VOLUME 7

FRONTIER STONE, LLC
PROPOSED FRONTIER STONE QUARRY

APPENDIX 15

- National Grid Correspondence

APPENDIX 16

- HydroCAD Models

APPENDIX 17

- Water Withdrawal Permit Application

January 29, 2014

APPENDIX 15

- National Grid Correspondence

November 30, '10

Re: License for (3) Surface Road Crossings, Town of Shelby, Orleans County, New York, NMPC Reference 2010-05-11-0603

Dear Mr. Olds:

This letter is to confirm our conversation earlier today where I informed you that I did not want to sign the License agreement for the above referenced Surface Road Crossings until obtaining a permit for mining activities on the property. You told me that you didn't see a problem with putting the execution of the agreement on hold until a future date and that you would note this in the file.

If you need to discuss this matter further I can be reached at 716-751-9670.

Sincerely,
David J. Maher
Pres. Frontier Stone

nationalgrid

Mark G. Agle, P.L.S.
Supervisor
Real Estate Energy Delivery Support

October 20, 2010

Mr. David J. Mahar
Frontier Stone LLC
4172 East Lake Road
Wilson NY 14172

Re: License for (3) Surface Road Crossings
Town of Shelby, Orleans County, NY
NMPC Reference: 2010-05-11-0003

Dear Mr. Mahar:

Enclosed please find an original and duplicate original of the License Agreement relative to the above-referenced matter.

Upon completion of your review, please have the agreement executed by an authorized representative of your company, have the signature notarized and return both the original and duplicate original to my attention together with evidence of the required insurance coverage, including naming National Grid USA as an additional insured, as specified in Article 11 and Exhibit "C" of the Agreement.

I will return an original to you upon execution by our Corporation and receipt of the required Certificate of Insurance. Meanwhile, no work may commence on this project until both parties have executed this Agreement.

Sincerely,

Mark G. Agle, P.L.S.

/doc
Enc.

S:\2010\Frontier Stone-Fwd Lic.doc

144 Kensington Avenue, Buffalo, NY 14214
T: 716.831.7464 ■ F: 716.831.7427 ■ Mark.Agle@us.ngrid.com ■ www.nationalgrid.com

LICENSE AGREEMENT

THIS INDENTURE, made the day of , 2010, by and between **NIAGARA MOHAWK POWER CORPORATION d/b/a NATIONAL GRID**, a transportation corporation organized and existing under the laws of the State of New York, with its principal office and place of business at 300 Erie Boulevard West in the City of Syracuse, County of Onondaga, and State of New York, 13202 (hereinafter called "Licensor"), and **FRONTIER STONE LLC**, a New York State limited liability company with offices at 4172 East Lake Road, Wilson, New York, 14172 (hereinafter called "Licensee"),

WITNESSETH:

WHEREAS, pursuant to a certain deed dated March 7, 1972 and which deed is recorded in the Orleans County Clerk's Office in Liber 356 of Deeds at Page 97, Licensor acquired in fee a certain 150' wide strip of land for its high voltage electrical transmission right-of-way in the Town of Shelby, Orleans County, New York (the "Property"); and

)CATION OF CENSEE'S ITIES

WHEREAS, Licensee has entered into a certain lease dated August 1, 2005 for the purpose of quarrying stone from certain lands which are situate on each side of the aforementioned 150' wide strip of Licensor's land; and

WHEREAS, the Licensee has requested Licensor's permission for three (3) fifty-foot (50') wide surface roadway crossings of its Property for the limited purpose of providing private and controlled access for Licensor's vehicles and equipment between its quarry operations sites.

NOW, THEREFORE, subject to and upon the terms and conditions hereinafter set forth and upon receipt of the annual payment of THREE THOUSAND DOLLARS ($3,000.00) by Licensee to the Licensor, the Licensor does hereby authorize and grant to the Licensee, its successors and assigns as hereinafter provided, license to install, construct, maintain, operate, repair, reconstruct, relocate and remove at its own cost,

expense, and risk three (3) fifty-foot (50') wide surface haul roadway crossings, the location of which are as shown on **Exhibits "A1 thru A6"** attached hereto and made a part hereof (the "License Area"),.

TOGETHER WITH a right of ingress and egress over Licensor's adjacent Property to the minimal extent reasonably necessary in order to exercise the rights granted hereunder.

The rights described above are given upon the conditions and covenants set forth herein, each and all of which Licensee shall keep and perform.

GRANT SUBORDINATE TO PRIOR RIGHTS

1. Licensee's rights granted hereunder shall be subject to the following:

A. Any and all outstanding leases, tenancies, easements, licenses or other tenures and/or claims of title affecting the Property and License Area or any portion or portions thereof; and subject also to any and all encumbrances, liens, conditions, restrictions, and/or reservations subject to or under which Licensor holds the same.

B. The paramount right of Licensor now and hereafter to occupy and use all or any portion or portions of the License Area, and Licensor shall not be responsible to Licensee for changes to Licensee's facilities arising out of Licensor's operations or otherwise.

C. The right of Licensor from time to time hereafter to grant to others or to authorize the occupancy or use by others of any portion or portions of the License Area for any purpose or purposes whatsoever, provided, however, that any such future grant or authorization shall not interfere with the rights conferred herein.

DISCLAIMER OF WARRANTY

2. Licensor's consent herein to cross its Property at the specific locations as identified in **Exhibits "A1 thru A6"** is without covenant or warranty, express or implied. The Licensor does not warrant the fitness or suitability of its Property for any purpose(s) granted herein. Licensee accepts the condition of the Property "as is where is," with all hazards, and shall not look to Licensor for maintenance, repairs or improvements of said Property.

SPECIAL CONDITIONS REQUIREMENTS

3. The installation, construction, maintenance, operation, repair, relocation, and removal of Licensee's facilities shall be in accordance with the terms and conditions set forth in this Agreement, including any such terms and conditions contained in **any Exhibits and/or Appendices** specifically attached hereto and made a part hereof.

PRIOR NOTICE OF CONSTRUCTION

4. Licensee shall give Licensor at least seven (7) days' written notice before commencing any fieldwork hereunder whether in the initial construction or subsequently. Such notice shall be addressed to Licensor as follows:

Niagara Mohawk Power Corporation
1570 E. Avon-Rochester Road
Avon, New York 14414
Attention: Rick Eichhorn, Supervisor TLS

RIGHTS OF INSPECTION

5. Licensor, at its election, may have an Inspector present at the time or times field work by Licensee is being performed, and such Inspector shall have the right and authority to require the modification or cessation of any or all work hereunder when, in his judgment, such work is contrary to the provisions of this grant or is, or may become, a source of danger to the facilities of Licensor. If billed by Licensor, Licensee shall pay to Licensor the reasonable cost and expense of such inspection, based on prevailing wage rates of Licensor's inspection personnel. The presence or absence of Licensor's Inspector shall not constitute a waiver of any provision of this Agreement.

INTERFERENCE WITH FACILITIES

6. A. Licensee shall construct and shall thereafter maintain, operate, repair, relocate and/or remove its facilities so as not to injure or damage the Property or injure, damage or interfere with the Licensor's facilities.

B. Licensee shall not block or impede access to or along the Property, or damage roads or trails used to gain access to or along the Property.

C. Licensee hereby assumes the responsibility for reimbursing Licensor for any adjustment (temporary or permanent), and outages or relocations (temporary or permanent) of its facilities necessary to accommodate the construction, operation, maintenance or removal of Licensee's facilities.

TORATION OF PROPERTY

7. All earth or soil disturbed by the installation, construction,

maintenance, operation, repair, relocation and/or removal of Licensee's facilities shall be properly replaced and the surface thereof restored to its former condition (including reseeding) by Licensee at its sole cost and expense.

Unless otherwise directed or previously agreed upon, all vegetative material and debris removed as a result of Licensee's activities shall be hauled away and properly disposed of by Licensee at its sole expense.

REIMBURSEMENT FOR MODIFICATION OF FACILITIES

8. Licensee shall promptly reimburse Licensor for any costs and expenses which Licensor may incur in changing, modifying or relocating Licensor's facilities, now or in the future, in order to accommodate the construction, maintenance, operation, repair, relocation and/or removal of Licensee's facilities installed under the terms of this Agreement upon submission of proper bills therefor.

RELOCATION OF LICENSEE'S FACILITIES

9. A. As soon as practicable, but in any event no later than upon ninety (90) days' prior notice from Licensor, Licensee shall, at its sole cost and expense, relocate all or any part or parts of the facilities installed under the terms of this Agreement as Licensor may at any time, or from time to time, require.

B. Should Licensee not desire to relocate its facilities, Licensee may elect to leave said facilities in place upon delivering to Licensor its written agreement to reimburse Licensor for any increase in cost resulting from Licensor's need to alter its normal design in the construction or installation of the Licensor's own facilities or other improvements upon the License Area.

PHOTOGRAPHS

10. Photographs of the condition of the area where the License Area shall be taken by Licensee both prior to, and after, the completion of all construction by Licensee, and prints of such photographs shall be made available to the Licensor.

INSURANCE REQUIREMENT

11. Licensee shall provide to Licensor, prior to exercise of rights hereby granted, and keep in force during the term of this Agreement, unless waived in writing by Licensor, a general Public Liability insurance policy which shall include contractual coverage. Such policy(ies) shall be written by a company and contain language and policy limits to be approved by Licensor. The type of policy, nature of special endorsements, if any, and amount of coverage shall be as set forth in **Exhibit "C"** attached hereto and made a part hereof.

If the exercise of the rights herein granted or any part of such rights are performed by one or more contractors, the insurance provisions attached, except self-insurance, shall apply.

INDEMNIFICATION

12. Licensee hereby assumes all risk of loss, damage or injury (including death) to persons or property occasioned by negligence or otherwise, and arising out of or in any way connected with the construction, maintenance, renewal, repair, operation, use, existence or removal of Licensee's facilities or the activities herein authorized. Licensee hereby expressly agrees to indemnify, defend and save harmless Licensor, its officers, contractors, agents and employees from and against all such loss, damage or injury, whether resulting or accruing to Licensor, its officers, contractors, agents or employees, or to any other person or persons, and from all claims arising out of such loss, damage or injury, and from all costs and expenses connected therewith (including, but not limited to, counsel fees and disbursements incurred by Licensor in any action or proceeding between Licensee and Licensor or between Licensor and any third party or otherwise), unless it is established and the same was occasioned by the sole negligence of Licensor.

It is agreed that Licensee is responsible for all costs, expenses or damages arising out of, or in connection with, any injuries to persons or damages to property (including real property, personal property and environmental damages) caused by the installation, erection, construction or reconstruction, excavation, grade of land or maintenance of Licensee's facilities, as previously described.

Licensee specifically agrees to indemnify Licensor against any claim which may be made pursuant to the federal Comprehensive Environmental Response Compensation and Liability Act of 1980, and any subsequent amendments thereto, arising from the operation of the subject facilities. This indemnification also applies to any claims resulting from Licensee's violation of any state laws or regulations pertaining to releases or spills of toxic and/or hazardous substances to the environment.

Licensee shall take prompt action to defend and indemnify Licensor against claims, actual or threatened, but in no event later than notice by Licensor to

Licensee of the service of a notice, summons, complaint, petition or other service of a process against Licensor alleging damage, injury, liability, or expenses attributed in any way to this Agreement, including but not limited to the acts, fault, negligence, equipment, materials, properties, facilities, personnel, or property of the Licensee, it's agents, employees, sub-contractors or suppliers. Licensee shall defend any such claim or threatened claim, including as applicable, engagement of legal counsel, to respond to, defend, settle, or compromise any claim or threatened claim.

Furthermore, Licensee understands and agrees it is responsible for any and all costs and expenses incurred by Licensor to enforce this indemnification provision.

The obligations set forth in this article shall survive completion of the work, termination or expiration of this contract.

13. [Intentionally left blank]

NOTICE

14. Any notice given to either party under the terms of this Agreement (except construction notification as set forth in paragraph 3 hereof), shall be given by certified or registered mail, return receipt, or by overnight delivery service, addressed as follows:

To Licensor:
Niagara Mohawk Power Corporation
Attn: Real Estate Supervisor
144 Kensington Avenue
Buffalo, New York 14214

To Licensee:
Frontier Stone LLC
Attn: Mr. David J. Mahar, President
4172 E. Lake Road
Wilson, New York 14172

Notice shall be deemed to have been given three (3) days after mailing if made by certified or registered mail, and one (1) day after mailing if made by overnight courier.

REIMBURSEMENT OF TAXES

15. Licensee shall bear, pay and discharge all taxes, assessments and public charges, ordinary and extraordinary, levied, assessed or accruing upon the Property

because of its License Area and facilities. Every such tax, assessment and public charge shall be paid, discharged or cancelled not more than thirty (30) days after the same shall become a lien, and if Licensee shall fail to pay, discharge or cancel any such tax, assessment or public charge within thirty (30) days after the same shall become a lien, Licensor may, at its option, pay and satisfy the same and any amount so paid, together will all penalties in connection therewith, together with interest from date of payment, shall be repaid to Licensor, upon thirty (30) days' demand.

COMPLIANCE WITH LAW

16. Licensee shall, at its own cost, comply with all applicable laws, ordinances, orders, rules and regulations of the United States, of the State of New York, of any departments, bureaus, authorities or commissions created under the laws of either government and of the several municipalities in which the Property and License Area are situated insofar as the same relate to the exercise of any privilege or the performance of any duty under this Agreement, and whether the same are obligatory upon the Licensee or upon the Licensor. Specifically, Licensee agrees that its activities shall be in accordance with the Conservation Law of New York State and 6NYCRR Parts 420-425.

REMOVAL OF LICENSEE'S FACILITIES

17. Upon termination, revocation, cancellation or surrender of this Agreement in accordance with its terms, Licensor shall, in its sole discretion, determine if the facilities must be removed or must be abandoned in place. If Licensor shall require Licensee's facilities to be removed, such removal shall be accomplished at the expense of the Licensee, and field work shall be performed by personnel designated and authorized by Licensor. Licensor may elect to protect its system and facilities by authorizing removal work to be done only by its own employees or contractors.

ASSIGNABILITY

18. This Agreement , nor any rights granted hereunder, shall be assigned without the written consent of Licensor and the assumption in writing by Licensee's assignee of all duties and obligations hereunder.

TERM

19. The annual rental for each successive five-year period shall be adjusted by the same percentage by which the Consumer Price Index, Northeast Region All Items, published by the Bureau of Labor Statistics of the United Stated Department of

Labor (the "CPI") has increased since the preceding Adjustment Date. If the CPI ceases to be published, a similar index chosen by mutual agreement of Grantor and Grantee shall be used.

REVOCATION

20. Licensor hereby reserves the right to terminate, cancel and revoke the privileges or rights extended to Licensee by the terms of this agreement at any time, without cause, upon sixty (60) days' written notice to Licensee. Upon revocation, this agreement shall become null and void and all rights of Licensee hereunder shall forever cease and determine and be in all respects forfeited. Thereafter, Licensor may require Licensee to remove said facilities from the premises, and if Licensee fails so to do within sixty (60) days after the mailing of such notice, Licensor may effect such removal, demand and collect the cost thereof from Licensee, without liability on account of or with respect to said facilities, or the salvage value thereof.

ENTIRE AGREEMENT

21. No provision of this Agreement shall be deemed to have been waived by the Licensor unless such waiver be in writing signed by the Licensor. This Agreement contains the entire agreement between the parties and any executory agreement hereafter made shall be ineffective to change, modify or discharge it in whole or in part unless such executory agreement is in writing and signed by the Licensor and Licensee. In the event that any part of this Agreement is determined to be invalid, illegal or unenforceable, such determination shall not affect the validity, legality or enforceability of any other part of this instrument and remaining parts of this instrument shall be enforced as if such invalid, illegal or unenforceable part were not contained in the instrument.

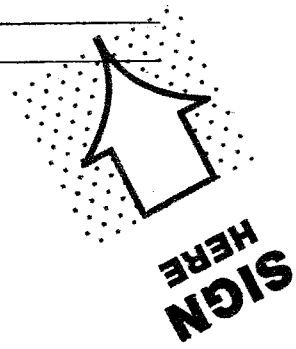
IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their proper officers thereunto duly authorized and their respective corporate seals to be affixed hereunto all as of the day and year first above written.

NIAGARA MOHAWK POWER CORPORATION
d/b/a NATIONAL GRID

By_____
Name: Paul J. Cianchetti
Title: Vice President Operations-NY

FRONTIER STONE LLC

By_____
Name: _____
Title: _____



STATE OF NEW YORK :
SS:
COUNTY OF ERIE :

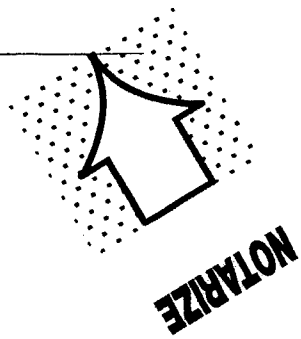
On this _____ day of _____, in the year 20____, before me, the undersigned, personally appeared **PAUL J. CIANCHETTI**, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public

STATE OF NEW YORK :
SS:
COUNTY OF :

On this _____ day of _____, in the year 20___, before me, the undersigned, personally appeared_____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public



Appendix "A"

SPECIAL CONDITIONS

1. It is hereby understood that the roadway crossings will only be used by vehicles and equipment that are capable of traveling public highways without the heed of any oversize permits.

2. Jersey barriers shall be placed around NMPC structures during construction of the roadway crossings.

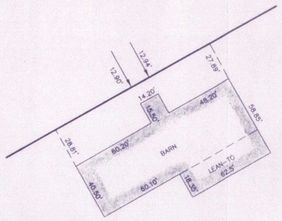
3. A minimum clearance of thirty (30') feet from the finished grade of the road to the lowest conductor will be maintained at all times.

4. No structures of any kind shall be constructed on the right-of-way.

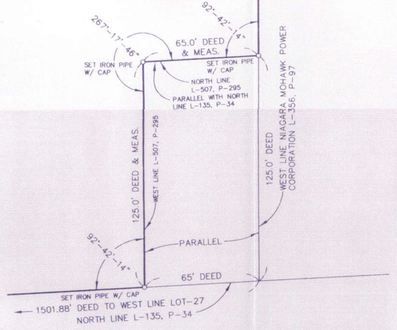
5. There will be no stockpiling of materials nor standing/parking of vehicles or equipment on NMPC lands.

6. No vehicle, equipment or machinery having extensions whose highest point reaches (or which is capable of reaching) within 15 feet of the lowest electric conductor shall be permitted within the License Area.

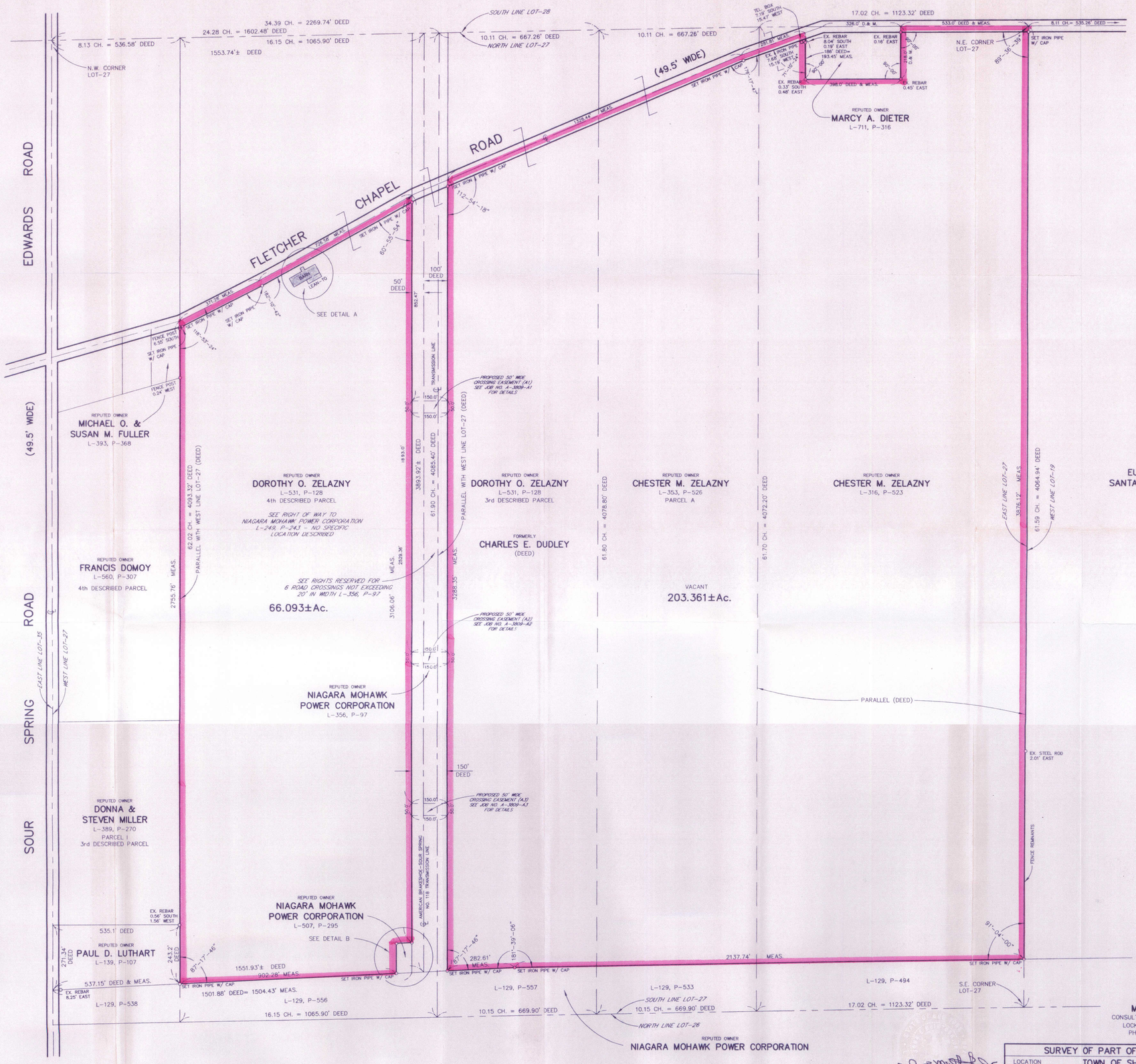
7. No personnel or object shall climb or be placed atop vehicles, equipment or machinery using the roadway crossings.



DETAIL A
SCALE: 1"= 50'



DETAIL B
SCALE: 1"= 40'



RESURVEY	REVISION
	ADDED PROPOSED EASEMENTS JUNE 23, 2010
	REVISED PROP. CROSSING EASE (A2)- SEPT. 24, 2010

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NOTE: THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATE OF FACTS THAT MAY BE REVEALED BY AN EXAMINATION OF SUCH.

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
LOCKPORT, NEW YORK PHONE 434-9138
BUFFALO, NEW YORK PHONE 625-8360

SURVEY OF PART OF LOT-27, TWP.-14, R.-3, HOLLAND PURCHASE

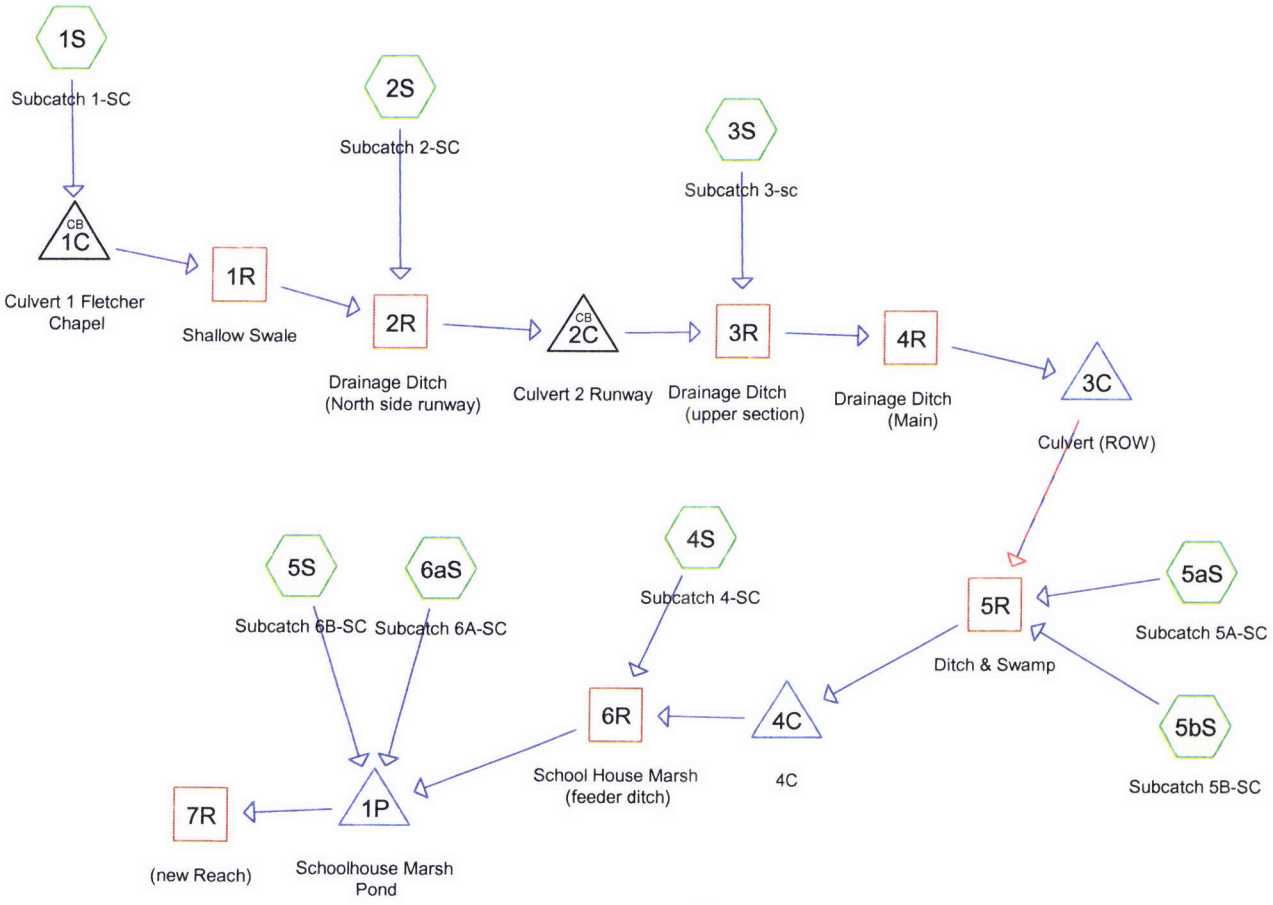
LOCATION: TOWN OF SHELBY, ORLEANS COUNTY, NEW YORK

JOB No.	SCALE	DATE	DRAWN	COMP.	DESIG.	CADFILE
A-3809	1"= 200'	JANUARY 25, 2006	MAS	RCS		A3809.DWG

APPENDIX 16

- **HydroCAD Models**

HydroCAD Analyses



Subcat Reach Pond Link

Drainage Diagram for Frontier Partnership1a
Prepared by CONTINENTAL PLACER, INC.
HydroCAD® 9.10 s/n 00523 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.319	55	Woods, Good, HSG B (1S)
6.100	56	Brush, Fair, HSG B (5bS)
41.411	58	Meadow, non-grazed, HSG B (1S, 5aS, 5S, 6aS)
1.186	58	Woods/grass comb., Good, HSG B (1S)
10.600	60	Woods, Fair, HSG B (4S, 5S)
5.232	65	2 acre lots, 12% imp, HSG B (3S)
2.200	65	Woods/grass comb., Fair, HSG B (6aS)
28.700	67	Brush, Poor, HSG B (4S, 5bS)
206.409	67	Row crops, straight row, Good, HSG A (2S, 3S)
1.023	68	1 acre lots, 20% imp, HSG B (2S)
5.000	70	Brush, Fair, HSG C (5bS)
5.000	73	Woods/grass comb., Poor, HSG B (5aS)
16.046	75	Row crops, SR + CR, Good, HSG B (3S)
40.550	78	Row crops, straight row, Good, HSG B (2S, 3S)
4.000	98	Water Surface, HSG B (5bS)
373.776	68	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
206.409	HSG A	2S, 3S
162.368	HSG B	1S, 2S, 3S, 4S, 5aS, 5bS, 5S, 6aS
5.000	HSG C	5bS
0.000	HSG D	
0.000	Other	
373.776		**TOTAL AREA**

Land-Use Listing (all nodes)

Area (acres)	Land Use	Subcatchment Numbers
39.800	Brush	4S, 5bS
263.005	Cropland	2S, 3S
41.411	Meadow	1S, 5aS, 5S, 6aS
4.000	Open Water	5bS
6.255	Residential	2S, 3S
19.305	Woods	1S, 4S, 5aS, 5S, 6aS
373.776	**TOTAL**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	1C	649.00	647.00	60.0	0.0333	0.021	12.0	0.0	0.0
2	1P	614.00	613.50	60.0	0.0083	0.025	24.0	0.0	0.0
3	2C	631.00	630.50	80.0	0.0063	0.025	18.0	0.0	0.0
4	3C	620.60	620.20	80.0	0.0050	0.020	24.0	0.0	0.0
5	4C	618.50	618.00	80.0	0.0063	0.020	96.0	60.0	0.0

Time span=5.00-120.00 hrs, dt=0.05 hrs, 2301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatch 1-SC Runoff Area=344,838 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=550' Tc=42.7 min CN=58 Runoff=0.20 cfs 0.088 af

Subcatchment 2S: Subcatch 2-SC Runoff Area=107.553 ac 0.19% Impervious Runoff Depth=0.46"
Flow Length=1,700' Slope=0.0110 '/' Tc=41.0 min CN=70 Runoff=25.37 cfs 4.080 af

Subcatchment 3S: Subcatch 3-sc Runoff Area=7,043,959 sf 0.39% Impervious Runoff Depth=0.42"
Flow Length=2,800' Tc=49.3 min CN=69 Runoff=29.62 cfs 5.671 af

Subcatchment 4S: Subcatch 4-SC Runoff Area=32.300 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=1,100' Tc=37.1 min CN=65 Runoff=4.09 cfs 0.801 af

Subcatchment 5aS: Subcatch 5A-SC Runoff Area=11.000 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=700' Slope=0.0300 '/' Tc=57.4 min CN=65 Runoff=1.05 cfs 0.273 af

Subcatchment 5bS: Subcatch 5B-SC Runoff Area=19.300 ac 20.73% Impervious Runoff Depth=0.49"
Flow Length=800' Tc=43.6 min CN=71 Runoff=4.87 cfs 0.790 af

Subcatchment 5S: Subcatch 6B-SC Runoff Area=16.800 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=1,100' Tc=70.5 min CN=58 Runoff=0.36 cfs 0.187 af

Subcatchment 6aS: Subcatch 6A-SC Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.15"
Flow Length=800' Tc=39.5 min CN=59 Runoff=0.59 cfs 0.219 af

Reach 1R: Shallow Swale Avg. Flow Depth=0.17' Max Vel=0.70 fps Inflow=0.20 cfs 0.088 af
n=0.050 L=1,355.0' S=0.0103 '/' Capacity=16.53 cfs Outflow=0.16 cfs 0.088 af

Reach 2R: Drainage Ditch (North side runway) Avg. Flow Depth=2.29' Max Vel=1.43 fps Inflow=25.37 cfs 4.168 af
n=0.025 L=2,440.0' S=0.0004 '/' Capacity=26.49 cfs Outflow=16.80 cfs 4.168 af

Reach 3R: Drainage Ditch (upper section) Avg. Flow Depth=3.08' Max Vel=2.61 fps Inflow=32.85 cfs 9.839 af
n=0.035 L=1,220.0' S=0.0025 '/' Capacity=30.90 cfs Outflow=32.49 cfs 9.839 af

Reach 4R: Drainage Ditch (Main) Avg. Flow Depth=1.69' Max Vel=2.64 fps Inflow=32.49 cfs 9.839 af
n=0.030 L=2,655.0' S=0.0026 '/' Capacity=305.22 cfs Outflow=31.28 cfs 9.839 af

Reach 5R: Ditch & Swamp Avg. Flow Depth=2.22' Max Vel=0.32 fps Inflow=10.44 cfs 10.183 af
n=0.100 L=700.0' S=0.0003 '/' Capacity=19.46 cfs Outflow=10.21 cfs 10.178 af

Reach 6R: School House Marsh (feeder ditch) Avg. Flow Depth=0.91' Max Vel=0.52 fps Inflow=4.09 cfs 0.801 af
n=0.070 L=427.0' S=0.0012 '/' Capacity=44.45 cfs Outflow=3.45 cfs 0.801 af

Reach 7R: (new Reach) Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=500.0' S=0.0030 '/' Capacity=85.74 cfs Outflow=0.00 cfs 0.000 af

Pond 1C: Culvert 1 Fletcher Chapel Peak Elev=649.22' Inflow=0.20 cfs 0.088 af
12.0" Round Culvert n=0.021 L=60.0' S=0.0333 '/' Outflow=0.20 cfs 0.088 af

Pond 1P: Schoolhouse Marsh Pond Peak Elev=617.07' Storage=2,426,242 cf Inflow=4.27 cfs 1.207 af
Outflow=0.00 cfs 0.000 af

Pond 2C: Culvert 2 Runway Peak Elev=641.70' Inflow=16.80 cfs 4.168 af
18.0" Round Culvert n=0.025 L=80.0' S=0.0063 '/' Outflow=16.80 cfs 4.168 af

Pond 3C: Culvert (ROW) Peak Elev=622.21' Storage=178,403 cf Inflow=31.28 cfs 9.839 af
Primary=7.35 cfs 8.471 af Secondary=2.30 cfs 0.649 af Outflow=9.65 cfs 9.120 af

Pond 4C: 4C Peak Elev=617.94' Storage=443,315 cf Inflow=10.21 cfs 10.178 af
96.0" x 60.0" Box Culvert n=0.020 L=80.0' S=0.0063 '/' Outflow=0.00 cfs 0.000 af

Total Runoff Area = 373.776 ac Runoff Volume = 12.109 af Average Runoff Depth = 0.39"
98.71% Pervious = 368.944 ac 1.29% Impervious = 4.832 ac

Summary for Subcatchment 1S: Subcatch 1-SC

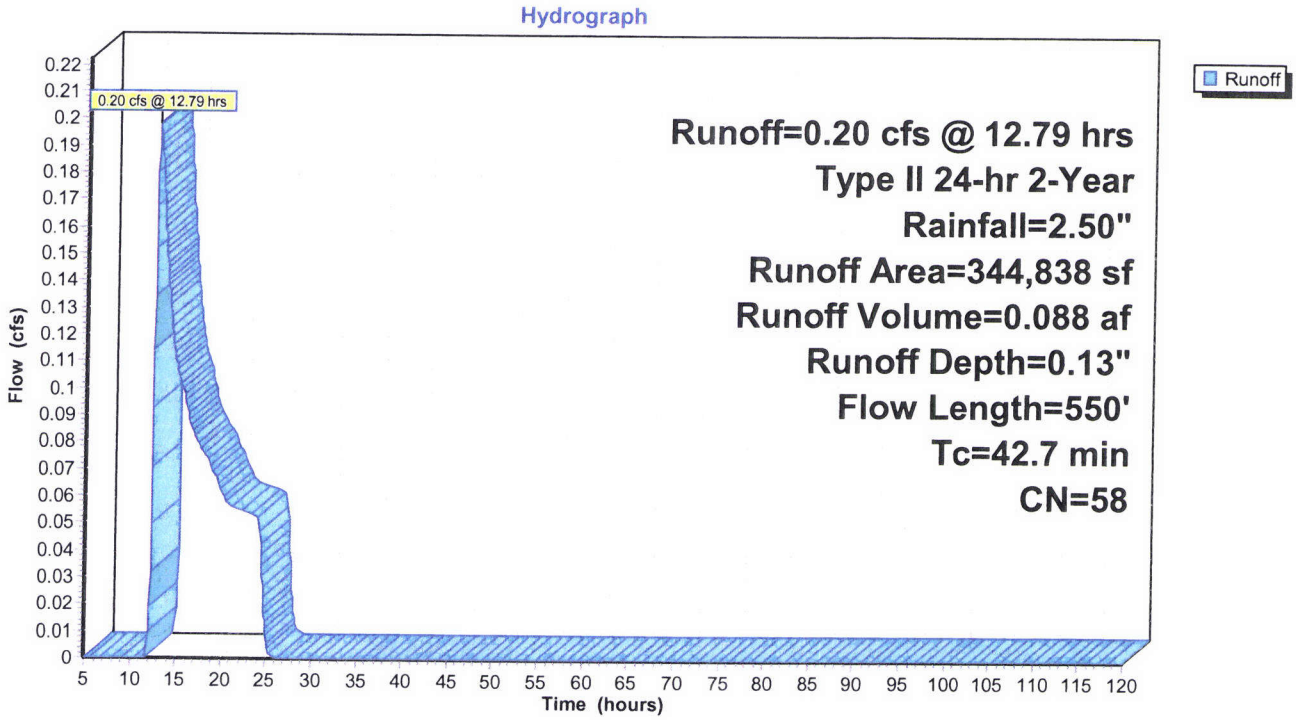
Runoff = 0.20 cfs @ 12.79 hrs, Volume= 0.088 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (sf)	CN	Description	Land Use
51,656	58	Woods/grass comb., Good, HSG B	Woods
13,902	55	Woods, Good, HSG B	Woods
279,280	58	Meadow, non-grazed, HSG B	Meadow
344,838	58	Weighted Average	
344,838		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5	300	0.0170	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
1.2	250	0.2500	3.50		**Shallow Concentrated Flow, Shallow-con 1-SC** Short Grass Pasture Kv= 7.0 fps
42.7	550	Total			

Subcatchment 1S: Subcatch 1-SC



Summary for Subcatchment 2S: Subcatch 2-SC

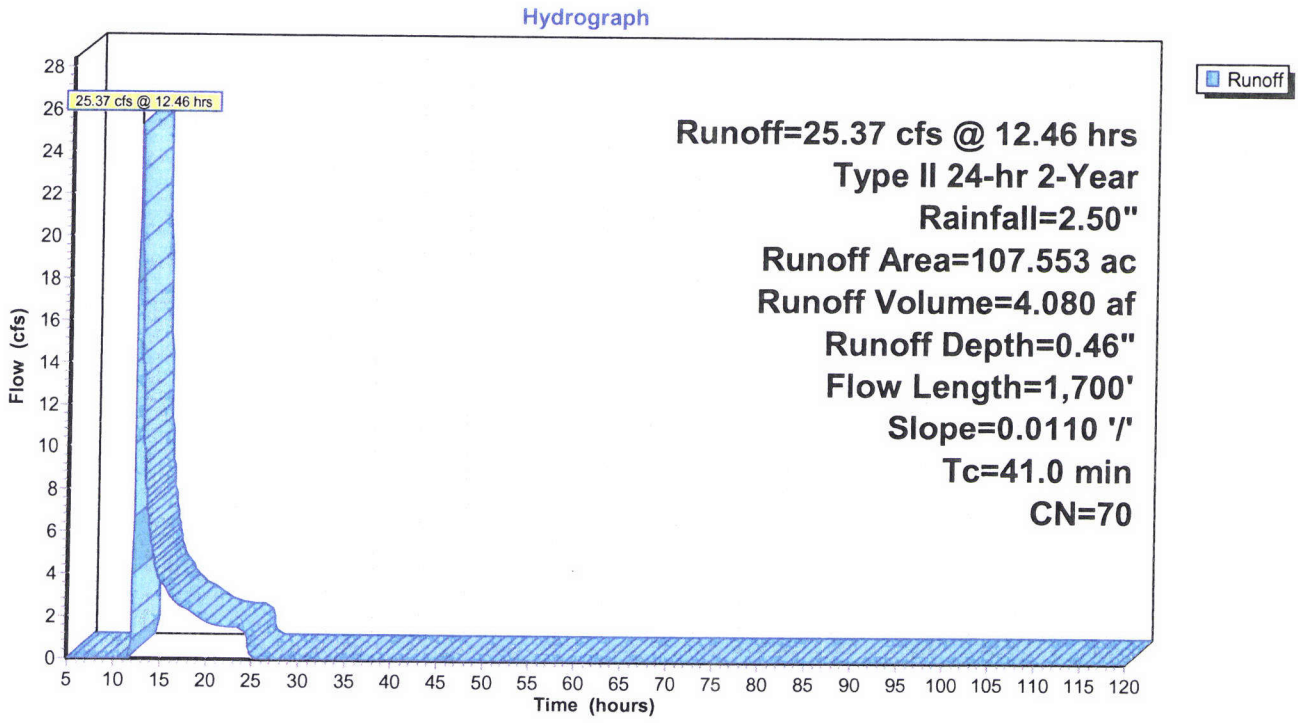
Runoff = 25.37 cfs @ 12.46 hrs, Volume= 4.080 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
80.653	67	Row crops, straight row, Good, HSG A	Cropland
25.877	78	Row crops, straight row, Good, HSG B	Cropland
1.023	68	1 acre lots, 20% imp, HSG B	Residential
107.553	70	Weighted Average	
107.348		99.81% Pervious Area	
0.205		0.19% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	300	0.0110	0.31		**Sheet Flow, Sheet Flow (corn Field)** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
24.7	1,400	0.0110	0.94		**Shallow Concentrated Flow, Shallow Con (corn field)** Cultivated Straight Rows Kv= 9.0 fps
41.0	1,700	Total			

Subcatchment 2S: Subcatch 2-SC



Summary for Subcatchment 3S: Subcatch 3-sc

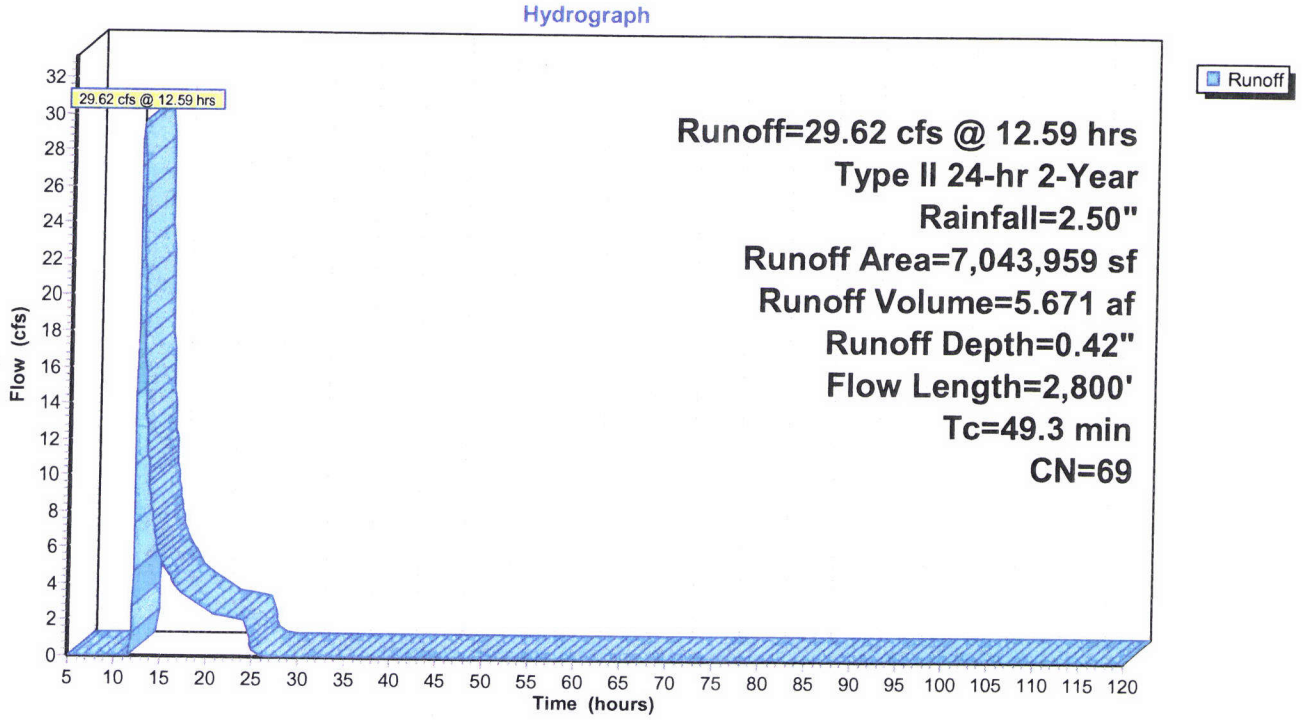
Runoff = 29.62 cfs @ 12.59 hrs, Volume= 5.671 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (sf)	CN	Description	Land Use
125,285	65	2 acre lots, 12% imp, HSG B	Residential
102,640	65	2 acre lots, 12% imp, HSG B	Residential
639,161	78	Row crops, straight row, Good, HSG B	Cropland
5,477,913	67	Row crops, straight row, Good, HSG A	Cropland
698,960	75	Row crops, SR + CR, Good, HSG B	Cropland
7,043,959	69	Weighted Average	
7,016,608		99.61% Pervious Area	
27,351		0.39% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0120	0.32		**Sheet Flow, sheet flow (corn field** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
27.8	1,500	0.0100	0.90		**Shallow Concentrated Flow, Shallow Conc. (corn field)** Cultivated Straight Rows Kv= 9.0 fps
5.8	1,000	0.0090	2.89	9.63	**Parabolic Channel, Drainage (cornfield** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.035 Earth, dense weeds
49.3	2,800	Total			

Subcatchment 3S: Subcatch 3-sc



Summary for Subcatchment 4S: Subcatch 4-SC

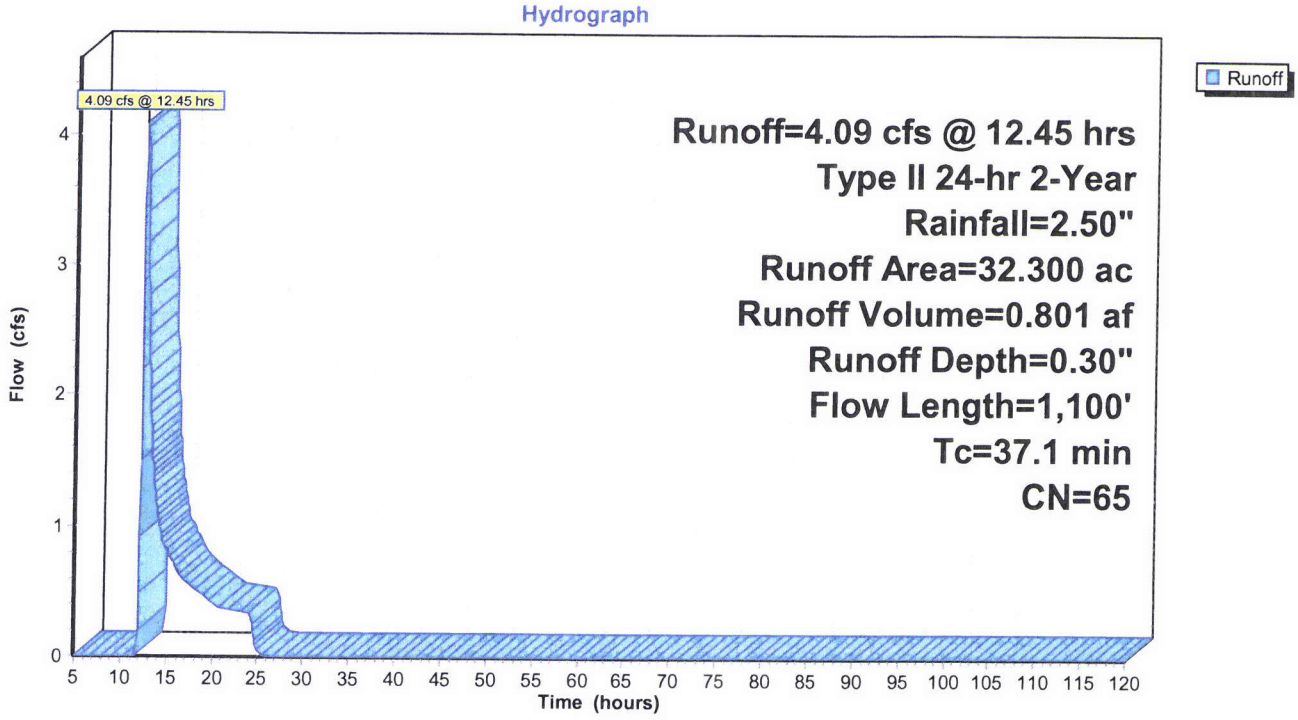
Runoff = 4.09 cfs @ 12.45 hrs, Volume= 0.801 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
24.500	67	Brush, Poor, HSG B	Brush
7.800	60	Woods, Fair, HSG B	Woods
32.300	65	Weighted Average	
32.300		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1	300	0.0350	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
6.0	800	0.0220	2.22		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
37.1	1,100	Total			

Subcatchment 4S: Subcatch 4-SC



Summary for Subcatchment 5aS: Subcatch 5A-SC

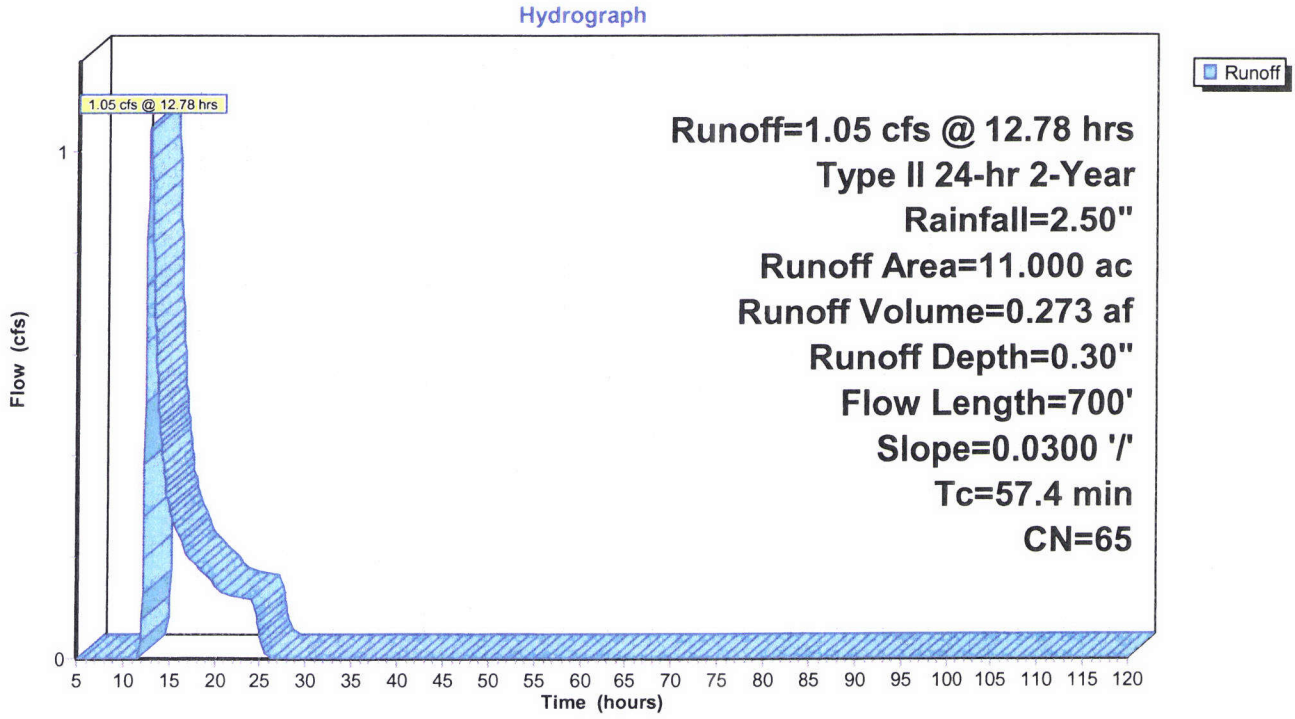
Runoff = 1.05 cfs @ 12.78 hrs, Volume= 0.273 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
6.000	58	Meadow, non-grazed, HSG B	Meadow
5.000	73	Woods/grass comb., Poor, HSG B	Woods
11.000	65	Weighted Average	
11.000		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow, Shallow Concetrated** Woodland Kv= 5.0 fps
57.4	700	Total			

Subcatchment 5aS: Subcatch 5A-SC



Summary for Subcatchment 5bS: Subcatch 5B-SC

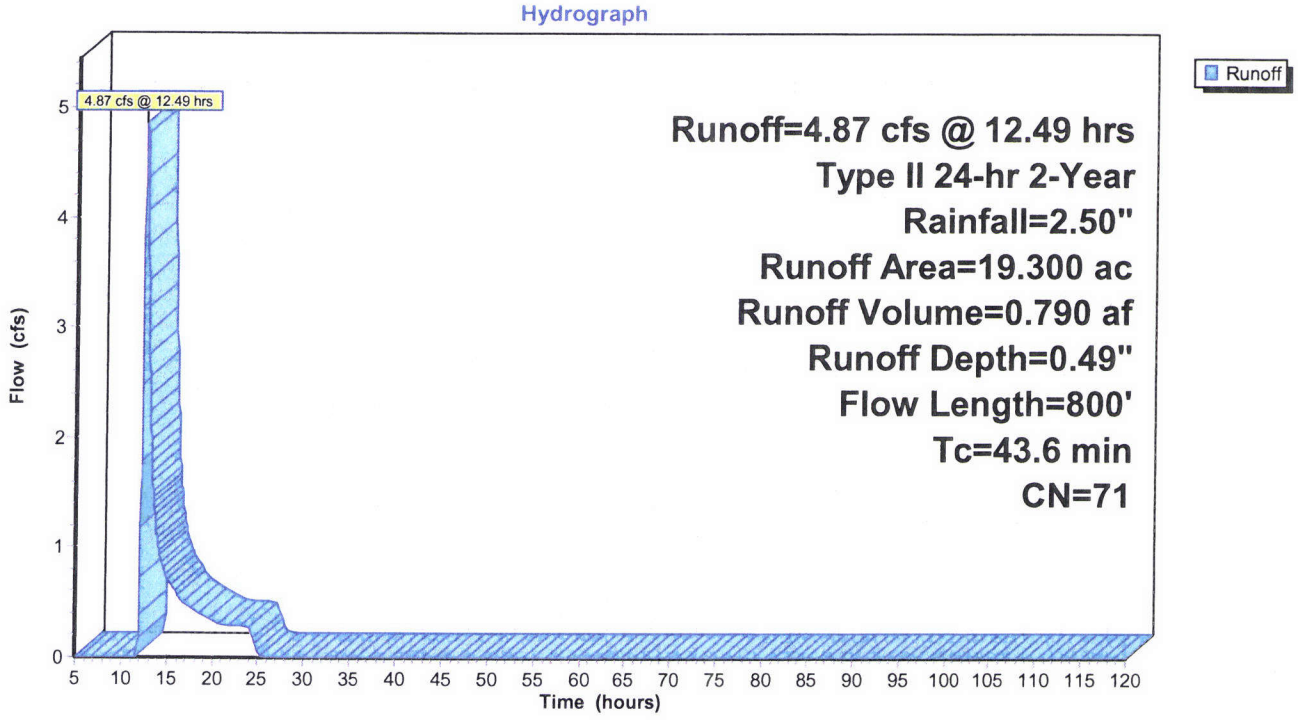
Runoff = 4.87 cfs @ 12.49 hrs, Volume= 0.790 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
6.100	56	Brush, Fair, HSG B	Brush
4.200	67	Brush, Poor, HSG B	Brush
5.000	70	Brush, Fair, HSG C	Brush
4.000	98	Water Surface, HSG B	Open Water
19.300	71	Weighted Average	
15.300		79.27% Pervious Area	
4.000		20.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.6	300	0.0500	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	500	0.0350	2.81		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
43.6	800	Total			

Subcatchment 5bS: Subcatch 5B-SC



Summary for Subcatchment 5S: Subcatch 6B-SC

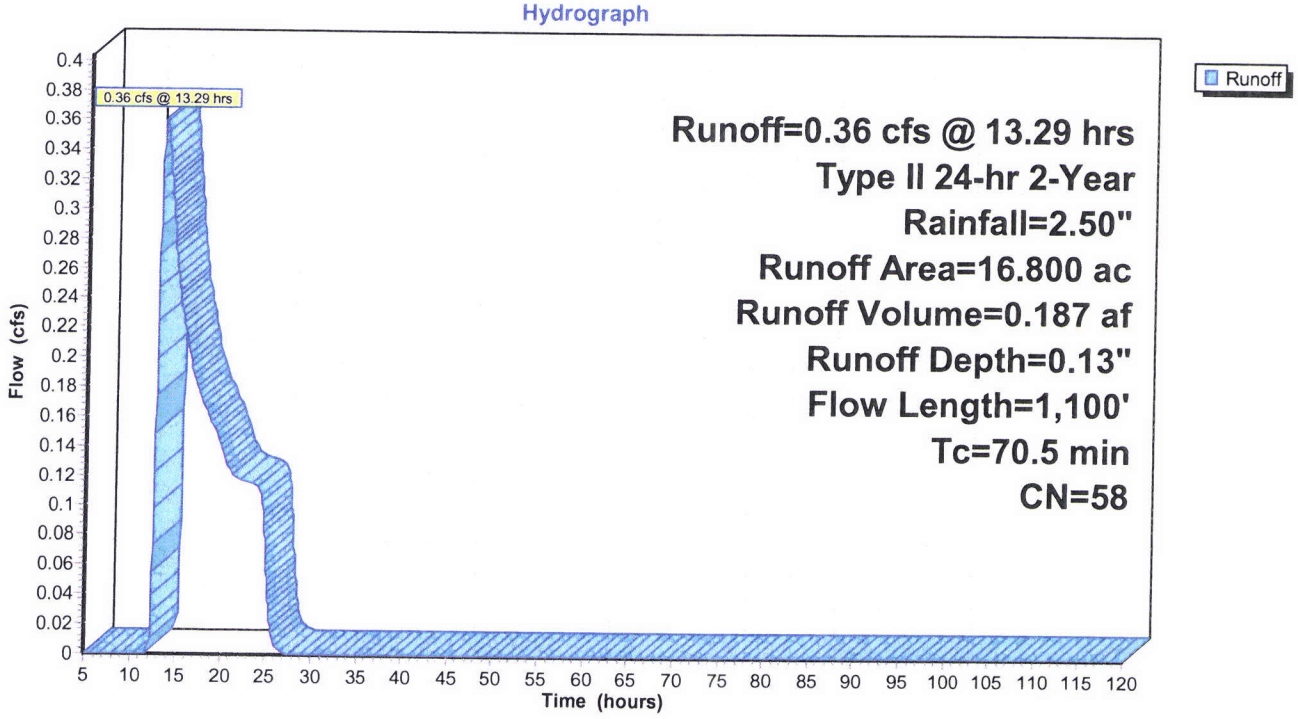
Runoff = 0.36 cfs @ 13.29 hrs, Volume= 0.187 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
14.000	58	Meadow, non-grazed, HSG B	Meadow
2.800	60	Woods, Fair, HSG B	Woods
16.800	58	Weighted Average	
16.800		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.5	300	0.0200	0.09		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
12.0	800	0.0250	1.11		**Shallow Concentrated Flow, Shallow Concentrated** Short Grass Pasture Kv= 7.0 fps
70.5	1,100	Total			

Subcatchment 5S: Subcatch 6B-SC



Summary for Subcatchment 6aS: Subcatch 6A-SC

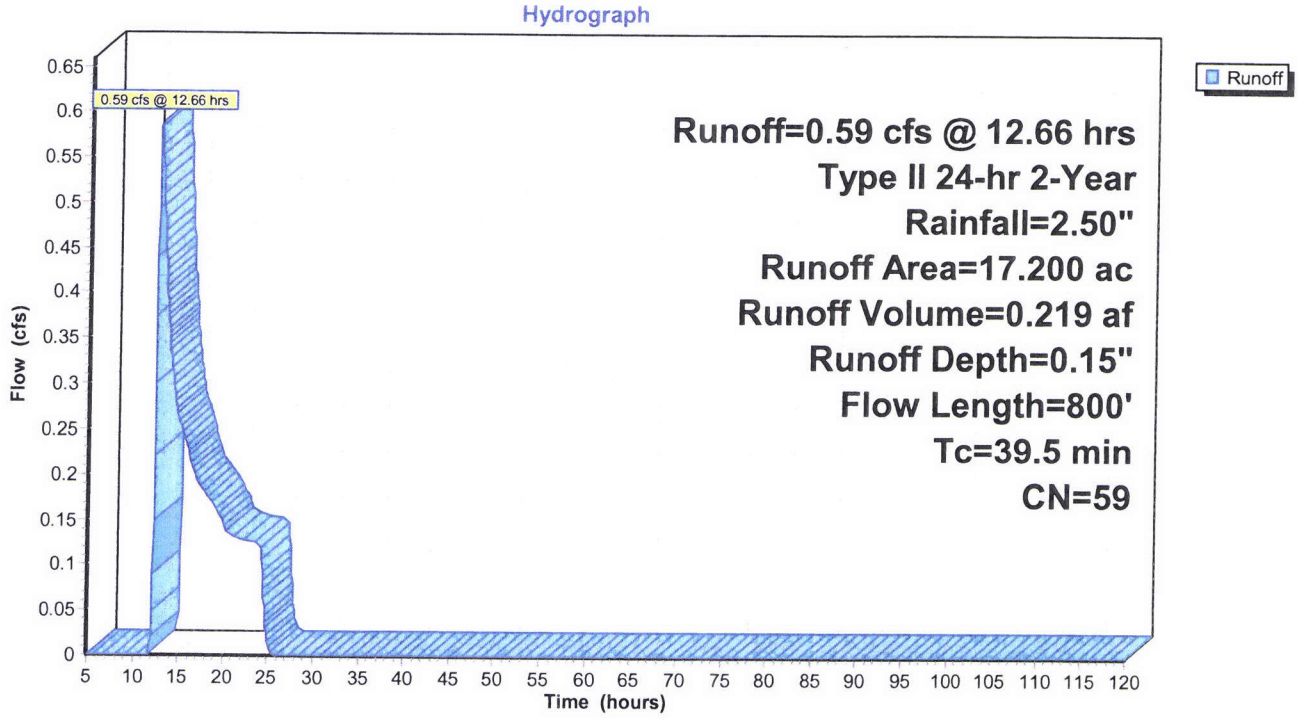
Runoff = 0.59 cfs @ 12.66 hrs, Volume= 0.219 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.50"

Area (ac)	CN	Description	Land Use
15.000	58	Meadow, non-grazed, HSG B	Meadow
2.200	65	Woods/grass comb., Fair, HSG B	Woods
17.200	59	Weighted Average	
17.200		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.1	300	0.0300	0.15		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 2.50"
6.4	500	0.0350	1.31		**Shallow Concentrated Flow, shallow concentrated** Short Grass Pasture Kv= 7.0 fps
39.5	800	Total			

Subcatchment 6aS: Subcatch 6A-SC



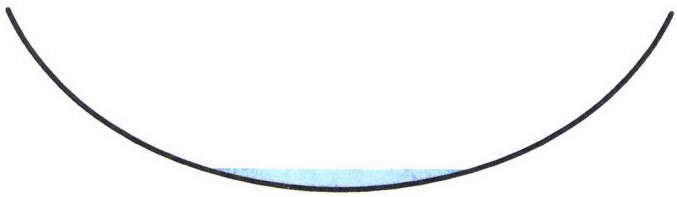
Summary for Reach 1R: Shallow Swale

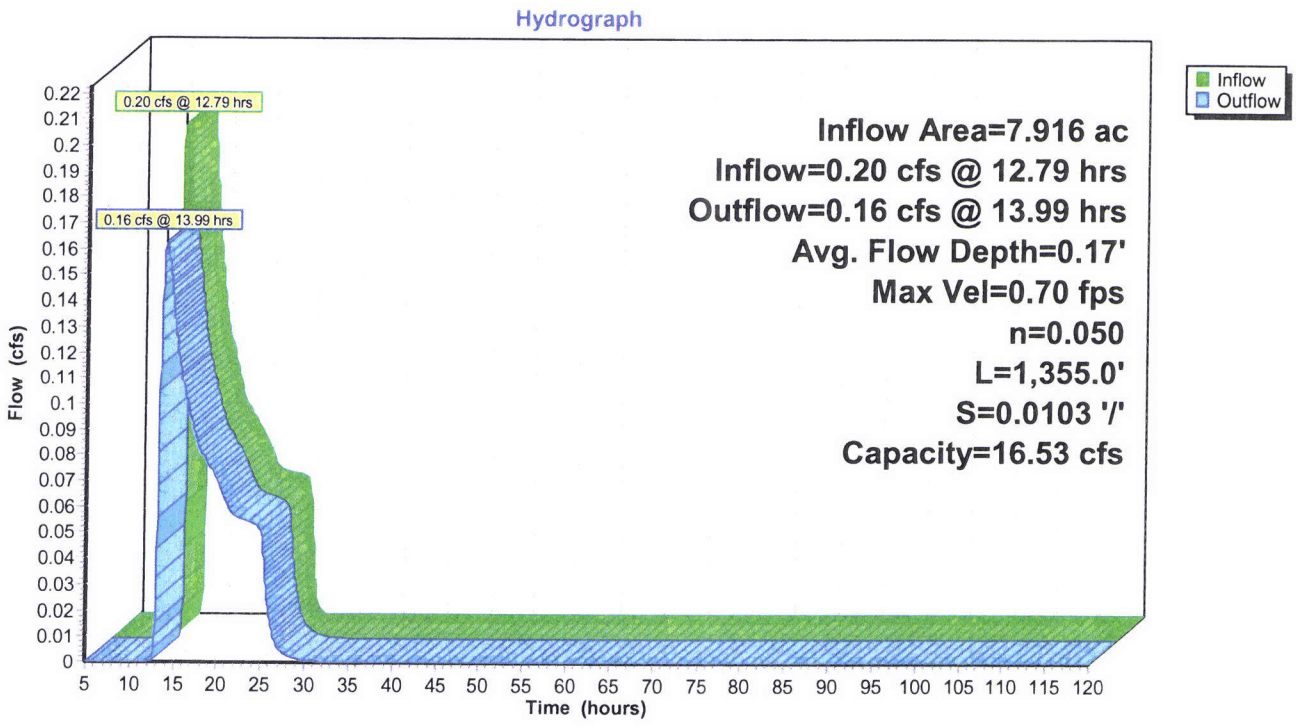
Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.13" for 2-Year event
Inflow = 0.20 cfs @ 12.79 hrs, Volume= 0.088 af
Outflow = 0.16 cfs @ 13.99 hrs, Volume= 0.088 af, Atten= 18%, Lag= 71.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.70 fps, Min. Travel Time= 32.1 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 65.4 min

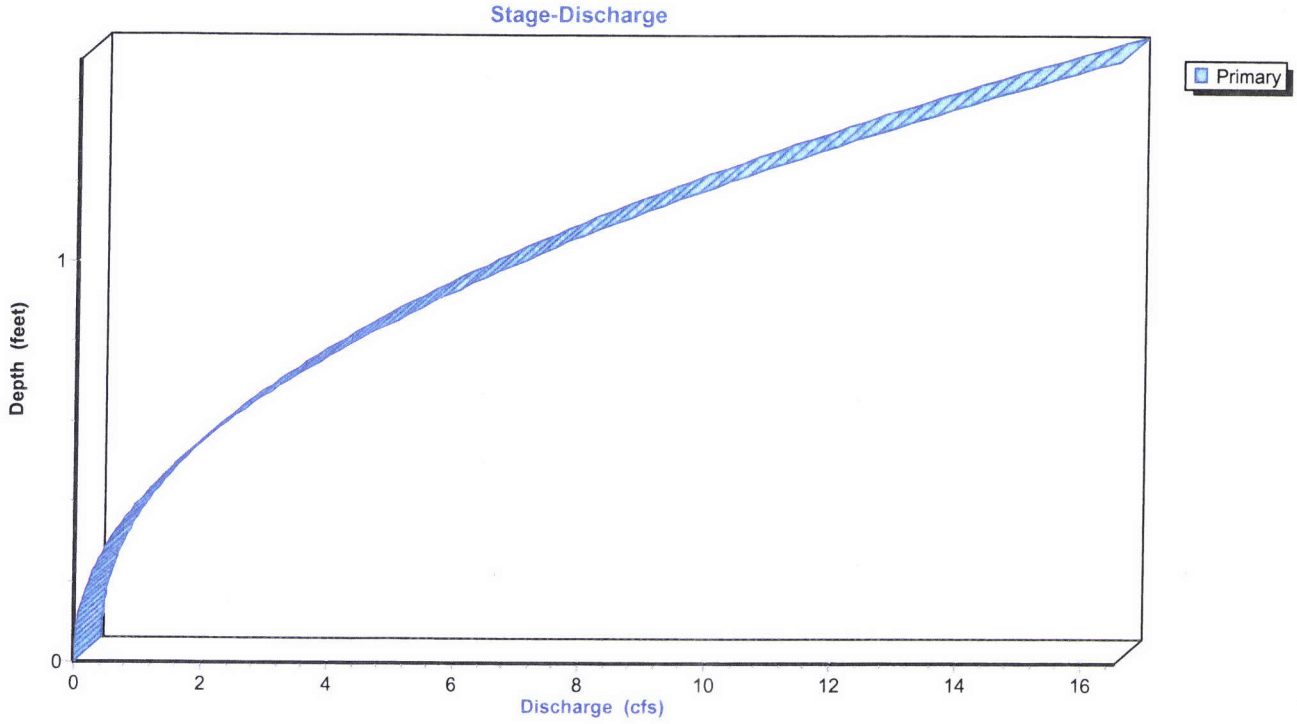
Peak Storage= 314 cf @ 13.45 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 16.53 cfs

6.00' x 1.50' deep Parabolic Channel, n= 0.050 Sluggish weedy reaches w/pools
Length= 1,355.0' Slope= 0.0103 '/'
Inlet Invert= 646.00', Outlet Invert= 632.00'

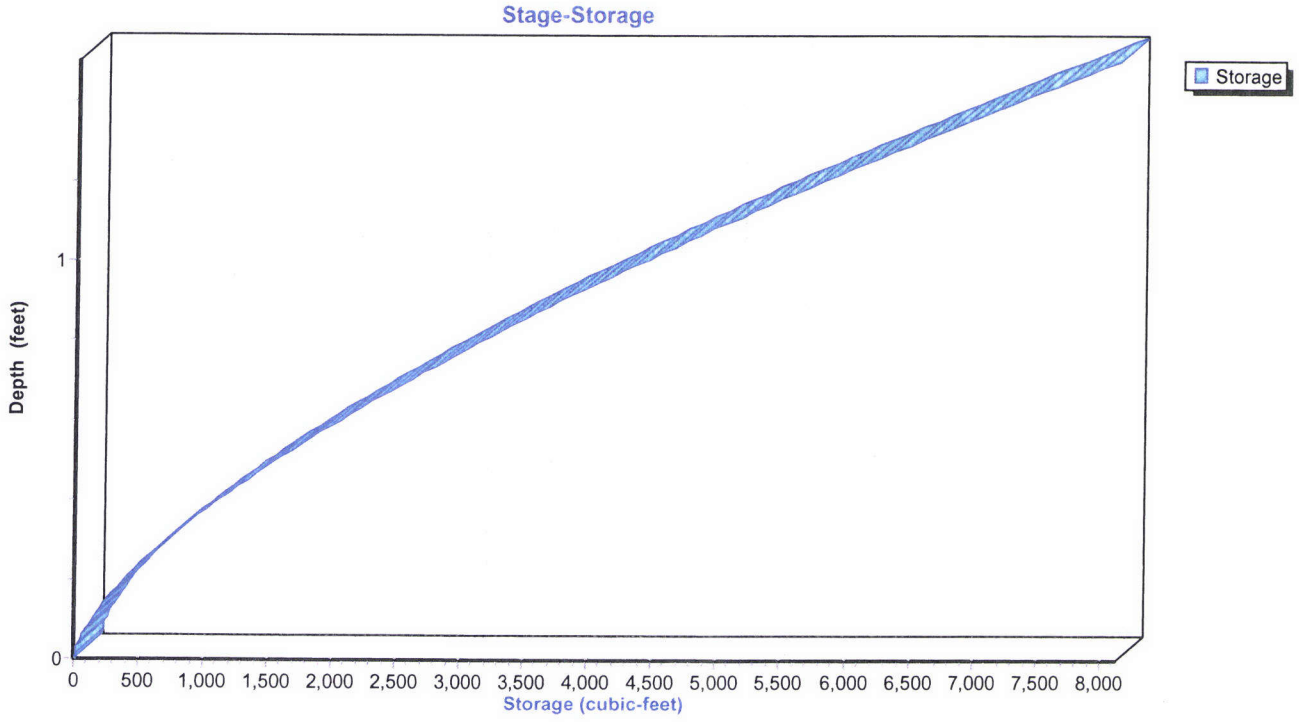




Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



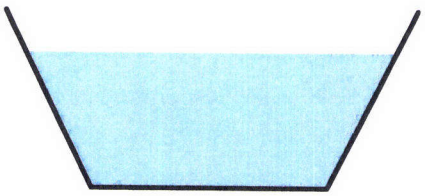
Summary for Reach 2R: Drainage Ditch (North side runway)

Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 25.37 cfs @ 12.46 hrs, Volume= 4.168 af
Outflow = 16.80 cfs @ 13.27 hrs, Volume= 4.168 af, Atten= 34%, Lag= 48.7 min

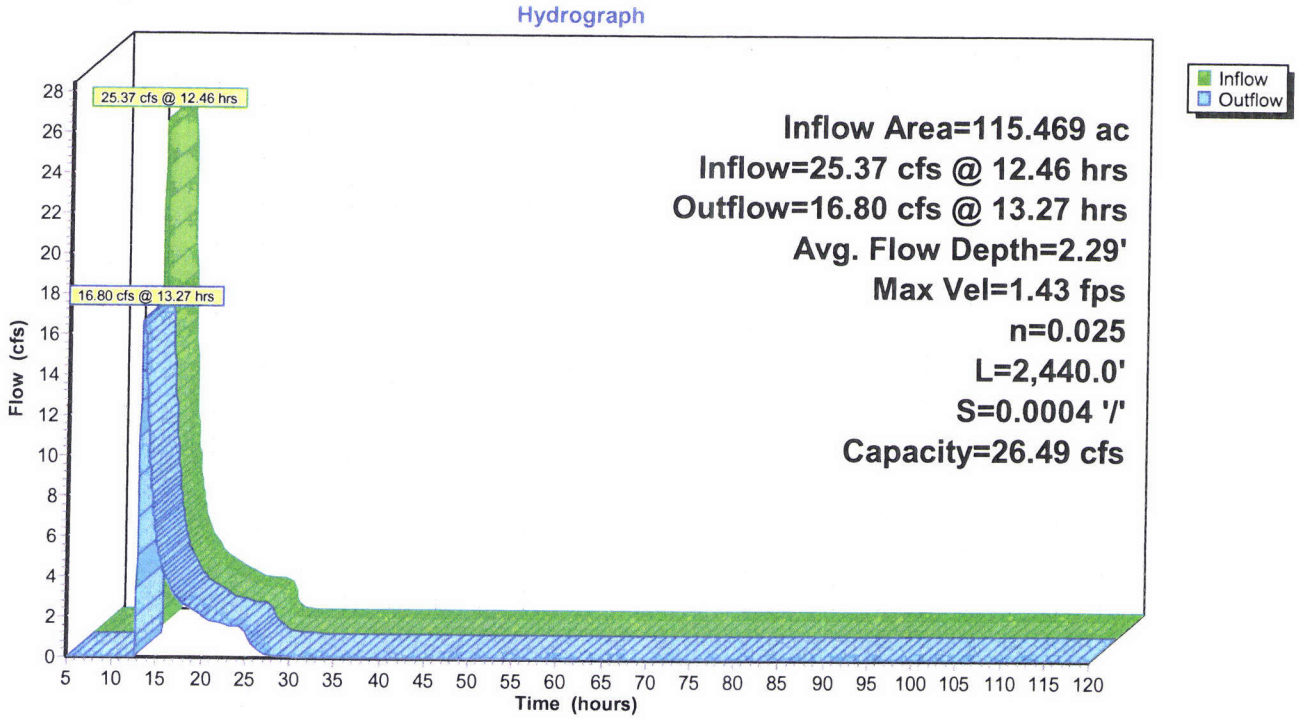
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.43 fps, Min. Travel Time= 28.5 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 142.8 min

Peak Storage= 28,754 cf @ 12.80 hrs
Average Depth at Peak Storage= 2.29'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 26.49 cfs

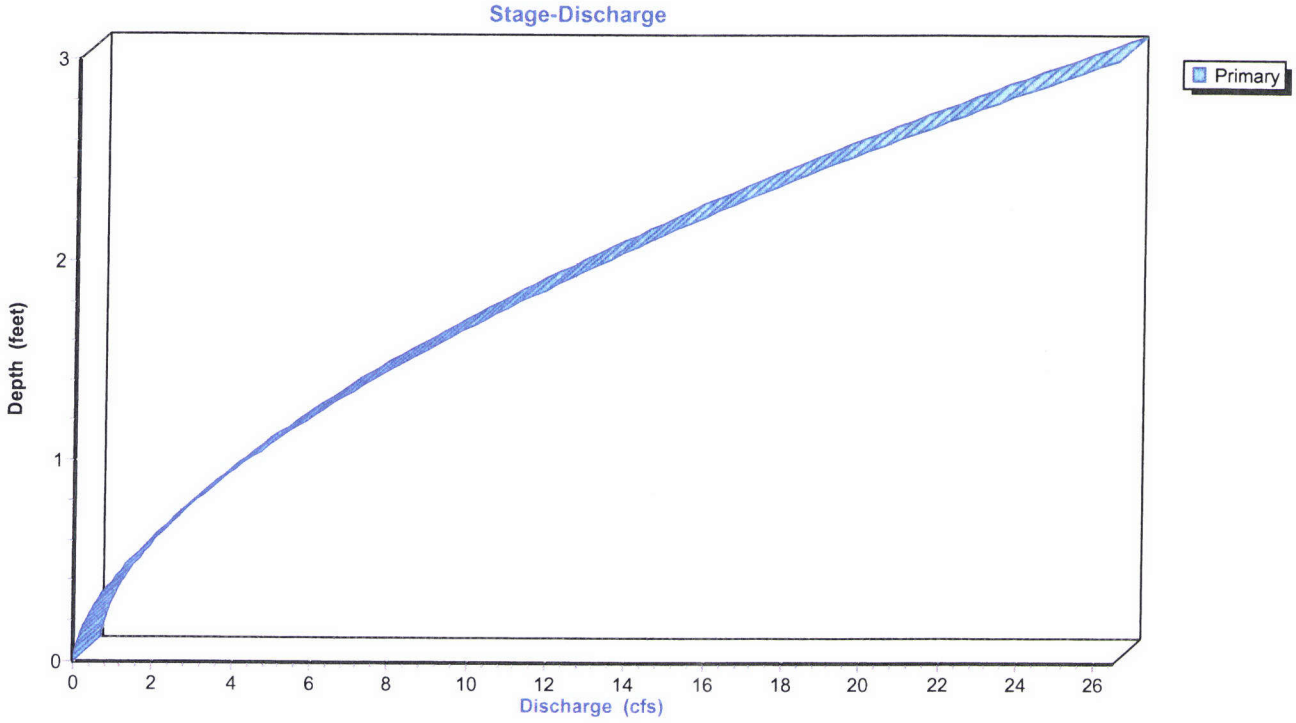
4.00' x 3.00' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 0.5 '/' Top Width= 7.00'
Length= 2,440.0' Slope= 0.0004 '/'
Inlet Invert= 632.00', Outlet Invert= 631.00'



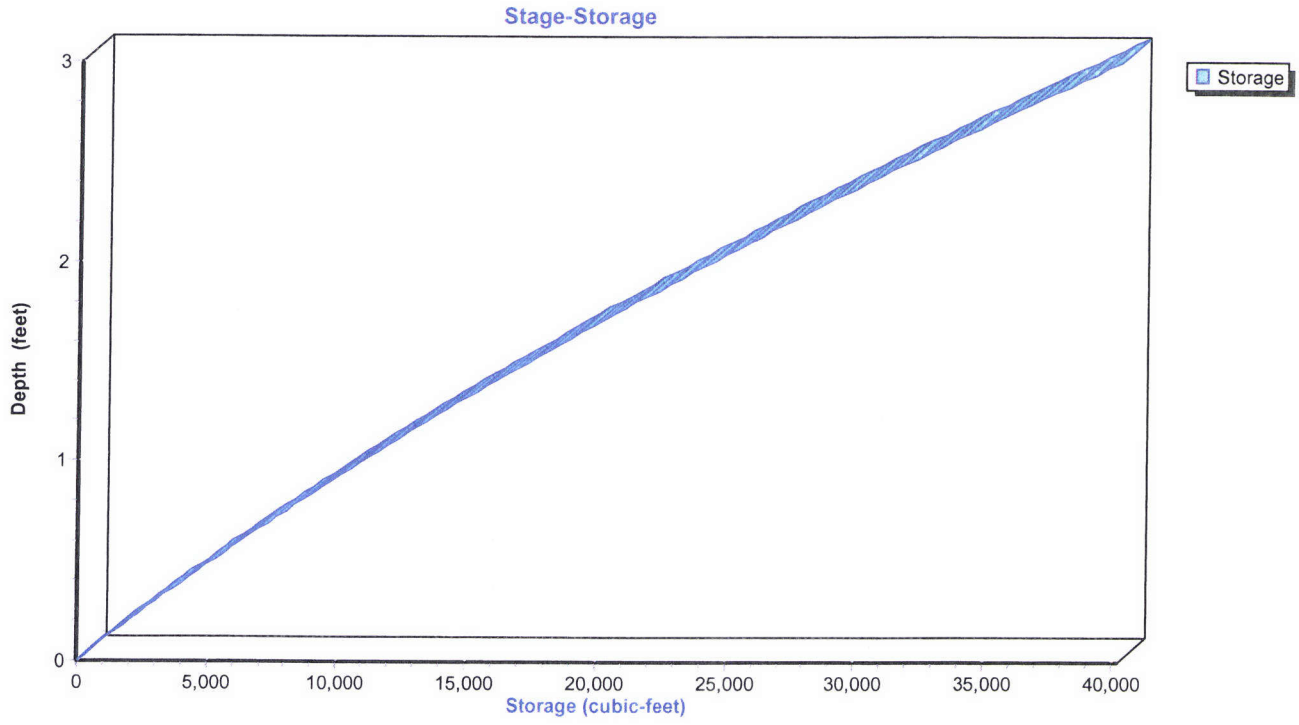
Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



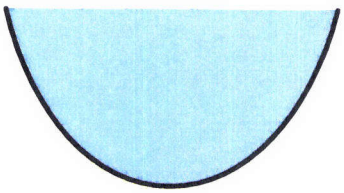
Summary for Reach 3R: Drainage Ditch (upper section)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 32.85 cfs @ 13.09 hrs, Volume= 9.839 af
Outflow = 32.49 cfs @ 13.30 hrs, Volume= 9.839 af, Atten= 1%, Lag= 12.4 min

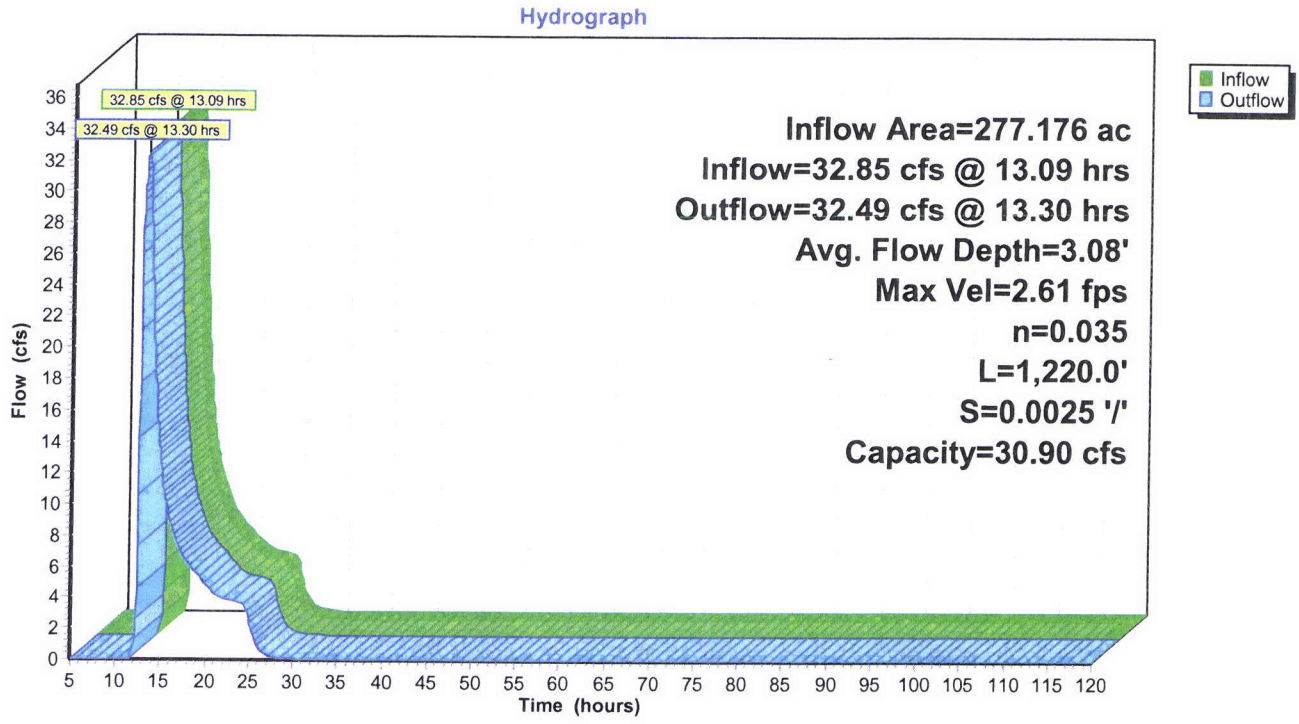
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.61 fps, Min. Travel Time= 7.8 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 37.0 min

Peak Storage= 15,218 cf @ 13.17 hrs
Average Depth at Peak Storage= 3.08'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 30.90 cfs

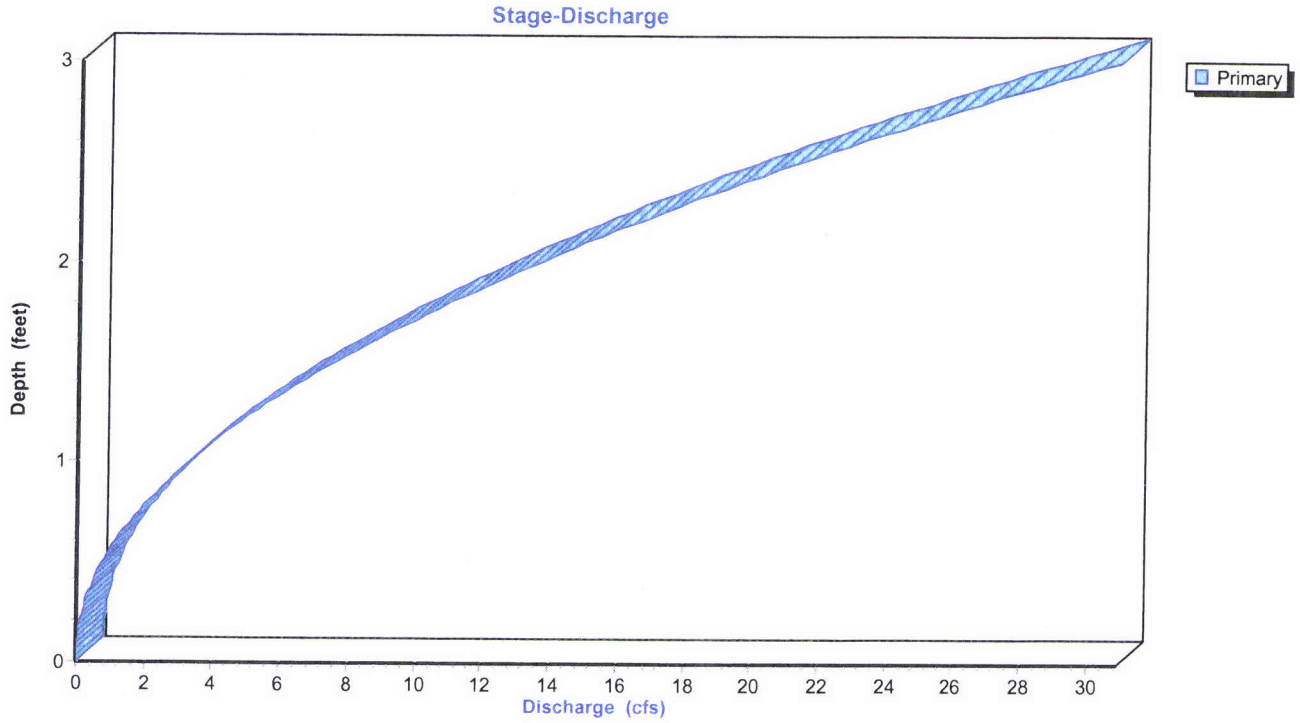
6.00' x 3.00' deep Parabolic Channel, n= 0.035 High grass
Length= 1,220.0' Slope= 0.0025 '/'
Inlet Invert= 631.00', Outlet Invert= 628.00'



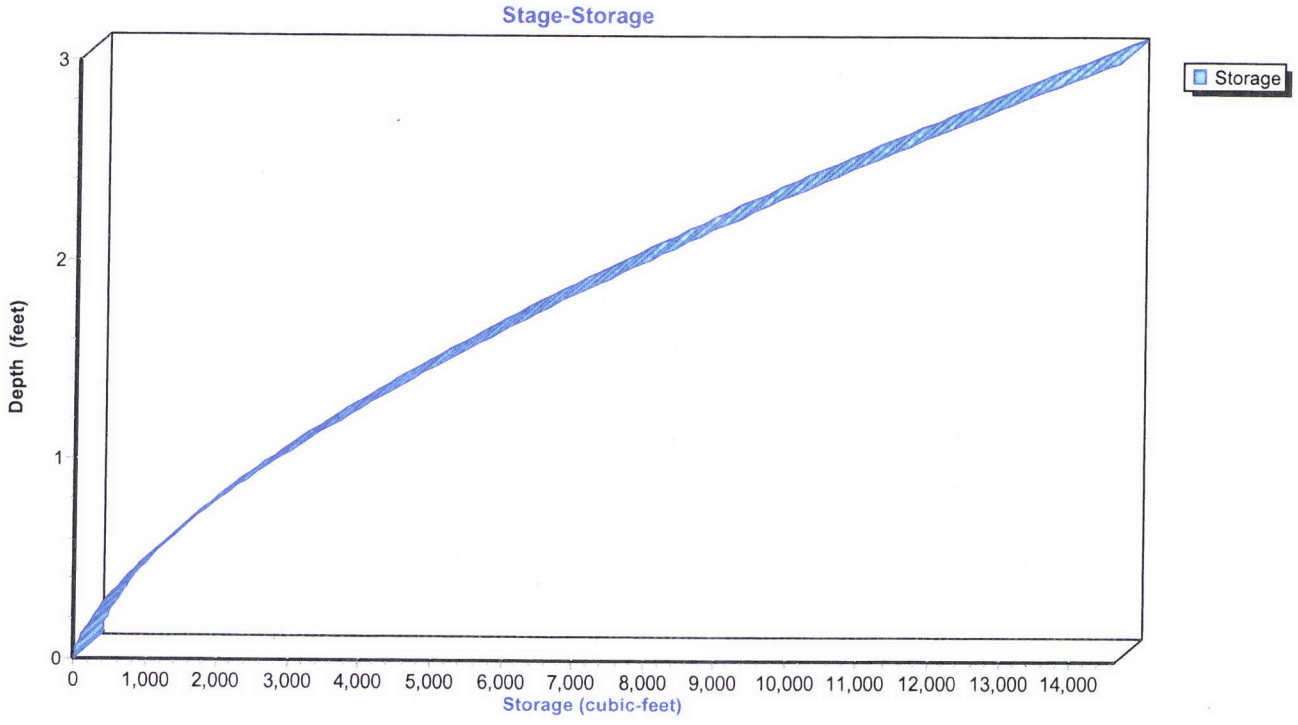
Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



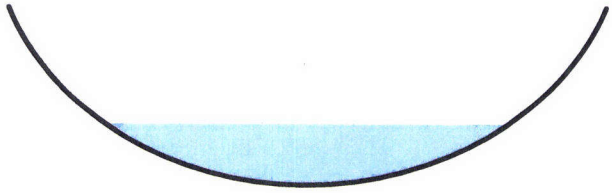
Summary for Reach 4R: Drainage Ditch (Main)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 32.49 cfs @ 13.30 hrs, Volume= 9.839 af
Outflow = 31.28 cfs @ 13.76 hrs, Volume= 9.839 af, Atten= 4%, Lag= 27.4 min

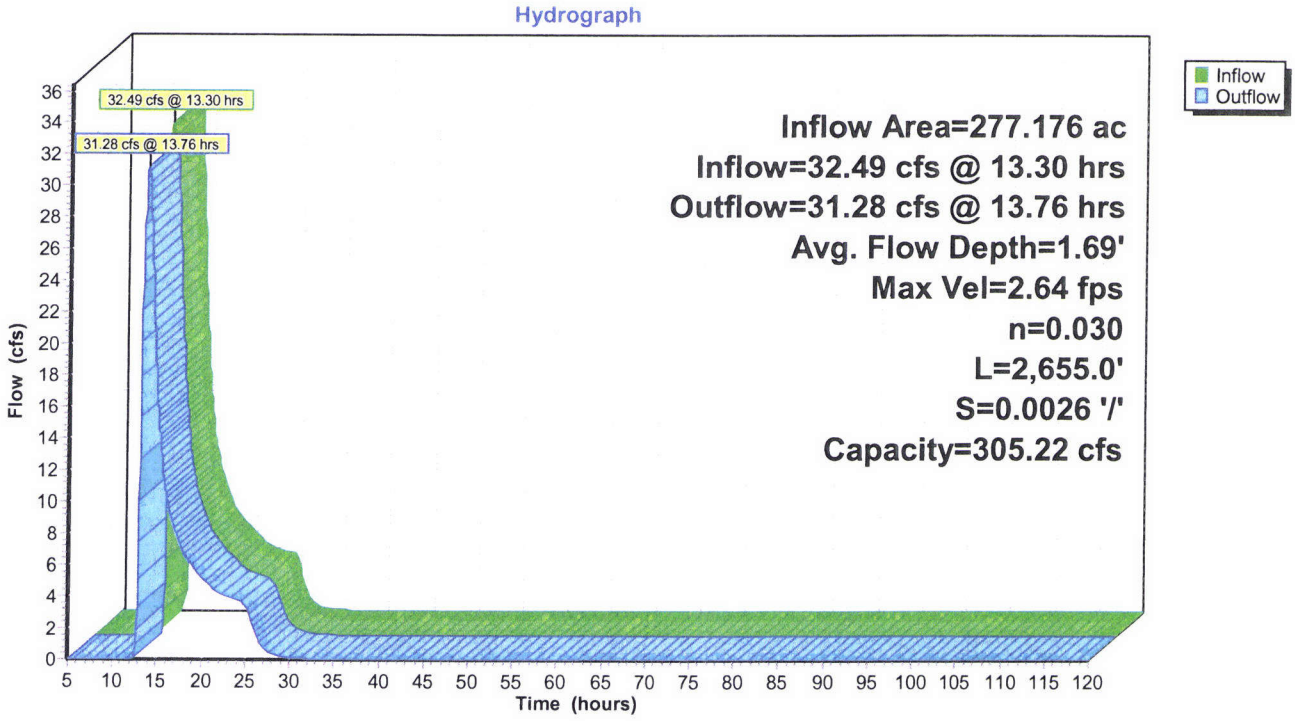
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.64 fps, Min. Travel Time= 16.7 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 73.6 min

Peak Storage= 31,430 cf @ 13.48 hrs
Average Depth at Peak Storage= 1.69'
Bank-Full Depth= 5.00', Capacity at Bank-Full= 305.22 cfs

