect Guarantee will be released after one year elapses, including a full winter season.

Also enclosed is a check payable to the City of Portland for \$469.00. The amount includes the Engineering Review Fee (\$169.00) and Inspection Fee (\$300.00) as you informed us.

We wish to commence construction activities on or before August 1, 2000 and look forward to your comments and reply.

Very truly yours,

WOODARD & CURRAN, INC.

Randy E. Tome, P.E.
Project Manager

BSS/cmg
990047.01

Enclosures

Item	PUBLIC			PRIVATE		
	Quantity	Unit Cost	Subtotal	Quantity	Unit Cost	Subtotal
7. LANDSCAPING (Attach breakdown of plant materials, quantities, and unit costs)	(Topsoil, Seed, & Mulch)			1	\$8000.00	\$8000.00
8. MISCELLANEOUS	(Grading)			1	\$3000.00	\$3000.00
TOTAL:					\$16,900.00	
GRAND TOTAL:					\$16,900.00	

INSPECTION FEE (to be filled out by City)

	PUBLIC	PRIVATE	TOTAL
A: 1.7% of totals:			
or			
B: Alternative Assessment:			
Assessed by:	(name)	(name)	

**CITY OF PORTLAND, MAINE
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Proposed Building square Feet or # of Units 6.65 Acreage of Site I1 Zoning

Check Review Required:

Site Plan (major/minor) Subdivision # of lots PAD Review 14-403 Streets Review
 Flood Hazard Shoreland Historic Preservation DEP Local Certification
 Zoning Conditional Use (ZBA/PB) Zoning Variance Other

Fees Paid: Site Plan \$400.00 Subdivision _____ Engineer Review _____ Date: 6/9/00

DRC Approval Status:

Reviewer steve

Approved Approved w/Conditions see attache Denied

Approval Date 6/21/00 Approval Expiration 6/21/01 Extension to _____ Additional Sheets Attached

Condition Compliance steve bushey 6/21/00
 signature date

Performance Guarantee Required* Not Required

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<input type="checkbox"/> Defect Guarantee Submitted	_____ submitted date	_____ amount	_____ expiration date
<input type="checkbox"/> Defect Guarantee Released	_____ date	_____ signature	

From: "Steve Bushey" <srbushey@maine.rr.com>
To: "Sarah Hopkins" <SH@ci.portland.me.us>
Date: Tue, Jun 20, 2000 8:20 PM
Subject: CADCAM Parking Lot

Sarah,

I have reviewed the application package submitted by Woodard and Curran for the CADCAM parking lot and find it to be complete and acceptable for approval either by staff or by the Planning Board. They have included the proper erosion control measures and have addressed stormwater runoff for the parking area. Please call if you have any questions.

Steve Bushey Acting development review coordinator



WOODARD & CURRAN
Engineering • Science • Operations

41 Hutchins Drive
Portland, ME 01402
(207) 774-2112 z 800-426-4262
FAX: (207) 774-6635

FAX: Transmittal Sheet

TO: Sarah Hopkins FAX NO.: 756.8258
City of Portland

FROM: Barry Sheff DATE: July 11, 2000

No. of Pages, Including Cover: 4
Hard Copy to Follow in Mail: Yes No

Comments

As we discussed just moments ago, we'd like to submit the entire package together if possible to streamline the process. I am transmitting the Cost Estimate and the DRAFT letter of transmittal I intended to send with the package. If you need, I can round up a copy of the proposed letter of credit from our Comptroller for your review.

Thank you for your assistance.

If you are unable to reach me tonight or tomorrow, you will need to contact Randy Tome in our office as I will be on a somewhat extended vacation from Thursday through middle of August.

I look forward to talking with you.

Barry

Note: This message is intended only for the use of the individual or entity named above and may contain information that is privileged, confidential, and exempt from disclosure under the applicable law. If you are not the intended recipient or the employee or agent responsible for delivering the message to the intended recipient, please notify us immediately by telephone and return the original to us by postal service at the address noted on this stationary. Any dissemination, distribution, or copying of this communication by anyone other than the intended recipient is strictly prohibited. Thank you!

Portland, ME ■ Bangor, ME ■ Dedham, MA ■ Concord, NH

Item	PUBLIC			PRIVATE		
	Quantity	Unit Cost	Subtotal	Quantity	Unit Cost	Subtotal
7. LANDSCAPING (Attach breakdown of plant materials, quantities, and unit costs)	(Topsoil, Seed, & Mulch)			1	\$8000.00	\$8000.00
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or			
B: Alternative Assessment:			
Assessed by:	(name)	(name)	



July 18, 2000

Sarah Greene Hopkins, Senior Planner
City of Portland
389 Congress Street
Portland, Maine 04101

RE: Performance Guarantee, Minor Development for CADCAM Associates-Parking Lot Addition,
Hutchins Drive

Dear Sarah:

On behalf of the applicant, CADCAM Associates, we submit the following enclosures: Cost Estimate of Improvements to be Covered by Performance Guarantee, hereinafter referred to as Cost Estimate; Performance Guarantee; and a check for Engineering and Inspection Fees.

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We wish to commence construction activities on or before August 1, 2000 and look forward to your comments and reply.

Very truly yours,

WOODARD & CURRAN, INC.

Randy E. Tome, P.E.
Project Manager

BSS/cmj
990047.01

Enclosures

the City written notice, by certified mail (restricted delivery to Duane Kline, Director of Finance, City of Portland, 389 Congress Street, Room 110, Portland, Maine) of the expiration of this escrow within sixty (60) days prior thereto. Otherwise, drafts may be submitted by the City of Portland no later than ninety (90) days following such notice, whenever given. Provided, however, that the City shall notify the Applicant of its intention to call on the guarantee and to retain the monies posted as guarantee. The City shall provide the Applicant thirty (30) days from the date of such notice in which to complete the noted improvements.

Seen and Agreed to: [Applicant]

By: _____



Pursuant to Portland Code of Ordinances, Chapter 14 §§501, 525:

By: _____
Director of Planning and Urban Development

Date: _____

By: _____
Director of Finance

Date: _____

By: _____
Corporation Counsel

Date: _____

Attach **Letter of Approval and Estimated Cost of Improvements** to this form.

Distribution

1. This information will be completed by Planning Staff.
2. The account number can be obtained by calling Paul Colpitts, ext. 8665.
3. The Agreement will be executed with one original and one copy.
4. The original and copy, each signed by the Developer, will be delivered to the Finance Office, together with a copy of the Report of Receipts form.
5. The Director of Finance will sign the copies, retain the original for their files and deliver the other signed copy to the Planning Office.
6. The Planning Office will keep one copy for their files and the original signed copy will be mailed to the Developer.



DeLUCA-HOFFMAN ASSOCIATES, INC.
CONSULTING ENGINEERS

778 MAIN STREET
SUITE 8
SOUTH PORTLAND, MAINE 04106
TEL. 207 775 1121
FAX 207 879 0896

- ROADWAY DESIGN
- ENVIRONMENTAL ENGINEERING
- TRAFFIC STUDIES AND MANAGEMENT
- PERMITTING
- AIRPORT ENGINEERING
- SITE PLANNING
- CONSTRUCTION ADMINISTRATION

MEMORANDUM

TO: Code Enforcement
Kandi Talbot, Planner

FROM: Chris Earle, Construction Representative
Reviewed by Steve Bushey, P.E., Acting Development Review Coordinator

DATE: November 14, 2000

RE: Certificate of Occupancy – 41 Hutchins Drive (Parking Lot)

On November 14, 2000, the site was reviewed for compliance with the conditions of approval.

It is our opinion that a **permanent certificate of occupancy could be issued**, assuming neither Code Enforcement nor Public Works has any outstanding issues.



Stormwater Management Plan
For
CAD-CAM Associates
Parking Lot Addition
Portland, Maine



WOODARD & CURRAN

Engineering • Science • Operations

41 Hutchins Drive
Portland, ME 04102

Tel. (207) 774-2112

June 2, 2000

INTRODUCTION

This report has been prepared to address stormwater management for the proposed work by CAD-CAM Associates at 41 Hutchins Drive, Portland, Maine. The project includes construction of a parking lot with new driveway and a bituminous pedestrian sidewalk north of the existing Woodard & Curran office.

The property is presently developed. The existing development includes buildings, paved and concrete surfaces, and landscaped areas. Stormwater management for the existing facility consists of piped stormdrain systems, catch basins, a detention basin, and culverts. The stormwater from the site drains to an unnamed brook that flows to the Stroudwater River. The site is bisected by the unnamed brook with both floodplain and non-floodplain wetlands associated with it.

SITE CHANGES

The project includes clearing and grubbing of a mostly softwood stand of forest to the extent necessary to grade and construct a parking area approximately 110 foot by 110 foot, ingress/egress driveway, 5' foot wide bituminous pedestrian sidewalk, and stormwater management controls. Approximately 17,000 square feet of impervious surface area will be created as part of this project. A copy of the Grading and Utilities Plan, sheet C-03 is attached in Appendix A.

STORMWATER CALCULATIONS

The intent of this section is to address the effects of site runoff from a proposed development project on the local watershed. The stormwater modeling presented compares the existing site conditions with the proposed site conditions when the project is complete (pre-development and post-development).

Stormwater modeling was done with the HydroCAD Stormwater Modeling System by Applied Microcomputer Systems. HydroCAD uses TR20 runoff calculation methodology. The computation sheets resulting from the modeling are attached as Appendix B to this report.

Soils information used in the computations was obtained from the Soil Survey of Cumberland County, Maine, USDA Soil Conservation Service. The project site is located in an area of Elmwood and Scantic soils. The Elmwood soils are mapped for the generally higher, drier topography of the site, while the Scantic soils are in the lower, wet regions. An interpretation of the delineation between soils was made using the site's wetland mapping. Selection of the hydrologic soil group for computation of runoff curve numbers assumes that the floodplain wetlands mapped for the project are Scantic soil and the remaining non-floodplain areas are Elmwood soil. The Scantic series soil is Hydrologic Soils Group "D" and the Elmwood series soil is Hydrologic Soils Group "C".

For this project, the 2, 10, and 25 year return frequency storms of 24 hour duration were analyzed. A Type III rainfall distribution was applied to these storms. The 2, 10, and 25 year 24 hour precipitation (2.6", 4.5", and 5.4", respectively) were taken from Section 5 of the City of Portland, Maine Technical and Design Standards and Guidelines, Adopted September 1987, Amended March 2000.

To model the project, the site was delineated by multiple drainage area subcatchments. Subcatchments 1 and 2 are the pre-development condition, representing the north and south side of the unnamed brook respectively. The two hydrographs for the pre-development condition (subcatchments 1 and 2) are

summed in Reach 1 to approximate the receiving unnamed brook. See the Pre-Development Stormwater Plan in Appendix A. Subcatchments 10, 11, 12, and 20 are the post-development condition. Additionally, subcatchment 11 is routed through pond 11 (parking area detention pond). The four hydrographs for the post-development condition (subcatchments 10, 12, 20 and pond 11) are summed in Reach 100 to approximate the same unnamed brook as the pre-development condition. See the Post-Development Stormwater Plan in Appendix A. The Watershed Routing diagram output from HydroCAD is attached in Appendix B. The runoff curve numbers (RCN) for the subcatchments have been computed using the TR55 methodology. The subcatchments were divided up based on land use and then acreage measurements were used to compute a weighted (composite) runoff curve number.

The time of concentration (Tc) paths for the subcatchments were selected to represent the most hydrologically remote point of the watershed. The Tc paths are shown respectively on the Pre-Development and Post-Development Stormwater Plans attached in Appendix A. Note that the Tc computations contain time calculations using both TR55 sheet flow and shallow concentrated flow equations, and also the 'Upland Method' as presented in the SCS National Engineering Handbook 4. The Upland Method permits a better estimation of travel time, particularly for shallow concentrated flow, because it has provisions for many land surface conditions, rather than just paved or unpaved surfaces which are presented in TR55.

Peak runoff values calculated for the pre-development and post-development conditions are listed in Table 1 below.

