DRAINAGE REPORT

FOR

MONARCH LANDING 2ND ADDITION
Wichita, Kansas

MARCH 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: City of Wichita Date: March 8, 2007

Subdivision Name: Monarch Landing 2nd Addition Location: Wichita, Kansas

Total Land Area Of Ownership: 122 Acres

Type: ✔ Residential ☐ Commercial ☐ Industrial ☐ Recreation ☐ Municipal ☐ Other

Applicant: Ritchie Associates, Inc. Contact: Rob Ramseyer Phone #: 684-7300

Engineer: MKEC Engineering Consultants, Inc. Contact: Kara Anderson, P.E. Phone # 684-9600

Please check the appropriate box: I = Included; NA = Non-Applicable; R= Required prior to development

(If "NA" is checked, an explanation must be entered)

	Applicant			Engr	
Tab 1. Project Narrative	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Site Location Map, using USGS Map	✔	☐	Figure 1.1	☐	☐
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	✔	☐	Tab 1.B	☐	☐
C. Discussion of offsite conditions	✔	☐	Tab 1.C	☐	☐
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	✔	☐	Tab 1.D	☐	☐
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	✔	☐	Tab 1.E	☐	☐
F. Copy of the plat	✔	☐	Figure 1.2	☐	☐
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	✔	☐	Figure 1.3	☐	☐
H. Professional Engineer seal, signature and date on cover of report	✔	☐	Cover	☐	☐
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	✔	☐	Tab 1.I	☐	☐

	Applicant			Engr	
Tab 2. Existing Conditions Runoff Calculations	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	✔	☐	Figure 2.1	☐	☐
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	✔	☐	Tab 2.B	☐	☐
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	✔	☐	Figure 2.2	☐	☐
D. Total Site Area and Total Impervious Area (acres)	✔	☐	Tab 2.D	☐	☐
E. Benchmarks used for site control	✔	☐	Figure 1.2	☐	☐
F. Streams, creeks, and waterway labeled	✔	☐	Figure 2.3	☐	☐
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✔	☐	Figure 2.4	☐	☐
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	✔	☐	Tab 2.H	☐	☐
I. Location of existing roads, buildings, parking lots and other impervious areas.	✔	☐	Tab 2.I	☐	☐

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	✔	☐	Tab 2.J	☐	☐
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔	☐	Tab 2.K	☐	☐
L. Flow paths	✔	☐	Figure 2.2	☐	☐
M. Location and dimensions of existing channels, bridges or culvert crossings	✔	☐	Tab 2.M	☐	☐
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	✔	☐	Tab 2.N	☐	☐
O. Assumed pre-developed runoff curve numbers	✔	☐	Tab 2.O	☐	☐
P. Existing time of concentrations used in calculations	✔	☐	Tab 2.P	☐	☐
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✔	☐	Figure 2.5	☐	☐
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	✔	☐	Tab 2.R	☐	☐
S. Cross-section data for open channels	✔	☐	Tab 2.S	☐	☐
T. Ground water elevations, if applicable	✔	☐	Tab 2.T	☐	☐

	Applicant			Engr	
Tab 3. Post-Development Hydrologic Analysis	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	✔	☐	Tab 3.A Figure 3.1	☐	☐
B. Proposed time of concentrations used in calculations	✔	☐	Tab 3.B	☐	☐
C. Assumed post-developed runoff curve numbers	✔	☐	Tab 3.C	☐	☐
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	✔	☐	Figure 3.2	☐	☐
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✔	☐	Figure 3.3	☐	☐
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	✔	☐	Figure 3.1	☐	☐
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	✔	☐	Tab 3.G	☐	☐
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	✔	☐	Tab 3.H	☐	☐
I. Design water surface elevations and normal pool elevation for ponds.	✔	☐	Tab 3.I	☐	☐
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	✔	☐	Tab 3.J	☐	☐
K. Proposed limits of clearing and grading	✔	☐	Tab 3.K	☐	☐
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	✔	☐	Figure 3.2	☐	☐
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✔	☐	Figure 3.2	☐	☐
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔	☐	Figure 3.2	☐	☐
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	✔	☐	Tab 3.O	☐	☐

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P. Preliminary selection and location of stormwater controls	✔	☐	Tab 3.P	☐	☐
Q. Emergency overflow structure's flow path	✔	☐	Tab 3.Q	☐	☐
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	✔	☐	Tab 3.R	☐	☐
S. The 100-year 24-hour HWL delineated on the plan for detention pond	✔	☐	Tab 3.S	☐	☐
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	✔	☐	Tab 3.T	☐	☐
U. Stormwater Management Facilities located within a Reserve	✔	☐	Tab 3.U	☐	☐
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)	✔	☐	Tab 3.V	☐	☐
W. Off-site drainage easements or agreements required, where necessary	✔	☐	Tab 3.W	☐	☐

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile	☐	✔	Tab 4	☐	☐
B. Nearest base flood elevations	☐	✔	Tab 4	☐	☐
C. Delineation of pre-developed regulatory floodplain/floodway limits	☐	✔	Tab 4	☐	☐
D. Delineation of post-developed regulatory floodplain and floodway limits	☐	✔	Tab 4	☐	☐
E. Floodplain boundary determination per elevation (project limits shown)	☐	✔	Tab 4	☐	☐
F. Provide source of floodway data table and discharges	☐	✔	Tab 4	☐	☐
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits	☐	✔	Tab 4	☐	☐
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions	☐	✔	Tab 4	☐	☐
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)	☐	✔	Tab 4	☐	☐
J. Flood plains and floodways located within a Reserve, where necessary	☐	✔	Tab 4	☐	☐

	Applicant			Engr	
Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	**I/R**	**NA**	**Explanation / Location in Plan**	**I/R**	**NA**
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)	☐	✔	Tab 5.A	☐	☐
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)	☐	✔	Tab 5.B	☐	☐
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.	☐	✔	Tab 5.C	☐	☐
D. Kansas Department of Transportation	☐	✔	Tab 5.D	☐	☐
E. Sedgwick County Right-of-way Permit	☐	✔	Tab 5.E	☐	☐

Consulting Engineer Initials _____

Tab 1. Project Narrative

A. Location

The site is located in unincorporated Sedgwick County, with anticipated annexation by the City of Wichita, Kansas. The site is in the Southeast Quarter of Section 1, Township 29 South, Range 2 East or more commonly the northwest corner of 159th Street East and 21st Street North.

The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

The overall project intends to develop the site for single-family residential, commercial, and school use. The site is currently undeveloped agricultural land. No wetlands, riparian areas, or floodplains exist on site.

The current plat (Monarch Landing Second Addition) will be developed for residential use with 1/4 acre and 1/3 acre lots. The plat for Phase 1 also identified development as residential use with 1/4 acre and 1/3 acre lots. Two additional plats are anticipated. The residential plat will be designated as the third addition, and the southeast corner of the site will be zoned and platted separately for commercial use.

The southwest corner of the project site will be developed as an elementary school Ownership for the elementary school site has been transferred to the Andover School District.

Detention is provided in appropriate locations throughout the site. Details are provided under Tab 2.

C. Discussion of Offsite

Parcels north and west from the site continue to be used for agricultural purposes. A second off-site new school is under construction on the adjacent parcel east of 159th Street. Several single family residences on large rural lots lie south of 21st Street, and a single large residential parcel lies in the northeast quarter of the southeast quarter.

D. Summary of Runoff

The project was modeled using the SCS method in Hydraflow Hydrographs. Pre-development analysis is included in the November 2006 report. As coordination with school site has progressed, modifications have been made to the post-development detention plan shown in the previous report. Final drainage areas, detention facility contours and discharge structure characteristics, and 100-year discharge and elevation information for Phase 1 are included with preliminary Phase 2 information under Tab 3. The table below shows the comparison between pre and post-project runoff rates.

Comparison of Pre and Post-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
Pre-Development A	34.0	53.2	66.2	86.1	115.3
Post-Development A	28.5	39.0	48.0	61.4	79.7
Pre-Development B	24.5	38.2	47.6	62.0	83.0
Post-Development B	25.6	40.5	51.0	66.4	85.8
Pre-Development C	37.2	58.1	72.3	94.4	126.3
Post-Development C	19.3	39.6	53.4	75.2	118.4
Pre-Development D	15.7	24.4	30.3	39.5	52.9
Post-Development D	15.1	22.8	28.0	35.8	47.4
Pre-Development E	11.7	18.2	22.6	29.5	39.5
Post-Development E	10.5	14.1	16.5	20.0	24.9

E. Best Management Practices

Detention outlet channels will be protected against erosion. Detention facility side slopes will not exceed 3:1 (H:V). The site will be seeded or sodded after construction of grading and utilities are complete. The outlet structure of the detention pond will be protected against erosion.

F. Plat

The plat is included, Figure 1.2.

G. Preliminary Grading Plan

The preliminary lot grading plan for Phase 2 is included, Figure 1.3.

H. Professional Engineer Seal

The cover of the report will be signed and dated.

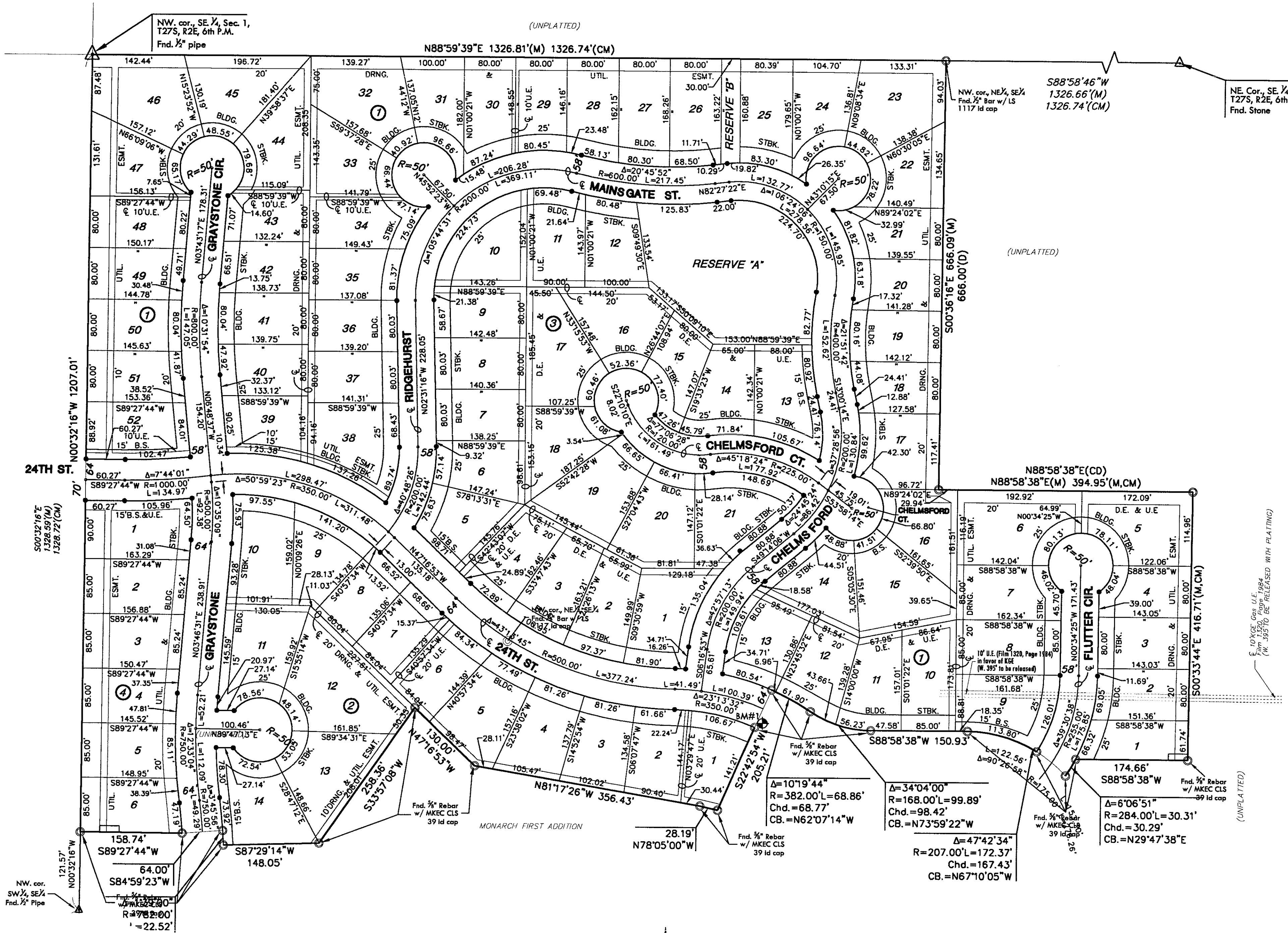
I. CD

A CD of the drainage report in PDF format is attached to the inside front cover of the bound report.

Figure 1.2

Plat

FINAL PLAT
MONARCH LANDING SECOND ADDITION
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS



CERTIFICATE OF SURVEY

I, Gregory J. Allison, a registered land surveyor in Kansas, do hereby certify that I have been in responsible charge of surveying and platting of "MONARCH LANDING ADDITION", an addition to Wichita, Sedgwick County, Kansas, into Lots, Blocks, Reserves and Streets, the same being accurately set forth in the accompanying plat and described herein:

A tract of land lying in the Southeast Quarter, Section 1, Township 27 South, Range 2 East, of the 6th Principal Meridian, Wichita, Sedgwick County, Kansas; said tract being more particularly described as follows: **BEGINNING** at the northwest corner of said Southeast Quarter; thence along the north line of said Southeast Quarter on a Kansas coordinate system 1983 south zone bearing of N88°59'39"E, 1326.81 feet to the northeast corner of the Northwest Quarter of said Southeast Quarter; thence along the east line of said Northwest Quarter S00°36'16"E, 666.12 feet; thence N88°58'22"E, 394.95 feet; thence S00°33'44"E, 416.71 feet to the northeast most corner of Monarch Landing Addition, an addition to Wichita, Sedgwick County, Kansas; thence along the northerly lines of said addition for the next fifteen (15) courses S88°58'38"W, 174.66 feet to a point on a non-tangent curve to the right; thence along said curve to the right 30.31 feet a non-tangent curve to the left, said curve to the right having a central angle of 06°06'51", a radius of 284.00 feet, and a long chord distance of 30.29 feet, bearing S29°47'38"W; thence along said non-tangent curve to the left 172.37 feet, said curve having a central angle of 47°42'35", a radius of 207.00 feet, and a long chord distance of 167.43 feet, bearing N67°10'05"W; thence S88°58'38"W, 150.93 feet to a point on a curve to the right; thence along said curve 99.89 feet to a reverse curve, said curve to the right having a central angle of 34°04'00", a radius of 168.00 feet, and a long chord distance of 98.42 feet, bearing N73°59'22"W; thence along said reverse curve 68.86 feet, said curve having a central angle of 10°19'44", a radius of 382.00 feet, and a long chord distance of 68.77 feet, bearing N62°07'14"W; thence S22°42'54"W, 205.21 feet; thence N78°05'00"W, 28.19 feet; thence N81°17'26"W, 356.43 feet; thence N47°16'53"W, 130.00 feet; thence S33°57'08"W, 258.36 feet; thence S87°29'14"W, 148.05 feet to a point on a non-tangent curve to the left; thence along said curve 22.52 feet, said curve having a central angle of 01°39'00", a radius of 782.00 feet, and a long chord distance of 22.52 feet, bearing N04°11'07"W; thence S84°59'23"W, 64.00 feet; thence S89°27'44"W, 158.74 feet to the northwest most corner of said Monarch Landing Addition being coincident with the west line of the said Northwest Quarter of said Southeast Quarter; thence along said west line N00°32'15"W, 1207.01 feet to the **POINT OF BEGINNING.**

All reserves, streets, utility easements, building setbacks, access control, together with, that portion of a 10 foot utility easement recorded in Film 1320, Page 1984; a 40 foot right-of-way easement recorded on Misc. Book 308 Page 347; all of a 15 foot right of way easement recorded on Film 1813, Page 1435; and all of a 15 foot right of way easement recorded on Film 1840, Page 2119, all within the above described property are hereby vacated and replatted by virtue of K.S.A. 12-512(b).

I hereby certify that the details of this plat are correct to the best of my knowledge and belief this___day of_____________2007.

Gregory J. Allison, PE, LS #1257
MKEC Engineering Consultants, Inc.
411 North Webb Road
Wichita, Kansas 67206

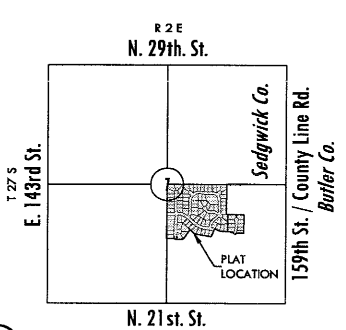
Know all men by these presents that we the undersigned property owners of the land above set forth in the Registered Land Surveyor's Certificate, have caused the same to be surveyed and platted into Lots, Blocks, Reserves and Streets the same to be known as "MONARCH LANDING SECOND ADDITION," an addition to Wichita, Sedgwick County, Kansas.

Easements for the construction and maintenance of public utilities and drainage, as indicated on the accompanying plat are hereby granted to the public.

The streets are hereby dedicated to and for the use of the public.

Reserves "K", and "L" are platted for utilities confined by easements, sidewalks, landscaping, irrigation, open space, and monuments. The Reserves shall be owned and maintained by a homeowner's association and are reserved for uses stated.

A drainage plan has been developed for this plat drainage easements, rights-of-way, or reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer, and unobstructed to allow for the conveyance of storm water.



VICINITY MAP

LEGEND

Date of Survey: September, 2006

- △ = Section Corner Monument Found
- ◎ = Found Survey Monument. See annotation
- ● = Set ⅝" Rebar w/ MKEC CLS 39 Id. cap
- (M) = Measured
- (CM) = Calculated from measured

N

1"=100' / 1 : 1200

100 0 100

Basis of Bearings: Kansas coordinate system 1983 south zone bearing of S88°59'39"W along the N. Line of NW. ¼, Sec. 1, T27S, R2E, 6th P.M.

BENCH MARKS

BM#1 Top of fence T-post 6" below ground, 8' NNE of the northwest corner of Lot 1, Blk. 2. Elev. = 1375.29 NGVD 29.

MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316-684-9600

FINAL PLAT

MONARCH LANDING SECOND ADDITION

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

OWNER'S CERTIFICATES

MONARCH LANDING, LLC, a Kansas limited liability company

______________________, President
Kevin Mullen, President
Ritchie Development Corporation, manager

STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on this ____ day of __________, 2007, Kevin Mullen, President, Ritchie Development Corporation, manager, Monarch Landing, LLC, a Kansas limited liability company.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

______________, Notary Public
Notary Public:
My Term Expires: ____________.

UNIFIED SCHOOL DISTRICT No. 385

______________________, Superintendent
Mark Evans, Superintendent

STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on this ____ day of __________, 2007, Mark Evans, Superintendent, Unified School District No 385.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

______________, Notary Public
Notary Public:
My Term Expires: ____________.

MORTGAGE CERTIFICATE

We INTRUST Bank, N.A. holders of a mortgage on the above described property, do hereby consent to the plat of "MONARCH LANDING SECOND ADDITION."

INTRUST Bank, N.A.

______________________, Executive Vice President
Gary D. Schmitt, Executive Vice President

This instrument was acknowledged before me on this ____ day of __________, 2007, by Gary D. Schmitt, Executive Vice President, INTRUST Bank, N.A..

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

SEAL

______________________, Notary Public
Notary Public:
My Term Expires: ____________.

PLANNING COMMISSION CERTIFICATE

This plat of "MONARCH LANDING SECOND ADDITION" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this ____ day of __________, 2007

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

______________________, Chair
Darrell A. Downing, Chair

Attest:

______________________, Secretary
John L. Schlegel, Secretary

AFFIX SEAL

GOVERNING BODY CERTIFICATE

The dedications shown on this plat are hereby accepted and this plat is hereby approved by the governing body of the City of Wichita, Kansas.

Dated this ____ day of __________, 2007

At the direction of the City Council.

______________________, Mayor
Carlos Mayans, Mayor

AFFIX SEAL

Attest:

______________________, City Clerk
Karen Sublett, City Clerk

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY} ss:

Entered on transfer record this ____ day of __________, 2007

______________________, County Clerk
Don Brace, County Clerk

AFFIX SEAL

REGISTER OF DEEDS CERTIFICATE

This is to certify that this instrument was filed for record in the Register of Deeds office this ____ day of __________, 2007, at ________ o'clock _M; and is duly recorded.

______________________, Register of Deeds
Bill Meek, Register of Deeds

AFFIX SEAL

Attest:

______________________, Deputy
Tonya E. Buckingham, Deputy

COUNTY SURVEYOR

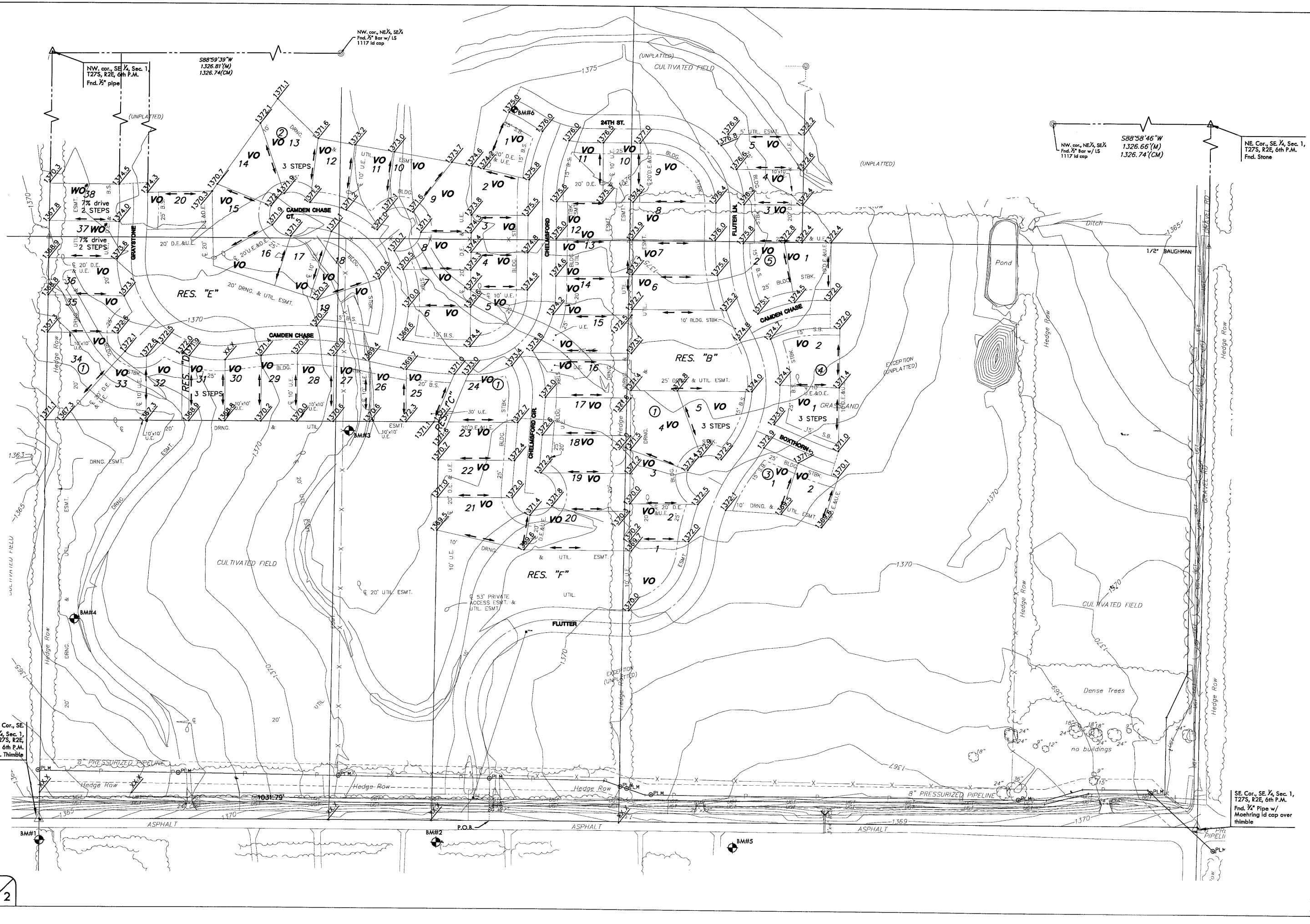
Reviewed in accordance with K.S.A. 58-2005 on this ____ day of __________, 2007.

______________________, Deputy County Surveyor
Tricia L. Robello, LS #1246
Deputy County Surveyor
Sedgwick County, Kansas

MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316-684-9600

Figure 1.3

Preliminary Grading Plan



MONARCH LANDING
PROJECT NAME

PRELIMINARY LOT GRADING
DESIGN TITLE

KLA	DM\CMJ
DESIGN	DRAWN BY:
KLA	FEB. 2007
CHECKED BY:	DATE
06201	1 / 1
JOB NO.	SHEET/OF

MKEC ENGINEERING CONSULTANTS
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

J:\Civil\06201\dwg\Grad\06201_LOTGRAD.dwg

Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included with Monarch Landing 2nd Addition shown. Monarch Landing 1st Addition is also indicated, as well as future plats on Figure 2.1.

B. Runoff Method

The site was modeled using the SCS method; refer to the Monarch Landing November 2006 drainage report.

C. Existing Topography

The existing topography is shown on the Existing Conditions Drawing, Figure 2.2.

D. Site Areas

The total site area of Monarch Landing Addition is 122 acres. The Monarch Landing 2nd Addition is 38 acres. Monarch Landing 1st Addition is platted as residential lots, with about 30% impervious. For planing purposes, the school watershed is assumed to be similar to commercial land use, or 75% impervious. The 2nd Addition is currently undeveloped, 0% impervious.

E. Benchmarks

Benchmarks used for site control are included on the plat provided previously under Tab 1, Figure 1.2.

F. Streams, Creeks, and Waterways

Drainage is directed to all sides of the site from the top of the low rise near the center. Elevations across the site range from 1376 in the center of the site to 1364 on the south side of the project site at the culvert crossing under 21st Street North. Monarch Landing Second Addition is located in Zone A, as shown on the FIRM Figure 2.3. Since there are no mapped streams on site, a 100-year water surface elevation has not been determined for the area.

G. Soils

Soils throughout the Monarch Landing Addition have been classified as Rosehill silty clays, 1 to 3% slopes Goesell silty clay 0 to 1% slopes and according to the NRCS (SCS) Sedgwick & Butler County Soils Survey (Appendix B). The Hydrologic Soil Group used to select runoff coefficients is “D”. See Figure 2.4.

H. Natural Features

No natural water features are found on the site.

I. Location of Existing Impervious Areas

Currently the site is all undeveloped agricultural land. There are no roads, buildings, or parking lots in the area identified on the plat as Phase 2.

J. Location of Existing Utilities

Currently Phase 2 is all undeveloped agricultural land. Water, sewer, and electric services have been installed in various locations throughout Monarch Landing Addition to serve both phases.

K. Location of Existing Conveyance Systems

Monarch Landing First Addition storm water sewers, including detention ponds and outlet structures, have been contracted and are under construction. Flow across the site is by overland flow.

L. Flow Paths

Flow paths are shown on the Existing Conditions Drawing, Figure 2.2. Part of Phase 2 drains south to Phase 1, but generally flow is northward to the head of an SCS Grassed Waterway that discharges north from the site.

M. Location and Sizes of Existing Structures

There are no existing structures in the area identified on the plat as Phase 2.

N. Existing Conditions Hydrologic Analysis

Hydrologic analysis was completed and provided previously with the November 2006 Monarch Landing Addition Preliminary Drainage Report, which includes the Monarch Landing Second Addition. The resulting pre-project flows are reported in the table below.

Pre-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
A	34.0	53.2	66.2	86.1	115.3
B	24.5	38.2	47.6	62.0	83.0
C	37.2	58.1	72.3	94.4	126.3
D	15.7	24.4	30.3	39.5	52.9
E	11.7	18.2	22.6	29.5	39.5

O. Pre-Developed Runoff Curve Numbers

The curve number used for pre-developed conditions is 80.

P. Existing time of Concentration

The times of concentration for pre-development conditions are shown in the following table. The calculations can be found in the spreadsheet contained in the November 2006 Monarch Landing Drainage Report.

