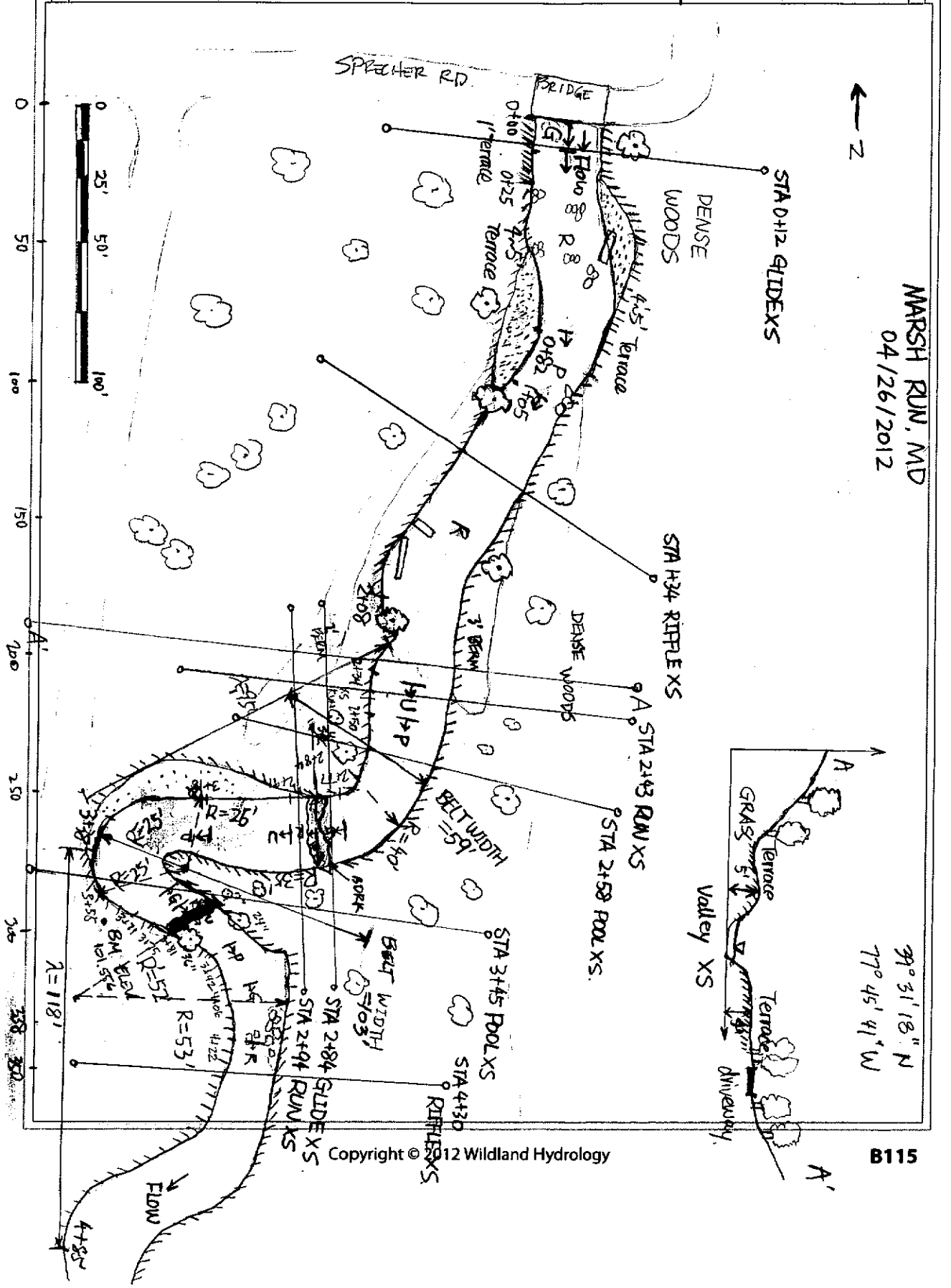
AREA-SITE LOCATION....REACH MAP

Stream: Marsh Run Reach: 2

Drawn By: HQ / JG Date: April 26, 2012



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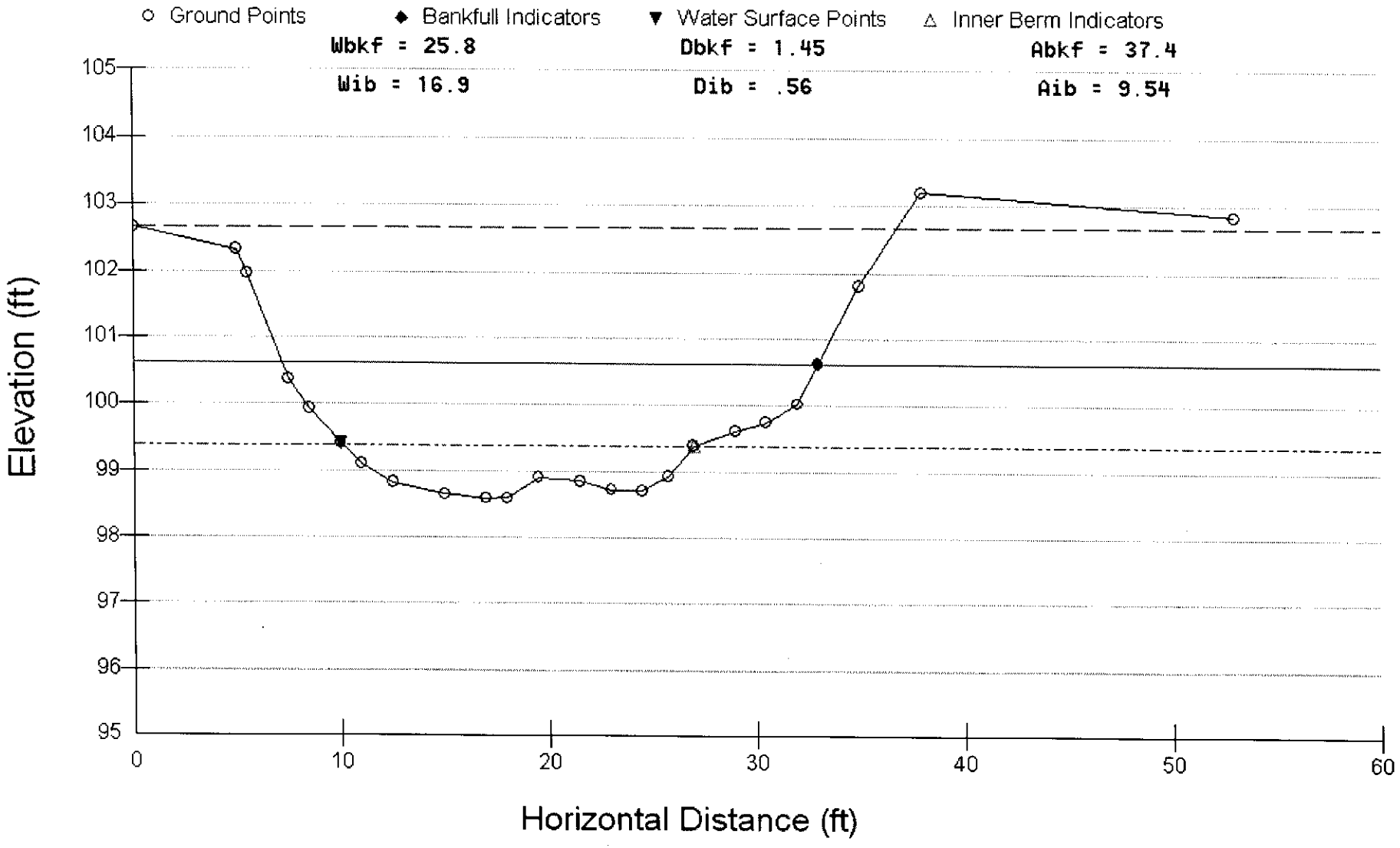
Riffle 1+34


Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 25.8
Dbkf = 1.45
Abkf = 37.4
Wib = 16.9
Dib = .56
Aib = 9.54
105
104
103
102
101
100
99
98
97
96
95
Elevation (ft)
0
10
20
30
40
50
60
Horizontal Distance (ft)

SURVEY DATA → CROSS - SECTION 2

SITE: Riffle 1+34 JK/SH Date: 4/26/12

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29						
30	0+00		5.26			
31	5		5.59			TOB
32	5.5		5.94			
33	7.5		7.54			BKFL *
34	8.5		7.98			
35	10		8.49			LEW
36	11		8.80			
37	12.5		9.08			
38	15		9.25			
39	17		9.32			
40	18		9.31			TWG
41	19.5		9.0			
42	21.5		9.05			
43	23		9.18			
44	~~24.5~~		9.19			
45	25.8		8.97			
46	27		8.52			REW
47	29		8.30			
48	30.5		8.16			
49	32		7.89			
50	~~32.8~~ 33		7.29			? BKFL ?
51	35		6.10			
52	38		4.73			
53	53		5.08			
54						
55						
56						
57						
58						
59						

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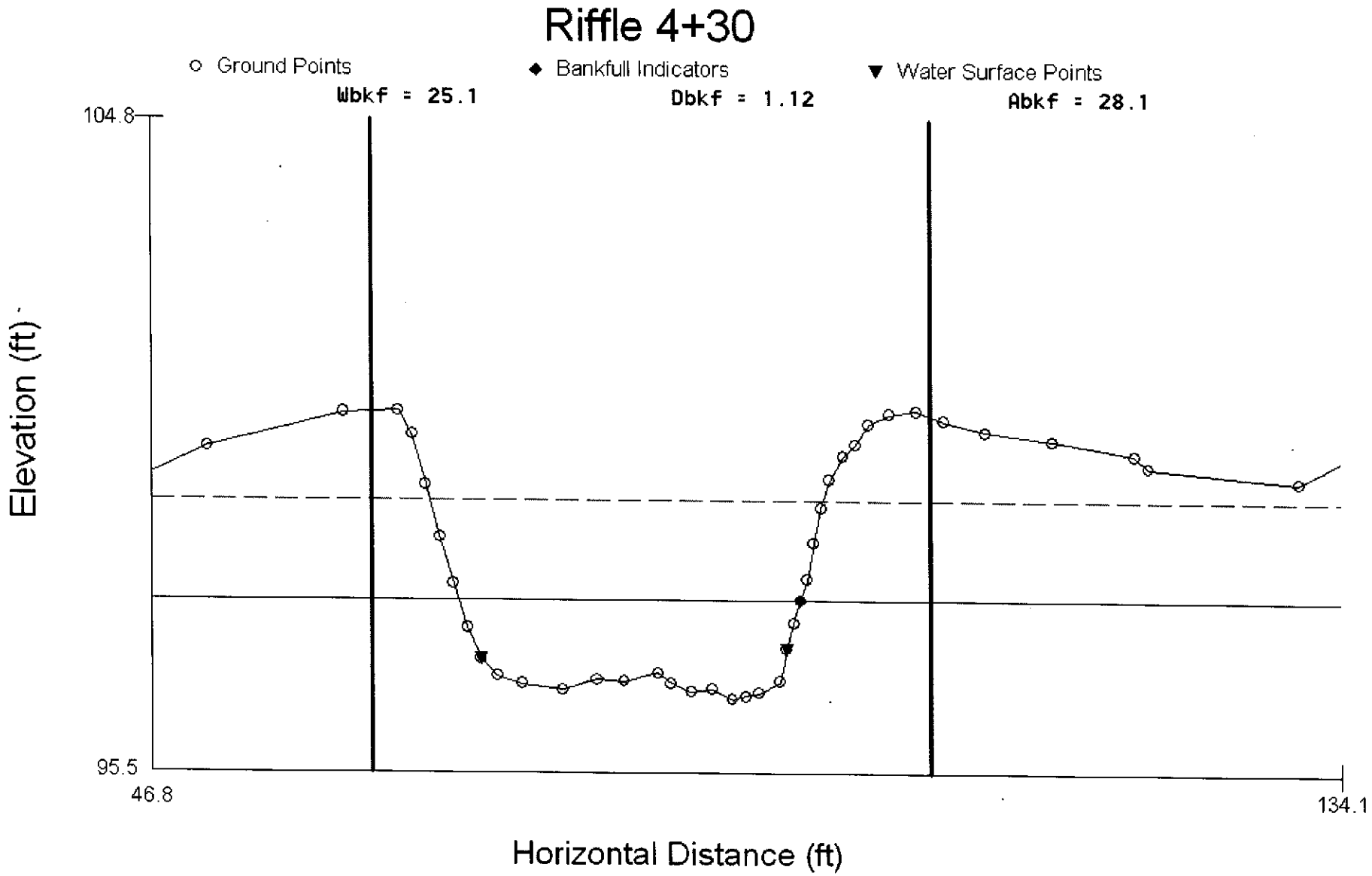
Riffle 4+30
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 25.1
Dbkf = 1.12
Abkf = 28.1
104.8
95.5
46.8
134.1
Elevation (ft)
Horizontal Distance (ft)

SURVEY DATA → CROSS - SECTION 1

SITE: R1 Ag1 T#2: 4.59 Date: 4/26/12

Location: Marsh Run Creek LP Sta: 4+30

Party / Notes: HUC:

Item	Distance, Point, or STATION ft	Back-Sight B S ft	Height of Instrument H I ft	Fore-Sight F S ft	Elevation ft	REMARKS / COMMENTS / NOTES
1	0.0			5.30		
2	15.0			5.39		
3	24.0			6.27		
4	30.0			6.44		
5	38.0			6.24		
6	51.0			5.04		
7	61.0			4.55		
8	65.0			4.52		
9	66.0			4.86		
10	67.0			4.58		
11	68.0			6.32		
12	69.0			6.99		BKF ??
13	70.0			7.61		
14	71.0			8.06		LEW
15	72.2			8.31		
16	74.0			8.42		
17	77.0			8.50		
18	79.5			8.36		Start Bedrock ledge
19	81.5			8.38		
20	84.0			8.26		
21	85.0			8.41		
22	86.5			8.53		
23	88.0			8.49		
24	89.5			8.65		TW
25	90.5			8.60		
26	91.5			8.55		
27	93.0			8.38		
28	93.5			7.92		REW

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SURVEY DATA → CROSS - SECTION 2

SITE: R1 Pg 2 **Date:**

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	94.0			7.54		
30	94.5			7.22		
31	95.0			6.92		BKF?
32	95.5			6.39		
33	96.0			5.89		
34	96.6			5.49		
35	97.6			5.16		
36	98.5			4.99		
37	99.5			4.69		
38	101.0			4.55		
39	103.0			4.50		
40	105.0			4.64		
41	108.0			4.80		
42	113.0			4.93		
43	119.0			5.13		
44	120.0			5.31		Edge of Road
45	131.0			5.59		Edge of Road
46	135.0			5.11		
47	142.0			4.12		
48	150.0			2.48		
49	155.0			0.98		
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						

