DRAINAGE PLAN
For
WICHITA READINESS CENTER

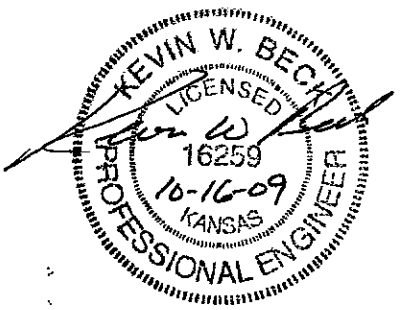
North of E. Fork of Chisholm Creek, South of UPRR & East of I-135
Wichita, Kansas

Submitted To:

City of Wichita

Prepared By:

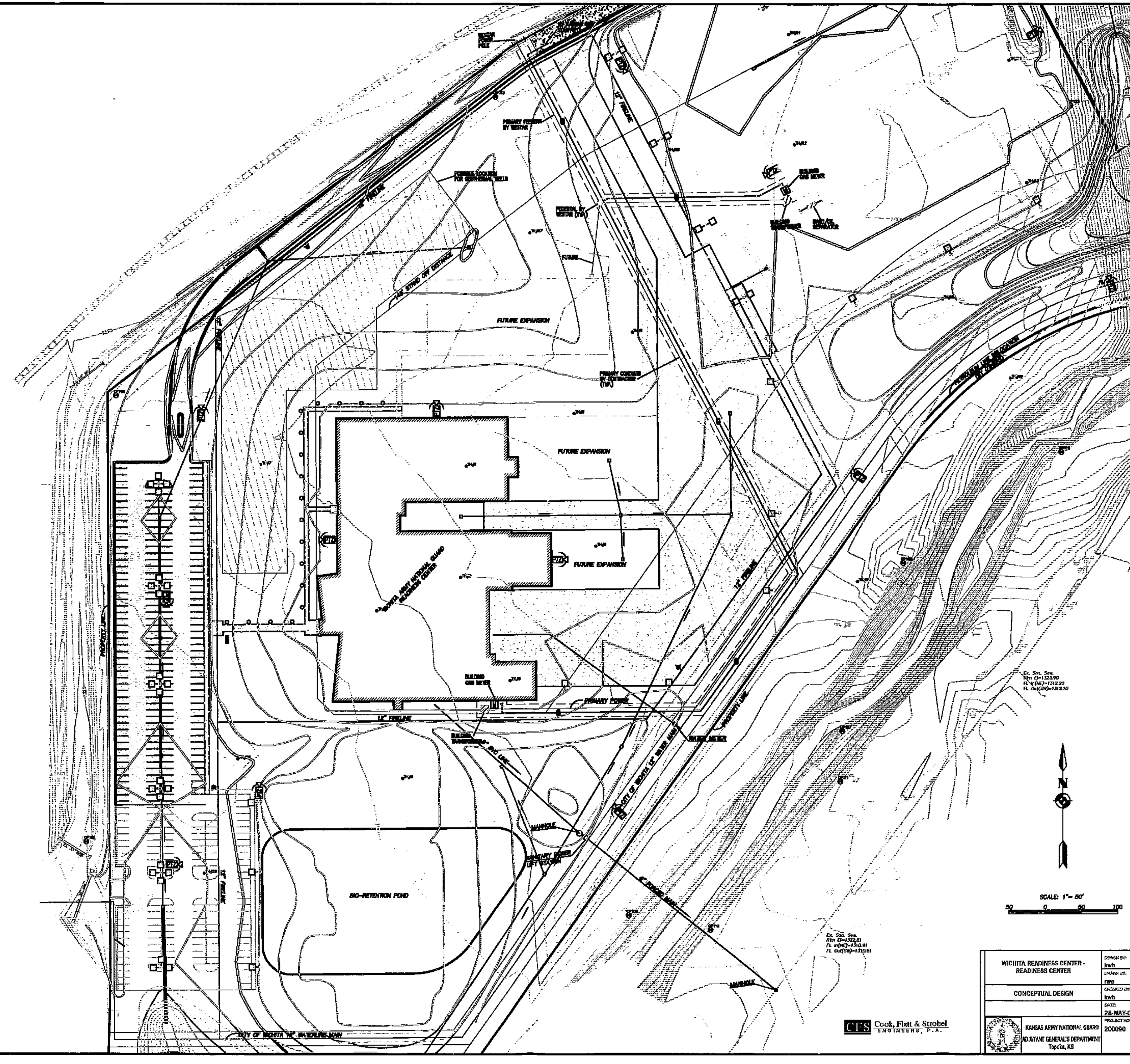
Cook, Flatt & Strobel Engineers, P.A.



Date:
October 16, 2009

CF&S Proj. No. 09-5030

Appendix H
Existing and Proposed Utilities



CFS Cook, Flatt & Strobel ENGINEERS, P.A.

WICHITA READINESS CENTER - READINESS CENTER		DESIGN BY: kwb
		DRAWN BY: rwe
CONCEPTUAL DESIGN		CHECKED BY: kwb
		DATE: 28-MAY-09
KANSAS ARMY NATIONAL GUARD	ADJUTANT GENERAL'S DEPARTMENT Topeka, KS	PROJECT NO: 200090

HTK ARCHITECTS

CONCEPTUAL DESIGN

Date:
- 28-MAY-09

Revised Date:

HTK Project Number:
- 0 9 0 3 . 0 2

DEPARTMENT OF ADMINISTRATION
DIVISION OF FACILITIES
MANAGEMENT
900 SW JACKSON, SUITE 600
TOPEKA, KANSAS 66612-1200
TELEPHONE 785-296-8899
FAX 785-296-8898

WICHITA READINESS CENTER - READINESS CENTER

ADJUTANT GENERAL'S DEPARTMENT, STATE OF KANSAS
KANSAS ARMY NATIONAL GUARD, TOPEKA, KS

Sheet Contents:
- UTILITIES PLAN
- READINESS CENTER

DFM Project Number:
- A- PENDING

Sheet Number:

C2.0

Original Contract Documents

UNION PACIFIC RAILROAD

WICHITA ARMY NATIONAL GUARD FIELD MAINTENANCE SHOP

HELICOPTER PAD

PROPERTY LINE

PRIMARY FEEDERS BY WESTAR

POSSIBLE LOCATION FOR GEOTHERMAL WELLS

FEEDERS BY WESTAR (TYP.)

FUTURE

BUILDING TRANSFORMER

BUILDING GAS METER

BACK-FLOW SEPARATOR

MANHOLE

BIO-RETENTION POND

PRIMARY CONDUITS BY CONTRACTOR (TYP.)

Ex. San. Sew. Rim Elv.=1320.13
Ft. In(E)=1314.23
Ft. Out(SW)=1314.03

Ex. San. Sew. Rim Elv.=1320.08
Ft. In(E)=1313.58
Ft. Out(SW)=1313.38

SCALE: 1" = 50'
50 0 50 100

N

WICHITA READINESS CENTER - FIELD MAINTENANCE SHOP	DESIGN BY: kwb
	DRAWN BY: mss
CONCEPT REVIEW SUBMITTAL	CHECKED BY: kwb
	DATE: 28-MAY-09
KANSAS ARMY NATIONAL GUARD ADJUTANT GENERAL'S DEPARTMENT Topeka, KS	PROJECT NO. 200063

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

HTK ARCHITECTS

CONCEPT REVIEW SUBMITTAL

Date:
- 28-MAY-09

Revised Date:

HTK Project Number:
- 0903.01

DEPARTMENT OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT
900 SW JACKSON, SUITE 600
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WICHITA READINESS CENTER - FIELD MAINTENANCE SHOP

ADJUTANT GENERAL'S DEPARTMENT, STATE OF KANSAS,
KANSAS ARMY NATIONAL GUARD, TOPEKA, KS

Sheet Contents:
- UTILITIES PLAN
- FMS

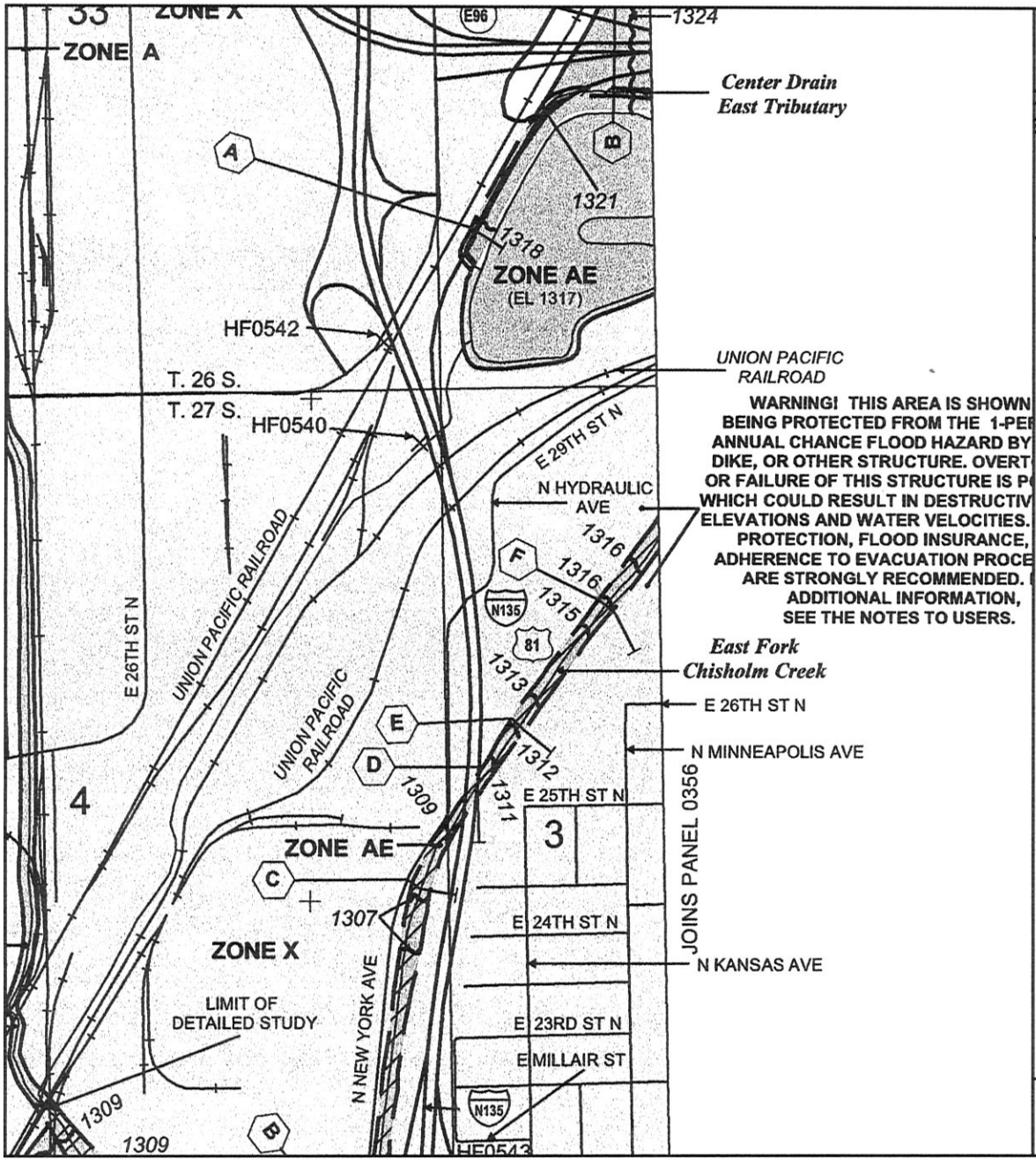
DFM Project Number:
- A- Pending

Sheet Number:

C2.0

Original Contract Documents

Appendix G
FEMA FIRM Map information



MAP SCALE 1" = 1000'

1000 2000 FEET

0 300 600 METERS

PANEL 0355E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS

AND INCORPORATED AREAS

PANEL 355 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

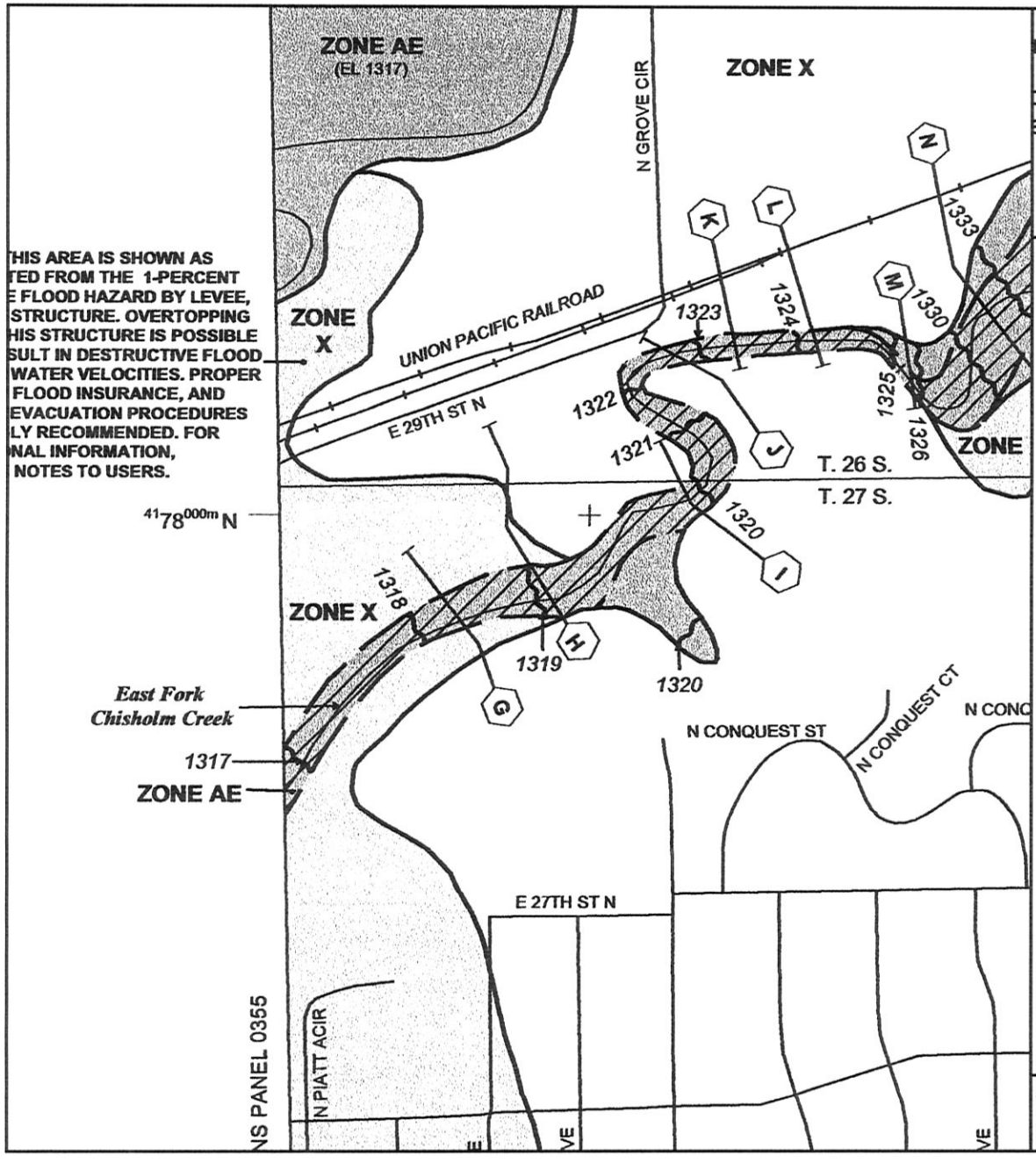
COMMUNITY	NUMBER	PANEL	SUFFIX
WICHITA, CITY OF	200328	0355	E

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
20173C0355E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency



MAP SCALE 1" = 500'

500 1000 FEET

METERS 0 150 300

PANEL 0356E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 356 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EDGWICK COUNTY	200321	0356	E
ICHITA, CITY OF	200328	0356	E

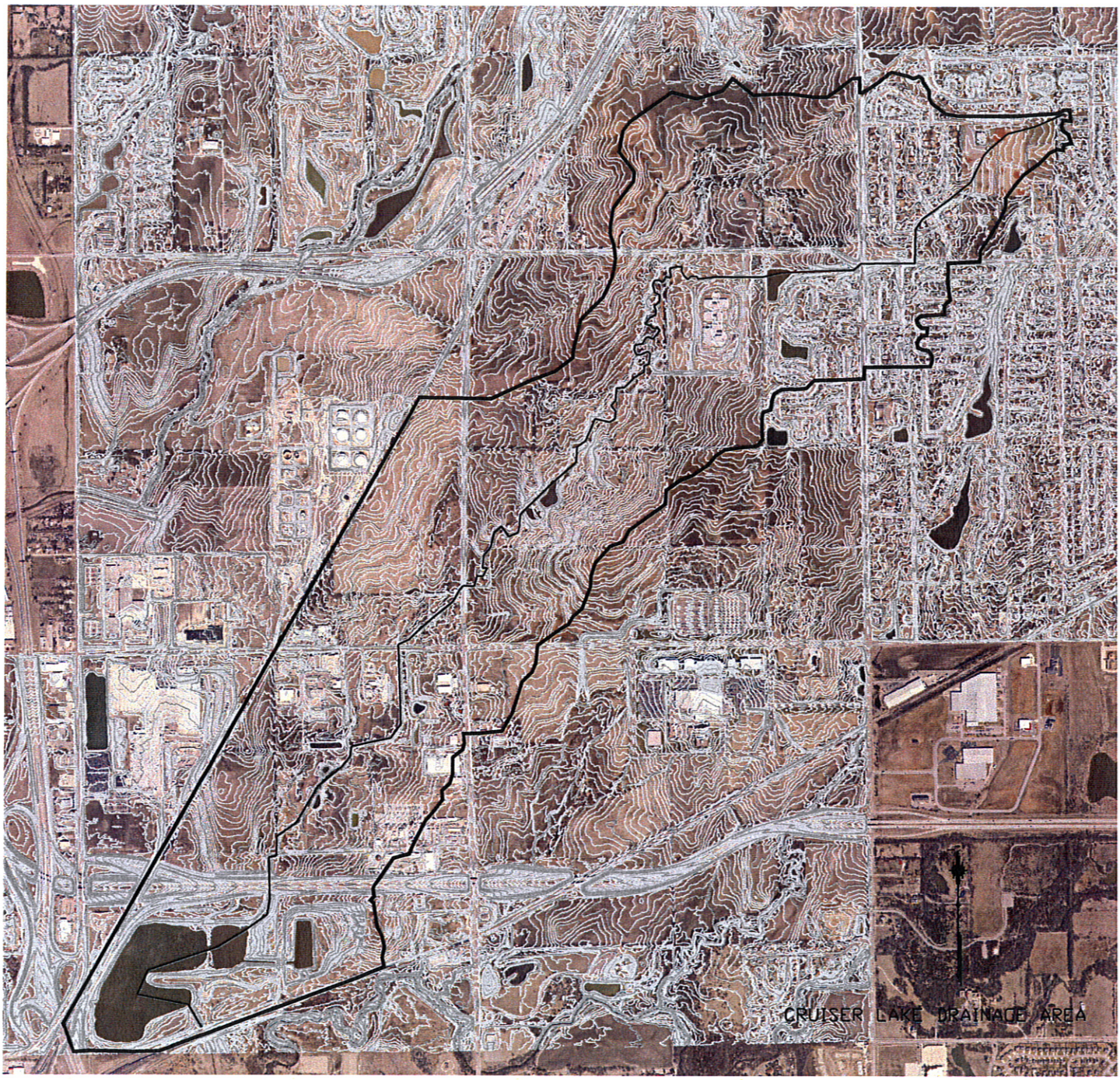
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0356E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

Appendix F
Off-Site Runoff from Cruiser Lake Calculations



CRUISER LAKE
DRAINAGE AREA

N

1" = 2000'

SCS METHOD

$P_2 = 3.5"$ $P_5 = 4.5"$ $P_{10} = 5.2"$ $P_{25} = 6.1"$ $P_{100} = 7.8"$

$S = \frac{1000}{CN} - 10 = \frac{1000}{73} - 10 = 3.70$

CN: Soil Hydrologic Group B

≈ 1/3 dev., 2/3 undev. farmland

From "Urban Hydrology for Small Watersheds" Tech. Release 55 June 1986

Total Acres = 1177 Ac.

1/3 dev = 1177 (1/3) = 392 Ac

2/3 Cult. land = 785 Ac.

Dev. Ac

3/5 Industrial: 0.6 (392) = 235 Ac CN = 88

2/3 Residential: 0.4 (392) = 157 Ac CN = 72

1/3 Ac. Lots

Undev. Ac. (785 Ac)

Pasture - Fair drainage CN = 69

Combined CN:

$\frac{235}{1177}(88) + \frac{157}{1177}(72) + \frac{785}{1177}(69) = 73$

Time of Concentration

$T_{CF} = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$ $\quad n = 0.13\left(\frac{785}{1177}\right) + 0.$ $\quad L = 22636$ $\quad S = 2.0\%$

$= \frac{0.007[0.13(300)]^{0.8}}{(3.5)^{0.5}(0.02)^{0.4}} = 0.34 hr = 20.1 min$

T_{SC}: $V = 20.3282(S)^{1/2} = 20.3282(0.02)^{1/2}$

$= 2.87 ft/s$

$T_{SC} = \frac{700}{60(2.87)} = 4.0 min$

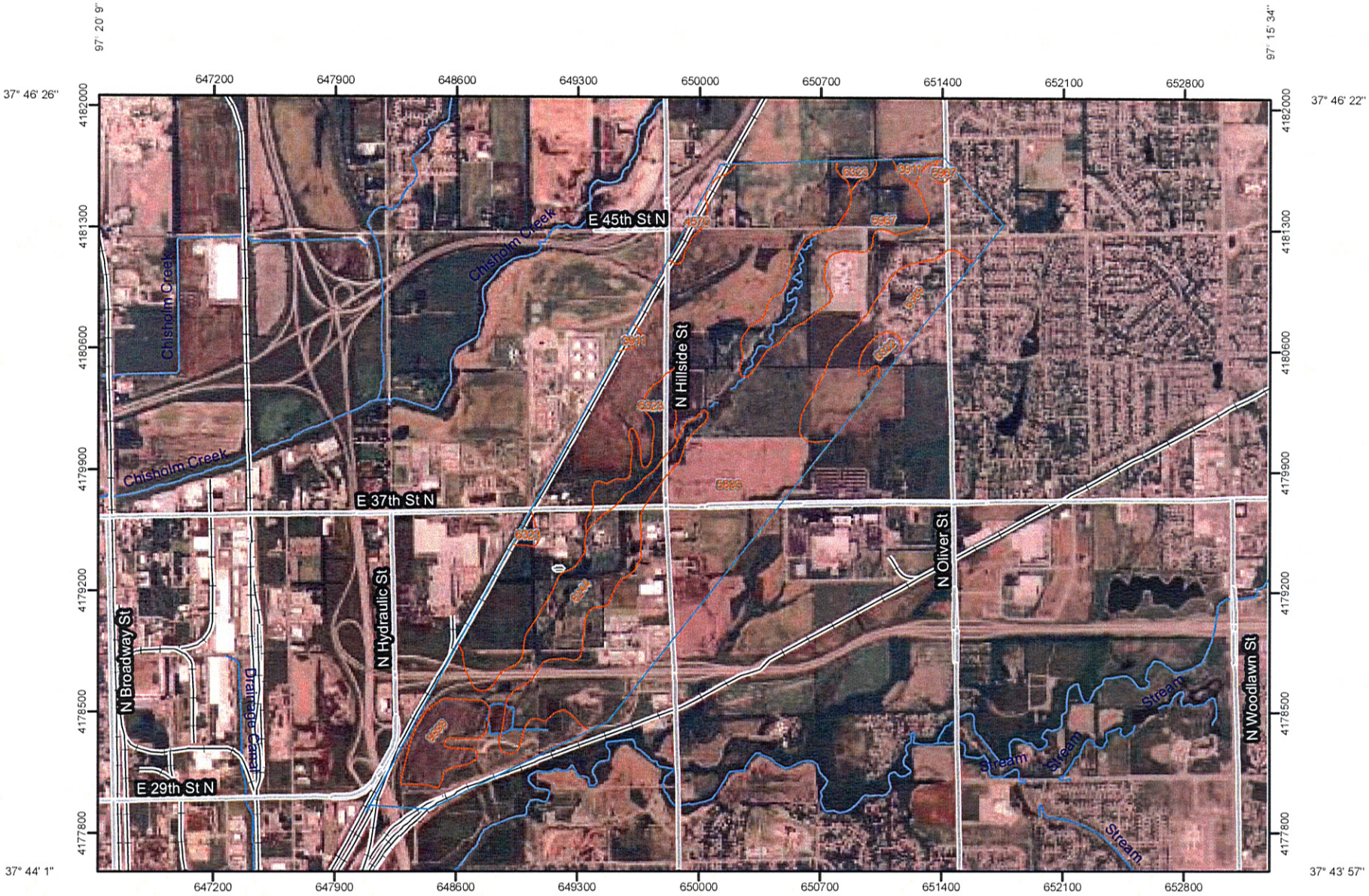
T_{CF}: $V = 1.5(V_{SC}) = 2.87(1.5) = 4.31 ft/s$

$T_c = \frac{21,636'}{60(4.31)} = 84 min$

$T_c = 20.1 + 4.0 + 84 = 108.1 min = 1.8 hrs$

$1/2 =$

Soil Map—Sedgwick County, Kansas
(Cruiser Lake Watershed)



Map Unit Legend

Sedgwick County, Kansas (KS173)				
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	
3911	Rosehill silty clay, 1 to 3 percent slopes	7.7	0.6%	D
4570	Clime silty clay, 3 to 7 percent slopes	8.1	0.6%	C
5893	Farnum loam, 1 to 3 percent slopes	826.1	64.8%	B
5967	Tabler silty clay loam, 0 to 1 percent slopes	89.3	7.0%	D
6244	Elandco silt loam, rarely flooded	167.3	13.1%	B
6322	Blanket silt loam, 0 to 1 percent slopes	10.3	0.8%	C
6323	Blanket silt loam, 1 to 3 percent slopes	43.8	3.4%	C
6369	Milan loam, 1 to 3 percent slopes	82.3	6.5%	B
9999	Water	39.7	3.1%	–
Totals for Area of Interest		**1,274.8**	**100.0%**	

Majority is B Soil Hydrologic Group

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 or swamp
- 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
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:32,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

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 5, Dec 3, 2008

Date(s) aerial images were photographed: 6/20/2006

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.

Cruiser Lake Analysis
Culvert with Inlet Control + Weir Overflow Structure

POND-2 Version: 5.21
S/N:

Wichita Readiness Center
Cruiser Lake Storage Volume

CALCULATED 10-07-2009 08:32:04
DISK FILE: CRULKVOL.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
1,309.80	1,750,000.00	40.17	0.00	0.00	0.00
1,310.00	1,800,000.00	41.32	122.24	8.15	8.15
1,311.00	1,812,417.00	41.61	124.39	41.46	49.61
1,312.00	1,877,720.00	43.11	127.06	42.35	91.97
1,313.00	1,938,621.00	44.50	131.41	43.80	135.77
1,314.00	2,001,315.00	45.94	135.67	45.22	180.99
1,315.00	2,063,664.00	47.38	139.97	46.66	227.65
1,316.00	2,138,861.00	49.10	144.71	48.24	275.89
1,317.00	2,226,770.00	51.12	150.32	50.11	325.99
1,318.00	2,336,530.00	53.64	157.12	52.37	378.37
1,319.00	2,434,405.00	55.89	164.28	54.76	433.13
1,320.00	2,521,091.00	57.88	170.64	56.88	490.01
1,321.00	2,658,294.00	61.03	178.33	59.44	549.45
1,322.00	2,795,497.00	64.18	187.78	62.59	612.04
1,326.00	4,223,065.00	96.95	240.00	320.00	932.05
1,327.00	4,477,781.00	102.80	299.57	99.86	1,031.90
1,329.00	4,909,909.00	112.72	323.15	215.44	1,247.34

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
1309.80	0.0	10
1310.80	10.3	10
1311.80	38.1	10
1312.80	79.3	10
1313.80	131.2	10
1314.80	190.7	10
1315.80	254.8	10
1316.80	322.0	10
1317.80	390.6	10
1318.80	460.8	10
1319.80	529.5	10
1320.80	938.6	10 +20
1321.80	2847.5	10 +20
1322.80	7507.6	10 +20
1323.00	0.0	

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outlet Structure File: CRULKST .STR
Planimeter Input File: CRULKVOL.VOL
Rating Table Output File: CRULKPND.PND

Min. Elev.(ft) = 1309.8 Max. Elev.(ft) = 1323 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
CULVERT-CR	10			->	10
WEIR-XY	20	+	10	->	30

Outflow rating table summary was stored in file:
CRULKPND.PND

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

>>>>>> Structure No. 10 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	1309.80
E2 elev.(ft)?	1323
Diam. (ft)?	8.5
Inv. el.(ft)?	1309.80
Slope (ft/ft)?	0.005
T1 ratio?	
T2 ratio?	
K Coeff.?	0.034
M Coeff.?	1.5
c Coeff.?	0.0553
Y Coeff.?	.54
Form 1 or 2?	1
Slope factor?	-.5

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

>>>>>> Structure No. 20 <<<<<<
(Input Data)

WEIR-XY
Weir - Defined by X, Y Coordinates
E1 (ft) =1309.80 E2 (ft) =1323

X dist.(ft)	Y elev.(ft)
1556	1328
1556	1323
1793	1322
2290	1320
2335	1320
2647	1322
3205	1324
3205	1324

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table for Structure #10
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages		
1309.80	0.0	No headwater		
1310.80	10.3	Equ.1: HW =1.0	dc=.763	Ac=2.519
1311.80	38.1	Equ.1: HW =2.0	dc=1.481	Ac=6.63
1312.80	79.3	Equ.1: HW =3.0	dc=2.154	Ac=11.307
1313.80	131.2	Equ.1: HW =4.0	dc=2.791	Ac=16.222
1314.80	190.7	Equ.1: HW =5.0	dc=3.389	Ac=21.108
1315.80	254.8	Equ.1: HW =6.0	dc=3.943	Ac=25.762
1316.80	322.0	Equ.1: HW =7.0	dc=4.456	Ac=30.122
1317.80	390.6	Equ.1: HW =8.0	dc=4.93	Ac=34.131
1318.80	460.8	Equ.1: HW =9.0	dc=5.374	Ac=37.812
1319.80	529.5	Equ.1: HW =10.0	dc=5.773	Ac=41.034
1320.80	596.4	Transition: HW =11.0		
1321.80	656.4	Transition: HW =12.0		
1322.80	700.4	Submerged: HW =13.0		
1323.00	0.0	E = or > E2=1323		

Used Unsubmerged Equ. Form (1) for elev. less than 1320.51 ft
Used Submerged Equation for elevations greater than 1321.89 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=1320.51 ft; Q1=579.04 cfs; Dc=6.04 ft; E2=1321.89 ft; Q2=661.76 cfs

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table for Structure #20
WEIR-XY Weir - Defined by X, Y Coordinates

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
1309.80	0.0	E < Y min= 1320
1310.80	0.0	E < Y min= 1320
1311.80	0.0	E < Y min= 1320
1312.80	0.0	E < Y min= 1320
1313.80	0.0	E < Y min= 1320
1314.80	0.0	E < Y min= 1320
1315.80	0.0	E < Y min= 1320
1316.80	0.0	E < Y min= 1320
1317.80	0.0	E < Y min= 1320
1318.80	0.0	E < Y min= 1320
1319.80	0.0	E < Y min= 1320
1320.80	342.2	W(ft)=368.62 Max. D(ft)=.8
1321.80	2191.1	W(ft)=773.120 Max. D(ft)=1.8
1322.80	6807.2	W(ft)=1266.825 Max. D(ft)=2.8
1323.00	0.0	E = or > E2=1323

Outlet Structure File: CRULKST .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table 30
Table 30 = 10 + 20

Elevation (ft)	Q (cfs)	Contributing Structures
1309.80	0.0	10
1310.80	10.3	10
1311.80	38.1	10
1312.80	79.3	10
1313.80	131.2	10
1314.80	190.7	10
1315.80	254.8	10
1316.80	322.0	10
1317.80	390.6	10
1318.80	460.8	10
1319.80	529.5	10
1320.80	938.6	10 +20
1321.80	2847.5	10 +20
1322.80	7507.6	10 +20
1323.00	0.0	-

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:04:13
Watershed file: --> CRUISLWS.WSD
Hydrograph file: --> CRUISLK .HYD

Wichita Readiness Center
Cruiser Lake Watershed
2-year storm event

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Total Area	1177.00	73.0	2.00	0.00	3.50	1.18	.21 .30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1177.00 acres or 1.8391 sq.mi
Peak discharge = 401 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Total Area	1.80	0.00	2.00	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:04:13
Watershed file: --> CRUISLWS.WSD
Hydrograph file: --> CRUISLK .HYD

Wichita Readiness Center
Cruiser Lake Watershed
2-year storm event

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Total Area	401	13.6
Composite Watershed	401	13.6

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:04:13
Watershed file: --> CRUISLWS.WSD
Hydrograph file: --> CRUISLK .HYD

Wichita Readiness Center
Cruiser Lake Watershed
2-year storm event

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Total Area	0	0	0	0	0	2	7	17	33
Total (cfs)	0	0	0	0	0	2	7	17	33

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Total Area	54	82	117	161	250	321	365	401	369
Total (cfs)	54	82	117	161	250	321	365	401	369

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Total Area	345	284	239	193	152	124	106	91	82
Total (cfs)	345	284	239	193	152	124	106	91	82

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Total Area	74	63	56	43	11
Total (cfs)	74	63	56	43	11

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:04:13
Watershed file: --> CRUISLWS.WSD
Hydrograph file: --> CRUISLK .HYD

Wichita Readiness Center
Cruiser Lake Watershed
2-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	216
11.1	0	14.9	204
11.2	0	15.0	193
11.3	0	15.1	185
11.4	0	15.2	177
11.5	0	15.3	168
11.6	0	15.4	160
11.7	0	15.5	152
11.8	0	15.6	146
11.9	0	15.7	141
12.0	0	15.8	135
12.1	2	15.9	130
12.2	7	16.0	124
12.3	17	16.1	120
12.4	33	16.2	117
12.5	54	16.3	113
12.6	82	16.4	110
12.7	117	16.5	106
12.8	161	16.6	103
12.9	206	16.7	100
13.0	250	16.8	97
13.1	286	16.9	94
13.2	321	17.0	91
13.3	343	17.1	89
13.4	365	17.2	87
13.5	383	17.3	86
13.6	401	17.4	84
13.7	385	17.5	82
13.8	369	17.6	80
13.9	357	17.7	79
14.0	345	17.8	77
14.1	325	17.9	76
14.2	304	18.0	74
14.3	284	18.1	73
14.4	269	18.2	72
14.5	254	18.3	71
14.6	239	18.4	70
14.7	228	18.5	68

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:04:13
Watershed file: --> CRUISLWS.WSD
Hydrograph file: --> CRUISLK .HYD

Wichita Readiness Center
Cruiser Lake Watershed
2-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	67	22.4	40
18.7	66	22.5	39
18.8	65	22.6	38
18.9	64	22.7	37
19.0	63	22.8	37
19.1	62	22.9	36
19.2	62	23.0	35
19.3	61	23.1	34
19.4	60	23.2	33
19.5	60	23.3	33
19.6	59	23.4	32
19.7	58	23.5	31
19.8	57	23.6	30
19.9	57	23.7	29
20.0	56	23.8	29
20.1	55	23.9	28
20.2	55	24.0	27
20.3	54	24.1	26
20.4	53	24.2	25
20.5	53	24.3	25
20.6	52	24.4	24
20.7	51	24.5	23
20.8	51	24.6	22
20.9	50	24.7	21
21.0	50	24.8	21
21.1	49	24.9	20
21.2	48	25.0	19
21.3	48	25.1	18
21.4	47	25.2	17
21.5	46	25.3	17
21.6	46	25.4	16
21.7	45	25.5	15
21.8	44	25.6	14
21.9	44	25.7	13
22.0	43	25.8	13
22.1	42	25.9	12
22.2	41		
22.3	41		

****
* *
* Wichita Readiness Center *
* Cruiser Lake *
* Detention Calculation *
* 02-Year Storm Event *
* *
****

Inflow Hydrograph: CRUISLK .HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1309.80 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1309.80	0.0	0.000	0.0	0.0
1310.80	10.3	41.298	9994.2	10004.5
1311.80	38.1	83.378	20177.5	20215.6
1312.80	79.3	126.900	30709.8	30789.1
1313.80	131.2	171.835	41584.2	41715.4
1314.80	190.7	218.207	52806.0	52996.7
1315.80	254.8	266.103	64397.0	64651.8
1316.80	322.0	315.813	76426.7	76748.7
1317.80	390.6	367.694	88981.9	89372.5
1318.80	460.8	421.998	102123.5	102584.3
1319.80	529.5	478.473	115790.5	116320.0
1320.80	938.6	537.311	130029.3	130967.9
1321.80	2847.5	599.276	145024.7	147872.2
1322.80	7507.6	665.776	161117.8	168625.4

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.5	0.5	0.00	1309.80
11.100	0.00	0.0	0.5	0.5	0.00	1309.80
11.200	0.00	0.0	0.5	0.5	0.00	1309.80
11.300	0.00	0.0	0.5	0.5	0.00	1309.80
11.400	0.00	0.0	0.5	0.5	0.00	1309.80
11.500	0.00	0.0	0.5	0.5	0.00	1309.80
11.600	0.00	0.0	0.5	0.5	0.00	1309.80
11.700	0.00	0.0	0.5	0.5	0.00	1309.80
11.800	0.00	0.0	0.5	0.5	0.00	1309.80
11.900	0.00	0.0	0.5	0.5	0.00	1309.80
12.000	0.00	0.0	0.5	0.5	0.00	1309.80
12.100	2.00	2.0	2.5	2.5	0.00	1309.80
12.200	7.00	9.0	11.4	11.5	0.01	1309.80
12.300	17.00	24.0	35.4	35.4	0.04	1309.80
12.400	33.00	50.0	85.2	85.4	0.09	1309.81
12.500	54.00	87.0	171.8	172.2	0.18	1309.82
12.600	82.00	136.0	307.2	307.8	0.32	1309.83
12.700	117.00	199.0	505.2	506.2	0.52	1309.85
12.800	161.00	278.0	781.6	783.2	0.81	1309.88
12.900	206.00	367.0	1146.2	1148.6	1.18	1309.91
13.000	250.00	456.0	1598.9	1602.2	1.65	1309.96
13.100	286.00	536.0	2130.5	2134.9	2.20	1310.01
13.200	321.00	607.0	2731.9	2737.5	2.82	1310.07
13.300	343.00	664.0	3388.9	3395.9	3.50	1310.14
13.400	365.00	708.0	4088.4	4096.9	4.22	1310.21
13.500	383.00	748.0	4826.5	4836.4	4.98	1310.28
13.600	401.00	784.0	5598.9	5610.5	5.78	1310.36
13.700	385.00	786.0	6371.8	6384.9	6.57	1310.44
13.800	369.00	754.0	7111.1	7125.8	7.34	1310.51
13.900	357.00	726.0	7821.0	7837.1	8.07	1310.58
14.000	345.00	702.0	8505.4	8523.0	8.77	1310.65
14.100	325.00	670.0	9156.5	9175.4	9.45	1310.72
14.200	304.00	629.0	9765.4	9785.5	10.07	1310.78
14.300	284.00	588.0	10330.9	10353.4	11.25	1310.83
14.400	269.00	553.0	10858.5	10883.9	12.69	1310.89
14.500	254.00	523.0	11353.4	11381.5	14.05	1310.93
14.600	239.00	493.0	11815.8	11846.4	15.31	1310.98
14.700	228.00	467.0	12249.8	12282.8	16.50	1311.02
14.800	216.00	444.0	12658.5	12693.8	17.62	1311.06
14.900	204.00	420.0	13041.2	13078.5	18.67	1311.10
15.000	193.00	397.0	13398.9	13438.2	19.65	1311.14
15.100	185.00	378.0	13735.7	13776.9	20.57	1311.17
15.200	177.00	362.0	14054.8	14097.7	21.44	1311.20
15.300	168.00	345.0	14355.3	14399.8	22.27	1311.23
15.400	160.00	328.0	14637.2	14683.3	23.04	1311.26

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	152.00	312.0	14901.7	14949.2	23.76	1311.28
15.600	146.00	298.0	15150.8	15199.7	24.44	1311.31
15.700	141.00	287.0	15387.6	15437.8	25.09	1311.33
15.800	135.00	276.0	15612.2	15663.6	25.71	1311.35
15.900	130.00	265.0	15824.6	15877.2	26.29	1311.38
16.000	124.00	254.0	16025.0	16078.6	26.84	1311.39
16.100	120.00	244.0	16214.3	16269.0	27.36	1311.41
16.200	117.00	237.0	16395.6	16451.3	27.85	1311.43
16.300	113.00	230.0	16568.9	16625.6	28.33	1311.45
16.400	110.00	223.0	16734.4	16791.9	28.78	1311.46
16.500	106.00	216.0	16891.9	16950.4	29.21	1311.48
16.600	103.00	209.0	17041.7	17100.9	29.62	1311.49
16.700	100.00	203.0	17184.7	17244.7	30.01	1311.51
16.800	97.00	197.0	17320.9	17381.7	30.38	1311.52
16.900	94.00	191.0	17450.4	17511.9	30.74	1311.54
17.000	91.00	185.0	17573.3	17635.4	31.08	1311.55
17.100	89.00	180.0	17690.5	17753.3	31.40	1311.56
17.200	87.00	176.0	17803.1	17866.5	31.70	1311.57
17.300	86.00	173.0	17912.1	17976.1	32.00	1311.58
17.400	84.00	170.0	18017.5	18082.1	32.29	1311.59
17.500	82.00	166.0	18118.3	18183.5	32.57	1311.60
17.600	80.00	162.0	18214.7	18280.3	32.83	1311.61
17.700	79.00	159.0	18307.5	18373.7	33.09	1311.62
17.800	77.00	156.0	18396.8	18463.5	33.33	1311.63
17.900	76.00	153.0	18482.7	18549.8	33.57	1311.64
18.000	74.00	150.0	18565.1	18632.7	33.79	1311.64
18.100	73.00	147.0	18644.1	18712.1	34.01	1311.65
18.200	72.00	145.0	18720.7	18789.1	34.22	1311.66
18.300	71.00	143.0	18794.9	18863.7	34.42	1311.67
18.400	70.00	141.0	18866.6	18935.9	34.62	1311.67
18.500	68.00	138.0	18935.0	19004.6	34.80	1311.68
18.600	67.00	135.0	19000.1	19070.0	34.98	1311.69
18.700	66.00	133.0	19062.7	19133.1	35.15	1311.69
18.800	65.00	131.0	19123.1	19193.7	35.32	1311.70
18.900	64.00	129.0	19181.2	19252.1	35.48	1311.71
19.000	63.00	127.0	19236.9	19308.2	35.63	1311.71
19.100	62.00	125.0	19290.3	19361.9	35.78	1311.72
19.200	62.00	124.0	19342.5	19414.3	35.92	1311.72
19.300	61.00	123.0	19393.4	19465.5	36.06	1311.73
19.400	60.00	121.0	19442.0	19514.4	36.19	1311.73
19.500	60.00	120.0	19489.4	19562.0	36.32	1311.74
19.600	59.00	119.0	19535.5	19608.4	36.45	1311.74
19.700	58.00	117.0	19579.3	19652.5	36.57	1311.74
19.800	57.00	115.0	19621.0	19694.3	36.68	1311.75
19.900	57.00	114.0	19661.4	19735.0	36.79	1311.75
20.000	56.00	113.0	19700.6	19774.4	36.90	1311.76

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	55.00	111.0	19737.6	19811.6	37.00	1311.76
20.200	55.00	110.0	19773.4	19847.6	37.10	1311.76
20.300	54.00	109.0	19808.0	19882.4	37.19	1311.77
20.400	53.00	107.0	19840.5	19915.0	37.28	1311.77
20.500	53.00	106.0	19871.7	19946.5	37.37	1311.77
20.600	52.00	105.0	19901.8	19976.7	37.45	1311.78
20.700	51.00	103.0	19929.8	20004.8	37.53	1311.78
20.800	51.00	102.0	19956.6	20031.8	37.60	1311.78
20.900	50.00	101.0	19982.2	20057.6	37.67	1311.78
21.000	50.00	100.0	20006.8	20082.2	37.74	1311.79
21.100	49.00	99.0	20030.1	20105.8	37.80	1311.79
21.200	48.00	97.0	20051.4	20127.1	37.86	1311.79
21.300	48.00	96.0	20071.6	20147.4	37.91	1311.79
21.400	47.00	95.0	20090.7	20166.6	37.97	1311.80
21.500	46.00	93.0	20107.6	20183.7	38.01	1311.80
21.600	46.00	92.0	20123.5	20199.6	38.06	1311.80
21.700	45.00	91.0	20138.3	20214.5	38.10	1311.80
21.800	44.00	89.0	20151.0	20227.3	38.15	1311.80
21.900	44.00	88.0	20162.7	20239.0	38.19	1311.80
22.000	43.00	87.0	20173.2	20249.7	38.23	1311.80
22.100	42.00	85.0	20181.7	20258.2	38.27	1311.80
22.200	41.00	83.0	20188.1	20264.7	38.29	1311.80
22.300	41.00	82.0	20193.5	20270.1	38.31	1311.81
22.400	40.00	81.0	20197.8	20274.5	38.33	1311.81
22.500	39.00	79.0	20200.1	20276.8	38.34	1311.81
22.600	38.00	77.0	20200.4	20277.1	38.34	1311.81
22.700	37.00	75.0	20198.8	20275.4	38.33	1311.81
22.800	37.00	74.0	20196.1	20272.8	38.32	1311.81
22.900	36.00	73.0	20192.5	20269.1	38.31	1311.81
23.000	35.00	71.0	20186.9	20263.5	38.29	1311.80
23.100	34.00	69.0	20179.4	20255.9	38.26	1311.80
23.200	33.00	67.0	20170.0	20246.4	38.22	1311.80
23.300	33.00	66.0	20159.6	20236.0	38.18	1311.80
23.400	32.00	65.0	20148.3	20224.6	38.14	1311.80
23.500	31.00	63.0	20135.2	20211.3	38.09	1311.80
23.600	30.00	61.0	20120.1	20196.2	38.05	1311.80
23.700	29.00	59.0	20103.1	20179.1	38.00	1311.80
23.800	29.00	58.0	20085.2	20161.1	37.95	1311.79
23.900	28.00	57.0	20066.4	20142.2	37.90	1311.79
24.000	27.00	55.0	20045.7	20121.4	37.84	1311.79
24.100	26.00	53.0	20023.1	20098.7	37.78	1311.79
24.200	25.00	51.0	19998.7	20074.1	37.71	1311.79
24.300	25.00	50.0	19973.4	20048.7	37.65	1311.78
24.400	24.00	49.0	19947.3	20022.4	37.57	1311.78
24.500	23.00	47.0	19919.3	19994.3	37.50	1311.78
24.600	22.00	45.0	19889.4	19964.3	37.42	1311.78

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	21.00	43.0	19857.8	19932.4	37.33	1311.77
24.800	21.00	42.0	19825.3	19899.8	37.24	1311.77
24.900	20.00	41.0	19792.0	19866.3	37.15	1311.77
25.000	19.00	39.0	19756.9	19831.0	37.05	1311.76
25.100	18.00	37.0	19720.0	19793.9	36.95	1311.76
25.200	17.00	35.0	19681.3	19755.0	36.85	1311.75
25.300	17.00	34.0	19641.8	19715.3	36.74	1311.75
25.400	16.00	33.0	19601.6	19674.8	36.63	1311.75
25.500	15.00	31.0	19559.5	19632.6	36.51	1311.74
25.600	14.00	29.0	19515.7	19588.5	36.39	1311.74
25.700	13.00	27.0	19470.2	19542.7	36.27	1311.73
25.800	13.00	26.0	19423.9	19496.2	36.14	1311.73
25.900	12.00	25.0	19376.9	19448.9	36.01	1311.72

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1309.80 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	401.00 cfs
Peak Outflow	=	38.34 cfs
Peak Elevation	=	1311.81 ft

***** Summary of Approximate Peak Storage *****

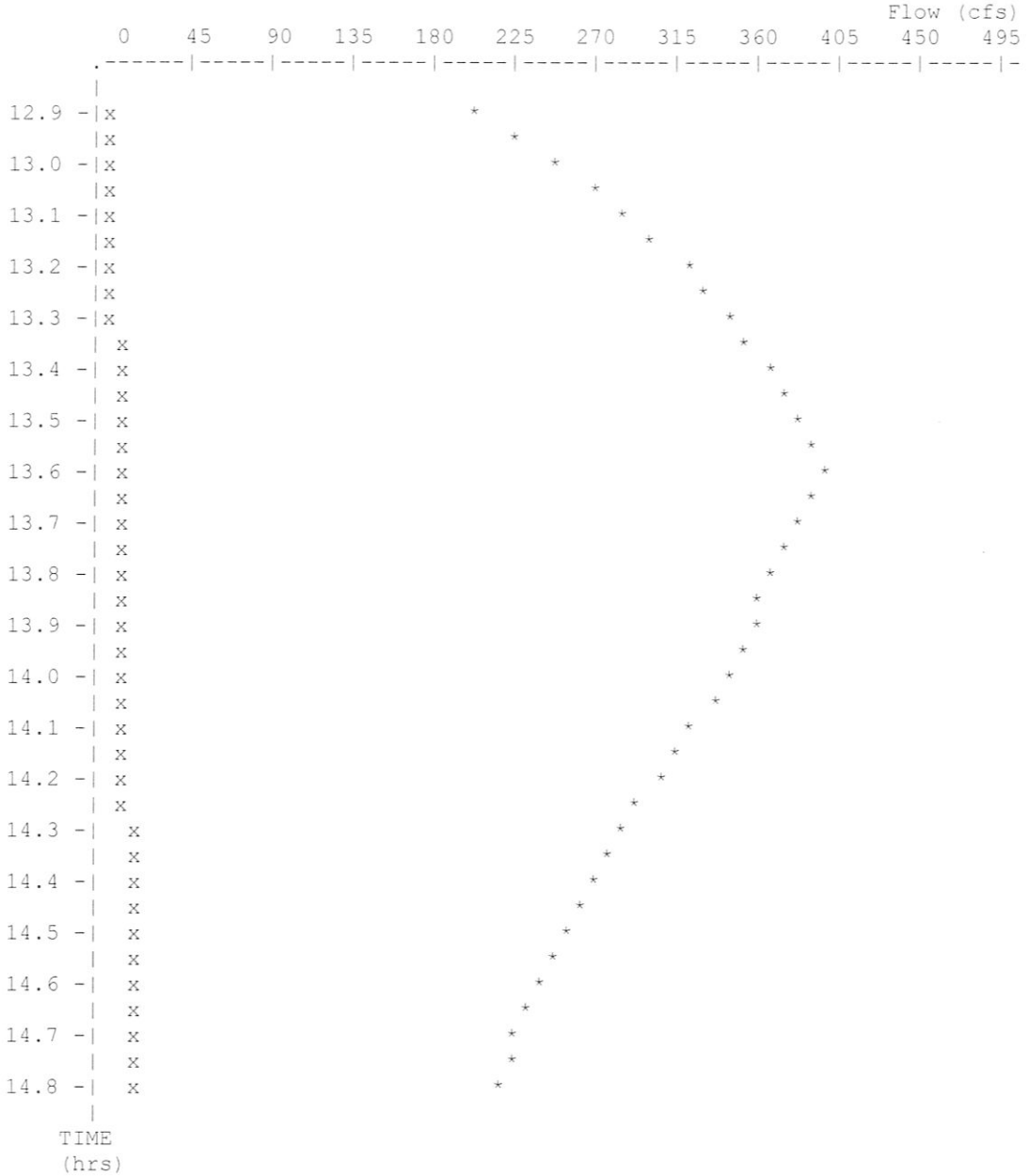
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	83.63 ac-ft
Total Storage in Pond	=	83.63 ac-ft

Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISLK .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
08:37:29

Peak Inflow = 401.00 cfs
Peak Outflow = 38.34 cfs
Peak Elevation = 1311.81 ft



* File: CRUISLK .HYD Qmax = 401.0 cfs
x File: OUT .HYD Qmax = 38.3 cfs

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:06:09
Watershed file: --> CRUISL05.WSD
Hydrograph file: --> CRUISL05.HYD

Wichita Readiness Center
Cruiser Lake Watershed
5-year storm event

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Total Area	1177.00	73.0	2.00	0.00	4.50	1.90	.16 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1177.00 acres or 1.8391 sq.mi
Peak discharge = 790 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Total Area	1.80	0.00	2.00	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:06:09
Watershed file: --> CRUISL05.WSD
Hydrograph file: --> CRUISL05.HYD

Wichita Readiness Center
Cruiser Lake Watershed
5-year storm event

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Total Area	790	13.4
Composite Watershed	790	13.4

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:06:09
Watershed file: --> CRUISL05.WSD
Hydrograph file: --> CRUISL05.HYD

Wichita Readiness Center
Cruiser Lake Watershed
5-year storm event

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Total Area	24	31	42	56	63	73	94	126	171
Total (cfs)	24	31	42	56	63	73	94	126	171

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Total Area	224	287	363	444	598	702	790	727	674
Total (cfs)	224	287	363	444	598	702	790	727	674

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Total Area	598	461	367	276	203	157	126	105	91
Total (cfs)	598	461	367	276	203	157	126	105	91

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Total Area	80	70	59	45	10
Total (cfs)	80	70	59	45	10

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:06:09
Watershed file: --> CRUISL05.WSD
Hydrograph file: --> CRUISL05.HYD

Wichita Readiness Center
Cruiser Lake Watershed
5-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	24	14.8	322
11.1	26	14.9	299
11.2	29	15.0	276
11.3	31	15.1	261
11.4	35	15.2	247
11.5	38	15.3	232
11.6	42	15.4	218
11.7	47	15.5	203
11.8	51	15.6	194
11.9	56	15.7	185
12.0	63	15.8	175
12.1	73	15.9	166
12.2	94	16.0	157
12.3	126	16.1	151
12.4	171	16.2	145
12.5	224	16.3	138
12.6	287	16.4	132
12.7	363	16.5	126
12.8	444	16.6	122
12.9	521	16.7	118
13.0	598	16.8	113
13.1	650	16.9	109
13.2	702	17.0	105
13.3	746	17.1	102
13.4	790	17.2	99
13.5	759	17.3	97
13.6	727	17.4	94
13.7	700	17.5	91
13.8	674	17.6	89
13.9	636	17.7	87
14.0	598	17.8	84
14.1	552	17.9	82
14.2	507	18.0	80
14.3	461	18.1	79
14.4	430	18.2	78
14.5	398	18.3	77
14.6	367	18.4	76
14.7	344	18.5	75

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:06:09
Watershed file: --> CRUISL05.WSD
Hydrograph file: --> CRUISL05.HYD

Wichita Readiness Center
Cruiser Lake Watershed
5-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	74	22.4	42
18.7	73	22.5	41
18.8	72	22.6	40
18.9	71	22.7	39
19.0	70	22.8	38
19.1	69	22.9	37
19.2	68	23.0	36
19.3	67	23.1	35
19.4	66	23.2	34
19.5	64	23.3	34
19.6	63	23.4	33
19.7	62	23.5	32
19.8	61	23.6	31
19.9	60	23.7	30
20.0	59	23.8	29
20.1	58	23.9	28
20.2	58	24.0	28
20.3	57	24.1	27
20.4	56	24.2	26
20.5	56	24.3	25
20.6	55	24.4	24
20.7	54	24.5	23
20.8	53	24.6	22
20.9	53	24.7	21
21.0	52	24.8	20
21.1	51	24.9	20
21.2	51	25.0	19
21.3	50	25.1	18
21.4	49	25.2	17
21.5	48	25.3	16
21.6	48	25.4	15
21.7	47	25.5	14
21.8	46	25.6	14
21.9	46	25.7	13
22.0	45	25.8	12
22.1	44	25.9	11
22.2	43		
22.3	42		

****
* Wichita Readiness Center *
* Cruiser Lake *
* Detention Calculation *
* 5-Year Storm Event *
****

Inflow Hydrograph: CRUISL05.HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1309.80 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1309.80	0.0	0.000	0.0	0.0
1310.80	10.3	41.298	9994.2	10004.5
1311.80	38.1	83.378	20177.5	20215.6
1312.80	79.3	126.900	30709.8	30789.1
1313.80	131.2	171.835	41584.2	41715.4
1314.80	190.7	218.207	52806.0	52996.7
1315.80	254.8	266.103	64397.0	64651.8
1316.80	322.0	315.813	76426.7	76748.7
1317.80	390.6	367.694	88981.9	89372.5
1318.80	460.8	421.998	102123.5	102584.3
1319.80	529.5	478.473	115790.5	116320.0
1320.80	938.6	537.311	130029.3	130967.9
1321.80	2847.5	599.276	145024.7	147872.2
1322.80	7507.6	665.776	161117.8	168625.4

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	24.00	-----	0.5	0.5	0.00	1309.80
11.100	26.00	50.0	50.4	50.5	0.05	1309.81
11.200	29.00	55.0	105.2	105.4	0.11	1309.81
11.300	31.00	60.0	164.8	165.2	0.17	1309.82
11.400	35.00	66.0	230.4	230.8	0.24	1309.82
11.500	38.00	73.0	302.7	303.4	0.31	1309.83
11.600	42.00	80.0	381.9	382.7	0.39	1309.84
11.700	47.00	89.0	470.0	470.9	0.48	1309.85
11.800	51.00	98.0	566.8	568.0	0.58	1309.86
11.900	56.00	107.0	672.4	673.8	0.69	1309.87
12.000	63.00	119.0	789.8	791.4	0.81	1309.88
12.100	73.00	136.0	923.9	925.8	0.95	1309.89
12.200	94.00	167.0	1088.6	1090.9	1.12	1309.91
12.300	126.00	220.0	1305.9	1308.6	1.35	1309.93
12.400	171.00	297.0	1599.6	1602.9	1.65	1309.96
12.500	224.00	395.0	1990.5	1994.6	2.05	1310.00
12.600	287.00	511.0	2496.4	2501.5	2.58	1310.05
12.700	363.00	650.0	3139.9	3146.4	3.24	1310.11
12.800	444.00	807.0	3938.8	3946.9	4.06	1310.19
12.900	521.00	965.0	4893.7	4903.8	5.05	1310.29
13.000	598.00	1119.0	6000.3	6012.7	6.19	1310.40
13.100	650.00	1248.0	7233.4	7248.3	7.46	1310.52
13.200	702.00	1352.0	8567.7	8585.4	8.84	1310.66
13.300	746.00	1448.0	9995.0	10015.7	10.33	1310.80
13.400	790.00	1536.0	11502.1	11531.0	14.46	1310.95
13.500	759.00	1549.0	13013.9	13051.1	18.59	1311.10
13.600	727.00	1486.0	14454.9	14499.9	22.54	1311.24
13.700	700.00	1427.0	15829.2	15881.9	26.30	1311.38
13.800	674.00	1374.0	17143.5	17203.2	29.90	1311.50
13.900	636.00	1310.0	18386.8	18453.5	33.30	1311.63
14.000	598.00	1234.0	19547.9	19620.8	36.48	1311.74
14.100	552.00	1150.0	20617.9	20697.9	39.98	1311.85
14.200	507.00	1059.0	21589.3	21676.9	43.79	1311.94
14.300	461.00	968.0	22462.9	22557.3	47.22	1312.02
14.400	430.00	891.0	23253.2	23353.9	50.33	1312.10
14.500	398.00	828.0	23974.9	24081.2	53.16	1312.17
14.600	367.00	765.0	24628.4	24739.9	55.73	1312.23
14.700	344.00	711.0	25223.3	25339.4	58.07	1312.28
14.800	322.00	666.0	25768.9	25889.3	60.21	1312.34
14.900	299.00	621.0	26265.6	26389.9	62.16	1312.38
15.000	276.00	575.0	26712.8	26840.6	63.91	1312.43
15.100	261.00	537.0	27118.7	27249.8	65.51	1312.47
15.200	247.00	508.0	27492.8	27626.7	66.98	1312.50
15.300	232.00	479.0	27835.1	27971.8	68.32	1312.53
15.400	218.00	450.0	28146.0	28285.1	69.54	1312.56

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	203.00	421.0	28425.8	28567.0	70.64	1312.59
15.600	194.00	397.0	28679.5	28822.8	71.64	1312.61
15.700	185.00	379.0	28913.4	29058.5	72.56	1312.64
15.800	175.00	360.0	29126.6	29273.4	73.39	1312.66
15.900	166.00	341.0	29319.3	29467.6	74.15	1312.68
16.000	157.00	323.0	29492.6	29642.3	74.83	1312.69
16.100	151.00	308.0	29649.7	29800.6	75.45	1312.71
16.200	145.00	296.0	29793.7	29945.7	76.01	1312.72
16.300	138.00	283.0	29923.7	30076.7	76.52	1312.73
16.400	132.00	270.0	30039.7	30193.7	76.98	1312.74
16.500	126.00	258.0	30142.9	30297.7	77.39	1312.75
16.600	122.00	248.0	30235.4	30390.9	77.75	1312.76
16.700	118.00	240.0	30319.3	30475.4	78.08	1312.77
16.800	113.00	231.0	30393.5	30550.3	78.37	1312.78
16.900	109.00	222.0	30458.3	30615.5	78.62	1312.78
17.000	105.00	214.0	30514.6	30672.3	78.84	1312.79
17.100	102.00	207.0	30563.5	30721.6	79.04	1312.79
17.200	99.00	201.0	30606.1	30764.5	79.20	1312.80
17.300	97.00	196.0	30643.4	30802.1	79.36	1312.80
17.400	94.00	191.0	30675.4	30834.4	79.52	1312.80
17.500	91.00	185.0	30701.1	30860.4	79.64	1312.81
17.600	89.00	180.0	30721.6	30881.1	79.74	1312.81
17.700	87.00	176.0	30738.0	30897.6	79.82	1312.81
17.800	84.00	171.0	30749.2	30909.0	79.87	1312.81
17.900	82.00	166.0	30755.4	30915.2	79.90	1312.81
18.000	80.00	162.0	30757.6	30917.4	79.91	1312.81
18.100	79.00	159.0	30756.8	30916.6	79.91	1312.81
18.200	78.00	157.0	30754.0	30913.8	79.89	1312.81
18.300	77.00	155.0	30749.3	30909.0	79.87	1312.81
18.400	76.00	153.0	30742.6	30902.3	79.84	1312.81
18.500	75.00	151.0	30734.0	30893.6	79.80	1312.81
18.600	74.00	149.0	30723.5	30883.0	79.75	1312.81
18.700	73.00	147.0	30711.1	30870.5	79.69	1312.81
18.800	72.00	145.0	30696.9	30856.1	79.62	1312.81
18.900	71.00	143.0	30680.8	30839.9	79.54	1312.80
19.000	70.00	141.0	30662.9	30821.8	79.46	1312.80
19.100	69.00	139.0	30643.2	30801.9	79.36	1312.80
19.200	68.00	137.0	30621.7	30780.2	79.27	1312.80
19.300	67.00	135.0	30598.3	30756.7	79.17	1312.80
19.400	66.00	133.0	30573.2	30731.3	79.07	1312.79
19.500	64.00	130.0	30545.2	30703.2	78.97	1312.79
19.600	63.00	127.0	30514.6	30672.2	78.84	1312.79
19.700	62.00	125.0	30482.1	30639.6	78.72	1312.79
19.800	61.00	123.0	30447.9	30605.1	78.58	1312.78
19.900	60.00	121.0	30412.1	30568.9	78.44	1312.78
20.000	59.00	119.0	30374.5	30531.1	78.29	1312.78

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	58.00	117.0	30335.2	30491.5	78.14	1312.77
20.200	58.00	116.0	30295.2	30451.2	77.98	1312.77
20.300	57.00	115.0	30254.6	30410.2	77.82	1312.76
20.400	56.00	113.0	30212.3	30367.6	77.66	1312.76
20.500	56.00	112.0	30169.3	30324.3	77.49	1312.76
20.600	55.00	111.0	30125.7	30280.3	77.32	1312.75
20.700	54.00	109.0	30080.4	30234.7	77.14	1312.75
20.800	53.00	107.0	30033.5	30187.4	76.96	1312.74
20.900	53.00	106.0	29985.9	30139.5	76.77	1312.74
21.000	52.00	105.0	29937.8	30090.9	76.58	1312.73
21.100	51.00	103.0	29888.0	30040.8	76.38	1312.73
21.200	51.00	102.0	29837.6	29990.0	76.19	1312.72
21.300	50.00	101.0	29786.7	29938.6	75.99	1312.72
21.400	49.00	99.0	29734.1	29885.7	75.78	1312.71
21.500	48.00	97.0	29680.0	29831.1	75.57	1312.71
21.600	48.00	96.0	29625.3	29776.0	75.35	1312.70
21.700	47.00	95.0	29570.0	29720.3	75.14	1312.70
21.800	46.00	93.0	29513.2	29663.0	74.91	1312.69
21.900	46.00	92.0	29455.8	29605.2	74.69	1312.69
22.000	45.00	91.0	29397.9	29546.8	74.46	1312.68
22.100	44.00	89.0	29338.4	29486.9	74.23	1312.68
22.200	43.00	87.0	29277.4	29425.4	73.99	1312.67
22.300	42.00	85.0	29215.0	29362.4	73.74	1312.67
22.400	42.00	84.0	29152.0	29299.0	73.49	1312.66
22.500	41.00	83.0	29088.5	29235.0	73.24	1312.65
22.600	40.00	81.0	29023.5	29169.5	72.99	1312.65
22.700	39.00	79.0	28957.1	29102.5	72.73	1312.64
22.800	38.00	77.0	28889.1	29034.1	72.46	1312.63
22.900	37.00	75.0	28819.8	28964.1	72.19	1312.63
23.000	36.00	73.0	28748.9	28892.8	71.91	1312.62
23.100	35.00	71.0	28676.7	28819.9	71.63	1312.61
23.200	34.00	69.0	28603.0	28745.7	71.34	1312.61
23.300	34.00	68.0	28528.9	28671.0	71.05	1312.60
23.400	33.00	67.0	28454.4	28595.9	70.75	1312.59
23.500	32.00	65.0	28378.5	28519.4	70.46	1312.59
23.600	31.00	63.0	28301.2	28441.5	70.15	1312.58
23.700	30.00	61.0	28222.5	28362.2	69.84	1312.57
23.800	29.00	59.0	28142.4	28281.5	69.53	1312.56
23.900	28.00	57.0	28061.0	28199.4	69.21	1312.56
24.000	28.00	56.0	27979.2	28117.0	68.89	1312.55
24.100	27.00	55.0	27897.1	28034.2	68.57	1312.54
24.200	26.00	53.0	27813.6	27950.1	68.24	1312.53
24.300	25.00	51.0	27728.8	27864.6	67.90	1312.52
24.400	24.00	49.0	27642.7	27777.8	67.57	1312.52
24.500	23.00	47.0	27555.2	27689.7	67.22	1312.51
24.600	22.00	45.0	27466.5	27600.2	66.87	1312.50

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	21.00	43.0	27376.5	27509.5	66.52	1312.49
24.800	20.00	41.0	27285.1	27417.5	66.16	1312.48
24.900	20.00	40.0	27193.5	27325.1	65.80	1312.47
25.000	19.00	39.0	27101.6	27232.5	65.44	1312.46
25.100	18.00	37.0	27008.5	27138.6	65.08	1312.45
25.200	17.00	35.0	26914.1	27043.5	64.71	1312.45
25.300	16.00	33.0	26818.4	26947.1	64.33	1312.44
25.400	15.00	31.0	26721.5	26849.4	63.95	1312.43
25.500	14.00	29.0	26623.4	26750.5	63.56	1312.42
25.600	14.00	28.0	26525.0	26651.4	63.18	1312.41
25.700	13.00	27.0	26426.5	26552.0	62.79	1312.40
25.800	12.00	25.0	26326.7	26451.5	62.40	1312.39
25.900	11.00	23.0	26225.7	26349.7	62.00	1312.38

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1309.80 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	790.00 cfs
Peak Outflow	=	79.91 cfs
Peak Elevation	=	1312.81 ft

***** Summary of Approximate Peak Storage *****

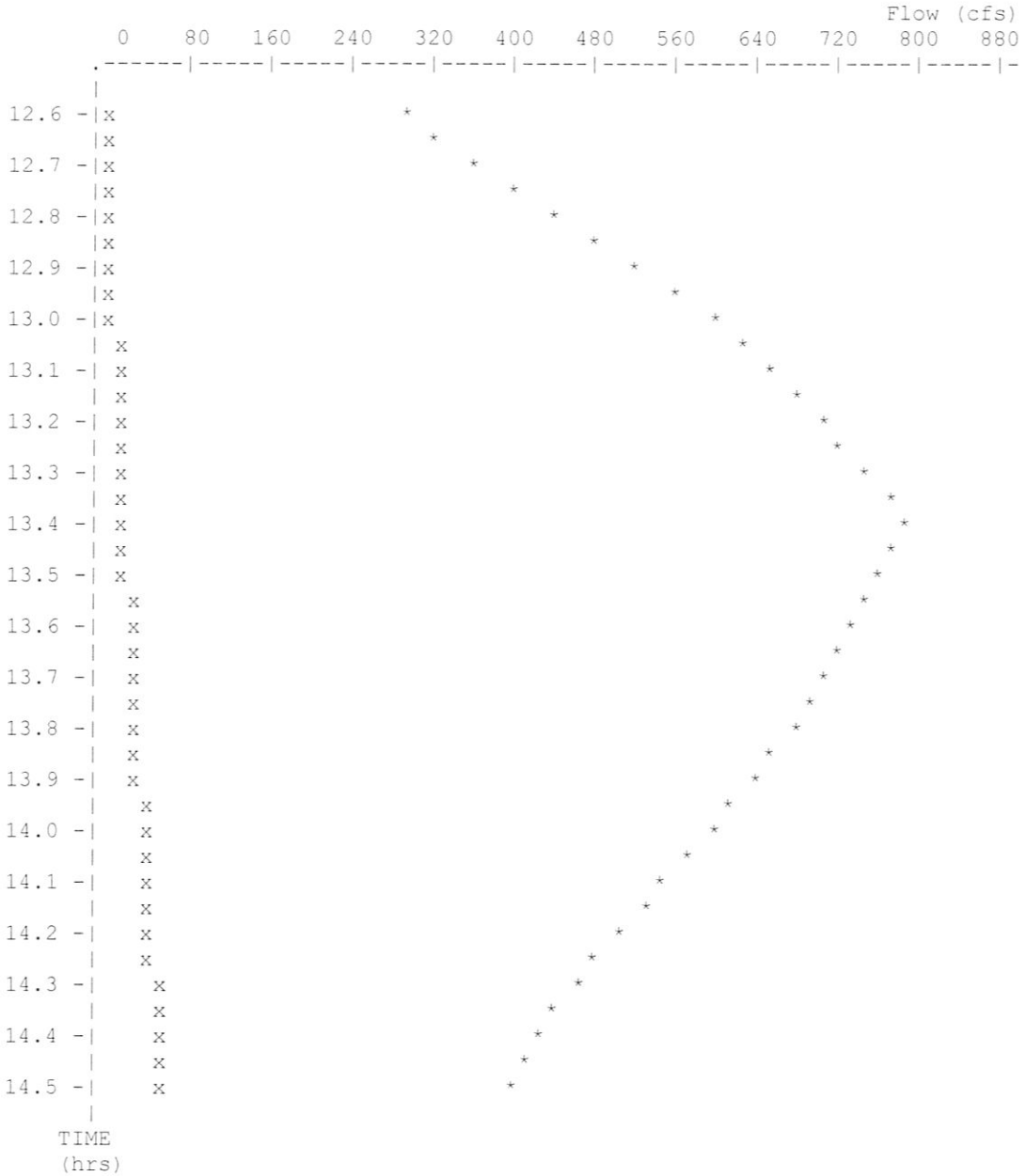
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	127.43 ac-ft
Total Storage in Pond	=	127.43 ac-ft

Warning: Inflow hydrograph truncated on left side.
Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL05.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
08:27:29

