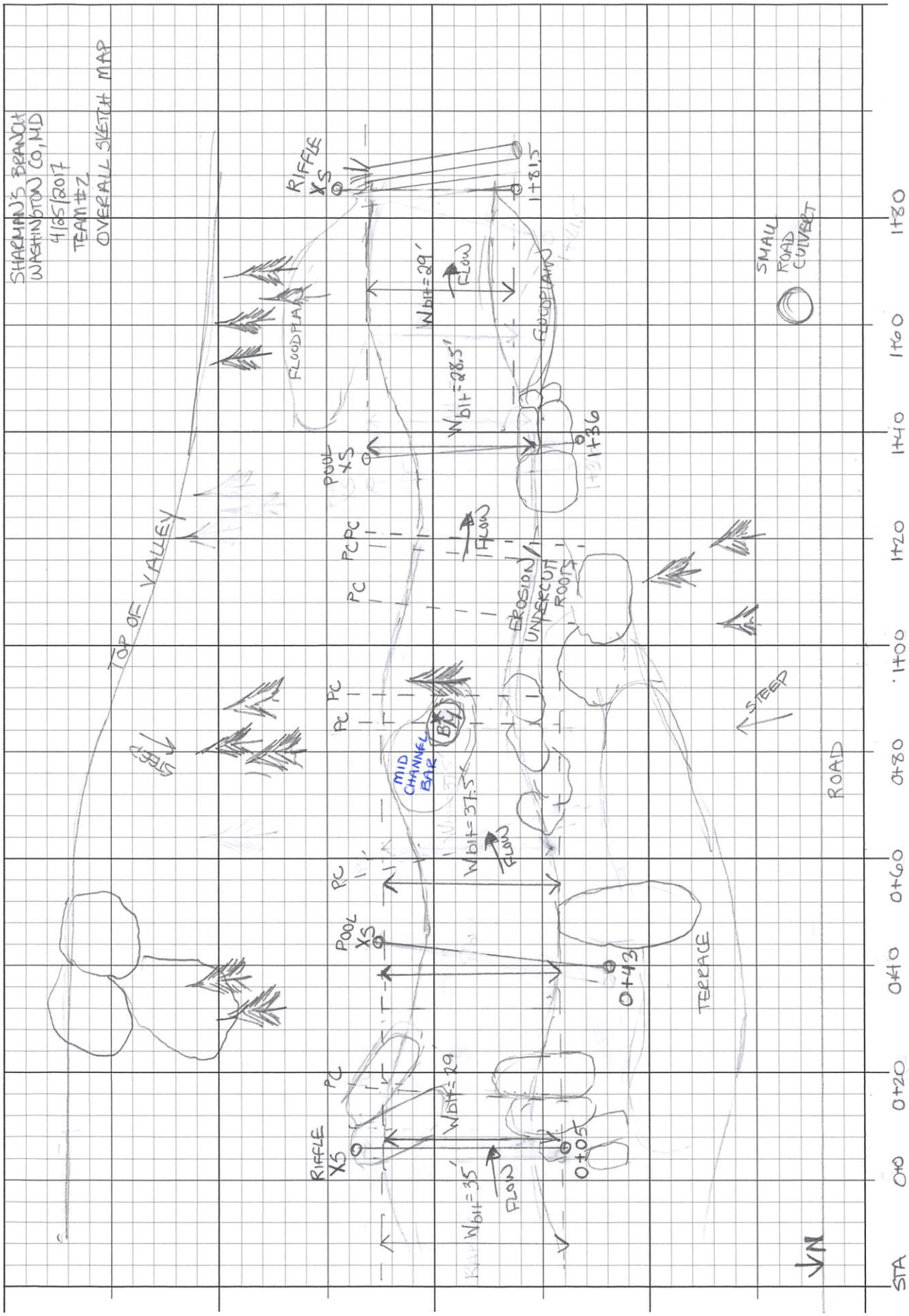
Sharman's Branch, Reach 2, Team 2, 4/25/17



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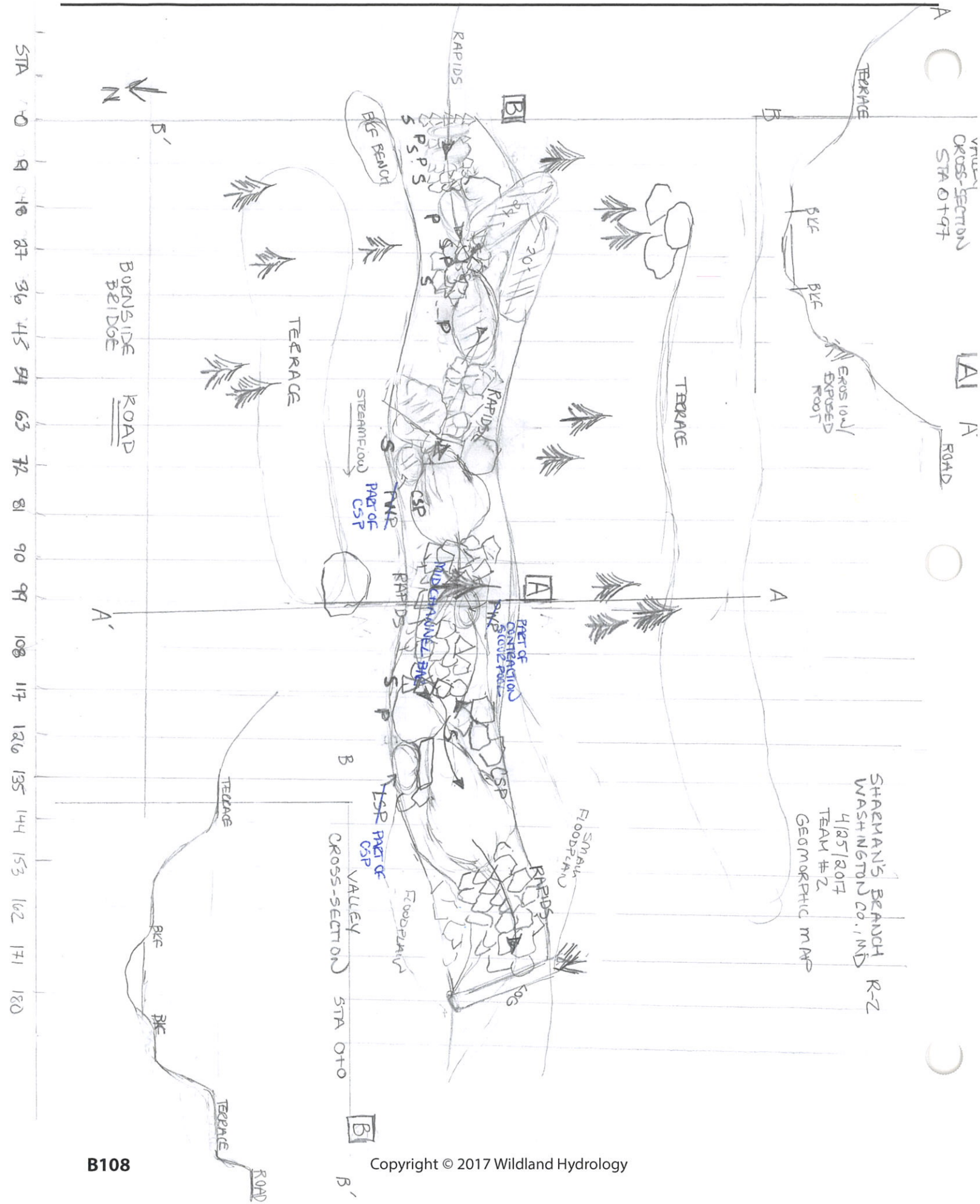
Sharman's Branch, Reach 2, Team 2, 4/25/17



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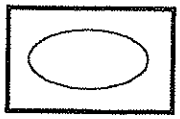
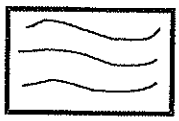
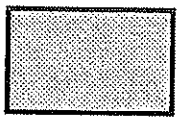
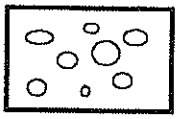
Geomorphic Map Symbols Key


Pool

Riffle


Run


Sand

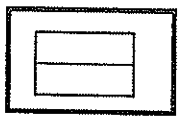

Gravel

Boulder

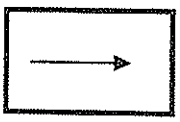
Bedrock

Baltimore City Cross Section

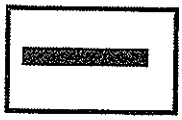
U.S. Fish and Wildlife Service Cross Section

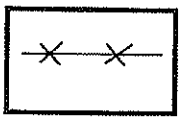

Building

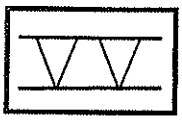
Bridge Crossing

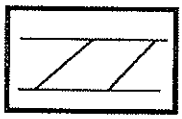

Flow Direction

Fallen Tree

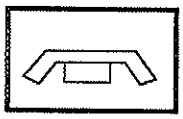

Utility Crossing

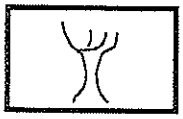

Fence


Raw Steep Bank

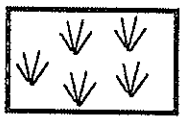

Stable Sloped Bank
(angle of line represents angle of bank)

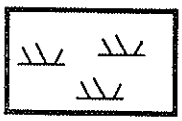
Camera Shot


Outfall


Individual Tree

Group of Trees


Herbaceous


Wetland

Project Reach Limits

AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Sharman's Branch Site/Reach: 2

Drawn By: Team 2 Date: 4/25/17

SINUOSITY (k) = STREAM LENGTH / VALLEY LENGTH

= 182' / 145' = 1.26

BELT WIDTH =

#1	29.0'	@ Sta 158
#2	28.5'	@ Sta 142
#3	37.5	@ Sta 62.5
#4	29	@ Sta 10
#5	35	@ Sta 10

MEANDER WIDTH RATIO = BELT WIDTH / BANKFULL WIDTH

SIDE POOLS

① STA. 70 POCKET WATER POOL
POOL LENGTH = 17.2'
MAX DEPTH = 1.54 + 1.8 = 3.34'
SLOPE = (10.75 − 10.76) / 17.2 = 0% DIFF VS TO BKF

② STA. 98.2 POCKET WATER POOL
LENGTH = 13.3
SLOPE = (12.04 − 12.08) / 13.3 = 0.3%
MAX DEPTH = 0.82 + 1.8 = 2.62'

