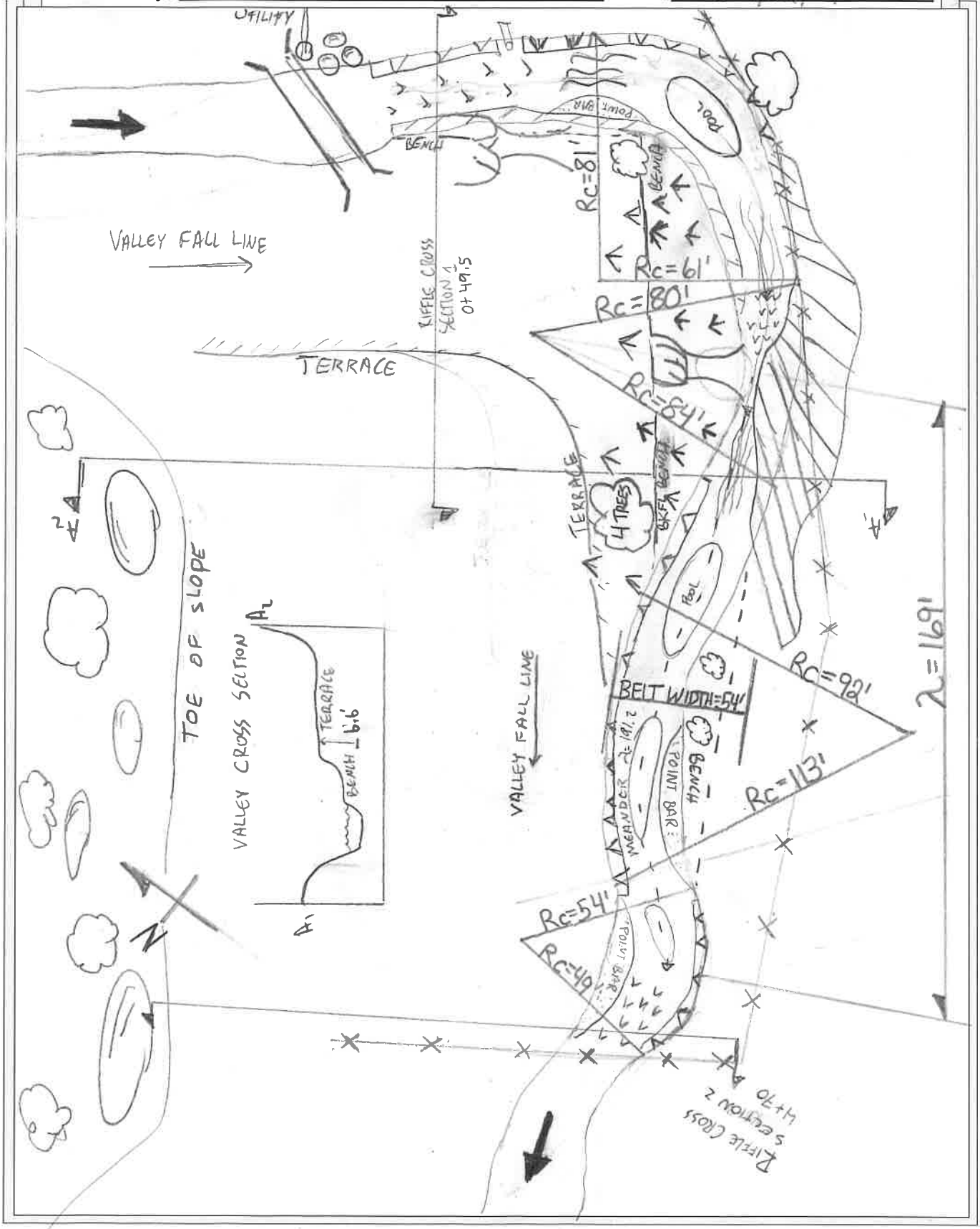
# AREA-SITE LOCATION....REACH MAP

Stream: Little Conococheague Creek Reach: 4

Drawn By: TEAM 4 Date: 04/09/19

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**SURVEY DATA** ⟹ **CROSS - SECTION** 1

**SITE:** Little Conococheague Creek Date: 4-9-19

Location: WASHINGTON CO. MD

Observers: Andrew S / Kate A 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 | ~~+19.5~~ | 3.32 | 103.32 | | | Watershed 40% Karst |
| 2 | -69 | | | 1.12 | 102.2 | |
| 3 | 0 | | | 3.49 | 99.83 | |
| 4 | 6 | | | 4.03 | 99.29 | |
| 5 | 8 | | | 5.44 | 97.88 | Slope Break (SB) |
| 6 | 9.5 | | | 6.67 | 96.65 | SB |
| 7 | 11.6 | | | 7.10 | 96.22 | LEW |
| 8 | 14 | | | 7.55 | 95.77 | |
| 9 | 16 | | | 7.66 | 95.66 | |
| 10 | 18.5 | | | 7.58 | 95.74 | |
| 11 | 22 | | | 7.72 | 95.6 | |
| 12 | 24.2 | | | 7.75 | 95.57 | Thalweg |
| 13 | 26 | | | 7.49 | 95.83 | |
| 14 | 27.8 | | | 7.13 | 96.19 | REW |
| 15 | 29.9 | | | 6.79 | 96.53 | SB |
| 16 | 32.4 | | | 5.85 | 97.47 | BF, SB |
| 17 | 38.5 | | | 5.59 | 97.73 | SB |
| 18 | 53 | | | 4.61 | 98.71 | SB |
| 19 | 61.2 | | | 4.55 | 98.77 | |
| 20 | 71 | | | 4.62 | 98.70 | |
| 21 | 81.2 | | | 4.22 | 99.1 | |
| 22 | 87.7 | | | 3.1 | 100.22 | |
| 23 | 96.2 | | | 1.44 | 101.88 | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |


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**SURVEY DATA** ⟹ **CROSS - SECTION 1 ~~2~~**

**SITE:** Little Conoc. Date: 4-9-19

| Item | STATION ft | B S ft | H I ft | F S ft | Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | | Elev ft | depth ft | cell w ft | cell AVE d ft | Incre Area (ft²) |
| 30 | -6.9 | 102.2 | | 6.9 | | |
| 31 | 0 | 99.83 | 0 | 6 | | |
| 32 | 6 | 99.29 | | 6-0 6 | | |
| 33 | 8 | 97.88 | | 8-6 2 | | |
| 34 | 8.54 9.5 | 97.47 96.65 | 0 0.82 | 0.54 1.5 | .41 | 0.615 1 |
| 35 | 11.6 | 96.22 | 1.25 | 2.1 | 1.035 | 2.174 2 |
| 36 | 14 | 95.77 | 1.7 | 2.4 | 1.475 | 3.415 3 |
| 37 | 16 | 95.66 | 1.81 | 2 | 1.755 | 3.51 4 |
| 38 | 18.5 | 95.74 | 1.73 | 2.5 | 1.77 | 4.425 5 |
| 39 | 22 | 95.6 | 1.87 | 3.5 | 1.8 | 6.3 6 |
| 40 | 24.2 | 95.57 | 1.9 | 2.2 | 1.89 | 4.158 7 |
| 41 | 26 | 95.83 | 1.64 | 1.8 | 1.77 | 3.186 8 |
| 42 | 27.8 | 96.19 | 1.28 PREV | 1.8 | 1.46 | 2.628 9 |
| 43 | 29.9 | 96.53 | 0.94 | 2.1 | 1.11 | 2.331 10 |
| 44 | 32.4 | 97.47 | 0.0 | 2.5 | .47 | 1.175 11 |
| 45 | 38.5 | 97.73 | | | | 33.899 total area (ft²) |
| 46 | 53 | 98.71 | | | | |
| 47 | 61.2 | 98.77 | | | | |
| 48 | 71 | 98.70 | | | | |
| 49 | 81.2 | 99.10 | | | | |
| 50 | 87.7 | 100.12 | | | | Bankfull Area = 33.899 ft² |
| 51 | 96.2 | 101.32 | | | | " width = 23.86 ft |
| 52 | | | | | | " mean depth = 1.42 ft |
| 53 | | | Rich | adjusted | to | width/depth = 16.8 |
| 54 | | | use | Xsec 2 | as BA | FP width = 77 ft |
| 55 | | | does | not fit | curve | Entrench Ratio = 3.23 (<7 Not entrenched) |
| 56 | | Dave | , believes | we | should have | |
| 57 | | cont. | calcs, | as | velocity | would |
| 58 | have | been | ↑ (~5 ft/s) | @ | Xsec 1 | |
| 59 | | | | | | |