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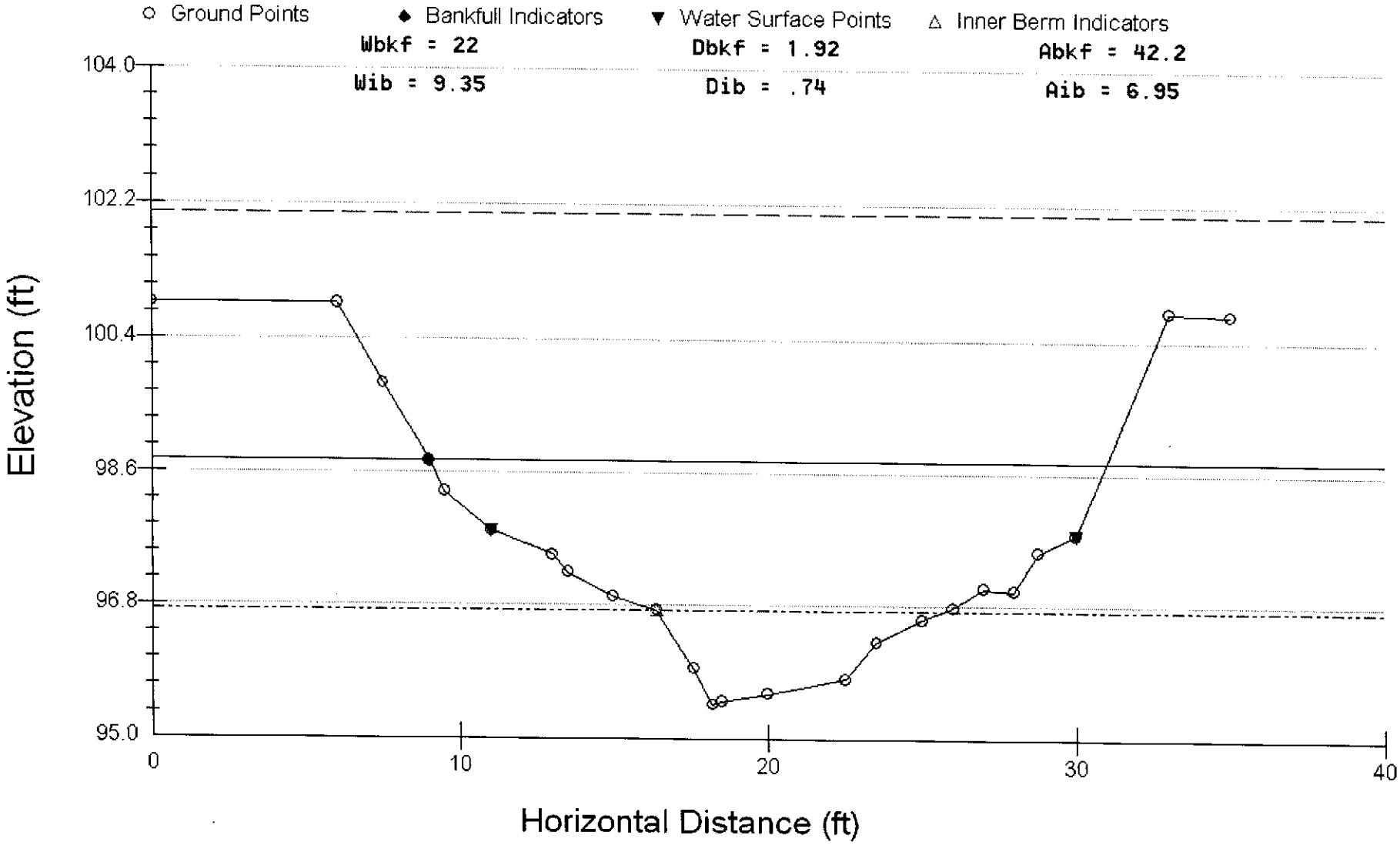
Pool 2+58


Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 22
Wib = 9.35
Dbkf = 1.92
Dib = .74
Abkf = 42.2
Aib = 6.95
104.0
102.2
100.4
98.6
96.8
95.0
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)

SURVEY DATA ⟹ **CROSS - SECTION 4**

SITE: Z+58 Pool JK/NH Date: 4/26/12

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29		4.94				Pin
30						
31	0		4.68			
32	6		4.68			TOB
33	7.5		5.76			
34	9		6.80			BKFL
35	9.5		7.22			
36	11		7.75			LEW
37	13		8.08			
38	13.5		8.32			
39	15		8.64			
40	16.4		8.82			
41	17.6		9.61			
42	18.2		10.10	< 10.06		
43	20		9.95			
44	22.5		9.75			
45	23.5		9.24			
46	25		8.94			
47	26		8.78			
48	27		8.52			
49	28		8.55			
50	28.8		8.03			
51	30		7.79			REW
52	33		4.76			
53	45		4.80			
54						
55						
56						
57						
58						
59						

6.57

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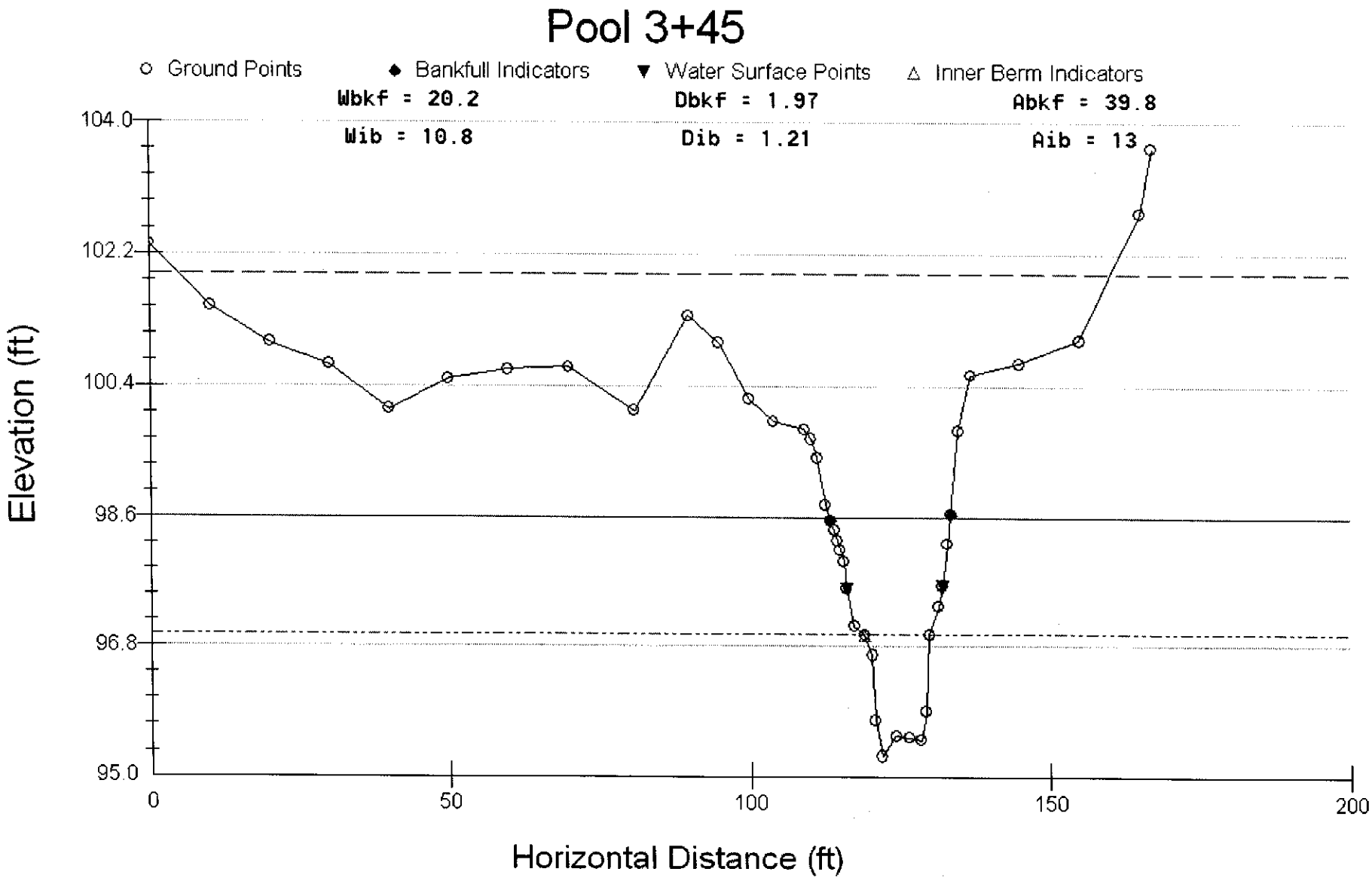
Pool 3+45
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 20.2
Dbkf = 1.97
Abkf = 39.8
Wib = 10.8
Dib = 1.21
Aib = 13
104.0
102.2
100.4
98.6
96.8
95.0
Elevation (ft)
0
50
100
150
200
Horizontal Distance (ft)

Top pin 101.556 near 68

4,225 ~~feet~~ static

SURVEY DATA → **CROSS - SECTION** 5

SITE: LP STA:345 Pool #1 Pyl **Date:** Apr. 26 2012

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
29	0			2.52		Edge Woods
30	10			3.35		
31	20			3.85		
32	30			4.15		
33	40			4.76		
34	50			4.34		
35	60			4.22		
36	70			4.18		
37	81			4.78		LB swale
38	90			3.48		Top
39	95			3.85		
40	100			4.62		
41	104			4.92		
42	109			5.02		
43	110.2			5.16		
44	111.2			5.42		
45	112.0			6.06		
46	113.4			6.28		BKF
47	114			6.41		
48	114.6			6.56		
49	115			6.69		
50	115.6			6.85		
51	116.1			7.24		LB W.
52	117.3			7.76		
53	119			7.88		
54	120.3			8.16		
55	120.8			9.06		
56	121.9			9.56		Thal
57	124.2			9.28		
58	126.4			9.3		
59	128.4			9.34		

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SURVEY DATA → CROSS - SECTION 6

SITE: Plug SC/CM Date: 4/26/12

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	129.3			8.94		
30	129.8			7.88		
31	131.5			7.49		
32	132.1			7.20		RB w
33	133			6.61		
34	133.5			6.20		BKf??
35	134.8			5.05		
36	~~136.5~~	137.		4.28		
37	145			4.12		Road middle
38	155			3.80		far Road
39	165			2.08		
40	167			1.18		
41						
42	Glpgl	SC/CM				4/26/12
43	0.0			3.95		
44	4.0			4.13		
45	8.0			4.24		
46	12.0			4.47		
47	15.0			4.56		
48	17.0			4.58		
49	20.0			4.60		
50	22.0			4.55		
51	23.3			4.62		LTob
52	24.2			5.12		
53	25.0			5.55		
54	26.0			5.96		
55	26.5			6.23		BKF
56	27.4			6.58		
57	28.3			6.67		
58	29.2			7.19		LEW
59	29.7			7.33		

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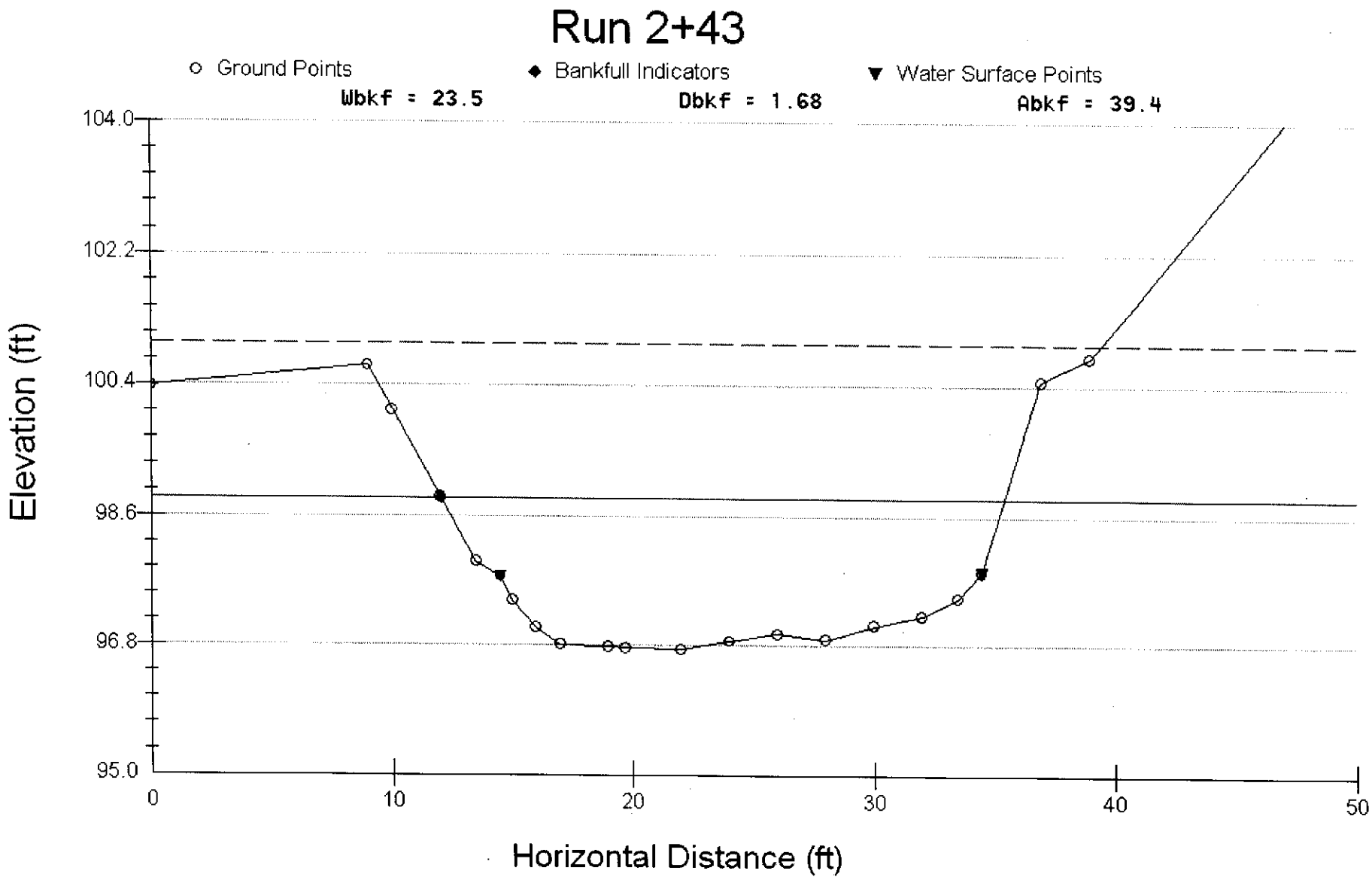
Run 2+43
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 23.5
Dbkf = 1.68
Abkf = 39.4
104.0
102.2
100.4
98.6
96.8
95.0
Elevation (ft)
0
10
20
30
40
50
Horizontal Distance (ft)

