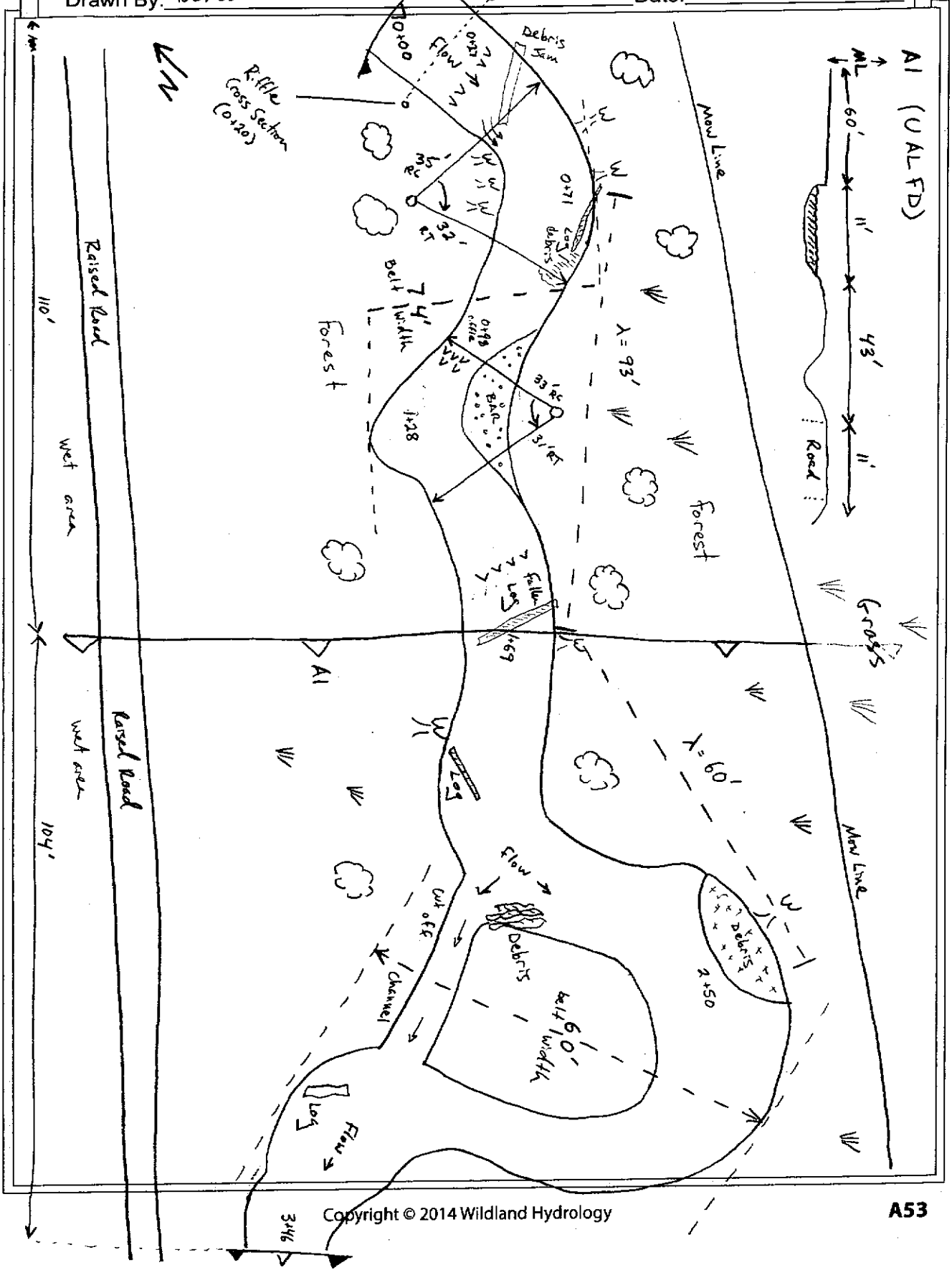
AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Israel Creek, MD Site/Reach: 3 (Group 2)

Drawn By: BB/BD Date: 4/8/14



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SURVEY DATA ⟹ **CROSS - SECTION 1**

SITE: Date:

Location:

Party / Notes: Jennifer Pritchett, Scott Ketterman, Ralston HUC:

Long pro Station 20.5

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	6.66	106.66		100	Benchmark
2	0			5.47	101.19	Terrace left bank
3	5			5.37	101.29	Terrace left bank
4	9.4			5.52	101.14	Edge of cut bank (top)
5	10			7.55	99.11	Bottom of cut bank (under cut bank)
6	10.9			8.00	98.66	LB waters edge
7	11.8			8.39	98.27	slope change, bench in channel
8	12.5			8.37	98.29	slope change in channel
9	13			8.95	97.71	slope change in channel
10	14.5			8.83	97.83	on left edge of bar in channel
11	16			8.85	97.81	on top of bar
12	17.2			9.00	97.66	on right edge of bar in channel
13	18.6			9.28	97.38	slope change
14	20.0			9.38	97.28	slope change
15	21.0			9.43	97.23	Thalweg
16	22.3			9.42	97.24	Toe of right bank
17	23.0			8.51	98.15	Bench on right bank
18	23.4			8.01	98.65	Right bank waters edge
19	24.0			7.12	99.54	Bench on bank
20	25.4			6.62	100.04	Bank full Right bank
21	28.0			6.22	100.44	Terrace
22	29.2			6.46	100.20	Depression/Levee on terrace
23	34.0			5.90	100.76	Terrace end of tape
24						
25						
26						
27						
28						

deepest part cut bank is station 10

0.7ft ← elevation at .7ft = 1ft ↑ = 6.55ft

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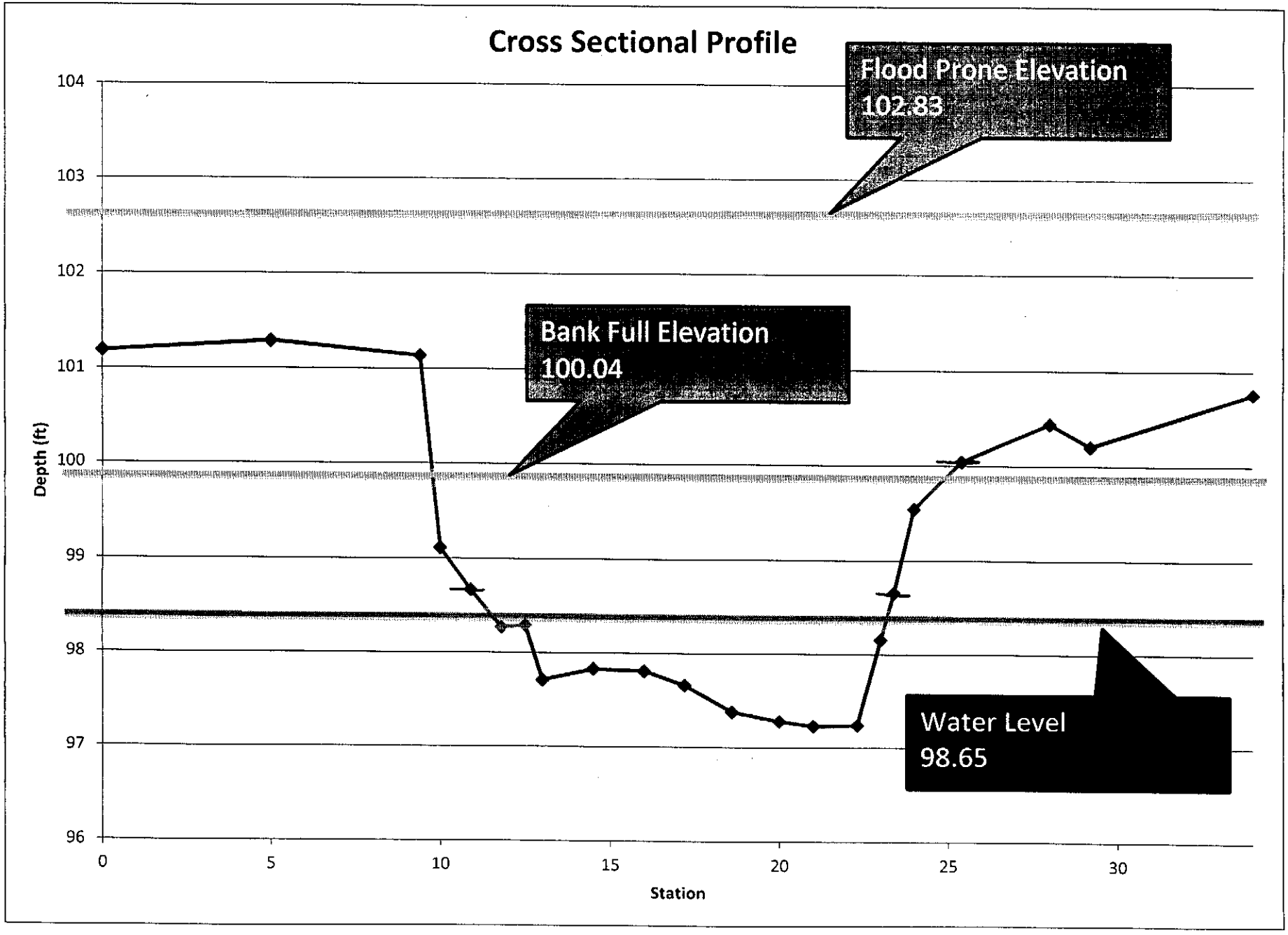
Cross Sectional Profile
Flood Prone Elevation
102.83
Bank Full Elevation
100.04
Water Level
98.65
Depth (ft)
104
103
102
101
100
99
98
97
96
0
5
10
15
20
25
30
Station

