TEAM 2 PRESENTATION NOTES (1/20/11)

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
NATIONAL CONSERVATION TRAINING CENTER

① RIFFLE @ STA 0+33.9
↳ TRY NOT TO INCLUDE LATERAL PROTRUSION POOL IN RIFFLE

② POOL @ STA 3+04.5
↳ INNER BERM LOW → RAISE CLOSER TO POINT BAR @ DEPOSITION
(MEAN ANNUAL DISCHARGE FOR INNER BERM 20-30% OF BANKFULL DISCHARGE)

③ GLIDE 2+63.5
↳ RAISE INNER BERM TO BENCH (TEND TOWARDS HIGHER BENCH)

④ LONGPRO
↳ TRY TO AVOID POCKET WATER POOLS
↳ 2 POOLS CLOSE TOGETHER (STA 2+41.5) ON SAME ARC LENGTH
↳ NOT COMPOUND POOL/BEND
↳ BOTH POOLS TURNING IN DOWNSTREAM DIRECTION WITH SEPARATE RADII

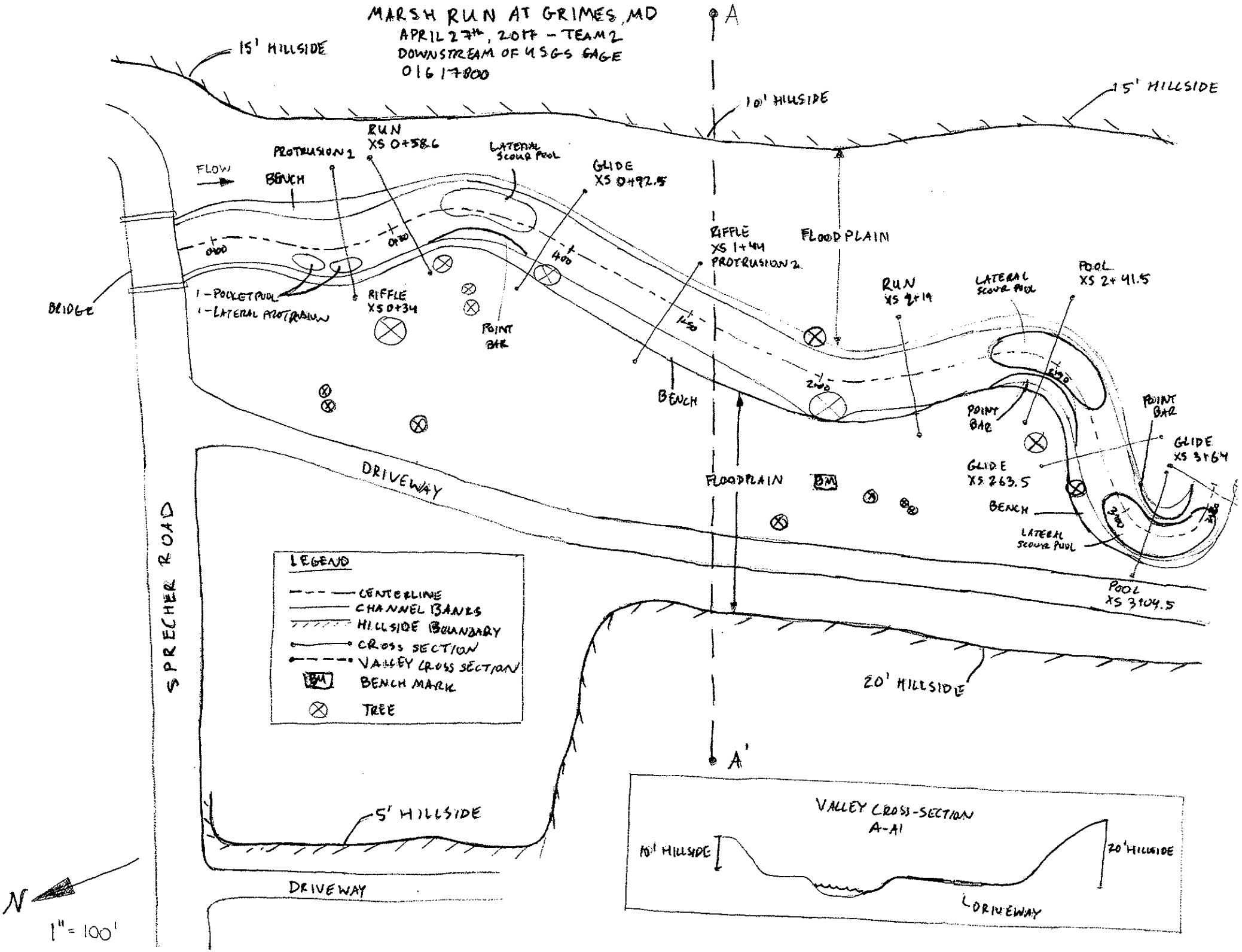
⑤ PROTRUSION
↳ DOMINATED / INFLUENCED BY D50 (VELOCITY)

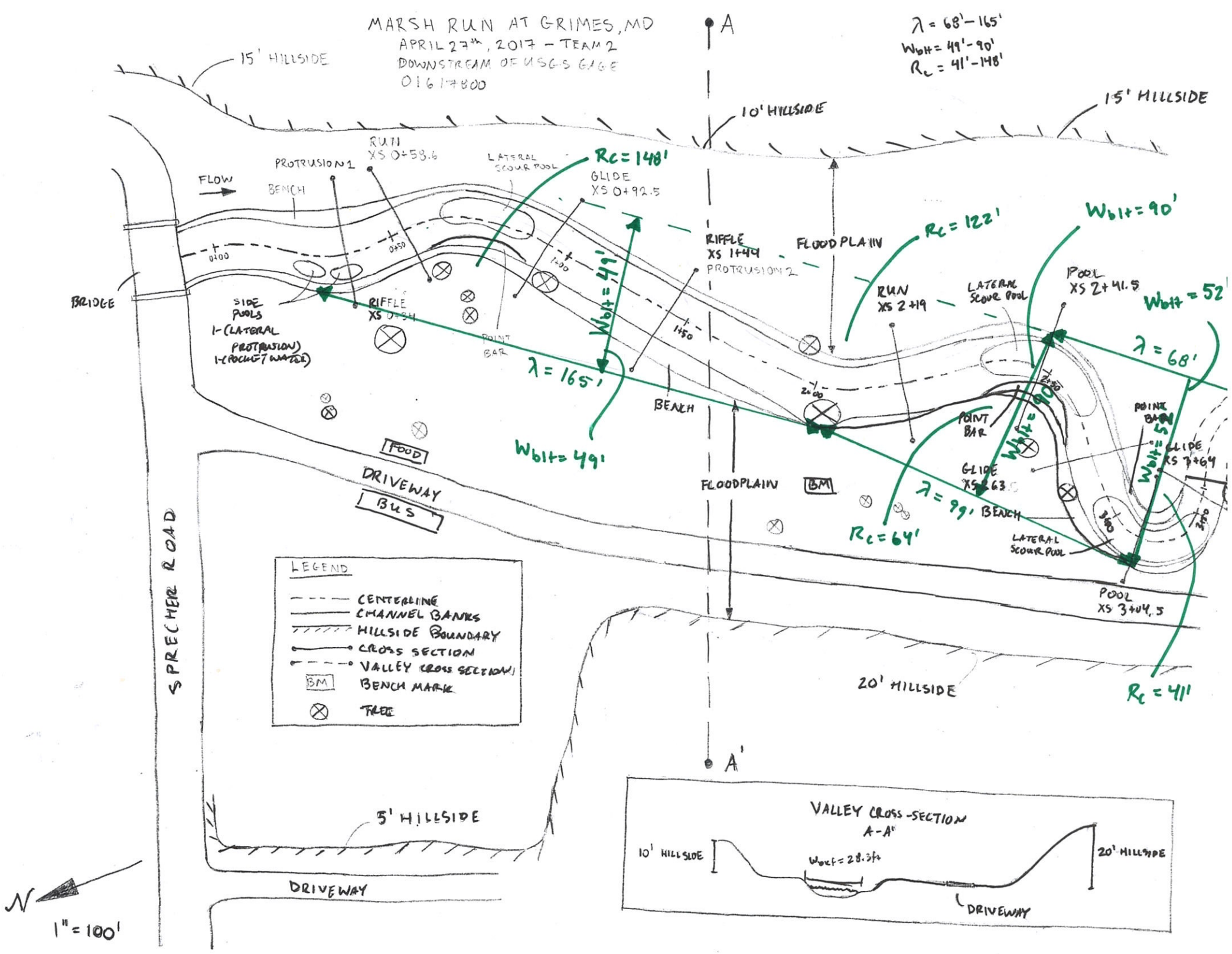
⑥ WKSHT B-3b
↳ LINEAR WAVELENGTH CANNOT BE LESS THAN (SHORTER) THAN STREAM MEANDER LENGTH
↳ RIVERMORPH / FIELD INPUT DATA ERROR?
↳ SKETCH MAP REFLECTS THEM CORRECTLY

⑦ WKSHT B-3b
↳ POOL SLOPE 1.396 IS STEEP
↳ INCLUDED LATERAL PROTRUSION POOL WHICH SHOULD BE REMOVED (ONLY INCLUDE PATTERN FORMING POOLS LIKE LATERAL SCOUR POOLS)

⑧ FIGURE B-34 RELATIVE ROUGHNESS VS FRICTION FACTOR
↳ USED D84 INSTEAD OF D50 → USED IN VELOCITY CALCS.

FIGURE B-36 MANNING'S N BY STREAM TYPE
↳ ADD DATA POINT FOR STREAM TYPE F 1/6/4


MARSH RUN AT GRIMES, MD
APRIL 27th, 2017 - TEAM 2
DOWNSTREAM OF USGS GAGE
01617800
15' HILLSIDE
10' HILLSIDE
15' HILLSIDE
A
FLOW
BENCH
PROTRUSION 1
RUN
XS 0+58.6
LATERAL SCOUR POOL
GLIDE
XS 0+92.5
RIFFLE
XS 1+44
PROTRUSION 2
FLOOD PLAIN
RUN
XS 2+19
LATERAL SCOUR POOL
POOL
XS 2+41.5
BRIDGE
1 - POCKET POOL
1 - LATERAL PROTRUSION
RIFFLE
XS 0+34
POINT BAR
BENCH
POINT BAR
POINT BAR
GLIDE
XS 3+64
GLIDE
XS 2+63.5
BENCH
LATERAL SCOUR POOL
POOL
XS 3+04.5
DRIVEWAY
FLOODPLAIN
BM
SPRECHER ROAD
LEGEND
CENTERLINE
CHANNEL BANKS
HILLSIDE BOUNDARY
CROSS SECTION
VALLEY CROSS SECTION
BENCH MARK
TREE
20' HILLSIDE
A'
5' HILLSIDE
DRIVEWAY
VALLEY CROSS-SECTION
A-A'
10' HILLSIDE
20' HILLSIDE
DRIVEWAY
N
1" = 100'


MARSH RUN AT GRIMES, MD
APRIL 27th, 2017 – TEAM 2
DOWNSTREAM OF USGS GAGE
01617800
λ = 68'–165'
Wbkf = 49'–90'
Rc = 41'–148'
A
A'
15' HILLSIDE
10' HILLSIDE
15' HILLSIDE
FLOW
BENCH
PROTRUSION 1
RUN
XS 0+58.6
LATERAL SCOUR POOL
Rc = 148'
GLIDE
XS 0+92.5
RIFFLE
XS 1+49
PROTRUSION 2
FLOODPLAIN
Rc = 122'
Wbkf = 90'
RUN
XS 2+19
LATERAL SCOUR POOL
POOL
XS 2+41.5
Wbkf = 52'
λ = 68'
BRIDGE
SIDE POOLS
1-(LATERAL PROTRUSION)
1-(POCKET WATER)
RIFFLE
XS 0+34
POINT BAR
Wbkf = 49'
λ = 165'
BENCH
Wbkf = 49'
POINT BAR
Wbkf = 90'
POINT BAR
Wbkf = 52'
GLIDE
XS 3+64
FOOD
DRIVEWAY
BUS
FLOODPLAIN
BM
GLIDE
XS 2+63.5
λ = 99'
BENCH
Rc = 64'
LATERAL SCOUR POOL
POOL
XS 3+44.5
Rc = 41'
SPRECHER ROAD
LEGEND
CENTERLINE
CHANNEL BANKS
HILLSIDE BOUNDARY
CROSS SECTION
VALLEY CROSS SECTION
BM BENCH MARK
TREE
20' HILLSIDE
5' HILLSIDE
DRIVEWAY
N
1" = 100'
VALLEY CROSS-SECTION
A-A'
10' HILLSIDE
Wbkf = 28.3ft
20' HILLSIDE
DRIVEWAY

SURVEY DATA ⟹ **CROSS - SECTION 1**

SITE: MARSH RUN TEAM #2 - Riffle Sta 01+44 Date: 4/27/17

Location: station 01+44

Observers: Ben & Katie HUC:

Item	Distance, Point, or STATION ft	Back-Sight B S ft	Height of Instrument H I ft	Fore-Sight F S ft	Elevation ft	REMARKS / COMMENTS / NOTES
1	Bm	5.40	105.40		100	BM
2	0			4.88		
3	2			5.02		
4	4			5.26		
5	5.5			5.37		
6	7			5.39		
7	9			5.27		
8	11			5.17		
9	13			5.16		
10	14			5.13		
11	14.9			5.54		
12	15.7			6.12		
13	18.4			7.96		WS
14	20			8.56		
15	21			8.57		
16	22			8.41		
17	23			8.49		
18	24			8.49		
19	25			8.44		
20	26			8.39		
21	27			8.37		
22	28			8.39		
23	29			8.51		
24	30			8.54		
25	31			8.46		
26	32			8.41		
27	33			8.34		
28	34			8.32		
	35			8.28		
	36			8.34		

other lag 5.73 .36

7.8 8.43

8.57 − 7.96 = .61

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37		8.33		
38		8.36		WS 8.01
39.3		8.25		7.92
40		8.01		IB 7.61
41		7.94		IB 7.57
42		7.46		IB 7.49
43		7.34		IB 7.31
44.8		7.15		~~BKF~~ 7.10 WS - BKF
45.3		7.02		BKF 7.01
46		6.73		6.75
47		6.17		
48		5.52		
49		4.98		
50.8		4.40		LB
52		4.26		
53		4.20		
54		4.18		
56		4.28		

5.8
6.87

~~1.21~~
~~1.61~~
~~1.42~~
~~3.64~~

DM laser
5.75 difference .35
5.4

WS BKF
8.01 - 7.01 = 1.00

8.01 - 6.75 = 1.26 ?

