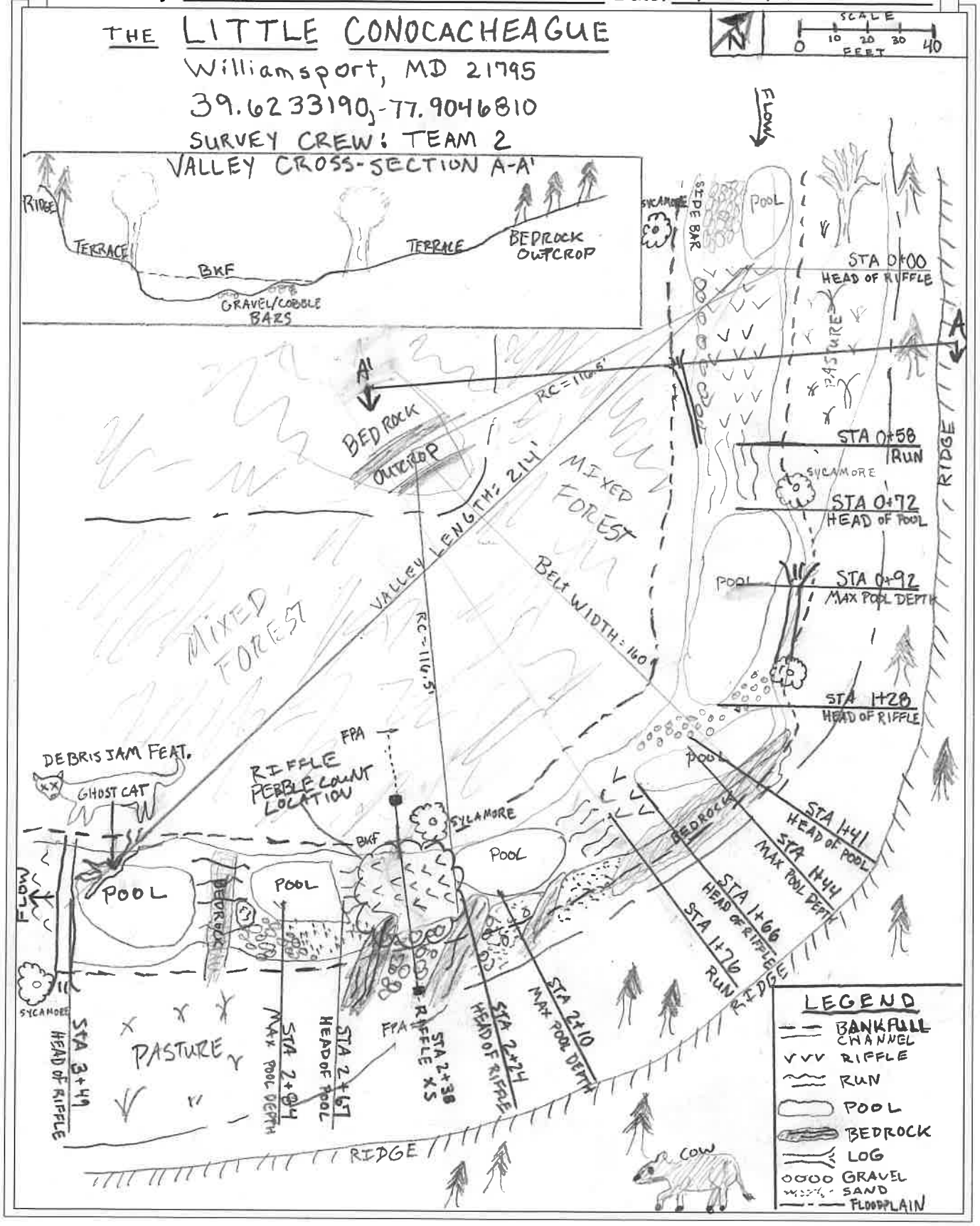
AREA-SITE LOCATION....REACH MAP

Stream: Little Conocacheague Creek Reach: 2

Drawn By: DMC Date: 4-9-19



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SURVEY DATA ⟹ CROSS - SECTION 1