SURVEY DATA → **CROSS - SECTION 3**

SITE: Run Z+43 **Date:** 4/26/12

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29		4.94	[illegible]			Pin
30						
31	0		5.19			
32	9		4.90			TOB
33	10		5.51			
34	12		4.70			BKFL ✱
35	13.5		7.60			
36	14.5		7.80			LEW
37	15		8.14			
38	16		8.52			
39	17		8.75			
40	19		8.78			
41	19.7		8.79			
42	22		8.81			
43	24		8.70			TWG
44	26		8.10			
45	28		8.08			
46	30		8.18			
47	32		8.35			
48	33.5		8.10			
49	34.5		7.74			REW
50	37		5.10			
51	39		4.77			
52	49		4.75			
53						
54						
55						
56						
57						
58						
59						

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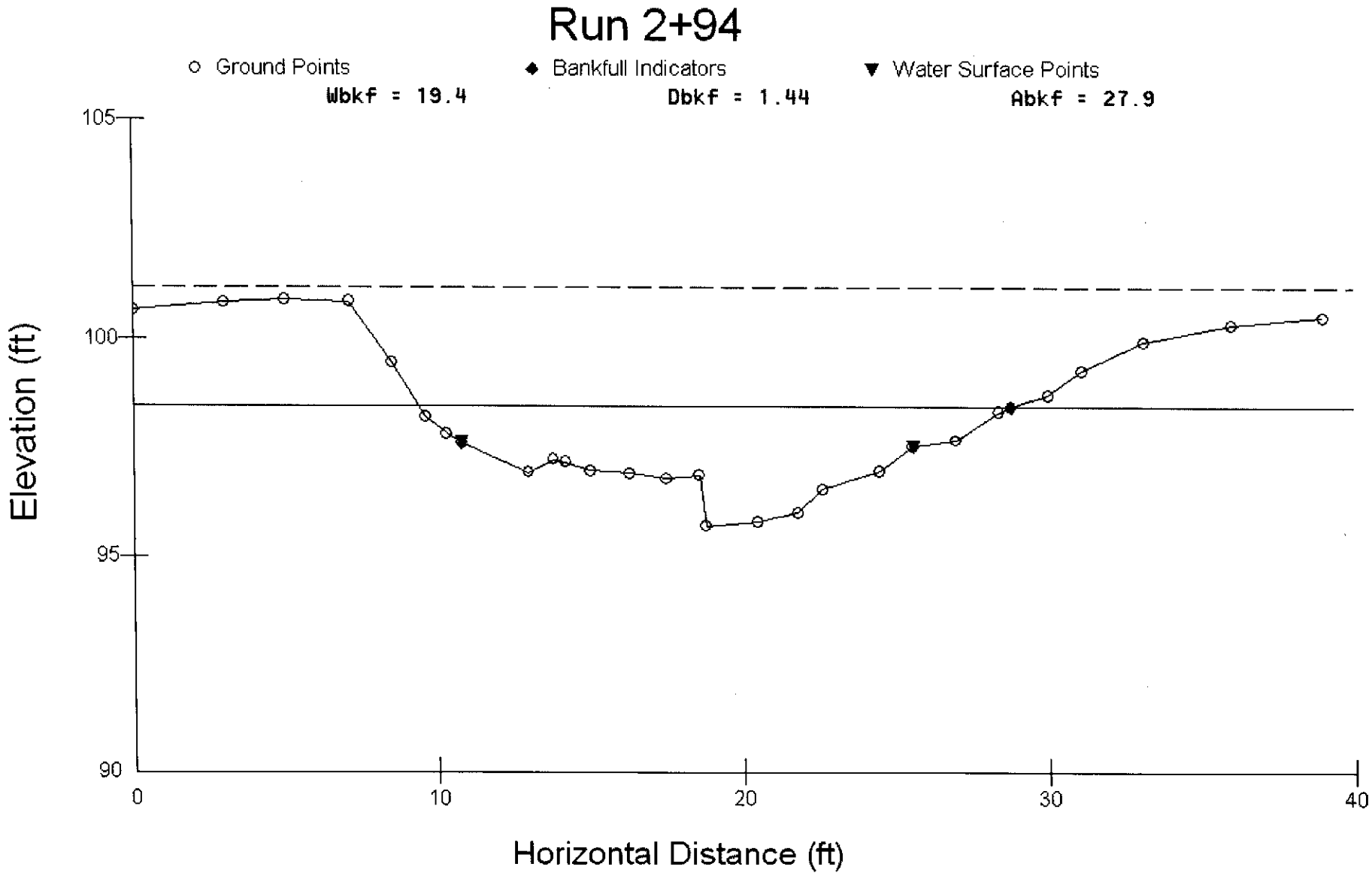
Run 2+94
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 19.4
Dbkf = 1.44
Abkf = 27.9
105
100
95
90
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)

SURVEY DATA → **CROSS - SECTION 8**

SITE: G1 P3 CM/SC Date: 4/26/12

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	55.0			4.32		
30	59.0			4.84		
31	64.0			4.05		
32						
33	Run			4		
34	0			4.18		
35	3			3.99		
36	5			3.94		
37	7.1			3.98		LB Top
38	8.5			5.38		
39	9.6			6.63		
40	10.3			7.02		
41	10.8			7.22		LB Water
42	13			7.90		
43	13.8			7.60		
44	14.2			7.66		Inner Berm
45	15			7.86		Lower Inner Berm
46	16.3			7.92		
47	17.5			8.04		
48	18.6			7.96		
49	18.8			9.13		
50	20.5			9.02		
51	21.8			8.82		
52	22.6			8.28		
53	24.5			7.85		
54	25.6			7.28		RB water
55	27.0			7.16		
56	28.4			6.5		
57	28.8			6.39		BKF
58	30			6.12		
59	31.1			5.55		

Dist 294

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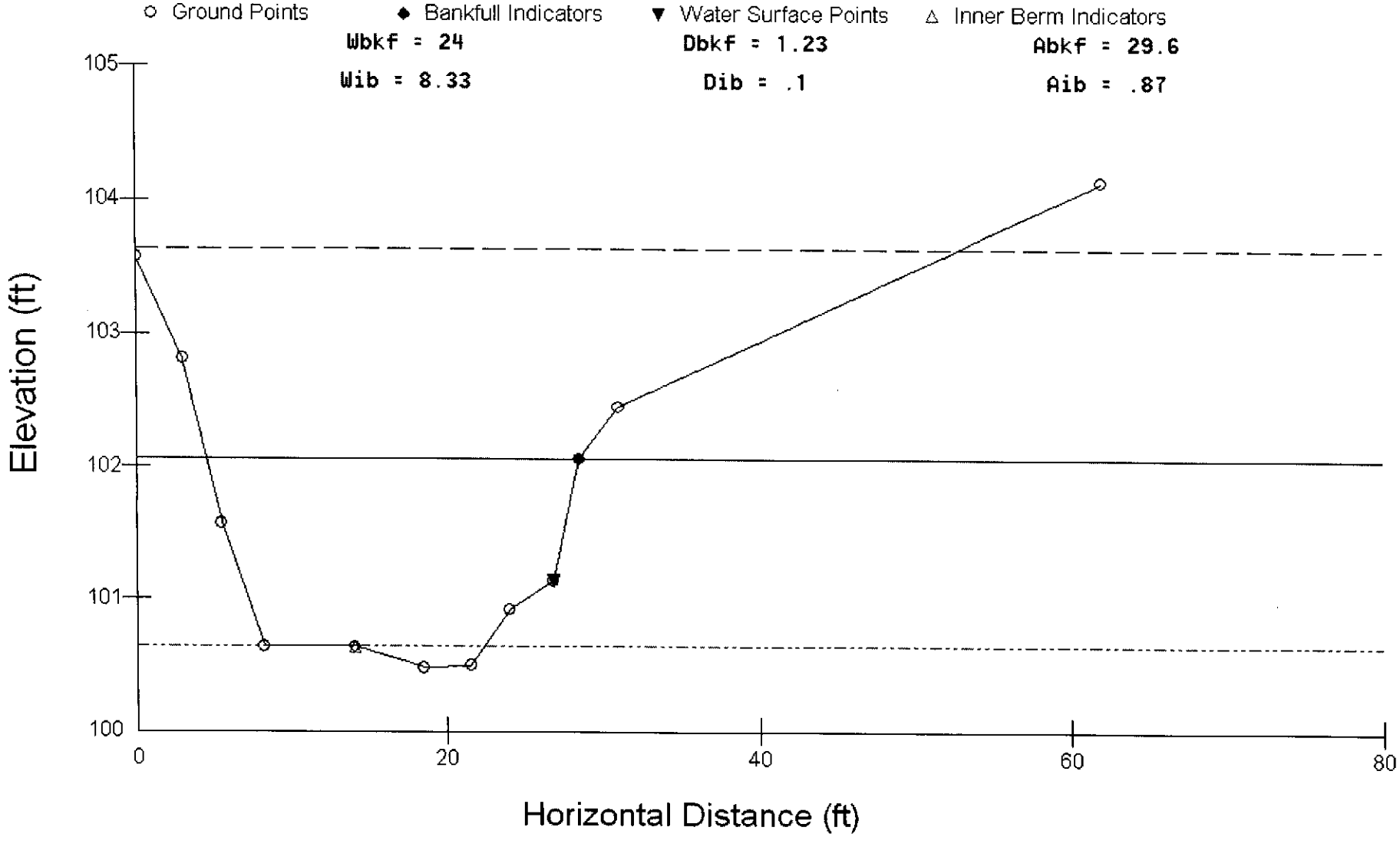
	dist	FS	
60	33.1	4.90	
61	36.0	4.50	
62	39	4.32	End of Run

Glide 0+12


○ Ground Points
◆ Bankfull Indicators
▼ Water Surface Points
△ Inner Berm Indicators
Wbkf = 24
Wib = 8.33
Dbkf = 1.23
Dib = .1
Abkf = 29.6
Aib = .87
105
104
103
102
101
100
Elevation (ft)
0
20
40
60
80
Horizontal Distance (ft)

SURVEY DATA → **CROSS - SECTION** 1

SITE: Date: 4/26/12

Location: Marsh Run GLIDE ~~RIFFLE~~ 10+12

Party / Notes: JK / JH HUC:

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	REMARKS / COMMENTS / NOTES
1					0.8	Benchmark 10.7.106
2	0	4.34				
3	3	5.10				
4	5.5	6.34				LBF
5	8.2	7.27				LEW
6	10.5	8.80				
7	14	7.27				
8	18.5	7.43				TWG
9	21.5	7.41				
10	24	6.99				
11	26.8	6.77				REW
12	28.5	5.85				RBF
13	31	5.45				
14	62	3.78				
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						

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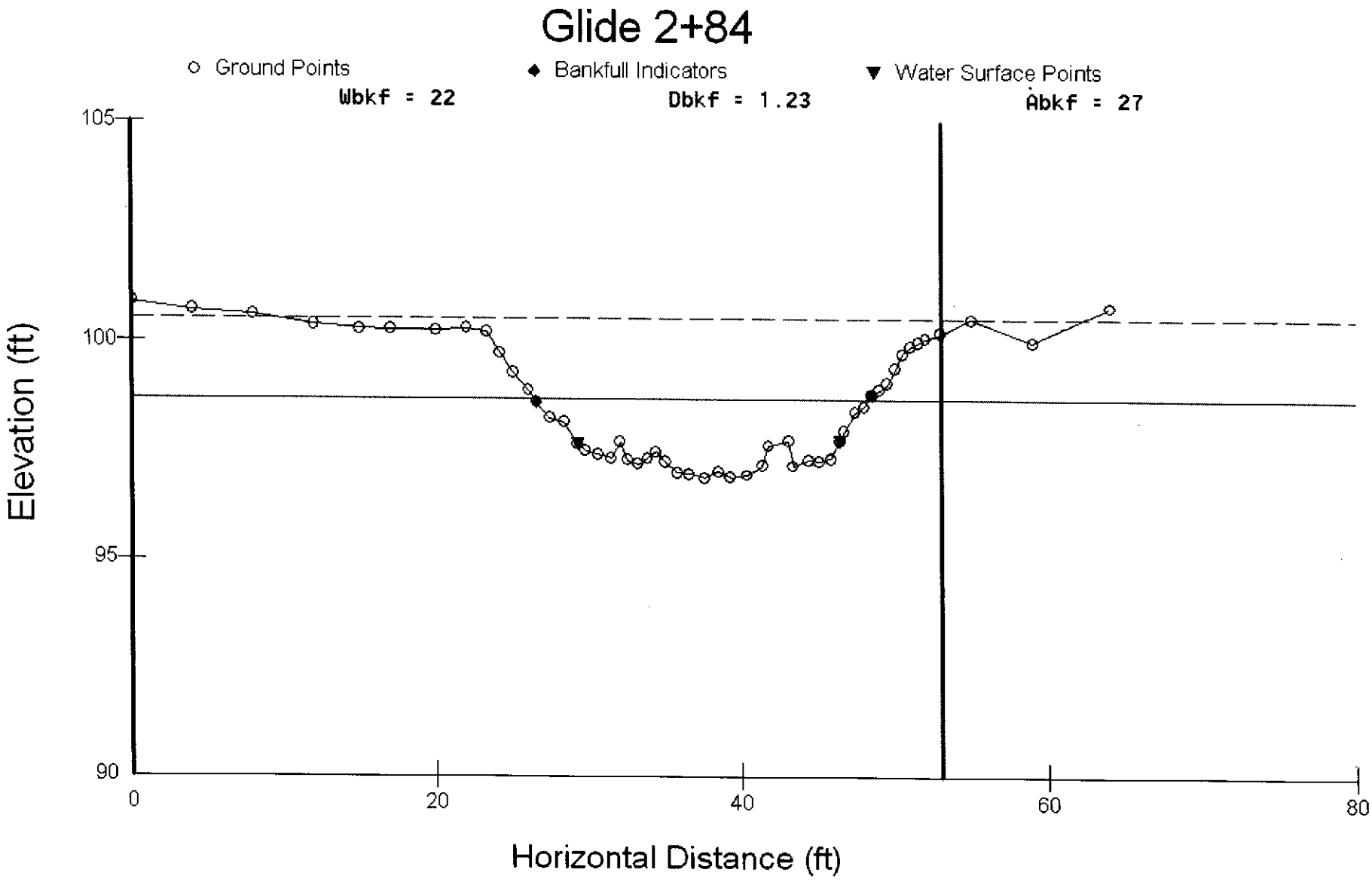
Glide 2+84
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 22
Dbkf = 1.23
Abkf = 27
105
100
95
90
Elevation (ft)
0
20
40
60
80
Horizontal Distance (ft)

Station 2+84 Glide #1

41						
42	Glide	SKEM				4/26/12
43	0.0			3.95		
44	4.0			4.13		
45	8.0			4.24		
46	12.0			4.47		
47	15.0			4.56		
48	17.0			4.58		
49	20.0			4.60		
50	22.0			4.55		
51	23.3			4.62		LTob
52	24.2			5.12		
53	25.0			5.55		
54	26.0			5.96		
55	26.5			6.23		BKF
56	27.4			6.58		
57	28.3			6.67		
58	29.2			7.19		LEW
59	29.7			7.33		

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SURVEY DATA → CROSS - SECTION 7