Existing Times of Concentration

Area	T_c
	minutes
A	54.6
B	47.7
C	48.7
D	39.2
E	36.7

Q. Downstream Drainage Capacity

A cross section of the area directly downstream of Pond C was established and the 100-year flow from Pond C was routed through this area. Calculations showing the ability of the downstream area to handle the 100-year discharge from Pond C are in Figure 2.5.

R. Existing Structural Elevations

The 3x4 RCB under 21st Street has a flow line elevation of 1363.4.

S. Open Channels

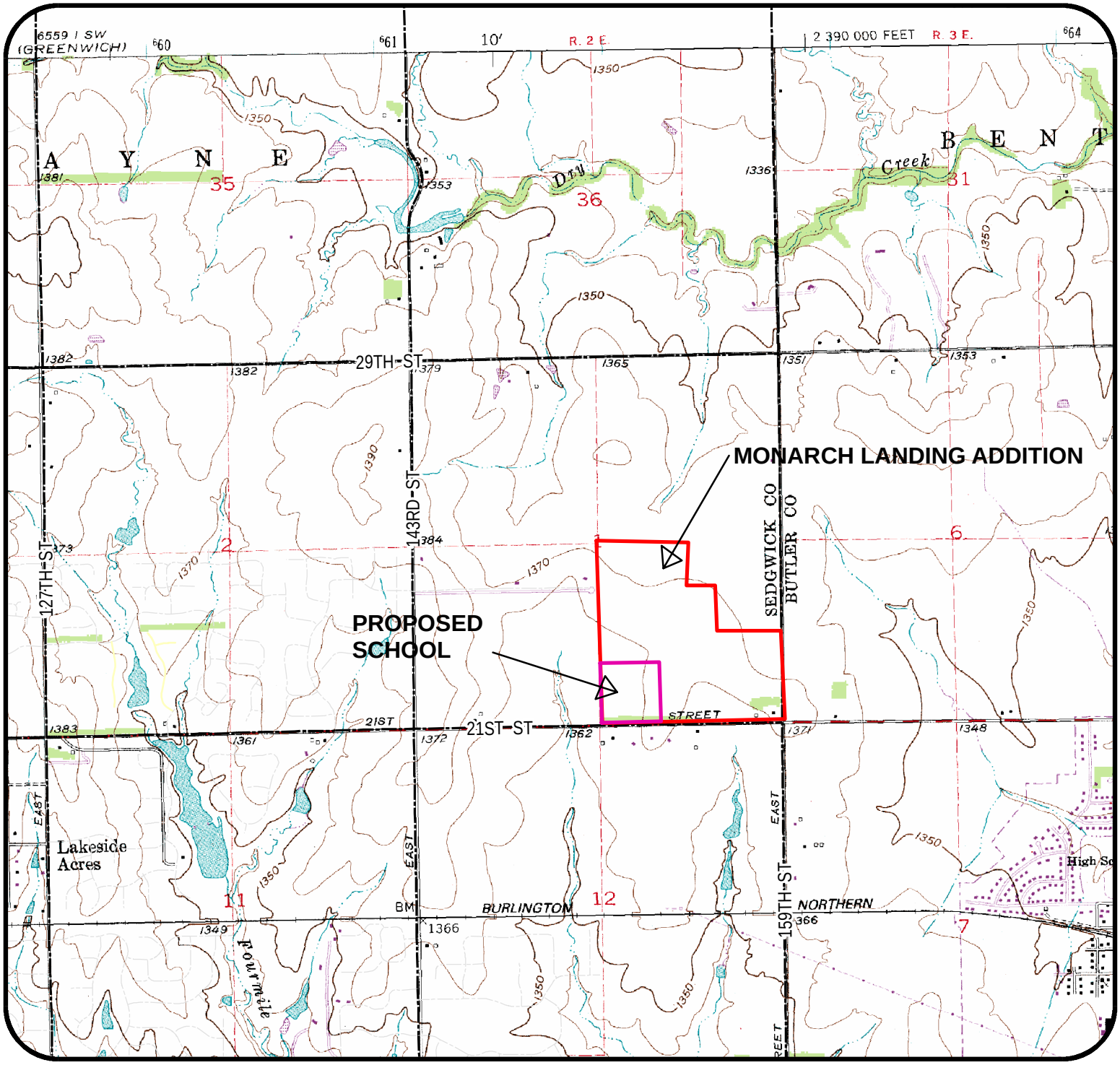
There are no open channels onsite.

T. Groundwater Elevations

The groundwater is not a factor in development for this area.

Figure 1.1

USGS Quadrangle Map



MONARCH LANDING ADDITION

Project Name:

USGS - Sedgwick County, KS

Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

CMJ	JANUARY 2007
Drawn By:	Date:
TMH/ KLA	06201
Design / Review:	Job No.:

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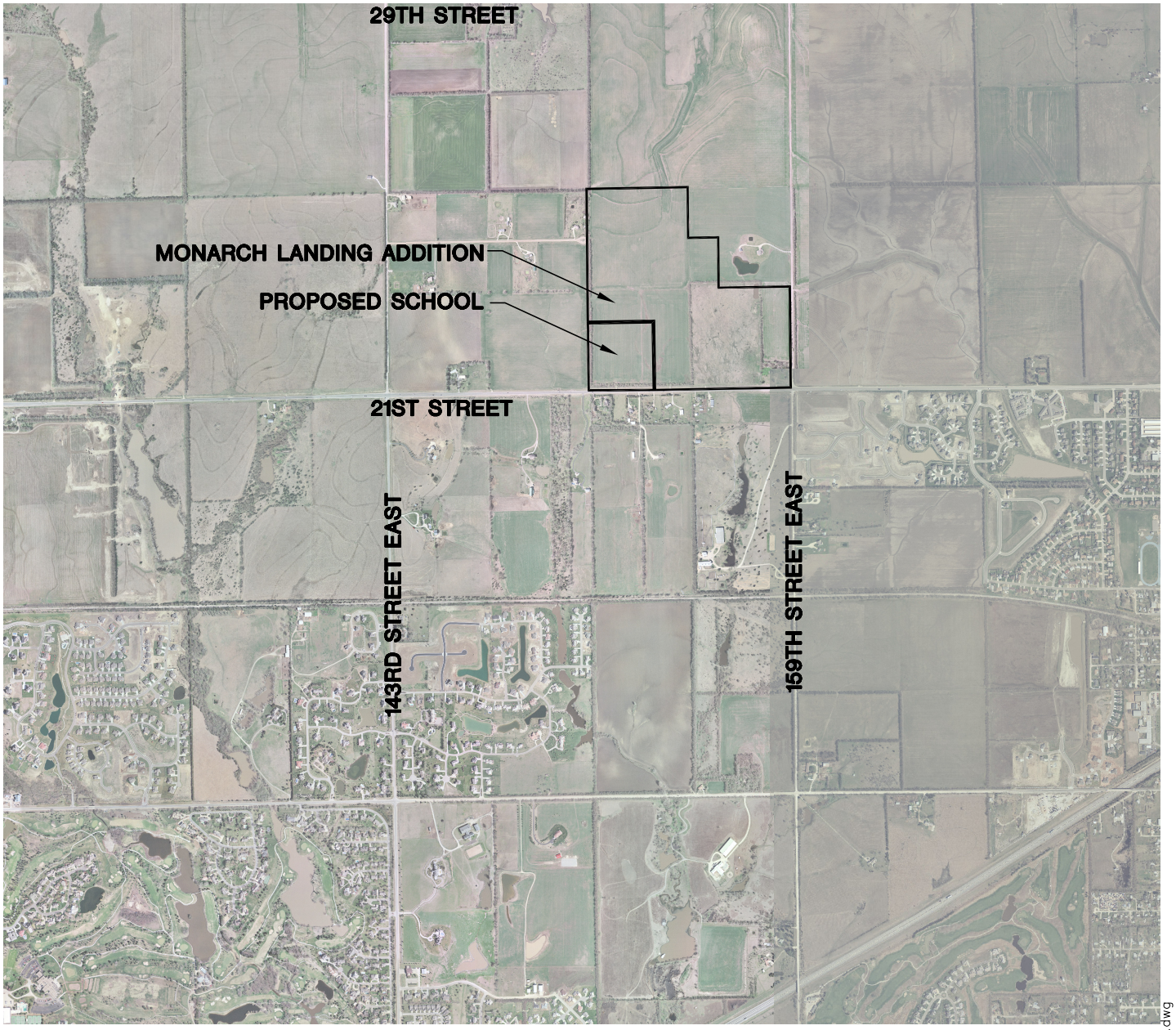
Figure 2.1

Orthophotograph



SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

J:\Civil\06201\dwg\Drng\monarch_aerial2.dwg

REVISED: 03/07/07

MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

MONARCH LANDING ADDITION
PROJECT NAME

AERIAL MAP
ANDOVER, KANSAS QUADRANGLE
SHEET TITLE

TMH	CMJ	TMH
DESIGN BY:	DRAWN BY:	CHECKED BY:
JANUARY 2007	06201	1 / 1
DATE	JOB NO.	SHEET/OF

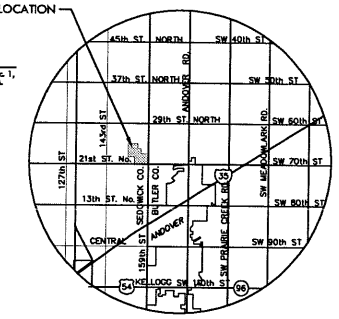
Figure 2.2

Existing Conditions Drawing

Center Sec. 1, T27S, R2E, 6th P.M. Fnd. ½" pipe

NE. Cor., SE ¼, Sec. 1, T27S, R2E, 6th P.M. Fnd. stone

PLAT LOCATION



VICINITY MAP

LEGEND

- CONIFEROUS TREE & DIAMETER
- DECIDUOUS TREE & DIAMETER
- SIGN
- POWER POLE AND GUY ANCHOR
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE BASIN
- FLOW ARROW

C
AREA=36.9 ac

B
AREA=24.3 ac

A
AREA=38.1 ac

D
AREA=13.1 ac

E
AREA=9.8 ac

CULTIVATED FIELD
RESIDENCE
BARN
POND
GRASSLAND
GULLY
IRT. RD.

SW. Cor., SE ¼, Sec. 1, T27S, R2E, 6th P.M. Fnd. thimble

SE. Cor., SE ¼, Sec. 1, T27S, R2E, 6th P.M. Fnd. ½" pipe w/ Mowbray cap over thimble

NORTH
SCALE: 1" = 100'
100 0 100 200

REVISED: 03/07/07

MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

MONARCH LANDING ADDITION
PROJECT NAME

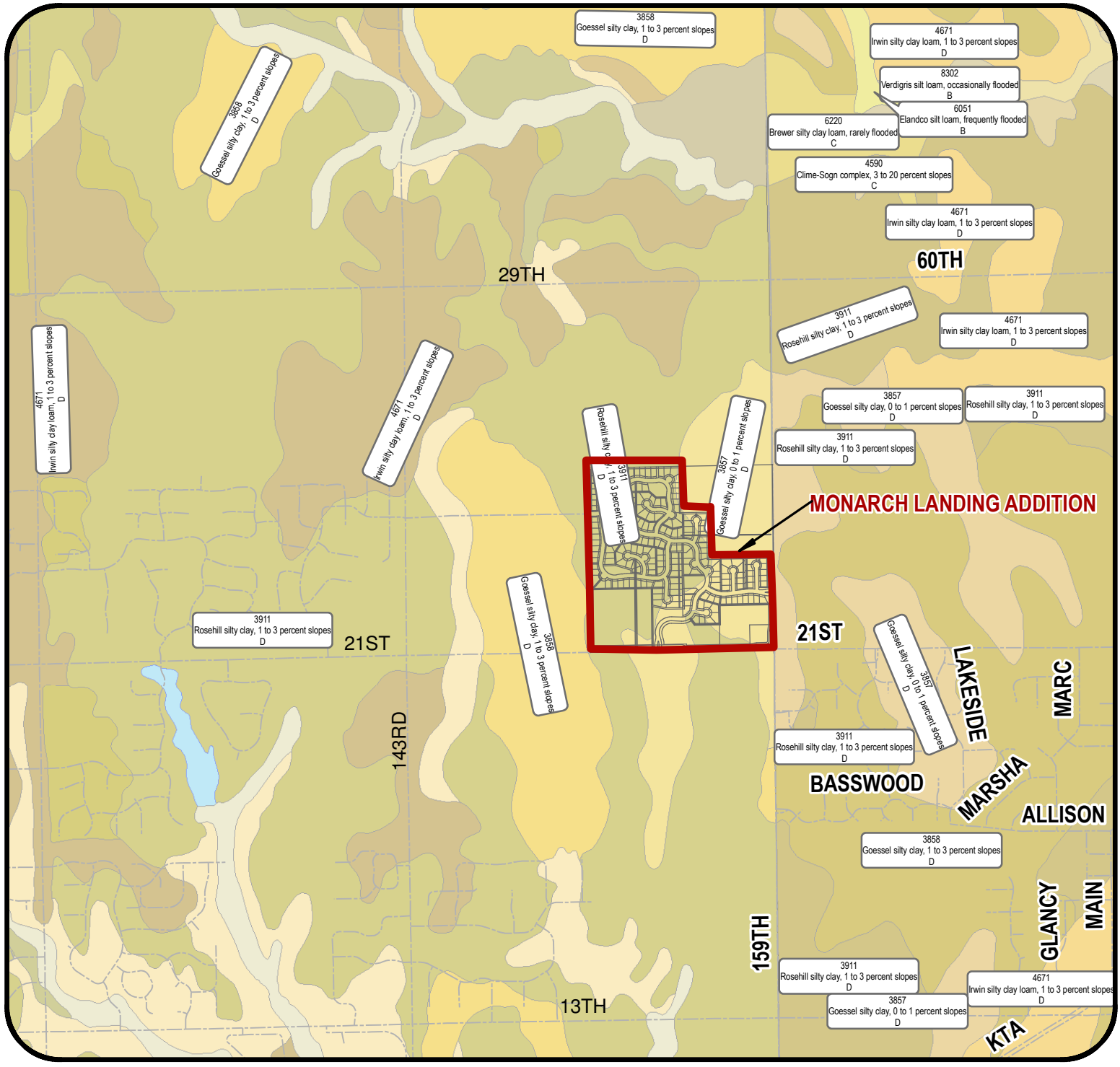
EXISTING BASIN BOUNDARIES
SHEET TITLE

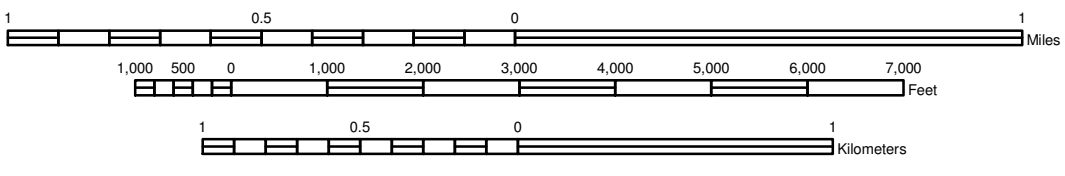
DESIGN BY	DRAWN BY	CHECKED BY
TW	KWS	CJA
DATE	JOB NO.	SHEET/OF
NOVEMBER 2006	06201	1 / 1

Z:\CIVIL\06201\DWG\MONARCH EX. BASIN BOUNDARY

Figure 2.3

Soil Survey





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MONARCH LANDING ADDITION

Project Name:

Soil Survey - Sedgwick & Bulter County, KS

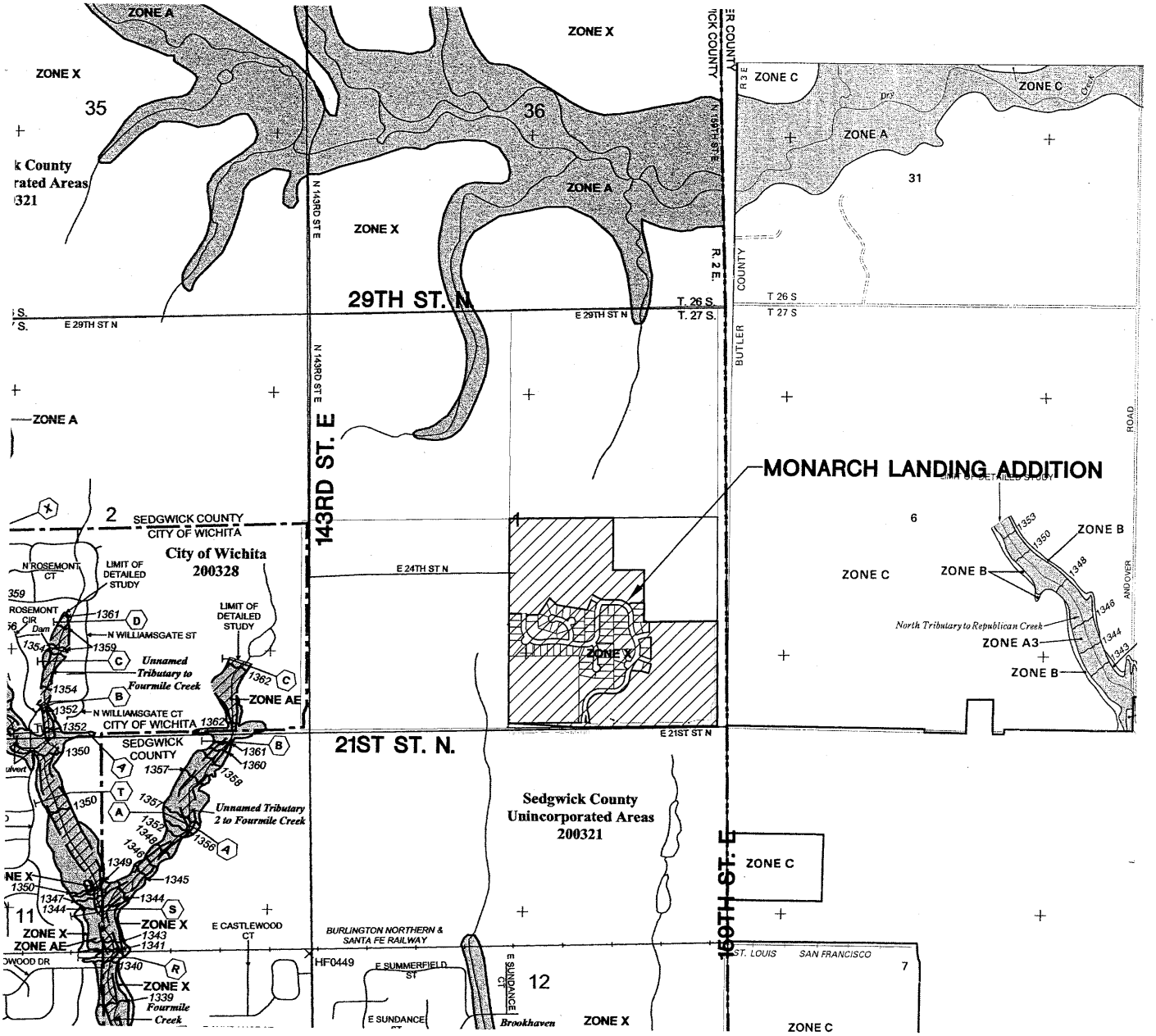
Sheet Title:

MKEC ENGINEERING CONSULTANTS, INC.

KWS	SEPT. 2006
Drawn By:	Date:
TM	06201
Design / Review:	Job No.:

Figure 2.4

FIRM



FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 385 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0385	E
WICHITA, CITY OF	200328	0385	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0385E

EFFECTIVE DATE
FEBRUARY 2, 2007
Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

BUTLER COUNTY, KANSAS
(UNINCORPORATED AREAS)

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
200037 0165 C

MAP REVISED:
JUNE 20, 2001

Federal Emergency Management Agency

N

APPROXIMATE SCALE

1000 0 1000 FEET

MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316 - 684 - 9600

MONARCH LANDING ADDITION
PROJECT NAME

FIRM MAP
SEDGWICK & BUTLER COUNTY, KANSAS
SHEET TITLE

AJK	KWS	TM
DESIGN BY:	DRAWN BY:	CHECKED BY:

SEPTEMBER 2006	06201	1 / 1
DATE	JOB NO.	SHEET/OF

J:\Civil\06201\dwg\Dwg\FIRM

Figure 2.5

Flowmaster Calculations

Down Stream Capacity

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02000	ft/ft
Discharge	119.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	1365.00
0+46	1364.00
0+66	1364.00
0+96	1365.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1365.00)	(0+96, 1365.00)	0.030

Results

Normal Depth	0.66	ft
Elevation Range	1364.00 to 1365.00 ft	
Flow Area	30.03	ft²
Wetted Perimeter	70.56	ft
Top Width	70.54	ft
Normal Depth	0.66	ft
Critical Depth	0.69	ft
Critical Slope	0.01727	ft/ft
Velocity	3.96	ft/s
Velocity Head	0.24	ft
Specific Energy	0.91	ft
Froude Number	1.07	
Flow Type	Supercritical	

Down Stream Capacity

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.66	ft
Critical Depth	0.69	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01727	ft/ft

Down Stream Capacity

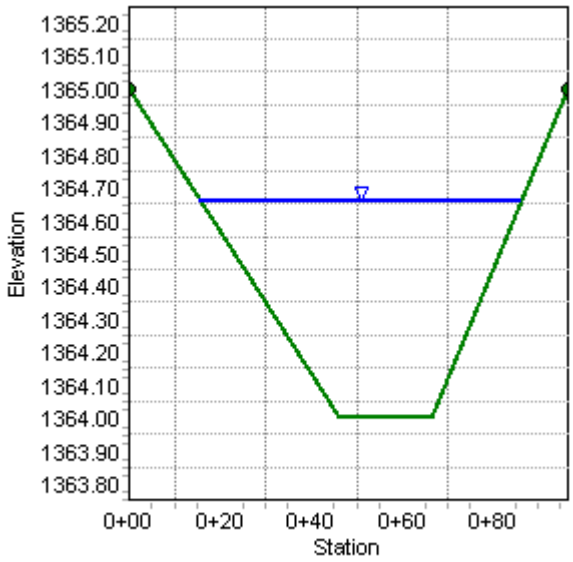
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	0.66	ft
Discharge	119.00	ft³/s

Cross Section Image



Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

Hydraflow Hydrographs, 2004 by Inelisolve was used to complete the hydrologic analysis for Monarch Landing Second Addition. Slight modifications were made to the November 2006 calculations. Updated calculations are in Figure 3.1. The resulting flows are in the table below.

Post-Development Flowrates

Description	Design Storm Flows (cfs)				
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**100-Yr**
A	28.5	39.0	48.0	61.4	79.7
B	25.6	40.5	51.0	66.4	85.8
C	19.3	39.6	53.4	75.2	118.4
D	15.1	22.8	28.0	35.8	47.4
E	10.5	14.1	16.5	20.0	24.9

B. Proposed Time of Concentration

The time of concentration was calculated using the FAA method. The following table shows the post-development time of concentrations.

Proposed Times of Concentration

Area	T_c
	minutes
A1	55.8
A2	32.8
A3	32.8
B1	52.3
B2	29.9
C1	37.6
C2	44.7
D	36.8
E	32.5

C. Assumed Post-Developed Curve Numbers

The curve number used for pre-developed conditions is 87.

D. Proposed Contours for Detention

The proposed contours for Pond C are shown on the drainage and utility plan, Figure 3.2. Pond C is designed to provide detention for the Second Addition of Monarch Landing.

E. Preliminary SWS Sizing Calculations

Monarch Phase 1 storm sewer pipes were sized using Hydraflow Storm Sewer by Intelisolve, Figure 3.3. Using 2-year design flows obtained from the rational method, Mannings equation was used to size Phase 2 storm sewer pipes, Figure 3.3

F. Stage-Storage-Discharge

The stage-storage-discharge for Pond C is in Figure 3.1.

G. Analysis of upstream/downstream impact

The impacts upstream and downstream of Monarch Landing are negligible. Runoff flows for all design storms remain the same or decrease from pre to post-development

H. Existing and Proposed Structural Elevations

There are no existing structures on site. Where applicable, minimum pad elevations will be set 3 feet above the 100-year water surface elevation. When feasible, current grade will dictate structural elevations.

I. Pond Design Elevations

The pond will be designed to provide 5.3 ac-ft of detention. The normal pool will be set at 1362.5 and the 100-year water surface elevation will be 1367.5. The outlet structure for Pond C is a two-stage weir. The first stage is a 3.5 foot opening with a flowline of 1364.5. The second stage has a crest length of 16 feet with a flowline of 1367.0.

J. Structure Details

Single family homes will be built on the designated lots.

K. Limits of Clearing and Grading

The entire site will be cleared and graded.

L. Location of Impervious Areas

The Roads will be located as shown on the drainage and utility plan, Figure 3.2. Residential houses will be constructed on each lot.

M. Location of Utilities

Proposed utilities are shown on the drainage and utility plan, Figure 3.2.

N. Location of Conveyance Systems

Proposed utilities are shown on the drainage and utility plan, Figure 3.2. Stormwater sewer will carry flow from the paving and backyards into the pond.

O. Location of Channel Modifications

Channel modifications are not proposed for this Addition.

P. Selection and Location of Stormwater Controls

Stormwater controls consist of curb and area inlets, located throughout the Addition, storm sewer sized to handle the 2-year flows, a 5.3 ac-ft. detention pond and a two-stage weir to control pond discharge.

Q. Emergency Overflow

Pond C will emergency overflow to the north through a natural drainage swale.

R. Freeboard

Pond C design will include a 1-foot freeboard for added safety.

S. 100-Year High Water Line

Monarch Landing Second Addition is located in areas with minimal flooding. A 100-year water surface elevation has been determined for Pond C. The 100-year water surface elevation for Pond C is 1367.5

T. Lowest Openings

The lowest openings for lots adjacent to Pond C will be set at 1370.5. All other lots will be graded to maintain at least 0.5% slope in the streets and 2% in the backyards.

U. Stormwater Management Facilities

The detention pond onsite is located within a reserve.

V. Maintenance Responsibility

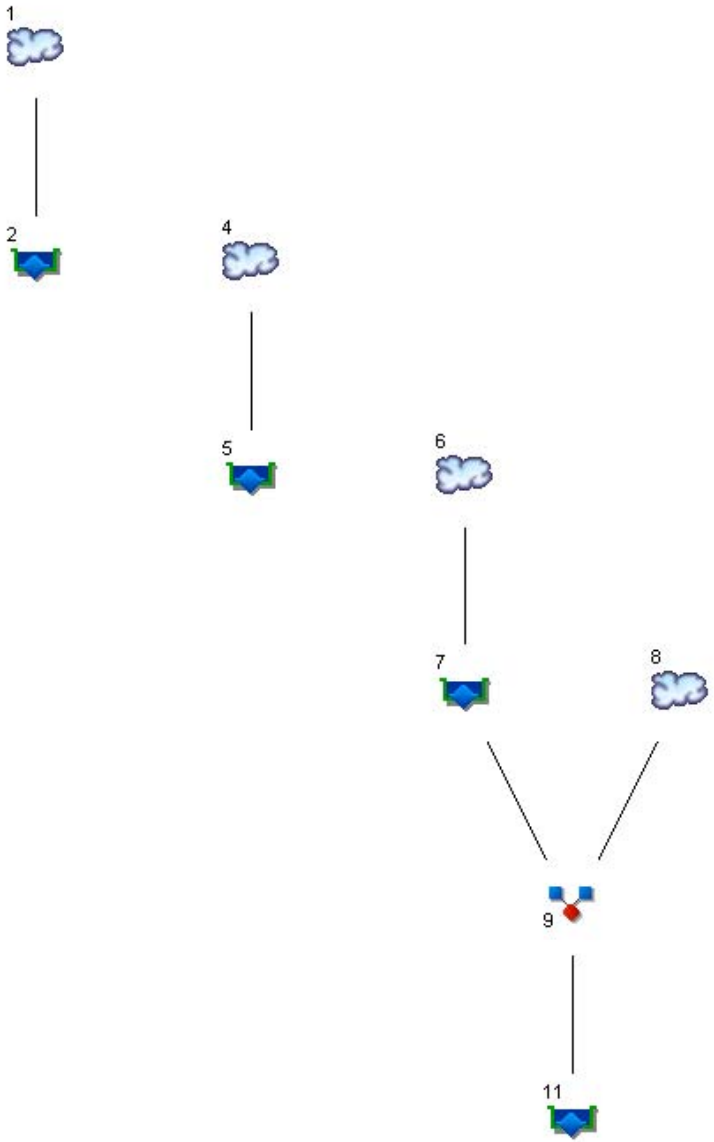
The maintenance of the reserve will be the responsibility of the owner until it is turned over to the homeowners association.

