DRAINAGE EASEMENT

This EASEMENT made this 26 day of July, 2006, by and between the Homer Morgan, party of the first part and the City of Wichita of the second part.

WITNESSETH: That the said first parties, in consideration of the sum of One Dollar ($1.00) and other valuable consideration, the receipt whereof is hereby acknowledged, do hereby grant and convey unto the said second party a perpetual right-of-way and easement for the purpose of constructing, maintaining, repairing and accessing a drainage system over, along, and under the following-described real estate situated in Sedgwick County, Kansas; to wit:

The west 85.00 feet of the following described property:

Lots 16, 17, 18 and 19, East Kellogg Acres Addition, Sedgwick County, Kansas, EXCEPT the east 10 feet thereof for street.

And said second party is hereby granted the right to enter upon said premises at any time for the purpose of constructing, operating, maintaining, repairing, and accessing said drainage system.

IN WITNESS WHEREOF: The said first party has signed these presents the day and year first above written.

By: Homer Morgan
Homer Morgan

STATE OF KANSAS)
COUNTY OF SEDGWICK) SS:

BE IT REMEMBERED, That on this 25th day of July, 2006, before me, a Notary Public, in and for the County and State aforesaid, came Homer Morgan, personally known to me to be the same person who executed the within instrument of writing and such person duly acknowledged to me the execution of the same.

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

Barbara A. Morgan
Notary Public

(My Appointment Expires: 9/8/06)

BARBARA A. MORGAN
NOTARY PUBLIC
OFFICIAL SEAL
STATE OF KANSAS
MY COMMISSION EXPIRES
September 8, 2006

BARBARA A. MORGAN
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And said second party is hereby granted the right to enter upon said premises at any time for the purpose of constructing, operating, maintaining, repairing, and accessing said drainage system.

IN WITNESS WHEREOF: The said first party has signed these presents the day and year first above written.

By: Homer Morgan
Homer Morgan

STATE OF KANSAS)
COUNTY OF SEDGWICK) SS:

BE IT REMEMBERED, That on this 25th day of July, 2006, before me, a Notary Public, in and for the County and State aforesaid, came Homer Morgan, personally known to me to be the same person who executed the within instrument of writing and such person duly acknowledged to me the execution of the same.

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

Barbara A. Morgan
Notary Public

(My Appointment Expires: 9/8/06)

OFFICIAL SEAL
BARBARA A. MORGAN
MY COMMISSION EXPIRES
September 8, 2006

OFFICIAL SEAL
MORGAN
MY COMMISSION EXPIRES
September 8, 2006

EXISTING

- Flows are 'Developed Conditions' from PEC model

ditch.rep

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: ditch
Project File : ditch.prj
Run Date and Time: 5/17/2006 8:01:55 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\ditch.p01

Geometry Title: ditch-existing
Geometry File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\ditch.g01

Flow Title : pecflow
Flow File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\ditch.f01

Plan Summary Information:

Number of:	Cross Sections	= 9	Multiple Openings	=	0
	Culverts	= 1	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

FLOW DATA

Flow Title: pecflow
Flow File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\ditch.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Upper Reach	Ditch	5585	1860

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Upper Reach	Ditch	PF 1	Critical	

GEOMETRY DATA

Geometry Title: ditch-existing
Geometry File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\ditch.g01

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5585

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5056	1348.4	5138	1347.4	5153	1346.4	5169	1345.4	5193	1344.4
5243	1343.44	5304	1343.4	5330	1342.4	5335	1340.4	5336	1339.4
5350	1338.4	5355	1338.4	5361	1339.4	5369	1340.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5056	.15	5335	.065	5369	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5335	5369	85	85	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1348.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.150	0.065
W.S. Elev (ft)	1347.91	Reach Len. (ft)	85.00	85.00
85.00				
Crit W.S. (ft)		Flow Area (sq ft)	765.31	299.68

E.G. Slope (ft/ft)	0.001978	Area (sq ft)	765.31	299.68
Q Total (cfs)	1860.00	Flow (cfs)	732.59	1127.41
Top Width (ft)	272.44	Top Width (ft)	238.44	34.00
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	0.96	3.76
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)	3.21	8.81
Conv. Total (cfs)	41824.0	Conv. (cfs)	16473.1	25351.0
Length Wtd. (ft)	85.00	Wetted Per. (ft)	238.94	42.10
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.40	0.88
Alpha	2.93	Stream Power (lb/ft s)	0.38	3.31
Frctn Loss (ft) 4.94	0.17	Cum Volume (acre-ft)	30.90	6.99
C & E Loss (ft) 1.45	0.00	Cum SA (acres)	6.73	0.98

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5500

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5056	1348.4	5107	1348.4	5129	1347.4	5149	1346.4	5161	1345.4
5180	1344.4	5212	1343.4	5326	1342.4	5330	1341.4	5334	1340.4
5338	1339.4	5339	1338.4	5349	1338.4	5351	1339.4	5353	1340.4
5360	1341.4	5370	1341.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5056	.15	5330	.065	5360	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5330	5360	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.150	0.065
0.150				
W.S. Elev (ft)	1347.75	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	793.07	242.34
63.45				
E.G. Slope (ft/ft)	0.001924	Area (sq ft)	793.07	242.34

63.45				
Q Total (cfs)	1860.00	Flow (cfs)	838.87	953.03
68.10				
Top Width (ft)	248.58	Top Width (ft)	208.58	30.00
10.00				
Vel Total (ft/s)	1.69	Avg. Vel. (ft/s)	1.06	3.93
1.07				
Max Chl Dpth (ft)	9.34	Hydr. Depth (ft)	3.80	8.08
6.34				
Conv. Total (cfs)	42402.1	Conv. (cfs)	19123.6	21726.1
1552.4				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	208.82	31.20
16.34				
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.46	0.93
0.47				
Alpha	2.96	Stream Power (lb/ft s)	0.48	3.67
0.50				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	29.38	6.46
4.88				
C & E Loss (ft)	0.00	Cum SA (acres)	6.29	0.92
1.44				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5400

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5035	1346.4	5045	1347.4	5115	1347.4	5135	1346.4	5143	1345.4
5160	1344.4	5178	1343.4	5206	1342.77	5314	1342.4	5328	1341.4
5335	1340.4	5339	1339.4	5340	1338.4	5348	1338.4	5349	1339.4
5357	1340.4	5361	1341.4	5368	1341.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5035	.15	5328	.065	5361	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5328	5361	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.150	0.065
0.150				
W.S. Elev (ft)	1347.55	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	894.26	255.45
43.05				
E.G. Slope (ft/ft)	0.001977	Area (sq ft)	894.26	255.45
43.05				
Q Total (cfs)	1860.00	Flow (cfs)	826.19	992.00

41.81				
Top Width (ft)	333.00	Top Width (ft)	293.00	33.00
7.00				
Vel Total (ft/s)	1.56	Avg. Vel. (ft/s)	0.92	3.88
0.97				
Max Chl Dpth (ft)	9.15	Hydr. Depth (ft)	3.05	7.74
6.15				
Conv. Total (cfs)	41831.0	Conv. (cfs)	18580.8	22309.9
940.2				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	294.39	34.21
13.15				
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.37	0.92
0.40				
Alpha	3.47	Stream Power (lb/ft s)	0.35	3.58
0.39				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	27.44	5.89
4.75				
C & E Loss (ft)	0.03	Cum SA (acres)	5.71	0.84
1.42				

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5300

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5030	1344.4	5032	1344.4	5045	1345.4	5116	1345.4	5137	1344.4
5140	1343.4	5154	1342.4	5195	1341.4	5226	1341.4	5305	1341.4
5325	1340.4	5341	1339.4	5342	1338.4	5352	1339.4	5353	1339.4
5356	1340.4	5362	1341.4	5367	1341.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5030	.15	5305	.065	5362	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5305	5362	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.150	0.065
0.150				
W.S. Elev (ft)	1347.50	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	1218.15	418.42
30.48				
E.G. Slope (ft/ft)	0.000733	Area (sq ft)	1218.15	418.42

30.48				
Q Total (cfs)	1860.00	Flow (cfs)	874.26	969.70
16.03				
Top Width (ft)	337.00	Top Width (ft)	275.00	57.00
5.00				
Vel Total (ft/s)	1.12	Avg. Vel. (ft/s)	0.72	2.32
0.53				
Max Chl Dpth (ft)	9.10	Hydr. Depth (ft)	4.43	7.34
6.10				
Conv. Total (cfs)	68685.5	Conv. (cfs)	32284.4	35808.9
592.1				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	278.37	57.77
11.10				
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.20	0.33
0.13				
Alpha	2.45	Stream Power (lb/ft s)	0.14	0.77
0.07				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	25.02	5.12
4.67				
C & E Loss (ft)	0.00	Cum SA (acres)	5.06	0.74
1.41				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5200

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5024	1346.4	5036	1345.4	5075	1345.4	5113	1345.4	5124	1344.4
5140	1343.4	5152	1342.4	5163	1341.4	5260	1340.4	5327	1339.4
5332	1338.4	5339	1337.4	5350	1337.4	5353	1338.4	5356	1339.4
5358	1340.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5024	.15	5327	.065	5358	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5327	5358	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.150	0.065
W.S. Elev (ft)	1347.43	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	1511.69	288.89
E.G. Slope (ft/ft)	0.000731	Area (sq ft)	1511.69	288.89
Q Total (cfs)	1860.00	Flow (cfs)	1178.78	681.22