π #1: 4.72 SITE: G1 pg CM/SC LP St A: 284 Date: 4/26/12

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	30.5			7.41		
30	31.4			7.50		CS
31	32.0			7.12		ROCK
32	32.5			7.54		CS
33	33.2			7.63		
34	33.8			7.75		
35	34.4			7.35		ROCK
36	35.0			7.58		ROCK
37	35.8			7.83		
38	36.6			7.86		
39	37.6			7.95		
40	38.5			7.80		
41	39.3			7.93		
42	40.4			7.88		
43	41.4			7.66		
44	41.8			7.20		ROCK
45	43.1			7.09		
46	43.4			7.67		ROCK
47	44.4			7.53		
48	45.1			7.56		
49	45.8			7.50		
50	46.4			7.09		REW
51	46.7			6.86		
52	47.4			6.44		
53	48.0			6.30		
54	48.5			6.04		BKF ??
55	49.0			5.93		
56	49.5			5.78		
57	50.0			5.44		
58	50.5			5.11		
59	51.0			4.94		
	51.5			4.85		
	52.0			4.76		
	53.0			4.64		

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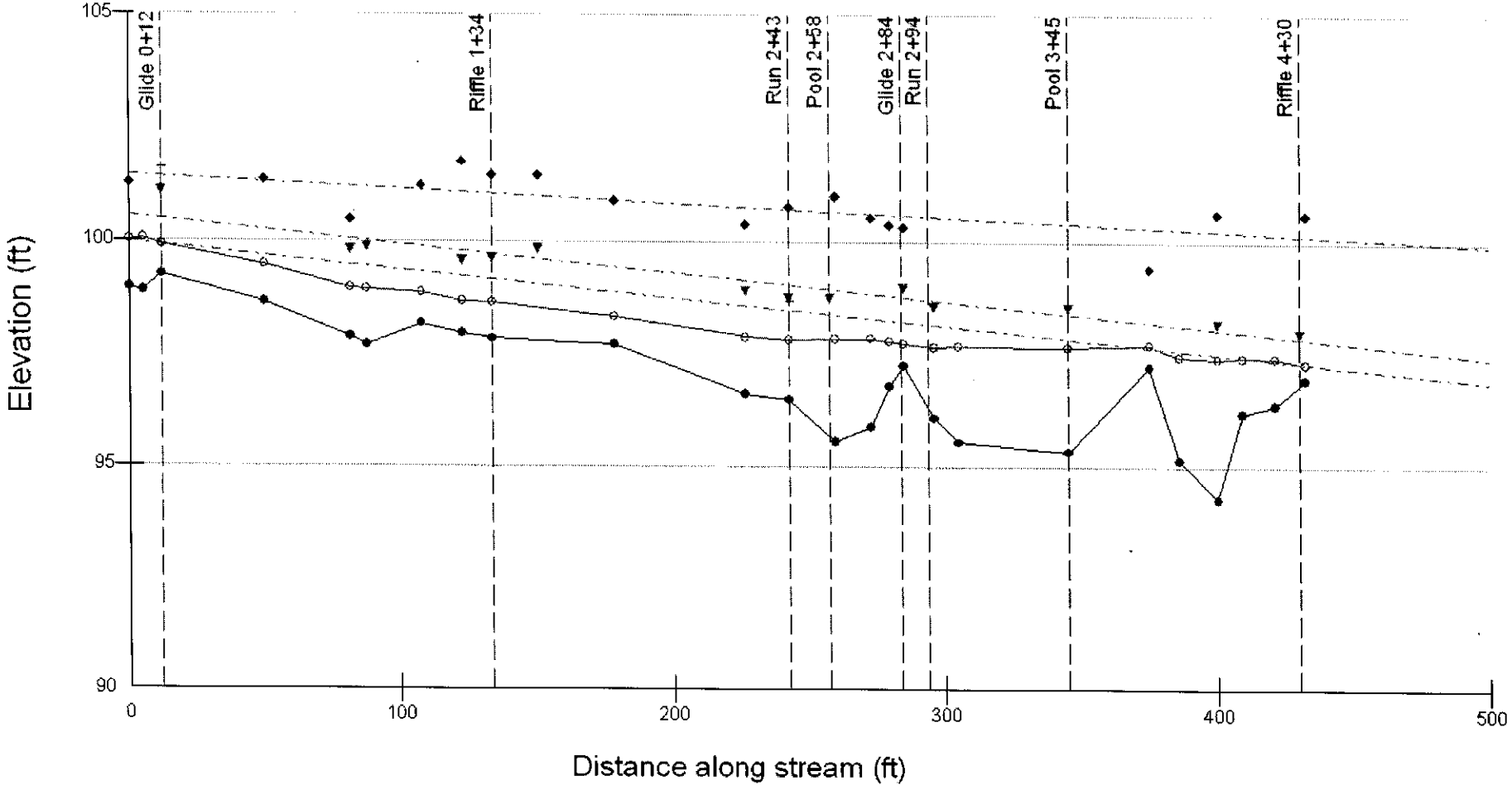
SURVEY DATA → CROSS - SECTION 8

SITE: G1 B3 CM/SC Date: 4/26/12

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	55.0			4.32		
30	59.0			4.84		
31	64.0			4.05		

Longitudinal Profile - Marsh Run Reach 2



SURVEY DATA → LONGITUDINAL PROFILE 1

SITE: Team 2 Joe & Clint **Date:** 4/26/11

Location: Marsh Run @ Grimes, MD

Party / Notes: BM 107.106 **HUC:**

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Thalweg Fore-Sight FS ft	Thalweg Elevation Elev. ft	Water Surface Fore-Sight FS ft	Water Surface Elevation Elev. ft	Bankfull Fore-Sight FS ft	Bankfull Elevation Elev. ft	Low Bank HI Fore-Sight FS ft	Low Bank HI Elevation Elev. ft	NOTES e.g. Riffle Run Pool Glide	
1	BM1	3.99	111.096	3.98									closed 3.98
2	0			12.15		11.10				9.86		TG	
3	5			12.21		11.07						~~TAR~~ MG	
4	12			11.85		11.19		10.03				TR	XS
5	50			12.45		11.62				9.77		MR	
6	82			13.23		12.15		11.35		10.62		TP	
7	88			13.40		12.17		11.23				MP	
8	108			12.93		12.25				9.91		TR	
9	123			13.14		12.43		11.53		9.38		MR	
10	151							11.26		9.68			
11	134			13.26		12.46				9.67		R XS	
12	TP1	5.69	106.31	10.58	100.62							TP1	
13	179			8.58		7.97				5.43		R_{mid}	
14	227			9.69		8.42		7.39		5.93		U	
15	243			9.81		8.48		7.55		5.56		P	XS
16	260			10.75		8.46				5.32		P_{max}	XS
17	273			10.41		8.45				5.79		G	
18	280			9.52		8.58				5.94		G_{mid}	
19	285			9.06		8.56		7.33		5.99		U	
20	296			10.22		8.69		7.74				U_{mid}	
21	305			10.76		8.62						P	
22	345			10.97		8.65						P_{max}	XS
23	375			9.07		8.59				6.89		R	
24	386			11.17		8.84						P	
25	400			12.05		8.89		8.12		5.68		P_{max}	
26	409			10.1		8.86						TG	
27	421			9.93		8.87						G_{max}	

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Station tape at REW.

SURVEY DATA → LONGITUDINAL PROFILE 2

SITE: Team 2 Joe, Clint Date: 4/26/11

Location: Marsh Run @ Grimes

Party / Notes: HUC: _ _ _ _ _ _ _ _ _ _ _ _

	Distance, Point, or	Back-Sight	Height of Instru-ment	Thalweg		Water Surface		Bankfull		Low Bank HI		NOTES
				Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	e.g. Riffle Run Pool Glide
	STATION	BS	HI	FS	Elev.	FS	Elev.	FS	Elev.	FS	Elev.	
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	
28	432			9.35		9.0	9	8.09*		5.7		TR
29												
30	356							7.86				
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												

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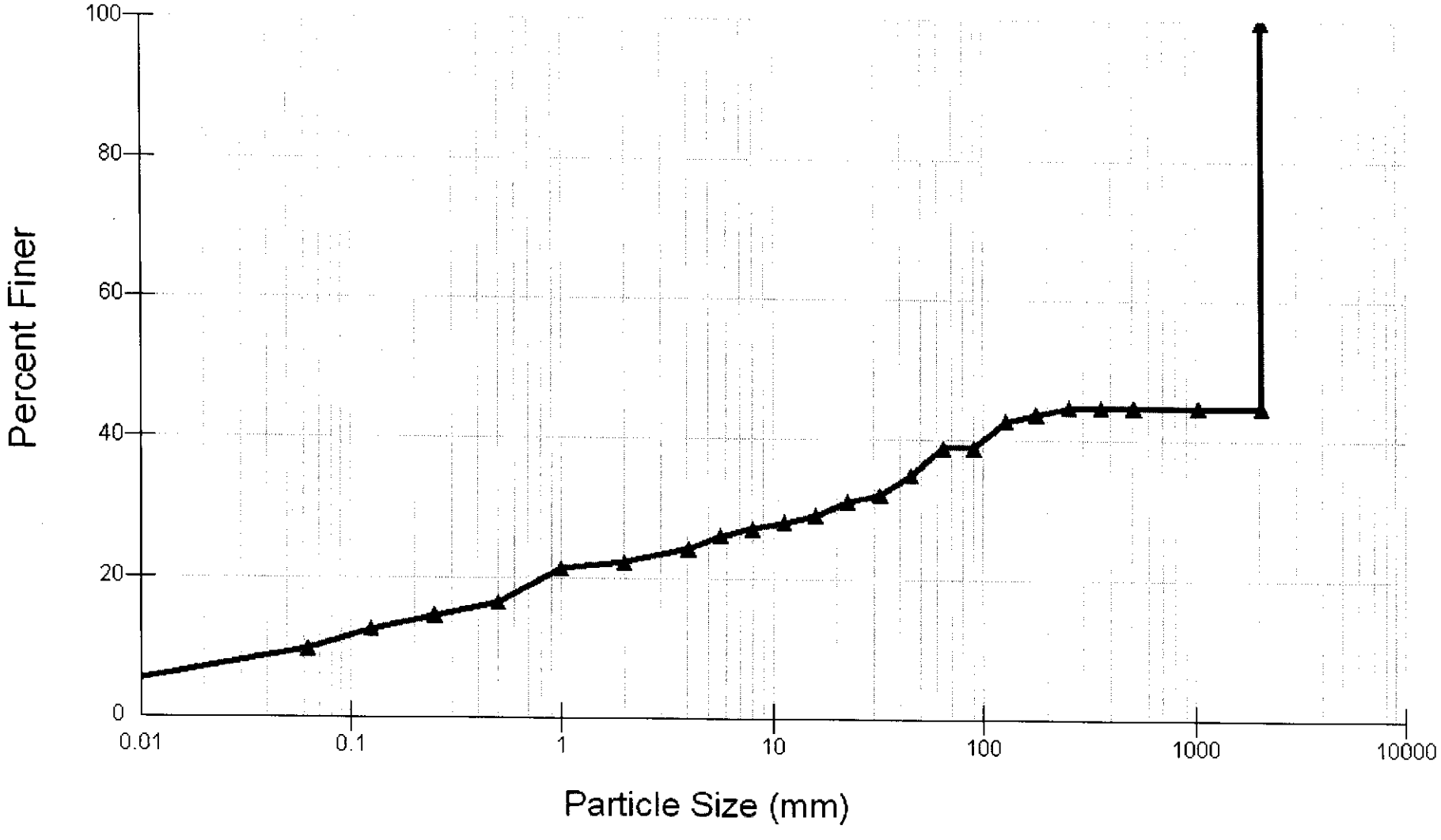
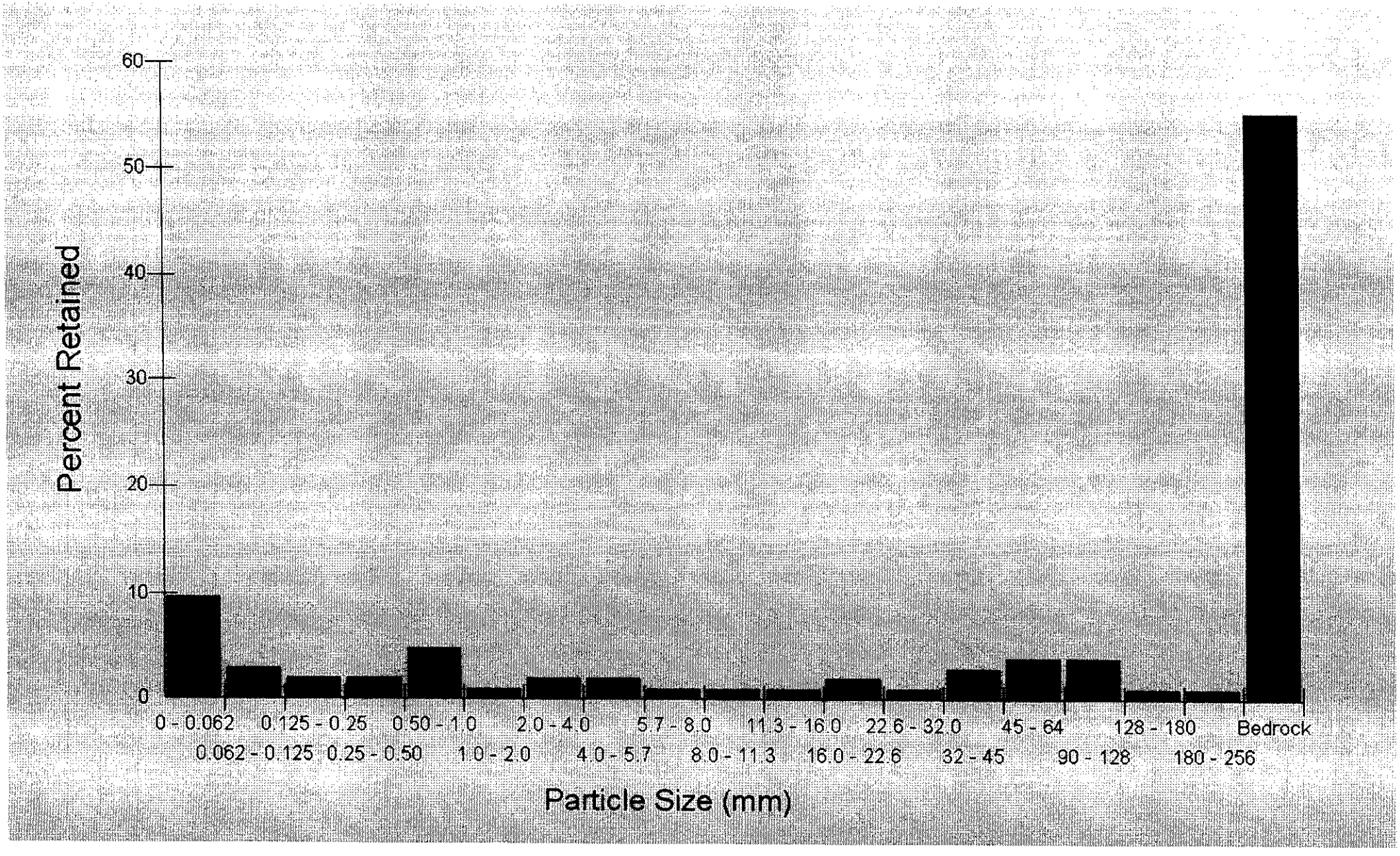
REPRESENTATIVE PEBBLE COUNT