W. Offsite-Drainage Easements

Not applicable to Monarch Landing Second Addition.

Figure 3.1

Hydraflow Hydrographs



Legend

Hyd.	Origin	Description
1	SCS Runoff	Watershed A B4 10
2	Reservoir	Incidental 21st St Det
4	SCS Runoff	Watershed A1 FTR 10 w/School Add
5	Reservoir	Watershed A1
6	SCS Runoff	Watershed A2 FTR 10
7	Reservoir	Detention Routing A2
8	SCS Runoff	Watershed A3 FTR 10
9	Combine	Combine All FTR @ 21st
11	Reservoir	Concetp Det @ 21st Fut

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	34.02	6	750	5.144	----	------	------	Watershed A B4 10
2	Reservoir	28.32	6	768	5.143	1	1366.22	0.239	Incidental 21st St Det
4	SCS Runoff	22.49	6	750	3.355	----	------	------	Watershed A1 FTR 10 w/School Add
5	Reservoir	10.42	6	786	3.030	4	1367.22	1.381	Watershed A1
6	SCS Runoff	14.53	6	732	1.731	----	------	------	Watershed A2 FTR 10
7	Reservoir	3.989	6	768	1.728	6	1368.63	0.915	Detention Routing A2
8	SCS Runoff	27.58	6	732	3.287	----	------	------	Watershed A3 FTR 10
9	Combine	28.45	6	732	5.015	7, 8	------	------	Combine All FTR @ 21st
11	Reservoir	11.71	6	768	5.014	9	1364.71	1.471	Concetp Det @ 21st Fut

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	53.21	6	750	7.949	----	------	------	Watershed A B4 10
2	Reservoir	46.10	6	762	7.948	1	1366.78	0.685	Incidental 21st St Det
4	SCS Runoff	32.58	6	744	4.876	----	------	------	Watershed A1 FTR 10 w/School Add
5	Reservoir	16.10	6	786	4.550	4	1367.81	1.975	Watershed A1
6	SCS Runoff	19.50	6	732	2.357	----	------	------	Watershed A2 FTR 10
7	Reservoir	8.471	6	762	2.354	6	1369.16	1.109	Detention Routing A2
8	SCS Runoff	37.01	6	732	4.474	----	------	------	Watershed A3 FTR 10
9	Combine	39.03	6	738	6.828	7, 8	------	------	Combine All FTR @ 21st
11	Reservoir	16.92	6	774	6.827	9	1365.19	2.089	Concetp Det @ 21st Fut

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	66.24	6	750	9.878	----	------	------	Watershed A B4 10
2	Reservoir	56.35	6	762	9.878	1	1367.02	0.918	Incidental 21st St Det
4	SCS Runoff	39.27	6	744	5.895	----	------	------	Watershed A1 FTR 10 w/School Add
5	Reservoir	21.42	6	780	5.570	4	1368.07	2.263	Watershed A1
6	SCS Runoff	22.73	6	732	2.768	----	------	------	Watershed A2 FTR 10
7	Reservoir	11.22	6	762	2.764	6	1369.45	1.223	Detention Routing A2
8	SCS Runoff	43.15	6	732	5.254	----	------	------	Watershed A3 FTR 10
9	Combine	48.03	6	738	8.019	7, 8	------	------	Combine All FTR @ 21st
11	Reservoir	20.32	6	774	8.018	9	1365.50	2.506	Concetp Det @ 21st Fut

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	86.14	6	750	12.865	----	------	------	Watershed A B4 10
2	Reservoir	64.39	6	768	12.864	1	1367.24	1.563	Incidental 21st St Det
4	SCS Runoff	49.33	6	744	7.447	----	------	------	Watershed A1 FTR 10 w/School Add
5	Reservoir	27.90	6	780	7.122	4	1368.44	2.704	Watershed A1
6	SCS Runoff	27.55	6	732	3.386	----	------	------	Watershed A2 FTR 10
7	Reservoir	15.14	6	756	3.383	6	1369.86	1.392	Detention Routing A2
8	SCS Runoff	52.30	6	732	6.428	----	------	------	Watershed A3 FTR 10
9	Combine	61.44	6	738	9.810	7, 8	------	------	Combine All FTR @ 21st
11	Reservoir	25.31	6	774	9.810	9	1365.95	3.134	Concetp Det @ 21st Fut

Table of Contents

100 - Year

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	115.28	6	744	17.260	----	------	------	Watershed A B4 10
2	Reservoir	76.82	6	774	17.260	1	1367.64	2.726	Incidental 21st St Det
4	SCS Runoff	63.67	6	744	9.695	----	------	------	Watershed A1 FTR 10 w/School Add
5	Reservoir	36.18	6	780	9.370	4	1368.97	3.343	Watershed A1
6	SCS Runoff	34.40	6	732	4.271	----	------	------	Watershed A2 FTR 10
7	Reservoir	19.93	6	756	4.268	6	1370.43	1.636	Detention Routing A2
8	SCS Runoff	65.31	6	732	8.108	----	------	------	Watershed A3 FTR 10
9	Combine	79.66	6	738	12.376	7, 8	------	------	Combine All FTR @ 21st
11	Reservoir	33.64	6	774	12.375	9	1366.56	4.014	Concetp Det @ 21st Fut

Hydrograph Plot

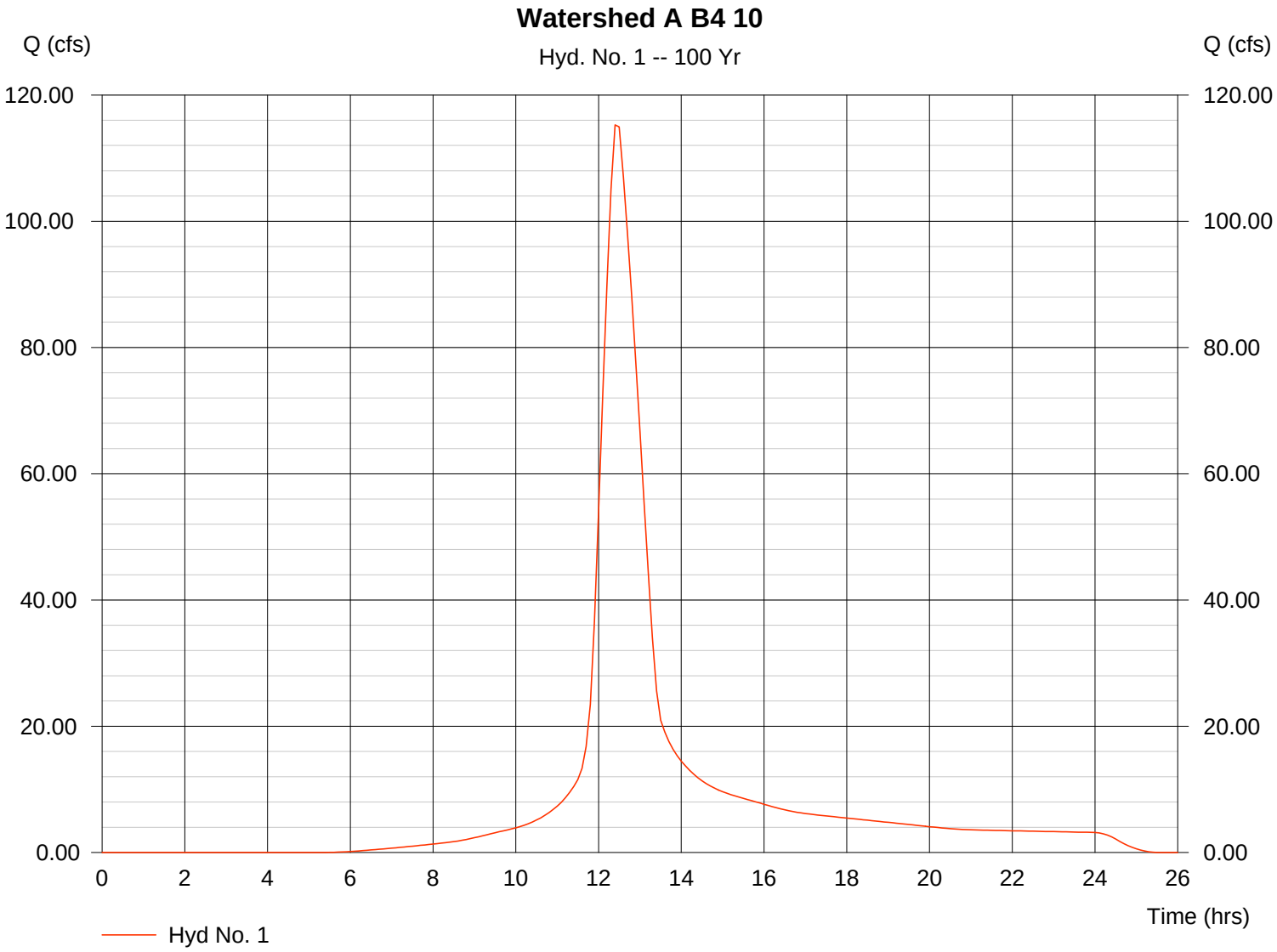
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 1

Watershed A B4 10

Hydrograph type	= SCS Runoff	Peak discharge	= 115.28 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 38.090 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 54.60 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 17.260 acft



Hydrograph Plot

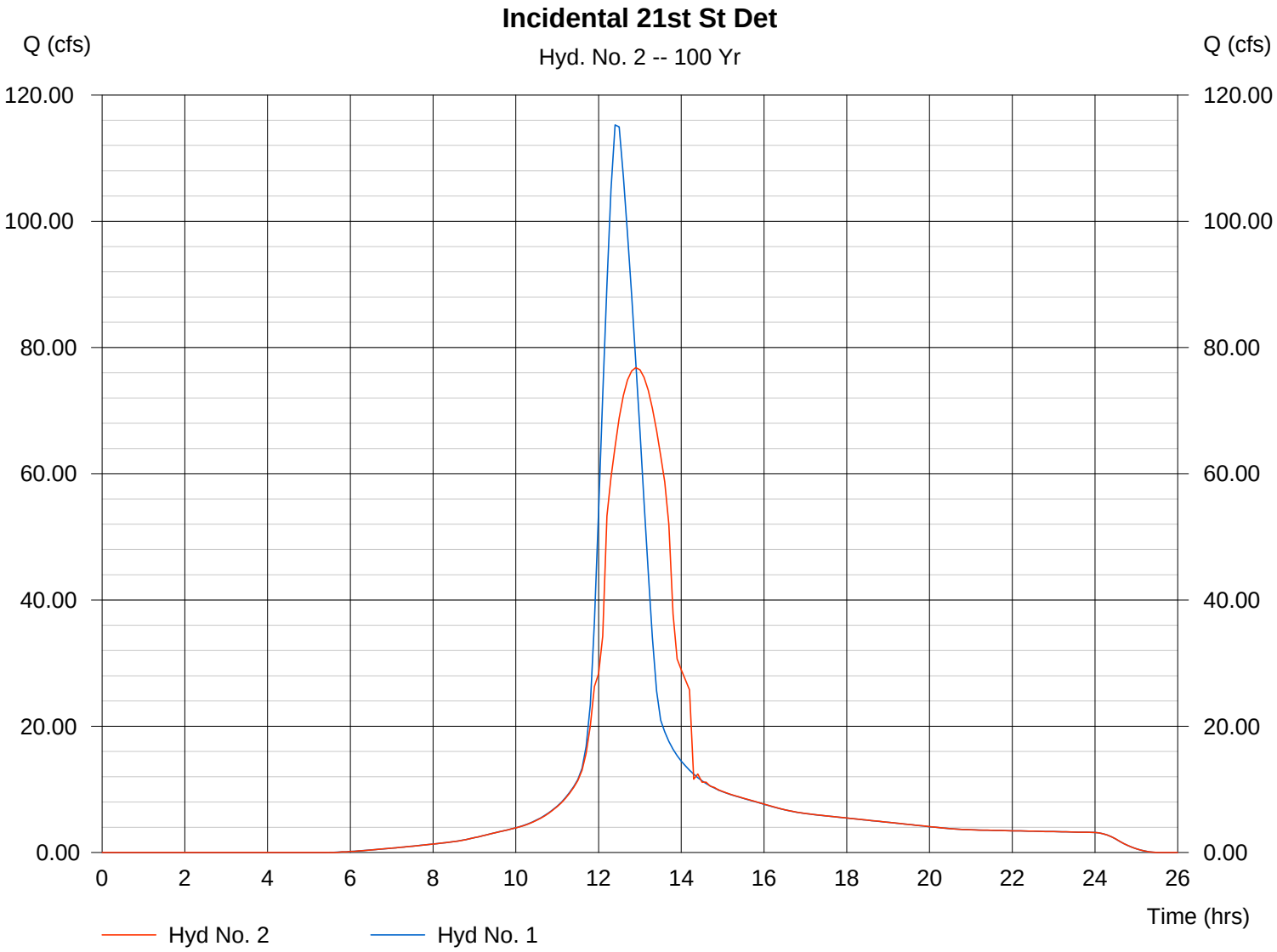
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 2

Incidental 21st St Det

Hydrograph type	=	Reservoir	Peak discharge	=	76.82 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	1	Max. Elevation	=	1367.64 ft
Reservoir name	=	Existing Detention at 21s	Max. Storage	=	2.726 acft

Storage Indication method used. | Hydrograph Volume = 17.260 acft



Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Pond No. 3 - Existing Detention at 21s

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1363.00	20	0.000	0.000
1.00	1364.00	100	0.001	0.001
2.00	1365.00	1,000	0.013	0.014
3.00	1366.00	3,000	0.046	0.060
4.00	1367.00	66,616	0.799	0.859
5.00	1368.00	188,341	2.927	3.786
6.00	1369.00	365,769	6.360	10.146

Culvert / Orifice Structures

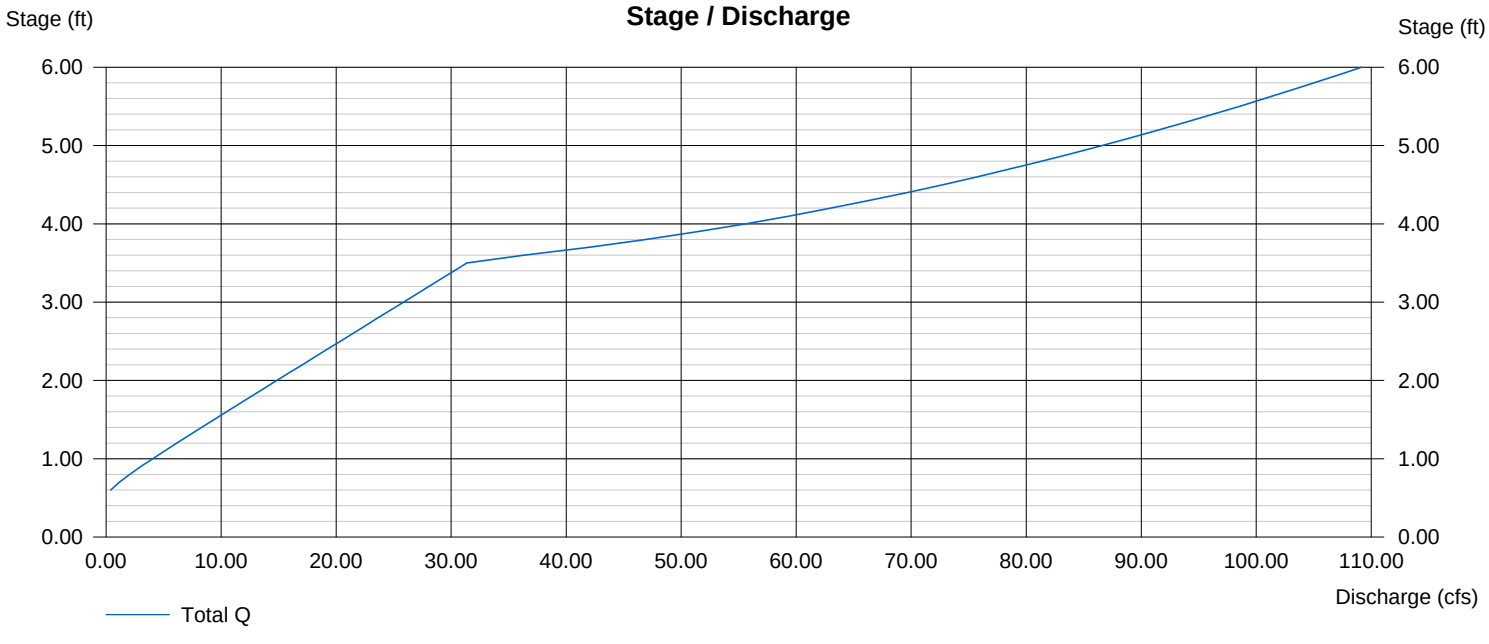
	[A]	[B]	[C]	[D]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1363.50	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	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.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

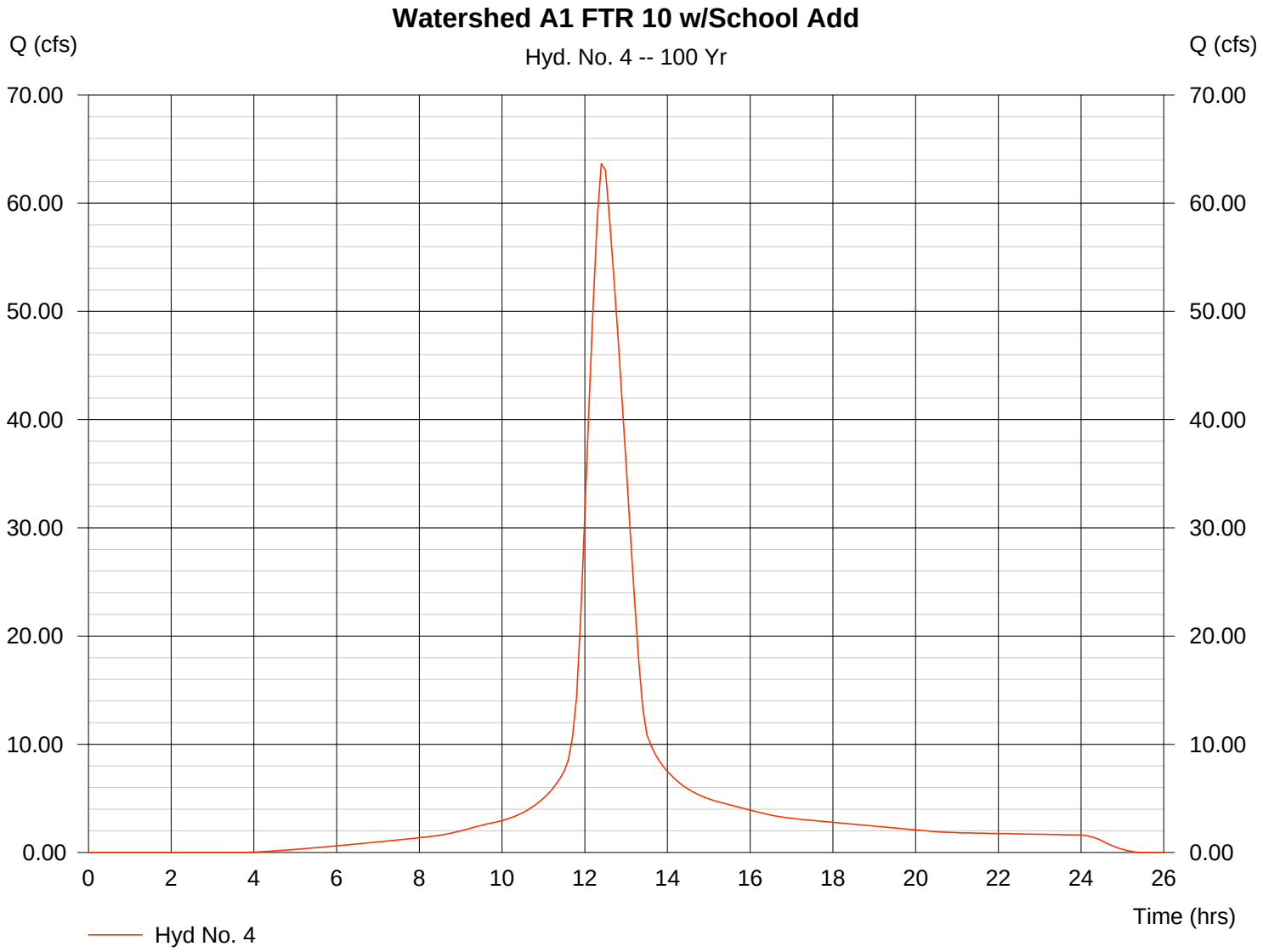
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 4

Watershed A1 FTR 10 w/School Add

Hydrograph type	= SCS Runoff	Peak discharge	= 63.67 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 18.600 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 55.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 9.695 acft



Hydrograph Plot

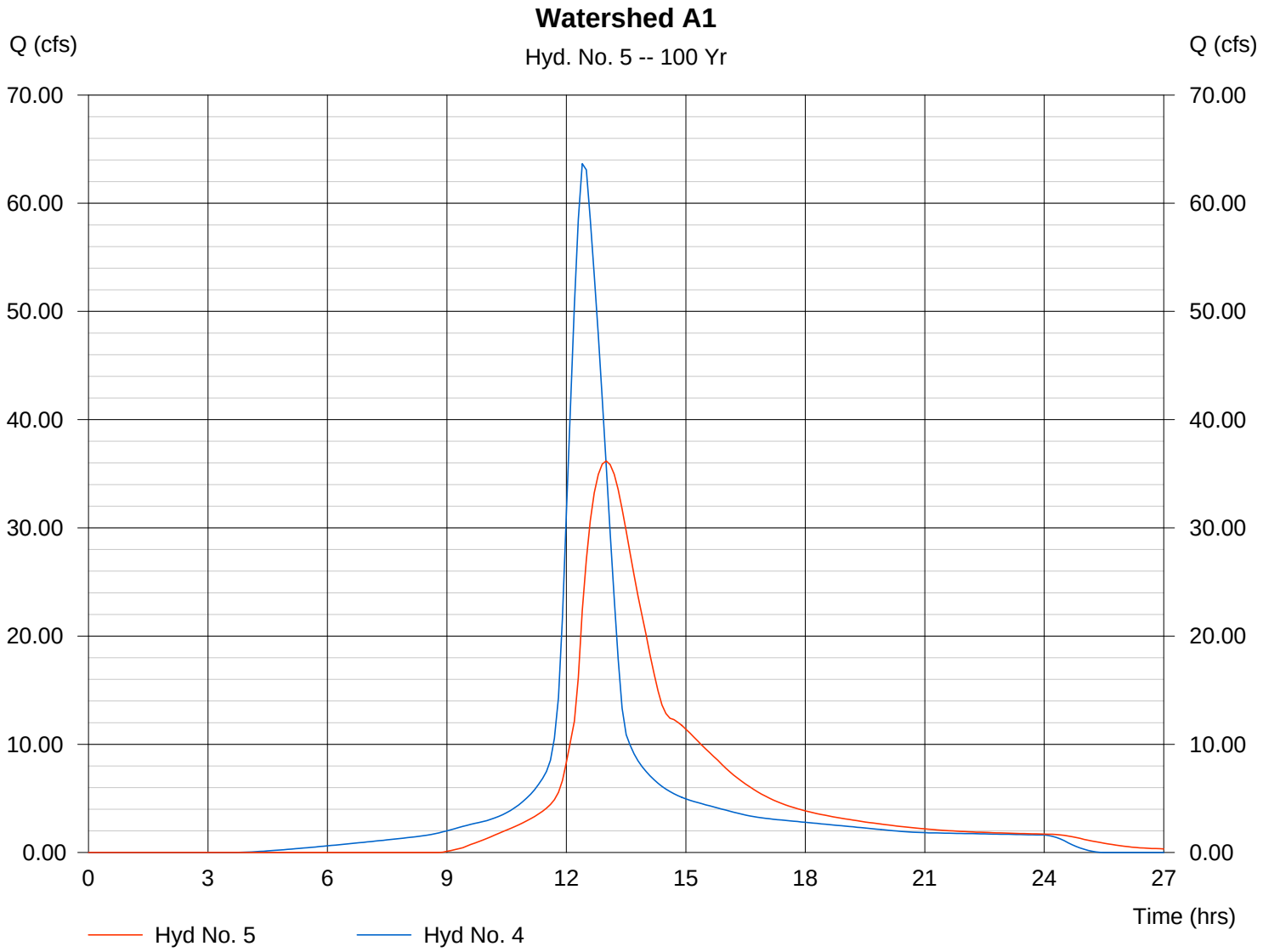
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 5

Watershed A1

Hydrograph type	=	Reservoir	Peak discharge	=	36.18 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	4	Max. Elevation	=	1368.97 ft
Reservoir name	=	Conceptual Watershed A1	Max. Storage	=	3.343 acft

Storage Indication method used. | Hydrograph Volume = 9.370 acft



Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Pond No. 1 - Conceptual Watershed A1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1365.50	25,000	0.000	0.000
0.50	1366.00	31,644	0.325	0.325
1.50	1367.00	40,839	0.832	1.157
2.50	1368.00	47,748	1.017	2.174
3.50	1369.00	57,043	1.203	3.377
4.50	1370.00	87,291	1.657	5.033
5.00	1371.00	90,000	1.018	6.051

Culvert / Orifice Structures

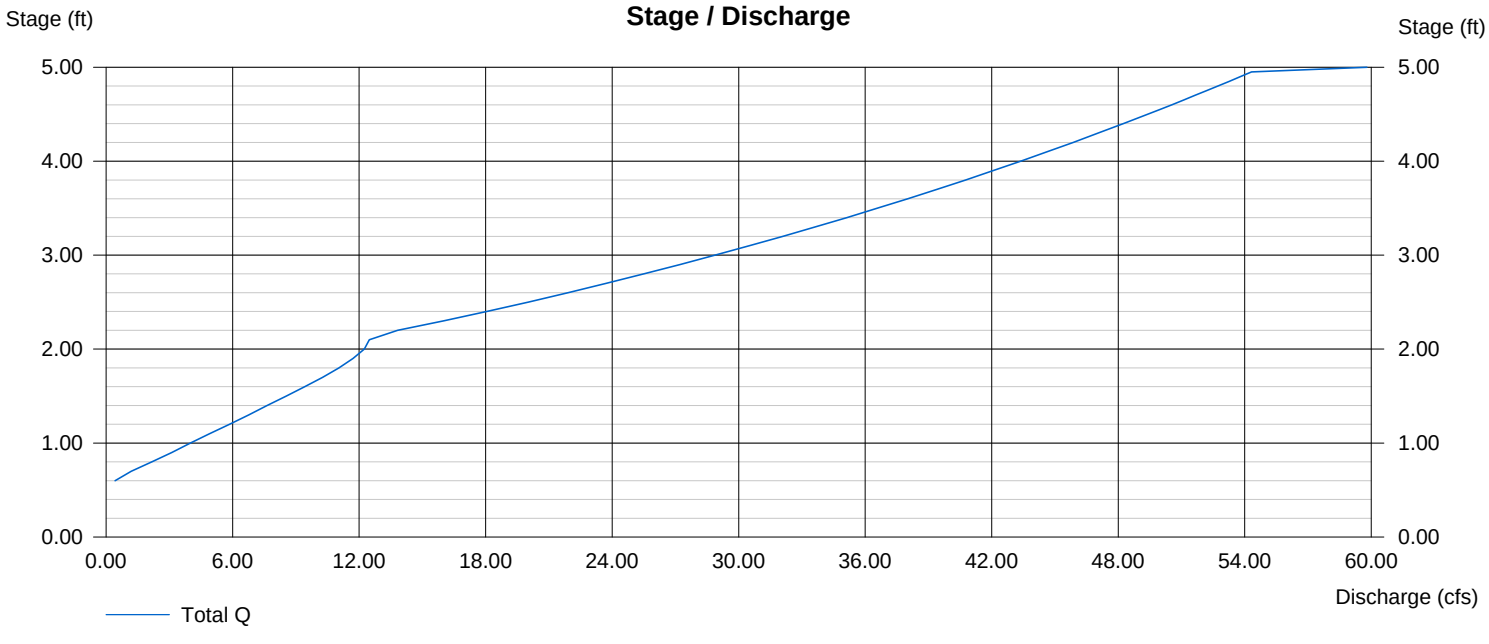
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 2	0	0	0
Invert El. (ft)	= 1365.50	0.00	0.00	0.00
Length (ft)	= 70.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 1366.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

