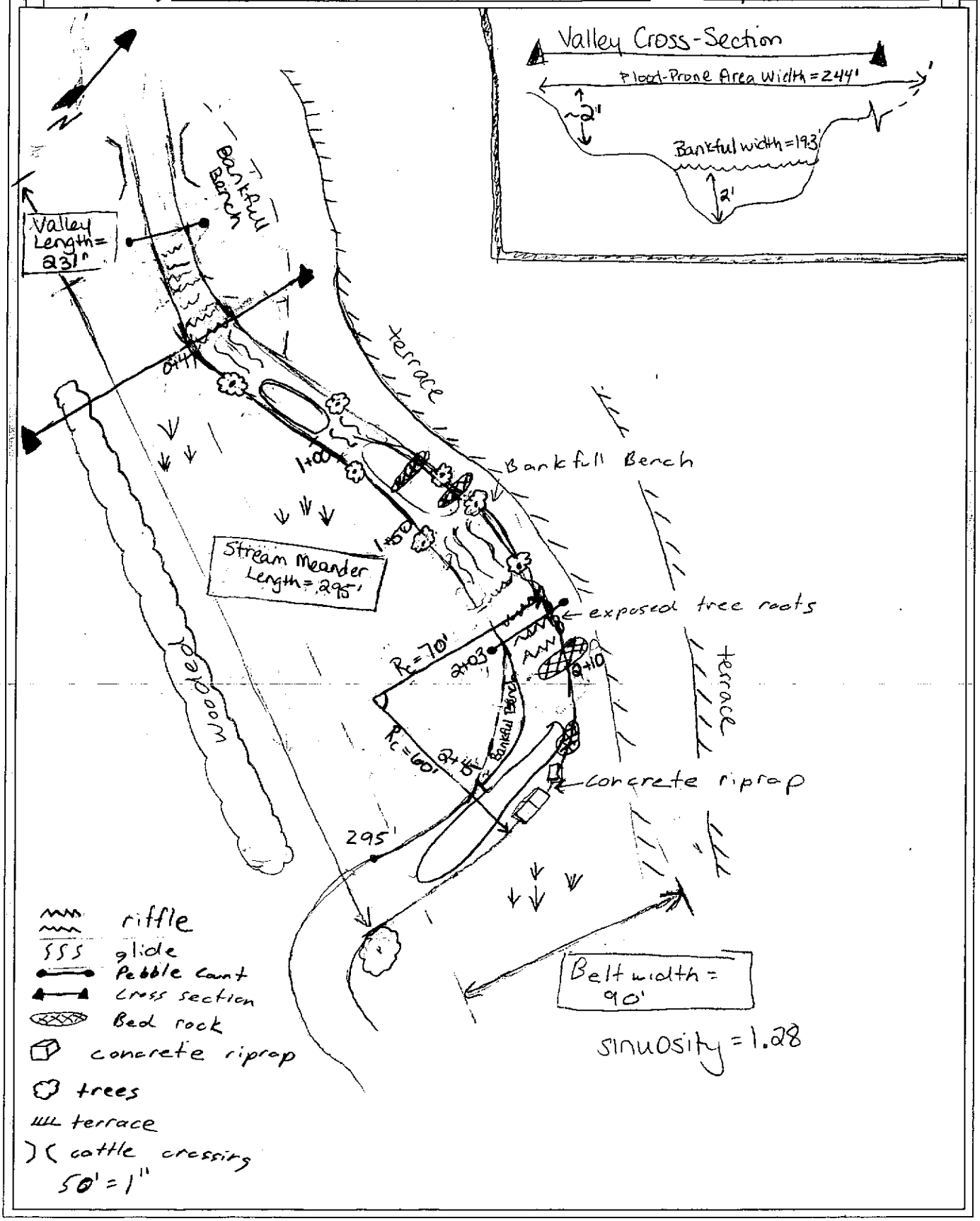
Team 1

AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Little Conococheague Site/Reach: 1

