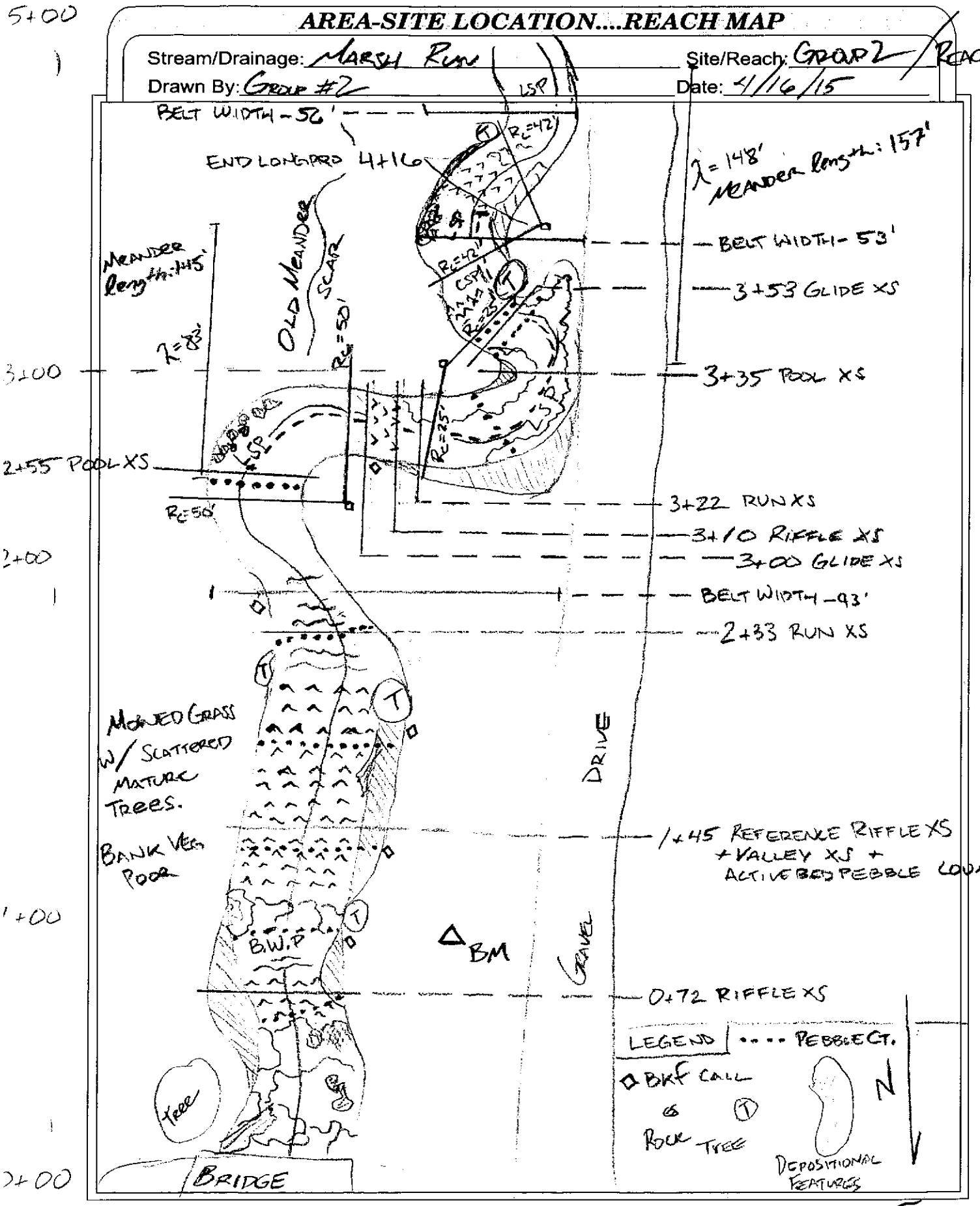
AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Marsh Run Site/Reach: Group 2 / Reach 2

Drawn By: Group #2 Date: 4/16/15

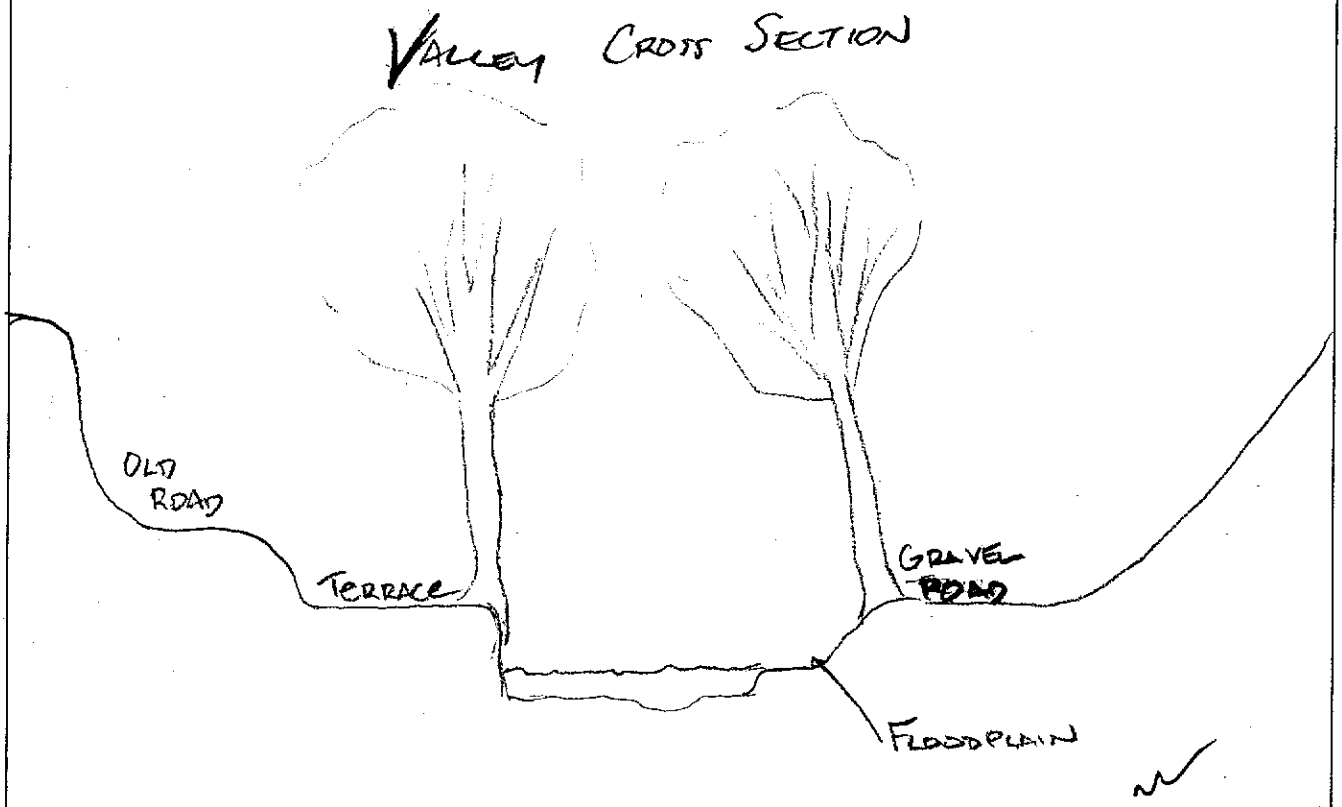


Copyright © 2015 Wildland Hydrology

AREA-SITE LOCATION....REACH MAP

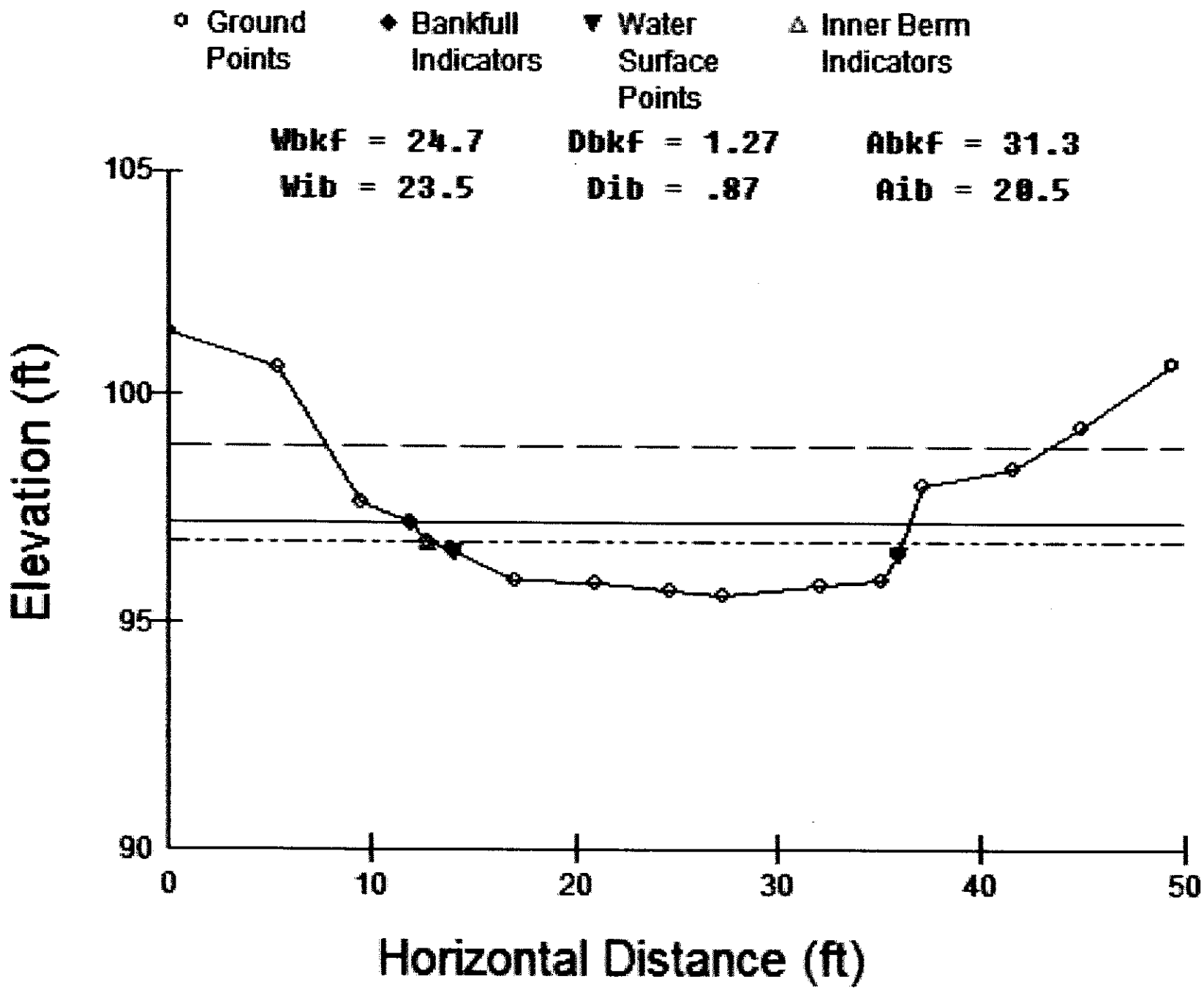
Stream/Drainage: MARSH RUN Site/Reach: GROUP 2 / REACH 2