**TABLE 1
RUNOFF SUMMARY**

REACH	PEAK RUNOFF 2 yr (cfs)	PEAK RUNOFF 10 yr (cfs)	PEAK RUNOFF 25 yr (cfs)
1 (Pre-Development)	3	8	11
100 (Post-Development)	3	8	11
CHANGE IN RUNOFF	0	0	0

As shown in Table 1 and the appended calculations, by utilizing a controlled outlet structure at the parking area detention pond, runoff from the site is controlled and remains unchanged for the 2, 10, and 25 year storms as a result of the post-development condition.

DRAINAGE DESIGN

The proposed project requires changes to the stormwater drainage system. These changes include the grading of areas to include the parking area detention pond, grassed drainage channel, a culvert beneath the new driveways and a riprap apron at the culvert's outlet end. These improvements would direct the stormwater off the proposed roadway surfaces.

The parking area detention pond stage-storage data is attached in Appendix B with the HydroCAD output. The peak water level elevation within the pond for the 25 year storm event is 48.7 feet, for a water depth of 2.7 feet. The primary outlet from the pond is a 1" diameter hole drilled into a closed/capped corrugated polyethylene (CPE) culvert, while the secondary outlet from the pond is a 2" diameter hole drilled into the cap (see Pond Outlet detail on sheet C-05 in Appendix A). The overflow outlet elevation shall be set at elevation 48.5 to accommodate the 25 year storm event. The flood elevation for the pond, or the point at which the water level overtops the embankment, is 49.5 feet. Utilizing an engineered controlled outlet structure for the pond, attenuation of 21% and a lag of 5.2 minutes are achieved for the 25 year 24 hour storm event. The primary and secondary outlets both flow through 12" corrugated polyethylene (CPE) culvert to the riprap apron at the south of the pond.

The pond outlet riprap apron was designed using Maine Conservation Practice Hydraulic Design Package E-DES-HY version date 10-17-96 and the Maine Erosion and Sediment Control Handbook for Construction Best Management Practices. For peak flow in subcatchment 11 for the 25 year 24 hour storm, a riprap apron lined with $D_{50} = 4$ inch stone is acceptable. A copy of the design calculations is attached in Appendix C. A copy of the detail for the riprap apron is included (see Riprap Apron detail on sheet C-04) in Appendix A.

The riprap apron outlet to the 15" CPE culvert beneath the driveway was designed using Maine Conservation Practice Hydraulic Design Package E-DES-HY version date 10-17-96 and the Maine Erosion and Sediment Control Handbook for Construction Best Management Practices. The flow from the upstream 12" CMP culvert was calculated based upon the capacity of that culvert at full pipe flow, 3.2 cfs. Peak flow from subcatchment 12 for the 25 year 24 hour storm was added to the 3.2 cfs upstream flow to define the design flow for the 15" CPE, 5.36 cfs. For the 5.36 cfs flow, a riprap apron lined with $D_{50} = 6$ inch stone is acceptable. A copy of the design calculations is attached in Appendix C. A copy of the detail for the riprap apron is included (see Riprap Apron detail on sheet C-04) in Appendix A.

CONCLUSION

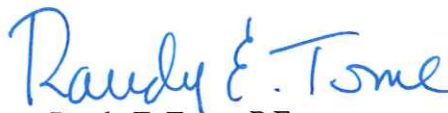
The proposed project does not cause or increase flooding on-site or on adjacent properties nor create an unreasonable flood hazard to a structure. As such, the proposed project does not alter the existing land use of the site.

Prepared By:



Barry Sheff
Engineer
Woodard & Curran

Reviewed By:



Randy E. Tome, P.E.
Project Manager
Woodard & Curran

**APPENDIX A
DRAWINGS AND FIGURES**

**APPENDIX B
HYDROCAD CALCULATIONS**

Data for W&C PARKING LOT ADDITION

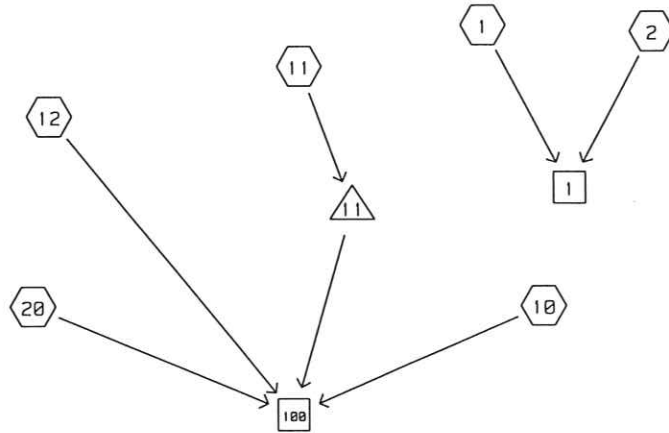
TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

Prepared by WOODARD & CURRAN

31 May 00

HydroCAD 5.01 001204 (c) 1986-1998 Applied Microcomputer Systems

WATERSHED ROUTING =====



SUBCATCHMENT 1	= PRE-DEVELOPMENT NORTH	-> REACH 1
SUBCATCHMENT 2	= PRE-DEVELOPMENT SOUTH	-> REACH 1
SUBCATCHMENT 10	= POST-DEVELOPMENT NORTH-CENTRAL	-> REACH 100
SUBCATCHMENT 11	= POST-DEVELOPMENT CENTRAL	-> POND 11
SUBCATCHMENT 12	= POST-DEVELOPMENT NORTH	-> REACH 100
SUBCATCHMENT 20	= POST-DEVELOPMENT SOUTH	-> REACH 100
REACH 1	=	->
REACH 100	=	->
POND 11	= POST-DEVELOPMENT DETENTION POND	-> REACH 100

Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

Prepared by WOODARD & CURRAN

31 May 00

HydroCAD 5.01 001204 (c) 1986-1998 Applied Microcomputer Systems

SUBCATCHMENT 1

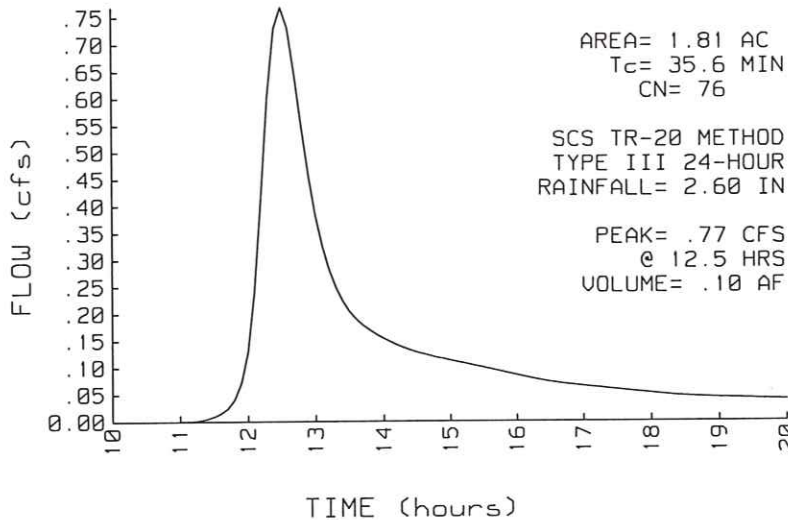
PRE-DEVELOPMENT NORTH

PEAK= .77 CFS @ 12.50 HRS, VOLUME= .10 AF

ACRES	CN		SCS TR-20 METHOD
.24	79	WOODS (FAIR) -HSG "D"	TYPE III 24-HOUR
1.09	73	WOODS (FAIR) -HSG "C"	RAINFALL= 2.60 IN
.38	79	OPEN SPACE (FAIR) -HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.10	98	IMPERVIOUS (ROAD)	
1.81	76		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	11.5
Woods: Light underbrush n=.4 L=57' P2=2.6 in s=.04 '/'		
TR-55 SHEET FLOW	Segment ID:BC	21.8
Woods: Light underbrush n=.4 L=200' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.7
Woodland Kv=5 L=73' s=.11 '/' V=1.66 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	1.6
Woodland Kv=5 L=110' s=.05 '/' V=1.12 fps		
Total Length= 440 ft		Total Tc= 35.6

SUBCATCHMENT 1 RUNOFF
PRE-DEVELOPMENT NORTH



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

Prepared by WOODARD & CURRAN

31 May 00

HydroCAD 5.01 001204 (c) 1986-1998 Applied Microcomputer Systems

SUBCATCHMENT 2

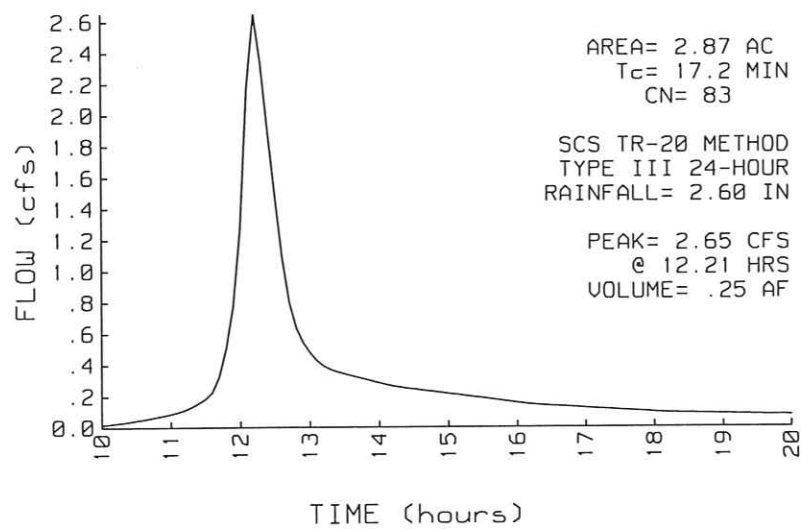
PRE-DEVELOPMENT SOUTH

PEAK= 2.65 CFS @ 12.21 HRS, VOLUME= .25 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 2.60 IN
.22	79	WOODS (FAIR)-HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 2 RUNOFF
PRE-DEVELOPMENT SOUTH



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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SUBCATCHMENT 10

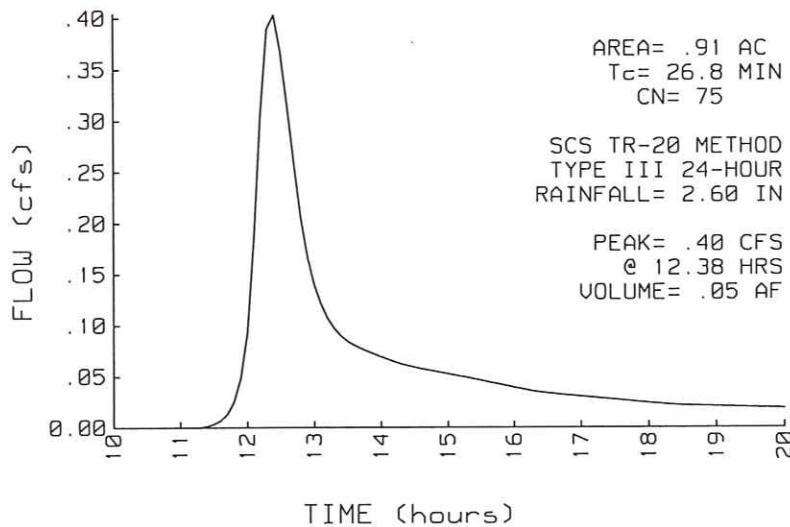
POST-DEVELOPMENT NORTH-CENTRAL

PEAK= .40 CFS @ 12.38 HRS, VOLUME= .05 AF

ACRES	CN		SCS TR-20 METHOD
0.00	98	IMPERVIOUS (PAVEMENT)	TYPE III 24-HOUR
.54	73	WOODS (FAIR)-HSG "C"	RAINFALL= 2.60 IN
.13	74	OPEN SPACE (GOOD)-HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.24	79	WOODS (FAIR)-HSG "D"	
.91	75		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	6.5
Woods: Light underbrush n=.4	L=37' P2=2.6 in s=.07 '/'	
TR-55 SHEET FLOW	Segment ID:BC	18.6
Woods: Light underbrush n=.4	L=194' P2=2.6 in s=.14 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	1.7
Woodland Kv=5	L=99' s=.04 '/' V=1 fps	
Total Length= 330 ft		Total Tc= 26.8