Drawn By: John Hottenstein Date: 4/11/17



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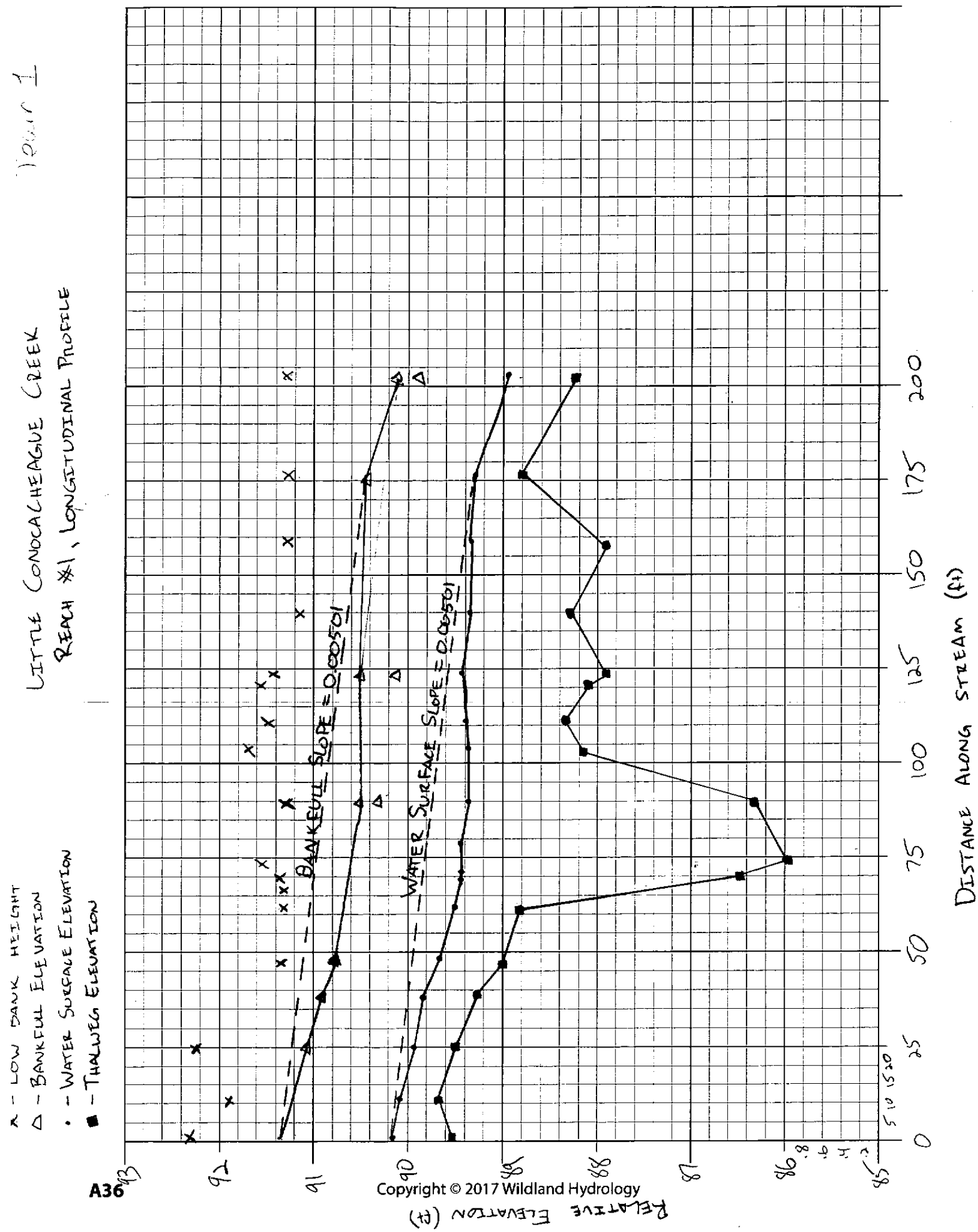

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SURVEY DATA → LONGITUDINAL PROFILE 1

