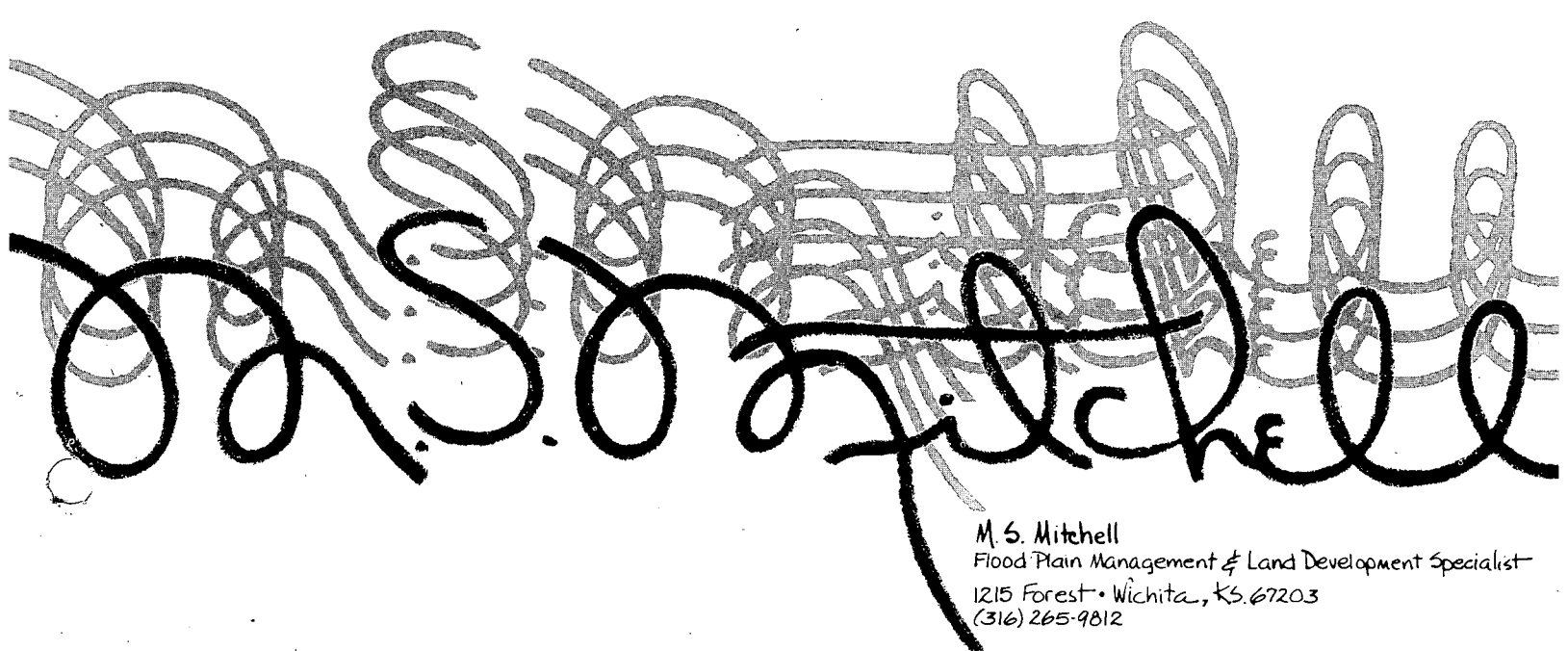


ANALYSIS OF
COWSKIN CREEK
FLOODPLAIN ENCROACHMENT
FOR
WALNUT VALLEY AND
WHISTLING WALK ESTATES 4TH
ADDITIONS



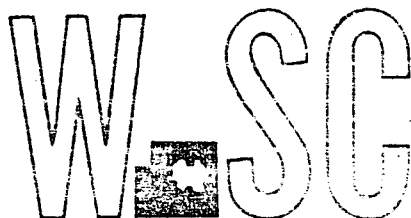
M. S. Mitchell
Flood Plain Management & Land Development Specialist
1215 Forest • Wichita, KS. 67203
(316) 265-9812

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WICHITA - SEDGWICK COUNTY



METROPOLITAN AREA PLANNING
DEPARTMENT

CITY HALL - TENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202
(316) 268-4561

May 21, 1982

Mr. Gary Wiley
Professional Engineering
Consultants
1440 East English
Wichita, Kansas 67211

Re: S/D 82-26 Sketch Plat of Walnut
Valley and Whistling Walk
Estates 4th Addition

Dear Mr. Wiley:

We have reviewed the above referenced sketch plat with other
City and County Departments and offer the following comments:

1. The preliminary federal floodway maps show a regulatory floodway approximately 1,200 feet wide in this Cowskin Creek area. We realize that the location of this floodway is based on former characteristics of the creek and may be different now that the channel has been cleaned. The elevations required to keep properties above the flood level may also be lower than specified in the federal flood study due to the channel improvements. The burden of proof will be upon the applicant to provide a detailed analysis showing that recent channel improvements combined with desired encroachment will not cause a 100-year water surface greater than that shown on the preliminary federal studies. This is especially critical so that no effect is realized for the original Whistling Walk Addition which provided for little or no freeboard for this projected 100-year elevation.
2. We think the road in Whistling Walk Estates 4th Addition should be a public road since it is a direct continuation of an existing public road. County engineering recommends that the road be at or above the 100-year elevation whether it be public or private. They point out that the preliminary federal flood data shows a difference of

WICHITA - SEDGWICK COUNTY

Mr. Gary Wiley
Page Two
May 21, 1982

only 1 1/2 feet between the 10-year and the 100-year flood elevation. No one will be able to specify what the elevation of the road should be until the applicant provides the necessary calculations based on the new channel improvements.

