

GSP CONSULTING

6626 Gordon Road, Unit C
 WILMINGTON, NORTH CAROLINA, 28411
 (910) 442-7870
 FAX (910) 799-6659

LETTER OF TRANSMITTAL

DATE	11/07/12	JOB NO.	2012-0008
ATTENTION	Rob Gordon		
PHONE #			
RE:	Shinnwood West		

TO: Rob Gordon
City of Wilmington
414 Chestnut St., 2nd floor
Wilmington, NC 28402

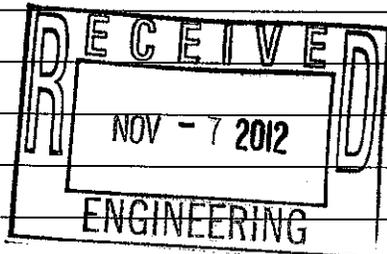
WE ARE SENDING YOU Attached Under separate cover via _____ the following items:
 Fee Check Permit Applications Plans Calculations Specifications
 Copy of Letter Change order Diskette _____

COPIES	DESCRIPTION
1	Shinnwood West Plans
1	Stormwater Calculations
1	Stormwater Permit Application & \$1,000 Stormwater Permit Fee
1	Property Deed
1	Low Density Supplement
16	Grassed Swale O&M Agreement
16	Grassed Swale Supplement

THESE ARE TRANSMITTED as checked below:

- For approval Approved as submitted Resubmit _____ copies for approval
 For your use Approved as noted Submit _____ copies for distribution
 As requested Returned for corrections Return _____ corrected prints
 For review and comment _____
 FOR BIDS DUE _____ PRINTS RETURNED AFTER LOAN TO US

REMARKS: _____



COPY TO: File SIGNED: _____ - Garry S. Pape, P.E.

If enclosures are not as noted, kindly notify us at once.

**CITY OF WILMINGTON
ENGINEERING PLAN REVIEW CHECKLIST**

Version 2.0

Name of Project: Shinnwood West

Required Submittal Information

Initials

BSP

One (1) original signed and notarized Stormwater Management Permit Application Form

BSP

One (1) original signed and notarized Deed Restrictions & Protective Covenants (if required)

One (1) BMP supplement form (PE sealed, signed and dated) for **each** Stormwater BMP (not required for LID Projects). Enter the total number of proposed BMP's for each type of BMP:

_____	Wet Detention Ponds	_____	Stormwater Wetland
_____	Infiltration Basin	_____	Permeable Pavement
_____	Infiltration Trench	_____	Bioretention Area
_____	Level Spreader/	_____	Sand Filter
	Vegetated Filter Strip		

BSP

X Other: Grassed Swale (16)

BSP

One (1) BMP Checklist for **each** Stormwater BMP listed above (not required for LID projects)

BSP

One (1) original signed and notarized BMP Operation and Maintenance form for **each type** of Stormwater BMP

Permit application processing fee. Make checks payable to the City of Wilmington

Circle appropriate fee: \$1,000 – Stormwater Management Permit
\$200 – Drainage Plan
\$150 – Redevelopment Exclusion

BSP

A detailed narrative (one to two pages) describing the stormwater treatment/management system. Include TRC and/or the concept plan review comments and how they have been addressed.

BSP

A detailed soils map showing the hydrologic group and all soils for the project

BSP

One (1) set of calculations (PE sealed, signed and dated)

BSP

Copy of any applicable soils report with the associated SHWT elevations (identify elevations in addition to depths) as well as a map of the boring locations with the existing elevations and boring logs. For projects with infiltration BMPs, the report should also include the soil type, infiltration rate determined by field testing, the depth of the test and the method of determining the infiltration rate.

BSP

A copy of the most current property deed. Deed Book: 5683 Page No: 1196-1206

BSP

One (1) set of plans folded to 8.5" x 14" (PE sealed, signed and dated) that include all items required for site plan review as identified in Section 18-60(c) of the Land Development Code (attached for reference) and all items required below

CITY OF WILMINGTON
ENGINEERING PLAN REVIEW CHECKLIST
Version 2.0

AD

J

- tailwater effects into the analysis.
- All rim elevations above 10-yr HGL
- 50-yr HGL does not cause flooding of any structures
- Pipe velocity greater than 2.5 ft/s (flowing full)
- All proposed swales have a non-erosive velocity
- 10-yr energy dissipater calculations for each outlet

Landscape Plan

MA

Initials

MA

J

- Landscape plan shows how BMP landscaping conforms to SD 15-16 (for all infiltration basins and wet ponds)
- BMP landscaping meets requirements of NCDENR Stormwater BMP manual
- 5-10' landscape zone as required by Sec. V-4(g) of the technical standards
- Tree Protection Detail SD 15-08
- Stormwater management is incorporated into landscape islands where feasible in accordance with Sections 18-448 (h) & (l) of the land development code.
- Temporary and permanent vegetative stabilization methods and including seedbed preparation. Must be appropriate for this area

10
26
\$1550.00



FOR REGISTRATION REGISTER OF DEEDS
JENNIFER H. MACNEISH
NEW HANOVER COUNTY, NC
2012 OCT 26 12:59 58 PM
BK 5683 PG 1196-1206 FEE \$26 00
NC REV STAMP \$1,550 00
INSTRUMENT # 2012037183

NORTH CAROLINA SPECIAL WARRANTY DEED

Excise Tax \$1,550 00

Kivsten E. Foyles, Esq.

This deed was prepared by First Troy SPE, LLC, 340 Commerce Ave, Ste 17B, Southern Pines, NC 28387

Mail after recording to: GRANTEE

NO OPINION ON TITLE REQUESTED OR GIVEN

THIS DEED made this 18th day of October, 2012, by and between

GRANTOR:

FIRST TROY SPE, LLC

A North Carolina Limited Liability Company

341 North Main St Troy, NC 27371

And

GRANTEE:

SHINNWOOD WEST, LLC

A North Carolina Limited Liability Company

6105 Oleander Dr, Ste, 201, Wilmington, NC 28403

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the County of New Hanover, North Carolina and more particularly described as follows .

SEE ATTACHED EXHIBIT "A"

This is the same property described in a Deed of Trust executed by *Beasley-Pigford Properties, LLC* The Deed of Trust was foreclosed (see *09 SP 1283*), New Hanover County Registry

The property hereinabove described was acquired by Grantor by instruments recorded in **Book 5464, Page 2150**, New Hanover County Registry

Return to
Hogue Hill LLP

All or a portion of the property herein conveyed does not include the primary residence of the Grantor

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple

And the Grantor covenants with the Grantee, that Grantor has done nothing to impair such title as Grantor received, and Grantor will warrant and defend the title against the lawful claims of all persons claiming by, under or through Grantor, except for the exceptions hereinafter stated

1. Easements, Rights of Way, Restrictions and Encumbrances of record.

Pursuant to Article VI Sec. 6.1 (a) of the Operating Agreement of First Troy SPE, LLC dated November 16, 2009, the management and control of the business and affairs of said LLC is vested in its' Board of Directors, each member of whom constitutes a manager of the LLC. Pursuant to Article VI Sec. 6.12 (a), the Board of Directors may, from time to time, designate and/or employ one or more individuals to be officers of the Company. ...the officers of the Company shall have the authority to pursue the business and purpose of the Company, including without limitation the authority to (i) acquire and retain for any period of time, any real or personal property, or interest in such property; (ii) sell, exchange, quitclaim, convert, partition, grant an option on, abandon or otherwise dispose of all or any part of any real or personal property or any interest in such property;... By Resolution dated September 24, 2012, the signing officer herein was authorized and empowered to execute instruments on behalf of the LLC and such power remains in full force and effect as of the date hereof.

IN WITNESS WHEREOF, the Grantor has caused this instrument to be executed in its company name by its duly authorized Vice President the day and year first above written

FIRST TROY SPE, LLC

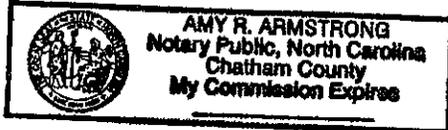
BY  (SEAL)
KIRSTEN E. FOYLES, Vice President

NORTH CAROLINA, CHATHAM COUNTY

I, Amy R. Armstrong, a Notary Public of the County and State aforesaid do hereby certify that KIRSTEN E. FOYLES, Vice President, for FIRST TROY SPE, LLC, a North Carolina Limited Liability Company, personally appeared before me this day and acknowledged the due execution of the foregoing instrument for the purposes therein expressed being authorized to do so on behalf of the company

Witness my hand and official stamp or seal, this 18th day of October, 2012

SEAL



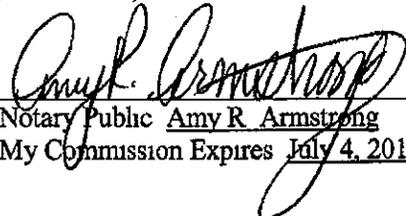
 (SEAL)
Notary Public Amy R. Armstrong
My Commission Expires July 4, 2015

EXHIBIT "A"

Property Address: 6371 Greenville Loop Road

To arrive at the true point of beginning commence at the intersection of the center-lines of Greenville Loop Road (60 foot right-of-way), also known as S.R. # 1421, and Shinnwood Road (60 foot right-of-way), in Wilmington, North Carolina. Go thence South 38 degrees 30 minutes 08 seconds West 4.72 feet, along the center-line of said Greenville Loop Road to a point. Go thence North 55 degrees 57 minutes 45 seconds West 30.09 feet, to an old iron pipe on the westerly right-of-way line of said Greenville Loop Road, the easternmost corner of a tract deeded to Kirk Pigford by deed recorded in Book 3957 at Page 725 Tract Two of said Registry. Go thence North 55 degrees 57 minutes 45 seconds West 329.93 feet, along a northerly line of said tract deeded to Kirk Pigford to an old iron pipe. Go thence South 20 degrees 26 minutes 04 seconds West 88.44 feet, along the westerly line of said Pigford Tract to an old iron pipe. Go thence North 69 degrees 27 minutes 34 seconds West 164.92 feet, along a southerly line of said Pigford Tract, Tract Three, to an old iron pipe. Go thence North 69 degrees 33 minutes 25 seconds West 167.13 feet, along the southerly line of said Pigford Tract, Tract One to an old concrete monument, THE TRUE POINT OF BEGINNING. Said beginning monument being the southernmost corner of a tract deeded to Hollis D. Hales and Beverly B. Mintz by deed recorded in Book 1298 at Page 697 of said Registry. Running thence from said beginning point:

1. North 70 degrees 14 minutes 37 seconds West 1003.72 feet, along the southerly line of said Hollis-Mintz Tract and the northerly line of a tract deeded to Irene Fullwood by deed recorded in Book 3046 at Page 337 of said Registry to a new iron pipe; thence
2. North 19 degrees 50 minutes 35 seconds East 262.46 feet, along the westerly line of said Hollis-Mintz Tract to a new iron pipe at the northernmost corner of said Hollis-Mintz Tract, thence
3. South 70 degrees 12 minutes 47 seconds East 795.32 feet, along the northerly line of said Hollis-Mintz Tract and the southerly line of a tract deeded to T. Russell Brock and Margaret Brock by deed recorded in Book 1269 at Page 719 of said Registry to an old wagon axle at the westernmost corner of a tract described in a deed to Grace J. Corbett and husband Joseph C. Corbett, recorded in Book 1659 at Page 83 of said Registry; thence
4. South 69 degrees 32 minutes 54 seconds East 211.14 feet, to an old iron pipe at the northernmost corner of said tract deeded to Kirk Pigford by deed recorded in Book 3957 at Page 725, Tract One, of said Registry; thence
5. South 20 degrees 22 minutes 52 seconds West 259.49 feet, to the point of beginning.

The above described tract contains 6.04 acres, more or less. The same being that tract deeded to Hollis D. Hales and Beverly Blake Mintz by deed recorded in Book 1298 at Page 697 of the New Hanover County Registry. Bearings are based on NCGS 1983.

EXHIBIT "A" (cont.)

Property Address: 6379 Greenville Loop Road

To arrive at the true point of beginning commence at the intersection of the center-lines of Greenville Loop Road (60 foot right-of-way), also known as S.R. # 1421 and Shinnwood Road (60 foot right-of-way), in Wilmington, North Carolina. Go thence South 38 degrees 30 minutes 08 seconds West 4.72 feet, along the center-line of said Greenville Loop Road to a point. Go thence North 55 degrees 57 minutes 45 seconds West 30.09 feet, to an old iron pipe on the westerly right-of-way line of said Greenville Loop Road. Go thence North 55 degrees 57 minutes 45 seconds West 329.93 feet, along the northerly line of a tract deeded to Kirk Pigford by deed recorded in Book 3957 at Page 725, Tract Two, of said Registry to an old iron pipe. Go thence South 20 degrees 26 minutes 04 seconds West 83.44 feet, along the westerly line of said Pigford Tract to an old iron pipe. Go thence North 69 degrees 27 minutes 34 seconds West 164.92 feet, along the southerly line of said Pigford Tract described in said Deed recorded in Book 3957 at Page 725, Tract Three, to an old iron pipe. Go thence North 69 degrees 33 minutes 25 seconds West 167.13 feet, along the southern line of the tract recorded in Deed Book 3957 at Page 725, Tract One, to an old concrete monument. Go thence North 70 degrees 14 minutes 37 seconds West 1003.72 feet to a new iron pipe, the TRUE POINT OF BEGINNING. Said beginning point being the westernmost corner of a tract deeded to Hollis D. Hales and Beverly B. Mintz by deed recorded in Book 1298 at Page 697 of the New Hanover County Registry. Running thence from said beginning point:

1. North 70 degrees 14 minutes 37 seconds West 1013.83 feet, along the northerly line of a tract deeded to Irene Fullwood by deed recorded in Book 3046 at Page 337 of said Registry to a new iron pipe. Last said point being on the easterly line of Lot 3, Lands End Subdivision as shown on a map recorded in Map Book 31 at Page 17 of said Registry; thence
2. North 26 degrees 52 minutes 56 seconds East 265.03 feet, along the easterly line of said Lands End Subdivision to a point at the westernmost corner of a tract deeded to T. Russell Brock and Margaret Brock by deed recorded in Book 1269 at Page 719 of said Registry. Last said point being located South 26 degrees 52 minutes 56 seconds West 49.43 feet, from an old stone marked "SPC", thence
3. South 70 degrees 12 minutes 47 seconds East 981.35 feet along the northerly line of a tract described in Book 1298 at Page 695 of said Registry to a new iron pipe; thence
4. South 19 degrees 50 minutes 35 seconds West 262.46 feet, along the westerly line of said Hollis- Brock Tract recorded in Book 1298 at Page 697 of said Registry to the point of beginning

The above described tract contains 6.02 acres, more or less. The same being that tract conveyed to Hollis D Hales and Beverly Blake Mintz, by deed recorded in Book 1298 at Page 695. Bearings are based on NCGS 1983.

EXHIBIT "A" (cont.)

Having tax parcel number R06200-003-036-000 and being described further as:

Being all of that +/- 4.2 acre tract of land described by metes and bounds conveyed by Marguerite V. Rogers (widow) to Thomas R. Brock, Jr. and wife, Margaret Ann Brock by NC General Warranty Deed dated October 11, 1984 and recorded October 22, 1984 in Deed Book 1269, Page 719, New Hanover County Registry,

LESS AND EXCEPT that +/- one acre tract of land described by metes and bounds conveyed by Grace James Corbett to Grace James Corbett and husband, J.C. Corbett, Sr. by NC General Warranty Deed recorded April 19, 1993 in Deed Book 1659, Page 83, New Hanover County Registry, reference to which deeds is hereby made for a more particular description.

Property Address: 6385 Greenville Loop

Property Address: 6351 Greenville Loop

TRACT 2:

BEGINNING at a point in the Northwestern right of way line of the Greenville Loop Road (60-foot right of way), said point being located North 49 degrees 38 minutes West 30.0 feet from a point in the center line of Greenville Loop Road (S.R. #1421), said point in the center line of Greenville Loop Road being 5.80 feet as measured Southwestwardly along the center line of Greenville Loop Road from its point of intersection with its center line of Shinn Point Road (S.R. #1513); running thence from said beginning point with the Northwestern right of way line of the Greenville Loop Road South 40 degrees 22 minutes West 176.0 feet to a point; thence North 53 degrees 57 minutes West 274.0 feet to a point; thence North 22 degrees 30 minutes East 180.32 feet to a point; thence South 53 degrees 58 minutes East 329.52 feet to the point of beginning; containing 1.2 acres, more or less; and being the same lands as described in deed to William V. Hussey and wife, Blanche E. Hussey, recorded August 4, 1958 in Book 622 at Page 504 in the New Hanover County Registry; and being the same lands as described in deed to William V. Hussey and Doris Lorraine Hussey recorded June 25, 1987 in Book 1380 at Page 1664 in the New Hanover County Registry, and as shown on map by Jack G. Stocks, R.L.S., dated June 4, 1987.

EXHIBIT "A" (cont.)

TRACT 3:

BEGINNING at a stake or iron pin on the East side of a ditch (Stokley Everett's S. E. corner and Alex, Galloway's N.E. Corner) and running thence along said ditch North 23 degrees East 260 feet to a stake, thence North 67 degrees West 167 ½ feet to a stake, thence South 23 degrees West 260 feet to a stake and thence South 67 degrees East 167 ½ feet to the beginning, containing one acre more or less, and being the Eastern one-half of a lot of land conveyed by Stokley Everett and wife, Sallie to Margaret Ann Willis, by deed bearing date February 14, 1903, and recorded in the office of the Register of Deeds of New Hanover County in Book 35 at Page 229.

EXHIBIT "A" (cont.)

Property Address: 5.25 Acres Greenville Loop Road
Frederick Fullwood

To arrive at the true point of beginning: commence at the intersection of the center-lines of Greenville Loop Road (60 foot right-of-way), also known as S.R. 1421 and Shinnwood Road (60 foot right-of-way), Wilmington, New, North Carolina. Go thence South 38 degrees 30 minutes 08 seconds West 4.72 feet, along the center-line of said Greenville Loop Road to a point. Go thence North 55 degrees 57 minutes 45 West 30.09 feet, to an old iron pipe, the easternmost corner of a tract deeded to Kirk Pigford by deed recorded in Book 3957 at Page 725, Tract Two, of the New Hanover County Registry. Go thence North 55 degrees 57 minutes 45 seconds West 329.93 feet, along a northerly line of said Pigford tract to a point. Go thence South 20 degrees 26 minutes 04 seconds West 83.39 feet, along the westerly line of said Tract Two to an old iron pipe. Said last pipe being a common corner between said Pigford Tract and a tract deeded to Irene Fullwood by deed recorded in Book 3046 at Page 337 of said Registry. Go thence South 20 degrees 35 minutes 12 seconds West 96.79 feet to an old iron pipe at the easternmost corner of a tract deeded to Frederick E. Fullwood by deed recorded in Book 1812 at Page 883 of said Registry, the TRUE POINT OF BEGINNING. Running thence from said beginning pipe:

1. South 17 degrees 41 minutes 06 seconds West 97.06 feet, to a new iron pipe, the southernmost corner of said Frederick E. Fullwood tract; thence
2. North 70 degrees 06 minutes 36 seconds West 2375.76 feet, along the southerly line of said Frederick Fullwood Tract, to a new iron pipe on the easterly line of Lot 2, Lands End Subdivision as shown on a map recorded in Map Book 31 at Page 17 of the New Hanover County Registry; thence
3. North 26 degrees 52 minutes 56 seconds East 97.00 feet, along the easterly line said Lands End Subdivision to a new iron pipe. Last said point being the westernmost corner of said tract deeded to Irene Fullwood, by said deed recorded in Book 3046 at Page 337 of said Registry; thence
4. South 70 degrees 07 minutes 39 seconds East 2360.21 feet, along the southerly line of said Irene Fullwood Tract, to the point of beginning.

The above described tract contains 5.25 acres, more or less. The same being that tract deeded to Frederick E. Fullwood by deed recorded in Book 1812 at Page 883 of the New Hanover County Registry Bearings are based on NCGS 1983.

EXHIBIT "A" (cont.)

Property Address: 5.32 Acres Greenville Loop Road

To arrive at the true point of beginning: commence at the intersection of the center-lines of Greenville Loop Road (60 foot right-of-way), also known as S.R. 1421, and Shinnwood Road (60 foot right-of-way), Wilmington, New Hanover County, North Carolina. Go thence South 38 degrees 30 minutes 08 seconds West 4.72 feet, along the center-line of said Greenville Loop Road to a point. Go thence North 55 degrees 57 minutes 45 seconds West 30.09 feet, West to an old iron pipe on the easternmost corner of a tract deeded to Kirk Pigford by deed recorded in Book 3957 at Page 725, Tract Two, of the New Hanover County Registry. Go thence North 55 degrees 57 minutes 45 seconds West 329.93 feet to an old iron pipe. Go thence South 20 degrees 26 minutes 04 seconds West 83.44 feet, along the westerly line of said Tract Two, to an old iron pipe, the TRUE POINT OF BEGINNING. Running thence from said beginning pipe

1. South 20 degrees 35 minutes 12 seconds West 96.79 feet, along a westerly line of said Pigford Tract to an old iron pipe, a common corner between said Pigford, and Irene Fullwood, and Frederick E. Fullwood; thence
2. North 70 degrees 07 minutes 39 seconds West 2360.21 feet, to a new iron pipe on the eastern of line of Lot 3, Lands End Subdivision as shown on a map recorded in Map Book 31 at Page 17 of the New Hanover County Registry; thence
3. North 26 degrees 52 minutes 56 seconds East 97.00 feet along the easterly line of said Lands End Subdivision to a new iron pipe. Last said pipe being the westernmost corner of a tract deeded to Hollis Hales and Beverly Blake Mintz by deed recorded in Book 1298 at Page 695 of said Registry; thence
4. South 70 degrees 14 minutes 37 seconds East 1013.83 feet, along the southerly line of said Hollis-Blake Tract, to a new iron pipe at the westernmost corner of a tract deeded to Hollis D. Hales and Beverly Blake Mintz by deed recorded in Book 1298 at Page 697 of said Registry; thence
5. Continuing South 70 degrees 14 minutes 37 seconds East 1003.72 feet, along the southerly line of said tract recorded in Book 1298 at Page 697 to an old concrete monument, the westernmost corner of a tract deeded Kirk Pigford by deed recorded in Book 3957 at Page 725, Tract One, of said Registry; thence
6. South 69 degrees 33 minutes 25 seconds East 167.13 feet, along the southerly line of said Tract One to an old iron pipe; thence
7. South 69 degrees 27 minutes 34 seconds East 164.92 feet, along the southerly line of said Pigford Tract, Tract Three, to the point of beginning.

The above described tract contains 5.32 acres, more or less. The same being that tract deeded to Irene Fullwood by deed recorded in Book 3046 at Page 337 of the New Hanover County Registry. Bearings are based on NCGS 1983.

EXHIBIT "A" (cont.)

Description for
Grace J. Corbett to Roy Beasley

Beginning at an old iron pipe in the westerly right-of-way line of Greenville Loop Road (60 foot public right-of-way) said beginning pipe being located north, 64 degrees, 44 minutes, 42 seconds West, 30.82 feet from the intersection of the center line of said Greenville Loop Road with the center line of Shinnwood Road. Said beginning pipe being the dividing corner between a tract deeded to Beasley-Pigford Properties, LLC, by deed recorded in book 5001 at page 900 of the New Hanover County Registry and a tract deeded to Grace J. Corbett and husband, Joseph C. Corbett, by deed recorded in book 1659 at page 83 of said Registry. Running thence from said beginning pipe;

1. North, 55 degrees, 57 minutes, 45 seconds West, 329.93 feet along said dividing line to an old iron pipe, a common corner between said Beasley-Pigford tract and said Corbett tract; THENCE
2. North, 20 degrees, 33 minutes, 13 seconds East, 30.85 feet along Corbett's westerly line, to a new iron pipe; THENCE
3. South, 55 degrees, 00 minutes, 06 seconds East, 339.07 feet along a new line, and along the proposed northerly right-of-way line of a public road right-of-way to a new iron pipe in said westerly line of Greenville Loop Road; THENCE
4. South, 38 degrees, 30 minutes, 08 seconds West, 24.39 feet to the point of beginning.

The above-described tract contains 0.21 acres, more or less. The same being a portion of said tract deeded to Grace J. Corbett and husband, Joseph C. Corbett, by said deed recorded in book 1659, at page 83 of the New Hanover County Registry.

The same also being a portion of Tract 2, shown on a map recorded in Map Book 52 at Page 292 of said Registry.



Public Services
 Engineering
 414 Chestnut St, Suite 200
 Wilmington, NC 28401
 910 341-7807
 910 341-5881 fax
 wilmingtonnc.gov
 Dial 711 TTY/Voice

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 (Form SWP 2.2)

I. GENERAL INFORMATION

1. Project Name (subdivision, facility, or establishment name - should be consistent with project name on plans, specifications, letters, operation and maintenance agreements, etc.):

Shinwood West

2. Location of Project (street address):

6361 Greenville Loop Road

City: Wilmington County: New Hanover Zip: 28403

3. Directions to project (from nearest major intersection):

Project is located approximately 4,500' heading south from Oleander Drive/Greenville Loop Road intersection on the right

II. PERMIT INFORMATION

1. Specify the type of project (check one): Low Density High Density
 Drains to an Offsite Stormwater System Drainage Plan Other

If the project drains to an Offsite System, list the Stormwater Permit Number(s):

City of Wilmington: _____ State – NCDENR/DWQ: _____

2. Is the project currently covered (whole or in part) by an existing City or State (NCDENR/DWQ) Stormwater Permit? Yes No

If yes, list all applicable Stormwater Permit Numbers:

City of Wilmington: _____ State – NCDENR/DWQ: _____

3. Additional Project Permit Requirements (check all applicable):

CAMA Major Sedimentation/Erosion Control

NPDES Industrial Stormwater 404/401 Permit: Proposed Impacts: 0.25 Ac

If any of these permits have already been acquired please provide the Project Name, Project/Permit Number, issue date and the type of each permit:

III. CONTACT INFORMATION

1. Print Applicant / Signing Official's name and title (specifically the developer, property owner, lessee, designated government official, individual, etc. who owns the project):

Applicant / Organization: Shinnwood West, LLC.

Signing Official & Title: Howard Penton - Member/Manager

- a. Contact information for Applicant / Signing Official:

Street Address: 6105 Oleander Drive, Suite 201

City: Wilmington State: NC Zip: 28403

Phone: 910-452-1410 Fax: _____ Email: howard@pentondevelopment.com

Mailing Address (if different than physical address): _____

City: _____ State: _____ Zip: _____

- b. Please check the appropriate box. The applicant listed above is:

- The property owner (Skip to item 3)
 Lessee* (Attach a copy of the lease agreement and complete items 2 and 2a below)
 Purchaser* (Attach a copy of the pending sales agreement and complete items 2 and 2a below)
 Developer* (Complete items 2 and 2a below.)

2. Print Property Owner's name and title below, if you are the lessee, purchaser, or developer. (This is the person who owns the property that the project is on.)

Property Owner / Organization: _____

Signing Official & Title: _____

- a. Contact information for Property Owner:

Street Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____ Email: _____

Mailing Address (if different than physical address): _____

City: _____ State: _____ Zip: _____

3. (Optional) Print the name and title of another contact such as the project's construction supervisor or another person who can answer questions about the project:

Other Contact Person / Organization: _____

Signing Official & Title: _____

a. Contact information for person listed in item 3 above:

Street Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____ Email: _____

Mailing Address (if different than physical address): _____

City: _____ State: _____ Zip: _____

IV. PROJECT INFORMATION

1. In the space provided below, briefly summarize how the stormwater runoff will be treated.

The stormwater for this project will be treated by grassed swales

2. Total Property Area: 2,003,307 square feet

3. Total Coastal Wetlands Area: 0 square feet

4. Total Surface Water Area: 0 square feet

5. Total Property Area (2) – Total Coastal Wetlands Area (3) – Total Surface Water Area (4) = Total Project Area: 2,003,307 square feet.

6. Existing Impervious Surface within Property Area: _____ square feet

7. Existing Impervious Surface to be Removed/Demolished: _____ square feet

8. Existing Impervious Surface to Remain: _____ square feet

9. Total Onsite (within property boundary) Newly Constructed Impervious Surface (*in square feet*):

Buildings/Lots	274,031
Impervious Pavement	153,665
Pervious Pavement (adj. total, with % credit applied)	
Impervious Sidewalks	41,898
Pervious Sidewalks (adj. total, with % credit applied)	
Other (describe) Common Area/Pool/Clubhouse/Parking Lot	11,200
Future Development	
Total Onsite Newly Constructed Impervious Surface	480,794

10. Total Onsite Impervious Surface

(Existing Impervious Surface to remain + Onsite Newly Constructed Impervious Surface) = 480,794 square feet

11. Project percent of impervious area: (Total Onsite Impervious Surface / Total Project Area) x100 = 24 %

12. Total Offsite Newly Constructed Impervious Area (improvements made outside of property boundary, in square feet):

Impervious Pavement	
Pervious Pavement (adj. total, with % credit applied)	
Impervious Sidewalks	
Pervious Sidewalks (adj. total, with % credit applied)	
Other (describe)	
Total Offsite Newly Constructed Impervious Surface	0

13. Total Newly Constructed Impervious Surface

(Total Onsite + Offsite Newly Constructed Impervious Surface) = 480794 square feet

14. Complete the following information for each Stormwater BMP drainage area. If there are more than three drainage areas in the project, attach an additional sheet with the information for each area provided in the same format as below. Low Density projects may omit this section and skip to Section V.

Basin Information	(Type of BMP) BMP #	(Type of BMP) BMP #	(Type of BMP) BMP #
Receiving Stream Name	Hewletts Creek/Cape Fear		
Receiving Stream Index Number	18-87-26		
Stream Classification	SA, HQW		
Total Drainage Area (sf)	2003307	0	0
On-Site Drainage Area (sf)	2003307		
Off-Site Drainage Area (sf)			
Total Impervious Area (sf)	480794	0	0
Buildings/Lots (sf)	274031		
Impervious Pavement (sf)	153665		
Pervious Pavement, % credit (sf)			
Impervious Sidewalks (sf)	41898		
Pervious Sidewalks, % credit (sf)			
Other (sf)	11200		
Future Development (sf)			
Existing Impervious to remain (sf)			
Offsite (sf)			
Percent Impervious Area (%)	24		

15. How was the off-site impervious area listed above determined? Provide documentation:

V. SUBMITTAL REQUIREMENTS

1. Supplemental and Operation & Maintenance Forms - One applicable City of Wilmington Stormwater BMP supplement form and checklist must be submitted for **each** BMP specified for this project. One applicable proposed operation and maintenance (O&M) form must be submitted for **each type** of stormwater BMP. Once approved, the operation and maintenance forms must be referenced on the final plat and recorded with the register of deeds office.
2. Deed Restrictions and Restrictive Covenants - For all subdivisions, outparcels, and future development, the appropriate property restrictions and protective covenants are required to be recorded prior to the sale of any lot. Due to variability in lot sizes or the proposed BUA allocations, a table listing each lot number, lot size, and the allowable built-upon area must be provided as an attachment to the completed and notarized deed restriction form. The appropriate deed restrictions and protective covenants forms can be downloaded at the link listed in section V (3). Download the latest versions for each submittal.

In instances where the applicant is different than the property owner, it is the responsibility of the property owner to sign the deed restrictions and protective covenants form while the applicant is responsible for ensuring that the deed restrictions are recorded.

By the notarized signature(s) below, the permit holder(s) certify that the recorded property restrictions and protective covenants for this project, if required, shall include all the items required in the permit and listed on the forms available on the website, that the covenants will be binding on all parties and persons claiming under them, that they will run with the land, that the required covenants cannot be changed or deleted without concurrence from the City of Wilmington, and that they will be recorded prior to the sale of any lot.

3. Only complete application packages will be accepted and reviewed by the City. A complete package includes all of the items listed on the City Engineering Plan Review Checklist, including the fee. Copies of the Engineering Plan Review Checklist, all Forms, Deed Restrictions as well as detailed instructions on how to complete this application form may be downloaded from:

<http://www.wilmingtonnc.gov/PublicServices/Engineering/PlanReview/StormwaterPermits.aspx>

The complete application package should be submitted to the following address:

City of Wilmington – Engineering
Plan Review Section
414 Chestnut Street, Suite 200
Wilmington, NC 28402

VI. CONSULTANT INFORMATION AND AUTHORIZATION

1. Applicant: Complete this section if you wish to designate authority to another individual and/or firm (such as a consulting engineer and /or firm) so that they may provide information on your behalf for this project (such as addressing requests for additional information).

Consulting Engineer: Garry S. Pape, P.E.

Consulting Firm: GSP Consulting, PLLC

- a. Contact information for consultant listed above:

Mailing Address: 6626 Gordon Road, Unit C

City: Wilmington State: NC Zip: 28411

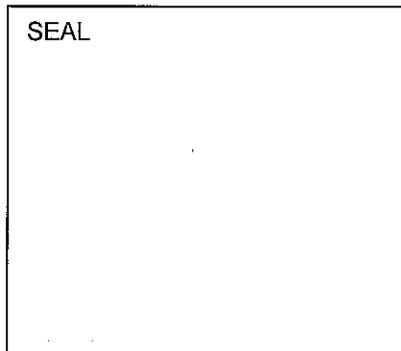
Phone: 910-442-7870 Fax: 910-799-6659 Email: gpape@gsp-consulting.com

VII. PROPERTY OWNER AUTHORIZATION (If Section III(2) has been filled out, complete this section)

I, (print or type name of person listed in Contact Information, item 2) _____, certify that I own the property identified in this permit application, and thus give permission to (print or type name of person listed in Contact Information, item 1) _____ with (print or type name of organization listed in Contact Information, item 1) _____ to develop the project as currently proposed. A copy of the lease agreement or pending property sales contract has been provided with the submittal, which indicates the party responsible for the operation and maintenance of the stormwater system.

As the legal property owner I acknowledge, understand, and agree by my signature below, that if my designated agent (entity listed in Contact Information, item 1) dissolves their company and/or cancels or defaults on their lease agreement, or pending sale, responsibility for compliance with the City of Wilmington Stormwater Permit reverts back to me, the property owner. As the property owner, it is my responsibility to notify the City of Wilmington immediately and submit a completed Name/Ownership Change Form within 30 days; otherwise I will be operating a stormwater treatment facility without a valid permit. I understand that the operation of a stormwater treatment facility without a valid permit is a violation of the City of Wilmington Municipal Code of Ordinances and may result in appropriate enforcement including the assessment of civil penalties.

Signature: _____ Date: _____



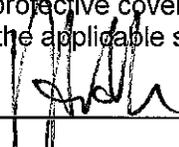
I, _____, a Notary Public for the State of _____, County of _____, do hereby certify that _____ personally appeared before me this day of _____, _____, and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

My commission expires: _____

VIII. APPLICANT'S CERTIFICATION

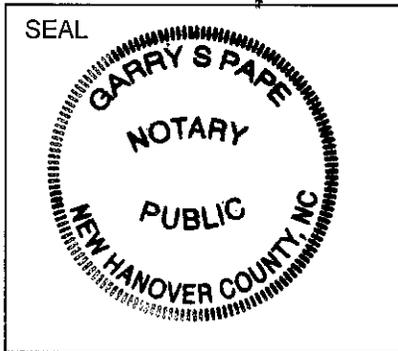
I, (print or type name of person listed in Contact Information, item 1) Howard Penton certify that the information included on this permit application form is, to the best of my knowledge, correct and that the project will be constructed in conformance with the approved plans, that the required deed restrictions and protective covenants will be recorded, and that the proposed project complies with the requirements of the applicable stormwater rules under.

Signature: _____



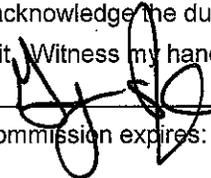
Date: _____

10/26/2012



I, Garry S. Pape, a Notary Public for the State of North Carolina, County of New Hanover do hereby certify that Howard Penton personally appeared before me this day of October, 2012 and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

My commission expires: _____



April 13, 2015

STORMWATER MANAGEMENT PERMIT APPLICATION FORM

LOW DENSITY SUPPLEMENT
This form may be photocopied for use as an original

A low density project is one that meets the appropriate criteria for built upon area and transports stormwater runoff primarily through vegetated conveyances. Low density projects should not have a discrete stormwater collection system as defined by 15A NCAC 2H .1002(18). Low density requirements and density factors can be found in the City of Wilmington Land Development Code (LDC) Section 18-760 through 18-762, and the DWQ BMP Manual. Curb and gutter systems are allowed provided they meet the requirements in 15A NCAC 2H .1008(g).

I. PROJECT INFORMATION

Project Name : Shinnwood West

Contact Person: Garry S. Pape, P.E. - GSP Consulting Phone Number: (910) 442-7870

Number of Lots: 94 Allowable Built Upon Area (BUA) Per Lot*: See Attached
Number of Dwelling Units Per Acre**: 2.04

Low Density Development (check one): without curb & gutter with curb & gutter, outlets to (check one):
 Swales Vegetated Area

*If lot sizes are not uniform, attach a table indicating the number of lots, lot sizes and allowable built upon area for each lot. The attachment must include the project name, phase, page numbers and provide area subtotals and totals. BUA shall be shown in units of square feet.

** (Phase II Post-Construction (non-SA) only)

II. BUILT UPON AREA

Refer to City of Wilmington's forms and applications website for specific language that must be recorded in the deed restrictions for all subdivided projects.
(<http://www.wilmingtonnc.gov/PublicServices/Engineering/PlanReview/StormwaterPermits.aspx>)

Complete the following calculation in the space provided below where:

- SA Site Area - the total project area above Mean High Water.
- DF Density Factor - the appropriate percent built upon area divided by 100.
- RA Road Area - the total impervious surface occupied by roadways.
- OA Other Area - the total area of impervious surfaces such as clubhouses, tennis courts, sidewalks, etc.
- No. of Lots - the total number of lots in the subdivision.
- BUA per Lot - the computed allowable built upon area for each lot including driveways and impervious surfaces located between the front lot line and the edge of pavement.
- Total allowable lot BUA - the computed allowable built upon area for all lots combined.
- Total BUA from lot listing - the sum of built upon area allocated for each lot on the list of non-uniform lots.

Calculation:

For uniform lot sizes:

$$(SA: \text{ft}^2 \times DF: \text{ }) - (RA: \text{ft}^2) - (OA: \text{ft}^2) = \text{BUA per Lot} = \text{ } \text{ft}^2$$

(No of Lots:)

For non-uniform lot sizes:

a. (SA: 2003307 ft² x DF: 0.24) - (RA: 195563 ft²) - (OA: 11200 ft²) = Total allowable lot BUA = 274030 ft²

b. Total BUA from lot listing: 274030sf. **b must be ≤ a**

III. DESIGN INFORMATION

Complete the following table. If additional space is needed the information should be provided in the same format as Table 1 and attached to this form. Rainfall intensity data can be found in City of Wilmington's Technical Standards Manual.

Table 1. Swale design information based on the **10-year storm**.

Swale No.	Drainage Area (ac)	Impervious Area (ac)	Grassed Area (ac)	C	Q (cfs)	Slope (%)	V _{allow} (fps)	V _{actual} (fps)	Flow Depth (ft)
1	1.39	.75	.64	0.63	6.30	0.30	3.5	1.97	0.44
2	0.34	0.24	0.10	0.76	1.84	0.30	3.5	1.34	0.22
3	1.27	0.64	0.63	0.60	5.50	0.30	3.5	1.89	0.41
4	0.54	0.37	0.17	0.74	2.86	0.30	3.5	1.54	0.29
5	0.61	0.41	0.20	0.73	3.19	0.30	3.5	1.60	0.31
6	0.82	0.53	0.29	0.70	4.19	0.30	3.5	1.74	0.36
7	1.14	0.72	0.42	0.69	5.71	0.30	3.5	1.91	0.42
8	0.17	0.12	0.05	0.77	0.92	0.30	3.5	1.06	0.15
9	0.18	0.14	0.04	0.78	1.03	0.30	3.5	1.10	0.16
10	0.13	0.09	0.04	0.72	0.69	0.30	3.5	0.96	0.13
11	0.54	0.36	0.18	0.71	2.77	0.30	3.5	1.53	0.28
12	0.44	0.29	0.15	0.71	2.24	0.30	3.5	1.43	0.25
13	1.42	0.72	0.70	0.61	6.23	0.30	3.5	1.96	0.44
14	0.92	0.55	0.37	0.67	4.43	0.30	3.5	1.77	0.37
15	0.16	0.11	0.05	0.75	0.87	0.30	3.5	1.04	0.15
16	0.78	0.46	0.32	0.66	3.72	0.30	3.5	1.68	0.33
17									
18									
19									
20									

IV. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements per the City of Wilmington LDC, and the NCDENR BMP Manual (2007).

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate that the following requirements have been met and supporting documentation is provided as necessary. If the applicant has designated an agent on the Stormwater Management Permit Application Form, the agent may initial below. **If any item is not met, then justification must be attached.** Only complete items n through p for projects with curb outlets.

Initials	Page/Plan Sheet No.	
<u>MA</u>	_____	a. A 50 foot wide vegetative buffer is provided adjacent to surface waters. For Redevelopment projects, 30' wide vegetative buffer adjacent surface water is provided.
<u>NIA</u>	_____	b. For Phase II Post-Construction projects: All built upon area is located at least 30 feet landward of all perennial and intermittent surface waters.
<u>AP</u>	_____	d. Deed restriction language as required on form SWP 1.0 shall be recorded as a restrictive covenant. A copy of the recorded document shall be provided to the City of Wilmington within 30 days of platting and prior to the sale of any lots.
<u>AP</u>	<u>(calc)</u>	e. Built upon area calculations are provided for the overall project and all lots.
<u>AP</u>	<u>Plans & Calc</u>	f. Project conforms to low density requirements within the ORW AEC. (If applicable per the LDC)
<u>AP</u>	<u>C-6.2 & C-6.3</u>	g. Side slopes of swales are no steeper than 3:1; <i>or no steeper than 5:1 for curb outlet swales.</i>
<u>AP</u>	<u>C-6.2 & C-6.3</u>	h. Longitudinal slope of swales is no greater than 5%; <i>for non-curb outlet projects</i> , calculations for shear stress and velocity are provided if slope is greater than 5%.
<u>AP</u>	<u>Calc</u>	i. At a minimum, swales are designed to carry the 10 year storm velocity at a non-erosive rate.
<u>AP</u>	<u>(calc)</u>	j. Swales discharging to wetlands are designed to flow into and through the wetlands at a non-erosive velocity (for this flow requirement into wetlands, non-erosive is velocity ≤ 2 ft/s).
<u>AP</u>	<u>C-6.2 & C-6.3</u>	k. Swale detail and permanent vegetation is specified on the plans.
<u>AP</u>	<u>C-6.2 & C-6.3</u>	l. Swale detail provided on plans; includes grass type(s) for permanent vegetative cover.
<u>AP</u>	_____	m. Swales are located in recorded drainage easements.
_____	_____	n. ^{††} Length of swale or vegetated area is at least 100 feet for each curb outlet.
<u>AP</u>	_____	o. ^{††} The system takes into account the run-off at ultimate built-out potential from all surfaces draining to the system (delineate drainage area for each swale).
<u>AP</u>	<u>C-6.2 & C-6.3</u>	p. ^{††} Curb outlets direct flow to a swale or vegetated area.

^{††} Only complete these items for projects with curb outlets.

V. SWALE SYSTEM MAINTENANCE REQUIREMENTS

1. Mowing will be accomplished as needed according to the season. Grass height will not exceed six inches at any time; and grass will not be mowed too close to the ground or "scalped".
2. Swales will be inspected monthly or after every runoff producing rainfall event for sediment build-up, erosion, and trash accumulation.
3. Accumulated sediment and trash will be removed as necessary. Swales will be reseeded or sodded following sediment removal.
4. Eroded areas of the swales will be repaired and reseeded. Swales will be revegetated as needed and in a timely manner based on the monthly inspections. Side slopes must be maintained at the permitted slope.
5. Catch basins, curb cuts, velocity reduction devices, and piping will be inspected monthly or after every significant runoff producing rainfall event. Trash and debris will be cleared away from grates, curb cuts, velocity reduction devices and piping.
6. Swales will not be altered, piped, or filled in without approval from the City of Wilmington Engineering Division.

I acknowledge and agree by my signature below that I am responsible for the performance of the six maintenance procedures listed above. I agree to notify the City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

Print Name and Title: Shinnwood West, LLC - Howard Penton - Member/Manager

Address: 6105 Oleander Drive, Suite 201, Wilmington, NC 28403

Phone: 910-452-1410 Date: 10/26/2012

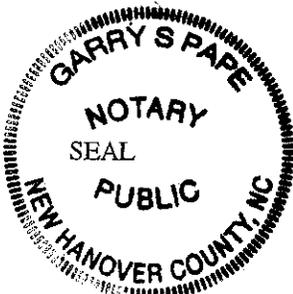
Signature: [Handwritten Signature]

Note: The legally responsible party should not be a homeowners association unless more than 50% of the lots have been sold and a resident of the subdivision has been named the president.

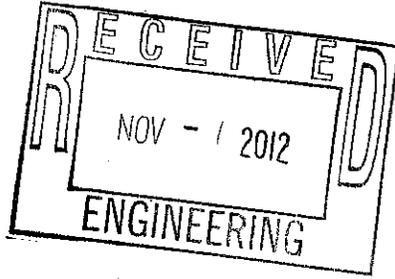
I, Garry S. Pape, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Howard Penton personally appeared before me this 26th day of October, 2012, and acknowledge the due execution of the forgoing swale maintenance requirements.

Witness my hand and official seal,

[Handwritten Signature]
Notary signature



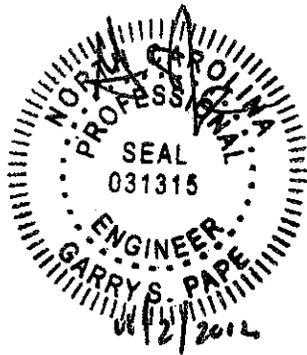
My commission expires April 13, 2015



SHINNWOOD WEST

STORMWATER & EROSION CONTROL
NARRATIVE & CALCULATIONS

November 2, 2012



GSP CONSULTING, PLLC.
6626 Gordon Road, Unit C
Wilmington, North Carolina 28411
(910) 442-7870

STORMWATER NARRATIVE

SHINNWOOD WEST

WILMINGTON, NC

SITE DESCRIPTION

This 45.99 ac site is located off Greenville Loop Road in the City of Wilmington North Carolina. The site drains to the south of the property. This low density project will consist of the construction of 94 single family homes and related site appurtenances. The amount of impervious area proposed for the project compared to the total project boundary is 24.0%.

SOILS

The soils for this project consist of Leon series soils (Hydrologic Soil Group B/D) & Johnston series soils (Hydrologic Soil Group D). The Leon series soils consist of nearly level, poorly drained, rapidly permeable soils on the rims of depressions. The Johnston series soils are nearly level, poorly drained soils on flood plains of major streams.

STORM DRAINAGE DESIGN

The primary stormwater measures for this project are grassed swales located at low points along the proposed roadway system that convey the stormwater to existing depressions within the existing onsite wetlands. From the existing depressions the stormwater outfalls through stormwater pipes and existing natural weirs. The existing depressions control the post development peak discharge of the 2, 10 & 25-year storm events so as not to exceed the pre-development peak runoff discharge rates to meet the City of Wilmington Stormwater Regulations. The 2, 10, 25 & 50-year events are controlled based on the attached calculations and analyzed for the 100-Year storm event. After leaving the site the stormwater drains to an unnamed tributary to Hewletts Creek (Classification SA; HQW).

EROSION CONTROL PLAN FOR SHINNWOOD WEST

Area to be disturbed: +/- 30.90 acres

This 45.99 ac site is located off Greenville Loop Road in the City of Wilmington North Carolina. The site drains to the south of the property. This low density project will consist of the construction of 94 single family homes and related site appurtenances. The amount of impervious area proposed for the project compared to the total project boundary is 24.0%. The primary stormwater measures for this project are grassed swales located at low points along the proposed roadway system that convey the stormwater to existing depressions within the existing onsite wetlands. From the existing depressions the stormwater outfalls through stormwater pipes and existing natural weirs. The existing depressions control the post development peak discharge of the 2, 10 & 25-year storm events so as not to exceed the pre-development peak runoff discharge rates to meet the City of Wilmington Stormwater Regulations. The 2, 10, 25 & 50-year events are controlled based on the attached calculations and analyzed for the 100-Year storm event. After leaving the site the stormwater drains to an unnamed tributary to Hewletts Creek (Classification SA; HQW).

EROSION CONTROL MEASURES: This project will primarily control erosion with the use of a temporary construction entrance, outlet protection at the end of culvert and a temporary sediment trap.

The contractor shall install, maintain and remove upon completion the sediment trapping measures as necessary to prevent any sediment from leaving the project limits. This will include any temporary stockpile areas if necessary. Contractor shall clean and restore to pre-construction conditions any areas that may inadvertently be damaged due to the failure of the erosion control measures.

SCHEDULING OF WORK: Clearing and grubbing shall be scheduled and performed in such a manner that fine grading operations and erosion control practices can follow immediately thereafter. Excavation and embankment operations will be conducted such that cuts and fills will be completed to final grades in a continuous operation. All construction areas not otherwise protected shall be planted with permanent vegetative cover in accordance with the specifications within 15 working days after completion of active construction.

MINIMUM AREAS TO BE DISTURBED: Only those areas necessary for timely and proper completion of the project shall be stripped of native vegetation. The angle for graded sloped and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. Slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion. All other areas to be stabilized within 15 working days of cease of any phase of activity.

PLACEMENT OF SEDIMENT CONTROL DEVICES: All devices (temporary sediment traps, tree protection, construction entrances, etc.) for sediment control shall be constructed prior to beginning clearing and grubbing on the site.

FINAL COVER: As soon as practicable after finished grades have been established, all operations in connection with establishing final ground cover shall be performed. Any inactive disturbed ground area to remain denuded more than 15 working days shall be temporarily-seeded in accordance with the temporary seeding schedule as noted on the plans. All slopes to be stabilized within 21 calendar days.

SEQUENCE OF CONSTRUCTION

1. Install temporary construction entrance as shown on erosion & sediment control plan.
2. Install perimeter controls (sediment traps, silt fence, tree protection fencing, etc.) as shown on the erosion & sediment control plan. This step needs to be completed prior to upslope land disturbing activities.
3. Once perimeter controls and sediment trapping measures are installed clear and grub site within limits of disturbance.
4. Upon bringing the site to rough grade, stabilize all areas with temporary vegetation if left undisturbed for 15 working days and all slopes within 21 calendar days.
5. Once the storm sewers, sanitary sewers and waterlines are in place, install inlet protection and outlet protection as shown on the erosion & sediment control plans.
6. Upon bringing the road to subgrade elevations, stabilize the areas by placing stone base as early as possible.
7. For temporary vegetative stabilization of all denuded areas see note referencing the erosion control program and specifications.
8. After construction operations have ended and all disturbed areas have stabilized, mechanical sediment controls shall be removed. Sediment from temporary sediment trapping devices shall be disposed of by spreading on the site or hauling away if not suitable for fill. All denuded areas are to be permanently stabilized with permanent vegetation.

PROJECT: Shinnwood West

PROJ. NO: 2012-0008

DATE: November 1, 2012

DESIGNED BY: GSP

TEMPORARY SEDIMENT TRAP TABLE

DAM NUMBER	DENUDED AREA (AC)	DRAINAGE AREA (AC)	RUNOFF COEFFICIENT	SYSTEM INTENSITY (IN/HR)	10-YEAR PEAK FLOW (CFS)	WEIR LENGTH (FT)	AREA REQUIRED (SF)	AREA PROVIDED (SF)	VOLUME REQUIRED (CF)	VOLUME PROVIDED (CF)
ST#1	1.41	1.41	0.30	6.30	2.66	6	1,161	9,111	5,076	7,808
ST#2	1.13	1.13	0.30	6.30	2.14	6	930	15,800	4,068	14,826
ST#3	1.70	1.70	0.30	6.30	3.21	6	1,400	6,875	6,120	6,723
ST#4	0.73	0.73	0.30	6.30	1.38	4	601	5,221	2,628	4,966
ST#5	2.00	2.00	0.30	6.30	3.78	6	1,647	26,261	7,200	23,230
ST#6	2.65	2.65	0.30	6.30	5.01	8	2,182	32,627	9,540	27,351
ST#7	1.56	1.56	0.30	6.30	2.95	6	1,284	8,584	5,616	7,174
ST#8	3.24	3.24	0.30	6.30	6.12	10	2,667	41,768	11,664	36,278
ST#9	1.09	1.09	0.30	6.30	2.06	6	897	19,152	3,924	16,474

NOTES:

1. Runoff Coefficients used are taken from Table 8.03a of NC ESCPDM (0.30 - Graded Areas, 0.10 - Woodlands, 0.20 - Unimproved).
2. System Intensity calculated for Tc=10 min.