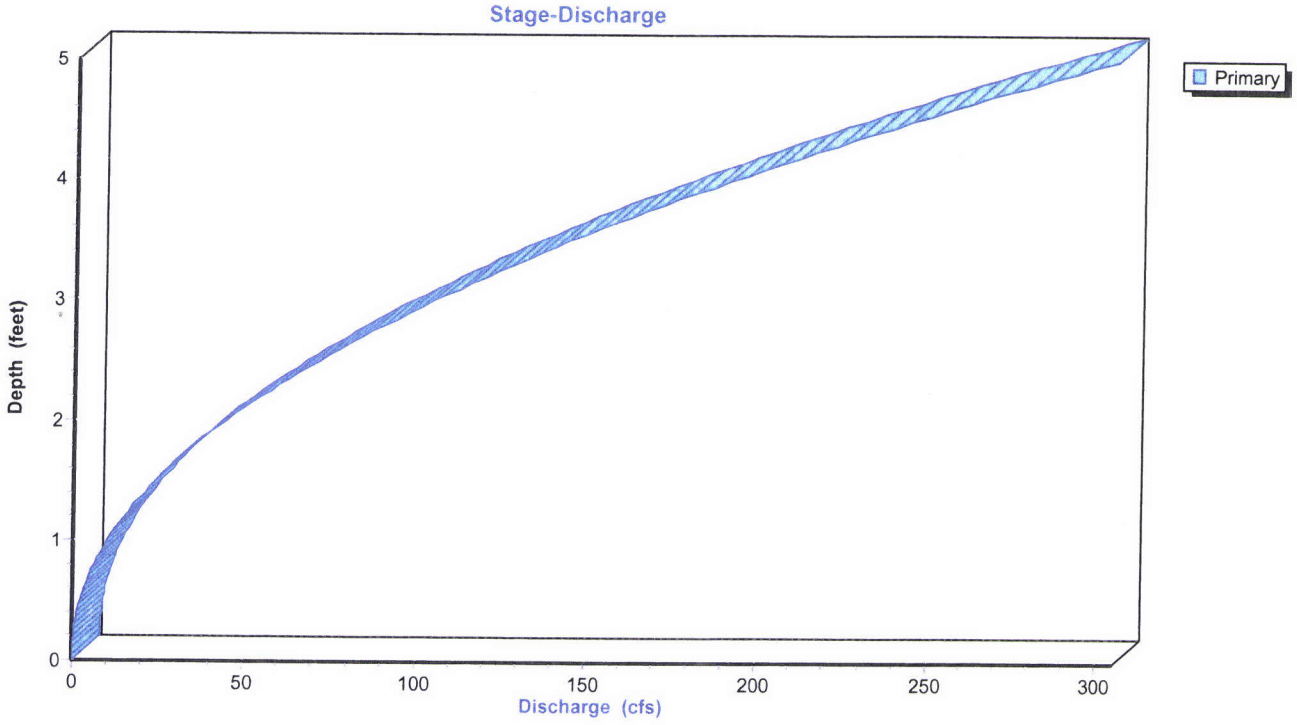
18.00' x 5.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 2,655.0' Slope= 0.0026 '/'
Inlet Invert= 628.00', Outlet Invert= 621.00'



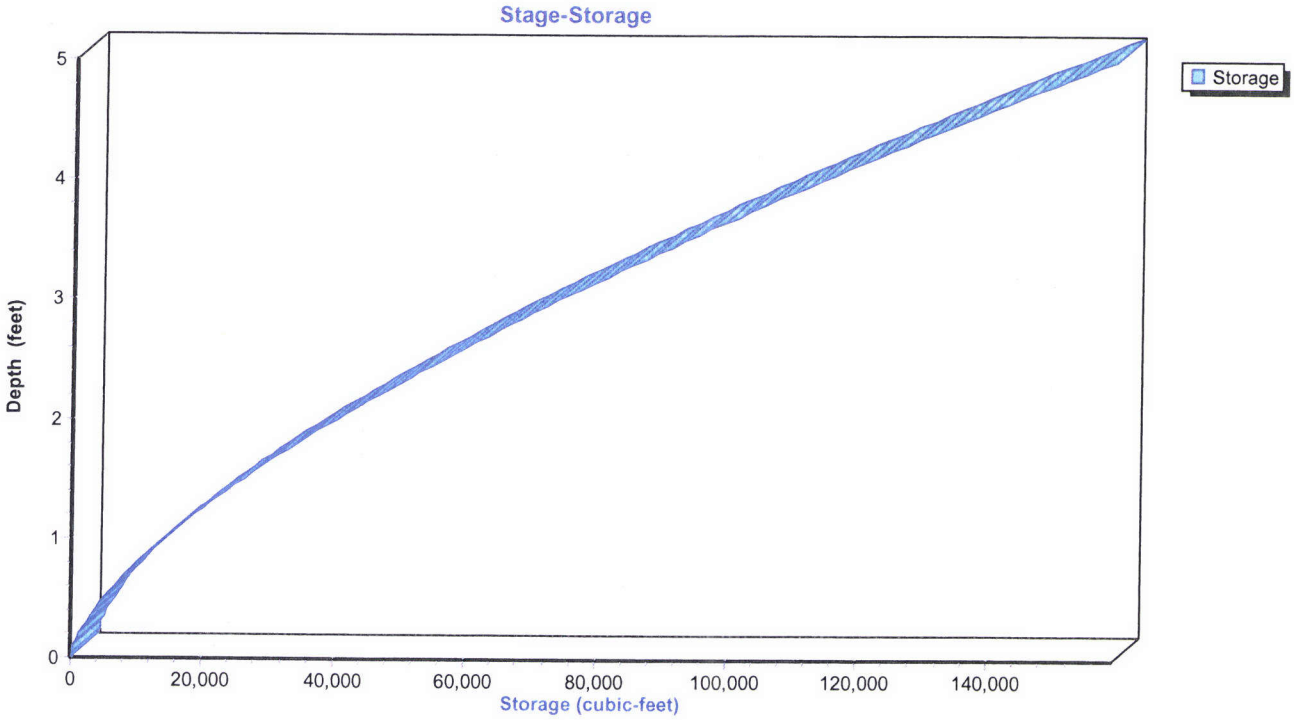
Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



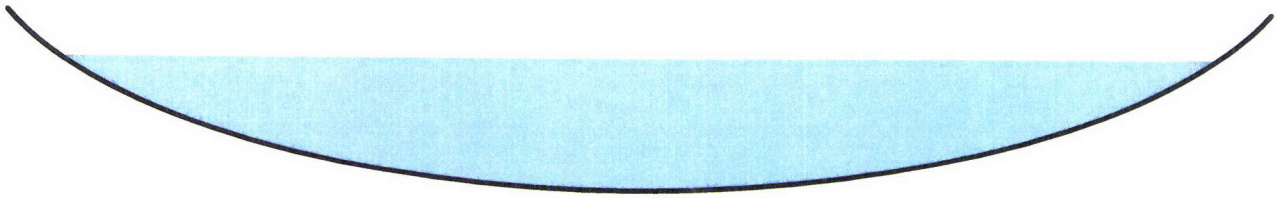
Summary for Reach 5R: Ditch & Swamp

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.40" for 2-Year event
Inflow = 10.44 cfs @ 16.20 hrs, Volume= 10.183 af
Outflow = 10.21 cfs @ 17.37 hrs, Volume= 10.178 af, Atten= 2%, Lag= 70.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 36.4 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 109.7 min

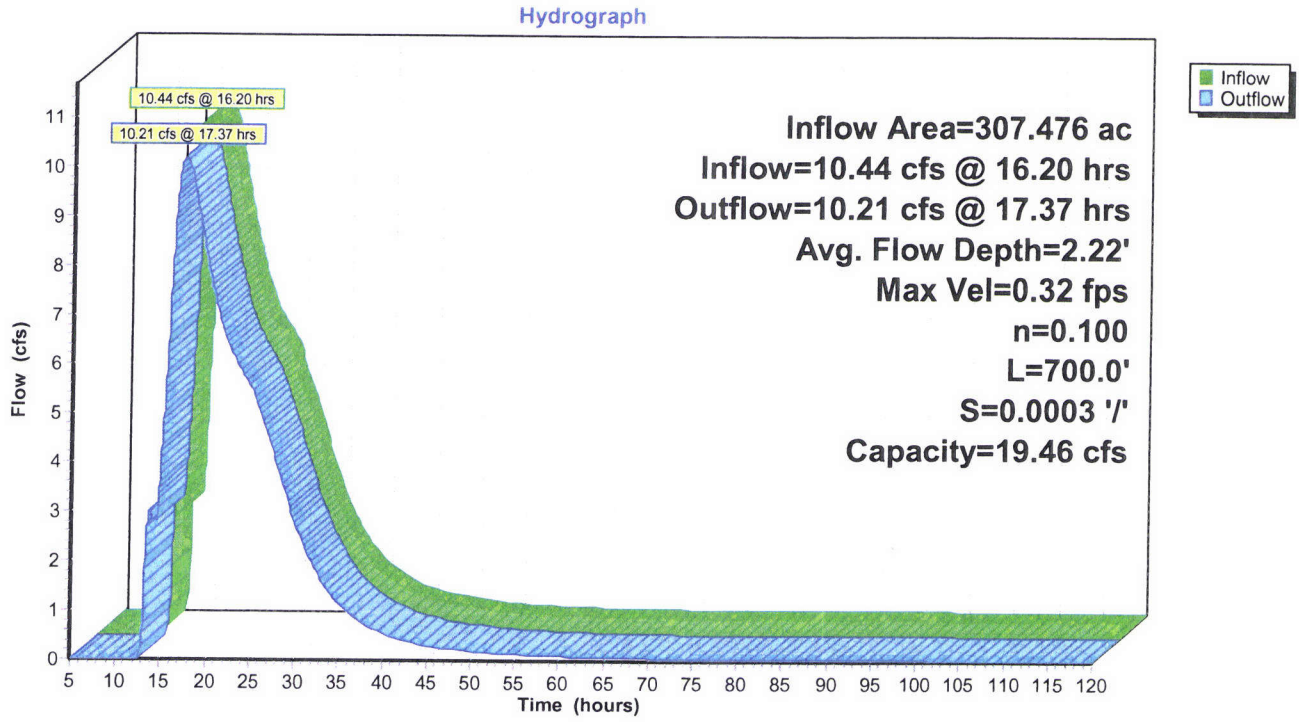
Peak Storage= 22,300 cf @ 16.76 hrs
Average Depth at Peak Storage= 2.22'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 19.46 cfs

25.00' x 3.00' deep Parabolic Channel, n= 0.100 Very weedy reaches w/pools
Length= 700.0' Slope= 0.0003 '/'
Inlet Invert= 620.20', Outlet Invert= 620.00'

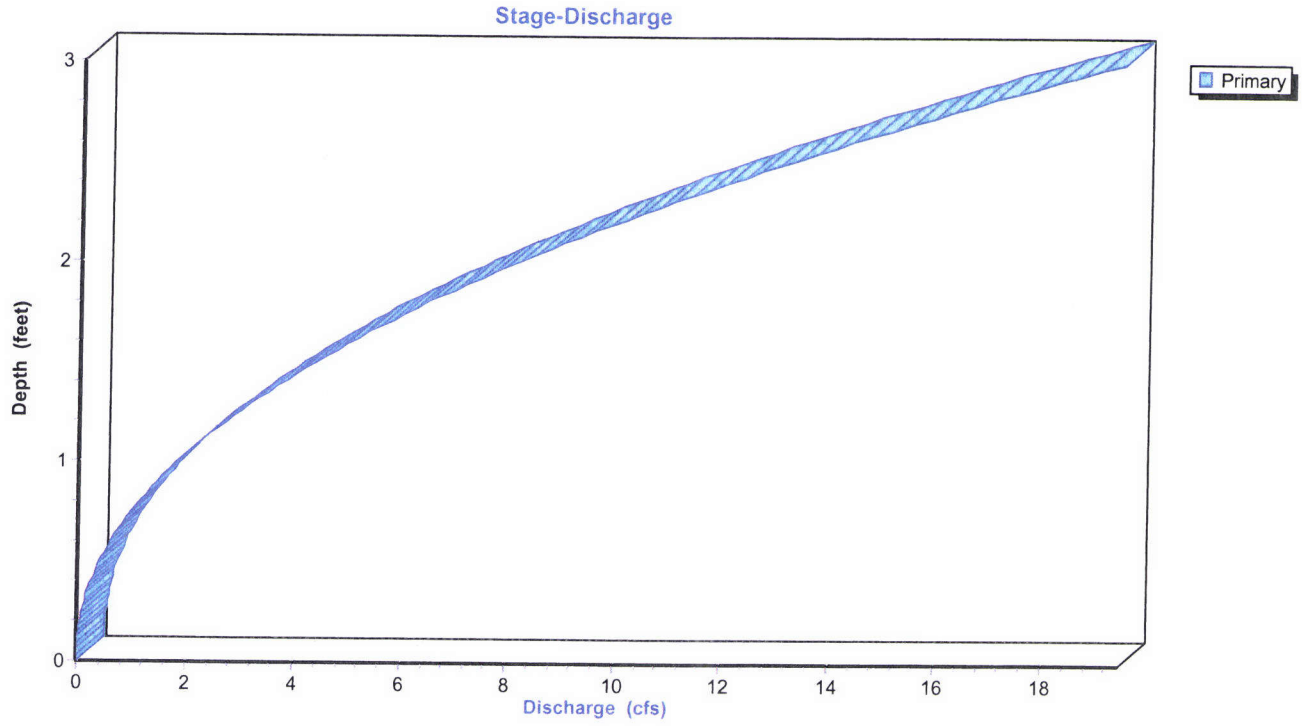


‡

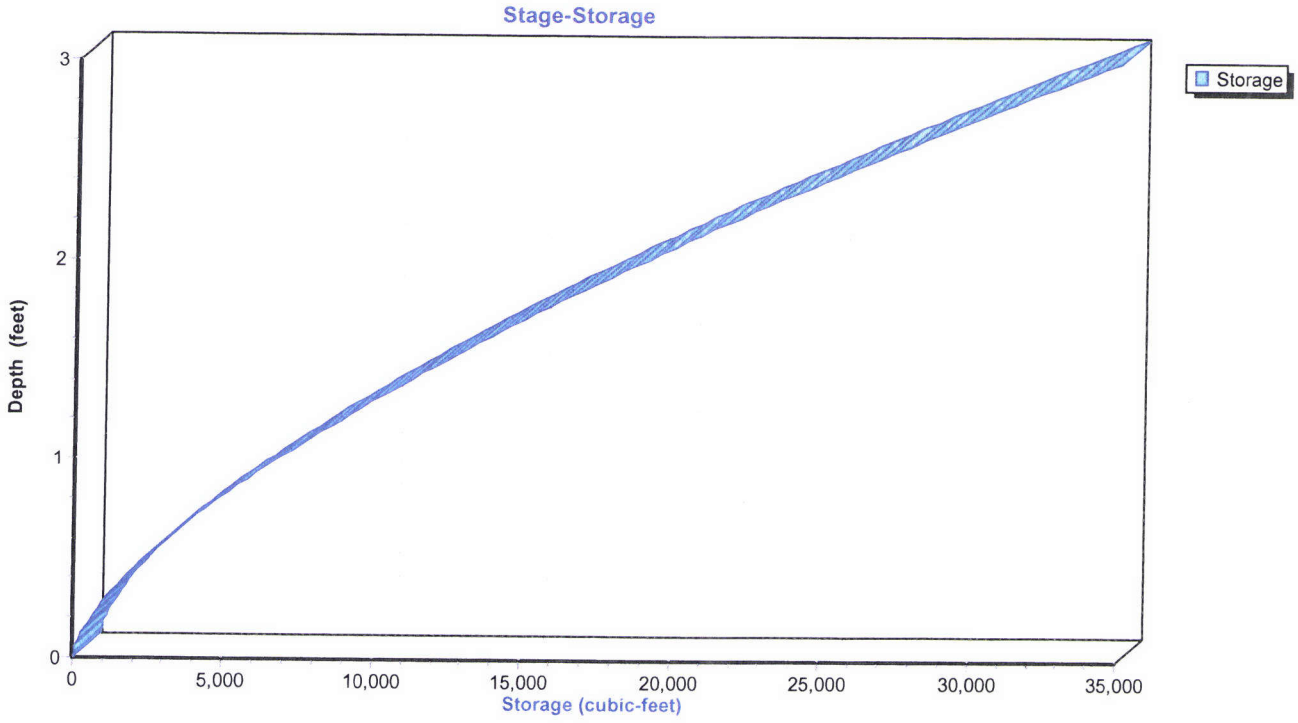
Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



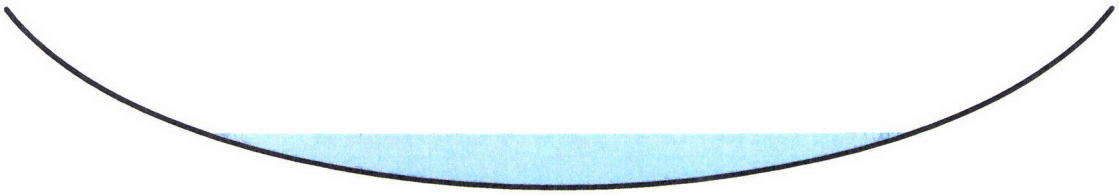
Summary for Reach 6R: School House Marsh (feeder ditch)

Inflow Area = 339.776 ac, 1.42% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 4.09 cfs @ 12.45 hrs, Volume= 0.801 af
Outflow = 3.45 cfs @ 12.87 hrs, Volume= 0.801 af, Atten= 16%, Lag= 25.2 min

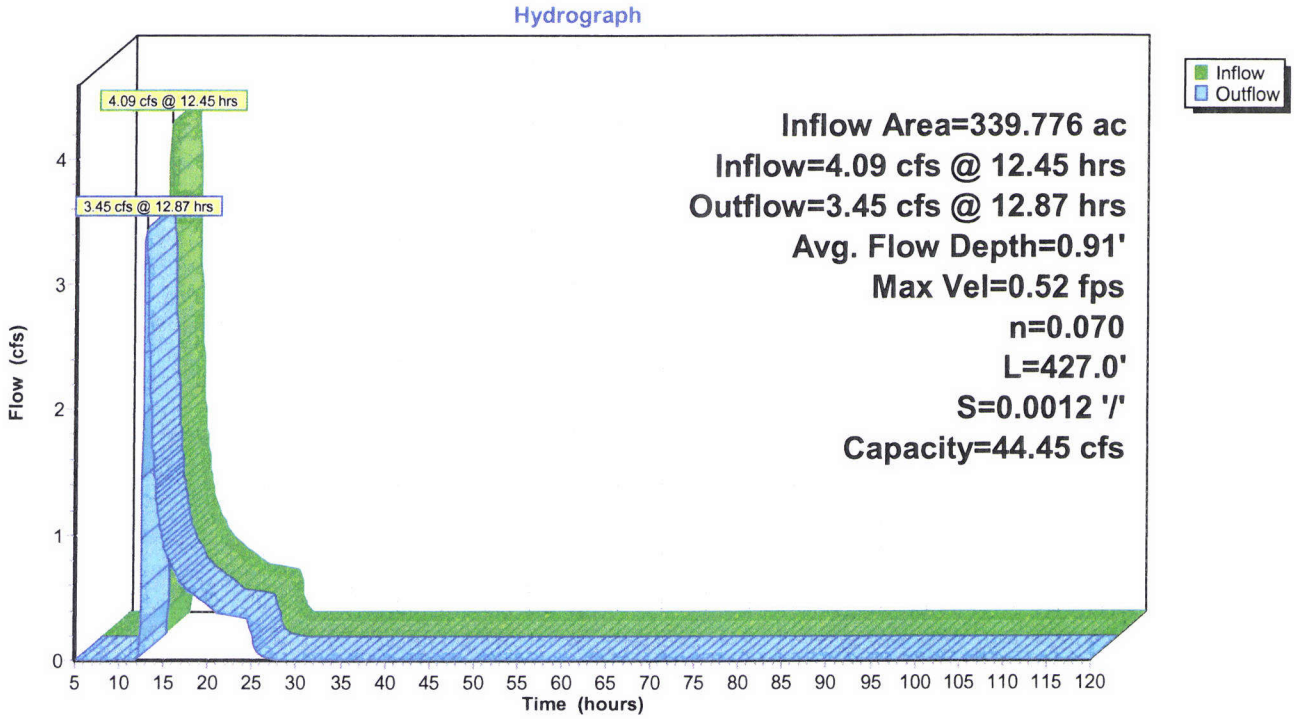
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.52 fps, Min. Travel Time= 13.8 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 42.5 min

Peak Storage= 2,865 cf @ 12.64 hrs
Average Depth at Peak Storage= 0.91'
Defined Flood Depth= 622.00', Capacity at Flood Depth= 19,490.63 cfs
Bank-Full Depth= 3.00', Capacity at Bank-Full= 44.45 cfs

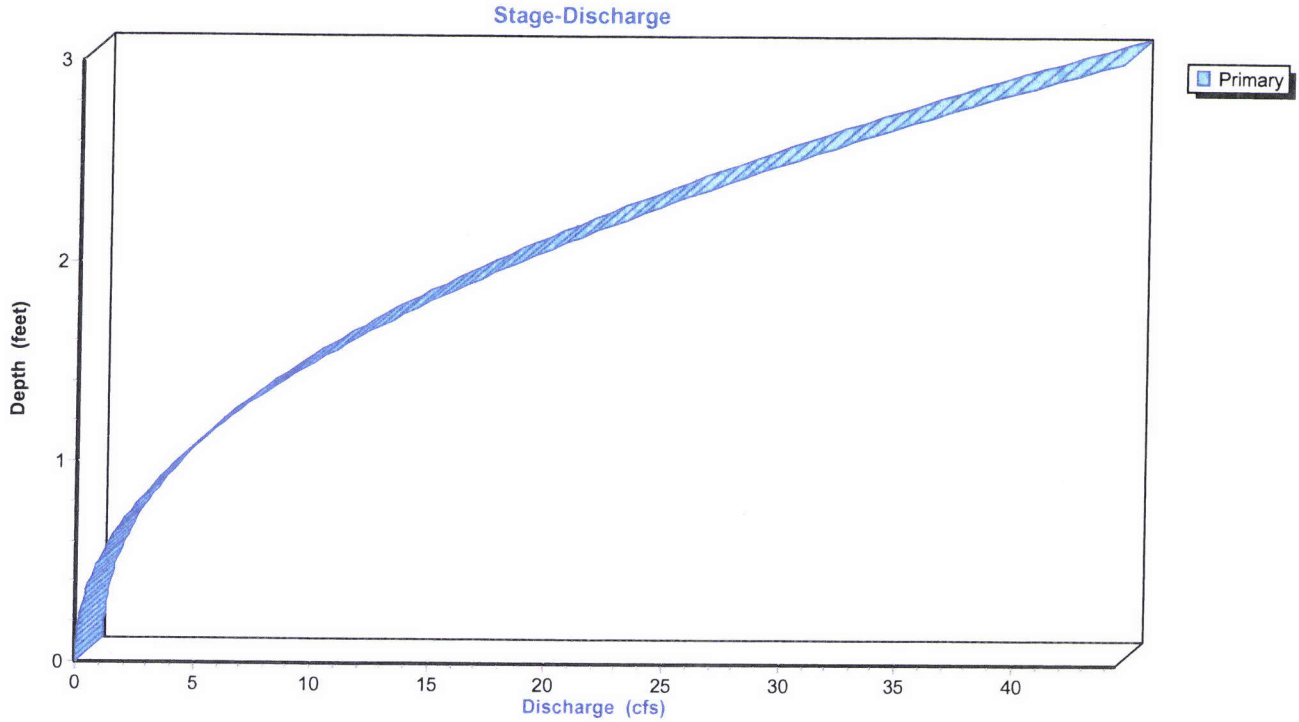
20.00' x 3.00' deep Parabolic Channel, n= 0.070 Sluggish weedy reaches w/pools
Length= 427.0' Slope= 0.0012 '/'
Inlet Invert= 618.50', Outlet Invert= 618.00'



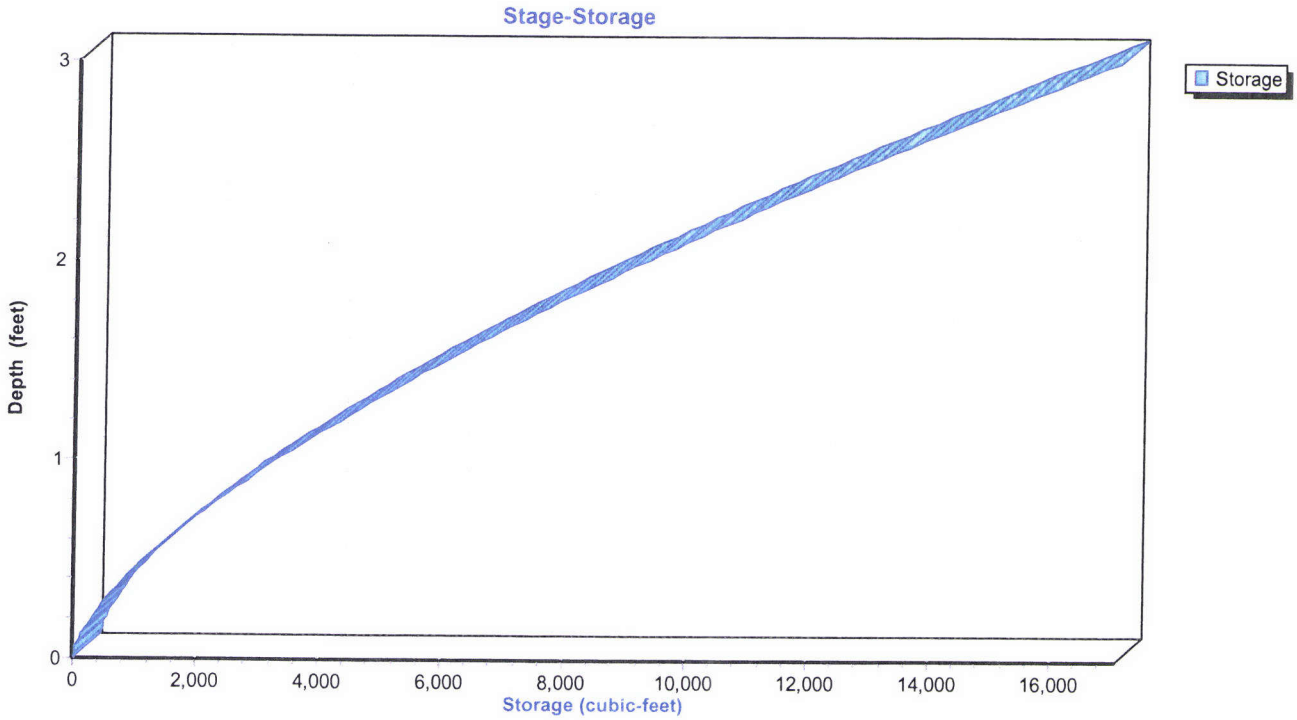
Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Summary for Reach 7R: (new Reach)

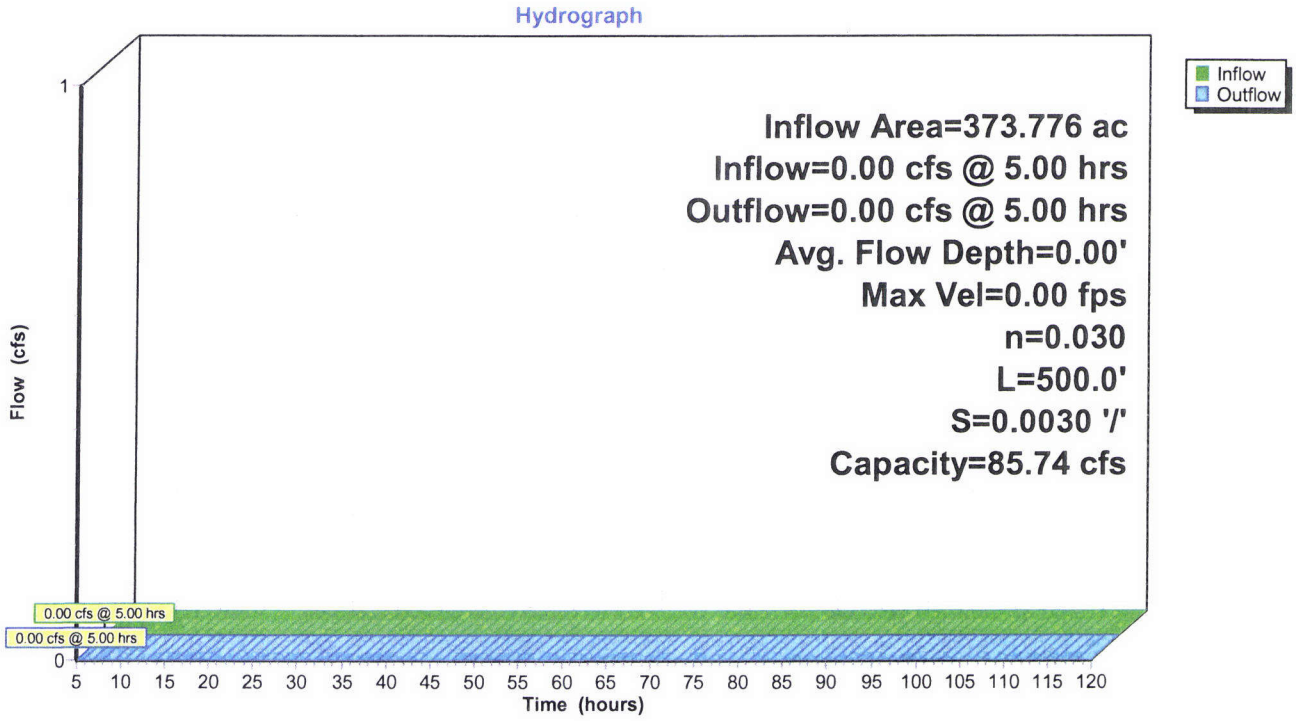
Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

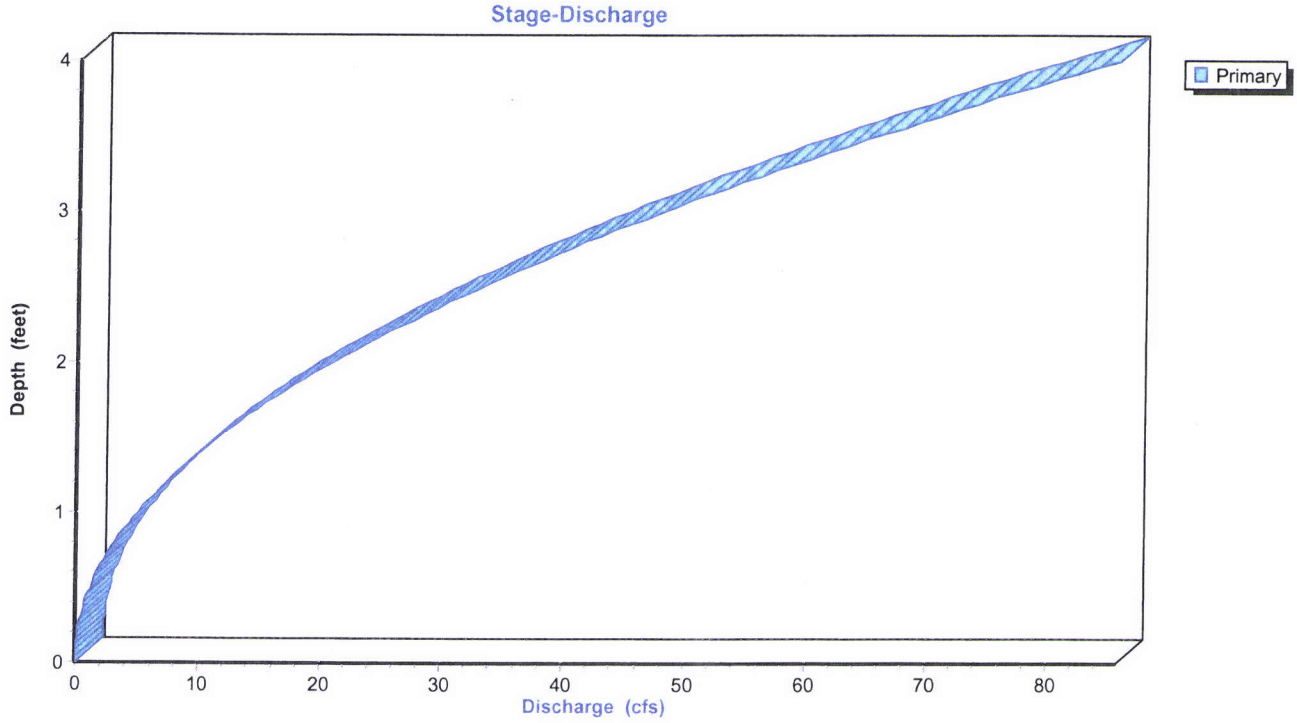
Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 85.74 cfs

8.00' x 4.00' deep Parabolic Channel, n= 0.030 Short grass
Length= 500.0' Slope= 0.0030 '/'
Inlet Invert= 613.50', Outlet Invert= 612.00'

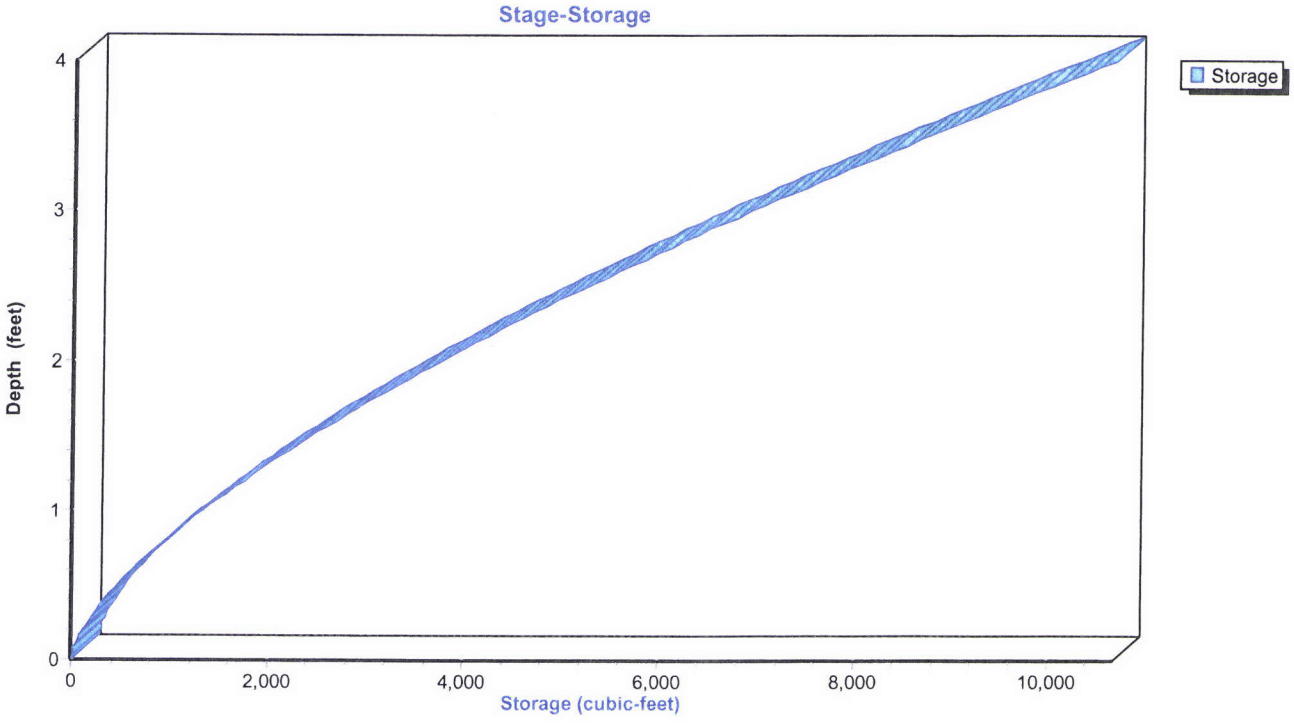
Reach 7R: (new Reach)



Reach 7R: (new Reach)



Reach 7R: (new Reach)



Summary for Pond 1C: Culvert 1 Fletcher Chapel

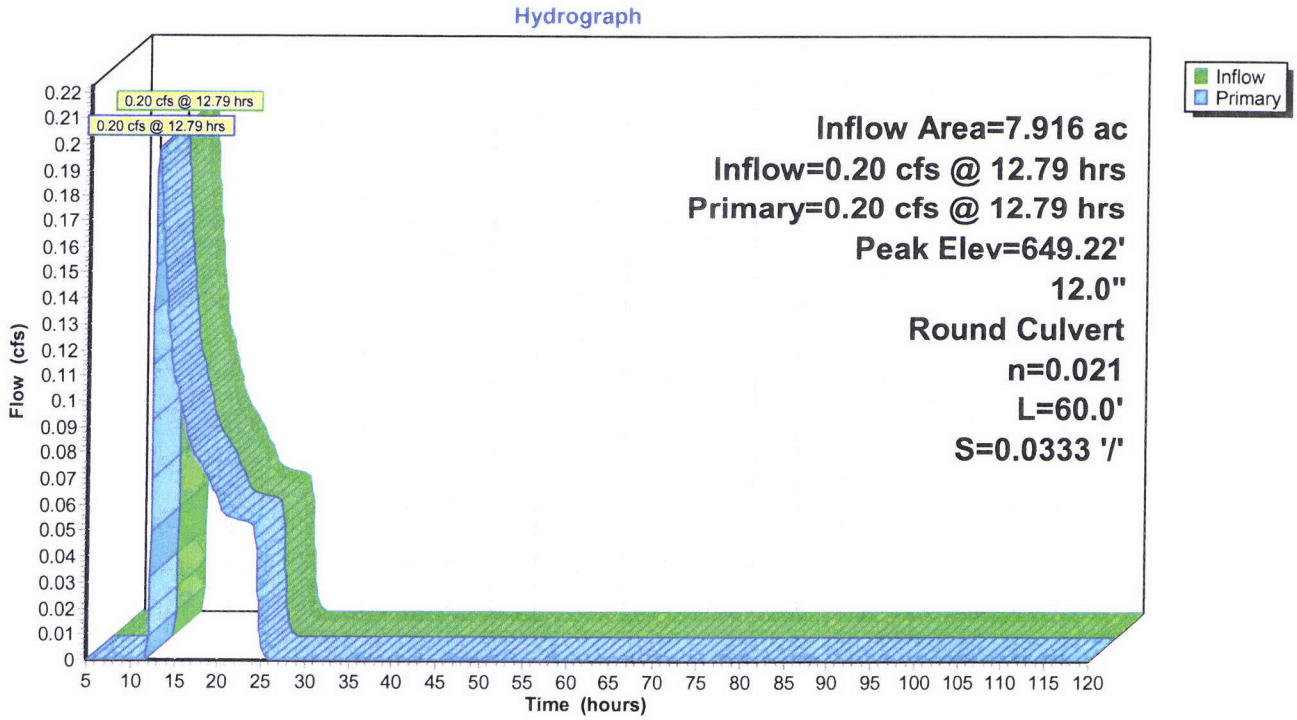
Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.13" for 2-Year event
Inflow = 0.20 cfs @ 12.79 hrs, Volume= 0.088 af
Outflow = 0.20 cfs @ 12.79 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.79 hrs, Volume= 0.088 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 649.22' @ 12.79 hrs

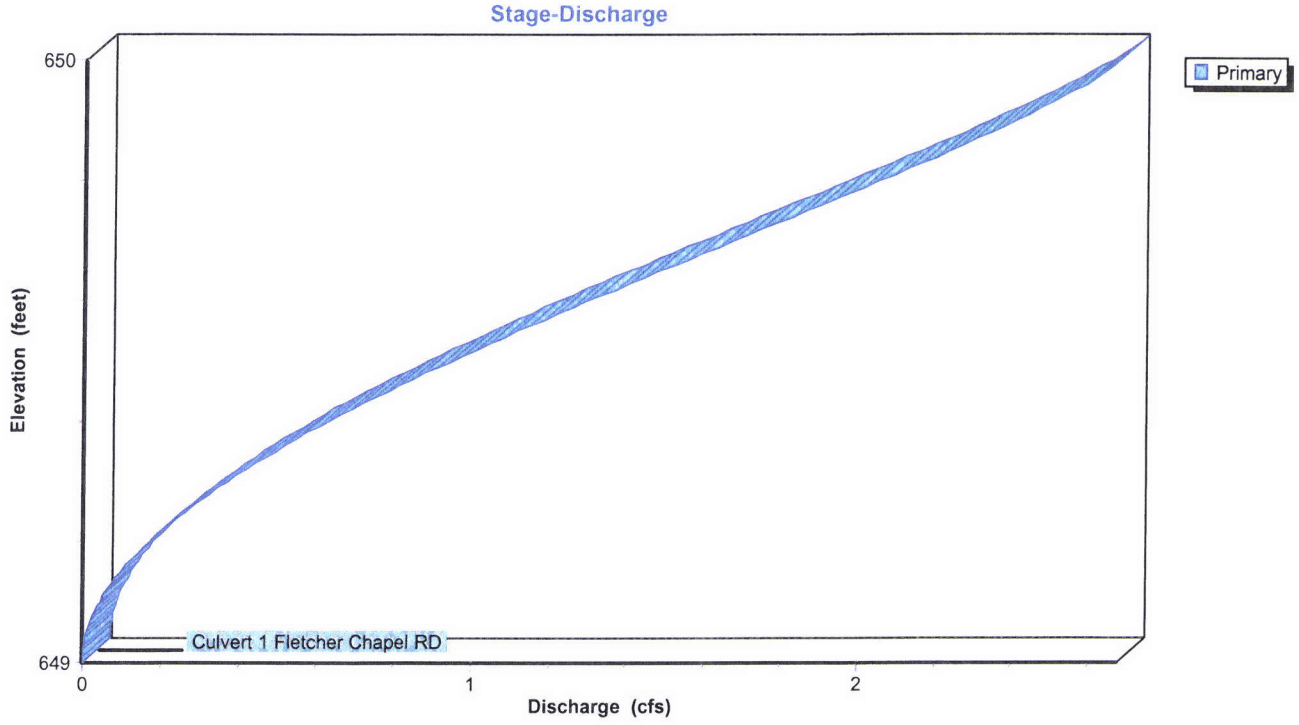
Device	Routing	Invert	Outlet Devices
#1	Primary	649.00'	**12.0" Round Culvert 1 Fletcher Chapel RD** L= 60.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 649.00' / 647.00' S= 0.0333 '/' Cc= 0.900 n= 0.021 Corrugated metal

Primary OutFlow Max=0.20 cfs @ 12.79 hrs HW=649.22' (Free Discharge)
1=Culvert 1 Fletcher Chapel RD (Inlet Controls 0.20 cfs @ 1.58 fps)

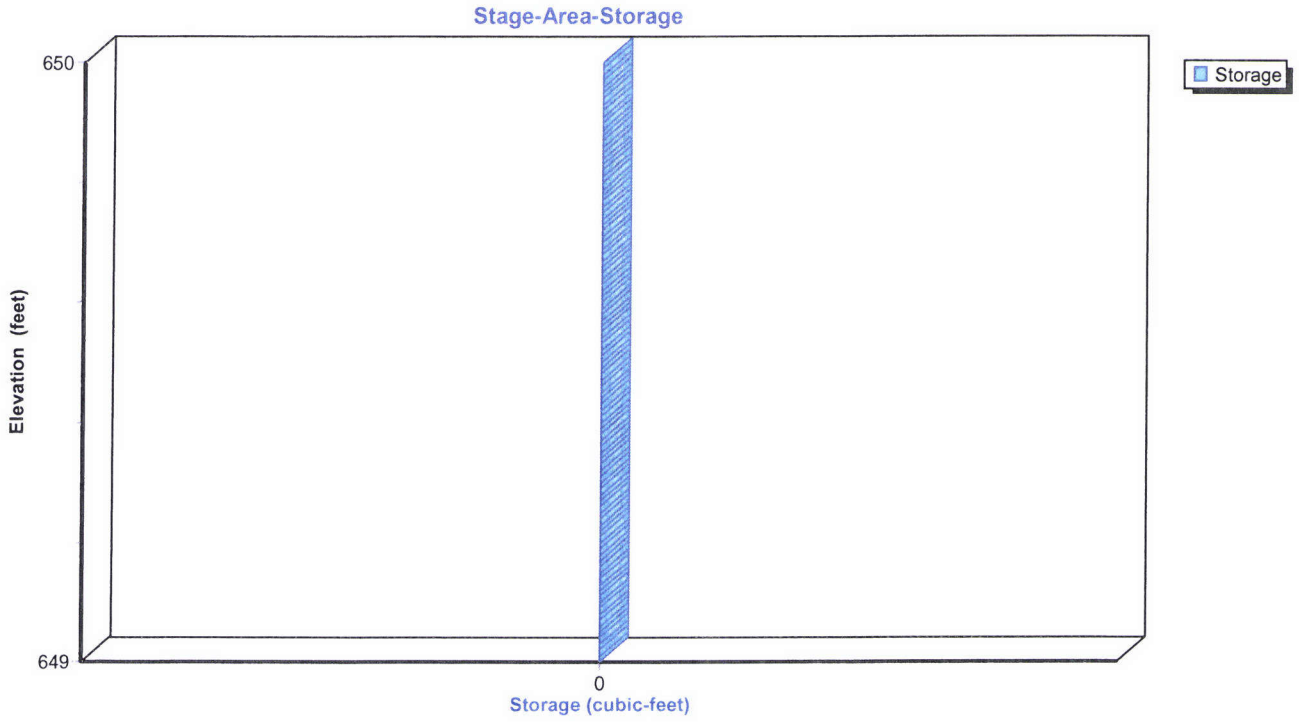
Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth = 0.04" for 2-Year event
Inflow = 4.27 cfs @ 12.88 hrs, Volume= 1.207 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.07' @ 72.35 hrs Surf.Area= 771,337 sf Storage= 2,426,242 cf (52,486 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

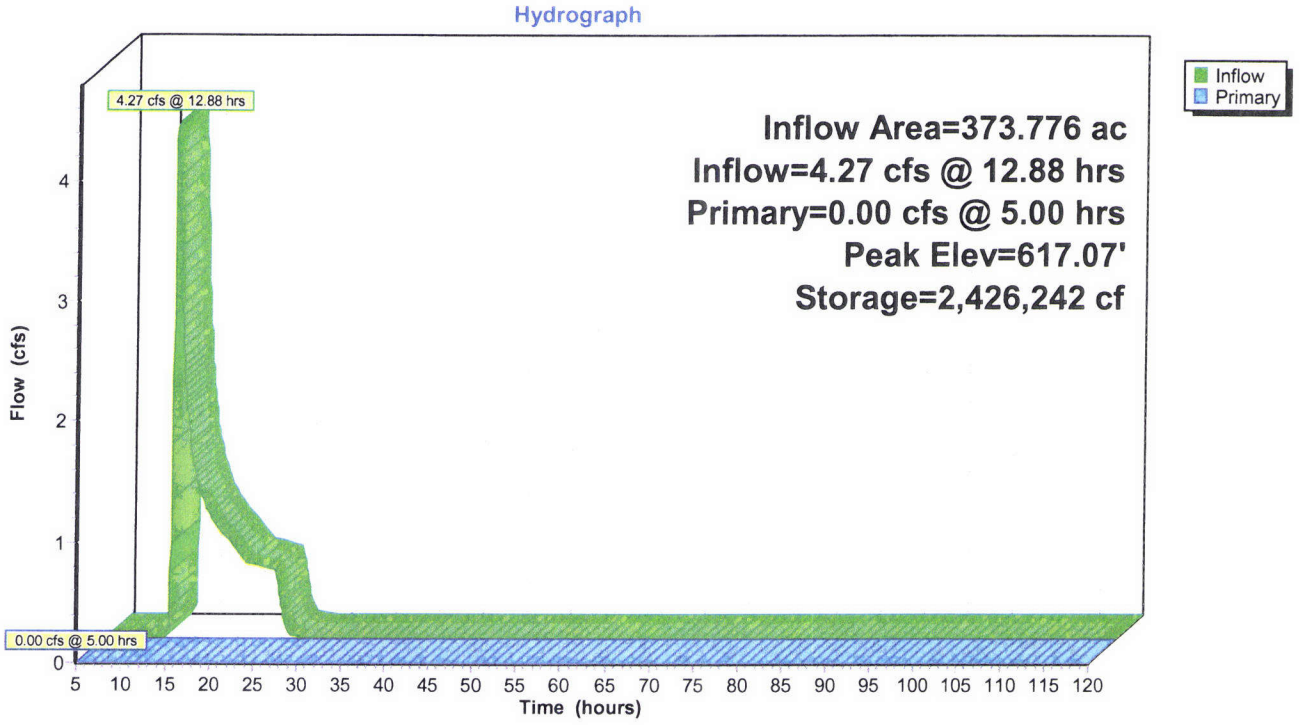
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

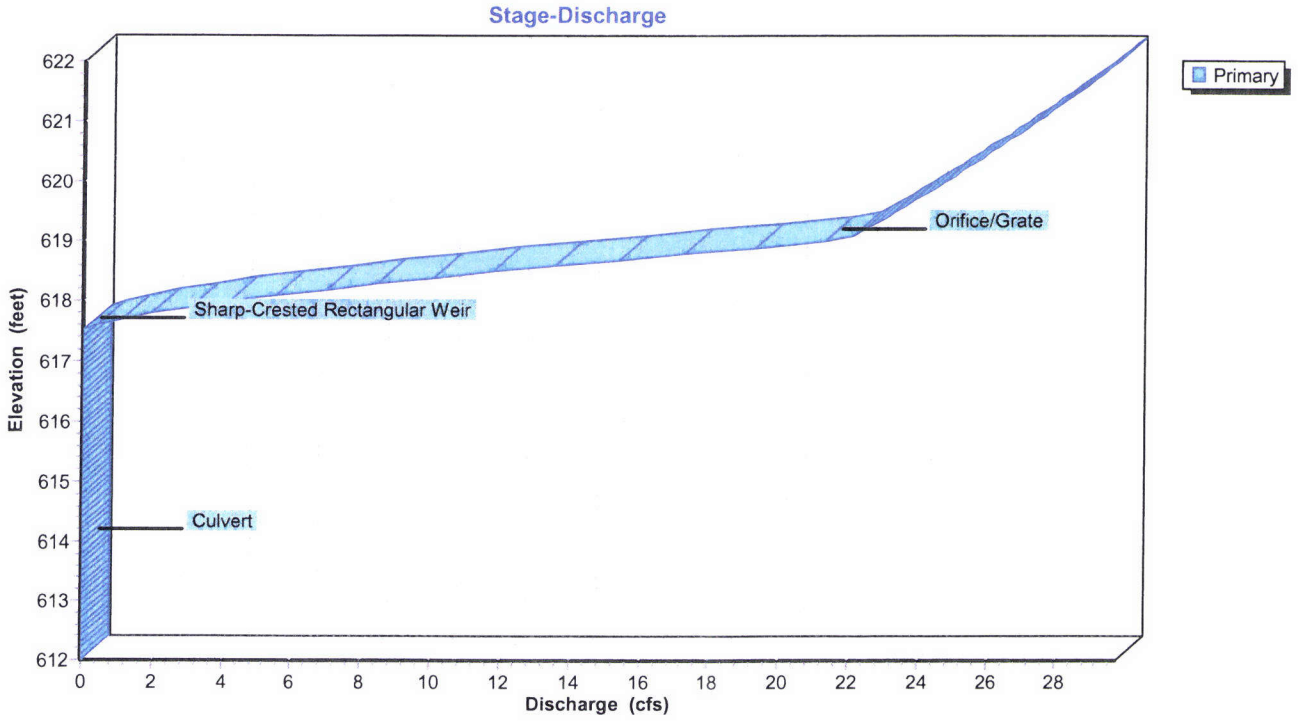
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
  └**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

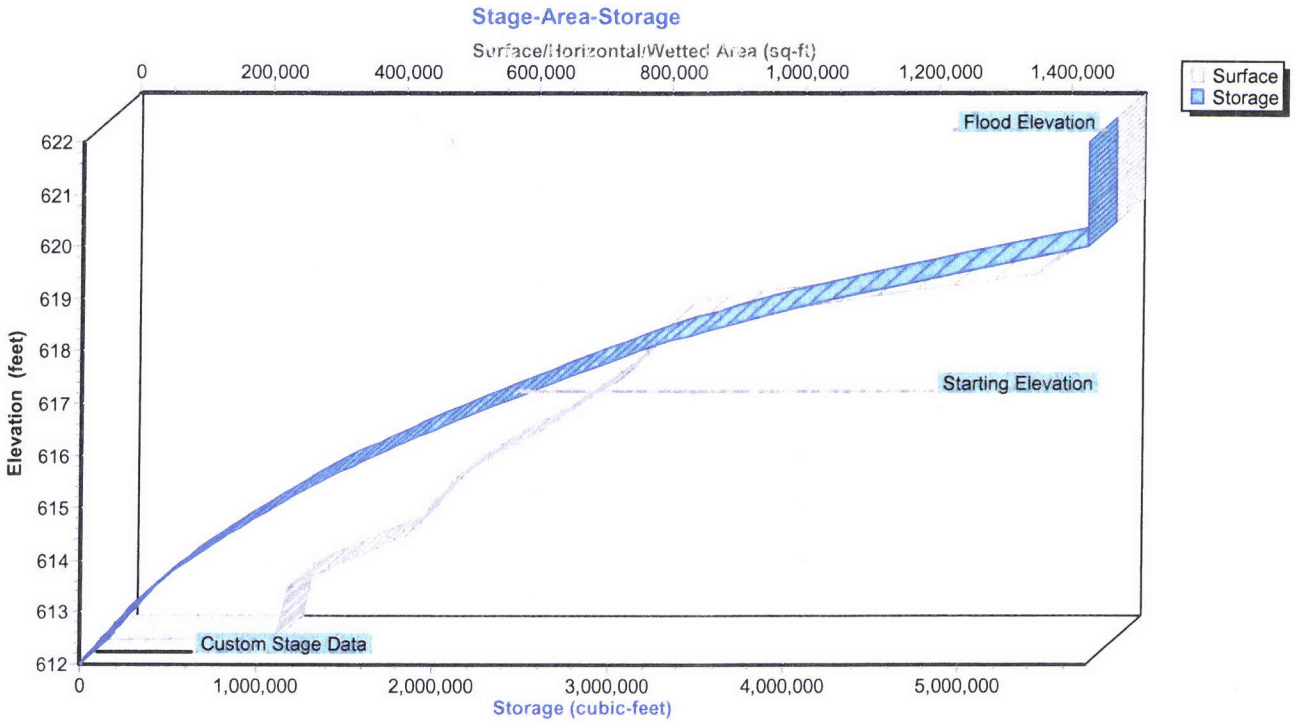
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 2C: Culvert 2 Runway

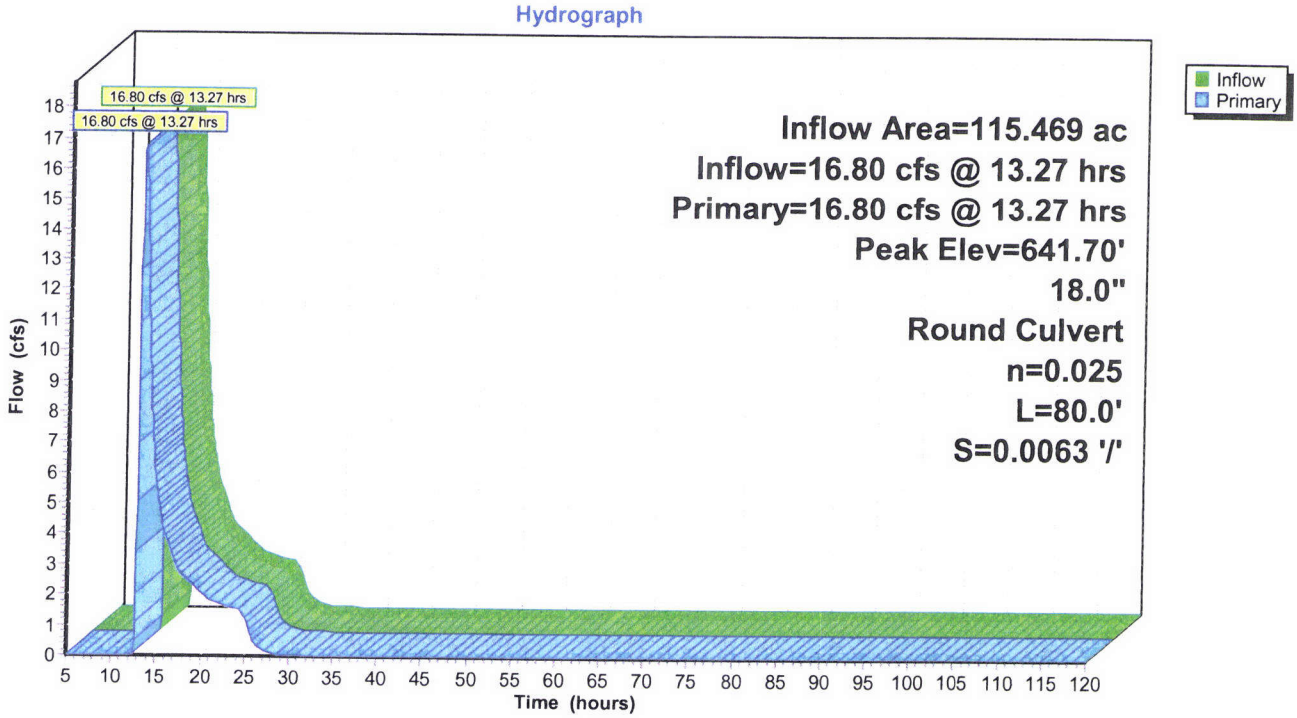
Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 16.80 cfs @ 13.27 hrs, Volume= 4.168 af
Outflow = 16.80 cfs @ 13.27 hrs, Volume= 4.168 af, Atten= 0%, Lag= 0.0 min
Primary = 16.80 cfs @ 13.27 hrs, Volume= 4.168 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 641.70' @ 13.27 hrs
Flood Elev= 633.00'

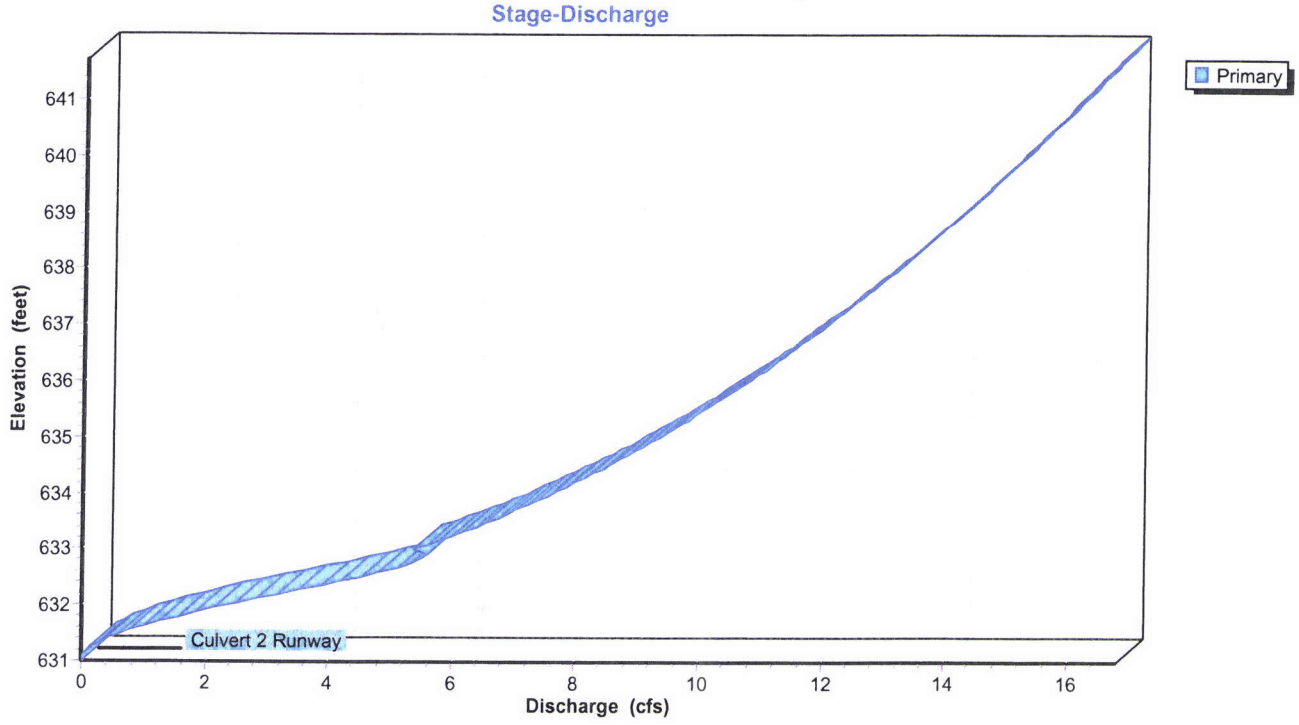
Device	Routing	Invert	Outlet Devices
#1	Primary	631.00'	**18.0" Round Culvert 2 Runway** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 631.00' / 630.50' S= 0.0063 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=16.77 cfs @ 13.27 hrs HW=641.67' (Free Discharge)
└**1=Culvert 2 Runway** (Barrel Controls 16.77 cfs @ 9.49 fps)

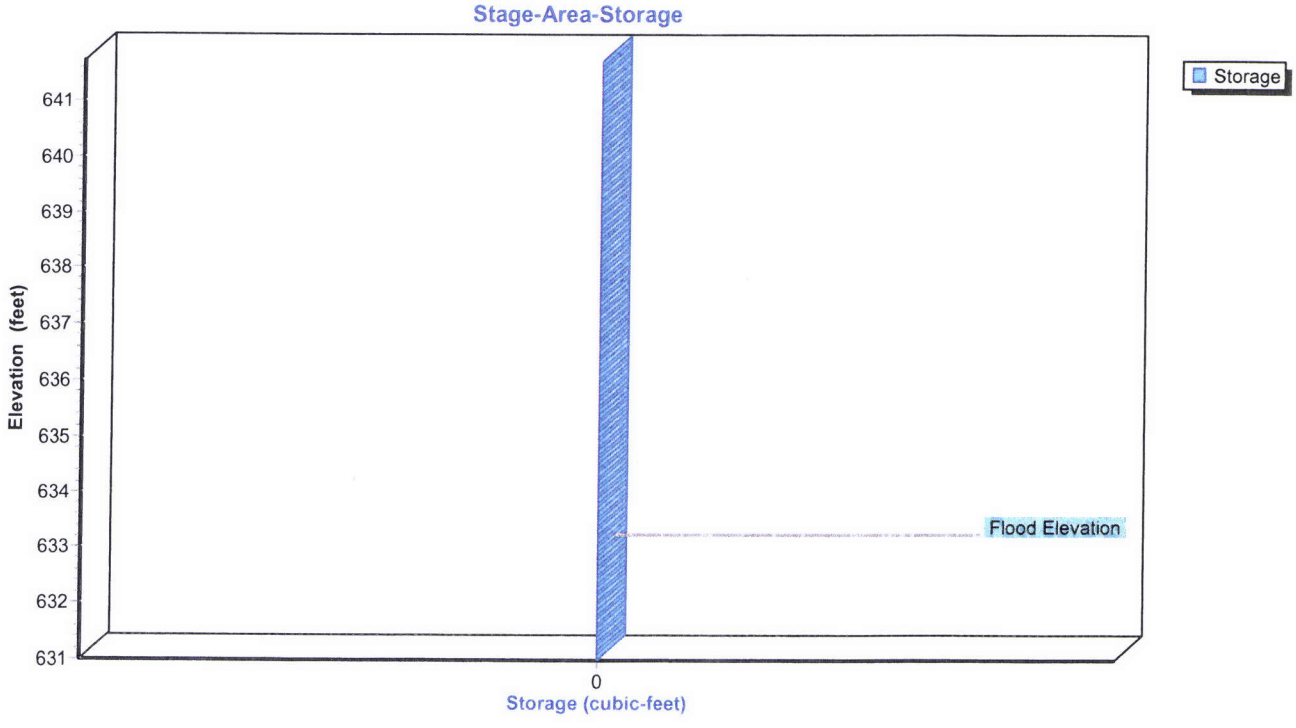
Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Summary for Pond 3C: Culvert (ROW)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 31.28 cfs @ 13.76 hrs, Volume= 9.839 af
Outflow = 9.65 cfs @ 16.30 hrs, Volume= 9.120 af, Atten= 69%, Lag= 152.4 min
Primary = 7.35 cfs @ 16.30 hrs, Volume= 8.471 af
Secondary = 2.30 cfs @ 16.30 hrs, Volume= 0.649 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 622.21' @ 16.30 hrs Surf.Area= 130,906 sf Storage= 178,403 cf
Flood Elev= 623.00' Surf.Area= 140,320 sf Storage= 285,888 cf

Plug-Flow detention time= 438.5 min calculated for 9.120 af (93% of inflow)
Center-of-Mass det. time= 396.3 min (1,422.3 - 1,026.0)

Volume	Invert	Avail.Storage	Storage Description
#1	620.00'	285,888 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
620.00	37,051	702.0	0	0	37,051
621.00	71,069	1,385.0	53,145	53,145	150,487
622.00	128,499	1,860.0	98,377	151,522	273,157
623.00	140,320	2,180.0	134,366	285,888	376,054

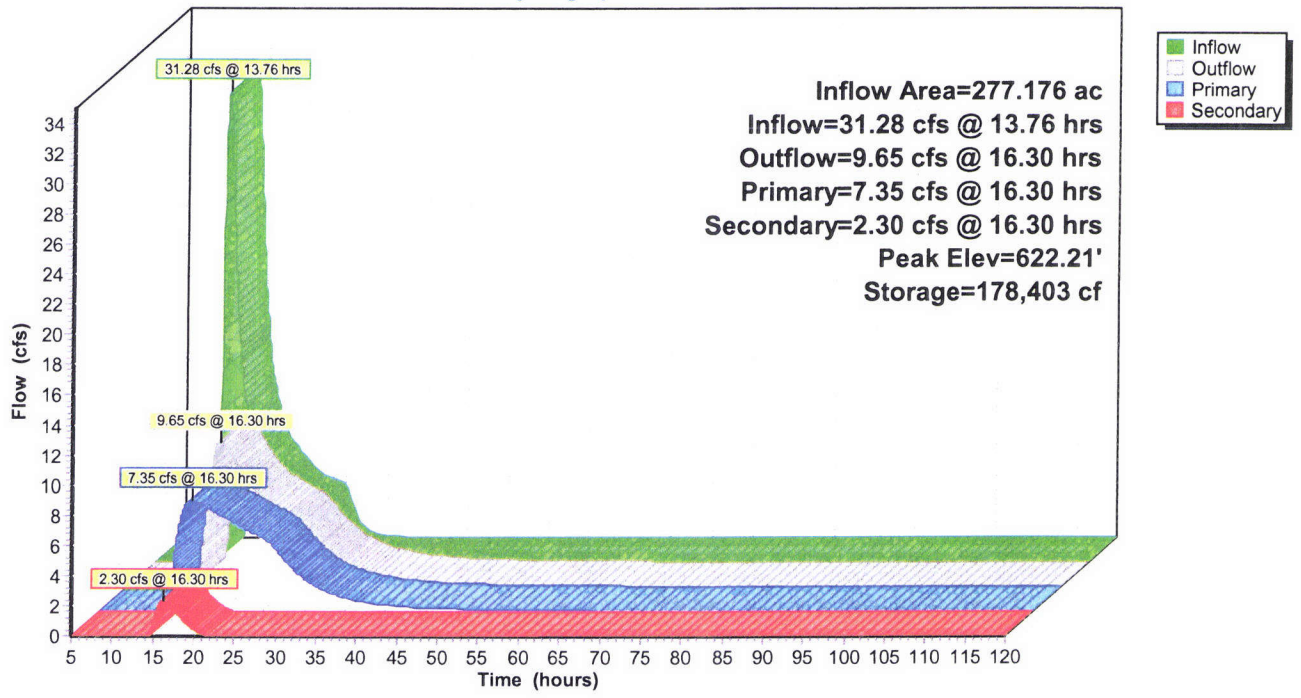
Device	Routing	Invert	Outlet Devices
#1	Primary	620.60'	**24.0" Round Culvert** L= 80.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 620.60' / 620.20' S= 0.0050 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior
#2	Secondary	622.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=7.35 cfs @ 16.30 hrs HW=622.21' (Free Discharge)
↑**1=Culvert** (Barrel Controls 7.35 cfs @ 3.71 fps)

Secondary OutFlow Max=2.30 cfs @ 16.30 hrs HW=622.21' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 2.30 cfs @ 1.11 fps)

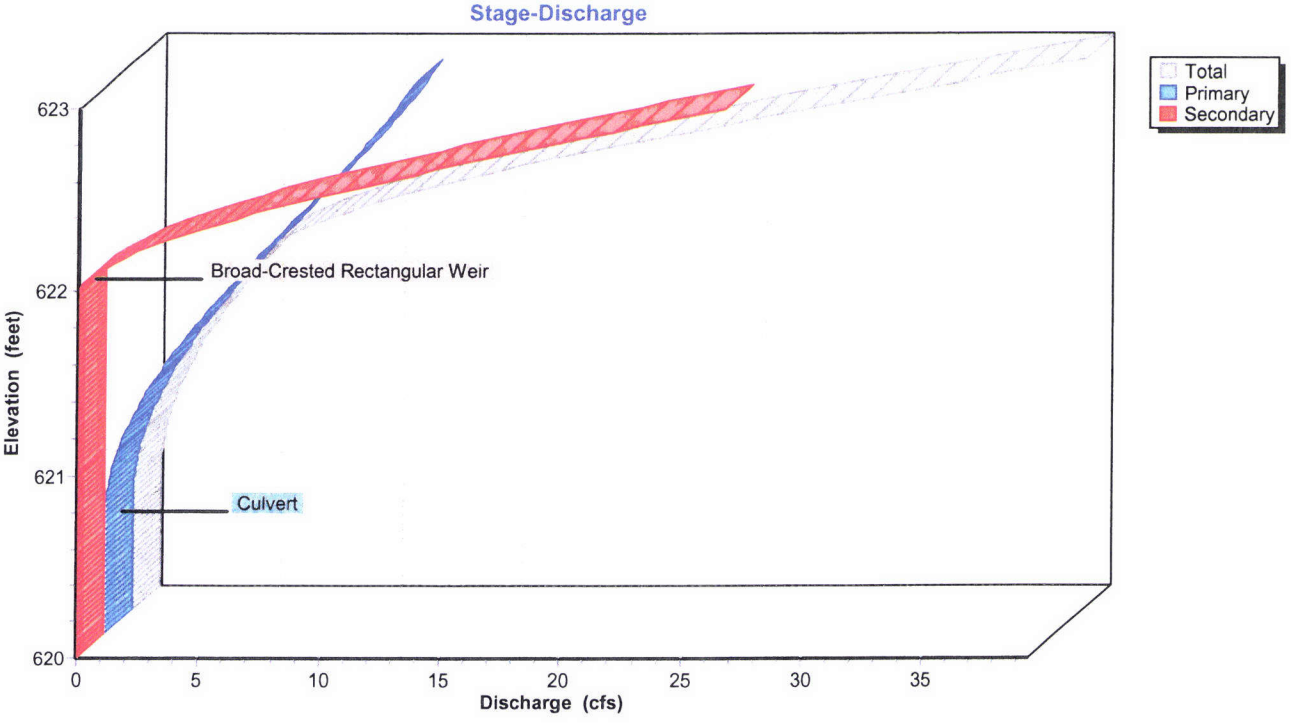
Pond 3C: Culvert (ROW)

Hydrograph

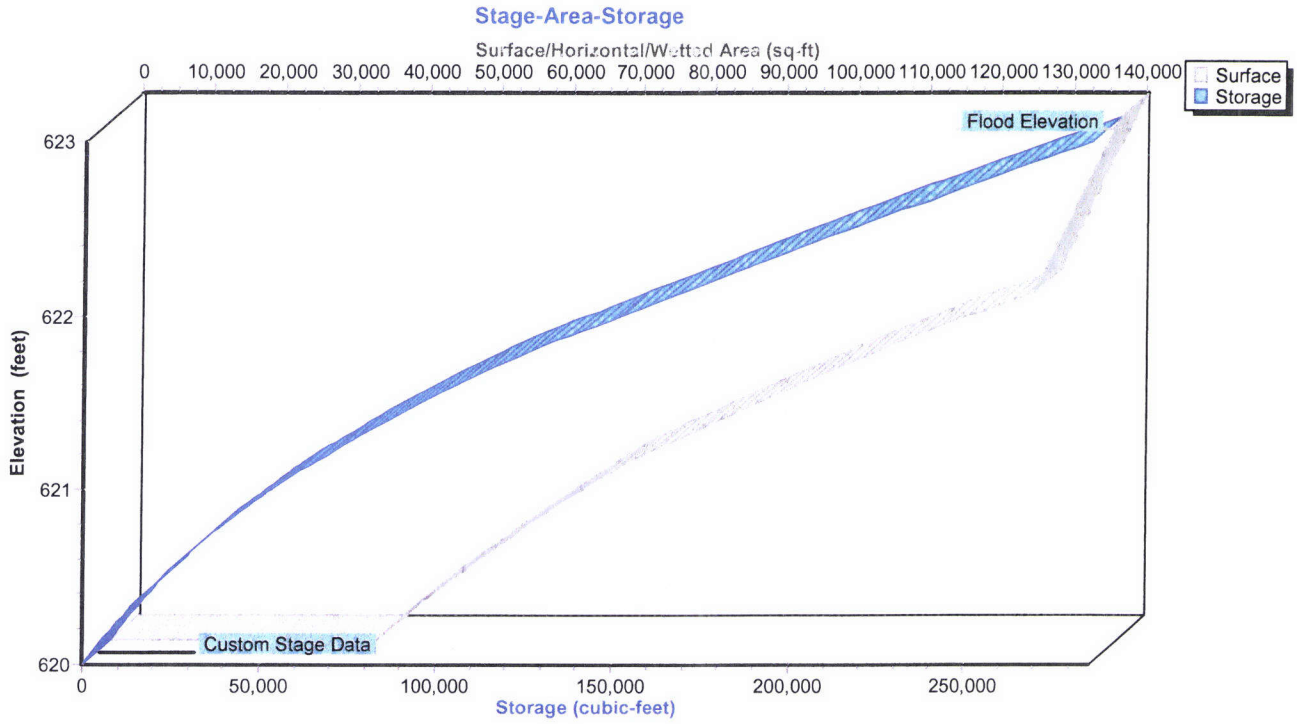


Pond 3C: Culvert (ROW)

Stage-Discharge



Pond 3C: Culvert (ROW)



Summary for Pond 4C: 4C

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.40" for 2-Year event
Inflow = 10.21 cfs @ 17.37 hrs, Volume= 10.178 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 617.94' @ 120.00 hrs Surf.Area= 347,628 sf Storage= 443,315 cf
Flood Elev= 622.00' Surf.Area= 535,800 sf Storage= 1,427,903 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

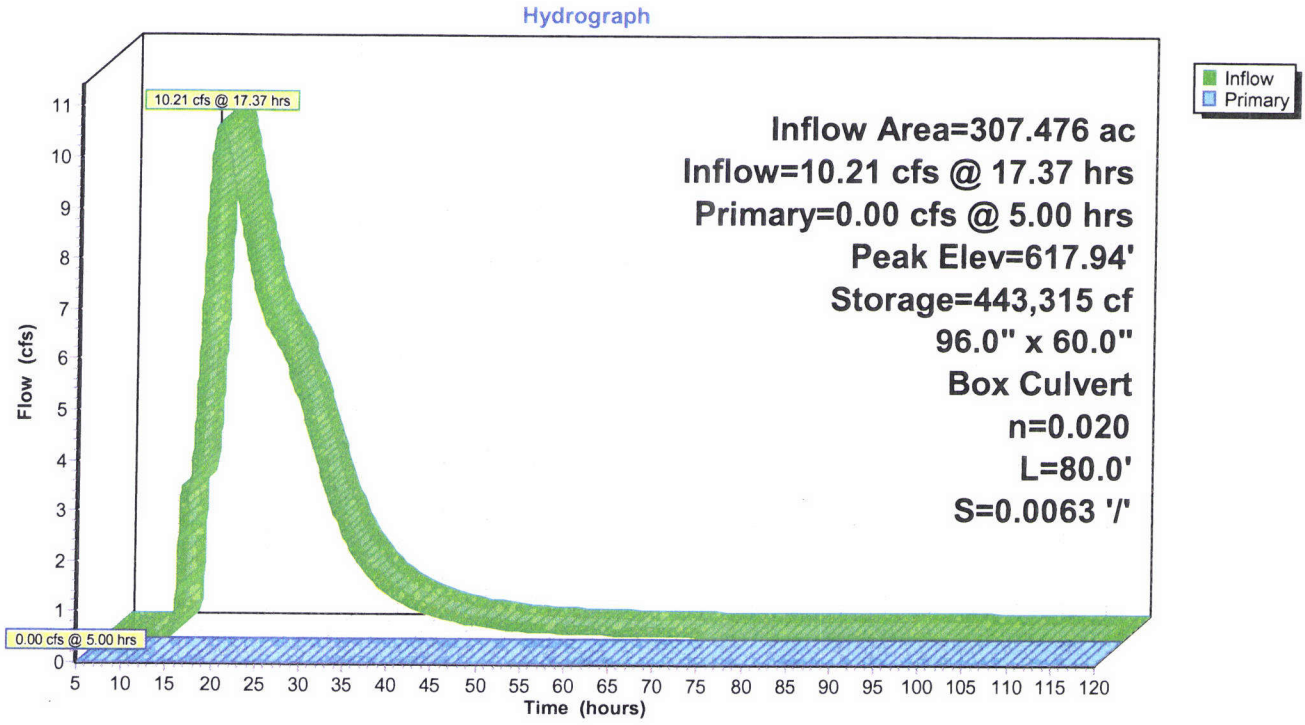
Volume	Invert	Avail.Storage	Storage Description
#1	616.00'	1,427,903 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
616.00	42,800	305.0	0	0	42,800
617.00	286,279	2,304.0	146,590	146,590	457,830
618.00	351,919	2,393.0	318,535	465,125	491,178
619.00	521,710	2,863.0	434,038	899,163	687,778
620.00	535,800	3,120.0	528,739	1,427,903	810,175

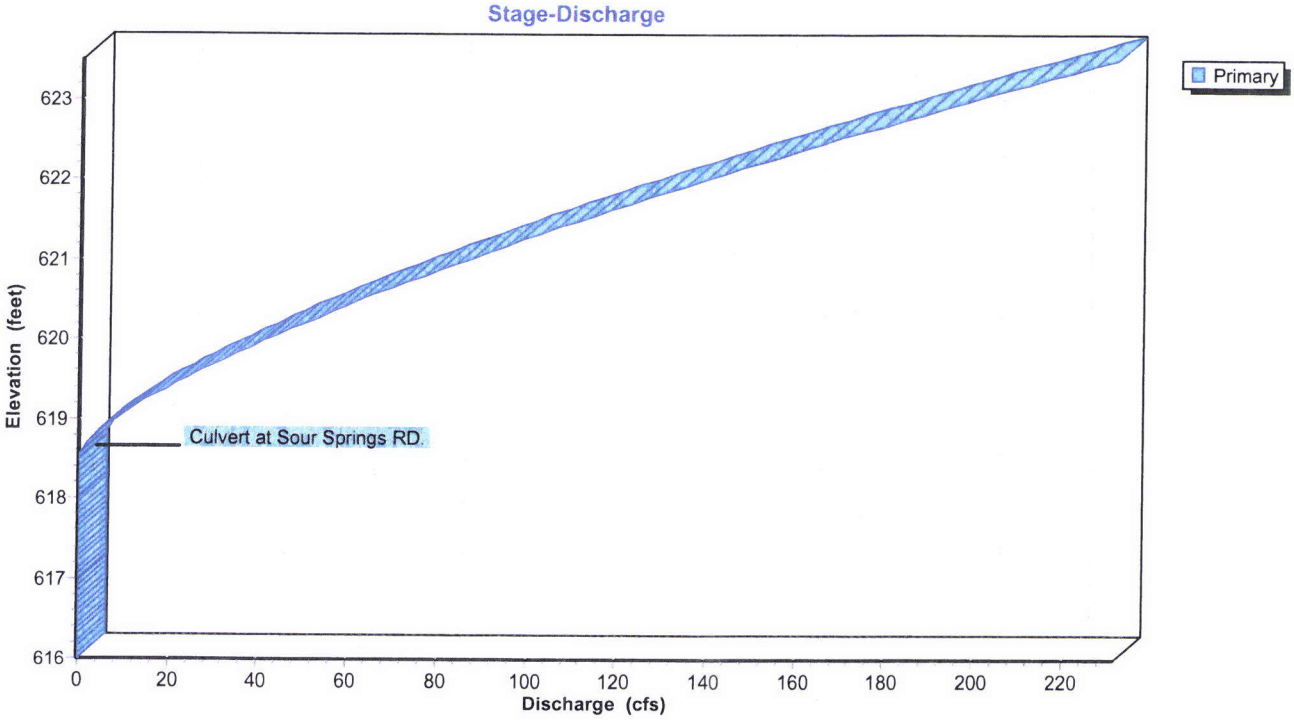
Device	Routing	Invert	Outlet Devices
#1	Primary	618.50'	**96.0" W x 60.0" H Box Culvert at Sour Springs RD.** L= 80.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 618.50' / 618.00' S= 0.0063 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=616.00' (Free Discharge)
↑**1=Culvert at Sour Springs RD.** (Controls 0.00 cfs)

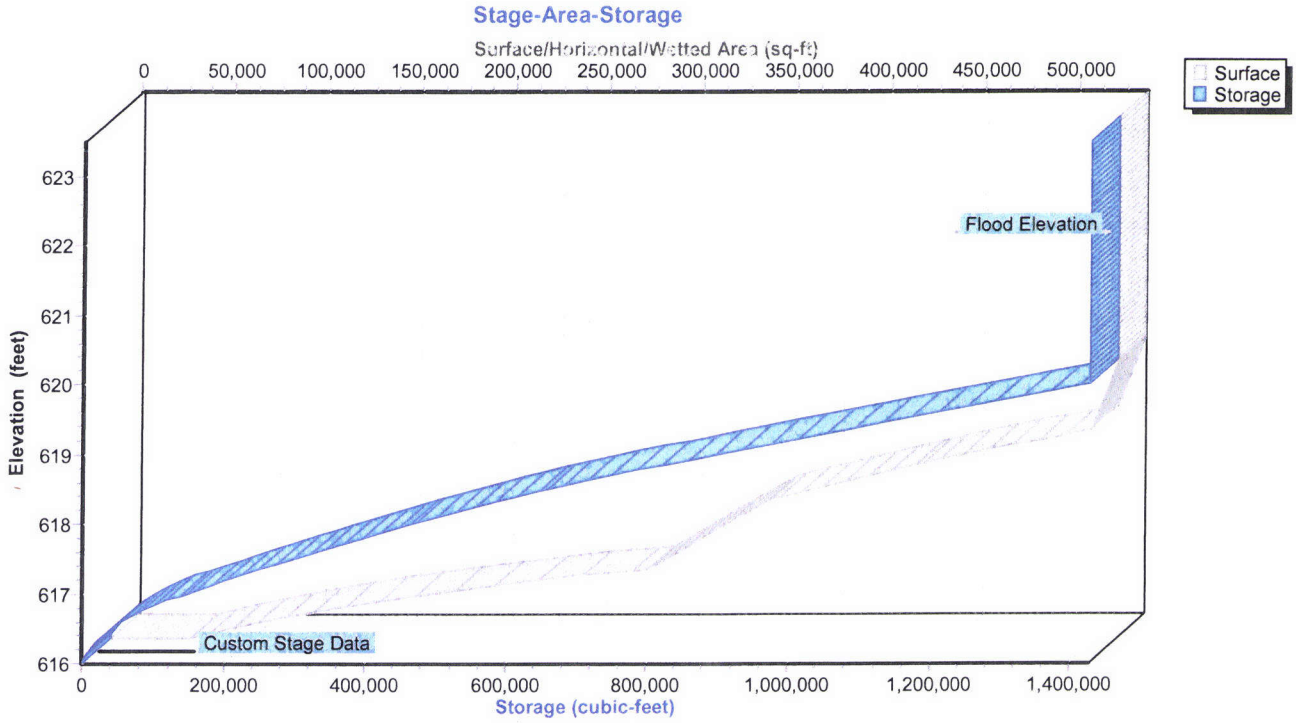
Pond 4C: 4C



Pond 4C: 4C



Pond 4C: 4C


Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
Surface
Storage
623
622
621
620
619
618
617
616
Elevation (feet)
Flood Elevation
Custom Stage Data
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
Storage (cubic-feet)

Time span=5.00-120.00 hrs, dt=0.05 hrs, 2301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatch 1-SC Runoff Area=344,838 sf 0.00% Impervious Runoff Depth=0.27"
Flow Length=550' Tc=42.7 min CN=58 Runoff=0.69 cfs 0.181 af

Subcatchment 2S: Subcatch 2-SC Runoff Area=107.553 ac 0.19% Impervious Runoff Depth=0.71"
Flow Length=1,700' Slope=0.0110 '/' Tc=41.0 min CN=70 Runoff=44.94 cfs 6.402 af

Subcatchment 3S: Subcatch 3-sc Runoff Area=7,043,959 sf 0.39% Impervious Runoff Depth=0.67"
Flow Length=2,800' Tc=49.3 min CN=69 Runoff=53.98 cfs 9.025 af

Subcatchment 4S: Subcatch 4-SC Runoff Area=32.300 ac 0.00% Impervious Runoff Depth=0.51"
Flow Length=1,100' Tc=37.1 min CN=65 Runoff=8.74 cfs 1.362 af

Subcatchment 5aS: Subcatch 5A-SC Runoff Area=11.000 ac 0.00% Impervious Runoff Depth=0.51"
Flow Length=700' Slope=0.0300 '/' Tc=57.4 min CN=65 Runoff=2.19 cfs 0.464 af

Subcatchment 5bS: Subcatch 5B-SC Runoff Area=19.300 ac 20.73% Impervious Runoff Depth=0.76"
Flow Length=800' Tc=43.6 min CN=71 Runoff=8.41 cfs 1.223 af

Subcatchment 5S: Subcatch 6B-SC Runoff Area=16.800 ac 0.00% Impervious Runoff Depth=0.27"
Flow Length=1,100' Tc=70.5 min CN=58 Runoff=1.10 cfs 0.383 af

Subcatchment 6aS: Subcatch 6A-SC Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=800' Tc=39.5 min CN=59 Runoff=1.88 cfs 0.434 af

Reach 1R: Shallow Swale Avg. Flow Depth=0.30' Max Vel=1.01 fps Inflow=0.69 cfs 0.181 af
n=0.050 L=1,355.0' S=0.0103 '/' Capacity=16.53 cfs Outflow=0.54 cfs 0.181 af

Reach 2R: Drainage Ditch (North side runway) Avg. Flow Depth=3.34' Max Vel=1.67 fps Inflow=44.94 cfs 6.583 af
n=0.025 L=2,440.0' S=0.0004 '/' Capacity=26.49 cfs Outflow=31.51 cfs 6.583 af

Reach 3R: Drainage Ditch (upper section) Avg. Flow Depth=4.55' Max Vel=2.94 fps Inflow=63.12 cfs 15.607 af
n=0.035 L=1,220.0' S=0.0025 '/' Capacity=30.90 cfs Outflow=62.51 cfs 15.607 af

Reach 4R: Drainage Ditch (Main) Avg. Flow Depth=2.31' Max Vel=3.20 fps Inflow=62.51 cfs 15.607 af
n=0.030 L=2,655.0' S=0.0026 '/' Capacity=305.22 cfs Outflow=60.30 cfs 15.607 af

Reach 5R: Ditch & Swamp Avg. Flow Depth=3.47' Max Vel=0.42 fps Inflow=27.26 cfs 16.574 af
n=0.100 L=700.0' S=0.0003 '/' Capacity=19.46 cfs Outflow=25.88 cfs 16.569 af

Reach 6R: School House Marsh (feeder ditch) Avg. Flow Depth=1.32' Max Vel=0.66 fps Inflow=8.74 cfs 2.628 af
n=0.070 L=427.0' S=0.0012 '/' Capacity=44.45 cfs Outflow=7.68 cfs 2.624 af

Reach 7R: (new Reach) Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=500.0' S=0.0030 '/' Capacity=85.74 cfs Outflow=0.00 cfs 0.000 af

Pond 1C: Culvert 1 Fletcher Chapel Peak Elev=649.42' Inflow=0.69 cfs 0.181 af
12.0" Round Culvert n=0.021 L=60.0' S=0.0333 '/' Outflow=0.69 cfs 0.181 af

Pond 1P: Schoolhouse Marsh Pond Peak Elev=617.19' Storage=2,523,636 cf Inflow=10.16 cfs 3.441 af
Outflow=0.00 cfs 0.000 af

Pond 2C: Culvert 2 Runway Peak Elev=666.12' Inflow=31.51 cfs 6.583 af
18.0" Round Culvert n=0.025 L=80.0' S=0.0063 '/' Outflow=31.51 cfs 6.583 af

Pond 3C: Culvert (ROW) Peak Elev=622.67' Storage=240,828 cf Inflow=60.30 cfs 15.607 af
Primary=10.75 cfs 10.767 af Secondary=14.93 cfs 4.120 af Outflow=25.68 cfs 14.887 af

Pond 4C: 4C Peak Elev=618.57' Storage=691,894 cf Inflow=25.88 cfs 16.569 af
96.0" x 60.0" Box Culvert n=0.020 L=80.0' S=0.0063 '/' Outflow=0.39 cfs 1.266 af

Total Runoff Area = 373.776 ac Runoff Volume = 19.474 af Average Runoff Depth = 0.63"
98.71% Pervious = 368.944 ac 1.29% Impervious = 4.832 ac

Summary for Subcatchment 1S: Subcatch 1-SC

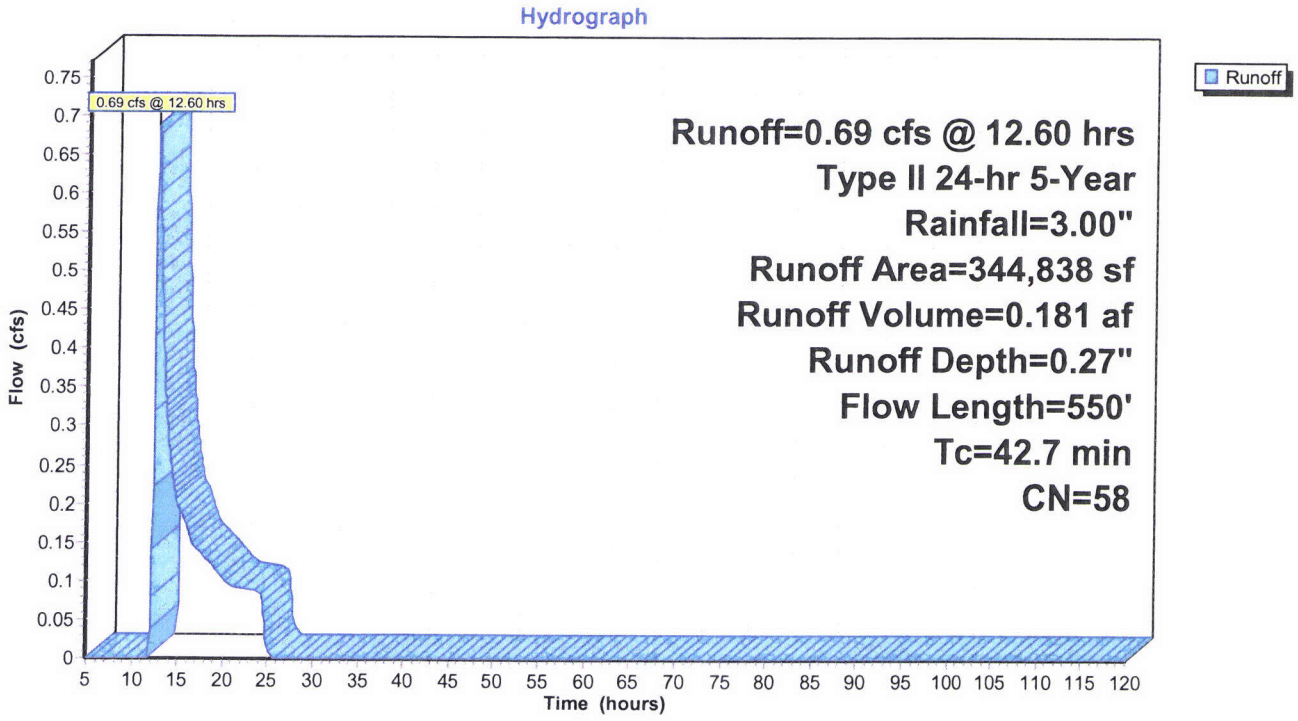
Runoff = 0.69 cfs @ 12.60 hrs, Volume= 0.181 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (sf)	CN	Description	Land Use
51,656	58	Woods/grass comb., Good, HSG B	Woods
13,902	55	Woods, Good, HSG B	Woods
279,280	58	Meadow, non-grazed, HSG B	Meadow
344,838	58	Weighted Average	
344,838		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5	300	0.0170	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
1.2	250	0.2500	3.50		**Shallow Concentrated Flow, Shallow-con 1-SC** Short Grass Pasture Kv= 7.0 fps
42.7	550	Total			

Subcatchment 1S: Subcatch 1-SC



Summary for Subcatchment 2S: Subcatch 2-SC

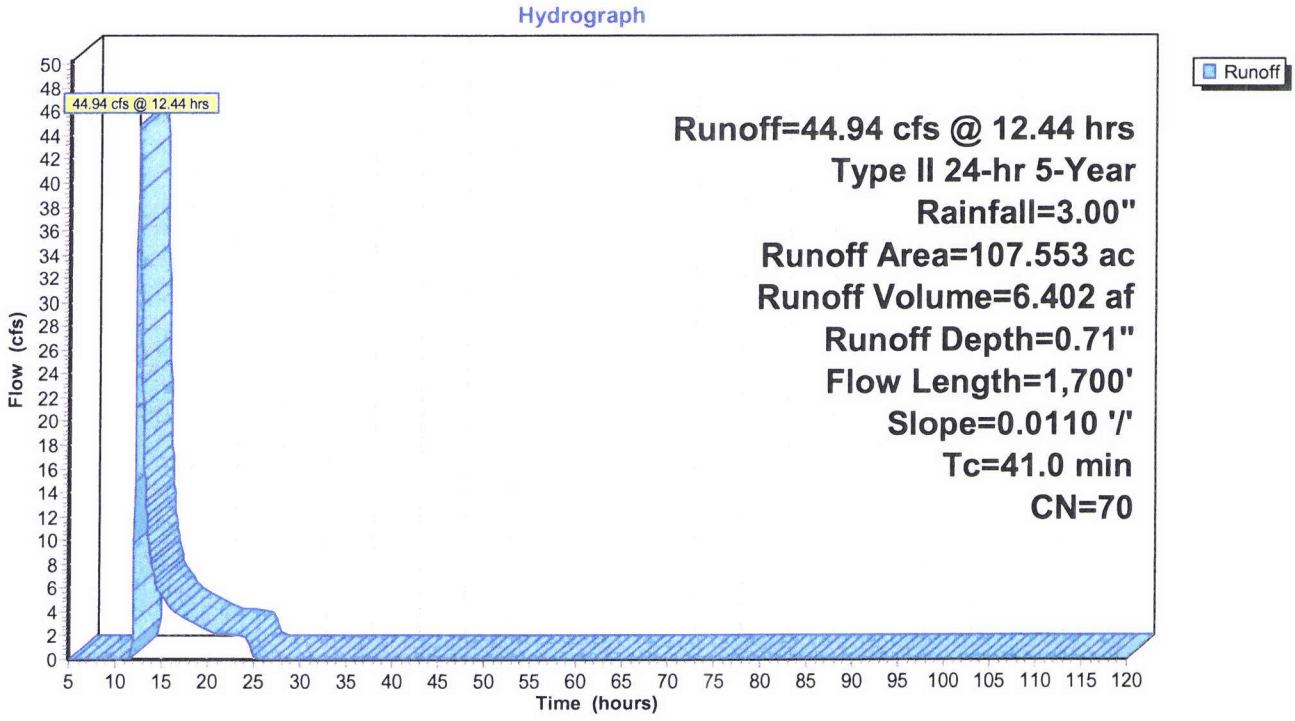
Runoff = 44.94 cfs @ 12.44 hrs, Volume= 6.402 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
80.653	67	Row crops, straight row, Good, HSG A	Cropland
25.877	78	Row crops, straight row, Good, HSG B	Cropland
1.023	68	1 acre lots, 20% imp, HSG B	Residential
107.553	70	Weighted Average	
107.348		99.81% Pervious Area	
0.205		0.19% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	300	0.0110	0.31		**Sheet Flow, Sheet Flow (corn Field)** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
24.7	1,400	0.0110	0.94		**Shallow Concentrated Flow, Shallow Con (corn field)** Cultivated Straight Rows Kv= 9.0 fps
41.0	1,700	Total			