3. The Health Department should be contacted to find out what tests may be necessary and what standards are to be met for approval of on-site sewerage facilities for Whistling Walk Estates 4th Addition.
4. Don Schneider advises that sanitary sewer service can be provided for Walnut Valley but will require a temporary lift station and force main in addition to a 20-inch sewer main and the usual sewer laterals.
5. The use of Reserve A in Walnut Valley for "community facilities" has been questioned. I believe you told us this meant such things as picnic tables and open recreational uses. You may want to revise the wording on the preliminary plat so as not to cause undue alarm.

The Walnut Valley property has been approved for annexation and will probably be annexed by May 28th. Before proceeding with the residential community unit plan and the plat, however, you will need to have enough definite drainage information to be able to show the floodway boundaries. You should submit this information to Chris Breitenstein as soon as it is available. County Engineering also needs this information in order to make an accurate analysis of the Whistling Walk plat. Based on existing data, they say that Lots 1, 2, and 3 and the road are not protected from flooding. Again, it will be this applicant's responsibility to prove otherwise.

Since the federal flood data is in mean sea level figures, it would be most helpful if the topographical information sub-

WICHITA - SEDGWICK COUNTY

Mr. Gary Wiley
Page Three
May 21, 1982

mitted with these plats is also based on mean sea level rather than City data.

If you have any questions about our comments, please call. I ~~have enclosed a copy of County engineering's comments for your~~ review.

Sincerely,


Louise Olivarez
Senior Planner

LO:jps
Enclosure

cc: Dean DeWitt, President, DeWitt Land Company, Inc.,
505 South Broadway, Wichita, Kansas 67202

INTRODUCTION

The floodplain analysis of Cowskin Creek between 119th Street and 13th Street begins with the Sedgwick County Flood Insurance Study by Howard-Needles-Tammen and Bergendoff which sets the 100-year discharge at 15,050 cubic feet per second. During 1981 and 1982 the Sedgwick County Stream Maintenance crews changed the channel cross-section and alignment, cleared underbrush and trimmed up major trees between the Established Banklines between 13th and City Park property located approximately one mile downstream. The owner of Walnut Valley and Whistling Walk Estates 4th Additions extended the work done by the Stream Maintenance Program to include all the flood plain area on his property. Even though the work done downstream from 119th may improve flow conditions there, this analysis begins with the Floodway Encroachment elevation at 119th Street included in the Flood Insurance Study. Several encroachment plans were studied to obtain the best balance between left bank and right bank encroachments. Plan 4A, which keeps the 100-year water surface profile below that of the Flood Insurance Study Floodway, sets up a transition from a future bridge section at 13th and into a future bridge section at 119th Street, and is presented here for review and approval.

WALNUT VALLEY & WHISTLING WALK ESTATES IV

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Section B, cont

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CLR

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2.152838736

CLR

Lab
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.0007518797
.0007518797
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2.240601504
2.240601504
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.0064935065
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Section D		
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	.0008264463	X
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P	1.895041322	
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R ² / ₃	1.53463295	
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	11275.	
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Lob		
Area	2656.25	
		CLR
W.P	735.	1/X
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	2656.	=
P	3.613605442	
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	0.67	=
R ² / ₃	2.364940889	
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Area	1397.5	
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P	9.445945946	
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		CLR
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P	3.613605442	
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		CLR

Section E		
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	Elev 1334.6	
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Area	2632.25	
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W.P	960.	1/X
	.0010416667	
	.0010416667	X
	2632.	=
P	2.741666667	
	2.741666667	YX
	0.67	=
R ² / ₃	1.965485376	
		CLR
	1.	
	Elev 1334.6	
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Ch		
Area	1210.25	
		CLR
W.P	118.	1/X
	.0084745763	
	.0084745763	X
	1210.	=
P	10.25423729	
	10.25423729	YX
	0.67	=
R ² / ₃	4.75669443	
		CLR

Section E, Cont. ✓
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11440.
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11125.
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Area 3299.5
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12030. -
11125. =
W.P. 905.
905. 1/X
.0011049724
.0011049724 X
3300. =
R 3.64640884 YX
3.64640884 =
0.67
R₃ 2.379303216 CLR

Section F
1.
Elev 1334.7
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11145.
31.5
11145.
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10815.
33.5
10805.
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Lob 2.
Area 1582.
W.P. 795.
.0012578616
.0012578616 X
1582. =
R 1.989937107 YX
1.989937107 =
0.67
R₂ 1.585704888 CLR
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Ch 2.
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W.P. 113.
.0088495575
.0088495575 X
1133. =
R 10.02654867 YX
10.02654867 =
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R₃ 4.685667663 CLR

Section F Cont
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Area 2360.
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12055. -
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2360. =
R 2.95 YX
2.95 =
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R₂ 2.064337732 CLR

Natural Sections -
Cowskin Creek

548

[illegible]

Sec 6, Cont		CLR
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	31.11	
	15.13	
	35.03	
W.P.	162.46	
	162.46	1/X
	0061553613	
	0061553613	X
	1308.	=
2	8.051212606	
	8.051212606	YX
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	11160.	=
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	0011904762	X
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Rob

Area

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10006472452

10006472452

4984.

3.223409960

3.223409960

0.67

2.191771111

R

R^{2/3}

Section I

Elev 1335.6
35.6
10045.
35.6
10240.
34.
10240.
21.
10185.
21.
10170.
29.5
10135.
0.
2.
ch
Area 1301.25

233. WP

5.584763948

5.584763948

0.67

3.165871115

R

R^{2/3}

PG

2

Sista

I

Rob

Chert

WP

Section I

elev 1335.6
35.6
10240.
35.6
11690.
34.
11630.
33.
11260.
32.
11150.
31.5
10950.
34.5
10420.
34.
10240.
0.
2.

Rob

Area 3557.