Percent Retained
60
50
40
30
20
10
0
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.50
0.50 - 1.0
1.0 - 2.0
2.0 - 4.0
4.0 - 5.7
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
45 - 64
90 - 128
128 - 180
180 - 256
Bedrock
Particle Size (mm)

Page 1/2

Site: Representative (Pebble Count) Date: 4/26/12
Location: Marsh Run HUC:
Party: TEAM 2

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	Dot Count for POOL 2	Dot Count for COMP. 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C				5			5					
	Very Fine	.062 - .125	SAND				2			1					
	Fine	.125 - .25	SAND				1			1					
	Medium	.25 - .50	SAND				1			1					
	Coarse	.50 - 1.0	SAND				2			3					
.04 - .08	Very Coarse	1.0 - 2	SAND				0			1					
.08 - .16	Very Fine	2 - 4	GRAVEL				2			0					
.16 - .22	Fine	4 - 5.7	GRAVEL				1			1					
.22 - .31	Fine	5.7 - 8	GRAVEL				0			1					
.31 - .44	Medium	8 - 11.3	GRAVEL				1			0					
.44 - .63	Medium	11.3 - 16	GRAVEL				0			1					
.63 - .89	Coarse	16 - 22.6	GRAVEL				0			2					
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				1			0					
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL				3			0					
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL				4			0					
2.5 - 3.5	Small	64 - 90	COBBLE				0			0					
3.5 - 5.0	Small	90 - 128	COBBLE				4			0					
5.0 - 7.1	Large	128 - 180	COBBLE				1			0					
7.1 - 10.1	Large	180 - 256	COBBLE				1			0					
10.1 - 14.3	Small	256 - 362	BOULDER				0			0					
14.3 - 20	Small	362 - 512	BOULDER				0			0					
20 - 40	Medium	512 - 1024	BOULDER				0			0					
40 - 80	Large-Vry Large	1024 - 2048	BOULDER				0			0					
	Bedrock		BDRK				43			14					
Stream Type:			Valley Type:			TOTAL→	72			31					

A-A

Riffle Glide Riffle Riffle Riffle

29
93
72

17
14
31

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Page 2/2

Representative Pebble Count

Site:
Location: Marsh Run HUC:
Party: Team 2
Date:

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	Dot Count for POOL 2	Dot Count for COMP. 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C							4					
	Very Fine	.062 - .125	SAND							1					
	Fine	.125 - .25	SAND							1					
	Medium	.25 - .50	SAND												
	Coarse	.50 - 1.0	SAND							1					
.04 - .08	Very Coarse	1.0 - 2	SAND							1					
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7	GRAVEL												
.22 - .31	Fine	5.7 - 8	GRAVEL							1					
.31 - .44	Medium	8 - 11.3	GRAVEL												
.44 - .63	Medium	11.3 - 16	GRAVEL							1					
.63 - .89	Coarse	16 - 22.6	GRAVEL							2					
.89 - 1.3	Coarse	22.6 - 32	GRAVEL												
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL												
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL												
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128	COBBLE												
5.0 - 7.1	Large	128 - 180	COBBLE												
7.1 - 10.1	Large	180 - 256	COBBLE												
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		BDRK							8					
Stream Type:			Valley Type:			TOTAL→				20					

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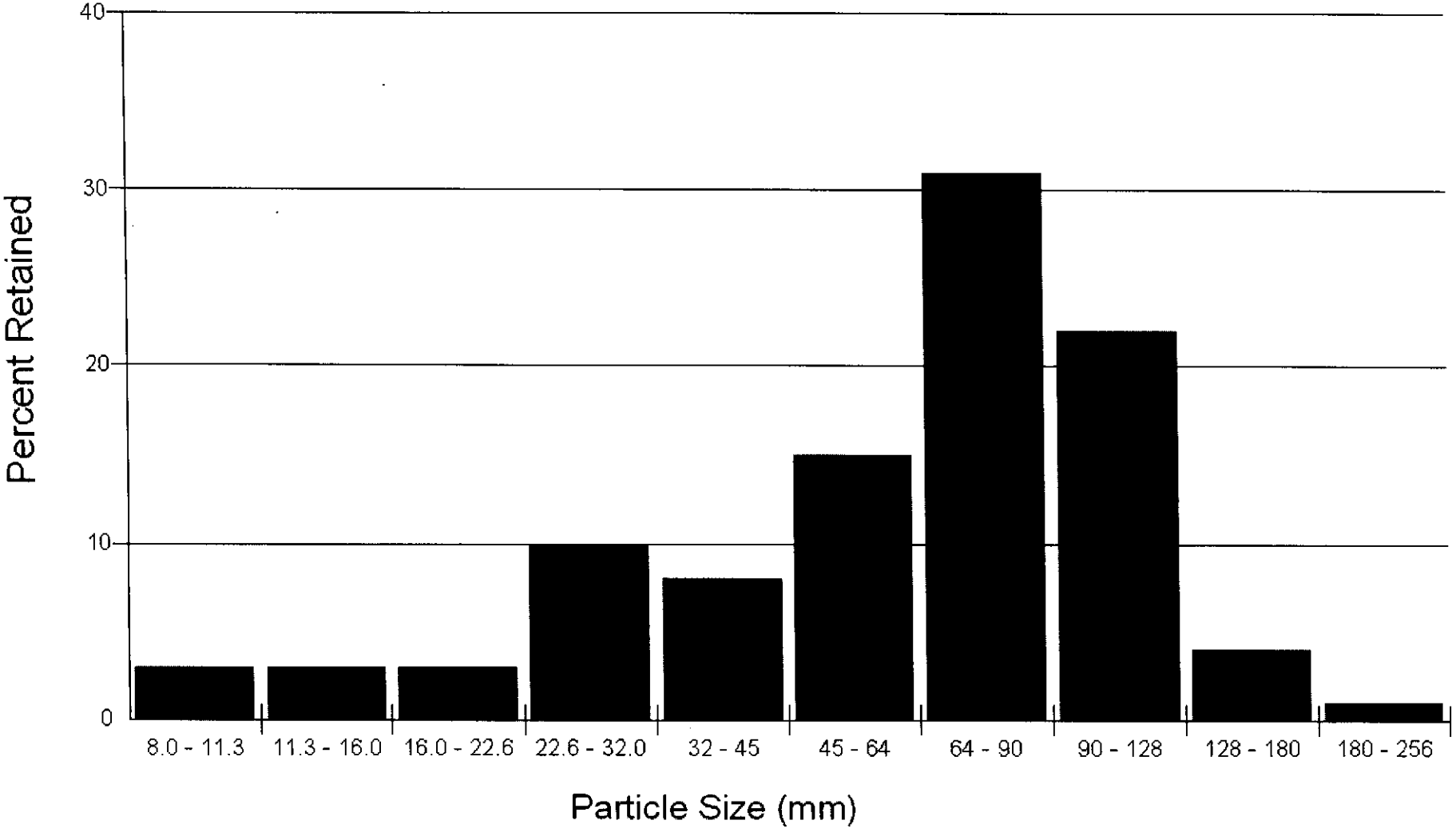
ACTIVE RIFFLE PROTUSIOIN STATION 1+34



Site: Marsh Run
Location: HUC:
Party: Gallie / Salyn / TEAM 2
Date:

Stream Type: C/E or F
Valley Type:

Inches	PARTICLE	Millimeters	S/C
	Silt / Clay	< .062	S/C
	Very Fine	.062 - .125	SAND
	Fine	.125 - .25	
	Medium	.25 - .50	
	Coarse	.50 - 1.0	
.04 - .08	Very Coarse	1.0 - 2	
.08 - .16	Very Fine	2 - 4	GRAVEL
.16 - .22	Fine	4 - 5.7	
.22 - .31	Fine	5.7 - 8	
.31 - .44	Medium	8 - 11.3	
.44 - .63	Medium	11.3 - 16	
.63 - .89	Coarse	16 - 22.6	
.89 - 1.3	Coarse	22.6 - 32	
1.3 - 1.8	Very Coarse	32 - 45	
1.8 - 2.5	Very Coarse	45 - 64	
2.5 - 3.5	Small	64 - 90	COBBLE
3.5 - 5.0	Small	90 - 128	
5.0 - 7.1	Large	128 - 180	
7.1 - 10.1	Large	180 - 256	BOULDER
10.1 - 14.3	Small	256 - 362	
14.3 - 20	Small	362 - 512	
20 - 40	Medium	512 - 1024	
40 - 80	Large-Very Large	1024 - 2048	
	Bedrock		DR

Dot Count for RIFFLE 1 POOL 2 COMP. 3

TOTAL →

RIFFLE (1)			POOL (2)			COMPOSITE (3)		
Reach:			Reach:			Reach:		
Date:			Date:			Date:		
TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM

Pathway — Upstream Right Bk. (Active Riffle)
— Station 1+36
34

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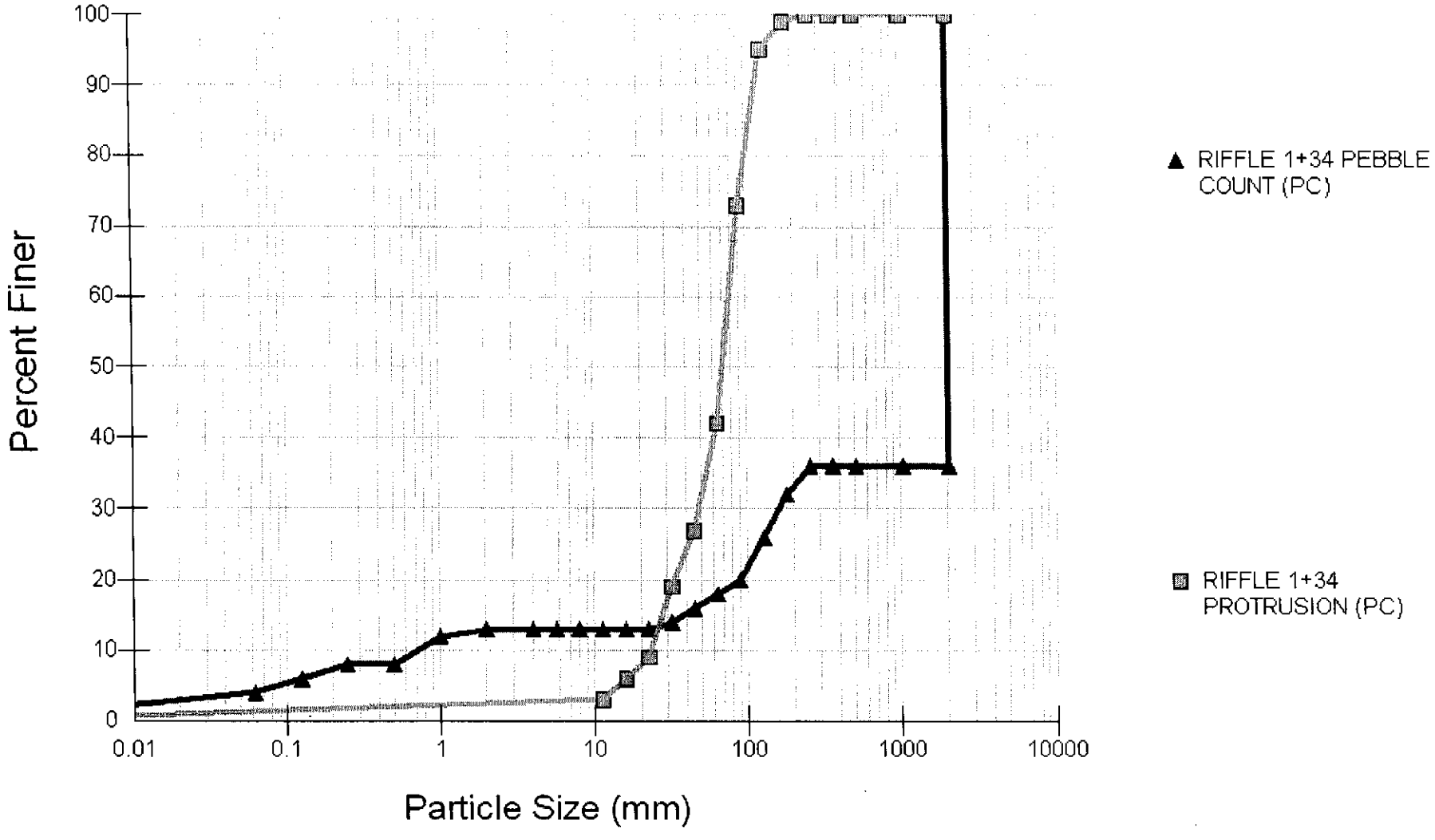
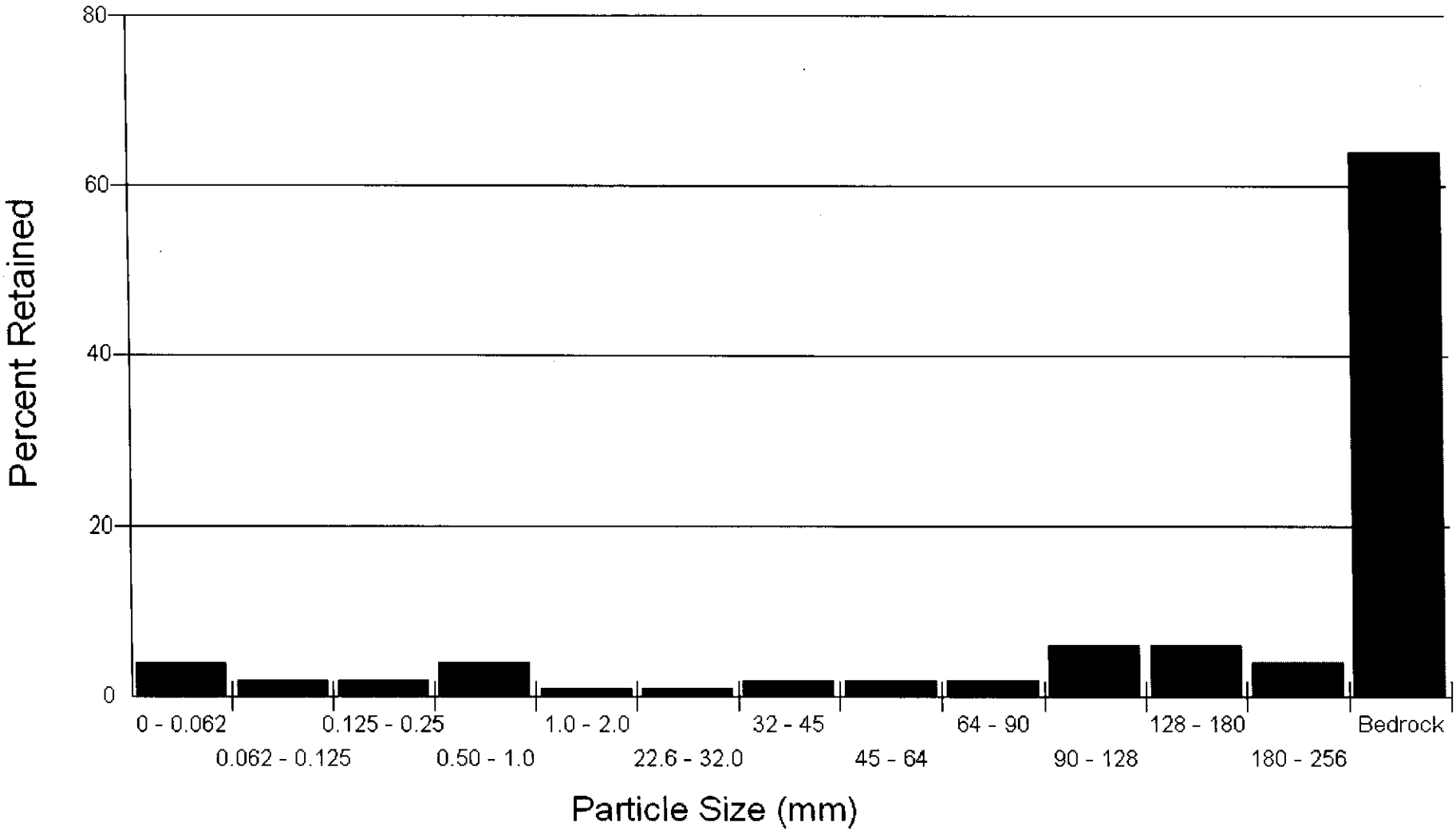
ACTIVE RIFFLE PEBBLE COUNT STATION 1+34