Subcatchment 2S: Subcatch 2-SC



Summary for Subcatchment 3S: Subcatch 3-sc

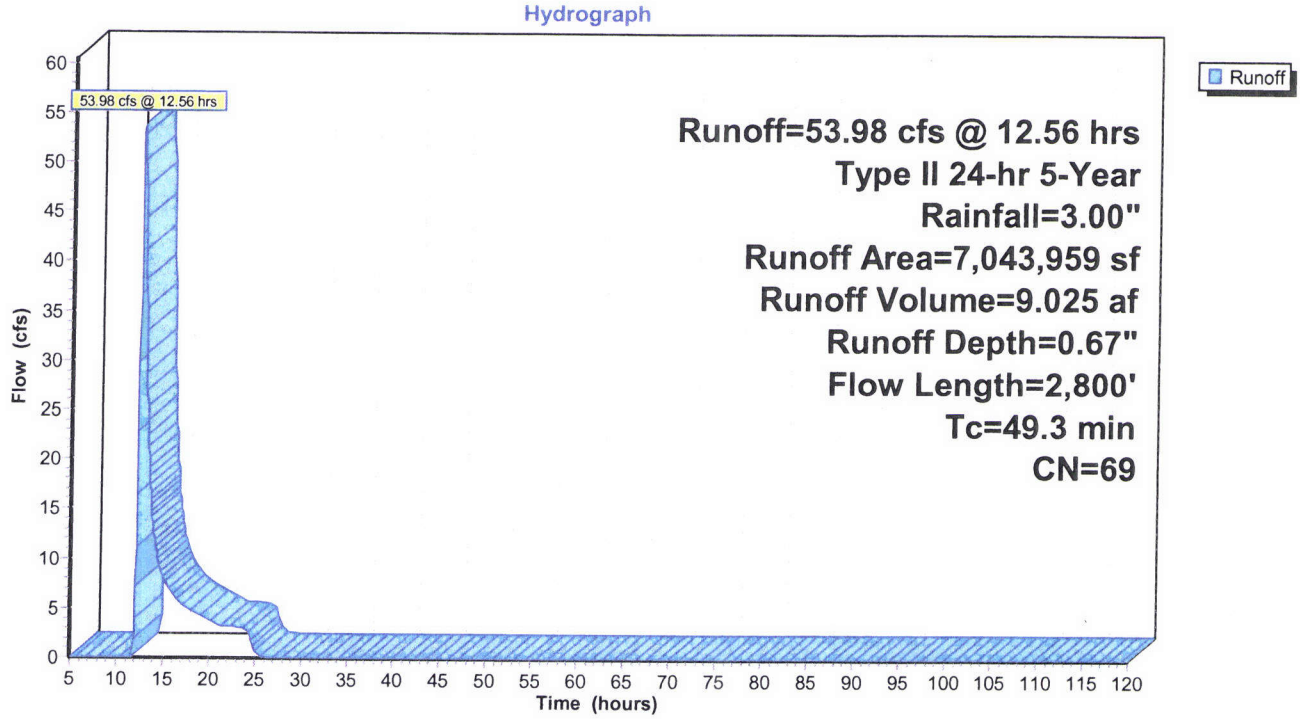
Runoff = 53.98 cfs @ 12.56 hrs, Volume= 9.025 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (sf)	CN	Description	Land Use
125,285	65	2 acre lots, 12% imp, HSG B	Residential
102,640	65	2 acre lots, 12% imp, HSG B	Residential
639,161	78	Row crops, straight row, Good, HSG B	Cropland
5,477,913	67	Row crops, straight row, Good, HSG A	Cropland
698,960	75	Row crops, SR + CR, Good, HSG B	Cropland
7,043,959	69	Weighted Average	
7,016,608		99.61% Pervious Area	
27,351		0.39% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0120	0.32		**Sheet Flow, sheet flow (corn field** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
27.8	1,500	0.0100	0.90		**Shallow Concentrated Flow, Shallow Conc. (corn field)** Cultivated Straight Rows Kv= 9.0 fps
5.8	1,000	0.0090	2.89	9.63	**Parabolic Channel, Drainage (cornfield** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.035 Earth, dense weeds
49.3	2,800	Total			

Subcatchment 3S: Subcatch 3-sc



Summary for Subcatchment 4S: Subcatch 4-SC

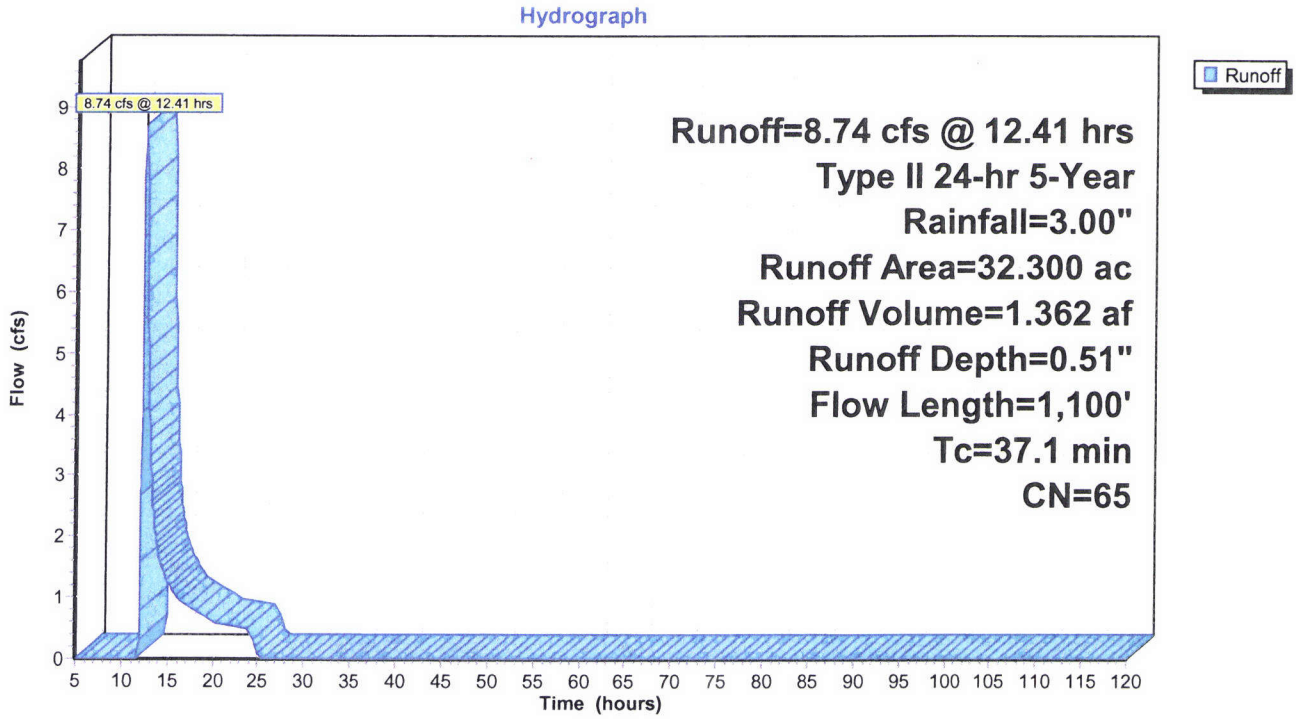
Runoff = 8.74 cfs @ 12.41 hrs, Volume= 1.362 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
24.500	67	Brush, Poor, HSG B	Brush
7.800	60	Woods, Fair, HSG B	Woods
32.300	65	Weighted Average	
32.300		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1	300	0.0350	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
6.0	800	0.0220	2.22		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
37.1	1,100	Total			

Subcatchment 4S: Subcatch 4-SC



Summary for Subcatchment 5aS: Subcatch 5A-SC

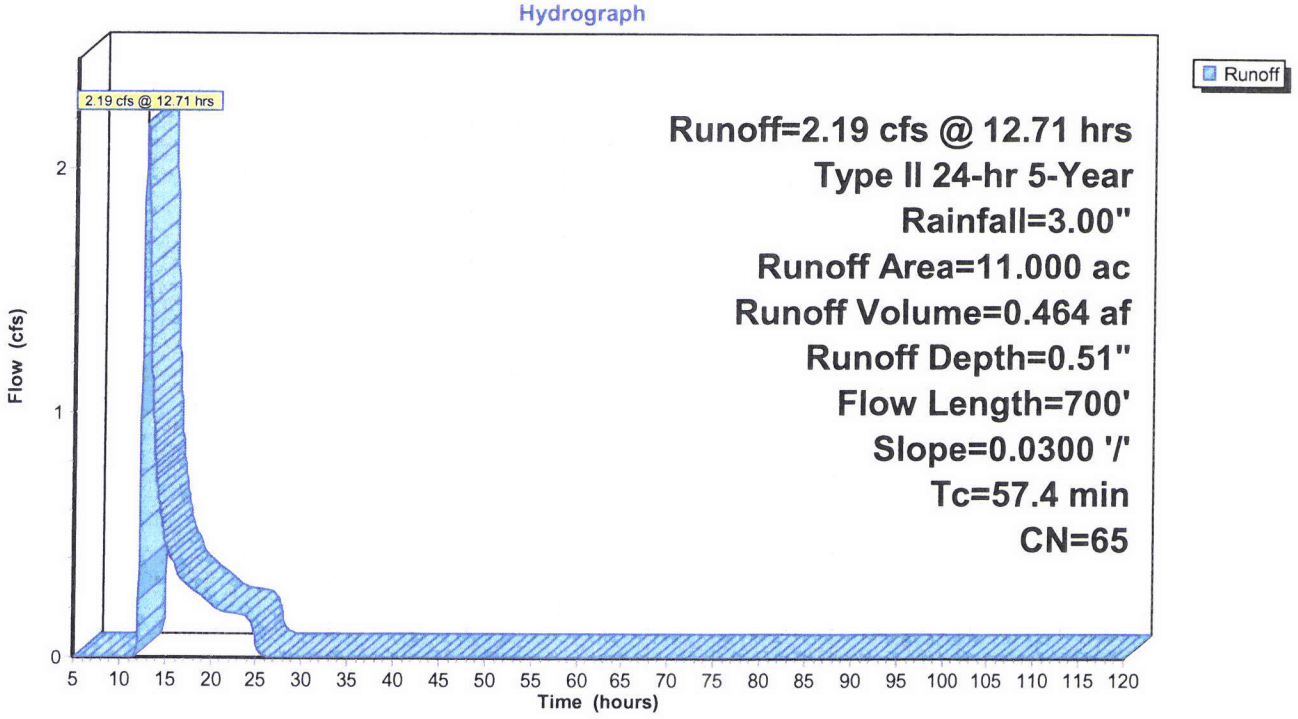
Runoff = 2.19 cfs @ 12.71 hrs, Volume= 0.464 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
6.000	58	Meadow, non-grazed, HSG B	Meadow
5.000	73	Woods/grass comb., Poor, HSG B	Woods
11.000	65	Weighted Average	
11.000		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow, Shallow Concetrated** Woodland Kv= 5.0 fps
57.4	700	Total			

Subcatchment 5aS: Subcatch 5A-SC



Summary for Subcatchment 5bS: Subcatch 5B-SC

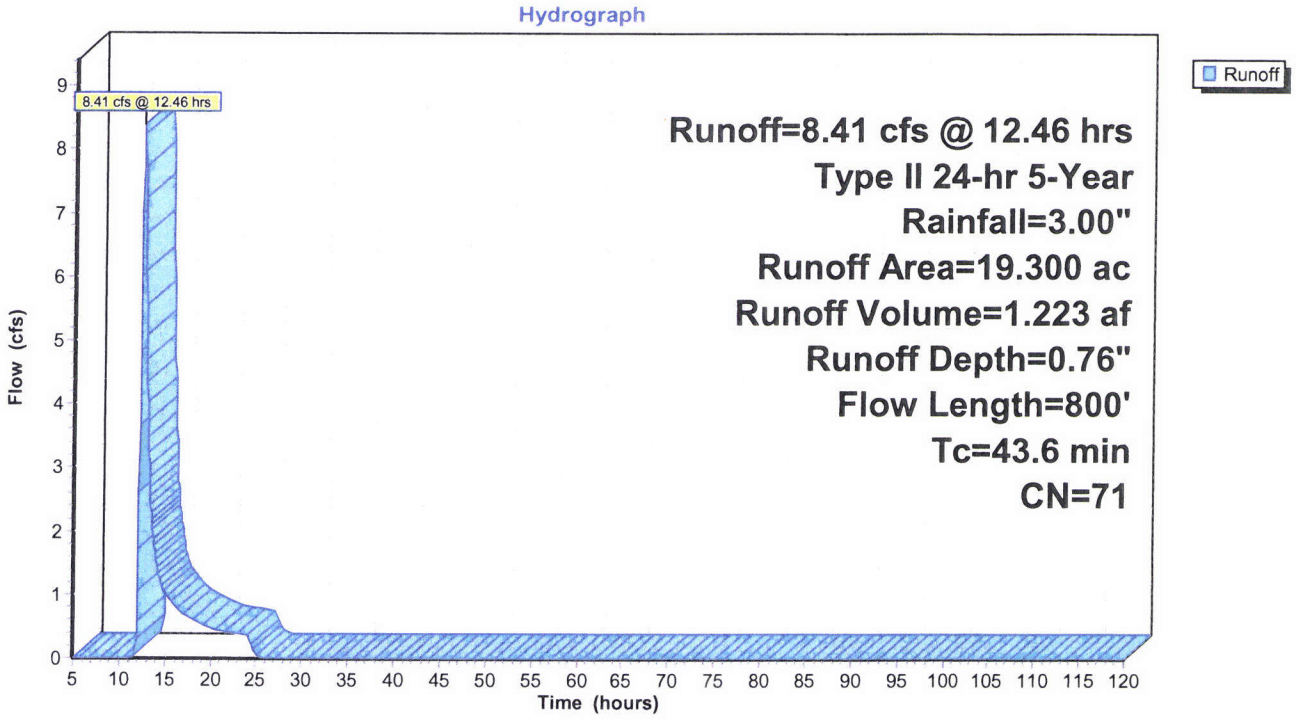
Runoff = 8.41 cfs @ 12.46 hrs, Volume= 1.223 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
6.100	56	Brush, Fair, HSG B	Brush
4.200	67	Brush, Poor, HSG B	Brush
5.000	70	Brush, Fair, HSG C	Brush
4.000	98	Water Surface, HSG B	Open Water
19.300	71	Weighted Average	
15.300		79.27% Pervious Area	
4.000		20.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.6	300	0.0500	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	500	0.0350	2.81		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
43.6	800	Total			

Subcatchment 5bS: Subcatch 5B-SC



Summary for Subcatchment 5S: Subcatch 6B-SC

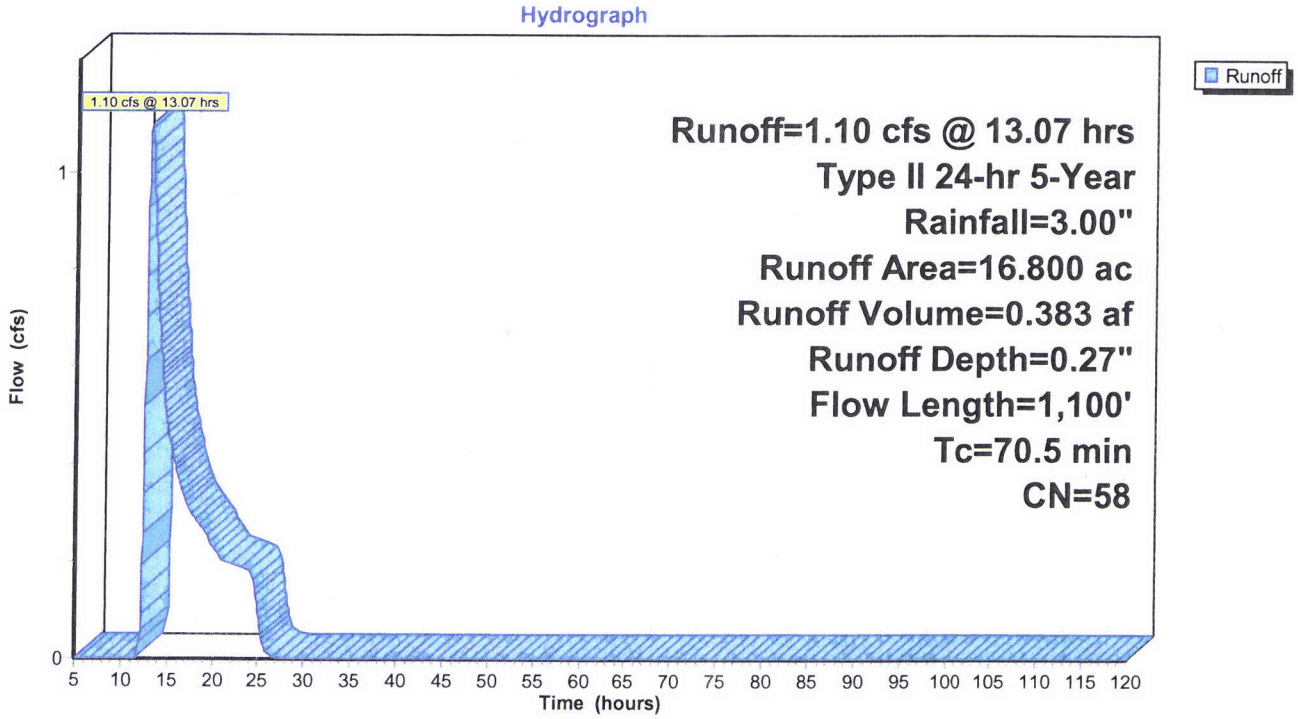
Runoff = 1.10 cfs @ 13.07 hrs, Volume= 0.383 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
14.000	58	Meadow, non-grazed, HSG B	Meadow
2.800	60	Woods, Fair, HSG B	Woods
16.800	58	Weighted Average	
16.800		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.5	300	0.0200	0.09		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
12.0	800	0.0250	1.11		**Shallow Concentrated Flow, Shallow Concentrated** Short Grass Pasture Kv= 7.0 fps
70.5	1,100	Total			

Subcatchment 5S: Subcatch 6B-SC



Summary for Subcatchment 6aS: Subcatch 6A-SC

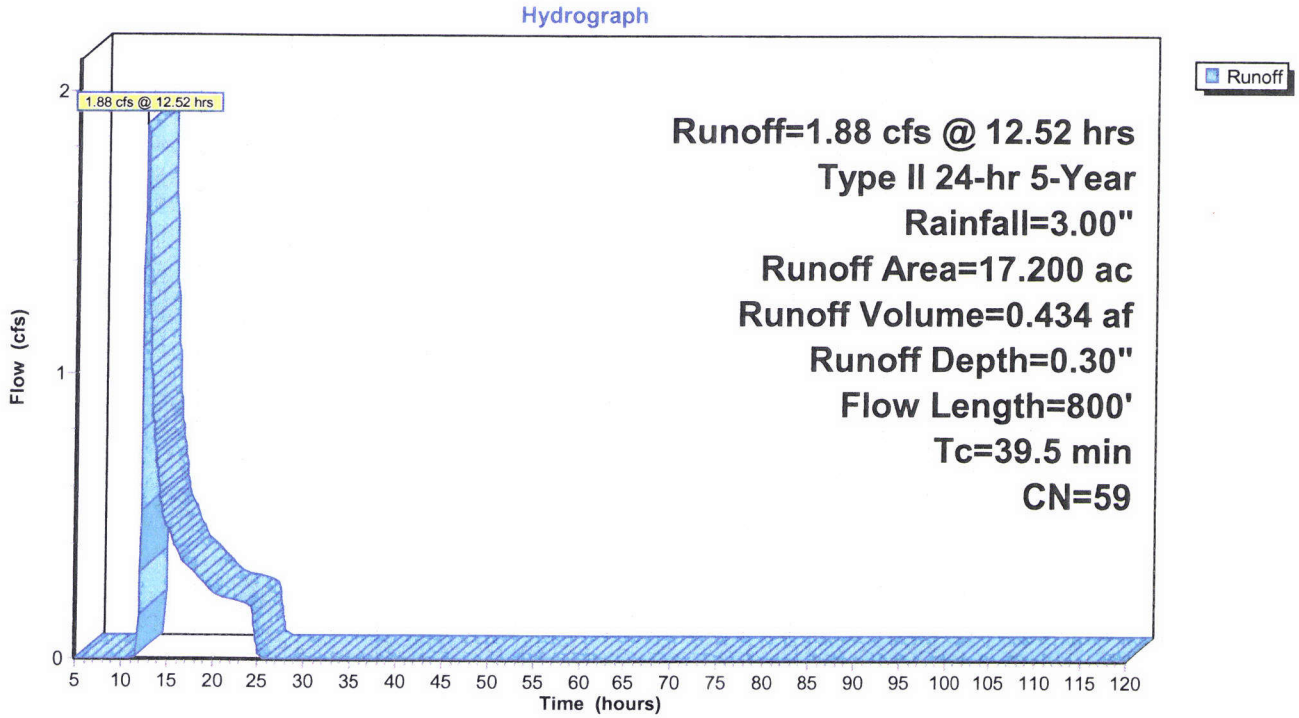
Runoff = 1.88 cfs @ 12.52 hrs, Volume= 0.434 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-Year Rainfall=3.00"

Area (ac)	CN	Description	Land Use
15.000	58	Meadow, non-grazed, HSG B	Meadow
2.200	65	Woods/grass comb., Fair, HSG B	Woods
17.200	59	Weighted Average	
17.200		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.1	300	0.0300	0.15		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 2.50"
6.4	500	0.0350	1.31		**Shallow Concentrated Flow, shallow concentrated** Short Grass Pasture Kv= 7.0 fps
39.5	800	Total			

Subcatchment 6aS: Subcatch 6A-SC



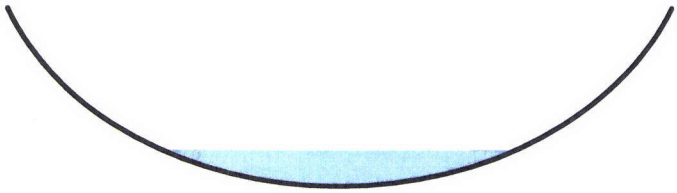
Summary for Reach 1R: Shallow Swale

Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.27" for 5-Year event
Inflow = 0.69 cfs @ 12.60 hrs, Volume= 0.181 af
Outflow = 0.54 cfs @ 13.29 hrs, Volume= 0.181 af, Atten= 22%, Lag= 41.7 min

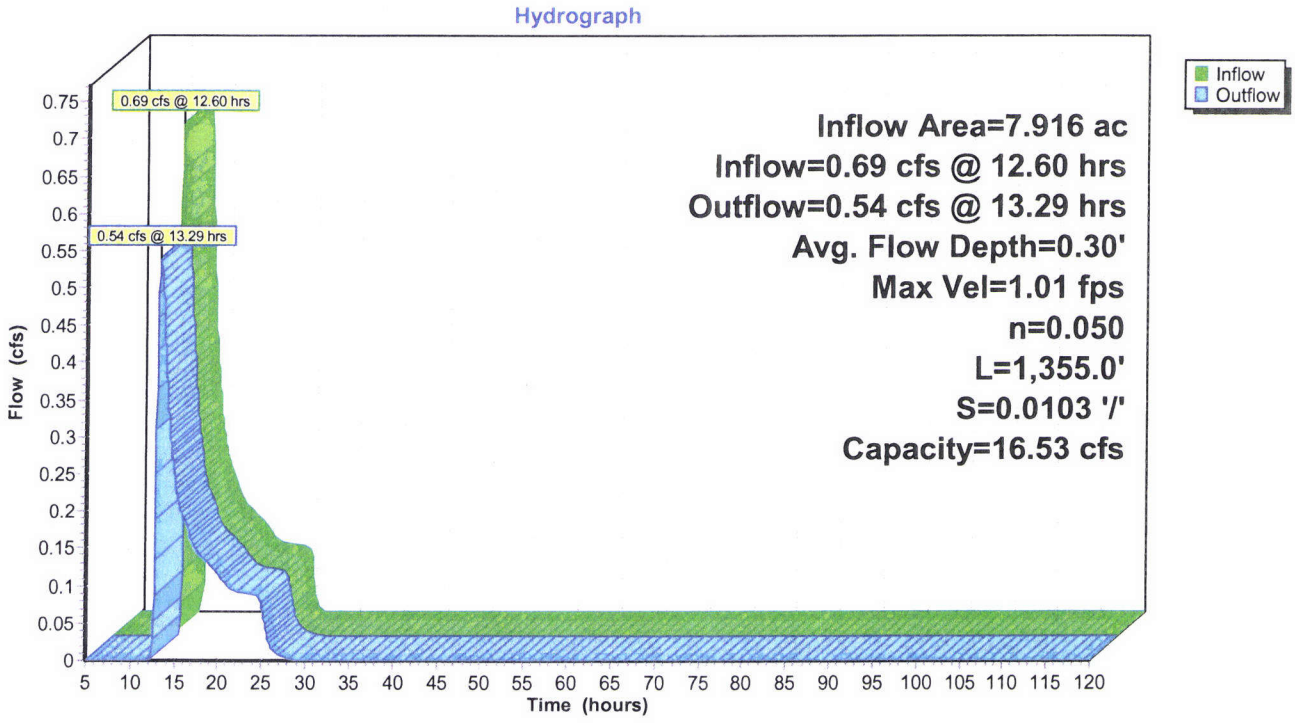
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.01 fps, Min. Travel Time= 22.4 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 55.9 min

Peak Storage= 724 cf @ 12.92 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 16.53 cfs

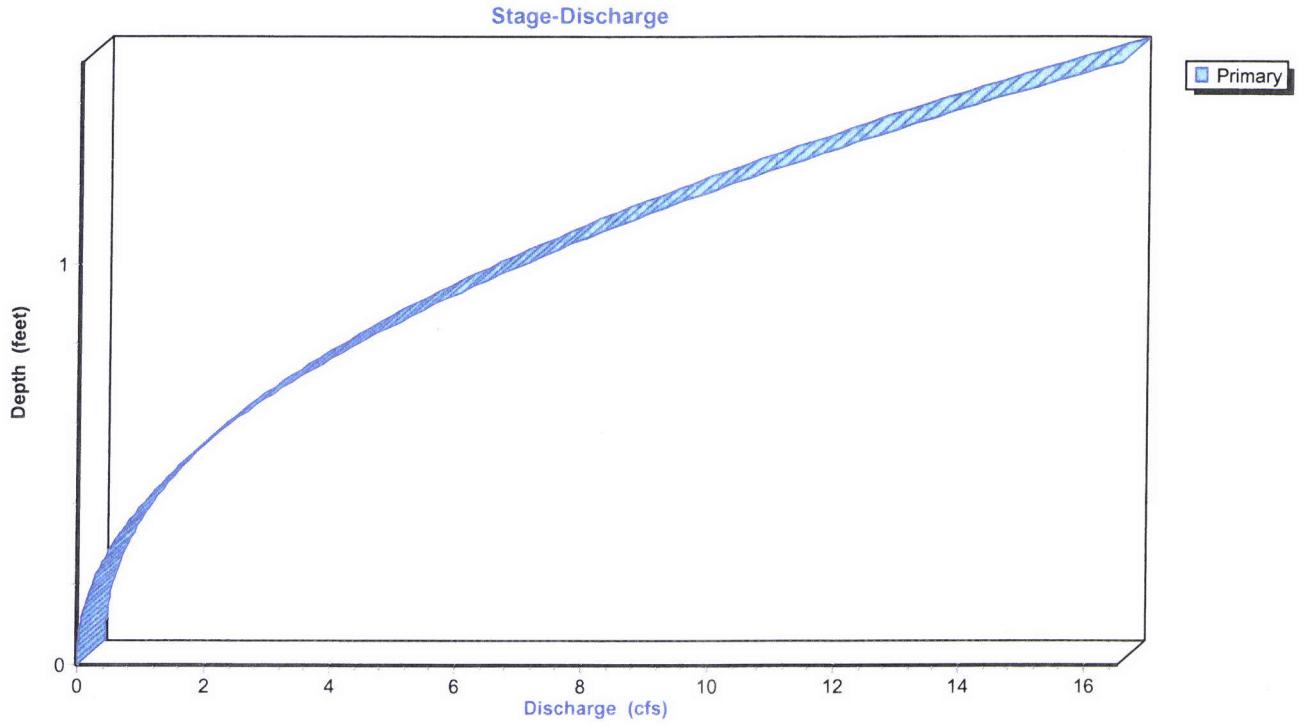
6.00' x 1.50' deep Parabolic Channel, n= 0.050 Sluggish weedy reaches w/pools
Length= 1,355.0' Slope= 0.0103 '/'
Inlet Invert= 646.00', Outlet Invert= 632.00'



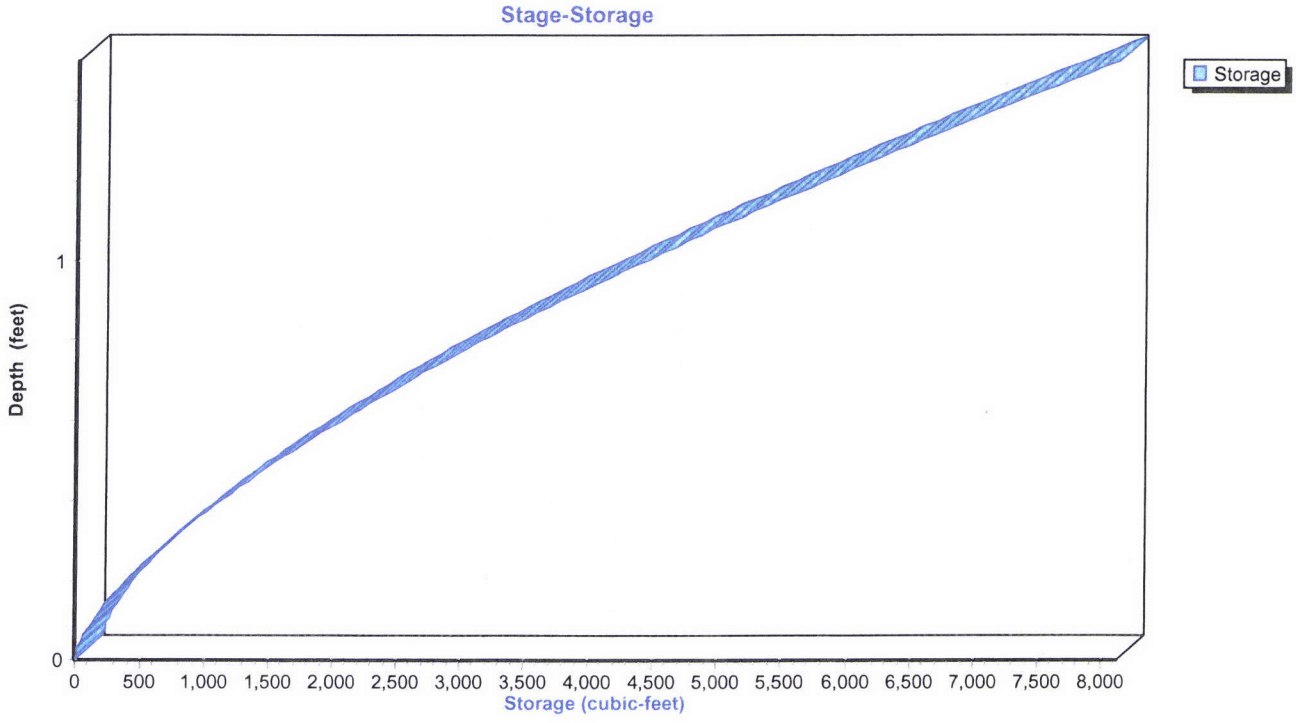
Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



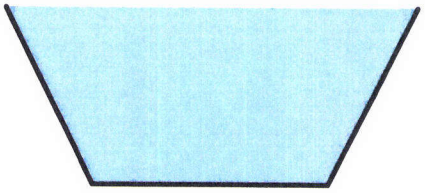
Summary for Reach 2R: Drainage Ditch (North side runway)

Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.68" for 5-Year event
Inflow = 44.94 cfs @ 12.44 hrs, Volume= 6.583 af
Outflow = 31.51 cfs @ 13.13 hrs, Volume= 6.583 af, Atten= 30%, Lag= 41.6 min

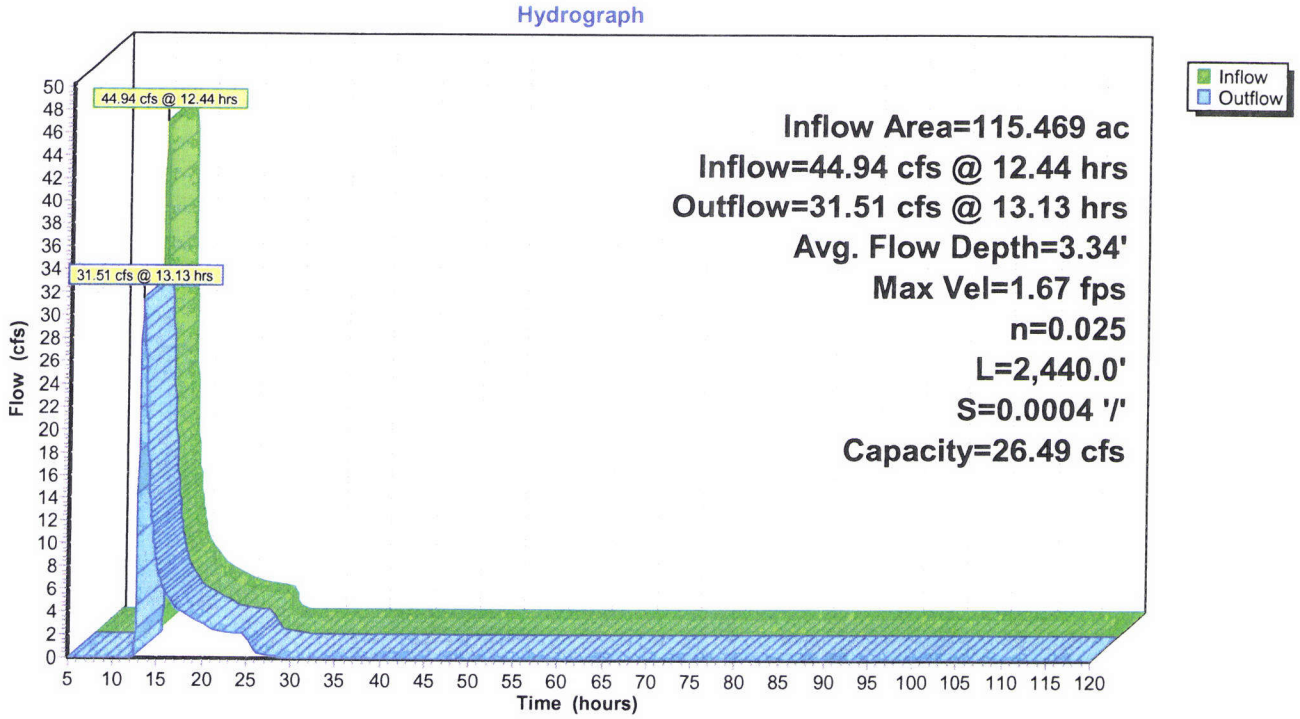
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 24.3 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 131.4 min

Peak Storage= 46,020 cf @ 12.72 hrs
Average Depth at Peak Storage= 3.34'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 26.49 cfs

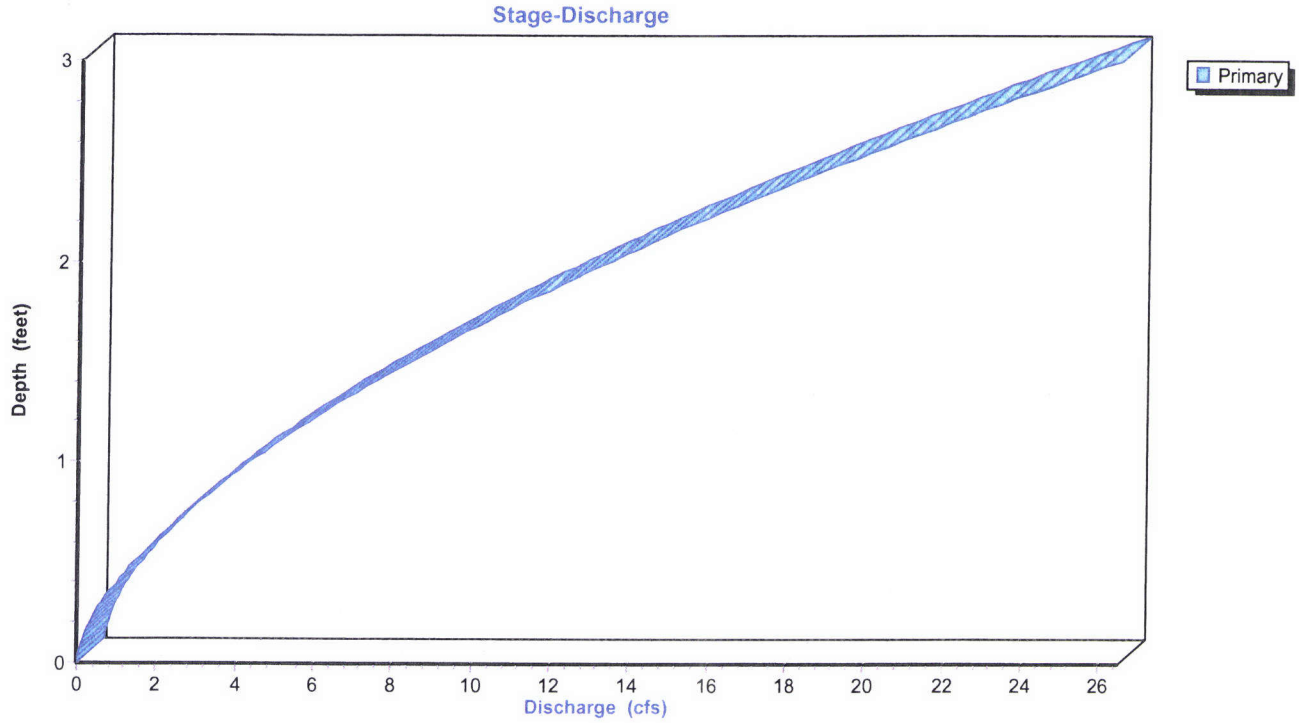
4.00' x 3.00' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 0.5 '/' Top Width= 7.00'
Length= 2,440.0' Slope= 0.0004 '/'
Inlet Invert= 632.00', Outlet Invert= 631.00'



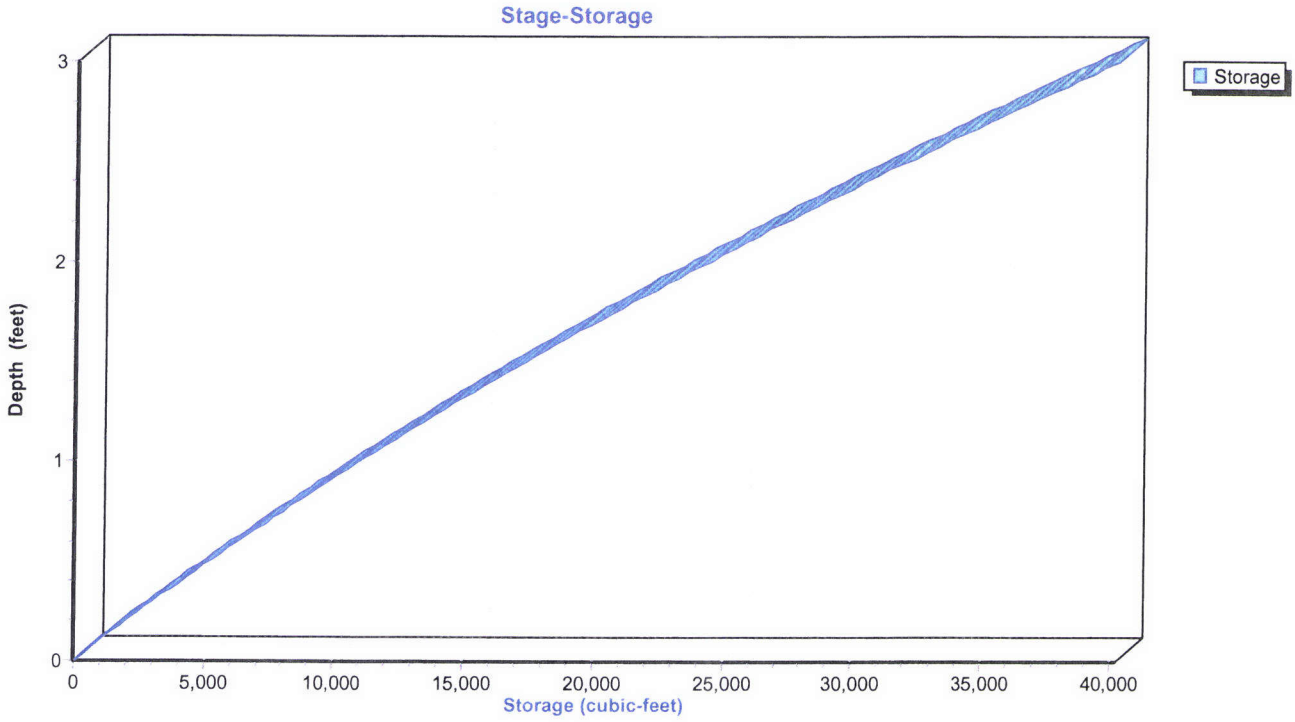
Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



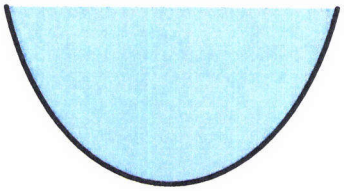
Summary for Reach 3R: Drainage Ditch (upper section)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.68" for 5-Year event
Inflow = 63.12 cfs @ 12.91 hrs, Volume= 15.607 af
Outflow = 62.51 cfs @ 13.11 hrs, Volume= 15.607 af, Atten= 1%, Lag= 12.0 min

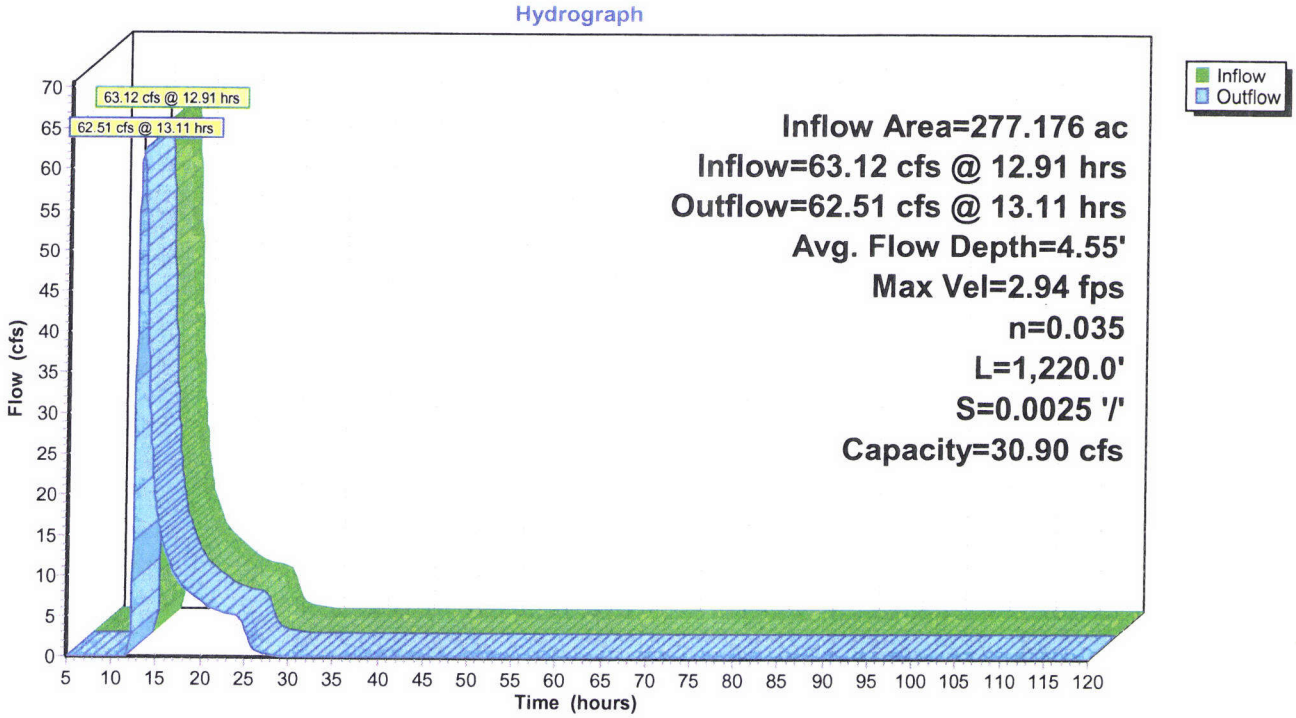
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 6.9 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 34.4 min

Peak Storage= 25,938 cf @ 13.00 hrs
Average Depth at Peak Storage= 4.55'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 30.90 cfs

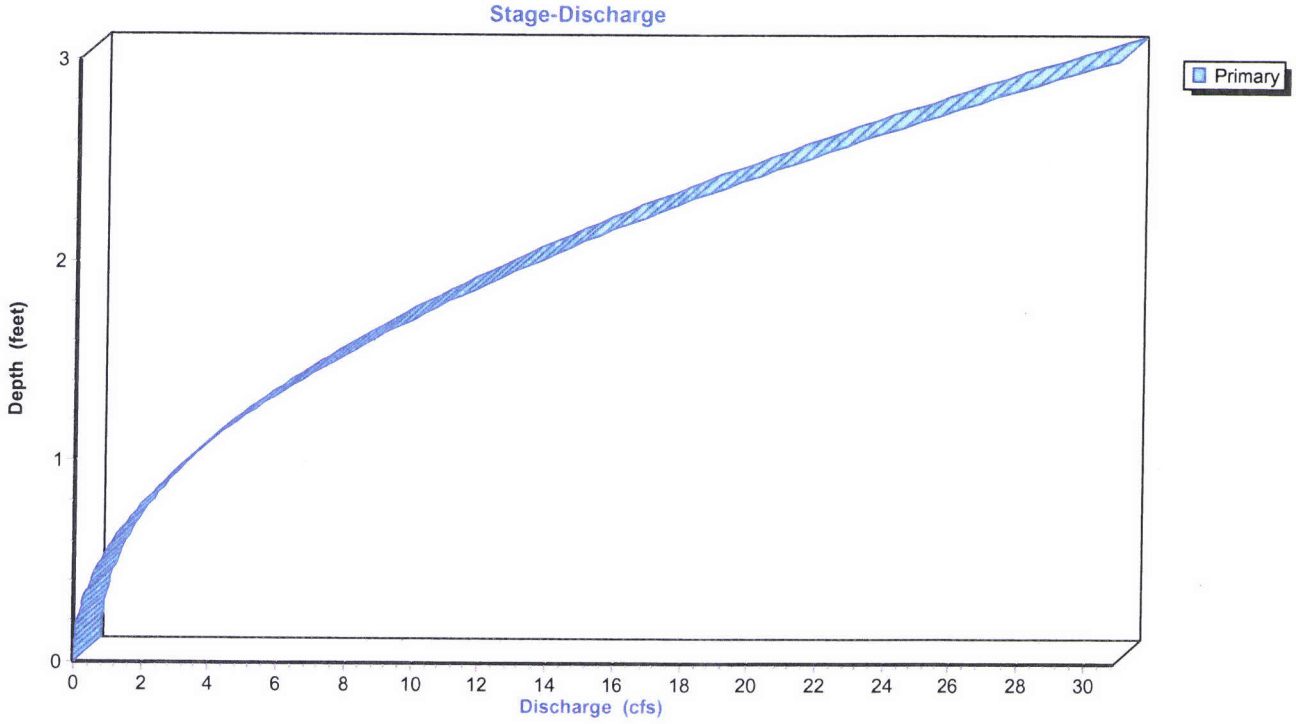
6.00' x 3.00' deep Parabolic Channel, n= 0.035 High grass
Length= 1,220.0' Slope= 0.0025 '/'
Inlet Invert= 631.00', Outlet Invert= 628.00'



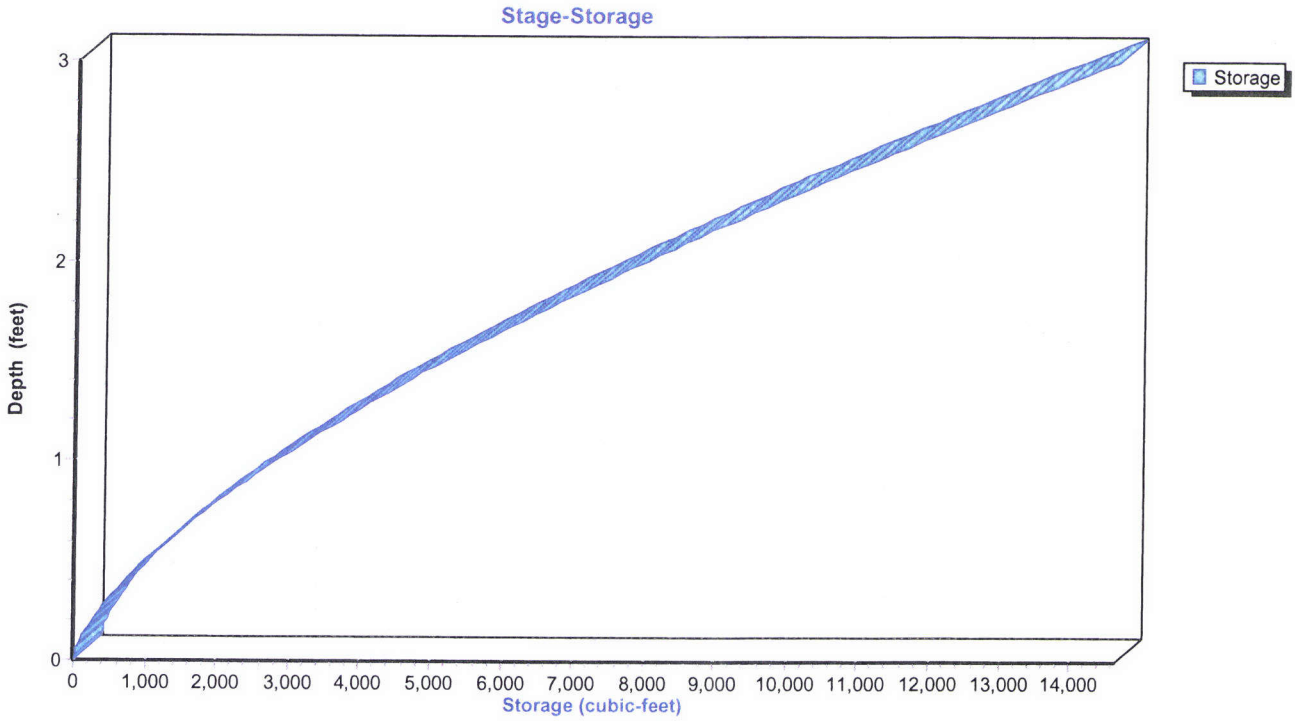
Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



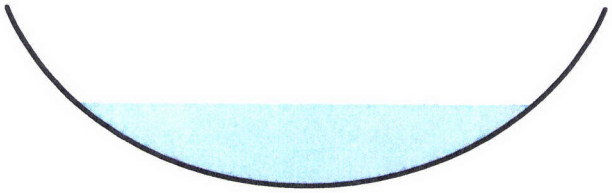
Summary for Reach 4R: Drainage Ditch (Main)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.68" for 5-Year event
Inflow = 62.51 cfs @ 13.11 hrs, Volume= 15.607 af
Outflow = 60.30 cfs @ 13.51 hrs, Volume= 15.607 af, Atten= 4%, Lag= 24.1 min

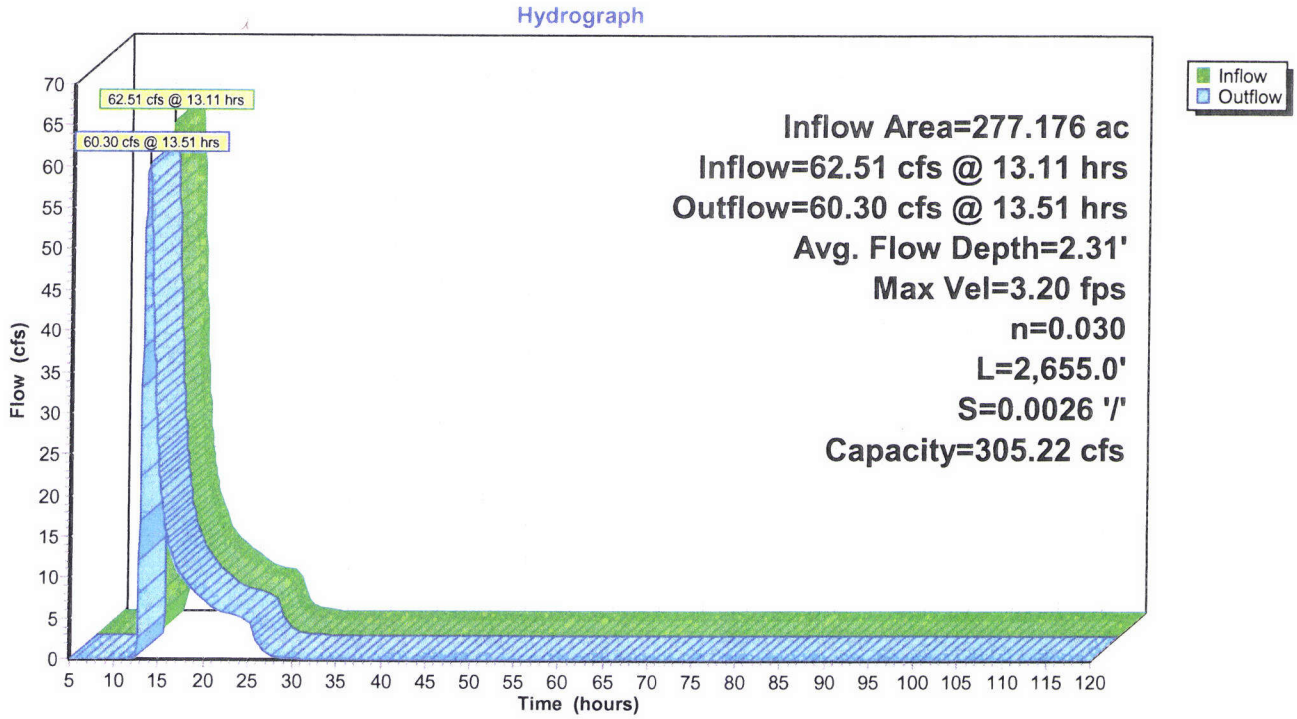
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.20 fps, Min. Travel Time= 13.8 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 68.2 min

Peak Storage= 49,987 cf @ 13.28 hrs
Average Depth at Peak Storage= 2.31'
Bank-Full Depth= 5.00', Capacity at Bank-Full= 305.22 cfs

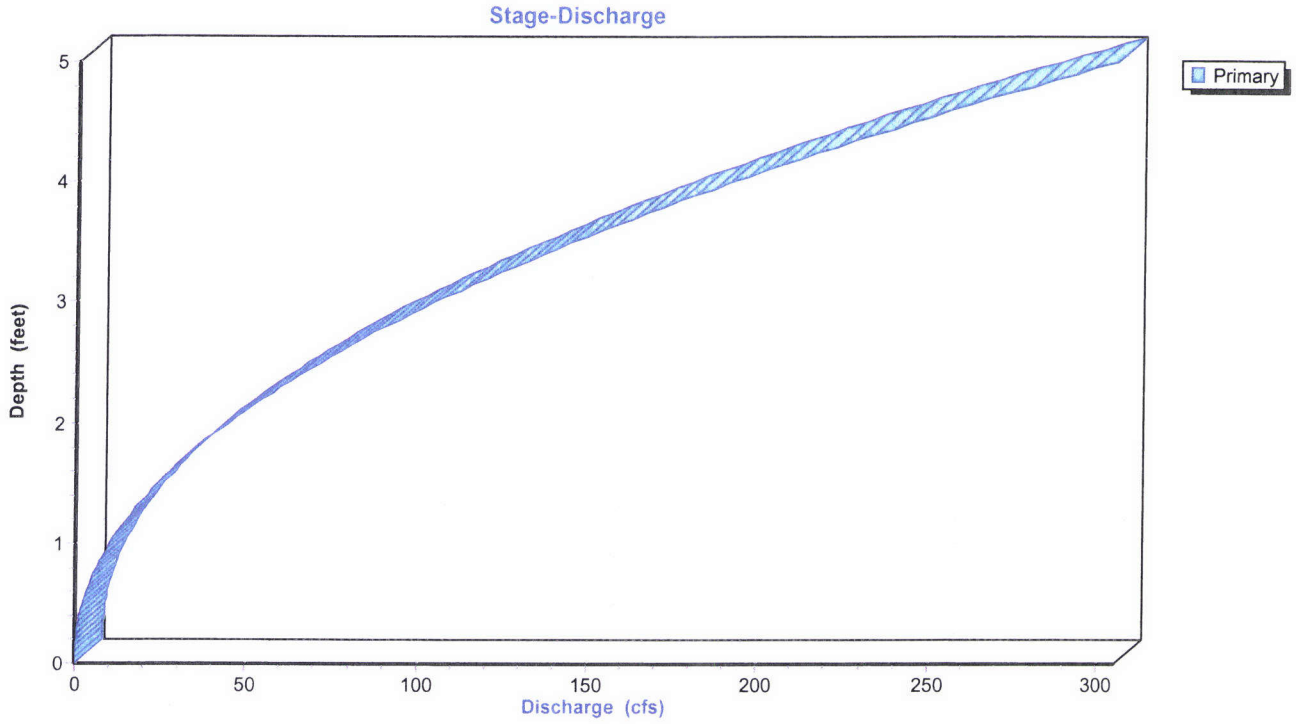
18.00' x 5.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 2,655.0' Slope= 0.0026 '/'
Inlet Invert= 628.00', Outlet Invert= 621.00'



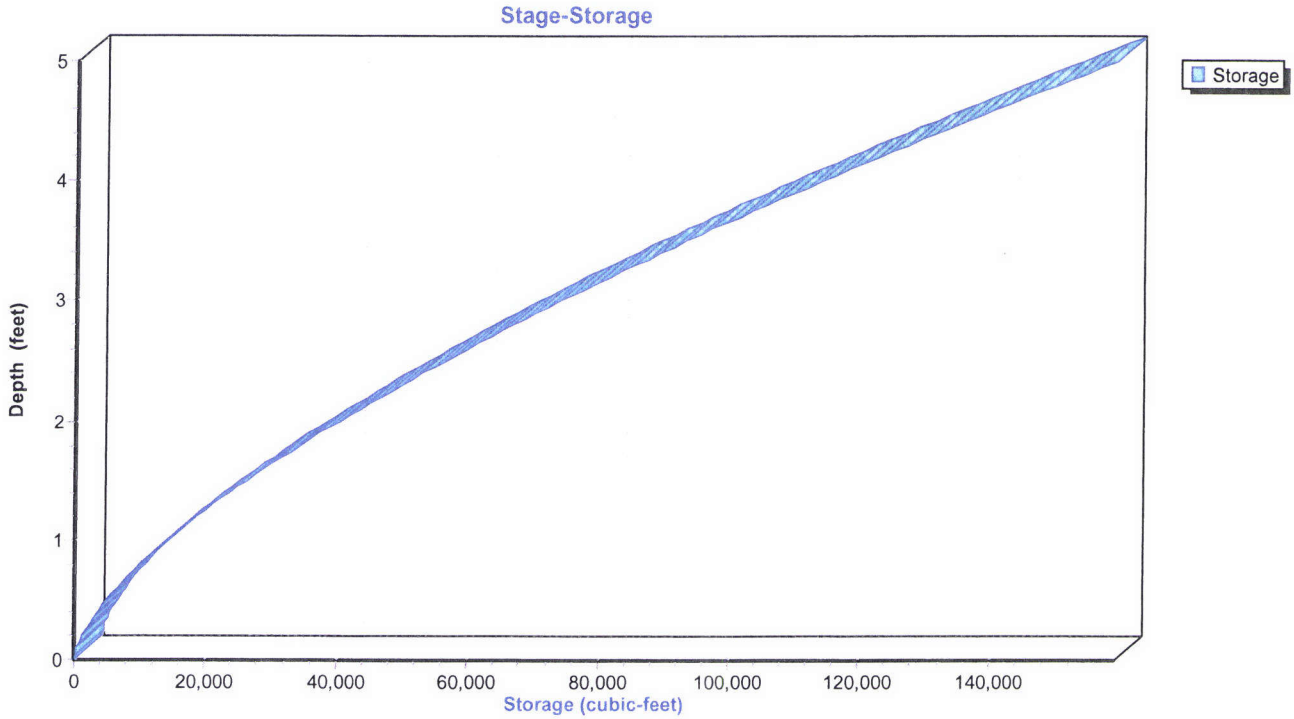
Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



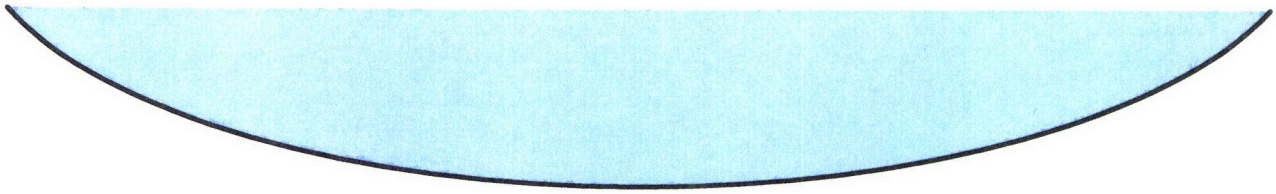
Summary for Reach 5R: Ditch & Swamp

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.65" for 5-Year event
Inflow = 27.26 cfs @ 14.78 hrs, Volume= 16.574 af
Outflow = 25.88 cfs @ 15.70 hrs, Volume= 16.569 af, Atten= 5%, Lag= 55.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 27.8 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 101.9 min

Peak Storage= 43,119 cf @ 15.23 hrs
Average Depth at Peak Storage= 3.47'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 19.46 cfs

25.00' x 3.00' deep Parabolic Channel, n= 0.100 Very weedy reaches w/pools
Length= 700.0' Slope= 0.0003 '/'
Inlet Invert= 620.20', Outlet Invert= 620.00'



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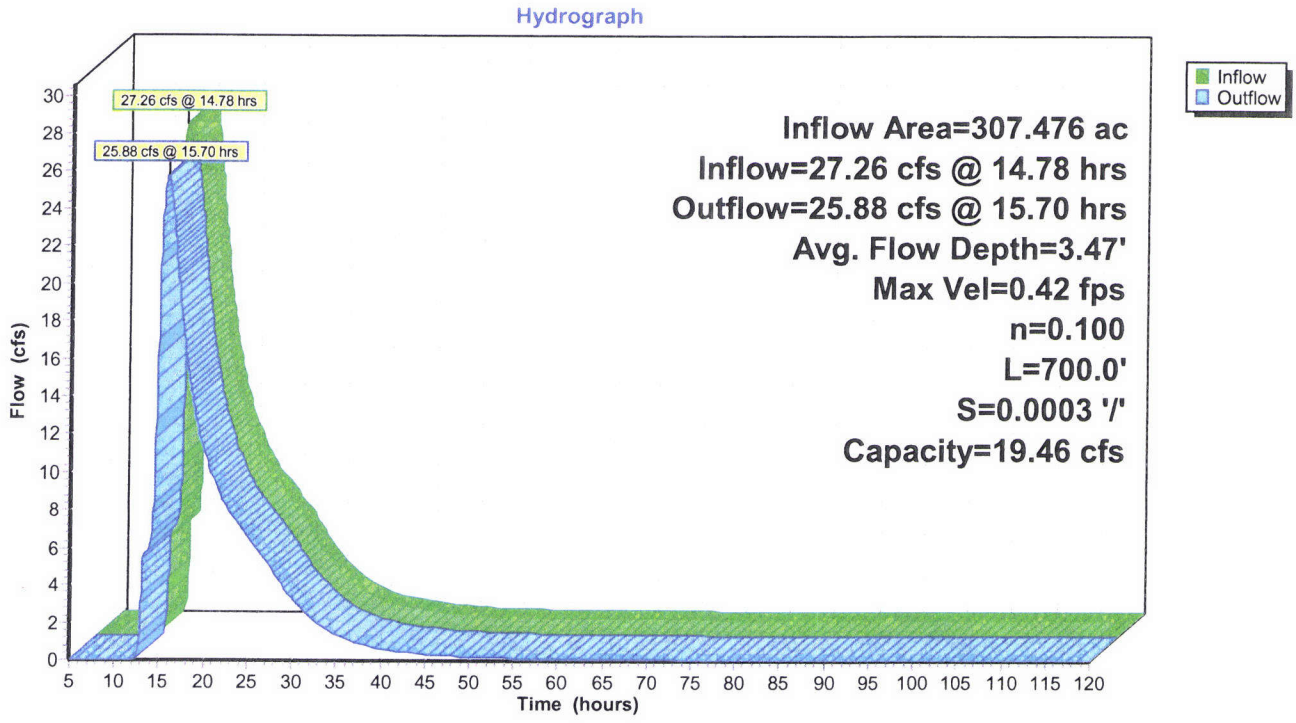
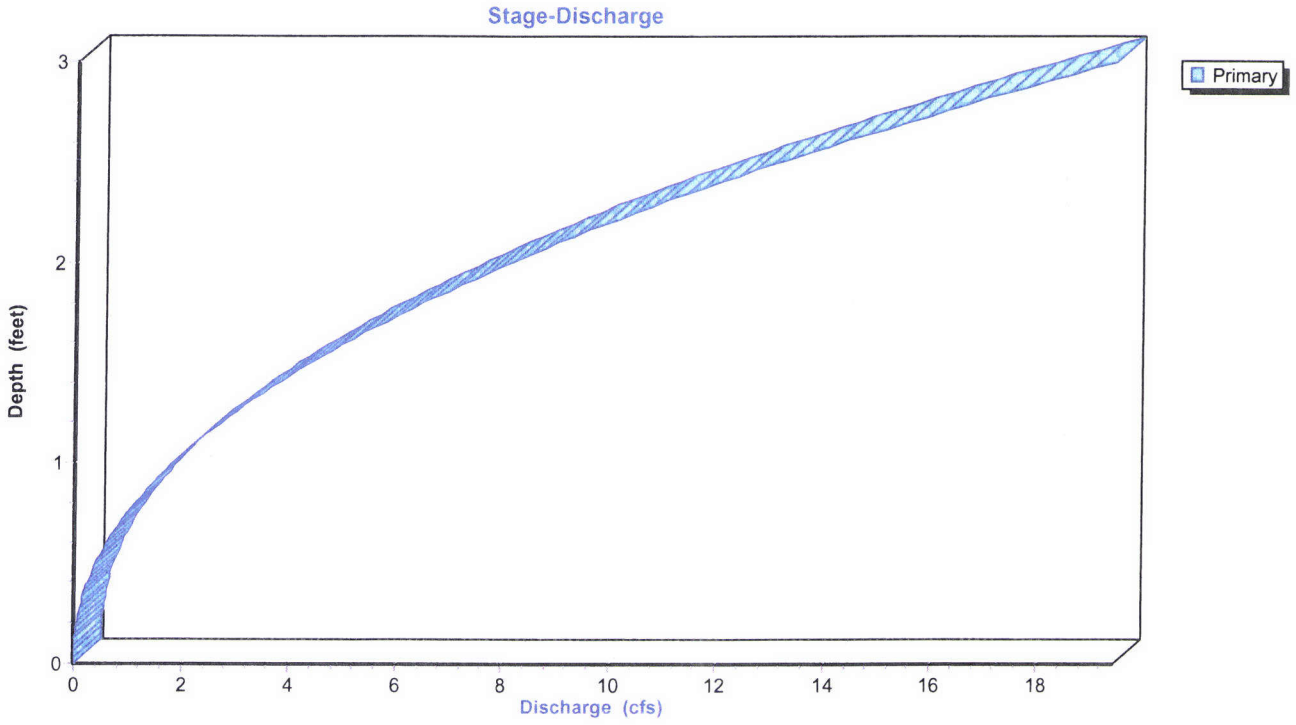
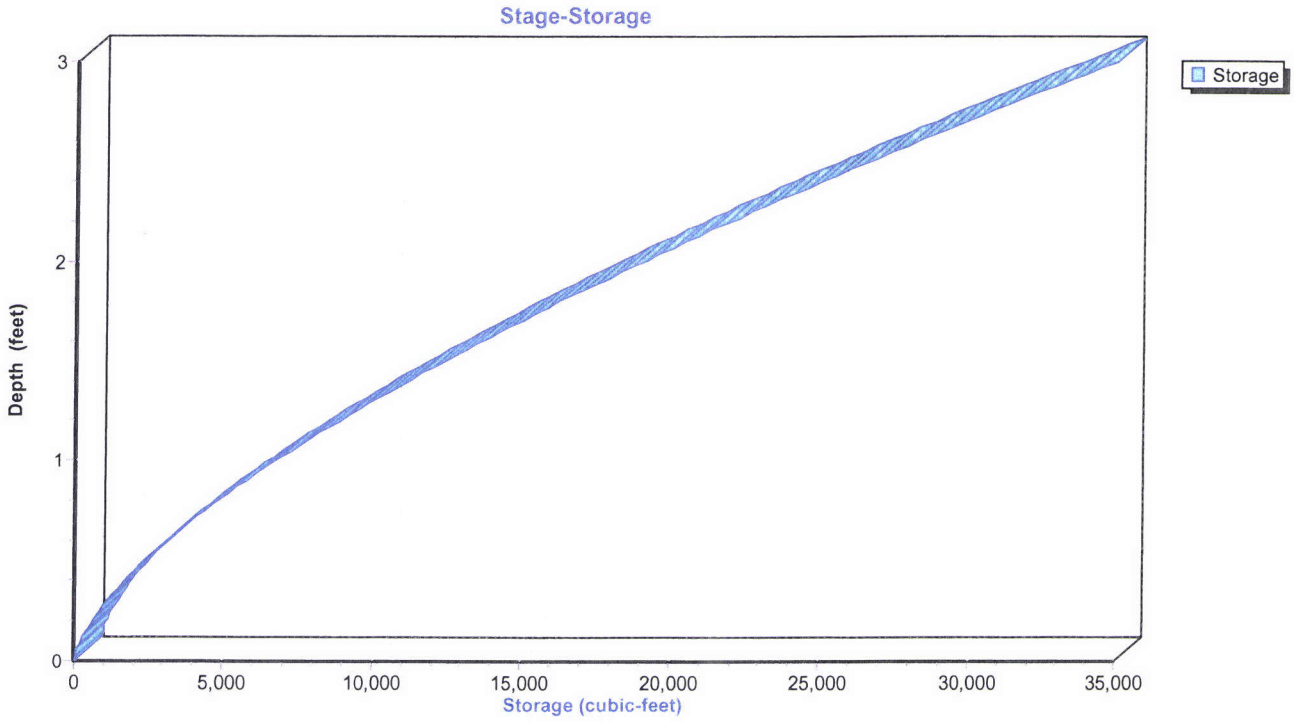
Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



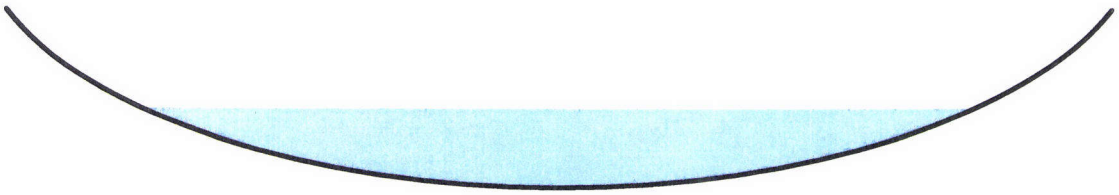
Summary for Reach 6R: School House Marsh (feeder ditch)

Inflow Area = 339.776 ac, 1.42% Impervious, Inflow Depth > 0.09" for 5-Year event
Inflow = 8.74 cfs @ 12.41 hrs, Volume= 2.628 af
Outflow = 7.68 cfs @ 12.74 hrs, Volume= 2.624 af, Atten= 12%, Lag= 19.9 min

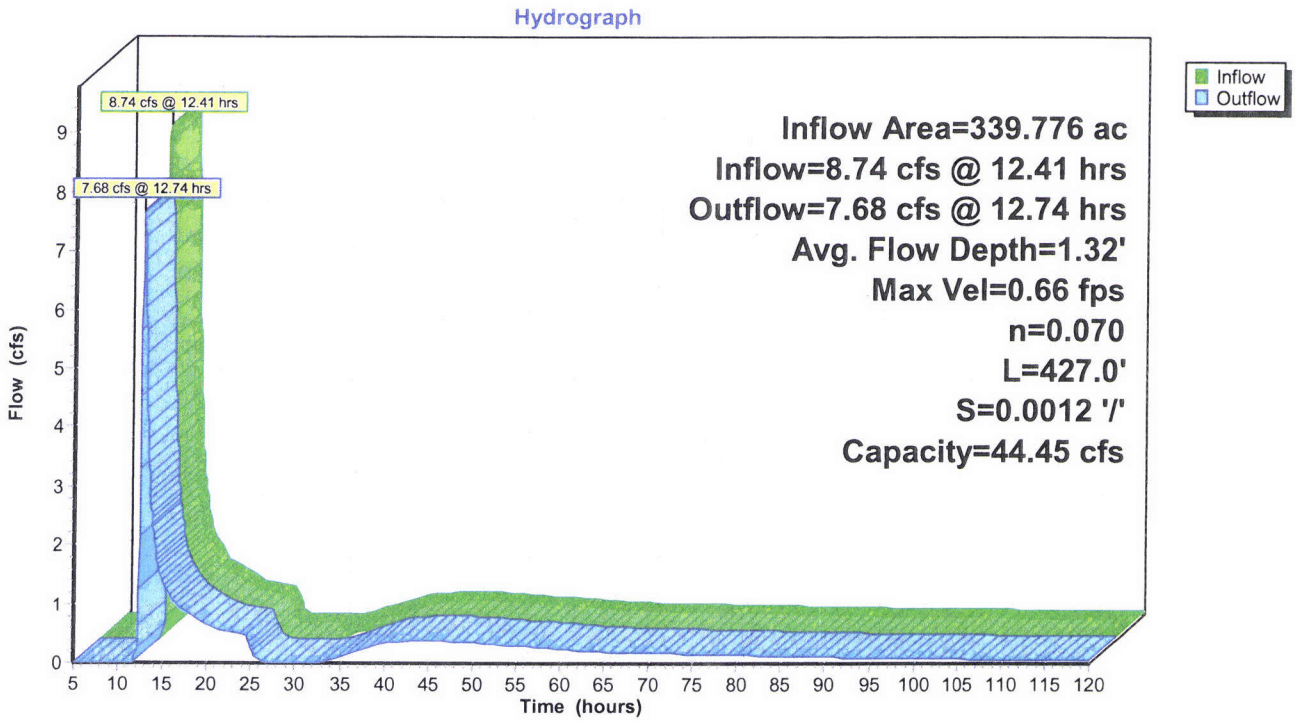
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.66 fps, Min. Travel Time= 10.8 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 34.1 min

Peak Storage= 5,009 cf @ 12.56 hrs
Average Depth at Peak Storage= 1.32'
Defined Flood Depth= 622.00', Capacity at Flood Depth= 19,490.63 cfs
Bank-Full Depth= 3.00', Capacity at Bank-Full= 44.45 cfs

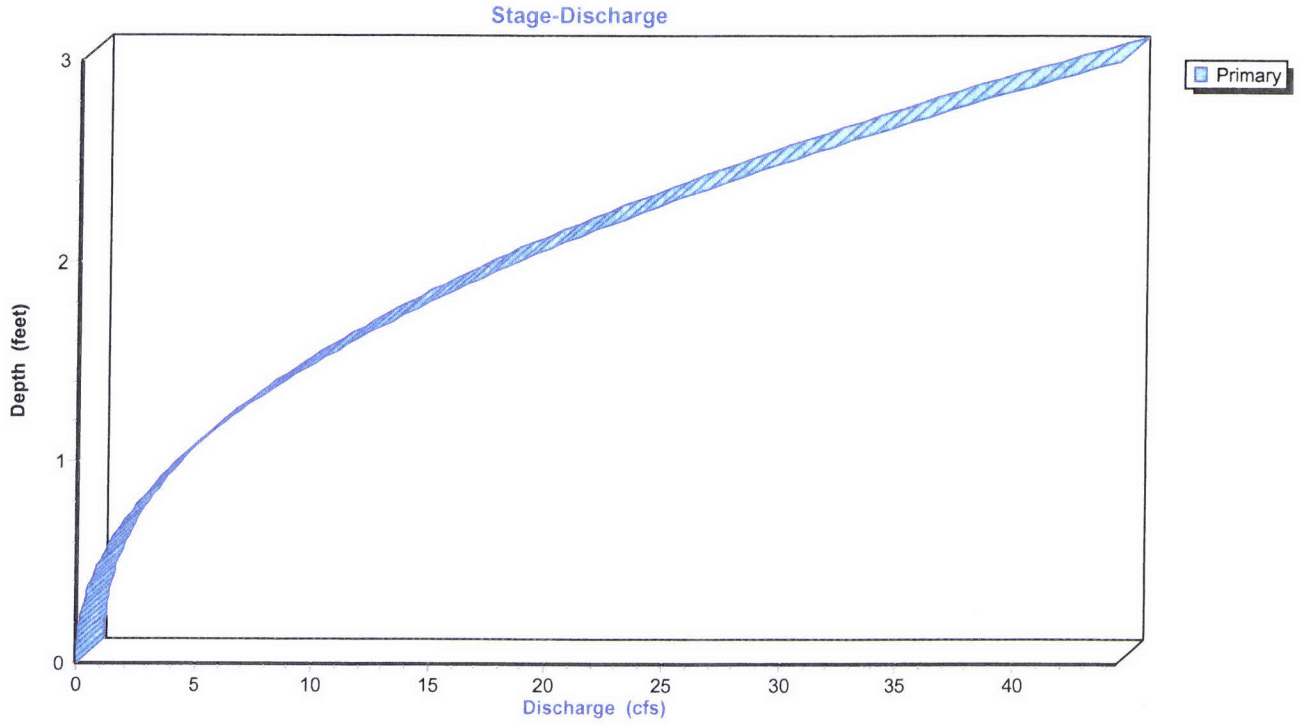
20.00' x 3.00' deep Parabolic Channel, n= 0.070 Sluggish weedy reaches w/pools
Length= 427.0' Slope= 0.0012 '/'
Inlet Invert= 618.50', Outlet Invert= 618.00'



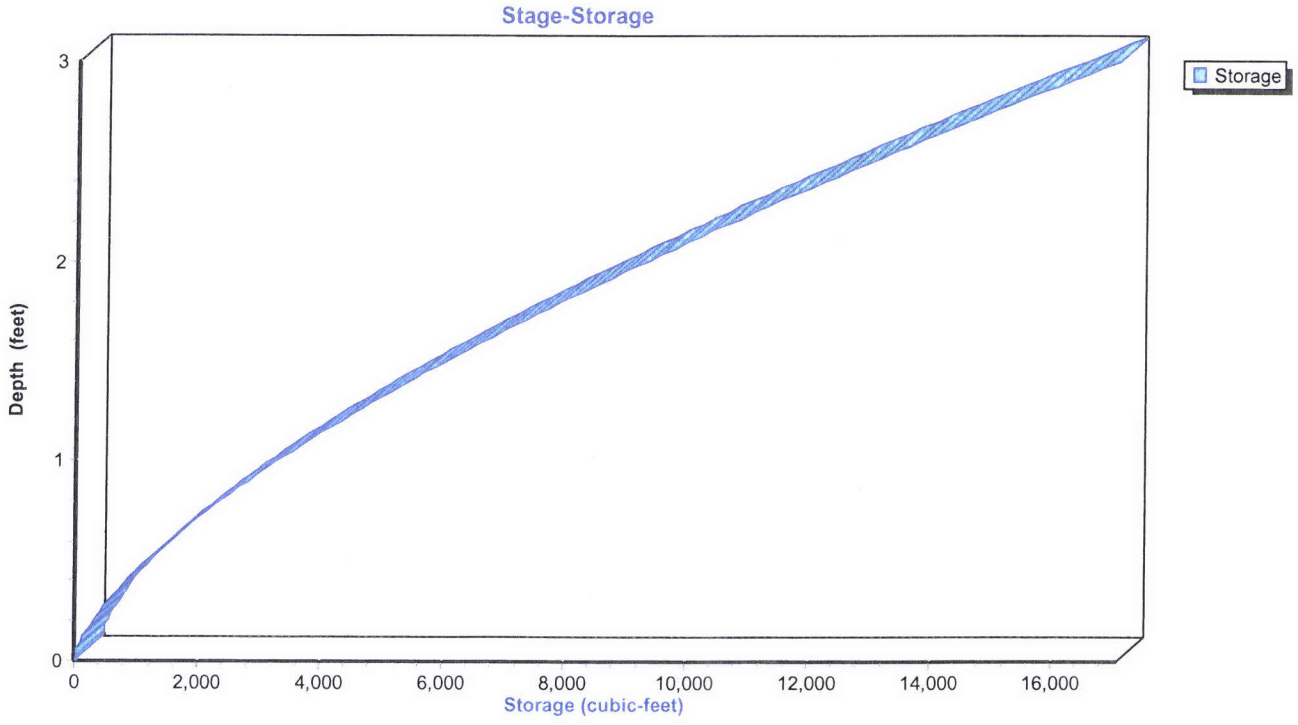
Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Summary for Reach 7R: (new Reach)

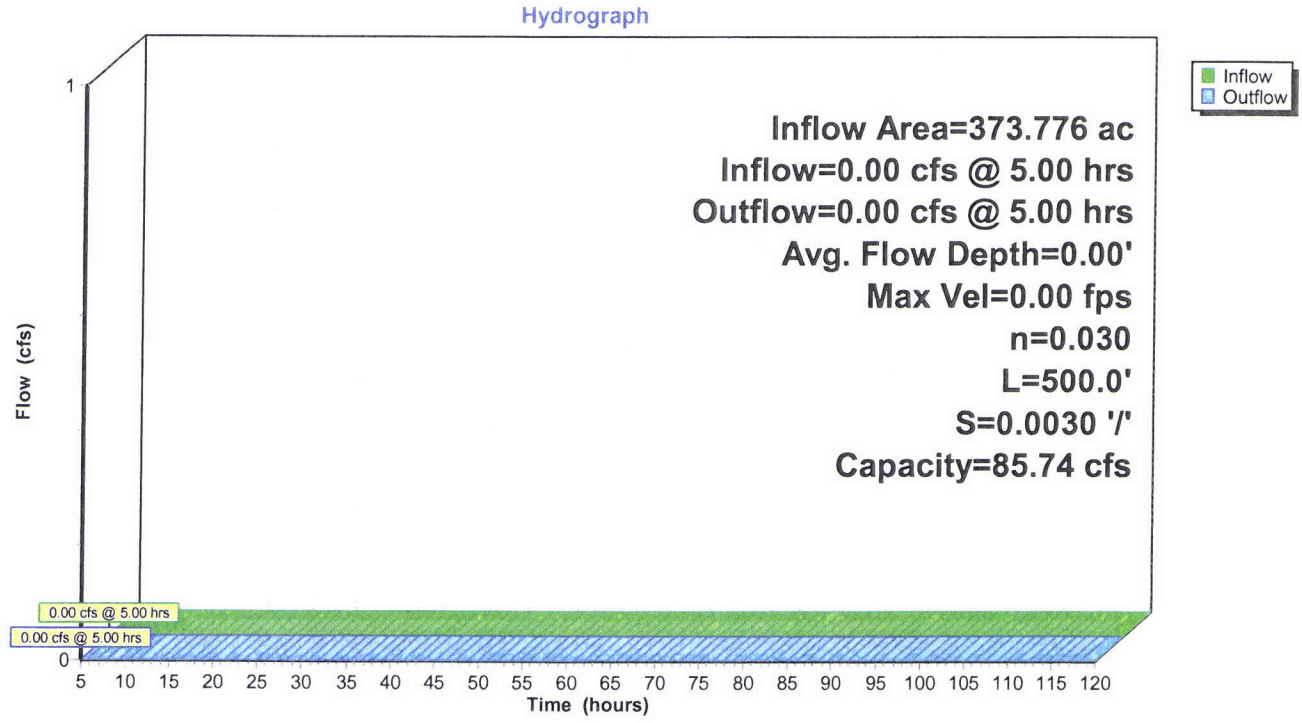
Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth = 0.00" for 5-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

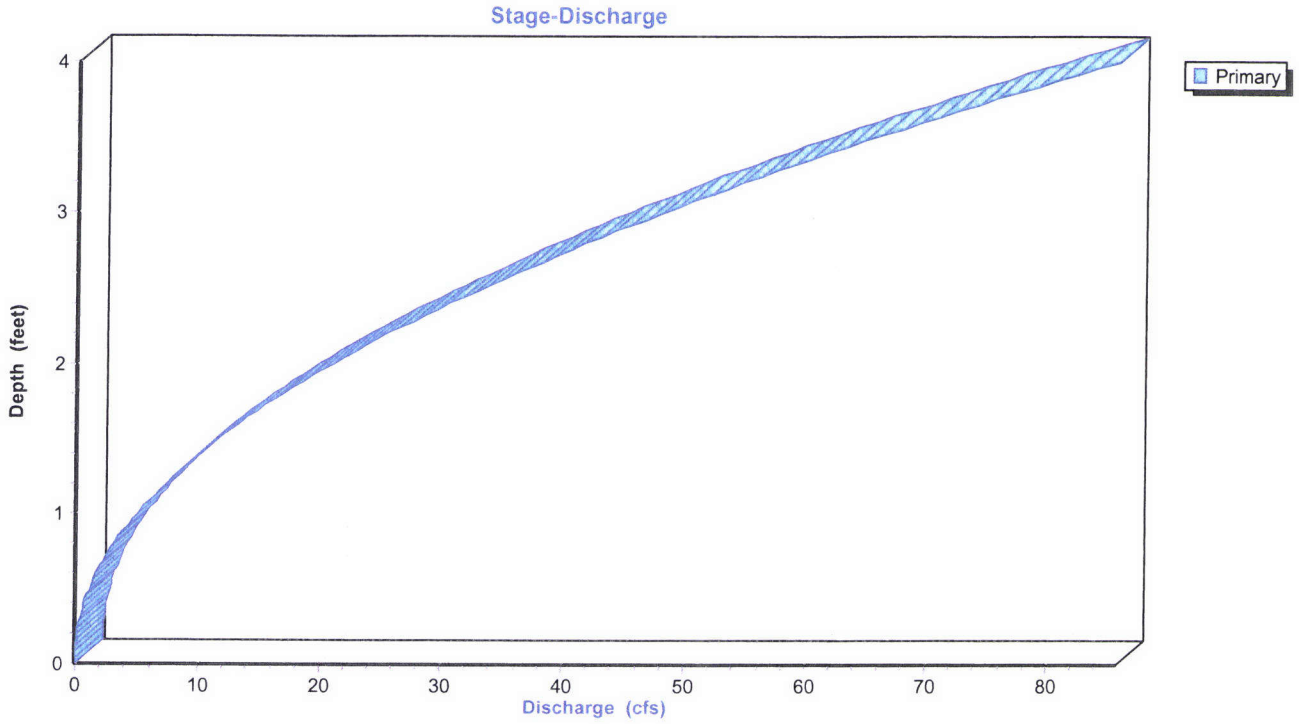
Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 85.74 cfs

8.00' x 4.00' deep Parabolic Channel, n= 0.030 Short grass
Length= 500.0' Slope= 0.0030 '/'
Inlet Invert= 613.50', Outlet Invert= 612.00'

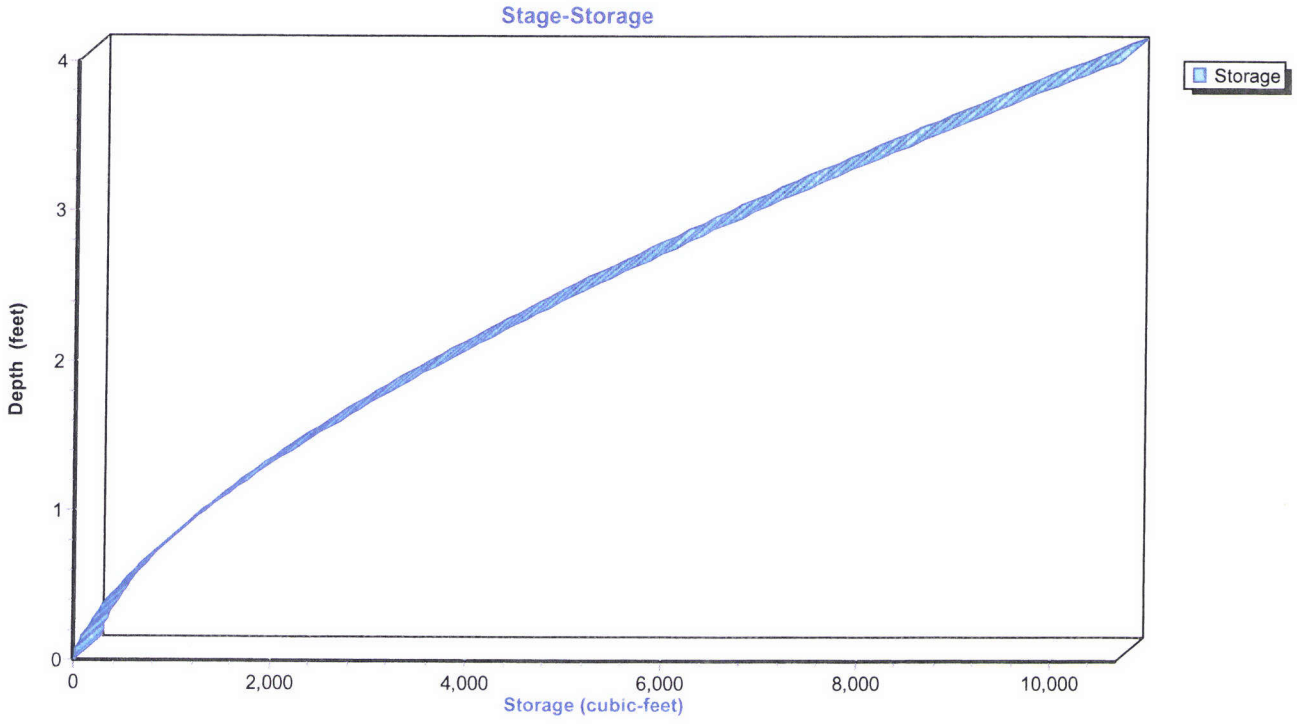
Reach 7R: (new Reach)



Reach 7R: (new Reach)



Reach 7R: (new Reach)



Summary for Pond 1C: Culvert 1 Fletcher Chapel

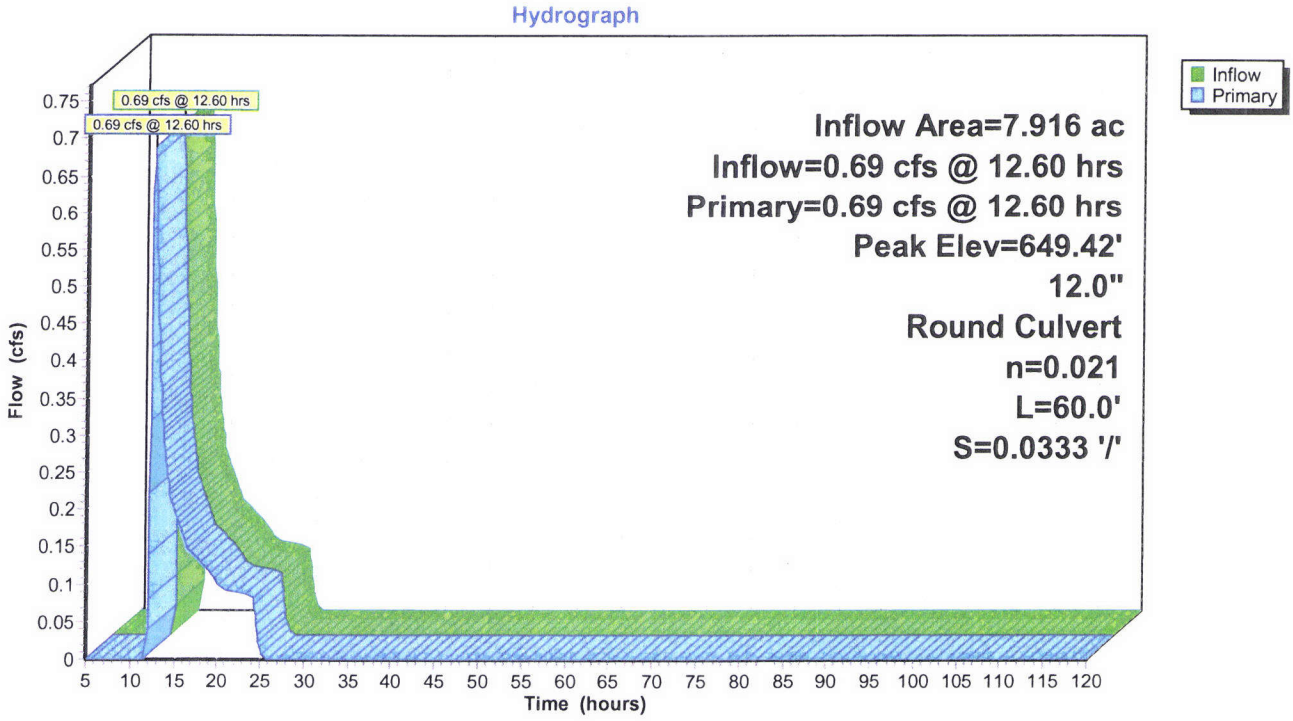
Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.27" for 5-Year event
Inflow = 0.69 cfs @ 12.60 hrs, Volume= 0.181 af
Outflow = 0.69 cfs @ 12.60 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.60 hrs, Volume= 0.181 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 649.42' @ 12.60 hrs