1450. WP

2.453103448

2.453103448

0.67

1.824356160

R

R^{2/3}

CLI

SECTION J cont

Elev 1335.2

10255.
35.7
11200.
32.
11120.
34.
11115.
34.
11085.
32.
11075.
26.
11015.
26.
10845.
34.
10795.
34.5
10590.
32.5
10435.
32.
10255.
0.
2.
3744.73

Rob
Area

11200.
10255.
34.5 WP
345.

.0010582011
.0010582011
3744.75
3.002698417
3.002698417
0.67
2.51567135

e

2 2/3

CLF
=
1 1/2
X
=
YX
=
CLF

Elev 1335.2

10100.
38.
10145.
36.
10255.
22.
10205.
22.
10190.
35.5
10110.
0.

ch

Area 1172.5

51.2
15.
81.13
10.

ch

WP 157.33

7.4054684 2

7.4504684

7.67

3.640678106 2 2/3

Elev 1336

10020.
36.
10185.
33.5
10185.
33.5
10095.
35.
10065.
34.
10065.
0.
2.

Lob
Area

362.5

WP

10185.
10020.
175.
175.
.0057142857
.0057142857
362.5
2.071428571 2
2.071428571
0.67
1.628924197 2 2/3

CLF
=
=
=
=
YX
=
CLF

Elev 1336

10185.
36.
10340.
33.5
10340.
32.
10275.
32.
10365.
33.5
10185.
0.
2.

ch

Area 1253.75

Walnut Valley E.W.N.E. 4th

Natural Sections
Cowskin Creek

8
4
1
2

sec. K cont

WP

2

2 2/3

Elev 1336.

10940.

36.

11055.

34.

11020.

33.5

10975.

35.

10960.

35.

10900.

34.

10920.

34.

10865.

26.

10815.

26.

10855.

32.

10615.

33.5

10415.

33.5

10340.

0.

Rob 2.

Area 3335.

11055.

10850.

WP 715.

715.

0013986014

0013986014

3335.

4.654385664

4.654385664

0.67

2.80500967.

2 2/3

Cowskin Creek - 119th to 13th
Section Properties - Natural Sections

Pg 1 of 3

$$\Sigma \frac{L \bar{Q}}{P} =$$

Section #	W.S.	Elev	Area	W/P	R	R ^{4/3}	K x 10 ³	L	%KT	Q _{us}	Q _{ds}	$\bar{Q}$	L $\bar{Q}$	L
A	34.5													
Lob		5332	1490	3.58	2.35	532.0	80	54	8084					
Ch		1638	143	11.45	5.12	356.1	80	36	5411					
Rob		1066	315	3.38	2.26	102.3	80	10	1555					
		8036				990.4			15050					
Sec B	34.5													
Lob		4200	1570	2.68	1.93	344.2	65	50	7525	8084	7804	507,260		
Ch		1466	163	8.98	4.35	270.8	150	39	5870	5411	5641	846,150		110
Rob		848	270	3.14	2.15	77.4	190	11	1655	1555	1605	304,950		
		6514				692.4			15050		15050	1,658,360		
Sec C	34.7													
Lob		3246	1330	2.44	1.82		45	29	4434	7525	5980	269,100		
Ch		1588	154	10.33	4.78		340	38	5714	5870	5792	1,969,280		218
Rob		2420	740	3.27	2.11		320			1655				
									15050		15050			
	34.5													
Lob		2980	1330	2.24	1.72	217.6	45	29	4392	7525	5958	268,124		
Ch		1557	154	10.11	4.71	311.4	340	42	6283	5870	6072	2,066,069		219
Rob		2420	740	3.27	2.11	216.8	320	29	4375	1655	3015	964,802		
		6957				745.8			15050		15050	3,298,995		
Sec D	34.9													
		2777	1210	2.30	1.74		90	27	4010	4434	4222	379,980		
		1334	148	8.99	4.36		160	32	4825	5714	5269	843,040		131
		2950	735	4.01	2.54		135	41	6215	4902	5559	750,465		
									15050		15050	1,973,485		
	34.5													
Lob		2293	1210	1.90	1.53	149.0	90	22	3287	4253	3770	339,300		
Ch		1298	148	9.45	4.50	367.1	160	39	5892	6085	5988	958,160		134
Rob		2656	735	3.61	2.36	266.1	135	39	5871	4712	5292	714,352		

Cowskin Creek - 119th to 13th
Section Properties - Natural Sections

Pg 2 of 3
El Q
Q=L

Section #	W.S. Elev	Area	WP	R	R ² /3	K x 10 ³	l	%KT	Q _{us}	Q _{ds}	Q̄	l Q̄	Q=L
Sec E	35.1												
Lob		3137	1000	3.14	2.15		130	30	4514	4434	4474	581620	376
Ch		1268	118	10.76	4.91		400	28	4166	5714	4940	1,976,000	
Rob		3748	935	4.01	2.54		550	42	6370	4902	5636	3,099,800	
									15050		15050	5,657,420	
	34.6												
Lob		2632	960	2.74	1.97	220.1	130	28	4150	3287	3718	483,405	394
Ch		1210	118	10.25	4.76	244.5	400	31	4610	5892	5251	2,100,400	
Rob		3300	905	3.65	2.38	333.4	550	41	6290	5871	6081	3,344,270	
						78.0			15050		15050	5,928,080	
Sec F	35.1												
Lob		1902	815	2.33	1.76		180	22	3357	4514	3935	708,300	291
Ch		1177	113	10.39	4.80		430	38	5668	4166	4917	2,114,310	
Rob		2718	835	3.26	2.21		250	40	6025	6370	6198	1,599,500	
									15050		15050	4,372,110	
	34.7												
Lob		1582	795	1.99	1.59	106.8	180	20	2983	4150	3566	641,970	299
Ch		1133	113	10.03	4.69	225.6	430	42	6302	4610	5456	2,346,080	
Rob		2360	800	2.95	2.06	206.4	250	38	5765	6290	6028	1,506,815	
						538.8			15050		15050	4,494,925	
Sec G	35.0												
Lob		1052	670	1.57	1.35	60.3	130	12	1761	2983	2372	308,360	222
Ch		1308	162	8.05	4.05	224.9	200	44	6568	6302	6436	1,287,133	
Rob		2568	840	3.06	2.11	230.1	280	44	6721	5765	6242	1,747,827	
						515.3			15050	15050		3,343,320	
Sec H	35.3												
Lob		94	105	0.90	0.93		550	01	88	1761	924	508,475	678
Ch		1198	142	8.41	4.17		810	33	5017	6568	5793	4,691,925	
Rob		4649	1505	3.09	2.13		600	66	9945	6721	8333	4,999,800	
									15050		15050	10,200,200	
	35.7												
Lob		132	120	1.1	1.07	6.0	550	01	122	1761	941	517,825	675
Ch		1254	142	8.83	4.30	228.9	810	31	4659	6568	5614	4,546,935	
Rob		5234	1535	3.41	2.27	504.4	600	68	10269	6721	8495	5,097,000	