③ STA. 133 LATERAL POTRUSION POOL
LENGTH = 11.5'
SLOPE = (13.86 − 13.78) / 11.5 = 0.70%
MAX DEPTH = 0.8 + 1.8 = 2.60'

STATIONING

2.8 STEP
4.5 POOL
6.2 STEP
8.2 POOL
11 STEP → PEBBLE COUNT (PC)
14.4 POOL → PC (STA 16)
21 STEP
32 POOL
36
40.4 POOL
42 CX 1
53 RAPID
66.5 STEP → PC (STA 62)
70 SIDE POOL
75 CONTRACTION SCOUR POOL
↳ PC (STA 85)
RAPIDS { 88.5 STEP → PC (STA 90)
92.5 POOL
98.5 SIDE POOL TREE
100 STEP
102 POOL → PC (STA 107)
RAPIDS { 110 STEP
112 POOL
117 STEP — PC (STA 118)
119.5 POOL — PC (STA 120)
123 STEP
131.5 CONTRACTION SCOUR POOL
133 LATERAL POTRUSION POOL
154 RAPIDS
182 STEP

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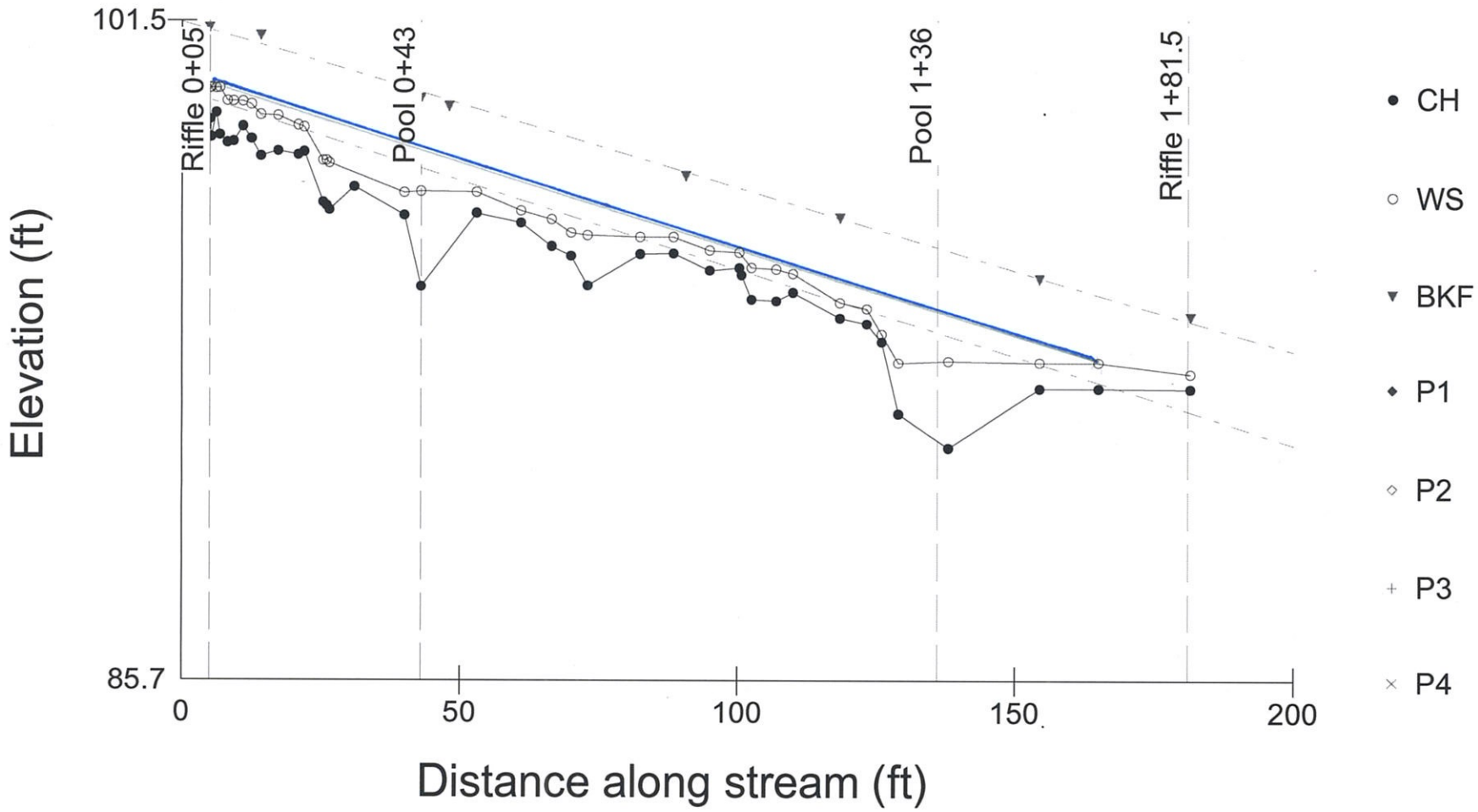
Sharman's Branch, Reach 2, Longpro



RIVERMORPH PROFILE SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Profile Name: LongPro1
Survey Date: 04/25/2017

Survey Data

DIST	CH	WS	BKF	P1	P2	P3	P4
0	7.32	6.75					
3	7.67	7.08					
3.6	7.59	7.12					
4.4	8.05	7.14					
5	7.87	7.15	5.69				
5.3	8.29	7.13					
6.2	7.72	7.15					
6.8	8.24	7.14					
8.2	8.42	7.44					
9.3	8.39	7.45					
11	8.04	7.46					
12.5	8.33	7.53					
14.2	8.74	7.77	5.88				
17.3	8.62	7.79					
20.9	8.71	8.01					
22	8.64	8.06					
25.4	9.84	8.84					
26	9.92	8.84					
26.5	10.02	8.9					
31	9.47						
40	10.15	9.61					
43	11.85	9.58	7.39				
48			7.58				
53	10.1	9.6					
61	10.33	10.04					
66.5	10.89	10.25					
70	11.12	10.57					
73	11.83	10.63					
82.5	11.08	10.67					
88.5	11.06	10.67					
90.7			9.22				
95	11.47	10.99					
100.3	11.41	11.04					
100.7	11.58						
102.5	12.17	11.4					
107	12.21	11.44					
110	12	11.55					
118.5	12.63	12.25	10.22				
123.3	12.77	12.4					
126	13.21	13.02					
129	14.95	13.73					
138	15.75	13.68					
154.4	14.35	13.72	11.68				
165	14.35	13.72					
181.5	14.37	14	12.61				

Cross Section / Bank Profile Locations

Name	Type	Profile Station

Rapid 0+05	Riffle XS	5
Pool 0+43	Pool XS	43
Pool 1+36	Pool XS	136
Rapid1+81.5	Other XS	181

Measurements from Graph

Bankfull Slope: 0.042

Variable	Min	Avg	Max
S riffle	0.01739	0.05092	0.08614
S pool	0	0.00768	0.02293
S run	0	0	0
S glide	0	0	0
S step	0.02739	0.13555	0.23707
P - P	1.19	16.6	32.74
Pool length	1.09	7.1	25.36
Riffle length	6.52	7.67	8.46
Dmax riffle	2.07	2.24	2.41
Dmax pool	2.33	3.19	4.72
Dmax run	0	0	0
Dmax glide	0	0	0
Dmax step	1.88	2.29	3.33
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

♀

RIVERMORPH PROFILE SUMMARY

Notes

River Name: Sharman's Branch
Reach Name: Team 2
Profile Name: LongPro1
Survey Date: 04/25/2017

DIST	Note
0	START
3	TS
3.6	MS
4.4	TP
5	XS
5.3	MP
6.2	TS
6.8	MS
8.2	TP
9.3	MP
11	TS
12.5	MS
14.2	TP
17.3	MP
20.9	TS
22	MS
25.4	TP
26	MP
26.5	TS
31	MS
40	TP
43	MP/XS
48	BKF
53	TR
61	MR

66.5	TS
70	MS
73	TP
82.5	MP
88.5	TR
90.7	BKF
95	MR
100.3	TS
100.7	MS
102.5	TP
107	MP
110	TR
118.5	MR
123.3	TS
126	MS
129	TP
138	MP/XS
154.4	TR
165	MR
181.5	XS

SURVEY DATA ⟹ *LONGITUDINAL PROFILE 1* 1/4

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

Location: Reach 2

Observers: VC/DC, Team 2 HUC: 0 2 0 7 0 0 0 4 1 0 0 9

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instru-ment 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	7.02	107.02		100								
2	0			7.32	99.7	6.75						EW	
3	3			~~6.38~~ 7.6		7.08						Top S	
4	3.6			7.59		[illegible]	7.12					Mid S	
5													
6	4.4			8.05		7.14						Top P	
7													
8	5.3			8.29		7.13						Mid P	SP
9													
10	6.2			7.72		[illegible]	7.15					~~TP~~ TS	
11													
12	6.8			8.24		7.14						~~TP~~ MS	
13													
14	8.2			8.42		7.44						TP	
15													
16	9.3			8.39		7.45						MP	
17													
18	5.0			7.33		7.15		5.69				X-Section	SP
19													
20	14.2			8.74		7.77		5.88				BKF/TP	
21													
22	11.0			8.04		7.46						TS	
23													
24	12.5			8.33		7.53						MS	
25													
26	17.3			8.62		7.79						~~TP~~ MP	
27													

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SURVEY DATA → *LONGITUDINAL PROFILE 2* 2/4

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

Location: Reach 2

Observers: VC/IC, Team 2 HUC: 0 2 0 7 0 0 0 4 1 0 0 9

	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	20.9			8.71		8.01						TS	
29													
30	22			8.64		8.06						MS	
31													
32	25.4			9.84		8.84		7.13				TP	
33													
34	26			9.92			8.34					MP	SP
35													
36	26.5			10.02		8.96						TS	
37													
38	31			9.47								MS	
39													
40	40			10.15		9.61						TP	
41													
42	43			11.85		9.58		7.39				MP	SP
43													
44	48							7.58				BKF	
45													
46	53			10.10		9.60						TBR	
47													
48	61			10.33		10.04						MR	RAPID
49													
50	66.5			10.89		10.25						TS	
51													
52	70			11.12		10.57						MS	
53													
54	73			11.83		10.67						TP	?

