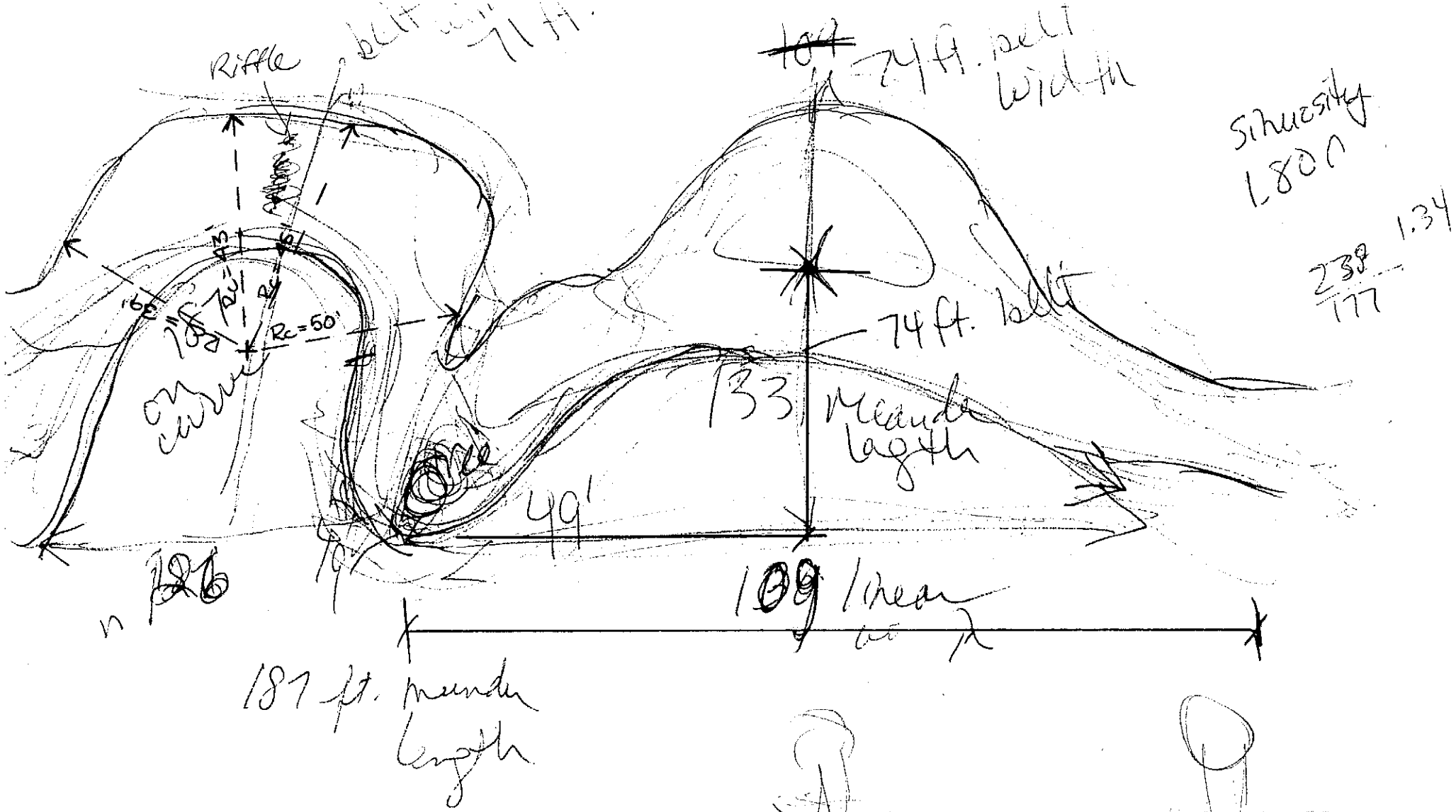
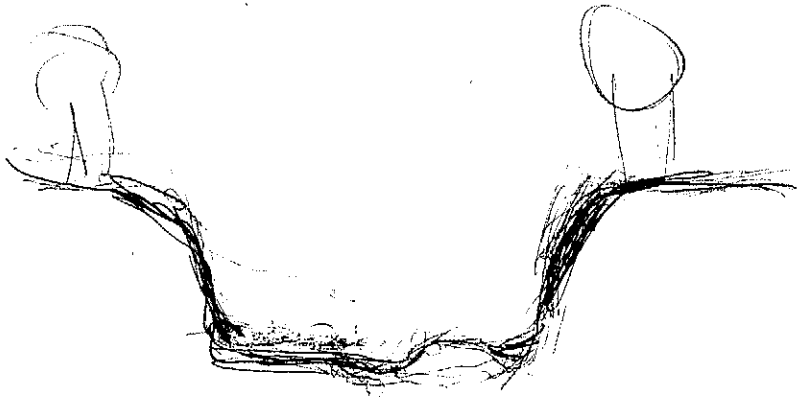