Peak Inflow = 790.00 cfs
Peak Outflow = 79.91 cfs
Peak Elevation = 1312.81 ft



* File: CRUISL05.HYD Qmax = 790.0 cfs
x File: OUT .HYD Qmax = 79.9 cfs

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:13
Watershed file: --> CRUISL10.WSD
Hydrograph file: --> CRUISL10.HYD

Wichita Readiness Center
Cruiser Lake Watershed
10-year storm event

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Total Area	1177.00	73.0	2.00	0.00	5.20	2.44	.14 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1177.00 acres or 1.8391 sq.mi
Peak discharge = 1014 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Total Area	1.80	0.00	2.00	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:13
Watershed file: --> CRUISL10.WSD
Hydrograph file: --> CRUISL10.HYD

Wichita Readiness Center
Cruiser Lake Watershed
10-year storm event

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Total Area	1014	13.4
Composite Watershed	1014	13.4

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:13
Watershed file: --> CRUISL10.WSD
Hydrograph file: --> CRUISL10.HYD

Wichita Readiness Center
Cruiser Lake Watershed
10-year storm event

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Total Area	31	40	54	72	81	94	121	162	220
Total (cfs)	31	40	54	72	81	94	121	162	220

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Total Area	287	368	467	570	767	902	1014	933	866
Total (cfs)	287	368	467	570	767	902	1014	933	866

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Total Area	767	592	471	354	260	202	162	135	117
Total (cfs)	767	592	471	354	260	202	162	135	117

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Total Area	103	90	76	58	13
Total (cfs)	103	90	76	58	13

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:13
Watershed file: --> CRUISL10.WSD
Hydrograph file: --> CRUISL10.HYD

Wichita Readiness Center
Cruiser Lake Watershed
10-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	31	14.8	412
11.1	34	14.9	383
11.2	37	15.0	354
11.3	40	15.1	335
11.4	45	15.2	316
11.5	49	15.3	298
11.6	54	15.4	279
11.7	60	15.5	260
11.8	66	15.6	248
11.9	72	15.7	237
12.0	81	15.8	225
12.1	94	15.9	214
12.2	121	16.0	202
12.3	162	16.1	194
12.4	220	16.2	186
12.5	287	16.3	178
12.6	368	16.4	170
12.7	467	16.5	162
12.8	570	16.6	157
12.9	669	16.7	151
13.0	767	16.8	146
13.1	835	16.9	140
13.2	902	17.0	135
13.3	958	17.1	131
13.4	1014	17.2	128
13.5	974	17.3	124
13.6	933	17.4	121
13.7	899	17.5	117
13.8	866	17.6	114
13.9	816	17.7	111
14.0	767	17.8	109
14.1	709	17.9	106
14.2	650	18.0	103
14.3	592	18.1	102
14.4	552	18.2	100
14.5	511	18.3	99
14.6	471	18.4	98
14.7	442	18.5	96

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:13
Watershed file: --> CRUISL10.WSD
Hydrograph file: --> CRUISL10.HYD

Wichita Readiness Center
Cruiser Lake Watershed
10-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	95	22.4	54
18.7	94	22.5	52
18.8	93	22.6	51
18.9	91	22.7	50
19.0	90	22.8	49
19.1	89	22.9	48
19.2	87	23.0	47
19.3	86	23.1	46
19.4	84	23.2	44
19.5	83	23.3	43
19.6	82	23.4	42
19.7	80	23.5	41
19.8	79	23.6	40
19.9	77	23.7	39
20.0	76	23.8	38
20.1	75	23.9	37
20.2	74	24.0	36
20.3	73	24.1	34
20.4	72	24.2	33
20.5	72	24.3	32
20.6	71	24.4	31
20.7	70	24.5	30
20.8	69	24.6	29
20.9	68	24.7	28
21.0	67	24.8	26
21.1	66	24.9	25
21.2	65	25.0	24
21.3	64	25.1	23
21.4	63	25.2	22
21.5	62	25.3	21
21.6	62	25.4	20
21.7	61	25.5	19
21.8	60	25.6	18
21.9	59	25.7	16
22.0	58	25.8	15
22.1	57	25.9	14
22.2	56		
22.3	55		

****
*
* Wichita Readiness Center *
* Cruiser Lake *
* Detention Calculation *
* 10-Year Storm Event *
*
****

Inflow Hydrograph: CRUISL10.HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1309.80 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1309.80	0.0	0.000	0.0	0.0
1310.80	10.3	41.298	9994.2	10004.5
1311.80	38.1	83.378	20177.5	20215.6
1312.80	79.3	126.900	30709.8	30789.1
1313.80	131.2	171.835	41584.2	41715.4
1314.80	190.7	218.207	52806.0	52996.7
1315.80	254.8	266.103	64397.0	64651.8
1316.80	322.0	315.813	76426.7	76748.7
1317.80	390.6	367.694	88981.9	89372.5
1318.80	460.8	421.998	102123.5	102584.3
1319.80	529.5	478.473	115790.5	116320.0
1320.80	938.6	537.311	130029.3	130967.9
1321.80	2847.5	599.276	145024.7	147872.2
1322.80	7507.6	665.776	161117.8	168625.4

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	31.00	-----	0.5	0.5	0.00	1309.80
11.100	34.00	65.0	65.4	65.5	0.07	1309.81
11.200	37.00	71.0	136.1	136.4	0.14	1309.81
11.300	40.00	77.0	212.6	213.1	0.22	1309.82
11.400	45.00	85.0	297.0	297.6	0.31	1309.83
11.500	49.00	94.0	390.2	391.0	0.40	1309.84
11.600	54.00	103.0	492.2	493.2	0.51	1309.85
11.700	60.00	114.0	605.0	606.2	0.62	1309.86
11.800	66.00	126.0	729.4	731.0	0.75	1309.87
11.900	72.00	138.0	865.7	867.4	0.89	1309.89
12.000	81.00	153.0	1016.6	1018.7	1.05	1309.90
12.100	94.00	175.0	1189.1	1191.6	1.23	1309.92
12.200	121.00	215.0	1401.2	1404.1	1.45	1309.94
12.300	162.00	283.0	1680.8	1684.2	1.73	1309.97
12.400	220.00	382.0	2058.5	2062.8	2.12	1310.01
12.500	287.00	507.0	2560.2	2565.5	2.64	1310.06
12.600	368.00	655.0	3208.6	3215.2	3.31	1310.12
12.700	467.00	835.0	4035.3	4043.6	4.16	1310.20
12.800	570.00	1037.0	5061.8	5072.3	5.22	1310.31
12.900	669.00	1239.0	6287.9	6300.8	6.49	1310.43
13.000	767.00	1436.0	7708.0	7723.9	7.95	1310.57
13.100	835.00	1602.0	9290.8	9310.0	9.58	1310.73
13.200	902.00	1737.0	11001.6	11027.8	13.09	1310.90
13.300	958.00	1860.0	12825.5	12861.6	18.08	1311.08
13.400	1014.00	1972.0	14750.8	14797.5	23.35	1311.27
13.500	974.00	1988.0	16681.5	16738.8	28.63	1311.46
13.600	933.00	1907.0	18521.1	18588.5	33.67	1311.64
13.700	899.00	1832.0	20275.9	20353.1	38.64	1311.81
13.800	866.00	1765.0	21950.4	22040.9	45.21	1311.97
13.900	816.00	1682.0	23529.6	23632.4	51.41	1312.12
14.000	767.00	1583.0	24998.3	25112.6	57.18	1312.26
14.100	709.00	1476.0	26349.3	26474.3	62.49	1312.39
14.200	650.00	1359.0	27573.7	27708.3	67.30	1312.51
14.300	592.00	1242.0	28672.5	28815.7	71.61	1312.61
14.400	552.00	1144.0	29665.5	29816.5	75.51	1312.71
14.500	511.00	1063.0	30570.3	30728.5	79.06	1312.79
14.600	471.00	982.0	31386.5	31552.3	82.93	1312.87
14.700	442.00	913.0	32126.5	32299.5	86.47	1312.94
14.800	412.00	854.0	32801.1	32980.5	89.71	1313.00
14.900	383.00	795.0	33410.8	33596.1	92.63	1313.06
15.000	354.00	737.0	33957.3	34147.8	95.25	1313.11
15.100	335.00	689.0	34451.1	34646.3	97.62	1313.15
15.200	316.00	651.0	34902.5	35102.1	99.79	1313.19
15.300	298.00	614.0	35313.0	35516.5	101.76	1313.23
15.400	279.00	577.0	35682.9	35890.0	103.53	1313.27

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	260.00	539.0	36011.7	36221.9	105.11	1313.30
15.600	248.00	508.0	36306.7	36519.7	106.52	1313.32
15.700	237.00	485.0	36576.1	36791.7	107.81	1313.35
15.800	225.00	462.0	36820.1	37038.1	108.98	1313.37
15.900	214.00	439.0	37039.0	37259.1	110.03	1313.39
16.000	202.00	416.0	37233.1	37455.0	110.96	1313.41
16.100	194.00	396.0	37405.5	37629.1	111.79	1313.43
16.200	186.00	380.0	37560.5	37785.5	112.53	1313.44
16.300	178.00	364.0	37698.1	37924.5	113.19	1313.45
16.400	170.00	348.0	37818.5	38046.1	113.77	1313.46
16.500	162.00	332.0	37922.0	38150.5	114.27	1313.47
16.600	157.00	319.0	38011.6	38241.0	114.70	1313.48
16.700	151.00	308.0	38089.5	38319.6	115.07	1313.49
16.800	146.00	297.0	38155.7	38386.5	115.39	1313.50
16.900	140.00	286.0	38210.4	38441.7	115.65	1313.50
17.000	135.00	275.0	38253.7	38485.4	115.86	1313.50
17.100	131.00	266.0	38287.6	38519.7	116.02	1313.51
17.200	128.00	259.0	38314.3	38546.6	116.15	1313.51
17.300	124.00	252.0	38333.9	38566.3	116.24	1313.51
17.400	121.00	245.0	38346.3	38578.9	116.30	1313.51
17.500	117.00	238.0	38351.6	38584.3	116.33	1313.51
17.600	114.00	231.0	38350.0	38582.6	116.32	1313.51
17.700	111.00	225.0	38342.4	38575.0	116.28	1313.51
17.800	109.00	220.0	38329.9	38562.4	116.22	1313.51
17.900	106.00	215.0	38312.7	38544.9	116.14	1313.51
18.000	103.00	209.0	38289.6	38521.7	116.03	1313.51
18.100	102.00	205.0	38262.8	38494.6	115.90	1313.51
18.200	100.00	202.0	38233.3	38464.8	115.76	1313.50
18.300	99.00	199.0	38201.1	38432.3	115.61	1313.50
18.400	98.00	197.0	38167.2	38398.1	115.44	1313.50
18.500	96.00	194.0	38130.7	38361.2	115.27	1313.49
18.600	95.00	191.0	38091.5	38321.7	115.08	1313.49
18.700	94.00	189.0	38050.7	38280.5	114.88	1313.49
18.800	93.00	187.0	38008.4	38237.7	114.68	1313.48
18.900	91.00	184.0	37963.4	38192.4	114.47	1313.48
19.000	90.00	181.0	37916.0	38144.4	114.24	1313.47
19.100	89.00	179.0	37866.9	38095.0	114.00	1313.47
19.200	87.00	176.0	37815.4	38042.9	113.76	1313.46
19.300	86.00	173.0	37761.4	37988.4	113.50	1313.46
19.400	84.00	170.0	37705.0	37931.4	113.23	1313.45
19.500	83.00	167.0	37646.1	37872.0	112.94	1313.45
19.600	82.00	165.0	37585.8	37811.1	112.65	1313.44
19.700	80.00	162.0	37523.1	37747.8	112.35	1313.44
19.800	79.00	159.0	37458.0	37682.1	112.04	1313.43
19.900	77.00	156.0	37390.6	37614.0	111.72	1313.42
20.000	76.00	153.0	37320.8	37543.6	111.38	1313.42

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	75.00	151.0	37249.7	37471.8	111.04	1313.41
20.200	74.00	149.0	37177.3	37398.7	110.70	1313.40
20.300	73.00	147.0	37103.6	37324.3	110.34	1313.40
20.400	72.00	145.0	37028.7	37248.6	109.98	1313.39
20.500	72.00	144.0	36953.4	37172.7	109.62	1313.38
20.600	71.00	143.0	36877.9	37096.4	109.26	1313.38
20.700	70.00	141.0	36801.1	37018.9	108.89	1313.37
20.800	69.00	139.0	36723.1	36940.1	108.52	1313.36
20.900	68.00	137.0	36643.8	36860.1	108.14	1313.36
21.000	67.00	135.0	36563.3	36778.8	107.75	1313.35
21.100	66.00	133.0	36481.6	36696.3	107.36	1313.34
21.200	65.00	131.0	36398.7	36612.6	106.96	1313.33
21.300	64.00	129.0	36314.6	36527.7	106.56	1313.33
21.400	63.00	127.0	36229.3	36441.6	106.15	1313.32
21.500	62.00	125.0	36142.8	36354.3	105.73	1313.31
21.600	62.00	124.0	36056.1	36266.8	105.32	1313.30
21.700	61.00	123.0	35969.3	36179.1	104.90	1313.29
21.800	60.00	121.0	35881.4	36090.3	104.48	1313.29
21.900	59.00	119.0	35792.3	36000.4	104.05	1313.28
22.000	58.00	117.0	35702.0	35909.3	103.62	1313.27
22.100	57.00	115.0	35610.7	35817.0	103.18	1313.26
22.200	56.00	113.0	35518.2	35723.7	102.74	1313.25
22.300	55.00	111.0	35424.6	35629.2	102.29	1313.24
22.400	54.00	109.0	35329.9	35533.6	101.84	1313.23
22.500	52.00	106.0	35233.2	35435.9	101.37	1313.23
22.600	51.00	103.0	35134.4	35336.2	100.90	1313.22
22.700	50.00	101.0	35034.5	35235.4	100.42	1313.21
22.800	49.00	99.0	34933.7	35133.5	99.94	1313.20
22.900	48.00	97.0	34831.8	35030.7	99.45	1313.19
23.000	47.00	95.0	34728.9	34926.8	98.95	1313.18
23.100	46.00	93.0	34625.0	34821.9	98.46	1313.17
23.200	44.00	90.0	34519.1	34715.0	97.95	1313.16
23.300	43.00	87.0	34411.2	34606.1	97.43	1313.15
23.400	42.00	85.0	34302.4	34496.2	96.91	1313.14
23.500	41.00	83.0	34192.6	34385.4	96.38	1313.13
23.600	40.00	81.0	34081.9	34273.6	95.85	1313.12
23.700	39.00	79.0	33970.3	34160.9	95.32	1313.11
23.800	38.00	77.0	33857.7	34047.3	94.78	1313.10
23.900	37.00	75.0	33744.3	33932.7	94.23	1313.09
24.000	36.00	73.0	33629.9	33817.3	93.68	1313.08
24.100	34.00	70.0	33513.6	33699.9	93.13	1313.07
24.200	33.00	67.0	33395.5	33580.6	92.56	1313.06
24.300	32.00	65.0	33276.5	33460.5	91.99	1313.04
24.400	31.00	63.0	33156.7	33339.5	91.41	1313.03
24.500	30.00	61.0	33036.0	33217.7	90.84	1313.02
24.600	29.00	59.0	32914.5	33095.0	90.25	1313.01

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	28.00	57.0	32792.2	32971.5	89.67	1313.00
24.800	26.00	54.0	32668.1	32846.2	89.07	1312.99
24.900	25.00	51.0	32542.1	32719.1	88.47	1312.98
25.000	24.00	49.0	32415.4	32591.1	87.86	1312.96
25.100	23.00	47.0	32287.9	32462.4	87.25	1312.95
25.200	22.00	45.0	32159.6	32332.9	86.63	1312.94
25.300	21.00	43.0	32030.6	32202.6	86.01	1312.93
25.400	20.00	41.0	31900.8	32071.6	85.39	1312.92
25.500	19.00	39.0	31770.3	31939.8	84.77	1312.91
25.600	18.00	37.0	31639.0	31807.3	84.14	1312.89
25.700	16.00	34.0	31506.0	31673.0	83.50	1312.88
25.800	15.00	31.0	31371.3	31537.0	82.85	1312.87
25.900	14.00	29.0	31235.9	31400.3	82.20	1312.86

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1309.80 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	1014.00 cfs
Peak Outflow	=	116.33 cfs
Peak Elevation	=	1313.51 ft

***** Summary of Approximate Peak Storage *****

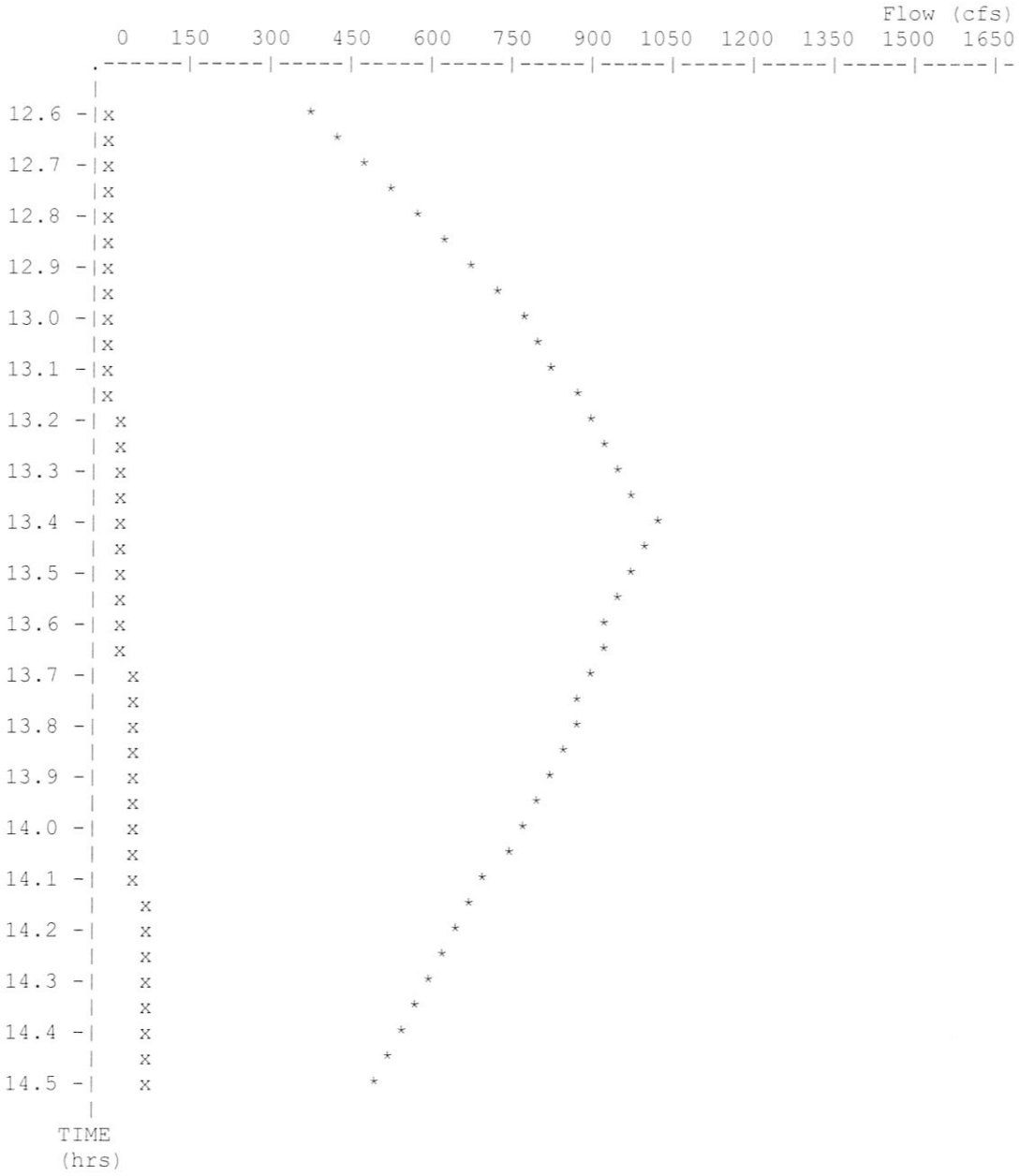
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	158.96 ac-ft
Total Storage in Pond	=	158.96 ac-ft

Warning: Inflow hydrograph truncated on left side.
Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL10.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
08:28:08

Peak Inflow = 1014.00 cfs
Peak Outflow = 116.33 cfs
Peak Elevation = 1313.51 ft



* File: CRUISL10.HYD Qmax = 1014.0 cfs
x File: OUT .HYD Qmax = 116.3 cfs

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:58
Watershed file: --> CRUISL25.WSD
Hydrograph file: --> CRUISL25.HYD

Wichita Readiness Center
Cruiser Lake Watershed
25-year storm event

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Total Area	1177.00	73.0	2.00	0.00	6.10	3.17	.12 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1177.00 acres or 1.8391 sq.mi
Peak discharge = 1318 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Total Area	1.80	0.00	2.00	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:58
Watershed file: --> CRUISL25.WSD
Hydrograph file: --> CRUISL25.HYD

Wichita Readiness Center
Cruiser Lake Watershed
25-year storm event

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Total Area	1318	13.4
Composite Watershed	1318	13.4

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:58
Watershed file: --> CRUISL25.WSD
Hydrograph file: --> CRUISL25.HYD

Wichita Readiness Center
Cruiser Lake Watershed
25-year storm event

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Total Area	41	52	70	93	105	122	157	210	286
Total (cfs)	41	52	70	93	105	122	157	210	286

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Total Area	373	478	606	740	997	1172	1318	1213	1125
Total (cfs)	373	478	606	740	997	1172	1318	1213	1125

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Total Area	997	770	612	461	338	262	210	175	152
Total (cfs)	997	770	612	461	338	262	210	175	152

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Total Area	134	117	99	76	17
Total (cfs)	134	117	99	76	17

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:58
Watershed file: --> CRUISL25.WSD
Hydrograph file: --> CRUISL25.HYD

Wichita Readiness Center
Cruiser Lake Watershed
25-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	41	14.8	536
11.1	45	14.9	499
11.2	48	15.0	461
11.3	52	15.1	436
11.4	58	15.2	412
11.5	64	15.3	387
11.6	70	15.4	363
11.7	78	15.5	338
11.8	85	15.6	323
11.9	93	15.7	308
12.0	105	15.8	292
12.1	122	15.9	277
12.2	157	16.0	262
12.3	210	16.1	252
12.4	286	16.2	241
12.5	373	16.3	231
12.6	478	16.4	220
12.7	606	16.5	210
12.8	740	16.6	203
12.9	869	16.7	196
13.0	997	16.8	189
13.1	1084	16.9	182
13.2	1172	17.0	175
13.3	1245	17.1	170
13.4	1318	17.2	166
13.5	1266	17.3	161
13.6	1213	17.4	157
13.7	1169	17.5	152
13.8	1125	17.6	148
13.9	1061	17.7	145
14.0	997	17.8	141
14.1	921	17.9	138
14.2	846	18.0	134
14.3	770	18.1	132
14.4	717	18.2	131
14.5	665	18.3	129
14.6	612	18.4	127
14.7	574	18.5	126

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:07:58
Watershed file: --> CRUISL25.WSD
Hydrograph file: --> CRUISL25.HYD

Wichita Readiness Center
Cruiser Lake Watershed
25-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	124	22.4	70
18.7	122	22.5	69
18.8	120	22.6	67
18.9	119	22.7	66
19.0	117	22.8	64
19.1	115	22.9	63
19.2	113	23.0	61
19.3	112	23.1	60
19.4	110	23.2	58
19.5	108	23.3	57
19.6	106	23.4	55
19.7	104	23.5	54
19.8	103	23.6	52
19.9	101	23.7	51
20.0	99	23.8	49
20.1	98	23.9	48
20.2	97	24.0	46
20.3	96	24.1	45
20.4	94	24.2	44
20.5	93	24.3	42
20.6	92	24.4	41
20.7	91	24.5	39
20.8	90	24.6	38
20.9	89	24.7	36
21.0	88	24.8	35
21.1	86	24.9	33
21.2	85	25.0	32
21.3	84	25.1	30
21.4	83	25.2	29
21.5	82	25.3	27
21.6	81	25.4	26
21.7	79	25.5	24
21.8	78	25.6	23
21.9	77	25.7	21
22.0	76	25.8	20
22.1	75	25.9	18
22.2	73		
22.3	72		

****
* Wichita Readiness Center *
* Cruiser Lake *
* Detention Calculation *
* 25-Year Storm Event *
****

Inflow Hydrograph: CRUISL25.HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1309.80 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1309.80	0.0	0.000	0.0	0.0
1310.80	10.3	41.298	9994.2	10004.5
1311.80	38.1	83.378	20177.5	20215.6
1312.80	79.3	126.900	30709.8	30789.1
1313.80	131.2	171.835	41584.2	41715.4
1314.80	190.7	218.207	52806.0	52996.7
1315.80	254.8	266.103	64397.0	64651.8
1316.80	322.0	315.813	76426.7	76748.7
1317.80	390.6	367.694	88981.9	89372.5
1318.80	460.8	421.998	102123.5	102584.3
1319.80	529.5	478.473	115790.5	116320.0
1320.80	938.6	537.311	130029.3	130967.9
1321.80	2847.5	599.276	145024.7	147872.2
1322.80	7507.6	665.776	161117.8	168625.4

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	41.00	-----	0.5	0.5	0.00	1309.80
11.100	45.00	86.0	86.3	86.5	0.09	1309.81
11.200	48.00	93.0	178.9	179.3	0.18	1309.82
11.300	52.00	100.0	278.4	278.9	0.29	1309.83
11.400	58.00	110.0	387.6	388.4	0.40	1309.84
11.500	64.00	122.0	508.5	509.6	0.52	1309.85
11.600	70.00	134.0	641.2	642.5	0.66	1309.86
11.700	78.00	148.0	787.6	789.2	0.81	1309.88
11.800	85.00	163.0	948.6	950.6	0.98	1309.90
11.900	93.00	178.0	1124.3	1126.6	1.16	1309.91
12.000	105.00	198.0	1319.6	1322.3	1.36	1309.93
12.100	122.00	227.0	1543.4	1546.6	1.59	1309.95
12.200	157.00	279.0	1818.6	1822.4	1.88	1309.98
12.300	210.00	367.0	2181.1	2185.6	2.25	1310.02
12.400	286.00	496.0	2671.6	2677.1	2.76	1310.07
12.500	373.00	659.0	3323.8	3330.6	3.43	1310.13
12.600	478.00	851.0	4166.2	4174.8	4.30	1310.22
12.700	606.00	1084.0	5239.4	5250.2	5.41	1310.32
12.800	740.00	1346.0	6571.8	6585.4	6.78	1310.46
12.900	869.00	1609.0	8164.0	8180.8	8.42	1310.62
13.000	997.00	1866.0	10009.2	10030.0	10.37	1310.80
13.100	1084.00	2081.0	12058.3	12090.2	15.98	1311.00
13.200	1172.00	2256.0	14270.2	14314.3	22.03	1311.22
13.300	1245.00	2417.0	16630.2	16687.2	28.49	1311.45
13.400	1318.00	2563.0	19122.6	19193.2	35.32	1311.70
13.500	1266.00	2584.0	21618.7	21706.6	43.91	1311.94
13.600	1213.00	2479.0	23991.3	24097.7	53.23	1312.17
13.700	1169.00	2382.0	26249.1	26373.3	62.09	1312.38
13.800	1125.00	2294.0	28402.0	28543.1	70.55	1312.59
13.900	1061.00	2186.0	30431.0	30588.0	78.52	1312.78
14.000	997.00	2058.0	32314.2	32489.0	87.37	1312.96
14.100	921.00	1918.0	34040.9	34232.2	95.65	1313.12
14.200	846.00	1767.0	35601.6	35807.9	103.14	1313.26
14.300	770.00	1616.0	36998.0	37217.6	109.84	1313.39
14.400	717.00	1487.0	38253.3	38485.0	115.86	1313.50
14.500	665.00	1382.0	39392.6	39635.3	121.32	1313.61
14.600	612.00	1277.0	40417.2	40669.6	126.23	1313.70
14.700	574.00	1186.0	41341.8	41603.2	130.67	1313.79
14.800	536.00	1110.0	42181.6	42451.8	135.08	1313.87
14.900	499.00	1035.0	42938.4	43216.6	139.12	1313.93
15.000	461.00	960.0	43613.0	43898.4	142.71	1313.99
15.100	436.00	897.0	44218.1	44510.0	145.94	1314.05
15.200	412.00	848.0	44768.4	45066.1	148.87	1314.10
15.300	387.00	799.0	45264.3	45567.4	151.52	1314.14
15.400	363.00	750.0	45706.6	46014.3	153.87	1314.18

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	338.00	701.0	46095.7	46407.6	155.95	1314.22
15.600	323.00	661.0	46441.1	46756.7	157.79	1314.25
15.700	308.00	631.0	46753.2	47072.1	159.45	1314.27
15.800	292.00	600.0	47031.3	47353.2	160.93	1314.30
15.900	277.00	569.0	47275.9	47600.3	162.24	1314.32
16.000	262.00	539.0	47488.1	47814.9	163.37	1314.34
16.100	252.00	514.0	47673.4	48002.1	164.36	1314.36
16.200	241.00	493.0	47836.0	48166.4	165.22	1314.37
16.300	231.00	472.0	47976.0	48308.0	165.97	1314.38
16.400	220.00	451.0	48093.8	48427.0	166.60	1314.39
16.500	210.00	430.0	48189.6	48523.8	167.11	1314.40
16.600	203.00	413.0	48267.6	48602.6	167.52	1314.41
16.700	196.00	399.0	48330.8	48666.6	167.86	1314.42
16.800	189.00	385.0	48379.6	48715.8	168.12	1314.42
16.900	182.00	371.0	48414.0	48750.6	168.30	1314.42
17.000	175.00	357.0	48434.2	48771.0	168.41	1314.43
17.100	170.00	345.0	48442.2	48779.2	168.46	1314.43
17.200	166.00	336.0	48441.3	48778.2	168.45	1314.43
17.300	161.00	327.0	48431.5	48768.3	168.40	1314.43
17.400	157.00	318.0	48412.9	48749.5	168.30	1314.42
17.500	152.00	309.0	48385.6	48721.9	168.15	1314.42
17.600	148.00	300.0	48349.7	48685.6	167.96	1314.42
17.700	145.00	293.0	48307.2	48642.7	167.74	1314.41
17.800	141.00	286.0	48258.3	48593.2	167.48	1314.41
17.900	138.00	279.0	48202.9	48537.3	167.18	1314.40
18.000	134.00	272.0	48141.2	48474.9	166.85	1314.40
18.100	132.00	266.0	48074.2	48407.2	166.49	1314.39
18.200	131.00	263.0	48005.0	48337.2	166.12	1314.39
18.300	129.00	260.0	47933.5	48265.0	165.74	1314.38
18.400	127.00	256.0	47858.8	48189.5	165.35	1314.37
18.500	126.00	253.0	47781.9	48111.8	164.94	1314.37
18.600	124.00	250.0	47702.9	48031.9	164.51	1314.36
18.700	122.00	246.0	47620.8	47948.9	164.08	1314.35
18.800	120.00	242.0	47535.5	47862.8	163.62	1314.34
18.900	119.00	239.0	47448.2	47774.5	163.16	1314.34
19.000	117.00	236.0	47358.8	47684.2	162.68	1314.33
19.100	115.00	232.0	47266.5	47590.8	162.19	1314.32
19.200	113.00	228.0	47171.1	47494.5	161.68	1314.31
19.300	112.00	225.0	47073.8	47396.1	161.16	1314.30
19.400	110.00	222.0	46974.5	47295.8	160.63	1314.29
19.500	108.00	218.0	46872.3	47192.5	160.09	1314.29
19.600	106.00	214.0	46767.3	47086.3	159.53	1314.28
19.700	104.00	210.0	46659.4	46977.3	158.95	1314.27
19.800	103.00	207.0	46549.6	46866.4	158.37	1314.26
19.900	101.00	204.0	46438.1	46753.6	157.77	1314.25
20.000	99.00	200.0	46323.8	46638.1	157.16	1314.24

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	98.00	197.0	46207.7	46520.8	156.54	1314.23
20.200	97.00	195.0	46090.8	46402.7	155.92	1314.22
20.300	96.00	193.0	45973.2	46283.8	155.29	1314.20
20.400	94.00	190.0	45853.9	46163.2	154.66	1314.19
20.500	93.00	187.0	45732.9	46040.9	154.01	1314.18
20.600	92.00	185.0	45611.2	45917.9	153.36	1314.17
20.700	91.00	183.0	45488.7	45794.2	152.71	1314.16
20.800	90.00	181.0	45365.6	45669.7	152.06	1314.15
20.900	89.00	179.0	45241.8	45544.6	151.40	1314.14
21.000	88.00	177.0	45117.4	45418.8	150.73	1314.13
21.100	86.00	174.0	44991.3	45291.4	150.06	1314.12
21.200	85.00	171.0	44863.5	45162.3	149.38	1314.11
21.300	84.00	169.0	44735.1	45032.5	148.70	1314.09
21.400	83.00	167.0	44606.1	44902.1	148.01	1314.08
21.500	82.00	165.0	44476.5	44771.1	147.32	1314.07
21.600	81.00	163.0	44346.2	44639.5	146.62	1314.06
21.700	79.00	160.0	44214.4	44506.2	145.92	1314.05
21.800	78.00	157.0	44081.0	44371.4	145.21	1314.04
21.900	77.00	155.0	43947.0	44236.0	144.49	1314.02
22.000	76.00	153.0	43812.4	44100.0	143.78	1314.01
22.100	75.00	151.0	43677.3	43963.4	143.06	1314.00
22.200	73.00	148.0	43540.6	43825.3	142.33	1313.99
22.300	72.00	145.0	43402.5	43685.6	141.59	1313.97
22.400	70.00	142.0	43262.8	43544.5	140.85	1313.96
22.500	69.00	139.0	43121.6	43401.8	140.09	1313.95
22.600	67.00	136.0	42978.9	43257.6	139.33	1313.94
22.700	66.00	133.0	42834.8	43111.9	138.57	1313.92
22.800	64.00	130.0	42689.2	42964.8	137.79	1313.91
22.900	63.00	127.0	42542.2	42816.2	137.01	1313.90
23.000	61.00	124.0	42393.8	42666.2	136.21	1313.88
23.100	60.00	121.0	42243.9	42514.8	135.42	1313.87
23.200	58.00	118.0	42092.7	42361.9	134.61	1313.86
23.300	57.00	115.0	41940.1	42207.7	133.80	1313.84
23.400	55.00	112.0	41786.2	42052.1	132.98	1313.83
23.500	54.00	109.0	41630.9	41895.2	132.15	1313.82
23.600	52.00	106.0	41474.2	41736.9	131.31	1313.80
23.700	51.00	103.0	41316.2	41577.2	130.54	1313.79
23.800	49.00	100.0	41156.6	41416.2	129.78	1313.77
23.900	48.00	97.0	40995.6	41253.6	129.01	1313.76
24.000	46.00	94.0	40833.1	41089.6	128.23	1313.74
24.100	45.00	91.0	40669.2	40924.1	127.44	1313.73
24.200	44.00	89.0	40504.9	40758.2	126.65	1313.71
24.300	42.00	86.0	40339.2	40590.9	125.86	1313.70
24.400	41.00	83.0	40172.1	40422.2	125.06	1313.68
24.500	39.00	80.0	40003.6	40252.1	124.25	1313.67
24.600	38.00	77.0	39833.7	40080.6	123.43	1313.65

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	36.00	74.0	39662.5	39907.7	122.61	1313.63
24.800	35.00	71.0	39489.9	39733.5	121.79	1313.62
24.900	33.00	68.0	39316.0	39557.9	120.95	1313.60
25.000	32.00	65.0	39140.8	39381.0	120.11	1313.59
25.100	30.00	62.0	38964.3	39202.8	119.27	1313.57
25.200	29.00	59.0	38786.5	39023.3	118.41	1313.55
25.300	27.00	56.0	38607.3	38842.5	117.55	1313.54
25.400	26.00	53.0	38427.0	38660.3	116.69	1313.52
25.500	24.00	50.0	38245.3	38477.0	115.82	1313.50
25.600	23.00	47.0	38062.5	38292.3	114.94	1313.49
25.700	21.00	44.0	37878.3	38106.5	114.06	1313.47
25.800	20.00	41.0	37693.0	37919.3	113.17	1313.45
25.900	18.00	38.0	37506.4	37731.0	112.27	1313.44

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1309.80 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	1318.00 cfs
Peak Outflow	=	168.46 cfs
Peak Elevation	=	1314.43 ft

***** Summary of Approximate Peak Storage *****

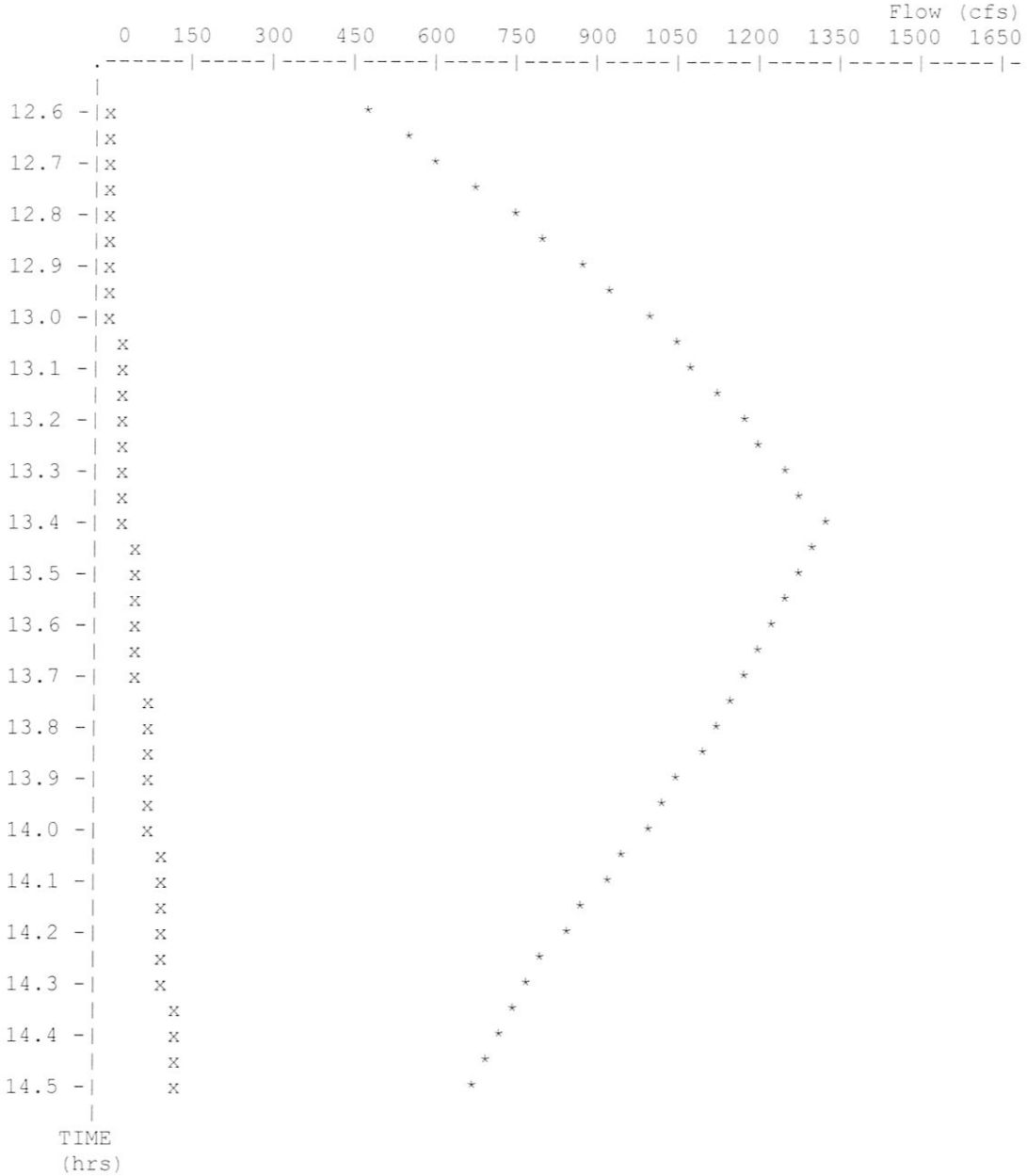
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	200.87 ac-ft
Total Storage in Pond	=	200.87 ac-ft

Warning: Inflow hydrograph truncated on left side.
Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL25.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
08:29:18

Peak Inflow = 1318.00 cfs
Peak Outflow = 168.46 cfs
Peak Elevation = 1314.43 ft



* File: CRUISL25.HYD Qmax = 1318.0 cfs
x File: OUT .HYD Qmax = 168.5 cfs

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:08:58
Watershed file: --> CRUISL00.WSD
Hydrograph file: --> CRUISL00.HYD

Wichita Readiness Center
Cruiser Lake Watershed
100-year storm event

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Total Area	1177.00	73.0	2.00	0.00	7.80	4.63	.09	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1177.00 acres or 1.8391 sq.mi
Peak discharge = 1924 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Total Area	1.80	0.00	2.00	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:08:58
Watershed file: --> CRUISL00.WSD
Hydrograph file: --> CRUISL00.HYD

Wichita Readiness Center
Cruiser Lake Watershed
100-year storm event

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Total Area	1924	13.4
Composite Watershed	1924	13.4

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:08:58
Watershed file: --> CRUISL00.WSD
Hydrograph file: --> CRUISL00.HYD

Wichita Readiness Center
Cruiser Lake Watershed
100-year storm event

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Total Area	60	77	102	136	153	179	230	307	417
Total (cfs)	60	77	102	136	153	179	230	307	417

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Total Area	545	698	886	1081	1456	1711	1924	1771	1643
Total (cfs)	545	698	886	1081	1456	1711	1924	1771	1643

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Total Area	1456	1124	894	673	494	383	307	255	221
Total (cfs)	1456	1124	894	673	494	383	307	255	221

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Total Area	196	170	145	111	26
Total (cfs)	196	170	145	111	26

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:08:58
Watershed file: --> CRUISL00.WSD
Hydrograph file: --> CRUISL00.HYD

Wichita Readiness Center
Cruiser Lake Watershed
100-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	60	14.8	783
11.1	66	14.9	728
11.2	71	15.0	673
11.3	77	15.1	637
11.4	85	15.2	601
11.5	94	15.3	566
11.6	102	15.4	530
11.7	113	15.5	494
11.8	125	15.6	472
11.9	136	15.7	450
12.0	153	15.8	427
12.1	179	15.9	405
12.2	230	16.0	383
12.3	307	16.1	368
12.4	417	16.2	353
12.5	545	16.3	337
12.6	698	16.4	322
12.7	886	16.5	307
12.8	1081	16.6	297
12.9	1268	16.7	286
13.0	1456	16.8	276
13.1	1584	16.9	265
13.2	1711	17.0	255
13.3	1818	17.1	248
13.4	1924	17.2	241
13.5	1848	17.3	235
13.6	1771	17.4	228
13.7	1707	17.5	221
13.8	1643	17.6	216
13.9	1550	17.7	211
14.0	1456	17.8	206
14.1	1345	17.9	201
14.2	1235	18.0	196
14.3	1124	18.1	193
14.4	1047	18.2	191
14.5	971	18.3	188
14.6	894	18.4	186
14.7	839	18.5	183

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 09-30-2009 11:08:58
Watershed file: --> CRUISL00.WSD
Hydrograph file: --> CRUISL00.HYD

Wichita Readiness Center
Cruiser Lake Watershed
100-year storm event

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	180	22.4	102
18.7	178	22.5	100
18.8	175	22.6	98
18.9	173	22.7	96
19.0	170	22.8	94
19.1	168	22.9	92
19.2	165	23.0	90
19.3	162	23.1	88
19.4	160	23.2	86
19.5	158	23.3	83
19.6	155	23.4	81
19.7	152	23.5	79
19.8	150	23.6	77
19.9	148	23.7	75
20.0	145	23.8	73
20.1	143	23.9	71
20.2	142	24.0	68
20.3	140	24.1	66
20.4	138	24.2	64
20.5	136	24.3	62
20.6	135	24.4	60
20.7	133	24.5	58
20.8	131	24.6	56
20.9	130	24.7	54
21.0	128	24.8	52
21.1	126	24.9	49
21.2	125	25.0	47
21.3	123	25.1	45
21.4	121	25.2	43
21.5	120	25.3	41
21.6	118	25.4	39
21.7	116	25.5	37
21.8	114	25.6	34
21.9	113	25.7	32
22.0	111	25.8	30
22.1	109	25.9	28
22.2	107		
22.3	105		

Wichita Readiness Center
Cruiser Lake
Detention Calculation
100-Year Storm Event

Inflow Hydrograph: CRUISL00.HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1309.80 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1309.80	0.0	0.000	0.0	0.0
1310.80	10.3	41.298	9994.2	10004.5
1311.80	38.1	83.378	20177.5	20215.6
1312.80	79.3	126.900	30709.8	30789.1
1313.80	131.2	171.835	41584.2	41715.4
1314.80	190.7	218.207	52806.0	52996.7
1315.80	254.8	266.103	64397.0	64651.8
1316.80	322.0	315.813	76426.7	76748.7
1317.80	390.6	367.694	88981.9	89372.5
1318.80	460.8	421.998	102123.5	102584.3
1319.80	529.5	478.473	115790.5	116320.0
1320.80	938.6	537.311	130029.3	130967.9
1321.80	2847.5	599.276	145024.7	147872.2
1322.80	7507.6	665.776	161117.8	168625.4

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	60.00	-----	0.5	0.5	0.00	1309.80
11.100	66.00	126.0	126.2	126.5	0.13	1309.81
11.200	71.00	137.0	262.7	263.2	0.27	1309.83
11.300	77.00	148.0	409.8	410.7	0.42	1309.84
11.400	85.00	162.0	570.7	571.8	0.59	1309.86
11.500	94.00	179.0	748.1	749.7	0.77	1309.87
11.600	102.00	196.0	942.2	944.1	0.97	1309.89
11.700	113.00	215.0	1154.8	1157.2	1.19	1309.92
11.800	125.00	238.0	1389.9	1392.8	1.43	1309.94
11.900	136.00	261.0	1647.5	1650.9	1.70	1309.97
12.000	153.00	289.0	1932.5	1936.5	1.99	1309.99
12.100	179.00	332.0	2259.9	2264.5	2.33	1310.03
12.200	230.00	409.0	2663.4	2668.9	2.75	1310.07
12.300	307.00	537.0	3193.8	3200.4	3.29	1310.12
12.400	417.00	724.0	3909.7	3917.8	4.03	1310.19
12.500	545.00	962.0	4861.7	4871.7	5.02	1310.29
12.600	698.00	1243.0	6092.1	6104.7	6.28	1310.41
12.700	886.00	1584.0	7660.3	7676.1	7.90	1310.57
12.800	1081.00	1967.0	9607.5	9627.3	9.91	1310.76
12.900	1268.00	2349.0	11925.3	11956.5	15.61	1310.99
13.000	1456.00	2724.0	14603.4	14649.3	22.95	1311.25
13.100	1584.00	3040.0	17581.2	17643.4	31.10	1311.55
13.200	1711.00	3295.0	20794.8	20876.2	40.67	1311.86
13.300	1818.00	3529.0	24215.6	24323.8	54.11	1312.19
13.400	1924.00	3742.0	27821.1	27957.6	68.27	1312.53
13.500	1848.00	3772.0	31426.8	31593.1	83.12	1312.87
13.600	1771.00	3619.0	34846.8	35045.8	99.52	1313.19
13.700	1707.00	3478.0	38094.6	38324.8	115.09	1313.49
13.800	1643.00	3350.0	41184.8	41444.6	129.91	1313.78
13.900	1550.00	3193.0	44087.3	44377.8	145.24	1314.04
14.000	1456.00	3006.0	46774.2	47093.3	159.56	1314.28
14.100	1345.00	2801.0	49229.9	49575.2	172.65	1314.50
14.200	1235.00	2580.0	51441.0	51809.9	184.44	1314.69
14.300	1124.00	2359.0	53409.7	53800.0	195.12	1314.87
14.400	1047.00	2171.0	55170.9	55580.7	204.91	1315.02
14.500	971.00	2018.0	56761.4	57188.9	213.76	1315.16
14.600	894.00	1865.0	58183.1	58626.4	221.66	1315.28
14.700	839.00	1733.0	59458.6	59916.1	228.75	1315.39
14.800	783.00	1622.0	60610.3	61080.6	235.16	1315.49
14.900	728.00	1511.0	61639.5	62121.3	240.88	1315.58
15.000	673.00	1401.0	62548.6	63040.5	245.94	1315.66
15.100	637.00	1310.0	63357.7	63858.6	250.44	1315.73
15.200	601.00	1238.0	64086.8	64595.7	254.49	1315.80
15.300	566.00	1167.0	64737.5	65253.8	258.14	1315.85
15.400	530.00	1096.0	65310.7	65833.5	261.36	1315.90

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	494.00	1024.0	65806.4	66334.7	264.15	1315.94
15.600	472.00	966.0	66239.3	66772.4	266.58	1315.98
15.700	450.00	922.0	66623.8	67161.3	268.74	1316.01
15.800	427.00	877.0	66959.6	67500.8	270.63	1316.04
15.900	405.00	832.0	67247.1	67791.6	272.24	1316.06
16.000	383.00	788.0	67487.9	68035.1	273.59	1316.08
16.100	368.00	751.0	67689.4	68238.9	274.73	1316.10
16.200	353.00	721.0	67859.1	68410.4	275.68	1316.11
16.300	337.00	690.0	67996.2	68549.1	276.45	1316.12
16.400	322.00	659.0	68101.1	68655.2	277.04	1316.13
16.500	307.00	629.0	68175.2	68730.1	277.46	1316.14
16.600	297.00	604.0	68223.7	68779.2	277.73	1316.14
16.700	286.00	583.0	68251.0	68806.7	277.88	1316.14
16.800	276.00	562.0	68257.1	68813.0	277.92	1316.14
16.900	265.00	541.0	68242.5	68798.1	277.83	1316.14
17.000	255.00	520.0	68207.2	68762.5	277.64	1316.14
17.100	248.00	503.0	68155.5	68710.2	277.34	1316.14
17.200	241.00	489.0	68090.5	68644.5	276.98	1316.13
17.300	235.00	476.0	68013.4	68566.5	276.55	1316.12
17.400	228.00	463.0	67924.4	68476.4	276.05	1316.12
17.500	221.00	449.0	67822.4	68373.4	275.47	1316.11
17.600	216.00	437.0	67709.7	68259.4	274.84	1316.10
17.700	211.00	427.0	67588.4	68136.7	274.16	1316.09
17.800	206.00	417.0	67458.5	68005.4	273.43	1316.08
17.900	201.00	407.0	67320.2	67865.5	272.65	1316.07
18.000	196.00	397.0	67173.6	67717.2	271.83	1316.05
18.100	193.00	389.0	67020.6	67562.6	270.97	1316.04
18.200	191.00	384.0	66864.5	67404.6	270.09	1316.03
18.300	188.00	379.0	66705.1	67243.5	269.20	1316.01
18.400	186.00	374.0	66542.5	67079.1	268.28	1316.00
18.500	183.00	369.0	66376.8	66911.5	267.35	1315.99
18.600	180.00	363.0	66207.0	66739.8	266.40	1315.97
18.700	178.00	358.0	66034.1	66565.0	265.43	1315.96
18.800	175.00	353.0	65858.3	66387.1	264.44	1315.94
18.900	173.00	348.0	65679.4	66206.3	263.44	1315.93
19.000	170.00	343.0	65497.6	66022.4	262.41	1315.91
19.100	168.00	338.0	65312.8	65835.6	261.38	1315.90
19.200	165.00	333.0	65125.2	65645.8	260.32	1315.88
19.300	162.00	327.0	64933.7	65452.2	259.25	1315.87
19.400	160.00	322.0	64739.4	65255.7	258.15	1315.85
19.500	158.00	318.0	64543.3	65057.4	257.05	1315.83
19.600	155.00	313.0	64344.4	64856.3	255.94	1315.82
19.700	152.00	307.0	64141.8	64651.4	254.80	1315.80
19.800	150.00	302.0	63936.5	64443.8	253.66	1315.78
19.900	148.00	298.0	63729.5	64234.5	252.50	1315.76
20.000	145.00	293.0	63519.8	64022.5	251.34	1315.75

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	143.00	288.0	63307.5	63807.8	250.16	1315.73
20.200	142.00	285.0	63094.5	63592.5	248.97	1315.71
20.300	140.00	282.0	62881.0	63376.5	247.79	1315.69
20.400	138.00	278.0	62665.8	63159.0	246.59	1315.67
20.500	136.00	274.0	62449.0	62939.8	245.38	1315.65
20.600	135.00	271.0	62231.7	62720.0	244.18	1315.63
20.700	133.00	268.0	62013.7	62499.7	242.96	1315.62
20.800	131.00	264.0	61794.2	62277.7	241.74	1315.60
20.900	130.00	261.0	61574.2	62055.2	240.52	1315.58
21.000	128.00	258.0	61353.6	61832.2	239.29	1315.56
21.100	126.00	254.0	61131.5	61607.6	238.06	1315.54
21.200	125.00	251.0	60908.9	61382.5	236.82	1315.52
21.300	123.00	248.0	60685.7	61156.9	235.58	1315.50
21.400	121.00	244.0	60461.0	60929.7	234.33	1315.48
21.500	120.00	241.0	60235.9	60702.0	233.08	1315.46
21.600	118.00	238.0	60010.2	60473.9	231.82	1315.44
21.700	116.00	234.0	59783.1	60244.2	230.56	1315.42
21.800	114.00	230.0	59554.5	60013.1	229.29	1315.40
21.900	113.00	227.0	59325.5	59781.5	228.01	1315.38
22.000	111.00	224.0	59096.0	59549.5	226.74	1315.36
22.100	109.00	220.0	58865.1	59316.0	225.45	1315.34
22.200	107.00	216.0	58632.8	59081.1	224.16	1315.32
22.300	105.00	212.0	58399.1	58844.8	222.86	1315.30
22.400	102.00	207.0	58163.0	58606.1	221.55	1315.28
22.500	100.00	202.0	57924.5	58365.0	220.22	1315.26
22.600	98.00	198.0	57684.8	58122.5	218.89	1315.24
22.700	96.00	194.0	57443.7	57878.8	217.55	1315.22
22.800	94.00	190.0	57201.2	57633.7	216.20	1315.20
22.900	92.00	186.0	56957.6	57387.2	214.85	1315.18
23.000	90.00	182.0	56712.6	57139.6	213.48	1315.16
23.100	88.00	178.0	56466.4	56890.6	212.12	1315.13
23.200	86.00	174.0	56218.9	56640.4	210.74	1315.11
23.300	83.00	169.0	55969.2	56387.9	209.35	1315.09
23.400	81.00	164.0	55717.3	56133.2	207.95	1315.07
23.500	79.00	160.0	55464.2	55877.3	206.54	1315.05
23.600	77.00	156.0	55209.9	55620.2	205.13	1315.03
23.700	75.00	152.0	54954.5	55361.9	203.71	1315.00
23.800	73.00	148.0	54698.0	55102.5	202.28	1314.98
23.900	71.00	144.0	54440.3	54842.0	200.85	1314.96
24.000	68.00	139.0	54180.5	54579.3	199.40	1314.94
24.100	66.00	134.0	53918.6	54314.5	197.95	1314.91
24.200	64.00	130.0	53655.6	54048.6	196.48	1314.89
24.300	62.00	126.0	53391.6	53781.6	195.02	1314.87
24.400	60.00	122.0	53126.5	53513.6	193.54	1314.84
24.500	58.00	118.0	52860.3	53244.5	192.06	1314.82
24.600	56.00	114.0	52593.2	52974.3	190.58	1314.80

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	54.00	110.0	52324.9	52703.2	189.15	1314.77
24.800	52.00	106.0	52055.5	52430.9	187.72	1314.75
24.900	49.00	101.0	51783.9	52156.5	186.27	1314.73
25.000	47.00	96.0	51510.3	51879.9	184.81	1314.70
25.100	45.00	92.0	51235.6	51602.3	183.35	1314.68
25.200	43.00	88.0	50959.9	51323.6	181.88	1314.65
25.300	41.00	84.0	50683.1	51043.9	180.40	1314.63
25.400	39.00	80.0	50405.2	50763.1	178.92	1314.60
25.500	37.00	76.0	50126.3	50481.2	177.43	1314.58
25.600	34.00	71.0	49845.5	50197.3	175.94	1314.55
25.700	32.00	66.0	49562.6	49911.5	174.43	1314.53
25.800	30.00	62.0	49278.8	49624.6	172.91	1314.50
25.900	28.00	58.0	48994.0	49336.8	171.40	1314.48

****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1309.80 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 1924.00 cfs
Peak Outflow = 277.92 cfs
Peak Elevation = 1316.14 ft

***** Summary of Approximate Peak Storage *****

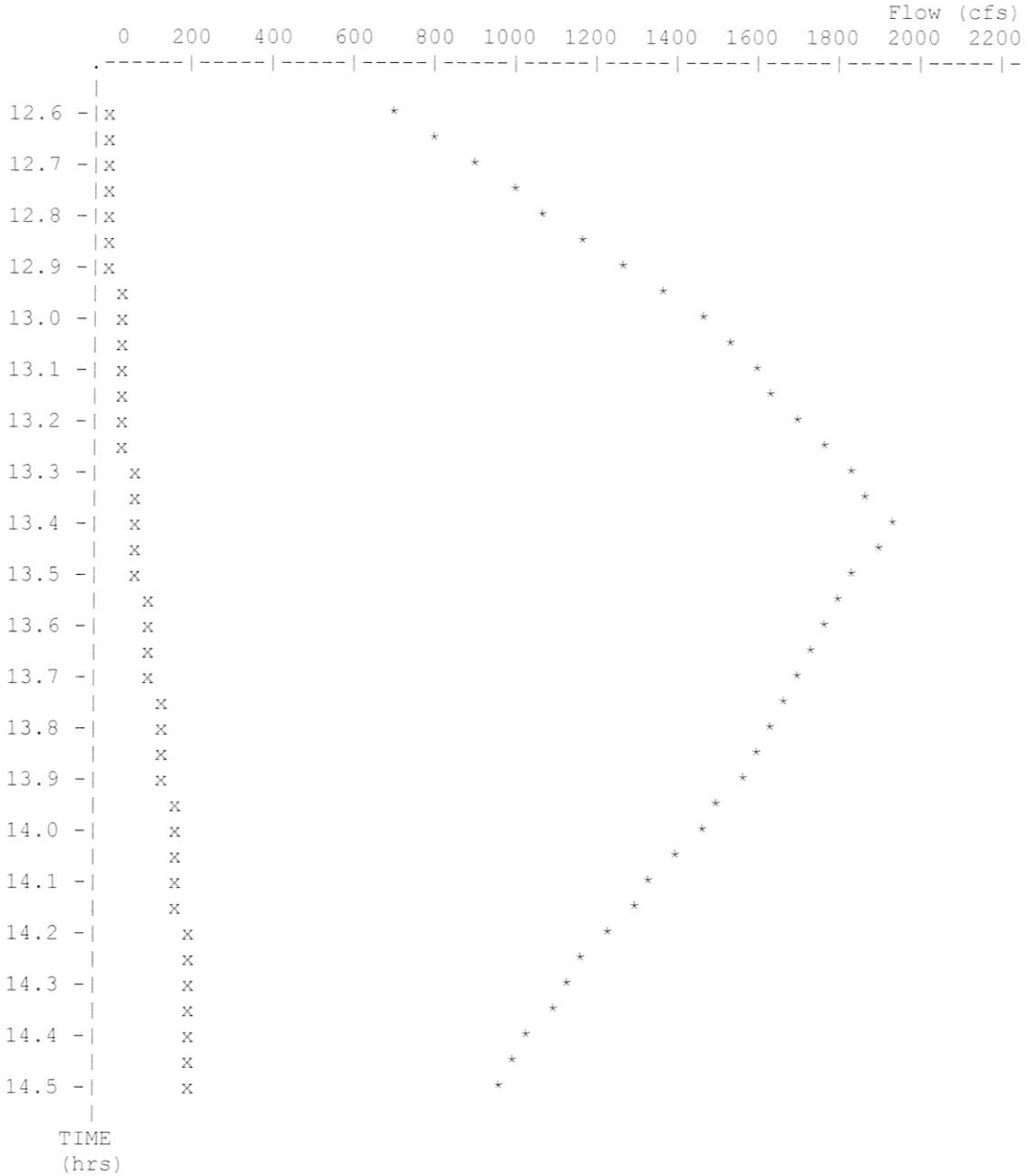
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	283.20 ac-ft
Total Storage in Pond	=	283.21 ac-ft

Warning: Inflow hydrograph truncated on left side.
Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
08:30:06

Peak Inflow = 1924.00 cfs
Peak Outflow = 277.92 cfs
Peak Elevation = 1316.14 ft



* File: CRUISL00.HYD Qmax = 1924.0 cfs
x File: OUT .HYD Qmax = 277.9 cfs

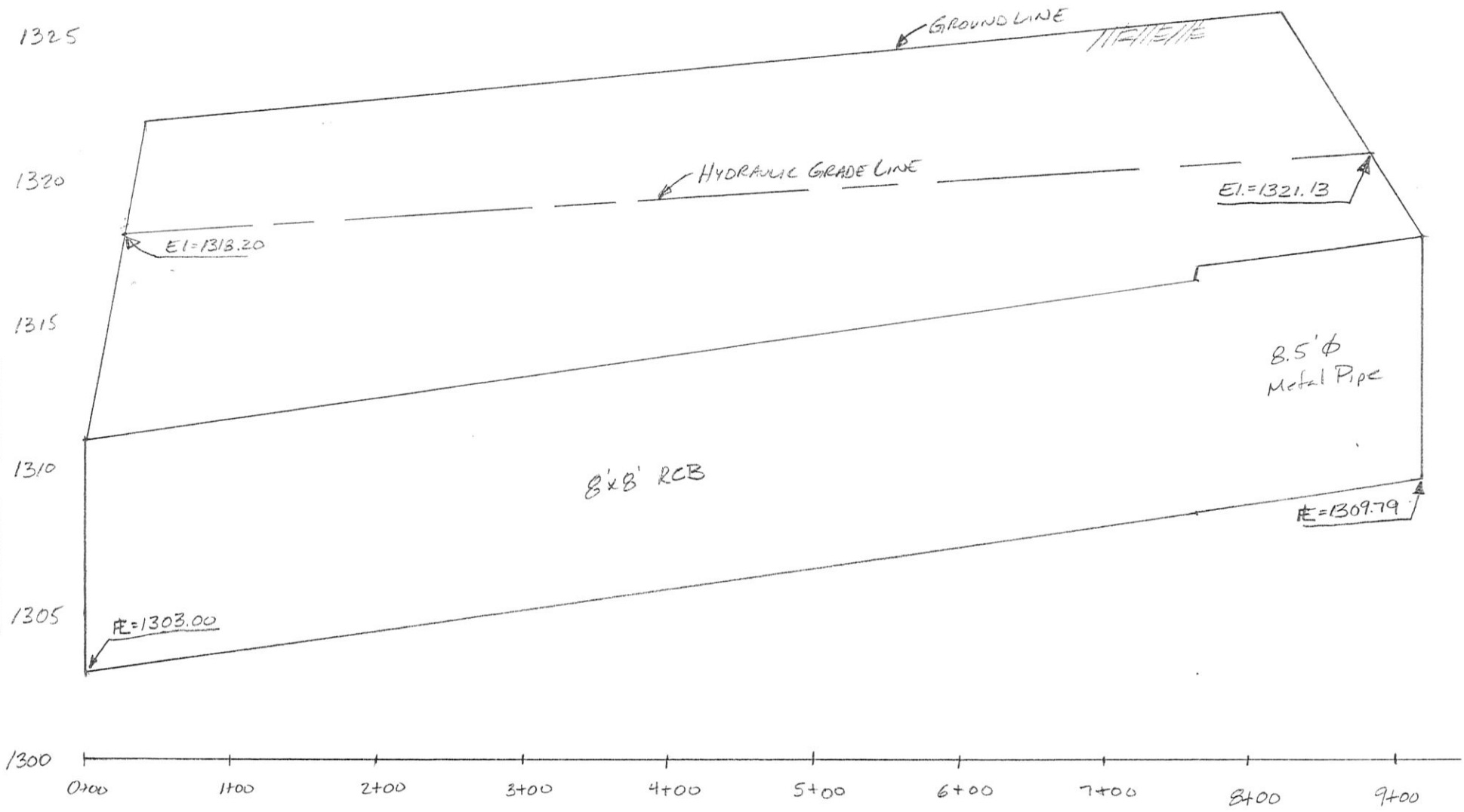
Cruiser Lake Analysis
100-Year Event in E. Fork of Chisholm Creek
100-Year Event in Cruiser Lake
Submerged Culvert + Weir Overflow Structure

Cook, Flatt & Strobel ENGINEERS, P.A.

