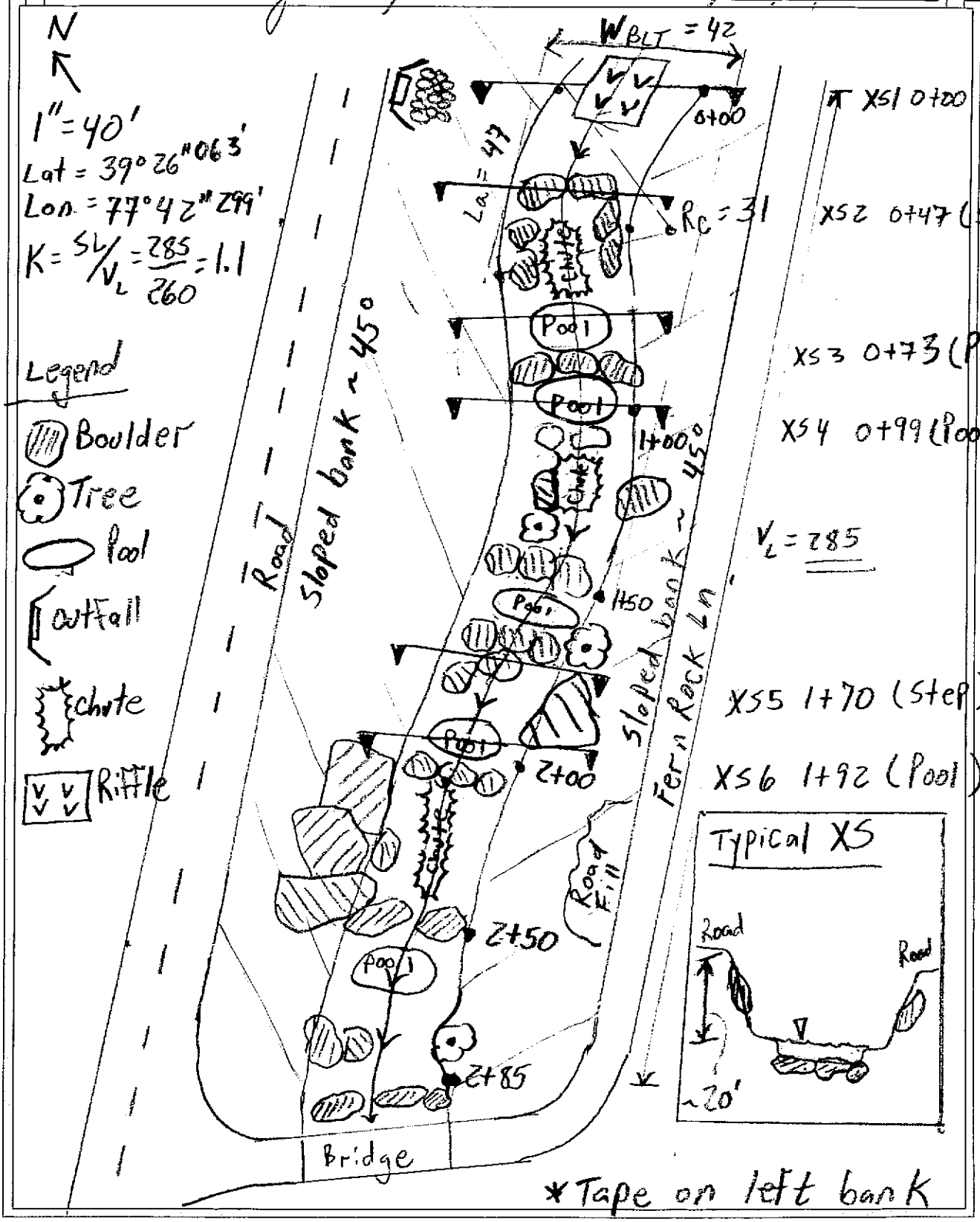
AREA-SITE LOCATION....REACH MAP

Stream: Sharmans Branch Reach: Team1

Drawn By: Morgan Byars Date: 4/15/14



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Reach 1

Riffle XS1 Pg 1 of 2

SURVEY DATA ⟹ **CROSS - SECTION 1**

SITE: 0 S00+02.5 Date: 4/15/14

Location: 0+00 XS1 RF

Party / Notes: KM, WB, MS 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	3.48	103.48		100.00	
2	0.0			2.5	97.5	TOP of BANK
3	2			3.12		Edge of Slope
4	3			3.54	99.94	MID Slope Rock
5	4			4.14		STREAM SIDE of ROCK
6	5			4.44		
7	6			5.3		
8	7			6.38	97.1	LEW
9	8			6.76		
10	9			6.88		
11	10			6.94		
12	11			7.10		
13	12			6.76		
14	13			7.06		
15	14			7.24		MAX DEPTH TH
16	15			7.08		
17	16			7.06		
18	17			7.00		
19	18			6.94		
20	19			6.98		
21	20			6.88		
22	21			6.80		
23	22			6.58		
24	22.8			6.30	97.18	REW
25	23			6.18		
26	24			5.98		
27	25			5.82		
28	26			5.72		

0.85' water to Buf

LEW

LBKF

TB

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Team 1 Peak 1

SURVEY DATA ⟹ **CROSS - SECTION** ~~#~~ 1

SITE: Shannons Branch

Date: 4/15/2014

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
29	27			5.62		
30	28			5.38		
31	28.8			5.45	98.03	RBKF
32	30			5.30		
33	31.8			5.04		
34	33			4.78		
35	34.5			4.58		
36	35.5			4.28		
37	36			4.24		
38	37			4.02		
39	38			3.82		
40	39			3.32		
41	39.2			3.26		
42						
43						
44						
45						
46						
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						

6.30
- .85
5.45

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Team 1 - Reach 7

Top of STEP XS2 @ 47.3 1 of 1

SURVEY DATA ⟹ **CROSS - SECTION** #2

HI 103.48

SITE: Sherman's Branch **Date:** 4-15-14

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
29	1 ft			4.18	99.3	left edge
30	6			5.00	98.48	
31	13			5.50	97.98	
32	18			6.80	96.68	LEW
33	20			7.48	96.0	
34	21			7.14	96.34	LE Rock
35	23.5			7.26	96.22	RE
36	24.5			7.76	95.72	
37	25.5			7.96	95.52	
38	27			7.78	95.70	midchannel
39	28			7.86	95.62	
40	28.9			7.64	95.84	LE Rock
41	32			7.18	96.30	mid rock
42	34.5			7.20	96.28	RE Rock
43	36			7.82	95.66	
44	38			7.50	95.98	
45	40			7.12	96.36	REW
46	41			6.00	97.48	
47	42			5.66	97.82	
48	43			5.28	98.20	
49	44			4.32	99.16	
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						

16 BK 6.16 97.32 BKF width

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Sherman's Branch Team 1 Reach 1

XS #3 Pool

SURVEY DATA ⟹ **CROSS - SECTION** #3

SITE: Sharmans Branch 103.48 0+73 Date:

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
29	0		~~4.55~~ 4.70		98.78	LEW
30	~~10~~		4.55		98.93	
31	10.4		6.65		96.83	
32	11.6		7.35		96.13	
33	14		7.45		96.03	
34	14.3		6.75		96.73	L.Rock
35	16.6		6.90		96.58	Mid of Rock
36	20.5		9.85		93.63	R.Rock
37	19.2					~~R~~ LEW
38	23		10.45		93.03	
39	25		10.65		92.83	
40	~~25~~ 30		10.80	*	92.68	
41	32		10.40		93.08	
42	33		10.32		93.16	
43	35		10.45		93.03	
44	36		10.10		93.38	
45	37		9.45		94.03	
46	38		9.05		94.43	
47	38.5		8.45		95.03	REW
48	39		7.85		95.63	
49	40		6.85		96.63	
50	41		6.00		97.48	
51	44		4.40		99.08	
52						
53						
54						
55						
56						
57						
58						
59						

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Sharmans Branch Team 1 Reach 1

SURVEY DATA ⟹ **CROSS - SECTION** 4

SITE: Sharmans Branch Date: 4-15-14

Location: Washington Co. MD

Party / Notes: 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			105.11			
2	0.00			5.17	99.94	Top of Rock on left bank
3	2.20			7.85	97.26	Bottom of Rock L Bank
4	3.60			8.37	96.74	
5	7.20			10.49	94.62	
6	8.70			10.93	94.18	R LEW
7	10.70			11.31	93.80	
8	11.6			11.48	93.63	
9	13.2			11.73	93.38	
10	14.9			11.78	93.33	
11	16.2			11.73	93.38	
12	17.6			12.01	93.10	
13	19.2			12.01	93.10	
14	21.2			12.31	92.80	
15	23.4			12.68	92.43	TH
16	27.8			10.35	94.76	BED Rock
17	28.8			10.18	94.93	R Edge of Rock
18	30.50			11.63	93.48	
19	31.90			10.56	94.55	R REW
20	33.3			10.32	94.79	
21	36.0			10.20	94.91	
22	39.7			7.97	97.14	
23	42.8			6.32	98.79	
24						
25						
26						
27						
28						