SEDIMENT TRAP #1

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	4,337	1,084	1,084
25.0	9,111	6,724	7,808

SEDIMENT TRAP #2

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	9,234	2,309	2,309
25.0	15,800	12,517	14,826

SEDIMENT TRAP #3

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	4,381	1,095	1,095
25.0	6,875	5,628	6,723

SEDIMENT TRAP #4

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	3,140	785	785
25.0	5,221	4,181	4,966

SEDIMENT TRAP #5

CONTOUR	AREA	INCR VOL	ACCUM VOL
24.5	0	0	0
25.0	13,466	3,367	3,367
26.0	26,261	19,864	23,230

SEDIMENT TRAP #6

CONTOUR	AREA	INCR VOL	ACCUM VOL
24.5	0	0	0
25.0	14,717	3,679	3,679
26.0	32,627	23,672	27,351

SEDIMENT TRAP #7

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	3,843	961	961
25.0	8,584	6,214	7,174

SEDIMENT TRAP #8

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	20,525	5,131	5,131
25.0	41,768	31,147	36,278

SEDIMENT TRAP #9

CONTOUR	AREA	INCR VOL	ACCUM VOL
23.5	0	0	0
24.0	9,197	2,299	2,299
25.0	19,152	14,175	16,474

PRE DEVELOPMENT

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	86.71	1	725	274,180	---	-----	-----	EXISTING
EXISTING.gpw					Return Period: 2 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Hyd. No. 1

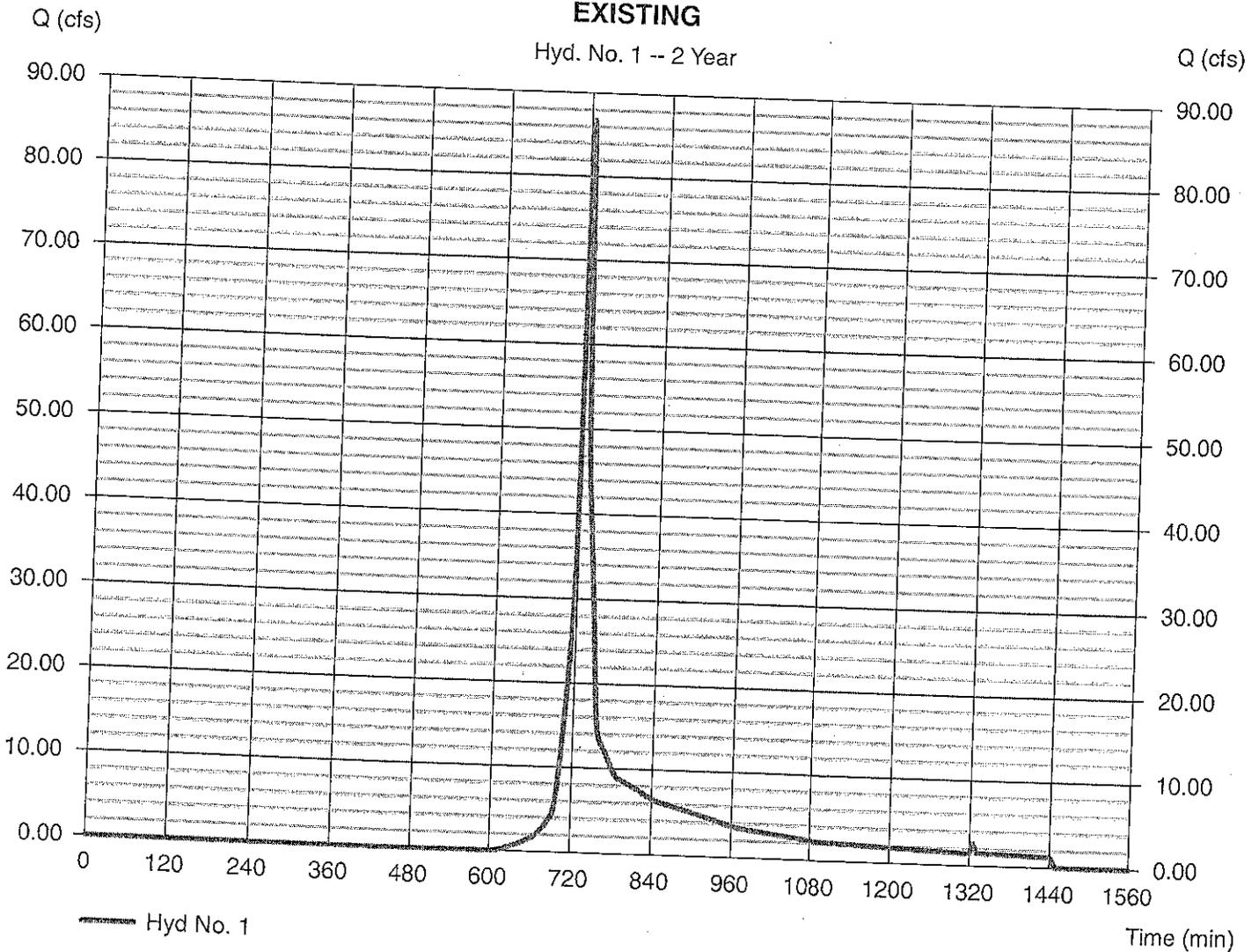
EXISTING

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 43.760 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 4.50 in
 Storm duration = 24 hrs

Peak discharge = 86.71 cfs
 Time to peak = 725 min
 Hyd. volume = 274,180 cuft
 Curve number = 70
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

EXISTING

Hyd. No. 1 -- 2 Year



Hyd No. 1

Time (min)

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	192.39	1	725	592,740	----	-----	-----	EXISTING
EXISTING.gpw				Return Period: 10 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

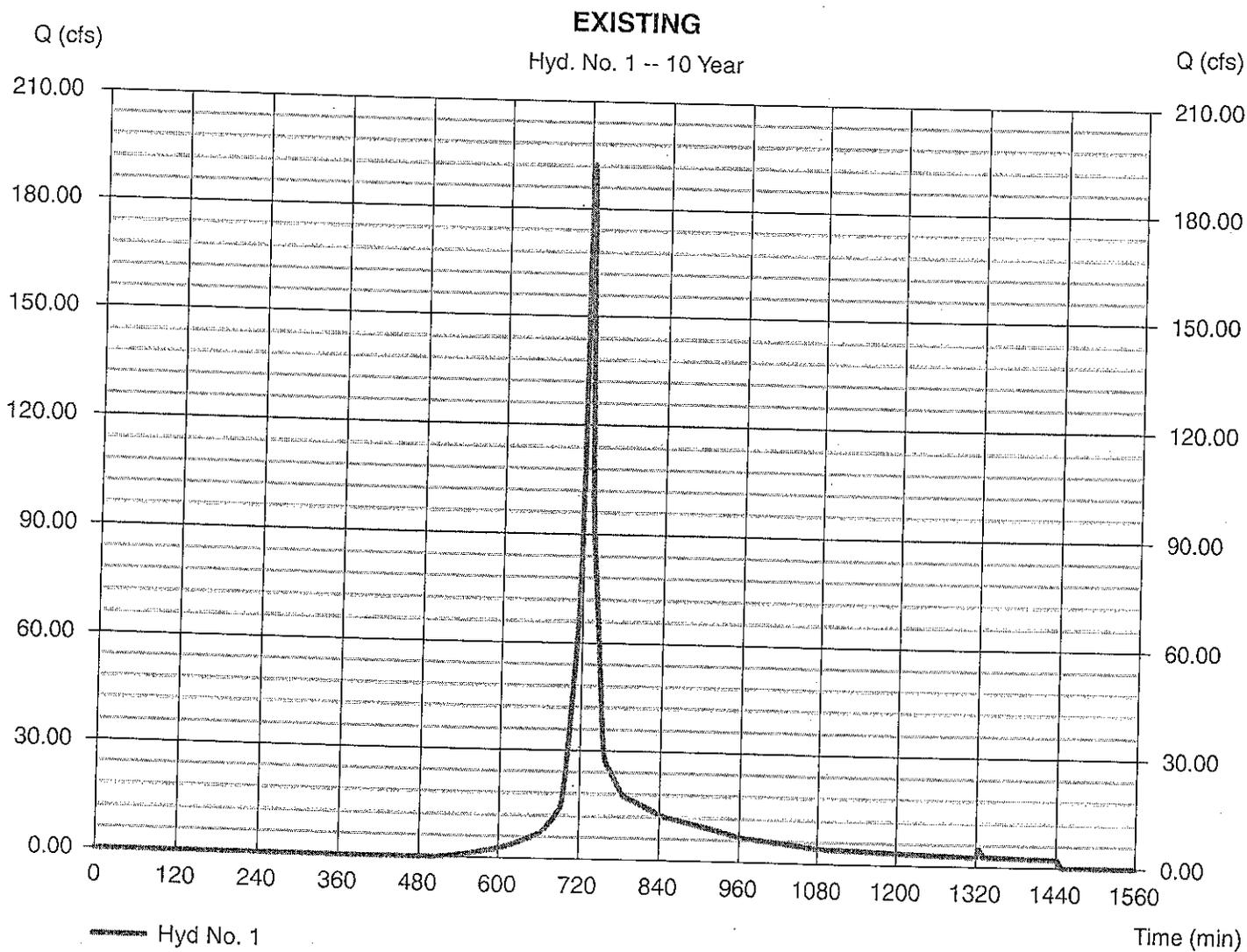
Friday, Nov 2, 2012

Hyd. No. 1

EXISTING

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 43.760 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.00 in
Storm duration = 24 hrs

Peak discharge = 192.39 cfs
Time to peak = 725 min
Hyd. volume = 592,740 cuft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	239.60	1	725	738,351	---	-----	-----	EXISTING
EXISTING.gpw				Return Period: 25 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

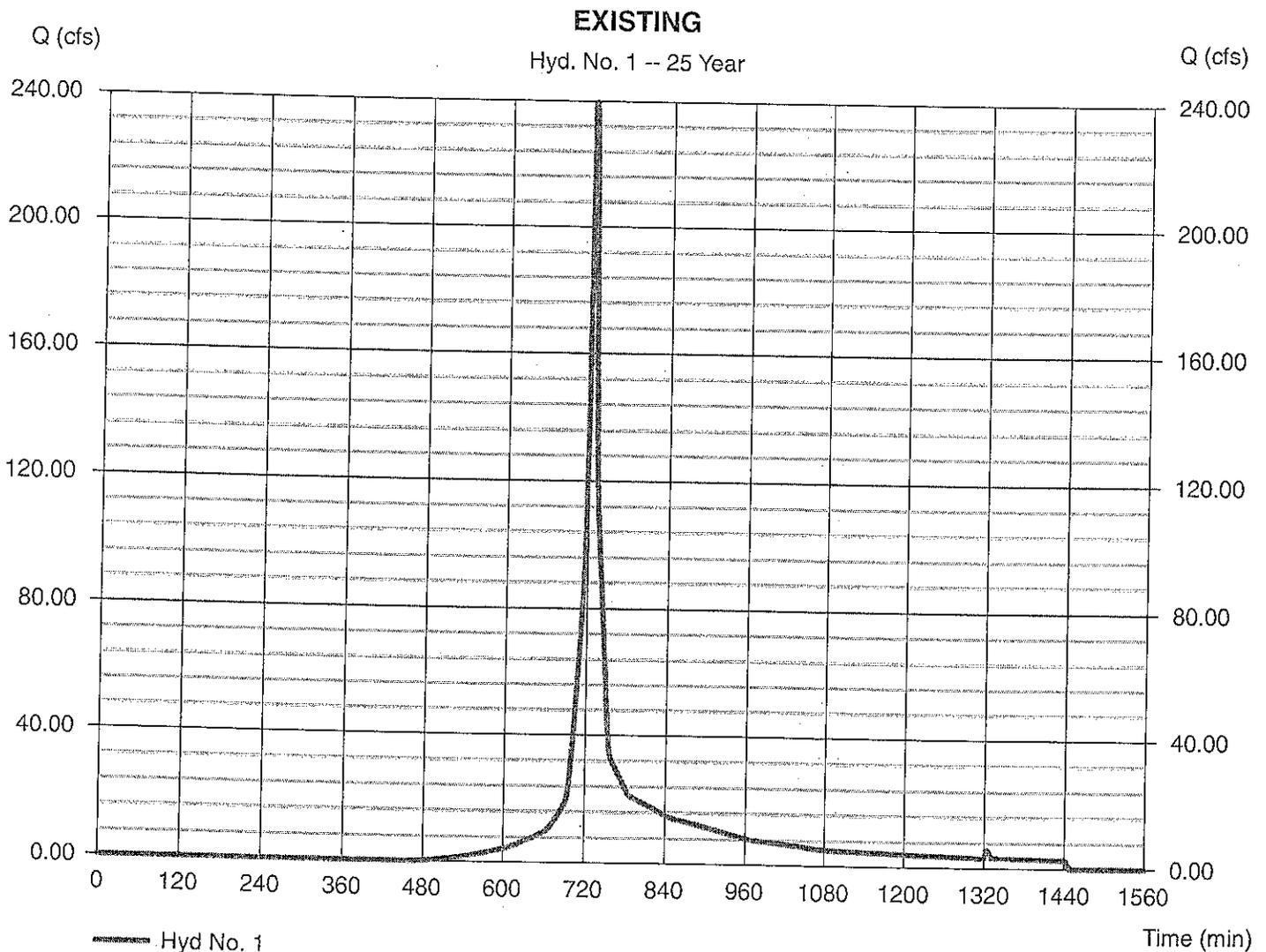
Friday, Nov 2, 2012

Hyd. No. 1

EXISTING

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 43.760 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 239.60 cfs
Time to peak = 725 min
Hyd. volume = 738,351 cuft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



POST DEVELOPMENT

WETLAND A

Site Area

Site Area
98,248 sf
2.26 ac

Impervious Area Calculation

ROW 12,790
Lots 6,699
Other/Common Areas 11,554
Total 31,043 sf
Total 0.71 ac
% Impervious 31.60%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 3.32 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 4.08 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 4.60 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.47
Q=C*I*A 6.25 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.47
Q=C*I*A 7.68 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.47
Q=C*I*A 8.66 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	7.689	1	725	23,829	---	---	---	WETLAND A
2	Reservoir	0.368	1	892	5,401	1	24.50	18,471	
WETLAND A.gpw					Return Period: 2 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

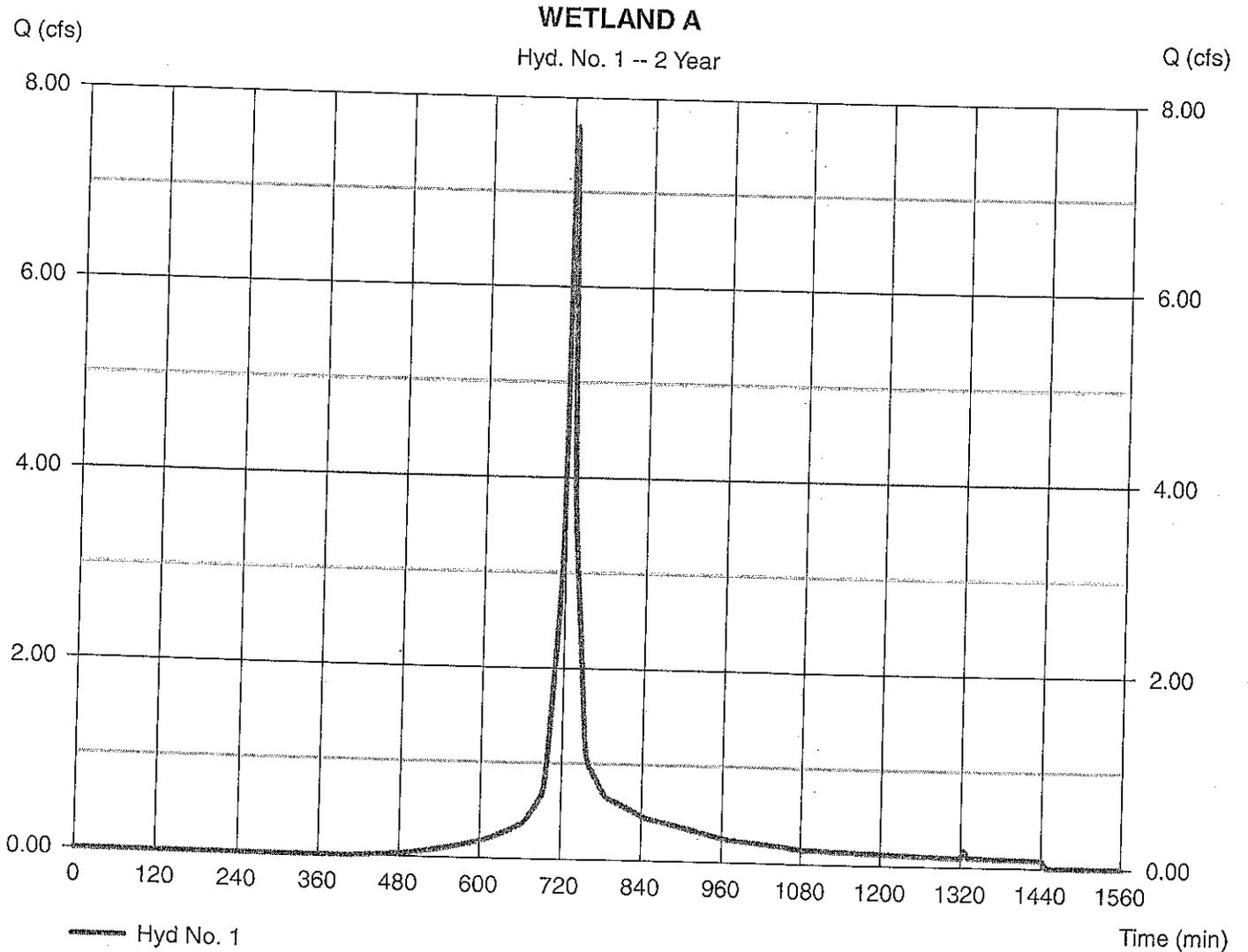
Hyd. No. 1

WETLAND A

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 2.260 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 7.689 cfs
Time to peak = 725 min
Hyd. volume = 23,829 cuft
Curve number = 84*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.710 x 98) + (1.550 x 77)] / 2.260



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

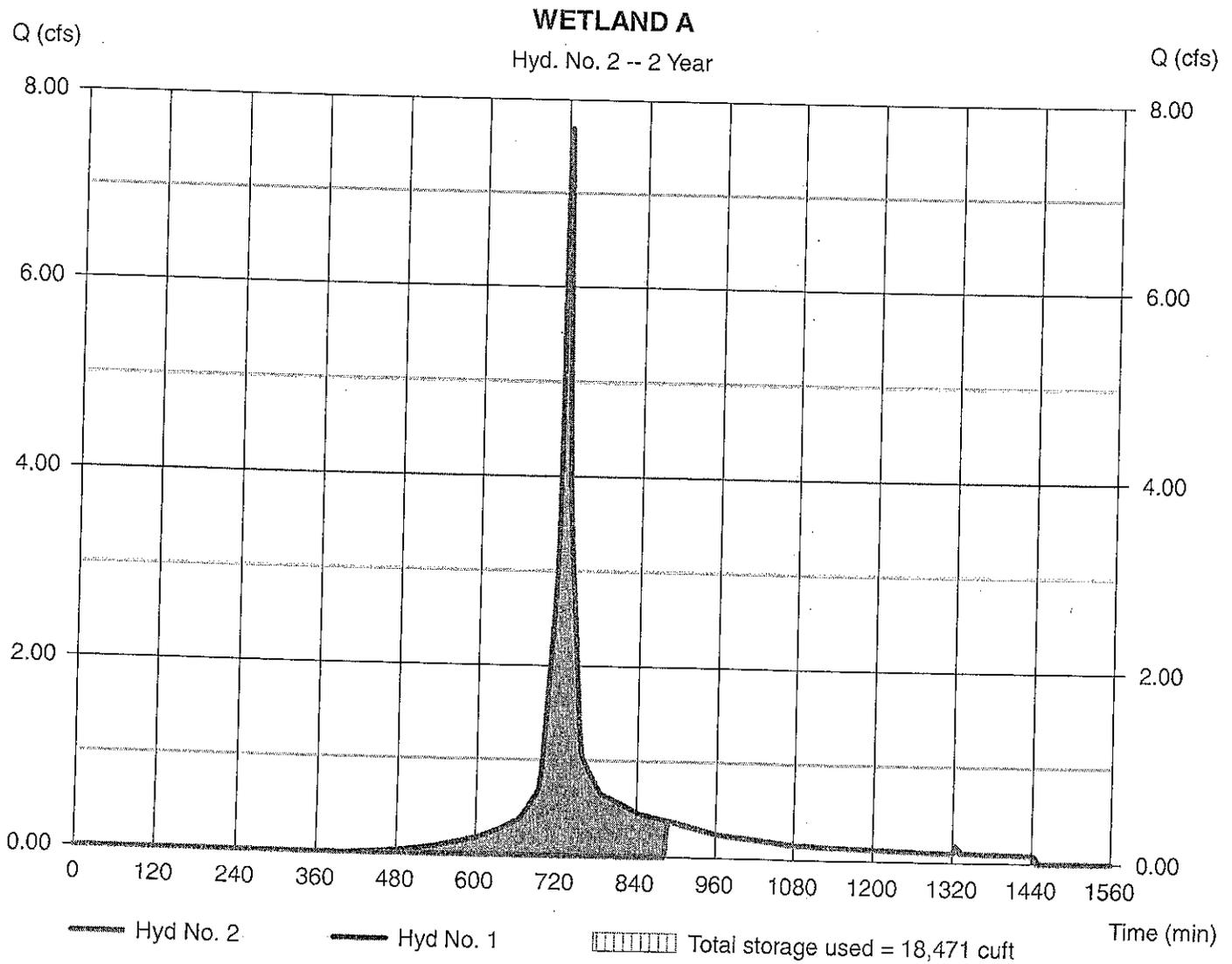
Hyd. No. 2

WETLAND A

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND A
Reservoir name = WETLAND A

Peak discharge = 0.368 cfs
Time to peak = 892 min
Hyd. volume = 5,401 cuft
Max. Elevation = 24.50 ft
Max. Storage = 18,471 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Pond No. 1 - WETLAND A

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 22.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	22.50	00	0	0
0.50	23.00	1,887	314	314
1.50	24.00	11,231	5,907	6,221
2.50	25.00	40,650	24,413	30,635

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 222.00	0.00	0.00	0.00
Crest El. (ft)	= 24.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	22.50	---	---	---	---	0.00	---	---	---	---	---	0.00
0.05	31	22.55	---	---	---	---	0.00	---	---	---	---	---	0.00
0.10	63	22.60	---	---	---	---	0.00	---	---	---	---	---	0.00
0.15	94	22.65	---	---	---	---	0.00	---	---	---	---	---	0.00
0.20	126	22.70	---	---	---	---	0.00	---	---	---	---	---	0.00
0.25	157	22.75	---	---	---	---	0.00	---	---	---	---	---	0.00
0.30	189	22.80	---	---	---	---	0.00	---	---	---	---	---	0.00
0.35	220	22.85	---	---	---	---	0.00	---	---	---	---	---	0.00
0.40	252	22.90	---	---	---	---	0.00	---	---	---	---	---	0.00
0.45	283	22.95	---	---	---	---	0.00	---	---	---	---	---	0.00
0.50	314	23.00	---	---	---	---	0.00	---	---	---	---	---	0.00
0.60	905	23.10	---	---	---	---	0.00	---	---	---	---	---	0.00
0.70	1,496	23.20	---	---	---	---	0.00	---	---	---	---	---	0.00
0.80	2,086	23.30	---	---	---	---	0.00	---	---	---	---	---	0.00
0.90	2,677	23.40	---	---	---	---	0.00	---	---	---	---	---	0.00
1.00	3,268	23.50	---	---	---	---	0.00	---	---	---	---	---	0.00
1.10	3,858	23.60	---	---	---	---	0.00	---	---	---	---	---	0.00
1.20	4,449	23.70	---	---	---	---	0.00	---	---	---	---	---	0.00
1.30	5,040	23.80	---	---	---	---	0.00	---	---	---	---	---	0.00
1.40	5,630	23.90	---	---	---	---	0.00	---	---	---	---	---	0.00
1.50	6,221	24.00	---	---	---	---	0.00	---	---	---	---	---	0.00
1.60	8,662	24.10	---	---	---	---	0.00	---	---	---	---	---	0.00
1.70	11,104	24.20	---	---	---	---	0.00	---	---	---	---	---	0.00
1.80	13,545	24.30	---	---	---	---	0.00	---	---	---	---	---	0.00
1.90	15,986	24.40	---	---	---	---	0.00	---	---	---	---	---	0.00
2.00	18,428	24.50	---	---	---	---	0.00	---	---	---	---	---	0.00
2.10	20,869	24.60	---	---	---	---	0.00	---	---	---	---	---	0.00
2.20	23,311	24.70	---	---	---	---	21.06	---	---	---	---	---	21.06
2.30	25,752	24.80	---	---	---	---	59.57	---	---	---	---	---	59.57
2.40	28,193	24.90	---	---	---	---	109.44	---	---	---	---	---	109.44
2.50	30,635	25.00	---	---	---	---	168.49	---	---	---	---	---	168.49
							235.47	---	---	---	---	---	235.47

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	13.74	1	724	43,485	---	---	---	WETLAND A	
2	Reservoir	8.129	1	731	25,057	1	24.54	19,370	WETLAND A	
WETLAND A.gpw				Return Period: 10 Year			Friday, Nov 2, 2012			

Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.1

Friday, Nov 2, 2012

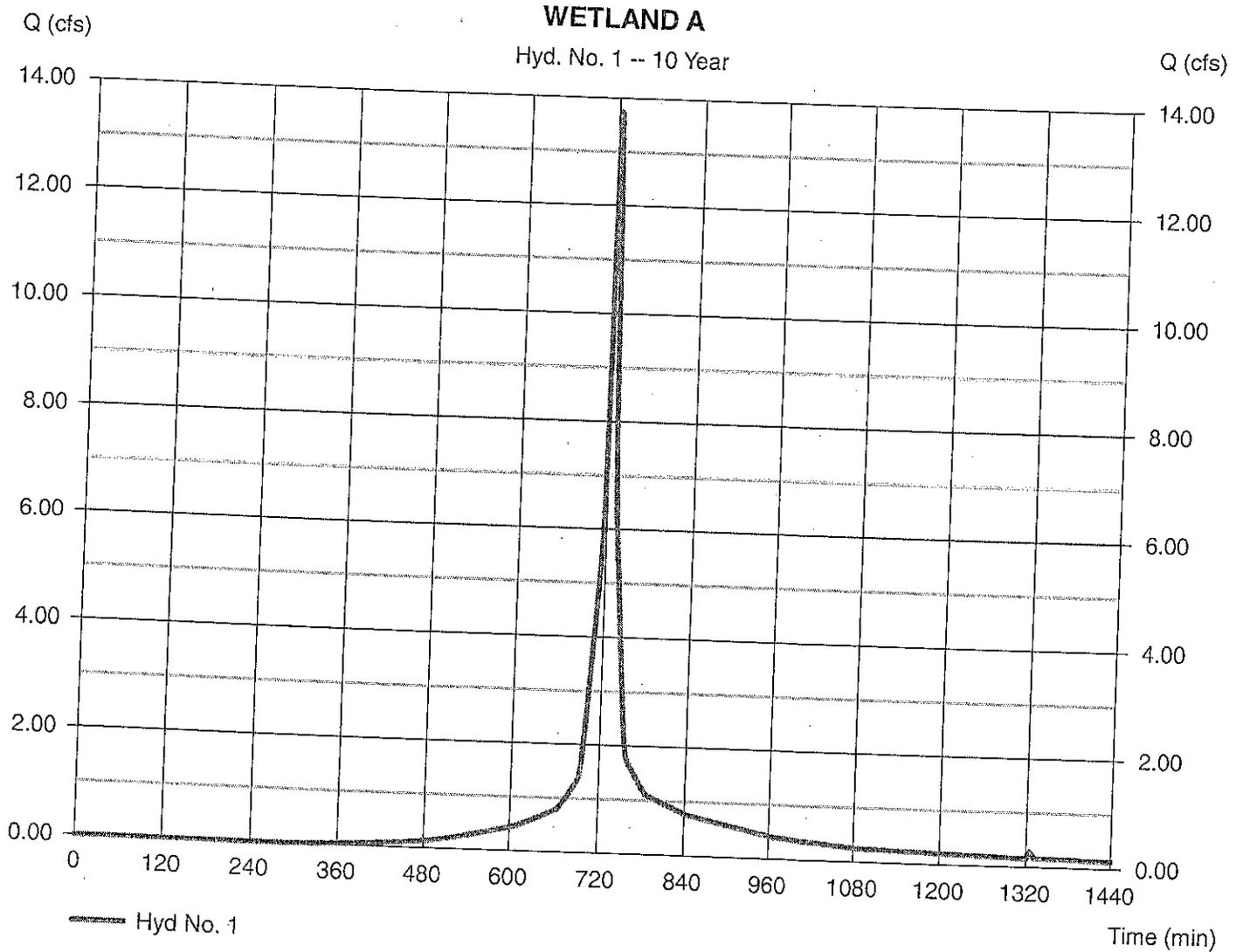
Hyd. No. 1

WETLAND A

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 2.260 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.00 in
Storm duration = 24 hrs

Peak discharge = 13.74 cfs
Time to peak = 724 min
Hyd. volume = 43,485 cuft
Curve number = 84*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.710 \times 98) + (1.550 \times 77)] / 2.260$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

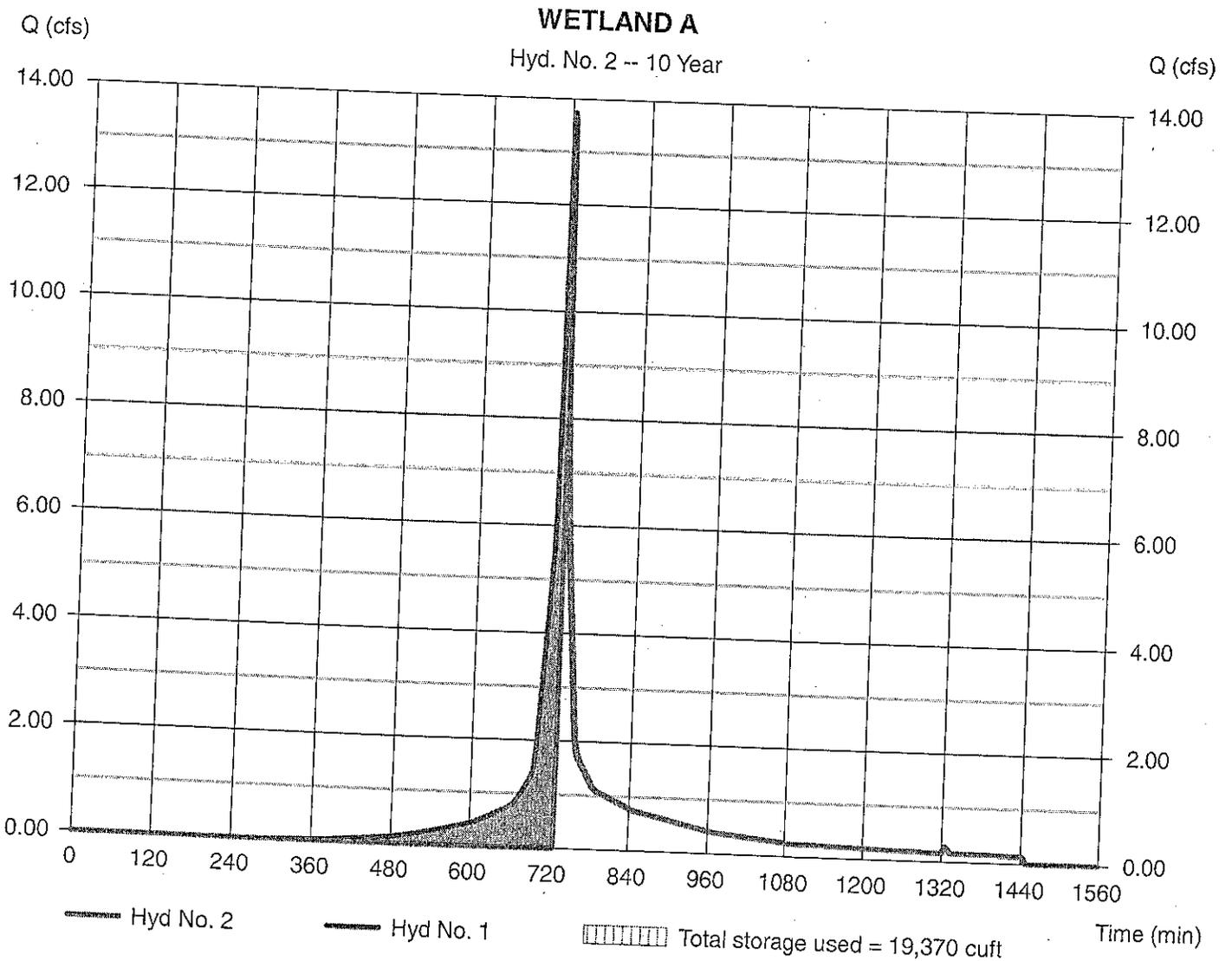
Hyd. No. 2

WETLAND A

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND A
Reservoir name = WETLAND A

Peak discharge = 8.129 cfs
Time to peak = 731 min
Hyd. volume = 25,057 cuft
Max. Elevation = 24.54 ft
Max. Storage = 19,370 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	16.29	1	724	51,973	----	-----	-----	WETLAND A
2	Reservoir	14.04	1	727	33,545	1	24.57	20,056	WETLAND A
WETLAND A.gpw				Return Period: 25 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

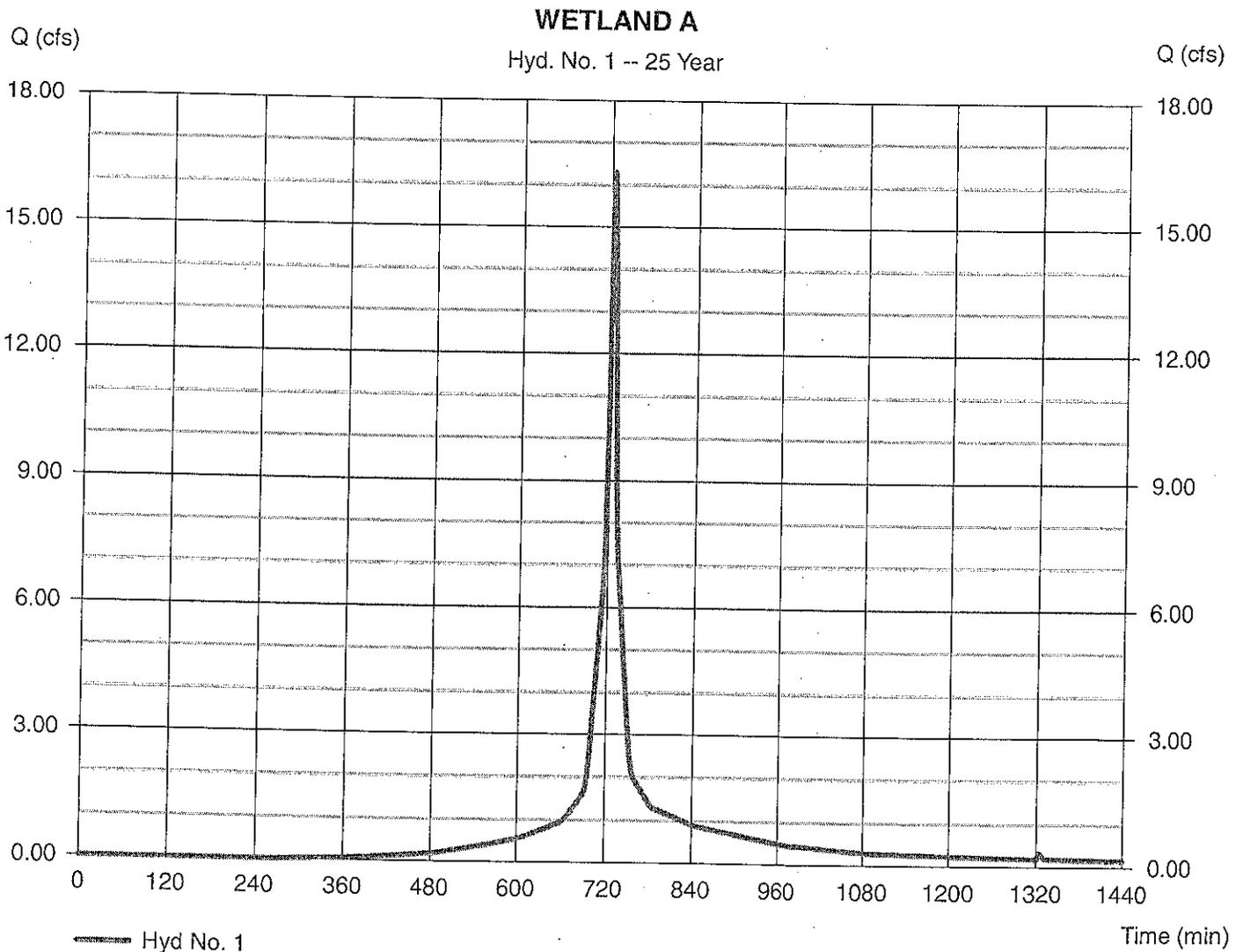
Hyd. No. 1

WETLAND A

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 2.260 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 16.29 cfs
Time to peak = 724 min
Hyd. volume = 51,973 cuft
Curve number = 84*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.710 x 98) + (1.550 x 77)] / 2.260



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

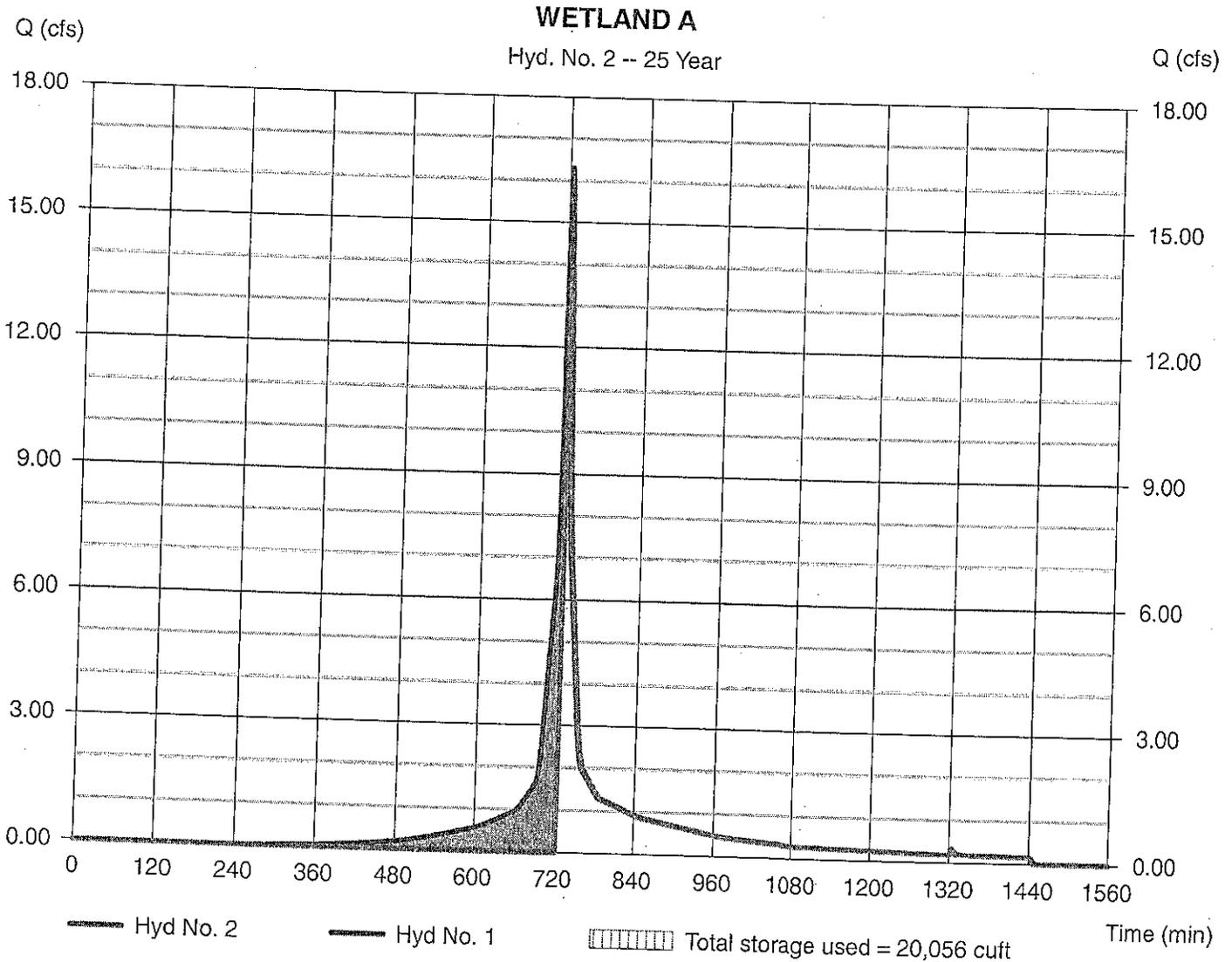
Hyd. No. 2

WETLAND A

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND A
Reservoir name = WETLAND A

Peak discharge = 14.04 cfs
Time to peak = 727 min
Hyd. volume = 33,545 cuft
Max. Elevation = 24.57 ft
Max. Storage = 20,056 cuft

Storage Indication method used.



WETLAND B

Site Area

Site Area 346,917 sf
7.96 ac

Impervious Area Calculation

ROW 41,151
Lots 37,819
Other/Common Areas
Total 78,970 sf
Total 1.81 ac
% Impervious 22.76%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 11.71 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 14.40 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 16.23 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.41
Q=C*I*A 19.17 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.41
Q=C*I*A 23.57 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.41
Q=C*I*A 26.57 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	34.64	1	725	106,705	----	-----	-----	WETLAND B	
2	Reservoir	2.724	1	809	40,745	1	24.22	67,393	WETLAND B	
WETLAND B.gpw					Return Period: 2 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.1

Friday, Nov 2, 2012

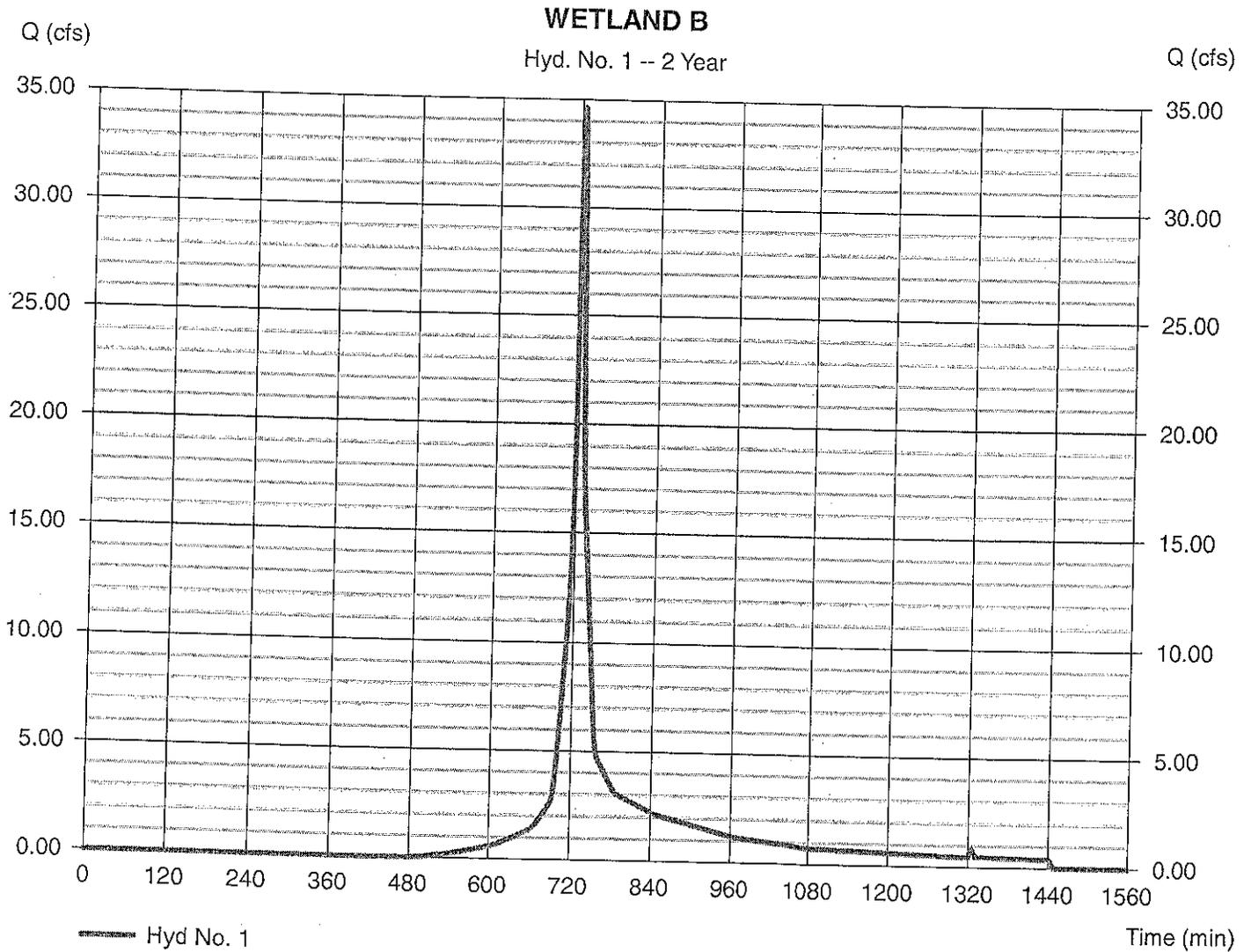
Hyd. No. 1

WETLAND B

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 11.580 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 34.64 cfs
Time to peak = 725 min
Hyd. volume = 106,705 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(1.810 x 98) + (9.770 x 77)] / 11.580



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

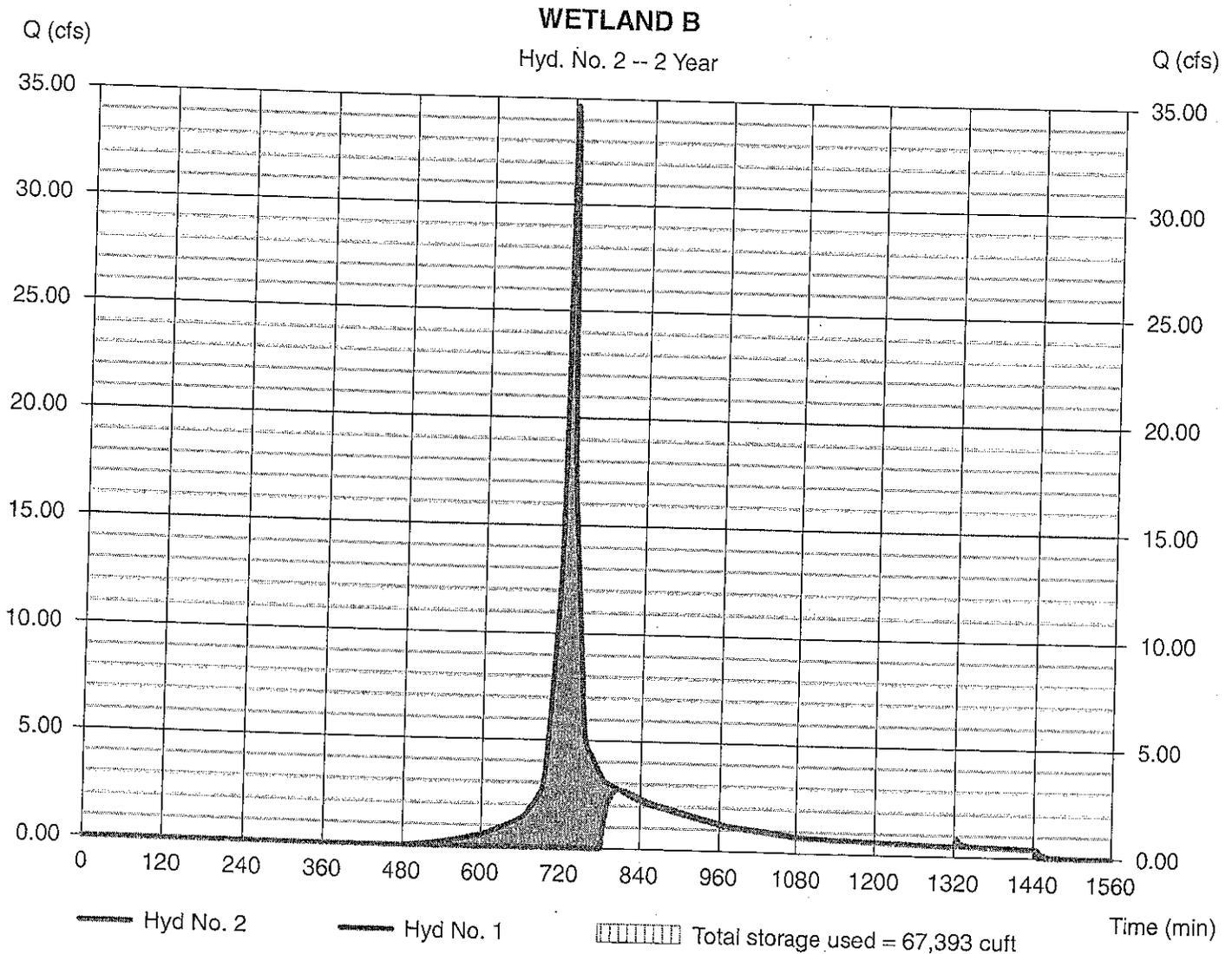
Hyd. No. 2

WETLAND B

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND B
Reservoir name = WETLAND A

Peak discharge = 2.724 cfs
Time to peak = 809 min
Hyd. volume = 40,745 cuft
Max. Elevation = 24.22 ft
Max. Storage = 67,393 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Pond No. 1 - WETLAND A

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 21.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	21.50	00	0	0
0.50	22.00	3,049	508	508
1.50	23.00	25,061	12,283	12,791
2.50	24.00	53,061	38,192	50,983
3.50	25.00	99,096	74,882	125,865

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 150.00	0.00	0.00	0.00
Crest El. (ft)	= 24.20	0.00	0.00	0.00
Weir Coeff.	= 3.00	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	21.50	---	---	---	---	0.00	---	---	---	---	---	0.00
0.05	51	21.55	---	---	---	---	0.00	---	---	---	---	---	0.00
0.10	102	21.60	---	---	---	---	0.00	---	---	---	---	---	0.00
0.15	152	21.65	---	---	---	---	0.00	---	---	---	---	---	0.00
0.20	203	21.70	---	---	---	---	0.00	---	---	---	---	---	0.00
0.25	254	21.75	---	---	---	---	0.00	---	---	---	---	---	0.00
0.30	305	21.80	---	---	---	---	0.00	---	---	---	---	---	0.00
0.35	356	21.85	---	---	---	---	0.00	---	---	---	---	---	0.00
0.40	406	21.90	---	---	---	---	0.00	---	---	---	---	---	0.00
0.45	457	21.95	---	---	---	---	0.00	---	---	---	---	---	0.00
0.50	508	22.00	---	---	---	---	0.00	---	---	---	---	---	0.00
0.60	1,736	22.10	---	---	---	---	0.00	---	---	---	---	---	0.00
0.70	2,965	22.20	---	---	---	---	0.00	---	---	---	---	---	0.00
0.80	4,193	22.30	---	---	---	---	0.00	---	---	---	---	---	0.00
0.90	5,421	22.40	---	---	---	---	0.00	---	---	---	---	---	0.00
1.00	6,649	22.50	---	---	---	---	0.00	---	---	---	---	---	0.00
1.10	7,878	22.60	---	---	---	---	0.00	---	---	---	---	---	0.00
1.20	9,106	22.70	---	---	---	---	0.00	---	---	---	---	---	0.00
1.30	10,334	22.80	---	---	---	---	0.00	---	---	---	---	---	0.00
1.40	11,562	22.90	---	---	---	---	0.00	---	---	---	---	---	0.00
1.50	12,791	23.00	---	---	---	---	0.00	---	---	---	---	---	0.00
1.60	16,610	23.10	---	---	---	---	0.00	---	---	---	---	---	0.00
1.70	20,429	23.20	---	---	---	---	0.00	---	---	---	---	---	0.00
1.80	24,248	23.30	---	---	---	---	0.00	---	---	---	---	---	0.00
1.90	28,068	23.40	---	---	---	---	0.00	---	---	---	---	---	0.00
2.00	31,887	23.50	---	---	---	---	0.00	---	---	---	---	---	0.00
2.10	35,706	23.60	---	---	---	---	0.00	---	---	---	---	---	0.00
2.20	39,525	23.70	---	---	---	---	0.00	---	---	---	---	---	0.00
2.30	43,344	23.80	---	---	---	---	0.00	---	---	---	---	---	0.00
2.40	47,164	23.90	---	---	---	---	0.00	---	---	---	---	---	0.00
2.50	50,983	24.00	---	---	---	---	0.00	---	---	---	---	---	0.00
2.60	58,471	24.10	---	---	---	---	0.00	---	---	---	---	---	0.00
2.70	65,959	24.20	---	---	---	---	0.00	---	---	---	---	---	0.00
2.80	73,448	24.30	---	---	---	---	14.23	---	---	---	---	---	14.23
2.90	80,936	24.40	---	---	---	---	40.25	---	---	---	---	---	40.25
3.00	88,424	24.50	---	---	---	---	73.94	---	---	---	---	---	73.94
3.10	95,912	24.60	---	---	---	---	113.84	---	---	---	---	---	113.84

Continues on next page...