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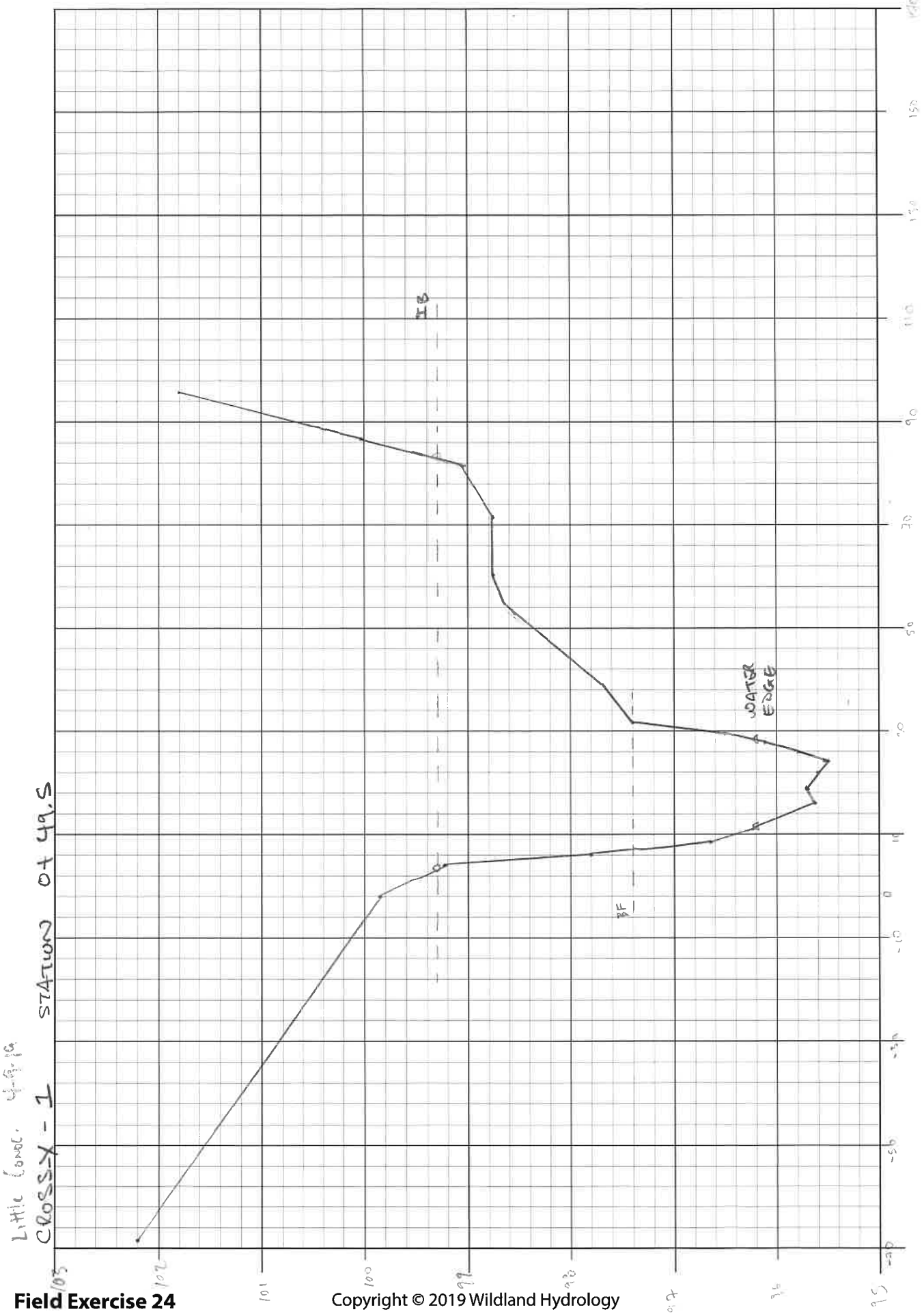




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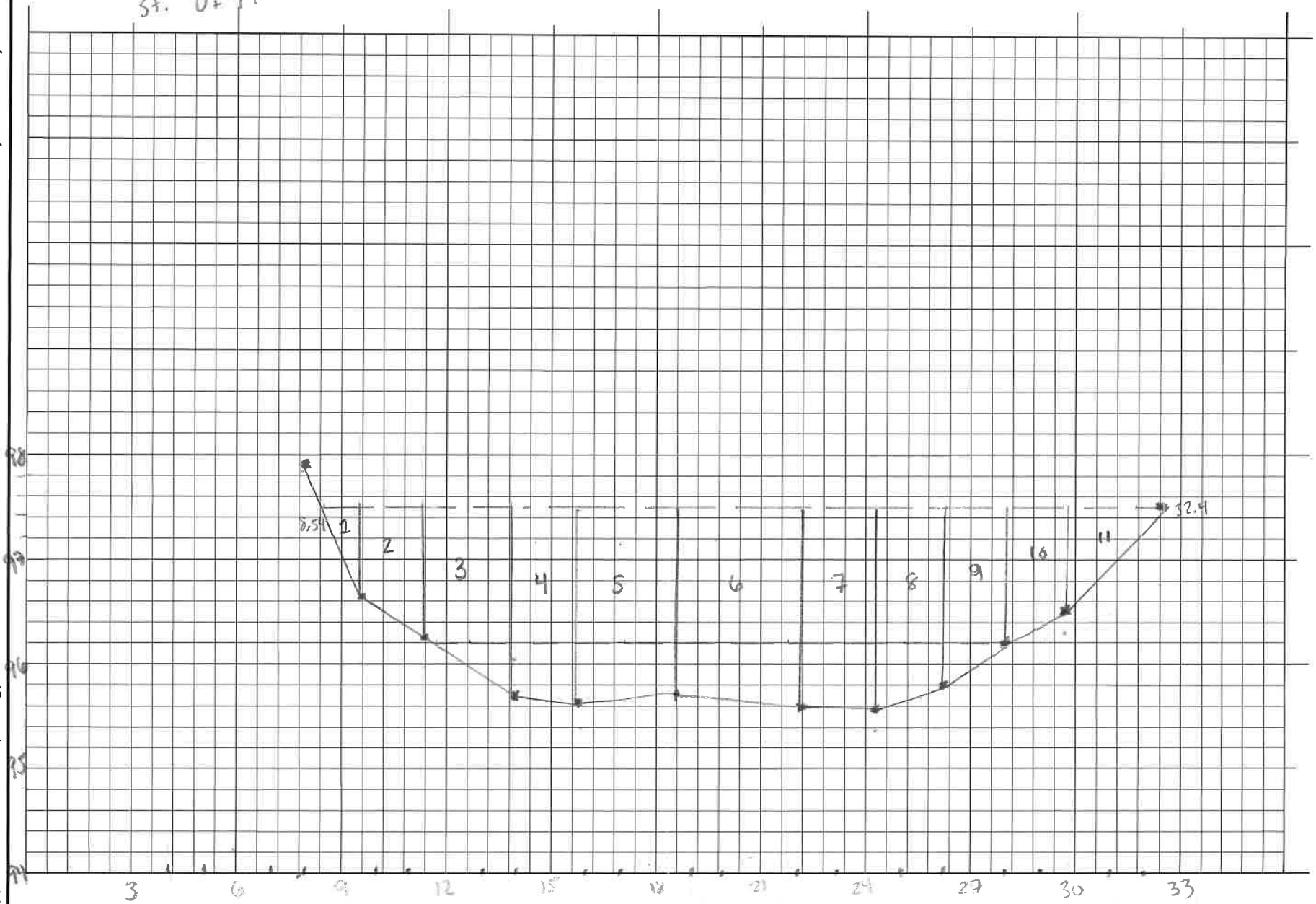
Litt. Cond.
4-9-19
BF XS
St. 0+49