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Team 1 Beam 1

SURVEY DATA ⟹ **CROSS - SECTION** ~~2~~ 5 STEP

SITE: X-S 5 (STEP) @ STAT 0+171 **Date:** 4/15/14

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	–	5.11	105.11	–	100	
30	0.0			9.30	95.81	
31	2.0			10.06	95.05	
32	3.0			10.92	94.19	
33	5.0			11.45	94.54	
34	6.1			13.08	92.03	LEW
35	7.5			13.26	91.85	
36	9.0			13.60	91.51	
37	11.0			13.63	91.48	
38	12.2			13.09	92.02	BEDROCK
39	15.6			13.05	92.06	
40	17.4			13.51	91.6	
41	19.0			13.75	91.36	
42	21.0			13.18	91.93	
43	22.5			13.12	91.99	
44	24.0			13.36	91.75	
45	25.0			13.30	91.81	
46	27.0			13.73	91.38	
47	28.5			13.99	91.12	
48	30.0			13.69	91.42	
49	31.9			13.50	91.61	REW
50	33.0			12.81	92.23	
51	35.5			12.16	92.95	
52	36.0 37.0			12.57 11.84	92.54 93.27	BFW (R)
53	39.0			11.42	93.69	
54	41.0			10.88	94.23	
55	42.0			10.45	94.66	
56						
57						
58						
59						

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Sharmans Branch Term 1 Reach 1

SURVEY DATA ⟹ **CROSS - SECTION** 6

SITE: XS 6 @ Pool STA 0+192 Date: 4-15

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
29	0	5.11	105.11			
30	.0			9.48	95.63	B @ Pin
31	1.50			12.36	92.75	
32	2.92			13.09	92.02	
33	4.00			13.06	92.05	LBKF
34	6.00			13.73	91.38	LEW
35	7.20			14.64	90.47	
36	11.00			14.78	90.33	
37	19.00			14.20	90.91	
38	23.00			14.71	90.40	
39	26.30			14.36	90.75	
40	27.60			13.91	91.20	REW
41	29.00			13.22	91.89	RBKF
42	36.5			9.93	95.18	
43						
44						
45						
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59						

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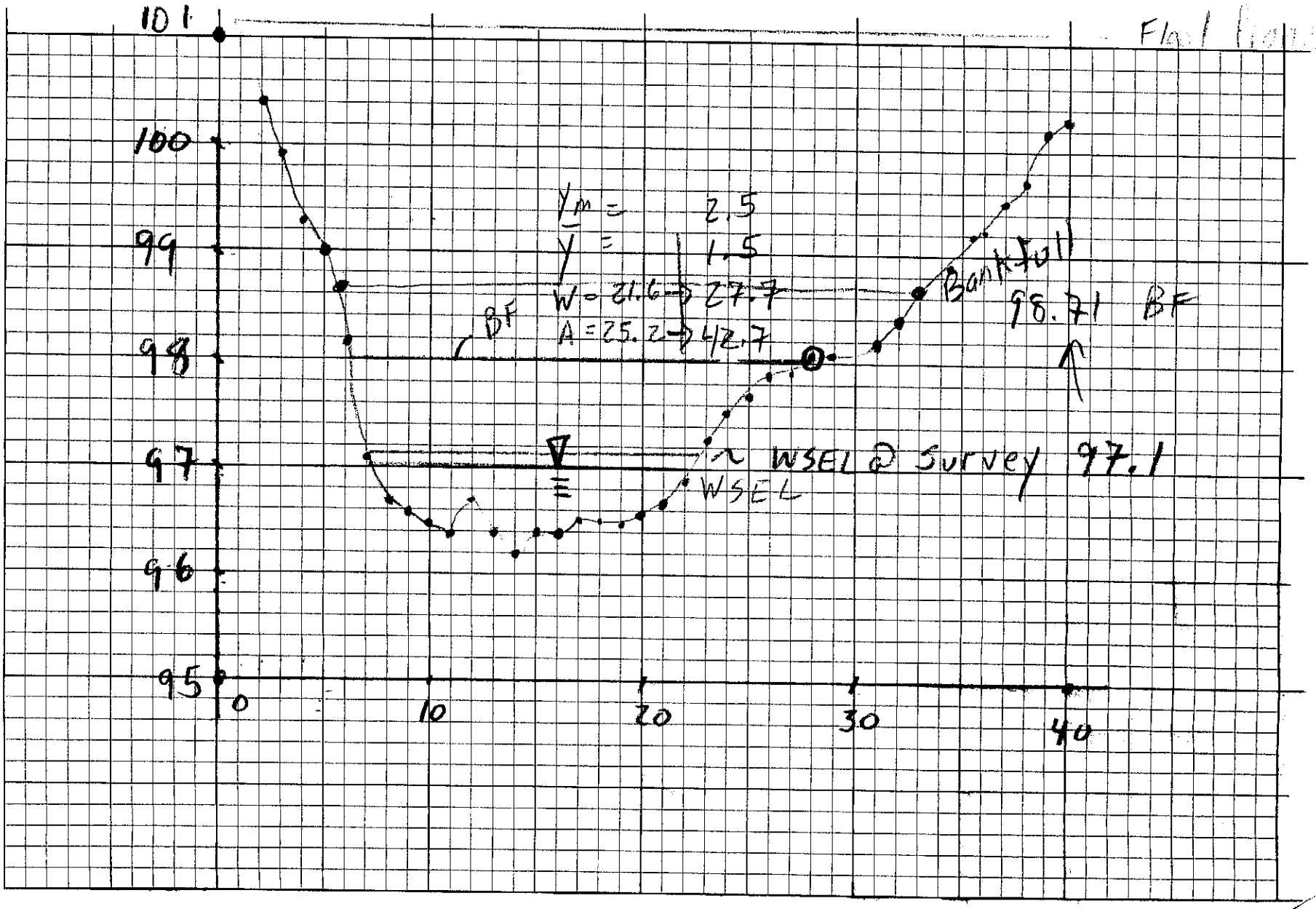
Flow 1 Reach 1

Team 1 XS 1 - Shortmans Branch 4/15/14

4/15/14 Station 0+03

Reach 1



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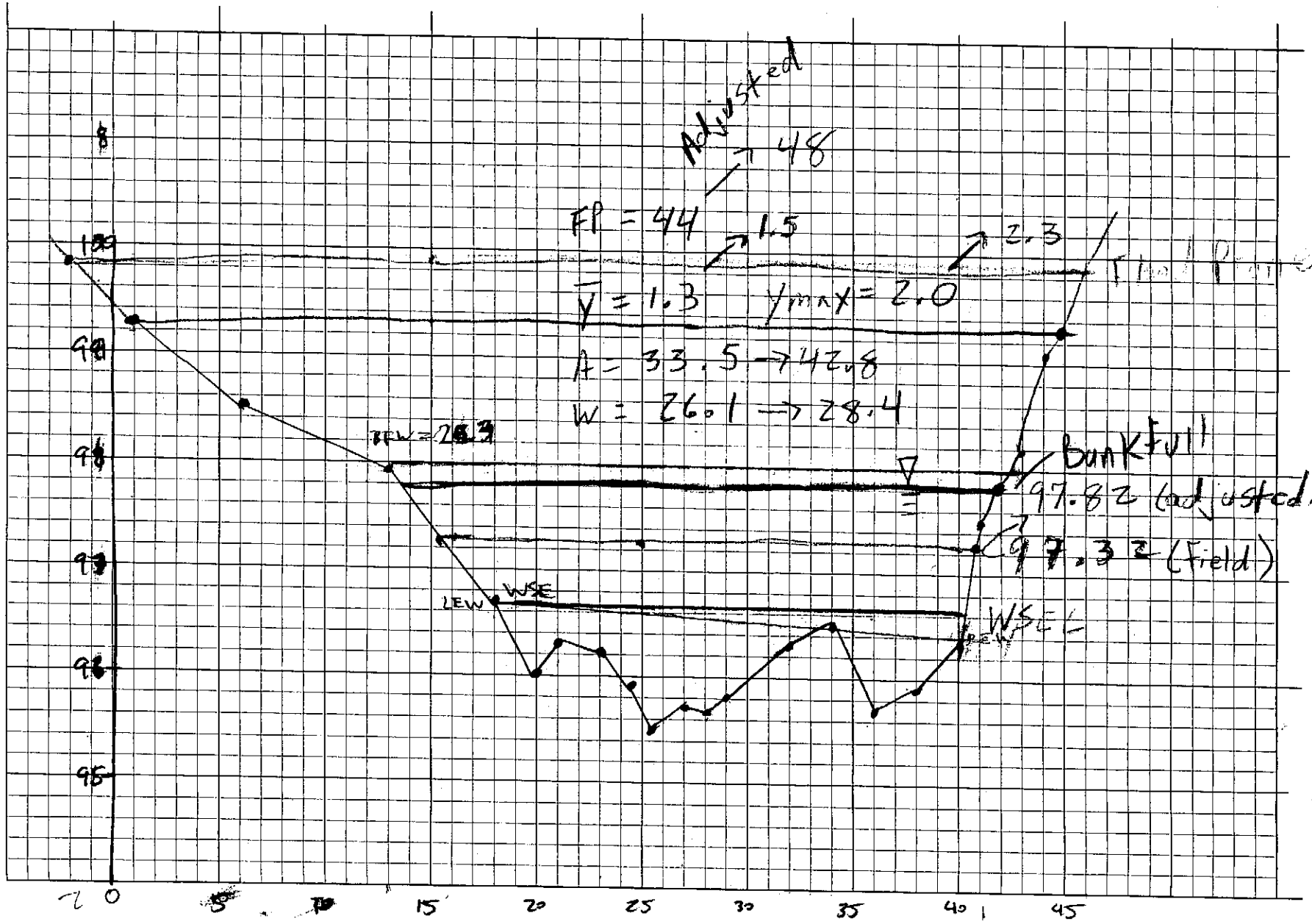
Team 1 XS-2 Top of step STA 47.3 4/15/14 1/1