SURVEY DATA ⟶ **LONGITUDINAL PROFILE 1**

SITE: ISRAEL CREEK Date: 4-8-14

Location:

Party / Notes: Team 2 HUC:

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instru-ment 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	BM	6.67	106.67										
2	0+13			-9.68	96.99	-7.96	98.71	-6.61	100.06	-6.61	100.06	Top Glide	1.35
3	0+19			-9.50	97.17	-7.91	98.76	-6.65	100.02				1.26
4	0+23			[illegible]		-7.99	98.68					BKF No Good	
5	0+27			-9.10	97.57	-7.98	98.67					Top Riffle	
6	0+41			-9.15	97.52	-8.03	98.64					Top Run	
7	0+44											Debris Jam	
8	0+48			-11.57	95.10	-8.47	98.20			-5.62	101.05	Top Pool	
9	0+83			-11.07	95.6	-8.45	98.22			-5.56	101.11	Top [illegible]	
10	0+98			-9.31	97.36							Top Riff	
11	1+02			-9.67	97.00	-8.57	98.10			-5.72	100.95	Top Run	
12	1+06					-8.56	98.11	-7.22	99.45				1.34
13	1+17			-10.62	96.05	-8.56	98.11					Top Pool	
14	1+56			-10.24	96.43	-8.54	98.13					Top Glide	
15	1+76					-8.81	97.86	-7.38	99.29	-6.92	99.75	Top Riff	1.43
16	1+80			-10.15	96.52	-8.81	97.86						
17	2+03					-8.87	97.80						
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													

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SURVEY DATA ⟶ **LONGITUDINAL PROFILE 1**

SITE: Date:

Location:

Party / Notes: 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	BM	+6.~~72~~ 67	106.67									
2	0+27			-9.10	97.57	-7.98	99.20					top of Riffle
3	0+23					-7.99	99.21	~~-6.85~~				BRF No Good
4	0+13			-9.68	97.52	-7.96	99.24	Good -6.61		-6.61		Top of Glide
5	0+19			-9.50	97.70	-7.91	99.29	Good -6.65				D 1-26
6	0+41			-9.15	98.05	-8.03	99.17					Top Run
7	0+44											Debris Jam
8	0+48			-11.57	95.63	-8.47	98.73			-5.62		Top pool
9	0+83			-11.07	96.13	-8.45	98.75			-5.56		top Glide
10	0+98			-9.31	97.89							top Rif
11	1+02			-9.67		8.57				-5.72		top Run
12	1+06					-8.56		-7.22 ~~-6.65~~				
13	1+17			-10.62		-8.56						Top pool
14	1+56			-10.24		-8.59						top Glide
15	1+76					-8.81		Good -7.38		-6.92		Top Rif
16	1+80			-10.15		-8.81						
17	2+03					-9.87						
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												

