

CERTIFIED ENGINEERING DESIGN, P.A.

810 W. Douglas, Suite C
Wichita, KS 67203
(316) 262-8808 Office
(316) 262-1669 Fax

LETTER OF TRANSMITTAL

DATE: April 15, 2008

TO: Ms. Julianne Kallman, P.E.
Engineering Division
City of Wichita
7th Floor, City Hall
455 North Main
Wichita, KS 67202

SUBJ: Eliot Second Addition
Wichita, KS

FROM: Harlan D. Foraker, P.E. *HDF*

COMMENTS: Attached please find the final drainage plan and supporting calculations for Eliot Second Addition. Please notify me if any additional information is required. If you have questions please call me at (316) 262-8808.

attachments



**Public Works, Engineering Division
Final Drainage Plan Submittal Checklist**

Reviewer: _____ Date: March 24, 2008
 Subdivision Name: Eliot Second Addition Location: _____
 Total Land Area Of Ownership: 2.02 Acres
 Type: _____ Residential Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other _____
 Applicant: James Eliot Contact: _____ Phone #: _____
 Engineer: Certified Engineering Design Contact: _____ Phone #: 262-8808

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development
 (If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Site Location Map, using USGS Map				/	
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain				/	
C. Discussion of offsite conditions				/	
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series				/	
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design					
F. Copy of the plat				/	
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.)					/
H. Professional Engineer seal, signature and date on cover of report				/	
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover					

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



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements				/	
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow				/	
L. Flow paths				/	
M. Location and dimensions of existing channels, bridges or culvert crossings				/	
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				/	
O. Assumed pre-developed runoff curve numbers				/	
P. Existing time of concentrations used in calculations				/	
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site					
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)					
S. Cross-section data for open channels					
T. Ground water elevations, if applicable					

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	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)				/	
B. Proposed time of concentrations used in calculations				/	
C. Assumed post-developed runoff curve numbers				/	
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)				/	
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration				/	
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities				/	
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary				/	
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)				/	
I. Design water surface elevations and normal pool elevation for ponds.				/	
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.				/	
K. Proposed limits of clearing and grading				/	
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.				/	
M. Location of existing and proposed utilities (e.g., water, sewer) and easements				/	
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow				/	
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings				/	



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

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile					
B. Nearest base flood elevations					
C. Delineation of pre-developed regulatory floodplain/floodway limits					
D. Delineation of post-developed regulatory floodplain and floodway limits					
E. Floodplain boundary determination per elevation (project limits shown)					
F. Provide source of floodway data table and discharges					
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					
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions					
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)					
J. Flood plains and floodways located within a Reserve, where necessary					

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)					
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)					
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.					
D. Kansas Department of Transportation					
E. Sedgwick County Right-of-way Permit					

**DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS**

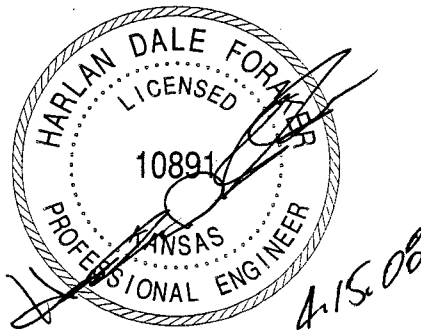
**FOR
ELIOT SECOND ADDITION
WICHITA, KANSAS**

**PREPARED FOR:
Mr. JAMES ELIOT
4039 SOUTH TYLER ROAD
WICHITA, KANSAS 67203**

MARCH 25, 2008

PREPARED BY:

**CERTIFIED ENGINEERING DESIGN, P.A.
810 WEST DOUGLAS, SUITE C
WICHITA, KANSAS 67203-6105
(316)262-8808 PHONE
(316)262-1669 FAX**



DRAINAGE PLAN AND SUPPORTING CALCULATIONS

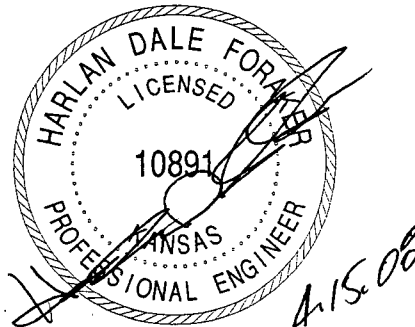
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Drainage Plan (Con't.)
Eliot Second Addition
March 25, 2008

CERTIFIED ENGINEERING DESIGN, P.A
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(316)262-8808 Office
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LETTER OF TRANSMITTAL

DATE: March 25, 2008

TO: Ms. Julianne Kallman, P.E.,
Engineering Division
455 North Main
Wichita, KS 67202

RE: Drainage Plan
Eliot Second Addition
Wichita, KS

FROM: Harlan D. Foraker, P.E. *HDF*

I. PROJECT AREA DESCRIPTION

The proposed development site is located 330 feet east of Tyler Road and south of MacArthur Road in the North half of the Northeast Quarter of Section 17, Township 28 South, Range 1 West. The eastern two-thirds of the site is currently developed as Eliot First Addition as a general commercial development which is a self storage facility. The western third has a pond that extends into it along the west property line. The remaining ground has dense grass cover. The soil types present within Eliot Second Addition are Blanket Silt Loam and Milan Loam.

II. EXISTING AND DEVELOPED CONDITIONS RUNOFF CALCULATIONS

The rational method will be used to determine the peak discharges from the subareas of the study area. Rational 'C' Factors were assigned to the existing site and proposed improvements from "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation" for the City of Wichita, Kansas.

The rainfall intensity tables for Sedgwick County, Kansas were utilized to calculate the I-D-F curves that were used to determine the rainfall intensity for the 2 thru 100 year design storms.

Drainage Plan (Con't.)
 Eliot Second Addition
 March 25, 2008

The Soil Conservation Service TR-55 manual was used to compute the Time of Concentration for the drainage subareas. A design assumption was made as follows that the minimum subarea time of concentration is 15 minutes

Soil types were determined from the Natural Resources Conservation Service's Soil Survey web site. There are three soil types present on the property being platted. The predominant SCS soil type is Blanket Silt Loam it is approximately 60% of the area. This includes both the 0-1% and 1-3% categories. The remaining classification is the Milan Loam, 1-3%. The The Blanket Silt Loams are a Class C Soil. The Milan Loam is a Class B Soil.

The existing and developed drainage subarea consisting of 2.02 acres has been delineated on the 1" = 100' site and topographic mapping survey performed for this site by Savoy Company, P.A.

Design Storm Events Evaluated: 2, 5, 10, 25, and 100 yr. storm events

The runoff calculations for surface drainage from the existing and proposed developed site have been computed using the Rational formula for the 2 thru 100 year storm events.

The following table summarizes the peak discharges for existing and developed conditions for the 7.1 acres flowing into the pond on the west end of the Eliot Second Addition. The calculations have been based on the pond being full to the exit elevation of the pond. However, at the present time, the water is over three feet below this level, which does not appear to be unusual. The results show that there is a minimal increase in the outflow from the pond. The increase is less than 0.4 cfs in all cases. If the water is at its current level there is no discharge.

COMPUTATION OF PEAK DISCHARGES				
Description	Pond Elevation	Total Storage Used Cu. Ft.	Q(cfs) in to pond	Q(cfs) out of pond
UNDEVELOPED CONDITIONS				
Drainage Flows (2 yr.)	1311.01	9,781	5.0	-
Drainage Flows (5 yr.)	1311.11	13,139	6.4	0.03
Drainage Flows (10 yr.)	1311.21	16,294	8.2	1.0
Drainage Flows (25 yr.)	1311.26	17,739	9.6	1.7
Drainage Flows (100 yr.)	1311.40	22,927	14.1	4.8
DEVELOPED CONDITIONS				
Drainage Flows (2 yr.)	1311.04	10,767	6.1	-
Drainage Flows (5 yr.)	1311.14	14,085	7.7	0.2
Drainage Flows (10 yr.)	1311.23	16,790	9.5	1.3
Drainage Flows (25 yr.)	1311.27	18,225	11.1	2.0
Drainage Flows (100 yr.)	1311.40	23,170	15.4	5.0

Drainage Plan (Con't.)
Eliot Second Addition
March 25, 2008

The site is a self storage facility adjacent to a small field and pond. By platting the total area, the storage facility may take advantage of the open field by constructing one more complete structure and possibly one that fits the remaining space north of the pond. The existing runoff from the self storage facility flows to the pond, as does the open area. The pond discharges to the south ditch of MacArthur road.

The developed conditions of the property would consist of one commercial lot fronting on MacArthur. There would be approximately 1.6 acres of impermeable surfaces in the form of structures, parking lots, and sidewalks. This would be an increase of approximately 18,000 square feet over the existing condition.

IV. FLOODPLAIN SUBMITTAL

No FEMA floodplain is located on this plat.

V. FEDERAL, STATE AND LOCAL PERMITS

- A. US Army Corp of Engineers- Not Applicable
- B. Kansas Dept. of Agriculture-Not Applicable
- C. FEMA –Not Applicable
- D. Kansas Department of Transportation-Not Applicable.
- E. Sedgwick County Right-of-Way Permit-Not Applicable

VI. SUMMARY DISCUSSION:

The existing and developed peak runoff from the site development of the Eliot Second Addition will continue to drain in the same general pattern as prior to construction. The parcel will drain to the pond. The amount of impervious area being added by the site development is approximately 0.40 acres. With the use of the pond, the peak developed runoff discharge will be within 0.4 cfs of the pre-developed flow. The construction will see the completion of one or two commercial structures. The majority of the impervious surface will be parking lot.

OFFSITE DRAINAGE BASIN

The offsite drainage included in the drainage calculations is that area which drains to the pond. It is currently used as rural home sites.

DETENTION STORAGE

The Eliot Second Addition will expand the existing self storage facility. This will increase the amount of pavement by approximately 18,000 square feet. The existing pond on the south and west side of Eliot Second Addition will also serve the proposed addition. Consequently, the increase in runoff as a result of the development will utilize the existing pond. The detention pond will collect and provide a reduction in the peak discharge and convey it into the south ditch of MacArthur.

DETENTION POND

The existing pond releases at an elevation of 1311.1 into the south ditch of MacArthur; however, it would appear that the normal pool is often several feet lower. All calculations have been based on the pool elevation of 1311.

The pond proposed in the reserve area has the stage versus storage relationship as follows:

DETENTION POND TABLE STAGE VS. STORAGE STAGE VS. VOLUME			
	Surface Area	Storage	Cumulative
Stage	Sq. Ft.	Volume (cu.	Volume(cu.ft.)
1311	28,446	9,538	9,541
1311.2	35,456	7,971	17,511
1311.5	38,562	9,249	26,760

It should be noted that the ponds normal pool is several feet lower, approximately 1307. This would add over 60,000 cu. ft. of storage.

The results of the detention analysis for the pond utilizing the Hydraflow Hydrographs program are presented in the table below:

DETENTION ANALYSIS FOR NORTH POND				
	Q100 In	Q100 Out		Storage Vol
Description	(cfs)	(cfs)	Peak Stage	Used (cu.ft.)
Pond	15.39	4.95	1311.40	23,170

Drainage Plan (Con't.)
Eliot Second Addition
March 25, 2008

SUMMARY

The Eliot Second Addition consists of the original Eliot Addition and approximately 27,000 square feet of additional land. This will allow for the construction of one full size self storage unit and possibly a partial unit. These combined would add approximately 0.4 acres of impervious surface to the site.

All drainage from the site flows to the west to an existing pond. By developing the site, there is an increase of less than 0.4 cfs to the discharge of the pond; assuming the pond is at capacity at the time of the storm.

VII. APPENDIX I:

All charts, graphs, tables and nomographs used in the drainage plan design are included.

VIII. DRAINAGE PLAN MAP:

A 1" = 100' scale drainage plan map is included for review.

