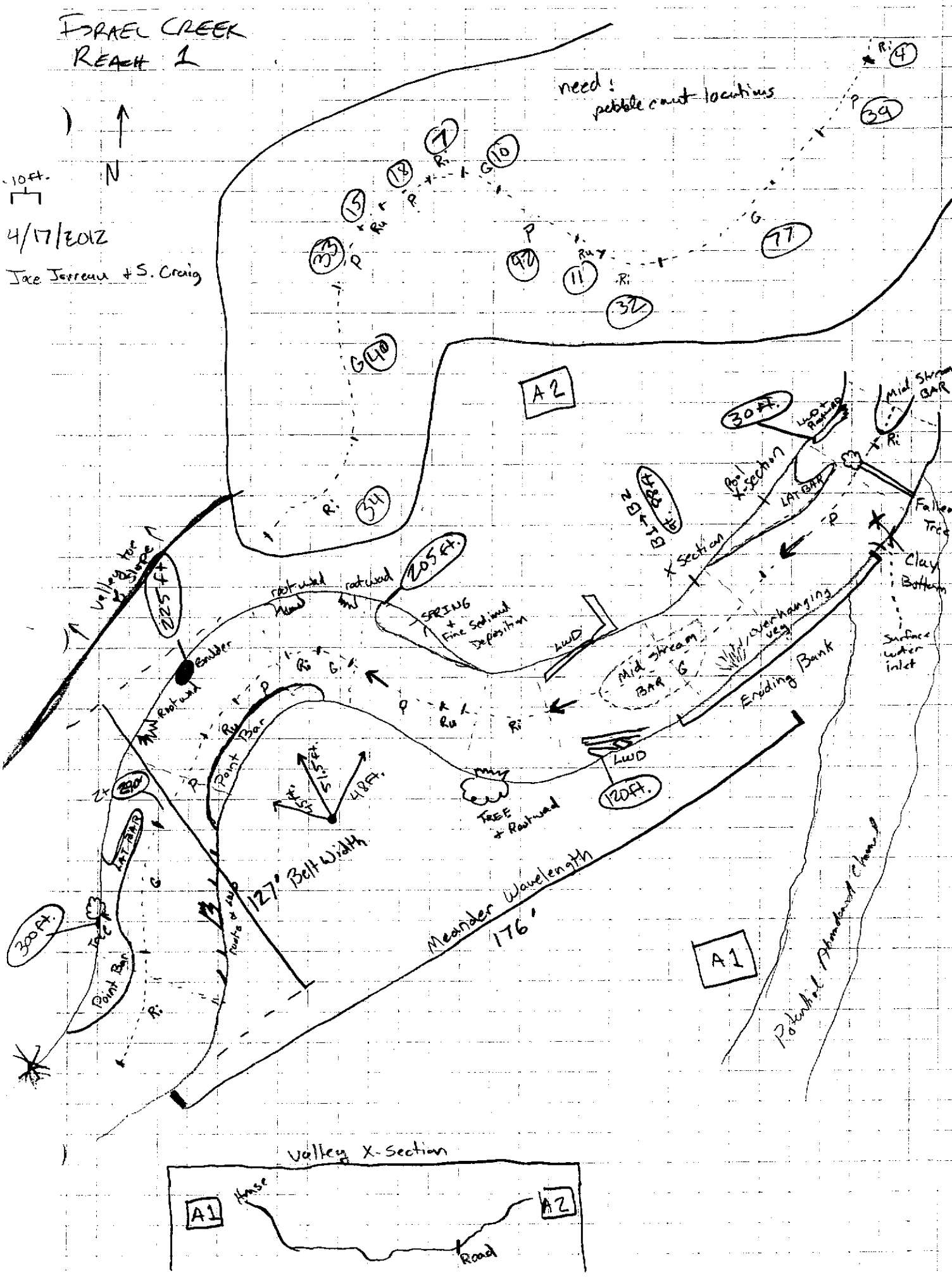
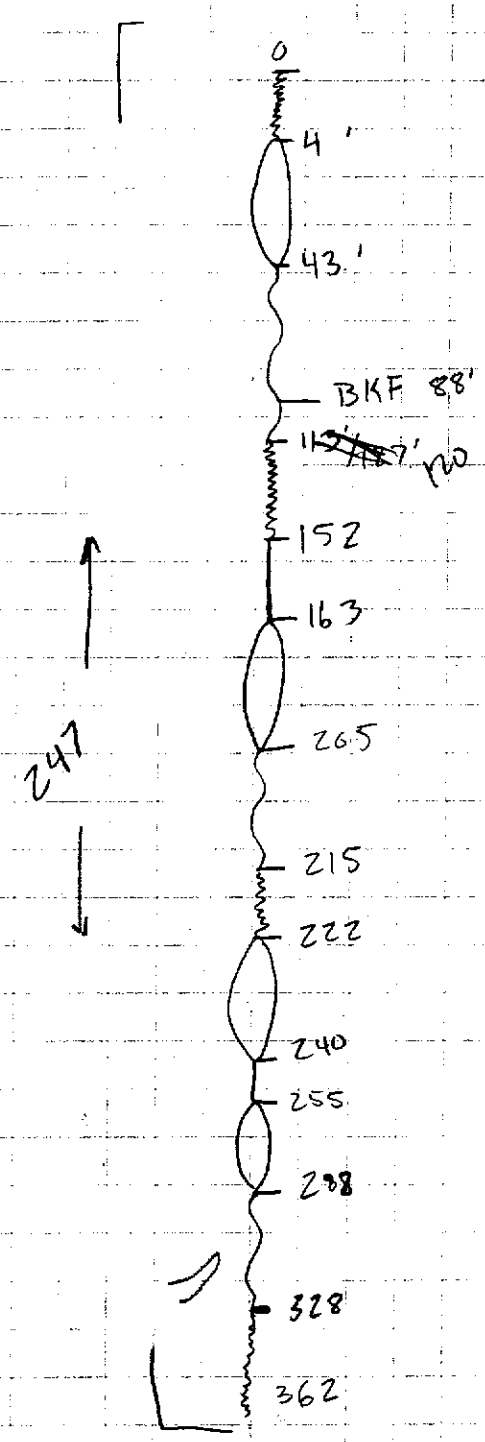
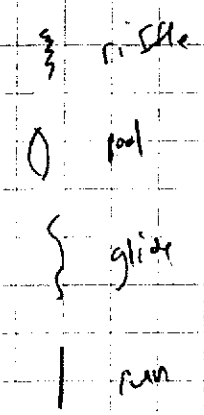
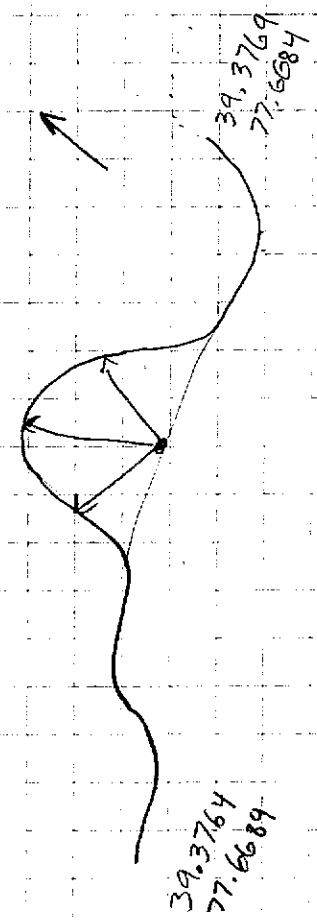


