

Appendix 6

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 3	
Station: 200 feet upstream		Observers: Will Wilhelm	
Date: 5/10/2010	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)	
Study Bank Height (ft) =	8.70 (A)	Bankfull Height (ft) =	1.60 (B)	(A) / (B) =	5.44 (C)	
					10.0	
Root Depth / Study Bank Height (E)						
Root Depth (ft) =	3.00 (D)	Study Bank Height (ft) =	8.70 (A)	(D) / (A) =	0.34 (E)	
					5.0	
Weighted Root Density (G)						
Root Density as % =	50% (F)	(F) × (E) =		4.35 (G)	7.5	
Bank Angle (H)						
Bank Angle as Degrees =	110 (H)					9.0
Surface Protection (I)						
Surface Protection as % =	20% (I)					7.1

<p style="text-align: center;">Bank Material Adjustment:</p> <p>Bedrock (Overall Very Low BEHI)</p> <p>Boulders (Overall Low BEHI)</p> <p>Cobble (Subtract 10 points if uniform medium to large cobble)</p> <p>Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)</p> <p>Sand (Add 10 points)</p> <p>Silt/Clay (no adjustment)</p>	<p>Bank Material Adjustment</p> <p>10</p> <hr/> <p>Stratification Adjustment</p> <p>Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</p> <p>5</p>
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Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Extreme
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 3	
Station: 400 feet upstream (Right)		Observers: Will Wilhelm	
Date: 5/10/2010	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	7.20 (A)	Bankfull Height (ft) =	2.00 (B)	(A) / (B) =	3.60 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	4.50 (D)	Study Bank Height (ft) =	7.20 (A)	(D) / (A) =	0.63 (E)
					3.0
Weighted Root Density (G)					
Root Density as % =	30% (F)	(F) × (E) =			2.16 (G)
					7.5
Bank Angle (H)					
Bank Angle as Degrees =	50 (H)				3.2
Surface Protection (I)					
Surface Protection as % =	75% (I)				2.1

<p style="text-align: center;">Bank Material Adjustment:</p> <p>Bedrock (Overall Very Low BEHI)</p> <p>Boulders (Overall Low BEHI)</p> <p>Cobble (Subtract 10 points if uniform medium to large cobble)</p> <p>Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)</p> <p>Sand (Add 10 points)</p> <p>Silt/Clay (no adjustment)</p>	<p>Bank Material Adjustment</p> <p>8</p> <hr/> <p>Stratification Adjustment</p> <p>Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</p> <p>7</p>
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Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Very High
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 3	
Station: 200 feet upstream		Observers: Will Wilhelm	
Date: 5/10/2010	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	6.50 (A)	Bankfull Height (ft) =	2.50 (B)	(A) / (B) =	2.60 (C)
					8.8
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	1.50 (D)	Study Bank Height (ft) =	6.50 (A)	(D) / (A) =	0.23 (E)
					6.2
Weighted Root Density (G)					
Root Density as % =	75% (F)	(F) × (E) =			4.875 (G)
					7.7
Bank Angle (H)					
Bank Angle as Degrees =	90 (H)				
					7.9
Surface Protection (I)					
Surface Protection as % =	5% (I)				
					10.0

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	5
	Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	5

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Extreme
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		50.6

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek	Location: Reach 4
Station: 400 feet upstream (Right)	Observers: Will Wilhelm
Date: 5/13/2011	Stream Type: _____ Valley Type: _____

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	6.00 (A)	Bankfull Height (ft) =	1.50 (B)	(A) / (B) =	4.00 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	2.00 (D)	Study Bank Height (ft) =	6.00 (A)	(D) / (A) =	0.33 (E)
					5.8
Weighted Root Density (G)					
Root Density as % =	50% (F)	(F) × (E) =			3 (G)
					7.8
Bank Angle (H)					
Bank Angle as Degrees =	80 (H)				
					5.9
Surface Protection (I)					
Surface Protection as % =	80% (I)				
					1.9

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	0
	Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	High
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		31.4

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek	Location: Reach 4
Station: 300 feet upstream survey XS-1	Observers: Will Wilhelm
Date: 5/13/2011	Stream Type: _____ Valley Type: _____

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	3.90 (A)	Bankfull Height (ft) =	1.20 (B)	(A) / (B) =	3.25 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	1.00 (D)	Study Bank Height (ft) =	3.90 (A)	(D) / (A) =	0.26 (E)
					6.3
Weighted Root Density (G)					
Root Density as % =	25% (F)	(F) × (E) =			0.975 (G)
					8.8
Bank Angle (H)					
Bank Angle as Degrees =	90 (H)				
					7.9
Surface Protection (I)					
Surface Protection as % =	5% (I)				
					10.0

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	10
	Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Extreme
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		53.0

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 7	
Station:		Observers: Will Wilhelm/Jason Diaz	
Date: 5/15/2012	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	9.50 (A)	Bankfull Height (ft) =	2.00 (B)	(A) / (B) =	4.75 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	1.50 (D)	Study Bank Height (ft) =	9.50 (A)	(D) / (A) =	0.16 (E)
					7.8
Weighted Root Density (G)					
Root Density as % =	30% (F)	(F) × (E) =			2.85 (G)
					9.5
Bank Angle (H)					
Bank Angle as Degrees =	50 (H)				3.0
Surface Protection (I)					
Surface Protection as % =	90% (I)				1.0

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	<ul style="list-style-type: none"> Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	High
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 7	
Station:		Observers: Will Wilhelm/Jason Diaz	
Date: 5/15/2012	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	9.00 (A)	Bankfull Height (ft) =	2.00 (B)	(A) / (B) =	4.50 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	2.00 (D)	Study Bank Height (ft) =	9.00 (A)	(D) / (A) =	0.22 (E)
					6.2
Weighted Root Density (G)					
Root Density as % =	30% (F)	(F) × (E) =			2.7 (G)
					9.5
Bank Angle (H)					
Bank Angle as Degrees =	45 (H)				
					3.0
Surface Protection (I)					
Surface Protection as % =	90% (I)				
					1.0

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	<ul style="list-style-type: none"> Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Moderate
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		29.7

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek		Location: Reach 6	
Station:		Observers: Will Wilhelm/Jason Diaz	
Date: 5/15/2012	Stream Type:	Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	8.00 (A)	Bankfull Height (ft) =	1.50 (B)	(A) / (B) =	5.33 (C)
					10.0
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	1.50 (D)	Study Bank Height (ft) =	8.00 (A)	(D) / (A) =	0.19 (E)
					7.0
Weighted Root Density (G)					
Root Density as % =	20% (F)	(F) × (E) =	1.6 (G)		10.0
Bank Angle (H)					
Bank Angle as Degrees =	75 (H)		5.8		
Surface Protection (I)					
Surface Protection as % =	50% (I)		4.0		

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	<ul style="list-style-type: none"> Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	High
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		36.8

Bank Sketch

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

Stream: Reedy Creek			Location: Reach 11		
Station:			Observers: Will Wilhelm/Jason Diaz		
Date: 5/15/2012		Stream Type:		Valley Type:	

Study Bank Height / Bankfull Height (C)					BEHI Score (Fig. 3-7)
Study Bank Height (ft) =	6.00 (A)	Bankfull Height (ft) =	2.00 (B)	(A) / (B) =	3.00 (C)
					9.5
Root Depth / Study Bank Height (E)					
Root Depth (ft) =	1.50 (D)	Study Bank Height (ft) =	6.00 (A)	(D) / (A) =	0.25 (E)
					6.5
Weighted Root Density (G)					
Root Density as % =	10% (F)	(F) × (E) =			0.6 (G)
					10.0
Bank Angle (H)					
Bank Angle as Degrees =	85 (H)				7.0
Surface Protection (I)					
Surface Protection as % =	5% (I)				10.0

Bank Material Adjustment:	Bank Material Adjustment
<ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) 	<ul style="list-style-type: none"> Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage
	0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score	Very High
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50		43.0

Bank Sketch

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 1
LENGTH ASSESSED:	3,709
TOTAL TONS/YR:	2,206
TOTAL TONS/YR/FT:	0.59

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	High	10	3.5	116	4,060
Extreme	Low	10	1.9	930	17,670
Very High	Very High	10	1.1	207	2,277
Very High	High	10	0.9	152	1,368
Very High	Low	10	0.5	448	2,240
TOTAL FT ³ /YR					27,615
TOTAL YD ³ /YR					1,023
TOTAL TONS/YR					1,330

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Very High	8	5	66	2,640
Extreme	High	8	3.5	136	3,808
Extreme	Low	8	1.9	442	6,718
Very High	Very High	8	1.1	215	1,892
Very High	High	8	0.9	146	1,051
Very High	Low	8	0.5	496	1,984
Low	Very High	8	0.15	88	106
Low	Low	8	0.002	267	4
TOTAL FT ³ /YR					18,203
TOTAL YD ³ /YR					674
TOTAL TONS/YR					876

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 2
LENGTH ASSESSED:	3,435
TOTAL TONS/YR:	1,093
TOTAL TONS/YR/FT:	0.32

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	6	7	55	2,310
Extreme	High	6	3.5	105	2,205
Extreme	Low	6	1.9	253	2,884
High	Extreme	6	0.4	73	175
High	Very High	6	0.22	165	218
High	High	6	0.2	43	52
High	Low	6	0.12	514	370
Low	High	6	0.004	97	2
Low	Low	6	0.002	413	5
TOTAL FT ³ /YR					8,221
TOTAL YD ³ /YR					304
TOTAL TONS/YR					396

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	6.5	7	104	4,732
Extreme	Very High	6.5	5	102	3,315
Extreme	High	6.5	3.5	52	1,183
Extreme	Low	6.5	1.9	334	4,125
High	Extreme	6.5	0.4	28	73
High	Very High	6.5	0.22	166	237
High	High	6.5	0.2	185	241
High	Low	6.5	0.12	746	582
TOTAL FT ³ /YR					14,487
TOTAL YD ³ /YR					537
TOTAL TONS/YR					698

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 3
LENGTH ASSESSED:	2,834
TOTAL TONS/YR:	1,332
TOTAL TONS/YR/FT:	0.47

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	8	7	97	5,432
Extreme	Low	8	1.9	247	3,754
Very High	High	8	0.9	173	1,246
Very High	Low	8	0.5	196	784
High	High	8	0.2	133	213
High	Low	8	0.12	318	305
Low	Low	8	0.002	252	4
TOTAL FT ³ /YR					11,738
TOTAL YD ³ /YR					435
TOTAL TONS/YR					565

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	6	7	135	5,670
Extreme	Very High	6	5	174	5,220
Extreme	High	6	3.5	33	693
Extreme	Low	6	1.9	276	3,146
Very High	Very High	6	1.1	86	568
Very High	Low	6	0.5	22	66
High	High	6	0.2	143	172
High	Low	6	0.12	549	395
TOTAL FT ³ /YR					15,930
TOTAL YD ³ /YR					590
TOTAL TONS/YR					767

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 4
LENGTH ASSESSED:	3,684
TOTAL TONS/YR:	986
TOTAL TONS/YR/FT:	0.27

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	3	7	28	588
Extreme	Very High	3	5	124	1,860
Extreme	High	3	3.5	4	42
Extreme	Low	3	1.9	140	798
Very High	Extreme	3	1.6	26	125
Very High	Very High	3	1.1	146	482
Very High	High	3	0.9	285	770
Very High	Low	3	0.5	713	1,070
High	Extreme	3	0.4	13	16
High	High	3	0.2	129	77
High	Low	3	0.12	235	85
TOTAL FT ³ /YR					5,911
TOTAL YD ³ /YR					219
TOTAL TONS/YR					285

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	5	7	50	1,750
Extreme	Very High	5	5	148	3,700
Extreme	High	5	3.5	175	3,063
Extreme	Low	5	1.9	353	3,354
Very High	Very High	5	1.1	78	429
Very High	High	5	0.9	299	1,346
Very High	Low	5	0.5	367	918
Low	High	5	0.004	89	2
Low	Low	5	0.002	282	3
TOTAL FT ³ /YR					14,563
TOTAL YD ³ /YR					539
TOTAL TONS/YR					701

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 5
LENGTH ASSESSED:	974
TOTAL TONS/YR:	390
TOTAL TONS/YR/FT:	0.40

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Very High	7	5	30	1,050
Extreme	Low	7	1.9	62	825
Very High	Very High	7	1.1	146	1,124
Very High	Low	7	0.5	70	245
High	High	7	0.2	163	228
High	Low	7	0.12	16	13
TOTAL FT ³ /YR					3,485
TOTAL YD ³ /YR					129
TOTAL TONS/YR					168

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	7	7	12	588
Extreme	High	7	3.5	76	1,862
Extreme	Low	7	1.9	22	293
Very High	Very High	7	1.1	153	1,178
Very High	High	7	0.9	90	567
Very High	Low	7	0.5	36	126
Low	High	7	0.004	82	2
Low	Low	7	0.002	16	0
TOTAL FT ³ /YR					4,616
TOTAL YD ³ /YR					171
TOTAL TONS/YR					222

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 6
LENGTH ASSESSED:	9,042
TOTAL TONS/YR:	860
TOTAL TONS/YR/FT:	0.10

BOTH BANKS

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	8	7	92	5,152
Extreme	Extreme	4	7	88	2,464
Extreme	Low	8	1.9	138	2,098
Extreme	Low	4	1.9	134	1,018
High	Extreme	8	0.4	184	589
High	Extreme	4	0.4	178	285
High	Low	8	0.12	276	265
High	Low	4	0.12	266	128
Moderate	Extreme	8	0.4	1104	3,533
Moderate	Extreme	4	0.4	1066	1,706
Moderate	Low	8	0.03	1656	397
Moderate	Low	4	0.03	1600	192
Low	Extreme	8	0.004	460	15
Low	Extreme	4	0.004	444	7
Low	Low	8	0.002	690	11
Low	Low	4	0.002	666	5
				TOTAL FT ³ /YR	17,864
				TOTAL YD ³ /YR	662
				TOTAL TONS/YR	860

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 7
LENGTH ASSESSED:	4,014
TOTAL TONS/YR:	475
TOTAL TONS/YR/FT:	0.12

BOTH BANKS

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	8	7	60	3,360
Extreme	Low	8	1.9	140	2,128
High	Extreme	8	0.4	180	576
High	Low	8	0.12	422	405
Moderate	Extreme	8	0.4	904	2,893
Moderate	Low	8	0.03	2108	506
Low	Extreme	8	0.004	60	2
Low	Low	8	0.002	140	2
				TOTAL FT ³ /YR	9,872
				TOTAL YD ³ /YR	366
				TOTAL TONS/YR	475

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 8
LENGTH ASSESSED:	7,672
TOTAL TONS/YR:	853
TOTAL TONS/YR/FT:	0.11

BOTH BANKS

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	8	7	76	4,256
Extreme	Extreme	7.5	7	52	2,730
Extreme	Extreme	4	7	18	504
Extreme	Low	8	1.9	76	1,155
Extreme	Low	7.5	1.9	120	1,710
Extreme	Low	4	1.9	40	304
High	Extreme	8	0.4	154	493
High	Extreme	7.5	0.4	104	312
High	Extreme	4	0.4	34	54
High	Low	8	0.12	154	148
High	Low	7.5	0.12	242	218
High	Low	4	0.12	80	38
Moderate	Extreme	8	0.4	920	2,944
Moderate	Extreme	7.5	0.4	622	1,866
Moderate	Extreme	4	0.4	208	333
Moderate	Low	8	0.03	920	221
Moderate	Low	7.5	0.03	1450	326
Moderate	Low	4	0.03	484	58
Low	Extreme	8	0.004	384	12
Low	Extreme	7.5	0.004	258	8
Low	Extreme	4	0.004	86	1
Low	Low	8	0.002	384	6
Low	Low	7.5	0.002	604	9
Low	Low	4	0.002	202	2
				TOTAL FT ³ /YR	17,709
				TOTAL YD ³ /YR	656
				TOTAL TONS/YR	853