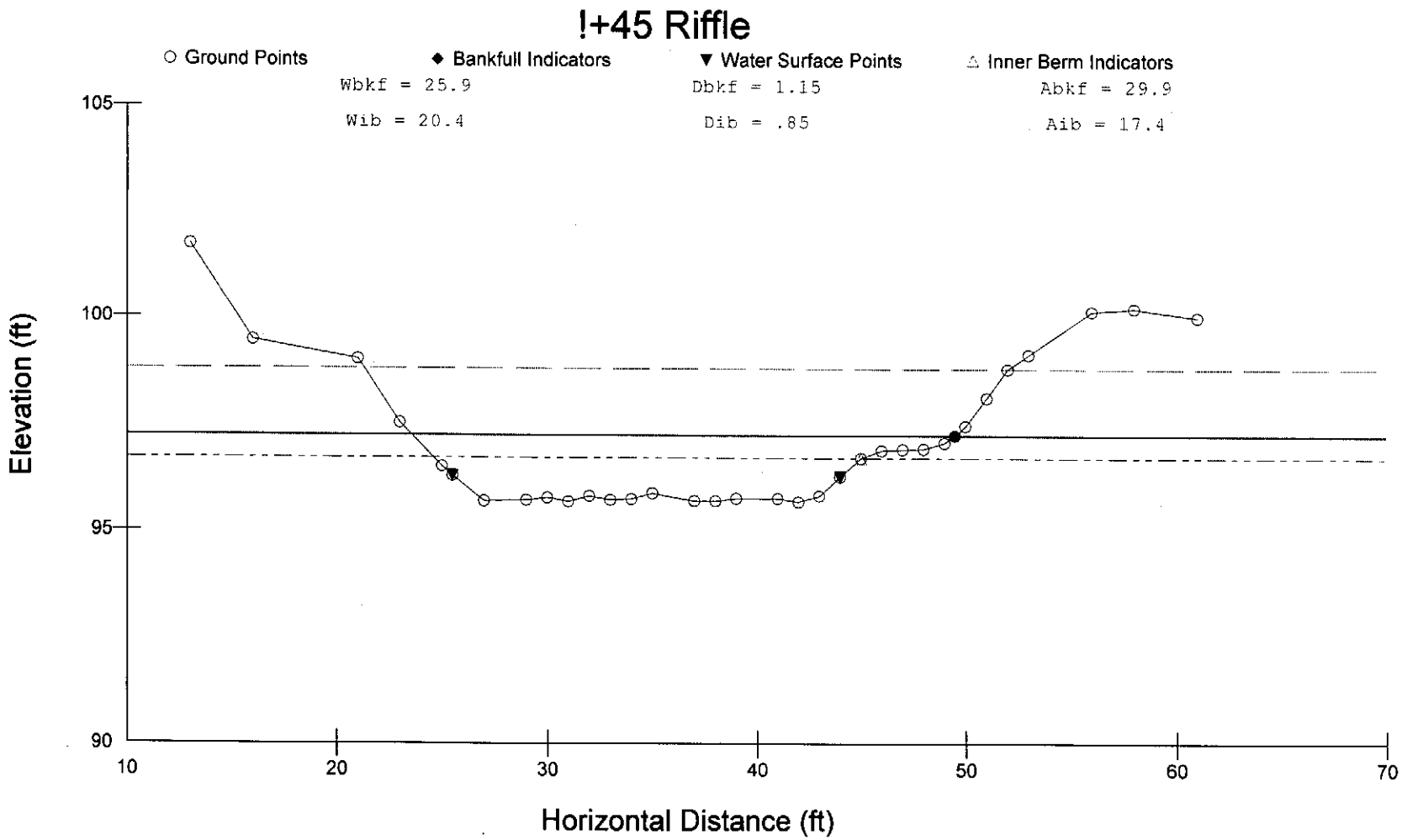
Drawn By: Date: 4/16/15

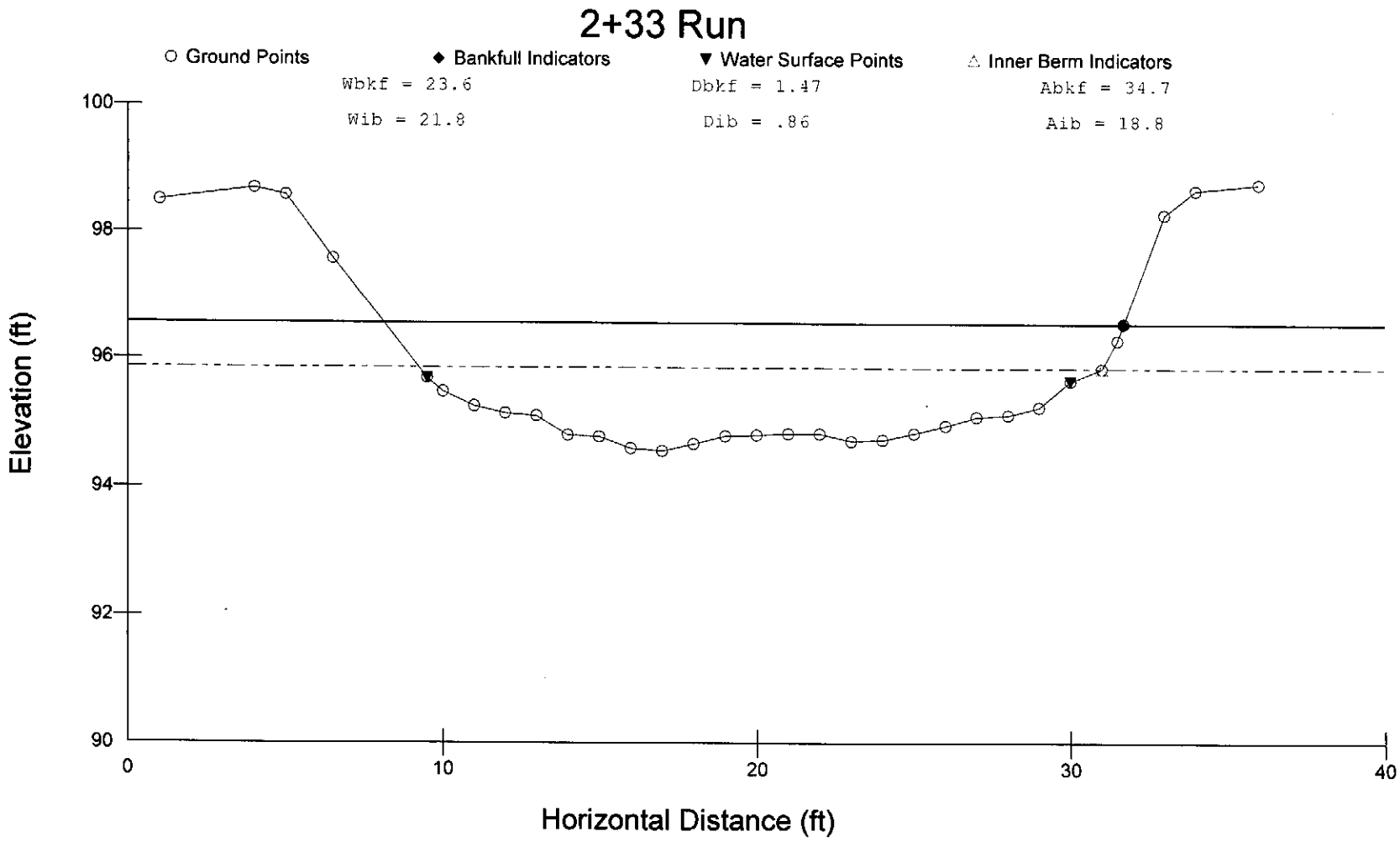


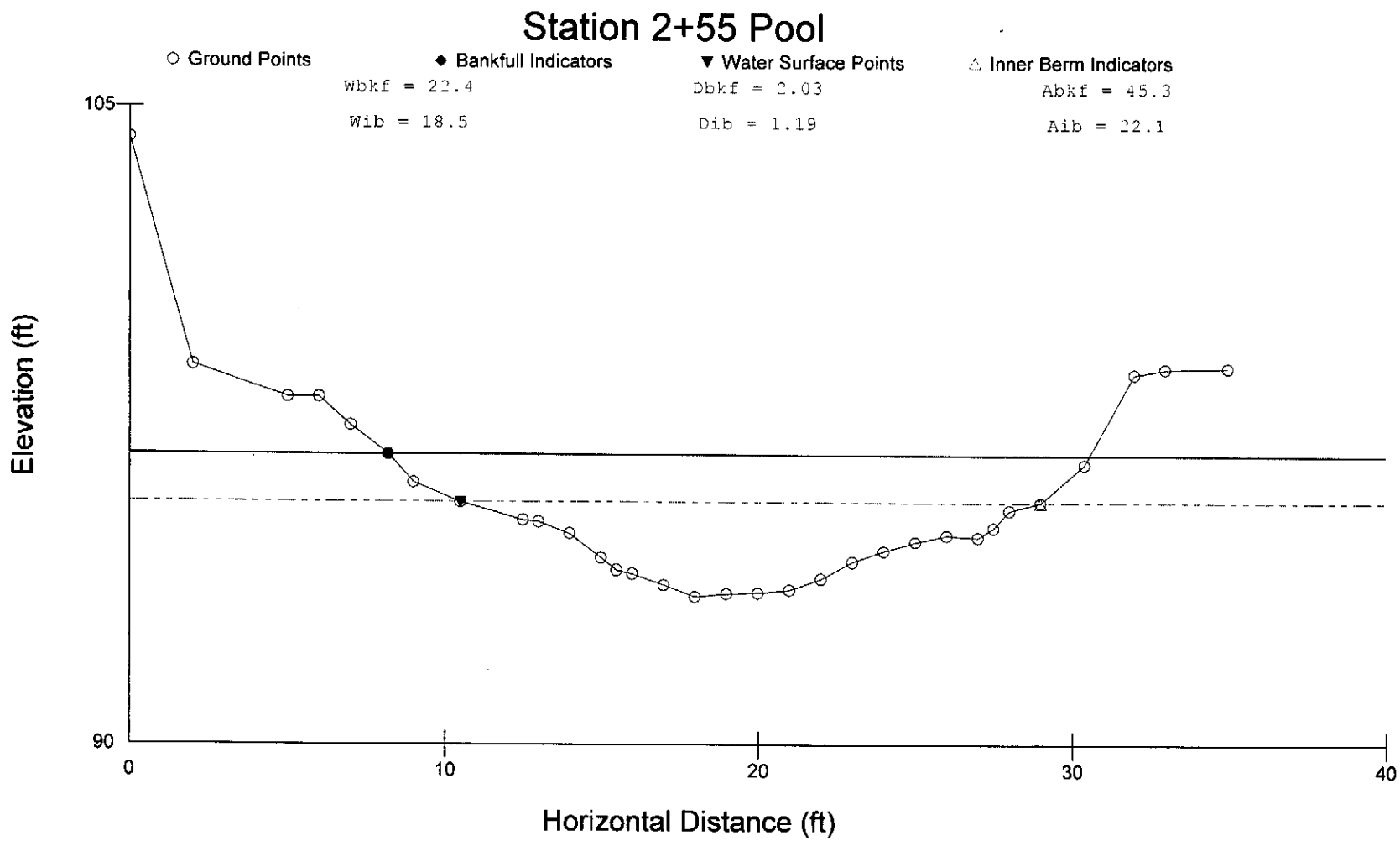
Copyright © 2015 Wildland Hydrology

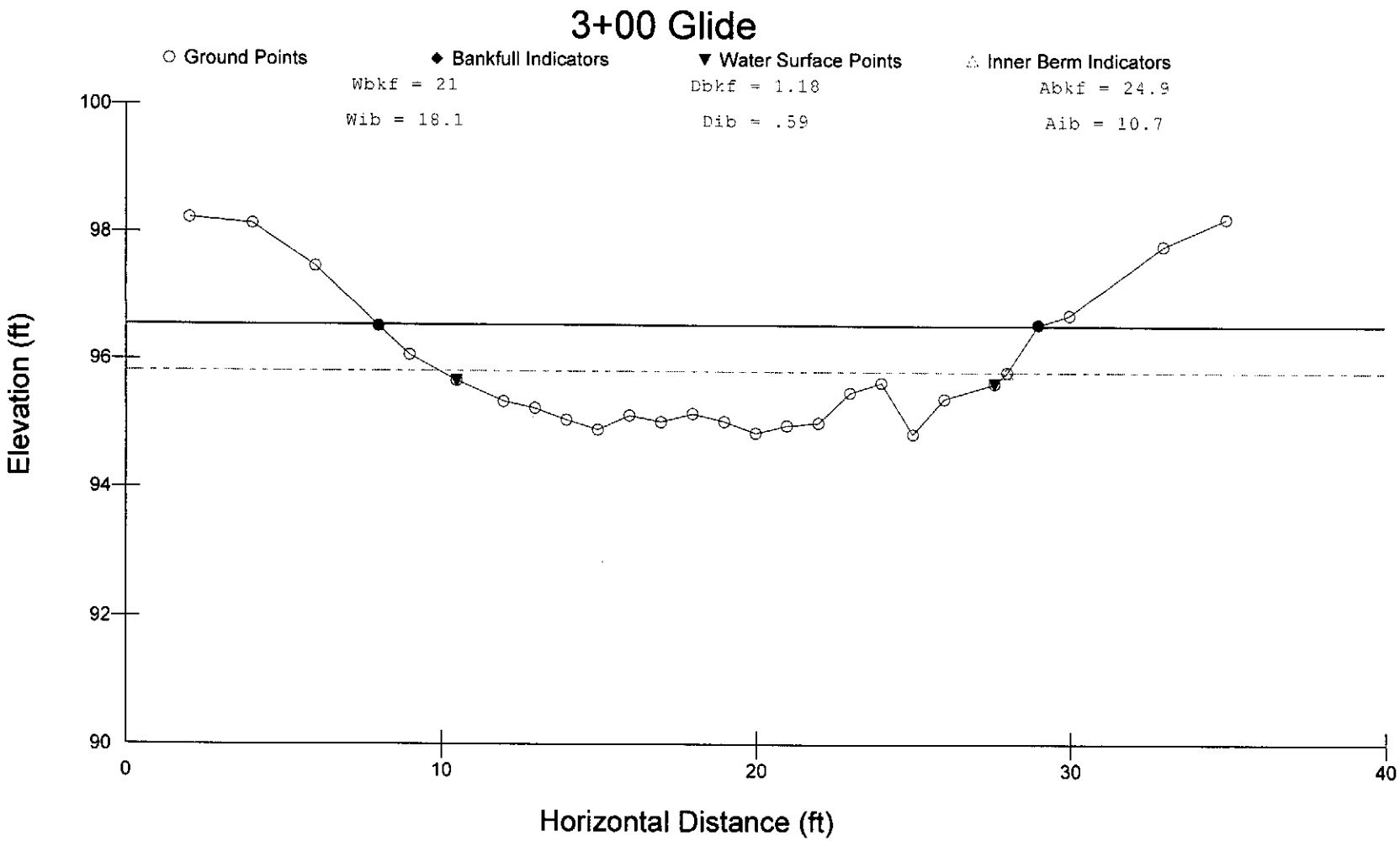
0+72 Riffle

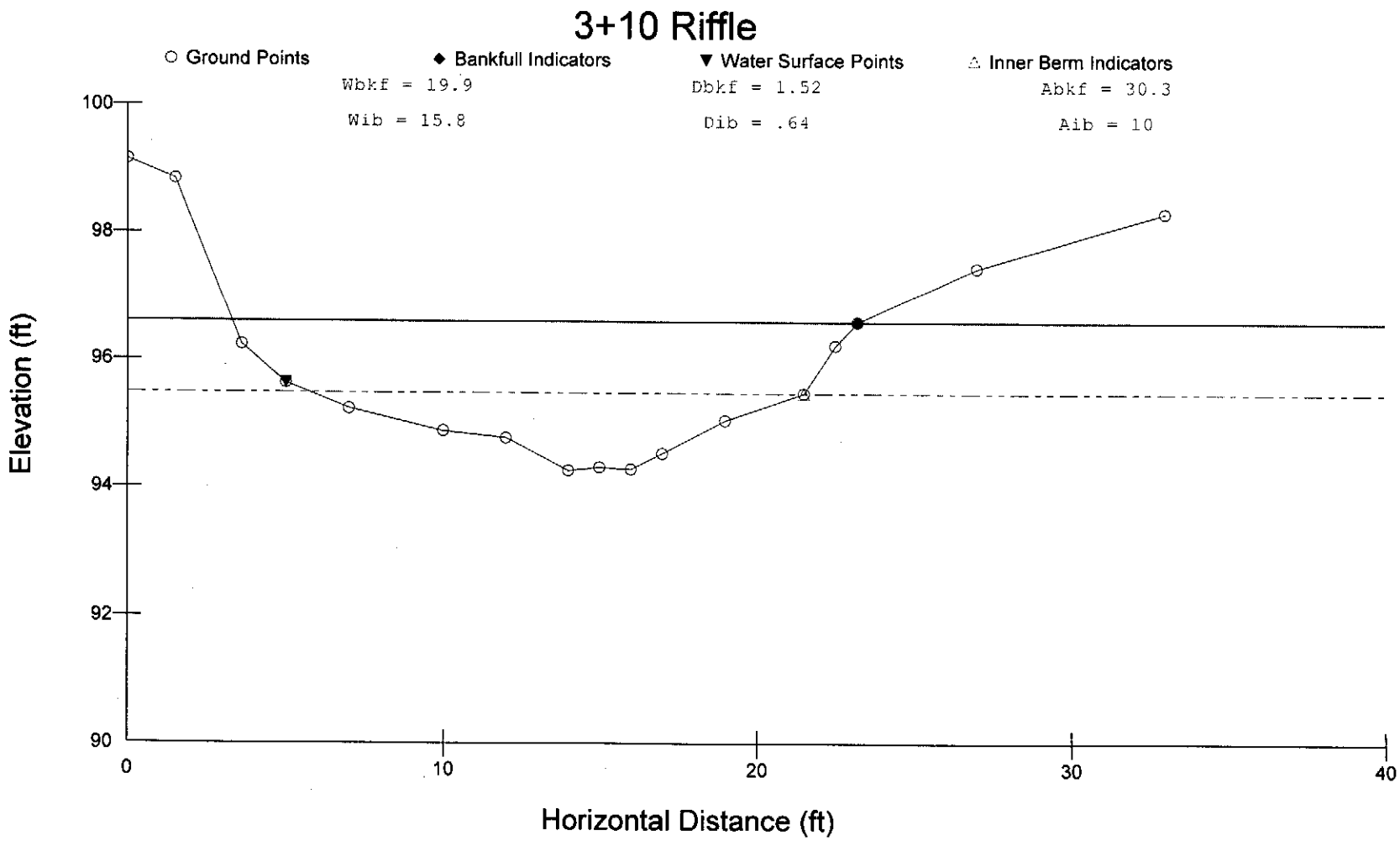

Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 24.7
Dbkf = 1.27
Abkf = 31.3
Wib = 23.5
Dib = .87
Aib = 20.5
105
100
95
90
Elevation (ft)
0
10
20
30
40
50
Horizontal Distance (ft)