Top Width (ft)	334.00	Top Width (ft)	303.00	31.00
Vel Total (ft/s)	1.03	Avg. Vel. (ft/s)	0.78	2.36
Max Chl Dpth (ft)	10.03	Hydr. Depth (ft)	4.99	9.32
Conv. Total (cfs)	68802.9	Conv. (cfs)	43603.9	25199.0
Length Wtd. (ft)	100.00	Wetted Per. (ft)	304.25	38.76
Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.23	0.34
Alpha	2.27	Stream Power (lb/ft s)	0.18	0.80
Frctn Loss (ft) 4.64	0.07	Cum Volume (acre-ft)	21.89	4.30
C & E Loss (ft) 1.40	0.00	Cum SA (acres)	4.40	0.64

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5100

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5027	1346.4	5048	1345.4	5103	1345.4	5107	1345.4	5110	1345.4
5120	1344.4	5131	1343.4	5145	1342.4	5162	1341.4	5215	1340.4
5319	1339.4	5332	1338.4	5335	1337.4	5348	1337.4	5352	1338.4
5355	1339.4	5359	1340.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5027	.15	5319	.065	5359	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5319	5359	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.150	0.065
W.S. Elev (ft)	1347.36	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	1489.34	361.04
E.G. Slope (ft/ft)	0.000607	Area (sq ft)	1489.34	361.04
Q Total (cfs)	1860.00	Flow (cfs)	1074.49	785.51
Top Width (ft)	332.00	Top Width (ft)	292.00	40.00

Vel Total (ft/s)	1.01	Avg. Vel. (ft/s)	0.72	2.18
Max Chl Dpth (ft)	9.96	Hydr. Depth (ft)	5.10	9.03
Conv. Total (cfs)	75474.3	Conv. (cfs)	43600.3	31873.9
Length Wtd. (ft)	100.00	Wetted Per. (ft)	293.16	47.57
Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.19	0.29
Alpha	2.28	Stream Power (lb/ft s)	0.14	0.63
Frctn Loss (ft) 4.64	0.06	Cum Volume (acre-ft)	18.44	3.56
C & E Loss (ft) 1.40	0.00	Cum SA (acres)	3.72	0.56

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5000

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5027	1346.4	5036	1345.4	5089	1345.4	5114	1344.4	5134	1343.4
5148	1342.4	5161	1341.4	5173	1340.4	5320	1339.4	5329	1338.4
5331	1337.4	5341	1337.4	5349	1338.4	5356	1339.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5027	.15	5320	.065	5356	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5320	5356	175	175	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.150	0.065
W.S. Elev (ft) 175.00	1347.30	Reach Len. (ft)	175.00	175.00
Crit W.S. (ft)		Flow Area (sq ft)	1538.74	327.53
E.G. Slope (ft/ft)	0.000626	Area (sq ft)	1538.74	327.53
Q Total (cfs)	1860.00	Flow (cfs)	1149.34	710.66
Top Width (ft)	329.00	Top Width (ft)	293.00	36.00
Vel Total (ft/s)	1.00	Avg. Vel. (ft/s)	0.75	2.17

Max Chl Dpth (ft)	9.90	Hydr. Depth (ft)	5.25	9.10
Conv. Total (cfs)	74340.7	Conv. (cfs)	45936.9	28403.7
Length Wtd. (ft)	175.00	Wetted Per. (ft)	294.12	44.33
Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.20	0.29
Alpha	2.16	Stream Power (lb/ft s)	0.15	0.63
Frctn Loss (ft) 4.64	0.18	Cum Volume (acre-ft)	14.97	2.77
C & E Loss (ft) 1.40	0.01	Cum SA (acres)	3.04	0.47

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 4825.9

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1349.81	4.3	1349.72	11.54	1349.58	18.19	1349.51	24.65	1349.43
28.83	1349.24	71.65	1347.62	72.89	1347.56	75.82	1347.22	80.19	1346.58
97.56	1344.07	103.03	1343.52	107.27	1343.07	136.13	1343.07	149.24	1343.07
156.34	1343.31	170.9	1343.75	199.23	1342.72	208.8	1342.36	236.19	1341.54
244.33	1341.3	296.85	1340.25	307.32	1340.04	310	1340	455.4	1338
463.4	1336	475.4	1336	485.4	1338	515	1340	540	1342
620	1344	695	1346	810	1348	821.24	1348.4	851.71	1349.26
867.7	1349.84	948.69	1352.48	960.98	1352.86	965.52	1352.96	1009.66	1353.79
1058.22	1354.38	1083.63	1354.57	1210.46	1355.54	1243.28	1355.48	1395.59	1354.47
1434.63	1354.47	1487.56	1354.01						

Manning's n Values num= 1

Sta	n Val
0	.4

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
455.4	485.4	261.5	261.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.15	Element	Left OB	Channel
Right OB				
Vel Head (ft) 0.400	0.00	Wt. n-Val.	0.400	0.400
W.S. Elev (ft) 261.50	1347.14	Reach Len. (ft)	261.50	261.50
Crit W.S. (ft) 923.95	1340.27	Flow Area (sq ft)	2272.76	316.25

E.G. Slope (ft/ft)	0.002045	Area (sq ft)	2272.76	316.25
923.95				
Q Total (cfs)	1860.00	Flow (cfs)	1259.30	252.92
347.79				
Top Width (ft)	684.29	Top Width (ft)	379.04	30.00
275.24				
Vel Total (ft/s)	0.53	Avg. Vel. (ft/s)	0.55	0.80
0.38				
Max Chl Dpth (ft)	11.14	Hydr. Depth (ft)	6.00	10.54
3.36				
Conv. Total (cfs)	41132.2	Conv. (cfs)	27848.1	5593.0
7691.0				
Length Wtd. (ft)	261.50	Wetted Per. (ft)	379.40	30.44
275.45				
Min Ch El (ft)	1336.00	Shear (lb/sq ft)	0.76	1.33
0.43				
Alpha	1.15	Stream Power (lb/ft s)	0.42	1.06
0.16				
Frctn Loss (ft)		Cum Volume (acre-ft)	7.31	1.47
2.78				
C & E Loss (ft)		Cum SA (acres)	1.69	0.34
0.85				

CULVERT

RIVER: Upper Reach
REACH: Ditch RS: 4713.16

INPUT
Description:
Distance from Upstream XS = 30
Deck/Roadway Width = 206
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 42

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1363.3		61.4	1363.3		68	1359.9	
68.2	1359.9		70.4	1359.9		78.4	1354.6	
89.7	1347.8		96.5	1345.7		103.7	1343.9	
107.8	1344.3		115.8	1343.2		128.4	1343.2	
144.1	1343.2		153.7	1344		159.5	1343.9	
174.5	1351.8		190.2	1359.2		192.5	1359.2	
193.4	1359.2		193.7	1359.2		193.8	1363.3	
390.4	1362		590.4	1360		762.4	1358	
862.4	1356.3		962.4	1354.6		1062.4	1353	
1162.4	1351.9		1262.4	1351.3		1362.4	1351.3	
1462.4	1351.7		1562.4	1352.3		1662.4	1352.8	
1762.4	1353.4		1862.4	1353.9		1962.4	1354.4	
2062.4	1355		2162.4	1355.5		2262.4	1356.1	
2362.4	1356.6		2462.4	1357.1		2562.4	1357.7	

Upstream Bridge Cross Section Data
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1349.81	4.3	1349.72	11.54	1349.58	18.19	1349.51	24.65	1349.43
28.83	1349.24	71.65	1347.62	72.89	1347.56	75.82	1347.22	80.19	1346.58
97.56	1344.07	103.03	1343.52	107.27	1343.07	136.13	1343.07	149.24	1343.07
156.34	1343.31	170.9	1343.75	199.23	1342.72	208.8	1342.36	236.19	1341.54
244.33	1341.3	296.85	1340.25	307.32	1340.04	310	1340	455.4	1338
463.4	1336	475.4	1336	485.4	1338	515	1340	540	1342

620	1344	695	1346	810	1348	821.24	1348.4	851.71	1349.26
867.7	1349.84	948.69	1352.48	960.98	1352.86	965.52	1352.96	1009.66	1353.79
1058.22	1354.38	1083.63	1354.57	1210.46	1355.54	1243.28	1355.48	1395.59	1354.47
1434.63	1354.47	1487.56	1354.01						

Manning's n Values num= 1

Sta	n Val
0	.4

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff Contr.	Expan.
455.4	485.4	.1	.3

Downstream Deck/Roadway Coordinates

num= 42

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1363		237.3	1363.3		237.4	1359.9	
237.6	1359.9		239.8	1359.9		247.8	1354.6	
259.1	1347.8		265.9	1345.7		273.1	1343.9	
277.2	1344.3		285.2	1343.2		297.8	1343.2	
313.5	1343.2		323.1	1344		328.9	1343.9	
343.9	1351.8		359.6	1359.2		361.9	1359.2	
362.8	1359.2		363.1	1359.2		363.2	1363.3	
559.8	1362		759.8	1360		931.8	1358	
1031.8	1356.3		1131.8	1354.6		1231.8	1353	
1331.8	1351.9		1431.8	1351.3		1531.8	1351.3	
1631.8	1351.7		1731.8	1352.3		1831.8	1352.8	
1931.8	1353.4		2031.8	1353.9		2131.8	1354.4	
2231.8	1355		2331.8	1355.5		2431.8	1356.1	
2531.8	1356.6		2631.8	1357.1		2731.8	1357.7	