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 9
LENGTH ASSESSED:	3,269
TOTAL TONS/YR:	51
TOTAL TONS/YR/FT:	0.02

BOTH BANKS

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Moderate	Extreme	6	0.4	327	785
Moderate	Low	6	0.03	1471	265
Low	Low	6	0.002	1471	18
				TOTAL FT ³ /YR	1,067
				TOTAL YD ³ /YR	40
				TOTAL TONS/YR	51

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 10
LENGTH ASSESSED:	9,500
TOTAL TONS/YR:	595
TOTAL TONS/YR/FT:	0.06

BOTH BANKS - REACH 10

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
Extreme	Extreme	7	7	32	1,568
Extreme	Low	7	1.9	292	3,884
High	Extreme	7	0.4	98	274
High	Low	7	0.12	878	738
Moderate	Extreme	7	0.4	488	1,366
Moderate	Low	7	0.03	4388	921
Low	Extreme	7	0.004	32	1
Low	Low	7	0.002	292	4
TOTAL FT ³ /YR					8,756
TOTAL YD ³ /YR					324
TOTAL TONS/YR					422

BOTH BANKS - REACH 10a

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
High	Low	10	0.12	3000	3,600
TOTAL FT ³ /YR					3,600
TOTAL YD ³ /YR					133
TOTAL TONS/YR					173

SEDIMENT LOADING ASSESSMENT

SITE:	REACH 11
LENGTH ASSESSED:	1,788
TOTAL TONS/YR:	63
TOTAL TONS/YR/FT:	0.04

BOTH BANKS

A	B	C	D	E	F
BEHI	NBS	BANK HEIGHT (FT)	FEET/YEAR (from NC Curve Rev. 3-31-09)	BANK LENGTH (FT)	VOLUME/YEAR (FT ³ /YEAR)
High	Extreme	9.5	0.4	36	137
High	Low	9.5	0.12	322	367
Moderate	Extreme	9.5	0.4	126	479
Moderate	Low	9.5	0.03	1126	321
Low	Extreme	9.5	0.004	18	1
Low	Low	9.5	0.002	160	3
				TOTAL FT ³ /YR	1,307
				TOTAL YD ³ /YR	48
				TOTAL TONS/YR	63

SEDIMENT LOADING ASSESSMENT

Reach	Bank Length (FT)	TOTAL TONS/YR	TOTAL TONS/YR/FT
1	3,709	2,206	0.59
2	3,435	1,093	0.32
3	2,834	1,332	0.47
4	3,684	986	0.27
5	974	390	0.40
6	9,042	860	0.10
7	4,014	475	0.12
8	7,672	853	0.11
9	3,269	51	0.02
10	9,500	595	0.06
11	1,788	63	0.04
TOTAL	49,921	8,905	0.18

Appendix 7

Technical Memorandum

Date: March 26, 2011

Project: WO#2 – Reedy Creek

Subject: Reach 5 Assessment (Southwest Reach)

To: William Harris, E.I.

Purpose: For Review

Assessment

Kimley-Horn and Associates, Inc. (KHA) staff Will Wilhelm and Jason Diaz performed a visual assessment of the subject site on May 13, 2011. The lower 500 feet of stream (reach 5) showed obvious visual signs of impairment through bed/bank erosion and active headcuts. The stream does not have access to an active floodprone area/bench because of this down-cutting/incision. This incision is likely caused from historical straightening and historic land uses. However, upstream of this unstable 500 feet the stream visually appeared to be in a stable condition with adequate access to a floodprone area. The stream makes this transition from a highly unstable to stable at a large headcut that has been stopped by a large bedrock outcrop. Upstream of the bedrock the stream and its tributaries appear to be in equilibrium with little or no signs of instability. These reaches are ideal for reference reaches for the restoration efforts in the other Reedy Creek reaches.

Mitigation Potential

A majority of the stream (reach 5) and its tributaries (reach 5-A and 5-B) are contained on public property and approximately 1,200 feet of reach 5-B is located on a private parcel (See Figure 1). Table 1 below lists the parcels and owner names. All of reach 5 and its jurisdictional tributaries would qualify for mitigation credit ratio assuming conservation easements were obtained and the Interagency Review Team (IRT) agreed to allow preservation on within the existing nature preserve. The City may argue that the mitigation plan for this area is a complete watershed approach and incorporates restoration and preservation to protect the watershed and its assets in perpetuity through measures such as a conservation easement. Table 2 and Figure 1 below summarize of the estimated mitigation potential of the reach when combined with the other components (Reach 1-4) of the Reedy Creek project:

Table 1. Parcels

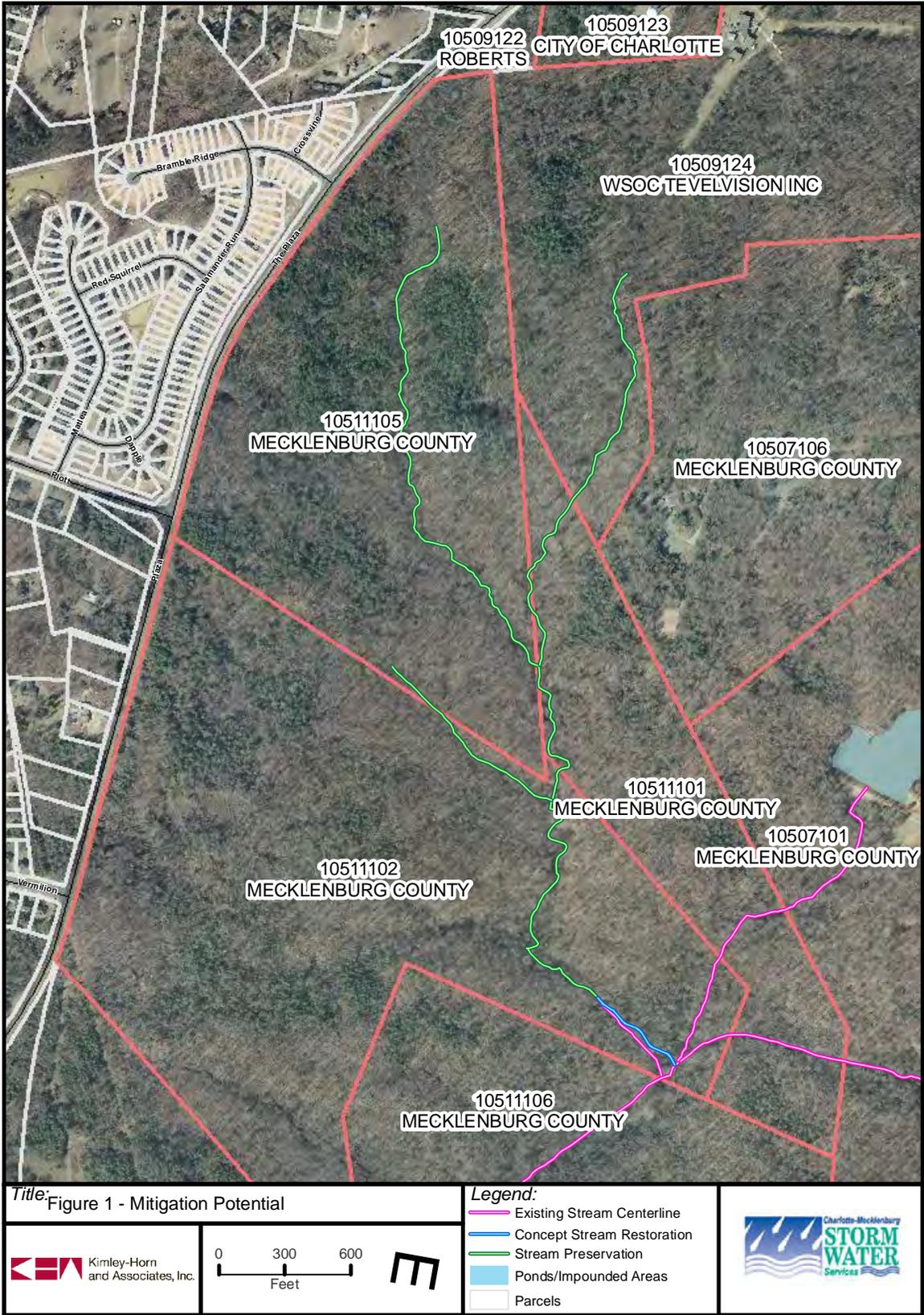
Parcel Identification Number	Owner
10509124	WSOC Television Inc.
10507101	Mecklenburg County
10507106	Mecklenburg County
10511101	Mecklenburg County
10511102	Mecklenburg County
10511105	Mecklenburg County

Table 2. Mitigation Credit Potential

Reach	Mitigation Type	Length (feet)*		Credit Ratio	Mitigation Credit
		Existing	Design		
5	Restoration	487	491	1:1	491
5	Preservation	4,579	4,579	5:1	916
5-A	Preservation	2,064	2,064	5:1	413
5-B	Preservation	978	978	5:1	196
TOTALS	--	8,108	8,112	--	2,016

*Stream lengths based on Mecklenburg County GIS data layer(s).

Figure 1. Mitigation Potential for Reach 5



Site Photos



Photo 1: Restoration Potential/Lower 500 Feet of Reach 5



Photo 2: Restoration Potential/Lower 500 Feet of Reach 5

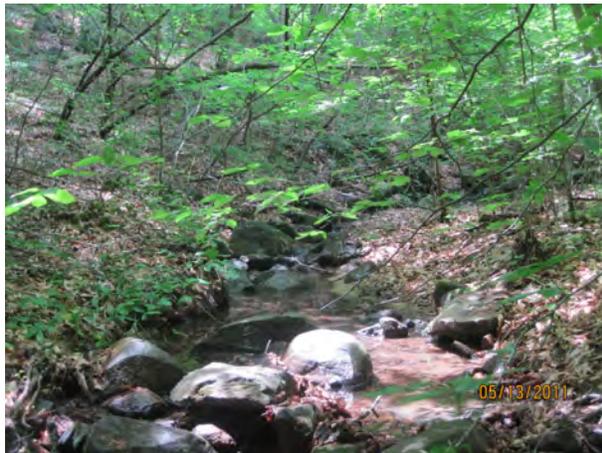


Photo 3: Preservation/Potential Reference Reach 5



Photo 4: Preservation/Potential Reference Reach 5



Photo 5: Preservation/Potential Reference Reach 5



Photo 6: Preservation/Potential Reference Reach 5

Appendix 8

Reach 1 - Cross Section 2 (Riffle)

○ Ground Points

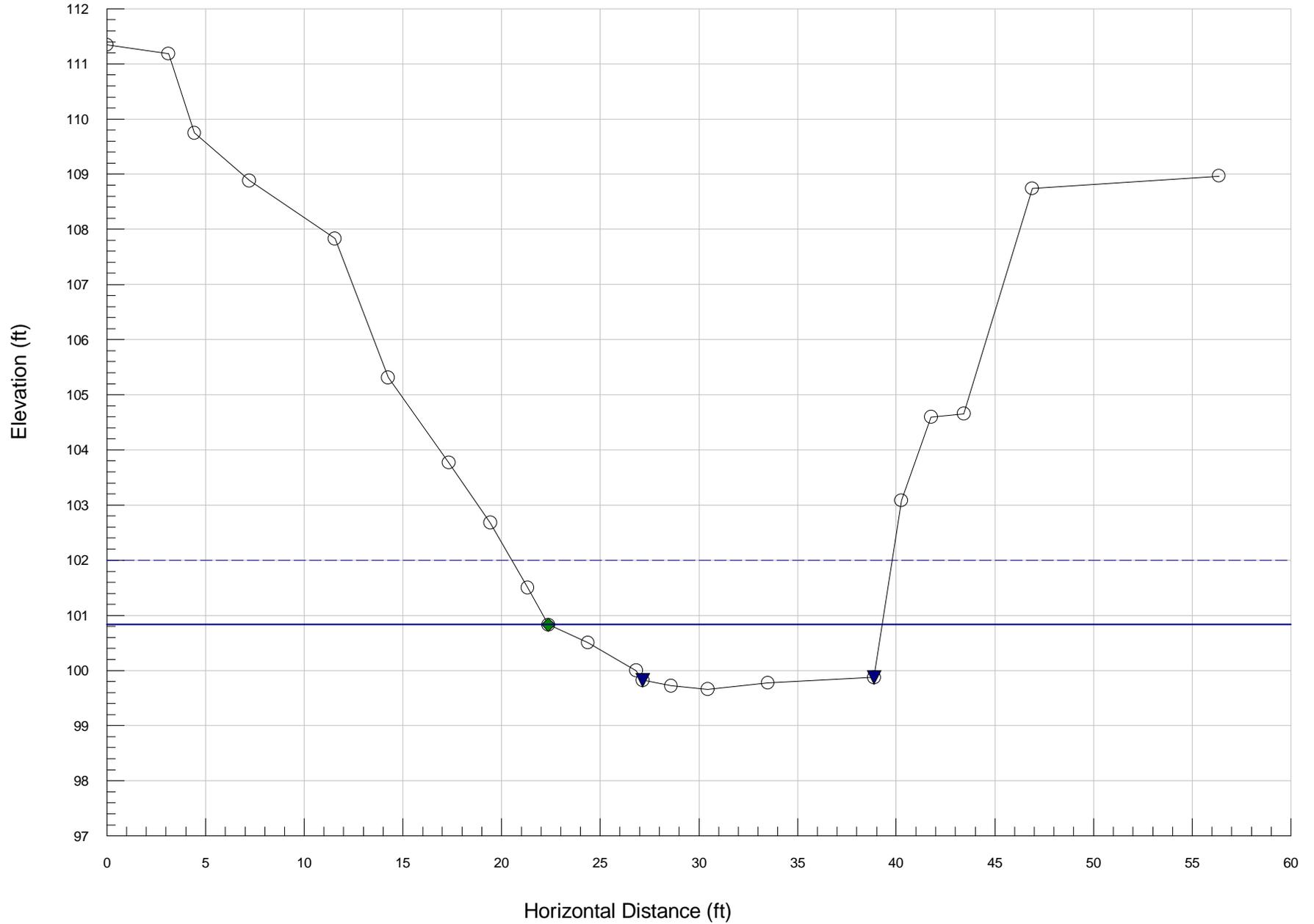
◆ Bankfull Indicators

▼ Water Surface Points

$wbkf = 16.9$

$Dbkf = .87$

$Abkf = 14.7$



Reach 1 - Cross Section 1 (Pool)

