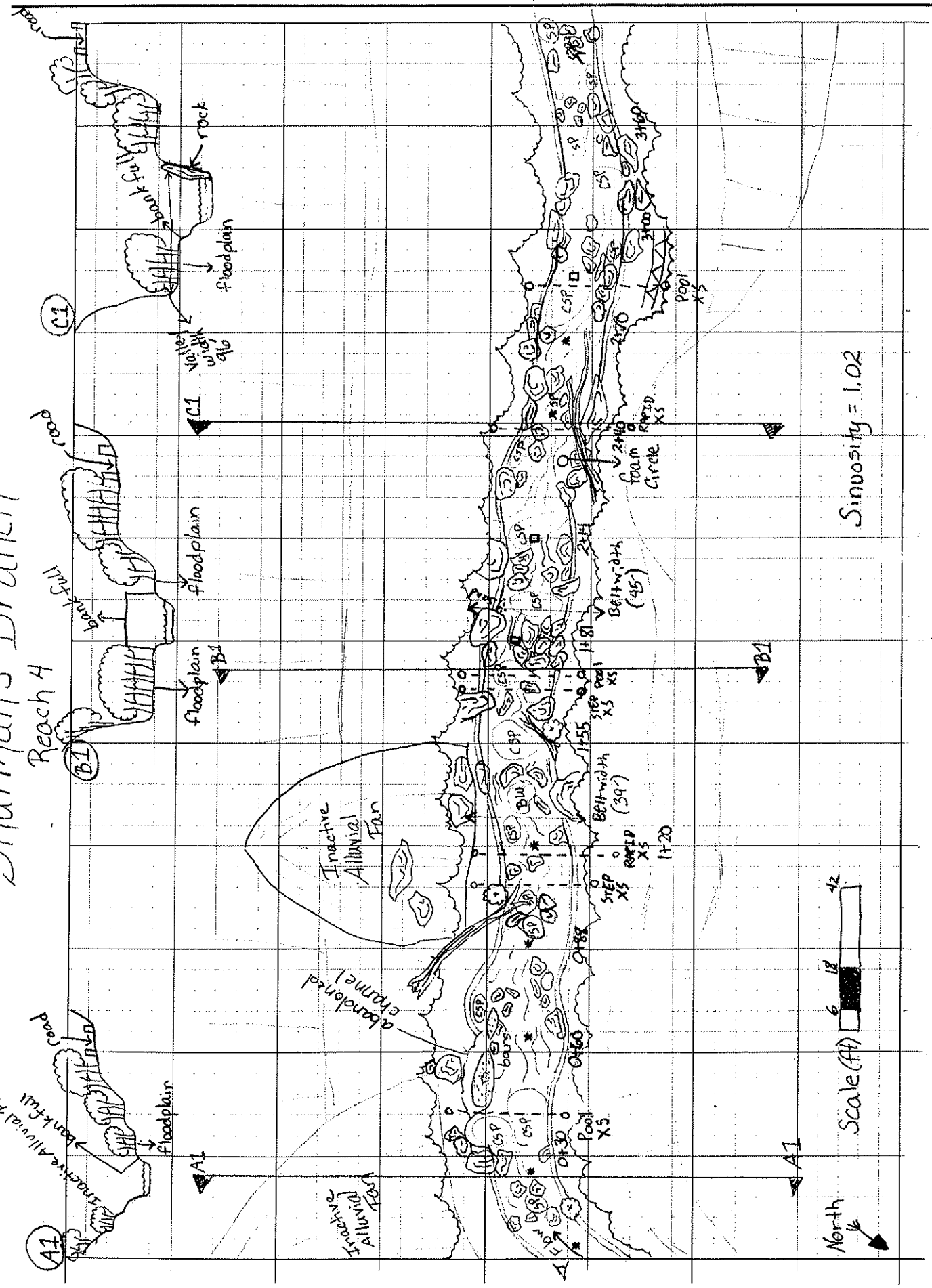
4/25/17

Sharman's Branch
Reach 4



Surveyors: Kari Hedin

Key
CSP = Contraction Scour Pool
SP = Step Pool
BWP = Backwater Pool
xs = Cross-Section
* = Riffle Pebble Station

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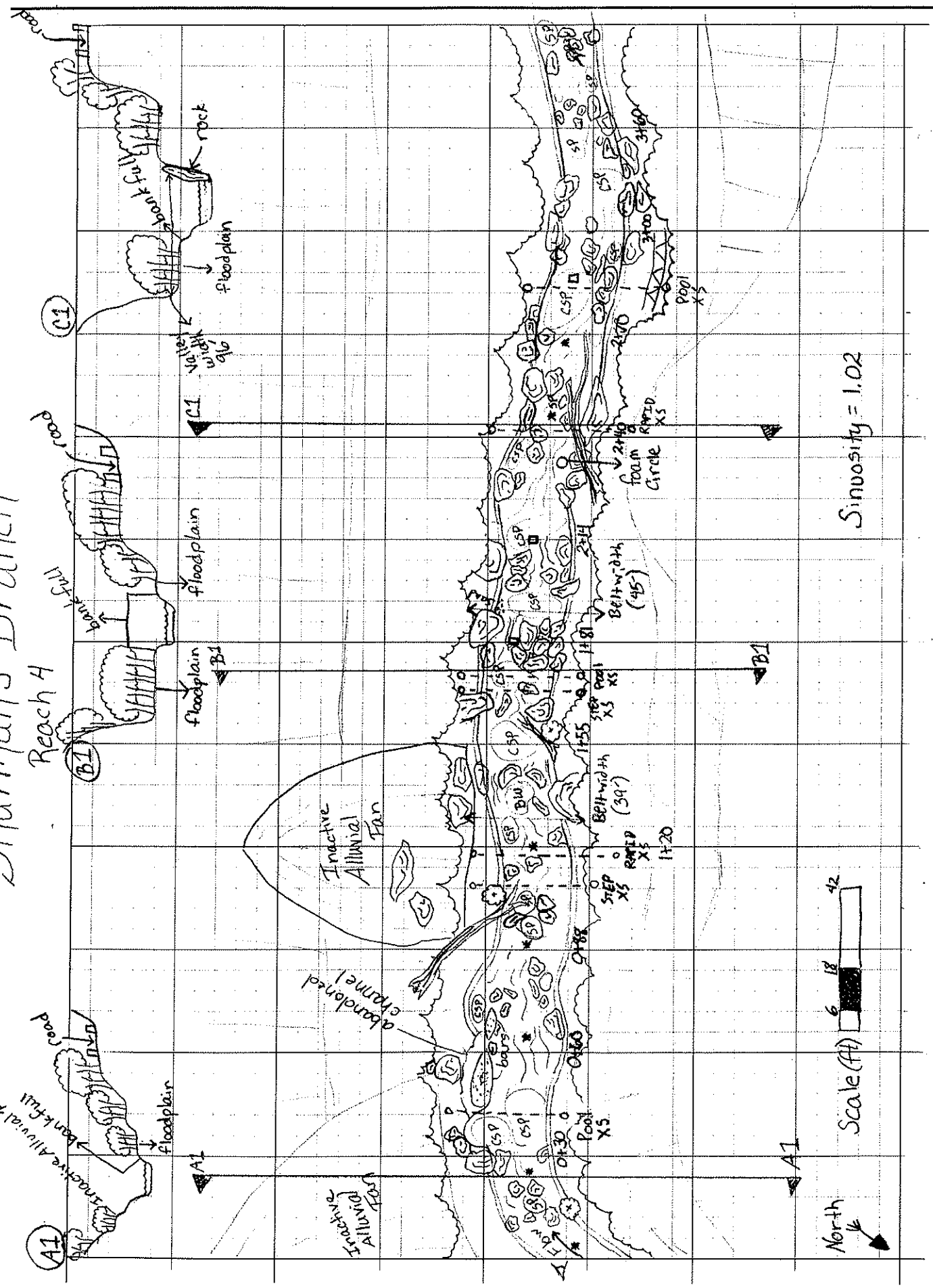
4/25/17

Sharman's Branch
Reach 4



Surveyors
Kari Hedin

Key
CSP = Contraction Scour Pool SP = Step Pool
XS = Cross-Section BWP = Backwater Pool
* = Riffle Pebble Station

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0+42.4

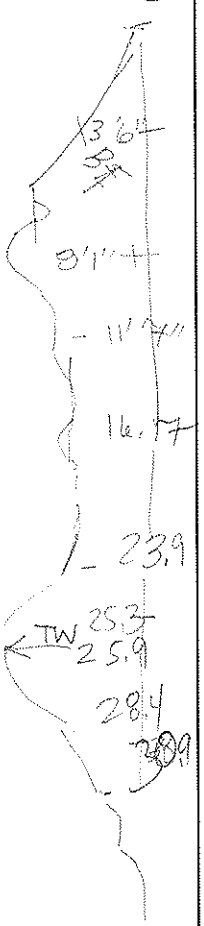
SURVEY DATA ⟹ **CROSS - SECTION 2**

SITE: SHARMAN'S BRANCH, TEAM 4 Contraction Scour pool STA 42.4 Date: 4·25·17

BM @ sta = 4.35

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0+42.4			4.35		Bench mark
2	tape					
3	0+00			2.32		Left bank
4	2+00			3.36		middle of slope
5	3+6"			4.30		bankful
6	4.9			5.29		edge of water
7	~~6.7~~ 8.1			5.64		mini pool ~~edge of a rock~~
8	11.7			5.32		edge mini pool
9	16.7			5.48		edge of mini island
10	21.8			5.63		island
11	23.9			6.12		beginning scour pool
12	25.3			6.53		Slope break
13	25.9			6.67		THALWEG WS surface 1.45'
14	28.4			6.46		side of pool
15	30.9	6.28				side of pool
16	34.1	5.18				edge of water
17	36.1	4.85				Slope break mini flat
18	38.0	3.80				bankful
19						
20	39.5	3.65				toe of slope 3.3 from tail
21	42.8	1.38				top of rock 3.45 @ BR
22	47.0					
23						
24						
25						
26						
27						
28						
29						
30						
31						

these are BS



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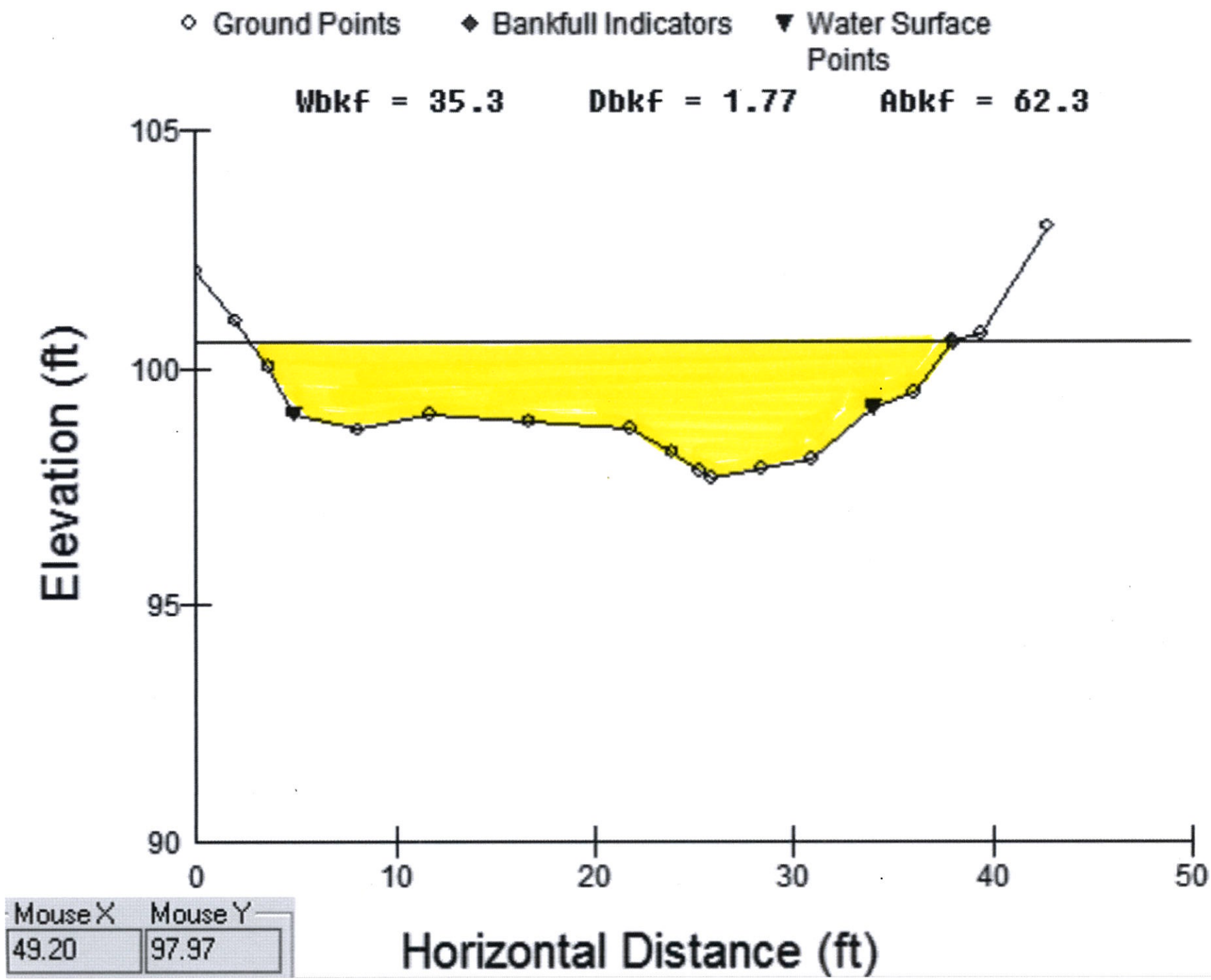
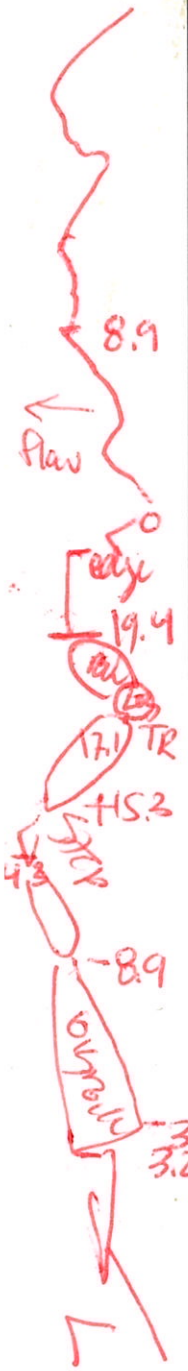
Contraction Scour Pool @ Sta. 42.4



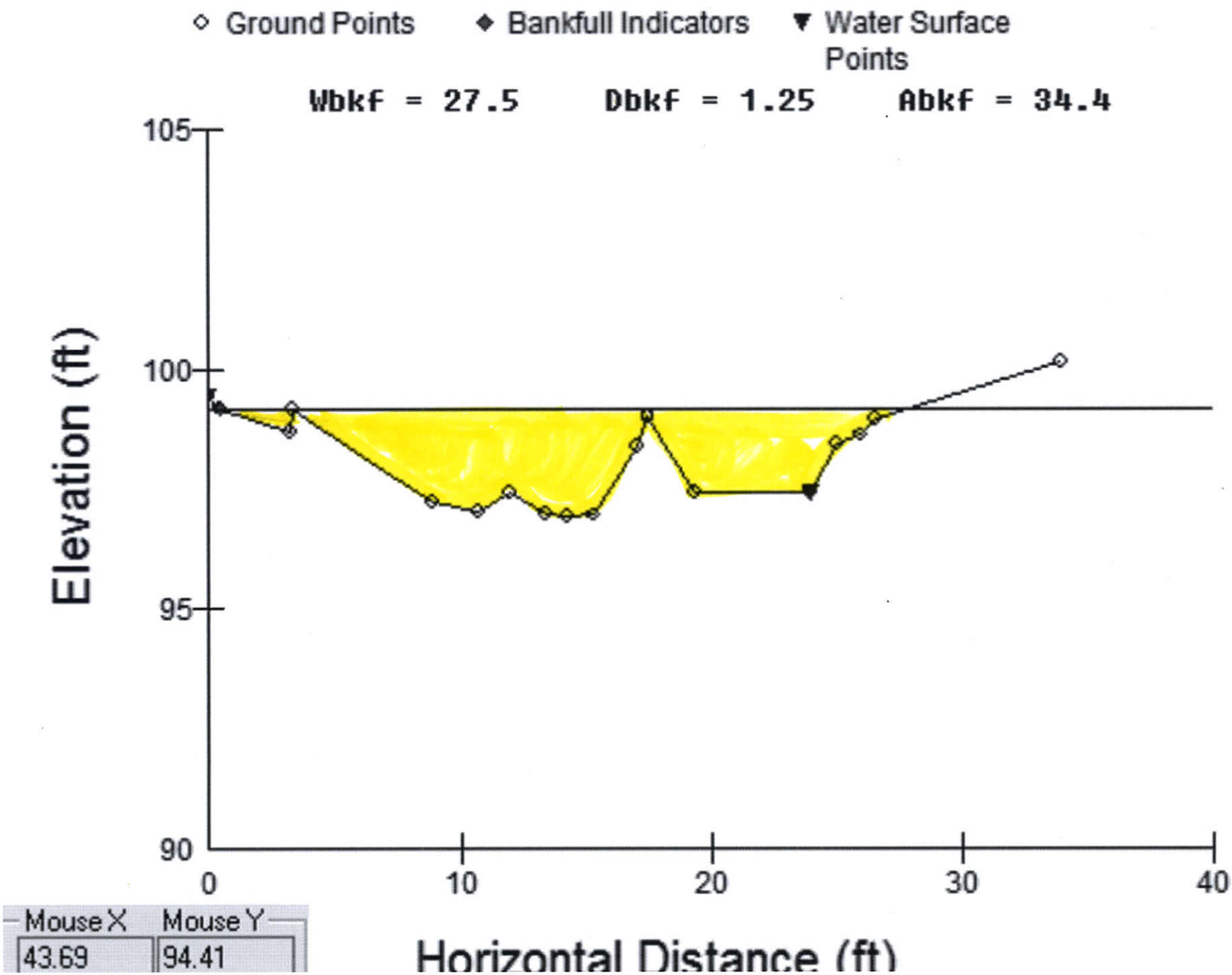
SURVEY DATA → **CROSS - SECTION** 6

SITE: SHARMAN'S BRANCH, TEAM 4 MIDDLE OF STEP 1+07 Date: 4-25-17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1						Left bank
2	0+00	4.89				
3	+0.4	5.14	Δ=1.9			change in slope BANKFULL
4	+3.2	5.61				bottom of rock
5	+3.3	5.15				top of rock
6	8.9	7.10				big rock - end
7	10.7	7.30				Rock DIP
8	12.0	6.9				middle of rock
9	13.4	7.33				dip in rock
10	14.3	~~7.30~~				middle of step - Thalweg
11		7.4				water depth 0.35
12						(Long pr 7.36)
13						
14	15.3	7.37				edge of rock
15	17.1	~~5.94~~				Top of rock
16	17.5	~~5.6~~ 5.29				Top of ~~rock~~ LOG
17		5.31				
18						
19	19.4	~~10.50~~	6.88			other side of log pile
20	24.0	~~10.37~~	6.87			edge of channel
21	25.0	←	5.06			top of low bank
22	26.0	5.69	Δ1.36			bankfull?
23	26.6	5.35	Δ=1.70			bankfull ~~Longpro~~
24	34.0	4.10				
25						
26						
27						
28						
29						
30						
31						



Middle of Step @ Sta. 107



SURVEY DATA ⟹ **CROSS - SECTION 7**

SITE: middle of ~~Riffle~~ RAPID STA 1+15.8 Date: 4-25-17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	3.0	0.80				left bank hillslope
2	4.0	0.95				
3	6.0	1.95				
4	7.4	2.80				
5	9.7	4.20				break in slope - tree line
6	11.2	5.38				top of bench
7	~~14.2~~					~~edge of bench, @ base of tree~~
8	12.2	5.50 ☆				mid of bench bankfull
9	15.4	6.18				edge of tree root
10	17.8	7.35				edge of water / bottom of tree
11	18.9	7.40				top of small rock
12	20.0	7.51				
13	20.5	7.78				gap btwn rocks
14	21.3	7.76				
15	21.9	7.82				gravel patch
16	22.7	7.74				
17	23.5	7.81				~~top of rock~~
18	24.3	7.90				
19	25.0	7.76				
20	25.5	7.65				top of a rock
21	26.3	7.44				ws @ top of this rock
22	26.8	7.68				
23	27.5	7.42				rock ~ FT out of water
24	23.3	8.1				thalweg, depth 0.65
25	28.1	7.57				edge of water
26	28.9	7.32				start of flat
27	31.9	6.94				edge of flat
28	32.3	6.57				~~bankfull (low est.)~~
29	32.9	6.23				~~bank full flag pin~~
30	~~35.2~~ 35.8	5.50				break in slope
31	40.2	4.52				break in slope

CHANNEL

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Bankfulls for Long Pro

Sta	FS	Elev		
115.8	5.5	98.85	(TBM.)	Rapid
181.1	3.78	101.76	(TBM.)	pool
107.0	5.69	98.66		
42.4	5.14	99.21	(TBM.)	step
	3.80	100.55		
	4.30	100.05	(TBM.)	pool

	(TBM.)
243	7.88
285	10.05

SURVEY DATA → CROSS - SECTION 8

SITE: ~~Riffle~~ RAPID XS Cont'd Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	43.6	4.20				flood prone area
2	47.3	3.72				↓
3	49.8	3.16				
4	53.7	2.28				
5	58.0	1.10				
6	TBM1	4.36				bald spot marked on rock @ sta 42.4
7						
~~8~~						
9	POOL XS @ STA 181.1					USING DS LASER + TBM2
10	TBM2	7.43				left bank
11	0.0	2.20				
12	1.7	2.68				
13	4.5	3.48				
14	6.1	3.78				bankfull est.
15	7.6	4.29				edge of water
16	9.4	5.32				sandy berm
17	10.5	5.14				↓
18	11.9	5.42				beg of pool
19	12.65	5.80				
20	14.4	6.37				
21	15.0	6.31				
22	16.0	6.50				
23	17.0	6.68				
24	17.8	6.77				
25	18.5	6.87				deepest ; water depth = 1.95
26	19.5	6.73				to rock
27	19.8	5.78				
28	21.2	6.1				
29	24.6	5.76				
30	28.7	5.20				edge of water
31	29	4.52				