Hydrograph Summary Report

Hydraflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	65.18	1	725	203,500	----	-----	-----	WETLAND B
2	Reservoir	38.46	1	731	137,540	1	24.39	80,420	WETLAND B
WETLAND B.gpw					Return Period: 10 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

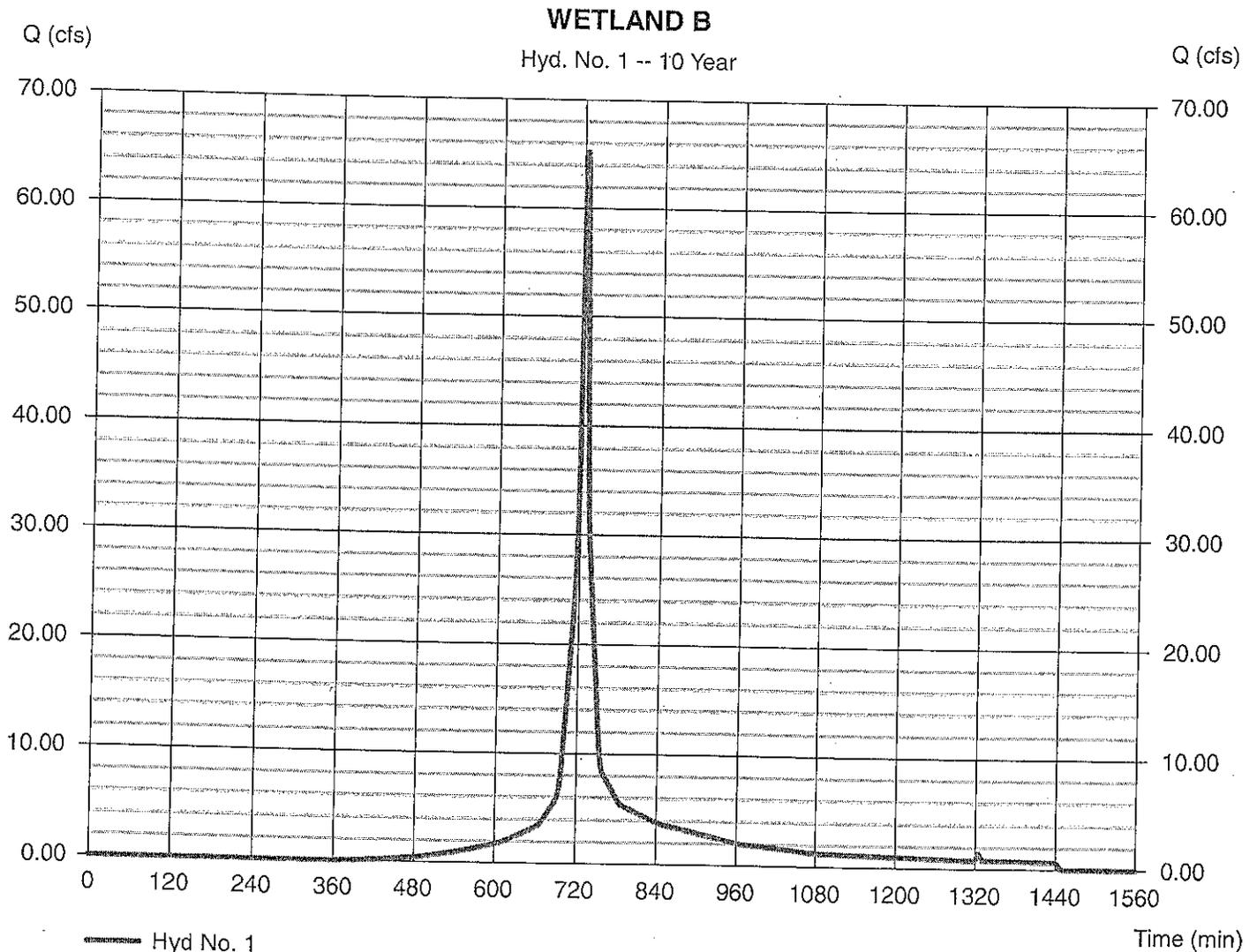
Hyd. No. 1

WETLAND B

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 11,580 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.00 in
Storm duration = 24 hrs

Peak discharge = 65.18 cfs
Time to peak = 725 min
Hyd. volume = 203,500 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(1.810 \times 98) + (9.770 \times 77)] / 11,580$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

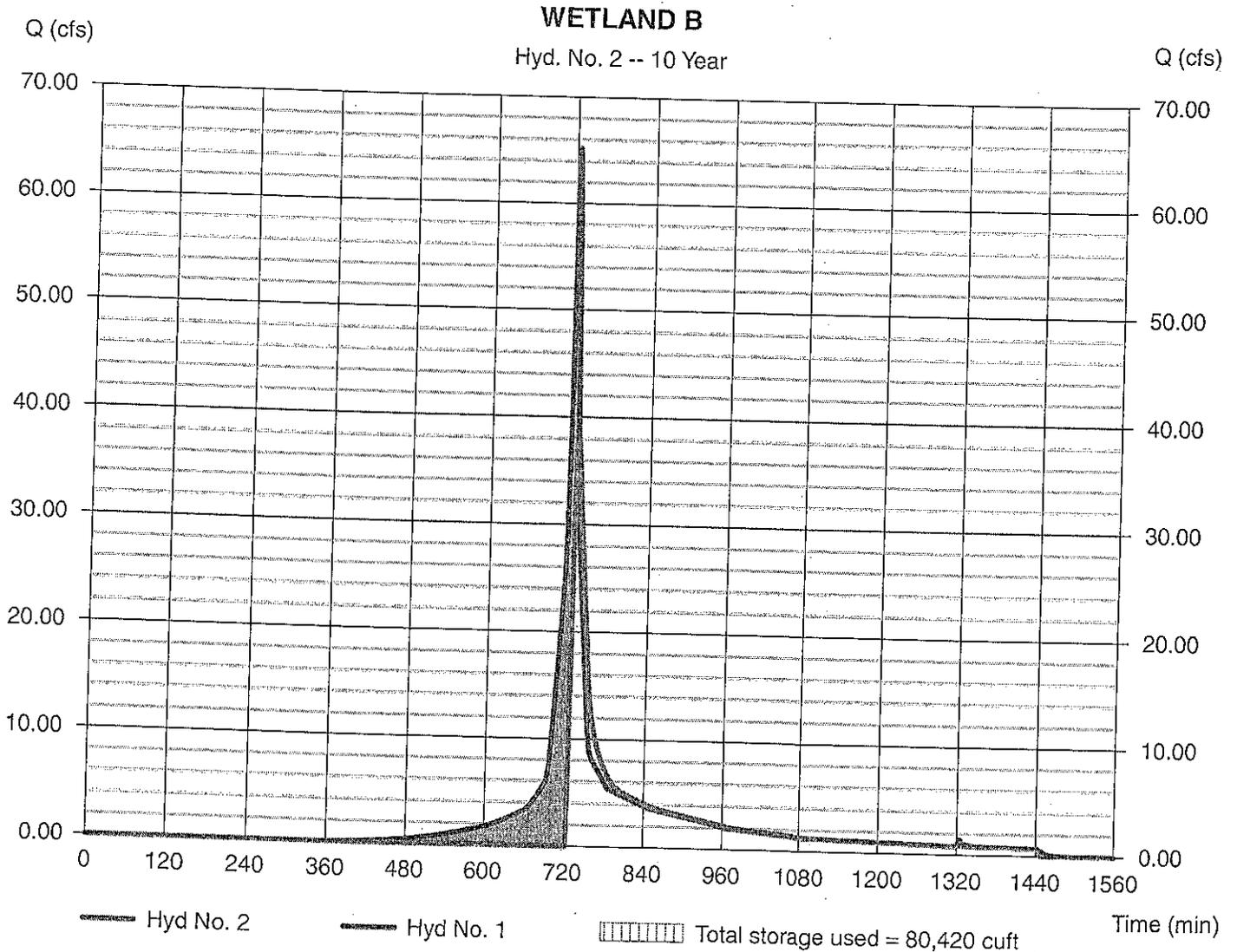
Hyd. No. 2

WETLAND B

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND B
Reservoir name = WETLAND A

Peak discharge = 38.46 cfs
Time to peak = 731 min
Hyd. volume = 137,540 cuft
Max. Elevation = 24.39 ft
Max. Storage = 80,420 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	78.25	1	724	245,871	---	-----	-----	WETLAND B	
2	Reservoir	61.76	1	728	179,911	1	24.46	85,716	WETLAND B	
WETLAND B.gpw					Return Period: 25 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

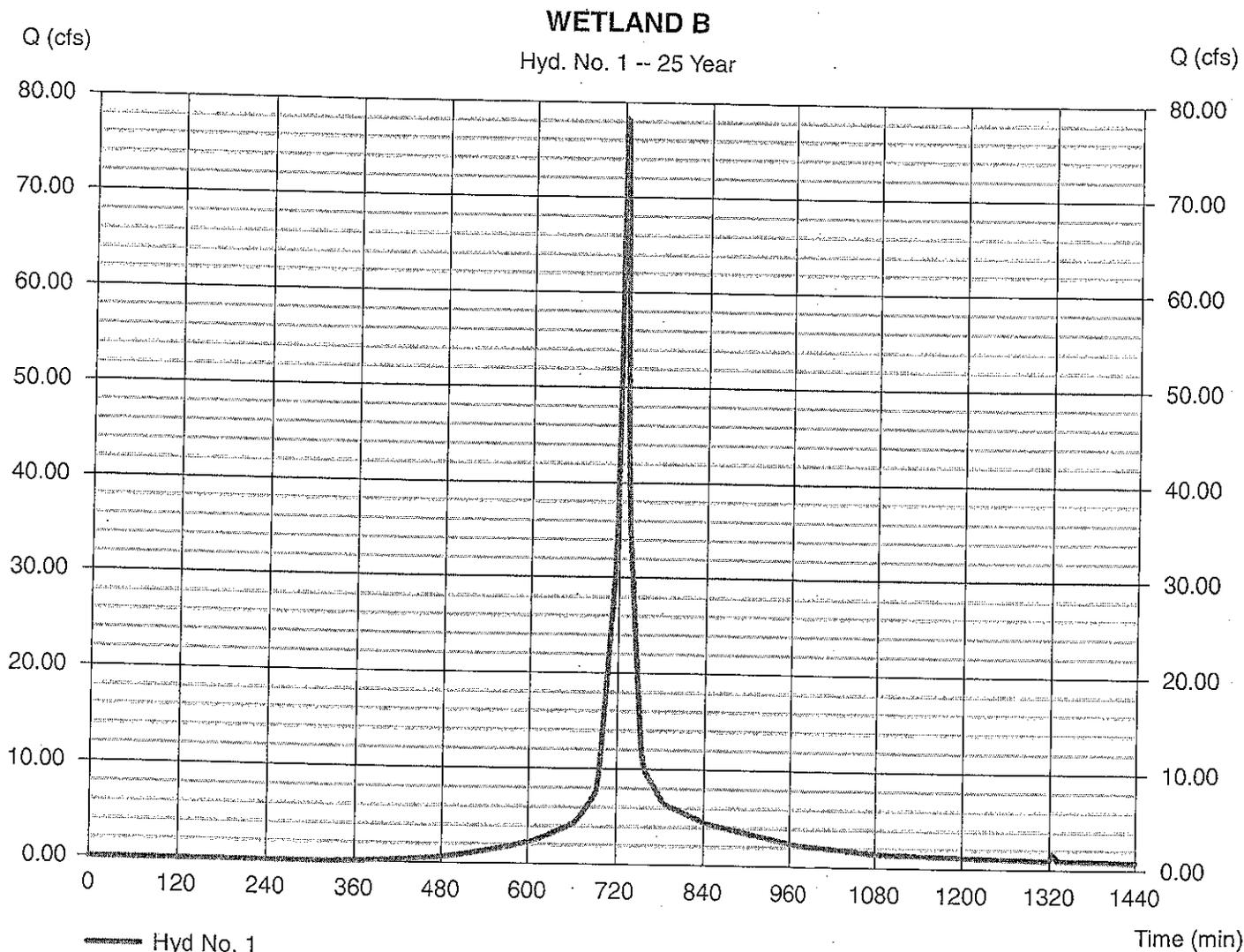
Hyd. No. 1

WETLAND B

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 11.580 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.05 in
 Storm duration = 24 hrs

Peak discharge = 78.25 cfs
 Time to peak = 724 min
 Hyd. volume = 245,871 cuft
 Curve number = 80*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(1.810 \times 98) + (9.770 \times 77)] / 11.580$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

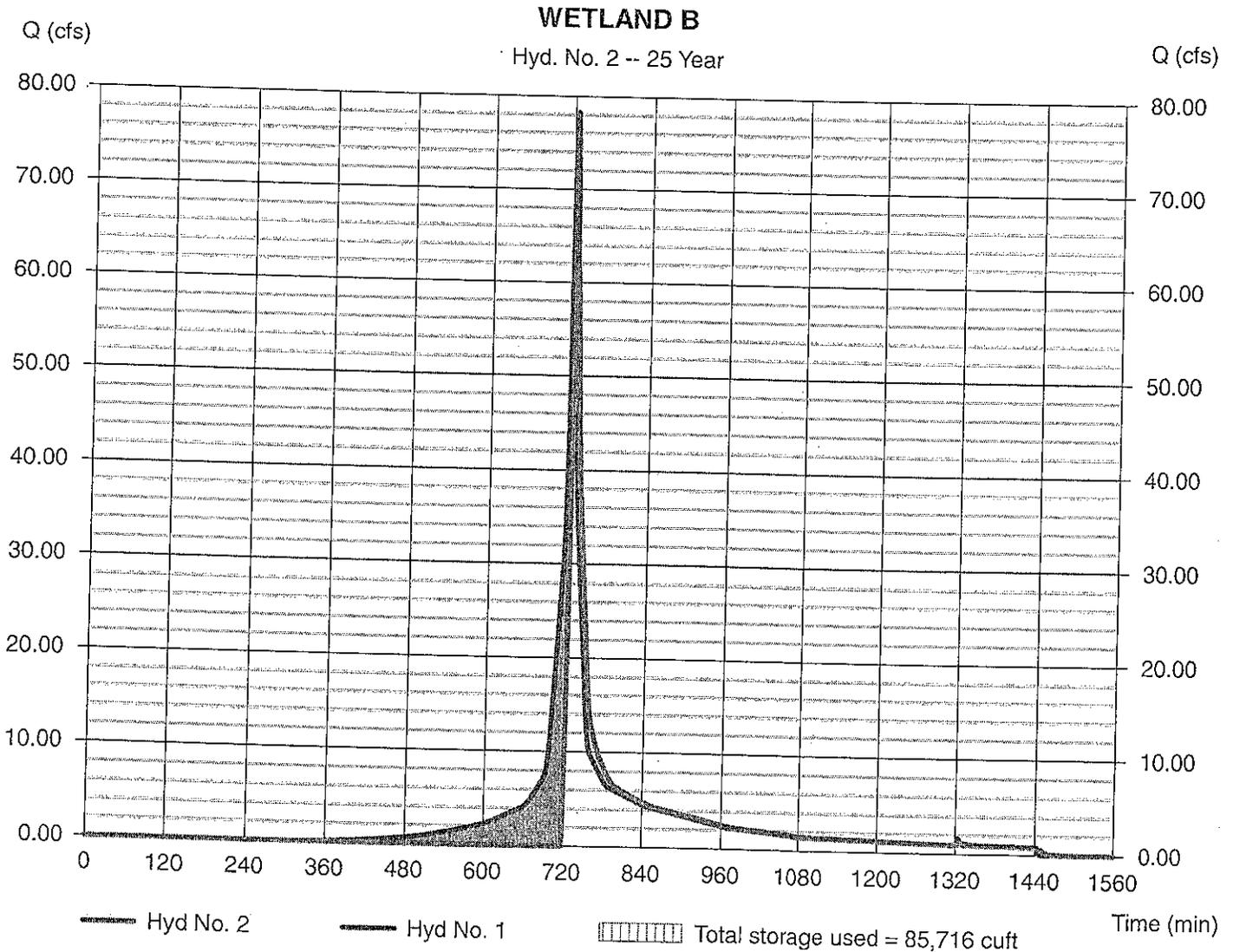
Hyd. No. 2

WETLAND B

Hydrograph type = Reservoir
 Storm frequency = 25 yrs
 Time interval = 1 min
 Inflow hyd. No. = 1 - WETLAND B
 Reservoir name = WETLAND A

Peak discharge = 61.76 cfs
 Time to peak = 728 min
 Hyd. volume = 179,911 cuft
 Max. Elevation = 24.46 ft
 Max. Storage = 85,716 cuft

Storage Indication method used.



WETLAND C

Site Area

Site Area 450,922 sf
10.35 ac

Impervious Area Calculation

ROW 44,660
Lots 61,407
Other/Common Areas
Total 106,067 sf
Total 2.43 ac
% Impervious 23.52%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 15.22 cfs

10-Year Pre Dev. Peak Flow
intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 18.71 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 21.09 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.41
Q=C*I*A 25.24 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.41
Q=C*I*A 31.03 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.41
Q=C*I*A 34.98 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	33.09	1	725	102,133	---	-----	-----	WETLAND C	
2	Reservoir	10.37	1	744	53,789	1	24.63	50,315	WETLAND C	
WETLAND C.gpw					Return Period: 2 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

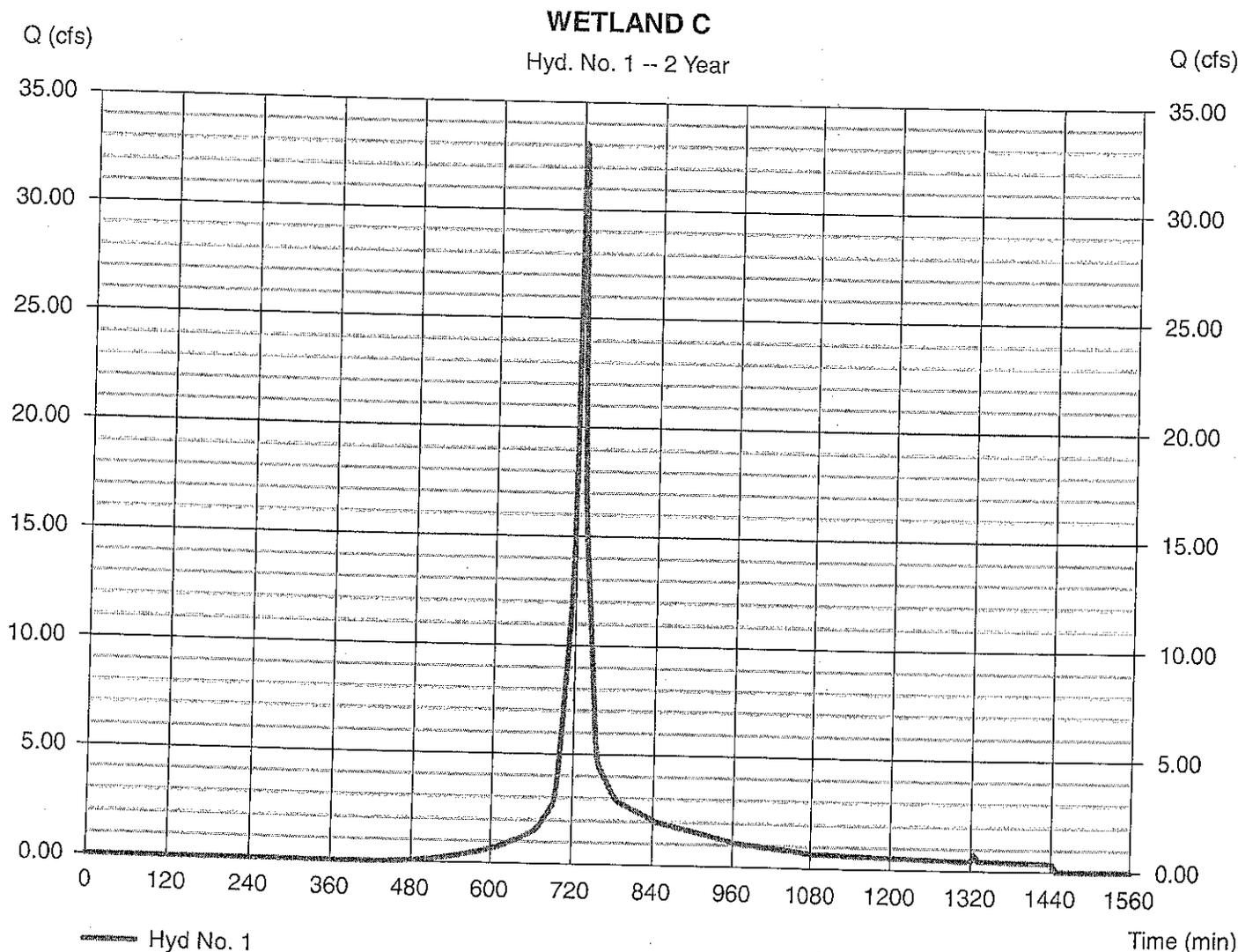
Hyd. No. 1

WETLAND C

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 10.350 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 33.09 cfs
Time to peak = 725 min
Hyd. volume = 102,133 cuft
Curve number = 82*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(2.430 \times 98) + (7.920 \times 77)] / 10.350$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

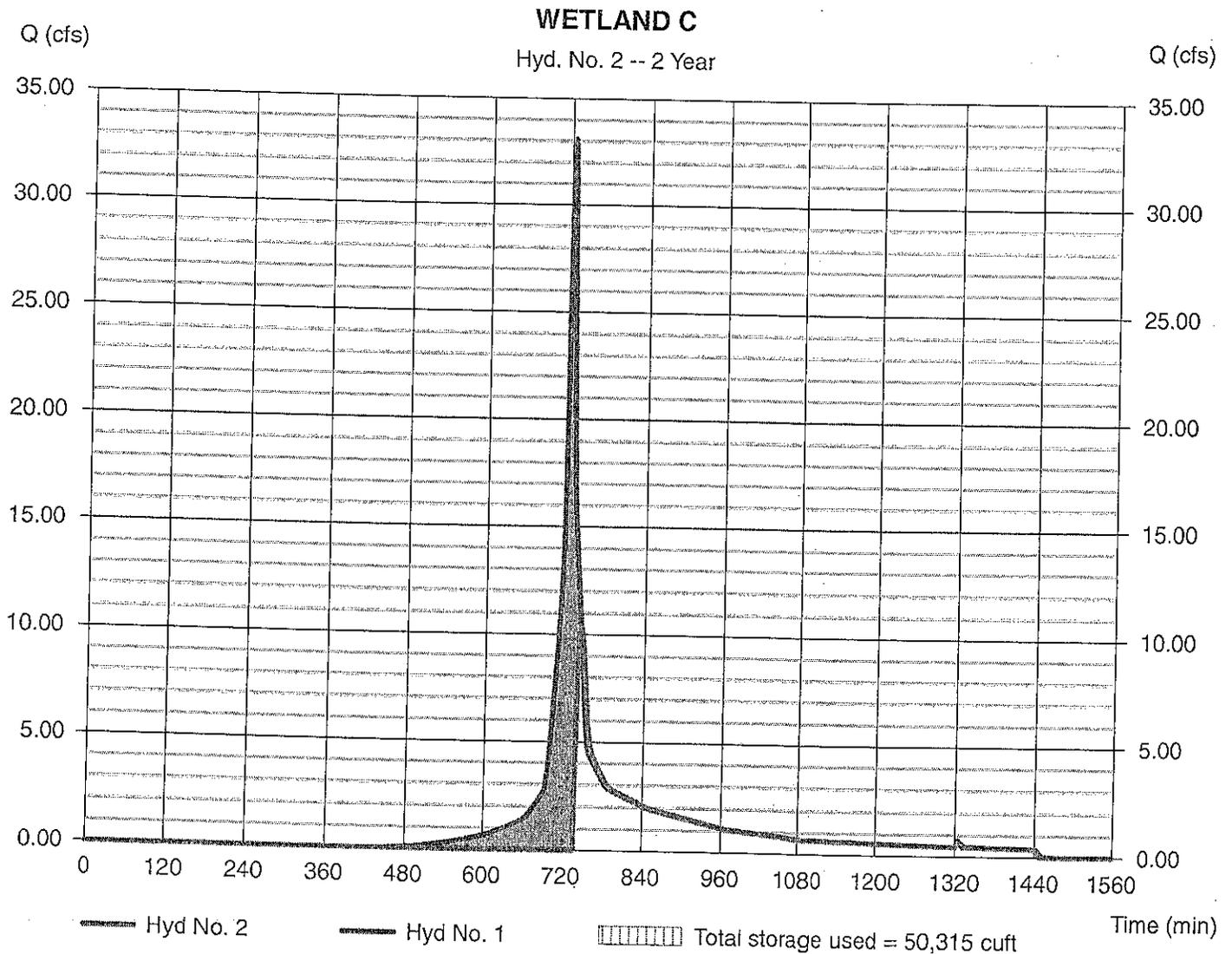
Hyd. No. 2

WETLAND C

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow-hyd: No. = 1 - WETLAND C
Reservoir name = WETLAND C

Peak discharge = 10.37 cfs
Time to peak = 744 min
Hyd. volume = 53,789 cuft
Max. Elevation = 24.63 ft
Max. Storage = 50,315 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Pond No. 1 - WETLAND C

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 23.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	23.50	00	0	0
0.50	24.00	30,542	5,090	5,090
1.50	25.00	124,169	72,091	77,180

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 400.00	0.00	0.00	0.00
Crest El. (ft)	= 24.60	0.00	0.00	0.00
Weir Coeff.	= 3.00	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	23.50	---	---	---	---	0.00	---	---	---	---	---	0.00
0.05	509	23.55	---	---	---	---	0.00	---	---	---	---	---	0.00
0.10	1,018	23.60	---	---	---	---	0.00	---	---	---	---	---	0.00
0.15	1,527	23.65	---	---	---	---	0.00	---	---	---	---	---	0.00
0.20	2,036	23.70	---	---	---	---	0.00	---	---	---	---	---	0.00
0.25	2,545	23.75	---	---	---	---	0.00	---	---	---	---	---	0.00
0.30	3,054	23.80	---	---	---	---	0.00	---	---	---	---	---	0.00
0.35	3,563	23.85	---	---	---	---	0.00	---	---	---	---	---	0.00
0.40	4,072	23.90	---	---	---	---	0.00	---	---	---	---	---	0.00
0.45	4,581	23.95	---	---	---	---	0.00	---	---	---	---	---	0.00
0.50	5,090	24.00	---	---	---	---	0.00	---	---	---	---	---	0.00
0.60	12,299	24.10	---	---	---	---	0.00	---	---	---	---	---	0.00
0.70	19,508	24.20	---	---	---	---	0.00	---	---	---	---	---	0.00
0.80	26,717	24.30	---	---	---	---	0.00	---	---	---	---	---	0.00
0.90	33,926	24.40	---	---	---	---	0.00	---	---	---	---	---	0.00
1.00	41,135	24.50	---	---	---	---	0.00	---	---	---	---	---	0.00
1.10	48,344	24.60	---	---	---	---	0.00	---	---	---	---	---	0.00
1.20	55,553	24.70	---	---	---	---	37.95	---	---	---	---	---	37.95
1.30	62,762	24.80	---	---	---	---	107.33	---	---	---	---	---	107.33
1.40	69,971	24.90	---	---	---	---	197.18	---	---	---	---	---	197.18
1.50	77,180	25.00	---	---	---	---	303.58	---	---	---	---	---	303.58

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	60.85	1	724	190,475	---	-----	-----	WETLAND C	
2	Reservoir	56.77	1	726	142,130	1	24.73	57,509	WETLAND C	
WETLAND C.gpw					Return Period: 10 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelsolve v9.1

Friday, Nov 2, 2012

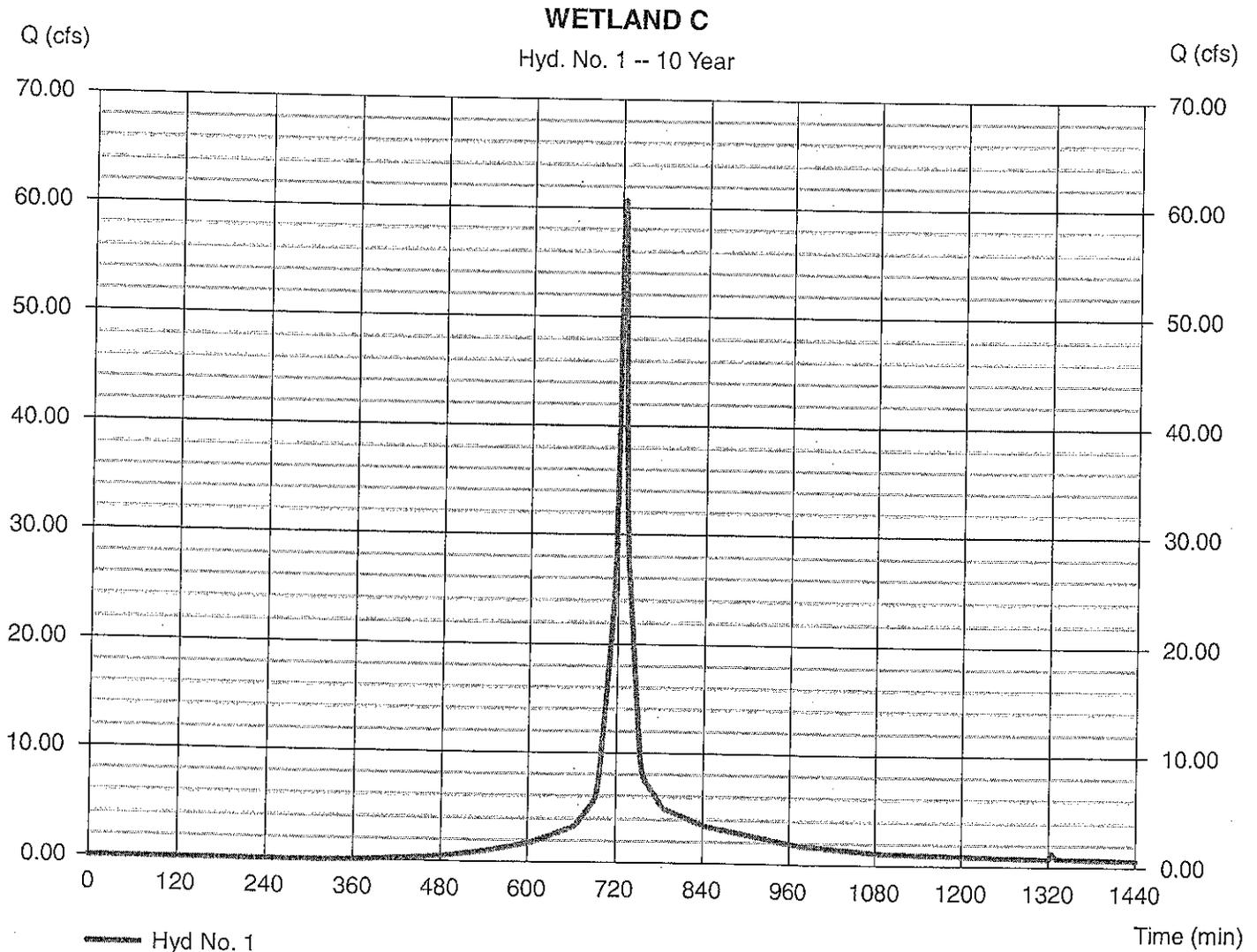
Hyd. No. 1

WETLAND C

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 10.350 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.00 in
 Storm duration = 24 hrs

Peak discharge = 60.65 cfs
 Time to peak = 724 min
 Hyd. volume = 190,475 cuft
 Curve number = 82*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(2.430 \times 98) + (7.920 \times 77)] / 10.350$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

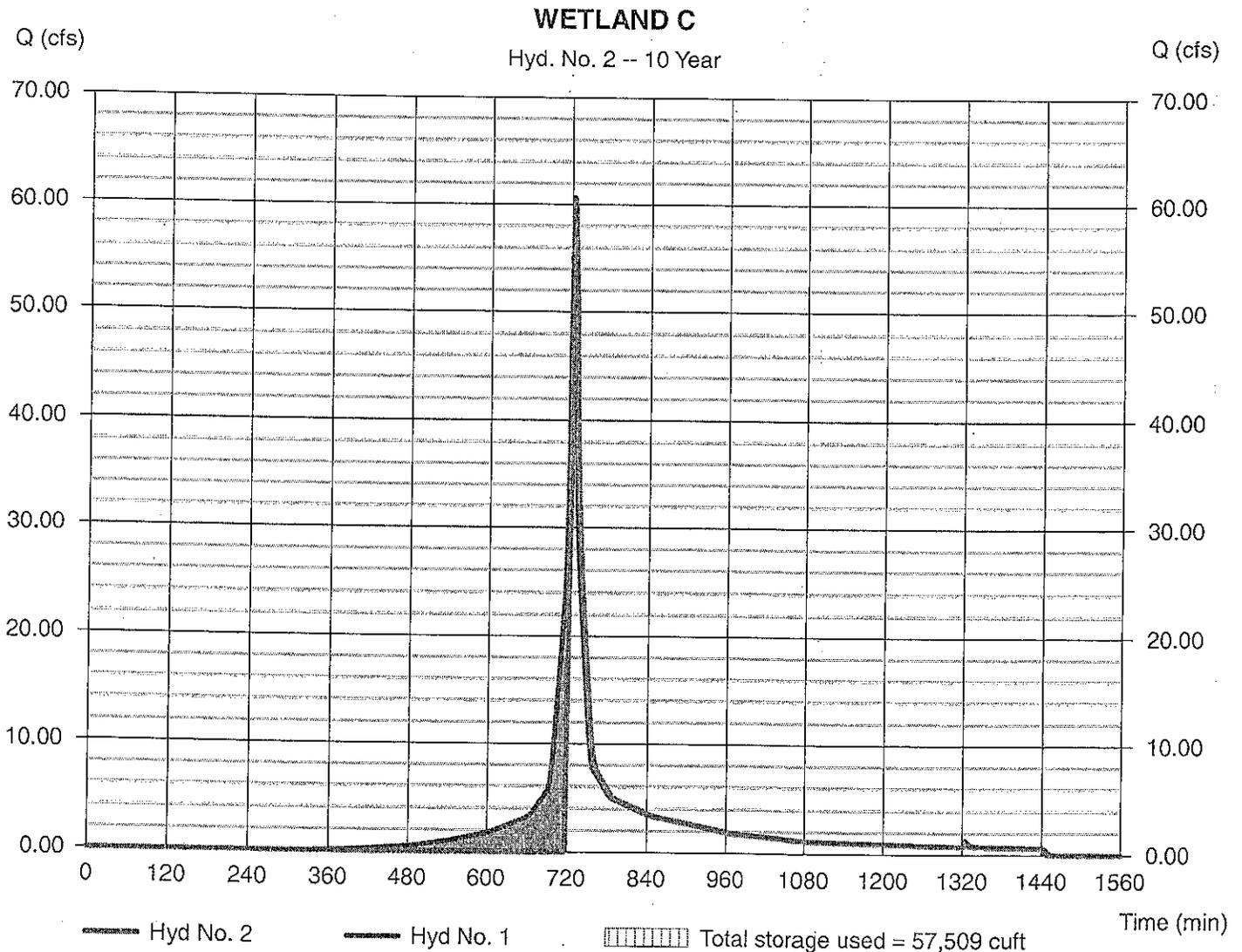
Hyd. No. 2

WETLAND C

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND C
Reservoir name = WETLAND C

Peak discharge = 56.77 cfs
Time to peak = 726 min
Hyd. volume = 142,130 cuft
Max. Elevation = 24.73 ft
Max. Storage = 57,509 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	72.35	1	724	228,873	---	-----	-----	WETLAND C
2	Reservoir	69.05	1	726	180,529	1	24.74	58,785	WETLAND C
WETLAND C.gpw					Return Period: 25 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

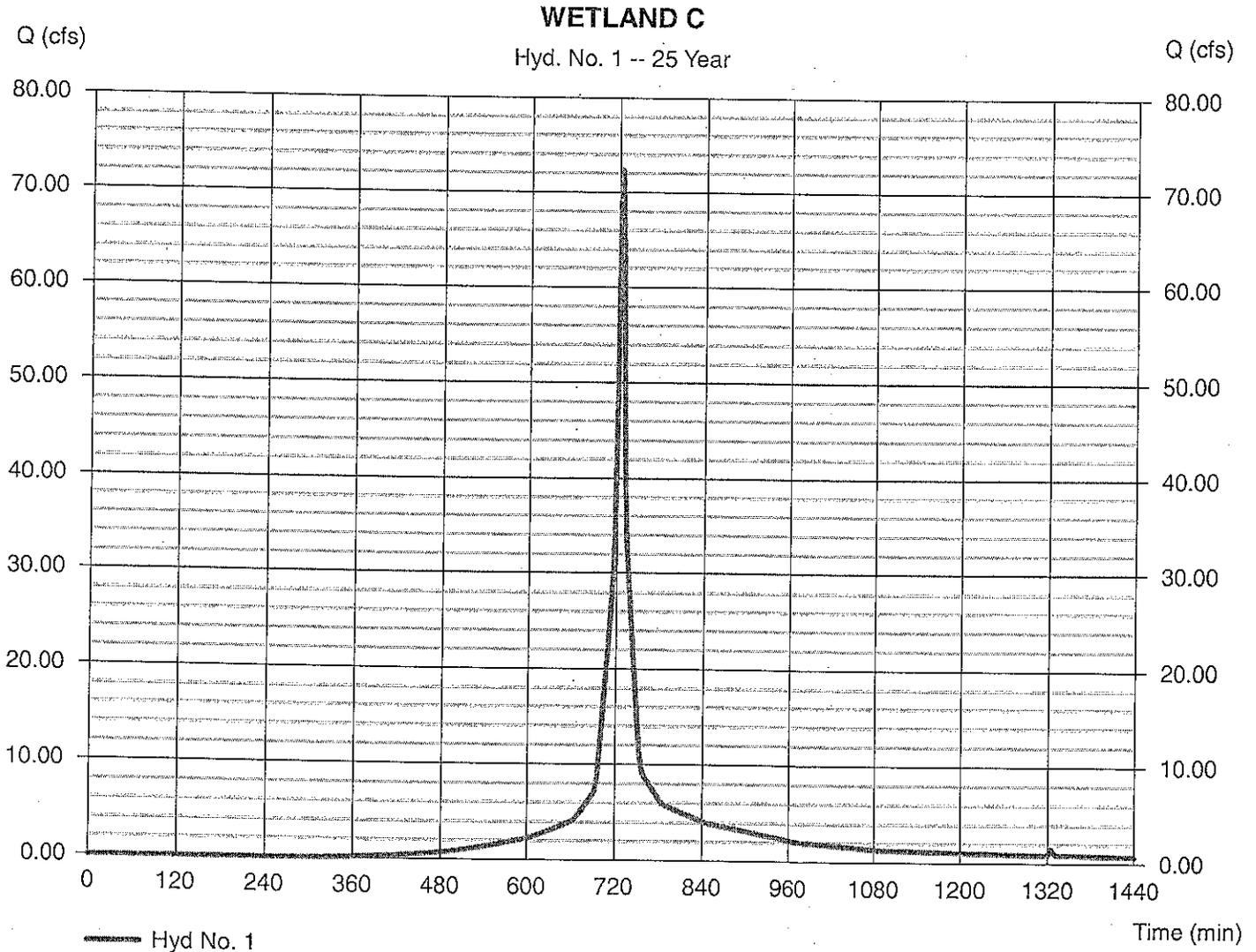
Hyd. No. 1

WETLAND C

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 10.350 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.05 in
 Storm duration = 24 hrs

Peak discharge = 72.35 cfs
 Time to peak = 724 min
 Hyd. volume = 228,873 cuft
 Curve number = 82*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = [(2.430 x 98) + (7.920 x 77)] / 10.350



Hydrograph Report

Hydraflow Hydrographs by Intelsolve v9.1

Friday, Nov 2, 2012

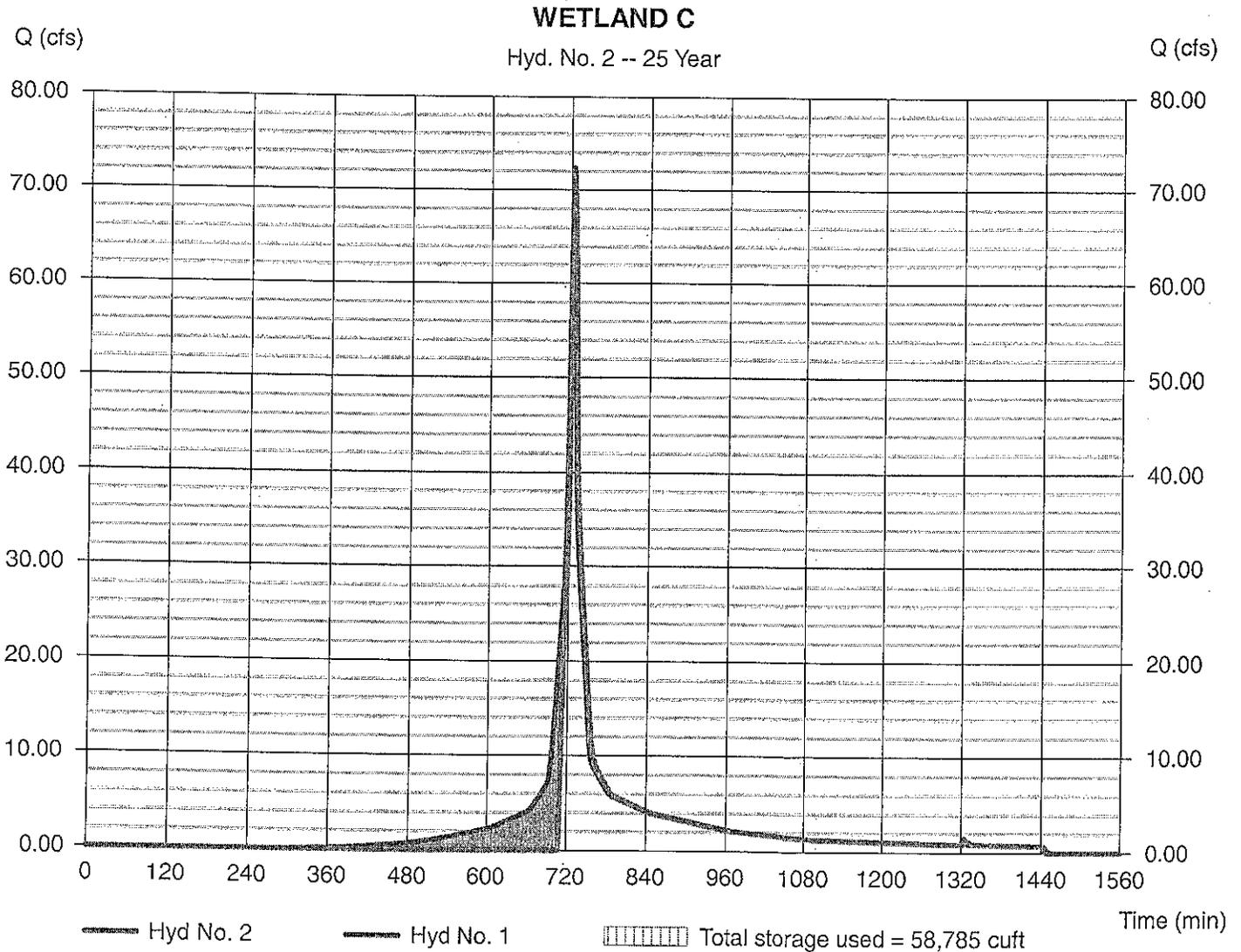
Hyd. No. 2

WETLAND C

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND C
Reservoir name = WETLAND C

Peak discharge = 69.05 cfs
Time to peak = 726 min
Hyd. volume = 180,529 cuft
Max. Elevation = 24.74 ft
Max. Storage = 58,785 cuft

Storage Indication method used.



WETLAND D

Site Area

Site Area 64,141 sf
1.47 ac

Impervious Area Calculation

ROW
Lots 11,432
Other/Common Areas
Total 11,432 sf
Total 0.26 ac
% Impervious 17.82%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 2.16 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 2.66 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 3.00 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.37
Q=C*I*A 3.24 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.37
Q=C*I*A 3.99 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.37
Q=C*I*A 4.50 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	4.549	1	725	14,022	---	-----	-----	WETLAND D
2	Reservoir	0.181	1	936	2,792	1	23.50	11,251	WETLAND D
WETLAND D.gpw					Return Period: 2 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by intelsolve v9.1

Friday, Nov 2, 2012

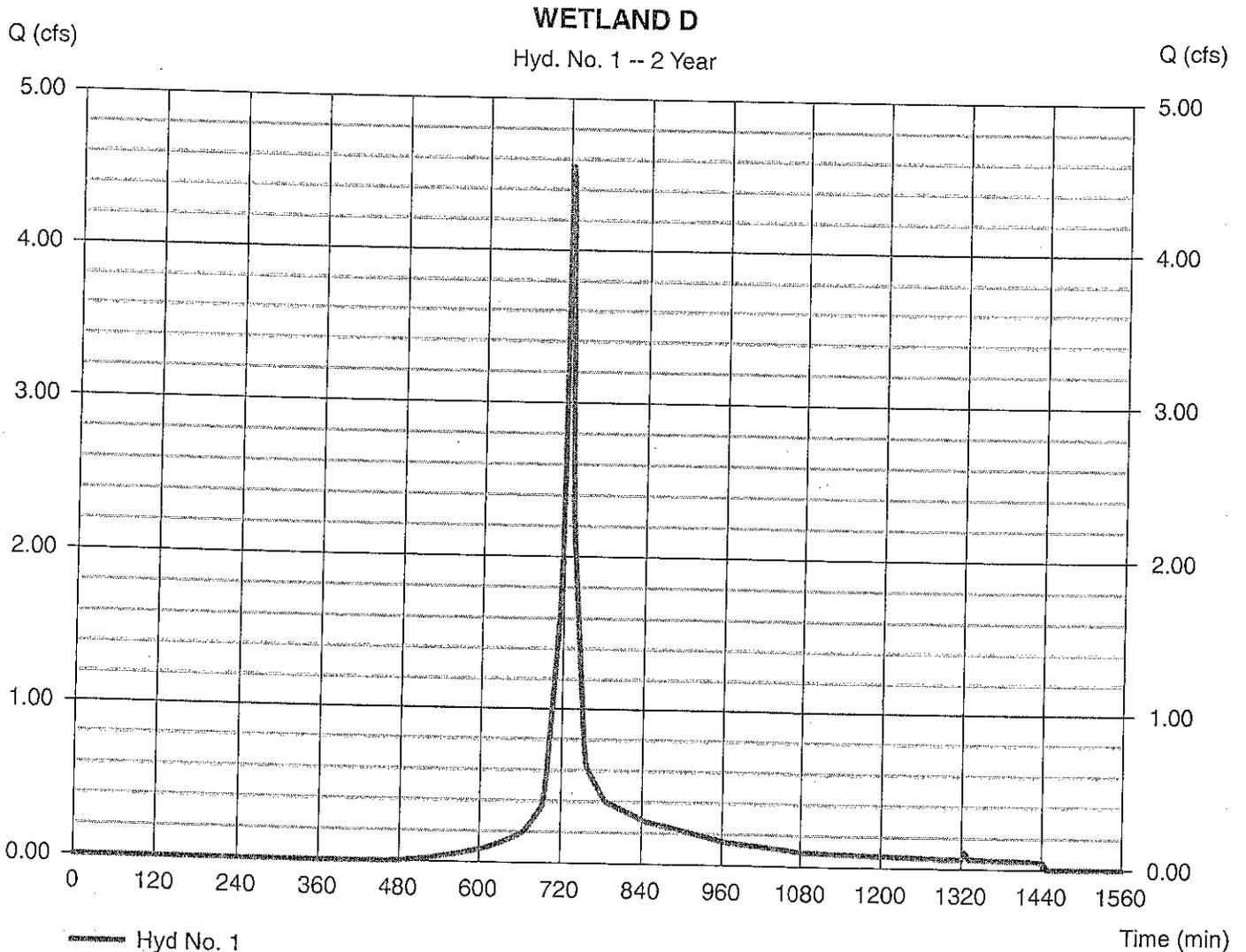
Hyd. No. 1

WETLAND D

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 1.470 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 4.549 cfs
Time to peak = 725 min
Hyd. volume = 14,022 cuft
Curve number = 81*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.260 x 98) + (1.210 x 77)] / 1.470



Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.1

Friday, Nov 2, 2012

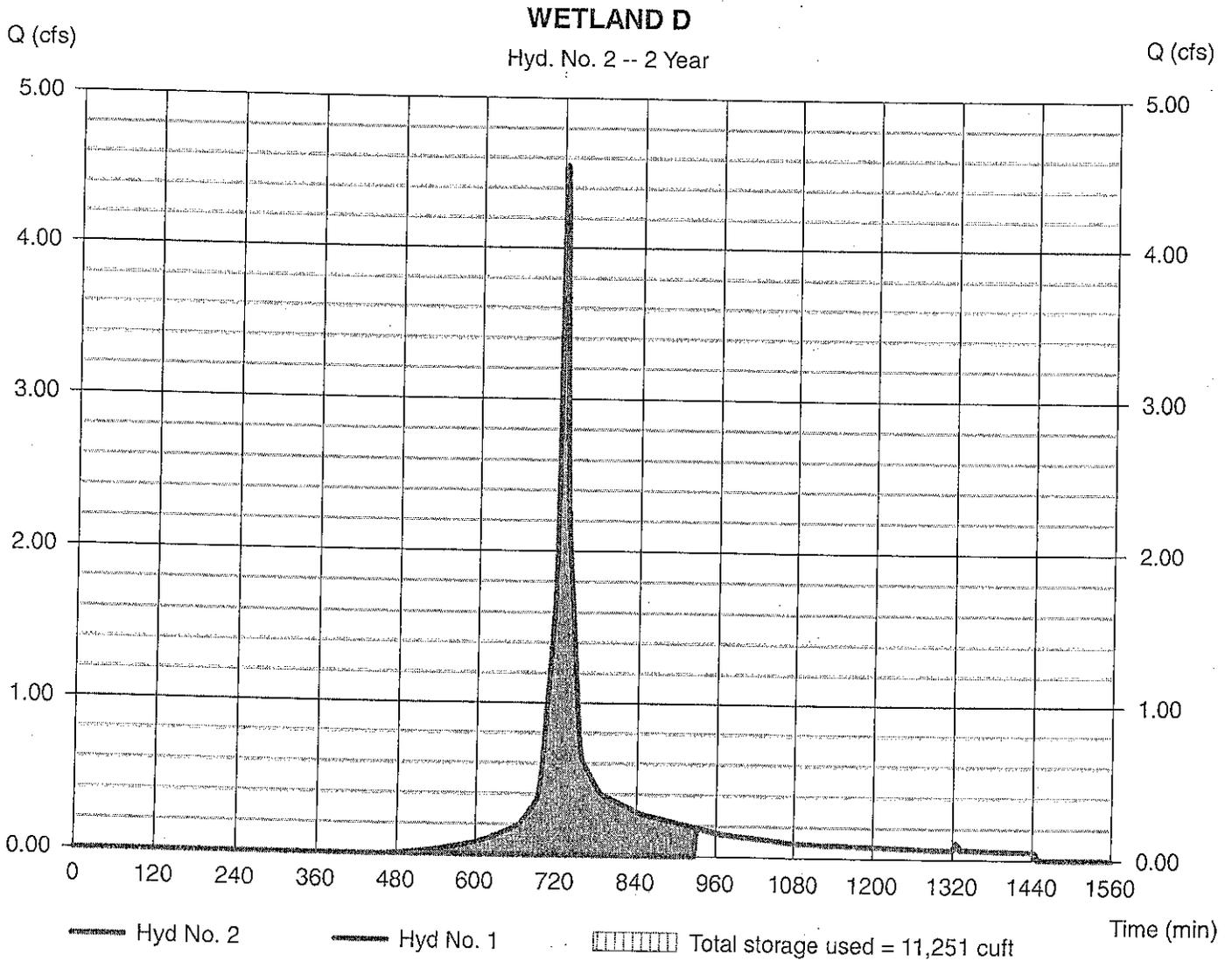
Hyd. No. 2

WETLAND D

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND D
Reservoir name = WETLAND D