SITE: Little Conococheague Creek Date: 4/11/17

Location: Reach 7

Observers: Ben Nick Lay, Daniel Martinez, Aaron Maxwell 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 Hl Fore-Sight FS (ft)	Low Bank Hl Elevation Elev. (ft)	NOTES e.g. Riffle Run Pool Glide	
1	0 ~~11~~		100	10.47	89.53	9.81	90.19			7.65	92.35	Riffle	? Lo Bank side 91.3
2	11			10.33	89.67	9.91	90.09			8.12	91.88	Riffle	
3	25			10.50	89.5	10.06	89.94	8.91 L	91.09	7.74 L	92.26	Riffle	1.15
4	39			10.74	89.26	10.18	89.82	9.02 L	90.98	8.17 L	91.83	Riffle	1.16
5	47			11.00	89	10.36	89.64	9.20 L	90.80	8.63 L	91.37	Riffle	XS 1.16
6	62			11.17	88.83	10.56	89.49			8.94 L	91.06		
7	68			12.55	87.45	10.58	89.42			8.94 L	91.06	Riffle	
8	70.5			13.53	86.47	10.58	89.42			8.92 L	91.08	Pool	
9	74.5			14.02	85.98	10.57	89.43			8.67 L	91.33	Pool	expect values
10	90			13.42	86.58	10.62	89.38	9.61 L	90.39	7.10 L	92.90	Pool	1.01 90.53
11	104			11.83	88.17	10.61	89.39			8.33 L	91.67	Pool	
12	110.5			11.61	88.39	10.60	89.4			8.56 L	91.44	Riffle	
13	120.5			11.87	88.13	10.67	? 89.33			8.41 L	91.59	Riffle	
14	124			12.15	87.85	10.58	89.42	9.84	90.16	8.42 R	91.58	Pool	0.74 90.57
15	140			11.67	88.33	10.63	89.37			8.90 R	91.1	Pool	
16	159			12.11	87.89	10.65	89.35			8.74 R	91.26	Pool	
17	176.5			11.20	88.80	10.69	89.31			8.73 R	91.27	Riffle	90.46
18	203			11.79	88.21	11.01	LOW 88.99 HIGH	10.34 10.14	89.66 89.86	8.73 R	91.27	R	.67 .97 90.14
19													
20													
21													
22													
23													
24													
25													
26													
27													

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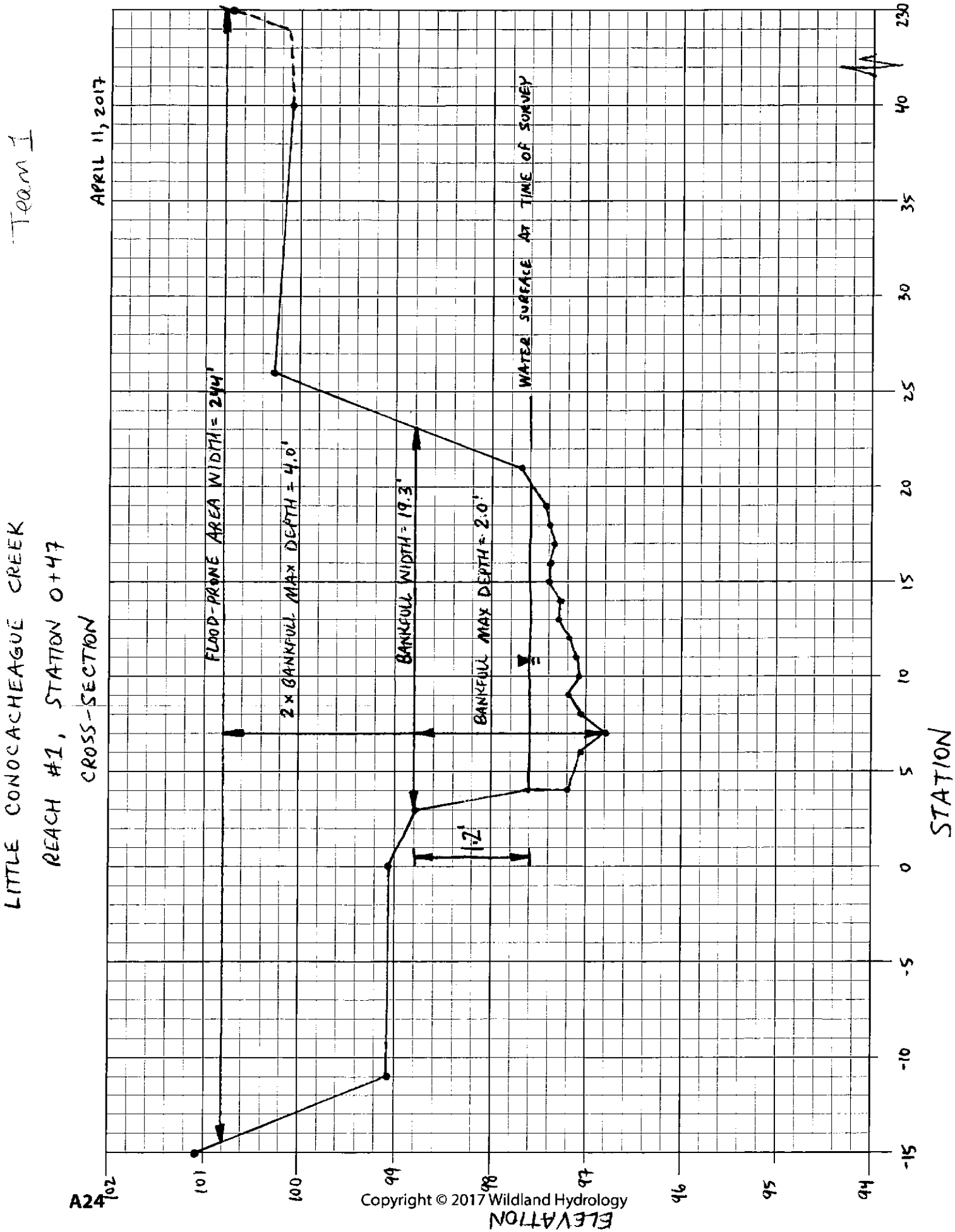