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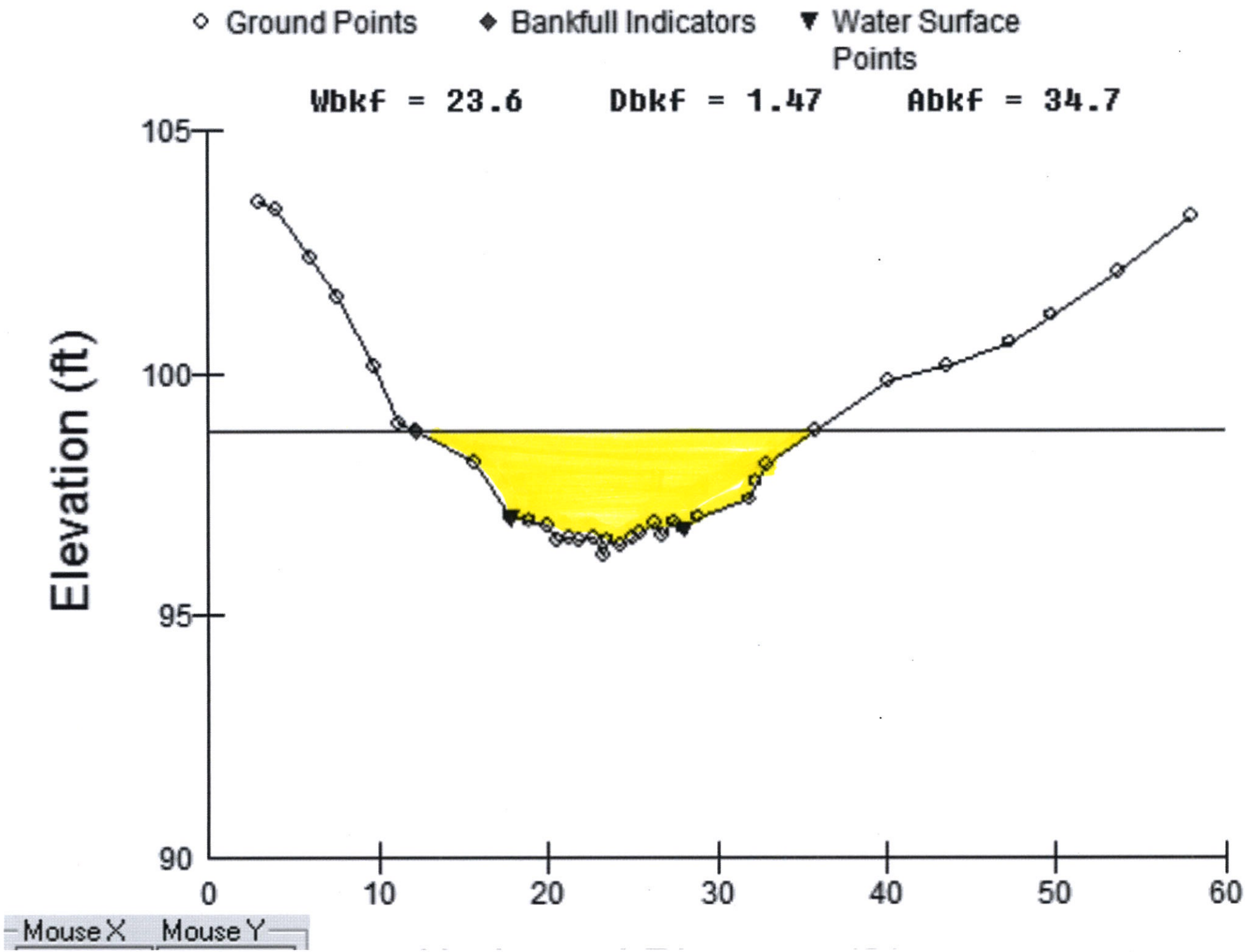
98.11 FT = ELEV TBM2

Sta	BS	Comment
30.0	4.00	
32.0	3.79	
33.8	3.25	
35.8	3.12	
TBM_2	7.42	

Rapid @ Sta. 115.8



SURVEY DATA ⟹ **CROSS - SECTION** 4

SITE: 1+69 Sep SHARMAN'S BRANCH **Date:** 4/25/17

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0+00			3.73	10.62	
2	0+02.5			4.63		
3	0+06			5.50		
4	0+09			5.86		
5	0+13			6.20		
6	0+17			6.38		
7	0+21			6.55		
8	0+23			6.51		
9	0+25.5			7.08		
10	0+27			7.27		
11	0+28			7.26		
12	0+30			7.75		
13	0+31			8.02		
14	0+32			8.39		
15	0+33.4			7.57		
16	0+34.2			8.24		
17	0+35.6			9.29		
18	0+34.6			8.65		LEW 4.56 m
19	0+36.2			9.23		TEW
20	0+37.2			9.02		2.6 m
21	0+38			8.34		
22	0+39.5			8.42		
23	0+40.7			9.10		
24	0+41.4			9.22		REW
25	0+41.7			8.64		
26	0+42.9			9.10		
27	0+45.5			8.20		
28	0+46			8.89		Large Tree Root
29	0+47			8.99		
30	0+49			7.64		
31	0+51			7.85		

BM 4.35 104.35 104.3

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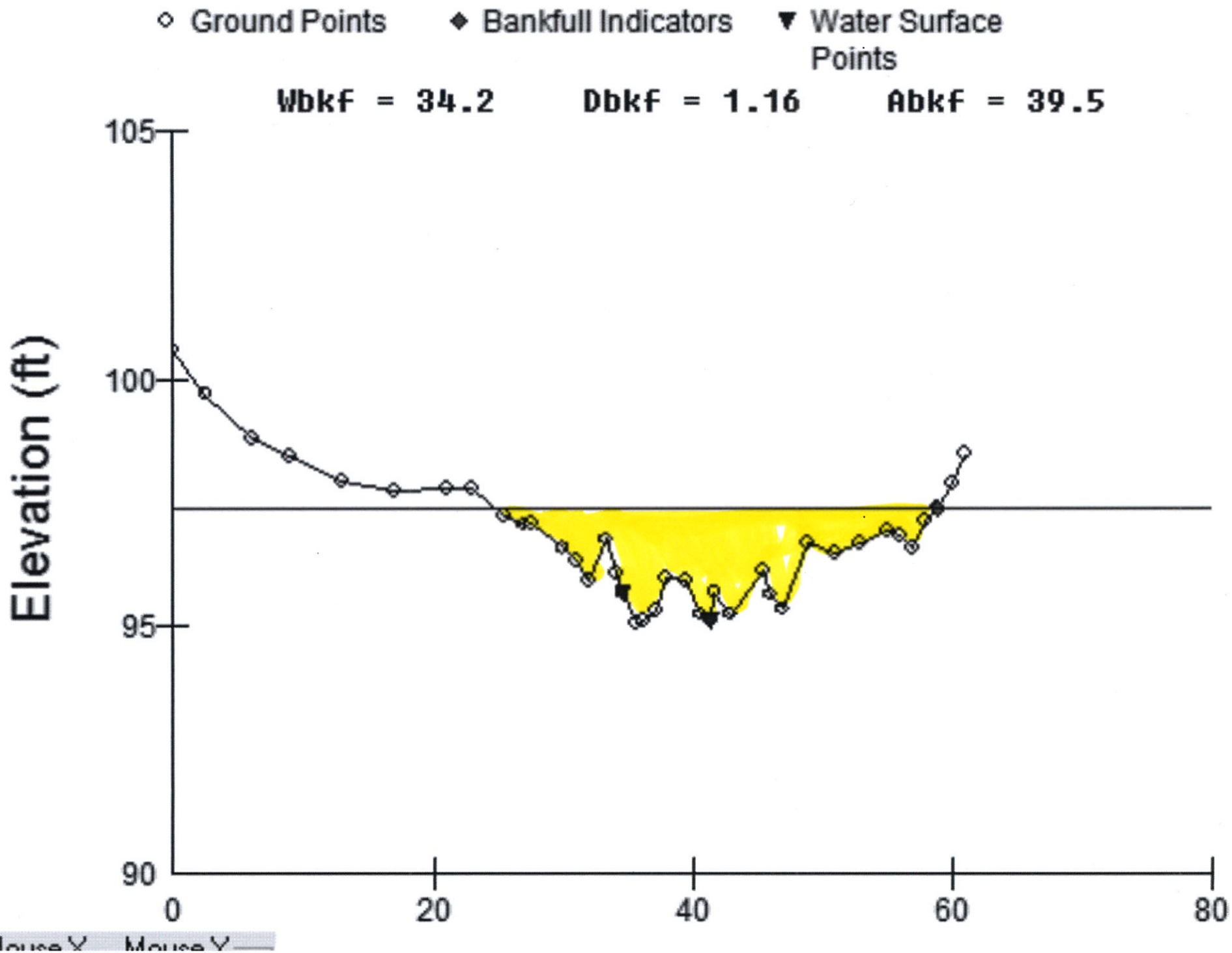
Station	FS	
0+53	7.63	
0+55	7.41	
0+56	7.49	
0+57	7.37	
0+58	7.19	
0+59	6.92	
0+60	6.41	
0+61	5.82	Bank straight up
← 0+[illegible]/143.[illegible]	9.19	[illegible]

169 Step


Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 34.2
Dbkf = 1.16
Abkf = 39.5
Elevation (ft)
105
100
95
90
0
20
40
60
80
Mouse X
Mouse Y

SURVEY DATA ⟹ **CROSS - SECTION 3**

SITE: 241.3 2543 Exe 16 SHARMAN'S BRANCH TEAM #4 Date: 4-25-17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0			3.49		
2	1			4.17		
3	2			4.93		
4	5			5.96		
5	7			6.47		
6	20			6.18		
7	27			6.57		
8	41			6.46		
9	46			7.41		
10	48.8			7.48		
11	51			8.75		
12	53.8			9.23		
WS 13	55.2			9.78		
14	57			10.10		
15	58.5			10.92		
TW 16	60			11.00		
17	61			10.67		
18	62.5			10.33		
19	64			10.29		
WS 64.5 9.75 ← 20	65			9.06		
21	66			8.65		
22	68			8.97		
23	70			8.38		
B= 24	73			7.46		
25	76			7.46		
26	78			6.15		
27	81.4			4.10		
28	84			2.24		
29						
30						
31						

flattens at that elevation

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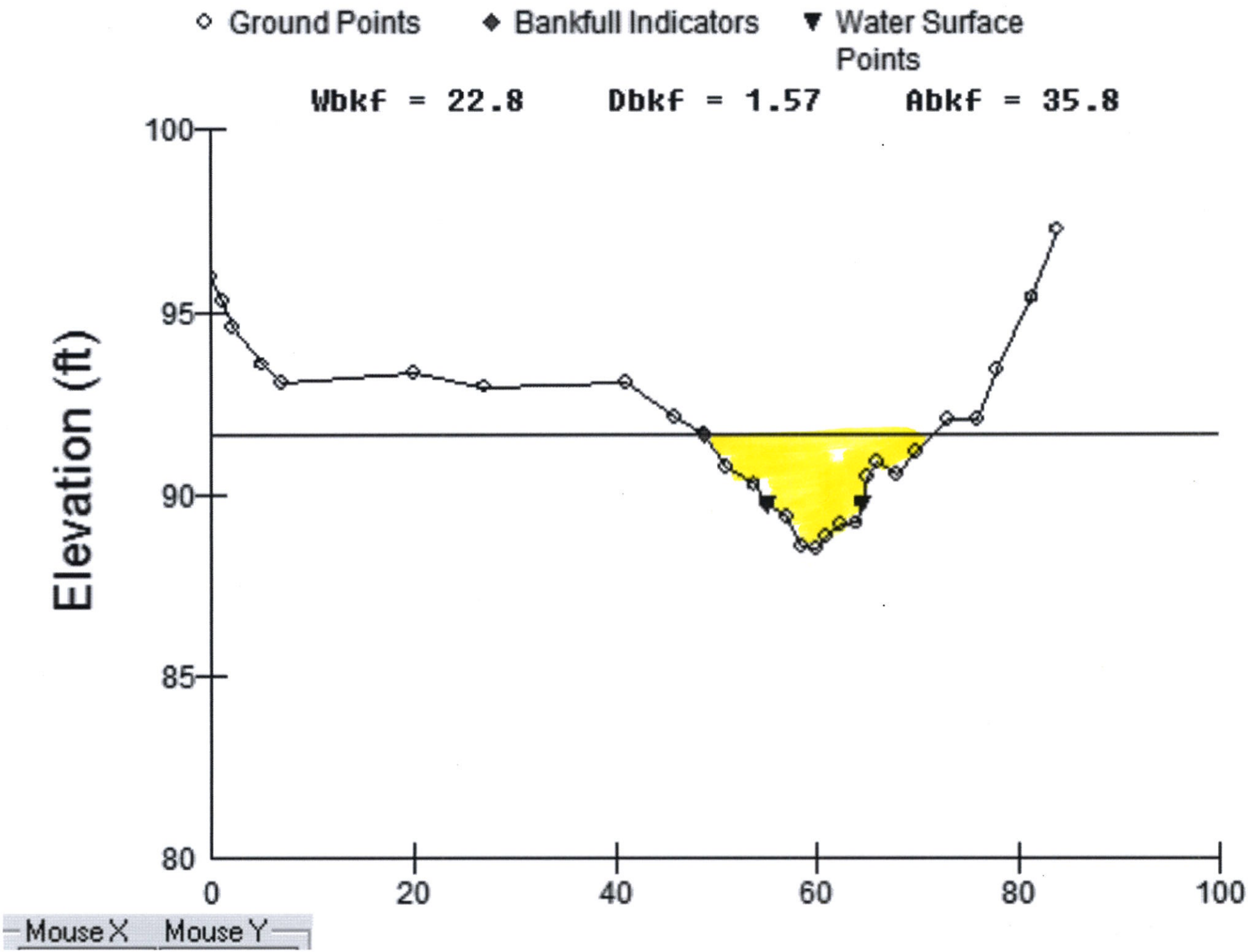
243 Rapid


Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 22.8
Dbkf = 1.57
Abkf = 35.8
Elevation (ft)
100
95
90
85
80
0
20
40
60
80
100
Mouse X
Mouse Y

SURVEY DATA → **CROSS - SECTION 1**

SITE: 2+85 SHARMAN'S BRANCH Date: 4/25/17

Location: Contraction Scour Pool

Observers: Lindsey Adams, TEAM 4 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	0.00			8.17		LDB top
2	0+01			8.20		
3	0+02			8.30		
4	0+03			8.40		
5	0+04			8.42		
6	0+05			8.71		
7	0+06			9.05		
8	0+07			10.04		Bankfull?
9	0+08			10.53		
10	0+09			11.07		
11	0+10			11.62		
12	0+11			11.84		
13	0+10.4			11.70		LEW
14	0+12			12.14		
15	0+13			12.33		
16	0+14			12.56		
17	0+15			12.70		
18	0+15.5			12.94		TIW
19	0+16			12.85		
20	0+17			12.67		
21	0+18			12.52		
22	0+19			12.40		
23	0+20			11.75		
24	0+21			11.74		
25	0+22			11.51		
26	0+23			11.87		
27	0+24			11.31		
28	0+25			11.98		

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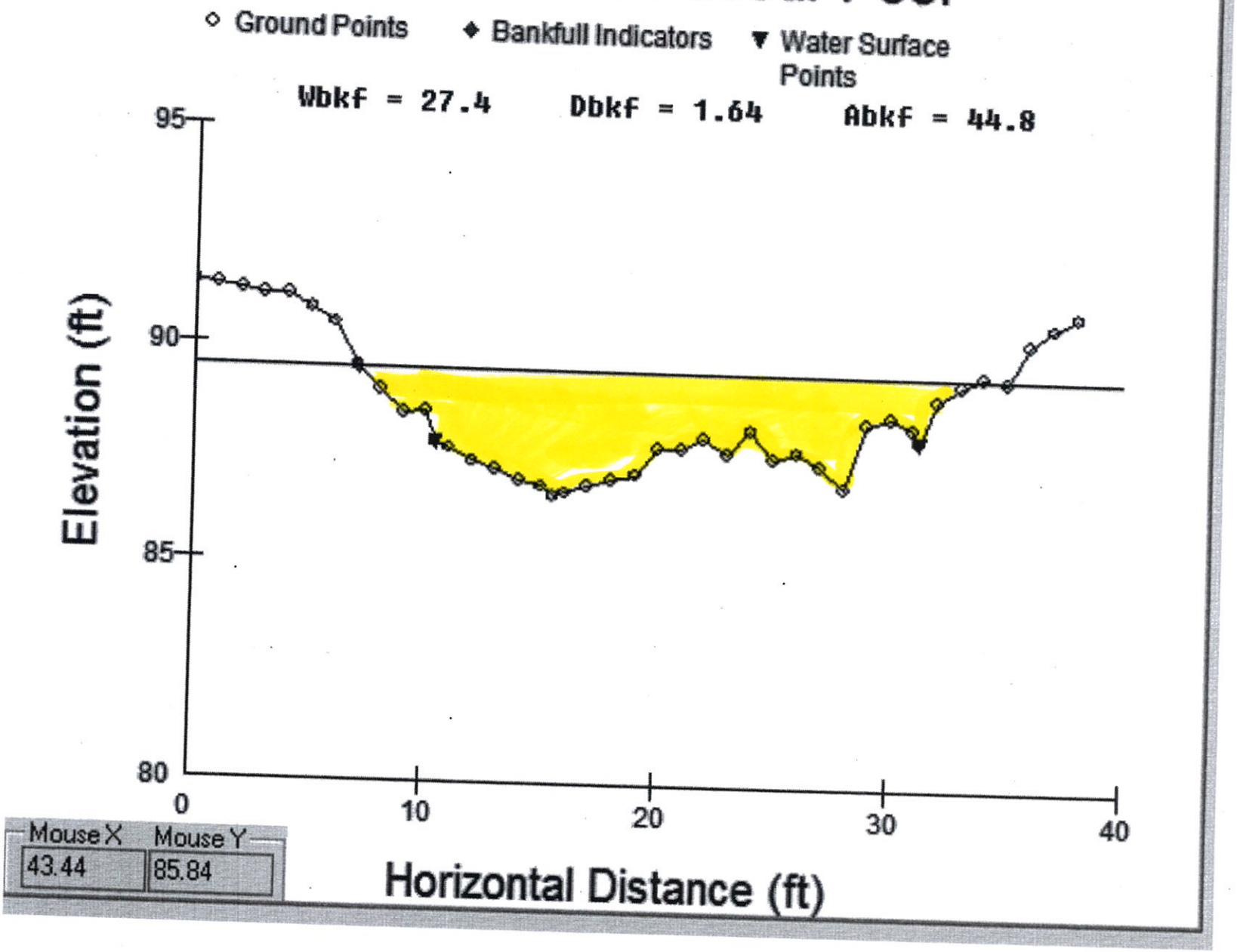
Station	FS	
0+26	11.80	
0+27	12.13	
0+28	12.62	Into star post
0+29	11.09	
0+30	10.95	
* 0+31	11.21	
0+32	10.56	
0+33	10.19	
0+34	9.99	
0+35	10.10	
0+36	9.22	
0+37	8.84	
0+38	8.56 - High bank	
* 0+31.2	11.50	REW

285 Contraction Scour Pool



SURVEY DATA ⟹ **CROSS - SECTION 5**

SITE: Pools STA 1+81 **Date:**

Item	STATION (Type) ft	B S (Midpoint Station) ft	H I (Length) ft	F S (Max depth) ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	LPP	39	3	1.2		
2	LPP	65.5	1.7	0.6		
3	BWP?	69.6	11	1.4		
4	Step SP	89.8	3	0.6		
5	SP/BW	97.3	2	0.5		
6	BW	109.4	2	0.6		
7	LPP	125.8	1.5	0.7		
8	PWP	133.4	2	0.5		
9	BW	141	8	✓ [illegible]		
10	PP	146.7	1.5	1.1		
11	BW	180	4	1.4		
12	PP	210-212	5	1.5		
13	SP	233	3	0.9		
14	BW/PWP	251	2	0.6		
15	PWP	251.5	2	0.7		
16	PP/SP	256	3	0.8		
17	PWP	266	4	1		
18	SP	286	3	1.1		
19	SP/BW	311.5	3.3	0.7		
20	~~PP~~	~~317~~	~~2~~	~~1.2~~		
21	PP	322	10	1.2		
22	BWP	324	6	0.8		
23	PWP	336	4	0.7		
24	PP	358	1.5	0.5		
25						
26						
27						
28						
29						
30						
31						

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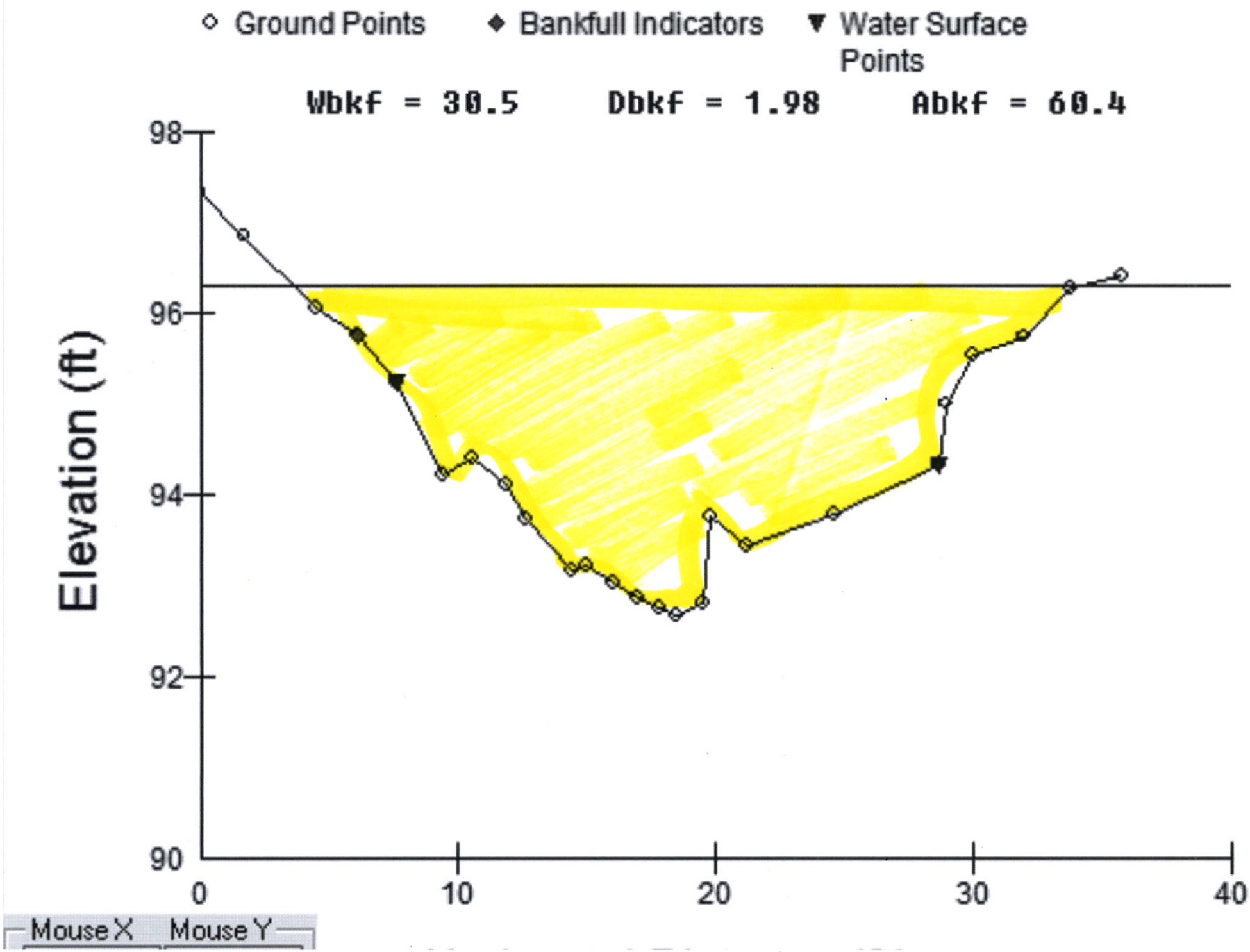
Pool@ Sta. 181.1