ELIOT SECOND ADDITION

MacArthur Road

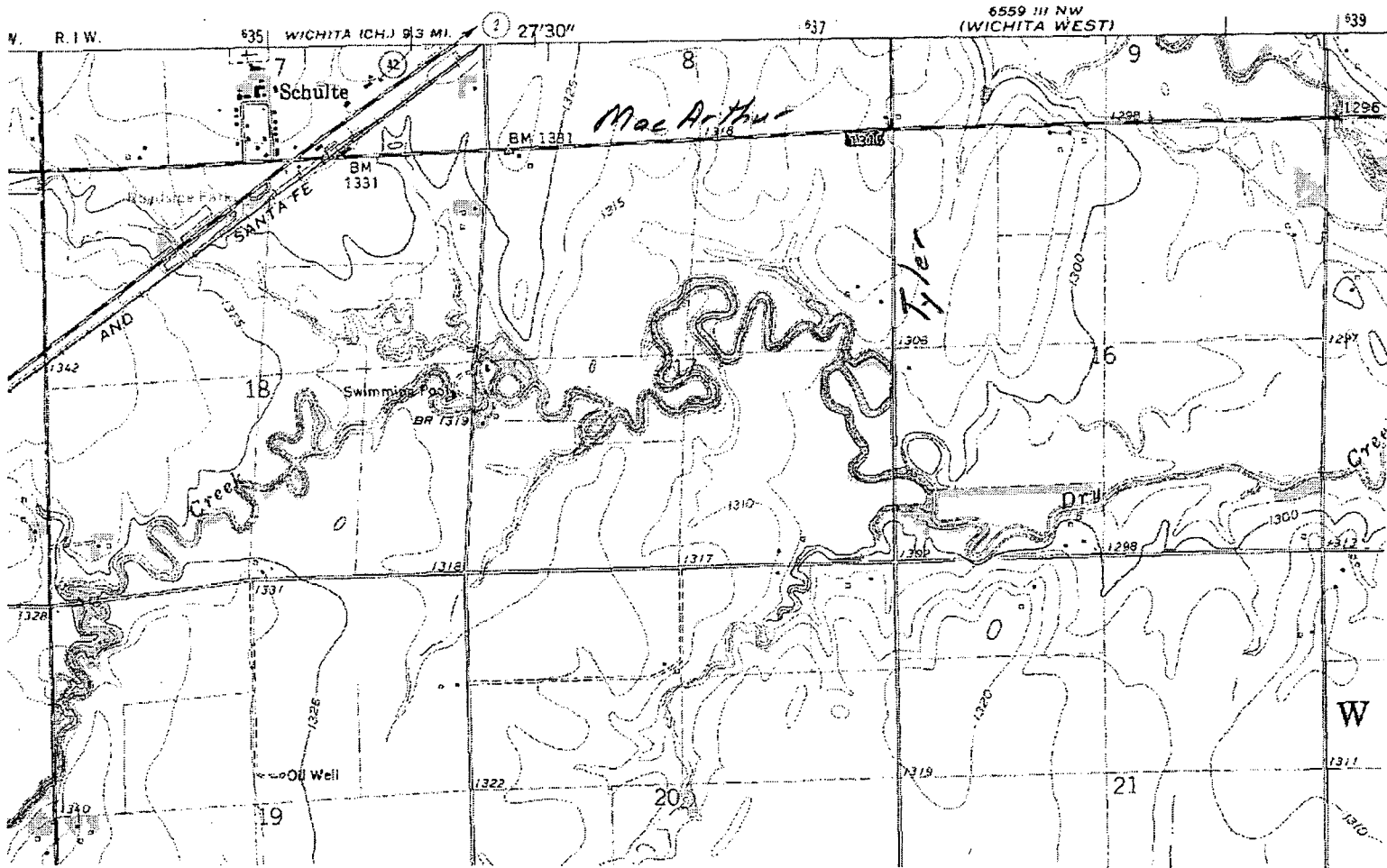
Tyler Road

Lot 1

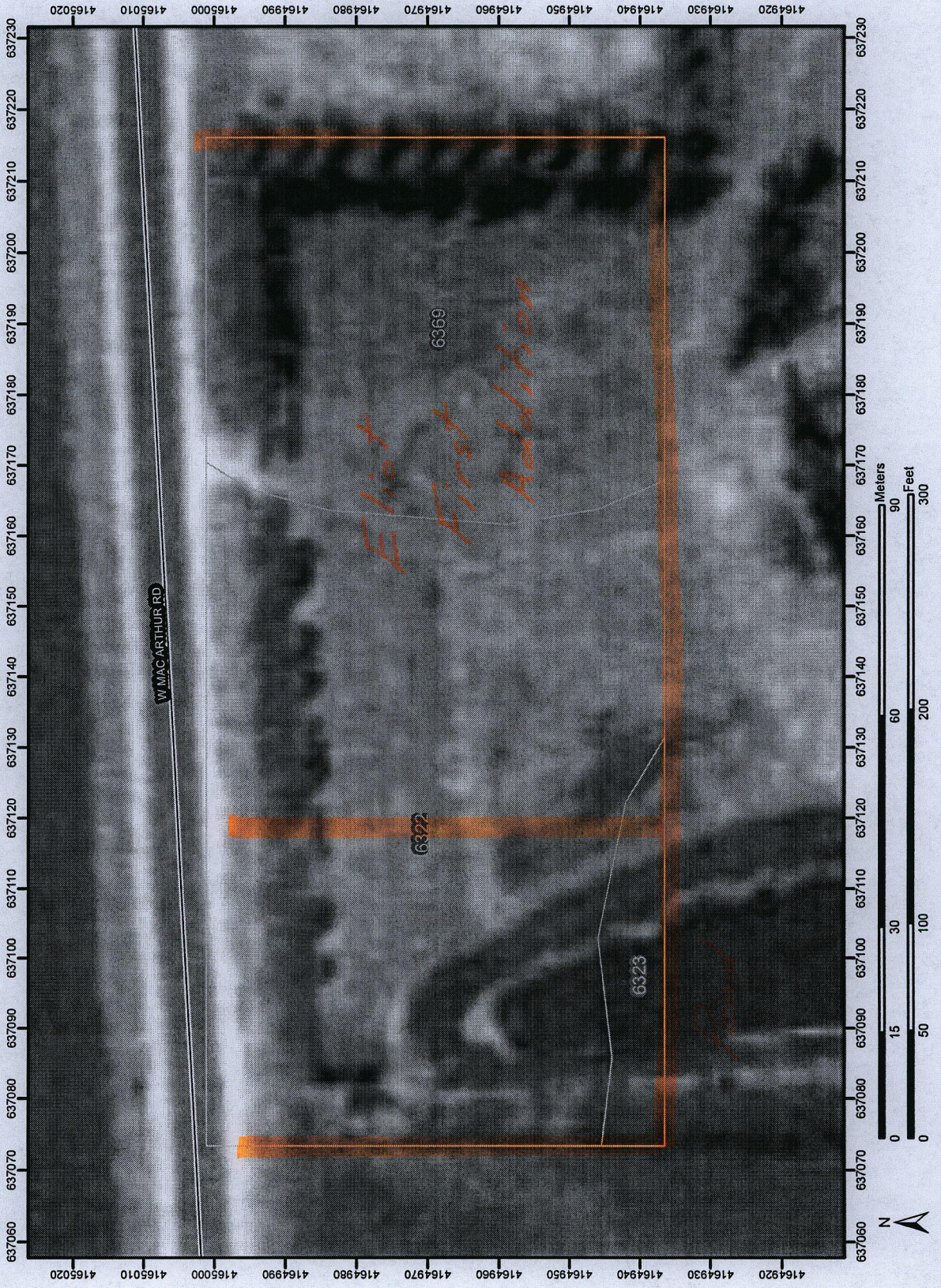
GRAPHIC SCALE

(1" = 100 FEET)
1" = 100 FT.





Soil Map—Sedgwick County, Kansas
(Eliot Second Addition)



MAP LEGEND

- Area of Interest (AOI)
 - Area of Interest (AOI)
- Soils
 - Soil Map Units
- Special Point Features
 - Blowout
 - Borrow Pit
 - Clay Spot
 - Closed Depression
 - Gravel Pit
 - Gravelly Spot
 - Landfill
 - Lava Flow
 - Marsh
 - Mine or Quarry
 - Miscellaneous Water
 - Perennial Water
 - Rock Outcrop
 - Saline Spot
 - Sandy Spot
 - Severely Eroded Spot
 - Sinkhole
 - Slide or Slip
 - Sodic Spot
 - Spoil Area
 - Stony Spot
- Special Line Features
 - Gully
 - Short Steep Slope
 - Other
- Political Features
 - Municipalities
 - Cities
 - Urban Areas
- Water Features
 - Oceans
 - Streams and Canals
- Transportation
 - Rails
 - Roads
 - Interstate Highways
 - US Routes
 - State Highways
 - Local Roads
 - Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 14N

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

Soil Survey Area: Sedgwick County, Kansas
 Survey Area Data: Version 4, Dec 29, 2007

Date(s) aerial images were photographed: 3/20/1996; 3/31/1996

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

Map Unit Legend

Sedgwick County, Kansas (KS173)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6322	Blanket silt loam, 0 to 1 percent slopes	1.3	59.1%
6323	Blanket silt loam, 1 to 3 percent slopes	0.1	4.6%
6369	Milan loam, 1 to 3 percent slopes	0.8	36.4%
Totals for Area of Interest (AOI)		2.3	100.0%

Eliot Second Addition



(C) 2008 Sedgwick County GIS

Legend

Historic Site Buffers		Zoning Districts	
	1000' National Historic Site Buffers		Rural Residential
	500' Local Historic Site Buffers		Single Family 20,000
	Historic Districts		Single Family 10,000
	Nationally Registered Historic Sites		Single Family 5,000
	Locally Registered Historic Sites		Two-Family
	Special Use Cases		Multi-Family 18 d.u./ac
			Multi-Family 29 d.u./ac
			Multi-Family 75 d.u./ac
			Manufactured Housing
			Neighborhood Office
			General Office
			Neighborhood Retail
			Limited Commercial
			Office Warehouse
			General Commercial
			Industrial Park
			Industrial Park - Airport
			Central Business District
			Limited Industrial
			General Industrial
			University
			Planned Unit Development
			Air Force Base
			Unknown
			Not Zoned



Geographic Information Services
 Division of Information & Operations
www.sedgwickcounty.org/gis
 525 N. Main, Suite 212, Wichita, KS 67203
 Tel: 316.660.9290 Fax: 316.262.1174

DISCLAIMER: It is understood that, while Sedgwick County Geographic Information Services (SCGIS), City of Wichita GIS, (for purposes of the road centerline file), participating agencies, and information suppliers, have no indication or reason to believe that there are inaccuracies in information provided, SCGIS, its suppliers make no representations of any kind, including, but not limited to, warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied with respect to the information, data or service furnished herein. In no event shall the Data Providers become liable to users of these data, or any other party, for any loss or damages, consequential or otherwise, including but not limited to time, money, or goodwill, arising from the use, operation or modification of the data. In using these data, users further agree to indemnify, defend, and hold harmless the Data Providers for any and all liability of any nature arising out of or resulting from the lack of accuracy or correctness of the data, or the use of the data. No person shall sell, give or receive for the purpose of selling or offering for sale, any portion of the information provided herein.