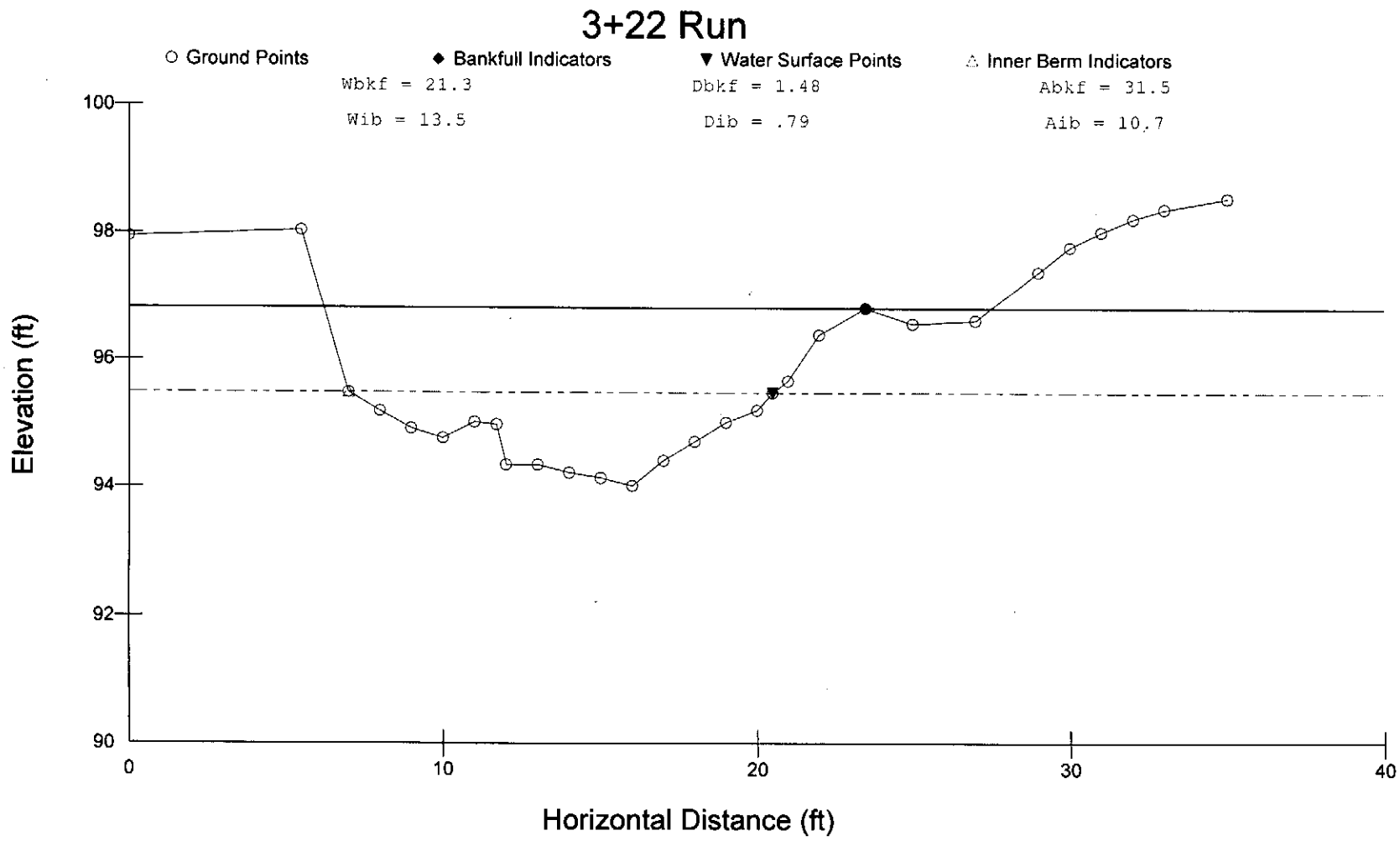

!+45 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 25.9
Wib = 20.4
Dbkf = 1.15
Dib = .85
Abkf = 29.9
Aib = 17.4
105
100
95
90
Elevation (ft)
10
20
30
40
50
60
70
Horizontal Distance (ft)

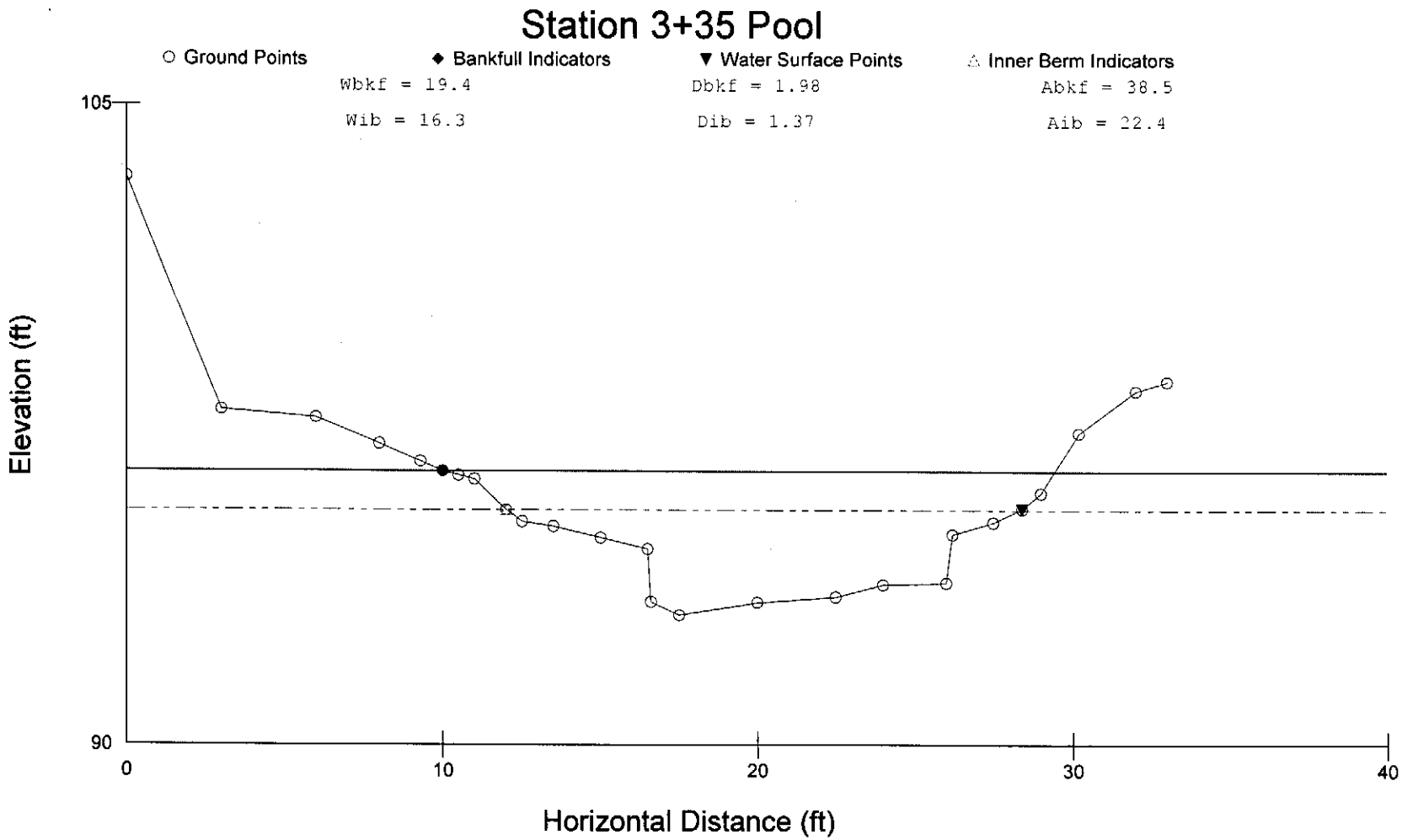

2+33 Run
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 23.6
Wib = 21.8
Dbkf = 1.47
Dib = .86
Abkf = 34.7
Aib = 18.8
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
Horizontal Distance (ft)