SURVEY DATA ⟶ **LONGITUDINAL PROFILE 1**

SITE: Sharman's Branch **Date:** 4/25/17

Location: Ref Reach 4

Observers: Susie / Andrea / Nikki **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	BM	4.35	[illegible]	3.78		3.10		1.29				
2	0			3.78		3.10		1.39				Pool
3	7			4.75		0.65				0.20		Riffle
4	11			4.21		0.66						Run
5	15			4.90		0.90						P
6	17			5.10		1.20						Pmax
7	18			4.88		0.60						
8	20			4.71		0.67						
9	30			4.81		0.60						R
10	33			5.38		0.59						Run
11	39			6.09		0.94						P
12	43			6.56		1.45		3.80				
13	47			6.03		0.89						G
14	55			5.82		0.63				0.75		R
15	59			6.00		0.66						R-max
16	63			6.10		0.71		4.01				P
17	66			6.33		0.92						Pmax
18	75			6.14		0.77						R
19	78			6.65		0.78						R
20	83			6.60		0.67						
21	90			6.62		0.50						
22	97			7.13		0.48		[illegible]				
23	106.9			7.47		0.49						R top mid
24	107			7.36		0.25		5.69				
25	107.2			7.89		0.60						
26	120			8.42		0.85		5.36				P
27	137			8.61		0.87		5.62				

XS-1 pool

XS-2 step

XS-3 115

Pool notes & depth

Riffle

Run

Step

BF

6.08

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SURVEY DATA ⟹ **LONGITUDINAL PROFILE 2**

SITE: Sharman's Branch Date:

Location: Reach 4

Observers: 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	150			8.81		0.78						Top step
29	151.5			8.31		0.1						mid step
30	152			9.49		0.98						P-max
31	156			9.09		0.70		7.08				behind bulder
32	163			9.12		0.49						top step
33	169			9.23		0.15						mid step
34		6.24										TP1 setup 1
35				1.4								TP1 setup 2
36	180			6.73		1.88						Pool max
37	191			5.52		0.50						Start of step
38	200			6.72		0.55						mid step
39	208			12.93		1.35						end step
40	213			9.35		1.5		6.09				Pool max
41				6.09								BKFR
42	228			8.5		0.4						Top of step
43	231			9.42		0.6						Bottom step
44		7.4										BM
45	236			9.76		0.55		7.64				Top step
46	238			9.94		0.3						Bottom step
47	241			10.14		0.9						
48	243.3			10.92		1.4						Rapid XS
49	257			10.83		0.85						Rapid
50	268			11.58		0.98						Rapid
51	275			11.32		0.65						Top step
52	280			12.67		1.00						Bottom step
53	285			12.78		1.5						Max pool
54	300			12.22		0.5						Top step

Step XS

XS-5 181

XS-6

XS-4

Pool XS

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SURVEY DATA ⟶ **LONGITUDINAL PROFILE 3**

SITE: Sharman's Branch Date:

Location: Reach 4

Observers: 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
55	3+02			13.31		0.5						Bottom Step
56	3+17			13.40		0.65						
57	3+25			14.34		1.55						Pool (BW?)
58	3+41			13.43		0.5		11.00				
59	3+62			15.65		0.5						Top of Riffle (Grade Break)
60												
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												
76												
77												
78												
79												
80												
81												

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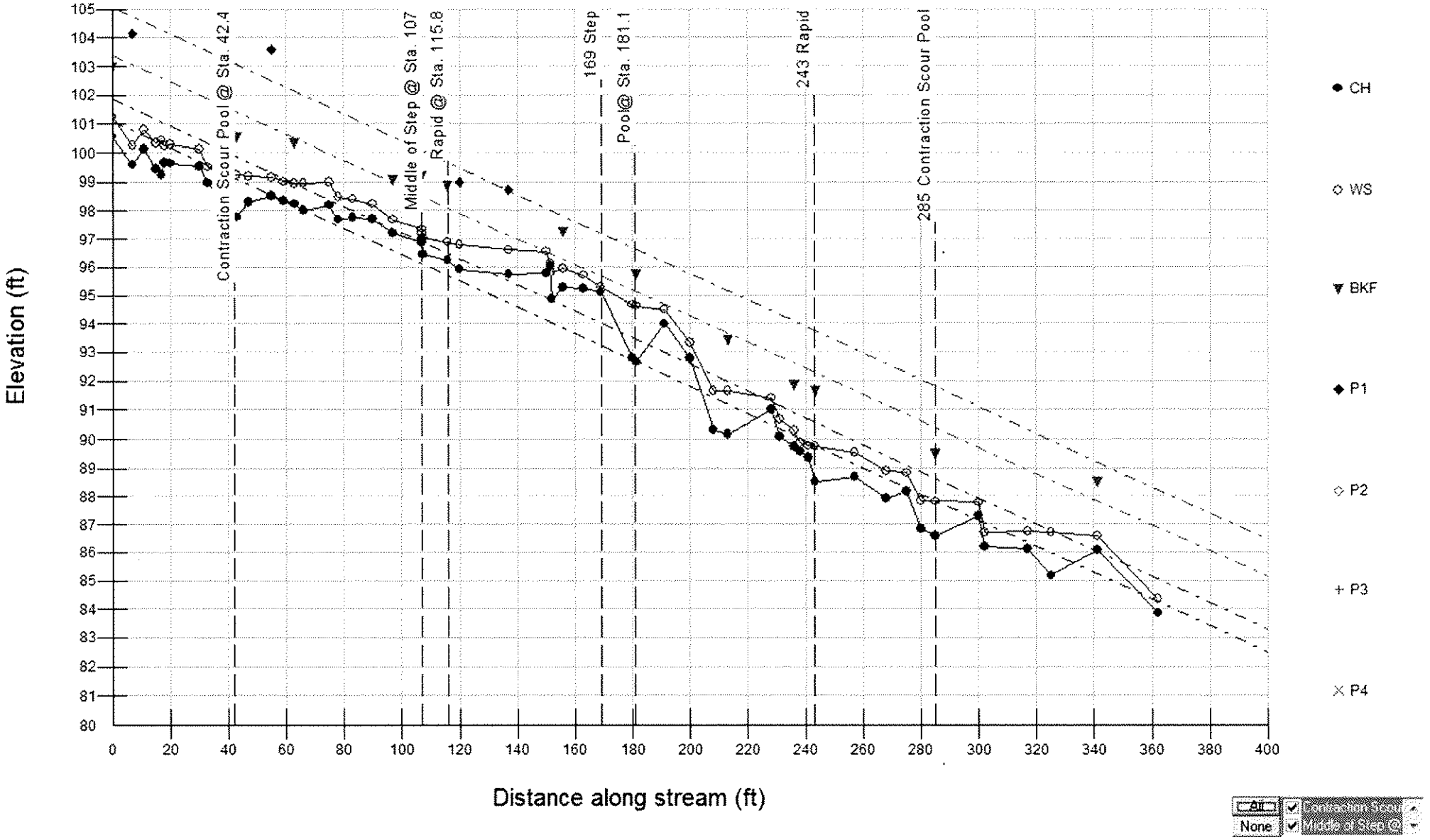
Sharman's Branch Reach 4 Long Pro



COMPOSITE

Site: SHARMAN'S BRANCH

Location: REACH #4 HUC: _ _ _ _ _ _ _ _ _ _ _ _

Observers: KUTCH/CHARLES

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1 70%	Dot Count for POOL 2 30%	Dot Count for 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:	Reach:	Reach:									
				Date:	Date:	Date:									
	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	1	3										
.22 - .31	Fine	5.7 - 8	GRAVEL	2	0										
.31 - .44	Medium	8 - 11.3	GRAVEL	5	4										
.44 - .63	Medium	11.3 - 16	GRAVEL	2	0										
.63 - .89	Coarse	16 - 22.6	GRAVEL	3	2										
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	4	0										
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	1	0										
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL	2	4										
2.5 - 3.5	Small	64 - 90	COBBLE	7	4										
3.5 - 5.0	Small	90 - 128	COBBLE	6	3										
5.0 - 7.1	Large	128 - 180	COBBLE	10	0										
7.1 - 10.1	Large	180 - 256	COBBLE	5	3										
10.1 - 14.3	Small	256 - 362	BOULDER	4	2										
14.3 - 20	Small	362 - 512	BOULDER	2	0										
20 - 40	Medium	512 - 1024	BOULDER	6	0										
40 - 80	Large-Vry Large	1024 - 2048	BOULDER	9	4										
	Bedrock		BDRK	1	1										
Stream Type:		Landscape Type: CONFINED				TOTAL→									

RIFFLE SAMPLE STATIONS

1. 0+05
2. 0+25
3. 0+65
4. 0+90
5. 1+18
6. 2+44
7. 2+67

POOL SAMPLE STATIONS

1. 1+81
2. 2+11
3. 2+85

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Pebble Protrusion

Site: SHARMAN'S BRANCH

Location: STATION 1+18 HUC:

Observers: KUTCH / CHARLES

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	~~POOL~~ Protrusion	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
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND	0											
	Fine	.125 - .25	SAND	0											
	Medium	.25 - .50	SAND	0											
	Coarse	.50 - 1.0	SAND	0											
.04 - .08	Very Coarse	1.0 - 2	SAND	0											
.08 - .16	Very Fine	2 - 4	GRAVEL	• 1											
.16 - .22	Fine	4 - 5.7	GRAVEL	• 1											
.22 - .31	Fine	5.7 - 8	GRAVEL	0											
.31 - .44	Medium	8 - 11.3	GRAVEL	⁝ 3											
.44 - .63	Medium	11.3 - 16	GRAVEL	⁝ 4											
.63 - .89	Coarse	16 - 22.6	GRAVEL	0											
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	6											
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	8											
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL	8	⁝	3									
2.5 - 3.5	Small	64 - 90	COBBLE	18	⁝	14									
3.5 - 5.0	Small	90 - 128	COBBLE	11	⁝	15									
5.0 - 7.1	Large	128 - 180	COBBLE	6	•	31									
7.1 - 10.1	Large	180 - 256	COBBLE	7		27									
10.1 - 14.3	Small	256 - 362	BOULDER	6		8									
14.3 - 20	Small	362 - 512	BOULDER	7	⁝	2									
20 - 40	Medium	512 - 1024	BOULDER	5											
40 - 80	Large-Vry Large	1024 - 2048	BOULDER	16											
	Bedrock		BDRK	• 1											
Stream Type:			Landscape Type: CONFINED			TOTAL→									

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Site: SHARMAN'S BRANCH

Pebble Protrusion

Location: STATION 2+44 HUC:

Observers: KUTCH / CHARLES

				Dot Count for RIFFLE 1	~~POOL~~ Protrusion	COMP. 3	RIFFLE (1)			POOL (2)			COMPOSITE (3)		
							Reach:			Reach:			Reach:		
							Date:			Date:			Date:		
Inches	PARTICLE	Millimeters					TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND	0											
	Fine	.125 - .25	SAND	0											
	Medium	.25 - .50	SAND	0											
	Coarse	.50 - 1.0	SAND	0											
.04 - .08	Very Coarse	1.0 - 2	SAND	1											
.08 - .16	Very Fine	2 - 4	GRAVEL	2											
.16 - .22	Fine	4 - 5.7	GRAVEL	4											
.22 - .31	Fine	5.7 - 8	GRAVEL	0											
.31 - .44	Medium	8 - 11.3	GRAVEL	3											
.44 - .63	Medium	11.3 - 16	GRAVEL	5											
.63 - .89	Coarse	16 - 22.6	GRAVEL	3											
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	7											
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	5											
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL	12		8									
2.5 - 3.5	Small	64 - 90	COBBLE	10		8									
3.5 - 5.0	Small	90 - 128	COBBLE	2		8									
5.0 - 7.1	Large	128 - 180	COBBLE	4		25									
7.1 - 10.1	Large	180 - 256	COBBLE	5		28									
10.1 - 14.3	Small	256 - 362	BOULDER	4		10									
14.3 - 20	Small	362 - 512	BOULDER	0		11									
20 - 40	Medium	512 - 1024	BOULDER	1		2									
40 - 80	Large-Vry Large	1024 - 2048	BOULDER	31											
	Bedrock		BDRK	1											
Stream Type:			Landscape Type: CONFINED			TOTAL→									

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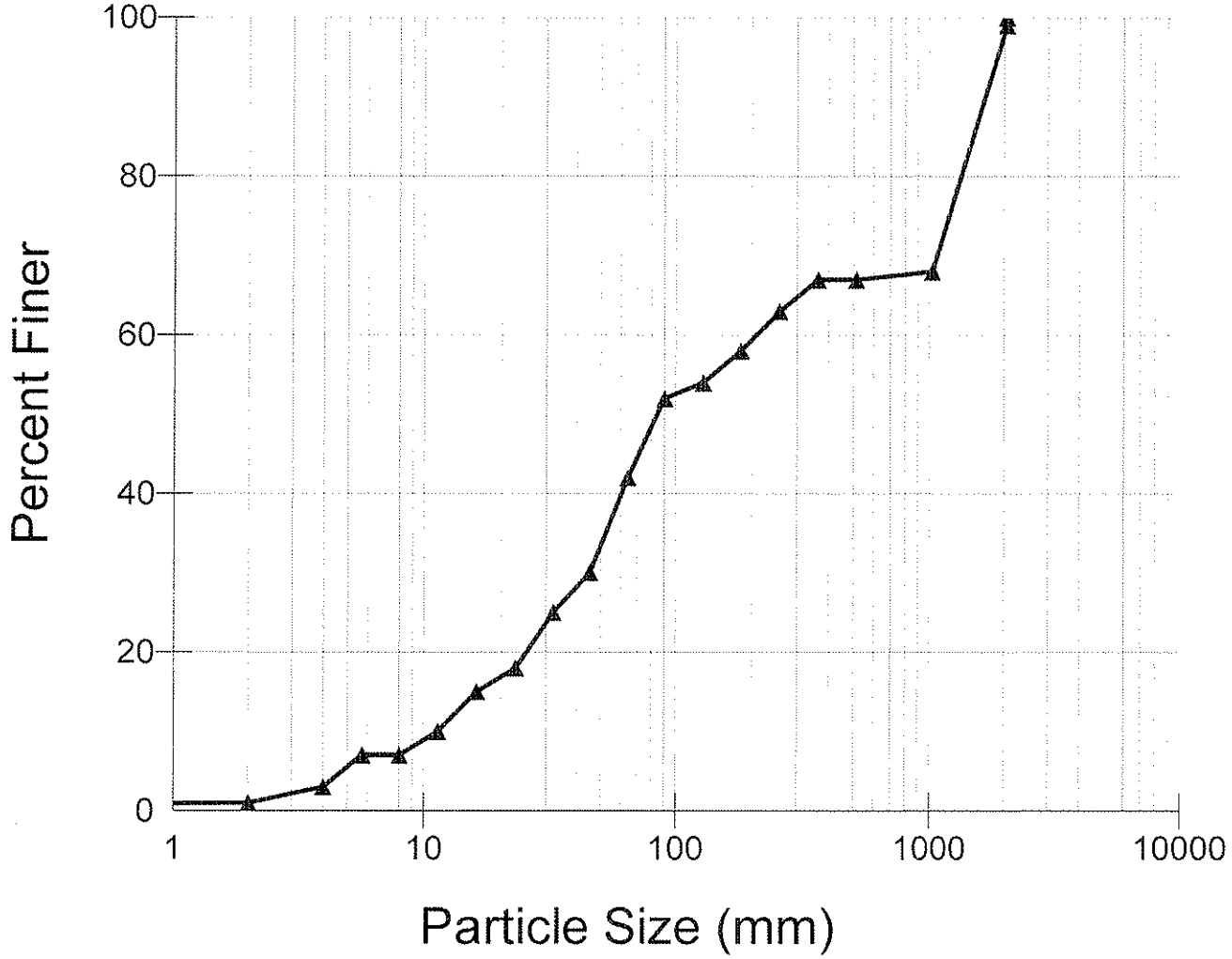
River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Riffle 2+44: Pebble Count
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	1	1.00	1.00
2.0 - 4.0	2	2.00	3.00
4.0 - 5.7	4	4.00	7.00
5.7 - 8.0	0	0.00	7.00
8.0 - 11.3	3	3.00	10.00
11.3 - 16.0	5	5.00	15.00
16.0 - 22.6	3	3.00	18.00
22.6 - 32.0	7	7.00	25.00
32 - 45	5	5.00	30.00
45 - 64	12	12.00	42.00
64 - 90	10	10.00	52.00
90 - 128	2	2.00	54.00
128 - 180	4	4.00	58.00
180 - 256	5	5.00	63.00
256 - 362	4	4.00	67.00
362 - 512	0	0.00	67.00
512 - 1024	1	1.00	68.00
1024 - 2048	31	31.00	99.00
Bedrock	1	1.00	100.00

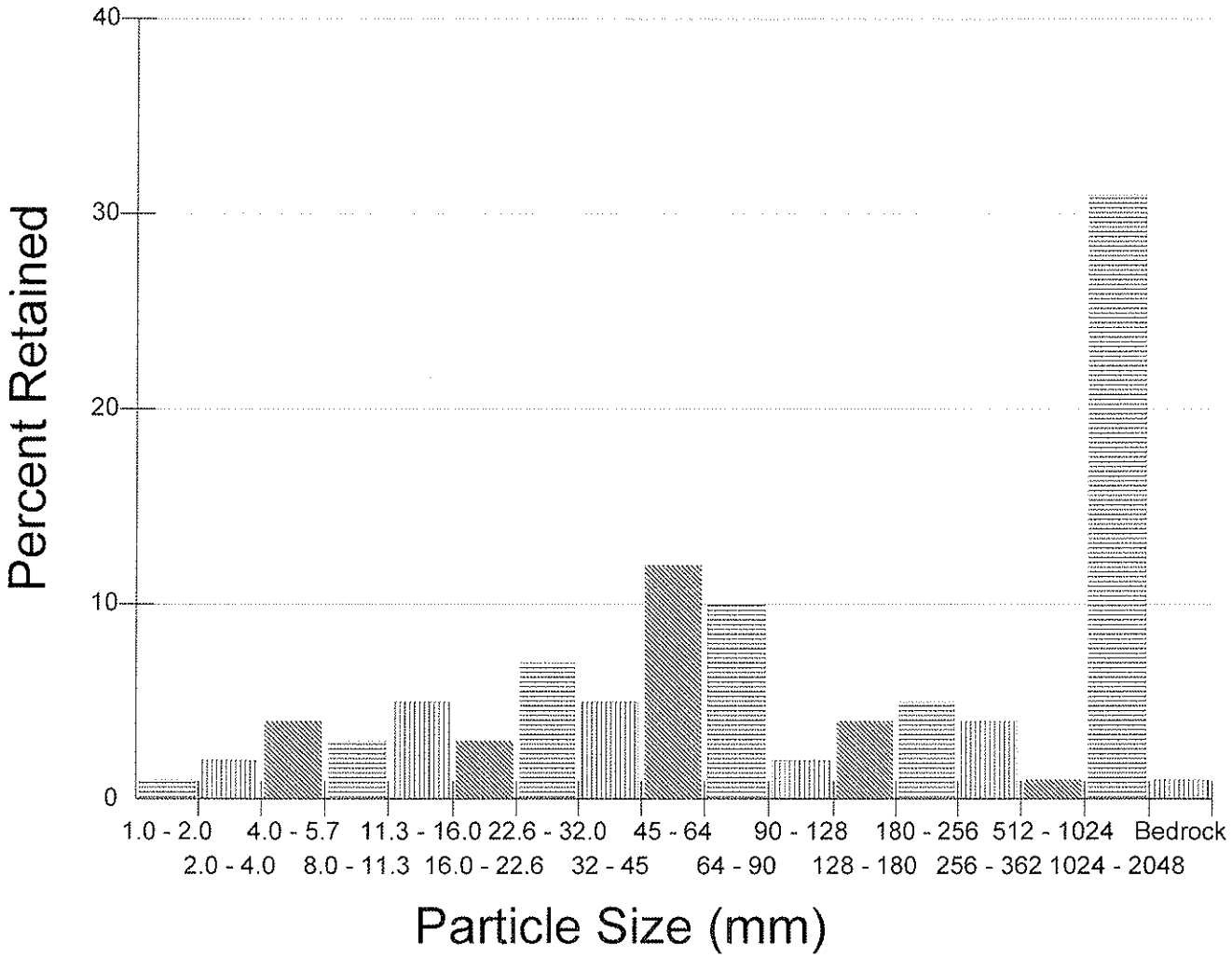
D16 (mm)	18.2
D35 (mm)	52.92
D50 (mm)	84.8
D84 (mm)	1552.52
D95 (mm)	1915.87
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	1
Gravel (%)	41
Cobble (%)	21
Boulder (%)	36
Bedrock (%)	1

Total Particles = 100.