Cowskin Creek - 119th to 13th
 Section Properties - Natural Sections Pg 3 of 3

N.S.	Elev	Area	WP	R	R ^{2/3}	Kx10 ³	%KT	l	Qus	Qds	$\bar{Q}$	l $\bar{Q}$	$\Sigma \frac{l\bar{Q}}{Q=L}$
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Section H 35.5

Lob	115	115	1	1	4.9	01	550	106	1761	934	513.515	}	676
Ch	1226	142	8.63	4.24	220.7	32	810	4806	6568	5687	4,606,501		
Rob	4984	1545	3.23	2.20	465.5	67	600	10,138	6721	8429	5,057,580		
	6325				691.1						10,177,595		

Section I 35.6

Lob	0	0	0	0	0	0	290	0	106	53	15370	}	247
Ch	1301	733	5.58	3.16	174.5	39	260	5845	4806	5326	1,384,760		
Rob	3557	1450	2.45	1.82	274.9	61	240	9205	10,138	9671	2,321,040		
	4858				449.4			15050	15050	15050	3,721,170		

Section J 35.9

Lob	0	0	0	0	0	0						}	211
Ch	1202	157	7.64	3.91	199.5	32	250	4749	5845	5297	1,324,253		
Rob	3936	950	4.14	2.59	432.8	68	190	10301	9205	9753	1,853,067		
	5138				632.4						3,177,321		

35.7

Lob	0	0	0	0								}	211
Ch	1172	157	7.45	3.84	191.1	32							
Rob	3745	945	3.96	2.52	400.7	68							
	4917				591.8								

Section K 36.0

	362	175	2.07	1.63	25.1	4	320	583	0	291	93,228	}	268
	1254	147	8.53	4.21	224.1	35	320	5213	4749	4981	1,593,962		
	3335	715	4.66	2.81	397.9	61	240	9254	10,301	9778	2,346,607		
					647.1			15050	15050	15050	4,033,797		

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek Natural Sections - 119th Street West
to 13th Street, Walnut Valley & Whistling Walk
Estates 4th Addition

Page 1 of 4

Computed by: MSM Date June 1982

Checked by: MSM Date Dec 1982

over Mile
Per FIS
@ 119th St

15050 cfs = 100 YR FIS $n = .035$

$$\frac{1.486}{n} = 42.46$$

Pg 3-30 FIS HRC-2 Appendix

$$Q/A = V$$

CWSEL

Mile or Sec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	K x10 ³	K ^{2/3} x10 ³	Sp	hf	K ^{2/3} x10 ³	α	V	αV ² 2g	h _v	h _o	H	Comp. Elev.
20.974			7265							1.5	2.07	.10				1334.29
Sec A	80	1334.5	5332	2.35	532.0				5296							
			1638	5.12	356.1				16830							
			1066	2.26	102.3				942							
			8036		990.4	990.4	.00021	.02	23068	1.53	1.87	.08	.02	0	.04	1334.33
Sec B		1334.5	4200	1.93	344.2				2312							
			1966	4.35	270.8				9240							
			848	2.15	77.4				645							
	110		6514		692.4	841.4	.00032	.04	12197	1.56	2.31	.13	-.05	.02	.01	1334.34
Sec C		1334.7	3246	1.82	280.1				1485							
			1588	4.78	322.3				13276							
			3482	1.87	276.5				1744							
	218		8316		848.9	770.6	.00038	.08	16505	1.87	1.81	.10	.03	—	.11	1334.45

ΔH =
-.17
OK

ΔH =
-.16
OK

ΔH =
-.25
X

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Natural Sections 119th West
to 13th Street (Walnut Valley & Whistling Walk
Estates - 4th Addition

Page 2 of 4

Computed by: MSM Date June 1982

Checked by: MSM Date Dec 1982

Q = 15050 cfs = 100 YR FIS n = .035 $\frac{1.486}{R} = 42.46$

11e or ec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	K $\frac{K^2}{R^{1.486}}$	$\frac{K^2}{R^{1.486}}$	Sp	hf	KVA sig	α	V	$\frac{\alpha V^2}{2g}$	h _v	h _o	H	Comp. Elev.
Sac B	110	1334.5			092.4					1.56	2.31	.13				1334.34
Sac C		1334.5	2980	1.72	217.6				1160							
			1557	4.71	311.4				1245							
			2420	2.11	216.8				1740							
	219		6957		745.8	719.1	.00043	.09	1535	1.79	2.16	.13	—	—	.09	1334.43
Sac D		1334.5	2293	1.53	149.0				629							
			1398	4.50	267.1				9750							
			2656	2.36	266.1				2671							
	134		6347		682.2	726.1	.00043	.06	1305	1.66	2.37	.14	7.02	.01	.05	1334.49
Sac E		1334.6	2632	1.97	220.1				1539							
			1210	4.76	244.5				9983							
			3300	2.38	333.4				3380							
	394		7142		798.0	740.2	.00041	.16	1492	1.50	2.11	.10	.04	—	.20	1334.69
Sac F		1334.7	1582	1.59	106.8				487							
			1133	4.69	225.6				8945							
			2360	2.06	206.4				1579							
	299		5075		538.8	668.4	.00051	.15	1101	1.81	2.97	.25	.15	.05	.05	1334.74