SURVEY DATA MARSH RUN TEAM 2 → CROSS - SECTION 2

SITE: XS RUN @ 2+19 BEN + CATIE Date: 4/27/17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0+0			5.67		
2	0+2			5.51		
3	0+4			5.52		
4	0+6			5.55		
5	0+8			5.76		LB
6	0+10			6.49		
	0+10.7			7.51		BKF
7	0+11			7.70		~~BKF~~
8	0+11.5			7.94		
9	0+12			8.30		INNER BERM (TYPICALLY NO INNER BERM ON RUNS)
10	0+12.5			8.55		WS
11	0+13			8.72		
12	0+14			9.11		
13	0+15			9.29		
14	0+16			9.32		
15	0+17			9.32		
16	0+18			9.16		
17	0+19			9.11		
18	0+20			9.15		
19	0+21			9.29		
20	0+22			9.02		
21	0+23			8.90		
22	0+24			9.28		
23	0+25			8.88		
24	0+26			9.42		
25	0+27			9.39		
26	0+28			9.29		
27	0+29			9.17		
28	0+30			8.97		
29	0+31			8.84		
30	0+32.1			8.53		WS
31	0+33.2			8.45		

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0+34	8.10
0+35	7.51
0+36	6.67
0+37	6.05
0+39	5.93
0+41	5.80
0+43	5.46
0+45	5.16
0+47	4.92

01+10.7	7.51

8.55	WS
7.51	BKF
1.04	

SURVEY DATA MARSH RUN TEAM 2 → CROSS - SECTION 3

SITE: Pool 02+41.5 Ben & Katie Date: 4/27/17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1		5.40	105.40		100.00	BM
2	0			5.46		
3	2			5.31		
4	4.2			5.31		
5	6			5.22		
6	7.5			5.26		
7	9			6.06		
8	10			7.06		
9	11			7.39		BKF
10	11.5			7.95		
11	12.2			8.22		
12	13.3			8.51		WS
13	14			8.67		
14	15			8.69		
15	16			9.00		
16	17			9.03		
17	18					
18	19.7			9.6		
19	20					
20	21			10.48		
21	21.5			10.49		
22	22			10.51		
23	23			10.49		
24	24			10.39		
25	25			10.11		
26	26			9.87		
27	27			9.62		
28	28			9.38		
29	29			9.40		
30	30			9.31		
31	31			8.55		WS

8.51
7.39
1.12

8.51 WS
7.39 BKF
1.12

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31.5	8.42
32.5	8.09
32.9	7.62
35	5.43
37	5.29
39	5.27
	5.30
41	
43	5.35
45	5.45

9.55
7.62
.93

point bar slope
toe: 9.71
8.62
1.09

6.65 horizontal

$\frac{1.09}{6.65} = .1639$
$= 16.4\%$

POINT BAR SLOPE
TOE: 9.71
8.62
1.09

$\frac{1.09 \text{ EL}}{6.65 \text{ RUN}} = 0.1639$
16.4%

MARSH RUN TEAM 2

XS GLIDE @ 3+64 BEN / CATIE 4/27/17

0+07	→	BKF	
0+11.5	→	THALWEG	
0+00	5.97		
0+02	6.30		
0+04	6.74		
0+05	7.09		
0+06	7.38		
0+07	7.85	BKF	WS BKF 8.90 - 7.85 = 1.05
0+07.4	8.00		
0+07.5	8.96	WS	
0+07.56	9.24		
0+08	9.44		
0+09	9.51		
0+10	9.29		
0+11	9.31		
0+12	9.31		
0+13	9.11		
0+14	9.04		
0+15	9.16		
0+16	9.18		
0+17	9.13		
0+18	9.25		
0+19	9.20		
0+20	9.11		
0+21	8.86	WS	
0+22.3	8.56		
0+23.2	6.95	LOG / TREE ROOT	
0+24	7.22		
0+25	7.04		
0+26	6.30		
0+27	6.16		
0+28	6.03		
0+29	5.87		

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SURVEY DATA → CROSS - SECTION 4

SITE: Glide 2635 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	5.24				
2						
3				5.75		
4						
5				6.98		
6						
7						
8						
9						
10						
11				8.64		
12	0			5.72		
13	4.2			5.86		Top of Bank
14	5.4			6.29		
15	6.5			6.83		
16	7.6			7.52		
17	9.2			7.93		
18	8.0			7.60		
19	9.9			8.34		
20	10.8			8.34		
21	11.3			8.39		WS
22	12.6			9.05		
23	13.4			9.32		
24	15.3			9.31		
25	16.8			9.23		
26	18			8.99		Rock
27	18.5			9.34		
28	19.9			9.23		
29	20.9			9.13		
30	22.3			8.86		
31	23.1			8.76		Rock

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Station	FS	
24.6	8.78	Rock
25.7	8.74	
25.9	8.44	WS
26.2	8.23	
26.8	7.94	
27.8	7.52	
29	7.04	
28.5	7.31	Bankfull
29.7	6.73	
30.9	6.24	
32.2	6.00	Top of Bank
38.6	5.06	Root upheaval
BM	5.24	

1412 249 1900 135 2816

SURVEY DATA → CROSS - SECTION 5

SITE: 1st Riffle 33.9 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0+00	6.43		4.22		LBP
2	0+1.5			4.29		
3	2.3			4.39		Top Bank
4	2.9			4.95		
5	4.0			5.69		
6	5.4			6.75		
7	5.8			7.02		BKF
8	6.1			7.26		BKF 7.1 BKF
9	6.5			7.42		
10	6.9			7.65		
11	7.6			7.82		
12	8.4			7.90		IB
13	10.1			8.19		IB
14	11.4			8.08		IB
15	13.3			7.92		"
16	14.7			7.88		"
17	16.6			8.03		"
18	17.7			8.31		"
19	18.5			8.41		
20	19.1			8.23		LOG
21	20			7.92		
22	21			8.65		
23	21.8			8.28		Branch (wood)
24	22.4			8.45		
25	23.3			8.38		WS
26	24.4			8.55		WS
27	25			8.52		
28	25.8			8.65		
29	28.5			8.75		
30	29.9			8.71		
31	31.5			8.52		

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Sta	FS	COMMENT
33	8.55	
34.2	8.83	
35.4	9.02	
36.5	9.07	
38	9.46	TWG
39	8.53	
38.5	8.63	
40.2	9.04	
41.6	9.04	
42.5	8.63	
42.8	7.33	Log
43.5	7.98	Log
44.0	8.65	
45.7	8.33	WS
46.4	6.76	
48.0	5.24	TOB
50.0	4.76	TOB
68.0	4.78	RBP
50	4.05	

SURVEY DATA → CROSS - SECTION 6

SITE: GLIDE Sta 0+92.5 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0+00	6.43		3.80		LB
2	2.0			4.49		
3	6.0			5.29		
4	8.4			5.45		LTB
5	10			5.66		
6	11.3			6.10		
7	12.5			6.5		
8	13.7			6.93		
9	14.6			7.35		
10	15.0			7.68		Pos. BKF
11	15.4			8.2		Pos. BKF
12	15.7			8.25		Pos. BKF
13	16.3			8.72		"
14	17.4			8.90		WS
15	18.9			9.13		
16	19.8			9.10		
17	20.7			9.01		
18	21.1			9.15		
19	21.5			8.82		Rock
20	22.4			9.00		"
21	23.0			9.22		TWG
22	23.9			9.49		
23	25.0			9.55		TWG
24	26.9			9.30		
25	27.3			9.25		
26	28.5			9.20		
27	29.9			9.22		
28	31.7			9.39		
29	32.3			9.09		
30	33.5			8.75		WS (Root Mass Uplifting Water ?)
31	34.6			8.53		Root soil

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STA	FS	COMMENT
35.2	7.8	Root soil
36.0	7.43	"
36.9	6.91	
38.8	6.04	
41.0	5.21	TOB
44.0	4.27	
47.0	4.26	
55.0	5.07	
70.0	5.13	RBP

SURVEY DATA → CROSS - SECTION 7

SITE: 1st Run Station: [redacted] 58.6 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	6.78				
2	0	3.94				
3	5	4.40				
4	6.9	4.69				Top of Bank
5	8	5.23				
6	9	6.00				
7	10.2	6.76				
8	10.8	7.21				
9	11.3	7.68				
10	11.6	7.86				
11	12.6	8.08				
12	13.9	8.39				
13	14.8	8.69				
14	15.4	8.83				Inner berm
15	16.5	9.00				Water surface
16	17.4	9.23				
17	18.6	9.54				
18	20.7	9.59				
19	22.4	9.65				
20	24.8	9.53				
21	25.8	9.64				
22	27.3	9.59				
23	28.3	9.65				
24	30.0	9.51				
25	31.0	9.51				
26	31.5	9.64				
27	32.5	9.49				
28	33.1	9.39				
29	34.2	9.54				
30	34.9	9.49				
31	35.8	9.42				

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Station	FS	
37.5	9.52	
38.3	9.64	
39.7	9.51	
40.2	9.08	WS
40.2	9.43	
40.7	7.59	
41.3	7.34	
43	7.34	
44.6	7.14	
46.3	6.77	
47.6	5.89	
49.2	5.09	
50.3	4.74	Top of bank
52	4.71	
60	5.30	
74	5.18	

BM — 6.78

SURVEY DATA → CROSS - SECTION 8

SITE: Pool 304.5 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	5.48				
2	0			6.52		
3	4.3			6.59		
4	6.2			7.09		Top of Bank
5	7.0			8.62		WS
6	7.5			9.18		
7	8.5			9.15		
8	9.5			9.26		
9	10.2			9.30		
10	11.2			9.49		
11	12.3			9.62		
12	13.3			9.63		Rock
13	14.5			9.74		Rock
14	15.2			10.09		
15	16.2			10.35		
16	17.2			10.45		
17	18.4			10.49		
18	19.4			10.79		
19	20.4			11.01		Thalweg
20	22			10.72		
21	22.5			10.84		
22	23.2			10.63		
23	24.2			10.06 *		
24	25.1			9.86		
25	26.3			9.28 *		
26	27.0			9.00		
27	27.2			8.84		WS
28	27.5			8.79		
29	28.2			8.64		
30	29.3			8.22		
31	29.4			8.18		

* redone due to initial misreading of instrument

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Station	FS	
30.2	7.79	Bank full (?)
32.8	7.83	
34.2	6.94	
35	6.60	
~~[illegible]~~		~~Top of Bank~~
35.5	5.84	
36.1	5.55	Top of Bank
43.4	5.42	RB
BM	5.48	

SURVEY DATA ⟹ **LONGITUDINAL PROFILE 1**

SITE: Marsh Run @ Grimes, MD **Date:** 4/27/17

Location: Reach 2

Observers: Team 2 HUC: 02070004110 4

IB

	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	5.40	105.40				100					
2	0					6.70						riffle/top
3	-5.5			7.22		6.65		5.99?		0.66?		riffle top
4	0			7.41		6.74						in riffle
5	8			7.62		6.93		5.84?		1.09		in riffle
6	13			7.56		7.16						top run
7	15.5			7.98		7.16						end run/top pool
8	18			8.13		7.51						middle pool
9	22			8.43		7.15						deepest part of pool
10	27			8.42		7.12						end pool/start glide
11	31			8.25		7.14						glide
12	33.9			8.45		7.61						XS 1 - R
13	41			8.55		7.36						riffle?
14	46			7.98		7.38						riffle?
15	51			8.21		7.42		6.15?		1.27		end riffle? run begin
16	61			8.35		7.65		6.05?		1.60?		run
17	64			8.75		7.66						start pool
18	71			8.88		7.65		6.56*		1.09		mid pool
19	76.2			8.85		7.68		6.65*		1.03		mid pool
20	80			8.70		7.65						end pool/glide
21	58.6			8.15		7.66		6.61*		1.05		XS-2 - R
22	86			8.67		7.67						start riffle
23	90			8.62		7.69		6.03?		1.66?		mid break riffle
24	97			8.53		7.95						bottom break R, F
25	109.5			8.64		7.95		7.16?		0.79?		
26	137.5			8.53		8.01		6.87*		1.14		CS
27												

100/bank sampling main pool

92.5

7.75

144

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SURVEY DATA → **LONGITUDINAL PROFILE 2** 2/2

SITE: Marsh Run Date: 4/27/17

Location: Reach 2

Observers: Team 2 HUC: 02070004110 4

	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~~ BF Elev	~~Low Bank HI Elevation Elev. ft~~	NOTES e.g. Riffle Run Pool Glide
28	178		10.53	8.57		8.16		7.26		0.96		mid R
29	210			9.59		8.53		7.45		1.08		mid R
30	205			8.88		8.53						mid R
31	234			10.20		8.58						top P
32	241.5			10.54		8.54						Pool-XS-P
33	255.6			10.42		8.56		7.69		0.87		mid P
34	258			9.27		8.61						~~[illegible]~~
35	263.5			9.23		8.66		7.47		1.19		G-XS-G
36	277.7			10.27		8.74		7.64		1.10		top G
37	272			9.57		8.86						mid R
38	304			10.95		8.79						P-XS P
39	342			10.55		8.80		7.67		1.13		BF, P
40	359			9.46		8.90						mid G
41	367			10.09		8.95						mid R
42	364			9.35		8.83		7.79		1.04		G-XS-G ? Break
43	92.5			8.37		7.68		6.73		0.95		G-XS-G
44	144			8.56		8.04		6.95		1.09		R-XS-R
45	219			9.46		8.57		7.81		0.76		U-XS-U
46												
47												
48												
49												
50												
51												
52												
53												
54												