Riffle 2+44: Pebble Count



Riffle 2+44: Pebble Count



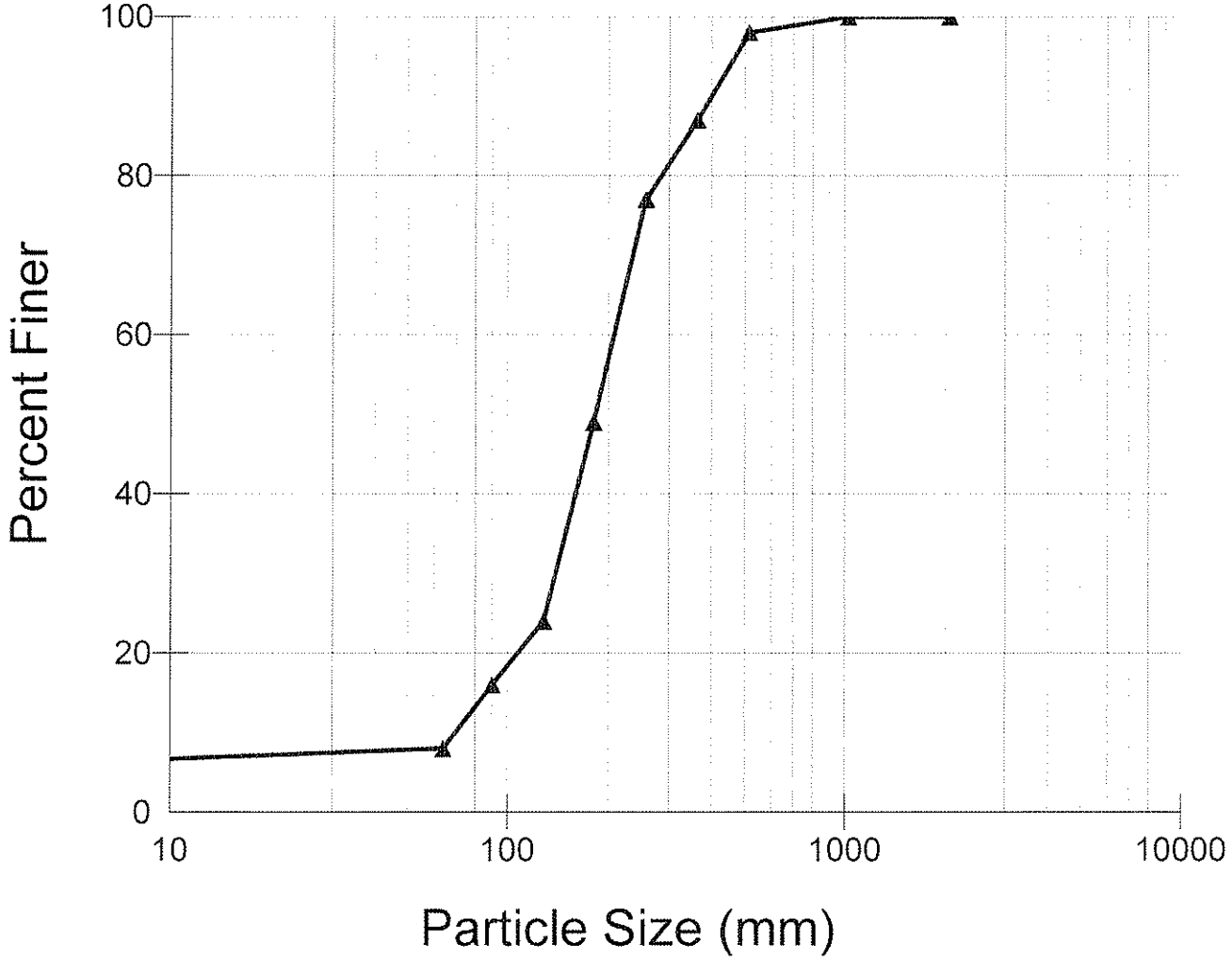
River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Riffle 2+44: Protrusion
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	0	0.00	0.00
5.7 - 8.0	0	0.00	0.00
8.0 - 11.3	0	0.00	0.00
11.3 - 16.0	0	0.00	0.00
16.0 - 22.6	0	0.00	0.00
22.6 - 32.0	0	0.00	0.00
32 - 45	0	0.00	0.00
45 - 64	8	8.00	8.00
64 - 90	8	8.00	16.00
90 - 128	8	8.00	24.00
128 - 180	25	25.00	49.00
180 - 256	28	28.00	77.00
256 - 362	10	10.00	87.00
362 - 512	11	11.00	98.00
512 - 1024	2	2.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

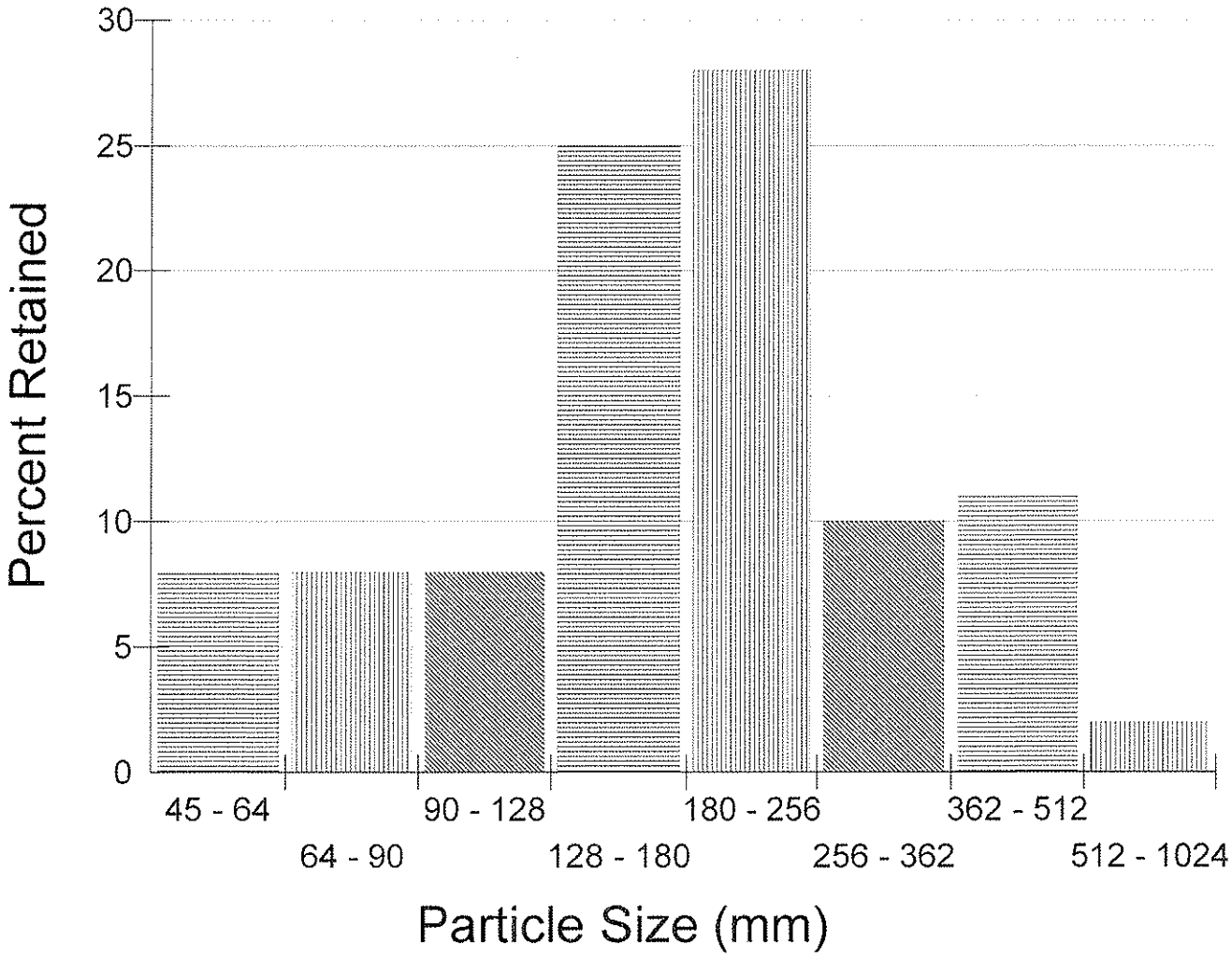
D16 (mm)	90
D35 (mm)	150.88
D50 (mm)	182.71
D84 (mm)	330.2
D95 (mm)	471.09
D100 (mm)	1023.97
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	8
Cobble (%)	69
Boulder (%)	23
Bedrock (%)	0

Total Particles = 100.

Riffle 2+44: Protrusion



Riffle 2+44: Protrusion



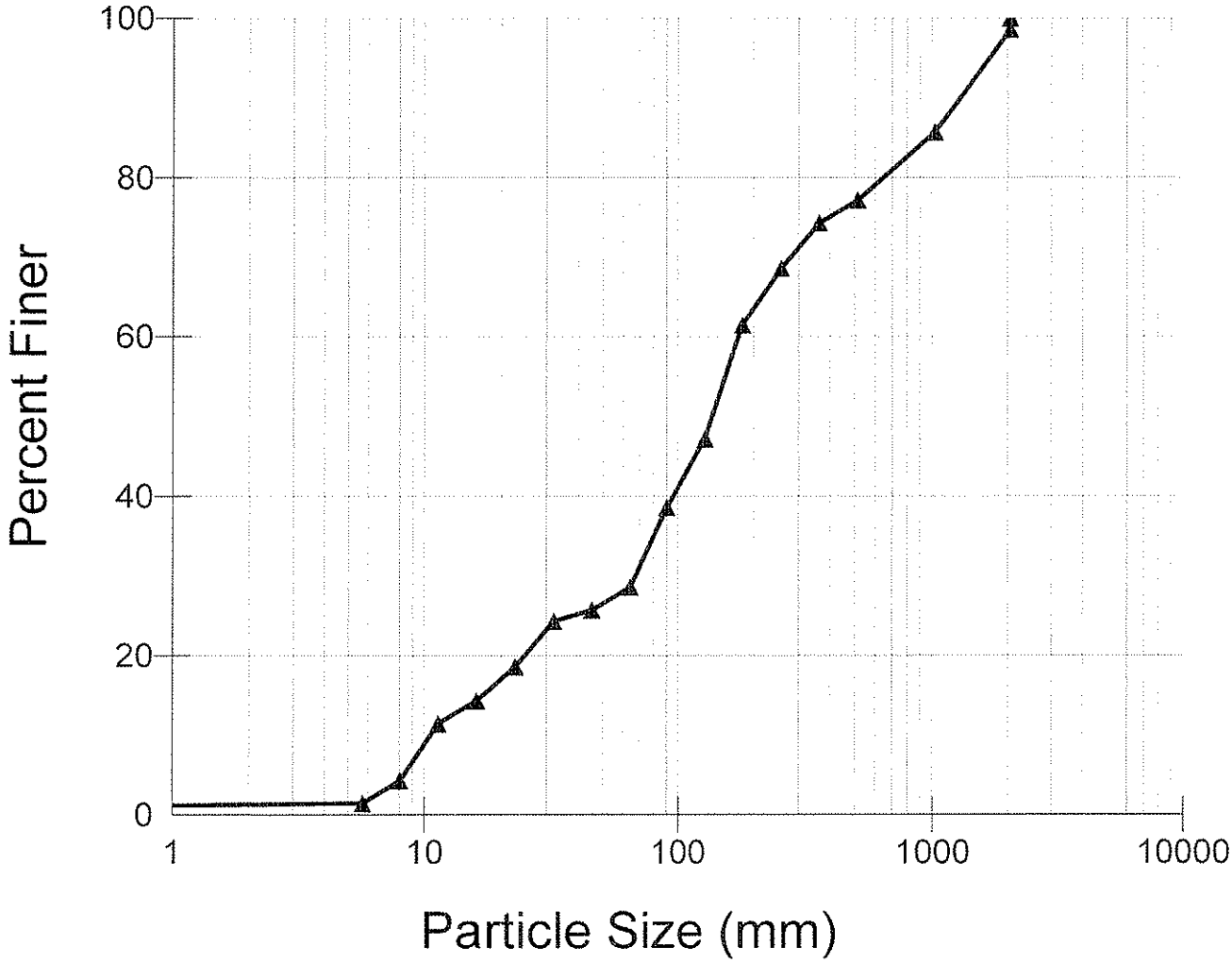
River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Riffle: Representative
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	1	1.43	1.43
5.7 - 8.0	2	2.86	4.29
8.0 - 11.3	5	7.14	11.43
11.3 - 16.0	2	2.86	14.29
16.0 - 22.6	3	4.29	18.57
22.6 - 32.0	4	5.71	24.29
32 - 45	1	1.43	25.71
45 - 64	2	2.86	28.57
64 - 90	7	10.00	38.57
90 - 128	6	8.57	47.14
128 - 180	10	14.29	61.43
180 - 256	5	7.14	68.57
256 - 362	4	5.71	74.29
362 - 512	2	2.86	77.14
512 - 1024	6	8.57	85.71
1024 - 2048	9	12.86	98.57
Bedrock	1	1.43	100.00

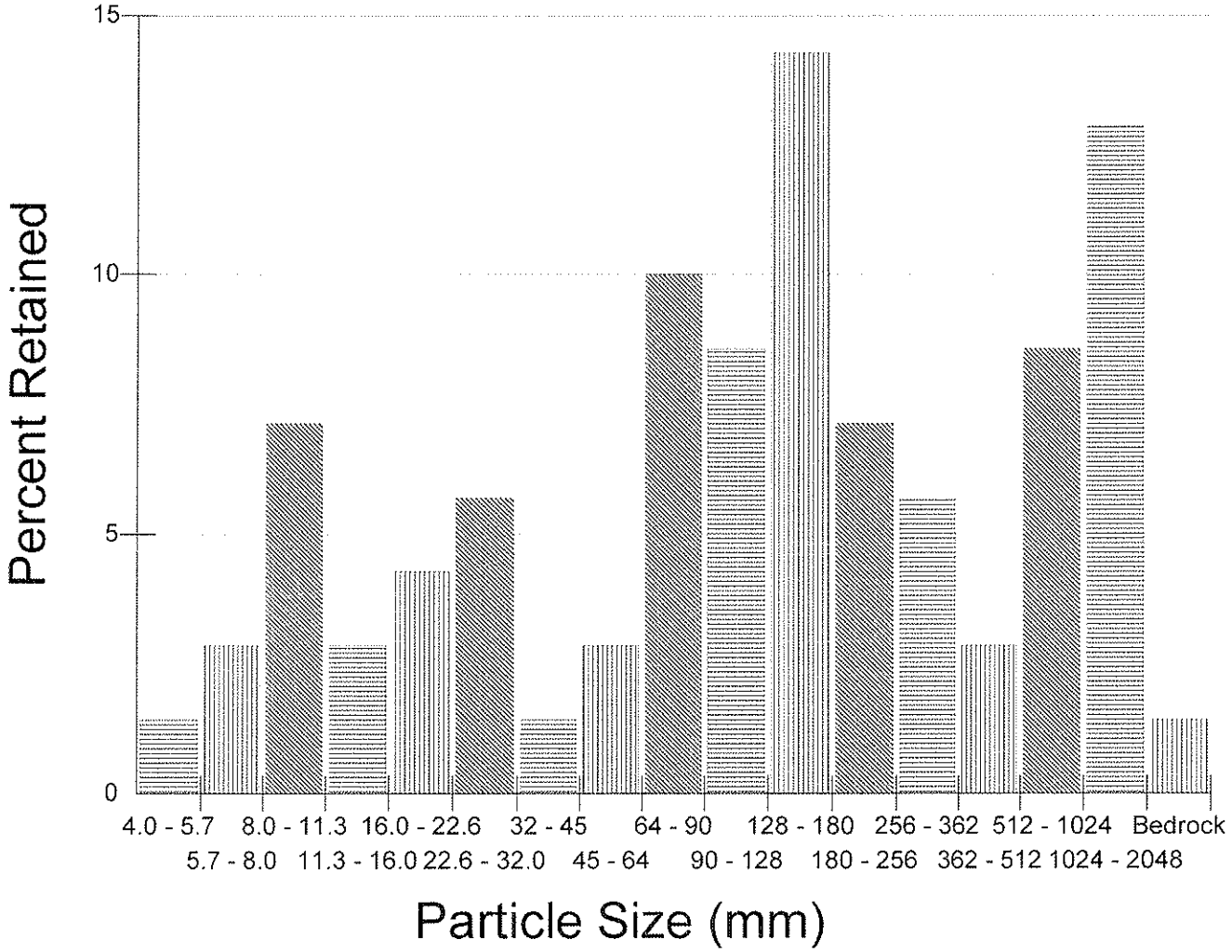
D16 (mm)	18.64
D35 (mm)	80.72
D50 (mm)	138.41
D84 (mm)	921.84
D95 (mm)	1763.73
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	28.57
Cobble (%)	40
Boulder (%)	30
Bedrock (%)	1.43

Total Particles = 70.

Riffle: Representative



Riffle: Representative

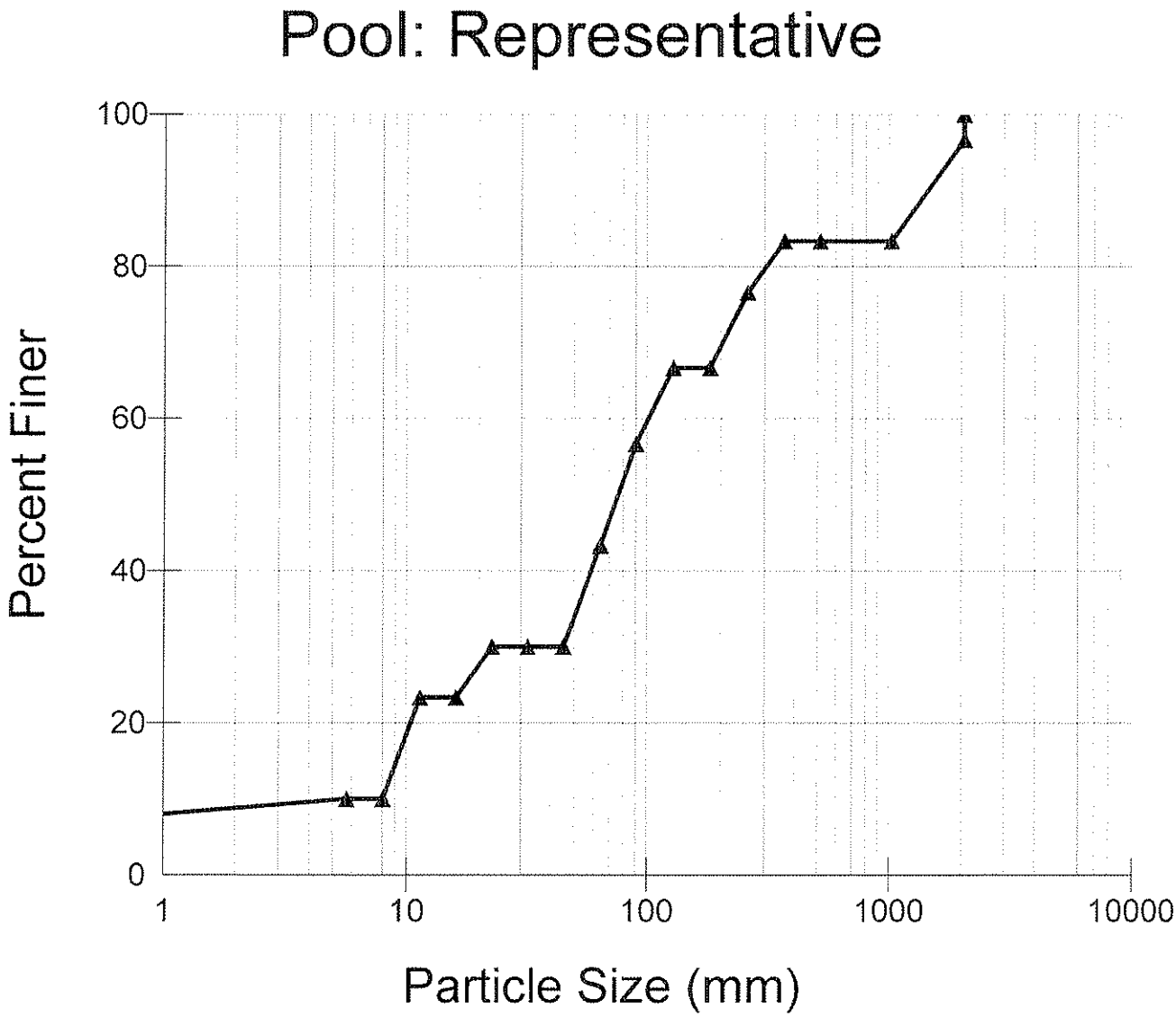


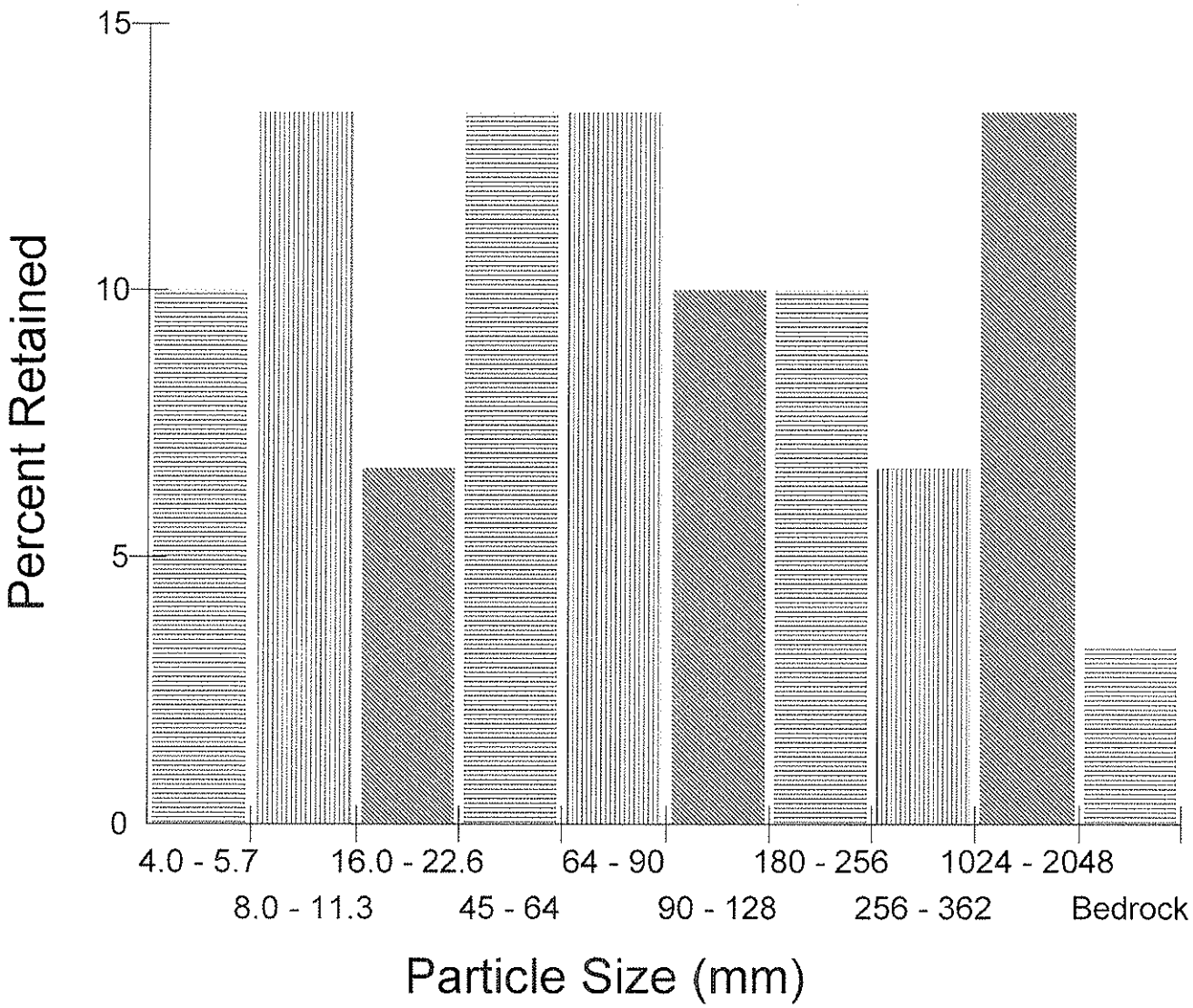
River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Pool: Representative
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	3	10.00	10.00
5.7 - 8.0	0	0.00	10.00
8.0 - 11.3	4	13.33	23.33
11.3 - 16.0	0	0.00	23.33
16.0 - 22.6	2	6.67	30.00
22.6 - 32.0	0	0.00	30.00
32 - 45	0	0.00	30.00
45 - 64	4	13.33	43.33
64 - 90	4	13.33	56.67
90 - 128	3	10.00	66.67
128 - 180	0	0.00	66.67
180 - 256	3	10.00	76.67
256 - 362	2	6.67	83.33
362 - 512	0	0.00	83.33
512 - 1024	0	0.00	83.33
1024 - 2048	4	13.33	96.67
Bedrock	1	3.33	100.00

D16 (mm)	9.49
D35 (mm)	52.13
D50 (mm)	77
D84 (mm)	1075.43
D95 (mm)	1919.81
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	43.33
Cobble (%)	33.34
Boulder (%)	20
Bedrock (%)	3.33

Total Particles = 30 (need at least 60).