SITE: Riffle cross section 1 - Station 238 Date: 4/9/19

Location: Reach 2 - Little Conocacheague Creek

Observers: Team 2 HUC:

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	BM	6.75	97.83			Benchmark
2	0.00			3.95	93.88	LFPA
3	7.40			5.33	92.50	
4	15.00			5.61	92.22	
5	16.20			6.12	91.71	LBKF - estimate
6	17.60			6.49	91.34	
7	19.50			6.46	91.37	LTOB
8	21.80			6.67	91.16	
9	24.00			7.29	90.54	LEW
10	26.40			7.91	89.92	
11	28.90			8.16	89.67	
12	31.90			8.29	89.54	THL
13	34.60			8.20	89.63	
14	37.00			8.19	89.64	
15	39.90			8.03	89.80	
16	42.30			8.15	89.68	
17	45.20			8.24	89.59	
18	47.10			7.64	90.19	REW
19	47.70			6.70	91.13	
20	49.10			6.12	91.71	RBKF*
21	50.40			5.53	92.30	RTOB
22	62.40			5.28	92.55	
23	81.80			3.95	93.88	RFPA
24						
25						
26						
27						
28						

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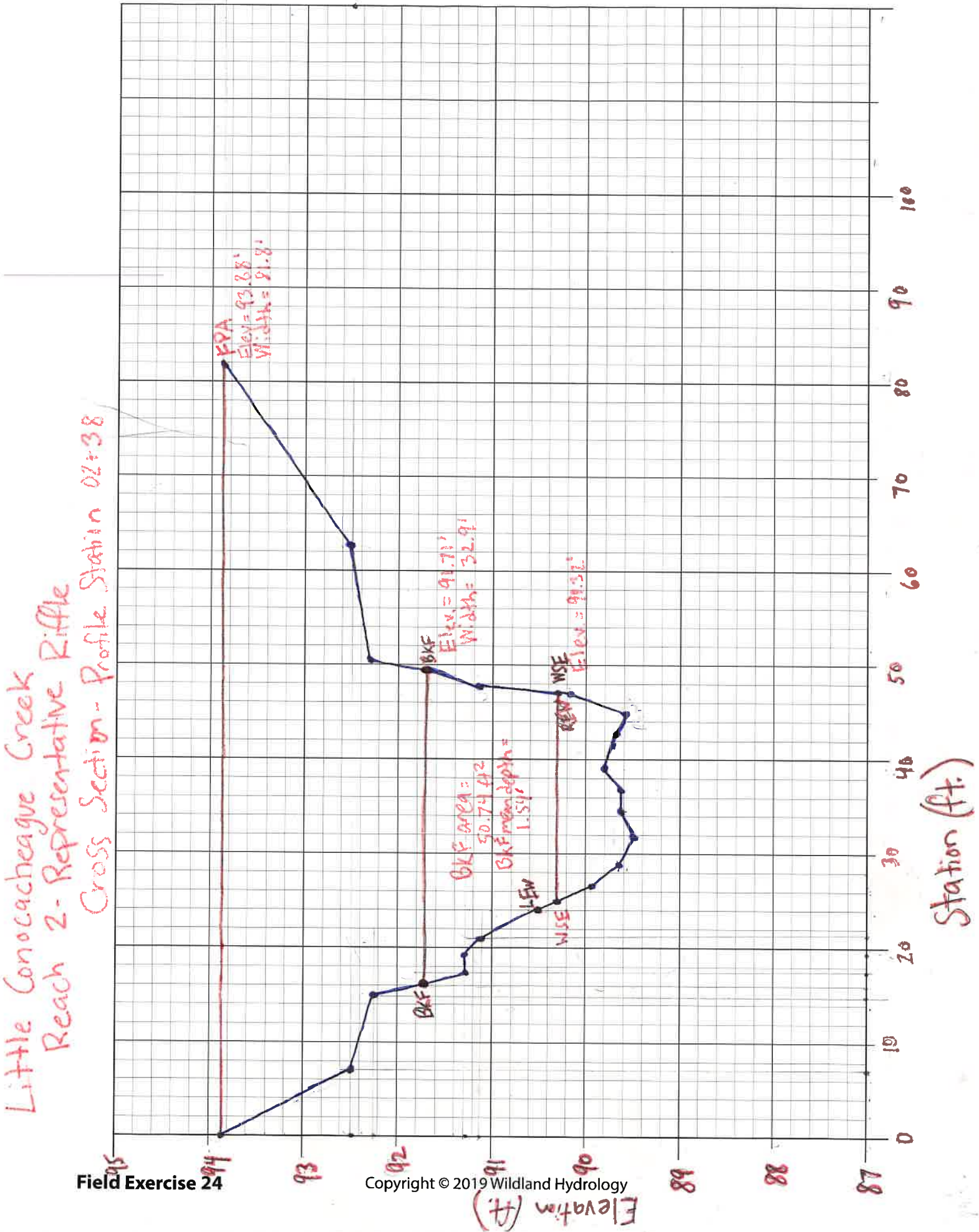