CFS

Subject _____ Sheet No. _____ of _____

By _____ Date _____ Job No. _____



HYDRAULIC GRADE LINE

8'x8' RCB + 8.5'ϕ PIPE

100-YR FLOOD EVENT

(BASED ON 100-YR FLOOD ELEV IN CREEK)

HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1318.20	0.00	0.00	0.00	1
1318.87	40.00	40.00	0.00	1
1319.26	80.00	80.00	0.00	1
1319.62	120.00	120.00	0.00	1
1319.97	160.00	160.00	0.00	1
1320.33	200.00	200.00	0.00	1
1320.70	240.00	240.00	0.00	1
1321.09	280.00	280.00	0.00	1
1321.49	320.00	320.00	0.00	1
1321.91	360.00	360.00	0.00	1
1322.36	400.00	400.00	0.00	1
1326.00	663.94	663.94	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 1

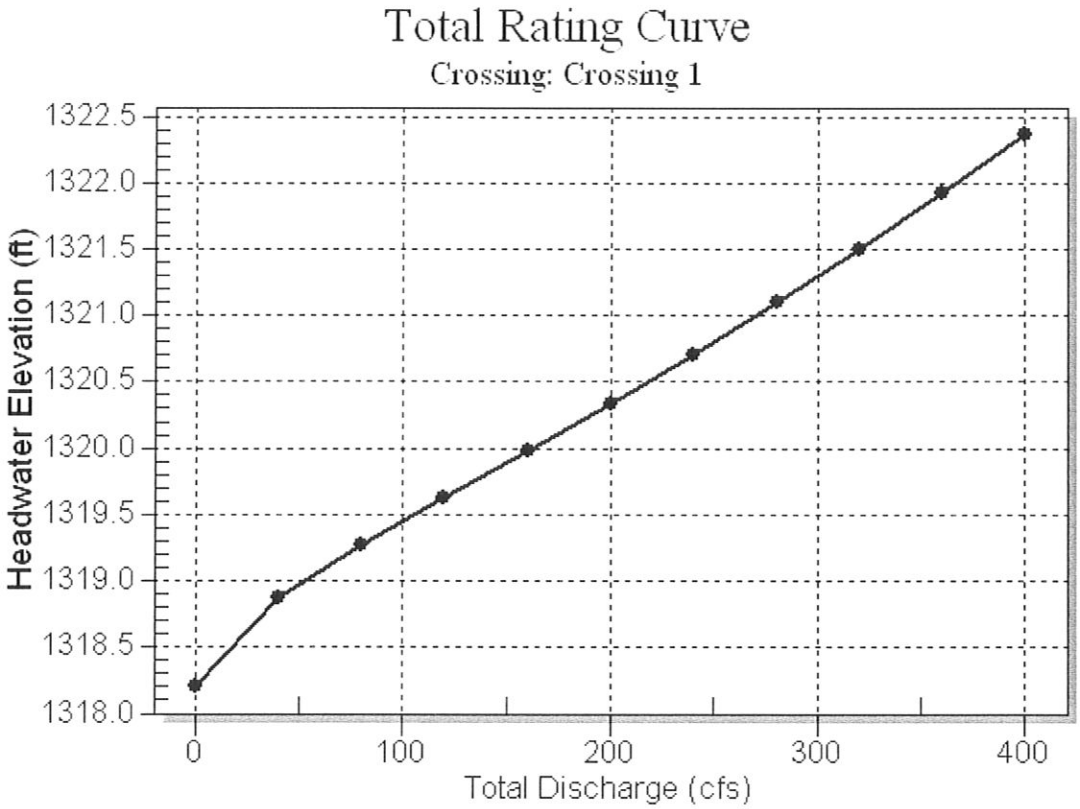


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	1318.20	0.000	8.410	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
40.00	40.00	1318.87	2.040	9.080	4-FFf	1.102	1.472	8.500	0.657	0.705	3.046
80.00	80.00	1319.26	2.940	9.472	4-FFf	1.619	2.124	8.500	1.009	1.410	3.966
120.00	120.00	1319.62	3.654	9.830	4-FFf	1.969	2.653	8.500	1.300	2.115	4.617
160.00	160.00	1319.97	4.263	10.184	4-FFf	2.288	3.068	8.500	1.559	2.820	5.130
200.00	200.00	1320.33	4.916	10.542	4-FFf	2.594	3.467	8.500	1.797	3.525	5.566
240.00	240.00	1320.70	5.509	10.913	4-FFf	2.838	3.800	8.500	2.020	4.229	5.940
280.00	280.00	1321.09	6.057	11.297	4-FFf	3.083	4.132	8.500	2.231	4.934	6.276
320.00	320.00	1321.49	6.574	11.701	4-FFf	3.327	4.429	8.500	2.433	5.639	6.576
360.00	360.00	1321.91	7.070	12.123	4-FFf	3.549	4.706	8.500	2.627	6.344	6.852
400.00	400.00	1322.36	7.558	12.566	4-FFf	3.761	4.984	8.500	2.815	7.049	7.104

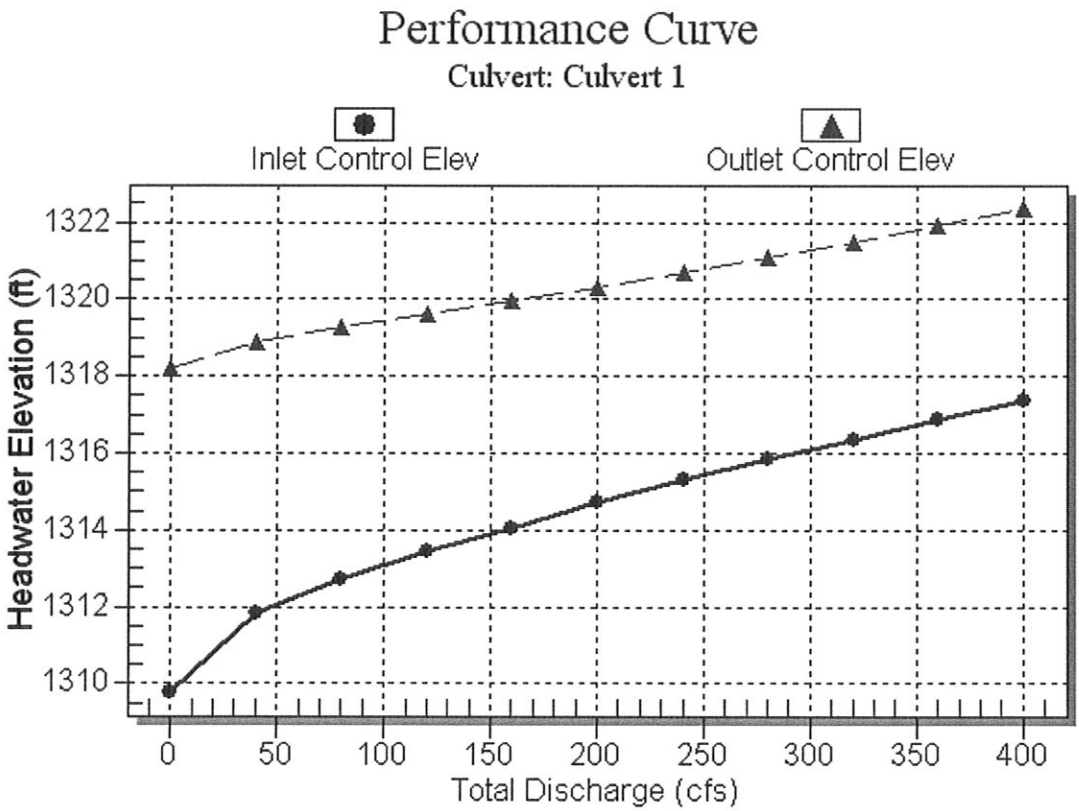
****

Inlet Elevation (invert): 1309.79 ft, Outlet Elevation (invert): 1308.68 ft

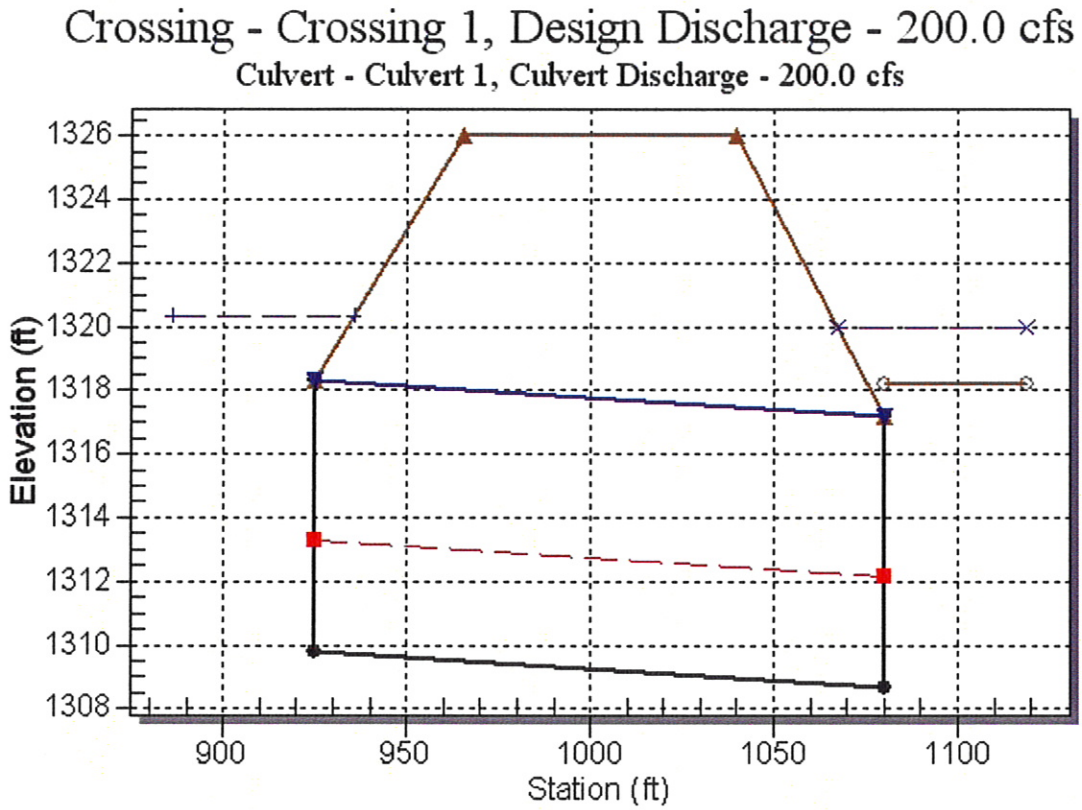
Culvert Length: 155.00 ft, Culvert Slope: 0.0072

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 925.00 ft

Inlet Elevation: 1309.79 ft

Outlet Station: 1080.00 ft

Outlet Elevation: 1308.68 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 8.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	1318.20	0.00	0.00	0.00	0.00
40.00	1318.86	0.66	3.05	0.29	0.66
80.00	1319.21	1.01	3.97	0.45	0.70
120.00	1319.50	1.30	4.62	0.58	0.71
160.00	1319.76	1.56	5.13	0.70	0.72
200.00	1320.00	1.80	5.57	0.81	0.73
240.00	1320.22	2.02	5.94	0.91	0.74
280.00	1320.43	2.23	6.28	1.00	0.74
320.00	1320.63	2.43	6.58	1.09	0.74
360.00	1320.83	2.63	6.85	1.18	0.74
400.00	1321.02	2.82	7.10	1.26	0.75

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 20.00 ft

Channel Slope: 0.0072

Channel Manning's n: 0.0300

Channel Invert Elevation: 1318.20 ft

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1326.00 ft

Roadway Surface: Gravel

Roadway Top Width: 75.00 ft

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1322.36	400.00	400.00	0.00	1
1324.25	552.50	552.50	0.00	1
1326.12	705.00	673.18	31.49	7
1326.41	857.50	645.90	210.76	6
1326.62	1010.00	612.00	396.72	5
1326.79	1162.50	575.65	586.15	5
1326.95	1315.00	535.67	778.98	5
1326.95	1320.00	534.22	785.29	3
1327.23	1620.00	444.64	1174.43	4
1327.36	1772.50	400.00	1371.72	4
1327.47	1925.00	372.08	1551.63	3
1326.00	674.67	674.67	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 1

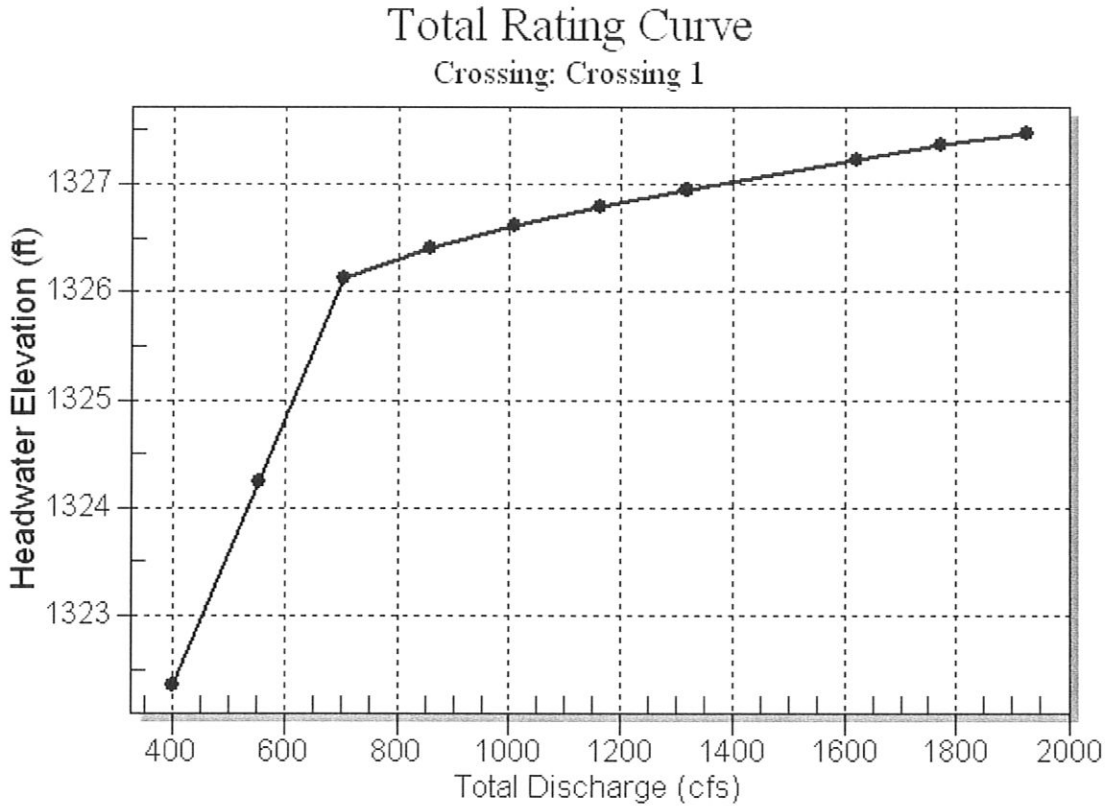


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
400.00	400.00	1322.36	7.558	12.566	4-FFf	3.761	4.984	8.500	2.815	7.049	7.104
552.50	552.50	1324.25	9.487	14.455	4-FFf	4.552	5.895	8.500	3.489	9.737	7.919
705.00	673.18	1326.12	11.267	16.317	4-FFf	5.160	6.485	8.500	4.112	11.863	8.573
857.50	645.90	1326.41	10.837	16.604	4-FFf	5.021	6.354	8.500	4.700	11.383	9.123
1010.00	612.00	1326.62	10.327	16.811	4-FFf	4.851	6.191	8.500	5.264	10.785	9.594
1162.50	575.65	1326.79	9.806	16.993	4-FFf	4.668	6.016	8.500	5.808	10.145	10.008
1315.00	535.67	1326.95	9.261	17.150	4-FFf	4.467	5.797	8.500	6.337	9.440	10.376
1320.00	534.22	1326.95	9.242	17.155	4-FFf	4.460	5.788	8.500	6.354	9.414	10.387
1620.00	444.64	1327.23	8.103	17.424	4-FFf	3.997	5.263	8.500	7.358	7.836	11.008
1772.50	400.00	1327.36	7.558	17.604	4-FFf	3.761	4.984	8.500	7.854	7.049	11.285
1925.00	372.08	1327.47	7.218	17.911	4-FFf	3.613	4.790	8.500	8.342	6.557	11.538

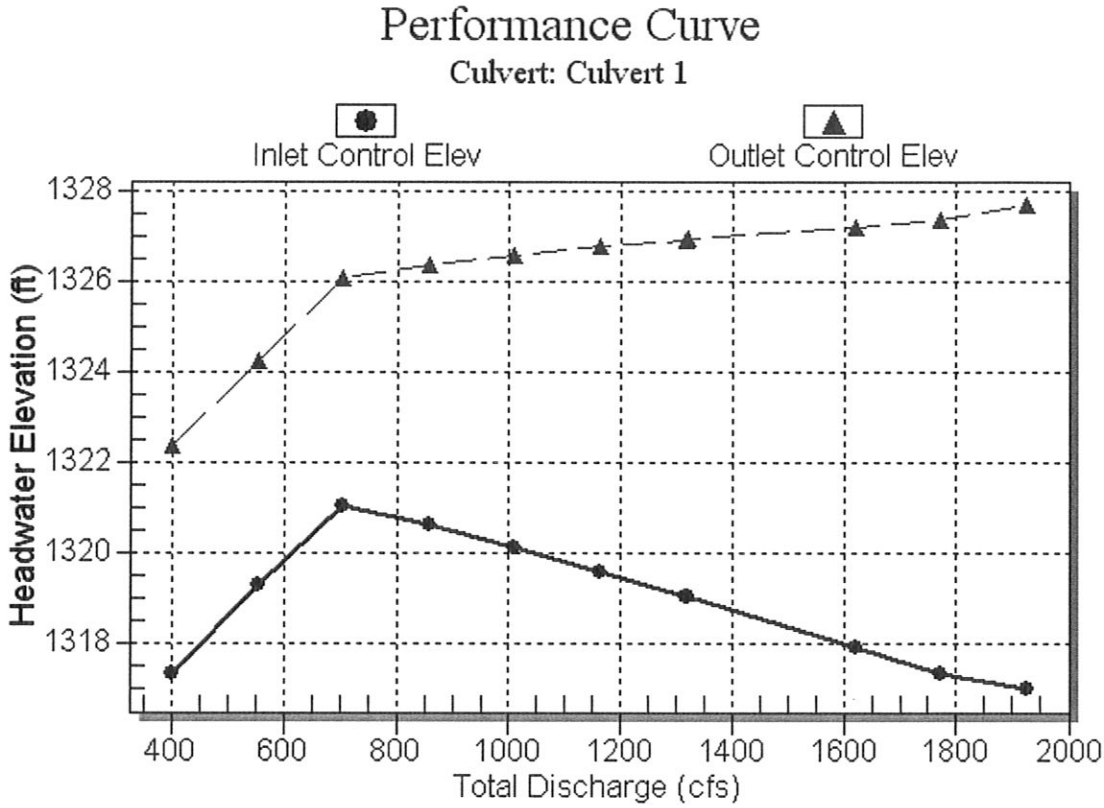
****

Inlet Elevation (invert): 1309.79 ft, Outlet Elevation (invert): 1308.68 ft

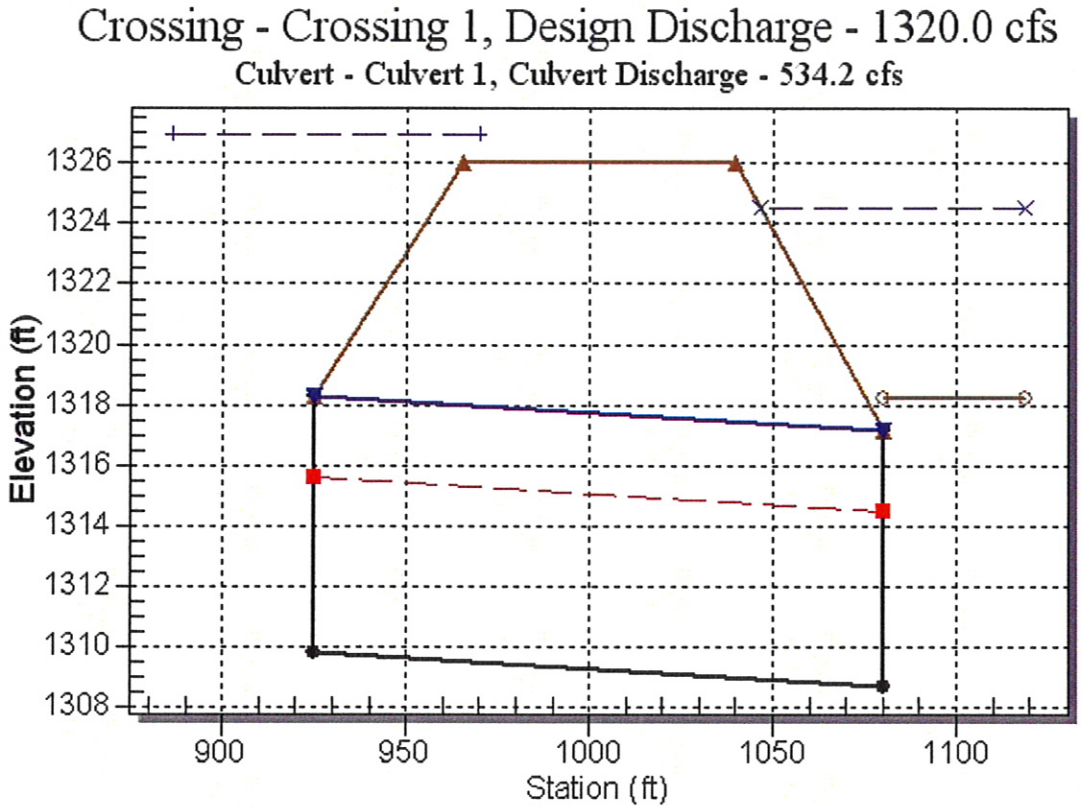
Culvert Length: 155.00 ft, Culvert Slope: 0.0072

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 925.00 ft

Inlet Elevation: 1309.79 ft

Outlet Station: 1080.00 ft

Outlet Elevation: 1308.68 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 8.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
400.00	1321.02	2.82	7.10	1.26	0.75
552.50	1321.69	3.49	7.92	1.57	0.75
705.00	1322.31	4.11	8.57	1.85	0.75
857.50	1322.90	4.70	9.12	2.11	0.74
1010.00	1323.46	5.26	9.59	2.36	0.74
1162.50	1324.01	5.81	10.01	2.61	0.73
1315.00	1324.54	6.34	10.38	2.85	0.73
1320.00	1324.55	6.35	10.39	2.85	0.73
1620.00	1325.56	7.36	11.01	3.31	0.72
1772.50	1326.05	7.85	11.28	3.53	0.71
1925.00	1326.54	8.34	11.54	3.75	0.70

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 20.00 ft

Channel Slope: 0.0072

Channel Manning's n: 0.0300

Channel Invert Elevation: 1318.20 ft

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1326.00 ft

Roadway Surface: Gravel

Roadway Top Width: 75.00 ft

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
1318.20	0.0	10
1319.20	76.0	10
1320.20	205.3	10 +20
1321.20	1144.2	10 +20
1321.57	1917.9	10 +20
1322.20	4025.8	10 +20
1323.00	0.0	

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outlet Structure File: CRULKSTR.STR
Planimeter Input File: CRULKVOL.VOL
Rating Table Output File: CRULKPND.PND

Min. Elev.(ft) = 1318.2 Max. Elev.(ft) = 1323 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *
1321.57

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
TABLE	10			->	10
WEIR-XY	20	+	10	->	30

Outflow rating table summary was stored in file:
CRULKPND.PND

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

>>>>>> Structure No. 10 <<<<<<
(Input Data)

TABLE
Input your own rating table.
E1 (ft) =1318.20 E2 (ft) =1323

Constant (ft) added to each elevation was:

Elev. (ft)	Q (cfs)
1318.2	0
1318.87	40
1319.97	160
1320.33	200
1321.49	320
1322.36	400
1324.25	552.5

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

>>>>>> Structure No. 20 <<<<<<
(Input Data)

WEIR-XY
Weir - Defined by X, Y Coordinates
E1 (ft) =1318.20 E2 (ft) =1323

X dist.(ft)	Y elev.(ft)
1556	1328
1556	1323
1793	1322
2290	1320
2335	1320
2647	1322
3205	1324
3205	1324

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table for Structure #10
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
1318.20	0.0	
1319.20	76.0	Interpolated from input table
1320.20	185.6	Interpolated from input table
1321.20	290.0	Interpolated from input table
1321.57	327.4	Interpolated from input table
1322.20	385.3	Interpolated from input table
1323.00	0.0	E = or > E2=1323

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table for Structure #20
WEIR-XY Weir - Defined by X, Y Coordinates

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
1318.20	0.0	E < Y min= 1320
1319.20	0.0	E < Y min= 1320
1320.20	19.7	W(ft)=125.88 Max. D(ft)=.2
1321.20	854.2	W(ft)=530.38 Max. D(ft)=1.2
1321.57	1590.5	W(ft)=680.043 Max. D(ft)=1.57
1322.20	3640.5	W(ft)=957.175 Max. D(ft)=2.2
1323.00	0.0	E = or > E2=1323

Outlet Structure File: CRULKSTR.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
Cruiser Lake
Detention Calculation
****

Outflow Rating Table 30
Table 30 = 10 + 20

Elevation (ft)	Q (cfs)	Contributing Structures
1318.20	0.0	10
1319.20	76.0	10
1320.20	205.3	10 +20
1321.20	1144.2	10 +20
1321.57	1917.9	10 +20
1322.20	4025.8	10 +20
1323.00	0.0	-

****
* Wichita Readiness Center *
* Cruiser Lake *
* Detention Calculation *
* 100-Year Storm Event *
****

Inflow Hydrograph: CRUISL00.HYD
Rating Table file: CRULKPND.PND

----INITIAL CONDITIONS----
Elevation = 1318.20 ft
Outflow = 0.00 cfs
Storage = 389.14 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1318.20	0.0	389.138	94171.3	94171.3
1319.20	76.0	444.341	107530.5	107606.5
1320.20	205.3	501.640	121396.9	121602.2
1321.20	1144.2	561.714	135934.8	137079.0
1321.57	1917.9	584.739	141506.8	143424.7
1322.20	4025.8	625.023	151255.7	155281.5

Time increment (t) = 0.100 hrs.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	60.00	-----	94171.3	94171.3	0.00	1318.20
11.100	66.00	126.0	94295.9	94297.3	0.71	1318.21
11.200	71.00	137.0	94430.0	94432.9	1.48	1318.22
11.300	77.00	148.0	94573.4	94578.0	2.30	1318.23
11.400	85.00	162.0	94729.0	94735.4	3.19	1318.24
11.500	94.00	179.0	94899.6	94908.0	4.17	1318.25
11.600	102.00	196.0	95085.2	95095.6	5.23	1318.27
11.700	113.00	215.0	95287.4	95300.2	6.39	1318.28
11.800	125.00	238.0	95510.1	95525.4	7.66	1318.30
11.900	136.00	261.0	95753.0	95771.1	9.05	1318.32
12.000	153.00	289.0	96020.8	96042.0	10.58	1318.34
12.100	179.00	332.0	96328.2	96352.8	12.34	1318.36
12.200	230.00	409.0	96708.1	96737.2	14.51	1318.39
12.300	307.00	537.0	97210.3	97245.1	17.39	1318.43
12.400	417.00	724.0	97891.8	97934.3	21.29	1318.48
12.500	545.00	962.0	98800.8	98853.8	26.49	1318.55
12.600	698.00	1243.0	99977.4	100043.8	33.22	1318.64
12.700	886.00	1584.0	101477.8	101561.4	41.80	1318.75
12.800	1081.00	1967.0	103339.8	103444.8	52.46	1318.89
12.900	1268.00	2349.0	105558.5	105688.8	65.15	1319.06
13.000	1456.00	2724.0	108118.0	108282.5	82.25	1319.25
13.100	1584.00	3040.0	110940.4	111158.0	108.81	1319.45
13.200	1711.00	3295.0	113960.9	114235.4	137.24	1319.67
13.300	1818.00	3529.0	117155.3	117489.9	167.31	1319.91
13.400	1924.00	3742.0	120499.7	120897.3	198.79	1320.15
13.500	1848.00	3772.0	123537.2	124271.7	367.25	1320.37
13.600	1771.00	3619.0	126071.8	127156.2	542.24	1320.56
13.700	1707.00	3478.0	128174.9	129549.8	687.44	1320.71
13.800	1643.00	3350.0	129910.4	131524.9	807.26	1320.84
13.900	1550.00	3193.0	131297.3	133103.4	903.02	1320.94
14.000	1456.00	3006.0	132351.7	134303.3	975.81	1321.02
14.100	1345.00	2801.0	133098.0	135152.7	1027.34	1321.08
14.200	1235.00	2580.0	133559.6	135678.0	1059.21	1321.11
14.300	1124.00	2359.0	133771.0	135918.6	1073.80	1321.13
14.400	1047.00	2171.0	133791.6	135942.0	1075.22	1321.13
14.500	971.00	2018.0	133675.2	135809.6	1067.19	1321.12
14.600	894.00	1865.0	133438.5	135540.2	1050.85	1321.10
14.700	839.00	1733.0	133114.5	135171.5	1028.48	1321.08
14.800	783.00	1622.0	132732.3	134736.5	1002.09	1321.05
14.900	728.00	1511.0	132299.0	134243.3	972.17	1321.02
15.000	673.00	1401.0	131821.6	133700.0	939.21	1320.98
15.100	637.00	1310.0	131322.1	133131.6	904.73	1320.94
15.200	601.00	1238.0	130820.0	132560.1	870.06	1320.91
15.300	566.00	1167.0	130316.4	131987.0	835.29	1320.87
15.400	530.00	1096.0	129811.5	131412.4	800.44	1320.83

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	494.00	1024.0	129304.6	130835.5	765.44	1320.80
15.600	472.00	966.0	128808.3	130270.6	731.17	1320.76
15.700	450.00	922.0	128333.5	129730.3	698.39	1320.73
15.800	427.00	877.0	127876.8	129210.5	666.86	1320.69
15.900	405.00	832.0	127436.0	128708.8	636.42	1320.66
16.000	383.00	788.0	127009.9	128224.0	607.01	1320.63
16.100	368.00	751.0	126603.1	127760.9	578.92	1320.60
16.200	353.00	721.0	126219.3	127324.1	552.42	1320.57
16.300	337.00	690.0	125854.8	126909.3	527.25	1320.54
16.400	322.00	659.0	125507.2	126513.8	503.26	1320.52
16.500	307.00	629.0	125175.5	126136.2	480.36	1320.49
16.600	297.00	604.0	124862.1	125779.5	458.72	1320.47
16.700	286.00	583.0	124568.2	125445.1	438.43	1320.45
16.800	276.00	562.0	124291.6	125130.2	419.33	1320.43
16.900	265.00	541.0	124030.0	124832.6	401.27	1320.41
17.000	255.00	520.0	123781.8	124550.0	384.13	1320.39
17.100	248.00	503.0	123548.7	124284.8	368.04	1320.37
17.200	241.00	489.0	123331.6	124037.7	353.05	1320.36
17.300	235.00	476.0	123129.4	123807.6	339.09	1320.34
17.400	228.00	463.0	122940.3	123592.4	326.04	1320.33
17.500	221.00	449.0	122761.9	123389.3	313.72	1320.32
17.600	216.00	437.0	122594.6	123198.9	302.16	1320.30
17.700	211.00	427.0	122438.8	123021.6	291.41	1320.29
17.800	206.00	417.0	122293.1	122855.8	281.35	1320.28
17.900	201.00	407.0	122156.3	122700.1	271.90	1320.27
18.000	196.00	397.0	122027.3	122553.3	263.00	1320.26
18.100	193.00	389.0	121906.9	122416.3	254.69	1320.25
18.200	191.00	384.0	121796.7	122290.9	247.08	1320.24
18.300	188.00	379.0	121695.5	122175.7	240.09	1320.24
18.400	186.00	374.0	121602.2	122069.5	233.65	1320.23
18.500	183.00	369.0	121515.9	121971.2	227.69	1320.22
18.600	180.00	363.0	121434.7	121878.9	222.08	1320.22
18.700	178.00	358.0	121359.0	121792.7	216.86	1320.21
18.800	175.00	353.0	121288.1	121712.0	211.96	1320.21
18.900	173.00	348.0	121221.3	121636.1	207.35	1320.20
19.000	170.00	343.0	121154.4	121564.3	204.95	1320.20
19.100	168.00	338.0	121083.9	121492.4	204.29	1320.19
19.200	165.00	333.0	121009.7	121416.9	203.59	1320.19
19.300	162.00	327.0	120931.0	121336.7	202.85	1320.18
19.400	160.00	322.0	120848.9	121253.0	202.07	1320.18
19.500	158.00	318.0	120764.3	121166.9	201.28	1320.17
19.600	155.00	313.0	120676.4	121077.3	200.45	1320.16
19.700	152.00	307.0	120584.2	120983.4	199.58	1320.16
19.800	150.00	302.0	120488.9	120886.2	198.69	1320.15
19.900	148.00	298.0	120391.3	120786.9	197.77	1320.14
20.000	145.00	293.0	120290.7	120684.3	196.82	1320.13

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	143.00	288.0	120187.0	120578.7	195.84	1320.13
20.200	142.00	285.0	120082.3	120472.0	194.86	1320.12
20.300	140.00	282.0	119976.5	120364.3	193.86	1320.11
20.400	138.00	278.0	119868.8	120254.5	192.85	1320.10
20.500	136.00	274.0	119759.2	120142.8	191.82	1320.10
20.600	135.00	271.0	119648.7	120030.2	190.78	1320.09
20.700	133.00	268.0	119537.2	119916.7	189.73	1320.08
20.800	131.00	264.0	119423.9	119801.2	188.66	1320.07
20.900	130.00	261.0	119309.7	119684.9	187.59	1320.06
21.000	128.00	258.0	119194.7	119567.7	186.50	1320.05
21.100	126.00	254.0	119077.9	119448.7	185.40	1320.05
21.200	125.00	251.0	118960.3	119328.9	184.30	1320.04
21.300	123.00	248.0	118841.9	119208.3	183.18	1320.03
21.400	121.00	244.0	118721.8	119085.9	182.05	1320.02
21.500	120.00	241.0	118601.0	118962.8	180.92	1320.01
21.600	118.00	238.0	118479.4	118839.0	179.77	1320.00
21.700	116.00	234.0	118356.2	118713.4	178.61	1319.99
21.800	114.00	230.0	118231.3	118586.2	177.44	1319.98
21.900	113.00	227.0	118105.8	118458.3	176.26	1319.98
22.000	111.00	224.0	117979.7	118329.8	175.07	1319.97
22.100	109.00	220.0	117852.0	118199.7	173.87	1319.96
22.200	107.00	216.0	117722.7	118068.0	172.65	1319.95
22.300	105.00	212.0	117591.8	117934.7	171.42	1319.94
22.400	102.00	207.0	117458.5	117798.8	170.16	1319.93
22.500	100.00	202.0	117322.7	117660.5	168.88	1319.92
22.600	98.00	198.0	117185.5	117520.7	167.59	1319.91
22.700	96.00	194.0	117047.0	117379.5	166.29	1319.90
22.800	94.00	190.0	116907.0	117237.0	164.97	1319.89
22.900	92.00	186.0	116765.7	117093.0	163.64	1319.88
23.000	90.00	182.0	116623.1	116947.7	162.30	1319.87
23.100	88.00	178.0	116479.3	116801.1	160.95	1319.86
23.200	86.00	174.0	116334.1	116653.3	159.58	1319.85
23.300	83.00	169.0	116186.7	116503.1	158.19	1319.84
23.400	81.00	164.0	116037.1	116350.7	156.78	1319.82
23.500	79.00	160.0	115886.4	116197.1	155.37	1319.81
23.600	77.00	156.0	115734.5	116042.4	153.94	1319.80
23.700	75.00	152.0	115581.6	115886.5	152.50	1319.79
23.800	73.00	148.0	115427.5	115729.6	151.05	1319.78
23.900	71.00	144.0	115272.3	115571.5	149.58	1319.77
24.000	68.00	139.0	115115.1	115411.3	148.10	1319.76
24.100	66.00	134.0	114955.9	115249.1	146.61	1319.75
24.200	64.00	130.0	114795.7	115085.9	145.10	1319.73
24.300	62.00	126.0	114634.5	114921.7	143.58	1319.72
24.400	60.00	122.0	114472.4	114756.5	142.06	1319.71
24.500	58.00	118.0	114309.4	114590.4	140.52	1319.70
24.600	56.00	114.0	114145.4	114423.4	138.98	1319.69

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	54.00	110.0	113980.5	114255.4	137.43	1319.68
24.800	52.00	106.0	113814.8	114086.5	135.87	1319.66
24.900	49.00	101.0	113647.2	113915.8	134.29	1319.65
25.000	47.00	96.0	113477.8	113743.2	132.69	1319.64
25.100	45.00	92.0	113307.7	113569.8	131.09	1319.63
25.200	43.00	88.0	113136.7	113395.7	129.48	1319.61
25.300	41.00	84.0	112965.0	113220.7	127.87	1319.60
25.400	39.00	80.0	112792.5	113045.0	126.24	1319.59
25.500	37.00	76.0	112619.2	112868.5	124.61	1319.58
25.600	34.00	71.0	112444.3	112690.2	122.97	1319.56
25.700	32.00	66.0	112267.7	112510.3	121.30	1319.55
25.800	30.00	62.0	112090.4	112329.7	119.64	1319.54
25.900	28.00	58.0	111912.5	112148.4	117.96	1319.52

****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1318.20 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 1924.00 cfs
Peak Outflow = 1075.22 cfs
Peak Elevation = 1321.13 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 389.14 ac-ft
Peak Storage From Storm = 168.17 ac-ft

Total Storage in Pond = 557.30 ac-ft

Warning: Inflow hydrograph truncated on left side.
Warning: Inflow hydrograph truncated on right side.

Pond File: CRULKPND.PND
Inflow Hydrograph: CRUISL00.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 10-07-2009
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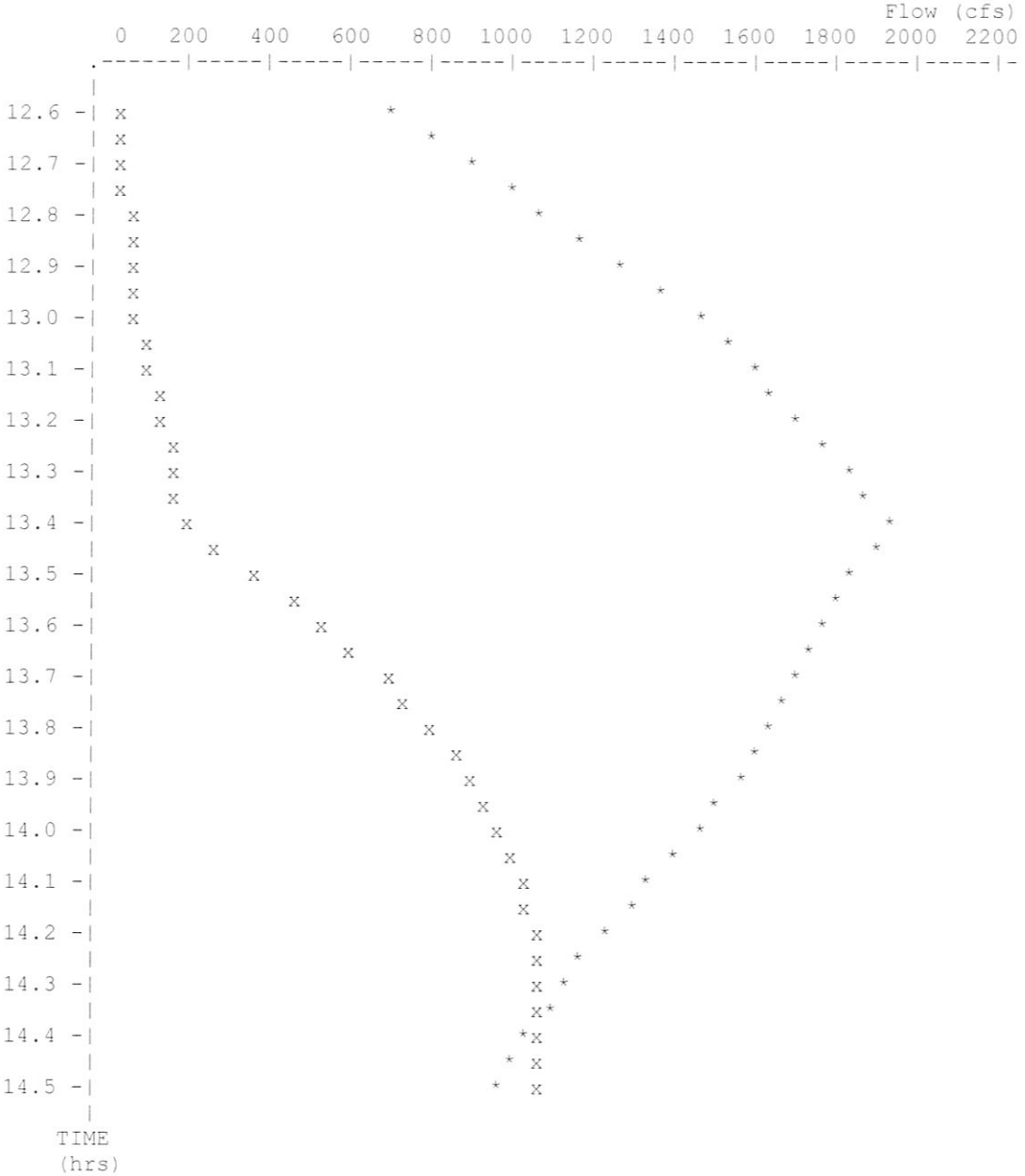
Peak Inflow = 1924.00 cfs
Peak Outflow = 1075.22 cfs
Peak Elevation = 1321.13 ft



* File: CRUISL00.HYD Qmax = 1924.0 cfs
x File: OUT .HYD Qmax = 1075.2 cfs

8'x8' RCB

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
38.00	38.00	1311.31	1.521	0.0*	1-S2n	0.583	0.890	0.590	0.637	8.049	2.983
45.80	45.80	1311.52	1.728	0.0*	1-S2n	0.702	1.008	0.707	0.714	8.097	3.207
53.60	53.60	1311.71	1.921	0.0*	1-S2n	0.812	1.120	0.814	0.787	8.236	3.406
61.40	61.40	1311.89	2.101	0.0*	1-S2n	0.876	1.226	0.885	0.856	8.676	3.586
69.20	69.20	1312.06	2.273	0.0*	1-S2n	0.940	1.327	0.947	0.922	9.131	3.754
77.00	77.00	1312.23	2.435	0.0*	1-S2n	1.004	1.425	1.015	0.985	9.480	3.909
80.00	80.00	1312.29	2.496	0.0*	1-S2n	1.029	1.462	1.052	1.009	9.505	3.966
92.60	92.60	1312.53	2.743	0.0*	1-S2n	1.132	1.612	1.152	1.105	10.049	4.189
100.40	100.40	1312.69	2.899	0.0*	1-S2n	1.196	1.701	1.200	1.162	10.457	4.318
108.20	108.20	1312.84	3.049	3.049	1-S1f	1.261	1.788	1.788	1.218	7.564	4.440
116.00	116.00	1312.99	3.195	3.195	1-S1f	1.325	1.873	1.873	1.272	7.741	4.559

8'x8' RCB

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
168.00	168.00	1313.87	4.077	4.077	1-S1f	1.724	2.398	2.398	1.608	8.758	5.223
181.20	181.20	1314.07	4.281	4.281	1-S1f	1.813	2.522	2.522	1.687	8.982	5.370
194.40	194.40	1314.27	4.480	4.480	1-S1f	1.901	2.643	2.643	1.765	9.195	5.508
207.60	207.60	1314.46	4.675	4.675	1-S1f	1.990	2.761	2.761	1.841	9.399	5.639
220.80	220.80	1314.66	4.865	4.865	1-S1f	2.078	2.877	2.877	1.915	9.594	5.766
234.00	234.00	1314.84	5.053	5.053	1-S1f	2.167	2.990	2.990	1.988	9.781	5.886
247.20	247.20	1315.03	5.236	5.236	1-S1f	2.255	3.102	3.102	2.059	9.962	6.004
260.40	260.40	1315.21	5.416	5.416	1-S1f	2.344	3.211	3.211	2.128	10.136	6.117
273.60	273.60	1315.38	5.594	5.594	1-S1f	2.429	3.319	3.319	2.198	10.305	6.223
278.00	278.00	1315.44	5.652	5.652	1-S1f	2.456	3.354	3.354	2.220	10.360	6.260
300.00	300.00	1315.73	5.941	5.941	1-S1f	2.588	3.529	3.529	2.333	10.626	6.429

****

Inlet Elevation (invert): 1309.79 ft, Outlet Elevation (invert): 1303.00 ft

Culvert Length: 916.03 ft, Culvert Slope: 0.0074

****

8'x8' RCB

8.5'ϕ Smooth Pipe (Metal)

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
38.00	38.00	1311.77	1.984	0.0*	1-S2n	1.067	1.427	1.117	0.637	8.332	2.983
45.80	45.80	1311.99	2.199	0.0*	1-S2n	1.166	1.605	1.195	0.714	9.102	3.207
53.60	53.60	1312.18	2.392	0.0*	1-S2n	1.266	1.751	1.341	0.787	9.061	3.406
61.40	61.40	1312.35	2.562	0.0*	1-S2n	1.365	1.861	1.451	0.856	9.331	3.586
69.20	69.20	1312.51	2.725	0.0*	1-S2n	1.464	1.972	1.471	0.922	10.335	3.754
77.00	77.00	1312.67	2.881	0.0*	1-S2n	1.563	2.082	1.572	0.985	10.539	3.909
80.00	80.00	1312.73	2.939	0.0*	1-S2n	1.601	2.124	1.614	1.009	10.580	3.966
92.60	92.60	1312.97	3.178	0.0*	1-S2n	1.738	2.302	1.742	1.105	11.112	4.189
100.40	100.40	1313.11	3.320	0.0*	1-S2n	1.799	2.412	1.802	1.162	11.370	4.318
108.20	108.20	1313.25	3.460	0.0*	1-S2n	1.860	2.523	1.873	1.218	11.578	4.440
116.00	116.00	1313.38	3.590	0.0*	1-S2n	1.921	2.611	1.941	1.272	11.780	4.559

8.5'ϕ Smooth Pipe (Metal)

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
168.00	168.00	1314.19	4.398	0.0*	1-S2n	2.329	3.152	2.342	1.608	13.137	5.223
181.20	181.20	1314.41	4.616	0.0*	1-S2n	2.432	3.289	2.439	1.687	13.420	5.370
194.40	194.40	1314.62	4.827	4.827	1-S1f	2.536	3.421	3.421	1.765	9.099	5.508
207.60	207.60	1314.82	5.032	5.032	1-S1f	2.618	3.531	3.531	1.841	9.310	5.639
220.80	220.80	1315.02	5.230	5.230	1-S1f	2.698	3.640	3.640	1.915	9.507	5.766
234.00	234.00	1315.21	5.422	5.422	1-S1f	2.777	3.750	3.750	1.988	9.689	5.886
247.20	247.20	1315.40	5.610	5.610	1-S1f	2.856	3.860	3.860	2.059	9.857	6.004
260.40	260.40	1315.58	5.792	5.792	1-S1f	2.936	3.970	3.970	2.128	10.014	6.117
273.60	273.60	1315.76	5.971	5.971	1-S1f	3.015	4.079	4.079	2.198	10.159	6.223
278.00	278.00	1315.82	6.030	6.030	1-S1f	3.041	4.116	4.116	2.220	10.206	6.260
300.00	300.00	1316.11	6.318	6.318	1-S1f	3.174	4.291	4.291	2.333	10.447	6.429

* theoretical depth is impractical. Depth reported is corrected.

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Inlet Elevation (invert): 1309.79 ft, Outlet Elevation (invert): 1303.00 ft

Culvert Length: 916.03 ft, Culvert Slope: 0.0074

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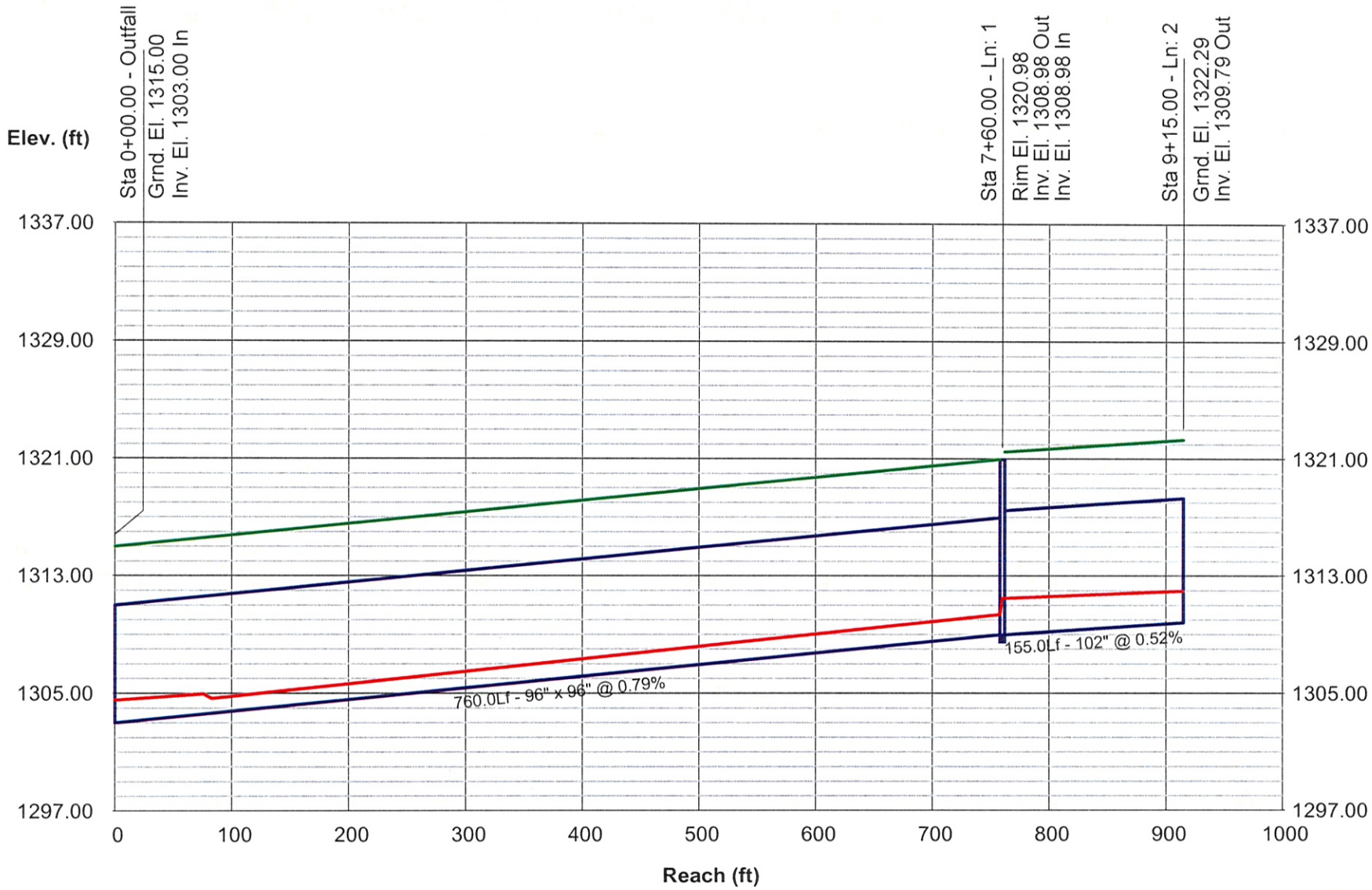
8.5' ϕ Smooth Pipe (Metal)

Storm Sewer Profile

Proj. file: rcb-5yr.stm

5-YR Storm



Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	96 96 b	73.89	1303.00	1304.55	1.55	12.40	5.96	0.55	1305.10	n/a	760	1308.98	1310.36 j	1.38**	11.07	6.67	0.69	1311.06i	n/a	n/a	n/a	0.15	n/a
2	102	80.07	1308.98	1311.47	2.49	13.88	5.77	0.52	1311.99	0.135	155	1309.79	1311.97	2.18**	11.47	6.98	0.76	1312.72	0.231	0.183	n/a	1.00	n/a

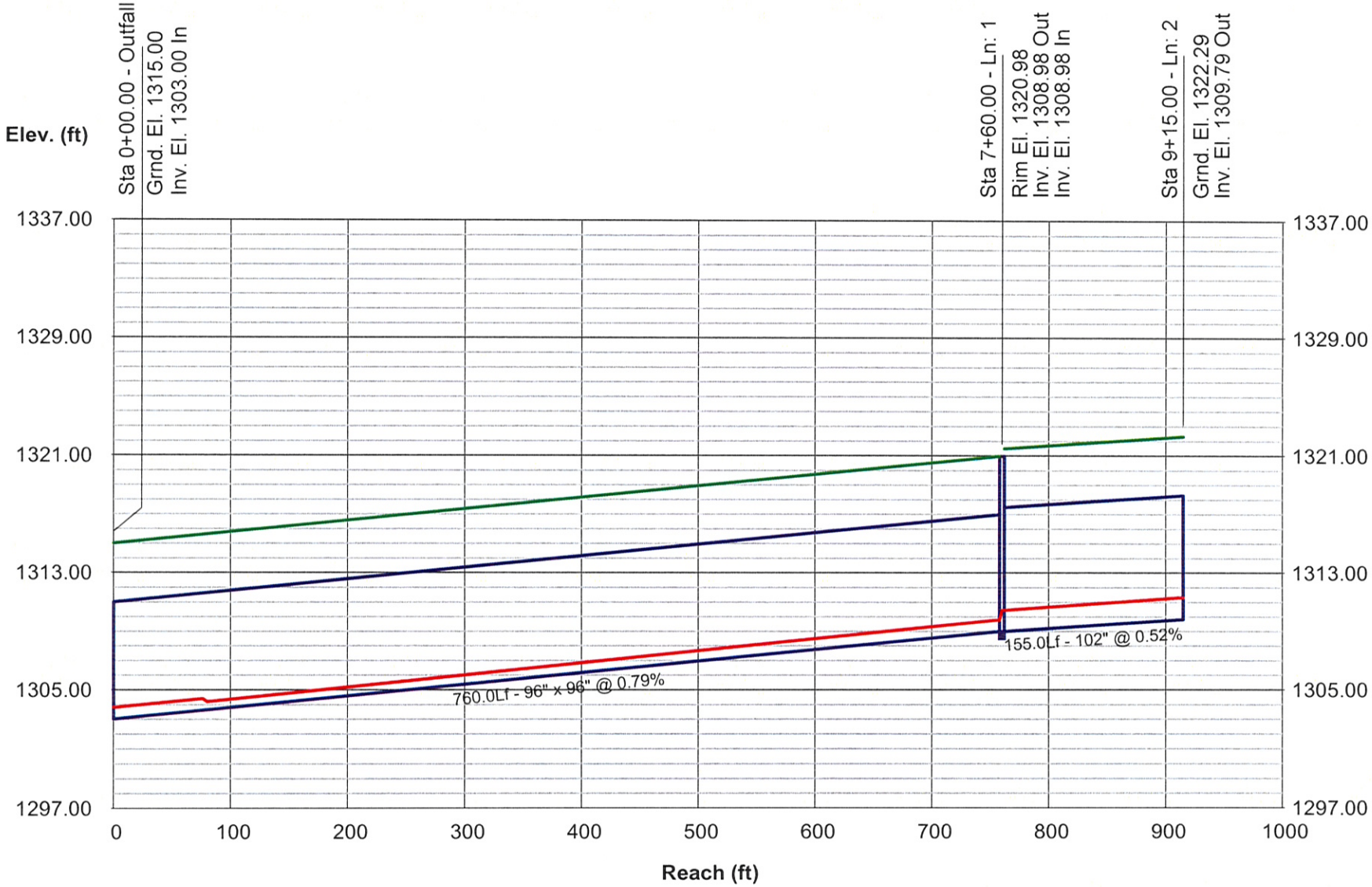
Project File: rcb-5yr.stm | Number of lines: 2 | Run Date: 10-14-2009

Notes: ; ** Critical depth.; j-Line contains hyd. jump.

Storm Sewer Profile

Proj. file: rcb.stm

2-YR. Storm



Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	96 96 b	32.48	1303.00	1303.81	0.81	6.48	5.01	0.39	1304.20	n/a	760	1308.98	1309.78 j	0.80**	6.40	5.07	0.40	1310.18i	n/a	n/a	n/a	0.15	n/a
2	102	38.14	1308.98	1310.42	1.44	6.37	5.99	0.56	1310.98	0.276	155	1309.79	1311.29	1.50**	6.76	5.64	0.49	1311.79	0.233	0.255	n/a	1.00	0.49

Project File: rcb.stm | Number of lines: 2 | Run Date: 10-14-2009

Notes: ; ** Critical depth.; j-Line contains hyd. jump.

Hydraflow HGL Computation Procedure

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Appendix E
East Detention Pond Calculations

Culvert Calculator Report
East Detention Pond

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	1,320.45	ft	Headwater Depth/Height	2.78	
Computed Headwater Elev	1,320.45	ft	Discharge	36.75	cfs
Inlet Control HW Elev.	1,318.20	ft	Tailwater Elevation	1,318.20	ft
Outlet Control HW Elev.	1,320.45	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,313.50	ft	Downstream Invert	1,312.75	ft
Length	150.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	5.45	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	2.05	ft
Velocity Downstream	7.49	ft/s	Critical Slope	0.007995	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,320.45	ft	Upstream Velocity Head	0.87	ft
Ke	0.20		Entrance Loss	0.17	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,318.20	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	4.9	ft²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

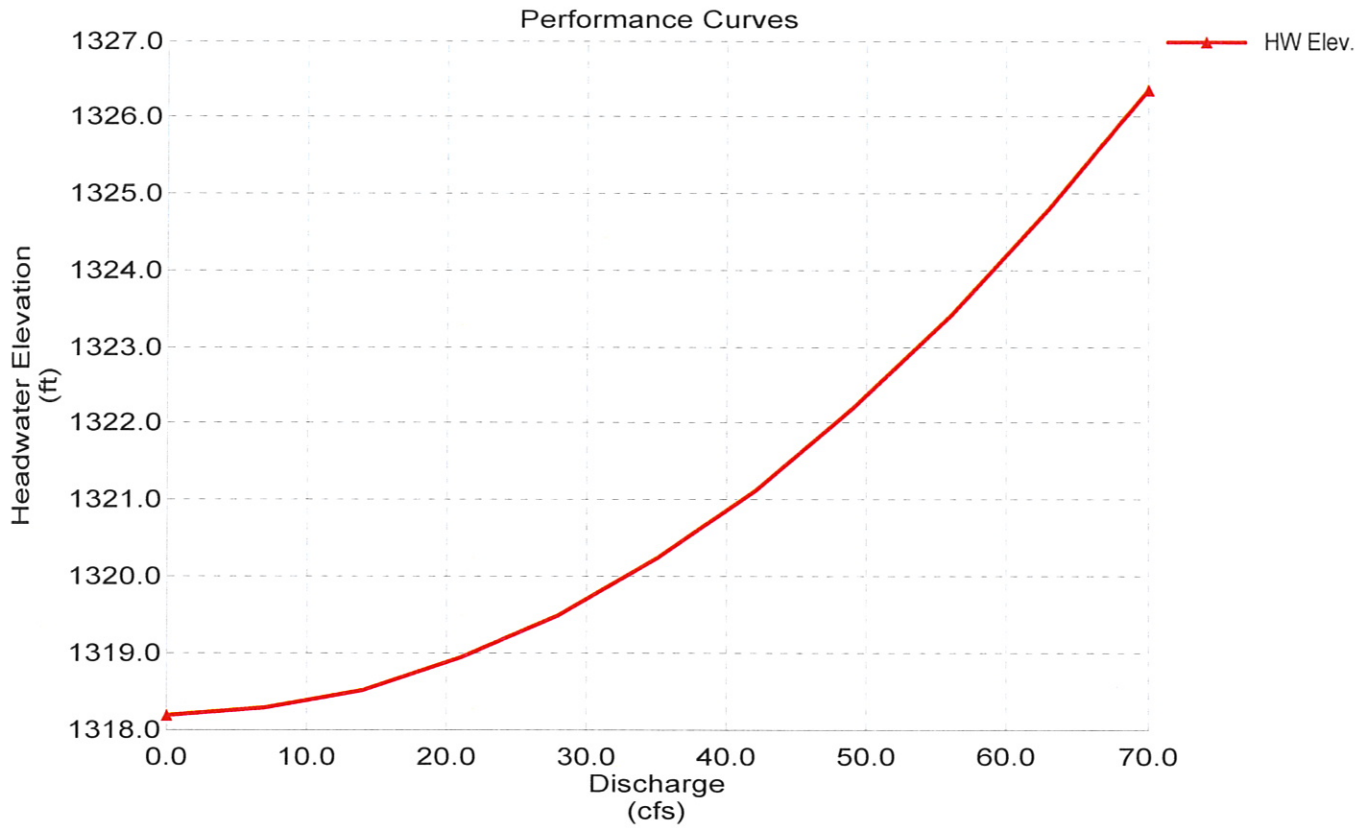
Rating Table Report
East Detention Pond

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	70.00	7.00	cfs

Discharge (cfs)	HW Elev. (ft)
0.00	1,318.20
7.00	1,318.28
14.00	1,318.53
21.00	1,318.93
28.00	1,319.51
35.00	1,320.24
42.00	1,321.14
49.00	1,322.20
56.00	1,323.42
63.00	1,324.81
70.00	1,326.36

Performance Curves Report
East Detention Pond

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	70.00	7.00	cfs



POND-2 Version: 5.21
S/N:

Wichita Readiness Center
East Detention Pond

CALCULATED 09-08-2009 14:44:13
DISK FILE: 95030EVO.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume * (acre-ft)	Volume Sum (acre-ft)
1,313.90	0.00	0.00	0.00	0.00	0.00
1,314.00	150.00	0.00	0.00	0.00	0.00
1,315.00	3,491.00	0.08	0.10	0.03	0.03
1,316.00	10,964.00	0.25	0.47	0.16	0.19
1,317.00	18,892.00	0.43	1.02	0.34	0.53
1,318.00	27,569.00	0.63	1.59	0.53	1.06
1,319.00	38,151.00	0.88	2.25	0.75	1.81
1,320.00	51,271.00	1.18	3.07	1.02	2.83
1,321.00	63,961.00	1.47	3.96	1.32	4.15
1,322.00	83,299.00	1.91	5.06	1.69	5.84

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
1313.90	0.0	
1314.15	0.0	
1314.40	0.0	
1314.65	0.0	
1314.90	0.0	
1315.15	1.2	5
1315.40	2.0	5
1315.65	2.6	5
1315.90	3.0	5
1316.15	3.4	5
1316.40	3.8	5
1316.65	4.1	5
1316.90	4.4	5
1317.15	4.7	5
1317.40	4.9	5
1317.65	5.2	5
1317.90	5.4	5
1318.15	5.6	5
1318.40	5.9	5
1318.65	6.1	5
1318.90	6.3	5
1319.15	6.5	5
1319.40	6.7	5
1319.65	7.7	5 +10
1319.90	12.9	5 +10
1320.15	20.4	5 +10
1320.40	28.1	5 +10
1320.65	35.2	5 +10
1320.90	42.3	5 +10
1321.15	49.4	5 +10
1321.40	54.3	5 +10
1321.65	57.5	5 +10
1321.90	60.5	5 +10
1322.00	0.0	

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
****

Outlet Structure File: 95030EST.STR
Planimeter Input File: 95030EVO.VOL
Rating Table Output File: 95030EPD.PND

Min. Elev.(ft) = 1313.9 Max. Elev.(ft) = 1322 Incr.(ft) = .25

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
ORIFICE	5			->	5
STAND PIPE	10	+	5	->	10

Outflow rating table summary was stored in file:
95030EPD.PND

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond

****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	1315.00
E2 elev.(ft)?	1322.00
Orifice coeff.?	.6
Invert elev.(ft)?	1315.00
Datum elev.(ft) ?	1315.00
Orifice area (sq ft)?	.66

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond

****

>>>>>> Structure No. 10 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 1318.20
E2 elev.(ft)? 1322
Crest elev.(ft)? 1319.55
Diameter (ft)? 3.0
Weir coefficient? 3
Orifice coefficient? .60
Start transition elev.(ft) @ ?
Transition height (ft)? 1

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
****

Outflow Rating Table for Structure #5
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
1313.90	0.0	E < E1=1315.00
1314.15	0.0	E < E1=1315.00
1314.40	0.0	E < E1=1315.00
1314.65	0.0	E < E1=1315.00
1314.90	0.0	E < E1=1315.00
1315.15	1.2	H =.15
1315.40	2.0	H =.4
1315.65	2.6	H =.65
1315.90	3.0	H =.9
1316.15	3.4	H =1.15
1316.40	3.8	H =1.4
1316.65	4.1	H =1.65
1316.90	4.4	H =1.9
1317.15	4.7	H =2.15
1317.40	4.9	H =2.4
1317.65	5.2	H =2.65
1317.90	5.4	H =2.9
1318.15	5.6	H =3.15
1318.40	5.9	H =3.4
1318.65	6.1	H =3.65
1318.90	6.3	H =3.9
1319.15	6.5	H =4.15
1319.40	6.7	H =4.4
1319.65	6.9	H =4.65
1319.90	7.0	H =4.9
1320.15	7.2	H =5.15
1320.40	7.4	H =5.4
1320.65	7.6	H =5.65
1320.90	7.7	H =5.9
1321.15	7.9	H =6.15
1321.40	8.0	H =6.4
1321.65	8.2	H =6.65
1321.90	8.3	H =6.9
1322.00	0.0	E = or > E2=1322.00

C = .6 A = .66 sq.ft.
H (ft) = Table elev. - Datum elev. (1315 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond

****

Outflow Rating Table for Structure #10
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
1313.90	0.0	E < Inv.El.= 1319.55
1314.15	0.0	E < El=1318.20
1314.40	0.0	E < El=1318.20
1314.65	0.0	E < El=1318.20
1314.90	0.0	E < El=1318.20
1315.15	0.0	E < El=1318.20
1315.40	0.0	E < El=1318.20
1315.65	0.0	E < El=1318.20
1315.90	0.0	E < El=1318.20
1316.15	0.0	E < El=1318.20
1316.40	0.0	E < El=1318.20
1316.65	0.0	E < El=1318.20
1316.90	0.0	E < El=1318.20
1317.15	0.0	E < El=1318.20
1317.40	0.0	E < El=1318.20
1317.65	0.0	E < El=1318.20
1317.90	0.0	E < El=1318.20
1318.15	0.0	E < El=1318.20
1318.40	0.0	E < Inv.El.= 1319.55
1318.65	0.0	E < Inv.El.= 1319.55
1318.90	0.0	E < Inv.El.= 1319.55
1319.15	0.0	E < Inv.El.= 1319.55
1319.40	0.0	E < Inv.El.= 1319.55
1319.65	0.9	Weir: H =.1
1319.90	5.9	Weir: H =.35
1320.15	13.1	Weir: H =.6
1320.40	20.7	Transition: H =.85
1320.65	27.7	Transition: H =1.1
1320.90	34.6	Transition: H =1.35
1321.15	41.5	Transition: H =1.6
1321.40	46.3	Orifice: H =1.85
1321.65	49.3	Orifice: H =2.1

Outlet Structure File: 95030EST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #10
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
1321.90	52.2	Orifice: H =2.35
1322.00	0.0	E = or > E2=1322

Weir Cw = 3 Weir length = 9.424779 ft
Orifice Co = .6 Orifice area = 7.068584 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 1320.254 and 1321.254 ft
Weir equation = Orifice equation @ elev.= 1320.754 ft

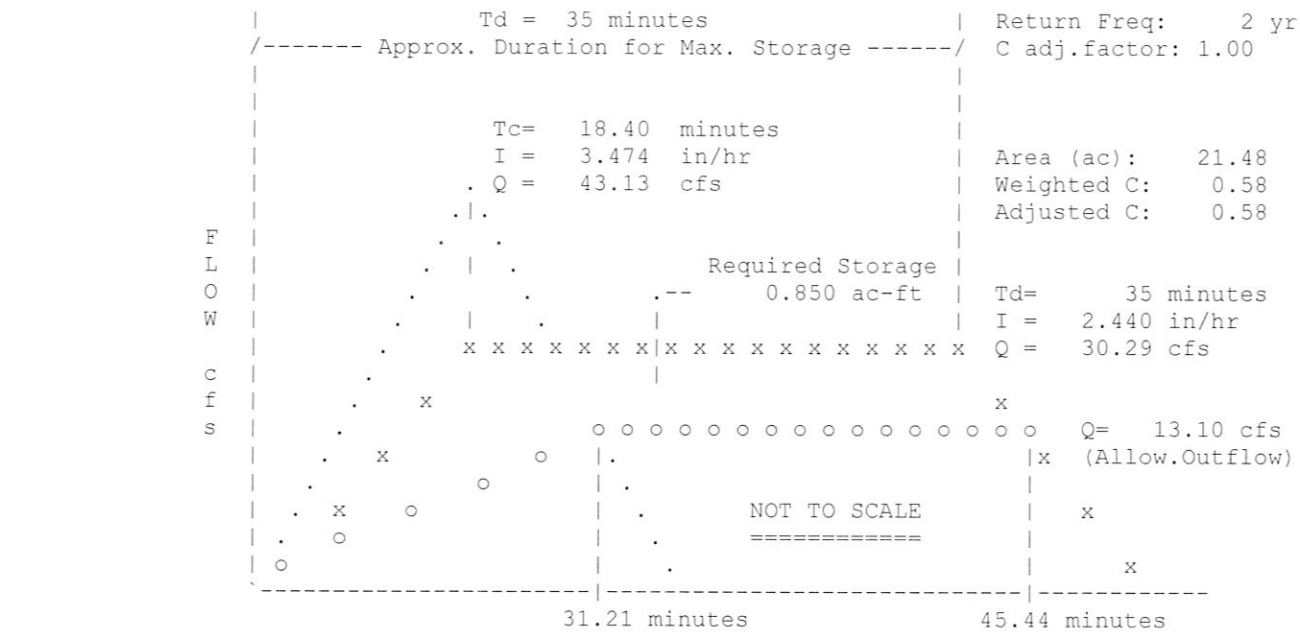
Quick TR-55 Ver.5.46 S/N:
Executed: 14:46:57 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
02 -Year Storm Event

```
*************************************************************************
*  RETURN FREQUENCY:   2 yr    |  Allowable Outflow:    13.10 cfs    *
*  'C' Adjustment: 1.000       |  Required Storage:     0.850 ac-ft  *
*-----------------------------------------------------------------------*
*  Peak Inflow:   30.29 cfs       Inflow .HYD stored: 95030E02.HYD   *
*************************************************************************
```



Quick TR-55 Ver.5.46 S/N:
Executed: 14:46:57 09-08-2009

Wichita Readiness Center
East Detention Pond
02 -Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
total	0.578	21.48						
			18.40	0.578	0.578	3.474	21.48	43.13

Quick TR-55 Ver.5.46 S/N:
Executed: 14:46:57 09-08-2009

Wichita Readiness Center
East Detention Pond
02 -Year Storm Event

**** Modified Rational Hydrograph *****
Weighted C = 0.578 Area= 21.480 acres Tc = 18.40 minutes

Adjusted C = 0.578 Td= 35.00 min. I= 2.44 in/hr Qp= 30.29 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 95030E02.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.007	0.66	2.30	3.95	5.60	7.24	8.89	10.54
0.123	12.18	13.83	15.48	17.12	18.77	20.42	22.06
0.240	23.71	25.35	27.00	28.65	30.29	30.29	30.29
0.357	30.29	30.29	30.29	30.29	30.29	30.29	30.29
0.473	30.29	30.29	30.29	30.29	30.29	30.29	30.29
0.590	29.64	27.99	26.34	24.70	23.05	21.40	19.76
0.707	18.11	16.46	14.82	13.17	11.52	9.88	8.23
0.823	6.59	4.94	3.29	1.65	0.00		

Quick TR-55 Ver.5.46 S/N:
Executed: 14:46:57 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
02 -Year Storm Event

Area = 21.48 acres Tc = 18.40 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
2	0.578	35	2.440	30.29	13.10	1.460	0.850

Quick TR-55 Ver.5.46 S/N:
Executed: 14:46:57 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
02 -Year Storm Event

RETURN FREQUENCY: 2 yr `C' Adjustment = 1.000 Allowable Q = 13.10 cfs

Hydrograph file duration= 35.00 minutes
Hydrograph file: 95030E02.HYD Tc = 18.40 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.578	0.578	18	3.474	21.48	43.13	1.093	0.761
0.578	0.578	20	3.330	21.48	41.34	1.139	0.780
0.578	0.578	30	2.670	21.48	33.15	1.370	0.844
0.578	0.578	35	2.440	21.48	30.29	1.460	0.850
0.578	0.578	40	2.240	21.48	27.81	1.532	0.838
0.578	0.578	50	1.950	21.48	24.21	1.667	0.805
0.578	0.578	60	1.690	21.48	20.98	1.734	0.705

Storage Maximum

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* 02-Year Storm Event *
* *
* *
****

Inflow Hydrograph: 95030E02.HYD
Rating Table file: 95030EPD.PND

----INITIAL CONDITIONS----
Elevation = 1313.90 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1313.90	0.0	0.000	0.0	0.0
1314.15	0.0	0.001	1.4	1.4
1314.40	0.0	0.005	6.8	6.8
1314.65	0.0	0.013	18.2	18.2
1314.90	0.0	0.026	37.9	37.9
1315.15	1.2	0.047	68.2	69.4
1315.40	2.0	0.077	111.1	113.1
1315.65	2.6	0.116	168.6	171.2
1315.90	3.0	0.167	243.0	246.0
1316.15	3.4	0.231	335.4	338.8
1316.40	3.8	0.305	443.2	447.0
1316.65	4.1	0.391	567.0	571.1
1316.90	4.4	0.488	708.0	712.4
1317.15	4.7	0.597	866.9	871.6
1317.40	4.9	0.718	1042.9	1047.8
1317.65	5.2	0.852	1236.6	1241.8
1317.90	5.4	0.998	1448.9	1454.3
1318.15	5.6	1.158	1680.7	1686.3
1318.40	5.9	1.332	1933.2	1939.1
1318.65	6.1	1.521	2207.5	2213.6
1318.90	6.3	1.725	2504.3	2510.6
1319.15	6.5	1.946	2824.9	2831.4
1319.40	6.7	2.184	3171.2	3177.9
1319.65	8.5	2.442	3544.5	3553.0
1319.90	14.2	2.718	3945.7	3959.9
1320.15	22.0	3.014	4375.1	4397.1
1320.40	29.5	3.327	4830.2	4859.7
1320.65	36.6	3.659	5311.4	5348.0
1320.90	43.7	4.009	5819.6	5863.3
1321.15	50.8	4.379	6357.1	6407.9
1321.40	55.0	4.775	6932.2	6987.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1321.65	58.1	5.199	7547.1	7605.2
1321.90	61.1	5.651	8203.1	8264.2

Time increment (t) = 0.017 hrs.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E02.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.007	0.66	-----	0.0	0.0	0.00	1313.90
0.023	2.30	3.0	3.0	3.0	0.00	1314.22
0.040	3.95	6.3	9.2	9.2	0.00	1314.45
0.057	5.60	9.6	18.8	18.8	0.00	1314.66
0.073	7.24	12.8	31.6	31.6	0.00	1314.82
0.090	8.89	16.1	47.0	47.7	0.37	1314.98
0.107	10.54	19.4	64.2	66.4	1.09	1315.13
0.123	12.18	22.7	83.9	87.0	1.52	1315.25
0.140	13.83	26.0	106.0	109.9	1.94	1315.38
0.157	15.48	29.3	130.9	135.4	2.23	1315.50
0.173	17.12	32.6	158.4	163.5	2.52	1315.62
0.190	18.77	35.9	188.9	194.3	2.72	1315.73
0.207	20.42	39.2	222.3	228.1	2.90	1315.84
0.223	22.06	42.5	258.6	264.8	3.08	1315.95
0.240	23.71	45.8	297.9	304.4	3.25	1316.06
0.257	25.35	49.1	340.1	346.9	3.43	1316.17
0.273	27.00	52.4	385.2	392.4	3.60	1316.27
0.290	28.65	55.7	433.3	440.9	3.78	1316.39
0.307	30.29	58.9	484.4	492.2	3.91	1316.49
0.323	30.29	60.6	536.9	545.0	4.04	1316.60

0.340	30.29		60.6	589.2	597.5	4.16	1316.70
0.357	30.29		60.6	641.2	649.8	4.27	1316.79
0.373	30.29		60.6	693.1	701.8	4.38	1316.88
0.390	30.29		60.6	744.7	753.7	4.48	1316.96
0.407	30.29		60.6	796.1	805.3	4.57	1317.05
0.423	30.29		60.6	847.4	856.7	4.67	1317.13
0.440	30.29		60.6	898.5	907.9	4.74	1317.20
0.457	30.29		60.6	949.4	959.0	4.80	1317.27
0.473	30.29		60.6	1000.3	1010.0	4.86	1317.35
0.490	30.29		60.6	1051.0	1060.9	4.92	1317.42
0.507	30.29		60.6	1101.6	1111.6	5.00	1317.48
0.523	30.29		60.6	1152.1	1162.2	5.08	1317.55
0.540	30.29		60.6	1202.3	1212.6	5.15	1317.61
0.557	30.29		60.6	1252.5	1262.9	5.22	1317.67
0.573	30.29		60.6	1302.5	1313.0	5.27	1317.73
0.590	29.64		59.9	1351.8	1362.4	5.31	1317.79
0.607	27.99		57.6	1398.7	1409.4	5.36	1317.85
0.623	26.34		54.3	1442.3	1453.1	5.40	1317.90
0.640	24.70		51.0	1482.4	1493.3	5.43	1317.94
0.657	23.05		47.8	1519.3	1530.2	5.47	1317.98
0.673	21.40		44.5	1552.7	1563.7	5.49	1318.02
0.690	19.76		41.2	1582.8	1593.9	5.52	1318.05
0.707	18.11		37.9	1609.6	1620.7	5.54	1318.08
0.723	16.46		34.6	1633.1	1644.2	5.56	1318.10
0.740	14.82		31.3	1653.2	1664.3	5.58	1318.13

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E02.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.757	13.17	28.0	1670.0	1681.2	5.60	1318.14
0.773	11.52	24.7	1683.4	1694.7	5.61	1318.16
0.790	9.88	21.4	1693.6	1704.8	5.62	1318.17
0.807	8.23	18.1	1700.5	1711.7	5.63	1318.18
0.823	6.59	14.8	1704.0	1715.3	5.63	1318.18
0.840	4.94	11.5	1704.3	1715.5	5.63	1318.18
0.857	3.29	8.2	1701.2	1712.5	5.63	1318.18
0.874	1.65	4.9	1694.9	1706.2	5.62	1318.17
0.890	0.00	1.7	1685.4	1696.6	5.61	1318.16

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E02.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1313.90 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	30.29 cfs
Peak Outflow	=	5.63 cfs
Peak Elevation	=	1318.18 ft

