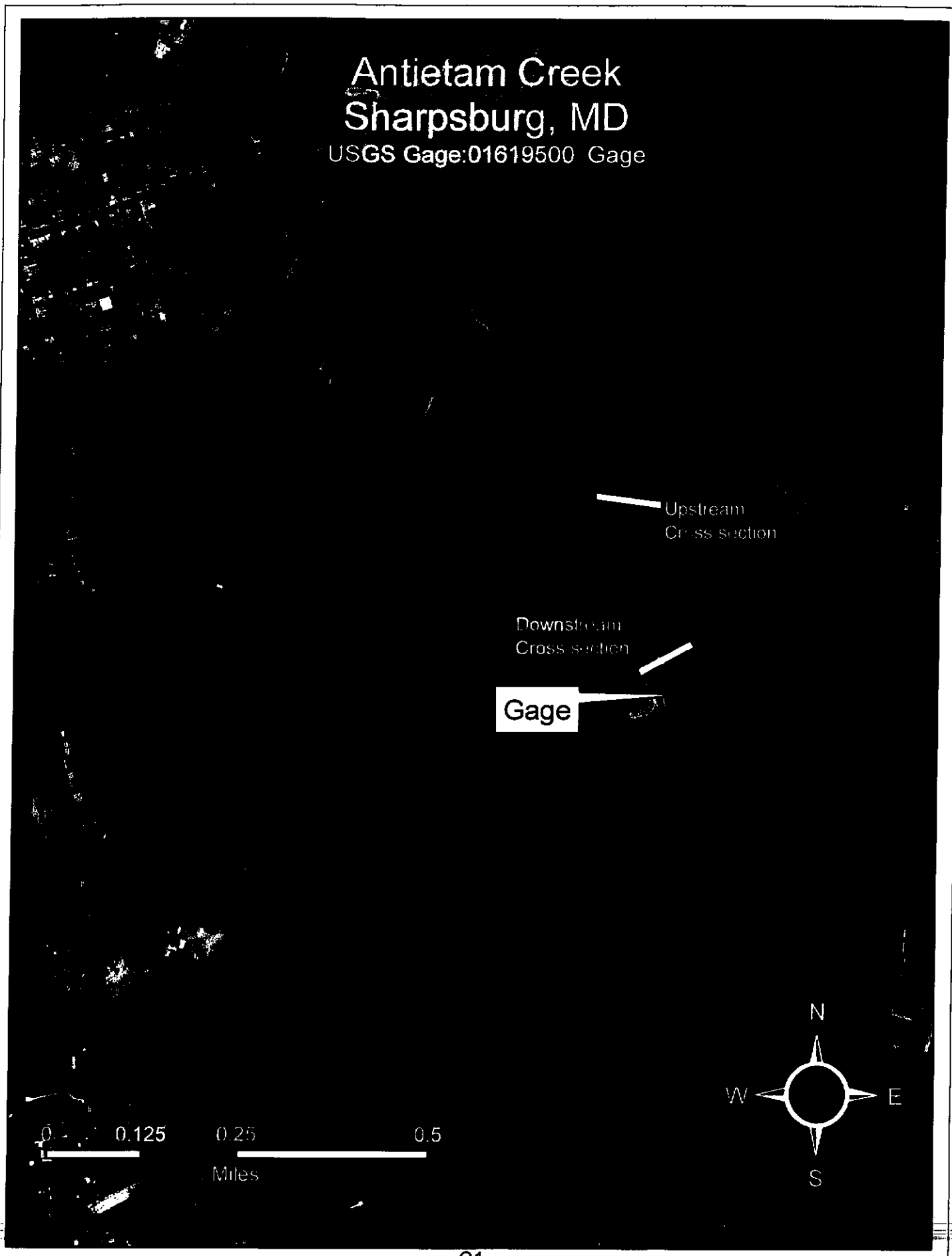
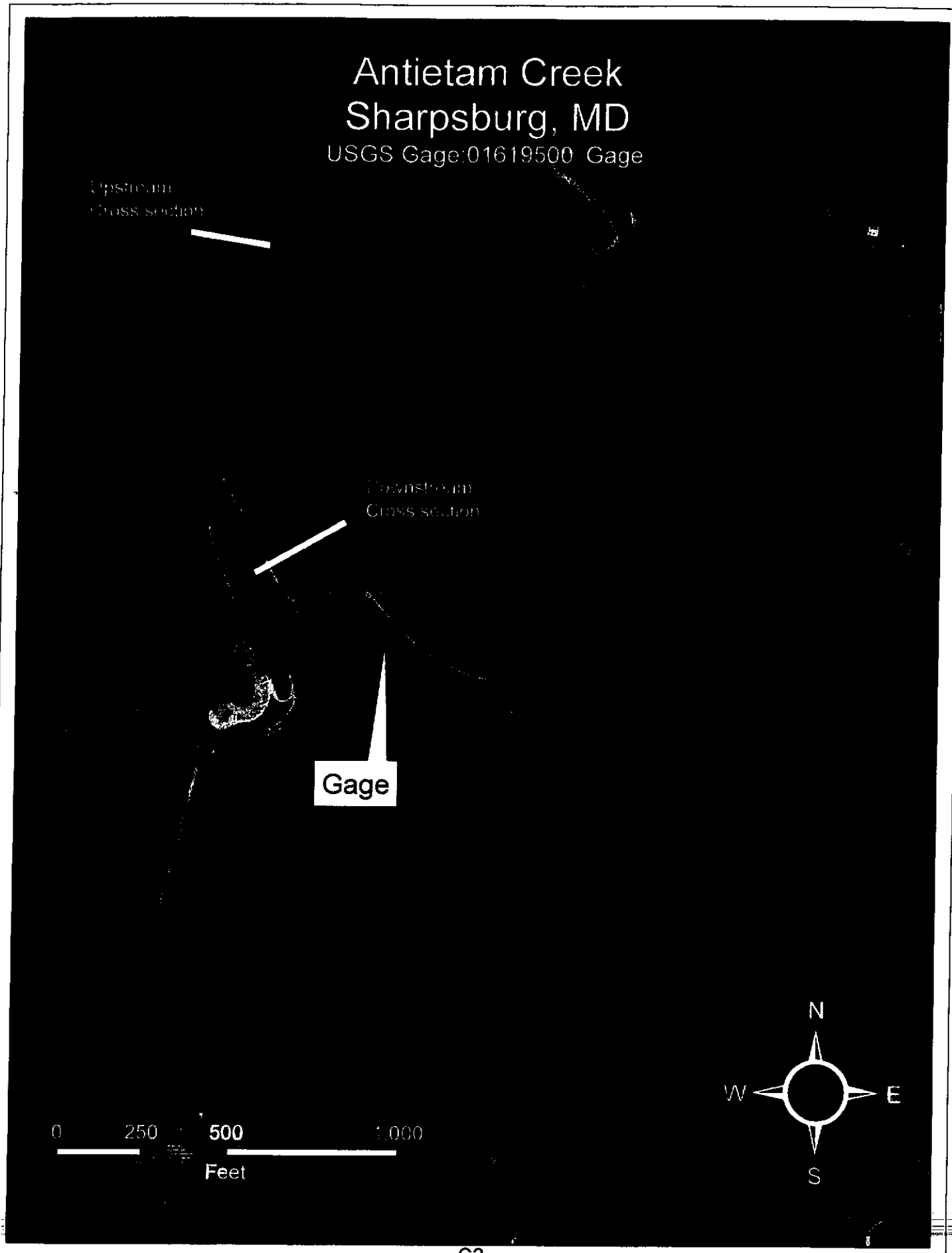
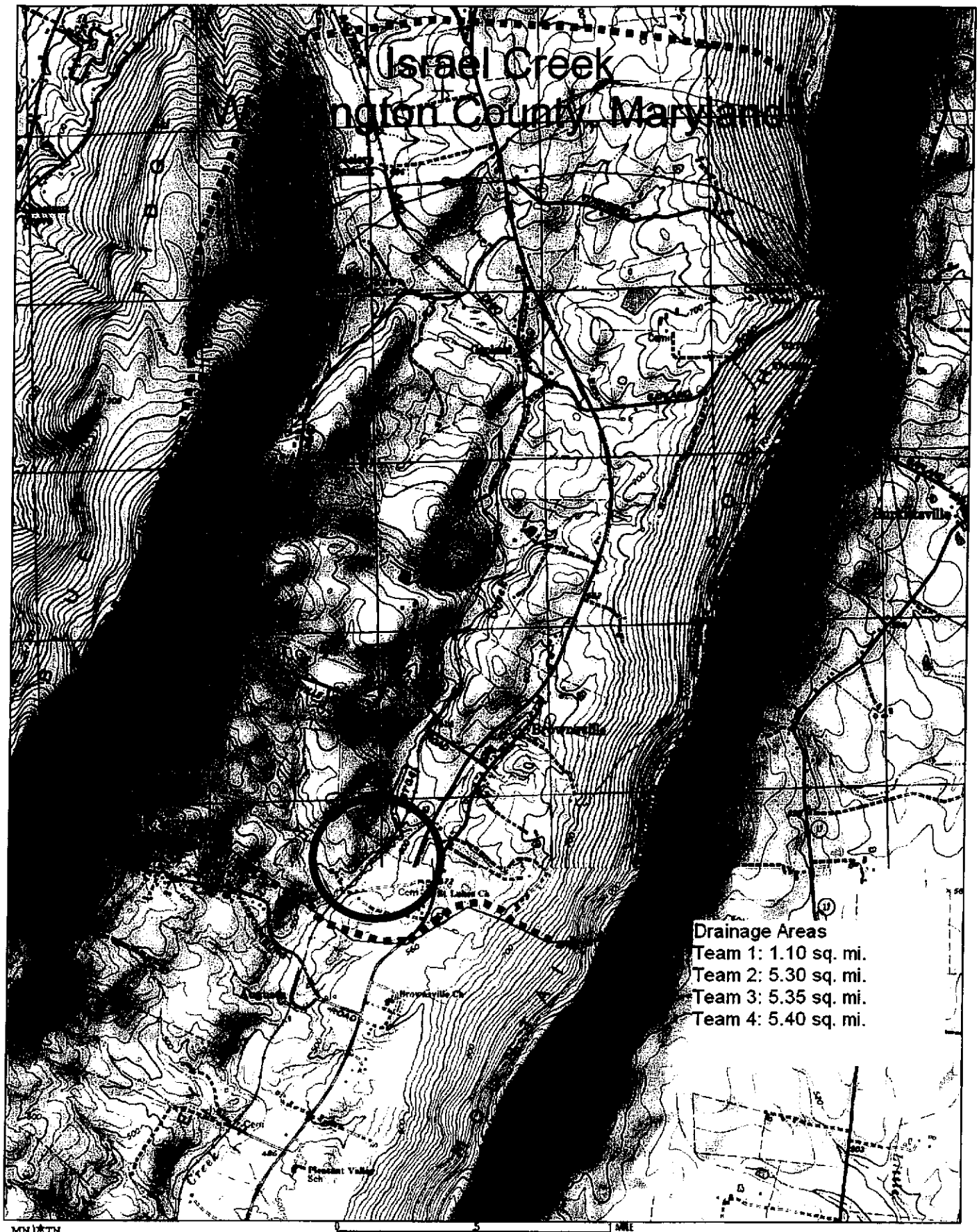
# Section C