PROJECT: Eliot Second Addition
LOCATION: NE 1/4, Sec 17, T-28-S, R-1-W
CLIENT: _____

DATE March 24, 2008
BY _____ CKD _____
JOB NO. _____ SHEET NO. _____ OF _____

Drainage Area - Pond + immediate area

$$DA = .9$$

milen (1-3) B

Time of Concentration

use 15 minutes

$$L_{10} = 5.27$$

$$L_{100} = 7.40$$

"L" Factor

$$B_{1-3 10} = .28$$

$$B_{1-3 2} = .2$$

$$B_{1-3 100} = .41$$

$$B_{1-3 5} = .22$$

Undeveloped Peak Discharge

$$Q = ciA$$

$$Q_{10} = .28 (5.27) (.9) = 1.3$$

$$Q_{100} = .41 (7.40) (.9) = 2.7$$

PROJECT: Eliot Second Addition

DATE March 24, 2008

LOCATION: NE 1/4, Sec 17, T-28-S, R-1-W

BY _____ CKD _____

CLIENT: _____

JOB NO. _____ SHEET NO. _____ OF _____

Drainage Area East of Pond excluding Eliot 2nd + 1st

DA = 4.6 acres

SLS	Soils	Type	%
	Blanket (0-1)	C	10
	Blanket (1-3)	C	5
	Milan (1-3)	B	85

Time of Concentration

Travel Length = 723 Lin Ft $T_c = 54$ min $L_{10} = 2.68$
 $L_{100} = 3.95$

"C" Factor

$C_{0-1, 10} = .35$ $C_{1-3, 10} = .37$ $B_{1-3, 10} = .28$

$C_{0-1, 100} = .51$ $C_{1-3, 100} = .53$ $B_{1-3, 100} = .41$

Weighted C

$$.1(.35) + .05(.37) + .85(.28) = .29 = C_{10}$$

$$.1(.51) + .05(.53) + .85(.41) = .42 = C_{100}$$

$$.1(.24) + .05(.26) + .85(.20) = .21 = C_2$$

$$.1(.27) + .05(.29) + .85(.22) = .23 = C_5$$

Undeveloped Peak Discharge

$$Q = C i A$$

$$Q_{10} = .29 \cdot 2.68 \cdot 4.6 = 3.6 \text{ cfs}$$

$$Q_{100} = .42 \cdot 3.95 \cdot 4.6 = 7.6 \text{ cfs}$$

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project Eliot Second Addition By _____ Date _____

Location NE 1/4, Sec 17, T-28-S, R-1-W Checked _____ Date _____

Circle one: Present Developed Area East of Pond Excluding 1st & 2nd
 Circle one: T_c T_t through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

- | | Segment ID | |
|---|------------|--|
| 1. Surface description (table 3-1) | | yard |
| 2. Manning's roughness coeff., n (table 3-1) .. | | .24 |
| 3. Flow length, L (total L \leq 300 ft) | ft | 300 |
| 4. Two-yr 24-hr rainfall, P_2 | in | 3.5 |
| 5. Land slope, s | ft/ft | .007 |
| 6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_t | hr | .83 + = 49 |

Shallow concentrated flow

- | | Segment ID | |
|--|------------|---|
| 7. Surface description (paved or unpaved) | | unpaved |
| 8. Flow length, L | ft | 423 |
| 9. Watercourse slope, s | ft/ft | .007 |
| 10. Average velocity, V (figure 3-1) | ft/s | 1.35 |
| 11. $T_t = \frac{L}{3600 V}$ Compute T_t | hr | .09 + = 5 |

Channel flow

- | | Segment ID | |
|--|-----------------|--------|
| 12. Cross sectional flow area, a | ft ² | |
| 13. Wetted perimeter, P_w | ft | |
| 14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r | ft | |
| 15. Channel slope, s | ft/ft | .725 |
| 16. Manning's roughness coeff., n | | |
| 17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V | ft/s | |
| 18. Flow length, L | ft | |
| 19. $T_t = \frac{L}{3600 V}$ Compute T_t | hr | |
| 20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) | hr | 54 min |

PROJECT: Eliot Second Addition

DATE Mar 24, 2008

LOCATION: NE 1/4, Sec 17, T-28-S, R-1-W

BY _____ CKD _____

CLIENT: _____

JOB NO. _____ SHEET NO. _____ OF _____

Existing Condition

3

Drainage Area of Eliot 1st + 2nd (excluding pond)

Drainage Area 1.6 ac

34% Grass	23,220	soil
42% Pavement	28,360	
23% Structures	15,850	
	<u>67,430</u>	

Time of Concentration

use 15 minutes

$$L_{10} = 5.21$$

$$L_{100} = 7.40$$

"C" Factor

$$C_{0-1,10} = .35$$

$$Roofs_{10} = .90$$

$$Parking lot_{10} = .88$$

$$C_{0-1,100} = .51$$

$$Roofs_{100} = .93$$

$$Parking lot_{100} = .89$$

Weighted "C" Factor

$$C_{10} = .35(.34) + .90(.23) + .88(.42) = .70$$

$$C_{100} = .51(.34) + .93(.23) + .89(.42) = .76$$

$$C_2 = .24(.34) + .80(.23) + .87(.42) = .63$$

$$C_5 = .27(.34) + .85(.23) + .87(.42) = .65$$

$$Q = c i A$$

$$Q_{10} = .70 (5.21) (1.6) = 5.8 \text{ cfs}$$

$$Q_{100} = .76 (7.40) (1.6) = 9.0 \text{ cfs}$$

PROJECT: Eliot Second Addition

DATE March 24

LOCATION: NE 1/4, Sec 17, T-28-S, R-1-W

BY _____ CKD _____

CLIENT: _____

JOB NO. _____ SHEET NO. _____ OF _____

Proposed Condition

Drainage Area of Eliot 1st + 2nd (Excluding Pond)

Drainage Area 1.6 acres

Grass $C_{0.1}$	4,600	70%
Roof	19,430	29%
Parking Lot	43,380	64%

Time of Concentration

USE 15 minutes

$L_{10} = 5.21$

$L_{100} = 7.40$

"C" Factor

$C_{0.1,10} = .35$

$Roof_{S,10} = .90$

$Parking Lot_{10} = .88$

$C_{0.1,100} = .51$

$Roof_{S,100} = .93$

$Parking Lot_{100} = .89$

Weighted "C" Factor

$C_{10} = .07(.35) + .29(.90) + .64(.88) = .85$

$C_{100} = .07(.51) + .29(.93) + .64(.89) = .87$

$C_2 = .07(.24) + .29(.80) + .64(.87) = .81$

$C_5 = .07(.27) + .29(.85) + .64(.87) = .82$

$Q = C L A$

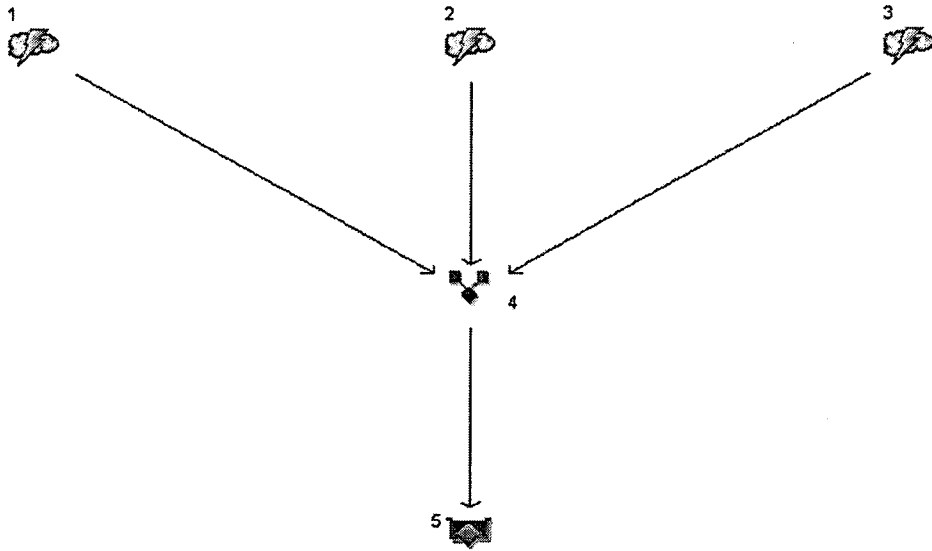
$Q_{10} = .85 (5.21) (1.6) = 7.1 \text{ cfs}$

$Q_{100} = .87 (7.40) (1.6) = 10.3 \text{ cfs}$

Watershed Model Schematic

Existing

Hydraflow Hydrographs by Intelisolve v9.1



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1 Rational	Pond and immediate area, sw
2 Rational	Area East of Pond excluding 1st and 2nd Additions
3 Rational	1st and 2nd addition
4 Combine	Combined flow to pond
5 Reservoir	existing pond

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	Rational	0.685	1	15	617	—	—	—	Pond and immediate area, sw	
2	Rational	1.763	1	54	5,711	—	—	—	Area East of Pond excluding 1st an	
3	Rational	3.837	1	15	3,453	—	—	—	1st and 2nd addition	
4	Combine	5.012	1	15	9,781	1, 2, 3	—	—	Combined flow to pond	
5	Reservoir	0.000	1	n/a	0	4	1311.01	9,781	existing pond	
Eliot Second existing 2yr.gpw					Return Period: 2 Year			Wednesday, Mar 26, 2008		

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	0.923	1	15	831	—	—	—	Pond and immediate area, sw
2	Rational	2.458	1	54	7,965	—	—	—	Area East of Pond excluding 1st an
3	Rational	4.849	1	15	4,364	—	—	—	1st and 2nd addition
4	Combine	6.455	1	15	13,160	1, 2, 3	—	—	Combined flow to pond
5	Reservoir	0.030	1	107	417	4	1311.11	13,139	existing pond

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	Rational	1.331	1	15	1,198	---	---	---	Pond and immediate area, sw	
2	Rational	3.569	1	54	11,563	---	---	---	Area East of Pond excluding 1st an	
3	Rational	5.916	1	15	5,324	---	---	---	1st and 2nd addition	
4	Combine	8.238	1	15	18,086	1, 2, 3	---	---	Combined flow to pond	
5	Reservoir	1.023	1	93	5,343	4	1311.21	16,294	existing pond	
Eliot Second existing 10yr.gpw					Return Period: 10 Year		Wednesday, Mar 26, 2008			

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	1.554	1	15	1,398	---	---	---	Pond and immediate area, sw
2	Rational	4.236	1	54	13,726	---	---	---	Area East of Pond excluding 1st an
3	Rational	6.906	1	15	6,215	---	---	---	1st and 2nd addition
4	Combine	9.636	1	15	21,339	1, 2, 3	---	---	Combined flow to pond
5	Reservoir	1.747	1	86	8,597	4	1311.26	17,739	existing pond
Eliot Second existing 10yr.gpw					Return Period: 25 Year			Wednesday, Mar 26, 2008	

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	Rational	2.780	1	15	2,502	—	—	—	Pond and immediate area, sw	
2	Rational	7.634	1	54	24,736	—	—	—	Area East of Pond excluding 1st an	
3	Rational	9.160	1	15	8,244	—	—	—	1st and 2nd addition	
4	Combine	14.06	1	15	35,482	1, 2, 3	—	—	Combined flow to pond	
5	Reservoir	4.788	1	74	22,739	4	1311.40	22,927	existing pond	
Eliot Second existing 100yr.gpw					Return Period: 100 Year		Wednesday, Mar 26, 2008			