○ Ground Points

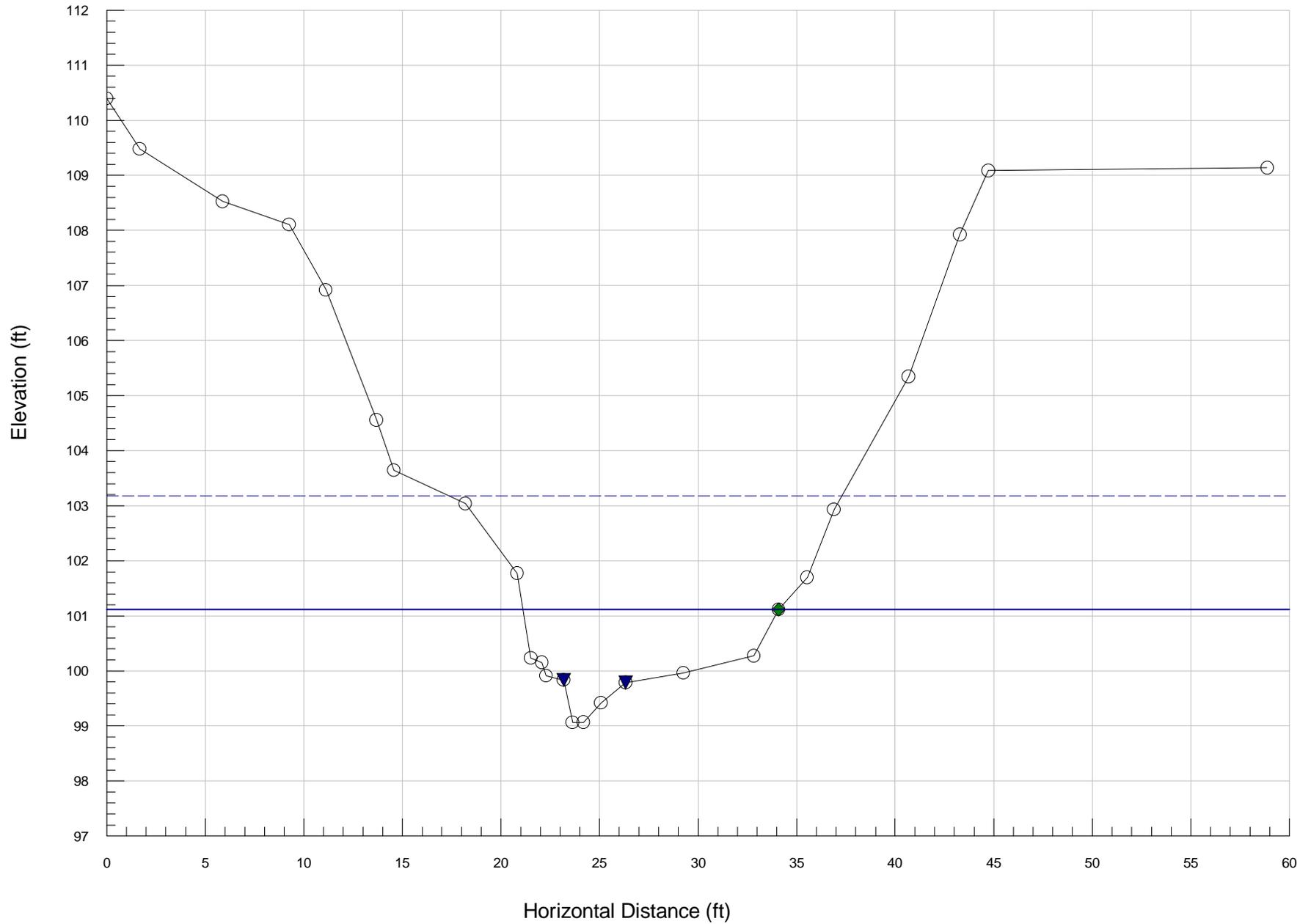
◆ Bankfull Indicators

▼ Water Surface Points

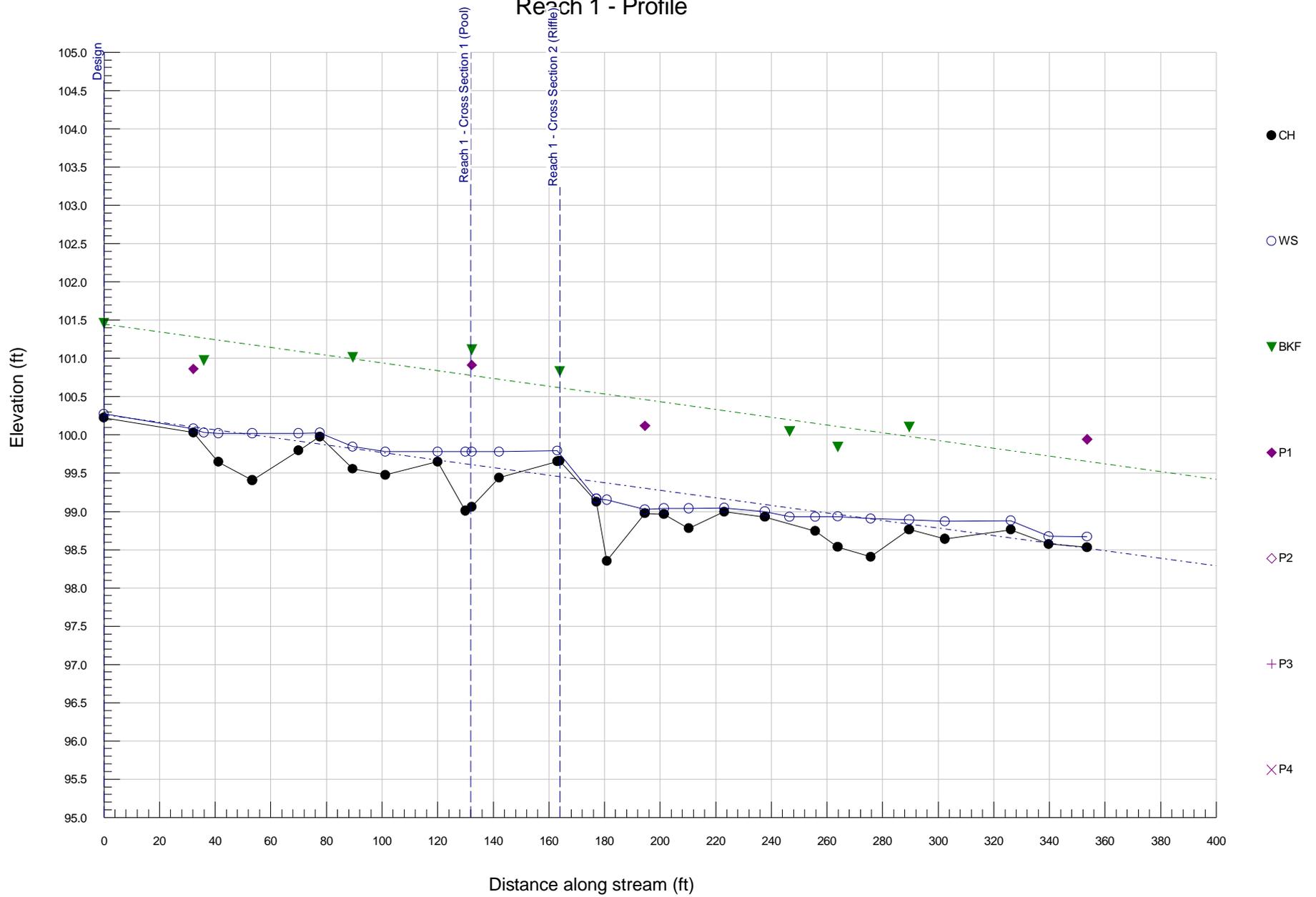
$w_{bkf} = 13$

$D_{bkf} = 1.18$

$A_{bkf} = 15.3$

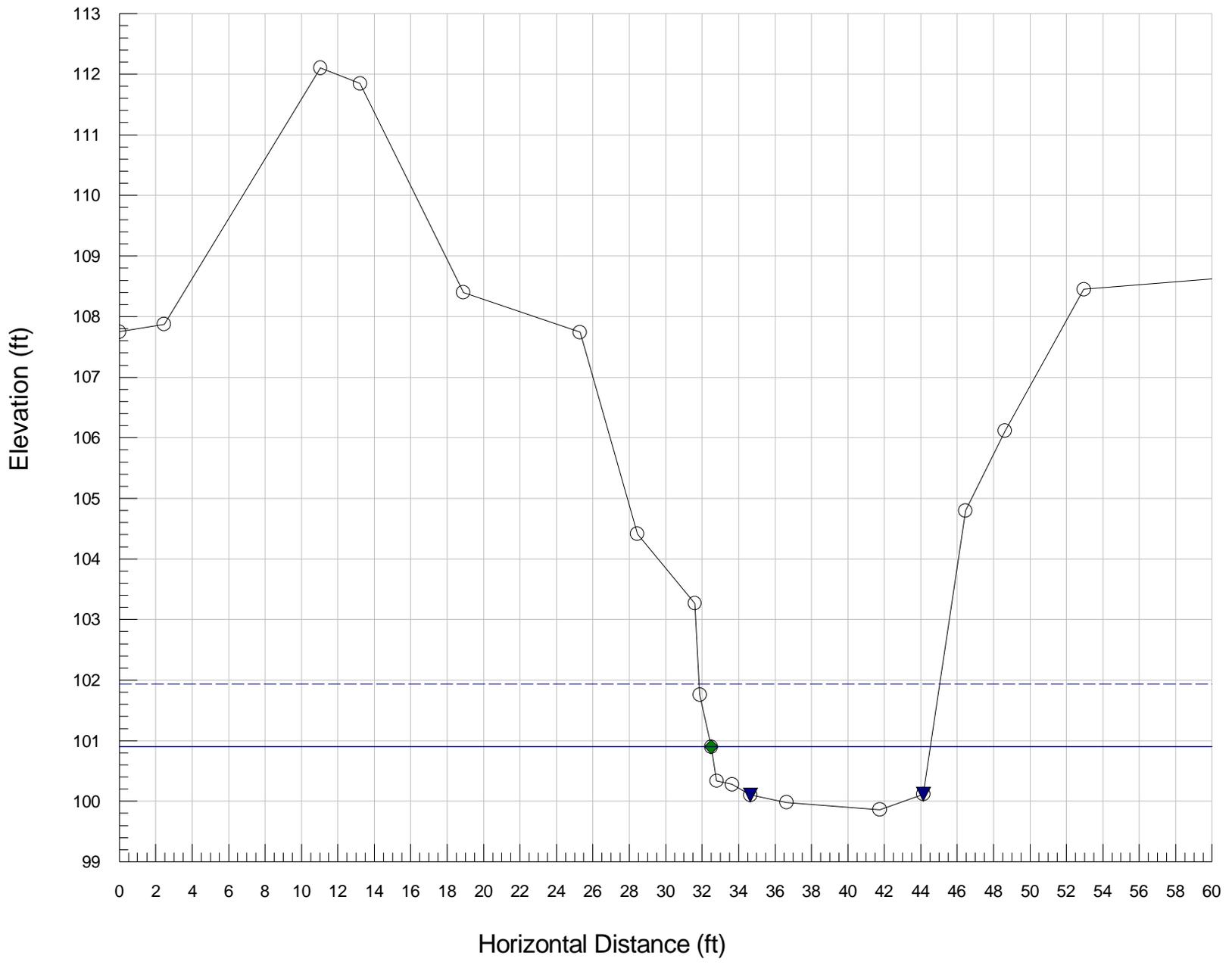


Reach 1 - Profile



Reach 10 - Cross Section 1 (Riffle)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 12 Dbkf = .86 Abkf = 10.3



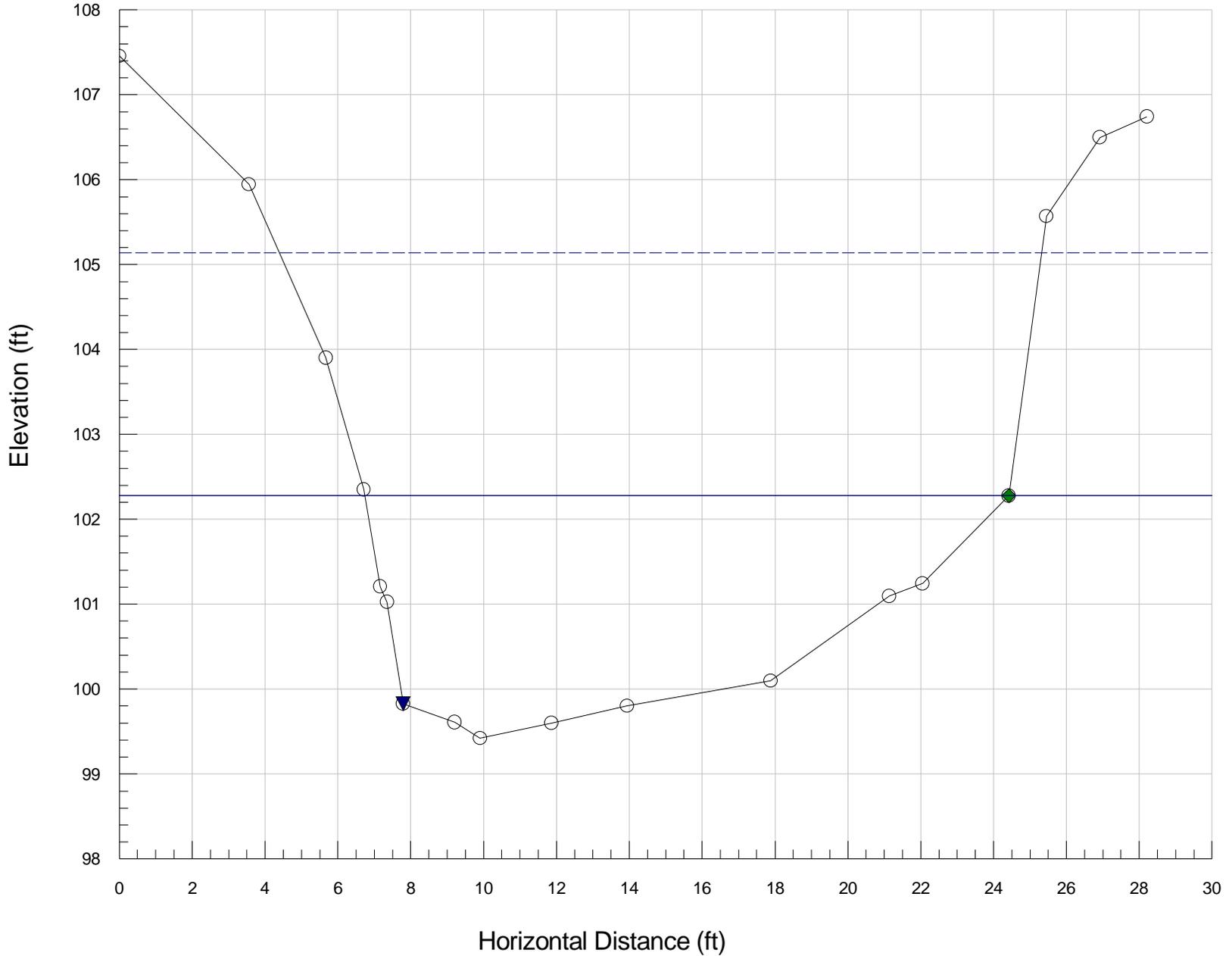
Reach 10 - Cross Section 2 (Pool)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points

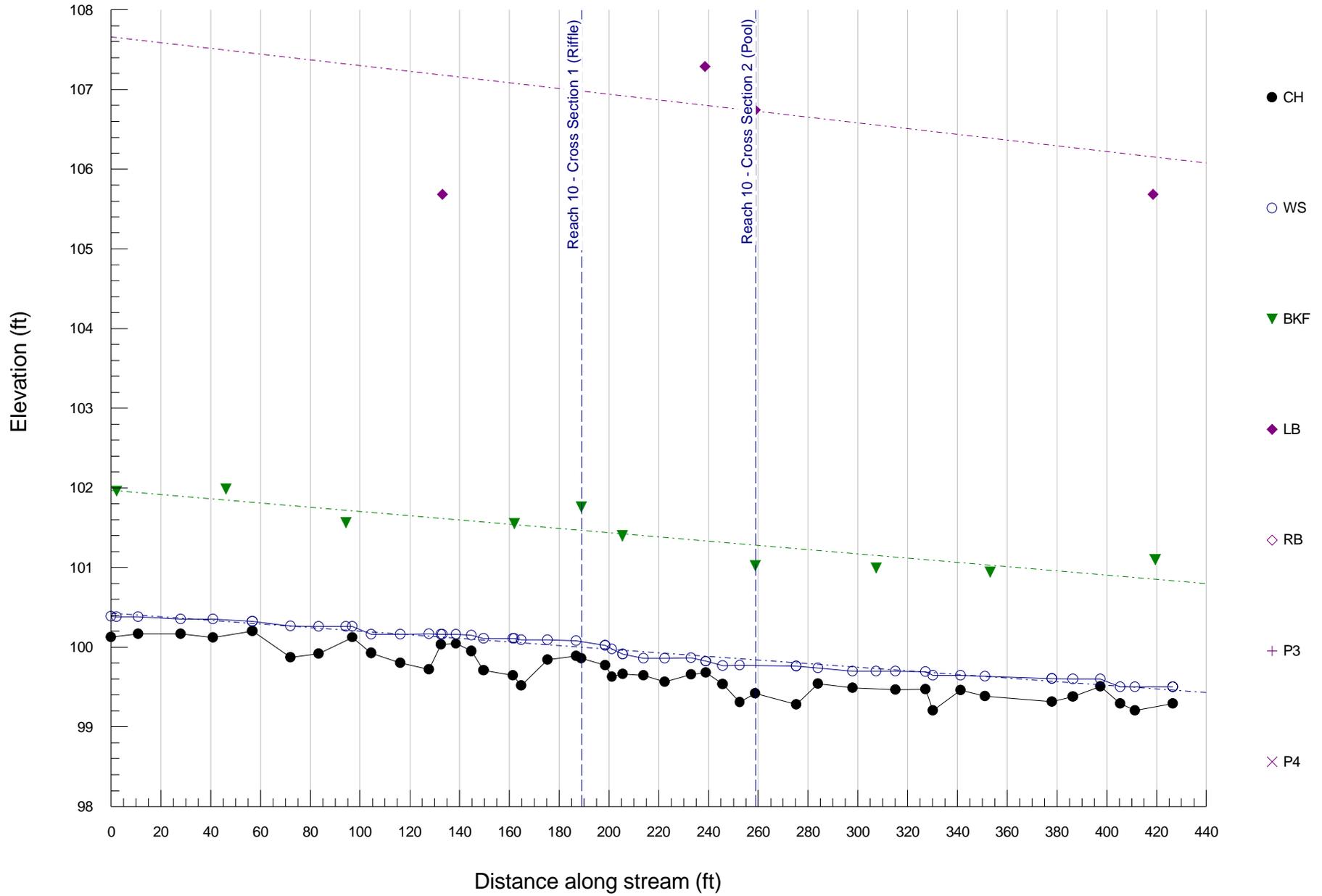
wbkf = 17.7

Dbkf = 1.95

Abkf = 34.5



Reach 10 - Profile



Reach 11 - Cross Section 1 (Pool)

