Team #1 4/9/13 Isreal Creek

Presentation Order

As a team, prepare to present the following items in order:

1. Sketch Map
2. Riffle Cross-Section Graph
3. Longitudinal Profile Graph
4. Representative Pebble Count for Stream Classification Graph
5. Active Bed Riffle Pebble Count for Hydraulic Calculations Graph
6. Velocity Comparison Form (**Worksheet A-2**)
7. Stream Channel Classification Form (**Worksheet A-1**)
8. Summary of Morphological Variables (**Worksheet A-3**)

Checklist for Team Folder

Folder Holder: Please collect the following items from your team members and insert into your team folder. Please make sure all corrections have been made following your team presentation and give your completed team folder to Dave.

☑ Sketch Map

☑ Riffle Cross-Section Raw Data and Graph

☑ Longitudinal Profile Raw Data and Graph

☑ Representative Pebble Count Raw Data and Graph

☑ Active Bed Riffle Pebble Count Raw Data and Graph

☑ Stream Channel Classification Form (**Worksheet A-1**)

☑ Velocity Comparison Form (**Worksheet A-2**)

☑ Summary of Morphological Variables (**Worksheet A-3**)

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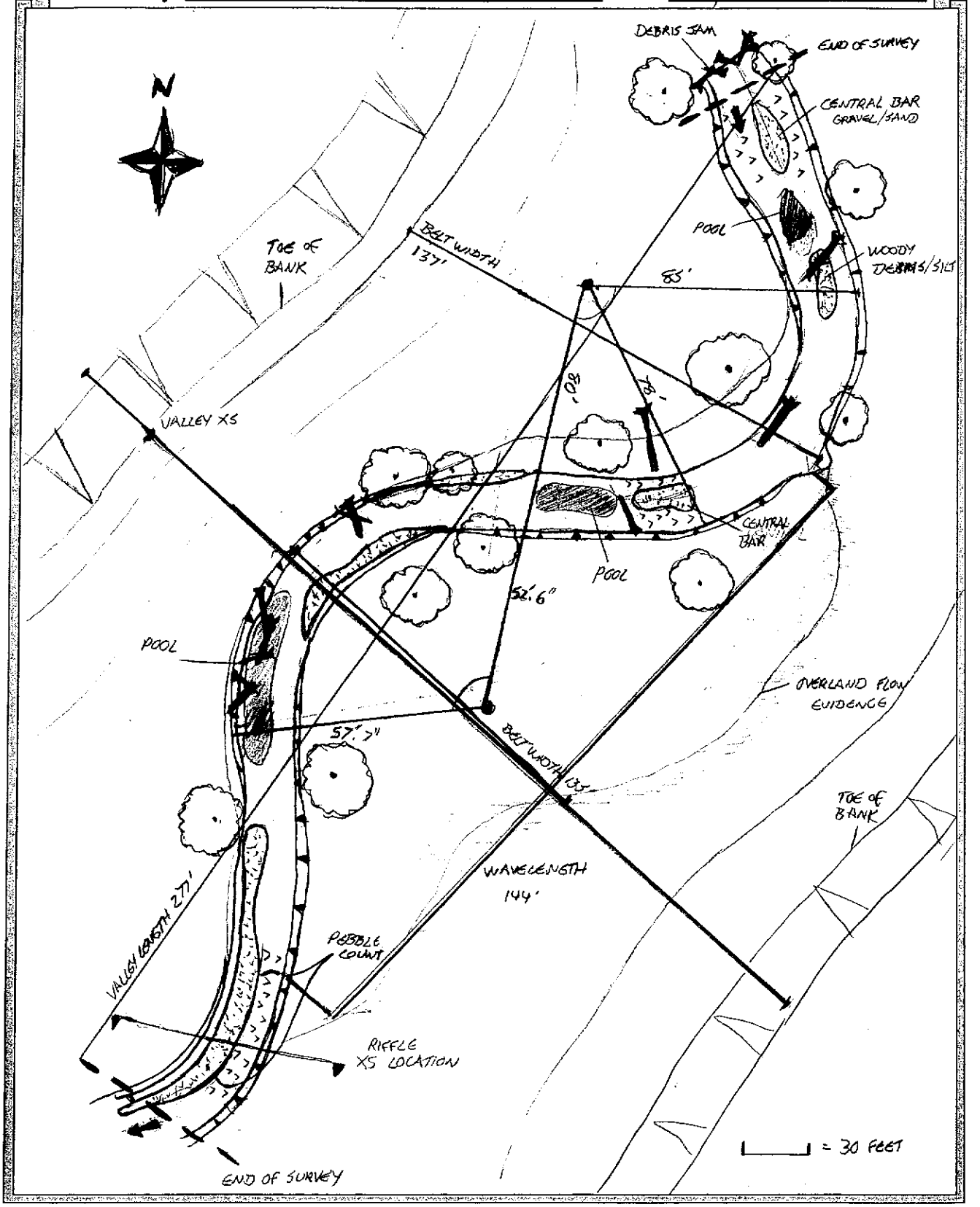
AREA-SITE LOCATION...REACH MAP