Peak discharge = 0.181 cfs
Time to peak = 936 min
Hyd. volume = 2,792 cuft
Max. Elevation = 23.50 ft
Max. Storage = 11,251 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - WETLAND D

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 22.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	22.00	413	0	0
1.00	23.00	9,213	3,858	3,858
2.00	24.00	21,083	14,743	18,601

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 133.00	0.00	0.00	0.00
Crest El. (ft)	= 23.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	3.33	3.33	3.33
Weir Type	= Broad.	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	22.00	---	---	---	---	0.00	---	---	---	---	---	0.00
0.10	386	22.10	---	---	---	---	0.00	---	---	---	---	---	0.00
0.20	772	22.20	---	---	---	---	0.00	---	---	---	---	---	0.00
0.30	1,158	22.30	---	---	---	---	0.00	---	---	---	---	---	0.00
0.40	1,543	22.40	---	---	---	---	0.00	---	---	---	---	---	0.00
0.50	1,929	22.50	---	---	---	---	0.00	---	---	---	---	---	0.00
0.60	2,315	22.60	---	---	---	---	0.00	---	---	---	---	---	0.00
0.70	2,701	22.70	---	---	---	---	0.00	---	---	---	---	---	0.00
0.80	3,087	22.80	---	---	---	---	0.00	---	---	---	---	---	0.00
0.90	3,473	22.90	---	---	---	---	0.00	---	---	---	---	---	0.00
1.00	3,858	23.00	---	---	---	---	0.00	---	---	---	---	---	0.00
1.10	5,333	23.10	---	---	---	---	0.00	---	---	---	---	---	0.00
1.20	6,807	23.20	---	---	---	---	0.00	---	---	---	---	---	0.00
1.30	8,281	23.30	---	---	---	---	0.00	---	---	---	---	---	0.00
1.40	9,756	23.40	---	---	---	---	0.00	---	---	---	---	---	0.00
1.50	11,230	23.50	---	---	---	---	0.00	---	---	---	---	---	0.00
1.60	12,704	23.60	---	---	---	---	12.62	---	---	---	---	---	12.62
1.70	14,178	23.70	---	---	---	---	35.69	---	---	---	---	---	35.69
1.80	15,653	23.80	---	---	---	---	65.56	---	---	---	---	---	65.56
1.90	17,127	23.90	---	---	---	---	100.94	---	---	---	---	---	100.94
2.00	18,601	24.00	---	---	---	---	141.07	---	---	---	---	---	141.07

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	8.445	1	724	26,441	---	-----	-----	WETLAND D
2	Reservoir	4.329	1	732	15,211	1	23.53	11,736	WETLAND D
WETLAND D.gpw					Return Period: 10 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

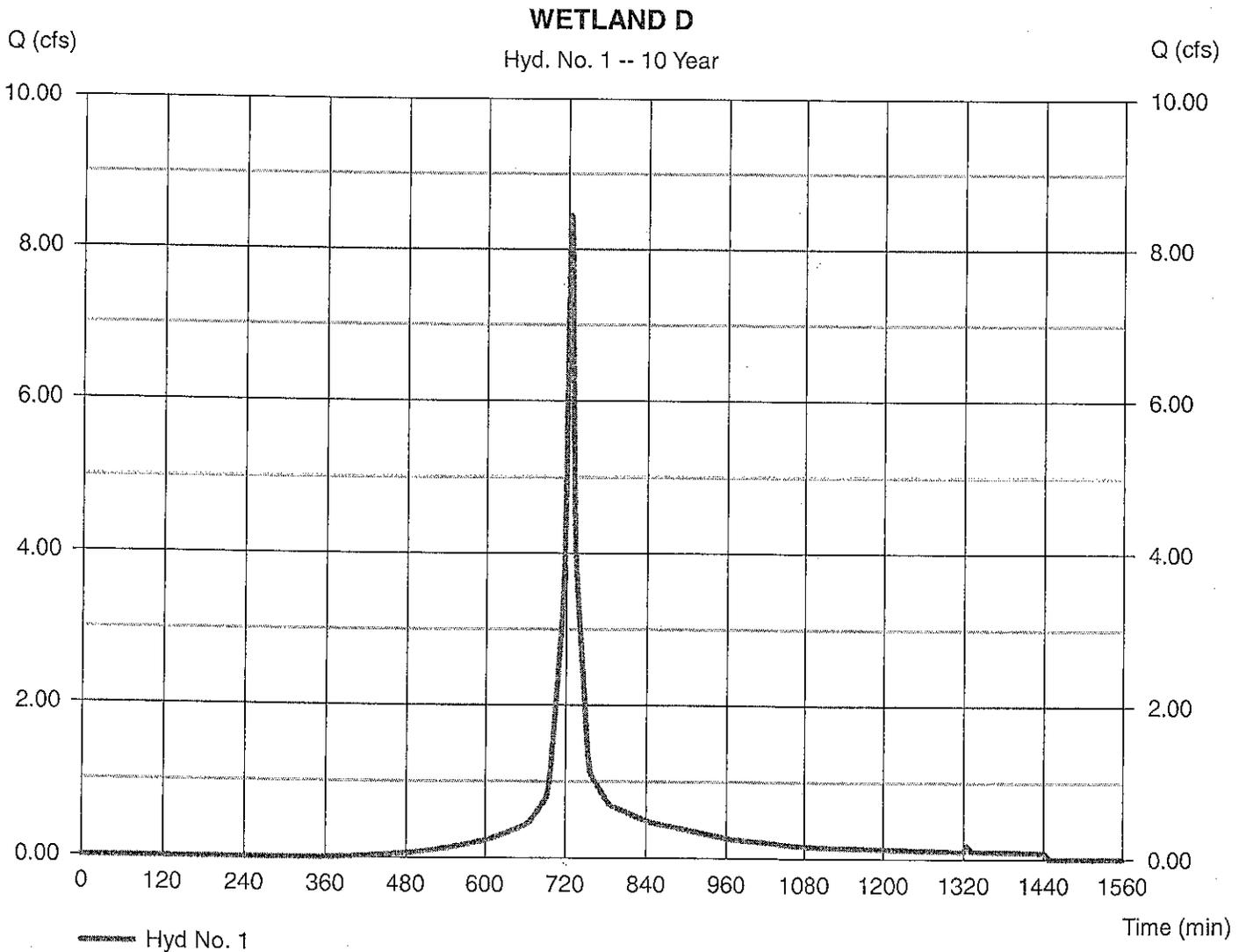
Hyd. No. 1

WETLAND D

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 1.470 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.00 in
 Storm duration = 24 hrs

Peak discharge = 8.445 cfs
 Time to peak = 724 min
 Hyd. volume = 26,441 cuft
 Curve number = 81*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.260 \times 98) + (1.210 \times 77)] / 1.470$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

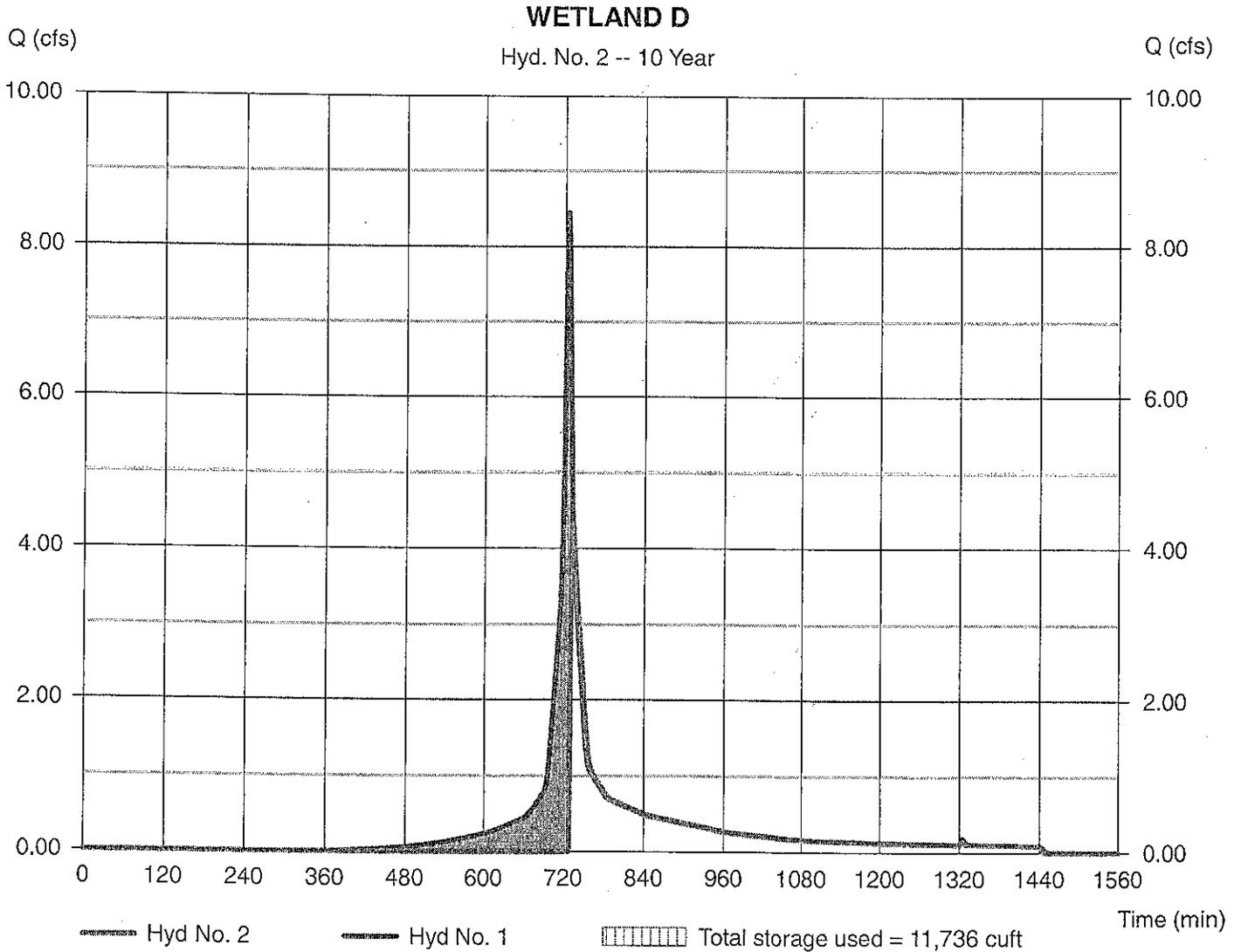
Hyd. No. 2

WETLAND D

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND D
Reservoir name = WETLAND D

Peak discharge = 4.329 cfs
Time to peak = 732 min
Hyd. volume = 15,211 cuft
Max. Elevation = 23.53 ft
Max. Storage = 11,736 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelsolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	10.11	1	724	31,859	---	-----	-----	WETLAND D	
2	Reservoir	8.288	1	728	20,629	1	23.57	12,198	WETLAND D	
WETLAND D.gpw					Return Period: 25 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

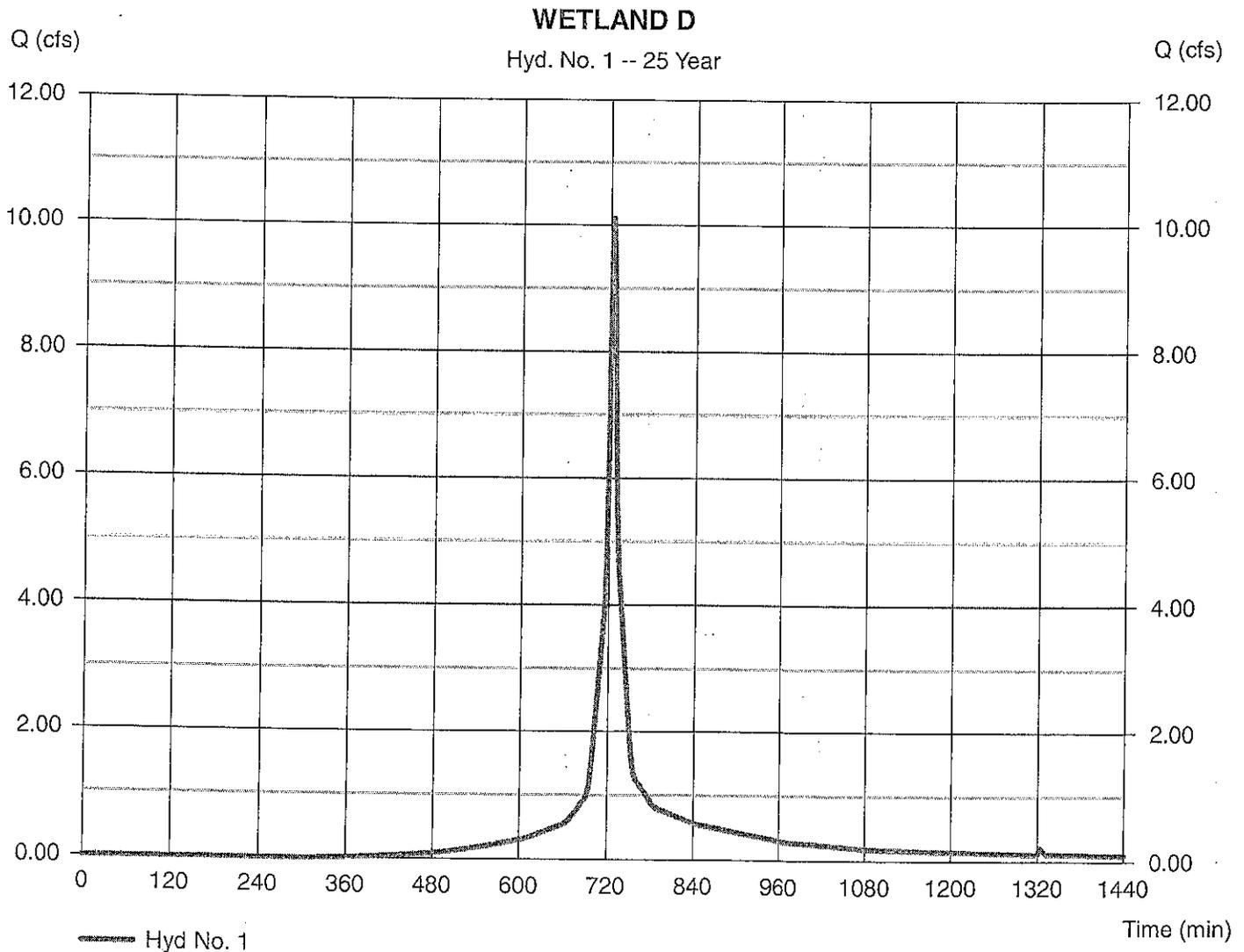
Hyd. No. 1

WETLAND D

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 1.470 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 10.11 cfs
Time to peak = 724 min
Hyd. volume = 31,859 cuft
Curve number = 81*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.260 \times 98) + (1.210 \times 77)] / 1.470$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

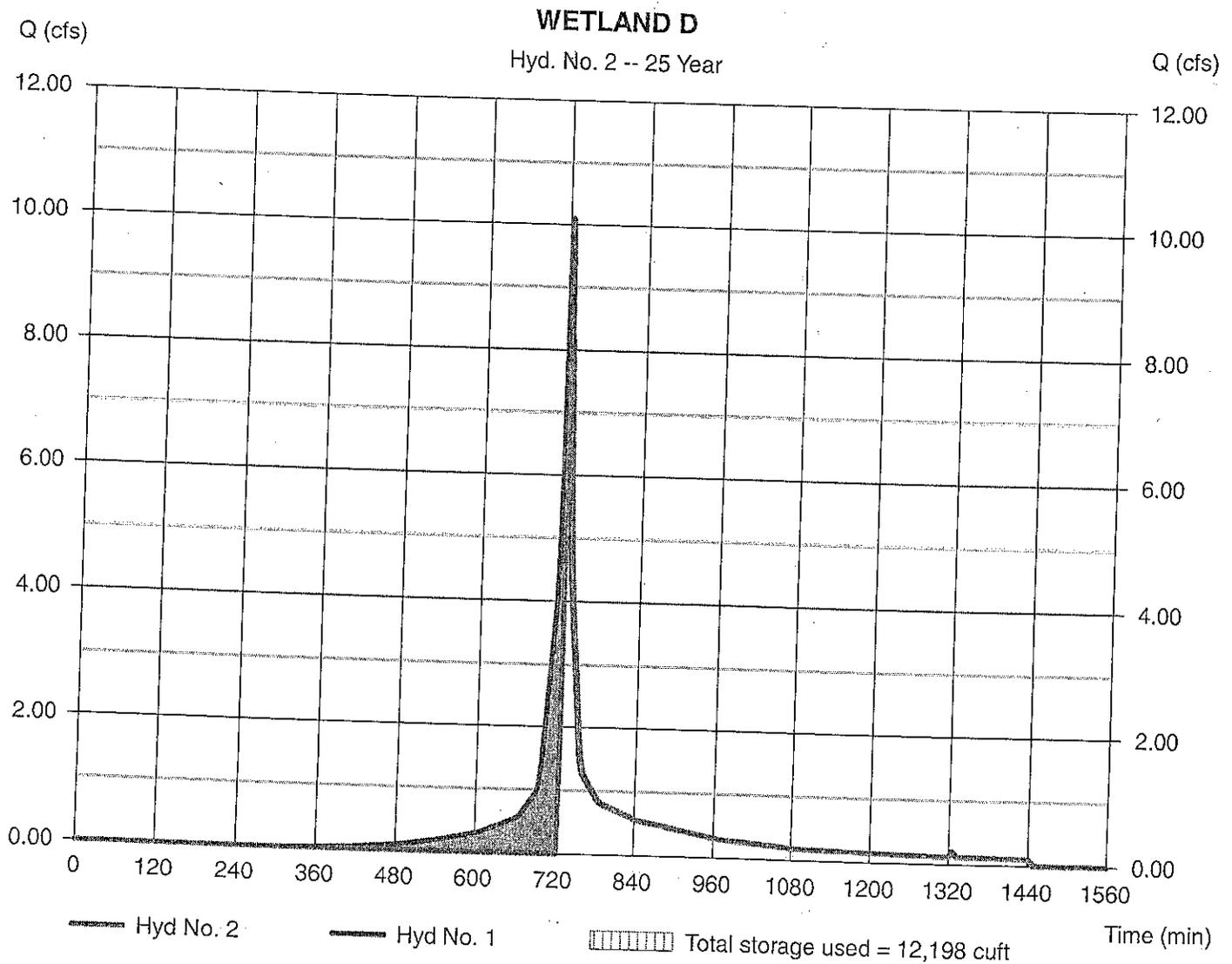
Hyd. No. 2

WETLAND D

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND D
Reservoir name = WETLAND D

Peak discharge = 8.288 cfs
Time to peak = 728 min
Hyd. volume = 20,629 cuft
Max. Elevation = 23.57 ft
Max. Storage = 12,198 cuft

Storage Indication method used.



WETLAND D & E

Site Area

Site Area 603,784 sf
13.86 ac

Impervious Area Calculation

ROW 56,210
Lots 104,557
Other/Common Areas
Total 160,767 sf
Total 3.69 ac
% Impervious 26.63%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 20.38 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 25.05 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 28.24 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.44
Q=C*I*A 35.57 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.44
Q=C*I*A 43.73 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.44
Q=C*I*A 49.30 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	45.74	1	725	141,414	----	-----	-----	WETLAND D & E
2	Reservoir	0.345	1	1443	27,283	1	25.14	132,600	WETLAND D & E
WETLAND D & E.gpw					Return Period: 2 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

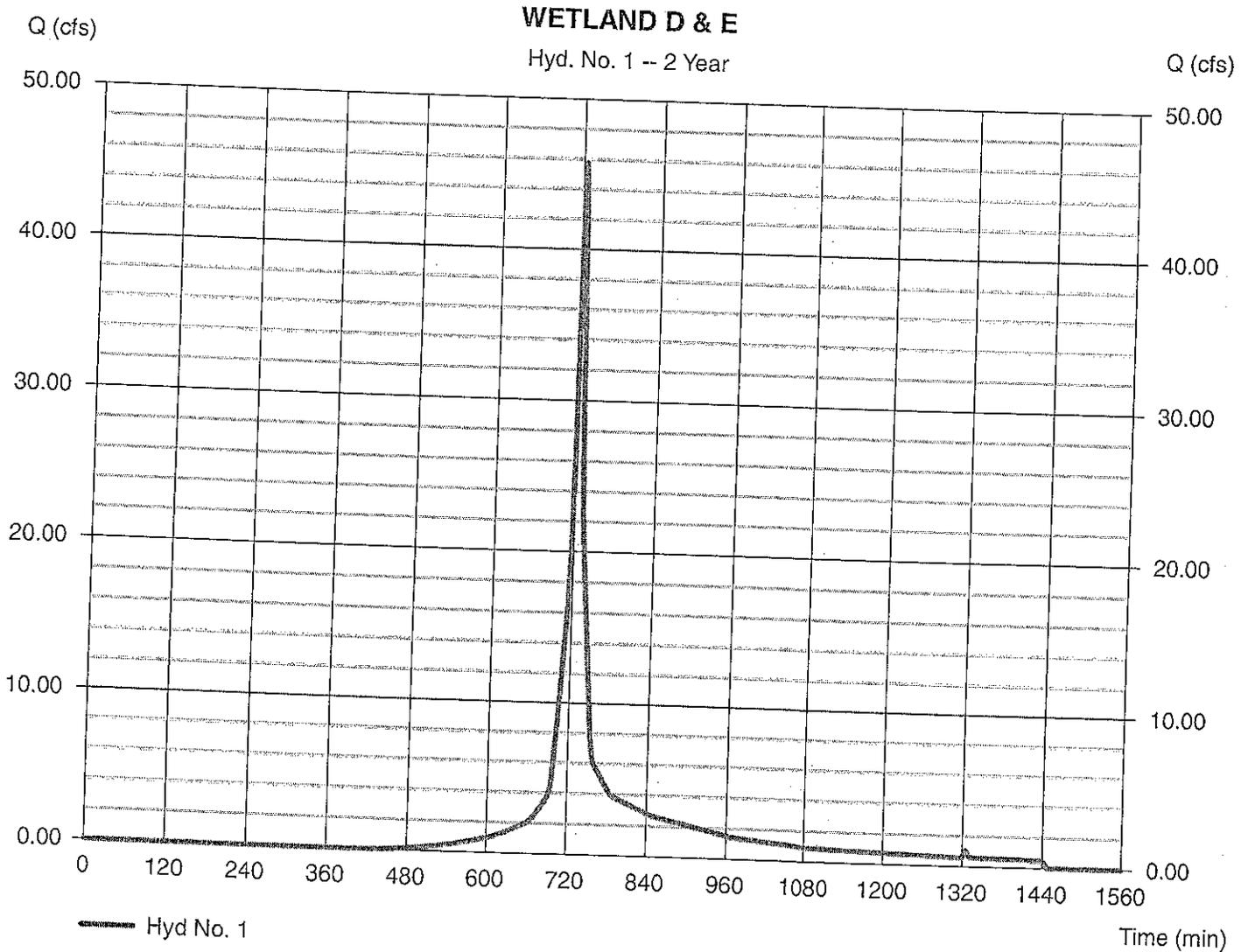
Hyd. No. 1

WETLAND D & E

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 13.860 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 45.74 cfs
Time to peak = 725 min
Hyd. volume = 141,414 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(3.690 x 98) + (10.170 x 77)] / 13.860



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

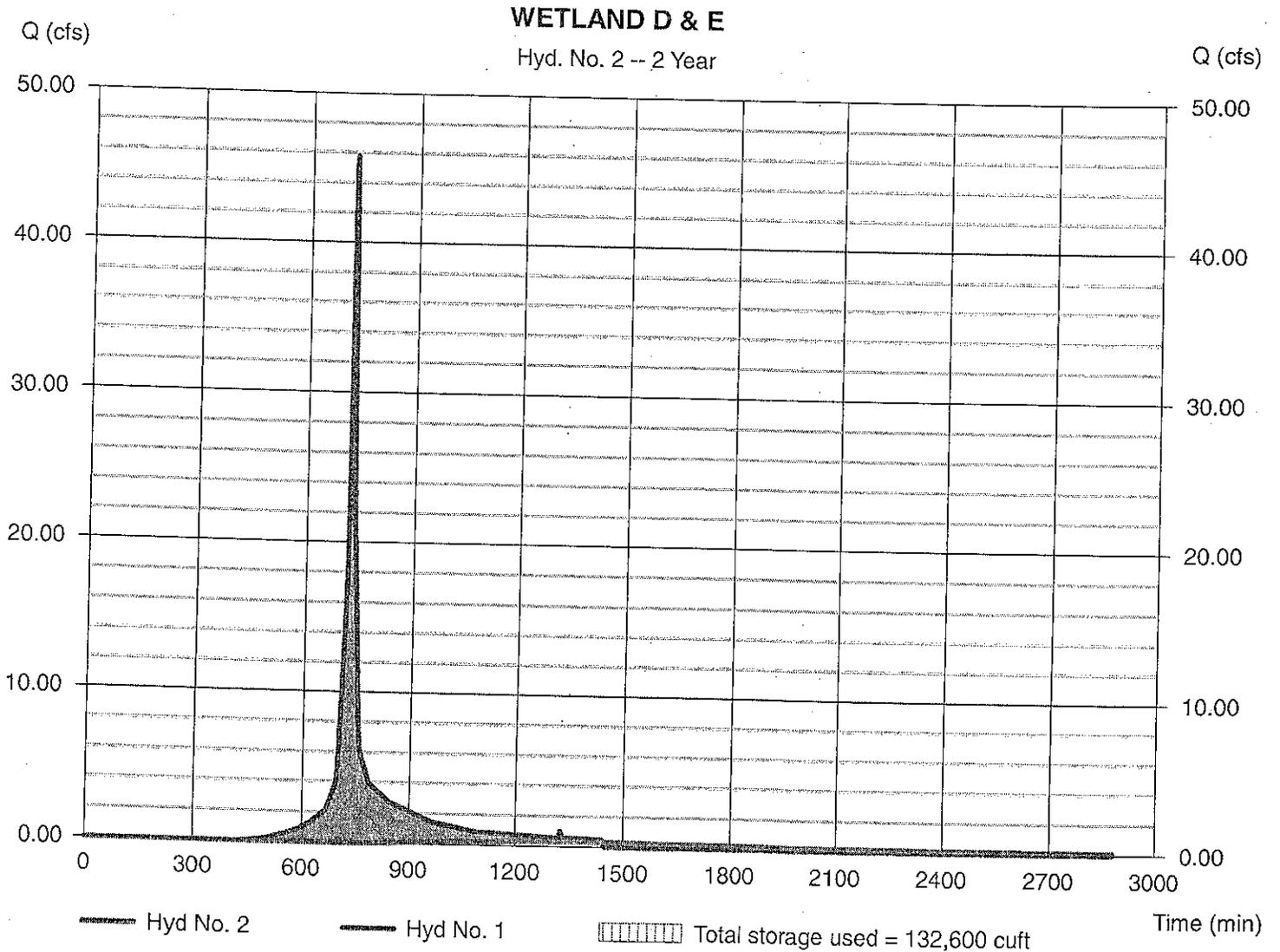
Hyd. No. 2

WETLAND D & E

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND D & E
Reservoir name = WETLAND D & E

Peak discharge = 0.345 cfs
Time to peak = 1443 min
Hyd. volume = 27,283 cuft
Max. Elevation = 25.14 ft
Max. Storage = 132,600 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	82.78	1	724	260,862	---	-----	-----	WETLAND D & E
2	Reservoir	1.676	1	1064	128,138	1	25.50	206,715	WETLAND D & E
WETLAND D & E.gpw					Return Period: 10 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Hyd. No. 1

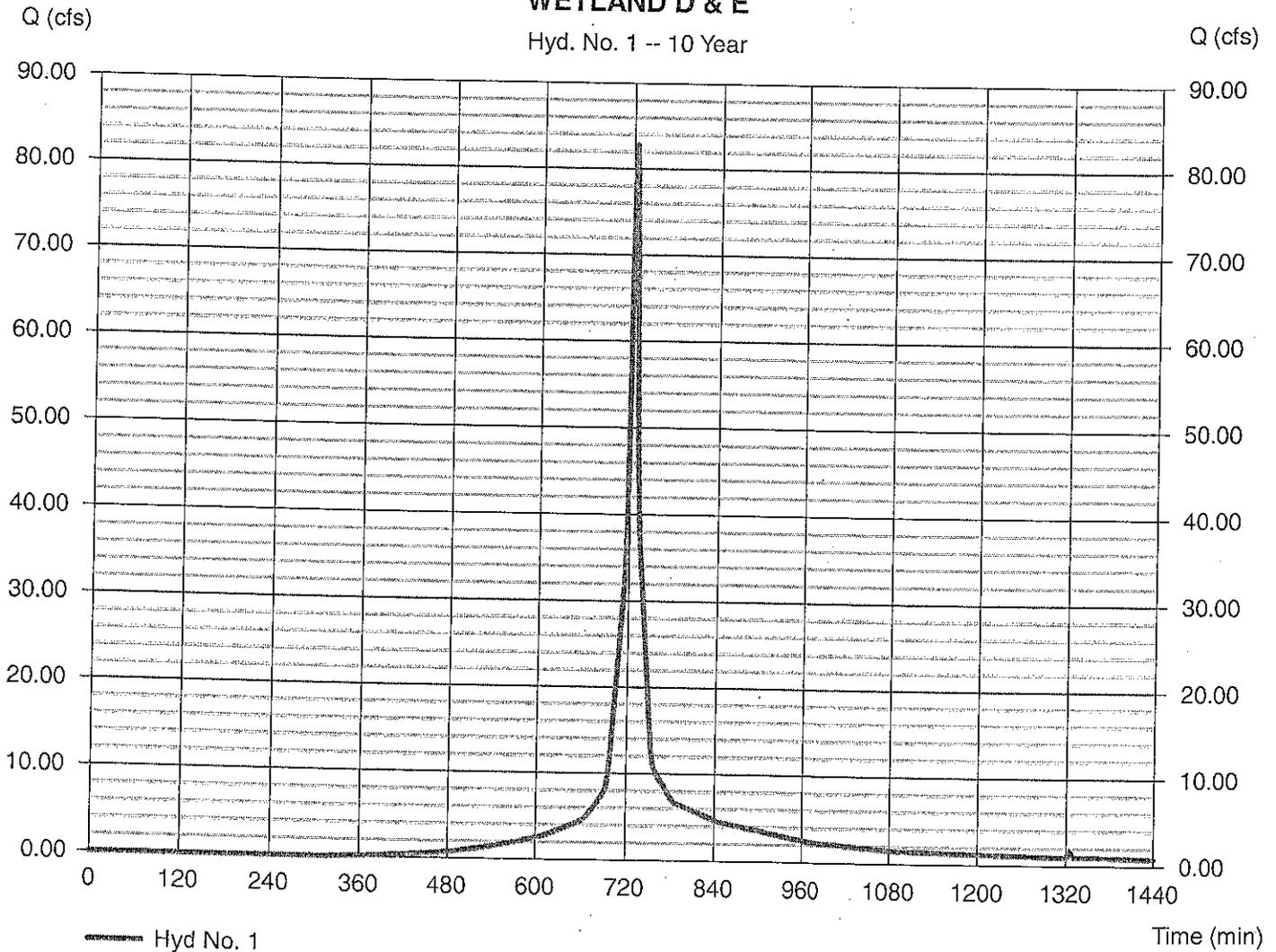
WETLAND D & E

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 13.860 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.00 in
 Storm duration = 24 hrs

Peak discharge = 82.78 cfs
 Time to peak = 724 min
 Hyd. volume = 260,862 cuft
 Curve number = 83*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = [(3.690 x 98) + (10.170 x 77)] / 13.860

WETLAND D & E
 Hyd. No. 1 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by intelisolve v9.1

Friday, Nov 2, 2012

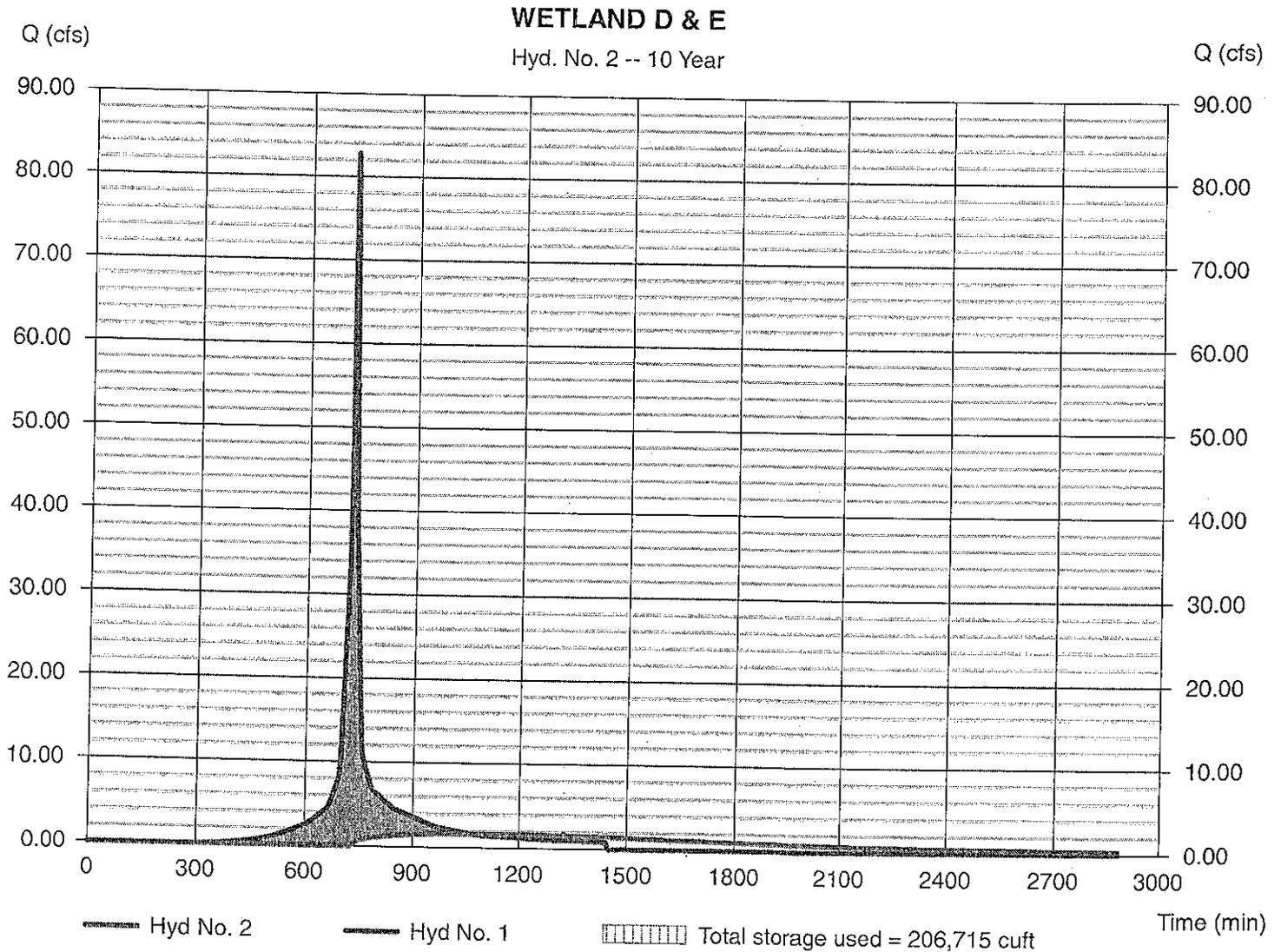
Hyd. No. 2

WETLAND D & E

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 1 min
 Inflow hyd. No. = 1 - WETLAND D & E
 Reservoir name = WETLAND D & E

Peak discharge = 1.676 cfs
 Time to peak = 1064 min
 Hyd. volume = 128,138 cuft
 Max. Elevation = 25.50 ft
 Max. Storage = 206,715 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	98.43	1	724	312,610	----	-----	-----	WETLAND D & E
2	Reservoir	2.309	1	1024	174,170	1	25.66	241,032	WETLAND D & E
WETLAND D & E.gpw					Return Period: 25 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.1

Friday, Nov 2, 2012

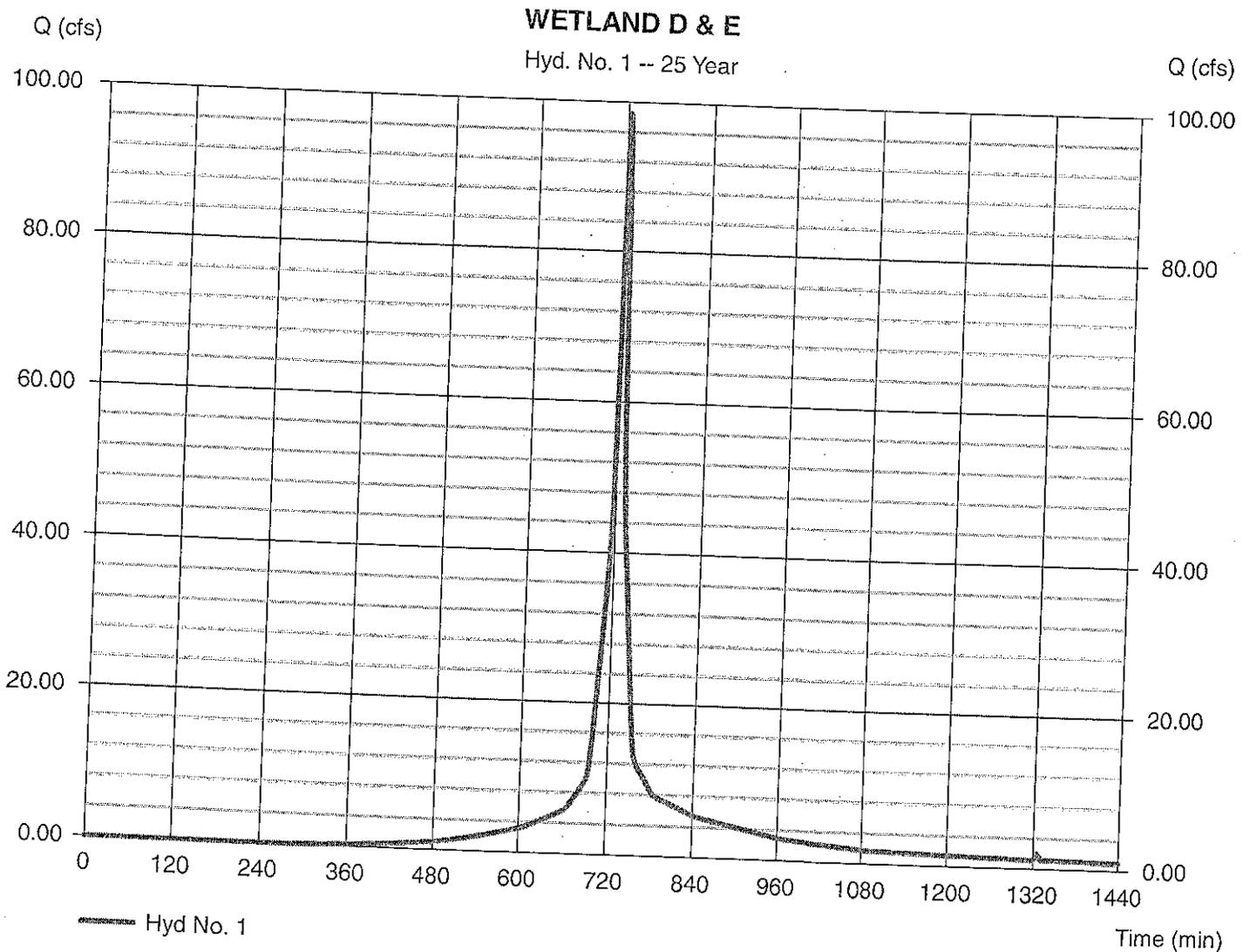
Hyd. No. 1

WETLAND D & E

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 13.860 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 98.43 cfs
Time to peak = 724 min
Hyd. volume = 312,610 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(3.690 x 98) + (10.170 x 77)] / 13.860



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

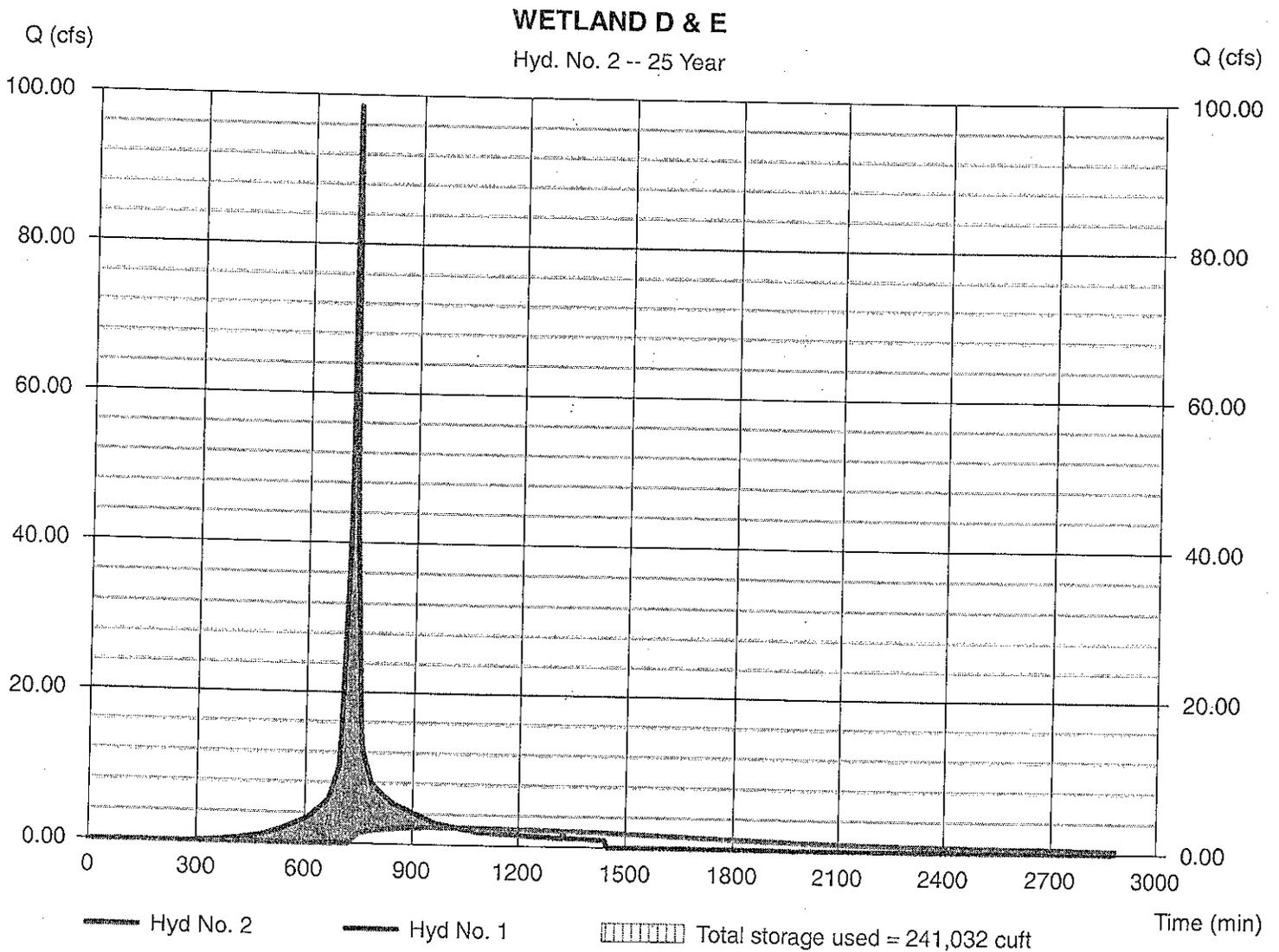
Hyd. No. 2

WETLAND D & E

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND D & E
Reservoir name = WETLAND D & E

Peak discharge = 2.309 cfs
Time to peak = 1024 min
Hyd. volume = 174,170 cuft
Max. Elevation = 25.66 ft
Max. Storage = 241,032 cuft

Storage Indication method used.



WETLAND F

Site Area

Site Area 110,820 sf
2.54 ac

Impervious Area Calculation

ROW
Lots 33,349
Other/Common Areas
Total 33,349 sf
Total 0.77 ac
% Impervious 30.09%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 3.74 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 4.60 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 5.18 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.46
Q=C*I*A 6.89 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.46
Q=C*I*A 8.47 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.46
Q=C*I*A 9.55 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	8.382	1	725	25,916	----	----	----	WETLAND F
2	Reservoir	0.000	1	n/a	0	1	25.21	25,916	WETLAND F
WETLAND F.gpw					Return Period: 2 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

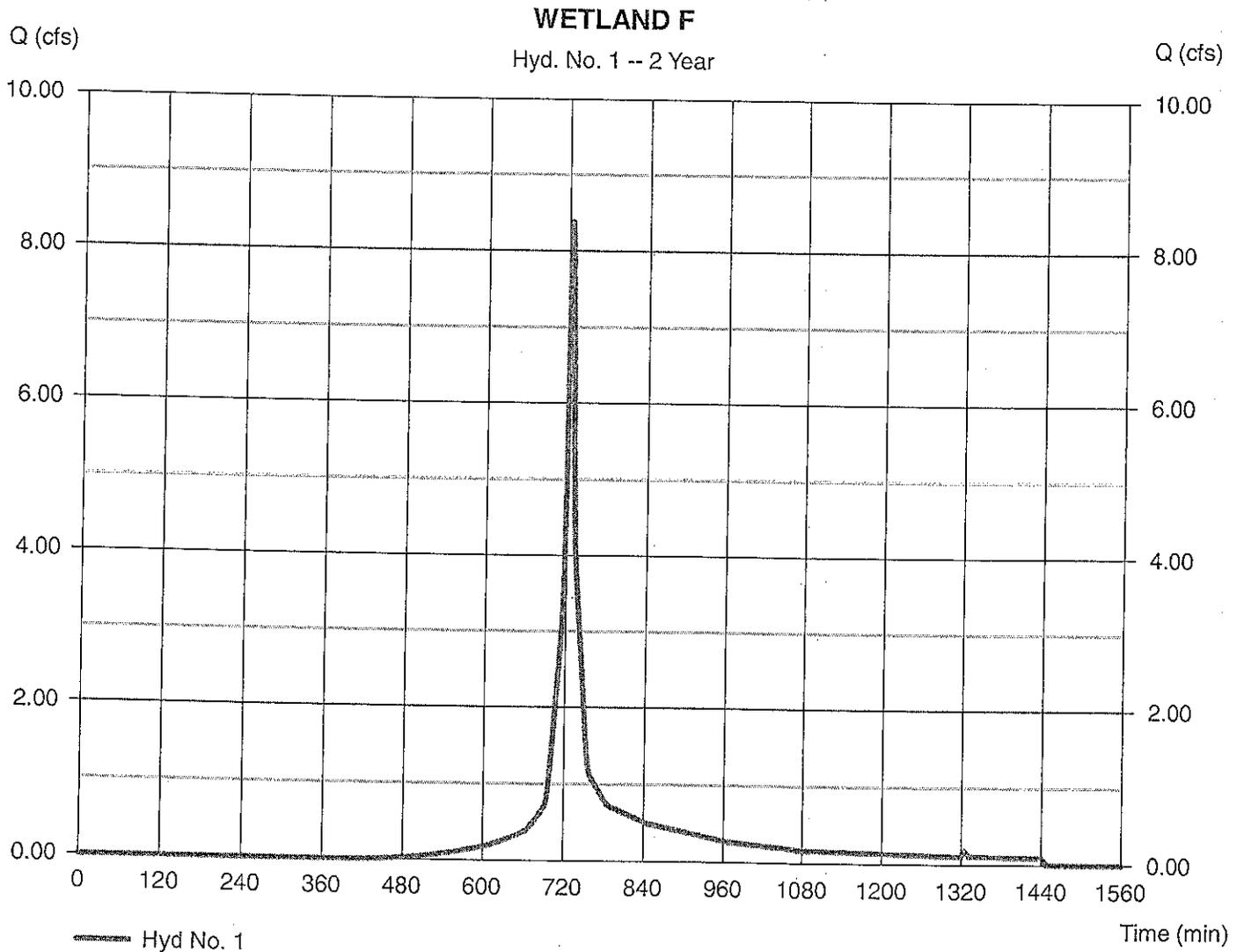
Hyd. No. 1

WETLAND F

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 2.540 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 8.382 cfs
Time to peak = 725 min
Hyd. volume = 25,916 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.770 x 98) + (1.770 x 77)] / 2.540



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

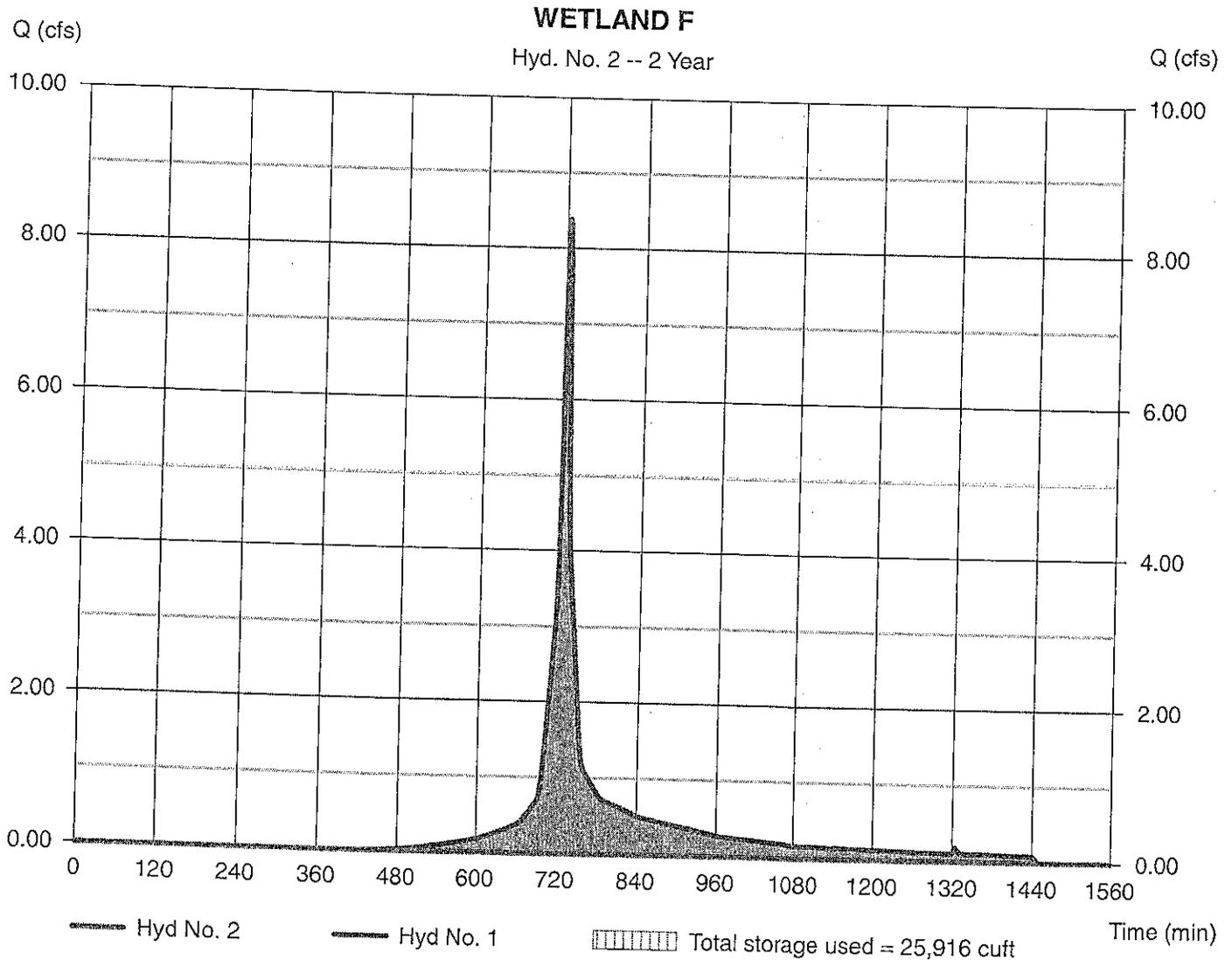
Hyd. No. 2

WETLAND F

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND F
Reservoir name = WETLAND F

Peak discharge = 0.000 cfs
Time to peak = n/a
Hyd. volume = 0 cuft
Max. Elevation = 25.21 ft
Max. Storage = 25,916 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Pond No. 1 - WETLAND F

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 20.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	20.50	00	0	0
0.50	21.00	1,071	178	178
1.50	22.00	1,509	1,284	1,462
2.50	23.00	2,204	1,845	3,307
3.50	24.00	7,988	4,795	8,103
4.50	25.00	16,570	12,020	20,123
5.50	26.00	41,077	27,909	48,032
6.50	27.00	43,310	42,184	90,216

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 2	0	0	0
Invert El. (ft)	= 25.31	0.00	0.00	0.00
Length (ft)	= 70.00	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil. (in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	20.50	0.00	---	---	---	---	---	---	---	---	---	0.00
0.05	18	20.55	0.00	---	---	---	---	---	---	---	---	---	0.00
0.10	36	20.60	0.00	---	---	---	---	---	---	---	---	---	0.00
0.15	54	20.65	0.00	---	---	---	---	---	---	---	---	---	0.00
0.20	71	20.70	0.00	---	---	---	---	---	---	---	---	---	0.00
0.25	89	20.75	0.00	---	---	---	---	---	---	---	---	---	0.00
0.30	107	20.80	0.00	---	---	---	---	---	---	---	---	---	0.00
0.35	125	20.85	0.00	---	---	---	---	---	---	---	---	---	0.00
0.40	143	20.90	0.00	---	---	---	---	---	---	---	---	---	0.00
0.45	161	20.95	0.00	---	---	---	---	---	---	---	---	---	0.00
0.50	178	21.00	0.00	---	---	---	---	---	---	---	---	---	0.00
0.60	307	21.10	0.00	---	---	---	---	---	---	---	---	---	0.00
0.70	435	21.20	0.00	---	---	---	---	---	---	---	---	---	0.00
0.80	564	21.30	0.00	---	---	---	---	---	---	---	---	---	0.00
0.90	692	21.40	0.00	---	---	---	---	---	---	---	---	---	0.00
1.00	820	21.50	0.00	---	---	---	---	---	---	---	---	---	0.00
1.10	949	21.60	0.00	---	---	---	---	---	---	---	---	---	0.00
1.20	1,077	21.70	0.00	---	---	---	---	---	---	---	---	---	0.00
1.30	1,205	21.80	0.00	---	---	---	---	---	---	---	---	---	0.00
1.40	1,334	21.90	0.00	---	---	---	---	---	---	---	---	---	0.00
1.50	1,462	22.00	0.00	---	---	---	---	---	---	---	---	---	0.00
1.60	1,647	22.10	0.00	---	---	---	---	---	---	---	---	---	0.00
1.70	1,831	22.20	0.00	---	---	---	---	---	---	---	---	---	0.00
1.80	2,016	22.30	0.00	---	---	---	---	---	---	---	---	---	0.00
1.90	2,200	22.40	0.00	---	---	---	---	---	---	---	---	---	0.00
2.00	2,385	22.50	0.00	---	---	---	---	---	---	---	---	---	0.00
2.10	2,569	22.60	0.00	---	---	---	---	---	---	---	---	---	0.00
2.20	2,754	22.70	0.00	---	---	---	---	---	---	---	---	---	0.00
2.30	2,938	22.80	0.00	---	---	---	---	---	---	---	---	---	0.00
2.40	3,123	22.90	0.00	---	---	---	---	---	---	---	---	---	0.00
2.50	3,307	23.00	0.00	---	---	---	---	---	---	---	---	---	0.00
2.60	3,787	23.10	0.00	---	---	---	---	---	---	---	---	---	0.00
2.70	4,267	23.20	0.00	---	---	---	---	---	---	---	---	---	0.00
2.80	4,746	23.30	0.00	---	---	---	---	---	---	---	---	---	0.00

Continues on next page...