Sharpman Branch Reach 1



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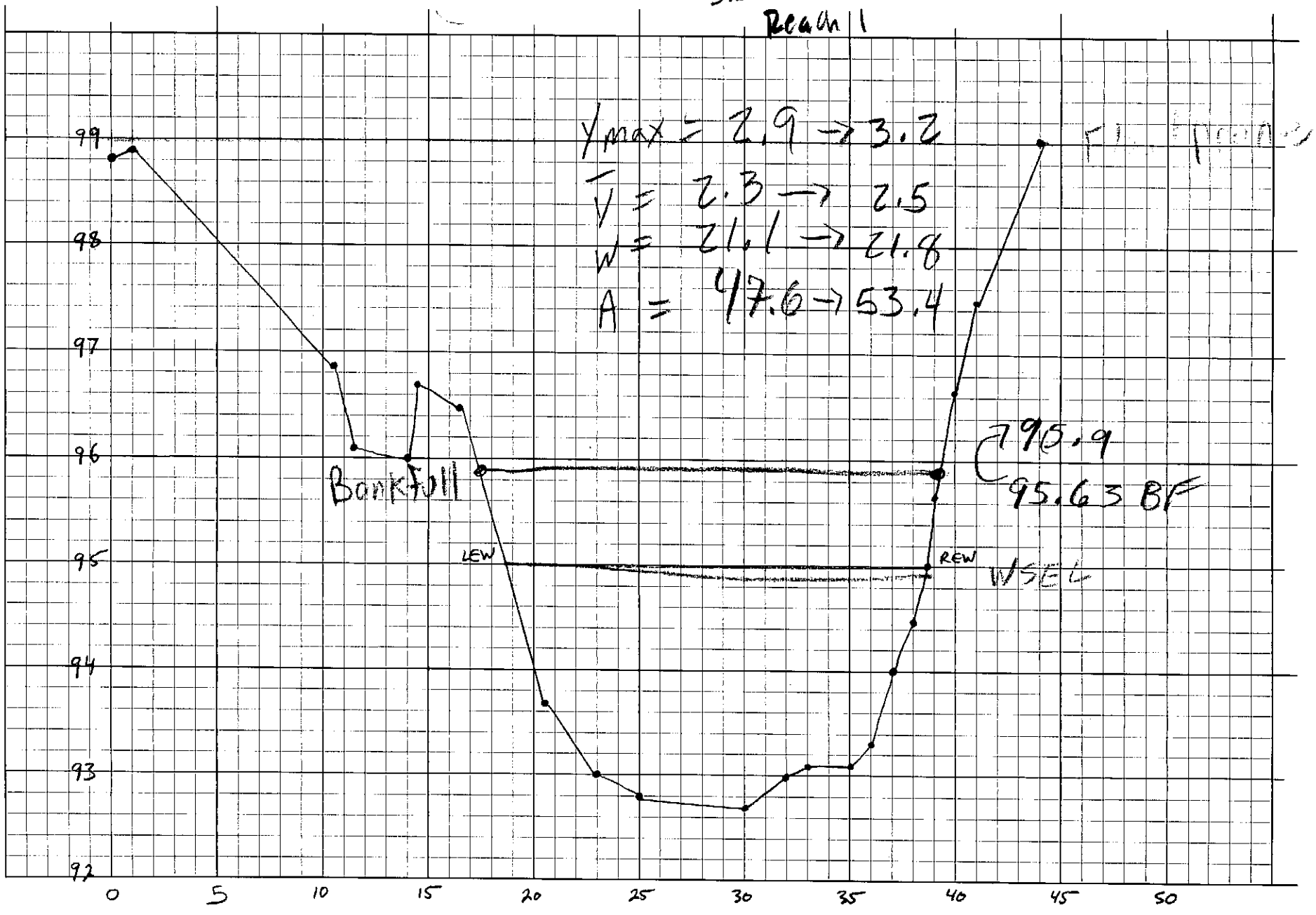
5/41
-13
28

XS #3 (Pool) 0+73'

Group 1 4/15/14

Sharman's Branch

Reach 1



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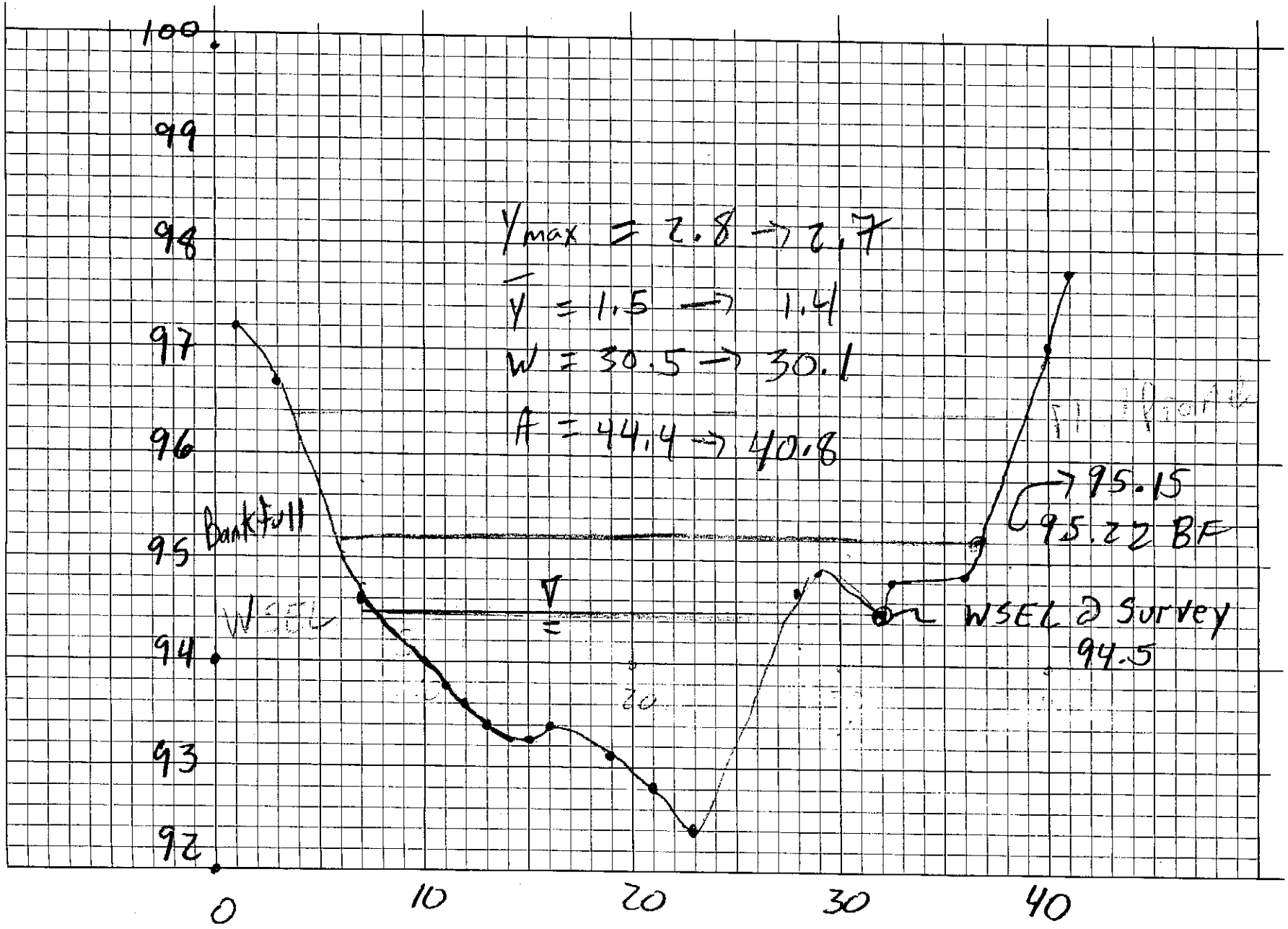
Team 1 XS4 - Skarmans Branch 4/15/14