Stream: ISRAEL CREEK Reach: 1

Drawn By: TEAM 1 Date: 4/9/13



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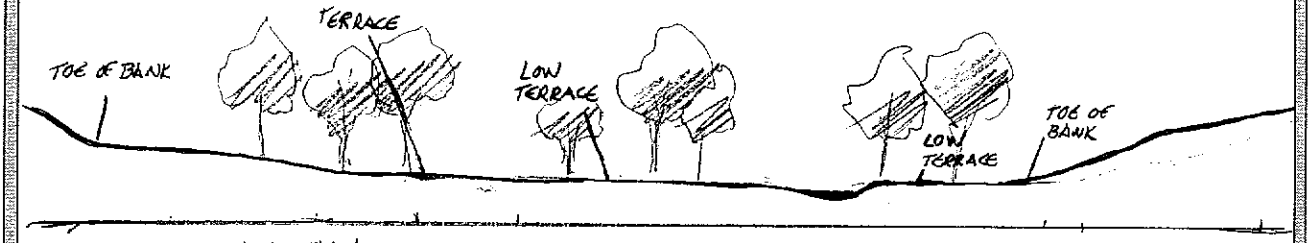
AREA-SITE LOCATION...REACH MAP

Stream: ISRAEL CREEK Reach: 1

Drawn By: TEAM 1 Date: 4/9/13

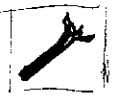
RIFFLE CROSS SECTION



VALLEY CROSS SECTION

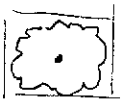
POINT BAR/CENTRAL BAR

END OF SURVEY



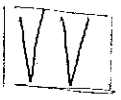
WOODY DEBRIS

RIFFLE



TREE NEAR OR ON STREAM

POOL



STEEP BANK

RAW STEEP BANK

FLOW DIRECTION

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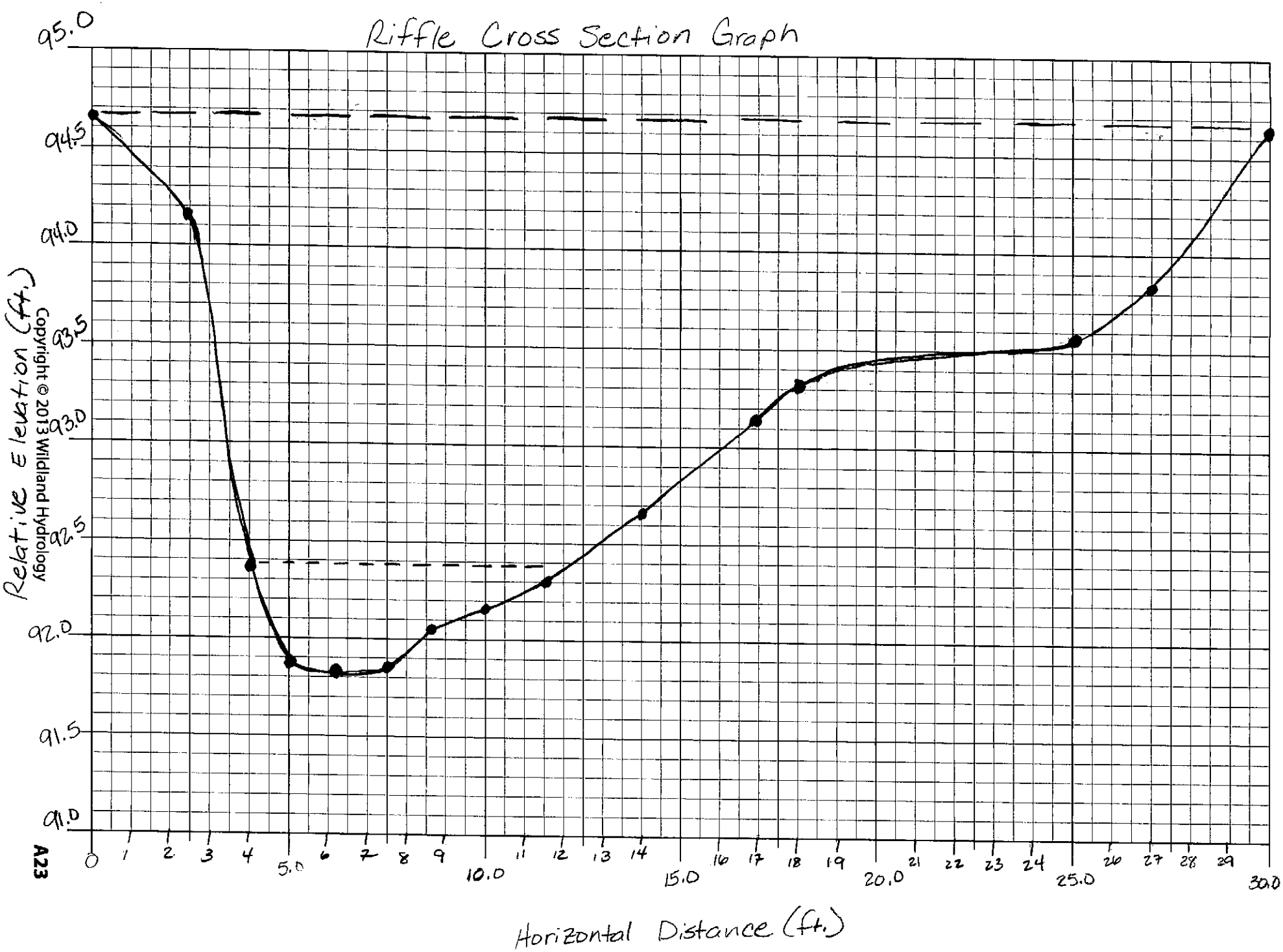
Team 1
Isreal Cr.

Riffle Cross Section Graph



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SURVEY DATA ⟶ **CROSS - SECTION 1**

SITE: Isreal Creek **Date:** 4/9/13

Location:

Party / Notes: Team 1 **HUC:**

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	REMARKS / COMMENTS / NOTES	
1	BM		100	5.2	97.8	BM LBK	Depth
2	20			5.35	94.65	LBKF	0
3	22.5			5.82	94.18		0.47 1
4	24			7.64	92.36	LEW	2.29 2
5	25			8.14	91.86	LTOS	2.79 3
6	26.3			8.19	91.81	THL	2.84 4
7	27.6			8.15	91.85		2.80 5
8	28.7			7.95	92.05		2.60 6
9	30.6			7.85	92.15		2.50 7
10	31.6			7.71	92.29	REW	2.36 8
11	34.0			7.35	92.65		2 9
12	37.0			6.87	93.13		1.52 10
13	38.0			6.67	93.33		1.32 11
14	45.0			6.45	93.55		1.10 12
15	47.0			6.19	93.81		0.84 13
16	50.0			5.40	94.6	RBKF	0
17	59.0			5.20	94.8		25.43
18							~1.69
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							

50'