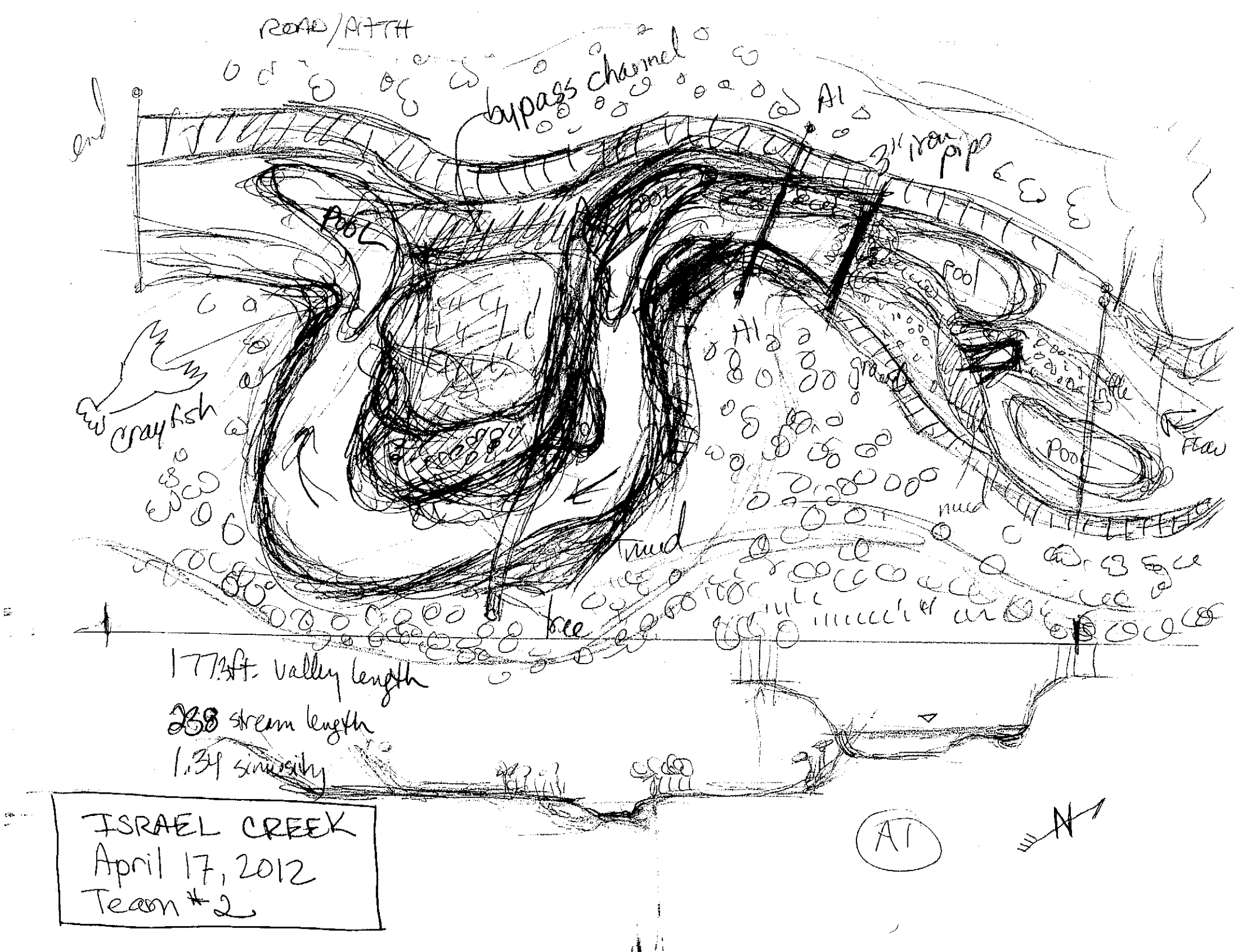