Pool Reach 1



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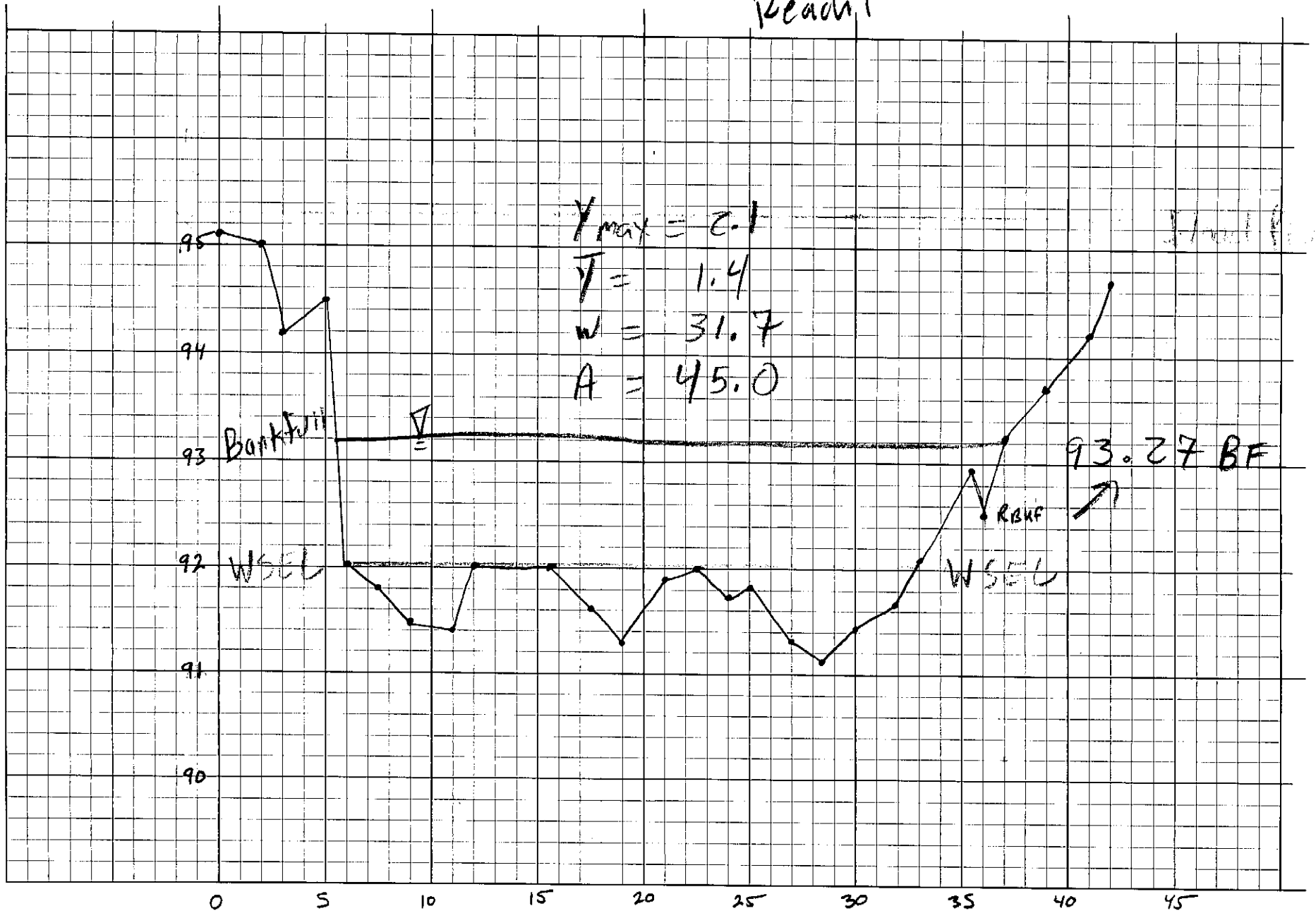
XS #5 (Step) 1+71'

Group 1 4/15/14

Sharman's Branch

Reach 1



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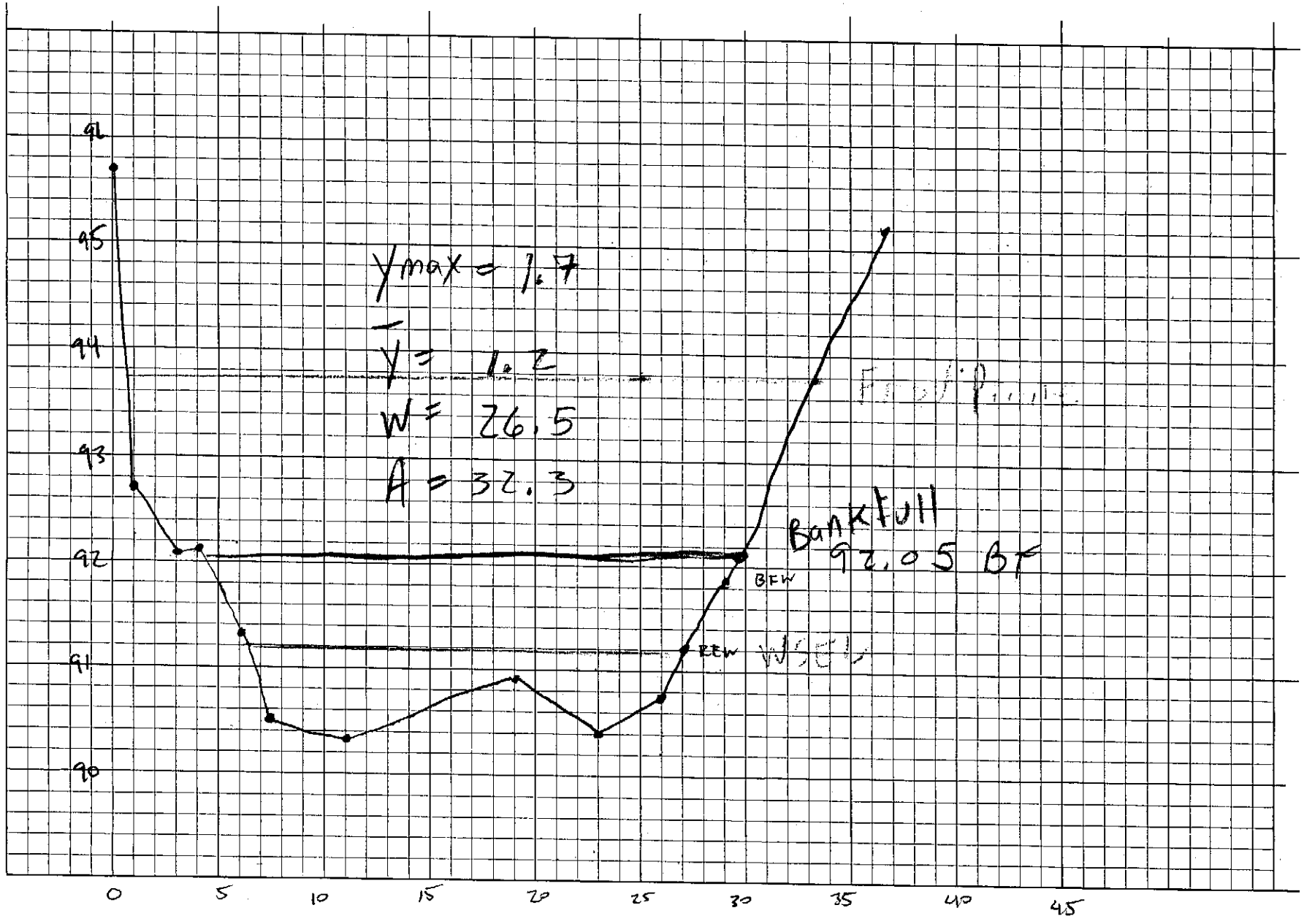
TEAM 1 XS-6 @ Pool STA 192 SHAZMAN'S BRANCH Reach 1 4/15/14



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SURVEY DATA → LONGITUDINAL PROFILE 1

SITE: Shaman's Branch — Date: 4-15-14

Location: Washington Co, MD — Reach 1

Party / Notes: TK, JC, DZO — HUC:

	Distance, Point, or STATION (ft)	Back-Sight BS (ft)	Height of Instrument HI (ft)	Thalweg Fore-Sight FS (ft)	Thalweg Elevation Elev. (ft)	Water Surface Fore-Sight FS (ft)	Water Surface Elevation Elev. (ft)	Bankfull Fore-Sight FS (ft)	Bankfull Elevation Elev. (ft)	Low Bank HI Fore-Sight FS (ft)	Low Bank HI Elevation Elev. (ft)	NOTES e.g. Riffle Run Pool Glide
1	BM1	3.46	103.46									
2	0+00				7.62	95.84	6.34	97.12	5.60	97.86		
3	0+03				7.21	96.25						XS-1 begin Rapid
4	0+09				7.58	95.88						
5	0+16				7.68	95.78						
6	0+20				7.32	96.14						
7	0+22				7.07	96.39						Thal
8	0+23				7.53	95.93						
9	0+29				7.61	95.85	7.49	95.97				W/S
10	0+33				8.07	95.39						
11	0+34				7.83	95.63						Top Chute
12	0+39				8.33	95.13						Bottom Chute
13	0+42								6.04	97.42		Bank
14	0+44				7.94	95.52						Pool
15	0+46.5				7.93	95.53						XS.2
16											5.19	Low Bank
17	0+49				8.3	95.16					98.27	Top Chute
18	0+51				9.13	94.33						Bottom Chute
19	0+56				9.32	94.14						~~Pool~~
20	0+59				9.53	93.93						~~Top Chute~~ Pool
21	0+61				9.43	94.03						Top Chute
22	0+64				10.03	93.43						Bottom chute
23	0+73				11.64	91.82						Pool
24	0+76				11.99	91.47	8.42	95.04				Pool XS-3
25	0+84				9.64	93.82						end Pool
26	0+87				9.85	93.61						top Chute
27												