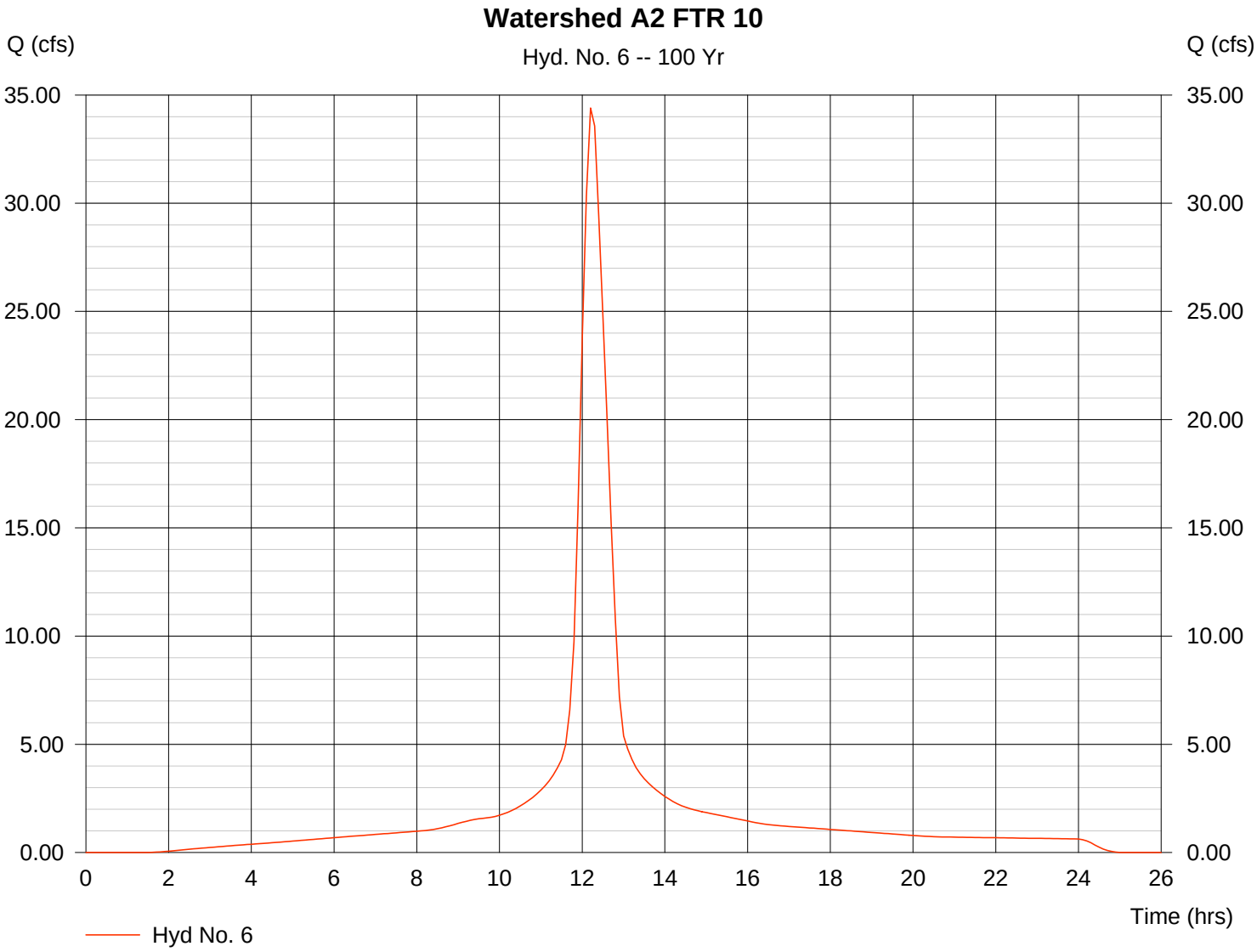
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 6

Watershed A2 FTR 10

Hydrograph type	= SCS Runoff	Peak discharge	= 34.40 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 6.900 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 32.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4.271 acft



Hydrograph Plot

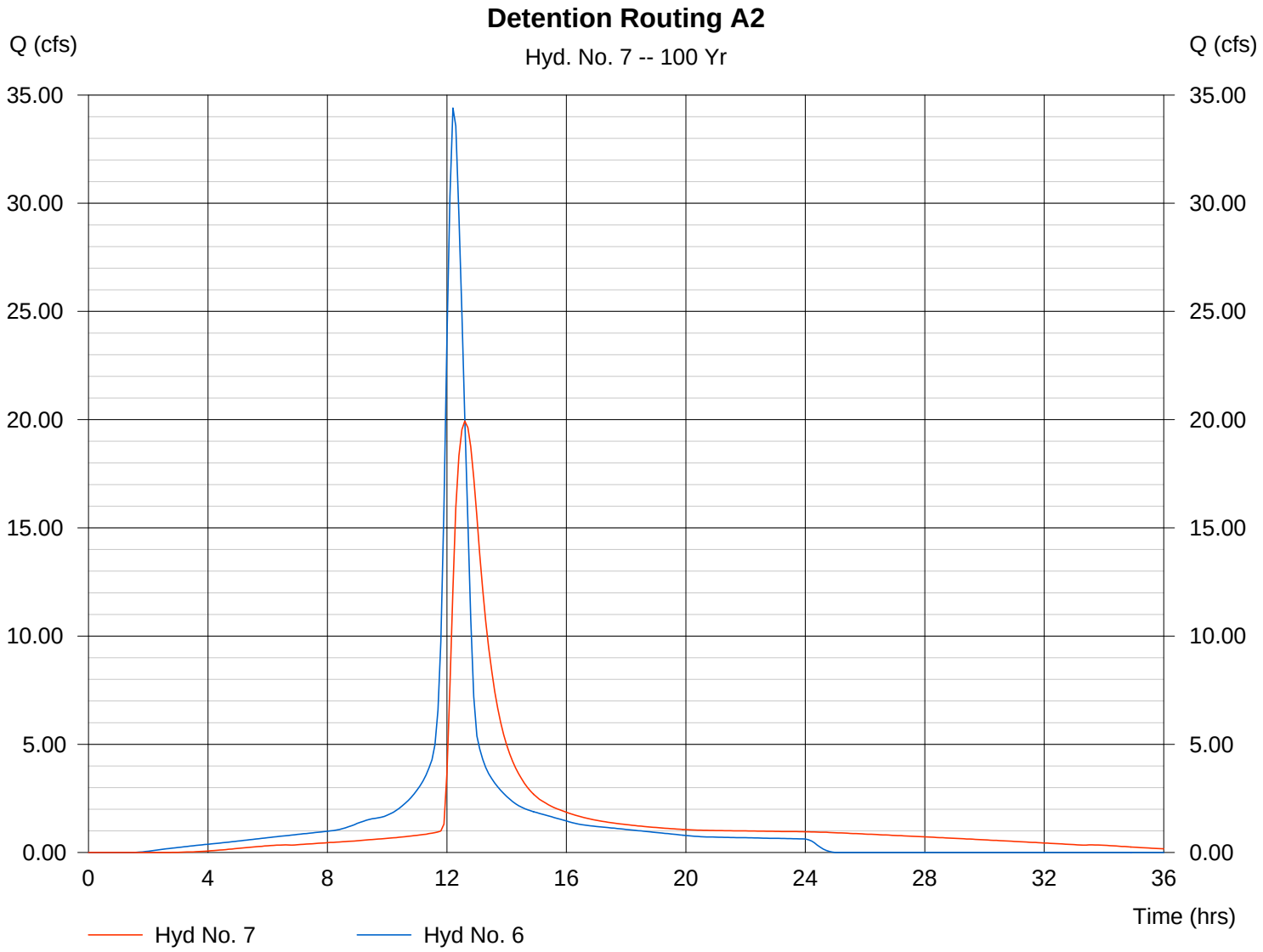
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 7

Detention Routing A2

Hydrograph type	=	Reservoir	Peak discharge	=	19.93 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	6	Max. Elevation	=	1370.43 ft
Reservoir name	=	Watershed A2	Max. Storage	=	1.636 acft

Storage Indication method used. | Hydrograph Volume = 4.268 acft



Pond Report

Pond No. 2 - Watershed A2

Pond Data

Bottom LxW = 100.0 x 100.0 ft Side slope = 4.0:1 Bottom elev. = 1365.50 ft Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1365.50	10,000	0.000	0.000
0.25	1365.75	10,404	0.059	0.059
0.50	1366.00	10,816	0.061	0.119
0.75	1366.25	11,236	0.063	0.183
1.00	1366.50	11,664	0.066	0.248
1.25	1366.75	12,100	0.068	0.317
1.50	1367.00	12,544	0.071	0.387
1.75	1367.25	12,996	0.073	0.461
2.00	1367.50	13,456	0.076	0.537
2.25	1367.75	13,924	0.079	0.615
2.50	1368.00	14,400	0.081	0.696
2.75	1368.25	14,884	0.084	0.780
3.00	1368.50	15,376	0.087	0.867
3.25	1368.75	15,876	0.090	0.957
3.50	1369.00	16,384	0.093	1.049
3.75	1369.25	16,900	0.096	1.145
4.00	1369.50	17,424	0.098	1.243
4.25	1369.75	17,956	0.102	1.345
4.50	1370.00	18,496	0.105	1.450
4.75	1370.25	19,044	0.108	1.557
5.00	1370.50	19,600	0.111	1.668

Culvert / Orifice Structures

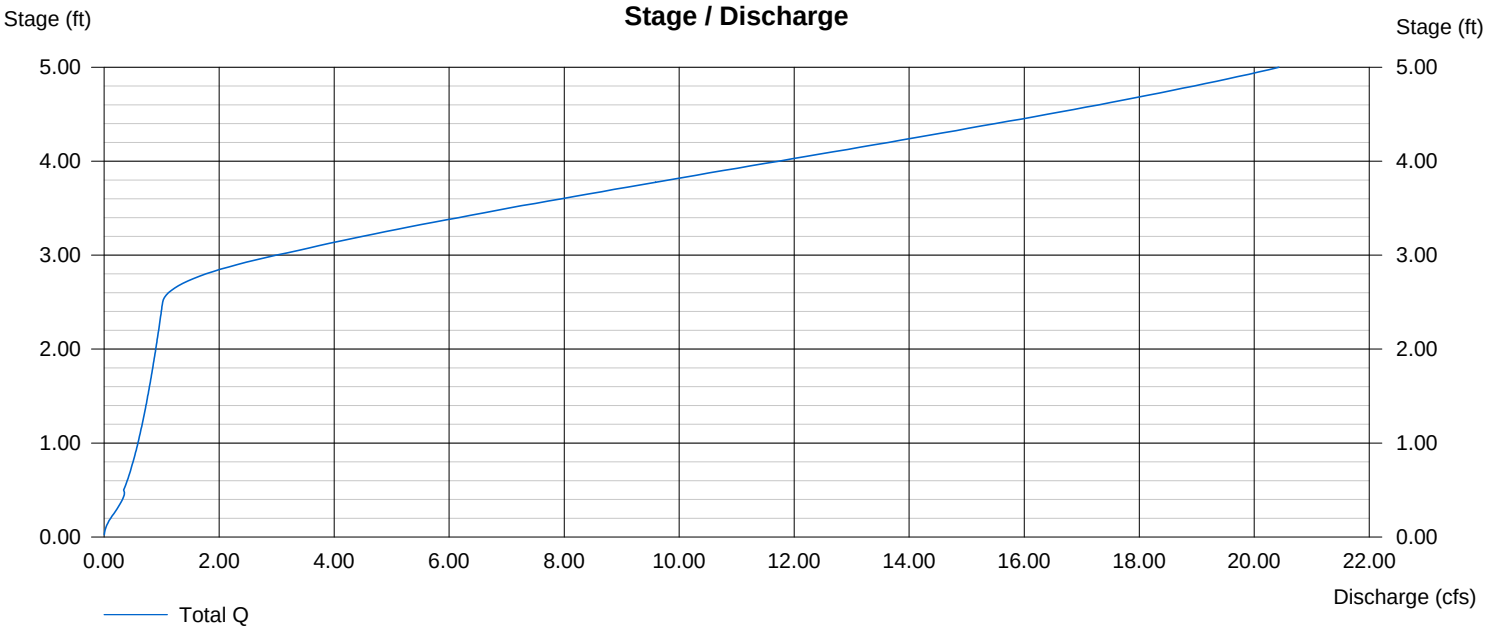
	[A]	[B]	[C]	[D]
Rise (in)	= 6.00	36.00	0.00	0.00
Span (in)	= 6.00	36.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1365.50	1368.00	0.00	0.00
Length (ft)	= 50.00	50.00	0.00	0.00
Slope (%)	= 0.50	0.50	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	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	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

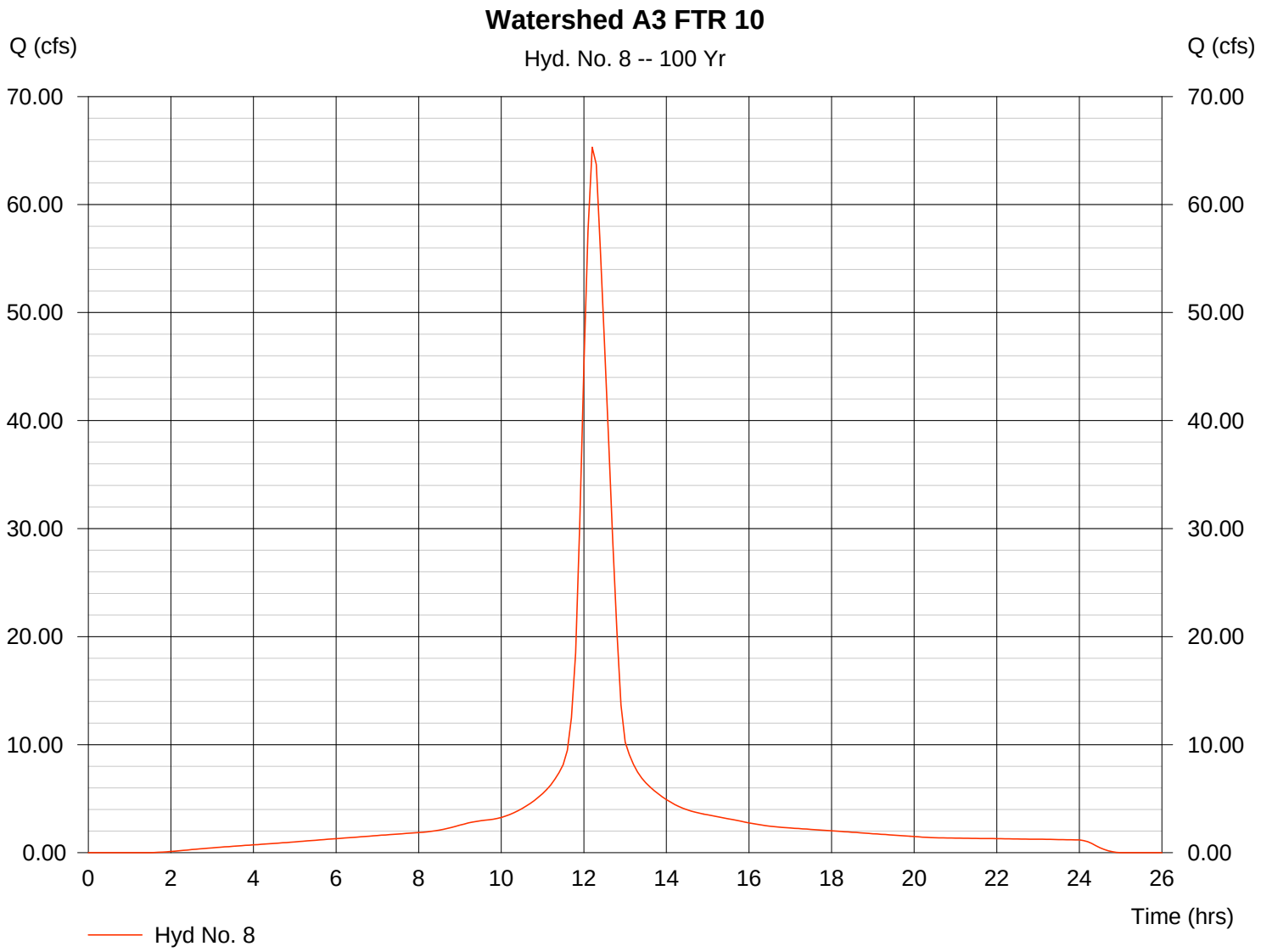
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 8

Watershed A3 FTR 10

Hydrograph type	= SCS Runoff	Peak discharge	= 65.31 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 13.100 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 32.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8.108 acft



Hydrograph Plot

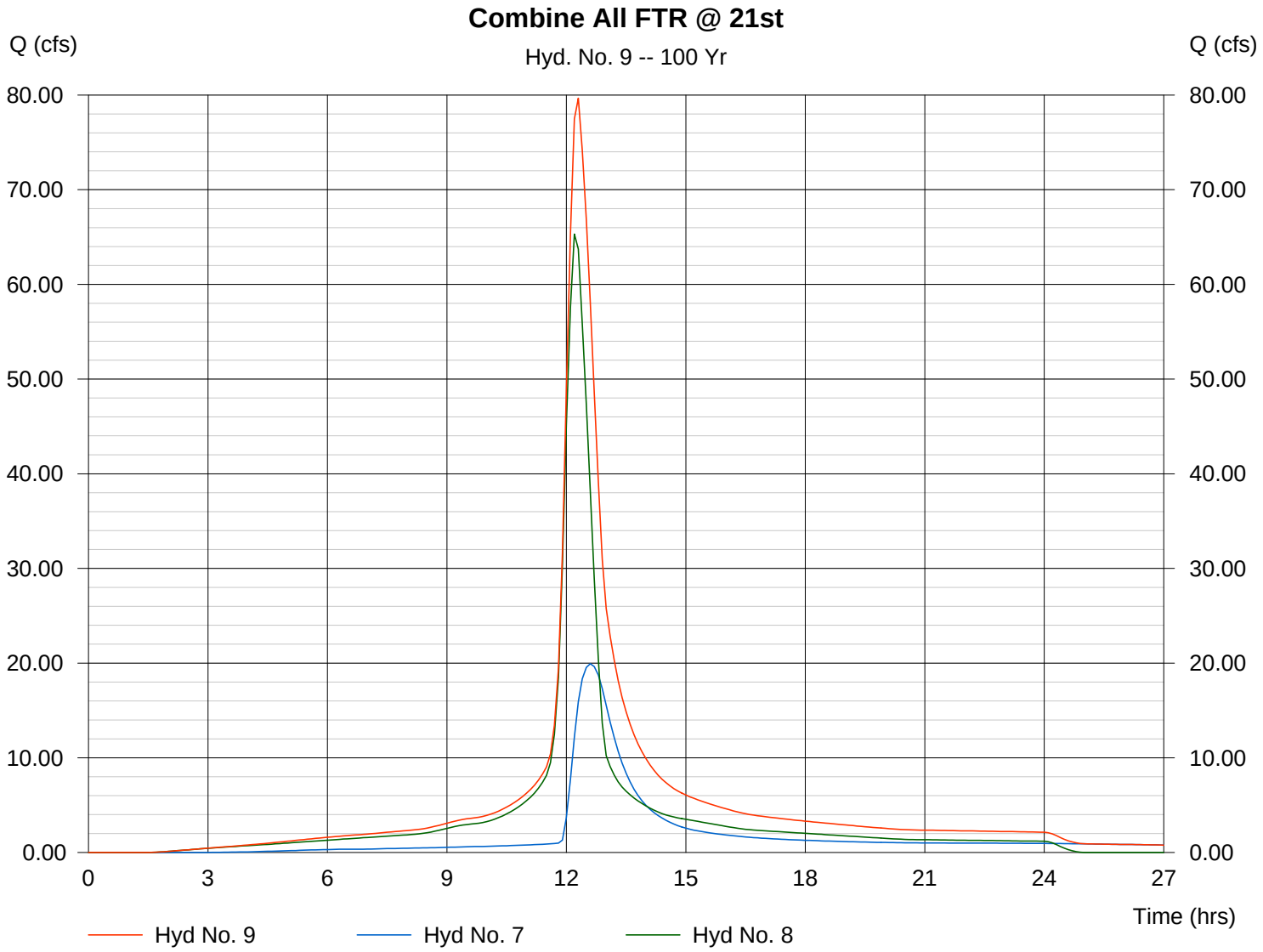
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 9

Combine All FTR @ 21st

Hydrograph type	= Combine	Peak discharge	= 79.66 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 7, 8		

Hydrograph Volume = 12.376 acft



Hydrograph Plot

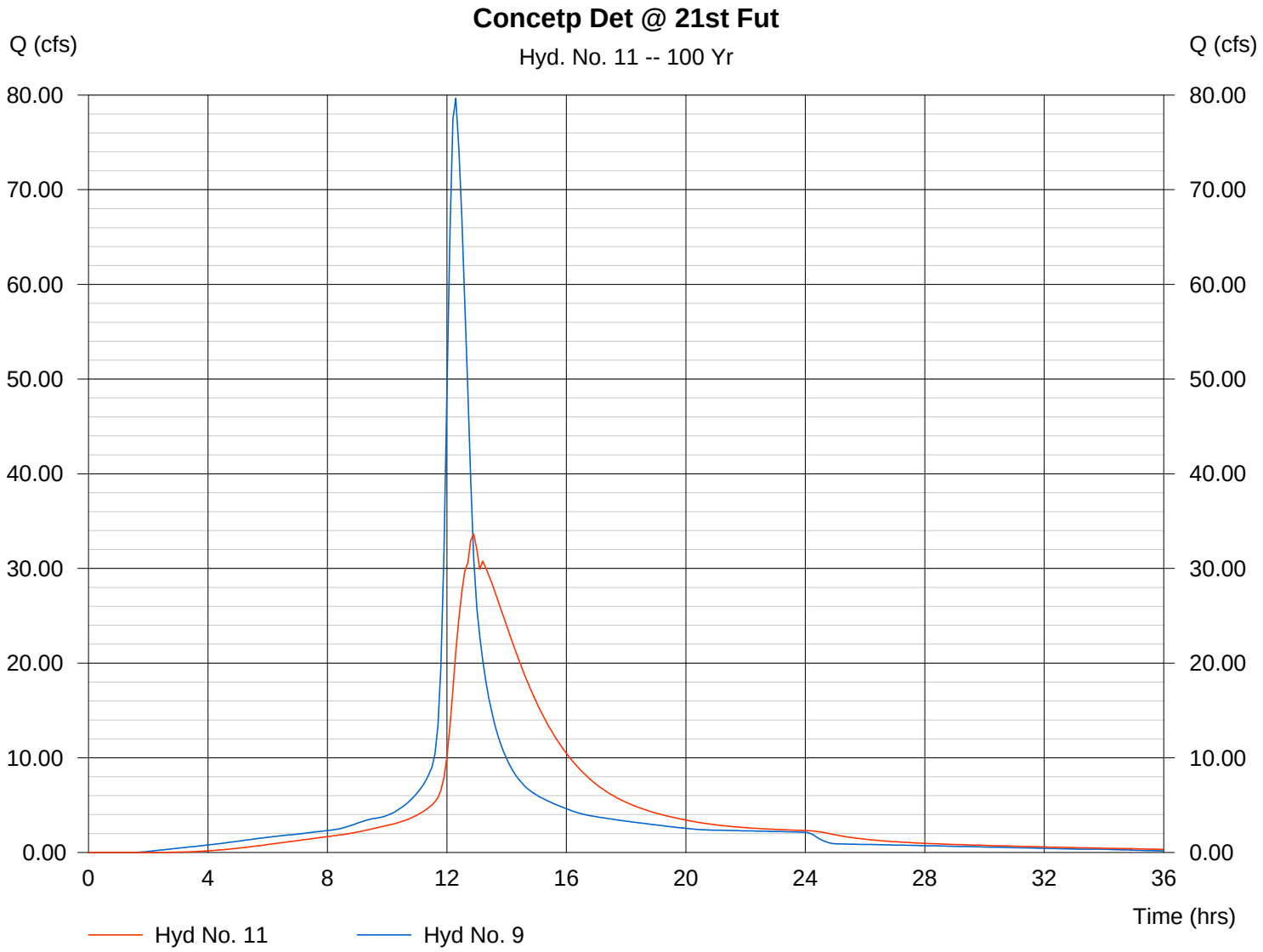
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:52 PM

Hyd. No. 11

Concetp Det @ 21st Fut

Hydrograph type	=	Reservoir	Peak discharge	=	33.64 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	9	Max. Elevation	=	1366.56 ft
Reservoir name	=	Concept Det @21 Fut	Max. Storage	=	4.014 acft

Storage Indication method used. | Hydrograph Volume = 12.375 acft



Pond Report

Pond No. 4 - Concept Det @21 Fut

Pond Data

Bottom LxW = 250.0 x 200.0 ft Side slope = 5.0:1 Bottom elev. = 1363.50 ft Depth = 6.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1363.50	50,000	0.000	0.000
0.30	1363.80	51,359	0.349	0.349
0.60	1364.10	52,736	0.358	0.707
0.90	1364.40	54,131	0.368	1.075
1.20	1364.70	55,544	0.378	1.453
1.50	1365.00	56,975	0.387	1.841
1.80	1365.30	58,424	0.397	2.238
2.10	1365.60	59,891	0.407	2.645
2.40	1365.90	61,376	0.418	3.063
2.70	1366.20	62,879	0.428	3.491
3.00	1366.50	64,400	0.438	3.929
3.30	1366.80	65,939	0.449	4.378
3.60	1367.10	67,496	0.459	4.837
3.90	1367.40	69,071	0.470	5.308
4.20	1367.70	70,664	0.481	5.789
4.50	1368.00	72,275	0.492	6.281
4.80	1368.30	73,904	0.503	6.784
5.10	1368.60	75,551	0.515	7.299
5.40	1368.90	77,216	0.526	7.825
5.70	1369.20	78,899	0.538	8.363
6.00	1369.50	80,600	0.549	8.912

Culvert / Orifice Structures

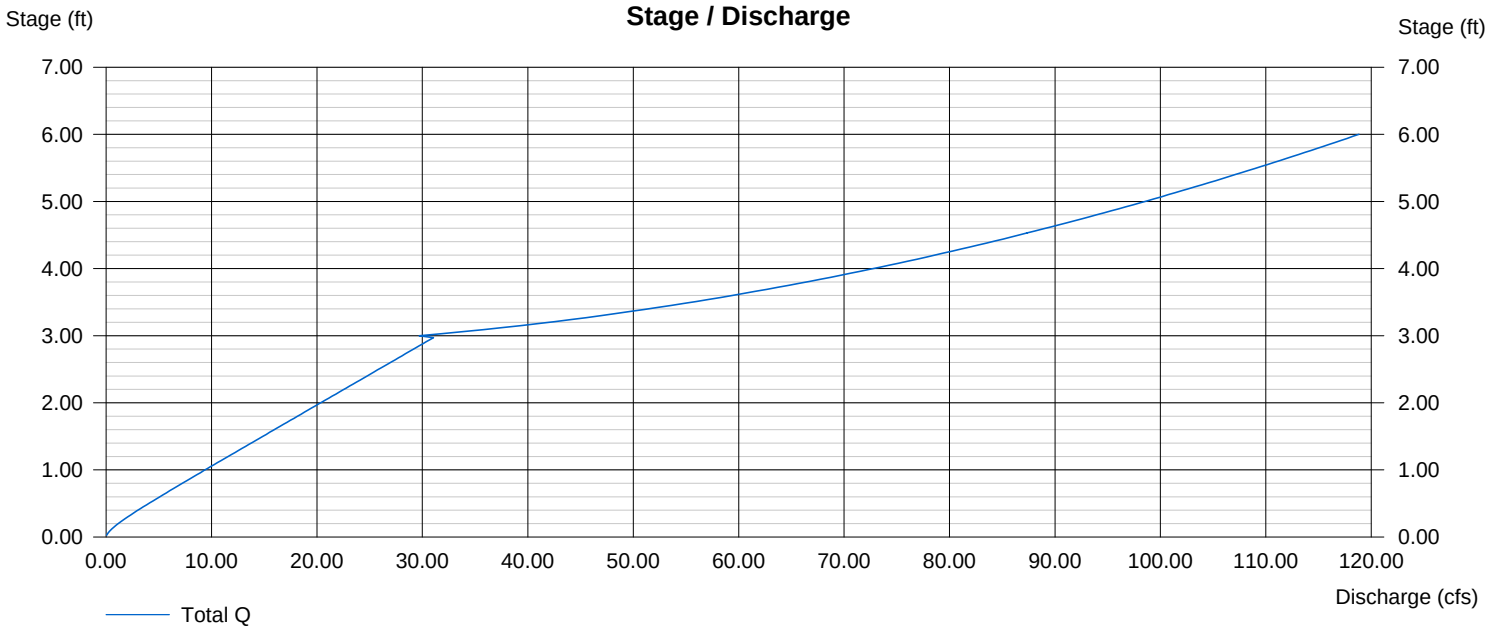
	[A]	[B]	[C]	[D]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1363.50	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

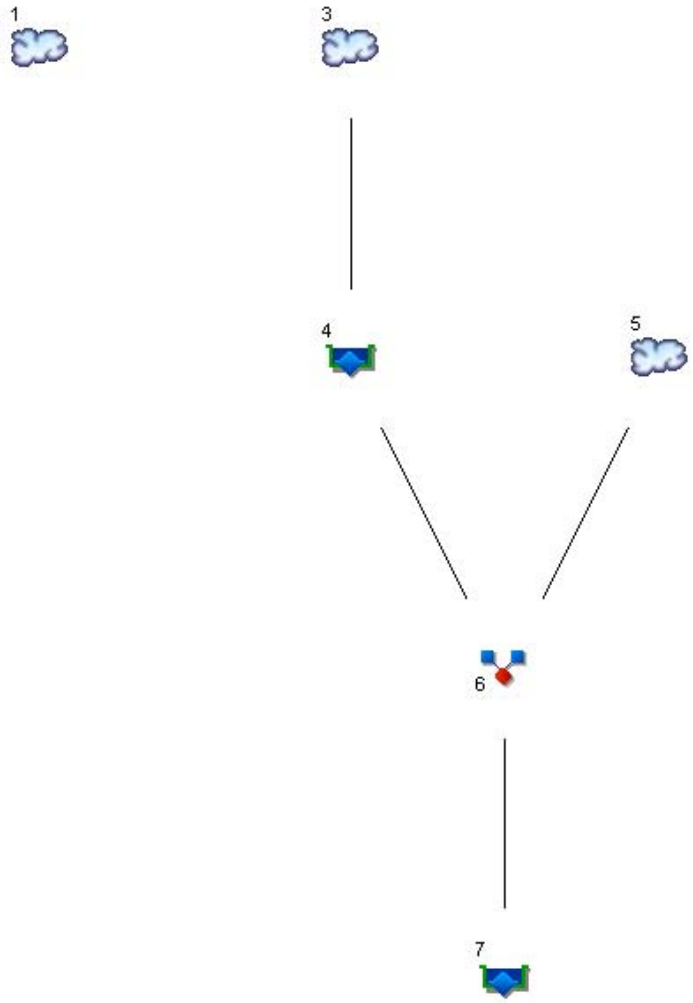
Weir Structures

	[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.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.