Downstream Bridge Cross Section Data

Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
24.14	1347.22	62	1347.53	82	1347.69	86.47	1347.77	92.83	1347.77
103.4	1347.67	184	1346.61	190.02	1346.57	195.99	1346.51	219.95	1345.78
254.05	1344.82	258.86	1343.71	262.52	1342.98	275.51	1342.44	276.52	1342.38
281.39	1342.35	282.74	1342.56	284.32	1342.74	289.93	1343.29	302.15	1343.29
317.36	1343.29	324.49	1342.35	326.66	1342.17	343.69	1341.08	343.77	1341.07
343.91	1341.08	344.61	1341.06	370.92	1340.52	383.17	1340.33	454.16	1338.21
470.42	1337.76	542.56	1337.82	548.75	1337.84	549.49	1337.83	595.35	1337.85
596.5	1337.83	610.08	1337.82	610.26	1337.82	610.46	1337.82	620.65	1337.9
628.17	1335.8	632.76	1335.33	638.76	1335.33	644.76	1335.33	654.23	1336.12
655.3	1336.47	657.24	1336.92	664.54	1336.69	677.64	1336.82	682.6	1337.41
702.95	1338.2	705.66	1338.42	717.62	1339.39	763.07	1340.73	866.49	1342.71
902.09	1343.75	1098.84	1349.2	1118.97	1349.53	1314.83	1353.01	1331.94	1352.99
1385.25	1352.93								

Manning's n Values num= 1

Sta	n Val
24.14	.04

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff Contr.	Expan.
620.65	702.95	.1	.3

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	5	5

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
30	206	.013	.013	0	.2	.4

Number of Barrels = 2
Upstream Elevation = 1336
Centerline Stations

Sta.	Sta.
466.65	472.15

Downstream Elevation = 1335.33
Centerline Stations

Sta.	Sta.
636.01	641.51

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	749.41	Culv Full Len (ft)	206.00
# Barrels	2	Culv Vel US (ft/s)	14.99
Q Barrel (cfs)	374.71	Culv Vel DS (ft/s)	14.99
E.G. US. (ft)	1347.15	Culv Inv El Up (ft)	1336.00
W.S. US. (ft)	1347.14	Culv Inv El Dn (ft)	1335.33
E.G. DS (ft)	1339.36	Culv Frctn Ls (ft)	2.63
W.S. DS (ft)	1338.78	Culv Exit Loss (ft)	4.46
Delta EG (ft)	7.79	Culv Entr Loss (ft)	0.70
Delta WS (ft)	8.37	Q Weir (cfs)	1110.59
E.G. IC (ft)	1347.19	Weir Sta Lft (ft)	91.91
E.G. OC (ft)	1347.15	Weir Sta Rgt (ft)	165.61
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1341.00	Weir Max Depth (ft)	3.92
Culv WS Outlet (ft)	1340.33	Weir Avg Depth (ft)	3.15
Culv Nml Depth (ft)	5.00	Weir Flow Area (sq ft)	232.14
Culv Crt Depth (ft)	5.00	Min El Weir Flow (ft)	1343.21

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 4564.4

INPUT
Description:
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
24.14	1347.22	62	1347.53	82	1347.69	86.47	1347.77	92.83	1347.77

103.4	1347.67	184	1346.61	190.02	1346.57	195.99	1346.51	219.95	1345.78
254.05	1344.82	258.86	1343.71	262.52	1342.98	275.51	1342.44	276.52	1342.38
281.39	1342.35	282.74	1342.56	284.32	1342.74	289.93	1343.29	302.15	1343.29
317.36	1343.29	324.49	1342.35	326.66	1342.17	343.69	1341.08	343.77	1341.07
343.91	1341.08	344.61	1341.06	370.92	1340.52	383.17	1340.33	454.16	1338.21
470.42	1337.76	542.56	1337.82	548.75	1337.84	549.49	1337.83	595.35	1337.85
596.5	1337.83	610.08	1337.82	610.26	1337.82	610.46	1337.82	620.65	1337.9
628.17	1335.8	632.76	1335.33	638.76	1335.33	644.76	1335.33	654.23	1336.12
655.3	1336.47	657.24	1336.92	664.54	1336.69	677.64	1336.82	682.6	1337.41
702.95	1338.2	705.66	1338.42	717.62	1339.39	763.07	1340.73	866.49	1342.71
902.09	1343.75	1098.84	1349.2	1118.97	1349.53	1314.83	1353.01	1331.94	1352.99
1385.25	1352.93								

Manning's n Values num= 1

Sta	n Val
24.14	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
620.65	702.95	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1339.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.040	0.040
0.040				
W.S. Elev (ft)	1338.78	Reach Len. (ft)		
Crit W.S. (ft)	1338.78	Flow Area (sq ft)	162.28	174.91
2.03				
E.G. Slope (ft/ft)	0.013109	Area (sq ft)	162.28	174.91
2.03				
Q Total (cfs)	1860.00	Flow (cfs)	631.52	1224.73
3.76				
Top Width (ft)	274.78	Top Width (ft)	185.40	82.30
7.08				
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)	3.89	7.00
1.85				
Max Chl Dpth (ft)	3.44	Hydr. Depth (ft)	0.88	2.13
0.29				
Conv. Total (cfs)	16245.4	Conv. (cfs)	5515.7	10696.9
32.8				
Length Wtd. (ft)		Wetted Per. (ft)	185.41	82.81
7.11				
Min Ch El (ft)	1335.33	Shear (lb/sq ft)	0.72	1.73
0.23				
Alpha	1.25	Stream Power (lb/ft s)	2.79	12.10
0.43				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:Upper Reach

Reach	River Sta.	n1	n2	n3

Ditch	5585	.15	.065	.15
Ditch	5500	.15	.065	.15
Ditch	5400	.15	.065	.15
Ditch	5300	.15	.065	.15
Ditch	5200	.15	.065	.15
Ditch	5100	.15	.065	.15
Ditch	5000	.15	.065	.15
Ditch	4825.9	.4		
Ditch	4713.16	Culvert		
Ditch	4564.4	.04		

SUMMARY OF REACH LENGTHS

River: Upper Reach

Reach	River Sta.	Left	Channel	Right
Ditch	5585	85	85	85
Ditch	5500	100	100	100
Ditch	5400	100	100	100
Ditch	5300	100	100	100
Ditch	5200	100	100	100
Ditch	5100	100	100	100
Ditch	5000	175	175	175
Ditch	4825.9	261.5	261.5	261.5
Ditch	4713.16	Culvert		
Ditch	4564.4	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Upper Reach

Reach	River Sta.	Contr.	Expan.
Ditch	5585	.1	.3
Ditch	5500	.1	.3
Ditch	5400	.1	.3
Ditch	5300	.1	.3
Ditch	5200	.1	.3
Ditch	5100	.1	.3
Ditch	5000	.1	.3
Ditch	4825.9	.1	.3
Ditch	4713.16	Culvert	
Ditch	4564.4	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.
E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	
			(cfs)	(ft)	(ft)	(ft)
(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		
Ditch	5585	PF 1	1860.00	1338.40	1347.91	

1348.04	0.001978	3.76	1065.00	272.44	0.22	
Ditch	5500	PF 1	1860.00	1338.40	1347.75	
1347.88	0.001924	3.93	1098.86	248.58	0.24	
Ditch	5400	PF 1	1860.00	1338.40	1347.55	
1347.68	0.001977	3.88	1192.76	333.00	0.25	
Ditch	5300	PF 1	1860.00	1338.40	1347.50	
1347.54	0.000733	2.32	1667.05	337.00	0.15	
Ditch	5200	PF 1	1860.00	1337.40	1347.43	
1347.47	0.000731	2.36	1800.58	334.00	0.14	
Ditch	5100	PF 1	1860.00	1337.40	1347.36	
1347.40	0.000607	2.18	1850.38	332.00	0.13	
Ditch	5000	PF 1	1860.00	1337.40	1347.30	
1347.34	0.000626	2.17	1866.27	329.00	0.13	
Ditch	4825.9	PF 1	1860.00	1336.00	1347.14	1340.27
1347.15	0.002045	0.80	3512.96	684.29	0.04	
Ditch	4713.16		Culvert			
Ditch	4564.4	PF 1	1860.00	1335.33	1338.78	1338.78
1339.36	0.013109	7.00	339.22	274.78	0.85	