7.90
8.27
219

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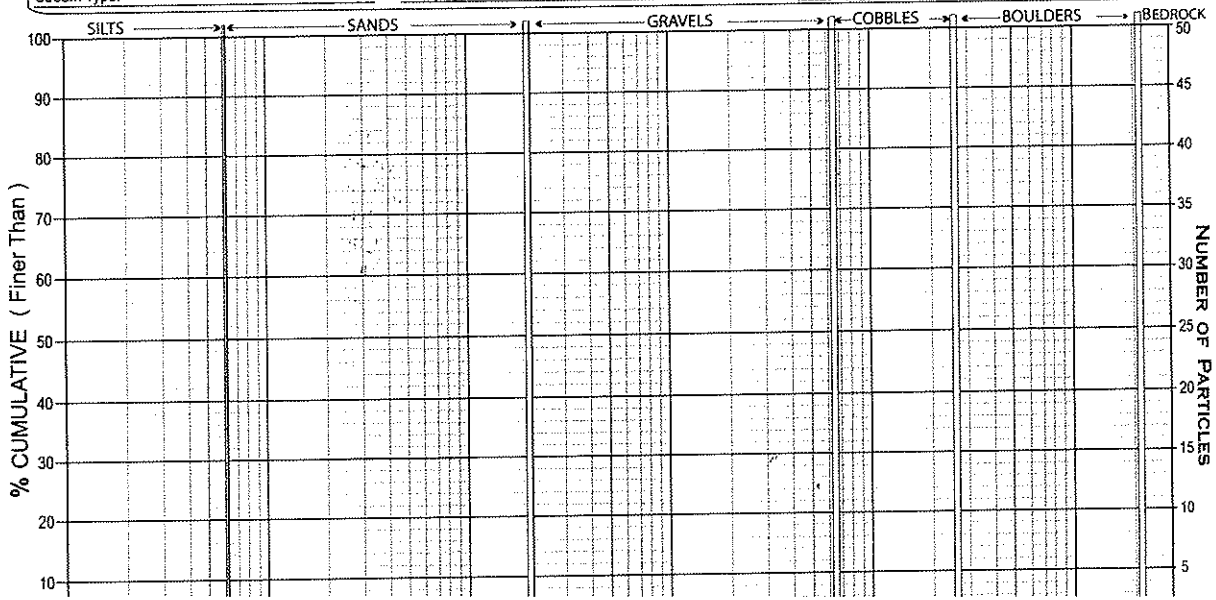
Reach 1

Site: Marsh Run - Velocity station 1+44 Riffle #1 Protrusion
Date: 4/27/2007
Location: Reach 2
HUC:
Party: Team 2

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
	Silt/ Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL				3								
.16 - .22	Fine	4 - 5.7					4								
.22 - .31	Fine	5.7 - 8					4								
.31 - .44	Medium	8 - 11.3					3								
.44 - .63	Medium	11.3 - 16					9								
.63 - .89	Coarse	16 - 22.6					13								
.89 - 1.3	Coarse	22.6 - 32					18								
1.3 - 1.8	Very Coarse	32 - 45					15								
1.8 - 2.5	Very Coarse	45 - 64					14								
2.5 - 3.5	Small	64 - 90	COBBLE				14								
3.5 - 5.0	Small	90 - 128					9								
5.0 - 7.1	Large	128 - 180					6								
7.1 - 10.1	Large	180 - 256					1								
10.1 - 14.3	Small	256 - 362	BOULDER				1								
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
Stream Type:			Valley Type:			TOTAL→									

PEBBLE COUNT DATA

LOCATION: Date:
REACH: PARTY:
Stream Type: Valley Type: HUC:



Reach 1

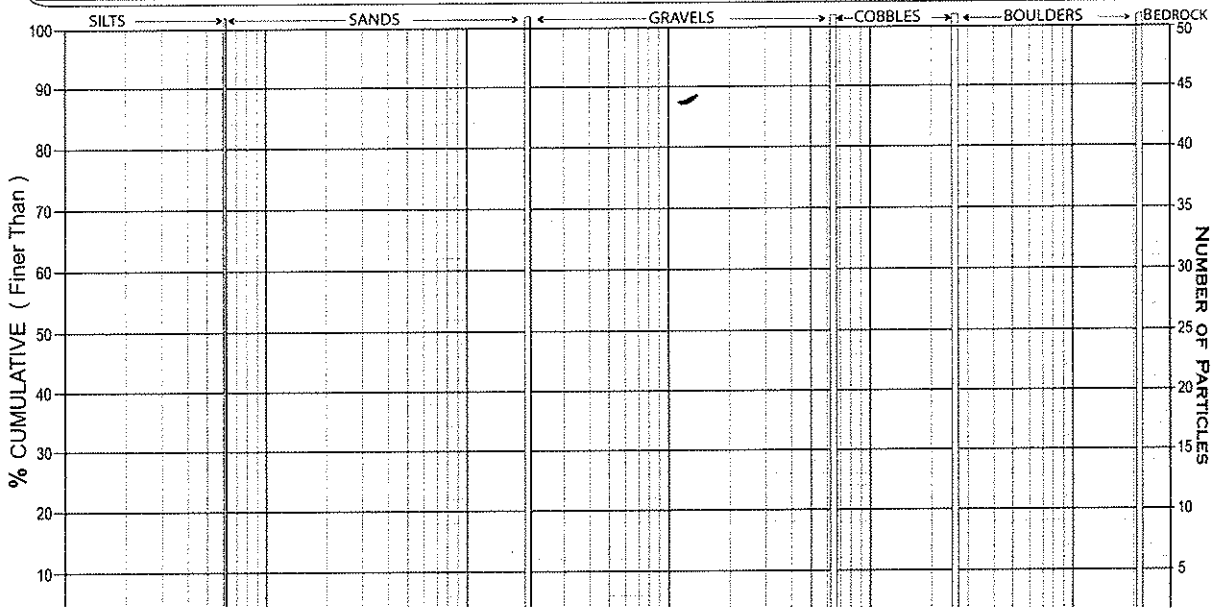
Site:
Location: Reach 2
Party:
Date: 9/27/2017
HUC:

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE	POOL	COMP.	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4					1								
.16 - .22	Fine	4 - 5.7	GRAVEL	1			1								
.22 - .31	Fine	5.7 - 8		1			1								
.31 - .44	Medium	8 - 11.3		1			5								
.44 - .63	Medium	11.3 - 16		卌			7								
.63 - .89	Coarse	16 - 22.6		卌			7								
.89 - 1.3	Coarse	22.6 - 32		卌			7								
1.3 - 1.8	Very Coarse	32 - 45		卌			14								
1.8 - 2.5	Very Coarse	45 - 64		卌 卌			13								
2.5 - 3.5	Small	64 - 90	COBBLE	卌 卌			13								
3.5 - 5.0	Small	90 - 128		卌 卌			19								
5.0 - 7.1	Large	128 - 180		卌 卌 卌			15								
7.1 - 10.1	Large	180 - 256		卌 卌			5								
10.1 - 14.3	Small	256 - 362	BOULDER	卌			2								
14.3 - 20	Small	362 - 512		卌			3								
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												

Stream Type: Valley Type: TOTAL →

PEBBLE COUNT DATA

LOCATION: Date:
REACH: PARTY:
Stream Type: Valley Type: HUC:



Reach 1

70% Riffle 30% Pool

Site: Reach 2

Location: Marsh Run HUC:

Date: 4/27/17

Party: TEAM 2

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

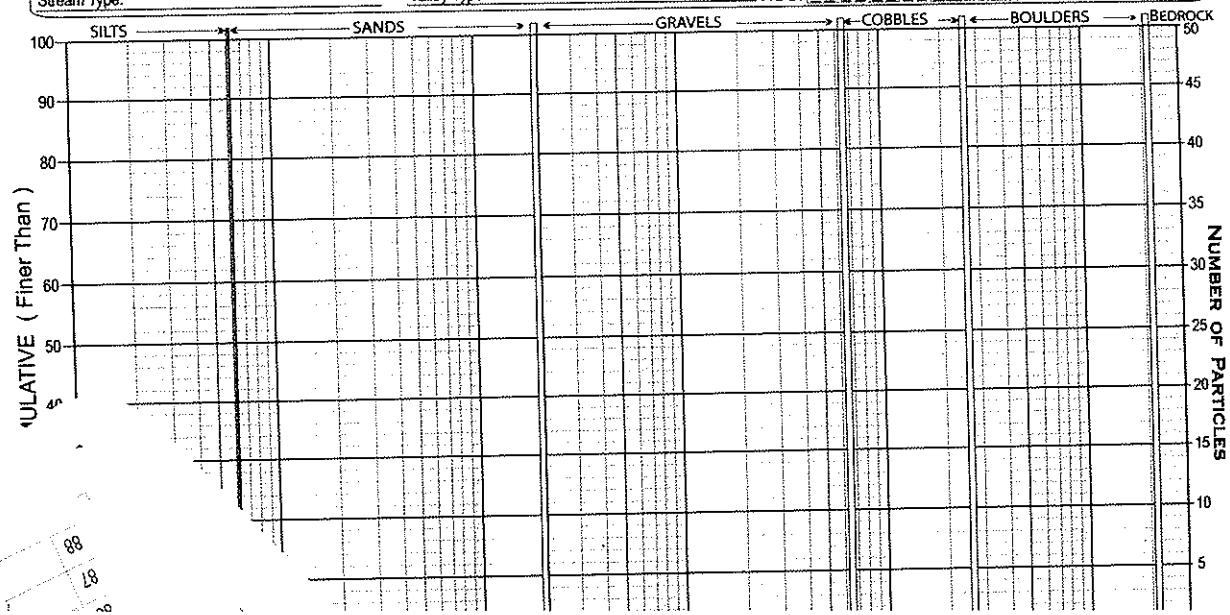
Stream Type: 1111 Valley Type: 39 10 TOTAL→

PEBBLE COUNT DATA

LOCATION: Date:

REACH: PARTY:

Stream Type: Valley Type: HUC:



Reach 1

Worksheet 2-3. Field form for Level II stream classification (Rosgen, 1996; Rosgen and Silvey, 2005).

Stream:	**Marsh Run, Reach - Reach 2 (Team 2)**				
Basin:		Drainage Area:	**12173** acres	**19.02**	mi^2
Location:	**Marsh Run Team 2**				
Twp.&Rge:	**;**	Sec.&Qtr.:	**;**		
Cross-Section Monuments (Lat./Long.):	**39.51456 Lat / 77.77722 Long**			Date:	**04/27/17**
Observers:	**Team 2**			Valley Type:	U-AL-AD

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**28.29**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A / W_{bkf}$).	**1.11**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**31.48**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**25.49**	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.	**1.56**	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.	**33.43**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.18**	ft/ft
Channel Materials (Particle Size Index) D_{50} The D_{50} particle size index represents the mean diameter of channel materials, as sampled from the channel surface, between the bankfull stage and Thalweg elevations.	**34.6**	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.	**0.00482**	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).	**1.25**	

Stream Type **F 1/6/4** (See **Figure 2-14**)

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

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Marsh Run			Location:	Reach - Reach 2 (Team 2)
Date:	4/27/2017	Stream Type:	F2	Valley Type:	U-AL-AD
Observers:	Team 2			HUC:	20700041104

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	31.48	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.11	d_{bkf} (ft)
Bankfull Riffle WIDTH	28.29	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	28.89	W_p (ft)
D_{84} at Riffle	34.60	Dia. (mm)	D_{84} (mm) / 304.8	0.11	D_{84} (ft)
Bankfull SLOPE	0.0048	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.09	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	9.56	R / D_{84}
Drainage Area	19.0	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	0.411	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.45	ft / sec	108.61	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.033	3.31	ft / sec	104.26	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.076	1.44	ft / sec	45.27	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 $n =$ 0.051	2.16	ft / sec	67.84	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	3.53	ft / sec	111.26	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Chezy C	0.00	ft / sec	0.00	cfs
4. Continuity Equations: a) Regional Curves $u = Q / A$ Return Period for Bankfull Discharge Q = 1.9 year	3.27	ft / sec	103.00	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$	3.46	ft / sec	109.00	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 2-4b. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Marsh Run**		Location: **Reach - Reach 2 (Team 2)**	
Observers: **Team 2**	Date: **04/27/17**	Valley Type: **U-AL-FD**	Stream Type: **F 3/1**

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	3.45	ft/sec	Estimation Method	Manning	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	108.61	cfs	Drainage Area	19.02	mi^2

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	110	68	165	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	3.220	1.989	4.832
Stream Meander Length (L_m)	150	143	153	ft	Stream Meander Length Ratio (L_m / W_{bkf})	4.378	4.183	4.475
Radius of Curvature (R_c)	93.8	41	148	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	3.310	1.450	5.230
Belt Width (W_{blt})	63.7	49	90	ft	Meander Width Ratio (W_{blt} / W_{bkf})	1.863	1.433	2.632
Arc Length (L_a)	59.3	42	84	ft	Arc Length to Riffle Width (L_a / W_{bkf})	1.734	1.228	2.457
Riffle Length (L_r)	59.3	5.6	113	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	1.733	0.164	3.302
Individual Pool Length (L_p)	45	25.9	87.5	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	1.316	0.758	2.558
Pool to Pool Spacing (P_s)	95.9	49.1	163	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	2.806	1.435	4.778

Channel Profile

Valley Slope (S_{val})	0.006	ft/ft	Average Water Surface Slope (S)	0.00482	ft/ft	Sinuosity (S_{val} / S)	1.25
Stream Length (SL)	372.5	ft	Valley Length (VL)	297.6	ft	Sinuosity (SL / VL)	1.25