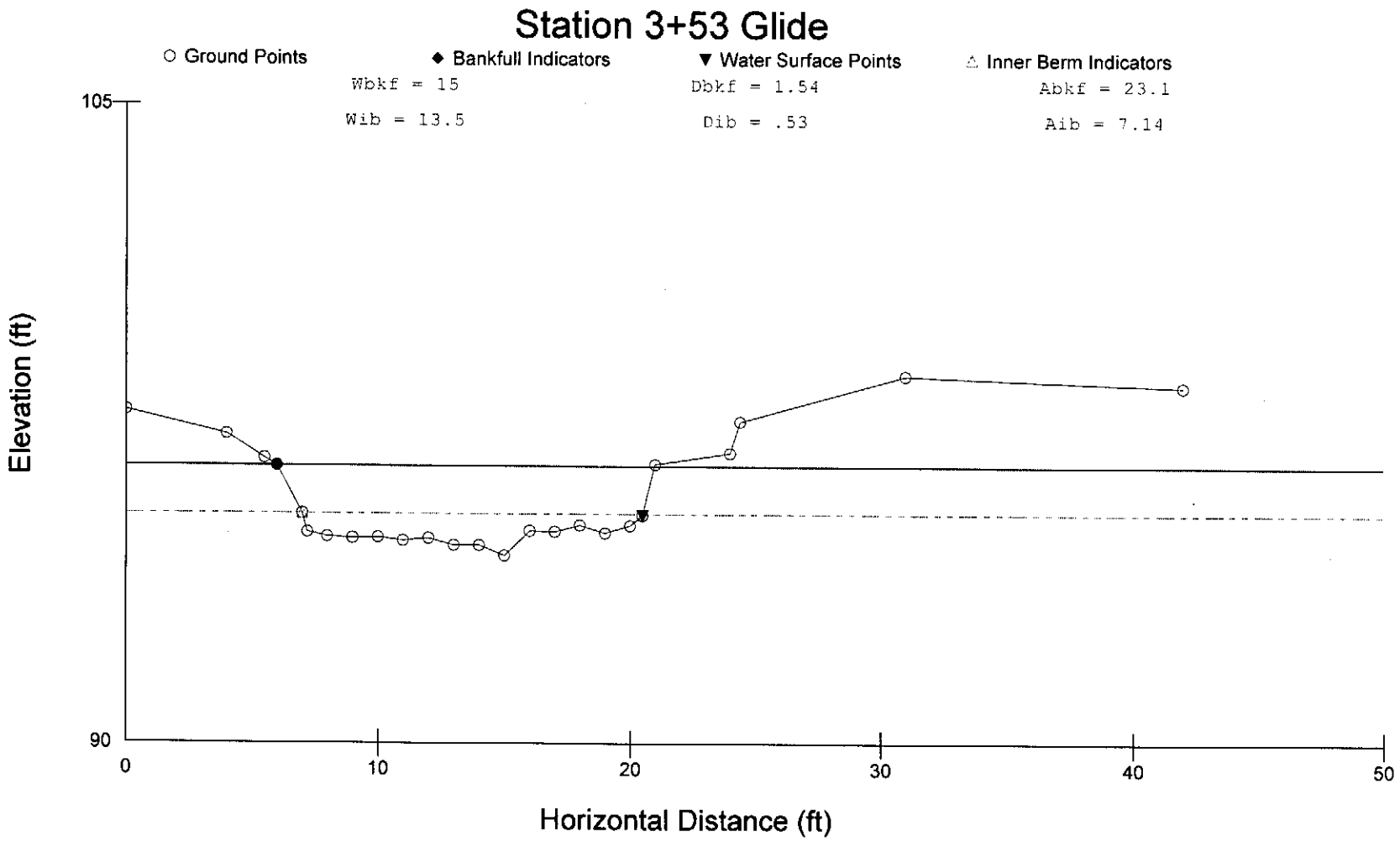

Station 2+55 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 22.4
Wib = 18.5
Dbkf = 2.03
Dib = 1.19
Abkf = 45.3
Aib = 22.1
105
90
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)


3+00 Glide
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 21
Wib = 18.1
Dbkf = 1.18
Dib = .59
Abkf = 24.9
Aib = 10.7
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
Horizontal Distance (ft)


3+10 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 19.9
Wib = 15.8
Dbkf = 1.52
Dib = .64
Abkf = 30.3
Aib = 10
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
Horizontal Distance (ft)


3+22 Run
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 21.3
Wib = 13.5
Dbkf = 1.48
Dib = .79
Abkf = 31.5
Aib = 10.7
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
Horizontal Distance (ft)


Station 3+35 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 19.4
Wib = 16.3
Dbkf = 1.98
Dib = 1.37
Abkf = 38.5
Aib = 22.4
105
90
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)


Station 3+53 Glide
Ground Points
Bankfull Indicators
Water Surface Points
Inner Berm Indicators
Wbkf = 15
Wib = 13.5
Dbkf = 1.54
Dib = .53
Abkf = 23.1
Aib = 7.14
105
90
Elevation (ft)
0
10
20
30
40
50
Horizontal Distance (ft)

SURVEY DATA ⟹ **CROSS - SECTION** 4

SITE: 0+72 Riffle Team 2 Reach 2 **Date:** 4/16/15

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	BM	5.69	105.69		100	
30	0.0			4.24		
31	5.4			5.09		
32	9.5			8.03		LBNFL ?
33	11.9			8.45		Front Bench
34	12.7			8.90		
35	14.0			9.12	96.57	LEW
36	17.0			9.76		
37	21.0			9.79		
38	24.7			9.98		
39	27.4			10.10	95.59	
40	32.2			9.88		
41	35.2			9.77		Edge of toe
42	36.0			9.16		REW
43	37.2			7.67		Top of Bench
44	41.6			7.28		
45	45.0			6.35		
46	49.5			4.95		
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						

4.95

Sol ↑ 5.96 LL

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION 1** *Representative Riffle

SITE: Station 1+45 Riffle **Date:** 4/16/15

Team 2 Reach 2

Location:

Party / Notes: Katie, Chris **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	BM	4.26	104.26			Establish HI
2	13.0			2.53		
3	16.0			4.81		
4	21.0			5.26		Left bank TOB
5	23.0			6.75		
6	25.0			7.76		
7	25.5			7.98		LEW
8	27.0			8.57		
9	29.0			8.55		
10	31.0			8.58	95.68	TW?
11	33.0			8.54		
12	34.0			8.52		
13	35.0			8.38		
14	37.0			8.56		
15	39.0			8.50		
16	41.0			8.50		
17	42.0			8.58	95.68	TW?
18	43.0			8.44		
19	44.0			8.0		REW
20	30.0			8.49		
21	32.0			8.45		
22	38.0			8.56		
23	45.0			7.56		
24	46.0			7.38		
25	47.0			7.35		
26	48.0			7.34		
27	49.0			7.20		
28	50.0			6.80		
	49.5			7.03	97.23	BKF - Fairly confident

97.23
-95.68
1.55
× 2
3.10

5.48 rod reading FPA height

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION** 2

SITE: STATION 2+33 Run Date: Team 2 Reach 2 4/16/15

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	BM6		104.26			
30	1			5.76		
31	4			5.57		
32	5			5.68		TOP Left BANK
33	6.5			6.68		
34	9.5			8.57		Left water edge (TOP of water)
35	10			8.78		IN MUD?
36	11			9.0		
37	12			9.11		
38	13			9.15		
39	14			9.45		
40	15			9.47		
41	16			9.65		
42	17			9.69		
43	18			9.58		
44	19			9.46		
45	20			9.44		
46	21			9.42		
47	22			9.42		
48	23			9.53		
49	24			9.51		
50	25			9.41		
51	26			9.29		
52	27			9.15		
53	28			9.12		
54	29			9.00		
55	30			8.60		Rt edge water - water surface
56	31			8.40		
57	31.5			7.96		
58	31.7			7.70		BKF - ???
59	33			5.97		TOP RGT BANK
	34			5.59		
	36			5.49		

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION** 3

SITE: Pool STAT. 255 **Date:** Team 2 Reach 2 4/16/15

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	0		104.26			
30	2			5.37		
31	5			5.36		TOP BANK
32	6			6.13		
33	7			6.78		
34	8.2			7.46		BKF (flagged by team)
35	9			8.12		
36	10.5			8.59		~~edge~~ ~~rt~~ left edge water top of water
37	~~13~~			~~[illegible]~~		
38	12.5			9.0		
39	13			9.04		
40	14			9.31		
41	15			9.89		
42	15.5			10.17		
43	16			10.25		
44	17			10.50		
45	18			10.78		
46	19			10.71		
47	20			10.69		
48	21			10.62		
49	22			10.36		
50	23			9.98		
51	24			9.72		
52	25			9.50		
53	26			9.34		
54	27			9.39		
55	27.5			9.16		
56	28			8.76		
57	29			8.58		RT water edge / surface
58	30.4			7.67		BKF ???
59	32			5.59		RT BANK
	33			5.42		
	35			5.39		

Tree in way

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION 5**

Team 2
Reach 2

SITE: Station 3+00 Glide **Date:** 4-16-15

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	2.0			6.03		
30	4.0			6.12		TOB Left
31	6.0			6.79		
32	8.0			7.74		Bkf ? Outside of meander
33	9.0			8.19		
34	10.5			18.59		LEW
35	12.0			8.92		
36	13.0			9.02		
37	14.0			9.20		
38	15.0			9.35		
39	16.0			9.13		
40	17.0			9.23		
41	18.0			9.10		
42	19.0			9.22		
43	20.0			9.40		
44	21.0			9.28		
45	22.0			9.24		
46	23.0			8.77		Rock / At water surface
47	24.0			8.61		On top of rock / Above WS
48	25.0			9.41		
49	26.0			8.86		
50	27.6			8.62		REW
51	28.0			8.44		
52	29.0			7.70		Bkf
53	30.0			7.55		Tree in the way, stepped 1' back from tape
54	33.0			6.45		TOB Right
55	35.0			6.02		
56						
57						
58						
59						

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION 8**

Team 2
12 and 2

SITE: Riffle XSC 3+10 **Date:** 4-16-15

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	BM	3.28	103.28			BS to BM 100.00
30	0			4.13		
31	1.5			4.44		edge of bank
32	3.6			7.05		
33	5.0			7.65		L EOW
34	7.0			8.05		
35	10.0			8.40		
36	12.0			8.51		
37	14.0			9.02	94.26	TW
38	15			8.97		TW
39	16			9.00		
40	17			8.75		
41	19			8.23		
42	21.5			7.80		R EOW
43	22.5			7.05		mid bank
44	23.2			6.68	96.60	BF
45	27			5.82		
46	33			4.95		
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						

Do Not Use!

4.4

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟹ **CROSS - SECTION** 6

4-16-15

SITE: RUN @ STAT 3+22 **Date:** Team 2 Reach 2

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
29	BS		104.26			HI
30	0			6.32		
31	5.5			6.22		TOP of left BANK
32	7			8.78		WATER surface - left water edge
33	8			9.08		
34	9			9.35		
35	10			9.50		
36	11			9.25		
37						
38	11.7			9.29		
39	12			9.92		
40	13			9.92		
41	14			10.04		
42	15			10.12		
43	16			10.24		
44	17			9.85		
45	18			9.55		
46	19			9.25		
47	20			9.06		
48	20.5			8.78		WATER surface - RT. edge
49	21			8.59		
50	22			7.86		
51	23.5			7.45		BKF - ??? PER JASON
52	25			7.69		
53	27			7.64		
54	29			6.87		
55	30			6.48		
56	31			6.24		
57	32			6.03		
58	33			5.88		
59	35			5.71		

Copyright © 2015 Wildland Hydrology

MARSH

4-16-15 Team 2 Reach 2

STA	Shec. Br. BS	HI	POOL FS	STA 3+35 ELEV	NOTES
BM	3.32	103.32		100	
0+03			5.5		
0+06			5.69		
0+08			6.3		
0+09.3			6.71		BF
0+10			6.94		↓
0+10.5			7.04		
0+11			7.13		
0+12			7.85		LEW
0+12.5			8.12		
0+13.5			8.23		
0+15			8.49		
0+16.5			8.76		
0+16.6			9.96		
0+17.5			10.27		Thal
0+20			9.98		
0+22.5			9.85		
0+24			9.56		
0+26			7.52		
0+26.2			8.41		
0+27.5			8.13		
0+28.4			7.82		REW
0+29			7.44		
0+30.2			6.04		
0+32			5.04		next page →

STA	FS	Elev
0+33	4.81	

Team 2 Reach 2 4-16-15

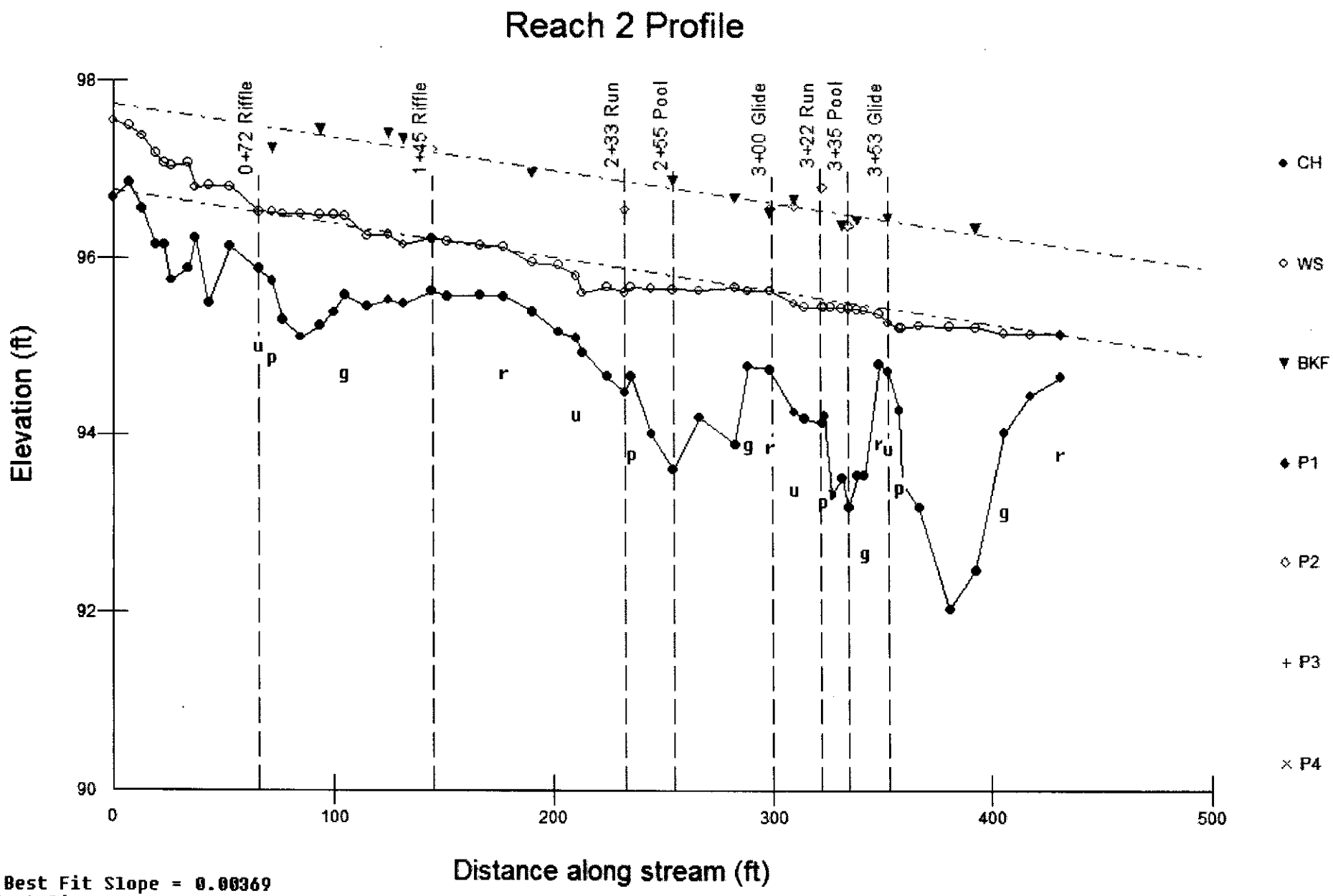
STA	SHER. BR. B5	H1	GLIDE F8 (−)	3+53 ELEV	NOTES
BM	+3.32	103.32		100	BM
0+04			5.55	97.77	
0+05			6.12	97.2	
0+06.5			6.68	96.64	
0+07			6.85	96.47	BKF
0+08			7.97	95.35	LEW
0+08.2			8.40	94.92	
0+09			8.50	94.82	
0+10			8.54	94.78	
0+11			8.52	[illegible]	94.80
0+12			8.59	94.73	
0+13			8.54	94.78	
0+14			8.70	94.62	
0+15			8.70	94.62	
0+16			8.94	94.38	TW
0+17			8.36	94.96	
0+18			8.38	94.94	
0+19			8.23	95.09	
0+20			8.41	94.91	
0+21			8.24	94.08	
~~STA (−1) FOR ACTUAL — TAPE WAS TIED~~					
0+21.5			8.00	95.32	REW
0+22			6.80	96.52	
0+25			6.53	96.79	
0+25.4			5.79	97.53	
0+32			4.70	98.62	