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn
Loss C & E Loss	Q Left	Q Channel	Q Right	Top Width		
(ft) (ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	
				(ft)		
Ditch	5585	PF 1	1348.04	1347.91	0.14	
0.17 0.00	732.59	1127.41		272.44		
Ditch	5500	PF 1	1347.88	1347.75	0.13	
0.20 0.00	838.87	953.03	68.10	248.58		
Ditch	5400	PF 1	1347.68	1347.55	0.13	
0.11 0.03	826.19	992.00	41.81	333.00		
Ditch	5300	PF 1	1347.54	1347.50	0.05	
0.07 0.00	874.26	969.70	16.03	337.00		
Ditch	5200	PF 1	1347.47	1347.43	0.04	
0.07 0.00	1178.78	681.22		334.00		
Ditch	5100	PF 1	1347.40	1347.36	0.04	
0.06 0.00	1074.49	785.51		332.00		
Ditch	5000	PF 1	1347.34	1347.30	0.03	
0.18 0.01	1149.34	710.66		329.00		
Ditch	4825.9	PF 1	1347.15	1347.14	0.00	
	1259.30	252.92	347.79	684.29		
Ditch	4713.16		Culvert			
Ditch	4564.4	PF 1	1339.36	1338.78	0.58	
	631.52	1224.73	3.76	274.78		

DEVELOPED

developed.rep

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X       X
X     X  X        X    X      X   X    X    X       X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: ditch-developed
Project File : developed.prj
Run Date and Time: 5/17/2006 9:15:58 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\developed.p01

Geometry Title: ditch-existing
Geometry File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\developed.g01

Flow Title : pecflow
Flow File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\developed.f01

Plan Summary Information:

Number of:	Cross Sections	= 9	Multiple Openings	=	0
	Culverts	= 1	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: pecflow
Flow File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\developed.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Upper Reach	Ditch	5585	1860

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Upper Reach	Ditch	PF 1	Critical	

GEOMETRY DATA

Geometry Title: ditch-existing
Geometry File : f:\HYDRO\Projects\East Kellogg Acres 5-10-06\Spring Branch HEC-RAS\developed.g01

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5585

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5056	1348.4	5125	1349.4	5200	1349.4	5258	1348.4	5258	1338.4
5350	1338.4	5355	1338.4	5361	1339.4	5369	1340.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5056	.15	5258	.065	5369	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5258	5369	85	85	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.		0.065
W.S. Elev (ft)	1347.53	Reach Len. (ft)	85.00	85.00
85.00				
Crit W.S. (ft)		Flow Area (sq ft)		998.72

E.G. Slope (ft/ft)	0.000426	Area (sq ft)		998.72
Q Total (cfs)	1860.00	Flow (cfs)		1860.00
Top Width (ft)	111.00	Top Width (ft)		111.00
Vel Total (ft/s)	1.86	Avg. Vel. (ft/s)		1.86
Max Chl Dpth (ft)	9.13	Hydr. Depth (ft)		9.00
Conv. Total (cfs)	90091.1	Conv. (cfs)		90091.1
Length Wtd. (ft)	85.00	Wetted Per. (ft)		127.41
Min Ch El (ft)	1338.40	Shear (lb/sq ft)		0.21
Alpha	1.00	Stream Power (lb/ft s)		0.39
Frctn Loss (ft) 4.93	0.04	Cum Volume (acre-ft)	17.13	15.38
C & E Loss (ft) 1.45	0.00	Cum SA (acres)	3.71	1.84

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5500

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5056	1348.4	5116	1349.4	5200	1349.4	5256	1348.4	5256	1338.4
5339	1338.4	5349	1338.4	5351	1339.4	5353	1340.4	5360	1341.4
5370	1341.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5056	.15	5256	.065	5360	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5256	5360	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.55	Element	Left OB	Channel
Right OB				
Vel Head (ft) 0.150	0.06	Wt. n-Val.		0.065
W.S. Elev (ft) 100.00	1347.49	Reach Len. (ft)	100.00	100.00
Crit W.S. (ft) 60.88		Flow Area (sq ft)		923.69
E.G. Slope (ft/ft) 60.88	0.000459	Area (sq ft)		923.69
Q Total (cfs)	1860.00	Flow (cfs)		1828.63

31.37					
Top Width (ft)	114.00	Top Width (ft)			104.00
10.00					
Vel Total (ft/s)	1.89	Avg. Vel. (ft/s)			1.98
0.52					
Max Chl Dpth (ft)	9.09	Hydr. Depth (ft)			8.88
6.09					
Conv. Total (cfs)	86832.4	Conv. (cfs)			85367.8
1464.6					
Length Wtd. (ft)	100.00	Wetted Per. (ft)			113.63
16.09					
Min Ch El (ft)	1338.40	Shear (lb/sq ft)			0.23
0.11					
Alpha	1.08	Stream Power (lb/ft s)			0.46
0.06					
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)		17.13	13.51
4.87					
C & E Loss (ft)	0.00	Cum SA (acres)		3.71	1.63
1.44					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5400

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5035	1346.4	5045	1347.4	5100	1349.4	5200	1349.4	5255	1348.4
5255	1338.4	5340	1338.4	5348	1338.4	5349	1339.4	5357	1340.4
5361	1341.4	5368	1341.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5035	.15	5255	.065	5361	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5255	5361	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.150	0.065
0.150				
W.S. Elev (ft)	1347.44	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	5.46	936.07
42.30				
E.G. Slope (ft/ft)	0.000455	Area (sq ft)	5.46	936.07
42.30				
Q Total (cfs)	1860.00	Flow (cfs)	0.67	1839.75
19.58				
Top Width (ft)	124.19	Top Width (ft)	11.19	106.00
7.00				

Vel Total (ft/s)	1.89	Avg. Vel. (ft/s)	0.12	1.97
0.46				
Max Chl Dpth (ft)	9.04	Hydr. Depth (ft)	0.49	8.83
6.04				
Conv. Total (cfs)	87217.4	Conv. (cfs)	31.5	86267.7
918.1				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	12.28	115.64
13.04				
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.01	0.23
0.09				
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.45
0.04				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	17.13	11.37
4.75				
C & E Loss (ft)	0.00	Cum SA (acres)	3.70	1.39
1.42				

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5300

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5030	1344.4	5032	1344.4	5045	1345.4	5100	1349.4	5200	1349.4
5250	1348.4	5250	1338.4	5342	1338.4	5352	1339.4	5353	1339.4
5356	1340.4	5362	1341.4	5367	1341.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5030	.15	5250	.065	5362	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5250	5362	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.150	0.065
0.150				
W.S. Elev (ft)	1347.40	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	66.19	982.99
30.02				
E.G. Slope (ft/ft)	0.000408	Area (sq ft)	66.19	982.99
30.02				
Q Total (cfs)	1860.00	Flow (cfs)	16.96	1831.31
11.73				
Top Width (ft)	159.56	Top Width (ft)	42.56	112.00
5.00				
Vel Total (ft/s)	1.72	Avg. Vel. (ft/s)	0.26	1.86
0.39				

Max Chl Dpth (ft)	9.00	Hydr. Depth (ft)	1.56	8.78
6.00				
Conv. Total (cfs)	92082.5	Conv. (cfs)	839.6	90662.2
580.7				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	45.68	121.30
11.00				
Min Ch El (ft)	1338.40	Shear (lb/sq ft)	0.04	0.21
0.07				
Alpha	1.15	Stream Power (lb/ft s)	0.01	0.38
0.03				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	17.04	9.17
4.67				
C & E Loss (ft)	0.00	Cum SA (acres)	3.64	1.14
1.41				

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5200

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5024	1346.4	5036	1345.4	5100	1349.4	5200	1349.4	5250	1348.4
5250	1337.4	5339	1337.4	5350	1337.4	5353	1338.4	5356	1339.4
5358	1340.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5024	.15	5250	.065	5358	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5250	5358	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.150	0.065
W.S. Elev (ft)	1347.37	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	48.78	1065.99
E.G. Slope (ft/ft)	0.000333	Area (sq ft)	48.78	1065.99
Q Total (cfs)	1860.00	Flow (cfs)	9.35	1850.65
Top Width (ft)	151.55	Top Width (ft)	43.55	108.00
Vel Total (ft/s)	1.67	Avg. Vel. (ft/s)	0.19	1.74
Max Chl Dpth (ft)	9.97	Hydr. Depth (ft)	1.12	9.87

Conv. Total (cfs)	101958.2	Conv. (cfs)	512.8	101445.5
Length Wtd. (ft)	100.00	Wetted Per. (ft)	44.63	125.51
Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.02	0.18
Alpha	1.08	Stream Power (lb/ft s)	0.00	0.31
Frctn Loss (ft) 4.64	0.03	Cum Volume (acre-ft)	16.91	6.82
C & E Loss (ft) 1.40	0.00	Cum SA (acres)	3.54	0.89

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5100

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5027	1346.4	5048	1345.4	5100	1349.4	5200	1349.4	5250	1348.4
5250	1337.4	5335	1337.4	5348	1337.4	5352	1338.4	5355	1339.4
5359	1340.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5027	.15	5250	.065	5359	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5250	5359	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.150	0.065
W.S. Elev (ft) 100.00	1347.34	Reach Len. (ft)	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	54.66	1066.85
E.G. Slope (ft/ft)	0.000334	Area (sq ft)	54.66	1066.85
Q Total (cfs)	1860.00	Flow (cfs)	10.91	1849.09
Top Width (ft)	155.21	Top Width (ft)	46.21	109.00
Vel Total (ft/s)	1.66	Avg. Vel. (ft/s)	0.20	1.73
Max Chl Dpth (ft)	9.94	Hydr. Depth (ft)	1.18	9.79
Conv. Total (cfs)	101758.0	Conv. (cfs)	596.7	101161.3