***** Summary of Approximate Peak Storage *****

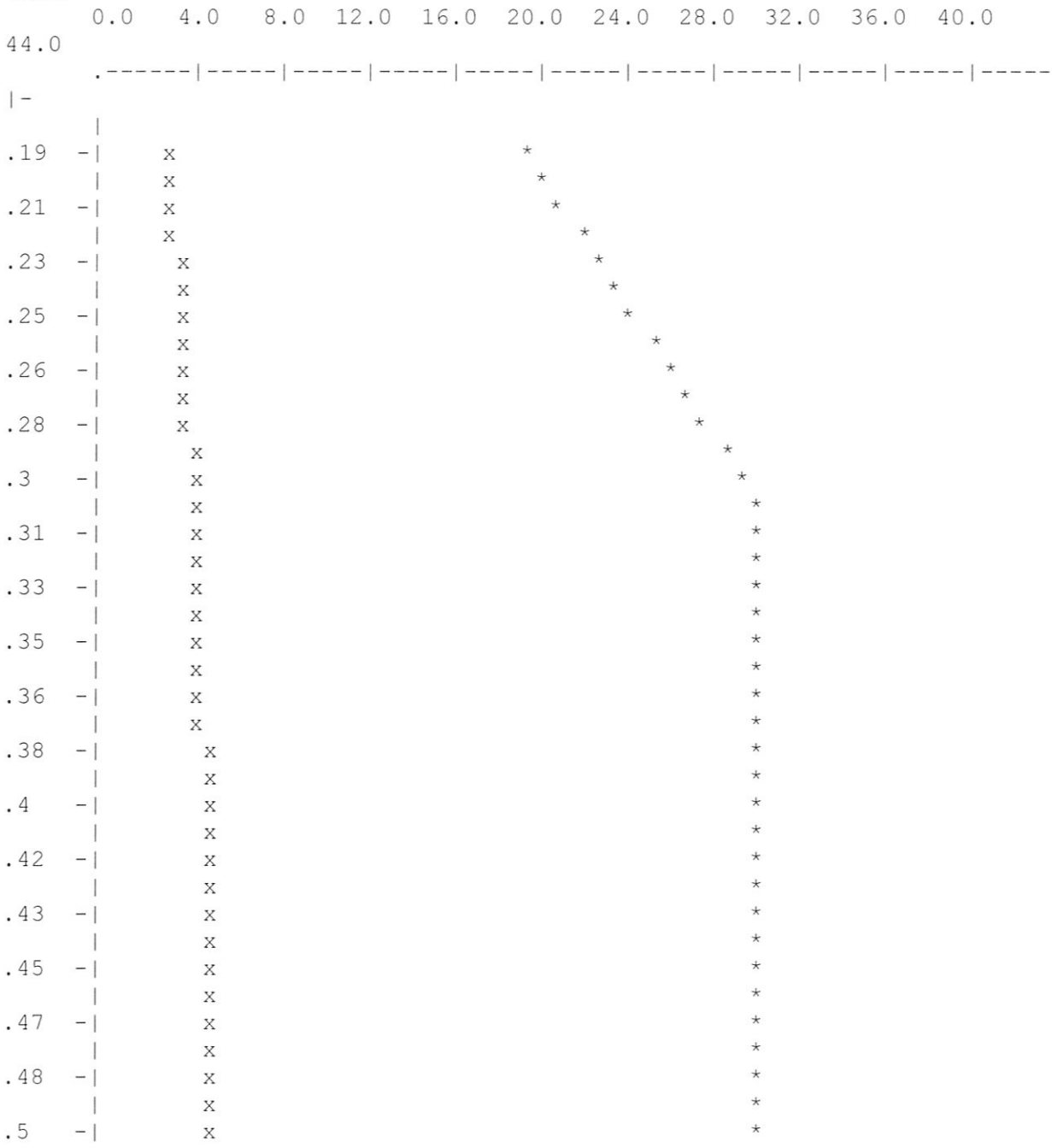
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.18 ac-ft
Total Storage in Pond	=	1.18 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E02.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009

Peak Inflow = 30.29 cfs
14:41:41
Peak Outflow = 5.63 cfs
Peak Elevation = 1318.18 ft



TIME
(hrs)

x File: OUT .HYD Qmax = 5.6 cfs
* File: 95030E02.HYD Qmax = 30.3 cfs

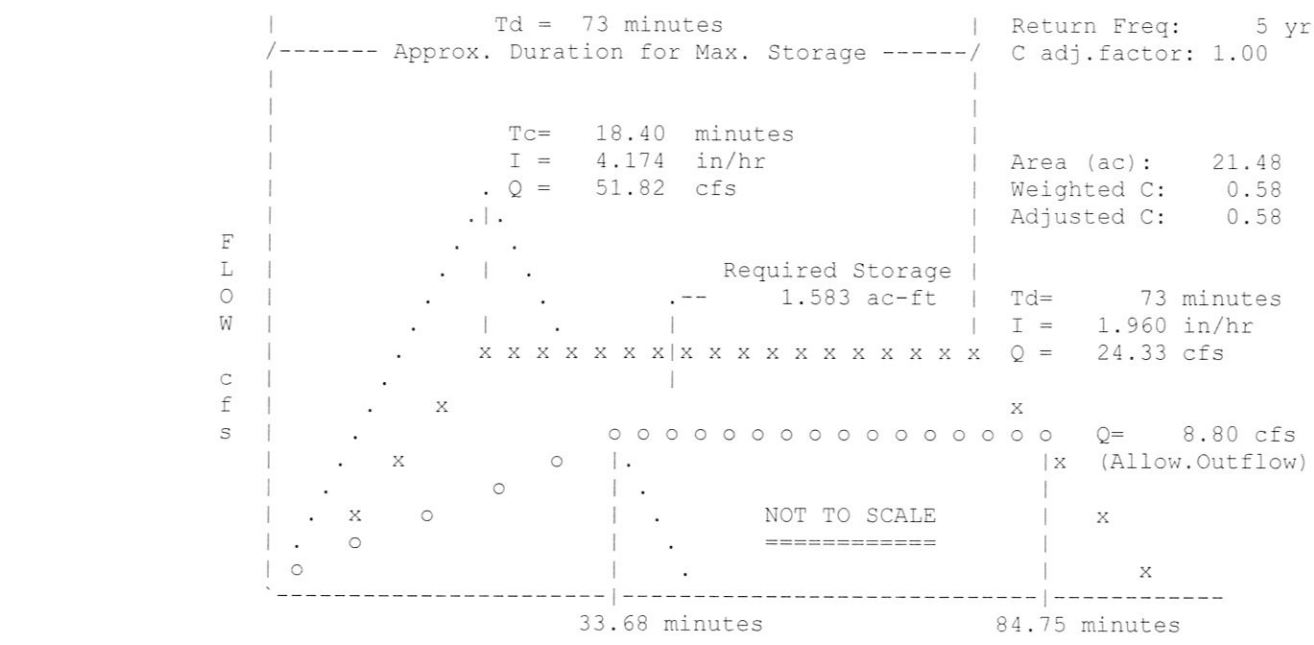
Quick TR-55 Ver.5.46 S/N:
Executed: 14:53:11 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
05 -Year Storm Event

RETURN FREQUENCY: 5 yr	Allowable Outflow: 8.80 cfs
'C' Adjustment: 1.000	Required Storage: 1.583 ac-ft
Peak Inflow: 24.33 cfs	Inflow .HYD stored: 95030E05.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 14:53:11 09-08-2009

Wichita Readiness Center
East Detention Pond
05 -Year Storm Event

**** Modified Rational Hydrograph *****

Weighted C = 0.578 Area= 21.480 acres Tc = 18.40 minutes

Adjusted C = 0.578 Td= 73.00 min. I= 1.96 in/hr Qp= 24.33 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Output file: 95030E05.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 5 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.007	0.53	1.85	3.17	4.50	5.82	7.14	8.46
0.123	9.79	11.11	12.43	13.75	15.08	16.40	17.72
0.240	19.04	20.37	21.69	23.01	24.33	24.33	24.33
0.357	24.33	24.33	24.33	24.33	24.33	24.33	24.33
0.473	24.33	24.33	24.33	24.33	24.33	24.33	24.33
0.590	24.33	24.33	24.33	24.33	24.33	24.33	24.33
0.707	24.33	24.33	24.33	24.33	24.33	24.33	24.33
0.823	24.33	24.33	24.33	24.33	24.33	24.33	24.33
0.940	24.33	24.33	24.33	24.33	24.33	24.33	24.33
1.057	24.33	24.33	24.33	24.33	24.33	24.33	24.33
1.173	24.33	24.33	24.33	23.81	22.48	21.16	19.84
1.290	18.52	17.19	15.87	14.55	13.23	11.90	10.58
1.407	9.26	7.94	6.61	5.29	3.97	2.65	1.32
1.523	0.00						

Quick TR-55 Ver.5.46 S/N:
Executed: 14:53:11 09-08-2009

Wichita Readiness Center
East Detention Pond
05 -Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
total	0.578	21.48						
			18.40	0.578	0.578	4.174	21.48	51.82

Quick TR-55 Ver.5.46 S/N:
Executed: 14:53:11 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
05 -Year Storm Event

Area = 21.48 acres Tc = 18.40 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
5	0.578	73	1.960	24.33	8.80	2.447	1.583

Quick TR-55 Ver.5.46 S/N:
Executed: 14:53:11 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
05 -Year Storm Event

RETURN FREQUENCY: 5 yr `C' Adjustment = 1.000 Allowable Q = 8.80 cfs

Hydrograph file duration= 73.00 minutes
Hydrograph file: 95030E05.HYD Tc = 18.40 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.578	0.578	18	4.174	21.48	51.82	1.313	1.090
0.578	0.578	20	4.330	21.48	53.76	Qpeak > Qtc	
0.578	0.578	30	3.240	21.48	40.23	1.662	1.304
0.578	0.578	40	2.760	21.48	34.27	1.888	1.413
0.578	0.578	50	2.410	21.48	29.92	2.061	1.468
0.578	0.578	60	2.150	21.48	26.69	2.206	1.497
0.578	0.578	73	1.960	21.48	24.33	2.447	1.583

Storage Maximum

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* 5-Year Storm Event *
* *
* *
****

Inflow Hydrograph: 95030E05.HYD
Rating Table file: 95030EPD.PND

----INITIAL CONDITIONS----
Elevation = 1313.90 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1313.90	0.0	0.000	0.0	0.0
1314.15	0.0	0.001	1.4	1.4
1314.40	0.0	0.005	6.8	6.8
1314.65	0.0	0.013	18.2	18.2
1314.90	0.0	0.026	37.9	37.9
1315.15	1.2	0.047	68.2	69.4
1315.40	2.0	0.077	111.1	113.1
1315.65	2.6	0.116	168.6	171.2
1315.90	3.0	0.167	243.0	246.0
1316.15	3.4	0.231	335.4	338.8
1316.40	3.8	0.305	443.2	447.0
1316.65	4.1	0.391	567.0	571.1
1316.90	4.4	0.488	708.0	712.4
1317.15	4.7	0.597	866.9	871.6
1317.40	4.9	0.718	1042.9	1047.8
1317.65	5.2	0.852	1236.6	1241.8
1317.90	5.4	0.998	1448.9	1454.3
1318.15	5.6	1.158	1680.7	1686.3
1318.40	5.9	1.332	1933.2	1939.1
1318.65	6.1	1.521	2207.5	2213.6
1318.90	6.3	1.725	2504.3	2510.6
1319.15	6.5	1.946	2824.9	2831.4
1319.40	6.7	2.184	3171.2	3177.9
1319.65	8.5	2.442	3544.5	3553.0
1319.90	14.2	2.718	3945.7	3959.9
1320.15	22.0	3.014	4375.1	4397.1
1320.40	29.5	3.327	4830.2	4859.7
1320.65	36.6	3.659	5311.4	5348.0
1320.90	43.7	4.009	5819.6	5863.3
1321.15	50.8	4.379	6357.1	6407.9
1321.40	55.0	4.775	6932.2	6987.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1321.65	58.1	5.199	7547.1	7605.2
1321.90	61.1	5.651	8203.1	8264.2

Time increment (t) = 0.017 hrs.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.007	0.53	-----	0.0	0.0	0.00	1313.90
0.023	1.85	2.4	2.4	2.4	0.00	1314.19
0.040	3.17	5.0	7.4	7.4	0.00	1314.41
0.057	4.50	7.7	15.1	15.1	0.00	1314.58
0.073	5.82	10.3	25.4	25.4	0.00	1314.74
0.090	7.14	13.0	38.3	38.4	0.02	1314.90
0.107	8.46	15.6	52.7	53.9	0.61	1315.03
0.123	9.79	18.3	68.5	70.9	1.23	1315.16
0.140	11.11	20.9	86.3	89.4	1.57	1315.26
0.157	12.43	23.5	105.9	109.8	1.94	1315.38
0.173	13.75	26.2	127.7	132.1	2.20	1315.48
0.190	15.08	28.8	151.6	156.5	2.45	1315.59
0.207	16.40	31.5	177.8	183.1	2.66	1315.69
0.223	17.72	34.1	206.3	211.9	2.82	1315.79
0.240	19.04	36.8	237.1	243.0	2.98	1315.89
0.257	20.37	39.4	270.2	276.5	3.13	1315.98
0.273	21.69	42.1	305.7	312.3	3.29	1316.08
0.290	23.01	44.7	343.5	350.4	3.44	1316.18
0.307	24.33	47.3	383.7	390.9	3.59	1316.27
0.323	24.33	48.7	424.8	432.3	3.75	1316.37
0.340	24.33	48.7	465.8	473.5	3.86	1316.45
0.357	24.33	48.7	506.5	514.4	3.96	1316.54
0.373	24.33	48.7	547.0	555.2	4.06	1316.62
0.390	24.33	48.7	587.4	595.7	4.15	1316.69
0.407	24.33	48.7	627.6	636.1	4.24	1316.76
0.423	24.33	48.7	667.6	676.2	4.32	1316.84
0.440	24.33	48.7	707.4	716.3	4.41	1316.91
0.457	24.33	48.7	747.1	756.1	4.48	1316.97
0.473	24.33	48.7	786.7	795.8	4.56	1317.03
0.490	24.33	48.7	826.1	835.3	4.63	1317.09
0.507	24.33	48.7	865.3	874.7	4.70	1317.15
0.523	24.33	48.7	904.5	914.0	4.75	1317.21
0.540	24.33	48.7	943.6	953.2	4.79	1317.27
0.557	24.33	48.7	982.6	992.2	4.84	1317.32
0.573	24.33	48.7	1021.5	1031.2	4.88	1317.38
0.590	24.33	48.7	1060.2	1070.1	4.93	1317.43
0.607	24.33	48.7	1098.9	1108.9	4.99	1317.48
0.623	24.33	48.7	1137.5	1147.6	5.05	1317.53
0.640	24.33	48.7	1175.9	1186.1	5.11	1317.58
0.657	24.33	48.7	1214.2	1224.6	5.17	1317.63
0.673	24.33	48.7	1252.4	1262.9	5.22	1317.67
0.690	24.33	48.7	1290.6	1301.1	5.26	1317.72
0.707	24.33	48.7	1328.7	1339.2	5.29	1317.76
0.723	24.33	48.7	1366.7	1377.3	5.33	1317.81
0.740	24.33	48.7	1404.6	1415.3	5.36	1317.85

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.757	24.33	48.7	1442.5	1453.3	5.40	1317.90
0.773	24.33	48.7	1480.3	1491.1	5.43	1317.94
0.790	24.33	48.7	1518.0	1528.9	5.46	1317.98
0.807	24.33	48.7	1555.7	1566.6	5.50	1318.02
0.823	24.33	48.7	1593.3	1604.3	5.53	1318.06
0.840	24.33	48.7	1630.8	1641.9	5.56	1318.10
0.857	24.33	48.7	1668.3	1679.5	5.59	1318.14
0.874	24.33	48.7	1705.7	1716.9	5.64	1318.18
0.890	24.33	48.7	1742.9	1754.3	5.68	1318.22
0.907	24.33	48.7	1780.2	1791.6	5.72	1318.25
0.924	24.33	48.7	1817.3	1828.8	5.77	1318.29
0.940	24.33	48.7	1854.3	1865.9	5.81	1318.33
0.957	24.33	48.7	1891.3	1903.0	5.86	1318.36
0.974	24.33	48.7	1928.1	1939.9	5.90	1318.40
0.990	24.33	48.7	1964.9	1976.8	5.93	1318.43
1.007	24.33	48.7	2001.7	2013.6	5.95	1318.47
1.024	24.33	48.7	2038.4	2050.3	5.98	1318.50
1.040	24.33	48.7	2075.0	2087.0	6.01	1318.53
1.057	24.33	48.7	2111.6	2123.7	6.03	1318.57
1.074	24.33	48.7	2148.1	2160.3	6.06	1318.60
1.090	24.33	48.7	2184.6	2196.8	6.09	1318.63
1.107	24.33	48.7	2221.1	2233.3	6.11	1318.67
1.124	24.33	48.7	2257.4	2269.7	6.14	1318.70
1.140	24.33	48.7	2293.8	2306.1	6.16	1318.73
1.157	24.33	48.7	2330.1	2342.4	6.19	1318.76
1.174	24.33	48.7	2366.3	2378.7	6.21	1318.79
1.190	24.33	48.7	2402.5	2415.0	6.24	1318.82
1.207	24.33	48.7	2438.6	2451.2	6.26	1318.85
1.224	23.81	48.1	2474.2	2486.8	6.28	1318.88
1.240	22.48	46.3	2507.9	2520.5	6.31	1318.91
1.257	21.16	43.6	2538.9	2551.5	6.33	1318.93
1.274	19.84	41.0	2567.2	2579.9	6.34	1318.95
1.290	18.52	38.4	2592.8	2605.5	6.36	1318.97
1.307	17.19	35.7	2615.8	2628.5	6.37	1318.99
1.324	15.87	33.1	2636.1	2648.9	6.39	1319.01
1.340	14.55	30.4	2653.7	2666.5	6.40	1319.02
1.357	13.23	27.8	2668.7	2681.5	6.41	1319.03
1.374	11.90	25.1	2681.0	2693.8	6.41	1319.04
1.390	10.58	22.5	2690.6	2703.5	6.42	1319.05
1.407	9.26	19.8	2697.6	2710.5	6.42	1319.06
1.424	7.94	17.2	2702.0	2714.8	6.43	1319.06
1.440	6.61	14.6	2703.6	2716.5	6.43	1319.06
1.457	5.29	11.9	2702.7	2715.5	6.43	1319.06
1.474	3.97	9.3	2699.1	2711.9	6.43	1319.06
1.490	2.65	6.6	2692.9	2705.7	6.42	1319.05
1.507	1.32	4.0	2684.0	2696.8	6.42	1319.05

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.524	0.00	1.3	2672.5	2685.3	6.41	1319.04

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E05.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1313.90 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	24.33 cfs
Peak Outflow	=	6.43 cfs
Peak Elevation	=	1319.06 ft

***** Summary of Approximate Peak Storage *****

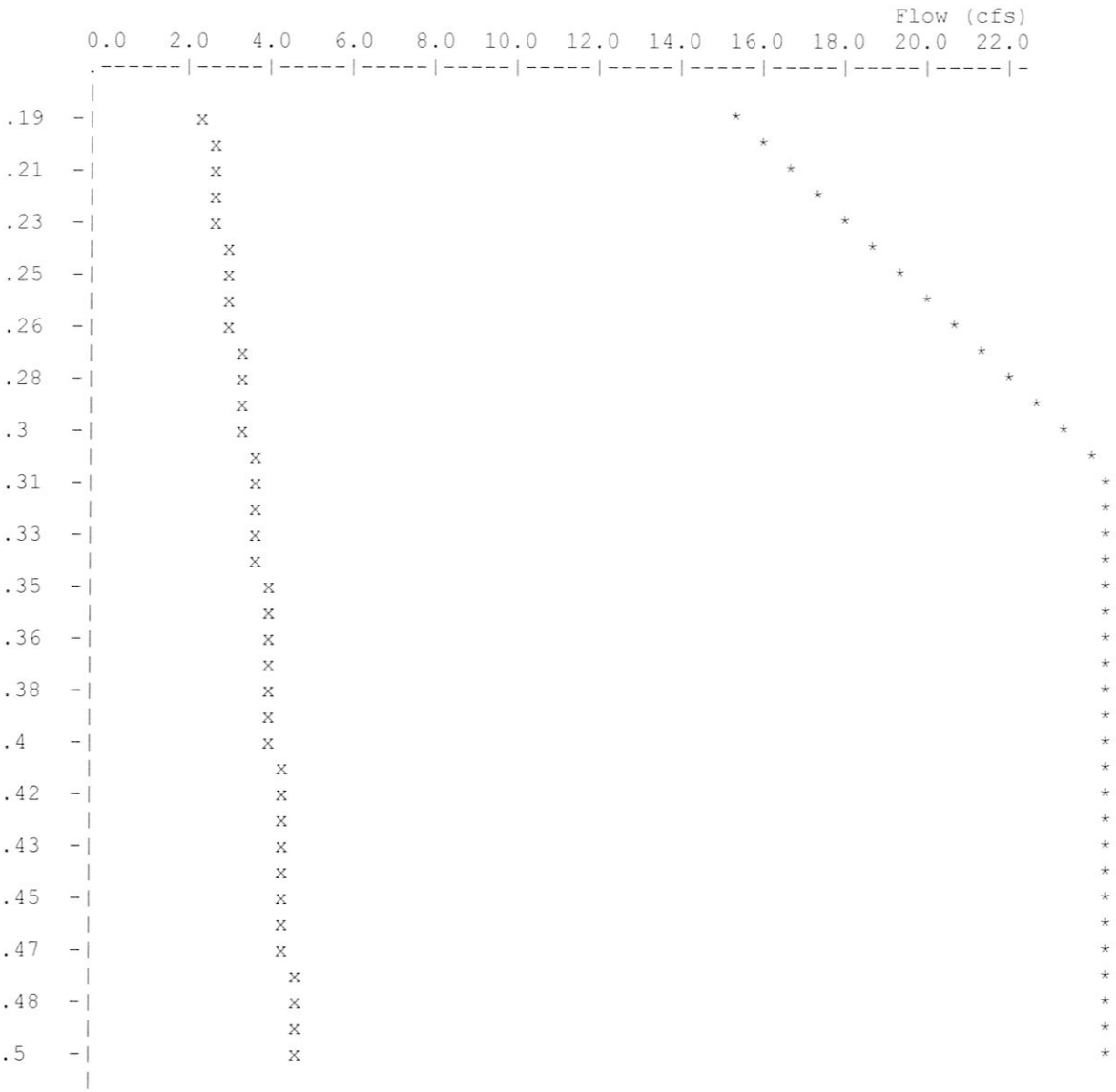
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.87 ac-ft
Total Storage in Pond	=	1.87 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E05.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
14:53:37

Peak Inflow = 24.33 cfs
Peak Outflow = 6.43 cfs
Peak Elevation = 1319.06 ft



x File: OUT .HYD Qmax = 6.4 cfs
* File: 95030E05.HYD Qmax = 24.3 cfs

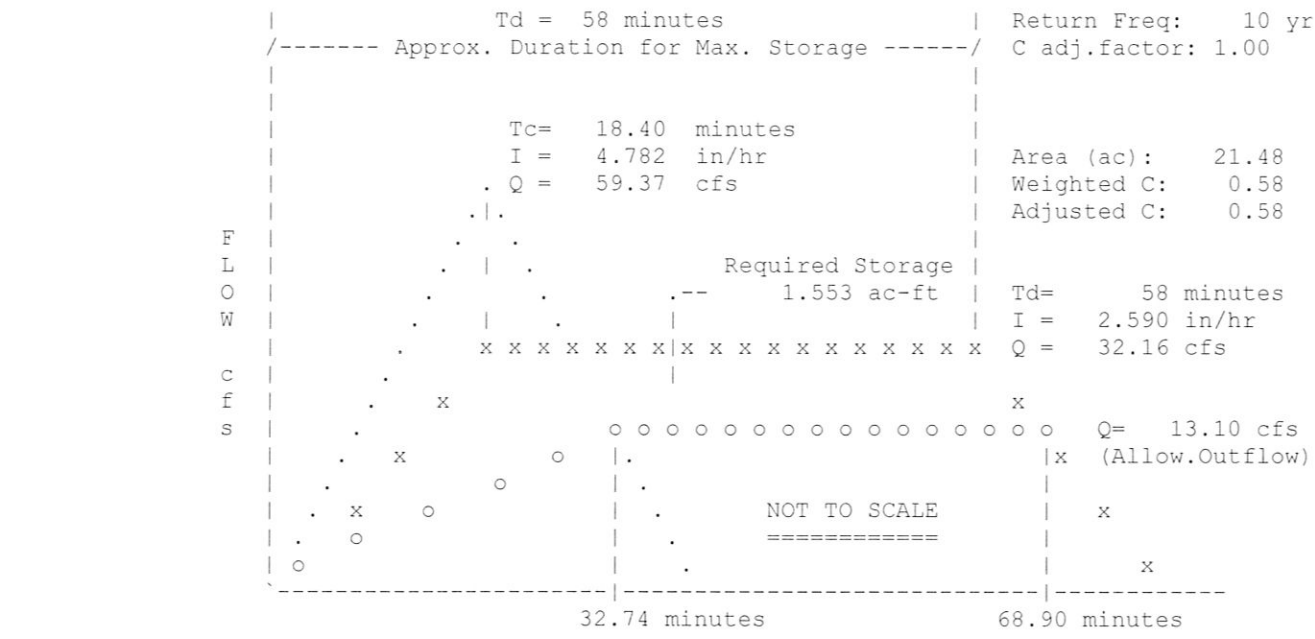
Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:12 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
10 -Year Storm Event

RETURN FREQUENCY: 10 yr	Allowable Outflow: 13.10 cfs
'C' Adjustment: 1.000	Required Storage: 1.553 ac-ft
Peak Inflow: 32.16 cfs	Inflow .HYD stored: 95030E10.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:12 09-08-2009

Wichita Readiness Center
East Detention Pond
10 -Year Storm Event

**** Modified Rational Hydrograph *****

Weighted C = 0.578 Area= 21.480 acres Tc = 18.40 minutes

Adjusted C = 0.578 Td= 58.00 min. I= 2.59 in/hr Qp= 32.16 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 95030E10.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.007	0.70	2.45	4.19	5.94	7.69	9.44	11.18
0.123	12.93	14.68	16.43	18.18	19.92	21.67	23.42
0.240	25.17	26.91	28.66	30.41	32.16	32.16	32.16
0.357	32.16	32.16	32.16	32.16	32.16	32.16	32.16
0.473	32.16	32.16	32.16	32.16	32.16	32.16	32.16
0.590	32.16	32.16	32.16	32.16	32.16	32.16	32.16
0.707	32.16	32.16	32.16	32.16	32.16	32.16	32.16
0.823	32.16	32.16	32.16	32.16	32.16	32.16	32.16
0.940	32.16	32.16	31.46	29.71	27.96	26.21	24.47
1.057	22.72	20.97	19.22	17.48	15.73	13.98	12.23
1.173	10.49	8.74	6.99	5.24	3.50	1.75	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:12 09-08-2009

Wichita Readiness Center
East Detention Pond
10 -Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
total	0.578	21.48						
			18.40	0.578	0.578	4.782	21.48	59.37

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:12 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
10 -Year Storm Event

Area = 21.48 acres Tc = 18.40 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
10	0.578	58	2.590	32.16	13.10	2.569	1.553

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:12 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
10 -Year Storm Event

RETURN FREQUENCY: 10 yr `C' Adjustment = 1.000 Allowable Q = 13.10 cfs

Hydrograph file duration= 58.00 minutes
Hydrograph file: 95030E10.HYD Tc = 18.40 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.578	0.578	18	4.782	21.48	59.37	1.505	1.173
0.578	0.578	20	4.600	21.48	57.11	1.573	1.214
0.578	0.578	30	3.760	21.48	46.68	1.929	1.398
0.578	0.578	40	3.220	21.48	39.98	2.203	1.499
0.578	0.578	50	2.830	21.48	35.14	2.420	1.543
0.578	0.578	58	2.590	21.48	32.16	2.569	1.553
0.578	0.578	60	2.530	21.48	31.41	2.596	1.546

Storage Maximum

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* 10-Year Storm Event *
* *
* *
****

Inflow Hydrograph: 95030E10.HYD
Rating Table file: 95030EPD.PND

----INITIAL CONDITIONS----
Elevation = 1313.90 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1313.90	0.0	0.000	0.0	0.0
1314.15	0.0	0.001	1.4	1.4
1314.40	0.0	0.005	6.8	6.8
1314.65	0.0	0.013	18.2	18.2
1314.90	0.0	0.026	37.9	37.9
1315.15	1.2	0.047	68.2	69.4
1315.40	2.0	0.077	111.1	113.1
1315.65	2.6	0.116	168.6	171.2
1315.90	3.0	0.167	243.0	246.0
1316.15	3.4	0.231	335.4	338.8
1316.40	3.8	0.305	443.2	447.0
1316.65	4.1	0.391	567.0	571.1
1316.90	4.4	0.488	708.0	712.4
1317.15	4.7	0.597	866.9	871.6
1317.40	4.9	0.718	1042.9	1047.8
1317.65	5.2	0.852	1236.6	1241.8
1317.90	5.4	0.998	1448.9	1454.3
1318.15	5.6	1.158	1680.7	1686.3
1318.40	5.9	1.332	1933.2	1939.1
1318.65	6.1	1.521	2207.5	2213.6
1318.90	6.3	1.725	2504.3	2510.6
1319.15	6.5	1.946	2824.9	2831.4
1319.40	6.7	2.184	3171.2	3177.9
1319.65	8.5	2.442	3544.5	3553.0
1319.90	14.2	2.718	3945.7	3959.9
1320.15	22.0	3.014	4375.1	4397.1
1320.40	29.5	3.327	4830.2	4859.7
1320.65	36.6	3.659	5311.4	5348.0
1320.90	43.7	4.009	5819.6	5863.3
1321.15	50.8	4.379	6357.1	6407.9
1321.40	55.0	4.775	6932.2	6987.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1321.65	58.1	5.199	7547.1	7605.2
1321.90	61.1	5.651	8203.1	8264.2

Time increment (t) = 0.017 hrs.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.007	0.70	-----	0.0	0.0	0.00	1313.90
0.023	2.45	3.2	3.2	3.2	0.00	1314.23
0.040	4.19	6.6	9.8	9.8	0.00	1314.47
0.057	5.94	10.1	19.9	19.9	0.00	1314.67
0.073	7.69	13.6	33.6	33.6	0.00	1314.84
0.090	9.44	17.1	49.7	50.7	0.49	1315.00
0.107	11.18	20.6	67.9	70.3	1.22	1315.16
0.123	12.93	24.1	88.8	92.0	1.61	1315.28
0.140	14.68	27.6	112.3	116.4	2.03	1315.41
0.157	16.43	31.1	138.8	143.4	2.31	1315.53
0.173	18.18	34.6	168.2	173.4	2.61	1315.66
0.190	19.92	38.1	200.7	206.3	2.79	1315.77
0.207	21.67	41.6	236.3	242.3	2.98	1315.89
0.223	23.42	45.1	275.1	281.4	3.15	1316.00
0.240	25.17	48.6	317.0	323.7	3.34	1316.11
0.257	26.91	52.1	362.1	369.1	3.51	1316.22
0.273	28.66	55.6	410.3	417.7	3.69	1316.33
0.290	30.41	59.1	461.6	469.4	3.85	1316.45
0.307	32.16	62.6	516.2	524.2	3.99	1316.56
0.323	32.16	64.3	572.3	580.6	4.12	1316.67
0.340	32.16	64.3	628.2	636.6	4.24	1316.77
0.357	32.16	64.3	683.8	692.5	4.36	1316.86
0.373	32.16	64.3	739.2	748.1	4.47	1316.96
0.390	32.16	64.3	794.3	803.5	4.57	1317.04
0.407	32.16	64.3	849.3	858.7	4.68	1317.13
0.423	32.16	64.3	904.1	913.6	4.75	1317.21
0.440	32.16	64.3	958.8	968.4	4.81	1317.29
0.457	32.16	64.3	1013.4	1023.1	4.87	1317.37
0.473	32.16	64.3	1067.8	1077.7	4.95	1317.44
0.490	32.16	64.3	1122.1	1132.2	5.03	1317.51
0.507	32.16	64.3	1176.2	1186.4	5.11	1317.58
0.523	32.16	64.3	1230.1	1240.5	5.20	1317.65
0.540	32.16	64.3	1283.9	1294.4	5.25	1317.71
0.557	32.16	64.3	1337.6	1348.2	5.30	1317.78
0.573	32.16	64.3	1391.3	1402.0	5.35	1317.84
0.590	32.16	64.3	1444.8	1455.6	5.40	1317.90
0.607	32.16	64.3	1498.2	1509.1	5.45	1317.96
0.623	32.16	64.3	1551.5	1562.5	5.49	1318.02
0.640	32.16	64.3	1604.8	1615.9	5.54	1318.07
0.657	32.16	64.3	1657.9	1669.1	5.59	1318.13
0.673	32.16	64.3	1711.0	1722.3	5.64	1318.19
0.690	32.16	64.3	1763.9	1775.3	5.71	1318.24
0.707	32.16	64.3	1816.7	1828.2	5.77	1318.29
0.723	32.16	64.3	1869.3	1881.0	5.83	1318.34
0.740	32.16	64.3	1921.9	1933.6	5.89	1318.39

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.757	32.16	64.3	1974.3	1986.2	5.93	1318.44
0.773	32.16	64.3	2026.7	2038.6	5.97	1318.49
0.790	32.16	64.3	2079.0	2091.0	6.01	1318.54
0.807	32.16	64.3	2131.2	2143.3	6.05	1318.59
0.823	32.16	64.3	2183.3	2195.5	6.09	1318.63
0.840	32.16	64.3	2235.4	2247.7	6.12	1318.68
0.857	32.16	64.3	2287.4	2299.7	6.16	1318.72
0.874	32.16	64.3	2339.4	2351.7	6.19	1318.77
0.890	32.16	64.3	2391.2	2403.7	6.23	1318.81
0.907	32.16	64.3	2443.0	2455.5	6.26	1318.85
0.924	32.16	64.3	2494.7	2507.3	6.30	1318.90
0.940	32.16	64.3	2546.4	2559.1	6.33	1318.94
0.957	32.16	64.3	2598.0	2610.7	6.36	1318.98
0.974	31.46	63.6	2648.8	2661.6	6.39	1319.02
0.990	29.71	61.2	2697.1	2710.0	6.42	1319.06
1.007	27.96	57.7	2741.9	2754.8	6.45	1319.09
1.024	26.21	54.2	2783.1	2796.1	6.48	1319.12
1.040	24.47	50.7	2820.8	2833.8	6.50	1319.15
1.057	22.72	47.2	2855.0	2868.0	6.52	1319.18
1.074	20.97	43.7	2885.6	2898.6	6.54	1319.20
1.090	19.22	40.2	2912.6	2925.8	6.55	1319.22
1.107	17.48	36.7	2936.2	2949.3	6.57	1319.24
1.124	15.73	33.2	2956.3	2969.4	6.58	1319.25
1.140	13.98	29.7	2972.8	2986.0	6.59	1319.26
1.157	12.23	26.2	2985.8	2999.0	6.60	1319.27
1.174	10.49	22.7	2995.3	3008.5	6.60	1319.28
1.190	8.74	19.2	3001.3	3014.6	6.61	1319.28
1.207	6.99	15.7	3003.9	3017.1	6.61	1319.28
1.224	5.24	12.2	3002.9	3016.1	6.61	1319.28
1.240	3.50	8.7	2998.4	3011.6	6.60	1319.28
1.257	1.75	5.3	2990.5	3003.7	6.60	1319.27
1.274	0.00	1.8	2979.0	2992.2	6.59	1319.27

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E10.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1313.90 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	32.16 cfs
Peak Outflow	=	6.61 cfs
Peak Elevation	=	1319.28 ft

***** Summary of Approximate Peak Storage *****

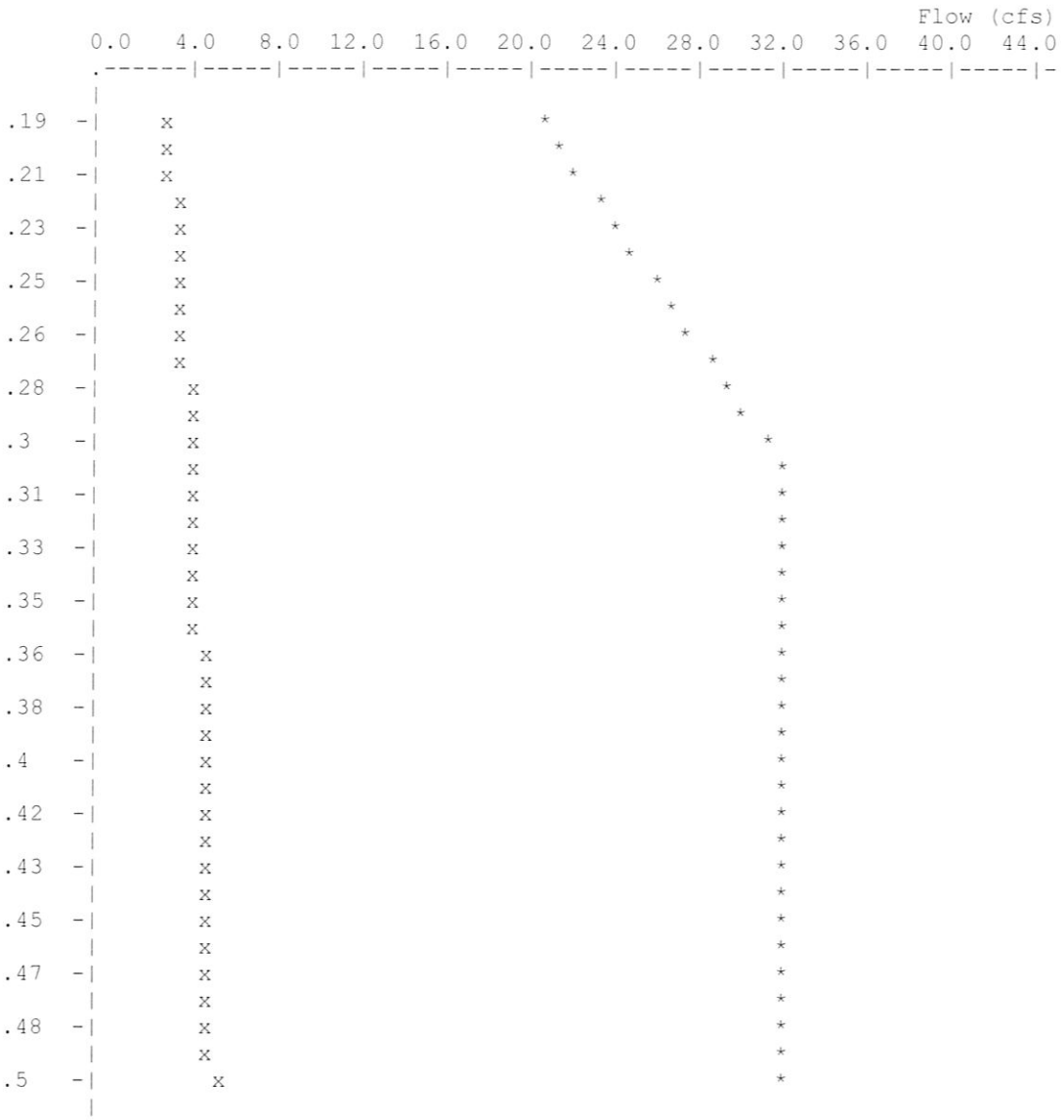
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.07 ac-ft
Total Storage in Pond	=	2.07 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E10.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
14:42:21

Peak Inflow = 32.16 cfs
Peak Outflow = 6.61 cfs
Peak Elevation = 1319.28 ft



x File: OUT .HYD Qmax = 6.6 cfs
* File: 95030E10.HYD Qmax = 32.2 cfs

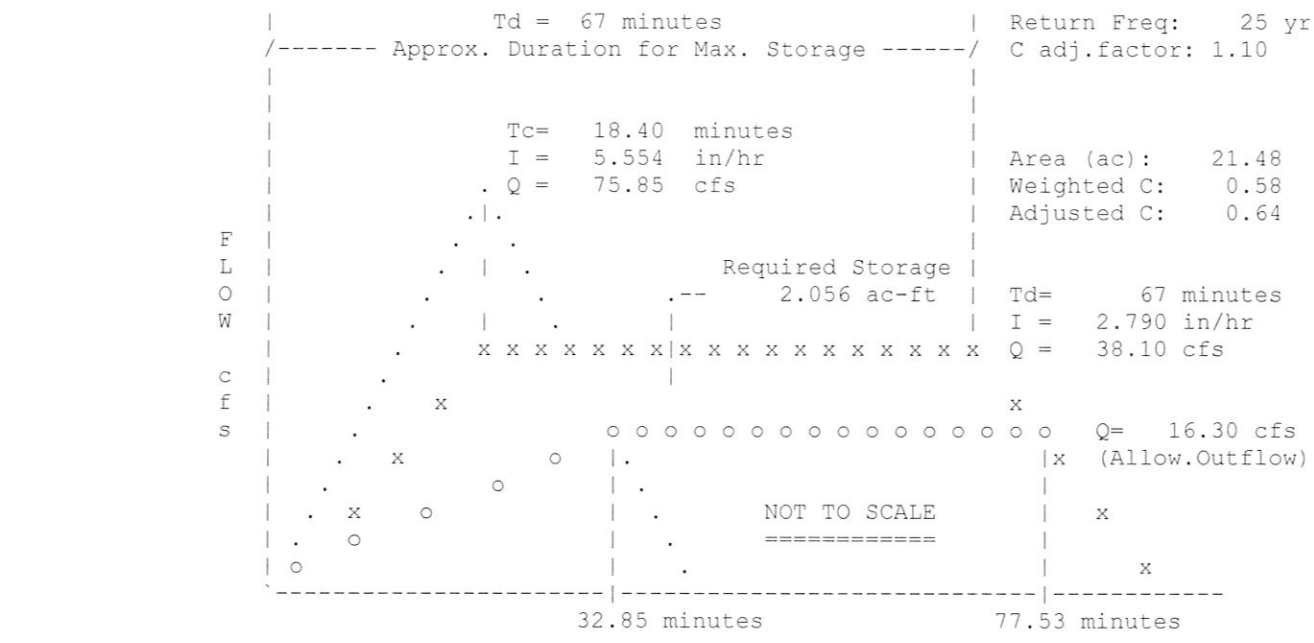
Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:26 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
25 -Year Storm Event

```
*************************************************************************
*  RETURN FREQUENCY:  25 yr     |  Allowable Outflow:    16.30 cfs     *
*  'C' Adjustment: 1.100        |  Required Storage:     2.056 ac-ft   *
*-----------------------------------------------------------------------*
*  Peak Inflow:   38.10 cfs       Inflow .HYD stored: 95030E25.HYD    *
*************************************************************************
```



Quick TR-55 Ver.5.46 S/N:
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Wichita Readiness Center
East Detention Pond
25 -Year Storm Event

**** Modified Rational Hydrograph *****

Weighted C = 0.578 Area= 21.480 acres Tc = 18.40 minutes

Adjusted C = 0.636 Td= 67.00 min. I= 2.79 in/hr Qp= 38.10 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 95030E25.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.007	0.83	2.90	4.97	7.04	9.11	11.18	13.25
0.123	15.32	17.39	19.47	21.54	23.61	25.68	27.75
0.240	29.82	31.89	33.96	36.03	38.10	38.10	38.10
0.357	38.10	38.10	38.10	38.10	38.10	38.10	38.10
0.473	38.10	38.10	38.10	38.10	38.10	38.10	38.10
0.590	38.10	38.10	38.10	38.10	38.10	38.10	38.10
0.707	38.10	38.10	38.10	38.10	38.10	38.10	38.10
0.823	38.10	38.10	38.10	38.10	38.10	38.10	38.10
0.940	38.10	38.10	38.10	38.10	38.10	38.10	38.10
1.057	38.10	38.10	38.10	38.10	37.27	35.20	33.13
1.173	31.06	28.99	26.92	24.85	22.78	20.71	18.64
1.290	16.57	14.50	12.42	10.35	8.28	6.21	4.14
1.407	2.07	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:26 09-08-2009

Wichita Readiness Center
East Detention Pond
25 -Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
`C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
total	0.578	21.48						
			18.40	0.578	0.636	5.554	21.48	75.85

Quick TR-55 Ver.5.46 S/N:
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MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
25 -Year Storm Event

Area = 21.48 acres Tc = 18.40 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
25	0.636	67	2.790	38.10	16.30	3.516	2.056

Quick TR-55 Ver.5.46 S/N:
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MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
25 -Year Storm Event

RETURN FREQUENCY: 25 yr `C' Adjustment = 1.100 Allowable Q = 16.30 cfs

Hydrograph file duration= 67.00 minutes
Hydrograph file: 95030E25.HYD Tc = 18.40 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.578	0.636	18	5.554	21.48	75.85	1.922	1.509
0.578	0.636	20	5.350	21.48	73.06	2.013	1.565
0.578	0.636	30	4.390	21.48	59.95	2.477	1.816
0.578	0.636	40	3.760	21.48	51.35	2.829	1.952
0.578	0.636	50	3.320	21.48	45.34	3.123	2.030
0.578	0.636	60	2.980	21.48	40.70	3.363	2.055
0.578	0.636	67	2.790	21.48	38.10	3.516	2.056

********** Storage Maximum

****
* Wichita Readiness Center *
* East Detention Pond *
* 25-Year Storm Event *
****

Inflow Hydrograph: 95030E25.HYD
Rating Table file: 95030EPD.PND

----INITIAL CONDITIONS----
Elevation = 1313.90 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
1313.90	0.0	0.000	0.0	0.0
1314.15	0.0	0.001	1.4	1.4
1314.40	0.0	0.005	6.8	6.8
1314.65	0.0	0.013	18.2	18.2
1314.90	0.0	0.026	37.9	37.9
1315.15	1.2	0.047	68.2	69.4
1315.40	2.0	0.077	111.1	113.1
1315.65	2.6	0.116	168.6	171.2
1315.90	3.0	0.167	243.0	246.0
1316.15	3.4	0.231	335.4	338.8
1316.40	3.8	0.305	443.2	447.0
1316.65	4.1	0.391	567.0	571.1
1316.90	4.4	0.488	708.0	712.4
1317.15	4.7	0.597	866.9	871.6
1317.40	4.9	0.718	1042.9	1047.8
1317.65	5.2	0.852	1236.6	1241.8
1317.90	5.4	0.998	1448.9	1454.3
1318.15	5.6	1.158	1680.7	1686.3
1318.40	5.9	1.332	1933.2	1939.1
1318.65	6.1	1.521	2207.5	2213.6
1318.90	6.3	1.725	2504.3	2510.6
1319.15	6.5	1.946	2824.9	2831.4
1319.40	6.7	2.184	3171.2	3177.9
1319.65	8.5	2.442	3544.5	3553.0
1319.90	14.2	2.718	3945.7	3959.9
1320.15	22.0	3.014	4375.1	4397.1
1320.40	29.5	3.327	4830.2	4859.7
1320.65	36.6	3.659	5311.4	5348.0
1320.90	43.7	4.009	5819.6	5863.3
1321.15	50.8	4.379	6357.1	6407.9
1321.40	55.0	4.775	6932.2	6987.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1321.65	58.1	5.199	7547.1	7605.2
1321.90	61.1	5.651	8203.1	8264.2

Time increment (t) = 0.017 hrs.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.007	0.83	-----	0.0	0.0	0.00	1313.90
0.023	2.90	3.7	3.7	3.7	0.00	1314.26
0.040	4.97	7.9	11.6	11.6	0.00	1314.51
0.057	7.04	12.0	23.6	23.6	0.00	1314.72
0.073	9.11	16.2	39.6	39.8	0.07	1314.91
0.090	11.18	20.3	58.2	59.9	0.84	1315.07
0.107	13.25	24.4	79.8	82.7	1.44	1315.23
0.123	15.32	28.6	104.5	108.3	1.91	1315.37
0.140	17.39	32.7	132.7	137.2	2.25	1315.50
0.157	19.47	36.9	164.4	169.6	2.58	1315.64
0.173	21.54	41.0	199.9	205.4	2.78	1315.76
0.190	23.61	45.2	239.0	245.0	2.99	1315.90
0.207	25.68	49.3	282.0	288.3	3.18	1316.01
0.223	27.75	53.4	328.6	335.4	3.39	1316.14
0.240	29.82	57.6	379.0	386.2	3.58	1316.26
0.257	31.89	61.7	433.2	440.7	3.78	1316.39
0.273	33.96	65.8	491.2	499.0	3.93	1316.50
0.290	36.03	70.0	553.0	561.2	4.08	1316.63
0.307	38.10	74.1	618.7	627.2	4.22	1316.75
0.323	38.10	76.2	686.2	694.9	4.36	1316.87
0.340	38.10	76.2	753.4	762.4	4.49	1316.98
0.357	38.10	76.2	820.4	829.6	4.62	1317.08
0.373	38.10	76.2	887.1	896.6	4.73	1317.19
0.390	38.10	76.2	953.7	963.3	4.80	1317.28
0.407	38.10	76.2	1020.1	1029.9	4.88	1317.37
0.423	38.10	76.2	1086.4	1096.3	4.98	1317.46
0.440	38.10	76.2	1152.4	1162.6	5.08	1317.55
0.457	38.10	76.2	1218.3	1228.6	5.18	1317.63
0.473	38.10	76.2	1284.0	1294.5	5.25	1317.71
0.490	38.10	76.2	1349.6	1360.2	5.31	1317.79
0.507	38.10	76.2	1415.0	1425.8	5.37	1317.87
0.523	38.10	76.2	1480.3	1491.2	5.43	1317.94
0.540	38.10	76.2	1545.6	1556.5	5.49	1318.01
0.557	38.10	76.2	1610.7	1621.8	5.54	1318.08
0.573	38.10	76.2	1675.7	1686.9	5.60	1318.15
0.590	38.10	76.2	1740.5	1751.9	5.68	1318.21
0.607	38.10	76.2	1805.2	1816.7	5.75	1318.28
0.623	38.10	76.2	1869.7	1881.4	5.83	1318.34
0.640	38.10	76.2	1934.1	1945.9	5.90	1318.41
0.657	38.10	76.2	1998.4	2010.3	5.95	1318.46
0.673	38.10	76.2	2062.6	2074.6	6.00	1318.52
0.690	38.10	76.2	2126.7	2138.8	6.05	1318.58
0.707	38.10	76.2	2190.8	2202.9	6.09	1318.64
0.723	38.10	76.2	2254.7	2267.0	6.14	1318.69
0.740	38.10	76.2	2318.5	2330.9	6.18	1318.75

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.757	38.10	76.2	2382.3	2394.7	6.22	1318.80
0.773	38.10	76.2	2446.0	2458.5	6.26	1318.86
0.790	38.10	76.2	2509.5	2522.2	6.31	1318.91
0.807	38.10	76.2	2573.0	2585.7	6.35	1318.96
0.823	38.10	76.2	2636.5	2649.2	6.39	1319.01
0.840	38.10	76.2	2699.8	2712.7	6.43	1319.06
0.857	38.10	76.2	2763.1	2776.0	6.47	1319.11
0.874	38.10	76.2	2826.3	2839.3	6.50	1319.16
0.890	38.10	76.2	2889.4	2902.5	6.54	1319.20
0.907	38.10	76.2	2952.4	2965.6	6.58	1319.25
0.924	38.10	76.2	3015.4	3028.6	6.61	1319.29
0.940	38.10	76.2	3078.3	3091.6	6.65	1319.34
0.957	38.10	76.2	3141.1	3154.5	6.69	1319.38
0.974	38.10	76.2	3203.6	3217.3	6.89	1319.43
0.990	38.10	76.2	3265.4	3279.8	7.19	1319.47
1.007	38.10	76.2	3326.6	3341.6	7.49	1319.51
1.024	38.10	76.2	3387.3	3402.8	7.78	1319.55
1.040	38.10	76.2	3447.3	3463.5	8.07	1319.59
1.057	38.10	76.2	3506.8	3523.5	8.36	1319.63
1.074	38.10	76.2	3565.2	3583.0	8.92	1319.67
1.090	38.10	76.2	3621.9	3641.4	9.74	1319.70
1.107	38.10	76.2	3677.0	3698.1	10.53	1319.74
1.124	37.27	75.4	3729.8	3752.4	11.29	1319.77
1.140	35.20	72.5	3778.3	3802.3	11.99	1319.80
1.157	33.13	68.3	3821.4	3846.6	12.61	1319.83
1.174	31.06	64.2	3859.3	3885.6	13.16	1319.85
1.190	28.99	60.1	3892.1	3919.3	13.63	1319.88
1.207	26.92	55.9	3919.9	3948.0	14.03	1319.89
1.224	24.85	51.8	3942.8	3971.7	14.41	1319.91
1.240	22.78	47.6	3961.0	3990.5	14.75	1319.92
1.257	20.71	43.5	3974.5	4004.5	15.00	1319.93
1.274	18.64	39.4	3983.5	4013.8	15.16	1319.93
1.290	16.57	35.2	3988.2	4018.7	15.25	1319.93
1.307	14.50	31.1	3988.8	4019.3	15.26	1319.93
1.324	12.42	26.9	3985.3	4015.7	15.20	1319.93
1.340	10.35	22.8	3978.0	4008.1	15.06	1319.93
1.357	8.28	18.6	3966.9	3996.6	14.85	1319.92
1.374	6.21	14.5	3952.2	3981.4	14.58	1319.91
1.390	4.14	10.4	3934.1	3962.6	14.25	1319.90
1.407	2.07	6.2	3912.4	3940.3	13.92	1319.89
1.424	0.00	2.1	3887.4	3914.5	13.56	1319.87

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E25.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1313.90 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	38.10 cfs
Peak Outflow	=	15.26 cfs
Peak Elevation	=	1319.93 ft

***** Summary of Approximate Peak Storage *****

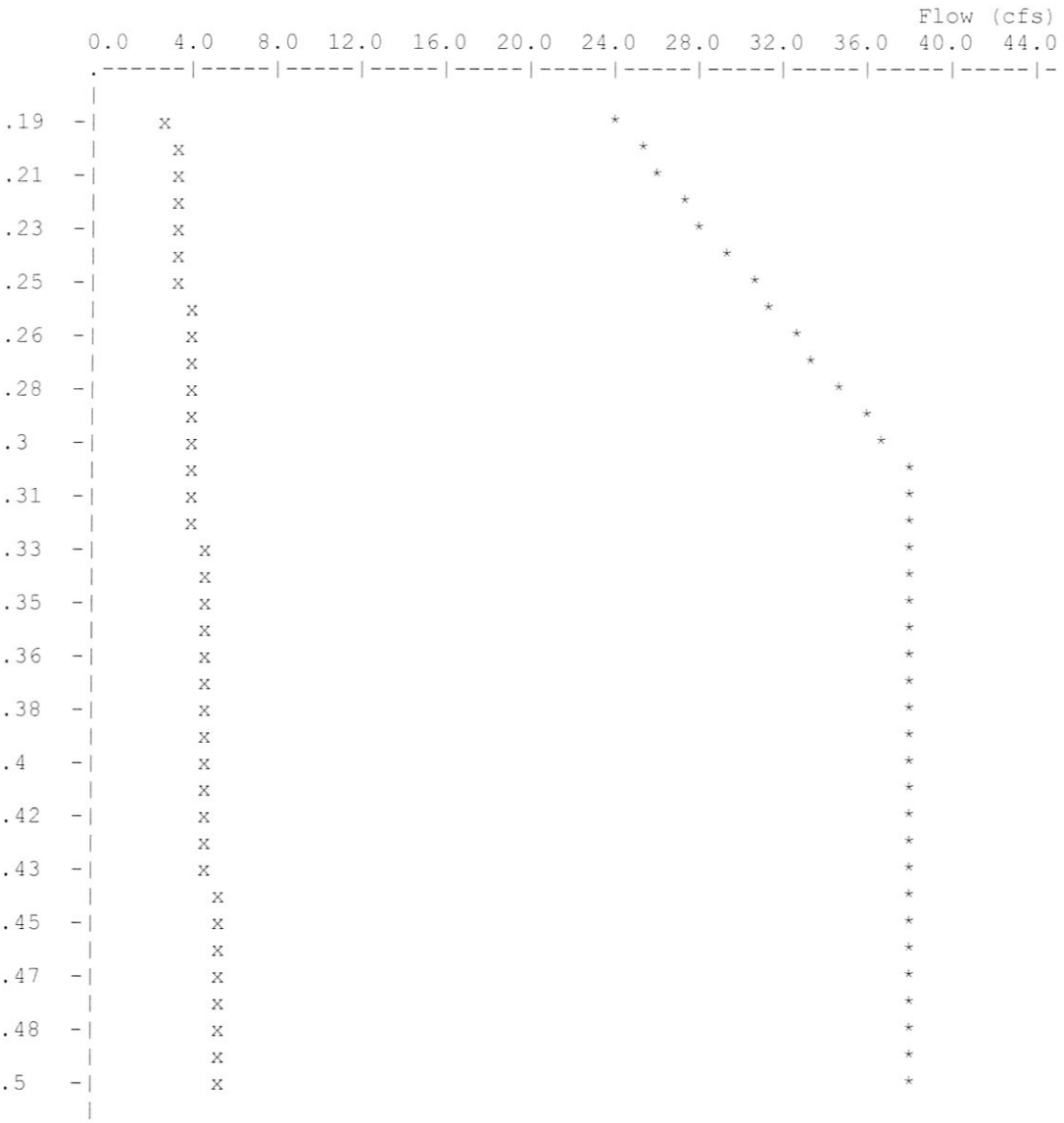
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.76 ac-ft
Total Storage in Pond	=	2.76 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E25.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
14:42:49

Peak Inflow = 38.10 cfs
Peak Outflow = 15.26 cfs
Peak Elevation = 1319.93 ft



x File: OUT .HYD Qmax = 15.3 cfs
* File: 95030E25.HYD Qmax = 38.1 cfs

Quick TR-55 Ver.5.46 S/N:
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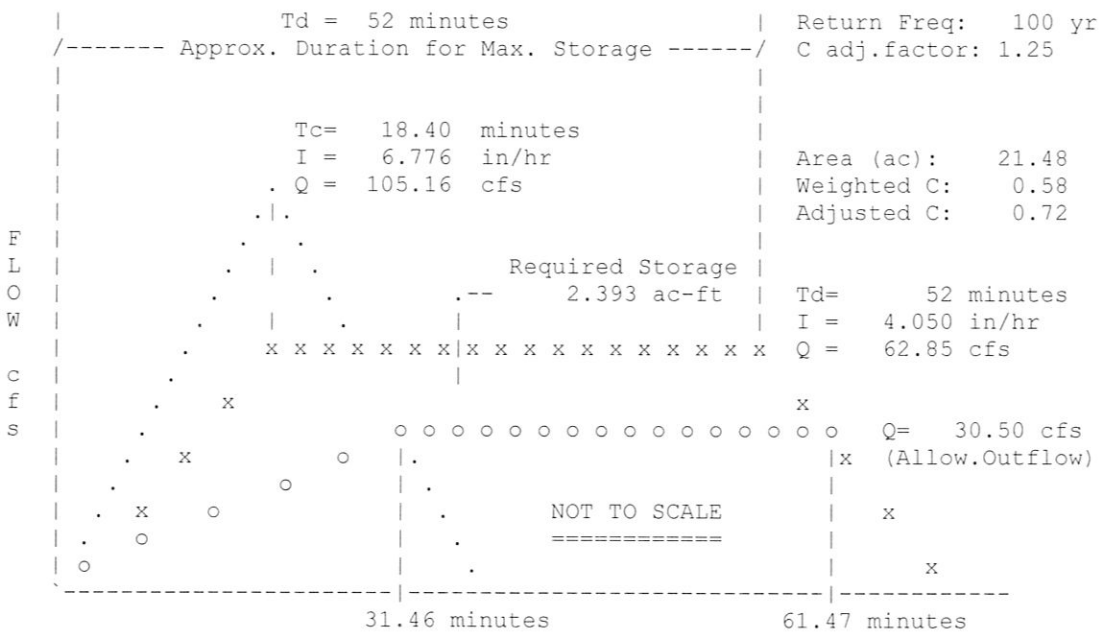
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
100-Year Storm Event

RETURN FREQUENCY: 100 yr	Allowable Outflow: 30.50 cfs
'C' Adjustment: 1.250	Required Storage: 2.393 ac-ft
Peak Inflow: 62.85 cfs	Inflow .HYD stored: 95030E00.HYD



Quick TR-55 Ver.5.46 S/N:
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Wichita Readiness Center
East Detention Pond
100-Year Storm Event

**** Modified Rational Hydrograph *****
Weighted C = 0.578 Area= 21.480 acres Tc = 18.40 minutes

Adjusted C = 0.723 Td= 52.00 min. I= 4.05 in/hr Qp= 62.85 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 95030E00.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.007	1.37	4.78	8.20	11.61	15.03	18.45	21.86
0.123	25.28	28.69	32.11	35.53	38.94	42.36	45.77
0.240	49.19	52.61	56.02	59.44	62.85	62.85	62.85
0.357	62.85	62.85	62.85	62.85	62.85	62.85	62.85
0.473	62.85	62.85	62.85	62.85	62.85	62.85	62.85
0.590	62.85	62.85	62.85	62.85	62.85	62.85	62.85
0.707	62.85	62.85	62.85	62.85	62.85	62.85	62.85
0.823	62.85	62.85	62.85	61.49	58.07	54.65	51.24
0.940	47.82	44.41	40.99	37.58	34.16	30.74	27.33
1.057	23.91	20.50	17.08	13.66	10.25	6.83	3.42
1.173	0.00						

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:41 09-08-2009

Wichita Readiness Center
East Detention Pond
100-Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.578	21.48						
			18.40	0.578	0.723	6.776	21.48	105.16

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:41 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
100-Year Storm Event

Area = 21.48 acres Tc = 18.40 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
100	0.723	52	4.050	62.85	30.50	4.502	2.393

Quick TR-55 Ver.5.46 S/N:
Executed: 14:47:41 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
East Detention Pond
100-Year Storm Event

RETURN FREQUENCY: 100 yr `C' Adjustment = 1.250 Allowable Q = 30.50 cfs

Hydrograph file duration= 52.00 minutes
Hydrograph file: 95030E00.HYD Tc = 18.40 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.578	0.723	18	6.776	21.48	105.16	2.665	1.892
0.578	0.723	20	6.530	21.48	101.34	2.792	1.956
0.578	0.723	30	5.400	21.48	83.80	3.463	2.231
0.578	0.723	40	4.660	21.48	72.32	3.985	2.355
0.578	0.723	50	4.130	21.48	64.09	4.414	2.386
0.578	0.723	52	4.050	21.48	62.85	4.502	2.393
0.578	0.723	60	3.730	21.48	57.89	4.784	2.355

Storage Maximum

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* *
* Wichita Readiness Center *
* East Detention Pond *
* 100-Year Storm Event *
* *
* *
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Inflow Hydrograph: 95030E00.HYD
Rating Table file: 95030EPD.PND

----INITIAL CONDITIONS----
Elevation = 1313.90 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
1313.90	0.0	0.000	0.0	0.0
1314.15	0.0	0.001	1.4	1.4
1314.40	0.0	0.005	6.8	6.8
1314.65	0.0	0.013	18.2	18.2
1314.90	0.0	0.026	37.9	37.9
1315.15	1.2	0.047	68.2	69.4
1315.40	2.0	0.077	111.1	113.1
1315.65	2.6	0.116	168.6	171.2
1315.90	3.0	0.167	243.0	246.0
1316.15	3.4	0.231	335.4	338.8
1316.40	3.8	0.305	443.2	447.0
1316.65	4.1	0.391	567.0	571.1
1316.90	4.4	0.488	708.0	712.4
1317.15	4.7	0.597	866.9	871.6
1317.40	4.9	0.718	1042.9	1047.8
1317.65	5.2	0.852	1236.6	1241.8
1317.90	5.4	0.998	1448.9	1454.3
1318.15	5.6	1.158	1680.7	1686.3
1318.40	5.9	1.332	1933.2	1939.1
1318.65	6.1	1.521	2207.5	2213.6
1318.90	6.3	1.725	2504.3	2510.6
1319.15	6.5	1.946	2824.9	2831.4
1319.40	6.7	2.184	3171.2	3177.9
1319.65	7.7	2.442	3544.5	3552.2
1319.90	12.9	2.718	3945.7	3958.6
1320.15	20.4	3.014	4375.1	4395.5
1320.40	28.1	3.327	4830.2	4858.3
1320.65	35.2	3.659	5311.4	5346.6
1320.90	42.3	4.009	5819.6	5861.9
1321.15	49.4	4.379	6357.1	6406.5
1321.40	54.3	4.775	6932.2	6986.5

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1321.65	57.5	5.199	7547.1	7604.6
1321.90	60.5	5.651	8203.1	8263.6

Time increment (t) = 0.017 hrs.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.007	1.37	-----	0.0	0.0	0.00	1313.90
0.023	4.78	6.2	6.2	6.2	0.00	1314.37
0.040	8.20	13.0	19.1	19.1	0.00	1314.66
0.057	11.61	19.8	38.9	38.9	0.04	1314.91
0.073	15.03	26.6	63.4	65.5	1.05	1315.12
0.090	18.45	33.5	93.5	96.9	1.70	1315.31
0.107	21.86	40.3	129.4	133.8	2.21	1315.49
0.123	25.28	47.1	171.2	176.5	2.63	1315.67
0.140	28.69	54.0	219.4	225.2	2.89	1315.83
0.157	32.11	60.8	273.9	280.2	3.15	1315.99
0.173	35.53	67.6	334.8	341.6	3.41	1316.16
0.190	38.94	74.5	401.9	409.2	3.66	1316.31
0.207	42.36	81.3	475.4	483.2	3.89	1316.47
0.223	45.77	88.1	555.4	563.6	4.08	1316.63
0.240	49.19	95.0	641.8	650.4	4.27	1316.79
0.257	52.61	101.8	734.7	743.6	4.46	1316.95
0.273	56.02	108.6	834.0	843.3	4.65	1317.11
0.290	59.44	115.5	939.9	949.5	4.79	1317.26
0.307	62.85	122.3	1052.4	1062.2	4.92	1317.42
0.323	62.85	125.7	1167.9	1178.1	5.10	1317.57
0.340	62.85	125.7	1283.1	1293.6	5.25	1317.71
0.357	62.85	125.7	1398.1	1408.8	5.36	1317.85
0.373	62.85	125.7	1512.8	1523.8	5.46	1317.97
0.390	62.85	125.7	1627.4	1638.5	5.56	1318.10
0.407	62.85	125.7	1741.8	1753.1	5.68	1318.22
0.423	62.85	125.7	1855.8	1867.5	5.81	1318.33
0.440	62.85	125.7	1969.7	1981.5	5.93	1318.44
0.457	62.85	125.7	2083.3	2095.4	6.01	1318.54
0.473	62.85	125.7	2196.8	2209.0	6.10	1318.65
0.490	62.85	125.7	2310.2	2322.5	6.17	1318.74
0.507	62.85	125.7	2423.4	2435.9	6.25	1318.84
0.523	62.85	125.7	2536.4	2549.1	6.32	1318.93
0.540	62.85	125.7	2649.4	2662.1	6.39	1319.02
0.557	62.85	125.7	2762.1	2775.1	6.46	1319.11
0.573	62.85	125.7	2874.8	2887.8	6.53	1319.19
0.590	62.85	125.7	2987.3	3000.5	6.60	1319.27
0.607	62.85	125.7	3099.6	3113.0	6.66	1319.35
0.623	62.85	125.7	3211.7	3225.3	6.83	1319.43
0.640	62.85	125.7	3323.1	3337.4	7.13	1319.51
0.657	62.85	125.7	3434.0	3448.8	7.42	1319.58
0.673	62.85	125.7	3544.1	3559.7	7.80	1319.65
0.690	62.85	125.7	3651.4	3669.8	9.20	1319.72
0.707	62.85	125.7	3755.9	3777.1	10.58	1319.79
0.723	62.85	125.7	3857.8	3881.6	11.92	1319.85
0.740	62.85	125.7	3956.9	3983.5	13.33	1319.91

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.757	62.85	125.7	4052.5	4082.6	15.03	1319.97
0.773	62.85	125.7	4144.9	4178.2	16.67	1320.03
0.790	62.85	125.7	4234.0	4270.6	18.26	1320.08
0.807	62.85	125.7	4320.2	4359.7	19.79	1320.13
0.823	62.85	125.7	4403.4	4445.9	21.24	1320.18
0.840	62.85	125.7	4483.8	4529.1	22.62	1320.22
0.857	62.85	125.7	4561.6	4609.5	23.96	1320.27
0.874	61.49	124.3	4635.5	4686.0	25.23	1320.31
0.890	58.07	119.6	4702.3	4755.1	26.38	1320.34
0.907	54.65	112.7	4760.3	4815.0	27.38	1320.38
0.924	51.24	105.9	4809.7	4866.1	28.21	1320.40
0.940	47.82	99.1	4851.1	4908.8	28.83	1320.43
0.957	44.41	92.2	4884.7	4943.3	29.34	1320.44
0.974	40.99	85.4	4910.6	4970.1	29.73	1320.46
0.990	37.58	78.6	4929.2	4989.2	30.00	1320.47
1.007	34.16	71.7	4940.6	5000.9	30.17	1320.47
1.024	30.74	64.9	4945.0	5005.5	30.24	1320.48
1.040	27.33	58.1	4942.7	5003.1	30.20	1320.47
1.057	23.91	51.2	4933.7	4993.9	30.07	1320.47
1.074	20.50	44.4	4918.5	4978.2	29.84	1320.46
1.090	17.08	37.6	4897.0	4956.1	29.52	1320.45
1.107	13.66	30.7	4869.5	4927.8	29.11	1320.44
1.124	10.25	23.9	4836.2	4893.4	28.61	1320.42
1.140	6.83	17.1	4797.3	4853.3	28.02	1320.40
1.157	3.42	10.3	4753.0	4807.5	27.26	1320.37
1.174	0.00	3.4	4703.6	4756.4	26.41	1320.34

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E00.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1313.90 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	62.85 cfs
Peak Outflow	=	30.24 cfs
Peak Elevation	=	1320.48 ft

***** Summary of Approximate Peak Storage *****

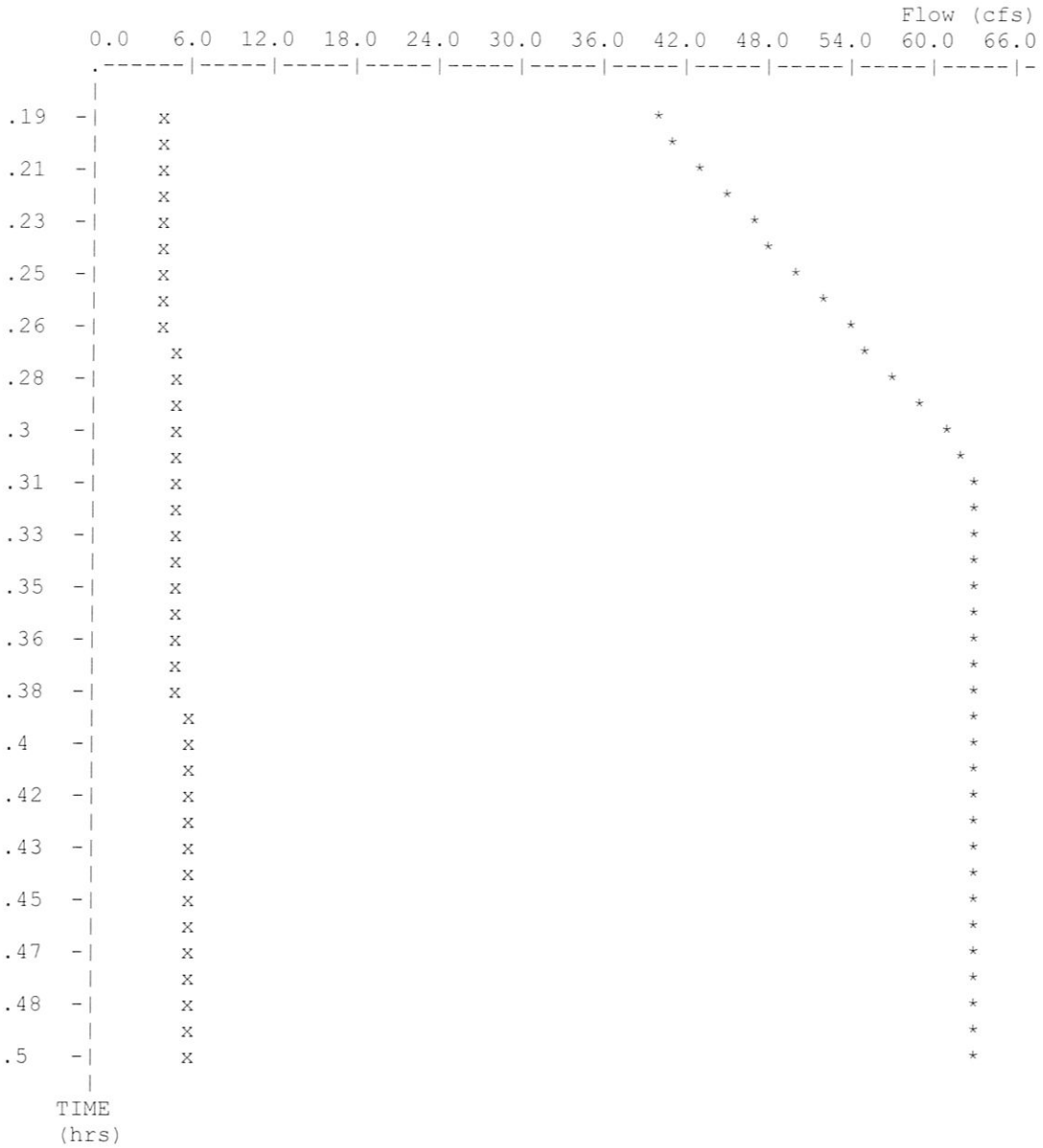
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	3.43 ac-ft
Total Storage in Pond	=	3.43 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: 95030EPD.PND
Inflow Hydrograph: 95030E00.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
15:15:36