103.32
8.24
95.08

NEXT PAGE

GLIDE	FS	ELEV
0+43	4.95	98.37

STA: 3+53



BKF Best Fit Slope = 0.00369
P1 Best Fit Slope = 0.00376

SHEET #1

SURVEY DATA ⟶ **LONGITUDINAL PROFILE 1**

SITE: MARSH RUN TEAM 2 Reach 2 Date: 4/16/15

Location: ★TEAM 3 HI 2.34

Party / Notes: RA, AM, CS HUC:

POOL TYPES
CSP
LSP
SP

	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	BM				100							
2	HI	4.26	104.26									
3	0			7.58	96.68	6.71	97.55					START GLIDE
4	7			7.41		6.77						RIFFLE HEAD
5	13			7.70		6.88						RIF MID
6	19			8.11		7.08						RIF MID
7	23			8.11		7.19						RIF MID / STEP POOL ?
8	26			8.51		7.22						RIF MID / SP?
9	34			8.38		7.19						RIF MID - Logs near WSEL meas.
10	37			8.03		7.46						RIF MID
11	43			8.77		7.44				6.01		RIF MID
12	53			8.13		7.45				6.35		RIF
13	66			8.38		7.73						RIF
14	72			8.52	95.74	7.74	96.52					RIF END / RUN START
15	77			8.96		7.76						RUN
16	85			9.15		7.73						BWP
17	94			9.02	95.24	7.72	96.54	6.80	97.46			BWP BKF - TEAM CALL
18	100			8.87		7.71						glide
19	105			8.68		7.72						end of glide
20	115			8.80		8.00						LSP OSR RIFFLE
21	125			8.73		7.99		6.84	97.42			BKF - TEAM CALL RIF
22	132			8.77		8.10		6.90				BKF - TEAM RIF
23	145			8.63		8.03						RIF
24	152			8.69		8.06						RIF
25	167			8.68		8.11						RIF
26	178			8.69		8.13						RIF
27	191			8.86		8.30		7.29				TEAM BKF CALL

RIF #1 XS

0 XS RIF

Copyright © 2015 Wildland Hydrology

SHEET 2

SURVEY DATA ⟶ **LONGITUDINAL PROFILE 2**

SITE: MARSH RUN REACH 2 — Date: 7/16/15

Location: group 2

Party / Notes: 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
28	203		104.26	9.09		8.33						RIFFLE
29	211			9.16		8.45						RIFFLE – WSEL ON TREE ROOT
30	214			9.33		8.65		7.49				RIFFLE TEAM BKF CALL
31	225			9.60		8.58						END RIFF / START RUN
32	233			9.78		8.64		7.73				RUN XS BKF – LPT CALL?
33	236			9.60		8.58						END OF RUN
34	245			10.24		8.60						end of RUN / START POOL
35	255			10.65		8.61		7.38				MAX D POOL TEAM BKF CALL
36	267			10.06		8.62						POOL LSP (RA) NOT CREAT BKF TOUGH SHOT
37	283			10.36		8.58		7.57				TEAM BKF LSP
38	289			9.48		8.62						end of pool – BOULDER start glide
39	299			9.52		8.62		7.73				glide TEAM BKF
40	310			10.00		8.76		7.60				RIFFLE TEAM BKF – (RA) BKF?
41	315			10.07		8.80						end of RIF / start RUN
42	323			10.12		8.77						start pool
43	324			10.09		8.75						POOL – LSP
44	327			10.93		8.77						mid pool
45	332			10.74		8.79		7.88				TEAM BKF call LSP
46	335			10.07		8.75		7.82				pool MAX D
47	339			10.71		8.79		7.82				TEAM BKF
48	342			10.71		8.84						end pool start glide
49	349			9.46		8.88						glide MID
50	353			9.53		8.98		7.91				glide end team BKF
51	358			9.97		9.04						end RIFFLE
52	359			10.80		9.04						Lat – deep pool (step)
53	367			11.07		9.01						? CLP SP?
54	381			12.22		9.02						pool