Bed rock

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Reach 1

103.46 HI

Team 1 2 of 3

SURVEY DATA ⟹ **LONGITUDINAL PROFILE 2**

SITE: Sharmans Branch Date: 4/15/2014

Location: Washington Co MD Reach 1

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	0+91				11.26	92.20						Bottom Chute	~~XS4 0+99~~
29	~~1+01~~				~~10.29~~							~~end Pool~~	
* 30	0+99				10.36	93.10						XS-4	mild Pool
31	1+01				10.29	93.17						end Pool	
32	1+07						9.30	94.16					
33	1+07				10.43	93.03							
34	1+19				10.66	92.80						Top chute	
35	1+26				11.33	92.13						Bot Chute	
36	1+38				11.64	91.82						Pool	
37	1+47				12.27	91.19						end Pool	
38	1+53				11.62	91.84						Top Chute	
39	1+59				13.03	90.43						~~Pool~~	Bot Chute
40	1+65				12.69	90.77						Pool	
171 * 41	1+73					90.66	11.43	92.03	10.8 ~~11.43~~	92.66	Bedrock		1+71 XS5 Steppool
42	1+76				12.91	90.55						Top Chute	
* 43	1+83				14.3	89.16						XS-6	Pool
44	1+89				13.48	89.98						end Pool	
45	1+96				13.42	90.04						Top Chute	
46	1+99				13.8	89.66						Chute	
47	2+09				14.17	89.29	13.11	90.35					
48	2+18				14.75	88.71						Bott Chute	
49	2+23				14.85	88.61							
50	2+29				15.22	88.24							
51	2+30				14.6	88.86	13.44	90.02					
52	2+37				15.83	87.63							
53	2+44				15.62	87.84						Top Chute	
54													

Bedrock

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SURVEY DATA ⟶ **LONGITUDINAL PROFILE 3**

SITE: Sharmans Branch Date: 4/15/2014

Location: Wash. Co. Md. Reach 1

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
55	2+49			87.37	14.09							Bottom chute
56	2+52			87.5	15.96	86.70	14.76	89.17	14.29			pool
57	2+57			87.94	15.52				14.37			pool
58	2+63			87.68	15.78							top chute
59	2+69			85.8	17.66							bottom step chute
60	2+75			86.12	17.34							chute
61	2+78											pool
62												
63												
64												
65												
66												
67												
68												
69												
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79												
80												
81												

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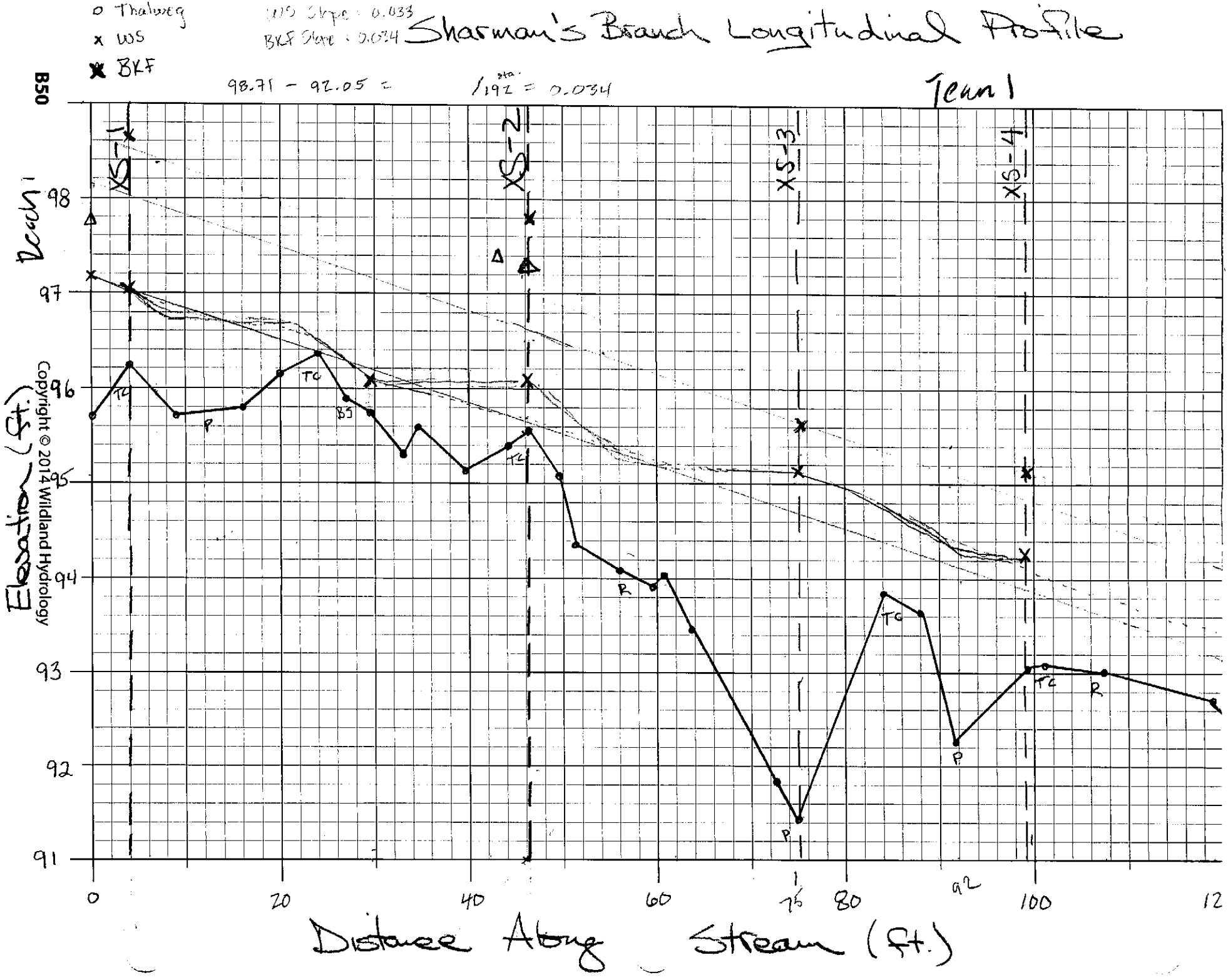

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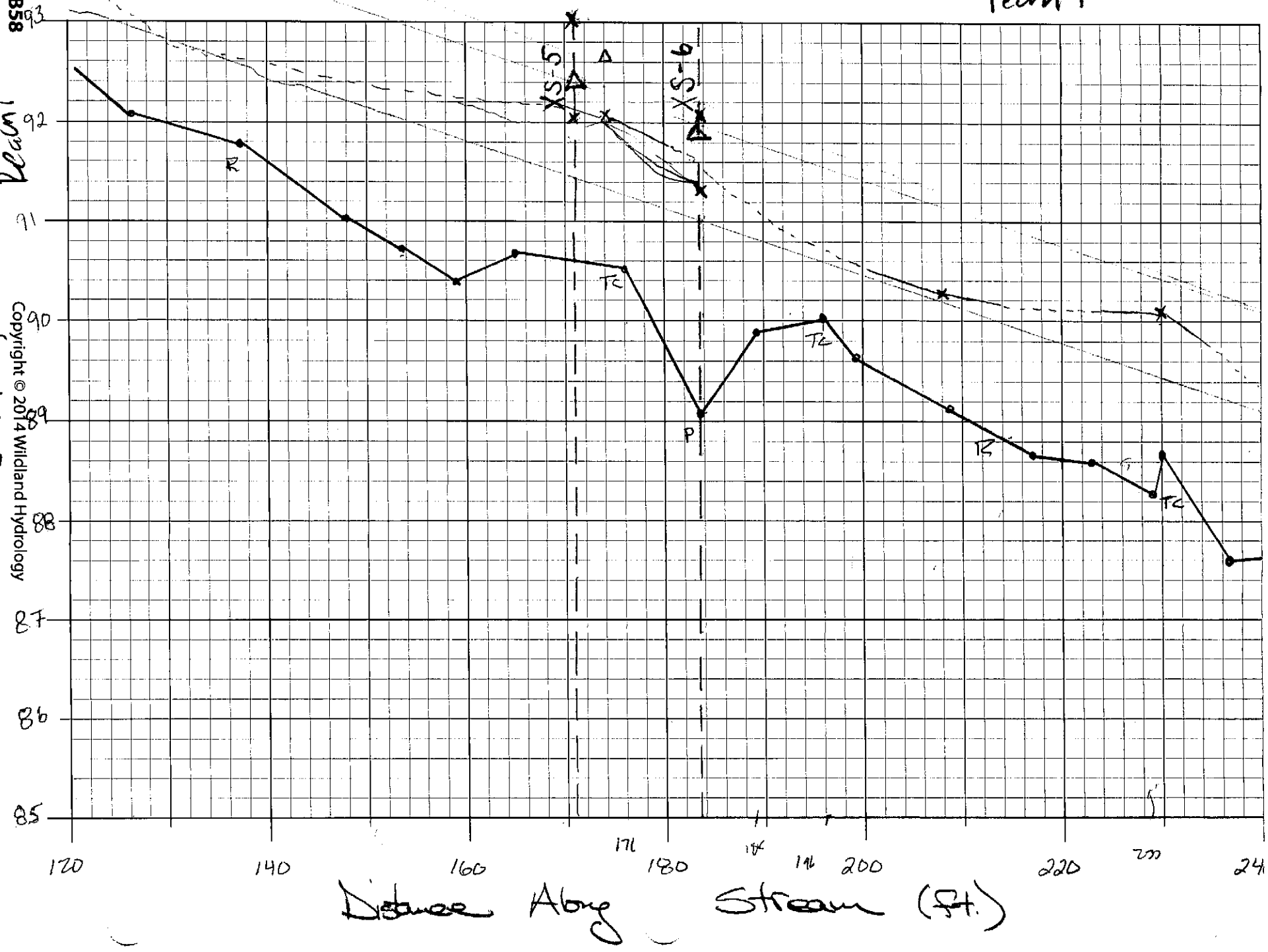
Sharman's Branch Long Pro (cont.)