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

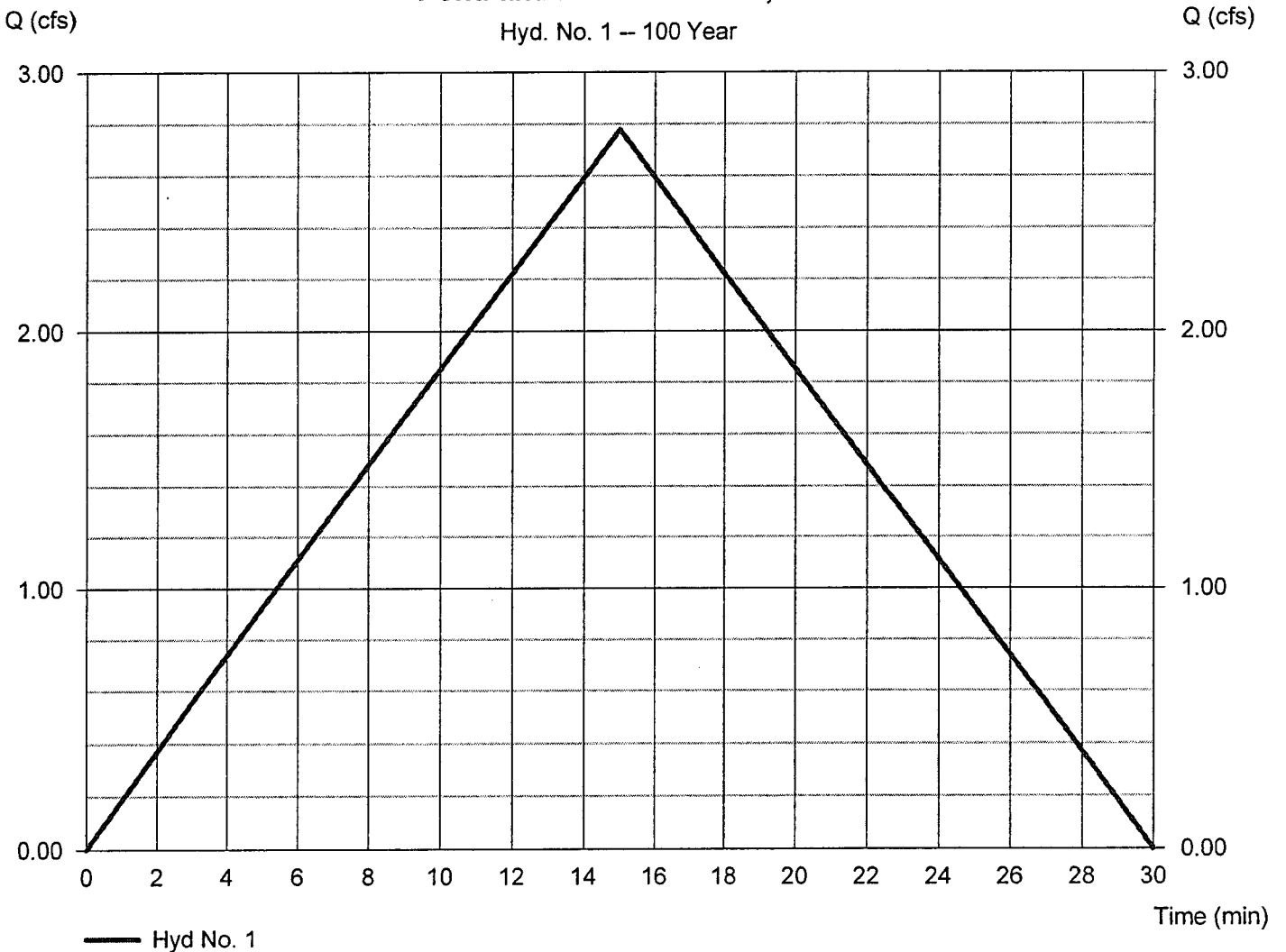
Hyd. No. 1

Pond and immediate area, sw

Hydrograph type	= Rational	Peak discharge	= 2.780 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 2,502 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.41
Intensity	= 7.533 in/hr	Tc by User	= 15.00 min
IDF Curve	= Sedgwick County Rainfall IDF.IDF	Asc/Rec limb fact	= 1/1

Pond and immediate area, sw

Hyd. No. 1 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

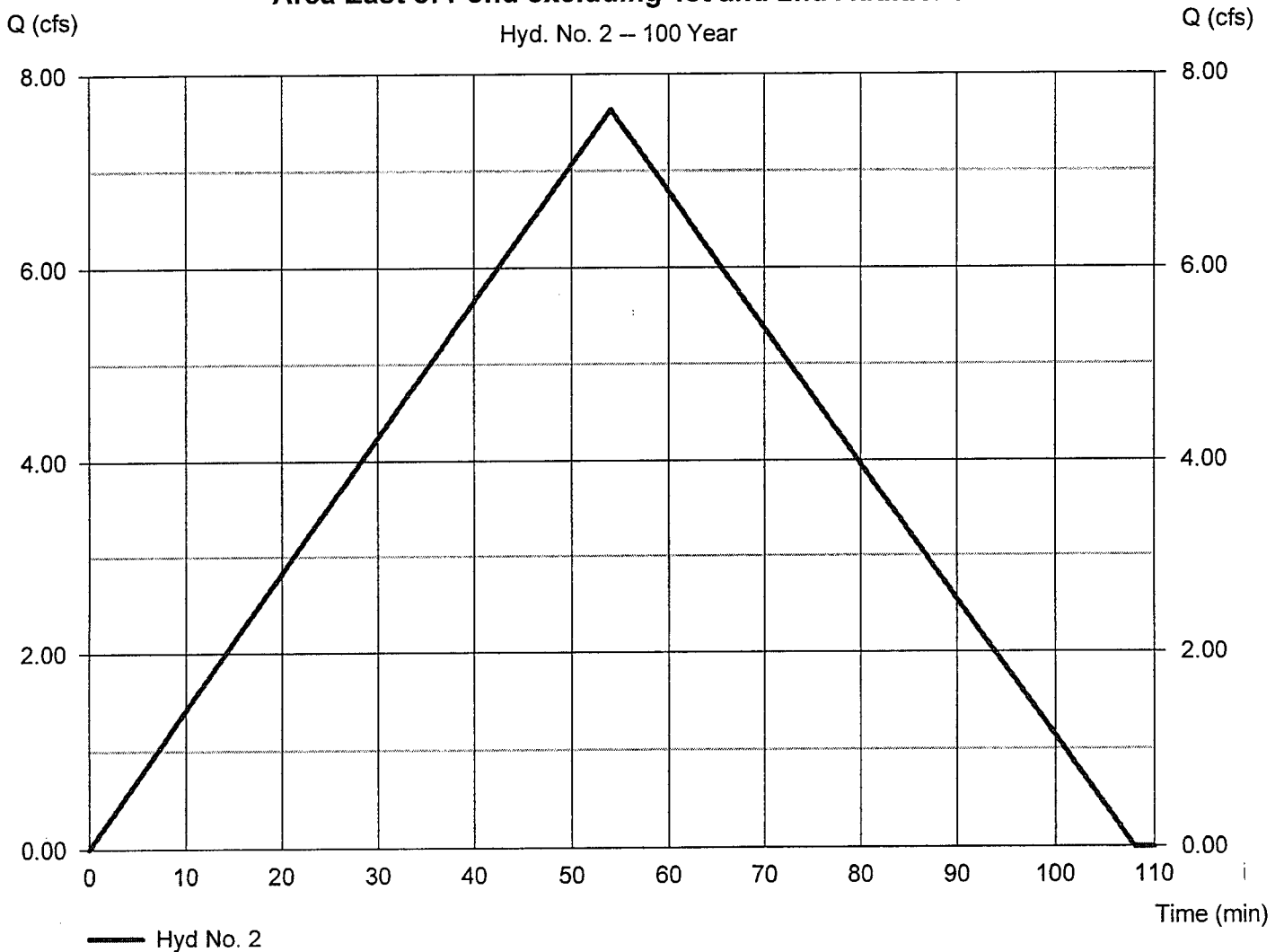
Hyd. No. 2

Area East of Pond excluding 1st and 2nd Additions

Hydrograph type	= Rational	Peak discharge	= 7.634 cfs
Storm frequency	= 100 yrs	Time to peak	= 54 min
Time interval	= 1 min	Hyd. volume	= 24,736 cuft
Drainage area	= 4.600 ac	Runoff coeff.	= 0.42
Intensity	= 3.952 in/hr	Tc by User	= 54.00 min
IDF Curve	= Sedgwick County Rainfall IDF.IDF	Asc/Rec limb fact	= 1/1

Area East of Pond excluding 1st and 2nd Additions

Hyd. No. 2 -- 100 Year



Hydrograph Report

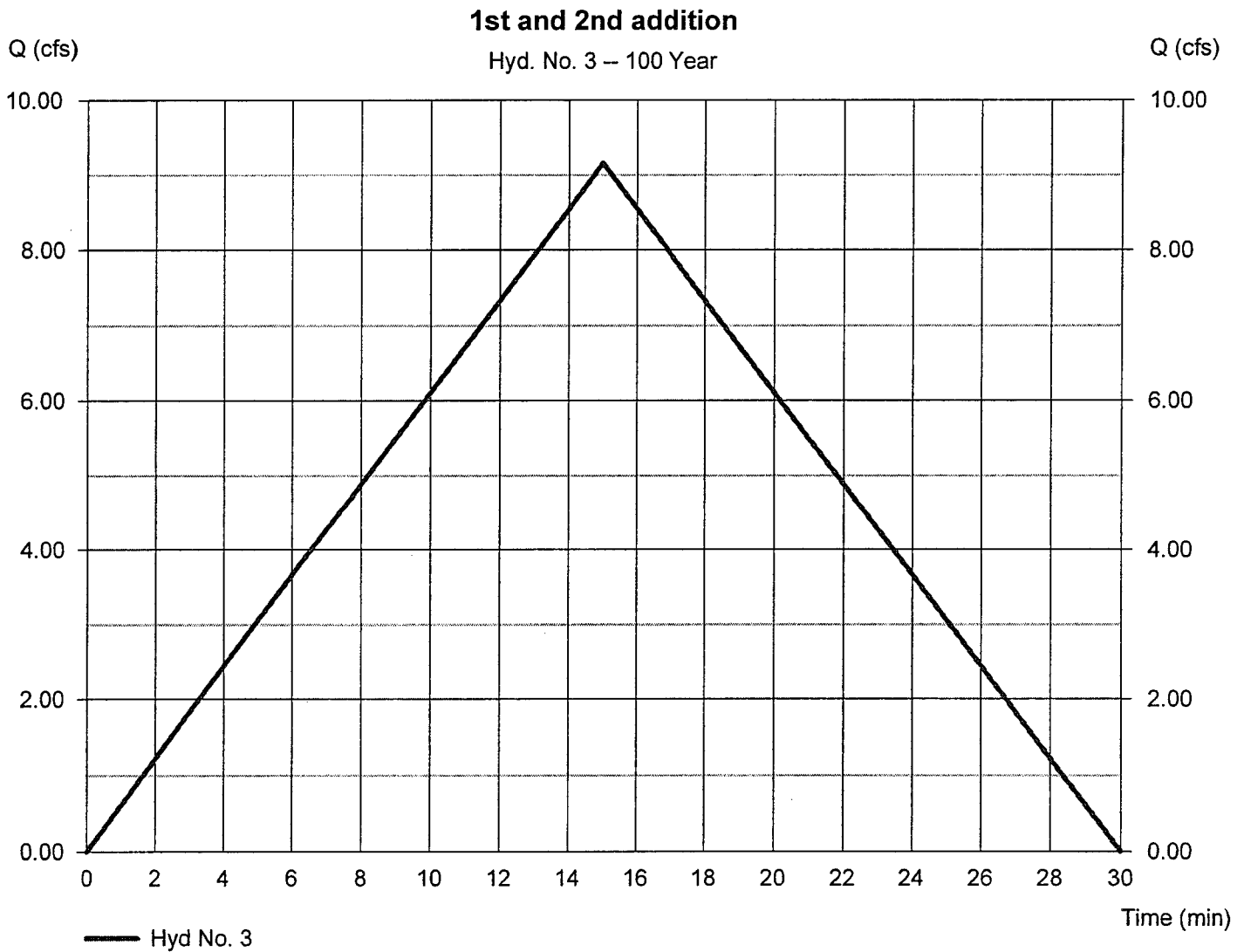
Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

Hyd. No. 3

1st and 2nd addition

Hydrograph type	= Rational	Peak discharge	= 9.160 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,244 cuft
Drainage area	= 1.600 ac	Runoff coeff.	= 0.76
Intensity	= 7.533 in/hr	Tc by User	= 15.00 min
IDF Curve	= Sedgwick County Rainfall IDF.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