ISRAEL CREEK
April 17th, 2012
Reach #2



ISRAEL CREEK
April 17, 2012
Team #2

TEAM 2

4/17/12

Israel Creek

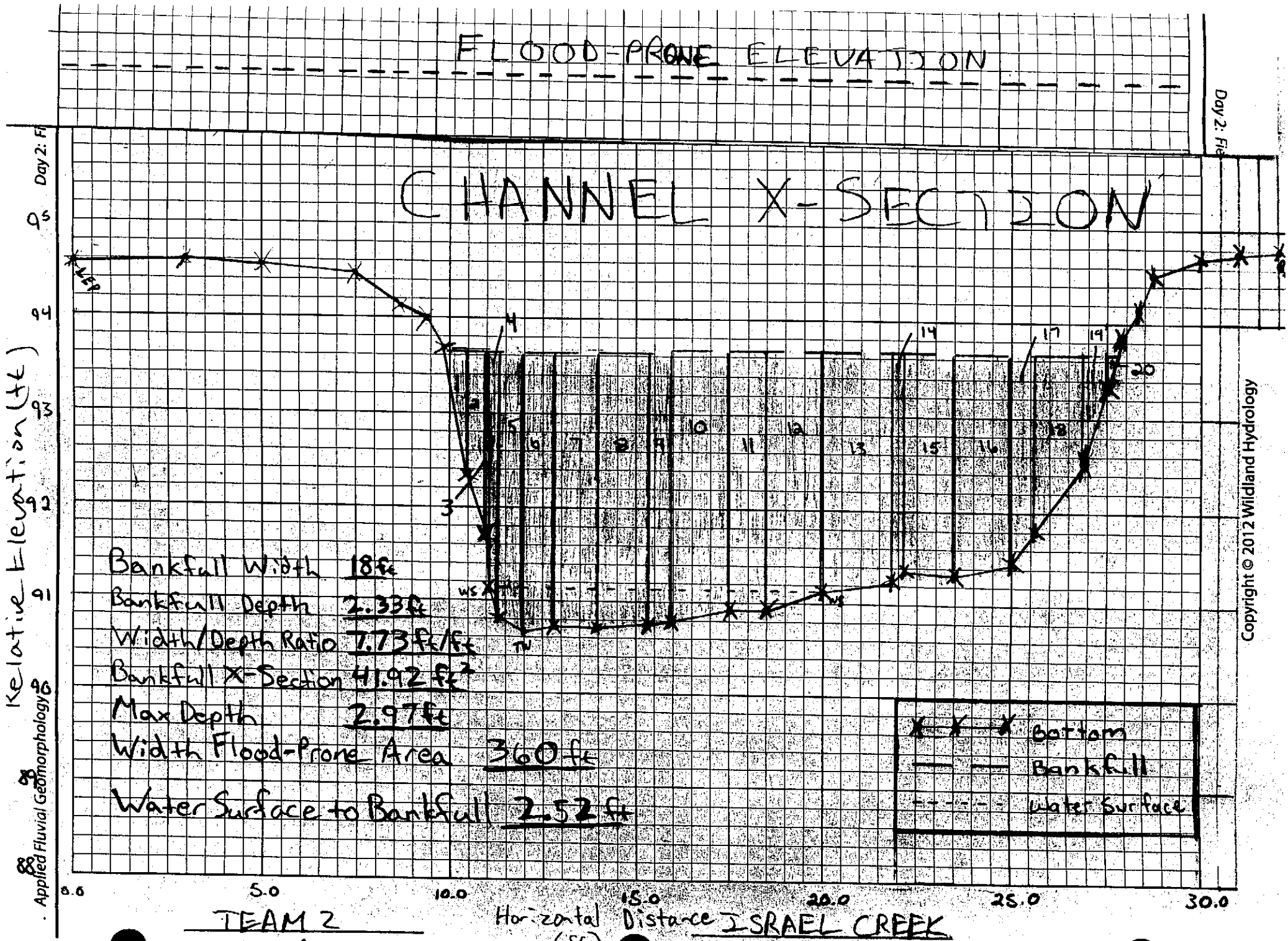
Valley Type VIIIC

Drainage Area 5.35 mi²

CROSS SECTIONAL AREA CALC.

Cell (#)	Station (ft)	Elevation (ft)	Depth (ft)	Cell Width (ft)	Avg. Cell Depth (ft)	Incramental Area (ft²)
	9.8	93.64	0	0		
1	10.5	92.35	1.29	0.7	0.645	0.4515
2	11	91.72	1.92	0.5	1.605	0.8025
3	11.1	91.[illegible]	2.52	0.1	2.22	0.222
4	11.3	90.81	2.83	0.2	2.675	0.535
5	12	90.67	2.97	0.7	2.9	2.03
6	12.8	90.72	2.92	0.8	2.945	2.356
7	14	90.71	2.93	1.2	2.925	3.51
8	15.3	90.77	2.87	1.3	2.935	3.77
9	16	90.8	2.84	0.7	2.855	1.9985
10	17.5	90.91	2.73	1.5	2.785	4.1775
11	18.5	90.9	2.74	1	2.735	2.735
12	20	91.11	2.53	1.5	2.635	3.9525
13	21.8	91.21	2.43	1.8	2.48	4.464
14	22.2	91.35	2.29	0.4	2.36	0.944
15	23.5	91.31	2.33	1.3	2.31	3.003
16	25	91.45	2.19	1.5	2.26	3.39
17	25.6	91.8	1.84	0.6	2.015	1.209
18	26.8	92.53	1.11	1.2	1.475	1.77
19	27.6	93.33	0.31	0.8	0.71	0.568
20	27.8	93.82	0	0.2	0.155	0.031
					Total Area (ft²)	41.92

ABKF



TEAM 2

4/17/12

ISRAEL CREEK

VALLEY TYPE V.II.C

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SURVEY DATA ⟶ LONGITUDINAL PROFILE 1