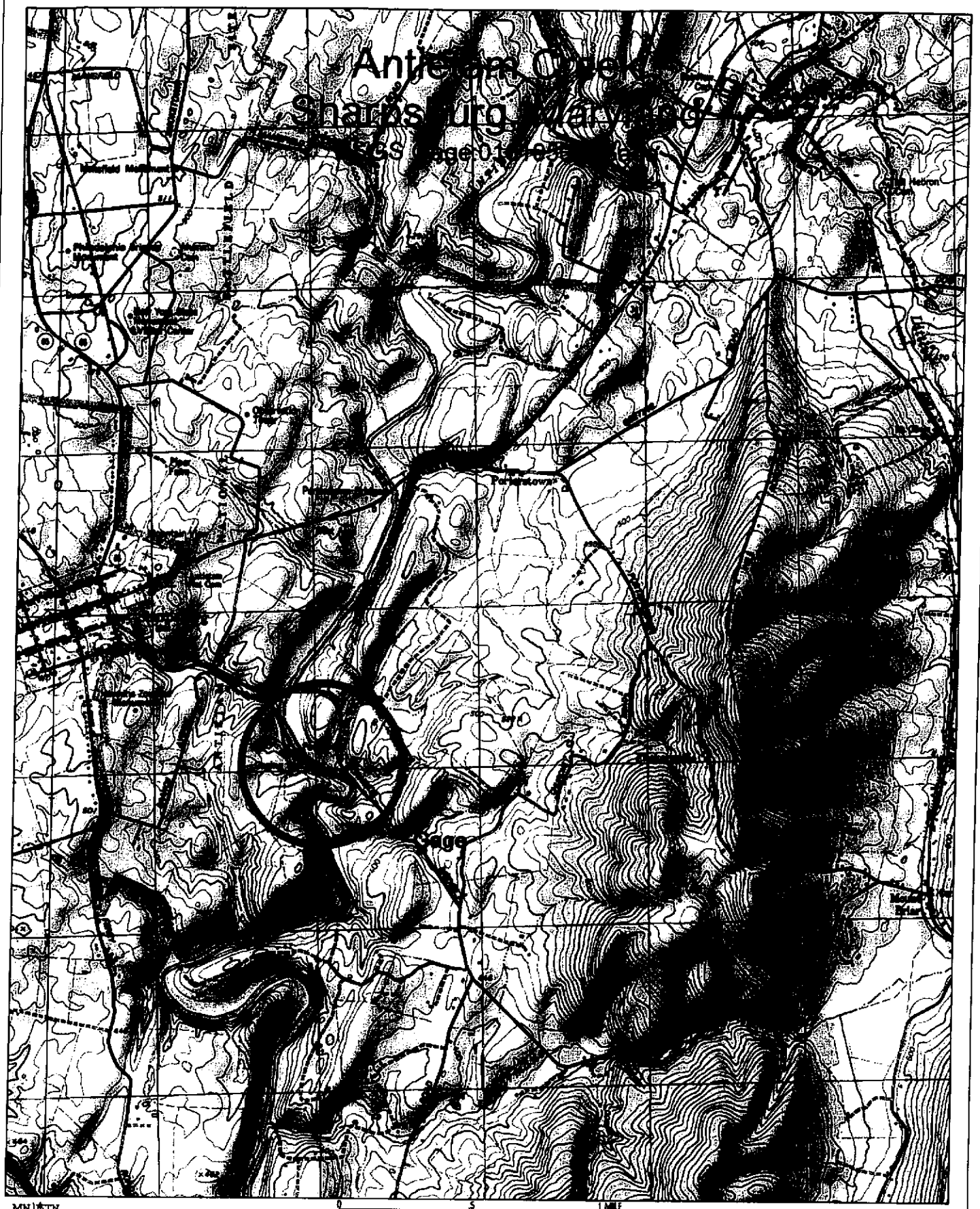
## Maps and Aerial Photos


| | |
|---|---|
| Antietam Creek Aerial Photo | C1 |
| Antietam Creek Enlarged Aerial Photo | C2 |
| Antietam Creek Topographic Map | C3 |
| Israel Creek Aerial Photo | C4 |
| Israel Creek Enlarged Aerial Photo | C5 |
| Israel Creek Topographic Map | C6 |


Antietam Creek
Sharpsburg, MD
USGS Gage:01619500 Gage
Upstream
Cross section
Downstream
Cross section
Gage
N
W
E
S
0
0.125
0.25
0.5
Miles

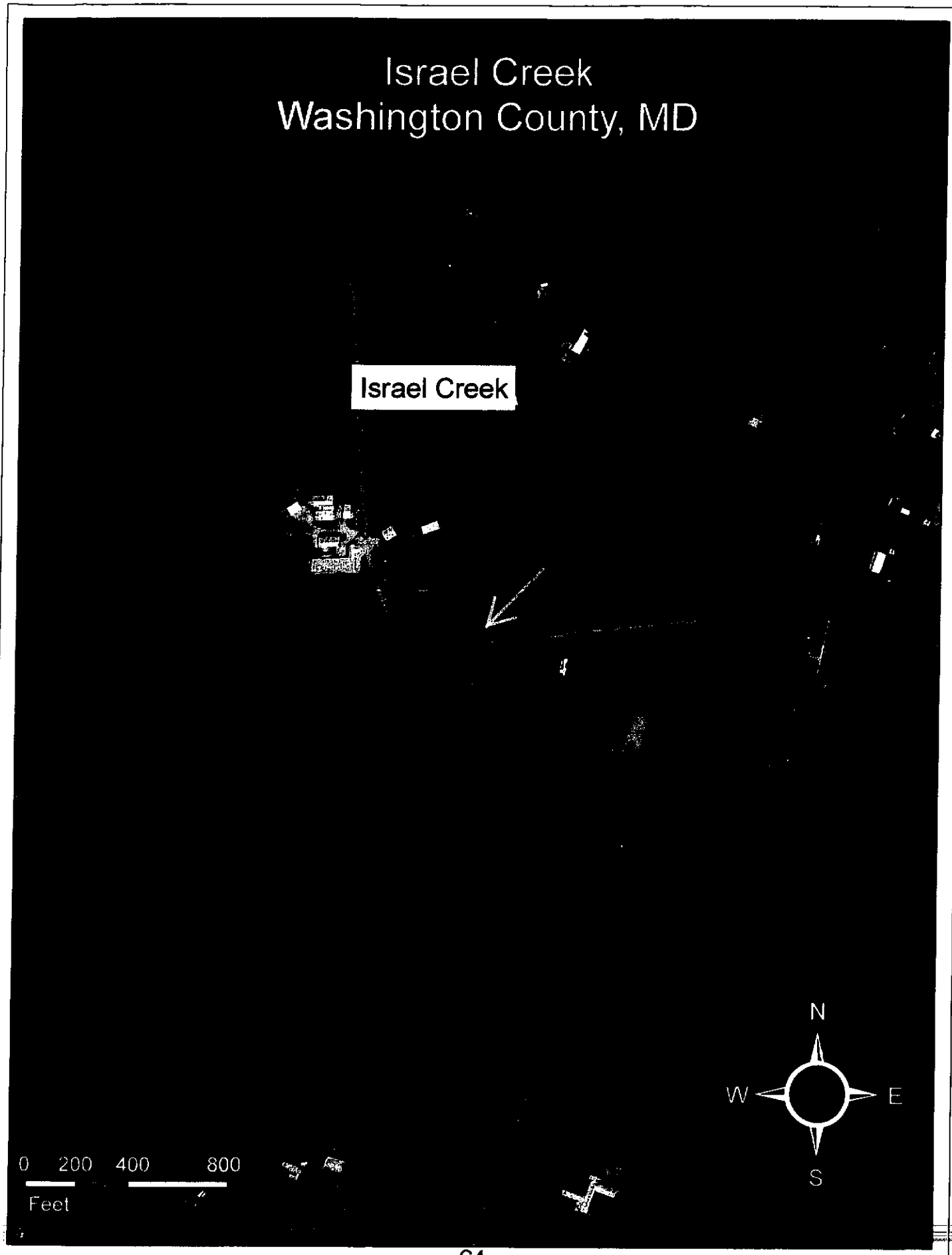

Antietam Creek
Sharpsburg, MD
USGS Gage:01619500 Gage
Upstream
Cross section
Downstream
Cross section
Gage
N
W
E
S
0
250
500
1,000
Feet