Length Wtd. (ft)	100.00	Wetted Per. (ft)	47.24	126.29
Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.02	0.18
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.31
Frctn Loss (ft) 4.64	0.04	Cum Volume (acre-ft)	16.79	4.37
C & E Loss (ft) 1.40	0.00	Cum SA (acres)	3.43	0.64

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 5000

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5027	1346.4	5036	1345.4	5089	1345.4	5114	1344.4	5134	1343.4
5148	1342.4	5161	1341.4	5173	1340.4	5320	1339.4	5329	1338.4
5331	1337.4	5341	1337.4	5349	1338.4	5356	1339.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5027	.15	5320	.065	5356	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5320	5356	175	175	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.150	0.065
W.S. Elev (ft) 175.00	1347.30	Reach Len. (ft)	175.00	175.00
Crit W.S. (ft)		Flow Area (sq ft)	1538.74	327.53
E.G. Slope (ft/ft)	0.000626	Area (sq ft)	1538.74	327.53
Q Total (cfs)	1860.00	Flow (cfs)	1149.34	710.66
Top Width (ft)	329.00	Top Width (ft)	293.00	36.00
Vel Total (ft/s)	1.00	Avg. Vel. (ft/s)	0.75	2.17
Max Chl Dpth (ft)	9.90	Hydr. Depth (ft)	5.25	9.10
Conv. Total (cfs)	74340.7	Conv. (cfs)	45936.9	28403.7
Length Wtd. (ft)	175.00	Wetted Per. (ft)	294.12	44.33

Min Ch El (ft)	1337.40	Shear (lb/sq ft)	0.20	0.29
Alpha	2.16	Stream Power (lb/ft s)	0.15	0.63
Frctn Loss (ft) 4.64	0.18	Cum Volume (acre-ft)	14.97	2.77
C & E Loss (ft) 1.40	0.01	Cum SA (acres)	3.04	0.47

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 4825.9

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1349.81	4.3	1349.72	11.54	1349.58	18.19	1349.51	24.65	1349.43
28.83	1349.24	71.65	1347.62	72.89	1347.56	75.82	1347.22	80.19	1346.58
97.56	1344.07	103.03	1343.52	107.27	1343.07	136.13	1343.07	149.24	1343.07
156.34	1343.31	170.9	1343.75	199.23	1342.72	208.8	1342.36	236.19	1341.54
244.33	1341.3	296.85	1340.25	307.32	1340.04	310	1340	455.4	1338
463.4	1336	475.4	1336	485.4	1338	515	1340	540	1342
620	1344	695	1346	810	1348	821.24	1348.4	851.71	1349.26
867.7	1349.84	948.69	1352.48	960.98	1352.86	965.52	1352.96	1009.66	1353.79
1058.22	1354.38	1083.63	1354.57	1210.46	1355.54	1243.28	1355.48	1395.59	1354.47
1434.63	1354.47	1487.56	1354.01						

Manning's n Values num= 1

Sta	n Val
0	.4

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
455.4	485.4	261.5	261.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1347.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.400	0.400
0.400				
W.S. Elev (ft)	1347.14	Reach Len. (ft)	261.50	261.50
261.50				
Crit W.S. (ft)	1340.27	Flow Area (sq ft)	2272.76	316.25
923.95				
E.G. Slope (ft/ft)	0.002045	Area (sq ft)	2272.76	316.25
923.95				
Q Total (cfs)	1860.00	Flow (cfs)	1259.30	252.92
347.79				
Top Width (ft)	684.29	Top Width (ft)	379.04	30.00
275.24				

Vel Total (ft/s)	0.53	Avg. Vel. (ft/s)	0.55	0.80
0.38				
Max Chl Dpth (ft)	11.14	Hydr. Depth (ft)	6.00	10.54
3.36				
Conv. Total (cfs)	41132.2	Conv. (cfs)	27848.1	5593.0
7691.0				
Length Wtd. (ft)	261.50	Wetted Per. (ft)	379.40	30.44
275.45				
Min Ch El (ft)	1336.00	Shear (lb/sq ft)	0.76	1.33
0.43				
Alpha	1.15	Stream Power (lb/ft s)	0.42	1.06
0.16				
Frctn Loss (ft)		Cum Volume (acre-ft)	7.31	1.47
2.78				
C & E Loss (ft)		Cum SA (acres)	1.69	0.34
0.85				

CULVERT

RIVER: Upper Reach
REACH: Ditch RS: 4713.16

INPUT
Description:
Distance from Upstream XS = 30
Deck/Roadway Width = 206
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 42

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1363.3		61.4	1363.3		68	1359.9	
68.2	1359.9		70.4	1359.9		78.4	1354.6	
89.7	1347.8		96.5	1345.7		103.7	1343.9	
107.8	1344.3		115.8	1343.2		128.4	1343.2	
144.1	1343.2		153.7	1344		159.5	1343.9	
174.5	1351.8		190.2	1359.2		192.5	1359.2	
193.4	1359.2		193.7	1359.2		193.8	1363.3	
390.4	1362		590.4	1360		762.4	1358	
862.4	1356.3		962.4	1354.6		1062.4	1353	
1162.4	1351.9		1262.4	1351.3		1362.4	1351.3	
1462.4	1351.7		1562.4	1352.3		1662.4	1352.8	
1762.4	1353.4		1862.4	1353.9		1962.4	1354.4	
2062.4	1355		2162.4	1355.5		2262.4	1356.1	
2362.4	1356.6		2462.4	1357.1		2562.4	1357.7	

Upstream Bridge Cross Section Data
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1349.81	4.3	1349.72	11.54	1349.58	18.19	1349.51	24.65	1349.43
28.83	1349.24	71.65	1347.62	72.89	1347.56	75.82	1347.22	80.19	1346.58
97.56	1344.07	103.03	1343.52	107.27	1343.07	136.13	1343.07	149.24	1343.07
156.34	1343.31	170.9	1343.75	199.23	1342.72	208.8	1342.36	236.19	1341.54
244.33	1341.3	296.85	1340.25	307.32	1340.04	310	1340	455.4	1338
463.4	1336	475.4	1336	485.4	1338	515	1340	540	1342
620	1344	695	1346	810	1348	821.24	1348.4	851.71	1349.26
867.7	1349.84	948.69	1352.48	960.98	1352.86	965.52	1352.96	1009.66	1353.79
1058.22	1354.38	1083.63	1354.57	1210.46	1355.54	1243.28	1355.48	1395.59	1354.47
1434.63	1354.47	1487.56	1354.01						

Manning's n Values num= 1

Sta	n Val
0	.4

Bank Sta: Left	Right	Coeff Contr.	Expan.
455.4	485.4	.1	.3

Downstream Deck/Roadway Coordinates
num= 42

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1363		237.3	1363.3		237.4	1359.9	
237.6	1359.9		239.8	1359.9		247.8	1354.6	
259.1	1347.8		265.9	1345.7		273.1	1343.9	
277.2	1344.3		285.2	1343.2		297.8	1343.2	
313.5	1343.2		323.1	1344		328.9	1343.9	
343.9	1351.8		359.6	1359.2		361.9	1359.2	
362.8	1359.2		363.1	1359.2		363.2	1363.3	
559.8	1362		759.8	1360		931.8	1358	
1031.8	1356.3		1131.8	1354.6		1231.8	1353	
1331.8	1351.9		1431.8	1351.3		1531.8	1351.3	
1631.8	1351.7		1731.8	1352.3		1831.8	1352.8	
1931.8	1353.4		2031.8	1353.9		2131.8	1354.4	
2231.8	1355		2331.8	1355.5		2431.8	1356.1	
2531.8	1356.6		2631.8	1357.1		2731.8	1357.7	

Downstream Bridge Cross Section Data
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
24.14	1347.22	62	1347.53	82	1347.69	86.47	1347.77	92.83	1347.77
103.4	1347.67	184	1346.61	190.02	1346.57	195.99	1346.51	219.95	1345.78
254.05	1344.82	258.86	1343.71	262.52	1342.98	275.51	1342.44	276.52	1342.38
281.39	1342.35	282.74	1342.56	284.32	1342.74	289.93	1343.29	302.15	1343.29
317.36	1343.29	324.49	1342.35	326.66	1342.17	343.69	1341.08	343.77	1341.07
343.91	1341.08	344.61	1341.06	370.92	1340.52	383.17	1340.33	454.16	1338.21
470.42	1337.76	542.56	1337.82	548.75	1337.84	549.49	1337.83	595.35	1337.85
596.5	1337.83	610.08	1337.82	610.26	1337.82	610.46	1337.82	620.65	1337.9
628.17	1335.8	632.76	1335.33	638.76	1335.33	644.76	1335.33	654.23	1336.12
655.3	1336.47	657.24	1336.92	664.54	1336.69	677.64	1336.82	682.6	1337.41
702.95	1338.2	705.66	1338.42	717.62	1339.39	763.07	1340.73	866.49	1342.71
902.09	1343.75	1098.84	1349.2	1118.97	1349.53	1314.83	1353.01	1331.94	1352.99
1385.25	1352.93								

Manning's n Values num= 1

Sta	n Val
24.14	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
620.65	702.95	.1	.3