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SURVEY DATA ⟹ **LONGITUDINAL PROFILE 1**

SITE: Israel Creek **Date:** 4/9/13

Location: Reach I

Party / Notes: 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
	STATION	BS	HI	FS	Elev.	FS	Elev.	FS	Elev.	FS	Elev.	
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	
1	00+25		100	8.3	91.70	6.57	93.43	18.11	194.91			B Riff
2	00+76			8.05	91.95	6.57	93.43					T Pool
3	01+04			7.63	92.37	6.57	93.43			5.45	94.55	Dmax
4	01+28			8.15	91.85	6.57	93.43	4.72	95.28			Dmax
5	01+48			7.11	92.89	6.57	93.43					T Run
6	01+72			7.08	92.92	6.68	93.32					T Riff
7	02+10			8.50	91.50	7.20	92.80	5.22	94.78			T Pool
8	02+35					7.24	92.76	5.45	94.55			Pool
9	02+36			8.81	90.99	7.24	92.76					D max
10	02+51									4.56	95.28	start In size
11	02+63			9.10	90.90							Dmax
12	02+75			8.25	91.75	7.25	92.75	5.35	94.65			T Run
13	02+89			8.86	91.14	7.40	92.60					B Run
14	02+86			10.17	89.83	–						Dmax
15	03+09			8.19	91.81	7.40	92.60	5.43	94.57	4.72	94.71	T Riff
16	03+38			8.30	91.70							Channel Shot
17	03+70						92.86	5.86	94.14			X-sec 390
18	03+78			8.38	91.62	7.73	92.27			5.29	95.44	B Riff
19												
20												
21						1.16 / 353 =		0.0033 = Slope				
22												
23												
24												
25												
26												
27												

Bankfull – bad read no line of sight

run offshoot

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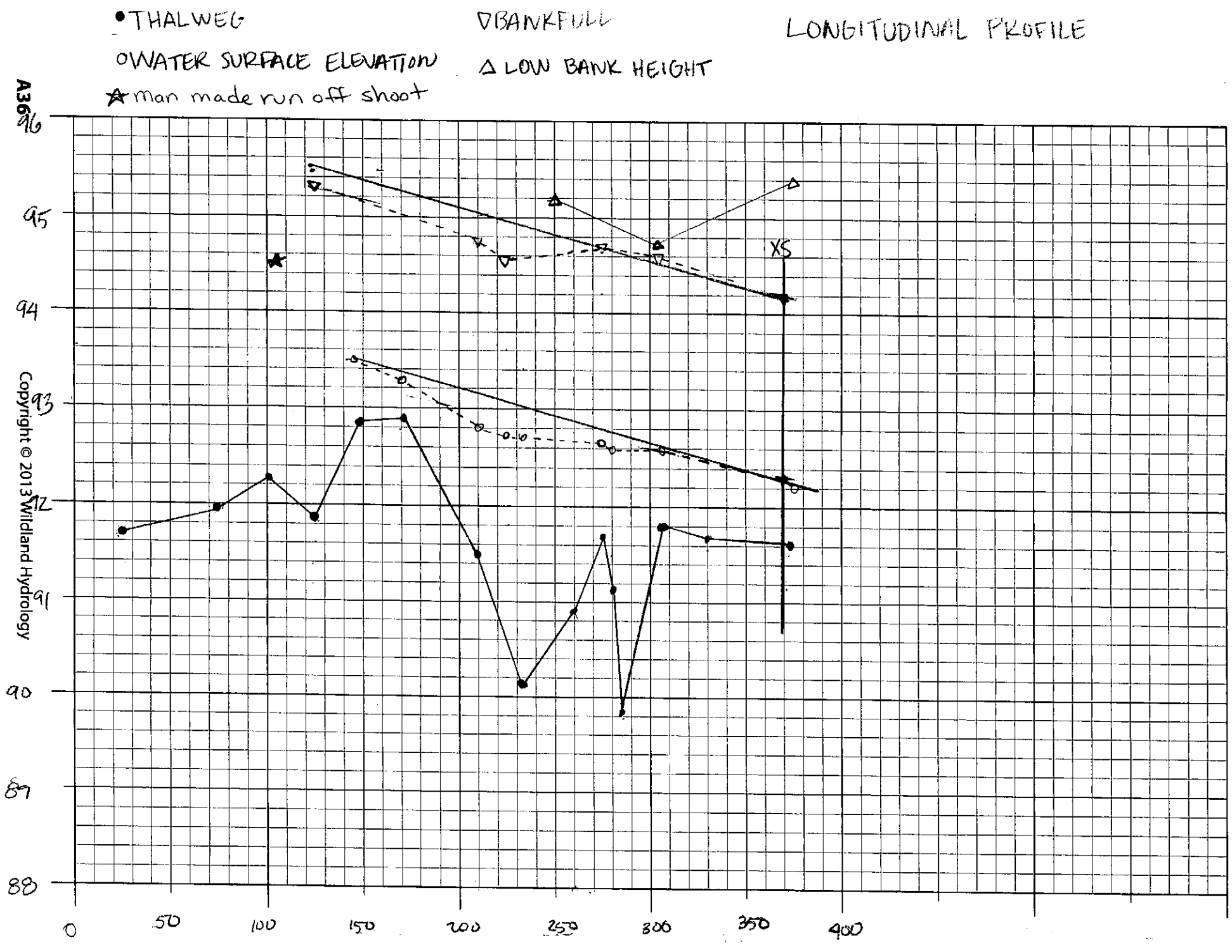