Peak Inflow = 62.85 cfs
Peak Outflow = 30.24 cfs
Peak Elevation = 1320.48 ft



x File: OUT .HYD Qmax = 30.2 cfs
* File: 95030E00.HYD Qmax = 62.8 cfs

Appendix D
West Detention Pond Calculations

Culvert Calculator Report
West Detention Pond

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	1,316.00	ft	Headwater Depth/Height	3.24	
Computed Headwater Elev	1,316.00	ft	Discharge	50.71	cfs
Inlet Control HW Elev.	1,314.00	ft	Tailwater Elevation	1,314.00	ft
Outlet Control HW Elev.	1,316.00	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,306.29	ft	Downstream Invert	1,305.39	ft
Length	180.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	8.61	ft
Slope Type	N/A		Normal Depth	2.79	ft
Flow Regime	N/A		Critical Depth	2.32	ft
Velocity Downstream	7.17	ft/s	Critical Slope	0.006506	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,316.00	ft	Upstream Velocity Head	0.80	ft
Ke	0.20		Entrance Loss	0.16	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,314.00	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	7.1	ft²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

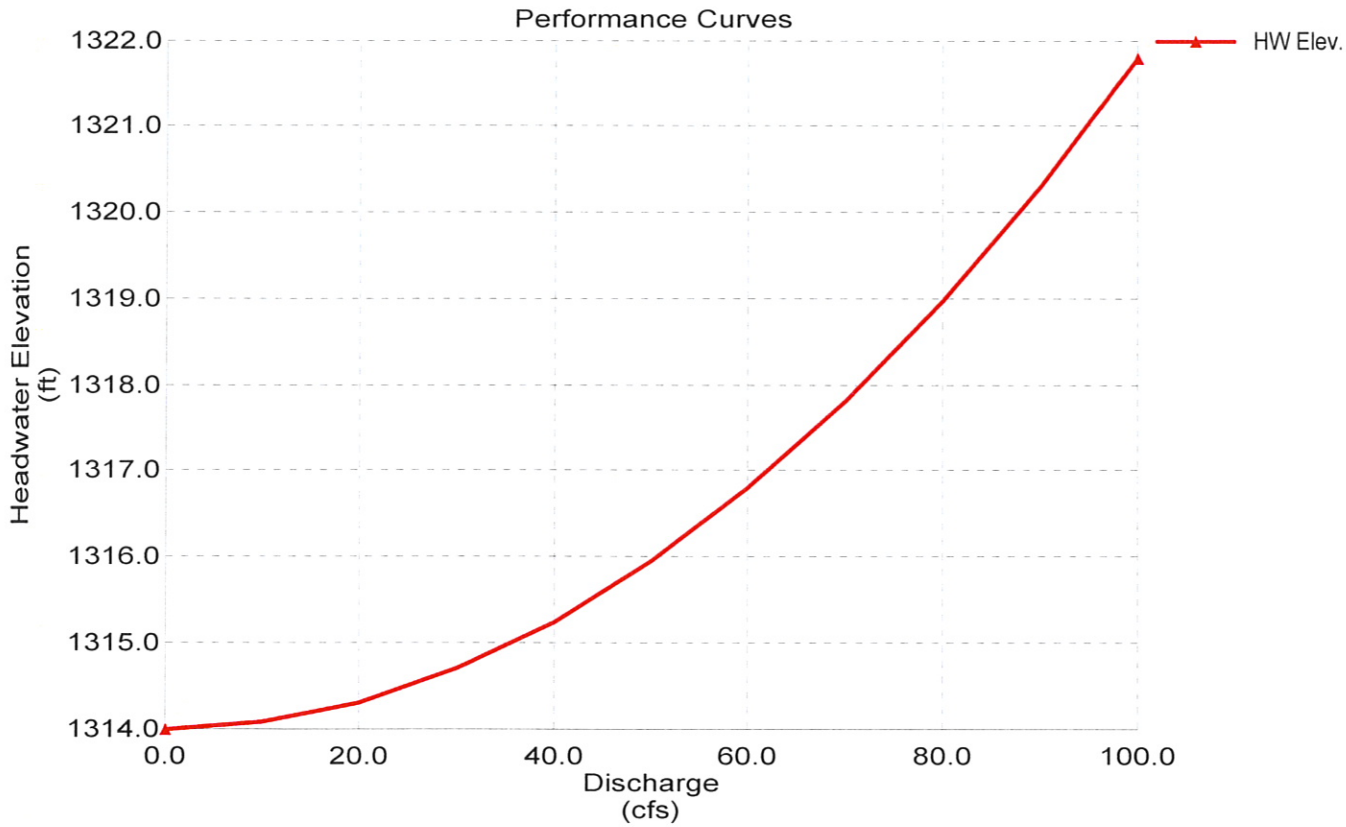
Rating Table Report
West Detention Pond

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	100.00	10.00	cfs

Discharge (cfs)	HW Elev. (ft)
0.00	1,314.00
10.00	1,314.08
20.00	1,314.31
30.00	1,314.70
40.00	1,315.24
50.00	1,315.94
60.00	1,316.80
70.00	1,317.81
80.00	1,318.98
90.00	1,320.30
100.00	1,321.78

Performance Curves Report
West Detention Pond

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	100.00	10.00	cfs



POND-2 Version: 5.21
S/N:

Wichita Readiness Center
West Detention Pond Volume

CALCULATED 09-08-2009 15:50:52
DISK FILE: 95030WVO.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume * (acre-ft)	Volume Sum (acre-ft)
1,307.00	894.00	0.02	0.00	0.00	0.00
1,308.00	3,328.00	0.08	0.14	0.05	0.05
1,309.00	6,919.00	0.16	0.35	0.12	0.16
1,310.00	11,668.00	0.27	0.63	0.21	0.37
1,311.00	17,568.00	0.40	1.00	0.33	0.70
1,312.00	25,605.00	0.59	1.48	0.49	1.20
1,313.00	42,006.00	0.96	2.31	0.77	1.97
1,314.00	63,829.00	1.47	3.62	1.21	3.17
1,315.00	82,587.00	1.90	5.03	1.68	4.85
1,316.00	104,461.00	2.40	6.43	2.14	6.99
1,317.00	120,254.00	2.76	7.73	2.58	9.57
1,318.00	128,596.00	2.95	8.57	2.86	12.42

$$IA = (\text{sq.rt}(Area1) + ((Ei-E1)/(E2-E1))*(\text{sq.rt}(Area2)-\text{sq.rt}(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

Outlet Structure File: 95030WST.STR
Planimeter Input File: 95030WVO.VOL
Rating Table Output File: 95030WPD.PND

Min. Elev.(ft) = 1307 Max. Elev.(ft) = 1318 Incr.(ft) = .5

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
ORIFICE	5			->	5
STAND PIPE	10	+	5	->	10

Outflow rating table summary was stored in file:
95030WPD.PND

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
1307.00	0.0	
1307.50	0.0	
1308.00	0.0	
1308.50	0.0	
1309.00	0.0	
1309.50	0.0	
1310.00	0.0	5
1310.50	4.2	5
1311.00	5.9	5
1311.50	7.2	5
1312.00	8.4	5
1312.50	9.3	5
1313.00	10.2	5
1313.50	15.8	5 +10
1314.00	36.3	5 +10
1314.50	62.7	5 +10
1315.00	85.4	5 +10
1315.50	104.6	5 +10
1316.00	114.8	5 +10
1316.50	124.1	5 +10
1317.00	132.8	5 +10
1317.50	140.9	5 +10
1318.00	0.0	

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	1310.00
E2 elev.(ft)?	1318.00
Orifice coeff.?	.6
Invert elev.(ft)?	1310.00
Datum elev.(ft) ?	1310.00
Orifice area (sq ft)?	1.227

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

>>>>>> Structure No. 10 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 1312.00
E2 elev.(ft)? 1318
Crest elev.(ft)? 1313.25
Diameter (ft)? 4.0
Weir coefficient? 3
Orifice coefficient? .60
Start transition elev.(ft) @ ?
Transition height (ft)? 1

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

Outflow Rating Table for Structure #5
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
1307.00	0.0	E < E1=1310.00
1307.50	0.0	E < E1=1310.00
1308.00	0.0	E < E1=1310.00
1308.50	0.0	E < E1=1310.00
1309.00	0.0	E < E1=1310.00
1309.50	0.0	E < E1=1310.00
1310.00	0.0	H =0.0
1310.50	4.2	H =.5
1311.00	5.9	H =1.0
1311.50	7.2	H =1.5
1312.00	8.4	H =2.0
1312.50	9.3	H =2.5
1313.00	10.2	H =3.0
1313.50	11.1	H =3.5
1314.00	11.8	H =4.0
1314.50	12.5	H =4.5
1315.00	13.2	H =5.0
1315.50	13.9	H =5.5
1316.00	14.5	H =6.0
1316.50	15.1	H =6.5
1317.00	15.6	H =7.0
1317.50	16.2	H =7.5
1318.00	0.0	E = or > E2=1318.00

C = .6 A = 1.227 sq.ft.
H (ft) = Table elev. - Datum elev. (1310 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 95030WST.STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
Wichita Readiness Center
East Detention Pond
Outfall Structure
****

Outflow Rating Table for Structure #10
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
1307.00	0.0	E < Inv.El.= 1313.25
1307.50	0.0	E < E1=1312.00
1308.00	0.0	E < E1=1312.00
1308.50	0.0	E < E1=1312.00
1309.00	0.0	E < E1=1312.00
1309.50	0.0	E < E1=1312.00
1310.00	0.0	E < E1=1312.00
1310.50	0.0	E < E1=1312.00
1311.00	0.0	E < E1=1312.00
1311.50	0.0	E < E1=1312.00
1312.00	0.0	E < Inv.El.= 1313.25
1312.50	0.0	E < Inv.El.= 1313.25
1313.00	0.0	E < Inv.El.= 1313.25
1313.50	4.7	Weir: H =.25
1314.00	24.5	Weir: H =.750
1314.50	50.2	Transition: H =1.25
1315.00	72.2	Transition: H =1.75
1315.50	90.8	Orifice: H =2.25
1316.00	100.3	Orifice: H =2.75
1316.50	109.1	Orifice: H =3.25
1317.00	117.2	Orifice: H =3.75
1317.50	124.7	Orifice: H =4.25
1318.00	0.0	E = or > E2=1318

Weir Cw = 3 Weir length = 12.56637 ft
Orifice Co = .6 Orifice area = 12.56637 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 1314.355 and 1315.355 ft
Weir equation = Orifice equation @ elev.= 1314.855 ft

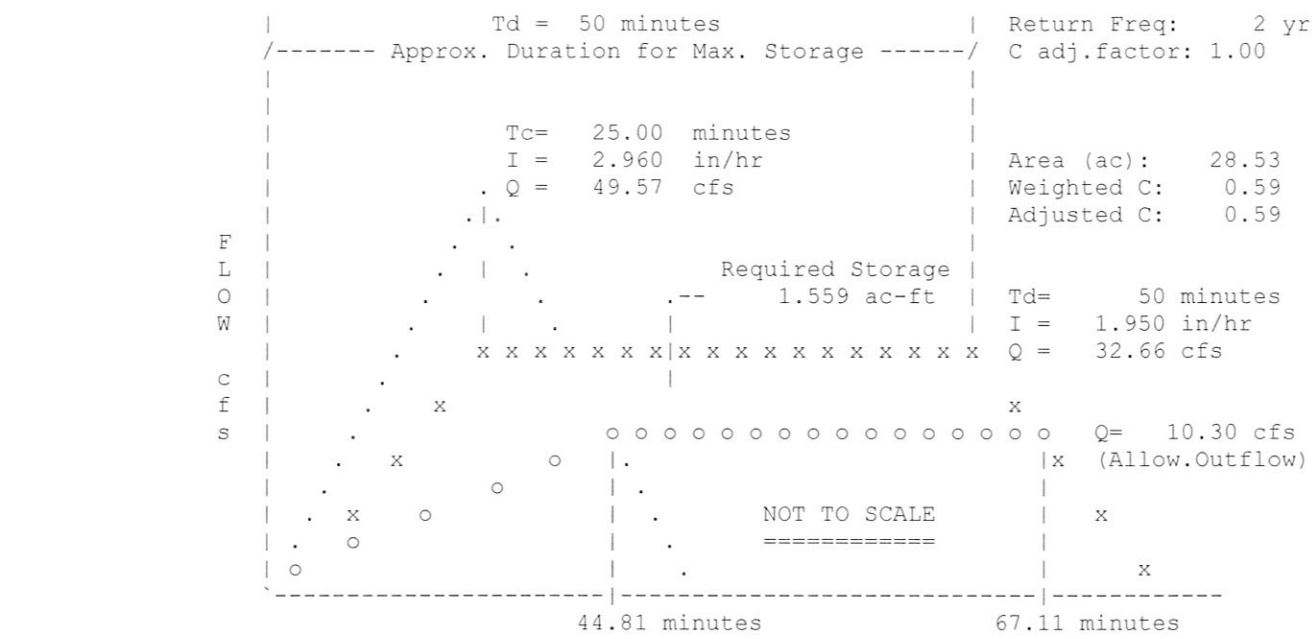
Quick TR-55 Ver.5.46 S/N:
Executed: 15:24:13 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
02 - Year Storm Event

RETURN FREQUENCY: 2 yr	Allowable Outflow: 10.30 cfs
'C' Adjustment: 1.000	Required Storage: 1.559 ac-ft
Peak Inflow: 32.66 cfs	Inflow .HYD stored: 95030W02.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 15:24:13 09-08-2009

Wichita Readiness Center
West Detention Pond
02 - Year Storm Event

**** Modified Rational Hydrograph *****
Weighted C = 0.587 Area= 28.530 acres Tc = 25.00 minutes

Adjusted C = 0.587 Td= 50.00 min. I= 1.95 in/hr Qp= 32.66 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 95030W02.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	1.31	2.61	3.92	5.23	6.53	7.84
0.117	9.14	10.45	11.76	13.06	14.37	15.68	16.98
0.233	18.29	19.59	20.90	22.21	23.51	24.82	26.13
0.350	27.43	28.74	30.04	31.35	32.66	32.66	32.66
0.467	32.66	32.66	32.66	32.66	32.66	32.66	32.66
0.583	32.66	32.66	32.66	32.66	32.66	32.66	32.66
0.700	32.66	32.66	32.66	32.66	32.66	32.66	32.66
0.817	32.66	32.66	31.35	30.04	28.74	27.43	26.13
0.933	24.82	23.51	22.21	20.90	19.59	18.29	16.98
1.050	15.68	14.37	13.06	11.76	10.45	9.14	7.84
1.167	6.53	5.23	3.92	2.61	1.31	0.00	

Quick TR-55 Ver.5.46 S/N:
Executed: 15:24:13 09-08-2009

Wichita Readiness Center
West Detention Pond
02 - Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.587	28.53						
			25.00	0.587	0.587	2.960	28.53	49.57

Quick TR-55 Ver.5.46 S/N:
Executed: 15:24:13 09-08-2009

****
****
*
*
* MODIFIED RATIONAL METHOD
* ---- Grand Summary For All Storm Frequencies ----
*
*
****
****

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
02 - Year Storm Event

Area = 28.53 acres Tc = 25.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
2	0.587	50	1.950	32.66	10.30	2.249	1.559

Quick TR-55 Ver.5.46 S/N:
Executed: 15:24:13 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
02 - Year Storm Event

RETURN FREQUENCY: 2 yr `C' Adjustment = 1.000 Allowable Q = 10.30 cfs

Hydrograph file duration= 50.00 minutes
Hydrograph file: 95030W02.HYD Tc = 25.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.587	0.587	25	2.960	28.53	49.57	1.707	1.352
0.587	0.587	30	2.670	28.53	44.71	1.848	1.426
0.587	0.587	40	2.240	28.53	37.51	2.067	1.511
0.587	0.587	50	1.950	28.53	32.66	2.249	1.559 Storage Maximum
0.587	0.587	60	1.690	28.53	28.30	2.339	1.516

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* *
* Wichita Readiness Center *
* East Detention Pond *
* Outfall Structure *
* 02-Year Storm Event *
* *
****

Inflow Hydrograph: 95030W02.HYD
Rating Table file: 95030WPD.PND

----INITIAL CONDITIONS----
Elevation = 1307.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1307.00	0.0	0.000	0.0	0.0
1307.50	0.0	0.016	22.9	22.9
1308.00	0.0	0.046	66.1	66.1
1308.50	0.0	0.093	134.7	134.7
1309.00	0.0	0.161	233.2	233.2
1309.50	0.0	0.253	366.6	366.6
1310.00	0.0	0.372	539.5	539.5
1310.50	4.2	0.521	756.8	761.0
1311.00	5.9	0.705	1023.3	1029.2
1311.50	7.2	0.928	1347.4	1354.6
1312.00	8.4	1.198	1738.5	1746.9
1312.50	9.3	1.535	2227.9	2237.2
1313.00	10.2	1.966	2853.9	2864.1
1313.50	15.8	2.506	3638.5	3654.3
1314.00	36.3	3.172	4604.9	4641.2
1314.50	62.7	3.956	5743.3	5806.0
1315.00	85.4	4.848	7038.0	7123.4
1315.50	104.6	5.856	8501.7	8606.3
1316.00	114.8	6.990	10147.7	10262.5
1316.50	124.1	8.233	11952.6	12076.7
1317.00	132.8	9.567	13889.1	14021.9
1317.50	140.9	10.971	15927.3	16068.2

Time increment (t) = 0.017 hrs.

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W02.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	1307.00
0.017	1.31	1.3	1.3	1.3	0.00	1307.03
0.033	2.61	3.9	5.2	5.2	0.00	1307.11
0.050	3.92	6.5	11.8	11.8	0.00	1307.26
0.067	5.23	9.2	20.9	20.9	0.00	1307.46
0.083	6.53	11.8	32.7	32.7	0.00	1307.61
0.100	7.84	14.4	47.0	47.0	0.00	1307.78
0.117	9.14	17.0	64.0	64.0	0.00	1307.98
0.133	10.45	19.6	83.6	83.6	0.00	1308.13
0.150	11.76	22.2	105.8	105.8	0.00	1308.29
0.167	13.06	24.8	130.6	130.6	0.00	1308.47
0.183	14.37	27.4	158.1	158.1	0.00	1308.62
0.200	15.68	30.1	188.1	188.1	0.00	1308.77
0.217	16.98	32.7	220.8	220.8	0.00	1308.94
0.233	18.29	35.3	256.1	256.1	0.00	1309.09
0.250	19.59	37.9	293.9	293.9	0.00	1309.23
0.267	20.90	40.5	334.4	334.4	0.00	1309.38
0.283	22.21	43.1	377.5	377.5	0.00	1309.53
0.300	23.51	45.7	423.3	423.3	0.00	1309.66
0.317	24.82	48.3	471.6	471.6	0.00	1309.80
0.333	26.13	51.0	522.5	522.5	0.00	1309.95
0.350	27.43	53.6	574.7	576.1	0.69	1310.08
0.367	28.74	56.2	627.4	630.9	1.73	1310.21
0.383	30.04	58.8	680.6	686.2	2.78	1310.33
0.400	31.35	61.4	734.3	742.0	3.84	1310.46
0.417	32.66	64.0	789.5	798.3	4.44	1310.57
0.433	32.66	65.3	845.2	854.8	4.79	1310.67
0.450	32.66	65.3	900.2	910.5	5.15	1310.78
0.467	32.66	65.3	954.6	965.6	5.50	1310.88
0.483	32.66	65.3	1008.2	1019.9	5.84	1310.98
0.500	32.66	65.3	1061.4	1073.5	6.08	1311.07
0.517	32.66	65.3	1114.1	1126.7	6.29	1311.15
0.533	32.66	65.3	1166.4	1179.4	6.50	1311.23
0.550	32.66	65.3	1218.3	1231.7	6.71	1311.31
0.567	32.66	65.3	1269.8	1283.6	6.92	1311.39
0.583	32.66	65.3	1320.9	1335.1	7.12	1311.47
0.600	32.66	65.3	1371.6	1386.2	7.30	1311.54
0.617	32.66	65.3	1422.0	1436.9	7.45	1311.60
0.633	32.66	65.3	1472.1	1487.4	7.61	1311.67
0.650	32.66	65.3	1521.9	1537.5	7.76	1311.73
0.667	32.66	65.3	1571.4	1587.3	7.91	1311.80
0.683	32.66	65.3	1620.6	1636.8	8.06	1311.86
0.700	32.66	65.3	1669.5	1686.0	8.21	1311.92
0.717	32.66	65.3	1718.1	1734.8	8.36	1311.98
0.733	32.66	65.3	1766.5	1783.4	8.47	1312.04

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W02.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.750	32.66	65.3	1814.7	1831.8	8.56	1312.09
0.767	32.66	65.3	1862.7	1880.0	8.64	1312.14
0.783	32.66	65.3	1910.6	1928.1	8.73	1312.18
0.800	32.66	65.3	1958.3	1975.9	8.82	1312.23
0.817	32.66	65.3	2005.8	2023.6	8.91	1312.28
0.833	32.66	65.3	2053.1	2071.1	9.00	1312.33
0.850	31.35	64.0	2099.0	2117.1	9.08	1312.38
0.867	30.04	61.4	2142.0	2160.4	9.16	1312.42
0.884	28.74	58.8	2182.4	2200.8	9.23	1312.46
0.900	27.43	56.2	2219.9	2238.5	9.30	1312.50
0.917	26.13	53.6	2254.8	2273.5	9.35	1312.53
0.934	24.82	51.0	2286.9	2305.7	9.40	1312.55
0.950	23.51	48.3	2316.4	2335.3	9.44	1312.58
0.967	22.21	45.7	2343.1	2362.1	9.48	1312.60
0.984	20.90	43.1	2367.2	2386.2	9.51	1312.62
1.000	19.59	40.5	2388.6	2407.7	9.54	1312.64
1.017	18.29	37.9	2407.4	2426.5	9.57	1312.65
1.034	16.98	35.3	2423.4	2442.6	9.59	1312.66
1.050	15.68	32.7	2436.9	2456.1	9.61	1312.67
1.067	14.37	30.1	2447.7	2466.9	9.63	1312.68
1.084	13.06	27.4	2455.8	2475.1	9.64	1312.69
1.100	11.76	24.8	2461.3	2480.6	9.65	1312.69
1.117	10.45	22.2	2464.2	2483.5	9.65	1312.70
1.134	9.14	19.6	2464.5	2483.8	9.65	1312.70
1.150	7.84	17.0	2462.2	2481.5	9.65	1312.69
1.167	6.53	14.4	2457.3	2476.6	9.64	1312.69
1.184	5.23	11.8	2449.8	2469.0	9.63	1312.68
1.200	3.92	9.2	2439.7	2458.9	9.62	1312.68
1.217	2.61	6.5	2427.0	2446.2	9.60	1312.67
1.234	1.31	3.9	2411.8	2430.9	9.58	1312.65
1.250	0.00	1.3	2394.0	2413.1	9.55	1312.64

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W02.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1307.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	32.66 cfs
Peak Outflow	=	9.65 cfs
Peak Elevation	=	1312.70 ft

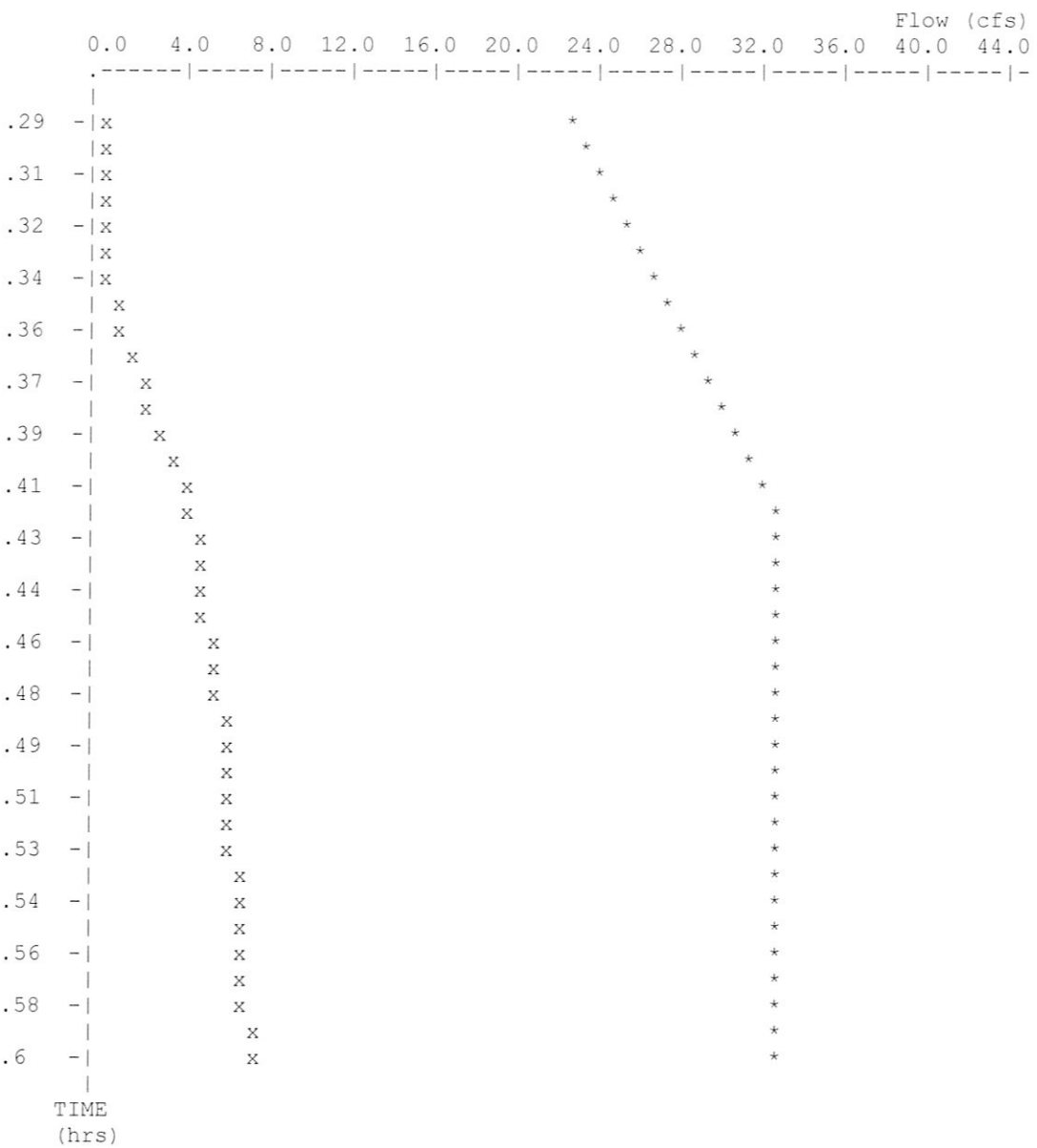
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.70 ac-ft
Total Storage in Pond	=	1.70 ac-ft

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W02.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
15:51:11

Peak Inflow = 32.66 cfs
Peak Outflow = 9.65 cfs
Peak Elevation = 1312.70 ft



x File: OUT .HYD Qmax = 9.6 cfs
* File: 95030W02.HYD Qmax = 32.7 cfs

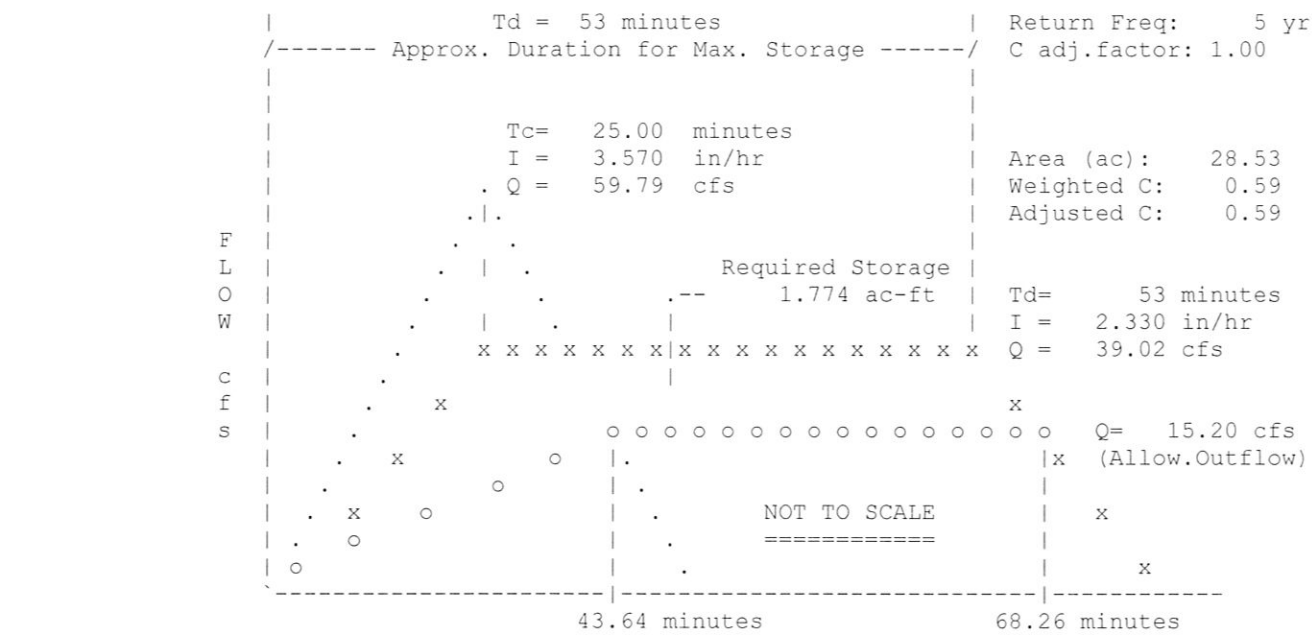
Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:04 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
05 - Year Storm Event

RETURN FREQUENCY: 5 yr	Allowable Outflow: 15.20 cfs
'C' Adjustment: 1.000	Required Storage: 1.774 ac-ft
Peak Inflow: 39.02 cfs	Inflow .HYD stored: 95030W05.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:04 09-08-2009

Wichita Readiness Center
West Detention Pond
05 - Year Storm Event

**** Modified Rational Hydrograph *****
Weighted C = 0.587 Area= 28.530 acres Tc = 25.00 minutes

Adjusted C = 0.587 Td= 53.00 min. I= 2.33 in/hr Qp= 39.02 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Output file: 95030W05.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 5 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	1.56	3.12	4.68	6.24	7.80	9.36
0.117	10.93	12.49	14.05	15.61	17.17	18.73	20.29
0.233	21.85	23.41	24.97	26.53	28.09	29.66	31.22
0.350	32.78	34.34	35.90	37.46	39.02	39.02	39.02
0.467	39.02	39.02	39.02	39.02	39.02	39.02	39.02
0.583	39.02	39.02	39.02	39.02	39.02	39.02	39.02
0.700	39.02	39.02	39.02	39.02	39.02	39.02	39.02
0.817	39.02	39.02	39.02	39.02	39.02	37.46	35.90
0.933	34.34	32.78	31.22	29.66	28.09	26.53	24.97
1.050	23.41	21.85	20.29	18.73	17.17	15.61	14.05
1.167	12.49	10.93	9.36	7.80	6.24	4.68	3.12
1.283	1.56	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:04 09-08-2009

Wichita Readiness Center
West Detention Pond
05 - Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.587	28.53						
			25.00	0.587	0.587	3.570	28.53	59.79

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:04 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
05 - Year Storm Event

Area = 28.53 acres Tc = 25.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
5	0.587	53	2.330	39.02	15.20	2.849	1.774

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:04 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
05 - Year Storm Event

RETURN FREQUENCY: 5 yr `C' Adjustment = 1.000 Allowable Q = 15.20 cfs

Hydrograph file duration= 53.00 minutes
Hydrograph file: 95030W05.HYD Tc = 25.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.587	0.587	25	3.570	28.53	59.79	2.059	1.535
0.587	0.587	30	3.240	28.53	54.26	2.242	1.621
0.587	0.587	40	2.760	28.53	46.22	2.547	1.729
0.587	0.587	50	2.410	28.53	40.36	2.780	1.765
0.587	0.587	53	2.330	28.53	39.02	2.849	1.774
0.587	0.587	60	2.150	28.53	36.01	2.976	1.763

********** Storage Maximum **********

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* *
* Wichita Readiness Center *
* East Detention Pond *
* Outfall Structure *
* 05-Year Storm Event *
* *
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Inflow Hydrograph: 95030W05.HYD
Rating Table file: 95030WPD.PND

----INITIAL CONDITIONS----
Elevation = 1307.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
1307.00	0.0	0.000	0.0	0.0
1307.50	0.0	0.016	22.9	22.9
1308.00	0.0	0.046	66.1	66.1
1308.50	0.0	0.093	134.7	134.7
1309.00	0.0	0.161	233.2	233.2
1309.50	0.0	0.253	366.6	366.6
1310.00	0.0	0.372	539.5	539.5
1310.50	4.2	0.521	756.8	761.0
1311.00	5.9	0.705	1023.3	1029.2
1311.50	7.2	0.928	1347.4	1354.6
1312.00	8.4	1.198	1738.5	1746.9
1312.50	9.3	1.535	2227.9	2237.2
1313.00	10.2	1.966	2853.9	2864.1
1313.50	15.8	2.506	3638.5	3654.3
1314.00	36.3	3.172	4604.9	4641.2
1314.50	62.7	3.956	5743.3	5806.0
1315.00	85.4	4.848	7038.0	7123.4
1315.50	104.6	5.856	8501.7	8606.3
1316.00	114.8	6.990	10147.7	10262.5
1316.50	124.1	8.233	11952.6	12076.7
1317.00	132.8	9.567	13889.1	14021.9
1317.50	140.9	10.971	15927.3	16068.2

Time increment (t) = 0.017 hrs.

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	1307.00
0.017	1.56	1.6	1.6	1.6	0.00	1307.03
0.033	3.12	4.7	6.2	6.2	0.00	1307.14
0.050	4.68	7.8	14.0	14.0	0.00	1307.31
0.067	6.24	10.9	25.0	25.0	0.00	1307.52
0.083	7.80	14.0	39.0	39.0	0.00	1307.69
0.100	9.36	17.2	56.2	56.2	0.00	1307.89
0.117	10.93	20.3	76.4	76.4	0.00	1308.08
0.133	12.49	23.4	99.9	99.9	0.00	1308.25
0.150	14.05	26.5	126.4	126.4	0.00	1308.44
0.167	15.61	29.7	156.1	156.1	0.00	1308.61
0.183	17.17	32.8	188.9	188.9	0.00	1308.77
0.200	18.73	35.9	224.8	224.8	0.00	1308.96
0.217	20.29	39.0	263.8	263.8	0.00	1309.11
0.233	21.85	42.1	305.9	305.9	0.00	1309.27
0.250	23.41	45.3	351.2	351.2	0.00	1309.44
0.267	24.97	48.4	399.6	399.6	0.00	1309.60
0.283	26.53	51.5	451.1	451.1	0.00	1309.74
0.300	28.09	54.6	505.7	505.7	0.00	1309.90
0.317	29.66	57.8	562.5	563.4	0.45	1310.05
0.333	31.22	60.9	620.2	623.4	1.59	1310.19
0.350	32.78	64.0	678.7	684.2	2.74	1310.33
0.367	34.34	67.1	738.0	745.8	3.91	1310.47
0.383	35.90	70.2	799.3	808.3	4.50	1310.59
0.400	37.46	73.4	862.8	872.6	4.91	1310.71
0.417	39.02	76.5	928.6	939.3	5.33	1310.83
0.433	39.02	78.0	995.2	1006.7	5.76	1310.96
0.450	39.02	78.0	1061.0	1073.2	6.08	1311.07
0.467	39.02	78.0	1126.4	1139.1	6.34	1311.17
0.483	39.02	78.0	1191.2	1204.4	6.60	1311.27
0.500	39.02	78.0	1255.6	1269.3	6.86	1311.37
0.517	39.02	78.0	1319.4	1333.6	7.12	1311.47
0.533	39.02	78.0	1382.8	1397.4	7.33	1311.55
0.550	39.02	78.0	1445.7	1460.8	7.52	1311.64
0.567	39.02	78.0	1508.3	1523.8	7.72	1311.72
0.583	39.02	78.0	1570.6	1586.4	7.91	1311.80
0.600	39.02	78.0	1632.4	1648.6	8.10	1311.87
0.617	39.02	78.0	1693.9	1710.5	8.29	1311.95
0.633	39.02	78.0	1755.0	1771.9	8.45	1312.03
0.650	39.02	78.0	1815.9	1833.1	8.56	1312.09
0.667	39.02	78.0	1876.6	1894.0	8.67	1312.15
0.683	39.02	78.0	1937.1	1954.7	8.78	1312.21
0.700	39.02	78.0	1997.4	2015.2	8.89	1312.27
0.717	39.02	78.0	2057.4	2075.4	9.00	1312.33
0.733	39.02	78.0	2117.2	2135.5	9.11	1312.40

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W05.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS					
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)	
0.750	39.02	78.0	2176.8	2195.3	9.22	1312.46	
0.767	39.02	78.0	2236.2	2254.9	9.33	1312.51	
0.783	39.02	78.0	2295.4	2314.3	9.41	1312.56	
0.800	39.02	78.0	2354.5	2373.5	9.50	1312.61	
0.817	39.02	78.0	2413.4	2432.5	9.58	1312.66	
0.833	39.02	78.0	2472.1	2491.4	9.66	1312.70	
0.850	39.02	78.0	2530.6	2550.1	9.75	1312.75	
0.867	39.02	78.0	2589.0	2608.7	9.83	1312.80	
0.884	39.02	78.0	2647.2	2667.0	9.92	1312.84	
0.900	37.46	76.5	2703.7	2723.7	10.00	1312.89	
0.917	35.90	73.4	2756.9	2777.0	10.07	1312.93	
0.934	34.34	70.2	2806.8	2827.1	10.15	1312.97	
0.950	32.78	67.1	2853.4	2873.9	10.27	1313.01	
0.967	31.22	64.0	2896.3	2917.4	10.58	1313.03	
0.984	29.66	60.9	2935.4	2957.1	10.86	1313.06	
1.000	28.09	57.8	2970.9	2993.2	11.11	1313.08	
1.017	26.53	54.6	3002.9	3025.6	11.34	1313.10	
1.034	24.97	51.5	3031.3	3054.4	11.55	1313.12	
1.050	23.41	48.4	3056.2	3079.7	11.73	1313.14	
1.067	21.85	45.3	3077.7	3101.5	11.88	1313.15	
1.084	20.29	42.1	3095.8	3119.8	12.01	1313.16	
1.100	18.73	39.0	3110.6	3134.8	12.12	1313.17	
1.117	17.17	35.9	3122.1	3146.5	12.20	1313.18	
1.134	15.61	32.8	3130.4	3154.9	12.26	1313.18	
1.150	14.05	29.7	3135.4	3160.0	12.30	1313.19	
1.167	12.49	26.5	3137.3	3162.0	12.31	1313.19	
1.184	10.93	23.4	3136.2	3160.8	12.30	1313.19	
1.200	9.36	20.3	3131.9	3156.4	12.27	1313.18	
1.217	7.80	17.2	3124.6	3149.1	12.22	1313.18	
1.234	6.24	14.0	3114.4	3138.7	12.15	1313.17	
1.250	4.68	10.9	3101.2	3125.3	12.05	1313.17	
1.267	3.12	7.8	3085.1	3109.0	11.94	1313.15	
1.284	1.56	4.7	3066.2	3089.8	11.80	1313.14	
1.300	0.00	1.6	3044.5	3067.8	11.64	1313.13	

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W05.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1307.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	39.02 cfs
Peak Outflow	=	12.31 cfs
Peak Elevation	=	1313.19 ft

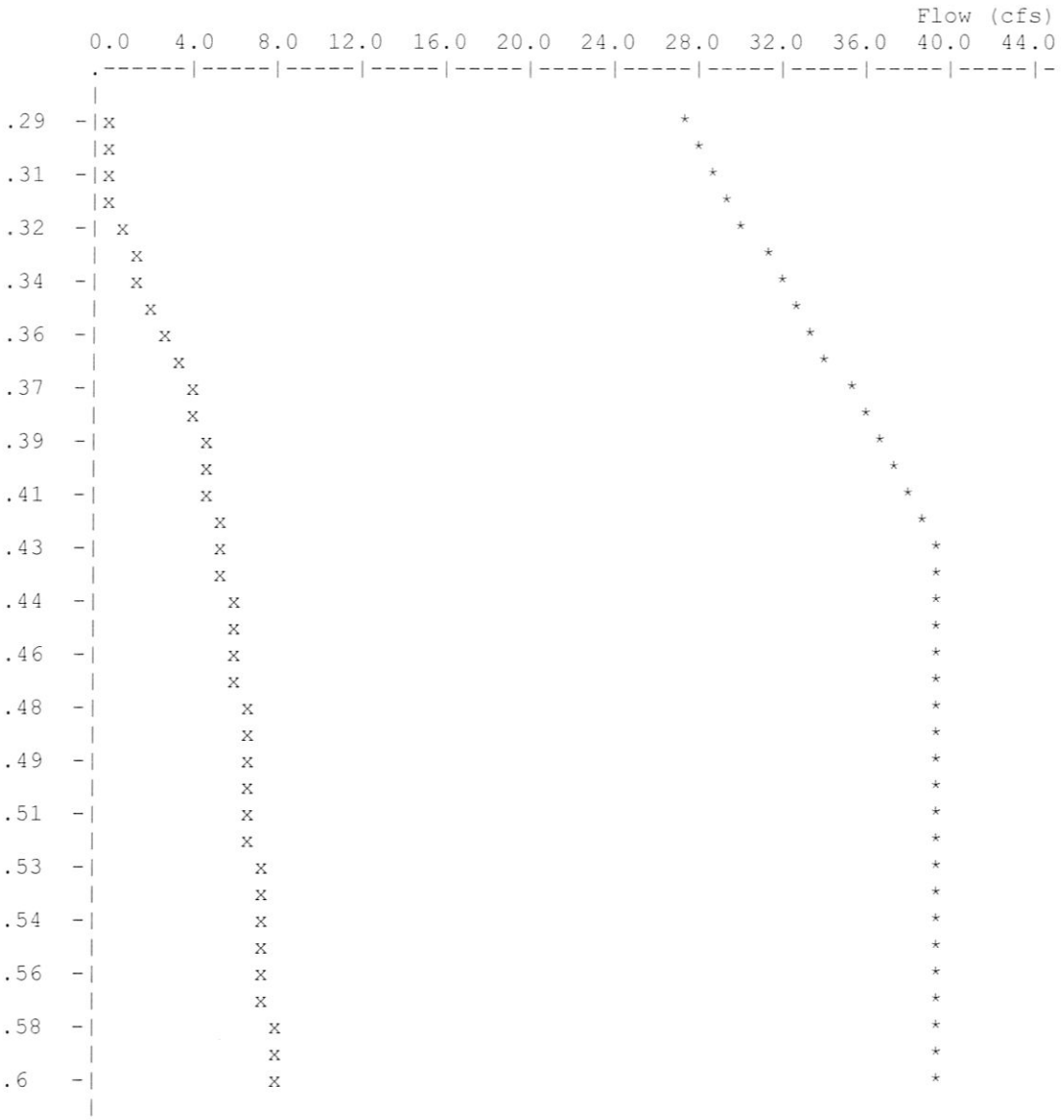
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.17 ac-ft
Total Storage in Pond	=	2.17 ac-ft

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W05.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
15:52:00

Peak Inflow = 39.02 cfs
Peak Outflow = 12.31 cfs
Peak Elevation = 1313.19 ft



x File: OUT .HYD Qmax = 12.3 cfs
* File: 95030W05.HYD Qmax = 39.0 cfs

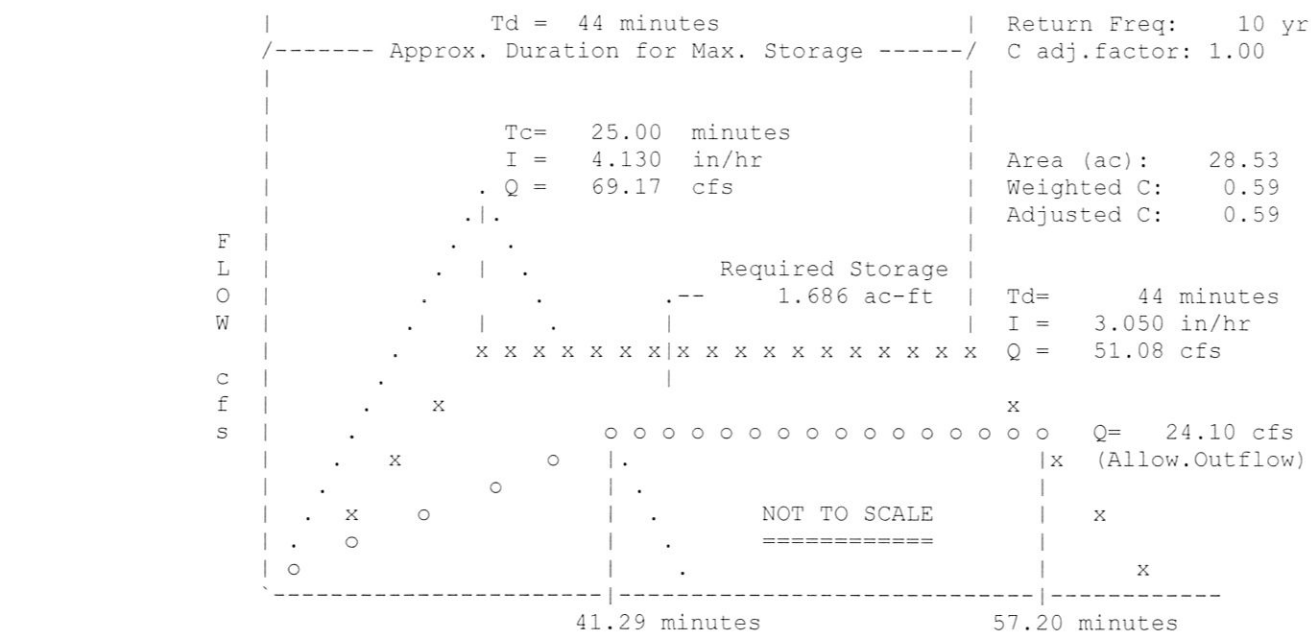
Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:33 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
10 - Year Storm Event

RETURN FREQUENCY: 10 yr	Allowable Outflow: 24.10 cfs
'C' Adjustment: 1.000	Required Storage: 1.686 ac-ft
Peak Inflow: 51.08 cfs	Inflow .HYD stored: 95030W10.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:33 09-08-2009

Wichita Readiness Center
West Detention Pond
10 - Year Storm Event

**** Modified Rational Hydrograph *****

Weighted C = 0.587 Area= 28.530 acres Tc = 25.00 minutes

Adjusted C = 0.587 Td= 44.00 min. I= 3.05 in/hr Qp= 51.08 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 95030W10.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	2.04	4.09	6.13	8.17	10.22	12.26
0.117	14.30	16.35	18.39	20.43	22.47	24.52	26.56
0.233	28.60	30.65	32.69	34.73	36.78	38.82	40.86
0.350	42.91	44.95	46.99	49.04	51.08	51.08	51.08
0.467	51.08	51.08	51.08	51.08	51.08	51.08	51.08
0.583	51.08	51.08	51.08	51.08	51.08	51.08	51.08
0.700	51.08	51.08	51.08	49.04	46.99	44.95	42.91
0.817	40.86	38.82	36.78	34.73	32.69	30.65	28.60
0.933	26.56	24.52	22.47	20.43	18.39	16.35	14.30
1.050	12.26	10.22	8.17	6.13	4.09	2.04	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:33 09-08-2009

Wichita Readiness Center
West Detention Pond
10 - Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.587	28.53						
			25.00	0.587	0.587	4.130	28.53	69.17

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:33 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
10 - Year Storm Event

Area = 28.53 acres Tc = 25.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
10	0.587	44	3.050	51.08	24.10	3.096	1.686

Quick TR-55 Ver.5.46 S/N:
Executed: 15:25:33 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
10 - Year Storm Event

RETURN FREQUENCY: 10 yr `C' Adjustment = 1.000 Allowable Q = 24.10 cfs

Hydrograph file duration= 44.00 minutes
Hydrograph file: 95030W10.HYD Tc = 25.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.587	0.587	25	4.130	28.53	69.17	2.382	1.552
0.587	0.587	30	3.760	28.53	62.97	2.602	1.620
0.587	0.587	40	3.220	28.53	53.93	2.971	1.684
0.587	0.587	44	3.050	28.53	51.08	3.096	1.686 Storage Maximum
0.587	0.587	50	2.830	28.53	47.39	3.264	1.671
0.587	0.587	60	2.530	28.53	42.37	3.502	1.601

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* Outfall Structure *
* 10-Year Storm Event *
* *
****

Inflow Hydrograph: 95030W10.HYD
Rating Table file: 95030WPD.PND

----INITIAL CONDITIONS----
Elevation = 1307.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1307.00	0.0	0.000	0.0	0.0
1307.50	0.0	0.016	22.9	22.9
1308.00	0.0	0.046	66.1	66.1
1308.50	0.0	0.093	134.7	134.7
1309.00	0.0	0.161	233.2	233.2
1309.50	0.0	0.253	366.6	366.6
1310.00	0.0	0.372	539.5	539.5
1310.50	4.2	0.521	756.8	761.0
1311.00	5.9	0.705	1023.3	1029.2
1311.50	7.2	0.928	1347.4	1354.6
1312.00	8.4	1.198	1738.5	1746.9
1312.50	9.3	1.535	2227.9	2237.2
1313.00	10.2	1.966	2853.9	2864.1
1313.50	15.8	2.506	3638.5	3654.3
1314.00	36.3	3.172	4604.9	4641.2
1314.50	62.7	3.956	5743.3	5806.0
1315.00	85.4	4.848	7038.0	7123.4
1315.50	104.6	5.856	8501.7	8606.3
1316.00	114.8	6.990	10147.7	10262.5
1316.50	124.1	8.233	11952.6	12076.7
1317.00	132.8	9.567	13889.1	14021.9
1317.50	140.9	10.971	15927.3	16068.2

Time increment (t) = 0.017 hrs.

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	1307.00
0.017	2.04	2.0	2.0	2.0	0.00	1307.04
0.033	4.09	6.1	8.2	8.2	0.00	1307.18
0.050	6.13	10.2	18.4	18.4	0.00	1307.40
0.067	8.17	14.3	32.7	32.7	0.00	1307.61
0.083	10.22	18.4	51.1	51.1	0.00	1307.83
0.100	12.26	22.5	73.6	73.6	0.00	1308.05
0.117	14.30	26.6	100.1	100.1	0.00	1308.25
0.133	16.35	30.7	130.8	130.8	0.00	1308.47
0.150	18.39	34.7	165.5	165.5	0.00	1308.66
0.167	20.43	38.8	204.3	204.3	0.00	1308.85
0.183	22.47	42.9	247.2	247.2	0.00	1309.05
0.200	24.52	47.0	294.2	294.2	0.00	1309.23
0.217	26.56	51.1	345.3	345.3	0.00	1309.42
0.233	28.60	55.2	400.5	400.5	0.00	1309.60
0.250	30.65	59.3	459.7	459.7	0.00	1309.77
0.267	32.69	63.3	523.1	523.1	0.00	1309.95
0.283	34.73	67.4	588.5	590.5	0.97	1310.12
0.300	36.78	71.5	655.5	660.0	2.29	1310.27
0.317	38.82	75.6	723.8	731.1	3.63	1310.43
0.333	40.86	79.7	794.6	803.5	4.47	1310.58
0.350	42.91	83.8	868.4	878.3	4.94	1310.72
0.367	44.95	87.9	945.4	956.3	5.44	1310.86
0.383	46.99	91.9	1025.5	1037.4	5.93	1311.01
0.400	49.04	96.0	1109.0	1121.5	6.27	1311.14
0.417	51.08	100.1	1195.9	1209.1	6.62	1311.28
0.433	51.08	102.2	1284.1	1298.0	6.97	1311.41
0.450	51.08	102.2	1371.7	1386.2	7.30	1311.54
0.467	51.08	102.2	1458.7	1473.8	7.56	1311.65
0.483	51.08	102.2	1545.2	1560.8	7.83	1311.76
0.500	51.08	102.2	1631.1	1647.3	8.10	1311.87
0.517	51.08	102.2	1716.6	1733.3	8.36	1311.98
0.533	51.08	102.2	1801.7	1818.8	8.53	1312.07
0.550	51.08	102.2	1886.5	1903.8	8.69	1312.16
0.567	51.08	102.2	1970.9	1988.6	8.84	1312.25
0.583	51.08	102.2	2055.1	2073.1	9.00	1312.33
0.600	51.08	102.2	2139.0	2157.3	9.15	1312.42
0.617	51.08	102.2	2222.5	2241.1	9.31	1312.50
0.633	51.08	102.2	2305.8	2324.7	9.43	1312.57
0.650	51.08	102.2	2388.9	2408.0	9.55	1312.64
0.667	51.08	102.2	2471.7	2491.0	9.66	1312.70
0.683	51.08	102.2	2554.3	2573.9	9.78	1312.77
0.700	51.08	102.2	2636.7	2656.5	9.90	1312.83
0.717	51.08	102.2	2718.8	2738.8	10.02	1312.90
0.733	51.08	102.2	2800.7	2821.0	10.14	1312.97

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W10.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.750	49.04	100.1	2879.9	2900.8	10.46	1313.02
0.767	46.99	96.0	2953.9	2975.9	10.99	1313.07
0.783	44.95	91.9	3022.9	3045.9	11.49	1313.11
0.800	42.91	87.9	3086.8	3110.7	11.95	1313.16
0.817	40.86	83.8	3145.9	3170.6	12.37	1313.19
0.833	38.82	79.7	3200.0	3225.6	12.76	1313.23
0.850	36.78	75.6	3249.4	3275.6	13.12	1313.26
0.867	34.73	71.5	3294.0	3320.9	13.44	1313.29
0.884	32.69	67.4	3334.0	3361.5	13.72	1313.31
0.900	30.65	63.3	3369.4	3397.3	13.98	1313.34
0.917	28.60	59.3	3400.2	3428.6	14.20	1313.36
0.934	26.56	55.2	3426.6	3455.4	14.39	1313.37
0.950	24.52	51.1	3448.6	3477.7	14.55	1313.39
0.967	22.47	47.0	3466.2	3495.6	14.68	1313.40
0.984	20.43	42.9	3479.6	3509.1	14.77	1313.41
1.000	18.39	38.8	3488.7	3518.4	14.84	1313.41
1.017	16.35	34.7	3493.7	3523.5	14.87	1313.42
1.034	14.30	30.7	3494.6	3524.4	14.88	1313.42
1.050	12.26	26.6	3491.5	3521.2	14.86	1313.42
1.067	10.22	22.5	3484.3	3514.0	14.81	1313.41
1.084	8.17	18.4	3473.3	3502.7	14.73	1313.40
1.100	6.13	14.3	3458.3	3487.6	14.62	1313.39
1.117	4.09	10.2	3439.6	3468.6	14.48	1313.38
1.134	2.04	6.1	3417.1	3445.7	14.32	1313.37
1.150	0.00	2.0	3390.9	3419.1	14.13	1313.35

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W10.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1307.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	51.08 cfs
Peak Outflow	=	14.88 cfs
Peak Elevation	=	1313.42 ft

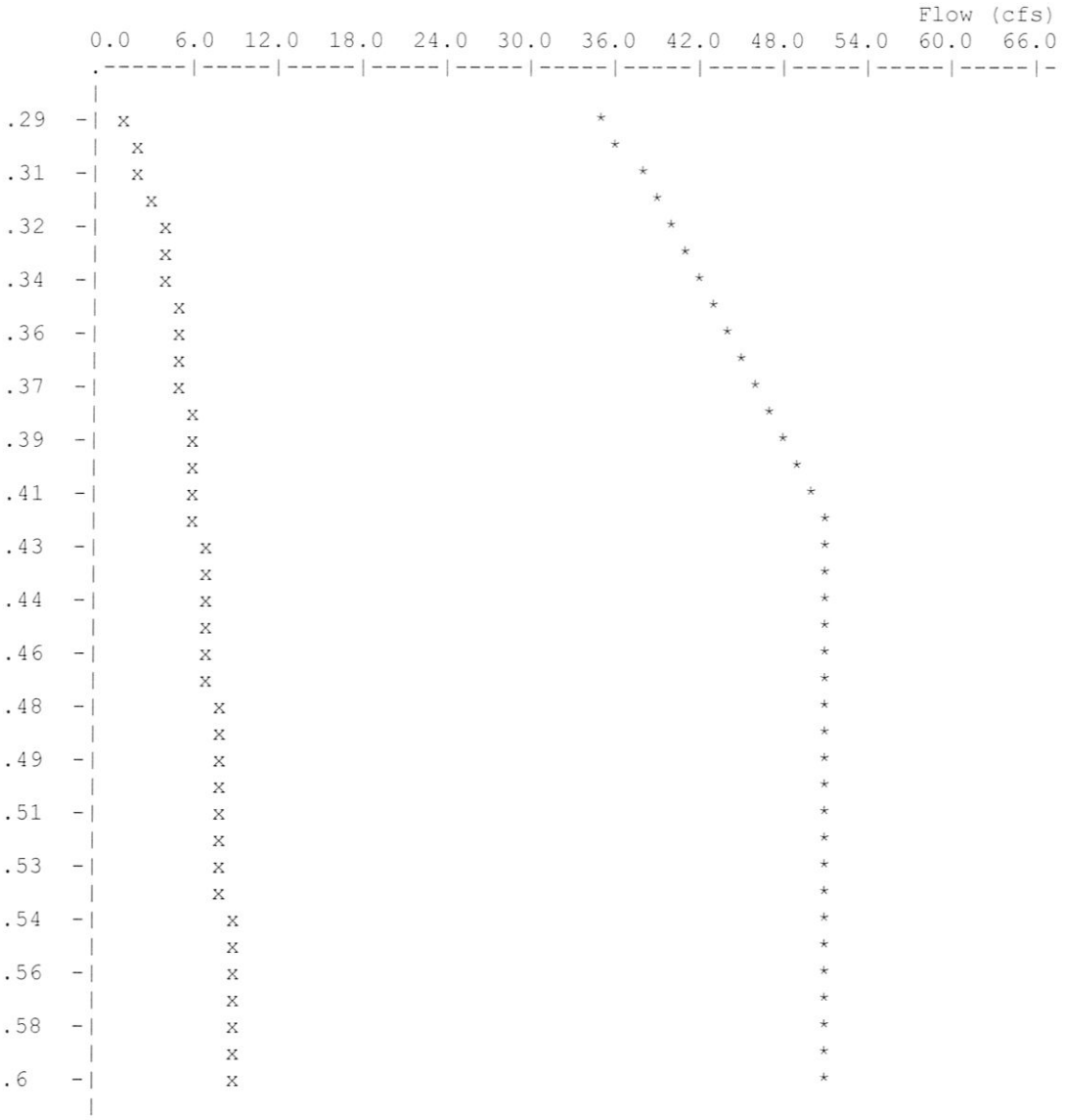
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.42 ac-ft
Total Storage in Pond	=	2.42 ac-ft

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W10.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
16:02:46

Peak Inflow = 51.08 cfs
Peak Outflow = 14.88 cfs
Peak Elevation = 1313.42 ft



x File: OUT .HYD Qmax = 14.9 cfs
* File: 95030W10.HYD Qmax = 51.1 cfs

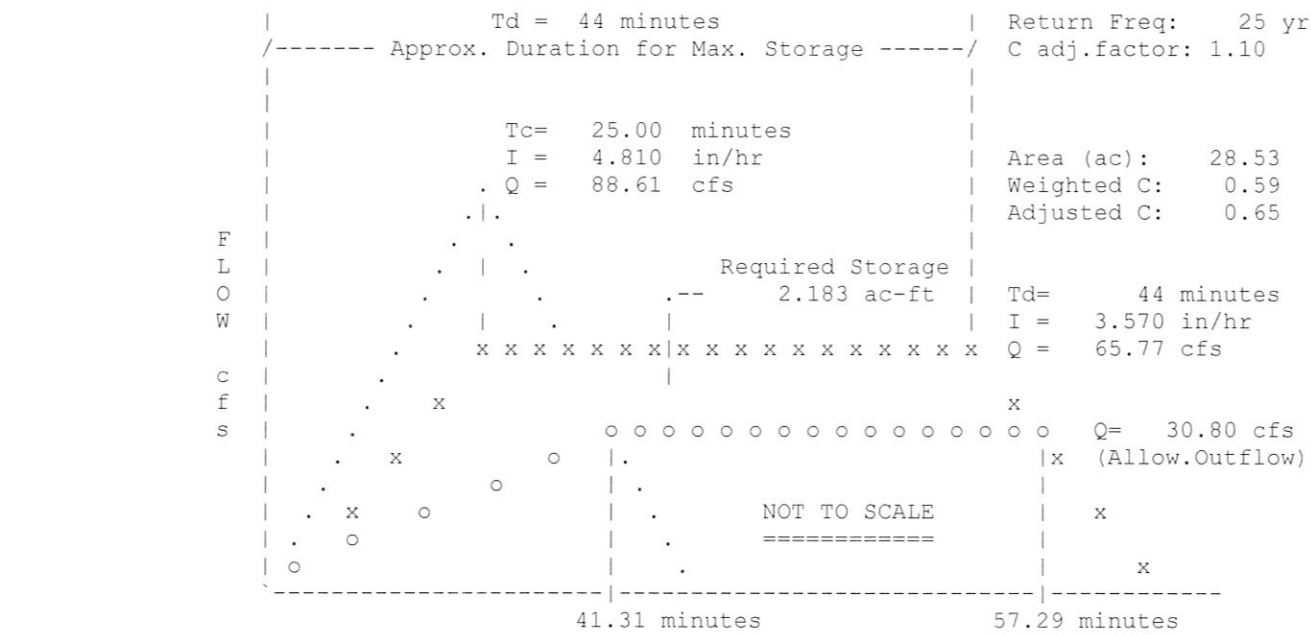
Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:07 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
25 - Year Storm Event

RETURN FREQUENCY: 25 yr	Allowable Outflow: 30.80 cfs
'C' Adjustment: 1.100	Required Storage: 2.183 ac-ft
Peak Inflow: 65.77 cfs	Inflow .HYD stored: 95030W25.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:07 09-08-2009

Wichita Readiness Center
West Detention Pond
25 - Year Storm Event

**** Modified Rational Hydrograph *****

Weighted C = 0.587 Area= 28.530 acres Tc = 25.00 minutes

Adjusted C = 0.646 Td= 44.00 min. I= 3.57 in/hr Qp= 65.77 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 95030W25.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	2.63	5.26	7.89	10.52	13.15	15.78
0.117	18.41	21.05	23.68	26.31	28.94	31.57	34.20
0.233	36.83	39.46	42.09	44.72	47.35	49.98	52.61
0.350	55.24	57.87	60.50	63.14	65.77	65.77	65.77
0.467	65.77	65.77	65.77	65.77	65.77	65.77	65.77
0.583	65.77	65.77	65.77	65.77	65.77	65.77	65.77
0.700	65.77	65.77	65.77	63.14	60.50	57.87	55.24
0.817	52.61	49.98	47.35	44.72	42.09	39.46	36.83
0.933	34.20	31.57	28.94	26.31	23.68	21.05	18.41
1.050	15.78	13.15	10.52	7.89	5.26	2.63	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:07 09-08-2009

Wichita Readiness Center
West Detention Pond
25 - Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
`C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.587	28.53						
			25.00	0.587	0.646	4.810	28.53	88.61

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:07 09-08-2009

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
25 - Year Storm Event

Area = 28.53 acres Tc = 25.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
25	0.646	44	3.570	65.77	30.80	3.986	2.183

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:07 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
25 - Year Storm Event

RETURN FREQUENCY: 25 yr `C' Adjustment = 1.100 Allowable Q = 30.80 cfs

Hydrograph file duration= 44.00 minutes
Hydrograph file: 95030W25.HYD Tc = 25.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
0.587	0.646	25	4.810	28.53	88.61	3.051	1.991
0.587	0.646	30	4.390	28.53	80.87	3.342	2.087
0.587	0.646	40	3.760	28.53	69.27	3.816	2.171
0.587	0.646	44	3.570	28.53	65.77	3.986	2.183
0.587	0.646	50	3.320	28.53	61.16	4.212	2.174
0.587	0.646	60	2.980	28.53	54.90	4.537	2.105

********** Storage Maximum

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* Outfall Structure *
* 25-Year Storm Event *
* *
****

Inflow Hydrograph: 95030W25.HYD
Rating Table file: 95030WPD.PND

----INITIAL CONDITIONS----
Elevation = 1307.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1307.00	0.0	0.000	0.0	0.0
1307.50	0.0	0.016	22.9	22.9
1308.00	0.0	0.046	66.1	66.1
1308.50	0.0	0.093	134.7	134.7
1309.00	0.0	0.161	233.2	233.2
1309.50	0.0	0.253	366.6	366.6
1310.00	0.0	0.372	539.5	539.5
1310.50	4.2	0.521	756.8	761.0
1311.00	5.9	0.705	1023.3	1029.2
1311.50	7.2	0.928	1347.4	1354.6
1312.00	8.4	1.198	1738.5	1746.9
1312.50	9.3	1.535	2227.9	2237.2
1313.00	10.2	1.966	2853.9	2864.1
1313.50	15.8	2.506	3638.5	3654.3
1314.00	36.3	3.172	4604.9	4641.2
1314.50	62.7	3.956	5743.3	5806.0
1315.00	85.4	4.848	7038.0	7123.4
1315.50	104.6	5.856	8501.7	8606.3
1316.00	114.8	6.990	10147.7	10262.5
1316.50	124.1	8.233	11952.6	12076.7
1317.00	132.8	9.567	13889.1	14021.9
1317.50	140.9	10.971	15927.3	16068.2

Time increment (t) = 0.017 hrs.