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SURVEY DATA ⟶ **LONGITUDINAL PROFILE 3**

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

Location: Reach 2

Observers: VC/DC, Team 2 HUC: 02070001410009

	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													CSP
56													
57	82.5			11.08		10.67						MP	
58													
59	88.5			11.06		10.67						TR	
60													
61		90.7						9.22				BKF	RAPID
62													
63	95			11.47		10.99						MR	
64													
65	100.3			11.41		11.04						TS	
66													
67	100.7			11.58								MS	
68													
69	102.5			12.17		11.40						TP	
70													SP
71	107			12.21		11.44						MP	
72													
73	110			12.00		11.51						TR	
74													
75													RAPID
76													
77	118.5			12.63		12.25		10.22				MR	
78	123.3			12.77		12.40						TS	
79		126		13.21		13.02						MS	
80	129			14.95		13.73						TP	
81	138			15.75		13.08						MP	CSP

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SURVEY DATA → *LONGITUDINAL PROFILE 4* 4/4

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

Location: Reach 2

Observers: VC/DC, Team 2 HUC: 0 3 0 7 0 0 0 4 1 0 0 9

	Distance, Point, or	Back-Sight	Height of Instru-ment	Thalweg		Water Surface		Bankfull		Low Bank HI		NOTES
				Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	Fore-Sight	Elevation	e.g. Riffle Run Pool Glide
	STATION	BS	HI	FS	Elev.	FS	Elev.	FS	Elev.	FS	Elev.	
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	
82	154.4			14.35		13.72		11.68				TR
83	~~[illegible]~~											
84	165			14.35		13.72						MR
85												
86	181.5			14.37	12.65	14.00		11.47				X-sucha
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												
101												
102												
103												
104												
105												
106												
107												
108												

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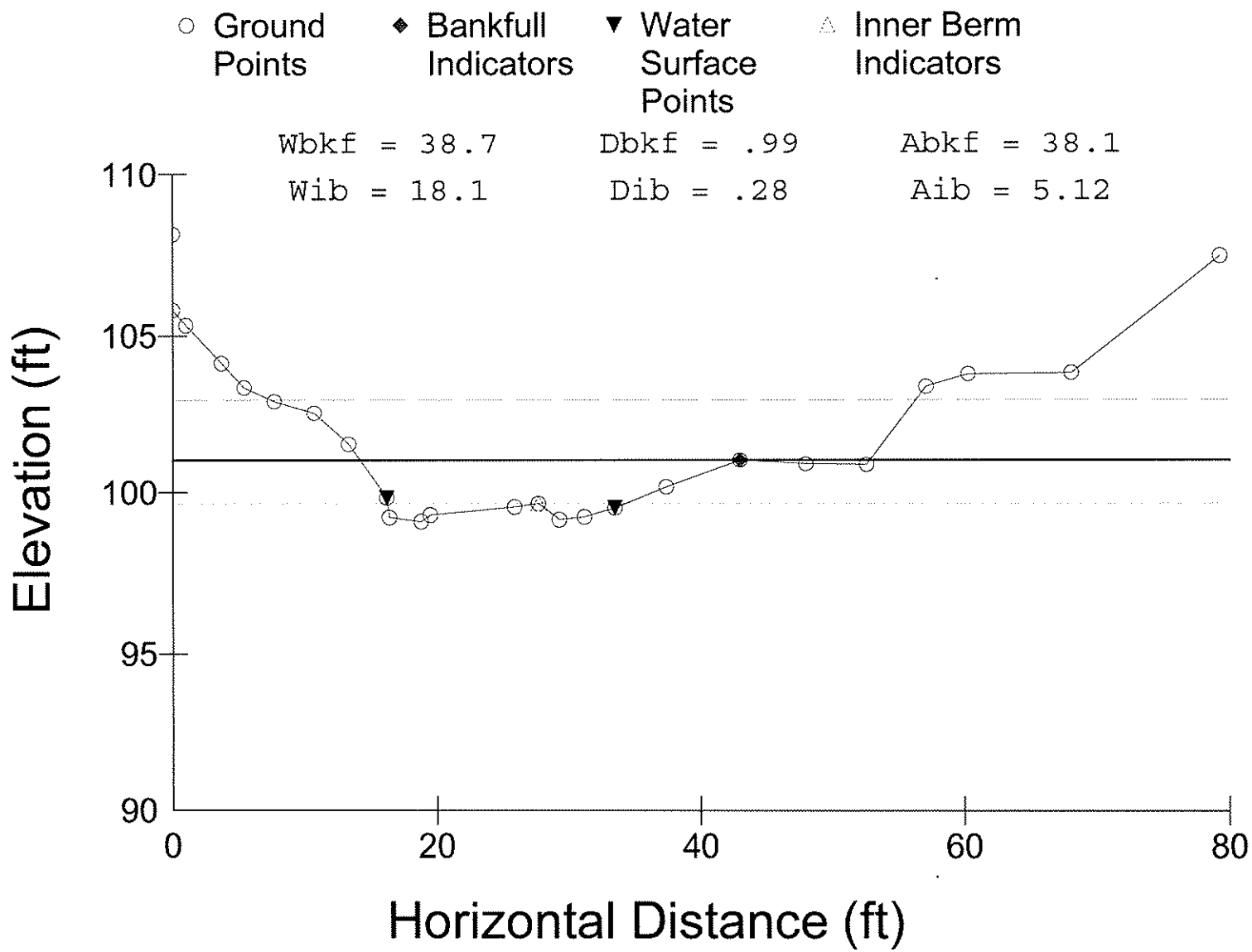
Sharman's Branch, Reach 2, Rapid @ 0+05



RIVERMORPH CROSS SECTION SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Cross Section Name: Rapid 0+05
Survey Date: 04/25/2017

Cross Section Data Entry

BM Elevation: 100 ft
Backsight Rod Reading: 8.15 ft

TAPE	FS	ELEV	NOTE
0	0	108.15	Height of Instrument
0	2.34	105.81	LEP
1	2.82	105.33	
3.7	4	104.15	
5.4	4.78	103.37	
7.7	5.22	102.93	
10.7	5.6	102.55	
13.3	6.6	101.55	
16.2	8.32	99.83	LEW
16.4	8.93	99.22	
18.8	9.06	99.09	
19.5	8.86	99.29	
25.9	8.61	99.54	
27.7	8.5	99.65	IB
29.3	9	99.15	TW
31.2	8.92	99.23	
33.5	8.64	99.51	REW
37.4	7.98	100.17	
43	7.12	101.03	BKF
48	7.24	100.91	
52.6	7.26	100.89	
57.1	4.74	103.41	
60.3	4.34	103.81	
68.1	4.3	103.85	LT
79.3	0.68	107.47	REP

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	102.97	102.97	102.97
Bankfull Elevation (ft)	101.03	101.03	101.03
Floodprone Width (ft)	48.82	-----	-----
Bankfull Width (ft)	38.67	19.33	19.34
Entrenchment Ratio	1.26	-----	-----
Mean Depth (ft)	0.99	1.56	0.41
Maximum Depth (ft)	1.94	1.94	1.52
Width/Depth Ratio	39.06	12.39	47.17
Bankfull Area (sq ft)	38.11	30.16	7.95
Wetted Perimeter (ft)	39.74	21.76	21.02
Hydraulic Radius (ft)	0.96	1.39	0.38
Begin BKF Station	14.18	14.18	33.51
End BKF Station	52.85	33.51	52.85

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

SURVEY DATA ⟹ **CROSS - SECTION** 1

SITE: Riffle XS 0+05 Date: 4/25/17

Location: Sharman's Branch - Reach 2

Observers: Team 2 HUC: 0 2 0 7 0 0 0 4 1 0 0 9

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	8.15	108.15		100	
2	0.0			2.34		LDB PIN
3	1.0			2.82		
4	3.7			4.00		
5	5.4			4.78		
6	7.7			5.22		
7	10.7			5.60		
8	13.3			6.60		
9	16.2			8.32		
10	16.4			8.93		
11	18.8			9.06		
12	19.5			8.86		
13	25.9			8.61		
14	27.7			8.50		
15	29.3			9.00		
16	31.2			8.92		
17	33.5			8.64		
18	37.4			7.98		
19	43.0			7.12		
20	48.0			7.24		
21	52.6			7.26		
22	57.1			4.74		
23	60.3			4.34		
24	68.1			4.30		
25	79.3			0.68		
26						
27						
28						

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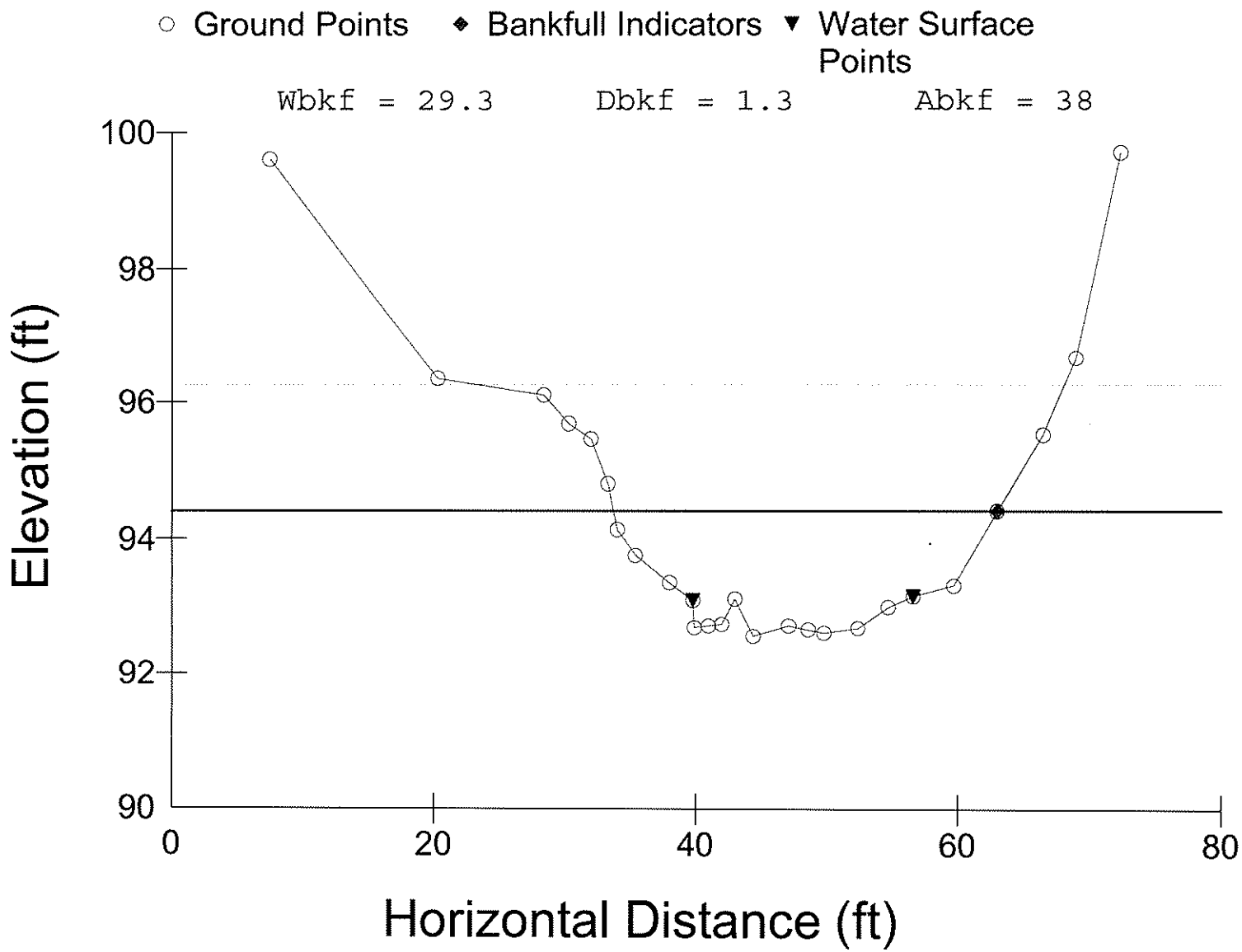
Sharman's Branch, Reach 2, Rapid @ 1+81.5