ISRAEL CREEK
REACH 1
N
10 ft.
4/17/2012
Jace Jarreau + S. Craig
need: pebble count locations
A2
A1
30 ft.
Mid Stream BAR
Pool X-section
LAT BAR
Fallen Tree
Clay Bottom
Surface water inlet
X Section
Overhanging veg
Eroding Bank
Mid Stream BAR
LWD
205 ft.
SPRING + Fine Sediment Deposition
Valley toe slope
225 ft
Boulder
Rootwad
Point Bar
51.5 ft.
48 ft.
TREE + Rootwad
120 ft.
127' Belt Width
Meander Wavelength
176'
300 ft.
Potential Abandoned Channel
Valley X-Section
Hinge
Road





Sinuosity - 1.47



Dep. Fechans

Israel Creek
Reach 1 4/17/12

Long pro. station # :125

SURVEY DATA ⟹ **CROSS - SECTION 1**

SITE: Israel Creek Reach 1 **Date:** 4/17/2012

Location: riffle with bar

Party / Notes: Cross Section **HUC:**

GS: Ground shot

LTOB: Left top of bank

CS: Channel shot

SLPBRK: Slope break

Flood prone width: 248

BankFul: 27.1' width

Mean Depth: 1.73'

2 x BankFul max Depth = 4.34

BankFul Max Depth = 2.17

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	5.00	105.00		100	1st Temp. BM
2	0.0	4.54			100.46	GS.
3	3.0	4.66			100.34	GS
4	6.5	4.64			100.36	LTOB
5	7.0	7.16			97.84	LEW
6	7.0	7.35			97.65	CS
7	8.0	7.51			97.49	CS
8	10.0	7.47			97.53	CS
9	12.0	7.47			97.53	CS
10	14.0	7.27			97.73	CS
11	16.0	7.13			97.87	CS
12	18.0	7.20			97.80	CS
13	20.0	7.24			97.76	CS
14	22.0	7.39			97.61	CS
15	24.0	7.41			97.59	CS
16	26.7	7.57			97.43	CS
17	26.7	7.29			97.71	REW
18	28.4	6.38			98.62	SLPBRK
19	31.3	5.81			99.19	SLPBRK
20	33.9	5.40			99.60	BankFul RTOB
21	37.0	5.23			99.77	SLPBRK
22	40.5	4.29			100.71	SLPBRK } Floodplain depositional feature
23	43	4.49			100.51	SLPBRK } due to LWD (tree)
24	45.5	4.71			100.29	SLPBRK
25	48.0	4.80			100.20	GS
26	50.6	4.58			100.42	GS
27						~~R Flood Prone Length~~
28						