○ Ground Points

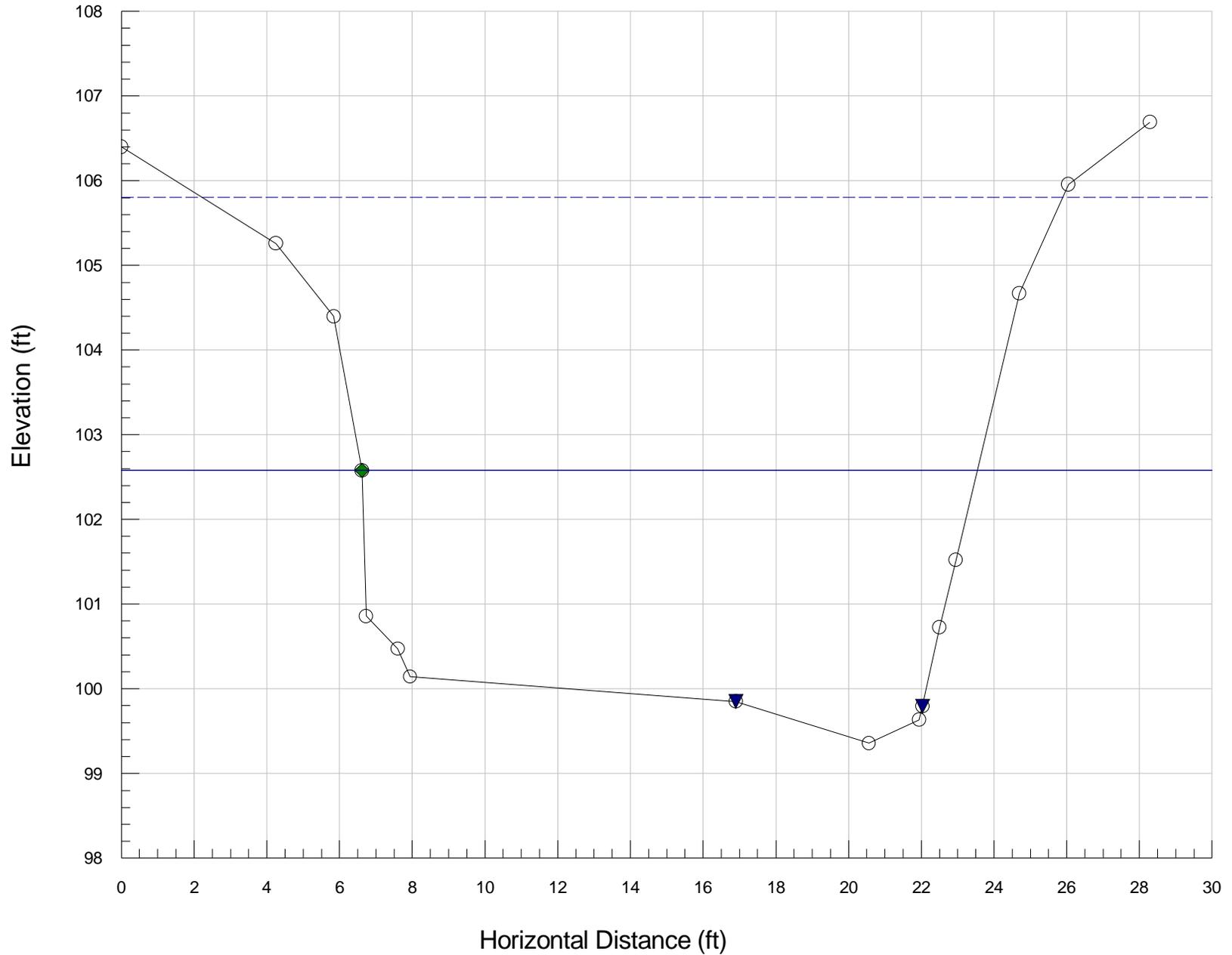
◆ Bankfull Indicators

▼ Water Surface Points

wbkf = 16.9

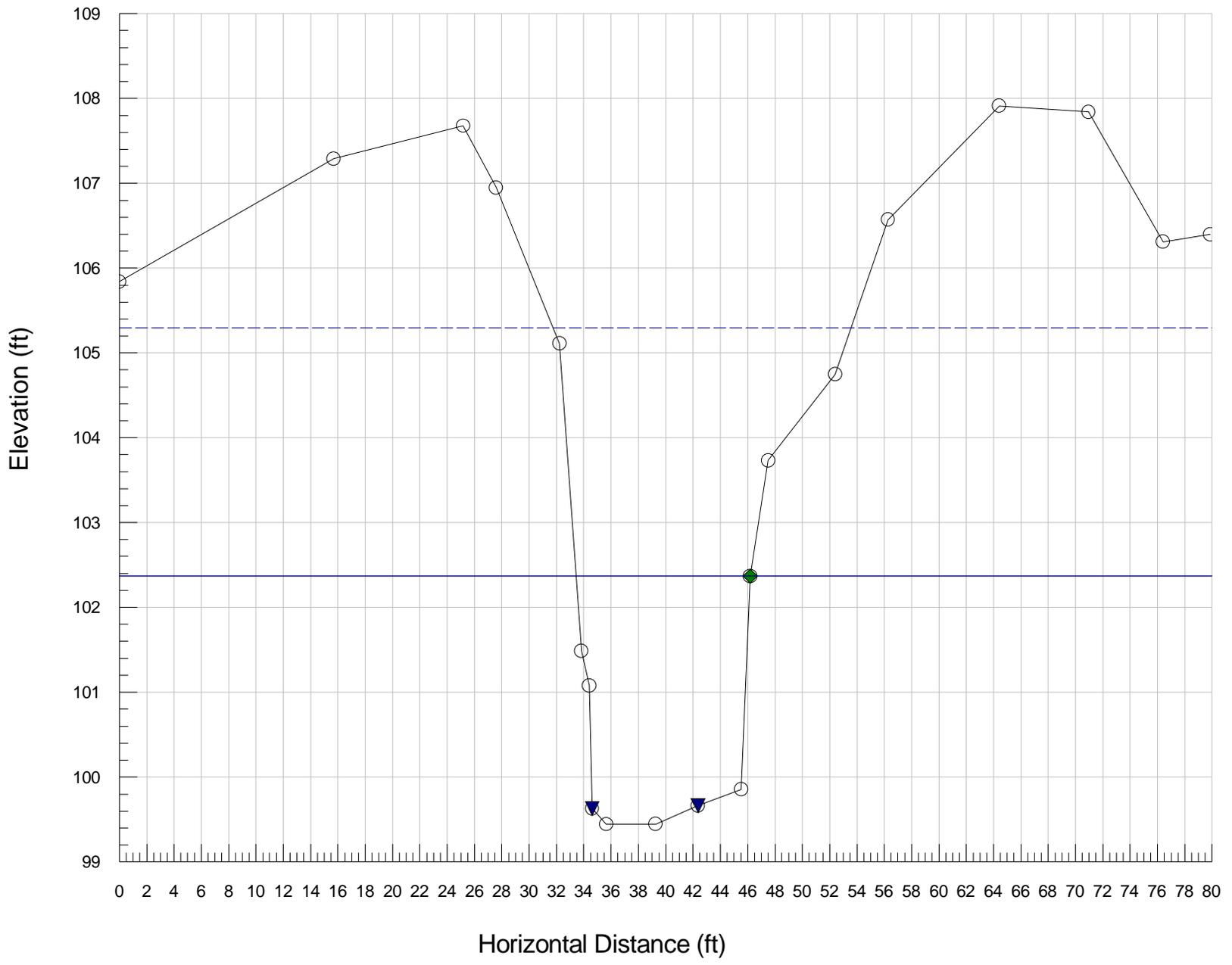
Dbkf = 2.55

Abkf = 43.2

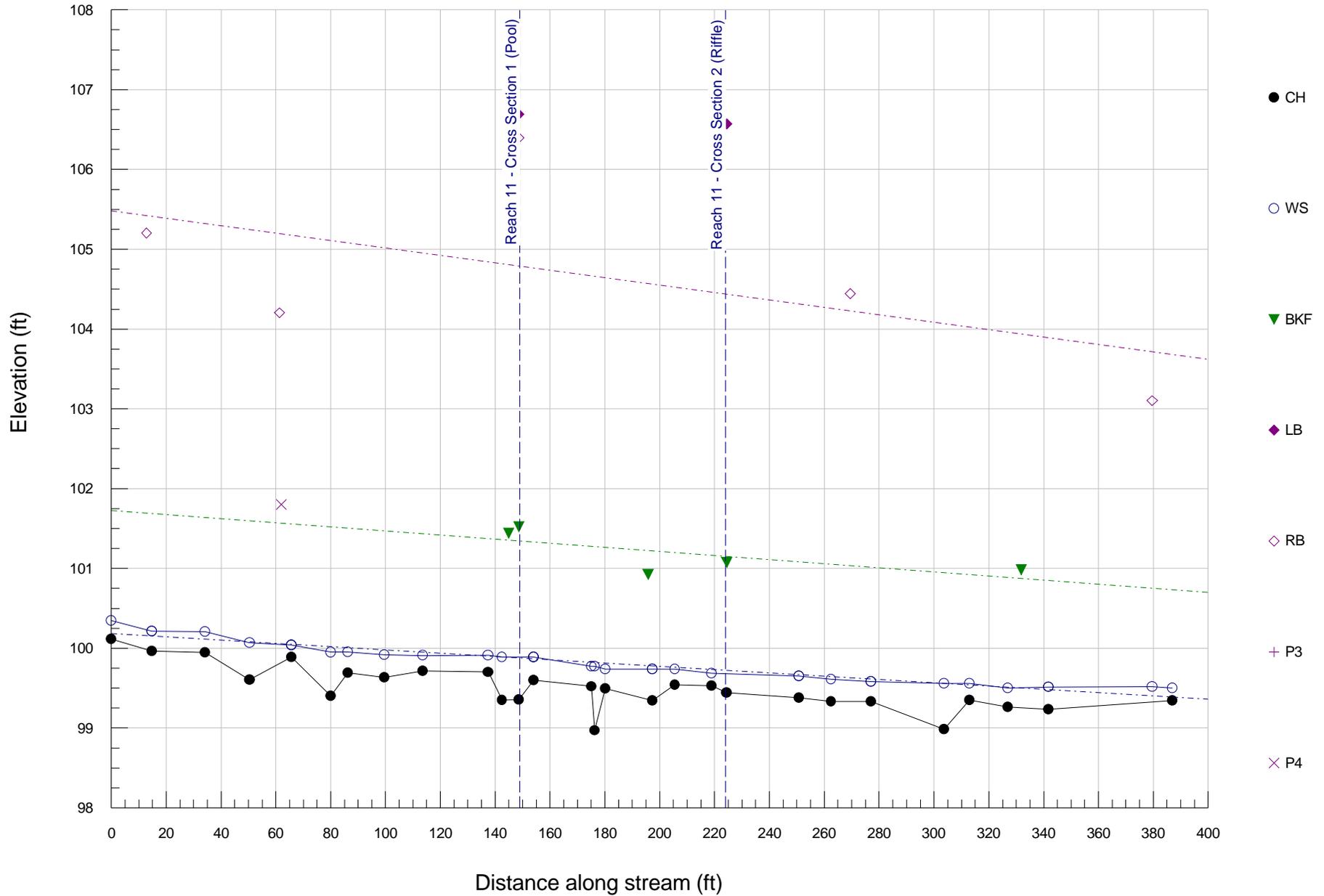


Reach 11 - Cross Section 2 (Riffle)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 12.8 Dbkf = 2.55 Abkf = 32.6



Reach 10 - Profile



Reach 2 - Cross Section (Riffle)

○ Ground Points

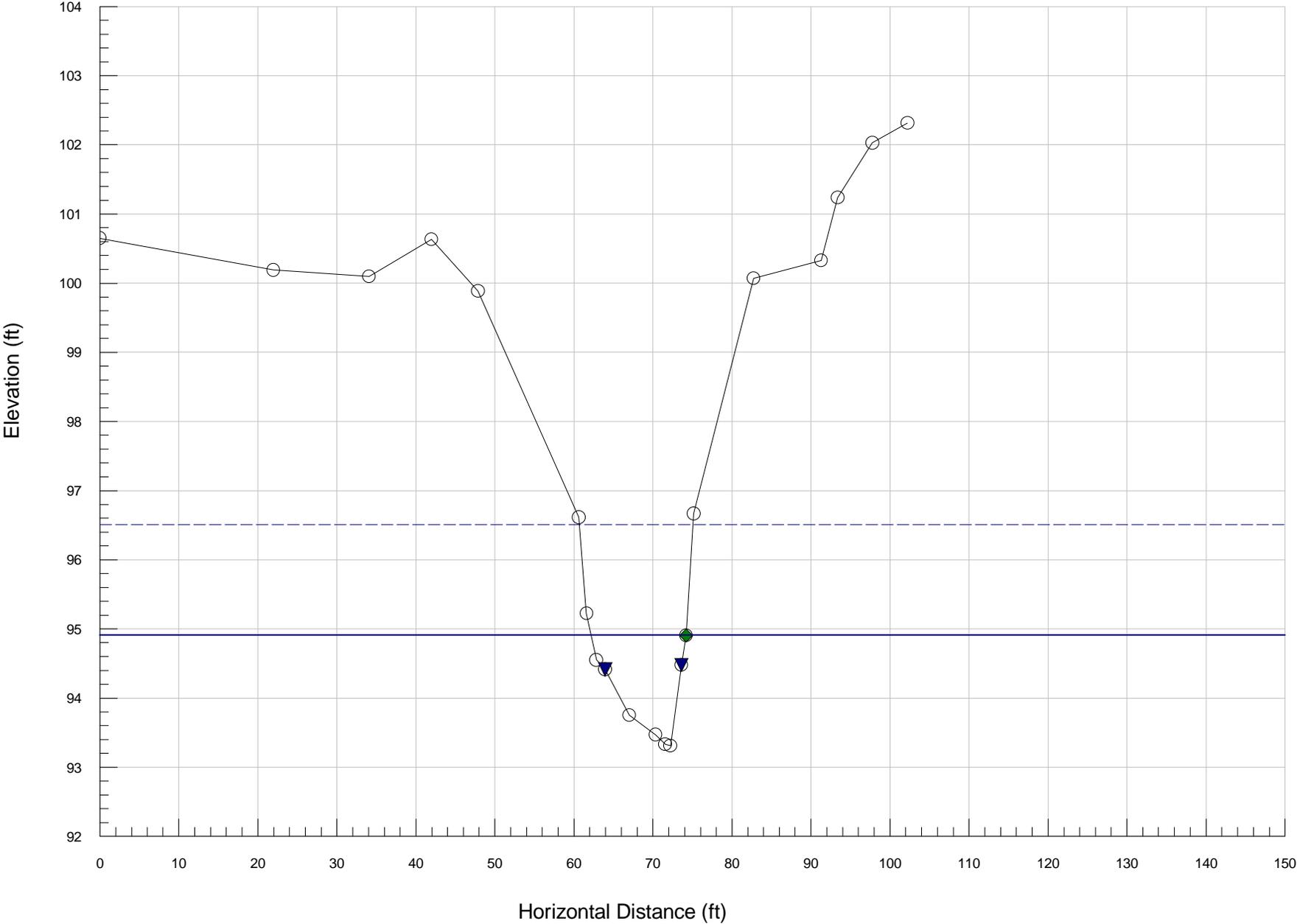
◆ Bankfull Indicators

▼ Water Surface Points

$wbkf = 12$

$Dbkf = .99$

$Abkf = 11.9$



Reach 2 - Cross Section 2 (Pool)