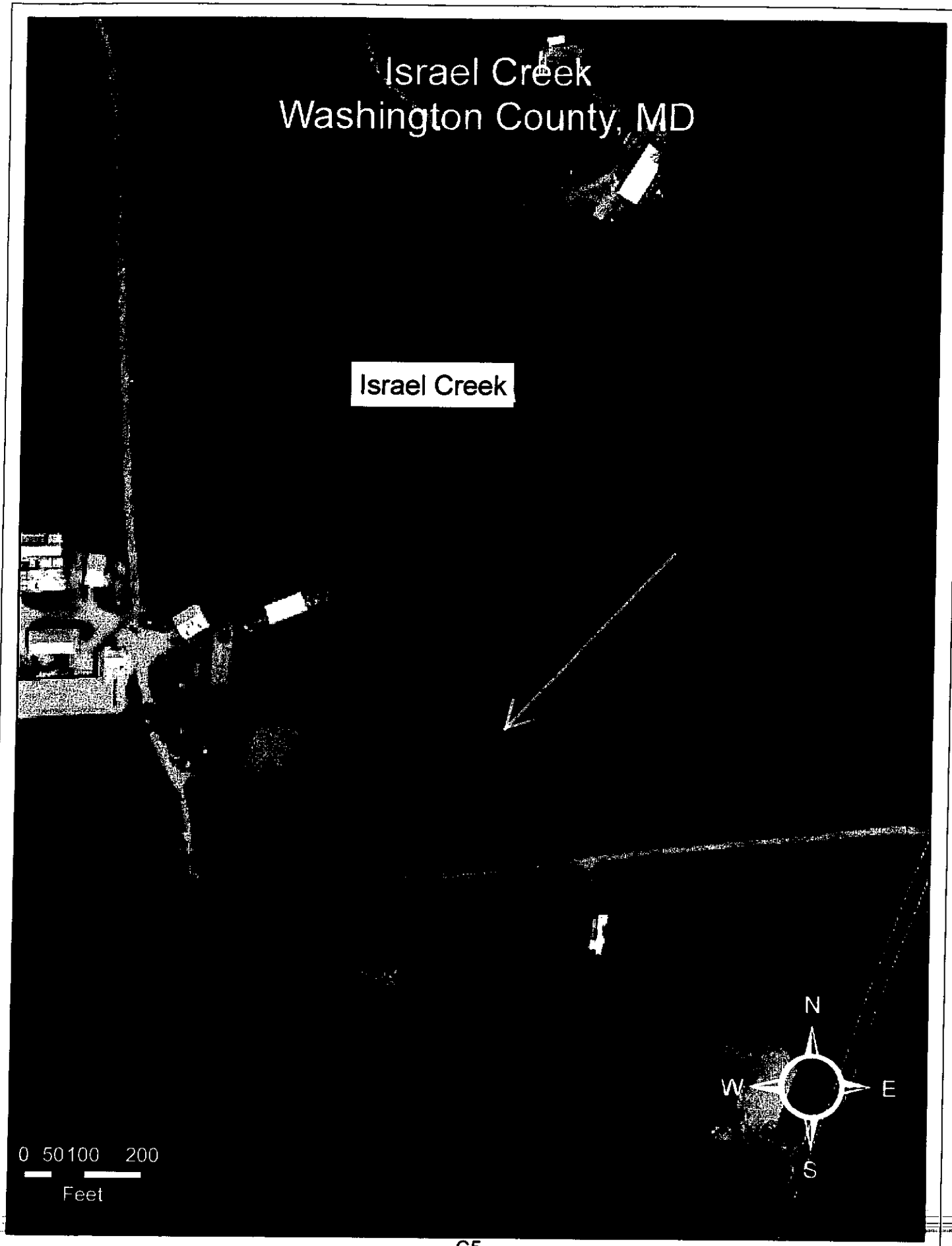

Israel Creek
Drainage Areas
Team 1: 1.10 sq. mi.
Team 2: 5.30 sq. mi.
Team 3: 5.35 sq. mi.
Team 4: 5.40 sq. mi.
MN
11°
TN
MILE
1000 FEET
1000 METERS
Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)




Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)

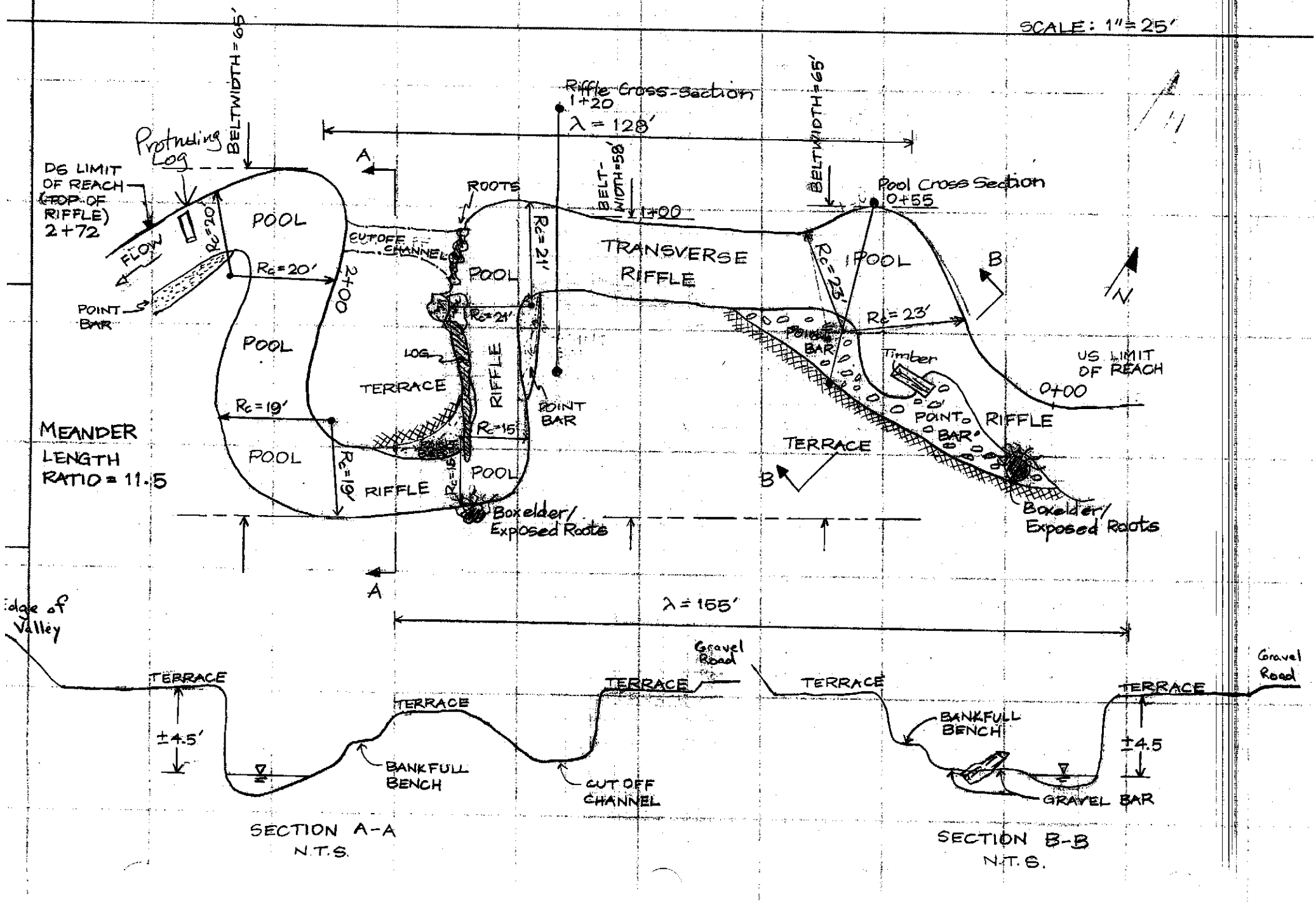
# Israel Creek
# Washington County, MD




Israel Creek
Washington County, MD
Israel Creek
N
W
E
S
0 50100 200
Feet

# Area - Site Location ... Reach Map

ISRAEL CREEK
REACH 3, TEAM 3
APRIL 20, 2010
SCALE: 1" = 25'