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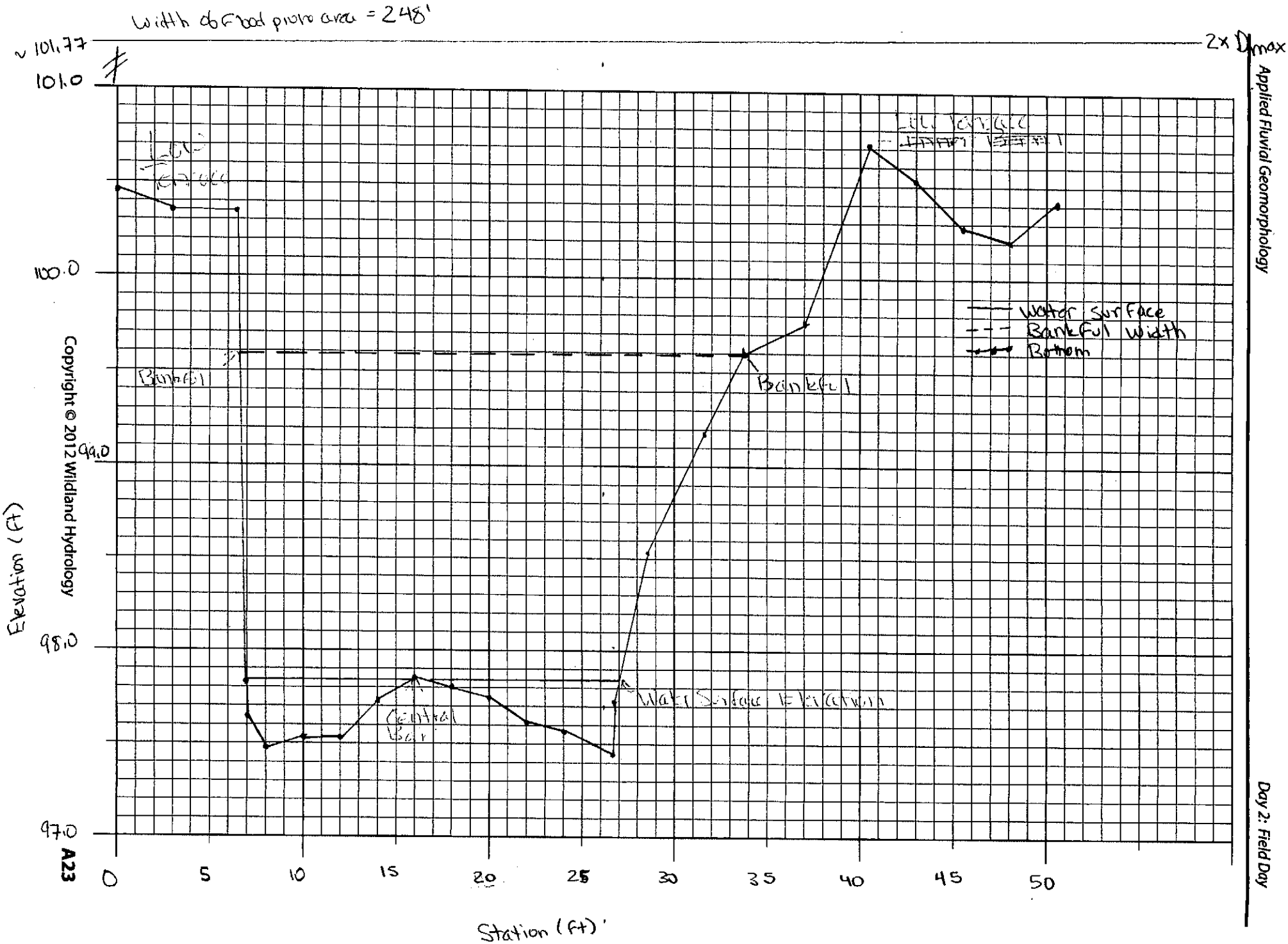
2.11

RIFFLE XS



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~~Cro~~ Long pro. station # 95

SURVEY DATA → CROSS - SECTION 2

SITE: Cross Section 2, Pool, Reach 1, Team 1 **Date:** 4/17/202

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
29	BM	5.01	105.01		100	Same BM as XS1
30	0.0	5.01			100.01	GS
31	3.0	5.24			99.77	GS
32	6.0	5.37			99.64	GS
33	9.0	5.22			99.79	GS
34	12.0	5.06			99.95	GS
35	14.0	5.30			99.71	LTOB
36	15.0	6.12			98.89	mid bank (LB)
37	16.0	7.32			97.69	LEW
38	16.2	7.56			97.45	CS - not at bottom of channel
39	17.0	7.66			97.35	CS
40	18.0	7.85			97.16	CS
41	20	8.48			96.53	CS
42	20.9	8.53			96.48	CS - bottom of pool
43	23.0	7.93			97.08	CS
44	25.0	7.64			97.37	CS
45	27.4	7.13			97.88	REW
46	29.0	7.08			97.93	SLPBRK
47	30.0	6.62			98.39	SLP BRK
48	32.0	6.32			98.69	SLP BRK
49	33.0	5.92			99.09	GS
50	34.0	5.48			99.53	SLPBRK
51	36.0	5.30			99.71	RTOB Bankful
52	39.0	5.26			99.75	SLP BRK
53	40.6	4.84			100.17	GS
54	43.0	4.46			100.55	SLPBRK
55	45.9	4.30			100.71	GS
56	50.0	4.46			100.55	GS
57						
58						
59						