○ Ground Points

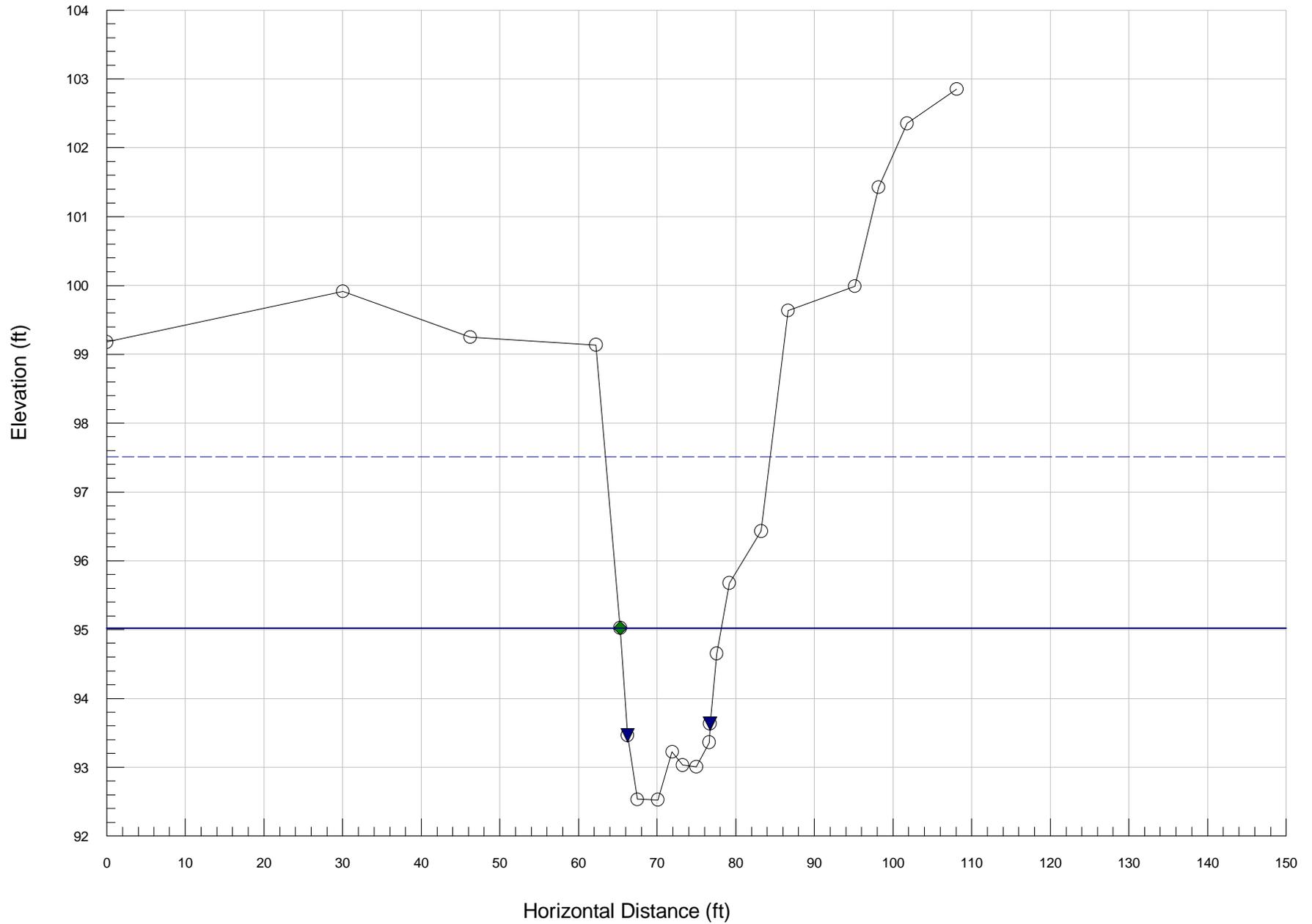
◆ Bankfull Indicators

▼ Water Surface Points

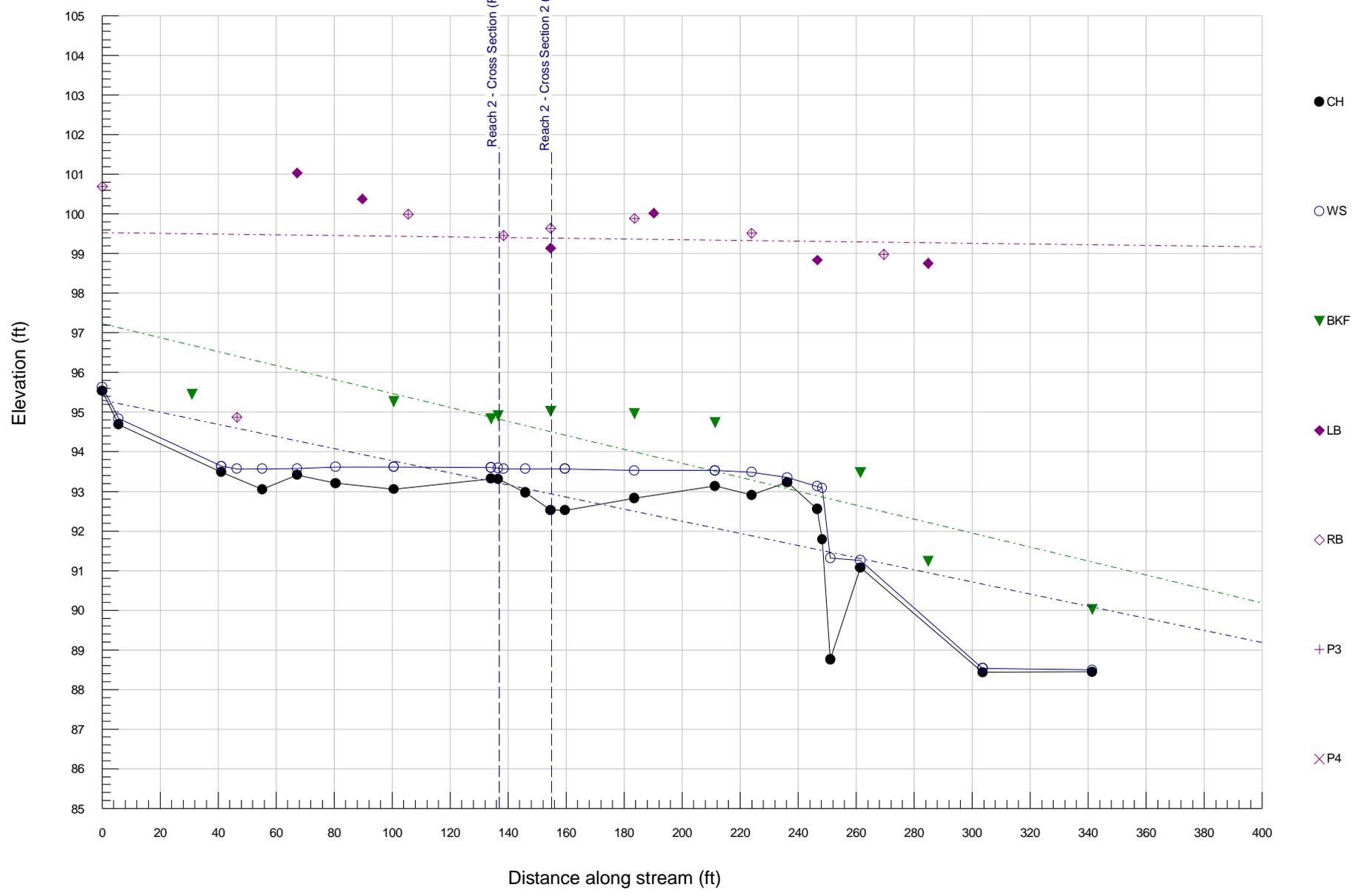
$wbkf = 12.9$

$Dbkf = 1.84$

$Abkf = 23.7$



Reach 2 - Profile



Reach 3 - Cross Section 2 (Riffle)

○ Ground Points

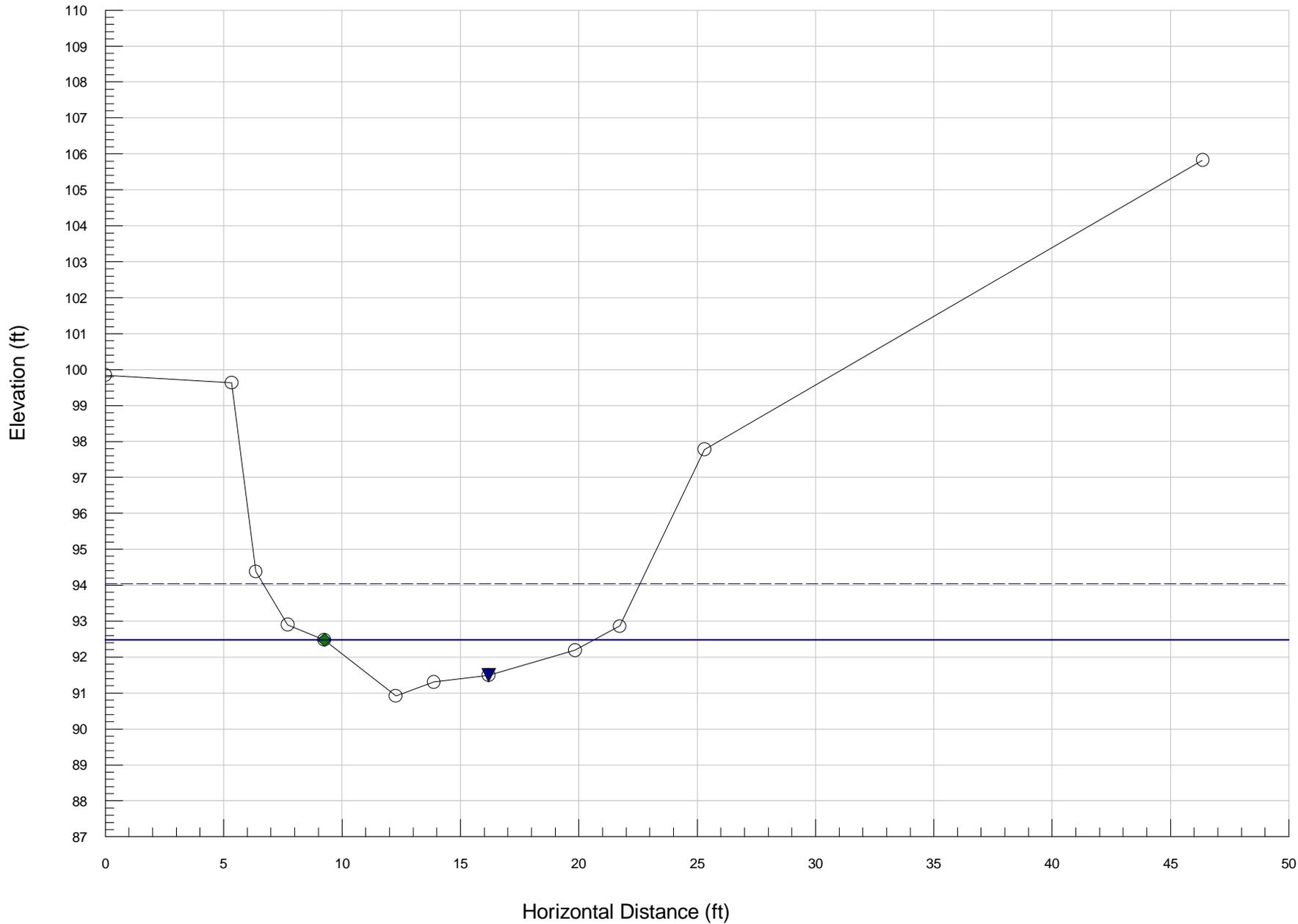
◆ Bankfull Indicators

▼ Water Surface Points

wbkf = 11.4

Dbkf = .83

Abkf = 9.52



Reach 3 - Cross Section 1 (Pool)