ΔH = -0.07

ΔH = -0.01

ΔH = +0.09

ΔH = +0.04

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Natural Sections - 119th West to
13th Street (Walnut Valley & Whistling Walk Estates
4th Addition

Page 3 of 4

Computed by: MSM Date June 8 Dec 1982

Checked by: MSM Date Dec 1982

Q = 15050 cfs = 100 YR FIS n = .035 $\frac{1.486}{D} = 42.46$

Mile or Sec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	K $\frac{K^2}{100}$	$\frac{K^2}{100}$	Sp	hf	K/A $\frac{K^2}{100}$	α	V	$\frac{\alpha V^2}{2g}$	h _v	h _o	H	Comp. Elev.
Sac F					538.8											1334.74
Sac G		1335.0	1052	1.35	60.3				1980							
			1308	4.05	224.9				6449							
			2568	2.11	230.1				1047							
	222		4928		515.3	527.0	.00082	.18	8694	1.54	3.05	.22	.03	—	.21	1334.95
Sac H		1335.5	115	1	4.9				9							
			1226	4.24	220.7				7152							
			4984	2.20	465.5				4061							
	676		6325		691.1	603.2	.00062	.42	11223	1.36	2.38	.12	.10	.01	.53	1335.48
Sac I		1335.6	0	0	0				0							
			1301	3.16	174.5				3142							
			3557	1.82	274.9				1641							
	247		4858		449.4	570.2	.00070	.17	4783	1.24	3.10	.19	-.07	.02	.12	1335.60
Sac J		1335.7	0	0	0				0							
			1172	3.84	191.1				5079							
			3745	2.52	400.7				4587							
	211		4917		591.8	520.6	.00084	.18	9666	1.13	3.06	.16	.03	—	.21	1335.81

OK
ΔH = -.05

OK
ΔH = .02

OK

OK
ΔH = +.11

WALNUT VALLEY & WHISTLING WALK ESTATES IV

ENCROACHMENT PLAN 4A

Encroachment Plan 4 A.

Encroachment Plan 4A
Section A

1.
35.
35.
11360.
11360.
35.
11600.
30.
11600.
30.
11360.
0.
2.

Rob
Area 1200.

Area 1200.

2.440. WP

5. WP

0.67 R

2.939746642 R2/3

Encroachment Plan 4A

Section A

1.
35.
35.
11600.
35.
11740.
30.
11740.
17.
11685.
17.
11670.
30.
11600.

Ch. 1707.5
Area 1707.5

143. WP

11.94055944 R

11.94055944 Y

0.67

5.267524111 R2/3

Encroachment Plan 4A
Section A

1.
35.
35.
11740.
11740.
35.
12070.
32.
11990.
30.
11850.
30.
11740.

Rob

Area 1230.

Area 1230.

330. WP

3.727272727 R

3.727272727 R

0.67

2.414527104 R2/3

Encroachment Plan 4A
Section B

1.
35.
35.
35.
11410.
35.
11710.
31.5
11710.
31.5
11410.
0.
2.

Lob

Area 1050.

Area 1050.

300. WP

3.5 R

3.5

0.67

2.31486458 R2/3

Encroachment Plan 4A
Section B

1.
35.
35.
11710.
35.
11870.
31.5
11870.
21.5
11815.
18.
11810.
18.
11800.
21.5
11790.
31.5
11710.

Ch

Area 1546.25

163. WP

0.486196319 R

0.486196319 Y

0.67

4.514937185 R2/3

Encroachment Plan 4A
Section B

1.
35.
35.
11870.
35.
12150.
30.
12030.
31.5
11870.
0.
2.

Rob

Area 980.

Area 980.

280. WP

3.5

3.5 R

0.67

2.31486458 R2/3

Encroachment Plan 4 A.

Encroachment Plan 4A

Section C

35.3
35.3
11100.
35.3
11180.
31.5
11180.
31.5
11100.
0.
2.
Lob Area 304. WP =
Lob Area 80. R =
Area 3.8 R Y =
3.8 Y =
0.67 =
2.445991870 R2/3 CL

Encroachment Plan 4A
Section C

1.
35.3
35.3

11180.
35.3

11330.
30.

11330.
25.5

11310.
31.5

11280.
18.

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Encroachment Plan 4A
Section C

1.
35.3
35.3
11330.
35.3
11625.
31.
11625.
31.5
11520.
30.
11330.
0.
2.

Rob Area 1289.75

295. WP

4.372033898 R

4.372033898 R

0.67

2.886939939 R2/3

Encroachment Plan 4A
Section D

35.4
35.4
10960.
35.4
11130.
31.5
11130.
31.5
10960.
0.

Lob Area 663.

170. WP

3.9 R

0.9

0.67

2.488933463 R2/3

Encroachment Plan 4A
Section D

1.
35.4
35.4
11130.
35.4
11275.
29.5
11275.
29.5
11230.
19.
11215.
19.
11190.
29.5
11165.
31.5
11130.
0.

Ch Area 1528.

148. WP

10.32432432 R

10.32432432 R

0.67

4.778452772 R2/3

35.4

35.4

11275.

35.4

11400.

31.5

11400.

31.5

11375.

29.5

11275.

0.

2.

Rob Area 587.5

125. WP

4.7 R

4.7

0.67

2.820366612 R2/3

Encroachment Plan 4 A.

Encroachment Plan 4A
Section E

1.

35.9

10950.