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Reach 1 above road

Team #1 Isreal Creek 4/9/13

Site: Date:

Location: HUC:

Party: Zone 1

Inches	PARTICLE	Millimeters		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							3	5%	5	1	1%	1
	Very Fine	.062 - .125	SAND							1	1.6%	6.6	1	1	2
	Fine	.125 - .25	SAND							1	1.6%	8.2	2	2	4
	Medium	.25 - .50	SAND							2	3.3%	11.5			
	Coarse	.50 - 1.0	SAND							8	13.3%	24.8	14	14	18
.04 - .08	Very Coarse	1.0 - 2	SAND							1	1.6%	26.4			
.08 - .16	Very Fine	2 - 4	GRAVEL							4	6.6%	33	1	1	19
.16 - .22	Fine	4 - 5.7	GRAVEL							8	13.3%	46.3	4	4	23
.22 - .31	Fine	5.7 - 8	GRAVEL				5	12.5	12.5	9	15%	61.3	17	17	40
.31 - .44	Medium	8 - 11.3	GRAVEL				11	27.5	40	11	18.3%	79.6	23	23	63
.44 - .63	Medium	11.3 - 16	GRAVEL				14	35	75	10	16.6%	96.2	27	27	90
.63 - .89	Coarse	16 - 22.6	GRAVEL				9	22.5	97.5	2	3.3%	100	9	9	99
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				1	2.5	100				1	1	100
1.3 - 1.8	Very Coarse	32 - 45													
1.8 - 2.5	Very Coarse	45 - 64													
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: C4			**Valley Type:**			TOTAL→	40			60			100		