Pool: Representative
Percent Finer
100
80
60
40
20
0
1
10
100
1000
10000
Particle Size (mm)


15
10
5
0
Percent Retained
4.0 - 5.7
8.0 - 11.3
16.0 - 22.6
45 - 64
64 - 90
90 - 128
180 - 256
256 - 362
1024 - 2048
Bedrock
Particle Size (mm)

Presentation Order – *First Field Day*

As a team, prepare to present the following items in order:

1. Sketch Map
2. Cross-Section Graphs:
   - Riffle Cross-Section(s)
   - Pool Cross-Section(s)
   - Run Cross-Section(s) (if applicable)
   - Glide Cross-Section(s) (if applicable)
3. Longitudinal Profile Graph
4. Representative Pebble Count for Stream Classification (Graph)
5. Active Bed Riffle Pebble Count for Hydraulic Calculations (Graph)
6. Velocity Computation Form (**Worksheet B-2**)
7. Stream Classification Form (**Worksheet B-1**)
8. Morphological Relations & Dimensionless Ratios Form (**Worksheet B-3**)
9. Pool Dimensionless Ratios Form (**Worksheet B-4**)

Checklist for Team Folder – *First Field Day*

Folder Holder: Please collect the following items from your team members and insert into your team folder in the order listed below. Please make sure all corrections have been made following your team presentation and give your completed team folder to Dave.

- ☐ Sketch Map
- ☐ Cross-Section Raw Data and Graphs for all Cross-sections Measured
- ☐ Longitudinal Profile Raw Data and Graph
- ☐ Representative Pebble Count Raw Data and Graph
- ☐ Active Bed Riffle Pebble Count Raw Data and Graph
- ☐ Stream Classification Form (**Worksheet B-1**)
- ☐ Velocity Computation Form (**Worksheet B-2**)
- ☐ Morphological Relations & Dimensionless Ratios Form (**Worksheet B-3**)
- ☐ Pool Dimensionless Ratios Form (**Worksheet B-4**)

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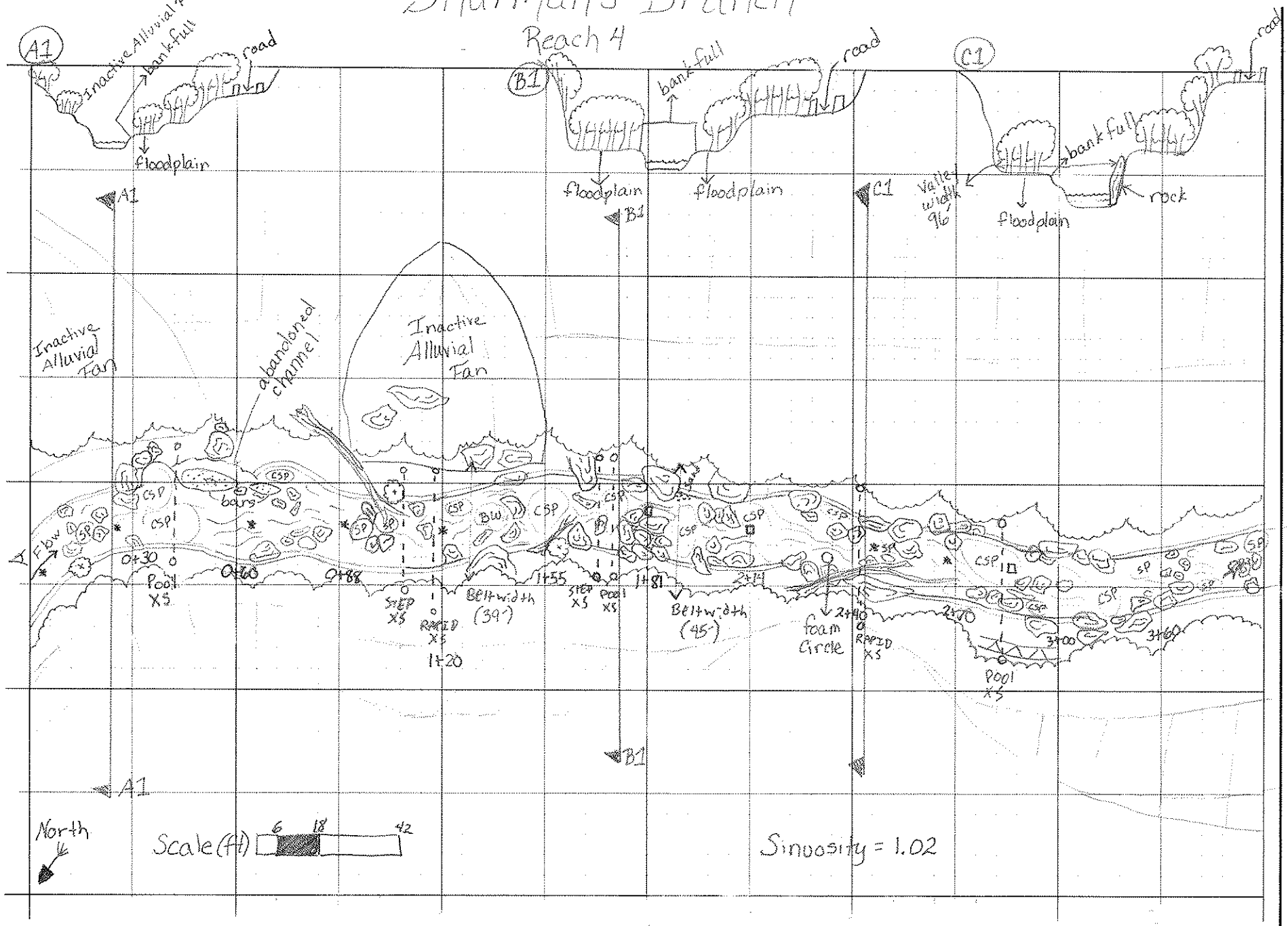
Sharman's Branch

4/25/17

Reach 4



Key

CSP = Contraction Scour Pool SP = Step Pool

XS = Cross-section BWP = Backwater Pool

* = Riffle Pebble Station

Surveyors
Kari Hedin &
Shawn Wurst

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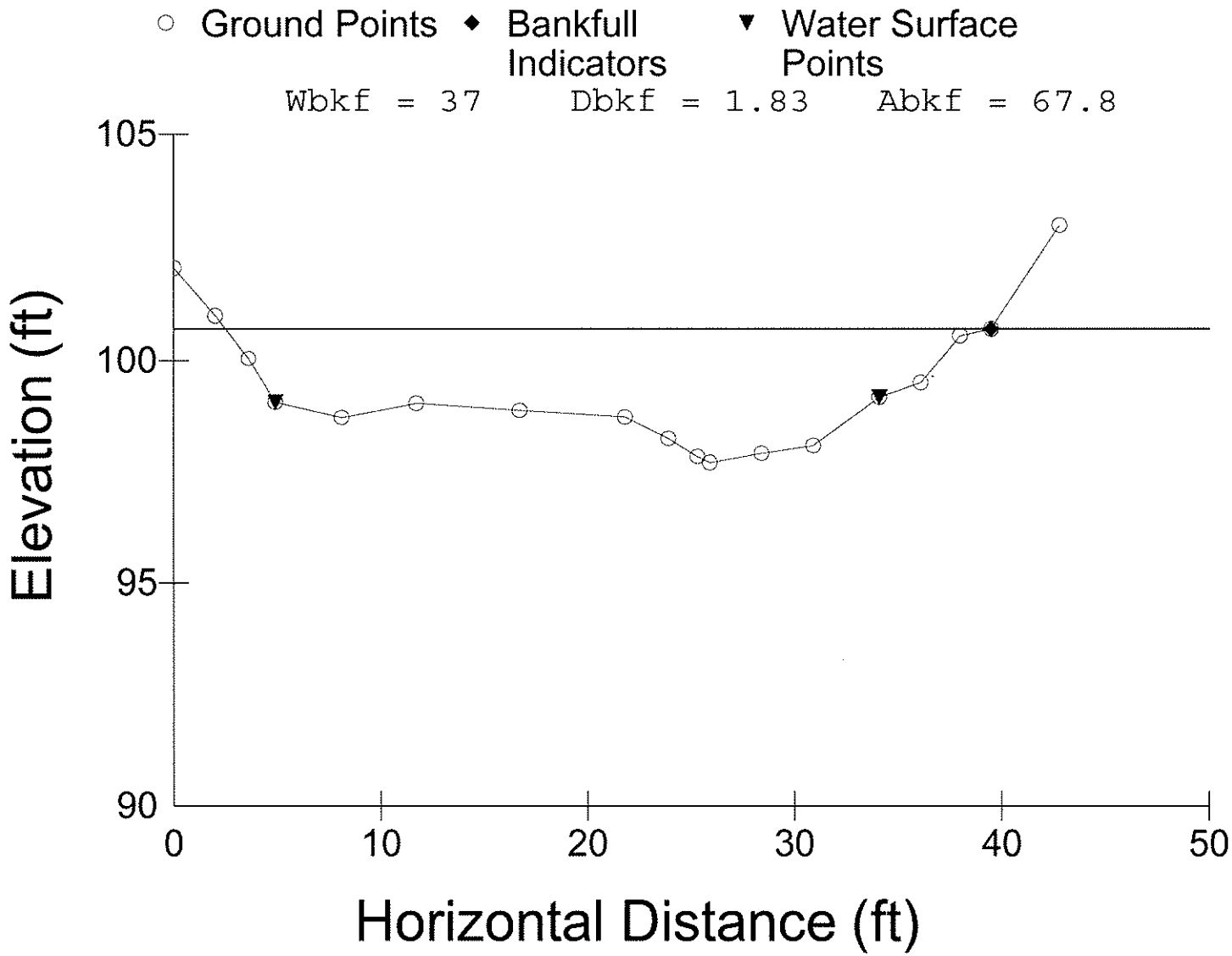
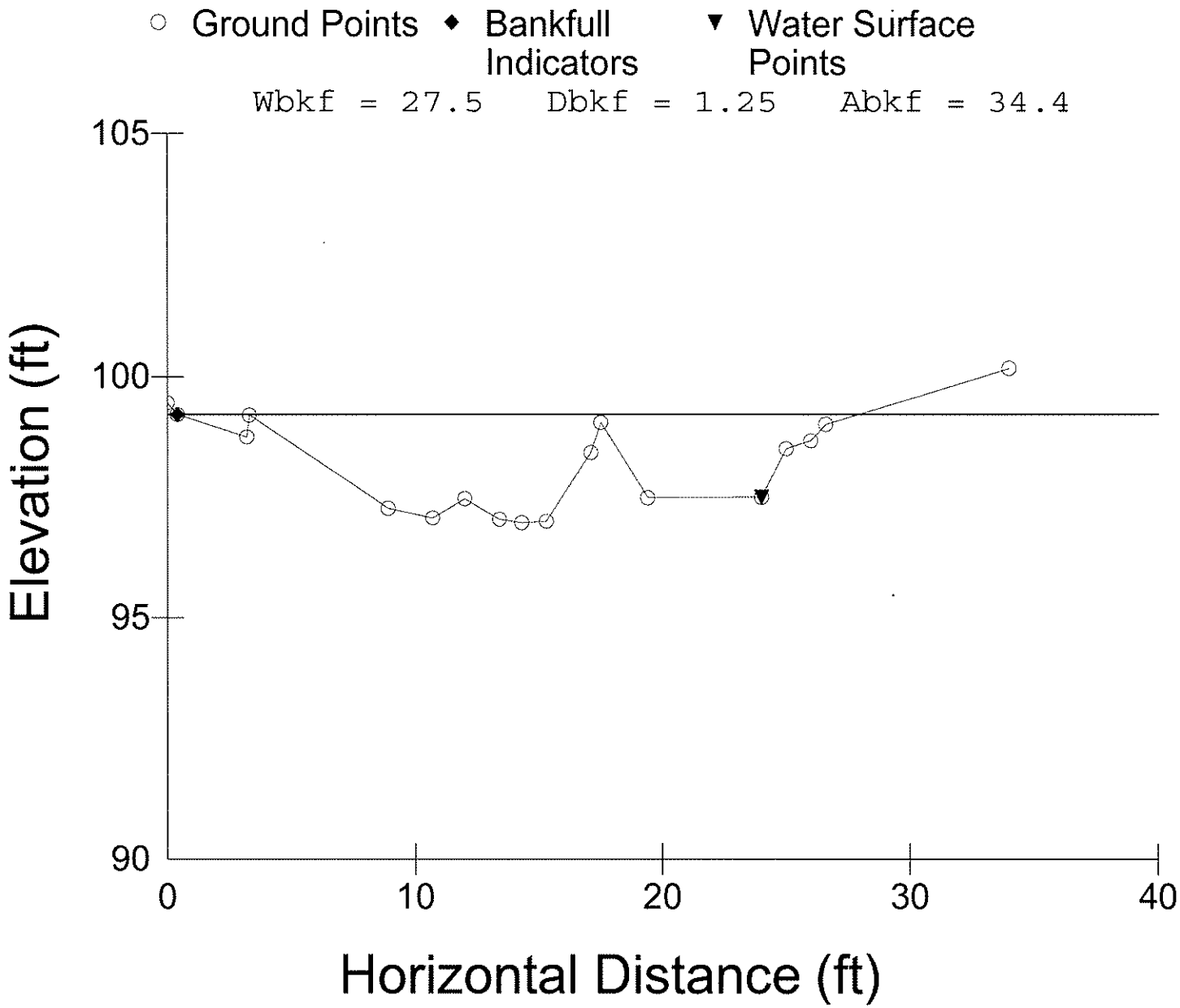
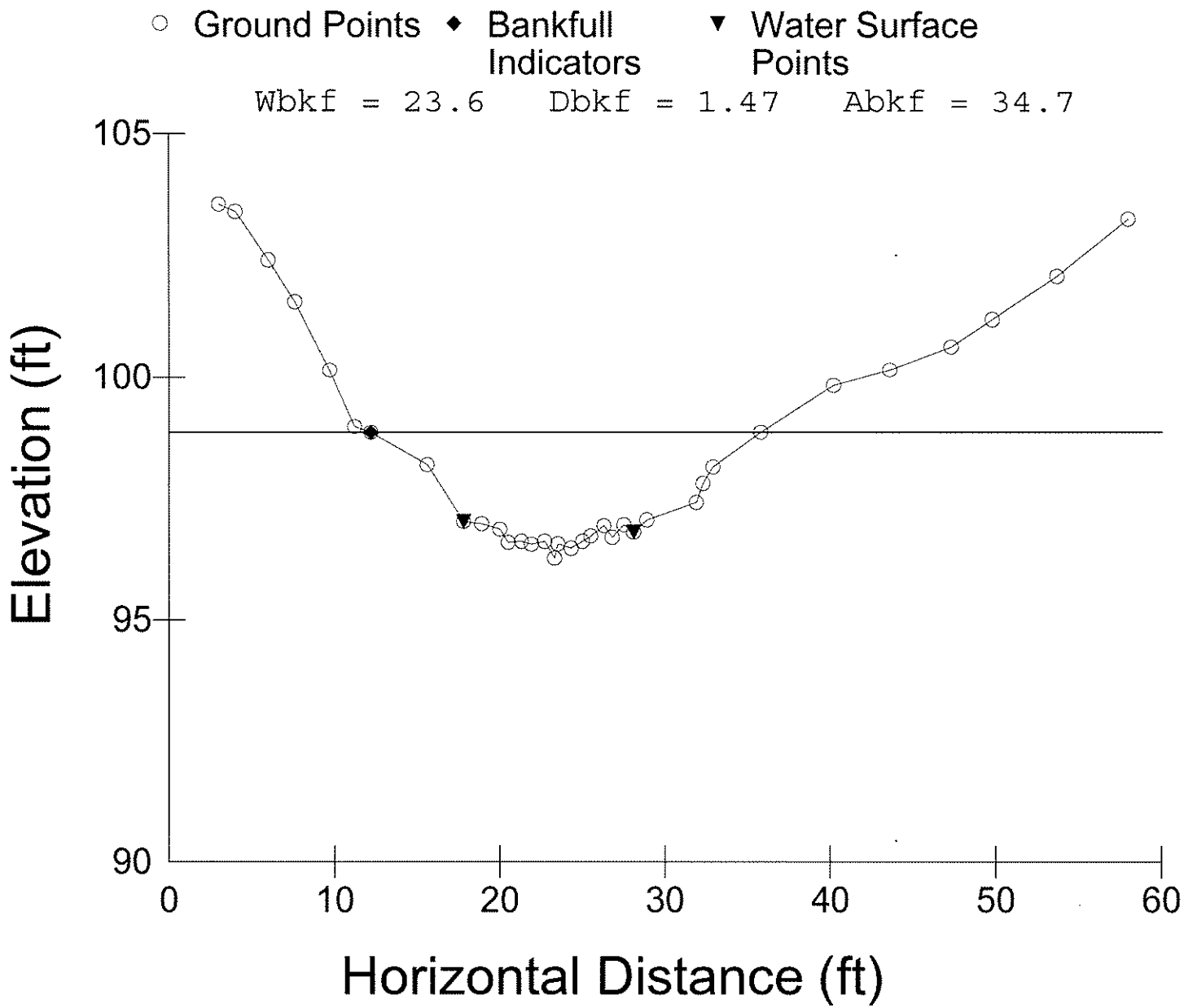
Contraction Scour Pool @ Sta. 42.4