SITE: Israel Creek **Date:** 04-17-12

Location: Reach #1

Party / Notes: Team #2 **HUC:**

	Distance, Point, or	Back-Sight	Height of Instrument	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	WATER SURFACE - BANKFULL
	STATION	BS	HI	FS	Elev.	FS	Elev.	FS	Elev.	FS	Elev.		
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft		
1	0		100	9.04	90.96	8.67	91.33	6.23	93.77	6.23	93.77	RIFFLE	2.44
2	9.6			9.57	90.43	8.76	91.24					RUN	
3	16.2			9.21	90.79	8.66	91.34					TOP OF POOL	
4	19			10.55	89.45	8.66	91.34					MAX DEPTH	
5	23.2			9.77	90.23	8.73	91.27					GLIDE	
6	56			9.21	90.79	8.81	91.19	6.26	93.74	5.77	94.23	RIFFLE (ARTIFICIAL) → @ PIPE	2.55
7	63			9.0	91	8.78	91.22					U/S OF PIPE	
8	63.3			9.46	90.54	8.86	91.34					D/S OF PIPE	
* 9	82.3			9.35	90.65	8.90	91.10	6.36	93.64	5.54	94.46	@ X-SECTION	2.54
10	91.6			9.42	90.58	9.01	90.99	6.31	93.69	6.10	93.90	RANDOM LOCATION	2.70
11	94			9.43	90.57	9.04	90.96					TOP OF POOL	
12	98			10.71	89.29	9.08	90.92					MAX DEPTH	
13	115			9.48	90.52	9.18	90.82					TOP OF RIFFLE	
14	127.5					9.23	90.77	6.91	93.09	6.74	93.26	BANKFULL MEASUREMENT	2.32
15	131			9.94	90.06	9.23	90.77					TOP OF POOL	
16	138.5			11.12	88.88	9.35	90.65					MAX DEPTH	
17	147			10.53	89.47	9.29	90.71					GLIDE	
18	159			10.21	89.79	9.32	90.68	6.50	93.50	*		BANKFULL / RUN	~~2.7~~ 2.82
19	1+68			10.39	89.61	9.27	90.73					TOP OF POOL	
20	1+91			10.77	89.23							MAX DEPTH POOL	
21	2+13					9.34	90.66	7.34	92.66			BANKFULL AT POOL	2.0
22	2+37			9.84	90.16	9.29	90.71					TOP OF RIFFLE	end
23													
24													
25													
26													
27													

82.3 X-SECTION

9.84 − 7.07 = 0.80

SLOPE 0.80 / 237 = 0.0033

9.23 − 6.91 = 2.32 ; 9.32 − 7.25 = 2.07 ; 9.32 − 6.50 = 2.82

9.34 − 7.34

* - ON THE ISLAND

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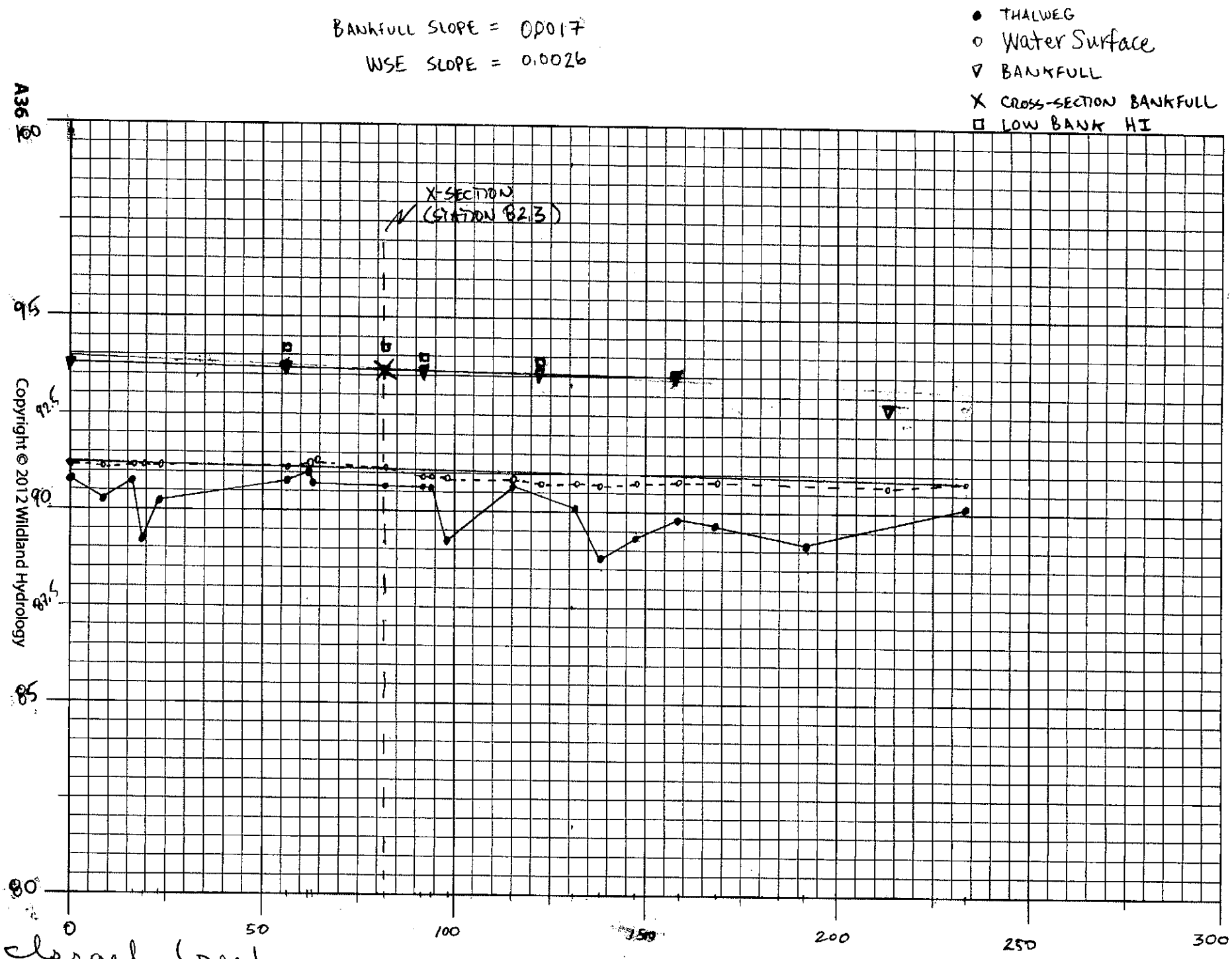
BANKFULL SLOPE = 0.0017