○ Ground Points

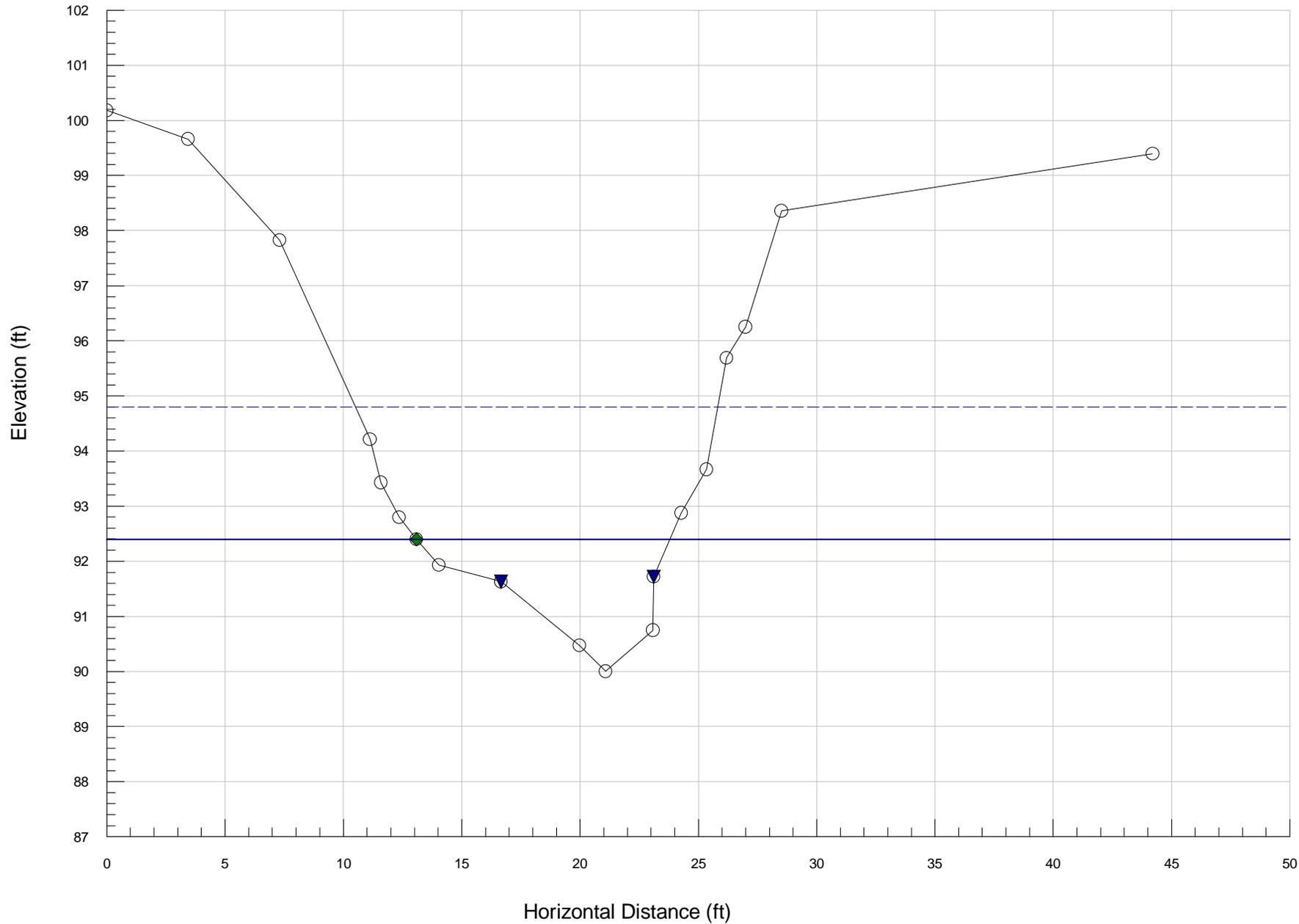
◆ Bankfull Indicators

▼ Water Surface Points

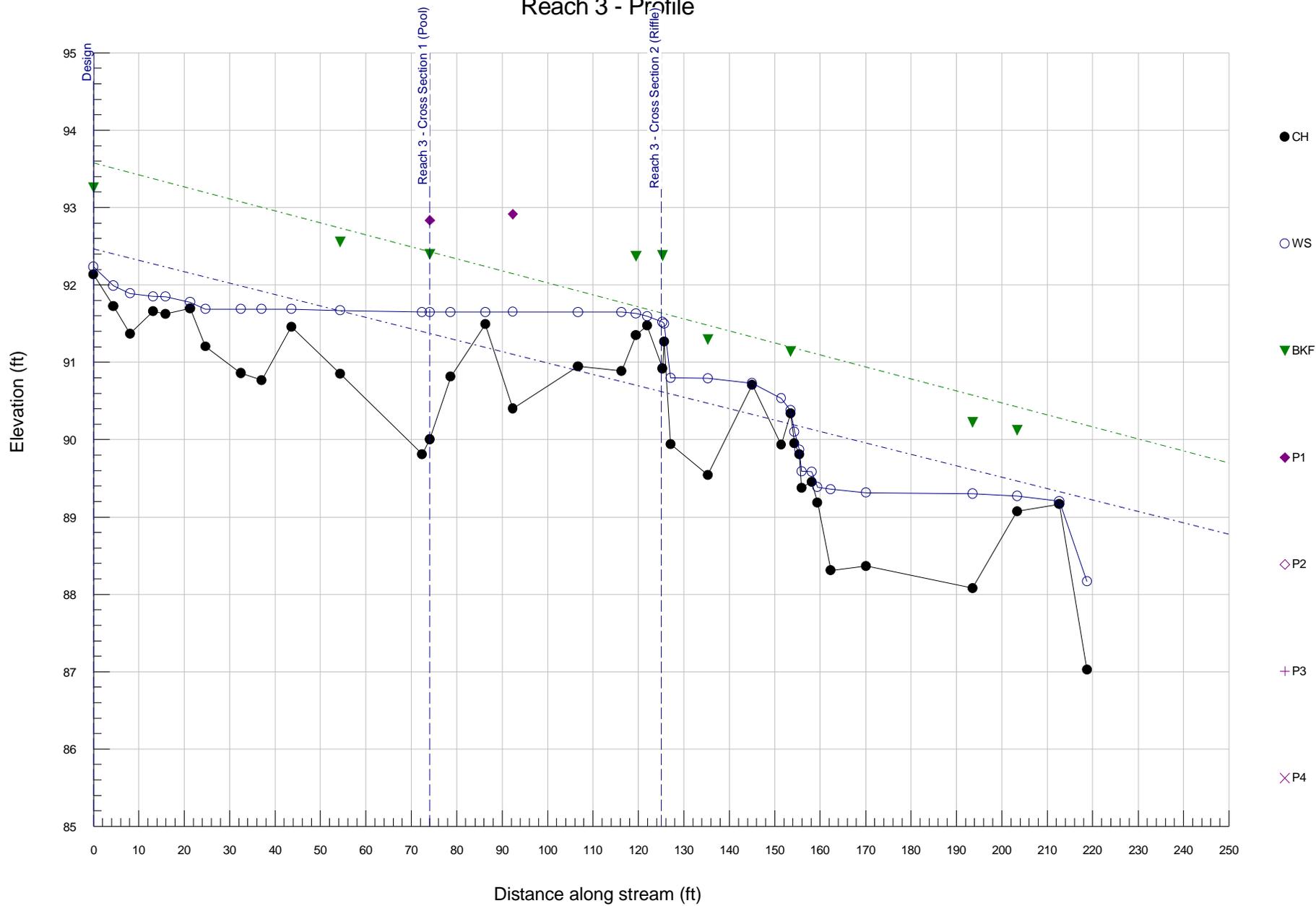
$wbkf = 10.7$

$Dbkf = 1.22$

$Abkf = 13$



Reach 3 - Profile



Reach 4 - Cross Section 1 (Riffle)

○ Ground Points

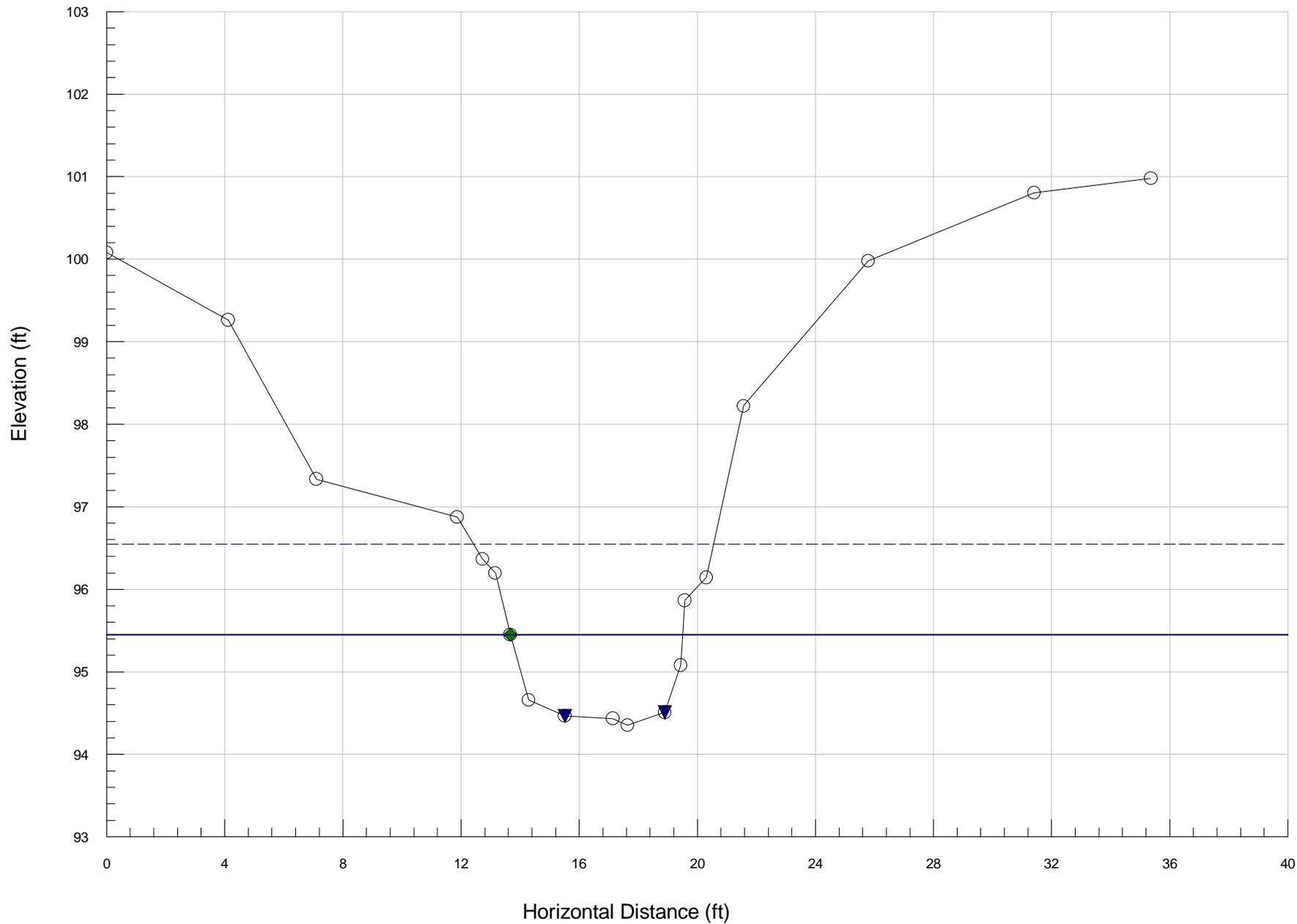
◆ Bankfull Indicators

▼ Water Surface Points

$wbkf = 5.84$

$Dbkf = .88$

$Abkf = 5.14$



Reach 4 - Cross Section 2 (Pool)

○ Ground Points

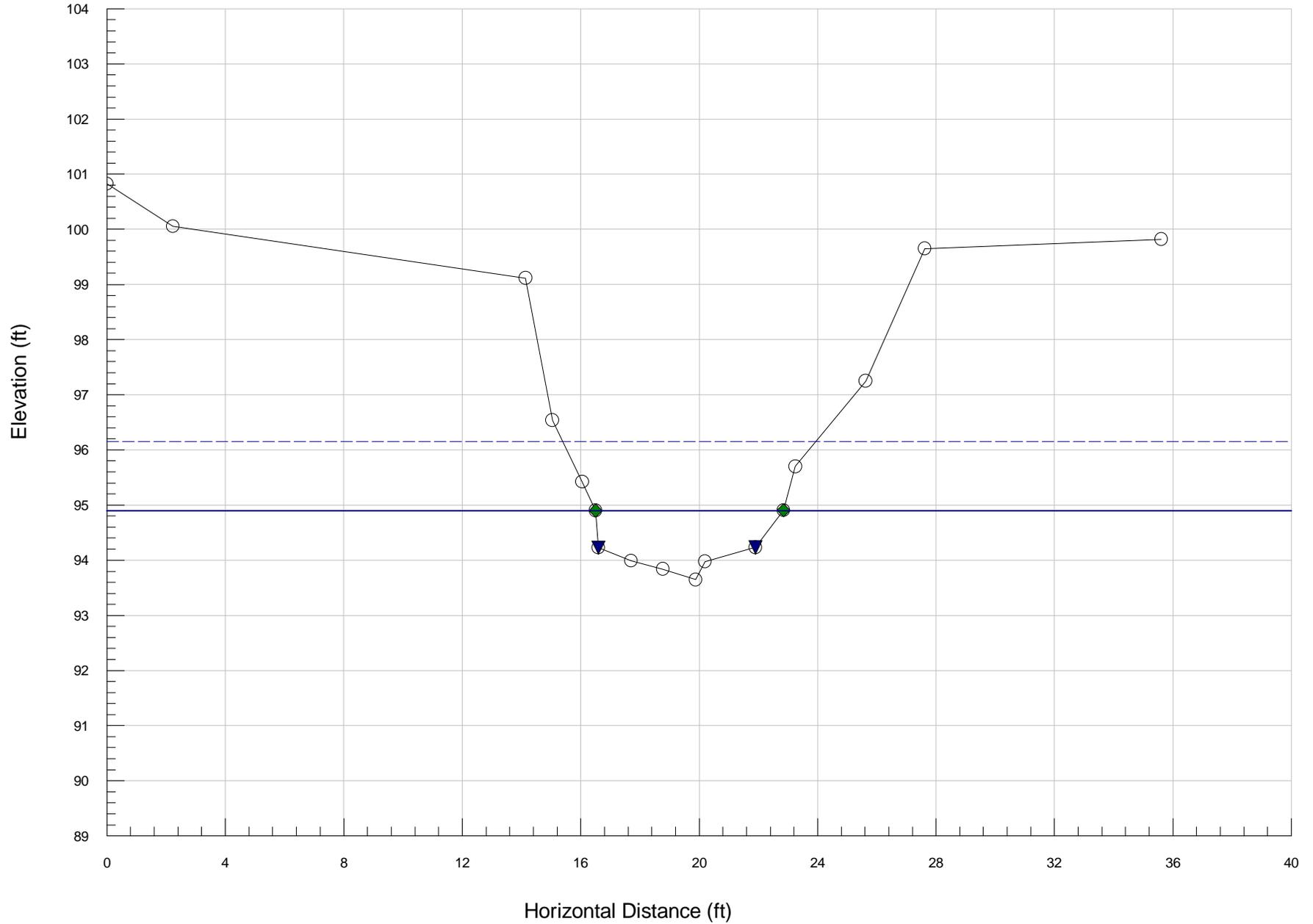
◆ Bankfull Indicators

▼ Water Surface Points

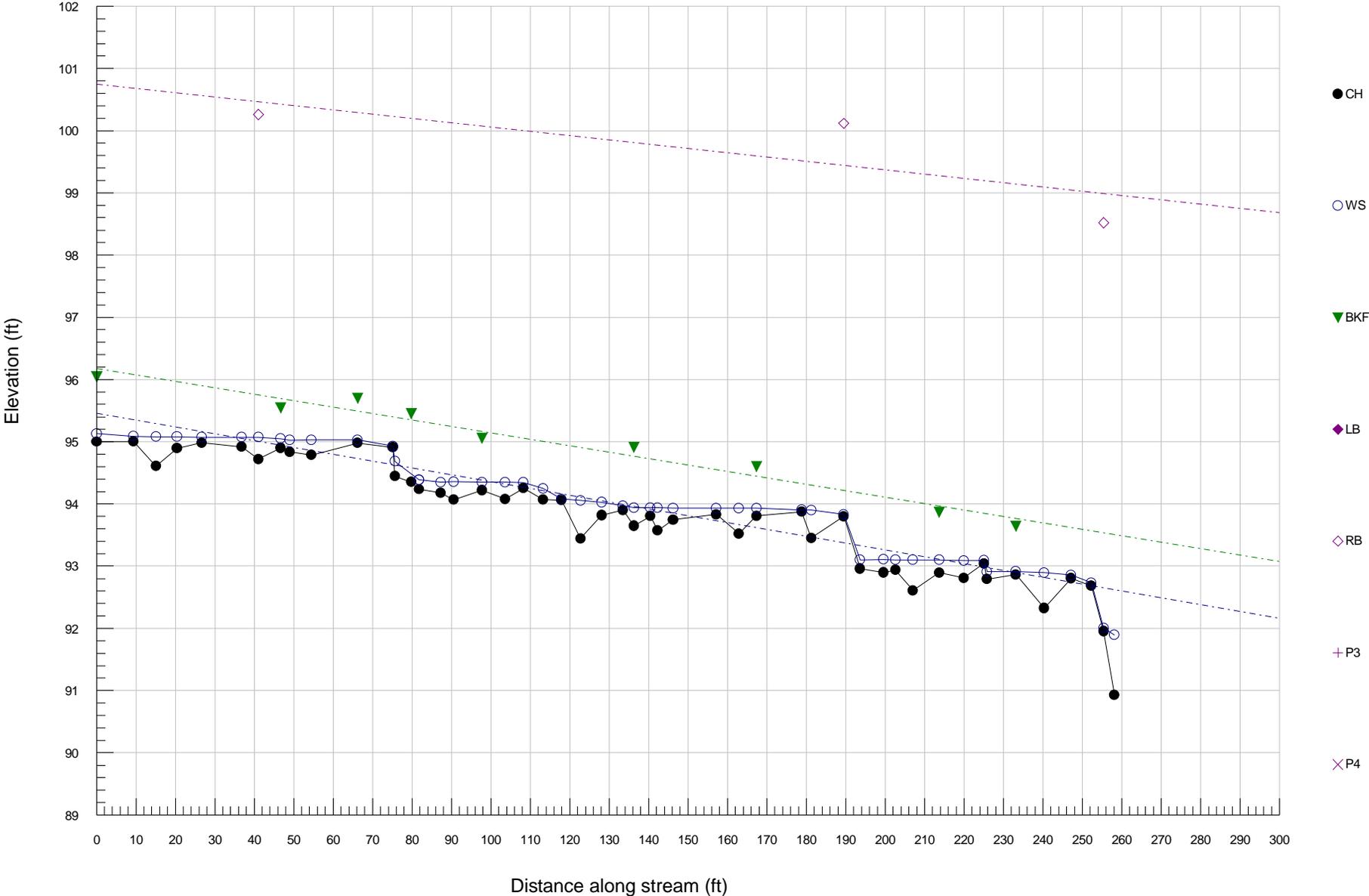
Wbkf = 6.34

Dbkf = .83

Abkf = 5.26



Reach 4 - Profile



Reach 6 - Cross Section 1 (Riffle)