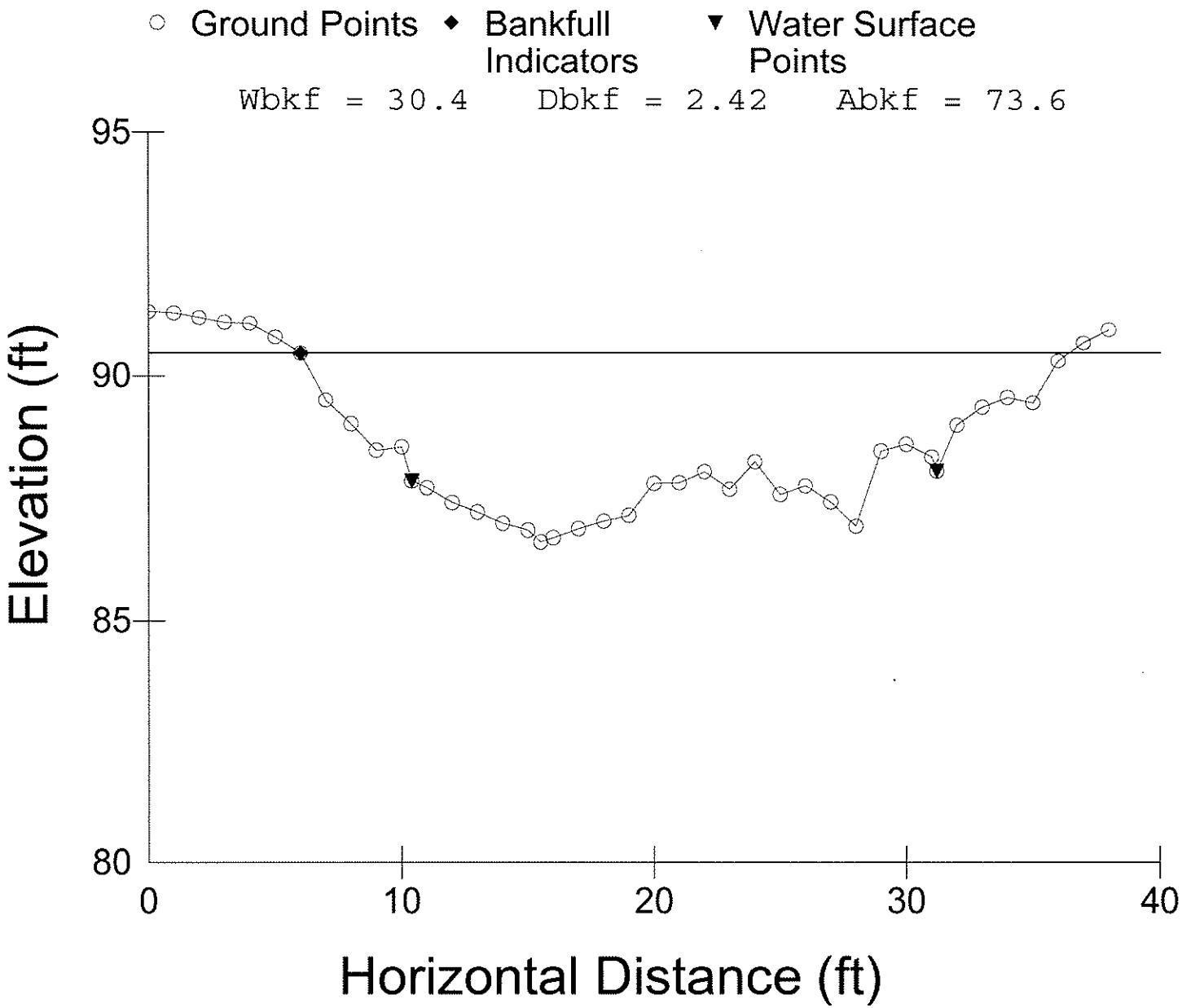
Middle of Step @ Sta. 107



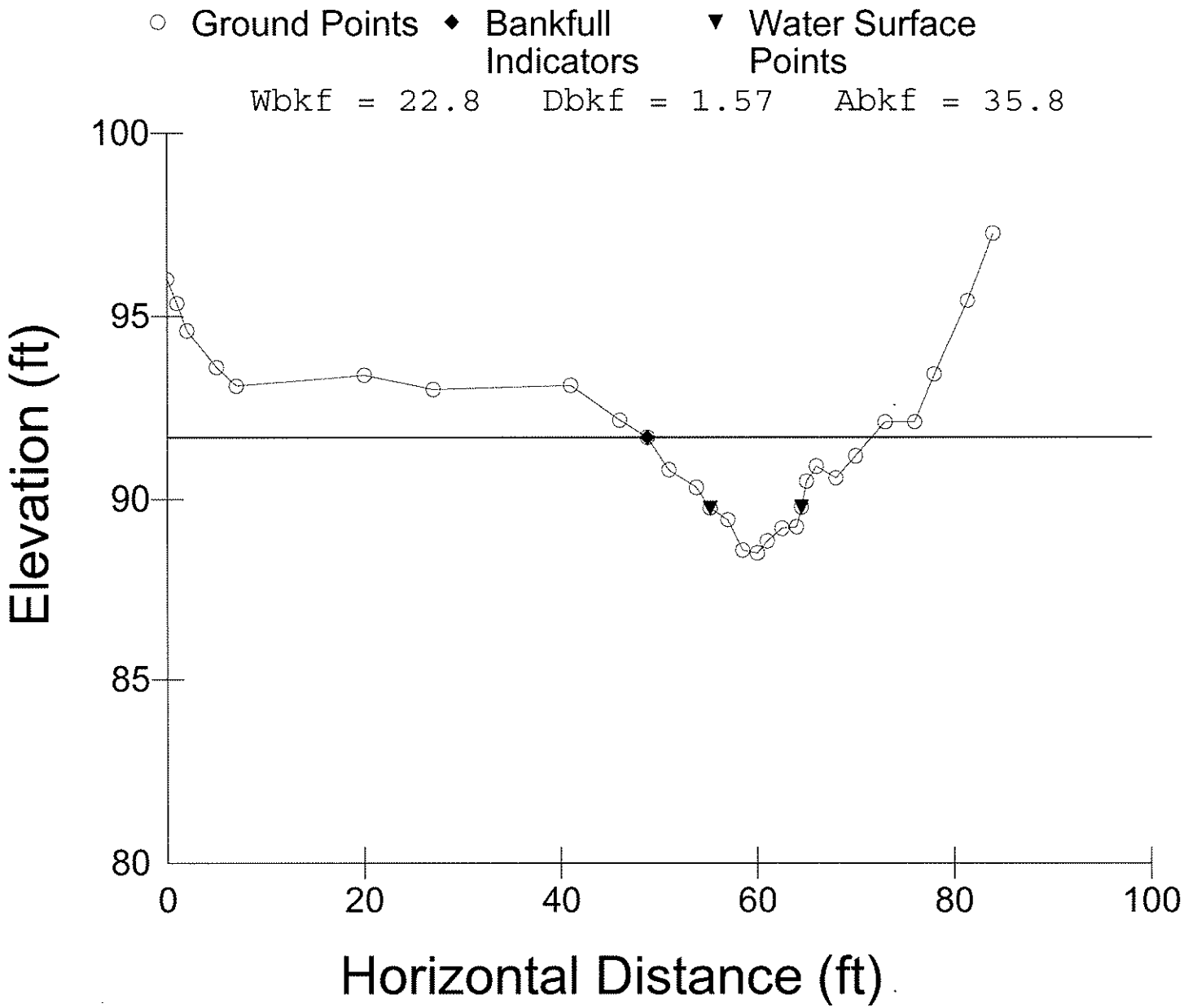
Rapid @ Sta. 115.8



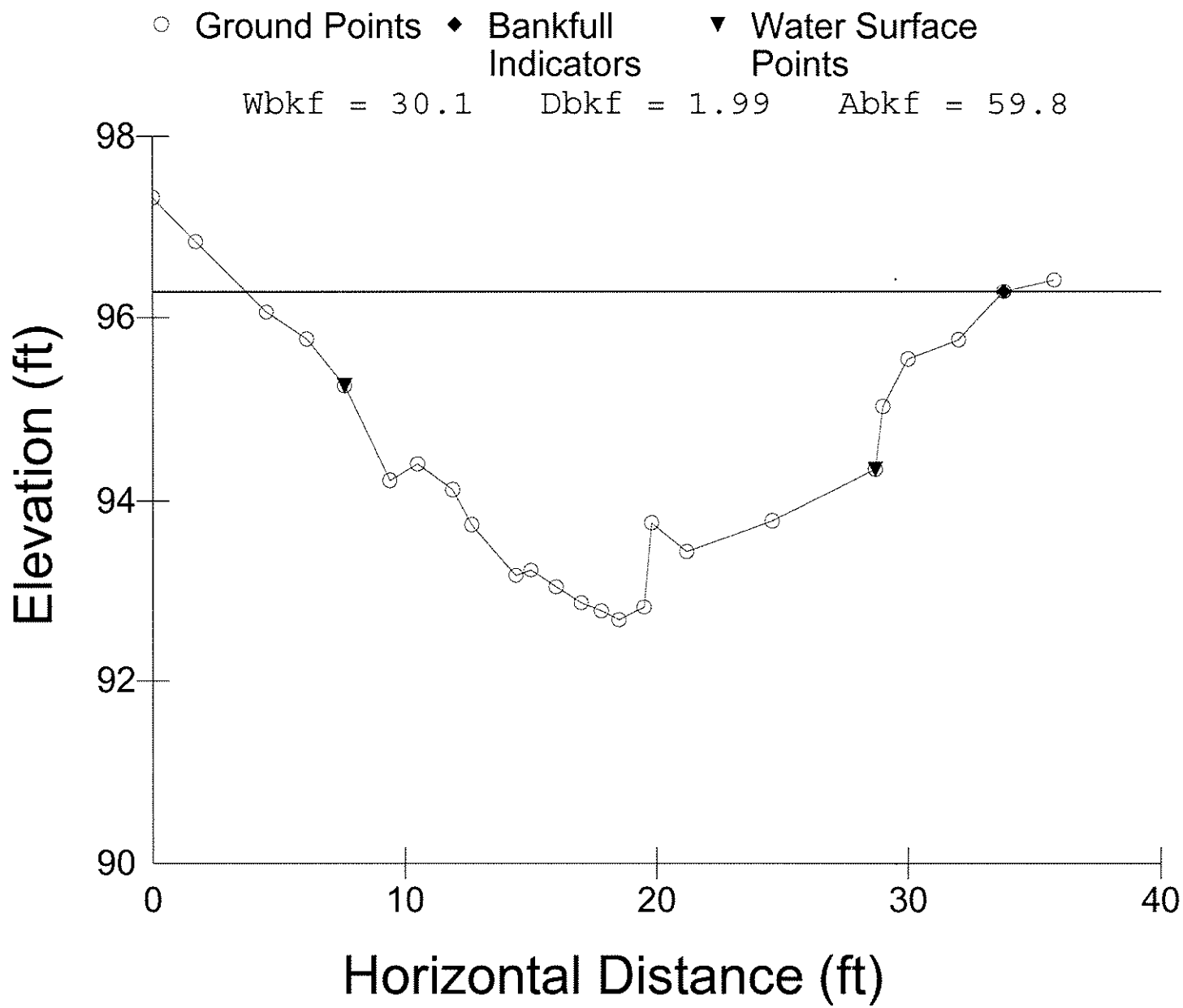
285 Contraction Scour Pool



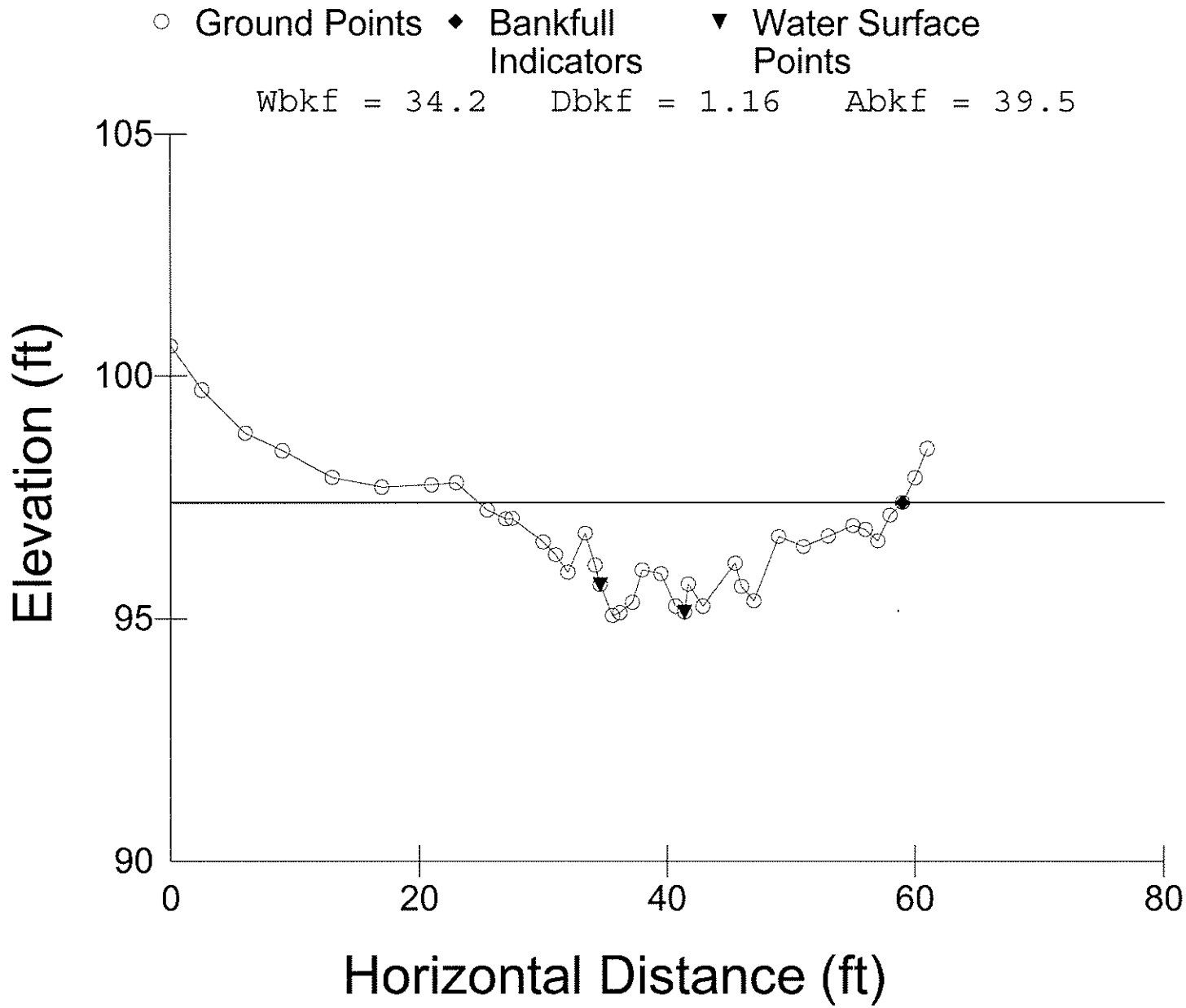
243 Rapid


Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 22.8 Dbkf = 1.57 Abkf = 35.8
100
95
90
85
80
Elevation (ft)
0
20
40
60
80
100
Horizontal Distance (ft)

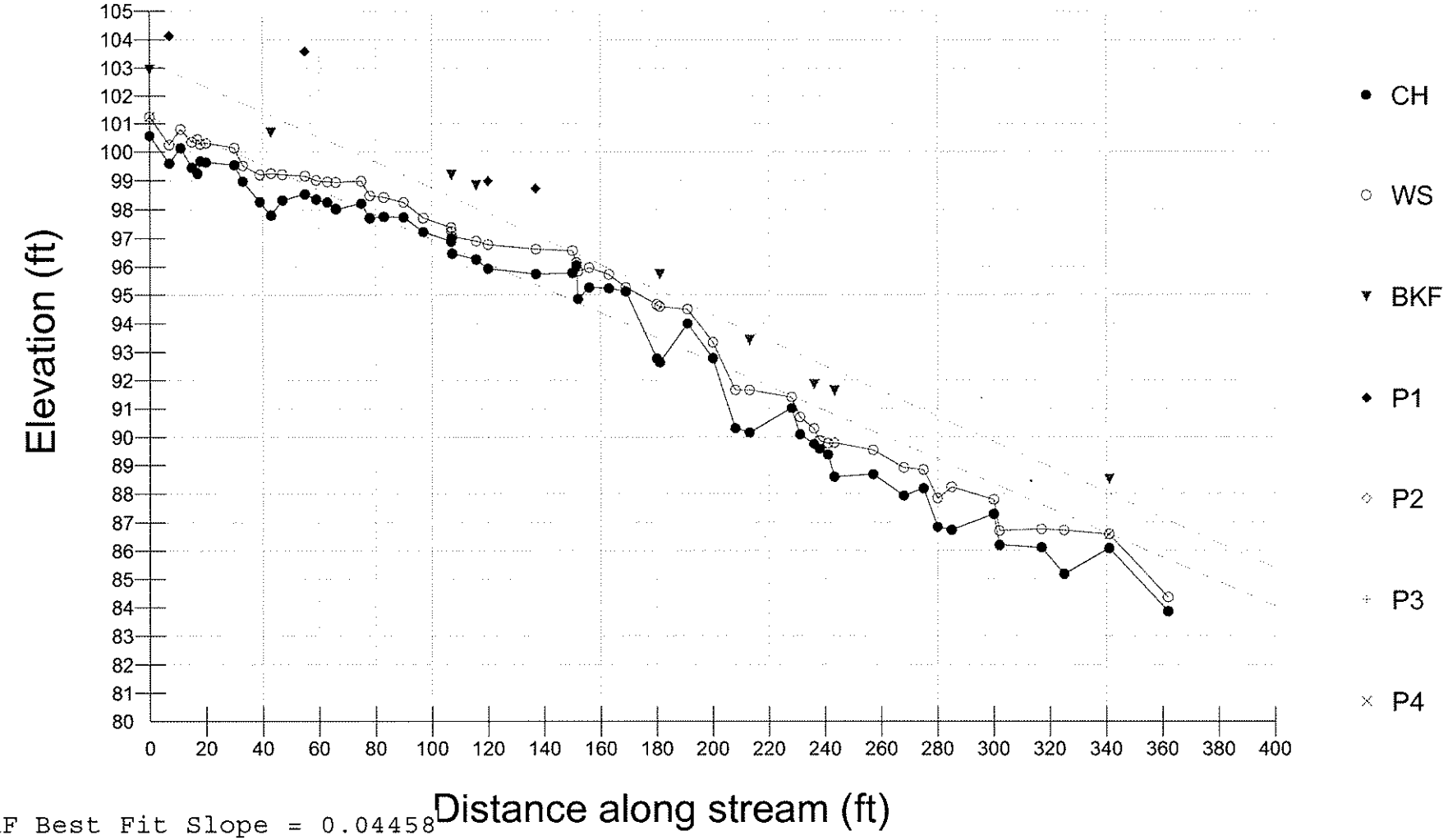
Pool@ Sta. 181.1



169 Step

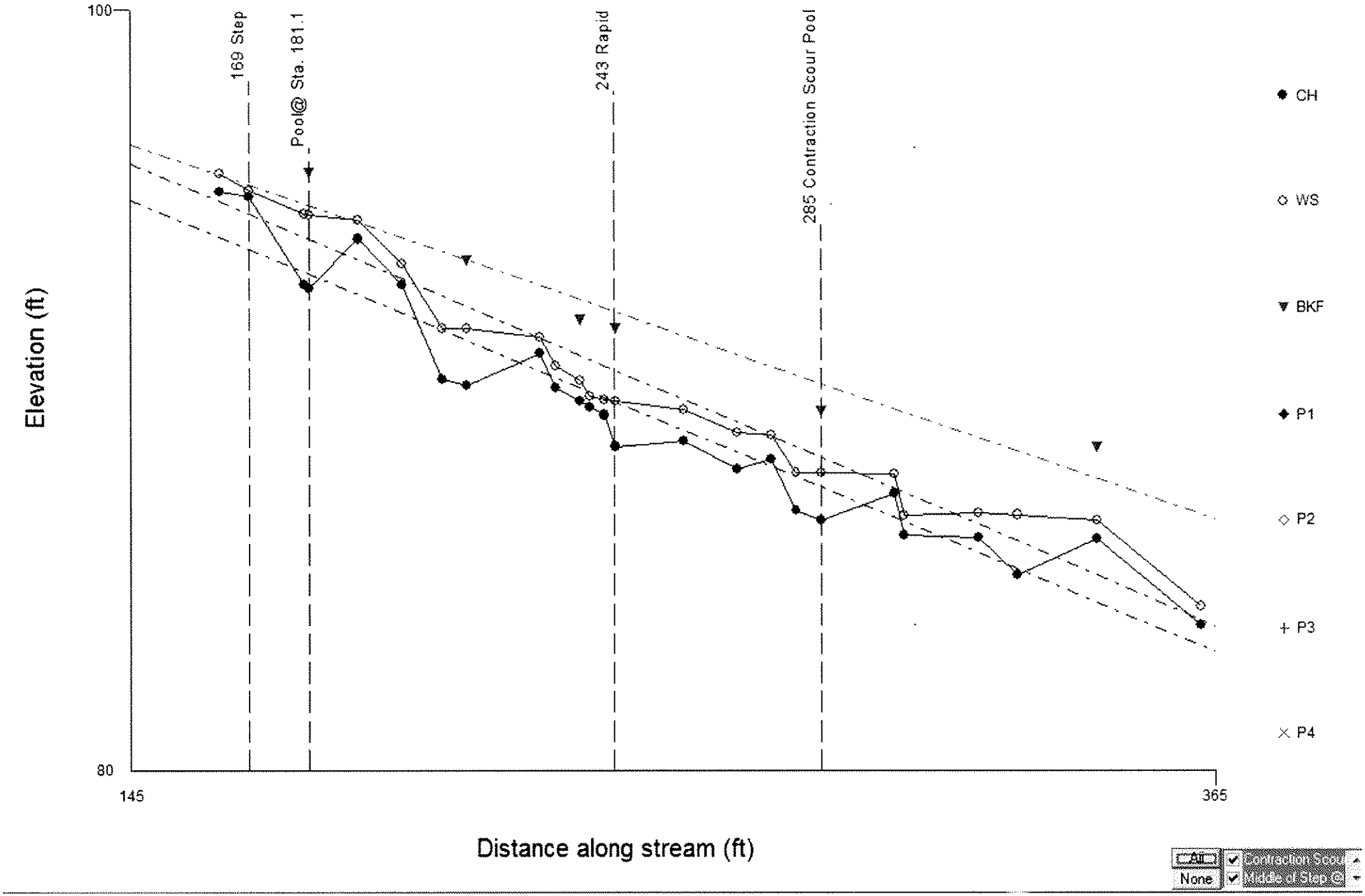

Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 34.2 Dbkf = 1.16 Abkf = 39.5
105
100
95
90
Elevation (ft)
0
20
40
60
80
Horizontal Distance (ft)

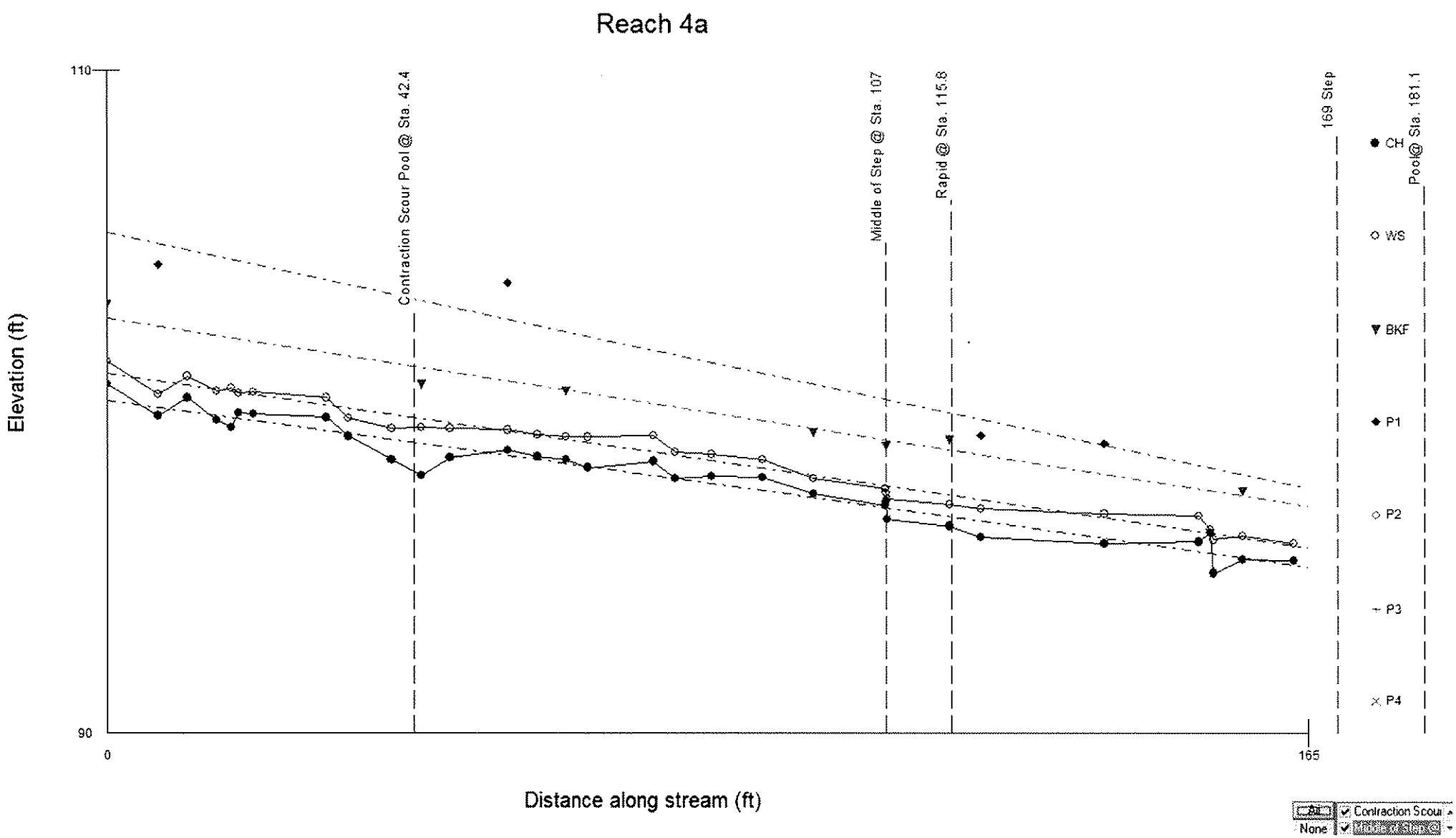
Sharman's Branch Reach 4 Long Pro



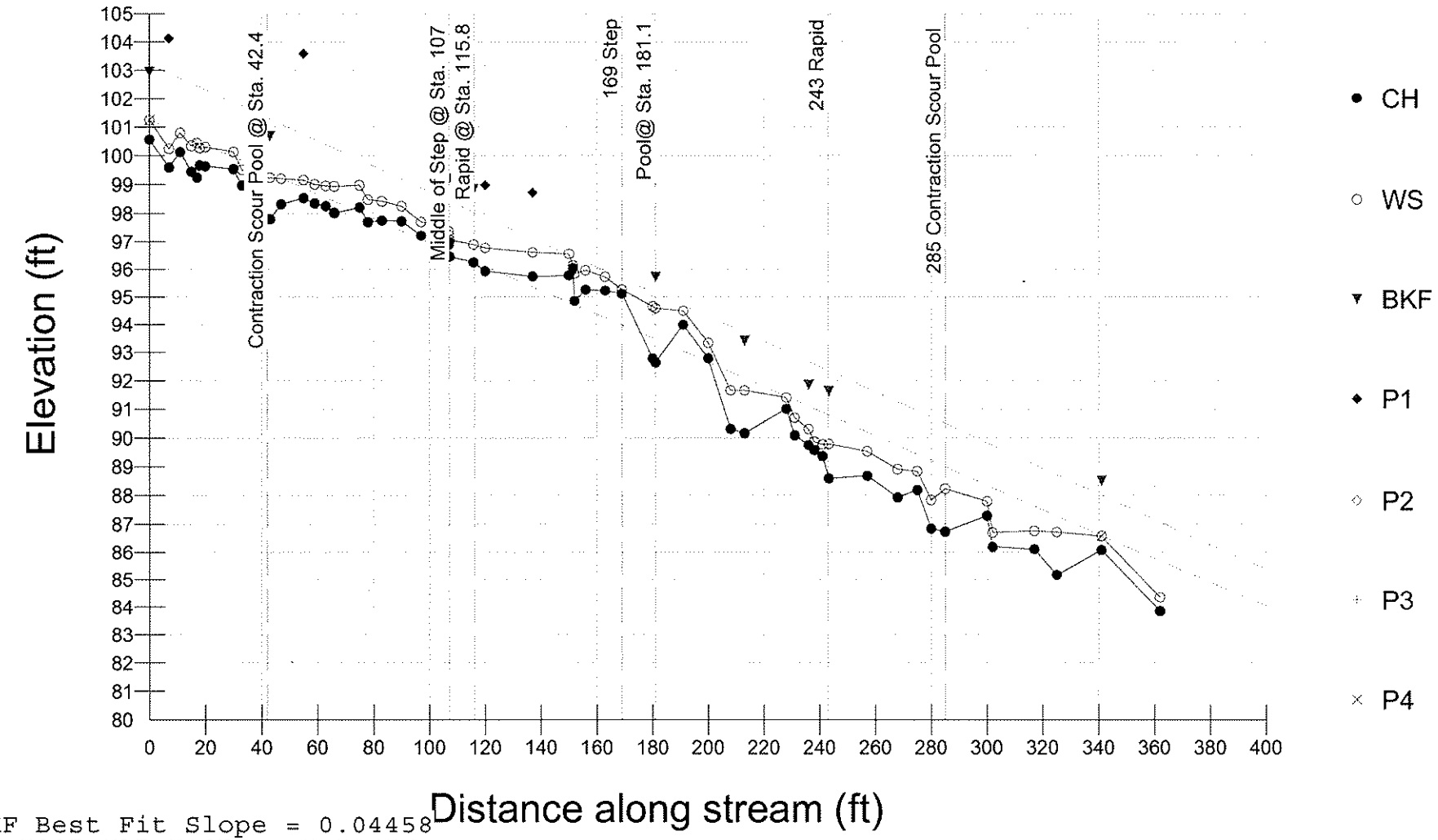
BKF Best Fit Slope = 0.04458
P4 Best Fit Slope = 0.04302