RIVERMORPH CROSS SECTION SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Cross Section Name: Riffle 1+81.5
Survey Date: 04/25/2017

Cross Section Data Entry

BM Elevation: 100 ft
Backsight Rod Reading: 1.56 ft

TAPE	FS	ELEV	NOTE
7.5	1.95	99.61	LEP
20.3	5.21	96.35	
28.4	5.46	96.1	
30.3	5.88	95.68	
32	6.1	95.46	
33.3	6.75	94.81	
34	7.42	94.14	
35.4	7.8	93.76	
38	8.2	93.36	
39.8	8.46	93.1	LEW
39.9	8.87	92.69	
41	8.84	92.72	
42	8.82	92.74	
43	8.44	93.12	
44.4	9	92.56	TW
47.1	8.84	92.72	
48.6	8.9	92.66	
49.8	8.95	92.61	
52.4	8.88	92.68	
54.7	8.56	93	
56.6	8.4	93.16	REW
59.7	8.24	93.32	
63	7.15	94.41	BKF
66.5	6.04	95.52	
69	4.9	96.66	
72.4	1.86	99.7	REP

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	96.26	96.26	96.26
Bankfull Elevation (ft)	94.41	94.41	94.41
Floodprone Width (ft)	44.91	-----	-----
Bankfull Width (ft)	29.28	14.86	14.42
Entrenchment Ratio	1.53	-----	-----
Mean Depth (ft)	1.3	1.33	1.27
Maximum Depth (ft)	1.85	1.85	1.8
Width/Depth Ratio	22.52	11.2	11.35
Bankfull Area (sq ft)	38.04	19.73	18.32
Wetted Perimeter (ft)	30.21	17.33	16.38
Hydraulic Radius (ft)	1.26	1.14	1.12
Begin BKF Station	33.72	33.72	48.58
End BKF Station	63	48.58	63

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

SURVEY DATA ⟹ **CROSS - SECTION** 7 CS: 4/4

SITE: Sharman's Branch, Reach 2 Date: 4/26/07

STA = 1+81.5

7.5 | 1.95

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	1.56	101.56		100	Benchmark
2	26.3	5.21				
3	28.4	5.40				
4	30.3	5.88				bankfull
5	32.0	6.10				
6	33.3	6.45				
7	34.0	7.42				
8	35.4	7.80				
9	38.0	8.20				
10	39.8	8.40				LEW
11	39.9	8.87				
12	41.0	8.84				
13	42.0	8.82				
14	43.0	8.44				
15	44.4	9.00				TW
16	47.1	8.84				
17	48.6	8.90				
18	49.8	8.95				
19	52.4	8.88				
20	54.7	8.56				
21	56.6	8.40				REW
22	59.7	8.21				
23	63.0	7.15				
24	66.5	6.24				
25	69	4.90				
26	72.4	1.80				
27						
28						Close Loop
29						
30						
31						

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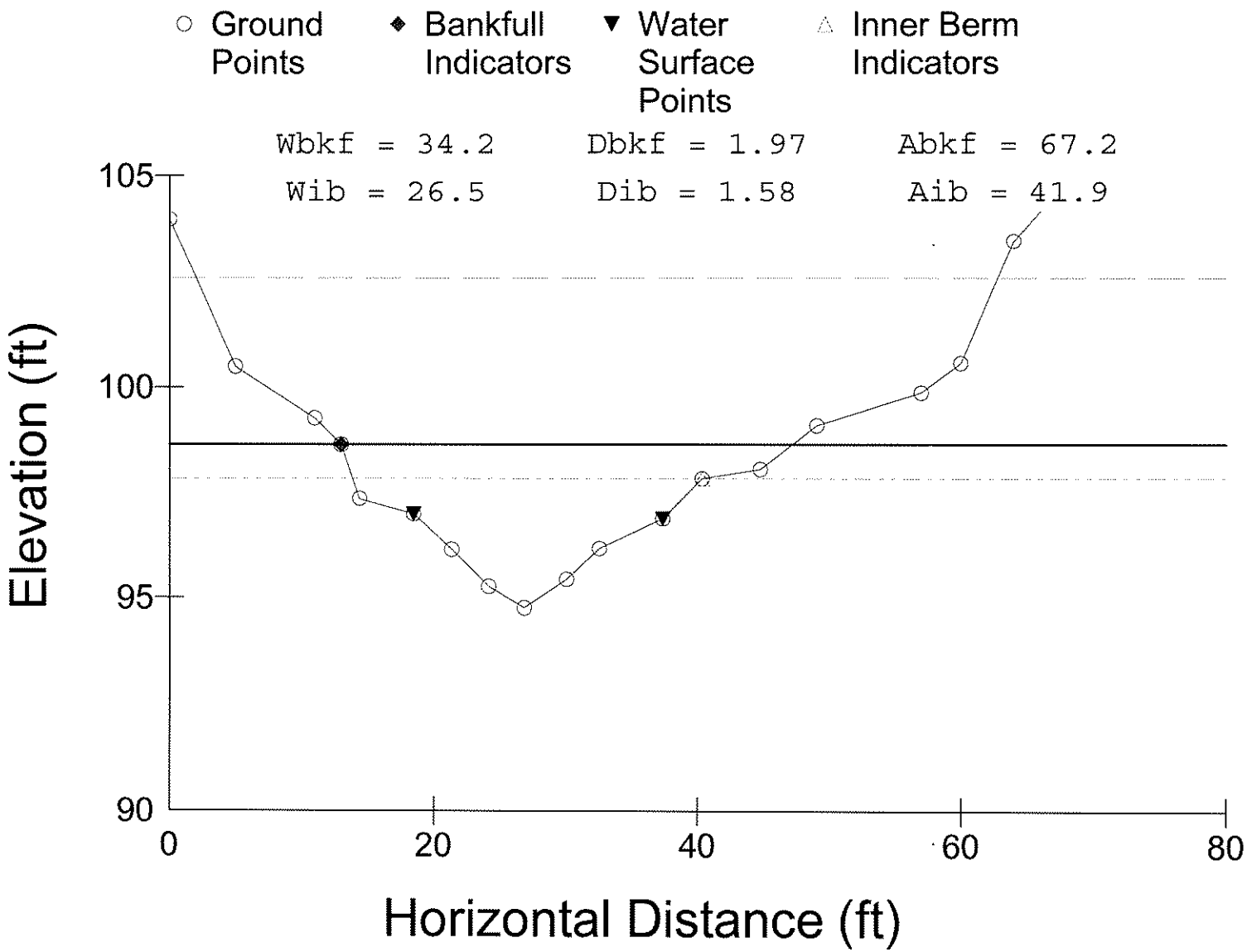
Sharman's Branch, Reach 2, Pool @ 0+43



RIVERMORPH CROSS SECTION SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Cross Section Name: Pool 0+43
Survey Date: 04/25/2017

Cross Section Data Entry

BM Elevation: 100 ft
Backsight Rod Reading: 8.15 ft

TAPE	FS	ELEV	NOTE
0	4.19	103.96	LEP
5	7.67	100.48	
11	8.88	99.27	
13	9.5	98.65	BKF
14.4	10.78	97.37	
18.5	11.15	97	LEW
21.4	12	96.15	
24.2	12.89	95.26	
26.9	13.39	94.76	TW
30.1	12.72	95.43	
32.6	11.98	96.17	
37.4	11.26	96.89	REW
40.4	10.3	97.85	IB
44.8	10.08	98.07	
49.1	9.05	99.1	
57	8.28	99.87	
60	7.59	100.56	
64	4.72	103.43	
67	3.66	104.49	REP

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	102.54	102.54	-----
Bankfull Elevation (ft)	98.65	98.65	-----
Floodprone Width (ft)	60.72	-----	-----
Bankfull Width (ft)	34.22	47.26	-----
Entrenchment Ratio	1.77	-----	-----
Mean Depth (ft)	1.97	1.97	-----
Maximum Depth (ft)	3.89	3.89	-----
Width/Depth Ratio	17.37	24.05	-----
Bankfull Area (sq ft)	67.25	67.25	-----
Wetted Perimeter (ft)	35.5	35.5	-----
Hydraulic Radius (ft)	1.89	1.89	-----
Begin BKF Station	13	13	-----
End BKF Station	47.22	47.22	-----

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			

SURVEY DATA → CROSS - SECTION 2

SITE: Pool XS 0+43 Date: 4/25/17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	8.15	108.15		100	
2	0.0			4.19		
3	5.0			7.67		
4	11.0			8.88		
5	13.0			9.50		
6	14.4			10.78		
7	18.5			11.15		
8	21.4			12.00		
9	24.2			12.89		
10	26.9			13.39		
11	30.1			12.72		
12	32.6			11.98		
13	37.4			11.26		
14	40.4			10.30		
15	44.8			10.08		
16	49.1			9.05		
17	57.0			8.28		
18	60.0			7.59		
19	64.0			4.72		
20	67.0			3.66		
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