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WSS = 0.007 ft/ft
BFS = 0.0086 ft/ft

SURVEY DATA ⟹ LONGITUDINAL PROFILE 1

SITE: Little Conococheague Creek **Date:** 4.9.19

Location: Team 2

Observers: Jo-Anne, Geoff, Kyle **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	TBM	6.55	100.00									
2	0+00			8.77	91.23	7.85	92.15	6.16	93.84			R
3	0+27	9.01		9.01	90.99	8.21	91.79					R
4	0+50	9.60		9.60	90.4	8.75	91.25	7.32	92.68			R
5	0+58			9.88	90.12	8.81	91.19					N
6	0+62					8.86 (3.55 deep)	91.14	7.60	92.4			N
7	0+92			12.45	87.55		91.1					P
8	1+03			12.02	87.98	8.95 3.05	91.05					G mid
9	1+16.5			10.09	89.91	8.94	91.06					G top
10	1+24											
11	1+28			9.97	90.03	8.94	91.06	7.48	92.52			R
12	1+41			10.39	89.61	9.0	91.0	7.62	92.38			R
13	1+45			10.62	89.38	9.14	90.86					P
14	1+66			10.83	89.17	9.50	90.5					R
15	2+04.5					9.53	90.47	8.03	91.97			R / N
16	2+10			11.86	88.14	9.53	90.47					P
17	2+24			10.74	89.26	9.52	90.48					R
18	2+31							8.15	91.85			R (?)
19	2+38 XS1			10.67	89.33	9.68	90.32	8.92	91.08 (?)			R
20	2+67			11.62	88.38	10.39	89.61					R
21	2+84			12.17	87.83	10.43	89.57	+ 1.55 offset WL				P
22	3+15			12.67	87.33	10.45 2.18 dep	89.55					P
23	3+20							9.23	90.77			P
24	3+44			11.7	88.3	10.43	89.57					G end
25	3+49.5	0.8		11.09 ch	88.91	0.45 1.08	89.55					R
26	TP1	10.21 FS 7.97	97.76									
27	2+84							6.61	91.15			P
28	3+42					8.24	89.52	6.87	90.89			G

(19) our 8.92 = 6.75 of XS Team

this wasn't BF - it was to equalize both survey crews. Shouldn't have been recorded as BF!

Turned to get more accurate shots.