WSE SLOPE = 0.0026



Clarael Creek
1st reach, Team #2
4-17-12
LONG PRO

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D-84 (xs) @ cross section

(XS)

D84 = 20mm

Site: Israel Creek Date: 17 Apr 12

Location: 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	5			5	5.0%	5 %						
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25		3			3	3.0%	8 %						
	Medium	.25 - .50													
	Coarse	.50 - 1.0		5			5	5.0%	13 %						
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL	3			3	3.0%	16 %						
.16 - .22	Fine	4 - 5.7		6			6	6.0%	22 %						
.22 - .31	Fine	5.7 - 8		11			11	11.0%	33 %						
.31 - .44	Medium	8 - 11.3		19			19	19.0%	52 %						
.44 - .63	Medium	11.3 - 16		20			20	20.0%	72 %						
.63 - .89	Coarse	16 - 22.6		18			18	18.0%	90 %						
.89 - 1.3	Coarse	22.6 - 32		9			9	9.0%	99 %						
1.3 - 1.8	Very Coarse	32 - 45		1			1	1.0%	100%						
1.8 - 2.5	Very Coarse	45 - 64													
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128													
5.0 - 7.1	Large	128 - 180													
7.1 - 10.1	Large	180 - 256													
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
						TOTAL→	100								

Reach: / Date: 17 Apr 12 — RIFFLE (1)

Reach: / Date: — POOL (2)

Reach: / Date: — COMPOSITE (3)