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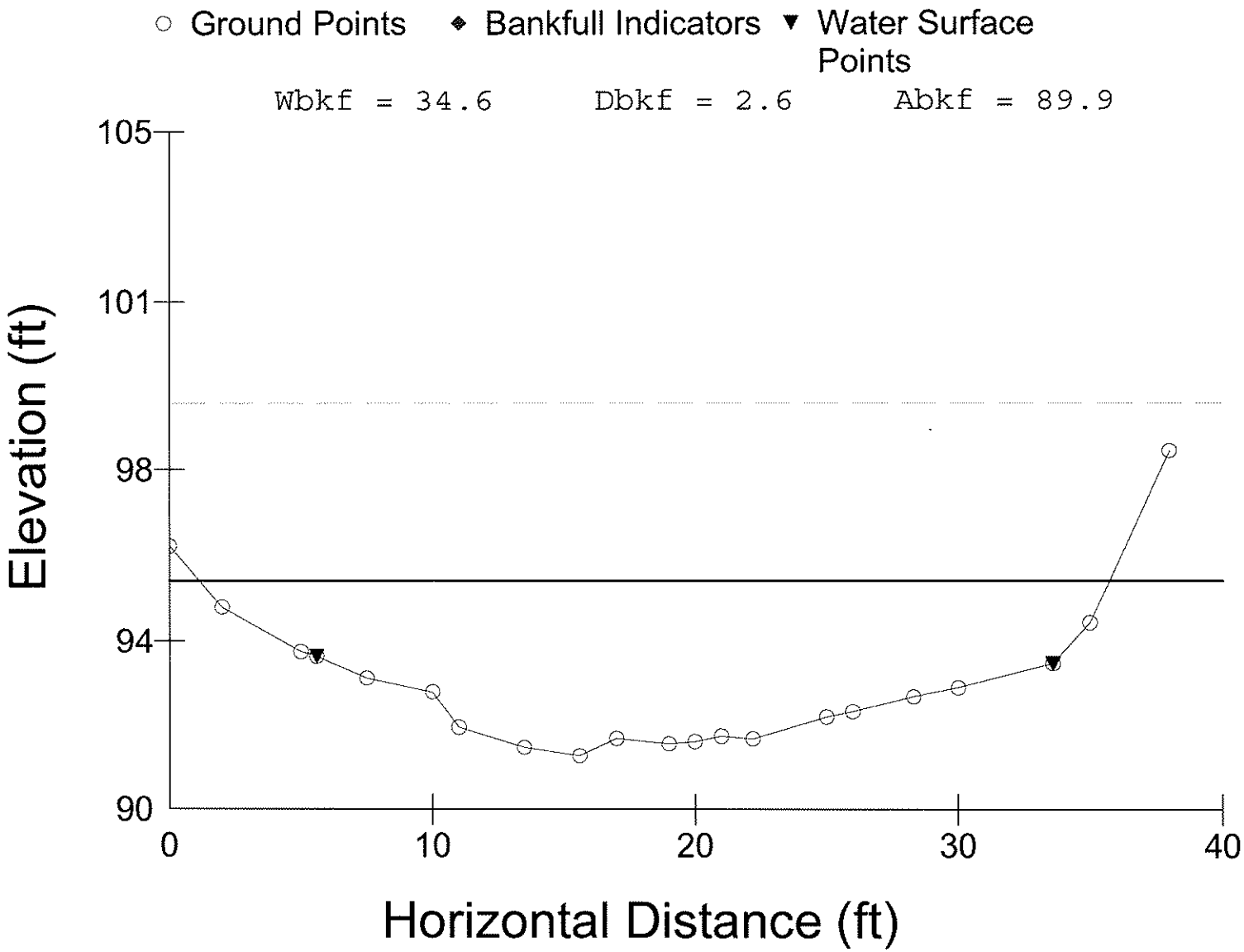
Sharman's Branch, Reach 2, Pool @ 1+36



RIVERMORPH CROSS SECTION SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Cross Section Name: Pool 1+36
Survey Date: 04/25/2017

Cross Section Data Entry

BM Elevation: 100 ft
Backsight Rod Reading: 1.57 ft

TAPE	FS	ELEV	NOTE
0	5.72	95.85	LEP
2	7.07	94.5	
5	8.06	93.51	
5.6	8.16	93.41	LEW
7.5	8.65	92.92	
10	8.96	92.61	
11	9.75	91.82	
13.5	10.2	91.37	
15.6	10.39	91.18	TW
17	10	91.57	
19	10.12	91.45	
20	10.07	91.5	
21	9.95	91.62	
22.2	10.01	91.56	
25	9.52	92.05	
26	9.4	92.17	
28.3	9.06	92.51	
30	8.86	92.71	
33.6	8.32	93.25	REW
35	7.41	94.16	
38	3.65	97.92	REP

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	98.92	98.92	98.92
Bankfull Elevation (ft)	95.05	95.05	95.05
Floodprone Width (ft)	38	-----	-----
Bankfull Width (ft)	34.52	32.99	1.53
Entrenchment Ratio	1.1	-----	-----
Mean Depth (ft)	2.56	2.64	0.83
Maximum Depth (ft)	3.87	3.87	1.42
Width/Depth Ratio	13.48	12.48	1.84
Bankfull Area (sq ft)	88.51	87.24	1.26
Wetted Perimeter (ft)	36.16	35.46	3.54
Hydraulic Radius (ft)	2.45	2.46	0.36
Begin BKF Station	1.19	1.19	34.18
End BKF Station	35.71	34.18	35.71

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side

SURVEY DATA ⟹ **CROSS - SECTION** 4 CS: 3/4

SITE: Sharman's Branch, Reach 2 Date: 4/25/17

1+36 Station

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	BM	1.57	101.57		100	Benchmark
2	0			8.72		
3	2.0			7.07		
4	5.0			8.68		
5	5.85			8.14		LEW
6	7.5			8.65		
7	10.0			8.96		
8	11.0			9.75		
9	15.6			10.30		TW
10	19.0			10.12		
11	20.0			10.07		
12	21.0			9.95		
13	22.2			10.01		
14	25.0			9.52		
15	26.0			9.40		
16	28.3			9.08		
17	30.0			8.86		
18	33.6			8.32		REW
19	35.0			7.41		
20	38.0			7.43		
21	13.5			10.20		On Boulder
22	17.0			10.0		On Boulder
23						
24				1.56		Close Loop
25						
26						
27						
28						
29						
30						
31						

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RIVERMORPH PARTICLE SUMMARY

River Name: Sharman's Branch
Reach Name: Team 2
Sample Name: Protrusion1
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	0	0.00	0.00
64 - 90	5	5.00	5.00
90 - 128	12	12.00	17.00
128 - 180	16	16.00	33.00
180 - 256	12	12.00	45.00
256 - 362	9	9.00	54.00
362 - 512	14	14.00	68.00
512 - 1024	28	28.00	96.00
1024 - 2048	4	4.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	124.83
D35 (mm)	192.67
D50 (mm)	314.89
D84 (mm)	804.57
D95 (mm)	1005.71
D100 (mm)	2047.97
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	0
Cobble (%)	45
Boulder (%)	55
Bedrock (%)	0

Total Particles = 100.

Protrusion count @ classification section

Site: Sharman's Branch, Reach 2, 4/25/17

Location: Washington County HUC: 0 2 0 7 0 0 0 4 1 0 0 9

Observers: CMS, AEH (Team 2)

				Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
							Reach: 2			Reach:			Reach:		
							Date: 4/25/2017			Date:			Date:		
Inches	PARTICLE	Millimeters													
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16													
.63 - .89	Coarse	16 - 22.6													
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45													
1.8 - 2.5	Very Coarse	45 - 64													
2.5 - 3.5	Small	64 - 90	COBBLE	5			5								
3.5 - 5.0	Small	90 - 128		12			12								
5.0 - 7.1	Large	128 - 180		16			16								
7.1 - 10.1	Large	180 - 256		12			12								
10.1 - 14.3	Small	256 - 362	BOULDER	9			9								
14.3 - 20	Small	362 - 512		14			14								
20 - 40	Medium	512 - 1024		28			28								
40 - 80	Large-Vry Large	1024 - 2048		4			4								
	Bedrock		BDRK												
Stream Type:			Landscape Type:			TOTAL→									