Legend

Hyd.	Origin	Description
1	SCS Runoff	Watershed B West
3	SCS Runoff	Watershed B1 FTR Res
4	Reservoir	Watershed B1
5	SCS Runoff	Watershed B2 FTR WestSchool
6	Combine	Total Discharge to West
7	Reservoir	School Detention

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	24.48	6	744	3.194	----	------	------	Watershed B West
3	SCS Runoff	20.43	6	750	3.048	----	------	------	Watershed B1 FTR Res
4	Reservoir	10.93	6	786	2.346	3	1367.69	1.288	Watershed B1
5	SCS Runoff	29.25	6	732	3.382	----	------	------	Watershed B2 FTR WestSchool
6	Combine	29.25	6	732	5.728	4, 5	------	------	Total Discharge to West
7	Reservoir	25.58	6	756	5.728	6	1365.04	0.542	School Detention

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	38.18	6	744	4.936	----	------	------	Watershed B West
3	SCS Runoff	29.60	6	744	4.430	----	------	------	Watershed B1 FTR Res
4	Reservoir	17.80	6	780	3.728	3	1368.12	1.677	Watershed B1
5	SCS Runoff	41.13	6	732	4.794	----	------	------	Watershed B2 FTR WestSchool
6	Combine	47.03	6	738	8.522	4, 5	------	------	Total Discharge to West
7	Reservoir	40.50	6	756	8.522	6	1365.56	0.841	School Detention

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	47.55	6	738	6.134	----	------	------	Watershed B West
3	SCS Runoff	35.68	6	744	5.356	----	------	------	Watershed B1 FTR Res
4	Reservoir	21.04	6	780	4.654	3	1368.40	1.964	Watershed B1
5	SCS Runoff	48.89	6	732	5.733	----	------	------	Watershed B2 FTR WestSchool
6	Combine	58.45	6	738	10.387	4, 5	------	------	Total Discharge to West
7	Reservoir	51.01	6	750	10.387	6	1365.85	1.008	School Detention

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	62.03	6	738	7.989	----	------	------	Watershed B West
3	SCS Runoff	44.82	6	744	6.767	----	------	------	Watershed B1 FTR Res
4	Reservoir	23.55	6	780	6.065	3	1368.91	2.497	Watershed B1
5	SCS Runoff	60.49	6	732	7.154	----	------	------	Watershed B2 FTR WestSchool
6	Combine	75.04	6	738	13.218	4, 5	------	------	Total Discharge to West
7	Reservoir	66.36	6	750	13.218	6	1366.21	1.225	School Detention

Table of Contents

100 - Year

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	83.02	6	738	10.718	----	------	------	Watershed B West
3	SCS Runoff	57.85	6	744	8.809	----	------	------	Watershed B1 FTR Res
4	Reservoir	27.30	6	786	8.107	3	1369.57	3.285	Watershed B1
5	SCS Runoff	76.96	6	732	9.201	----	------	------	Watershed B2 FTR WestSchool
6	Combine	95.59	6	738	17.308	4, 5	------	------	Total Discharge to West
7	Reservoir	85.82	6	744	17.308	6	1366.58	1.464	School Detention

Hydrograph Plot

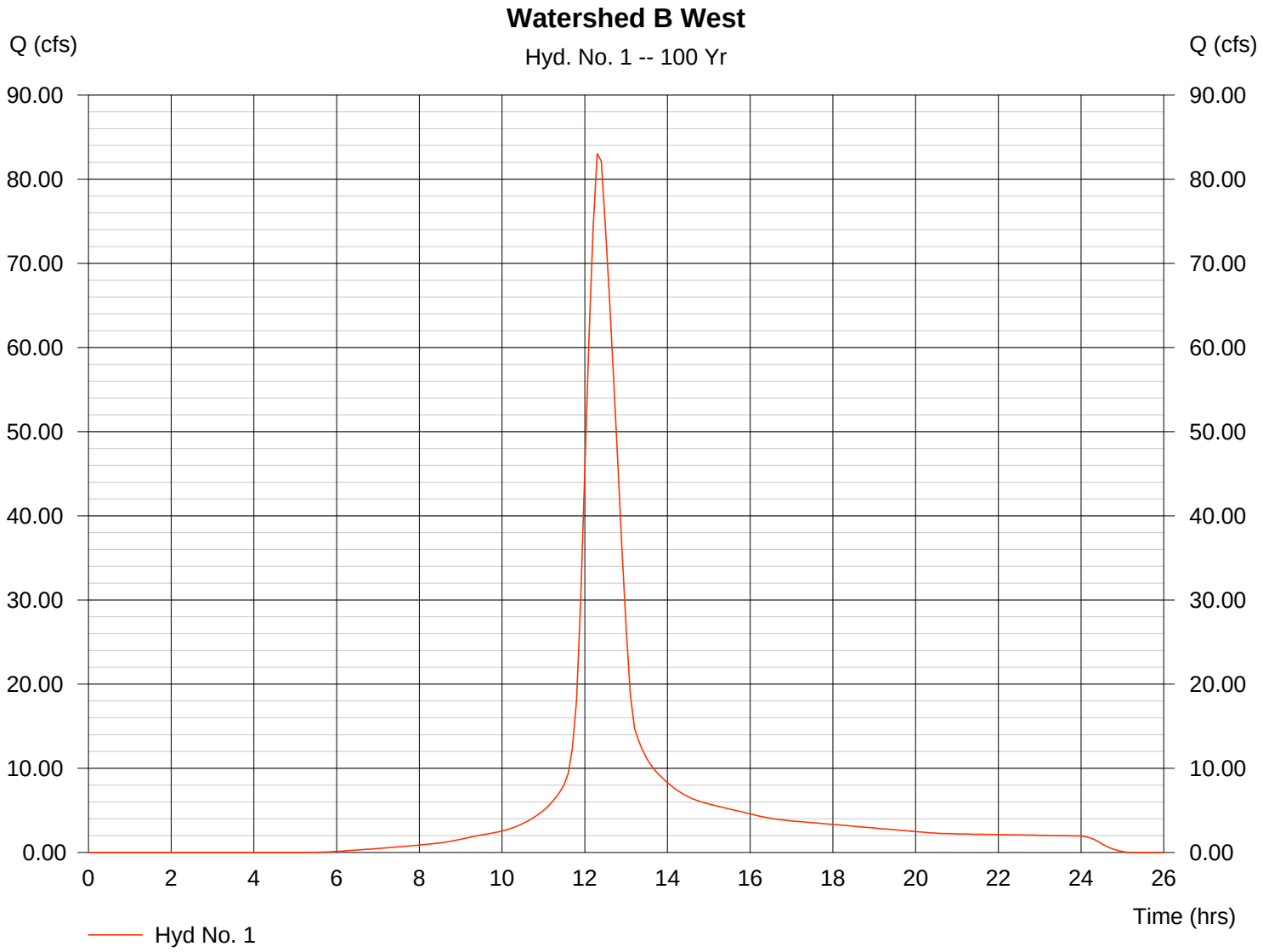
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 1

Watershed B West

Hydrograph type	= SCS Runoff	Peak discharge	= 83.02 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 24.259 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 47.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 10.718 acft



Hydrograph Plot

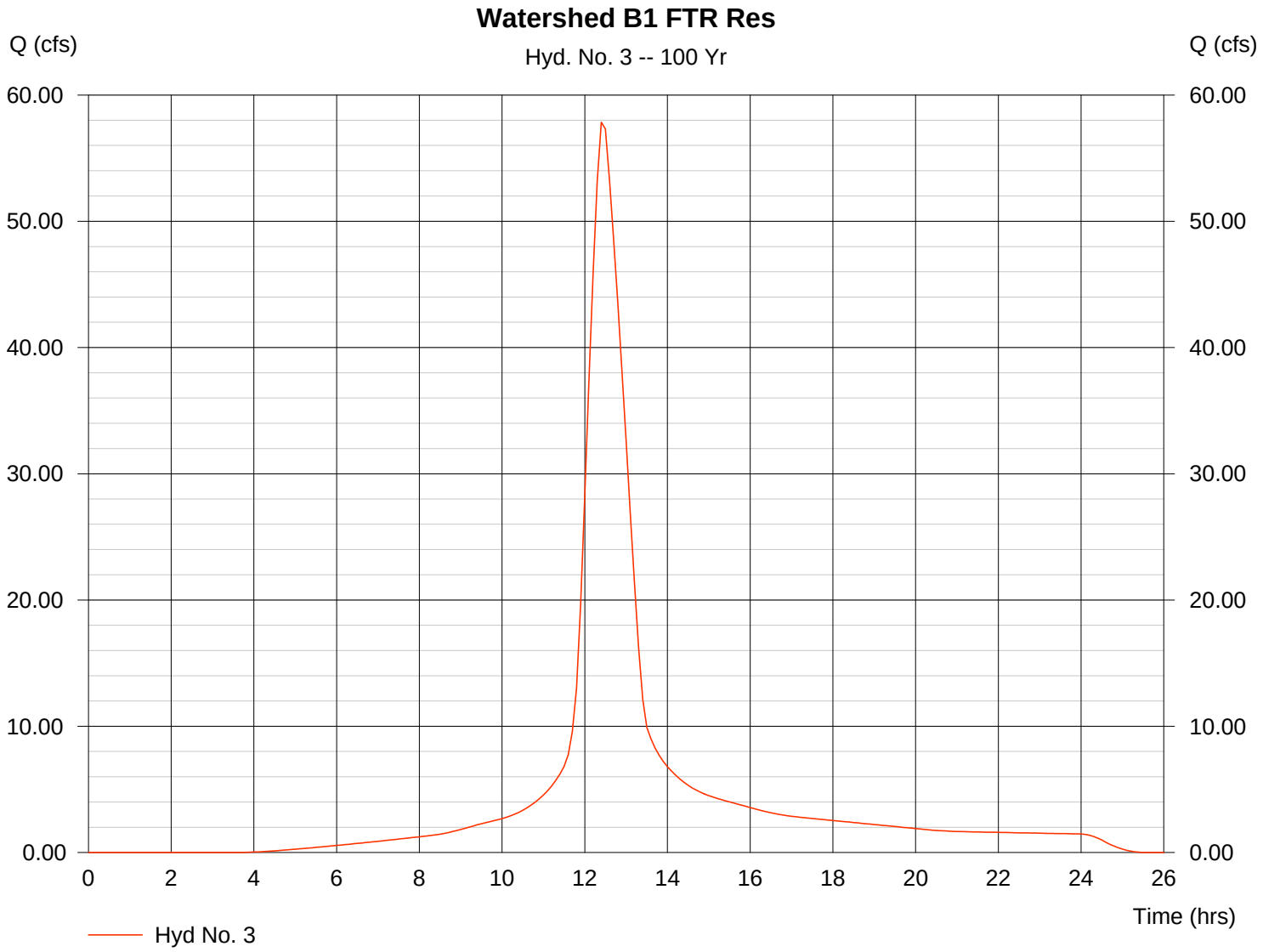
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 3

Watershed B1 FTR Res

Hydrograph type	= SCS Runoff	Peak discharge	= 57.85 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 16.900 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 52.30 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8.809 acft



Hydrograph Plot

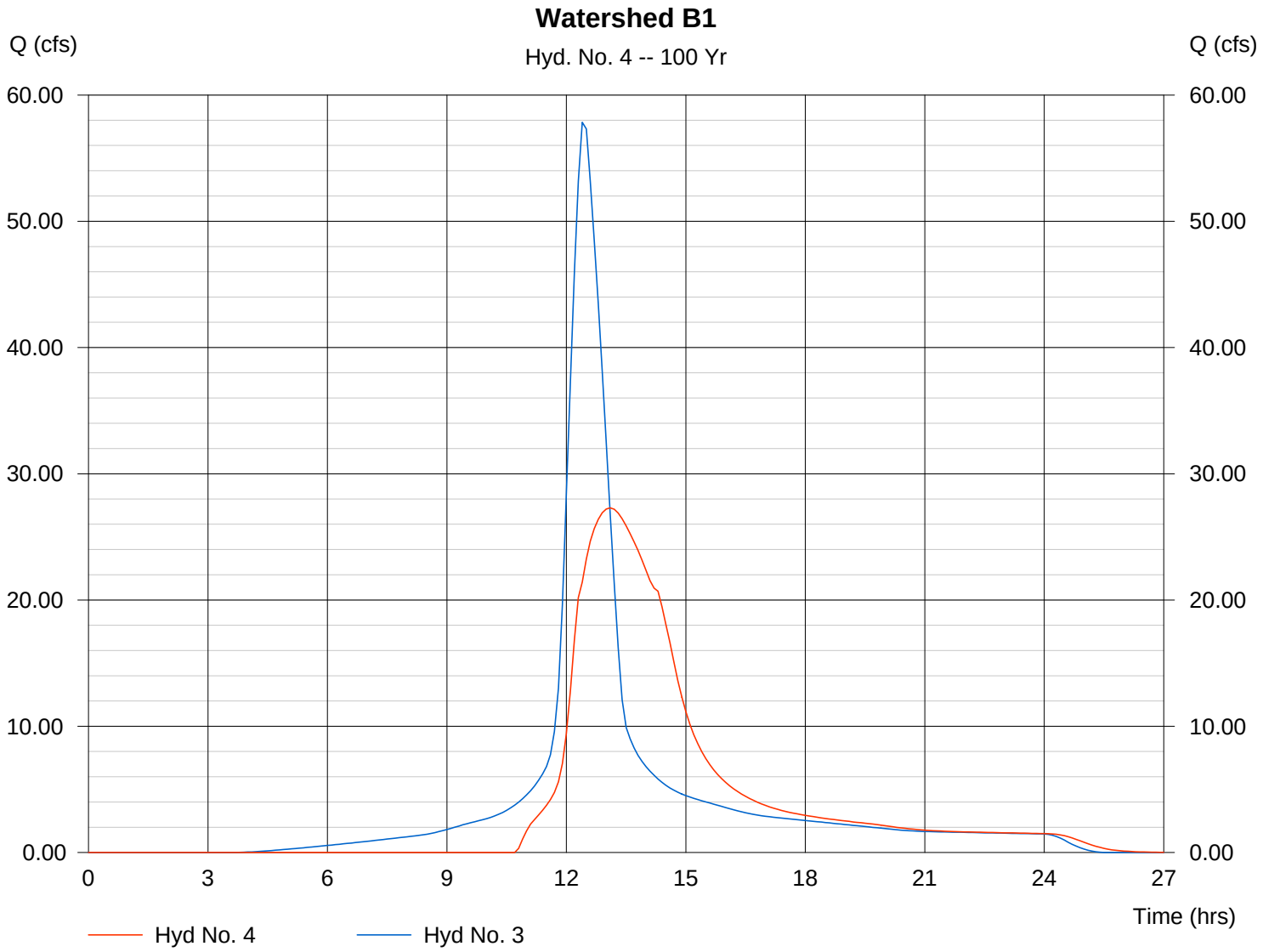
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 4

Watershed B1

Hydrograph type	=	Reservoir	Peak discharge	=	27.30 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	3	Max. Elevation	=	1369.57 ft
Reservoir name	=	Watershed B1 NorthWest	Max. Storage	=	3.285 acft

Storage Indication method used. | Hydrograph Volume = 8.107 acft



Pond Report

Pond No. 1 - Watershed B1 NorthWest

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1366.00	27,400	0.000	0.000
1.00	1367.00	33,760	0.702	0.702
2.00	1368.00	40,505	0.852	1.554
3.00	1369.00	49,457	1.033	2.587
4.00	1370.00	57,578	1.229	3.816

Culvert / Orifice Structures

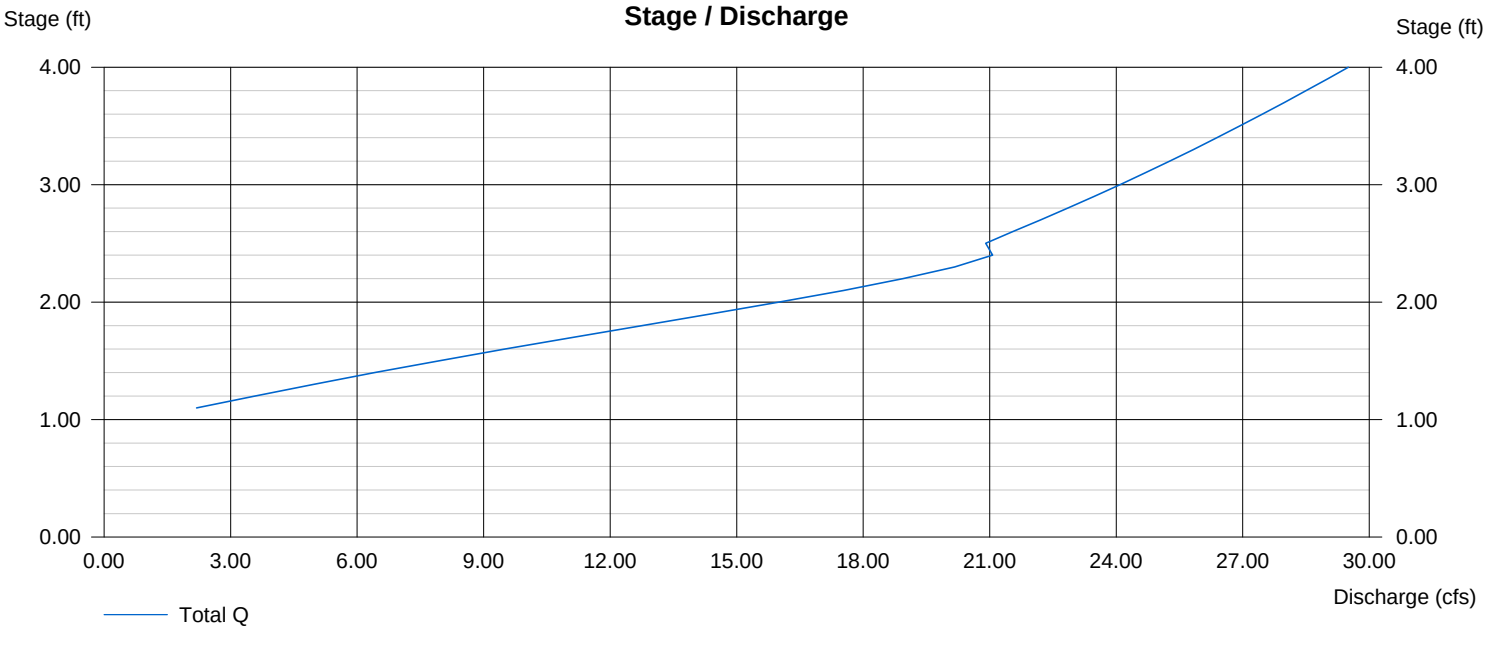
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1366.00	0.00	0.00	0.00
Length (ft)	= 420.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	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	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 1367.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

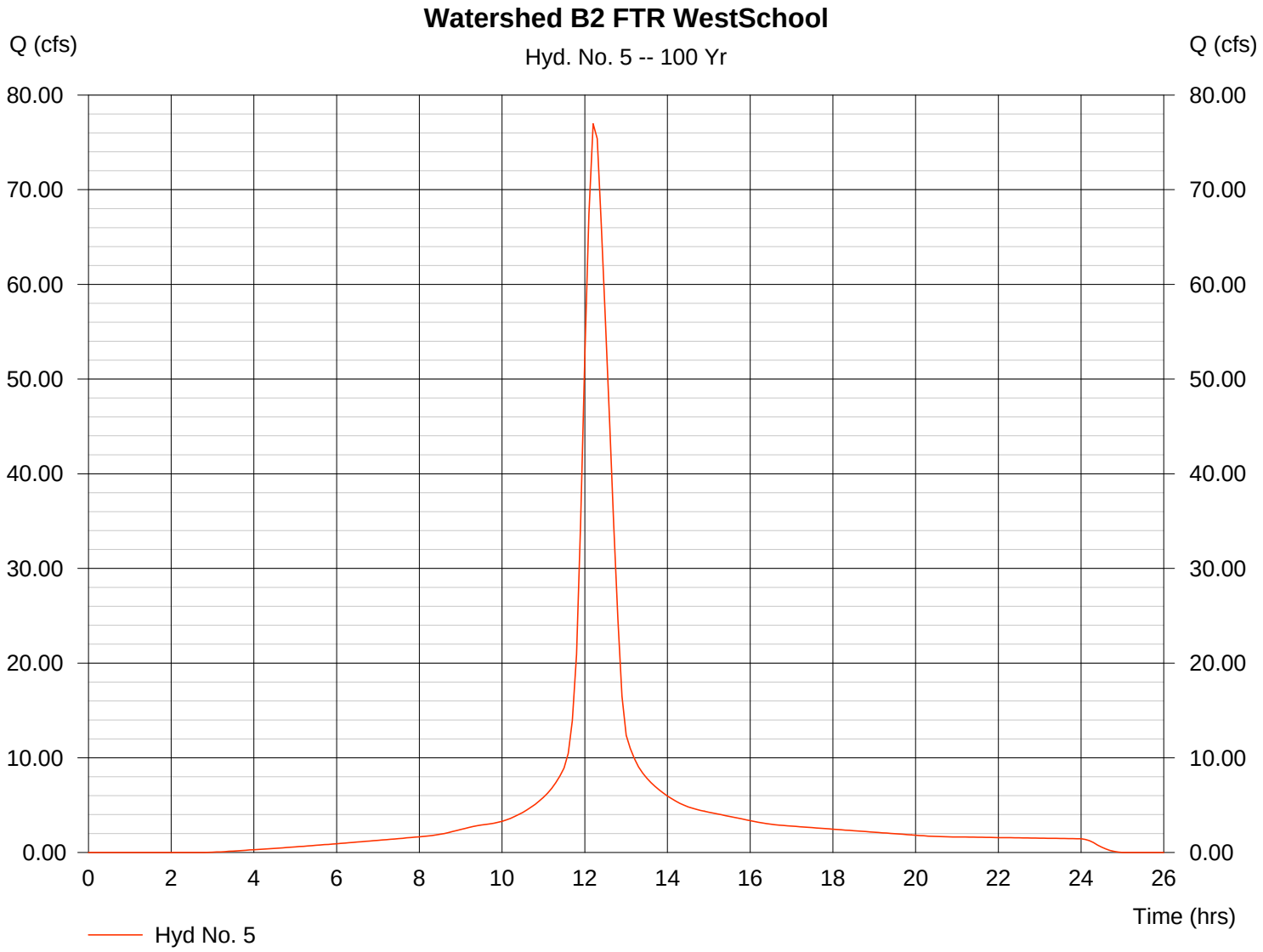
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 5

Watershed B2 FTR WestSchool

Hydrograph type	= SCS Runoff	Peak discharge	= 76.96 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 16.200 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 29.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 9.201 acft



Hydrograph Plot

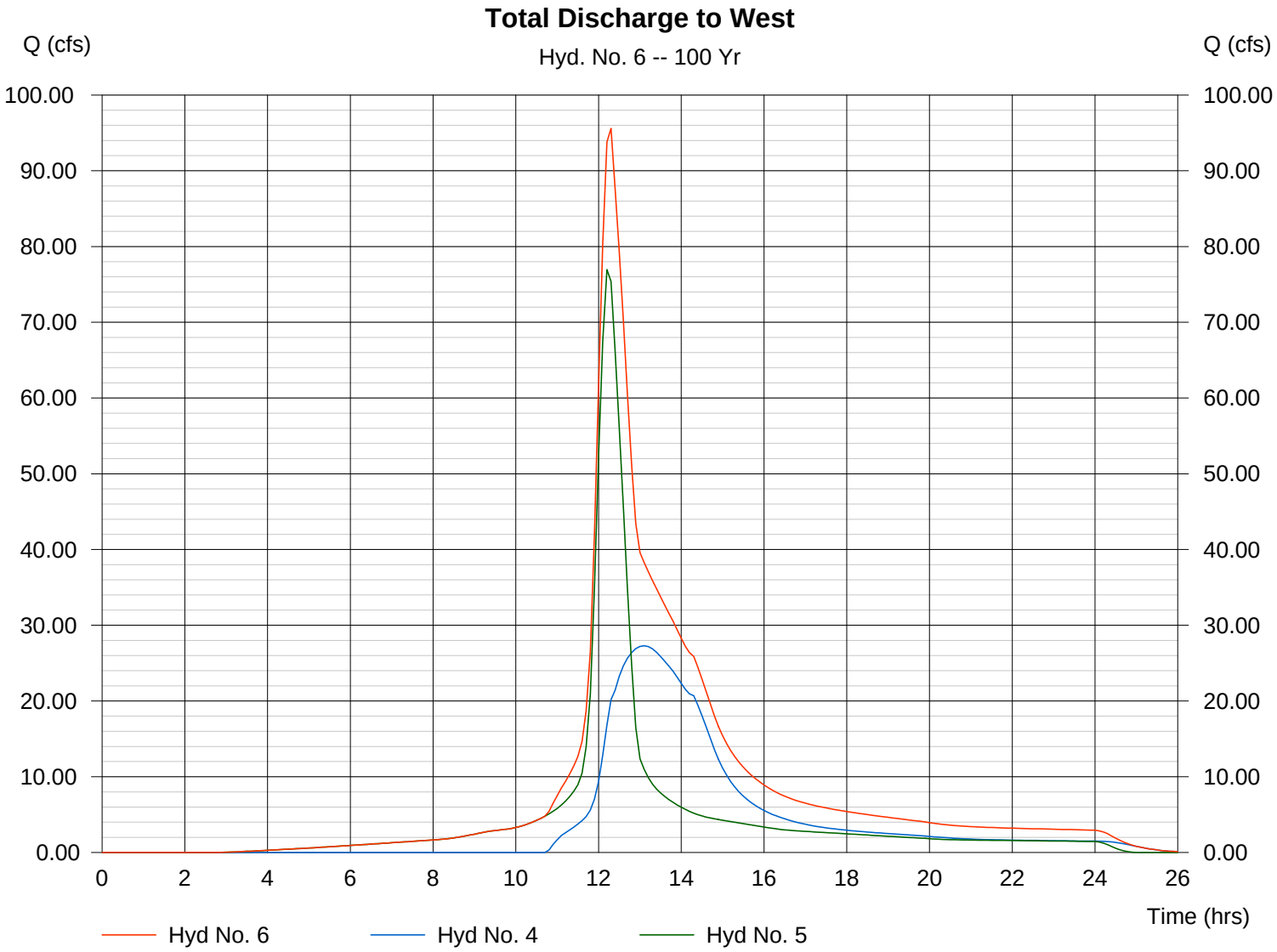
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 6