WETLAND F

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.90	5,226	23.40	0.00	---	---	---	---	---	---	---	---	---	0.00
3.00	5,705	23.50	0.00	---	---	---	---	---	---	---	---	---	0.00
3.10	6,185	23.60	0.00	---	---	---	---	---	---	---	---	---	0.00
3.20	6,664	23.70	0.00	---	---	---	---	---	---	---	---	---	0.00
3.30	7,144	23.80	0.00	---	---	---	---	---	---	---	---	---	0.00
3.40	7,623	23.90	0.00	---	---	---	---	---	---	---	---	---	0.00
3.50	8,103	24.00	0.00	---	---	---	---	---	---	---	---	---	0.00
3.60	8,305	24.10	0.00	---	---	---	---	---	---	---	---	---	0.00
3.70	10,507	24.20	0.00	---	---	---	---	---	---	---	---	---	0.00
3.80	11,709	24.30	0.00	---	---	---	---	---	---	---	---	---	0.00
3.90	12,911	24.40	0.00	---	---	---	---	---	---	---	---	---	0.00
4.00	14,113	24.50	0.00	---	---	---	---	---	---	---	---	---	0.00
4.10	15,315	24.60	0.00	---	---	---	---	---	---	---	---	---	0.00
4.20	16,517	24.70	0.00	---	---	---	---	---	---	---	---	---	0.00
4.30	17,719	24.80	0.00	---	---	---	---	---	---	---	---	---	0.00
4.40	18,921	24.90	0.00	---	---	---	---	---	---	---	---	---	0.00
4.50	20,123	25.00	0.00	---	---	---	---	---	---	---	---	---	0.00
4.60	22,914	25.10	0.00	---	---	---	---	---	---	---	---	---	0.00
4.70	25,705	25.20	0.00	---	---	---	---	---	---	---	---	---	0.00
4.80	28,496	25.30	0.00	---	---	---	---	---	---	---	---	---	0.00
4.90	31,286	25.40	0.06 oc	---	---	---	---	---	---	---	---	---	0.06
5.00	34,077	25.50	0.28 oc	---	---	---	---	---	---	---	---	---	0.28
5.10	36,868	25.60	0.61 oc	---	---	---	---	---	---	---	---	---	0.61
5.20	39,659	25.70	1.01 oc	---	---	---	---	---	---	---	---	---	1.01
5.30	42,450	25.80	1.46 oc	---	---	---	---	---	---	---	---	---	1.46
5.40	45,241	25.90	1.92 oc	---	---	---	---	---	---	---	---	---	1.92
5.50	48,032	26.00	2.36 oc	---	---	---	---	---	---	---	---	---	2.36
5.60	52,250	26.10	2.75 oc	---	---	---	---	---	---	---	---	---	2.75
5.70	56,469	26.20	3.03 oc	---	---	---	---	---	---	---	---	---	3.03
5.80	60,687	26.30	3.09 oc	---	---	---	---	---	---	---	---	---	3.09
5.90	64,906	26.40	3.60 oc	---	---	---	---	---	---	---	---	---	3.60
6.00	69,124	26.50	4.16 oc	---	---	---	---	---	---	---	---	---	4.16
6.10	73,343	26.60	4.65 oc	---	---	---	---	---	---	---	---	---	4.65
6.20	77,561	26.70	5.10 oc	---	---	---	---	---	---	---	---	---	5.10
6.30	81,779	26.80	5.51 oc	---	---	---	---	---	---	---	---	---	5.51
6.40	85,998	26.90	5.89 oc	---	---	---	---	---	---	---	---	---	5.89
6.50	90,216	27.00	6.24 oc	---	---	---	---	---	---	---	---	---	6.24

...End

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisoive v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	15.17	1	724	47,806	----	-----	-----	WETLAND F
2	Reservoir	0.524	1	941	18,732	1	25.57	36,141	WETLAND F
WETLAND F.gpw					Return Period: 10 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

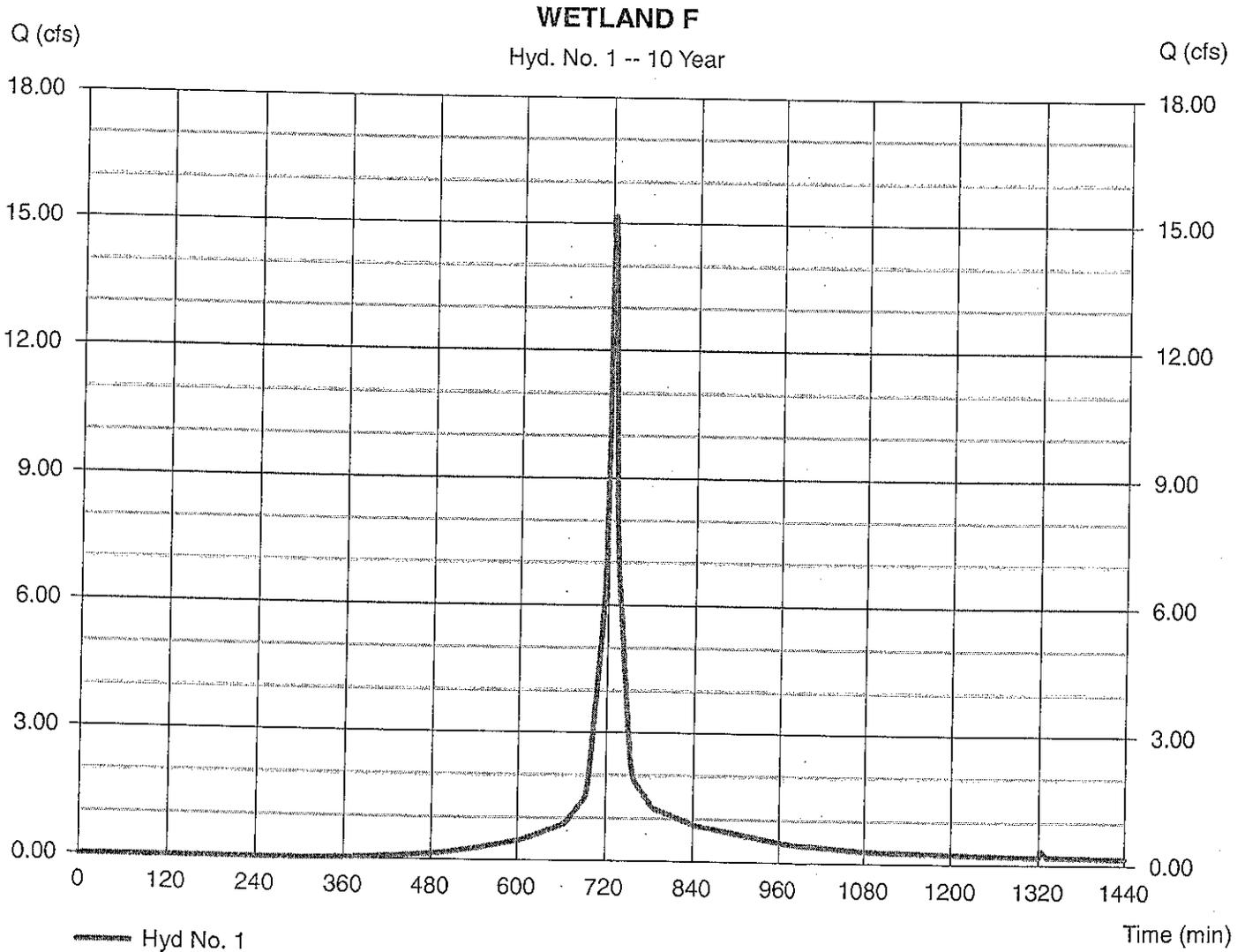
Hyd. No. 1

WETLAND F

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 2.540 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.00 in
Storm duration = 24 hrs

Peak discharge = 15.17 cfs
Time to peak = 724 min
Hyd. volume = 47,806 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.770 x 98) + (1.770 x 77)] / 2.540



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

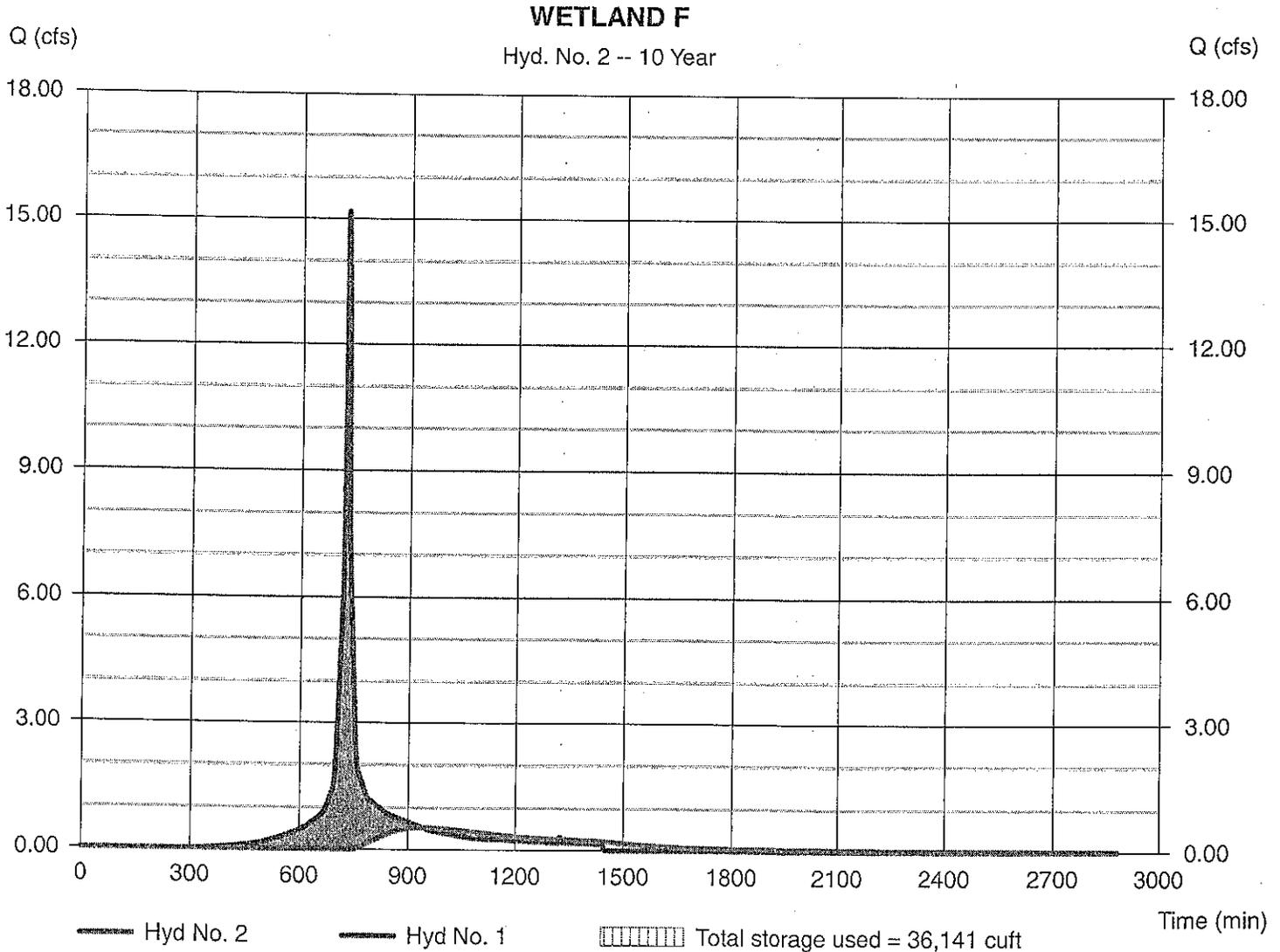
Hyd. No. 2

WETLAND F

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 1 min
 Inflow hyd. No. = 1 - WETLAND F
 Reservoir name = WETLAND F

Peak discharge = 0.524 cfs
 Time to peak = 941 min
 Hyd. volume = 18,732 cuft
 Max. Elevation = 25.57 ft
 Max. Storage = 36,141 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	18.04	1	724	57,289	----	-----	-----	WETLAND F
2	Reservoir	0.932	1	856	28,192	1	25.68	39,088	WETLAND F
WETLAND F.gpw					Return Period: 25 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

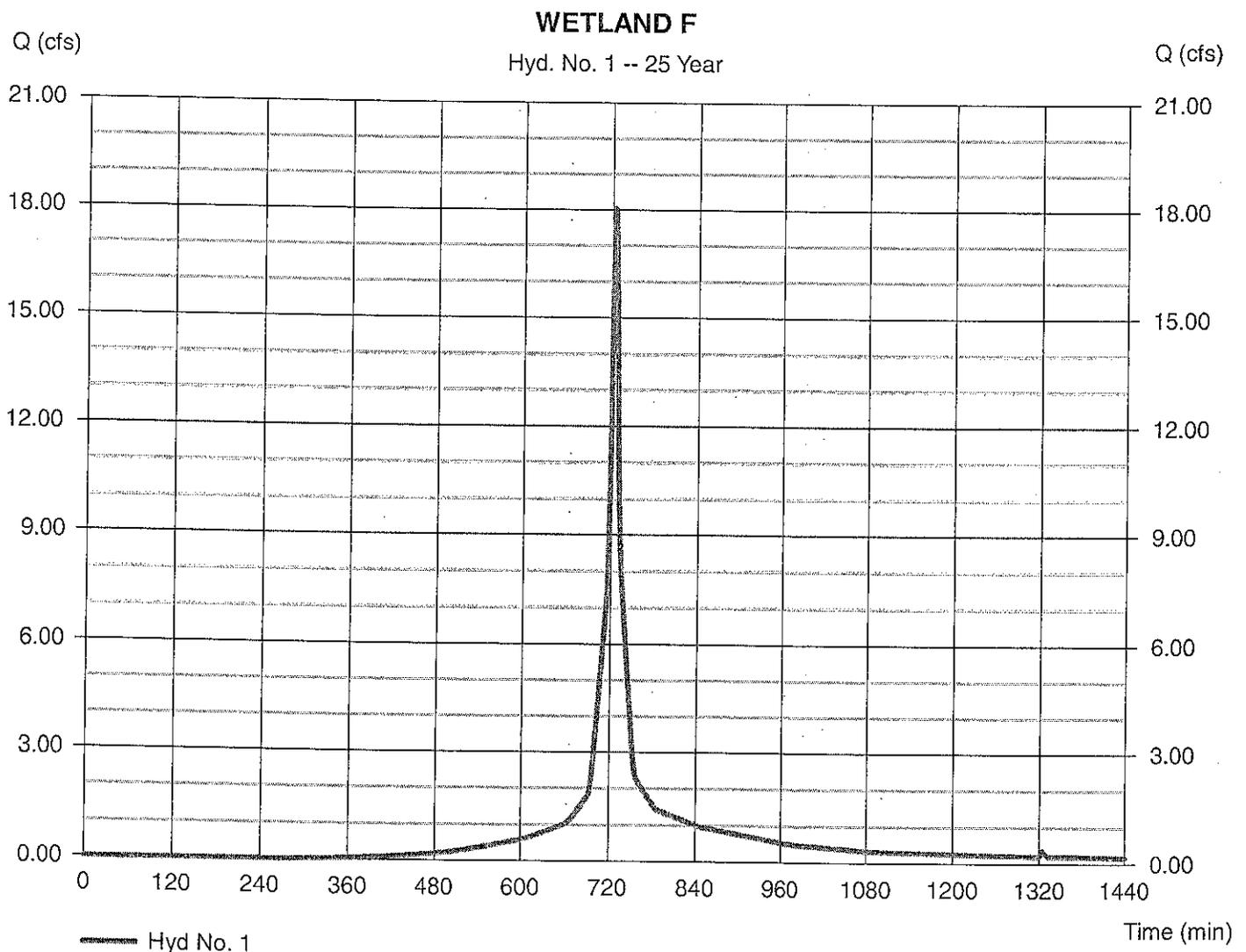
Hyd. No. 1

WETLAND F

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 2.540 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 18.04 cfs
Time to peak = 724 min
Hyd. volume = 57,289 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.770 \times 98) + (1.770 \times 77)] / 2.540$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

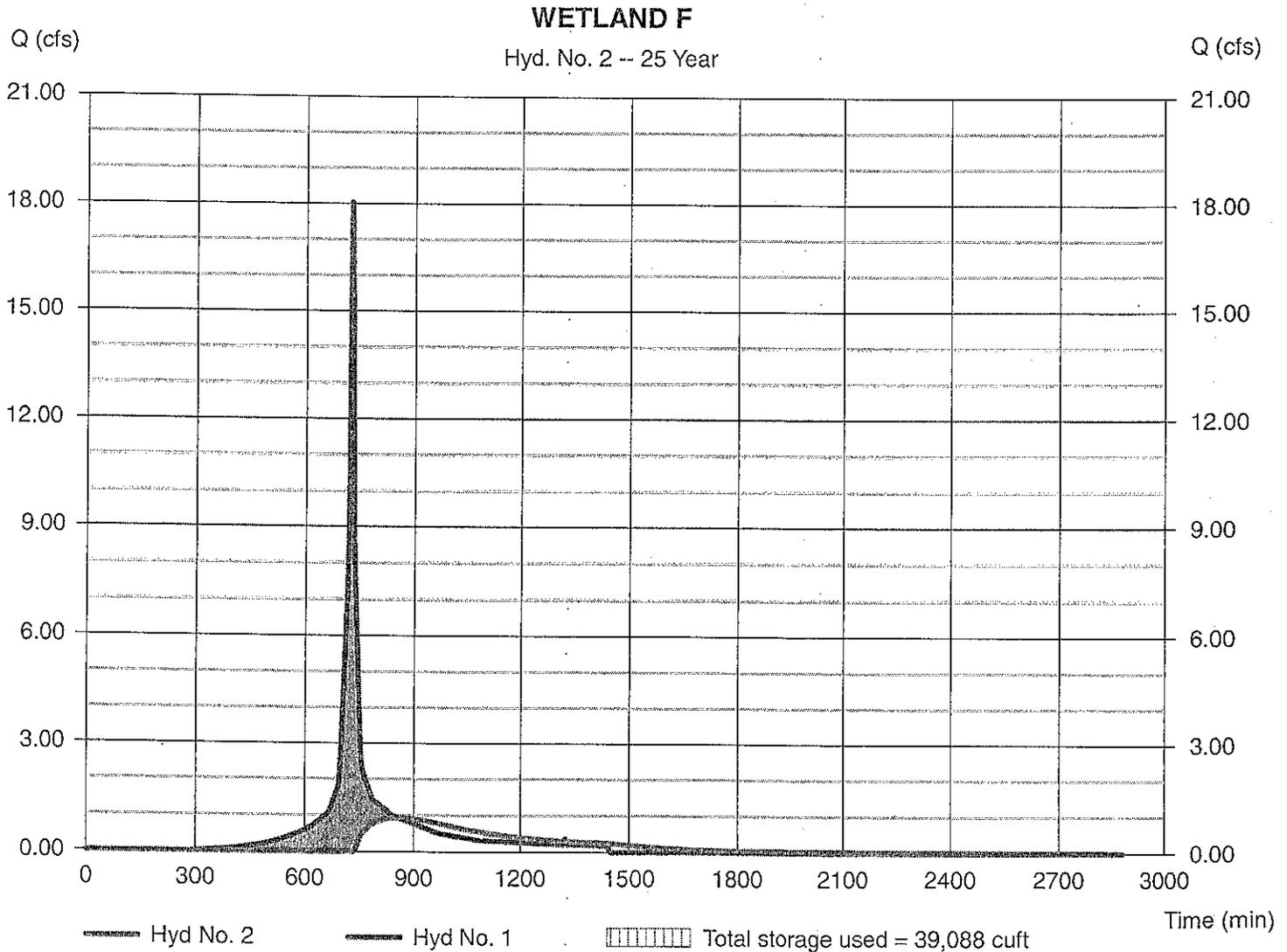
Hyd. No. 2

WETLAND F

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND F
Reservoir name = WETLAND F

Peak discharge = 0.932 cfs
Time to peak = 856 min
Hyd. volume = 28,192 cuft
Max. Elevation = 25.68 ft
Max. Storage = 39,088 cuft

Storage Indication method used.



WETLAND G

Site Area

Site Area
231,555 sf
5.32 ac

Impervious Area Calculation

ROW 15,115
Lots 19,401
Other/Common Areas
Total 34,516 sf
Total 0.79 ac
% Impervious 14.91%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 7.81 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 9.61 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 10.83 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.35
Q=C*I*A 11.08 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.35
Q=C*I*A 13.62 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.35
Q=C*I*A 15.35 cfs

Hydrograph Summary Report

Hydraflow Hydrographs by intelsolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	15.91	1	725	49,022	---	---	---	WETLAND G
2	Reservoir	0.000	1	n/a	0	1	24.24	49,022	WETLAND G
WETLAND G.gpw					Return Period: 2 Year			Friday, Nov 2, 2012	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

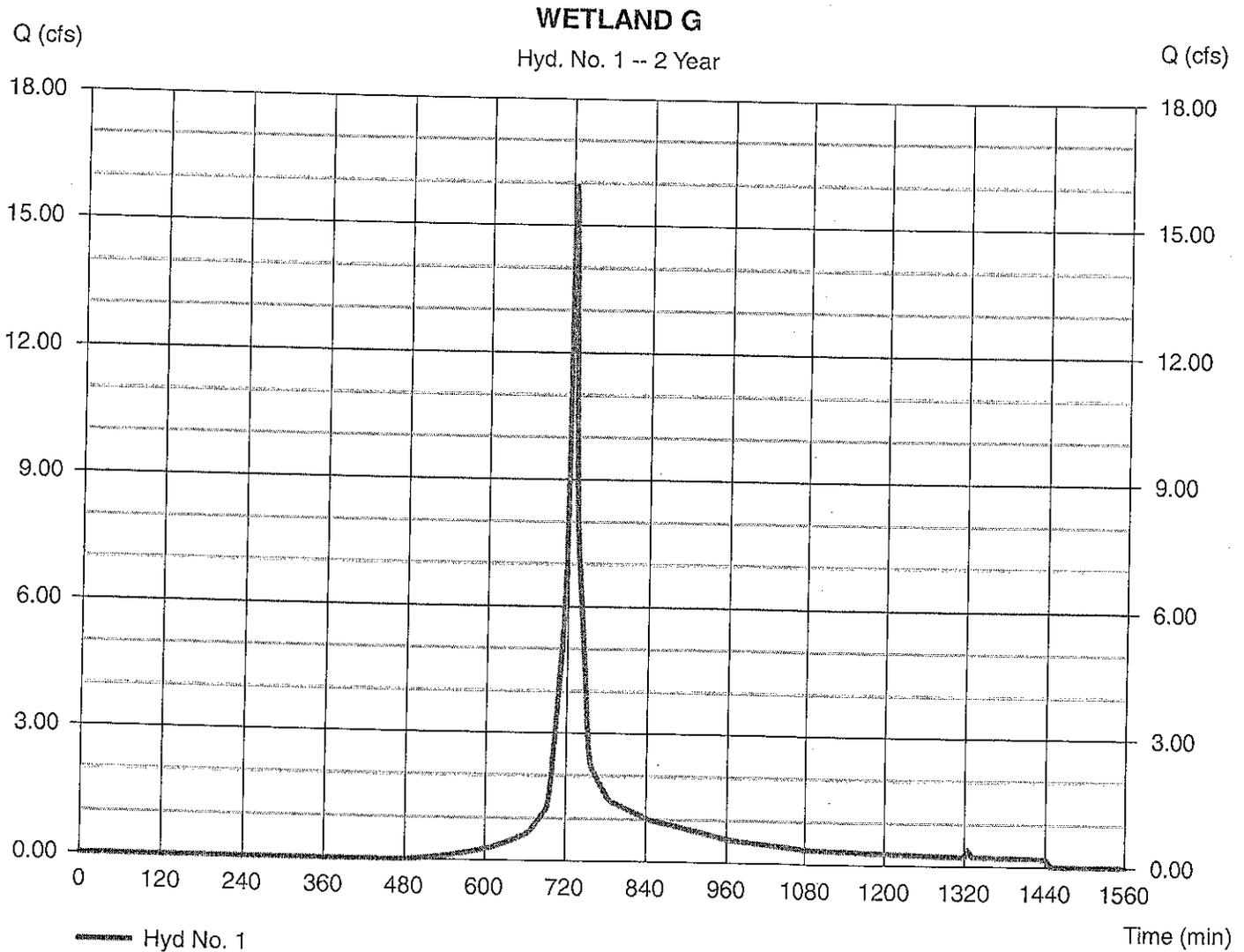
Hyd. No. 1

WETLAND G

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage-area = 5.320 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 15.91 cfs
Time to peak = 725 min
Hyd. volume = 49,022 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.790 \times 98) + (4.530 \times 77)] / 5.320$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Hyd. No. 2

WETLAND G

Hydrograph type = Reservoir

Storm frequency = 2 yrs

Time interval = 1 min

Inflow hyd. No. = 1 - WETLAND G

Reservoir name = WETLAND G

Peak discharge = 0.000 cfs

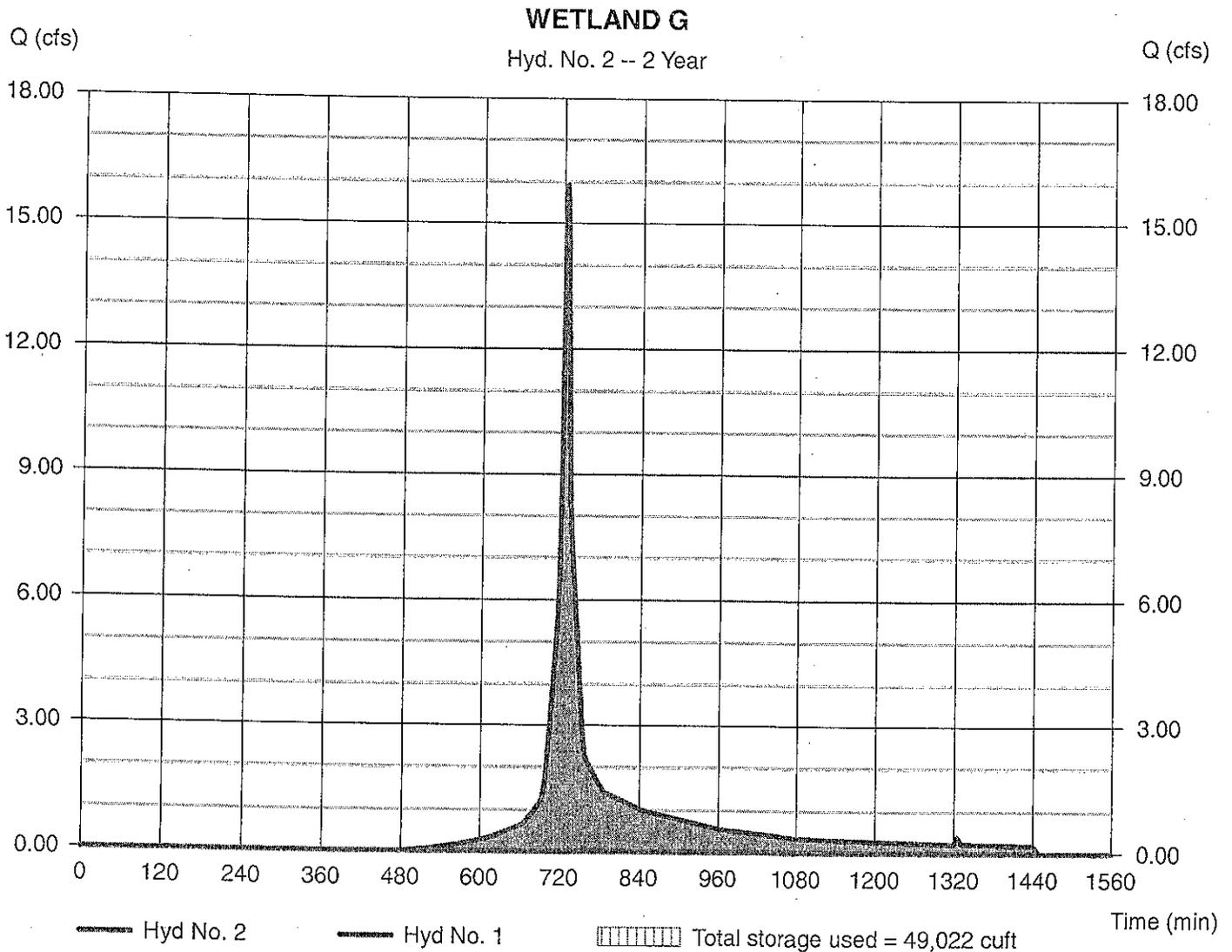
Time to peak = n/a

Hyd. volume = 0 cuft

Max. Elevation = 24.24 ft

Max. Storage = 49,022 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Pond No. 1 - WETLAND G

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 22.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	22.50	00	0	0
0.50	23.00	9,036	1,506	1,506
1.50	24.00	48,426	26,124	27,630
2.50	25.00	136,282	88,640	116,270
3.00	25.50	161,328	74,307	190,577

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 2	0	0	0
Invert El. (ft)	= 24.96	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	22.50	0.00	---	---	---	---	---	---	---	---	---	0.00
0.05	151	22.55	0.00	---	---	---	---	---	---	---	---	---	0.00
0.10	301	22.60	0.00	---	---	---	---	---	---	---	---	---	0.00
0.15	452	22.65	0.00	---	---	---	---	---	---	---	---	---	0.00
0.20	602	22.70	0.00	---	---	---	---	---	---	---	---	---	0.00
0.25	753	22.75	0.00	---	---	---	---	---	---	---	---	---	0.00
0.30	904	22.80	0.00	---	---	---	---	---	---	---	---	---	0.00
0.35	1,054	22.85	0.00	---	---	---	---	---	---	---	---	---	0.00
0.40	1,205	22.90	0.00	---	---	---	---	---	---	---	---	---	0.00
0.45	1,355	22.95	0.00	---	---	---	---	---	---	---	---	---	0.00
0.50	1,506	23.00	0.00	---	---	---	---	---	---	---	---	---	0.00
0.60	4,118	23.10	0.00	---	---	---	---	---	---	---	---	---	0.00
0.70	6,731	23.20	0.00	---	---	---	---	---	---	---	---	---	0.00
0.80	9,343	23.30	0.00	---	---	---	---	---	---	---	---	---	0.00
0.90	11,956	23.40	0.00	---	---	---	---	---	---	---	---	---	0.00
1.00	14,568	23.50	0.00	---	---	---	---	---	---	---	---	---	0.00
1.10	17,180	23.60	0.00	---	---	---	---	---	---	---	---	---	0.00
1.20	19,793	23.70	0.00	---	---	---	---	---	---	---	---	---	0.00
1.30	22,405	23.80	0.00	---	---	---	---	---	---	---	---	---	0.00
1.40	25,018	23.90	0.00	---	---	---	---	---	---	---	---	---	0.00
1.50	27,630	24.00	0.00	---	---	---	---	---	---	---	---	---	0.00
1.60	36,494	24.10	0.00	---	---	---	---	---	---	---	---	---	0.00
1.70	45,358	24.20	0.00	---	---	---	---	---	---	---	---	---	0.00
1.80	54,222	24.30	0.00	---	---	---	---	---	---	---	---	---	0.00
1.90	63,086	24.40	0.00	---	---	---	---	---	---	---	---	---	0.00
2.00	71,950	24.50	0.00	---	---	---	---	---	---	---	---	---	0.00
2.10	80,814	24.60	0.00	---	---	---	---	---	---	---	---	---	0.00
2.20	89,678	24.70	0.00	---	---	---	---	---	---	---	---	---	0.00
2.30	98,542	24.80	0.00	---	---	---	---	---	---	---	---	---	0.00
2.40	107,406	24.90	0.00	---	---	---	---	---	---	---	---	---	0.00
2.50	116,270	25.00	0.01 oc	---	---	---	---	---	---	---	---	---	0.01
2.55	123,701	25.05	0.06 oc	---	---	---	---	---	---	---	---	---	0.06
2.60	131,131	25.10	0.15 oc	---	---	---	---	---	---	---	---	---	0.15
2.65	138,562	25.15	0.27 oc	---	---	---	---	---	---	---	---	---	0.27
2.70	145,993	25.20	0.41 oc	---	---	---	---	---	---	---	---	---	0.41
2.75	153,423	25.25	0.58 oc	---	---	---	---	---	---	---	---	---	0.58
2.80	160,854	25.30	0.76 oc	---	---	---	---	---	---	---	---	---	0.76

Continues on next page...

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

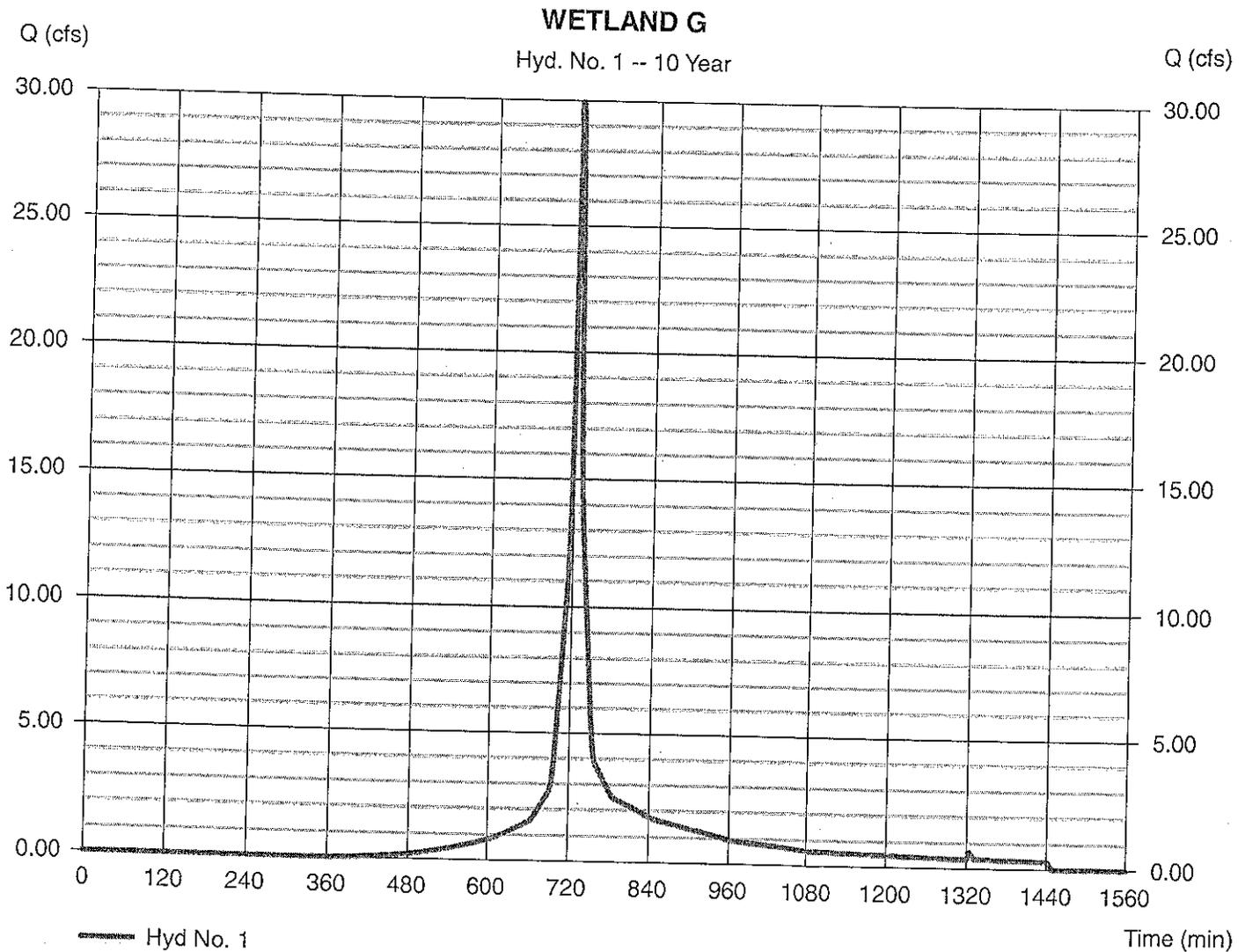
Hyd. No. 1

WETLAND G

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 5.320 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.00 in
Storm duration = 24 hrs

Peak discharge = 29.95 cfs
Time to peak = 725 min
Hyd. volume = 93,490 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.790 \times 98) + (4.530 \times 77)] / 5.320$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Hyd. No. 2

WETLAND G

Hydrograph type = Reservoir

Storm frequency = 10 yrs

Time interval = 1 min

Inflow hyd. No. = 1 - WETLAND G

Reservoir name = WETLAND G

Peak discharge = 0.000 cfs

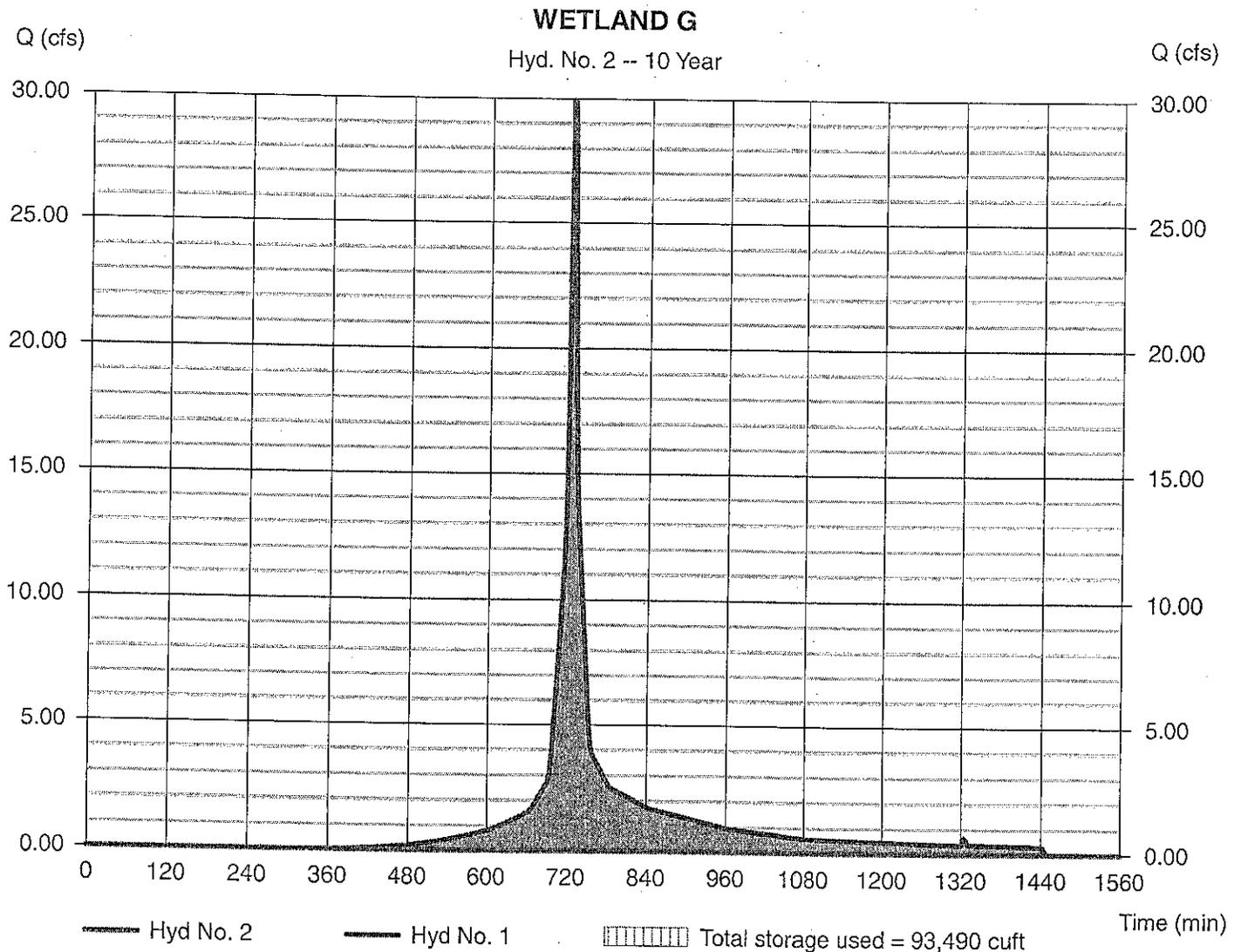
Time to peak = n/a

Hyd. volume = 0 cuft

Max. Elevation = 24.74 ft

Max. Storage = 93,490 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	35.95	1	724	112,956	----	----	----	WETLAND G	
2	Reservoir	0.007	1	1449	633	1	24.96	112,907	WETLAND G	
WETLAND G.gpw					Return Period: 25 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

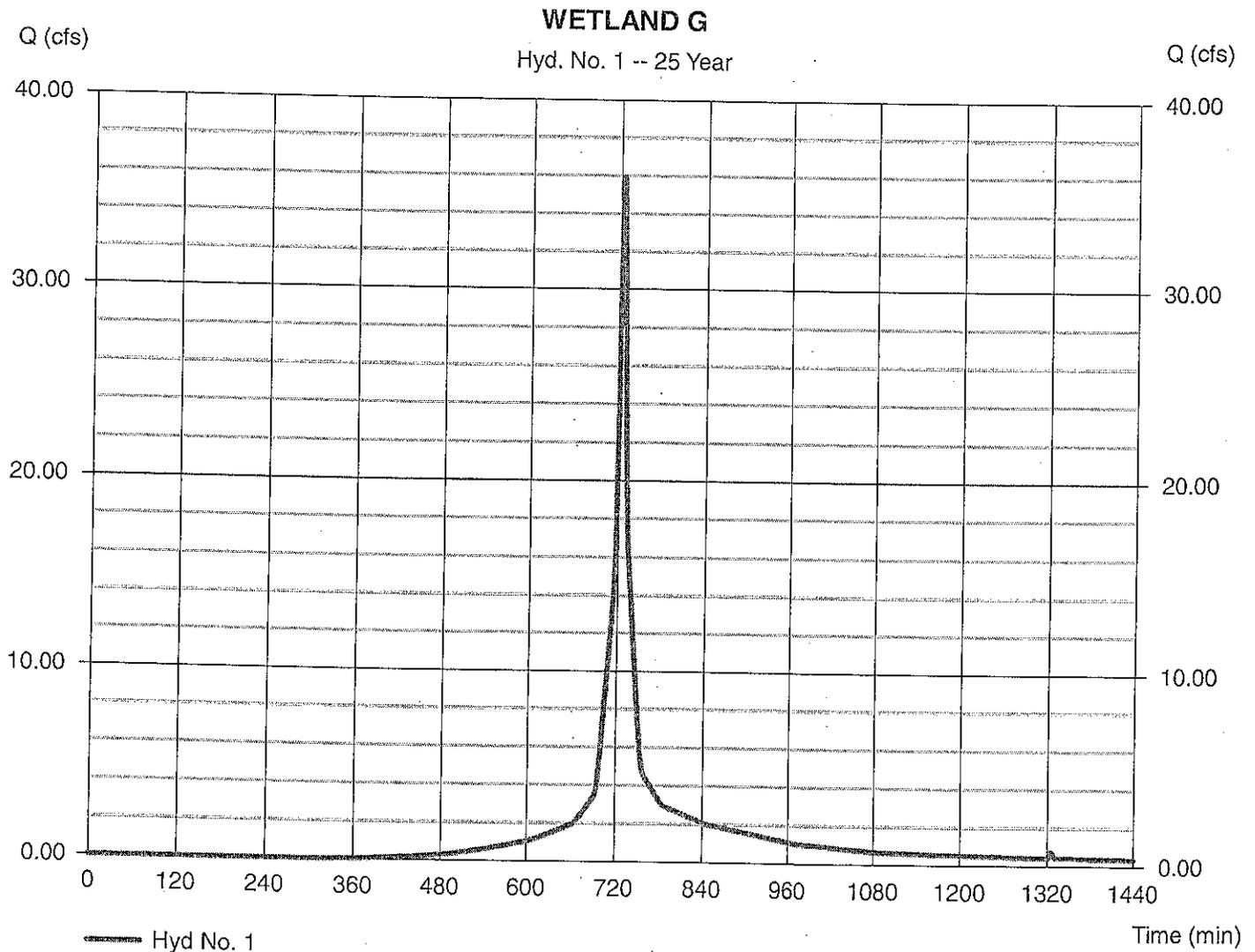
Hyd. No. 1

WETLAND G

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 5.320 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.05 in
Storm duration = 24 hrs

Peak discharge = 35.95 cfs
Time to peak = 724 min
Hyd. volume = 112,956 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.790 x 98) + (4.530 x 77)] / 5.320



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

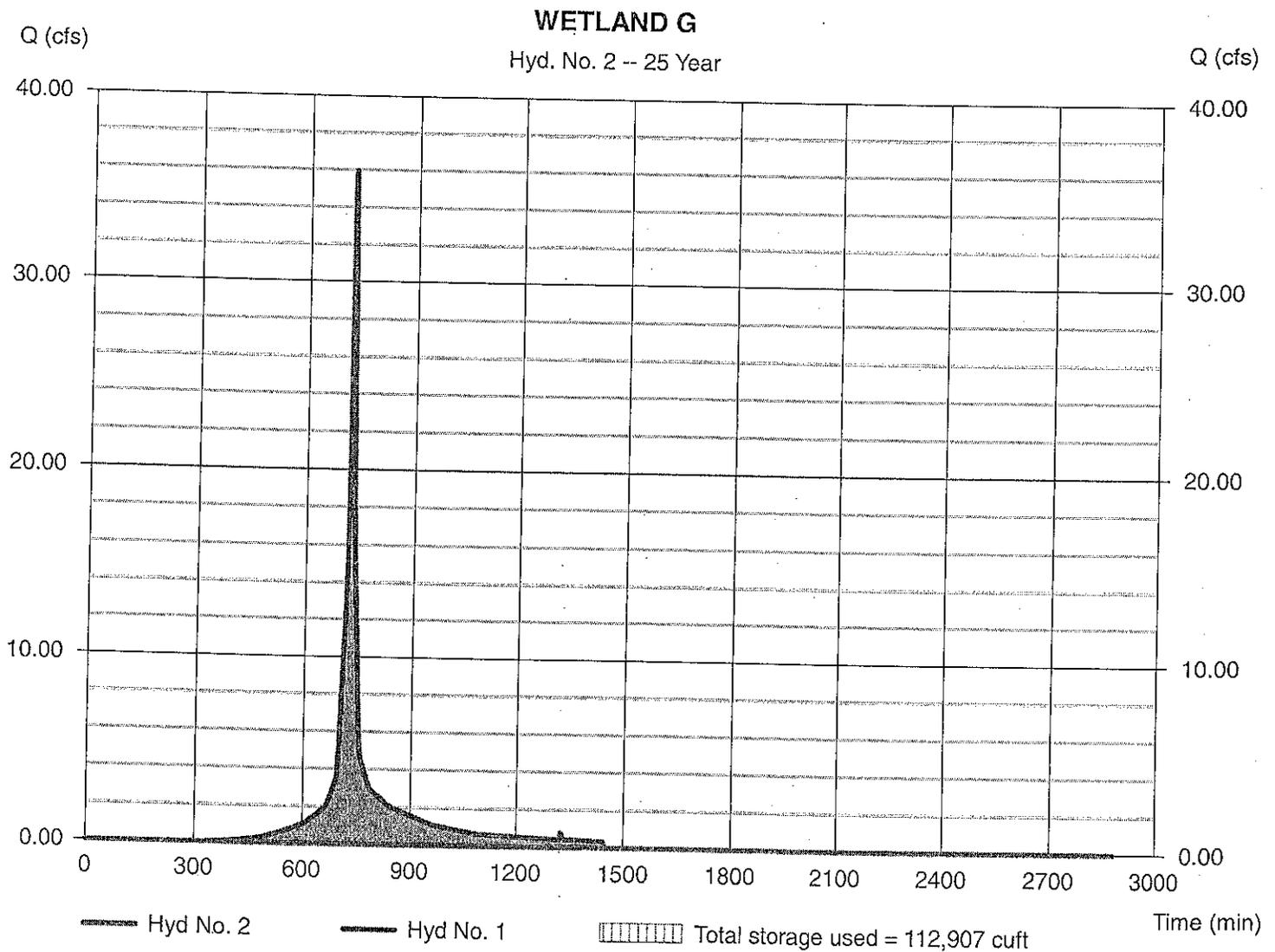
Hyd. No. 2

WETLAND G

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND G
Reservoir name = WETLAND G

Peak discharge = 0.007 cfs
Time to peak = 1449 min
Hyd. volume = 633 cuft
Max. Elevation = 24.96 ft
Max. Storage = 112,907 cuft

Storage Indication method used.