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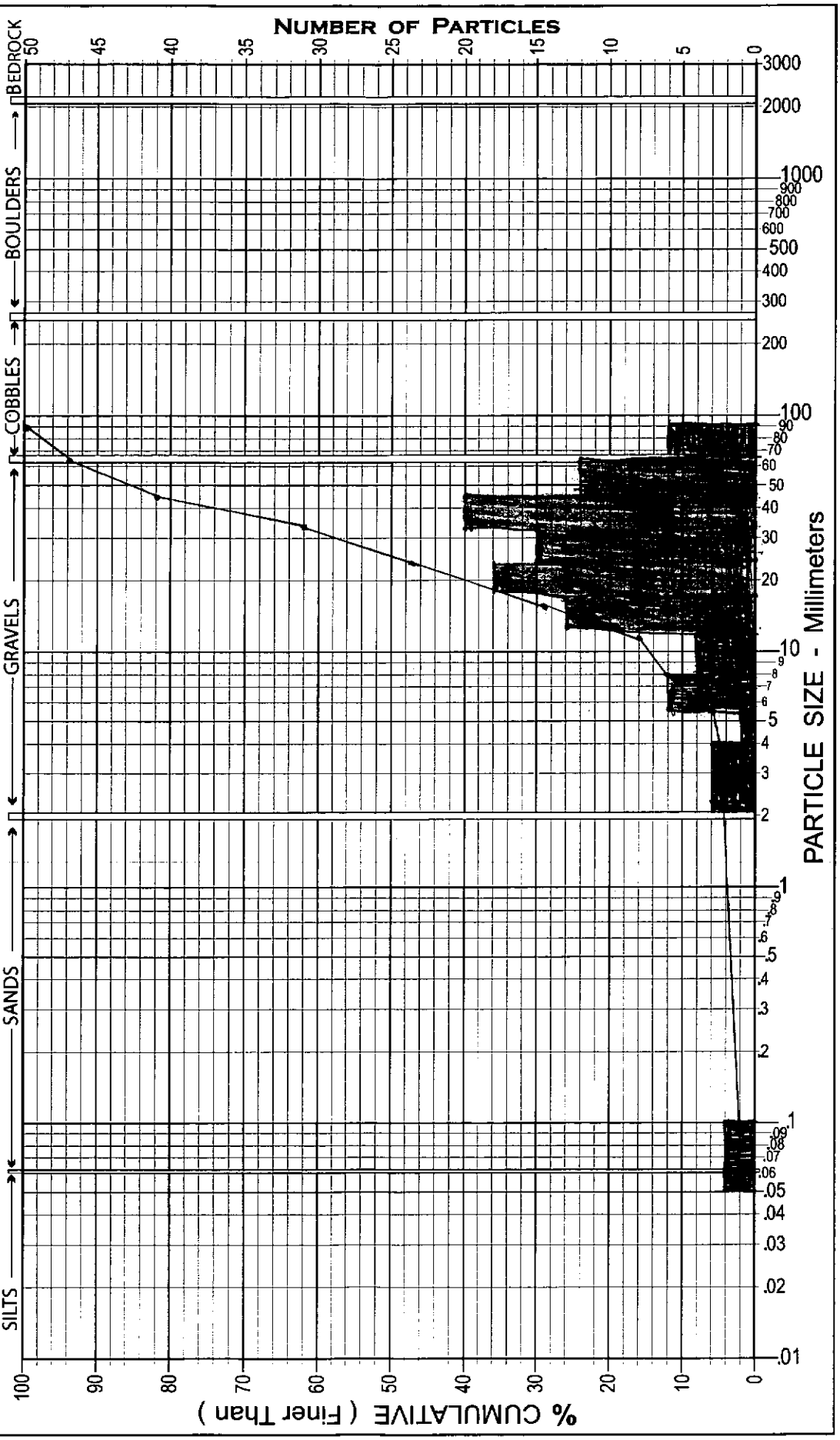
Little Conococheague Creek - Active