Total Discharge to West

Hydrograph type	= Combine	Peak discharge	= 95.59 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 4, 5		

Hydrograph Volume = 17.308 acft



Hydrograph Plot

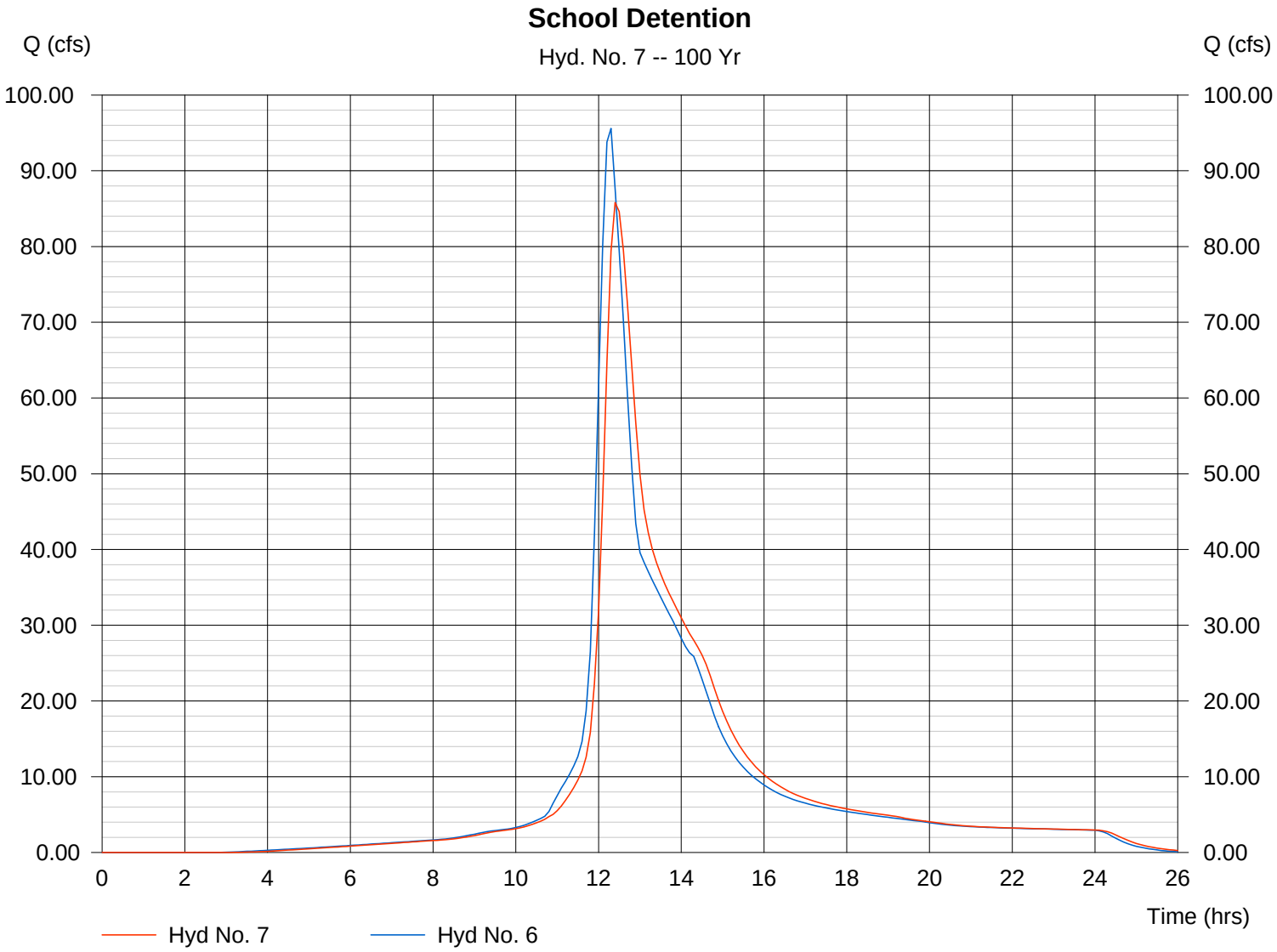
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Hyd. No. 7

School Detention

Hydrograph type	=	Reservoir	Peak discharge	=	85.82 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	6	Max. Elevation	=	1366.58 ft
Reservoir name	=	School Detention	Max. Storage	=	1.464 acft

Storage Indication method used. | Hydrograph Volume = 17.308 acft



Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:53 PM

Pond No. 2 - School Detention

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1363.50	00	0.000	0.000
0.50	1364.00	14,190	0.081	0.081
1.50	1365.00	23,730	0.435	0.517
2.50	1366.00	26,483	0.576	1.093
3.50	1367.00	29,279	0.640	1.733
4.50	1368.00	32,167	0.705	2.438

Culvert / Orifice Structures

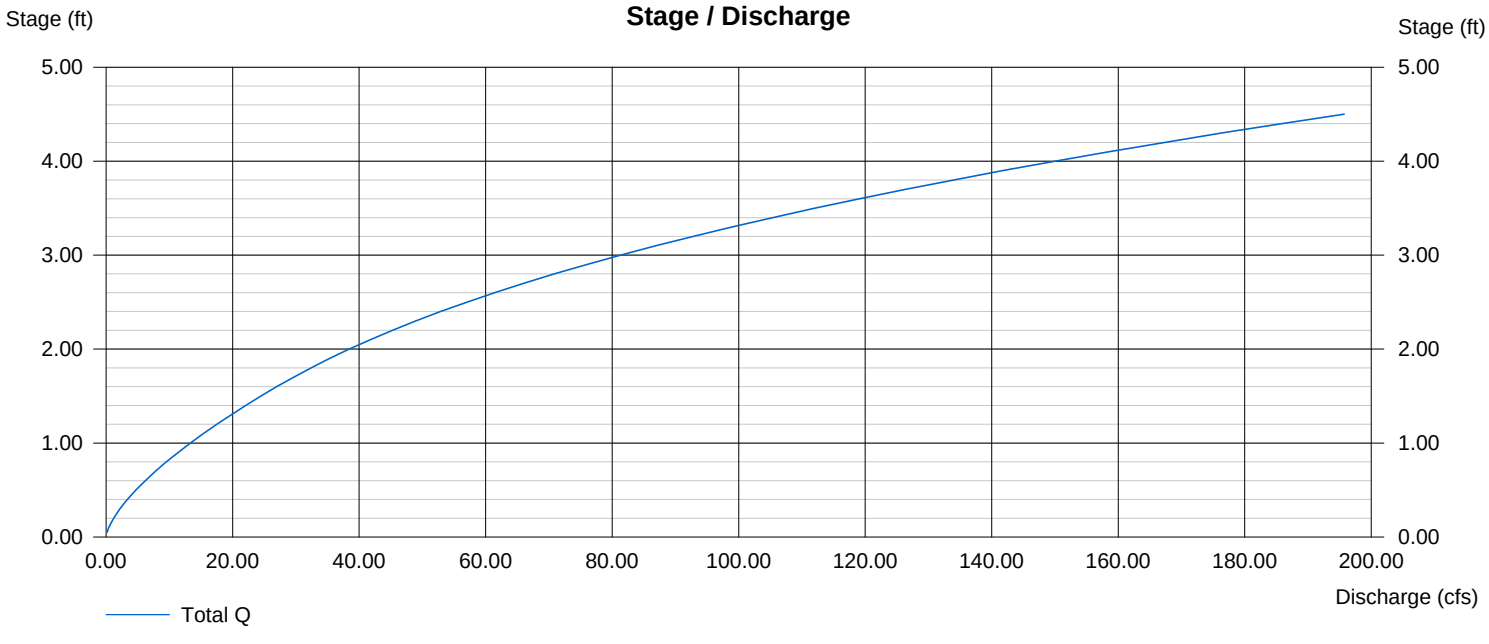
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

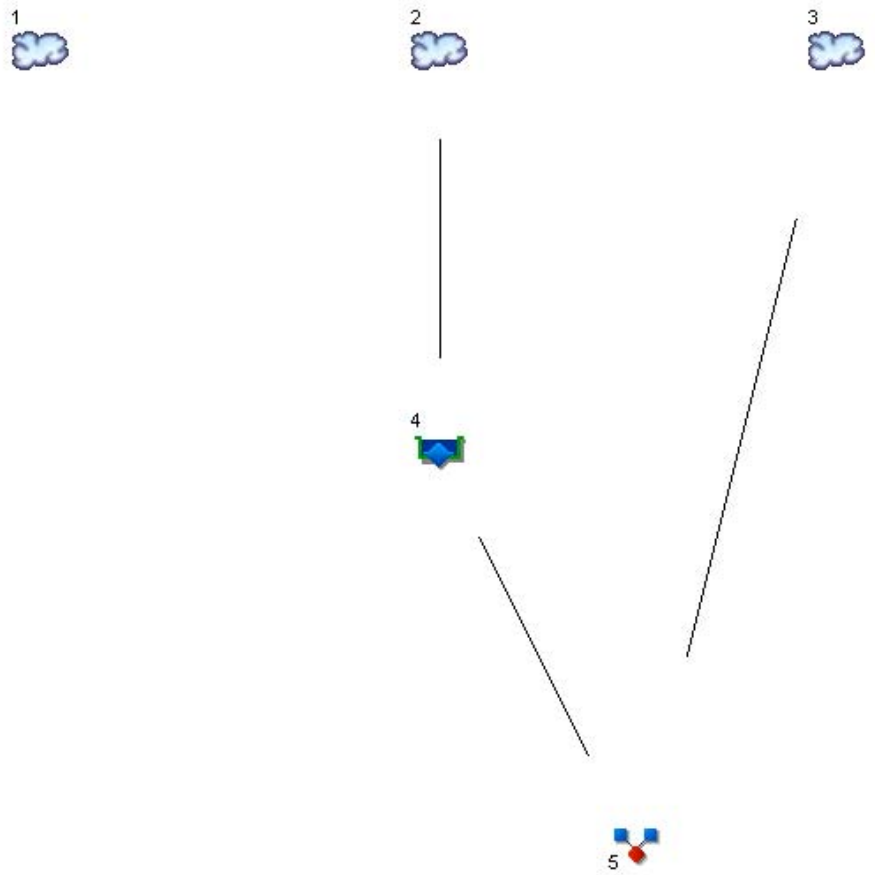
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 1363.50	1365.00	0.00	0.00
Weir Coeff.	= 3.33	4.40	0.00	0.00
Weir Type	= Rect	120degV	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.





Legend

Hyd.	Origin	Description
1	SCS Runoff	Watershed C B4 10
2	SCS Runoff	Watershed C1 FTR 10
3	SCS Runoff	Watershed C2 FTR 10
4	Reservoir	<no description>
5	Combine	<no description>

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	37.24	6	744	4.860	----	------	------	Watershed C B4 10
2	SCS Runoff	37.21	6	732	4.293	----	------	------	Watershed C1 FTR 10
3	SCS Runoff	13.82	6	738	1.780	----	------	------	Watershed C2 FTR 10
4	Reservoir	10.72	6	774	2.795	2	1365.45	2.299	<no description>
5	Combine	19.29	6	762	4.575	3, 4	------	------	<no description>

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	58.09	6	744	7.510	----	------	------	Watershed C B4 10
2	SCS Runoff	53.99	6	732	6.239	----	------	------	Watershed C1 FTR 10
3	SCS Runoff	20.04	6	738	2.586	----	------	------	Watershed C2 FTR 10
4	Reservoir	24.77	6	762	4.741	2	1366.15	2.945	<no description>
5	Combine	39.58	6	756	7.327	3, 4	------	------	<no description>

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	72.34	6	738	9.333	----	------	------	Watershed C B4 10
2	SCS Runoff	65.05	6	732	7.544	----	------	------	Watershed C1 FTR 10
3	SCS Runoff	24.15	6	738	3.127	----	------	------	Watershed C2 FTR 10
4	Reservoir	34.38	6	762	6.046	2	1366.56	3.320	<no description>
5	Combine	53.42	6	750	9.173	3, 4	------	------	<no description>

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	94.38	6	738	12.155	----	------	------	Watershed C B4 10
2	SCS Runoff	81.67	6	732	9.530	----	------	------	Watershed C1 FTR 10
3	SCS Runoff	30.32	6	738	3.951	----	------	------	Watershed C2 FTR 10
4	Reservoir	50.33	6	756	8.032	2	1367.10	3.854	<no description>
5	Combine	75.17	6	750	11.983	3, 4	------	------	<no description>

Table of Contents

100 - Year

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	126.32	6	738	16.307	----	------	------	Watershed C B4 10
2	SCS Runoff	105.33	6	732	12.407	----	------	------	Watershed C1 FTR 10
3	SCS Runoff	39.11	6	738	5.143	----	------	------	Watershed C2 FTR 10
4	Reservoir	82.21	6	750	10.909	2	1367.53	4.288	<no description>
5	Combine	118.38	6	744	16.052	3, 4	------	------	<no description>

Hydrograph Plot

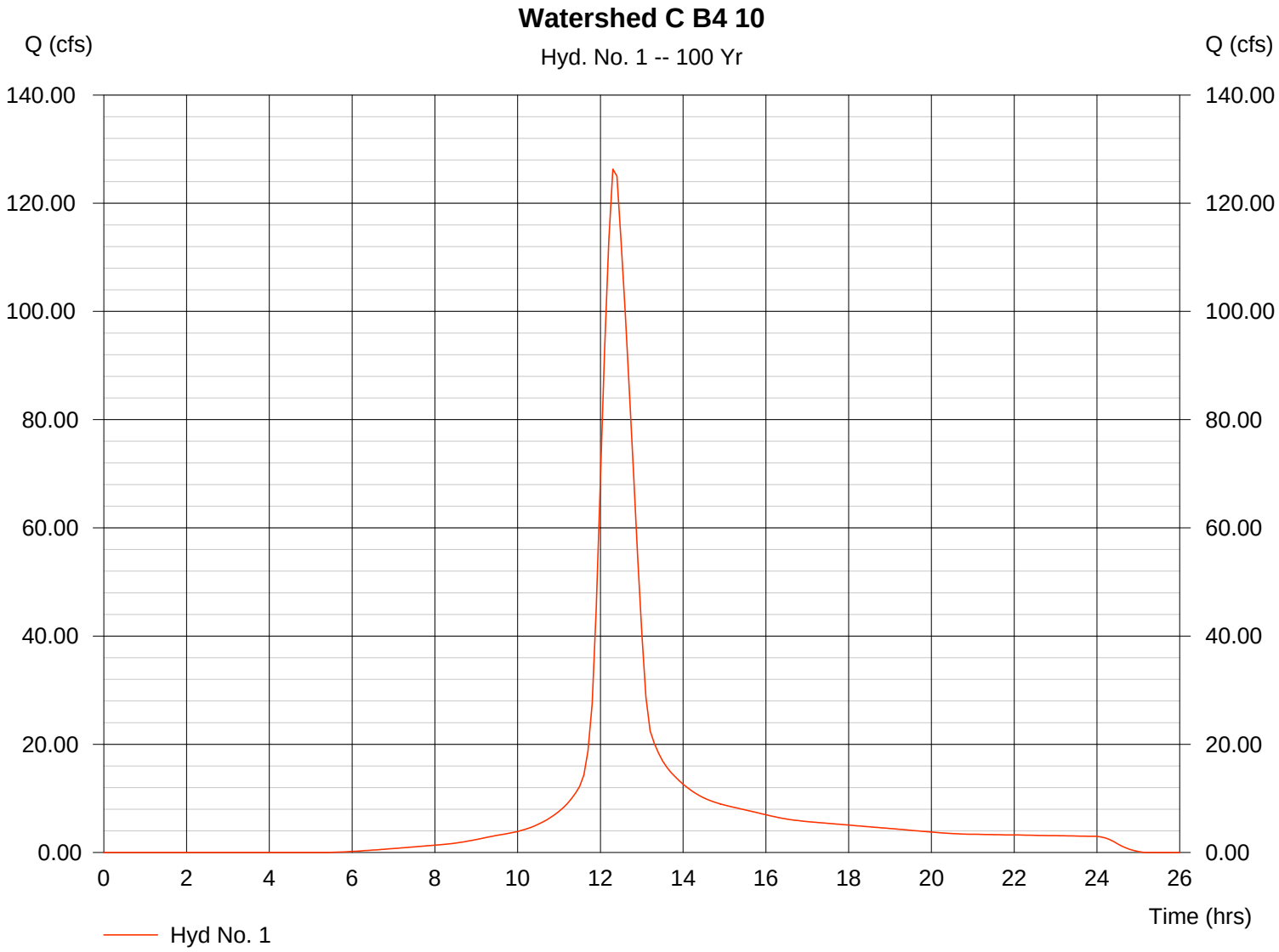
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:55 PM

Hyd. No. 1

Watershed C B4 10

Hydrograph type	= SCS Runoff	Peak discharge	= 126.32 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 36.910 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 48.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 16.307 acft



Hydrograph Plot

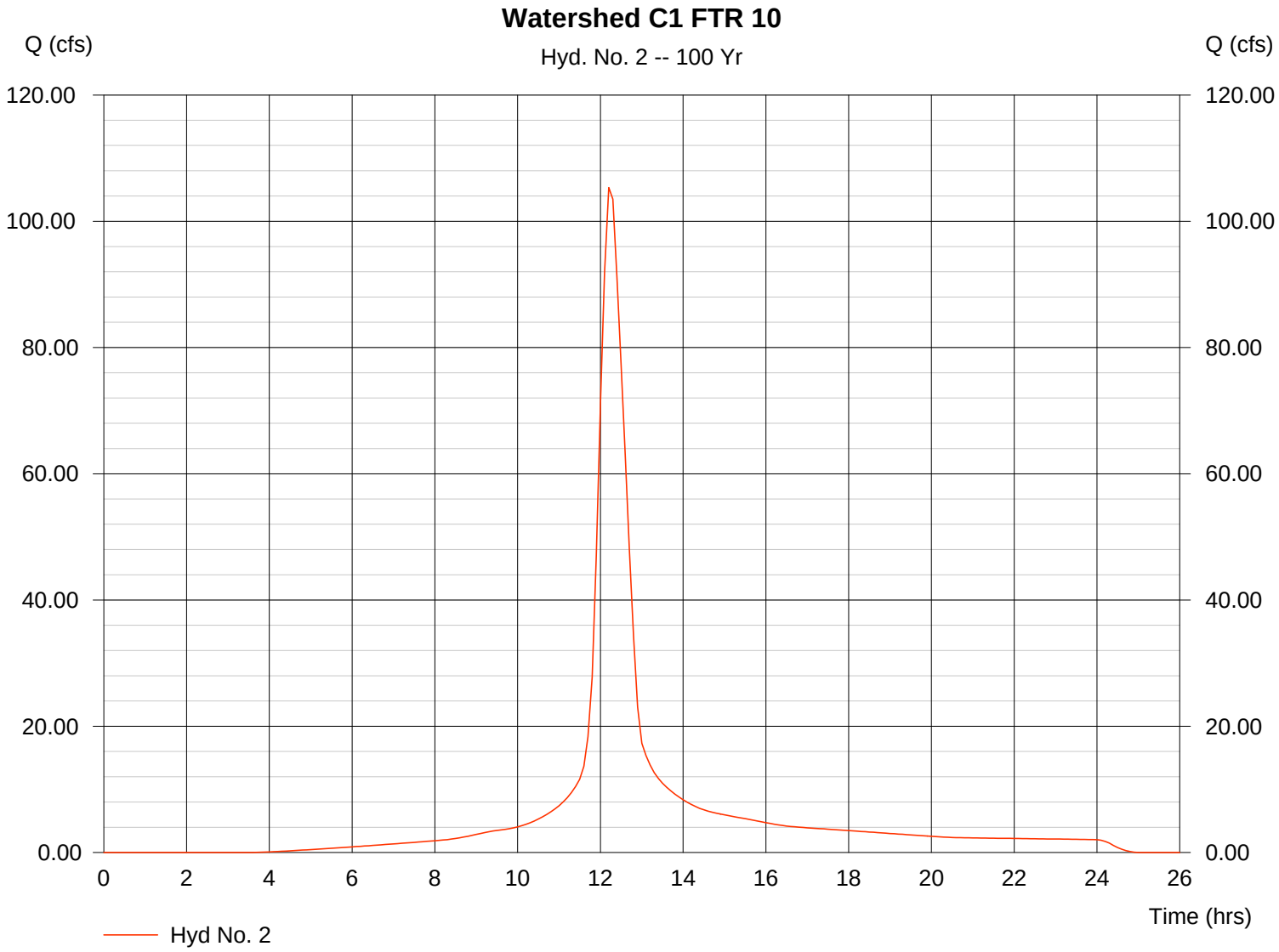
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:55 PM

Hyd. No. 2

Watershed C1 FTR 10

Hydrograph type	= SCS Runoff	Peak discharge	= 105.33 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 23.080 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 37.60 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12.407 acft



Hydrograph Plot

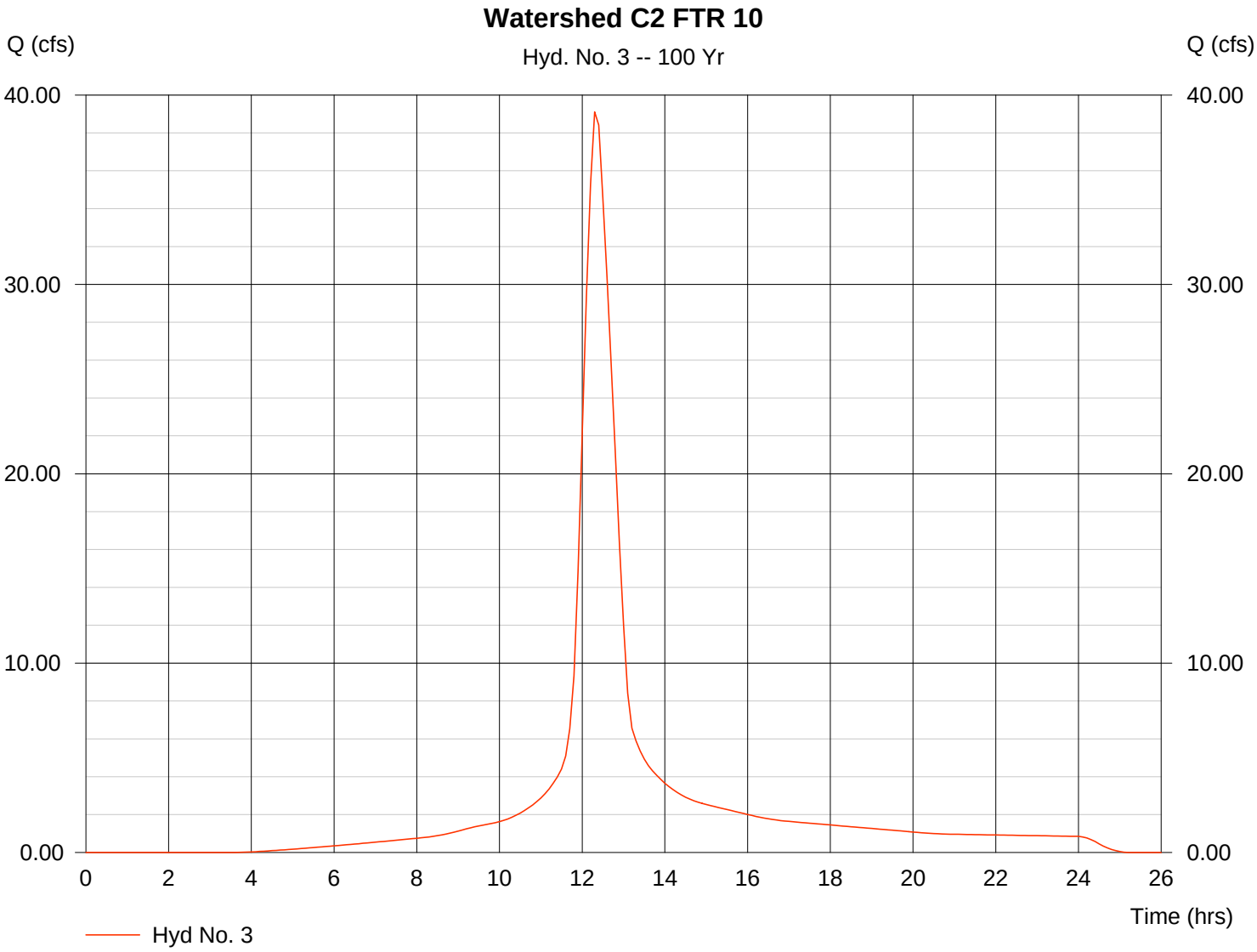
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:55 PM

Hyd. No. 3

Watershed C2 FTR 10

Hydrograph type	= SCS Runoff	Peak discharge	= 39.11 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 10.120 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5.143 acft



Hydrograph Plot

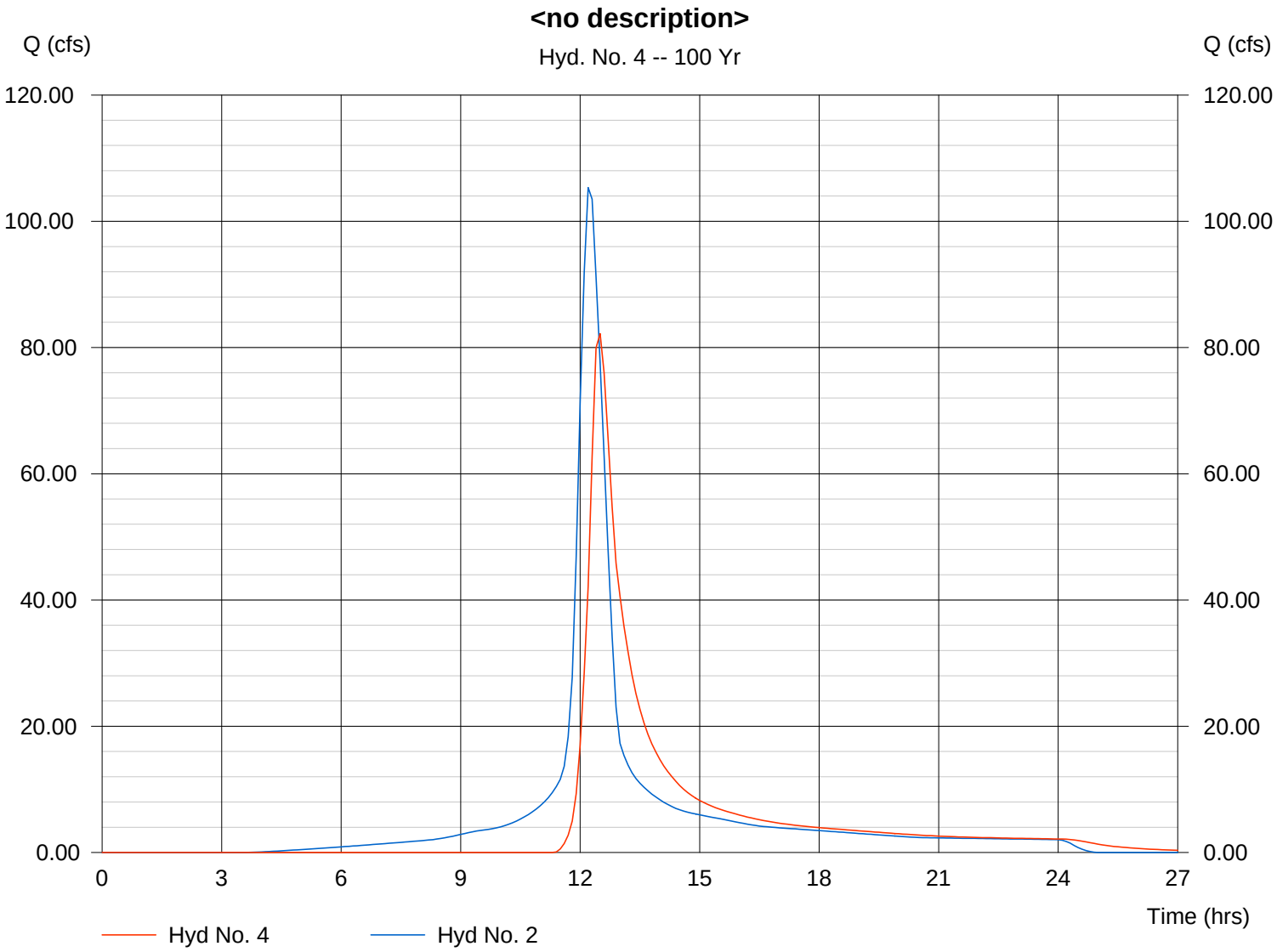
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:55 PM