Stream Type: **Valley Type:**

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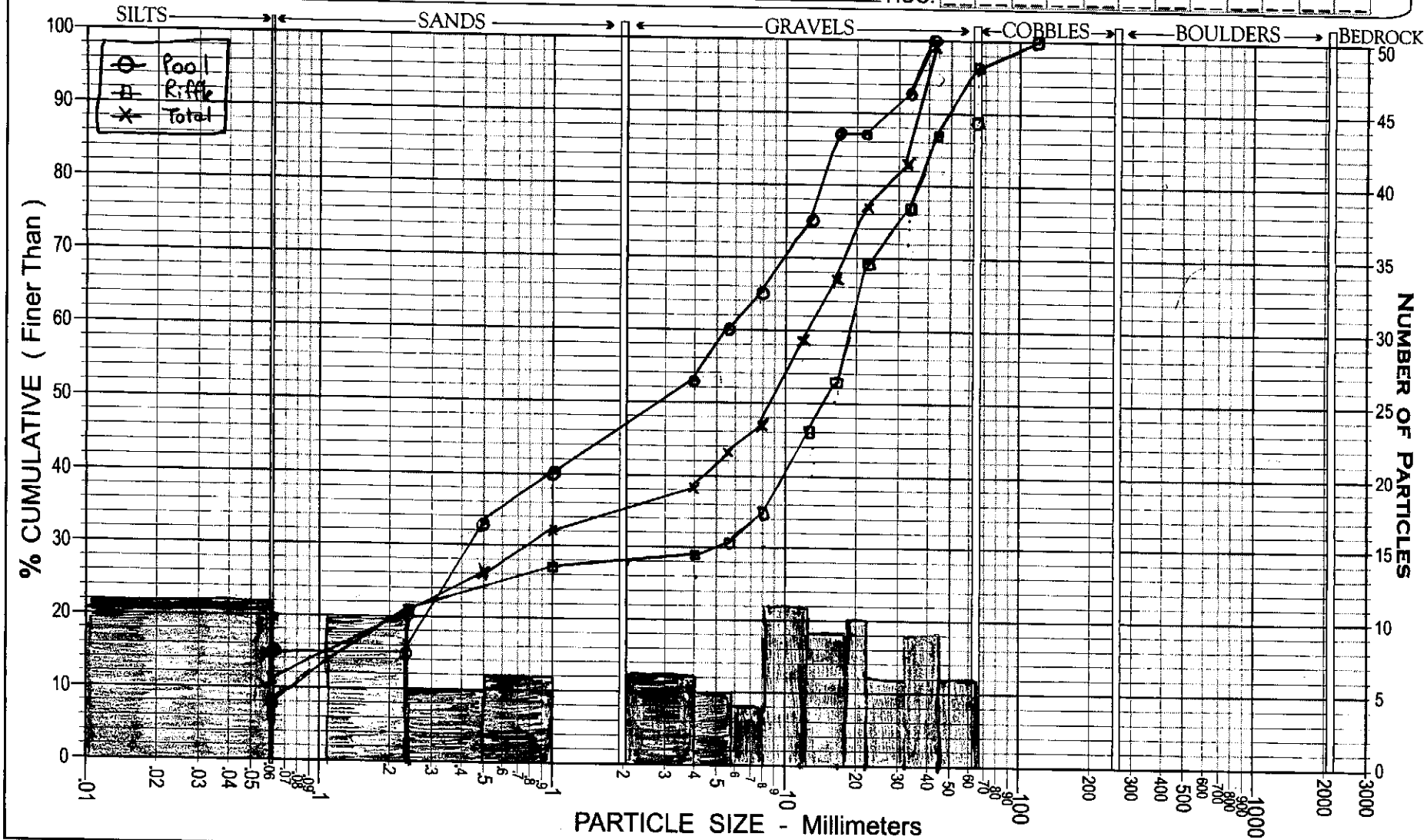
D50 = 9.5 mm

Pools = 4
Riffles = 6

LOCATION: Israel Creek
REACH: Reach #1
Stream Type: C4

PEBBLE COUNT DATA

PARTY: Team 2
Valley Type: 8C
Date: 17 Apr 12
HUC:



D_{50} = 3.0 mm
D_{84} = 16.0 mm

Pool length = 99' = 41%
non-pool length = 139' = 59%

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D-50

Total length of reach = 238'

Pool length = 99' (41%) = 4

non-pool length = 139' (59%) = 6

Site: Israel Creek Date: 4-17-12

Location: Reach #1 HUC:

Party: Team 2

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	Dot Count for POOL 2	Dot Count for COMP. 3	RIFFLE (1) TOT #	RIFFLE (1) ITEM %	RIFFLE (1) % CUM	POOL (2) TOT #	POOL (2) ITEM %	POOL (2) % CUM	COMPOSITE (3) TOT #	COMPOSITE (3) ITEM %	COMPOSITE (3) % CUM
	Silt / Clay	< .062	S/C	5	6	11	5	8.33	8.33	6	15	15	11	11	11
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25	SAND	8	2	10	8	13.33	21.66	2	5	20	10	10	21
	Medium	.25 - .50	SAND		5	5	0			5	12.5	32.5	5	5	26
	Coarse	.50 - 1.0	SAND	3	3	6	3	5.0	26.66	3	7.5	40	6	6	32
.04 - .08	Very Coarse	1.0 - 2	SAND												
.08 - .16	Very Fine	2 - 4	GRAVEL	1	5	6	1	1.66	28.32	5	12.5	52.5	6	6	38
.16 - .22	Fine	4 - 5.7	GRAVEL	2	3	5	2	3.33	31.65	3	7.5	60	5	5	43
.22 - .31	Fine	5.7 - 8	GRAVEL	2	2	4	2	3.33	34.98	2	5	65	4	4	47
.31 - .44	Medium	8 - 11.3	GRAVEL	7	4	11	7	11.66	46.64	4	10	75	11	11	58
.44 - .63	Medium	11.3 - 16	GRAVEL	4	5	9	4	6.66	53.3	5	12.5	87.5	9	9	67
.63 - .89	Coarse	16 - 22.6	GRAVEL	10		10	10	16.66	69.96	0	0	87.5	10	10	77
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	4	2	6	4	6.66	76.62	2	5	92.5	6	6	83
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	~~6~~ 8	~~2~~ 3	~~3~~ 9	6	10.0	86.62	~~3~~ 3	~~2.5~~	~~95~~	~~3~~ 9	~~3~~ 9	~~90~~ 99
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL	6		6	6	10.0	96.62	0	7.5	100	6	6	~~96~~ 100
2.5 - 3.5	Small	64 - 90	COBBLE	1		1	1	1.66	98.28	0			1	1	~~97~~
3.5 - 5.0	Small	90 - 128	COBBLE	1		1	1	1.66	99.94	0			1	1	~~98~~
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		~~1~~	~~2~~	0	0		2	5	~~100~~	2	2	100
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		BDRK												
Stream Type:			**Valley Type:**			TOTAL→	60			40			100		

Pool = ...