SUBCATCHMENT 10 RUNOFF
POST-DEVELOPMENT NORTH-CENTRAL



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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SUBCATCHMENT 11

POST-DEVELOPMENT CENTRAL

PEAK= .75 CFS @ 11.99 HRS, VOLUME= .05 AF

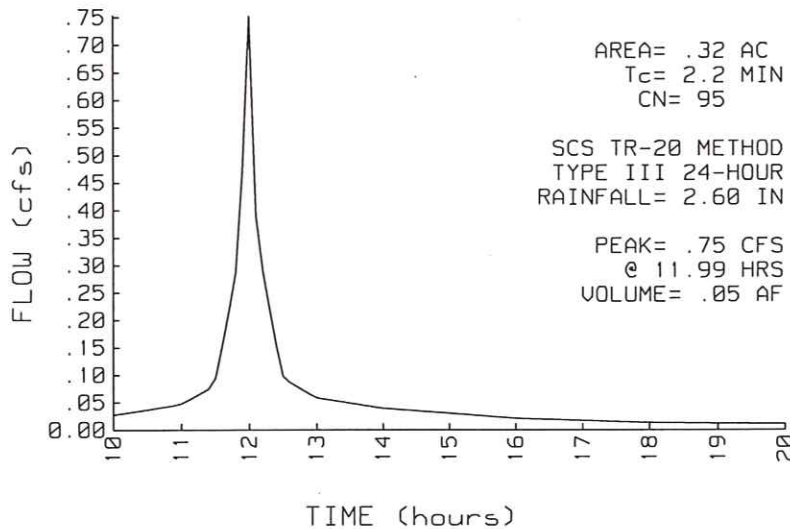
ACRES	CN
.27	98
.04	74
.01	89
.32	95

IMPERVIOUS (PARKING LOT)
 OPEN SPACE (GOOD) -HSG "C"
 RIP RAP-HSG "C"

SCS TR-20 METHOD
 TYPE III 24-HOUR
 RAINFALL= 2.60 IN
 SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	1.2
Smooth surfaces n=.011 L=106'	P2=2.6 in s=.0303 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.1
Kv=7 L=14' s=.33 '/' V=4.02 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.9
Short Grass Pasture Kv=7 L=55' s=.02 '/' V=.99 fps		
Total Length= 175 ft		Total Tc= 2.2

SUBCATCHMENT 11 RUNOFF
 POST-DEVELOPMENT CENTRAL



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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SUBCATCHMENT 12

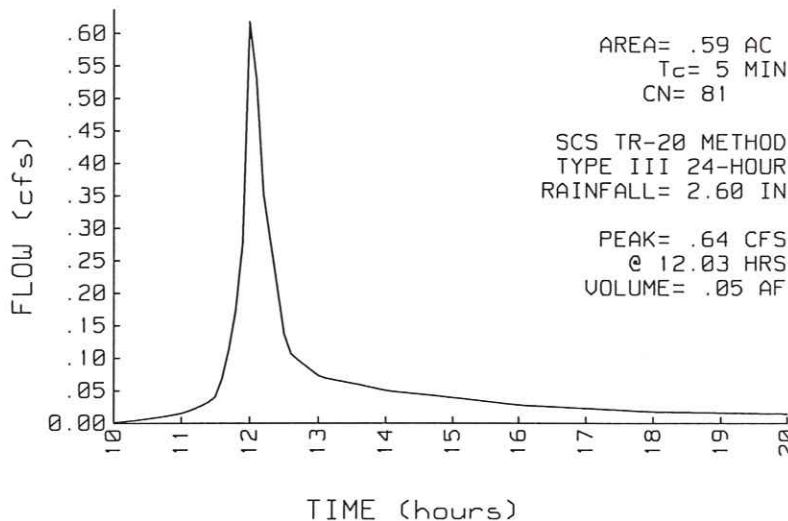
POST-DEVELOPMENT NORTH

PEAK= .64 CFS @ 12.03 HRS, VOLUME= .05 AF

ACRES	CN		SCS TR-20 METHOD
.02	73	WOODS (FAIR) -HSG "C"	TYPE III 24-HOUR
.40	74	OPEN SPACE (GOOD) -HSG "C"	RAINFALL= 2.60 IN
.17	98	IMPERVIOUS	SPAN= 10-20 HRS, dt=.1 HRS
.59	81		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	1.5
Grass: Dense n=.24 L=16' P2=2.6 in s=.19 '/'		
TR-55 SHEET FLOW	Segment ID:BC	.9
Grass: Dense n=.24 L=13' P2=2.6 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	1.3
Grassed Waterway Kv=15 L=185' s=.027 '/' V=2.46 fps		
CIRCULAR CHANNEL	SEGMENT ID:DE	.2
15" Diameter a=1.23 sq-ft Pw=3.9' r=.313'		
s=.01 '/' n=.012 V=5.7 fps L=60' Capacity=7 cfs		
SHALLOW CONCENTRATED/UPLAND FLOW	SEGMENT ID:EF	1.1
Grassed Waterway Kv=15 L=165' s=.03 '/' V=2.6 fps		
Total Length= 439 ft		Total Tc= 5.0

SUBCATCHMENT 12 RUNOFF
POST-DEVELOPMENT NORTH



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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SUBCATCHMENT 20

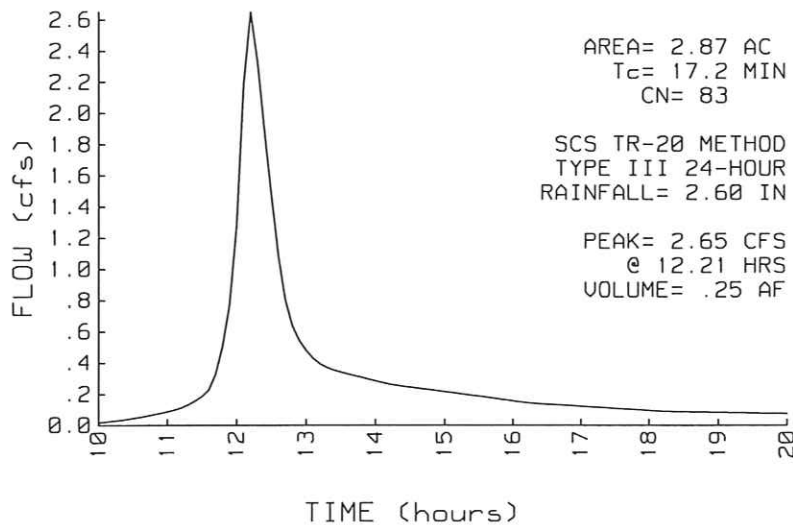
POST-DEVELOPMENT SOUTH

PEAK= 2.65 CFS @ 12.21 HRS, VOLUME= .25 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 2.60 IN
.22	79	WOODS (FAIR)-HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 20 RUNOFF
POST-DEVELOPMENT SOUTH



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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REACH 1

Not described

Qin = 3.11 CFS @ 12.23 HRS, VOLUME= .35 AF

Qout= 3.11 CFS @ 12.23 HRS, VOLUME= .35 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH END AREA DISCH
(FT) (SQ-FT) (CFS)

- METHOD

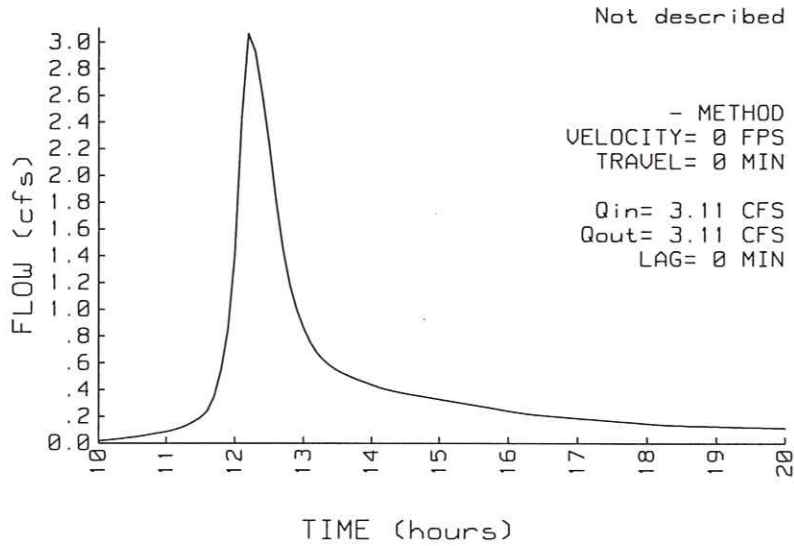
PEAK DEPTH= 0.00 FT

PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 1 INFLOW & OUTFLOW



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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REACH 100

Not described

Qin = 3.34 CFS @ 12.21 HRS, VOLUME= .36 AF

Qout= 3.34 CFS @ 12.21 HRS, VOLUME= .36 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH END AREA DISCH
(FT) (SQ-FT) (CFS)

- METHOD

PEAK DEPTH= 0.00 FT

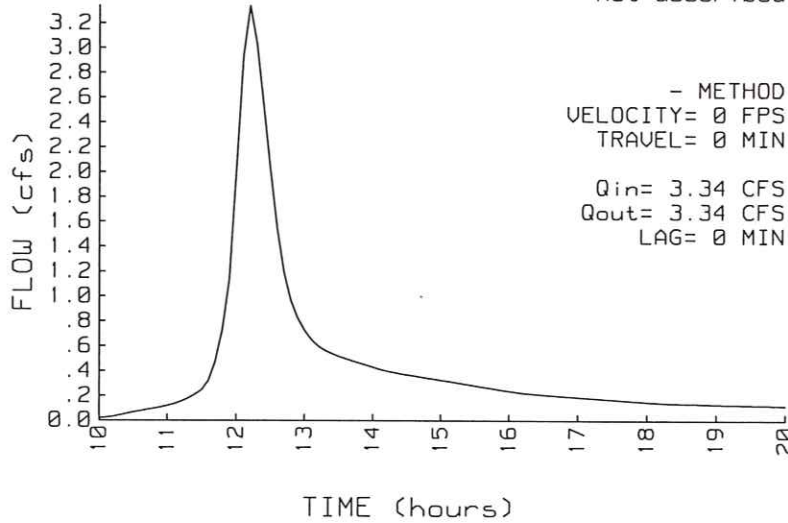
PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 100 INFLOW & OUTFLOW

Not described



Data for W&C PARKING LOT ADDITION

TYPE III 2-YEAR 24-HOUR RAINFALL= 2.60 IN

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POND 11

POST-DEVELOPMENT DETENTION POND

Qin = .75 CFS @ 11.99 HRS, VOLUME= .05 AF
 Qout= .16 CFS @ 12.40 HRS, VOLUME= .05 AF, ATTEN= 79%, LAG= 24.1 MIN
 Qpri= .03 CFS @ 12.40 HRS, VOLUME= .02 AF
 Qsec= .12 CFS @ 12.40 HRS, VOLUME= .03 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)	STOR-IND METHOD
46.0	10	0	0	PEAK STORAGE = 739 CF
47.0	117	64	64	PEAK ELEVATION= 48.3 FT
48.0	674	396	459	FLOOD ELEVATION= 49.0 FT
49.0	1276	975	1434	START ELEVATION= 46.0 FT
				SPAN= 10-20 HRS, dt=.1 HRS
				Tdet= 49.3 MIN (.05 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	46.5'	1" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
2	S	46.8'	2" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
3	S	48.5'	3.1' SHARP-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.27+.4 H/.5 L=Length-0(.1 H)