switched Rodman

② RUN XS –

③ pool XS –

④ Glide XS

⑤ RFL XS → RFL XS No good

⑥ glide XS –

Copyright © 2015 Wildland Hydrology

SURVEY DATA ⟶ **LONGITUDINAL PROFILE 3**

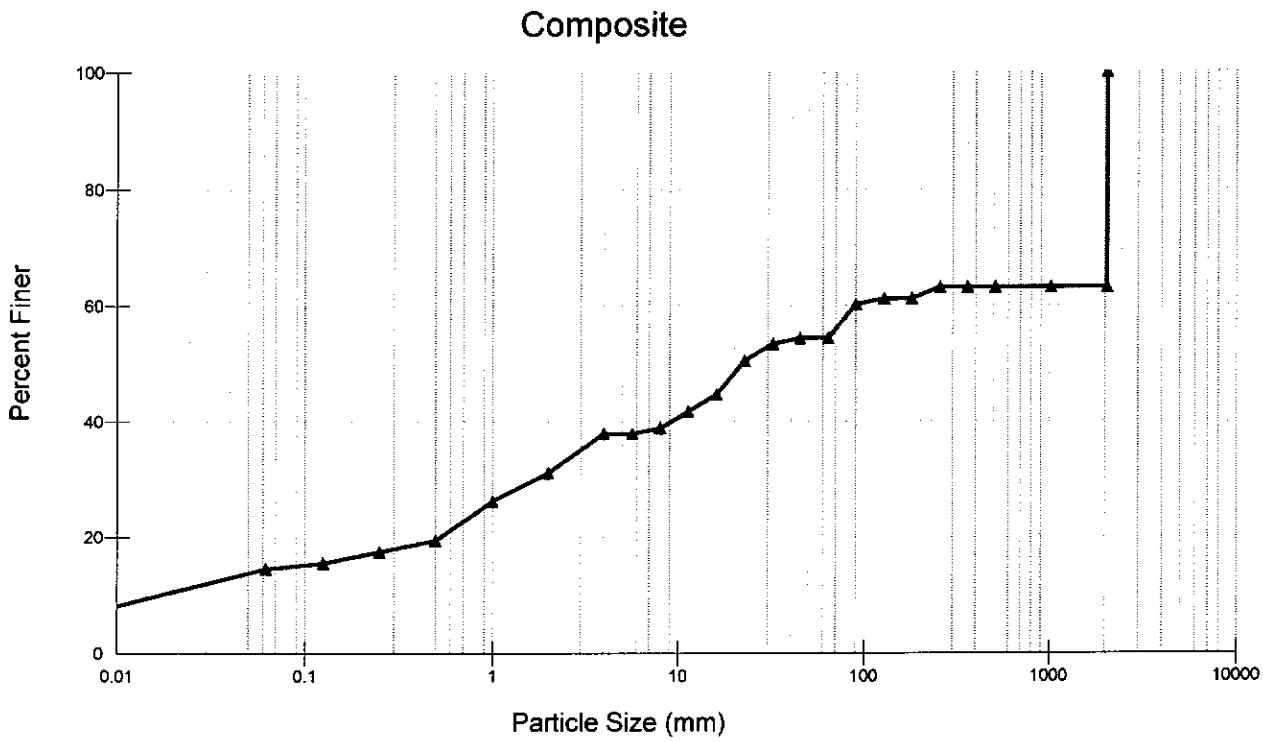
SITE: MARSH RUN Date: 4/16/15

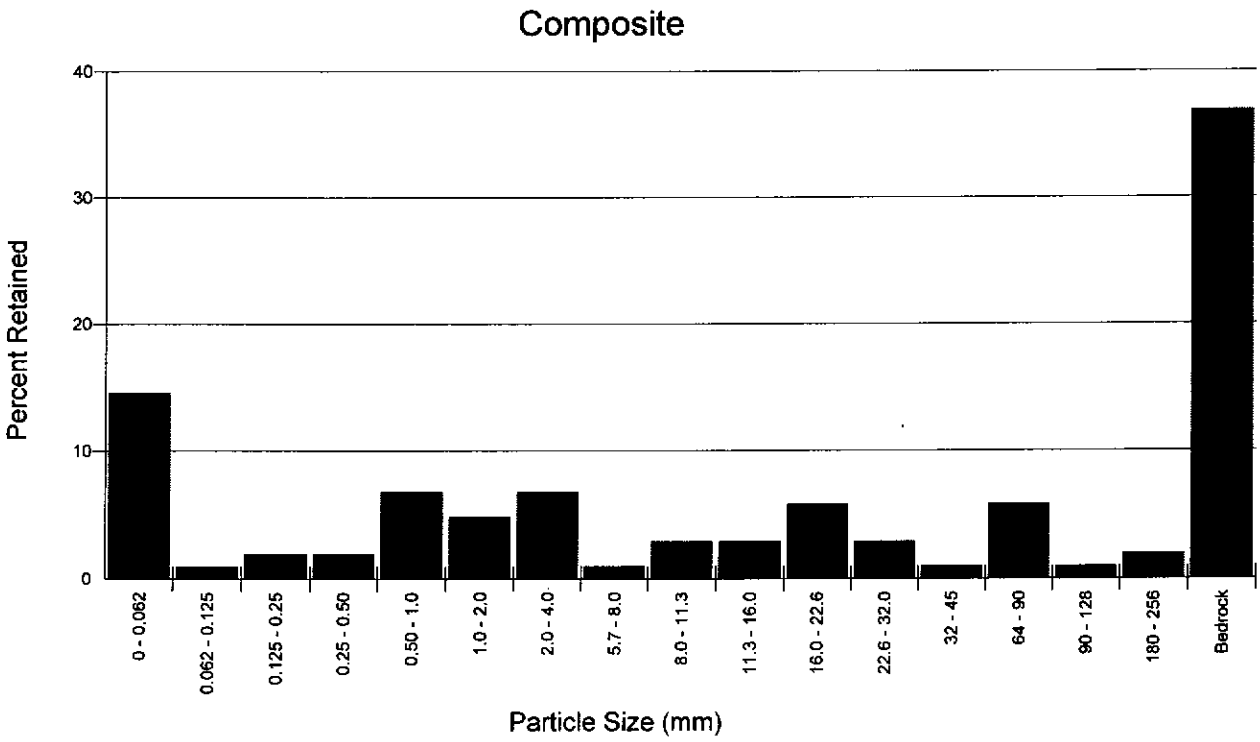
Location: TEAM 2 Reach 2

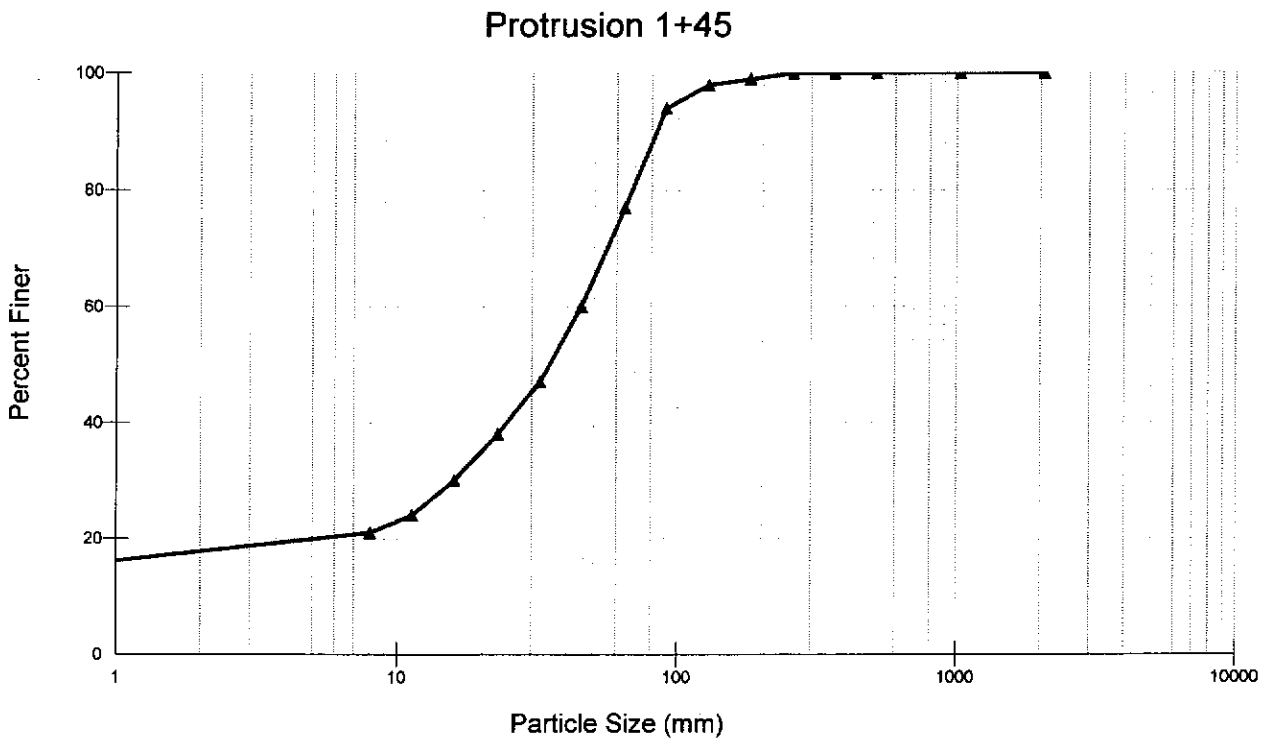
Party / Notes: RA, A, C HUC:

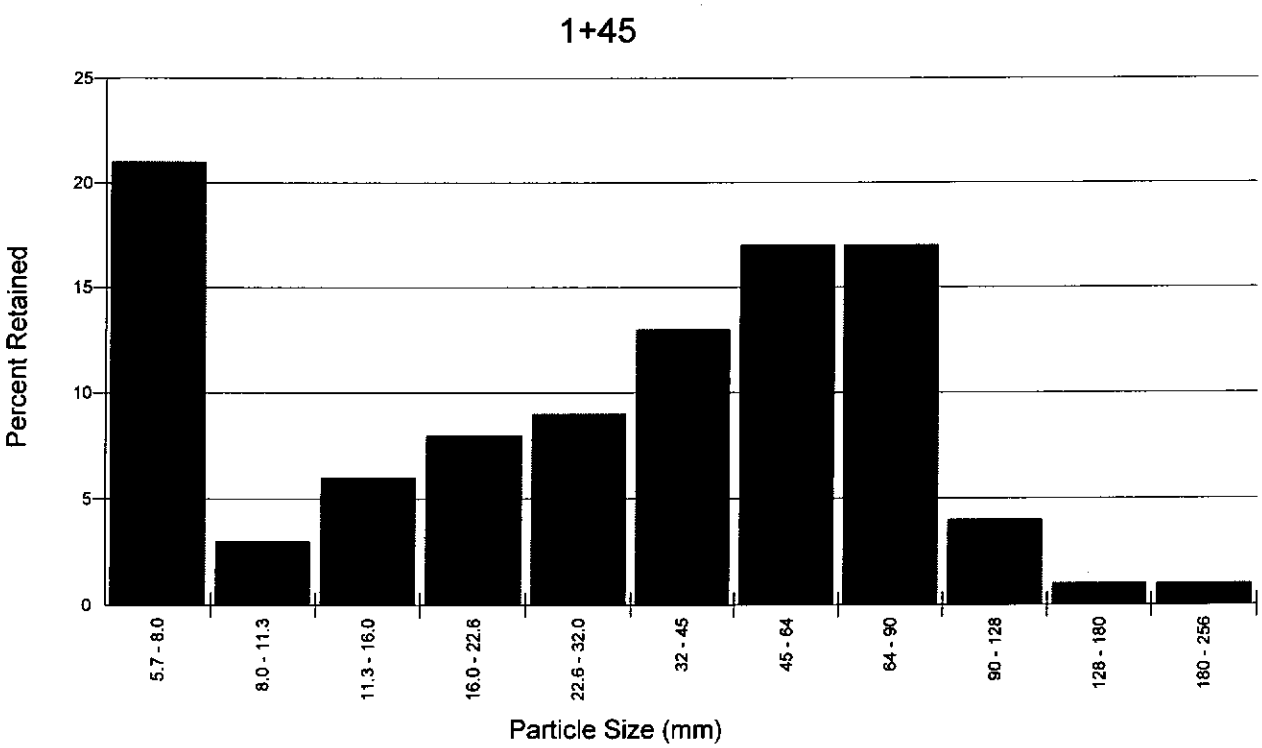
	Distance, Point, or	Back-Sight	Height of Instru-ment	Thalweg		Water Surface		Bankfull		Low Bank HI		NOTES
				Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	e.g. Riffle Run Pool Glide
	STATION	BS	HI	FS	Elev.	FS	Elev.	FS	Elev.	FS	Elev.	
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	
55	393	4.26	104.26	11.79		9.03		7.91				TEAM BKE CALL POOL
56	406			10.23		9.10						END POOL START GLIDE
57	418			9.81		9.11						END GLIDE START RIF
58	432			9.60		9.11						MID RIF END OF LONG PRO
59	BSCHK	4.26										
60												
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												
76												
77												
78												
79												
80												
81												

Copyright © 2015 Wildland Hydrology


Composite
Percent Finer
100
80
60
40
20
0
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)


Composite
Percent Retained
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
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
64 - 90
90 - 128
180 - 256
Bedrock
Particle Size (mm)


Protrusion 1+45
Percent Finer
100
80
60
40
20
0
1
10
100
1000
10000
Particle Size (mm)


1+45
Percent Retained
25
20
15
10
5
0
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
Particle Size (mm)

TEAM 2

60% NON-POOL 40%

Site: Reach 2 Date: 4/

Location: Marsh Run HUC:

Party: CTS/JF

Dot Count for

Inches	PARTICLE	Millimeters		RIFFLE 16	POOL 24	COMP. 3	RIFFLE (1) TOT #	RIFFLE (1) ITEM %	RIFFLE (1) % CUM	POOL (2) TOT #	POOL (2) ITEM %	POOL (2) % CUM	COMPOSITE (3) TOT #	COMPOSITE (3) ITEM %	COMPOSITE (3) % CUM
							Reach: 2			Reach: 2			Reach:		
							Date:			Date:			Date:		
	Silt / Clay	< .062	S/C			15	5	8.2	8.2	10					
	Very Fine	.062 - .125	SAND			1	1	.016		0					
	Fine	.125 - .25	SAND			2	1			1					
	Medium	.25 - .50	SAND			2	1			1					
	Coarse	.50 - 1.0	SAND			7	4			3					
.04 - .08	Very Coarse	1.0 - 2	SAND			5	0			5					
.08 - .16	Very Fine	2 - 4	GRAVEL			7	1			6					
.16 - .22	Fine	4 - 5.7	GRAVEL			0	0			0					
.22 - .31	Fine	5.7 - 8	GRAVEL			1	0			1					
.31 - .44	Medium	8 - 11.3	GRAVEL			3	3			0					
.44 - .63	Medium	11.3 - 16	GRAVEL			3	1			2					
.63 - .89	Coarse	16 - 22.6	GRAVEL			6	6			0					
.89 - 1.3	Coarse	22.6 - 32	GRAVEL			3	3			0					
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL			1	0			1					
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL			0	0			0					
2.5 - 3.5	Small	64 - 90	COBBLE			6	4			2					
3.5 - 5.0	Small	90 - 128	COBBLE			1	0			1					
5.0 - 7.1	Large	128 - 180	COBBLE			0	0			0					
7.1 - 10.1	Large	180 - 256	COBBLE			2	2			0					
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			38	29			9					
Stream Type:			**Valley Type:**	61	42	TOTAL→	61			42					

saprolite

1
32
129
61

Composite
D50 - 32.05
D84 - bedrock

Copyright © 2015 Wildland Hydrology

Site: Reach 2 Team 2 Date: 4-16-15

Location: Marsh Run HUC:

Party: CS/JF

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE XS @ 1+45	~~POOL~~ 3+22	COMP. 3	RIFFLE (1) 1+45 TOT #	ITEM %	% CUM	~~POOL~~ (2) RIFFLE 3+12 TOT #	ITEM %	% CUM	COMPOSITE (3) 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								3	3	3			
.22 - .31	Fine	5.7 - 8								0	0	3			
.31 - .44	Medium	8 - 11.3					21	21	21	17	17	20			
.44 - .63	Medium	11.3 - 16					3	3	24	3	3	23			
.63 - .89	Coarse	16 - 22.6					6	6	30	8	8	31			
.89 - 1.3	Coarse	22.6 - 32					8	8	38	10	10	41			
1.3 - 1.8	Very Coarse	32 - 45					9	9	47	8	18	49			
1.8 - 2.5	Very Coarse	45 - 64					13	13	60	16	16	65			
2.5 - 3.5	Small	64 - 90	COBBLE				17	15	77	12	12	77			
3.5 - 5.0	Small	90 - 128					17	17	94	9	9	86			
5.0 - 7.1	Large	128 - 180					4	4	98	11	11	97			
7.1 - 10.1	Large	180 - 256					1	1	99	3	3	100			
10.1 - 14.3	Small	256 - 362	BOULDER				1	1	100						
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
Stream Type:			**Valley Type:**			TOTAL→	100		100	100		100			

Reach: 2 Date: | Reach: 2 Date: | Reach: Date:

D50 35 D50 46.2
D84 74.7 D84 119.56
D95 99.5 D95 170.5

Copyright © 2015 Wildland Hydrology

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 - Team 2			Location:	Reach - Reach 2 - Team 2
Date:	4/16/2015	Stream Type:	F1	Valley Type:	VIIIb
Observers:	Team 2			HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	29.89	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.15	d_{bkf} (ft)
Bankfull Riffle WIDTH	25.95	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	26.57	W_p (ft)
D_{84} at Riffle	35.00	Dia. (mm)	D_{84} (mm) / 304.8	0.11	D_{84} (ft)
Bankfull SLOPE	0.0038	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.13	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	9.83	R / D_{84}
Drainage Area	19.0	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	0.374	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [2.83 + 5.66 * Log\{R / D_{84}\}] u^*$	3.15	ft / sec	94.08	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.03	3.32	ft / sec	99.27	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.041	2.43	ft / sec	72.63	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 $n =$ 0.046	2.16	ft / sec	64.47	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	3.23	ft / sec	96.65	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 = 2.0 year	3.51	ft / sec	105.00	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$	3.73	ft / sec	111.50	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 **"protrusion 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.

Copyright © 2008 Wildland Hydrology

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

Stream:	**Marsh Run - Team 2, Reach - Reach 2 - Team 2**		
Basin:	Drainage Area: **12096** acres	**18.9**	mi^2
Location:	**Marsh Run - Team 2**		
Twp.&Rge: **;**	Sec.&Qtr.: **;**		
Cross-Section Monuments (Lat./Long.):	**0 Lat / 0 Long**	Date: **04/16/15**	
Observers: **Team 2**		Valley Type: VIIIb	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**25.95**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A / W_{bkf}$).	**1.15**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**29.89**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**22.57**	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.	**1.55**	ft
WIDTH of Flood-Prone Area (W_{fpa}) Twice maximum DEPTH, or ($2 \times d_{mbkf}$) = the stage/elevation at which flood-prone area WIDTH is determined in a riffle section.	**30.7**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.18**	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.	**22.05**	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.	**0.00384**	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).	**1.3**	

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

Copyright © 2006 Wildland Hydrology

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

Stream: **Marsh Run - Team 2** Location: **Reach - Reach 2 - Team 2**

Observers: **Team 2** Date: **04/16/15** Valley Type: **VIIIb** Stream Type: **F1**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	26	24.7	26	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	29.89	29.89	31.31
Mean Riffle Depth (d_{bkf})	1.15	1.15	1.27	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	21.00	19.43	22.57
Maximum Riffle Depth (d_{max})	1.6	1.55	1.65	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.324	1.299	1.348
Width of Flood-Prone Area (W_{fpa})	33.1	30.7	35.6	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.313	1.183	1.442
Riffle Inner Berm Width (W_{ib})	22	20.4	23.5	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.870	0.786	0.953
Riffle Inner Berm Depth (d_{ib})	0.86	0.85	0.87	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.715	0.686	0.743
Riffle Inner Berm Area (A_{ib})	19	17.4	20.5	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.619	0.583	0.654
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	25.4	23.9	27					