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})	0.008	0.008	0.008	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	1.608	1.564	1.651
Run Slope (S_{run})	0.014	0.003	0.032	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	2.913	0.712	6.612
Pool Slope (S_p)	0.003	0.001	0.007	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.564	0.180	1.396
Glide Slope (S_g)	0.005	0.001	0.007	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	1.008	0.108	1.436
Step Slope (S_s)	0.000	0.000	0.000	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	0.000	0.000	0.000

Max Depths[a]	Mean	Min	Max		Dimensionless Depth Ratios	Mean	Min	Max
Max Riffle Depth (d_{maxrif})	1.6	1.58	1.61	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.4	1.386	1.41
Max Run Depth (d_{maxrun})	1.87	1.63	2.31	ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	1.64	1.43	2.03
Max Pool Depth (d_{maxp})	2.37	1.58	3.24	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.08	1.386	2.84
Max Glide Depth (d_{maxg})	1.57	1.36	1.72	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	1.38	1.193	1.51
Max Step Depth (d_{maxs})	0	0	0	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	0	0	0

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	11			D_{16}	0.75			13.51	mm
% Sand	9			D_{35}	22.6			24.64	mm
% Gravel	23			D_{50}	80.55			34.6	mm
% Cobble	15			D_{84}	Bedrock			87.69	mm
% Boulder	3			D_{95}	Bedrock			147.93	mm
% Bedrock	39			D_{100}	Bedrock			361.99	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 2-4a. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

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

Observers: **Team 2** Date: **04/27/17** Valley Type: **U-AL-FD** Stream Type: **F 3/1**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	34.19	28.29	40.08	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	39.04	31.48	46.60
Mean Riffle Depth (d_{bkf})	1.14	1.11	1.16	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	30.02	25.49	34.55
Maximum Riffle Depth (d_{max})	1.88	1.56	2.2	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.651	1.405	1.897
Width of Flood-Prone Area (W_{fpa})	39.56	33.43	45.69	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.161	1.140	1.182
Riffle Inner Berm Width (W_{ib})	27.68	19.47	35.9	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.792	0.688	0.896
Riffle Inner Berm Depth (d_{ib})	0.5	0.39	0.61	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.437	0.351	0.522
Riffle Inner Berm Area (A_{ib})	14.67	7.59	21.74	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.354	0.241	0.467
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	54.61	49.94	59.28					

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	24.21	22.12	26.3	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	0.708	0.647	0.769
Mean Pool Depth (d_{bkfp})	1.82	1.75	1.89	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.596	1.535	1.658
Pool Cross-Sectional Area (A_{bkfp})	44	41.87	46.13	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.127	1.072	1.182
Maximum Pool Depth (d_{maxp})	3.17	3.12	3.22	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.781	2.737	2.825
Pool Inner Berm Width (W_{ibp})	11.86	10.36	13.37	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.499	0.394	0.604
Pool Inner Berm Depth (d_{ibp})	0.72	0.65	0.79	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.395	0.373	0.417
Pool Inner Berm Area (A_{ibp})	8.64	6.76	10.53	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.199	0.147	0.251
Point Bar Slope (S_{pb})	0.159	0.153	0.164	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	16.428	15.877	16.978

Run Dimensions*	Mean	Min	Max		Run Dimensionless Ratios****	Mean	Min	Max
Run Width (W_{bkfr})	26.66	24.3	29.01	ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})	0.780	0.711	0.848
Mean Run Depth (d_{bkfr})	1.45	1.42	1.47	ft	Mean Run Depth to Mean Riffle Depth (d_{bkfr} / d_{bkf})	1.272	1.246	1.289
Run Cross-Sectional Area (A_{bkfr})	38.57	34.46	42.67	ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})	0.988	0.883	1.093
Maximum Run Depth (d_{maxr})	1.85	1.79	1.91	ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})	1.623	1.570	1.675
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})	18.42	17.11	19.74	ft				

Glide Dimensions*	Mean	Min	Max		Glide Dimensions & Dimensionless Ratios****	Mean	Min	Max
Glide Width (W_{bkfg})	19.01	15.7	21.23	ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})	0.556	0.459	0.621
Mean Glide Depth (d_{bkfg})	1.3	1.26	1.38	ft	Mean Glide Depth to Mean Riffle Depth (d_{bkfg} / d_{bkf})	1.140	1.105	1.211
Glide Cross-Sectional Area (A_{bkfg})	24.83	19.78	29.38	ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})	0.636	0.507	0.753
Maximum Glide Depth (d_{maxg})	1.81	1.66	2.03	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	1.588	1.456	1.781
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})	14.6	12.46	15.96	ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})	51.6	40.3	67.4
Glide Inner Berm Width (W_{ibg})	13.87	12.80	15.10	ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})	0.73	0.67	0.79
Glide Inner Berm Depth (d_{ibg})	0.28	0.19	0.34	ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})	0.22	0.19	0.34
Glide Inner Berm Area (A_{ibg})	3.98	2.43	4.83	ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})	0.16	0.10	0.19

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

Stream: MARSH RUN Location: TEAM 2

Observers: TEAM 2 Stream Type: F 1/6/4 Landscape Type: U-AL-AD Date: 4/27/17

Pool Type		Dimensional Values: Pool Length (L_p)	Pool Max Depth (d_{maxp})	Pool Slope (S_p)		Dimensionless Ratios: 28.3 Pool Length to Riffle Width (L_p / W_{bkf})	Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})	0.00489 Pool Slope to Average Slope (S_p / S)
1. Lateral Scour Pool (LSP)	Mean	49.63	3.17	0.000475	Mean	1.75	2.85	0.097
	Min.	35.00	3.12	0.0001	Min.	1.24	2.81	0.020
	Max.	64.26	3.22	0.00085	Max.	2.27	2.90	0.174
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	9.4	2.4	0.0011	Mean	0.33	2.16	0.22
	Min.	9.4	2.4	0.0011	Min.	0.33	2.16	0.22
	Max.	9.4	2.4	0.0011	Max.	0.33	2.16	0.22
7. Lateral Protrusion Pool (LPP)	Mean	8.7	2.2	0.0011	Mean	0.31	1.98	0.22
	Min.	8.7	2.2	0.0011	Min.	0.31	1.98	0.22
	Max.	8.7	2.2	0.0011	Max.	0.31	1.98	0.22
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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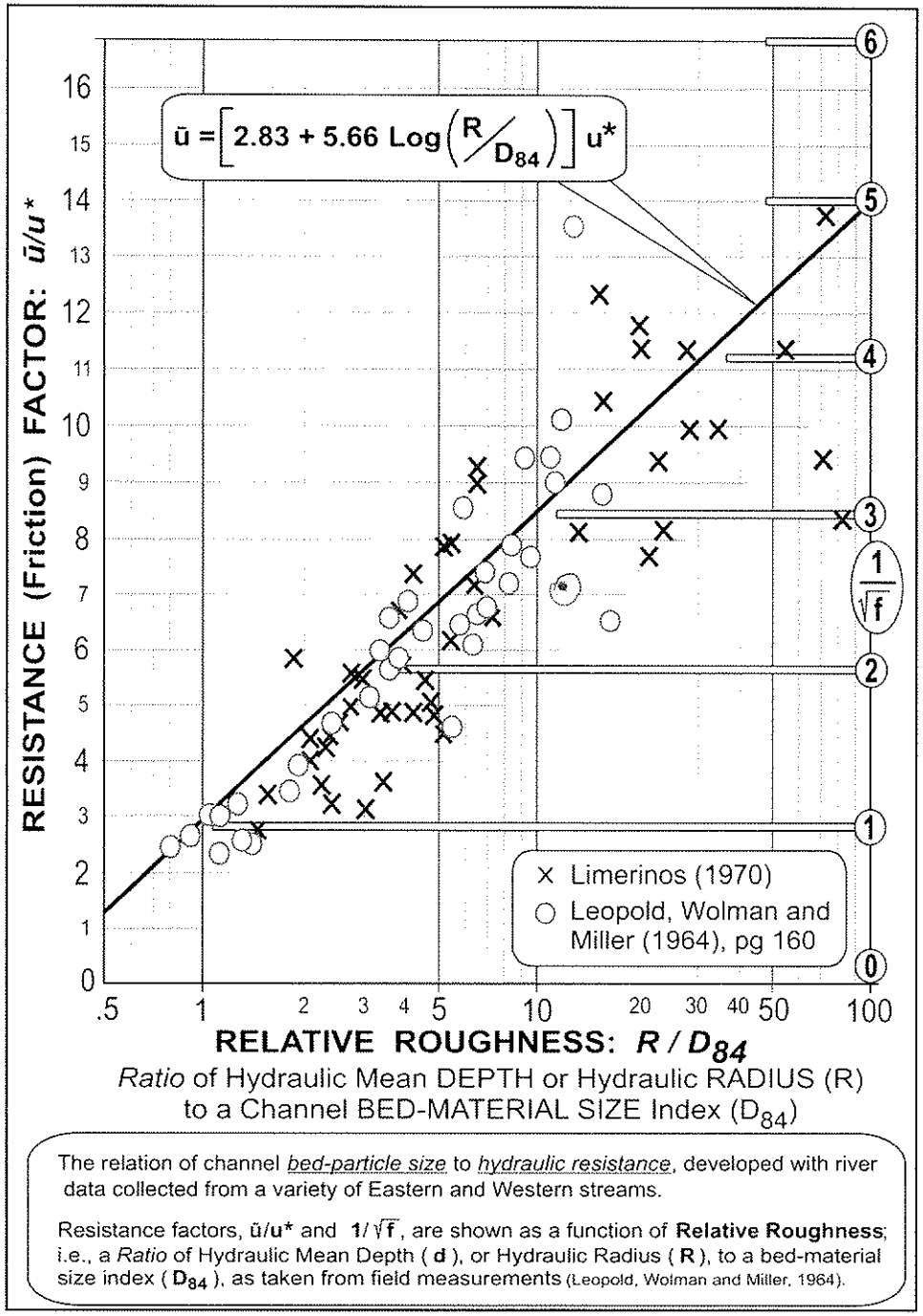

Figure B-34. Relative roughness (R/D_{84}) *vs.* friction factor ($\bar{u}/u^*$).

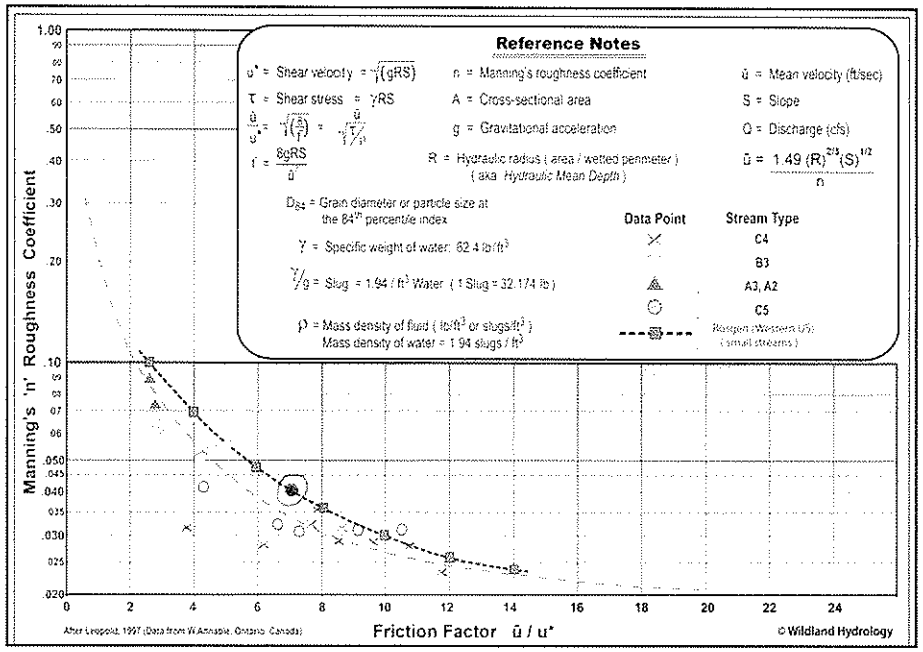

Figure B-35. Friction factor ($\bar{u}/u^*$) *vs.* Manning's roughness coefficient 'n'.

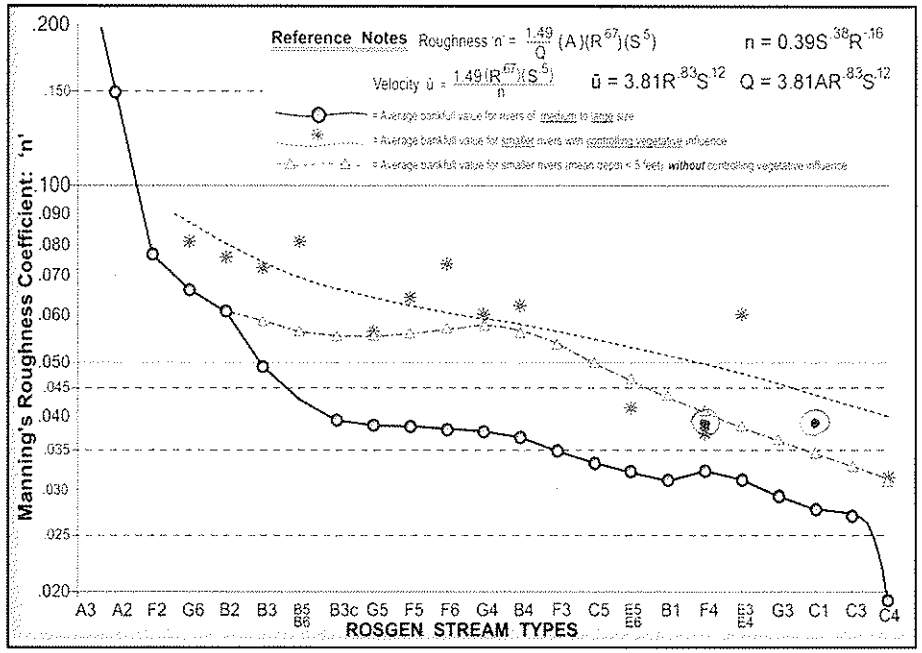

Figure B-36. Manning's 'n' roughness coefficient by stream type.