100-YEAR

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	21.00	1	724	67,928	----	-----	-----	WETLAND A
2	Reservoir	19.89	1	726	49,500	1	24.59	20,734	WETLAND A
WETLAND A.gpw					Return Period: 100 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

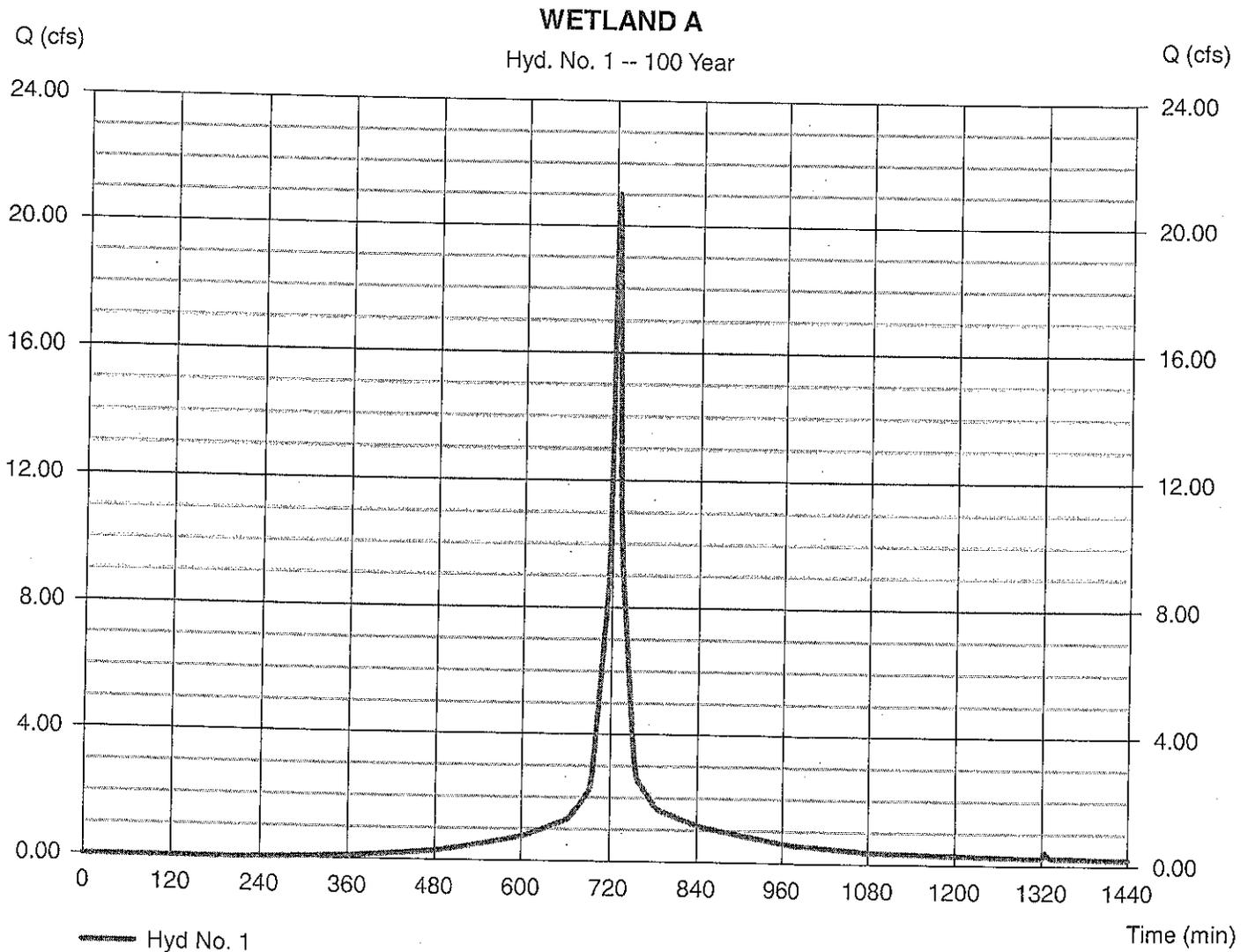
Hyd. No. 1

WETLAND A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 2.260 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 21.00 cfs
Time to peak = 724 min
Hyd. volume = 67,928 cuft
Curve number = 84*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.710 x 98) + (1.550 x 77)] / 2.260



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

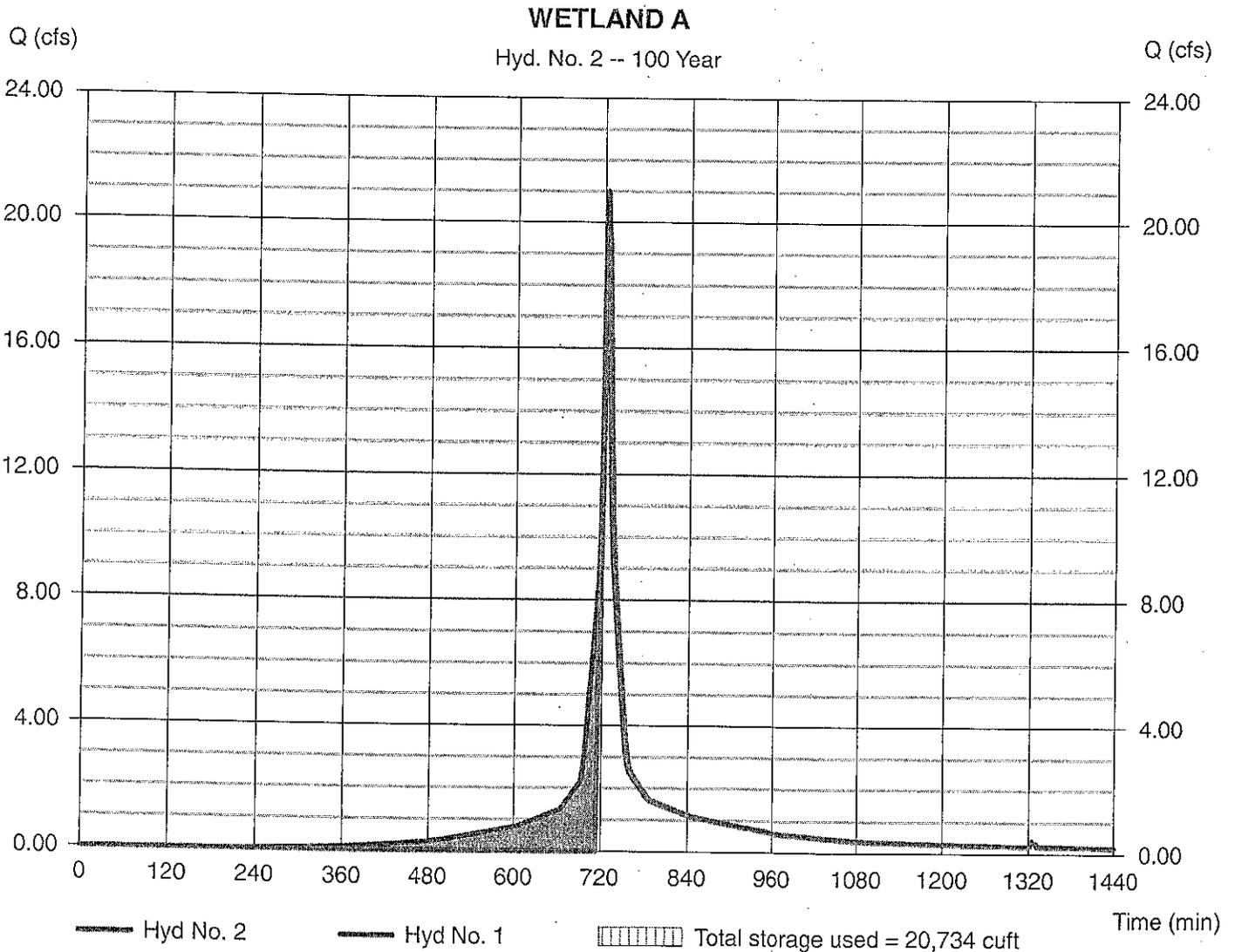
Hyd. No. 2

WETLAND A

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - WETLAND A
Reservoir name = WETLAND A

Peak discharge = 19.89 cfs
Time to peak = 726 min
Hyd. volume = 49,500 cuft
Max. Elevation = 24.59 ft
Max. Storage = 20,734 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	102.55	1	724	326,021	----	-----	-----	WETLAND B	
2	Reservoir	90.42	1	727	260,061	1	24.54	91,517	WETLAND B	
WETLAND B.gpw					Return Period: 100 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

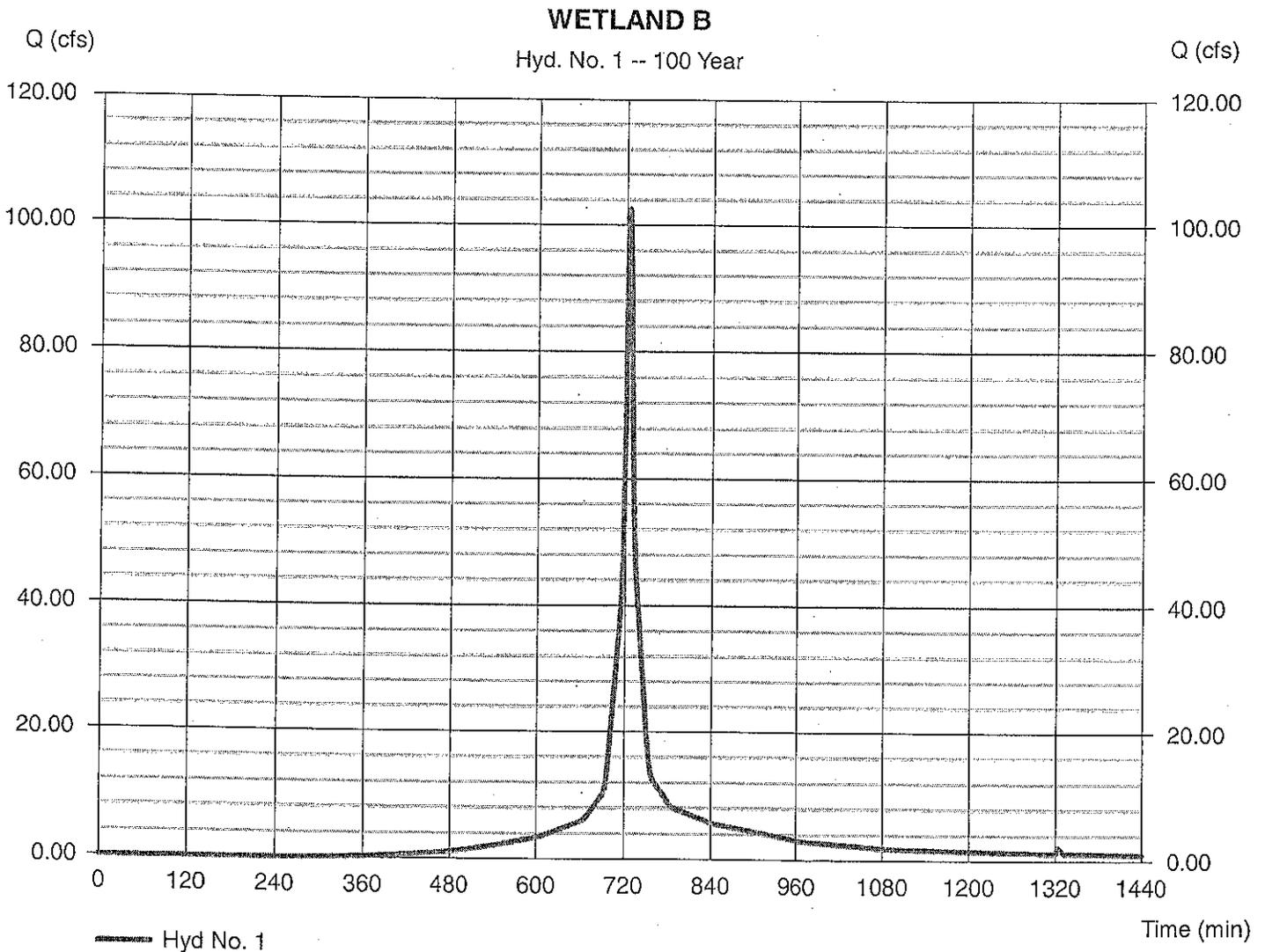
Hyd. No. 1

WETLAND B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 11.580 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 102.55 cfs
Time to peak = 724 min
Hyd. volume = 326,021 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(1.810 \times 98) + (9.770 \times 77)] / 11.580$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

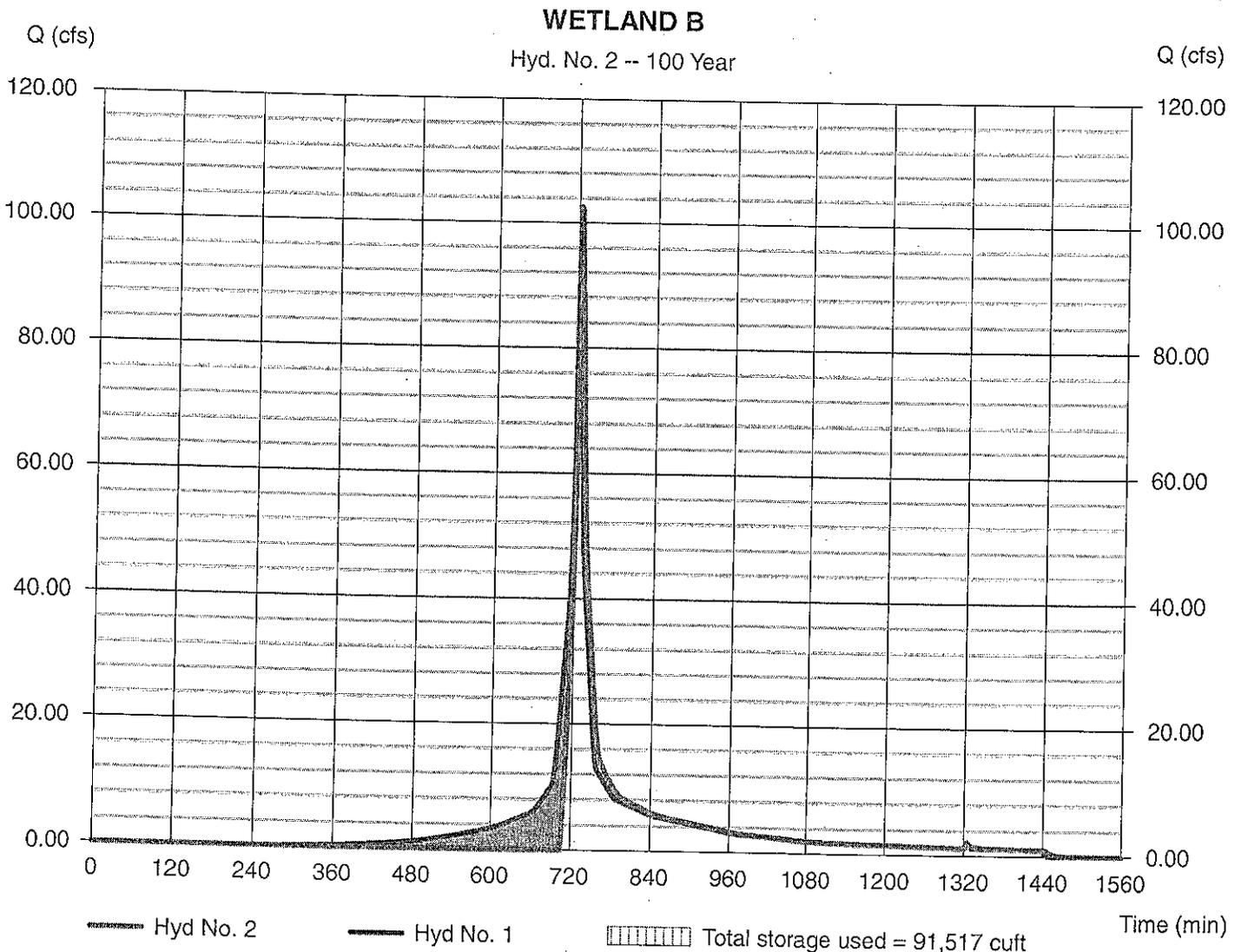
Hyd. No. 2

WETLAND B

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 1 -- WETLAND B
Reservoir name = WETLAND A

Peak discharge = 90.42 cfs
Time to peak = 727 min
Hyd. volume = 260,061 cuft
Max. Elevation = 24.54 ft
Max. Storage = 91,517 cuft

Storage indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	94.01	1	724	301,268	----	-----	-----	WETLAND C
2	Reservoir	89.90	1	726	252,923	1	24.77	60,951	WETLAND C
WETLAND C.gpw				Return Period: 100 Year			Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

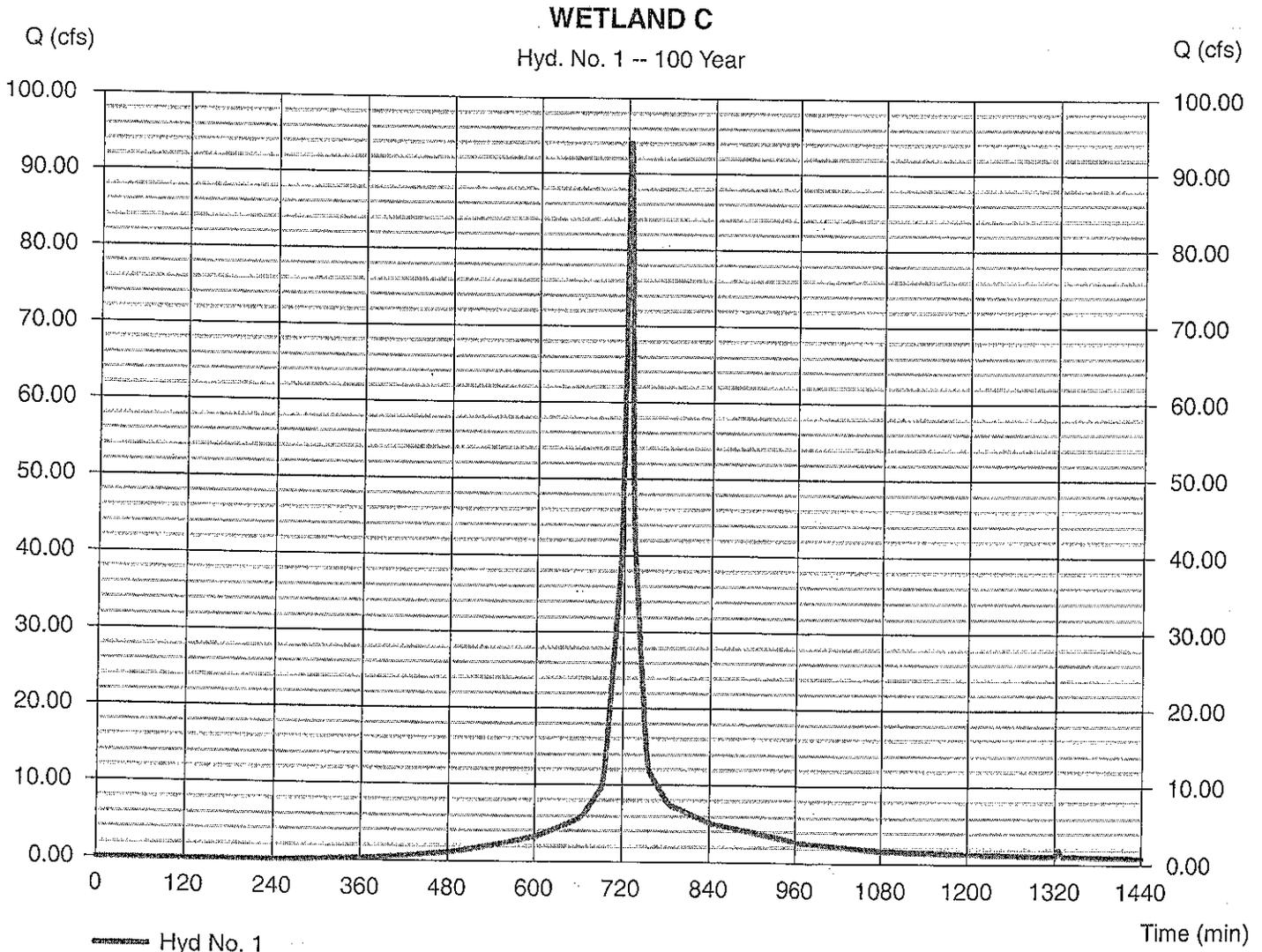
Hyd. No. 1

WETLAND C

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 10.350 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 10.00 in
 Storm duration = 24 hrs

Peak discharge = 94.01 cfs
 Time to peak = 724 min
 Hyd. volume = 301,268 cuft
 Curve number = 82*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = [(2.430 x 98) + (7.920 x 77)] / 10.350



Hydrograph Report

Hydraflow Hydrographs by Intellisolve v9.1

Friday, Nov 2, 2012

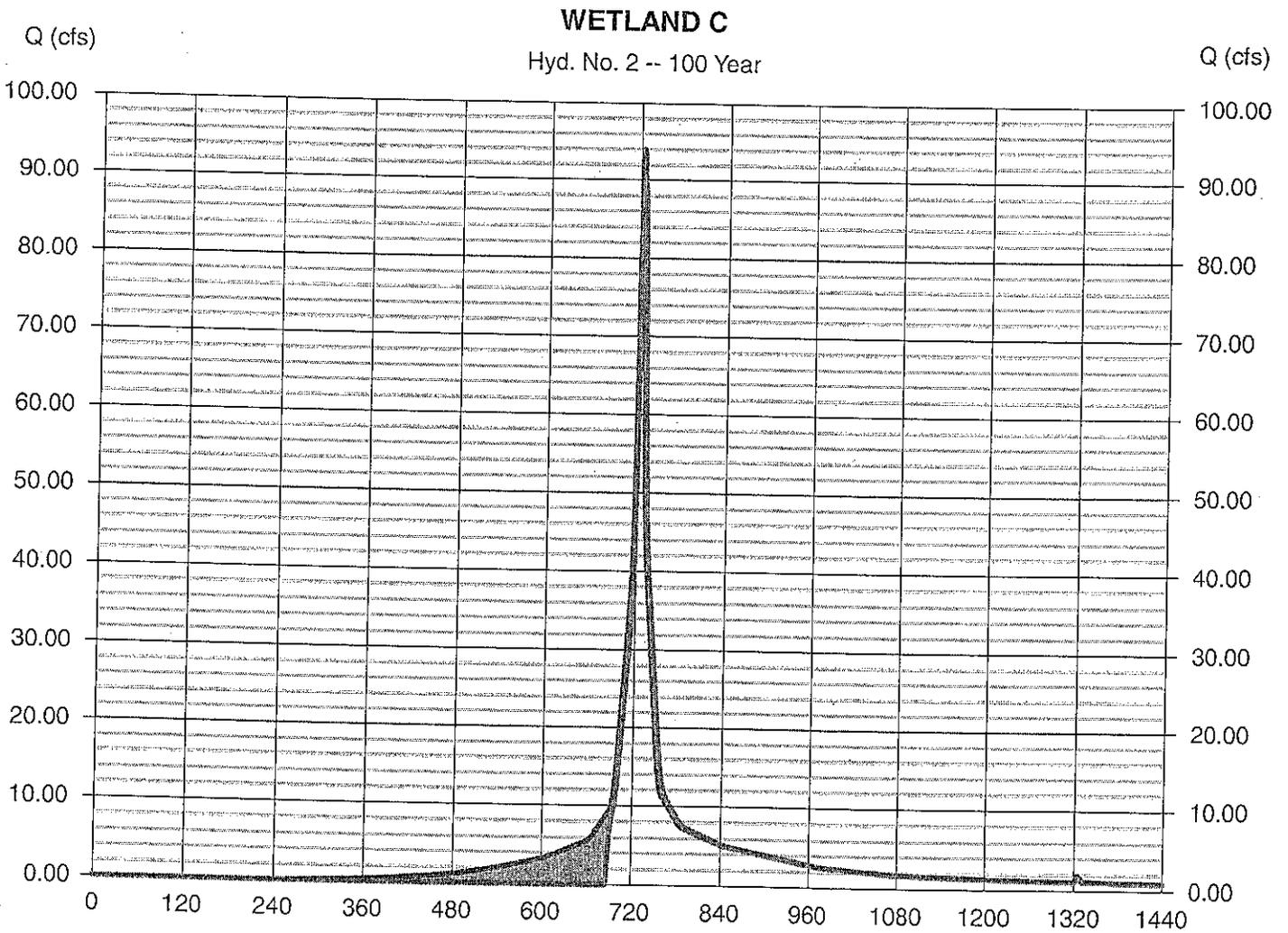
Hyd. No. 2

WETLAND C

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow-hyd. No. = 1 - WETLAND C
 Reservoir name = WETLAND C

Peak discharge = 89.90 cfs
 Time to peak = 726 min
 Hyd. volume = 252,923 cuft
 Max. Elevation = 24.77 ft
 Max. Storage = 60,951 cuft

Storage Indication method used.



Hyd No. 2

Hyd No. 1



Total storage used = 60,951 cuft

Time (min)

Hydrograph Summary Report

Hydraflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	13.19	1	724	42,088	----	-----	-----	WETLAND D	
2	Reservoir	12.47	1	726	30,858	1	23.60	12,687	WETLAND D	
WETLAND D.gpw					Return Period: 100 Year		Friday, Nov 2, 2012			

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

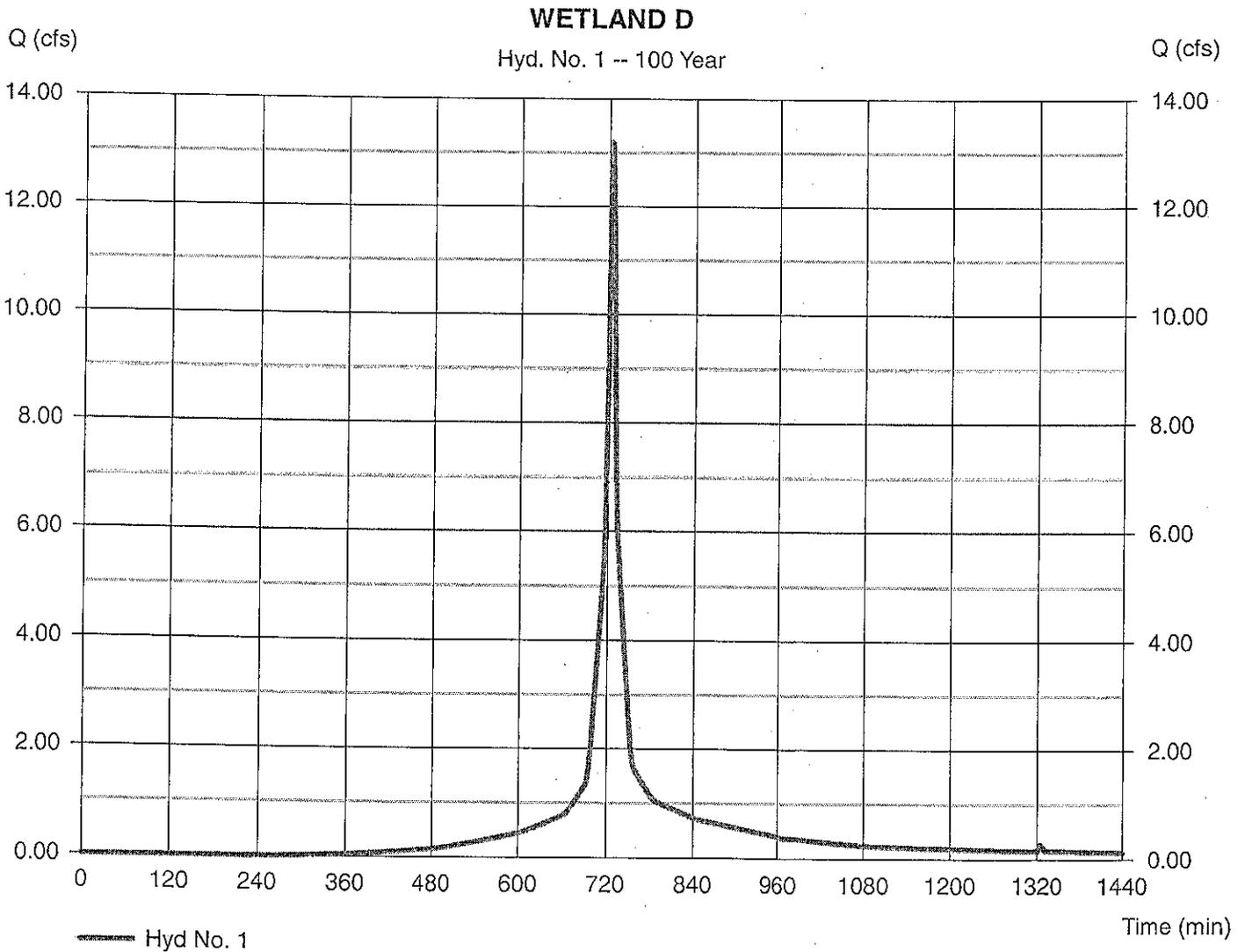
Hyd. No. 1

WETLAND D

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 1.470 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 13.19 cfs
Time to peak = 724 min
Hyd. volume = 42,088 cuft
Curve number = 81*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.260 \times 98) + (1.210 \times 77)] / 1.470$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

Hyd. No. 2

WETLAND D

Hydrograph type = Reservoir

Storm frequency = 100 yrs

Time interval = 1 min

Inflow-hyd. No. = 1 - WETLAND D

Reservoir name = WETLAND D

Peak discharge = 12.47 cfs

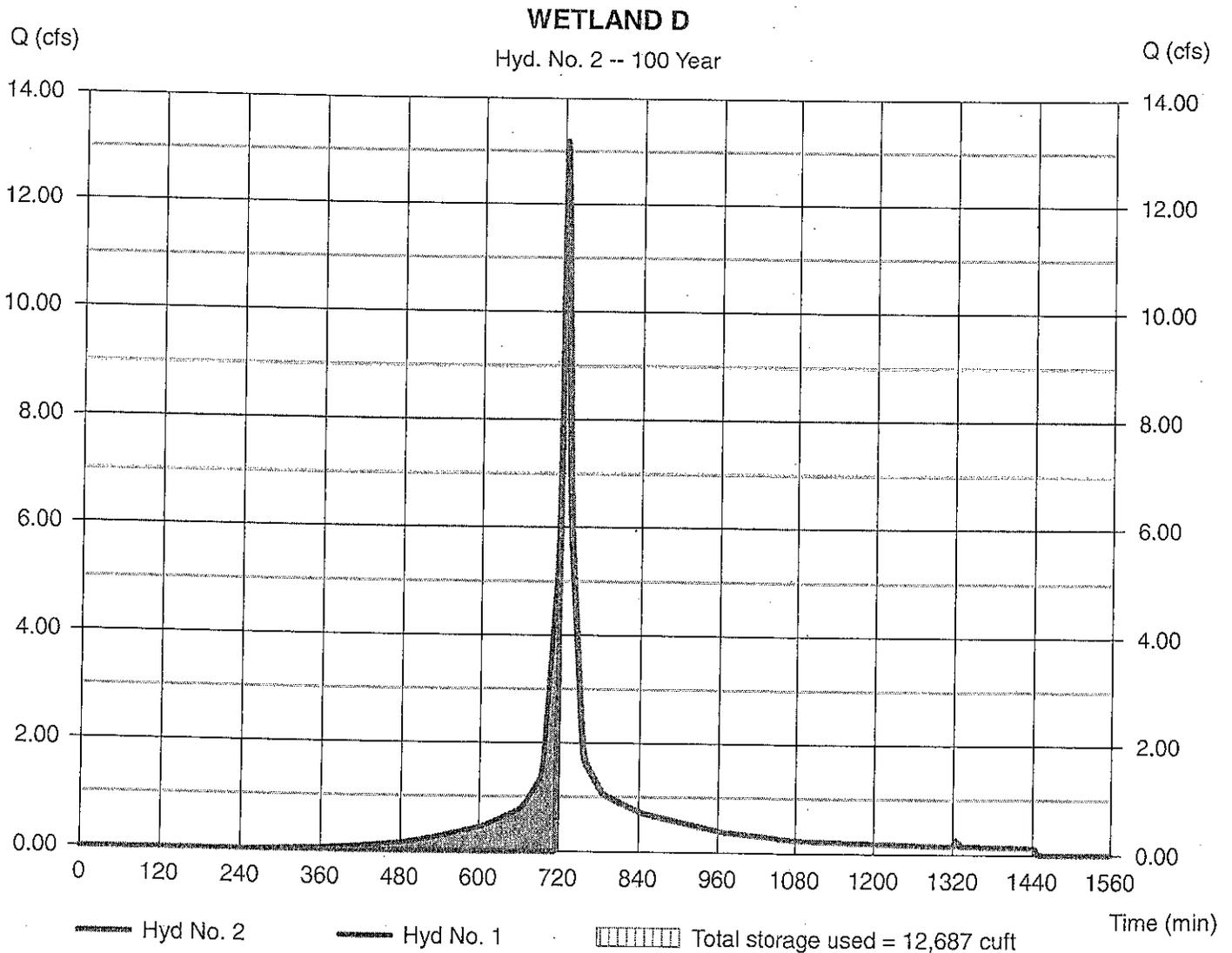
Time to peak = 726 min

Hyd. volume = 30,858 cuft

Max. Elevation = 23.60 ft

Max. Storage = 12,687 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	127.38	1	724	410,019	---	-----	-----	WETLAND D & E
2	Reservoir	3.342	1	987	259,536	1	25.99	310,873	WETLAND D & E
WETLAND D & E.gpw					Return Period: 100 Year		Friday, Nov 2, 2012		

Hydrograph Report

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Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

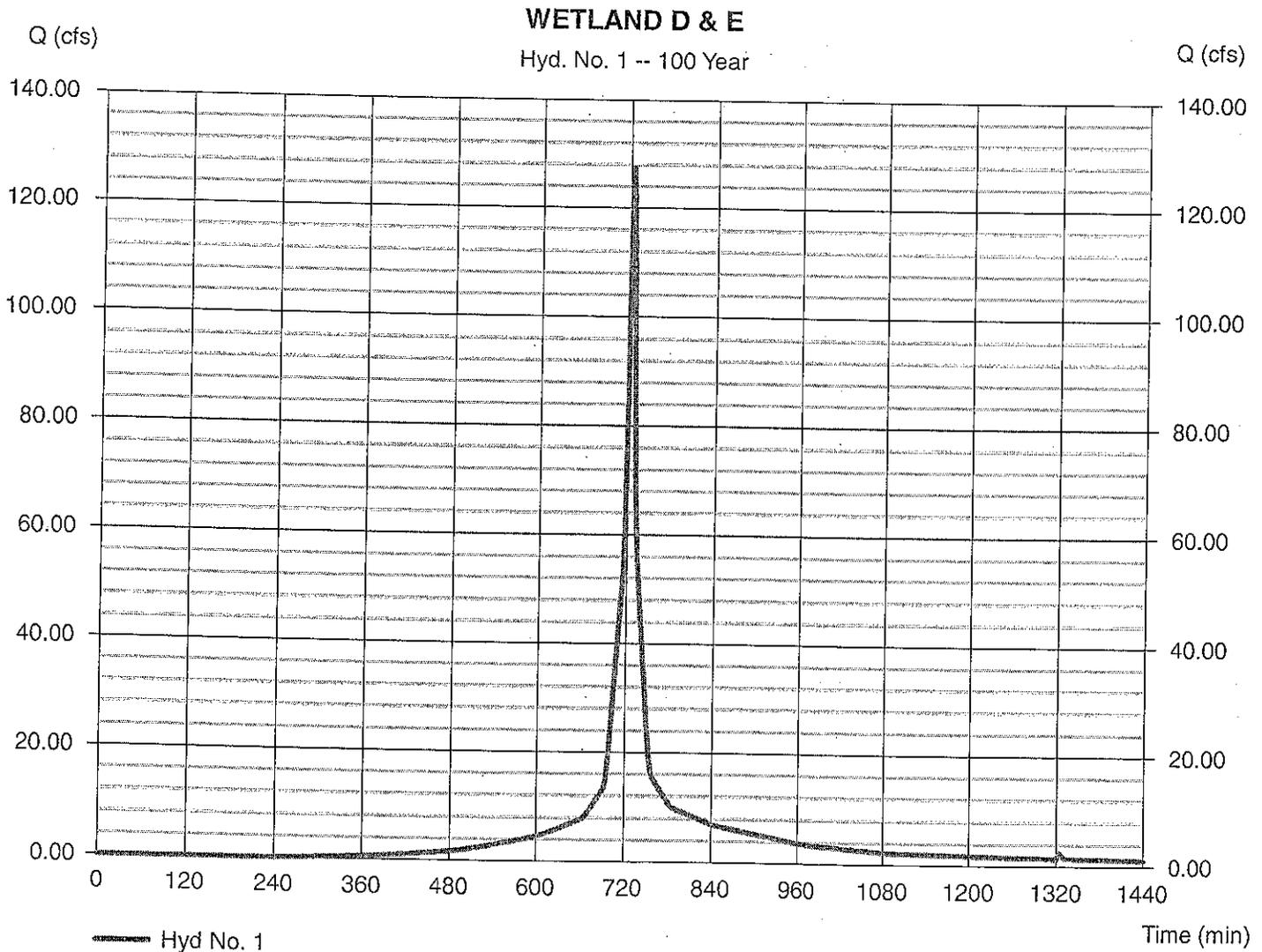
Hyd. No. 1

WETLAND D & E

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage-area = 13.860 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 127.38 cfs
Time to peak = 724 min
Hyd. volume = 410,019 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(3.690 x 98) + (10.170 x 77)] / 13.860



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

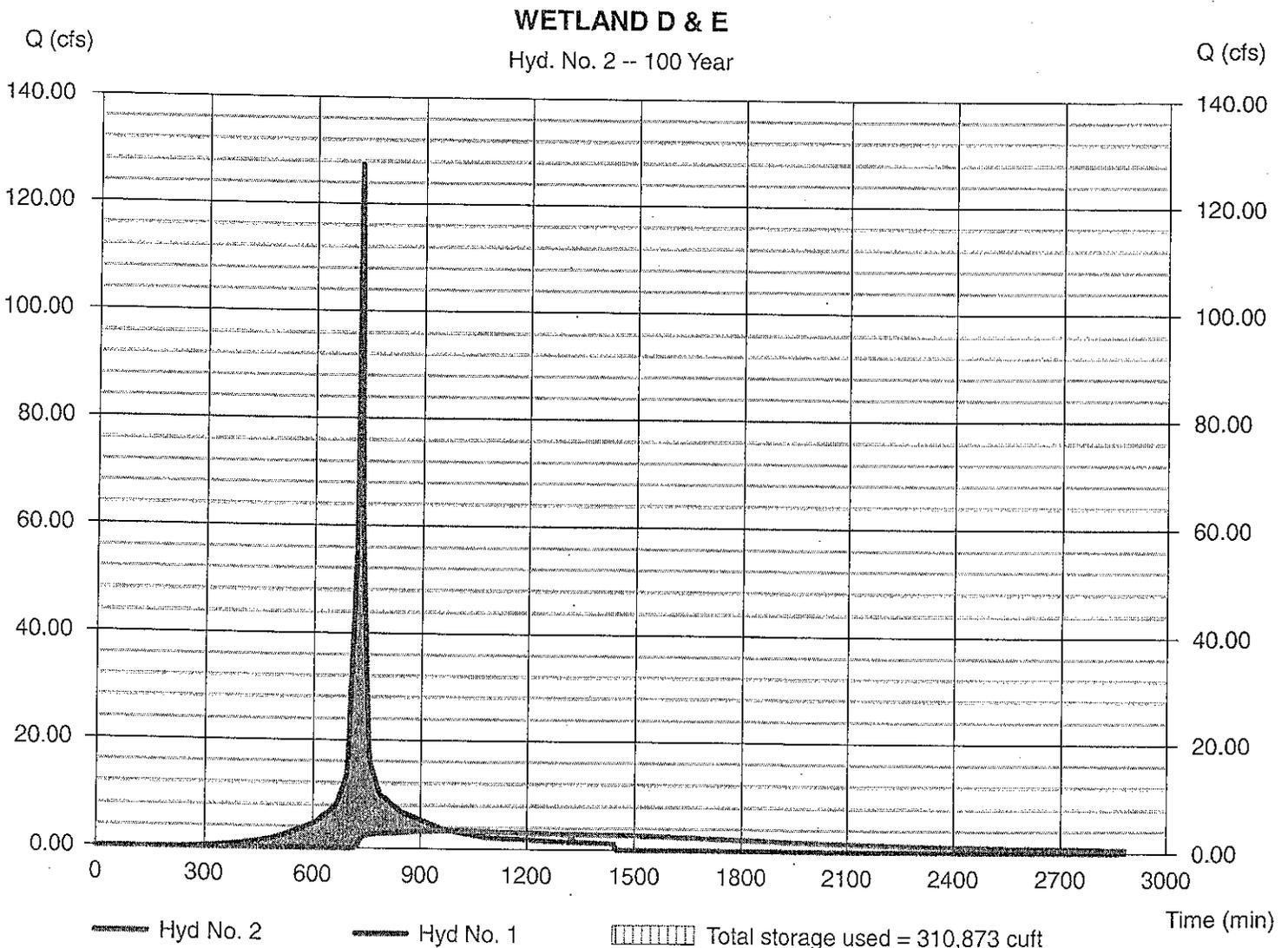
Hyd. No. 2

WETLAND D & E

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow-hyd. No. = 1 - WETLAND D & E
 Reservoir name = WETLAND D & E

Peak discharge = 3.342 cfs
 Time to peak = 987 min
 Hyd. volume = 259,536 cuft
 Max. Elevation = 25.99 ft
 Max. Storage = 310,873 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	23.34	1	724	75,141	----	-----	-----	WETLAND F
2	Reservoir	2.098	1	778	46,015	1	25.94	46,345	WETLAND F
WETLAND F.gpw					Return Period: 100 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

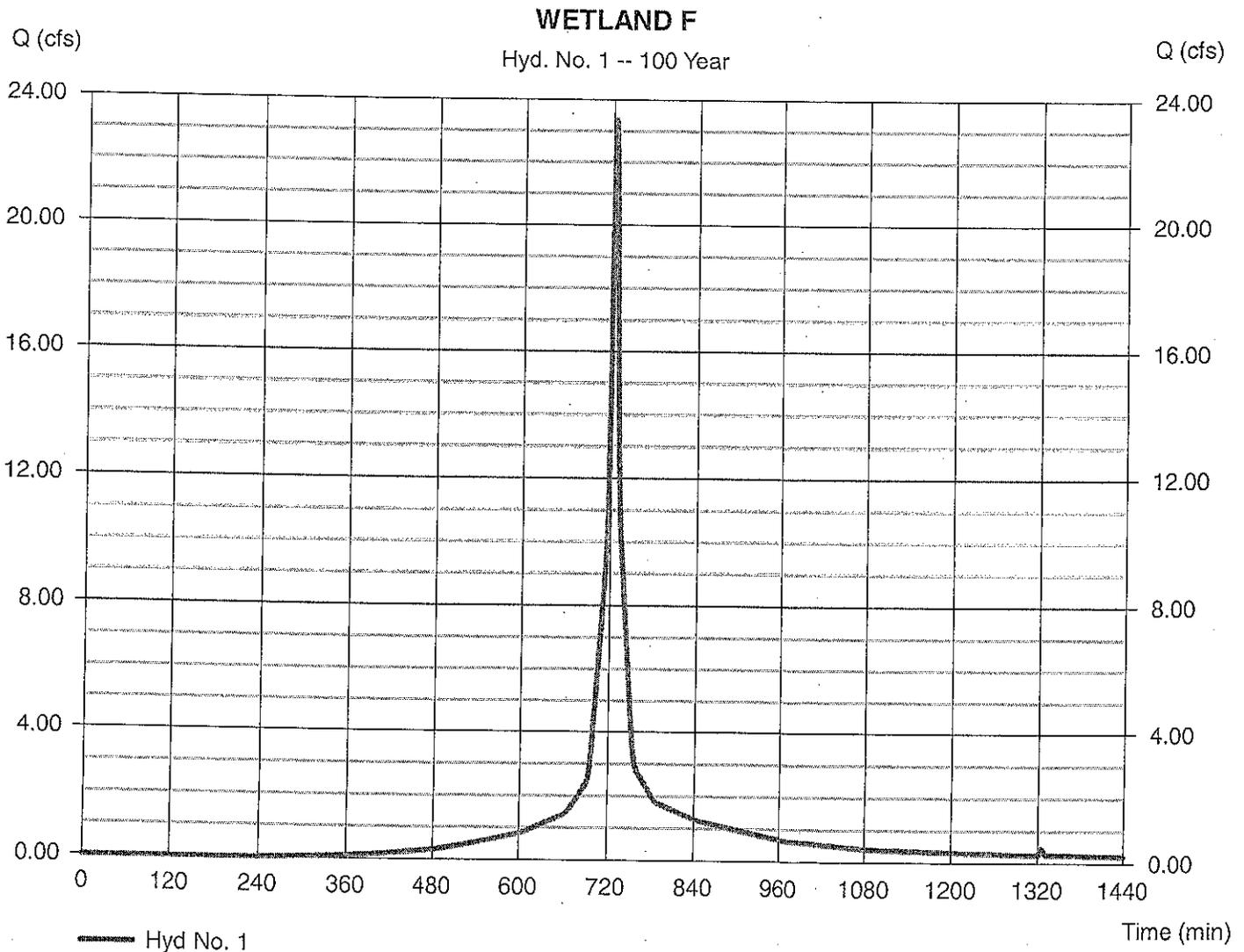
Hyd. No. 1

WETLAND F

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 2.540 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 23.34 cfs
Time to peak = 724 min
Hyd. volume = 75,141 cuft
Curve number = 83*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.770 x 98) + (1.770 x 77)] / 2.540



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

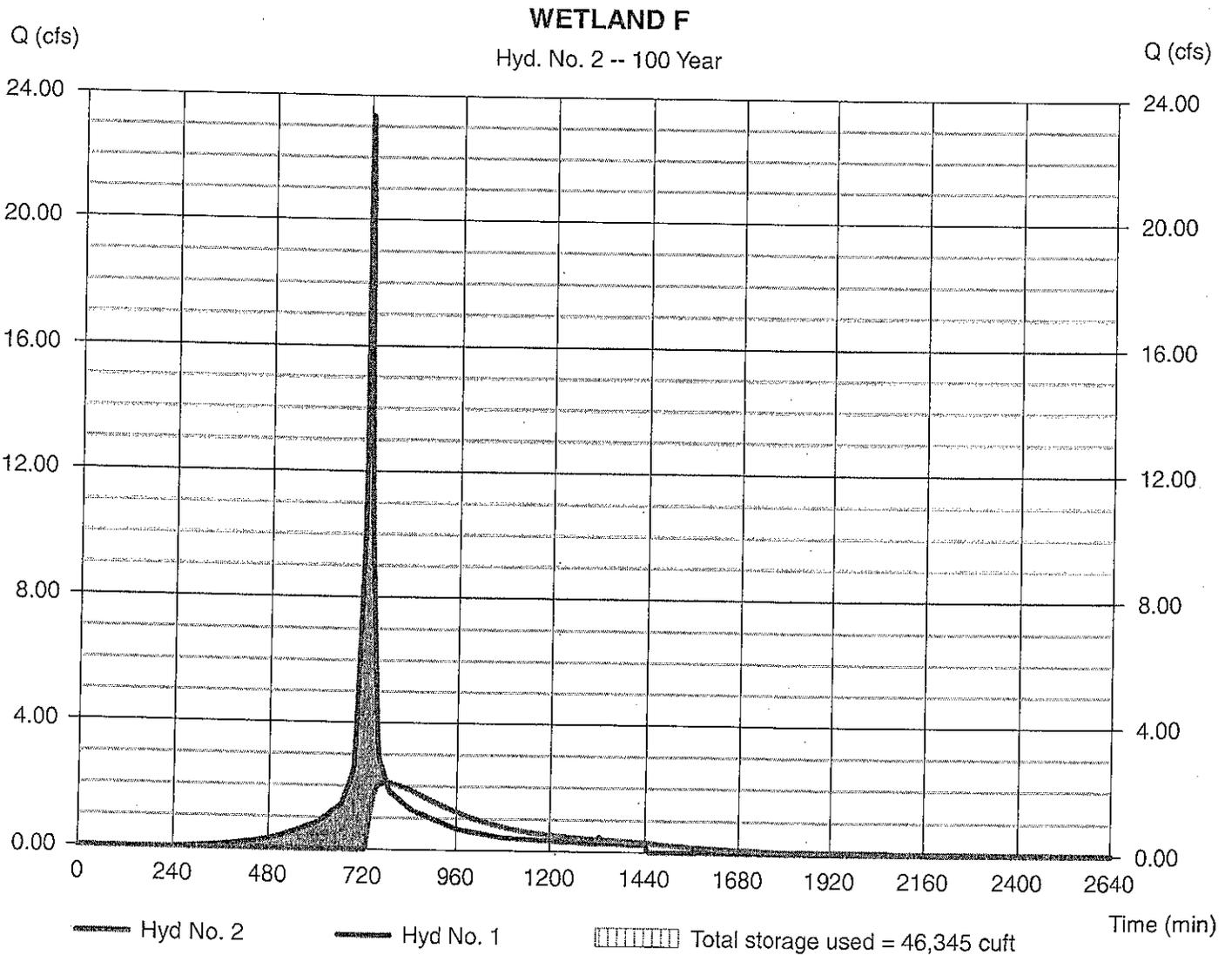
Hyd. No. 2

WETLAND F

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow-hyd. No. = 1 - WETLAND F
Reservoir name = WETLAND F

Peak discharge = 2.098 cfs
Time to peak = 778 min
Hyd. volume = 46,015 cuft
Max. Elevation = 25.94 ft
Max. Storage = 46,345 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisoive v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	47.11	1	724	149,778	---	-----	-----	WETLAND G
2	Reservoir	0.336	1	1443	23,210	1	25.17	142,092	WETLAND G
WETLAND G.gpw					Return Period: 100 Year		Friday, Nov 2, 2012		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

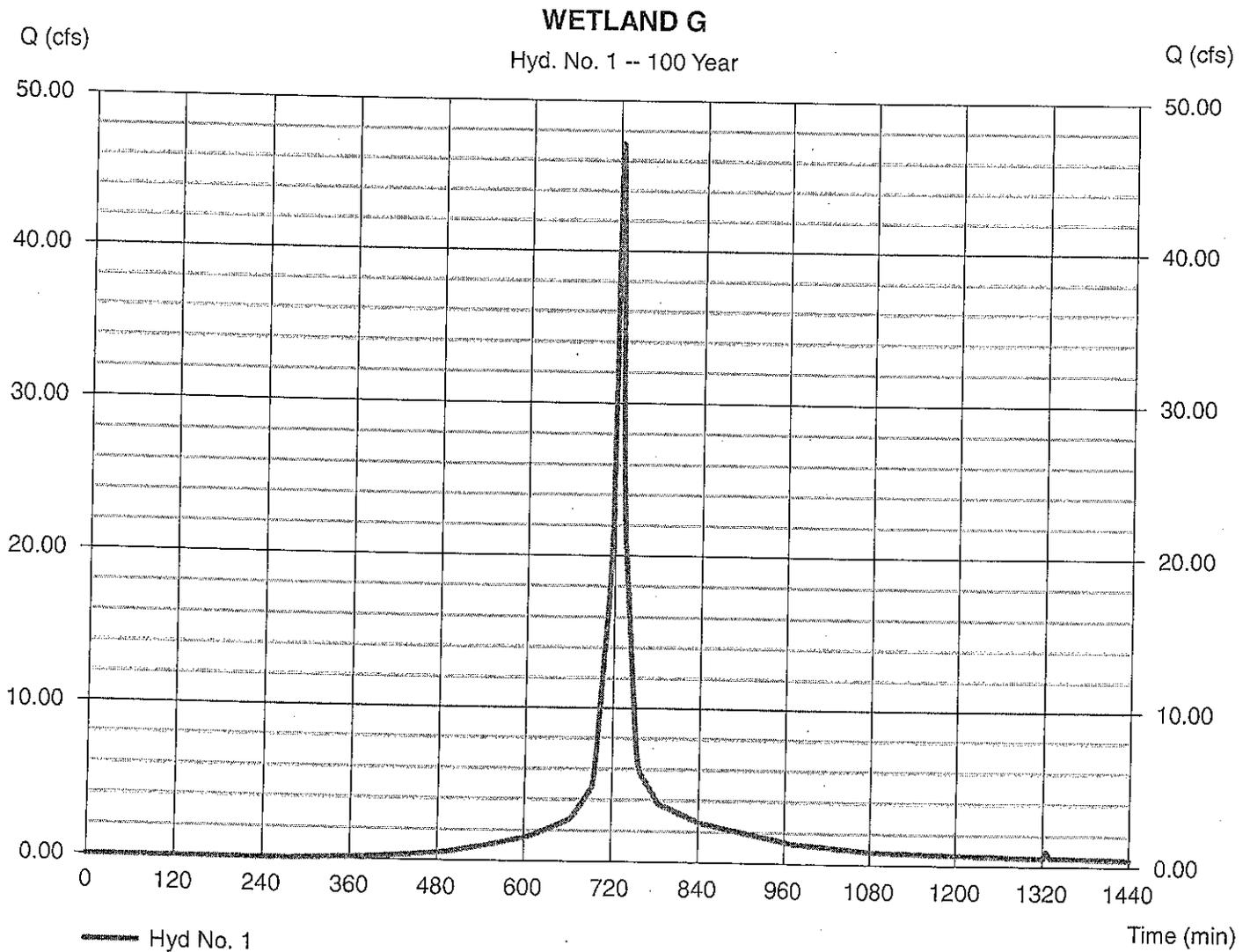
Hyd. No. 1

WETLAND G

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 5.320 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 10.00 in
Storm duration = 24 hrs

Peak discharge = 47.11 cfs
Time to peak = 724 min
Hyd. volume = 149,778 cuft
Curve number = 80*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.790 \times 98) + (4.530 \times 77)] / 5.320$



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Friday, Nov 2, 2012

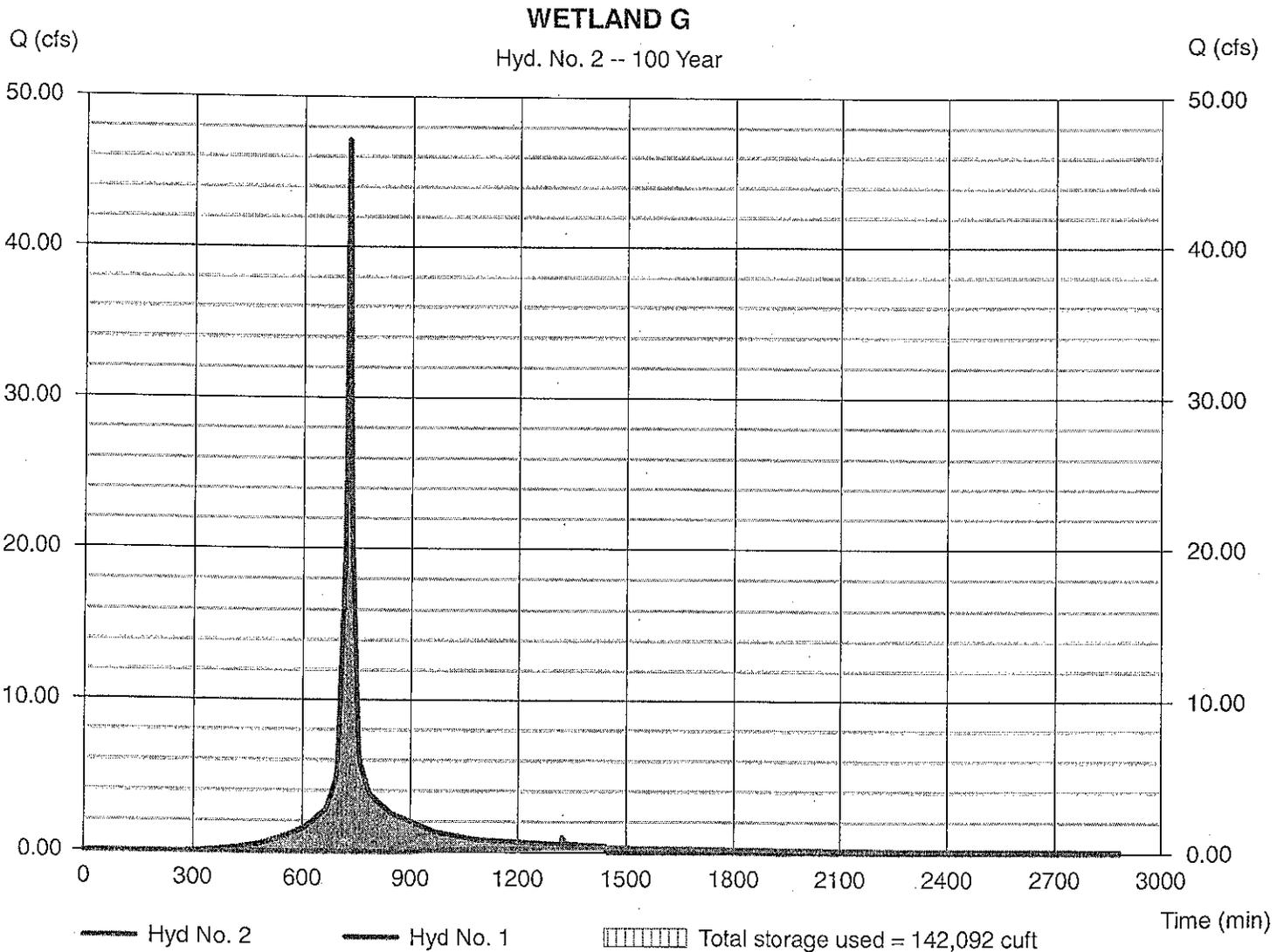
Hyd. No. 2

WETLAND G

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow-hyd.-No. = 1 - WETLAND G
Reservoir name = WETLAND G

Peak discharge = 0.336 cfs
Time to peak = 1443 min
Hyd. volume = 23,210 cuft
Max. Elevation = 25.17 ft
Max. Storage = 142,092 cuft

Storage Indication method used.