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

| | | | |
|---|---|---|---|
| Stream: | Israel Creek | | |
| Basin: | Drainage Area: | acres | 5.3 mi² |
| Location: | | | |
| Twp.&Rge: | Sec.&Qtr.: | | |
| Cross-Section Monuments (Lat./Long.): | | Date: | 4/20/10 |
| Observers: | | Valley Type: | VIII |

| | | |
|---|---|---|
| **Bankfull WIDTH ($W_{bkf}$)**<br>WIDTH of the stream channel at bankfull stage elevation, in a riffle section. | 17.4 | ft |
| **Bankfull DEPTH ($d_{bkf}$)**<br>Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$). | 2.04 | ft |
| **Bankfull X-Section AREA ($A_{bkf}$)**<br>AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section. | 35.43 | ft² |
| **Width/Depth Ratio ($W_{bkf} / d_{bkf}$)**<br>Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section. | 8.53 | ft/ft |
| **Maximum DEPTH ($d_{max}$)**<br>Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section. | 2.52 | ft |
| **WIDTH of Flood-Prone Area ($W_{fpa}$)**<br>Twice maximum DEPTH, or ($2 \times d_{mbkf}$) = the stage/elevation at which flood-prone area WIDTH is determined in a riffle section. | 248 | ft |
| **Entrenchment Ratio (ER)**<br>The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH ($W_{fpa} / W_{bkf}$) (riffle section). | 14.3 | ft/ft |
| **Channel Materials (Particle Size Index ) $D_{50}$**<br>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. | 4.8 | mm |
| **Water Surface SLOPE (S)**<br>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. | .0023 | ft/ft |
| **Channel SINUOSITY (k)**<br>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 ($S_{val} / S$). | 1.55 | |

***Stream Type*** B4 **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: | Sreal Creek | Location: | |
| Date: | 4/20/10 Stream Type: E4 | Valley Type: | VIII |
| Observers: | | HUC: | |

| INPUT VARIABLES | | | OUTPUT VARIABLES | | |
|---|---|---|---|---|---|
| Bankfull Riffle Cross-Sectional AREA | 35.43 | $A_{bkf}$ ($ft^2$) | Bankfull Riffle Mean DEPTH | 2.04 | $d_{bkf}$ (ft) |
| Bankfull Riffle WIDTH | 17.4 | $W_{bkf}$ (ft) | Wetted PERMIMETER ~ (2 * $d_{bkf}$) + $W_{bkf}$ | 21.48 | $W_p$ (ft) |
| $D_{84}$ at Riffle | 11.0 | Dia. (mm) | $D_{84}$ (mm) / 304.8 | 0.04 | $D_{84}$ (ft) |
| Bankfull SLOPE | .0023 | $S_{bkf}$ (ft / ft) | Hydraulic RADIUS $A_{bkf}$ / $W_p$ | 1.65 | R (ft) |
| Gravitational Acceleration | 32.2 | g ($ft / sec^2$) | Relative Roughness R(ft) / $D_{84}$ (ft) | 41.25 | $R / D_{84}$ |
| Drainage Area | 5.3 | DA ($mi^2$) | Shear Velocity $u^* = (gRS)^{1/2}$ | 0.35 | $u^*$ (ft/sec) |

## ESTIMATION METHODS

| | | | | |
|---|---|---|---|---|
| **1. Friction Factor / Relative Roughness** $u = [\,2.83 + 5.66 * Log\,\{\,R / D_{84}\,\}\,]\,u^*$ | 4.19 | ft / sec | 148.45 | cfs |
| **2. Roughness Coefficient: a) Manning's *n* from Friction Factor / Relative Roughness** (Figs. A-27, A-28) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ .027 | 3.7 | ft / sec | 130.93 | cfs |
| **2. Roughness Coefficient: b) Manning's *n* from Stream Type** (Fig. A-29) $u = 1.49 * R^{2/3} * S^{1/2} / n$ $n =$ .039 | 2.56 | ft / sec | 90.65 | 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 $n =$ | 2.77 | ft / sec | 98.20 | 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) Regional Curves** $u = Q / A$ **Return Period for Bankfull Discharge** $Q =$ year | 4.63 | ft / sec | 163.99 | cfs |
| **4. Continuity Equations: b) USGS Gage Data** $u = Q / A$ | — | ft / sec | — | 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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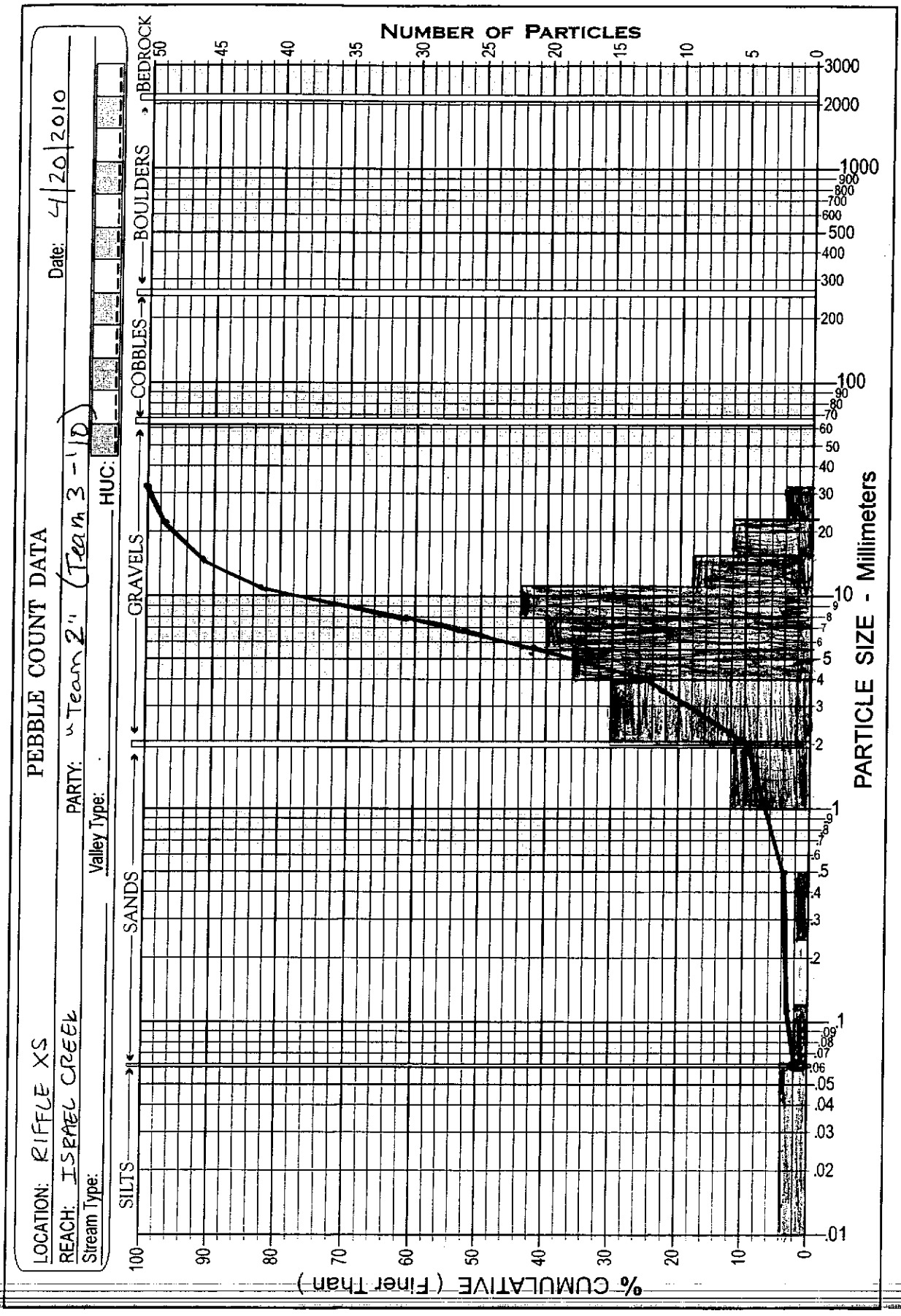