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

Station NAME:	Marsh Run	Station Number:	2
LOCATION:			
Period of Record:	52 yrs	Mean Annual DISCHARGE:	— cfs
Drainage AREA:	12173 acres 18.9 mi^2	Drainage Area Mn Elev:	— ft
Reference REACH SLOPE:	.00489 ft/ft	Valley Type:	V-AL-AD
Stream Type:	F1/4/6	HUC:	

"BANKFULL" CHARACTERISTICS

Determined from FIELD MEASUREMENT			Determined from GAGE DATA Analysis		
Bankfull WIDTH (W_{bkf})	28.3	ft	Bankfull WIDTH (W_{bkf})	21.509	ft
Bankfull Mean DEPTH (d_{bkf})	1.11	ft	Bankfull MEAN DEPTH (d_{bkf})	1.83	ft
Bankfull Xsec AREA (A_{bkf})	31.48	ft^2	Bankfull Xsec AREA (A_{bkf})	37.43	ft^2
Wetted PERIMETER (W_P)	28.89	ft	Wetted PERIMETER (W_P)	25.17	ft
Bankfull STAGE (Gage Ht)	2.00	ft	Bankfull STAGE (Gage Ht)	1.01	ft
Est. Mean VELOCITY (u)	3.45	ft/sec	Mean VELOCITY (u)	2.92	ft/sec
Est. Bkf. DISCHARGE (Q_{bkf})	108.61	cfs	Bankfull DISCHARGE (Q_{bkf})	109.1	cfs

Bankfull DISCHARGE associated with **"field-determined"** Bankfull STAGE (From Gage Height reading at Staff Plate and tabular Stage-Discharge curve data)	109	cfs
Recurrence Interval (Log-Pearson) associated with **"field-determined"** Bankfull Discharge	2	yrs

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

1.5 Year **R.I.** Discharge =	69.8	cfs	**10** Year **R.I.** Discharge =	285	cfs
2.0 Year **R.I.** Discharge =	102	cfs	**25** Year **R.I.** Discharge =	389	cfs
5.0 Year **R.I.** Discharge =	202	cfs	**50** Year **R.I.** Discharge =	467	cfs

MEANDER GEOMETRY

Meander Wavelength (L_m)	149.7	ft	Radius of Curvature (R_C)	93.75	ft
Belt Width (W_{blt})	63.7	ft	Meander Width Ratio (W_{blt}/W_{bkf})	2.25	ft/ft

HYDRAULIC GEOMETRY

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

	Width (**W**)	Depth (**d**)	Area (**A**)	Velocity(**u**)
Intercept Coefficient **a**)	11.242	.3878	.2202	4.5328
Slope Exponent **b**)	.1383	.3303	.5513	.45

Hydraulic Radius R = A / W_P	1.09	ft	**Manning's "n"** at Bankfull Stage	0.032	Coeff.

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

Worksheet B-5. Procedure to validate hydraulic relations using gage station data.

Validation of Hydraulic Relationships Using Gaging Station Data

1. Obtain the drainage area associated with the gaging station.
2. Obtain the field-determined bankfull discharge at the gaging station (**Figure B-43**).
3. Obtain the bankfull channel dimensions from the gaging station hydraulic geometry relationships (discharge *vs.* width, depth, area, and velocity).
4. Measure the average water surface slope.
5. Perform an active bed pebble count on the riffle to obtain D_{84}.
6. Determine the stream type.
7. Solve for Manning's 'n' at the bankfull stage: $n = (1.49R^{2/3}S^{1/2})/\bar{u}$ (use the bankfull mean velocity from Step 3).
8. Calculate relative roughness: R/D_{84}. Make sure that D_{84} is converted from millimeters to feet. Hydraulic radius (R) and mean depth (d_{bkf}) are often used interchangeably when width/depth ratios are greater than 12.
9. Calculate shear velocity: $u^* = (gRS)^{1/2}$.
10. Calculate friction factor: $\bar{u}/u^*$.
11. Plot bankfull discharge as a function of drainage area on the appropriate regional curve.
12. Plot bankfull channel dimensions as a function of drainage area on the appropriate regional curve (note stream type of plotted values using unique symbols).
13. Plot relative roughness by friction factor (**Figure B-34**) (Example in **Figure B-39**).
14. Plot Manning's 'n' by friction factor (**Figure B-35**) (Example in **Figure B-40**).
15. Plot Manning's 'n' by stream type (**Figure B-36**) (Example in **Figure B-41**).

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

1	2	3a	3b	3c	3d	4	5a	5b	6	7	8	9	10
Drainage Area (mi^2)	Bankfull Discharge Q_{bkf} (cfs)	Bankfull Width W_{bkf}	Bankfull Mean Depth d_{bkf} (ft)	Bankfull Area A_{bkf} (ft^2)	Bankfull Velocity $\bar{u}_{bkf}$ (ft/s)	Ave. Water Surface Slope S (ft/ft)	~~D_{84}~~ D_{50} (mm)	(ft)	Stream Type	Manning's 'n'	Relative Roughness R/D_{84} (ft/ft)	Shear Velocity u^* (ft/s)	Friction Factor $\bar{u}/u^*$
19.02	108.61	21.5	1.82	37.37	3.45	.00489	34.6	.11	F1/4/6	0.0593	13.545	0.484	7.128

$W_p = 2d_{bkf} + W_{bkf} = (2*1.82) + 21.5 = 25.14$

$R = A_{bkf}/W_p = 37.37/25.14 = 1.49$

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RIVERMORPH REACH SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)

Stream Type	Valley Type	D50(mm)	Val Slope	BKF Q(cfs)	DA(sq mi)
F 3/1	U-AL-FD	80.55	0.006	114.682	19.02

Dimension Summary

Database based on the following Cross Sections:
Riffle Sta 0+33.9
Riffle Sta 01+44
Pool Sta 3+04.5
Pool Sta 02+41.5
Run Sta 0+58.6
Run Sta 02+19
Glide Sta 0+92.5
Glide Sta 2+63.5
Glide Sta 03+64

Variable	Mean	Min	Max
Floodprone Width (ft)	39.56	33.43	45.69
Riffle Area (Sq ft)	39.04	31.48	46.6
Max Riffle Depth (ft)	1.88	1.56	2.2
Mean Riffle Depth (ft)	1.14	1.11	1.16
Riffle Width (ft)	34.19	28.29	40.08
Riffle W/D Ratio	30.02	25.49	34.55
Riffle IB Area	14.67	7.59	21.74
Riffle IB Depth	0.5	0.39	0.61
Riffle IB Width	27.68	19.47	35.9
Riffle IB W/D Ratio	54.61	49.94	59.28
Pool Area (Sq ft)	44.0	41.87	46.13
Max Pool Depth (ft)	3.17	3.12	3.22
Mean Pool Depth (ft)	1.82	1.75	1.89
Pool Width (ft)	24.21	22.12	26.3
Pool W/D Ratio	13.37	11.7	15.03
Pool IB Area	8.64	6.76	10.53
Pool IB Depth	0.72	0.65	0.79
Pool IB Width	11.86	10.36	13.37
Pool IB W/D Ratio	16.43	15.88	16.98
Run Area (Sq ft)	38.57	34.46	42.67
Max Run Depth (ft)	1.85	1.79	1.91
Mean Run Depth (ft)	1.45	1.42	1.47
Run Width (ft)	26.66	24.3	29.01
Run W/D Ratio	18.42	17.11	19.74
Glide Area (Sq ft)	24.83	19.78	29.38
Max Glide Depth (ft)	1.81	1.66	2.03
Mean Glide Depth (ft)	1.3	1.26	1.38
Glide Width (ft)	19.01	15.7	21.23
Glide W/D Ratio	14.6	12.46	15.96
Glide IB Area	1.43	0.0	4.28
Glide IB Depth	0.12	0.0	0.36
Glide IB Width	4.0	0.0	12.0
Glide IB W/D Ratio	11.2	0.0	33.59
Step Area	0	0	0
Max Step Depth	0	0	0
Mean Step Depth	0	0	0
Step Width	0	0	0
Step W/D Ratio	0	0	0

Pattern Summary

Variable	Mean	Min	Max
Sinuosity	1.25		
Stream Meander Length	149.7	143	153
Linear Wavelength	110.1	68	165.2
Radius of Curvature (ft)	0	0	0
Belt Width (ft)	63.7	49	90
Arc Length	59.3	42	84

Profile Summary

Data Based on the following:
Marsh Run, Reach 2, 27April2017

Variable	Mean	Min	Max
S riffle (ft/ft)	0.00775	0.00754	0.00796
S pool (ft/ft)	0.00272	0.00087	0.00673
S run (ft/ft)	0.01404	0.00343	0.03187
S glide (ft/ft)	0.00486	0.00052	0.00692
S step (ft/ft)	0	0	0
P - P (ft)	95.94	49.05	163.35
Pool length (ft)	45	25.91	87.46
Riffle length (ft)	59.25	5.6	112.89
Dmax riffle (ft)	1.6	1.58	1.61
Dmax pool (ft)	2.37	1.58	3.24
Dmax run (ft)	1.87	1.63	2.31
Dmax glide (ft)	1.57	1.36	1.72
Dmax step (ft)	0	0	0
Bankfull slope (ft/ft)	0.00482		

Hydraulic Summary

Variable	Mean	Min	Max
Discharge (cfs)	114.682		
Velocity (fps)	3.643		
Hydraulic Radius (ft)	1.08	1.06	1.09

RIVERMORPH REACH SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)

Stream Type	Valley Type	D50(mm)	Val Slope	BKF Q(cfs)	DA(sq mi)
F 3/1	U-AL-FD	80.55	0.006	114.682	19.02

Dimension Summary

Database based on the following Cross Sections:
Riffle Sta 0+33.9
Riffle Sta 01+44
Pool Sta 3+04.5
Pool Sta 02+41.5
Run Sta 0+58.6
Run Sta 02+19
Glide Sta 0+92.5
Glide Sta 2+63.5
Glide Sta 03+64

Variable	Mean	Min	Max
Floodprone Width (ft)	39.56	33.43	45.69
Riffle Area (Sq ft)	39.04	31.48	46.6
Max Riffle Depth (ft)	1.88	1.56	2.2
Mean Riffle Depth (ft)	1.14	1.11	1.16
Riffle Width (ft)	34.19	28.29	40.08
Riffle W/D Ratio	30.02	25.49	34.55
Riffle IB Area	14.67	7.59	21.74
Riffle IB Depth	0.5	0.39	0.61
Riffle IB Width	27.68	19.47	35.9
Riffle IB W/D Ratio	54.61	49.94	59.28
Pool Area (Sq ft)	44.0	41.87	46.13
Max Pool Depth (ft)	3.17	3.12	3.22
Mean Pool Depth (ft)	1.82	1.75	1.89
Pool Width (ft)	24.21	22.12	26.3
Pool W/D Ratio	13.37	11.7	15.03
Pool IB Area	8.64	6.76	10.53
Pool IB Depth	0.72	0.65	0.79
Pool IB Width	11.86	10.36	13.37
Pool IB W/D Ratio	16.43	15.88	16.98
Run Area (Sq ft)	38.57	34.46	42.67
Max Run Depth (ft)	1.85	1.79	1.91
Mean Run Depth (ft)	1.45	1.42	1.47
Run Width (ft)	26.66	24.3	29.01
Run W/D Ratio	18.42	17.11	19.74
Glide Area (Sq ft)	24.83	19.78	29.38
Max Glide Depth (ft)	1.81	1.66	2.03
Mean Glide Depth (ft)	1.3	1.26	1.38
Glide Width (ft)	19.01	15.7	21.23
Glide W/D Ratio	14.6	12.46	15.96
Glide IB Area	1.43	0.0	4.28
Glide IB Depth	0.12	0.0	0.36
Glide IB Width	4.0	0.0	12.0
Glide IB W/D Ratio	11.2	0.0	33.59
Step Area	0	0	0
Max Step Depth	0	0	0
Mean Step Depth	0	0	0
Step Width	0	0	0
Step W/D Ratio	0	0	0

Pattern Summary

Variable	Mean	Min	Max
Sinuosity	1.25		
Stream Meander Length	149.7	143	153
Linear Wavelength	110.1	68	165.2
Radius of Curvature (ft)	0	0	0
Belt Width (ft)	63.7	49	90
Arc Length	59.3	42	84

Profile Summary

Data Based on the following:

Variable	Mean	Min	Max
S riffle (ft/ft)	0	0	0
S pool (ft/ft)	0	0	0
S run (ft/ft)	0	0	0
S glide (ft/ft)	0	0	0
S step (ft/ft)	0	0	0
P - P (ft)	0	0	0
Pool length (ft)	0	0	0
Riffle length (ft)	0	0	0
Dmax riffle (ft)	0	0	0
Dmax pool (ft)	0	0	0
Dmax run (ft)	0	0	0
Dmax glide (ft)	0	0	0
Dmax step (ft)	0	0	0
Bankfull slope (ft/ft)	0.00482		

Hydraulic Summary

Variable	Mean	Min	Max
Discharge (cfs)	114.682		
Velocity (fps)	3.643		
Hydraulic Radius (ft)	1.08	1.06	1.09

RIVERMORPH REACH SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)

Stream Type	Valley Type	D50(mm)	Val Slope	BKF Q(cfs)	DA(sq mi)
F 3/1	U-AL-FD	80.55	0.006	114.682	19.02

Dimension Summary

Database based on the following Cross Sections:
Riffle Sta 0+33.9
Riffle Sta 01+44
Pool Sta 3+04.5
Pool Sta 02+41.5
Run Sta 0+58.6
Run Sta 02+19
Glide Sta 0+92.5
Glide Sta 2+63.5
Glide Sta 03+64