10950.

35.9

11010.

31.5

11010.

31.5

10950.

0.

Lob

Area

264.

60. WP

4.4 R

4.4

0.67

2.698443276 R2/3

Encroachment Plan 4A
Section E

1.

35.9

35.9

11125.

35.9

11330.

30.3

11330.

30.

11125.

0.

2.

Rob

Area 1178.75

205. WP

5.75 R

5.75

0.67

3.228326536 R2/3

Encroachment Plan 4A
Section F

1.

36.2

36.2

11145.

36.2

11255.

31.5

11255.

19.

11205.

19.

11190.

31.5

11145.

0.

Ch

Area 1298.25

113. WP

11.48893805 R

11.48893805

0.67

5.13319219 R2/3

Encroachment Plan 4A
Section E

1.

35.9

35.9

11010.

35.9

11125.

30.

11125.

19.

11070.

19.

11055.

31.5

11010.

0.

2.

Ch

Area

113. WP

11.52330503 R

11.52330503

0.67

5.143474965 R2/3

Encroachment Plan 4A
Section F

1.

36.2

36.2

11050.

11050.

36.2

11145.

31.5

11145.

31.5

11050.

30.

2.

Lob

Area 446.5

35. WP

4.7 R

4.7

0.67

2.830366612 R2/3

Encroachment Plan 4A
Section F

1.

36.2

36.2

11255.

11255.

36.2

36.2

11500.

31.5

11500.

31.5

11255.

0.

Rob

Area 151.5

245. WP

4.7 R

4.7

0.67

2.820366612 R2/3

Encroachment Plan 4 A.

Encroachment Plan 4A
Section G

1.
36.5
36.5
10950.
36.5
11000.
36.
11000.
36.
10950.
0.
Lob 2.
Area 175.
50. Wp
3.5 R
3.5
0.67
2.31486458 R2/3
CL

Encroachment Plan 4A
Section G

1.
36.5
36.5
11000.
36.5
11160.
31.5
11160.
20.
11105.
20.
11090.
29.5
11050.
31.5
11035.
36.
11000.
0.
2.
Ch Area 1547.5
162. WP
9.552469136 R
9.552469136 Y
0.67
4.536046322 R2/3
CL

Encroachment Plan 4A
Section G

1.
36.5
36.5
11160.
36.5
11550.
31.5
11550.
31.5
11160.
0.
2.
Rob Area 1950.
390. WP
5. R
5.
0.67
2.939746642 R2/3
CL

Encroachment Plan 4A
Section H

1.
37.
37.
10180.
37.
10295.
33.5
10295.
35.5
10180.
0.
2.
Lob Area 287.5
287.5
1.
115. WP
2.504347826 R
2.504347826 Y
0.67
1.84980272 R2/3
CL

Encroachment Plan 4A
Section H

1.
37.
37.
10295.
37.
10435.
31.5
10435.
23.5
10370.
21.
10365.
21.
10355.
33.5
10295.
0.
2.
Ch Area 1436.25
1436.25
142. WP
10.11443662 R
10.11443662 Y
0.67
4.713146478 R2/3
CL

Encroachment Plan 4A
Section H

1.
37.
37.
10435.
37.
11310.
31.9
11310.
31.5
10435.
0.
2.
Rob Area 4637.5
875. WP
875.
5.3 R
5.3
0.67
3.056784571 R2/3
CL

Encroachment Plan 4A
Section I

1.
37.1
37.1
10040.
37.1
10240.
34.
10240.
21.
10165.
21.
10170.
29.5
10135.
35.6
10045.
0.
2.

Ch

Area 1597.5
1597.5

196. WP

8.068181818 R

8.068181818

0.67

4.050789759 R2/3

CL

Encroachment Plan 4A
Section I

1.
37.1
37.1
10240.
37.1
11235.
34.
11235.
34.
10950.
32.
10930.
33.
10720.
34.5
10420.
34.
10240.
0.
2.

Rob

Area 3449.5

995. WP

995.

3.466834171 R

3.466834171

0.67

2.300144689 R2/3

CL

Encroachment Plan 4A
Section J

1.
37.2
37.2
10255.
37.2
11075.
26.
11015.
26.
10845.
34.
10795.
34.5
10590.
32.5
10435.
33.
10255.
0.
2.

Rob

Area 4579.25

821. WP

5.577344702 R

5.577344702

0.67

3.163052613 R2/3

CL

Encroachment Plan 4A
Section J

1.
37.2
37.2
10070.
37.2
10255.
33.
10255.
22.
10205.
22.
10190.
35.5
10110.
0.
2.

Ch

Area 1423.

187. WP

2.609625668 R

2.609625668

0.67

3.251505316 R2/3

CL

Encroachment Plan 4A
Section K

1.
37.3
37.3
10195.
37.3
10195.
33.5
10195.
33.5
10130.
0.
Lob 2.
Area 247.

247.
247.
10195. WP
10130.
65. WP
65.
3.8 R
3.8
0.67
2.445991873 R2/3
CL
R2/3

Encroachment Plan 4A
Section K

1.
37.3
37.3
10195.
37.3
10340.
33.5
10340.
22.
10275.
22.
10265.
33.5
10195.
0.
Ch 2.
Area 1442.25
1442.25
147. WP
9.81122449 R
9.81122449
0.67
4.610006636 R2/3
CL

Encroachment Plan 4A
Section K

1.
37.3
37.3
10140.
37.3
10340.
34.
10340.
34.
10265.
26.
10615.
26.
10655.
32.
10615.
33.5
10415.
33.5
10340.
0.
Rob 2.
Area 3832.
566. WP
6.770018021 R
6.770018021
0.67
3.601704488 R2/3