SWALES

SWALE #	ROAD CL ELEV	CL TO EOP	EOP ELEV	FLUME ELEV	FLUME CURB ELEV	FLOW	LENGTH	SWALE ELEV	EX. GROUND ELEV
SWALE #1	25.50	11	25.28	25.20	25.70	7.11	133	25.19	26.00
SWALE #2	25.73	61	25.12	25.12	25.62	2.08	48	25.11	25.50
SWALE #3	25.86	11	25.64	25.56	26.06	6.20	53	25.55	26.00
SWALE #4	26.12	11	25.90	25.82	26.32	3.23	25	25.81	26.00
SWALE #5	26.35	11	26.13	26.05	26.55	3.60	43	26.04	25.75
SWALE #6	25.10	11	24.88	24.80	25.30	4.73	233	24.79	25.50
SWALE #7	24.82			24.82	25.32	6.44	15	24.81	25.50
SWALE #8	26.39	9	26.21	26.13	26.63	1.03	20	26.12	25.50
SWALE #9	26.38	9	26.20	26.12	26.62	1.16	55	26.11	26.00
SWALE #10	26.20			26.20	26.70	0.78	104	26.19	25.50
SWALE #11	26.00	11	25.78	25.70	26.20	3.12	70	25.69	24.75
SWALE #12	25.72	11	25.50	25.42	25.92	2.52	35	25.41	25.75
SWALE #13	24.95	13	24.70	24.62	25.12	7.03	573	24.60	25.10
SWALE #14	25.38	9	25.20	25.12	25.62	4.99	50	25.11	25.50
SWALE #15	25.50	9	25.32	25.24	25.74	0.98	40	25.23	25.50
SWALE #16	25.48			25.48	25.98	4.19	20	25.47	26.00

**SWALE #1 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #1
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	6.30 cfs

Results	
Depth	0.44 ft
Flow Area	3.2 ft ²
Wetted Perim	9.52 ft
Top Width	9.43 ft
Critical Depth	0.33 ft
Critical Slope	0.92 %
Velocity	1.97 ft/s
Velocity Head	0.06 ft
Specific Energ	0.50 ft
Froude Numb	0.60
Flow Type	Subcritical

**SWALE #1 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #1
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	7.11 cfs

Results	
Depth	0.47 ft
Flow Area	3.5 ft ²
Wetted Perim	9.83 ft
Top Width	9.73 ft
Critical Depth	0.35 ft
Critical Slope	0.90 %
Velocity	2.04 ft/s
Velocity Head	0.06 ft
Specific Energ	0.54 ft
Froude Numb	0.60
Flow Type	Subcritical

SWALE #2

Site Area

Site Area 14,668 sf
0.34 ac

Impervious Area Calculation

ROW 10,628
Lots
Other/Common Areas
Total 10,628 sf
Total 0.24 ac
% Impervious 72.46%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.49 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.61 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 0.69 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.76
Q=C*I*A 1.50 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.76
Q=C*I*A 1.84 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.76
Q=C*I*A 2.08 cfs

**SWALE #2 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #2
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeffic	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	1.84 cfs

Results	
Depth	0.22 ft
Flow Area	1.4 ft ²
Wetted Perim	7.29 ft
Top Width	7.24 ft
Critical Depth	0.15 ft
Critical Slope	1.15 %
Velocity	1.34 ft/s
Velocity Head	0.03 ft
Specific Energ	0.25 ft
Froude Numb	0.54
Flow Type	Subcritical

**SWALE #2 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #2
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	2.08 cfs

Results	
Depth	0.24 ft
Flow Area	1.5 ft ²
Wetted Perim	7.45 ft
Top Width	7.41 ft
Critical Depth	0.17 ft
Critical Slope	1.12 %
Velocity	1.39 ft/s
Velocity Head	0.03 ft
Specific Energ	0.27 ft
Froude Numb	0.55
Flow Type	Subcritical

SWALE #3

Site Area

Site Area 55,131 sf
1.27 ac

Impervious Area Calculation

ROW 14,897
Lots 12,781
Other/Common Areas
Total 27,678 sf
Total 0.64 ac
% Impervious 50.20%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 1.86 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 2.29 cfs

25-Year Pre Dev. Peak Flow
intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 2.58 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.60
Q=C*I*A 4.48 cfs

10-Year Pre Dev. Peak Flow
intensity 7.23 in/hr
C-Factor 0.60
Q=C*I*A 5.50 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.60
Q=C*I*A 6.20 cfs

**SWALE #3 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #3
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	5.50 cfs

Results	
Depth	0.41 ft
Flow Area	2.9 ft ²
Wetted Perim	9.21 ft
Top Width	9.12 ft
Critical Depth	0.30 ft
Critical Slope	0.94 %
Velocity	1.89 ft/s
Velocity Head	0.06 ft
Specific Energ	0.47 ft
Froude Numb	0.59
Flow Type	Subcritical

**SWALE #3 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #3
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	6.20 cfs

Results	
Depth	0.44 ft
Flow Area	3.2 ft ²
Wetted Perim	9.48 ft
Top Width	9.40 ft
Critical Depth	0.32 ft
Critical Slope	0.92 %
Velocity	1.96 ft/s
Velocity Head	0.06 ft
Specific Energ	0.50 ft
Froude Numb	0.60
Flow Type	Subcritical

SWALE #4

Site Area

Site Area 23,429 sf
0.54 ac

Impervious Area Calculation

ROW 16,277
Lots
Other/Common Areas
Total 16,277 sf
Total 0.37 ac
% Impervious 69.47%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.79 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.97 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 1.10 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.74
Q=C*I*A 2.33 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.74
Q=C*I*A 2.86 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.74
Q=C*I*A 3.23 cfs

**SWALE #4 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #4
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Input Data	
Mannings Coeffic	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	2.86 cfs

Results	
Depth	0.29 ft
Flow Area	1.9 ft ²
Wetted Perimr	7.93 ft
Top Width	7.88 ft
Critical Depth	0.20 ft
Critical Slope	1.06 %
Velocity	1.54 ft/s
Velocity Head	0.04 ft
Specific Energ	0.32 ft
Froude Numb	0.56
Flow Type	Subcritical

**SWALE #4 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #4
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	3.23 cfs

Results	
Depth	0.31 ft
Flow Area	2.0 ft ²
Wetted Perim	8.14 ft
Top Width	8.08 ft
Critical Depth	0.22 ft
Critical Slope	1.03 %
Velocity	1.60 ft/s
Velocity Head	0.04 ft
Specific Energ	0.35 ft
Froude Numb	0.57
Flow Type	Subcritical

SWALE #5

Site Area

Site Area 26,459 sf
0.61 ac

Impervious Area Calculation

ROW 18,038
Lots
Other/Common Areas
Total 18,038 sf
Total 0.41 ac
% Impervious 68.17%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.89 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 1.10 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 1.24 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.73
Q=C*I*A 2.60 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.73
Q=C*I*A 3.19 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.73
Q=C*I*A 3.60 cfs

**SWALE #5 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #5
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	3.19 cfs

Results	
Depth	0.31 ft
Flow Area	2.0 ft ²
Wetted Perim	8.12 ft
Top Width	8.06 ft
Critical Depth	0.22 ft
Critical Slope	1.03 %
Velocity	1.60 ft/s
Velocity Head	0.04 ft
Specific Energ	0.35 ft
Froude Numb	0.57
Flow Type	Subcritical

**SWALE #5 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #5
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	3.60 cfs

Results	
Depth	0.33 ft
Flow Area	2.2 ft ²
Wetted Perim	8.33 ft
Top Width	8.27 ft
Critical Depth	0.23 ft
Critical Slope	1.02 %
Velocity	1.66 ft/s
Velocity Head	0.04 ft
Specific Energ	0.37 ft
Froude Numb	0.57
Flow Type	Subcritical

SWALE #6

Site Area

Site Area 35,859 sf
0.82 ac

Impervious Area Calculation

ROW 13,285
Lots 9,991
Other/Common Areas
Total 23,276 sf
Total 0.53 ac
% Impervious 64.91%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 1.21 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 1.49 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 1.68 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.70
Q=C*I*A 3.41 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.70
Q=C*I*A 4.19 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.70
Q=C*I*A 4.73 cfs

**SWALE #6 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #6
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	4.19 cfs

Results	
Depth	0.36 ft
Flow Area	2.4 ft ²
Wetted Perim	8.63 ft
Top Width	8.56 ft
Critical Depth	0.26 ft
Critical Slope	0.99 %
Velocity	1.74 ft/s
Velocity Head	0.05 ft
Specific Energ	0.40 ft
Froude Numb	0.58
Flow Type	Subcritical

**SWALE #6 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #6
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	4.73 cfs

Results	
Depth	0.38 ft
Flow Area	2.6 ft ²
Wetted Perim	8.87 ft
Top Width	8.80 ft
Critical Depth	0.27 ft
Critical Slope	0.97 %
Velocity	1.80 ft/s
Velocity Head	0.05 ft
Specific Energ	0.43 ft
Froude Numb	0.58
Flow Type	Subcritical

**SWALE #7 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #7
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	5.71 cfs

Results	
Depth	0.42 ft
Flow Area	3.0 ft ²
Wetted Perim	9.29 ft
Top Width	9.21 ft
Critical Depth	0.31 ft
Critical Slope	0.93 %
Velocity	1.91 ft/s
Velocity Head	0.06 ft
Specific Energ	0.48 ft
Froude Numb	0.59
Flow Type	Subcritical

SWALE #7 - 25-YEAR
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	SWALE #7
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	6.44 cfs

Results	
Depth	0.45 ft
Flow Area	3.2 ft ²
Wetted Perim	9.58 ft
Top Width	9.49 ft
Critical Depth	0.33 ft
Critical Slope	0.92 %
Velocity	1.98 ft/s
Velocity Head	0.06 ft
Specific Energ	0.51 ft
Froude Numb	0.60
Flow Type	Subcritical

SWALE #8

Site Area

Site Area 7,199 sf
0.17 ac

Impervious Area Calculation

ROW 5,324
Lots
Other/Common Areas
Total 5,324 sf
Total 0.12 ac
% Impervious 73.95%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.24 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.30 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 0.34 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.77
Q=C*I*A 0.75 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.77
Q=C*I*A 0.92 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.77
Q=C*I*A 1.03 cfs

**SWALE #8 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #8
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel-Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	0.92 cfs

Results	
Depth	0.15 ft
Flow Area	0.9 ft ²
Wetted Perim	6.54 ft
Top Width	6.51 ft
Critical Depth	0.10 ft
Critical Slope	1.30 %
Velocity	1.06 ft/s
Velocity Head	0.02 ft
Specific Energ	0.17 ft
Froude Numb	0.51
Flow Type	Subcritical

**SWALE #8 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #8
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	1.03 cfs

Results	
Depth	0.16 ft
Flow Area	0.9 ft ²
Wetted Perim	6.64 ft
Top Width	6.61 ft
Critical Depth	0.11 ft
Critical Slope	1.27 %
Velocity	1.10 ft/s
Velocity Head	0.02 ft
Specific Energ	0.18 ft
Froude Numb	0.52
Flow Type	Subcritical

SWALE #9

Site Area

Site Area 7,868 sf
0.18 ac

Impervious Area Calculation

ROW 6,013
Lots
Other/Common Areas
Total 6,013 sf
Total 0.14 ac
% Impervious 76.42%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.27 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.33 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 0.37 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.78
Q=C*I*A 0.83 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.78
Q=C*I*A 1.03 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.78
Q=C*I*A 1.16 cfs

**SWALE #9 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #9
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	1.03 cfs

Results	
Depth	0.16 ft
Flow Area	0.9 ft ²
Wetted Perim	6.64 ft
Top Width	6.61 ft
Critical Depth	0.11 ft
Critical Slope	1.27 %
Velocity	1.10 ft/s
Velocity Head	0.02 ft
Specific Energ	0.18 ft
Froude Numb	0.52
Flow Type	Subcritical

**SWALE #9 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #9
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel-Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	1.16 cfs

Results	
Depth	0.17 ft
Flow Area	1.0 ft ²
Wetted Perim	6.76 ft
Top Width	6.72 ft
Critical Depth	0.11 ft
Critical Slope	1.25 %
Velocity	1.15 ft/s
Velocity Head	0.02 ft
Specific Enerç	0.19 ft
Froude Numb	0.52
Flow Type	Subcritical

SWALE #10

Site Area

Site Area 5,784 sf
0.13 ac

Impervious Area Calculation

ROW 3,864
Lots
Other/Common Areas
Total 3,864 sf
Total 0.09 ac
% Impervious 66.80%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.20 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.24 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 0.27 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.72
Q=C*I*A 0.56 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.72
Q=C*I*A 0.69 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.72
Q=C*I*A 0.78 cfs

**SWALE #10 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #10
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	0.69 cfs

Results	
Depth	0.13 ft
Flow Area	0.7 ft ²
Wetted Perim	6.30 ft
Top Width	6.28 ft
Critical Depth	0.08 ft
Critical Slope	1.37 %
Velocity	0.96 ft/s
Velocity Head	0.01 ft
Specific Energ	0.14 ft
Froude Numb	0.50
Flow Type	Subcritical

**SWALE #10 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #10
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	0.78 cfs

Results	
Depth	0.14 ft
Flow Area	0.8 ft ²
Wetted Perim	6.40 ft
Top Width	6.37 ft
Critical Depth	0.09 ft
Critical Slope	1.34 %
Velocity	1.00 ft/s
Velocity Head	0.02 ft
Specific Energ	0.15 ft
Froude Numb	0.51
Flow Type	Subcritical

SWALE #11

Site Area

Site Area 23,368 sf
 0.54 ac

Impervious Area Calculation

 ROW 15,469
 Lots
 Other/Common Areas
 Total 15,469 sf
 Total 0.36 ac
 % Impervious 66.20%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.79 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.97 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 1.09 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.71
Q=C*I*A 2.25 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.71
Q=C*I*A 2.77 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.71
Q=C*I*A 3.12 cfs

**SWALE #11 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #11
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	2.77 cfs

Results	
Depth	0.28 ft
Flow Area	1.8 ft ²
Wetted Perim	7.88 ft
Top Width	7.83 ft
Critical Depth	0.20 ft
Critical Slope	1.06 %
Velocity	1.53 ft/s
Velocity Head	0.04 ft
Specific Energ	0.32 ft
Froude Numb	0.56
Flow Type	Subcritical

**SWALE #11 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #11
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	3.12 cfs

Results	
Depth	0.30 ft
Flow Area	2.0 ft ²
Wetted Perim	8.08 ft
Top Width	8.02 ft
Critical Depth	0.21 ft
Critical Slope	1.04 %
Velocity	1.59 ft/s
Velocity Head	0.04 ft
Specific Energ	0.34 ft
Froude Numb	0.56
Flow Type	Subcritical

SWALE #12

Site Area

Site Area 19,074 sf
0.44 ac

Impervious Area Calculation

ROW 12,457
Lots
Other/Common Areas
Total 12,457 sf
Total 0.29 ac
% Impervious 65.31%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 0.64 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 0.79 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 0.89 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.71
Q=C*I*A 1.82 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.71
Q=C*I*A 2.24 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.71
Q=C*I*A 2.52 cfs

SWALE #12 - 10-YEAR
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	SWALE #12
Flow Element	Trapezoidal Cha
Method	Manning's Forml
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	2.24 cfs

Results	
Depth	0.25 ft
Flow Area	1.6 ft ²
Wetted Perim	7.56 ft
Top Width	7.51 ft
Critical Depth	0.17 ft
Critical Slope	1.10 %
Velocity	1.43 ft/s
Velocity Head	0.03 ft
Specific Energ	0.28 ft
Froude Numb	0.55
Flow Type	Subcritical

SWALE #12 - 25-YEAR
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	SWALE #12
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	2.52 cfs

Results	
Depth	0.27 ft
Flow Area	1.7 ft ²
Wetted Perim	7.73 ft
Top Width	7.68 ft
Critical Depth	0.19 ft
Critical Slope	1.08 %
Velocity	1.48 ft/s
Velocity Head	0.03 ft
Specific Energ	0.30 ft
Froude Numb	0.56
Flow Type	Subcritical

SWALE #13

Site Area

Site Area 61,912 sf
1.42 ac

Impervious Area Calculation

ROW 20,590
Lots 10,962
Other/Common Areas
Total 31,552 sf
Total 0.72 ac
% Impervious 50.96%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 2.09 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 2.57 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 2.90 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.61
Q=C*I*A 5.07 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.61
Q=C*I*A 6.23 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.61
Q=C*I*A 7.03 cfs

**SWALE #13 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #13
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel_Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	6.23 cfs

Results	
Depth	0.44 ft
Flow Area	3.2 ft ²
Wetted Perim	9.49 ft
Top Width	9.41 ft
Critical Depth	0.32 ft
Critical Slope	0.92 %
Velocity	1.96 ft/s
Velocity Head	0.06 ft
Specific Energ	0.50 ft
Froude Numb	0.60
Flow Type	Subcritical

**SWALE #13 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #13
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	7.03 cfs

Results	
Depth	0.47 ft
Flow Area	3.5 ft ²
Wetted Perim	9.80 ft
Top Width	9.70 ft
Critical Depth	0.35 ft
Critical Slope	0.90 %
Velocity	2.03 ft/s
Velocity Head	0.06 ft
Specific Energ	0.53 ft
Froude Numb	0.60
Flow Type	Subcritical

**SWALE #14 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #14
Flow Element	Trapezoidal Cha
Method	Manning's Formi
Solve For	Channel-Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	4.43 cfs

Results	
Depth	0.37 ft
Flow Area	2.5 ft ²
Wetted Perim	8.74 ft
Top Width	8.67 ft
Critical Depth	0.26 ft
Critical Slope	0.98 %
Velocity	1.77 ft/s
Velocity Head	0.05 ft
Specific Energ	0.42 ft
Froude Numb	0.58
Flow Type	Subcritical

**SWALE #14 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #14
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	4.99 cfs

Results	
Depth	0.39 ft
Flow Area	2.7 ft ²
Wetted Perim	8.99 ft
Top Width	8.91 ft
Critical Depth	0.28 ft
Critical Slope	0.96 %
Velocity	1.83 ft/s
Velocity Head	0.05 ft
Specific Energ	0.44 ft
Froude Numb	0.59
Flow Type	Subcritical

**SWALE #15 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #15
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeffic	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	0.87 cfs

Results	
Depth	0.15 ft
Flow Area	0.8 ft ²
Wetted Perim	6.49 ft
Top Width	6.46 ft
Critical Depth	0.10 ft
Critical Slope	1.31 %
Velocity	1.04 ft/s
Velocity Head	0.02 ft
Specific Energ	0.16 ft
Froude Numb	0.51
Flow Type	Subcritical

SWALE #15 - 25-YEAR
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	SWALE #15
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	0.98 cfs

Results	
Depth	0.16 ft
Flow Area	0.9 ft ²
Wetted Perim	6.59 ft
Top Width	6.56 ft
Critical Depth	0.10 ft
Critical Slope	1.28 %
Velocity	1.08 ft/s
Velocity Head	0.02 ft
Specific Energ	0.17 ft
Froude Numb	0.52
Flow Type	Subcritical

SWALE #16

Site Area

Site Area 33,799 sf
0.78 ac

Impervious Area Calculation

ROW 9,689
Lots 10,248
Other/Common Areas
Total 19,937 sf
Total 0.46 ac
% Impervious 58.99%

Pre-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.25
Q=C*I*A 1.14 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.25
Q=C*I*A 1.40 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.25
Q=C*I*A 1.58 cfs

Post-Developed Flows

2-Year Pre Dev. Peak Flow
Intensity 5.88 in/hr
C-Factor 0.66
Q=C*I*A 3.02 cfs

10-Year Pre Dev. Peak Flow
Intensity 7.23 in/hr
C-Factor 0.66
Q=C*I*A 3.72 cfs

25-Year Pre Dev. Peak Flow
Intensity 8.15 in/hr
C-Factor 0.66
Q=C*I*A 4.19 cfs

**SWALE #16 - 10-YEAR
Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	SWALE #16
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	3.72 cfs

Results	
Depth	0.33 ft
Flow Area	2.2 ft ²
Wetted Perim	8.40 ft
Top Width	8.33 ft
Critical Depth	0.24 ft
Critical Slope	1.01 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energ	0.38 ft
Froude Numb	0.57
Flow Type	Subcritical

**SWALE #16 - 25-YEAR
Worksheet for Trapezoidal Channel**

Project Description

Worksheet	SWALE #16
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Input Data

Mannings Coeffic	0.020
Channel Slope	0.30 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Bottom Width	5.00 ft
Discharge	4.19 cfs

Results

Depth	0.36 ft
Flow Area	2.4 ft ²
Wetted Perim	8.63 ft
Top Width	8.56 ft
Critical Depth	0.26 ft
Critical Slope	0.99 %
Velocity	1.74 ft/s
Velocity Head	0.05 ft
Specific Energ	0.40 ft
Froude Numb	0.58
Flow Type	Subcritical

FLUMES

FLUME #1 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data
Channel Slope 0.30 %
Discharge 7.11 cfs

Options
Current Roughness Method <input type="checkbox"/> Lotter's Method
Open Channel Weighting Method <input type="checkbox"/> Lotter's Method
Closed Channel Weighting Method <input type="checkbox"/> Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	25.64 ft
Elevation Range	25.20 to 25.70
Flow Area	2.2 ft ²
Wetted Perimeter	5.88 ft
Top Width	5.02 ft
Actual Depth	0.44 ft
Critical Elevation	25.60 ft
Critical Slope	0.41 %
Velocity	3.24 ft/s
Velocity Head	0.16 ft
Specific Energy	25.80 ft
Froude Number	0.87
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.70
0+00.50	25.70
0+00.51	25.20
0+05.51	25.20
0+05.52	25.70
0+06.02	25.70

FLUME #2 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	2.08 cfs

Options	
Current Roughness Method	used Lotter's Method
Open Channel Weighting Method	used Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	25.32 ft
Elevation Range	25.12 to 25.62
Flow Area	1.0 ft ²
Wetted Perimeter	5.41 ft
Top Width	5.01 ft
Actual Depth	0.20 ft
Critical Elevation	25.30 ft
Critical Slope	0.48 %
Velocity	2.05 ft/s
Velocity Head	0.07 ft
Specific Energy	25.39 ft
Froude Number	0.80
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.62
0+00.50	25.62
0+00.51	25.12
0+05.51	25.12
0+05.52	25.62
0+06.02	25.62

FLUME #3 - 25-YEAR
Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #3
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	6.20 cfs

Options	
Current Roughness Method	Used Lotter's Method
Open Channel Weighting	Used Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	25.96 ft
Elevation Range	1.56 to 26.06
Flow Area	2.0 ft ²
Wetted Perimeter	5.80 ft
Top Width	5.02 ft
Actual Depth	0.40 ft
Critical Elevation	25.92 ft
Critical Slope	0.41 %
Velocity	3.09 ft/s
Velocity Head	0.15 ft
Specific Energy	26.11 ft
Froude Number	0.86
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.06
0+00.50	26.06
0+00.51	25.56
0+05.51	25.56
0+05.52	26.06
0+06.02	26.06

FLUME #4 - 25-YEAR Worksheet for Irregular Channel

Project Description

Worksheet	FLUME #4
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Channel Slope	0.30 %
Discharge	3.23 cfs

Options

Current Roughness Method	Used Lotter's Method
Open Channel Weighting	Used Lotter's Method
Closed Channel Weighting	Horton's Method

Results

Manning's Coefficient	0.013
Water Surface Elevation	26.09 ft
Elevation Range	26.12 to 26.32
Flow Area	1.3 ft ²
Wetted Perimeter	5.53 ft
Top Width	5.01 ft
Actual Depth	0.27 ft
Critical Elevation	26.05 ft
Critical Slope	0.45 %
Velocity	2.42 ft/s
Velocity Head	0.09 ft
Specific Energy	26.18 ft
Froude Number	0.83
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	26.32
0+00.50	26.32
0+00.51	25.82
0+05.51	25.82
0+05.52	26.32
0+06.02	26.32

FLUME #5 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #5
Flow Element	Irregular Chan
Method	Manning's Forr
Solve For	Channel-Depth

Input Data	
Channel Slope	0.30 %
Discharge	3.60 cfs

Options	
Current Roughness Method	aved Lotter's Method
Open Channel Weighting	aved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	26.33 ft
Elevation Range	26.05 to 26.55
Flow Area	1.4 ft ²
Wetted Perimeter	5.57 ft
Top Width	5.01 ft
Actual Depth	0.28 ft
Critical Elevation	26.30 ft
Critical Slope	0.44 %
Velocity	2.52 ft/s
Velocity Head	0.10 ft
Specific Energy	26.43 ft
Froude Number	0.83
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.55
0+00.50	26.55
0+00.51	26.05
0+05.51	26.05
0+05.52	26.55
0+06.02	26.55

FLUME #6 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #6
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	4.73 cfs

Options	
Current Roughness Method	used Lotter's Method
Open Channel Weighting Method	used Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	25.14 ft
Elevation Range	1.80 to 25.30
Flow Area	1.7 ft ²
Wetted Perimeter	5.68 ft
Top Width	5.01 ft
Actual Depth	0.34 ft
Critical Elevation	25.10 ft
Critical Slope	0.43 %
Velocity	2.79 ft/s
Velocity Head	0.12 ft
Specific Energy	25.26 ft
Froude Number	0.85
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.30
0+00.50	25.30
0+00.51	24.80
0+05.51	24.80
0+05.52	25.30
0+06.02	25.30

FLUME #7 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #7
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	6.44 cfs

Options	
Current Roughness Method	Wood's Method
Open Channel Weighting Method	Wood's Method
Closed Channel Weighting Method	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	25.23 ft
Elevation Range	1.82 to 25.32
Flow Area	2.1 ft ²
Wetted Perimeter	5.82 ft
Top Width	5.02 ft
Actual Depth	0.41 ft
Critical Elevation	25.19 ft
Critical Slope	0.41 %
Velocity	3.13 ft/s
Velocity Head	0.15 ft
Specific Energy	25.38 ft
Froude Number	0.86
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.32
0+00.50	25.32
0+00.51	24.82
0+05.51	24.82
0+05.52	25.32
0+06.02	25.32

FLUME #8 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #8
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	1.03 cfs

Options	
Current Roughness Method	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	26.26 ft
Elevation Range	26.13 to 26.63
Flow Area	0.7 ft ²
Wetted Perimeter	5.26 ft
Top Width	5.01 ft
Actual Depth	0.13 ft
Critical Elevation	26.24 ft
Critical Slope	0.54 %
Velocity	1.57 ft/s
Velocity Head	0.04 ft
Specific Energy	26.30 ft
Froude Number	0.76
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.63
0+00.50	26.63
0+00.51	26.13
0+05.51	26.13
0+05.52	26.63
0+06.02	26.63

FLUME #9 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #9
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	1.16 cfs

Options	
Current Roughness Method	aved Lotter's Method
Open Channel Weighting	aved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	26.26 ft
Elevation Range	1.12 to 26.62
Flow Area	0.7 ft ²
Wetted Perimeter	5.28 ft
Top Width	5.01 ft
Actual Depth	0.14 ft
Critical Elevation	26.24 ft
Critical Slope	0.53 %
Velocity	1.64 ft/s
Velocity Head	0.04 ft
Specific Energy	26.30 ft
Froude Number	0.77
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.62
0+00.50	26.62
0+00.51	26.12
0+05.51	26.12
0+05.52	26.62
0+06.02	26.62

FLUME #10 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data
Channel Slope 0.30 %
Discharge 0.78 cfs

Options
Current Roughness Method used Lotter's Method
Open Channel Weighting used Lotter's Method
Closed Channel Weighting used Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	26.31 ft
Elevation Range	26.20 to 26.70
Flow Area	0.6 ft ²
Wetted Perimeter	5.22 ft
Top Width	5.00 ft
Actual Depth	0.11 ft
Critical Elevation	26.29 ft
Critical Slope	0.57 %
Velocity	1.40 ft/s
Velocity Head	0.03 ft
Specific Energy	26.34 ft
Froude Number	0.74
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.70
0+00.50	26.70
0+00.51	26.20
0+05.51	26.20
0+05.52	26.70
0+06.02	26.70

FLUME #11 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #11
Flow Element	Irregular Chan
Method	Manning's Forr
Solve For	Channel-Depth

Input Data	
Channel Slo	0.30 %
Discharge	3.12 cfs

Options	
Current Roughness Method	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	25.96 ft
Elevation Range	1.70 to 26.20
Flow Area	1.3 ft ²
Wetted Perimeter	5.52 ft
Top Width	5.01 ft
Actual Depth	0.26 ft
Critical Elevation	25.93 ft
Critical Slope	0.45 %
Velocity	2.39 ft/s
Velocity Head	0.09 ft
Specific Energy	26.05 ft
Froude Number	0.83
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	26.20
0+00.50	26.20
0+00.51	25.70
0+05.51	25.70
0+05.52	26.20
0+06.02	26.20

FLUME #12 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #12
Flow Element	irregular Chan
Method	Manning's For
Solve For	Channel Depth

Input Data	
Channel Sk	0.30 %
Discharge	2.52 cfs

Options	
Current Roughness Method	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	25.65 ft
Elevation Range	25.42 to 25.92
Flow Area	1.1 ft ²
Wetted Perimeter	5.46 ft
Top Width	5.01 ft
Actual Depth	0.23 ft
Critical Elevation	25.62 ft
Critical Slope	0.47 %
Velocity	2.21 ft/s
Velocity Head	0.08 ft
Specific Energy	25.72 ft
Froude Number	0.81
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.92
0+00.50	25.92
0+00.51	25.42
0+05.51	25.42
0+05.52	25.92
0+06.02	25.92

FLUME #13 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #13
Flow Element	Irregular Chan
Method	Manning's Forr
Solve For	Channel.Depth

Input Data	
Channel Slope	0.30 %
Discharge	7.03 cfs

Options	
Current Roughness Method	used Lotter's Method
Open Channel Weighting	used Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	25.05 ft
Elevation Range	1.62 to 25.12
Flow Area	2.2 ft ²
Wetted Perimeter	5.87 ft
Top Width	5.02 ft
Actual Depth	0.43 ft
Critical Elevation	25.01 ft
Critical Slope	0.41 %
Velocity	3.23 ft/s
Velocity Head	0.16 ft
Specific Energy	25.22 ft
Froude Number	0.86
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.12
0+00.50	25.12
0+00.51	24.62
0+05.51	24.62
0+05.52	25.12
0+06.02	25.12

FLUME #14 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #14
Flow Element	Irregular Channel
Method	Manning's Form
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	4.99 cfs

Options	
Current Roughness Method	used Lotter's Method
Open Channel Weighting	used Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	24.84 ft
Elevation Range	24.49 to 24.99
Flow Area	1.8 ft ²
Wetted Perimeter	5.70 ft
Top Width	5.01 ft
Actual Depth	0.35 ft
Critical Elevation	24.80 ft
Critical Slope	0.42 %
Velocity	2.85 ft/s
Velocity Head	0.13 ft
Specific Energy	24.97 ft
Froude Number	0.85
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	24.99
0+00.50	24.99
0+00.51	24.49
0+05.51	24.49
0+05.52	24.99
0+06.02	24.99

FLUME #15 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #15
Flow Element	Irregular Chan:
Method	Manning's Forr
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	0.98 cfs

Options	
Current Roughness Method	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev	24.74 ft
Elevation Range	1.61 to 25.11
Flow Area	0.6 ft ²
Wetted Perimeter	5.26 ft
Top Width	5.01 ft
Actual Depth	0.13 ft
Critical Elevation	24.72 ft
Critical Slope	0.55 %
Velocity	1.54 ft/s
Velocity Head	0.04 ft
Specific Energy	24.77 ft
Froude Number	0.76
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	25.11
0+00.50	25.11
0+00.51	24.61
0+05.51	24.61
0+05.52	25.11
0+06.02	25.11

FLUME #16 - 25-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	FLUME #16
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.30 %
Discharge	4.19 cfs

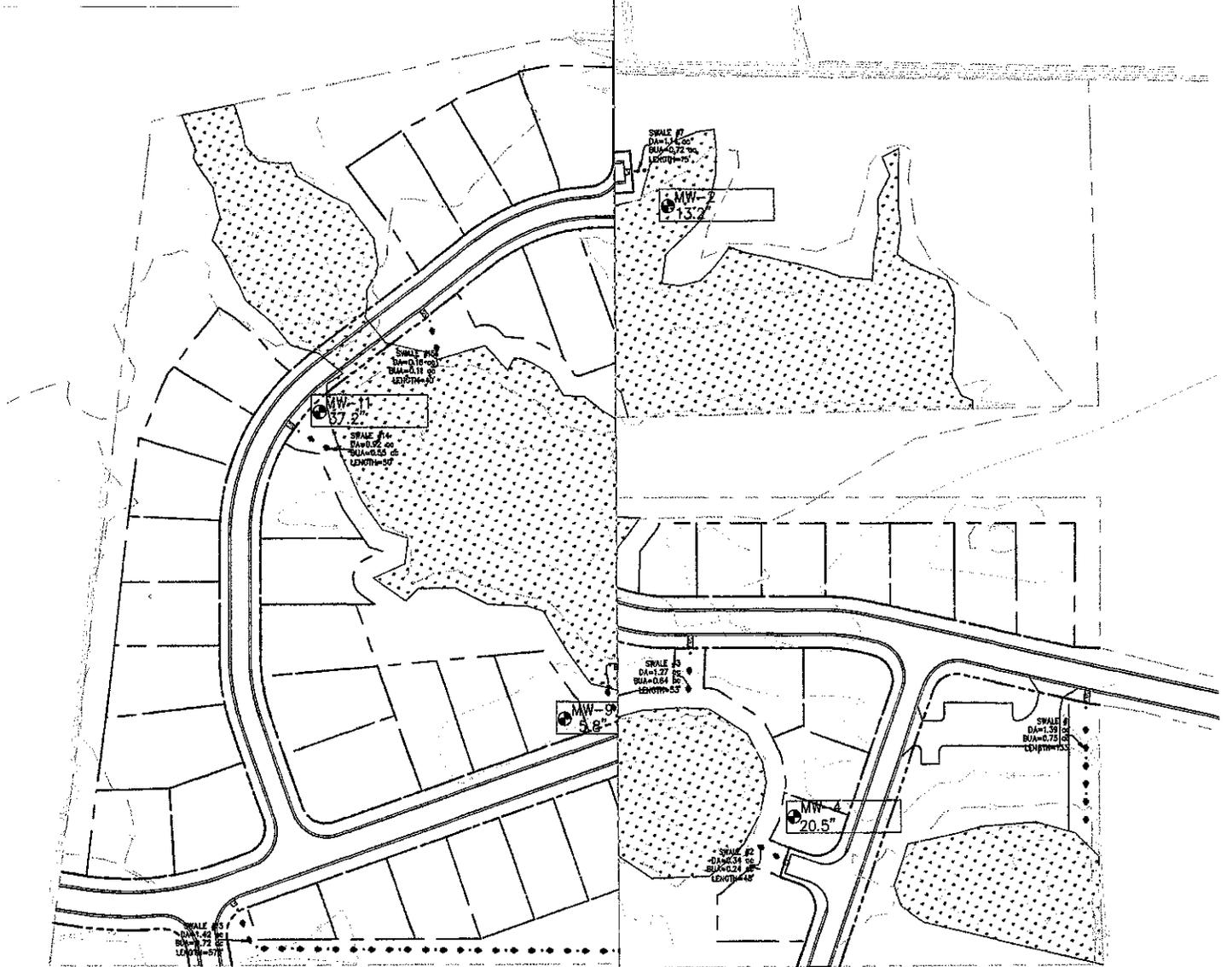
Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting	Improved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Manning's Coefficient	0.013
Water Surface Elevation	24.66 ft
Elevation Range	1.35 to 24.85
Flow Area	1.6 ft ²
Wetted Perimeter	5.63 ft
Top Width	5.01 ft
Actual Depth	0.31 ft
Critical Elevation	24.63 ft
Critical Slope	0.43 %
Velocity	2.67 ft/s
Velocity Head	0.11 ft
Specific Energy	24.77 ft
Froude Number	0.84
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+06.02	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	24.85
0+00.50	24.85
0+00.51	24.35
0+05.51	24.35
0+05.52	24.85
0+06.02	24.85

WATER TABLE DETERMINATIONS



DATES	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
14-Mar-08	-18.1			-20.6	-20.4	-21.8	-21.8	-12.7	-11.1		
15-Mar-08	-18.8			-21	-20.4	-23.1	-22.8	-14.4	-12.1		
16-Mar-08	-2.6			-14.6	-4	-5.1	-4.3	-4.8	-2.3		
17-Mar-08	-5.4			-16.1	-11.2	-9	-7.3	-6.1	-4.2		
18-Mar-08	-7.4			-16.5	-13	-11.2	-9.6	-6.9	-4.9		
19-Mar-08	-8.2			-16.7	-12.5	-11.6	-11.4	-6.2	-5		
20-Mar-08	-8			-16.9	-11.6	-11.1	-12	-5.9	-3.8		
21-Mar-08	-11.8			-17.7	-15.3	-15.3	-16.5	-8.4	-6.4		
22-Mar-08	-12.8			-18.1	-16	-16.1	-16.8	-9.1	-6.8		
23-Mar-08	-13.9			-19	-16.1	-17.8	-18.9	-10.4	-7.6		
24-Mar-08	-15.3			-19.6	-17.5	-18.9	-19.8	-12.1	-8.3		
25-Mar-08	-16.3			-20.9	-18	-20.7	-21.4	-13.6	-9.3		
26-Mar-08	-16.9			-21.4	-18.3	-21.3	-21.5	-14.4	-10.3		
27-Mar-08	-17.4			-22.1	-17.7	-22	-21.9	-15.3	-11.1		
28-Mar-08	-17.5			-22.7	-17.8	-22.3	-22.2	-16.1	-11.7		
29-Mar-08	-18.7			-23.5	-18.1	-23.8	-23.8	-18.3	-13.1		
30-Mar-08	-16.5			-23.3	-19	-24.2	-23.6	-13.5	-8		
31-Mar-08	-6.9			-17.3	-11.8	-13.3	-10.3	-5.5	-2.3		
1-Apr-08	-7.9			-16.5	-10.5	-11.9	-9.8	-5.8	-4.1		
2-Apr-08	-8.1			-16.5	-11	-11.6	-9.6	-5.8	-4.2		
3-Apr-08	-12			-17.2	-13.8	-15	-15.5	-7.7	-5.9		
4-Apr-08	-5.4			-15.5	-8	-8.3	-6.6	-5.5	-2.9		
5-Apr-08	-1			-14.2	-2.1	-5.3	-3.4	-2.8	0		
6-Apr-08	-3.5			-11.8	-5.5	-5.2	-5.3	-4.9	-2.4		
7-Apr-08	-5.1			-15.3	-9.2	-7.8	-7.4	-6.1	-3.3		
8-Apr-08	-6.6			-16.1	-11.2	-10.1	-9.5	-6.9	-4		
9-Apr-08	-7.7			-16.7	-12.1	-11.4	-11.5	-7.4	-4.5		
10-Apr-08	-8.5			-17.1	-12.6	-12.7	-13	-7.7	-4.9		
11-Apr-08	-9.5			-17.4	-12.8	-13.5	-14.2	-8.6	-5.6		
12-Apr-08	-10.2			-18.1	-13.8	-14.6	-15.1	-9	-5.9		
13-Apr-08	-11.9			-18.7	-15.3	-16.6	-17	-10.1	-6.9		
14-Apr-08	-14.3			-19.2	-17.2	-18.7	-18.9	-12.1	-8.2		
15-Apr-08	-15.3			-20.2	-17.9	-19.8	-20	-12.9	-8.8		
16-Apr-08	-16.8			-21.4	-18.5	-21.4	-21.4	-14.4	-10.1		
17-Apr-08	-17.7			-22.2	-18.8	-22.3	-22	-15.3	-11.4		
18-Apr-08	-18.7			-23.5	-18.4	-23.2	-22.7	-16.2	-12.5		
19-Apr-08	-19.2			-24.6	-18.7	-24.1	-23.1	-17.8	-13.6		
20-Apr-08	-19.5			-24.9	-19.1	-24.5	-22.9	-18.1	-11.8		
21-Apr-08	-19.4			-24.9	-19.5	-25.3	-23.7	-17.2	-13.7		
22-Apr-08	-5.2			-17.2	-9.3	-11	-5.7	-5.6	-2.4		
23-Apr-08	-10.2			-17.4	-13.5	-14.1	-10.1	-6.6	-4.6		
24-Apr-08	-13.6			-18.8	-15.8	-16.5	-14.6	-7.7	-6		
25-Apr-08	-15.6			-20.2	-17	-18.7	-17.4	-9	-7.2		
26-Apr-08	-17.4			-22	-17.9	-20.6	-19.3	-10.6	-8.3		
27-Apr-08	-19			-24	-18.3	-22.1	-20.9	-12	-9.6		
28-Apr-08	-19.8			-25.4	-19.1	-23.4	-21.7	-13.6	-10.8		
29-Apr-08	-20.3			-26.2	-19.7	-24.2	-22.8	-14.8	-11.8		
30-Apr-08	-21.6			-27.2	-20.9	-26.6	-24.6	-18.3	-14.6		
1-May-08	-22.5			-29.8	-21.9	-27.7	-25.5	-19.8	-16.3		
2-May-08	-23.2			-31.9	-22.2	-28.5	-26	-20.8	-17.5		
3-May-08	-23.7			-32.8	-22.4	-29.3	-26.3	-21.3	-18.5		
4-May-08	-24.2			-33.1	-22.5	-30.1	-27	-21.2	-18.6		
5-May-08	-25			-32.5	-23.3	-30.9	-27.7	-21.2	-19.6		
6-May-08	-23.2			-33.1	-23.7	-29.1	-25.7	-14.1	-12.5		
7-May-08	-24			-33.2	-24.4	-30.9	-27.7	-20.4	-17.2		

8-May-08	-25.3			-33.3	-25	-31.9	-28.4	-21.2	-19.4		
9-May-08	-26.1			-33.6	-25.5	-32.3	-28.6	-21.4	-20.2		
10-May-08	-26.9			-33.6	-26.1	-33.7	-30.1	-21.5	-22.4		
11-May-08	-27.8			-33.7	-26.9	-35	-31.2	-21.6	-23.5		
12-May-08	-16.4			-32.4	-25.9	-23.2	-18.5	-7.1	-5.9		
13-May-08	-20.1			-30.3	-26.2	-26.1	-23.4	-10.9	-10.1		
14-May-08	-22.6			-31.4	-26.4	-28.1	-25.7	-14.8	-13.8		
15-May-08	-23.7			-32.4	-26.5	-29.6	-26.8	-19.9	-16		
16-May-08	-24.7			-33.2	-26.4	-30.2	-27	-21.1	-17.4		
17-May-08	-25.9			-33.3	-26.3	-32.3	-29.4	-21.1	-19.5		
18-May-08	-26.9			-33.3	-27.2	-33.5	-29.9	-21.1	-21.3		
19-May-08	-27.9			-33.8	-27.7	-35	-31.5	-21.5	-23.3		
20-May-08	-28.7			-33.9	-28.1	-35.7	-32.2	-21.6	-23.8		
21-May-08	-28.8			-33.4	-28.6	-35.7	-33.2	-21.3	-24.4		
22-May-08	-28.9			-33.4	-29.4	-35.9	-34.1	-21.5	-26.3		
23-May-08	-29			-33.4	-30.3	-35.8	-34.6	-21.7			
24-May-08	-29.1			-33.7	-30.9	-35.8	-35.3	-22			
25-May-08	-29			-33.7	-31.5	-35.9	-35.8	-22			
26-May-08	-29.1			-33.6	-32.3	-35.9	-36.7	-22.1			
27-May-08	-29.1			-33.7	-33	-35.9	-37.2	-22.1			
28-May-08	-29.2			-34	-33.1	-35.9	-37.7	-22.5			
29-May-08	-28.9			-33.1	-32.9	-35.8	-37.8	-21.8			
30-May-08	-29			-32.8	-32.9	-35.9	-37.9	-21.9			
31-May-08	-29.1			-33.4	-33.1	-35.9	-38.1	-22.4			
1-Jun-08	-29.1			-33.8	-33.2	-35.9	-38.3	-22.5			
2-Jun-08	-28.9			-33.2	-33.2	-35.7	-38.1	-22.8			
3-Jun-08	-29			-32.6	-33.2	-35.9	-38.3	-22.4			
4-Jun-08	-29.1			-32.4	-33.1	-35.9	-38.4	-23.1			
5-Jun-08	-29.1			-33.4	-33.2	-35.9	-38.8	-23.3			
6-Jun-08	-29.1			-33.5	-33.3	-35.9	-39	-23.3			
7-Jun-08	-29.2			-33.6	-33.3	-35.9	-39.2	-23.3			
8-Jun-08	-29.2			-33.6	-33.3	-35.9	-39.5	-23.3			
9-Jun-08	-29.2			-33.7	-33.3	-35.9	-39.6	-23.4			
10-Jun-08	-29.2			-33.5	-33.3	-35.9	-39.6	-23.3			
11-Jun-08	-29.1			-33.4	-32.6	-36.1	-39.6	-23.3			
12-Jun-08	-29.1			-33.3	-32.5	-36.1	-39.6	-23.1			
13-Jun-08	-29.1			-33	-32.5	-36.1	-39.6	-23.1			
14-Jun-08	-29.1			-30.5	-32.4	-36.1	-39.6	-22.8			
15-Jun-08	-29.1			-30.6	-32.4	-36.1	-39.6	-22.9			
16-Jun-08	-20			-18.2	-19.3	-29.2	-26.1	-6.2			
17-Jun-08	-20.9			-16.9	-20.5	-26.4	-24.7	-10.3			
18-Jun-08	-22	-34.3	-40.8	-32.3	-22	-27.2	-26	-14.8			
19-Jun-08	-23.1	-35.1	-40.5	-33.1	-23.4	-28.7	-27.7	-20.9			
20-Jun-08	-24.1	-36.8	-41	-33.2	-24.8	-30.3	-29.3	-21.8			
21-Jun-08	-24.6	-36	-41.1	-32.4	-25.7	-30.4	-29.4	-21.5			
22-Jun-08	-19.1	-32.7	-40.9	-31.5	-26.3	-25.4	-23.1	-8.8			
23-Jun-08	-15.4	-30.7	-40.7	-30.5	-26.2	-19.7	-15.5	-5.7			
24-Jun-08	-18.5	-30.7	-40.2	-32.1	-26.4	-21.8	-20	-7.5			
25-Jun-08	-20.1	-31.8	-40.4	-31.6	-26.7	-24.5	-23.1	-10.4			
26-Jun-08	-21.6	-33.3	-40.6	-32.4	-27	-26.6	-24.6	-13	-18.2	-32.5	-31.2
27-Jun-08	-22.9	-35.8	-40.9	-33	-27.3	-28.7	-27.1	-17.1	-20.7	-33.7	-35.1
28-Jun-08	-23.9	-37.2	-41.1	-32.9	-27.9	-30.7	-29	-21.2	-22.6	-35.4	-37.5
29-Jun-08	-25	-37.9	-41.1	-33.1	-28.7	-32	-30.4	-22.1	-24.5	-37	-39.4
30-Jun-08	-25.8	-38.4	-41.1	-32.4	-29.3	-32.9	-31.2	-22.1	-25.3	-37.5	-39.9
1-Jul-08	-26.8	-38.9	-41.2	-32.6	-29.9	-34.2	-32.6	-22.1	-26.9	-39.1	-40.3
2-Jul-08	-27.5	-39	-41.4	-32.7	-30.3	-35.8	-34.1	-21.7	-27.9	-40	-41.4