Team 1

PEBBLE COUNT DATA

LOCATION: Pebble Count At Riffle
REACH: 1
Stream Type:
Date: 4/11/17
Observers: Emma, Josh, Andrew
Landscape Type:
HUC:



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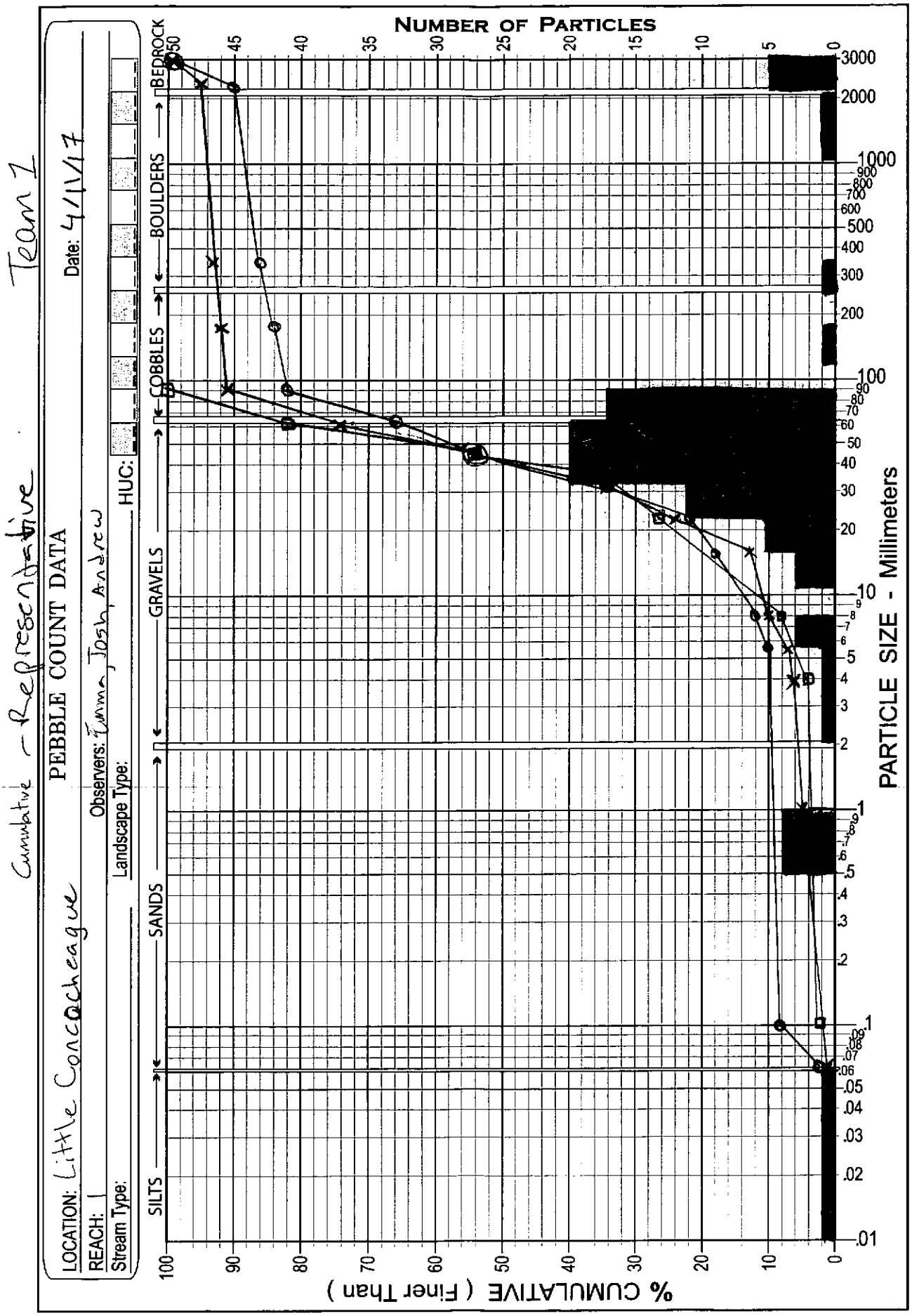