-5.72

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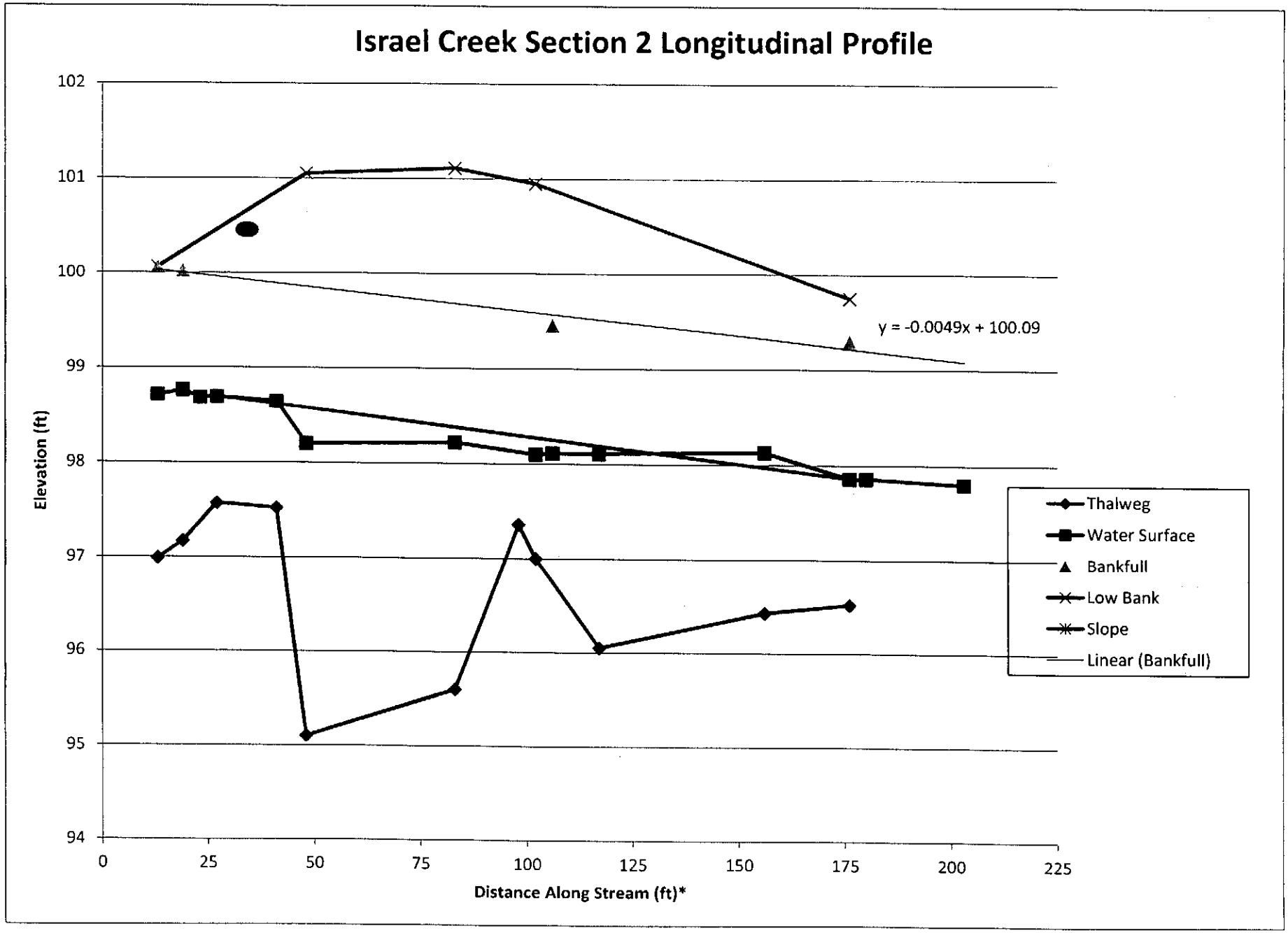
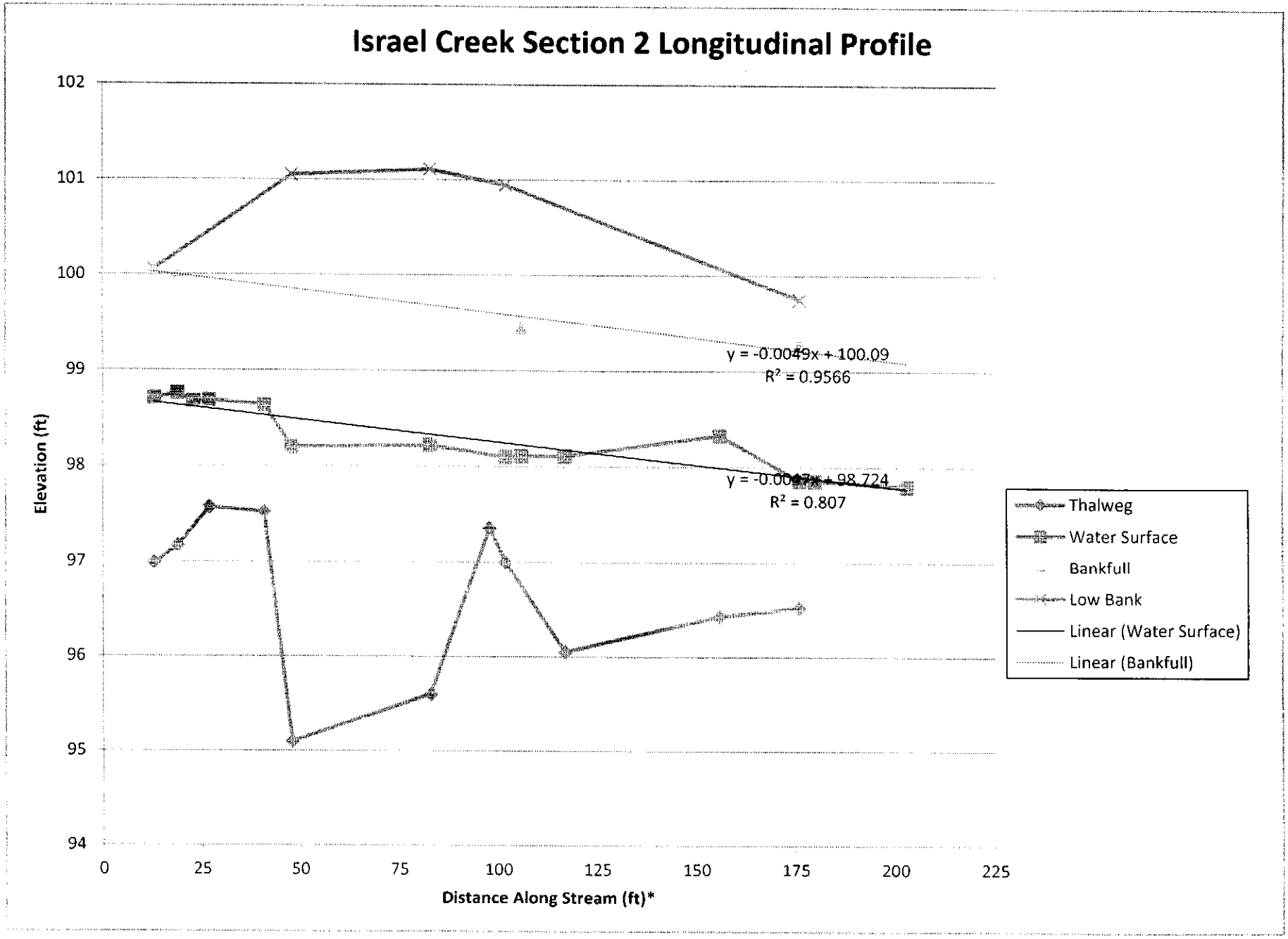

Israel Creek Section 2 Longitudinal Profile
Elevation (ft)
102
101
100
99
98
97
96
95
94
0
25
50
75
100
125
150
175
200
225
Distance Along Stream (ft)*
y = -0.0049x + 100.09
Thalweg
Water Surface
Bankfull
Low Bank
Slope
Linear (Bankfull)