Primary Discharge

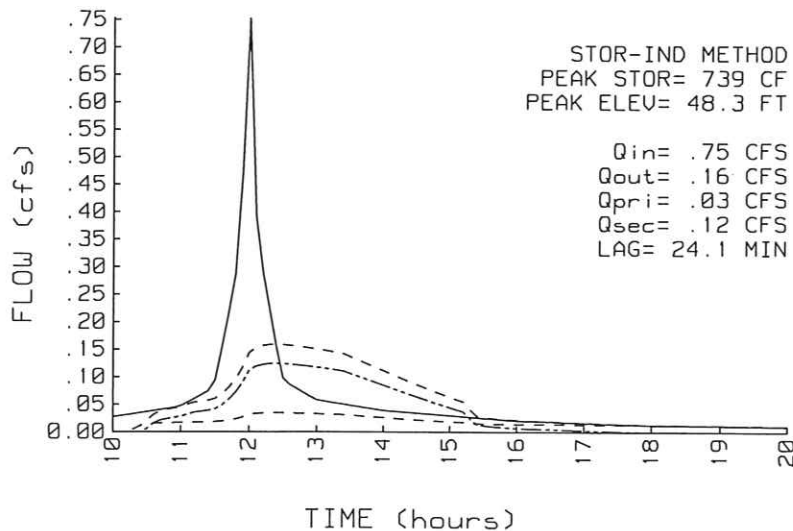
└─1=Orifice/Grate

Secondary Discharge

└─2=Orifice/Grate

└─3=Sharp-Crested Rectangular Weir

POND 11 INFLOW & OUTFLOW
POST-DEVELOPMENT DETENTION POND



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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31 May 00

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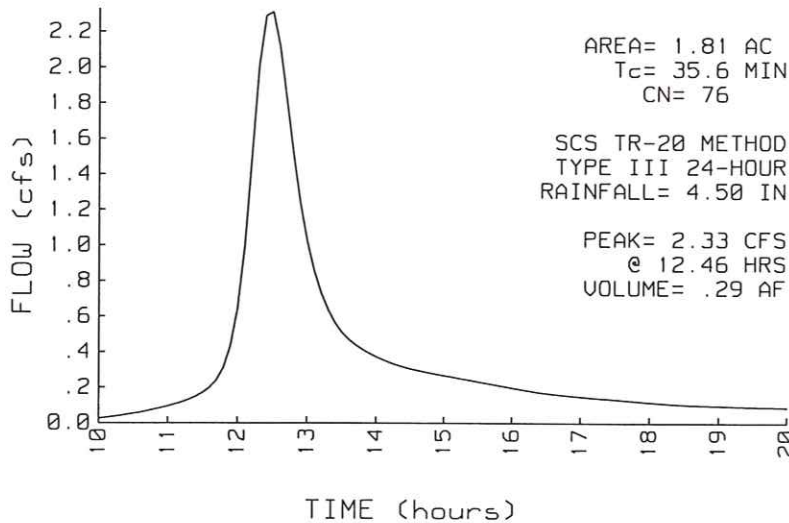
SUBCATCHMENT 1 PRE-DEVELOPMENT NORTH

PEAK= 2.33 CFS @ 12.46 HRS, VOLUME= .29 AF

ACRES	CN		SCS TR-20 METHOD
.24	79	WOODS (FAIR)-HSG "D"	TYPE III 24-HOUR
1.09	73	WOODS (FAIR)-HSG "C"	RAINFALL= 4.50 IN
.38	79	OPEN SPACE (FAIR)-HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.10	98	IMPERVIOUS (ROAD)	
1.81	76		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	11.5
Woods: Light underbrush n=.4 L=57' P2=2.6 in s=.04 '/'		
TR-55 SHEET FLOW	Segment ID:BC	21.8
Woods: Light underbrush n=.4 L=200' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.7
Woodland Kv=5 L=73' s=.11 '/' V=1.66 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	1.6
Woodland Kv=5 L=110' s=.05 '/' V=1.12 fps		
Total Length= 440 ft		Total Tc= 35.6

**SUBCATCHMENT 1 RUNOFF
PRE-DEVELOPMENT NORTH**



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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SUBCATCHMENT 2

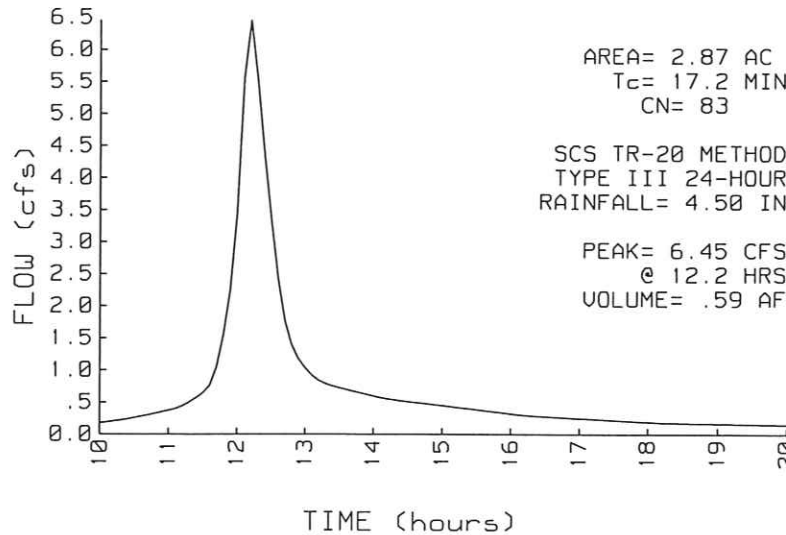
PRE-DEVELOPMENT SOUTH

PEAK= 6.45 CFS @ 12.20 HRS, VOLUME= .59 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 4.50 IN
.22	79	WOODS (FAIR)-HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 2 RUNOFF
PRE-DEVELOPMENT SOUTH



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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SUBCATCHMENT 10

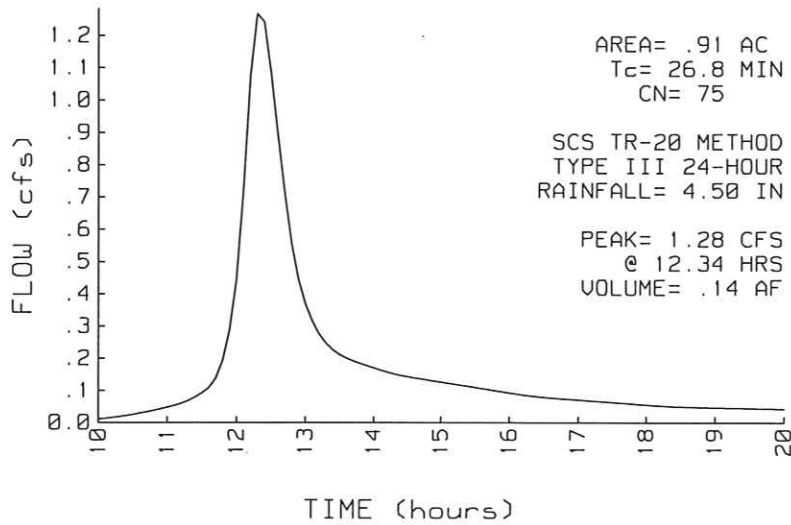
POST-DEVELOPMENT NORTH-CENTRAL

PEAK= 1.28 CFS @ 12.34 HRS, VOLUME= .14 AF

ACRES	CN		SCS TR-20 METHOD
0.00	98	IMPERVIOUS (PAVEMENT)	TYPE III 24-HOUR
.54	73	WOODS (FAIR)-HSG "C"	RAINFALL= 4.50 IN
.13	74	OPEN SPACE (GOOD)-HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.24	79	WOODS (FAIR)-HSG "D"	
.91	75		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	6.5
Woods: Light underbrush	n=.4 L=37' P2=2.6 in s=.07 '/'	
TR-55 SHEET FLOW	Segment ID:BC	18.6
Woods: Light underbrush	n=.4 L=194' P2=2.6 in s=.14 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	1.7
Woodland	Kv=5 L=99' s=.04 '/' V=1 fps	
Total Length= 330 ft		Total Tc= 26.8

SUBCATCHMENT 10 RUNOFF
POST-DEVELOPMENT NORTH-CENTRAL



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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SUBCATCHMENT 11

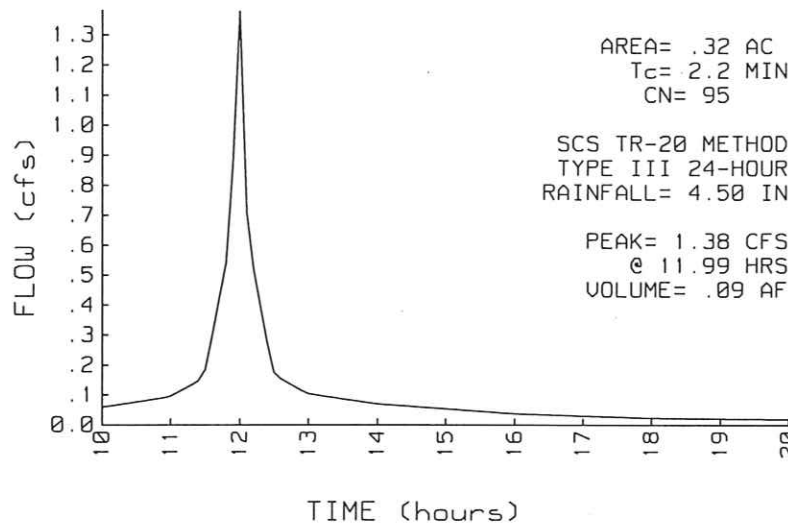
POST-DEVELOPMENT CENTRAL

PEAK= 1.38 CFS @ 11.99 HRS, VOLUME= .09 AF

ACRES	CN		SCS TR-20 METHOD
.27	98	IMPERVIOUS (PARKING LOT)	TYPE III 24-HOUR
.04	74	OPEN SPACE (GOOD) -HSG "C"	RAINFALL= 4.50 IN
.01	89	RIP RAP-HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.32	95		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	1.2
Smooth surfaces n=.011 L=106'	P2=2.6 in s=.0303 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.1
Kv=7 L=14' s=.33 '/' V=4.02 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.9
Short Grass Pasture Kv=7 L=55' s=.02 '/' V=.99 fps		
Total Length= 175 ft		Total Tc= 2.2

SUBCATCHMENT 11 RUNOFF
POST-DEVELOPMENT CENTRAL



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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SUBCATCHMENT 12

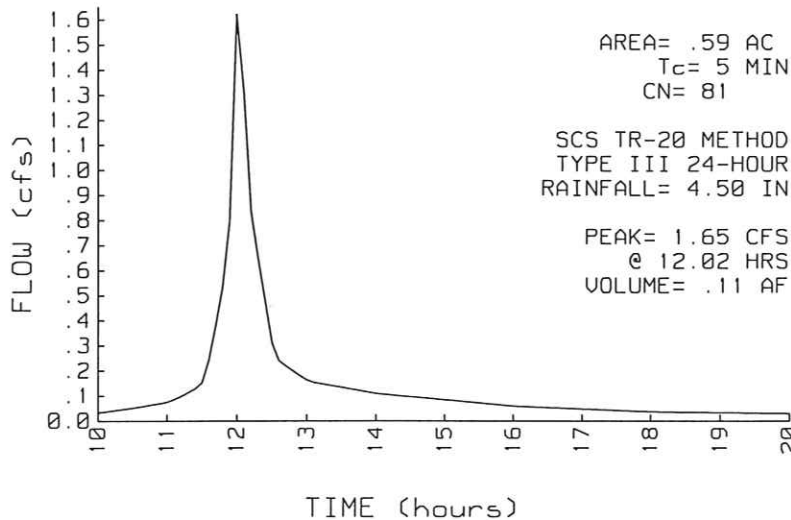
POST-DEVELOPMENT NORTH

PEAK= 1.65 CFS @ 12.02 HRS, VOLUME= .11 AF

ACRES	CN		SCS TR-20 METHOD
.02	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.40	74	OPEN SPACE (GOOD)-HSG "C"	RAINFALL= 4.50 IN
.17	98	IMPERVIOUS	SPAN= 10-20 HRS, dt=.1 HRS
.59	81		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	1.5
Grass: Dense n=.24 L=16' P2=2.6 in s=.19 '/'		
TR-55 SHEET FLOW	Segment ID:BC	.9
Grass: Dense n=.24 L=13' P2=2.6 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	1.3
Grassed Waterway Kv=15 L=185' s=.027 '/' V=2.46 fps		
CIRCULAR CHANNEL	SEGMENT ID:DE	.2
15" Diameter a=1.23 sq-ft Pw=3.9' r=.313'		
s=.01 '/' n=.012 V=5.7 fps L=60' Capacity=7 cfs		
SHALLOW CONCENTRATED/UPLAND FLOW	SEGMENT ID:EF	1.1
Grassed Waterway Kv=15 L=165' s=.03 '/' V=2.6 fps		
Total Length= 439 ft		Total Tc= 5.0