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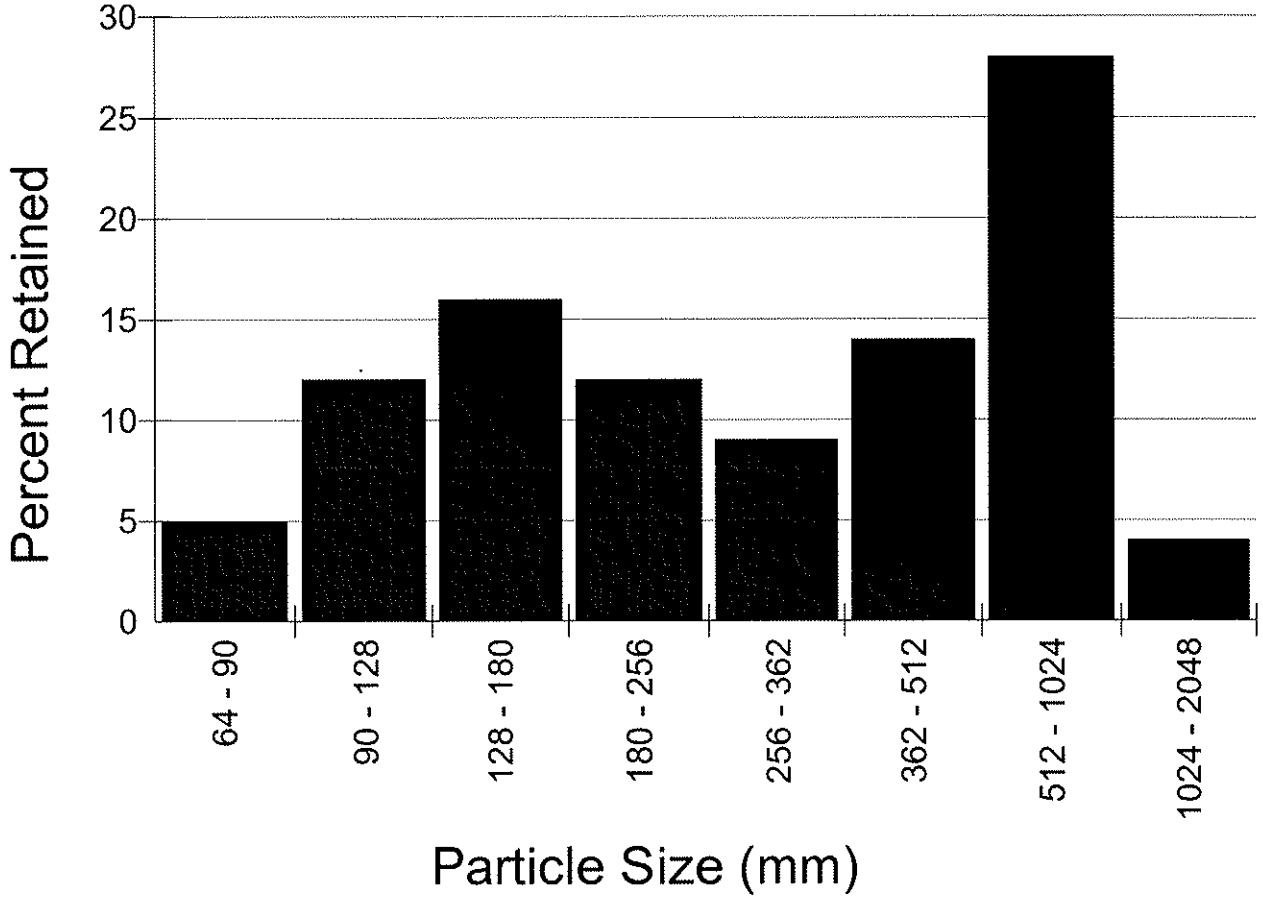
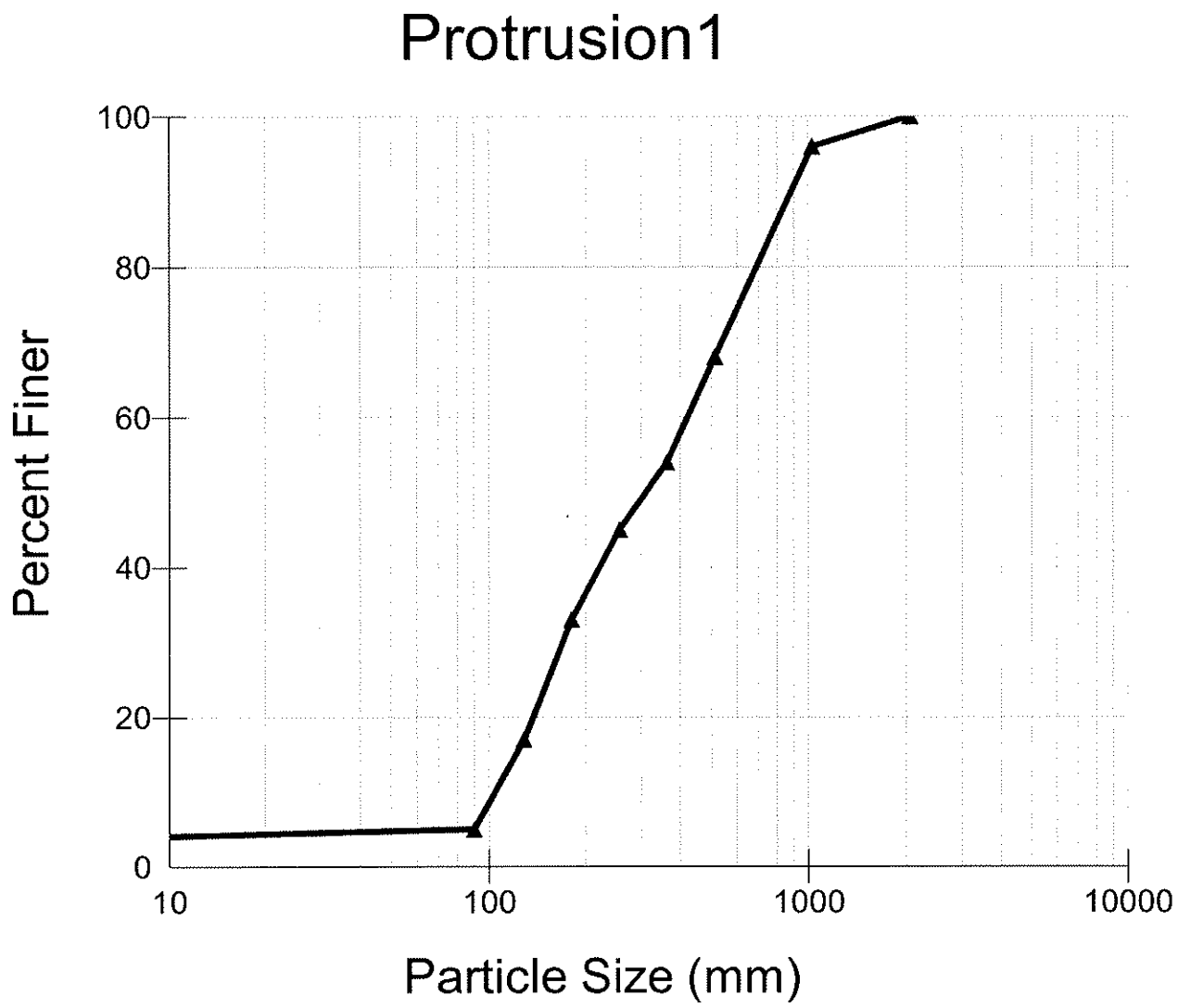
Sharman's Branch Protrusion Bar Graph




Protrusion1
Percent Finer
100
80
60
40
20
0
10
100
1000
10000
Particle Size (mm)

Pebble Count Locations:

0+11 step 0+85 pool 1+07 pool 1+49 pool
0+16 pool 0+87 pool 1+18 step
0+62 step 0+90 step 1+20 pool

Classification Count

Site: Sharman's Branch, Reach 2
Location: Washington County HUC: 0 2 0 7 0 0 0 4 1 0 0 9
Observers: CMS, AEH (Team 2)

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) Reach: 2 Date: 4/25/2017 TOT #	ITEM %	% CUM	POOL (2) Reach: 2 Date: 4/25/2017 TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND							6					
	Fine	.125 - .25	SAND							3					
	Medium	.25 - .50	SAND							2					
	Coarse	.50 - 1.0	SAND							4					
.04 - .08	Very Coarse	1.0 - 2	SAND							7					
.08 - .16	Very Fine	2 - 4	GRAVEL							5					
.16 - .22	Fine	4 - 5.7	GRAVEL							2					
.22 - .31	Fine	5.7 - 8	GRAVEL							6					
.31 - .44	Medium	8 - 11.3	GRAVEL							4					
.44 - .63	Medium	11.3 - 16	GRAVEL				3			8					
.63 - .89	Coarse	16 - 22.6	GRAVEL				2			5					
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				2			2					
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL				1			1					
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL				4			2					
2.5 - 3.5	Small	64 - 90	COBBLE				5			1					
3.5 - 5.0	Small	90 - 128	COBBLE				2			0					
5.0 - 7.1	Large	128 - 180	COBBLE				0			1					
7.1 - 10.1	Large	180 - 256	COBBLE				1			1					
10.1 - 14.3	Small	256 - 362	BOULDER				2								
14.3 - 20	Small	362 - 512	BOULDER				1								
20 - 40	Medium	512 - 1024	BOULDER				5								
40 - 80	Large-Vry Large	1024 - 2048	BOULDER				4								
	Bedrock		BDRK				3								
Stream Type:			Landscape Type:			TOTAL→	40			60					

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Reach Representative

Site: Shannon's Branch

Location: Washington County HUC:

Observers: CWS, ART

				Dot Count for RIFFLE 1	POOL 2	COMP. 3	Pool ~~RIFFLE~~ (1) TOT #	ITEM %	% CUM	Riffle ~~POOL~~ (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
							Reach: 2			Reach: 2			Reach:		
							Date: 4/25/17			Date: 4/25/17			Date:		
Inches	PARTICLE	Millimeters													
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND				6						6		
	Fine	.125 - .25					3						3		
	Medium	.25 - .50					2						2		
	Coarse	.50 - 1.0					4						4		
.04 - .08	Very Coarse	1.0 - 2					7						7		
.08 - .16	Very Fine	2 - 4	GRAVEL				5						5		
.16 - .22	Fine	4 - 5.7					2						2		
.22 - .31	Fine	5.7 - 8					6						6		
.31 - .44	Medium	8 - 11.3					4						4		
.44 - .63	Medium	11.3 - 16					8			3			11		
.63 - .89	Coarse	16 - 22.6					5			2			7		
.89 - 1.3	Coarse	22.6 - 32					2			2			4		
1.3 - 1.8	Very Coarse	32 - 45					1			1			2		
1.8 - 2.5	Very Coarse	45 - 64					2			4			6		
2.5 - 3.5	Small	64 - 90	COBBLE				1			5			6		
3.5 - 5.0	Small	90 - 128					0			2			2		
5.0 - 7.1	Large	128 - 180					1			5			6		
7.1 - 10.1	Large	180 - 256					1			1			2		
10.1 - 14.3	Small	256 - 362	BOULDER							2			2		
14.3 - 20	Small	362 - 512								1			1		
20 - 40	Medium	512 - 1024								5			5		
40 - 80	Large-Vry Large	1024 - 2048								4			4		
	Bedrock		BDRK							3			3		
Stream Type:			Landscape Type:			TOTAL→	60			40			100		