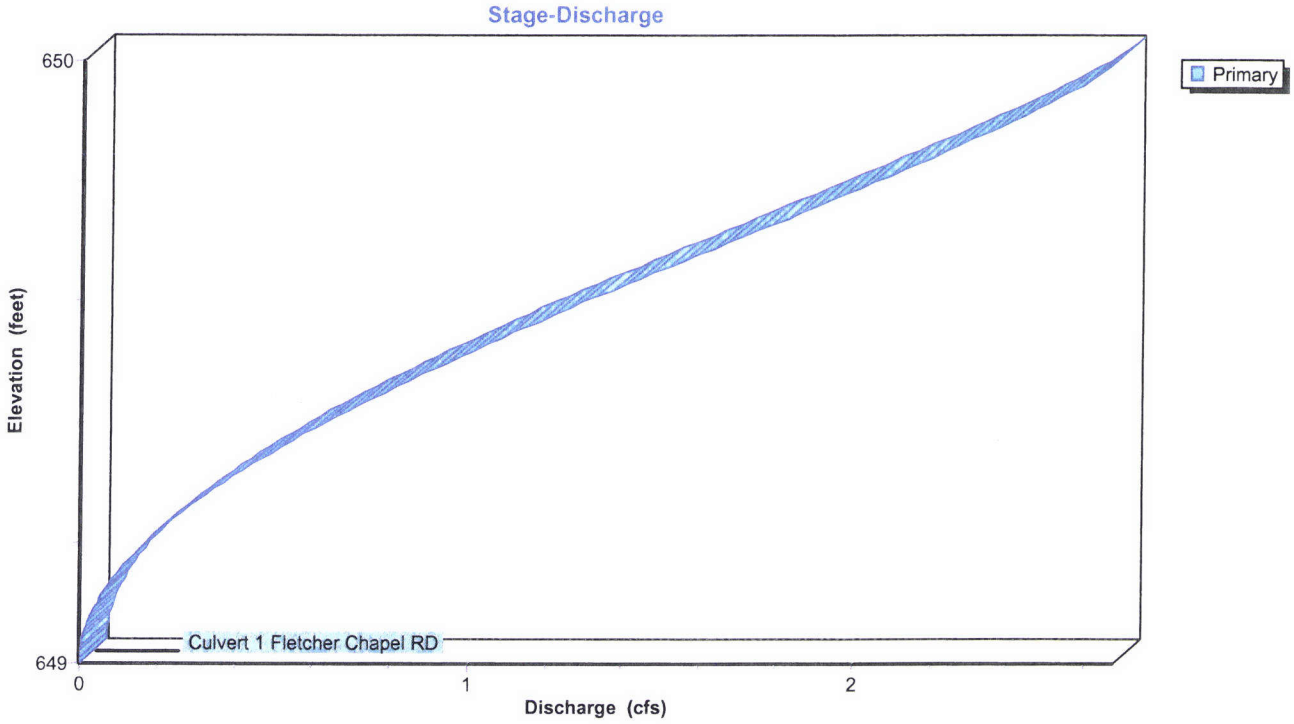
Device	Routing	Invert	Outlet Devices
#1	Primary	649.00'	**12.0" Round Culvert 1 Fletcher Chapel RD** L= 60.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 649.00' / 647.00' S= 0.0333 '/' Cc= 0.900 n= 0.021 Corrugated metal

Primary OutFlow Max=0.69 cfs @ 12.60 hrs HW=649.42' (Free Discharge)
1=Culvert 1 Fletcher Chapel RD (Inlet Controls 0.69 cfs @ 2.20 fps)

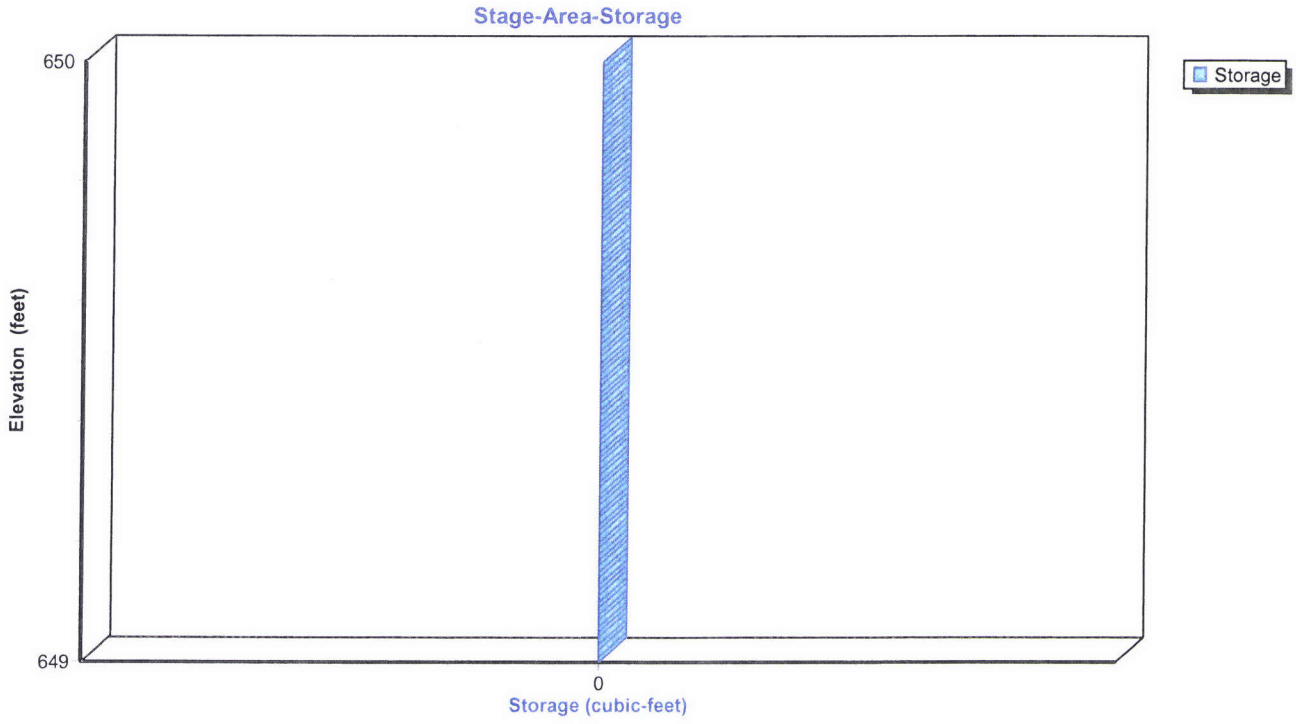
Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.11" for 5-Year event
Inflow = 10.16 cfs @ 12.74 hrs, Volume= 3.441 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.19' @ 120.00 hrs Surf.Area= 780,078 sf Storage= 2,523,636 cf (149,880 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

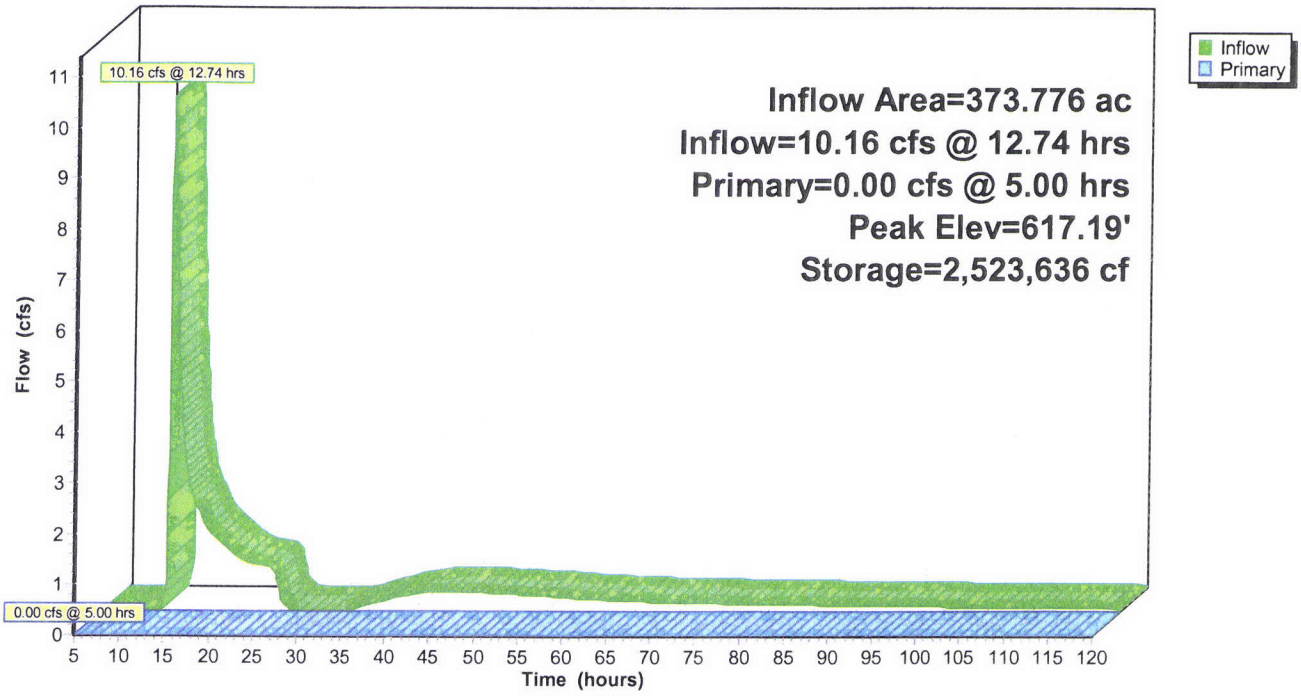
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
↑└─**1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
↑ ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 └─**3=Orifice/Grate** (Controls 0.00 cfs)

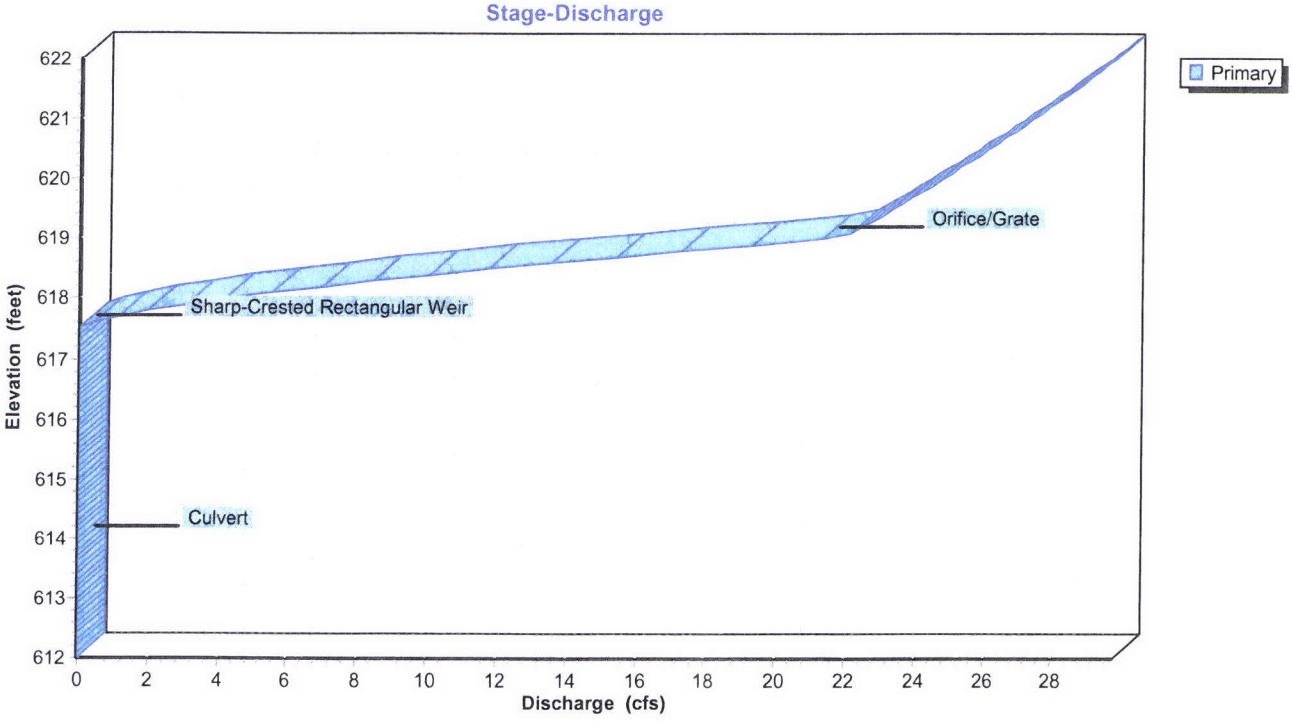
Pond 1P: Schoolhouse Marsh Pond

Hydrograph

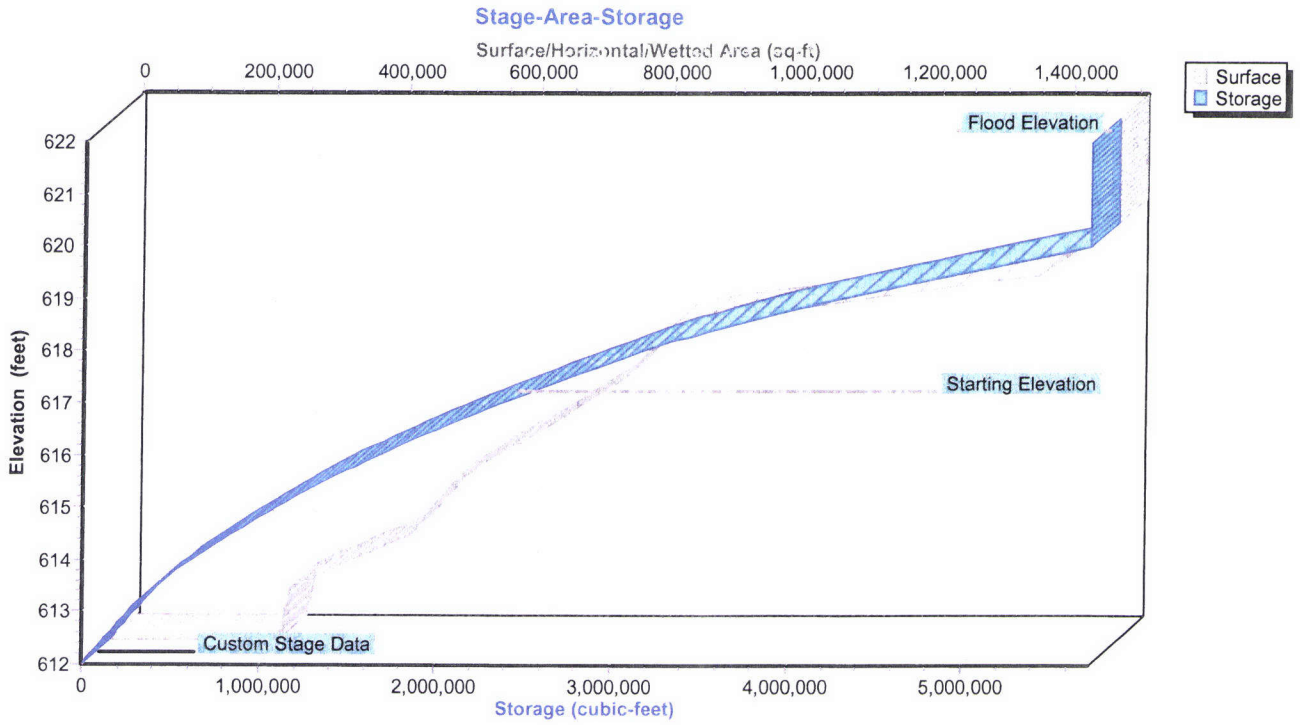


Pond 1P: Schoolhouse Marsh Pond

Stage-Discharge



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 2C: Culvert 2 Runway

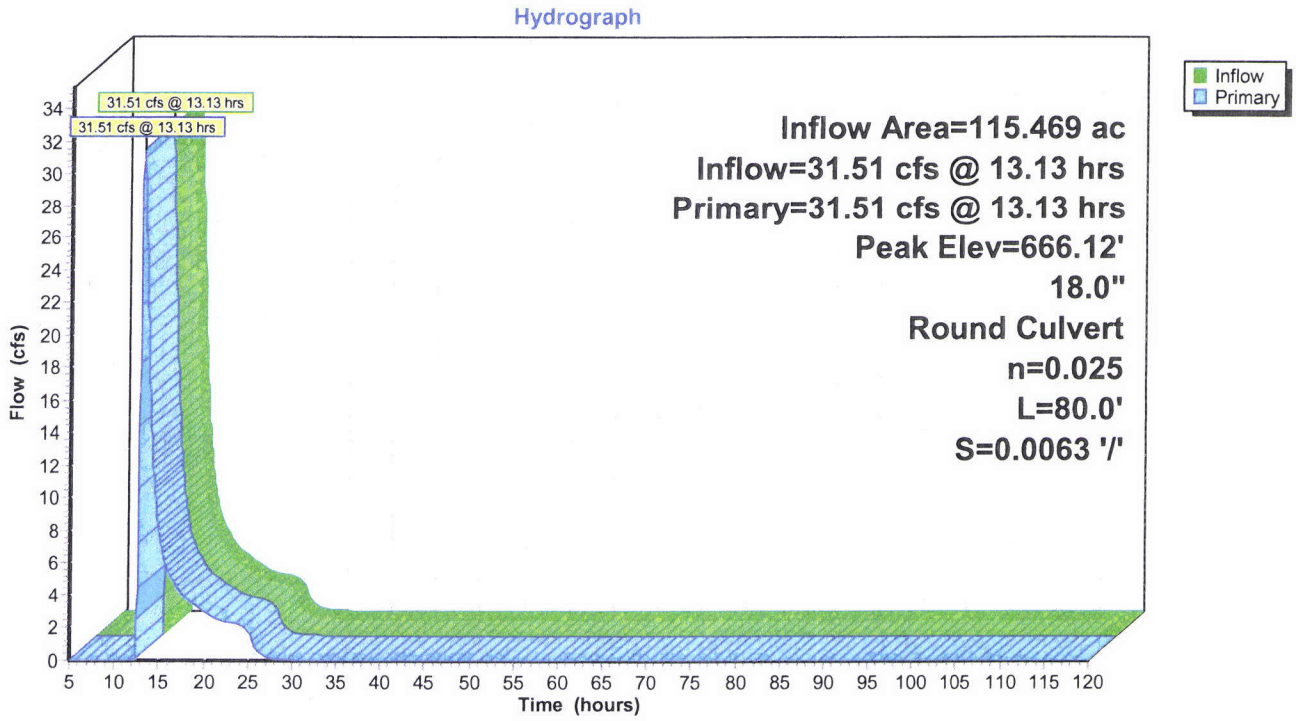
Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.68" for 5-Year event
Inflow = 31.51 cfs @ 13.13 hrs, Volume= 6.583 af
Outflow = 31.51 cfs @ 13.13 hrs, Volume= 6.583 af, Atten= 0%, Lag= 0.0 min
Primary = 31.51 cfs @ 13.13 hrs, Volume= 6.583 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 666.12' @ 13.13 hrs
Flood Elev= 633.00'

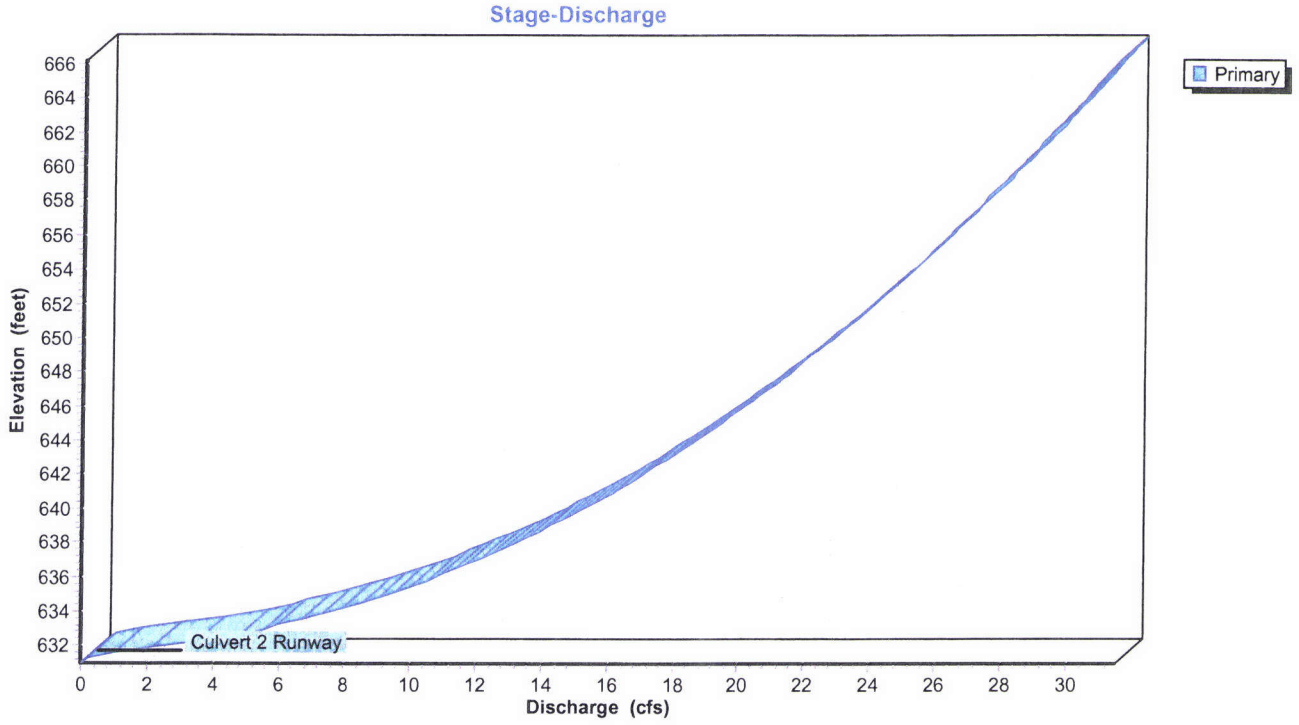
Device	Routing	Invert	Outlet Devices
#1	Primary	631.00'	**18.0" Round Culvert 2 Runway** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 631.00' / 630.50' S= 0.0063 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=31.46 cfs @ 13.13 hrs HW=666.02' (Free Discharge)
↳**1=Culvert 2 Runway** (Barrel Controls 31.46 cfs @ 17.81 fps)

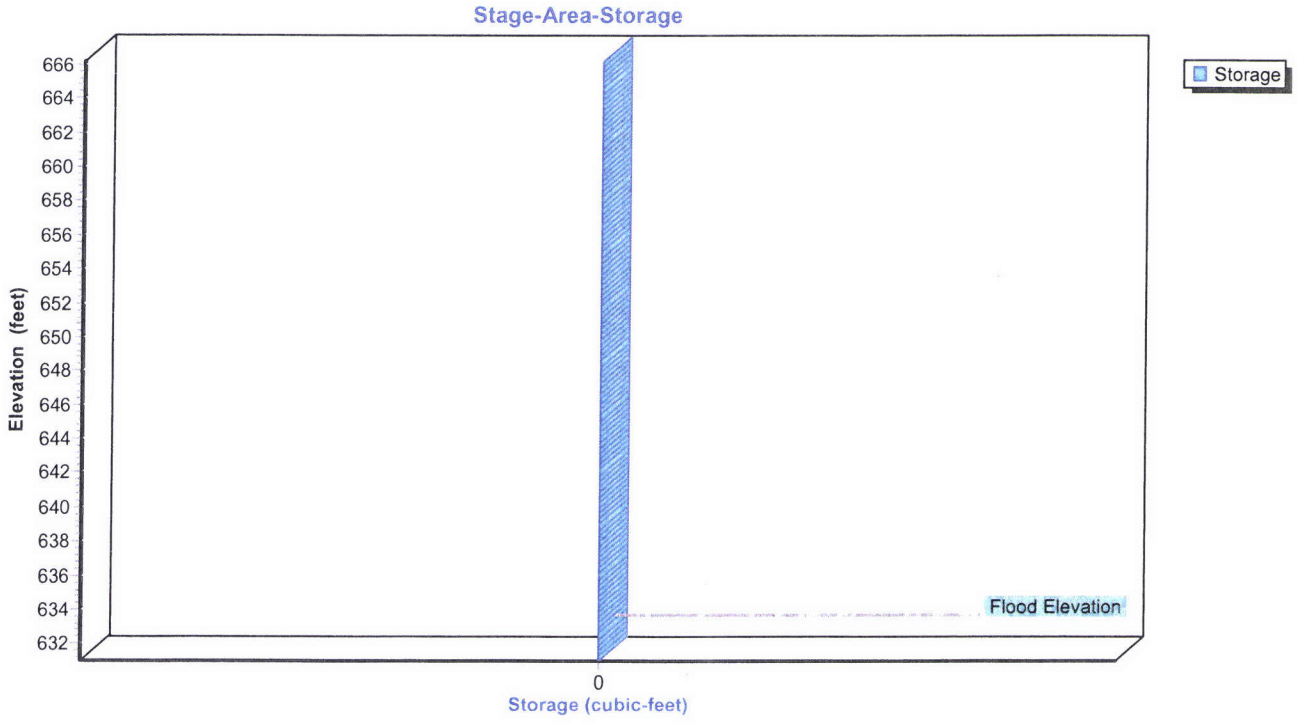
Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Summary for Pond 3C: Culvert (ROW)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.68" for 5-Year event
Inflow = 60.30 cfs @ 13.51 hrs, Volume= 15.607 af
Outflow = 25.68 cfs @ 14.80 hrs, Volume= 14.887 af, Atten= 57%, Lag= 77.4 min
Primary = 10.75 cfs @ 14.80 hrs, Volume= 10.767 af
Secondary = 14.93 cfs @ 14.80 hrs, Volume= 4.120 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 622.67' @ 14.80 hrs Surf.Area= 136,413 sf Storage= 240,828 cf
Flood Elev= 623.00' Surf.Area= 140,320 sf Storage= 285,888 cf

Plug-Flow detention time= 317.5 min calculated for 14.887 af (95% of inflow)
Center-of-Mass det. time= 289.4 min (1,284.2 - 994.7)

Volume	Invert	Avail.Storage	Storage Description
#1	620.00'	285,888 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
620.00	37,051	702.0	0	0	37,051
621.00	71,069	1,385.0	53,145	53,145	150,487
622.00	128,499	1,860.0	98,377	151,522	273,157
623.00	140,320	2,180.0	134,366	285,888	376,054

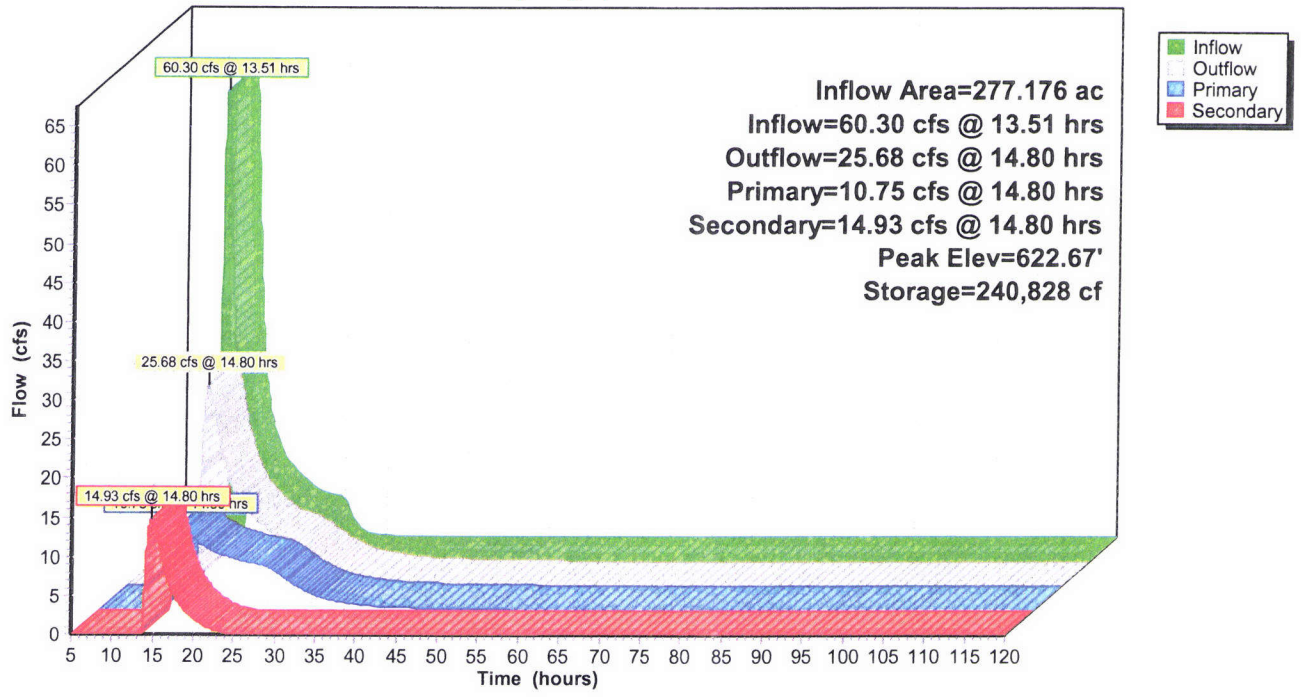
Device	Routing	Invert	Outlet Devices
#1	Primary	620.60'	**24.0" Round Culvert** L= 80.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 620.60' / 620.20' S= 0.0050 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior
#2	Secondary	622.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=10.75 cfs @ 14.80 hrs HW=622.67' (Free Discharge)
↑**1=Culvert** (Barrel Controls 10.75 cfs @ 4.10 fps)

Secondary OutFlow Max=14.93 cfs @ 14.80 hrs HW=622.67' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 14.93 cfs @ 2.21 fps)

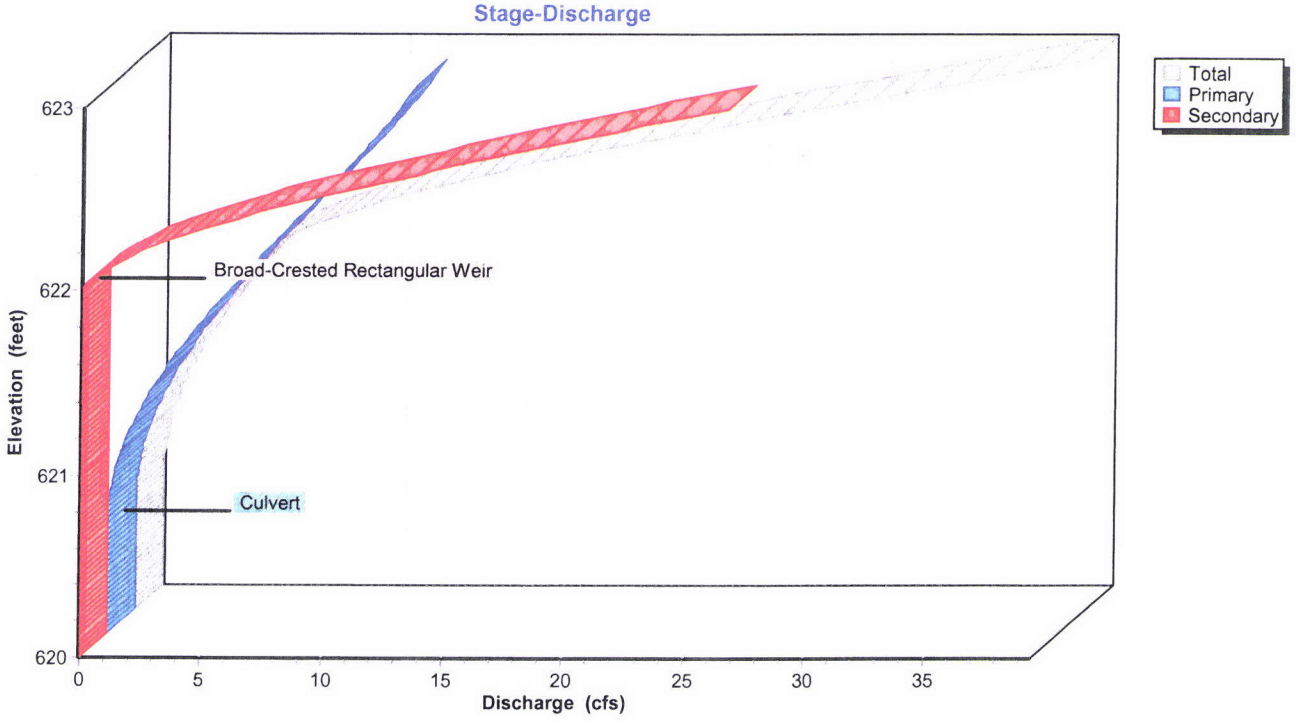
Pond 3C: Culvert (ROW)

Hydrograph

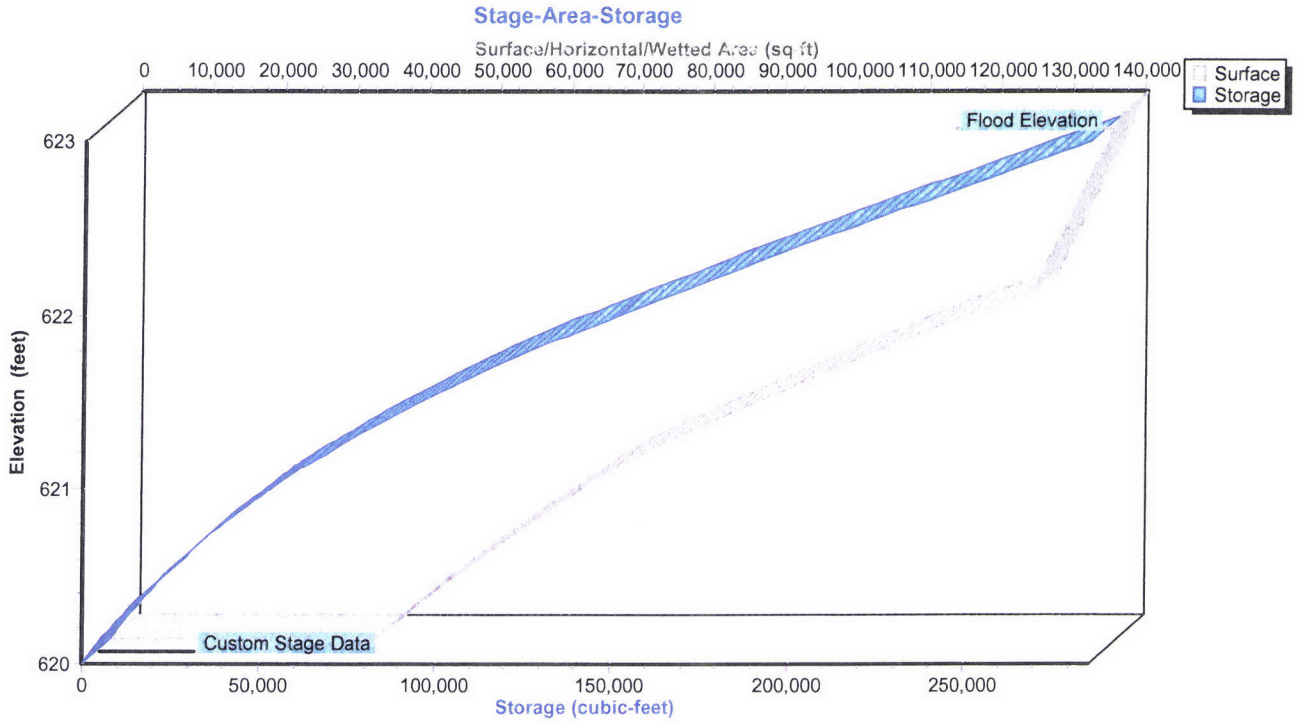


Pond 3C: Culvert (ROW)

Stage-Discharge



Pond 3C: Culvert (ROW)



Summary for Pond 4C: 4C

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.65" for 5-Year event
Inflow = 25.88 cfs @ 15.70 hrs, Volume= 16.569 af
Outflow = 0.39 cfs @ 43.91 hrs, Volume= 1.266 af, Atten= 99%, Lag= 1,692.8 min
Primary = 0.39 cfs @ 43.91 hrs, Volume= 1.266 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 618.57' @ 43.91 hrs Surf.Area= 444,721 sf Storage= 691,894 cf
Flood Elev= 622.00' Surf.Area= 535,800 sf Storage= 1,427,903 cf

Plug-Flow detention time= 2,968.4 min calculated for 1.266 af (8% of inflow)
Center-of-Mass det. time= 2,499.8 min (3,813.7 - 1,313.9)

Volume	Invert	Avail.Storage	Storage Description
#1	616.00'	1,427,903 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

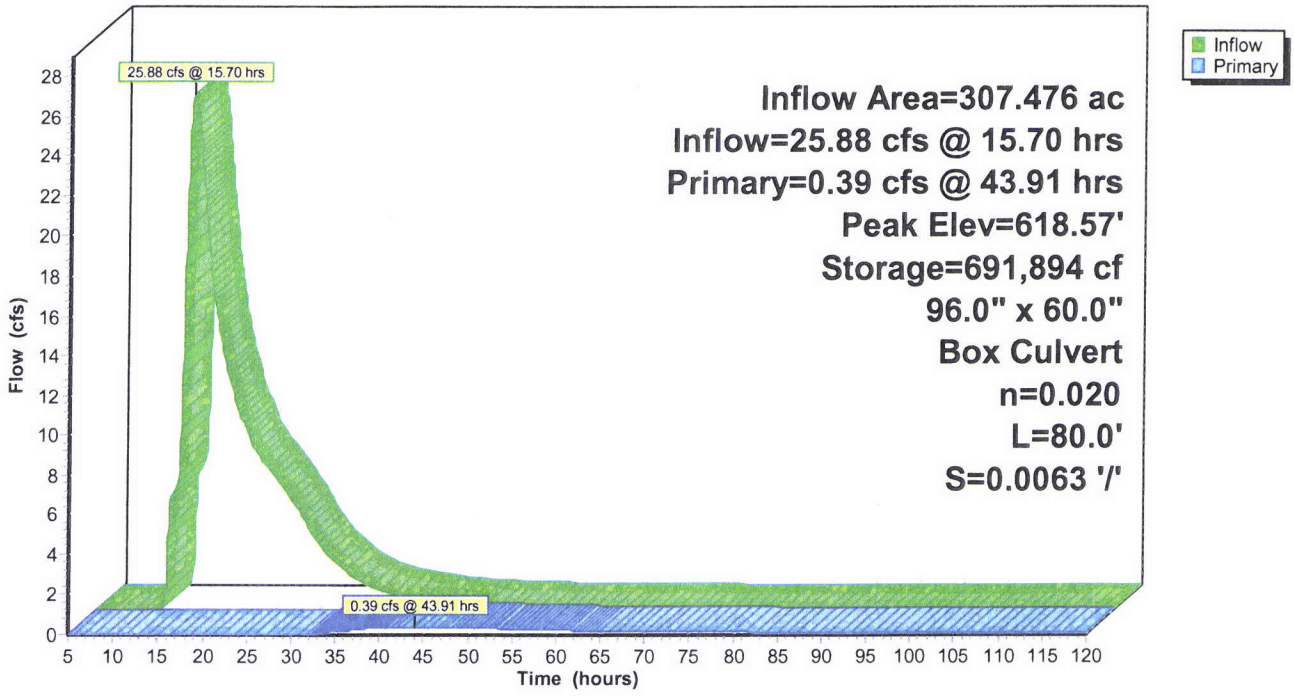
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
616.00	42,800	305.0	0	0	42,800
617.00	286,279	2,304.0	146,590	146,590	457,830
618.00	351,919	2,393.0	318,535	465,125	491,178
619.00	521,710	2,863.0	434,038	899,163	687,778
620.00	535,800	3,120.0	528,739	1,427,903	810,175

Device	Routing	Invert	Outlet Devices
#1	Primary	618.50'	**96.0" W x 60.0" H Box Culvert at Sour Springs RD.** L= 80.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 618.50' / 618.00' S= 0.0063 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=0.35 cfs @ 43.91 hrs HW=618.57' (Free Discharge)
↑**1=Culvert at Sour Springs RD.** (Barrel Controls 0.35 cfs @ 0.82 fps)

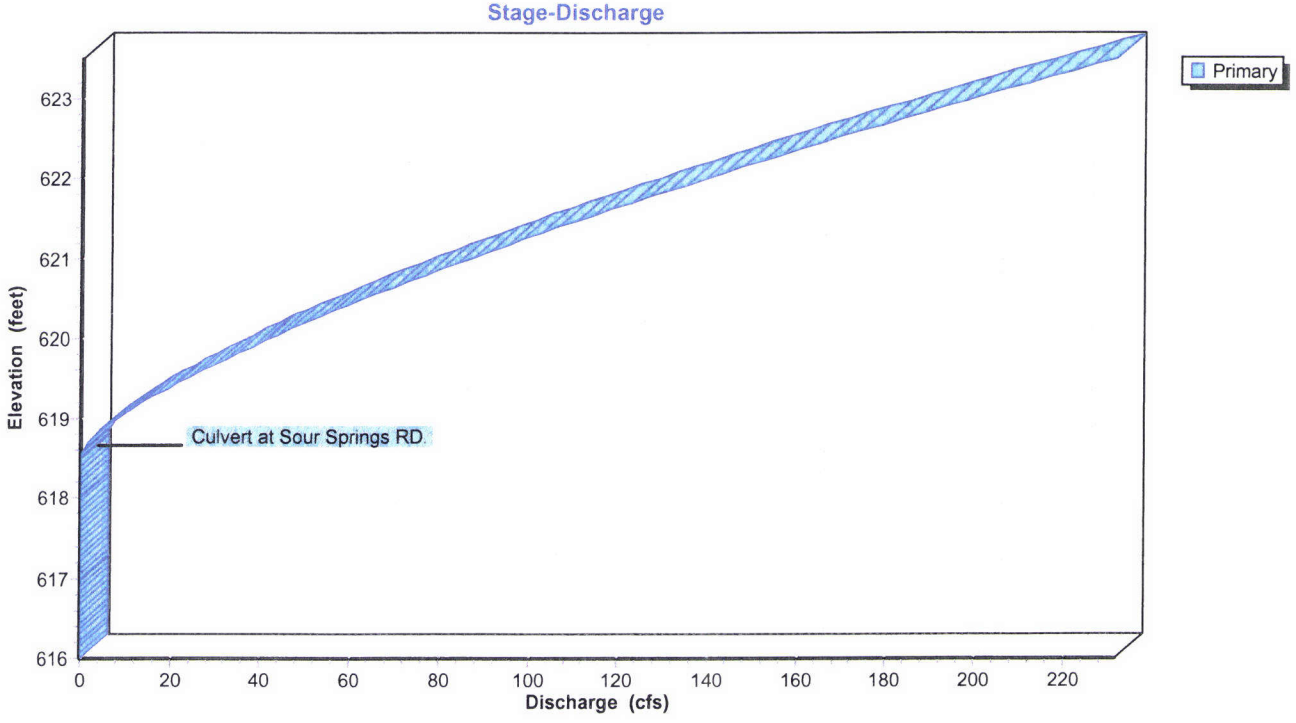
Pond 4C: 4C

Hydrograph

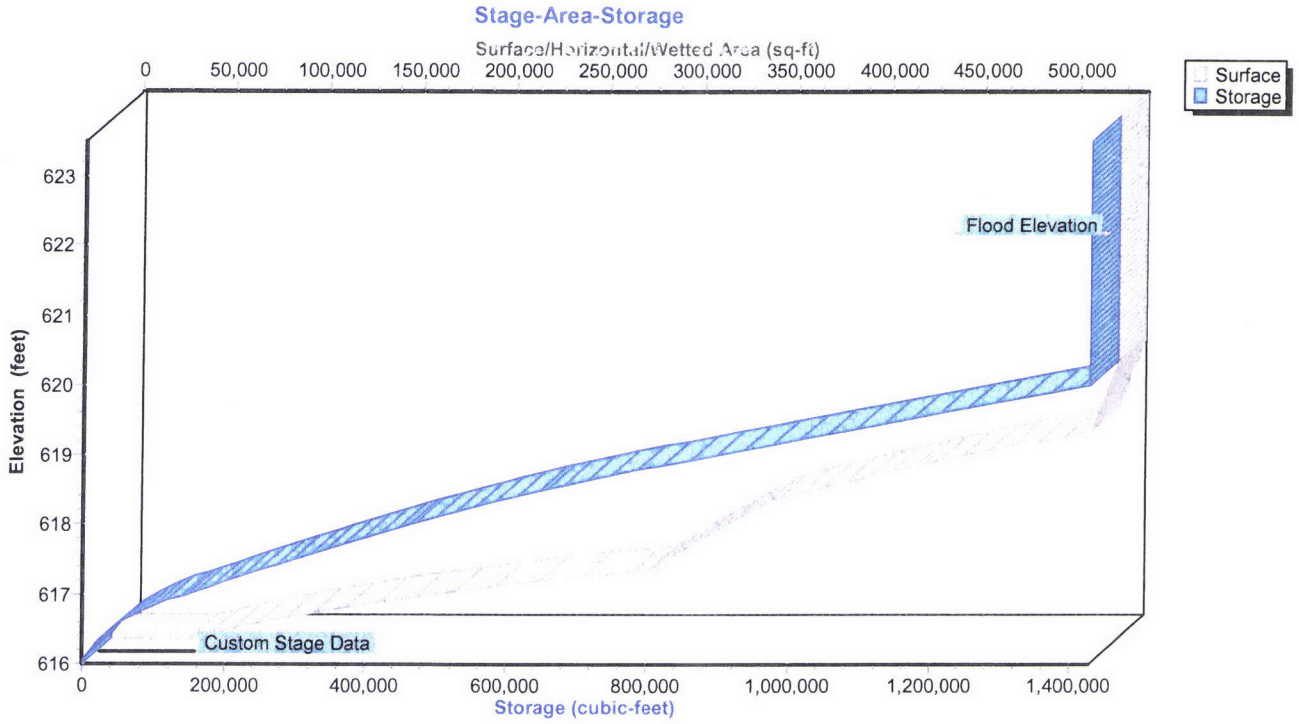


Pond 4C: 4C

Stage-Discharge



Pond 4C: 4C


Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
Surface
Storage
623
622
621
620
619
618
617
616
Elevation (feet)
Flood Elevation
Custom Stage Data
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
Storage (cubic-feet)

Time span=5.00-120.00 hrs, dt=0.05 hrs, 2301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatch 1-SC Runoff Area=344,838 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=550' Tc=42.7 min CN=58 Runoff=1.48 cfs 0.299 af

Subcatchment 2S: Subcatch 2-SC Runoff Area=107.553 ac 0.19% Impervious Runoff Depth=1.01"
Flow Length=1,700' Slope=0.0110 '/' Tc=41.0 min CN=70 Runoff=67.75 cfs 9.035 af

Subcatchment 3S: Subcatch 3-sc Runoff Area=7,043,959 sf 0.39% Impervious Runoff Depth=0.95"
Flow Length=2,800' Tc=49.3 min CN=69 Runoff=82.90 cfs 12.855 af

Subcatchment 4S: Subcatch 4-SC Runoff Area=32.300 ac 0.00% Impervious Runoff Depth=0.75"
Flow Length=1,100' Tc=37.1 min CN=65 Runoff=14.64 cfs 2.024 af

Subcatchment 5aS: Subcatch 5A-SC Runoff Area=11.000 ac 0.00% Impervious Runoff Depth=0.75"
Flow Length=700' Slope=0.0300 '/' Tc=57.4 min CN=65 Runoff=3.64 cfs 0.689 af

Subcatchment 5bS: Subcatch 5B-SC Runoff Area=19.300 ac 20.73% Impervious Runoff Depth=1.06"
Flow Length=800' Tc=43.6 min CN=71 Runoff=12.48 cfs 1.711 af

Subcatchment 5S: Subcatch 6B-SC Runoff Area=16.800 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=1,100' Tc=70.5 min CN=58 Runoff=2.25 cfs 0.634 af

Subcatchment 6aS: Subcatch 6A-SC Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.49"
Flow Length=800' Tc=39.5 min CN=59 Runoff=3.87 cfs 0.705 af

Reach 1R: Shallow Swale Avg. Flow Depth=0.44' Max Vel=1.29 fps Inflow=1.48 cfs 0.299 af
n=0.050 L=1,355.0' S=0.0103 '/' Capacity=16.53 cfs Outflow=1.21 cfs 0.299 af

Reach 2R: Drainage Ditch (North side runway) Avg. Flow Depth=4.50' Max Vel=1.81 fps Inflow=67.78 cfs 9.334 af
n=0.025 L=2,440.0' S=0.0004 '/' Capacity=26.49 cfs Outflow=48.90 cfs 9.334 af

Reach 3R: Drainage Ditch (upper section) Avg. Flow Depth=6.37' Max Vel=3.10 fps Inflow=101.42 cfs 22.189 af
n=0.035 L=1,220.0' S=0.0025 '/' Capacity=30.90 cfs Outflow=99.69 cfs 22.189 af

Reach 4R: Drainage Ditch (Main) Avg. Flow Depth=2.88' Max Vel=3.67 fps Inflow=99.69 cfs 22.189 af
n=0.030 L=2,655.0' S=0.0026 '/' Capacity=305.22 cfs Outflow=96.22 cfs 22.189 af

Reach 5R: Ditch & Swamp Avg. Flow Depth=5.37' Max Vel=0.48 fps Inflow=94.10 cfs 23.869 af
n=0.100 L=700.0' S=0.0003 '/' Capacity=19.46 cfs Outflow=52.06 cfs 23.864 af

Reach 6R: School House Marsh (feeder ditch) Avg. Flow Depth=1.71' Max Vel=0.77 fps Inflow=14.64 cfs 10.556 af
n=0.070 L=427.0' S=0.0012 '/' Capacity=44.45 cfs Outflow=13.28 cfs 10.551 af

Reach 7R: (new Reach) Avg. Flow Depth=0.28' Max Vel=0.86 fps Inflow=0.34 cfs 1.839 af
n=0.030 L=500.0' S=0.0030 '/' Capacity=85.74 cfs Outflow=0.34 cfs 1.832 af

Pond 1C: Culvert 1 Fletcher Chapel Peak Elev=649.65' Inflow=1.48 cfs 0.299 af
12.0" Round Culvert n=0.021 L=60.0' S=0.0333 '/' Outflow=1.48 cfs 0.299 af

Pond 1P: Schoolhouse Marsh Pond Peak Elev=617.59' Storage=2,838,452 cf Inflow=18.38 cfs 11.890 af
Outflow=0.34 cfs 1.839 af

Pond 2C: Culvert 2 Runway Peak Elev=714.18' Inflow=48.90 cfs 9.334 af
18.0" Round Culvert n=0.025 L=80.0' S=0.0063 '/' Outflow=48.90 cfs 9.334 af

Pond 3C: Culvert (ROW) Peak Elev=623.99' Storage=285,888 cf Inflow=96.22 cfs 22.189 af
Primary=16.72 cfs 12.377 af Secondary=74.08 cfs 9.092 af Outflow=90.79 cfs 21.469 af

Pond 4C: 4C Peak Elev=618.87' Storage=831,449 cf Inflow=52.06 cfs 23.864 af
96.0" x 60.0" Box Culvert n=0.020 L=80.0' S=0.0063 '/' Outflow=5.08 cfs 8.532 af

Total Runoff Area = 373.776 ac Runoff Volume = 27.952 af Average Runoff Depth = 0.90"
98.71% Pervious = 368.944 ac 1.29% Impervious = 4.832 ac

Summary for Subcatchment 1S: Subcatch 1-SC

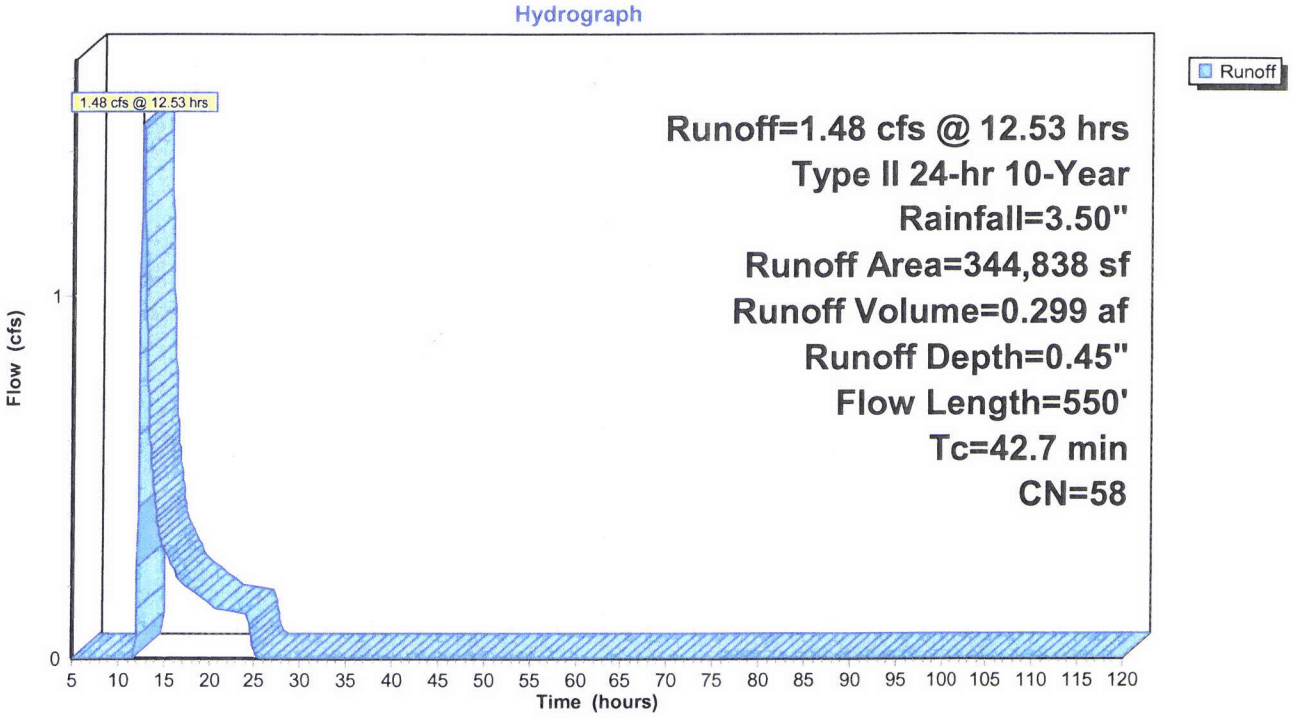
Runoff = 1.48 cfs @ 12.53 hrs, Volume= 0.299 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (sf)	CN	Description	Land Use
51,656	58	Woods/grass comb., Good, HSG B	Woods
13,902	55	Woods, Good, HSG B	Woods
279,280	58	Meadow, non-grazed, HSG B	Meadow
344,838	58	Weighted Average	
344,838		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5	300	0.0170	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
1.2	250	0.2500	3.50		**Shallow Concentrated Flow, Shallow-con 1-SC** Short Grass Pasture Kv= 7.0 fps
42.7	550	Total			

Subcatchment 1S: Subcatch 1-SC



Summary for Subcatchment 2S: Subcatch 2-SC

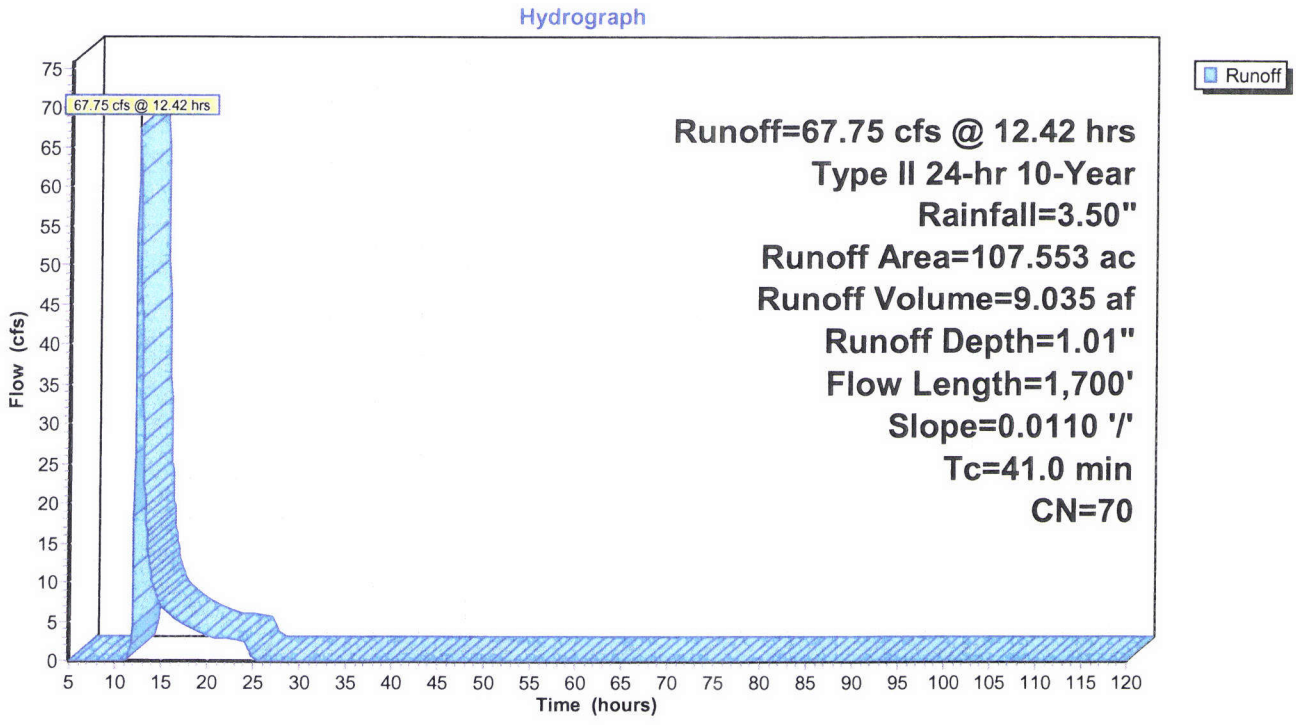
Runoff = 67.75 cfs @ 12.42 hrs, Volume= 9.035 af, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
80.653	67	Row crops, straight row, Good, HSG A	Cropland
25.877	78	Row crops, straight row, Good, HSG B	Cropland
1.023	68	1 acre lots, 20% imp, HSG B	Residential
107.553	70	Weighted Average	
107.348		99.81% Pervious Area	
0.205		0.19% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	300	0.0110	0.31		**Sheet Flow, Sheet Flow (corn Field)** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
24.7	1,400	0.0110	0.94		**Shallow Concentrated Flow, Shallow Con (corn field)** Cultivated Straight Rows Kv= 9.0 fps
41.0	1,700	Total			

Subcatchment 2S: Subcatch 2-SC



Summary for Subcatchment 3S: Subcatch 3-sc

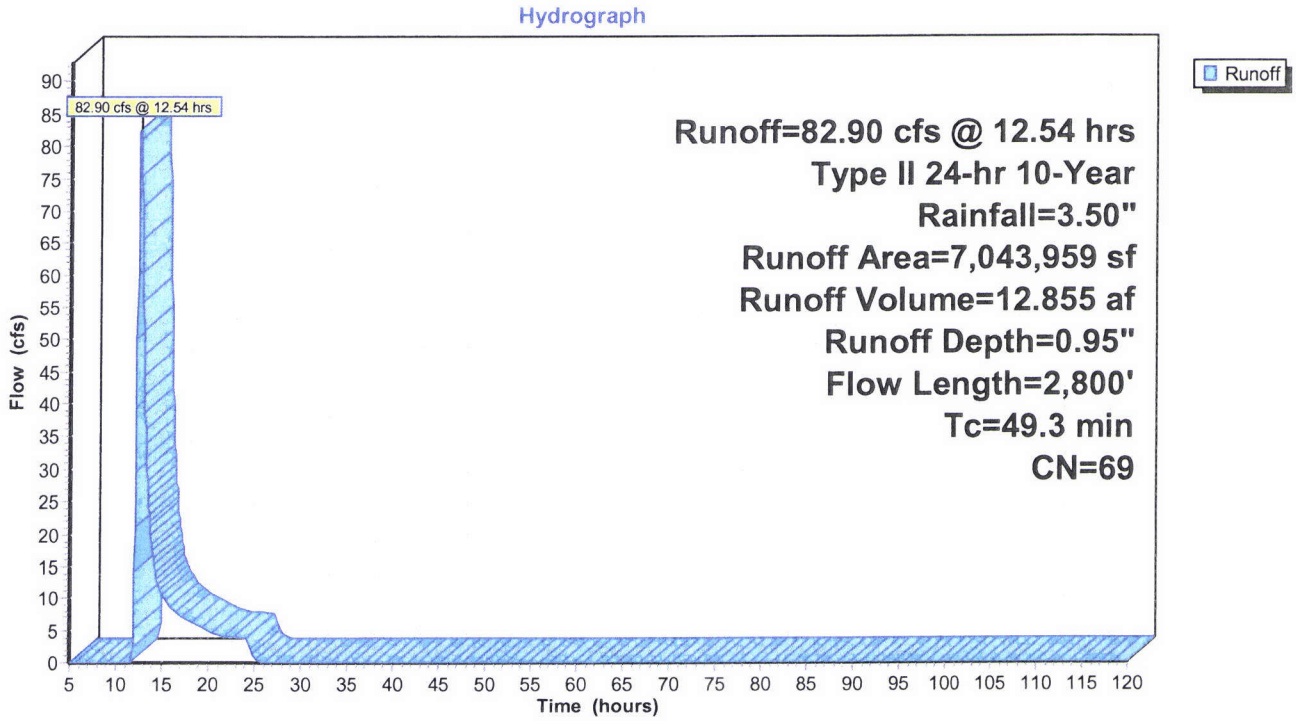
Runoff = 82.90 cfs @ 12.54 hrs, Volume= 12.855 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (sf)	CN	Description	Land Use
125,285	65	2 acre lots, 12% imp, HSG B	Residential
102,640	65	2 acre lots, 12% imp, HSG B	Residential
639,161	78	Row crops, straight row, Good, HSG B	Cropland
5,477,913	67	Row crops, straight row, Good, HSG A	Cropland
698,960	75	Row crops, SR + CR, Good, HSG B	Cropland
7,043,959	69	Weighted Average	
7,016,608		99.61% Pervious Area	
27,351		0.39% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0120	0.32		**Sheet Flow, sheet flow (corn field** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
27.8	1,500	0.0100	0.90		**Shallow Concentrated Flow, Shallow Conc. (corn field)** Cultivated Straight Rows Kv= 9.0 fps
5.8	1,000	0.0090	2.89	9.63	**Parabolic Channel, Drainage (cornfield** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.035 Earth, dense weeds
49.3	2,800	Total			

Subcatchment 3S: Subcatch 3-sc



Summary for Subcatchment 4S: Subcatch 4-SC

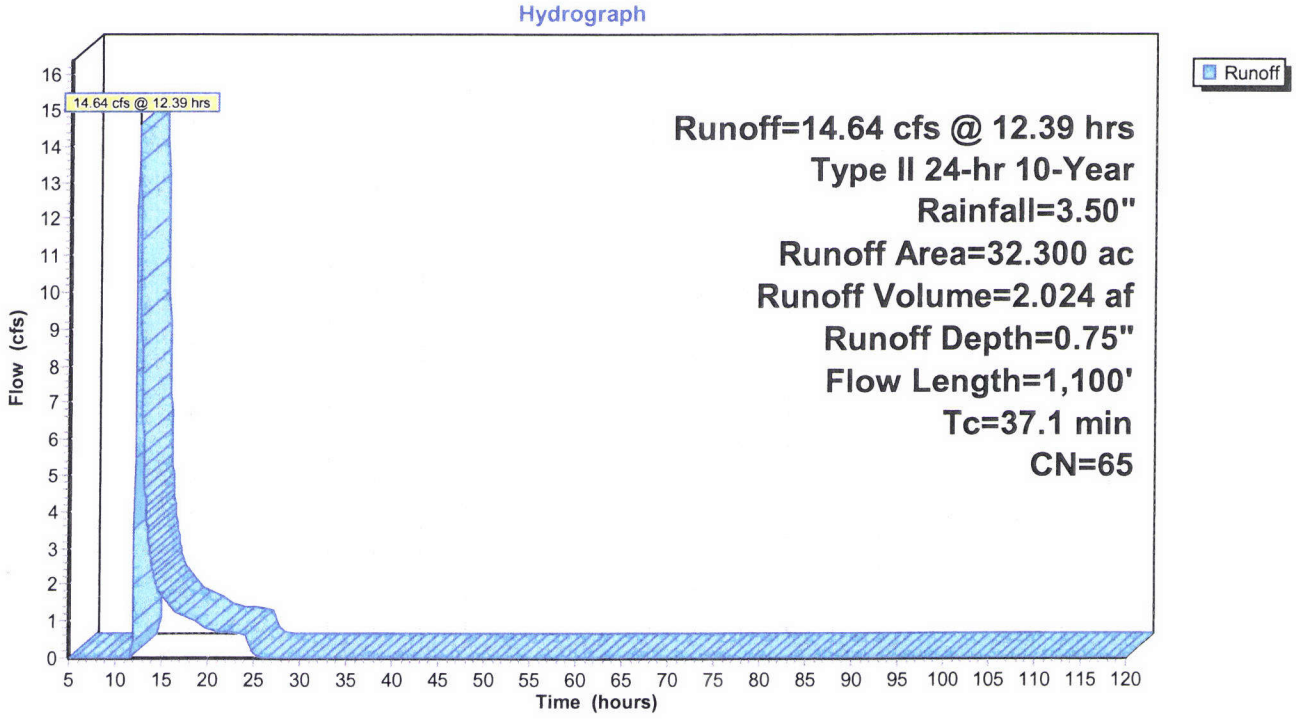
Runoff = 14.64 cfs @ 12.39 hrs, Volume= 2.024 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
24.500	67	Brush, Poor, HSG B	Brush
7.800	60	Woods, Fair, HSG B	Woods
32.300	65	Weighted Average	
32.300		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1	300	0.0350	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
6.0	800	0.0220	2.22		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
37.1	1,100	Total			

Subcatchment 4S: Subcatch 4-SC



Summary for Subcatchment 5aS: Subcatch 5A-SC

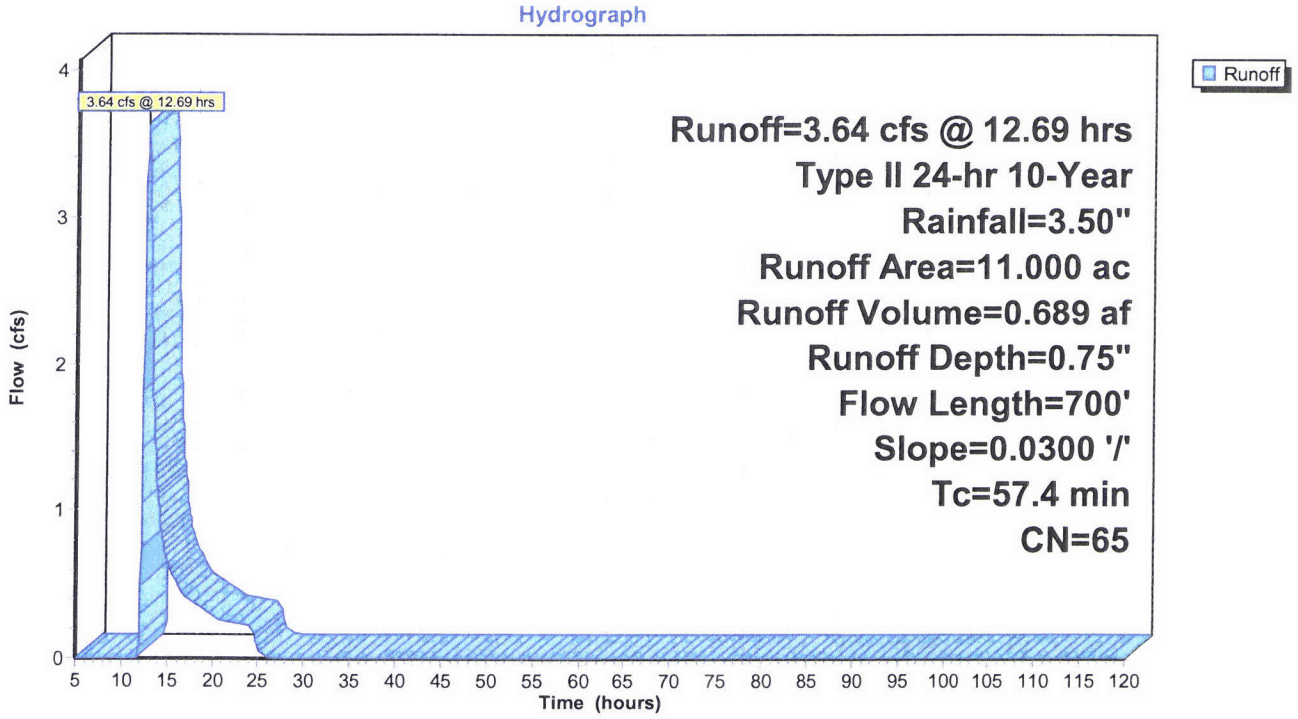
Runoff = 3.64 cfs @ 12.69 hrs, Volume= 0.689 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
6.000	58	Meadow, non-grazed, HSG B	Meadow
5.000	73	Woods/grass comb., Poor, HSG B	Woods
11.000	65	Weighted Average	
11.000		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow, Shallow Concetrated** Woodland Kv= 5.0 fps
57.4	700	Total			

Subcatchment 5aS: Subcatch 5A-SC



Summary for Subcatchment 5bS: Subcatch 5B-SC

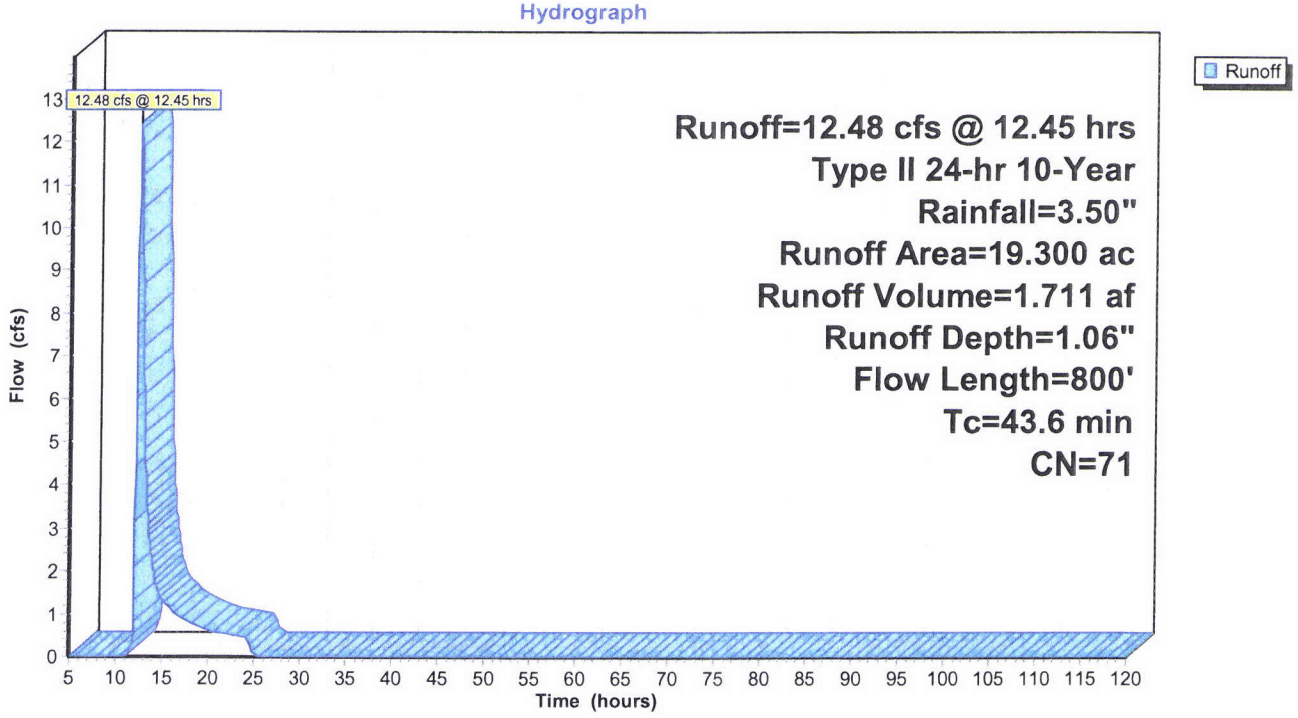
Runoff = 12.48 cfs @ 12.45 hrs, Volume= 1.711 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
6.100	56	Brush, Fair, HSG B	Brush
4.200	67	Brush, Poor, HSG B	Brush
5.000	70	Brush, Fair, HSG C	Brush
4.000	98	Water Surface, HSG B	Open Water
19.300	71	Weighted Average	
15.300		79.27% Pervious Area	
4.000		20.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.6	300	0.0500	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	500	0.0350	2.81		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
43.6	800	Total			

Subcatchment 5bS: Subcatch 5B-SC



Summary for Subcatchment 5S: Subcatch 6B-SC

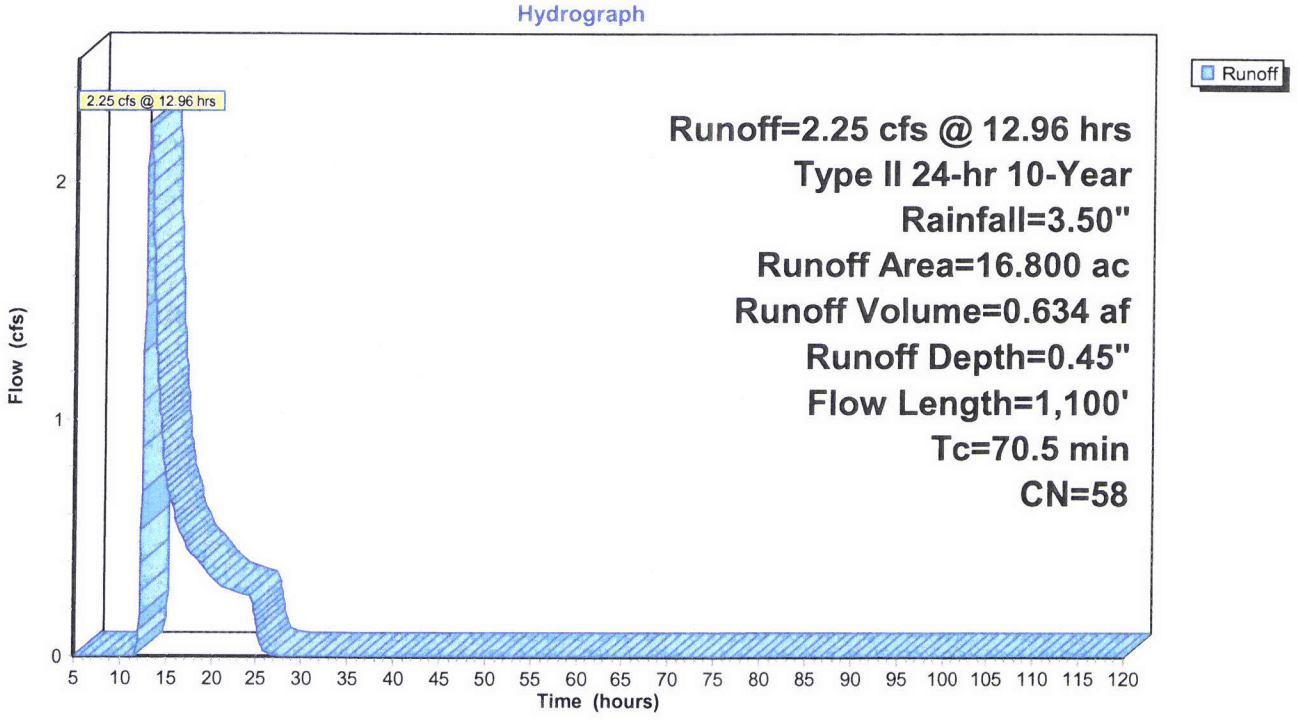
Runoff = 2.25 cfs @ 12.96 hrs, Volume= 0.634 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
14.000	58	Meadow, non-grazed, HSG B	Meadow
2.800	60	Woods, Fair, HSG B	Woods
16.800	58	Weighted Average	
16.800		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.5	300	0.0200	0.09		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
12.0	800	0.0250	1.11		**Shallow Concentrated Flow, Shallow Concentrated** Short Grass Pasture Kv= 7.0 fps
70.5	1,100	Total			

Subcatchment 5S: Subcatch 6B-SC



Summary for Subcatchment 6aS: Subcatch 6A-SC

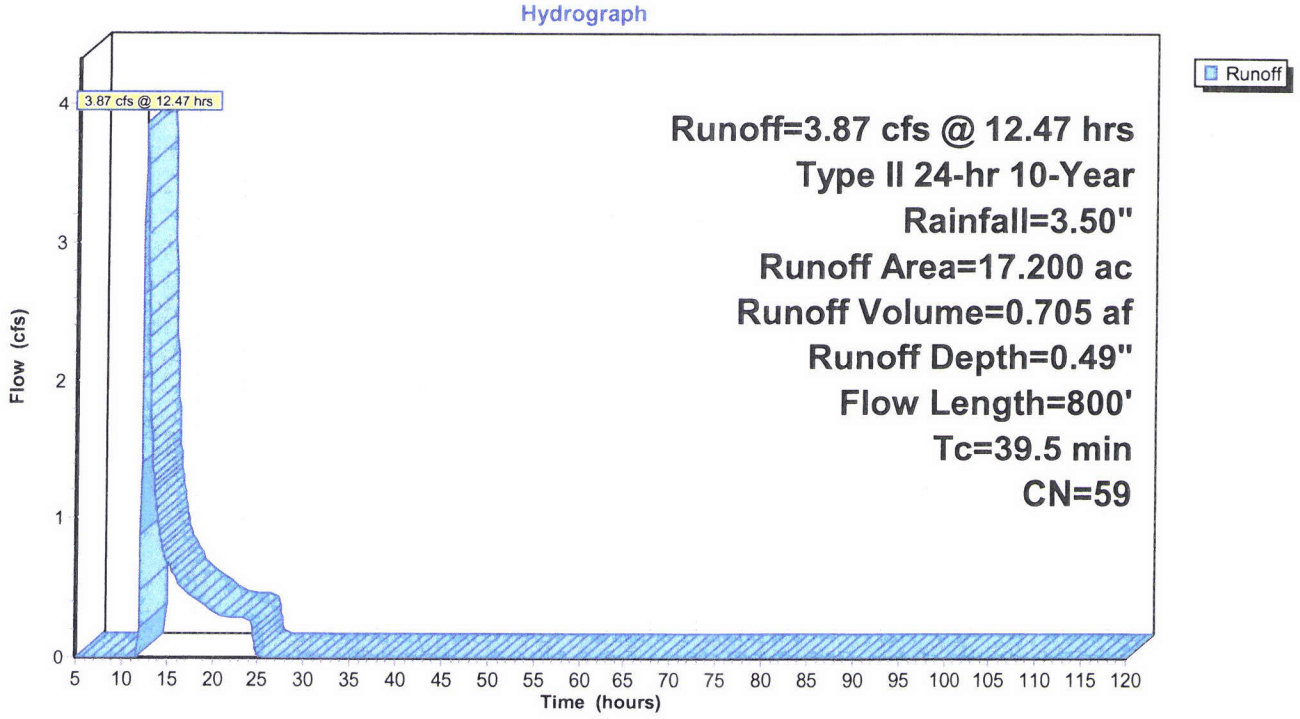
Runoff = 3.87 cfs @ 12.47 hrs, Volume= 0.705 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.50"

Area (ac)	CN	Description	Land Use
15.000	58	Meadow, non-grazed, HSG B	Meadow
2.200	65	Woods/grass comb., Fair, HSG B	Woods
17.200	59	Weighted Average	
17.200		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.1	300	0.0300	0.15		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 2.50"
6.4	500	0.0350	1.31		**Shallow Concentrated Flow, shallow concentrated** Short Grass Pasture Kv= 7.0 fps
39.5	800	Total			

Subcatchment 6aS: Subcatch 6A-SC



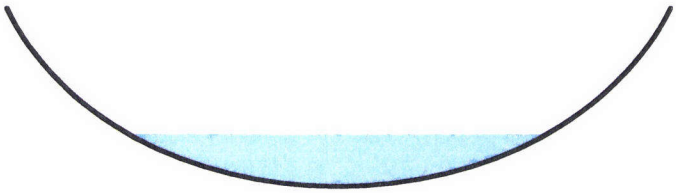
Summary for Reach 1R: Shallow Swale

Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.45" for 10-Year event
Inflow = 1.48 cfs @ 12.53 hrs, Volume= 0.299 af
Outflow = 1.21 cfs @ 13.06 hrs, Volume= 0.299 af, Atten= 18%, Lag= 31.9 min

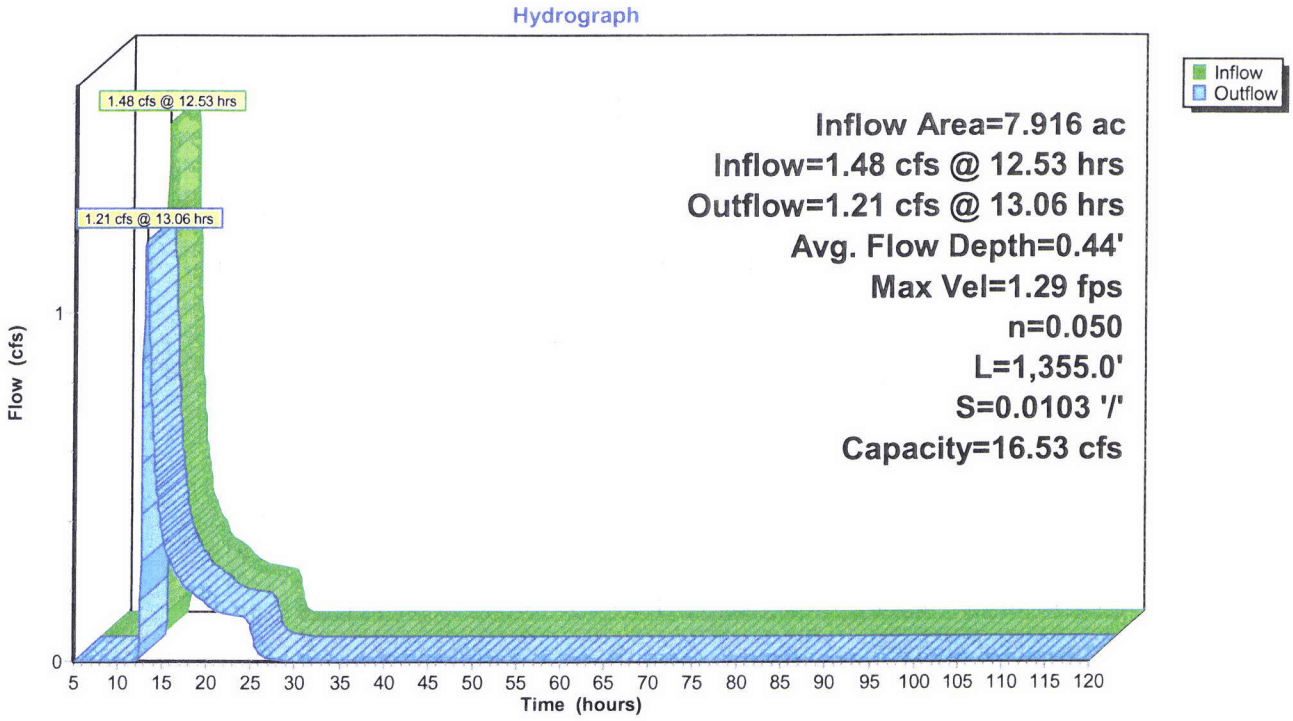
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.29 fps, Min. Travel Time= 17.6 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 50.3 min

Peak Storage= 1,274 cf @ 12.76 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 16.53 cfs

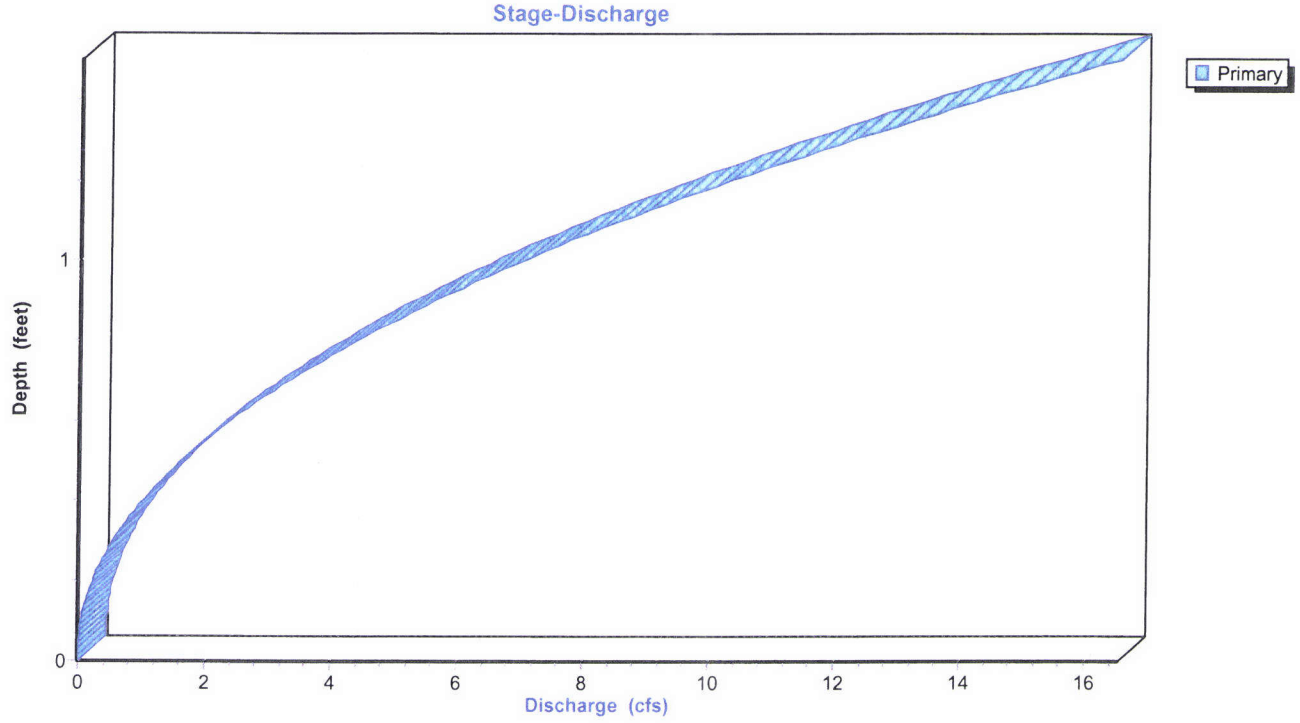
6.00' x 1.50' deep Parabolic Channel, n= 0.050 Sluggish weedy reaches w/pools
Length= 1,355.0' Slope= 0.0103 '/'
Inlet Invert= 646.00', Outlet Invert= 632.00'



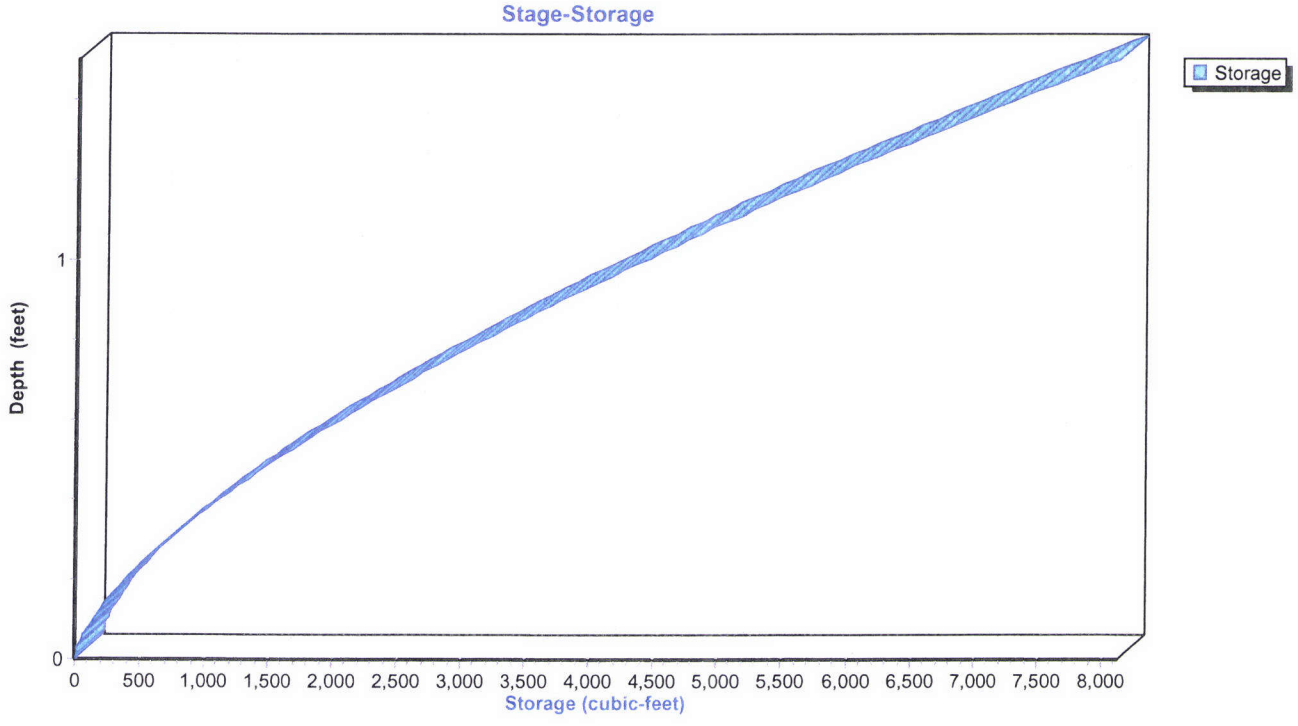
Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



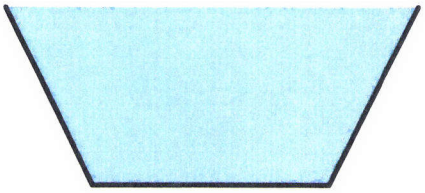
Summary for Reach 2R: Drainage Ditch (North side runway)

Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.97" for 10-Year event
Inflow = 67.78 cfs @ 12.42 hrs, Volume= 9.334 af
Outflow = 48.90 cfs @ 13.07 hrs, Volume= 9.334 af, Atten= 28%, Lag= 38.7 min

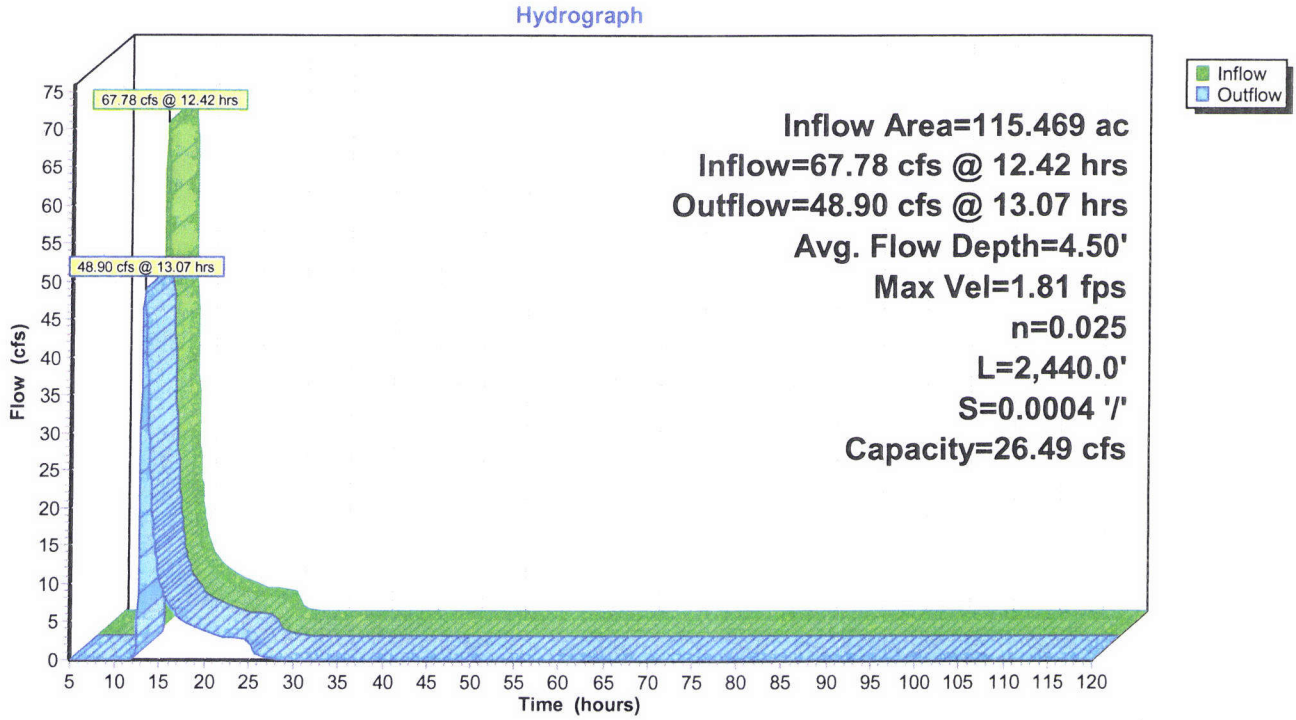
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.81 fps, Min. Travel Time= 22.4 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 123.6 min

Peak Storage= 65,852 cf @ 12.69 hrs
Average Depth at Peak Storage= 4.50'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 26.49 cfs

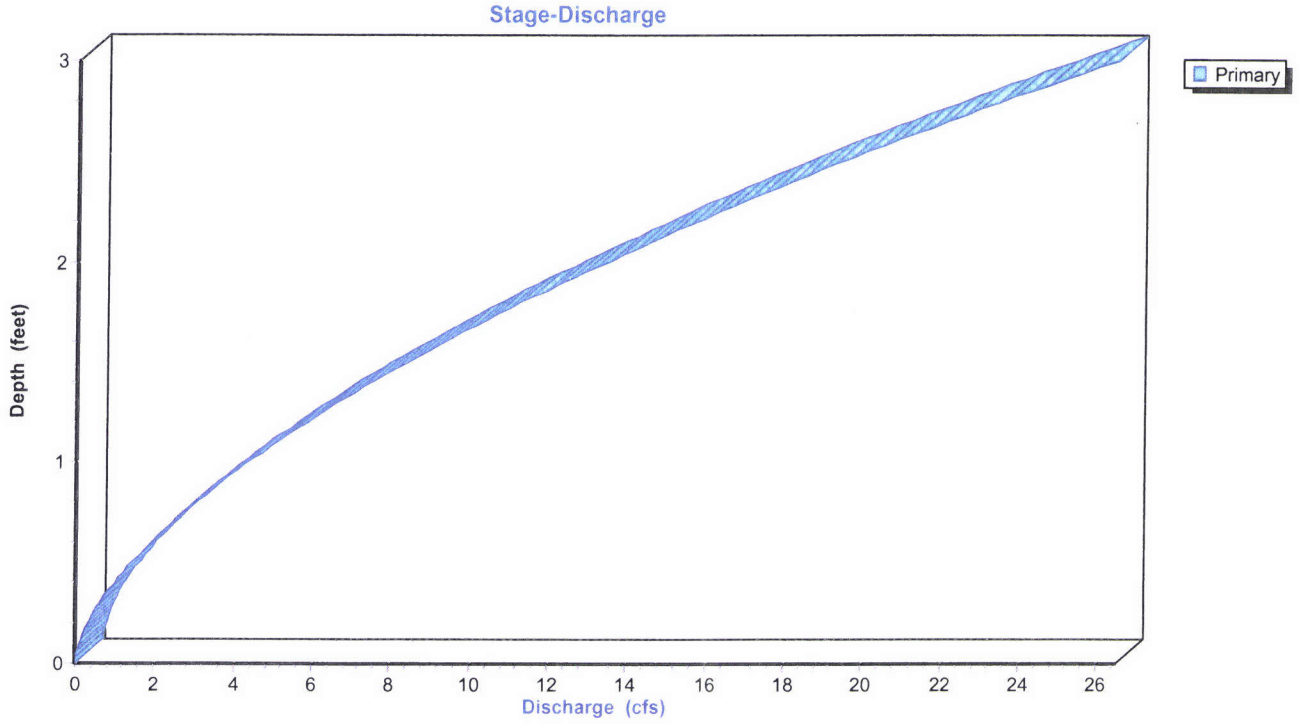
4.00' x 3.00' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 0.5 '/' Top Width= 7.00'
Length= 2,440.0' Slope= 0.0004 '/'
Inlet Invert= 632.00', Outlet Invert= 631.00'