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* Immediately downstream of active cattle crossing

Team 1

STA (0.47)

Site: Little Conococheague Creek

Location: 1 (Team 1) HUC:

Observers: Emma, Josh, Andrew

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
							Reach: 1			Reach:			Reach:		
							Date: 4/11/17			Date:			Date:		
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0					2	.02	2	—					2
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL				3	.03	5	—					5
.16 - .22	Fine	4 - 5.7					1	.01	6	—					6
.22 - .31	Fine	5.7 - 8					6	.06	12	—					12
.31 - .44	Medium	8 - 11.3					4	.04	16	—					16
.44 - .63	Medium	11.3 - 16					13	.13	29	—					29
.63 - .89	Coarse	16 - 22.6					18	.18	47	—					47
.89 - 1.3	Coarse	22.6 - 32					15	.15	62	—					62
1.3 - 1.8	Very Coarse	32 - 45					20	.20	82	—					82
1.8 - 2.5	Very Coarse	45 - 64					12	.12	94	—					94
2.5 - 3.5	Small	64 - 90	COBBLE				6	.06	100	—					100
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								

Stream Type: C4 **Landscape Type:** Alluvial Deposition, Terraces

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Team 1

Site: Little Conocacheague Creek

Location: 1 (Team 1) HUC:

Observers: Emma, Josh, Andrew

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) Reach: 1 Date: 4/11/17 TOT #	ITEM %	% CUM	POOL (2) Reach: 1 Date: 4/11/17 TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: 1 Date: 4/11/17 TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C							1	.02	2	1	[illegible]	1
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0					1	.02	2	3	.06	8	4	4	5
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL				1	.02	4				1	1	6
.16 - .22	Fine	4 - 5.7								1	.02	10	1	1	7
.22 - .31	Fine	5.7 - 8					2	.04	8	1	.02	12	3	3	10
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16								3	.06	18	3	3	13
.63 - .89	Coarse	16 - 22.6					9	.18	26	2	.04	22	11	11	24
.89 - 1.3	Coarse	22.6 - 32					4	.08	34	6	.12	34	10	10	34
1.3 - 1.8	Very Coarse	32 - 45					10	.2	54	10	.2	54	20	20	54
1.8 - 2.5	Very Coarse	45 - 64					14	.28	82	6	.12	66	20	20	74
2.5 - 3.5	Small	64 - 90	COBBLE				9	.18	100	8	.16	82	17	17	91
3.5 - 5.0	Small	90 - 128													
5.0 - 7.1	Large	128 - 180								1	.02	84	1	[illegible]	92
7.1 - 10.1	Large	180 - 256													
10.1 - 14.3	Small	256 - 362	BOULDER							1	.02	86	1	[illegible]	93
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048								2	.04	90	2	2	95
	Bedrock		BDRK							5	.1	100	5	5	100
						TOTAL→	50			50			100		

Stream Type: C4 **Landscape Type:** Alluvial Deposition, Terraces

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

Stream: Little Conocacheague Creek	
Basin: 02-14-05-05	Drainage Area: 7,680 acres 12 mi^2
Location: Clearsprings	
Twp.&Rge:	Sec.&Qtr.:
Cross-Section Monuments (Lat./Long.):	Date: 04-11-17
Observers: Team 1	Landscape Type: U-AL-AD

Bankfull Width (W_{bkf}) The surface width of the stream at bankfull stage elevation, in a riffle section.	19.3	ft
Bankfull Mean Depth (d_{bkf}) Mean depth of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.54	ft
Bankfull Cross-Sectional Area (A_{bkf}) Area of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	29.72	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) *Bankfull Width* divided by *Bankfull Mean Depth*, in a riffle section.	12.53	ft/ft
Bankfull 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	ft
Flood-Prone Area Width (W_{fpa}) Width of the channel at an elevation that is twice the *Bankfull Maximum Depth*, measured perpendicular to the fall line of the valley in a riffle section.	244	ft
Entrenchment Ratio (ER) The *Flood-Prone Area Width* divided by *Bankfull Width* (W_{fpa} / W_{bkf}), in a riffle section.	12.64	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.	42	mm
Average Water Surface Slope (S) The elevation difference of water surface measurements over the stream length between two similar bed features (e.g., start of riffle to start of last riffle) for several riffle-pool or step-pool sequences, representing channel gradient.	0.005	ft/ft
Channel Sinuosity (k) An index of channel pattern determined from stream length divided by valley length (SL / VL), or from valley slope divided by average water surface slope (S_{val} / S).	1.28	ft/ft