3-Jul-08	-28.3	-39.1	-41.4	-32.8	-30.6	-36	-34.8	-21.8	-28.8	-40.8	-47.8
4-Jul-08	-28.7	-38.9	-41.2	-33	-30.8	-36	-35.8	-22.2	-29.6	-41.7	-47.7
5-Jul-08	-28.7	-38.8	-41.2	-33.2	-31.4	-36.1	-36.8	-22.5	-30.1	-42.3	-46.8
6-Jul-08	-28.7	-38.6	-41.2	-33.3	-31.9	-36	-37.7	-22.6	-30.9	-42.9	-47.3
7-Jul-08	-28.5	-38.4	-41.3	-32.4	-32	-35.9	-37.7	-21.6	-31	-43.1	-47.4
8-Jul-08	-28.6	-38.3	-41.1	-30.7	-32	-35.9	-37.9	-21.7	-31.3	-44.1	-48.1
9-Jul-08	-28.6	-38.4	-41	-31	-31.9	-36	-38	-22.2	-32.2	-45.4	-47.6
10-Jul-08	-28.5	-38.3	-40.9	-31.7	-31.9	-35.9	-38.1	-21.7	-32.6	-46	-49
11-Jul-08	-11.1	-33.5	-40.2	-30.5	-25.2	-20.8	-6.4	-4.3	-2.5	-16.7	-39.8
12-Jul-08	-6.6	-29.2	-40.3	-30.7	-25.6	-12.5	-5.1	-4.6	-2.2	-17.2	-38.8
13-Jul-08	-12.3	-29.6	-40.3	-30	-25.8	-16.5	-10.3	-5.7	-3.9	-20	-39.1
14-Jul-08	-14.3	-30.8	-40.3	-30.7	-26	-19.1	-14.6	-6.3	-4.8	-21.9	-40.2
15-Jul-08	-15.9	-32	-40.3	-32.1	-26.1	-21.2	-18.1	-8.3	-6.1	-23.6	-41.1
16-Jul-08	-17.1	-33.1	-40.3	-31.4	-26.2	-23	-20.4	-10.3	-6.8	-24.9	-42.7
17-Jul-08	-18.3	-35.3	-40.9	-32.2	-26.7	-24.9	-22.2	-12.4	-8.3	-26.8	-42.6
18-Jul-08	-18.9	-36.6	-41.5	-32.4	-26.9	-27.2	-23.6	-15.8	-9.4	-28.6	-43.2
19-Jul-08	-19.4	-37.2	-41.4	-31.3	-27.3	-28.4	-24.8	-17	-11.2	-29.4	-44.2
20-Jul-08	-0.2	-19	-31.4	-14.4	-12.5	-1.2	-1.9	-3.5	0	-16.8	-37.6
21-Jul-08	-1	-19.8	-32.5	-15.8	-15.8	-4	-4.2	-4.8	-1.4	-17.6	-37.7
22-Jul-08	-2.1	-22.9	-35.5	-19.8	-17.7	-7.2	-6.2	-5.3	-2.4	-18.7	-31.8
23-Jul-08	-3.5	-24.8	-37.4	-25.7	-18.3	-11.5	-9.6	-5.7	-3.3	-20	-33.1
24-Jul-08	-0.8	-24.9	-37.9	-28.3	-18.9	-6.2	-4.5	-4.3	-0.9	-17.6	-30.9
25-Jul-08	-3	-25.8	-38.4	-29.8	-19.6	-11.4	-8.9	-5.5	-3	-19.3	-33.2
26-Jul-08	-4.9	-26.6	-39	-31.2	-20.1	-14.4	-12.3	-6.2	-3.7	-19.9	-34.6
27-Jul-08	-1.6	-25	-39.2	-30.9	-20.1	-9	-6.4	-5	-2.4	-18	-34.2
28-Jul-08	-3.1	-25.9	-39.4	-31.7	-20	-12.9	-10.1	-5.5	-3.2	-18.8	-32.8
29-Jul-08	-5.5	-27.3	-39.8	-32.4	-20	-16.2	-14	-5.9	-4.2	-19.8	-34.7
30-Jul-08	-7.1	-28.2	-39.9	-32.7	-20.1	-17.7	-16.5	-7.7	-5.3	-20.7	-35.9
31-Jul-08	-8.8	-29.3	-40	-32.8	-20.7	-19.5	-18.5	-9.2	-6	-21.7	-37.5
1-Aug-08	-1.6	-26.9	-39.9	-30.9	-20.7	-8.2	-4.9	-4.6	-1.9	-17.8	-33.8
2-Aug-08	-2.4	-26.7	-40.1	-30.9	-20.9	-10.7	-6.2	-5.1	-2.6	-17.9	-34.4
3-Aug-08	-5.3	-28.6	-40.1	-32	-21.2	-15.2	-11.4	-5.9	-4	-19.5	-35.3
4-Aug-08	-8.1	-30	-40.3	-32.6	-21.8	-18.1	-15.8	-7.2	-5	-20.4	-36.3
5-Aug-08	-10.3	-30.9	-40.2	-33.1	-22	-20.1	-18.7	-9.2	-6.2	-21	-37.3
6-Aug-08	-12.4	-32.2	-40.2	-33.3	-22.1	-21.7	-20.7	-12.3	-7.5	-23.4	-38.7
7-Aug-08	-14.2	-34.5	-40.3	-33.3	-22.9	-23.5	-22.2	-15.6	-10.1	-25.9	-40.4
8-Aug-08	-8.6	-35.3	-40.2	-31.9	-23.7	-22.3	-20.1	-8.2	-3.9	-21.1	-36.9
9-Aug-08	-13.8	-35.8	-40.4	-30.9	-24.9	-23.5	-21.8	-12.9	-8.7	-24.4	-39.6
10-Aug-08	-16.3	-36.6	-40.5	-29.8	-25.6	-25.5	-23.5	-17.1	-11.7	-26.8	-42
11-Aug-08	-1.6	-32	-40.3	-30.3	-25.9	-12.6	-4.4	-3.3	-0.5	-17.2	-37.6
12-Aug-08	-8.3	-31.3	-40.4	-30.5	-26.1	-15.4	-10.4	-5.7	-4.4	-19.8	-39
13-Aug-08	-3.2	-32.3	-40.3	-31.7	-26.1	-12.7	-5.3	-4	-0.8	-17.4	-37.4
14-Aug-08	-0.1	-21.8	-40	-16.7	-14.7	-2.7	-2.9	-3.8	-0.7	-17.2	-37.8
15-Aug-08	-0.9	-21.5	-39.7	-18.7	-17	-5.7	-5.2	-4.7	-2.4	-17.6	-37.5
16-Aug-08	-1.7	-22.9	-39.3	-24.4	-18.2	-8.8	-7.2	-5.1	-3.1	-17.8	-38.5
17-Aug-08	-2.8	-23.9	-39.4	-29	-18.7	-11.2	-9.6	-5.5	-3.7	-18.2	-39.6
18-Aug-08	2	-16	-30.8	-16.2	-8.4	-1.5	-2.7	-3.6	-0.2	-16.2	-38.4
19-Aug-08	1.6	-17.1	-32	-17	-12	-3.4	-4.5	-4.3	-1.6	-16.1	-38.5
20-Aug-08	0.9	-19	-34	-20.1	-14.5	-5.5	-6.2	-4.8	-2.5	-16.1	-38.7
21-Aug-08	0.5	-20.7	-35.4	-24.1	-16	-7.6	-7.9	-4.9	-3.1	-15.9	-39
22-Aug-08	-0.3	-21.8	-36.7	-27.2	-16.8	-9.8	-9.8	-5.1	-3.4	-16	-38.6
23-Aug-08	-1	-22.8	-37.6	-30.7	-17.4	-11.2	-11.7	-5.6	-4.1	-16.6	-38.7
24-Aug-08	-2.3	-24.1	-38.2	-33.1	-17.9	-13.7	-13.5	-6.6	-5.4	-17.1	-39.4
25-Aug-08	-3.8	-25	-38.9	-33.7	-18.7	-15.4	-15.3	-8.1	-6.4	-17.4	-39.8
26-Aug-08	-4.8	-25.2	-39.3	-33.2	-19	-15.7	-15.5	-8.1	-6.6	-17.5	-40.1
27-Aug-08	-5.7	-25.7	-39.6	-33.4	-19.2	-16.5	-16.1	-8.5	-6.9	-17.4	-40

28-Aug-08	3.7	-12.2	-22.4	-14.3	-1.8	0	-2.1	-2.6	0	-13.3	-37.1
29-Aug-08	4.2	-9.6	-19.6	-14.2	-0.4	0.9	-2	-1.7	0.6	-11.9	-37.1
30-Aug-08	3.8	-11.6	-24.3	-15	-5.1	-0.9	-3.4	-2.1	-0.3	-12.1	-37.5
31-Aug-08	3.4	-13.7	-27.1	-16.4	-8.4	-2.2	-4.2	-2.5	-1.1	-12.5	-37.7
1-Sep-08	2.8	-15.5	-28.6	-17.9	-10.8	-3.2	-4.9	-3	-1.8	-13.1	-38
2-Sep-08	1.9	-17.7	-30.3	-18.9	-13.5	-4.9	-5.9	-3.8	-2.7	-13.6	-38.5
3-Sep-08	1.2	-19.6	-32.1	-20.9	-15.7	-6.8	-6.7	-4.3	-3.3	-14.1	-38.9
4-Sep-08	0.4	-21.4	-33.5	-23.1	-16.4	-8.7	-7.8	-4.8	-4	-14.5	-39.4
5-Sep-08	-0.3	-22.5	-34.2	-27.4	-16.9	-9.9	-8.1	-4.7	-4.4	-14.5	-39.5
6-Sep-08	4.6	-7.4	-11.3	-11.6	1.7	1.9	-0.4	-0.2	1.9	-10	-37.9
7-Sep-08	4.2	-9.5	-18.5	-13.3	-2.4	-0.3	-1.8	-0.7	0.9	-10.6	-38.3
8-Sep-08	3.7	-11.1	-22	-15	-5.7	-1.4	-2.6	-1.1	0.1	-11.3	-38.5
9-Sep-08	3.5	-13.2	-24	-16.2	-7.4	-2.3	-3.2	-1.3	-0.1	-11.5	-38.7
10-Sep-08	2.9	-14.8	-25.8	-17.1	-9.1	-3.3	-3.9	-1.8	-0.9	-12.1	-39.1
11-Sep-08	4.3	-8.5	-14.2	-11.6	0	0.5	-1.3	-0.5	1.2	-10.3	-38.7
12-Sep-08	4	-9.6	-18.5	-14.2	-3.3	-0.7	-1.9	-0.8	0.2	-10.7	-37.6
13-Sep-08	3.9	-11.4	-20.9	-15	-5.5	-1.6	-2.7	-1	0	-11.1	-37.9
14-Sep-08	3.4	-13.5	-23.1	-16.3	-7.2	-2.5	-3.3	-1.2	-0.5	-11.5	-38.3
15-Sep-08	2.9	-15.4	-25	-17.5	-9.5	-3.4	-3.8	-1.5	-1.1	-11.7	-38.4
16-Sep-08	2.1	-17.4	-27	-19	-11.9	-4.6	-4.6	-2.1	-1.8	-12.4	-35.6
17-Sep-08	1.6	-17	-27.4	-18.9	-12.1	-5.6	-4.8	-2.4	-2.1	-12.6	-36
18-Sep-08	0.9	-19.1	-28.7	-20.1	-13.8	-7.3	-5.6	-3.1	-2.9	-13.2	-36.2
19-Sep-08	0	-20.8	-30.1	-22	-15.6	-9.5	-6.5	-3.6	-3.8	-13.8	-36.8
20-Sep-08	-1.2	-21.8	-30.8	-22.7	-16.6	-11.2	-7.5	-4.2	-4.7	-14.3	-37.4
21-Sep-08	-2.2	-22.2	-31.3	-23.9	-16.9	-11.9	-8.3	-4.4	-5.1	-14.5	-37.7
22-Sep-08	-2.5	-22.6	-31.6	-25.8	-16.9	-12.2	-7.9	-3.9	-3.8	-14.4	-38.2
23-Sep-08	-4.5	-22.9	-32	-26.9	-17.2	-13.2	-9.1	-4.8	-5.6	-14.8	-38.1
24-Sep-08	-7.3	-23.8	-32.9	-29.3	-17.9	-14.9	-10.6	-5.3	-6.8	-15.4	-38.7
25-Sep-08	-8.7	-24.4	-33.1	-30.2	-18.3	-14.9	-11.1	-5.5	-6.7	-15.9	-39.5
26-Sep-08	5.2	-0.5	-7.5	-4.9	1.8	2.2	0	1.1	2.1	-9.2	-33.9
27-Sep-08	4.7	-1.2	-10.2	-7.4	0.5	1.2	-0.9	0.5	1.3	-9.6	-35
28-Sep-08	4.2	-2.9	-12.7	-10.9	-1.8	-0.1	-1.6	-0.2	0.6	-10.3	-34.6
29-Sep-08	3.9	-4.7	-15.4	-13.7	-3.6	-0.9	-1.9	-0.7	0	-10.7	-35
30-Sep-08	3.6	-6.2	-16.6	-14.9	-4.9	-1.7	-2.2	-1	-0.3	-11	-35.1
1-Oct-08	3.3	-6.6	-17.2	-15.2	-5.3	-2.2	-2.7	-1.1	-0.6	-11.2	-35.5
2-Oct-08	2.5	-8.7	-19	-16.4	-7.7	-3.3	-3.5	-1.5	-1.4	-11.9	-35.9
3-Oct-08	2.2	-10.1	-20.7	-16.9	-9.5	-4.5	-4.2	-1.9	-2.2	-12.4	-36.2
4-Oct-08	1.4	-11.7	-22.1	-17.7	-11.4	-5.9	-4.8	-2.1	-2.9	-12.9	-36.7
5-Oct-08	0.7	-13.2	-22.8	-18.3	-12.4	-7.3	-5.5	-2.7	-3.5	-13.3	-37.4
6-Oct-08	-0.3	-14.5	-23.5	-19.4	-13.2	-8.7	-6.1	-3.3	-4.2	-13.7	-37.7
7-Oct-08	-1.3	-15.5	-24.4	-20.2	-13.3	-10.1	-6.7	-3.6	-4.8	-14	-38.3
8-Oct-08	-3.3	-16.4	-24.8	-20.9	-14.6	-11.4	-7.8	-4.1	-5.7	-14.4	-38.8
9-Oct-08	-4.1	-17.2	-24.8	-21.6	-14.3	-11.5	-7.9	-3.8	-5.8	-14.4	-39.2
10-Oct-08	-4.8	-17.4	-24.5	-21.2	-13.7	-11.4	-7.9	-3.9	-5.5	-13.9	-38.7
11-Oct-08	3.1	-8.9	-7.1	-15.9	0.4	0.9	0.4	-0.6	1.5	-11.6	-32.7
12-Oct-08	4.2	-2.9	-8.3	-5.8	1.5	1.7	-0.9	-0.2	1.2	-10.1	-33.2
13-Oct-08	3.7	-3.8	-11.2	-9.1	-1.1	-0.1	-2	-0.7	0.4	-10.7	-32.1
14-Oct-08	3.4	-5.4	-12.8	-12.7	-3.3	-1.1	-2.4	-1.2	-0.2	-11.2	-32.3
15-Oct-08	3.1	-6.6	-14.4	-15.2	-5.1	-2.1	-3	-1.4	-0.6	-11.6	-32.8
16-Oct-08	2.9	-8.4	-15.7	-16.1	-6.2	-2.9	-3.5	-1.6	-1.2	-12	-33.1
17-Oct-08	3.2	-9.8	-16.8	-16.8	-7.1	-3.6	-3.8	-1.8	-1.7	-12.3	-33.7
18-Oct-08	2.5	-10.7	-15.9	-16	-5.4	-2.8	-2.9	-1.8	-1	-12.4	-34.1
19-Oct-08	2.4	-9.4	-13.5	-13.1	-2.8	-1.4	-2.2	-1.4	-0.6	-12	-33.8
20-Oct-08	2.1	-10.6	-16.3	-16.6	-6.9	-3.5	-3.8	-1.9	-1.7	-12.6	-34
21-Oct-08	1.6	-11.9	-17.5	-17.4	-8.8	-5	-4.7	-2.3	-2.4	-13.1	-34.4
22-Oct-08	0.9	-13.2	-19	-17.9	-9.8	-6	-5	-2.4	-3	-13.3	-34.7

23-Oct-08	-0.2	-14.5	-20.4	-18.7	-12.2	-7.9	-6	-3.3	-3.7	-13.8	-35.3
24-Oct-08	-1	-15	-20.5	-19.2	-12.1	-9.1	-6.5	-3.5	-4.1	-13.9	-35.6
25-Oct-08	4.6	-6.9	-7.7	-8.1	0.3	0.3	-0.9	-0.9	0.5	-11.3	-33.1
26-Oct-08	3.2	-7	-12	-11.9	-2.2	-1.4	-2.5	-1.7	-0.7	-12	-33.1
27-Oct-08	2.4	-8.7	-13.9	-15.5	-4.8	-2.8	-3.6	-2	-1.2	-12.4	-33.7
28-Oct-08	1.9	-10.2	-15.5	-16.8	-7.1	-4	-4.4	-2.4	-2.1	-13	-34.1
29-Oct-08	1.1	-11.8	-17	-17.6	-9.2	-5.4	-5.2	-2.7	-2.9	-13.4	-34.7
30-Oct-08	0.3	-13.3	-18.8	-18.4	-10.4	-7	-5.9	-3.2	-3.5	-13.8	-35.4
31-Oct-08	-0.7	-14.5	-19.8	-19.1	-11.9	-8.8	-6.6	-3.8	-4.1	-14.2	-36
1-Nov-08	-1.9	-15	-19.9	-19.7	-12.1	-9.9	-7.1	-4	-4.6	-14.4	-36.2
2-Nov-08	-2.9	-15.5	-20.5	-20.1	-12.4	-10.9	-7.5	-3.7	-5	-14.7	-36.5
3-Nov-08	-3.6	-16	-21.1	-21.1	-13.1	-11.4	-8.2	-3.8	-5.3	-14.5	-36.7
4-Nov-08	4.2	-7.7	-9.6	-9.2	0.1	-0.2	-1.6	-1.4	-0.1	-12.2	-33.9
5-Nov-08	4.1	-7.5	-11.9	-11.4	-1.7	-1.4	-2.4	-1.4	-0.7	-12.2	-34.4
6-Nov-08	2.7	-9	-13.4	-14.6	-4	-2.9	-3.6	-2.1	-1.5	-12.7	-34.4
7-Nov-08	2.3	-10.4	-14.6	-15.8	-5.9	-4	-4.4	-2.5	-2.2	-12.9	-34.8
8-Nov-08	2.1	-11.4	-15.4	-16.4	-6.4	-5	-4.7	-2.6	-2.5	-13.1	-35.2
9-Nov-08	0.8	-12.5	-16.8	-17.4	-9.2	-6.4	-5.7	-3.4	-3.3	-13.6	-35.7
10-Nov-08	-0.2	-14	-18.2	-18.4	-10.9	-8.3	-6.6	-3.9	-3.8	-14	-36.3
11-Nov-08	-1.6	-14.9	-19.2	-19.1	-12.1	-9.9	-7.4	-4.3	-4.5	-14.3	-36.8
12-Nov-08	-2.9	-15.1	-19.4	-19.5	-12.5	-11.1	-8	-4.4	-5	-14.4	-37.2
13-Nov-08	0.8	-12.7	-12.4	-18.7	-3.9	-5.1	-3.7	-2.1	0.1	-13.1	-35.4
14-Nov-08	5.6	0	-7.7	-1.1	1.1	1.6	-0.4	-0.1	1.2	-9.6	-33.6
15-Nov-08	5.9	1.6	-7	1.9	1.2	1.9	-0.6	0.3	1.2	-9.3	-33.5
16-Nov-08	3.9	1.6	-8.4	-6.1	-0.1	0	-1.9	-0.4	0.2	-10.6	-34.2
17-Nov-08	3.2	1.4	-9	-9	-2.1	-1.1	-2.4	-0.8	-0.1	-11.3	-34.5
18-Nov-08	2.9	0.7	-9.2	-10.5	-3.5	-1.7	-2.5	-1.2	-0.7	-11.6	-34.7
19-Nov-08	2.2	0	-9.7	-13	-4.8	-2.6	-3.3	-1.7	-1.3	-12.2	-35.1
20-Nov-08	2	-0.1	-9.6	-13.5	-4.9	-3.1	-3.6	-2	-1.5	-12.4	-35.3
21-Nov-08	1.8	-1.5	-9.8	-14.6	-5.8	-3.7	-3.9	-2	-2	-12.7	-35.4
22-Nov-08	1.3	-2.6	-11.2	-16.1	-6.8	-4.7	-4.7	-2.5	-2.8	-13.1	-35.9
23-Nov-08	1.2	-3	-11	-16.4	-6.7	-5.3	-4.9	-2.5	-2.9	-13.3	-36.1
24-Nov-08	0.7	-3.5	-11	-16.7	-7	-5.9	-5.2	-2.7	-3.4	-13.5	-36.3
25-Nov-08	2.2	-3.1	-9.6	-15.9	-5.8	-5.6	-5	-2.4	-2.9	-13	-36.2
26-Nov-08	-0.1	-5.1	-11.6	-17	-7.2	-7.2	-5.7	-2.6	-4.1	-13.8	-36.5
27-Nov-08	-0.7	-5.7	-11.8	-17.2	-8	-8	-6.1	-3.3	-4.4	-14	-36.7
28-Nov-08	-1.2	-5.8	-11.1	-17.3	-7.6	-8.5	-6.2	-3.1	-4.6	-13.9	-36.8
29-Nov-08	-0.6	-5.5	-9.8	-16.6	-6.6	-8.1	-5.9	-3.2	-3.5	-13.2	-37
30-Nov-08	3.8	1.8	-5.4	1.6	0.9	1.4	0.1	-0.2	1.2	-10.6	-34.3
1-Dec-08	3.7	1.6	-7.4	-3	0	0.2	-1.7	-0.8	-0.1	-11.1	-35.1
2-Dec-08	2.8	1.5	-7.7	-7.7	-1.6	-1.1	-2.5	-1.2	-0.5	-11.7	-35.3
3-Dec-08	2.4	1.3	-7.9	-9	-2.9	-1.6	-2.9	-1.4	-1.1	-12	-35.7
4-Dec-08	2.3	1.3	-7.9	-10	-4	-2.2	-2.9	-1.7	-1.2	-12.2	-35.9
5-Dec-08	2.7	1.2	-7.8	-10.2	-4.1	-2.4	-3	-1.7	-1.2	-12.3	-35.8
6-Dec-08	1.8	0.7	-8	-11.6	-4	-3.3	-3.4	-2	-1.9	-12.7	-36
7-Dec-08	1.8	0.6	-8	-11.7	-4.1	-3	-3.7	-1.6	-2	-12.7	-36.3
8-Dec-08	1.3	-0.3	-8.3	-14.4	-6.4	-4.3	-4.5	-2.4	-2.7	-13.1	-36.6
9-Dec-08	1.7	-0.9	-8.1	-14	-5.8	-4.6	-4.5	-2.3	-2.6	-12.6	-36.8
10-Dec-08	3.3	0	-7.5	-12.6	-4.6	-4.2	-4.2	-1.8	-2	-11.6	-36.7
11-Dec-08	4.5	1.8	-6.6	0	0.6	0.5	-1.2	-1	0.3	-10.7	-34.8
12-Dec-08	4.6	4.2	-5	2.1	1	1.4	-0.7	-0.1	0.7	-10.3	-35
13-Dec-08	3.3	4	-5.1	-5.2	-0.4	-0.4	-2.1	-0.7	-0.2	-11.3	-35.8
14-Dec-08	3	4	-5.1	-7.2	-1.7	-1.2	-2.5	-1.1	-0.5	-11.6	-36.1
15-Dec-08	4.6	4.3	-4.8	-5.9	-2	-0.9	-2.2	-0.7	0	-11.1	-36.1
16-Dec-08	3.7	4.3	-4.9	-6.5	-2.1	-1	-2.2	-1.1	-0.8	-11.3	-36.1
17-Dec-08	4.2	4.4	-4.9	-5.9	-2.3	-0.9	-2.4	-1.4	-0.5	-11.4	-36.1

18-Dec-08	3.7	4.8	-4.9	-6.6	-2.9	-1.7	-2.6	-1.5	-1	-11	-36
19-Dec-08	3.8	4.6	-5	-7.2	-3.5	-2.1	-2.7	-1.6	-1.2	-11.2	-36.2
20-Dec-08	3.7	4.6	-5.1	-7.3	-3.5	-2.4	-2.9	-1.7	-1.5	-11.5	-36
21-Dec-08	4.2	4.4	-4.9	-7.1	-3.5	-2.6	-2.8	-1.7	-1.6	-11	-36.1
22-Dec-08	2.2	3.1	-6	-10.9	-5.5	-3.7	-4	-2.2	-2.4	-12.5	-36.7
23-Dec-08	1.6	2.9	-6.1	-13	-6.4	-4.8	-4.7	-2.5	-3.1	-13	-37.5
24-Dec-08	2.8	3.3	-5.9	-11.3	-5.3	-4.8	-4.5	-2.4	-2.7	-12.3	-37.4
25-Dec-08	3.4	3.7	-5.9	-10.7	-5	-4.7	-4.4	-2.3	-2.6	-11.7	-36.8
26-Dec-08	2.9	2.7	-6	-8.3	-3	-3	-3.2	-2.1	-2.2	-12.5	-36.8
27-Dec-08	2.9	2.7	-6.1	-9.7	-4	-3.8	-3.8	-2.1	-2.3	-12.7	-36.9
28-Dec-08	4.2	3.7	-5.7	-5.8	-2.2	-2.6	-2.7	-1.7	-0.9	-11.7	-36.4
29-Dec-08	3.7	3	-5.9	-7.3	-3.6	-3.7	-3.8	-2.2	-2.1	-11.8	-36.2
30-Dec-08	2.8	2.7	-5.6	-6.4	-1.2	-1.6	-2.7	-1.9	-1.2	-12.2	-35.5
31-Dec-08	2.9	2.8	-5.6	-7.7	-2.9	-2.5	-3	-2	-1.5	-12.3	-35.7
1-Jan-09	1.6	1.9	-5.9	-12.1	-6	-4.4	-4.5	-2.6	-2.8	-13	-36.6
2-Jan-09	1.4	2	-6	-12.3	-5.9	-5.1	-4.9	-2.8	-3.1	-13.3	-36.8
3-Jan-09	2	2.2	-5.9	-12.2	-5.3	-5.2	-4.6	-2.1	-2.4	-13.3	-36.7
4-Jan-09	1.8	2.1	-6	-12.8	-5.6	-5.9	-5	-2.4	-3.1	-13.4	-36.7
5-Jan-09	3.5	3	-5.8	-7.1	-2.5	-3.1	-3	-2	-1.8	-12	-36.2
6-Jan-09	3.6	2.9	-5.8	-8.1	-4	-4	-4	-2.2	-2.5	-12.2	-35.9
7-Jan-09	3.5	1.3	-5.8	-8.7	-3.9	-4.5	-4	-2	-2.3	-11.9	-35.8
8-Jan-09	1.2	0.1	-6.6	-12.5	-6.1	-6	-5.1	-2.7	-3.4	-13.5	-36.6
9-Jan-09	0	-0.3	-6.9	-14.8	-7.6	-7.4	-5.8	-3.1	-4	-13.9	-37.2
10-Jan-09	-0.5	-0.5	-7	-15.2	-8.1	-8.6	-6.3	-3.6	-4.4	-14	-37.6
11-Jan-09	1.2	0.1	-6.4	-9.6	-4.6	-7.2	-4.9	-2.8	-2.3	-13.2	-36.1
12-Jan-09	0.1	-0.5	-7.2	-11.6	-5.4	-5.8	-4.6	-2.9	-3.5	-13.9	-36.9
13-Jan-09	-0.9	-1.5	-7.3	-13.6	-6.6	-7.6	-5.7	-3.5	-3.9	-14.1	-37.2
14-Jan-09	1.8	0	-6.6	-7.5	-1.3	-2.6	-2.8	-2.5	-1.7	-13.3	-36.9
15-Jan-09	1.6	0	-6.7	-10	-3.8	-4.1	-3.6	-2.7	-2.5	-13.5	-37
16-Jan-09	0.3	-0.7	-6.9	-13.6	-6.4	-5.6	-4.7	-3	-3.5	-13.9	-37.6
17-Jan-09	-0.9	-1.8	-7.2	-14.6	-6.8	-6.9	-5.7	-3.6	-4.2	-14.2	-38.1
18-Jan-09	-0.7	-1.8	-6.8	-13.1	-5.7	-7.2	-5.3	-3.5	-3.7	-14.2	-38.4
19-Jan-09	1.6	-0.1	-6.6	-5.5	-0.9	-2.3	-2.5	-2.4	-1.5	-13.4	-37.7
20-Jan-09	2	0	-6.4	-5.7	-1.7	-2.3	-2.6	-2.2	-1.1	-13.2	-37.5
21-Jan-09	1.2	-0.5	-6.7	-9.6	-4.1	-3.6	-4	-2.8	-2.4	-13.5	-38
22-Jan-09	1.1	-0.5	-6.8	-11	-5.1	-4.6	-4.6	-3	-3	-13.7	-38.4
23-Jan-09	1.3	-0.5	-6.8	-11.5	-5.5	-5.2	-4.8	-2.9	-3.1	-13.7	-38.6
24-Jan-09	1.8	-0.5	-6.6	-10.3	-5.3	-5.6	-4.9	-2.8	-3.1	-13.5	-38.2
25-Jan-09	0.7	-1.7	-6.8	-12.2	-4.7	-5.3	-4.8	-2.4	-2.9	-13.8	-38.3
26-Jan-09	0	-2.1	-6.9	-13.8	-6.4	-7.2	-5.7	-3	-3.9	-14	-38.6
27-Jan-09	-0.1	-2.1	-6.7	-13.3	-6.1	-7.4	-5.4	-3.1	-3.4	-14	-38.7
28-Jan-09	0.7	-1.8	-6.4	-9.3	-4	-5.8	-4.5	-2.9	-2.4	-13.4	-38.7
29-Jan-09	2.7	-0.5	-5	-0.2	-0.3	-2.8	-1.3	-1.7	0.3	-12.7	-36.7
30-Jan-09	2.4	0	-6.1	-5.5	-0.5	-1.8	-2.8	-2.4	-1.3	-12.7	-37.8
31-Jan-09	2	0	-6.2	-8.3	-3.1	-2.9	-3.7	-2.6	-2	-13	-38
1-Feb-09	1.8	-0.1	-6.2	-9.8	-4.9	-3.9	-4.4	-2.7	-2.4	-13.1	-38.3
2-Feb-09	1.7	-0.1	-6.2	-9.9	-5.3	-4.5	-4.6	-2.5	-2.9	-13.3	-38.3
3-Feb-09	2.5	0	-5.9	-3.7	-1.4	-1.5	-2.1	-1.8	-1.3	-12.9	-37.9
4-Feb-09	1.7	-0.1	-6.2	-9	-4.3	-3.7	-4.2	-2.7	-2.4	-13.2	-38.4
5-Feb-09	1	-0.6	-6.4	-12.4	-6.4	-5.1	-5.2	-3.1	-3.4	-13.6	-38.9
6-Feb-09	-0.1	-1	-6.5	-13.4	-6.8	-6.1	-5.8	-3.4	-4	-13.9	-39.1
AVERAGES	-7.54	-13.19	-21.24	-20.54	-14.36	-13.68	-13.05	-7.97	-5.82	-15.98	-37.18
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 401 CERTIFICATION APPLICATION FORM
 GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	1

II. DESIGN INFORMATION

Site Characteristics

Drainage area	60,631.00 ft ²
Impervious area	32,605.00 ft ²
Percent impervious	53.8% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	6.30 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm) 3.50 ft/sec

Soil characteristics (enter "x" below)

Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	

Grass Type (enter "x" below)

Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

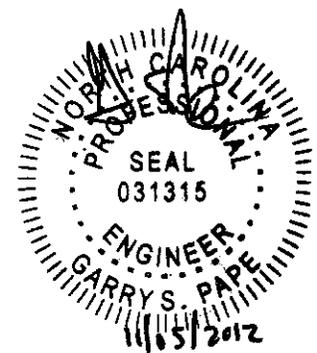
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.97		OK
Side slopes	5.00	:1	OK
Swale length	133.00	ft	OK

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

26.00 fmsl

What is the elevation of the bottom of the swale?

25.19 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2a
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2a
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calc.

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 401 CERTIFICATION APPLICATION FORM
 GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	2

II. DESIGN INFORMATION

Site Characteristics

Drainage area	14,668.00 ft ²
Impervious area	10,628.00 ft ²
Percent impervious	72.5% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	1.84 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
---	-------------

Soil characteristics (enter "x" below)

Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	

Grass Type (enter "x" below)

Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out *one* of the options below:

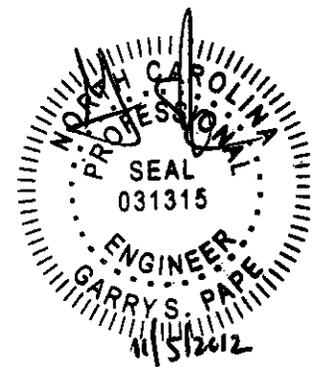
Option 1: Curb Outlet Swale:

	Y	(Y or N)
Maximum velocity	1.34	
Side slopes	5.00	:1
Swale length	48.00	ft

Option 2: Swale Seeking Poilutant Credit ("For-Credit" Swale):

		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft

OK
 OK
 Insufficient swale length.



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

25.11 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

II. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	3

II. DESIGN INFORMATION

Site Characteristics

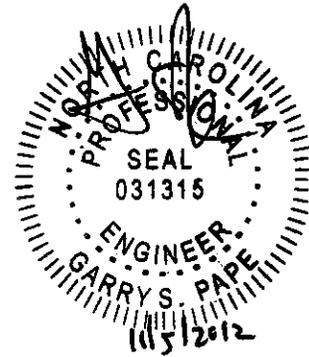
Drainage area	55,131.00 ft ²
Impervious area	27,678.00 ft ²
Percent impervious	50.2% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	5.50 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahia grass	
Kentucky bluegrass	
Grass-legume mixture	x



Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>	Y	(Y or N)	
Maximum velocity	1.89		OK
Side slopes	5.00	:1	OK
Swale length	53.00	ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		(Y or N)	
Maximum velocity for 10-yr storm			ft/sec
Side slopes			:1
Swale length			ft

Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

X

Parabolic

V-shaped

Width of the bottom of the swale

5.00 ft

Width of the top of the swale

8.00 ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

26.00 fmsl

What is the elevation of the bottom of the swale?

25.55 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2+
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2+
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calc

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	4

II. DESIGN INFORMATION

Site Characteristics

Drainage area	23,429.00 ft ²
Impervious area	16,277.00 ft ²
Percent impervious	69.5% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	2.86 ft ³ /sec

Velocity

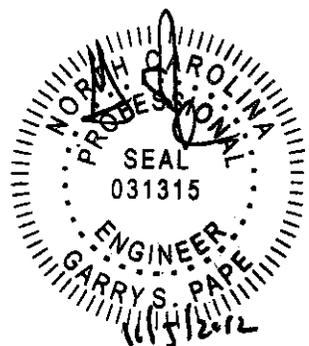
Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
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Soil characteristics (enter "x" below)

Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	

Grass Type (enter "x" below)

Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x



Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.54		OK
Side slopes	5.00	:1	OK
Swale length	25.00	ft	Insufficient swale length.

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)	
Maximum velocity for 10-yr storm			ft/sec
Side slopes		:1	
Swale length			ft

Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

26.00 fmsl

What is the elevation of the bottom of the swale?

25.81 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials Page/ Plan
 Sheet No.

AS

- 1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

- 2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

- 3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calc

- 4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

- 5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

- 6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	5

II. DESIGN INFORMATION

Site Characteristics

Drainage area	26,459.00 ft ²
Impervious area	18,038.00 ft ²
Percent impervious	68.2% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	3.19 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahagrass	
Kentucky bluegrass	
Grass-legume mixture	x

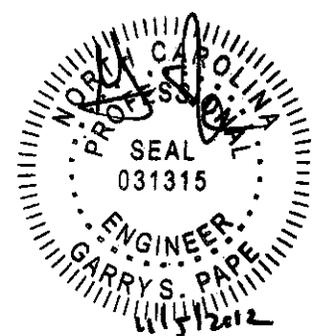
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.60		OK
Side slopes	5.00	:1	OK
Swale length	43.00	ft	Insufficient swale length.

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.75 fmsl

What is the elevation of the bottom of the swale?

26.04 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	6

II. DESIGN INFORMATION	
------------------------	--

Site Characteristics

Drainage area	35,859.00 ft ²
Impervious area	23,276.00 ft ²
Percent impervious	64.9% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	4.19 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahagrass	
Kentucky bluegrass	
Grass-legume mixture	x

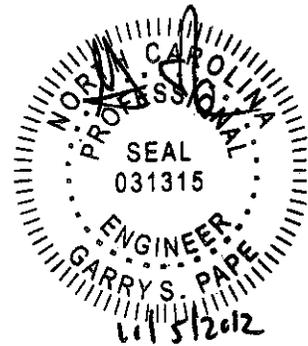
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.74		OK
Side slopes	5.00	:1	OK
Swale length	233.00	ft	OK

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)	
Maximum velocity for 10-yr storm			ft/sec
Side slopes			:1
Swale length			ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft #VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

24.79 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	7

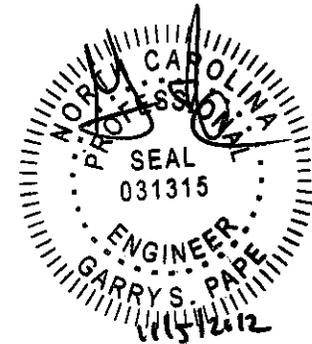
II. DESIGN INFORMATION	
------------------------	--

Site Characteristics	
Drainage area	49,574.00 ft ²
Impervious area	31,459.00 ft ²
Percent impervious	63.5% %
Design rainfall depth	1.50 inch

Peak Flow Calculations	
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	5.71 ft ³ /sec

Velocity	
Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec

Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x



Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>		
	Y	(Y or N)
Maximum velocity	1.91	OK
Side slopes	5.00 :1	OK
Swale length	15.00 ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft

Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

- Trapezoidal
- Parabolic
- V-shaped

Width of the bottom of the swale

Width of the top of the swale

X	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

What is the distance from the bottom of the swale to the SHWT?

What is the ground level elevation?

What is the elevation of the bottom of the swale?

What is the SHWT elevation?

What is the longitudinal slope of the swale?

What is the depth of freeboard?

y	(Y or N)	OK
y	(Y or N)	OK
#VALUE!	ft	
25.50	fmsl	
24.81	fmsl	
SEE ATTACHED	fmsl	
0.30	%	OK
0.50	ft	OK

#VALUE!

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

- | Initials | Page/ Plan Sheet No. | |
|-----------|------------------------------|---|
| <u>AS</u> | _____ | 1. Plans (1" = 50' or larger) of the entire site showing: <ul style="list-style-type: none"> - Design at ultimate build-out, - Off-site drainage (if applicable), - Delineated drainage basins (include Rational C coefficient per basin), - Swale dimensions (width, length, depth), - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Grass species, and - Boundaries of drainage easement. |
| <u>AS</u> | <u>C-6.2</u>
<u>C-6.3</u> | 2. Plan details (1" = 50' or larger) for the grassed swale showing: <ul style="list-style-type: none"> - Swale dimensions (width, length, depth), - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Design at ultimate build-out, - Grass species, - Off-site drainage (if applicable),and - Boundaries of drainage easement. |
| <u>AS</u> | <u>C-6.2</u>
<u>C-6.3</u> | 3. Section view of the grassed swale (1" = 20' or larger) showing: <ul style="list-style-type: none"> - Side slopes, - Longitudinal slope, - Freeboard - Swale dimensions, and - SHWT level(s) |
| <u>AS</u> | <u>Calc</u> | 4. Supporting calculations (including maximum velocity calculations for applicable storms) |
| <u>AS</u> | <u>Attached</u> | 5. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| <u>AS</u> | _____ | 6. A copy of the deed restrictions (if required). |

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	8

II. DESIGN INFORMATION

Site Characteristics

Drainage area	7,199.00 ft ²
Impervious area	5,324.00 ft ²
Percent impervious	74.0% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	0.92 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm) 3.50 ft/sec

Soil characteristics (enter "x" below)

Sand/silt (easily erodible) x

Clay mix (erosion resistant) _____

Grass Type (enter "x" below)

Bermuda _____

Tall fescue _____

Bahiagrass _____

Kentucky bluegrass _____

Grass-legume mixture x

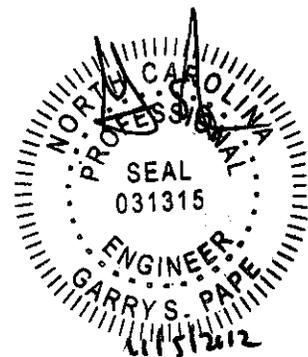
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	<u>Y</u>	(Y or N)	
Maximum velocity	<u>1.06</u>		OK
Side slopes	<u>5.00</u>	:1	OK
Swale length	<u>20.00</u>	ft	Insufficient swale length.

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

- Trapezoidal
- Parabolic
- V-shaped

Width of the bottom of the swale
 Width of the top of the swale

x
5.00
8.00

ft
ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

26.12 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

ASD

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

ASD

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

ASD

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

ASD

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

ASD

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

ASD

6. A copy of the deed restrictions (if required).

Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

26.00 fmsl

What is the elevation of the bottom of the swale?

26.11 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

VI. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calc

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 401 CERTIFICATION APPLICATION FORM
 GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	10

II. DESIGN INFORMATION	
------------------------	--

Site Characteristics

Drainage area	5,784.00 ft ²
Impervious area	3,864.00 ft ²
Percent impervious	66.8% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

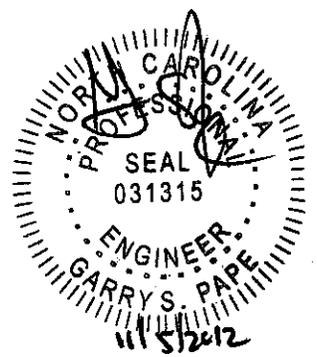
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	0.69 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>		
	Y	(Y or N)
Maximum velocity	0.96	OK
Side slopes	5.00 :1	OK
Swale length	104.00 ft	OK
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		
		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

- Trapezoidal
- Parabolic
- V-shaped

Width of the bottom of the swale
 Width of the top of the swale

x
5.00
8.00

ft
ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

26.19 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	11

II. DESIGN INFORMATION

Site Characteristics

Drainage area	23,368.00 ft ²
Impervious area	15,469.00 ft ²
Percent impervious	66.2% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	2.77 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm) 3.50 ft/sec

Soil characteristics (enter "x" below)

Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	

Grass Type (enter "x" below)

Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

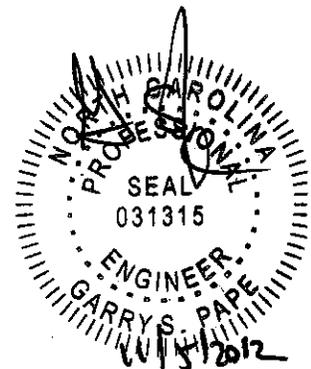
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.53		OK
Side slopes	5.00	:1	OK
Swale length	70.00	ft	Insufficient swale length.

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

- Trapezoidal
- Parabolic
- V-shaped

x	
5.00	ft
8.00	ft

Width of the bottom of the swale

Width of the top of the swale

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

24.75 fmsl

What is the elevation of the bottom of the swale?

25.69 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	12

II. DESIGN INFORMATION	
------------------------	--

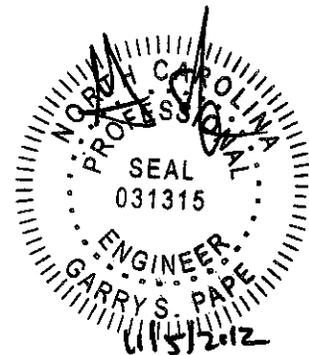
Site Characteristics	
Drainage area	19,074.00 ft ²
Impervious area	12,457.00 ft ²
Percent impervious	65.3% %
Design rainfall depth	1.50 inch

Peak Flow Calculations	
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	2.24 ft ³ /sec

Velocity	
Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>		
Maximum velocity	1.43	OK
Side slopes	5.00 :1	OK
Swale length	35.00 ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		
Maximum velocity for 10-yr storm		(Y or N)
Side slopes		ft/sec
Swale length		:1
		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

- Trapezoidal
- Parabolic
- V-shaped

X	
5.00	ft
8.00	ft

Width of the bottom of the swale

Width of the top of the swale

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.75 fmsl

What is the elevation of the bottom of the swale?

25.41 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 401 CERTIFICATION APPLICATION FORM
 GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
 The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	13

II. DESIGN INFORMATION

Site Characteristics

Drainage area	61,912.00 ft ²
Impervious area	31,552.00 ft ²
Percent impervious	51.0% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	6.23 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

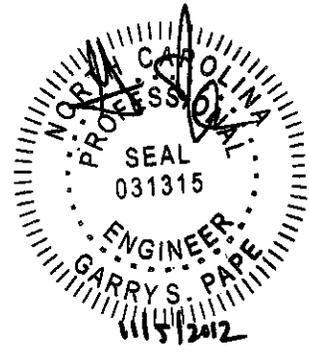
Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

	Y	(Y or N)	
Maximum velocity	1.96		OK
Side slopes	5.00	:1	OK
Swale length	573.00	ft	OK

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):

		(Y or N)	
Maximum velocity for 10-yr storm			ft/sec
Side slopes			:1
Swale length			ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.10 fmsl

What is the elevation of the bottom of the swale?

24.60 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	14

II. DESIGN INFORMATION

Site Characteristics

Drainage area	40,134.00 ft ²
Impervious area	23,797.00 ft ²
Percent impervious	59.3% %
Design rainfall depth	1.50 inch

Peak Flow Calculations

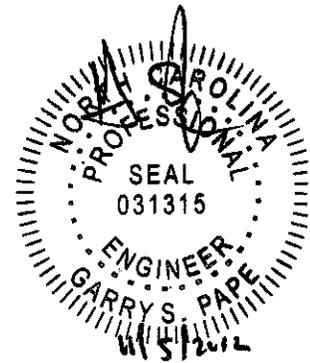
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	4.43 ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>		
	Y (Y or N)	
Maximum velocity	1.77	OK
Side slopes	5.00 :1	OK
Swale length	50.00 ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		
	(Y or N)	
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft #VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

25.11 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials	Page/ Plan Sheet No.	
<u>AS</u>	_____	1. Plans (1" = 50' or larger) of the entire site showing: <ul style="list-style-type: none"> - Design at ultimate build-out, - Off-site drainage (if applicable), - Delineated drainage basins (include Rational C coefficient per basin), - Swale dimensions (width, length, depth), - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Grass species, and - Boundaries of drainage easement.
<u>AS</u>	<u>C-6.2</u> <u>C-6.3</u>	2. Plan details (1" = 50' or larger) for the grassed swale showing: <ul style="list-style-type: none"> - Swale dimensions (width, length, depth), - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Design at ultimate build-out, - Grass species, - Off-site drainage (if applicable), and - Boundaries of drainage easement.
<u>AS</u>	<u>C-6.2</u> <u>C-6.3</u>	3. Section view of the grassed swale (1" = 20' or larger) showing: <ul style="list-style-type: none"> - Side slopes, - Longitudinal slope, - Freeboard - Swale dimensions, and - SHWT level(s)
<u>AS</u>	<u>Calcs</u>	4. Supporting calculations (including maximum velocity calculations for applicable storms)
<u>AS</u>	<u>Attached</u>	5. A copy of the signed and notarized operation and maintenance (O&M) agreement.
<u>AS</u>	_____	6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
 401 CERTIFICATION APPLICATION FORM
 GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
 The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	15

II. DESIGN INFORMATION	
------------------------	--

Site Characteristics	
Drainage area	7,000.00 ft ²
Impervious area	5,006.00 ft ²
Percent impervious	71.5% %
Design rainfall depth	1.50 inch

Peak Flow Calculations	
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	0.87 ft ³ /sec

Velocity	
Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out *one* of the options below:

<u>Option 1: Curb Outlet Swale:</u>		
	Y	(Y or N)
Maximum velocity	1.04	OK
Side slopes	5.00 :1	OK
Swale length	40.00 ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		
	Y	(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

AS

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable),and
 - Boundaries of drainage easement.

AS

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

*This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.*

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	15

II. DESIGN INFORMATION	
------------------------	--

Site Characteristics	
Drainage area	7,000.00 ft ²
Impervious area	5,006.00 ft ²
Percent impervious	71.5% %
Design rainfall depth	1.50 inch

Peak Flow Calculations	
10-yr storm runoff depth	6.72 in
10-yr storm intensity	7.23 in/hr
Post-development 10-yr storm peak flow	0.87 ft ³ /sec

Velocity	
Maximum non-erosive velocity (peak 10-year storm)	3.50 ft/sec
Soil characteristics (enter "x" below)	
Sand/silt (easily erodible)	x
Clay mix (erosion resistant)	
Grass Type (enter "x" below)	
Bermuda	
Tall fescue	
Bahiagrass	
Kentucky bluegrass	
Grass-legume mixture	x

Swale type: Fill out <i>one</i> of the options below:		
<u>Option 1: Curb Outlet Swale:</u>		
	Y	(Y or N)
Maximum velocity	1.04	OK
Side slopes	5.00 :1	OK
Swale length	40.00 ft	Insufficient swale length.
<u>Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale):</u>		
		(Y or N)
Maximum velocity for 10-yr storm		ft/sec
Side slopes		:1
Swale length		ft

Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

25.50 fmsl

What is the elevation of the bottom of the swale?

25.23 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials Page/ Plan
 Sheet No.

ASD

1. Plans (1" = 50' or larger) of the entire site showing:
 - Design at ultimate build-out,
 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

ASD

C-6.2
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

ASD

C-6.2
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

ASD

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

ASD

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

ASD

6. A copy of the deed restrictions (if required).

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM
GRASSED SWALE SUPPLEMENT**

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must also be filled out, printed and submitted along with all of the required information.

I. PROJECT INFORMATION	
Project name	Shinnwood West
Contact name	Garry S. Pape, P.E. - GSP Consulting
Phone number	910-442-7870
Date	November 5, 2012
Drainage area number	16

II. DESIGN INFORMATION

Site Characteristics

Drainage area	33,799.00	ft ²
Impervious area	19,937.00	ft ²
Percent impervious	59.0%	%
Design rainfall depth	1.50	inch

Peak Flow Calculations

10-yr storm runoff depth	6.72	in
10-yr storm intensity	7.23	in/hr
Post-development 10-yr storm peak flow	3.72	ft ³ /sec

Velocity

Maximum non-erosive velocity (peak 10-year storm) 3.50 ft/sec

Soil characteristics (enter "x" below)

Sand/silt (easily erodible) x

Clay mix (erosion resistant) _____

Grass Type (enter "x" below)

Bermuda _____

Tall fescue _____

Bahiagrass _____

Kentucky bluegrass _____

Grass-legume mixture x

Swale type: Fill out *one* of the options below:

Option 1: Curb Outlet Swale:

Y (Y or N)

Maximum velocity 1.68 OK

Side slopes 5.00 :1 OK

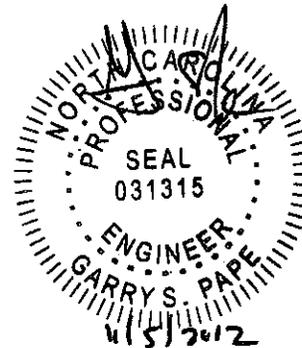
Swale length 20.00 ft Insufficient swale length.

Option 2: Swale Seeking Pollutant Credit ("For-Credit" Swale): (Y or N)

Maximum velocity for 10-yr storm _____ ft/sec

Side slopes _____ :1

Swale length _____ ft



Swale Characteristics

Swale Shape: Enter an "x" in the appropriate cell below:

Trapezoidal

Parabolic

V-shaped

Width of the bottom of the swale

Width of the top of the swale

x	
5.00	ft
8.00	ft

Additional Information

Is the swale sized for all runoff from ultimate build-out?

y (Y or N) OK

Is the BMP located in a proposed drainage easement with a recorded access easement to a public Right of Way (ROW)?

y (Y or N) OK

What is the distance from the bottom of the swale to the SHWT?

#VALUE! ft

#VALUE!

What is the ground level elevation?

26.00 fmsl

What is the elevation of the bottom of the swale?

25.47 fmsl

What is the SHWT elevation?

SEE ATTACHED fmsl

What is the longitudinal slope of the swale?

0.30 % OK

What is the depth of freeboard?

0.50 ft OK

III. REQUIRED ITEMS CHECKLIST

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Initials	Page/ Plan Sheet No.
----------	----------------------

AS

1. Plans (1" = 50' or larger) of the entire site showing:
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 - Off-site drainage (if applicable),
 - Delineated drainage basins (include Rational C coefficient per basin),
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Grass species, and
 - Boundaries of drainage easement.

AS

C-6.2a
C-6.3

2. Plan details (1" = 50' or larger) for the grassed swale showing:
 - Swale dimensions (width, length, depth),
 - Maintenance access,
 - Proposed drainage easement and public right of way (ROW),
 - Design at ultimate build-out,
 - Grass species,
 - Off-site drainage (if applicable), and
 - Boundaries of drainage easement.

AS

C-6.2a
C-6.3

3. Section view of the grassed swale (1" = 20' or larger) showing:
 - Side slopes,
 - Longitudinal slope,
 - Freeboard
 - Swale dimensions, and
 - SHWT level(s)

AS

Calcs

4. Supporting calculations (including maximum velocity calculations for applicable storms)

AS

Attached

5. A copy of the signed and notarized operation and maintenance (O&M) agreement.

AS

6. A copy of the deed restrictions (if required).