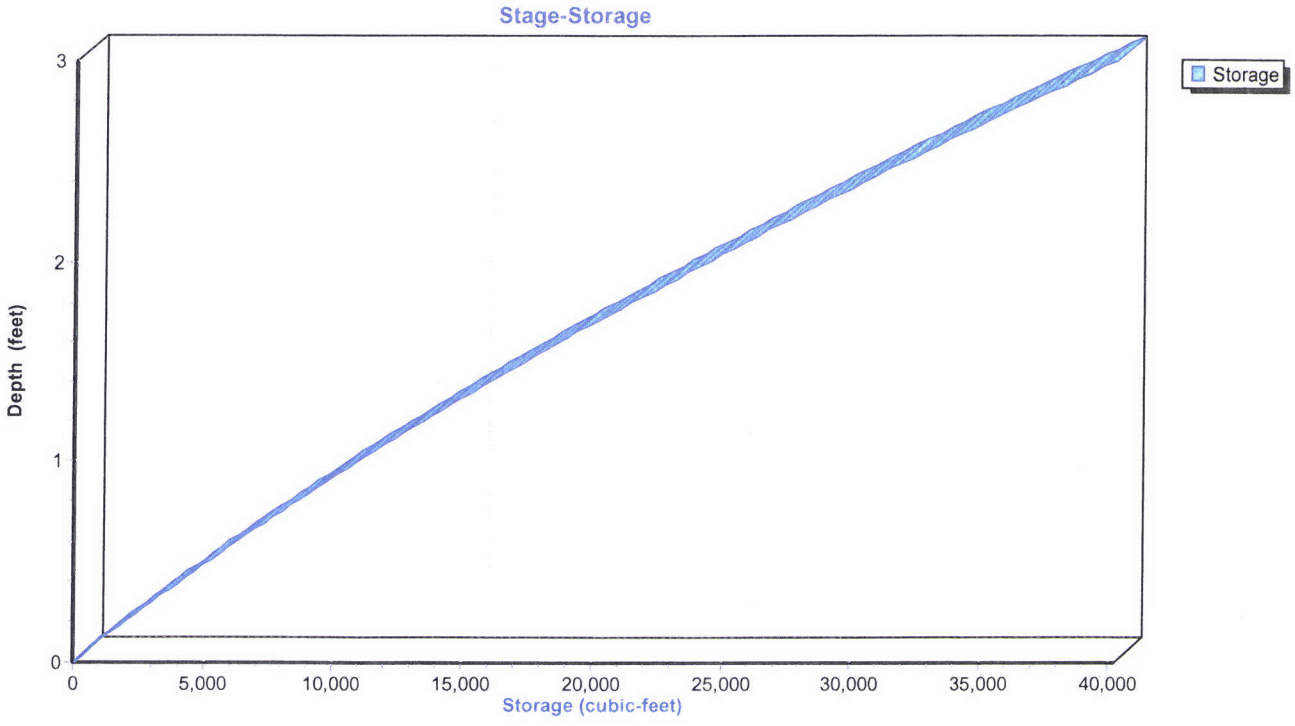
Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



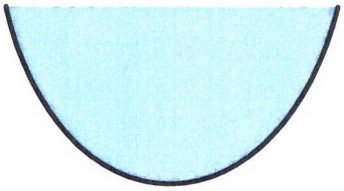
Summary for Reach 3R: Drainage Ditch (upper section)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.96" for 10-Year event
Inflow = 101.42 cfs @ 12.79 hrs, Volume= 22.189 af
Outflow = 99.69 cfs @ 13.01 hrs, Volume= 22.189 af, Atten= 2%, Lag= 13.4 min

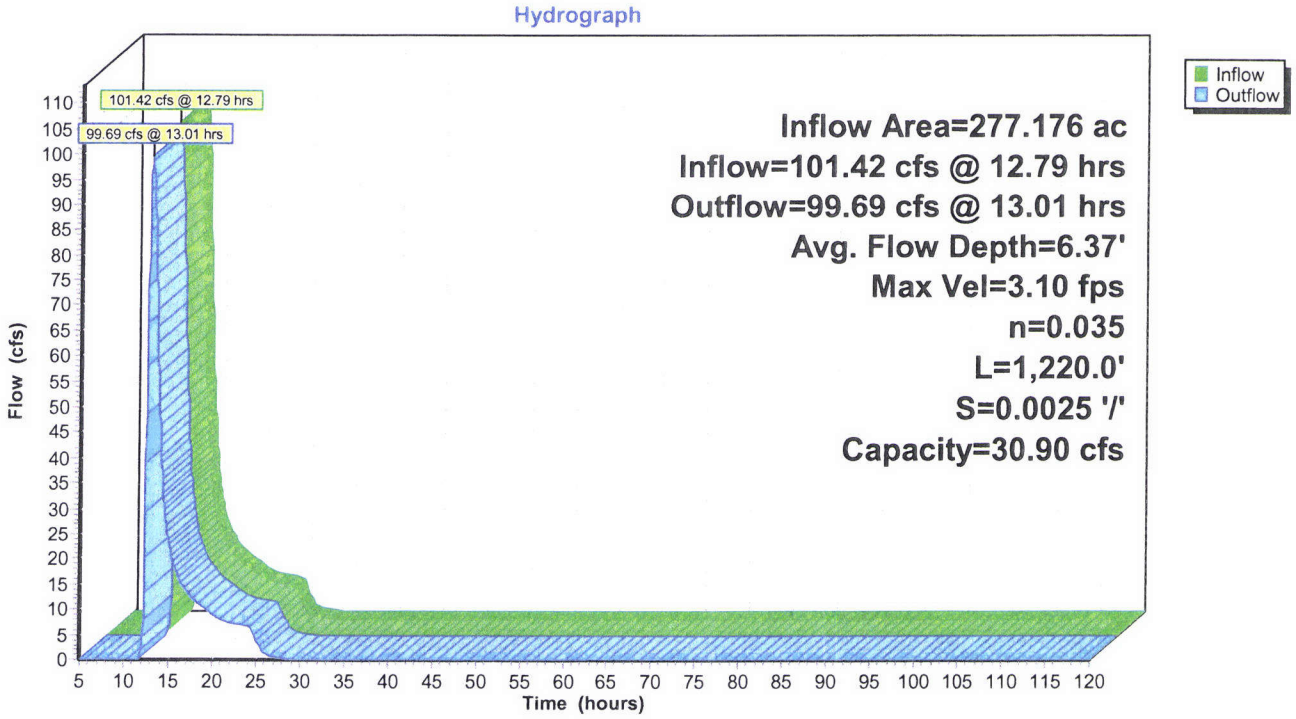
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.10 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 32.7 min

Peak Storage= 39,212 cf @ 12.90 hrs
Average Depth at Peak Storage= 6.37'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 30.90 cfs

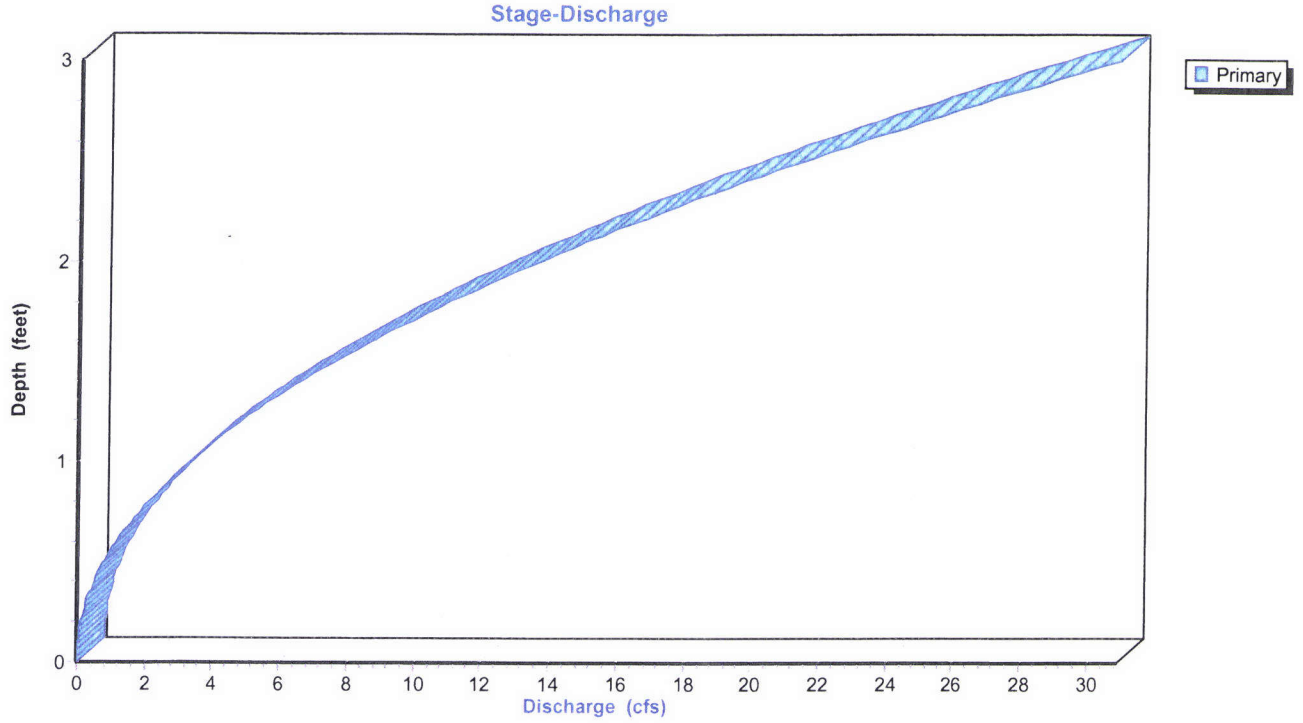
6.00' x 3.00' deep Parabolic Channel, n= 0.035 High grass
Length= 1,220.0' Slope= 0.0025 '/'
Inlet Invert= 631.00', Outlet Invert= 628.00'



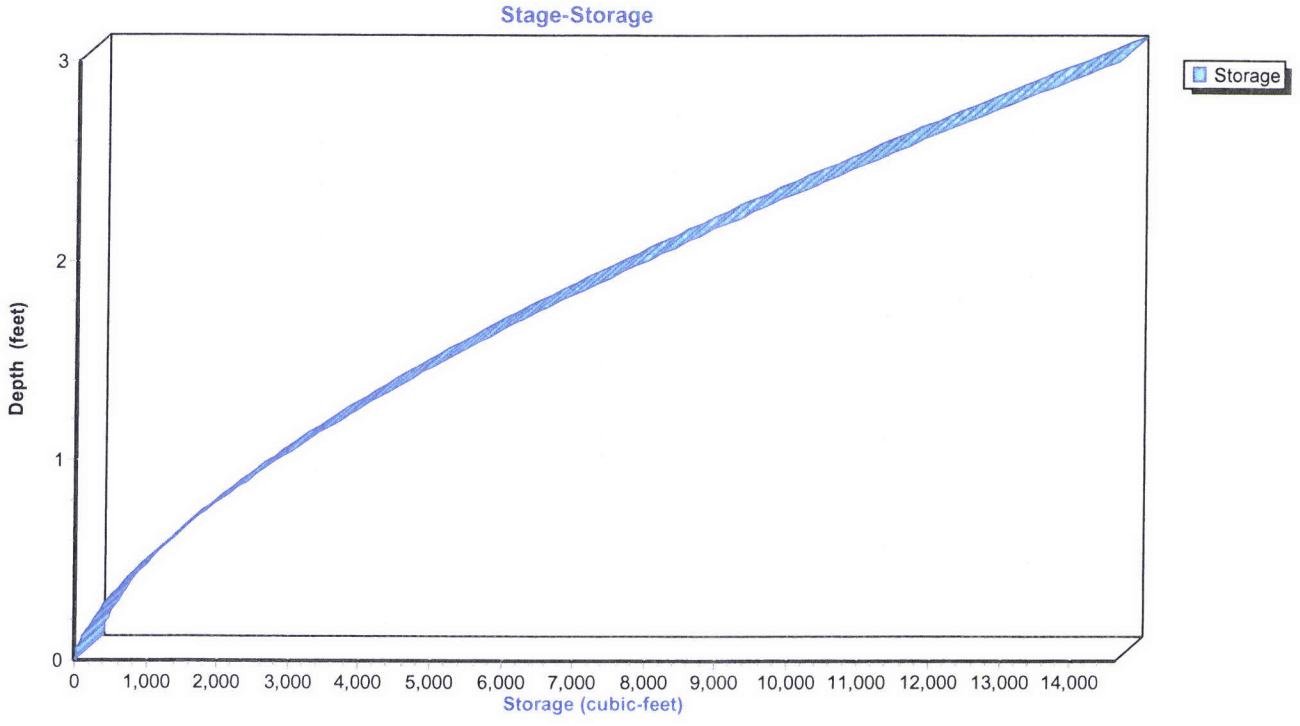
Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



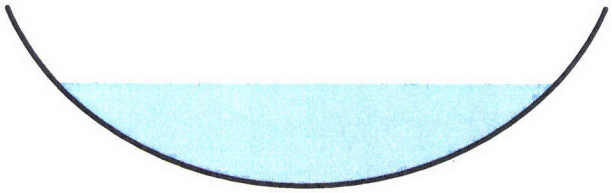
Summary for Reach 4R: Drainage Ditch (Main)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.96" for 10-Year event
Inflow = 99.69 cfs @ 13.01 hrs, Volume= 22.189 af
Outflow = 96.22 cfs @ 13.38 hrs, Volume= 22.189 af, Atten= 3%, Lag= 22.1 min

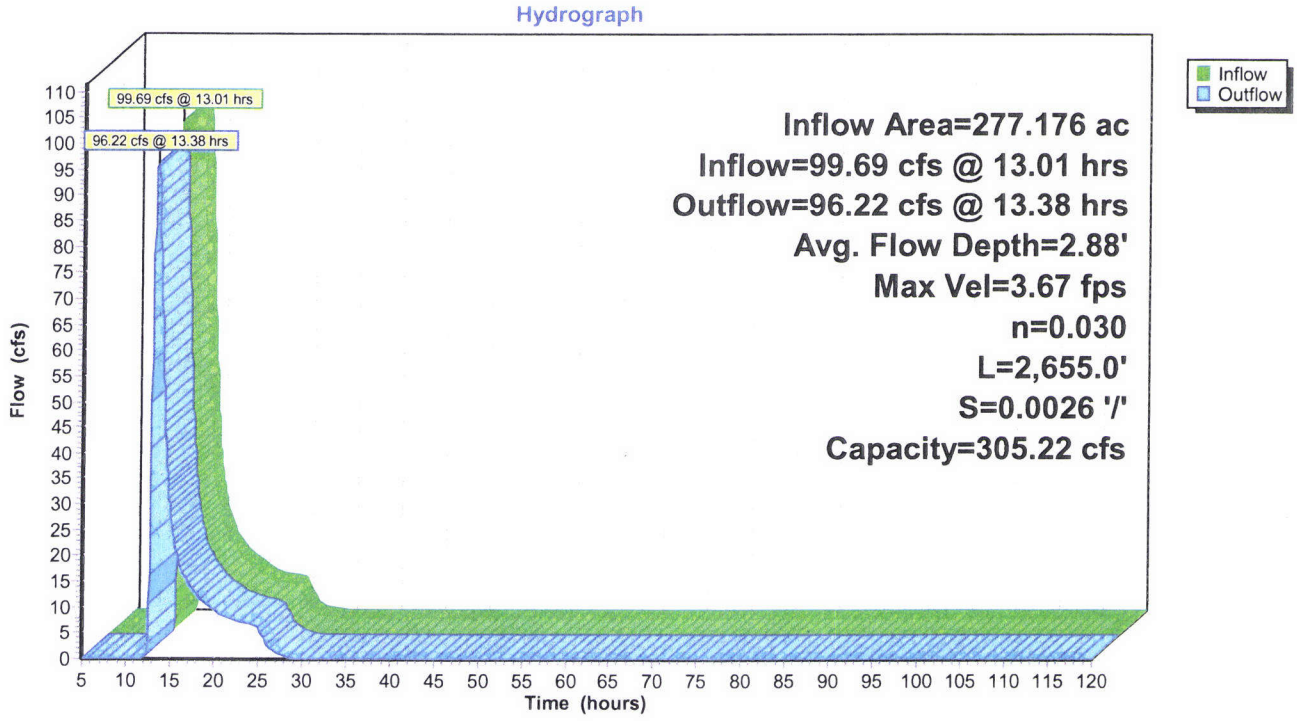
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 12.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 64.2 min

Peak Storage= 69,637 cf @ 13.18 hrs
Average Depth at Peak Storage= 2.88'
Bank-Full Depth= 5.00', Capacity at Bank-Full= 305.22 cfs

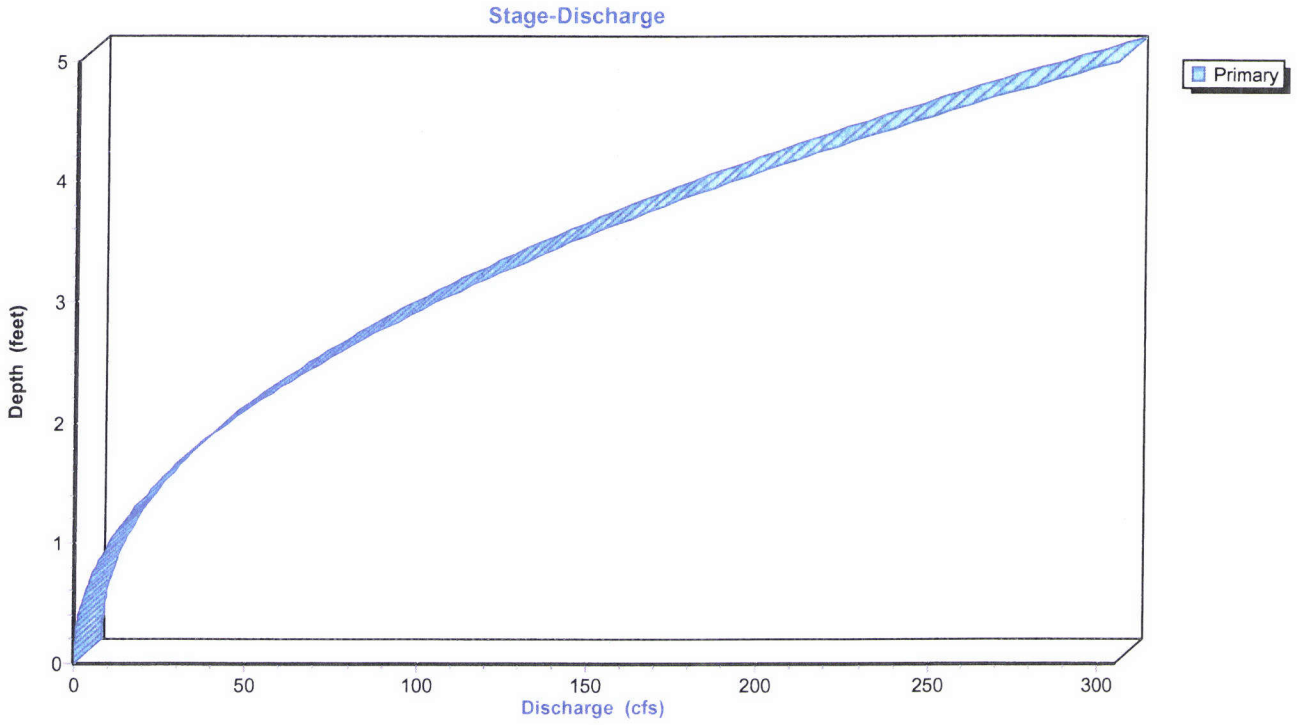
18.00' x 5.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 2,655.0' Slope= 0.0026 '/'
Inlet Invert= 628.00', Outlet Invert= 621.00'



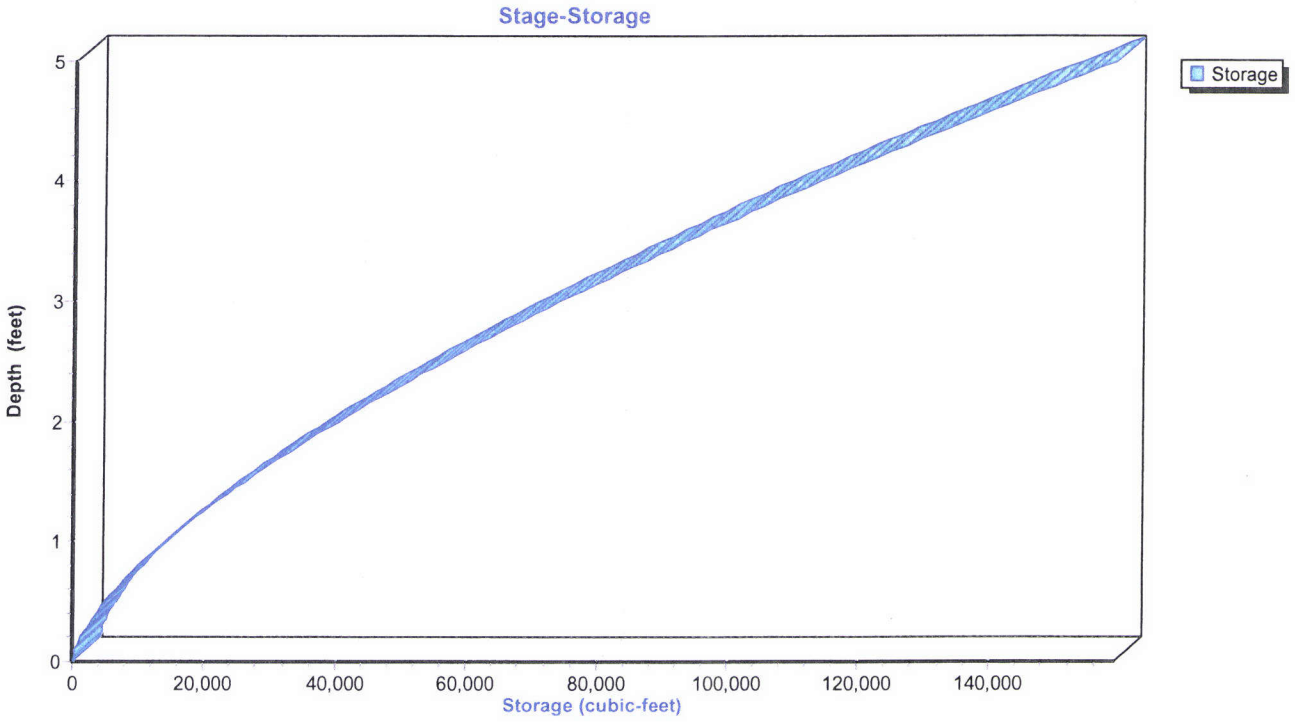
Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



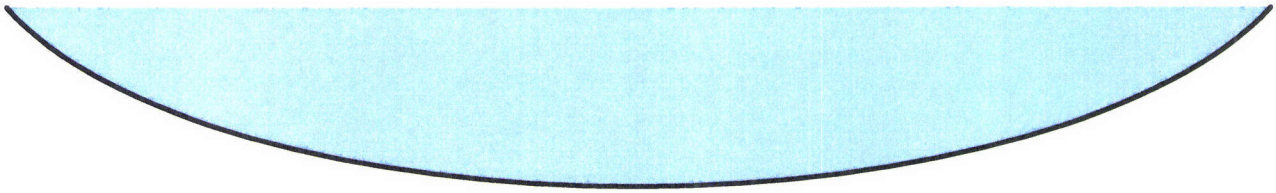
Summary for Reach 5R: Ditch & Swamp

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.93" for 10-Year event
Inflow = 94.10 cfs @ 13.90 hrs, Volume= 23.869 af
Outflow = 52.06 cfs @ 14.70 hrs, Volume= 23.864 af, Atten= 45%, Lag= 47.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.48 fps, Min. Travel Time= 24.4 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 97.3 min

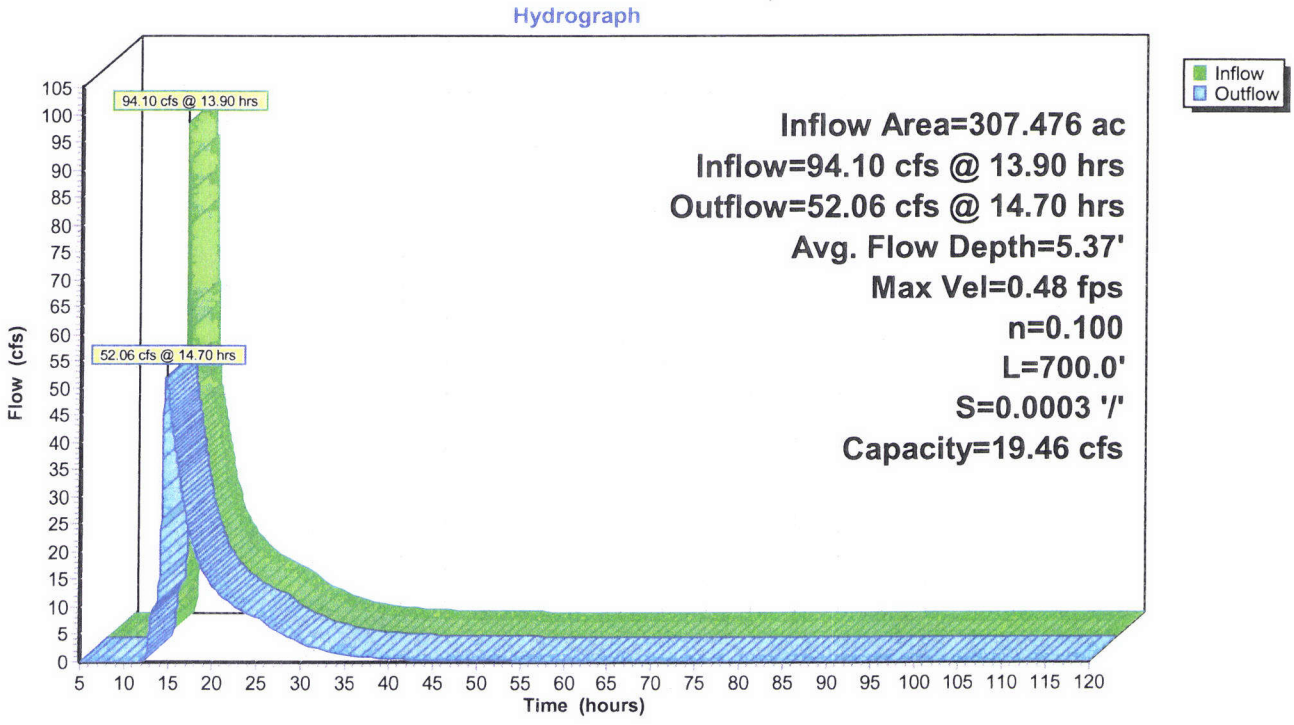
Peak Storage= 76,392 cf @ 14.27 hrs
Average Depth at Peak Storage= 5.37'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 19.46 cfs

25.00' x 3.00' deep Parabolic Channel, n= 0.100 Very weedy reaches w/pools
Length= 700.0' Slope= 0.0003 '/'
Inlet Invert= 620.20', Outlet Invert= 620.00'

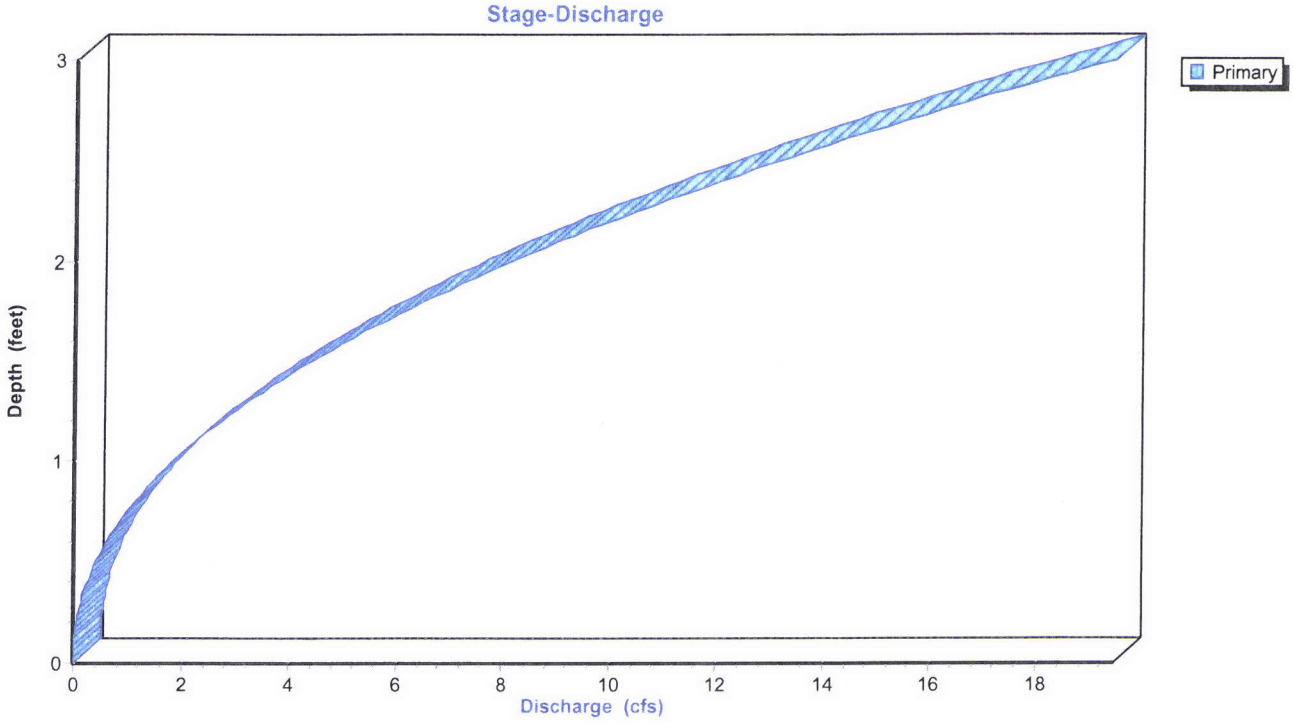


‡

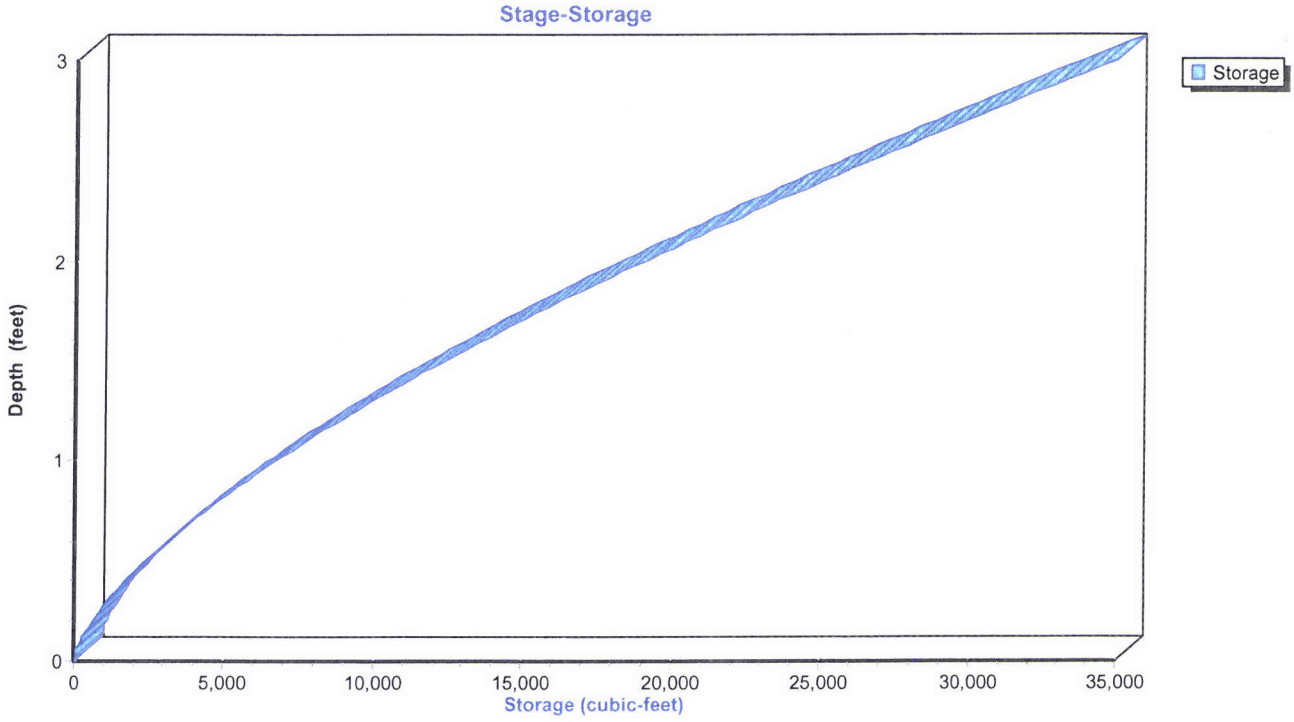
Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



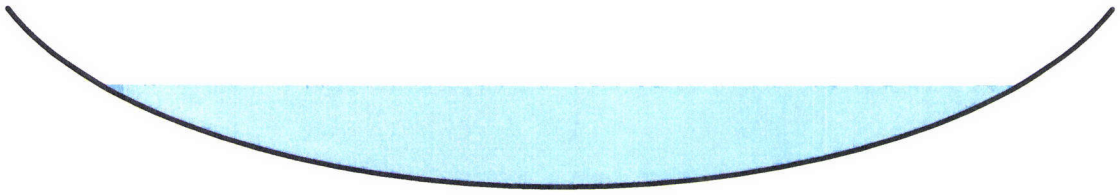
Summary for Reach 6R: School House Marsh (feeder ditch)

Inflow Area = 339.776 ac, 1.42% Impervious, Inflow Depth > 0.37" for 10-Year event
Inflow = 14.64 cfs @ 12.39 hrs, Volume= 10.556 af
Outflow = 13.28 cfs @ 12.67 hrs, Volume= 10.551 af, Atten= 9%, Lag= 16.7 min

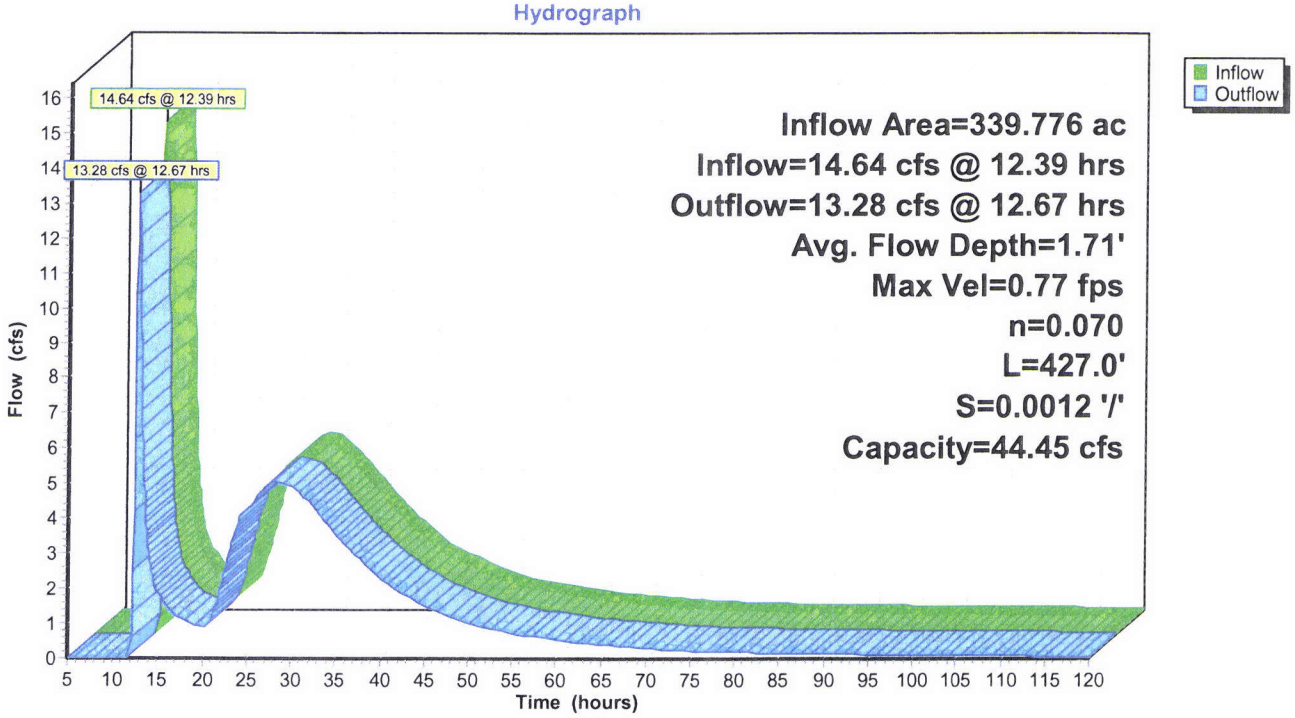
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.77 fps, Min. Travel Time= 9.2 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 23.2 min

Peak Storage= 7,329 cf @ 12.52 hrs
Average Depth at Peak Storage= 1.71'
Defined Flood Depth= 622.00', Capacity at Flood Depth= 19,490.63 cfs
Bank-Full Depth= 3.00', Capacity at Bank-Full= 44.45 cfs

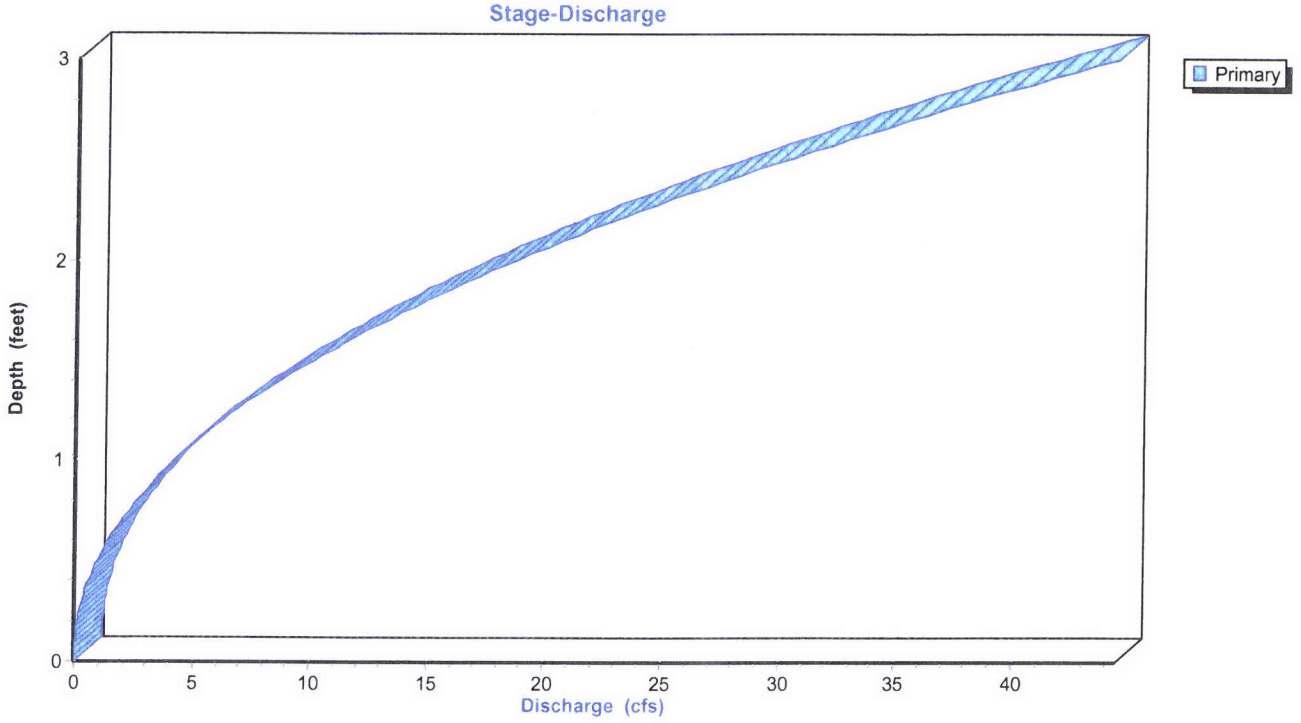
20.00' x 3.00' deep Parabolic Channel, n= 0.070 Sluggish weedy reaches w/pools
Length= 427.0' Slope= 0.0012 '/'
Inlet Invert= 618.50', Outlet Invert= 618.00'



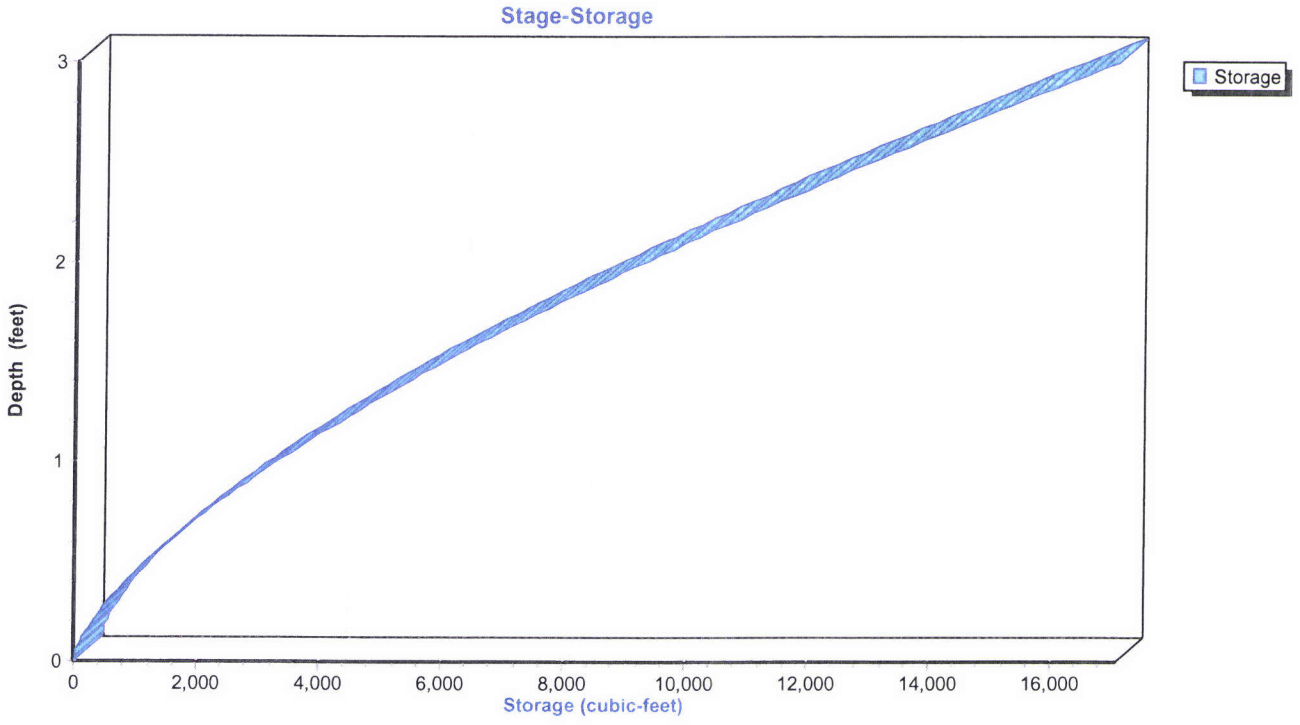
Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Summary for Reach 7R: (new Reach)

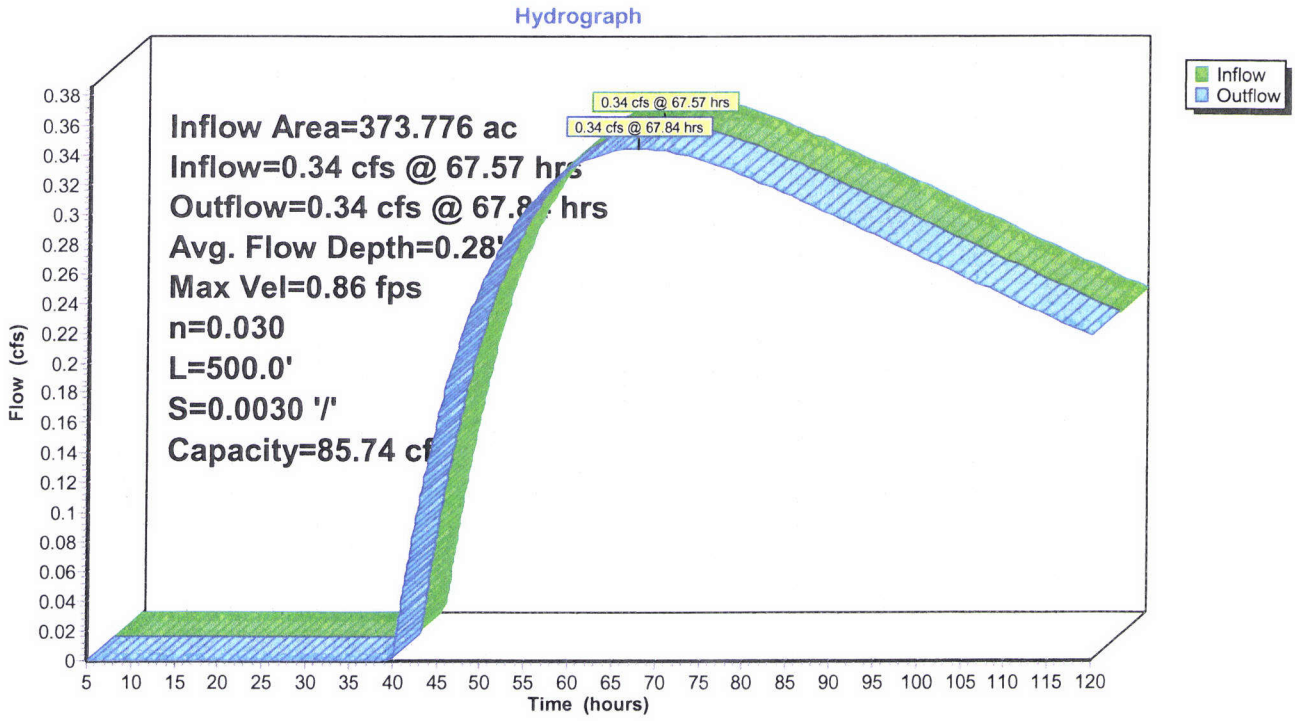
Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.06" for 10-Year event
Inflow = 0.34 cfs @ 67.57 hrs, Volume= 1.839 af
Outflow = 0.34 cfs @ 67.84 hrs, Volume= 1.832 af, Atten= 0%, Lag= 16.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.86 fps, Min. Travel Time= 9.6 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 10.4 min

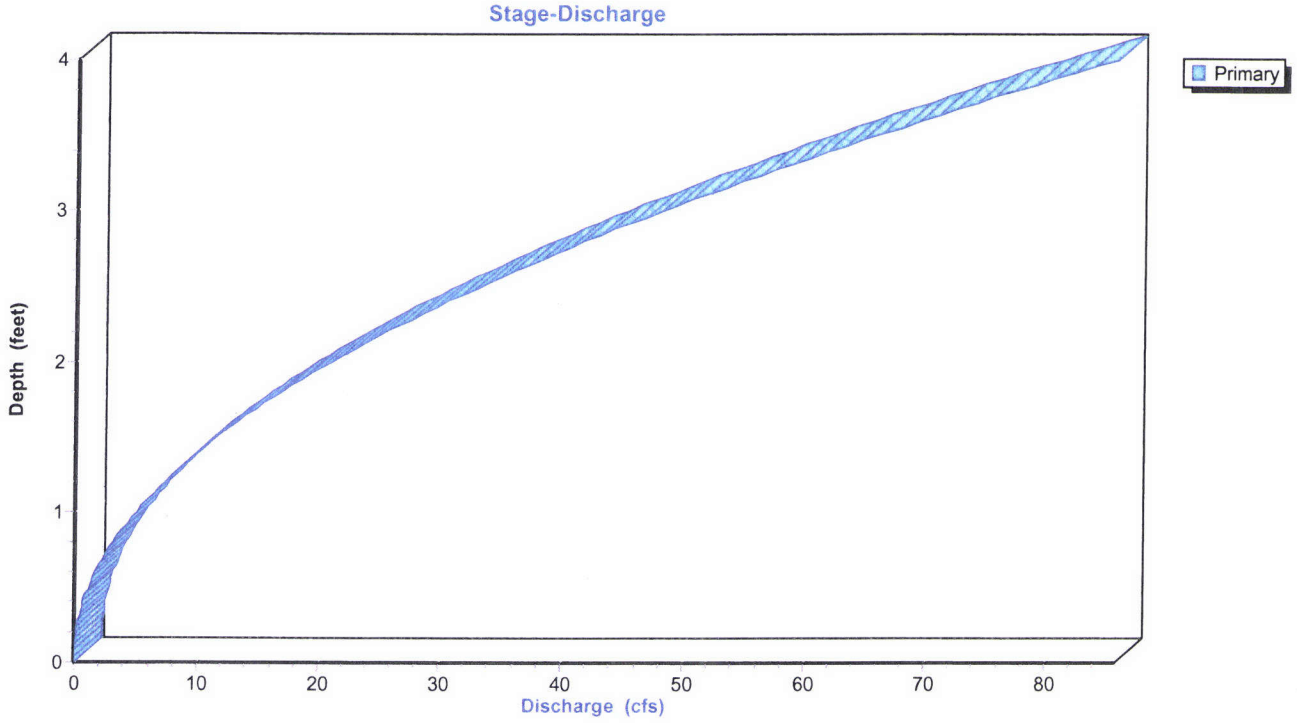
Peak Storage= 199 cf @ 67.68 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 85.74 cfs

8.00' x 4.00' deep Parabolic Channel, n= 0.030 Short grass
Length= 500.0' Slope= 0.0030 '/'
Inlet Invert= 613.50', Outlet Invert= 612.00'

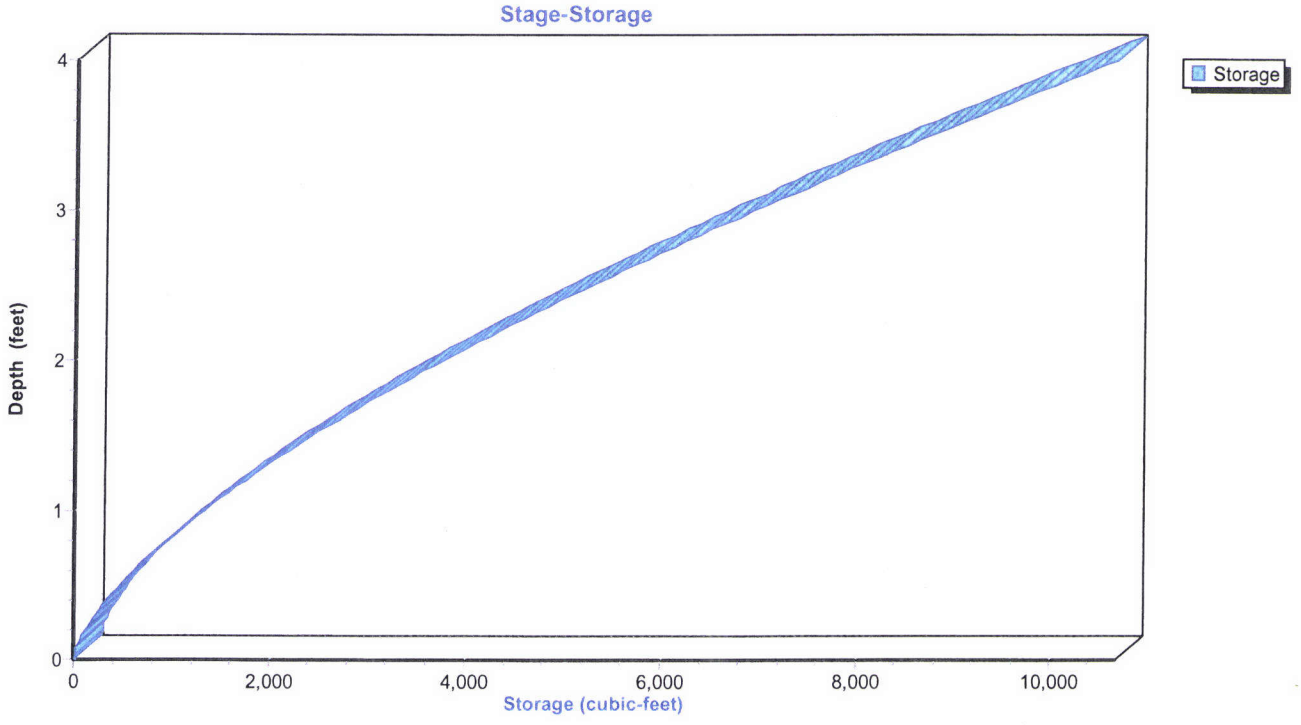
Reach 7R: (new Reach)



Reach 7R: (new Reach)



Reach 7R: (new Reach)



Summary for Pond 1C: Culvert 1 Fletcher Chapel

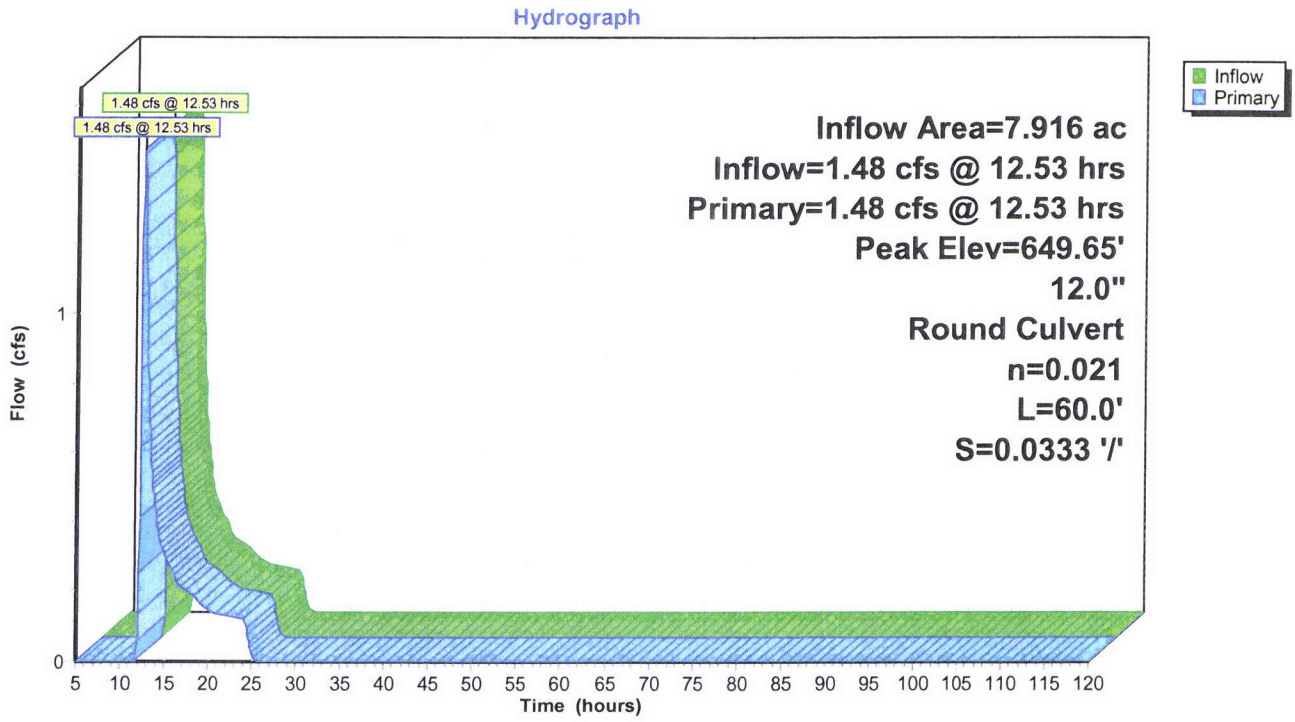
Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.45" for 10-Year event
Inflow = 1.48 cfs @ 12.53 hrs, Volume= 0.299 af
Outflow = 1.48 cfs @ 12.53 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min
Primary = 1.48 cfs @ 12.53 hrs, Volume= 0.299 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 649.65' @ 12.53 hrs

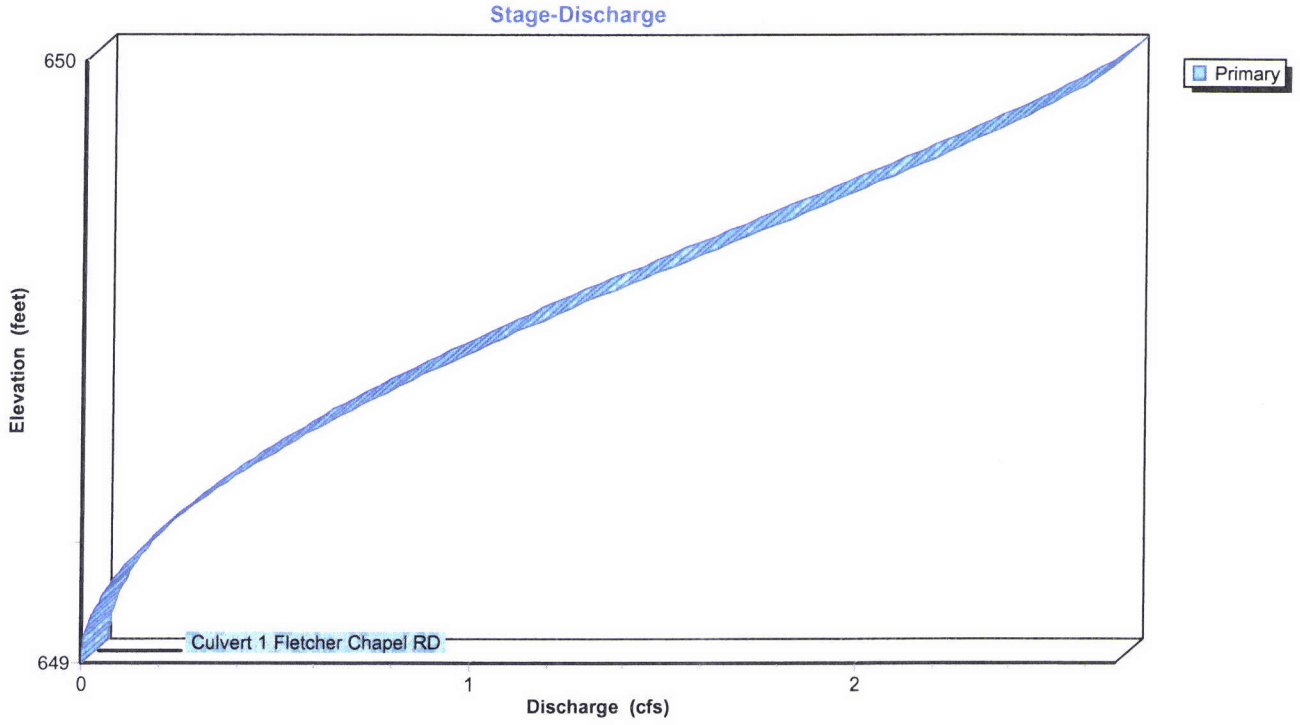
Device	Routing	Invert	Outlet Devices
#1	Primary	649.00'	**12.0" Round Culvert 1 Fletcher Chapel RD** L= 60.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 649.00' / 647.00' S= 0.0333 '/' Cc= 0.900 n= 0.021 Corrugated metal

Primary OutFlow Max=1.47 cfs @ 12.53 hrs HW=649.65' (Free Discharge)
1=Culvert 1 Fletcher Chapel RD (Inlet Controls 1.47 cfs @ 2.74 fps)

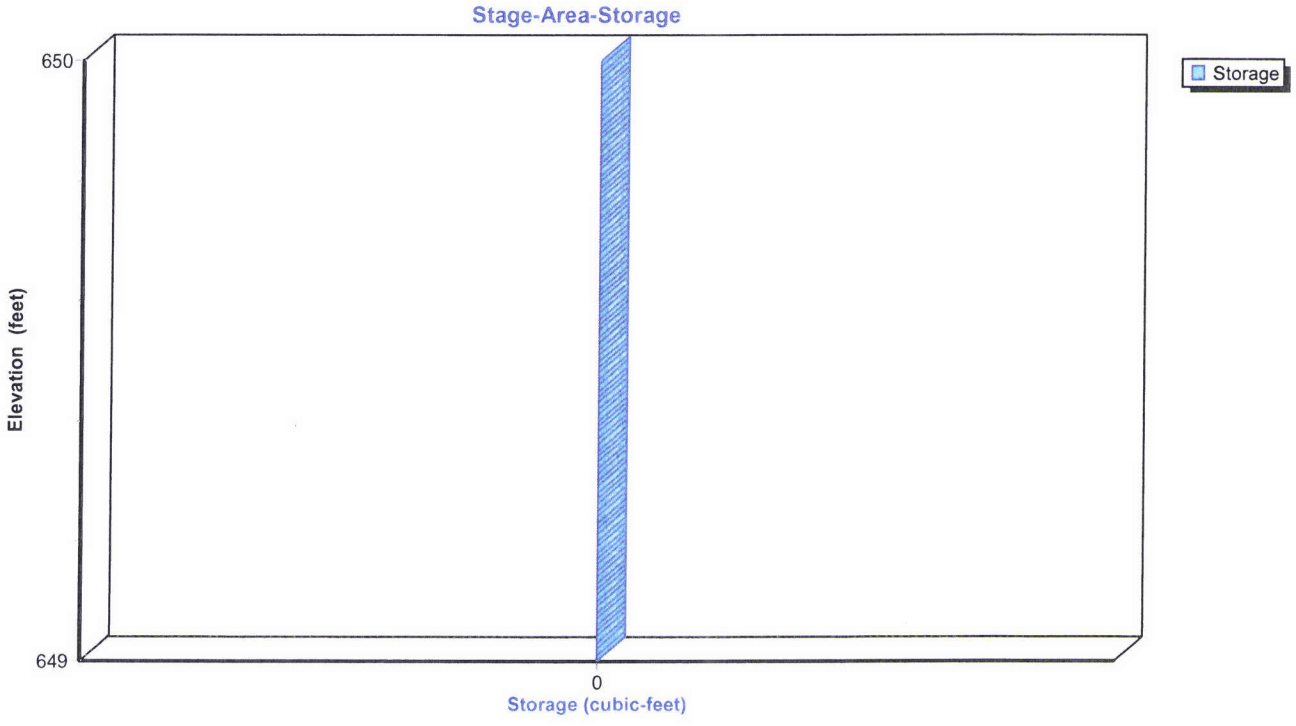
Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.38" for 10-Year event
Inflow = 18.38 cfs @ 12.66 hrs, Volume= 11.890 af
Outflow = 0.34 cfs @ 67.57 hrs, Volume= 1.839 af, Atten= 98%, Lag= 3,294.7 min
Primary = 0.34 cfs @ 67.57 hrs, Volume= 1.839 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.59' @ 67.57 hrs Surf.Area= 808,005 sf Storage= 2,838,452 cf (464,696 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 2,844.7 min (4,817.4 - 1,972.6)

Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

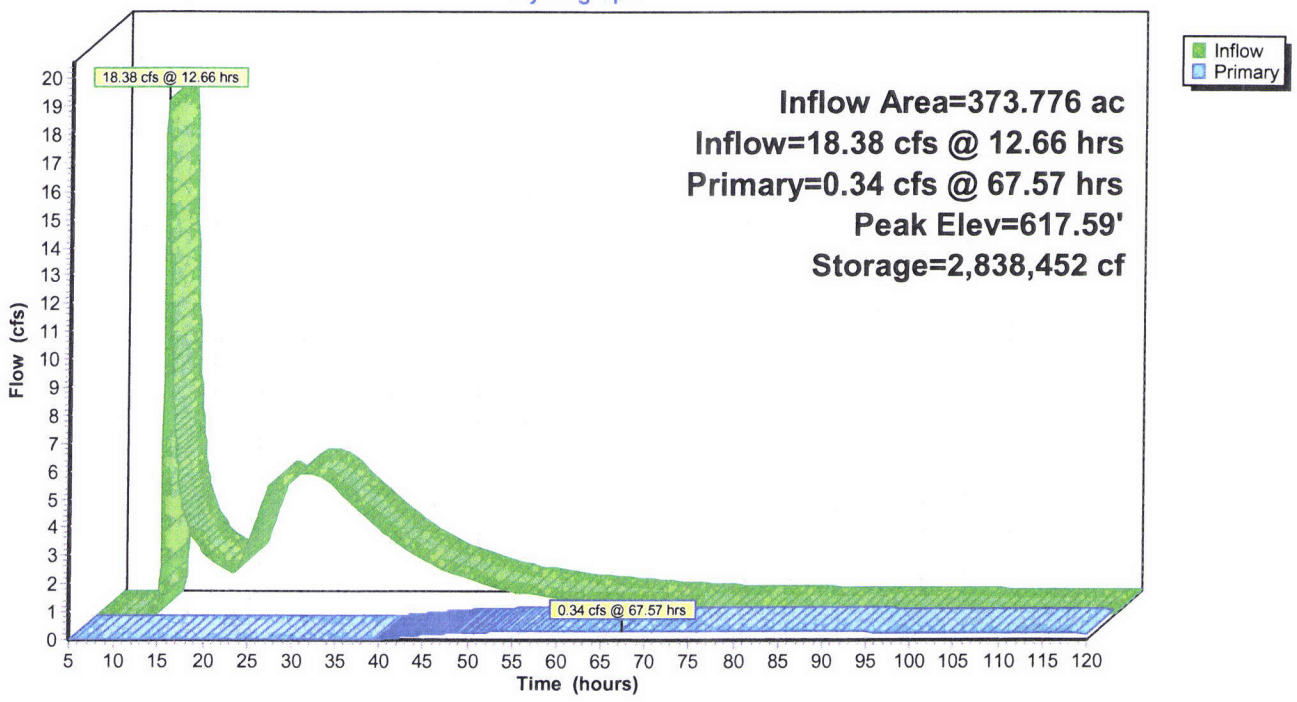
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.33 cfs @ 67.57 hrs HW=617.59' (Free Discharge)
└1=**Culvert** (Passes 0.33 cfs of 16.88 cfs potential flow)
  ├2=**Sharp-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.98 fps)
  └3=**Orifice/Grate** (Controls 0.00 cfs)

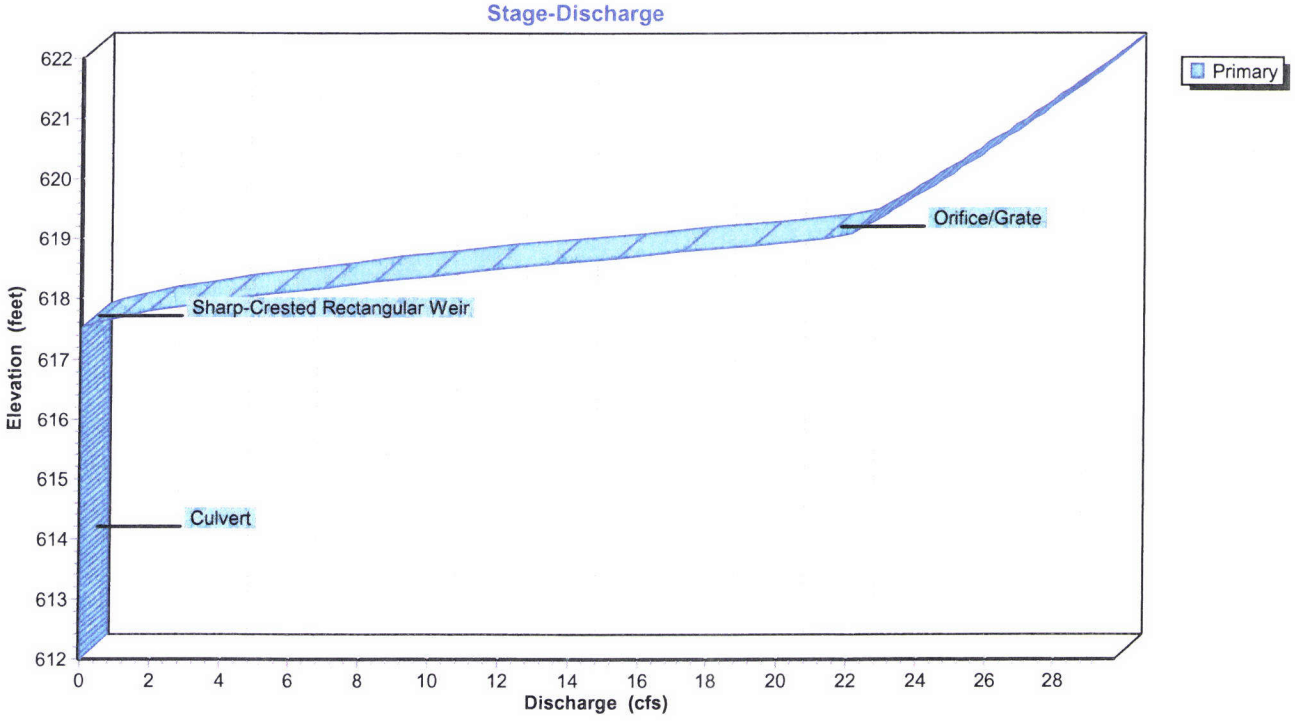
Pond 1P: Schoolhouse Marsh Pond

Hydrograph

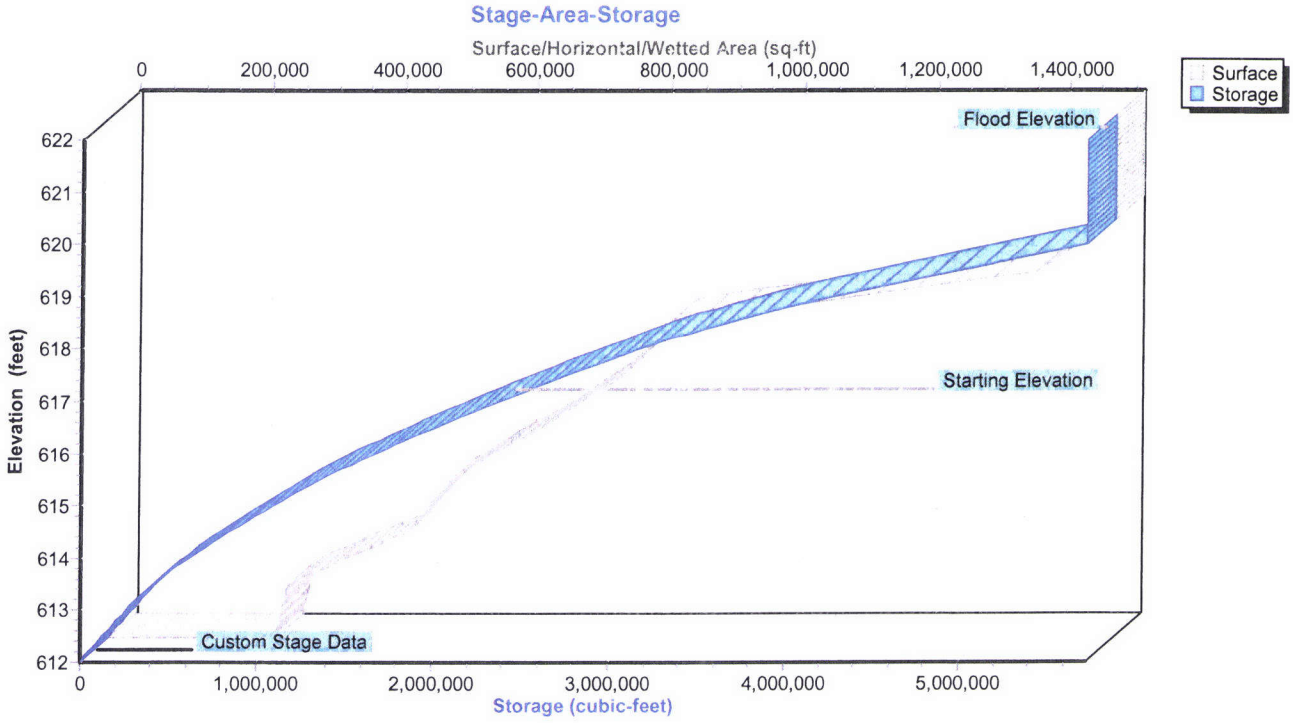


Pond 1P: Schoolhouse Marsh Pond

Stage-Discharge



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 2C: Culvert 2 Runway

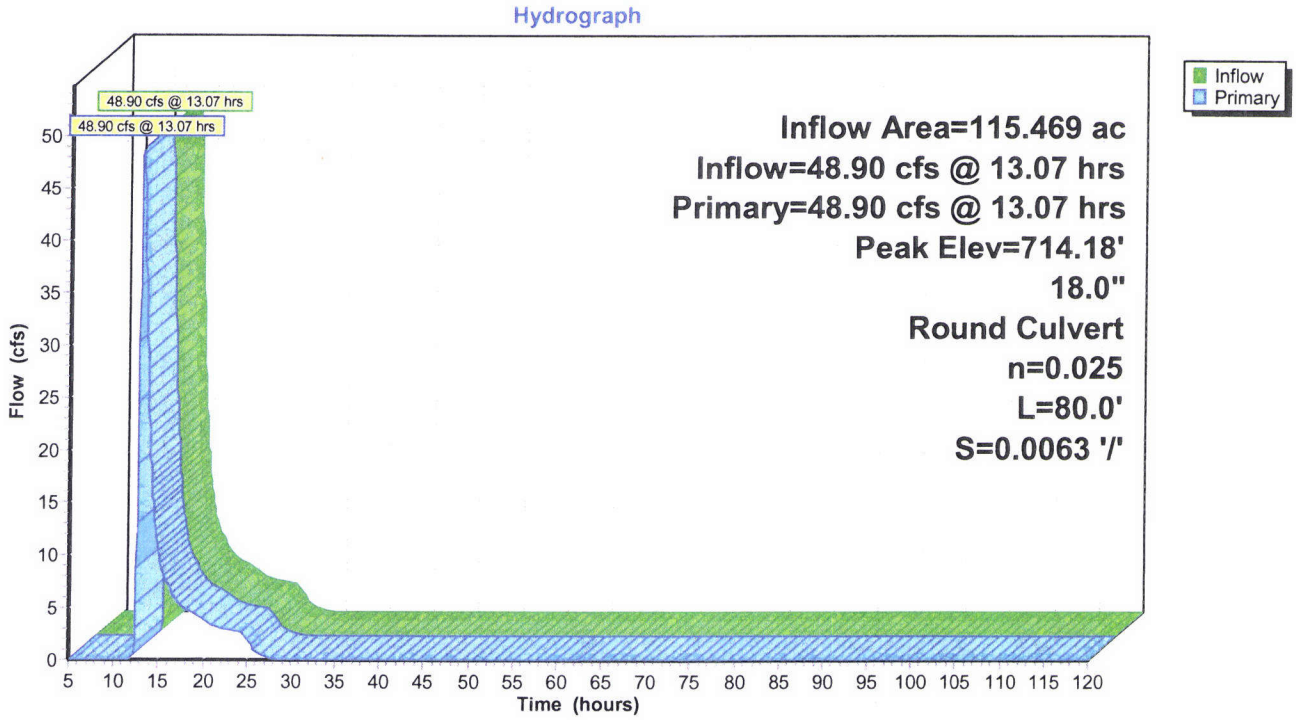
Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 0.97" for 10-Year event
Inflow = 48.90 cfs @ 13.07 hrs, Volume= 9.334 af
Outflow = 48.90 cfs @ 13.07 hrs, Volume= 9.334 af, Atten= 0%, Lag= 0.0 min
Primary = 48.90 cfs @ 13.07 hrs, Volume= 9.334 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 714.18' @ 13.07 hrs
Flood Elev= 633.00'

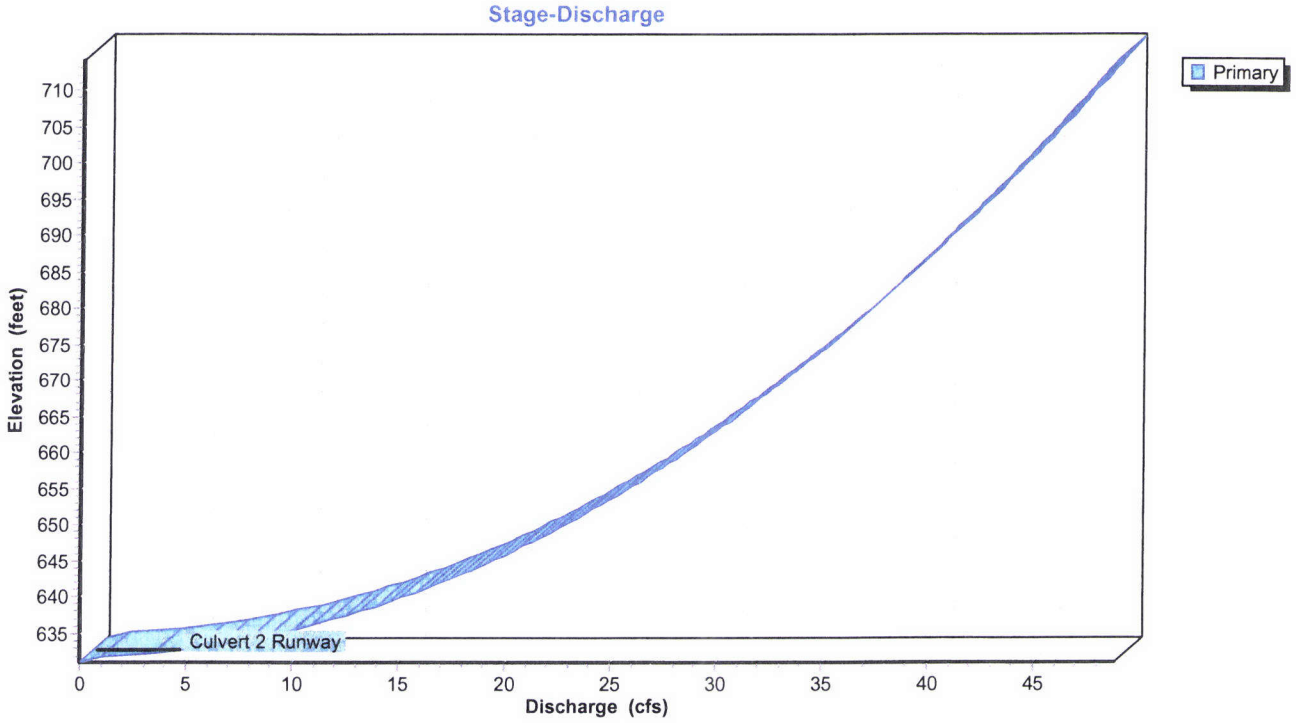
Device	Routing	Invert	Outlet Devices
#1	Primary	631.00'	**18.0" Round Culvert 2 Runway** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 631.00' / 630.50' S= 0.0063 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=48.81 cfs @ 13.07 hrs HW=713.87' (Free Discharge)
↑**1=Culvert 2 Runway** (Barrel Controls 48.81 cfs @ 27.62 fps)

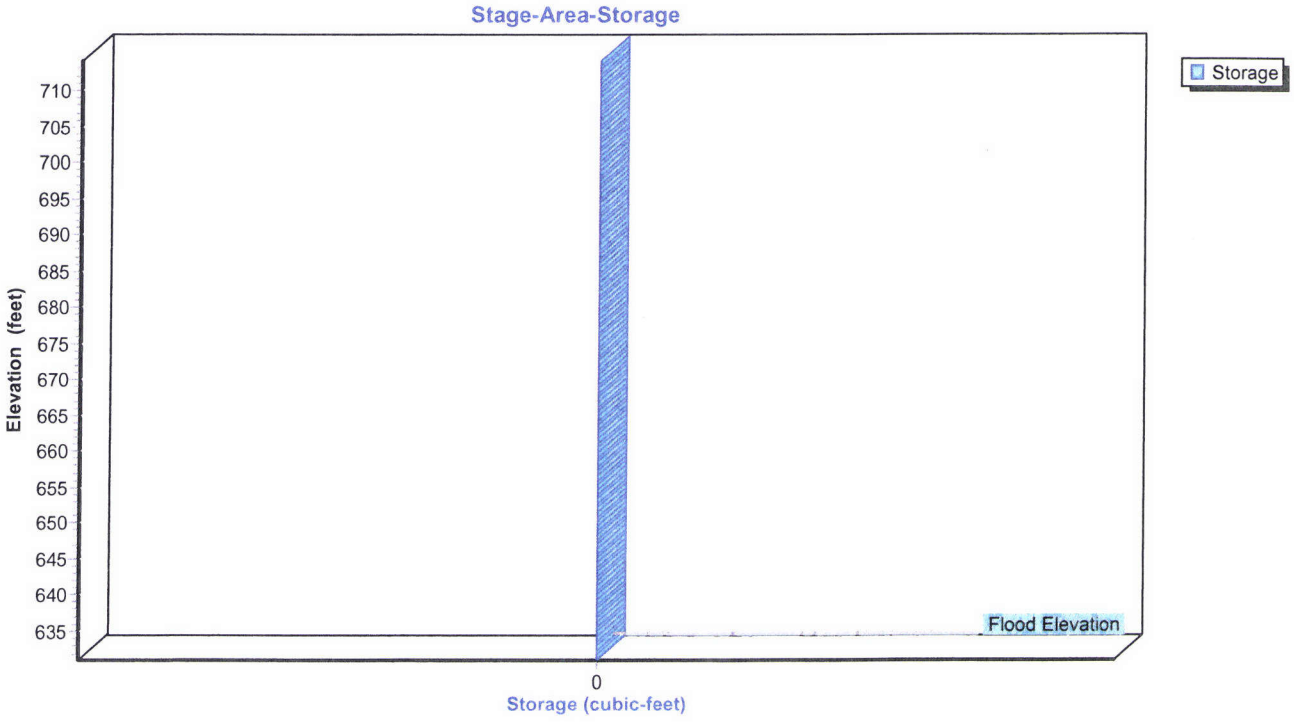
Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Summary for Pond 3C: Culvert (ROW)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 0.96" for 10-Year event
Inflow = 96.22 cfs @ 13.38 hrs, Volume= 22.189 af
Outflow = 90.79 cfs @ 13.90 hrs, Volume= 21.469 af, Atten= 6%, Lag= 31.6 min
Primary = 16.72 cfs @ 13.90 hrs, Volume= 12.377 af
Secondary = 74.08 cfs @ 13.90 hrs, Volume= 9.092 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 623.99' @ 13.90 hrs Surf.Area= 140,320 sf Storage= 285,888 cf
Flood Elev= 623.00' Surf.Area= 140,320 sf Storage= 285,888 cf

Plug-Flow detention time= 244.0 min calculated for 21.469 af (97% of inflow)
Center-of-Mass det. time= 223.6 min (1,198.3 - 974.8)

Volume	Invert	Avail.Storage	Storage Description
#1	620.00'	285,888 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
620.00	37,051	702.0	0	0	37,051
621.00	71,069	1,385.0	53,145	53,145	150,487
622.00	128,499	1,860.0	98,377	151,522	273,157
623.00	140,320	2,180.0	134,366	285,888	376,054

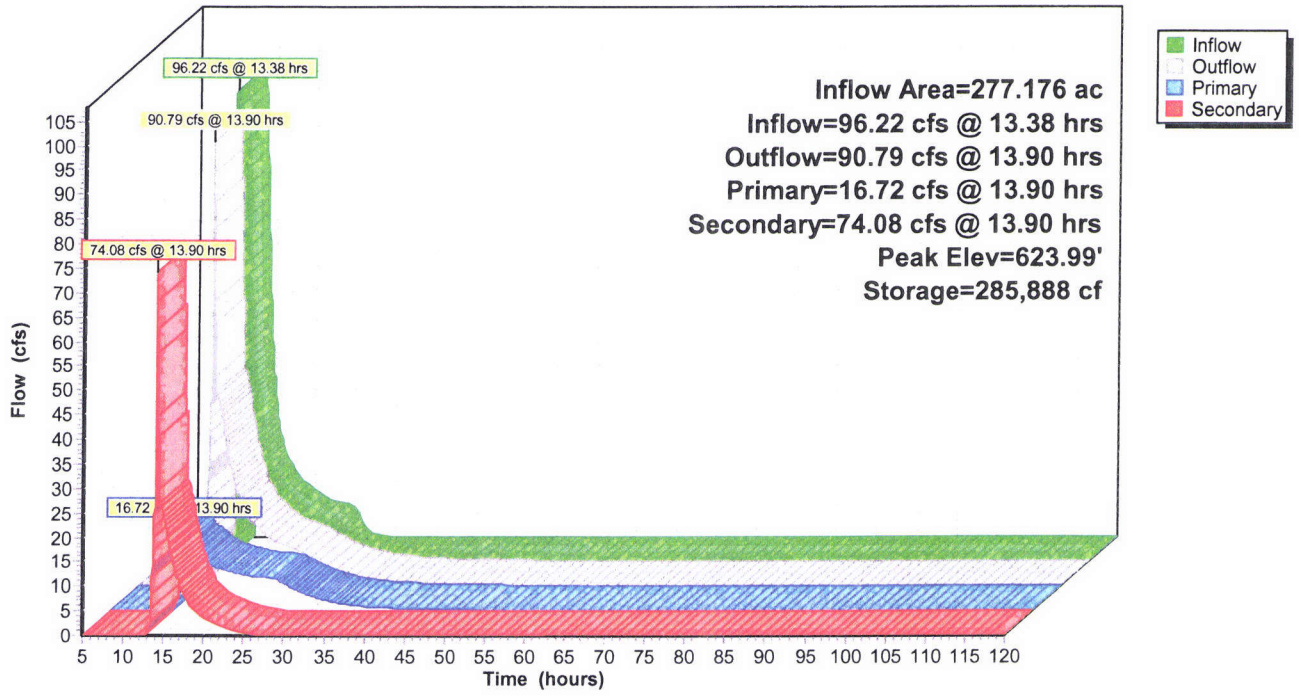
Device	Routing	Invert	Outlet Devices
#1	Primary	620.60'	**24.0" Round Culvert** L= 80.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 620.60' / 620.20' S= 0.0050 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior
#2	Secondary	622.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=16.64 cfs @ 13.90 hrs HW=623.97' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 16.64 cfs @ 5.30 fps)

Secondary OutFlow Max=71.05 cfs @ 13.90 hrs HW=623.93' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 71.05 cfs @ 3.67 fps)

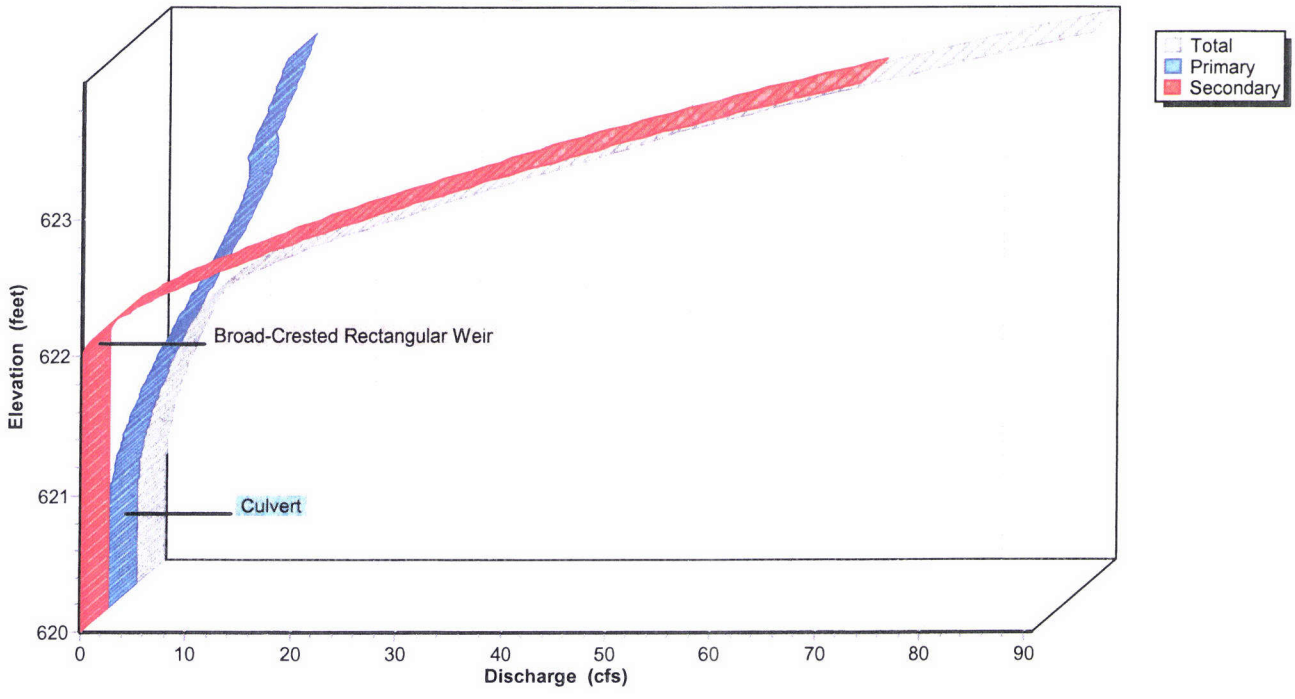
Pond 3C: Culvert (ROW)

Hydrograph

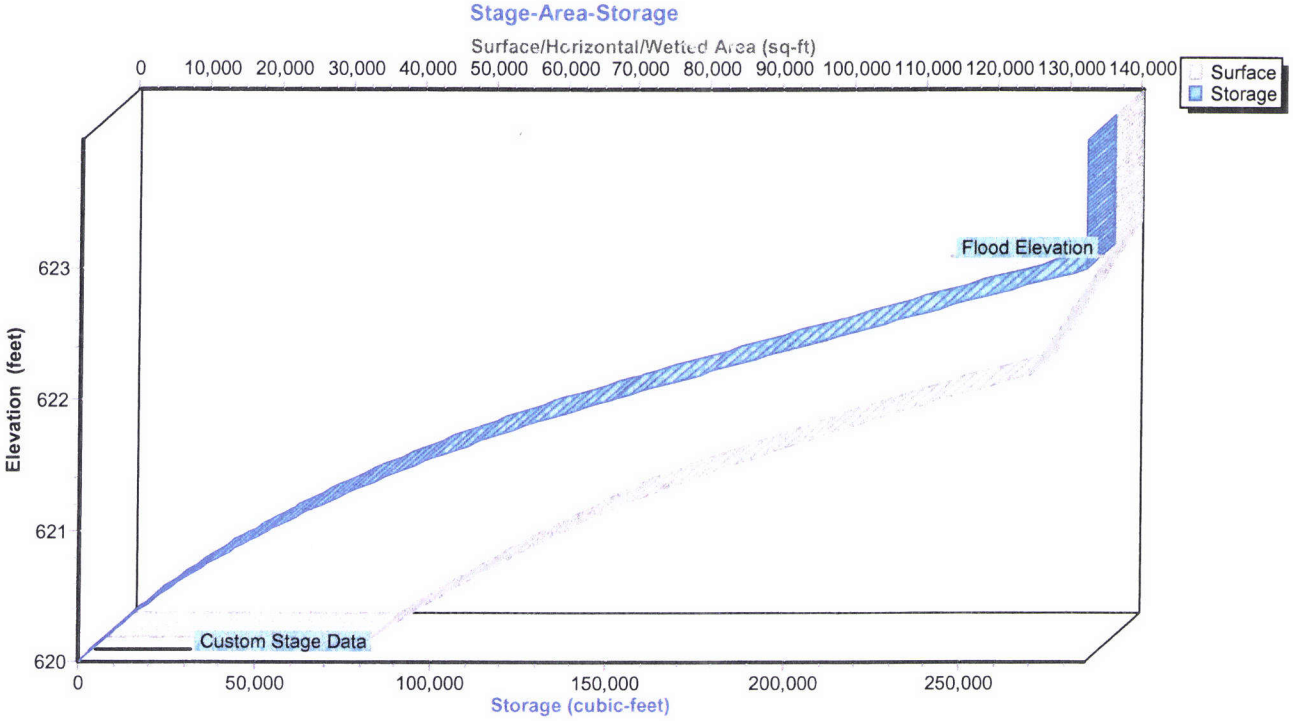


Pond 3C: Culvert (ROW)

Stage-Discharge



Pond 3C: Culvert (ROW)



Summary for Pond 4C: 4C

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 0.93" for 10-Year event
Inflow = 52.06 cfs @ 14.70 hrs, Volume= 23.864 af
Outflow = 5.08 cfs @ 28.14 hrs, Volume= 8.532 af, Atten= 90%, Lag= 806.6 min
Primary = 5.08 cfs @ 28.14 hrs, Volume= 8.532 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 618.87' @ 28.14 hrs Surf.Area= 497,221 sf Storage= 831,449 cf
Flood Elev= 622.00' Surf.Area= 535,800 sf Storage= 1,427,903 cf

Plug-Flow detention time= 1,457.4 min calculated for 8.532 af (36% of inflow)
Center-of-Mass det. time= 1,126.9 min (2,354.6 - 1,227.7)

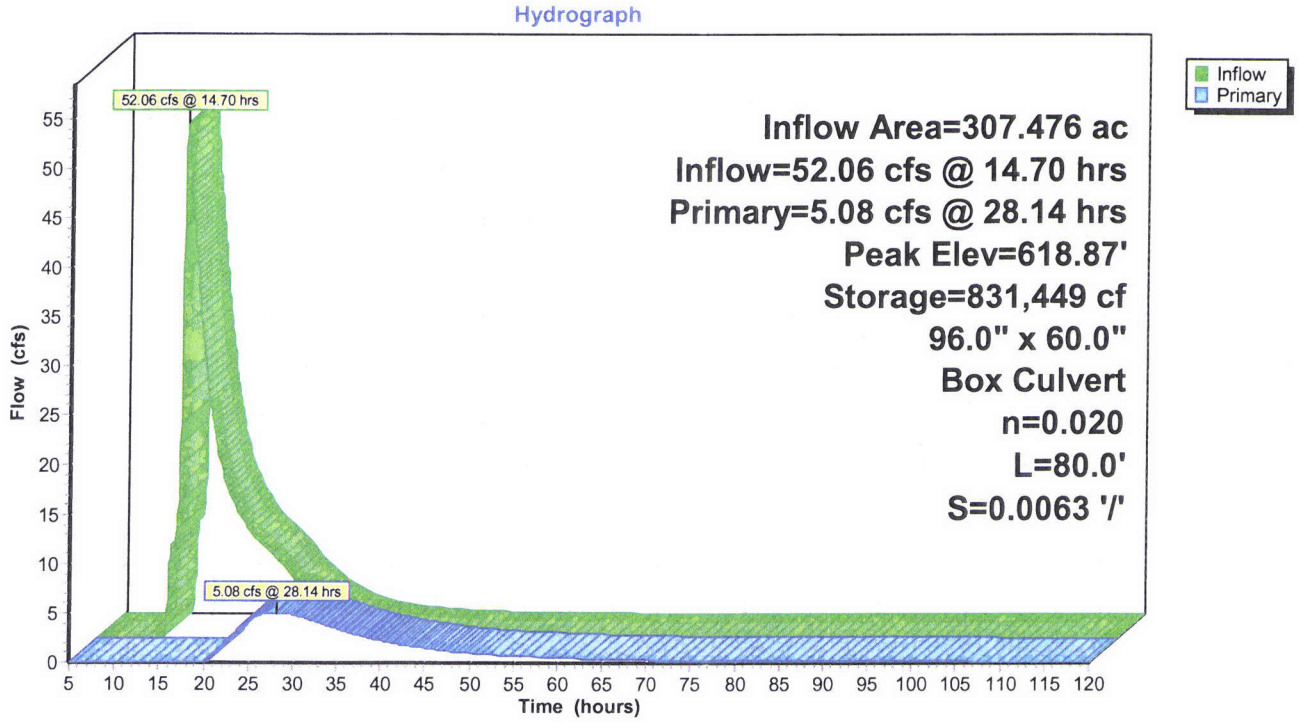
Volume	Invert	Avail.Storage	Storage Description
#1	616.00'	1,427,903 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
616.00	42,800	305.0	0	0	42,800
617.00	286,279	2,304.0	146,590	146,590	457,830
618.00	351,919	2,393.0	318,535	465,125	491,178
619.00	521,710	2,863.0	434,038	899,163	687,778
620.00	535,800	3,120.0	528,739	1,427,903	810,175