Hyd. No. 4

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	82.21 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	2	Max. Elevation	=	1367.53 ft
Reservoir name	=	New Pond4	Max. Storage	=	4.288 acft

Storage Indication method used. | Hydrograph Volume = 10.909 acft



Pond Report

Pond No. 4 - New Pond4

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1362.50	29,843	0.000	0.000
1.00	1363.50	32,590	0.717	0.717
2.00	1364.50	35,455	0.781	1.498
3.00	1365.50	38,439	0.848	2.346
4.00	1366.50	41,540	0.918	3.264
5.00	1367.50	44,760	0.991	4.254
6.00	1368.50	48,098	1.066	5.320

Culvert / Orifice Structures

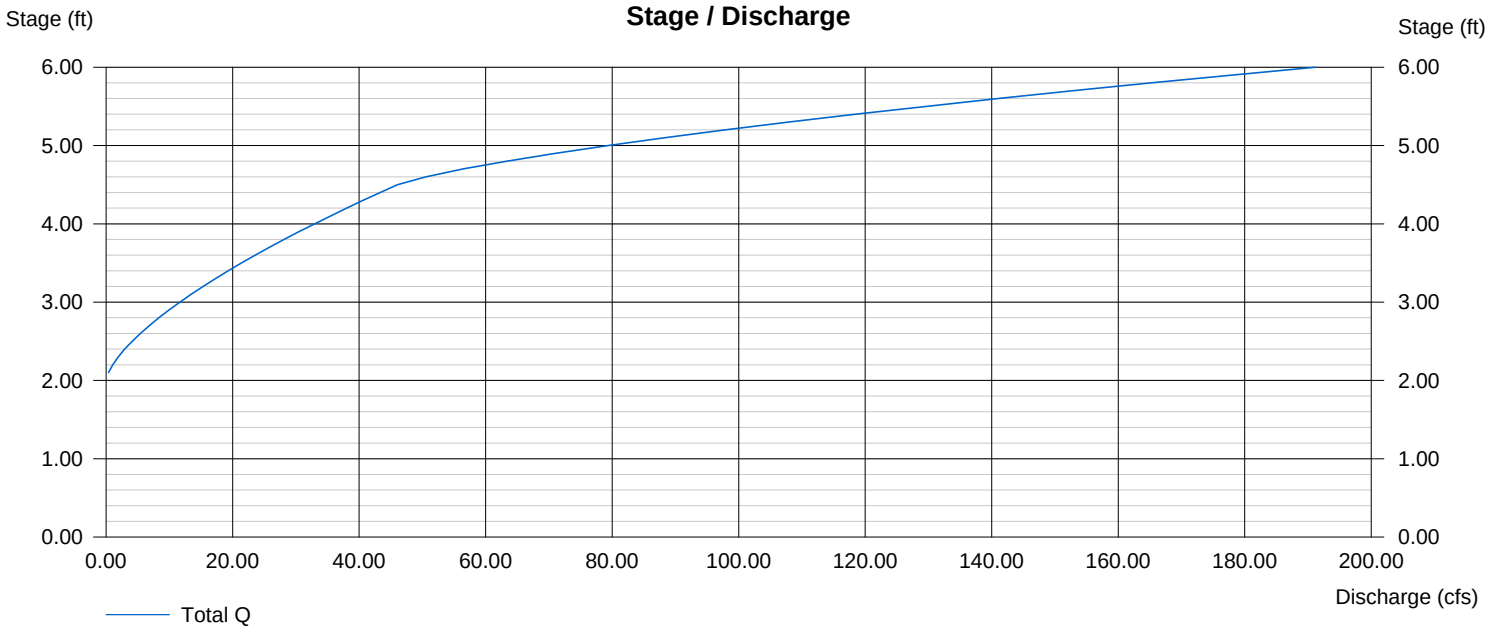
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.50	16.00	0.00	0.00
Crest El. (ft)	= 1364.50	1367.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Rect	Rect	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

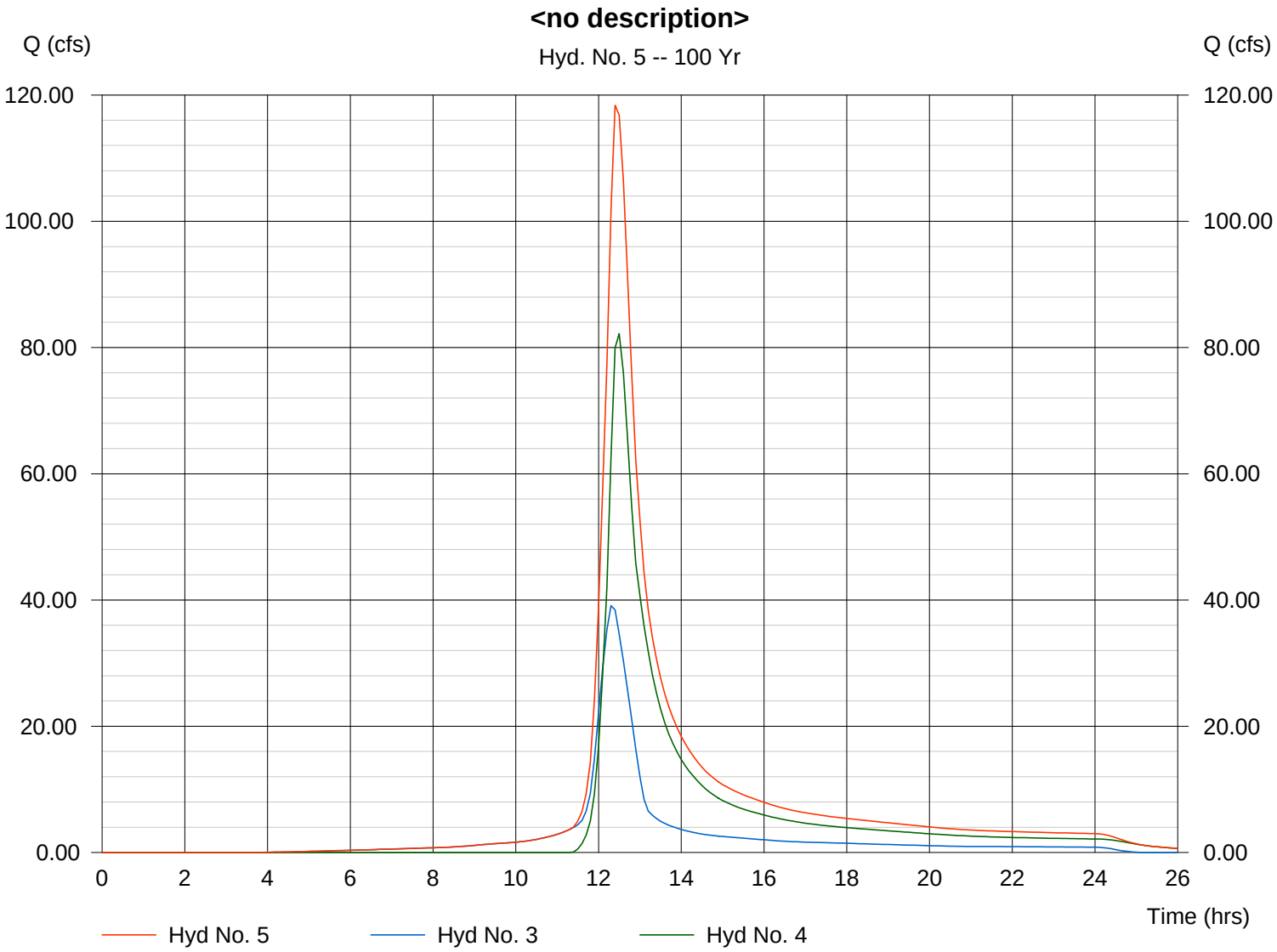
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:55 PM

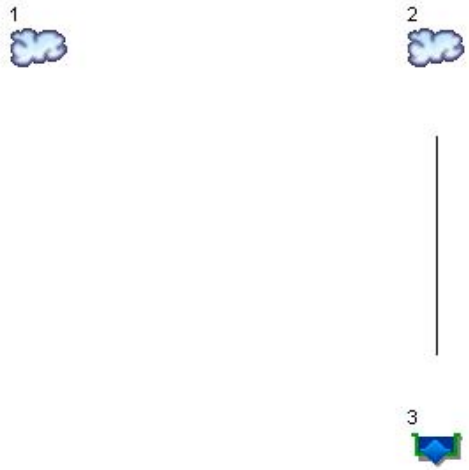
Hyd. No. 5

<no description>

Hydrograph type	= Combine	Peak discharge	= 118.38 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 16.052 acft





Legend

Hyd.	Origin	Description
1	SCS Runoff	Watershed D B4 10
2	SCS Runoff	Watershed D FTR 10
3	Reservoir	Detention D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	15.65	6	738	1.822	----	------	------	Watershed D B4 10
2	SCS Runoff	19.99	6	732	2.306	----	------	------	Watershed D FTR 10
3	Reservoir	15.13	6	750	2.306	2	1363.43	0.504	Detention D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	24.38	6	738	2.815	----	------	------	Watershed D B4 10
2	SCS Runoff	29.01	6	732	3.352	----	------	------	Watershed D FTR 10
3	Reservoir	22.84	6	750	3.352	2	1363.57	0.666	Detention D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	30.30	6	738	3.498	----	------	------	Watershed D B4 10
2	SCS Runoff	34.95	6	732	4.053	----	------	------	Watershed D FTR 10
3	Reservoir	27.96	6	750	4.053	2	1363.65	0.765	Detention D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	39.50	6	732	4.556	----	------	------	Watershed D B4 10
2	SCS Runoff	43.88	6	732	5.120	----	------	------	Watershed D FTR 10
3	Reservoir	35.83	6	744	5.120	2	1363.77	0.906	Detention D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	52.87	6	732	6.112	----	------	------	Watershed D B4 10
2	SCS Runoff	56.59	6	732	6.666	----	------	------	Watershed D FTR 10
3	Reservoir	47.42	6	744	6.665	2	1363.93	1.098	Detention D

Hydrograph Plot

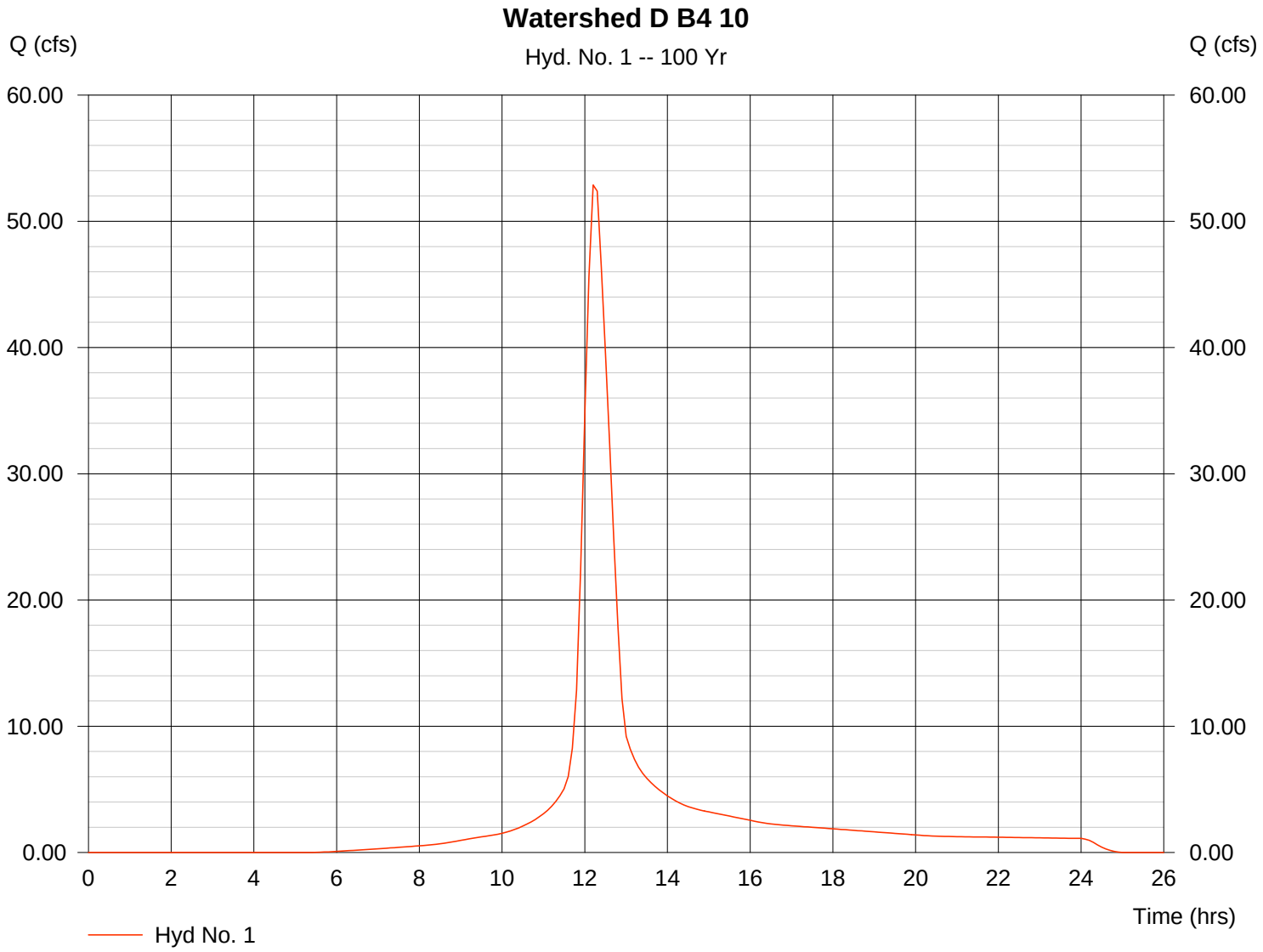
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:56 PM

Hyd. No. 1

Watershed D B4 10

Hydrograph type	= SCS Runoff	Peak discharge	= 52.87 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 13.080 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 39.20 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6.112 acft



Hydrograph Plot

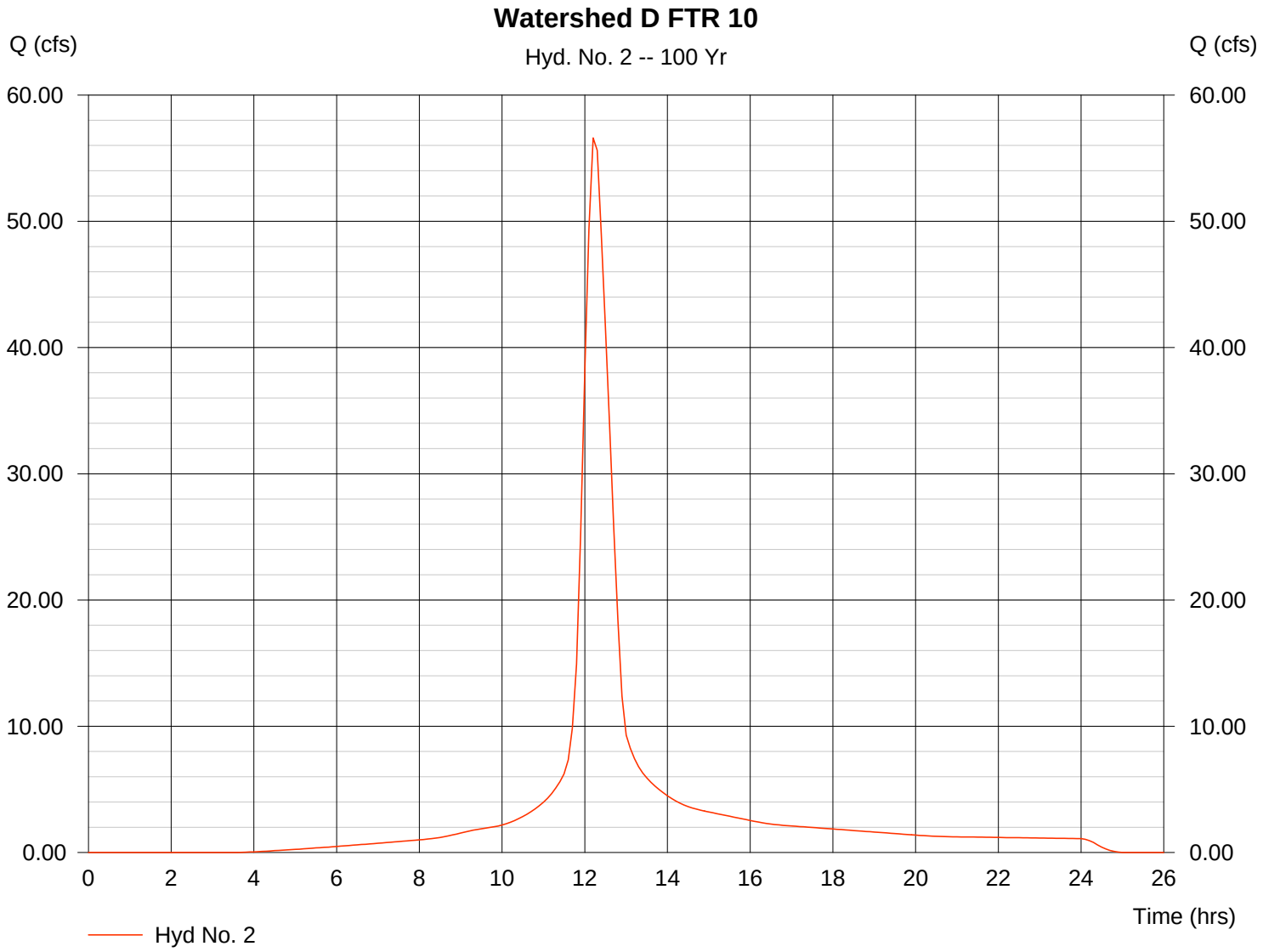
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:56 PM

Hyd. No. 2

Watershed D FTR 10

Hydrograph type	= SCS Runoff	Peak discharge	= 56.59 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 12.400 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 36.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6.666 acft



Hydrograph Plot

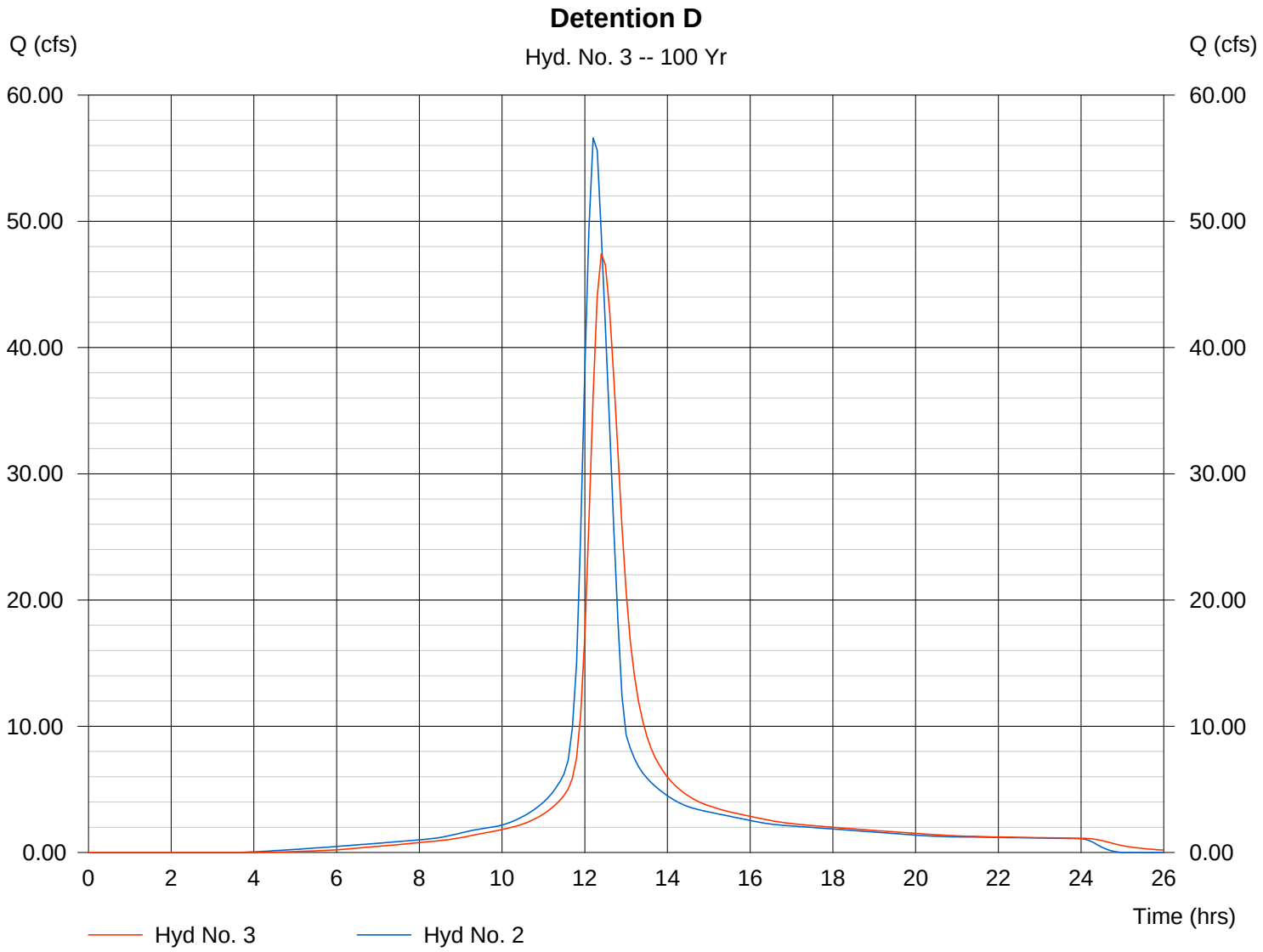
Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:56 PM

Hyd. No. 3

Detention D

Hydrograph type	=	Reservoir	Peak discharge	=	47.42 cfs
Storm frequency	=	100 yrs	Time interval	=	6 min
Inflow hyd. No.	=	2	Max. Elevation	=	1363.93 ft
Reservoir name	=	Conceptual Watershed D	Max. Storage	=	1.098 acft

Storage Indication method used. | Hydrograph Volume = 6.665 acft



Pond Report

Pond No. 1 - Conceptual Watershed D

Pond Data

Bottom LxW = 250.0 x 200.0 ft Side slope = 4.0:1 Bottom elev. = 1363.00 ft Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1363.00	50,000	0.000	0.000
0.25	1363.25	50,904	0.290	0.290
0.50	1363.50	51,816	0.295	0.584
0.75	1363.75	52,736	0.300	0.884
1.00	1364.00	53,664	0.305	1.190
1.25	1364.25	54,600	0.311	1.500
1.50	1364.50	55,544	0.316	1.816
1.75	1364.75	56,496	0.322	2.138
2.00	1365.00	57,456	0.327	2.465
2.25	1365.25	58,424	0.333	2.797
2.50	1365.50	59,400	0.338	3.136
2.75	1365.75	60,384	0.344	3.479
3.00	1366.00	61,376	0.349	3.829
3.25	1366.25	62,376	0.355	4.184
3.50	1366.50	63,384	0.361	4.545
3.75	1366.75	64,400	0.367	4.911
4.00	1367.00	65,424	0.373	5.284
4.25	1367.25	66,456	0.378	5.662
4.50	1367.50	67,496	0.384	6.047
4.75	1367.75	68,544	0.390	6.437
5.00	1368.00	69,600	0.396	6.833

Culvert / Orifice Structures

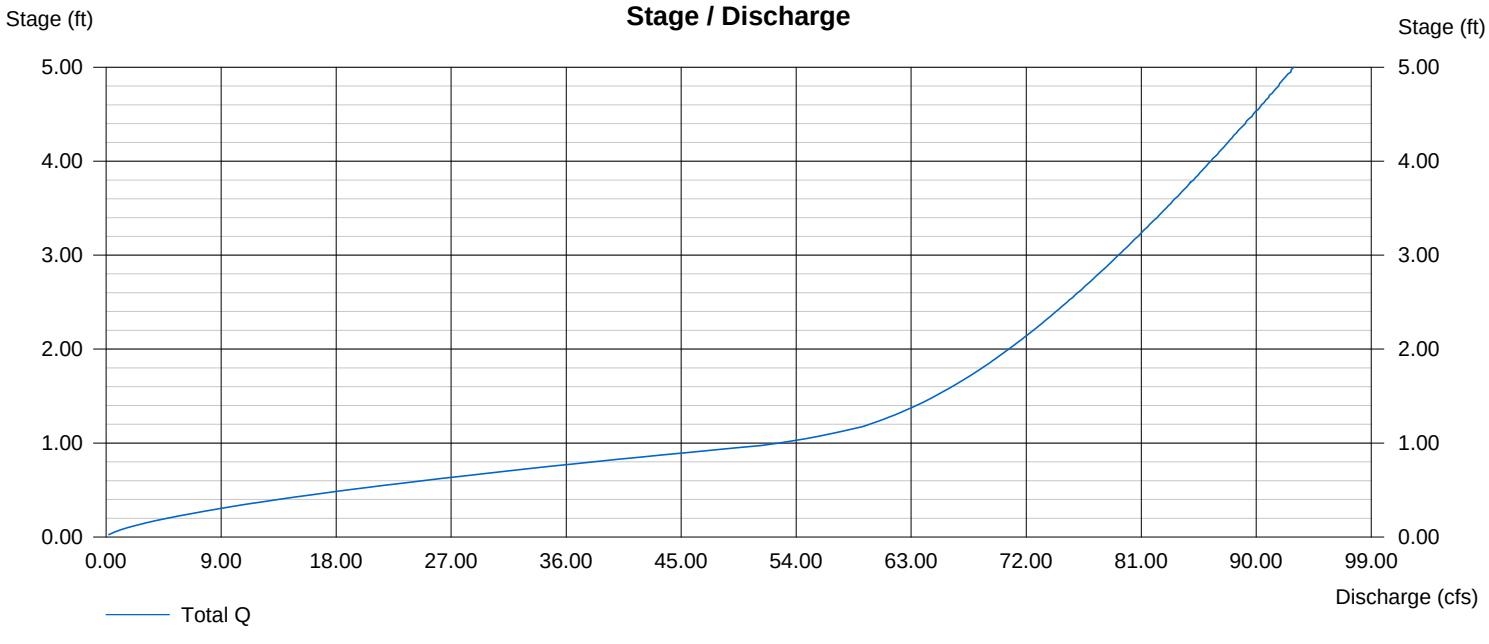
	[A]	[B]	[C]	[D]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1359.00	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 1363.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Legend

Hyd.	Origin	Description
1	SCS Runoff	Watershed E Pre-Project
2	SCS Runoff	Watershed E Post-project

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	11.68	6	738	1.360	----	------	------	Watershed E Pre-Project
2	SCS Runoff	10.53	6	732	1.254	----	------	------	Watershed E Post-project

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	18.20	6	738	2.101	----	------	------	Watershed E Pre-Project
2	SCS Runoff	14.13	6	732	1.708	----	------	------	Watershed E Post-project

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	22.62	6	738	2.611	----	------	------	Watershed E Pre-Project
2	SCS Runoff	16.47	6	732	2.005	----	------	------	Watershed E Post-project

Table of Contents

100 - Year

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	39.46	6	732	4.563	----	------	------	Watershed E Pre-Project
2	SCS Runoff	24.93	6	732	3.095	----	------	------	Watershed E Post-project

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve | Wednesday, Mar 7 2007, 6:59 PM

Hyd. No. 1

Watershed E Pre-Project

Hydrograph type	= SCS Runoff	Peak discharge	= 39.46 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 9.764 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 36.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4.563 acft