Israel Creek Section 2 Longitudinal Profile
Elevation (ft)
102
101
100
99
98
97
96
95
94
0
25
50
75
100
125
150
175
200
225
Distance Along Stream (ft)*
y = -0.0049x + 100.09
R² = 0.9566
y = -0.0047x + 98.724
R² = 0.807
Thalweg
Water Surface
Bankfull
Low Bank
Linear (Water Surface)
Linear (Bankfull)

Site: ISRAEL CREEK Date: 4/8/14

Location: HUC:

Party: TEAM 2

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:			Reach:			Reach:		
							Date:			Date:			Date:		
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25		•			2	2	2						
	Medium	.25 - .50		••			4	4	6						
	Coarse	.50 - 1.0		••			4	4	10						
.04 - .08	Very Coarse	1.0 - 2		••			4	4	17						
.08 - .16	Very Fine	2 - 4	GRAVEL	⊠			10	10	27						
.16 - .22	Fine	4 - 5.7		⊠ : .			13	13	40						
.22 - .31	Fine	5.7 - 8		⊠ :			12	12	52						
.31 - .44	Medium	8 - 11.3		⊠⊠ •			21	21	73						
.44 - .63	Medium	11.3 - 16		⊠ : .			8	8	86						
.63 - .89	Coarse	16 - 22.6		⊠			9	9	95						
.89 - 1.3	Coarse	22.6 - 32		I :			5	5	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													
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→	100								

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RIFFLE X-SEC

LOCATION: ISRAEL CREEK

PEBBLE COUNT DATA

Date: 4/8/14

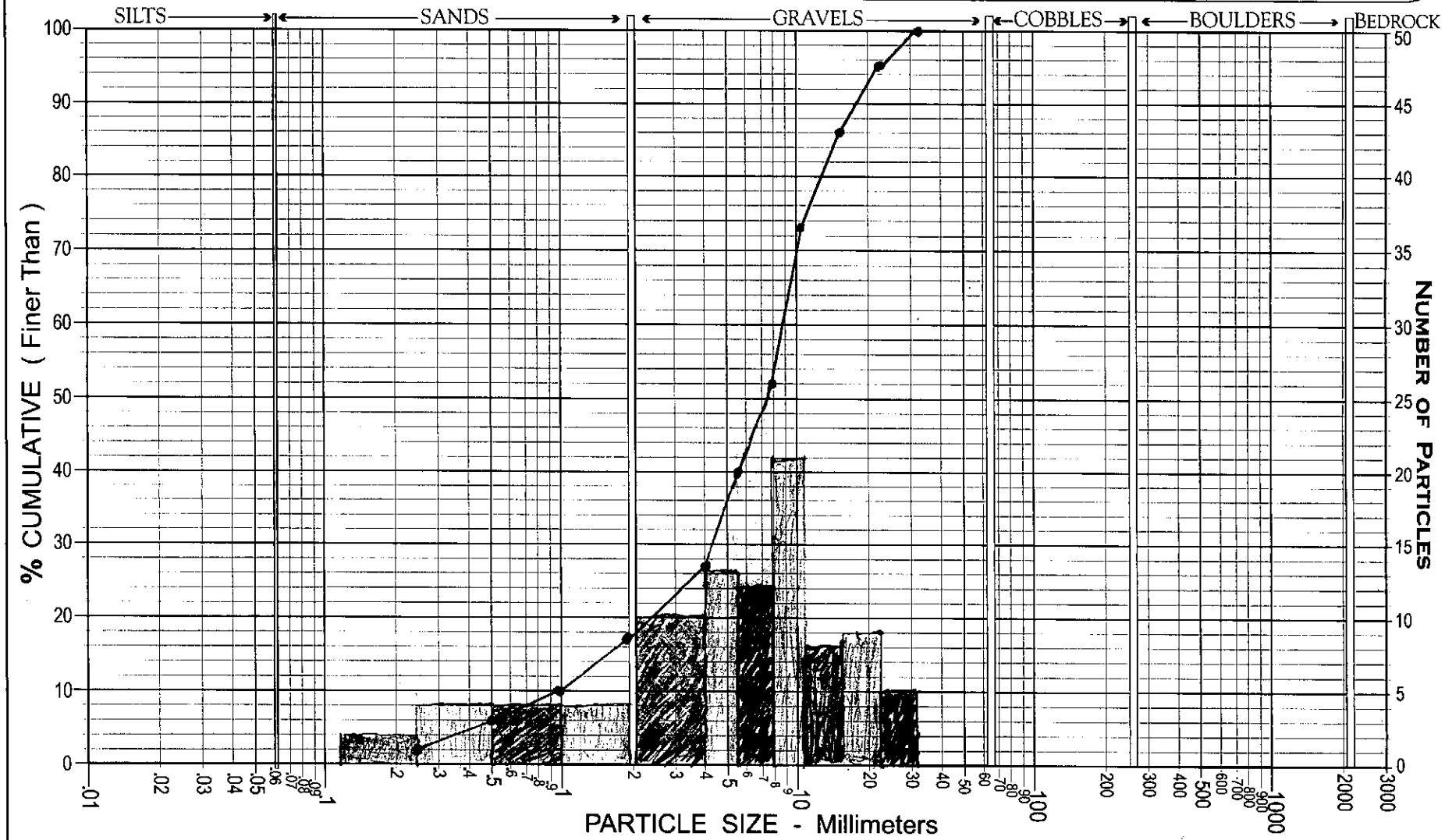
REACH:

PARTY:

Stream Type: TEAM 2

Valley Type:

HUC:



$D_{16} = 1.8$

$D_{35} = 5.5$

$D_{50} = 6.4$

$*D_{84} = 15$

$D_{95} = 28$

$D_{100} = 32$

4 TYPE STREAM

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

Stream: Israel Creek			
Basin:	Drainage Area:	acres	5.35 mi^2
Location: Site 2			
Twp.&Rge:	Sec.&Qtr.:		
Cross-Section Monuments (Lat./Long.):		Date: 4/8/14	
Observers: Team 2		Valley Type: U-AL-FD	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	16.0	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	2.123	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	33.968	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	7.537	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.	2.8	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.	500	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	31.25	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.	0.005	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).	1.54	

Stream Type E4 **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:	Site 2
Date:	4/8/14	Stream Type:	E4	Valley Type:	U-AL-FD
Observers:	Team 2			HUC:	-- -- -- -- -- -- -- -- -- -- --

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	33.968	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	2.12	d_{bkf} (ft)
Bankfull Riffle WIDTH	16.10	W_{bkf} (ft)	Wetted PERIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	20.25	W_p (ft)
D_{84} at Riffle	15	Dia. (mm)	D_{84} (mm) / 304.8	0.05	D_{84} (ft)
Bankfull SLOPE	0.005	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.68	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	33.60	R / D_{84}
Drainage Area	5.35	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	0.52	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	5.96	ft / sec	202	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. A-28, A-29) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.025	5.97	ft / sec	203	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. A-30) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.038	3.91	ft / sec	133	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 Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ 0.047	3.2	ft / sec	109	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 $\bar{u} = Q / A$ Return Period for Bankfull Discharge Q = ____ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	4.86	ft / sec	165	cfs

Protrusion Heights Correction Factor for Application to the Roughness Relation (Fig. 1) - 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-2. Computations of velocity and discharge using various methods.

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	ISRAEL CREEK			Location:	WASHINGTON CO. MARYLAND
Date:	4/8/14	Stream Type:	E4	Valley Type:	U-AL-FD
Observers:	GROUP 2			HUC:	-- -- -- -- -- -- -- -- -- -- --

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	33.97	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	2.12	d_{bkf} (ft)
Bankfull Riffle WIDTH	16.10	W_{bkf} (ft)	Wetted PERIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	20.24	W_p (ft)
D_{84} at Riffle	15	Dia. (mm)	D_{84} (mm) / 304.8	0.049	D_{84} (ft)
Bankfull SLOPE	0.0047	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.68	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	34.29	R / D_{84}
Drainage Area	5.35	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	.504	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * Log\{R / D_{84}\}\,]\,u^*$	~~4.24~~ 5.81	ft / sec	197.2	cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor / Relative Roughness (Figs. A-28, A-29) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ .026	~~4.44~~ 5.13	ft / sec	201.4	cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. A-30) 3.1 3.9 $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ .038	3.91	ft / sec	~~105~~ 133.3	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 Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ .047	3.04	ft / sec	105	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 $\bar{u} = Q / A$ Return Period for Bankfull Discharge Q = ____ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	4.86	ft / sec	165	cfs

Protrusion Based Options for D_{84} Grain Size Estimation (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 A-2. Computations of velocity and discharge using various methods.