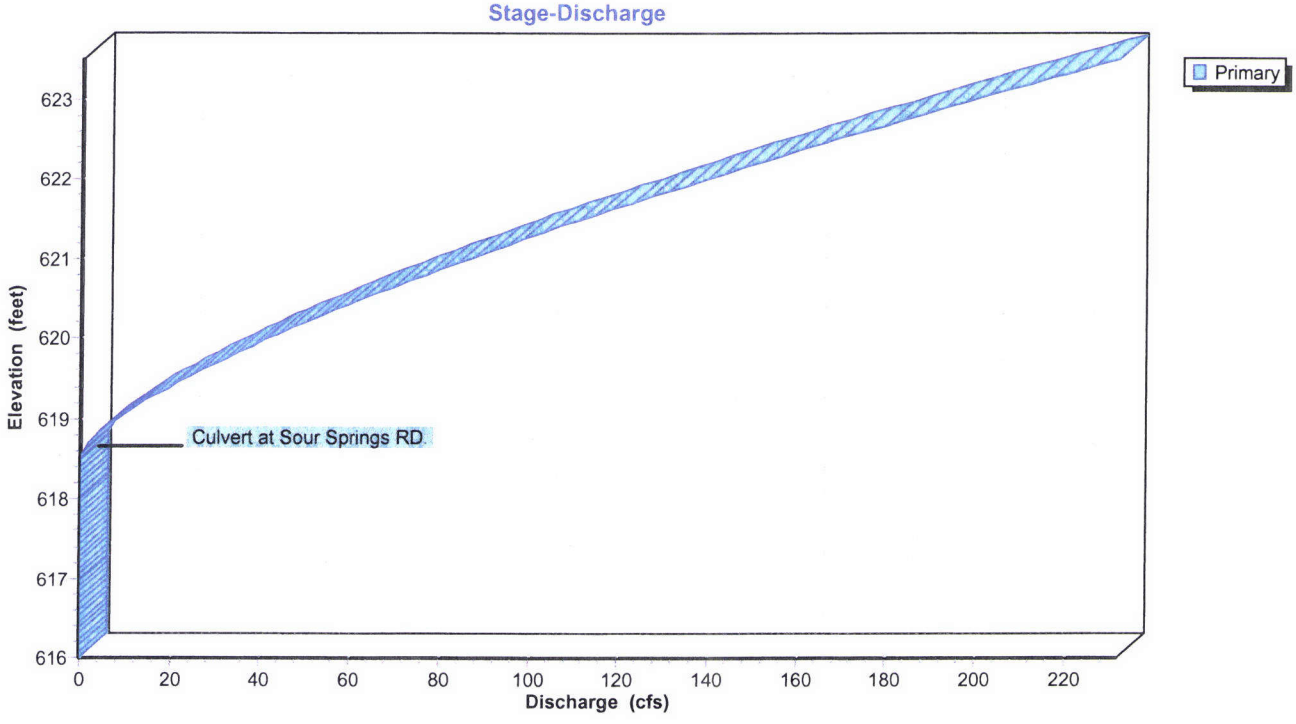
Device	Routing	Invert	Outlet Devices
#1	Primary	618.50'	**96.0" W x 60.0" H Box Culvert at Sour Springs RD.** L= 80.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 618.50' / 618.00' S= 0.0063 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=5.06 cfs @ 28.14 hrs HW=618.87' (Free Discharge)
↑**1=Culvert at Sour Springs RD.** (Barrel Controls 5.06 cfs @ 2.30 fps)

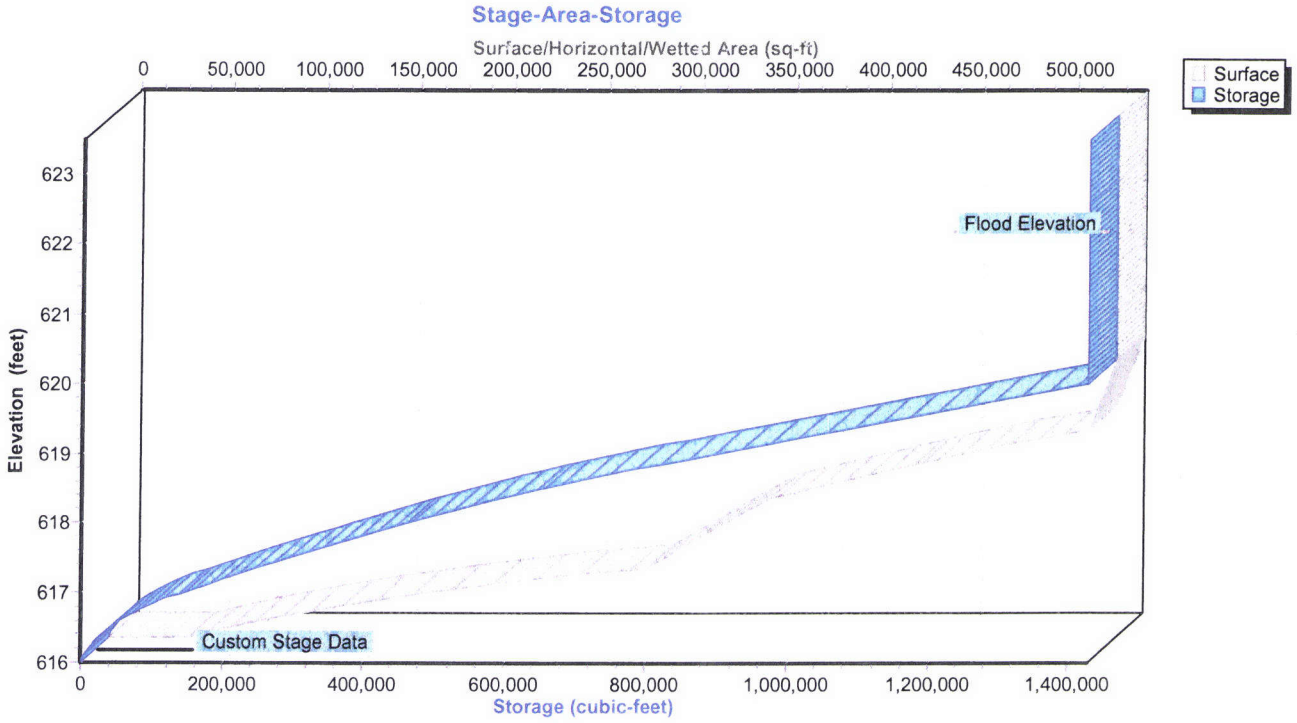
Pond 4C: 4C



Pond 4C: 4C



Pond 4C: 4C


Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
Surface
Storage
623
622
621
620
619
618
617
616
Elevation (feet)
Flood Elevation
Custom Stage Data
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
Storage (cubic-feet)

Time span=5.00-120.00 hrs, dt=0.05 hrs, 2301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatch 1-SC Runoff Area=344,838 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=550' Tc=42.7 min CN=58 Runoff=2.53 cfs 0.439 af

Subcatchment 2S: Subcatch 2-SC Runoff Area=107.553 ac 0.19% Impervious Runoff Depth=1.33"
Flow Length=1,700' Slope=0.0110 '/' Tc=41.0 min CN=70 Runoff=92.90 cfs 11.918 af

Subcatchment 3S: Subcatch 3-sc Runoff Area=7,043,959 sf 0.39% Impervious Runoff Depth=1.27"
Flow Length=2,800' Tc=49.3 min CN=69 Runoff=115.10 cfs 17.068 af

Subcatchment 4S: Subcatch 4-SC Runoff Area=32.300 ac 0.00% Impervious Runoff Depth=1.03"
Flow Length=1,100' Tc=37.1 min CN=65 Runoff=21.50 cfs 2.768 af

Subcatchment 5aS: Subcatch 5A-SC Runoff Area=11.000 ac 0.00% Impervious Runoff Depth=1.03"
Flow Length=700' Slope=0.0300 '/' Tc=57.4 min CN=65 Runoff=5.33 cfs 0.943 af

Subcatchment 5bS: Subcatch 5B-SC Runoff Area=19.300 ac 20.73% Impervious Runoff Depth=1.39"
Flow Length=800' Tc=43.6 min CN=71 Runoff=16.93 cfs 2.242 af

Subcatchment 5S: Subcatch 6B-SC Runoff Area=16.800 ac 0.00% Impervious Runoff Depth=0.66"
Flow Length=1,100' Tc=70.5 min CN=58 Runoff=3.76 cfs 0.931 af

Subcatchment 6aS: Subcatch 6A-SC Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=800' Tc=39.5 min CN=59 Runoff=6.44 cfs 1.022 af

Reach 1R: Shallow Swale Avg. Flow Depth=0.57' Max Vel=1.52 fps Inflow=2.53 cfs 0.439 af
n=0.050 L=1,355.0' S=0.0103 '/' Capacity=16.53 cfs Outflow=2.14 cfs 0.439 af

Reach 2R: Drainage Ditch (North side runway) Avg. Flow Depth=5.80' Max Vel=1.90 fps Inflow=93.05 cfs 12.356 af
n=0.025 L=2,440.0' S=0.0004 '/' Capacity=26.49 cfs Outflow=68.34 cfs 12.356 af

Reach 3R: Drainage Ditch (upper section) Avg. Flow Depth=8.42' Max Vel=3.19 fps Inflow=144.71 cfs 29.425 af
n=0.035 L=1,220.0' S=0.0025 '/' Capacity=30.90 cfs Outflow=141.69 cfs 29.425 af

Reach 4R: Drainage Ditch (Main) Avg. Flow Depth=3.41' Max Vel=4.06 fps Inflow=141.69 cfs 29.425 af
n=0.030 L=2,655.0' S=0.0026 '/' Capacity=305.22 cfs Outflow=136.93 cfs 29.425 af

Reach 5R: Ditch & Swamp Avg. Flow Depth=8.31' Max Vel=0.51 fps Inflow=152.39 cfs 31.889 af
n=0.100 L=700.0' S=0.0003 '/' Capacity=19.46 cfs Outflow=92.80 cfs 31.884 af

Reach 6R: School House Marsh (feeder ditch) Avg. Flow Depth=2.06' Max Vel=0.87 fps Inflow=21.50 cfs 19.315 af
n=0.070 L=427.0' S=0.0012 '/' Capacity=44.45 cfs Outflow=19.86 cfs 19.311 af

Reach 7R: (new Reach) Avg. Flow Depth=0.74' Max Vel=1.58 fps Inflow=2.68 cfs 10.444 af
n=0.030 L=500.0' S=0.0030 '/' Capacity=85.74 cfs Outflow=2.68 cfs 10.436 af

Pond 1C: Culvert 1 Fletcher Chapel Peak Elev=649.94' Inflow=2.53 cfs 0.439 af
12.0" Round Culvert n=0.021 L=60.0' S=0.0333 '/' Outflow=2.53 cfs 0.439 af

Pond 1P: Schoolhouse Marsh Pond Peak Elev=617.87' Storage=3,064,813 cf Inflow=28.43 cfs 21.263 af
Outflow=2.68 cfs 10.444 af

Pond 2C: Culvert 2 Runway Peak Elev=792.50' Inflow=68.34 cfs 12.356 af
18.0" Round Culvert n=0.025 L=80.0' S=0.0063 '/' Outflow=68.34 cfs 12.356 af

Pond 3C: Culvert (ROW) Peak Elev=624.86' Storage=285,888 cf Inflow=136.93 cfs 29.425 af
Primary=19.83 cfs 13.624 af Secondary=125.73 cfs 15.080 af Outflow=146.21 cfs 28.704 af

Pond 4C: 4C Peak Elev=619.09' Storage=947,551 cf Inflow=92.80 cfs 31.884 af
96.0" x 60.0" Box Culvert n=0.020 L=80.0' S=0.0063 '/' Outflow=10.63 cfs 16.547 af

Total Runoff Area = 373.776 ac Runoff Volume = 37.330 af Average Runoff Depth = 1.20"
98.71% Pervious = 368.944 ac 1.29% Impervious = 4.832 ac

Summary for Subcatchment 1S: Subcatch 1-SC

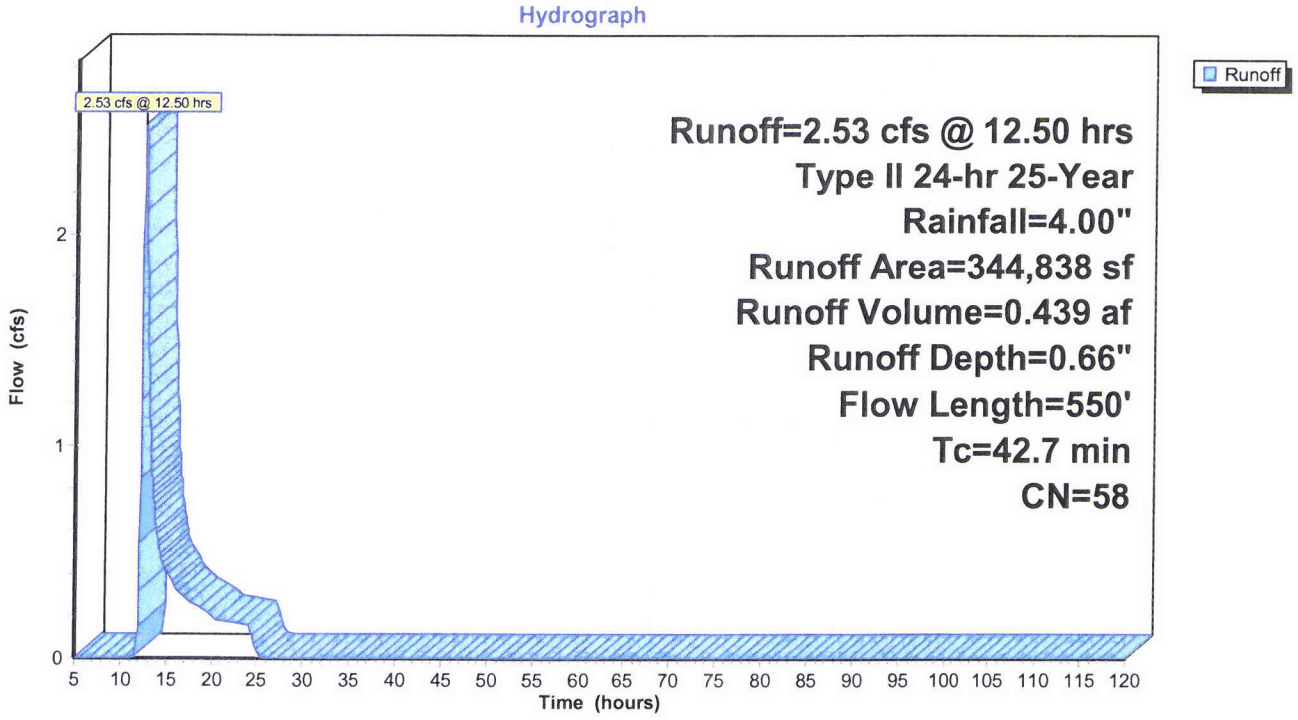
Runoff = 2.53 cfs @ 12.50 hrs, Volume= 0.439 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (sf)	CN	Description	Land Use
51,656	58	Woods/grass comb., Good, HSG B	Woods
13,902	55	Woods, Good, HSG B	Woods
279,280	58	Meadow, non-grazed, HSG B	Meadow
344,838	58	Weighted Average	
344,838		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5	300	0.0170	0.12		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
1.2	250	0.2500	3.50		**Shallow Concentrated Flow, Shallow-con 1-SC** Short Grass Pasture Kv= 7.0 fps
42.7	550	Total			

Subcatchment 1S: Subcatch 1-SC



Summary for Subcatchment 2S: Subcatch 2-SC

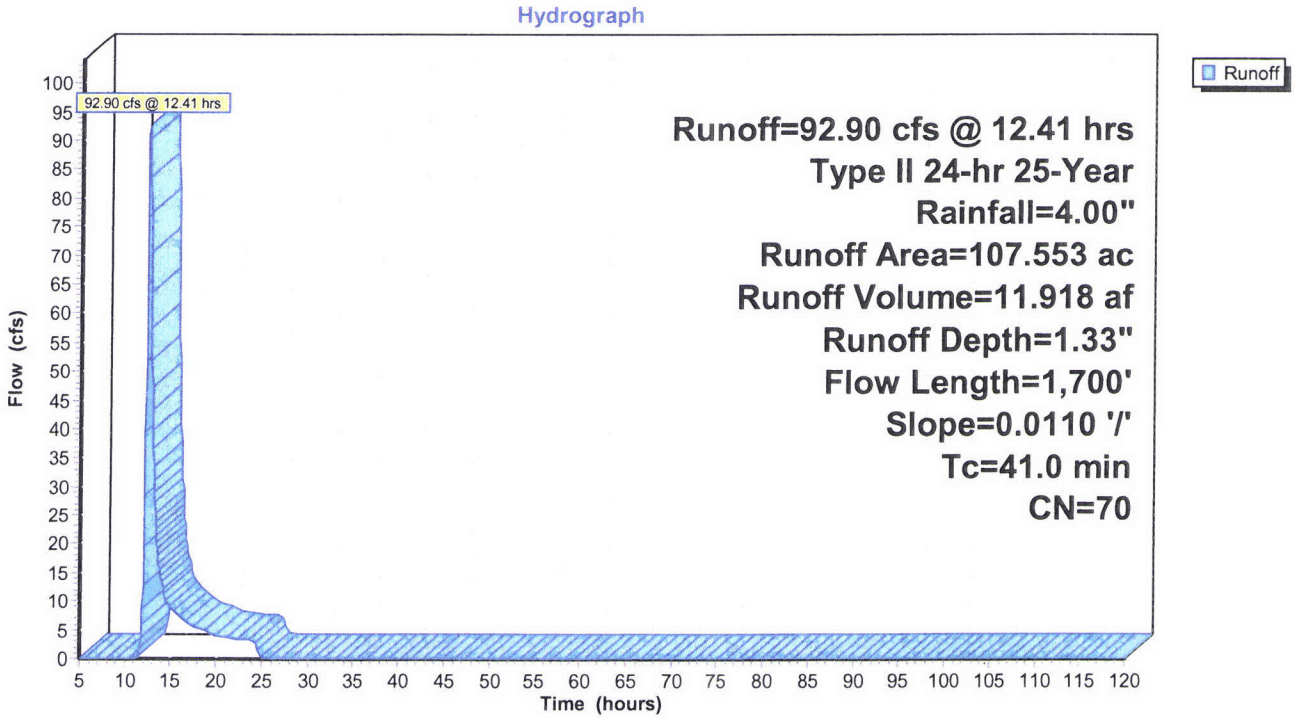
Runoff = 92.90 cfs @ 12.41 hrs, Volume= 11.918 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
80.653	67	Row crops, straight row, Good, HSG A	Cropland
25.877	78	Row crops, straight row, Good, HSG B	Cropland
1.023	68	1 acre lots, 20% imp, HSG B	Residential
107.553	70	Weighted Average	
107.348		99.81% Pervious Area	
0.205		0.19% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	300	0.0110	0.31		**Sheet Flow, Sheet Flow (corn Field)** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
24.7	1,400	0.0110	0.94		**Shallow Concentrated Flow, Shallow Con (corn field)** Cultivated Straight Rows Kv= 9.0 fps
41.0	1,700	Total			

Subcatchment 2S: Subcatch 2-SC



Summary for Subcatchment 3S: Subcatch 3-sc

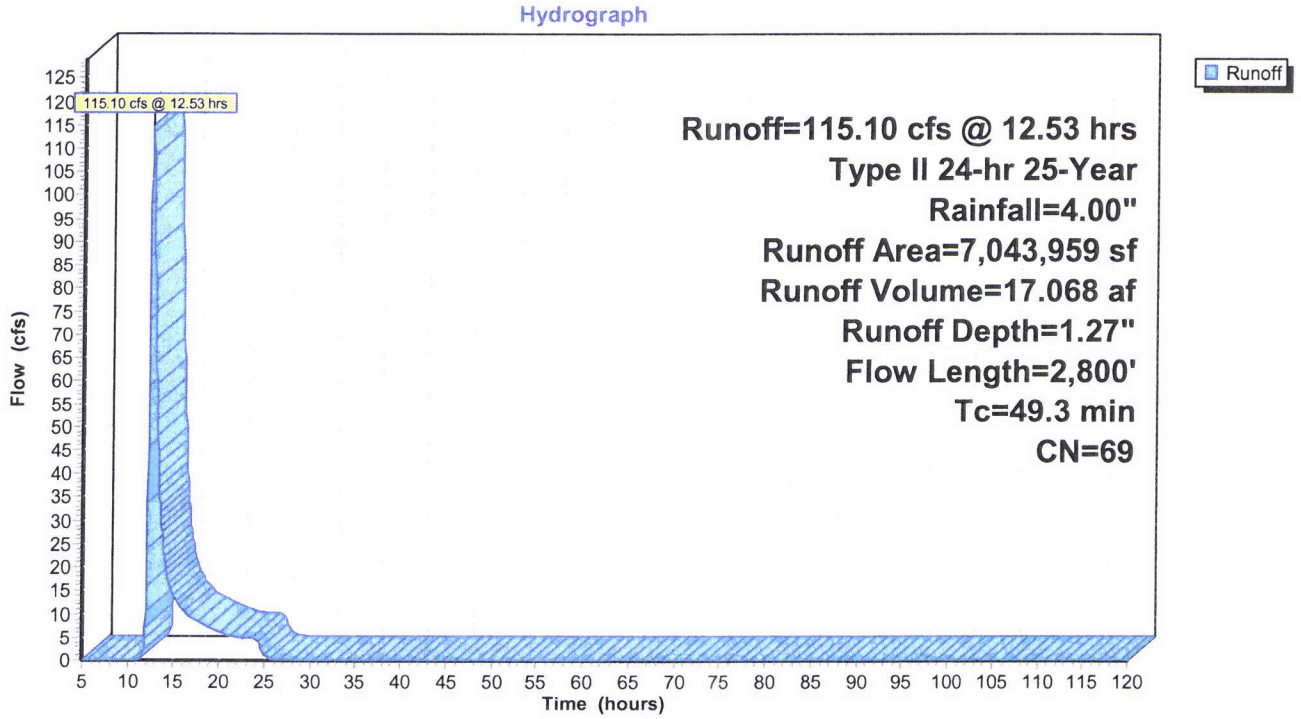
Runoff = 115.10 cfs @ 12.53 hrs, Volume= 17.068 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (sf)	CN	Description	Land Use
125,285	65	2 acre lots, 12% imp, HSG B	Residential
102,640	65	2 acre lots, 12% imp, HSG B	Residential
639,161	78	Row crops, straight row, Good, HSG B	Cropland
5,477,913	67	Row crops, straight row, Good, HSG A	Cropland
698,960	75	Row crops, SR + CR, Good, HSG B	Cropland
7,043,959	69	Weighted Average	
7,016,608		99.61% Pervious Area	
27,351		0.39% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0120	0.32		**Sheet Flow, sheet flow (corn field** Cultivated: Residue<=20% n= 0.060 P2= 2.50"
27.8	1,500	0.0100	0.90		**Shallow Concentrated Flow, Shallow Conc. (corn field)** Cultivated Straight Rows Kv= 9.0 fps
5.8	1,000	0.0090	2.89	9.63	**Parabolic Channel, Drainage (cornfield** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.035 Earth, dense weeds
49.3	2,800	Total			

Subcatchment 3S: Subcatch 3-sc



Summary for Subcatchment 4S: Subcatch 4-SC

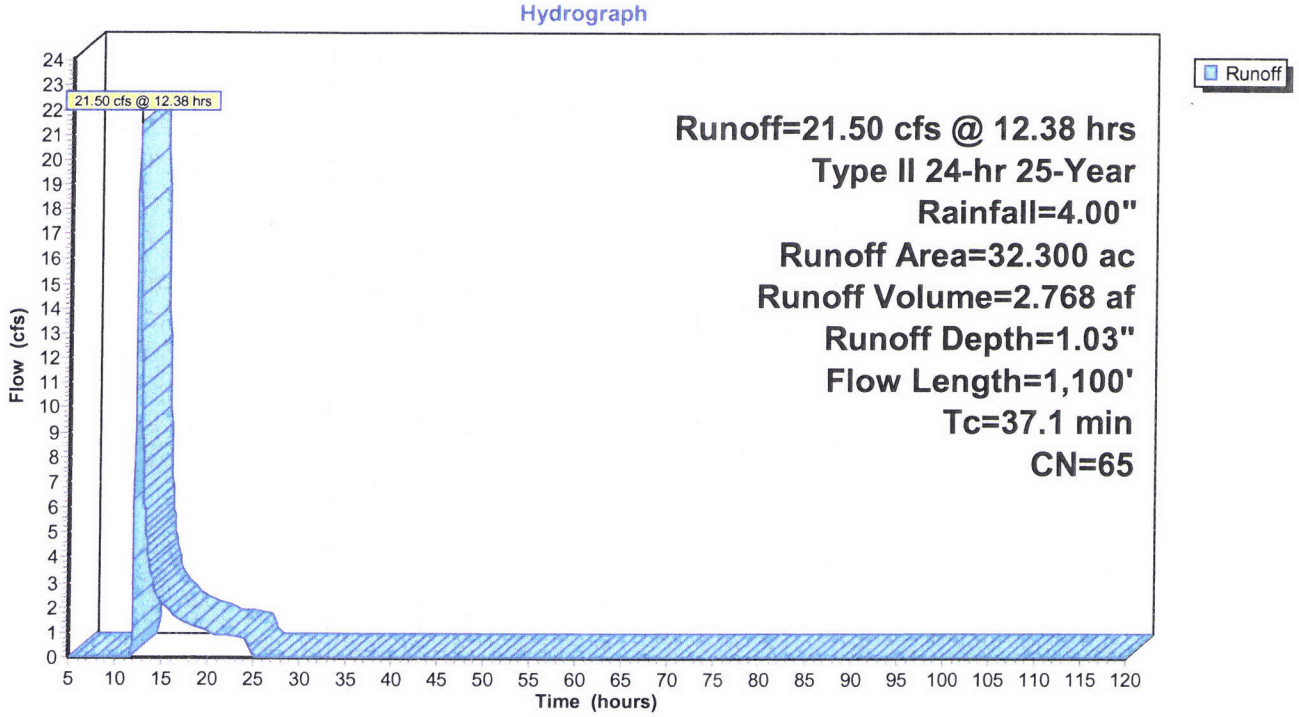
Runoff = 21.50 cfs @ 12.38 hrs, Volume= 2.768 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
24.500	67	Brush, Poor, HSG B	Brush
7.800	60	Woods, Fair, HSG B	Woods
32.300	65	Weighted Average	
32.300		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1	300	0.0350	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.50"
6.0	800	0.0220	2.22		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
37.1	1,100	Total			

Subcatchment 4S: Subcatch 4-SC



Summary for Subcatchment 5aS: Subcatch 5A-SC

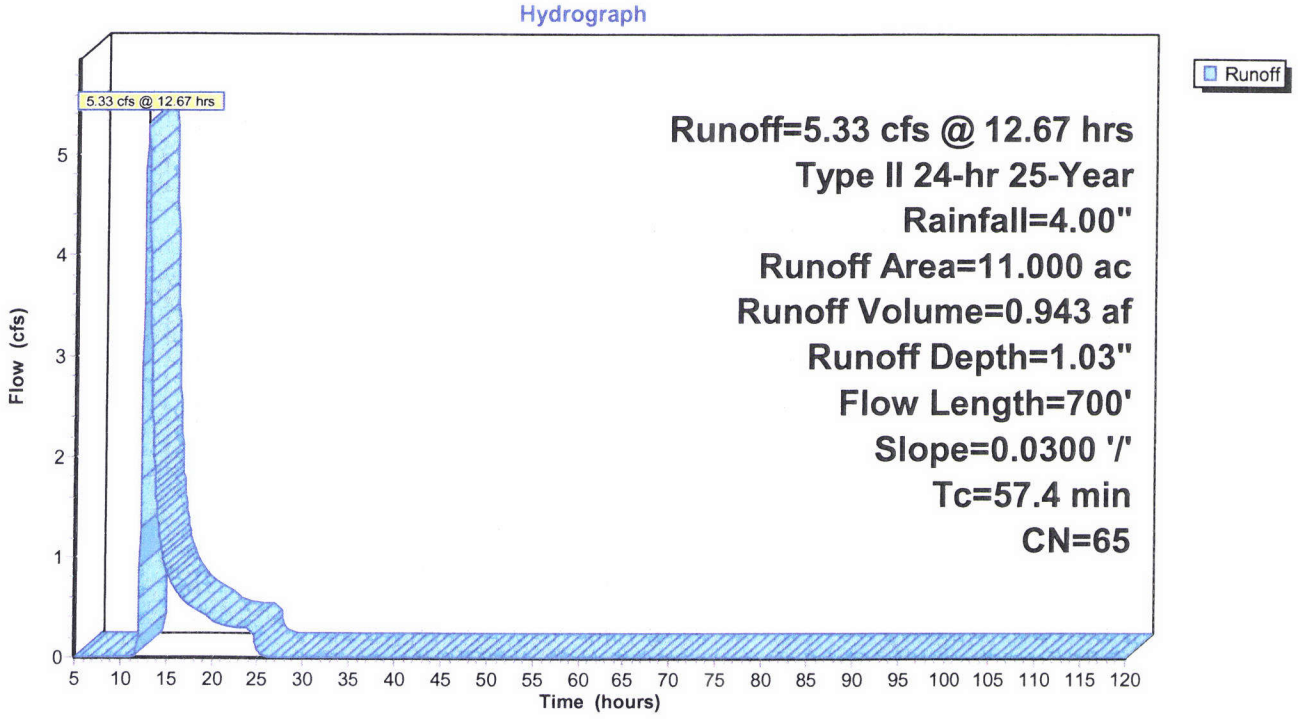
Runoff = 5.33 cfs @ 12.67 hrs, Volume= 0.943 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
6.000	58	Meadow, non-grazed, HSG B	Meadow
5.000	73	Woods/grass comb., Poor, HSG B	Woods
11.000	65	Weighted Average	
11.000		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow, Shallow Concetrated** Woodland Kv= 5.0 fps
57.4	700	Total			

Subcatchment 5aS: Subcatch 5A-SC



Summary for Subcatchment 5bS: Subcatch 5B-SC

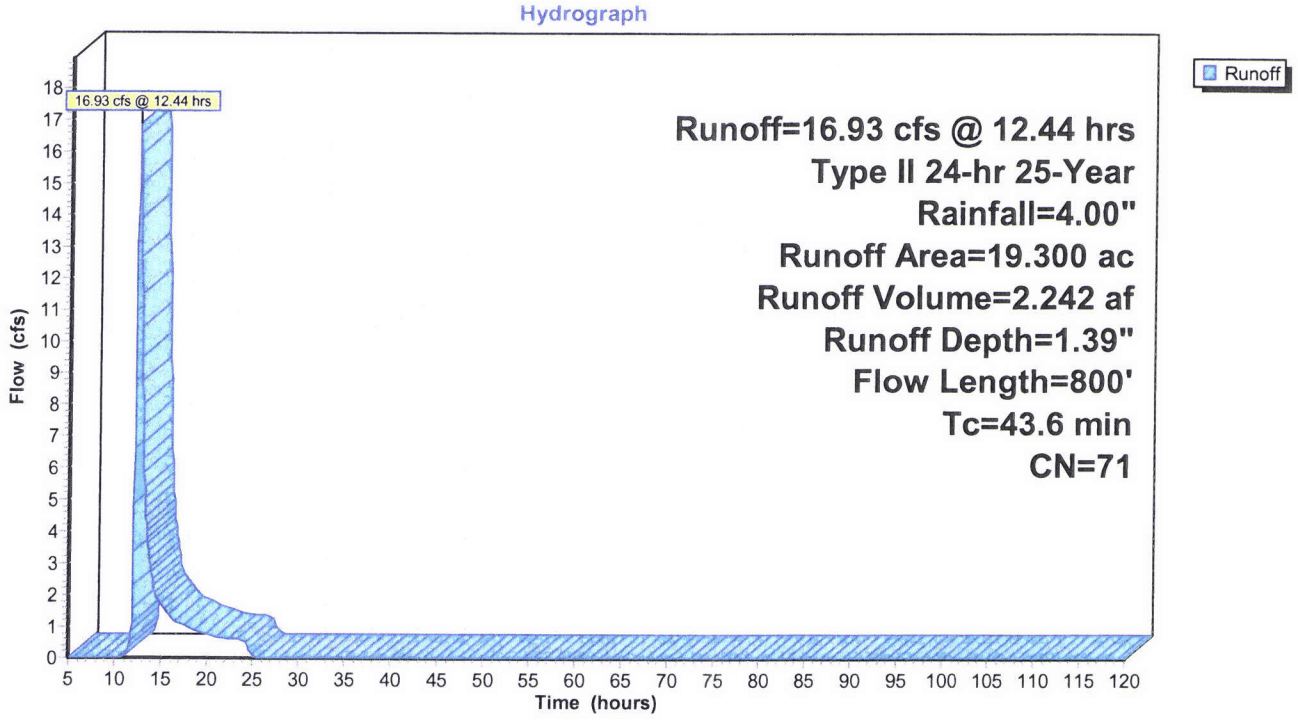
Runoff = 16.93 cfs @ 12.44 hrs, Volume= 2.242 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
6.100	56	Brush, Fair, HSG B	Brush
4.200	67	Brush, Poor, HSG B	Brush
5.000	70	Brush, Fair, HSG C	Brush
4.000	98	Water Surface, HSG B	Open Water
19.300	71	Weighted Average	
15.300		79.27% Pervious Area	
4.000		20.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.6	300	0.0500	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	500	0.0350	2.81		**Shallow Concentrated Flow, shallow concentrated** Grassed Waterway Kv= 15.0 fps
43.6	800	Total			

Subcatchment 5bS: Subcatch 5B-SC



Summary for Subcatchment 5S: Subcatch 6B-SC

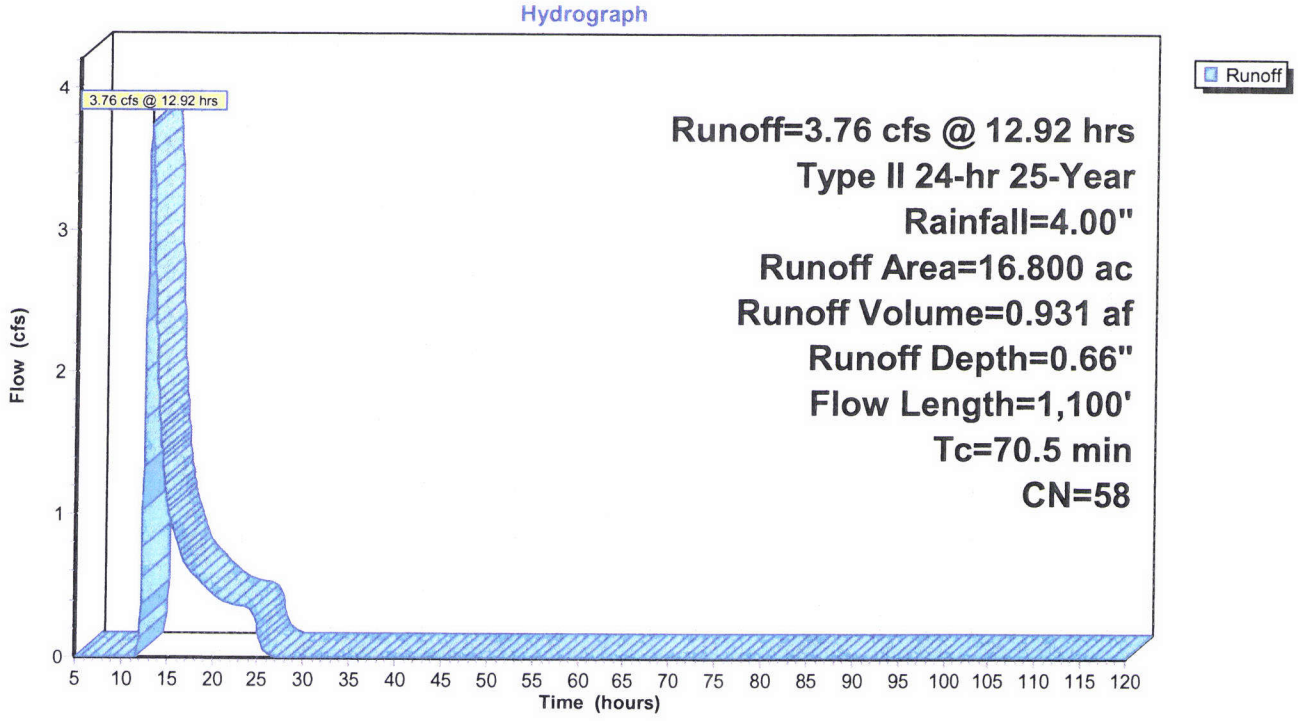
Runoff = 3.76 cfs @ 12.92 hrs, Volume= 0.931 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
14.000	58	Meadow, non-grazed, HSG B	Meadow
2.800	60	Woods, Fair, HSG B	Woods
16.800	58	Weighted Average	
16.800		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.5	300	0.0200	0.09		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.50"
12.0	800	0.0250	1.11		**Shallow Concentrated Flow, Shallow Concentrated** Short Grass Pasture Kv= 7.0 fps
70.5	1,100	Total			

Subcatchment 5S: Subcatch 6B-SC



Summary for Subcatchment 6aS: Subcatch 6A-SC

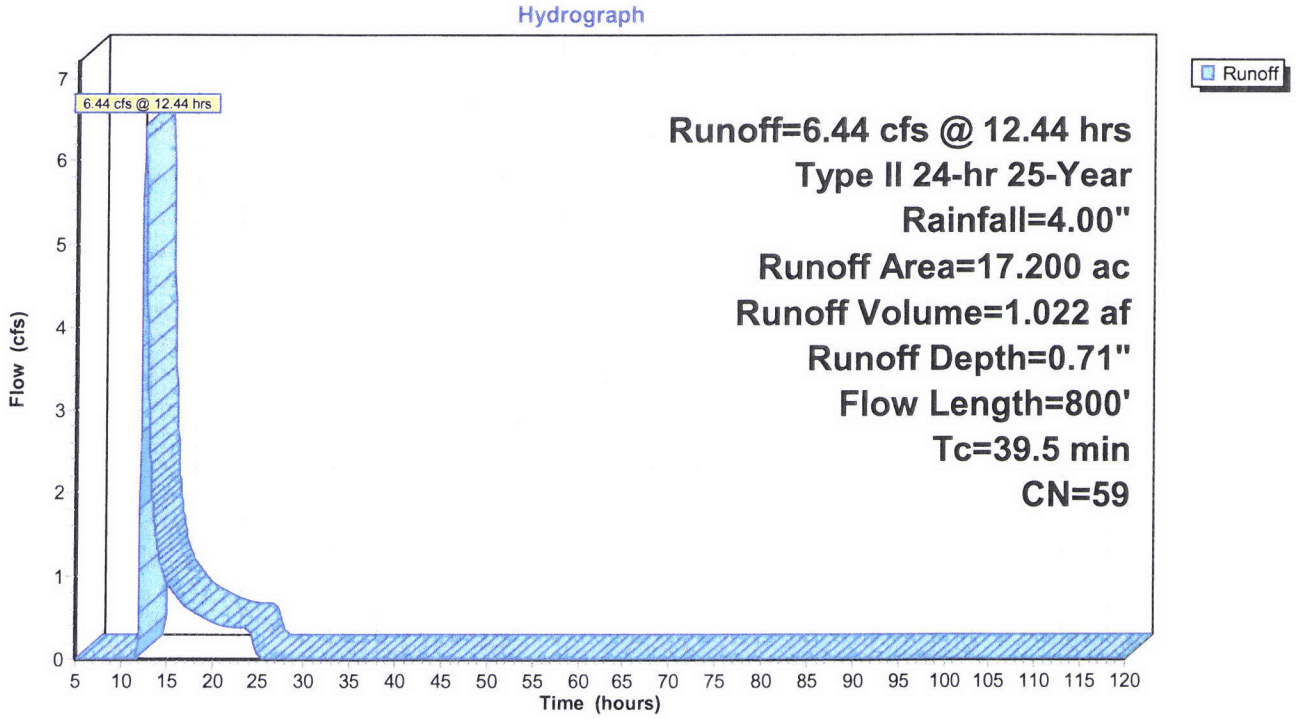
Runoff = 6.44 cfs @ 12.44 hrs, Volume= 1.022 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.00"

Area (ac)	CN	Description	Land Use
15.000	58	Meadow, non-grazed, HSG B	Meadow
2.200	65	Woods/grass comb., Fair, HSG B	Woods
17.200	59	Weighted Average	
17.200		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.1	300	0.0300	0.15		**Sheet Flow, sheet flow** Grass: Dense n= 0.240 P2= 2.50"
6.4	500	0.0350	1.31		**Shallow Concentrated Flow, shallow concentrated** Short Grass Pasture Kv= 7.0 fps
39.5	800	Total			

Subcatchment 6aS: Subcatch 6A-SC



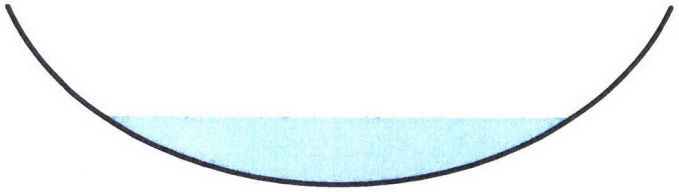
Summary for Reach 1R: Shallow Swale

Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.66" for 25-Year event
Inflow = 2.53 cfs @ 12.50 hrs, Volume= 0.439 af
Outflow = 2.14 cfs @ 12.94 hrs, Volume= 0.439 af, Atten= 15%, Lag= 26.7 min

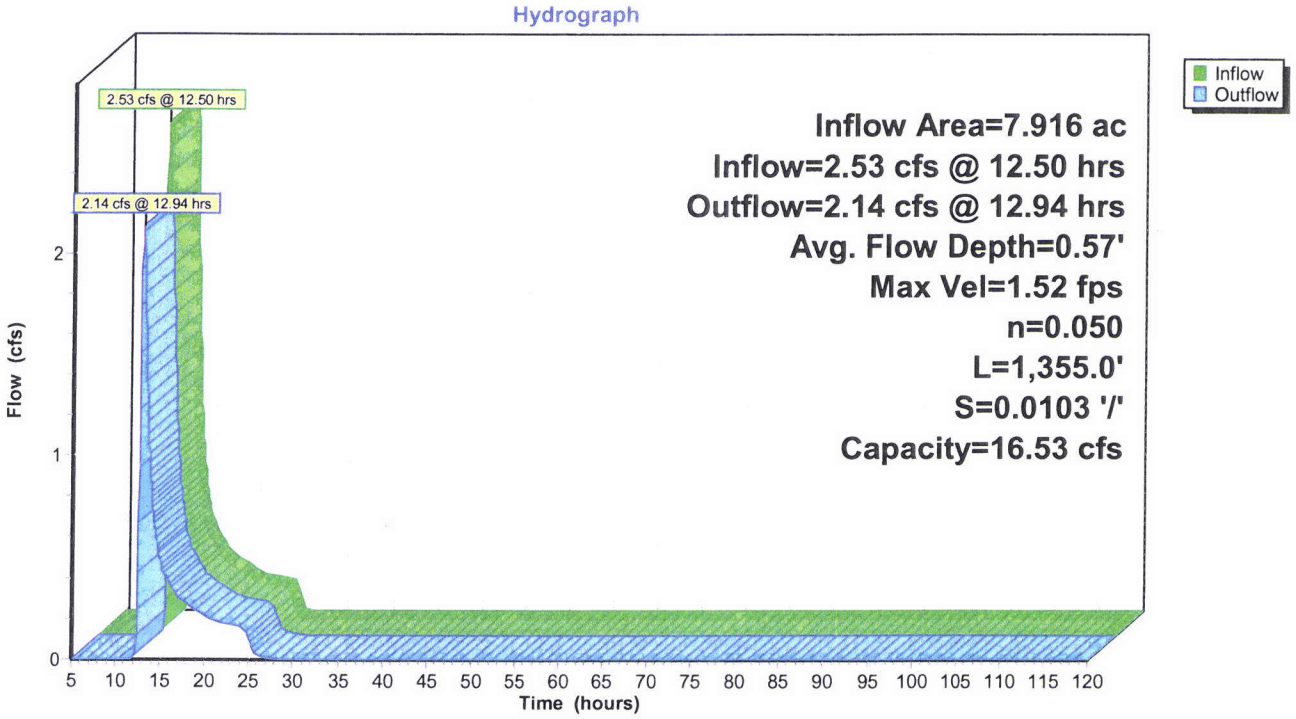
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 14.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 46.3 min

Peak Storage= 1,903 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 16.53 cfs

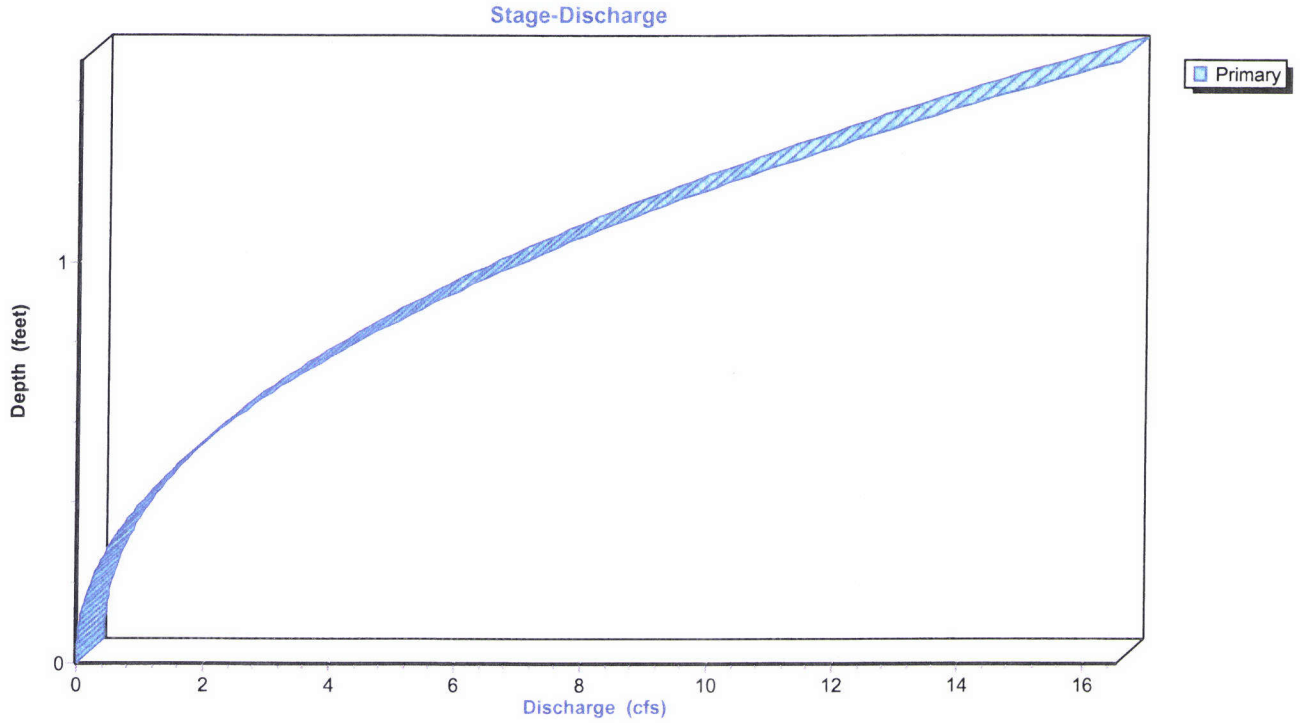
6.00' x 1.50' deep Parabolic Channel, n= 0.050 Sluggish weedy reaches w/pools
Length= 1,355.0' Slope= 0.0103 '/'
Inlet Invert= 646.00', Outlet Invert= 632.00'



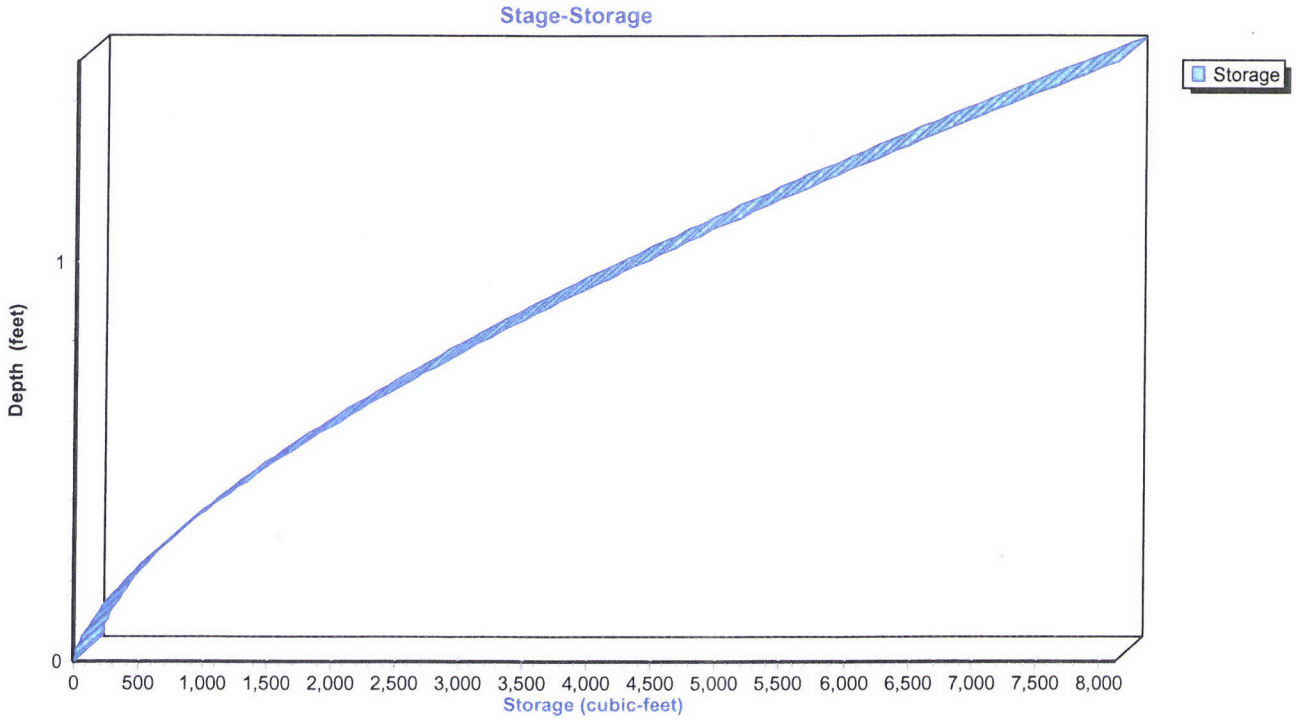
Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



Reach 1R: Shallow Swale



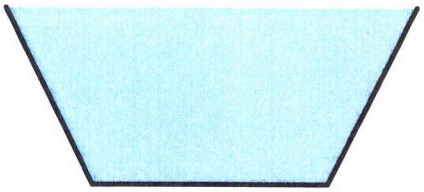
Summary for Reach 2R: Drainage Ditch (North side runway)

Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 1.28" for 25-Year event
Inflow = 93.05 cfs @ 12.41 hrs, Volume= 12.356 af
Outflow = 68.34 cfs @ 13.03 hrs, Volume= 12.356 af, Atten= 27%, Lag= 37.3 min

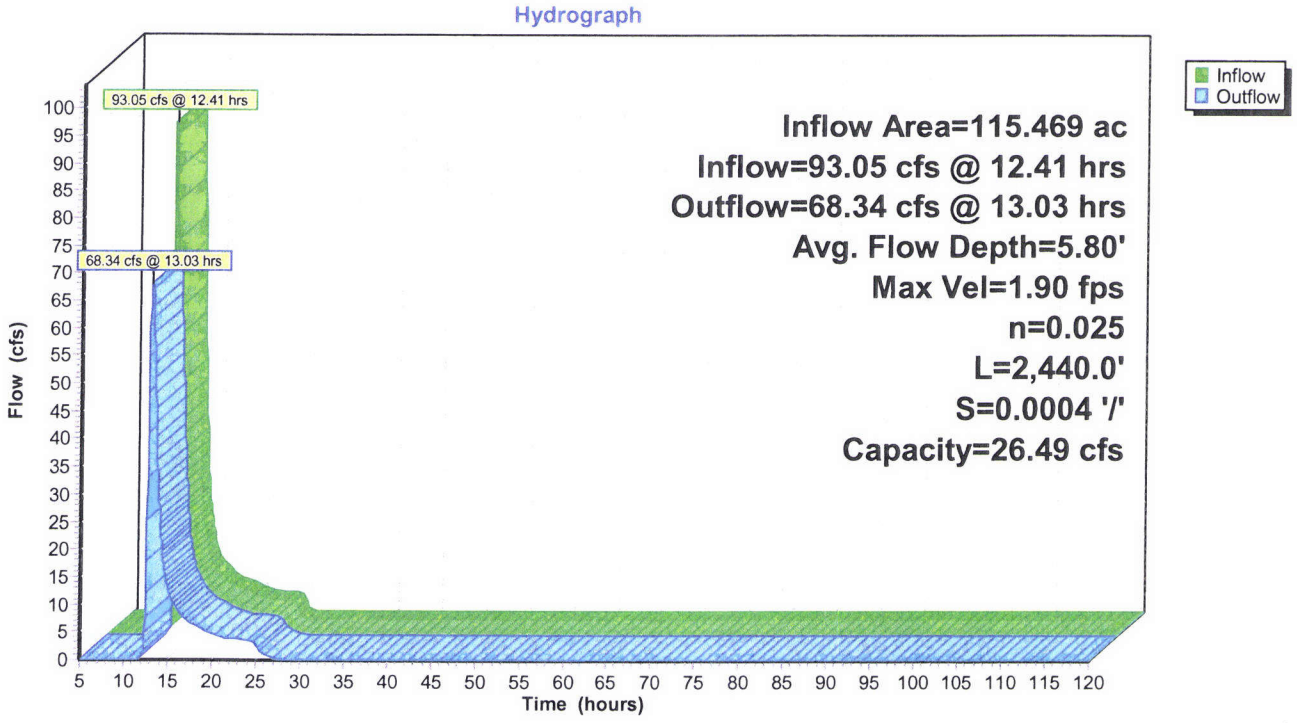
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.90 fps, Min. Travel Time= 21.4 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 117.6 min

Peak Storage= 87,952 cf @ 12.68 hrs
Average Depth at Peak Storage= 5.80'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 26.49 cfs

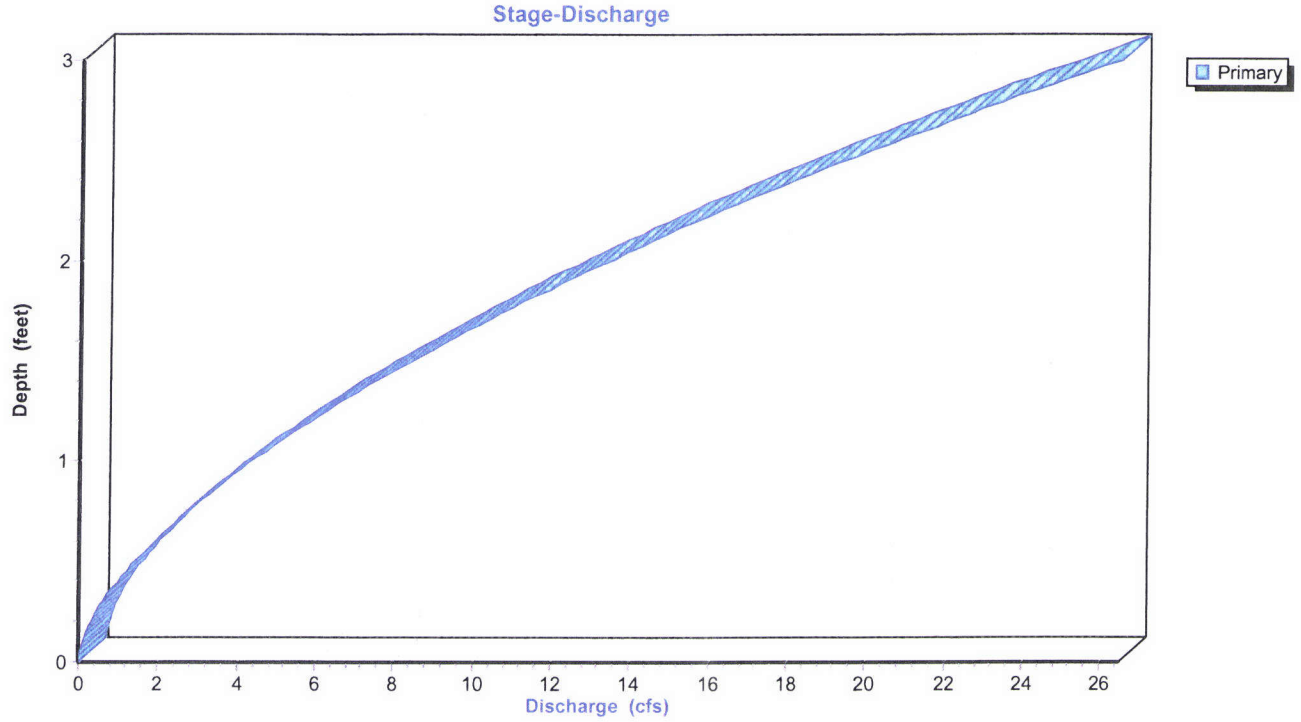
4.00' x 3.00' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 0.5 '/' Top Width= 7.00'
Length= 2,440.0' Slope= 0.0004 '/'
Inlet Invert= 632.00', Outlet Invert= 631.00'



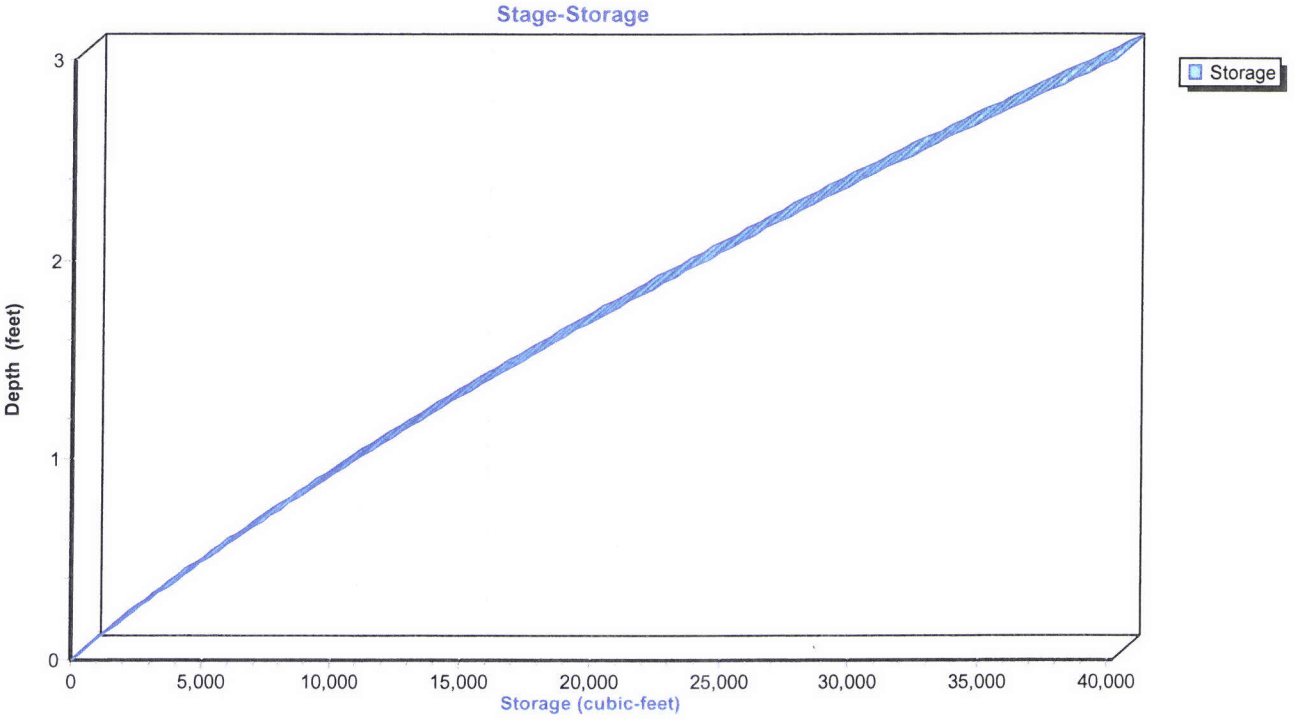
Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



Reach 2R: Drainage Ditch (North side runway)



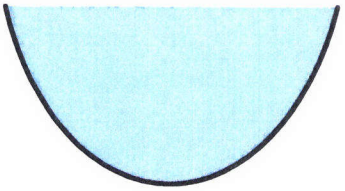
Summary for Reach 3R: Drainage Ditch (upper section)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 1.27" for 25-Year event
Inflow = 144.71 cfs @ 12.75 hrs, Volume= 29.425 af
Outflow = 141.69 cfs @ 12.96 hrs, Volume= 29.425 af, Atten= 2%, Lag= 12.6 min

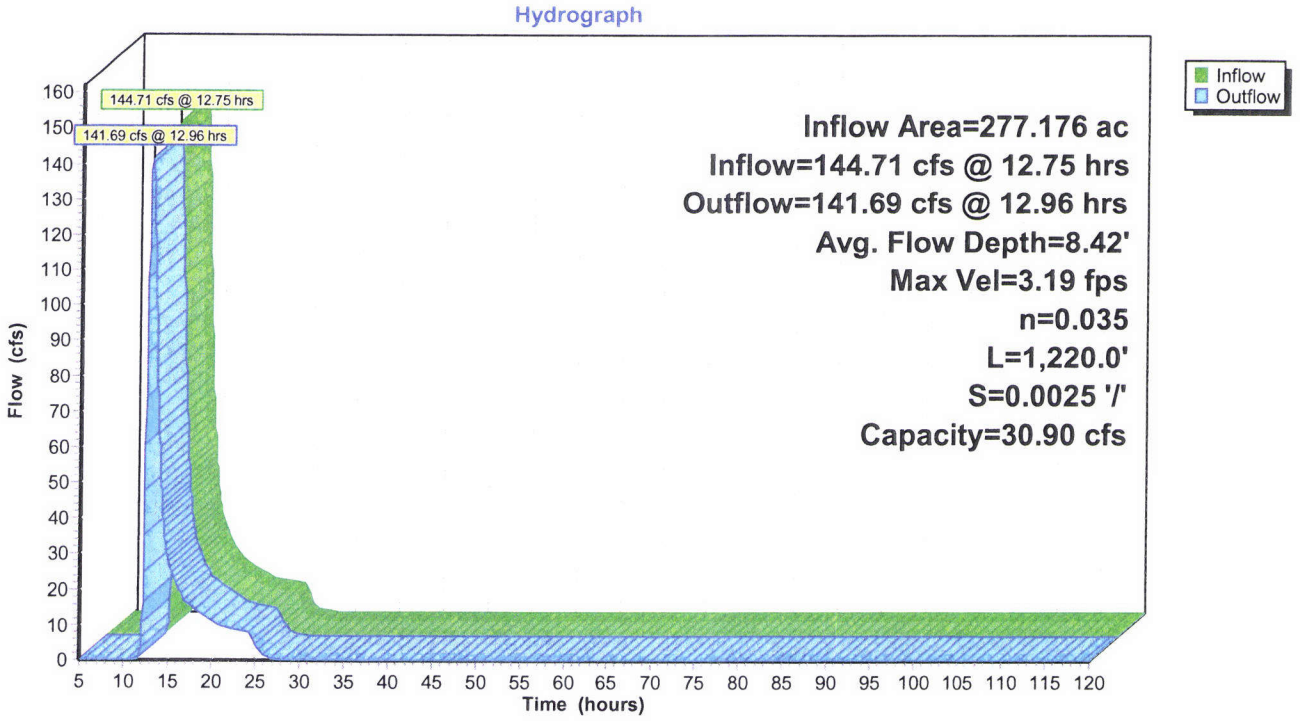
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.19 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 31.3 min

Peak Storage= 54,207 cf @ 12.85 hrs
Average Depth at Peak Storage= 8.42'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 30.90 cfs

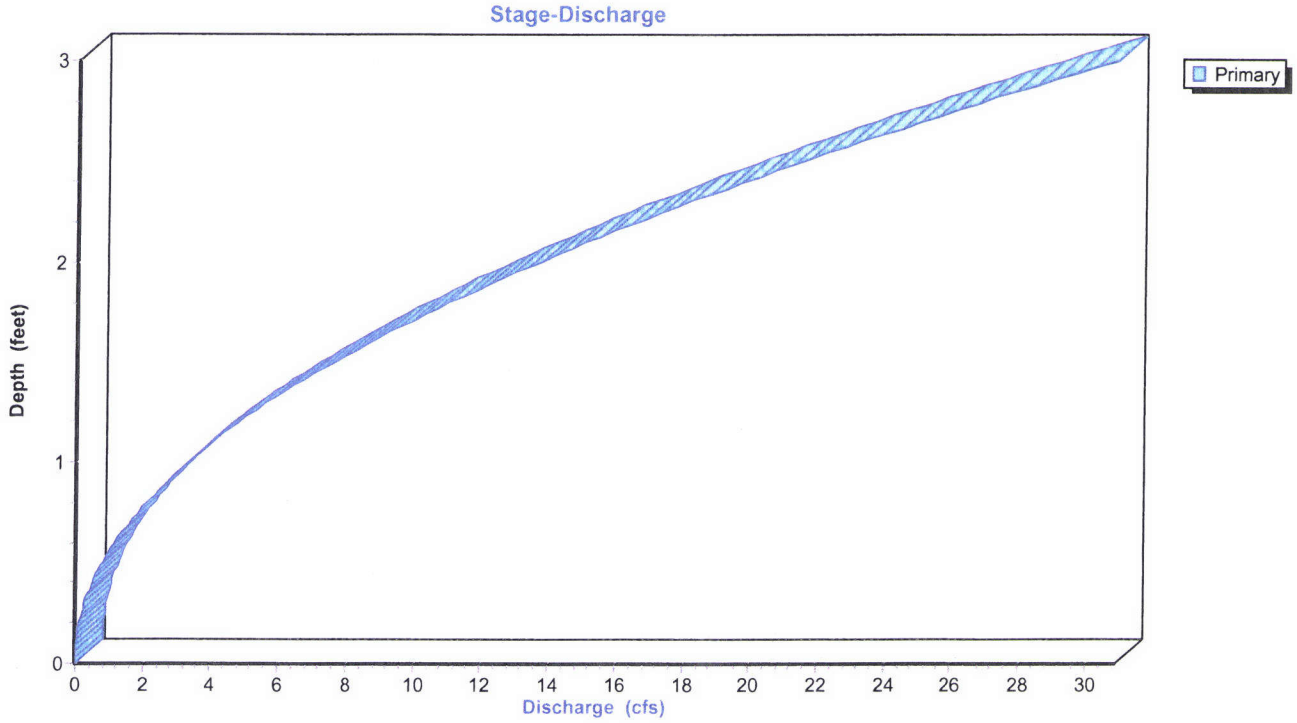
6.00' x 3.00' deep Parabolic Channel, n= 0.035 High grass
Length= 1,220.0' Slope= 0.0025 '/'
Inlet Invert= 631.00', Outlet Invert= 628.00'



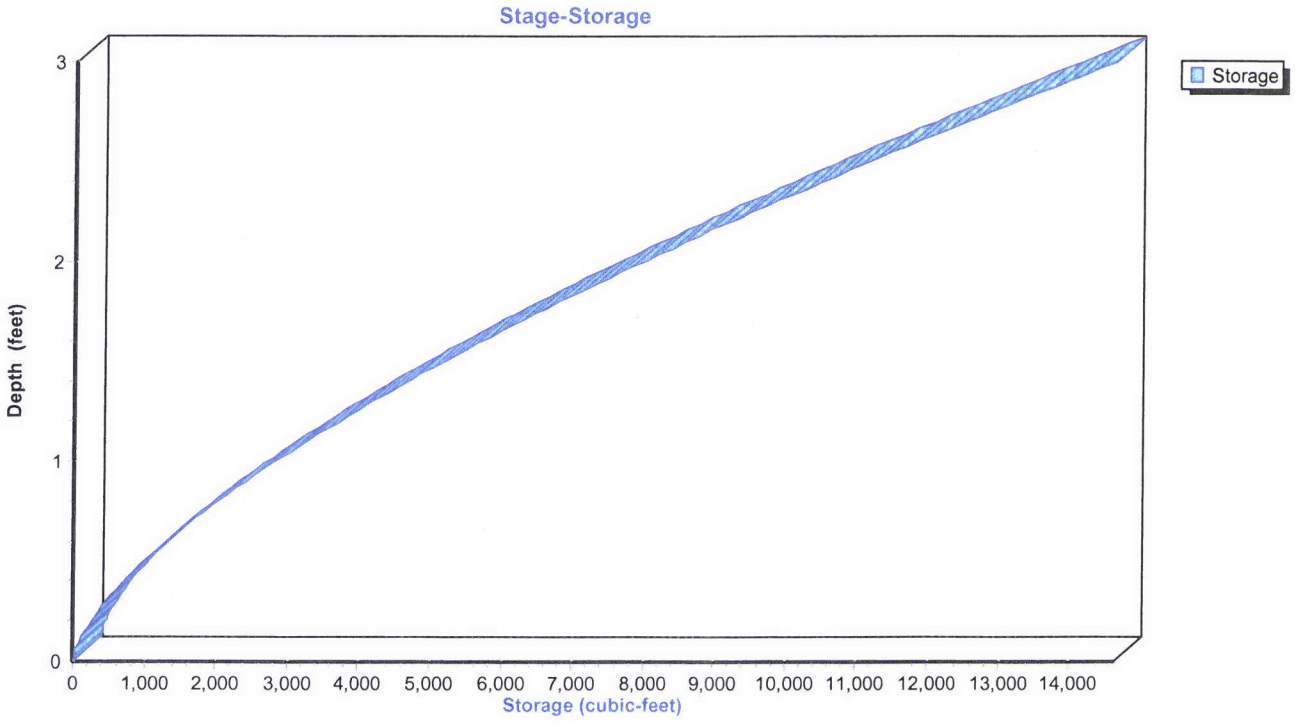
Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



Reach 3R: Drainage Ditch (upper section)



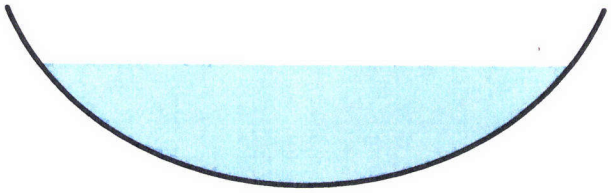
Summary for Reach 4R: Drainage Ditch (Main)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 1.27" for 25-Year event
Inflow = 141.69 cfs @ 12.96 hrs, Volume= 29.425 af
Outflow = 136.93 cfs @ 13.30 hrs, Volume= 29.425 af, Atten= 3%, Lag= 20.2 min

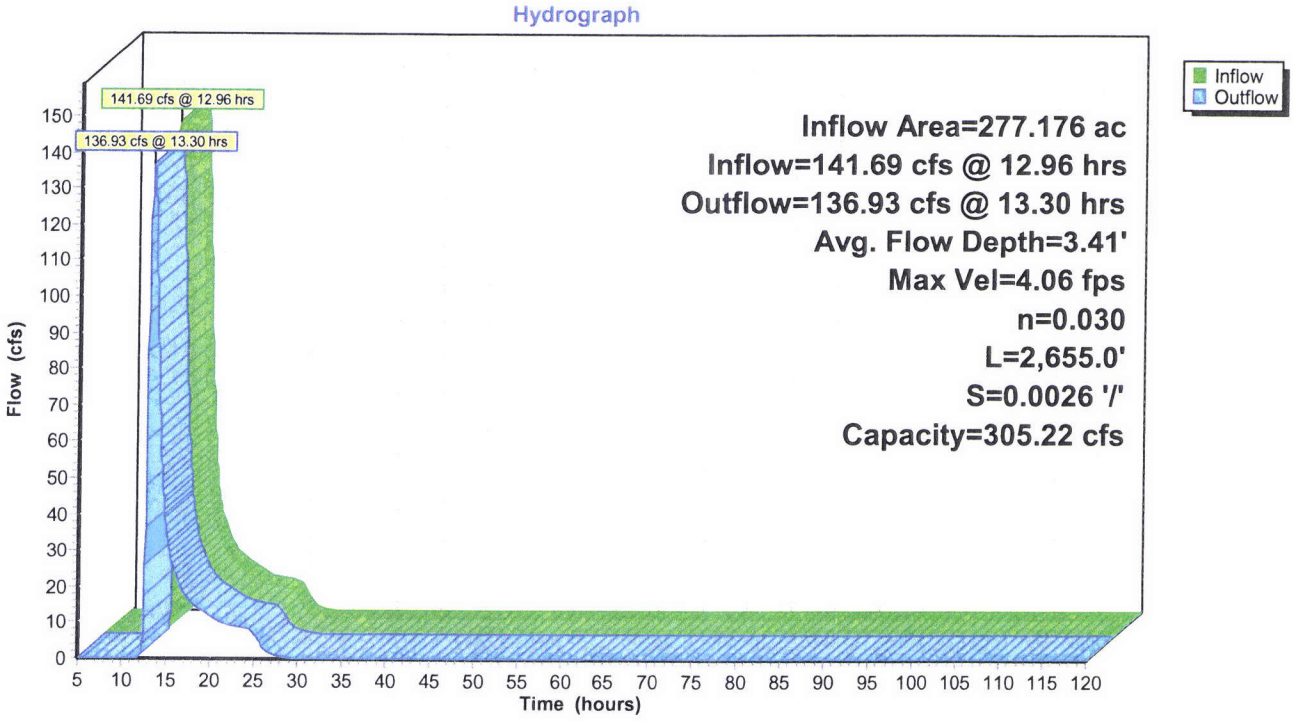
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.06 fps, Min. Travel Time= 10.9 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 61.1 min

Peak Storage= 89,626 cf @ 13.11 hrs
Average Depth at Peak Storage= 3.41'
Bank-Full Depth= 5.00', Capacity at Bank-Full= 305.22 cfs

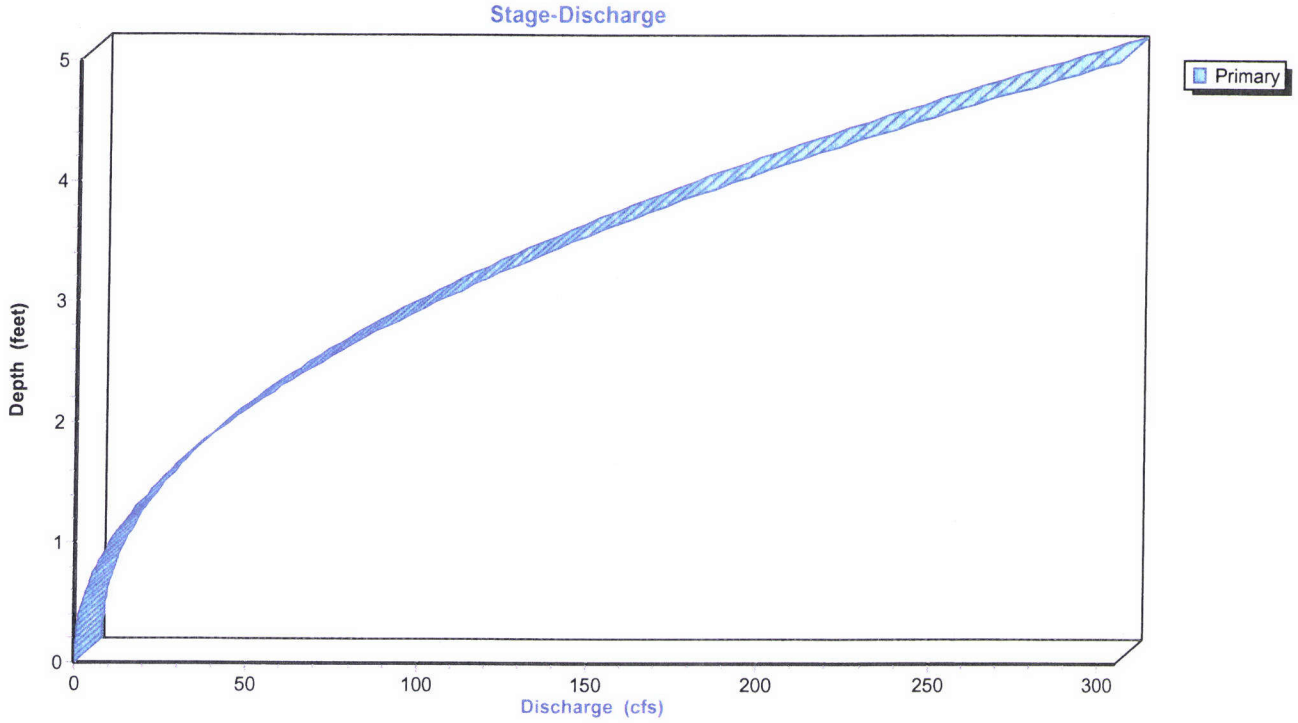
18.00' x 5.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 2,655.0' Slope= 0.0026 '/'
Inlet Invert= 628.00', Outlet Invert= 621.00'



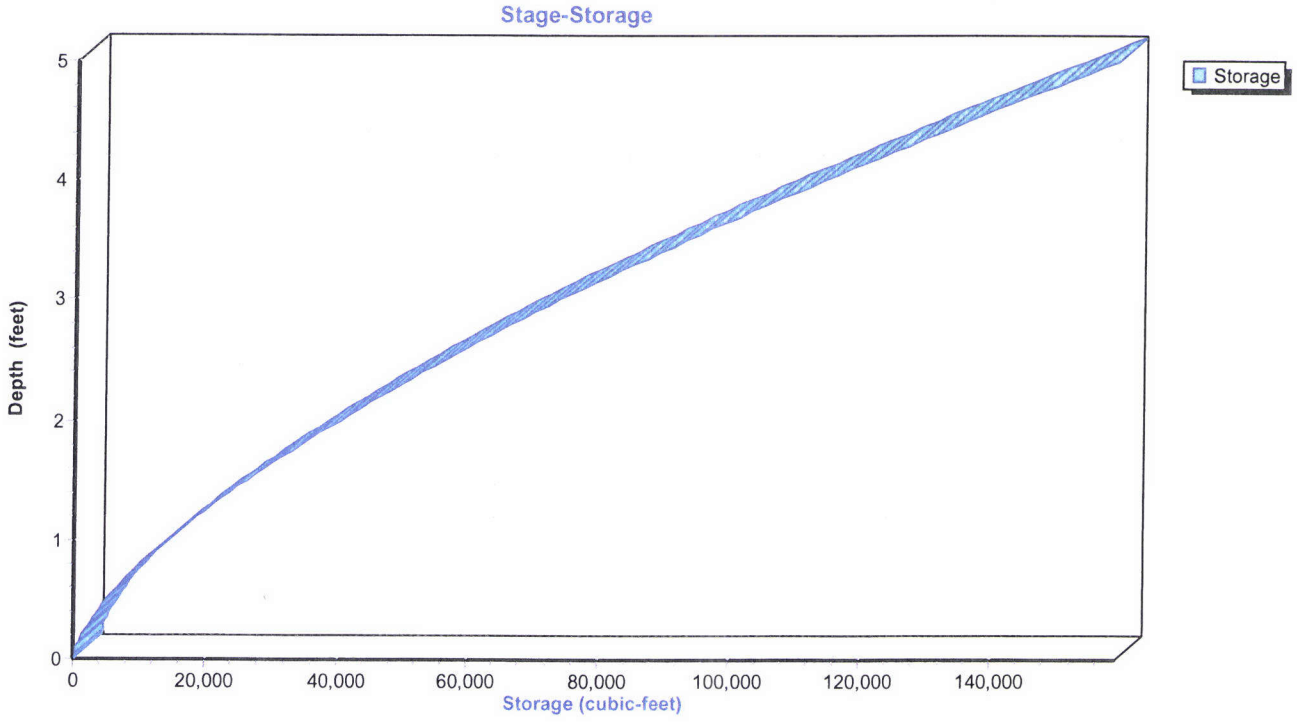
Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



Reach 4R: Drainage Ditch (Main)



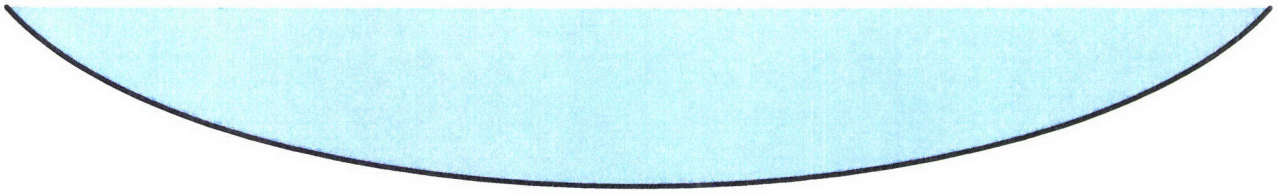
Summary for Reach 5R: Ditch & Swamp

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth = 1.24" for 25-Year event
Inflow = 152.39 cfs @ 13.47 hrs, Volume= 31.889 af
Outflow = 92.80 cfs @ 14.34 hrs, Volume= 31.884 af, Atten= 39%, Lag= 52.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.51 fps, Min. Travel Time= 22.9 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 94.4 min

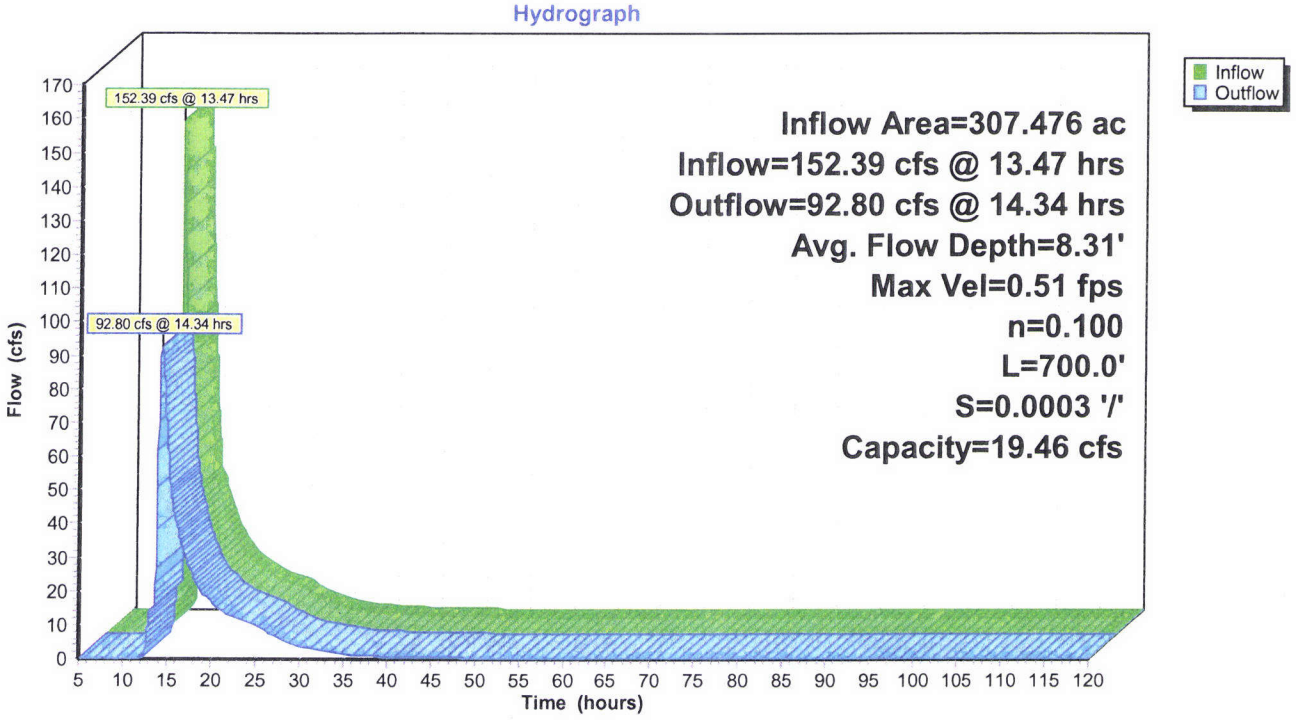
Peak Storage= 127,722 cf @ 13.96 hrs
Average Depth at Peak Storage= 8.31'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 19.46 cfs

25.00' x 3.00' deep Parabolic Channel, n= 0.100 Very weedy reaches w/pools
Length= 700.0' Slope= 0.0003 '/'
Inlet Invert= 620.20', Outlet Invert= 620.00'

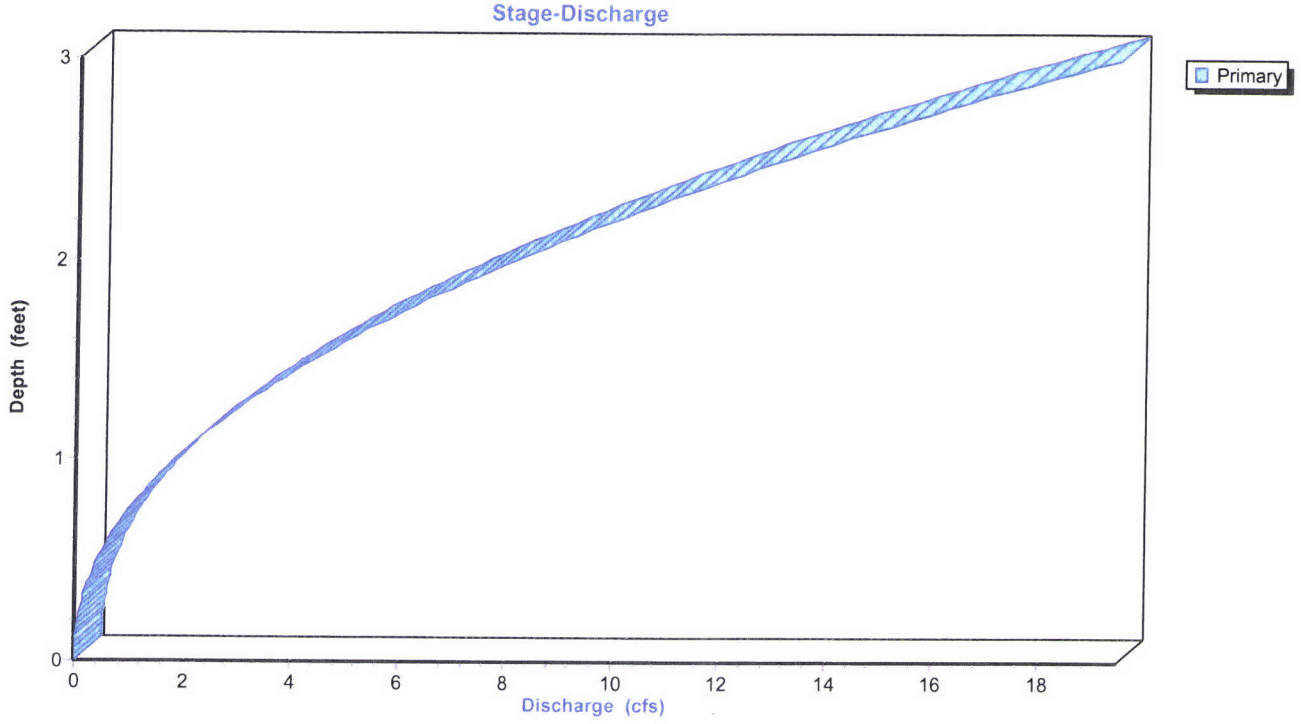


‡

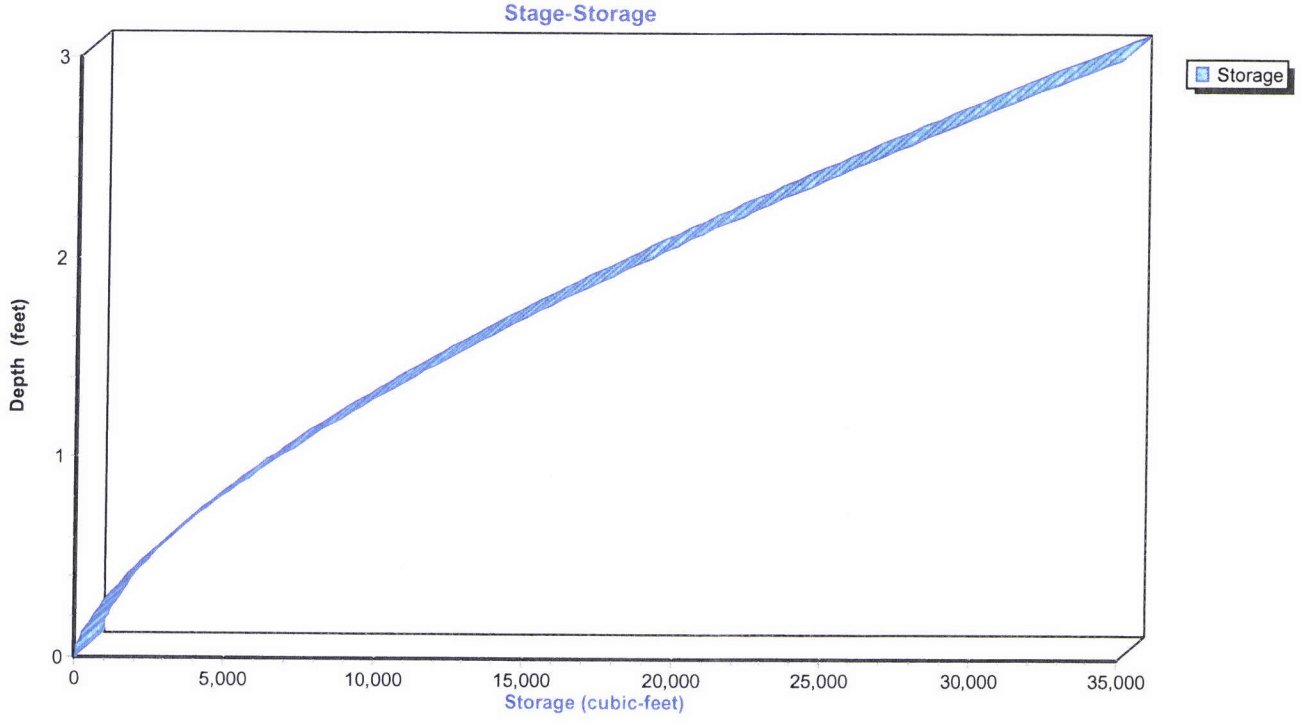
Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



Reach 5R: Ditch & Swamp



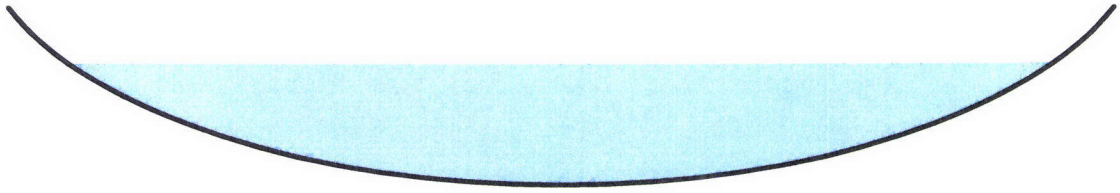
Summary for Reach 6R: School House Marsh (feeder ditch)

Inflow Area = 339.776 ac, 1.42% Impervious, Inflow Depth > 0.68" for 25-Year event
Inflow = 21.50 cfs @ 12.38 hrs, Volume= 19.315 af
Outflow = 19.86 cfs @ 12.62 hrs, Volume= 19.311 af, Atten= 8%, Lag= 14.8 min

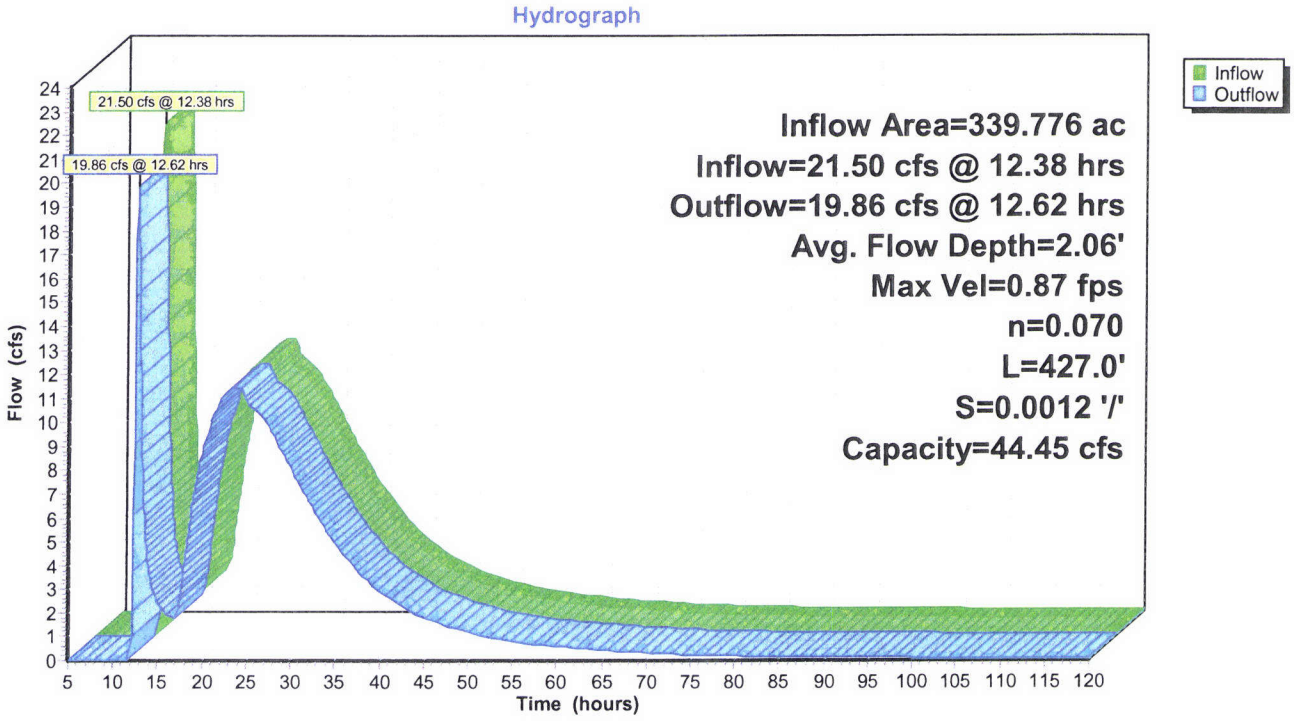
Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.87 fps, Min. Travel Time= 8.1 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 20.7 min

Peak Storage= 9,720 cf @ 12.49 hrs
Average Depth at Peak Storage= 2.06'
Defined Flood Depth= 622.00', Capacity at Flood Depth= 19,490.63 cfs
Bank-Full Depth= 3.00', Capacity at Bank-Full= 44.45 cfs