Active Riffle

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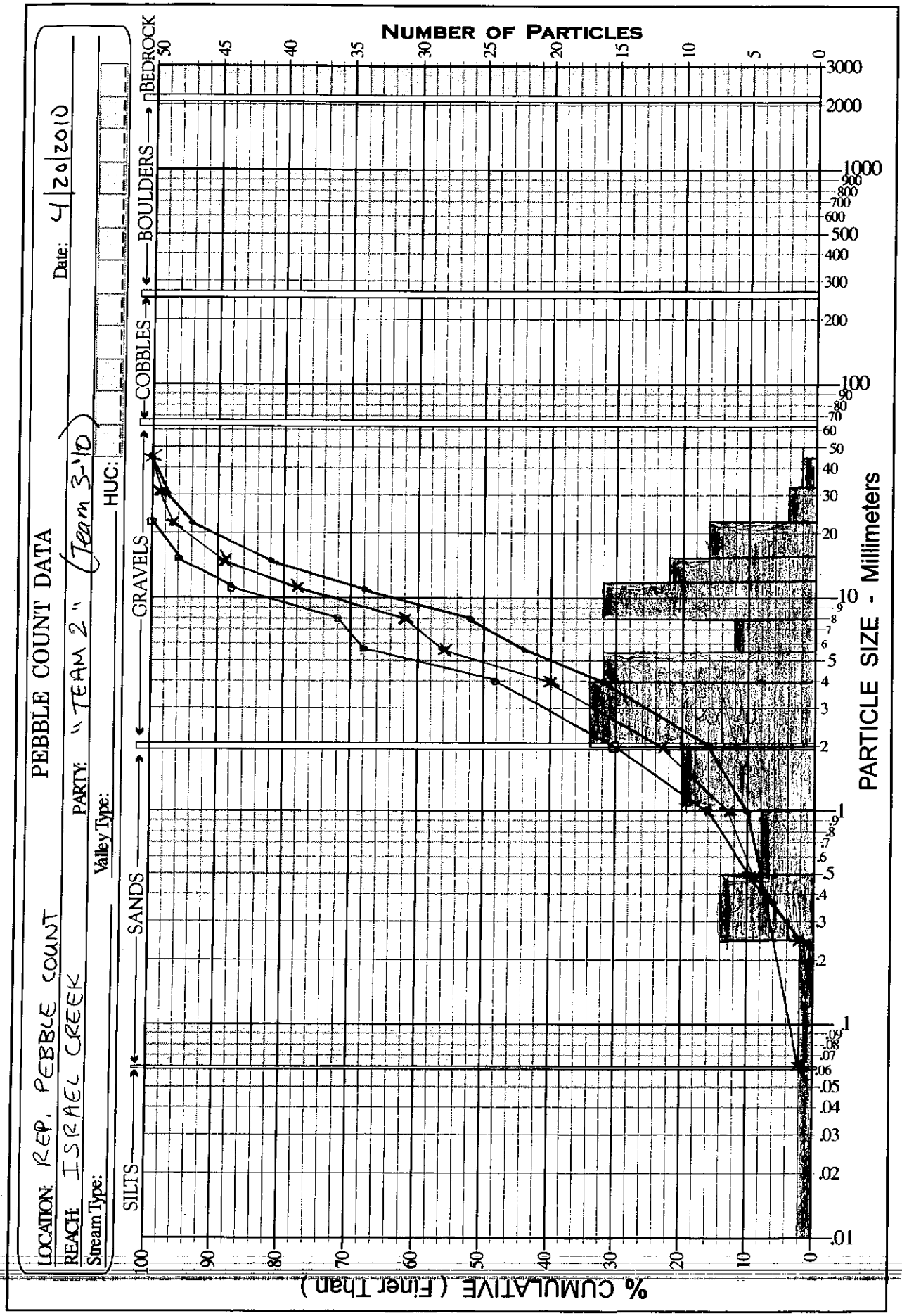


Riffle → red
Pool → blue
Total → black

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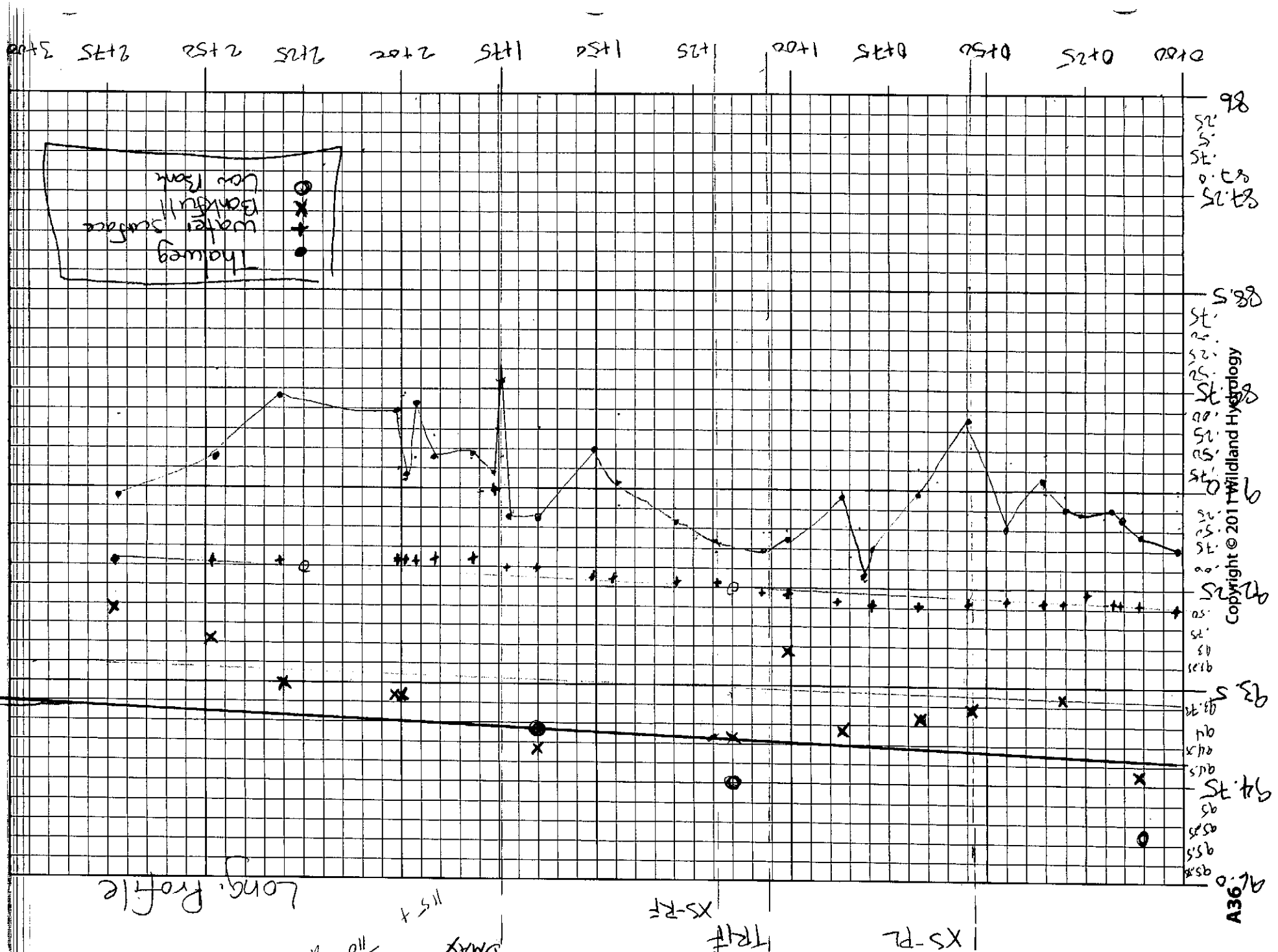


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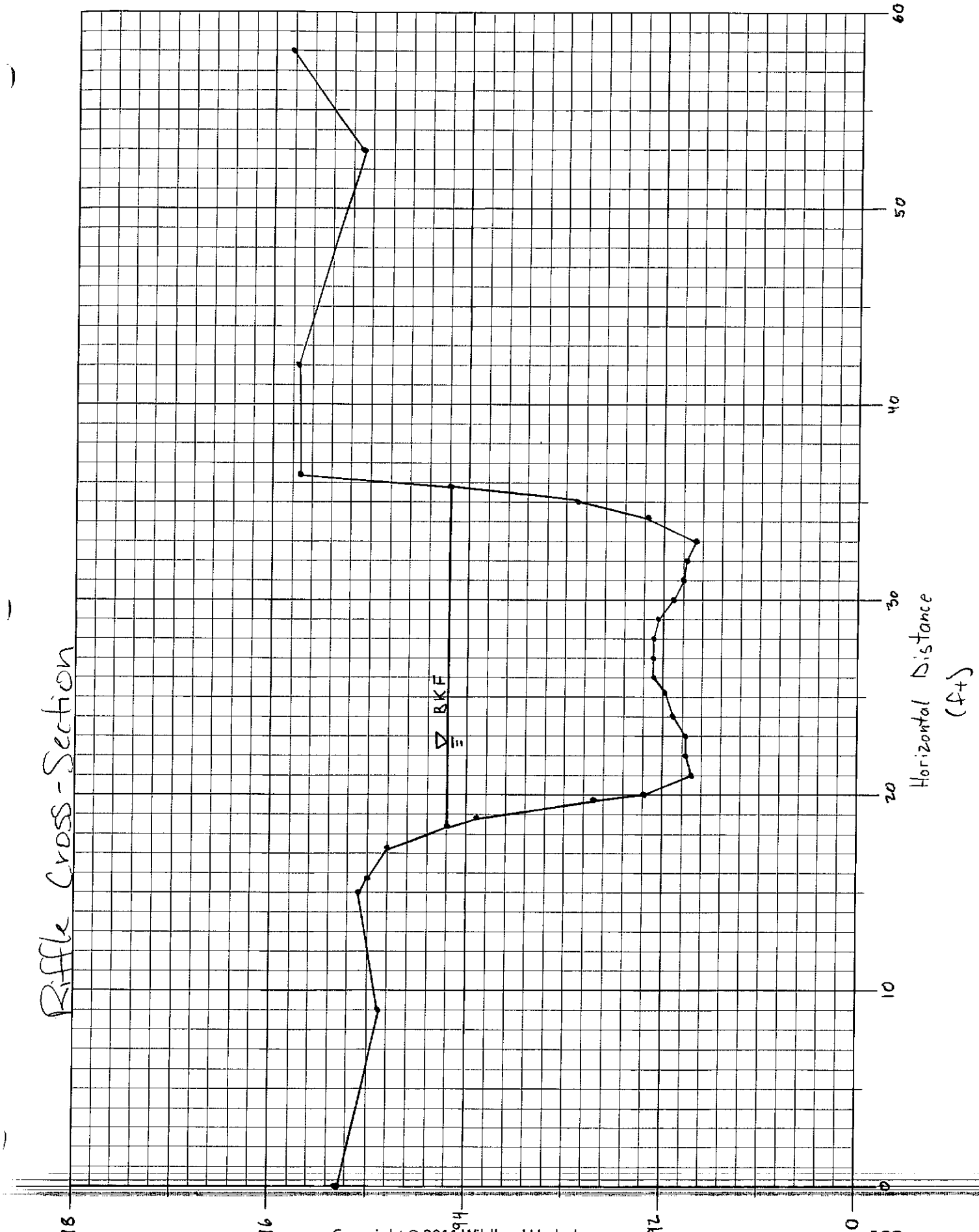