Team 1



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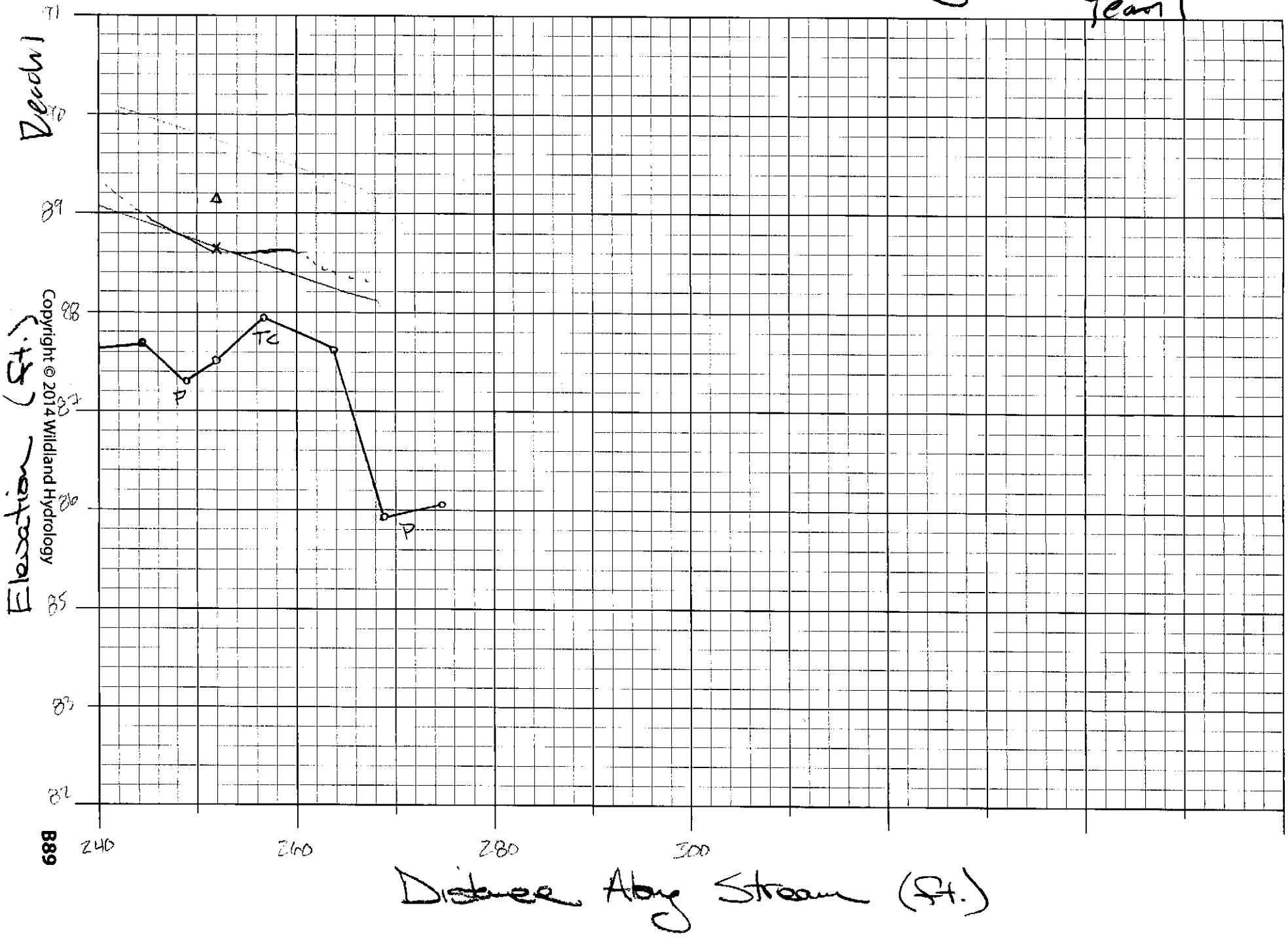
Sharman's - Branch Log Pro (cont.) - Team 1



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Team 1 Reach 1 Representative Riffle / Pool

Site: Shannons Branch Date: 4/15/14

Location: Reach 1 HUC:

Party: Team 1

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	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						Ref	Pool %					
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0						3		6.5					
.04 - .08	Very Coarse	1.0 - 2						1		2.2					
.08 - .16	Very Fine	2 - 4	GRAVEL				1	1	1.9 2%	2.2					
.16 - .22	Fine	4 - 5.7					2		3.8						
.22 - .31	Fine	5.7 - 8					1	1	1.9	2.2					
.31 - .44	Medium	8 - 11.3					2	3	3.8	6.5					
.44 - .63	Medium	11.3 - 16					3	3	5.8	6.5					
.63 - .89	Coarse	16 - 22.6					1	4	1.9	8.7					
.89 - 1.3	Coarse	22.6 - 32					1	4	1.9	8.7					
1.3 - 1.8	Very Coarse	32 - 45					4		7.7						
1.8 - 2.5	Very Coarse	45 - 64					3	6	5.8	13.0					
2.5 - 3.5	Small	64 - 90	COBBLE				4	4	7.7	8.7					
3.5 - 5.0	Small	90 - 128					4	3	7.7	6.5					
5.0 - 7.1	Large	128 - 180					2	4	3.8	8.7					
7.1 - 10.1	Large	180 - 256					3	1	5.8	2.2					
10.1 - 14.3	Small	256 - 362	BOULDER				5	3	9.6	6.5					
14.3 - 20	Small	362 - 512					4		7.7						
20 - 40	Medium	512 - 1024					4	1	7.7	2.2					
40 - 80	Large-Vry Large	1024 - 2048					4	3	7.7	6.5					
	Bedrock		BDRK				4	1	7.7	2.2					
Stream Type:			**Valley Type:**			TOTAL→	52	46							