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	5	5

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	30	206	.013	.013	0	.2	.4

Number of Barrels = 2
Upstream Elevation = 1336
Centerline Stations
Sta. Sta.
466.65 472.15
Downstream Elevation = 1335.33
Centerline Stations
Sta. Sta.
636.01 641.51

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	749.41	Culv Full Len (ft)	206.00
# Barrels	2	Culv Vel US (ft/s)	14.99
Q Barrel (cfs)	374.71	Culv Vel DS (ft/s)	14.99
E.G. US. (ft)	1347.15	Culv Inv El Up (ft)	1336.00
W.S. US. (ft)	1347.14	Culv Inv El Dn (ft)	1335.33
E.G. DS (ft)	1339.36	Culv Frctn Ls (ft)	2.63
W.S. DS (ft)	1338.78	Culv Exit Loss (ft)	4.46
Delta EG (ft)	7.79	Culv Entr Loss (ft)	0.70
Delta WS (ft)	8.37	Q Weir (cfs)	1110.59
E.G. IC (ft)	1347.19	Weir Sta Lft (ft)	91.91
E.G. OC (ft)	1347.15	Weir Sta Rgt (ft)	165.61
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1341.00	Weir Max Depth (ft)	3.92
Culv WS Outlet (ft)	1340.33	Weir Avg Depth (ft)	3.15
Culv Nml Depth (ft)	5.00	Weir Flow Area (sq ft)	232.14
Culv Crt Depth (ft)	5.00	Min El Weir Flow (ft)	1343.21

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION

RIVER: Upper Reach
REACH: Ditch RS: 4564.4

INPUT
Description:
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
24.14	1347.22	62	1347.53	82	1347.69	86.47	1347.77	92.83	1347.77
103.4	1347.67	184	1346.61	190.02	1346.57	195.99	1346.51	219.95	1345.78
254.05	1344.82	258.86	1343.71	262.52	1342.98	275.51	1342.44	276.52	1342.38
281.39	1342.35	282.74	1342.56	284.32	1342.74	289.93	1343.29	302.15	1343.29
317.36	1343.29	324.49	1342.35	326.66	1342.17	343.69	1341.08	343.77	1341.07
343.91	1341.08	344.61	1341.06	370.92	1340.52	383.17	1340.33	454.16	1338.21
470.42	1337.76	542.56	1337.82	548.75	1337.84	549.49	1337.83	595.35	1337.85

596.5	1337.83	610.08	1337.82	610.26	1337.82	610.46	1337.82	620.65	1337.9
628.17	1335.8	632.76	1335.33	638.76	1335.33	644.76	1335.33	654.23	1336.12
655.3	1336.47	657.24	1336.92	664.54	1336.69	677.64	1336.82	682.6	1337.41
702.95	1338.2	705.66	1338.42	717.62	1339.39	763.07	1340.73	866.49	1342.71
902.09	1343.75	1098.84	1349.2	1118.97	1349.53	1314.83	1353.01	1331.94	1352.99
1385.25	1352.93								

Manning's n Values num= 1

Sta	n Val
24.14	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
620.65	702.95	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1339.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.040	0.040
0.040				
W.S. Elev (ft)	1338.78	Reach Len. (ft)		
Crit W.S. (ft)	1338.78	Flow Area (sq ft)	162.28	174.91
2.03				
E.G. Slope (ft/ft)	0.013109	Area (sq ft)	162.28	174.91
2.03				
Q Total (cfs)	1860.00	Flow (cfs)	631.52	1224.73
3.76				
Top Width (ft)	274.78	Top Width (ft)	185.40	82.30
7.08				
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)	3.89	7.00
1.85				
Max Chl Dpth (ft)	3.44	Hydr. Depth (ft)	0.88	2.13
0.29				
Conv. Total (cfs)	16245.4	Conv. (cfs)	5515.7	10696.9
32.8				
Length Wtd. (ft)		Wetted Per. (ft)	185.41	82.81
7.11				
Min Ch El (ft)	1335.33	Shear (lb/sq ft)	0.72	1.73
0.23				
Alpha	1.25	Stream Power (lb/ft s)	2.79	12.10
0.43				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:Upper Reach

Reach	River Sta.	n1	n2	n3
Ditch	5585	.15	.065	.15
Ditch	5500	.15	.065	.15
Ditch	5400	.15	.065	.15
Ditch	5300	.15	.065	.15
Ditch	5200	.15	.065	.15

		developed.rep		
Ditch	5100	.15	.065	.15
Ditch	5000	.15	.065	.15
Ditch	4825.9	.4		
Ditch	4713.16	Culvert		
Ditch	4564.4	.04		

SUMMARY OF REACH LENGTHS

River: Upper Reach

Reach	River Sta.	Left	Channel	Right
Ditch	5585	85	85	85
Ditch	5500	100	100	100
Ditch	5400	100	100	100
Ditch	5300	100	100	100
Ditch	5200	100	100	100
Ditch	5100	100	100	100
Ditch	5000	175	175	175
Ditch	4825.9	261.5	261.5	261.5
Ditch	4713.16	Culvert		
Ditch	4564.4	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Upper Reach

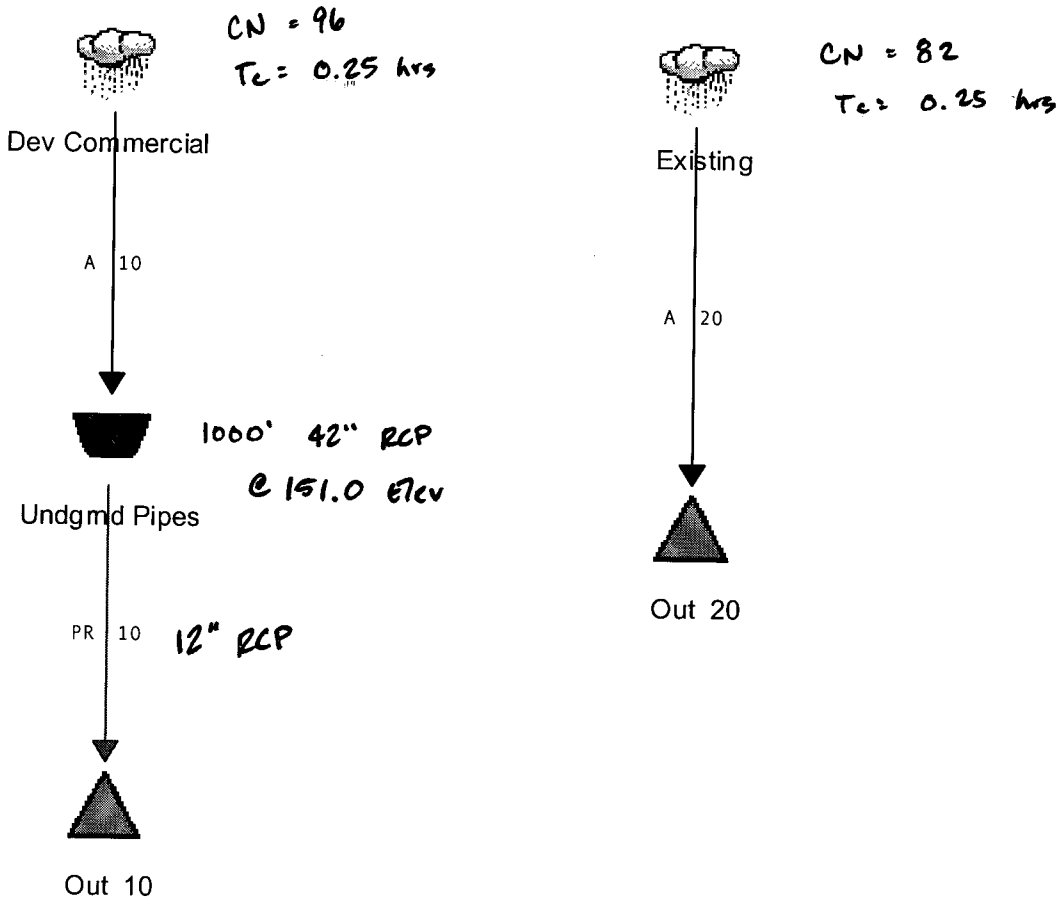
Reach	River Sta.	Contr.	Expan.
Ditch	5585	.1	.3
Ditch	5500	.1	.3
Ditch	5400	.1	.3
Ditch	5300	.1	.3
Ditch	5200	.1	.3
Ditch	5100	.1	.3
Ditch	5000	.1	.3
Ditch	4825.9	.1	.3
Ditch	4713.16	Culvert	
Ditch	4564.4	.1	.3

EXISTING

HEC-RAS Plan: Plan 01 River: Upper Reach Reach: Ditch Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Ditch	5585	PF 1	1860.00	1338.40	1347.91		1348.04	0.001978	3.76	1065.00	272.44	0.22
Ditch	5500	PF 1	1860.00	1338.40	1347.75		1347.88	0.001924	3.93	1098.86	248.58	0.24
Ditch	5400	PF 1	1860.00	1338.40	1347.55		1347.68	0.001977	3.88	1192.76	333.00	0.25
Ditch	5300	PF 1	1860.00	1338.40	1347.50		1347.54	0.000733	2.32	1667.05	337.00	0.15
Ditch	5200	PF 1	1860.00	1337.40	1347.43		1347.47	0.000731	2.36	1800.58	334.00	0.14
Ditch	5100	PF 1	1860.00	1337.40	1347.36		1347.40	0.000607	2.18	1850.38	332.00	0.13
Ditch	5000	PF 1	1860.00	1337.40	1347.30		1347.34	0.000626	2.17	1866.27	329.00	0.13
Ditch	4825.9	PF 1	1860.00	1336.00	1347.14	1340.27	1347.15	0.002045	0.80	3512.96	684.29	0.04
Ditch	4713.16		Culvert									
Ditch	4564.4	PF 1	1860.00	1335.33	1338.78	1338.78	1339.36	0.013109	7.00	339.22	274.78	0.85