d_{max} 8.53
Bnk Ful 5.30
3.23
Bankful Depth
6.46 = 2 × bankful depth

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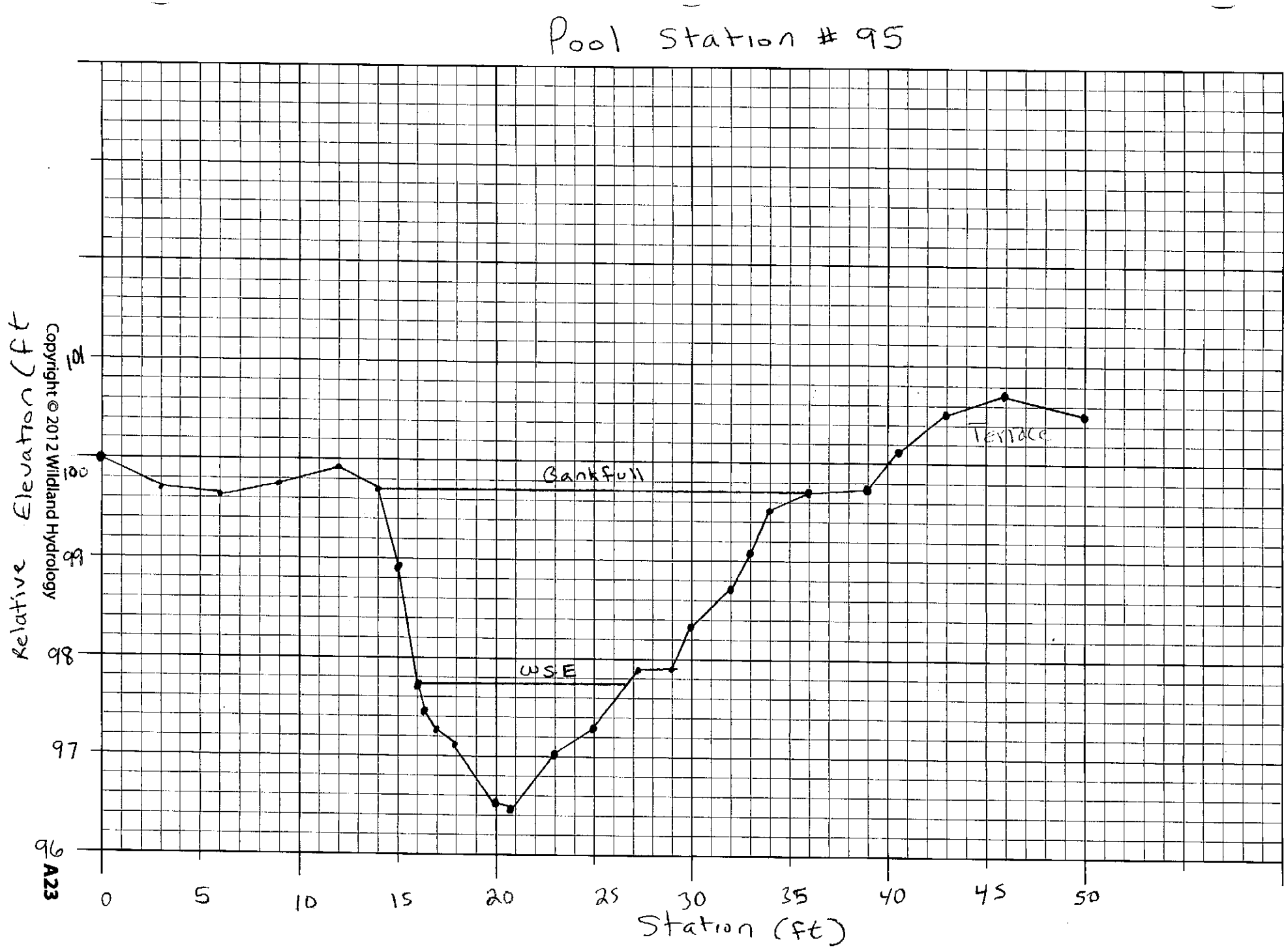
95' is Long pro station



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SURVEY DATA → LONGITUDINAL PROFILE 1

Keith M
Toby
Beth
Rusty

SITE: ISRALL CR. **Date:** 4/17/12

Location: MD

Party / Notes: TEAM 1 **HUC:**

	Distance, Point, or STATION (ft)	Back-Sight BS (ft)	Height of Instrument HI (ft)	Thalweg Fore-Sight FS (ft)	Thalweg Elevation Elev. (ft)	Water Surface Fore-Sight FS (ft)	Water Surface Elevation Elev. (ft)	Bankfull Fore-Sight FS (ft)	Bankfull Elevation Elev. (ft)	Low Bank HI Fore-Sight FS (ft)	Low Bank HI Elevation Elev. (ft)	NOTES e.g. Riffle Run Pool Glide
1	BM	4.01	104.9									
2	0		~~7.3~~	7.3	97.6	6.87	98.03	4.8	100.1	3.92	100.98	Top Riffle
3	0+05			7.82	97.08	6.89	98.01					Top Run
4	0+09			8.37	96.53	6.87	98.03					Top Pool
5	0+16			9.22	95.68							Max Pool Depth
6	0+37			7.73	97.17							End Pool Start glide (POINT BAR RR)
7	0+60.3			7.70	97.2							End glide
8	0+88 (TRANSIT 5.27)	~~4.01~~		8.10	96.8	6.83	98.07	4.96	99.94	4.11	100.79	Pool
9	0+113.3			7.83	97.07	6.92	97.98					Top glide
10	0+121			7.48	97.42	6.91	97.99	5.09	99.81	RIVER LEFT 4.43	100.47	Top Riffle
11	0+151			8.57	96.33	7.61	97.29					Top Run
12	0+162		-	9.19	95.71	RIV. LEFT ~~7.65~~	97.25	5.34	99.56	-		Top Pool
13	0+181			8.68	96.22	7.66	97.24					Max pool Depth
14	2+204			8.12	96.78	7.64	97.26					Start glide
15	2+215			7.76	97.14	7.66	97.24					Top Riffle
16	2+222			8.36	96.54	7.70	97.20					Top Pool
17	2+230			9.30	95.6							Max pool Depth
18	2+242			8.06	96.84	7.67	97.23	~~4.65~~		4.65	100.25	Top Run ?
19	2+257			8.32	96.58	7.73	97.17					Top Pool
20	2+276			9.79	95.11							Max pool Depth
21	2+290			8.31	96.59							End point bar (H2O)
22	3+328			8.32	96.58	7.87	97.03					Top Riffle
23	3+358					8.01	96.89	5.7	99.2			Riffle
* 24	TP	4.60	104.1	5.40	99.5							
25												
26												
27												