ACTIVE RIFFLE PEBBLE COUNT STATION 1+34



Active Riffle/Pebble
Station 1+36'

Site: Date:
Location: HUC:
Party:

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	~~POOL~~ 2	COMP. 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25	SAND												
	Medium	.25 - .50	SAND												
	Coarse	.50 - 1.0	SAND												
.04 - .08	Very Coarse	1.0 - 2	SAND												
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7	GRAVEL												
.22 - .31	Fine	5.7 - 8	GRAVEL												
.31 - .44	Medium	8 - 11.3	GRAVEL												
.44 - .63	Medium	11.3 - 16	GRAVEL												
.63 - .89	Coarse	16 - 22.6	GRAVEL												
.89 - 1.3	Coarse	22.6 - 32	GRAVEL												
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL												
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL												
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128	COBBLE												
5.0 - 7.1	Large	128 - 180	COBBLE												
7.1 - 10.1	Large	180 - 256	COBBLE												
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		DRK												
Stream Type:			**Valley Type:**			TOTAL→»									

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Station 4+31' Active Riffle

Site: Marsh Run (Protusim) Date: 4/26/12 (Pebble Count)

Location: HUC:

Party: Jalyn, Collie - Team 2

Dot Count for Riffle

Inches	PARTICLE	Millimeters		RIFFLE 1	POOL 2	~~COMP.~~ 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16													
.63 - .89	Coarse	16 - 22.6													
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45													
1.8 - 2.5	Very Coarse	45 - 64													
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128													
5.0 - 7.1	Large	128 - 180													
7.1 - 10.1	Large	180 - 256													
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		DRK												
							TOTAL →								

Stream Type: **Valley Type:**

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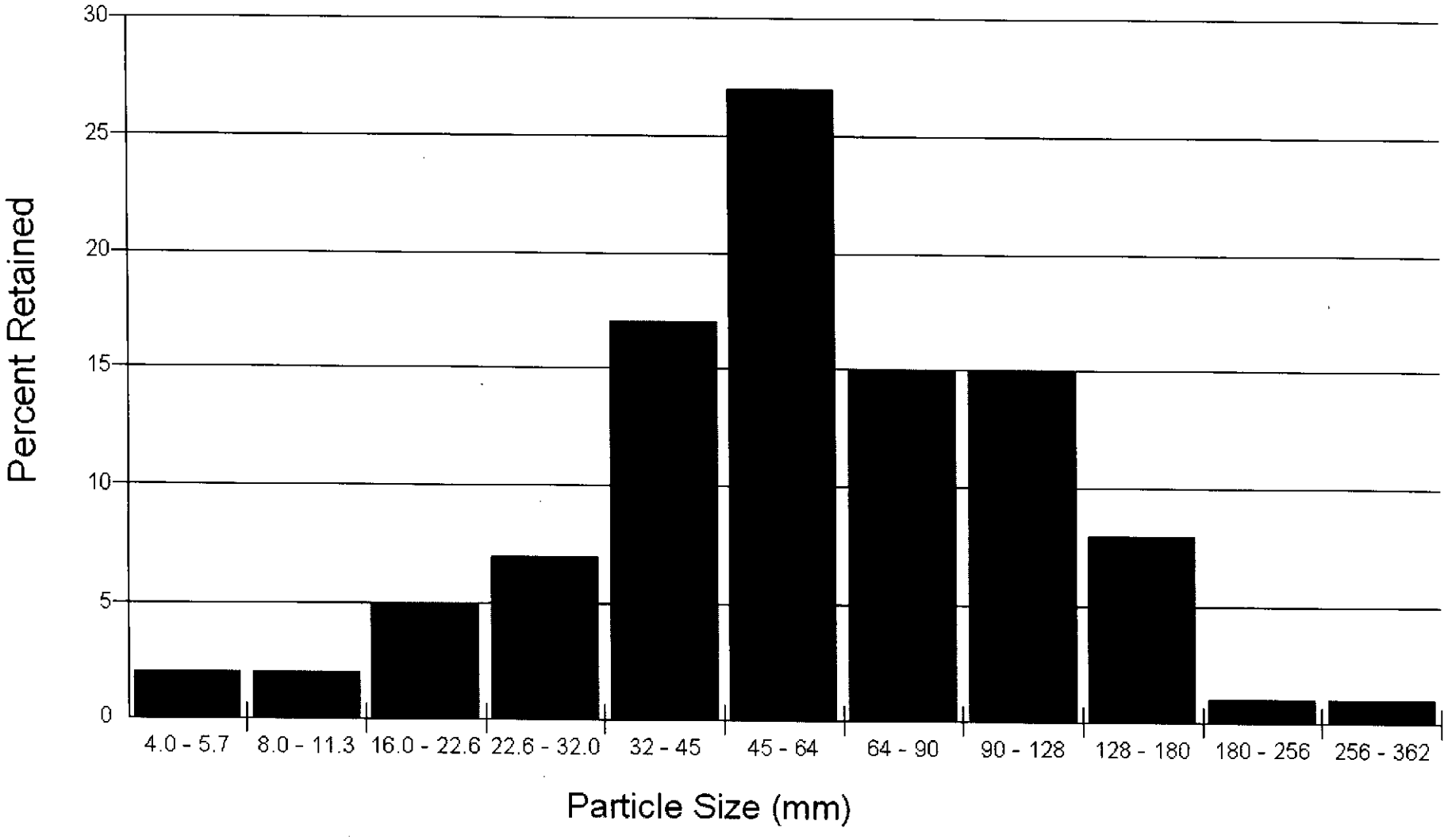
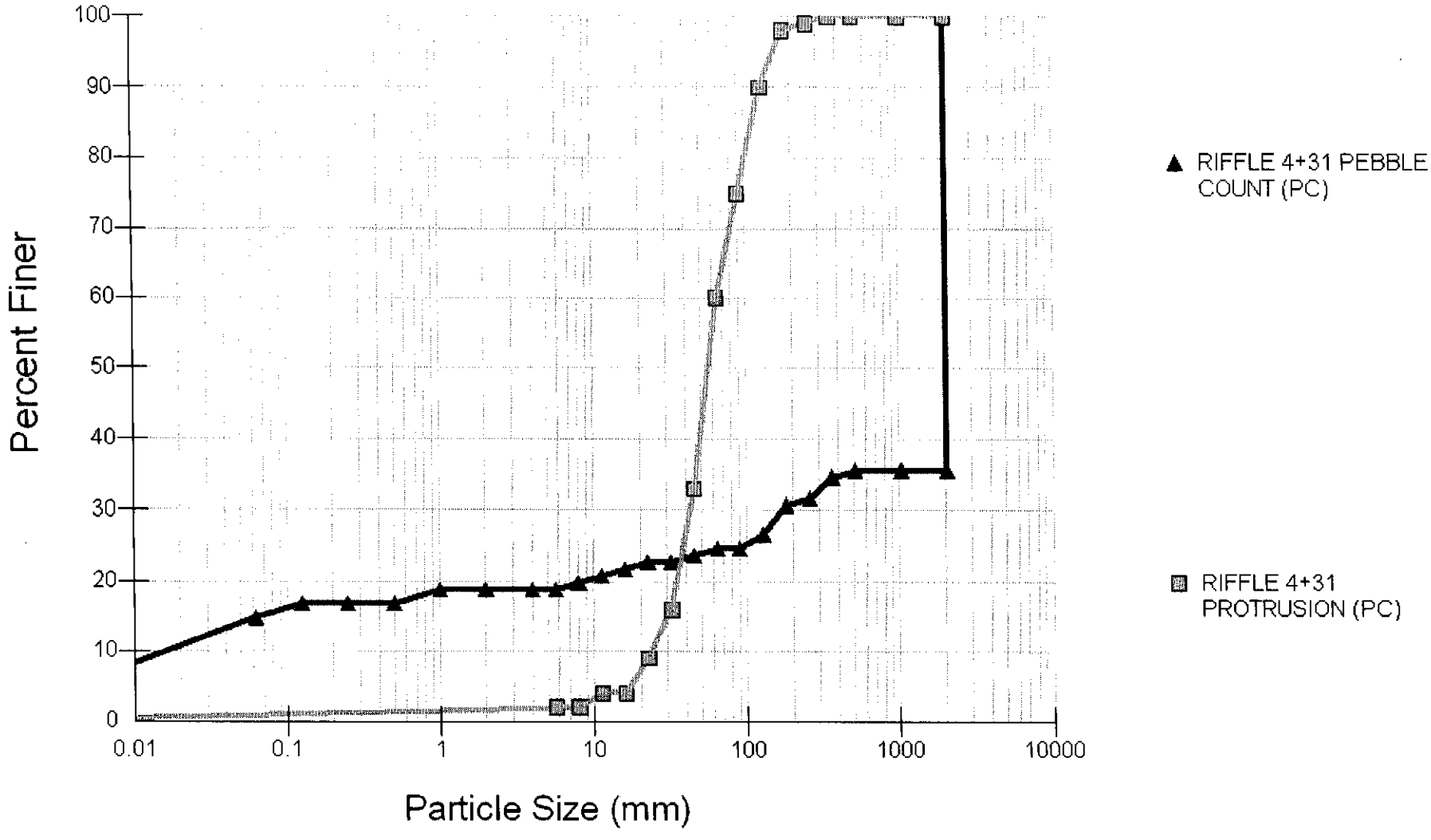
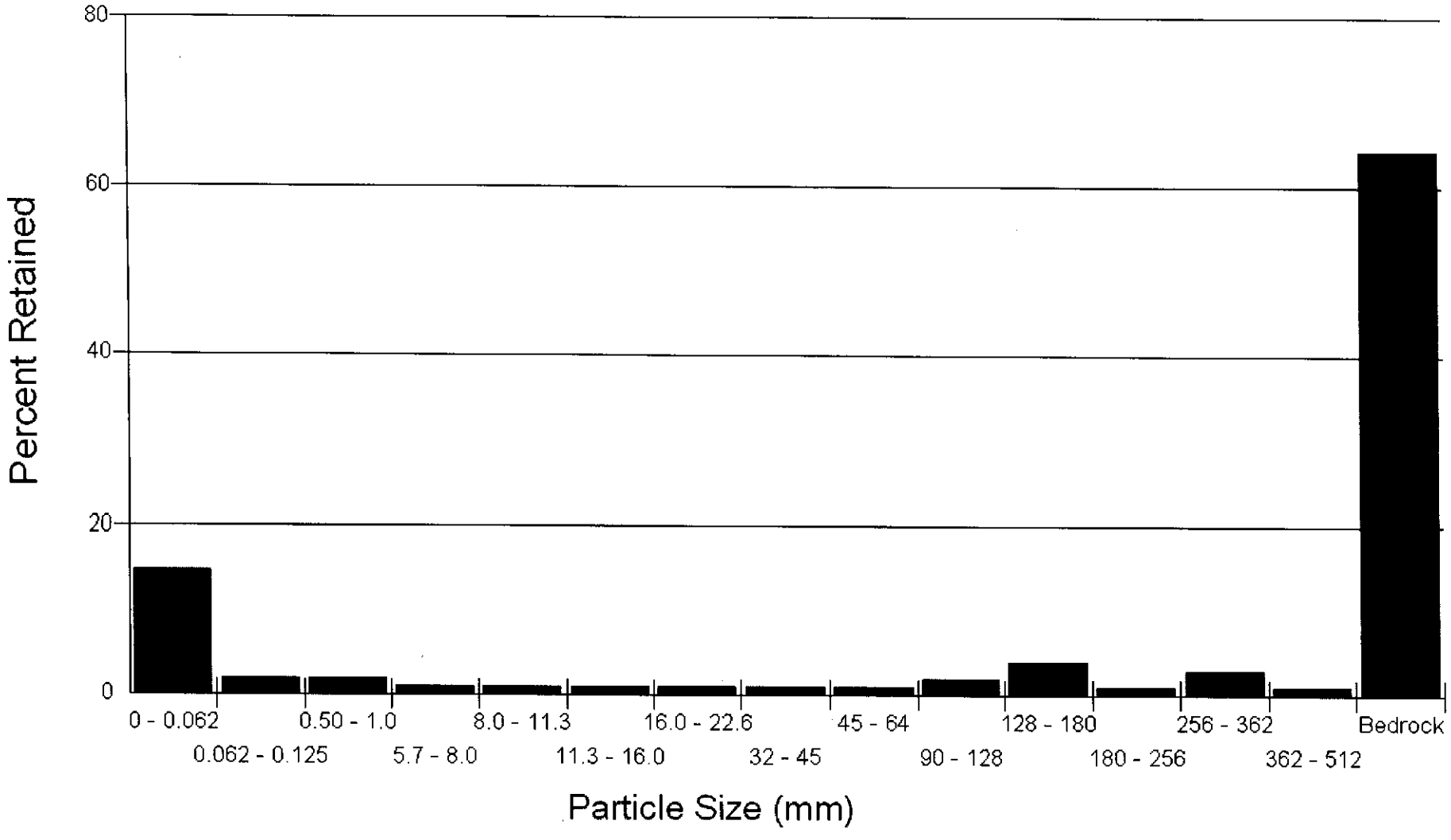
ACTIVE RIFFLE PROTRUSION STATION 4+31



ACTIVE RIFFLE 1 STATION 4+31



ACTIVE RIFFLE 1 STATION 4+31



Worksheet 2-2. Computations of velocity and bankfull discharge using various methods (Rosgen, 2006b; Rosgen and Silvey, 2007).