SUBCATCHMENT 12 RUNOFF
POST-DEVELOPMENT NORTH



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

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SUBCATCHMENT 20

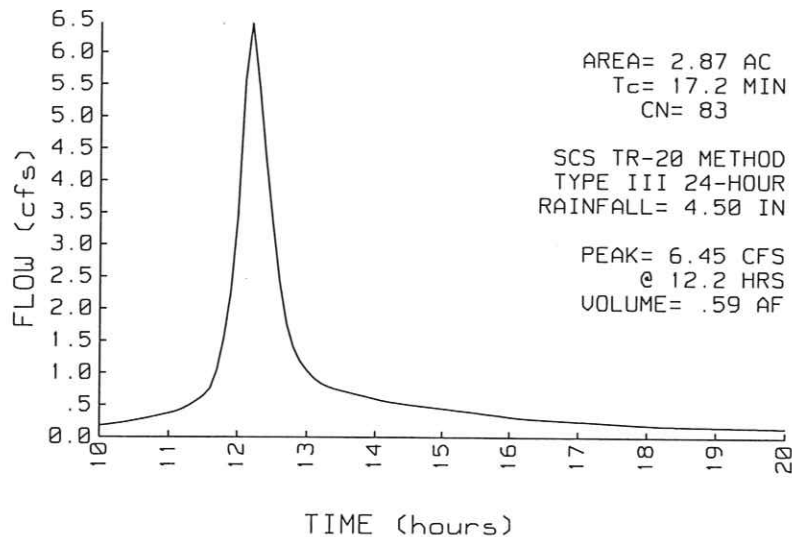
POST-DEVELOPMENT SOUTH

PEAK= 6.45 CFS @ 12.20 HRS, VOLUME= .59 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 4.50 IN
.22	79	WOODS (FAIR)-HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 20 RUNOFF
POST-DEVELOPMENT SOUTH



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

Prepared by WOODARD & CURRAN

31 May 00

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REACH 1

Not described

Qin = 8.02 CFS @ 12.23 HRS, VOLUME= .89 AF

Qout= 8.02 CFS @ 12.23 HRS, VOLUME= .89 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
---------------	---------------------	----------------

- METHOD

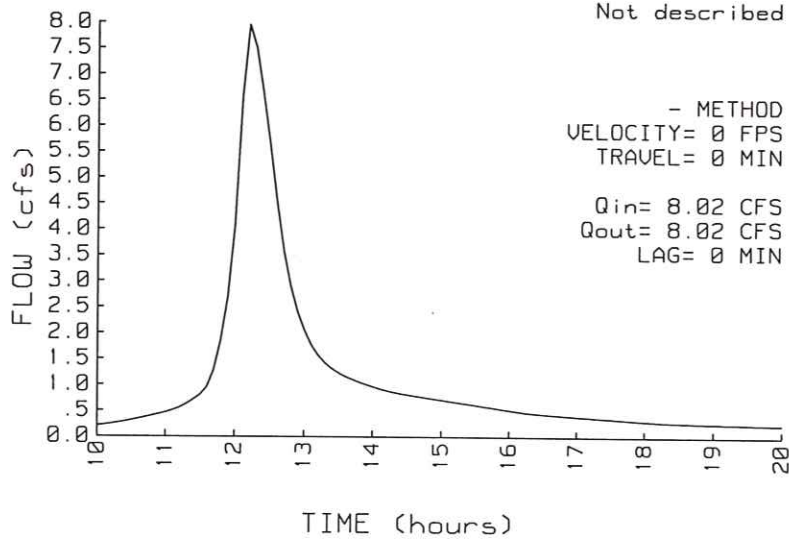
PEAK DEPTH= 0.00 FT

PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 1 INFLOW & OUTFLOW



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

Prepared by WOODARD & CURRAN

31 May 00

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REACH 100

Not described

Qin = 8.40 CFS @ 12.19 HRS, VOLUME= .87 AF

Qout= 8.40 CFS @ 12.19 HRS, VOLUME= .87 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH END AREA DISCH
 (FT) (SQ-FT) (CFS)

- METHOD

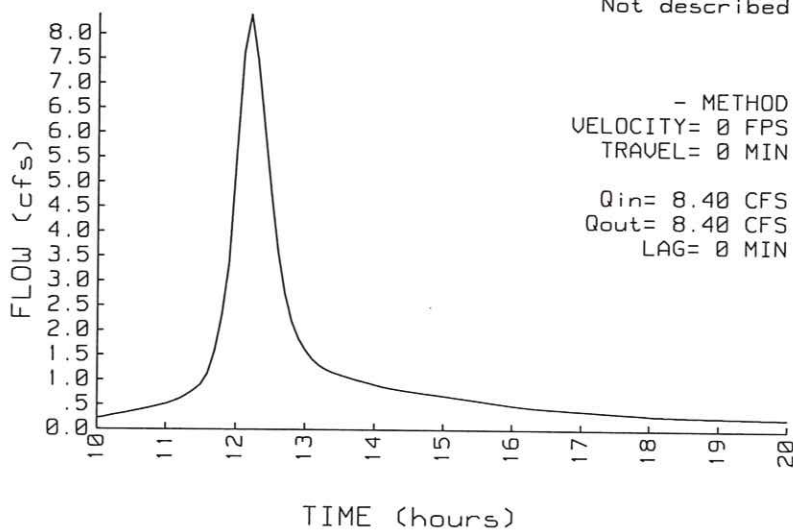
PEAK DEPTH= 0.00 FT

PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 100 INFLOW & OUTFLOW



TYPE III 10-YEAR 24-HOUR RAINFALL= 4.50 IN

Prepared by WOODARD & CURRAN

31 May 00

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POND 11

POST-DEVELOPMENT DETENTION POND

Q_{in} = 1.38 CFS @ 11.99 HRS, VOLUME= .09 AF
 Q_{out}= 1.03 CFS @ 12.11 HRS, VOLUME= .09 AF, ATTEN= 26%, LAG= 7.2 MIN
 Q_{pri}= .04 CFS @ 12.12 HRS, VOLUME= .02 AF
 Q_{sec}= .99 CFS @ 12.11 HRS, VOLUME= .07 AF

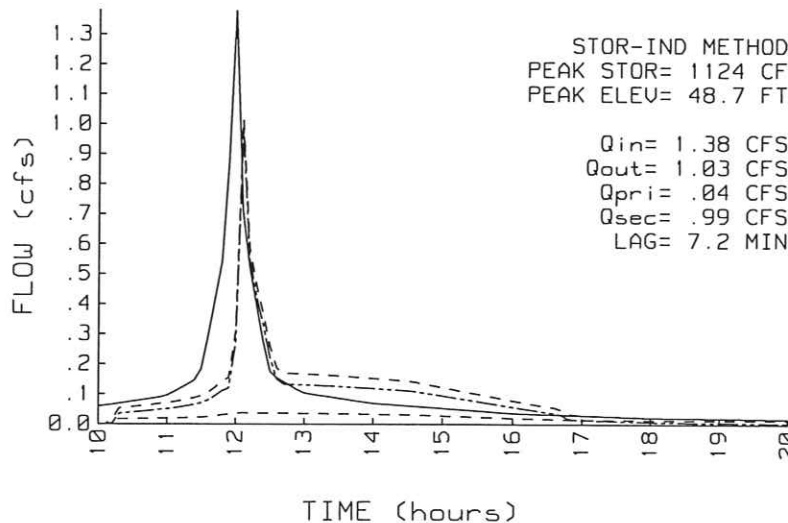
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)	STOR-IND METHOD
46.0	10	0	0	PEAK STORAGE = 1124 CF
47.0	117	64	64	PEAK ELEVATION= 48.7 FT
48.0	674	396	459	FLOOD ELEVATION= 49.0 FT
49.0	1276	975	1434	START ELEVATION= 46.0 FT
				SPAN= 10-20 HRS, dt=.1 HRS
				Tdet= 48.5 MIN (.09 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	46.5'	1" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
2	S	46.8'	2" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
3	S	48.5'	3.1' SHARP-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.27+.4 H/.5 L=Length-0(.1 H)

Primary Discharge
 └─1=Orifice/Grate

Secondary Discharge
 └─2=Orifice/Grate
 └─3=Sharp-Crested Rectangular Weir

POND 11 INFLOW & OUTFLOW
 POST-DEVELOPMENT DETENTION POND



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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31 May 00

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SUBCATCHMENT 1

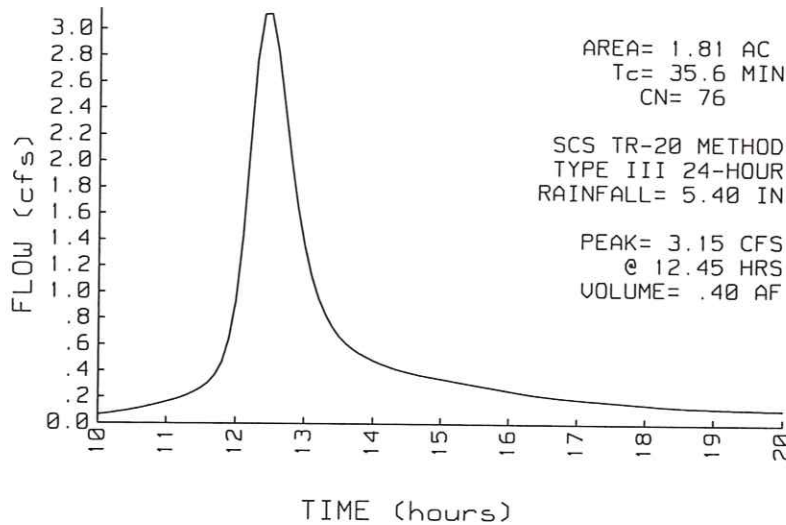
PRE-DEVELOPMENT NORTH

PEAK= 3.15 CFS @ 12.45 HRS, VOLUME= .40 AF

ACRES	CN		SCS TR-20 METHOD
.24	79	WOODS (FAIR)-HSG "D"	TYPE III 24-HOUR
1.09	73	WOODS (FAIR)-HSG "C"	RAINFALL= 5.40 IN
.38	79	OPEN SPACE (FAIR)-HSG "C"	SPAN= 10-20 HRS, dt=.1 HRS
.10	98	IMPERVIOUS (ROAD)	
1.81	76		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	11.5
Woods: Light underbrush n=.4	L=57' P2=2.6 in s=.04 '/'	
TR-55 SHEET FLOW	Segment ID:BC	21.8
Woods: Light underbrush n=.4	L=200' P2=2.6 in s=.1 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.7
Woodland Kv=5 L=73' s=.11 '/'	V=1.66 fps	
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	1.6
Woodland Kv=5 L=110' s=.05 '/'	V=1.12 fps	
Total Length= 440 ft		Total Tc= 35.6

SUBCATCHMENT 1 RUNOFF
PRE-DEVELOPMENT NORTH



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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SUBCATCHMENT 2