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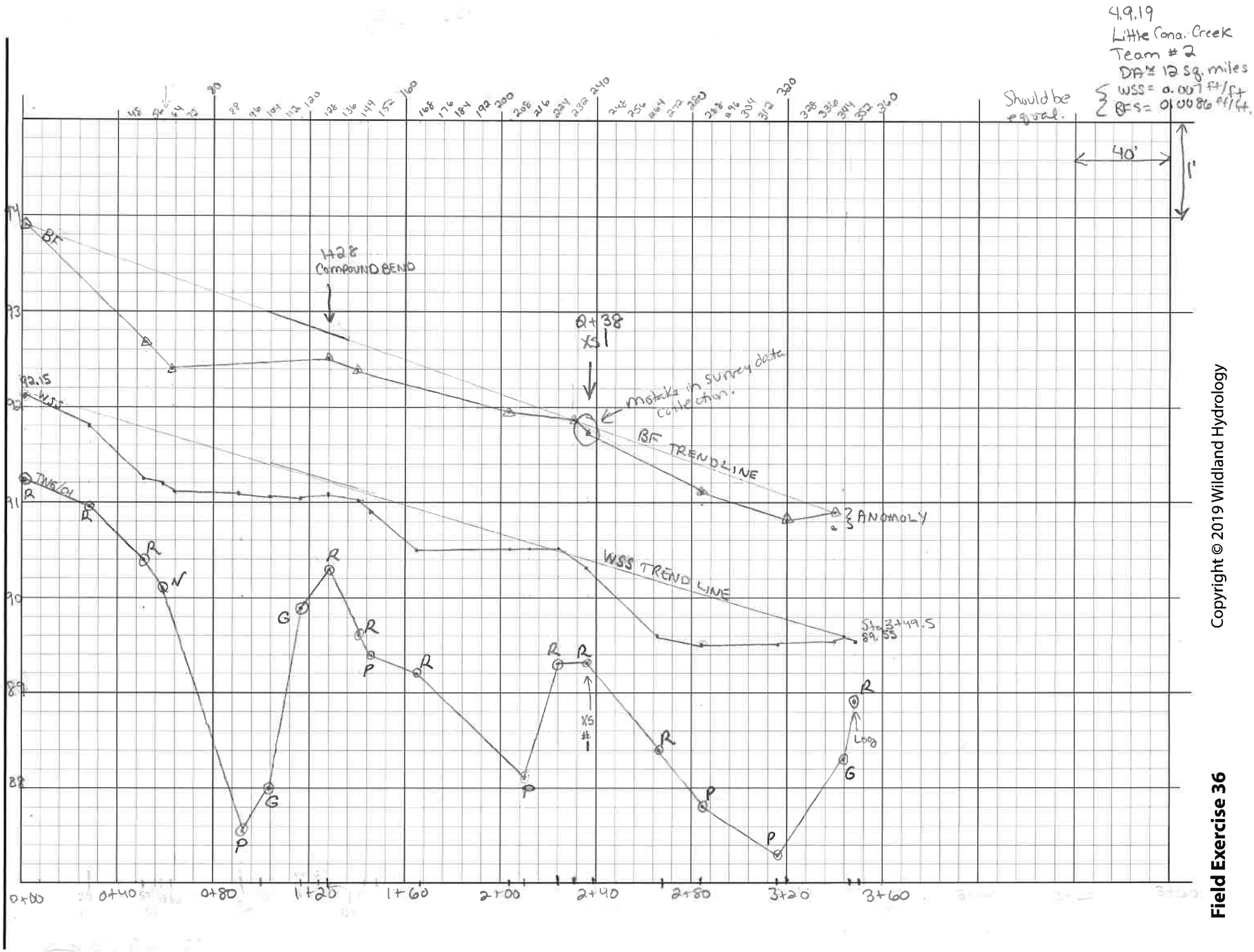

R = Riffle N = Run P = Pool G = Glide

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representative

cross section

100% riffle

Site:

Location: HUC:

Observers: team 2

	RIFFLE (1)	POOL (2)	COMPOSITE (3)
Reach:			
Date:			
	TOT # ITEM % % CUM	TOT # ITEM % % CUM	TOT # ITEM % % CUM

Dot Count for RIFFLE POOL ~~COMP.~~

Inches	PARTICLE	Millimeters		RIFFLE 1	POOL 2	COMP 3
	Silt / Clay	< .062	S/C			
	Very Fine	.062 - .125	SAND			
	Fine	.125 - .25				
	Medium	.25 - .50				
	Coarse	.50 - 1.0			1	
.04 - .08	Very Coarse	1.0 - 2			1	
.08 - .16	Very Fine	2 - 4	GRAVEL		1	2
.16 - .22	Fine	4 - 5.7				1
.22 - .31	Fine	5.7 - 8			2	1
.31 - .44	Medium	8 - 11.3				1
.44 - .63	Medium	11.3 - 16			3	1
.63 - .89	Coarse	16 - 22.6			16	11
.89 - 1.3	Coarse	22.6 - 32			16	10
1.3 - 1.8	Very Coarse	32 - 45			15	15
1.8 - 2.5	Very Coarse	45 - 64			22	26
2.5 - 3.5	Small	64 - 90	COBBLE		15	20
3.5 - 5.0	Small	90 - 128			5	9
5.0 - 7.1	Large	128 - 180			2	2
7.1 - 10.1	Large	180 - 256			1	1
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: **Landscape Type:**