○ Ground Points

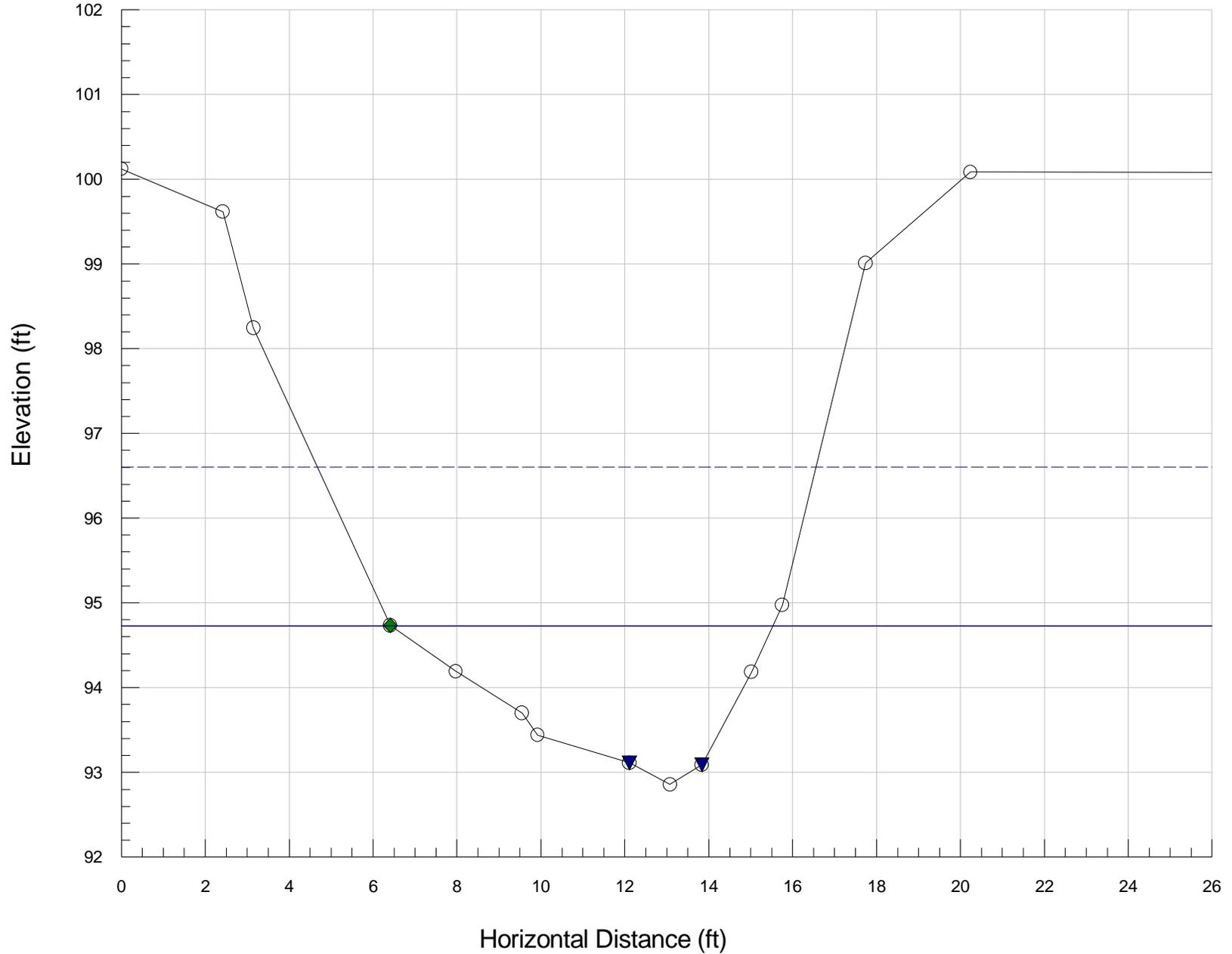
◆ Bankfull Indicators

▼ Water Surface Points

$W_{bkf} = 9.1$

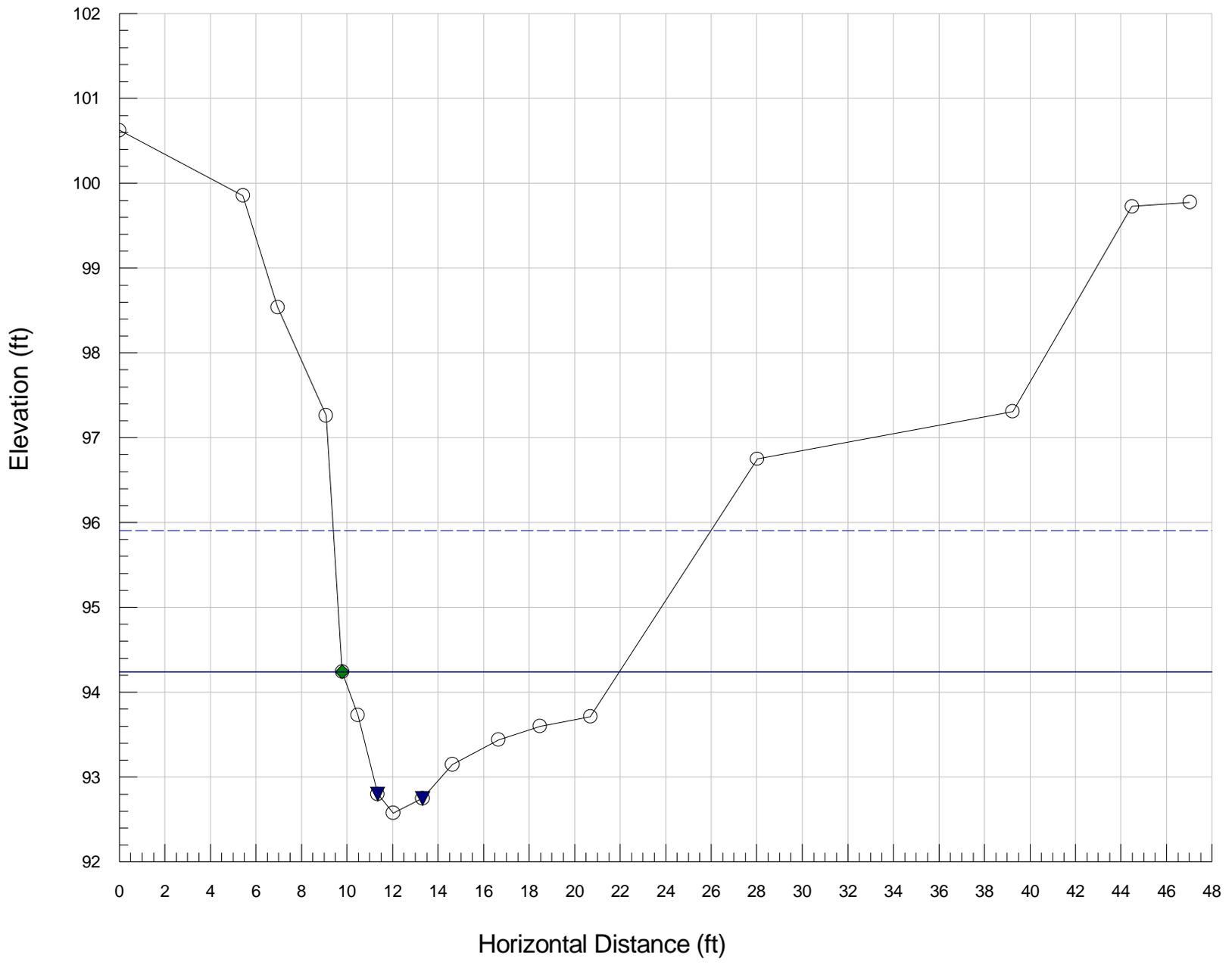
$D_{bkf} = 1.07$

$A_{bkf} = 9.72$

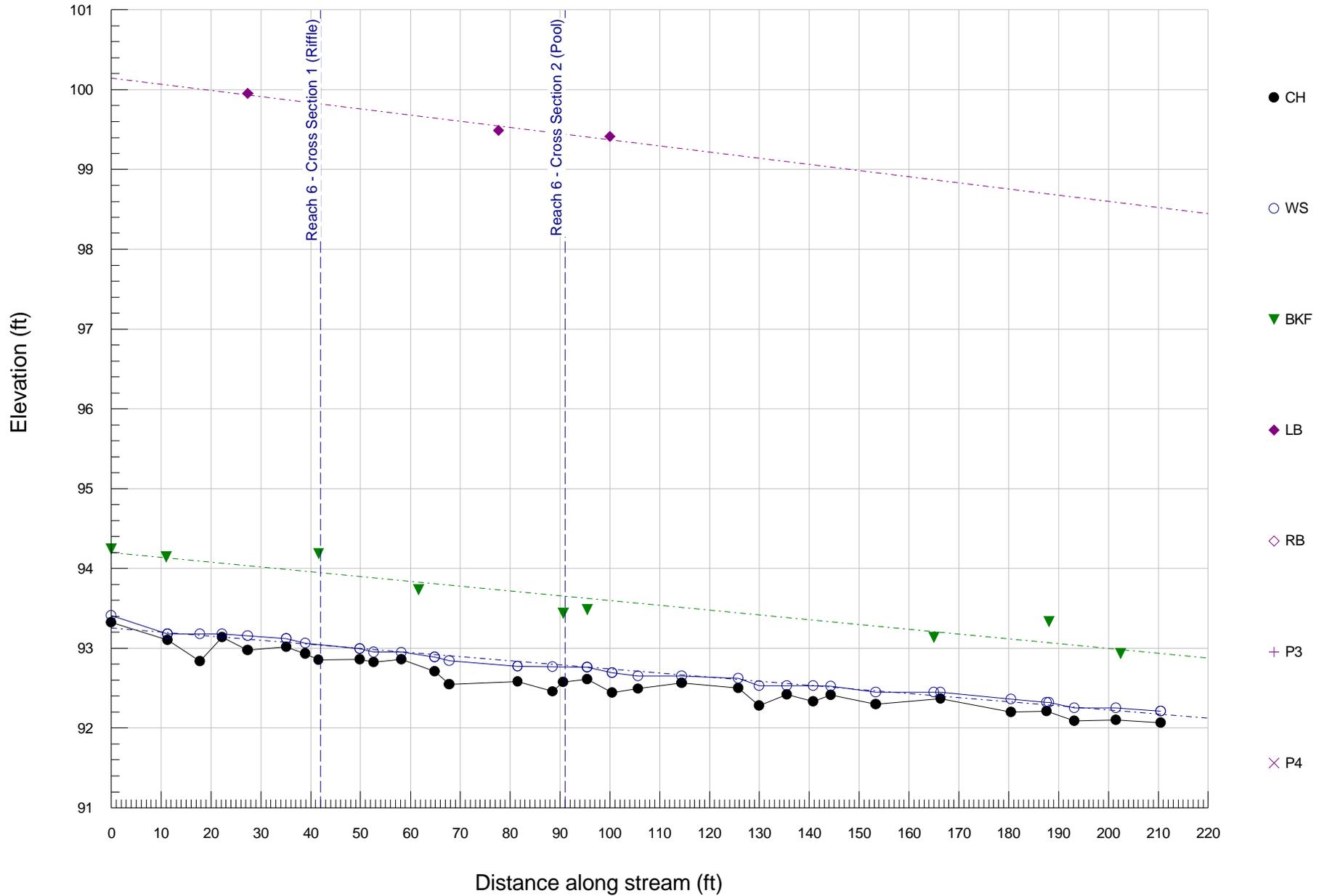


Reach 6 - Cross Section 2 (Pool)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 12.2 Dbkf = .88 Abkf = 10.7

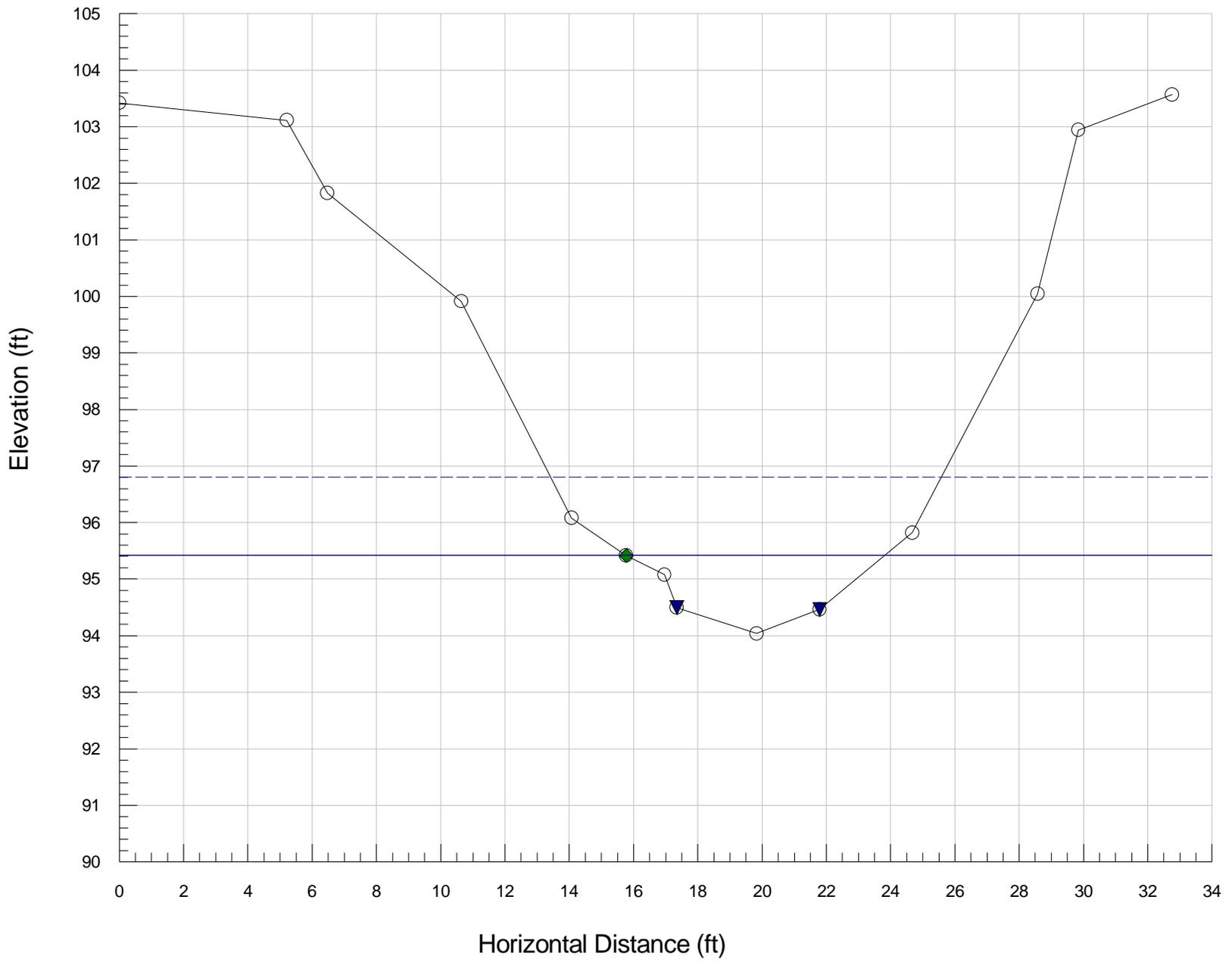


Reach 6 - Profile



Reach 7 - Cross Section 1 (Pool)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 8.05 Dbkf = .82 Abkf = 6.57