Section ID	W.S. Elev	Area	WP	R	R ^{2/3}	Kx10 ⁻³	%KT	Q _{us}	Q _{ds}	$\bar{\phi}$	l	$l\bar{\phi}$	$\Sigma \frac{l\bar{\phi}}{\phi} = L$
A	35.0												
	Lob	1200	240	5	2.94	149.8	23	3427			80		
	Ch	1708	143	11.94	5.27	382.2	58	8744			80		
	Rob	<u>1230</u>	330	3.73	2.41	<u>125.9</u>	19	2879			80		
		4138				657.8							
B	35.0												
	Lob	1050	300	3.5	2.31	103.0	21	3130	3427	3279	65	213,109	139
	Ch	1546	163	9.49	4.51	296.0	60	8998	8744	8871	150	1,330,670	
	Rob	<u>980</u>	280	3.5	2.31	<u>96.1</u>	19	2922	2879	2900	190	<u>551,050</u>	
		3576				495.1						2,094,829	
C	35.4												
	Lob	312	80	3.9	2.49	33.0	7	977	3130	2058	45	92,629	296
	Ch	1692	153	11.06	5.00	359.2	71	10,746	8998	9872	340	3,356,531	
	Rob	<u>1088</u>	295	3.69	2.40	<u>110.9</u>	22	3317	2922	3119	320	<u>998,219</u>	
		3092				503.0						4,447,379	
	35.3												
	Lob	304	80	3.8	2.45	31.6	6	893	3130	2011	45	90,516	296
	Ch	1678	153	10.96	4.97	354.1	66	9977	8998	9498	340	3,229,203	
	Rob	<u>1290</u>	295	4.37	2.69	<u>147.3</u>	28	4160	2922	3541	320	<u>1,133,095</u>	
		3272				533.0						4,452,812	
D	35.4												
	Lob	663	170	3.9	2.49	70.1	16	2341	893	1617	170	274,897	159
	Ch	1528	148	10.32	4.78	310.1	69	10,357	9977	10,177	160	1,628,360	
	Rob	<u>588</u>	125	4.7	2.82	<u>70.4</u>	15	2352	9160	3256	150	<u>488,356</u>	
		2779				450.6						2,391,613	
E	35.9												
	Lob	264	60	4.4	2.70	50.3	6	932	2341	1636	460	752,771	397
	Ch	1360	118	11.52	5.14	296.8	61	9139	10,357	9748	400	3,899,354	
	Rob	<u>1179</u>	205	5.75	3.23	<u>161.7</u>	34	4979	2352	6666	360	<u>1,319,546</u>	

Cowskin Creek - 119th to 13th
 Section Properties - Encroachment Plan 4A

Pg 2 of 3

○

Section ID	W.S. Elev	Area	WP	R	R ²	Kx10 ³	%KT	Qus	Qds	$\bar{Q}$	L	$L\bar{Q}$	$\Sigma \frac{L\bar{Q}}{\bar{Q}} = L$
F	36.2												
Lob		446	95	4.7	2.82	53.4	11	1695	932	1314	460	604,289	393
Ch		1298	11.3	11.49	5.13	282.7	60	8976	9139	9057	400	3,622,930	
Rob		1152	245	4.7	2.82	137.9	29	4379	4979	4679	360	1,684,440	
		2896				474.0						5,911,659	
G	36.2												
Lob		160	50	3.2	2.18	14.8	3	431	1645	1063	170	180,715	199
Ch		1500	162	9.26	4.44	282.8	55	8231	8976	8603	190	1,634,642	
Rob		1233	390	4.7	2.82	219.5	42	6388	4379	5384	220	1,184,390	
		3493				517.0						2,999,747	
	36.5												
Lob		175	50	3.5	2.31	17.2	3	462	1695	1079	170	183,356	199
Ch		1548	162	9.55	4.54	298.4	53	8034	8976	8505	190	1,615,959	
Rob		1950	390	5	2.94	243.4	44	6554	4379	5466	220	1,202,606	
		3673				559.0						3,001,921	
H	37.0												
Lob		288	115	2.50	1.85	22.6	2	373	462	418	760	317,300	679
Ch		1436	142	10.11	4.71	287.2	31	4737	8034	6386	840	5,363,820	
Rob		4638	875	5.30	3.06	602.6	67	9940	6554	8247	550	4,535,850	
		6362				912.3						10,216,970	
I	37.1												
Lob		0	0	0	0	0	0	0	373	186	270	50,355	254
Ch		1598	198	8.07	4.05	274.8	45	6761	4737	5749	260	1,494,713	
Rob		3450	995	3.47	2.30	336.9	55	8289	9940	9115	250	2,278,651	
		5048				611.7						3,823,719	
J	37.2												
Lob		0	0	0	0	0	0	0	0	0	0	0	212
Ch		1423	187	7.61	3.90	235.6	28	4172	6761	5467	250	1,366,640	
Rob		4579	821	5.58	3.16	614.3	72	10,878	8289	9583	190	1,820,854	
		6002				850.0						3,187,494	

Cowskin Creek - 119th to 13th

Section Properties - Encroachment plan & A

Section I.D.	W.S. Elev.	Area	W.P.	R	R ² /3	Kx10 ³ %KT	Q _{us}	Q _{ds}	$\bar{Q}$	L	L $\bar{Q}$	$\frac{\sum L\bar{Q}}{Q} = L$
K	37.3											
Lob		247	65	3.8	2.45	25.7	3	434	0	217	320	69,490
Ch		1422	147	9.81	4.62	278.9	31	4715	4172	4443	320	1,421,917
Rb		<u>3832</u>	566	6.77	<u>3.60</u>	<u>585.7</u>	66	9901	10,878	10,389	240	<u>2,493,445</u>
		5501				890.3						3,984,852

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BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Encroachment Plan 4A

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119th Street West to 13th Street (Walnut Valley and

Computed by: MSM Date Mar 1983

Whistling Walk Estates 4th Additions)