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**SURVEY DATA** → CROSS - SECTION 2 STA 470

SITE: LITTLE CONOCACHEAGUE CREEK REACH 4 Date: 4-9-19

| Item | STATION ft | B S ft | H I ft | F S ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | BM | 3.65 | 103.65 | | 100 | BENCHMARK |
| 30 | 0 | | | 3.82 | 99.83 | |
| 31 | 2.7 | | | 4.0 | 99.65 | |
| 32 | 5.4 | | | 4.33 | 99.32 | |
| 33 | 6.3 | | | 4.61 | 99.04 | |
| 34 | 7.5 | | | 4.68 | 98.97 | |
| 35 | 8.8 | | | 5.61 | 98.04 | TLB |
| 36 | 9.6 | | | 6.16 | 97.49 | |
| 37 | 10.6 | | | 7.16 | 96.49 | |
| 38 | 11.4 | | | 7.82 | 95.83 | |
| 39 | 12.5 | | | 8.56 | 95.09 | |
| 40 | 13.5 | | | 8.88 | 94.77 | LEW |
| ~~41~~ | ~~15.5~~ | | | ~~8.78~~ | ~~94.87~~ | |
| 42 | 18.2 | | | 9.4 | 94.25 | |
| 43 | 20.4 | | | 9.46 | 94.19 | |
| 44 | 23.3 | | | 9.64 | 94.01 | THL |
| 45 | 26.4 | | | 9.56 | 94.09 | |
| 46 | 28.9 | | | 9.47 | 94.18 | |
| 47 | 30.9 | | | 9.41 | 94.24 | |
| 48 | 32.4 | | | 9.0 | 94.65 | |
| 49 | 33.7 | | | 8.84 | 94.81 | REW |
| 50 | 34.6 | | | 8.66 | 94.99 | |
| 51 | 35.4 | | | 8.47 | 95.18 | |
| 52 | 36.0 | | | 7.88 | 95.77 | |
| 53 | 36.3 | | | 7.50 | 96.15 | SLPBRK |
| 54 | 36.8 | | | 7.38 | 96.27 | RBKF |
| 55 | 37.9 | | | 7.27 | 96.38 | SLPBRK |
| 56 | 40.7 | | | 7.30 | 96.35 | |
| 57 | 44.7 | | | 7.07 | 96.58 | SLPBRK |
| 58 | 49.1 | | | 6.46 | 97.19 | RTB |
| 59 | 52.7 | | | 6.06 | 97.59 | |

FPA = ROD 5.12
98.53

BKF = 2.26'
2xBKF = 4.52'
THL = 9.64
- 4.52
5.12'

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**SURVEY DATA** → **CROSS - SECTION 2**

**SITE:** Date:

| Item | STATION ft | B S ft | H I ft | F S ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | 59.0 | | | 5.62 | 98.03 | |
| 30 | 73.0 | | | 4.98 | 98.67 | |
| 31 | 90.0 | | | 4.54 | 99.11 | |
| 32 | 101.0 | | | 4.45 | 99.20 | |
| 33 | 119.0 | | | 4.13 | 99.52 | |
| 34 | 130.0 | | | 3.98 | 99.67 | |
| 35 | 139.0 | | | 3.61 | 100.04 | |
| 36 | | | | | | |
| 37 | | | | | | |
| 38 | | | | | | |
| 39 | | | | | | |
| 40 | | | | | | |
| 41 | | | | | | |
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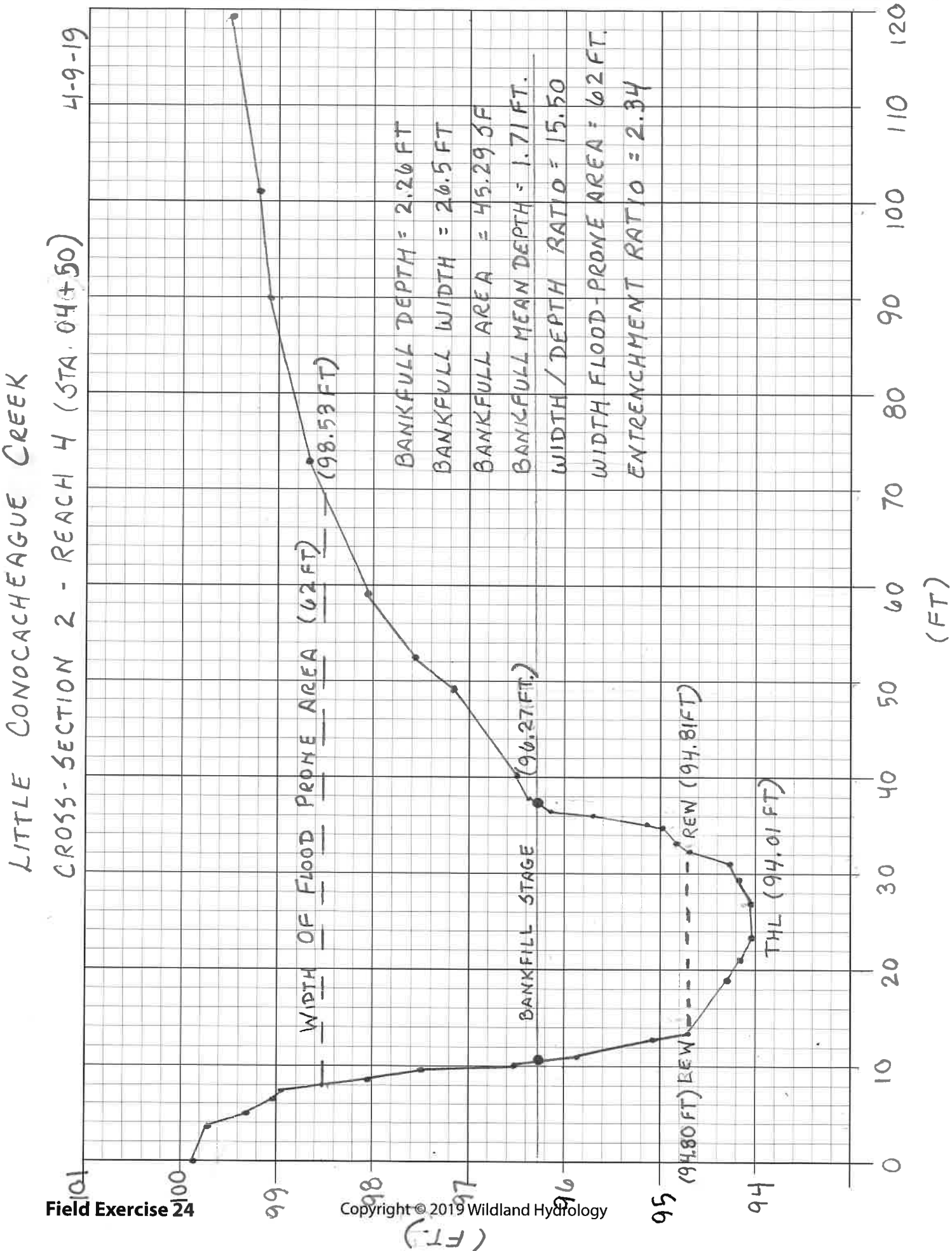