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	21	19.6	22.4	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	0.808	0.755	0.862
Mean Pool Depth (d_{bkfp})	2.02	2.01	2.03	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.757	1.748	1.765
Pool Cross-Sectional Area (A_{bkfp})	42.3	39.3	45.4	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.416	1.314	1.517
Maximum Pool Depth (d_{maxp})	3.35	3.32	3.37	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.913	2.887	2.930
Pool Inner Berm Width (W_{ibp})	17.4	16.3	18.5	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.831	0.829	0.833
Pool Inner Berm Depth (d_{ibp})	1.28	1.19	1.37	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.635	0.587	0.683
Pool Inner Berm Area (A_{ibp})	22.2	22.1	22.4	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.529	0.487	0.570
Point Bar Slope (S_{pb})	0.240	0.230	0.250	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	13.719	11.878	15.559

Run Dimensions*	Mean	Min	Max		Run Dimensionless Ratios****	Mean	Min	Max
Run Width (W_{bkfr})	22.4	21.3	23.6	ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})	0.864	0.820	0.909
Mean Run Depth (d_{bkfr})	1.48	1.47	1.48	ft	Mean Run Depth to Mean Riffle Depth (d_{bkfr} / d_{bkf})	1.287	1.278	1.287
Run Cross-Sectional Area (A_{bkfr})	33.1	31.5	34.7	ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})	1.108	1.055	1.161
Maximum Run Depth (d_{maxr})	2.39	1.99	2.79	ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})	2.078	1.730	2.426
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})	15.2	14.4	16	ft				

Glide Dimensions*	Mean	Min	Max		Glide Dimensions & Dimensionless Ratios****	Mean	Min	Max
Glide Width (W_{bkfg})	18	15	21	ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})	0.694	0.577	0.810
Mean Glide Depth (d_{bkfg})	1.36	1.18	1.54	ft	Mean Glide Depth to Mean Riffle Depth (d_{bkfg} / d_{bkf})	1.183	1.026	1.339
Glide Cross-Sectional Area (A_{bkfg})	24	23.1	24.9	ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})	0.803	0.773	0.832
Maximum Glide Depth (d_{maxg})	1.89	1.69	2.09	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	1.643	1.470	1.817
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})	13.8	9.73	17.8	ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})	27.999	25.563	30.434
Glide Inner Berm Width (W_{ibg})	15.8	13.5	18.1	ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})	0.881	0.859	0.902
Glide Inner Berm Depth (d_{ibg})	0.56	0.53	0.59	ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})	0.423	0.343	0.503
Glide Inner Berm Area (A_{ibg})	8.93	7.14	10.7	ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})	0.370	0.309	0.431

Step**	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 - Team 2**		Location: **Reach - Reach 2 - Team 2**	
Observers: **Team 2**	Date: **04/16/15**	Valley Type: **VIIIb**	Stream Type: **F1**

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	3.32	ft/sec	Estimation Method	ughness Coefficie	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	99.27	cfs	Drainage Area	18.9	mi^2

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	116	83	148	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	4.563	3.279	5.847
Stream Meander Length (L_m)	151	145	157	ft	Stream Meander Length Ratio (L_m / W_{bkf})	5.966	5.729	6.203
Radius of Curvature (R_c)	39	25	50	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	1.541	0.988	1.976
Belt Width (W_{blt})	67	53	93	ft	Meander Width Ratio (W_{blt} / W_{bkf})	2.647	2.094	3.674
Arc Length (L_a)	53	20	81	ft	Arc Length to Riffle Width (L_a / W_{bkf})	2.094	0.790	3.200
Riffle Length (L_r)	18.8	5.13	35.5	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	0.744	0.203	1.403
Individual Pool Length (L_p)	45.2	18.4	74.9	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	1.787	0.728	2.960
Pool to Pool Spacing (P_s)	101	51.8	178	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	3.973	2.045	7.032

Channel Profile

Valley Slope (S_{val})	0.0049	ft/ft	Average Water Surface Slope (S)	0.00376	ft/ft	Sinuosity (S_{val} / S)	1.3
Stream Length (SL)	416	ft	Valley Length (VL)	327	ft	Sinuosity (SL / VL)	1.27

Low Bank Height (LBH)	start	0	ft	Max Depth (d_{max})	start	0	ft	Bank-Height Ratio (BHR) (LBH / d_{max}) start
	end	0	ft		end	0	ft	end

Facet Slopes	Mean	Min	Max		Dimensionless Facet Slope Ratios	Mean	Min	Max
Riffle Slope (S_{rif})	0.017	0.012	0.025	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	4.457	3.207	6.590
Run Slope (S_{run})	0.005	0.001	0.010	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	1.335	0.274	2.705
Pool Slope (S_p)	0.002	0.001	0.005	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.537	0.173	1.285
Glide Slope (S_g)	0.004	0.000	0.008	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	0.947	0.000	2.112
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})	1.79	1.6	2.13	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.48	1.322	1.76
Max Run Depth (d_{maxrun})	2.07	1.65	2.36	ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	1.71	1.364	1.95
Max Pool Depth (d_{maxp})	3.27	2.32	4.26	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.7	1.917	3.52
Max Glide Depth (d_{maxg})	1.62	1.45	1.88	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	1.34	1.198	1.55
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	14.56	8.2		D_{16}	0.16	0.72		7.45	mm
% Sand	16.51	11.47		D_{35}	3.16	20.79		20.13	mm
% Gravel	23.3	22.95		D_{50}	22.05	199		35	mm
% Cobble	8.74	9.84		D_{84}	Bedrock	Bedrock		74.71	mm
% Boulder	0	0		D_{95}	Bedrock	Bedrock		99.5	mm
% Bedrock	36.89	47.54		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.

Copyright © 2009 Wildland Hydrology

Worksheet B-4. Dimensionless ratios of the ten pool types (*First Field Day*).

Stream: MARSH RUN at Grimes, MD | Location: Reach 2 -Team 2

Observers: | Stream Type: F1 | Valley Type: | Date: 4-16-15

Pool Type		Dimensional Values: Pool Length (Lp)	Pool Max. Depth (Dmax)	Pool Slope (Sp)		Dimensionless Ratios: Pool Length to Riffle Width (Lp/Wb)	Pool Max. Depth to Riffle Width (Dmax/Wb)	Pool Slope to Average Slope (Sp/Sb)
1. Lateral Scour Pool (LSP)	Mean	40.51	2.15	.0008	Mean	1.56	1.87	.213
	Min.	27.07	2.05	.00031	Min.	1.05	1.78	.082
	Max.	53.95	2.25	.00128	Max.	2.08	1.96	.34
2. Contraction Scour Pool (CSP)	Mean	48.01	3.2	.0011	Mean	1.85	2.78	.293
	Min.				Min.			
	Max.				Max.			
3. Step/Pool (SP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
4. Backwater Pool (BWP)	Mean	20.09	1.39	.00086	Mean	.776	1.21	.229
	Min.				Min.			
	Max.				Max.			
5. Plunge Pool (PP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
6. Pocket Water Pool (PWP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
7. Lateral Protrusion Pool (LPP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
8. Straight Dissipator Pool (SDP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
9. Converging Confluence Pool (CCP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
10. Compound Pool (CP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			

Copyright © 2015 Wildland Hydrology

MARSH RUN GROUP 2 / REACH 2 4/16/15 Team 2

Worksheet 4-7. 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(s) (**Figure 2-3**).
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: $u^* = (gRS)^{1/2}$.
10. Calculate friction factor: u/u^*.
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 2-18**) (Example in **Figure 4-10**).
14. Plot Manning's "n" by friction factor (**Figure 2-19**) (Example in **Figure 4-11**).
15. Plot Manning's "n" by stream type (**Figure 2-20**) (Example in **Figure 4-12**).

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} ~~D_{50}~~ (mm)	(ft)	Stream Type	Manning's "n"	Relative Rough-ness R/D_{84} (ft/ft)	Shear Velocity u* (ft/s)	Friction Factor u/u*
18.6	99.3	25.9	1.2	29.9	3.32	0.00376	35	0.11	F1	0.035	10.9	0.38	8.74

Copyright © 2008 Wildland Hydrology

Summary....*USGS GAGE STATION* Data / Records for STREAM CHANNEL CLASSIFICATION

Station NAME:	MARSH RUN AT GRIMES	Station Number:	01617800
LOCATION:	GRIMES, MD GROUP 2 / REACH 2		
Period of Record:	50 yrs	Mean Annual DISCHARGE:	17 cfs
Drainage AREA:	acres; 18.6 mi²	Drainage Area Mn Elev:	ft
Reference REACH SLOPE:	ft/ft	Valley Type:	VII
Stream Type:	F1	HUC:	

"BANKFULL" CHARACTERISTICS

Determined from FIELD MEASUREMENT			Determined from GAGE DATA Analysis		
Bankfull WIDTH (W_{bkf})	25.9	ft	Bankfull WIDTH (W_{bkf})	15.6	ft
Bankfull Mean DEPTH (d_{bkf})	1.2	ft	Bankfull MEAN DEPTH (d_{bkf})	1.8	ft
Bankfull Xsec AREA (A_{bkf})	29.9	ft²	Bankfull Xsec AREA (A_{bkf})	42.1	ft²
Wetted PERIMETER (W_P)	26.6	ft	Wetted PERIMETER (W_P)	19.2	ft
Bankfull STAGE (Gage Ht)	2.17	ft	Bankfull STAGE (Gage Ht)	2.0	ft
Est. Mean VELOCITY (u)	3.32	ft/sec	Mean VELOCITY (u)	2.6	ft/sec
Est. Bkf. DISCHARGE (Q_{bkf})	99.3	cfs	Bankfull DISCHARGE (Q_{bkf})	109.5	cfs

Bankfull DISCHARGE associated with **"field-determined"** Bankfull STAGE (From Gage Height reading at Staff Plate and tabular Stage-Discharge curve data): 111.5 cfs

Recurrence Interval (Log-Pearson) associated with **"field-determined"** Bankfull Discharge: 5 yrs

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

1.5 Year R.I. Discharge =	80	cfs	**10** Year R.I. Discharge =	275	cfs
2.0 Year R.I. Discharge =	105	cfs	**25** Year R.I. Discharge =	450	cfs
5.0 Year R.I. Discharge =	200	cfs	**50** Year R.I. Discharge =	459	cfs

MEANDER GEOMETRY

Meander Wavelength (L_m)	151	ft	Radius of Curvature (R_C)	39	ft
Belt Width (W_{blt})	67.3	ft	Meander Width Ratio (W_{blt}/W_{bkf})	2.6	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 (**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**).

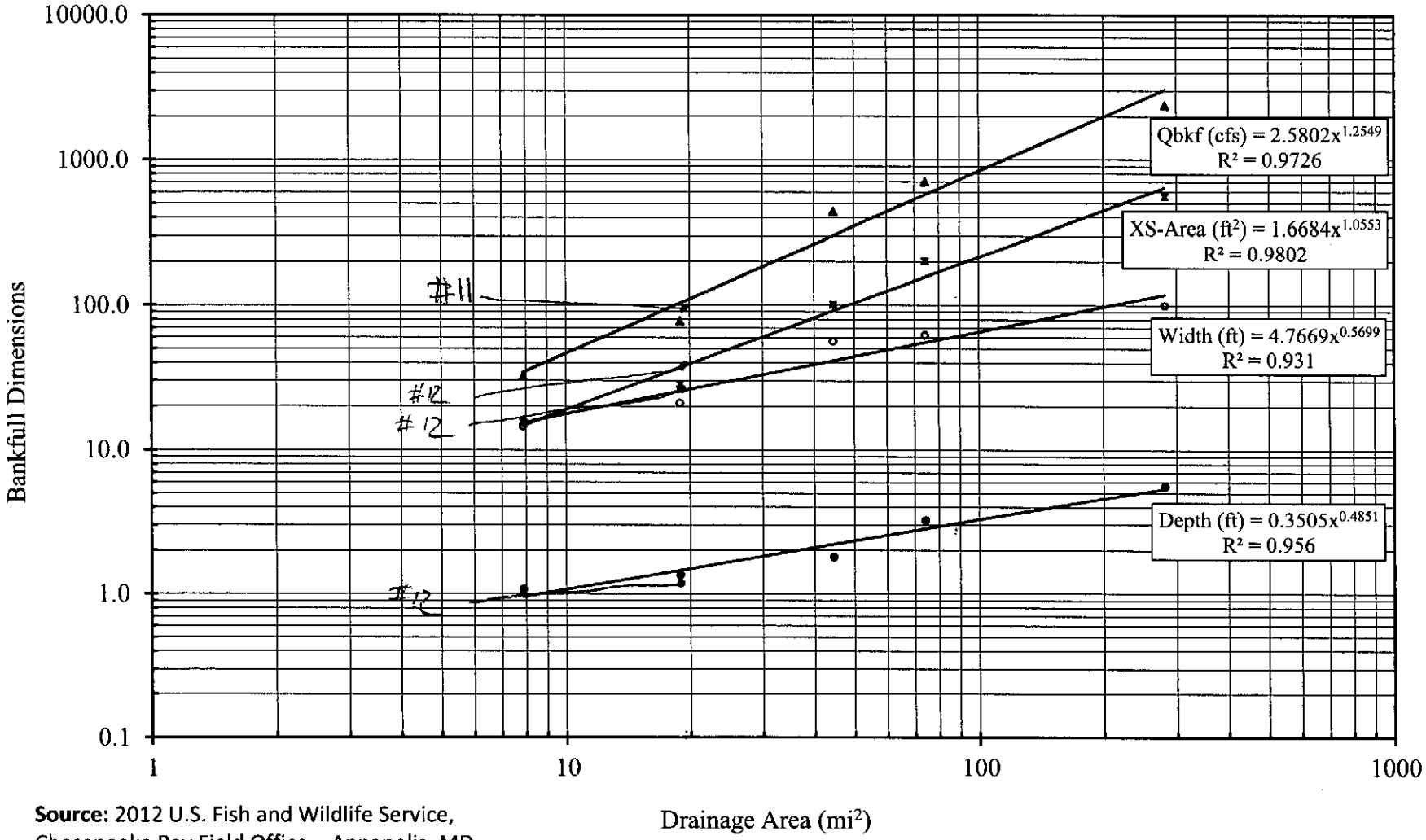
	Width (W)	Depth (d)	Area (A)	Velocity(u)
Intercept Coefficient **a**)	12.708	0.406	3.916	0.258
Slope Exponent **b**)	0.0438	0.311	0.504	0.4928