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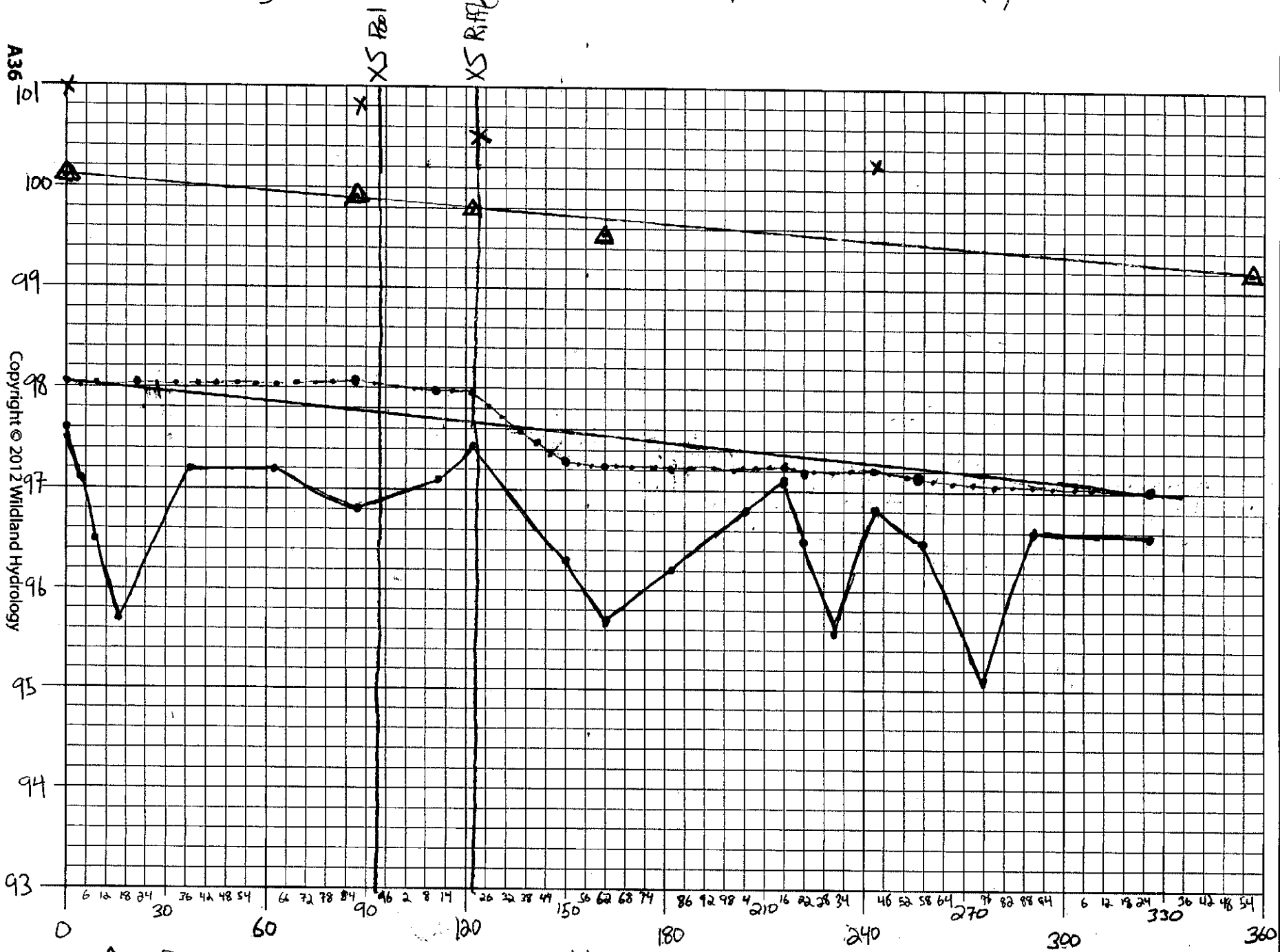
631
465

Longitudinal Profile of Reach 1, Israel Creek, MD



△ Bank Full
···· Water Surface
—— Thalweg

X = Low bank height

Water Surface Slope = 0.003 or 0.3%
Bank Full Slope = 0.0025 or 0.25%
Low Bank Slope = 0.003 or 0.3%