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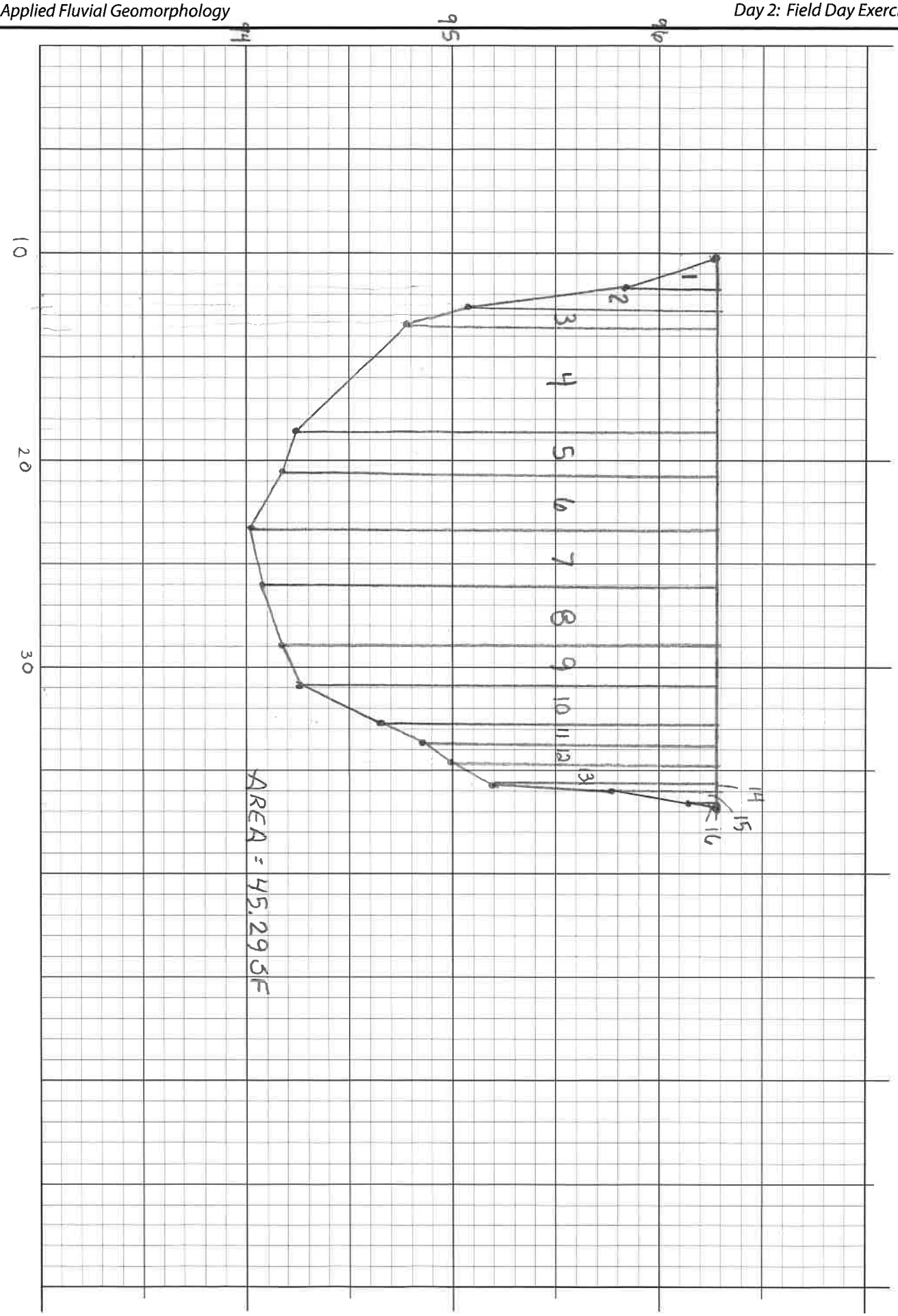



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# BANKFULL CROSS-SECTIONAL AREA CALCS.

| CELL # | STA. (ft) | ELEV. (ft) | DEPTH (ft) | CELL WIDTH (ft) | AVERAGE CELL DEPTH (ft) | INCREMENTAL AREA ($ft^2$) |
|---|---|---|---|---|---|---|
| | 10.3 | 96.27 | 0 | | | |
| 1 | 11.4 | 95.83 | .44 | 1.1 | 0.22 | 0.24 |
| 2 | 12.5 | 95.09 | 1.18 | 1.1 | 0.81 | 0.90 |
| 3 | 13.5 | 94.77 | 1.50 | 1.0 | 1.34 | 1.34 |
| 4 | 18.2 | 94.25 | 2.02 | 4.7 | 1.76 | 8.27 |
| 5 | 20.4 | 94.19 | 2.08 | 2.2 | 2.05 | 4.51 |
| 6 | 23.3 | 94.01 | 2.26 | 2.9 | 2.17 | 6.29 |
| 7 | 26.4 | 94.09 | 2.18 | 3.1 | 2.22 | 6.88 |
| 8 | 28.9 | 94.18 | 2.09 | 2.5 | 2.14 | 5.35 |
| 9 | 30.9 | 94.24 | 2.03 | 2.0 | 2.06 | 4.12 |
| 10 | 32.4 | 94.65 | 1.62 | 1.5 | 1.83 | 2.75 |
| 11 | 33.7 | 94.81 | 1.46 | 1.3 | 1.54 | 2.00 |
| 12 | 34.6 | 94.99 | 1.28 | 0.9 | 1.37 | 1.23 |
| 13 | 35.4 | 95.18 | 1.09 | 0.8 | 1.19 | 0.76 |
| 14 | 36.0 | 95.77 | 0.50 | 0.6 | 0.80 | 0.48 |
| 15 | 36.3 | 96.15 | 0.12 | 0.3 | 0.46 | 0.14 |
| 16 | 36.8 | 96.27 | 0 | 0.5 | 0.06 | 0.03 |

AREA: 45.29

BANKFULL WIDTH (ft): 26.5

BANKFULL AREA ($ft^2$): 45.29

BF MEAN DEPTH (ft): 45.29/26.5 = 1.71

OVER →



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**SURVEY DATA** → **LONGITUDINAL PROFILE 1**

**SITE:** Conococheague Creek Date: 4-9-19

Location: Reach 4

Observers: GK/JB 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 | BM1 | 5.48 | 105.48 | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | 0 | 9.31 | 96.17 | 9.31 | 96.17 | 8.59 | 96.89 | 7.31 | 98.17 | | | Top of riffle |
| 4 | 38.2 | | | 9.85 | 95.63 | | | | | | | middle of riffle |
| XS1 5 | 50.6 | | | | | 9.31 | | 8.02 | 97.46 | | | BKF |
| 6 | 73.4 | | | 10.39 | 95.09 | 9.54 | 95.94 | | | | | bottom of riffle |
| 7 | 91.0 | | | 13.31 | 92.17 | 9.62 | 95.86 | | | | | top of pool |
| 8 | 94.5 | | | 13.39 | 92.09 | | | | | | | max depth of pool |
| 9 | 129.3 | | | 11.44 | 94.04 | | | 8.49 | 96.99 | 6.98 | 98.50 | BKF |
| 10 | 173.1 | | | 10.95 | 94.53 | 9.58 | 95.90 | | | | | bottom of pool |
| 11 | 191.2 | | | 10.67 | 94.81 | 9.63 | 95.85 | | | | | top of riffle |
| 12 | 215 | | | 10.56 | 94.92 | | | 8.65 | 96.83 | | | middle of riffle / BKF |
| 13 | 238.7 | | | 11.21 | 94.27 | 10.19 | 95.29 | | | | | bottom of riffle |
| 14 | 261 | | | 12.07 | 93.41 | | | | | | | run |
| 15 | 301 | | | 12.59 | 92.89 | 10.41 | 95.07 | | | | | top of pool |
| 16 | 313.3 | | | 12.55 | 92.93 | | | 8.95 | 96.53 | | | middle of pool / BKF |
| 17 | 330.8 | | | 13.26 | 92.22 | | | | | | | max depth of pool |
| 18 | 340 | | | | | | | 8.80 | 96.68 | 7.91 | 97.57 | BKF |
| 19 | 366.7 | | | | | | | 8.73 | 96.75 | | | BKF-high |
| 20 | 366.7 | | | | | | | 8.97 | 96.51 | | | BKF-low |
| 21 | 367.6 | | | 13.14 | 92.34 | | | | | | | middle of pool |
| 22 | 398.8 | | | | | | | 9.33 | 96.15 | | | BKF |
| 23 | 412.4 | | | 12.18 | 93.3 | 10.51 | 94.97 | | | | | bottom of pool |
| 24 | 448.0 | | | 11.22 | 94.26 | 10.64 | 94.84 | | | | | top of riffle |
| XS2 25 | 469.7 | | | 11.57 | 93.91 | 10.86 | 94.62 | 9.36 | 96.12 | 8.44 | 97.04 | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |


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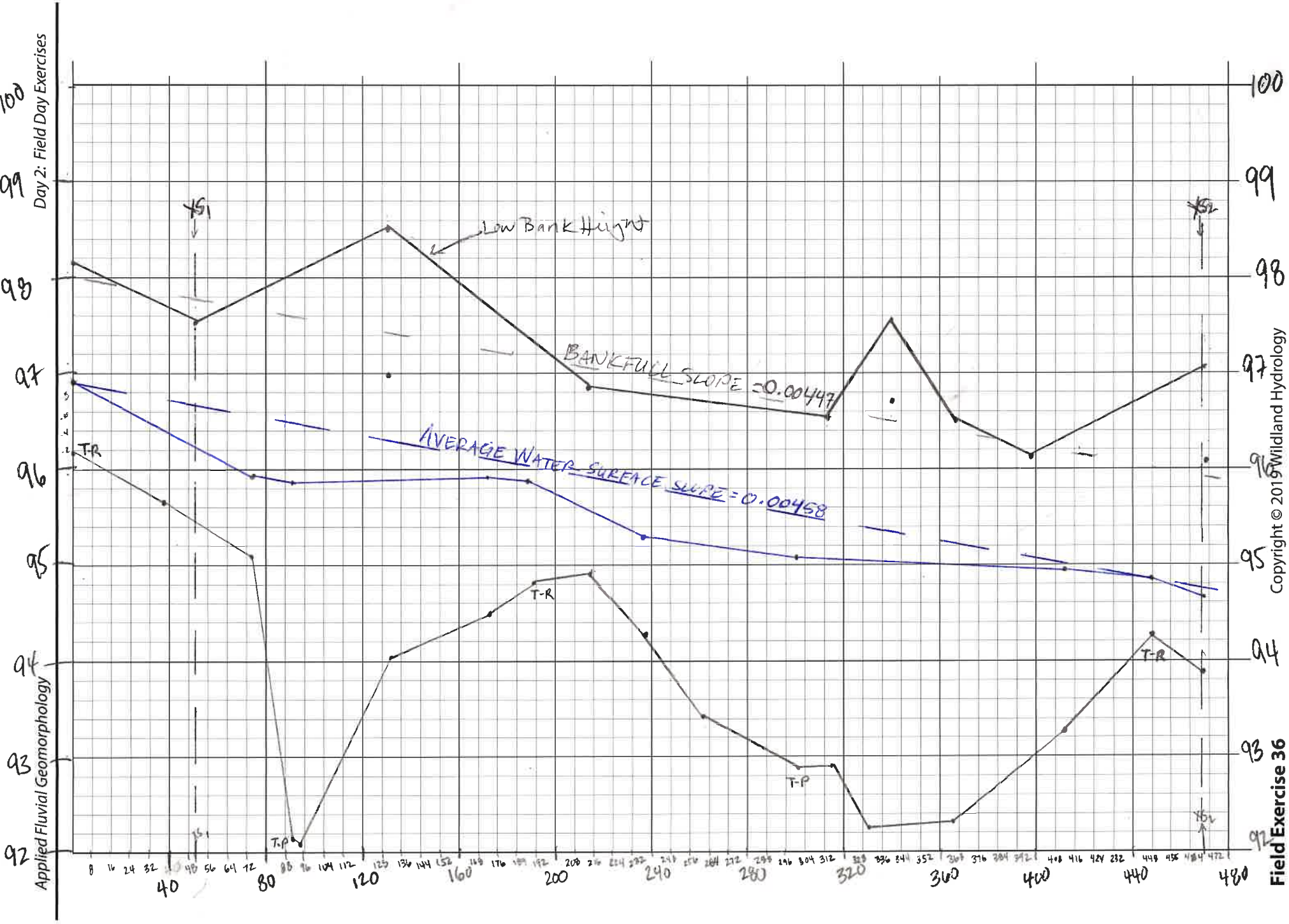
Reach 4




Day 2: Field Day Exercises

Applied Fluvial Geomorphology

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Active Bed Pebble Count

Site: Conocateague Creek

Location: Reach 4 HUC:

Observers: Team 4

| Inches | PARTICLE | Millimeters | | Dot Count for RIFFLE 1 | POOL 2 | COMP. 3 | RIFFLE (1) TOT # | ITEM % | % CUM | Riffle 2 ~~POOL~~ (2) TOT # | ITEM % | % CUM | COMPOSITE (3) TOT # | ITEM % | % CUM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Reach: 4 | | | Reach: 4 | | | Reach: | | |
| | | | | | | | Date: | | | Date: | | | Date: | | |
| | Silt / Clay | < .062 | S/C | | | | | | | | | | | | |
| | Very Fine | .062 - .125 | SAND | | | | | | | | | | | | |
| | Fine | .125 - .25 | | | | | | | | | | | | | |
| | Medium | .25 - .50 | | | | | | | | | | | | | |
| | Coarse | .50 - 1.0 | | | | | | | | 1 | | 1 | | | |
| .04 - .08 | Very Coarse | 1.0 - 2 | | | | | | | | | | | | | |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | | | | | | | | | | | | |
| .16 - .22 | Fine | 4 - 5.7 | | | | | 1 | 1% | 1 | | | | | | |
| .22 - .31 | Fine | 5.7 - 8 | | | | | 2 | 2% | 3 | | | | | | |
| .31 - .44 | Medium | 8 - 11.3 | | | | | 7 | 7% | 10 | 1 | | 2 | | | |
| .44 - .63 | Medium | 11.3 - 16 | | | | | 7 | 7% | 17 | 3 | | 5 | | | |
| .63 - .89 | Coarse | 16 - 22.6 | | | | | 16 | 16% | 33 | 10 | | 15 | | | |
| .89 - 1.3 | Coarse | 22.6 - 32 | | | | | 25 | 25% | 58 | 9 | | 24 | | | |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | | | | | 21 | 21% | 79 | 20 | | 44 | | | |
| 1.8 - 2.5 | Very Coarse | 45 - 64 | | | | | 13 | 13% | 92 | 14 | | 58 | | | |
| 2.5 - 3.5 | Small | 64 - 90 | COBBLE | | | | 6 | 6% | 98 | 20 | | 78 | | | |
| 3.5 - 5.0 | Small | 90 - 128 | | | | | 2 | 2% | 100 | 19 | | 97 | | | |
| 5.0 - 7.1 | Large | 128 - 180 | | | | | | | | 3 | | 100 | | | |
| 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 | | | | | | | | | | | | |
| Stream Type: | | | Landscape Type: | | | TOTAL→ | | | | | | | | | |