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(Cross-Section) Active Bed Riffle Pebble Count

PEBBLE COUNT DATA

LOCATION: Little Conococheague Creek

Date: 04/09/19

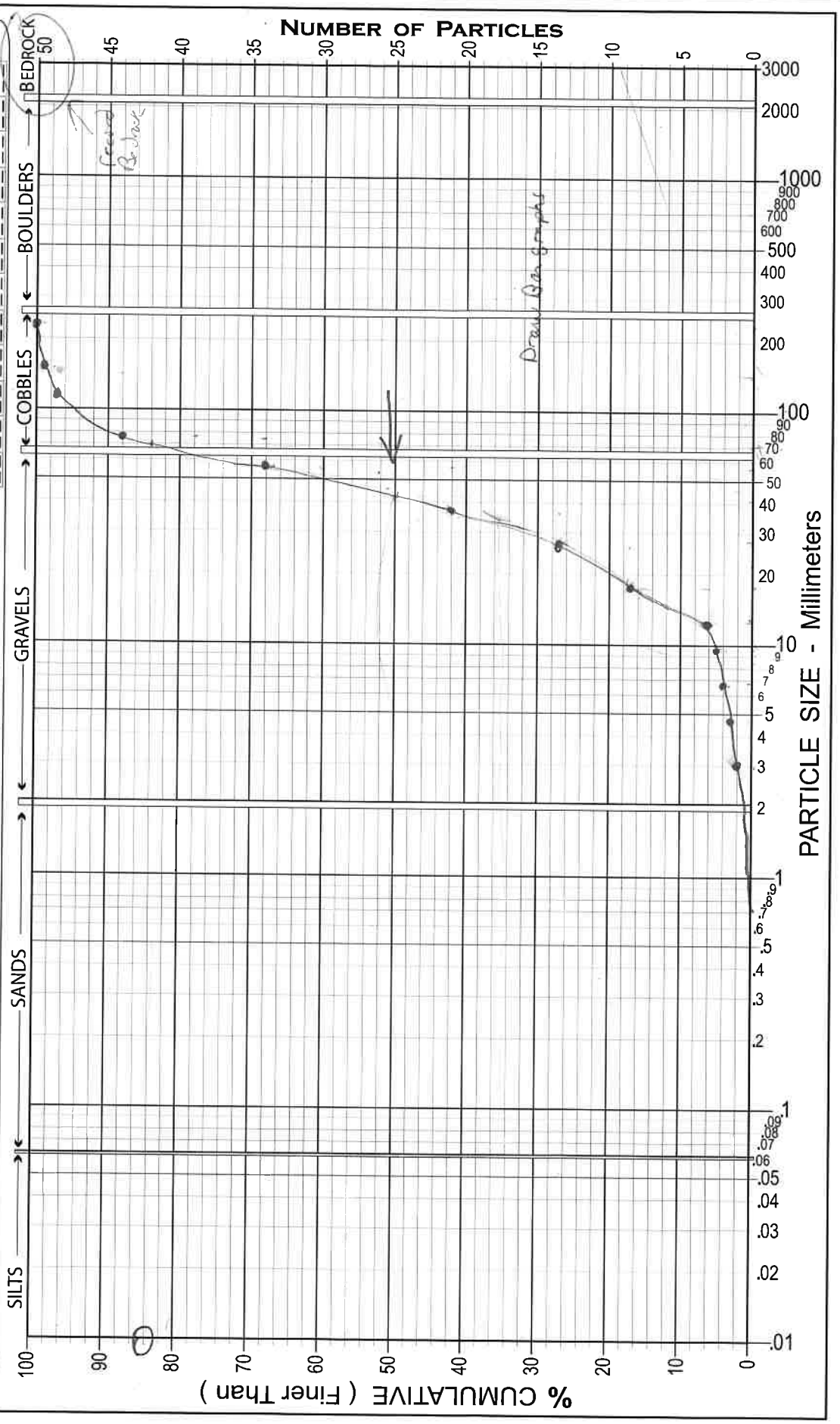
REACH: No. 2

Observers: Team #2

Stream Type: C4/1

Landscape Type: Conf. Alluv.