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Total

50/50 SPLIT

Site: ISRAEL CREEK
Date:
Location: 1
HUC:
Party: TEAM 1

Inches	PARTICLE	Millimeters	S/C	Dot Count for RIFFLE 1	POOL 2	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												
	Very Fine	.062 - .125	SAND				0	0	0	4	8	8	4	4	4
	Fine	.125 - .25	SAND				2	4%	4	2	4%	12	4	4	8
	Medium	.25 - .50	SAND				1	2%	6	3	6%	18	4	4	12
	Coarse	.50 - 1.0	SAND				2	4%	10	3	6%	24	5	5	17
.04 - .08	Very Coarse	1.0 - 2	SAND				2	4%	14	1	2%	26	3	3	20
.08 - .16	Very Fine	2 - 4	GRAVEL				1	2%	16	9	18%	44	10	10	30
.16 - .22	Fine	4 - 5.7	GRAVEL				5	10%	26	3	6%	50	8	8	38
.22 - .31	Fine	5.7 - 8	GRAVEL				7	14%	40	9	18%	68	16	16	54
.31 - .44	Medium	8 - 11.3	GRAVEL				14	28%	68	10	20%	88	24	24	78
.44 - .63	Medium	11.3 - 16	GRAVEL				8	16%	84	4	8%	96	12	12	90
.63 - .89	Coarse	16 - 22.6	GRAVEL				3	6%	90	2	4%	100%	5	5	95
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				5	10%	100	0	0		5	5	100
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL												
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL												
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128	COBBLE												
5.0 - 7.1	Large	128 - 180	COBBLE												
7.1 - 10.1	Large	180 - 256	COBBLE												
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		BDRK												
Stream Type:			**Valley Type:**			TOTAL→	50	100	100%	50	100%	100%	100	100%	100%

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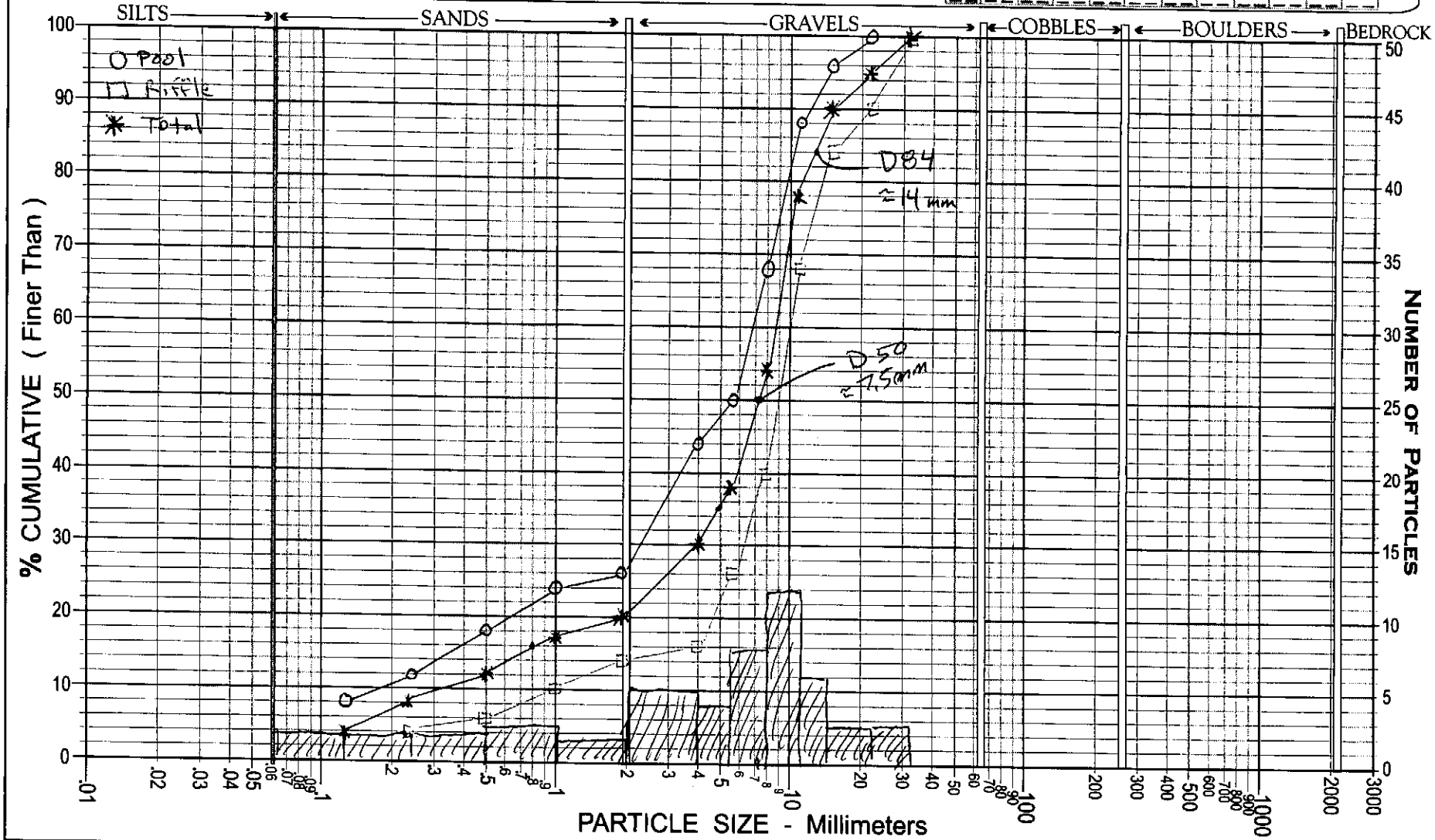
Total