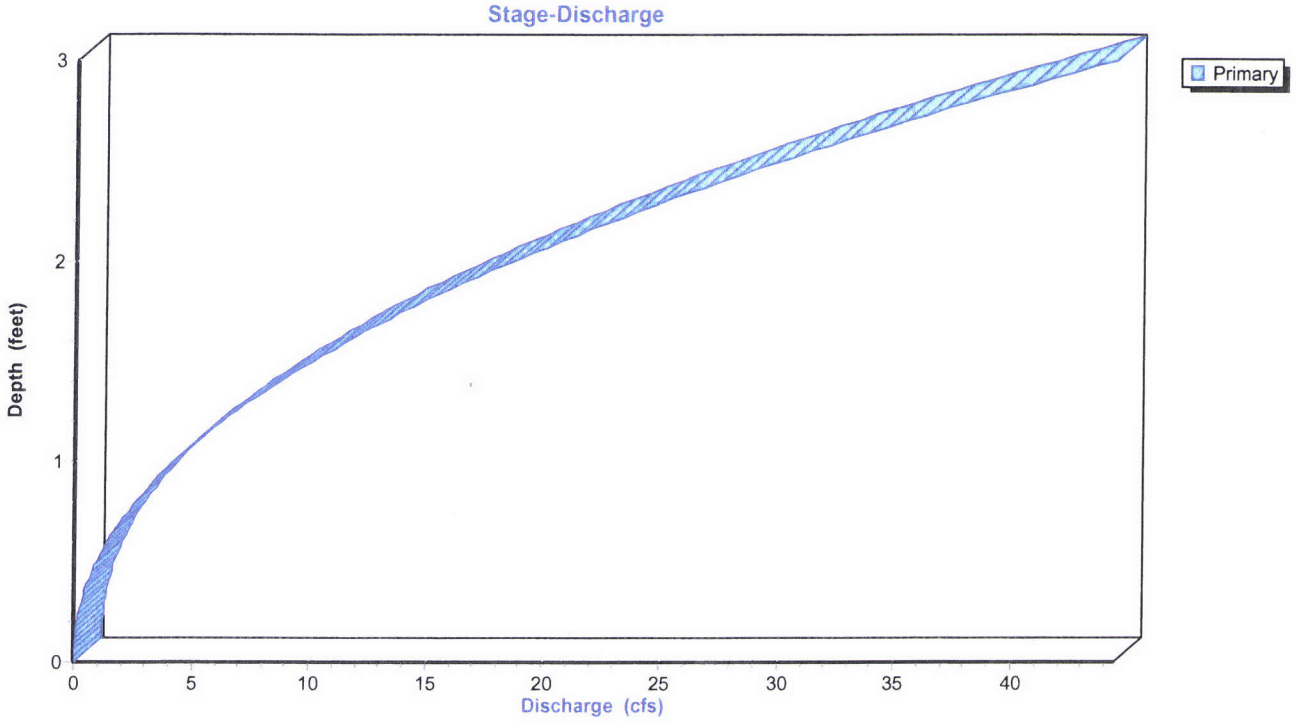
20.00' x 3.00' deep Parabolic Channel, n= 0.070 Sluggish weedy reaches w/pools
Length= 427.0' Slope= 0.0012 '/'
Inlet Invert= 618.50', Outlet Invert= 618.00'



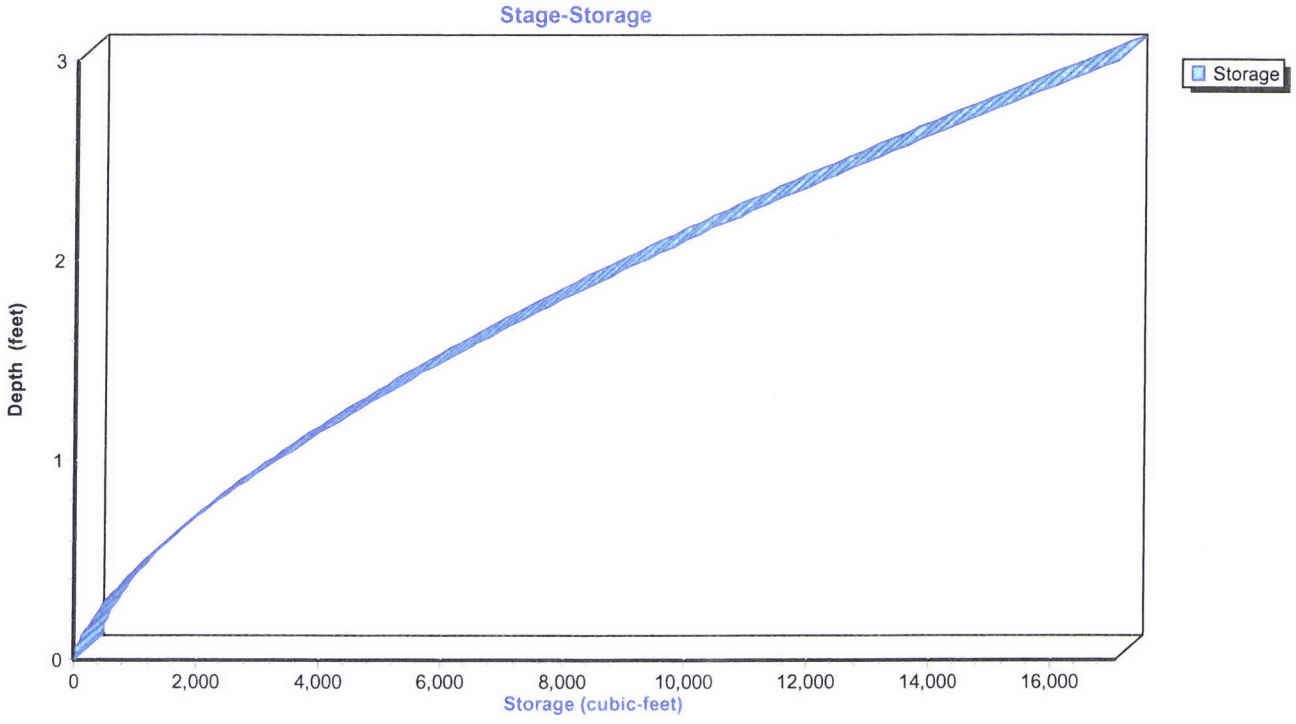
Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Reach 6R: School House Marsh (feeder ditch)



Summary for Reach 7R: (new Reach)

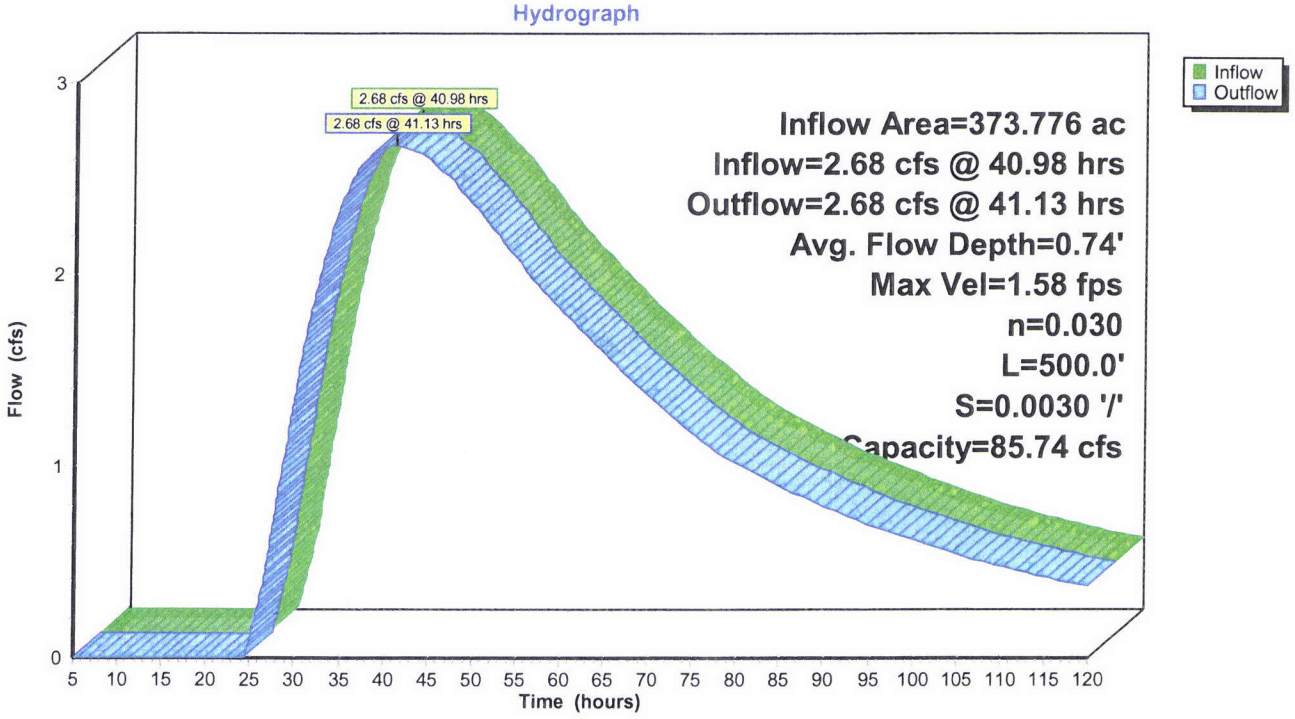
Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.34" for 25-Year event
Inflow = 2.68 cfs @ 40.98 hrs, Volume= 10.444 af
Outflow = 2.68 cfs @ 41.13 hrs, Volume= 10.436 af, Atten= 0%, Lag= 9.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.58 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 6.8 min

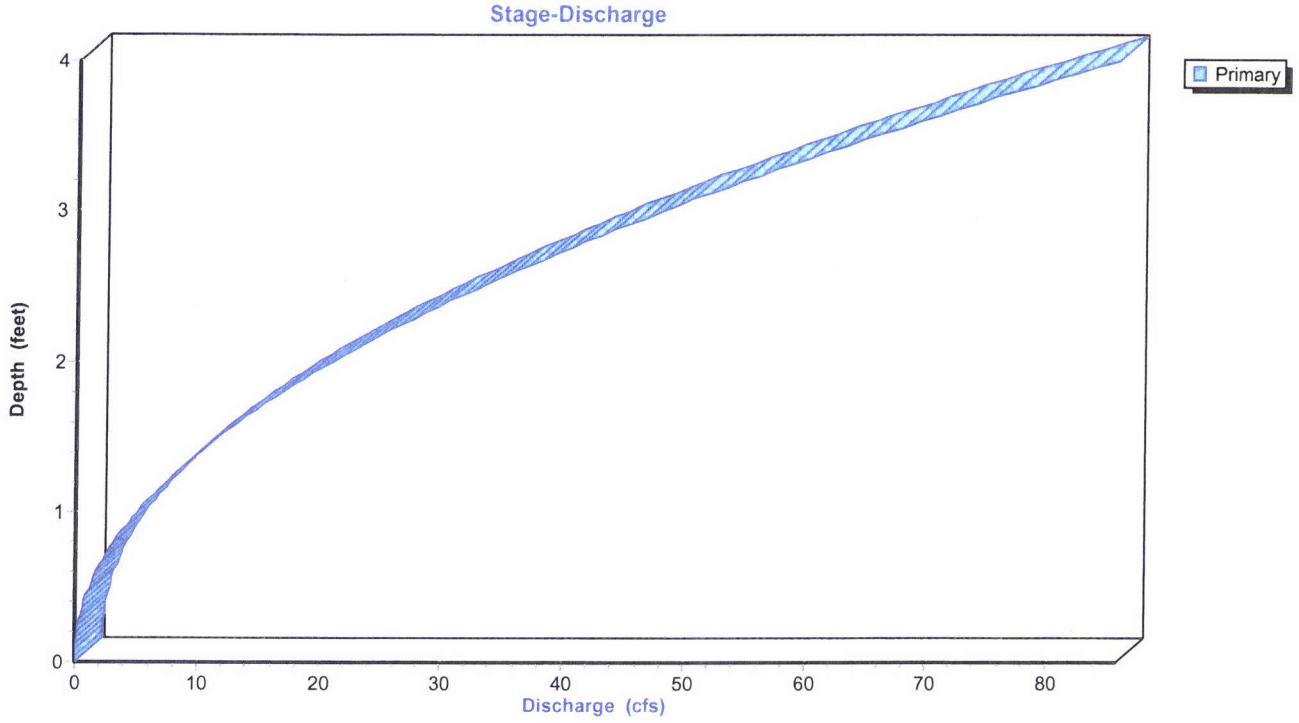
Peak Storage= 849 cf @ 41.04 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 85.74 cfs

8.00' x 4.00' deep Parabolic Channel, n= 0.030 Short grass
Length= 500.0' Slope= 0.0030 '/'
Inlet Invert= 613.50', Outlet Invert= 612.00'

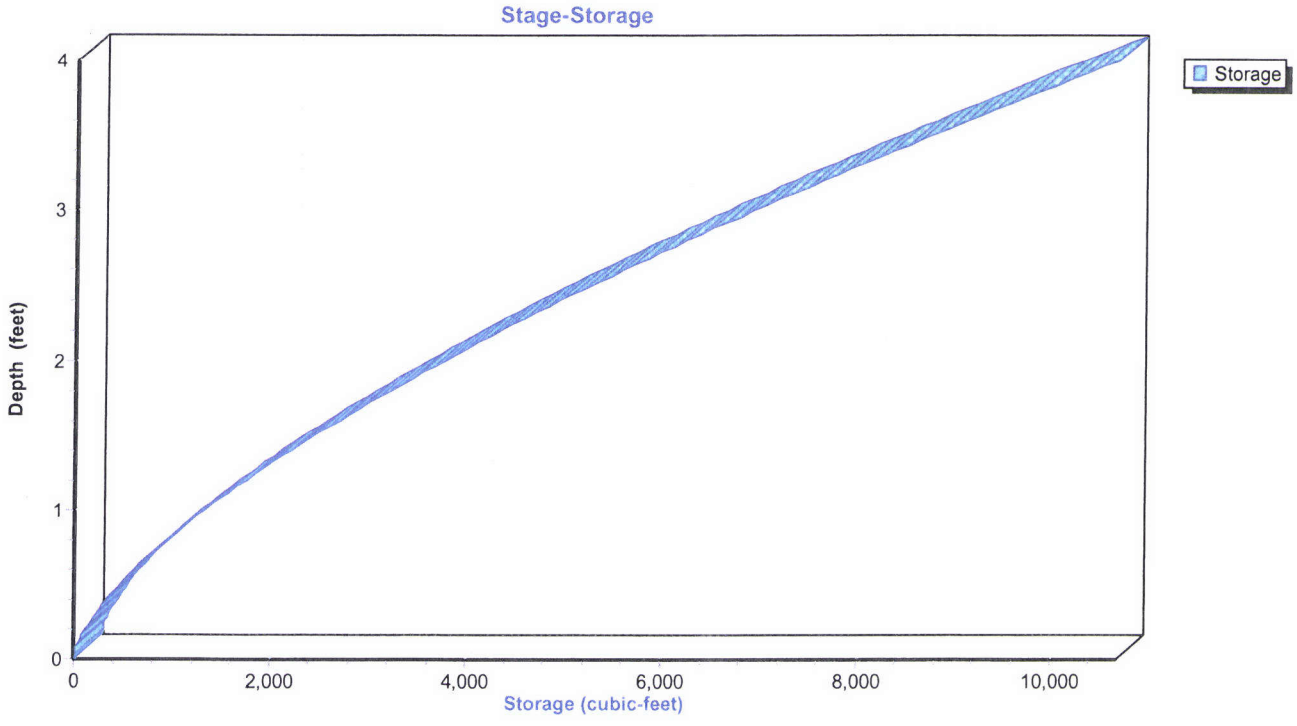
Reach 7R: (new Reach)



Reach 7R: (new Reach)



Reach 7R: (new Reach)



Summary for Pond 1C: Culvert 1 Fletcher Chapel

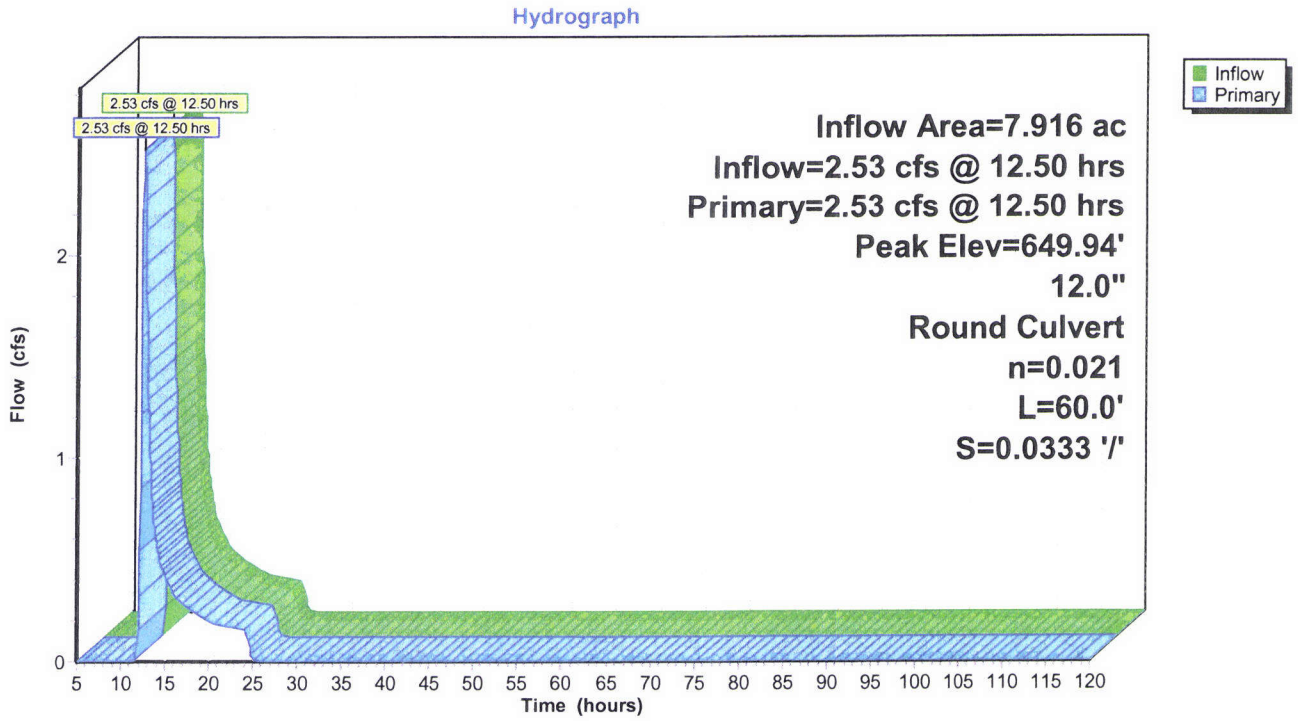
Inflow Area = 7.916 ac, 0.00% Impervious, Inflow Depth = 0.66" for 25-Year event
Inflow = 2.53 cfs @ 12.50 hrs, Volume= 0.439 af
Outflow = 2.53 cfs @ 12.50 hrs, Volume= 0.439 af, Atten= 0%, Lag= 0.0 min
Primary = 2.53 cfs @ 12.50 hrs, Volume= 0.439 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 649.94' @ 12.50 hrs

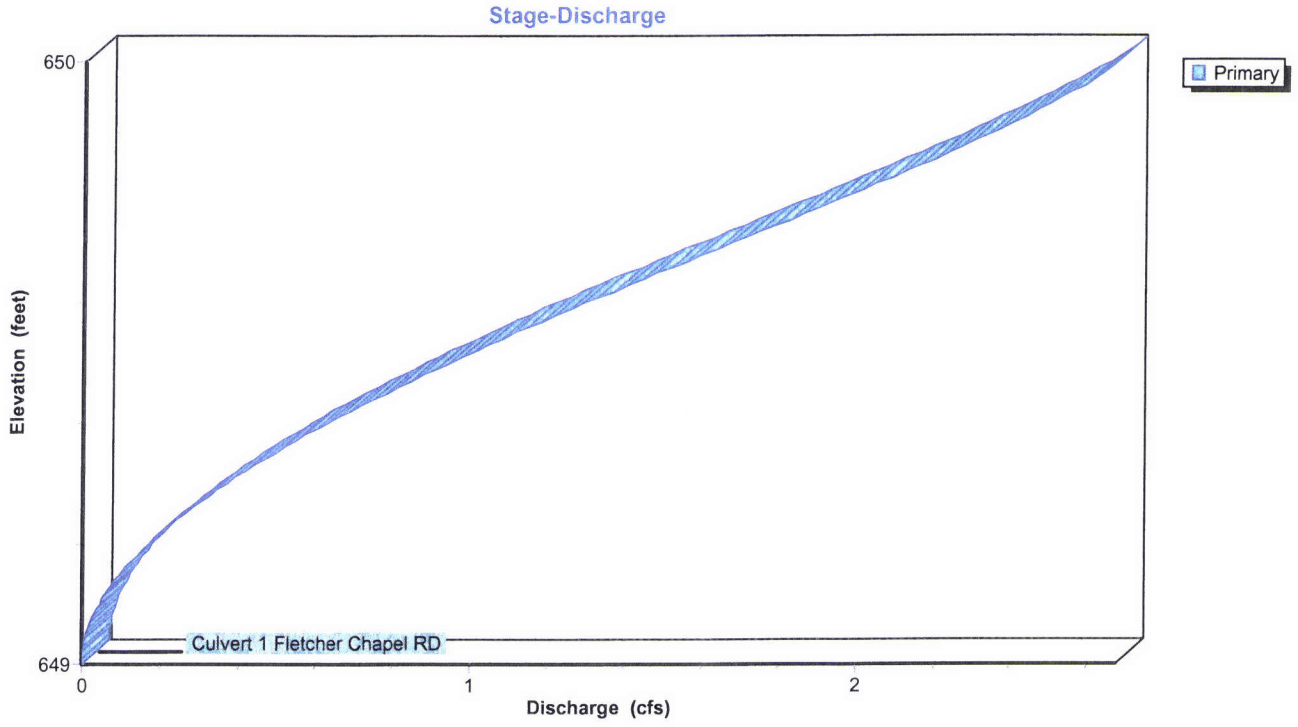
Device	Routing	Invert	Outlet Devices
#1	Primary	649.00'	**12.0" Round Culvert 1 Fletcher Chapel RD** L= 60.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 649.00' / 647.00' S= 0.0333 '/' Cc= 0.900 n= 0.021 Corrugated metal

Primary OutFlow Max=2.52 cfs @ 12.50 hrs HW=649.94' (Free Discharge)
↑**1=Culvert 1 Fletcher Chapel RD** (Inlet Controls 2.52 cfs @ 3.30 fps)

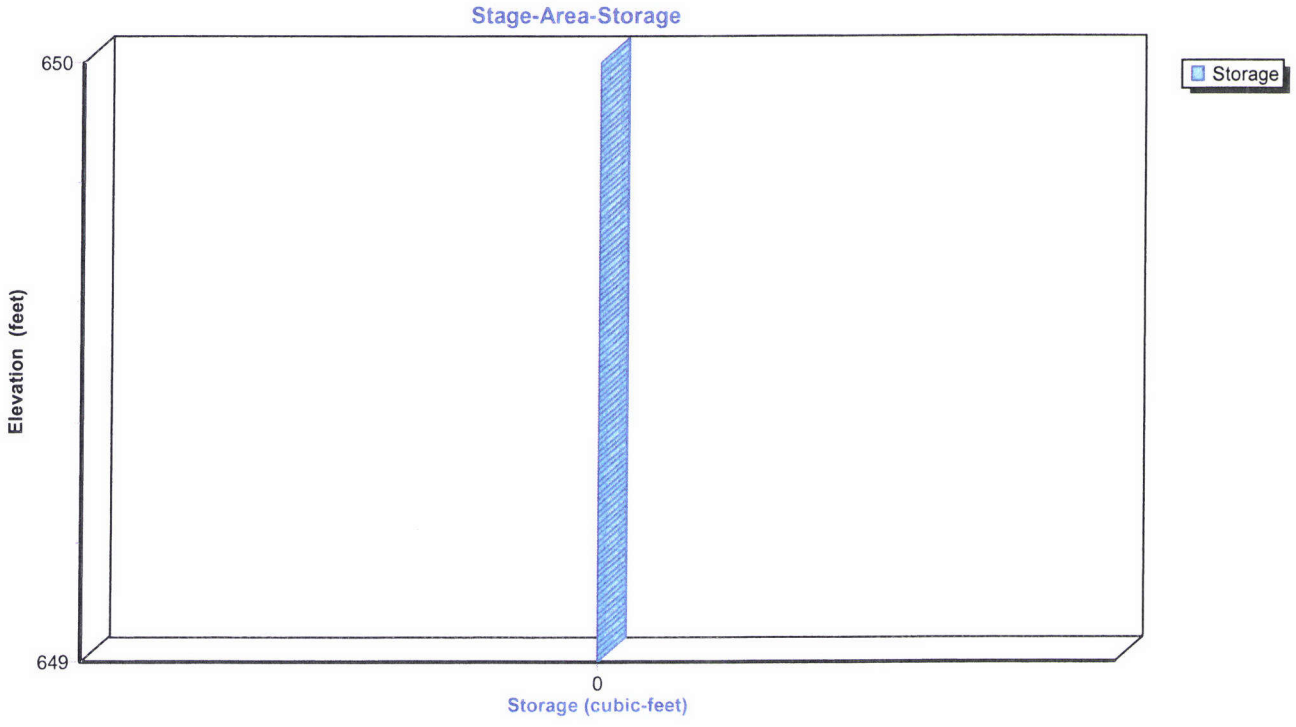
Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Pond 1C: Culvert 1 Fletcher Chapel



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.68" for 25-Year event
Inflow = 28.43 cfs @ 12.61 hrs, Volume= 21.263 af
Outflow = 2.68 cfs @ 40.98 hrs, Volume= 10.444 af, Atten= 91%, Lag= 1,702.1 min
Primary = 2.68 cfs @ 40.98 hrs, Volume= 10.444 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.87' @ 40.98 hrs Surf.Area= 827,789 sf Storage= 3,064,813 cf (691,058 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,851.3 min (3,607.7 - 1,756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

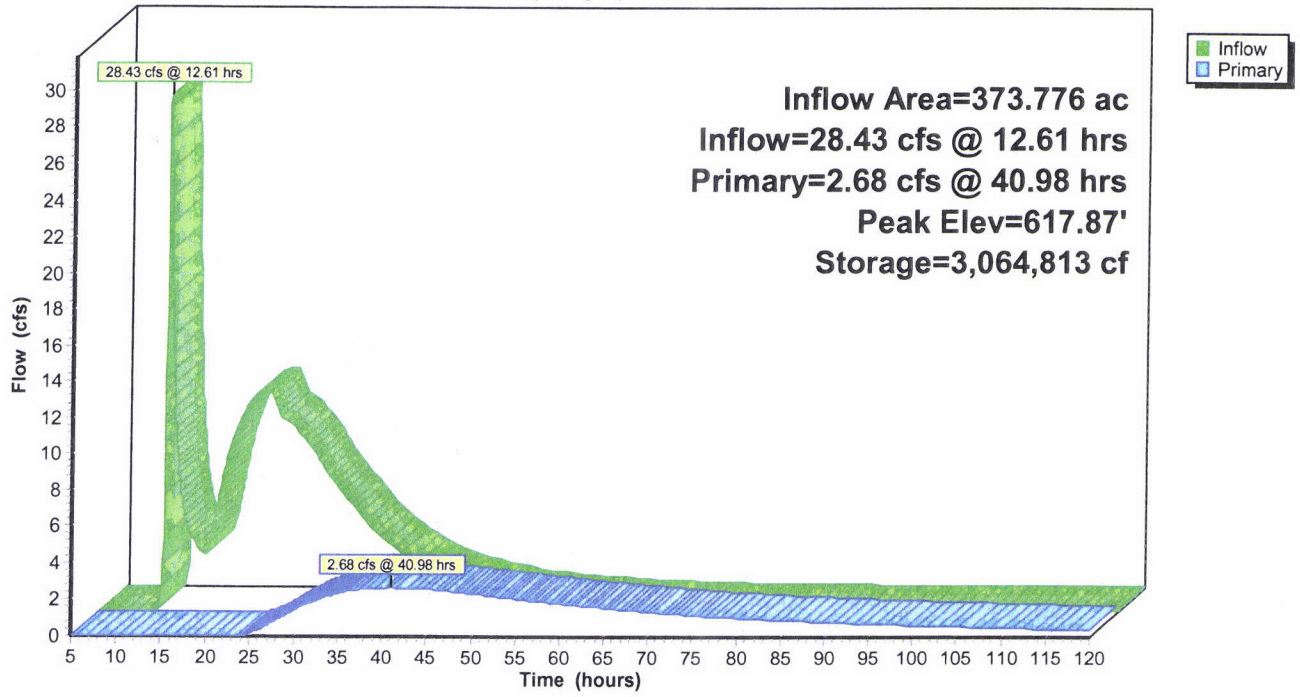
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.66 cfs @ 40.98 hrs HW=617.87' (Free Discharge)
↑—**1=Culvert** (Passes 2.66 cfs of 17.96 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.66 cfs @ 1.98 fps)
—**3=Orifice/Grate** (Controls 0.00 cfs)

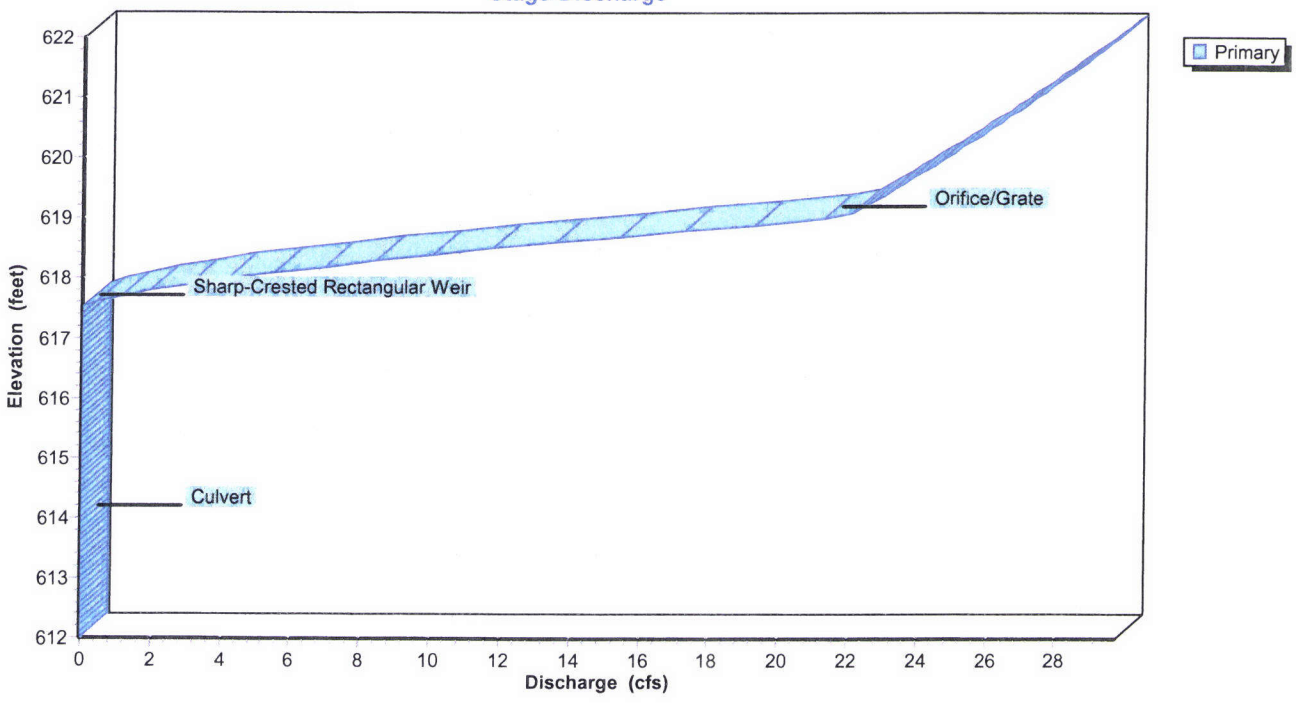
Pond 1P: Schoolhouse Marsh Pond

Hydrograph

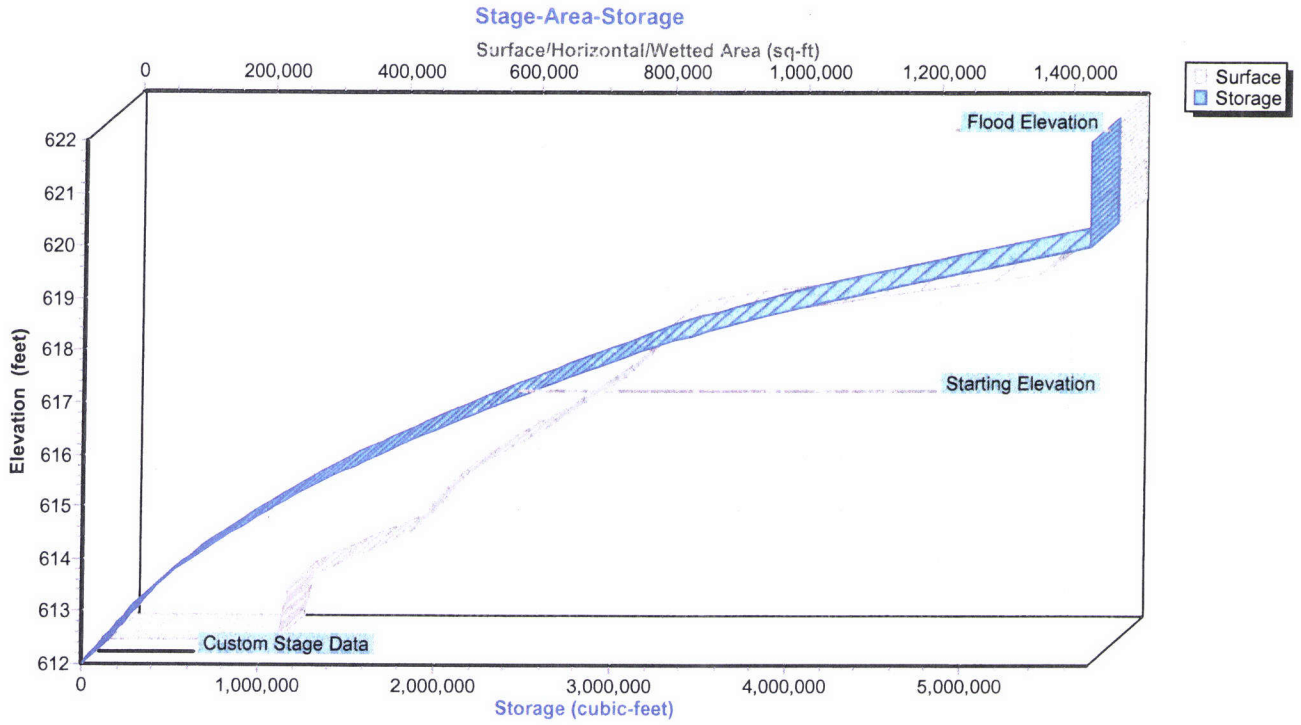


Pond 1P: Schoolhouse Marsh Pond

Stage-Discharge



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 2C: Culvert 2 Runway

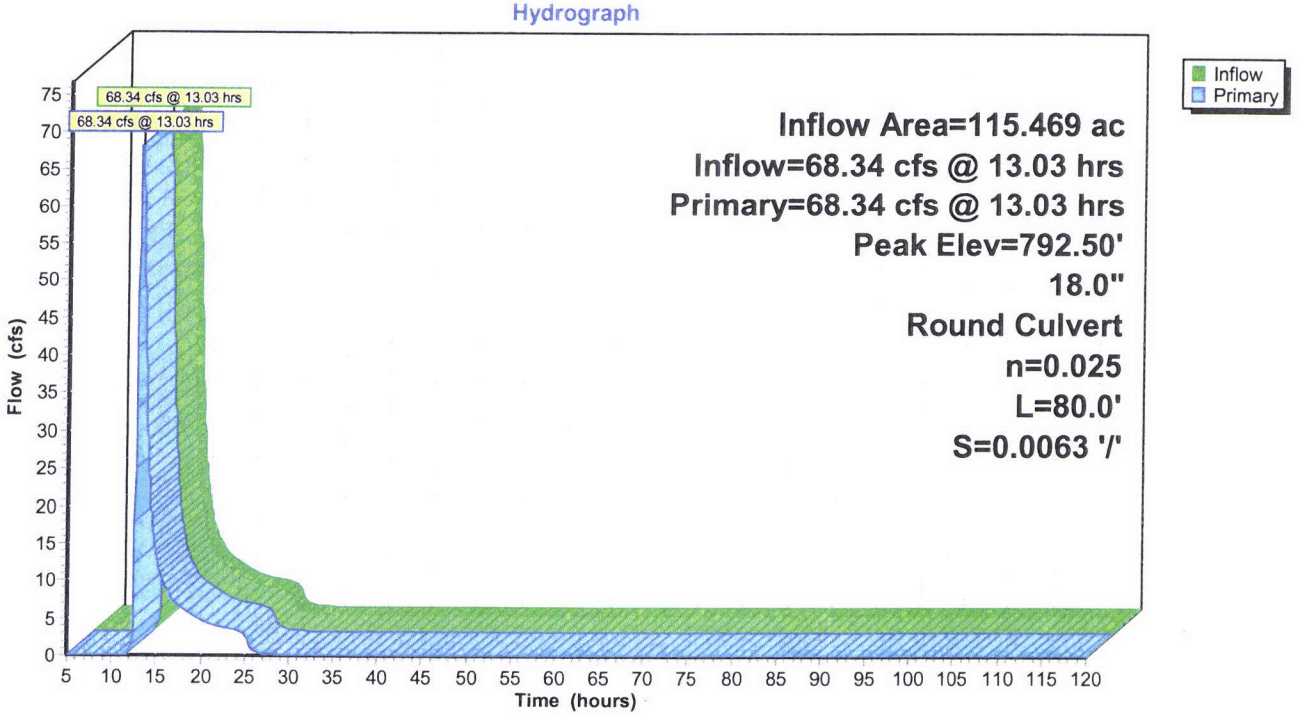
Inflow Area = 115.469 ac, 0.18% Impervious, Inflow Depth = 1.28" for 25-Year event
Inflow = 68.34 cfs @ 13.03 hrs, Volume= 12.356 af
Outflow = 68.34 cfs @ 13.03 hrs, Volume= 12.356 af, Atten= 0%, Lag= 0.0 min
Primary = 68.34 cfs @ 13.03 hrs, Volume= 12.356 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 792.50' @ 13.03 hrs
Flood Elev= 633.00'

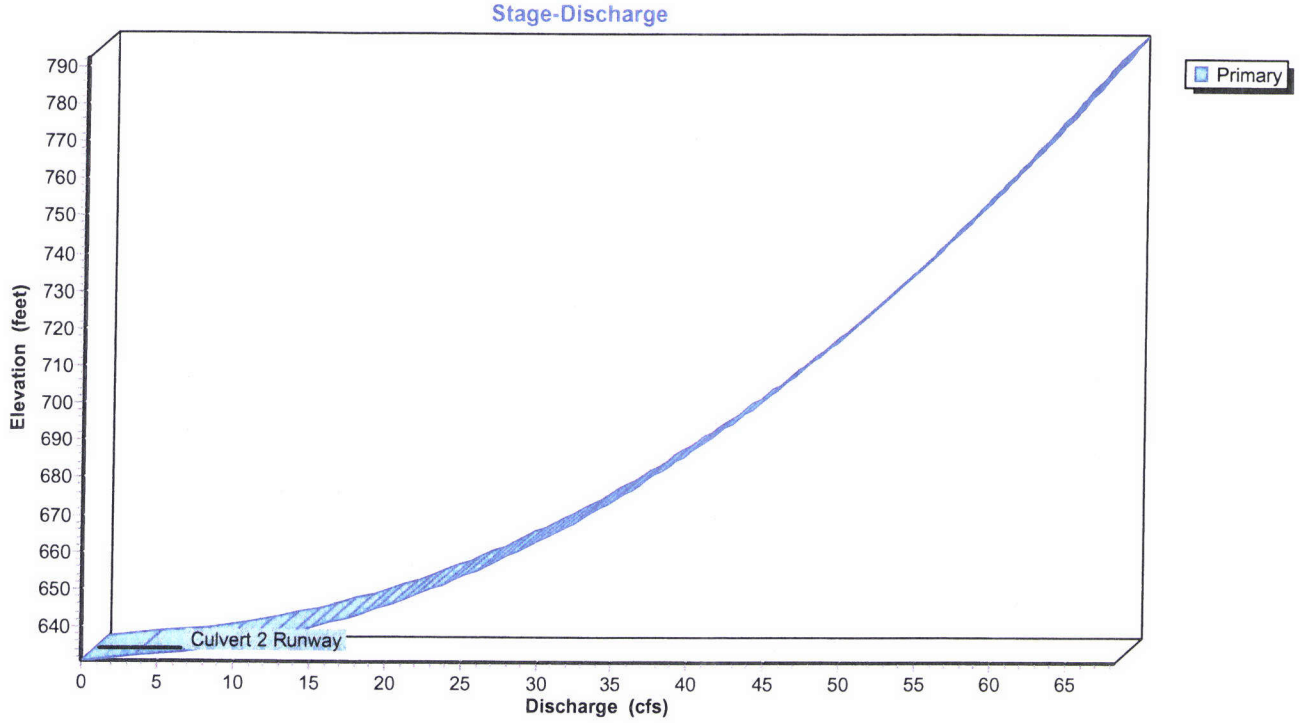
Device	Routing	Invert	Outlet Devices
#1	Primary	631.00'	**18.0" Round Culvert 2 Runway** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 631.00' / 630.50' S= 0.0063 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=68.24 cfs @ 13.03 hrs HW=792.01' (Free Discharge)
1=Culvert 2 Runway (Barrel Controls 68.24 cfs @ 38.62 fps)

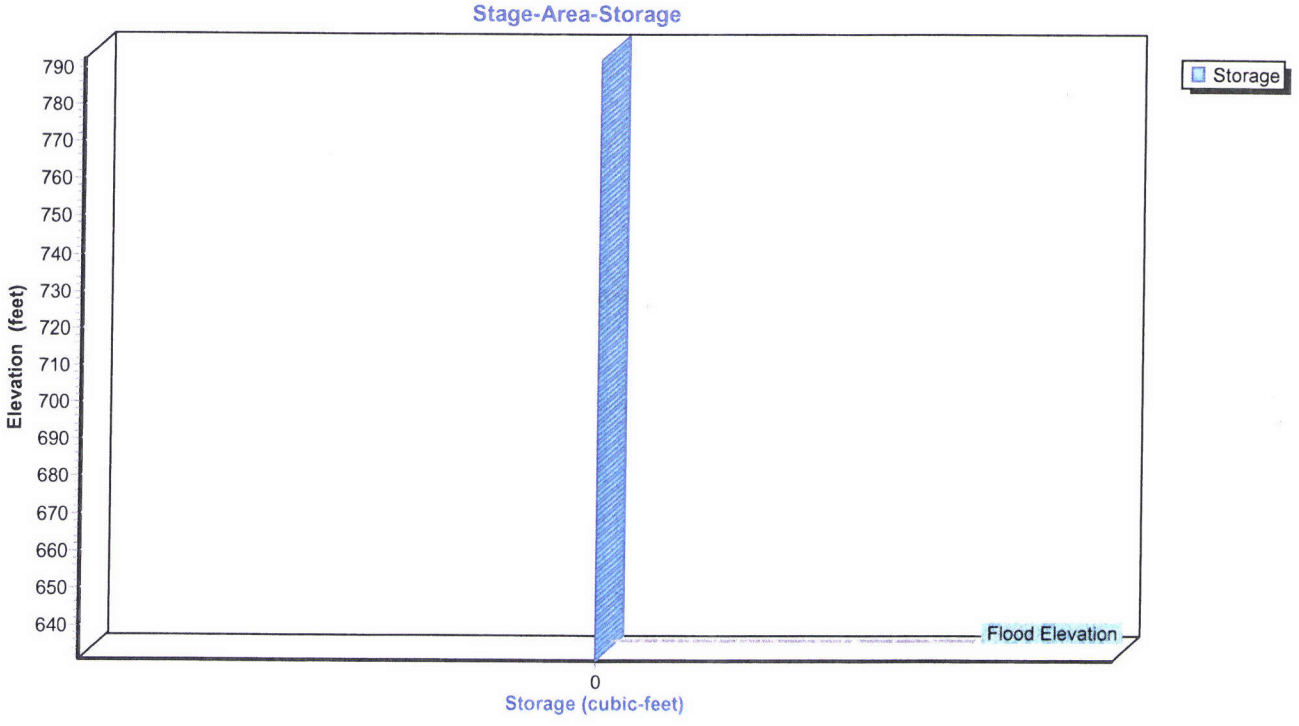
Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Pond 2C: Culvert 2 Runway



Summary for Pond 3C: Culvert (ROW)

Inflow Area = 277.176 ac, 0.30% Impervious, Inflow Depth = 1.27" for 25-Year event
Inflow = 136.93 cfs @ 13.30 hrs, Volume= 29.425 af
Outflow = 146.21 cfs @ 13.47 hrs, Volume= 28.704 af, Atten= 0%, Lag= 10.4 min
Primary = 19.83 cfs @ 13.45 hrs, Volume= 13.624 af
Secondary = 125.73 cfs @ 13.47 hrs, Volume= 15.080 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 624.86' @ 13.47 hrs Surf.Area= 140,320 sf Storage= 285,888 cf
Flood Elev= 623.00' Surf.Area= 140,320 sf Storage= 285,888 cf

Plug-Flow detention time= 191.4 min calculated for 28.692 af (98% of inflow)
Center-of-Mass det. time= 177.7 min (1,138.4 - 960.6)

Volume	Invert	Avail.Storage	Storage Description
#1	620.00'	285,888 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
620.00	37,051	702.0	0	0	37,051
621.00	71,069	1,385.0	53,145	53,145	150,487
622.00	128,499	1,860.0	98,377	151,522	273,157
623.00	140,320	2,180.0	134,366	285,888	376,054

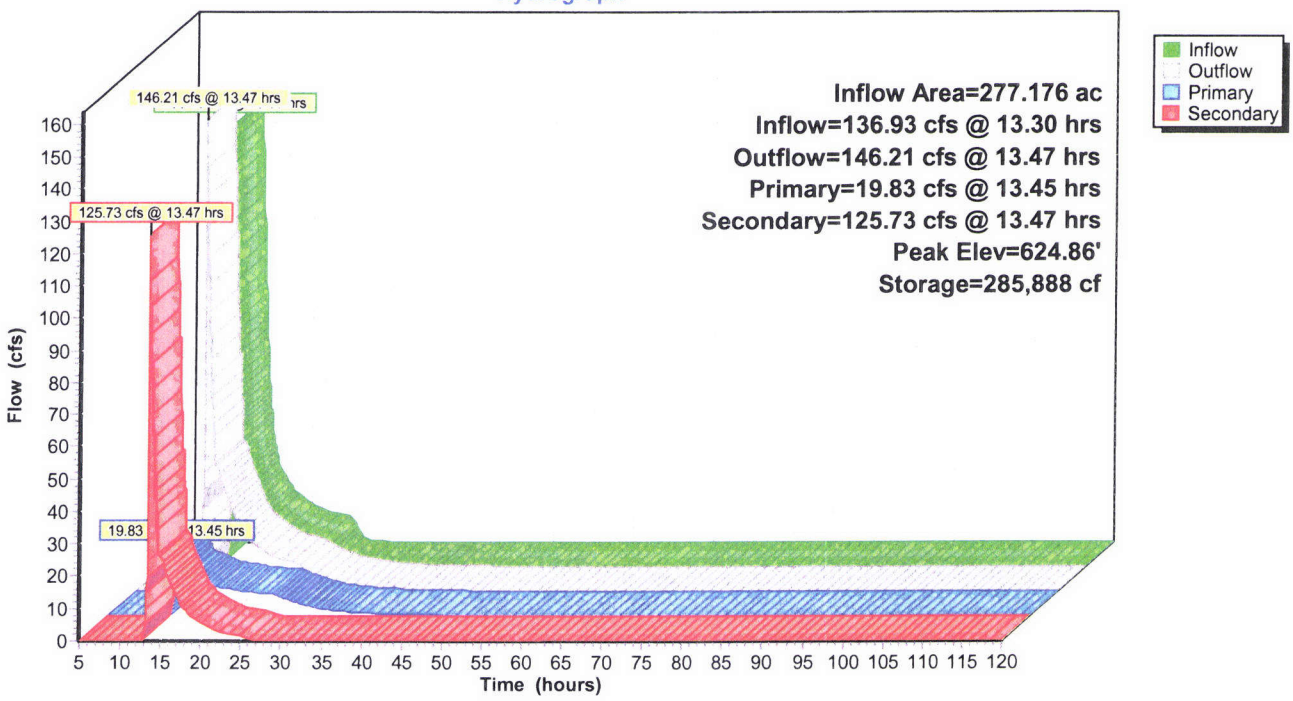
Device	Routing	Invert	Outlet Devices
#1	Primary	620.60'	**24.0" Round Culvert** L= 80.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 620.60' / 620.20' S= 0.0050 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior
#2	Secondary	622.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=19.83 cfs @ 13.45 hrs HW=624.71' (Free Discharge)
└**1=Culvert** (Barrel Controls 19.83 cfs @ 6.31 fps)

Secondary OutFlow Max=113.10 cfs @ 13.47 hrs HW=624.63' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 113.10 cfs @ 4.30 fps)

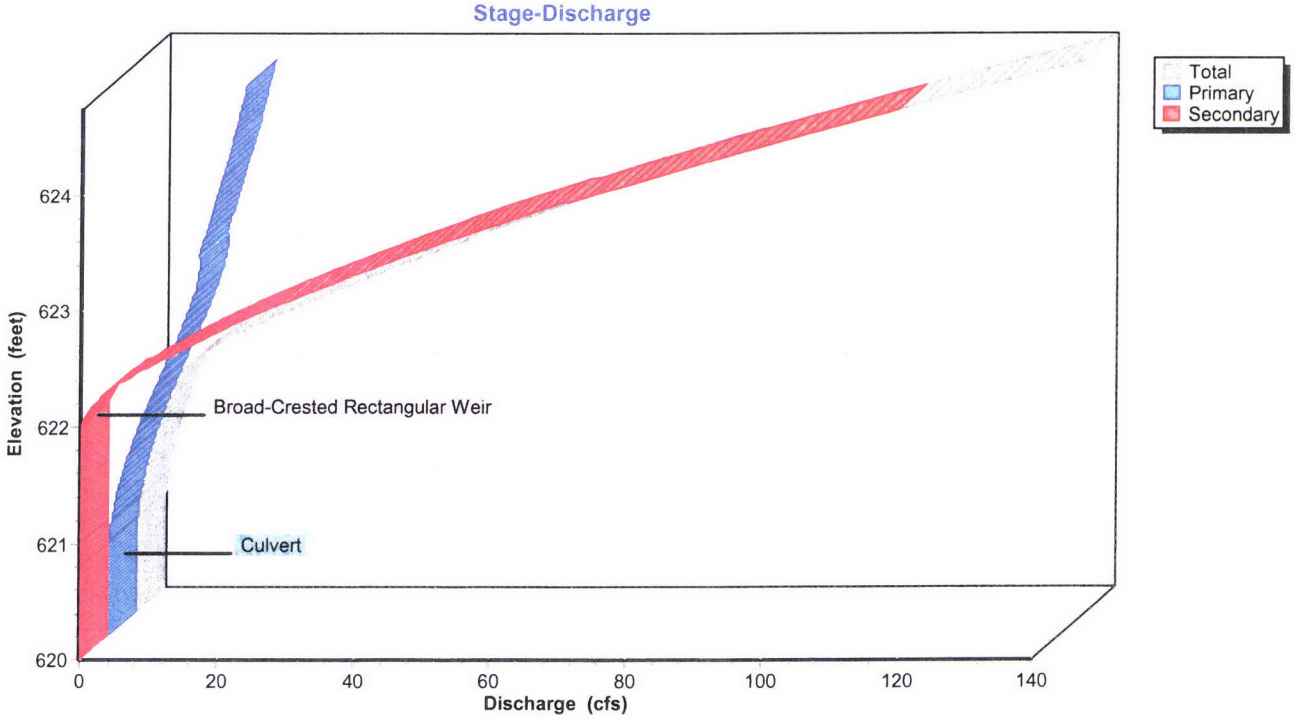
Pond 3C: Culvert (ROW)

Hydrograph

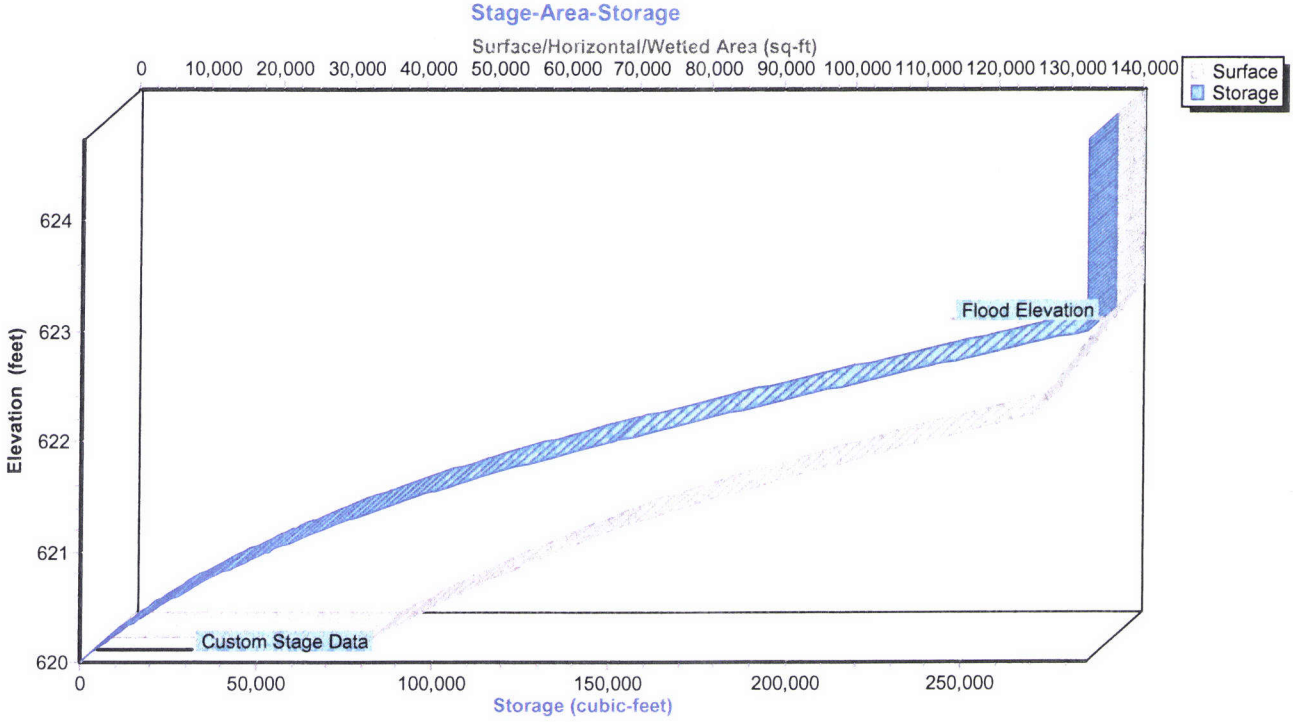


Pond 3C: Culvert (ROW)

Stage-Discharge



Pond 3C: Culvert (ROW)



Summary for Pond 4C: 4C

Inflow Area = 307.476 ac, 1.57% Impervious, Inflow Depth > 1.24" for 25-Year event
Inflow = 92.80 cfs @ 14.34 hrs, Volume= 31.884 af
Outflow = 10.63 cfs @ 24.26 hrs, Volume= 16.547 af, Atten= 89%, Lag= 595.0 min
Primary = 10.63 cfs @ 24.26 hrs, Volume= 16.547 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Peak Elev= 619.09' @ 24.26 hrs Surf.Area= 523,007 sf Storage= 947,551 cf
Flood Elev= 622.00' Surf.Area= 535,800 sf Storage= 1,427,903 cf

Plug-Flow detention time= 1,068.8 min calculated for 16.540 af (52% of inflow)
Center-of-Mass det. time= 803.9 min (1,972.5 - 1,168.6)

Volume	Invert	Avail.Storage	Storage Description
#1	616.00'	1,427,903 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

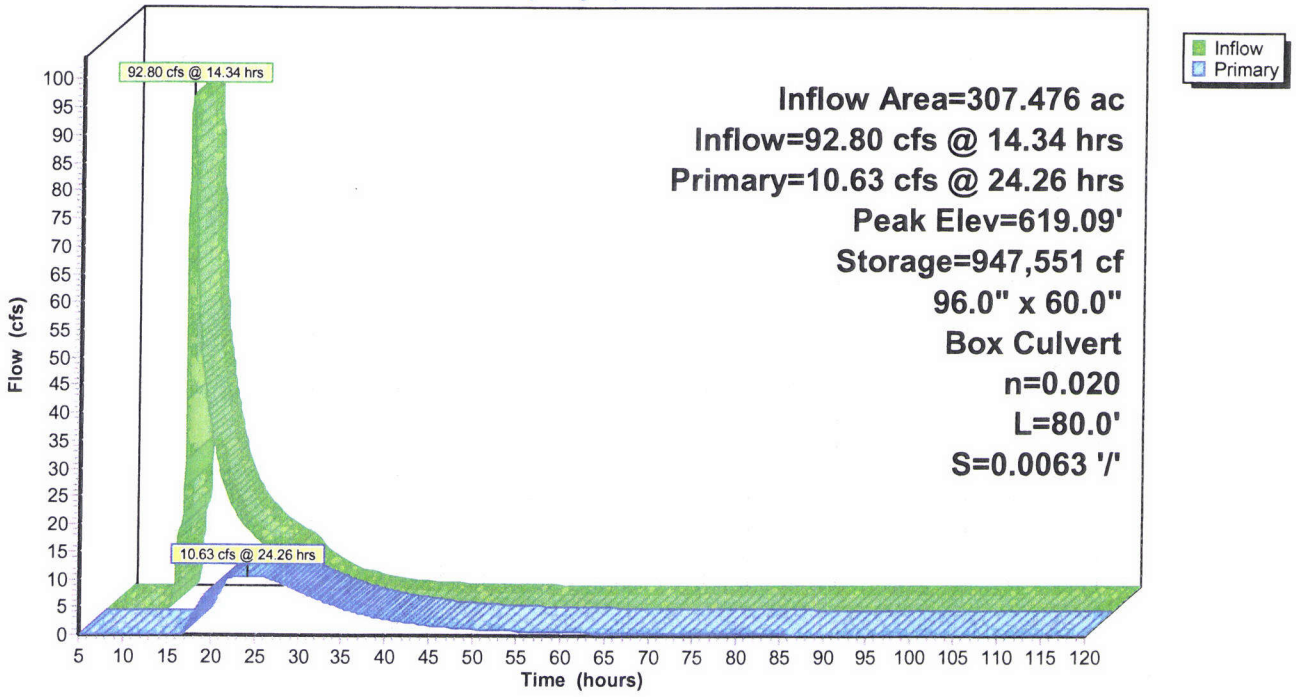
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
616.00	42,800	305.0	0	0	42,800
617.00	286,279	2,304.0	146,590	146,590	457,830
618.00	351,919	2,393.0	318,535	465,125	491,178
619.00	521,710	2,863.0	434,038	899,163	687,778
620.00	535,800	3,120.0	528,739	1,427,903	810,175

Device	Routing	Invert	Outlet Devices
#1	Primary	618.50'	**96.0" W x 60.0" H Box Culvert at Sour Springs RD.** L= 80.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 618.50' / 618.00' S= 0.0063 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=10.62 cfs @ 24.26 hrs HW=619.09' (Free Discharge)
↑**1=Culvert at Sour Springs RD.** (Barrel Controls 10.62 cfs @ 2.99 fps)

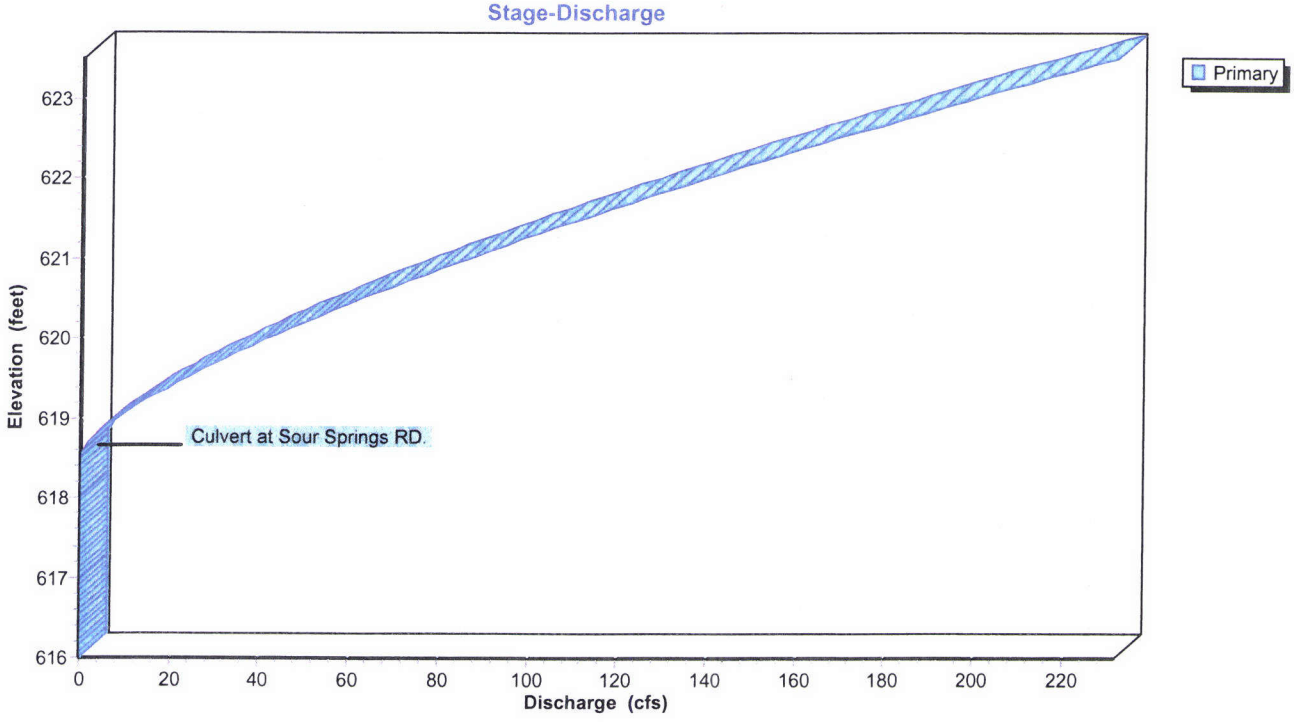
Pond 4C: 4C

Hydrograph

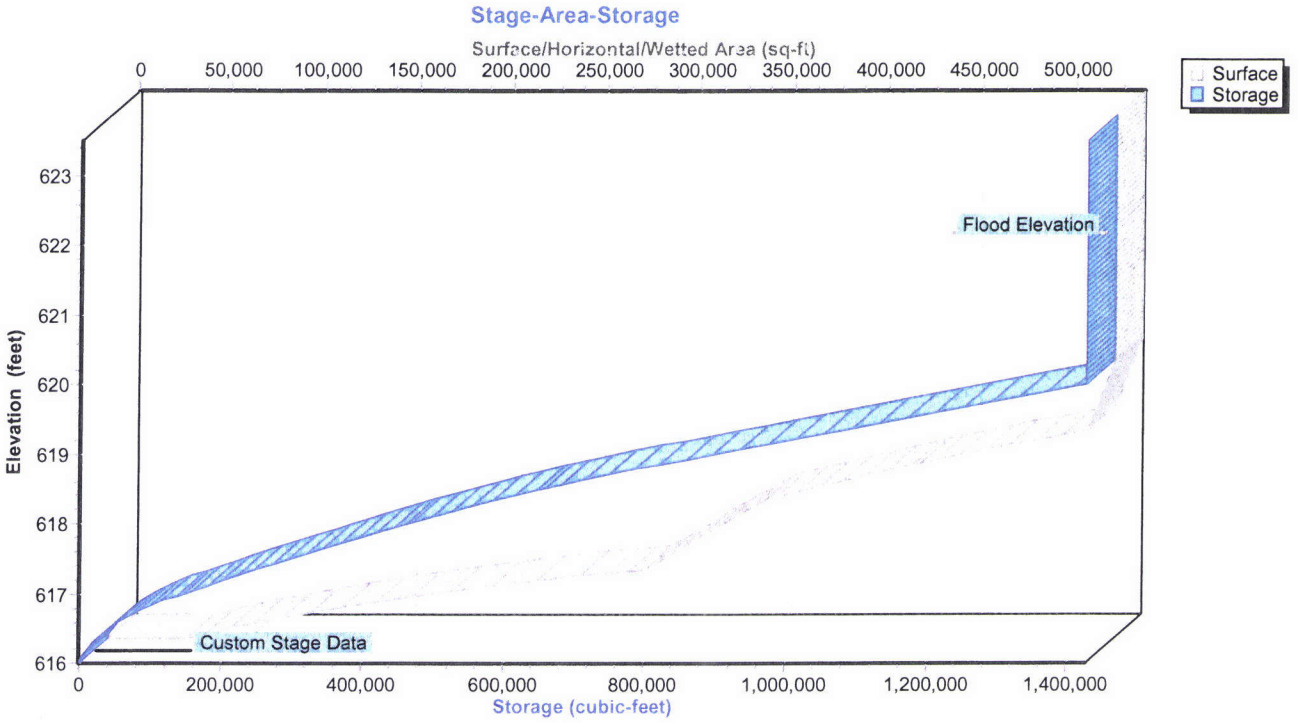


Pond 4C: 4C

Stage-Discharge



Pond 4C: 4C


Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
Surface
Storage
623
622
621
620
619
618
617
616
Elevation (feet)
Flood Elevation
Custom Stage Data
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
Storage (cubic-feet)

HydroCAD Individual Node Report
For Pond 1P School House Marsh Pond

(251 gpm or 0.56 cfs Discharge From Quarry)

Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth = 0.04" for 2-Year event
Inflow = 4.27 cfs @ 12.88 hrs, Volume= 1.207 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.07' @ 72.40 hrs Surf.Area= 771,337 sf Storage= 2,426,242 cf (52,486 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

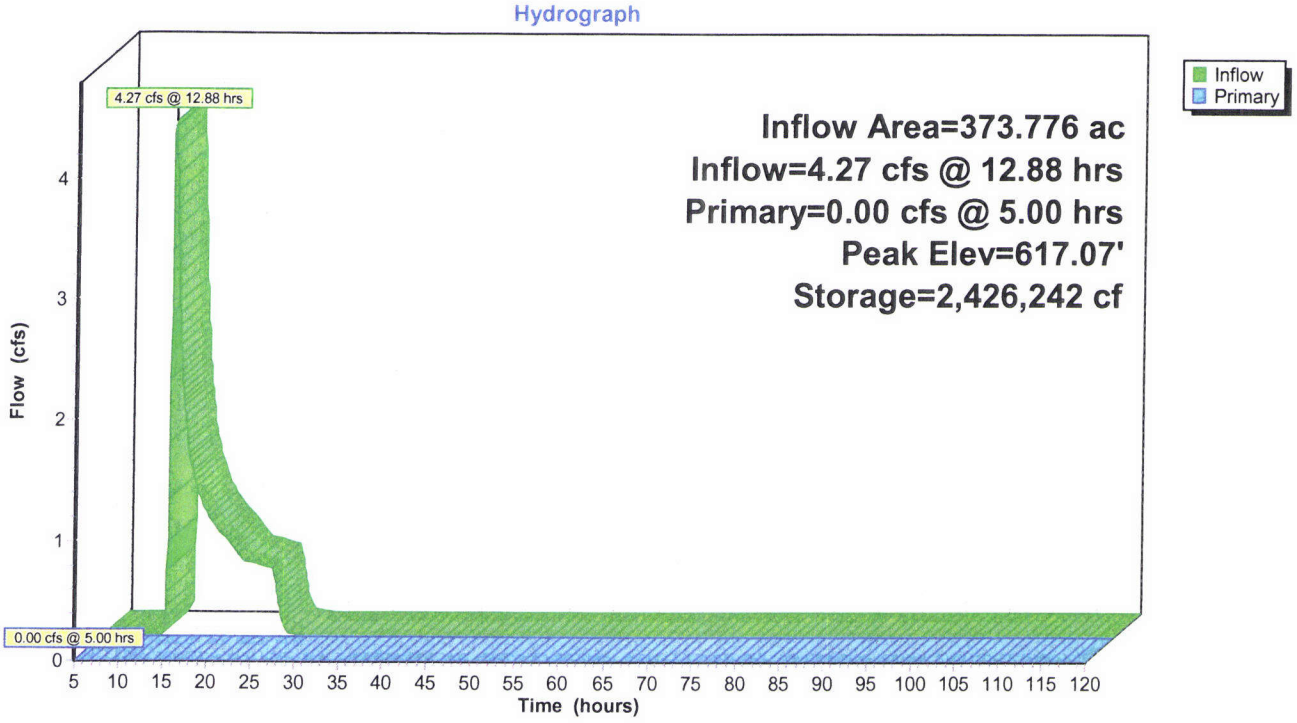
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

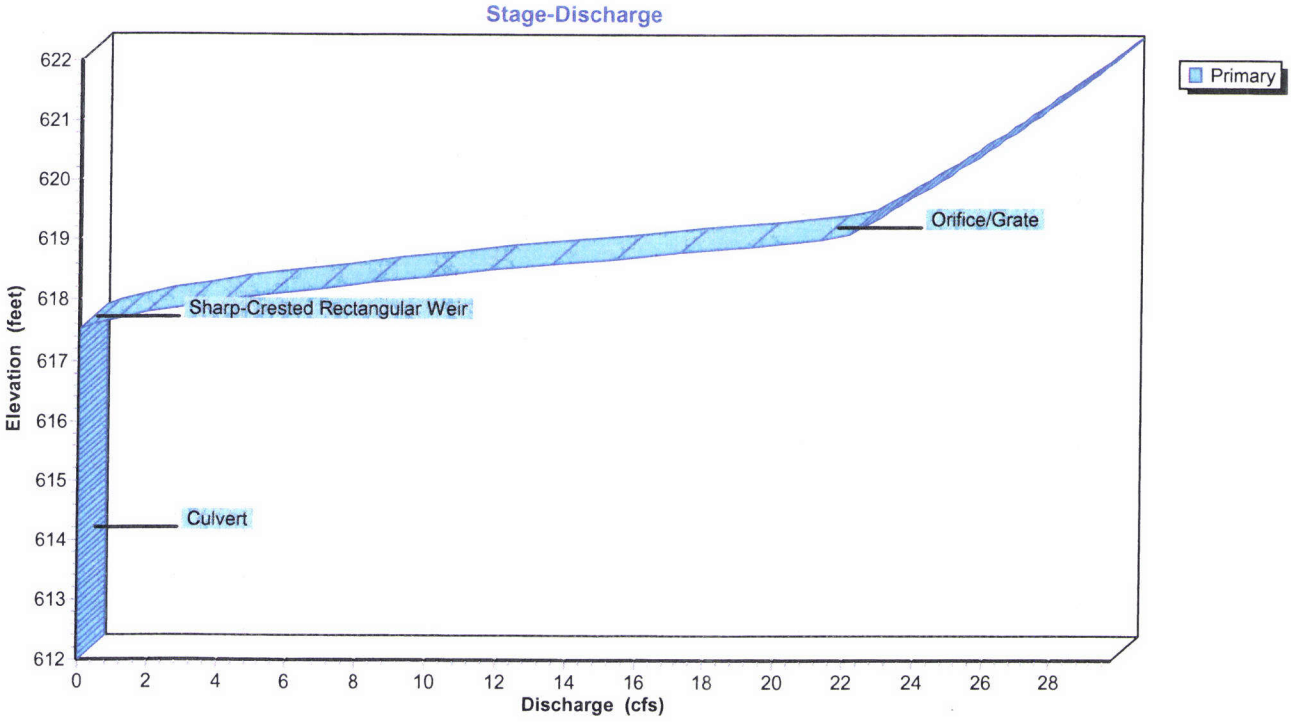
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
↑—**1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
—**3=Orifice/Grate** (Controls 0.00 cfs)

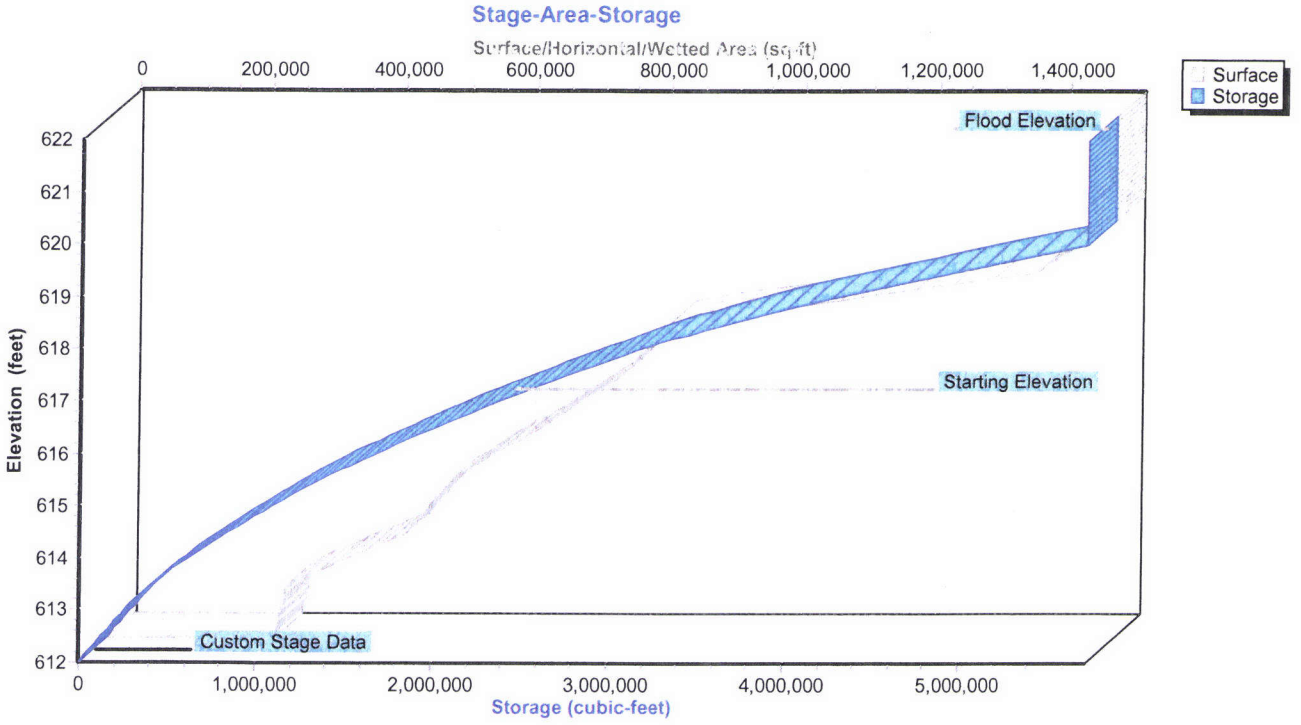
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.23" for 5-Year event
Inflow = 10.16 cfs @ 12.74 hrs, Volume= 7.302 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.41' @ 120.00 hrs Surf.Area= 795,051 sf Storage= 2,691,741 cf (317,985 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

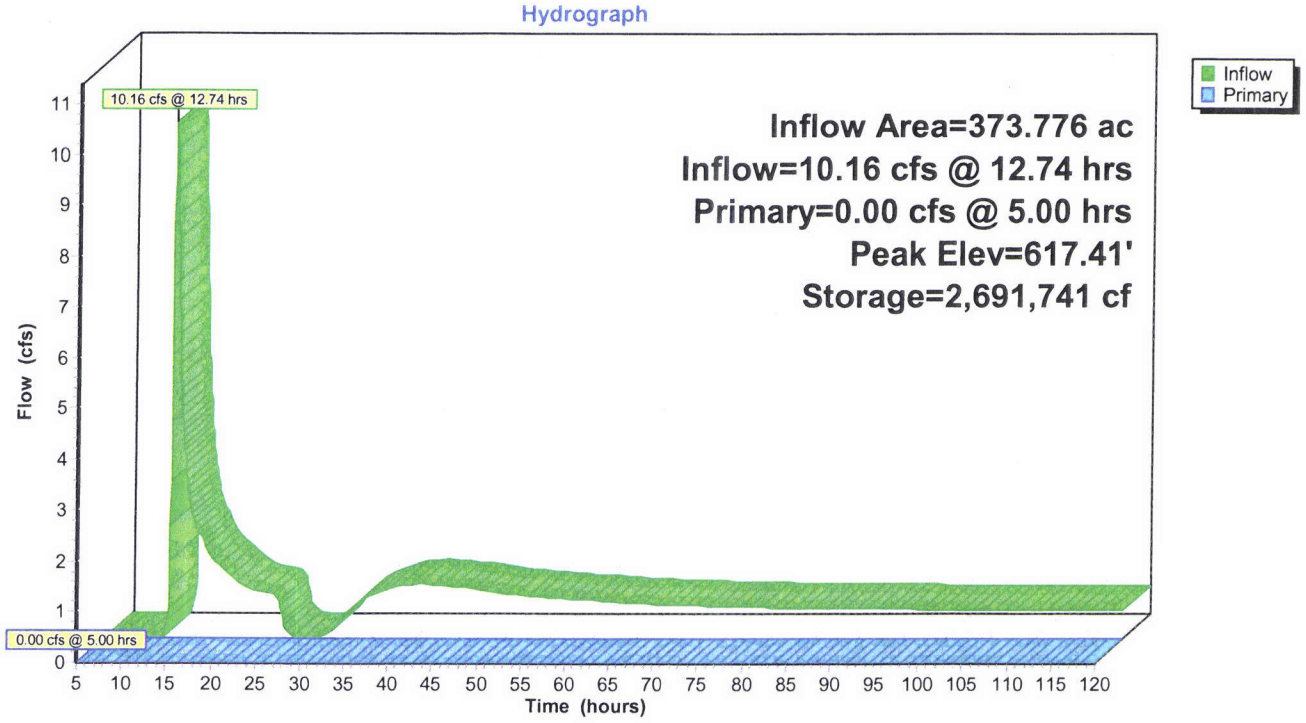
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

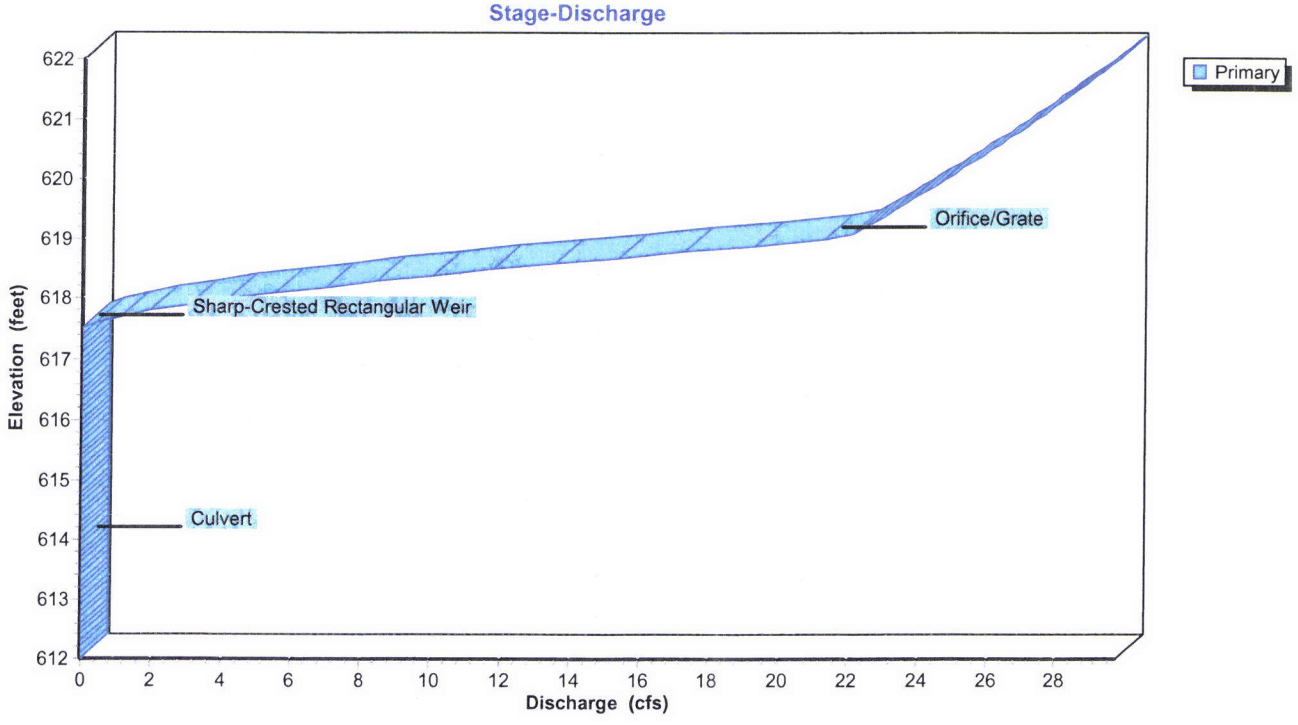
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

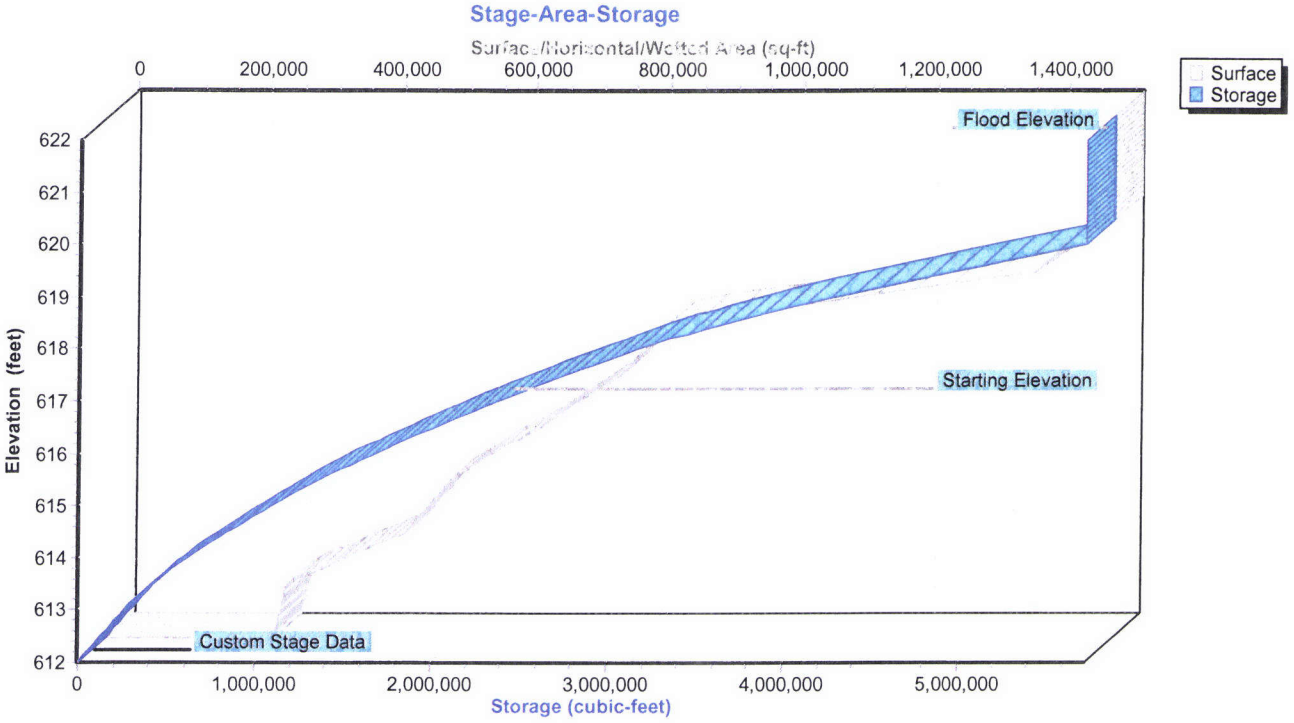
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.51" for 10-Year event
Inflow = 18.38 cfs @ 12.66 hrs, Volume= 15.783 af
Outflow = 0.73 cfs @ 69.64 hrs, Volume= 4.297 af, Atten= 96%, Lag= 3,418.7 min
Primary = 0.73 cfs @ 69.64 hrs, Volume= 4.297 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.65' @ 69.64 hrs Surf.Area= 812,264 sf Storage= 2,886,953 cf (513,197 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 2,368.3 min (4,866.7 - 2,498.4)

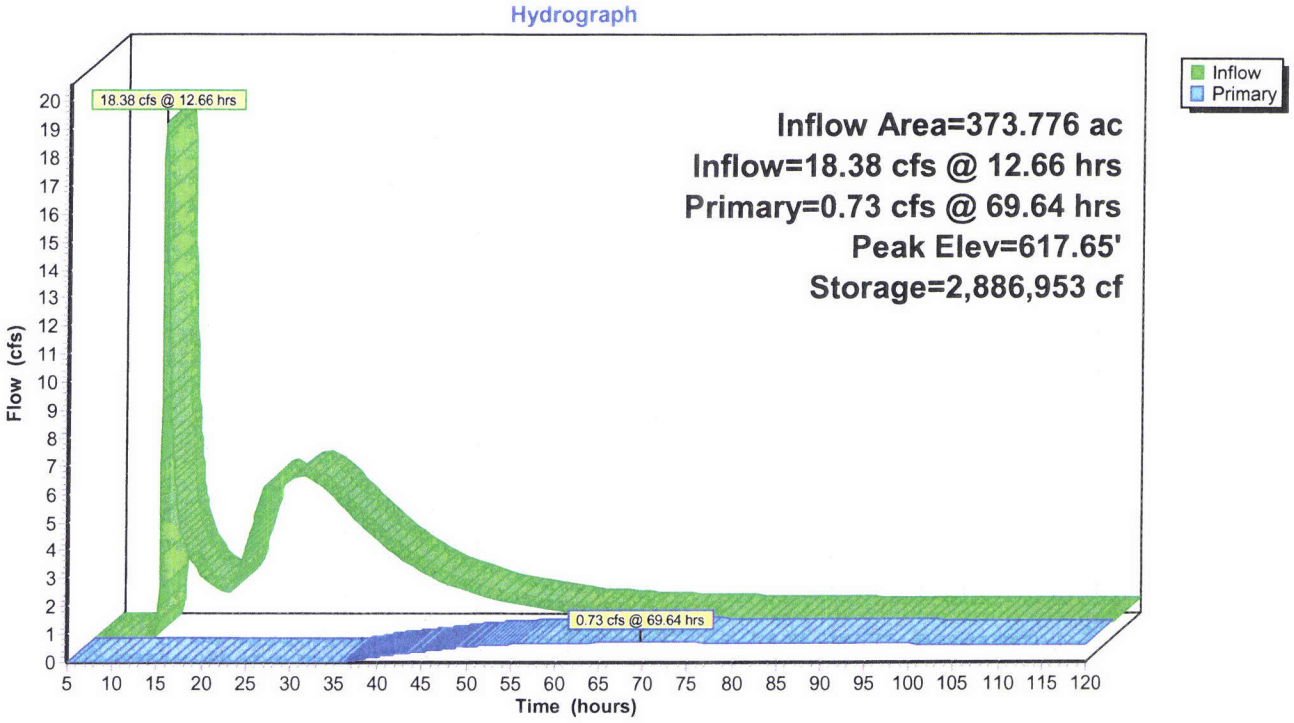
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

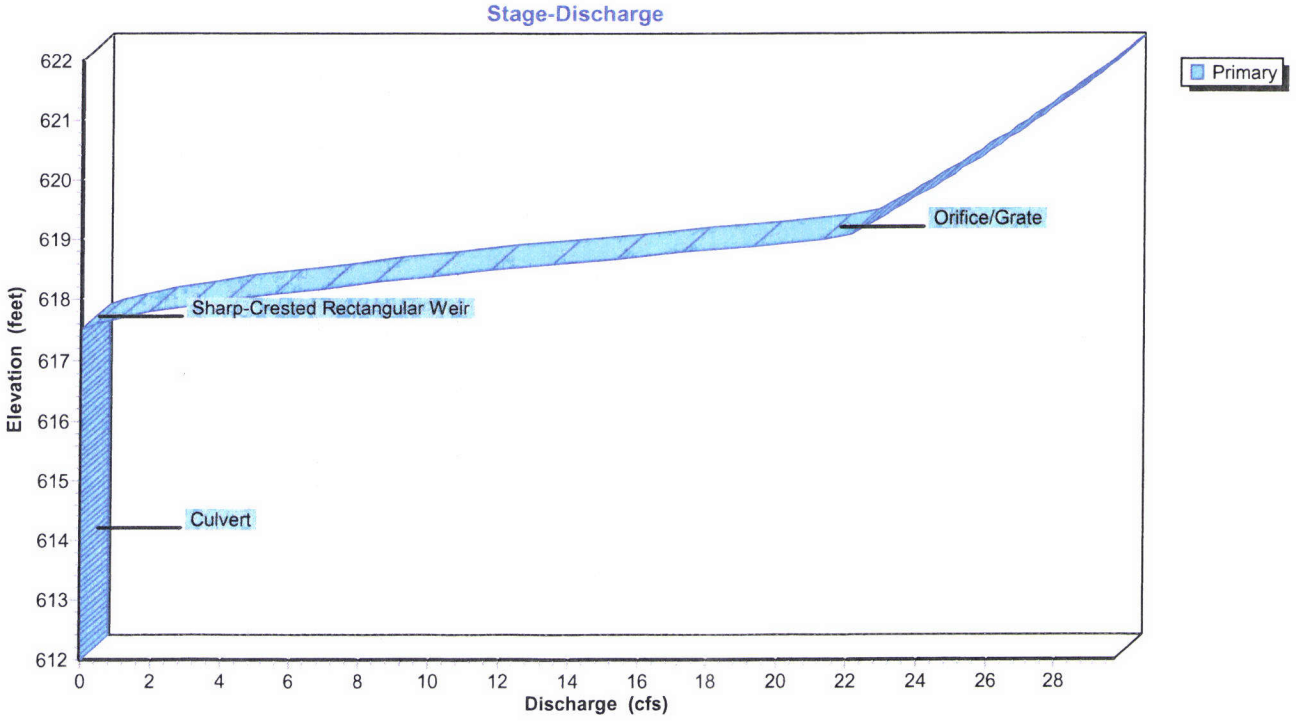
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.70 cfs @ 69.64 hrs HW=617.65' (Free Discharge)
↑—**1=Culvert** (Passes 0.70 cfs of 17.12 cfs potential flow)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.70 cfs @ 1.27 fps)
—**3=Orifice/Grate** (Controls 0.00 cfs)

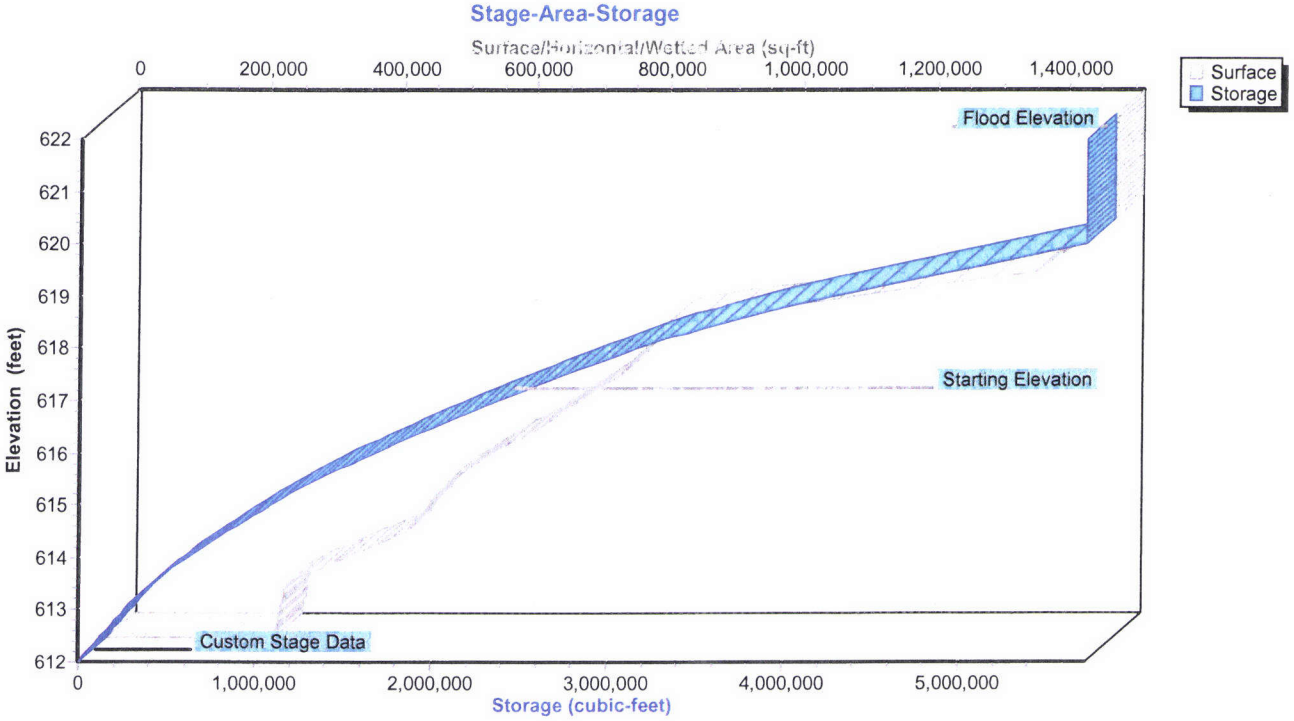
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.81" for 25-Year event
Inflow = 28.43 cfs @ 12.61 hrs, Volume= 25.164 af
Outflow = 3.05 cfs @ 40.93 hrs, Volume= 13.221 af, Atten= 89%, Lag= 1,699.0 min
Primary = 3.05 cfs @ 40.93 hrs, Volume= 13.221 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.90' @ 40.93 hrs Surf.Area= 830,280 sf Storage= 3,093,506 cf (719,751 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,671.2 min (3,782.2 - 2,111.1)

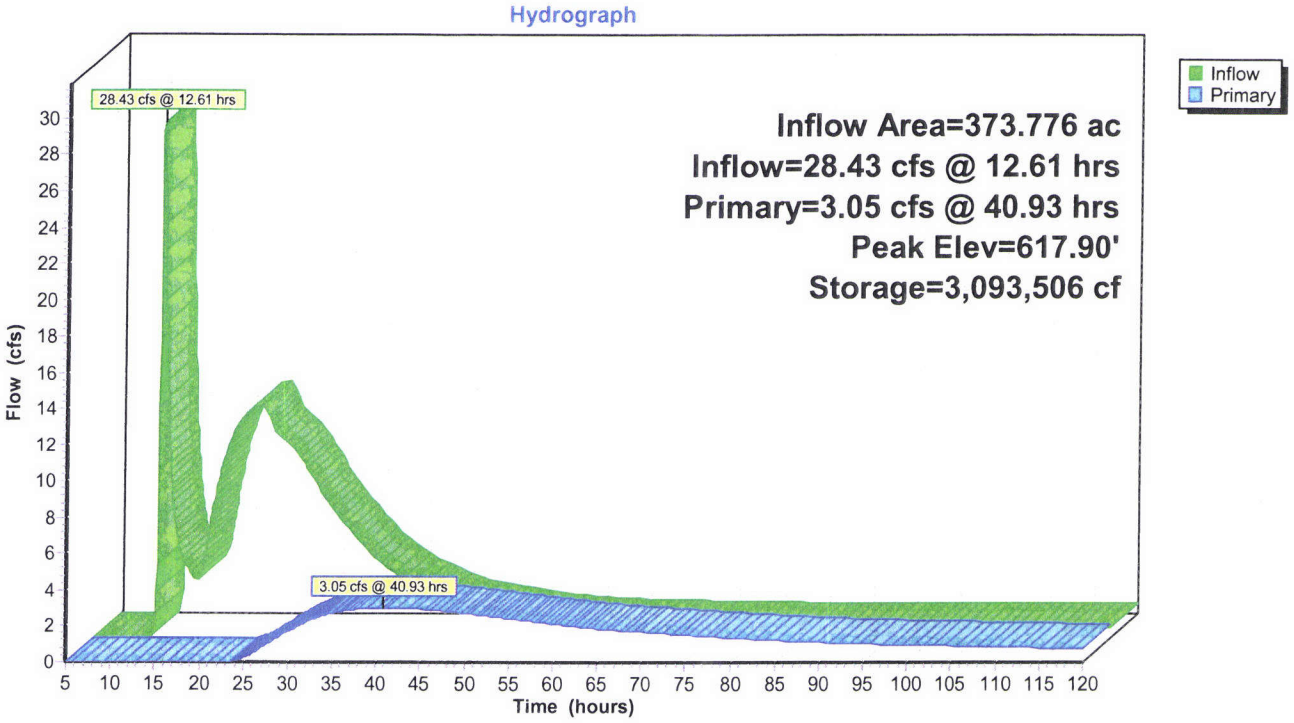
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