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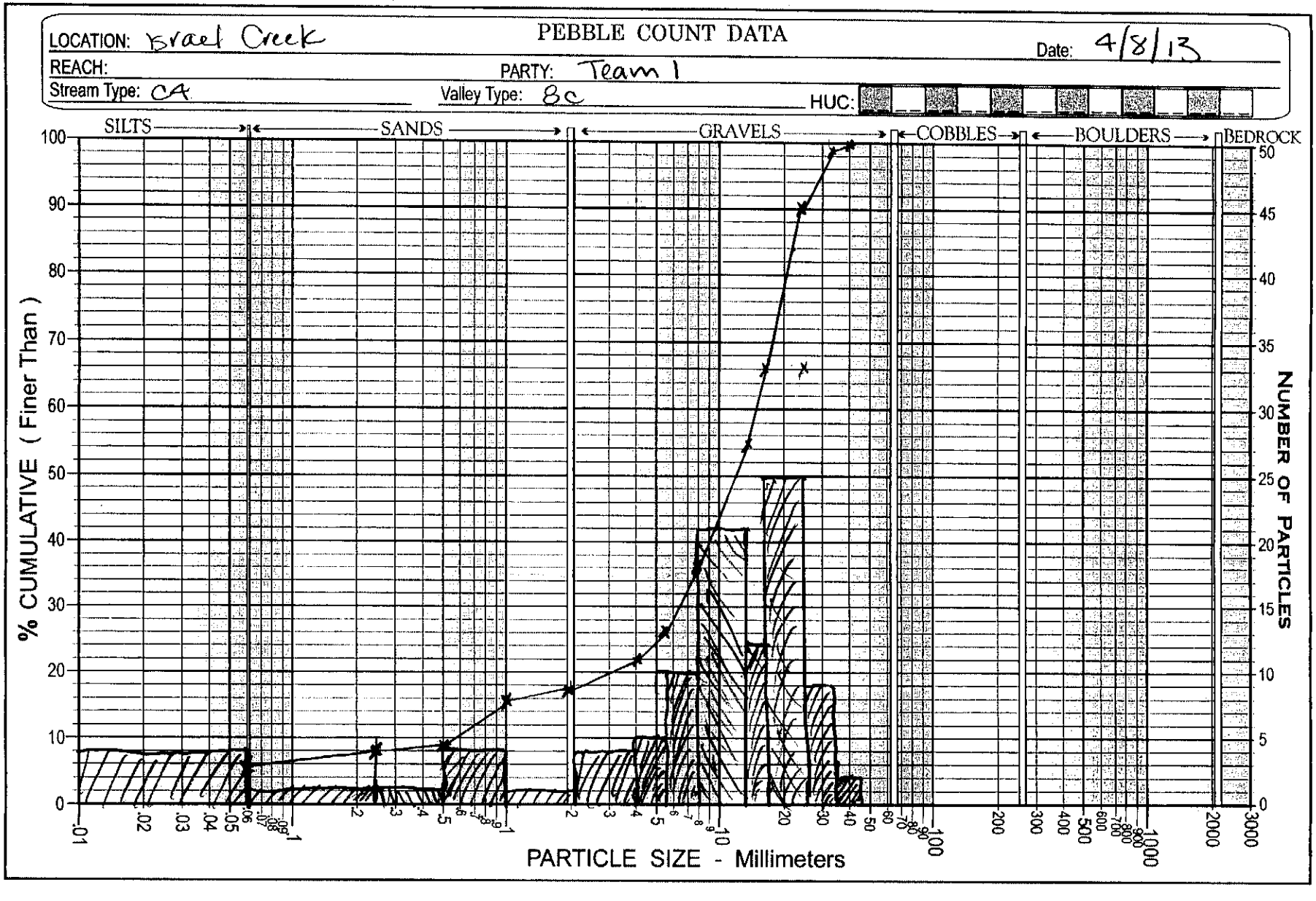
D84 = 22