AREA 3.2 acres



MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
2y24h	3.5000	Synthetic Curve	SCSTYPES	TypeII 24hr
5y24h	4.5000	Synthetic Curve	SCSTYPES	TypeII 24hr
100y24	7.9000	Synthetic Curve	SCSTYPES	TypeII 24hr

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0500 hrs
Output Time Step = .0500 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
DEV COMMERCIAL	AREA	2	.812		12.0500	10.79		
DEV COMMERCIAL	AREA	5	1.076		12.0500	14.07		
DEV COMMERCIAL	AREA	100	1.979		12.0500	25.12		
EXISTING	AREA	2	.475		12.0500	6.91		
EXISTING	AREA	5	.703		12.0500	10.18		
EXISTING	AREA	100	1.537		12.0500	21.66		
*OUT 10	T-E	2	.806		33.5000	5.87	159.80	
*OUT 10	T-E	5	1.063		33.8500	6.56	159.80	
*OUT 10	T-E	100	1.684		33.9000	7.44	159.80	
*OUT 20	JCT	2	.475		12.0500	6.91		
*OUT 20	JCT	5	.703		12.0500	10.18		
*OUT 20	JCT	100	1.537		12.0500	21.66		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
UNDGRND PIPES	POND	2	.812		12.0500	10.79		
UNDGRND PIPES	POND	5	1.076		12.0500	14.07		
UNDGRND PIPES	POND	100	1.979		12.0500	25.12		
UNDGRND PIPESOUT	POND	2	.806		33.5000	5.87	155.18	.812
UNDGRND PIPESOUT	POND	5	1.063		33.8500	6.56	155.49	1.076
UNDGRND PIPESOUT	POND	100	1.684		33.9000	7.44	156.52	1.979

Table of Contents

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
2y24h	3.5000	Synthetic Curve	SCSTYPES	TypeII 24hr
5y24h	4.5000	Synthetic Curve	SCSTYPES	TypeII 24hr
100y24	7.9000	Synthetic Curve	SCSTYPES	TypeII 24hr

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0500 hrs
Output Time Step = .0500 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
DEV COMMERCIAL	AREA	2	.812		12.0500	10.79		
DEV COMMERCIAL	AREA	5	1.076		12.0500	14.07		
DEV COMMERCIAL	AREA	100	1.979		12.0500	25.12		
EXISTING	AREA	2	.475		12.0500	6.91		
EXISTING	AREA	5	.703		12.0500	10.18		
EXISTING	AREA	100	1.537		12.0500	21.66		
*OUT 10	T-E	2	.806		33.5000	5.87	159.80	
*OUT 10	T-E	5	1.063		33.8500	6.56	159.80	
*OUT 10	T-E	100	1.684		33.9000	7.44	159.80	
*OUT 20	JCT	2	.475		12.0500	6.91		
*OUT 20	JCT	5	.703		12.0500	10.18		
*OUT 20	JCT	100	1.537		12.0500	21.66		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
UNDGRND PIPES	POND	2	.812		12.0500	10.79		
UNDGRND PIPES	POND	5	1.076		12.0500	14.07		
UNDGRND PIPES	POND	100	1.979		12.0500	25.12		
UNDGRND PIPESOUT	POND	2	.806		33.5000	5.87	155.18	.812
UNDGRND PIPESOUT	POND	5	1.063		33.8500	6.56	155.49	1.076
UNDGRND PIPESOUT	POND	100	1.684		33.9000	7.44	156.52	1.979

JOB TITLE NOT SPECIFIED
Click Project Summary on the File Menu to enter title

DESIGN STORMS SUMMARY

Design Storm File,ID = SEDGWICK.RNQ Sedgwick24

Storm Tag Name = 2y24h

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 5y24h
Description: Sedgwick County 5-yr 24 hour Duration

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 4.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100y24
Description: Sedgwick County 100-yr 24 hour Duration

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = SEDGWICK.RNQ Sedgwick24

Storm Tag Name = 2y24h

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 5y24h
Description: Sedgwick County 5-yr 24 hour Duration

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 4.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100y24
Description: Sedgwick County 100-yr 24 hour Duration

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... F:\HYDRO\PROJECTS\EAST KELLOGG ACRES 5-10-06\PONDPACK\UNDERGROUND_STORAGE.PPW

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (ac-ft)
151.00	.000
151.50	.019
152.00	.052
152.50	.090
153.00	.130
153.50	.170
154.00	.200
154.50	.220
160.00	5.000

File.... F:\HYDRO\PROJECTS\EAST KELLOGG ACRES 5-10-06\PONDPACK\UNDERGROUND_STORAGE.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 151.00 ft
Increment = .50 ft
Max. Elev.= 160.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular	CV	--->	TW	151.000	160.000
TW SETUP, DS Channel					

File.... F:\HYDRO\PROJECTS\EAST KELLOGG ACRES 5-10-06\PONDPACK\UNDERGROUND_STORAGE.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID	=	CV	
Structure Type	=	Culvert-Circular	
No. Barrels	=	1	
Barrel Diameter	=	1.0000	ft
Upstream Invert	=	151.00	ft
Dnstream Invert	=	150.00	ft
Horiz. Length	=	50.00	ft
Barrel Length	=	50.01	ft
Barrel Slope	=	.02000	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.031274	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0098
Inlet Control M	=	2.0000
Inlet Control c	=	.03980
Inlet Control Y	=	.6700
T1 ratio (HW/D)	=	1.150
T2 ratio (HW/D)	=	1.297
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

At T1 Elev =	152.15 ft	--->	Flow =	2.75	cfs
At T2 Elev =	152.30 ft	--->	Flow =	3.14	cfs

Index of Starting Page Numbers for ID Names

DEVELOPED

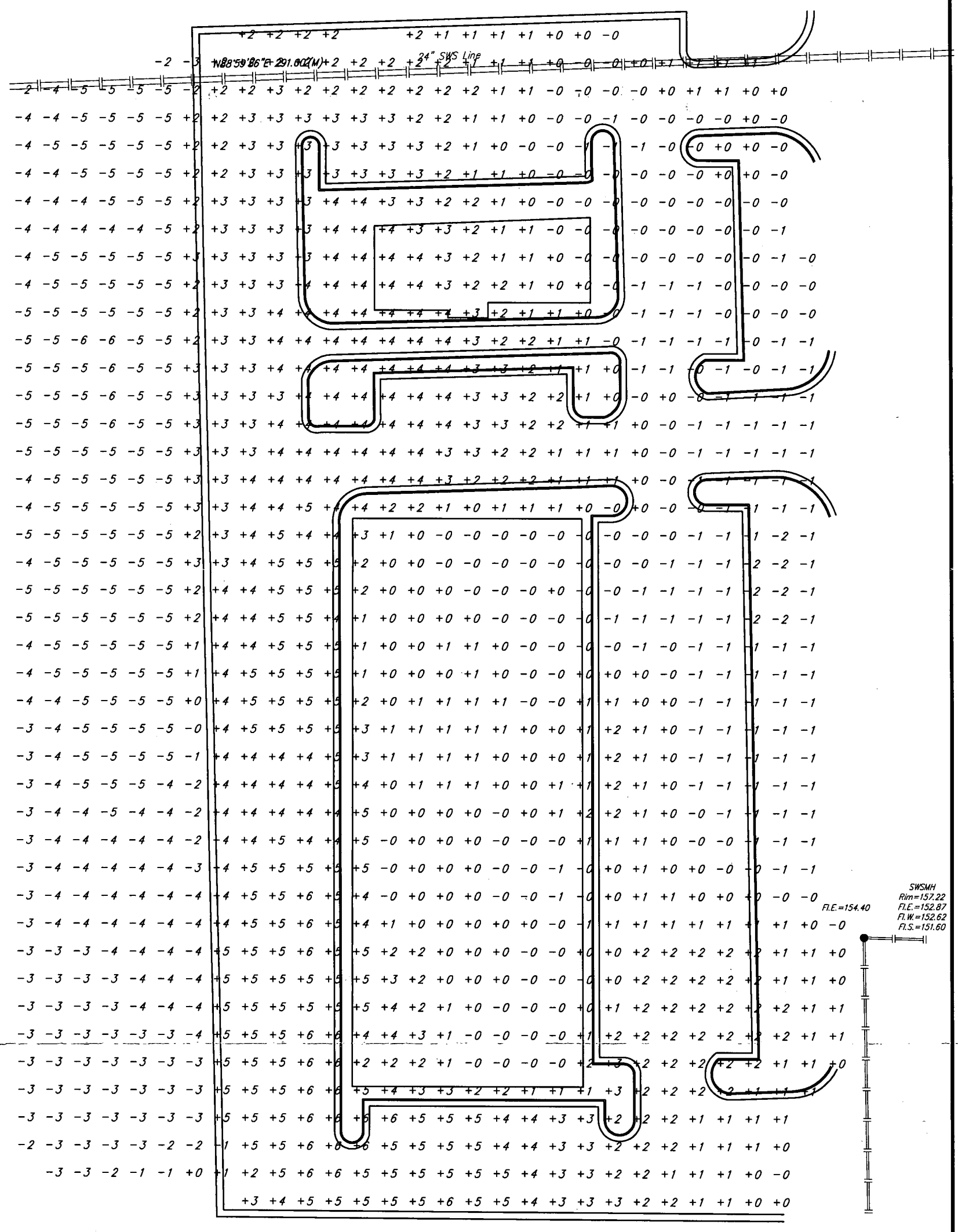
HEC-RAS Plan: Plan 01 River: Upper Reach Reach: Ditch Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Ditch	5585	PF 1	1860.00	1338.40	1347.53		1347.59	0.000426	1.86	998.72	111.00	0.11
Ditch	5500	PF 1	1860.00	1338.40	1347.49		1347.55	0.000459	1.98	984.58	114.00	0.12
Ditch	5400	PF 1	1860.00	1338.40	1347.44		1347.50	0.000455	1.97	983.83	124.19	0.12
Ditch	5300	PF 1	1860.00	1338.40	1347.40		1347.46	0.000408	1.86	1079.20	159.56	0.11
Ditch	5200	PF 1	1860.00	1337.40	1347.37		1347.42	0.000333	1.74	1114.78	151.55	0.10
Ditch	5100	PF 1	1860.00	1337.40	1347.34		1347.39	0.000334	1.73	1121.50	155.21	0.10
Ditch	5000	PF 1	1860.00	1337.40	1347.30		1347.34	0.000626	2.17	1866.27	329.00	0.13
Ditch	4825.9	PF 1	1860.00	1336.00	1347.14	1340.27	1347.15	0.002045	0.80	3512.96	684.29	0.04
Ditch	4713.16		Culvert									
Ditch	4564.4	PF 1	1860.00	1335.33	1338.78	1338.78	1339.36	0.013109	7.00	339.22	274.78	0.85