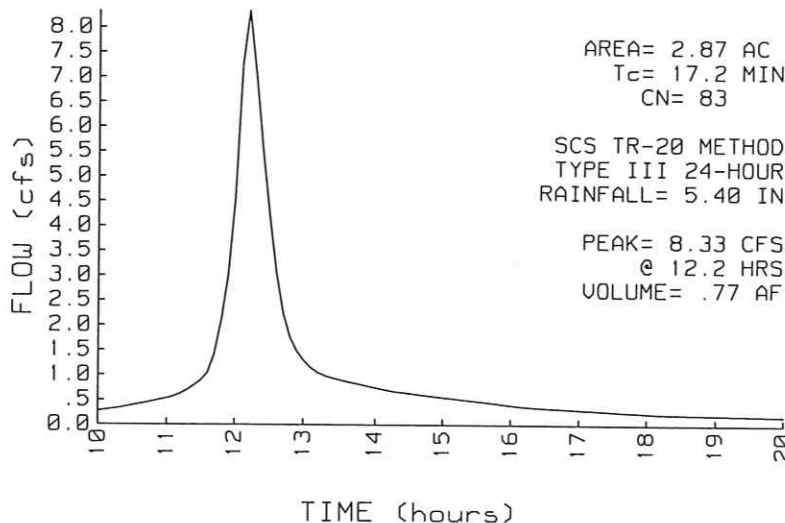
PRE-DEVELOPMENT SOUTH

PEAK= 8.33 CFS @ 12.20 HRS, VOLUME= .77 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR) -HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 5.40 IN
.22	79	WOODS (FAIR) -HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 2 RUNOFF
PRE-DEVELOPMENT SOUTH



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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SUBCATCHMENT 12

POST-DEVELOPMENT NORTH

PEAK= 2.16 CFS @ 12.02 HRS, VOLUME= .15 AF

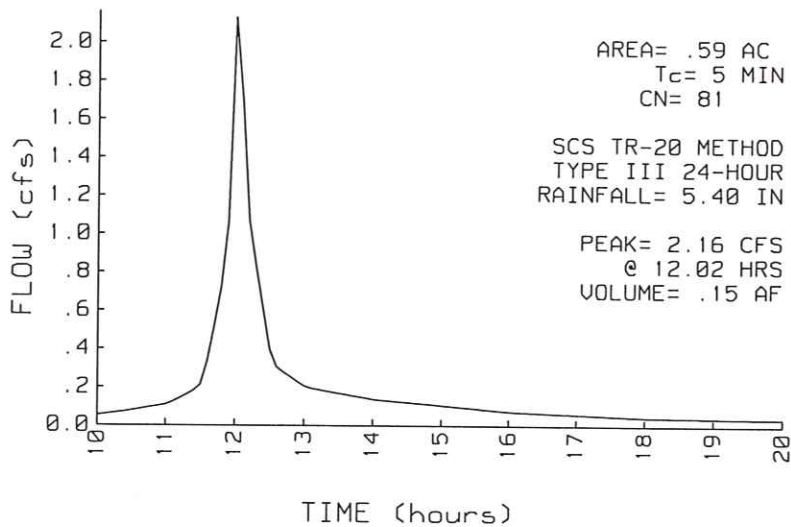
ACRES	CN
.02	73
.40	74
.17	98
.59	81

WOODS (FAIR) -HSG "C"
 OPEN SPACE (GOOD) -HSG "C"
 IMPERVIOUS

SCS TR-20 METHOD
 TYPE III 24-HOUR
 RAINFALL= 5.40 IN
 SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	1.5
Grass: Dense n=.24 L=16' P2=2.6 in s=.19 '/'		
TR-55 SHEET FLOW	Segment ID:BC	.9
Grass: Dense n=.24 L=13' P2=2.6 in s=.5 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	1.3
Grassed Waterway Kv=15 L=185' s=.027 '/' V=2.46 fps		
CIRCULAR CHANNEL	SEGMENT ID:DE	.2
15" Diameter a=1.23 sq-ft Pw=3.9' r=.313' s=.01 '/' n=.012 V=5.7 fps L=60' Capacity=7 cfs		
SHALLOW CONCENTRATED/UPLAND FLOW	SEGMENT ID:EF	1.1
Grassed Waterway Kv=15 L=165' s=.03 '/' V=2.6 fps		
Total Length= 439 ft		Total Tc= 5.0

SUBCATCHMENT 12 RUNOFF
 POST-DEVELOPMENT NORTH



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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SUBCATCHMENT 20

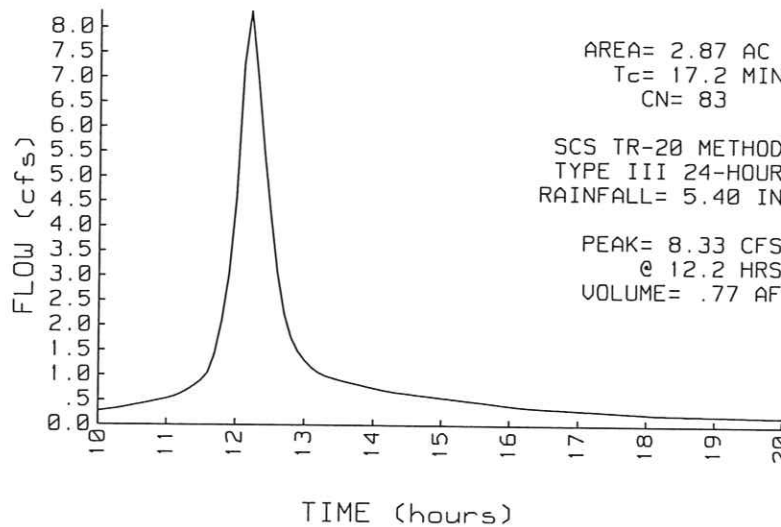
POST-DEVELOPMENT SOUTH

PEAK= 8.33 CFS @ 12.20 HRS, VOLUME= .77 AF

ACRES	CN		SCS TR-20 METHOD
.70	73	WOODS (FAIR)-HSG "C"	TYPE III 24-HOUR
.89	74	OPEN SPACE (GOODG "C"	RAINFALL= 5.40 IN
.22	79	WOODS (FAIR)-HSD "D"	SPAN= 10-20 HRS, dt=.1 HRS
1.06	98	IMPERVIOUS (BLDG, PAVEMENT)	
2.87	83		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:AB	15.4
Woods: Light underbrush n=.4 L=130' P2=2.6 in s=.1 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:BC	.4
Paved Kv=20.3282 L=67' s=.02 '/' V=2.87 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:CD	.1
Short Grass Pasture Kv=7 L=15' s=.23 '/' V=3.36 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:DE	.5
Paved Kv=20.3282 L=149' s=.05 '/' V=4.55 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:EF	.1
Short Grass Pasture Kv=7 L=20' s=.28 '/' V=3.7 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:FG	.7
Woodland Kv=5 L=72' s=.13 '/' V=1.8 fps		
Total Length= 453 ft		Total Tc= 17.2

SUBCATCHMENT 20 RUNOFF
POST-DEVELOPMENT SOUTH



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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REACH 1

Not described

Qin = 10.50 CFS @ 12.22 HRS, VOLUME= 1.16 AF

Qout= 10.50 CFS @ 12.22 HRS, VOLUME= 1.16 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH END AREA DISCH
(FT) (SQ-FT) (CFS)

- METHOD

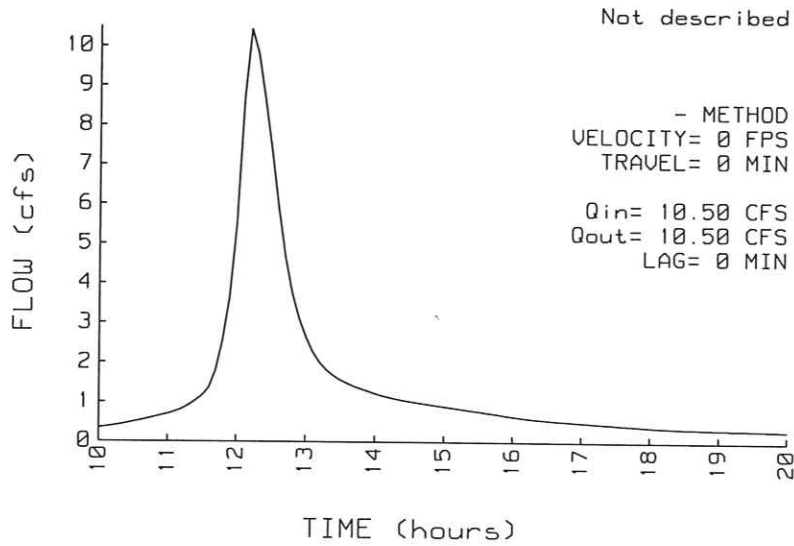
PEAK DEPTH= 0.00 FT

PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 1 INFLOW & OUTFLOW



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

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REACH 100

Not described

Qin = 10.94 CFS @ 12.19 HRS, VOLUME= 1.13 AF

Qout= 10.94 CFS @ 12.19 HRS, VOLUME= 1.13 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH END AREA DISCH
(FT) (SQ-FT) (CFS)

- METHOD

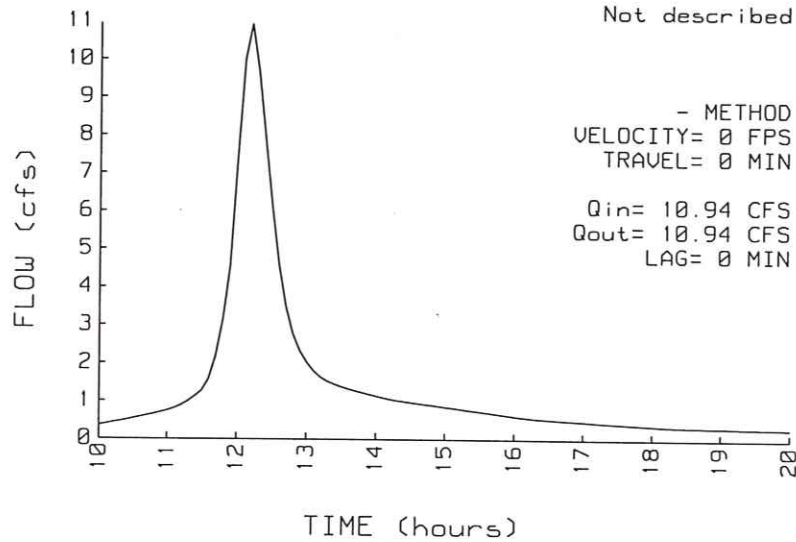
PEAK DEPTH= 0.00 FT

PEAK VELOCITY= 0.0 FPS

TRAVEL TIME = 0.0 MIN

SPAN= 10-20 HRS, dt=.1 HRS

REACH 100 INFLOW & OUTFLOW



Data for W&C PARKING LOT ADDITION

TYPE III 25-YEAR 24-HOUR RAINFALL= 5.40 IN

Prepared by WOODARD & CURRAN

31 May 00

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POND 11

POST-DEVELOPMENT DETENTION POND

Qin = 1.67 CFS @ 11.99 HRS, VOLUME= .11 AF
 Qout= 1.32 CFS @ 12.08 HRS, VOLUME= .11 AF, ATTEN= 21%, LAG= 5.2 MIN
 Qpri= .04 CFS @ 12.08 HRS, VOLUME= .02 AF
 Qsec= 1.28 CFS @ 12.08 HRS, VOLUME= .09 AF