98

1 2 3 4 5 6 7 8 9 10
P P R P R R P R R P

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LOCATION: Sharmans Branch

PEBBLE COUNT DATA

Date: 4/15/14

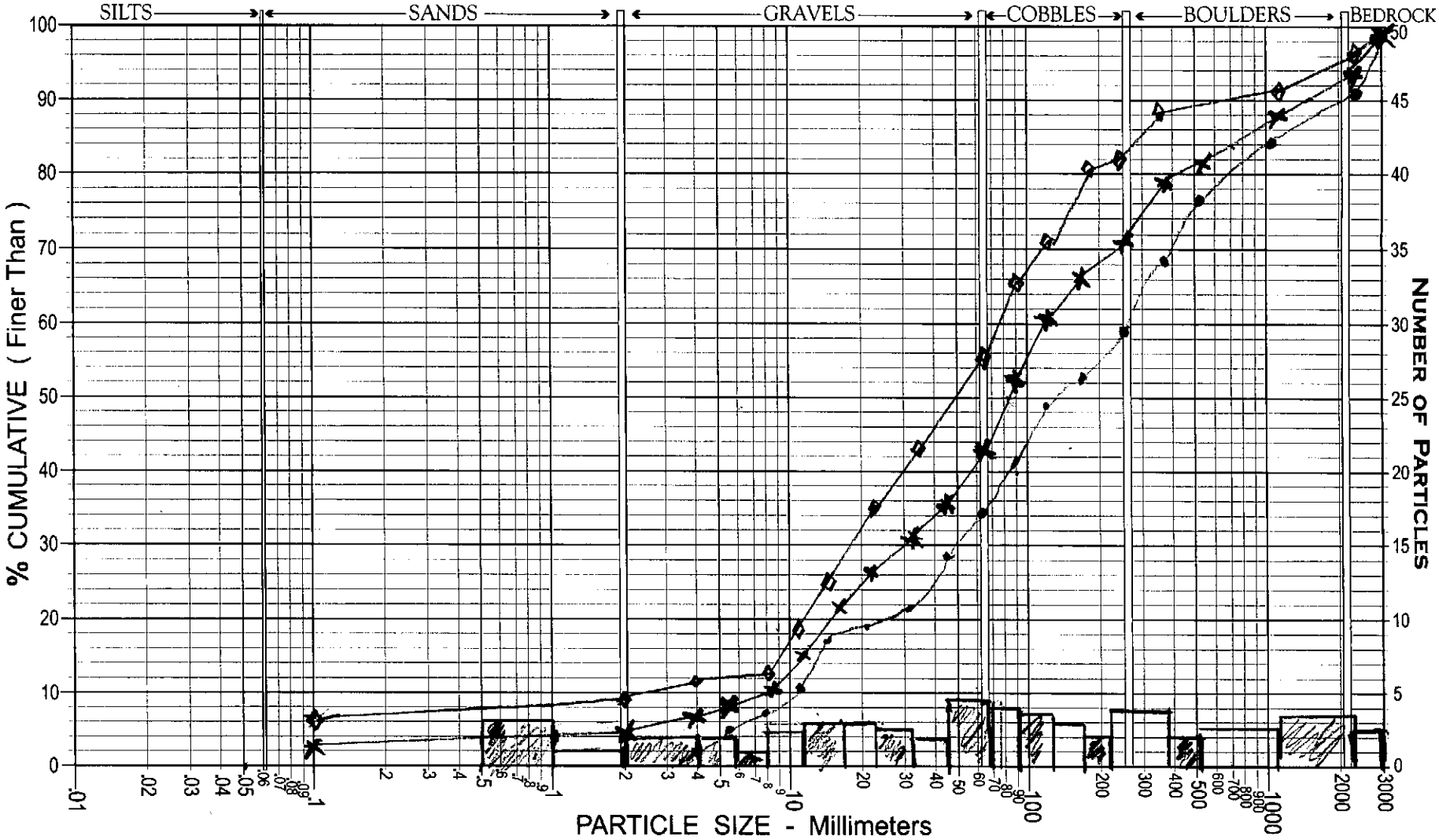
REACH: Reach 1

PARTY: Team 1

Stream Type:

Valley Type:

HUC:



• Riffle ◇ Pool × total

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Protrusion
Station ~~stage~~ 50'
Cross Section #2

XS 5 Protrusion

Site: Sharmans Branch Date: 4/15/14
Location: Reach 1 HUC:
Party: Team 1

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	Step ~~RIFFLE (1)~~ Reach: Date: TOT #	ITEM %	% CUM	Step ~~POOL (2)~~ Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16						XS 2		XS 5					
.63 - .89	Coarse	16 - 22.6						#	%	#	%				
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45								1	1	1			
1.8 - 2.5	Very Coarse	45 - 64								7	7	8			
2.5 - 3.5	Small	64 - 90	COBBLE					1	.97	6	6	14			
3.5 - 5.0	Small	90 - 128						7	6.8	4	4	18			
5.0 - 7.1	Large	128 - 180						15	14.6	27	27	45			
7.1 - 10.1	Large	180 - 256						36	34.96	21	21	66			
10.1 - 14.3	Small	256 - 362	BOULDER					27	26.21	18	18	84			
14.3 - 20	Small	362 - 512						15	14.56	13	13	97			
20 - 40	Medium	512 - 1024						2	1.94	3	3	100			
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
Stream Type:			**Valley Type:**			TOTAL→		103		100					

102

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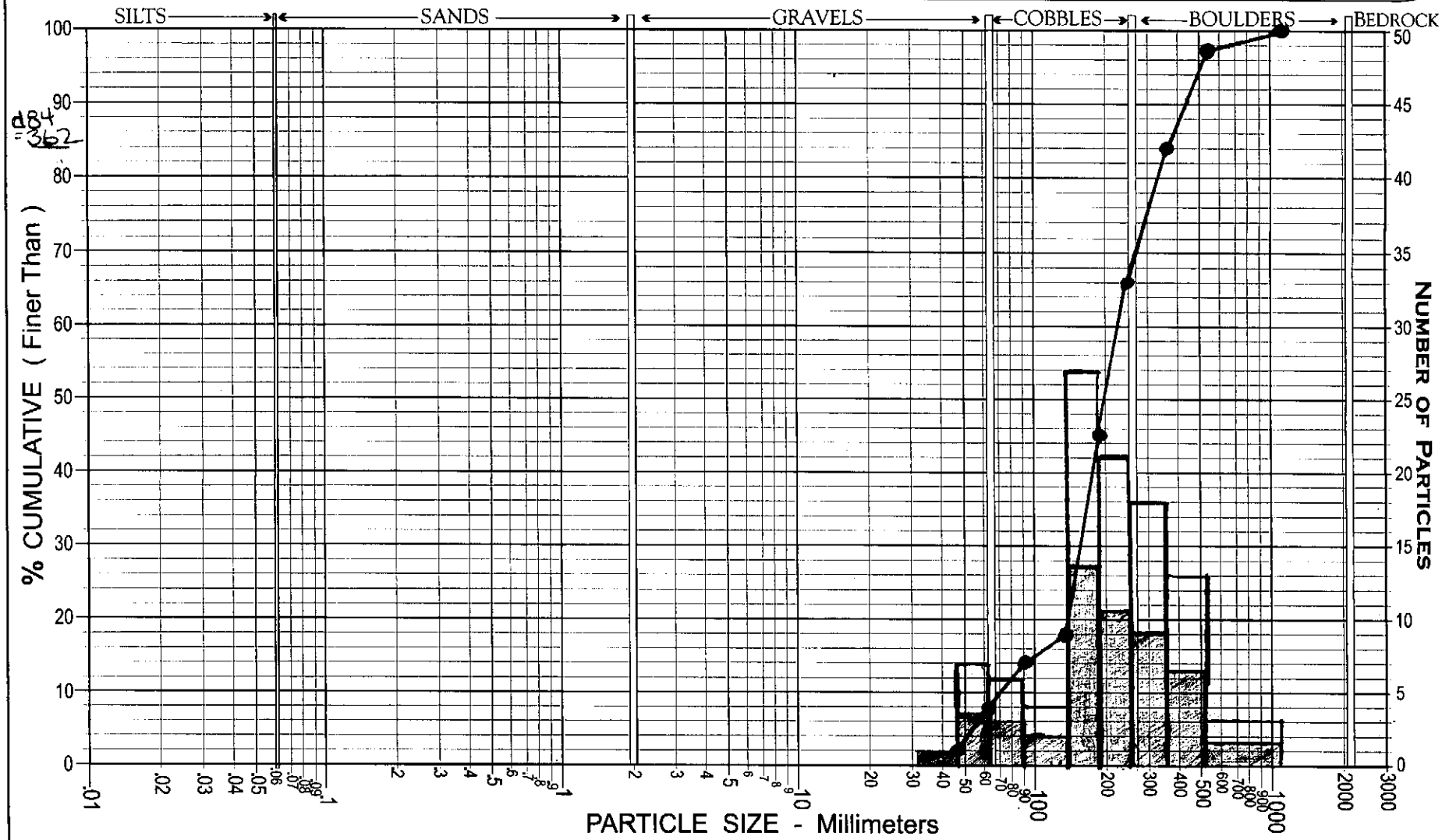
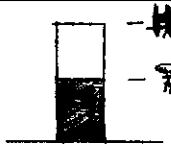
Protrusion Graph Reach 1

PEBBLE COUNT DATA

LOCATION: Sharman's Branch
Date: 4/15/14
REACH: Group 1
PARTY: Group 1
Stream Type: B1/2
Valley Type:
HUC:





Cross Section #5 Station

d_{84} = 362 mm d_{50} = 200 mm

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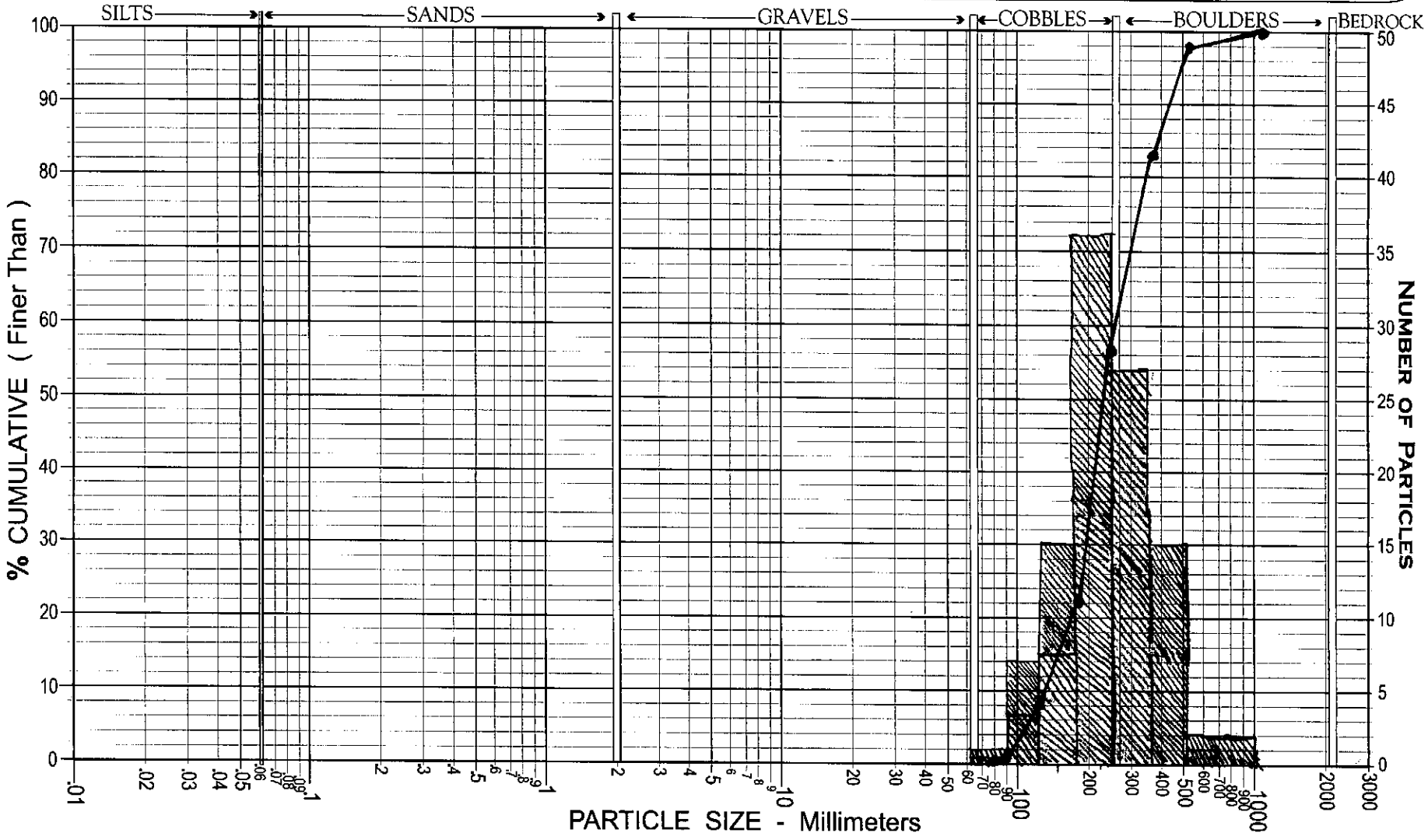
STATION 50' on Reach 1