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	1307.00
0.017	2.63	2.6	2.6	2.6	0.00	1307.06
0.033	5.26	7.9	10.5	10.5	0.00	1307.23
0.050	7.89	13.2	23.7	23.7	0.00	1307.51
0.067	10.52	18.4	42.1	42.1	0.00	1307.72
0.083	13.15	23.7	65.8	65.8	0.00	1308.00
0.100	15.78	28.9	94.7	94.7	0.00	1308.21
0.117	18.41	34.2	128.9	128.9	0.00	1308.46
0.133	21.05	39.5	168.3	168.3	0.00	1308.67
0.150	23.68	44.7	213.1	213.1	0.00	1308.90
0.167	26.31	50.0	263.1	263.1	0.00	1309.11
0.183	28.94	55.3	318.3	318.3	0.00	1309.32
0.200	31.57	60.5	378.8	378.8	0.00	1309.54
0.217	34.20	65.8	444.6	444.6	0.00	1309.73
0.233	36.83	71.0	515.6	515.6	0.00	1309.93
0.250	39.46	76.3	589.9	591.9	0.99	1310.12
0.267	42.09	81.6	666.5	671.5	2.50	1310.30
0.283	44.72	86.8	745.2	753.3	4.05	1310.48
0.300	47.35	92.1	827.9	837.2	4.68	1310.64
0.317	49.98	97.3	914.7	925.2	5.24	1310.81
0.333	52.61	102.6	1005.7	1017.3	5.82	1310.98
0.350	55.24	107.9	1101.0	1113.5	6.24	1311.13
0.367	57.87	113.1	1200.9	1214.1	6.64	1311.28
0.383	60.50	118.4	1305.1	1319.2	7.06	1311.45
0.400	63.14	123.6	1413.9	1428.8	7.43	1311.59
0.417	65.77	128.9	1527.3	1542.8	7.78	1311.74
0.433	65.77	131.5	1642.5	1658.8	8.13	1311.89
0.450	65.77	131.5	1757.2	1774.1	8.45	1312.03
0.467	65.77	131.5	1871.4	1888.7	8.66	1312.14
0.483	65.77	131.5	1985.2	2002.9	8.87	1312.26
0.500	65.77	131.5	2098.6	2116.7	9.08	1312.38
0.517	65.77	131.5	2211.6	2230.1	9.29	1312.49
0.533	65.77	131.5	2324.2	2343.1	9.45	1312.58
0.550	65.77	131.5	2436.5	2455.7	9.61	1312.67
0.567	65.77	131.5	2548.5	2568.0	9.77	1312.76
0.583	65.77	131.5	2660.2	2680.0	9.94	1312.85
0.600	65.77	131.5	2771.5	2791.7	10.10	1312.94
0.617	65.77	131.5	2882.1	2903.0	10.48	1313.02
0.633	65.77	131.5	2991.1	3013.6	11.26	1313.09
0.650	65.77	131.5	3098.6	3122.7	12.03	1313.16
0.667	65.77	131.5	3204.5	3230.1	12.79	1313.23
0.683	65.77	131.5	3309.0	3336.1	13.54	1313.30
0.700	65.77	131.5	3412.0	3440.5	14.28	1313.36
0.717	65.77	131.5	3513.5	3543.5	15.01	1313.43
0.733	65.77	131.5	3613.5	3645.0	15.73	1313.49

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W25.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.750	63.14	128.9	3707.2	3742.5	17.63	1313.54
0.767	60.50	123.6	3791.9	3830.8	19.47	1313.59
0.783	57.87	118.4	3868.0	3910.3	21.12	1313.63
0.800	55.24	113.1	3936.0	3981.1	22.59	1313.67
0.817	52.61	107.9	3996.0	4043.8	23.89	1313.70
0.833	49.98	102.6	4048.6	4098.6	25.03	1313.73
0.850	47.35	97.3	4093.9	4145.9	26.01	1313.75
0.867	44.72	92.1	4132.3	4185.9	26.84	1313.77
0.884	42.09	86.8	4164.0	4219.1	27.53	1313.79
0.900	39.46	81.6	4189.4	4245.6	28.08	1313.80
0.917	36.83	76.3	4208.7	4265.7	28.50	1313.81
0.934	34.20	71.0	4222.1	4279.7	28.79	1313.82
0.950	31.57	65.8	4230.0	4287.9	28.96	1313.82
0.967	28.94	60.5	4232.5	4290.5	29.02	1313.82
0.984	26.31	55.3	4229.8	4287.7	28.96	1313.82
1.000	23.68	50.0	4222.2	4279.8	28.79	1313.82
1.017	21.05	44.7	4209.9	4266.9	28.53	1313.81
1.034	18.41	39.5	4193.0	4249.3	28.16	1313.80
1.050	15.78	34.2	4171.8	4227.2	27.70	1313.79
1.067	13.15	28.9	4146.4	4200.7	27.15	1313.78
1.084	10.52	23.7	4117.1	4170.1	26.51	1313.76
1.100	7.89	18.4	4083.9	4135.5	25.80	1313.74
1.117	5.26	13.2	4047.0	4097.0	25.00	1313.72
1.134	2.63	7.9	4006.7	4054.9	24.12	1313.70
1.150	0.00	2.6	3963.0	4009.3	23.17	1313.68

****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W25.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1307.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	65.77 cfs
Peak Outflow	=	29.02 cfs
Peak Elevation	=	1313.82 ft

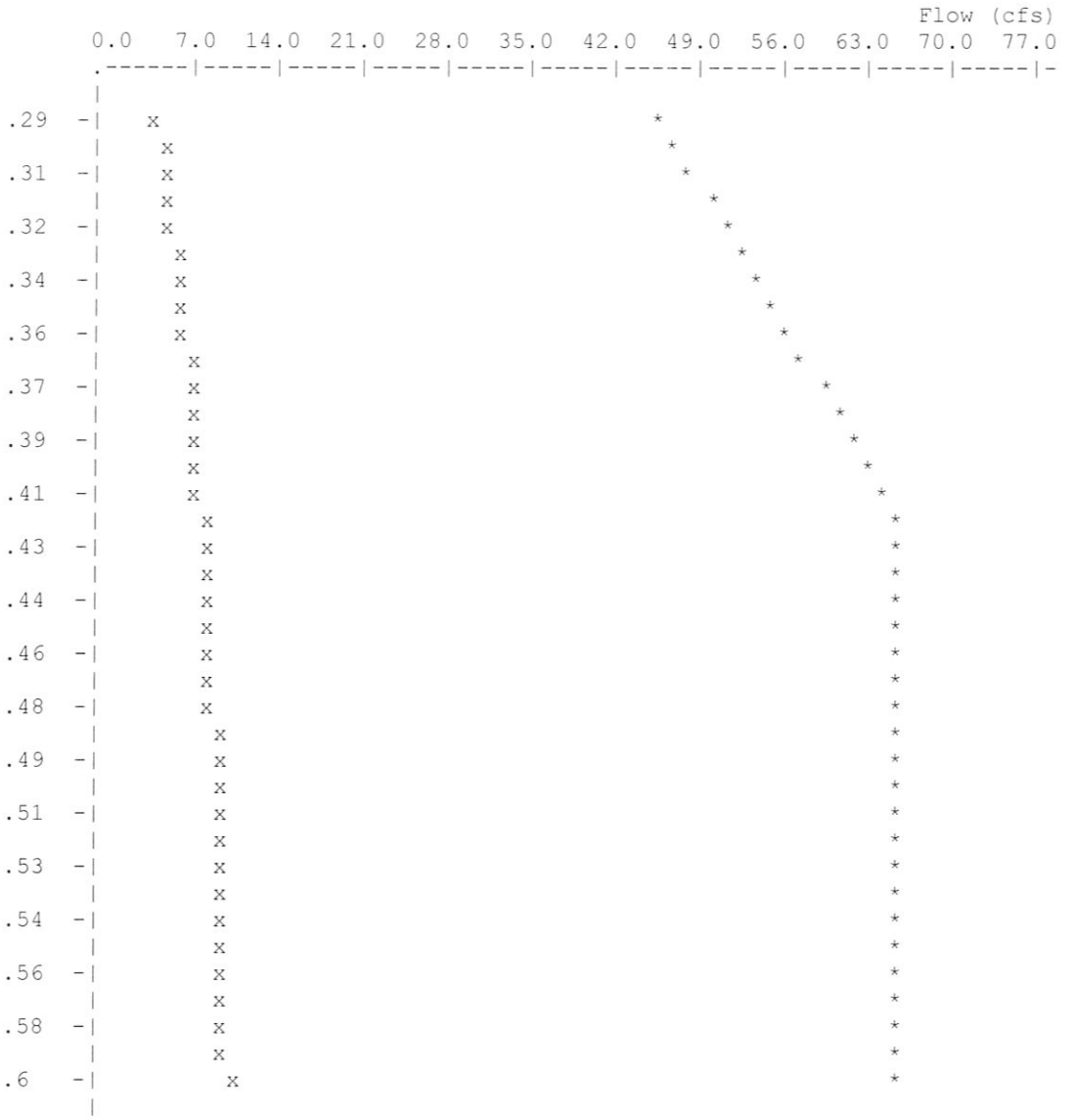
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.94 ac-ft
Total Storage in Pond	=	2.94 ac-ft

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W25.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
16:03:24

Peak Inflow = 65.77 cfs
Peak Outflow = 29.02 cfs
Peak Elevation = 1313.82 ft



x File: OUT .HYD Qmax = 29.0 cfs
* File: 95030W25.HYD Qmax = 65.8 cfs

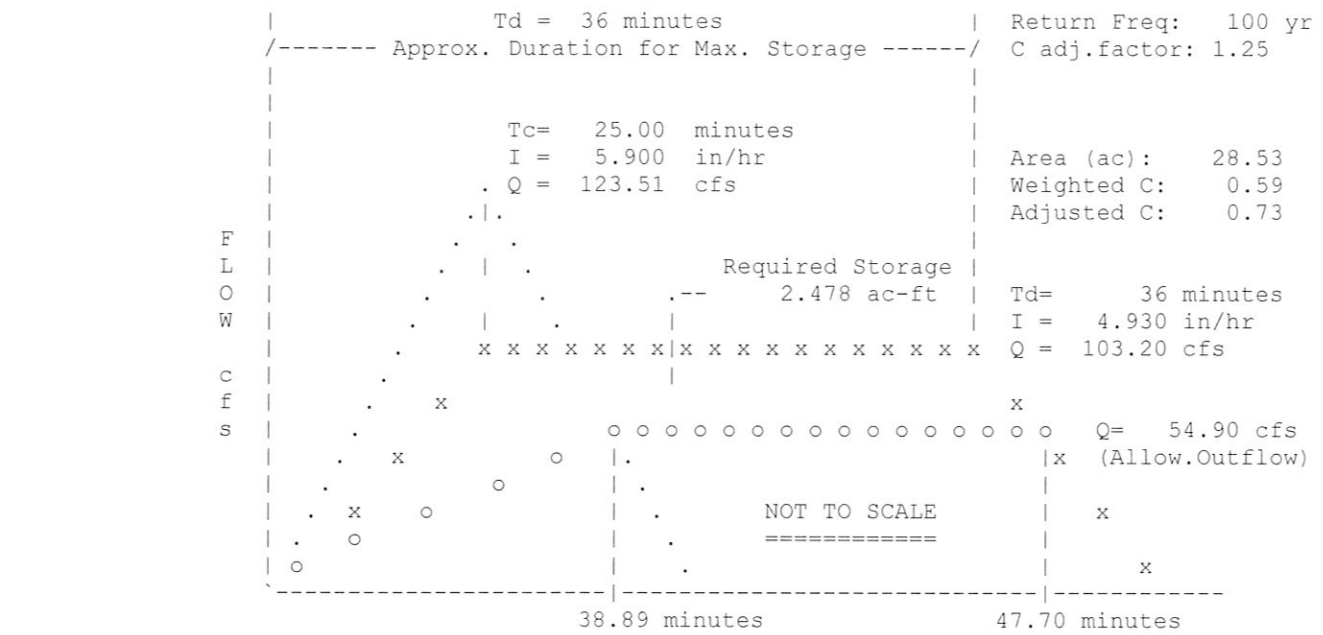
Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:46 09-08-2009

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
100- Year Storm Event

RETURN FREQUENCY: 100 yr	Allowable Outflow: 54.90 cfs
'C' Adjustment: 1.250	Required Storage: 2.478 ac-ft
Peak Inflow: 103.20 cfs	Inflow .HYD stored: 95030W00.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:46 09-08-2009

Wichita Readiness Center
West Detention Pond
100- Year Storm Event

**** Modified Rational Hydrograph *****
Weighted C = 0.587 Area= 28.530 acres Tc = 25.00 minutes

Adjusted C = 0.734 Td= 36.00 min. I= 4.93 in/hr Qp= 103.20 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 95030W00.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	4.13	8.26	12.38	16.51	20.64	24.77
0.117	28.90	33.03	37.15	41.28	45.41	49.54	53.67
0.233	57.79	61.92	66.05	70.18	74.31	78.44	82.56
0.350	86.69	90.82	94.95	99.08	103.20	103.20	103.20
0.467	103.20	103.20	103.20	103.20	103.20	103.20	103.20
0.583	103.20	103.20	99.08	94.95	90.82	86.69	82.56
0.700	78.44	74.31	70.18	66.05	61.92	57.79	53.67
0.817	49.54	45.41	41.28	37.15	33.03	28.90	24.77
0.933	20.64	16.51	12.38	8.26	4.13	0.00	

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:46 09-08-2009

Wichita Readiness Center
West Detention Pond
100- Year Storm Event

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
Total	0.587	28.53	25.00	0.587	0.734	5.900	28.53	123.51

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:46 09-08-2009

MODIFIED RATIONAL METHOD

---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
100- Year Storm Event

Area = 28.53 acres Tc = 25.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (ac-ft)	Storage (ac-ft)
100	0.734	36	4.930	103.20	54.90	5.118	2.478

Quick TR-55 Ver.5.46 S/N:
Executed: 15:26:46 09-08-2009

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Wichita Readiness Center
West Detention Pond
100- Year Storm Event

RETURN FREQUENCY: 100 yr `C' Adjustment = 1.250 Allowable Q = 54.90 cfs

Hydrograph file duration= 36.00 minutes
Hydrograph file: 95030W00.HYD Tc = 25.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (ac-ft)	VOLUMES Storage (ac-ft)
0.587	0.734	25	5.900	28.53	123.51	4.253	2.363
0.587	0.734	30	5.400	28.53	113.04	4.671	2.442
0.587	0.734	36	4.930	28.53	103.20	5.118	2.478
0.587	0.734	40	4.660	28.53	97.55	5.375	2.462
0.587	0.734	50	4.130	28.53	86.46	5.954	2.353
0.587	0.734	60	3.730	28.53	78.08	6.453	2.160

********** Storage Maximum

****
* *
* Wichita Readiness Center *
* East Detention Pond *
* Outfall Structure *
* 100-Year Storm Event *
* *
****

Inflow Hydrograph: 95030W00.HYD
Rating Table file: 95030WPD.PND

----INITIAL CONDITIONS----
Elevation = 1307.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
1307.00	0.0	0.000	0.0	0.0
1307.50	0.0	0.016	22.9	22.9
1308.00	0.0	0.046	66.1	66.1
1308.50	0.0	0.093	134.7	134.7
1309.00	0.0	0.161	233.2	233.2
1309.50	0.0	0.253	366.6	366.6
1310.00	0.0	0.372	539.5	539.5
1310.50	4.2	0.521	756.8	761.0
1311.00	5.9	0.705	1023.3	1029.2
1311.50	7.2	0.928	1347.4	1354.6
1312.00	8.4	1.198	1738.5	1746.9
1312.50	9.3	1.535	2227.9	2237.2
1313.00	10.2	1.966	2853.9	2864.1
1313.50	15.8	2.506	3638.5	3654.3
1314.00	36.3	3.172	4604.9	4641.2
1314.50	62.7	3.956	5743.3	5806.0
1315.00	85.4	4.848	7038.0	7123.4
1315.50	104.6	5.856	8501.7	8606.3
1316.00	114.8	6.990	10147.7	10262.5
1316.50	124.1	8.233	11952.6	12076.7
1317.00	132.8	9.567	13889.1	14021.9
1317.50	140.9	10.971	15927.3	16068.2

Time increment (t) = 0.017 hrs.

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	1307.00
0.017	4.13	4.1	4.1	4.1	0.00	1307.09
0.033	8.26	12.4	16.5	16.5	0.00	1307.36
0.050	12.38	20.6	37.2	37.2	0.00	1307.67
0.067	16.51	28.9	66.1	66.1	0.00	1308.00
0.083	20.64	37.2	103.2	103.2	0.00	1308.27
0.100	24.77	45.4	148.6	148.6	0.00	1308.57
0.117	28.90	53.7	202.3	202.3	0.00	1308.84
0.133	33.03	61.9	264.2	264.2	0.00	1309.12
0.150	37.15	70.2	334.4	334.4	0.00	1309.38
0.167	41.28	78.4	412.8	412.8	0.00	1309.63
0.183	45.41	86.7	499.5	499.5	0.00	1309.88
0.200	49.54	94.9	592.4	594.5	1.04	1310.12
0.217	53.67	103.2	689.7	695.6	2.96	1310.35
0.233	57.79	111.5	792.2	801.1	4.45	1310.57
0.250	61.92	119.7	901.6	911.9	5.16	1310.78
0.267	66.05	128.0	1017.8	1029.6	5.90	1311.00
0.283	70.18	136.2	1141.2	1154.0	6.40	1311.19
0.300	74.31	144.5	1271.9	1285.7	6.92	1311.39
0.317	78.44	152.8	1409.8	1424.6	7.41	1311.59
0.333	82.56	161.0	1555.1	1570.8	7.86	1311.78
0.350	86.69	169.3	1707.6	1724.3	8.33	1311.97
0.367	90.82	177.5	1867.8	1885.2	8.65	1312.14
0.383	94.95	185.8	2035.7	2053.6	8.96	1312.31
0.400	99.08	194.0	2211.1	2229.7	9.29	1312.49
0.417	103.20	202.3	2394.3	2413.4	9.55	1312.64
0.433	103.20	206.4	2581.1	2600.7	9.82	1312.79
0.450	103.20	206.4	2767.3	2787.5	10.09	1312.94
0.467	103.20	206.4	2951.7	2973.7	10.98	1313.07
0.483	103.20	206.4	3133.6	3158.1	12.28	1313.19
0.500	103.20	206.4	3312.8	3340.0	13.57	1313.30
0.517	103.20	206.4	3489.5	3519.2	14.84	1313.41
0.533	103.20	206.4	3662.6	3695.9	16.67	1313.52
0.550	103.20	206.4	3828.5	3869.0	20.26	1313.61
0.567	103.20	206.4	3987.5	4034.9	23.71	1313.69
0.583	103.20	206.4	4139.9	4193.9	27.01	1313.77
0.600	103.20	206.4	4285.9	4346.3	30.17	1313.85
0.617	99.08	202.3	4422.0	4488.2	33.12	1313.92
0.633	94.95	194.0	4544.4	4616.0	35.78	1313.99
0.650	90.82	185.8	4653.6	4730.2	38.32	1314.04
0.667	86.69	177.5	4749.9	4831.1	40.60	1314.08
0.683	82.56	169.3	4833.9	4919.1	42.60	1314.12
0.700	78.44	161.0	4906.3	4994.9	44.32	1314.15
0.717	74.31	152.8	4967.5	5059.0	45.77	1314.18
0.733	70.18	144.5	5018.0	5112.0	46.97	1314.20

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W00.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.750	66.05	136.2	5058.4	5154.3	47.93	1314.22
0.767	61.92	128.0	5089.1	5186.4	48.66	1314.23
0.783	57.79	119.7	5110.5	5208.8	49.16	1314.24
0.800	53.67	111.5	5123.0	5221.9	49.46	1314.25
0.817	49.54	103.2	5127.1	5226.2	49.56	1314.25
0.833	45.41	94.9	5123.1	5222.0	49.46	1314.25
0.850	41.28	86.7	5111.4	5209.8	49.19	1314.24
0.867	37.15	78.4	5092.4	5189.8	48.74	1314.24
0.884	33.03	70.2	5066.3	5162.6	48.12	1314.22
0.900	28.90	61.9	5033.6	5128.2	47.34	1314.21
0.917	24.77	53.7	4994.4	5087.2	46.41	1314.19
0.934	20.64	45.4	4949.2	5039.8	45.34	1314.17
0.950	16.51	37.2	4898.1	4986.3	44.12	1314.15
0.967	12.38	28.9	4841.4	4927.0	42.78	1314.12
0.984	8.26	20.6	4779.4	4862.0	41.31	1314.09
1.000	4.13	12.4	4712.4	4791.8	39.71	1314.06
1.017	0.00	4.1	4640.5	4716.5	38.01	1314.03

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W00.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 1307.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	103.20 cfs
Peak Outflow	=	49.56 cfs
Peak Elevation	=	1314.25 ft

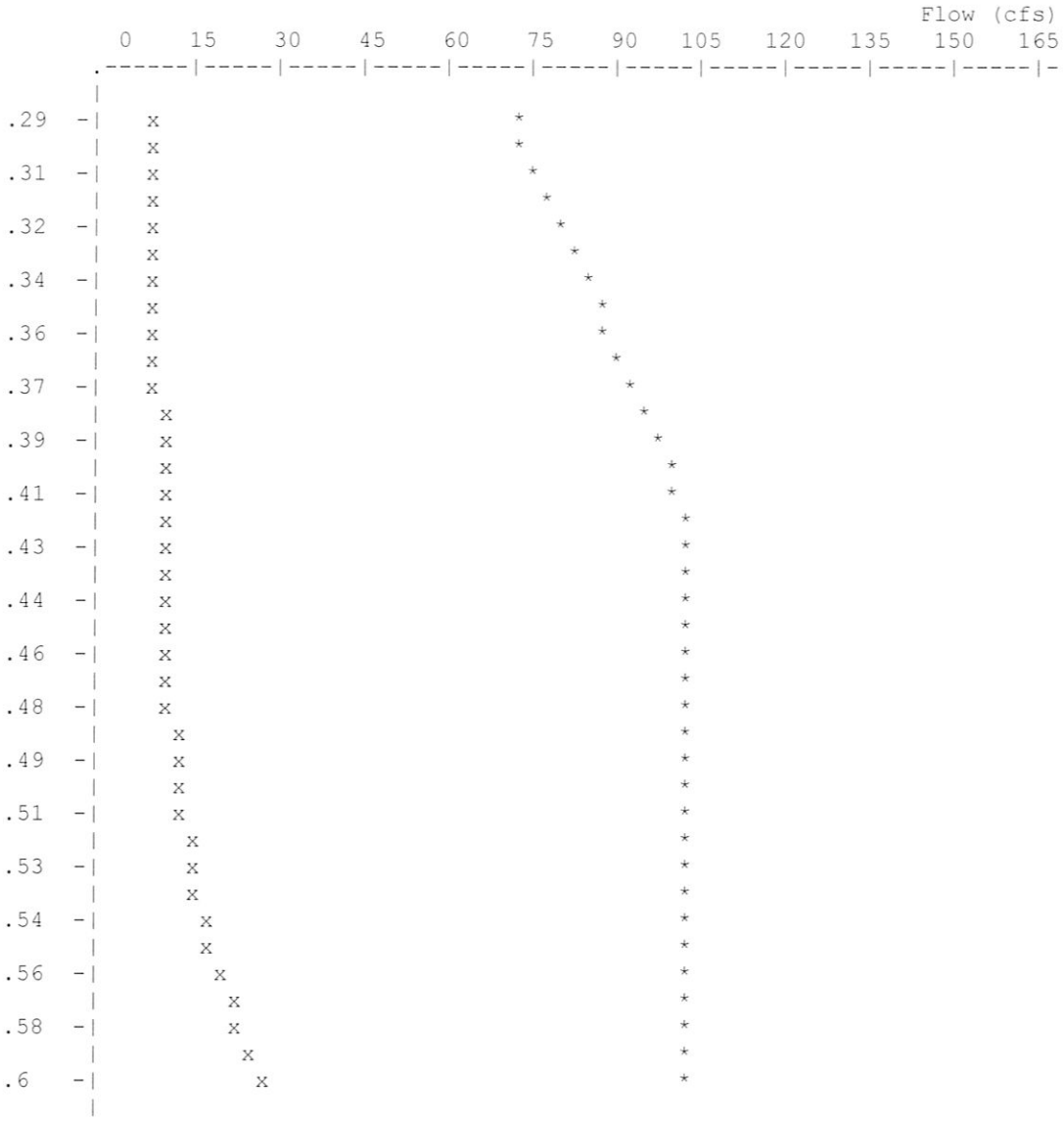
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	3.57 ac-ft
Total Storage in Pond	=	3.57 ac-ft

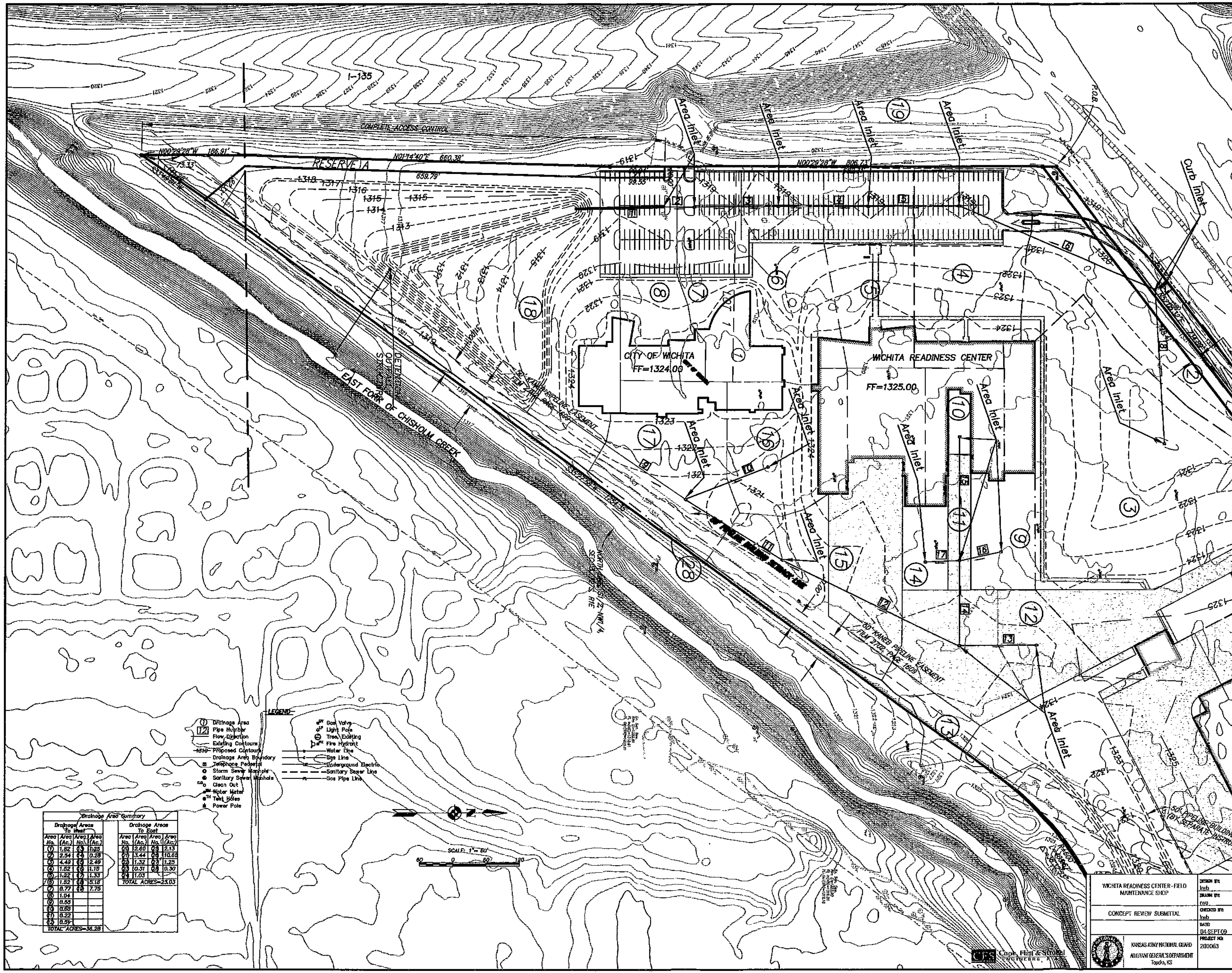
Pond File: 95030WPD.PND
Inflow Hydrograph: 95030W00.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 09-08-2009
16:03:55

Peak Inflow = 103.20 cfs
Peak Outflow = 49.56 cfs
Peak Elevation = 1314.25 ft



x File: OUT .HYD Qmax = 49.6 cfs
* File: 95030W00.HYD Qmax = 103.2 cfs



Drainage Area Summary

Drainage Areas To West				Drainage Areas To East			
Area No.	Area (Ac.)	Area No.	Area (Ac.)	Area No.	Area (Ac.)	Area No.	Area (Ac.)
1	1.82	13	0.25	20	2.60	25	2.13
2	2.54	14	0.28	21	3.44	26	10.65
3	4.49	15	2.49	22	1.32	27	1.25
4	1.52	16	1.15	23	0.31	28	0.30
5	1.22	17	1.33	24	1.03		
6	1.52	18	5.18	TOTAL ACRES=23.03			
7	0.77	19	7.75				
8	1.04						
9	0.55						
10	0.65						
11	0.22						
12	0.51						
TOTAL ACRES=36.28							

WICHITA READINESS CENTER - FIELD MAINTENANCE SHOP	DESIGN BY: kwb DRAWN BY: rwo
CONCEPT REVIEW SUBMITTAL	CHECKED BY: kwb DATE: 04-SEPT-09
KANSAS ARMY NATIONAL GUARD ADJUTANT GENERAL'S DEPARTMENT Topeka, KS	PROJECT NO: 200063

HTK ARCHITECTS

DRAINAGE PLAN SUBMITTAL

Date:
- 04-SEPT-09

Revised Date:

HTK Project Number:
- 0 9 0 3 . 0 1

DEPARTMENT OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT
900 SW JACKSON, SUITE 600
TOPEKA, KANSAS 66612-1200
TELEPHONE 785-296-8899
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WICHITA READINESS CENTER

ADJUTANT GENERAL'S DEPARTMENT, STATE OF KANSAS, KANSAS ARMY NATIONAL GUARD, TOPEKA, KS

Sheet Contents:
- DRAINAGE PLAN - PROPOSED AREAS

DFM Project Number:
- A- Pending

Sheet Number:

C0.2

Original Contract Documents

Curb Inlet

UPRR

Area Inlet

Area Inlet

FIELD MAINTENANCE SHOP

FF=1325.00

15" CMP

15" Dia. Manhole

10'x8' Transverse Concrete Box

50' PIPELINE EASEMENT (BY SEPARATE INSTRUMENT)

DETENTION BUTTERFLY STRUCTURE

20' STREET DEDICATION

Area Inlet

60' KANEB PIPELINE EASEMENT FILM 270Z - PAGE 1609

Drainage Area Summary							
Drainage Areas To Plant				Drainage Areas To East			
Area No.	Area (Ac.)	Area No.	Area (Ac.)	Area No.	Area (Ac.)	Area No.	Area (Ac.)
(1)	1.60	(8)	0.28	(22)	0.50	(25)	2.41
(2)	2.55	(9)	2.49	(23)	13.21	(26)	1.49
(3)	4.49	(10)	1.19	(24)	1.39	(27)	61.80
(4)	1.55	(11)	1.37	(25)	0.80		
(5)	1.22	(12)	0.18	(26)	11.69		
(6)	1.50	(13)	7.78	TOTAL ACRES= 93.03			
(7)	10.77						
(8)	1.04						
(9)	0.59						
(10)	0.60						
(11)	0.23						
(12)	0.61						
TOTAL ACRES= 96.26							

LEGEND

- Drainage Area
- Pipe Number
- Flow Direction
- Existing Contours
- Proposed Contours
- Drainage Area Boundary
- Retention Pond
- Storm Sewer Manhole
- Sanitary Sewer Manhole
- Clean Out
- Water Meter
- Test Hole
- Power Pole
- Gas Valve
- Light Pole
- Tree, Existing
- Fire Hydrant
- Water Line
- Gas Line
- Underground Electric
- Overhead Sewer Line
- Gas Pipe Line

SCALE: 1"= 60'

WICHITA READINESS CENTER - FIELD MAINTENANCE SHOP	DESIGN BY: kwb
	DRAWN BY: mrb
CONCEPT REVIEW SUBMITTAL	CHECKED BY: kwb
	DATE: 04-SEPT-09
KANSAS ARMY NATIONAL GUARD ADJUTANT GENERAL'S DEPARTMENT Topeka, KS	PROJECT NO: 200363

CFS Cook, Platt & Strobel ENGINEERS, P.A.

HTK ARCHITECTS

DRAINAGE PLAN SUBMITTAL

Date:
- 04-SEPT-09

Revised Date:

HTK Project Number:
- 0903.01

DEPARTMENT OF ADMINISTRATION
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WICHITA READINESS CENTER

ADJUTANT GENERAL'S DEPARTMENT, STATE OF KANSAS,
KANSAS ARMY NATIONAL GUARD, TOPEKA, KS

Sheet Contents:
- DRAINAGE PLAN - PROPOSED AREAS

DFM Project Number:
- A- Pending

Sheet Number:

C0.2

Original Contract Documents

Appendix C
Drainage Plan-Proposed Areas and Calculations

Area ①

$A = 1.82 A_2$

$C = 0.50$

$S = \frac{1325 - 1319}{860} = 0.007 = 70.7\%$ $\quad L_{OF} = 250'$ $\quad L_{SC} = 500'$ $\quad L_{CF} = 110'$

T_c: $T_{OF} = 1.8(1.1 - 0.50)\frac{\sqrt{250}}{\sqrt[3]{0.7}} = 19.2$ min.

T_{SC}: $V = 20.3282(0.007)^{1/2} = 1.7$ ft/s

$T_{SC} = \frac{500}{60(1.7)} = 4.9$ min.

T_{CF}: $V = 1.5\, V_{SC} = 1.5(1.7) = 2.55$ ft/s

$T_{CF} = \frac{110}{60(2.55)} = 0.7$ min.

$T_c = 19.2 + 4.9 + 0.7 = 24.8$ min.

$i_2 = 2.96$ in/hr $\quad i_5 = 3.57$ in/hr $\quad i_{10} = 4.13$ in/hr $\quad i_{25} = 4.81$ in/hr $\quad i_{100} = 5.90$ in/hr

$Q_2 = 1.0(0.5)(2.96)(1.82) = 2.7$ cfs

$Q_5 = 1.0(0.5)(3.57)(1.82) = 3.2$ cfs

$Q_{10} = 1.0(0.5)(4.13)(1.82) = 3.8$ cfs

$Q_{25} = 1.1(0.5)(4.81)(1.82) = 4.4$ cfs

$Q_{100} = 1.25(0.5)(5.90)(1.82) = 6.7$ cfs

Area (2)

$A = 2.51$ Ac.

$C = 0.50$

$S = \frac{1324 - 1319}{850} = 0.0059 \Rightarrow 0.60\%$ $L_{OF} = 100'$ $L_{SC} = 500'$ $L_{CF} = 250'$

T_c: $T_{OF} = 1.8(1.1 - 0.50)\frac{\sqrt{100}}{\sqrt[3]{0.60}} = 12.8$ min.

T_{SC}: $V = 20.3282(0.006)^{1/2} = 1.6$ ft/s

$T_{SC} = \frac{500}{60(1.6)} = 5.2$ min.

T_{CF}: $V = 1.5\, V_{SC} = 1.6(1.5) = 2.4$ ft/s

$T_{CF} = \frac{250}{60(2.4)} = 1.7$ min.

$T_c = 12.8 + 5.2 + 1.7 = 19.7$ min.

$i_2 = 3.33$ in/hr $i_5 = 4.00$ in/hr $i_{10} = 4.60$ in/hr $i_{25} = 5.35$ in/hr $i_{100} = 6.53$ in/hr

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

Subject _____ Sheet No. _____ of _____

_____ Job No. _____

By _____ Date _____

Area (13)

A = 4.49 Ac

C = 0.50 (Accounts for Future Expansion Possibility)

$S = \frac{1326.5 - 1319.6}{370} = 0.0186 = 1.86\%$ $L_{OF} = 200'$ $L_{SC} = 170'$

T_C: $T_{OF} = 1.8(1.1 - 0.50)\frac{\sqrt{200'}}{\sqrt[3]{1.86}} = 12.4$ min.

T_{SC}: $V = 16.1345(0.0186)^{1/2} = 2.2$ ft/s

$T_{SC} = \frac{170}{60(2.2)} = 1.3$ min.

$T_C = 12.4 + 1.3 = 13.7$ min.

$i_2 = 3.95$ in/hr $i_5 = 4.69$ in/hr $i_{10} = 5.37$ in/hr $i_{25} = 6.23$ in/hr $i_{100} = 7.57$ in/hr

Area (4)

$A = 1.52 A_E$

$C = 0.60$

$S = \frac{1324.50 - 1318.6}{310} = 0.019$ $\quad L_{OF} = 200'$ $\quad L_{SC} = 110'$

T_C: $T_{OF} = 1.8(1.1 - 0.6)\frac{\sqrt{200}}{\sqrt[3]{1.9}} = 10.3$ min.

T_{SC}: $V = 20.3282(0.019)^{1/2} = 2.80$ FT/S

$T_{SC} = \frac{110}{60(2.8)} = 0.7$ min.

$T_C = 10.3 + 0.7 = 11$ min.

$i_2 = 4.36$ in/hr $\quad i_5 = 5.16$ in/hr $\quad i_{10} = 5.89$ in/hr $\quad i_{25} = 6.81$ in/hr $\quad i_{100} = 8.27$ in/hr

Area (5)

$A = 1.22$ Ac

$C = 0.40$

$S = \frac{1324.5 - 1318.6}{250} = 0.0236 \Rightarrow 2.36\%$ $L_{OF} = 180'$ $L_{SC} = 70'$

T_c: $T_{OF} = 1.8(1.1 - 0.4)\frac{\sqrt{180'}}{\sqrt[3]{2.36}} = 9.1$ min.

T_{SC}: $V = 20.3282 (0.0236)^{1/2} = 3.12$ ft/s

$T_{SC} = \frac{70}{60(3.12)} = 0.4$ min.

$T_c = 9.1 + 0.4 = 9.5$ min.

$i_2 = 4.7$ in/hr $i_5 = 5.54$ in/hr $i_{10} = 6.31$ in/hr $i_{25} = 7.28$ in/hr $i_{100} = 8.83$ in/hr

Area ⑥

$A = 1.52\ Ac$

$C = 0.60$

$S = \frac{1324.5 - 1318.15}{350} = 0.0181 \Rightarrow 1.8\%$ $\quad L_{OF} = 100$ $\quad L_{SC} = 250$

T_C: $T_{OF} = 1.8(1.1 - 0.6)\frac{\sqrt{100}}{\sqrt[3]{1.8}} = 7.4\ min.$

T_C: $V = 20.3282(0.018)^{1/2} = 2.73\ ft/s$

$T_{SC} = \frac{250}{60(2.73)} = 1.5\ min$

$T_C = 7.4 + 1.5 = 8.9\ min.$

$i'_{10} = 4.70\ in/hr$ $\quad i'_5 = 5.54\ in/hr$ $\quad i'_{10} = 6.31\ in/hr$ $\quad i'_{25} = 7.28\ in/hr$ $\quad i'_{100} = 8.83\ in/hr$

Area (7)

A = 0.77 Ac

C = 0.60

$S = \frac{1328.50 - 1317.80}{225} = 0.0253 = 2.53\%$ $L_{OF} = 175'$ $L_{SC} = 50'$

T_C: $T_C = T_{OF} = 1.8(1.1 - 0.6)\frac{\sqrt{175}}{\sqrt[3]{2.53}} = 8.7$ min.

T_{SC}: $V = 20.3282(0.0253)^{1/2} = 3.23$ ft/s

$T_{SC} = \frac{50}{60(3.23)} = 0.3$ min.

$T_C = 8.7 + 0.3 = 9.0$ min.

$I_2 = 4.76$ in/hr $I_5 = 5.54$ in/hr $I_{10} = 6.31$ in/hr $I_{25} = 7.28$ in/hr $I_{100} = 8.83$ in/hr

Area (8)

A = 0.55 Ac.

C = 0.9 (Future Exp.)

$S = \frac{1324.5 - 1321.70}{151} = 0.0185 = 77.85\%$ $L_{OF} = 151'$

T_c: $T_{OF} = 1.8(1.1 - 0.9)\frac{\sqrt{151}}{\sqrt[3]{1.85}} = 3.1 \Rightarrow 5$ min.

Area (17)

A=

C=0.60

$S = \frac{1323.5 - 1320}{190'} = 0.0184 = 1.84\%$ $L_{OF} = 191'$

$T_c = T_{OF} = 1.8(1.1 - 0.6)\frac{\sqrt{191}}{\sqrt[3]{1.84}} = 10.2$ min.

$i_2 = 4.52$ in/hr $i_5 = 5.34$ in/hr $i_{10} = 6.09$ in/hr $i_{25} = 7.04$ in/hr $i_{100} = 8.54$ in/hr

Area (18)

$A = 5.18$ Ac.

$C = 0.50$

$S = 0.02 \Rightarrow 2\%$ $L_{OF} = 250'$ $L_{SC} = 200'$ $L_{CF} = 120'$

T_c: $T_{OF} = \frac{1.8(1.1 - 0.50)\sqrt{250}}{\sqrt[3]{2.0}} = 13.6$ min

T_{SC}: $V = 16.1345(0.02)^{1/2} = 2.28$ ft/s

$T_{SC} = \frac{200'}{60(2.28)} = 1.5$ min

T_{CF}: $V = V_{SC}(1.5) = 2.28(1.5) = 3.42$ ft/s

$T_{CF} = \frac{120}{60(3.42)} = 0.6$ min

$T_c = 13.6 + 1.5 + 0.6 = 15.7$ min

Area (19)

$A = 7.75$ Ac

$C_2 = 0.17$ $C_5 = 0.20$ $C_{10} = 0.26$ $C_{25} = 0.28$ $C_{100} = 0.40$

$S = \frac{1322 - 1313}{2360} = 0.0038 = 0.38\%$ $L_{OF} = 300'$ $L_{SC} = 700'$ $L_{CF} = 1360'$

T_c: $T_{OF_2} = 1.8(1.1 - 0.17)\frac{\sqrt{300}}{\sqrt[3]{0.38}} = 40$ min.

$T_{OF_5} = 1.8(1.1 - 0.20)\frac{\sqrt{300}}{\sqrt[3]{0.38}} = 38.7$ min

$T_{OF_{10}} = 1.8(1.1 - 0.26)\frac{\sqrt{300}}{\sqrt[3]{0.38}} = 36.2$ min

$T_{OF_{25}} = 1.8(1.1 - 0.28)\frac{\sqrt{300}}{\sqrt[3]{0.38}} = 35.3$ min

$T_{OF_{100}} = 1.8(1.1 - 0.40)\frac{\sqrt{300}}{\sqrt[3]{0.38}} = 30.1$ min

T_{SC}: $V = 16.1345(0.0038)^{1/2} = 1.0$ ft/s

$T_{SC} = \frac{700}{60(1.0)} = 11.7$ min.

T_{CF}: $V = 1.5\, V_{SC} = 1.5(1.0) = 1.5$ ft/s

$T_{CF} = \frac{1360}{60(1.5)} = 15.1$ min.

T_c: $T_{c_2} = 40 + 11.7 + 15.1 = 66.8$ min.

$T_{c_5} = 38.7 + 11.7 + 15.1 = 65.5$ min.

$T_{c_{10}} = 36.2 + 11.7 + 15.1 = 63$ min.

$T_{c_{25}} = 35.3 + 11.7 + 15.1 = 62.1$ min.

$T_{c_{100}} = 30.1 + 11.7 + 15.1 = 56.9$ min

$i_2 = 1.56$ in/hr $i_5 = 2.01$ in/hr $i_{10} = 2.37$ in/hr $i_{25} = 2.79$ in/hr $i_{100} = 3.51$ in/hr

$Q_2 = (0.17)(1.56)(7.75) = 2.1$ cfs

$Q_5 = (0.20)(2.01)(7.75) = 3.1$ cfs

$Q_{10} = (0.26)(2.37)(7.75) = 4.8$ cfs

$Q_{25} = (0.28)(2.79)(7.75) = 21.9$ cfs

$Q_{100} = (0.40)(3.51)(7.75) = 10.9$ cfs

Area (20)

$A = 2.60$ Ac.

$C = 0.60$

$S = \frac{1331 - 1322}{740'} = 0.0122 = 1.22\%$ $L_{OF} = 120$ $L_{SC} = 500'$ $L_{CF} = 140'$

T_c: $T_{OF} = 1.8(1.1 - 0.6)\frac{\sqrt{120}}{\sqrt[3]{1.22}} = 9.2$ min.

T_{SC}: $V = 20.3282(0.0122)^{1/2} = 2.25$ ft/s

$T_{SC} = \frac{500'}{60(2.25)} = 3.7$ min.

T_{CF}: $V = 1.5\,V_{SC} = 1.5(2.25) = 3.38$ ft/s

$T_{CF} = \frac{140}{60(3.38)} = 0.7$ min.

$T_c = 9.2 + 3.7 + 0.7 = 13.6$ min.

$i_2 = 4.08$ in/hr. $i_5 = 4.84$ in/hr. $i_{10} = 5.53$ in/hr. $i_{25} = 6.41$ in/hr. $i_{100} = 7.79$ in/hr.

$Q_2 = 1.0(0.60)(4.08) =$

$Q_5 = 1.0(0.60)(4.84) =$

$Q_{10} = 1.0(0.60)(5.53) =$

$Q_{25} = 1.1(0.60)(6.41) =$

$Q_{100} = 1.25(0.6)(7.79) =$

Area (27)

$L = 966'$ $L_{OF} = 200'$ $L_{SC} = 500'$ $L_{CF} = 266'$

$A = 3.44 Ac$

$C = 0.60$

$S = \frac{1330 - 1322}{966} = 0.0083 \Rightarrow 0.83\%$ $L_{OF} = 200'$ $L_{SC} = 500'$ $L_{CF} = 266'$

T_c: $T_{OF} = 1.8(1.1 - 0.60)\frac{\sqrt{200}}{\sqrt[3]{0.83}} = 13.5$ min.

T_c: $V = 20.3282 (0.0083)^{1/2} = 1.85$ ft/s

$T_{SC} = \frac{500}{60(1.85)} = 4.5$ min.

$T_c = 13.5 + 4.5 = 18.0$ min.

$i_2 = 3.51$ in/hr $i_5 = 4.20$ in/hr $i_{10} = 4.83$ in/hr $i_{25} = 5.61$ in/hr $i_{100} = 6.84$ in/hr

$Q_2 = 1.0(0.60)(3.51)(3.44) =$

$Q_5 = 1.0(0.60)(4.20)(3.44) =$

$Q_{10} = 1.0(0.60)(4.83)(3.44) =$

$Q_{25} = 1.1(0.60)(5.61)(3.44) =$

$Q_{100} = 1.25(0.60)(6.84)(3.44) =$

Area (25)

$A = 2.13$ Ac

$C = 0.58$ $L = 340'$ $L_{OF} = 200'$ $L_{SC} = 140'$

$S = \frac{1325.4 - 1320}{340} = 0.0116 = 1.16\%$

$T_C = T_{OF} = 1.8(1.1 - 0.50)\frac{\sqrt{200}}{\sqrt[3]{1.16}} = 13.11$ min

$T_{SC}: V = K_u 1.345 (0.012)^{1/2} = 2.04$ ft/s

$T_{SC} = \frac{140}{60(2.04)} = 1.1$ min

$T_C = 13.1 + 1.1 = 14.2$ min

$i_{10} = 5.37$ in/hr

$Q_{10} = 1.0(0.50)(5.37)(2.13) = 5.7$ cfs

$Q_{15} = \frac{1.49}{0.013}(1.227)\left(\frac{1.227}{5.98}\right)^{2/3}(0.01)^{1/2} = 6.5$ cfs ✓

AREA (26)

$A = 10.65 \text{ Ac}$

$C = 0.50$ $\quad L = 730'$ $\quad L_{OF} = 300'$ $\quad L_{SC} = 300'$ $\quad L_{CP} = 130'$

$S = \frac{1326 - 1313}{730} = 0.0178 = 1.78\%$

T_C: $T_{OF} = 1.8(1.1 - 0.5)\frac{\sqrt{300}}{\sqrt[3]{1.78}} = 15.4 \text{ min}$

T_{SC}: $V = 15.1345(0.0178)^{1/2} = 2.15 \text{ ft/s}$

$T_{SC} = \frac{300}{60(2.15)} = 2.3 \text{ min}$

T_{CP}: $V = V_{SC}(1.5) = 2.15(1.5) = 3.23 \text{ ft/s}$

$T_{CF} = \frac{130}{60(3.23)} = 0.7 \text{ min}$

$T_C = 15.4 + 2.3 + 0.7 = 18.4 \text{ min}$

$I_{10} = 4.88 \text{ in/hr}$

$Q_{10} = 1.0(0.50)(4.88)(10.65) = 25.7 \text{ cfs}$

AREA (27)

$A = 1.25\ Ac$

$C = 0.30$

$S =$

$T_c = 5$ min

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

Subject _____ Sheet No. _____ of _____

_____ Job No. _____

By _____ Date _____

Area 28

$A = 0.30\ Ac$

$C_2 = 0.16 \quad C_5 = 0.20 \quad C_{10} = 0.24 \quad C_{25} = 0.26 \quad C_{100} = 0.37$

$T_C = 5\ min.$

$i_2 = 5.57\ in/hr \quad i_5 = 6.53\ in/hr \quad i_{10} = 7.41\ in/hr \quad i_{25} = 8.52\ in/hr \quad i_{100} = 10.32\ in/hr$

$Q_2 = 0.16(5.57)(0.30) = 0.3\ cfs$

$Q_5 = 0.20(6.53)(0.30) = 0.4\ cfs$

$Q_{10} = (0.24)(7.41)(0.30) = 0.5\ cfs$

$Q_{25} = (0.26)(8.52)(0.30) = 0.7\ cfs$

$Q_{100} = (0.37)(10.32)(0.30) = 1.1\ cfs$

Drainage to Pond

ΣCxA => From Storm Sewer Tabulations (Pg 1) + Overland Flows (Area 18)

$= 8.07 + 6.10 + 5.18(0.5) = 16.76$

$T_{C\,ROOF} = 25$ min.

$I_2 = 2.96$ in/hr $I_5 = 3.57$ in/hr $I_{10} = 4.13$ in/hr $I_{25} = 4.81$ in/hr $I_{100} = 5.90$ in/hr

$Q_2 = 1.0(16.76)(2.96) = 49.6$ cfs

$Q_5 = 1.0(16.76)(3.57) = 59.8$ cfs

$Q_{10} = 1.0(16.76)(4.13) = 69.2$ cfs

$Q_{25} = 1.10(16.76)(4.81) = 88.7$ cfs

$Q_{100} = 1.25(16.76)(5.90) = 123.6$ cfs

$Q_{release}$

$Q_{REL.} = Q_{ORIG.} - Q_{UNDET.}$

$Q_{UNDET} = Q_{AREA\,(19)} + Q_{AREA\,(28)}$

$Q_{UNDET\,2} = \Sigma CxA\,(2.96) = [(7.75)(0.17) + (0.30)(0.16)](2.96) = 4.04$ cfs

$Q_{UNDET\,5} = \Sigma CxA\,(3.57) = [(7.75)(0.20) + (0.30)(0.20)](3.57) = 5.7$ cfs

$Q_{UNDET\,10} = \Sigma CxA\,(4.13) = [(7.75)(0.26) + (0.30)(0.24)](4.13) = 8.6$ cfs

$Q_{UNDET\,25} = \Sigma CxA\,(4.81) = [(7.75)(0.28) + (0.30)(0.26)](4.81) = 10.8$ cfs

$Q_{UNDET\,100} = \Sigma CxA\,(5.90) = [(7.75)(0.40) + (0.30)(0.37)](5.90) = 18.9$ cfs

$Q_{REL\,2} = 14.3 - 4.0 = 10.3$ cfs

$Q_{REL\,5} = 20.9 - 5.7 = 15.2$ cfs

$Q_{REL\,10} = 32.7 - 8.6 = 24.1$ cfs

$Q_{REL\,25} = 41.6 - 10.8 = 30.8$ cfs

$Q_{REL\,100} = 73.8 - 18.9 = 54.9$ cfs

Drainage to Pond

$\Sigma C \times A$ = FROM STORM SEWER TABULATIONS (PG. 1) + OVERLAND FLOW

$= 6.02 + (0.15)(2.13) + (0.5)(10.65) = 12.41$

$T_{C\,PEAK} = 18.4$ min

$i_2 = 3.51$ in/hr $\quad i_5 = 4.20$ in/hr $\quad i_{10} = 4.83$ in/hr $\quad i_{25} = 5.61$ in/hr $\quad i_{100} = 6.84$ in/hr

$Q_2 = 1.0\,(12.41)(3.51) = 43.6$ cfs

$Q_5 = 1.0\,(12.41)(4.20) = 52.1$ cfs

$Q_{10} = 1.0\,(12.41)(4.83) = 59.9$ cfs

$Q_{25} = 1.1\,(12.41)(5.61) = 76.6$ cfs

$Q_{100} = 1.25\,(12.41)(6.84) = 106.1$ cfs

$Q_{RELEASE}$

$Q_{REL} = Q_{ORIG} - Q_{UNDET}$

$Q_{UNDET} = Q_{AREA\,(27)}$

$Q_{UNDET\,2} = 1.25(0.30)(3.51) = 1.3$ cfs

$Q_{UNDET\,5} = 1.0\,(1.25)(0.30)(4.20) = 1.6$ cfs

$Q_{UNDET\,10} = 1.0\,(1.25)(0.30)(4.83) = 1.8$ cfs

$Q_{UNDET\,25} = 1.1\,(1.25)(6.30)(5.61) = 2.31$ cfs

$Q_{UNDET\,100} = 1.25\,(1.25)(0.30)(6.84) = 3.2$ cfs

$Q_{REL\,2} = 7.1 - 1.3 = 5.8$ cfs

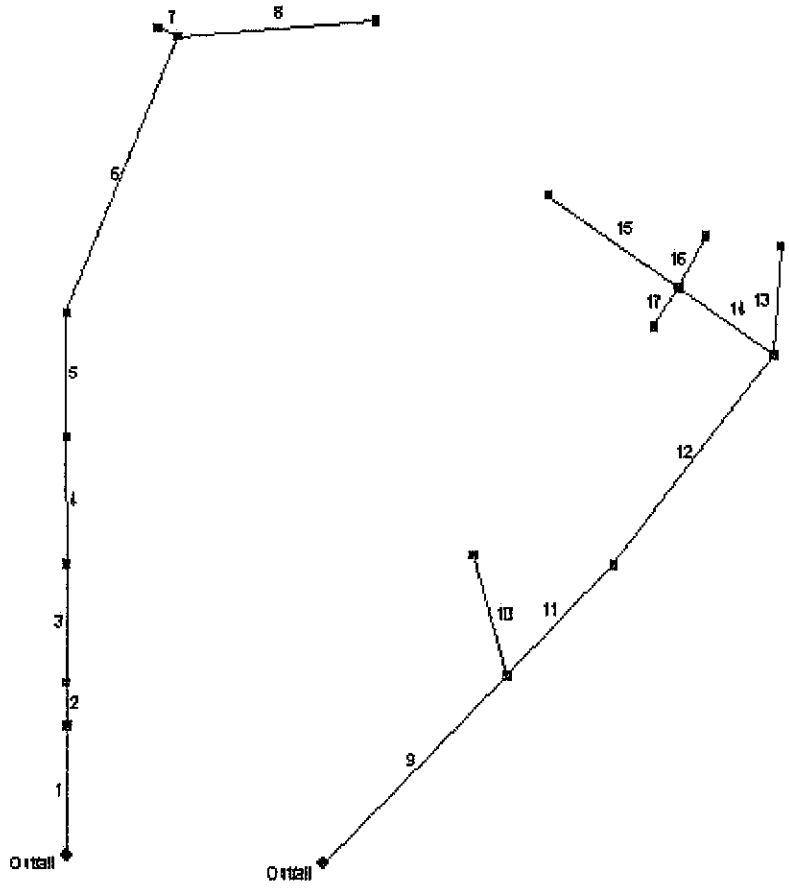
$Q_{REL\,5} = 10.4 - 1.6 = 8.8$ cfs

$Q_{REL\,10} = 14.9 - 1.8 = 13.1$ cfs

$Q_{REL\,25} = 18.6 - 2.3 = 16.3$ cfs

$Q_{REL\,100} = 33.9 - 3.2 = 30.7$ cfs

Hydraflow Plan View



Project File: West Storm Sewer.stm	No. Lines: 17	09-04-2009

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	165.0	-89.9	DrGrt	0.00	1.04	0.60	5.0	1309.73	0.20	1310.06	36	Cir	0.013	0.00	1317.80	Area 8
2	1	54.0	-0.8	DrGrt	0.00	0.77	0.60	9.0	1310.56	0.30	1310.72	30	Cir	0.013	0.00	1317.80	Area 7
3	2	153.0	0.6	DrGrt	0.00	1.52	0.60	9.0	1310.82	0.30	1311.28	30	Cir	0.013	0.00	1318.15	Area 6
4	3	162.0	-0.3	DrGrt	0.00	1.22	0.60	9.0	1311.38	0.30	1311.87	30	Cir	0.013	0.00	1318.55	Area 5
5	4	162.0	0.2	DrGrt	0.00	1.52	0.60	11.0	1311.97	0.30	1312.46	30	Cir	0.013	0.00	1318.55	Area 4
6	5	385.0	23.6	Curb	0.00	2.54	0.50	20.0	1312.96	0.30	1314.11	24	Cir	0.013	0.00	1318.61	Area 2
7	6	30.0	-90.0	Curb	0.00	1.82	0.50	25.0	1314.65	0.50	1314.80	18	Cir	0.013	0.00	1318.61	Area 1
8	6	278.0	62.2	DrGrt	0.00	4.49	0.50	14.0	1314.21	0.46	1315.50	24	Cir	0.013	0.00	1319.60	Area 3
9	End	352.0	-43.3	DrGrt	0.00	1.33	0.60	10.0	1313.26	0.20	1313.96	36	Cir	0.013	0.00	1320.00	Area 17
10	9	162.0	-63.5	DrGrt	0.00	1.15	0.60	5.0	1315.71	0.80	1317.00	15	Cir	0.013	0.00	1320.00	Area 16
11	9	206.0	-0.3	DrGrt	0.00	2.49	0.60	5.0	1314.46	0.30	1315.08	30	Cir	0.013	0.00	1320.00	Area 15
12	11	354.0	-7.1	DrGrt	0.00	1.25	0.90	5.0	1315.18	0.30	1316.24	30	Cir	0.013	0.00	1322.25	Area 13
13	12	140.0	-35.4	DrGrt	0.00	0.51	0.90	5.0	1317.00	0.71	1318.00	15	Cir	0.013	0.00	1323.00	Area 12
14	12	159.0	-96.7	DrGrt	0.00	0.22	0.90	5.0	1316.74	0.30	1317.22	24	Cir	0.013	0.00	1323.20	Area 11
15	14	217.0	0.3	DrGrt	0.00	0.65	0.90	5.0	1319.13	0.40	1320.00	15	Cir	0.013	0.00	1323.00	Area 10
16	14	77.0	86.5	DrGrt	0.00	0.55	0.90	5.0	1317.97	0.30	1318.20	15	Cir	0.013	0.00	1321.70	Area 9
17	14	61.0	-87.3	DrGrt	0.00	0.28	0.90	5.0	1318.00	0.33	1318.20	15	Cir	0.013	0.00	1322.50	Area 14

Project File: West Storm Sewer.stm | Number of lines: 17 | Date: 09-04-2009

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	Area 8	31.34	36 c	165.0	1309.73	1310.06	0.200	1311.51	1312.51	0.00	1312.51	End
2	Area 7	29.00	30 c	54.0	1310.56	1310.72	0.296	1313.06*	1313.33*	0.00	1313.33	1
3	Area 6	27.44	30 c	153.0	1310.82	1311.28	0.301	1313.39*	1314.07*	0.00	1314.07	2
4	Area 5	24.12	30 c	162.0	1311.38	1311.87	0.302	1314.18*	1314.74*	0.00	1314.74	3
5	Area 4	21.47	30 c	162.0	1311.97	1312.46	0.302	1314.82*	1315.27*	0.00	1315.27	4
6	Area 2	18.19	24 c	385.0	1312.96	1314.11	0.299	1315.27*	1317.76*	0.00	1317.76	5
7	Area 1	3.76	18 c	30.0	1314.65	1314.80	0.500	1318.21*	1318.25*	0.00	1318.25	6
8	Area 3	12.06	24 c	278.0	1314.21	1315.50	0.464	1318.05*	1318.84*	0.00	1318.84	6
9	Area 17	37.12	36 c	352.0	1313.26	1313.96	0.199	1315.20*	1317.20*	0.00	1317.20	End
10	Area 16	5.11	15 c	162.0	1315.71	1317.00	0.796	1317.36*	1318.37*	0.00	1318.37	9
11	Area 15	29.92	30 c	206.0	1314.46	1315.08	0.301	1317.20*	1318.29*	0.00	1318.29	9
12	Area 13	21.35	30 c	354.0	1315.18	1316.24	0.299	1318.58*	1319.54*	0.00	1319.54	11
13	Area 12	3.40	15 c	140.0	1317.00	1318.00	0.714	1319.71*	1320.10*	0.00	1320.10	12
14	Area 11	10.83	24 c	159.0	1316.74	1317.22	0.302	1319.65*	1320.01*	0.00	1320.01	12
15	Area 10	4.33	15 c	217.0	1319.13	1320.00	0.401	1320.24	1321.11	0.00	1321.11	14
16	Area 9	3.66	15 c	77.0	1317.97	1318.20	0.299	1320.06*	1320.30*	0.00	1320.30	14
17	Area 14	1.87	15 c	61.0	1318.00	1318.20	0.328	1320.16*	1320.21*	0.00	1320.21	14

Project File: West Storm Sewer.stm | Number of lines: 17 | Run Date: 09-04-2009

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	165.0	1.04	14.92	0.60	0.62	8.07	5.0	28.2	3.9	31.34	29.83	6.11	36	0.20	1310.06	1309.73	1312.51	1311.51	1317.80	0.00	Area 8
2	1	54.0	0.77	13.88	0.60	0.46	7.44	9.0	28.0	3.9	29.00	22.32	5.91	30	0.30	1310.72	1310.56	1313.33	1313.06	1317.80	1317.80	Area 7
3	2	153.0	1.52	13.11	0.60	0.91	6.98	9.0	27.5	3.9	27.44	22.49	5.59	30	0.30	1311.28	1310.82	1314.07	1313.39	1318.15	1317.80	Area 6
4	3	162.0	1.22	11.59	0.60	0.73	6.07	9.0	27.0	4.0	24.12	22.56	4.91	30	0.30	1311.87	1311.38	1314.74	1314.18	1318.55	1318.15	Area 5
5	4	162.0	1.52	10.37	0.60	0.91	5.34	11.0	26.3	4.0	21.47	22.56	4.37	30	0.30	1312.46	1311.97	1315.27	1314.82	1318.55	1318.55	Area 4
6	5	385.0	2.54	8.85	0.50	1.27	4.43	20.0	25.2	4.1	18.19	12.36	5.79	24	0.30	1314.11	1312.96	1317.76	1315.27	1318.61	1318.55	Area 2
7	6	30.0	1.82	1.82	0.50	0.91	0.91	25.0	25.0	4.1	3.76	7.43	2.13	18	0.50	1314.80	1314.65	1318.25	1318.21	1318.61	1318.61	Area 1
8	6	278.0	4.49	4.49	0.50	2.25	2.25	14.0	14.0	5.4	12.06	15.41	3.84	24	0.46	1315.50	1314.21	1318.84	1318.05	1319.60	1318.61	Area 3
9	End	352.0	1.33	8.43	0.60	0.80	6.10	10.0	10.0	6.1	37.12	29.74	6.46	36	0.20	1313.96	1313.26	1317.20	1315.20	1320.00	0.00	Area 17
10	9	162.0	1.15	1.15	0.60	0.69	0.69	5.0	5.0	7.4	5.11	5.76	4.16	15	0.80	1317.00	1315.71	1318.37	1317.36	1320.00	1320.00	Area 16
11	9	206.0	2.49	5.95	0.60	1.49	4.61	5.0	8.2	6.5	29.92	22.50	6.10	30	0.30	1315.08	1314.46	1318.29	1317.20	1320.00	1320.00	Area 15
12	11	354.0	1.25	3.46	0.90	1.13	3.11	5.0	6.8	6.9	21.35	22.44	4.35	30	0.30	1316.24	1315.18	1319.54	1318.58	1322.25	1320.00	Area 13
13	12	140.0	0.51	0.51	0.90	0.46	0.46	5.0	5.0	7.4	3.40	5.46	2.77	15	0.71	1318.00	1317.00	1320.10	1319.71	1323.00	1322.25	Area 12
14	12	159.0	0.22	1.70	0.90	0.20	1.53	5.0	6.0	7.1	10.83	12.43	3.45	24	0.30	1317.22	1316.74	1320.01	1319.65	1323.20	1322.25	Area 11
15	14	217.0	0.65	0.65	0.90	0.59	0.59	5.0	5.0	7.4	4.33	4.09	3.76	15	0.40	1320.00	1319.13	1321.11	1320.24	1323.00	1323.20	Area 10
16	14	77.0	0.55	0.55	0.90	0.50	0.50	5.0	5.0	7.4	3.66	3.53	2.99	15	0.30	1318.20	1317.97	1320.30	1320.06	1321.70	1323.20	Area 9
17	14	61.0	0.28	0.28	0.90	0.25	0.25	5.0	5.0	7.4	1.87	3.70	1.52	15	0.33	1318.20	1318.00	1320.21	1320.16	1322.50	1323.20	Area 14

Project File: West Storm Sewer.stm

Number of lines: 17

Run Date: 09-04-2009

NOTES: Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		4.62	0.00	4.62	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.25	12.17	0.25	12.17	0.00	Off
2		2.91	0.00	2.91	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.19	9.48	0.19	9.48	0.00	Off
3		5.75	0.00	5.75	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.29	13.77	0.29	13.77	0.00	Off
4		4.62	0.00	4.62	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.25	12.16	0.25	12.16	0.00	Off
5		5.37	0.00	5.37	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.28	13.24	0.28	13.24	0.00	Off
6		5.84	0.00	5.84	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.47	8.21	0.58	8.21	2.00	Off
7		3.76	0.00	3.76	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.37	6.11	0.47	6.11	2.00	Off
8		12.06	0.00	12.06	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	1.26	52.34	1.26	52.34	0.00	Off
9		4.86	0.00	4.86	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.26	12.52	0.26	12.52	0.00	Off
10		5.11	0.00	5.11	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.27	12.87	0.27	12.87	0.00	Off
11		11.06	0.00	11.06	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	1.06	44.37	1.06	44.37	0.00	Off
12		8.33	0.00	8.33	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.60	26.02	0.60	26.02	0.00	Off
13		3.40	0.00	3.40	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.21	10.29	0.21	10.29	0.00	Off
14		1.47	0.00	1.47	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.12	6.73	0.12	6.73	0.00	Off
15		4.33	0.00	4.33	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.24	11.74	0.24	11.74	0.00	Off
16		3.66	0.00	3.66	0.00	DrGrt	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.22	10.71	0.22	10.71	0.00	14
17		1.87	0.00	1.87	0.00	DrGrt	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.14	7.55	0.14	7.55	0.00	14

Project File: West Storm Sewer.stm | Number of lines: 17 | Run Date: 09-04-2009

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area C1 = 0.2 C2 = 0.5 C3 = 0.9			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise Span	HGL Pipe	Actual Full Flow		Date: 09-04-2009 / Frequency: 10 yrs / Proj: West Storm Sewer.st
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	DrGrt	0.013	165.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	28.18	0.66	3.88	8.07	0.00 31.34	1317.80	1312.51 1313.06 1310.06	1311.51 1312.73 1309.73	1.00 0.33	36 36 Cir	0.60 0.20	6.11 4.22	31.34 29.83	Area 8
2	1	DrGrt	0.013	54.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	28.02	0.16	3.90	7.44	0.00 29.00	1317.80	1313.33 1313.22 1310.72	1313.06 1313.06 1310.56	0.27 0.16	30 30 Cir	0.50 0.30	5.91 4.55	29.00 22.32	Area 7
3	2	DrGrt	0.013	153.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	27.55	0.48	3.93	6.98	0.00 27.44	1318.15	1314.07 1313.78 1311.28	1313.39 1313.32 1310.82	0.69 0.46	30 30 Cir	0.45 0.30	5.59 4.58	27.44 22.49	Area 6
4	3	DrGrt	0.013	162.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	26.98	0.57	3.97	6.07	0.00 24.12	1318.55	1314.74 1314.37 1311.87	1314.18 1313.88 1311.38	0.56 0.49	30 30 Cir	0.35 0.30	4.91 4.59	24.12 22.56	Area 5
5	4	DrGrt	0.013	162.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	26.34	0.63	4.02	5.34	0.00 21.47	1318.55	1315.27 1314.96 1312.46	1314.82 1314.47 1311.97	0.44 0.49	30 30 Cir	0.27 0.30	4.37 4.59	21.47 22.56	Area 4
6	5	Curb	0.013	385.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	25.24	1.11	4.11	4.43	0.00 18.19	1318.61	1317.76 1316.11 1314.11	1315.27 1314.96 1312.96	2.49 1.15	24 24 Cir	0.65 0.30	5.79 3.93	18.19 12.36	Area 2
7	6	Curb	0.013	30.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	25.00	0.24	4.13	0.91	0.00 3.76	1318.61	1318.25 1316.30 1314.80	1318.21 1316.15 1314.65	0.04 0.15	18 18 Cir	0.13 0.50	2.13 4.20	3.76 7.43	Area 1
8	6	DrGrt	0.013	278.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	14.00	1.21	5.37	2.25	0.00 12.06	1319.60	1318.84 1317.50 1315.50	1318.05 1316.21 1314.21	0.79 1.29	24 24 Cir	0.28 0.46	3.84 4.90	12.06 15.41	Area 3
9	End	DrGrt	0.013	352.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	10.00	1.17	6.09	6.10	0.00 37.12	1320.00	1317.20 1316.96 1313.96	1315.20 1316.26 1313.26	1.99 0.70	36 36 Cir	0.57 0.20	6.46 4.21	37.12 29.74	Area 17
10	9	DrGrt	0.013	162.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.65	7.40	0.69	0.00 5.11	1320.00	1318.37 1318.25 1317.00	1317.36 1316.96 1315.71	1.01 1.29	15 15 Cir	0.63 0.80	4.16 4.70	5.11 5.76	Area 16

NOTES: Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72 (in/hr) ; Time of flow in section is based on full flow.

Project File: West Storm Sewer.stm

FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area C1 = 0.2 C2 = 0.5 C3 = 0.9			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise Span	HGL Pipe	Actual Full Flow		Date: 09-04-2009 / Frequency: 10 yrs / Proj: West Storm Sewer.s
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
11	9	DrGrt	0.013	206.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	8.20	0.60	6.49	4.61	0.00 29.92	1320.00	1318.29 1317.58 1315.08	1317.20 1316.96 1314.46	1.10 0.62	30 30 Cir	0.53 0.30	6.10 4.58	29.92 22.50	Area 15
12	11	DrGrt	0.013	354.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.81	1.40	6.86	3.11	0.00 21.35	1322.25	1319.54 1318.74 1316.24	1318.58 1317.68 1315.18	0.96 1.06	30 30 Cir	0.27 0.30	4.35 4.57	21.35 22.44	Area 13
13	12	DrGrt	0.013	140.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.84	7.40	0.46	0.00 3.40	1323.00	1320.10 1319.25 1318.00	1319.71 1318.25 1317.00	0.39 1.00	15 15 Cir	0.28 0.71	2.77 4.45	3.40 5.46	Area 12
14	12	DrGrt	0.013	159.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.02	0.78	7.08	1.53	0.00 10.83	1323.20	1320.01 1319.22 1317.22	1319.65 1318.74 1316.74	0.36 0.48	24 24 Cir	0.23 0.30	3.45 3.96	10.83 12.43	Area 11
15	14	DrGrt	0.013	217.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	1.02	7.40	0.59	0.00 4.33	1323.00	1321.11 1321.25 1320.00	1320.24 1320.38 1319.13	0.87 0.87	15 15 Cir	0.40 0.40	3.76 3.33	4.33 4.09	Area 10
16	14	DrGrt	0.013	77.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.43	7.40	0.50	0.00 3.66	1321.70	1320.30 1319.45 1318.20	1320.06 1319.22 1317.97	0.25 0.23	15 15 Cir	0.32 0.30	2.99 2.88	3.66 3.53	Area 9
17	14	DrGrt	0.013	61.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.67	7.40	0.25	0.00 1.87	1322.50	1320.21 1319.45 1318.20	1320.16 1319.25 1318.00	0.05 0.20	15 15 Cir	0.08 0.33	1.52 3.01	1.87 3.70	Area 14

NOTES: Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72 (in/hr) ; Time of flow in section is based on full flow.

Project File: West Storm Sewer.stm

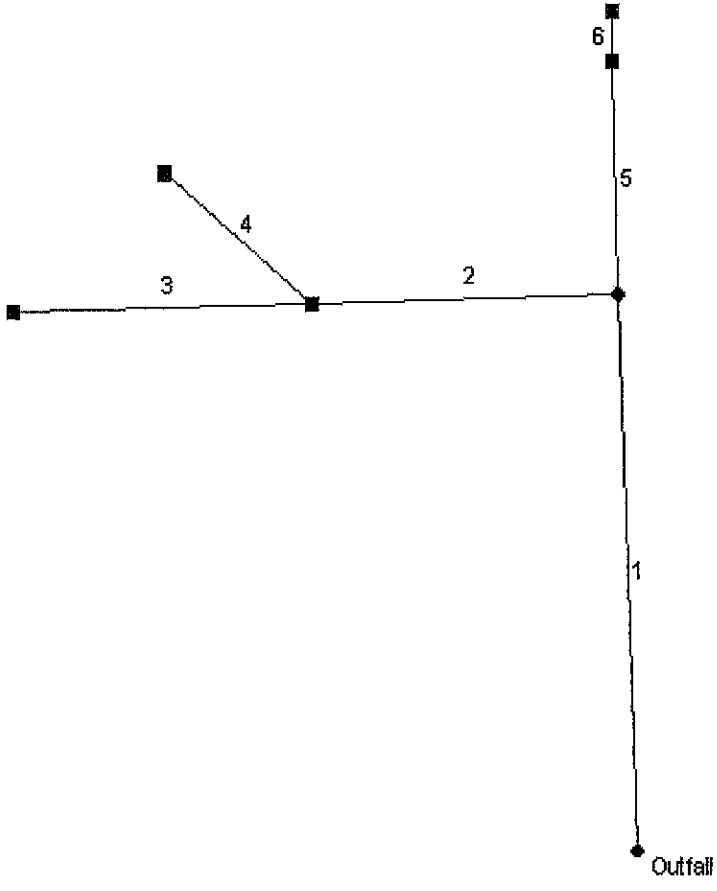
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	36	31.34	1309.73	1311.51	1.78	4.38	7.15	0.80	1312.31	0.502	165	1310.06	1312.51	2.45	6.18	5.07	0.40	1312.91	0.222	0.362	0.598	0.00	0.00
2	30	29.00	1310.56	1313.06	2.50*	4.91	5.91	0.54	1313.60	0.500	54.0	1310.72	1313.33	2.50	4.91	5.91	0.54	1313.87	0.500	0.500	0.270	0.00	0.00
3	30	27.44	1310.82	1313.39	2.50	4.91	5.59	0.49	1313.87	0.448	153	1311.28	1314.07	2.50	4.91	5.59	0.49	1314.56	0.448	0.448	0.685	0.00	0.00
4	30	24.12	1311.38	1314.18	2.50	4.91	4.91	0.38	1314.56	0.346	162	1311.87	1314.74	2.50	4.91	4.91	0.38	1315.12	0.346	0.346	0.560	0.00	0.00
5	30	21.47	1311.97	1314.82	2.50	4.91	4.37	0.30	1315.12	0.274	162	1312.46	1315.27	2.50	4.91	4.37	0.30	1315.56	0.274	0.274	0.444	0.00	0.00
6	24	18.19	1312.96	1315.27	2.00	3.14	5.79	0.52	1315.79	0.647	385	1314.11	1317.76	2.00	3.14	5.79	0.52	1318.28	0.647	0.647	2.490	0.00	0.00
7	18	3.76	1314.65	1318.21	1.50	1.77	2.13	0.07	1318.28	0.128	30.0	1314.80	1318.25	1.50	1.77	2.13	0.07	1318.32	0.128	0.128	0.038	0.00	0.00
8	24	12.06	1314.21	1318.05	2.00	3.14	3.84	0.23	1318.28	0.284	278	1315.50	1318.84	2.00	3.14	3.84	0.23	1319.07	0.284	0.284	0.790	0.00	0.00
9	36	37.12	1313.26	1315.20	1.94*	4.84	7.67	0.91	1316.12	0.548	352	1313.96	1317.20	3.00	7.07	5.25	0.43	1317.63	0.310	0.429	1.509	0.00	0.00
10	15	5.11	1315.71	1317.36	1.25	1.23	4.16	0.27	1317.63	0.626	162	1317.00	1318.37	1.25	1.23	4.16	0.27	1318.64	0.626	0.626	1.014	0.00	0.00
11	30	29.92	1314.46	1317.20	2.50	4.91	6.10	0.58	1317.77	0.533	206	1315.08	1318.29	2.50	4.91	6.10	0.58	1318.87	0.532	0.532	1.097	0.00	0.00
12	30	21.35	1315.18	1318.58	2.50	4.91	4.35	0.29	1318.87	0.271	354	1316.24	1319.54	2.50	4.91	4.35	0.29	1319.83	0.271	0.271	0.959	0.00	0.00
13	15	3.40	1317.00	1319.71	1.25	1.23	2.77	0.12	1319.83	0.277	140	1318.00	1320.10	1.25	1.23	2.77	0.12	1320.22	0.277	0.277	0.388	0.00	0.00
14	24	10.83	1316.74	1319.65	2.00	3.14	3.45	0.18	1319.83	0.229	159	1317.22	1320.01	2.00	3.14	3.45	0.18	1320.20	0.229	0.229	0.365	0.00	0.00
15	15	4.33	1319.13	1320.24	1.11*	1.15	3.76	0.22	1320.46	0.401	217	1320.00	1321.11	1.11	1.15	3.76	0.22	1321.33	0.401	0.401	0.870	0.00	0.00
16	15	3.66	1317.97	1320.06	1.25	1.23	2.99	0.14	1320.20	0.322	77.0	1318.20	1320.30	1.25	1.23	2.99	0.14	1320.44	0.322	0.322	0.248	0.00	0.00
17	15	1.87	1318.00	1320.16	1.25	1.23	1.52	0.04	1320.20	0.084	61.0	1318.20	1320.21	1.25	1.23	1.52	0.04	1320.25	0.083	0.083	0.051	0.00	0.00

Project File: West Storm Sewer.stm | Number of lines: 17 | Run Date: 09-04-2009

Notes: * Normal depth assumed.