Checked by: MSM Date Mar 1983

- River Mile

C 119th per

FIS Q = 15050 cfs = 100Yr FIS n = .035

R 345 FIS, HEC-2 CWSEL
w/Field survey

File or Sec. No.	Reach Length	Est. M.S. Elev.	Area	2/3 r	K m ³ /s	K ₁₀ x 10 ³	Sp	hf	K/A ² x 10 ⁶	α	V	αV ² 2g	h _v	h _o	H	Comp. Elev.	ΔH
20.974	Top Width	1190	6211	3.06	956					1	2.38	.09				1335.05	
Sac A		1335.0	1200	2.94	149.8				2334								
			1708	5.27	382.2				1933								
			1230	2.41	125.9				1318								
	80		4138		657.8	806.9	.00035	.03	23784	1.37	3.64	.28	7.19	.06	7.10	1334.95	ΔH = 7.05 OK
Sac B		1335.0	1050	2.31	103.0				991								
			1546	4.51	296.0				1084								
			980	2.31	96.1				925								
	139		3576		495.1	576.5	.00068	.09	12769	1.35	4.21	.37	7.09	.01	.01	1334.96	ΔH = 7.04 OK
Sac C		1335.4	312	2.49	33.0				369								
			1692	5.00	359.2				16187								
			1088	2.40	110.9				1151								
	296		3092		503.0	499.1	.00071	.27	11707	1.33	4.87	.49	7.08	.01	.20	1335.16	ΔH = 7.24 7.05 Low
		1335.3	304	2.45	31.6				342								
			1678	4.97	354.1				1574								
			1290	2.69	147.3				1422								
	296		3272		533.0	518.0	.00084	.25	13030	1.27	4.60	.42	7.05	.02	.22	1335.18	ΔH = 7.12 OK

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Encroachment Plan 4A

Page 2 of 4

119th Street West to 13th Street (Walnut Valley

Computed by: MSM Date Mar 1983

& Whistling Walk Estates 4th Additions)

Checked by: MSM Date Mar 1983

Q = 15050 cfs = 100 YR FIS n = 0.35

File or Sec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	K $\frac{K^2}{R^2} \times 10^3$	$\frac{K^2}{R^2}$	Sp	hf	K/A $\frac{K^2}{R^2}$	OK	V	$\frac{\alpha V^2}{2g}$	h _v	h _o	H	Comp. Elev.
Sec C					533.0					1.27	4.60	.42				1335.18
Sec D		1335.4	663	2.49	70.1				783							
			1528	4.78	310.1				1272							
			588	2.82	70.4				1009							
	159		2779		450.6	491.8	.00094	.15	14567	1.23	5.42	.56	-.06	.02	.11	1335.29
Sec E		1335.9	264	2.70	30.3				378							
			1360	5.14	276.8				1435							
			1179	3.23	161.7				3041							
	397		2803		488.7	469.7	.00103	.41	1753	1.18	5.37	.53	.04	.01	.46	1335.75
Sec F		1336.2	446	2.82	53.4				766							
			1298	5.13	282.7				1542							
			1152	2.82	137.9				1777							
	393		2896		474.0	481.4	.00098	.58	16154	1.27	5.20	.53	0	0	.58	1336.13
Sec G		1336.2	160	2.18	14.8				127							
			1500	4.44	282.8				10048							
			1833	2.82	219.5				3166							
		199	3493		571.0	495.5	.00092	.18	13521	1.18	4.31	.54	.19	.02	.59	1336.52
																low
																high

ΔH =
-.11
OK

ΔH =
-.15
OK

ΔH =
-.07
OK

ΔH =
+.32
low

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Encroachment Plan 4A
119th Street West to 13th Street (Walnut Valley and
Whistling Walk Estates 4th Additions)

Page

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4

Computed by: MSM Date Mar 1983

Checked by: MSM Date Mar 1983

Q = 15050 cfs = 100 Yr FIS n = .035

Mile or Sec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	K m ³ /s	$\frac{K^2}{n^2} \times 10^3$	Sp	hf	K/A ² m ³ /s ²	α	V	$\frac{\alpha V^2}{2g}$	h _v	h _o	H	Comp. Elev.
Sec F	436	1336.2	2896		474.0		.00098	.38		1.27	5.20	.53	0	0	.38	1336.13
Sec G		1336.5	1751	2.31	17.2				165							
			1548	4.54	298.4				11086							
			1950	2.94	243.4				3793							
	199		3673		559.0	516.5	.00085	.17	15044	1.16	4.10	.30	.23	.02	.42	1336.55
Sec H		1337.0	288	1.85	22.6				139							
			1436	4.71	287.2				11483							
			4638	3.06	603.6				10171							
	679		6362		912.3	735.6	.00042	.29	21794	1.16	2.37	.10	.20	.02	.52	1337.07
Sec I		1337.1	0	0	0				0							
			1598	4.05	274.8				8124							
			3450	2.30	336.9				3212							
	254		5048		611.7	762.0	.00039	.10	11337	1.26	2.98	.17	.07	.02	.05	1337.12
Sec J		1337.2	0	0	0				0							
			1423	3.90	235.6				4460							
			4579	3.16	614.3				11058							
	212		6002		850.0	730.8	.00042	.09	17518	1.03	2.50	.10	.07	.01	.17	1337.29

$\Delta H = 1.05$
OK

$\Delta H = 1.07$
OK

$\Delta H = 1.02$
OK

$\Delta H = 1.09$
OK

BACKWATER COMPUTATION WORK SHEET

Project: Cowskin Creek - Encroachment Plan 4-A
119th Street West to 13th Street (Walnut Valley
and Whistling Walk Estates 4th Additions)

$$15050 \text{ cfs} = 100 \text{ YE FTS}$$

$$n = \frac{.035}{100}$$
Page 4 of 2

Computed by: MSM Date Mar 1983

Checked by: M.S.M Date Mar, 1983

[illegible]