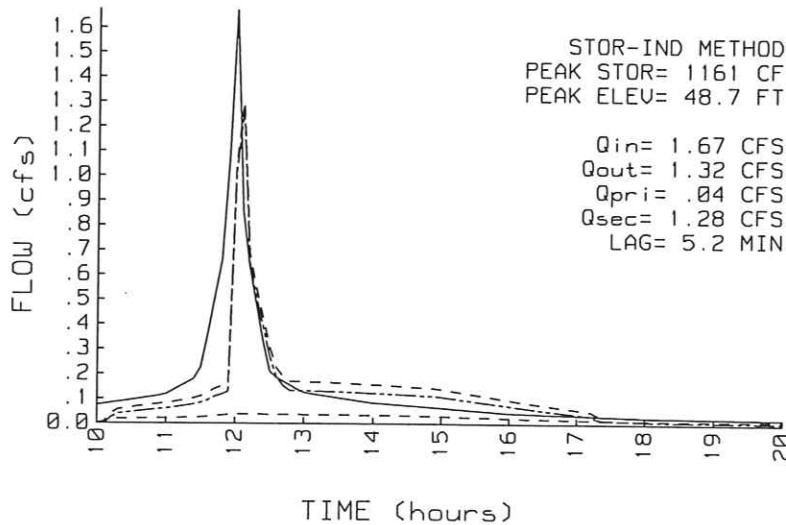
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)	STOR-IND METHOD
46.0	10	0	0	PEAK STORAGE = 1161 CF
47.0	117	64	64	PEAK ELEVATION= 48.7 FT
48.0	674	396	459	FLOOD ELEVATION= 49.0 FT
49.0	1276	975	1434	START ELEVATION= 46.0 FT
				SPAN= 10-20 HRS, dt=.1 HRS
				Tdet= 45.6 MIN (.11 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	46.5'	1" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
2	S	46.8'	2" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r)
3	S	48.5'	3.1' SHARP-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.27+.4 H/.5 L=Length-0(.1 H)

Primary Discharge
 └─1=Orifice/Grate

Secondary Discharge
 └─2=Orifice/Grate
 └─3=Sharp-Crested Rectangular Weir

POND 11 INFLOW & OUTFLOW
 POST-DEVELOPMENT DETENTION POND



APPENDIX C
DESIGN COMPUTATIONS



DESIGN of Riprap CHANNEL - POND OUTLET

FROM HYDROCAD V.5.01, OUTLET of POND II:
25 YEAR 24 HOUR STORM $Q_p = 1.32$ CFS

1. CALCULATE RIPRAP SIZE
Using FIG. 70.2 of BMP "n" for stone w/MAX
DIAMETER = 6"

$$D_{50} = 6"/1.5 = 4"$$

$$n = 0.044 \text{ for DEPTH of } 0.75' \text{ (SEE FIG. 70.2 ATTACHED)}$$

2. USE MAINE CONSERVATION DESIGN PACKAGE (E-DES-HY)
TO CALCULATE CHANNEL VELOCITY

$$\text{FOR } D_{50} = 4"$$

$$n = 0.044$$

$$S = 0.10 \%$$

$$Q_p = 1.32 \text{ cfs}$$

$$\underline{V \approx 3.04 \text{ fps}}$$

Copy of
Output
ATTACHED

3. Check Channel flow velocity for
ADEQUATE RIP RAP SIZING using
of BMP FIG. 70.1

$$\text{FOR : } V = 3.1 \text{ fps} \Rightarrow D_{50} \text{ REQ'D} = 1.5" \text{ (COPY of 70.1 ATTACHED)}$$

∴ DESIGN ACCEPTABLE w/ $D_{50} = 4"$

PROJECT Parking Lot Addition BY Untitled DATE 5/30/00
LSA

***** V AND TRAPEZOIDAL CHANNEL INPUT VALUES *****

BOTTOM WIDTH (USE 0 WHEN DESIGNING FOR V-DITCHES) (FT) B= 1.5
 MANNINGS' N EARTH=.02, GRASS=.04-.1, NATURAL=.04-.08 N= .044
 CHANNEL SLOPE (FT/FT) S= .1
 SIDESLOPES *** EXPRESSED AS A WHOLE # (Z : 1) *** Z= 3
 MAXIMUM CHANNEL DEPTH (FT) D= .75
 COMPUTATIONAL DEPTH INCREMENT (0 = DEFAULT = D/3) (FT) I= .1

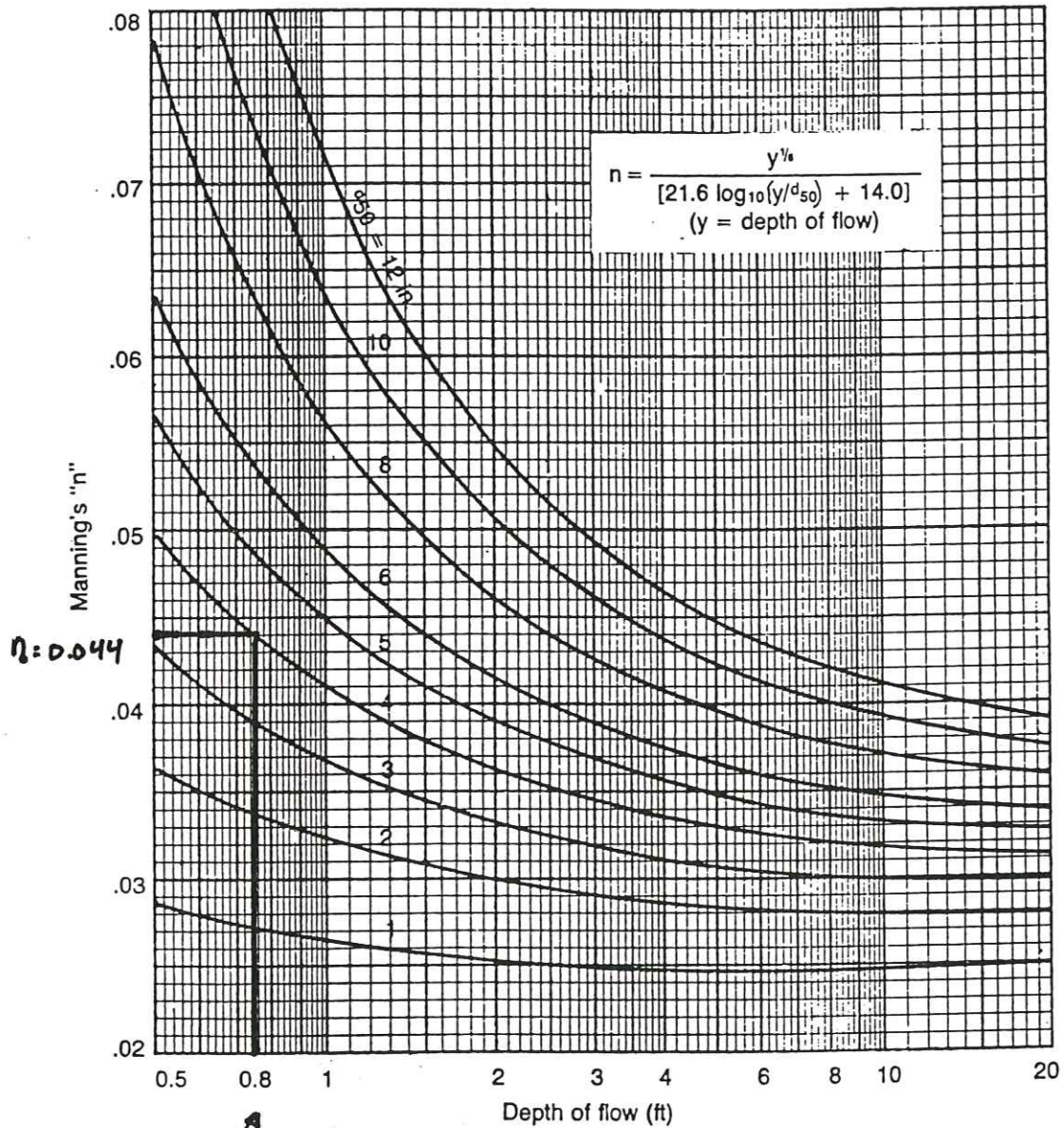
***** V AND TRAPEZOIDAL CHANNEL OUTPUT VALUES *****

DEPTH D (FT)	FLOW AREA A (SF)	PERIMETER P (FT)	TOP WIDTH T (FT)	VELOCITY V (FPS)	DISCHARGE QA (CFS)	CRIT. VEL CV (FPS)
.1	.18	2.13	2.1	1.98	.36	1.66
.2	.42	2.76	2.7	3.01	1.26	2.24
.3	.72	3.4	3.3	3.77	2.71	2.65
.4	1.08	4.03	3.9	4.46	4.82	2.98
.5	1.5	4.66	4.5	4.99	7.48	3.27
.6	1.98	5.29	5.1	5.5	11	3.53
.75	2.81	6.24	6	6.27	18	3.88

For $Q_A = 1.32$

$$V = \frac{3.77 - 3.01}{2.71 - 1.26} = \frac{3.77 - V}{2.71 - 1.32} = 3.04$$

Figure 70.2 DETERMINING "N" FOR RIPRAP CHANNELS



$n = 0.044$

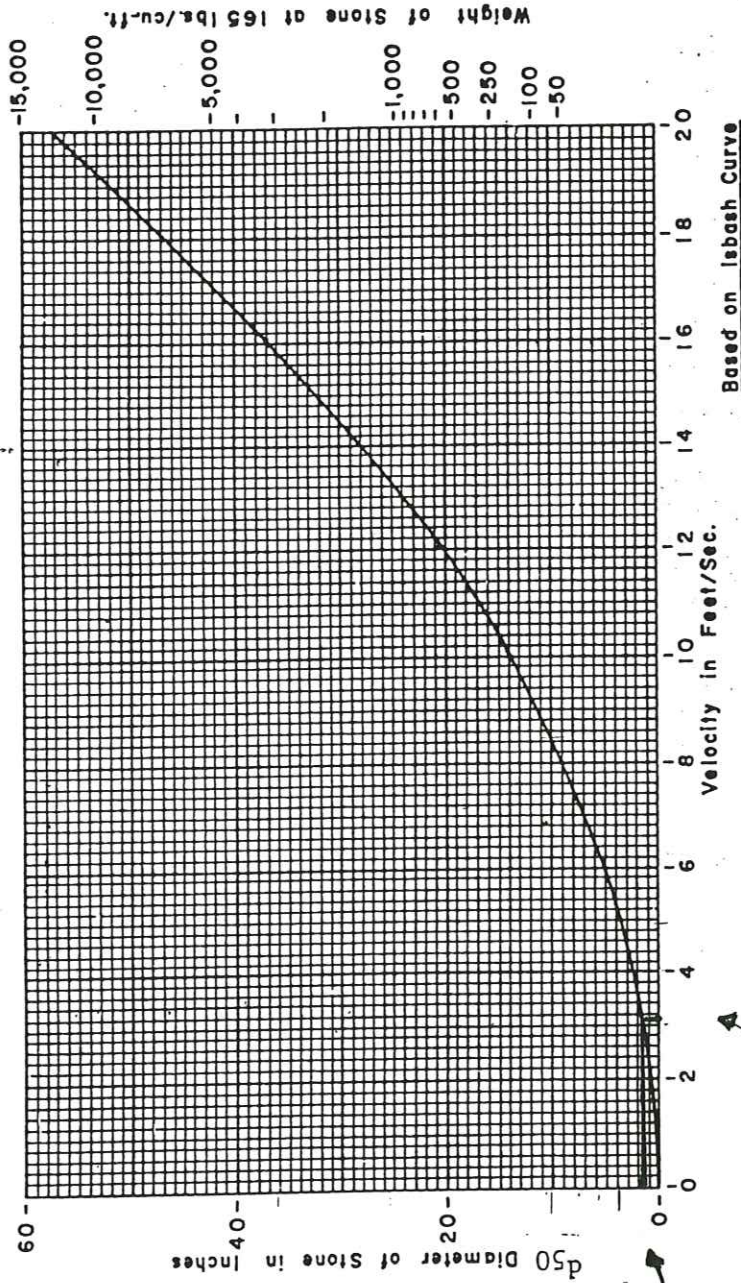
FOR DEPTH = 0.75' & $D_{50} = 4"$

y = Depth of water in feet

D_{50} = Riprap diameter in feet

MATERIALS SPECIFICATIONS

Figure 70.1 STONE SIZE FOR RIPRAP (USDA Soil Conservation Service)



Dep = 1.5'