HUC:



$D_{50} = 41$

$D_{84} = 70$

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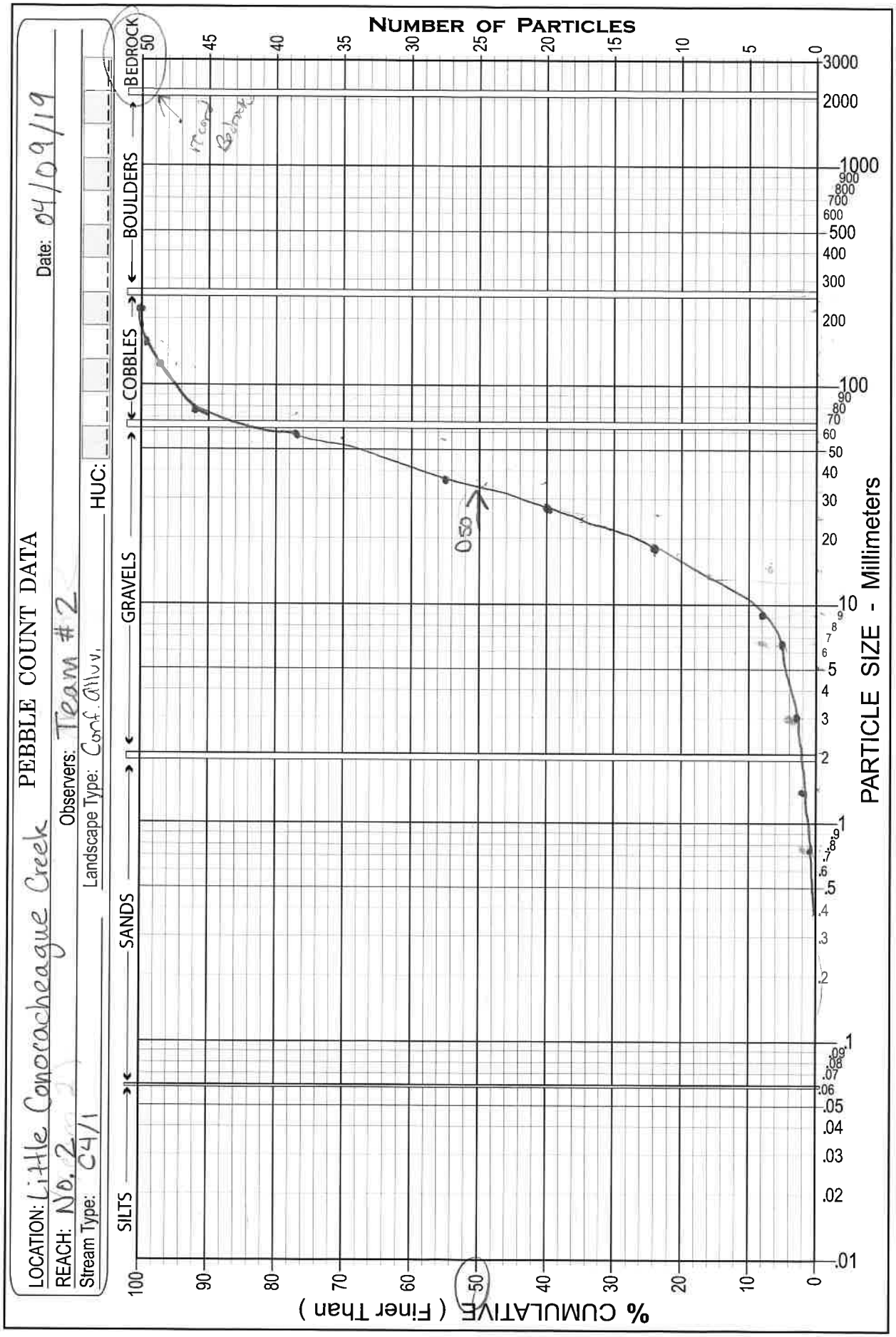