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Site: Little Conococheague

Location: #4 HUC:

Observers: Kai/Nick/Trevor

| Inches | PARTICLE | Millimeters | | Dot Count for RIFFLE 1 | POOL 2 | COMP. 3 | RIFFLE (1) Reach: 4 Date: 4/9/19 TOT # | ITEM % | % CUM | POOL (2) Reach: 4 Date: 4/9/19 TOT # | ITEM % | % CUM | COMPOSITE (3) Reach: 4 Date: 4/9/19 TOT # | ITEM % | % CUM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt / Clay | < .062 | S/C | | | | | | | | | | | | |
| | Very Fine | .062 - .125 | SAND | KTP | | | 0 | 0 | 0 | 3 | 7.5 | 7.5 | 3 | | 3 |
| | Fine | .125 - .25 | SAND | | | | 3 | 5% | 5 | 6 | 15 | 22.5 | 9 | | 12 |
| | Medium | .25 - .50 | SAND | | | | 0 | 0 | 5 | 0 | 0 | 22.5 | 0 | | 12 |
| | Coarse | .50 - 1.0 | SAND | | | | 2 | 3.3% | 8.3 | 3 | 7.5 | 30 | 5 | | 17 |
| .04 - .08 | Very Coarse | 1.0 - 2 | | | | | 0 | 0 | 8.3 | 1 | 2.5 | 32.5 | 1 | | 18 |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | | | | 0 | 0 | 8.3 | 1 | 2.5 | 35 | 1 | | 19 |
| .16 - .22 | Fine | 4 - 5.7 | GRAVEL | | | | 2 | 3.3% | 11.6 | 0 | 0 | 35 | 2 | | 21 |
| .22 - .31 | Fine | 5.7 - 8 | GRAVEL | | | | 3 | 5% | 16.6 | 1 | 2.5 | 37.5 | 4 | | 25 |
| .31 - .44 | Medium | 8 - 11.3 | GRAVEL | | | | 2 | 3.3% | 19.9 | 1 | 2.5 | 40 | 3 | | 28 |
| .44 - .63 | Medium | 11.3 - 16 | GRAVEL | | | | 4 | 6.7% | 26.6 | 1 | 2.5 | 42.5 | 5 | | 33 |
| .63 - .89 | Coarse | 16 - 22.6 | GRAVEL | | | | 6 | 10% | 36.6 | 5 | 12.5 | 55 | 11 | | 44 |
| .89 - 1.3 | Coarse | 22.6 - 32 | GRAVEL | | | | 15 | 25% | 61.6 | 5 | 12.5 | 67.5 | 21 | | 65 |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | GRAVEL | | | | 9 | 15% | 76.6 | 4 | 10 | 77.5 | 13 | | 78 |
| 1.8 - 2.5 | Very Coarse | 45 - 64 | GRAVEL | | | | 8 | 13.3% | 89.9 | 5 | 12.5 | 90 | 13 | | 91 |
| 2.5 - 3.5 | Small | 64 - 90 | COBBLE | | | | 2 | 3.3% | 93.2 | 1 | 2.5 | 92.5 | 3 | | 94 |
| 3.5 - 5.0 | Small | 90 - 128 | COBBLE | | | | 3 | 5% | 98.2 | 1 | 2.5 | 95 | 4 | | 98 |
| 5.0 - 7.1 | Large | 128 - 180 | COBBLE | | | | 1 | 1.7% | 99.9 | 1 | 2.5 | 97.5 | 1 | | 99 |
| 7.1 - 10.1 | Large | 180 - 256 | COBBLE | | | | | 0 | | 1 | 2.5 | 100 | 1 | | 100 |
| 10.1 - 14.3 | Small | 256 - 362 | BOULDER | | | | | | | 0 | 0 | | 0 | | 0 |
| 14.3 - 20 | Small | 362 - 512 | BOULDER | | | | | | | | | | | | |
| 20 - 40 | Medium | 512 - 1024 | BOULDER | | | | | | | | | | | | |
| 40 - 80 | Large-Vry Large | 1024 - 2048 | BOULDER | | | | | | | | | | | | |
| | Bedrock | | BDRK | | | | | | | | | | | | |
| | | | | | | TOTAL→ | 60 | | 100 | 40 | | 100 | 100 | | 100 |

**Stream Type:** **Landscape Type:**

2-riffle

310
99
35 = 148



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Riffle Pebble Count

Riffle #1 (49')

~~Riffle #2 (215')~~ Riffle #2

Site:
Location: HUC: ~~1 2 3 4 5 6 7 8 9~~
Observers:

| Inches | PARTICLE | Millimeters | | Dot Count for RIFFLE 1 2 5 | POOL 4 3 2 6 | COMP 7 8 9 | RIFFLE (1) Reach: Date: TOT # 10 | ITEM % 1 | % CUM 2 3 4 | POOL (2) Reach: Date: TOT # 5 6 | ITEM % 7 | % CUM 8 9 10 | COMPOSITE (3) Reach: Date: TOT # 5 6 | ITEM % 7 | % CUM 8 9 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | | | | | | | | | | | | |
| .16 - .22 | Fine | 4 - 5.7 | GRAVEL | | | | | | | | | | | | |
| .22 - .31 | Fine | 5.7 - 8 | GRAVEL | | | | | | | | | | | | |
| .31 - .44 | Medium | 8 - 11.3 | GRAVEL | | | | | | | | | | | | |
| .44 - .63 | Medium | 11.3 - 16 | GRAVEL | | | | | | | | | | | | |
| .63 - .89 | Coarse | 16 - 22.6 | GRAVEL | | | | | | | | | | | | |
| .89 - 1.3 | Coarse | 22.6 - 32 | GRAVEL | | | | | | | | | | | | |
| 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:** **Landscape Type:** TOTAL→

45x20x11

157x


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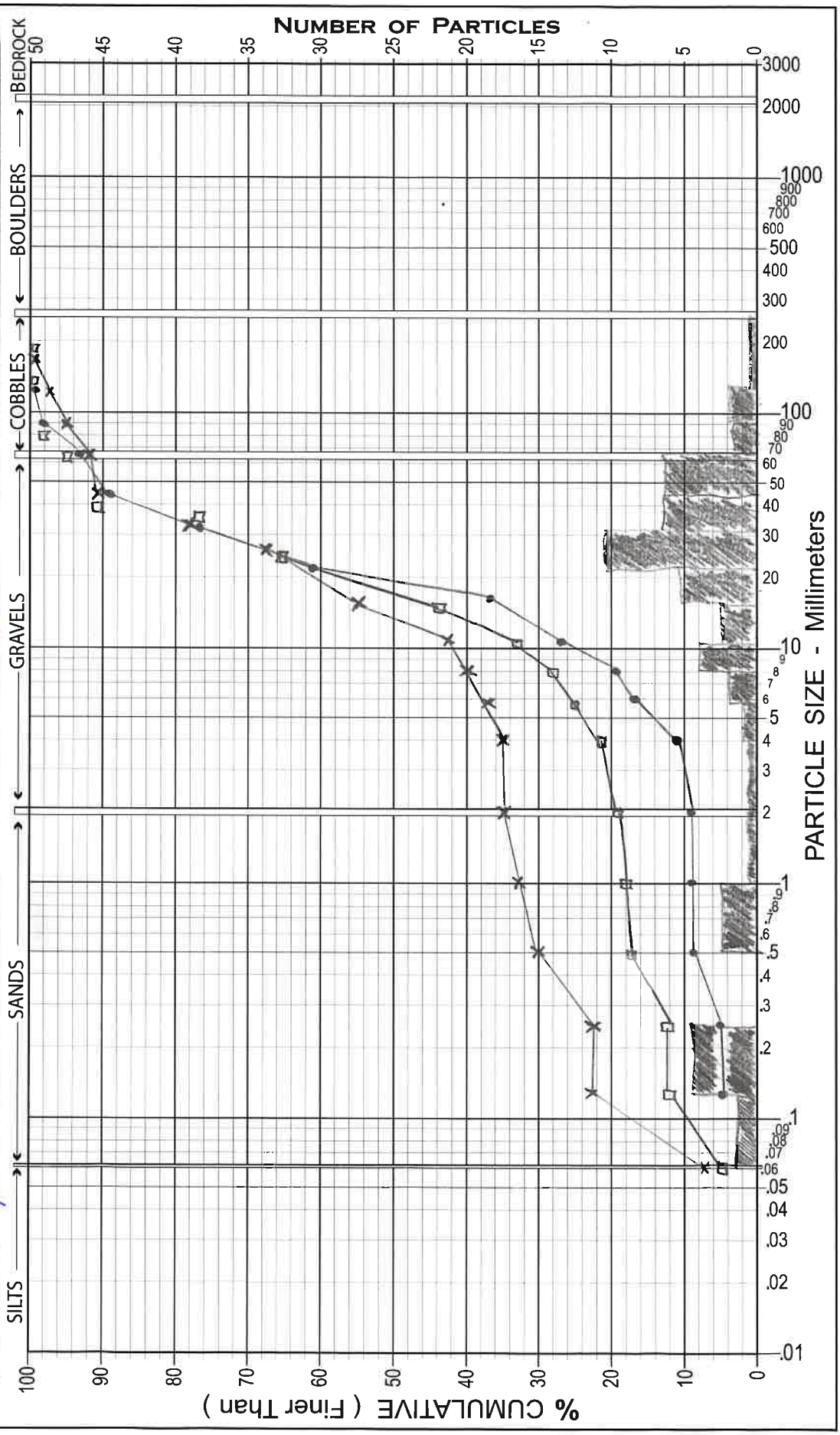
# PEBBLE COUNT DATA