Active Bed Riffle Pebble Count



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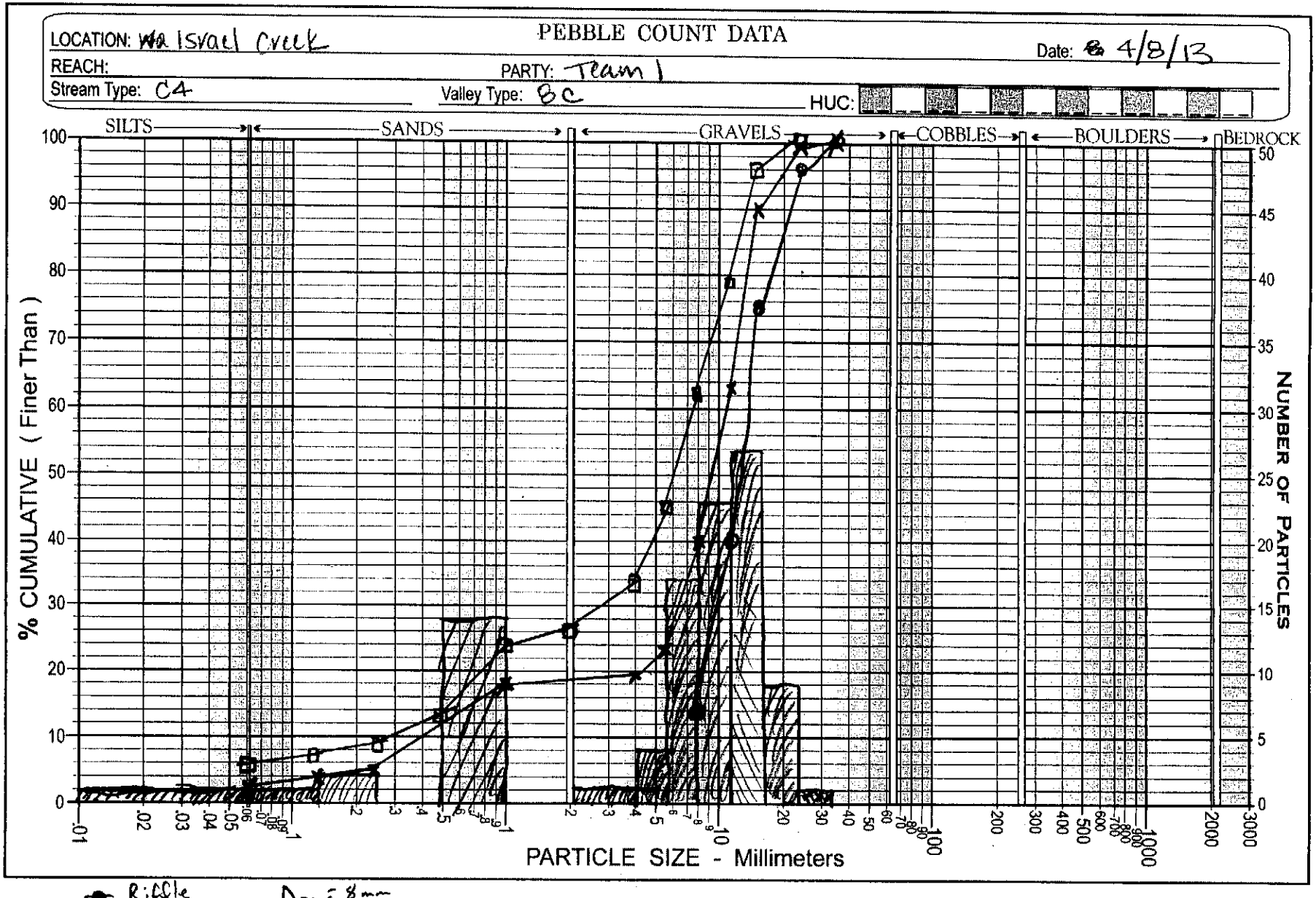
Representative Pebble Count



Riffle $D_{50} = 8$ mm

Pool

Comp

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D84

Site: Date:

Location: HUC:

Party:

Dot Count for RIFFLE 1 | POOL 2 | COMP. 3

Inches	PARTICLE	Millimeters		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	8	7.4	7.4						
	Very Fine	.062 - .125	SAND									
	Fine	.125 - .25	SAND	1	0.92	8.32						
	Medium	.25 - .50	SAND	1	0.92	9.24						
	Coarse	.50 - 1.0	SAND	8	7.4	16.64						
.04 - .08	Very Coarse	1.0 - 2	SAND	1	0.92	17.56						
.08 - .16	Very Fine	2 - 4	GRAVEL	4	3.7	21.26						
.16 - .22	Fine	4 - 5.7	GRAVEL	5	4.6	25.86						
.22 - .31	Fine	5.7 - 8	GRAVEL	10	9.3	35.16						
.31 - .44	Medium	8 - 11.3	GRAVEL	22	20.4	55.56						
.44 - .63	Medium	11.3 - 16	GRAVEL	13	12	67.56						
.63 - .89	Coarse	16 - 22.6	GRAVEL	25	23.1	90.66						
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	8	7.4	98.06						
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	2	1.9	99.96						
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→	108							