Representative

$D_{50} = 33$

$D_{84} = 62$

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

Bankfull Velocity and Discharge Estimates

Stream: Little Conococheague Creek Site 2	Stream Type: C 4/1
Location: Williamsport, Wash. Co. MD	Landscape Type: Confined alluvial.
Observers: Team 2	Date: 4.9.19

Input Variables active bed			Output Variables		
Bankfull Riffle Cross-Sectional Area	50.47	A_{bkf} (ft²)	Bankfull Riffle Mean Depth	1.54	d_{bkf} (ft)
Bankfull Riffle Width	32.9	W_{bkf} (ft)	Wetted Perimeter: $\approx (2 \cdot d_{bkf}) + W_{bkf}$	35.98	W_p (ft)
D_{84} Particle Size at Riffle	70	Dia. (mm)	D_{84} at Riffle (mm to ft): D_{84} (mm) / 304.8	0.23	D_{84} (ft)
Bankfull Slope	0.0086	S_{bkf} (ft / ft)	Hydraulic Radius A_{bkf} / W_p	1.40	R (ft)
Gravitational Acceleration	32.2	g (ft / sec²)	Relative Roughness: R (ft) / D_{84} (ft)	6.08	R / D_{84}
Drainage Area	12	DA (mi²)	Shear Velocity: $u^* = (gRS)^{1/2}$	.62	u^* (ft/sec)

Estimation Methods	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 \cdot \text{Log}\,(R / D_{84})\,]\,u^*$	5.58	ft / sec	281.75	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figures 28–29) $\bar{u} = 1.49 \cdot R^{2/3} \cdot S^{1/2} / n$ $n =$ 0.033	5.24	ft / sec	264.47	cfs
☆ 2. Roughness Coefficient: b) Manning's n from Stream Type (Figure 30) $\bar{u} = 1.49 \cdot R^{2/3} \cdot S^{1/2} / n$ $n =$ .04	4.32	ft / sec	218.19	cfs
2. Roughness Coefficient: c) Manning's n from Jarrett (USGS): $\bar{u} = 1.49 \cdot R^{2/3} \cdot S^{1/2} / n$ $n = 0.39 \cdot S^{0.38} \cdot R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for $n =$ 0.061	2.83	ft / sec	143.07	cfs
3. Other Methods (e.g., Hey, Darcy-Weisbach, or Chezy C)		ft / sec		cfs
3. Other Methods (e.g., Hey, Darcy-Weisbach, or Chezy C)		ft / sec		cfs
4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Discharge $Q_{bkf} =$ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	4.24	ft / sec	214.05	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 3. Summary of Morphological Variables.

Stream: Little Conococheague Creek Site 2	Location: Williamsport Wash. Co. MD
Team: 2	Date: 4.9.19

Riffle Channel Dimensions

1. Bankfull Width	(W_{bkf}) (ft)	32.9	2. Bankfull Mean Depth	(d_{bkf}) (ft)	1.54
3. Width/Depth Ratio	(W_{bkf}/d_{bkf})	21.4	4. Bankfull Cross-Sectional Area	(A_{bkf}) (ft^2)	50.47
5. Bankfull Maximum Depth	(d_{max}) (ft)	2.17	6. Width of Flood-Prone Area	(W_{fpa}) (ft)	81.8
7. Entrenchment Ratio	(W_{fpa}/W_{bkf})	2.49			