Riffle/Run/Glide ...

D52

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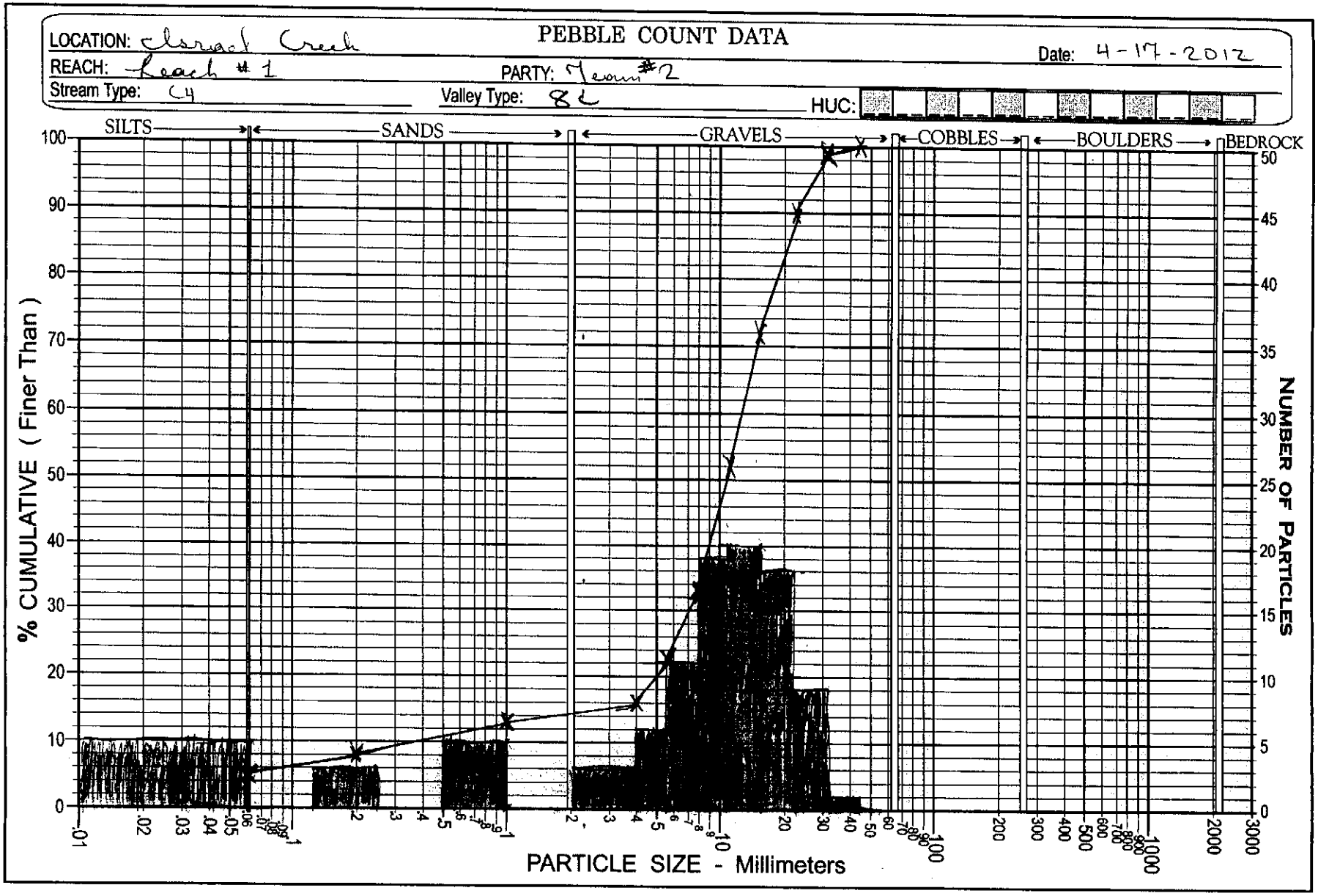
D84 = 20mm



D_{50} = 11.0 mm

D_{84} = 20.0 mm

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

Stream: Israel Creek	
Basin:	Drainage Area: 5.35 ~~m²~~ acres (mi²)
Location: Reach #1	
Twp.&Rge:	Sec.&Qtr.:
Cross-Section Monuments (Lat./Long.):	Date: 4-17-12
Observers: Team #2	Valley Type: 8c

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	18.0	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	2.33	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	41.92	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	7.73	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.	2.97	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.	360	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	20	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.	9.5	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.	.0026	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).	1.34	