Team #1 Isreal Creek Reach 1

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

Stream: Israel Creek	
Basin:	Drainage Area: 3,392 acres 5.35 mi^2
Location: Washington Cty, MD	
Twp.&Rge: N/A	Sec.&Qtr.: N/A
Cross-Section Monuments (Lat./Long.):	Date: 4/9/13
Observers: Team 1	Valley Type: 8C

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	29.5	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.[illegible]	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	44.[illegible]	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	19.[illegible]	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.	2.39	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.	266	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	8.96	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	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).	1.36	

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:	Washington Cty, MD
Date:	4/9/13	Stream Type:	C4
Observers:	Team 1	Valley Type:	Bc
		HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	44.97	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.50	d_{bkf} (ft)
Bankfull Riffle WIDTH	29.7	W_{bkf} (ft)	Wetted PERIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	32.72	W_p (ft)
D_{84} at Riffle	22	Dia. (mm)	D_{84} (mm) / 304.8	0.07	D_{84} (ft)
Bankfull SLOPE	0.003	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.37	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	19.57	R / D_{84}
Drainage Area	5.35	DA (mi^2)	Shear Velocity $u^* = (gRS)^{.5}$	0.36	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\ 2.83 + 5.66 * Log\ (R / D_{84})\ ]\ u^*$	3.69	ft / sec	163.7	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. A-28, A-29) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ 0.021	3.34	ft / sec	150.50	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. A-30) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ 0.040	2.52	ft / sec	113.15	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 $n =$	N/A	ft / sec	N/A	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	N/A	ft / sec	N/A	cfs
4. Continuity Equations: b) Regional Curves $u = Q / A$	3.65	ft / sec	164.45	cfs

Options / Methods for Bankfull Estimates

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 Cty, MD	
Team: 1	Date: 4/8/13	Drainage Area: 5.35	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	29.75	2. Bankfull Mean Depth (d_{bkf}) (ft)	1.51
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	19.67	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	44.97
5. Bankfull Maximum Depth (d_{max}) (ft)	2.79	6. Width of Flood-Prone Area (W_{fpa}) (ft)	266
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	8.96		

Channel Pattern / **Dimensionless Ratios**

8. Belt Width (W_{blt}) (ft)	Mean	136	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	4.95
	Min	135		Min	4.91
	Max	137		Max	4.98
10. Stream Meander Length (L_m) (ft)	Mean	229	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	8.33
	Min	—		Min	—
	Max	229		Max	8.33
12. Linear Wavelength (λ) (ft)	Mean	144	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	5.24
	Min	—		Min	—
	Max	144		Max	5.24
14. Radius of Curvature (R_c) (ft)	Mean	70.6	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	2.57
	Min	52.5		Min	1.91
	Max	85.0		Max	3.10

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	0.8	17. D_{35} (mm)	7	18. D_{50} (mm)	9
19. D_{84} (mm)	15	20. D_{95} (mm)	19	21. D_{100} (mm)	32

Active Bed Riffle Pebble Count

22. D_{16} (mm)	1.2	23. D_{35} (mm)	8	24. D_{50} (mm)	11
25. D_{84} (mm)	22	26. D_{95} (mm)	30	27. D_{100} (mm)	40

Classification

28. Sinuosity (k)	1.36	29. Average Water Surface Slope (S)	0.003
30. Stream Type	C4	31. Valley Type	BC

Velocity / Discharge

32. Friction Factor (U / u*)	10.216	33. Relative Roughness (R / D_{84})	19.57
34. Manning's 'n' from Friction Factor / Relative Roughness	0.029	35. Manning's 'n' from Stream Type	0.040
36. Estimated Bankfull Mean Velocity (U_{bkf}) (ft/sec)	3.64	37. Estimated Bankfull Discharge (cfs)	164
38. Estimation Method Selected for Velocity & Discharge	Friction factor / Relative Roughness (but Regional curve / Roughness coeff (a) are very similar)		

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