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Marsh Run			Location:	Reach - Reach 1
Date:	4/26/2012	Stream Type:	F6	Valley Type:	VIII
Observers:	Team 2			HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	37.43	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.45	d_{bkf} (ft)
Bankfull Riffle WIDTH	25.81	W_{bkf} (ft)	Wetted PERMIMETER ~ (2 * d_{bkf}) + W_{bkf}	26.50	W_p (ft)
D_{84} at Riffle	109.00	Dia. (mm)	D_{84} (mm) / 304.8	0.36	D_{84} (ft)
Bankfull SLOPE	0.0061	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.41	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	3.94	R / D_{84}
Drainage Area	19.0	DA (mi^2)	Shear Velocity $u^* = (gRS)^{½}$	0.526	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\ 2.83 + 5.66 * Log\ \{\ R / D_{84}\ \}\ ]\ u^*$	3.27	ft / sec	122.36	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ 0.058	2.52	ft / sec	94.32	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ 0.057	2.56	ft / sec	95.97	cfs
2. Roughness Coefficient: c) Manning's n from Jarrett (USGS): $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n = 0.39 * S^{0.38} * R^{-0.16}$ **Note:** This equation is applicable to **steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems**; i.e., for Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ 0.053	2.75	ft / sec	103.01	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	3.37	ft / sec	126.25	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Chezy C	0.00	ft / sec	0.00	cfs
4. Continuity Equations: a) Regional Curves $u = Q / A$ Return Period for Bankfull Discharge $Q =$ 1.8 year	2.75	ft / sec	103.00	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$	2.54	ft / sec	95.24	cfs

Protrusion Height Options for the D_{84} Term in the Relative Roughness Relation (R/D_{84}) – Estimation Method 1

Option 1.	For **sand-bed** channels: Measure 100 **"protrusion heights"** of sand dunes from the downstream side of feature to the top of feature. Substitute the D_{84} sand dune protrusion height in ft for the D_{84} term in method 1.
Option 2.	For **boulder-dominated** channels: Measure 100 **"protrusion heights"** of boulders on the sides from the bed elevation to the top of the rock on that side. Substitute the D_{84} boulder protrusion height in ft for the D_{84} term in method 1.
Option 3.	For **bedrock-dominated** channels: Measure 100 **"protrusion heights"** of rock separations, steps, joints or uplifted surfaces above channel bed elevation. Substitute the D_{84} bedrock protrusion height in ft for the D_{84} term in method 1.
Option 4.	For **log-influenced** channels: Measure **"protrustion heights"** proportionate to channel width of log diameters or the height of the log on upstream side if embedded. Substitute the D_{84} protrusion height in ft for the D_{84} term in method 1.

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Worksheet 5-3. Field form for Level II stream classification (Rosgen, 1996; Rosgen and Silvey, 2005).

Stream:	**Marsh Run, Reach - Reach 1**		
Basin:	Drainage Area: **12173** acres	**19.02**	mi^2
Location:			
Twp.&Rge: ;	Sec.&Qtr.: ;		
Cross-Section Monuments (Lat./Long.):	**0 Lat / 0 Long**	Date: **04/26/12**	
Observers: **TEAM 2**		Valley Type: VIII	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**25.81**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section (d_{bkf} = A / W_{bkf}).	**1.45**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**37.43**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**17.8**	ft/ft
Maximum DEPTH (d_{mbkf}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	**2.03**	ft
WIDTH of Flood-Prone Area (W_{fpa}) Twice maximum DEPTH, or (2 x d_{mbkf}) = the stage/elevation at which flood-prone area WIDTH is determined in a riffle section.	**36.84**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.43**	ft/ft
Channel Materials (Particle Size Index) D_{50} The D_{50} particle size index represents the mean diameter of channel materials, as sampled from the channel surface, between the bankfull stage and Thalweg elevations.	**2048**	mm
Water Surface SLOPE (S) Channel slope = "rise over run" for a reach approximately 20–30 bankfull channel widths in length, with the "riffle-to-riffle" water surface slope representing the gradient at bankfull stage.	**0.0061**	ft/ft
Channel SINUOSITY (k) Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL / VL); or estimated from a ratio of valley slope divided by channel slope (VS / S).	**1.38**	

Stream Type **F1/6** (See **Figure 2-14**)

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Worksheet 5-4. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Marsh Run** Location: **Reach - Reach 1**

Observers: **TEAM 2** Date: **04/26/12** Valley Type: **VIII** Stream Type: **F1/6**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, *

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	25.5	25.1	25.8	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	32.78	28.12	37.43
Mean Riffle Depth (d_{bkf})	1.29	1.12	1.45	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	20.12	17.80	22.44
Maximum Riffle Depth (d_{max})	1.73	1.42	2.03	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.334	1.268	1.400
Width of Flood-Prone Area (W_{fpa})	37.5	36.8	38.1	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.472	1.427	1.516
Riffle Inner Berm Width (W_{ib})	16.9	16.9	16.9	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.655	0.655	0.655
Riffle Inner Berm Depth (d_{ib})	0.56	0.56	0.56	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.389	0.389	0.389
Riffle Inner Berm Area (A_{ib})	9.54	9.54	9.54	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.255	0.255	0.255
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	29.9	29.9	29.9					

Pool Dimensions*, **, *

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	21.1	20.2	22	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	0.828	0.793	0.863
Mean Pool Depth (d_{bkfp})	1.95	1.92	1.97	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.512	1.488	1.527
Pool Cross-Sectional Area (A_{bkfp})	41	39.8	42.2	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.252	1.215	1.288
Maximum Pool Depth (d_{maxp})	3.31	3.3	3.32	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.566	2.558	2.574
Pool Inner Berm Width (W_{ibp})	10.1	9.35	10.8	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.480	0.425	0.535
Pool Inner Berm Depth (d_{ibp})	0.98	0.74	1.21	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.500	0.387	0.613
Pool Inner Berm Area (A_{ibp})	10	6.95	13	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.246	0.165	0.327
Point Bar Slope (S_{pb})	0.000	0.000	0.000	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	10.760	8.943	12.577

Run Dimensions*

Run Dimensions*	Mean	Min	Max		Run Dimensionless Ratios****	Mean	Min	Max
Run Width (W_{bkfr})	21.5	19.4	23.5	ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})	0.842	0.762	0.922
Mean Run Depth (d_{bkfr})	1.56	1.44	1.68	ft	Mean Run Depth to Mean Riffle Depth (d_{bkfr} / d_{bkf})	1.209	1.116	1.302
Run Cross-Sectional Area (A_{bkfr})	33.6	27.9	39.4	ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})	1.026	0.850	1.202
Maximum Run Depth (d_{maxr})	2.43	2.11	2.74	ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})	1.884	1.636	2.124
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})	13.7	13.5	14	ft				

Glide Dimensions*

Glide Dimensions*	Mean	Min	Max		Glide Dimensions & Dimensionless Ratios****	Mean	Min	Max
Glide Width (W_{bkfg})	23	22	24	ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})	0.903	0.864	0.942
Mean Glide Depth (d_{bkfg})	1.23	1.23	1.23	ft	Mean Glide Depth to Mean Riffle Depth (d_{bkfg} / d_{bkf})	0.953	0.953	0.953
Glide Cross-Sectional Area (A_{bkfg})	28.3	27	29.6	ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})	0.863	0.825	0.902
Maximum Glide Depth (d_{maxg})	1.7	1.58	1.82	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	1.318	1.225	1.411
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})	18.7	17.9	19.5	ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})	79.974	79.974	79.974
Glide Inner Berm Width (W_{ibg})	8.33	8.33	8.33	ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})	0.347	0.347	0.347
Glide Inner Berm Depth (d_{ibg})	0.1	0.1	0.1	ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})	0.085	0.085	0.085
Glide Inner Berm Area (A_{ibg})	0.87	0.87	0.87	ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})	0.029	0.029	0.029

Step**

Step Dimensions**	Mean	Min	Max		Step Dimensionless Ratios****	Mean	Min	Max
Step Width (W_{bkfs})	0	0	0	ft	Step Width to Riffle Width (W_{bkfs} / W_{bkf})	0.000	0.000	0.000
Mean Step Depth (d_{bkfs})	0	0	0	ft	Mean Step Depth to Riffle Depth (d_{bkfs} / d_{bkf})	0.000	0.000	0.000
Step Cross-Sectional Area (A_{bkfs})	0	0	0	ft	Step Area to Riffle Area (A_{bkfs} / A_{bkf})	0.000	0.000	0.000
Maximum Step Depth (d_{maxs})	0	0	0	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	0.000	0.000	0.000
Step Width/Depth Ratio (W_{bkfs} / d_{bkfs})	0	0	0					

*Riffle–Pool system (i.e., C, E, F stream types) bed features include riffles, runs, pools and glides.

**Step–Pool system (i.e., A, B, G stream types) bed features include riffles, rapids, chutes, pools and steps (note: include rapids and chutes in riffle category).

***Convergence-Divergence system (i.e., D stream types) bed features include riffles and pools; cross-sections taken at riffles for classification purposes.

****Mean values are used as the normalization parameter for all dimensionless ratios; e.g., minimum pool width to riffle width ratio uses the *mean* riffle width value.

Worksheet 5-4. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Marsh Run** Location: **Reach - Reach 1**

Observers: **TEAM 2** Date: **04/26/12** Valley Type: **VIII** Stream Type: **F1/6**

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	2.52	ft/sec	Estimation Method	Manning's	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	94.324	cfs	Drainage Area	19.02	mi^2

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	107	95	118	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	4.181	3.730	4.633
Stream Meander Length (L_m)	139	130	147	ft	Stream Meander Length Ratio (L_m / W_{bkf})	5.438	5.104	5.771
Radius of Curvature (R_c)	38.5	25	53	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	1.512	0.982	2.081
Belt Width (W_{blt})	81	59	103	ft	Meander Width Ratio (W_{blt} / W_{bkf})	3.180	2.316	4.044
Arc Length (L_a)	60.5	37	84	ft	Arc Length to Riffle Width (L_a / W_{bkf})	2.375	1.453	3.298
Riffle Length (L_r)	40.3	10.8	72.2	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	1.583	0.422	2.835
Individual Pool Length (L_p)	44.6	24.6	70.3	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	1.749	0.965	2.759
Pool to Pool Spacing (P_s)	104	55.3	172	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	4.096	2.171	6.755

Channel Profile

Valley Slope (S_{val})	0.0083	ft/ft	Average Water Surface Slope (S)	0.0061	ft/ft	Sinuosity (S_{val} / S) 1.38
Stream Length (SL)	420	ft	Valley Length (VL)	326	ft	Sinuosity (SL / VL) 1.29
Low Bank Height (LBH)	start 2.54 / end 6.34	ft	Max Depth (d_{max})	start 2.09 / end 3.74	ft	Bank-Height Ratio (BHR) (LBH / d_{max}) start 1.22 / end 1.7

Facet Slopes	Mean	Min	Max		Dimensionless Facet Slope Ratios	Mean	Min	Max
Riffle Slope (S_{rif})	0.008	0.007	0.012	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	1.385	1.093	1.943
Run Slope (S_{run})	0.011	0.006	0.017	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	1.731	0.939	2.715
Pool Slope (S_p)	0.002	0.001	0.004	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.375	0.123	0.631
Glide Slope (S_g)	0.005	0.001	0.008	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	0.848	0.136	1.249
Step Slope (S_s)	0.000	0.000	0.000	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	0.000	0.000	0.000

Max Depths[a]	Mean	Min	Max		Dimensionless Depth Ratios	Mean	Min	Max
Max Riffle Depth (d_{maxrif})	1.84	1.41	2.27	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.43	1.093	1.76
Max Run Depth (d_{maxrun})	1.98	1.82	2.14	ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	1.53	1.411	1.66
Max Pool Depth (d_{maxp})	3.1	2.27	3.76	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.4	1.76	2.91
Max Glide Depth (d_{maxg})	1.21	0.9	1.55	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	0.94	0.698	1.2
Max Step Depth (d_{maxs})	0	0	0	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	0	0	0

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	9.71	4		D_{16}	0.44	45		29.18	mm
% Sand	12.62	9		D_{35}	45.24	237		55.13	mm
% Gravel	16.5	5		D_{50}	Bedrock	Bedrock		70.71	mm
% Cobble	5.83	18		D_{84}	Bedrock	Bedrock		109	mm
% Boulder	0	0		D_{95}	Bedrock	Bedrock		128	mm
% Bedrock	55.34	64		D_{100}	Bedrock	Bedrock		255.99	mm

[a] Min, max & mean depths are measured from Thalweg to bankfull at mid-point of feature for riffles and runs, the deepest part of pools, & at the tail-out of glides.

[b] Composite sample of riffles and pools within the designated reach. [c] Active bed of a riffle. [d] Height of roughness feature above bed.

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Worksheet B-4. Procedure to validate hydraulic relations using gage station data.

1. Obtain the drainage area associated with the gaging station.
2. Obtain the field-determined bankfull discharge at the gaging station (**Figure B-43**).
3. Obtain the bankfull channel dimensions from the gaging station hydraulic geometry relationships (discharge vs. width, depth, area and velocity).
4. Measure the average water surface slope.
5. Perform an active bed pebble count on the riffle to obtain D_{84}.
6. Determine the stream type.
7. Solve for Manning's "n" at the bankfull stage: $n = (1.49R^{2/3}S^{1/2})/u$ (use the bankfull mean velocity from Step 3).
8. Calculate relative roughness: R/D_{84}. Make sure that D_{84} is converted from millimeters to feet. Hydraulic radius (R) and mean depth (d_{bkf}) are often used interchangeably when width/depth ratios are greater than 12.
9. Calculate shear velocity: $u^* = (gRS)^{1/2}$. .531
10. Calculate friction factor: u/u^*. 4.79
11. Plot bankfull discharge as a function of drainage area on the appropriate regional curve.
12. Plot bankfull channel dimensions as a function of drainage area on the appropriate regional curve (note stream type of plotted values using unique symbols).
13. Plot relative roughness by friction factor (**Figure B-34**) (Example in **FigureB-40**).
14. Plot Manning's "n" by friction factor (**Figure B-35**) (Example in **Figure B-41**).
15. Plot Manning's "n" by stream type (**Figure B-36**) (Example in **Figure B-42**).