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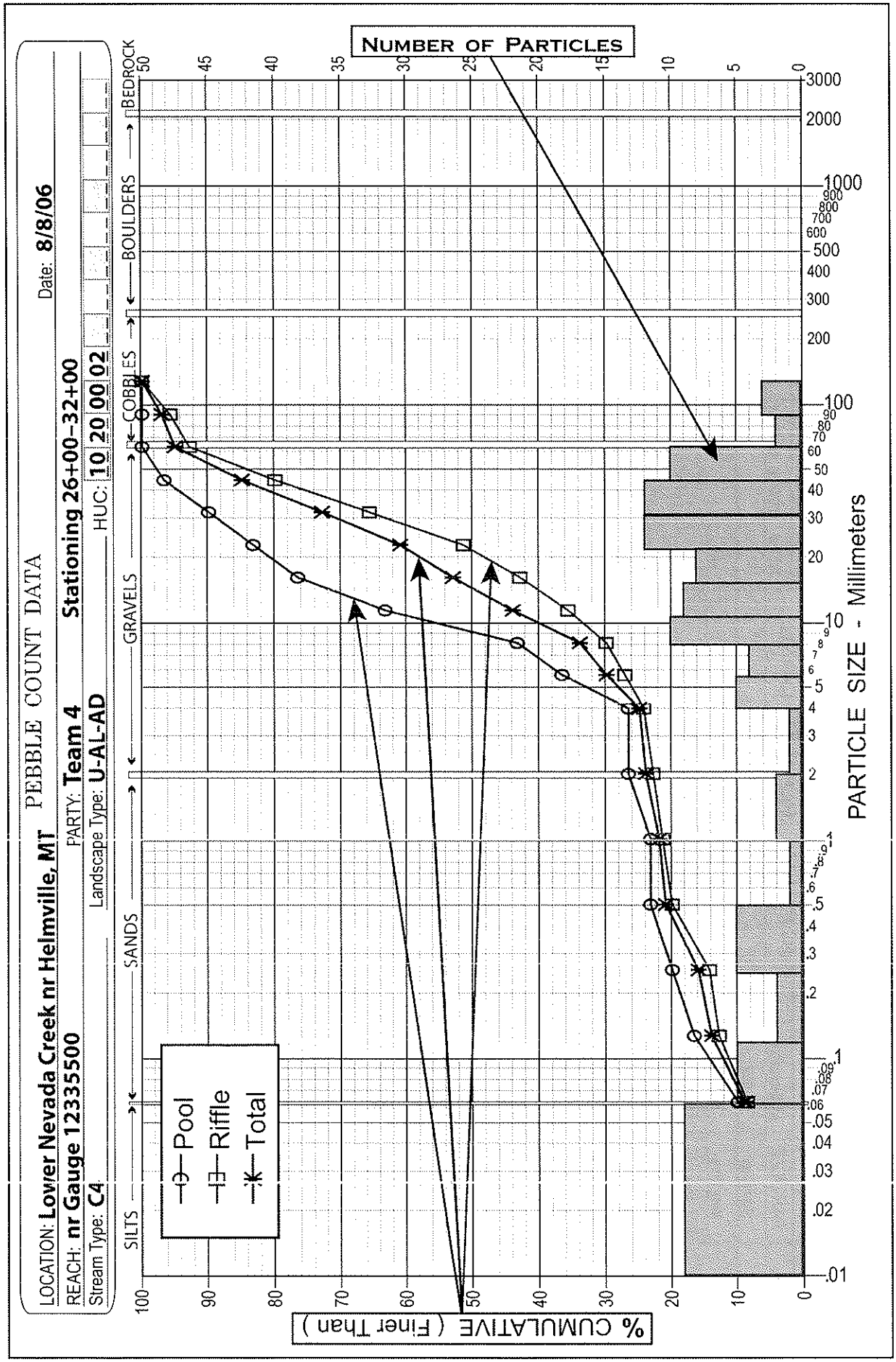

Figure B-22. Pebble count plot with example data.

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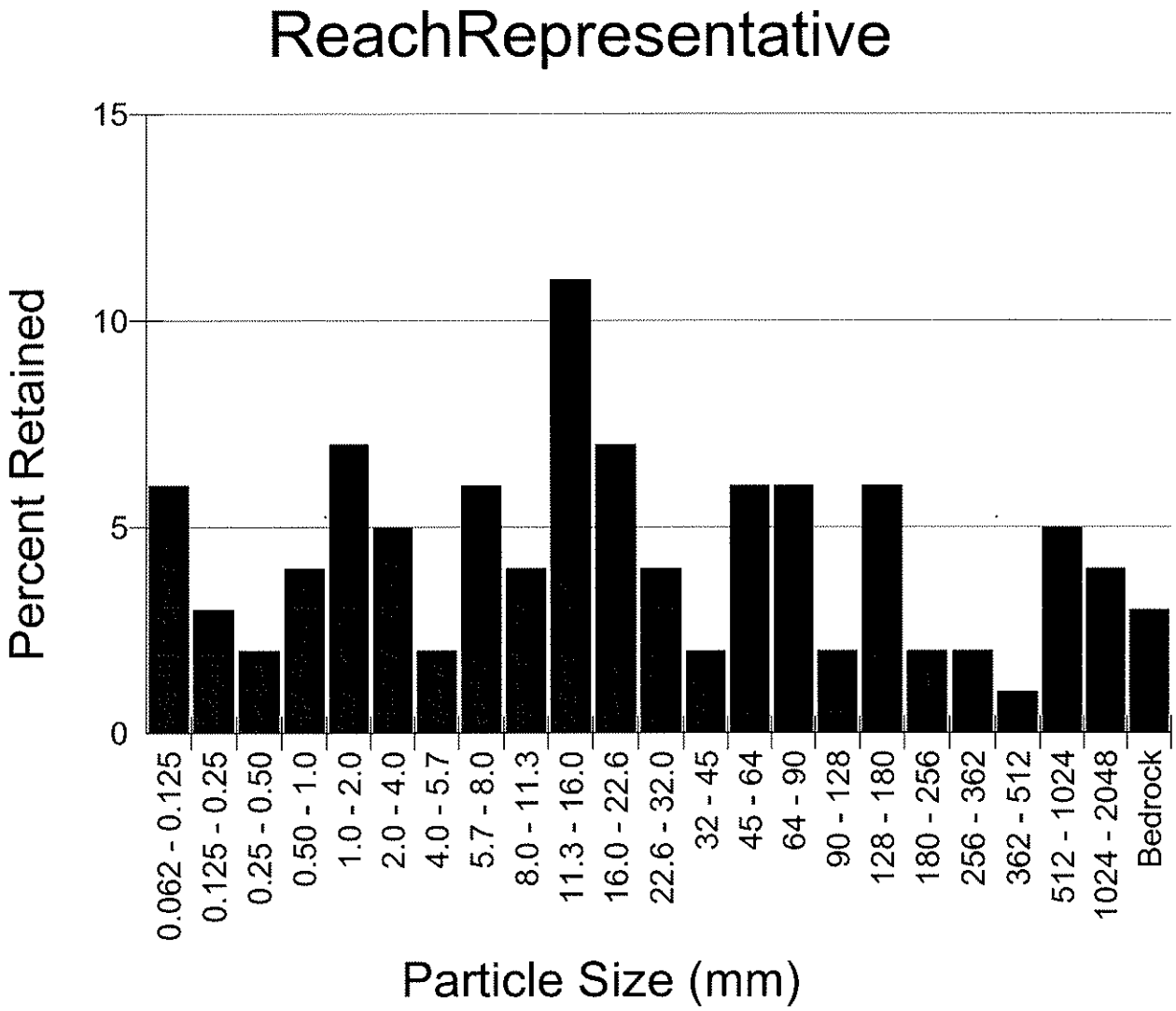
RIVERMORPH PARTICLE SUMMARY

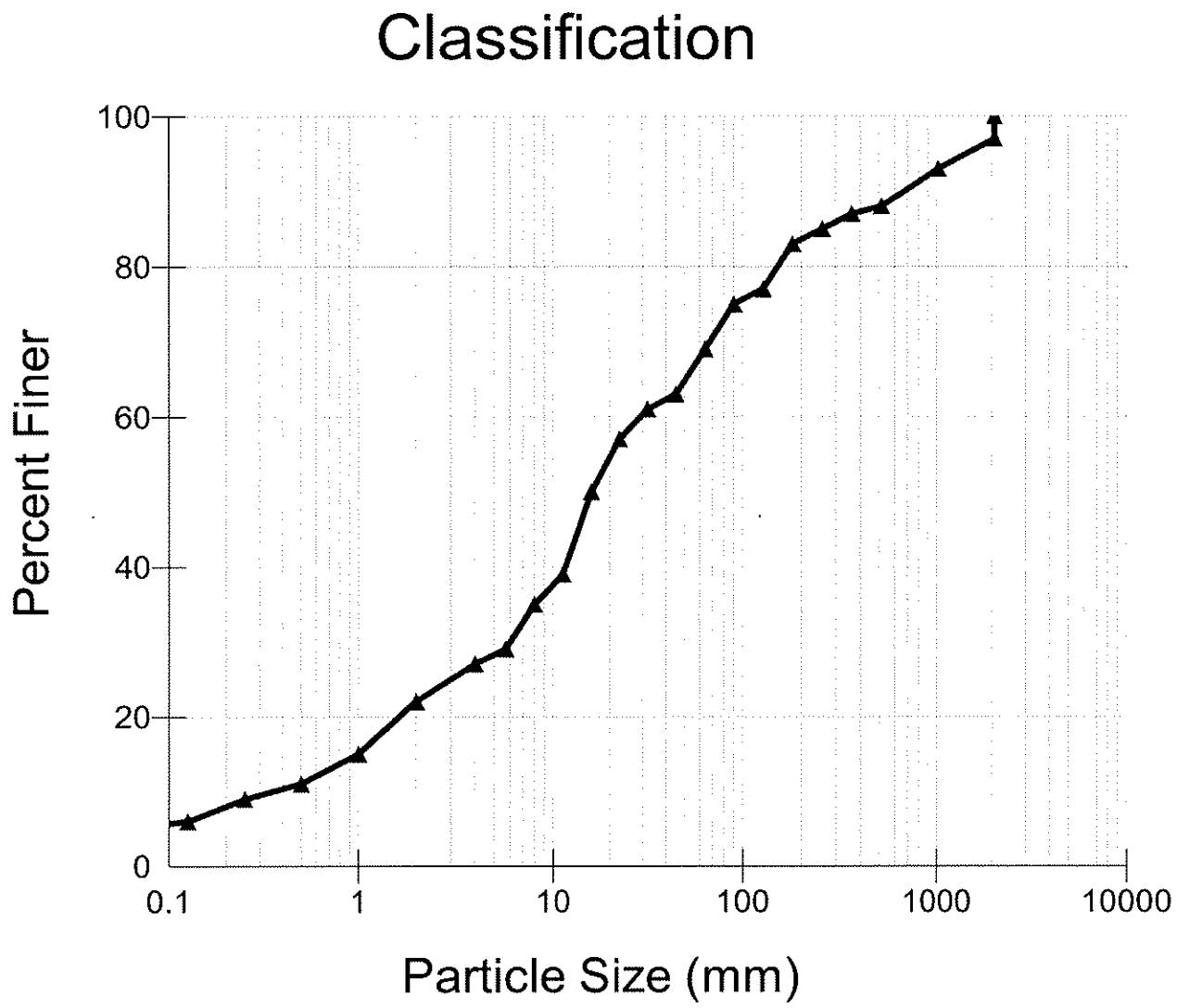
River Name: Sharman's Branch
Reach Name: Team 2
Sample Name: ReachRepresentative
Survey Date: 04/25/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	6	6.00	6.00
0.125 - 0.25	3	3.00	9.00
0.25 - 0.50	2	2.00	11.00
0.50 - 1.0	4	4.00	15.00
1.0 - 2.0	7	7.00	22.00
2.0 - 4.0	5	5.00	27.00
4.0 - 5.7	2	2.00	29.00
5.7 - 8.0	6	6.00	35.00
8.0 - 11.3	4	4.00	39.00
11.3 - 16.0	11	11.00	50.00
16.0 - 22.6	7	7.00	57.00
22.6 - 32.0	4	4.00	61.00
32 - 45	2	2.00	63.00
45 - 64	6	6.00	69.00
64 - 90	6	6.00	75.00
90 - 128	2	2.00	77.00
128 - 180	6	6.00	83.00
180 - 256	2	2.00	85.00
256 - 362	2	2.00	87.00
362 - 512	1	1.00	88.00
512 - 1024	5	5.00	93.00
1024 - 2048	4	4.00	97.00
Bedrock	3	3.00	100.00

D16 (mm)	1.14
D35 (mm)	8
D50 (mm)	16
D84 (mm)	218
D95 (mm)	1536
D100 (mm)	Bedrock
Silt/Clay (%)	0
Sand (%)	22
Gravel (%)	47
Cobble (%)	16
Boulder (%)	12
Bedrock (%)	3

Total Particles = 100.