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**Table A-1.** List of morphological relations and variables to estimate.

| | | | |
|---|---|---|---|
| 1. Bankfull Riffle Width ($W_{bkf}$) (ft) | 17.4 | 2. Bankfull Riffle Mean Depth ($d_{bkf}$) | 2.04 |
| 3. Width/Depth Ratio ($W_{bkf}$ / $d_{bkf}$) | 8.53 | 4. Bankfull Riffle Cross-Sectional Area ($A_{bkf}$) | 35.43 |
| 5. Width of Flood-Prone Area ($W_{fpa}$) | 248 | 6. Entrenchment Ratio (ER) ($W_{fpa}$ / $W_{bkf}$) | 14.3 |
| 7. Sinuosity (k) | 1.55 | 8. Average Water Surface Slope (S) | .0023 |
| 9. $D_{50}$ Particle Size for Reach | 4.8 | 10. Bankfull Discharge ($Q_{bkf}$) | 148.45 |
| 11. Valley Type | VIII | 12. Stream Type | E4 |

# Level II Stream Classification

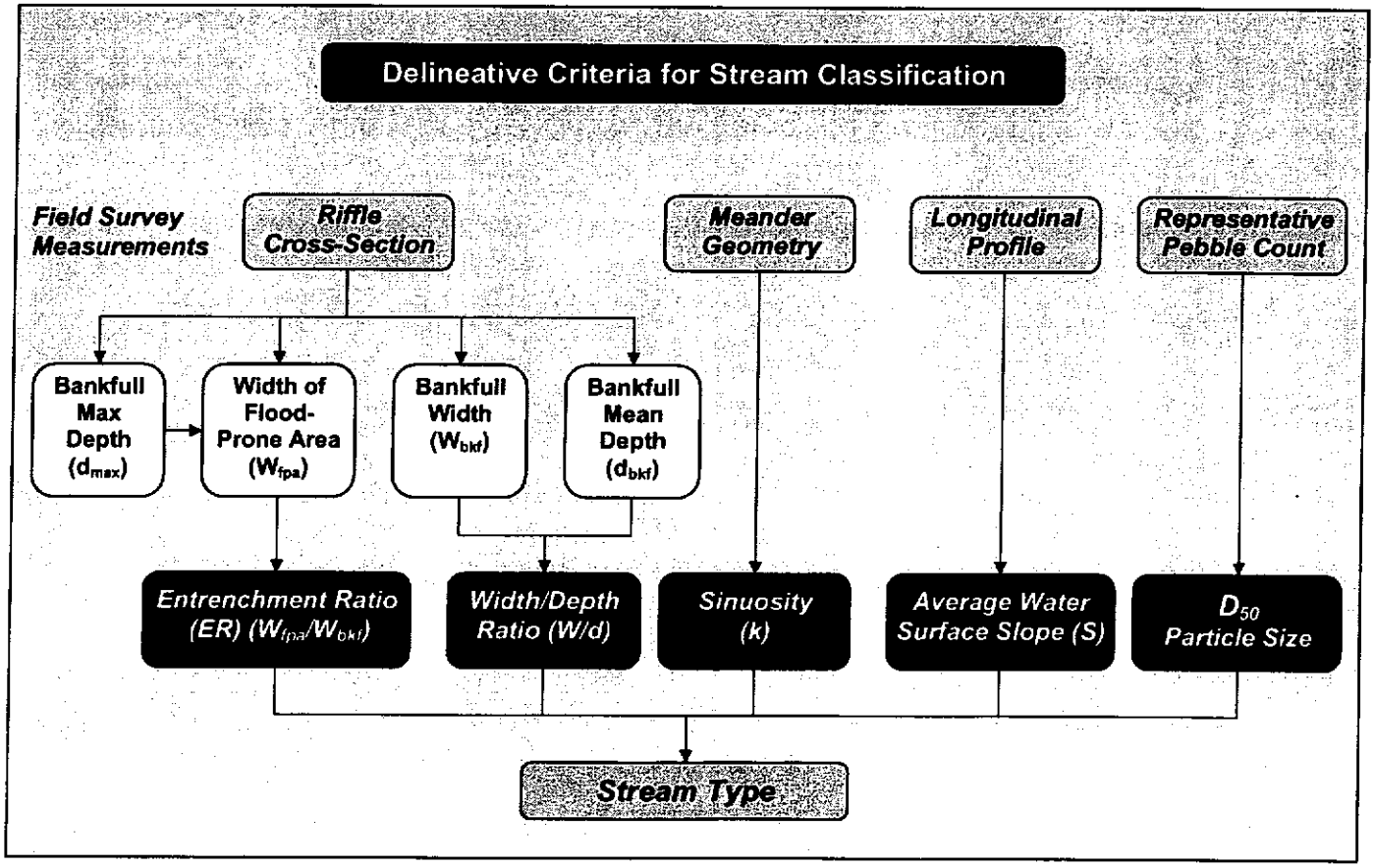


**Figure A-1.** Field survey methods to obtain delineative criteria for stream classification.


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**Worksheet A-3.** Summary of Morphological Variables.

| | | | |
|---|---|---|---|
| Stream: Isreal Creek | | Location: | |
| Team: Team 2 | Date: 4/20/10 | Drainage Area: | 5.3 m2 |

**Riffle Channel Dimensions**

| | | | |
|---|---|---|---|
| 1. Bankfull Width ($W_{bkf}$) (ft) | 17.4 | 2. Bankfull Mean Depth ($d_{bkf}$) (ft) | 2.04 |
| 3. Width/Depth Ratio ($W_{bkf}$ / $d_{bkf}$) | 8.53 | 4. Bankfull Cross-Sectional Area ($A_{bkf}$) ($ft^2$) | 35.43 |
| 5. Bankfull Maximum Depth ($d_{max}$) (ft) | 2.52 | 6. Width of Flood-Prone Area ($W_{fpa}$) (ft) | 248 |
| 7. Entrenchment Ratio (ER) ($W_{fpa}$ / $W_{bkf}$) | 14.3 | | |

**Channel Pattern** / **Dimensionless Ratios**

| | | | | | |
|---|---|---|---|---|---|
| 8. Belt Width ($W_{blt}$) (ft) | Mean | 62.67 | 9. Meander Width Ratio (MWR) ($W_{blt}$ / $W_{bkf}$) | Mean | 3.6 |
| | Min | 58 | | Min | 3.33 |
| | Max | 65 | | Max | 3.74 |
| 10. Stream Meander Length ($L_m$) (ft) | Mean | 177.5 | 11. Meander Length Ratio (MLR) ($L_m$ / $W_{bkf}$) | Mean | 10.20 |
| | Min | 175 | | Min | 10.06 |
| | Max | 180 | | Max | 10.34 |
| 12. Linear Wavelength ($\lambda$) (ft) | Mean | 141.5 | 13. Linear Wavelength to Bankfull Width ($\lambda$ / $W_{bkf}$) | Mean | 8.13 |
| | Min | 128 | | Min | 7.36 |
| | Max | 155 | | Max | 8.91 |
| 14. Radius of Curvature ($R_c$) (ft) | Mean | 19 | 15. Radius of Curvature to Bankfull Width ($R_c$ / $W_{bkf}$) | Mean | 1.09 |
| | Min | 15 | | Min | 0.86 |
| | Max | 23 | | Max | 1.32 |

**Channel Particles**

***Representative Pebble Count***

| | | | | | |
|---|---|---|---|---|---|
| 16. $D_{16}$ (mm) | 1.25 | 17. $D_{35}$ (mm) | 3.4 | 18. $D_{50}$ (mm) | 4.8 |
| 19. $D_{84}$ (mm) | 14.3 | 20. $D_{95}$ (mm) | 20.0 | 21. $D_{100}$ (mm) | 45.0 |

***Active Bed Riffle Pebble Count***

| | | | | | |
|---|---|---|---|---|---|
| 22. $D_{16}$ (mm) | 2.6 | 23. $D_{35}$ (mm) | 4.8 | 24. $D_{50}$ (mm) | 5.5 |
| 25. $D_{84}$ (mm) | 11.0 | 26. $D_{95}$ (mm) | 19.5 | 27. $D_{100}$ (mm) | 32.5 |

**Classification**

| | | | |
|---|---|---|---|
| 28. Sinuosity (k) | 1.55 | 29. Average Water Surface Slope (S) | .0023 |
| 30. Stream Type | E4 | 31. Valley Type | VIII |

**Velocity & Discharge**

| | | | |
|---|---|---|---|
| 32. Friction Factor (u / u*) | 11.9 | 33. Relative Roughness (R / $D_{84}$) | 41.25 |
| 34. Manning's "n" from Friction Factor / Relative Roughness | .027 | 35. Manning's "n" from Stream Type | 0.039 |
| 36. Estimated Mean Velocity ($u_{bkf}$) (ft/sec) | 4.19 | 37. Estimated Bankfull Discharge (cfs) | 148.45 |
| 38. Estimation Method Selected for Velocity & Discharge | Friction factor / Relative Roughness | | |