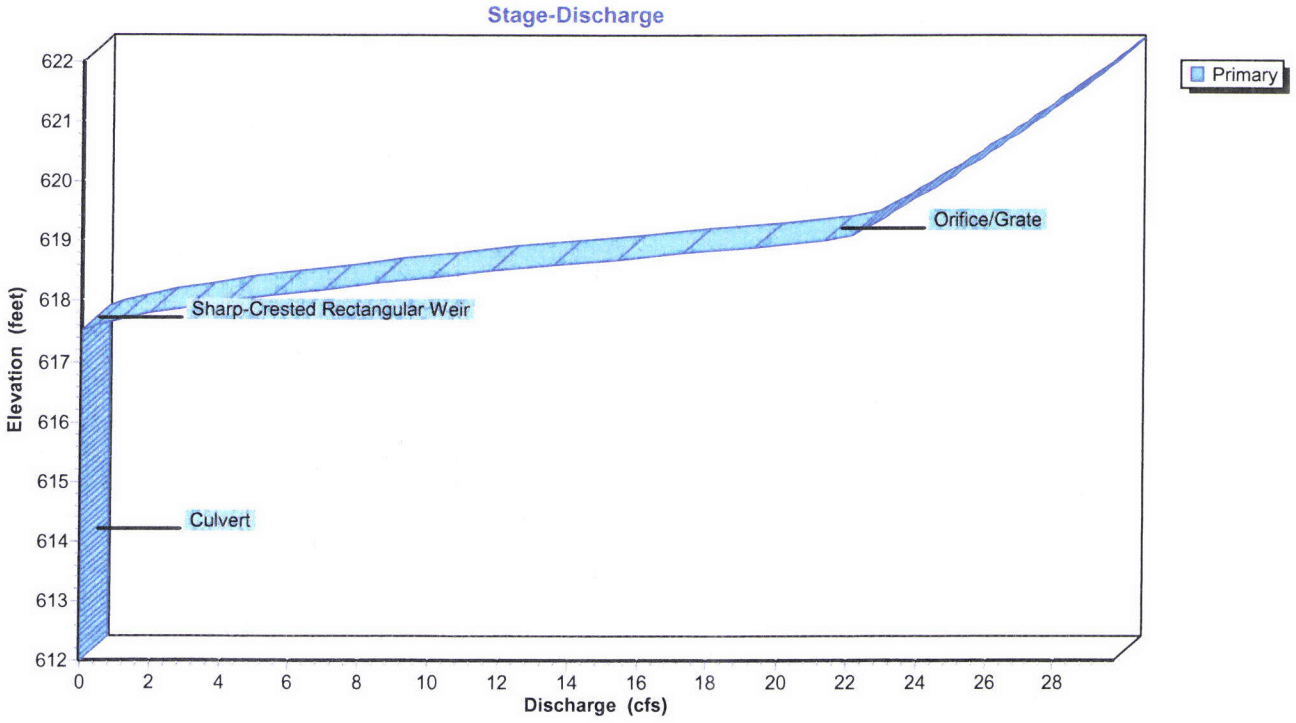
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.05 cfs @ 40.93 hrs HW=617.90' (Free Discharge)
↑└**1=Culvert** (Passes 3.05 cfs of 18.09 cfs potential flow)
↑├**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.05 cfs @ 2.07 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

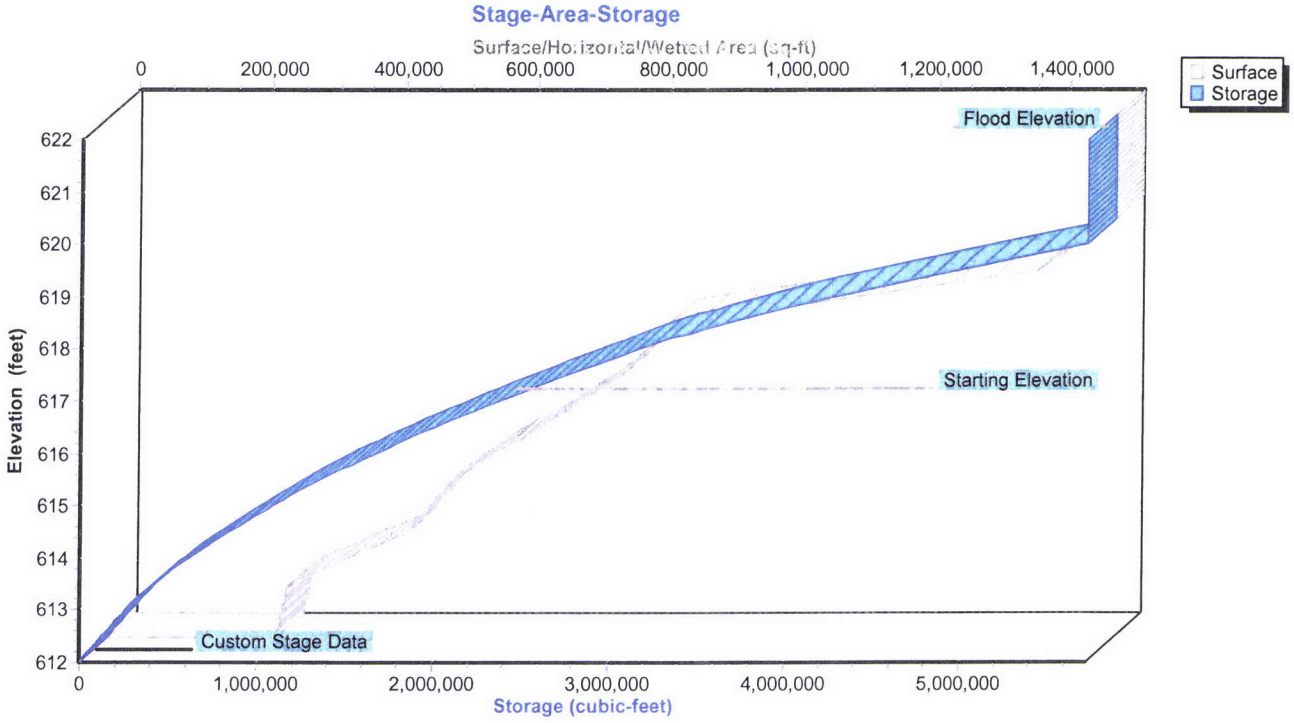
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



HydroCAD Individual Node Report
For Pond 1P School House Marsh Pond
(No Quarry Discharge)

Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth = 0.04" for 2-Year event
Inflow = 4.27 cfs @ 12.88 hrs, Volume= 1.207 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.07' @ 72.40 hrs Surf.Area= 771,337 sf Storage= 2,426,242 cf (52,486 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

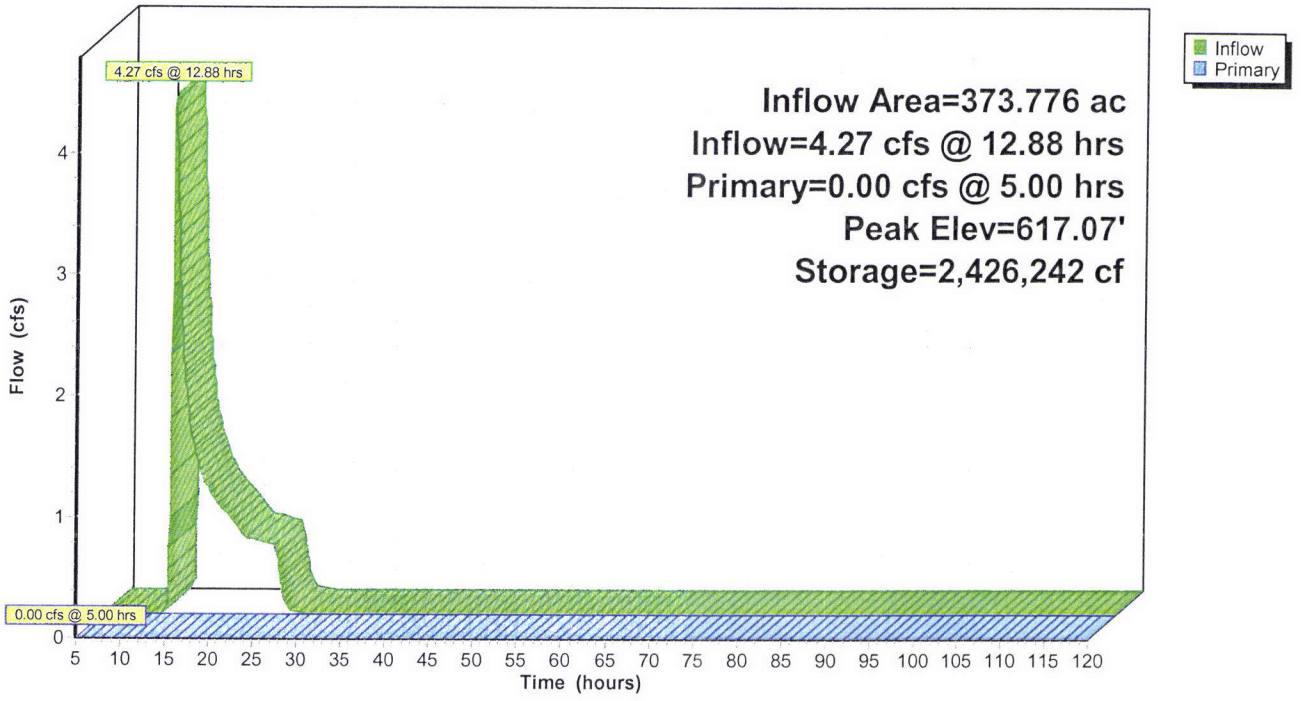
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
↑ **1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
3=Orifice/Grate (Controls 0.00 cfs)

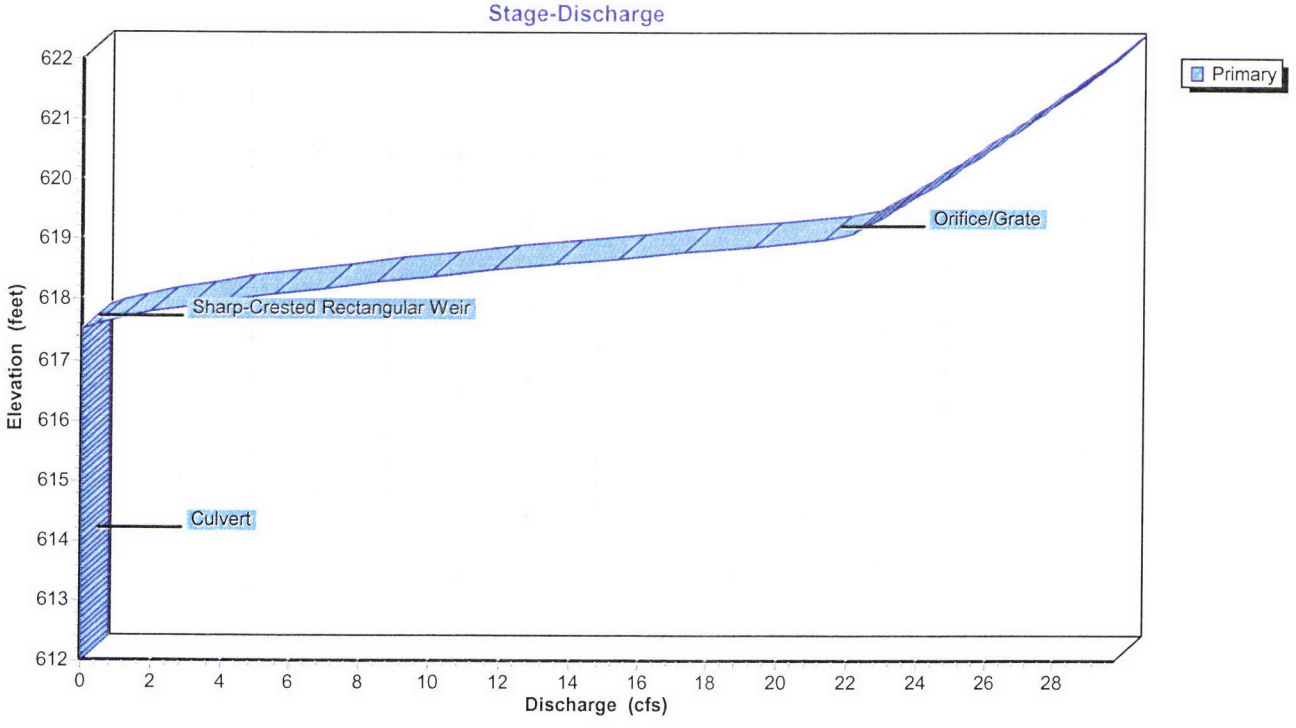
Pond 1P: Schoolhouse Marsh Pond

Hydrograph

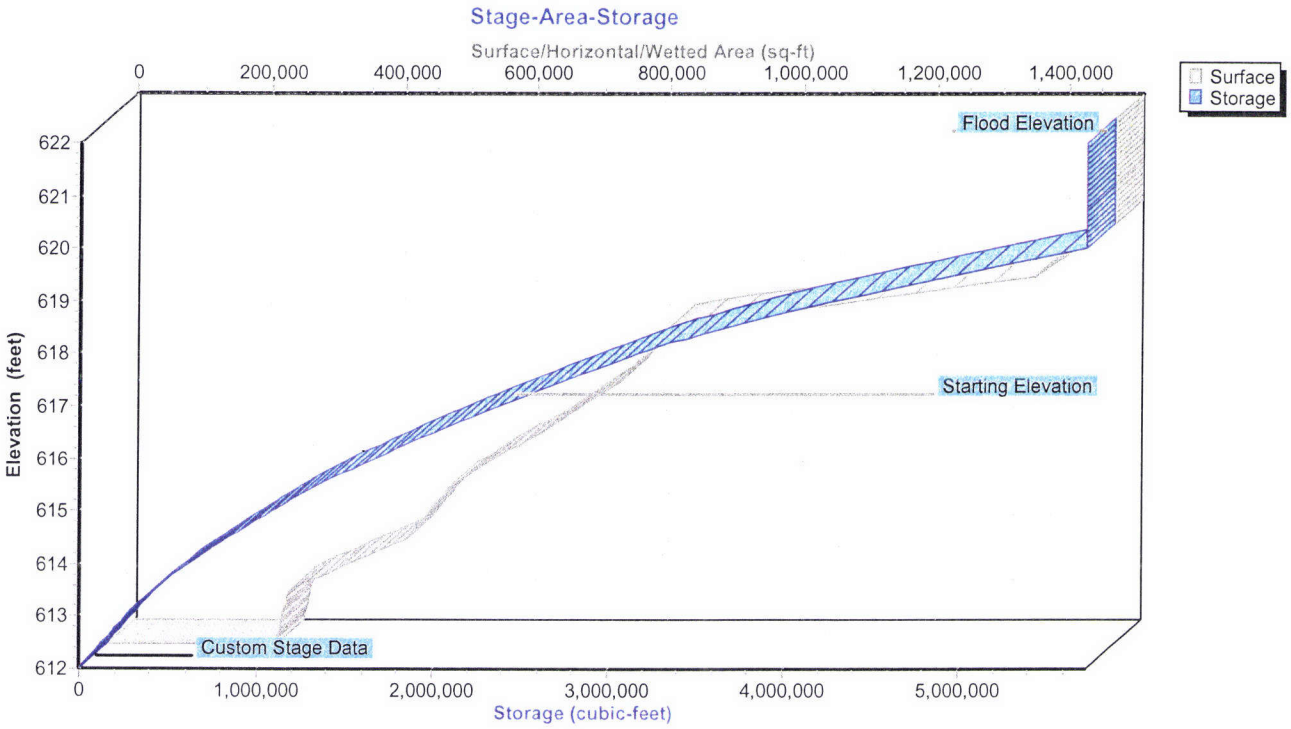


Pond 1P: Schoolhouse Marsh Pond

Stage-Discharge



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.11" for 5-Year event
Inflow = 10.16 cfs @ 12.74 hrs, Volume= 3.441 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.19' @ 120.00 hrs Surf.Area= 780,078 sf Storage= 2,523,636 cf (149,880 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

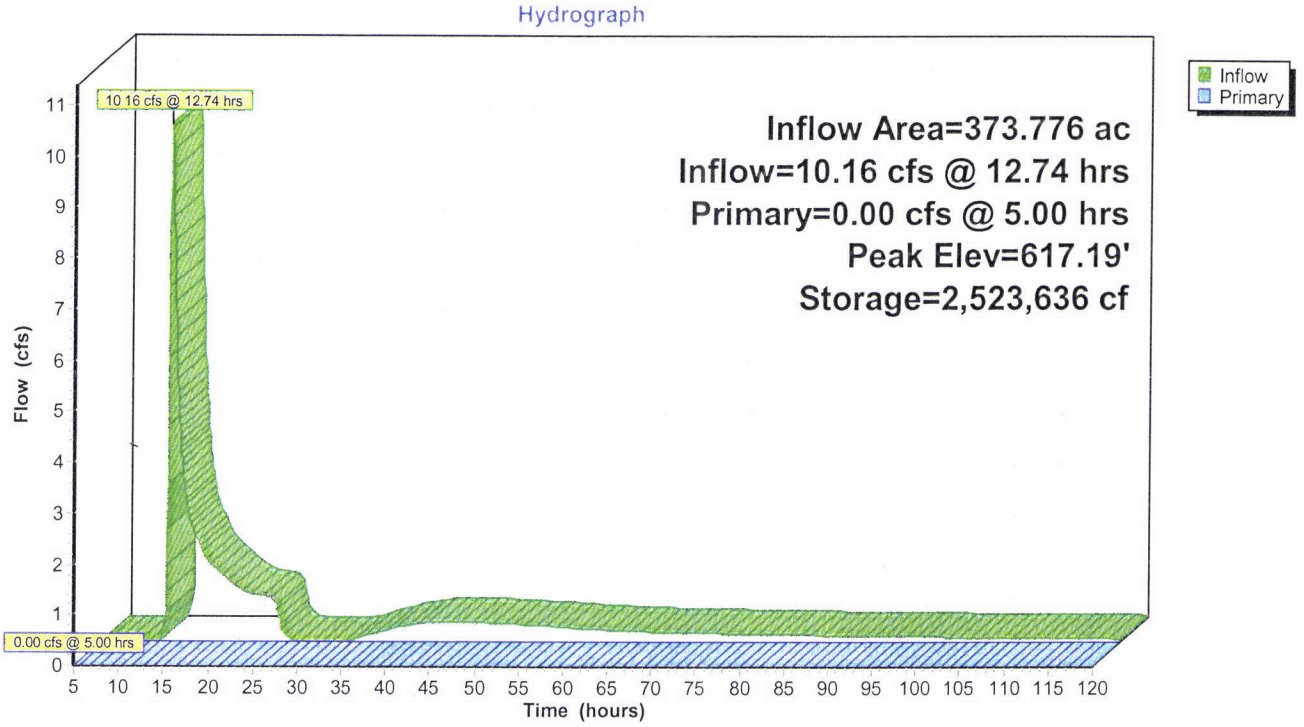
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

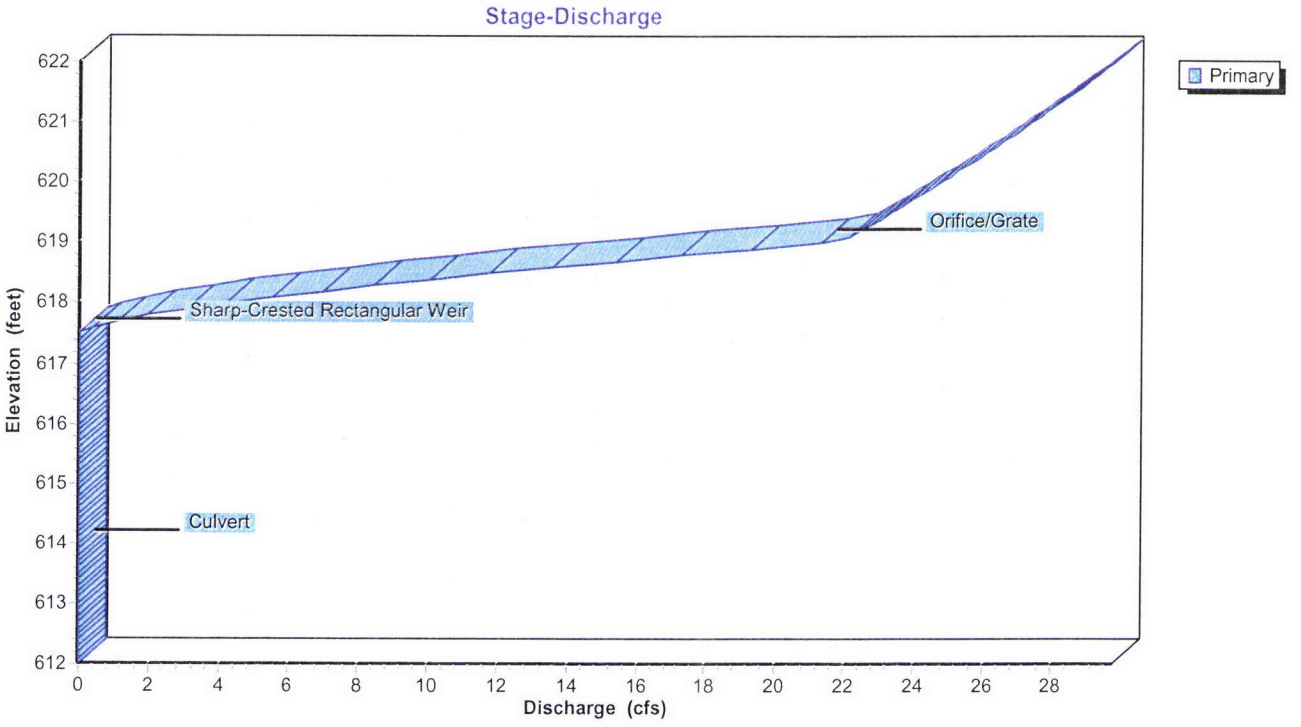
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=617.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 14.30 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

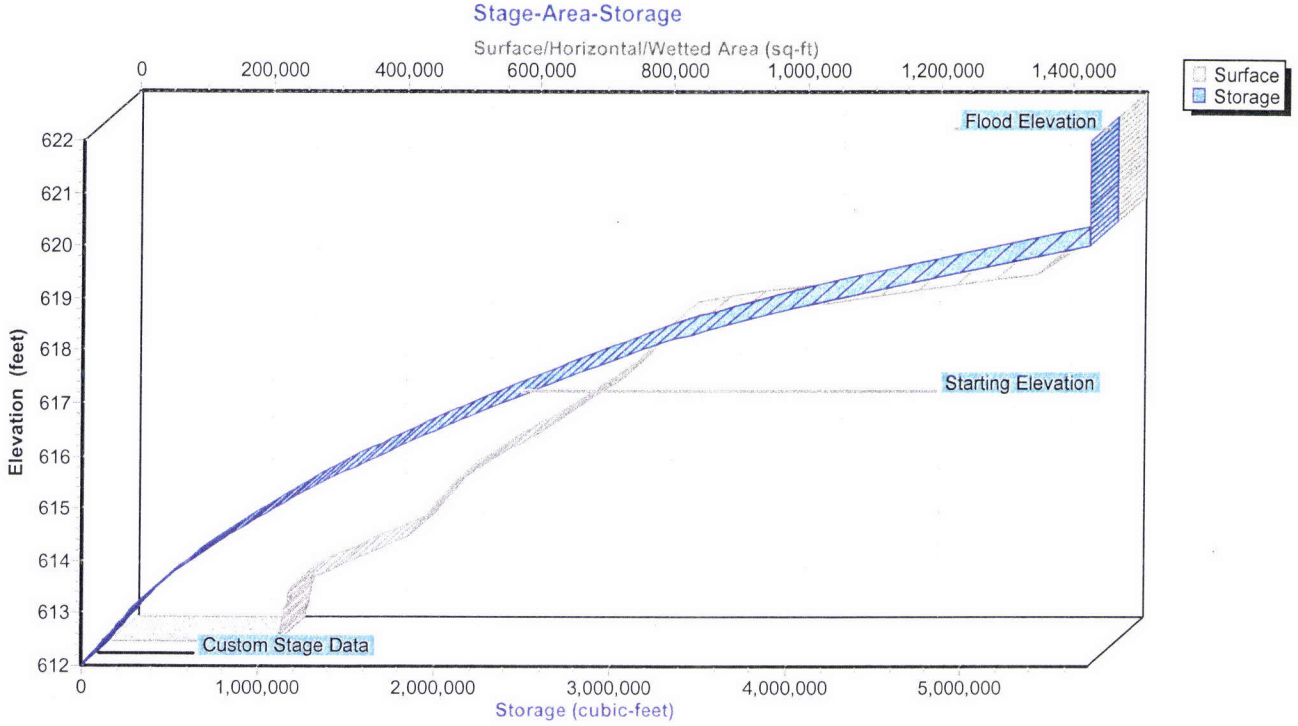
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.38" for 10-Year event
Inflow = 18.38 cfs @ 12.66 hrs, Volume= 11.890 af
Outflow = 0.34 cfs @ 67.57 hrs, Volume= 1.839 af, Atten= 98%, Lag= 3,294.7 min
Primary = 0.34 cfs @ 67.57 hrs, Volume= 1.839 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.59' @ 67.57 hrs Surf.Area= 808,005 sf Storage= 2,838,452 cf (464,696 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 2,844.7 min (4,817.4 - 1,972.6)

Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

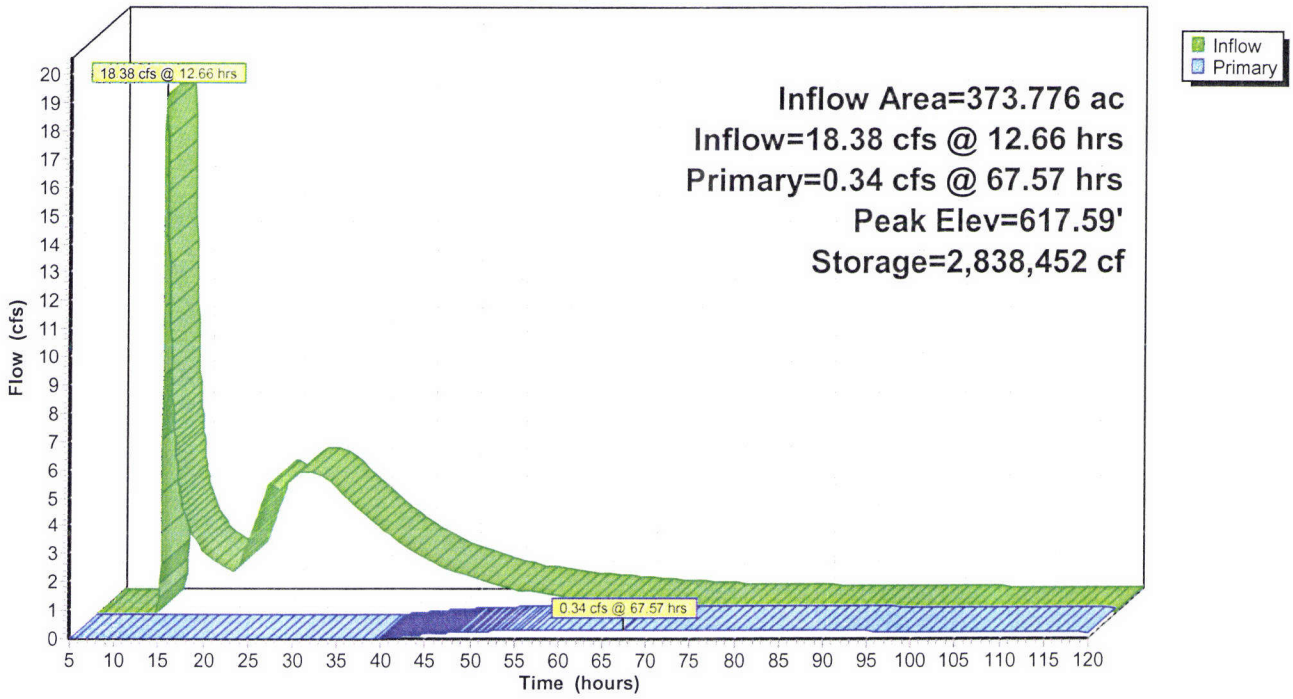
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.33 cfs @ 67.57 hrs HW=617.59' (Free Discharge)
└1=**Culvert** (Passes 0.33 cfs of 16.88 cfs potential flow)
├2=**Sharp-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.98 fps)
└3=**Orifice/Grate** (Controls 0.00 cfs)

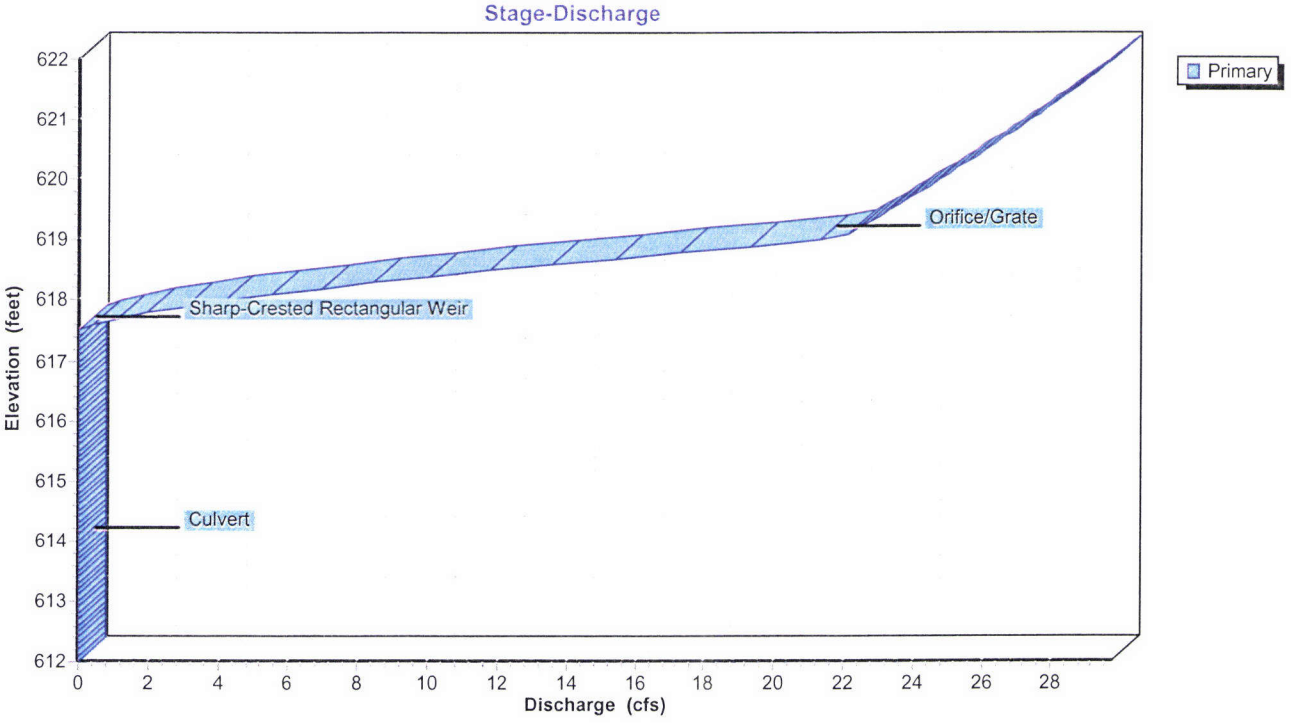
Pond 1P: Schoolhouse Marsh Pond

Hydrograph

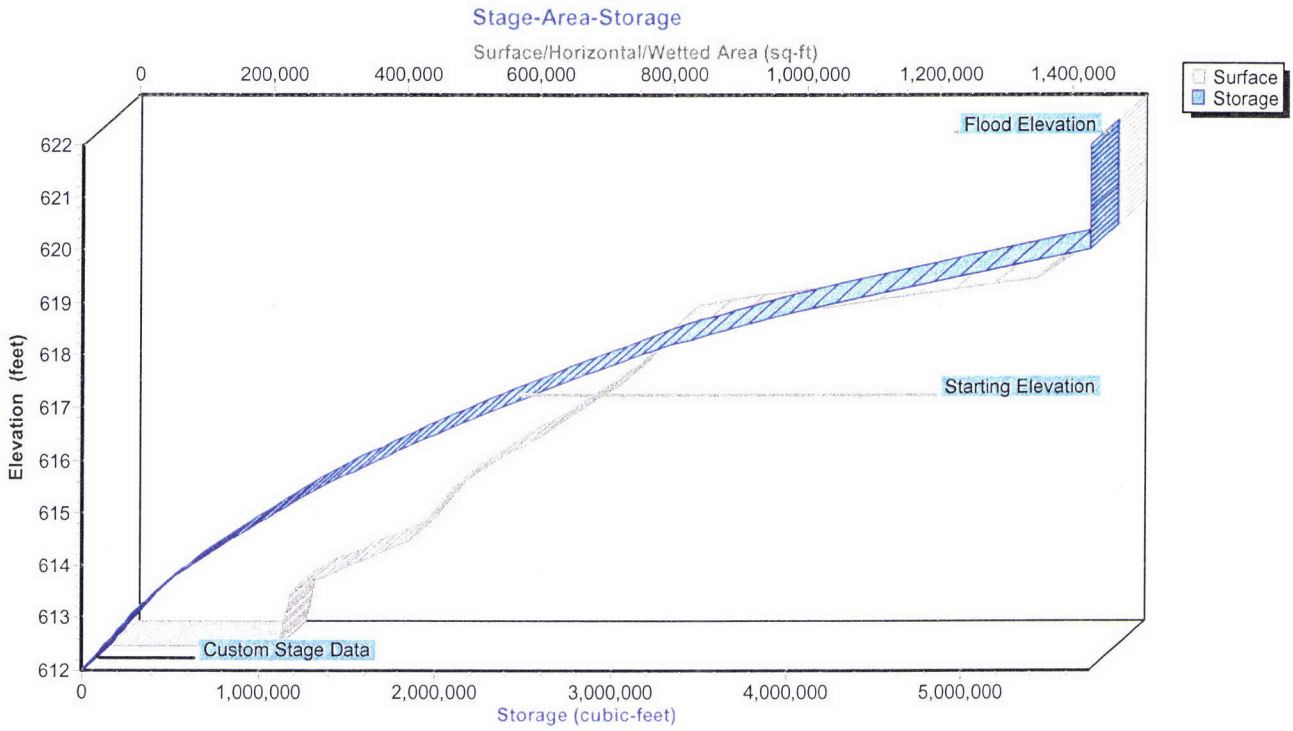


Pond 1P: Schoolhouse Marsh Pond

Stage-Discharge



Pond 1P: Schoolhouse Marsh Pond



Summary for Pond 1P: Schoolhouse Marsh Pond

Inflow Area = 373.776 ac, 1.29% Impervious, Inflow Depth > 0.68" for 25-Year event
Inflow = 28.43 cfs @ 12.61 hrs, Volume= 21.263 af
Outflow = 2.68 cfs @ 40.98 hrs, Volume= 10.444 af, Atten= 91%, Lag= 1,702.1 min
Primary = 2.68 cfs @ 40.98 hrs, Volume= 10.444 af

Routing by Stor-Ind method, Time Span= 5.00-120.00 hrs, dt= 0.05 hrs
Starting Elev= 617.00' Surf.Area= 766,606 sf Storage= 2,373,756 cf
Peak Elev= 617.87' @ 40.98 hrs Surf.Area= 827,789 sf Storage= 3,064,813 cf (691,058 cf above start)
Flood Elev= 622.00' Surf.Area= 1,509,962 sf Storage= 5,726,877 cf (3,353,122 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,851.3 min (3,607.7 - 1,756.4)

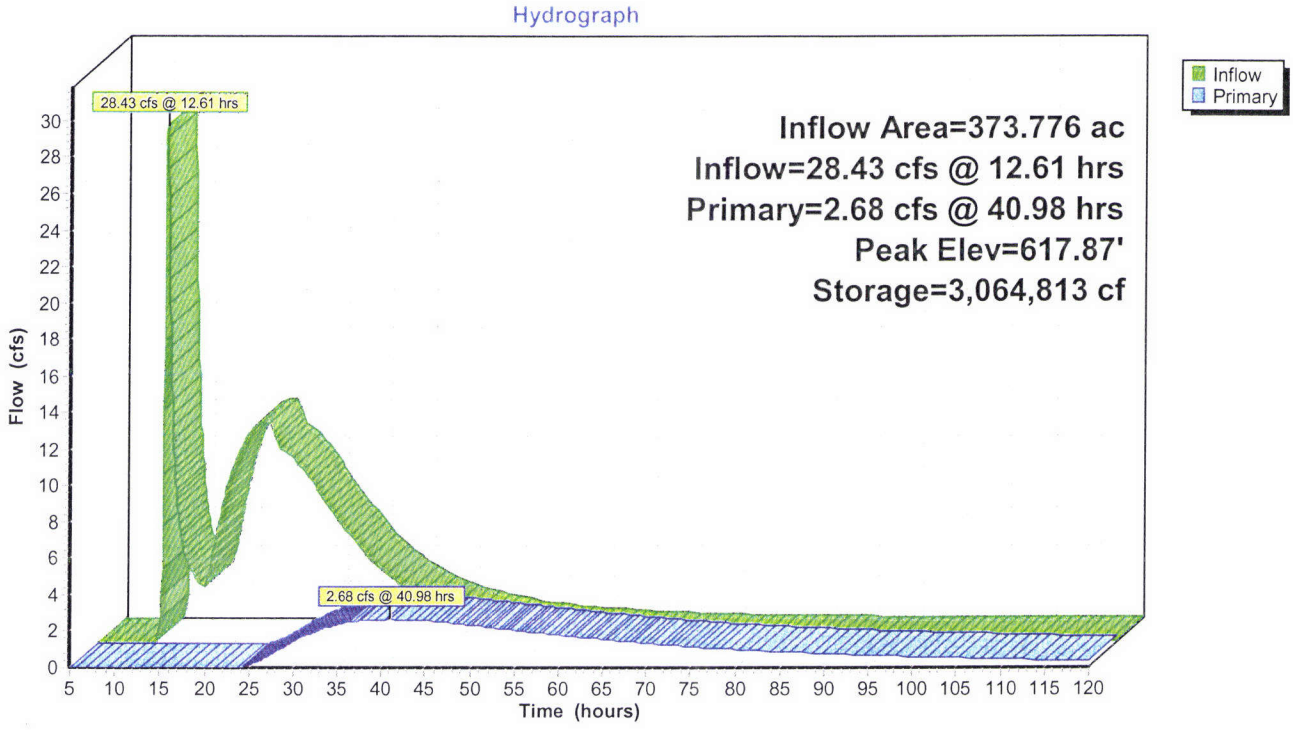
Volume	Invert	Avail.Storage	Storage Description
#1	612.00'	5,726,877 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
612.00	250,900	3,100.0	0	0	250,900
613.00	269,057	3,291.0	259,926	259,926	348,091
614.00	445,617	3,381.0	353,645	613,570	395,992
615.00	513,667	3,452.0	479,239	1,092,810	434,750
616.00	642,923	3,867.0	577,087	1,669,897	676,485
617.00	766,606	4,666.0	703,858	2,373,756	1,219,050
618.00	837,377	4,770.0	801,731	3,175,487	1,297,285
619.00	1,389,734	4,997.0	1,101,958	4,277,445	1,473,785
620.00	1,509,962	5,085.0	1,449,432	5,726,877	1,544,567

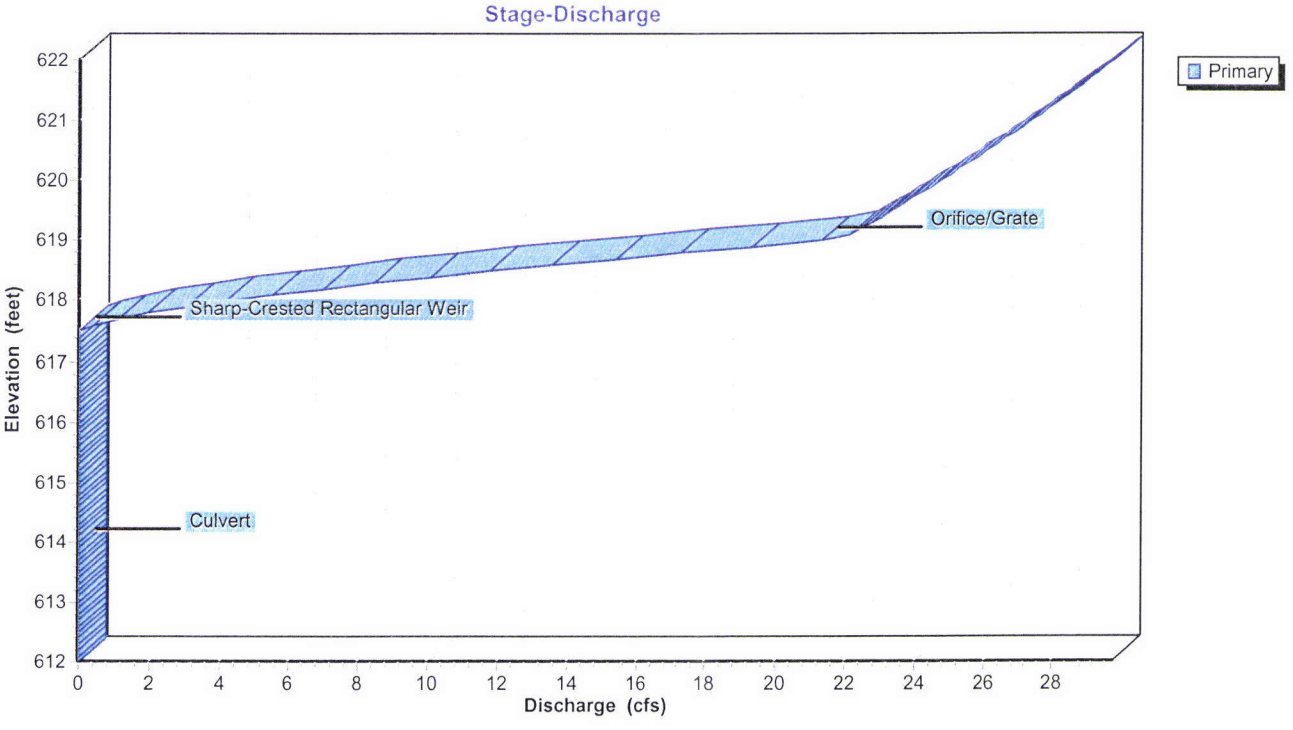
Device	Routing	Invert	Outlet Devices
#1	Primary	614.00'	**24.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 614.00' / 613.50' S= 0.0083 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	617.50'	**3.7' long x 1.50' rise Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#3	Device 1	619.00'	**20.0" x 44.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.66 cfs @ 40.98 hrs HW=617.87' (Free Discharge)
└─**1=Culvert** (Passes 2.66 cfs of 17.96 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.66 cfs @ 1.98 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

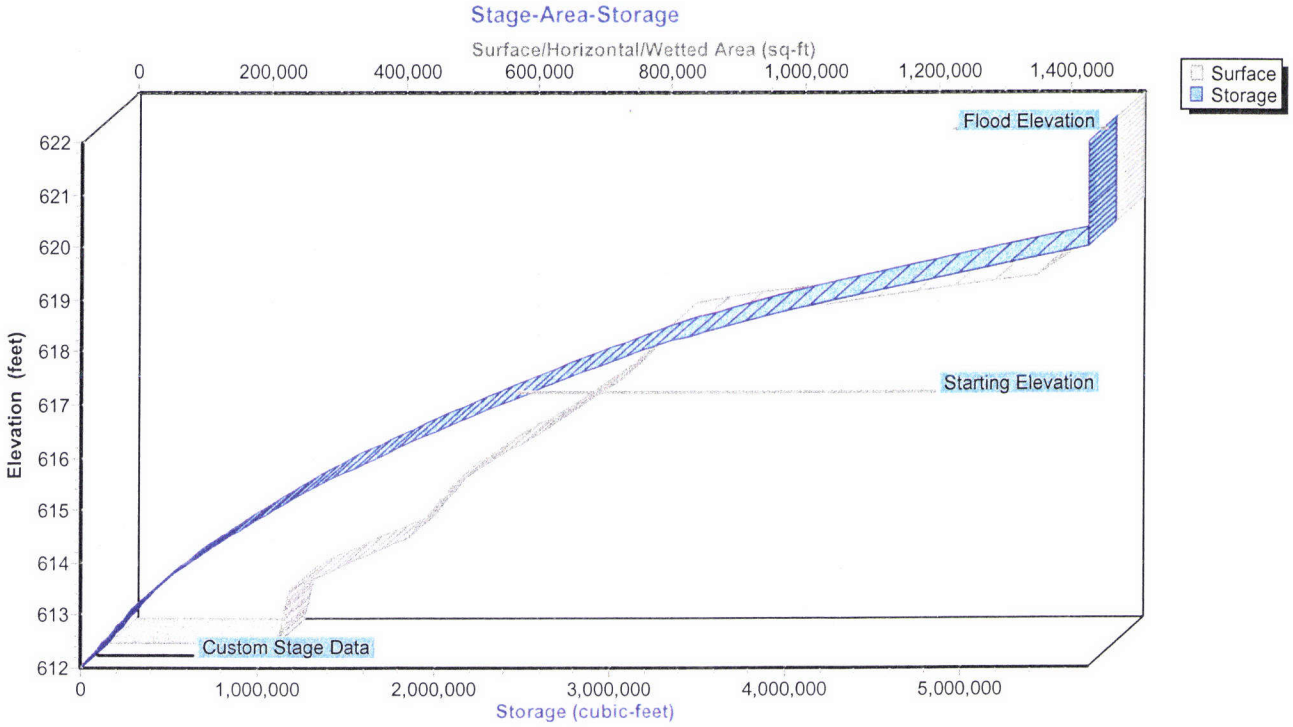
Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



Pond 1P: Schoolhouse Marsh Pond



APPENDIX 17

- **Water Withdrawal Permit Application**

CONTINENTAL PLACER INC.
II Winners Circle • Albany, New York 12205
(518) 458-9203 *fax* (518) 458-9206
www.continentalplacer.com

June 14, 2013

Mr. Scott Sheeley, Regional Permit Administrator
NYSDEC Region 8,
6274 East Avon-Lima Rd.
Avon, NY 14414

RE: Frontier Stone, LLC Water Withdrawal Application

Scott:

As per §601.10, Application for a permit (water withdrawal) enclosed is our permit application.

Data to be included in this transmittal letter as outlined on page 3 section (m) of the Department's instructions follows:

Applicant
Frontier Stone, LLC
4172 East Lake Road
Wilson, New York 14172
David J. Mahar, President
(716) 751-9670 • mahartz43@aol.com

Attorney
Brown & Sharlow, PC
621 West Genesee St.
Syracuse, New York 13204
Kevin J. Brown, Esq.
(315) 399-4343 • kevin.brown@brownsharlowlaw.com

Consultants
Continental Placer Inc.
II Winners Circle
Albany, New York 12205
John R. Hellert, CPG
(518) 458-9203 • hellert@continentalplacer.com

Alpha Geoscience
679 Plank Road
Clifton Park, New York 12065
Sam Gowan, PhD.
(518) 348-6995 • sgowan@alphageoscience.com

Engineer
David A. Myers, P.E.
Greystone Engineering PLCC
4 Franklin Square, Suite A
Saratoga Springs, NY 12866
(518) 265-4343 • dmyers@greystone.com

Public Halls
Town of Shelby, Town Hall
4062 Salt Works Rd
Medina, NY 14103

Local Newspaper
Journal-Register
413 Main Street
Medina, New York 14103
(585) 798-1400

If further data is needed or questions arise, please call.

Best regards,

John R. Hellert
Senior Geologist

Enclosures

JRH/eih

JOINT APPLICATION FORM

For Permits/Determinations to undertake activities affecting streams, waterways, waterbodies, wetlands, coastal areas and sources of water withdrawal.

New York State

US Army Corps of Engineers (USA

You must separately apply for and obtain separate Permits/Determinations from each involved agency prior to proceeding with work. Please read all instructions.

APPLICATIONS TO

1. NYS Department of Environmental Conservation

Check all permits that apply:

- ☐ Stream Disturbance
- ☐ Excavation and Fill in Navigable Waters
- ☐ Docks, Moorings or Platforms
- ☐ Dams and Impoundment Structures
- ☐ 401 Water Quality Certification
- ☐ Freshwater Wetlands
- ☐ Tidal Wetlands
- ☐ Coastal Erosion Management
- ☐ Wild, Scenic and Recreational Rivers
- ☑ Water Withdrawal
- ☐ Long Island Well
- ☐ Aquatic Vegetation Control
- ☐ Aquatic Insect Control
- ☐ Fish Control
- ☐ Incidental Take of Endangered/Threatened Species

☑ I am sending this application to this agency.

2. US Army Corps of Engineers

Check all permits that apply:

- ☐ Section 404 Clean Water Act
- ☐ Section 10 Rivers and Harbors Act
- ☐ Nationwide Permit(s) - Identify Number(s): _____

Preconstruction Notification - ☐ Y / ☐ N

☐ I am sending this application to this agency.

3. NYS Office of General Services

Check all permits that apply:

- ☐ State Owned Lands Under Water
  - ☐ Utility Easement (pipelines, conduits, cables, etc.)
  - ☐ Docks, Moorings or Platforms

☐ I am sending this application to this agency.

4. NYS Department of State

Check if this applies:

- ☐ Coastal Consistency Concurrence

☐ I am sending this application to this agency.

5. Name of Applicant (use full name)

Frontier Stone, LLC

Mailing Address: 4172 East Lake Road

Post Office City: Wilson

State: NY Zip Code: 14172

Telephone (daytime): (716) 751-9670

Email: mahartz43@aol.com

Applicant must be:

- ☐ Owner
- ☑ Operator
- ☐ Lessee

(check all that apply)

Taxpayer ID (If applicant is NOT an individual): 02-0630958

6. Name of Facility or Property Owner (if different than Applicant) Chester Zelany

Mailing Address: 11763 Fletcher Chapel Road

Post Office City: Medina

State: NY Zip Code: 14103

Telephone (daytime):

Email:

7. Contact/Agent Name

John Hellert, CPG

Company Name: Continental Placer Inc.

Mailing Address: 2 Winners Circle

Post Office City: Albany

State: NY Zip Code: 12205

Telephone (daytime): (518) 458-9203

Email: hellert@continentalplacer.com

8. Project / Facility Name

Frontier Stone Quarry

Property Tax Map Section / Block / Lot Number: 113/1/27

Project Location - Provide directions and distances to roads, bridges and bodies of waters:

Located in the Town of Shelby, Orleans County about 3.7 miles south of the Village of Medina. The property principally fronts along Fletcher Chapel Road.

Street Address, if applicable: Sour Springs Road

Post Office City: Medina State: NY Zip Code: 14103

Town / Village / City: Shelby

County: Orleans

Name of USGS Quadrangle Map: Knowlesville

Stream/Water Body Name: Quarry

Location Coordinates: Enter NYTMs in kilometers, **OR** Latitude/Longitude

NYTM-E	NYTM-N	Latitude	Longitude
		43.157	78.378

For Agency Use Only DEC Application Number: USACE Number:

9. **Project Description and Purpose:** Provide a complete narrative description of the proposed work and its purpose. Attach additional page(s) if necessary. Include: description of current site conditions and how the site will be modified by the proposed project; structures and fill materials to be installed; type and quantity of materials to be used (i.e., square ft of coverage and cubic yds of fill material and/or structures bel ordinary/mean high water) area of excavation or dredging, volumes of material to be removed and location of dredged material disposal or use, work methods and type of equipment to be used; pollution control methods and mitigation activities proposed to compensate for resource impacts; and where applicable, the phasing of activities. **ATTACH PLANS ON SEPARATE PAGES.**

Frontier proposes to develop and operate a 215.5± acre dolomite/limestone quarry which will produce high quality construction aggregate and high-grade agricultural lime. The excavation area totals 172.2± acres and mining is divided into four (4) phases over the estimated 75 year operational life of the mine. Quarrying will be conducted by standard drill and blast technology with front-end loaders and (or) excavators feeding a primary crusher with shot rock. The primary crusher will follow the advancing face. Rock will be conveyed to the processing plant by field conveyor for further processing. Mining will occur below the water table and the project includes dewatering of the quarry area. During operation of the quarry, groundwater and precipitation will seasonally accumulate in the quarry sump, initially located in the southeast corner of Phase 1. This water will be discharged via pipe to the adjacent agricultural drainage ditch via a settling basin system pursuant to a State Pollutant Discharge Elimination System Permit (SPDES). Once operations have cease, the site will be reclaimed by grading, replacement of topsoil and revegetating upland areas. The reclamation objective will be to create open space with the predominant feature being two lakes for recreation and/or wildlife habitat. The two lakes, separated by an existing utility line, will be approximately 35.2 and 156.1 acres in size with an anticipated water elevation at 625± feet.

Proposed Use: ☐ Private ☐ Public ☑ Commercial	Proposed Start Date: April 1, 2014	Estimated Completion Date: 75 years
Has Work Begun on Project? ☐ Yes ☑ No If Yes, explain.		
Will Project Occupy Federal, State or Municipal Land? ☐ Yes ☑ No If Yes, please specify.		

10. List Previous Permit / Application Numbers (if any) and Dates:
N/A

11. Will this project require additional Federal, State, or Local Permits including zoning changes? ☑ Yes ☐ No If yes, please list:
Mining Permit, SPDES Permit, State Facility Air Permit Registration, Mining Overlay District & Industrial Zoning/Special Use permit.

12. **Signatures.** If applicant is not the owner, both must sign the application.
I hereby affirm that information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law. Further, the applicant accepts full responsibility for all damage, direct or indirect, of whatever nature, and by whomever suffered, arising out of the project described herein and agrees to indemnify and save harmless the State from suits, actions, damages and costs of every name and description resulting from said project. In addition, Federal Law, 18 U.S.C., Section 1001 provides for a fine of not more than $10,000 or imprisonment for not more than 5 years, or both where an applicant knowingly and willingly falsifies, conceals, or covers up a material fact; or knowingly makes or uses a false, fictitious or fraudulent statement.

	Printed Name	Title	Date
Signature of Applicant	David J. Mahar	President	
Signature of Owner			
Signature of Agent			

For Agency Use Only **DETERMINATION OF NO PERMIT REQUIRED**

Agency Project Number _____

_____ (Agency Name) has determined that No Permit is required from this Agency for the project described in this application.

Agency Representative: Name (printed) _____ Title _____

Signature _____ Date _____

New York State Department of Environmental Conservation

Water Withdrawal Application Supplement WW-1

Pursuant to 6 NYCRR Part 601: http://www.dec.ny.gov/regs/4445.html

READ THE INSTRUCTIONS ON PAGE 2 BEFORE COMPLETING THIS FORM

May 2013

FOR DEPARTMENT USE ONLY
Application No.
WWA Number

1. APPLICANT NAME Frontier Stone, LLC

2. FACILITY NAME Frontier Stone Quarry

3. PROJECT TYPE
☑ Water Withdrawal ☐ New Public Water Supply Service Area or Extension
☐ Land Acquisition for Public Water Supply ☐ Change in Use of Existing Water Withdrawal

4. WATER USE TYPE
☐ Public Water Supply ☐ Bottled/Bulk Water ☐ Commercial ☐ Cooling ☐ Industrial
☐ Institutional ☑ Mine Dewatering ☐ Oil/Gas Production ☐ Power Production ☐ Recreational
☐ Other:

5. WITHDRAWAL TYPE ☐ Existing ☑ New If this is an existing public water supply, provide the most recent WSA or WWA Number:
If other than public water supply, list other existiing or pending related DEC permits (e.g., SPDES, Mining, Dam):
Mining Permit, SPDES Permit, State Facility Air Permit.

6. WATER WITHDRAWAL SOURCE ☑ Surface Water Water Body Name(s) Quarry
☑ Groundwater Nearest Surface Water Body Unamed Pond Distance From Well (in feet) 500

7. WATER SUPPLY TO OTHER STATES Does this project involve the transport of any fresh water of NYS through pipes, conduits, ditches or canals to any other state?
☑ No ☐ Yes, describe:

8. TRANSPORTATION OF WATER BY VESSEL Does this project involve the transport by vessel of more than 10,000 gallons per day of surface water? (Excludes ballast water necessary for normal vessel activity. A vessel is defined as any floating craft propelled by mechanical power.) ☐ Yes ☑ No

9. WATER WITHDRAWAL AMOUNTS This project involves the withdrawal of up to: 864,000 gallons per day Source Name Quarry dewatering
Does the project include a MAJOR DRAINAGE BASIN TRANSFER of water? See map at http://www.dec.ny.gov/lands/56800.html ☑ No ☐ Yes
If yes, ☐ Existing ☐ New From Basin To Basin

10. *REQUIRED EXHIBITS (6 NYCRR Part 601.10)* *Provide the names of the required exhibits applicable to this withdrawal:*

601.10(a) *PROJECT AUTHORIZATION FOR PUBLIC WATER SUPPLY SYSTEMS (e.g. Resolutions, Ordinances)*	Project Authorization	***601.10(h)*** *ACQUISITION MAPS (Map of any lands to be acquired as part of project)*	N/A
601.10(b) *GENERAL MAP (e.g. Project Location, For Public Water Supplies - water service area boundary)*	General Map and Phot	***601.10(i)*** *WATER ANALYSES (Public Water Supplies should submit chemical & bacterial analysis directly to NYSDOH)*	N/A
601.10(c) *WATERSHED MAPS (Topographic map with location of withdrawal and any return flow or interbasin diversions).*	Watershed Map	***601.10(j)*** *TREATMENT METHODS (Public Water Supplies - proposed methods to meet NYSDOH standards)*	N/A
601.10(d) *CONTRACT PLANS (Public Water Supplies should submit directly to NYSDOH for review and approval)*	Contract Plans	***601.10(k)*** *PROJECT JUSTIFICATION (Provide summary statement of answers to the eight justification questions)*	Project Justifications
601.10(e) *ENGINEER'S REPORT (Signed by NYS PE, includes project description, water source yields and demands, etc.)*	Engineering Report	***601.10(l)*** *CANAL WITHDRAWAL APPROVALS (If applicable, provide adequate proof of approval from Canal Authority)*	N/A
601.10(f) *WATER CONSERVATION PROGRAM (Completed Water Conservation Program Form)*	Water Conservation	***601.10(m)*** *TRANSMITTAL LETTER (Include all contact information for applicant, attorney, engineer, etc.)*	Transmittal letter
601.10(g) *ANNUAL REPORTING FORM FOR EXISTING WITHDRAWALS (Most recent submitted annual report)*	N/A	***601.10(n)*** *GREAT LAKES-ST. LAWRENCE RIVER WATER RESOURCES COMPACT PROCESS REQUIREMENTS (Only applicable to Public Water Supply diversions from Great Lakes Basin - no other diversion types are allowed).*	N/A

Clear Form

Applicant Signature

Name

Title

Date

EXHIBITS

Exhibit A. Project Authorization

This project is a proposed mining site, all necessary permits are being applied for to all necessary agencies. Agencies and applicable permit programs are listed the table below.

Permits Required

Agency	**Application Program**	**Process/Complete**
NYSDEC	Mining Permit	In process
NYSDEC	Stormwater SPDES Permit	In process
NYSDEC	State Facility Air Permit Registration	In process
NYSDEC	Water Withdrawal Permit	In process
NYS Office of Parks, Recreation and Historic Preservation	Cultural resources, historic preservation review	Completed
Town of Shelby	Mining Overlay District & industrial zoning, site plan approval, special permit.	In process

Exhibit B. General Location Map and Site Photograph

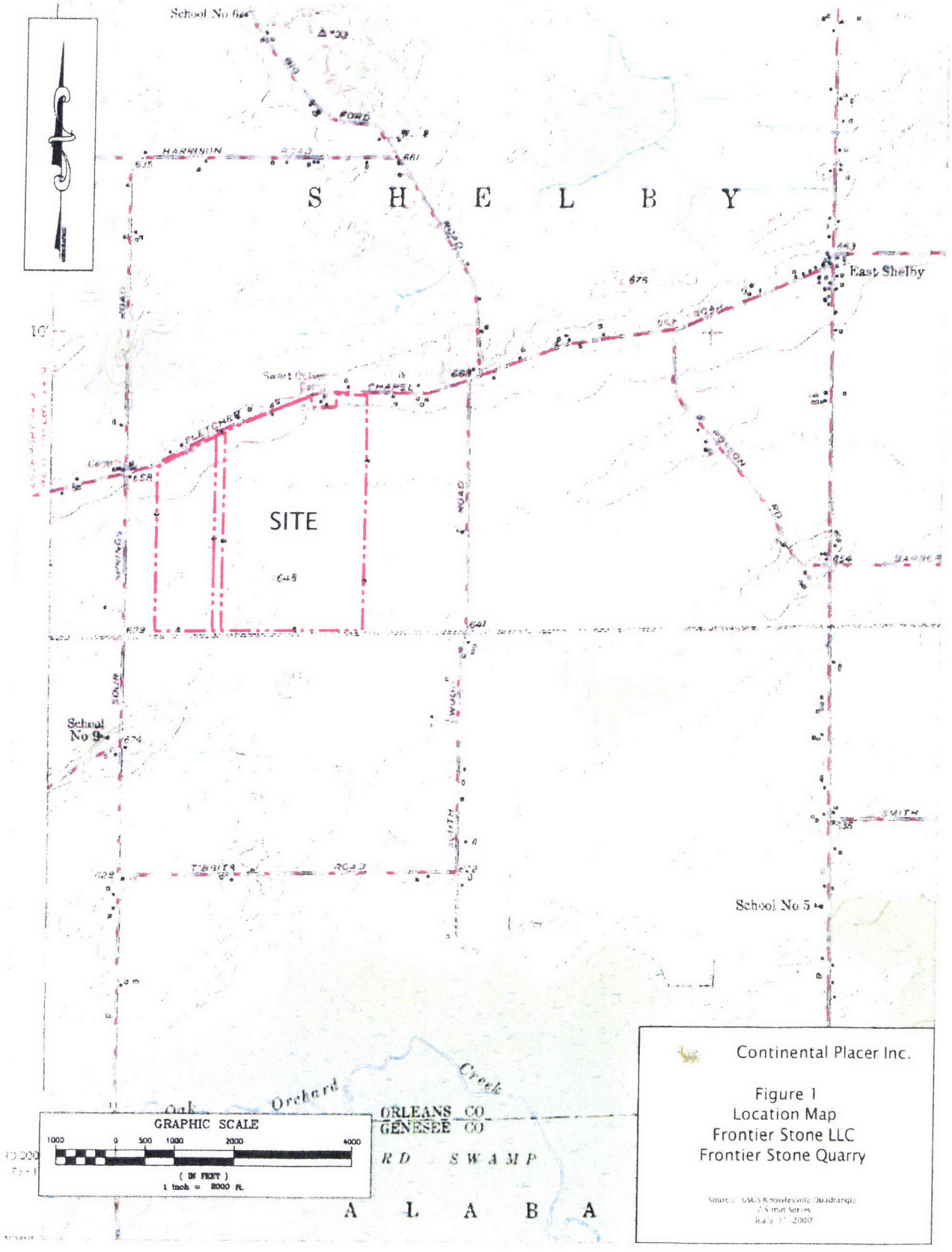


Exhibit C. Watershed Map/Drainage Basin Map

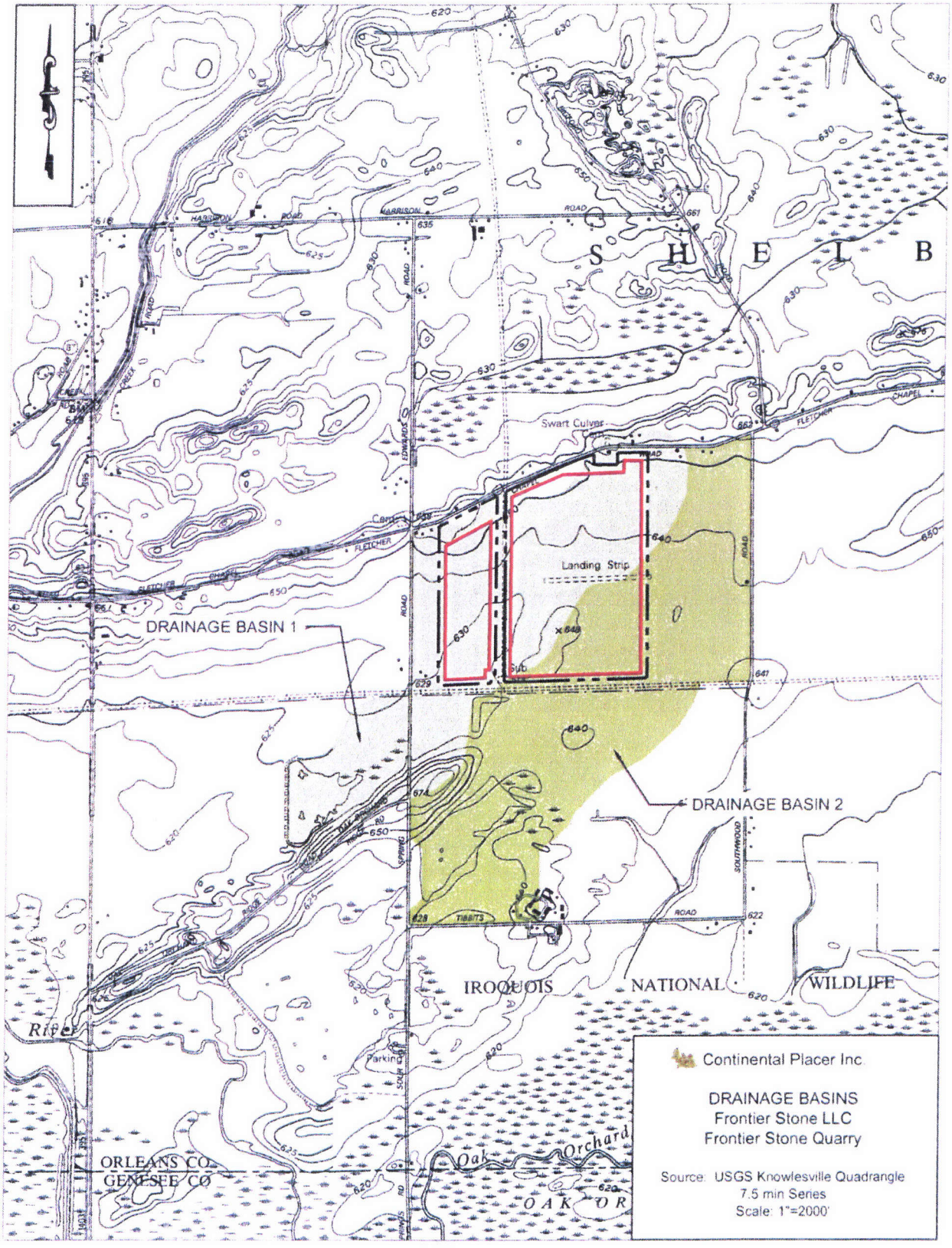
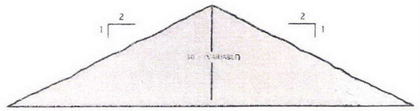


Exhibit D. Contract Plans:

The following Mining Plan Map illustrates the excavation areas to be dewatered. As shown, water will accumulate in the sumps within the mine and then exit via three settling basins to an existing agricultural drainage ditch.

OVERBURDEN BERM DETAIL (TYPICAL)



SCALE: 1" = 20'

NOTES

1. BERM SURFACE WILL BE ROUGH GRADED.
2. VEGETATION MIX
   - PERENNIAL RYE GRASS (20 POUNDS PER ACRE)
   - CREEPING RED FESCUE (10 POUNDS PER ACRE)
   - ALFALFA (8 POUNDS PER ACRE)
   - BIRDSFOOT TREFOIL (5 POUNDS PER ACRE)
   - SWEET CLOVER (1 POUND PER ACRE)
   - OATS AND WHEAT (30 POUNDS PER ACRE)
3. SEEDING WILL TAKE PLACE DURING THE FIRST PLANTING SEASON (SPRING OR FALL) FOLLOWING EMPLACEMENT.

Garage Well
Elev. 651.950'

FLETCHER CHAPEL ROAD

FLETCHER CHAPEL ROAD ENTRANCE

BREAK IN BERM PER REQUEST OF LANDOWNER

FUTURE PROPOSED OVERBURDEN BERM AREA
9.5± ACRES

WELL SET 2

LIFE-OF-MINE AFFECTED AREA 171.8± ACRES

EXCAVATION AREA 143.8 ACRES

Barn Well
Elev. 656.938'

DH 4-05
ELEV. 641.541'

PHASE 3
EXCAVATION AREA
76.2± ACRES

OVERBURDEN BERM AREA

FUTURE OVERBURDEN BERM AREA

WELL SET 4

LIFE-OF-MINE AFFECTED AREA 43.7± ACRES

PHASE 4 EXCAVATION AREA AND TOPSOIL STORAGE AREA 9.2± ACRES

PROPOSED SUMP AREA

EXCAVATION AREA 28.4± ACRES

PART OF EXCAVATION AREA 4 7.6± ACRES

PLANT, FUTURE SETTLING POND AND STOCKPILE AREA 8.8± ACRES

OFFICE

SCALES

ENTRANCE

CONCRETE PAD

OVERBURDEN DRILL HOLE ELEV. 627'

PHASE 1
2011-2016
EXCAVATION AREA
11.6± ACRES

DH 5-05
ELEV. 626.265'

PROPOSED SUMP AREA

SETTLING BASINS

MW-1
Elev. 634.223'

PW-1
Elev. 633.243'

NIAGARA MOHAWK

ROW EASEMENT

DH 3-05
ELEV. 627'

PIPING DISCHARGE ROUTE

POTENTIAL DISTURBED AREA

PHASE 2
EXCAVATION AREA
67.6± ACRES

DH 2-05
ELEV. 632'

DH 1-05
ELEV. 633.661'

PROPOSED SUMP AREA

OVERBURDEN BERM

POTENTIAL DISTURBED AREA

WELL SET 3

LANDING STRIP (Inactive)

WELL SET 1

AGRICULTURE DRAINAGE DITCH

SUB STATION

NIAGARA MOHAWK

ACREAGE SUMMARY

2011-2016 PERMIT TERM

EXCAVATION AREA (PHASE 1)	11.6 ± acres
PLANT STOCKPILE, et.al.	8.8 ± acres
INITIAL OVERBURDEN STORAGE AREA	9.2 ± acres
PERIMETER BERM AREAS AND MISCELLANEOUS POTENTIAL DISTURBED AREAS	14.1 ± acres
TOTAL FOR 2011-2016 PERMIT TERM	43.7± acres

FUTURE AFFECTED AREAS

PHASE 2 EXCAVATION AREA	67.6 ± acres
PHASE 3 EXCAVATION AREA	76.2 ± acres
FUTURE PROPOSED BERM AREA AND DISTURBED AREAS	28.0 ± acres
TOTAL FUTURE AFFECTED AREAS	171.8± acres
TOTAL LIFE OF MINE	215.5± acres

LEGEND

- DH 2-05 — DRILL HOLE/MONITORING WELL LOCATION
- MW-1 — MONITORING WELL LOCATION
- PW-1 — PUMP WELL LOCATION
- PROPOSED MONITORING WELL SET

NOTES:

1. PROPERTY LINES ARE APPROXIMATE
2. DATUM: MEAN SEA LEVEL
3. KNOWLESVILLE 7.5 MIN QUAD
4. ORTHO PHOTOS FROM NYS ORTHOIMAGERY PROGRAM, 2005
5. TOPOGRAPHY FROM USGS DIGITAL ELEVATION MODEL
6. DRILL HOLES SURVEYED BY GIS INSTRUMENT
7. PLANT LAYOUT SCHEMATIC

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

CONTOUR INTERVAL 2'

Date	Revisions	By
8/14/07	MINE PLAN LAYOUT REVISED	JRH
3/18/07	WELLS ADDED	WM
7/28/09	ELEVATIONS AND TOPOGRAPHY REVISED	JRH
12/21/10	SETTLING BASIN & BERMS ADDED	JRH
12/20/12	WELL SETS & FLETCHER CHAPLE ENTRANCE	JRH

CONTINENTAL PLACER INC.
11 Winners Circle, Albany, New York 12205
ph: 518/458-9203 fax: 518/458-9206

MINING PLAN MAP

Frontier Stone LLC.
Frontier Stone Quarry
Town of Shelby Orleans Co., NY.

Project Manager: JRH	Date: March 7, 2006	Sheet No: 1
Prepared By: JRH		
Drafted By: CAP	Project No: 629-01-05-2531	
Reviewed By:		

Exhibit E. Engineering Report

1. **General Description:**

Frontier proposes to develop and operate a 172± acre dolomite/limestone quarry which will produce high quality construction aggregate and high-grade agricultural lime. The excavation area totals 172.2± acres and mining is divided into four (4) phases over the estimated 75 year operational life of the mine.

Quarrying will be operated using standard drill and blast technology, front-end loaders and (or) excavators, a primary crusher which will follow the advancing face. Rock will be conveyed to the processing plant by field conveyor for further processing. Mining will occur below the water table and the project includes dewatering of the quarry area.

During operation of the quarry, groundwater and precipitation will seasonally accumulate in the quarry sump, initially located in the southeast corner of Phase 1. This water will be discharged via pipe to the adjacent agricultural drainage ditch via a settling basin system pursuant to a State Pollutant Discharge Elimination System Permit (SPDES).

As the mine advances into Phase 2 the agricultural ditch will be mined through in its upper 1400± feet (between mine phases 2 and 3). However, the precipitation that may have collected in that area of the ditch will now collect in the quarry where it will be pumped back to the unaffected ditch via the depleted Phase 1 quarry and the settling pond system to resume the pre-existing condition drainage pattern. Any overland flow which collects in the quarry will collect in a sump which will also act as a settling basin before the water is pumped to the settling ponds and then flow to the ditch.

Once operations have ceased, the site will be reclaimed by grading, replacement of topsoil and revegetating upland areas. The reclamation objective will be to create open space with the predominant feature being two lakes for recreation and/or wildlife habitat. The two lakes, separated by an existing utility line, will be approximately 35.2 and 156.1 acres in size with an anticipated water elevation at 625± feet.

2. **Existing sources for this operations:**

The project site does not have a water supply, it is an agricultural field planted with hay or row crops such as corn.

3. **Practicable Alternatives:**

There are no practicable alternatives which would meet the applicant's project objective which is to mine bedrock for the production of crushed stone aggregate. The mine must be dewatered to allow the extraction of the rock by heavy equipment within the quarry hole.

4. **Public Water Supply Systems:**

N.A.

5. **Public Water Supply Systems:**
N.A.

6. **General Design Features:**
See Mining Plan Map

7. **Proposed Daily Rates of Withdrawal:**
The maximum discharge is estimated to be approximately 385.6 gallons per minute (gpm). A Water Budget Summary is presented on the following page. The estimate is based on the proposed plan to pump continuously throughout the year (including the winter months) and under the assumption that all the precipitation during December, January and February will accumulate as a snow pack that is assumed to melt during the month of March. This spring snow melt would be pumped out of the quarry along with the direct precipitation and ground water inflow for the month of March. It is also assumed that there will be no evaporation in March. The assumption of accumulated snow pack and lack of evaporation results in a conservatively high discharge rate since snow melt and evaporation (sublimination) will occur during the winter months.

WATER BUDGET SUMMARY TABLE
Frontier Stone Quarry

	Average Annual Flow Rate	Average March Flow Rate	Average July Flow Rate	Average September Flow Rate
Surficial Drainage from Existing Basin 1	185.33	653.13	157.0	236.37
Surficial Drainage from the Unmined Area of Basin 1 at End of Phase 1 Mining	180.55	633.75	152.48	229.58
Ground Water Inflow from the Mine at the Full Development of the Phase 1 Quarry	251.04	310.40	186.21	183.26
Direct Precipitation into the mine at the Full Development of the Phase 1 Quarry	21.44	75.20	18.06	27.20
Evaporation from the mine for the Full Development Phase 1 Quarry	8.03	0.0	9.03	13.12
Discharge at Full Development of the Phase 1 Quarry	264.45	385.60	195.24	197.34
Total Future Discharge from Basin 1 at Full Development of the Phase 1 Mine	445.0	1019.35	347.72	426.92
Increase in the flow to Basin 1 after the Full Development of Phase 1	259.67	366.22	190.72	190.55

Notes: All discharges are in gallons per minute.
The existing Basin 1 area is 403.3 acres.
The unmined area will be reduced to 391.7 acres by the addition of the 11.6 acre Phase 1 quarry.
All the March discharges include the melt of accumulated snow for December, January and February.
Snow melt is imbedded in the direct precipitation of 75.20 gpm in the Future Phase 1 direct precipitation that is comprised of 19.8 gpm of March precipiation plus 55.4 gpm of snow melt.

8. **Fire Suppression Flows:**
N.A.

9. **Public Water Supply Treatment:**
N.A.

10. **Ground Water Sources**
The project area has installed monitoring wells and a pump test has been conducted on the site. Monitoring well data is show on the following table. The location of the wells is shown on the Mining Plan Map and on the following ground water contour map.

The below table lists the aquifer properties determined from the pump test.

Aquifer Hydraulic Properties Determined from 72-Hour Pumping Test

Well Name	Drawdown		Recovery	
	T (ft^2/day)	S	T (ft^2/day)	S
PW-1	1005	--	1168	--
MW-1	1054	7.40E-04	1108	6.91E-04
DH 1-05	1005	1.31E-05	1081	1.40E-05
DH 4-05	1081	4.14E-05	1138	3.87E-05
DH 5-05	1054	1.47E-05	1351	1.25E-05
Geometric Mean	1039	4.95E-05	1166	4.65E-05

Most of the water pumped during the pumping test was from the deep 56 to 89 foot bedding plane zone. This is where most of the mine dewatering water is expected to be derived. Noticeable dewatering is not expected to occur until the quarry is deepened to that level. Prior to mining down to the 56 to 89 foot below grade level, dewatering is not expected to impose noticeable water level declines in existing wells. Once the 56 to 89 foot deep bedding plane water-bearing zone is encountered by the mine, the dewatering has the potential to lower water levels in existing wells. However, it appears that most residential wells surrounding the site are shallower than a 56 to 89 foot bedding plane zone. Since the shallow bedrock wells have a weak hydraulic connection with the deep 56 to 89 zone and the low permeability of the unconsolidated overburden impedes vertical recharge, the lowering of the groundwater elevation is not expected to be significant and is not expected to deplete yields of the existing wells, or dewater surface water features (streams, wetlands).

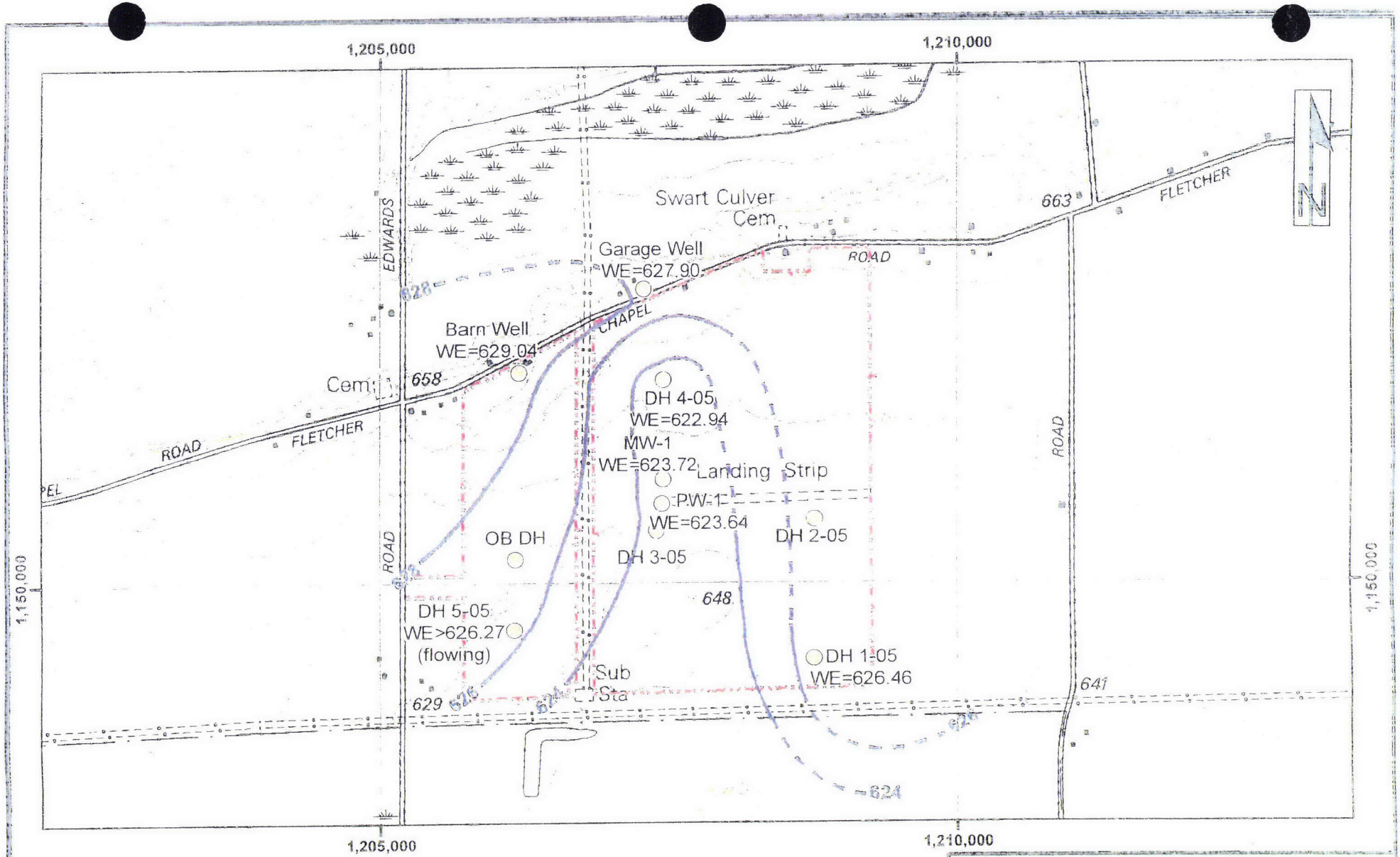
Assuming maximum groundwater contributions of 500 gpm and precipitation contributions of 100 gpm, the projected dewatering rates are expected to range from 150,000 gallons per day (gpd) to less than 1,000,000 gpd.

Static Groundwater Depths and Elevations

Frontier Stone Quarry

		5/04/2005		9/07/2005		11/28/2005		4/03/2007		6/04/2007		6/21/2007		9/16/2008		10/27/2008		5/11/2012		6/8/2012	
Well ID	**Measuring Point Elevation**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**	**Depth to Water (feet)**	**Elevation (feet)**
PW-1	633.24							4.18	629.06	7.61	625.63	9.3	623.94	11.22	622.02	9.6	623.64	8.25	624.97	6.03	627.21
MW-1	634.22							7.96	626.26	9.81	624.41	11.05	623.17	12.09	622.13	10.5	623.72	9.27	624.95	9.98	624.24
DH 1-05	633.66	6.3	627.36	11	622.66	6.26	627.4	4.76	628.9	6.32	627.34	7.65	626.01	8.85	624.81	7.2	626.46	4.5	629.16	5.5	628.16
DH 4-05	641.54	14.6	626.94	21.1	620.44	13.4	628.14	15.39	626.15	17.62	623.92	18.9	622.64	20.25	621.29	18.6	622.94	12.35	629.19	13.13	628.41
DH 5-05	[1]626.27	flowing	>626.27	4.5	621.77	flowing	>626.27							1.64	624.63	Flowing	>626.27	Flowing	>626.27	Flowing	>626.27
DH 5-05	[2]631.30							3.21	628.09	4.61	626.69	5.77	625.53								
Barn Well	656.94									28.55	628.39	27.85	629.09	29.68	627.26	24.05	629.04				
Garage Well	651.95									28.46	623.49	25.3	626.65	25.91	626.04		627.9	21.78	630.17	23.00	628.95

1. The measuring point elevation was 626.27 at the top of the steel casing without casing extension.
2. Measuring point elevation was 631.3 with 5.03 ft added to the top of the steel casing to measure the level when flowing.



Legend

Monitoring Well

DH 4-05
WE=Ground Water Elevation

Property Boundary

Life of Mine Boundary

Ground Water Elevation Contour

Notes:
-NYS Department of Transportation Raster Quadrangle
(Portions of the Knowlesville and Medina quadrangles).

0 1,200 2,400 Feet

ALPHA GEOSCIENCE

Alpha Proj. No. 08122

FIGURE 7

GROUND WATER CONTOUR MAP
ALTERNATIVE A

October 27, 2008

Frontier Stone Quarry
Frontier Stone LLC
Town of Shelby
Orleans County, New York

Map Document: (Z:\projects\2008\08121 - 08140\08122- Frontier Stone\GIS\Groundwater Contours.mxd)

11. **Surface Water Sources:**

Precipitation which falls on the site and which collects in the quarry depression will also be dewatered from the quarry.

Precipitation affecting the dewatering activity is shown on the previously cited Water Budget Summary Table.

Dewatering does not affect any surface water features of the area, there are no surficial streams on-site.

PROFESSIONAL ENGINEER

I certify that this engineer's report has been prepared in accordance with good engineering practices and fulfills the requirements of the Water Withdrawal Permit as set forth in 6 NYCRR Part 601.10.

Name: David A. Myers, P.E. Registered Professional Engineer

Signature: D A Myers Date: 6/13/13

Registered Professional Engineer Number: 061989 • State of Registration: New York

Exhibit F. Water Conservation Program Form:

Form Attached.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

WATER CONSERVATION PROGRAM FORM

NON-POTABLE WATER WITHDRAWALS

TO BE COMPLETED AND SUBMITTED AS PART OF A NYSDEC WATER WITHDRAWAL PERMIT APPLICATION
***SEE PAGE 6 FOR FURTHER INTRODUCTION AND INSTRUCTION REGARDING THIS FORM**

If your water facility already has its own written water conservation program, you may submit it as a supplement to this WCPF. If your system is new, indicate the water conservation measures that will be taken when the system is completed (e.g. All sources of withdrawal will be 100% metered).

I. GENERAL SYSTEM INFORMATION

Facility Name: Frontier Stone Quarry		**DEC No.**	
Street Address: Sour Springs Road		**WWA No.**	
Post Office Box: Medina	**County:** Orleans	**State:** NY	**ZIP:** 14130
Contact Name: Frontier Stone, LLC Dave Mahar			
Street Address: 4172 East Lake Road			
Post Office Box: Wilson	**County:** Orleans	**State:** NY	**ZIP:** 14172
Applicant's Telephone: (716) 751-9670		**Contact's Telephone:** Same	

II. SOURCES OF WATER WITHDRAWAL

[State capacity and withdrawal in gallons per minute (**gpm**), gallons per day (**gpd**), or million gallons per day (**mgd**).]

Source Type: **S** = Surface supply, **G** = Groundwater supply, **P** = Purchased supply
Source Status: **R** = Regular use, **S** = Standby use, **E** = Emergency use, **I** = Inactive, **D** = Decommissioned

Source Name	Source Type	Source Status	Tested Capacity	Actual Current Withdrawal	Start-up Year
Quarry dewatering pump	SG	I	Proposed 500 gpm	0	2014?

III. WATER SOURCES AND METERING

For unmetered systems, please provide your best estimates for water production and/or consumption.

Are all sources of supply (including major interconnections) equipped with master meters? No
How often are they read? NA
How often are they calibrated? NA
Are there secondary meters located within the facility or system? No If yes, how many? NA
Describe secondary metering system if applicable: NA

Water Production for Calendar Year	
Total metered water production: Estimated at 139 mgy	gallons per year
Average day production (total/days of use): Estimated at 380,808	gallons per day
Maximum day production (largest single day): Estimated at 555,264	gallons per day

What are your future goals and schedule for water metering?

Metering will be estimated and reported as required by the site's SPDES from the quarry sump operation records.

Best Management Practices:

** 100% metering of all sources of water withdrawal.*

** Source and secondary meters must be tested and calibrated annually.*

IV. WATER AUDITING

The process of conducting an audit of a water system will enable the collection of data on how much and where water enters, leaves and is used within a facility or system. Another goal of a water audit is to estimate unaccounted-for water use, which includes: Losses through leaks, improperly-functioning or inoperative system controls and unmetered sources of water. The water audit provides a system with a baseline against which water-conservation measures can be evaluated.

Do you conduct a water audit at least once each year? If yes, please submit a copy of your latest audit in addition to completing the following section.

N/A

** Water Audit for Calendar Year

Total metered water production (from previous section)		Total		
Sources of Water Use	**Metered or Estimated?**			**% of Total**
Process Water		subtract		
Cooling Water		subtract		
Wash Water		subtract		
Sanitary		subtract		
Incorporation into Product		subtract		
Irrigation		subtract		
Other		subtract		
Other		subtract		
TOTAL UNACCOUNTED-FOR WATER		Sub-total		
Unaccounted-for water breakdown	Meter under-registration	subtract		
	Unrepaired leakage	subtract		
	Other:	subtract		
** Water measurement and accounting techniques are available in NYSDEC's Water Conservation Manual, http://www.dec.ny.gov/lands/39346.html			0	

What are your future goals for water system auditing?

Monitor discharge through best management practices and SPDES permit regulations.

Best Management Practices:

** At least once each year, a system water audit must be conducted using metered water production and consumption data to determine unaccounted-for water.*

** Keep accurate estimates of unmetered water use.*

** Quantify all authorized water uses by consumption categories.*

V. LEAK DETECTION AND REPAIR

Do you regularly survey your facility for leakage? N/A
Are leaks repaired in a timely manner?
If applicable, do you regularly survey underground piping for water leakage?

Total length of underground piping	Percent of piping surveyed each year	Length of pipe surveyed each year	Listening equipment used	Year of last survey	Number of leaks found	Number of leaks repaired

What are your future goals for water system leak detection and repair?
Monitor equipment and discharges through best management practices and SPDES permit regulations.

Best Management Practices:

** Check any underground water distribution systems for leaks each year.*

** Fix every detectable leak as soon as possible.*

** Have an on-going system rehabilitation program.*

VI. WATER REUSE, RECYCLING AND DROUGHT PLANNING

Does your facility reuse or recycle primary use water? If yes, describe process:
Maybe; There is potential to use the dewatered, water for crop irrigation.

Does your facility use reclaimed rainwater, storm water runoff or wastewater? If yes, describe process:
Water to be used for the water truck dust suppression will be collected from dewatering of the active quarry pit which includes rainwater and storm water runoff

Describe any equipment or processes that promote the efficient use of water by your facility:
Conveyors are to be employed lessening the need for haul roads and therefore less water use for dust suppression. Berms and vegetations practices will also lessen water usage for dust suppression. Phased mining reduces the area requiring dewatering at any one time allowing for the reduction in withdrawal capacity.

Does your system include storage tanks or ponds to meet short term water demands?
No.

Describe any actions that can be taken to reduce water use during times of drought:
The reliance on conveyors reduces the need for haul roads, minimizes water consumption. During times of drought the need to dewater the quarry is correspondingly reduced. Phased mining reduces the area requiring dewatering at any one time allowing for the reduction in withdrawal capacity.

What are your future goals for recycling or reducing water usage?
N/A

Best Management Practices:

** Reuse or recycle water whenever possible.*

** Employ efficient irrigation techniques*

** Develop a plan to reduce water use during times of drought.*

VI. SIGNATURE PAGE AND DISCUSSION

Facility Name: Frontier Stone Quarry	WWA No.

Signature:	Signatory: David J. Mahar
Title: President	Date:

***DISCUSSION*:**

Effective February 15, 2011, New York State Environmental Conservation Law (§ECL 15-1501) has required that all applications for a NYSDEC Water Withdrawal Permit include a water conservation program. This Water Conservation Program Form (WCPF) is a required submittal of all such applications.

The WCPF has been set up to cover the following basic elements of a water conservation program: Source Water Inventory, Water Usage and Metering, Water Auditing, Leak Detection/Repair, and Water Use Reduction. The Best Management Practices listed at the bottom of each page represent DEC water conservation policy objectives and should be incorporated into your program development. Additional water conservation measures that are specific to your category of water usage should also be incorporated into your individual program.

Water withdrawal permit applicants can consult the NYSDEC publication entitled "A Survey of Methods for Implementing and Documenting Water Conservation in New York".

The American Water Works Association (AWWA) is also an excellent source of information regarding water conservation practices and procedures. Information ranging from technical manuals to online resources and tools can be found at http://www.awwa.org.

Clear Entire Form

Exhibit G. Annual Reporting Forms:
This is a proposed operation and is still greenfield site.

Exhibit H. Acquisition Maps:
This is a quarry site that dewaters, an acquisition map is not applicable. A location map is located in Exhibit B.

Exhibit I. Water Analysis/Heath Review:
This is not a public water supply project and is not required to send samples for review.

Exhibit J. Treatment Methods:
This is not a public water supply project and is not required to develop water treatment methods.

There will be Best Management Practices in place as required by the MLUP permit and the SPDES as required for this project.

Exhibit K. Project Justifications:

Why the proposed project was selected from the evaluated alternatives?

The proposed quarry will supply the community and region with a long term economical source of high-quality construction aggregate and high-grade agricultural lime. The quarry can only be located where the stone occurs.

There is no alternative to dewatering the quarry, if water is not removed from the quarry we can not operate.

Why the proposed water withdrawal quantity is reasonable for the proposed use?

As stated in the "Surface Water and Ground Water Data" section of the Engineering Report, these are calculated amounts for the quarry operation based upon pump test data and water budget analysis. The question is not germane to the project.

Why the proposed water conservation measures are environmentally sound and economically feasible?

If there is a drought condition no water will accumulate and pumping is not needed. The conservation measures are logical and reasonable given the nature of the business and its economics.

Whether the proposed water supply is adequate?

This project will be removing water not supplying it.

Whether the proposed project is just and equitable to other municipalities and their inhabitants in regards to present and future needs for sources of potable water?

The project will not have an impact on water supplies and the project is non-consumptive.

Whether the proposed withdrawal will result in no significant individual or cumulative adverse environmental impacts?

The potential environmental impacts of quarry dewatering are discussed at length in a DEIS prepared for the project. Mitigation measures are proposed. No significant individual or cumulative impacts were indentified.

Whether the proposed withdrawal will be consistent with all applicable municipal, state and federal laws as well as regional interstate and international agreements?

The proposed withdrawal will meet the regulations and practices set forth in New York State's Mined Land Reclamation Law and the project has been extensively reviewed under SEQR.

Exhibit L. Canal withdrawal approvals:
This project will not withdraw from the New York State Canal System.

Exhibit M. Transmittal letter:
Please see cover pages.

Exhibit N. Great Lakes-St. Lawrence River Basin Water Resources Compact Process Requirements:
This project will comply with any and all requirements of the Great Lakes-St. Lawrence River Basin Water Resources Compact. There will be no diversions of water out of the Great Lakes-St. Lawrence River Basin.

Exhibit O. Permit Renewals.
The applicant will file for timely renewals.