Stream Type C4 **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:	Little Conocacheague Creek	Location:	Clearsprings
Date: 04-11-17	Stream Type: C4	Landscape Type:	U-AL-AD
Observers:	Team 1	HUC:	02 14 05 05 01 74

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional Area	29.7	A_{bkf} (ft^2)	Bankfull Riffle Mean Depth	1.54	d_{bkf} (ft)
Bankfull Riffle Width	19.3	W_{bkf} (ft)	Wetted Perimeter $\approx (2 * d_{bkf}) + W_{bkf}$	22.4	W_p (ft)
D_{84} Particle Size at Riffle	50	D_{84} (mm)	D_{84} Particle Size in Feet D_{84} (mm) / 304.8	0.164	D_{84} (ft)
Bankfull Slope	0.005	S_{bkf} (ft/ft)	Hydraulic Radius A_{bkf} / W_p	1.33	R (ft)
Gravitational Acceleration	32.2	g (ft/sec^2)	Relative Roughness R (ft) / D_{84} (ft)	8.11	R / D_{84} (ft/ft)
Drainage Area	12	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	0.463	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	3.7	ft / sec	110	cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor/Relative Roughness (Figs. A-27, A-28) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.034	3.7	ft / sec	110	cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. A-29) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.031	4.24	ft / sec	126	cfs
2. Roughness Coefficient: c) Manning's *n* from Jarrett (USGS): $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n = 0.39*S^{0.38}*R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for $n =$ 0.05	2.55	ft / sec	76	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)	N/A	ft / sec	N/A	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)	N/A	ft / sec	N/A	cfs
4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Q: Q = ____ year	N/A	ft / sec	N/A	cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	7.1	ft / sec	210	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 A-3. Summary of Morphological Variables.

Stream: Little Conococheague Creek		**Location:**	
Team: 1	**Date:** 04-11-17	**Drainage Area:** 12 mi^2	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	19.3	2. Bankfull Mean Depth (d_{bkf}) (ft)	1.54
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	12.53	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	29.7
5. Bankfull Maximum Depth (d_{max}) (ft)	2.00	6. Width of Flood-Prone Area (W_{fpa}) (ft)	244
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	12.64		

Channel Pattern / *Dimensionless Ratios*

8. Belt Width (W_{blt}) (ft)	Mean	90	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	4.66
	Min	N/A		Min	N/A
	Max	N/A		Max	N/A
10. Stream Meander Length (L_m) (ft)	Mean	295	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	15.3
	Min	N/A		Min	N/A
	Max	N/A		Max	N/A
12. Linear Wavelength (λ) (ft)	Mean	308	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	15.96
	Min	N/A		Min	N/A
	Max	N/A		Max	N/A
14. Radius of Curvature (R_c) (ft)	Mean	65	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	3.37
	Min	60		Min	N/A
	Max	70		Max	N/A

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	18	17. D_{35} (mm)	32	18. D_{50} (mm)	42
19. D_{84} (mm)	80	20. D_{95} (mm)	2100	21. D_{100} (mm)	3000

Active Bed Riffle Pebble Count

22. D_{16} (mm)	12	23. D_{35} (mm)	18	24. D_{50} (mm)	26
25. D_{84} (mm)	50	26. D_{95} (mm)	75	27. D_{100} (mm)	90

Classification

28. Sinuosity (k)	1.28	29. Average Water Surface Slope (S)	0.005
30. Stream Type	C4	31. Landscape Type	Alluvial Deposition terraces

Velocity & Discharge

32. Friction Factor ($\bar{u}$ / u*)	8.0	33. Relative Roughness (R / D_{84})	8.11
34. Manning's 'n' from Friction Factor / Relative Roughness	0.034	35. Manning's 'n' from Stream Type	0.031
36. Estimated Bankfull Mean Velocity ($\bar{u}_{bkf}$) (ft/sec)	3.7	37. Estimated Bankfull Discharge (cfs)	110
38. Estimation Method Selected for Velocity & Discharge	Field identified		

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