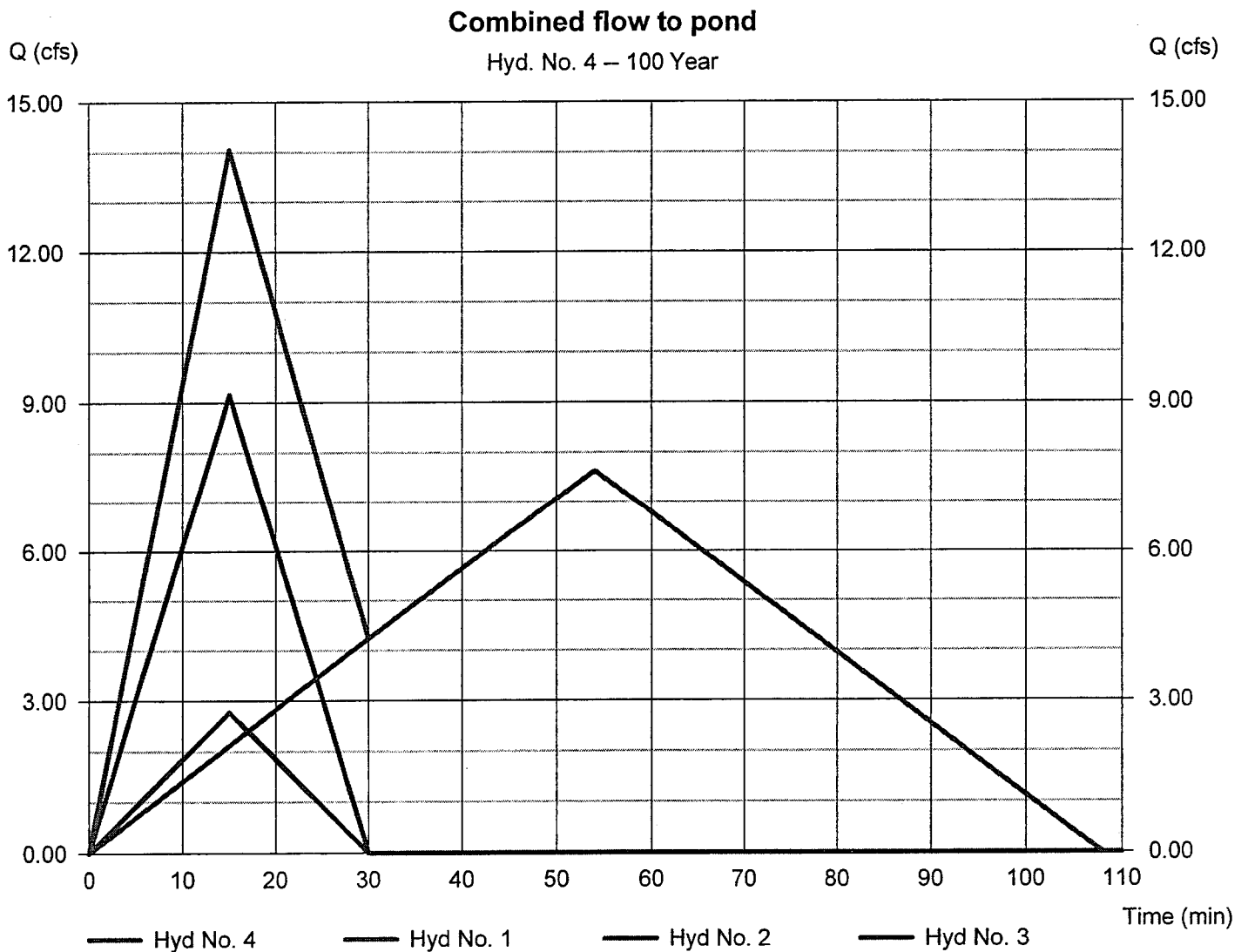
Wednesday, Mar 26, 2008

Hyd. No. 4

Combined flow to pond

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 3

Peak discharge = 14.06 cfs
Time to peak = 15 min
Hyd. volume = 35,482 cuft
Contrib. drain. area = 7.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

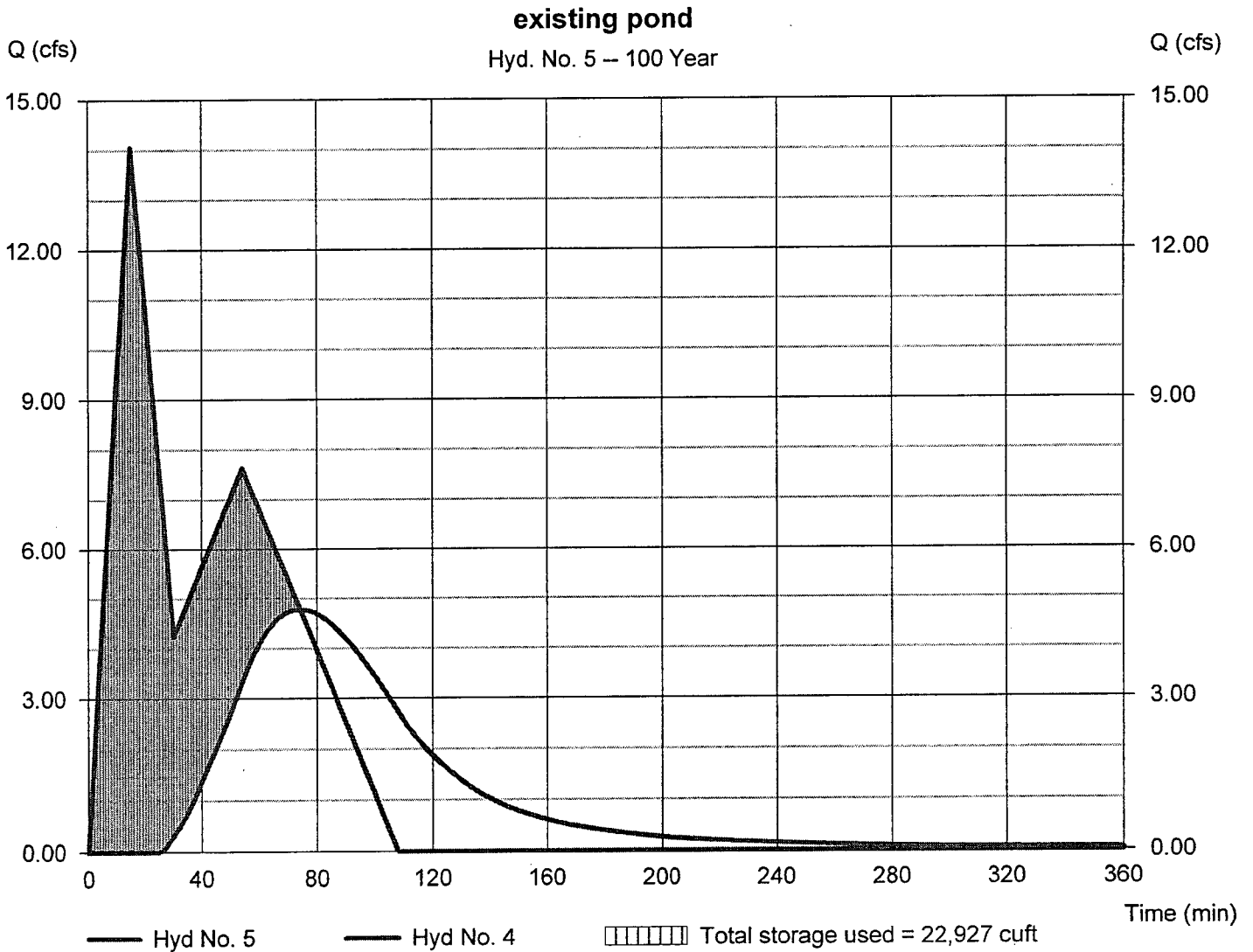
Hyd. No. 5

existing pond

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 4 - Combined flow to pond
Reservoir name = Existing Pond

Peak discharge = 4.788 cfs
Time to peak = 74 min
Hyd. volume = 22,739 cuft
Max. Elevation = 1311.40 ft
Max. Storage = 22,927 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

Pond No. 1 - Existing Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1307.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1307.00	01	0	0
1.00	1308.00	01	1	1
2.00	1309.00	01	1	2
3.00	1310.00	01	1	3
4.00	1311.00	28,446	9,538	9,541
4.25	1311.25	35,456	7,971	17,511
4.50	1311.50	38,562	9,249	26,760

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 1311.11	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	—	—	—
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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

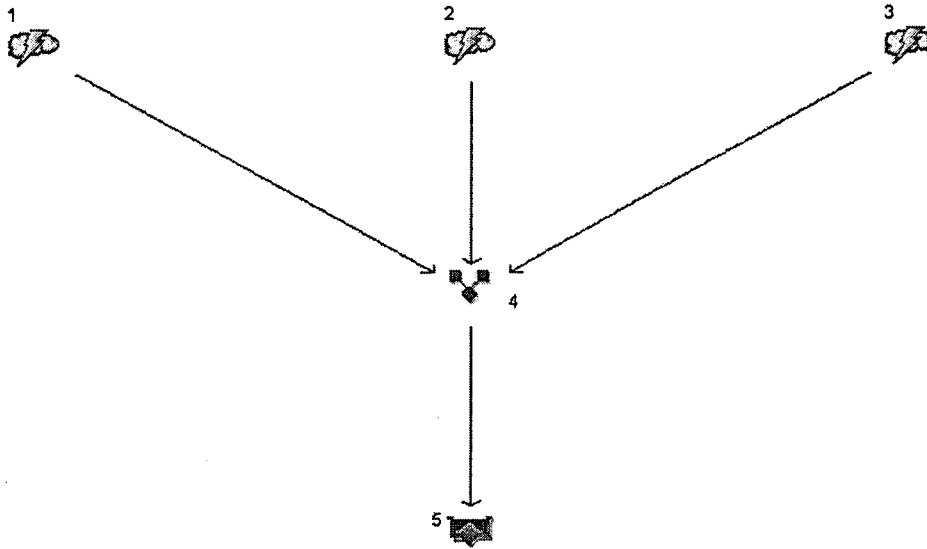
Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1307.00	—	—	—	—	0.00	—	—	—	—	—	0.00
1.00	1	1308.00	—	—	—	—	0.00	—	—	—	—	—	0.00
2.00	2	1309.00	—	—	—	—	0.00	—	—	—	—	—	0.00
3.00	3	1310.00	—	—	—	—	0.00	—	—	—	—	—	0.00
4.00	9,541	1311.00	—	—	—	—	0.00	—	—	—	—	—	0.00
4.25	17,511	1311.25	—	—	—	—	1.63	—	—	—	—	—	1.63
4.50	26,760	1311.50	—	—	—	—	7.60	—	—	—	—	—	7.60

Proposed

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.1



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	Rational Pond and immediate area, sw
2	Rational Area East of Pond excluding 1st and 2nd Additions
3	Rational 1st and 2nd addition
4	Combine Combined flow to pond
5	Reservoir existing pond

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	0.685	1	15	617	---	---	---	Pond and immediate area, sw
2	Rational	1.763	1	54	5,711	---	---	---	Area East of Pond excluding 1st an
3	Rational	4.934	1	15	4,440	---	---	---	1st and 2nd addition
4	Combine	6.108	1	15	10,767	1, 2, 3	---	---	Combined flow to pond
5	Reservoir	0.000	1	n/a	0	4	1311.04	10,767	existing pond
Eliot Second proposed 02yr.gpw					Return Period: 2 Year			Wednesday, Mar 26, 2008	

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	0.923	1	15	831	---	---	---	Pond and immediate area, sw
2	Rational	2.458	1	54	7,965	---	---	---	Area East of Pond excluding 1st an
3	Rational	6.117	1	15	5,506	---	---	---	1st and 2nd addition
4	Combine	7.723	1	15	14,302	1, 2, 3	---	---	Combined flow to pond
5	Reservoir	0.193	1	104	1,559	4	1311.14	14,085	existing pond
Eliot Second proposed 02yr.gpw					Return Period: 5 Year			Wednesday, Mar 26, 2008	

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	1.331	1	15	1,198	---	---	---	Pond and immediate area, sw Area East of Pond excluding 1st an 1st and 2nd addition Combined flow to pond existing pond
2	Rational	3.569	1	54	11,563	---	---	---	
3	Rational	7.183	1	15	6,465	---	---	---	
4	Combine	9.506	1	15	19,226	1, 2, 3	---	---	
5	Reservoir	1.259	1	89	6,484	4	1311.23	16,790	
Eliot Second proposed 10yr.gpw					Return Period: 10 Year		Wednesday, Mar 26, 2008		

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	1.554	1	15	1,398	—	—	—	Pond and immediate area, sw
2	Rational	4.236	1	54	13,726	—	—	—	Area East of Pond excluding 1st an
3	Rational	8.386	1	15	7,547	—	—	—	1st and 2nd addition
4	Combine	11.12	1	15	22,671	1, 2, 3	—	—	Combined flow to pond
5	Reservoir	1.987	1	83	9,928	4	1311.27	18,225	existing pond
Eliot Second proposed 10yr.gpw					Return Period: 25 Year		Wednesday, Mar 26, 2008		

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	2.780	1	15	2,502	---	---	---	Pond and immediate area, sw
2	Rational	7.634	1	54	24,736	---	---	---	Area East of Pond excluding 1st an
3	Rational	10.49	1	15	9,438	---	---	---	1st and 2nd addition
4	Combine	15.39	1	15	36,675	1, 2, 3	---	---	Combined flow to pond
5	Reservoir	4.953	1	73	23,932	4	1311.40	23,170	existing pond