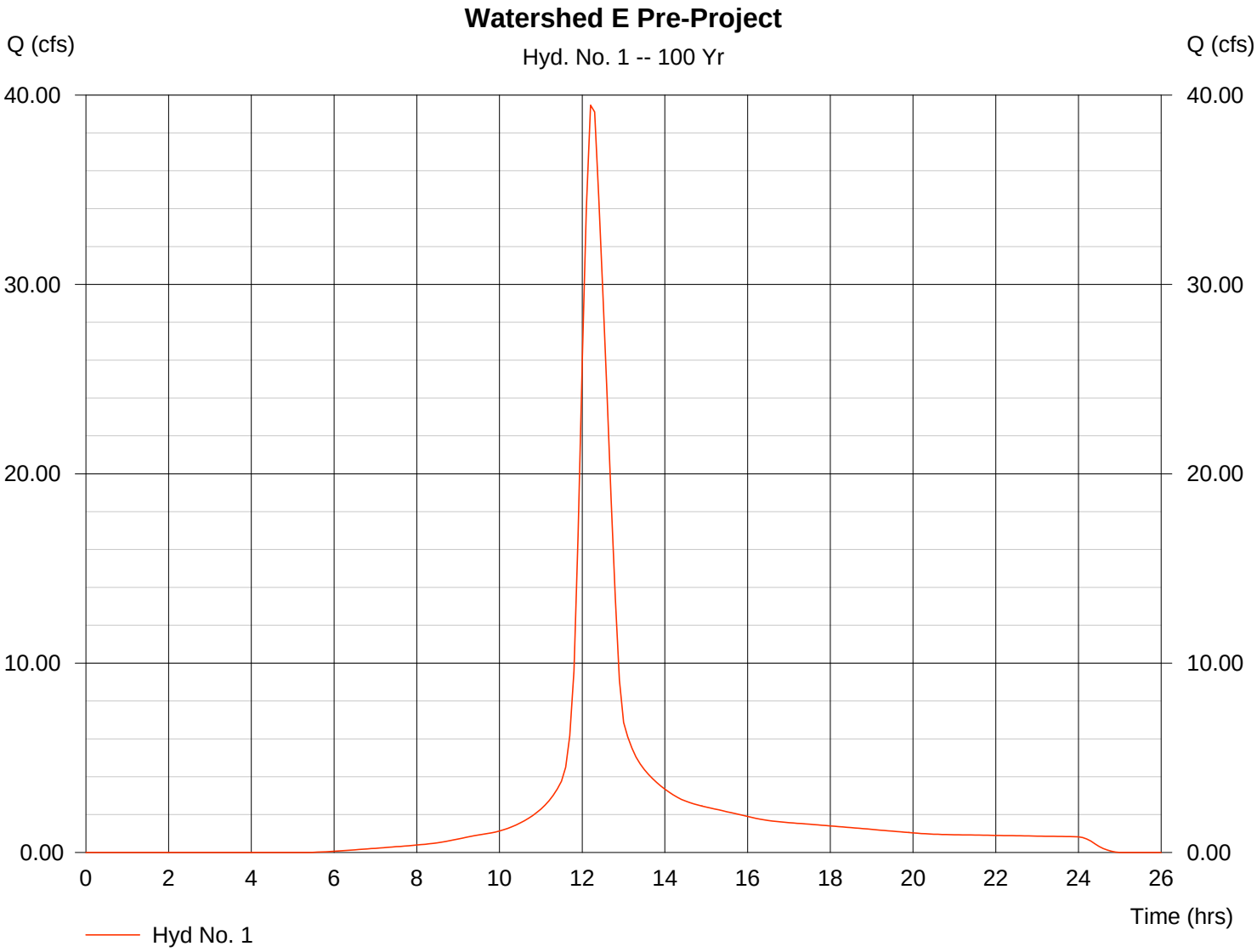


Figure 3.2

Drainage and Utility Plan

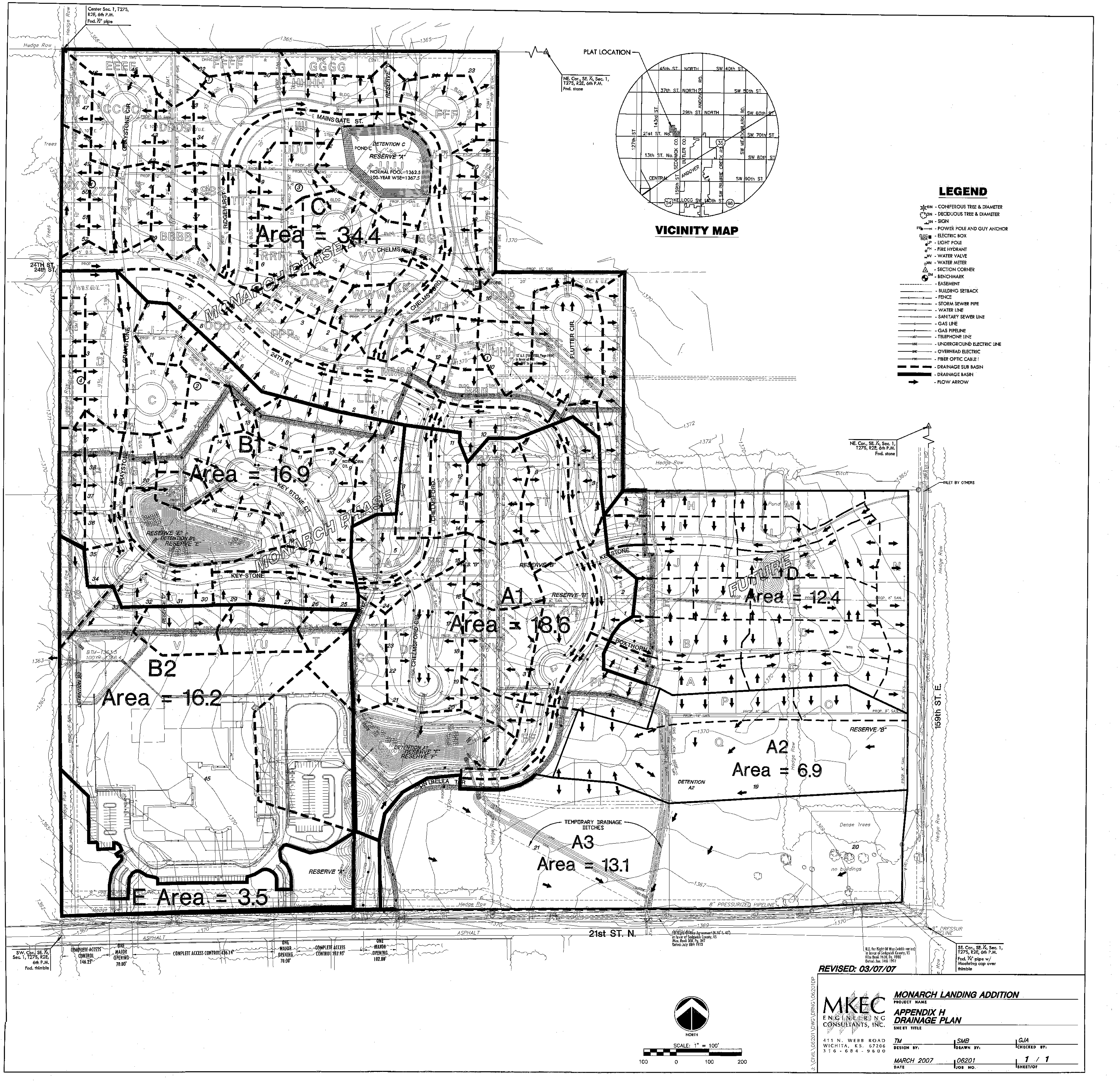

MONARCH LANDING ADDITION
PROJECT NAME
APPENDIX H
DRAINAGE PLAN
SHEET TITLE
REVISED: 03/07/07
MKEC ENGINEERING CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67206
316-684-9600
TM
DESIGN BY:
SMB
DRAWN BY:
GJA
CHECKED BY:
MARCH 2007
DATE
06201
JOB NO.
1 / 1
SHEET/OF
NORTH
SCALE: 1" = 100'
100 0 100 200
VICINITY MAP
PLAT LOCATION
LEGEND
- CONIFEROUS TREE & DIAMETER
- DECIDUOUS TREE & DIAMETER
- SIGN
- POWER POLE AND GUY ANCHOR
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
C
Area = 34.4
B1
Area = 16.9
B2
Area = 16.2
A1
Area = 18.6
D
Area = 12.4
A2
Area = 6.9
A3
Area = 13.1
E Area = 3.5
DETENTION C
RESERVE "A"
NORMAL POOL=1362.5
100-YEAR WSE=1367.5
TEMPORARY DRAINAGE DITCHES
MONARCH PHASE
FUTURE
MAINSGATE ST.
CHELMSFORD CIR.
KEY STONE
BOXTHORN
FLUTTER CIR.
24TH ST.
21st ST. N.
159th ST. E.
RESERVE "B"
RESERVE "A"
DETENTION A2
8" PRESSURIZED PIPELINE
Hedge Row
Dense Trees
no buildings

Figure 3.3

Pipe Sizing Calculations

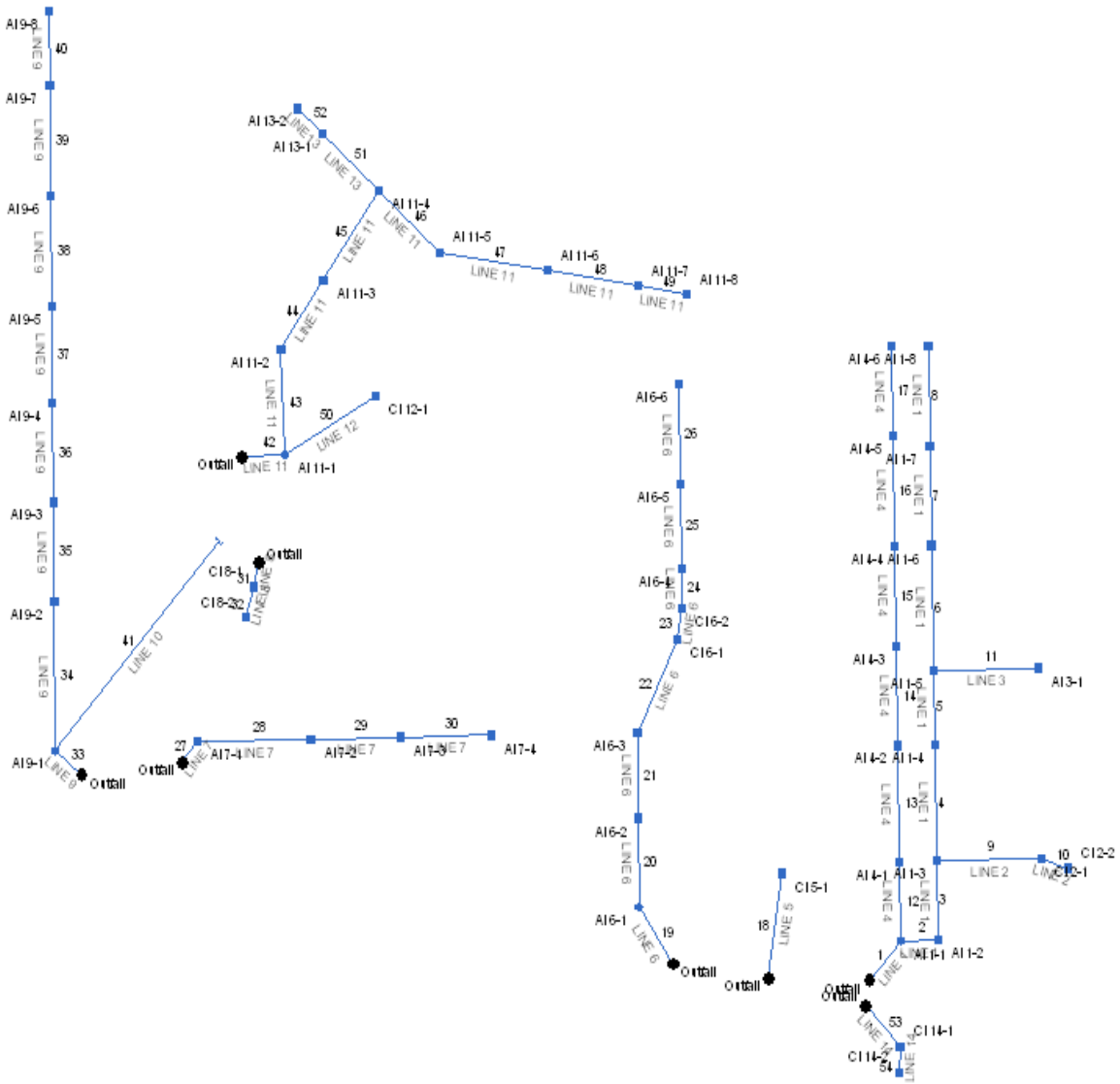
Time of Concentration Calculations by the FAA method

Monarch Landing Phase 1

$$T_c = \frac{(1.1-C)L^{1/2}}{100\ S^{1/3}}$$

Area Name	Land Use	Soil Group	Maximum Elevation	Minimum Elevation	Length (L)	Rational Runoff Coefficient, C				Time of Concentration (min), T_c			
						2-Year	5-Year	10-Year	100-Year	2-Year	5-Year	10-Year	100-Year
A	*Residential - 1/3 Acre*	*D*	*1378.6*	*1371.9*	*990*	0.46	0.50	0.59	0.73	41.3	38.7	32.9	23.9
B	*Residential - 1/3 Acre*	*D*	*1374.5*	*1372.6*	*300*	0.46	0.50	0.59	0.73	23.2	21.8	18.5	15.0
C	*Residential - 1/3 Acre*	*D*	*1377.2*	*1373.5*	*600*	0.46	0.50	0.59	0.73	33.2	31.1	26.4	19.2
D	*Residential - 1/3 Acre*	*D*	*1374.2*	*1370.5*	*610*	0.46	0.50	0.59	0.73	33.6	31.5	26.8	19.4
E	*Residential - 1/3 Acre*	*D*	*1375.0*	*1373.0*	*330*	0.46	0.50	0.59	0.73	24.7	23.2	19.7	15.0
F	*Residential - 1/3 Acre*	*D*	*1372.5*	*1372.0*	*400*	0.46	0.50	0.59	0.73	46.1	43.2	36.7	26.6

Hydraflow Plan View



Project File: SWS 2yr+100yr pipes.stm	No. Lines: 54	03-07-2007

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	72.0	-49.2	MH	0.00	0.00	0.00	15.0	1362.44	2.96	1364.57	30	Cir	0.013	0.78	1369.50	LINE 1
2	1	55.0	48.1	DrGrt	0.00	0.16	0.73	15.0	1365.32	0.51	1365.60	24	Cir	0.013	1.50	1369.50	LINE 1
3	2	107.5	-90.0	DrGrt	0.00	0.25	0.73	15.0	1366.10	0.50	1366.64	18	Cir	0.013	1.50	1369.90	LINE 1
4	3	157.5	0.0	DrGrt	0.00	0.27	0.73	15.0	1366.89	0.49	1367.66	15	Cir	0.013	0.50	1370.90	LINE 1
5	4	101.1	0.0	DrGrt	0.00	0.39	0.73	15.0	1367.91	0.52	1368.44	12	Cir	0.013	1.50	1371.30	LINE 1
6	5	168.9	0.0	DrGrt	0.00	0.48	0.46	15.0	1368.44	0.51	1369.30	12	Cir	0.013	0.50	1372.30	LINE 1
7	6	135.0	0.0	DrGrt	0.00	0.35	0.46	15.0	1369.30	0.52	1370.00	12	Cir	0.013	0.50	1373.00	LINE 1
8	7	136.1	0.0	DrGrt	0.00	0.37	0.46	15.0	1370.00	0.51	1370.70	12	Cir	0.013	1.00	1373.70	LINE 1
9	3	156.9	90.0	Curb	0.00	2.50	0.46	40.0	1366.89	0.50	1367.68	15	Cir	0.013	0.57	1371.90	LINE 2
10	9	41.3	19.1	Curb	0.00	2.26	0.46	40.0	1367.93	0.56	1368.16	12	Cir	0.013	1.00	1371.90	LINE 2
11	5	157.5	90.0	DrGrt	0.00	0.46	0.46	15.0	1368.44	0.51	1369.25	12	Cir	0.013	1.00	1371.80	LINE 3
12	1	107.6	-41.9	DrGrt	0.00	0.24	0.46	15.0	1366.32	0.49	1366.85	12	Cir	0.013	0.50	1370.20	LINE 4
13	12	157.5	0.0	DrGrt	0.00	0.32	0.46	15.0	1366.85	0.53	1367.69	12	Cir	0.013	0.50	1370.90	LINE 4
14	13	135.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1367.69	0.49	1368.35	12	Cir	0.013	0.50	1371.60	LINE 4
15	14	135.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1368.35	0.49	1369.01	12	Cir	0.013	0.50	1372.30	LINE 4
16	15	150.0	0.0	DrGrt	0.00	0.25	0.46	15.0	1369.01	0.51	1369.78	12	Cir	0.013	0.50	1373.30	LINE 4
17	16	121.1	0.0	DrGrt	0.00	0.39	0.46	15.0	1369.78	0.49	1370.37	12	Cir	0.013	1.00	1374.20	LINE 4
18	End	144.1	-81.6	Curb	0.00	2.16	0.46	15.0	1363.07	3.44	1368.03	18	Cir	0.013	1.00	1372.50	LINE 5
19	End	91.8	-123.4	MH	0.00	0.00	0.46	0.0	1362.52	2.76	1365.05	36	Cir	0.013	0.60	1369.50	LINE 6
20	19	120.9	32.9	DrGrt	0.00	0.17	0.46	15.0	1365.05	0.36	1365.48	36	Cir	0.013	0.50	1370.00	LINE 6
21	20	116.6	0.0	DrGrt	0.00	0.45	0.46	15.0	1365.98	0.29	1366.32	30	Cir	0.013	0.73	1370.90	LINE 6

Project File: SWS 2yr+100yr pipes.stm

Number of lines: 54

Date: 03-07-2007

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
22	21	139.3	25.5	Curb	0.00	1.35	0.46	20.0	1366.32	0.39	1366.87	24	Cir	0.013	0.50	1373.56	LINE 6
23	22	42.4	-14.2	Curb	0.00	1.16	0.46	20.0	1367.37	0.40	1367.54	18	Cir	0.013	0.50	1373.56	LINE 6
24	23	53.7	-11.8	DrGrt	0.00	0.19	0.46	15.0	1368.04	0.50	1368.31	12	Cir	0.013	0.50	1372.60	LINE 6
25	24	115.0	0.0	DrGrt	0.00	0.31	0.46	15.0	1368.31	0.50	1368.88	12	Cir	0.013	0.50	1372.90	LINE 6
26	25	135.0	0.0	DrGrt	0.00	0.40	0.46	15.0	1368.88	0.49	1369.54	12	Cir	0.013	1.00	1373.60	LINE 6
27	End	35.9	-52.2	DrGrt	0.00	0.22	0.46	15.0	1363.50	0.61	1363.72	12	Cir	0.013	1.22	1367.30	LINE 7
28	27	170.0	51.1	DrGrt	0.00	0.25	0.46	15.0	1363.72	0.52	1364.60	12	Cir	0.013	0.50	1368.70	LINE 7
29	28	135.0	0.0	DrGrt	0.00	0.25	0.46	15.0	1364.60	0.57	1365.37	12	Cir	0.013	0.50	1369.40	LINE 7
30	29	135.0	0.0	DrGrt	0.00	0.25	0.46	15.0	1365.37	0.52	1366.07	12	Cir	0.013	1.00	1370.10	LINE 7
31	End	33.1	101.7	Curb	0.00	2.26	0.46	20.0	1362.40	10.11	1365.75	30	Cir	0.013	0.50	1370.56	LINE 8
32	31	43.5	5.9	Curb	0.00	3.11	0.46	20.0	1366.25	0.23	1366.35	24	Cir	0.013	1.00	1370.56	LINE 8
33	End	51.8	-139.3	MH	0.00	0.00	0.46	0.0	1363.99	0.17	1364.08	30	Cir	0.013	1.00	1367.30	LINE 9
34	33	202.0	48.7	DrGrt	0.00	0.30	0.46	15.0	1364.14	0.21	1364.56	24	Cir	0.013	0.50	1367.30	LINE 9
35	34	135.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1365.31	0.41	1365.86	15	Cir	0.013	0.50	1368.00	LINE 9
36	35	135.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1365.86	0.41	1366.41	15	Cir	0.013	0.50	1368.70	LINE 9
37	36	130.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1366.41	0.42	1366.95	15	Cir	0.013	0.50	1369.40	LINE 9
38	37	150.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1367.20	0.50	1367.95	12	Cir	0.013	0.50	1370.10	LINE 9
39	38	150.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1367.95	0.52	1368.73	12	Cir	0.013	0.50	1370.80	LINE 9
40	39	100.0	0.0	DrGrt	0.00	0.30	0.46	15.0	1368.73	0.50	1369.23	12	Cir	0.013	1.00	1371.50	LINE 9
41	33	374.1	90.0	Hdwl	9.80	0.00	0.46	0.0	1364.12	0.36	1365.45	30	Cir	0.013	1.00	1370.00	LINE 10
42	End	64.4	-2.5	MH	0.00	0.00	0.46	0.0	1362.94	3.22	1365.01	30	Cir	0.013	1.00	1370.00	LINE 11

Project File: SWS 2yr+100yr pipes.stm | Number of lines: 54 | Date: 03-07-2007

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
43	42	142.1	-90.0	DrGrt	0.00	0.38	0.46	15.0	1366.01	0.34	1366.49	18	Cir	0.013	0.97	1370.30	LINE 11
44	43	113.4	36.5	DrGrt	0.00	0.38	0.46	15.0	1366.49	0.35	1366.89	18	Cir	0.013	0.50	1370.60	LINE 11
45	44	147.6	0.0	DrGrt	0.00	0.51	0.46	15.0	1367.14	0.34	1367.64	15	Cir	0.013	2.23	1371.00	LINE 11
46	45	124.2	98.8	DrGrt	0.00	0.44	0.46	15.0	1367.89	0.53	1368.55	12	Cir	0.013	0.92	1371.50	LINE 11
47	46	162.6	-34.0	DrGrt	0.00	0.44	0.46	15.0	1368.55	0.53	1369.41	12	Cir	0.013	0.50	1372.80	LINE 11
48	47	137.5	0.0	DrGrt	0.00	0.44	0.46	15.0	1369.41	0.50	1370.10	12	Cir	0.013	0.50	1373.50	LINE 11
49	48	74.3	0.0	DrGrt	0.00	0.30	0.46	15.0	1370.10	0.50	1370.47	12	Cir	0.013	1.00	1373.50	LINE 11
50	42	157.8	-27.9	Curb	0.00	2.50	0.46	15.0	1365.51	1.98	1368.63	24	Cir	0.013	1.00	1373.00	LINE 12
51	45	114.3	-81.2	DrGrt	0.00	0.44	0.46	15.0	1367.89	0.50	1368.46	12	Cir	0.013	0.50	1371.50	LINE 13
52	51	50.0	-1.0	DrGrt	0.00	0.44	0.46	15.0	1368.46	0.52	1368.72	12	Cir	0.013	1.00	1372.00	LINE13
53	End	75.0	46.9	Comb	0.00	0.95	0.46	27.0	1363.00	2.51	1364.88	24	Cir	0.013	1.13	1370.00	LINE 14
54	53	35.3	45.0	Curb	0.00	0.70	0.46	27.0	1365.38	0.51	1365.56	18	Cir	0.013	1.00	1370.00	LINE 14

Project File: SWS 2yr+100yr pipes.stm | Number of lines: 54 | Date: 03-07-2007

PIPE SIZING USING MANNING'S EQUATION

Monarch Landing Phase 2

Wichita, Kansas

Manning's n = 0.013

Pipe Identifier	Design Storm	Design Q (cfs)	Design Pipe Size (in)	Design Slope (%)	Minimum Slope (%)	Design Velocity (fps)	Capacity of Design Pipe (cfs)	Approx. Pipe Length, ft
CCC	2	3.08	15	0.40	0.23	3.3	4.1	291
DDD	None							
CCC-DDD	2	4.60	18	0.32	0.19	3.4	5.9	350
EEE	None							
CCC-EEE	2	5.88	18	0.32	0.31	3.4	5.9	151
FFF	None							
CCC-FFF	2	9.54	24	0.21	0.18	3.3	10.4	33
GGG	None							
CCC-GGG	2	10.55	30	0.16	0.07	3.3	16.4	48
NULL								
BBB	None							
AAA-BBB	2	2.99	15	0.40	0.21	3.3	4.1	156
HHH	2	1.26	12	0.40	0.13	2.9	2.3	70
AAA-HHH								
III	None							
AAA-III	2	5.61	18	0.32	0.29	3.4	5.9	189
JJJ	None							
AAA-JJJ	2	6.93	24	0.21	0.09	3.3	10.4	32
KKK	None							
AAA-KKK	2	7.91	24	0.21	0.12	3.3	10.4	138
LLL	2	1.70	12	0.40	0.23	2.9	2.3	34
MMM	None							
LLL-MMM	2	2.51	15	0.40	0.15	3.3	4.1	169
AAA-MMM	None							
WWW	None							
AAA-WWW	2	11.24	30	0.16	0.08	3.3	16.4	203
OOO	2	3.50	15	0.40	0.29	3.3	4.1	37
PPP	None							
OOO-PPP	2	7.18	24	0.21	0.10	3.3	10.4	167
QQQ	None							
AAA-QQQ	2	19.53	36	0.12	0.09	3.3	23.1	181
RRR	None							
AAA-RRR	2	20.93	36	0.12	0.10	3.3	23.1	153
SSS	2	1.36	12	0.40	0.15	2.9	2.3	38
TTT	None							
SSS-TTT	2	2.72	15	0.40	0.18	3.3	4.1	162
AAA-TTT	None							
UUU	None							
AAA-UUU	2	25.14	42	0.12	0.06	3.6	34.9	240
VVV	2	3.24	15	0.40	0.25	3.3	4.1	130
AAA-VVV	2	28.38	42	0.12	0.08	3.6	34.9	54
NULL								
XXX	2	1.38	12	0.40	0.15	2.9	2.3	277
YYY	None							
XXX-YYY	2	2.22	12	0.40	0.39	2.9	2.3	313
ZZZ	2	0.86	12	0.40	0.06	2.9	2.3	35
AAAA	None							
ZZZ-AAAA	2	2.09	12	0.40	0.34	2.9	2.3	162
BBBB	None							
ZZZ-BBBB	2	3.62	15	0.40	0.31	3.3	4.1	169
CCCC	2	2.30	15	0.40	0.13	3.3	4.1	139
DDDD	None							
ZZZ-DDDD	2	6.91	24	0.21	0.09	3.3	10.4	188
EEEE	None							

PIPE SIZING USING MANNING'S EQUATION

Monarch Landing Phase 2

Wichita, Kansas

XXX-EEEE	2	10.78	30	0.16	0.07	3.3	16.4	316
FFFF	None							
XXX-FFFF	2	11.74	30	0.16	0.08	3.3	16.4	336
GGGG	None							
NULL								
HHHH	2	3.79	15	0.40	0.34	3.3	4.1	44
IIII	None							
HHHH-IIII	2	5.42	18	0.32	0.27	3.4	5.9	72
JJJJ	None							
NULL								
A	2	0.57	12	0.40	0.03	2.9	2.3	216
B	None							
A-B	None							
C	2	2.24	12	0.40	0.40	2.9	2.3	44
D	None							
C-D	2	4.86	18	0.32	0.21	3.4	5.9	141
A-D	2	6.13	24	0.21	0.07	3.3	10.4	333
NULL								
J	2	1.07	12	0.40	0.09	2.9	2.3	238
K	None							
L	None							

Tab 4. Floodplain Submittal

Not applicable to Monarch Landing Second Addition.

Tab 5. Permits

A. US Army Corps of Engineers

Not applicable to Monarch Landing Second Addition.

B. Kansas Department of Agriculture

Not applicable to Monarch Landing Second Addition.

C. Federal Emergency Agency (FEMA)

Not applicable to Monarch Landing Second Addition.

D. Kansas Department of Transportation

Not applicable to Monarch Landing Second Addition.

E. Sedgwick County Right-of-way Permit

Not applicable to Monarch Landing Second Addition.