Hydraulic Radius R = A / W_P	1.2	ft	**Manning's "n" at Bankfull Stage**	0.075	Coeff.

$$\text{"n"} = 1.4895\,[(\text{Area})\,(\text{Hydraulic Radius}^{2/3})\,(\text{Slope})^{1/2}]\,/\,Q_{bkf}$$

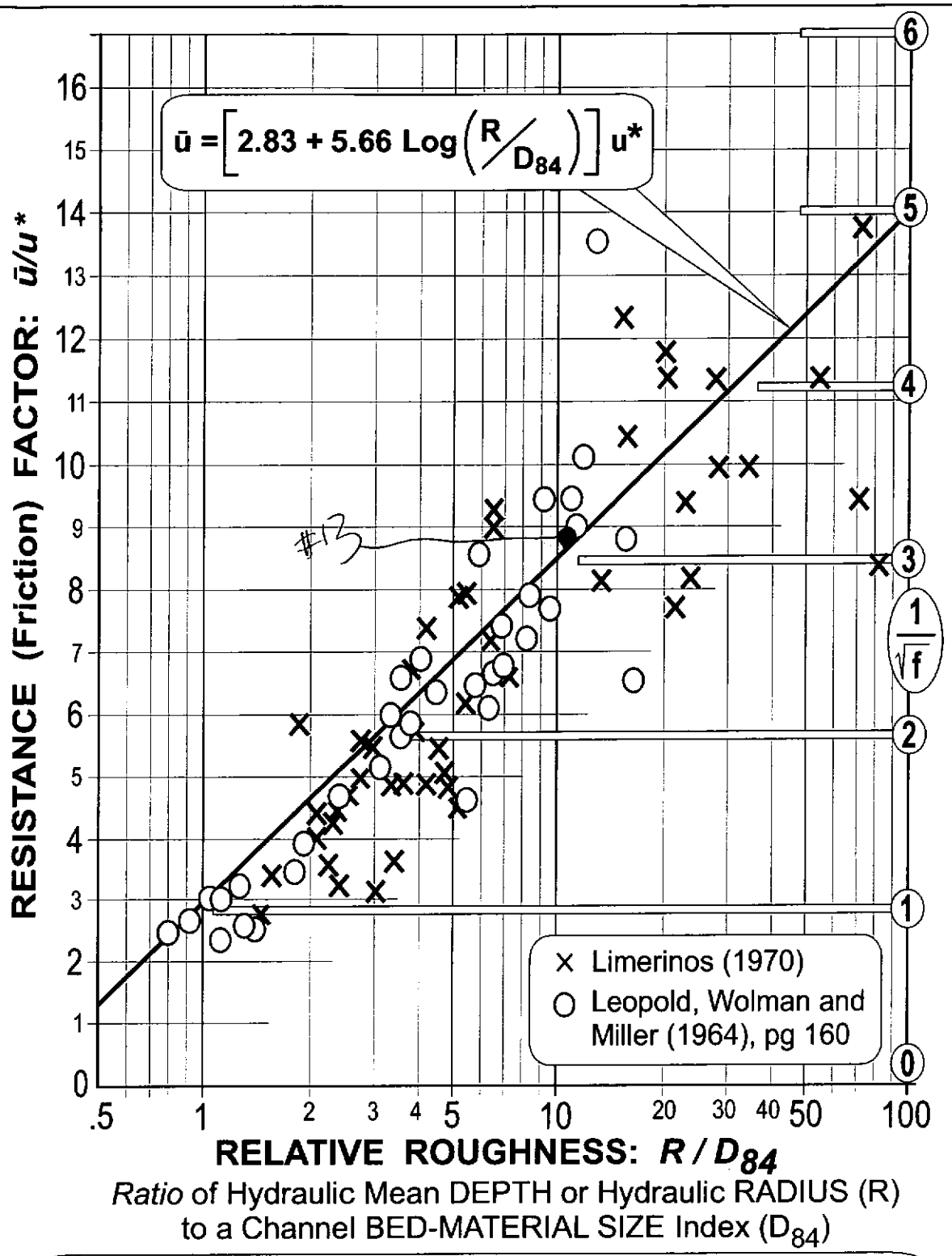
Marsh Run Group 2 4/16/15
Reach 2

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

Marsh Run Group 2 4/16/15 Reach 2



The relation of channel *bed-particle size* to *hydraulic resistance*, developed with river data collected from a variety of Eastern and Western streams.

Resistance factors, **ū/u*** and **$1/\sqrt{f}$**, are shown as a function of **Relative Roughness**; i.e., a *Ratio* of Hydraulic Mean Depth (**d**), or Hydraulic Radius (**R**), to a bed-material size index (**D_{84}**), as taken from field measurements (Leopold, Wolman and Miller, 1964).

Figure B-34. Relative roughness (R/D_{84}) *vs.* friction factor (ū/u*) (Rosgen, 2006b).

Copyright © 2015 Wildland Hydrology

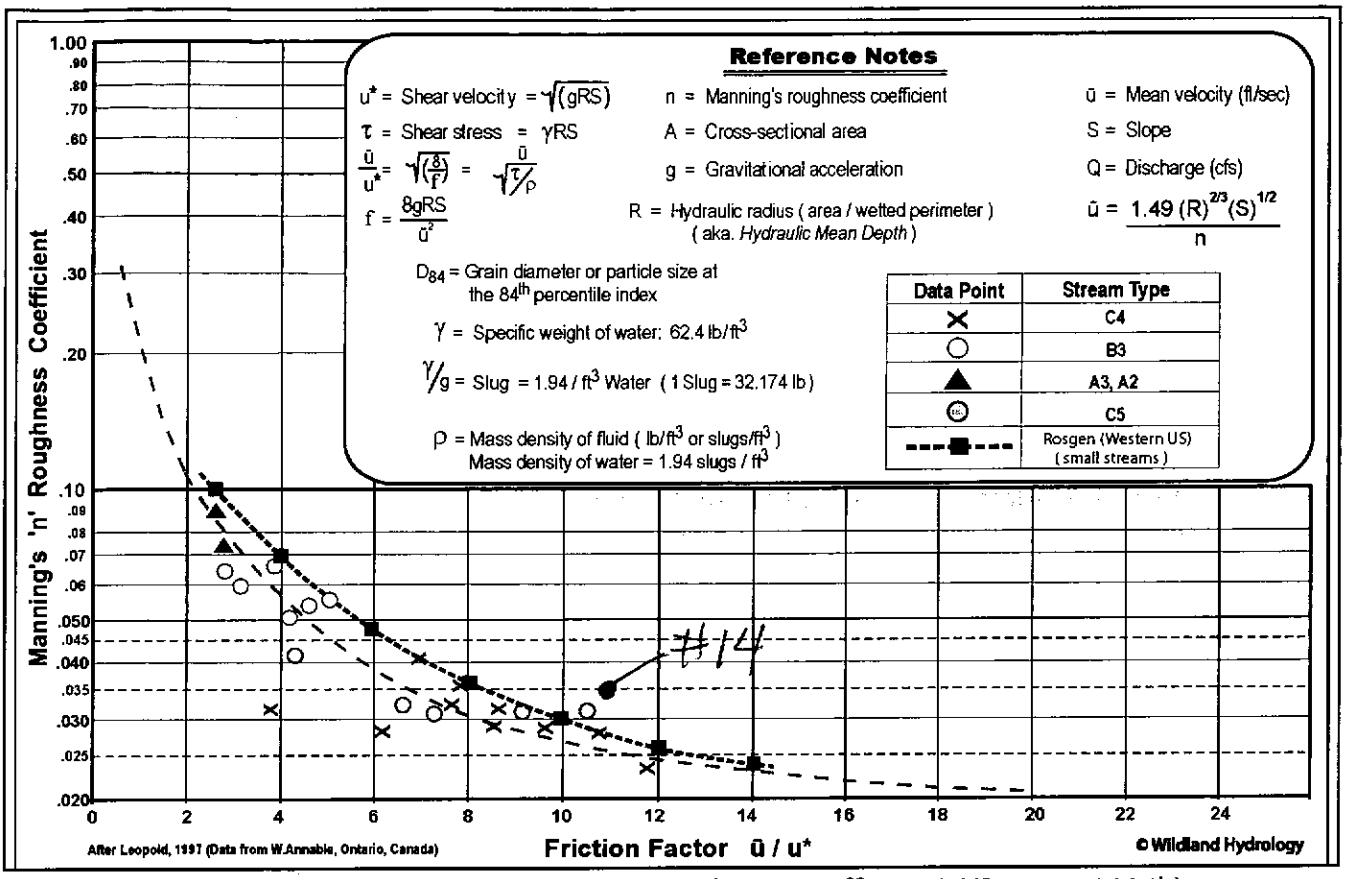


Figure B-35. Friction factor (ū/u*) *vs.* Manning's roughness coefficient 'n' (Rosgen, 2006b).

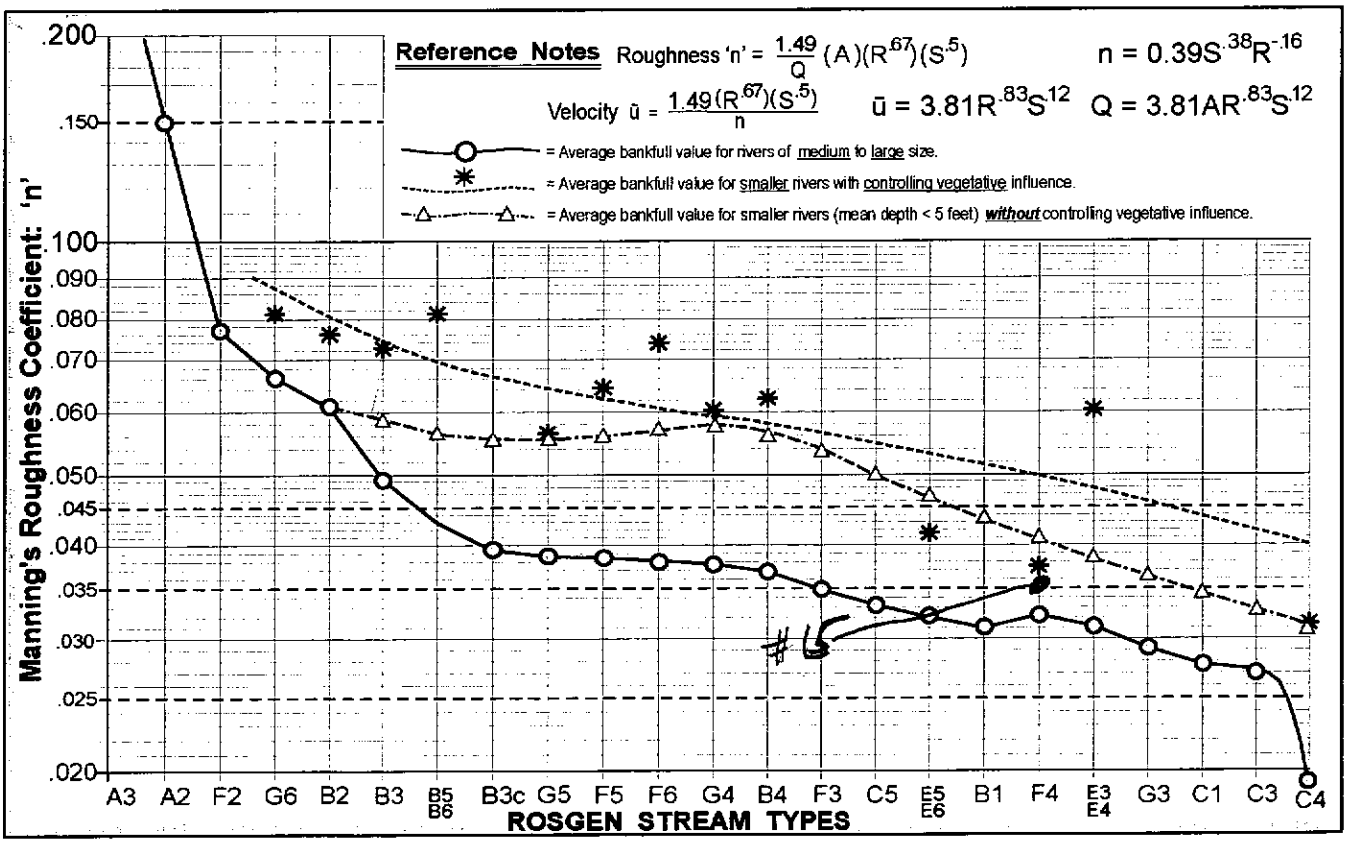


Figure B-36. Manning's 'n' by stream type.

Copyright © 2015 Wildland Hydrology