PEBBLE COUNT DATA

LOCATION: ISRAEL CREEK
REACH: 1
PARTY: TEAM 1
Date: 4/17/2012
Stream Type: C4
Valley Type: 8C
HUC:



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Riffle

Site: ISRAEL CREEK Date: 4/17/12
Location: TUS BRIDGE HUC:
Party: (1)

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	~~POOL~~ 2	COMP. 3	RIFFLE (1) Reach: ACTIVE BED Date: 4/17/12 TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25	SAND												
	Medium	.25 - .50	SAND												
	Coarse	.50 - 1.0	SAND												
.04 - .08	Very Coarse	1.0 - 2	SAND												
.08 - .16	Very Fine	2 - 4	GRAVEL		5		5	5%	5%						
.16 - .22	Fine	4 - 5.7	GRAVEL		4		4	4%	9%						
.22 - .31	Fine	5.7 - 8	GRAVEL		19		19	19%	28%						
.31 - .44	Medium	8 - 11.3	GRAVEL		22		22	22%	50%						
.44 - .63	Medium	11.3 - 16	GRAVEL		30		30	30%	80%						
.63 - .89	Coarse	16 - 22.6	GRAVEL		12		12	12%	92%						
.89 - 1.3	Coarse	22.6 - 32	GRAVEL		5		5	5%	97%						
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL												
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL		1		1	1%	98%						
2.5 - 3.5	Small	64 - 90	COBBLE		2		2	2%	100%						
3.5 - 5.0	Small	90 - 128	COBBLE												
5.0 - 7.1	Large	128 - 180	COBBLE												
7.1 - 10.1	Large	180 - 256	COBBLE												
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		BDRK												
Stream Type:			**Valley Type:**			TOTAL→	100	100%	100%						

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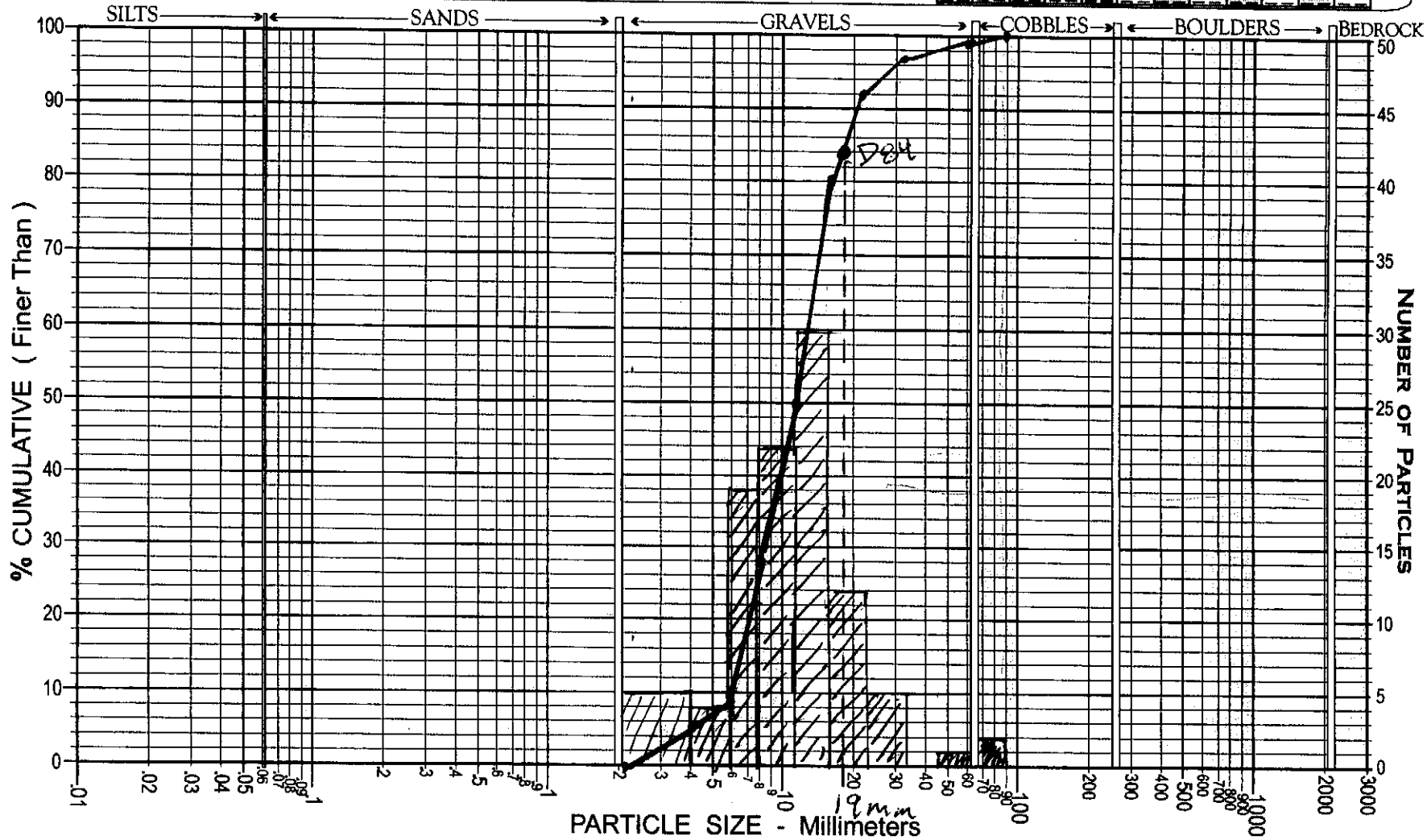
Riffle

PEBBLE COUNT DATA

LOCATION: ISRAEL CREEK
REACH: ACTIVE BED Reach 1
PARTY: [illegible]
Date: 4/17/12
Stream Type: C4
Valley Type: BC
HUC:



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Worksheet A-1. Field Form for Level II Stream Classification.