Channel Pattern / Pattern Ratios

8. Belt Width	(W_{blt}) (ft)	Avg:	140	9. Meander Width Ratio (MWR)	(W_{blt}/W_{bkf})	Avg:	4.26
		LL:	90			LL:	2.74
		UL:	210			UL:	6.38
10. Stream Meander Length	(L_m) (ft)	Avg:	211	11. Meander Length Ratio (MLR)	(L_m/W_{bkf})	Avg:	6.41
		LL:				LL:	
		UL:				UL:	
12. Linear Wavelength	(λ) (ft)	Avg:	188	13. Linear Wavelength to Bankfull Width	(λ/W_{bkf})	Avg:	5.71
		LL:				LL:	
		UL:				UL:	
14. Radius of Curvature	(R_c) (ft)	Avg:	107.75	15. Radius of Curvature to Bankfull Width	(R_c/W_{bkf})	Avg:	3.27
		LL:	116.5			LL:	3.54
		UL:	99			UL:	3.01

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	14	17. D_{35} (mm)	25	18. D_{50} (mm)	33
19. D_{84} (mm)	62	20. D_{95} (mm)	100	21. D_{100} (mm)	220

Active Bed Riffle Pebble Count

22. D_{16} (mm)	18	23. D_{35} (mm)	32	24. D_{50} (mm)	41
25. D_{84} (mm)	70	26. D_{95} (mm)	100	27. D_{100} (mm)	225

Channel Sinuosity & Slope

28. Sinuosity	(k)	1.67	29. Average Water Surface Slope	(S)	0.008

Classification

30. Stream Type	C4/1	31. Landscape Type	Conf. Alll.

Velocity & Discharge

32. Friction Factor	($\bar{u}$ / u^*)	9	33. Relative Roughness	(R/D_{84})	6.08
34. Manning's 'n' from R / D_{84}	(n)	.033	35. Manning's 'n' from Stream Type	(n)	.04
36. Estimated Bankfull Mean Velocity	($\bar{u}_{bkf}$) (ft/sec)	2.83	37. Estimated Bankfull Discharge	(Q) (cfs)	143.07
38. Estimation Method Selected for Velocity & Discharge		Manning's n from stream type			

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Worksheet 1. Field Form for Level II Stream Classification.

Stream: Little Conococheague Creek Site 2	
Location: Washington Co., MD (Williamsport)	Landscape Type: Conf. Alluv.
Observers: Team 2	Riffle Cross-Section: XS1 Team 2 ~~Site~~ 2+38
Date: 4.9.19	Drainage Area: 12 mi^2

Bankfull Riffle Width (W_{bkf}) The surface width of the stream at the bankfull stage elevation.	32.9	ft
Bankfull Riffle Mean Depth (d_{bkf}) Mean depth of the stream channel cross-section at the bankfull stage elevation ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.54	ft
Bankfull Riffle Cross-Sectional Area (A_{bkf}) Area of the stream channel cross-section at the bankfull stage elevation ($A_{bkf} = W_{bkf} \bullet d_{bkf}$).	50.47	ft^2
Bankfull Riffle Width/Depth Ratio (W_{bkf} / d_{bkf}) *Bankfull Riffle Width* divided by *Bankfull Riffle Mean Depth* that describes the channel shape (large number = wide and shallow channel; small number = narrow and deep channel).	21.4	ft/ft
Bankfull Riffle Maximum Depth (d_{max}) The distance measured between the bankfull stage elevation and the channel Thalweg.	2.17	ft
Flood-Prone Area Width (W_{fpa}) Width at an elevation that is twice the *Bankfull Riffle Maximum Depth*, measured perpendicular to the fall line of the valley in a riffle section.	81.8	ft
Entrenchment Ratio (ER) The vertical containment of a river calculated as *Flood-Prone Area Width* divided by *Bankfull Riffle Width* (W_{fpa} / W_{bkf}).	2.49	ft/ft
Channel Materials (Particle Size Index D_{50}) The median diameter of channel materials within the bankfull channel sampled proportionately through a reach.	37	mm — mat.
Average Water Surface Slope (S) Elevation difference of water surface between two similar bed features (e.g., start of riffle to start of last riffe) over the stream length for several riffle–pool or step–pool sequences, representing channel gradient.	0.007	ft/ft
Channel Sinuosity (k) An ~~index of channel~~ pattern determined from stream length divided by valley length (L_{st} / L_{val}), or from valley slope divided by average water surface slope (S_{val} / S).	1.67 (lengths)	ft/ft

Stream Type C4/1 **See Classification Key (Figure 2)**

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