Hydrograph Report

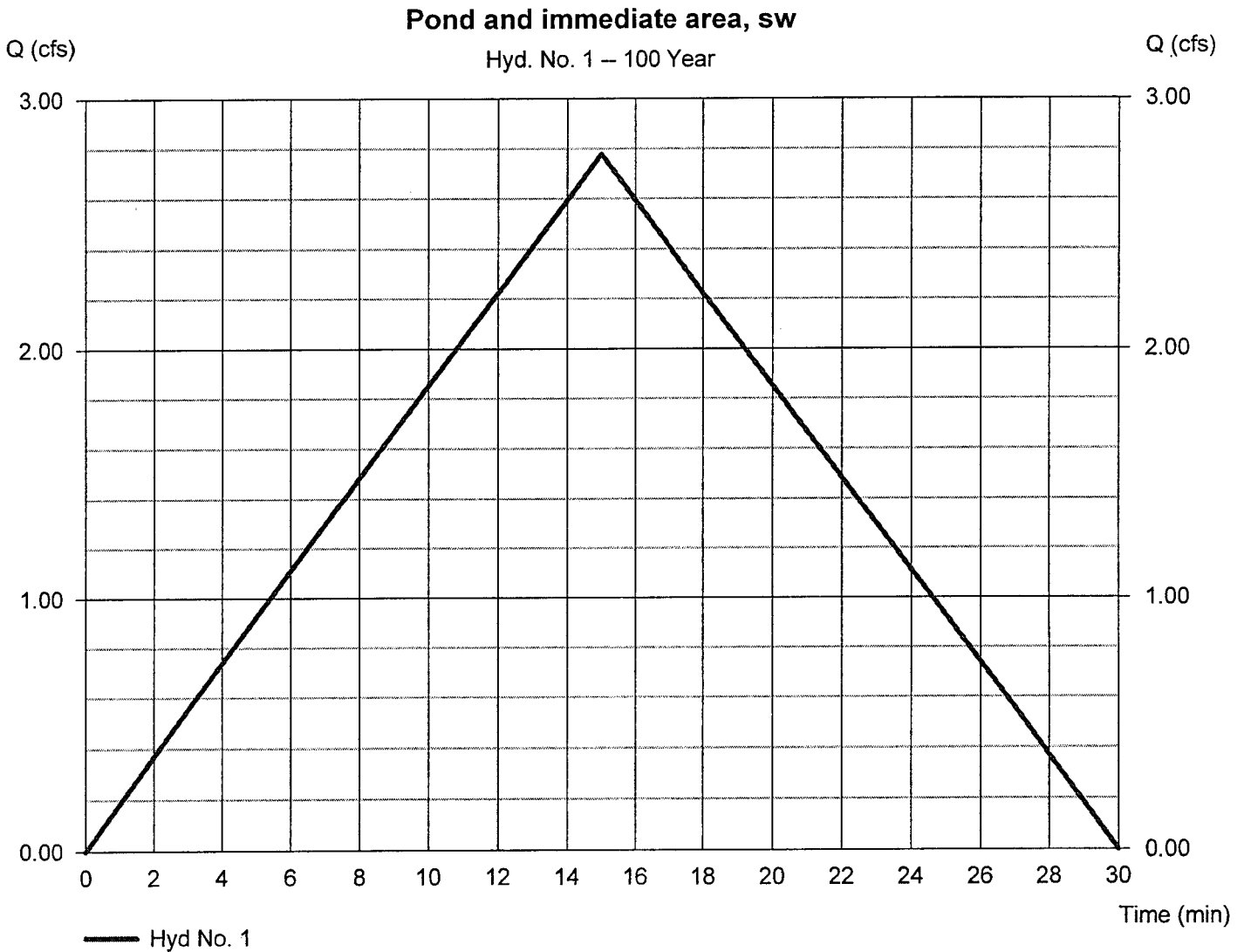
Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

Hyd. No. 1

Pond and immediate area, sw

Hydrograph type	= Rational	Peak discharge	= 2.780 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 2,502 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.41
Intensity	= 7.533 in/hr	Tc by User	= 15.00 min
IDF Curve	= Sedgwick County Rainfall IDF.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

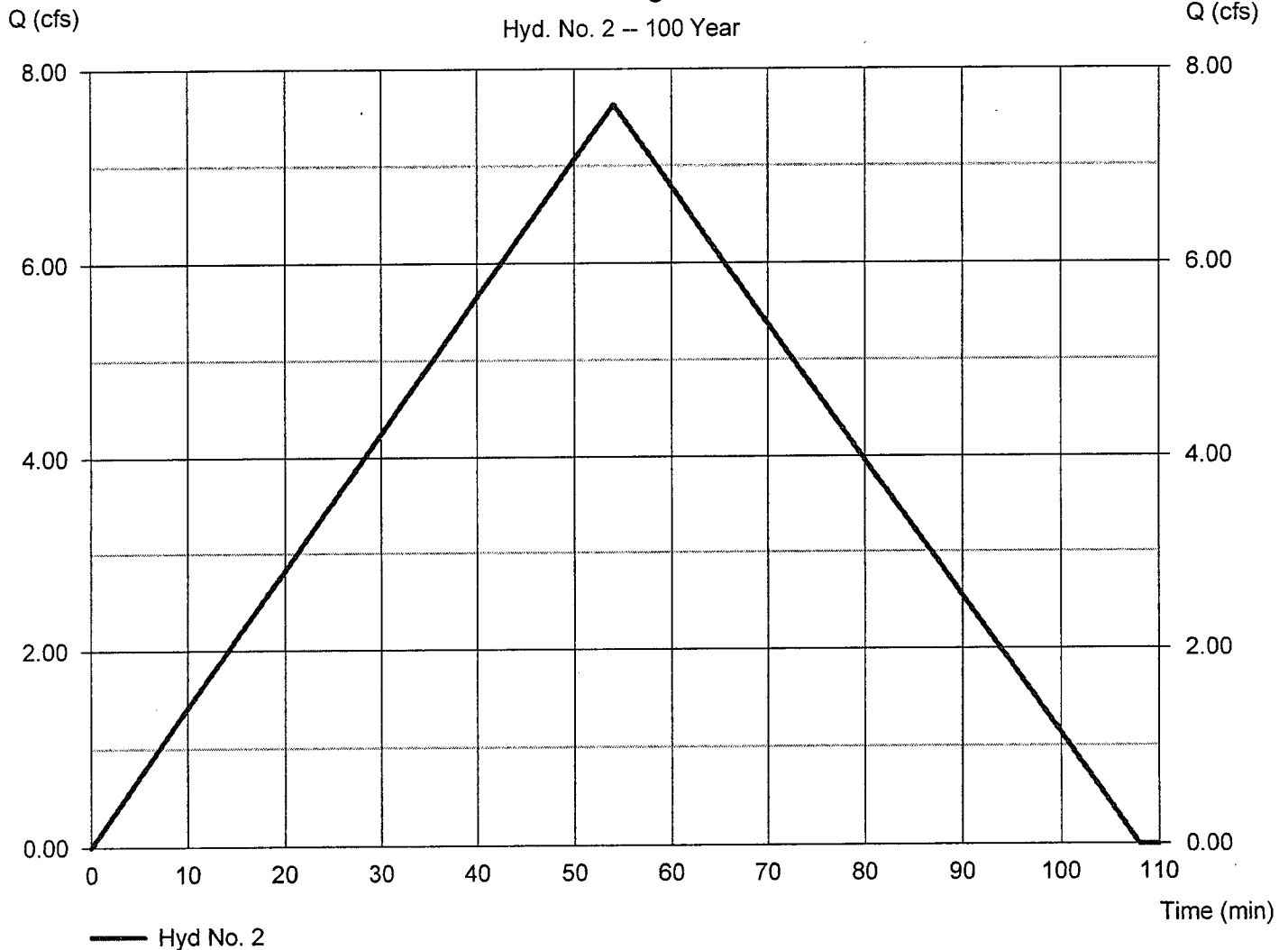
Hyd. No. 2

Area East of Pond excluding 1st and 2nd Additions

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 4.600 ac
Intensity = 3.952 in/hr
IDF Curve = Sedgwick County Rainfall IDF.IDF

Peak discharge = 7.634 cfs
Time to peak = 54 min
Hyd. volume = 24,736 cuft
Runoff coeff. = 0.42
Tc by User = 54.00 min
Asc/Rec limb fact = 1/1

Area East of Pond excluding 1st and 2nd Additions



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

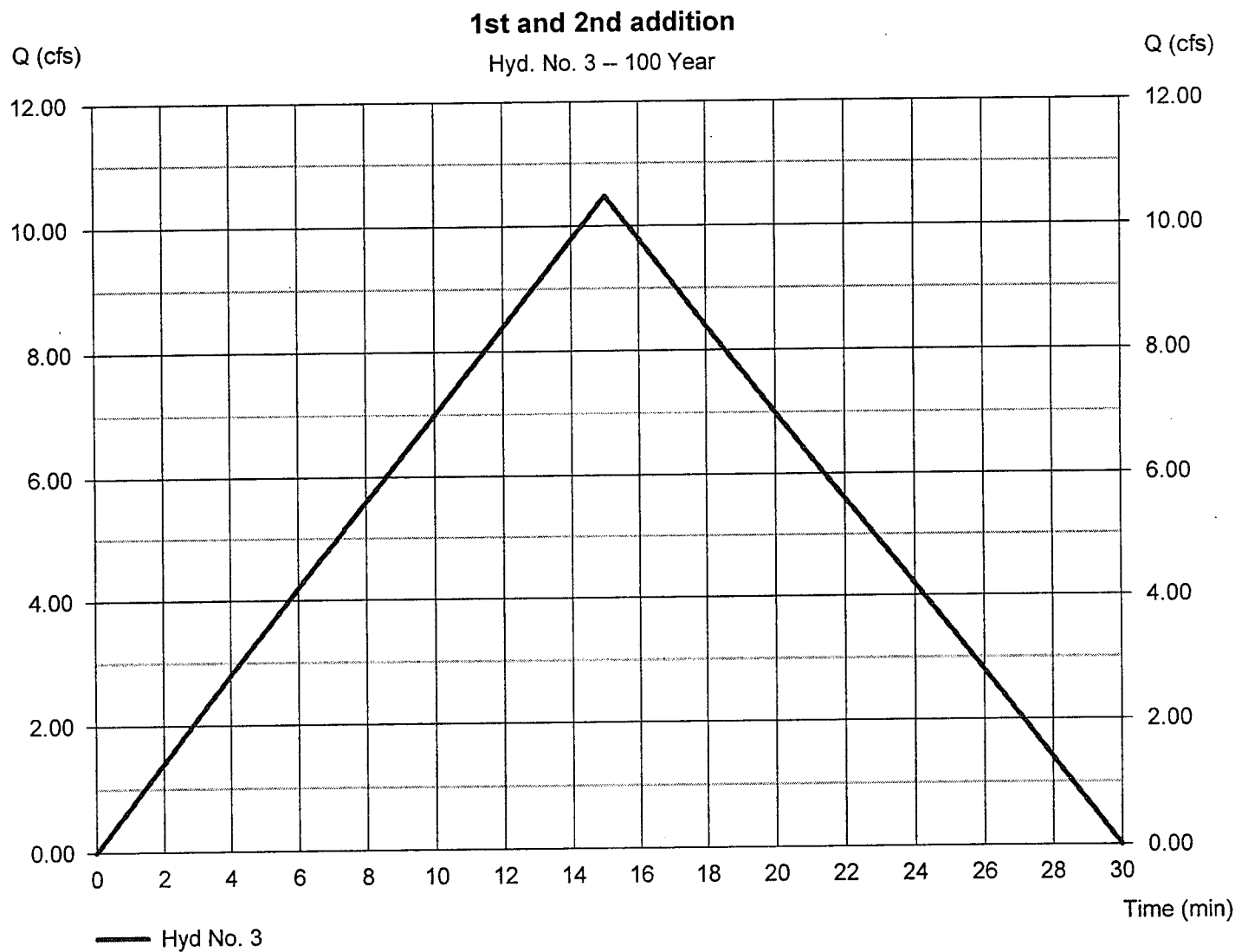
Wednesday, Mar 26, 2008

Hyd. No. 3

1st and 2nd addition

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 1.600 ac
Intensity = 7.533 in/hr
IDF Curve = Sedgwick County Rainfall IDF.IDF