Reach 4b


100
80
145
365
Elevation (ft)
Distance along stream (ft)
169 Step
Pool@ Sta. 181.1
243 Rapid
285 Contraction Scour Pool
CH
WS
BKF
P1
P2
P3
P4
All
None
Contraction Scou
Middle of Step @

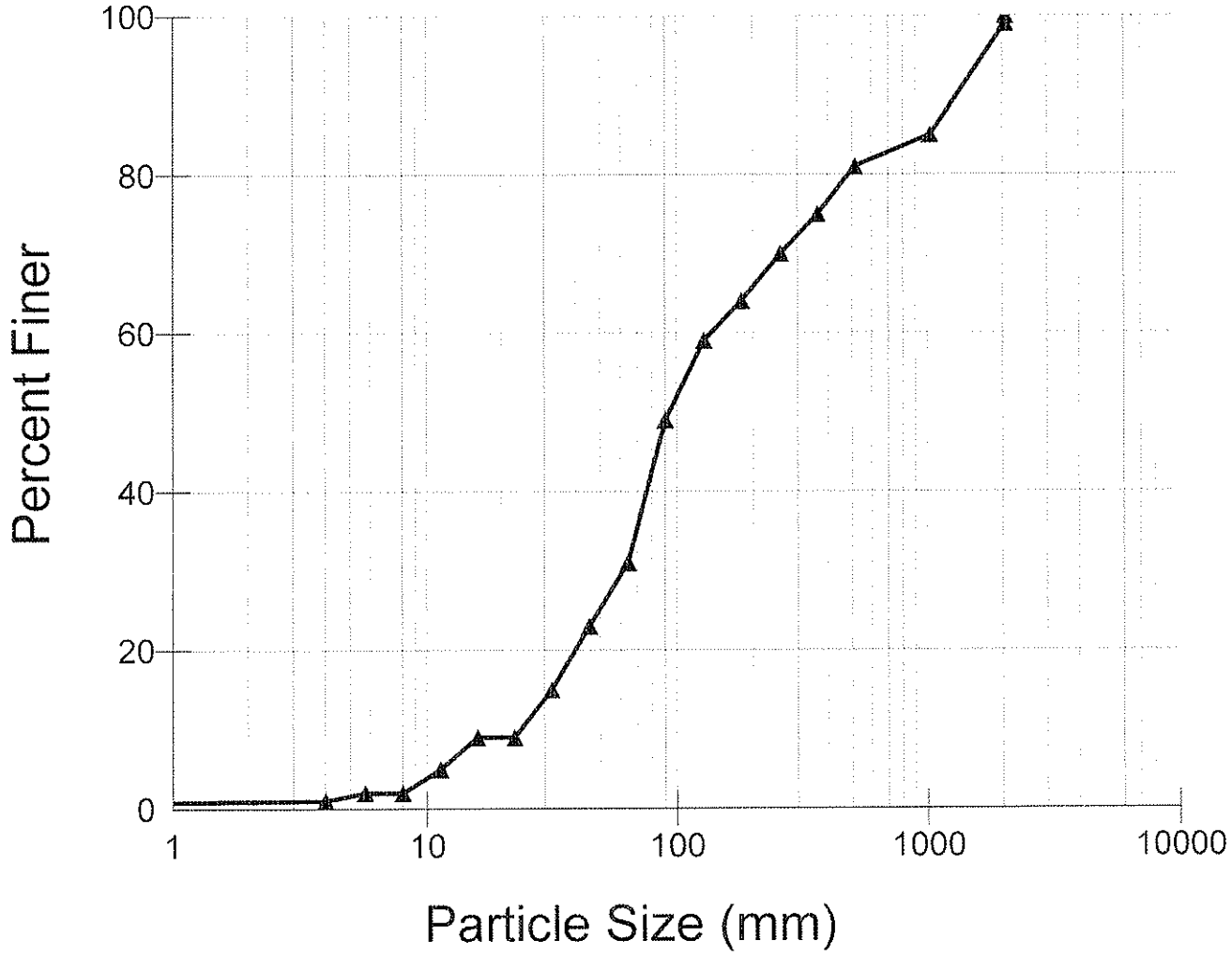

Reach 4a
Elevation (ft)
110
90
0
165
Distance along stream (ft)
Contraction Scour Pool @ Sta. 42.4
Middle of Step @ Sta. 107
Rapid @ Sta. 115.8
169 Step
Pool@ Sta. 181.1
CH
WS
BKF
P1
P2
P3
P4
All
None
Contraction Scour

Sharman's Branch Reach 4 Long Pro

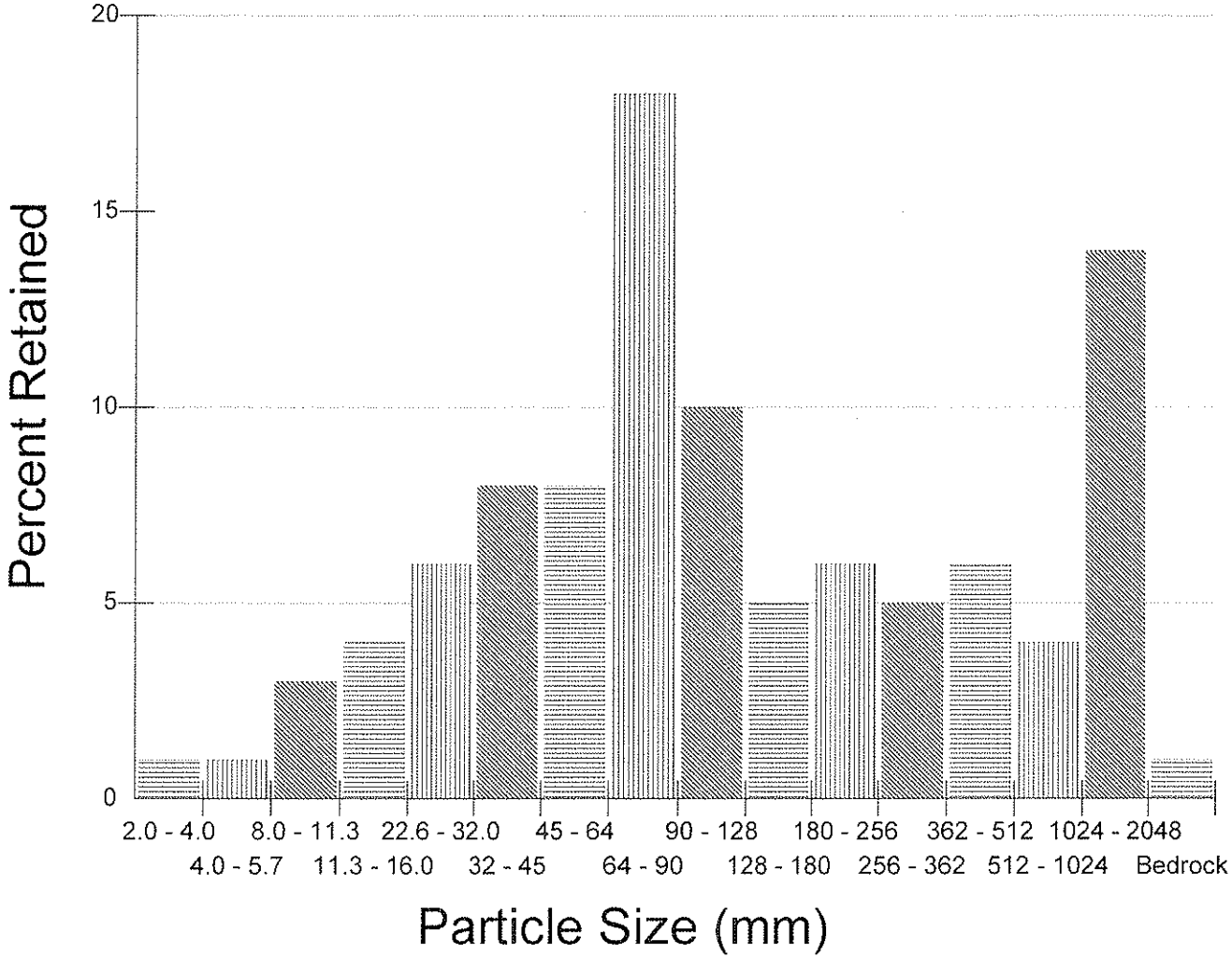


BKF Best Fit Slope = 0.04458
P4 Best Fit Slope = 0.04302

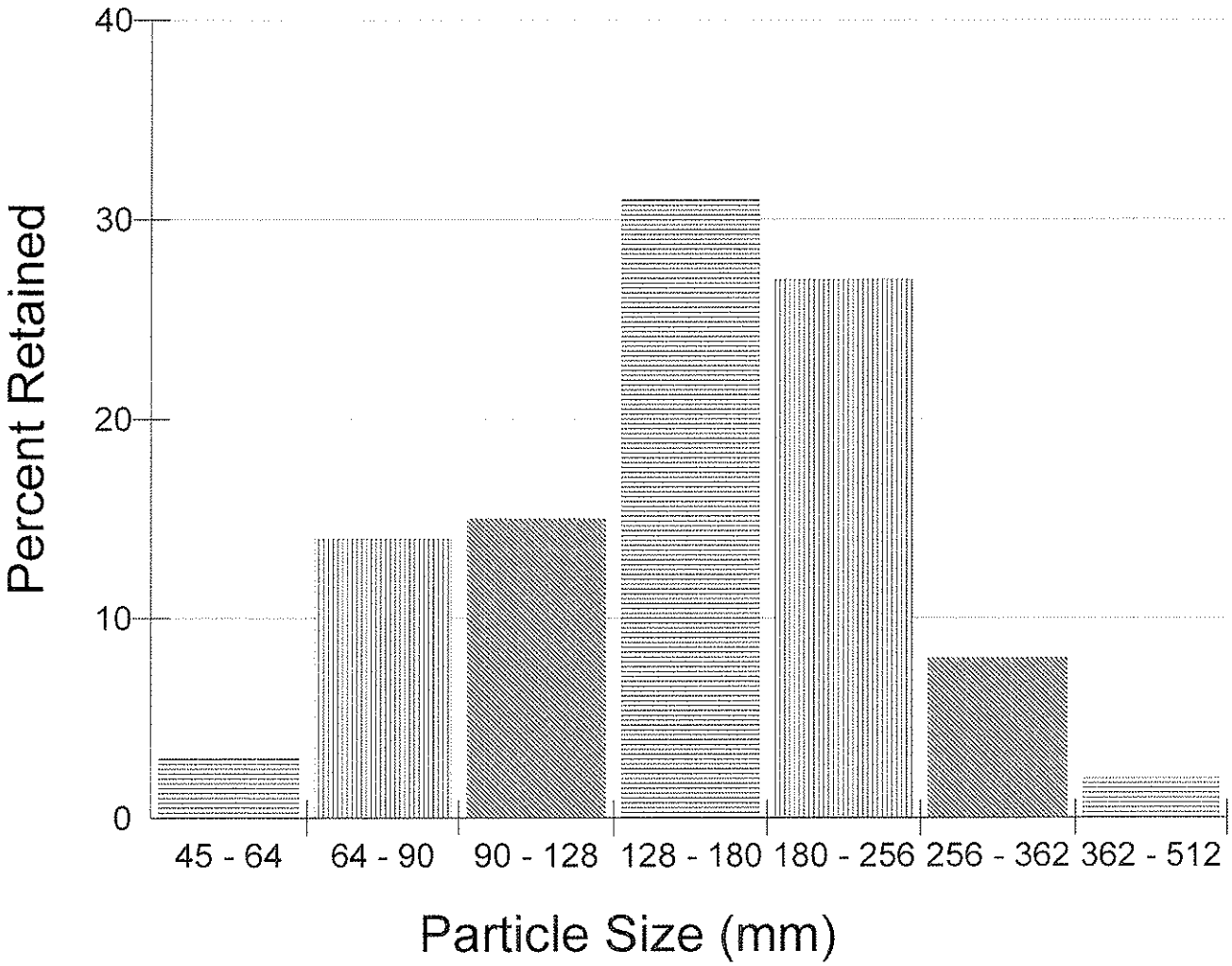
Riffle 1+18: Pebble Count



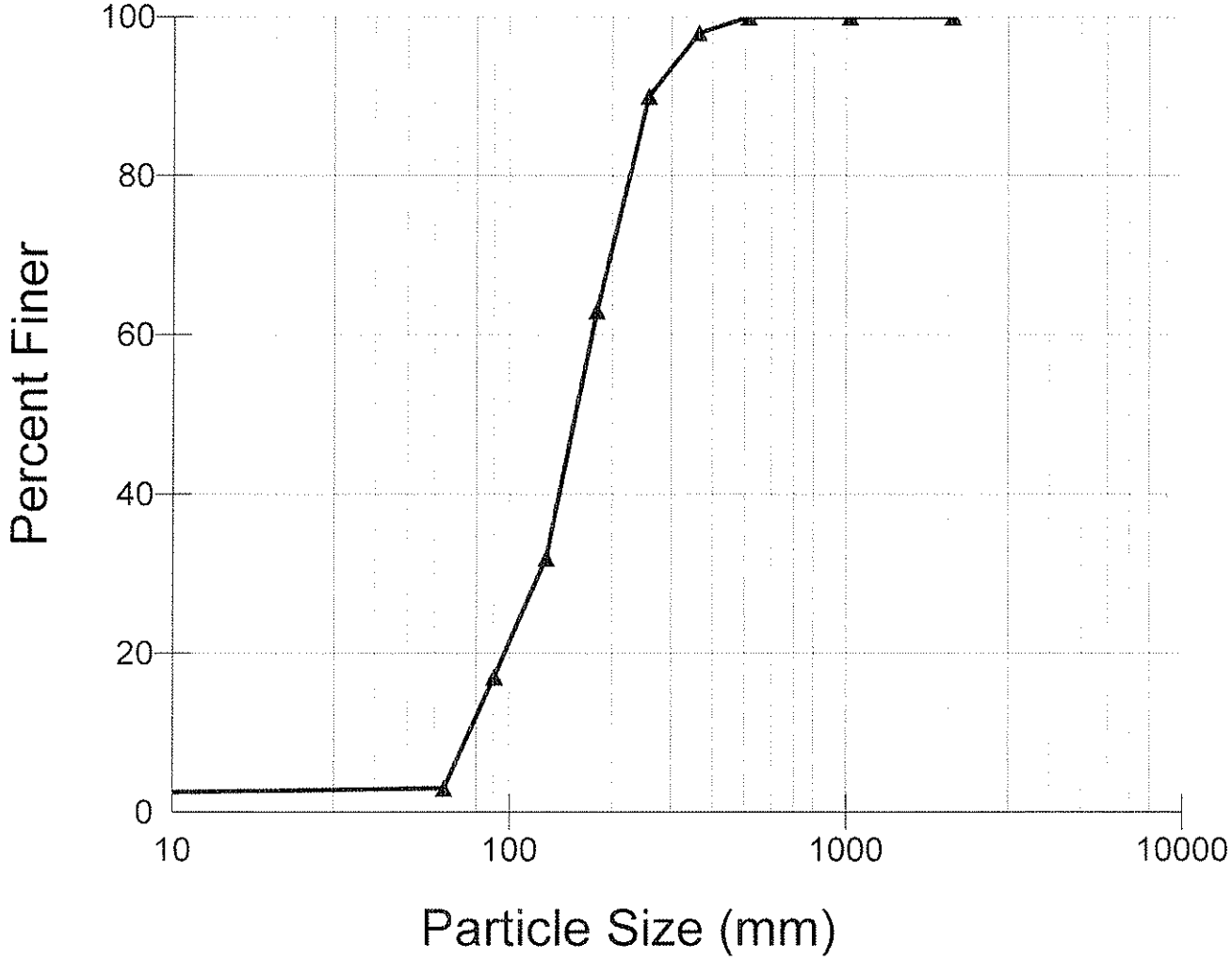
Riffle 1+18: Pebble Count



Riffle 1+18: Protrusion



Riffle 1+18: Protrusion



River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Riffle 1+18: Protrusion
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	0	0.00	0.00
5.7 - 8.0	0	0.00	0.00
8.0 - 11.3	0	0.00	0.00
11.3 - 16.0	0	0.00	0.00
16.0 - 22.6	0	0.00	0.00
22.6 - 32.0	0	0.00	0.00
32 - 45	0	0.00	0.00
45 - 64	3	3.00	3.00
64 - 90	14	14.00	17.00
90 - 128	15	15.00	32.00
128 - 180	31	31.00	63.00
180 - 256	27	27.00	90.00
256 - 362	8	8.00	98.00
362 - 512	2	2.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	88.14
D35 (mm)	133.03
D50 (mm)	158.19
D84 (mm)	239.11
D95 (mm)	322.25
D100 (mm)	511.99
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	3
Cobble (%)	87
Boulder (%)	10
Bedrock (%)	0

Total Particles = 100.

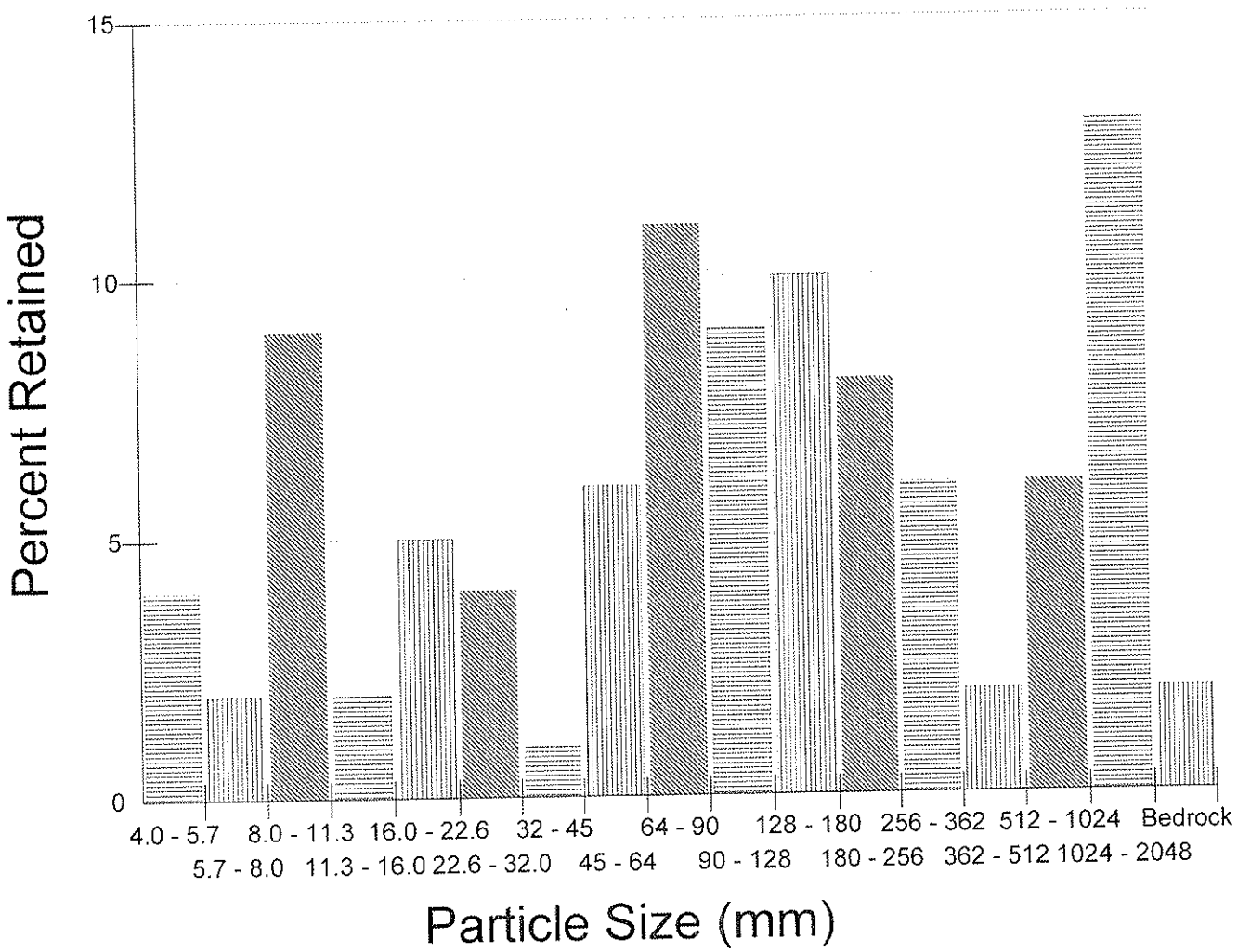
River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Riffle 1+18: Pebble Count
Survey Date: 04/25/2017

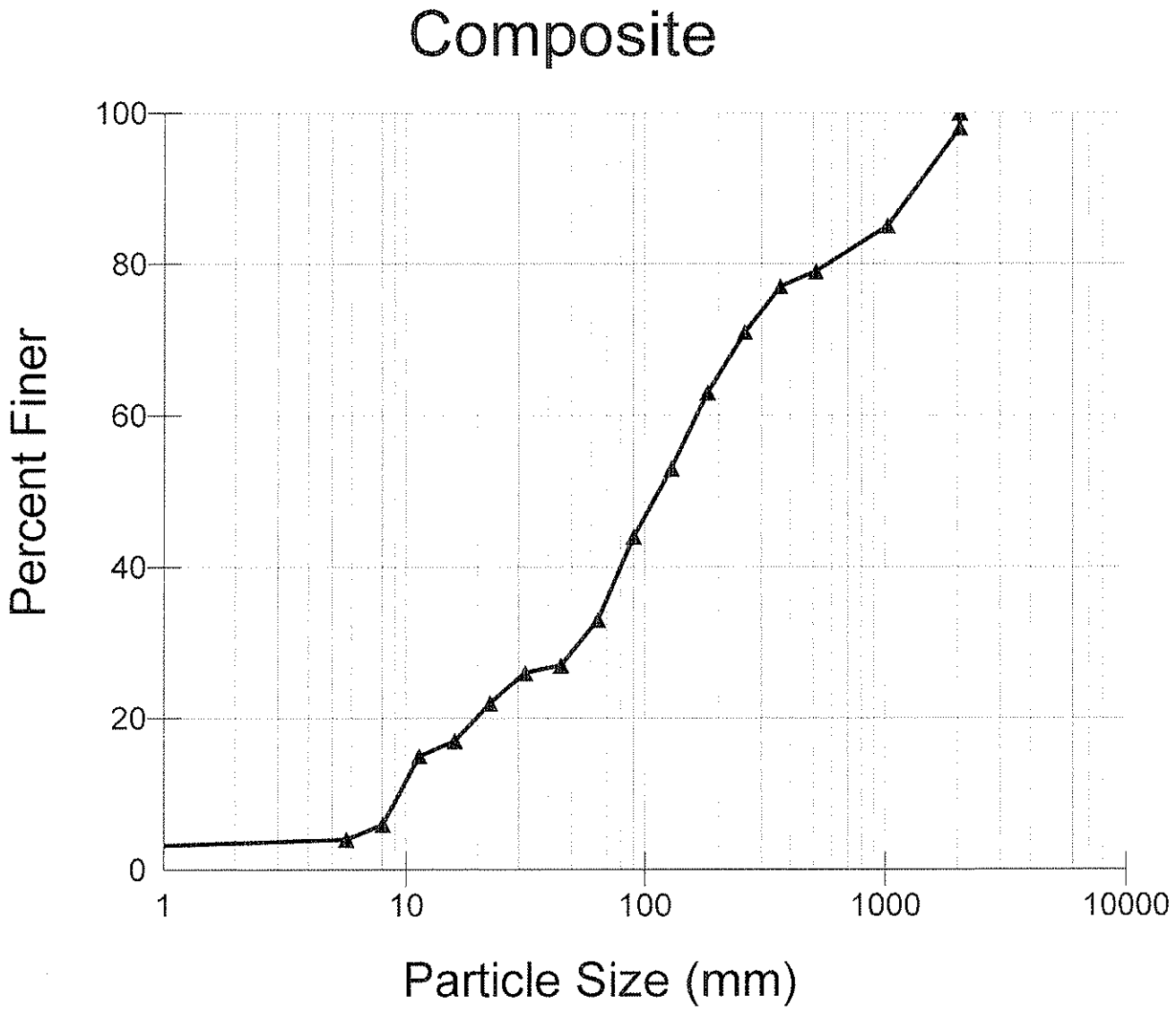
Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	1	1.00	1.00
4.0 - 5.7	1	1.00	2.00
5.7 - 8.0	0	0.00	2.00
8.0 - 11.3	3	3.00	5.00
11.3 - 16.0	4	4.00	9.00
16.0 - 22.6	0	0.00	9.00
22.6 - 32.0	6	6.00	15.00
32 - 45	8	8.00	23.00
45 - 64	8	8.00	31.00
64 - 90	18	18.00	49.00
90 - 128	10	10.00	59.00
128 - 180	5	5.00	64.00
180 - 256	6	6.00	70.00
256 - 362	5	5.00	75.00
362 - 512	6	6.00	81.00
512 - 1024	4	4.00	85.00
1024 - 2048	14	14.00	99.00
Bedrock	1	1.00	100.00

D16 (mm)	33.63
D35 (mm)	69.78
D50 (mm)	93.8
D84 (mm)	896
D95 (mm)	1755.43
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	31
Cobble (%)	39
Boulder (%)	29
Bedrock (%)	1

Total Particles = 100.