CUT & FILL EXHIBIT

EAST KELLOGG ACRES ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

storm water
STORMWATER MANAGEMENT MAINTENANCE AGREEMENT

THIS STORMWATER MANAGEMENT MAINTENANCE AGREEMENT:

Entered into this 28 day of January, 2008, by

Homer and Barbara Morgan

(the "Covenantor", and for indexing purposes "Grantor");
and the CITY OF WICHITA, SEDGWICK COUNTY STATE OF KANSAS,(the"City", Grantee").

WITNESSETH;

WHEREAS, the City is authorized and required to regulate and control the disposition of storm and surface waters within the Stormwater Management District of Wichita.

WHEREAS, the Covenantor is the owner and is seized in fee simple of a certain tracts of land more particularly described as Lots 16,17,18,19 East Kellogg Acres Addition Wichita, Sedgwick County, Kansas (the"Property"); and

WHEREAS, Covenantor desires to construct certain improvements on the Property which will alter existing storm and surface water conditions on both the Property and adjacent lands; and

WHEREAS, in order to accommodate and regulate these anticipated changes in existing storm and surface water flow conditions, the Covenantor desires to build and maintain at Covenantor's expense a storm and surface water management facility and system (the "Facility and System") more particularly described and shown on plans of Baughman Company titled sheets — drainage and grading and erosion control prepared by _Baughman company P.A. and dated 25 July 2006 which plans and any amendments thereto, are on file with the City of Wichita Engineering Department hereby incorporated by reference (the "Site Plan"), and

WHEREAS, the City has reviewed and approved the Site Plan subject to the execution of this Agreement.

NOW, THEREFORE, in consideration of the benefit received and to be received by the Covenantor, its successors and assigns, as a result of the City's approval of the Site Plan, the Covenantor, hereby covenants and agrees with the City as follows:

1. At their sole expense, the Covenantor, its successors and assigns, shall construct and perpetually maintain the Facility and System in strict accordance with the Site Plan and any amendments thereto which have been approved by the City, the Ordinance and the Act.

storm water

2. At their sole expense, the Covenantor, its successors and assigns, shall make such changes or modifications to the Facility and System as may be determined as reasonably necessary by the City to ensure that the Facility and System is properly maintained and continues to operate as originally designed and approved.

3. At reasonable times and in a reasonable manner as provided in of the OrdInance, the City, its agents,employees and contractors, shall have the right of ingress and egress over the Property and the right to inspect the Facility and System in order to ensure that the Facility and System is being properly maintained, is continuing to perform in an adequate manner and is in compliance with the Act, the Ordinance and Site Plan and any amendments thereto approved by the City.

4. Should either the Covenantor or its successors and assigns, fail to correct any defects in the Facility and System within the time specified in a written notice from the City that the Covenantor or its successors and assigns has/have failed to maintain the Facility and System in accordance with the approved design standards and/or the Site Plan and in accordance with the law and applicable regulations of the Act and the Ordinance, the City may pursue such remedies as provided by law, including, but not limited to, such civil and criminal remedies set forth in the Ordinance.

5 The Covenantor, its successors and assigns, shall indemnify, hold harmless and defend the City from and against any and all claims, demands, suits, liabilities, losses, damages and payments, including reasonable attorney fees claimed or made against the City that are alleged or proven to result or arise from the Covenantor's, its successors' andlor assigns', construction, operations or maintenance of the Facility and System

6 This Agreement and the covenants and agreements contained herein shall run with the title to the land and whenever the Property shall be held, sold, conveyed or otherwise transferred, it shall be subject to the covenants, stipulations, agreements and provisions of this Agreement which shall apply to, bind and be obligatory upon the Covenantor hereto, its successors and assigns, and shall bind all present and subsequent owners of the Property described herein.

Initially, the Covenantor is solely responsible for the performance of the obligations required hereunder and, to the extent permitted under applicable law, the payment of any and all fees, fines, and penalties associated with such performance or failure to perform under this Agreement. Notwithstanding any provisions of this Agreement to the contrary, upon the recordatiori of a deed or other instrument of sale, transfer or other conveyance of fee simple title to the Property or any portion thereof (a" Transfer") to a third party (the "Transferee"), the Covenantor shall be released of all of its obligations and responsibilities under this Agreement accruing after the date of such Transfer to the extent such obligations and responsibilities are applicable to that portion of the Property included in such Transfer, but such release shall be expressly

storm water
conditioned uponthe Transferee assuming such obligations and responsibilities by recorded written agreement for the benefit of the City. Such written agreement may be included in the Transfer deed or instrument, provided that the Transferee joins in the execution of such deed or instrument. A certified copy of such deed, instrument or agreement shall be provided to the City. The provisions of the preceding three sentences shall be applicable to the original Covenantor and any successor Transferee who has assumed the obligations and responsibilities of the Covenantor under this Agreement as provided above.

7. Nothing herein shall be construed to prohibit a transfer by the Covenantor to subsequent owners and assigns.

8. The provisions of this Agreement shall be severable and if any phrase, clause, sentence or provision is declared unconstitutional, or the applicability thereof to the Covenantor, its successors and assigns, is held invalid, the remainder of this Covenant shall not be affected thereby. This Agreement shall be interpreted under the laws of the State of Kansas.

9. State Bank of Kansas,the Noteholder, being the holder of a note or notes secured by a lien on the Property through a mortage dated _____,from _____to _____ in Deed Book _____, at page _____

10 This Agreement shall be recorded in the Register of Deeds office, Sedgwick County Kansas

11. Any and all suits for any claims or for any and every breach or dispute arising out of this Agreement shall be maintained in the appropriate court of competent jurisdiction in the City of Wichita, Kansas

12. This Agreement shall not be modified except by written instrument executed by the City and the owner(s) of the Property at the time of modification, and no modification shall be effective until recorded in the Register of Deeds office.

IN WITNESS WHEREOF, the Covenantor has executed this Agreement as of the date first set forth above.

Homer and Barbara Morgan

BY: _____ _____
Homer Morgan Barbara morgan

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CITY'S ACKNOWLEDGMENT:

STATE OF KANSAS
CITY OF WICHITA, to wit:

I, _____, a Notary Public in and for the City and State aforesaid, do hereby certify that CARL BEWER , City MAYOR for the City of WICHITA,KANSAS , whose name is signed to the foregoing agreement, bearing date on the day of _____, 2008, has acknowledged the same before me in my City and State aforesaid.

GIVEN under my hand this ____ day of ,2008.

_____ My commission expires: Notary Public

OWNER ACKNOWLEDGMENT

STATE OF KANSAS
CITY OF WICHITA,to wit:

I, Mary E. Kimmi a Notary Public in and for the City and State aforesaid, do hereby certify that HOMER AND BARBRA MORGAN respectfully, the owners , whose names as such are signed to the foregoing Agreement, have acknowledged the same before me in my City and State aforesaid.

GIVEN under my hand this 29 day of Jan , 2008

My Commission Expires: 9/25/2010
Notary Public

MARY E. KIMMI
NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. 9/25/2010