Peak discharge = 10.49 cfs
Time to peak = 15 min
Hyd. volume = 9,438 cuft
Runoff coeff. = 0.87
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

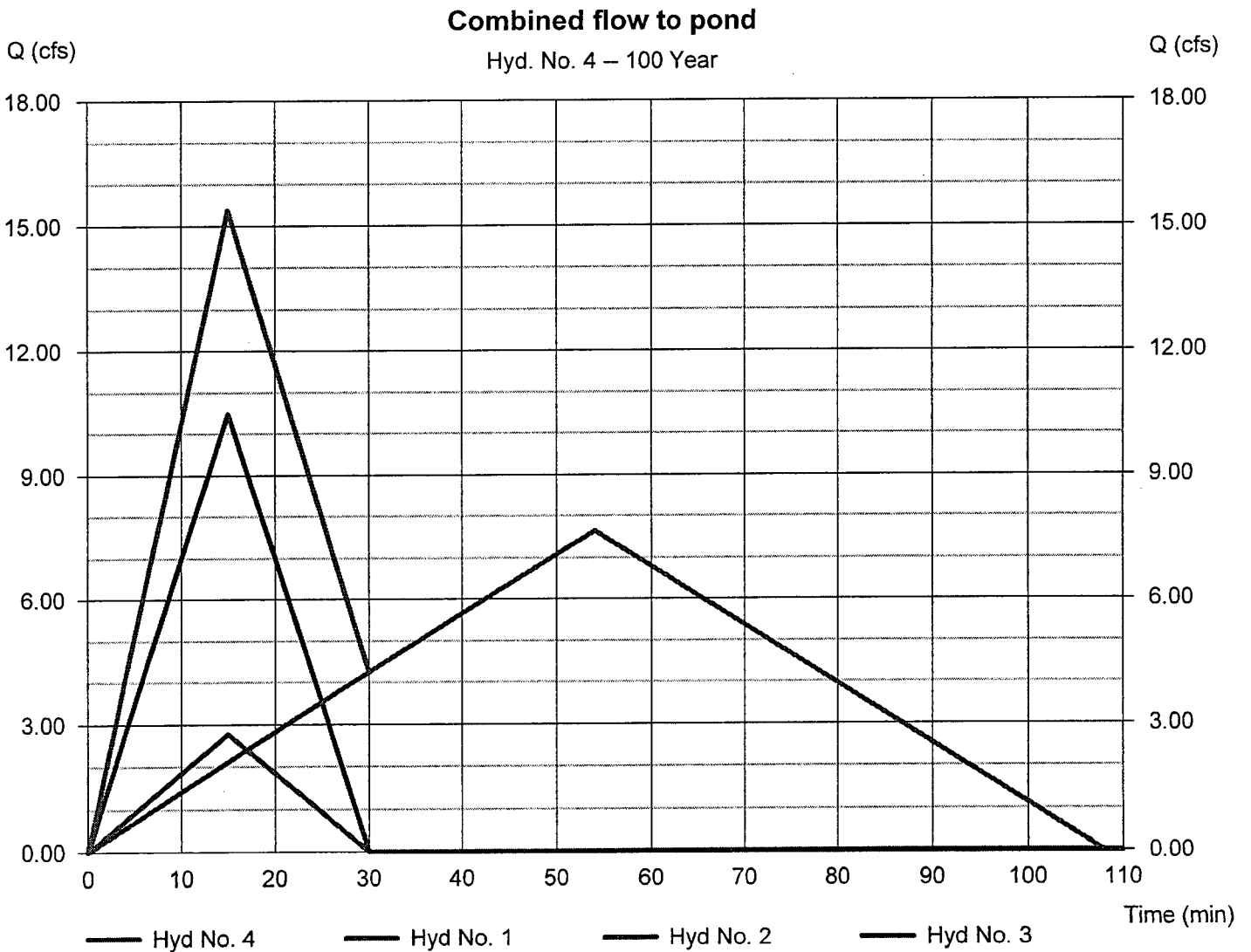
Wednesday, Mar 26, 2008

Hyd. No. 4

Combined flow to pond

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 3

Peak discharge = 15.39 cfs
Time to peak = 15 min
Hyd. volume = 36,675 cuft
Contrib. drain. area = 7.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

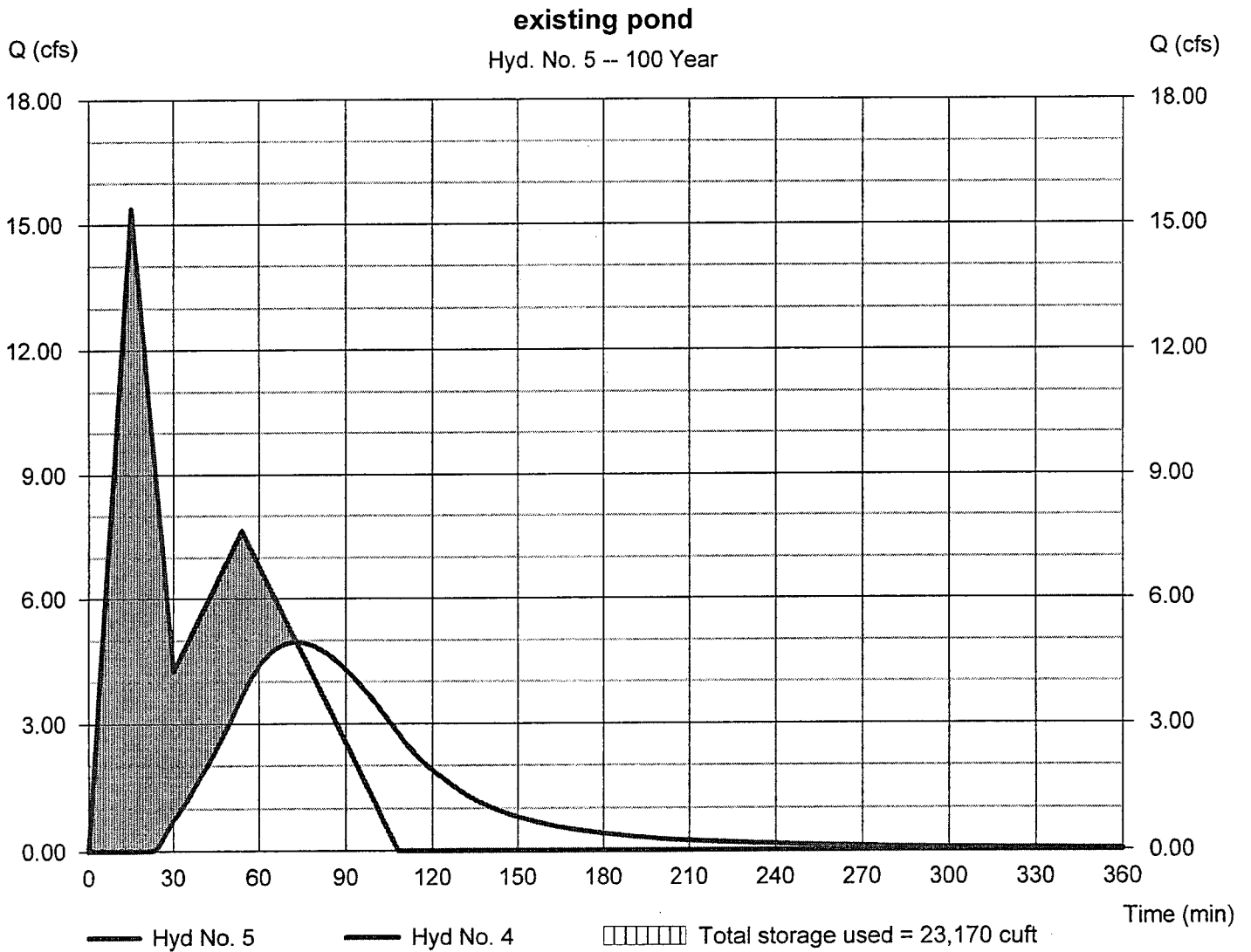
Hyd. No. 5

existing pond

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 4 - Combined flow to pond
Reservoir name = Existing Pond

Peak discharge = 4.953 cfs
Time to peak = 73 min
Hyd. volume = 23,932 cuft
Max. Elevation = 1311.40 ft
Max. Storage = 23,170 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intelisolve v9.1

Wednesday, Mar 26, 2008

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	42.7057	9.5000	0.8092	----
2	51.0295	10.8000	0.7986	----
3	0.0000	0.0000	0.0000	----
5	66.0363	12.9000	0.7963	----
10	81.2026	14.5000	0.8074	----
25	100.2580	15.9000	0.8129	----
50	107.3112	16.1000	0.8010	----
100	126.7670	17.2000	0.8131	----

File name: Sedgwick County Rainfall IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.91	3.86	3.21	2.76	2.43	2.18	1.98	1.82	1.68	1.56	1.47	1.38
2	5.63	4.52	3.81	3.30	2.93	2.64	2.41	2.22	2.06	1.92	1.80	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.64	5.46	4.66	4.09	3.65	3.31	3.03	2.80	2.61	2.44	2.30	2.17
10	7.38	6.14	5.28	4.65	4.17	3.79	3.48	3.22	3.00	2.81	2.64	2.50
25	8.47	7.12	6.17	5.46	4.91	4.47	4.11	3.81	3.55	3.33	3.14	2.97
50	9.33	7.87	6.84	6.07	5.47	4.99	4.59	4.26	3.98	3.74	3.53	3.34
100	10.19	8.64	7.53	6.70	6.05	5.52	5.09	4.72	4.41	4.14	3.91	3.70

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	0.00	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	0.00	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	2.67	0.00	0.00	5.22	5.25	6.00	7.37

RAINFALL INTENSITY TABLE
 SEDGWICK COUNTY
 KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
 IN INCHES PER HOUR.

<i>Time of conc.</i> DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.91	5.64	6.64	7.38	8.48	9.34	10.20
0:06	4.62	5.34	6.33	7.07	8.15	9.00	9.84
0:07	4.38	5.09	6.08	6.80	7.86	8.69	9.52
0:08	4.17	4.87	5.85	6.56	7.60	8.41	9.22
0:09	4.00	4.68	5.63	6.33	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.90	6.86	7.61	8.36
0:12	3.56	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.44	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.48	4.26	4.82	5.63	6.26	6.88
0:19	2.85	3.39	4.16	4.71	5.50	6.12	6.74
0:20	2.77	3.30	4.06	4.60	5.38	5.99	6.60
0:21	2.70	3.22	3.97	4.50	5.27	5.87	6.47
0:22	2.63	3.14	3.88	4.41	5.17	5.76	6.35
0:23	2.56	3.07	3.80	4.32	5.07	5.65	6.23
0:24	2.50	3.00	3.72	4.23	4.97	5.54	6.12
0:25	2.44	2.93	3.64	4.15	4.88	5.44	6.01
0:26	2.38	2.87	3.57	4.07	4.79	5.35	5.90
0:27	2.33	2.81	3.50	4.00	4.70	5.26	5.80
0:28	2.27	2.75	3.44	3.92	4.62	5.17	5.71
0:29	2.23	2.69	3.37	3.86	4.54	5.08	5.61
0:30	2.18	2.64	3.31	3.79	4.47	4.99	5.52
0:31	2.14	2.59	3.26	3.72	4.39	4.91	5.43
0:32	2.09	2.54	3.20	3.66	4.32	4.83	5.34
0:33	2.05	2.50	3.14	3.60	4.25	4.76	5.26
0:34	2.02	2.45	3.09	3.54	4.18	4.68	5.18
0:35	1.98	2.41	3.04	3.48	4.12	4.61	5.10
0:36	1.94	2.37	2.99	3.43	4.05	4.54	5.02
0:37	1.91	2.33	2.94	3.38	3.99	4.47	4.95
0:38	1.88	2.29	2.90	3.32	3.93	4.40	4.87
0:39	1.85	2.25	2.85	3.27	3.87	4.34	4.80
0:40	1.82	2.22	2.81	3.23	3.82	4.28	4.73
0:41	1.79	2.18	2.77	3.18	3.76	4.22	4.67
0:42	1.76	2.15	2.73	3.13	3.71	4.16	4.60
0:43	1.73	2.12	2.69	3.09	3.66	4.10	4.54
0:44	1.71	2.09	2.65	3.05	3.61	4.04	4.48
0:45	1.68	2.06	2.62	3.01	3.56	3.99	4.42