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Israel Creek	Location:	Site 2
Date: 4/8/14	Stream Type:	Valley Type:	
Observers:		HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	33.968	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	2.123	d_{bkf} (ft)
Bankfull Riffle WIDTH	16.10	W_{bkf} (ft)	Wetted PERIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	20.25	W_p (ft)
D_{84} at Riffle	15	Dia. (mm)	D_{84} (mm) / 304.8	0.05	D_{84} (ft)
Bankfull SLOPE	0.005	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.68	R (ft)
Gravitational Acceleration	32.2	g (ft / sec²)	Relative Roughness R(ft) / D_{84} (ft)	33.60	R / D_{84}
Drainage Area	5.35	DA (mi²)	Shear Velocity $u^* = (gRS)^{1/2}$	0.52	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [2.83 + 5.66 * Log\{R / D_{84}\}] u^*$	5.96	ft / sec	202	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. A-28, A-29) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.025	5.97	ft / sec	203	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. A-30) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.038	3.91	ft / sec	133	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 Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ 0.047	3.2	ft / sec	109	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 $\bar{u} = Q / A$ Return Period for Bankfull Discharge Q = 1.5 year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$	4.86	ft / sec	165	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: Israel Creek		**Location:** Site 2	
Team: 2	**Date:** 4/8/14	**Drainage Area:** 5.35	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	16.0	2. Bankfull Mean Depth (d_{bkf}) (ft)	2.123
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	7.54	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	33.968
5. Bankfull Maximum Depth (d_{max}) (ft)	2.8	6. Width of Flood-Prone Area (W_{fpa}) (ft)	500
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	31.25		

Channel Pattern / *Dimensionless Ratios*

8. Belt Width (W_{blt}) (ft)	Mean	67	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	4.19
	Min	60		Min	3.75
	Max	74		Max	4.63
10. Stream Meander Length (L_m) (ft)	Mean	89.5	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	5.60
	Min	81		Min	3.75
	Max	98		Max	4.63
12. Linear Wavelength (λ) (ft)	Mean	76.5	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	4.78
	Min	60		Min	3.75
	Max	93		Max	5.81
14. Radius of Curvature (R_c) (ft)	Mean	32.75	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	2.05
	Min	32		Min	2.00
	Max	33.5		Max	2.09

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	~~1.8~~ 0.9	17. D_{35} (mm)	~~5.5~~ 5.8	18. D_{50} (mm)	9
19. D_{84} (mm)	18	20. D_{95} (mm)	64	21. D_{100} (mm)	400

Active Bed Riffle Pebble Count

22. D_{16} (mm)	1.8	23. D_{35} (mm)	5.5	24. D_{50} (mm)	6.4
25. D_{84} (mm)	15	26. D_{95} (mm)	28	27. D_{100} (mm)	32

Classification

28. Sinuosity (k)	1.54	29. Average Water Surface Slope (S)	0.005
30. Stream Type	E4	31. Valley Type U-AL-FD	unconfined alluvial fluvial Deposition

Velocity & Discharge

32. Friction Factor ($\bar{u}$ / u^*)	11.48	33. Relative Roughness (R / D_{84})	34.085
34. Manning's 'n' from Friction Factor / Relative Roughness	0.026	35. Manning's 'n' from Stream Type	0.038
36. Estimated Bankfull Mean Velocity ($\bar{u}_{bkf}$) (ft/sec)	3.91	37. Estimated Bankfull Discharge (cfs)	133
38. Estimation Method Selected for Velocity & Discharge	Manning's n from Stream type unvegetated		

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