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Site: ISRAEL CREEK Date: 4/20/10

Location: REP. PEBBLE COUNTHUC:

Party: "Team 3"

| 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 | | | | 1 | 2 | 2 | 0 | 0 | 0 | 1 | 1 | 1 |
| | Very Fine | .062 - .125 | SAND | | | | | | | | | | | | |
| | Fine | .125 - .25 | | | | | | | | | | | | | |
| | Medium | .25 - .50 | | | | | 3 | 6 | 8 | 4 | 8 | 10 | 7 | 7 | 9 |
| | Coarse | .50 - 1.0 | | | | | 1 | 2 | 10 | 3 | 6 | 16 | 4 | 4 | 13 |
| .04 - .08 | Very Coarse | 1.0 - 2 | | | | | 3 | 6 | 16 | 7 | 14 | 30 | 10 | 10 | 23 |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | | | | 9 | 16 | 32 | 9 | 18 | 48 | 17 | 17 | 40 |
| .16 - .22 | Fine | 4 - 5.7 | | | | | 6 | 12 | 44 | 10 | 20 | 68 | 16 | 16 | 56 |
| .22 - .31 | Fine | 5.7 - 8 | | | | | 4 | 8 | 52 | 2 | 4 | 72 | 6 | 6 | 62 |
| .31 - .44 | Medium | 8 - 11.3 | | | | | 8 | 16 | 68 | 8 | 16 | 88 | 16 | 16 | 78 |
| .44 - .63 | Medium | 11.3 - 16 | | | | | 7 | 14 | 82 | 4 | 8 | 96 | 11 | 11 | 89 |
| .63 - .89 | Coarse | 16 - 22.6 | | | | | 6 | 12 | 94 | 2 | 4 | 100 | 9 | 8 | 97 |
| .89 - 1.3 | Coarse | 22.6 - 32 | | | | | 2 | 4 | 98 | | | | 2 | 2 | 99 |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | | | | | 1 | 2 | 100 | | | | 1 | 1 | 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 | | | | | | | | | | | | |
| **Stream Type:** | | | **Valley Type:** | | | TOTAL→ | 50 | | | 50 | | | 100 | | |

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Site: ISRAEL CREEK Date: 4/20/10

Location: RIFFLE XS HUC:

Party: "Team 3"

| Inches | PARTICLE | Millimeters | | Dot Count for RIFFLE 1 | POOL 2 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Reach: | | | Reach: | | | Reach: | | |
| | | | | | | | Date: | | | Date: | | | Date: | | |
| | Silt / Clay | < .062 | S/C | •• | | | 2 | 1.9 | 1.9 | | | | | | |
| | Very Fine | .062 - .125 | SAND | • | | | 1 | 1.0 | 2.9 | | | | | | |
| | Fine | .125 - .25 | | | | | | | | | | | | | |
| | Medium | .25 - .50 | | • | | | 1 | 1.0 | 3.9 | | | | | | |
| | Coarse | .50 - 1.0 | | | | | | | | | | | | | |
| .04 - .08 | Very Coarse | 1.0 - 2 | | ⊡ | | | 6 | 5.8 | 9.7 | | | | | | |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | ⊠ ⁚ | | | 15 | 14.7 | 24.4 | | | | | | |
| .16 - .22 | Fine | 4 - 5.7 | | ⊠ □ | | | 18 | 17.6 | 42 | | | | | | |
| .22 - .31 | Fine | 5.7 - 8 | | ⊠ ⊠ | | | 20 | 19.6 | 61.6 | | | | | | |
| .31 - .44 | Medium | 8 - 11.3 | | ⊠ ⊠ ⁚ | | | 22 | 21.5 | 83.1 | | | | | | |
| .44 - .63 | Medium | 11.3 - 16 | | ⊠ | | | 9 | 8.8 | 91.9 | | | | | | |
| .63 - .89 | Coarse | 16 - 22.6 | | ⁚⊡ | | | 6 | 5.8 | 97.7 | | | | | | |
| .89 - 1.3 | Coarse | 22.6 - 32 | | ⁚ | | | 2 | 1.9 | 100.0 | | | | | | |
| 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 | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | |
| ***Stream Type:*** | | | ***Valley Type:*** | | | TOTAL→ | 102 | | | | | | | | |

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

**SITE:** Israel Creek Date: 4/20/10

Location: Reach 3 Riffle (119.3) (Level 1)

Party / Notes: Oakes, Jarrie, Miranda 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 | 0.00 | | | 4.70 | 95.30 | L bank flood prone |
| 2 | 9.00 | | | 5.10 | 94.90 | |
| 3 | 15.00 | | | 4.87 | 95.13 | Top L bank |
| 4 | 15.75 | | | 5.00 | 95.00 | |
| 5 | 17.25 | | | 5.20 | 94.80 | |
| 6 | 18.40 | | | 5.81 | 94.19 | Bank Full (USE THIS ONE!) |
| 7 | 18.80 | | | 6.10 | 93.90 | |
| 8 | 19.70 | | | 7.24 | 92.76 | Bank Full Low |
| 9 | 20.00 | | | 7.81 | 92.19 | LEW |
| 10 | 21.00 | | | 8.26 | 91.74 | |
| 11 | 22.00 | | | 8.22 | 91.78 | |
| 12 | 23.00 | | | 8.22 | 91.78 | |
| 13 | 24.00 | | | 8.09 | 91.91 | |
| 14 | 25.20 | | | 8.02 | 91.98 | |
| 15 | 26.00 | | | 7.89 | 92.11 | |
| 16 | 27.00 | | | 7.87 | 92.13 | |
| 17 | 28.00 | | | 7.90 | 92.10 | |
| 18 | 29.00 | | | 7.96 | 92.04 | |
| 19 | 30.00 | | | 8.07 | 91.93 | |
| 20 | 31.00 | | | 8.20 | 91.80 | |
| 21 | 32.00 | | | 8.22 | 91.78 | |
| 22 | 33.00 | | | 8.33 | 91.67 | TW |
| 23 | 34.20 | | | 7.82 | 92.18 | REW |
| 24 | 35.00 | | | 7.10 | 92.90 | |
| 25 | 35.80 | | | 5.81 | 94.19 | |
| 26 | 36.30 | | | 4.20 | 95.74 | Top R bank |
| 27 | 42.00 | | | 4.25 | 95.75 | |
| 28 | 53.00 | | | 4.90 | 95.10 | |

Width of Flood Prone Area (Wfpa) = 24'



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**SURVEY DATA** ⟹ **LONGITUDINAL PROFILE 1**

**SITE:** [illegible] Team 3 Date: [illegible]

Location: [illegible]

Party / Notes: Sheet 1 of 2 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 | | | 100 | | | | | | | | | |
| 2 | [illegible] | | | 8.26 | 91.74 | 7.50 | 92.5 | | | | | T.F |
| 3 | [illegible] | | | [illegible] | 91.72 | [illegible] | 92.4 | 5.35* | 94.65 | 4.56 | 95.71 | [illegible] |
| 4 | 15.5 | | | [illegible] | 91.34 | [illegible] | 92.38 | | | | | |
| 5 | 17.5 | | | 8.75 | 91.25 | 7.56 | 92.44 | | | | | |
| 6 | 24.7 | | | 8.72 | 91.23 | 7.64 | 92.36 | | | | | |
| 7 | 32 | | | 8.75 | 91.25 | 7.60 | 92.4 | 5.51 | 94.49 | | | |
| 8 | 36 | | | 9.09 | 90.91 | 7.62 | 92.38 | | | | | |
| 9 | [illegible] | | | 8.51 | [illegible] | [illegible] | 92.[illegible] | | | | | |
| 10 | 54 | | | 8.90 | [illegible] | 7.65 | 92.35 | 6.22 | 93.78 | | | XS-DL |
| 11 | [illegible] | | | [illegible] | [illegible] | 7.55 | 92.47 | 6.10 | 93.90 | | | |
| 12 | [illegible] | | | [illegible] | 91.74 | 7.56 | 92.44 | | | | | |
| 13 | 81 | | | 7.87 | [illegible] | | | | | | | |
| 14 | [illegible] | | | 8.91 | 91.09 | [illegible] | 92.4 | 5.84 | 94.16 | | | |
| 15 | 101 | | | [illegible] | 91.65 | 7.71 | [illegible] | 6.34 | 93.16 | | | |
| 16 | 103 | | | 8.22 | 91.78 | 7.70 | 92.[illegible] | | | | | T.W |
| 17 | 119.7 | | | 9.[illegible] | [illegible] | 7.81 | 92.19 | 5.[illegible] | 94.19 | 5.22 | 94.78 | XS-RS |
| 18 | 129 | | | 9.40 | [illegible] | 7.8[illegible] | 9[illegible] | | | | | |
| 19 | 139 | | | | [illegible] | | | | | | | |
| 20 | 146 | | | 9.10 | 90.9 | 7.[illegible] | 92.13 | | | | | |
| 21 | 157 | | | [illegible] | [illegible] | 7.[illegible] | 9[illegible] | | | | | |
| 22 | 164 | | | [illegible] | 91.41 | [illegible] | [illegible] | 5.[illegible] | 94.13 | 5.53 | [illegible] | |
| 23 | 172 | | | 8.81 | [illegible] | [illegible] | [illegible] | | | | | |
| 24 | 174 | | | [illegible].44 | 39.56 | 8.64 | 91.[illegible] | | | | | DMAX |
| 25 | 176 | | | [illegible] | [illegible] | 8.05 | 91.95 | (6.66) 5.90 | (93.34) 94.01 | | | |
| 26 | 184 | | | 9.44 | [illegible] | [illegible] | 91.93 | [illegible] | 93.78 | | | |
| 27 | 193 | | | 9.36 | 90.64 | [illegible] | [illegible] | [illegible] | [illegible] | | | |