RAINFALL INTENSITY TABLE
 SEDGWICK COUNTY
 KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
 IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:46	1.66	2.03	2.58	2.96	3.51	3.94	4.36
0:47	1.63	2.00	2.55	2.93	3.47	3.89	4.30
0:48	1.61	1.97	2.51	2.89	3.42	3.84	4.25
0:49	1.59	1.95	2.48	2.85	3.38	3.79	4.20
0:50	1.57	1.92	2.45	2.81	3.34	3.74	4.15
0:51	1.55	1.90	2.42	2.78	3.30	3.70	4.10
0:52	1.53	1.87	2.39	2.75	3.26	3.65	4.05
0:53	1.51	1.85	2.36	2.71	3.22	3.61	4.00
0:54	1.49	1.83	2.33	2.68	3.18	3.57	3.95
0:55	1.47	1.80	2.30	2.65	3.14	3.53	3.91
0:56	1.45	1.78	2.28	2.62	3.11	3.49	3.86
0:57	1.43	1.76	2.25	2.59	3.07	3.45	3.82
0:58	1.41	1.74	2.22	2.56	3.04	3.41	3.78
0:59	1.40	1.72	2.20	2.53	3.01	3.37	3.74
1:00	1.38	1.70	2.17	2.50	2.97	3.34	3.70
1:05	1.30	1.61	2.06	2.38	2.82	3.17	3.52
1:10	1.23	1.53	1.96	2.26	2.69	3.02	3.35
1:15	1.17	1.45	1.87	2.16	2.57	2.89	3.20
1:20	1.11	1.38	1.79	2.06	2.46	2.77	3.07
1:25	1.06	1.32	1.71	1.98	2.36	2.65	2.95
1:30	1.01	1.27	1.64	1.90	2.27	2.55	2.83
1:35	0.97	1.21	1.58	1.83	2.18	2.46	2.73
1:40	0.93	1.16	1.52	1.76	2.10	2.37	2.63
1:45	0.89	1.12	1.46	1.70	2.03	2.29	2.54
1:50	0.86	1.08	1.41	1.64	1.96	2.21	2.46
1:55	0.82	1.04	1.36	1.58	1.89	2.13	2.38
2:00	0.79	1.00	1.31	1.53	1.83	2.07	2.30
2:05	0.76	0.97	1.27	1.48	1.77	2.00	2.23
2:10	0.74	0.93	1.23	1.43	1.72	1.94	2.16
2:15	0.71	0.90	1.19	1.39	1.67	1.88	2.10
2:20	0.69	0.87	1.15	1.35	1.62	1.83	2.04
2:25	0.66	0.85	1.12	1.31	1.57	1.78	1.98
2:30	0.64	0.82	1.09	1.27	1.53	1.73	1.93
2:35	0.62	0.80	1.06	1.24	1.49	1.68	1.88
2:40	0.61	0.78	1.03	1.21	1.45	1.64	1.83
2:45	0.59	0.75	1.01	1.18	1.42	1.60	1.79
2:50	0.57	0.74	0.98	1.15	1.38	1.56	1.74
2:55	0.56	0.72	0.96	1.12	1.35	1.53	1.70
3:00	0.55	0.70	0.94	1.10	1.32	1.49	1.67

SOIL LEGEND

<u>SYMBOL</u>	<u>HYDROLOGIC GROUP</u>	<u>NAME</u>
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loams, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loam, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loam
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Cline silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Yanoss silt loam, 0 to 1 percent slopes
Vb	B	Yanoss silt loam, 1 to 3 percent slopes
Vc	B	Yanoss silt loam, 3 to 6 percent slopes
Vd	B	Yanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent slopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
<u>Single Family (Soil Group A)</u>					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
<u>Multi-Family (Soil Group A)</u>					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:					
	15	0.33	0.35	0.42	0.55
5. Schools:					
	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:					
	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)					
	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:					
	96	0.87	0.87	0.88	0.89
10. Roofs:					
	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
<u>Soil Group A</u>					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
<u>Soil Group B</u>					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
<u>Soil Group C</u>					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

DRAINAGE PLAN

Preliminary Plat ELIOT SECOND ADDITION WICHITA, SEDGWICK COUNTY, KANSAS

Legal Description:

Lot 1, Block A, Eliot Addition, Wichita, Sedgwick County, Kansas and that part of the E1/3 of the N1/2 of the NE1/4 of Sec. 17, Twp. 28-S, R-1-W of the 6th P.M., Sedgwick County, Kansas described as commencing at the N.E. Corner of said NE1/4; thence west, along the north line of said NE1/4, 630 feet to the N.W. Corner of the plot of said Eliot Addition for a place of beginning; thence continuing west, along the north line of said NE1/4, 154.09 feet to the N.W. Corner of the E1/3 of the N1/2 of said NE1/4; thence south, along the west line of the E1/3 of the N1/2 of said NE1/4, 232.32 feet; thence east, parallel with the north line of said NE1/4, 160.39 feet to the S.W. Corner of the plot of said Eliot Addition; thence north along the west line of the plot of Eliot Addition, 232 feet to the place of beginning.

OWNER:
James Allen Eliot
4039 S. Tyler Road
Wichita, Kansas 67215
Phone: 524-8226

GROSS SIZE OF PLAT
88,007.28 Sq. Ft.
2.02 Acres

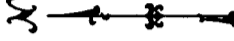
NET SIZE OF PLAT
78,712.93 Sq. Ft.
1.81 Acres

MINIMUM LOT SIZE
78,712.93 Sq. Ft.

ZONING
GC-General Commercial
SF-20 Single Family

CONTROL NUMBER
540068
317834

DRAINAGE PLAN PREPARED BY:
CED
CERTIFIED ENGINEERING DESIGN, P.A.
810 WEST DOUGLAS, SUITE C
WICHITA, KANSAS 67205
PH: (316) 262-1888
FAX: (316) 262-1889
TOTAL 1



Division = N.G.M.A.

Bound. Mark. City of Wichita, Ok. Div. 20724 & 21524 of Intermediate of Ave. Arden Road & Tyler Road
Division = 1305.05 N.G.M.A.

P = Proposed
M = Measured

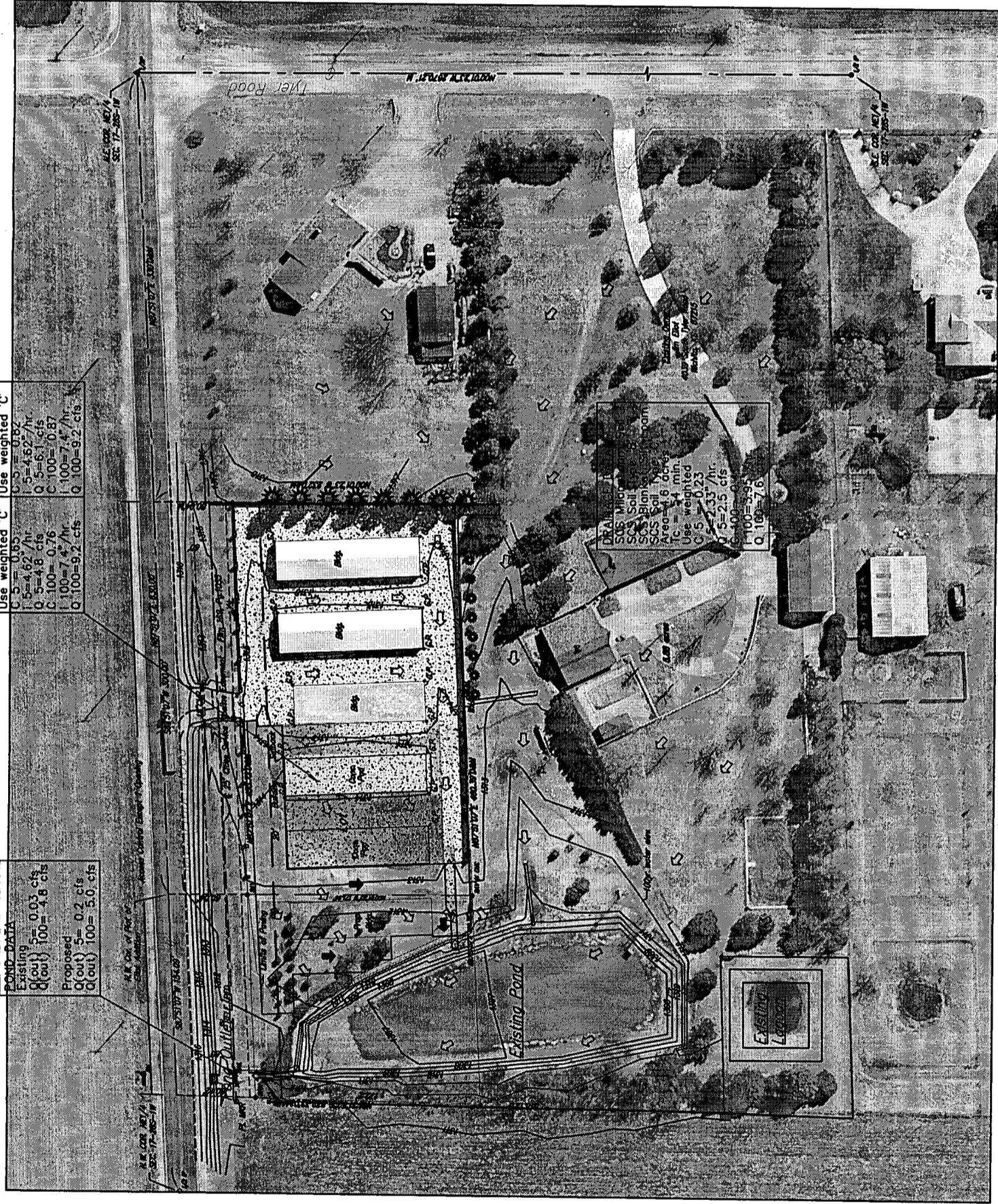
10'P = 10' from Centerline (Proposed)

10'P = 10' from Edge (Proposed)

10'P = 10' from Edge of Street Cap (Proposed)

DRAINAGE KEY

- Existing Surface Drainage Direction
- Proposed Surface Drainage Direction
- Existing Contours
- Proposed Contours



DRAINAGE DATA FOR PROPOSED SITE

Existing	Proposed
Parking Lot	Parking Lot
Roofs	Roofs
SCS Soil Type 'C'	SCS Soil Type 'C'
Area = 15 acres	Area = 15 acres
TC = 15 min	TC = 15 min
Use weighted 'C'	Use weighted 'C'
C 5 = 0.85	C 5 = 0.85
C 100 = 4.82 cfs	C 100 = 4.82 cfs
C 5 = 4.8 cfs	C 5 = 4.8 cfs
C 100 = 0.76	C 100 = 0.76
C 100 = 7.4 cfs	C 100 = 7.4 cfs
C 100 = 9.2 cfs	C 100 = 9.2 cfs

POND DATA

Existing	Proposed
Q (out) = 0.01 cfs	Q (out) = 0.2 cfs
Q (in) = 4.6 cfs	Q (in) = 5.0 cfs

DRAINAGE DATA

SCS Soil Type 'C'	SCS Soil Type 'C'
Area = 16 acres	Area = 16 acres
TC = 15 min	TC = 15 min
Use weighted 'C'	Use weighted 'C'
C 5 = 0.23	C 5 = 0.23
C 100 = 5.25 cfs	C 100 = 5.25 cfs
C 5 = 5.25 cfs	C 5 = 5.25 cfs
C 100 = 7.6	C 100 = 7.6

SURVEY DISCLAIMER:
SURVEY AND CONTOUR MAP USED IN PREPARING THIS PLAN WAS PROVIDED BY SAVOY COMPANY, P.A., 535 S. EMPORIA SUITE 104, WICHITA, KS. ENGINEER DOES NOT GUARANTEE SURVEY ELEVATIONS FOR ACCURACY. CONTRACTOR SHALL VERIFY ELEVATIONS AND NOTIFY ENGINEER OF ANY DISCREPANCIES.



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PROJECT NO. 0200001 P