Gaging Station Name: **Gaging Station Number:**

Drainage Area (mi^2)	Bankfull Discharge Q_{bkf} (cfs)	Bankfull Width W_{bkf}	Bankfull Mean Depth d_{bkf} (ft)	Bankfull Area A_{bkf} (ft^2)	Bankfull Velocity u_{bkf} (ft/s)	Ave. Water Surface Slope S (ft/ft)	D_{84} (mm)	D_{84} (ft)	Stream Type	Manning's "n"	Relative Roughness R/D_{84} (ft/ft)	Shear Velocity u* (ft/s)	Friction Factor u/u*
19.02	95.24	25.8	1.45	37.43	2.54	0.0062	109	0.36	F1/6	0.058	3.92	0.531	4.79

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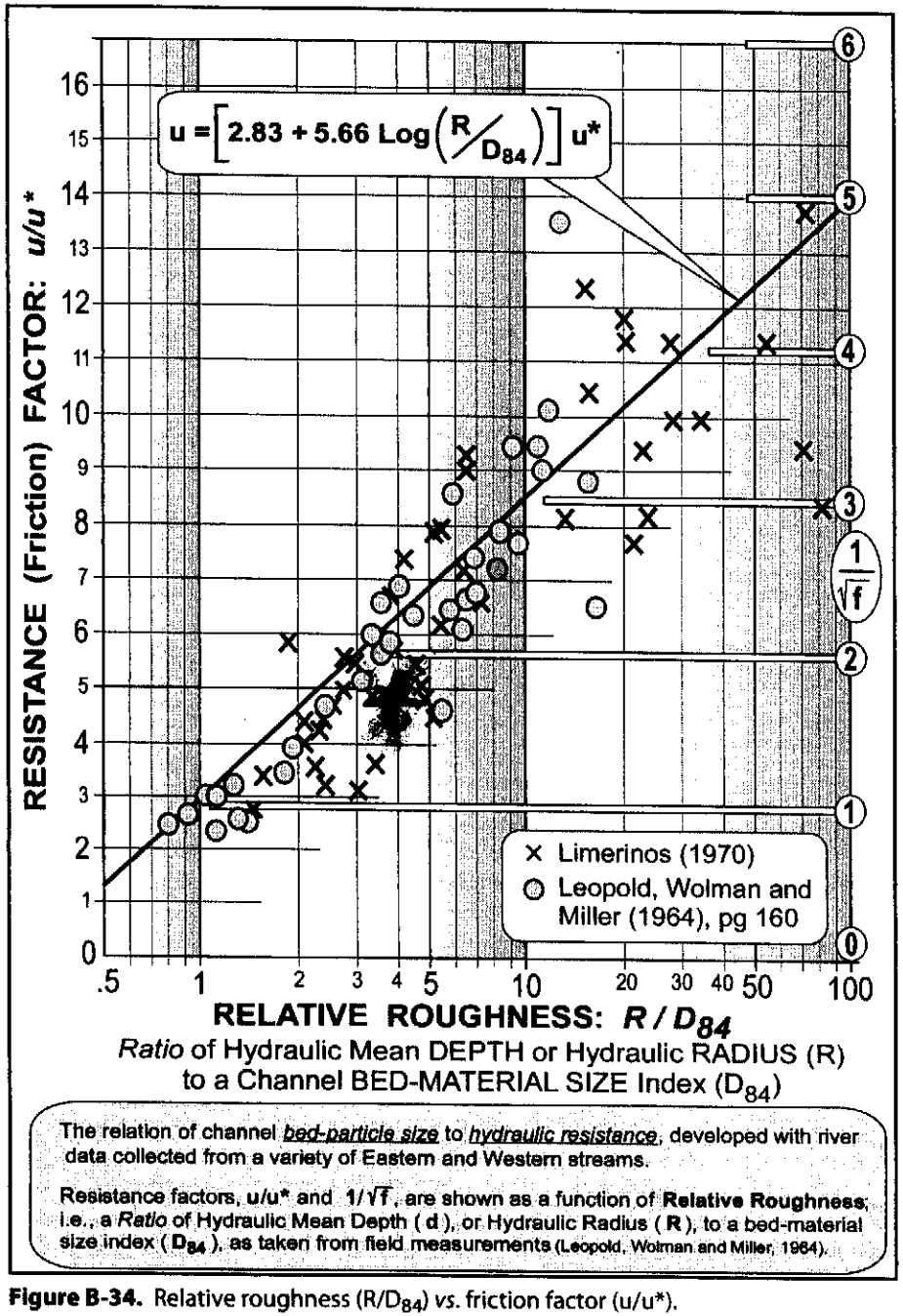

Figure B-34. Relative roughness (R/D_{84}) *vs.* friction factor (u/u^*).

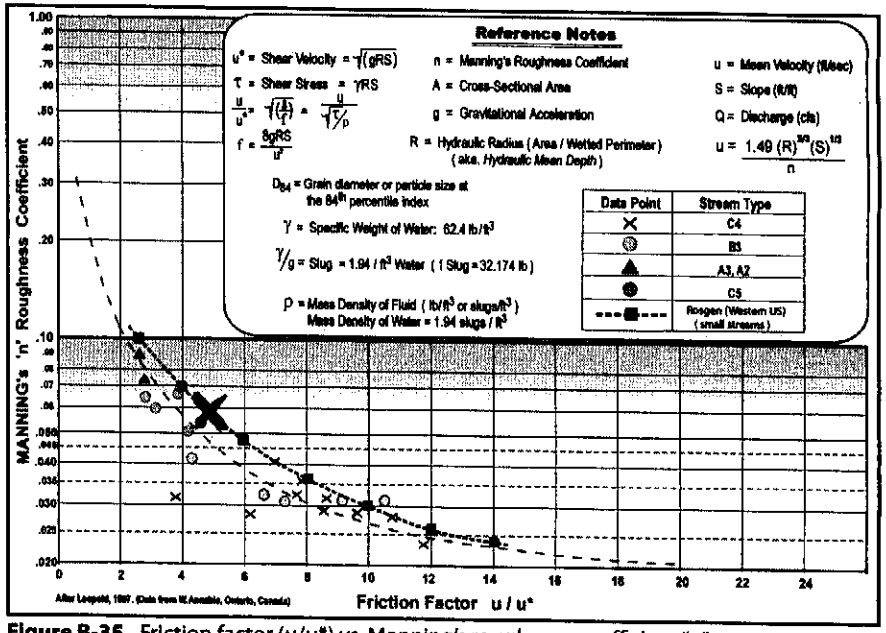

Figure B-35. Friction factor (u/u^*) *vs.* Manning's roughness coefficient "n".

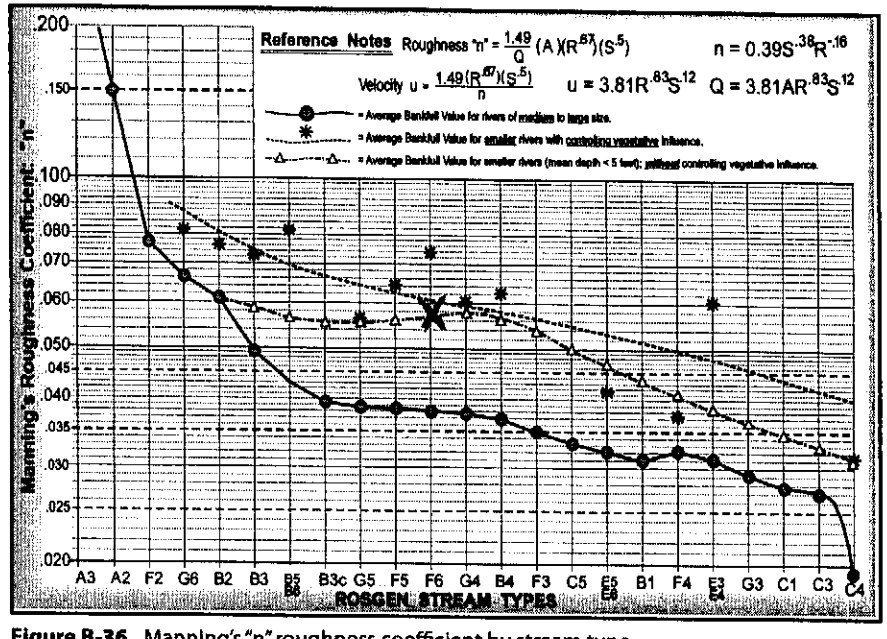

Figure B-36. Manning's "n" roughness coefficient by stream type.

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Step 11

Summarize USGS gage data:

Summary of USGS Gage Station Data

Station Name:	Marsh Run			Station Number:			
Station Location:	Grimes			Period of Record:		yrs	
Drainage Area (DA):		acres	19.02	mi^2	D.A. Mean Elevation:		ft
Stream Type:	E	Valley Type: VIII			Mean Annual Disch.:		cfs
Reference Reach Slope:	0.0022	ft/ft	HUC:				

BANKFULL CHARACTERISTICS

Determined from FIELD MEASUREMENT			Determined from GAGE DATA ANALYSIS		
Bankfull Width (W_{bkf})	25.81	ft	Bankfull Width (W_{bkf})	25.54	ft
Bankfull Mean Depth (d_{bkf})	1.45	ft	Bankfull Mean Depth (d_{bkf})	1.46	ft
Bankfull XS Area (A_{bkf})	37.43	ft^2	Bankfull XS Area (A_{bkf})	37.35	ft^2
Wetted Perimeter (W_p)	26.50	ft	Wetted Perimeter (W_p)	28.46	ft
Bankfull Stage (Gage Ht.)	2.27	ft	Bankfull Stage (Gage Ht.)	2.27	ft
Est. Mean Velocity ($\bar{u}$)	2.56	ft/sec	Mean Velocity ($\bar{u}$)	2.78	ft/sec
Est. BKF. Discharge (Q_{bkf})	95.97	cfs	Bankfull Discharge (Q_{bkf})	103.98	cfs
Bankfull Discharge associated with "field-determined" Bankfull Stage			95.24	cfs	
Recurrence Interval (R.I.) associated with "field-determined" Bankfull Stage			1.8	yrs	

From the *Annual Peak Flow Frequency Analysis* for the Gage Station, determine:

1.5 Year **R.I.** Discharge =	60	cfs	**10** Year **R.I.** Discharge =	245	cfs
2.0 Year **R.I.** Discharge =	100	cfs	**25** Year **R.I.** Discharge =	450	cfs
5.0 Year **R.I.** Discharge =	196	cfs	**50** Year **R.I.** Discharge =	470	cfs

MEANDER GEOMETRY

Linear Wavelength (λ)	107	ft	Stream Meander Length (L_m)	139	ft
Radius of Curvature (R_c)	38.5	ft	Belt Width (W_{blt})	81	ft/ft

HYDRAULIC GEOMETRY

Based on *USGS Discharge Summary Notes* data (Form 9-207) and regression analyses of measured discharge (**Q**) with the hydraulic parameters of Width (**W**), Area (**A**), Mean Depth (**d**) & Mean Velocity ($\bar{u}$), determine the *intercept coefficient* (***a***) and the *slope exponent* (***b***) values for a power function of the form $Y = aX^b$, when Y is one of the selected hydraulic parameters and X is a given discharge value (**Q**).

		Width (**W**)	Depth (**d**)	Area (**A**)	Vel. ($\bar{u}$)
Intercept Coefficient	(a)				
Slope Exponent	(b)				

Hydraulic Radius: $R = A / W_p$	1.41	ft	Manning's 'n' at Bankfull Stage	0.058	Coeff.

n = 1.49 [(**Area**) (Hydraulic **Radius**$^{2/3}$) (**Slope**$^{1/2}$)] / Q_{bkf}

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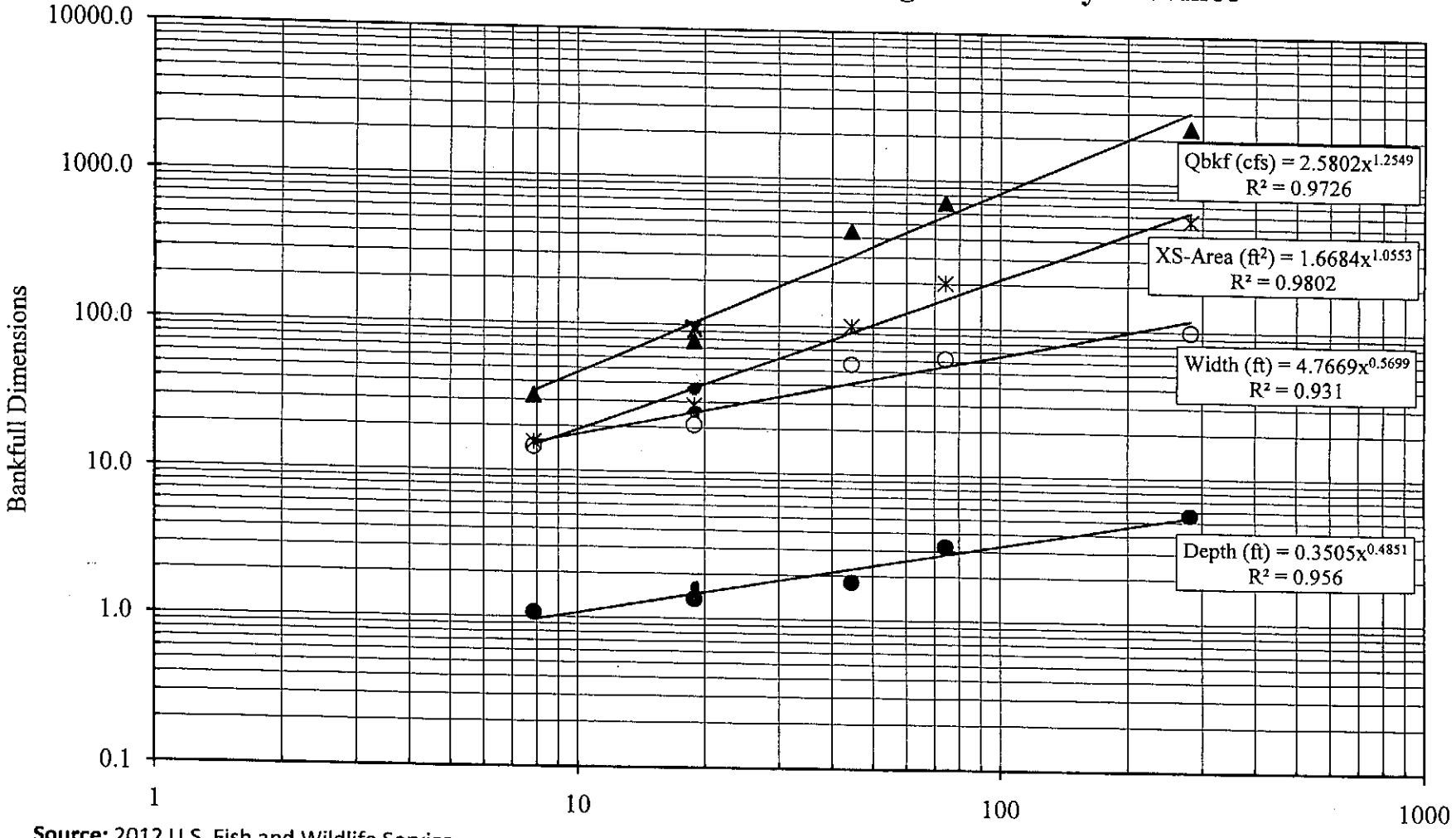
Bankfull Characteristics for Selected USGS Gages in the PA and MD Carbonate Great Valley Section of the Ridge and Valley Province



Source: 2012 U.S. Fish and Wildlife Service, Chesapeake Bay Field Office - Annapolis, MD

sta 134 $\bar{d}$ = 1.45 Q = 94 cfs
w = 25.8
Axs = 37.4