ReachRepresentative
Percent Retained
15
10
5
0
0.062 - 0.125
0.125 - 0.25
0.25 - 0.50
0.50 - 1.0
1.0 - 2.0
2.0 - 4.0
4.0 - 5.7
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)


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

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:	Reach - Team 2
Date:	4/25/2017	Stream Type:	B4/2a	Valley Type:	C-CO-US
Observers:	Team 2			HUC:	20700041009

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	38.11	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	0.99	d_{bkf} (ft)
Bankfull Riffle WIDTH	38.67	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	39.74	W_p (ft)
D_{84} at Riffle	314.89	Dia. (mm)	D_{84} (mm) / 304.8	1.03	D_{84} (ft)
Bankfull SLOPE	0.0420	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	0.96	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	0.93	R / D_{84}
Drainage Area	3.6	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	1.139	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.01	ft / sec	114.88	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.056	5.29	ft / sec	201.60	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.056	5.29	ft / sec	201.60	cfs
2. Roughness Coefficient: c) Manning's n from Jarrett (USGS): $u = 1.49*R^{2/3}*S^{1/2}/n$ $n = 0.39*S^{0.38}*R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ 0.118	2.52	ft / sec	95.92	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	3.15	ft / sec	120.08	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	3.14	ft / sec	119.60	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 **"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 2-3. Field form for Level II stream classification (Rosgen, 1996; Rosgen and Silvey, 2005).

Stream:	**Sharman's Branch , Reach - Team 2**				
Basin:	**Potomac**	Drainage Area:	acres	**3.6**	mi^2
Location:	**Washington County, MD**				
Twp.&Rge: ;		Sec.&Qtr.: ;			
Cross-Section Monuments (Lat./Long.):	**0 Lat / 0 Long**			Date: **04/25/17**	
Observers: **Team 2**				Valley Type: c-co-us	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**38.67**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A / W_{bkf}$).	**0.99**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**38.11**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**39.06**	ft/ft
Maximum DEPTH (d_{mbkf}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	**1.94**	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.	**48.82**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.26**	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.	**16**	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.	**0.042**	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).	**1.26**	

Stream Type **B 4a/2** (See **Figure 2-14**)

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RIVERMORPH STREAM CHANNEL CLASSIFICATION

River Name:	Sharman's Branch
Reach Name:	Team 2 <-- This is a Reference Reach
Drainage Area:	3.6 sq mi
State:	Maryland
County:	Washington
Latitude:	0
Longitude:	0
Survey Date:	04/25/2017

Classification Data

Valley Type:	C-CO-US	
Valley Slope:	0.0529	ft/ft
Number of Channels:	Single	
Width:	38.67	ft
Mean Depth:	0.99	ft
Flood-Prone Width:	48.82	ft
Channel Materials D50:	16	mm
Water Surface Slope:	0.042	ft/ft
Sinuosity:	1.26	
Discharge:	120.08	cfs
Velocity:	3.151	fps
Cross Sectional Area:	38.11	sq ft
Entrenchment Ratio:	1.46	
Width to Depth Ratio:	39.06	
Rosgen Stream Classification:	B 4a	

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

Stream: **Sharman's Branch** Location: **Reach - Team 2**

Observers: **Team 2** Date: **04/25/17** Valley Type: **C-CO-US** Stream Type: **B 4a**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	34	29.3	38.7	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	38.08	38.04	38.11
Mean Riffle Depth (d_{bkf})	1.15	0.99	1.3	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	30.79	22.52	39.06
Maximum Riffle Depth (d_{max})	1.9	1.85	1.94	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.692	1.423	1.960
Width of Flood-Prone Area (W_{fpa})	46.9	44.9	48.8	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.398	1.262	1.534
Riffle Inner Berm Width (W_{ib})	18.1	18.1	18.1	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.467	0.467	0.467
Riffle Inner Berm Depth (d_{ib})	0.28	0.28	0.28	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.286	0.286	0.286
Riffle Inner Berm Area (A_{ib})	5.12	5.12	5.12	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.134	0.134	0.134
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	63.8	63.8	63.8					

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	31.6	31.2	32	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	0.929	0.917	0.941
Mean Pool Depth (d_{bkfp})	1.7	1.55	1.84	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.478	1.348	1.600
Pool Cross-Sectional Area (A_{bkfp})	53.5	48.3	58.8	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.406	1.268	1.543
Maximum Pool Depth (d_{maxp})	3.15	2.98	3.31	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.739	2.591	2.878
Pool Inner Berm Width (W_{ibp})	26.5	26.5	26.5	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.775	0.775	0.775
Pool Inner Berm Depth (d_{ibp})	1.58	1.58	1.58	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.803	0.803	0.803
Pool Inner Berm Area (A_{ibp})	41.9	41.9	41.9	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.624	0.624	0.624
Point Bar Slope (S_{pb})	0.000	0.000	0.000	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	16.775	16.775	16.775

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

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

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

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

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

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

Stream: **Sharman's Branch**		Location: **Reach - Team 2**	
Observers: **Team 2**	Date: **04/25/17**	Valley Type: **C-CO-US**	Stream Type: **B 4a**

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	3.151	ft/sec	Estimation Method	Darcy-Weisbach	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	120.08	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})	31.8	28.5	37.5	ft	Meander Width Ratio (W_{blt} / W_{bkf})	0.936	0.839	1.104
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)	7.67	6.52	8.46	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	0.226	0.192	0.249
Individual Pool Length (L_p)	7.1	1.09	25.4	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	0.209	0.032	0.746
Pool to Pool Spacing (P_s)	16.6	1.19	32.7	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	0.489	0.035	0.964

Channel Profile

Valley Slope (S_{val})	0.0529	ft/ft	Average Water Surface Slope (S)	0.042	ft/ft	Sinuosity (S_{val} / S)	1.26
Stream Length (SL)	182	ft	Valley Length (VL)	145	ft	Sinuosity (SL / VL)	1.26

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})	0.051	0.017	0.086	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	1.212	0.414	2.051
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)	0.008	0.000	0.023	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.183	0.000	0.546
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)	0.136	0.027	0.237	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	3.227	0.652	5.645

Max Depths[a]	Mean	Min	Max		Dimensionless Depth Ratios	Mean	Min	Max
Max Riffle Depth (d_{maxrif})	2.24	2.07	2.41	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.95	1.8	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})	3.19	2.33	4.72	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.77	2.026	4.1
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})	2.29	1.88	3.33	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	1.99	1.635	2.9

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	0			D_{16}	1.14			124.83	mm
% Sand	22			D_{35}	8			192.67	mm
% Gravel	47			D_{50}	16			314.89	mm
% Cobble	16			D_{84}	218			804.57	mm
% Boulder	12			D_{95}	1536			1005.71	mm
% Bedrock	3			D_{100}	Bedrock			2047.97	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: Sharman's Branch Location: Washington County, MD

Observers: Team 2 Stream Type: B4c/2 Landscape Type: C-CO-US Date: 9/25/17

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				Mean			
	Min.				Min.			
	Max.				Max.			
2. Contraction Scour Pool (CSP)	Mean	16.95	4.04	0.27%	Mean	0.44	4.08	0.064
	Min.	8.5	3.41	0.04%	Min.	0.22	3.44	0.01
	Max.	25.4	4.67	0.5%	Max.	0.66	4.72	0.12
3. Step/Pool (SP)	Mean	7.4	3.54	0.4%	Mean	0.19	3.58	0.095
	Min.	1.8	2.5	0.1%	Min.	0.05	2.53	0.024
	Max.	13.0	4.57	0.7%	Max.	0.34	4.62	0.167
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	15.3	2.98	0.15%	Mean	0.40	3.01	0.036
	Min.	13.3	2.62	0%	Min.	0.34	2.65	0.0
	Max.	17.2	3.34	0.3%	Max.	0.44	3.37	0.071
7. Lateral Protrusion Pool (LPP)	Mean	11.5	2.60	0.7%	Mean	0.30	2.63	0.167
	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.			

W_{bkf} = 38.67
d_{maxp} = 0.99
S = 0.042

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SP 1: L = 1.8

4.4-6.2 Del = 7.15 - 7.14 = 0.01

S = 0.00556

d_{max} = 2.55

SP 2: L = 2.8

,2-11 Del = 7.46 - 7.44 = 0.02

S = 0.00714

d_{max} = 2.55

SP 3: ~~L = 1.1~~

~~Del = 8.90 - 8.84 = 0.06~~

~~S = 0.05455~~

SP 4: L = 13

40-53 Del = 9.60 - 9.61 = 0.01

S = 0.00077

d_{max} = 4.57

SP 5: ~~L = 7.5~~

~~Del = 11.51 - 11.4 = 0.11~~

leave out of average

CSP: L = 8.5

73-82.5 Del = 10.67 - 10.63 = 0.04

d_{max} = 3.41

S = 0.00471

CSP: L = 23.4

129-154.4 Del = 13.73 - 13.72 = 0.01

S = 0.00039

d_{max} = 4.67