LOCATION: Conococheague Creek
REACH: 4
Stream Type: C4/1
Date: 4/9/19
Observers: Kai, Nick, Trevor
Landscape Type: ~~Tr~~ TC-AL-AD
HUC:




riffle - •
pool - x
cumulative - □

D50 - 18 mm
D84 - 40 mm

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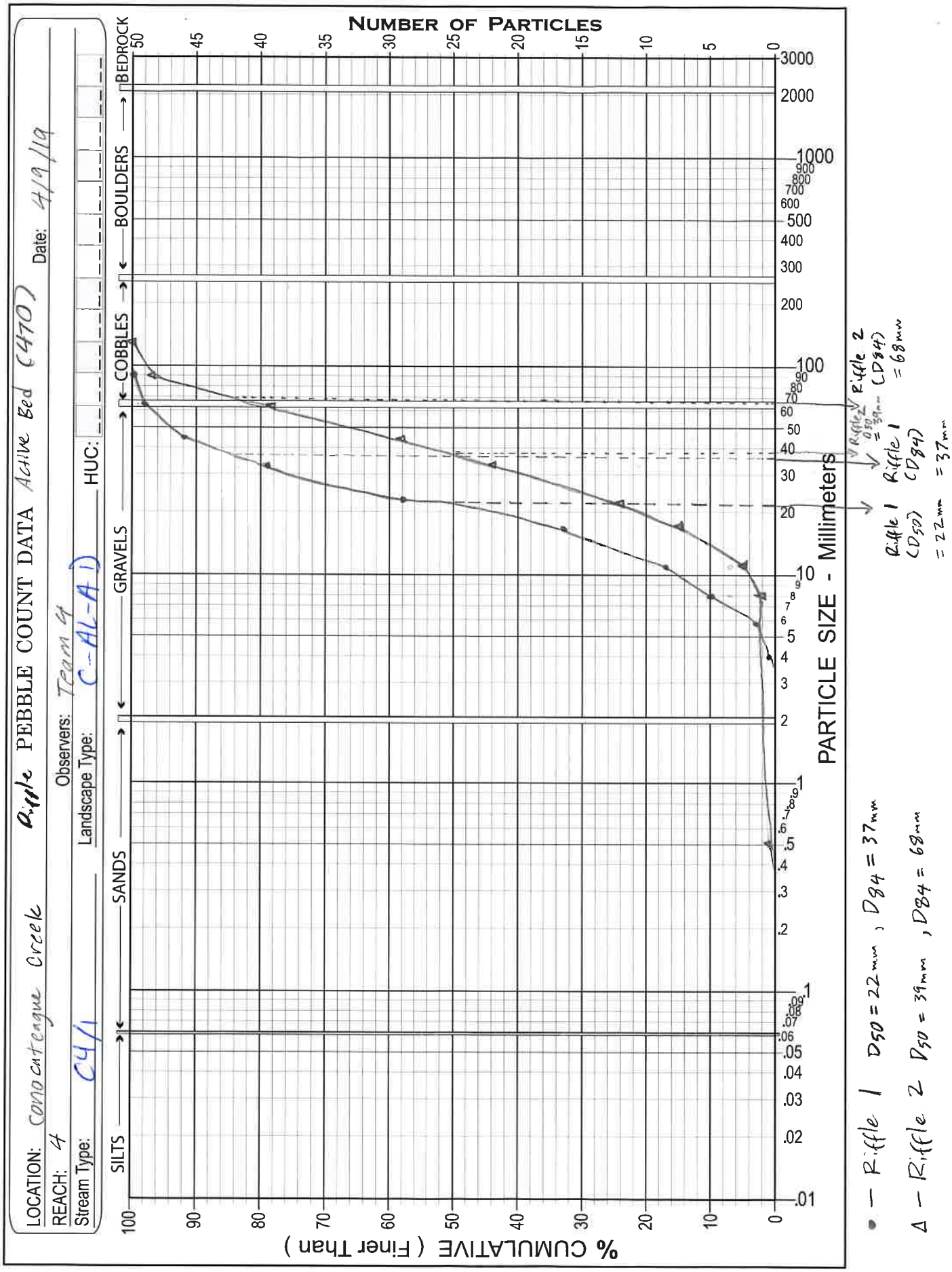


$D_{50}$
$D_{84}$

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

## Bankfull Velocity and Discharge Estimates

| | |
|---|---|
| Stream: Little Conococheague Reach 4 | Stream Type: C4 |
| Location: Charlton, MD | Landscape Type: Confined Alluvial/(C-A-FD) |
| Observers: Team 4 | Date: 04/09/19 |

| Input Variables | | | Output Variables | | |
|---|---|---|---|---|---|
| Bankfull Riffle Cross-Sectional Area | 45.29 | $A_{bkf}$ (ft²) | Bankfull Riffle Mean Depth | 1.71 | $d_{bkf}$ (ft) |
| Bankfull Riffle Width | 26.5 | $W_{bkf}$ (ft) | Wetted Perimeter: $\approx (2 \cdot d_{bkf}) + W_{bkf}$ | 29.92 | $W_p$ (ft) |
| $D_{84}$ Particle Size at Riffle | 68 | Dia. (mm) | $D_{84}$ at Riffle (mm to ft): $D_{84}$ (mm) / 304.8 | .2230 | $D_{84}$ (ft) |
| Bankfull Slope | .00447 | $S_{bkf}$ (ft / ft) | Hydraulic Radius $A_{bkf} / W_p$ | 1.513 | $R$ (ft) |
| Gravitational Acceleration | 32.2 | $g$ (ft / sec²) | Relative Roughness: $R$ (ft) / $D_{84}$ (ft) | 6.784 | $R / D_{84}$ |
| Drainage Area | 12 | DA (mi²) | Shear Velocity: $u^* = (gRS)^{½}$ | .4665 | $u^*$ (ft/sec) |