FOR V = 3.1 fps

DESIGN OF RIPRAP CHANNEL - 15" CULVERT OUTLET

FROM HYDROCAD V. 5.01, SUBCATCHMENT 12;
25 YEAR 24 HOUR STORM $Q_p = 2.16$ cfs

NEW 15" CULVERT ALSO RECEIVES FLOW FROM
12" CMP UPSTREAM, USE FLOWRATE = 3.20 cfs
(SEE ATTACHED PRINTOUT)

THERE Q_p OF 15" CULVERT = $3.20 \text{ cfs} + 2.16 \text{ cfs} = 5.36$

1. CALCULATE RIP RAP SIZE
USING FIG. 70.2 OF BMP, "n" FOR STONE w/ MAX.
DIAMETER = 6"

$n = 0.049$ FOR DEPTH = 1 (SEE FIG 70.2 ATTACHED)

2. USE MAINE CONSERVATION DESIGN PACKAGE (E-DES-HY)
TO CALCULATE CHANNEL VELOCITY

FOR $D_{50} = 6"$

$n = 0.049$

$S = 0.03$

$Q_p = 5.36$ cfs

$V = 2.67$ fps (COPY OF
OUTPUT
ATTACHED)

3. CHECK CHANNEL FLOW VELOCITY FOR ADEQUATE
RIP RAP SIZING USING FIG 70.1 OF BMP

FOR $V = 2.67$ fps \Rightarrow D_{50} REQ'D = 1.25"

(COPY OF FIG 70.1 ATTACHED)

\therefore DESIGN ACCEPTABLE w/ $D_{50} = 6"$

Untitled

***** CIRCULAR CULVERT ANALYSIS FOR SMALL PROJECTS *****

LANDOWNER CAD-CAM ASSOCIATES ADDRESS 41 HUTCHINS DR.
PROJECT Parking Lot Addition BY LSA DATE 5/30/00

***** IMPUTS FOR CURCULAR CULVERT ANALYSIS *****

MANNINGS COEFFICIENT PVC=.009 R/C=.013 CMP<=.025 N= .024
CULVERT DIAMETER (FT) D= 1
HEADWATER ABOVE UPSTREAM ENTRANCE INVERT (FT) DE= 2
TAILWATER ABOVE OUTLET INVERT => 0 (FT) TW= 0
LENGTH OF CULVERT PIPE (FT) LP= 50
DROP ALONG CULVERT LENGTH (INVERT TO INVERT) (FT) PD= .5
ENTRANCE LOSS COEFFICIENT KE= .5

***** CULVERT OUTLET CONTROL (PRESSURE FLOW) EXISTS *****

CULVERT CAPACITY ***** (CFS) Q= 3.19
PIPE VELOCITY (FPS) V= 4.06
NEUTRAL SLOPE (FT/FT) SN= .0273
ACTUAL SLOPE ON CULVERT PIPE (FT/FT) SO= .01

Untitled

***** CIRCULAR CULVERT ANALYSIS FOR SMALL PROJECTS *****

LANDOWNER _____ ADDRESS _____

PROJECT _____ BY _____ DATE ___/___/___

***** IMPUTS FOR CURCULAR CULVERT ANALYSIS *****

BOTTOM WIDTH (USE 0 WHEN DESIGNING FOR V-DITCHES) (FT) B= 2
 MANNINGS' N EARTH=.02, GRASS=.04-.1, NATURAL=.04-.08 N= .049
 CHANNEL SLOPE (FT/FT) S= .03
 SIDESLOPES *** EXPRESSED AS A WHOLE # (Z : 1) *** Z= 3
 MAXIMUM CHANNEL DEPTH (FT) D= 1
 COMPUTATIONAL DEPTH INCREMENT (0 = DEFAULT = D/3) (FT) I= .1

***** V AND TRAPEZOIDAL CHANNEL OUTPUT VALUES *****

DEPTH D (FT)	FLOW AREA A (SF)	PERIMETER P (FT)	TOP WIDTH T (FT)	VELOCITY V (FPS)	DISCHARGE QA (CFS)	CRIT.VEL CV (FPS)
.1	.23	2.63	2.6	1.05	.24	1.69
.2	.52	3.26	3.2	1.55	.81	2.29
.3	.87	3.9	3.8	1.91	1.66	2.71
.4	1.28	4.53	4.4	2.25	2.88	3.06
.5	1.75	5.16	5	2.56	4.48	3.35
.6	2.28	5.79	5.6	2.8	6.38	3.62
.7	2.87	6.43	6.2	3.08	8.84	3.86
.8	3.52	7.06	6.8	3.31	12	4.08
1	5	8.32	8	3.74	19	4.48

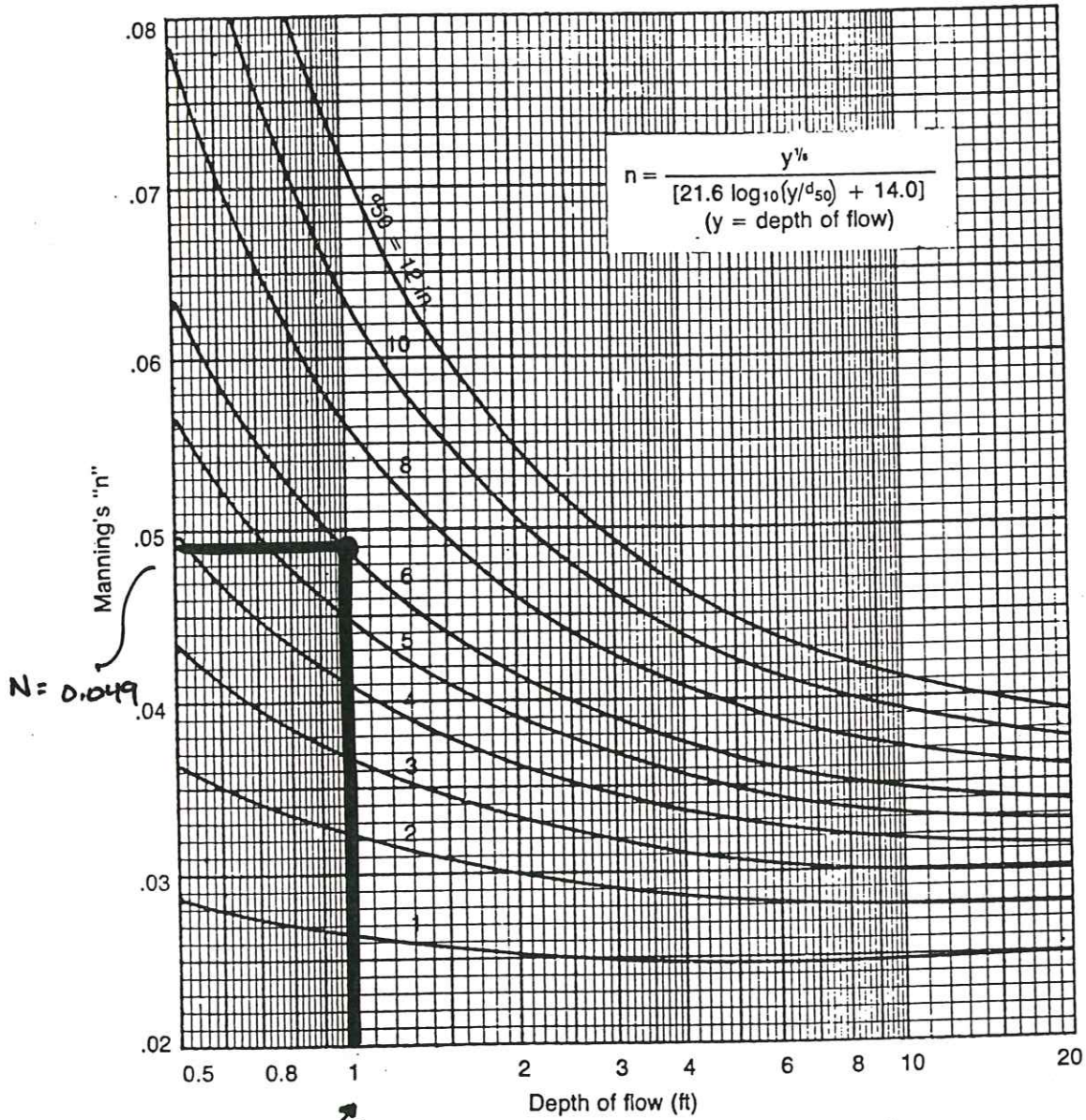


For $Q_A = 5.36$ CFS

$$V = \frac{2.8 - 2.56}{6.38 - 4.48} = \frac{2.8 - V}{6.38 - 5.36}$$

$$V = 2.67 \text{ fps}$$

Figure 70.2 DETERMINING "N" FOR RIPRAP CHANNELS

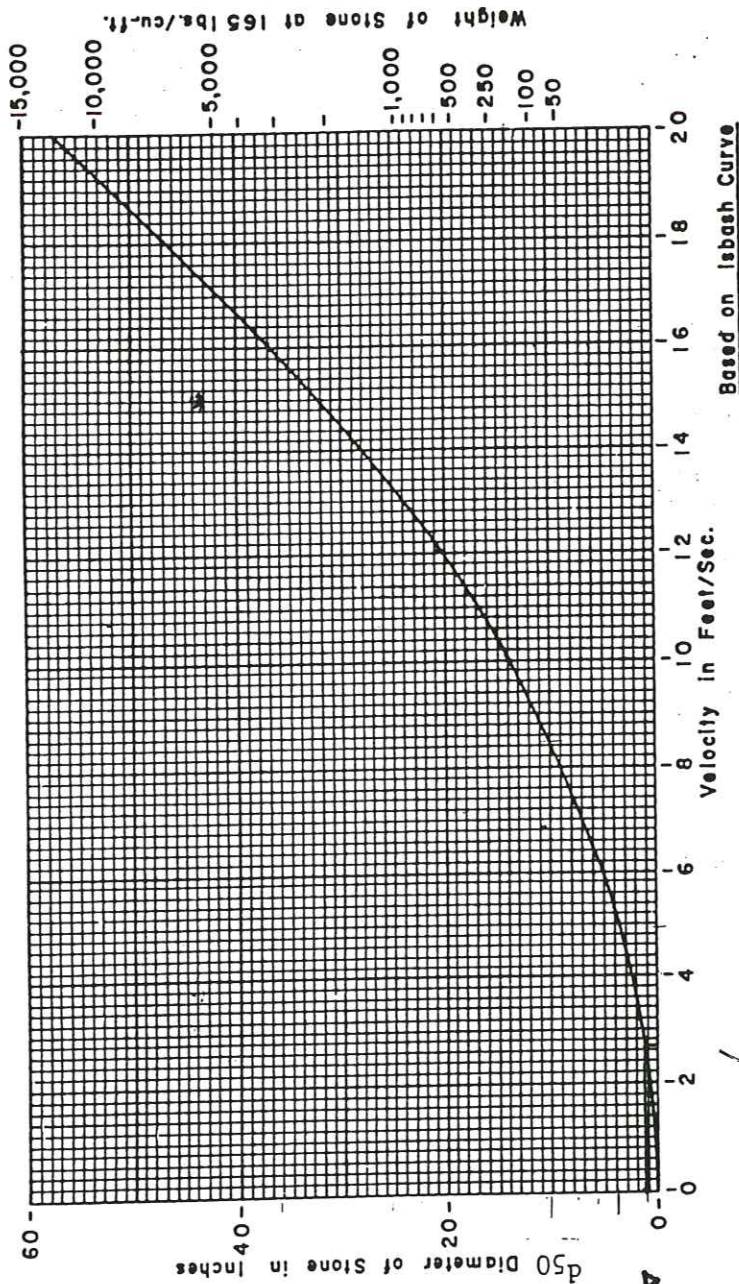


N = 0.049

FOR DEPTH = 1' & D₅₀ = 6"

y = Depth of water in feet
 D₅₀ = Riprap diameter in feet

Figure 70.1 STONE SIZE FOR RIPRAP (USDA Soil Conservation Service)



Based on Isbash Curve

For $V = 2.67 \text{ fps}$

$D_{50} = 1.25''$