Variable	Mean	Min	Max
Floodprone Width (ft)	39.56	33.43	45.69
Riffle Area (Sq ft)	39.04	31.48	46.6
Max Riffle Depth (ft)	1.88	1.56	2.2
Mean Riffle Depth (ft)	1.14	1.11	1.16
Riffle Width (ft)	34.19	28.29	40.08
Riffle W/D Ratio	30.02	25.49	34.55
Riffle IB Area	14.67	7.59	21.74
Riffle IB Depth	0.5	0.39	0.61
Riffle IB Width	27.68	19.47	35.9
Riffle IB W/D Ratio	54.61	49.94	59.28
Pool Area (Sq ft)	44.0	41.87	46.13
Max Pool Depth (ft)	3.17	3.12	3.22
Mean Pool Depth (ft)	1.82	1.75	1.89
Pool Width (ft)	24.21	22.12	26.3
Pool W/D Ratio	13.37	11.7	15.03
Pool IB Area	8.64	6.76	10.53
Pool IB Depth	0.72	0.65	0.79
Pool IB Width	11.86	10.36	13.37
Pool IB W/D Ratio	16.43	15.88	16.98
Run Area (Sq ft)	38.57	34.46	42.67
Max Run Depth (ft)	1.85	1.79	1.91
Mean Run Depth (ft)	1.45	1.42	1.47
Run Width (ft)	26.66	24.3	29.01
Run W/D Ratio	18.42	17.11	19.74
Glide Area (Sq ft)	24.83	19.78	29.38
Max Glide Depth (ft)	1.81	1.66	2.03
Mean Glide Depth (ft)	1.3	1.26	1.38
Glide Width (ft)	19.01	15.7	21.23
Glide W/D Ratio	14.6	12.46	15.96
Glide IB Area	1.43	0.0	4.28
Glide IB Depth	0.12	0.0	0.36
Glide IB Width	4.0	0.0	12.0
Glide IB W/D Ratio	11.2	0.0	33.59
Step Area	0	0	0
Max Step Depth	0	0	0
Mean Step Depth	0	0	0
Step Width	0	0	0
Step W/D Ratio	0	0	0

Pattern Summary

Variable	Mean	Min	Max
Sinuosity	1.25		
Stream Meander Length	149.7	143	153
Linear Wavelength	110.1	68	165.2
Radius of Curvature (ft)	0	0	0
Belt Width (ft)	63.7	49	90
Arc Length	59.3	42	84

Profile Summary

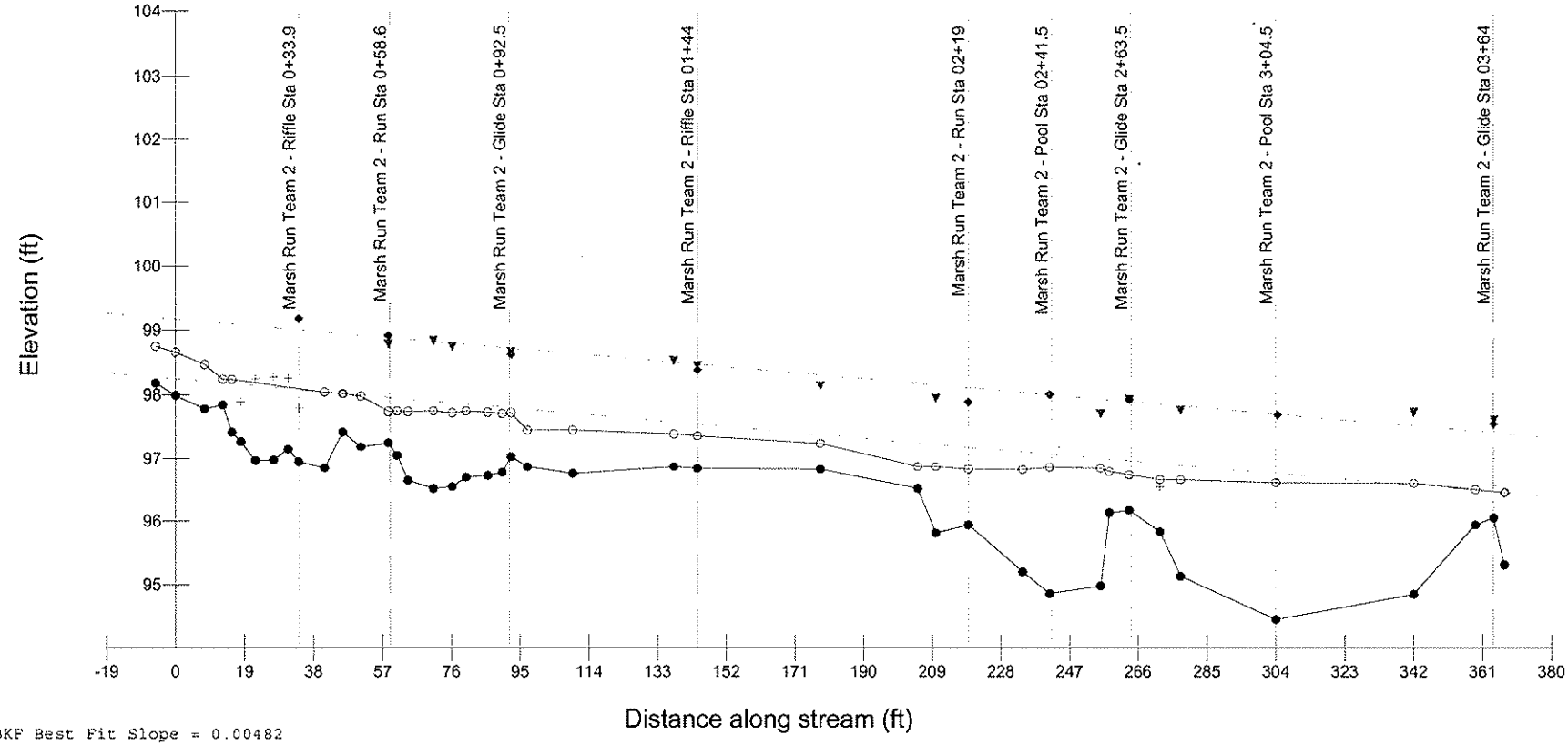
Data Based on the following:
Marsh Run, Reach 2, 27April2017

Variable	Mean	Min	Max
S riffle (ft/ft)	0.00775	0.00754	0.00796
S pool (ft/ft)	0.00272	0.00087	0.00673
S run (ft/ft)	0.01404	0.00343	0.03187
S glide (ft/ft)	0.00486	0.00052	0.00692
S step (ft/ft)	0	0	0
P - P (ft)	95.94	49.05	163.35
Pool length (ft)	45	25.91	87.46
Riffle length (ft)	59.25	5.6	112.89
Dmax riffle (ft)	1.6	1.58	1.61
Dmax pool (ft)	2.37	1.58	3.24
Dmax run (ft)	1.87	1.63	2.31
Dmax glide (ft)	1.57	1.36	1.72
Dmax step (ft)	0	0	0
Bankfull slope (ft/ft)	0.00482		

Hydraulic Summary

Variable	Mean	Min	Max
Discharge (cfs)	114.682		
Velocity (fps)	3.643		
Hydraulic Radius (ft)	1.08	1.06	1.09

Marsh Run, Reach 2, 27April2017



XS BKF Best Fit Slope = 0.00482
WS SLP Best Fit Slope = 0.00489

RIVERMORPH REACH SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)

Stream Type	Valley Type	D50(mm)	Val Slope	BKF Q(cfs)	DA(sq mi)
F 3/1	U-AL-FD	80.55	0.006	114.682	19.02

Dimension Summary

Database based on the following Cross Sections:
Riffle Sta 0+33.9
Riffle Sta 01+44
Pool Sta 3+04.5
Pool Sta 02+41.5
Run Sta 0+58.6
Run Sta 02+19
Glide Sta 0+92.5
Glide Sta 2+63.5
Glide Sta 03+64

Variable	Mean	Min	Max
Floodprone Width (ft)	39.56	33.43	45.69
Riffle Area (Sq ft)	39.04	31.48	46.6
Max Riffle Depth (ft)	1.88	1.56	2.2
Mean Riffle Depth (ft)	1.14	1.11	1.16
Riffle Width (ft)	34.19	28.29	40.08
Riffle W/D Ratio	30.02	25.49	34.55
Riffle IB Area	14.67	7.59	21.74
Riffle IB Depth	0.5	0.39	0.61
Riffle IB Width	27.68	19.47	35.9
Riffle IB W/D Ratio	54.61	49.94	59.28
Pool Area (Sq ft)	44.0	41.87	46.13
Max Pool Depth (ft)	3.17	3.12	3.22
Mean Pool Depth (ft)	1.82	1.75	1.89
Pool Width (ft)	24.21	22.12	26.3
Pool W/D Ratio	13.37	11.7	15.03
Pool IB Area	8.64	6.76	10.53
Pool IB Depth	0.72	0.65	0.79
Pool IB Width	11.86	10.36	13.37
Pool IB W/D Ratio	16.43	15.88	16.98
Run Area (Sq ft)	38.57	34.46	42.67
Max Run Depth (ft)	1.85	1.79	1.91
Mean Run Depth (ft)	1.45	1.42	1.47
Run Width (ft)	26.66	24.3	29.01
Run W/D Ratio	18.42	17.11	19.74
Glide Area (Sq ft)	24.83	19.78	29.38
Max Glide Depth (ft)	1.81	1.66	2.03
Mean Glide Depth (ft)	1.3	1.26	1.38
Glide Width (ft)	19.01	15.7	21.23
Glide W/D Ratio	14.6	12.46	15.96
Glide IB Area	1.43	0.0	4.28
Glide IB Depth	0.12	0.0	0.36
Glide IB Width	4.0	0.0	12.0
Glide IB W/D Ratio	11.2	0.0	33.59
Step Area	0	0	0
Max Step Depth	0	0	0
Mean Step Depth	0	0	0
Step Width	0	0	0
Step W/D Ratio	0	0	0

Pattern Summary

Variable	Mean	Min	Max
Sinuosity	1.25		
Stream Meander Length	149.7	143	153
Linear Wavelength	110.1	68	165.2
Radius of Curvature (ft)	0	0	0
Belt Width (ft)	63.7	49	90
Arc Length	59.3	42	84

Profile Summary

Data Based on the following:

Variable	Mean	Min	Max
S riffle (ft/ft)	0	0	0
S pool (ft/ft)	0	0	0
S run (ft/ft)	0	0	0
S glide (ft/ft)	0	0	0
S step (ft/ft)	0	0	0
P - P (ft)	0	0	0
Pool length (ft)	0	0	0
Riffle length (ft)	0	0	0
Dmax riffle (ft)	0	0	0
Dmax pool (ft)	0	0	0
Dmax run (ft)	0	0	0
Dmax glide (ft)	0	0	0
Dmax step (ft)	0	0	0
Bankfull slope (ft/ft)	0.00482		

Hydraulic Summary

Variable	Mean	Min	Max
Discharge (cfs)	114.682		
Velocity (fps)	3.643		
Hydraulic Radius (ft)	1.08	1.06	1.09

RIVERMORPH REACH SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)

Stream Type	Valley Type	D50(mm)	Val Slope	BKF Q(cfs)	DA(sq mi)
F 3/1	U-AL-FD	80.55	0.006	114.682	19.02

Dimension Summary

Database based on the following Cross Sections:
Riffle Sta 0+33.9
Riffle Sta 01+44
Pool Sta 3+04.5
Pool Sta 02+41.5
Run Sta 0+58.6
Run Sta 02+19
Glide Sta 0+92.5
Glide Sta 2+63.5
Glide Sta 03+64

Variable	Mean	Min	Max
Floodprone Width (ft)	39.56	33.43	45.69
Riffle Area (Sq ft)	39.04	31.48	46.6
Max Riffle Depth (ft)	1.88	1.56	2.2
Mean Riffle Depth (ft)	1.14	1.11	1.16
Riffle Width (ft)	34.19	28.29	40.08
Riffle W/D Ratio	30.02	25.49	34.55
Riffle IB Area	14.67	7.59	21.74
Riffle IB Depth	0.5	0.39	0.61
Riffle IB Width	27.68	19.47	35.9
Riffle IB W/D Ratio	54.61	49.94	59.28
Pool Area (Sq ft)	44.0	41.87	46.13
Max Pool Depth (ft)	3.17	3.12	3.22
Mean Pool Depth (ft)	1.82	1.75	1.89
Pool Width (ft)	24.21	22.12	26.3
Pool W/D Ratio	13.37	11.7	15.03
Pool IB Area	8.64	6.76	10.53
Pool IB Depth	0.72	0.65	0.79
Pool IB Width	11.86	10.36	13.37
Pool IB W/D Ratio	16.43	15.88	16.98
Run Area (Sq ft)	38.57	34.46	42.67
Max Run Depth (ft)	1.85	1.79	1.91
Mean Run Depth (ft)	1.45	1.42	1.47
Run Width (ft)	26.66	24.3	29.01
Run W/D Ratio	18.42	17.11	19.74
Glide Area (Sq ft)	24.83	19.78	29.38
Max Glide Depth (ft)	1.81	1.66	2.03
Mean Glide Depth (ft)	1.3	1.26	1.38
Glide Width (ft)	19.01	15.7	21.23
Glide W/D Ratio	14.6	12.46	15.96
Glide IB Area	1.43	0.0	4.28
Glide IB Depth	0.12	0.0	0.36
Glide IB Width	4.0	0.0	12.0
Glide IB W/D Ratio	11.2	0.0	33.59
Step Area	0	0	0
Max Step Depth	0	0	0
Mean Step Depth	0	0	0
Step Width	0	0	0
Step W/D Ratio	0	0	0

Pattern Summary

Variable	Mean	Min	Max
Sinuosity	1.25		
Stream Meander Length	149.7	143	153
Linear Wavelength	110.1	68	165.2
Radius of Curvature (ft)	0	0	0
Belt Width (ft)	63.7	49	90
Arc Length	59.3	42	84