Composite


Percent Retained
15
10
5
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
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)


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

River Name: Sharman's Branch
Reach Name: Reach 1
Sample Name: Composite
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	4	4.00	4.00
5.7 - 8.0	2	2.00	6.00
8.0 - 11.3	9	9.00	15.00
11.3 - 16.0	2	2.00	17.00
16.0 - 22.6	5	5.00	22.00
22.6 - 32.0	4	4.00	26.00
32 - 45	1	1.00	27.00
45 - 64	6	6.00	33.00
64 - 90	11	11.00	44.00
90 - 128	9	9.00	53.00
128 - 180	10	10.00	63.00
180 - 256	8	8.00	71.00
256 - 362	6	6.00	77.00
362 - 512	2	2.00	79.00
512 - 1024	6	6.00	85.00
1024 - 2048	13	13.00	98.00
Bedrock	2	2.00	100.00

D16 (mm)	13.65
D35 (mm)	68.73
D50 (mm)	115.33
D84 (mm)	938.67
D95 (mm)	1811.69
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	33
Cobble (%)	38
Boulder (%)	27
Bedrock (%)	2

Total Particles = 100.

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

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Sharman's Branch	Location:	Rapid 115.8 - Reach 4
Date: 4/25/2017	Stream Type: B3	Valley Type:	C-CO-US
Observers:	Group 4	HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	34.69	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.47	d_{bkf} (ft)
Bankfull Riffle WIDTH	23.60	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	24.86	W_p (ft)
D_{84} at Riffle	239.11	Dia. (mm)	D_{84} (mm) / 304.8	0.78	D_{84} (ft)
Bankfull SLOPE	0.0446	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.40	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	1.79	R / D_{84}
Drainage Area	3.6	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	1.418	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	6.01	ft / sec	208.44	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.06	6.53	ft / sec	226.60	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.074	5.30	ft / sec	183.72	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 $n =$ 0.113	3.46	ft / sec	119.89	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	6.39	ft / sec	221.48	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 = 0.0 year	3.26	ft / sec	113.00	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$	0.00	ft / sec	0.00	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 2-3. Field form for Level II stream classification (Rosgen, 1996; Rosgen and Silvey, 2005).

Stream:	**Group 4, Reach 4**				
Basin:		Drainage Area:	**2304** acres	**3.6**	mi^2
Location:	**Sharman's Branch**				
Twp.&Rge: ;		Sec.&Qtr.: ;			
Cross-Section Monuments (Lat./Long.):	**0 Lat / 0 Long**			Date: **04/25/17**	
Observers:	**Group 4**			Valley Type: C-CO-U	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**34.2**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A / W_{bkf}$).	**1.16**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**39.54**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**29.48**	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.	**2.37**	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.	**58.72**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.72**	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.	**115.33**	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.	**0.04302**	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).	**1.02**	

Stream Type **B3a/2** (See **Figure 2-14**)

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Worksheet 2-4a. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Group 4** Location: **Reach - Reach 1**

Observers: **Group 4** Date: **04/25/17** Valley Type: **C-CO-US** Stream Type: **B3a/2**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	23.2	22.8	23.6	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	35.25	34.69	35.81
Mean Riffle Depth (d_{bkf})	1.52	1.47	1.57	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	15.30	14.54	16.05
Maximum Riffle Depth (d_{max})	2.86	2.6	3.12	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.878	1.769	1.987
Width of Flood-Prone Area (W_{fpa})	60.9	43.2	78.5	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	2.636	1.831	3.440
Riffle Inner Berm Width (W_{ib})	0	0	0	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.000	0.000	0.000
Riffle Inner Berm Depth (d_{ib})	0	0	0	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.000	0.000	0.000
Riffle Inner Berm Area (A_{ib})	0	0	0	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.000	0.000	0.000
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	0	0	0					

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	32.5	30.1	37	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	1.401	1.297	1.594
Mean Pool Depth (d_{bkfp})	2.08	1.83	2.42	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.368	1.204	1.592
Pool Cross-Sectional Area (A_{bkfp})	67.1	59.8	73.6	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.902	1.696	2.088
Maximum Pool Depth (d_{maxp})	3.51	3.02	3.89	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.309	1.987	2.559
Pool Inner Berm Width (W_{ibp})	0	0	0	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.000	0.000	0.000
Pool Inner Berm Depth (d_{ibp})	0	0	0	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.000	0.000	0.000
Pool Inner Berm Area (A_{ibp})	0	0	0	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.000	0.000	0.000
Point Bar Slope (S_{pb})	0.000	0.000	0.000	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	0.000	0.000	0.000

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

Glide Dimensions*	Mean	Min	Max		Glide Dimensions & Dimensionless Ratios****	Mean	Min	Max
Glide Width (W_{bkfg})	0	0	0	ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})	0.000	0.000	0.000
Mean Glide Depth (d_{bkfg})	0	0	0	ft	Mean Glide Depth to Mean Riffle Depth (d_{bkfg} / d_{bkf})	0.000	0.000	0.000
Glide Cross-Sectional Area (A_{bkfg})	0	0	0	ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})	0.000	0.000	0.000
Maximum Glide Depth (d_{maxg})	0	0	0	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	0.000	0.000	0.000
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})	0	0	0	ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})	0.000	0.000	0.000
Glide Inner Berm Width (W_{ibg})	0	0	0	ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})	0.000	0.000	0.000
Glide Inner Berm Depth (d_{ibg})	0	0	0	ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})	0.000	0.000	0.000
Glide Inner Berm Area (A_{ibg})	0	0	0	ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})	0.000	0.000	0.000

Step**	Mean	Min	Max		Step Dimensionless Ratios****	Mean	Min	Max
Step Width (W_{bkfs})	30.9	27.5	34.2	ft	Step Width to Riffle Width (W_{bkfs} / W_{bkf})	1.329	1.186	1.473
Mean Step Depth (d_{bkfs})	1.21	1.16	1.25	ft	Mean Step Depth to Riffle Depth (d_{bkfs} / d_{bkf})	0.796	0.763	0.822
Step Cross-Sectional Area (A_{bkfs})	37	34.4	39.5	ft	Step Area to Riffle Area (A_{bkfs} / A_{bkf})	1.049	0.976	1.122
Maximum Step Depth (d_{maxs})	2.32	2.26	2.37	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	1.526	1.487	1.559
Step Width/Depth Ratio (W_{bkfs} / d_{bkfs})	25.8	22	29.5					

*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 2-4b. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Group 4**		Location: **Reach - Reach 1**	
Observers: **Group 4**	Date: **04/25/17**	Valley Type: **C-CO-US**	Stream Type: **B3a/2**

River Reach Summary Data.....2

Hydraulic

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	3.46	ft/sec	Estimation Method		
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	119.89	cfs	Drainage Area	3.6	mi^2

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	0	0	0	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	0.000	0.000	0.000
Stream Meander Length (L_m)	0	0	0	ft	Stream Meander Length Ratio (L_m / W_{bkf})	0.000	0.000	0.000
Radius of Curvature (R_c)	0	0	0	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	0.000	0.000	0.000
Belt Width (W_{blt})	42	39	45	ft	Meander Width Ratio (W_{blt} / W_{bkf})	1.809	1.680	1.938
Arc Length (L_a)	0	0	0	ft	Arc Length to Riffle Width (L_a / W_{bkf})	0.000	0.000	0.000
Riffle Length (L_r)	20	5	37	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	0.861	0.215	1.593
Individual Pool Length (L_p)	22	3	60	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	0.947	0.129	2.584
Pool to Pool Spacing (P_s)	36	15	74	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	1.550	0.646	3.187

Channel Profile

Valley Slope (S_{val})	0.0437	ft/ft	Average Water Surface Slope (S)	0.04458	ft/ft	Sinuosity (S_{val} / S)	1.02
Stream Length (SL)	0	ft	Valley Length (VL)	0	ft	Sinuosity (SL / VL)	

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})	0.060	0.027	0.100	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	1.339	0.607	2.238
Run Slope (S_{run})	0.000	0.000	0.000	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	0.000	0.000	0.000
Pool Slope (S_p)	0.015	0.003	0.038	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.328	0.070	0.863
Glide Slope (S_g)	0.000	0.000	0.000	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	0.000	0.000	0.000
Step Slope (S_s)	0.243	0.012	0.795	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	5.455	0.265	17.84

Max Depths[a]	Min	Mean	Max		Dimensionless Depth Ratios	Min	Mean	Max
Max Riffle Depth (d_{maxrif})	0	2.53	3.19	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	0	1.664	2.1
Max Run Depth (d_{maxrun})	0	0	0	ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	0	0	0
Max Pool Depth (d_{maxp})	2.8	3.58	4.04	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	1.84	2.355	2.66
Max Glide Depth (d_{maxg})	0	0	0	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	0	0	0
Max Step Depth (d_{maxs})	1.31	2.43	2.98	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	0.86	1.599	1.96

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	0	0		D_{16}	13.65	33.63		88.14	mm
% Sand	0	0		D_{35}	68.73	69.78		133.03	mm
% Gravel	33	31		D_{50}	115.33	93.8		158.19	mm
% Cobble	38	39		D_{84}	938.67	896		239.11	mm
% Boulder	27	29		D_{95}	1811.69	1755.43		322.25	mm
% Bedrock	2	1		D_{100}	Bedrock	Bedrock		511.99	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. Dimensionless ratios of the ten pool types (*First Field Day*).

Stream: SHARMANS BRANCH Location: REACH 4

Observers: TEAM 4 Stream Type: Landscape Type: Date: 4/24/17

Pool Type		Dimensional Values: Pool Length (L_p)	Pool Max Depth (d_{maxp})	Pool Slope (S_p)		Dimensionless Ratios: Pool Length to Riffle Width (L_p / W_{bkf})	Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})	Pool Slope to Average Slope (S_p / S)
1. Lateral Scour Pool (LSP)	Mean	2.25	2.7		Mean	0.07	2.33	
	Min.	1.5	2.4		Min.	0.04	2.07	
	Max.	3	3.0		Max.	0.09	2.59	
2. Contraction Scour Pool (CSP)	Mean	6.2	2.8		Mean	0.18	2.41	
	Min.	2	2.4		Min.	0.06	2.07	
	Max.	11	3.2		Max.	0.32	2.76	
3. Step/Pool (SP)	Mean	2.88	2.6		Mean	0.08	2.24	
	Min.	2	2.3		Min.	0.06	1.98	
	Max.	3.3	2.9		Max.	0.10	2.50	
4. Backwater Pool (BWP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
5. Plunge Pool (PP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
6. Pocket Water Pool (PWP)	Mean	2.80	2.55		Mean	0.08	2.20	
	Min.	2	2.30		Min.	0.06	2.24	
	Max.	4	2.80		Max.	0.12	2.41	
7. Lateral Protrusion Pool (LPP)	Mean	4.5	2.8		Mean	0.13	2.41	
	Min.	1.5	2.3		Min.	0.04	1.98	
	Max.	10	3.3		Max.	0.29	2.84	
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.			

$W_{BKF} = 34.2$
$d_{maxp} = 3.89$
$d_{BKF} = 1.16$

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Worksheet B-2. Computations of velocity and discharge using various methods (*First Field Day*).

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	SHARMAN'S BRANCH	Location:	REACH #4
Date:	4-25-17	Stream Type:	B3
Landscape Type:	C-CO-US		
Observers:	TEAM #4	HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional Area	34.09	A_{bkf} (ft^2)	Bankfull Riffle Mean Depth	1.47	d_{bkf} (ft)
Bankfull Riffle Width	23.6	W_{bkf} (ft)	Wetted Perimeter $\approx (2 * d_{bkf}) + W_{bkf}$	24.86	W_p (ft)
D_{84} Particle Size at Riffle	239	D_{84} (mm)	D_{84} Particle Size in Feet D_{84} (mm) / 304.8	0.784	D_{84} (ft)
Bankfull Slope	0.04458	S_{bkf} (ft / ft)	Hydraulic Radius A_{bkf} / W_p	1.4	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R (ft) / D_{84} (ft)	1.352	R / D_{84} (ft / ft)
Drainage Area	3.6	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	1.42	u^* (ft / sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	6.01	ft / sec	208	cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor/Relative Roughness (Figs. B-34, B-35) $\bar{u} = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$		ft / sec		cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. B-36) $\bar{u} = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ 0.074	5.30	ft / sec	184	cfs
2. Roughness Coefficient: c) Manning's *n* from Jarrett (USGS): $\bar{u} = 1.49 * R^{2/3} * S^{1/2} / n$ $n = 0.39 * S^{0.38} * R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for $n =$ 0.113	3.46	ft / sec	120	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Limerinos n: 0.0579	6.77	ft / sec	235	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach	6.39	ft / sec	221	cfs
4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Q Q = ____ year	NA	ft / sec	NA	cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	3.26	ft / sec	113	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.

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Worksheet B-1. Field Form for Level II Stream Classification (*First Field Day*).

Stream: SHARMAN'S BRANCH	
Basin:	Drainage Area: ~~3.6~~ acres 3.6 mi^2
Location: REACH #4	
Twp.&Rge:	Sec.&Qtr.:
Cross-Section Monuments (Lat./Long.):	Date: 4-25-17
Observers: TEAM #4	Landscape Type: C-CO-US

Bankfull Width (W_{bkf}) The surface width of the stream at bankfull stage elevation, in a riffle section.	23.6	ft
Bankfull Mean Depth (d_{bkf}) Mean depth of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.47	ft
Bankfull Cross-Sectional Area (A_{bkf}) Area of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	34.69	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) *Bankfull Width* divided by *Bankfull Mean Depth*, in a riffle section.	16	ft/ft
Bankfull Maximum Depth (d_{max}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	2.6	ft
Flood-Prone Area Width (W_{fpa}) Width of the channel at an elevation that is twice the *Bankfull Maximum Depth*, measured perpendicular to the fall line of the valley in a riffle section.	43.2	ft
Entrenchment Ratio (ER) The *Flood-Prone Area Width* divided by *Bankfull Width* (W_{fpa} / W_{bkf}), in a riffle section.	1.83	ft/ft
Channel Materials (Particle Size Index D_{50}) The D_{50} particle size index represents the median or dominant diameter of channel materials, as sampled proportionately from the channel surface between the bankfull stage and Thalweg elevations.	115	mm
Average Water Surface Slope (S) The elevation difference of water surface measurements over the stream length between two similar bed features (e.g., start of riffle to start of last riffle) for several riffle-pool or step-pool sequences, representing channel gradient.	0.04302	ft/ft
Channel Sinuosity (k) An index of channel pattern determined from stream length divided by valley length (SL / VL), or from valley slope divided by average water surface slope (S_{val} / S).	1.02	ft/ft

Stream Type Ba-3/2 **See Classification Key (Figure B-2)**

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Worksheet B-3a. Morphological relations, including dimensionless ratios (*First Field Day*).

Stream: SHARMAN'S BRANCH Location: REACH #4

Observers: TEAM #4 Date: 4-25-17 Landscape Type: C-CO-US Stream Type:

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min.	Max.		Riffle Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Riffle Width (W_{bkf})				ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)			
Riffle Mean Depth (d_{bkf})				ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})			
Riffle Maximum Depth (d_{max})				ft	Riffle Max Depth to Riffle Mean Depth (d_{max} / d_{bkf})			
Width of Flood-Prone Area (W_{fpa})				ft	Entrenchment Ratio (W_{fpa} / W_{bkf})			
Riffle Inner Berm Width (W_{ib})				ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})			
Riffle Inner Berm Depth (d_{ib})				ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})			
Riffle Inner Berm Area (A_{ib})				ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})			
Riffle Inner Berm W/d Ratio (W_{ib} / d_{ib})								

Pool Dimensions*, **, ***	Mean	Min.	Max.		Pool Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Pool Width (W_{bkfp})				ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})			
Pool Mean Depth (d_{bkfp})				ft	Pool Mean Depth to Riffle Mean Depth (d_{bkfp} / d_{bkf})			
Pool Cross-Sectional Area (A_{bkfp})				ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})			
Pool Maximum Depth (d_{maxp})				ft	Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})			
Pool Inner Berm Width (W_{ibp})				ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})			
Pool Inner Berm Depth (d_{ibp})				ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})			
Pool Inner Berm Area (A_{ibp})				ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})			
Point Bar Slope (S_{pb})				ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})			

Run Dimensions*	Mean	Min.	Max.		Run Dimensionless Ratios****	Mean	Min.	Max.
Run Width (W_{bkfr})				ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})			
Run Mean Depth (d_{bkfr})				ft	Run Mean Depth to Riffle Mean Depth (d_{bkfr} / d_{bkf})			
Run Cross-Sectional Area (A_{bkfr})				ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})			
Run Maximum Depth (d_{maxr})				ft	Run Max Depth to Riffle Mean Depth (d_{maxr} / d_{bkf})			
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})				ft				

Glide Dimensions*	Mean	Min.	Max.		Glide Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Glide Width (W_{bkfg})				ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})			
Glide Mean Depth (d_{bkfg})				ft	Glide Mean Depth to Riffle Mean Depth (d_{bkfg} / d_{bkf})			
Glide Cross-Sectional Area (A_{bkfg})				ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})			
Glide Maximum Depth (d_{maxg})				ft	Glide Max Depth to Riffle Mean Depth (d_{maxg} / d_{bkf})			
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})				ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})			
Glide Inner Berm Width (W_{ibg})				ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})			
Glide Inner Berm Depth (d_{ibg})				ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})			
Glide Inner Berm Area (A_{ibg})				ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})			

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

*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.

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Worksheet B-3b. Morphological relations, including dimensionless ratios (*First Field Day*).

Stream: SHARMAN'S BRANCH Location: REACH #4

Observers: TEAM #4 Date: 4-25-17 Landscape Type: Stream Type:

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage ($\bar{u}_{bkf}$)		ft/sec	Estimation Method	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})		cfs	Drainage Area	3.0 mi^2

Channel Pattern

Geometry	Mean	Min.	Max.		Dimensionless Geometry Ratios	Mean	Min.	Max.
Linear Wavelength (λ)				ft	Linear Wavelength to Riffle Width (λ / W_{bkf})			
Stream Meander Length (L_m)				ft	Stream Meander Length Ratio (L_m / W_{bkf})			
Radius of Curvature (R_c)				ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})			
Belt Width (W_{blt})				ft	Meander Width Ratio (W_{blt} / W_{bkf})			
Arc Length (L_a)				ft	Arc Length to Riffle Width (L_a / W_{bkf})			
Riffle Length (L_r)				ft	Riffle Length to Riffle Width (L_r / W_{bkf})			
Individual Pool Length (L_p)				ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})			
Pool-to-Pool Spacing (P_s)				ft	Pool-to-Pool Spacing to Riffle Width (P_s / W_{bkf})			

Channel Profile

Valley Slope (S_{val})		ft/ft	Average Water Surface Slope (S)		ft/ft	Sinuosity (S_{val} / S)
Stream Length (SL)		ft	Valley Length (VL)		ft	Sinuosity (SL / VL)
Low Bank Height (LBH) start		ft	Bankfull Max Depth (d_{max}) start		ft	Bank-Height Ratio (BHR) (LBH / d_{max}) start
end		ft	end		ft	end

Facet Slopes	Mean	Min.	Max.		Dimensionless Facet Slope Ratios	Mean	Min.	Max.
Riffle Slope (S_{rif})				ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)			
Run Slope (S_{run})				ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)			
Pool Slope (S_p)				ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)			
Glide Slope (S_g)				ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)			
Step Slope (S_s)				ft/ft	Step Slope to Average Water Surface Slope (S_s / S)			

Max Depths[a]	Mean	Min.	Max.		Dimensionless Depth Ratios	Mean	Min.	Max.
Max Riffle Depth (d_{max})				ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})			
Max Run Depth (d_{maxr})				ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})			
Max Pool Depth (d_{maxp})				ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})			
Max Glide Depth (d_{maxg})				ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})			
Max Step Depth (d_{maxs})				ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})			

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay				D_{16}					mm
% Sand				D_{35}					mm
% Gravel				D_{50}					mm
% Cobble				D_{84}					mm
% Boulder				D_{95}					mm
% Bedrock				D_{100}					mm

[a] *Mean*, *Min*., and *Max*. depths are measured from Thalweg to bankfull at mid-point of feature for riffles, runs, and steps, the deepest part of pools, and 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. Dimensionless ratios of the ten pool types (*First Field Day*).

Stream: SHARMAN'S BRANCH Location: REACH #4

Observers: TEAM #4 Stream Type: Landscape Type: Date: 4-25-17

Pool Type		Dimensional Values: Pool Length (L_p)	Dimensional Values: Pool Max Depth (d_{maxp})	Dimensional Values: Pool Slope (S_p)		Dimensionless Ratios: Pool Length to Riffle Width (L_p / W_{bkf})	Dimensionless Ratios: Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})	Dimensionless Ratios: Pool Slope to Average Slope (S_p / S)
1. Lateral Scour Pool (LSP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
2. Contraction Scour Pool (CSP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
3. Step/Pool (SP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
4. Backwater Pool (BWP)	Mean				Mean			
	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.			

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