LOCATION: Sharman's Branch - XS 2 PEBBLE COUNT DATA Protrusion Date: 4/15/14

REACH: Reach 1 PARTY: Group 1

Stream Type: B Valley Type: HUC:



D50 - 240 D84 - 390

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

Stream: SHARMANS BRANCH / Reach 1	
Basin:	Drainage Area: 36 mi² acres 3.6 mi²
Location: WASHINGTON CO MD	
Twp.&Rge:	Sec.&Qtr.:
Cross-Section Monuments (Lat./Long.):	Date: 4-15-14
Observers: TEAM 1	Valley Type: VII

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	28.4	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.5	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	42.8	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	18.9	ft/ft
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.	2.3	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.	48.6	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	1.7	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.	82	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.	0.033	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 (S_{val} / S).	1.1	

Stream Type B2 — B1 controled — **See Classification Key (Figure B-2)**

VII – U-shaped Confined Colluvial C-CO-US

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

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Sharmans Branch	Location:	Washington Co
Date:	4-15-14 Stream Type: B2	Valley Type:	V11
Observers:	Team 1 / Reach 1	HUC:	-- -- -- -- -- -- -- -- -- -- --

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	42.8	A_{bkf} (ft²)	Bankfull Riffle Mean DEPTH	1.5	d_{bkf} (ft)
Bankfull Riffle WIDTH	28.4	W_{bkf} (ft)	Wetted PERIMETER ~ (2 * d_{bkf}) + W_{bkf}	31.4	W_p (ft)
D_{84} at Riffle	390	Dia. (mm)	D_{84} (mm) / 304.8	1.3	D_{84} (ft)
Bankfull SLOPE	0.034	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.36	R (ft)
Gravitational Acceleration	32.2	g (ft / sec²)	Relative Roughness R(ft) / D_{84} (ft)	1.06	R / D_{84}
Drainage Area	3.6	DA (mi²)	Shear Velocity $u^* = (gRS)^{1/2}$	1.22	u* (ft/sec)

x5
2

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.62	ft / sec	154.9	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 = 0.055	6.11	ft / sec	261.9	cfs
based on stream type 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 = 0.058	5.80	ft / sec	248.4	cfs
steep, protrusions high n value 2. Roughness Coefficient: c) Manning's *n* from Jarrett (USGS): $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n = 0.39*S^{0.38}*R^{-0.16}$ n = 0.11 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	3.37	ft / sec	144.2	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Discharge Q = ____ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	2.65	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 **"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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1 Rep Riffle for only mean
3 Pools
2 Steps

Worksheet B-3a. Morphological relations, including dimensionless ratios (*First Field Day*). Reach 1

Stream: Sharmons Branch Location: Washington Co
Observers: Date: 4-15-14 Valley Type: V 11 Stream Type: B2-1

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	27.7	—	—	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	42.7	—	—
Riffle Mean Depth (d_{bkf})	1.5	—	—	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	18.5	—	—
Riffle Maximum Depth (d_{max})	2.5	—	—	ft	Riffle Max Depth to Riffle Mean Depth (d_{max} / d_{bkf})	1.7	—	—
Width of Flood-Prone Area (W_{fpa})	44	—	—	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.6	—	—
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})	26.1	21.8	30.1	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	0.89	1.13	5.98
Pool Mean Depth (d_{bkfp})	1.7	1.2	2.5	ft	Pool Mean Depth to Riffle Mean Depth (d_{bkfp} / d_{bkf})	1.13	—	—
Pool Cross-Sectional Area (A_{bkfp})	42.2	—	—	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	0.98	—	—
Pool Maximum Depth (d_{maxp})	2.6	1.7	3.2	ft	Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})	1.7	—	—
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**	Mean	Min	Max		Step Dimensionless Ratios****	Mean	Min	Max
Step Width (W_{bkfs})	29.2	27.7	31.7	ft	Step Width to Riffle Width (W_{bkfs} / W_{bkf})	43.5	42.7	48.6
Step Mean Depth (d_{bkfs})	1.49	1.4	1.5	ft	Step Mean Depth to Riffle Mean Depth (d_{bkfs} / d_{bkf})	19.6	—	—
Step Cross-Sectional Area (A_{bkfs})	2.3	2.1	2.5	ft	Step Area to Riffle Area (A_{bkfs} / A_{bkf})	1.5	—	—
Step Maximum Depth (d_{maxs})	2.2	2.1	2.3	ft	Step Max Depth to Riffle Mean Depth (d_{maxs} / d_{bkf})	1.5	—	—
Step Width/Depth Ratio (W_{bkfs} / d_{bkfs})	20.6	18.8	22.4					

*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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1 Meander to measure so no mins-max

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

Stream: Sharman's Branch Location: Washington County

Observers: US Date: 4-15-14 Valley Type: V1 Stream Type: B2-1

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage ($\bar{u}_{bkf}$)	3.37	ft/sec	Estimation Method	Mannings Jarret
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	144.2	cfs	Drainage Area	3.6 mi²

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	66			ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	2.32		
Stream Meander Length (L_m)	78			ft	Stream Meander Length Ratio (L_m / W_{bkf})	2.75		
Radius of Curvature (R_c)	31			ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	1.09		
Belt Width (W_{blt})	40.5	39	42	ft	Meander Width Ratio (W_{blt} / W_{bkf})	1.43		
Arc Length (L_a)	47			ft	Arc Length to Riffle Width (L_a / W_{bkf})	1.65		
Riffle Length (L_r)	34			ft	Riffle Length to Riffle Width (L_r / W_{bkf})	1.16		
Individual Pool Length (L_p)	26	22		ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	0.91		
Pool to Pool Spacing (P_s)	54.5	17	82	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	1.86		

Channel Profile

Valley Slope (S_{val})	3.1	ft/ft	Average Water Surface Slope (S)	3.4	ft/ft	Sinuosity (S_{val} / S)	0.91
Stream Length (SL)	285	ft	Valley Length (VL)	260	ft	Sinuosity (SL / VL)	1.1

Low Bank Height (LBH)	start	ft	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_{maxrif})	2.3			ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.54		
Max Run Depth (d_{maxrun})	—			ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	—		
Max Pool Depth (d_{maxp})	3.9			ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	3.1		
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	0 %	0%		D_{16}	12	14		170	mm
% Sand	4%	0%		D_{35}	45	62		200	mm
% Gravel	41%	34.6%		D_{50}	84	135		230	mm
% Cobble	26%	25%		D_{84}	700	1100		390	mm
% Boulder	24%	32.6%		D_{95}	2100	2600		500	mm
% Bedrock	5%	7.8%		D_{100}	3000 +	3000+		1020	mm

[a] Min, max & mean depths are measured from Thalweg to bankfull at mid-point of feature for riffles, runs & steps, 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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Team 1 - Shannon's Branch Reach 1 - 4/15/2014
Presentation Comments

① No need for Rc on map
Good job showing

② Cross Sections
Should have used break elevation on RL
Should add stationing to XS (e.g. 0+32)
No need for flood prone area on pool XS
Step should have been taken further downstream.

③ Long Pro -
No water surface elevations taken!!
Average Bkf line should pass through all Bkf points

④ Velocity -
Use D84 from protrusion
2.0 - Used wrong mannings - should have been 0.09
for 2.b also

⑤ Classification - Could be a 33/32/1

Morphological relations

- Group didn't fill in rates for min + max
  Didn't have H_2O surface elevations !!

Valley slope is flatter than stream slope