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 & DISCHARGE Estimates

Stream:	Israel Creek			Location:	First Reach
Date:	4-17-12	Stream Type:	C4	Valley Type:	8C
Observers:	Team # 2			HUC:	-- -- -- -- -- -- -- -- -- -- --

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	41.92	A_{bkf} (ft²)	Bankfull Riffle Mean DEPTH	2.33	d_{bkf} (ft)
Bankfull Riffle WIDTH	18.0	W_{bkf} (ft)	Wetted PERMIMETER ~ (2 * d_{bkf}) + W_{bkf}	22.66	W_p (ft)
D_{84} at Riffle	20.0	Dia. (mm)	D_{84} (mm) / 304.8	0.066	D_{84} (ft)
Bankfull SLOPE	.0017	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.85	R (ft)
Gravitational Acceleration	32.2	g (ft / sec²)	Relative Roughness R(ft) / D_{84} (ft)	28.03	R / D_{84}
Drainage Area	5.35	DA (mi²)	Shear Velocity $u^* = (gRS)^{1/2}$	0.318	u* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.505	ft / sec	146.93	cfs
★ 2. Roughness Coefficient: a) Manning's *n* from Friction Factor / Relative Roughness (Figs. A-27, A-28) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.0255	3.62	ft / sec	151.75	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	2.31	ft / sec	96.84	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 $n =$ 0.313	2.95	ft / sec	123.47	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Chezy: $1/\sqrt{F} = 4$; F=0.066 ; $F = 8(GRS)/\bar{u}^2$	3.50	ft / sec	146.9	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	n/a	ft / sec	n/a	cfs
4. Continuity Equations: b) Regional Curves u = Q / A	4.29	ft / sec	180.0	cfs

Protrusion Height Options for the D_{84} Term in the Relative Roughness Relation (R/D_{84}) Estimation Method

Option 1.	For **sand-bed** channels: Measure 100 **"protrusion heights"** of sand dunes from the downstream side of feature to the top of feature. Substitute the D_{84} sand dune protrusion height in ft for the D_{84} term in method 1.
Option 2.	For **boulder-dominated** channels: Measure 100 **"protrusion heights"** of boulders on the sides from the bed elevation to the top of the rock on that side. Substitute the D_{84} boulder protrusion height in ft for the D_{84} term in method 1.
Option 3.	For **bedrock-dominated** channels: Measure 100 **"protrusion heights"** of rock separations, steps, joints or uplifted surfaces above channel bed elevation. Substitute the D_{84} bedrock protrusion height in ft for the D_{84} term in method 1.
Option 4.	For **log-influenced** channels: Measure **"protrustion heights"** proportionate to channel width of log diameters or the height of the log on upstream side if embedded. Substitute the D_{84} protrusion height in ft for the D_{84} term in method 1.

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Worksheet A-3. Summary of Morphological Variables.

Stream: Israel Creek		**Location:** Reach #1	
Team: #2	**Date:** 4-17-12	**Drainage Area:** 5.35	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	18.0	2. Bankfull Mean Depth (d_{bkf}) (ft)	2.33
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	7.73	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	41.92
5. Bankfull Maximum Depth (d_{max}) (ft)	2.97	6. Width of Flood-Prone Area (W_{fpa}) (ft)	360
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	20.0		

Channel Pattern / Dimensionless Ratios

8. Belt Width (W_{blt}) (ft)	Mean	72.5	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	4.03
	Min	71.0		Min	3.94
	Max	74.0		Max	4.11
10. Stream Meander Length (L_m) (ft)	Mean	160.0	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	8.89
	Min	133.0		Min	7.39
	Max	187.0		Max	10.39
12. Linear Wavelength (λ) (ft)	Mean	117.5	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	6.53
	Min	109.0		Min	6.06
	Max	126.0		Max	7.0
14. Radius of Curvature (R_c) (ft)	Mean	44.25	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	2.46
	Min	39.0		Min	2.17
	Max	50.0		Max	2.78

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	0.13	17. D_{35} (mm)	0.55	18. D_{50} (mm)	2.95
19. D_{84} (mm)	16.0	20. D_{95} (mm)	62.0	21. D_{100} (mm)	43.0

Active Bed Riffle Pebble Count

22. D_{16} (mm)	4.0	23. D_{35} (mm)	8.0	24. D_{50} (mm)	11.0
25. D_{84} (mm)	20.0	26. D_{95} (mm)	29.0	27. D_{100} (mm)	45.0

Classification

28. Sinuosity (k)	1.345	29. Average Water Surface Slope (S)	0.0026
30. Stream Type	C4	31. Valley Type	8c

Velocity & Discharge

32. Friction Factor (u / u*)	7.46	33. Relative Roughness (R / D_{84})	0.0924
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)	3.62	37. Estimated Bankfull Discharge (cfs)	151.75
38. Estimation Method Selected for Velocity & Discharge	n = 0.0255 → mannings 'n' from friction factor / relative roughness		

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