Hydraflow Plan View



East Storm Sewer	No. Lines: 6	09-04-2009

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	338.0	-92.1	MH	0.00	0.00	0.00	0.0	1315.90	0.20	1316.58	30	Cir	0.013	0.00	0.00	Manhole
2	1	201.0	-89.9	DrGrt	0.00	1.03	0.90	5.0	1317.08	0.80	1318.69	24	Cir	0.013	0.00	1323.93	Area 24
3	2	195.0	0.3	DrGrt	0.00	1.32	0.90	5.0	1319.19	0.50	1320.16	18	Cir	0.013	0.00	1323.90	Area 22
4	2	124.0	40.8	DrGrt	0.00	0.31	0.90	5.0	1319.19	0.77	1320.15	15	Cir	0.013	0.00	1323.93	Area 23
5	1	139.0	0.2	Curb	0.00	3.44	0.60	18.0	1317.08	0.30	1317.50	24	Cir	0.013	0.00	1322.25	Area 21
6	5	30.0	3.3	Curb	0.00	2.60	0.60	14.0	1318.25	0.50	1318.40	15	Cir	0.013	0.00	1322.25	Area 20

East Storm Sewer | Number of lines: 6 | Date: 09-04-2009

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	Manhole	28.75	30 c	338.0	1315.90	1316.58	0.201	1318.24*	1319.82*	0.00	1319.82	End
2	Area 24	16.81	24 c	201.0	1317.08	1318.69	0.801	1319.91*	1321.02*	0.00	1321.02	1
3	Area 22	8.79	18 c	195.0	1319.19	1320.16	0.497	1321.08*	1322.44*	0.00	1322.44	2
4	Area 23	2.07	15 c	124.0	1319.19	1320.15	0.774	1321.42*	1321.54*	0.00	1321.54	2
5	Area 21	17.49	24 c	139.0	1317.08	1317.50	0.302	1319.87*	1320.70*	0.00	1320.70	1
6	Area 20	8.38	15 c	30.0	1318.25	1318.40	0.500	1320.70*	1321.21*	0.00	1321.21	5

East Storm Sewer | Number of lines: 6 | Run Date: 09-04-2009

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	338.0	0.00	8.70	0.00	0.00	6.02	0.0	18.4	4.8	28.75	18.39	5.94	30	0.20	1316.58	1315.90	1319.82	1318.24	0.00	0.00	Manhole
2	1	201.0	1.03	2.66	0.90	0.93	2.39	5.0	6.2	7.0	16.81	20.24	5.35	24	0.80	1318.69	1317.08	1321.02	1319.91	1323.93	0.00	Area 24
3	2	195.0	1.32	1.32	0.90	1.19	1.19	5.0	5.0	7.4	8.79	7.41	4.98	18	0.50	1320.16	1319.19	1322.44	1321.08	1323.90	1323.93	Area 22
4	2	124.0	0.31	0.31	0.90	0.28	0.28	5.0	5.0	7.4	2.07	5.68	1.68	15	0.77	1320.15	1319.19	1321.54	1321.42	1323.93	1323.93	Area 23
5	1	139.0	3.44	6.04	0.60	2.06	3.62	18.0	18.0	4.8	17.49	12.43	5.57	24	0.30	1317.50	1317.08	1320.70	1319.87	1322.25	0.00	Area 21
6	5	30.0	2.60	2.60	0.60	1.56	1.56	14.0	14.0	5.4	8.38	4.57	6.83	15	0.50	1318.40	1318.25	1321.21	1320.70	1322.25	1322.25	Area 20

East Storm Sewer | Number of lines: 6 | Run Date: 09-04-2009

NOTES: Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
2		6.86	0.00	6.86	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.41	18.31	0.41	18.31	0.00	Off
3		8.79	0.00	8.79	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.67	28.79	0.67	28.79	0.00	Off
4		2.07	0.00	2.07	0.00	DrGrt	0.0	0.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.000	0.15	7.94	0.15	7.94	0.00	Off
5		9.96	0.00	9.96	0.00	Curb	6.0	8.00	0.00	0.00	0.00	Sag	2.00	0.080	0.031	0.000	0.61	16.67	0.68	16.67	2.00	Off
6		8.38	0.00	8.38	0.00	Curb	6.0	8.00	0.00	0.00	0.00	Sag	2.00	0.080	0.031	0.000	0.56	14.85	0.63	14.85	2.00	Off

East Storm Sewer | Number of lines: 6 | Run Date: 09-04-2009

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area C1 = 0.2 C2 = 0.5 C3 = 0.9			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise / Span	HGL / Pipe	Actual / Full Flow		Date: 09-04-2009 / Frequency: 10 yrs / Proj: East Storm Sewer.st
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	MH	0.013	338.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	18.42	0.97	4.78	6.02	0.00 28.75	0.00	1319.82 1319.08 1316.58	1318.24 1318.40 1315.90	1.58 0.68	30 30 Cir	0.47 0.20	5.94 3.75	28.75 18.39	Manhole
2	1	DrGrt	0.013	201.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.23	0.63	7.02	2.39	0.00 16.81	1323.93	1321.02 1320.69 1318.69	1319.91 1319.08 1317.08	1.11 1.61	24 24 Cir	0.55 0.80	5.35 6.44	16.81 20.24	Area 24
3	2	DrGrt	0.013	195.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.65	7.40	1.19	0.00 8.79	1323.90	1322.44 1321.66 1320.16	1321.08 1320.69 1319.19	1.37 0.97	18 18 Cir	0.70 0.50	4.98 4.19	8.79 7.41	Area 22
4	2	DrGrt	0.013	124.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	1.23	7.40	0.28	0.00 2.07	1323.93	1321.54 1321.40 1320.15	1321.42 1320.44 1319.19	0.13 0.96	15 15 Cir	0.10 0.77	1.68 4.63	2.07 5.68	Area 23
5	1	Curb	0.013	139.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	18.00	0.42	4.83	3.62	0.00 17.49	1322.25	1320.70 1319.50 1317.50	1319.87 1319.08 1317.08	0.83 0.42	24 24 Cir	0.60 0.30	5.57 3.96	17.49 12.43	Area 21
6	5	Curb	0.013	30.0	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	14.00	0.07	5.37	1.56	0.00 8.38	1322.25	1321.21 1319.65 1318.40	1320.70 1319.50 1318.25	0.51 0.15	15 15 Cir	1.68 0.50	6.83 3.72	8.38 4.57	Area 20

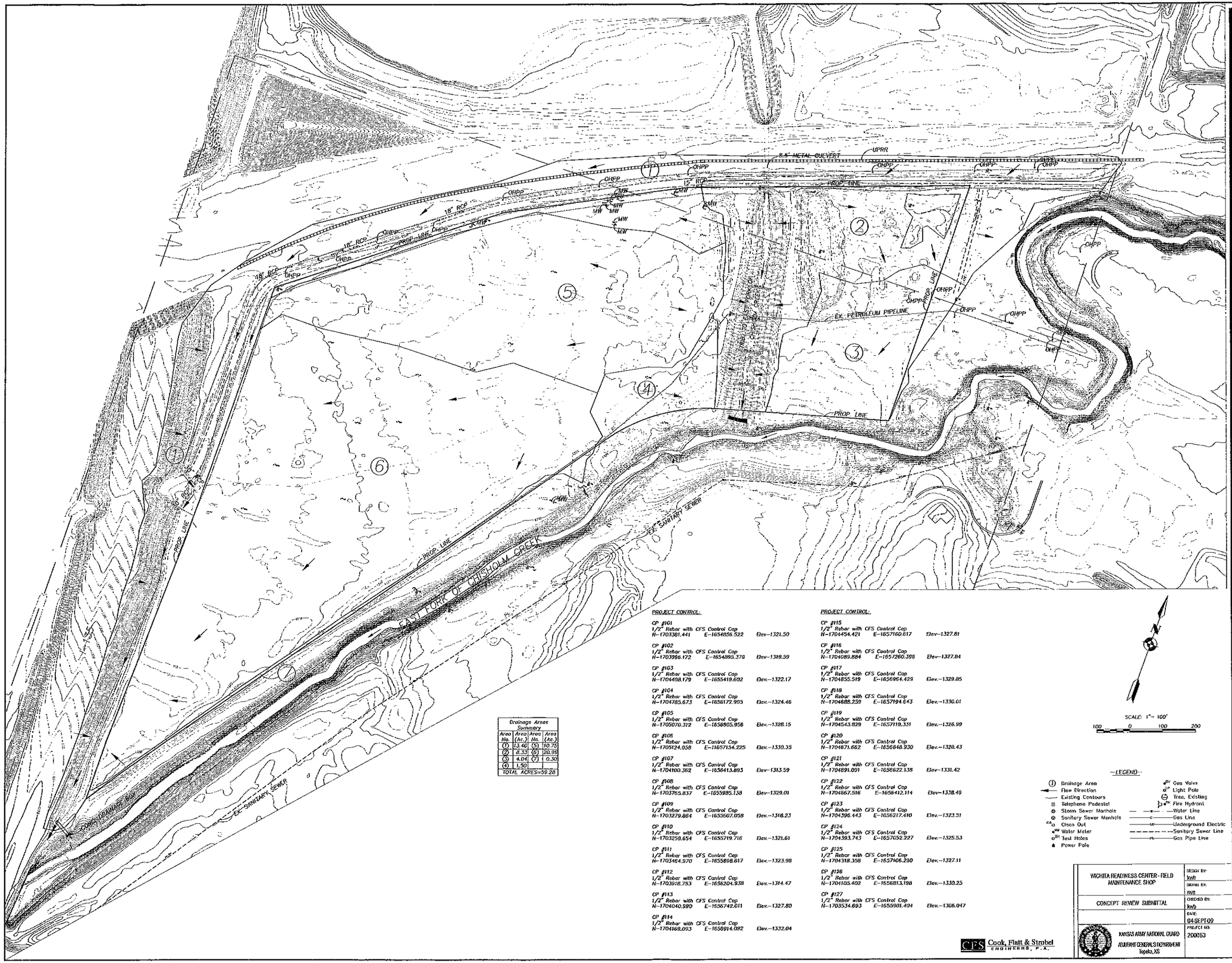
NOTES: Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72 (in/hr) ; Time of flow in section is based on full flow.

East Storm Sewer

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	28.75	1315.90	1318.24	2.34	4.78	6.02	0.56	1318.80	0.425	338	1316.58	1319.82	2.50	4.91	5.86	0.53	1320.35	0.491	0.458	1.548	0.00	0.00
2	24	16.81	1317.08	1319.91	2.00	3.14	5.35	0.45	1320.35	0.552	201	1318.69	1321.02	2.00	3.14	5.35	0.44	1321.46	0.552	0.552	1.110	0.00	0.00
3	18	8.79	1319.19	1321.08	1.50	1.77	4.98	0.39	1321.46	0.702	195	1320.16	1322.44	1.50	1.77	4.98	0.39	1322.83	0.701	0.702	1.368	0.00	0.00
4	15	2.07	1319.19	1321.42	1.25	1.23	1.68	0.04	1321.46	0.102	124	1320.15	1321.54	1.25	1.23	1.68	0.04	1321.59	0.102	0.102	0.127	0.00	0.00
5	24	17.49	1317.08	1319.87	2.00	3.14	5.57	0.48	1320.35	0.598	139	1317.50	1320.70	2.00	3.14	5.57	0.48	1321.18	0.598	0.598	0.831	0.00	0.00
6	15	8.38	1318.25	1320.70	1.25	1.23	6.83	0.72	1321.43	1.684	30.0	1318.40	1321.21	1.25	1.23	6.83	0.72	1321.93	1.683	1.684	0.505	0.00	0.00

East Storm Sewer | Number of lines: 6 | Run Date: 09-04-2009



Drainage Areas Summary			
Area No.	Area (Ac.)	Area No.	Area (Ac.)
(1)	13.40	(5)	10.75
(2)	8.33	(6)	20.98
(3)	4.04	(7)	0.30
(4)	1.50		
TOTAL ACRES=59.28			

PROJECT CONTROL:

CP #101
1/2" Rebar with CFS Control Cap
N-1703381.441 E-1654856.522 Elev.-1321.50

CP #102
1/2" Rebar with CFS Control Cap
N-1703996.172 E-1654895.379 Elev.-1319.59

CP #103
1/2" Rebar with CFS Control Cap
N-1704408.179 E-1655419.602 Elev.-1322.17

CP #104
1/2" Rebar with CFS Control Cap
N-1704785.673 E-1656172.905 Elev.-1324.46

CP #105
1/2" Rebar with CFS Control Cap
N-1705070.312 E-1656805.956 Elev.-1328.15

CP #106
1/2" Rebar with CFS Control Cap
N-1705124.058 E-1657134.225 Elev.-1330.35

CP #107
1/2" Rebar with CFS Control Cap
N-1704100.362 E-1658413.893 Elev-1313.59

CP #108
1/2" Rebar with CFS Control Cap
N-1703765.837 E-1655985.138 Elev-1329.01

CP #109
1/2" Rebar with CFS Control Cap
N-1703279.864 E-1655607.058 Elev.-1316.23

CP #110
1/2" Rebar with CFS Control Cap
N-1703259.654 E-1655719.716 Elev.-1321.61

CP #111
1/2" Rebar with CFS Control Cap
N-1703464.970 E-1655898.617 Elev.-1323.98

CP #112
1/2" Rebar with CFS Control Cap
N-1703918.753 E-1656204.938 Elev.-1314.47

CP #113
1/2" Rebar with CFS Control Cap
N-1704040.990 E-1656742.611 Elev.-1327.80

CP #114
1/2" Rebar with CFS Control Cap
N-1704169.093 E-1656914.092 Elev.-1332.04

PROJECT CONTROL:

CP #115
1/2" Rebar with CFS Control Cap
N-1704454.421 E-1657160.617 Elev-1327.81

CP #116
1/2" Rebar with CFS Control Cap
N-1704089.884 E-1657260.396 Elev-1327.84

CP #117
1/2" Rebar with CFS Control Cap
N-1704855.519 E-1656984.429 Elev.-1329.85

CP #118
1/2" Rebar with CFS Control Cap
N-1704688.259 E-1657194.643 Elev.-1330.01

CP #119
1/2" Rebar with CFS Control Cap
N-1704543.829 E-1657119.331 Elev.-1326.99

CP #120
1/2" Rebar with CFS Control Cap
N-1704671.662 E-1656848.930 Elev.-1328.43

CP #121
1/2" Rebar with CFS Control Cap
N-1704891.091 E-1656622.138 Elev-1331.42

CP #122
1/2" Rebar with CFS Control Cap
N-1704867.516 E-1656412.114 Elev-1338.49

CP #123
1/2" Rebar with CFS Control Cap
N-1704396.443 E-1656217.410 Elev.-1323.51

CP #124
1/2" Rebar with CFS Control Cap
N-1704393.743 E-1657052.227 Elev.-1325.53

CP #125
1/2" Rebar with CFS Control Cap
N-1704318.358 E-1657406.290 Elev.-1327.11

CP #126
1/2" Rebar with CFS Control Cap
N-1704105.402 E-1656813.198 Elev.-1330.25

CP #127
1/2" Rebar with CFS Control Cap
N-1703534.693 E-1655901.404 Elev.-1306.047

SCALE: 1"= 100'
100 0 100 200

-LEGEND-

- (J) Drainage Area
- Flow Direction
- Existing Contours
- Telephone Pedestal
- Storm Sewer Manhole
- Sanitary Sewer Manhole
- Clean Out
- Water Meter
- Test Holes
- Power Pole
- Gas Valve
- Light Pole
- Tree, Existing
- Fire Hydrant
- Water Line
- Gas Line
- Underground Electric
- Sanitary Sewer Line
- Gas Pipe Line

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

WICHITA READINESS CENTER - FIELD MAINTENANCE SHOP	DESIGN BY: KWB
	DRAWN BY: RWB
CONCEPT REVIEW SUBMITTAL	CHECKED BY: KWB
	DATE: 04-SEPT-09
KANSAS ARMY NATIONAL GUARD ADJUTANT GENERALS DEPARTMENT Topeka, KS	PROJECT NO: 200053

HTK ARCHITECTS

CONCEPT REVIEW SUBMITTAL

Date:
- 04-SEPT-09

Revised Date:

HTK Project Number:
- 0903.01

DEPARTMENT OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT
900 SW JACKSON, SUITE 600
TOPEKA, KANSAS 66612-1200
TELEPHONE 785-296-8899
FAX 785-296-8686

WICHITA READINESS CENTER

ADJUTANT GENERAL'S DEPARTMENT, STATE OF KANSAS,
KANSAS ARMY NATIONAL GUARD, TOPEKA, KS

Sheet Contents:
- DRAINAGE PLAN - EXISTING AREAS

OFM Project Number:
- A- Pending

Sheet Number:

CO.1

Original Contract Documents

Appendix B
Existing Drainage Areas and Calculations

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

Subject Wichita Readiness Center — Existing Drainage Calculations

Sheet No. ____ of ____

Job No. 09-5030

By KWS Date 8/09

Area ① (10 Wells) (Soil Type: Elanco, Soil Type B) = 88%

(Soil Type: Tabler, Soil Type D) = 12%

A = 583,448 S.F. = 13.4 Ac.

$S = \frac{1332 - 1313}{45125} = 0.0044 \Rightarrow 0.44\%$

$L_{OF} = 100'$ $L_{SC} = 700'$ $L_{CF} = 3525'$

(C FROM APPENDIX D, DRAINAGE CRITERIA)

$C_2 = 0.16(0.88) + 0.28(0.12) = 0.17$

$C_5 = 0.18(0.88) + 0.33(0.12) = 0.20$

$C_{10} = 0.24(0.88) + 0.43(0.12) = 0.26$

$C_{100} = 0.37(0.88) + 0.63(0.12) = 0.40$

$C_{25} = 0.28$

T_C: $T_{OF} = 1.8(1.1 - 0.3)\frac{\sqrt{100}}{\sqrt{0.44}} = 18.9$ min.

$T_{OF_2} = 22$ min. $T_{OF_5} = 21.3$ min. $T_{OF_{10}} = 19.9$ min. $T_{OF_{100}} = 16.6$ min. $T_{OF_{25}} = 19.4$ min.

T_{SC}: $V = 16.1345(0.0044)^{1/2} = 1.07$ ft/s

$T_{SC} = \frac{700}{60(1.07)} = 10.9$ min.

T_{CF}: $V = 1.5(V_{SC}) = 1.5(1.07) = 1.61$ ft/s

$T_{CF} = \frac{3525}{60(1.61)} = 36.5$ min.

$T_{C_2} = 22 + 10.9 + 36.5 = 69.4$ min. $T_{C_{25}} = 19.4 + 10.9 + 36.5 = 66.8$ min.

$T_{C_5} = 21.3 + 10.9 + 36.5 = 68.7$ min.

$T_{C_{10}} = 19.9 + 47.4 = 67.3$ min.

$T_{C_{100}} = 16.6 + 47.4 = 64$ min.

$i_2 = 1.52$ in/hr $i_5 = 1.97$ in/hr $i_{10} = 2.37$ in/hr $i_{100} = 3.60$ in/hr $i_{25} = 2.81$ in/hr

$Q_2 = 0.17(1.52)(13.4) = 3.5$ cfs $Q_{25} = 0.28(2.81)(13.4) = 10.5$ cfs

$Q_5 = 0.20(1.97)(13.4) = 5.3$ cfs

$Q_{10} = 0.26(2.37)(13.4) = 8.3$ cfs

$Q_{100} = 0.40(3.60)(13.4) = 19.3$ cfs

Area (2) (to N-S ditch)

$A = 362{,}695.86\,sf = 8.33\,Ac.$

$C_2 = 0.16 \quad C_5 = 0.20 \quad C_{10} = 0.24 \quad C_{100} = 0.37 \quad C_{25} = 0.26$

$S = \frac{1381 - 1303}{1700} = 0.0165 = 1.65\%$ $\quad L_{OF} = 100' \quad L_{SC} = 700' \quad L_{CF} = 900'$

T_c: T_{OF}: $T_{OF_2} = 1.8(1.1 - 0.16)\frac{\sqrt{100}}{\sqrt[3]{1.65}} = 14.3$ min. $\quad T_{OF_{25}} = 1.8(1.1 - 0.26)\frac{\sqrt{100}}{\sqrt[3]{1.65}} = 12.8$ min

$T_{OF_5} = 1.8(1.1 - 0.20)\frac{\sqrt{100}}{\sqrt[3]{1.65}} = 13.7$ min.

$T_{OF_{10}} = 1.8(1.1 - 0.24)\frac{\sqrt{100}}{\sqrt[3]{1.65}} = 13.1$ min.

$T_{OF_{100}} = 1.8(1.1 - 0.37)\frac{\sqrt{100}}{\sqrt[3]{1.65}} = 11.1$ min.

T_{SC}: $V = 16.1345(0.0165)^{1/2} = 2.07$ ft/s

$T_{SC} = \frac{700}{60(2.07)} = 5.6$ min.

T_{CF}: $V = 1.5(V_{SC}) = 1.5(2.07) = 3.11$ ft/s

$T_{CF} = \frac{900}{60(3.11)} = 4.8$ min

$T_{C_2} = 14.3 + 5.6 + 4.8 = 24.7$ min. $\quad T_{C_{25}} = 12.8 + 5.6 + 4.8 = 23.2$ min.

$T_{C_5} = 13.7 + 10.4 = 24.1$ min

$T_{C_{10}} = 13.1 + 10.4 = 23.5$ min

$T_{C_{100}} = 11.1 + 10.4 = 21.5$ min

$i_2 = 3.03$ in/hr $\quad i_5 = 3.65$ in/hr $\quad i_{10} = 4.31$ in/hr $\quad i_{100} = 6.39$ in/hr. $\quad i_{25} = 5.01$ in/hr

$Q_2 = 0.16(3.03)(8.33) = 4.0$ cfs

$Q_5 = 0.20(3.65)(8.33) = 6.1$ cfs $\quad Q_{25} = 0.26(5.01)(8.33) = 10.9$ cfs

$Q_{10} = 0.24(4.31)(8.33) = 8.6$ cfs

$Q_{100} = 0.37(6.39)(8.33) = 19.7$ cfs

Area (3) (To SEE)

A = 176078.65 SF = 4.04 Ac.

$C_2 = 0.20$ $C_5 = 0.22$ $C_{10} = 0.28$ $C_{100} = 0.41$ $C_{25} = 0.30$

$S = \frac{1328 - 1319}{525} = 0.0171 = 1.71\%$ $L_{OF} = 250'$ $L_{SC} = 369'$

T_C: $T_{OF_2} = 1.8(1.1 - 0.2)\frac{\sqrt{250}}{\sqrt[3]{1.71}} = 21.4$ min

$T_{OF_5} = 1.8(1.1 - 0.22)\frac{\sqrt{250}}{\sqrt[3]{1.71}} = 20.9$ min

$T_{OF_{10}} = 1.8(1.1 - 0.28)\frac{\sqrt{250}}{\sqrt[3]{1.71}} = 19.5$ min

$T_{OF_{100}} = 1.8(1.1 - 0.41)\frac{\sqrt{250}}{\sqrt[3]{1.71}} = 16.4$ min.

$T_{OF_{25}} = 1.8(1.1 - 0.3)\frac{\sqrt{250}}{\sqrt[3]{1.71}} = 19.0$ min.

T_{SC}: $V = 16.1345(0.0171)^{1/2} = 2.11$ Ft/s

$T_{SC} = \frac{369}{60(2.11)} = 2.9$ min

$T_{C_2} = 21.4 + 2.9 = 24.3$ min.

$T_{C_5} = 20.9 + 2.9 = 23.8$ min

$T_{C_{10}} = 19.5 + 2.9 = 22.4$ min

$T_{C_{100}} = 16.4 + 2.9 = 19.3$ min.

$T_{25} = 19.0 + 2.9 = 21.9$ min

$i_2 = 3.03$ in/hr $i_5 = 3.73$ in/hr $i_{10} = 4.40$ in/hr $i_{100} = 6.68$ in/hr. $i_{25} = 5.23$ in/hr

$Q_2 = 0.20(3.03)(4.04) = 2.4$ cfs

$Q_5 = 0.22(3.73)(4.04) = 3.3$ cfs

$Q_{10} = 0.28(4.4)(4.04) = 5.0$ cfs

$Q_{100} = 0.41(6.68)(4.04) = 11.1$ cfs

$Q_{25} = 0.30(5.23)(4.04) = 6.3$ cfs

Area ④ (to South)

$A = 65179.77\ SF = 1.50\ Ac.$

$S = \frac{1325 - 1320}{274} = 0.0182 = 1.82\%$ $L_{OF} = 150'$ $L_{SC} = 124'$

$C_2 = 0.20$ $C_5 = 0.22$ $C_{10} = 0.28$ $C_{100} = 0.41$ $C_{25} = 0.30$

T_c: T_{OF}: $T_{OF_2} = 1.8(1.1 - 0.20)\frac{\sqrt{150}}{\sqrt[3]{1.82}} = 16.3\ min$

$T_{OF_5} = 1.8(1.1 - 0.22)\frac{\sqrt{150}}{\sqrt[3]{1.82}} = 15.9\ min$

$T_{OF_{10}} = 1.8(1.1 - 0.28)\frac{\sqrt{150}}{\sqrt[3]{1.82}} = 14.8\ min$

$T_{OF_{100}} = 1.8(1.1 - 0.41)\frac{\sqrt{150}}{\sqrt[3]{1.82}} = 12.5\ min$

$T_{OF_{25}} = 1.8(1.1 - 0.30)\frac{\sqrt{150}}{\sqrt[3]{1.82}} = 14.4\ min$

T_{SC}: $V = 16.1345(0.0182)^{1/2} = 2.18\ ft/s$

$T_{SC} = \frac{124}{60(2.18)} = 0.9\ min$

T_c: $T_{c_2} = 16.3 + 0.9 = 17.2$

$T_{c_5} = 15.9 + 0.9 = 16.8$

$T_{c_{10}} = 14.8 + 0.9 = 15.7$

$T_{c_{100}} = 12.5 + 0.9 = 13.4$

$T_{c_{25}} = 14.4 + 0.9 = 15.3$

$i_2 = 3.61\ in/hr$ $i_5 = 4.43\ in/hr$ $i_{10} = 5.22\ in/hr$ $i_{100} = 7.79\ in/hr$ $i_{25} = 6.23\ in/hr$

$Q_2 = 0.20(3.61)(1.50) = 1.1\ cfs$

$Q_5 = 0.22(4.43)(1.50) = 1.5\ cfs$

$Q_{10} = 0.28(5.22)(1.50) = 2.2\ cfs$

$Q_{100} = 0.41(7.79)(1.50) = 4.8\ cfs$

$Q_{25} = 0.30(6.23)(1.50) = 2.8\ cfs$

Area (5) (to west & south)

$A = 468,277.46\ SF = 10.8\ Ac$

$S = \frac{1327-1313}{3060} = 0.0046 = 0.46\%$ $\quad L_{OF} = 300'$ $\quad L_{SC} = 700'$ $\quad L_{CF} = 2104'$

$C_2 = 0.88(0.28) + 0.12(0.14) = 0.27$ $\quad C_{25} = 0.44$

$C_5 = 0.88(0.33) + 0.12(0.18) = 0.31$

$C_{10} = 0.88(0.43) + 0.12(0.24) = 0.41$

$C_{100} = 0.88(0.63) + 0.12(0.37) = 0.60$

T_c: T_{OF}: $T_{OF_2} = 1.8(1.1-0.27)\frac{\sqrt{300}}{\sqrt[3]{0.46}} = 33.5\ min$

$T_{OF_5} = 1.8(1.1-0.31)\frac{\sqrt{300}}{\sqrt[3]{0.46}} = 31.9\ min.$

$T_{OF_{10}} = 1.8(1.1-0.41)\frac{\sqrt{300}}{\sqrt[3]{0.46}} = 27.9\ min$ $\quad T_{OF_{25}} = 1.8(1.1-0.44)\frac{\sqrt{300}}{\sqrt[3]{0.46}} = 26.7\ min.$

$T_{OF_{100}} = 1.8(1.1-0.60)\frac{\sqrt{300}}{\sqrt[3]{0.46}} = 20.2\ mins.$

T_{SC}: $V = 16.1345(0.0046)^{1/2} = 1.09\ ft/s$

$T_{SC} = \frac{700}{60(1.09)} = 10.7\ Min.$

T_{CF}: $V = 1.5(1.09) = 1.64\ ft/s$

$T_{CF} = \frac{2104}{60(1.64)} = 21.4\ min.$

$T_{C2} = 33.5 + 10.7 + 21.4 = 65.6\ min.$ $\quad T_{C25} = 26.7 + 10.7 + 21.4 = 58.8\ min.$

$T_{C5} = 31.9 + 10.7 + 21.4 = 64\ min.$

$T_{C10} = 27.9 + 10.7 + 21.4 = 60\ min.$

$T_{C100} = 20.2 + 10.7 + 21.4 = 52.3\ min.$

$i_2 = 1.59\ in/hr$ $\quad i_5 = 2.07\ in/hr$ $\quad i_{10} = 2.53\ in/hr$ $\quad i_{100} = 4.05\ in/hr$ $\quad i_{25} = 3.04\ in/hr$

$Q_2 = 0.27(1.59)(10.8) = 4.6\ cfs$ $\quad Q_{25} = 0.44(3.04)(10.8) = 14.4\ cfs$

$Q_5 = 0.31(2.07)(10.8) = 6.9\ cfs$

$Q_{10} = 0.41(2.53)(10.8) = 11.2\ cfs$

$Q_{100} = 0.60(4.05)(10.8) = 26.2\ cfs$

Area ⑥ (To West Swale)

$A = 913087.5\ SF = 21.0\ Ac$

$C_2 = 0.20 \quad C_5 = 0.22 \quad C_{10} = 0.28 \quad C_{100} = 0.41 \quad C_{25} = 0.30$

$S = \frac{1324 - 1313}{2110'} = 0.0052 = 0.52\% \quad L_{OF} = 300' \quad L_{SC} = 700' \quad L_{CF} = 1236'$

T_c: T_{OF}: $T_{OF_2} = 1.8(1.1 - 0.2)\frac{\sqrt{300}}{\sqrt[3]{0.52}} = 34.9$ min.

$T_{OF_5} = 1.8(1.1 - 0.22)\frac{\sqrt{300}}{\sqrt[3]{0.52}} = 34.1$ min.

$T_{OF_{10}} = 1.8(1.1 - 0.28)\frac{\sqrt{300}}{\sqrt[3]{0.52}} = 31.8$ min.

$T_{OF_{100}} = 1.8(1.1 - 0.41)\frac{\sqrt{300}}{\sqrt[3]{0.52}} = 26.8$ min

$T_{OF_{25}} = 1.8(1.1 - 0.30)\frac{\sqrt{300}}{\sqrt[3]{0.52}} = 31.0$ min.

T_{SC}: $V = 16.1345\,(0.0052)^{1/2} = 1.16$ ft/s

$T_{SC} = \frac{700}{60(1.16)} = 10.1$ min.

T_{CF}: $V = 1.5\,V_{SC} = 1.5(1.16) = 1.74$ ft/s

$T_{CF} = \frac{1236}{60(1.74)} = 11.8$ min.

$T_{c_2} = 34.9 + 10.1 + 11.8 = 56.8$ min

$T_{c_5} = 34.1 + 10.1 + 11.8 = 56$ min

$T_{c_{10}} = 31.8 + 10.1 + 11.8 = 53.7$ min

$T_{c_{100}} = 26.8 + 10.1 + 11.8 = 48.7$ min

$T_{c_{25}} = 31.0 + 10.1 + 11.8 = 52.9$ min.

$i_2 = 1.79$ in/hr $\quad i_5 = 2.25$ in/hr $\quad i_{10} = 2.73$ in/hr $\quad i_{100} = 4.23$ in/hr $\quad i_{25} = 3.24$ in/hr

$Q_2 = 0.20(1.79)(21.0) = 7.5$ cfs

$Q_5 = 0.22(2.25)(21.0) = 10.4$ cfs

$Q_{10} = 0.28(2.73)(21.0) = 16.1$ cfs

$Q_{100} = 0.41(4.23)(21.0) = 36.4$ cfs

$Q_{25} = 0.30(3.24)(21.0) = 20.4$ cfs

CFS Cook, Flatt & Strobel ENGINEERS, P.A.

Subject _____ Sheet No. _____ of _____

_____ Job No. _____

By _____ Date _____

Area (11) (To South to creek)

A = 13,289.3 SF = 0.30 Ac

T_c = 5 min (MARCCAN)

C_2 = 0.16 C_5 = 0.20 C_{10} = 0.24 C_{100} = 0.37 C_{25} = 0.26

i_2 = 5.57 in/hr i_5 = 6.53 in/hr i_{10} = 7.41 in/hr i_{100} = 10.32 in/hr i_{25} = 8.52 in/hr

$Q_2 = 0.16(5.57)(0.30) = 0.3$ cfs

$Q_5 = 0.20(6.53)(0.30) = 0.4$ cfs

$Q_{10} = 0.24(7.41)(0.30) = 0.5$ cfs

$Q_{100} = 0.37(10.32)(0.30) = 11.1$ cfs

$Q_{25} = 0.26(8.52)(0.30) = 0.7$ cfs

Total Runoff to Creek @ SW (Areas 1, 5, & 6)

$\Sigma(C \times A)_2 = 0.17(13.4) + 0.27(10.8) + 0.2(21) = 9.37$ $C_{Avg} = 0.208$

$\Sigma(C \times A)_5 = 0.20(13.4) + 0.31(10.8) + 0.22(21) = 10.6$ $C_{Avg} = 0.235$

$\Sigma(C \times A)_{10} = 0.26(13.4) + 0.41(10.8) + 0.28(21.0) = 13.8$ $C_{Avg} = 0.305$

$\Sigma(C \times A)_{25} = 0.28(13.4) + 0.44(10.8) + 0.30(21.0) = 14.8$ $C_{Avg} = 0.327$

$\Sigma(C \times A)_{100} = 0.40(13.4) + 0.60(10.8) + 0.41(21.0) = 20.5$ $C_{Avg} = 0.454$

T_c (Area ①):

$T_{c2} = 69.4$ min	$I_2 = 1.52$ in/hr
$T_{c5} = 68.7$ min	$I_5 = 1.97$ in/hr
$T_{c10} = 67.3$ min	$I_{10} = 2.37$ in/hr
$T_{c25} = 66.8$ min	$I_{25} = 2.81$ in/hr
$T_{c100} = 64$ min	$I_{100} = 3.60$ in/hr

$Q_2 = 9.39(1.52) = 14.3$ cfs

$Q_5 = 10.6(1.97) = 20.9$ cfs

$Q_{10} = 13.8(2.37) = 32.7$ cfs

$Q_{25} = 14.8(2.81) = 41.6$ cfs

$Q_{100} = 20.5(3.60) = 73.8$ cfs

Total Runoff to Creek @ SE SE (Area = 2,347)

$\Sigma C \times A_2 = 0.16(8.33) + 0.16(4.04) + 0.16(0.30) + 0.20(1.5) = 2.33$

$\Sigma C \times A_5 = (0.20)(8.33) + 0.20(4.04) + 0.20(0.30) + 0.22(1.5) = 2.86$

$\Sigma C \times A_{10} = (0.24)(8.33) + 0.24(4.04) + 0.24(0.30) + 0.28(1.5) = 3.46$

$\Sigma C \times A_{25} = (0.26)(8.33) + 0.26(4.04) + 0.26(0.30) + 0.30(1.5) = 3.71$

$\Sigma C \times A_{100} = (0.37)(8.33) + 0.37(4.04) + 0.37(0.30) + 0.41(1.5) = 5.30$

T_c (Area ②)

$T_{c_2} = 24.7$ min. $\quad i_2 = 3.03$ in/hr

$T_{c_5} = 24.1$ min $\quad i_5 = 3.65$ in/hr

$T_{c_{10}} = 23.5$ min $\quad i_{10} = 4.31$ in/hr

$T_{c_{25}} = 23.2$ min $\quad i_{25} = 5.01$ in/hr

$T_{c_{100}} = 21.5$ min $\quad i_{100} = 6.39$ in/hr

$Q_2 = 2.33(3.03) = 7.1$ cfs

$Q_5 = 2.86(3.65) = 10.4$ cfs

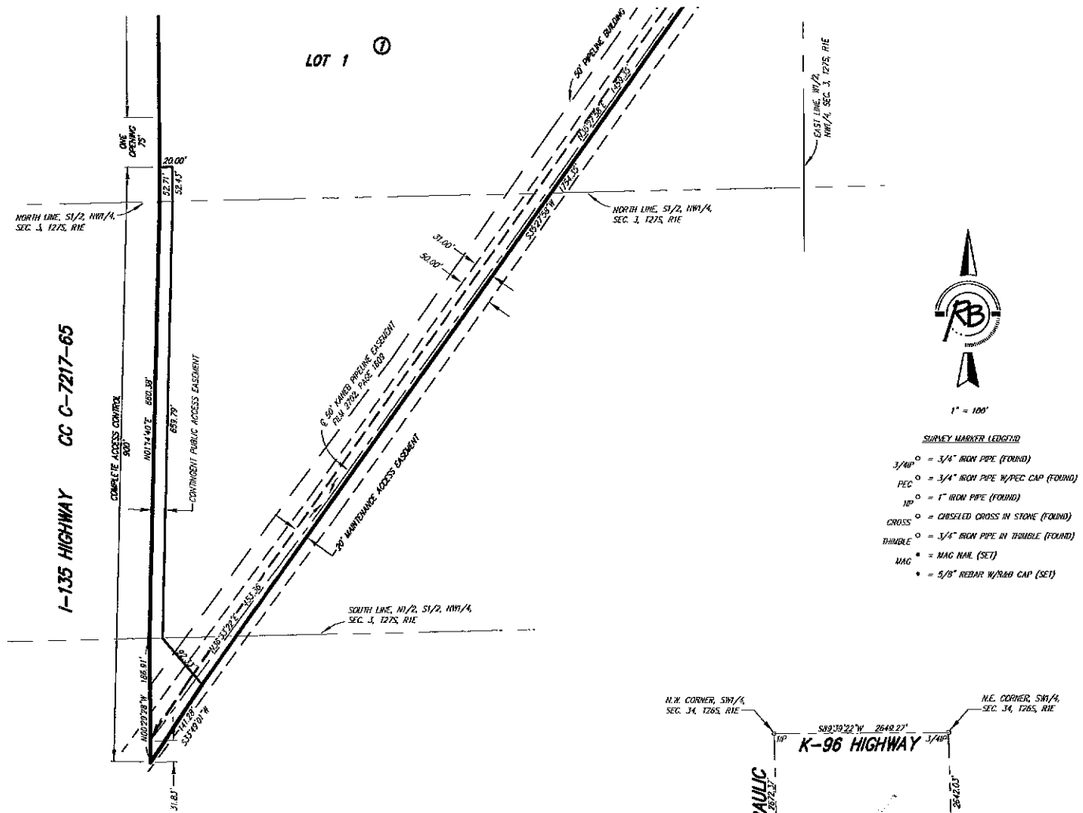
$Q_{10} = 3.46(4.31) = 14.9$ cfs

$Q_{25} = 3.71(5.01) = 18.6$ cfs

$Q_{100} = 5.30(6.39) = 33.9$ cfs

HEARTLAND PREPAREDNESS CENTER

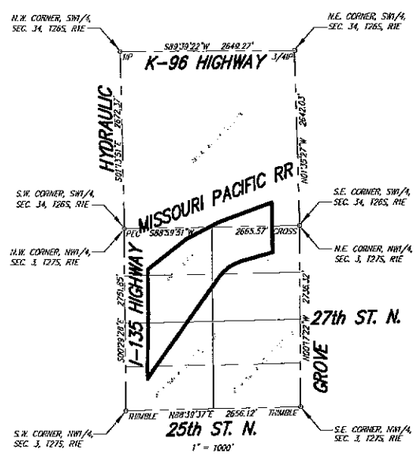
An Addition to Wichita, Sedgwick County, Kansas



1" = 100'

SURVEY MARKER LEGEND

- 3/4IP ○ = 3/4" IRON PIPE (FOUND)
- PEC ○ = 3/4" IRON PIPE W/PEC CAP (FOUND)
- IP ○ = 1" IRON PIPE (FOUND)
- CROSS ○ = CHISELED CROSS IN STONE (FOUND)
- TRIANGLE ○ = 3/4" IRON PIPE IN TRIANGLE (FOUND)
- MAG • = MAG NAIL (SET)
- • = 5/8" REBAR W/RB&B CAP (SET)



State of Kansas)
Sedgwick County) SS

We, Ruggles & Bohm, P.A., Land Surveyors in aforesaid county and state, do hereby certify that, under the supervision of the undersigned, we have surveyed and platted "HEARTLAND PREPAREDNESS CENTER", an Addition to Wichita, Sedgwick County, Kansas, and that the accompanying plat is a true and correct exhibit of the property surveyed, described as follows:

That part of the NW1/4 of Section 3, Township 27 South, and that part of the SW1/4 of Section 34, Township 26 South, all in Range 1 East of the 6th P.M., Sedgwick County, Kansas, described as follows: Beginning at the intersection of the east line of I-135 highway right- of-way, as condemned in Condemnation Case C-7212-65, and the northerly line of a parcel described at Book 433, Page 637; thence N52°05'32"E along said northerly line, 707.85 feet; thence N62°15'32"E along said northerly line, 329.02 feet to its intersection with the north line of said NW1/4 of Section 3; thence N62°15'32"E along said northerly line, 232.07 feet; thence N69°46'32"E along said northerly line, 888.18 feet; thence S00°45'09"E, 396.83 feet to the north line of said NW1/4 of Section 3; thence S00°45'09"E, 396.90 feet; thence S74°00'51"W, 503.84 feet to the P.C. of a curve to the left having a radius of 600.00 feet and a central angle of 38°32'53"; thence along said curve a distance of 403.67 feet to the P.T. of said curve, being on the westerly line of the Wichita and Valley Center East Branch Interception Canal Main Drain right-of-way described in Condemnation Case A-29430; thence S35°27'58"W along said line, 1754.35 feet; thence S33°49'01"W, 141.28 feet to a point on the east line of said highway right-of-way; thence N00°29'28"W along said east line, 186.91 feet to its intersection with the north line of the S1/2 of the NW1/4 of said Section 3; thence N01°14'40"W along said east line, 660.38 feet to its intersection with the north line of the S1/2 of the NW1/4 of said Section 3; thence N00°29'28"W along said east line, 857.10 feet to the point of beginning.

All public easements and dedications being vacated by virtue of K.S.A. 12-512(b).

Ruggles & Bohm, P.A.

_____ Land Surveyor
Thomas C. Ruggles

Know all men by these presents that we, the undersigned, have caused the land described in the surveyor's certificate to be platted into a Lot and a Block, to be known as "HEARTLAND PREPAREDNESS CENTER", an Addition to Wichita, Sedgwick County, Kansas. The Drainage Easement is hereby granted to the public as indicated for drainage purposes. The Maintenance Access Easement is hereby granted to the public for maintenance access only to the Wichita and Valley Center East Branch Interception Canal. The Contingent Public Access Easement is hereby granted to the public with the contingency that the property owner may enjoy full use of the easement until such time as the City of Wichita initiates construction of a bicycle or pedestrian path within the easement. Access control is hereby granted to the City of Wichita as indicated. A drainage plan has been developed for this plat; the property shall remain at established grades, or as modified with the approval of the City Engineer, and unobstructed to allow for the conveyance of storm water.

At the direction of the City Council

_____ Mayor
Carl Brewer

_____ City Clerk
Karen Sublett

This plat of "HEARTLAND PREPAREDNESS CENTER", an Addition to Wichita, Sedgwick County, Kansas, has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas. Dated this ____ day of _____, 2009.

Wichita-Sedgwick County Metropolitan Area Planning Commission

_____ Chairman
Darrell Downing

_____ Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this ____ day of _____, 2009.

At the direction of the City Council

_____ Mayor
Carl Brewer

_____ City Clerk
Karen Sublett

Reviewed in accordance with K.S.A. 58-2005 on this _____ day of _____, 2009.

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

Entered on transfer record this____ day of_____, 2009.

_____ County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County)) SS

This is to certify that this plat has been filed for record in the office of the Register of Deeds, this____ day of _____, 2009, at____ o'clock____ M, and is duly recorded.

_____ Register of Deeds
Bill Meek

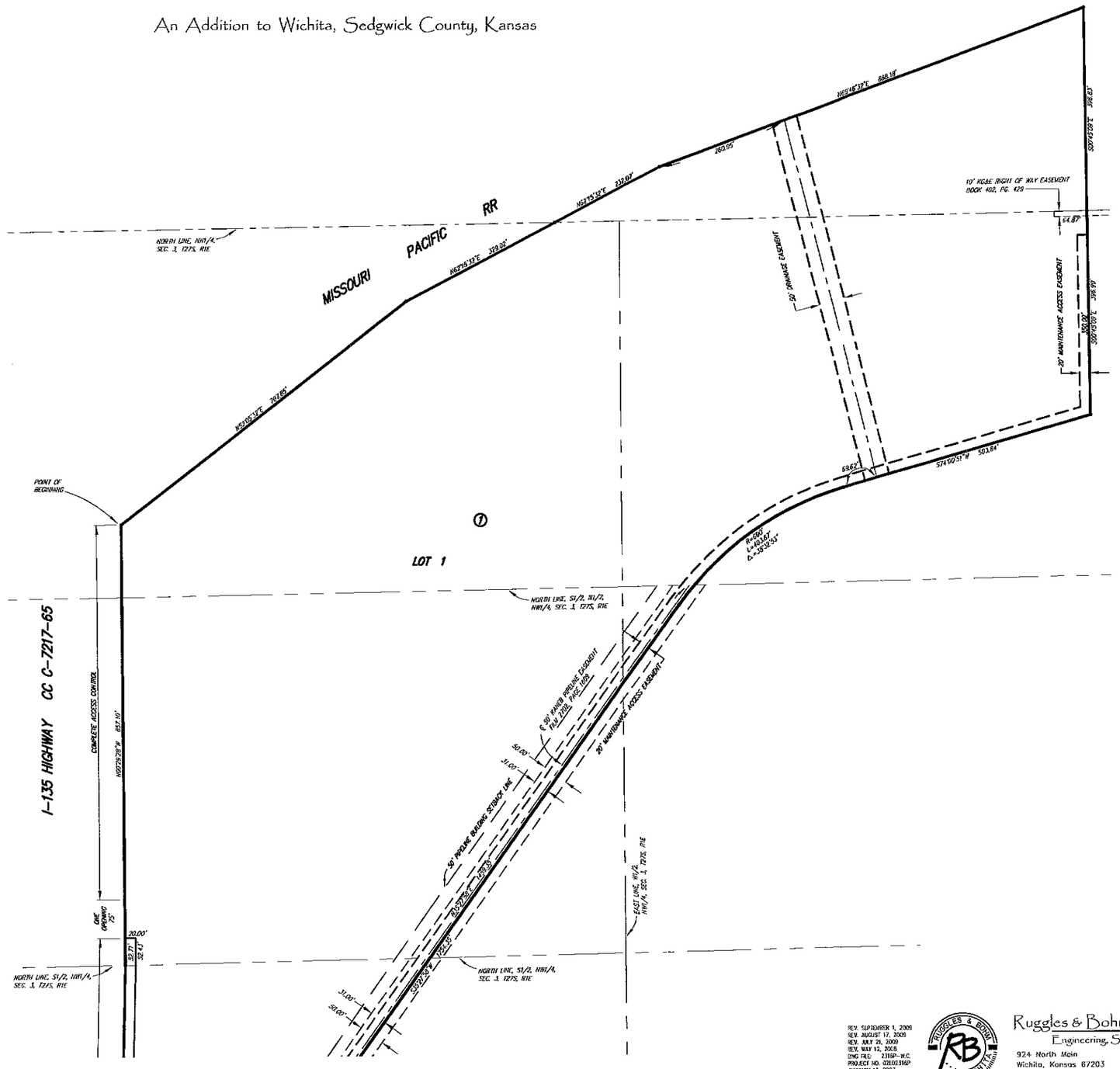
_____ Deputy
Tonya Buckingham

REV. SEPTEMBER 1, 2009
REV. AUGUST 17, 2009
REV. JULY 22, 2009
REV. MAY 12, 2008
RMG FILE: 2316P-W.C.
PROJECT NO. 03.0023ASP
JANUARY 13, 2003

Ruggles & Bohm, P.A.
Engineering, Surveying, Land Planning
924 North Main
Wichita, Kansas 67203
(316) 264-8008
(316) 264-4621 fax
www.rbkansas.com
E-mail: info@rbkansas.com

HEARTLAND PREPAREDNESS CENTER

An Addition to Wichita, Sedgwick County, Kansas



1" = 100'

SURVEY MARKER LEGEND

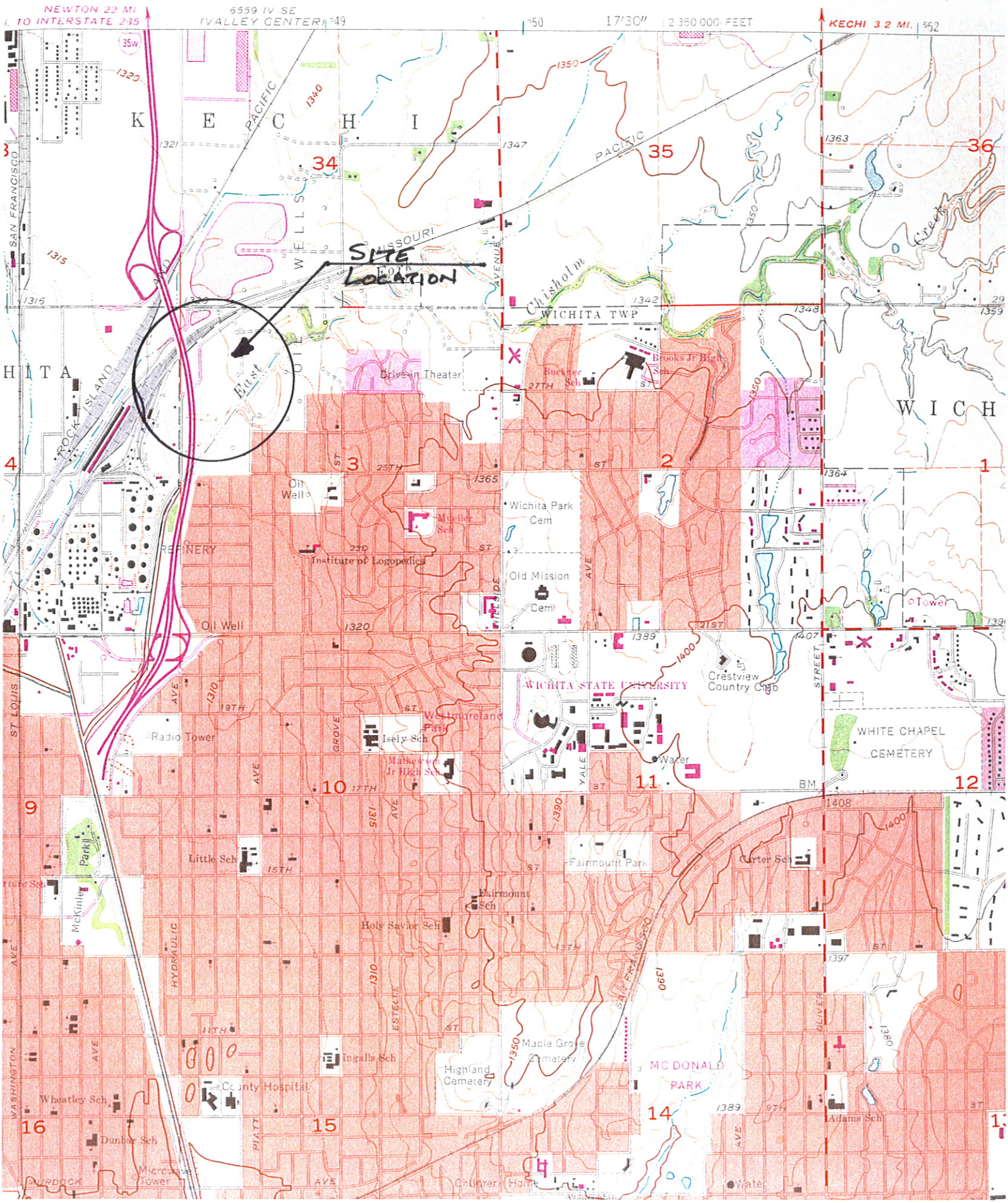
- 3/4R° = 3/4" IRON PIPE (FOUND)
- PEC° = 3/4" IRON PIPE W/PEC CAP (FOUND)
- IP° = 1" IRON PIPE (FOUND)
- CROSS° = CHISELED CROSS IN STONE (FOUND)
- THIMBLE° = 3/4" IRON PIPE IN THIMBLE (FOUND)
- MAG• = MAG NAIL (SET)
- • = 5/8" REBAR W/RAB CAP (SET)

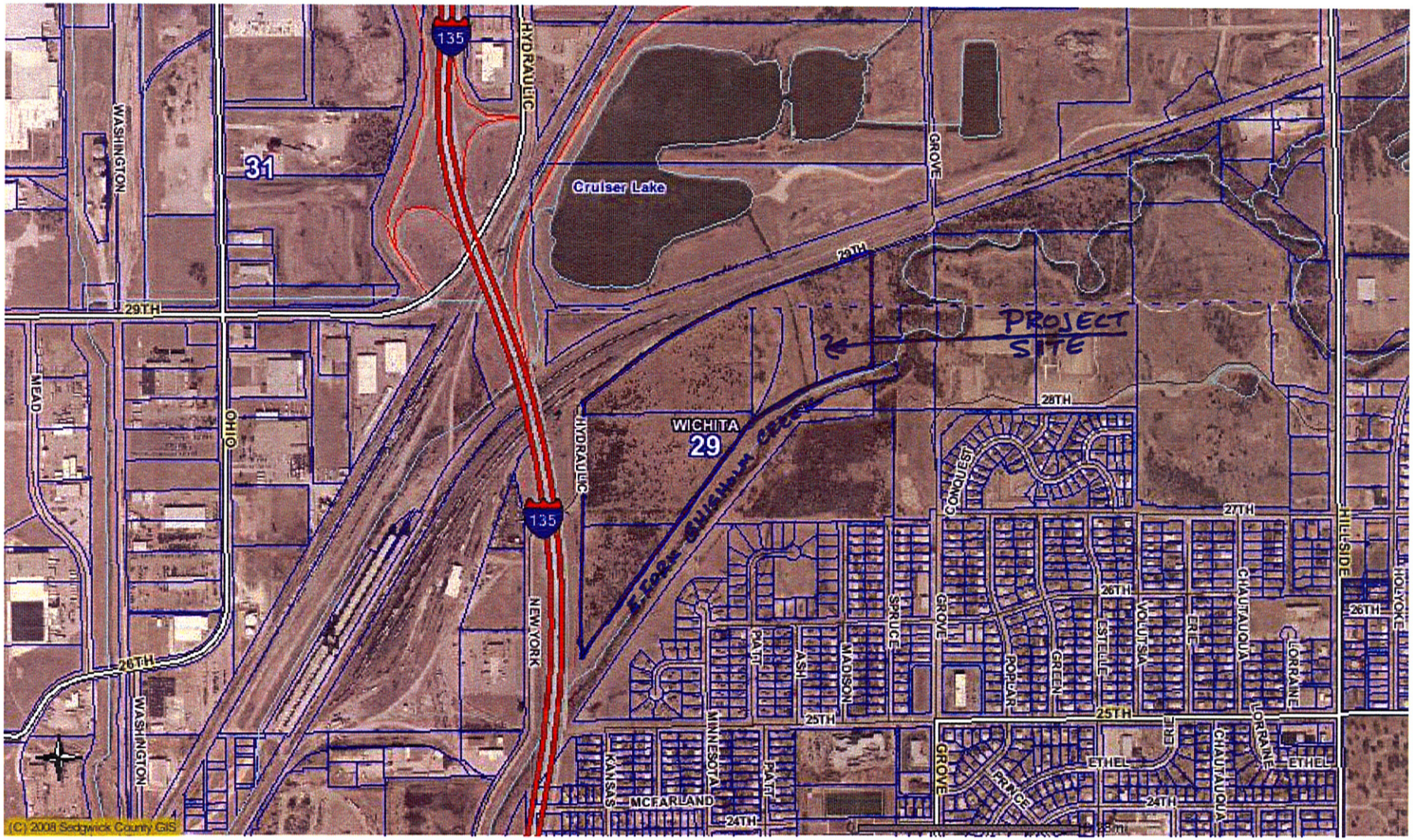
REV. SEPTEMBER 1, 2005
REV. AUGUST 17, 2005
REV. JULY 21, 2005
REV. MAY 12, 2005
DWG FILE: 2115P-W.C.
PROJECT NO. 021021165
JANUARY 13, 2003

Ruggles & Bohm, PA
Engineering, Surveying, Land Planning
924 North Main (316) 264-8008
Wichita, Kansas 67203 (316) 264-4621 fax
www.rbkansas.com E-mail: info@rbkansas.com

Appendix A
USGS Map Site Location, Copy of Plat & Orthophoto

STATE OF KANSAS




135
HYDRAULIC
WASHINGTON
31
Cruiser Lake
GROVE
29TH
PROJECT SITE
MEAD
OHIO
WICHITA
29
28TH
HYDRAULIC
135
27TH
HILLSIDE
HOLYOKE
NEW YORK
SPRUCE
GROVE
26TH
CHAUTAUQUA
LORRAINE
ASH
MADISON
POPLAR
GREEN
ESTELLE
VOLUTSIA
ERIE
25TH
MINNESOTA
KANSAS
MCFARLAND
ETHEL
PRICE
24TH
(C) 2008 Sedgwick County GIS

Soil Map—Sedgwick County, Kansas
(Wichita Readiness Center Site)

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 or swamp
- 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
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,330 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

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 5, Dec 3, 2008

Date(s) aerial images were photographed: 6/20/2006

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**
5967	Tabler silty clay loam, 0 to 1 percent slopes	7.8	11.9%
6244	Elandco silt loam, rarely flooded	54.4	83.5%
6252	Urban land-Elandco complex, 0 to 1 percent slopes	3.0	4.6%
Totals for Area of Interest		**65.2**	**100.0%**

Appendix I
Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Adopted: February 23, 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer:_____ Date:_____

Subdivision Name:_____ Location:_____

Total Land Area Of Ownership:_____ Acres

Type: _____Residential _____Commercial _____Industrial _____Recreation _____Municipal _____Other

Applicant:_____ Contact:_____ Phone #:_____

Engineer:_____ Contact:_____ Phone #_____

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					
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					

	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)					
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.					

Consulting Engineer Initials _____

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					

	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)					
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					

Consulting Engineer Initials _____

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 platters text. (e.g. HOA, Lot Owners Association, or lot)					
W. Off-site drainage easements or agreements required, where necessary					

	Applicant			Engr	
Tab 4. Floodplain Submittal	**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					

	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)					
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					

Consulting Engineer Initials _____

Appendix J
Copy of Preliminary Jurisdictional Determination

PRELIMINARY JURISDICTIONAL DETERMINATION

ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, SEDGWICK COUNTY, KANSAS

Project No. 01097041
April 17, 2009

Prepared for:

HTK Architects
Topeka, Kansas

Prepared by:

Terracon
Wichita, Kansas

Terracon

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Terracon

April 17, 2009

Mr. Keith Blackburn, AIA, Vice President
HTK Architects, PA
2900 MacVicar Avenue
Topeka, KS 66615

Telephone: 705.266.5373
E-mail: rk6@htkarchitects.net

Re: Preliminary Jurisdictional Determination
Armed Forces Readiness Center and Field Maintenance Shop
Near K-96 and I-135
Wichita, Sedgwick County, Kansas
Terracon Project No. 01097041

Dear Mr. Blackburn,

Terracon Consultants, Inc. (Terracon) has completed a Preliminary Jurisdictional Determination (PJD) for the above-referenced site. The PJD was performed in accordance with Terracon's Agreement for Services No. E0109066 dated March 13, 2009. The attached report details our observations and presents a summary opinion regarding the presence or absence of jurisdictional waters on the site, however, the final jurisdictional determination must be made by the U.S. Army Corps of Engineers (USACE).

Based on a review of readily available information and site reconnaissance, approximately 0.01 acres of wetlands are located on the site. Due to the relatively small size of the wetlands, wetland impacts to be sustained by development of the site do not appear to be jurisdictional or significant. Mitigation for the impacts to the potential wetlands on the site will likely not be required.

Due to an apparent significant nexus with jurisdictional waters of the US, the drainage ditch onsite appears to be jurisdictional. Based on information provided by the client, development of the site is likely to result in impacts to approximately 670 linear feet of the drainage ditch on the site. Permitting and mitigation may be required by the USACE for impacts to the drainage ditch. Terracon will submit a copy of this PJD report to the USACE for their review and determination of possible permitting requirements.

We appreciate the opportunity to perform this PJD for you. Please contact us if you have questions regarding this information or if we can provide any other services.

Sincerely,
Terracon Consultants, Inc.

Patrick C. Yamnik
Field Environmental Scientist

James I. Van Blaricon
Senior Staff Environmental Scientist

n:\projects\2009\01097041\finalreports\pjd_01097041.doc

PRELIMINARY JURISDICTIONAL DETERMINATION

ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, SEDGWICK COUNTY, KANSAS

Project No. 01097041
April 17, 2009

Prepared for:

HTK Architects
Topeka, Kansas

Prepared by:

Terracon
Wichita, Kansas

Terracon

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FIGURES

APPENDICES

PRELIMINARY JURISDICTIONAL DETERMINATION

ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, SEDGWICK COUNTY, KANSAS

Project No. 01097041
April 17, 2009

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) has completed a Preliminary Jurisdictional Determination (PJD) for the proposed Armed Forces Readiness Center (AFRC) and Field Maintenance Shop (FMS) on approximately 45 acres of City of Wichita owned land (site) near K-96 and I-135 in Wichita, Kansas. The purpose of the PJD is to determine if jurisdictional waters of the US, as defined by the US Army Corps of Engineers (USACE), exist at the site and to determine if impacts to jurisdictional waters of the US (if present) are likely to be sustained due to site development. If impacts are to occur, permitting and or mitigation may be required by the USACE. The results of the PJD are presented in this report.

1.1 Site Location

The site is located in portions of the NW/4 of Section 3, Township 27 South, Range 1 East, and the SE/4 of the SW/4 of Section 34, Township 26 South, Range 1 East, near K-96 and I-135 in Wichita, Sedgwick County, Kansas. The approximate site location is presented on Figure 1 (Topographic Map), which is a copy of a portion of the Wichita East, Kansas U.S. Geological Survey (USGS) 7.5-Minute Quadrangle. A Site Diagram showing the site on a 2006 aerial photograph is included as Figure 2. Approximate locations of sample plots and other site features are included in Figure 2. Photographs of the site taken at the time of the site reconnaissance are included in Appendix A.

2.0 GENERAL INFORMATION

2.1 Regulatory Overview

Under Section 404 of the Clean Water Act, the USACE has authority to regulate the discharge of dredged and fill material into waters of the U.S. Jurisdictional waters of the U.S. include traditional navigable waters and their non-navigable tributaries that typically flow year-round or have flow at least seasonally (e.g., typically three months).

Wetlands, which are special aquatic sites, are jurisdictional under Section 404 as a subset of waters of the U.S. Wetlands as defined by the Environmental Protection Agency (EPA) and the USACE, in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) (1987 Manual), are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The USACE will assert jurisdiction over wetlands adjacent to navigable waters and wetlands that directly abut their non-navigable tributaries.

Based on their "significant nexus" with traditional navigable waters, the USACE will decide jurisdiction over non-navigable tributaries that are not relatively permanent, wetlands adjacent to these tributaries, and wetlands adjacent to, but do not directly abut a relatively permanent non-navigable tributary. A "significant nexus" is based on the flow characteristics and functions of the tributary and the functions of wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of downstream traditional navigable waters.

On April 14, 2008, the USACE, Kansas City District, issued a public notice which stated that, a one year trial implementation of the *Great Plains Interim Regional Supplement* (GPIRS) to the 1987 Wetland Delineation Manual is required for wetland determinations/delineations. The procedures in GPIRS were utilized in this PJD.

For wetland identification three criteria must be met, specifically:

- Wetland hydrology: Areas exhibiting surface or near-surface saturation or inundation at some point in time (greater than 12.5 percent of growing season which was defined by number of frost-free days, 1987 Manual) during an average rainfall year and specific indicators defined by the 2008 GPIRS;

- Hydrophytic vegetation: Frequency of occurrence of wetland indicator plants (plant life growing in water, soil, or substrate that is periodically deficient in oxygen as a result of excessive water content); and

- Hydric soils: Landscape positions identified by saturation, flooding, or ponding long enough during the growing season (generally seven or more days) which develop characteristic color changes in the upper part of the soil as a result of anaerobic conditions and specific characteristics defined by the 2008 GPIRS.

2.2 PJD Work Scope

The PJD work scope conducted by Terracon included the following tasks:

- A historical review of topographic maps, aerial photos, National Wetland Inventory (NWI) maps and the Sedgwick County Soil Survey (1979) was conducted.
- Terracon personnel experienced in wetland hydrology, hydric soils and hydrophytic vegetation identification conducted a field reconnaissance of the site identified by the client.
- The approximate location and estimated size of potential jurisdictional waters on the site (if any) were identified.

3.0 HISTORICAL REVIEW

3.1 Topographic Maps

Based on the review of the Wichita East, Kansas USGS 7.5-minute Quadrangle, published 1961, photorevised 1982 (1:24,000), the site consists of undeveloped land with unimproved roads (Figure 2). The East Fork Chisholm Creek bounds the site to the south and east (Figure 2). The site elevation is approximately 1,320 feet above mean sea level and the general topographic gradient is to the southwest (Figure 1). Based on review of the Wichita East, Kansas USGS 7.5-minute Quadrangle, published 1943, an apparent channel (oxbow) of East Fork Chisholm Creek is located in the eastern portion of the site.

3.2 National Wetland Inventory Map

The NWI maps are produced by the U.S. Fish & Wildlife Service (USFWS) and microfilmed by the USGS. Wetland maps are prepared primarily by stereoscopic analysis of high altitude aerial photographs. Potential wetland areas are noted on the photographs based on interpretation by the USFWS of vegetation, visible hydrology, and geography. However, generally any water body visible on the high altitude aerial photographs will be designated by the USFWS as a "potential" wetland area on the NWI maps.

The Wichita East, Kansas NWI map for the site was reviewed and a copy of this map is included in Appendix B. Based on the NWI maps, a potential wetland (PEMCx) traverses the eastern portion of the site from north to south. The reach of East Fork Chisholm Creek located adjacent south of the site is also classified as PEMCx. A description of the potential wetland noted on the NWI map is summarized in Table 1 below.

Table 1. NWI Map Potential Wetland Areas		
Symbol	**Wetland Type**	**Wetland Description**
PEMCx	Palustrine Emergent Seasonally Flooded Excavated	Non-tidal wetlands dominated by erect rooted herbaceous vegetation which contain surface water for extended periods and are located within a basin or channel excavated by man.

3.3 Aerial Photographs

Select aerial photographs of the site were reviewed, if readily available, and compared with the NWI maps. Evaluation of these aerials may be limited by a photo's quality and scale. Selected photographs reviewed are listed and summarized below:

- National Agricultural Imagery Program (NAIP), Sedgwick County, 2003, 2004, 2005, 2006, 2008 no scale
- Orthographic SID, Sedgwick County, 1991, 2002 no scale
- Sedgwick County Geographic Information Services, Wichita East Section 3, 2000, 2003, 2006 no scale

The site appears as undeveloped land with multiple apparent unimproved roads located throughout the site. Apparent debris piles are located at various locations across the site. An apparent drainage ditch situated in the eastern portion of the site, traverses the site from north to south, and flows into East Fork Chisholm Creek (See Figure 3 and Appendix A). The drainage ditch appears to drain a waterbody located on the adjacent property north of the site. The waterbody on the adjacent property appears to be fed by an apparent unnamed intermittent stream, which flows into the waterbody from the northeast. The apparent intermittent stream corresponding to East Fork Chisholm Creek travels adjacent to the eastern and southern boundaries of the site. In later aerial photographs, the site generally appears as it did in the 1991 photograph. Based on information provided by the client, East Fork Chisholm Creek and the unnamed intermittent stream are not located on the site.

3.4 Soils Review

The USDA *Soil Survey of Sedgwick County*, Kansas (1979) was reviewed to identify soil classifications at the site. The following soils are indicated as present at the site:

Elandco silt loam soils, rarely flooded (Ea), consist of nearly level well drained soils with rare flooding. The surface layer is approximately 40 inches of dark grayish brown silt loam

underlain by dark grayish brown silt loam approximately 60 inches thick. Tabler, Vanoss, and Lesho soils constitute approximately 5 to 15 percent of the mapping unit. This soil type has a high available water capacity, moderate permeability, and slow runoff.

Tabler silty clay loam soils, 0 – 1 percent slopes (Ta), consist of nearly level moderately well drained soils. The surface layer is dark gray silty clay loam approximately 9 inches thick, with silty clay subsoil 35 inches thick. The subsoil ranges from very dark gray and firm in the upper part, to dark grayish brown and very firm in the central portion, to grayish brown and very firm in the lower part. Blanket, Farnum, Goessel, and Irwin soils make up 10 to 20 percent of this mapping unit. This soil type has a moderate available water capacity, very slow permeability, and slow runoff.

Table 2 below summarizes general characteristics for soils identified on the site by the *Soil Survey of Sedgwick County, Kansas (1979).*

Table 2. General Soil Characteristics

Soil Type	Symbol	Permeability (inches/hour)	Available Water Capacity (inch/per inch of soil)
Elandco silt loam, rarely flooded	Ea	0.6 - 2.0	0.15 – 0.22
Tabler silty clay loam, 0 – 1 percent slopes	Ta	0.2 - 0.6	0.15 – 0.24

According to the USDA NRCS national list of hydric soils and NRCS Electronic Field Office Technical Guide, hydric soils for Sedgwick County include both soil types listed in Table 2 above.

4.0 FIELD ACTIVITIES

Terracon personnel conducted a reconnaissance of the site on March 24, 2009 to observe for the presence of potential wetland characteristics (wetland hydrology, hydrophytic vegetation and hydric soil) and jurisdictional waters. Based on site access, areas of observed impact, information provided by the client, and qualitative observations, five sample plots (Plots 1, 2, 3, 4, and 6) were sampled within the site. A plot was also taken (Plot 5) in a suspected wetland area adjacent to the eastern boundary of the site, but wetland conditions were not observed at this location, therefore, the plot is not included in this report. Approximate locations of sample plots are shown on Figure 2. Plots 1 through 4 were taken at points along the drainage ditch which traverses the eastern portion of the site from north to south. Plots 1, 3, and 4 were taken directly adjacent to standing water in the drainage ditch, whereas Plot 2 was taken approximately 3 feet upland from standing water

in the drainage ditch. Plot 2 appears to be representative of the general conditions of the steeply sloped bank of the drainage ditch, and other upland areas on the site. Plot 6 was taken in a roadside ditch located on the western edge of the site. Vegetation, soils, hydrology, and other conditions were observed at each plot location as presented in the field data forms in Appendix C, and the results are discussed in Sections 4.1 through 4.3 below. Resumes for Terracon personnel performing this PJD are included in Appendix D.