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**SURVEY DATA → LONGITUDINAL PROFILE 1**

**SITE:** ISRAEL CREEK Team 3 Date: 04/20/10

Location: 0+00 THRU 2+70

Party / Notes: Sheet 1 of 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 | |
| | STATION | BS | HI | FS | Elev. | FS | Elev. | FS | Elev. | FS | Elev. | | |
| | ft | ft | ft | ft | ft | ft | ft | ft | ft | ft | ft | | |
| 1 | | | 100 | | | | | | | | | | |
| 2 | 0+02 | | | 8.26 | 91.74 | 7.50 | 92.5 | | | | | TRIF | |
| 3 | 0+11 | | | 8.28 | 91.72 | 7.60 | 92.4 | 5.35* | 94.65 | 4.56 | 95.44 | BRIF | 2.25 |
| 4 | 15.5 | | | 8.66 | 91.34 | 7.61 | 92.39 | | | | | | |
| 5 | 17.6 | | | 8.75 | 91.25 | 7.56 | 92.44 | | | | | | |
| 6 | 24.7 | | | 8.72 | 91.28 | 7.64 | 92.36 | | | | | | |
| 7 | 32 | | | 8.75 | 91.25 | 7.60 | 92.4 | (6.31) | 93.69 | | | | 1.29 |
| 8 | 36 | | | 9.09 | 90.91 | 7.62 | 92.38 | | | | | | |
| 9 | 45 | | | 8.51 | 91.49 | 7.65 | 92.35 | | | | | | POOL TOB-TO |
| 10 | 54 | | | 9.90 | 90.10 | 7.65 | 92.35 | (6.22) | 93.78 | | | XS-PL | 1.43 |
| 11 | 68 | | | 8.95 | 91.05 | 7.53 | 92.47 | (6.10) | 93.90 | | | | 1.43 |
| 12 | 79 | | | 8.26 | 91.74 | 7.56 | 92.44 | | | | | | |
| 13 | 81 | | | 7.87 | 92.13 | | | | | | | | |
| 14 | 88 | | | 8.91 | 91.09 | 7.60 | 92.4 | 5.84 | 94.16 | | | | 1.76 |
| 15 | 101 | | | 8.35 | 91.65 | 7.71 | 92.29 | (6.88) | 93.12 | | | | 0.83 |
| 16 | 108 | | | 8.22 | 91.78 | 7.70 | 92.3 | | | | | TRIF | |
| 17 | 119.7 | | | 8.33 | 91.67 | 7.81 | 92.19 | 5.81 | 94.19 | 5.22 | 94.78 | XS-RF | 58 LB-15' RB-22' |
| 18 | 129 | | | 8.42 | 91.48 | 7.82 | 92.18 | | | | | | |
| * 19 | 138 | CUT | OFF | CHANNEL | | | | | | | | | |
| 20 | 146 | | | 9.10 | 90.9 | 7.82 | 92.18 | | | | | | |
| 21 | 151 | | | 9.50 | 90.5 | 7.89 | 92.11 | | | | | | |
| 22 | 164 | | | 8.59 | 91.41 | 7.98 | 92.02 | 5.87 | 94.13 | 5.89 | 94.11 | | 2.11 |
| 23 | 172 | | | 8.61 | 91.39 | 8.00 | 92 | | | | | | |
| 24 | 174 | | | 10.44 | 89.56 | 8.94 | 91.06 | | | | | DMAX | |
| 25 | 176 | | | 9.23 | 90.77 | 8.05 | 91.95 | (6.66) 5.99 | (93.34) 94.01 | | | | 2.06 |
| 26 | 183 | | | 9.44 | 90.56 | 8.07 | 91.93 | 6.72 | 93.78 | | | | 1.95 |
| 27 | 193 | | | 9.36 | 90.64 | 8.08 | 91.92 | 6.34 | 93.66 | | | | 1.74 |

WS-BF


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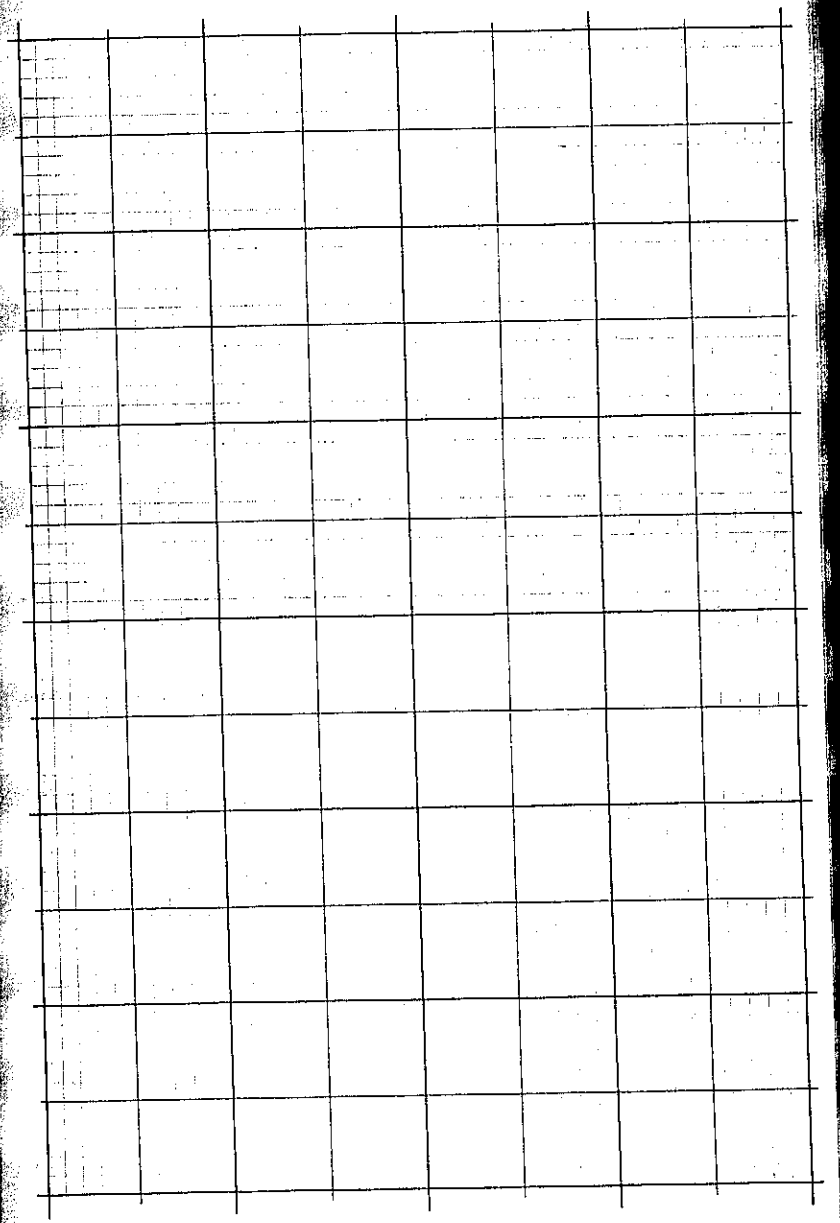
| | STA | Depth | Width | Avg Dep. | Inc Area | |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | 18.4 | 0 | — | — | — | |
| 3 | 18.8 | .29 | 0.4 | 0.15 | .06 | |
| 4 | 19.7 | 1.43 | 0.9 | 0.86 | .77 | |
| 5 | 20 | 2.0 | 0.3 | 1.72 | .52 | |
| 6 | 21 | 2.45 | 1.0 | 2.23 | 2.23 | |
| 7 | 22 | 2.41 | 1.0 | 2.43 | 2.43 | |
| 8 | 23 | 2.41 | 1.0 | 2.41 | 2.41 | |
| 9 | 24 | 2.28 | 1.0 | 2.35 | 2.35 | |
| 10 | 25.2 | 2.21 | 1.2 | 2.25 | 2.7 | |
| 11 | 26 | 2.08 | 0.8 | 2.15 | 1.72 | |
| 12 | 27 | 2.06 | 1.0 | 2.07 | 2.07 | |
| 13 | 28 | 2.09 | 1.0 | 2.08 | 2.08 | |
| 14 | 29 | 2.15 | 1.0 | 2.12 | 2.12 | |
| 15 | 30 | 2.26 | 1.0 | 2.21 | 2.21 | |
| 16 | 31 | 2.39 | 1.0 | 2.33 | 2.33 | |
| 17 | 32 | 2.41 | 1.0 | 2.40 | 2.40 | |
| 18 | 33 | 2.52 | 1.0 | 2.47 | 2.47 | |
| 19 | 34.2 | 2.01 | 1.2 | 2.27 | 2.72 | |
| 20 | 35 | 1.29 | 0.8 | 1.65 | 1.32 | |
| 21 | 35.8 | 0 | 0.8 | 0.65 | .52 | |
| 22 | | | | | | |
| 23 | | | Total | Area = | 35.43 | $ft^2$ |
| 24 | | | | | | |
| 25 | | | | | | |