.0669
1.318

| Estimation Methods | Bankfull VELOCITY | | Bankfull DISCHARGE | |
|---|---|---|---|---|
| 1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 \cdot \text{Log}\,(R / D_{84})\,]\,u^*$ | 3.52 | ft / sec | 159.42 | cfs |
| 2. Roughness Coefficient: a) Manning's $n$ from Friction Factor / Relative Roughness (Figures 28–29) $\bar{u} = 1.49 \cdot R^{2/3} \cdot S^{1/2} / n$ $n =$ 0.042 | 3.13 | ft / sec | 141.67 | cfs |
| 2. Roughness Coefficient: b) Manning's $n$ from Stream Type (Figure 30) $\bar{u} = 1.49 \cdot R^{2/3} \cdot S^{1/2} / n$ $n =$ 0.032 | 4.11 | ft / sec | 186.14 | 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 $n =$ N/A | N/A | ft / sec | N/A | cfs |
| 3. Other Methods (e.g., Hey, Darcy-Weisbach, or Chezy C) | N/A | ft / sec | N/A | cfs |
| 3. Other Methods (e.g., Hey, Darcy-Weisbach, or Chezy C) | N/A | ft / sec | N/A | cfs |
| 4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Discharge $Q_{bkf} =$ year | N/A | ft / sec | N/A | cfs |
| 4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$ | 4.42 | ft / sec | 200 | cfs |

n= .032

CAME FROM RICH'S DATA

**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 **"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 3.** Summary of Morphological Variables.

| | | | |
|---|---|---|---|
| Stream: | LITTLE CONOCACHEAGUE CREEK | Location: | WASHINGTON COUNTY, MARYLAND |
| Team: | #4 REACH #4 | Date: | 4-9-19 |

## Riffle Channel Dimensions

| | | | | | |
|---|---|---|---|---|---|
| 1. Bankfull Width | ($W_{bkf}$) (ft) | 26.5 | 2. Bankfull Mean Depth | ($d_{bkf}$) (ft) | 1.71 |
| 3. Width/Depth Ratio | ($W_{bkf}/d_{bkf}$) | 15.5 | 4. Bankfull Cross-Sectional Area | ($A_{bkf}$) ($ft^2$) | 45.29 |
| 5. Bankfull Maximum Depth | ($d_{max}$) (ft) | 2.26 | 6. Width of Flood-Prone Area | ($W_{fpa}$) (ft) | 62 |
| 7. Entrenchment Ratio | ($W_{fpa}/W_{bkf}$) | 2.3 | | | |

## Channel Pattern / Pattern Ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8. Belt Width | ($W_{blt}$) (ft) | Avg: | 54 | 9. Meander Width Ratio (MWR) | ($W_{blt}/W_{bkf}$) | Avg: | 2.03 |
| | | LL: | 54 | | | LL: | 2.03 |
| | | UL: | 54 | | | UL: | 2.03 |
| 10. Stream Meander Length | ($L_m$) (ft) | Avg: | 191.2 | 11. Meander Length Ratio (MLR) | ($L_m/W_{bkf}$) | Avg: | 7.21 |
| | | LL: | 191.2 | | | LL: | 7.21 |
| | | UL: | 191.2 | | | UL: | 7.21 |
| 12. Linear Wavelength | ($\lambda$) (ft) | Avg: | 169 | 13. Linear Wavelength to Bankfull Width | ($\lambda/W_{bkf}$) | Avg: | 6.37 |
| | | LL: | 169 | | | LL: | 6.37 |
| | | UL: | 169 | | | UL: | 6.37 |
| 14. Radius of Curvature | ($R_c$) (ft) | Avg: | 81 | 15. Radius of Curvature to Bankfull Width | ($R_c/W_{bkf}$) | Avg: | 3.05 |
| | | LL: | 49 | | | LL: | 1.84 |
| | | UL: | 113 | | | UL: | 4.26 |

## Channel Particles

### *Representative Pebble Count*

| | | | | | |
|---|---|---|---|---|---|
| 16. $D_{16}$ (mm) | 0.4 Med. Sand | 17. $D_{35}$ (mm) | 11 Med. gravel | 18. $D_{50}$ (mm) | 18 Coarse gravel |
| 19. $D_{84}$ (mm) | 40 V. Coarse gravel | 20. $D_{95}$ (mm) | 75 Sm. cobble | 21. $D_{100}$ (mm) | 180 Lg. cobble |

### *Active Bed Riffle Pebble Count*

| | | | | | |
|---|---|---|---|---|---|
| 22. $D_{16}$ (mm) | 17 | 23. $D_{35}$ (mm) | 28 | 24. $D_{50}$ (mm) | 39 |
| 25. $D_{84}$ (mm) | 68 | 26. $D_{95}$ (mm) | 89 | 27. $D_{100}$ (mm) | 125 |

## Channel Sinuosity & Slope

| | | | | | |
|---|---|---|---|---|---|
| 28. Sinuosity | ($k$) | 1.12 | 29. Average Water Surface Slope | ($S$) | 0.00458 |

## Classification

| | | | |
|---|---|---|---|
| 30. Stream Type | C4/1 | 31. Landscape Type | CAL-FD |

## Velocity & Discharge

| | | | | | |
|---|---|---|---|---|---|
| 32. Friction Factor | ($\bar{u}$ / $u^*$) | 7.75 | 33. Relative Roughness | ($R/D_{84}$) | 6.784 |
| 34. Manning's '$n$' from $R$ / $D_{84}$ | ($n$) | 0.042 | 35. Manning's '$n$' from Stream Type | ($n$) | 0.032 |
| 36. Estimated Bankfull Mean Velocity | ($\bar{u}_{bkf}$) (ft/sec) | 3.52 | 37. Estimated Bankfull Discharge | ($Q$) (cfs) | 159.42 |
| 38. Estimation Method Selected for Velocity & Discharge | | FF/RR | | | |


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**Worksheet 1.** Field Form for Level II Stream Classification.

| | |
|---|---|
| Stream: Little Conococheague Reach 4 | |
| Location: Charlton, MD | Landscape Type: C-AL-FD |
| Observers: Team 4 | Riffle Cross-Section: XS-2 |
| Date: 04/09/19 | Drainage Area: 12 $mi^2$ |

| | | |
|---|---|---|
| **Bankfull Riffle Width ($W_{bkf}$)**<br>The surface width of the stream at the bankfull stage elevation. | 26.5 | ft |
| **Bankfull Riffle Mean Depth ($d_{bkf}$)**<br>Mean depth of the stream channel cross-section at the bankfull stage elevation ($d_{bkf} = A_{bkf} / W_{bkf}$). | 1.71 | ft |
| **Bankfull Riffle Cross-Sectional Area ($A_{bkf}$)**<br>Area of the stream channel cross-section at the bankfull stage elevation ($A_{bkf} = W_{bkf} \bullet d_{bkf}$). | 45.29 | $ft^2$ |
| **Bankfull Riffle Width/Depth Ratio ($W_{bkf} / d_{bkf}$)**<br>*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). | 15.5 | ft/ft |
| **Bankfull Riffle Maximum Depth ($d_{max}$)**<br>The distance measured between the bankfull stage elevation and the channel Thalweg. | 2.26 | ft |
| **Flood-Prone Area Width ($W_{fpa}$)**<br>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. | 62 | ft |
| **Entrenchment Ratio ($ER$)**<br>The vertical containment of a river calculated as *Flood-Prone Area Width* divided by *Bankfull Riffle Width* ($W_{fpa} / W_{bkf}$). | 2.3 | ft/ft |
| **Channel Materials (Particle Size Index $D_{50}$)**<br>The median diameter of channel materials within the bankfull channel sampled proportionately through a reach. | Coarse gravel 18 | mm |
| **Average Water Surface Slope ($S$)**<br>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. | 0.00458 | ft/ft |
| **Channel Sinuosity ($k$)**<br>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 ($S_{val} / S$). | 1.12 | ft/ft |

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


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