4.1 Hydrology

According to the 1987 Manual, "areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively. Such characteristics are usually present in areas that are inundated or have soils that are saturated to the surface for sufficient duration to develop hydric soils and support vegetation typically adapted for life in periodically anaerobic soil conditions."

The site consists predominantly of undeveloped upland bounded on the south and east by East Fork Chisholm Creek. A drainage ditch traverses the eastern portion of the site from north to south, and flows into East Fork Chisholm Creek at the southern boundary of the site. Four check dams are located along the course of the drainage ditch. The drainage ditch appears to drain a waterbody located on the adjacent property north of the site. An apparent previously abandoned channel of the East Fork Chisholm Creek is located in the southeast portion of the site. Surface water was observed within the drainage ditch onsite and in the East Fork Chisholm Creek, adjacent to the site.

At the time of the site reconnaissance, the ordinary high water marks for the drainage ditch and East Fork Chisholm Creek were defined by a vegetated bank and non-vegetated streambed and drift lines (See Appendix A).

Sampling results for the five plots indicate surface soils from Plots 1, 3, and 4 were saturated within the upper 12 inches (See field data forms-Appendix C). Plots 2 and 6 were not saturated within the top 12 inches and did not display significant indicators of wetland hydrology. Based upon the field sampling data, Plots 1, 3, and 4 displayed characteristics of wetland hydrology.

4.2 Vegetation

Upland areas on the site are characterized by a variety of native herbaceous and woody vegetation, including heavily wooded areas in the eastern and southwestern portions of the site.

Based on the procedures outlined in the GPIRS, hydrophytic vegetation was observed and evaluated at each sample plot by performing the Dominance Test and, if necessary, a Plot-Based Prevalence Index. If greater than (>) 50% of the dominant species were identified as OBL, FACW, or FAC, the plot was classified as having hydrophytic vegetation, if this criterion was not met, the Prevalence Index was used and an Index value of less than (<) 3.0 indicates dominant hydrophytic vegetation. The Dominance Test and Prevalence Index results for each plot are included in the field data forms in Appendix C. As indicated therein, Plots 1, 3, 4, and 6 "passed" either the dominance test or prevalence index and are considered to be dominated by hydrophytic vegetation.

The following table is a summary of the vegetation identified during the site reconnaissance and includes their Central Plains (Region 5) wetlands indicator status.

Table 3: 1988 Wetland Indicator Status for Central Plains, Region 5

Scientific Name	Common Name	Wetland Indicator Status
Typha latifolia	Broadleaf cattail	OBL
Juncus effusus	Soft rush	OBL
Elmus americana	American elm	FAC
Plantago rugelii	Blackseed plantain	FAC
Cynodon dactylon	Bermuda grass	FACU
Andropogon gerardii	Big bluestem	FAC-
Salix sp.	Willow species	FACW

OBL (Obligate Wetland) = occur almost always (estimated probability greater than 99%) under natural conditions in wetlands.
FACW (Facultative Wetland) = usually occur in wetlands (estimated probability 67% - 99%) but occasionally found in non-wetlands.
FAC (Facultative) = equally likely to occur in wetlands or non-wetlands (estimated probability 34% - 66%).
FACU (Facultative Upland) = usually occur in non-wetlands (estimated probability 67% - 99%) but occasionally found in wetlands.
UPL (Obligate Upland) = rarely occur in wetlands, but occur almost always (estimated probability greater than 99%) under natural conditions in non-wetlands.
NE = No Indicator status established for this species from the U.S. Fish and Wildlife Service.
FACW, FAC, and FACU have (+) and (-) values to represent species near the wetter end of the spectrum (+), and species near the drier end of the spectrum (-).

Based on observation of the site vegetation and evaluation of vegetation collected at the sample plots, hydrophytic vegetation was the dominant vegetation for Plots 1, 3, 4, and 6.

4.3 Soils

To assess the site for hydric soil characteristics, individual near-surface soil samples from Plots 1, 2, 3, 4, and 6 (Figure 2) were collected to a depth of approximately 10 to 15 inches below ground surface, using soil boring equipment.

To assess the soil matrix chroma (color), each soil sample was compared to the Munsell Soil Color Charts and the results are presented in the field data forms in Appendix C and summarized below.

Table 4: Field Soil Samples Characteristics

Plot/Transect	Color and Texture	Chroma
1	Dark gray silty clay loam	1-6
2	Light olive brown silty clay loam	3
3	Very dark grayish brown silty clay loam	2
4	Very dark gray silty clay loam	1
6	Very dark gray loamy sand	1

Based upon the procedures outlined in the GPIRS, soils are classified as being hydric when they are characterized by at least one indicator of hydric soils. The hydric soil indicators of sulfidic odor and reducing conditions, as described in the GPIRS were observed in soil samples from Plots 1, and 4 (See Appendix C). Hydric soil indicators were not observed at Plots 2, 3, and 6. Soil profiles observed during the site reconnaissance generally appear to represent the soil profiles described in the USDA *Soil Survey of Sedgwick County*, Kansas (1979).

5.0 SUMMARY/CONCLUSIONS

A PJD of approximately 45 acres of land near K-96 and I-135 in Wichita, Sedgwick County, Kansas was conducted. The site was evaluated for potential jurisdictional waters, based on a review of readily available information, performance of a site reconnaissance, and limited sampling to assess for wetland hydrology, hydrophytic vegetation and hydric soils. Based on observations made at the time of the site reconnaissance, wetlands, as defined by the USACE, appear to be located on the site. Figure 3 shows the approximate locations and sizes of potential wetland identified from this PJD.

Conditions observed at Plots 1 and 4 meet the 1987 Manual's criteria for wetlands. The observed wetlands correspond to the PEMCx area identified in the NWI map (see Figure 3). Plots 1 and 4 are characteristic of wetland areas within portions of the drainage ditch traversing the eastern portion of the site (see Figure 3). Based upon this PJD, approximately 0.01 acres of potential fringe wetlands are located within the drainage ditch.

We understand the drainage ditch will be impacted by development and may be moved to another location on the site. Consequently, the approximate 0.01 acres of fringe wetlands within the drainage ditch are likely to be impacted by the development of the site. Due to the relatively small size of impacted wetlands (approximately 0.01 acres total), wetland impacts to be sustained by development of the site do not appear to be "jurisdictional" or "significant", and mitigation for the impacts to the potential wetlands on the site will likely not be required by the USACE. However, only the USACE can make the final decision on mitigation requirements for wetland impacts.

The onsite drainage ditch drains a waterbody located on the adjacent property north of the site, and the waterbody is fed by an apparent unnamed intermittent stream which flows into the waterbody from the northeast. The onsite portion of the drainage ditch is approximately 670 linear feet. The drainage ditch converges with East Fork Chisholm Creek along the southern boundary of the site and East Fork Chisholm Creek converges with Chisholm Creek approximately 1.5 miles downstream. Chisholm Creek flows into the Arkansas River approximately 6 miles, following its convergence with East Fork Chisholm Creek. The Arkansas River is classified by the USACE as a jurisdictional water as a Section 404 Water Body (Traditional Navigable Water of the U.S.). Due to the apparent significant nexus of the drainage ditch with respect to the Arkansas River, the drainage ditch appears to be a jurisdictional water and is subject to regulation by the USACE. Based on information provided by the client, development of the site is likely to result in impacts to approximately 670 linear feet of the drainage ditch; therefore, permitting and mitigation may be required by the USACE for impacts to the drainage ditch. However, only the USACE can make the final decision on mitigation requirements for impacts to jurisdictional waters.

The USACE must make the final jurisdictional determination. Terracon recommends a copy of this PJD report be submitted to the USACE for their final determination of potential jurisdictional waters/wetlands on the site and required USACE permitting and mitigation (if any) for potential impacts to these waters/wetlands.

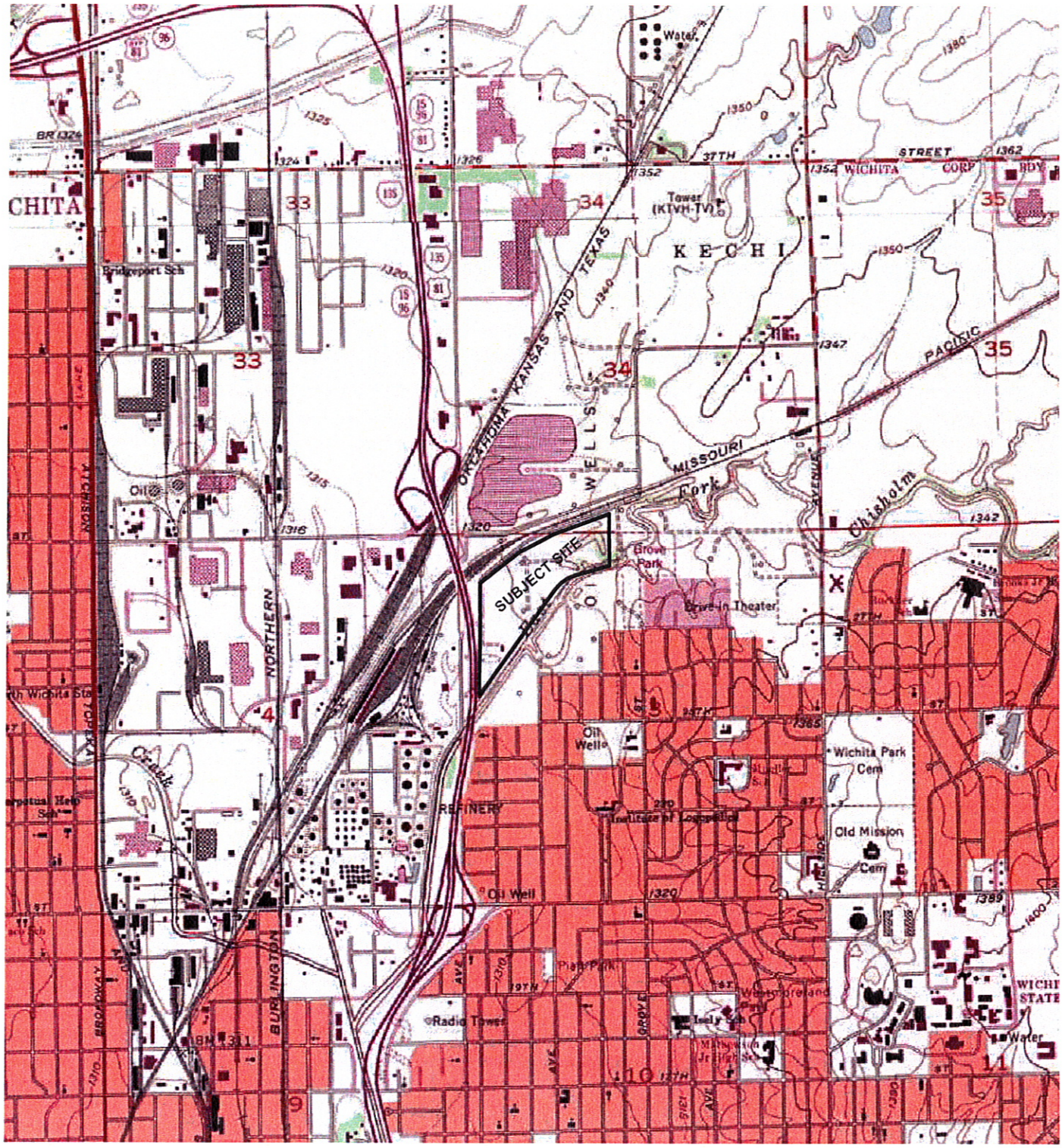
6.0 GENERAL COMMENTS

Terracon has performed a PJD within the scope of Terracon's Agreement for Services No. E0109066 dated March 13, 2009. This report has been prepared for the exclusive use of our client for specific application as discussed. It has been prepared in accordance with generally accepted environmental assessment practices within the constraints of the client's directives. Others drawing from the results of this assessment should recognize the limitations of the assessment methods used.

This assessment relied primarily upon readily available published information, visual observations, and limited sampling. Observations at other times and locations may indicate

different conditions. Also, this assessment was limited in scope and should not be considered a final jurisdictional wetlands determination or delineation. Only the USACE can make the final jurisdictional determination. Terracon does not warrant the work of regulatory agencies or other parties supplying information, which may have been used during the preparation of this report. No warranties, express or implied, are intended or made.

FIGURES



WICHITA EAST QUADRANGLE
KANSAS - SEDGWICK COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)
1961 - PHOTO REVISED IN 1982

APPROXIMATE NW/4
OF SECTION 3, TOWNSHIP 28
SOUTH, RANGE 1 EAST.

N

DIAGRAM IS INTENDED FOR GENERAL USE ONLY AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

TOPOGRAPHIC MAP
ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, KANSAS 67219
CLIENT: HTK ARCHITECTS

Project Mngr:	PCY
Designed By:	PCY
Checked By:	KRA
Approved By:	KCW
Drawn By:	BCB

Terracon
1815 S. Eisenhower
Wichita, Kansas 67209
Phone: (316) 262-0171
Fax: (316) 262-6997

Scale:	SHOWN
Date:	03/27/09
Project No.	01097041
File Name:	7041F1.DWG
Figure No.	1

LEGEND

● SAMPLE POINT

2006 AERIAL PHOTOGRAPH PROVIDED BY SEDGWICK COUNTY GEOGRAPHIC INFORMATION SERVICES.

N

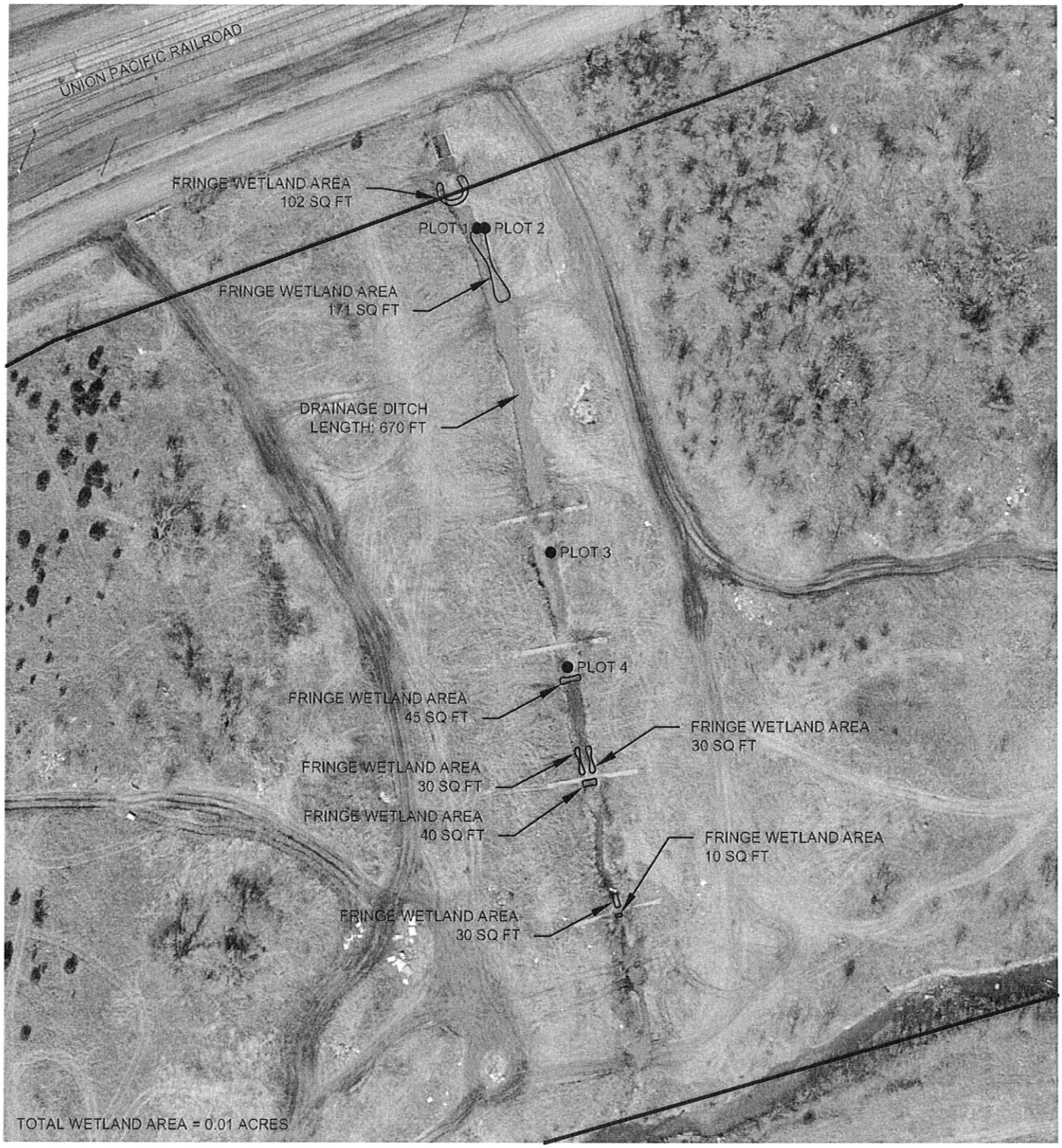
DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

SITE DIAGRAM
ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, KANSAS 67219
CLIENT: HTK ARCHITECTS

Project Mngr:	PCY
Designed By:	PCY
Checked By:	KRA
Approved By:	KCW
Drawn By:	BCB

Terracon
1815 S. Eisenhower
Wichita, Kansas 67209
Phone: (316) 262-0171
Fax: (316) 262-6997

Scale:	SHOWN
Date:	03/30/09
Project No.	01097041
File Name:	7041F2.DWG
Figure No.	2



0 50' 100' 200'

LEGEND

● SAMPLE POINT

NOTE:
1) FRINGE WETLAND AREAS ARE APPROXIMATE.
2) 2006 AERIAL PHOTOGRAPH PROVIDED BY SEDGWICK COUNTY GEOGRAPHIC INFORMATION SERVICES.

N

DIAGRAM IS INTENDED FOR GENERAL USE ONLY AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

WATER / WETLAND IMPACTS
ARMED FORCES READINESS CENTER AND FIELD MAINTENANCE SHOP
NEAR K-96 AND I-135
WICHITA, KANSAS 67219
CLIENT: HTK ARCHITECTS

Project Mngr:	PCY
Designed By:	PCY
Checked By:	KRA
Approved By:	KCW
Drawn By:	BCB

Terracon
1815 S. Eisenhower
Wichita, Kansas 67209
Phone: (316) 262-0171
Fax: (316) 262-6997

Scale:	SHOWN
Date:	03/30/09
Project No.	01097041
File Name:	7041F3.DWG
Figure No.	3

APPENDIX A

Terracon
Consulting Engineers & Scientists

Armed Forces Readiness Center and Field Maintenance Shop
Project No. 01097041
Date Photos Taken: March 24, 2009

Photo #1 View of culvert under Union Pacific Railroad and drainage ditch located on the northeast portion of site.

Photo #2 View of the north portion of the drainage ditch located on the site.

Photo #3 View of location of Plots 1 and 2 and drainage ditch.

Photo #4 Looking north along drainage ditch showing check dam and location of Plot 3.

Photo #5 Looking south along drainage ditch.

Photo #6 View of typical eroded bank along drainage ditch.

Terracon
Consulting Engineers & Scientists

Photo #7 View of location of Plot 4.

Photo #8 View of drainage ditch near confluence with East Fork Chisholm Creek.

Photo #9 View of East Fork Chisholm Creek looking west from confluence of drainage ditch and East Fork Chisholm Creek.

Photo #10 View of East Fork Chisholm Creek looking east from confluence of drainage ditch and East Fork Chisholm Creek.

Photo #11 View of East Fork Chisholm Creek looking west from the southwest portion of the site.

Photo #12 View of East Fork Chisholm Creek looking east from the southwest portion of the site.

Armed Forces Readiness Center and Field Maintenance Shop
Project No. 01097041
Date Photos Taken: March 24, 2009

Photo #13 View of apparent previously abandoned stream channel and location of Plot 5.

Photo #14 View of East Fork Chisholm Creek looking west from the southeastern portion of the site.

Photo #15 View of East Fork Chisholm Creek looking east from the southeastern portion of the site.

Photo #16 View of roadside ditch and culvert located on the western boundary of the site, and the location of Plot 6.

Photo #17 View of roadside ditch and culvert located on the western boundary of the site near underpass of Hydraulic Street and I-135.

Armed Forces Readiness Center and Field Maintenance Shop
Project No. 01097041
Date Photos Taken: March 24, 2009

Terracon
Consulting Engineers & Scientists

Photo #1 View of culvert under Union Pacific Railroad and drainage ditch located on the northeast portion of site.

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Armed Forces Readiness Center and Field Maintenance Shop
Project No. 01097041
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Terracon
Consulting Engineers & Scientists

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Photo #16 View of roadside ditch and culvert located on the western boundary of the site, and the location of Plot 6.

Photo #17 View of roadside ditch and culvert located on the western boundary of the site near underpass of Hydraulic Street and I-135.

APPENDIX B

APPENDIX C

WETLAND DETERMINATION FORM - Great Plains Region

Project/Site: Armed Forces Readiness Center and Field Maintenance Shop City/County: Wichita / Sedgwick Sample Date: 3/24/2009

Applicant/Owner: HTK Architects State: KS Sample Point: 1

Investigator(s): Patrick Yamnik / Terracon Section, Township, Range: Section 3, T27S, R1E

Landform (hillslope, terrace, etc.): Bank Local relief (concave,convex,none): None Slope (%): 2%

Subregion (LRR) Central Great Plains Winter Wheat and Range Lat: 37.73769 Long: 97.31143 Datum: NAD 83

Soil Map Unit Name: Elandco silt loam NWI classification: PEMCx

Are Climatic / Hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks:)

Are Vegetation ____ Soil, ____ or Hydrology, ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil, ____ or Hydrology, ____ naturally problematic? (If needed, explain any answers in Remarks:)

SUMMARY OF FINDINGS - Attach site map showing sampling prior locations, transects, important features, etc

Hydrophytic Vegetation Present? Yes X No ____

Hydric Soil Present? Yes X No ____

Wetland Hydrology Present? Yes X No ____

Is the sampled area within a Wetland? Yes X No ____

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1			
2			
3			
4			
5			
		= Total Cover	
Herb Stratum (Plot size: ____)			
1 *Typha latifolia*	75%	Yes	OBL
2			
3			
3			
4			
5			
6			
7			
8			
9			
10			
	75%	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1			
2			
		= Total Cover	

% Bare Ground in Herb Stratum 25%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worsheet:

Total % Cover of:			Multiply by:	
OBL species	0	X 1	=	0
FACW species	0	X 2	=	0
FAC species	0	X 3	=	0
FACU species	0	X 4	=	0
UPL species	0	X 5	=	0
Column Totals:	0		(A)	0 (B)

Prevalence Index = B/A = 0.00

Hydrophytic Vegetation Indicators:

X Dominance Test > 50%

____ Prevalence Index is < 3.0[1]

____ Morphological Adaptations[1] (Provide supporting data in Remarks or separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Profile Description:

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/1 (Drk Gry)	90	10YR 6/6	10			Silty Clay Loam	

[1]Type C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
X Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR F**)
__ 1 cm Muck (A9) (**LRR F, G, H**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
__ 5cm Mucky Peat or Peat (S3) (**LRR F**)

__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) H
__ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ High Plains Depressions (F16)
(**MLRA 72 & 73 of LRR H**)

__ 1 cm Muck (A9) (**LRR I, J**)
__ Coast Prairie Redox (A16) (LRR F, G, H)
__ Dark Surface (S7) (LRR G)
__ High Plains Depressions (F16)
(**LRR H outside of MLRA 72 & 73**)

__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[1]Indications of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Drk Gry = Dark Gray

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)

__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
X Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Oxidized Rhizospheres on Living Roots (C3)
(**where not tilled**)
X Presence of Reduced Iron (C4)
__ Thin Muck Surface (C7)
__ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

__ Surface Soil Cracks (B6)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres on Living Roots (C3)
(**where tilled**)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ FAC-Neutral Test (D5)
__ Frost-Heave Hummocks (C11) (LRR F)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): <1 inch
Water Table Present? Yes X No _____ Depth (inches): surface
Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): surface

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION FORM - Great Plains Region

Project/Site: Armed Forces Readiness Center and Field Maintenance Shop City/County: Wichita / Sedgwick Sample Date: 3/24/2009

Applicant/Owner: HTK Architects State: KS Sample Point: 2

Investigator(s): Patrick Yamnik / Terracon Section, Township, Range: Section 3, T27S, R1E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave,convex,none): None Slope (%): 10%

Subregion (LRR) Central Great Plains Winter Wheat and Range Lat: 37.73769 Long: 97.31141 Datum: NAD 83

Soil Map Unit Name: Elandco silt loam NWI classification: PEMCx

Are Climatic / Hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks:)

Are Vegetation X Soil, or Hydrology, significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation Soil, or Hydrology, naturally problematic? (If needed, explain any answers in Remarks:)

SUMMARY OF FINDINGS - Attach site map showing sampling prior locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes	No X	Is the sampled area within a Wetland? Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
		= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
		= Total Cover	
Herb Stratum (Plot size:)			
1 *Andropogon gerardii*	25%	Yes	FAC-
2 *Cynodon dactylon*	75%	Yes	FACU
3			
3			
4			
5			
6			
7			
8			
9			
10			
	100%	= Total Cover	
Woody Vine Stratum (Plot size:)			
1			
2			
		= Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 0 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worsheet:

Total % Cover of:			Multiply by:	
OBL species	0	X 1	=	0
FACW species	0	X 2	=	0
FAC species	25	X 3	=	75
FACU species	75	X 4	=	300
UPL species	0	X 5	=	0
Column Totals:	100		(A)	375 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

_____ Dominance Test > 50%

_____ Prevalence Index is < 3.0[1]

_____ Morphological Adaptations[1] (Provide supporting data in Remarks or separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks:

Vegetation was recently mowed.

SOIL

Profile Description:

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)		Type[1]	Loc[2]	Texture	Remarks
0-12	2.5Y 5/3 (Lght Olv Brwn)	100					Silty Clay Loam	

[1]Type C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__Histosol (A1)
__Histic Epipedon (A2)
__Black Histic (A3)
__Hydrogen Sulfide (A4)
__Stratified Layers (A5) (**LRR F**)
__1 cm Muck (A9) (**LRR F, G, H**)
__Depleted Below Dark Surface (A11)
__Thick Dark Surface (A12)
__Sandy Mucky Mineral (S1)
__2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
__5cm Mucky Peat or Peat (S3) (**LRR F**)

__Sandy Gleyed Matrix (S4)
__Sandy Redox (S5)
__Stripped Matrix (S6)
__Loamy Mucky Mineral (F1) H
__Loamy Gleyed Matrix (F2)
__Depleted Matrix (F3)
__Redox Dark Surface (F6)
__Depleted Dark Surface (F7)
__Redox Depressions (F8)
__High Plains Depressions (F16)
(**MLRA 72 & 73 of LRR H**)

__1 cm Muck (A9) (**LRR I, J**)
__Coast Prairie Redox (A16) (LRR F, G, H)
__Dark Surface (S7) (LRR G)
__ High Plains Depressions (F16)
(**LRR H outside of MLRA 72 & 73**)

__ Reduced Vertic (F18)
__Red Parent Material (TF2)
__Other (Explain in Remarks)

[3]Indications of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Lght Olv Brwn = Light Olive Brown

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__Surface Water (A1)
__High Water Table (A2)
__Saturation (A3)
__Water Marks (B1)
__Sediment Deposits (B2)
__Drift Deposits (B3)
__Algal Mat or Crust (B4)
__Iron Deposits (B5)
__Inundation Visible on Aerial Imagery (B7)
__Water-Stained Leaves (B9)

__Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__Hydrogen Sulfide Odor (C1)
__Dry-Season Water Table (C2)
__Oxidized Rhizospheres on Living Roots (C3)
(**where not tilled**)
__Presence of Reduced Iron (C4)
__Thin Muck Surface (C7)
__Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

__Surface Soil Cracks (B6)
__Sparsely Vegetated Concave Surface (B8)
__Drainage Patterns (B10)
__Oxidized Rhizospheres on Living Roots (C3)
(**where tilled**)
__Crayfish Burrows (C8)
__Saturation Visible on Aerial Imagery (C9)
__Geomorphic Position (D2)
__FAC-Neutral Test (D5)
__ Frost-Heave Hummocks (C11) (LRR F)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____
Water Table Present? Yes _____ No X Depth (inches): _____
Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION FORM - Great Plains Region

Project/Site: Armed Forces Readiness Center and Field Maintenance City/County: Wichita / Sedgwick Sample Date: 3/24/2009

Applicant/Owner: HTK Architects State: KS Sample Point: 3

Investigator(s): Patrick Yamnik / Terracon Section, Township, Range: Section 3, T27S, R1E

Landform (hillslope, terrace, etc.): Bank Local relief (concave,convex,none): None Slope (%): 3%

Subregion (LRR) Central Great Plains Winter Wheat and Range Lat: 37.73704 Long: 97.31125 Datum: NAD 83

Soil Map Unit Name: Elandco silt loam NWI classification: PEMCx

Are Climatic / Hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks:)

Are Vegetation X Soil, or Hydrology, significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation Soil, or Hydrology, naturally problematic? (If needed, explain any answers in Remarks:)

SUMMARY OF FINDINGS - Attach site map showing sampling prior locations, transects, important features, etc

Hydrophytic Vegetation Present? Yes X No

Hydric Soil Present? Yes No X

Wetland Hydrology Present? Yes X No

Is the sampled area within a Wetland? Yes No X

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
		= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1 *Salix nigra*	15%	Yes	OBL
2			
3			
4			
5			
	15%	= Total Cover	
Herb Stratum (Plot size:)			
1 *Typha latifolia*	10%	No	OBL
2 *Cynodon dactylon*	50%	Yes	FACU
3 *Juncus effusus*	10%	No	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	70%	= Total Cover	
Woody Vine Stratum (Plot size:)			
1			
2			
		= Total Cover	

% Bare Ground in Herb Stratum 30%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worsheet:

Total % Cover of:			Multiply by:	
OBL species	35	X 1	=	35
FACW species	0	X 2	=	0
FAC species	0	X 3	=	0
FACU species	50	X 4	=	200
UPL species	0	X 5	=	0
Column Totals:	85	(A)		235 (B)

Prevalence Index = B/A = 2.76

Hydrophytic Vegetation Indicators:

_ Dominance Test > 50%

X Prevalence Index is < 3.0[1]

_ Morphological Adaptations[1] (Provide supporting data in Remarks or separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

Vegetation was recently mowed.

SOIL

Profile Description:

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)		Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2 (Vry drk gry-brwn)	100					Silty Clay Loam	

[1]Type C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR F**)
__ 1 cm Muck (A9) (**LRR F, G, H**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
__ 5cm Mucky Peat or Peat (S3) (**LRR F**)

__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) H
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

__ 1 cm Muck (A9) (**LRR I, J**)
__ Coast Prairie Redox (A16) (LRR F, G, H)
__ Dark Surface (S7) (LRR G)
__ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indications of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Vry drk gry-brwn = Very Dark Grayish Brown

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)

__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
__ Presence of Reduced Iron (C4)
__ Thin Muck Surface (C7)
__ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

__ Surface Soil Cracks (B6)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ FAC-Neutral Test (D5)
__ Frost-Heave Hummocks (C11) (LRR F)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches):	_____	
Water Table Present?	Yes X	No _____	Depth (inches):	8	
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches):	7	**Wetland Hydrology Present?** Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION FORM - Great Plains Region

Project/Site: Armed Forces Readiness Center and Field Maintenance City/County: Wichita / Sedgwick Sample Date: 3/24/2009

Applicant/Owner: HTK Architects State: KS Sample Point: 4

Investigator(s): Patrick Yamnik / Terracon Section, Township, Range: Section 3, T27S, R1E

Landform (hillslope, terrace, etc.): Bank Local relief (concave,convex,none): None Slope (%): 3%

Subregion (LRR) Central Great Plains Winter Wheat and Range Lat: 37.73681 Long: 97.31121 Datum: NAD 83

Soil Map Unit Name: Elandco silt loam NWI classification: PEMCx

Are Climatic / Hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks:)

Are Vegetation X Soil, or Hydrology, significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation Soil, or Hydrology, naturally problematic? (If needed, explain any answers in Remarks:)

SUMMARY OF FINDINGS - Attach site map showing sampling prior locations, transects, important features, etc

Hydrophytic Vegetation Present? Yes X No

Hydric Soil Present? Yes X No

Wetland Hydrology Present? Yes X No

Is the sampled area within a Wetland? Yes X No

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
		= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1 *Salix nigra*	15%	Yes	OBL
2			
3			
4			
5			
	15%	= Total Cover	
Herb Stratum (Plot size:)			
1 *Typha latifolia*	10%	No	OBL
2 *Juncus effusus*	60%	Yes	OBL
3			
3			
4			
5			
6			
7			
8			
9			
10			
	70%	= Total Cover	
Woody Vine Stratum (Plot size:)			
1			
2			
		= Total Cover	

% Bare Ground in Herb Stratum 30%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worsheet:

Total % Cover of:			Multiply by:	
OBL species	0	X 1	=	0
FACW species	0	X 2	=	0
FAC species	0	X 3	=	0
FACU species	0	X 4	=	0
UPL species	0	X 5	=	0
Column Totals:	0	(A)		0 (B)

Prevalence Index = B/A = 0.00

Hydrophytic Vegetation Indicators:

X Dominance Test > 50%

Prevalence Index is < 3.0[1]

Morphological Adaptations[1] (Provide supporting data in Remarks or separate sheet)

Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

Vegetation was recently mowed.

SOIL

Profile Description:

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)		Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1 (Vry Drk Gry)	100					Silty Clay Loam	

[1]Type C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__Histosol (A1)
__Histic Epipedon (A2)
__Black Histic (A3)
X Hydrogen Sulfide (A4)
__Stratified Layers (A5) **(LRR F)**
__1 cm Muck (A9) **(LRR F, G, H)**
__Depleted Below Dark Surface (A11)
__Thick Dark Surface (A12)
__Sandy Mucky Mineral (S1)
__2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
__5cm Mucky Peat or Peat (S3) **(LRR F)**

__Sandy Gleyed Matrix (S4)
__Sandy Redox (S5)
__Stripped Matrix (S6)
__Loamy Mucky Mineral (F1) H
__Loamy Gleyed Matrix (F2)
__Depleted Matrix (F3)
__Redox Dark Surface (F6)
__Depleted Dark Surface (F7)
__Redox Depressions (F8)
__High Plains Depressions (F16)
(MLRA 72 & 73 of LRR H)

__1 cm Muck (A9) **(LRR I, J)**
__Coast Prairie Redox (A16) (LRR F, G, H)
__Dark Surface (S7) (LRR G)
__ High Plains Depressions (F16)
(LRR H outside of MLRA 72 & 73)

__ Reduced Vertic (F18)
__Red Parent Material (TF2)
__Other (Explain in Remarks)

[3]Indications of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Vry Drk Gry = Very Dark Gray

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
__Water Marks (B1)
__Sediment Deposits (B2)
__Drift Deposits (B3)
__Algal Mat or Crust (B4)
__Iron Deposits (B5)
__Inundation Visible on Aerial Imagery (B7)
__Water-Stained Leaves (B9)

__Salt Crust (B11)
__ Aquatic Invertebrates (B13)
X Hydrogen Sulfide Odor (C1)
__Dry-Season Water Table (C2)
__Oxidized Rhizospheres on Living Roots (C3)
(where not tilled)
X Presence of Reduced Iron (C4)
__Thin Muck Surface (C7)
__Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

__Surface Soil Cracks (B6)
__Sparsely Vegetated Concave Surface (B8)
__Drainage Patterns (B10)
__Oxidized Rhizospheres on Living Roots (C3)
(where tilled)
__Crayfish Burrows (C8)
__Saturation Visible on Aerial Imagery (C9)
__Geomorphic Position (D2)
__FAC-Neutral Test (D5)
__ Frost-Heave Hummocks (C11) (LRR F)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): <1 inch
Water Table Present? Yes X No _____ Depth (inches): surface
Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): surface

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION FORM - Great Plains Region

Project/Site: Armed Forces Readiness Center and Field Maintenance City/County: Wichita / Sedgwick Sample Date: 3/24/2009

Applicant/Owner: HTK Architects State: KS Sample Point: 6

Investigator(s): Patrick Yamnik / Terracon Section, Township, Range: Section 3, T27S, R1E

Landform (hillslope, terrace, etc.): Ditch Local relief (concave,convex,none): Concave Slope (%):

Subregion (LRR) Central Great Plains Winter Wheat and Range Lat: 37.73400 Long: 97.31619 Datum: NAD 83

Soil Map Unit Name: Elandco silt loam NWI classification: None

Are Climatic / Hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks:)

Are Vegetation ____ Soil, ____ or Hydrology, ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil, ____ or Hydrology, ____ naturally problematic? (If needed, explain any answers in Remarks:)

SUMMARY OF FINDINGS - Attach site map showing sampling prior locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes X	No	
Hydric Soil Present?	Yes	No X	Is the sampled area within a Wetland? Yes ____ No X
Wetland Hydrology Present?	Yes	No X	

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
		= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
		= Total Cover	
Herb Stratum (Plot size:)			
1 *Plantago rugelii*	5%	Yes	FAC
2			
3			
3			
4			
5			
6			
7			
8			
9			
10			
	5%	= Total Cover	
Woody Vine Stratum (Plot size:)			
1			
2			
		= Total Cover	

% Bare Ground in Herb Stratum 95%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worsheet:

Total % Cover of:			Multiply by:	
OBL species	0	X 1	=	0
FACW species	0	X 2	=	0
FAC species	0	X 3	=	0
FACU species	0	X 4	=	0
UPL species	0	X 5	=	0
Column Totals:	0		(A)	0 (B)

Prevalence Index = B/A = 0.00

Hydrophytic Vegetation Indicators:

X Dominance Test > 50%

____ Prevalence Index is < 3.0[1]

____ Morphological Adaptations[1] (Provide supporting data in Remarks or separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Profile Description:

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)		Type[1]	Loc[2]	Texture	Remarks
0-15	5Y 3/1 (Vry Drk Gry)	100					Loamy Sand	

[1]Type C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR F**)
__ 1 cm Muck (A9) (**LRR F, G, H**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
__ 5cm Mucky Peat or Peat (S3) (**LRR F**)

__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) H
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ High Plains Depressions (F16)
(**MLRA 72 & 73 of LRR H**)

__ 1 cm Muck (A9) (**LRR I, J**)
__ Coast Prairie Redox (A16) (LRR F, G, H)
__ Dark Surface (S7) (LRR G)
__ High Plains Depressions (F16)
(**LRR H outside of MLRA 72 & 73)**

__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indications of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Vry Drk Gry = Very Dark Gray

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)

__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Oxidized Rhizospheres on Living Roots (C3)
(**where not tilled**)
__ Presence of Reduced Iron (C4)
__ Thin Muck Surface (C7)
__ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

__ Surface Soil Cracks (B6)
X Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres on Living Roots (C3)
(**where tilled**)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ FAC-Neutral Test (D5)
__ Frost-Heave Hummocks (C11) (LRR F)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____
Water Table Present? Yes _____ No X Depth (inches): _____
Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D

PATRICK C. YAMNIK

FIELD ENVIRONMENTAL SCIENTIST

PROFESSIONAL EXPERIENCE

Mr. Yamnik is a Field Environmental Scientist in the Terracon Consultants, Inc. Wichita, Kansas office. His responsibilities include performance of threatened and endangered species surveys, EA/EIS assessments, habitat evaluations, and wetlands determinations/delineations.

Prior to Terracon Consultants Inc., Mr. Yamnik held positions with the University of Mississippi, as a Research Assistant utilizing GIS and Remote Sensing applications in the Geology and Gelogical Engineering Department, and as a Teaching Assistant in the Department of Biology.

Mr. Yamnik received his Master of Science degree in Biology from the University of Mississippi, Oxford, MS and his Bachelor of Science degree in Biology from Arizona State University, Tempe, AZ.

PROJECT EXPERIENCE

- **Preliminary Jurisdictional Determinations – Kansas**
  Performed fieldwork and report preparation on wetland and juridictional waters determinations in Kansas.
- **Wetlands Assessments –Kansas**
  Field determination and assessments using vegetation, soils, and hydrology to determine wetlands.
- **Biological Assessments –South Dakota, Oklahoma, and Kansas**
  Evaluated the presence and impacts of threatened and endangered species, migratory corridors and critical habitats for land developers.
- **Wetland/Stream Mitigation – Kansas**
  Developed stream mitigation plans according to USACE regulations.

EDUCATION

Master of Science, Biology, 2008, University of Mississippi

Bachelor of Science, Biology, 2005, Arizona State University

CERTIFICATIONS/ REGISTRATIONS/ AFFILIATIONS

Society for the Study of Amphibians and Reptiles

The Wildlife Society

WORK HISTORY

Terracon, Wichita, KS Environmental Biologist presently

University of Mississippi, Oxford, MS Department of Geology and Geological Engineering Research Assistant 2007-2008

University of Mississippi, Oxford, MS Department of Biology Teaching Assistant 2005-2008

Arizona Game and Fish Department, Phoenix, AZ Natural Heritage Program Intern 2005

JAMES I. VANBLARICON

ENVIRONMENTAL BIOLOGIST
SENIOR PROJECT MANAGER

PROFESSIONAL EXPERIENCE

Mr. VanBlaricon is an Environmental Biologist in Terracon's Manhattan, Kansas, office. Mr. VanBlaricon is a senior project manager for projects including Wetlands Determinations, Wetland Mitigation, Biological Assessments, Historical/Archeological Reviews, and Storm Water Management. In addition, Mr. VanBlaricon manages Phase I and Phase II Environmental Site Assessments, Asbestos Surveys, Indoor Air Quality Assessments, and senior project review.

Prior to Terracon, Mr. VanBlaricon worked as a Hydrologic Technician with the U.S. Geological Survey's Water Resources Division in Wichita, Kansas, where he was responsible for all phases of. Mr. VanBlaricon's experience with the USGS included stream stage and discharge measurements, construction/maintenance of stand-alone satellite data logging equipped for stream gaging stations, and field survey.

Mr. VanBlaricon received his Bachelor of Science in Biology at Wichita State University. His interest in ecology and environmental science included related course work of Vertebrate Zoology, Ecology, Ecological Risk Assessment, Taxonomy and Geography of Floral Plants, Ecological Anthropology, and Biological Statistics.

Mr. VanBlaricon has 15 years of experience in agricultural product design. Mr. VanBlaricon has several years experience in agricultural native grass reintroduction, no-till, and minimum-tillage techniques. Mr. VanBlaricon has received two patents for grain drill equipment design.

PROJECT EXPERIENCE

- **Wind Power Projects – Multiple Sites**
  Completed Environmental Assessments for proposed utility scale wind power projects located in Butler, Cloud, Cowley, Elk, Ford, McPhersen and Wichita Counties, Kansas. Also provided environmnetal assistance with wind power projects in Minnisota and Texas. Conducted Fatal Flaw Analysis for a portfolio of 12 wind power projects located in seven states. Environmental services included Phase I ESA, Wetland Determinations, Biological Reviews, Historic/Archeological Reviews, Biological Assessments, Obstruction of Stream Permitting, and NPDES Permitting.
- **Biological Assessments – Oklahoma**
  Biological Assessment of Prairies Dog and Burrowing Owl for proposed ODOT interchange redevelopment in Oklahoma.
- **Biological Assessments – Kansas**
  Biological Assessment for potential threatened and/or endangered species for a proposed tower site located adajcent to the Arkansas River.
- **Biological Assessments – Texas**
  Perfomed a Limited Biological Assessment for a proposed windfarm site in Hansford, Texas.

EDUCATION

Graduate Course Work in Biology, 1999-2002
Wichita State University

Bachelor of Science, Biology, 1999,
Wichita State University

Certificate of Mechanical Drafting 1978,
Salina Area Vocational Technical School

REGISTRATIONS

40-Hour OSHA Hazardous Waste Operations Training

AHERA-Trained and Certifide ACM Building Inspector in Kansas and Missouri

U.S. EPA Model Lead Inspector

AFFILIATIONS

Kansas Wildlife Federation

Kansas Alliance for Wetlands and Streams

WORK HISTORY

Terracon, Environmental Biologist, 2001-Present

U.S. Geological Survey, Hydrologic Technician, 1999-2001

LSI Logic, Technical Illustrator, (part-time) 1997-1998

The Bradbury Company Inc., Project Designer,1996

Great Plains Manufacturing. Inc., Project Designer, 1981-1996

Archer Danials Midland Co., Drafter-Designer, 1978-1981

PROFESSIONAL EXPERIENCE

- **Environmental Assessment – Hodgeman County, Kansas**
  Conducted an EA for a proposed watershed district reservoir as required by the U.S. Department of Army National Guard.
- **Wetland Erosion and Beaver Damage Repair – Tulsa, Oklahoma**
  Development of work plan to repair and prevent soil erosion within an existing wetland mitigation site. In addition, developed beaver control and damage repair measures.
- **Stream Mitigation – Kingman County, Kansas**
  Jurisdictional determination for a proposed private lake. Development of a mitigation plan to compensate to offset impacts to a jurisdictional stream located on site.
- **Stream Mitigation Plan – Hodgeman County, Kansas**
  Jurisdictional determination for a proposed watershed district reservoir. Development of a mitigation plan and contract negociation with in-leu fee provider to compensate for impacts to a jurisdictional stream and fringe wetlands located on site.
- **Stream Mitigation – Segdwick County, Kansas**
  Jurisdictional determination for a proposed private lake. Development of a mitigation plan to compensate to offset impacts to a jurisdictional stream located on site.
- **Stream and Wetland Mitigation Plan – Hughes County, Oklahoma**
  Jurisdictional determination for a proposed expansion of a domestic water supply reservoir. Development of a mitigation plan to compensate for impacts to a jurisdictional streams and wetlands located on site.
- **Wetland Mitigation Plan – Cowley County, Kansas**
  Jurisdictional determination for a proposed County College project. Development of a mitigation plan to compensate for impacts to a jurisdictional wetlands located on site.
- **Wetland Mitigation Quaterly Monitoring – Tulsa, Oklahoma**
  Quarterly monitoring of an Oklahoma Turnpike Authority wetland mitigation area. Monitoring of the developing wetland to document the ecological progression of a constructed wetland for a period of five years. The project objective is to establish and exhibit wetland success critea based on verification of wetland hydrology, hydrophytic plant community, and hydric soils.
- **Wetland Determinations – Kansas**
  Performed Preliminary Jurisdictional Determinations (PJDs)for proposed wind power projects located in Butler, Cloud, Cowley, Elk, Ford, and Wichita Counties, Kansas. In addition, performed PJDs for multiple proposed development projects including a proposed theme park project, ODOT Interchange, ODOT bridge alignments, casino, and residential and commercial development projects.
- **Historical/Archeological Reviews – Kansas**
  Historical/Archeological Reviews for several wind farm projects. State historic society corospondance and project oversight for follow-up archeological survey.
- **Stormwater Runoff Analysis – Multiple Sites in Kansas**
  Perfomed stormwater runoff analysis, using HydroCAD, for several C&D landfill expansion and closure projects, pond construction, KDA Water Rights and Obstruction of Streams permitting.
- **Pond Compliance Assessment – Barber County, Kansas**
  Assessment of a pond construction, watershed, and regulations for compliance with Kansas Department of Agriculture Water Rights and Obstruction of Streams Act.
- **Terrace Erosion Assessment – Harvey County, Kansas**
  Peformed the charicterization of a drainage basin and storm water runoff effecting pond overflow and resulting soil erosion. Provided expert testimony during court proceedings associated with damages from pond overflow. Developed options and cost to repair the erosion damage and prevent its recurrence.

- **Environmental Site Assessments – Multiple Sites**
  Completed more than one hundred Phase I ESAs including seven utility scale wind power projects, a 35,000 acre Oklahoma ranch, 360,000 square foot manufacturing facility, multistory office buildings, and various developed and undeveloped properties. Conducted NEPA reviews for several cellular towers and conducted follow-up Biological Assessments. Prepared an Environmental Assessment (EA) for a proposed reservoir located in Hodgeman County, Kansas.

PRESENTATIONS/PUBLICATIONS

VanBlaricon, James I. and Mammoliti, Chris, 2008. Mitigation You Can Live With. State Association of Kansas Watersheds 2008 Annual Conference.

VanBlaricon, James I. Navigating the Regulatory Complexities of Wind Farm Development. Terracon, Delivering Success, Newsletter, Fall 2006.

CERTIFICATIONS

40-Hour Hazardous Waste Operations & Emergency Response
AHERA Asbestos Inspector and Project Designer, Kansas

ADDITIONAL COURSES

Wetlands Delineation Training and Field Practicum, Adaptive Ecosystems, Inc., 2005
Selecting, Installing, and Inspection of Construction Site SWPPP, IRCA, 2003
Writing and Implementing a SWPPP, IRCA, 2003
Terracon Phase I Environmental Site Assessment Training, Terracon

Table of Contents:

Tab 1. Project Narrative:

A. Site Location Map: The project site is within the northwest quadrant of Section 3, Township 27 South, Range 1 East. It is bounded on the west by I-135, on the south by the East Fork of Chisholm Creek, and the north by the Union Pacific Railroad. The east boundary is currently undeveloped. A clip from the Wichita East Quadrangle USGS Topographic Map is included in Appendix A.

B. The existing site is undeveloped and vegetated. The terrain is flat with a general slope of less than 1% in any direction. There is a north-south open channel tributary to the East Fork of Chisholm Creek that is located at the approximate 1/3 point from the east that carries overflow from an existing pond north of the UP railroad facility. The off-site pond and the north-south tributary are connected by a smooth wall metal culvert that is approximately 8.5' in diameter. There are some existing monitoring wells in the north central portion of the property that monitor the ground water migrating from the north. They are due to a contaminant spill that occurred on the UPRR property several years ago.

   The property is currently outside of the floodplain as it is protected by a levee system. It does lie within designated Zone X (See FIRM maps in Appendix G). Stormwater runoff currently reaches the East Fork of Chisholm Creek from two locations. The east ¼ of the property (approximate) drains to the north-south tributary and the west ¾ of the property (approximate) drains to an outfall pipe in the southwest corner, on the I-135 right of way (see C0.1 – Drainage Plan-Existing Areas in Appendix B).

   The proposed development consists of four building structures, paved parking lots and access drives, sidewalks and a helicopter pad. Three of the structures being constructed are to be occupied by the Kansas Army National Guard and include the Wichita Readiness Center, the Field Maintenance Shop, and an unheated storage building. The fourth building is a City owned building planned for law enforcement training and a community center.

   The proposed stormwater conveyance consists of both enclosed and open graded systems. The enclosed systems will consist of curb inlets, area inlets and underground piping. The open graded systems will include graded swales and open end culverts. All on-site stormwater will be directed to detention/retention ponds (less minor fringe areas that will drain directly to the creek). The detention/retention ponds will serve to prevent an increase in peak storm discharge through a detention structure designed to allow discharge at existing levels into the creek. Additionally, the ponds will provide retention of the low flows to allow percolation and groundwater recharge. Another key element of the proposed drainage system is to enclose the north-south tributary

channel in a single cell box structure. See C0.2 – Drainage Plan-Proposed Areas in Appendix C).

C. Current off site conditions include undeveloped property to the east, railroad property to the north, Interstate 135 to the west and East Fork of Chisholm Creek to the south. A minor amount of the east off-site property drains stormwater onto this property (adjacent to the northeast corner of subject property) as does a portion of the railroad property to the north (see C0.1 – Drainage Plan-Existing Areas in Appendix B). The overflow from Cruiser Lake, north of the UP railroad flows across the site in the north-south tributary.

D. A summary of the existing and proposed stormwater calculations is provided below:

Existing Conditions (See calculations in Appendix B):

Stormwater Runoff to West	Stormwater Runoff to East
Q_2 = 14.3 cfs	Q_2 = 7.1 cfs
Q_5 = 20.9 cfs	Q_5 = 10.4 cfs
Q_{10} = 32.7 cfs	Q_{10} = 14.9 cfs
Q_{25} = 41.6 cfs	Q_{25} = 18.6 cfs
Q_{100} = 73.8 cfs	Q_{100} = 33.9 cfs

Proposed Conditions (See calculations in Appendix D):

Stormwater Runoff to West	Stormwater Runoff to East
Q_2 = 49.6 cfs	Q_2 = 43.6 cfs
Q_5 = 59.8 cfs	Q_5 = 52.1 cfs
Q_{10} = 69.2 cfs	Q_{10} = 59.9 cfs
Q_{25} = 88.7 cfs	Q_{25} = 76.6 cfs
Q_{100} = 123.6 cfs	Q_{100} = 106.1 cfs

The proposed stormwater runoff will be detained/retained within detention ponds located in each area. The final discharges into the East Fork of Chisholm Creek are listed below:

Stormwater Runoff to West	Stormwater Runoff to East
Q_2 = 9.7 cfs	Q_2 = 0 cfs (retained within pond)
Q_5 = 12.3 cfs	Q_5 = 5.6 cfs
Q_{10} = 14.9 cfs	Q_{10} = 6.6 cfs
Q_{25} = 29.0 cfs	Q_{25} = 15.3 cfs
Q_{100} = 49.6 cfs	Q_{100} = 30.2 cfs

E. The development will incorporate several "Best Management Practices" to prevent/reduce stormwater pollution from construction activities. As standard practice, all inlets will be protected through the use of silt fencing and/or gravel bags placed to block sediment from entering the inlets and enclosed storm sewer system. Additionally, the proposed detention/retention ponds will be utilized as sediment basins that will collect sediment carried across the site and prevent it from entering the outfall structures and creek. The sediment basins will be cleaned of excess sediment prior to final grading of the detention ponds. The outer limits of the construction will also be lined with silt fence to prevent runoff exiting the property directly to the creek from carrying sediment off site and polluting the creek. All outfall structures into the creek will include a blanket of riprap at the outfall to prevent erosion of the creek slopes.

   It is also anticipated that the north-south tributary will be protected along the tops of the embankment with silt fencing. As the single cell box is constructed within the channel, the contractor will utilize localized silt fencing. The existing rock ditch checks within the channel will also provide assistance.

   The stockpiling of topsoil or other excavations not currently being utilized will be protected with a temporary seed placed on the top of the pile along with silt fence installed around the perimeter of the stockpile.

   The contractor will be required to provide washout facilities to collect and dispose of washout materials from construction vehicles.

   Permanent erosion control will include the riprapped outfalls, permanent grassing and landscaping.

F. A copy of the Plat is included in Appendix A.
G. The preliminary Grading Plan is included in C0.3 – Drainage Plan-Proposed Areas in Appendix C.

Tab2. Existing Conditions Runoff Calculations:

A. See Orthophoto in Appendix A.
B. The Rational Method was utilized for this plan. Detention requirements were determined utilizing Haestad Methods QTR-55 and POND-2 modeling software. Additionally, HEC RAS was utilized to model the East Fork of Chisholm Creek.
C. Existing Topography is shown on C0.1 – Drainage Plan-Existing Areas in Appendix B.
D. The Total site area is 45.3 acres (m/l). Total area contributing drainage to the site (excluding the Cruiser Lake overflow) is 59.3 acres (m/l). There is no noted impervious area on the existing property.
E. Benchmarks for site control are included on C0.1 – Drainage Plan-Existing Areas in Appendix B.
F. All streams, creeks and waterways are labeled on C0.1 – Drainage Plan-Existing Areas in Appendix B.
G. The predominant soils for the site include Tabler silty clay loam and Elandco silt loam as shown on the Soil Map – Sedgwick County, Kansas which is included in Appendix A.
H. The locations and boundaries of wetlands, lakes and ponds are noted within the Preliminary Jurisdictional Determination in Appendix J.
I. There is no noted impervious area within the boundary of this site.
J. The existing utilities are noted on C0.1 – Drainage Plan-Existing Areas in Appendix B.
K. All conveyance systems are noted on C0.1 – Drainage Plan-Existing Areas in Appendix B.
L. Flow Paths are depicted on C0.1 – Drainage Plan-Existing Areas in Appendix B.
M. Existing channels and bridges and culverts are shown on C0.1 – Drainage Plan-Existing Areas in Appendix B.
N.-O. See Existing Drainage Calculations in Appendix B. Existing Drainage Calculations for Cruiser Lake and the 8.5' diameter metal culvert passing under the railroad are included in Appendix F.
Q. The existing downstream drainage capacity is sufficient for this project. There is no planned increase in peak flow discharge to the creek.
R.-S. All existing topo and pipes are shown on C0.1 – Drainage Plan-Existing Areas in Appendix B.

Tab 3. Post-Development Hydrologic Analysis:

A.-B. The developed site stormwater conveyance system will consist of a combination of overland flow and flow through an enclosed system of inlets and below-grade storm sewer piping. The site will be divided into two localized drainage basins with a majority of the flows being directed to detention/retention ponds within the respective basins. A small portion of the outer fringe along the south boundary of the property will flow off-site, un-detained. The off-site runoff that enters the property from the east and north has been included in the drainage areas and accounts for approximately 13.0 acres of the 58.3 acres that drain across the site. The rational method was utilized to determine the runoff rates and size the stormwater conveyance systems and detention. A summary of the drainage basins and conveyance systems for the 10-year storm event is provided in the tables below. The drainage areas and inlet numbers correspond to sheet C0.2 – Drainage Plan-Proposed Areas in Appendix C. Additional calculations for time of concentration are included in Appendix C.

Table III-1. Proposed Hydrologic Data Summary – West Drainage Basin

Drainage Area	Inlet No.	Area (Acres)	Runoff Coefficient (10-Yr)	Time of Concentration (10-Yr)	Rainfall Intensity (10-Yr)	10-Yr Runoff, Cfs
1	7	1.82	0.50	24.8	4.13	3.8
2	6	2.54	0.50	19.7	4.60	5.8
3	8	4.49	0.50	13.7	5.37	12.1
4	5	1.52	0.60	11.0	5.89	5.4
5	4	1.22	0.60	9.5	6.31	4.6
6	3	1.52	0.60	8.9	6.31	5.8
7	2	0.77	0.60	9.0	6.31	2.9
8	1	1.04	0.90	5.0	7.41	6.9
9	16	0.55	0.60	10.2	6.09	2.0
10	15	0.65	0.60	5.0	7.41	2.9
11	14	0.22	0.60	5.0	7.41	1.0
12	13	0.51	0.90	5.0	7.41	3.4
13	12	1.25	0.90	5.0	7.41	8.3
14	17	0.28	0.90	5.0	7.41	1.9
15	11	2.49	0.90	5.0	7.41	16.6
16	10	1.15	0.90	5.0	7.41	7.7
17	9	1.33	0.90	5.0	7.41	8.9
18	NA	5.18	0.50	15.7	5.08	13.2

Table III-2. Proposed Hydrologic Data Summary – East Drainage Basin

Drainage Area	Inlet No.	Area (Acres)	Runoff Coefficient (10-Yr)	Time of Concentration (10-Yr)	Rainfall Intensity (10-Yr)	10-Yr Runoff, Cfs
20	6	2.60	0.60	14.0	5.53	8.6
21	5	3.44	0.60	18.0	4.83	10.0
22	3	1.32	0.90	5.0	7.41	8.7
23	4	0.31	0.90	5.0	7.41	2.0
24	2	1.03	0.90	5.0	7.41	6.8
25	NA	2.13	0.50	14.2	5.37	5.7
26	NA	10.65	0.50	18.4	4.83	25.7

Table III-3. Proposed Hydrologic Data Summary – Un-Detained Runoff

Drainage Area	Inlet No.	Area (Acres)	Runoff Coefficient (10-Yr)	Time of Concentration (10-Yr)	Rainfall Intensity (10-Yr)	10-Yr Runoff, Cfs
19	7	7.75	0.26	63.0	2.37	4.8
27	6	1.25	0.30	5.0	7.41	2.8
28	8	0.30	0.24	5.0	7.41	0.5

Cruiser Lake Discharge

Cruiser Lake is located north of the project site, to the north of the UPRR tracks. The lake's watershed includes approximately 1177 acres to the northeast. The lake has two outfall structures, an 8.5' diameter metal pipe and an overflow weir. The 8.5' diameter metal pipe is located within the east half of the Project site. The pipe outfalls into a tributary to the East Fork of Chisholm Creek. The weir is located in the southwest corner of the lake.

The current plan includes the enclosure of the open channel tributary with an 8'x8' reinforced concrete box that will start on the north side of 29th St. N and daylight near the existing connection with the East Fork of Chisholm Creek. The RCB will attach to the 8.5' dia. metal pipe to the south of the railroad property. In comparing the open areas, the 8.5' dia. metal pipe has an open area of 56.75 square feet while the 8'x8' RCB has an open area of 64 sq. ft. which increases the open area slightly. An energy dissipater will need to be included in the final design to dissipate the high velocities at the outfall of the box. The calculated flows, velocities and headwater depths are

summarized below. The calculations are based on a culvert with inlet control and detention capacity of the pond. Full calculations are included in Appendix F.

Table III-4. Hydrologic Data Summary – Cruiser Lake Watershed and Detention

Storm Event (yr)	Total Runoff (cfs)	Discharge, structure (cfs)	Velocity, Outlet (fps)	Headwater Elev. (ft)
2	401	38	8.05	1311.77
5	790	80	9.51	1312.73
10	1014	116	7.74	1313.38
25	1318	168	8.76	1314.19
100	1924	278	10.36	1315.82

An additional analysis was completed for a "worst case" scenario which includes a 100-year event occurring within the creek combined with a 100-year event within the lake basin occurring simultaneously to see what the effects would be. Based on a creek 100-year event elevation of 1318.20, the RCB and metal culvert would be submerged. A computer model was utilized to determine the effects. In this scenario, the 100-year storm elevation within the pond is 1321.13 or approximately 1.1 feet above the weir base elevation of 1320. The water overtopping the weir flows off to the west and southwest within graded swales. The flow heading southwest should flow within an existing ditch along the east side of the I-135 embankment to the outfall structure at the creek. Full calculations are included in Appendix F.

C. N/A

D. The proposed contours for the detention pond facilities are shown on sheet C0.2 – Drainage Plan-Proposed Areas in Appendix C.

E.-F. There are two detention facilities planned for this development with one serving the west half of the site (approx.) and the other serving the east. The detention facilities will be sized to convey an equal to or lesser amount of discharge for all applicable storm events (2, 5, 10, 25 and 100 year events) into the East Fork of Chisholm Creek. The current proposed detention facilities are as follows:

West Detention Pond:

The west detention pond is a proposed detention/retention open pond with a detention outfall structure constructed along the south face of the pond. The detention structure is connected to the East Fork of Chisholm Creek with a 36" diameter reinforced concrete pipe daylighting in the north creek embankment (a riprap blanket would be constructed

around the outfall to minimize erosion and provide energy dissipation). The proposed detention outfall structure for the west detention pond is a combination of a 4' diameter standpipe and 15" orifice system. The orifice will control the discharge of smaller flow events while the standpipe combines with the orifice to control the larger flows. The circular orifice shall be cast into the side of the standpipe. Additionally, the orifice is set at an elevation such that there is some ponding created within the detention area to promote groundwater recharge and environmentally friendly design.

The 36" outfall pipe daylighting to the creek was sized to release flow under a submerged condition since the floodwater elevations within the creek generated from a larger storm event will exceed the flowline and top of pipe elevations. From the FEMA FIRM Map (see Appendix F) it was determined that the 100-year flood elevation within the creek is approximately 1314.00'. The planned outfall elevation of the 36" pipe is 1305.39'. A typical section of the detention outfall structure is shown on the next page.

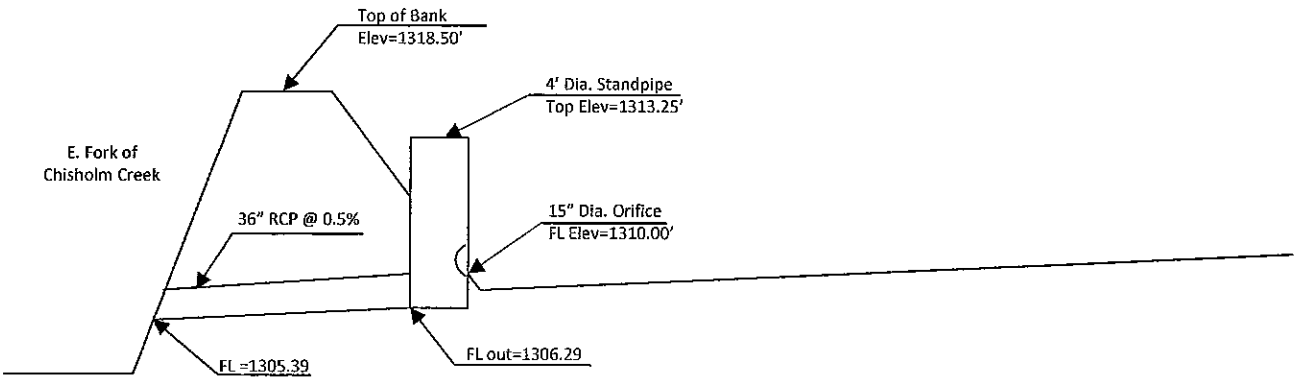
The rate of discharge allowed through the structure was determined by subtracting the un-detained flow (flows directly into the creek) from the flow generated by the undeveloped area for each applicable storm event.

A summary of the west detention outfall structure is presented below and the supporting calculations are included in Appendix D.

Allowable Discharge (Q_{rel}):
Q_2 = 14.3 cfs-4.0 cfs = 10.3 cfs
Q_5 = 20.9 cfs-5.7 cfs = 15.2 cfs
Q_{10} = 32.7 cfs-8.6 cfs = 24.1 cfs
Q_{25} = 41.6 cfs-10.8 cfs = 30.8 cfs
Q_{100} = 73.8 cfs-18.9 cfs = 54.9 cfs

Calculated Discharge through Detention Outfall Structure:
Q_2 = 9.6 cfs
Q_5 = 12.3 cfs
Q_{10} = 14.9 cfs
Q_{25} = 29.0 cfs
Q_{100} = 49.6 cfs

Discharge Allowed Through 36" RCP during 100-Year Storm Event (tailwater condition)
Q = 50.71 cfs (which is greater than Q_{100} discharged from the detention structure)



Typical Section – West Detention Outfall Structure

East Detention Pond:

The east detention pond is very similar to the west detention pond. It is also a proposed detention/retention open pond with a detention outfall structure constructed along the south face of the pond. The detention structure is connected to the East Fork of Chisholm Creek with a 30" diameter reinforced concrete pipe daylighting in the north creek embankment (a riprap blanket would be constructed around the outfall to minimize erosion and provide energy dissipation). The proposed detention outfall structure for the west detention pond is a combination of a 36" diameter standpipe and 11" orifice system. The orifice will control the discharge of smaller flow events while the standpipe combines with the orifice to control the larger flows. The circular orifice shall be cast into the side of the standpipe. Additionally, the orifice is set at an elevation such that there is some ponding created within the detention area to promote groundwater recharge and environmentally friendly design.

The 30" outfall pipe daylighting to the creek was sized to release flow under a submerged condition since the floodwater elevations within the creek generated from a larger storm event will exceed the flowline and top of pipe elevations. From the FEMA FIRM Map (see Appendix G) it was determined that the 100-year flood elevation within the creek is approximately 1318.20'. The planned outfall elevation of the 30" pipe is 1312.75'. A typical section of the proposed outfall structure is shown on the next page.

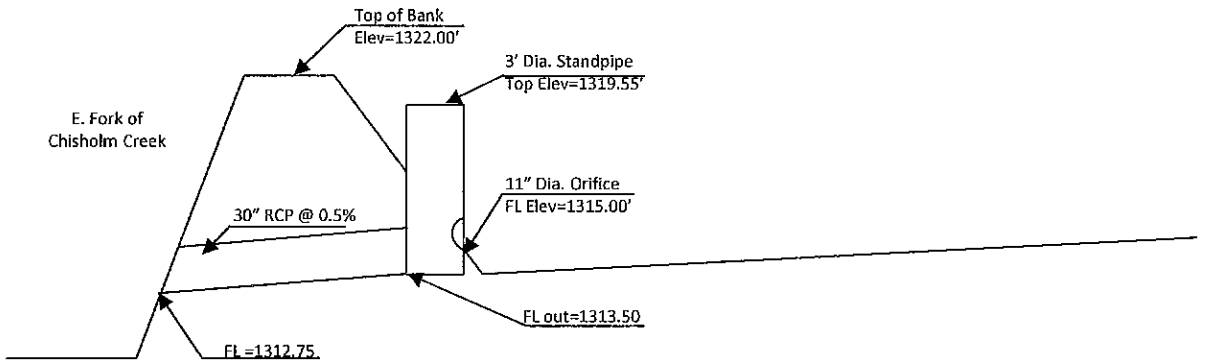
The rate of discharge allowed through the structure was determined by subtracting the un-detained flow (flows directly into the creek) from the flow generated by the undeveloped area for each applicable storm event.

A summary of the east detention outfall structure is presented below and the supporting calculations are included in Appendix E.

Allowable Discharge (Q_{rel}):
Q_2 = 7.1 cfs-1.3 cfs = 5.8 cfs
Q_5 = 10.4 cfs-1.6 cfs = 8.8 cfs
Q_{10} = 14.9 cfs-1.8 cfs = 13.1 cfs
Q_{25} = 18.6 cfs-2.3 cfs = 16.3 cfs
Q_{100} = 33.9 cfs-3.2 cfs = 30.7 cfs

Calculated Discharge through Detention Outfall Structure:
Q_2 = 5.6 cfs
Q_5 = 6.4 cfs
Q_{10} = 6.6 cfs
Q_{25} = 15.3 cfs
Q_{100} = 30.2 cfs

Discharge Allowed Through 36" RCP during 100-Year Storm Event (tailwater condition)
Q = 36.7 cfs (which is greater than Q_{100} discharged from the detention structure. The detention structure should control the rate)



Typical Section – East Detention Outfall Structure

G. With the proposed stormwater detention/retention facilities, there should be no negative impact on the East Fork of Chisholm Creek. All release rates are calculated to be equal to or less than the pre-development condition.

H. The proposed enclosed pipe invert elevations can be found in the Hydraflow analysis for the west and east storm sewers included in Appendix D and E respectively.

I. The design water surface elevations for the detention ponds are as follows:
West Detention Pond

2-Year Storm Event = 1312.70'
5-Year Storm Event = 1313.19'
10-Year Storm Event = 1313.42'
25-Year Storm Event = 1313.82'
100-Year Storm Event = 1314.25'

East Detention Pond
2-Year Storm Event = 1318.18'
5-Year Storm Event = 1319.06'
10-Year Storm Event = 1319.28'
25-Year Storm Event = 1319.93'
100-Year Storm Event = 1320.48'

J. Typical Details are included in Section E.-F of this report.

K. Proposed Limits of Clearing and grading can be seen on sheet C0.2 - Drainage Plan– Proposed Areas in Appendix C.

L. The existing roads and impervious area can be seen on sheet C0.1 – Drainage Plan-Existing Areas in Appendix B.

M. The existing utilities and proposed utilities can be seen on sheets C2.0 – Utility Plan-Readiness Center and C2.0 – Utility Plan-FMS in Appendix H.

N. The proposed conveyance systems can be seen on sheet C0. 2 – Drainage Plan-Proposed Areas in Appendix C.

O. The proposed 8'x8' RCB enclosure of the north-south tributary to E. Fork of Chisholm Creek can be seen on sheet C0.2-Drainage Plan-Proposed Areas in Appendix C.

P. Noted Above

Q. Emergency overflow from both detention ponds will flow over the bank and into the East Fork of Chisholm Creek.

R. The top of the west Detention Facility embankment is 1318.00. The top water surface elevation from the 100-year storm event is 1314.25' or 3.75' below the top of bank.

The top of the east Detention Facility embankment is 1322.00. The top water surface elevation from the 100-year storm event is 1320.48' or 1.52' below the top of bank.

Tab 4. Floodplain Submittal

The Heartland Preparedness Center site does not lie within a floodplain as it is currently protected by levees. See the FEMA FIRM maps in Appendix F.

Tab 5. Federal, State and Local Permits

All applicable permitting will be submitted through the appropriate governmental agencies prior to construction.