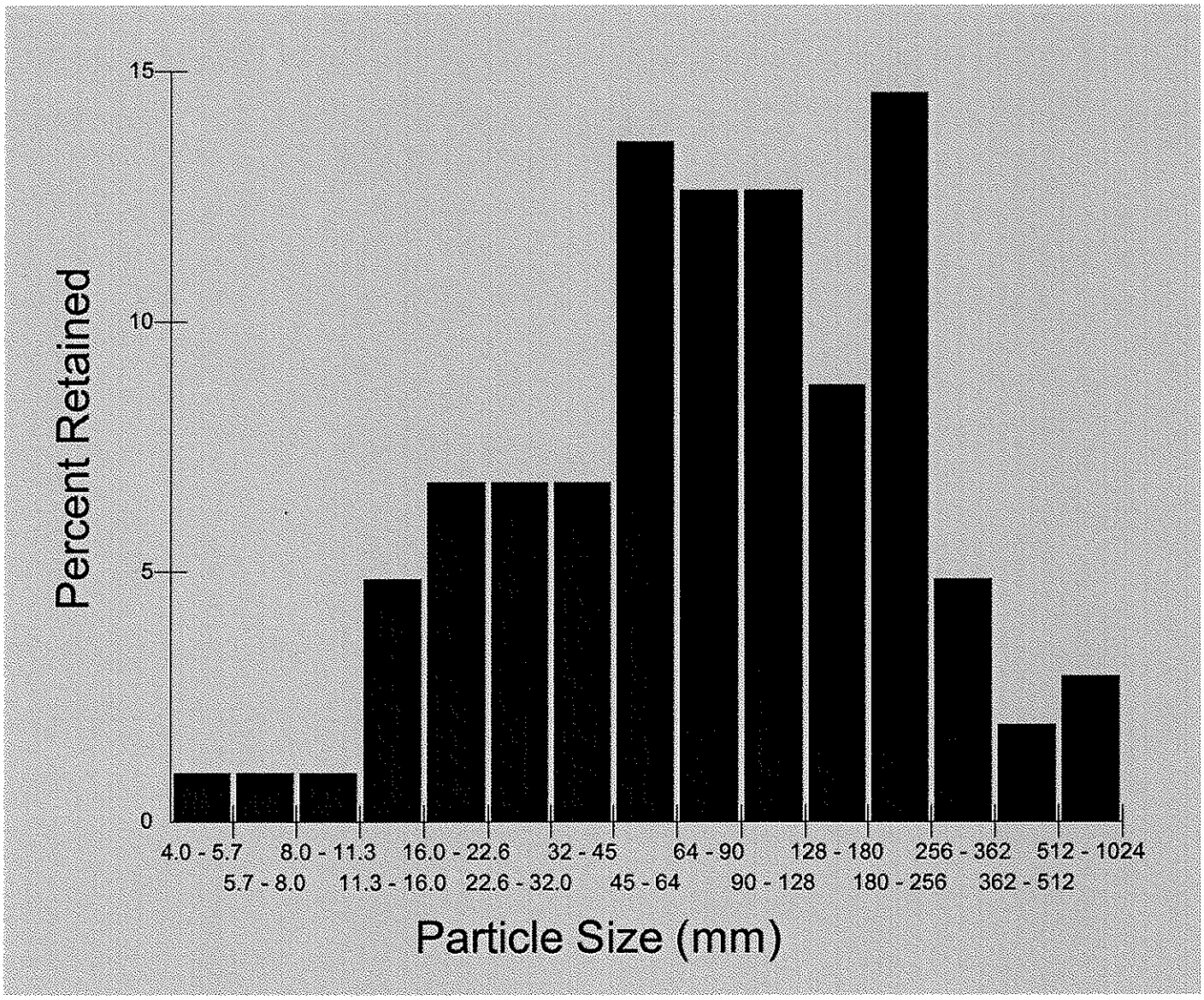
Profile Summary

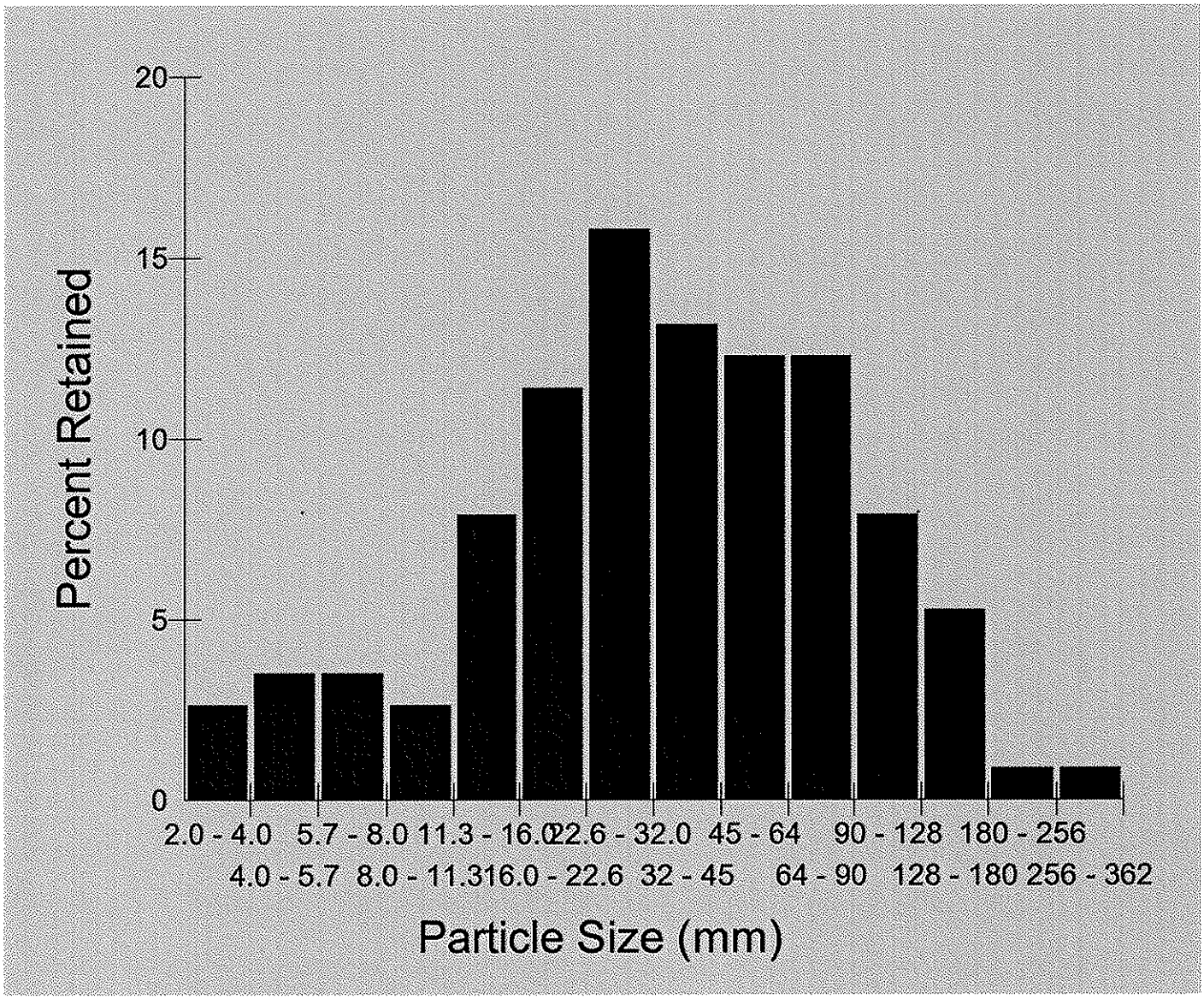
Data Based on the following:
Marsh Run, Reach 2, 27April2017

Variable	Mean	Min	Max
S riffle (ft/ft)	0.00775	0.00754	0.00796
S pool (ft/ft)	0.00272	0.00087	0.00673
S run (ft/ft)	0.01404	0.00343	0.03187
S glide (ft/ft)	0.00486	0.00052	0.00692
S step (ft/ft)	0	0	0
P - P (ft)	95.94	49.05	163.35
Pool length (ft)	45	25.91	87.46
Riffle length (ft)	59.25	5.6	112.89
Dmax riffle (ft)	1.6	1.58	1.61
Dmax pool (ft)	2.37	1.58	3.24
Dmax run (ft)	1.87	1.63	2.31
Dmax glide (ft)	1.57	1.36	1.72
Dmax step (ft)	0	0	0
Bankfull slope (ft/ft)	0.00482		

Hydraulic Summary

Variable	Mean	Min	Max
Discharge (cfs)	114.682		
Velocity (fps)	3.643		
Hydraulic Radius (ft)	1.08	1.06	1.09


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
Particle Size (mm)


Percent Retained
20
15
10
5
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
Particle Size (mm)

RIVERMORPH PARTICLE SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)
Sample Name: Marsh Run Team 2 - Representative
Survey Date: 04/27/2017

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	11	11.00	11.00
0.062 - 0.125	0	0.00	11.00
0.125 - 0.25	1	1.00	12.00
0.25 - 0.50	2	2.00	14.00
0.50 - 1.0	4	4.00	18.00
1.0 - 2.0	2	2.00	20.00
2.0 - 4.0	1	1.00	21.00
4.0 - 5.7	2	2.00	23.00
5.7 - 8.0	3	3.00	26.00
8.0 - 11.3	3	3.00	29.00
11.3 - 16.0	1	1.00	30.00
16.0 - 22.6	5	5.00	35.00
22.6 - 32.0	3	3.00	38.00
32 - 45	1	1.00	39.00
45 - 64	4	4.00	43.00
64 - 90	11	11.00	54.00
90 - 128	2	2.00	56.00
128 - 180	1	1.00	57.00
180 - 256	1	1.00	58.00
256 - 362	3	3.00	61.00
362 - 512	0	0.00	61.00
512 - 1024	0	0.00	61.00
1024 - 2048	0	0.00	61.00
Bedrock	39	39.00	100.00

D16 (mm)	0.75
D35 (mm)	22.6
D50 (mm)	80.55
D84 (mm)	Bedrock
D95 (mm)	Bedrock
D100 (mm)	Bedrock
Silt/Clay (%)	11
Sand (%)	9
Gravel (%)	23
Cobble (%)	15
Boulder (%)	3
Bedrock (%)	39

Total Particles = 100.

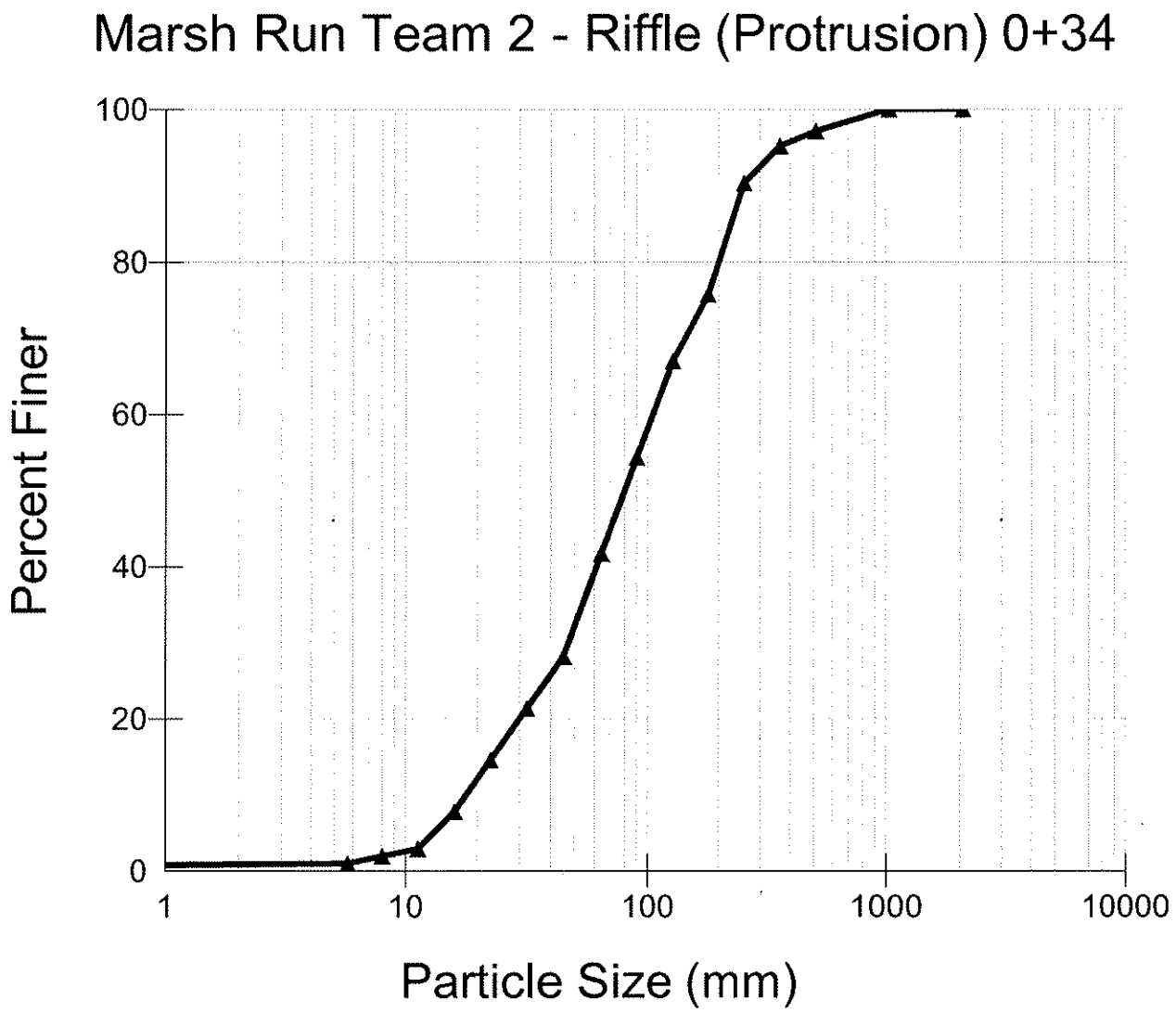
RIVERMORPH PARTICLE SUMMARY

River Name: Marsh Run
Reach Name: Reach 2 (Team 2)
Sample Name: Marsh Run Team 2 - Riffle (Protrusion) 0+34
Survey Date: 04/27/2017

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	0.97	0.97
5.7 - 8.0	1	0.97	1.94
8.0 - 11.3	1	0.97	2.91
11.3 - 16.0	5	4.85	7.77
16.0 - 22.6	7	6.80	14.56
22.6 - 32.0	7	6.80	21.36
32 - 45	7	6.80	28.16
45 - 64	14	13.59	41.75
64 - 90	13	12.62	54.37
90 - 128	13	12.62	66.99
128 - 180	9	8.74	75.73
180 - 256	15	14.56	90.29
256 - 362	5	4.85	95.15
362 - 512	2	1.94	97.09
512 - 1024	3	2.91	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	24.59
D35 (mm)	54.56
D50 (mm)	81
D84 (mm)	223.17
D95 (mm)	358.73
D100 (mm)	1023.98
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	41.75
Cobble (%)	48.54
Boulder (%)	9.71
Bedrock (%)	0

Total Particles = 103.