Stream: Israel Creek - Reach 1	
Basin:	Drainage Area: 3392 acres 5.3 mi^2
Location: .75 miles E. of Yarrowsburg in Washington County, MD	
Twp.&Rge:	Sec.&Qtr.:
Cross-Section Monuments (Lat./Long.):	Date: 04/17/2012
Observers: Team 1	Valley Type: 8c

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	27.1	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.73	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	46.9	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	15.7	ft/ft
Maximum DEPTH (d_{max}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	2.2	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.	248	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	9.2	ft/ft
Channel Materials (Particle Size Index) D_{50} The D_{50} particle size index represents the median or dominant diameter of channel materials, as sampled proportionately from the channel surface, between the bankfull stage and Thalweg elevations.	7.5	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.	0.003	ft/ft
Channel SINUOSITY (k) Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL / VL); or estimated from a ratio of valley slope divided by channel slope (S_{val} / S).	1.47	

Stream Type [redacted] **See Classification Key (Figure A-2)**

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Worksheet A-2. Computations of velocity and discharge using various methods.

Bankfull Velocity and Discharge Estimates

Stream:	ISRAEL CREEK	Location:	Reach 1
Date:	4/17/2012	Stream Type:	C4
Valley Type:	8c		
Observers:	Team 1	HUC:	02 07 00 08 02 01 -- -- -- -- --

INPUT VARIABLES			DERIVED VARIABLES		
Bankfull Riffle Cross-Sectional AREA	46.88	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.73	d_{bkf} (ft)
Bankfull Riffle WIDTH	27.1	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	30.56	W_p (ft)
D_{84} at Riffle	19	Dia. (mm)	D_{84} (mm) / 304.8	0.062	D_{84} (ft)
Bankfull SLOPE	0.0025	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.53	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	24.67	R / D_{84}
Drainage Area	5.3	DA (mi^2)	Shear Velocity $u^* = (gRS)^{½}$	.35	u^* (ft/sec)

ESTIMATION METHODS	BANKFULL VELOCITY		BANKFULL DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.75	ft / sec	175.8	cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor / Relative Roughness (Figs. A-27, A-28) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.026	3.8	ft / sec	178	cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. A-29) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.040	2.47	ft / sec	116	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 $n =$ 0.040	2.47	ft / sec	116	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
4. Continuity Equations: a) USGS Gage Data $u = Q / A$ Return Period for Bankfull Discharge Q = ____ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $u = Q / A$	3.50	ft / sec	164	cfs

Bankfull Estimation Options for the Determination of Relative Roughness (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 A-3. Summary of Morphological Variables.

Stream: Israel Creek		**Location:** Washington County, MD	
Team: 1	**Date:** 4/17/12	**Drainage Area:** 5.3 mi²	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	27.1	2. Bankfull Mean Depth (d_{bkf}) (ft)	1.73
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	15.7	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	46.9
5. Bankfull Maximum Depth (d_{max}) (ft)	2.2	6. Width of Flood-Prone Area (W_{fpa}) (ft)	248
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	9.2		

Channel Pattern / Dimensionless Ratios

8. Belt Width (W_{blt}) (ft)	Mean	127	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	4.69
	Min			Min	
	Max			Max	
10. Stream Meander Length (L_m) (ft)	Mean	270	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	9.96
	Min			Min	
	Max			Max	
12. Linear Wavelength (λ) (ft)	Mean	176	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	6.49
	Min			Min	
	Max			Max	
14. Radius of Curvature (R_c) (ft)	Mean	46.5	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	1.72
	Min	45		Min	
	Max	48		Max	

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	0.8	17. D_{35} (mm)	4.9	18. D_{50} (mm)	7.5
19. D_{84} (mm)	14	20. D_{95} (mm)	22.6	21. D_{100} (mm)	32

Active Bed Riffle Pebble Count

22. D_{16} (mm)	6.5	23. D_{35} (mm)	9	24. D_{50} (mm)	11
25. D_{84} (mm)	19	26. D_{95} (mm)	27	27. D_{100} (mm)	90

Classification

28. Sinuosity (k)	1.47	29. Average Water Surface Slope (S)	0.003
30. Stream Type	C4	31. Valley Type	8c

Velocity & Discharge

32. Friction Factor (u / u*) 3.5/0.35	10.0	33. Relative Roughness (R / D_{84})	24.67
34. Manning's "n" from Friction Factor / Relative Roughness	0.026	35. Manning's "n" from Stream Type	0.040
36. Estimated Mean Velocity (u_{bkf}) (ft/sec)	3.50	37. Estimated Bankfull Discharge (cfs)	164
38. Estimation Method Selected for Velocity & Discharge	Continuity Eq & Regional Curve		

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