Marsh Run Team 2 - Riffle (Protrusion) 0+34
Percent Finer
100
80
60
40
20
0
1
10
100
1000
10000
Particle Size (mm)

RIVERMORPH PARTICLE SUMMARY

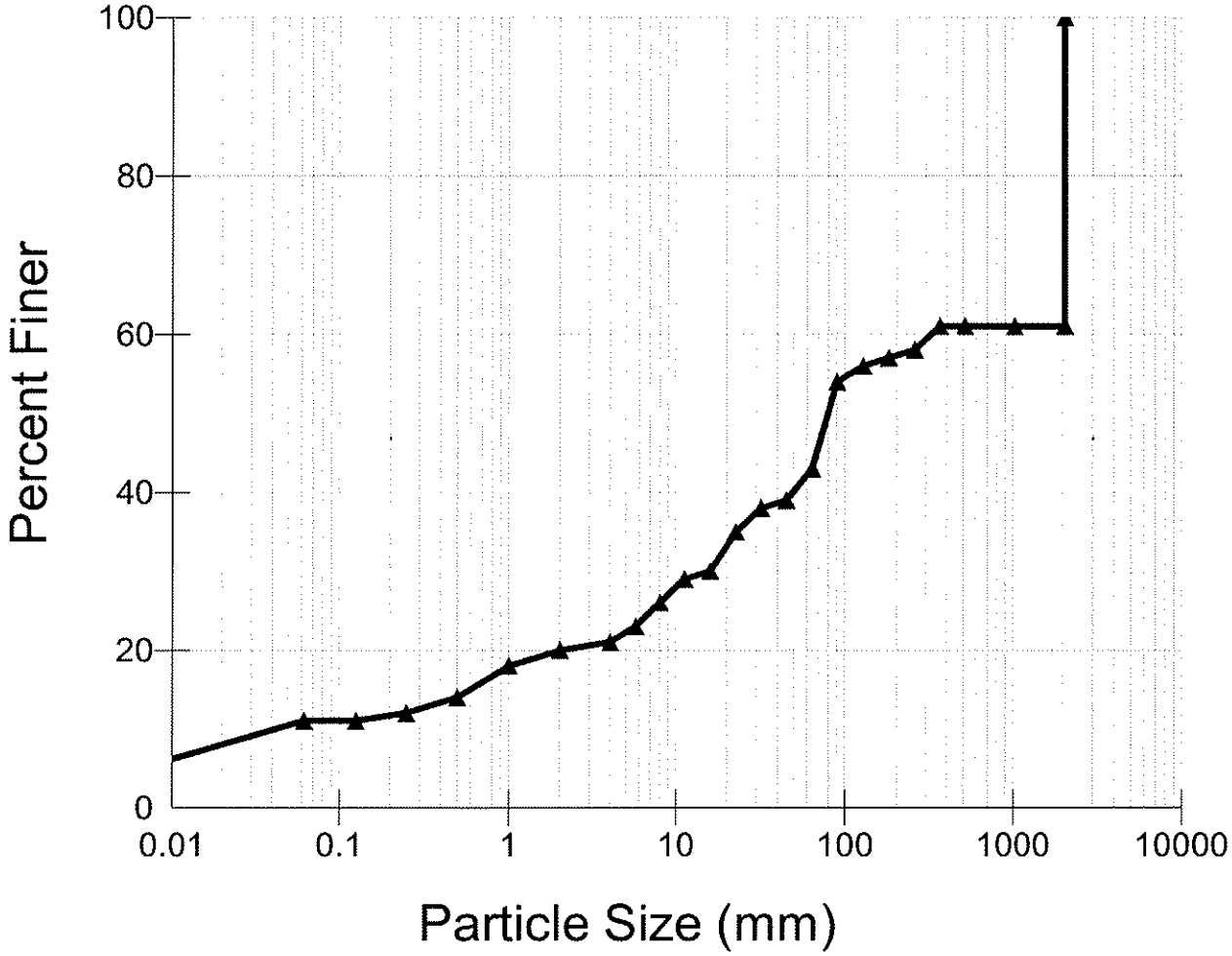
River Name: Marsh Run
Reach Name: Reach 2 (Team 2)
Sample Name: Marsh Run Team 2 - Riffle (Protrusion) 1+44
Survey Date: 04/27/2017

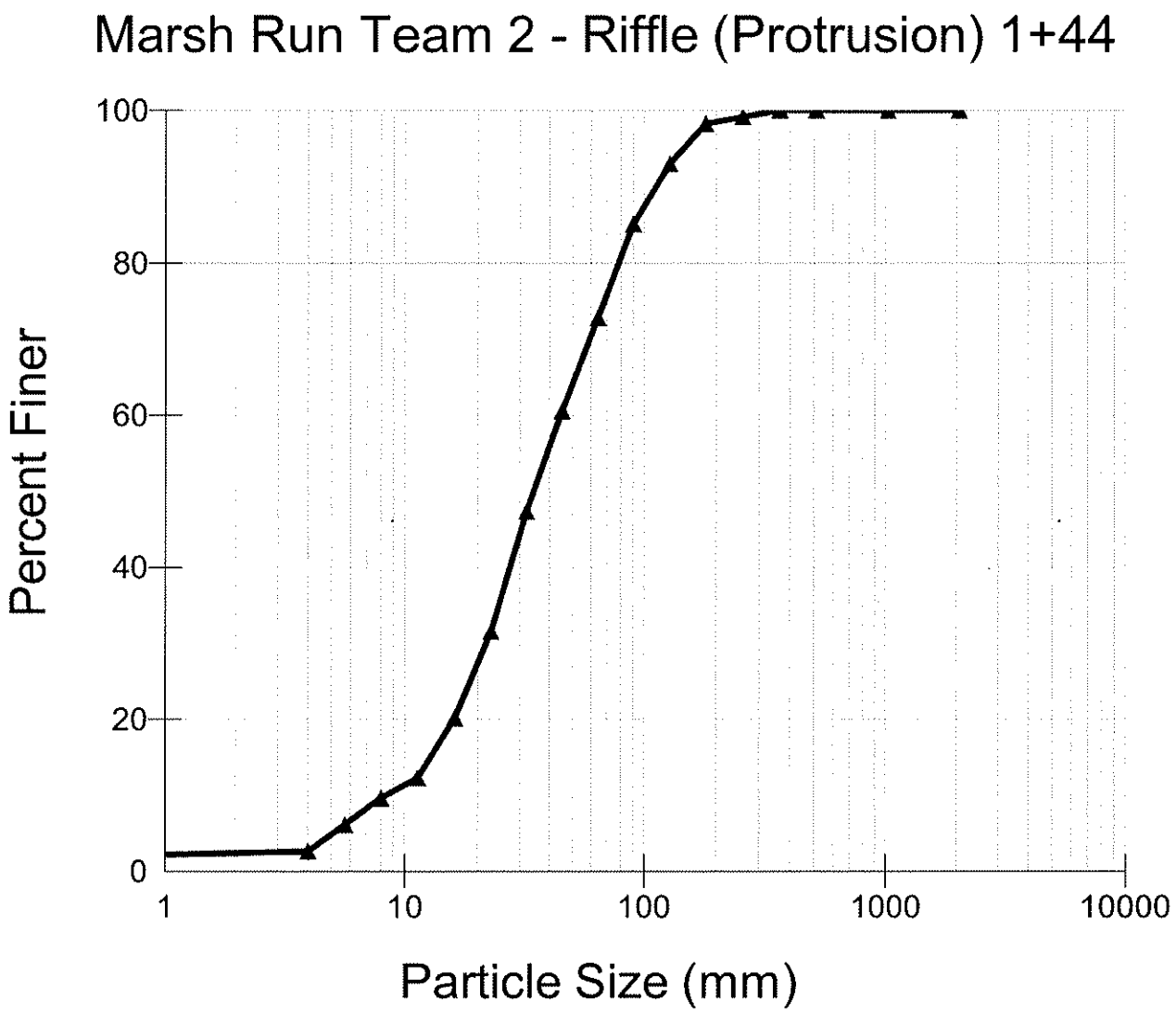
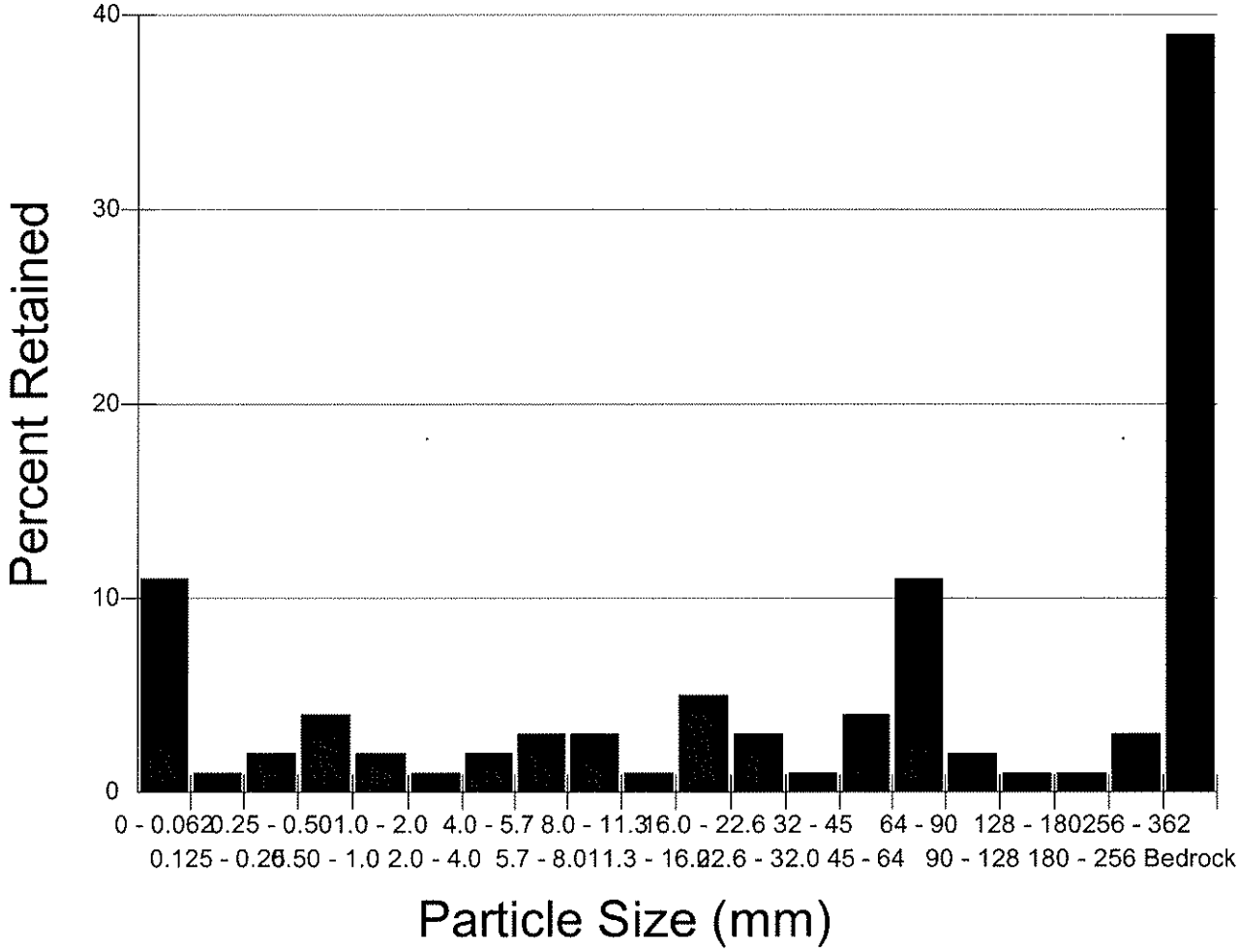
Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	3	2.63	2.63
4.0 - 5.7	4	3.51	6.14
5.7 - 8.0	4	3.51	9.65
8.0 - 11.3	3	2.63	12.28
11.3 - 16.0	9	7.89	20.18
16.0 - 22.6	13	11.40	31.58
22.6 - 32.0	18	15.79	47.37
32 - 45	15	13.16	60.53
45 - 64	14	12.28	72.81
64 - 90	14	12.28	85.09
90 - 128	9	7.89	92.98
128 - 180	6	5.26	98.25
180 - 256	1	0.88	99.12
256 - 362	1	0.88	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	13.51
D35 (mm)	24.64
D50 (mm)	34.6
D84 (mm)	87.69
D95 (mm)	147.93
D100 (mm)	361.99
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	72.81
Cobble (%)	26.31
Boulder (%)	0.88
Bedrock (%)	0

Total Particles = 114.

Marsh Run Team 2 - Representative




Marsh Run Team 2 - Riffle (Protrusion) 1+44
Percent Finer
100
80
60
40
20
0
1
10
100
1000
10000
Particle Size (mm)

Marsh Run Team 2 - Representative