Reach 7 - Cross Section 2 (Riffle)

○ Ground Points

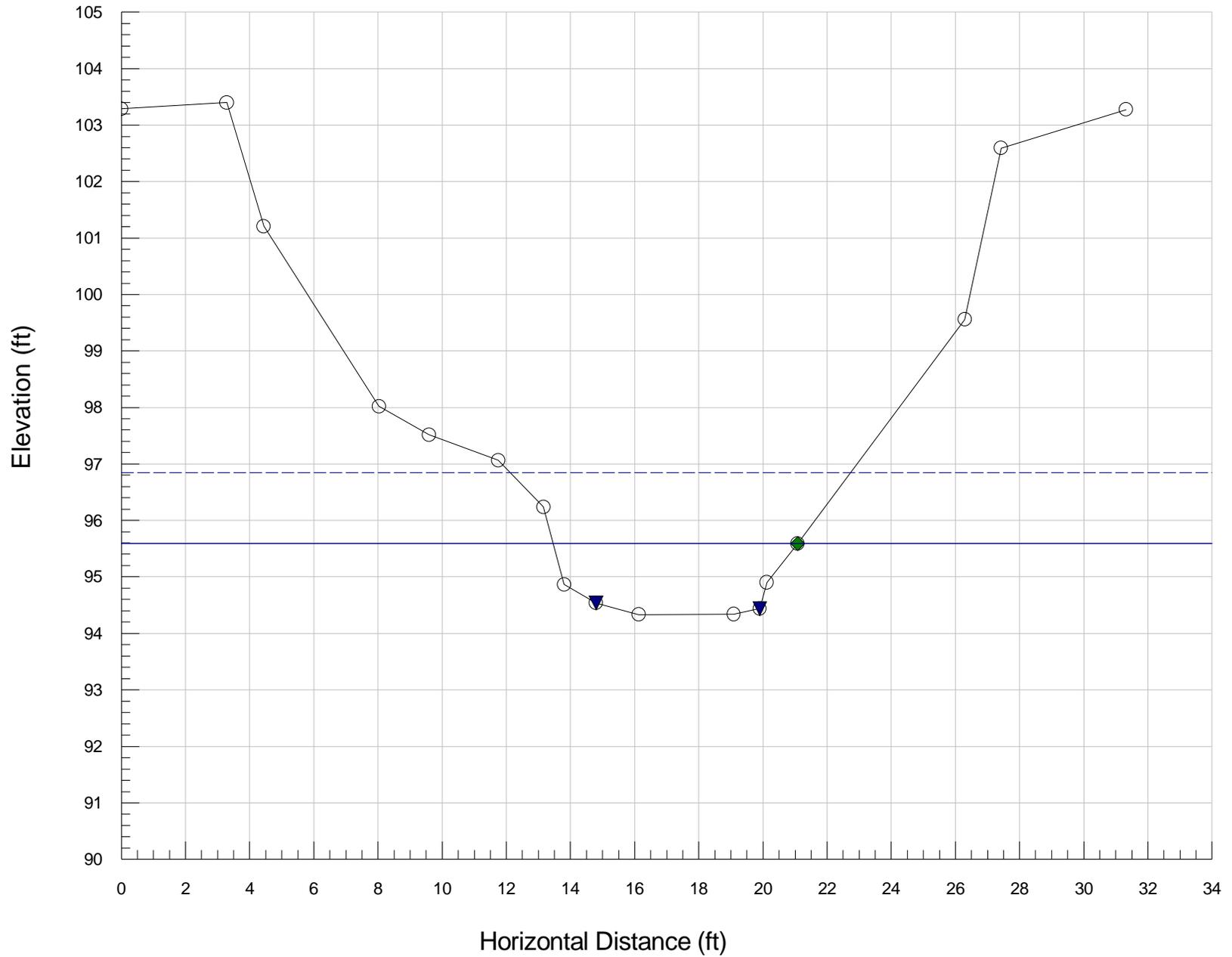
◆ Bankfull Indicators

▼ Water Surface Points

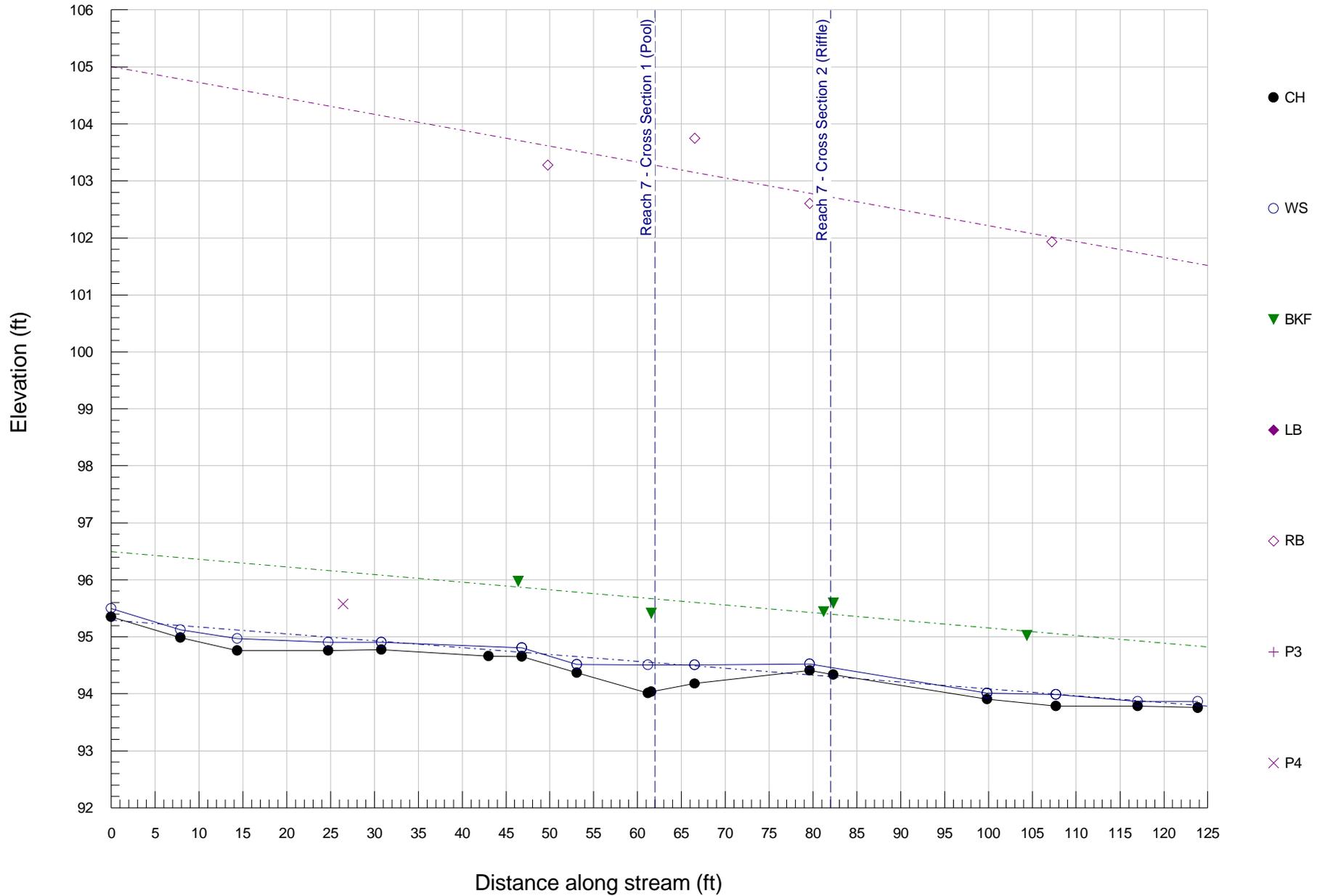
$wbkf = 7.61$

$Dbkf = 1.02$

$Abkf = 7.76$

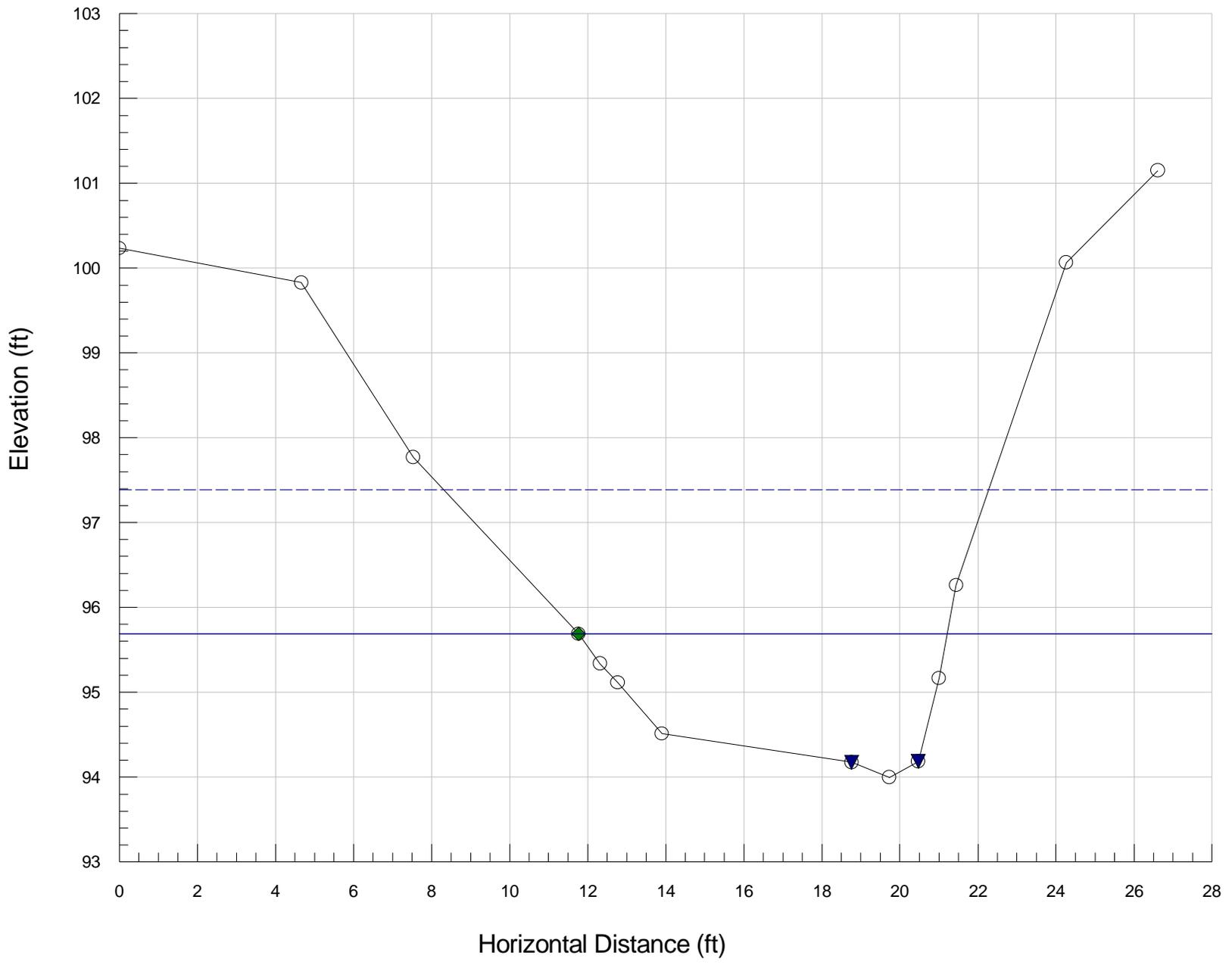


Reach 7 - Profile



Reach 8 - Cross Section 1 (Pool)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 9.44 Dbkf = 1.18 Abkf = 11.2



Reach 8 - Cross Section 2 (Riffle)

○ Ground Points

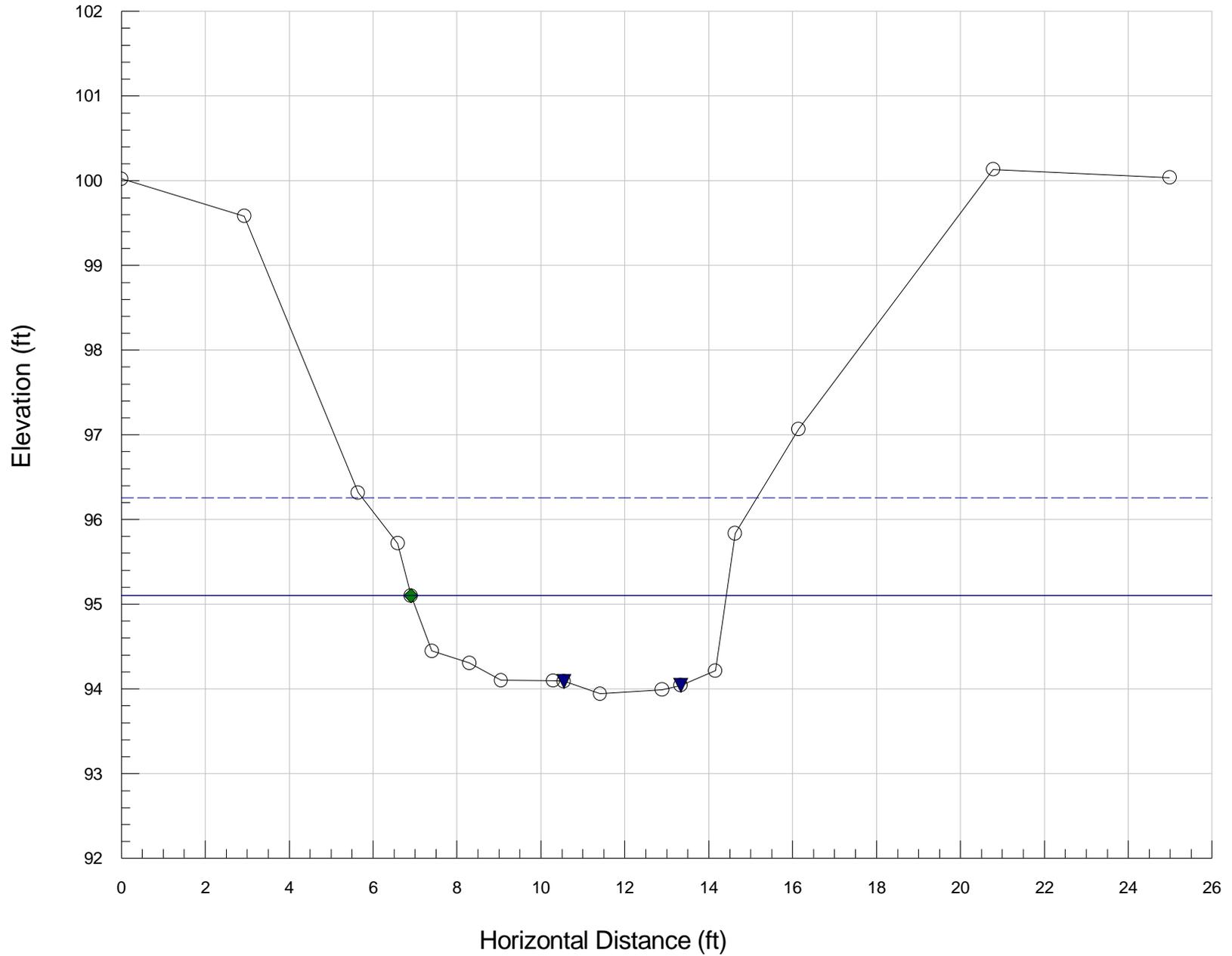
◆ Bankfull Indicators

▼ Water Surface Points

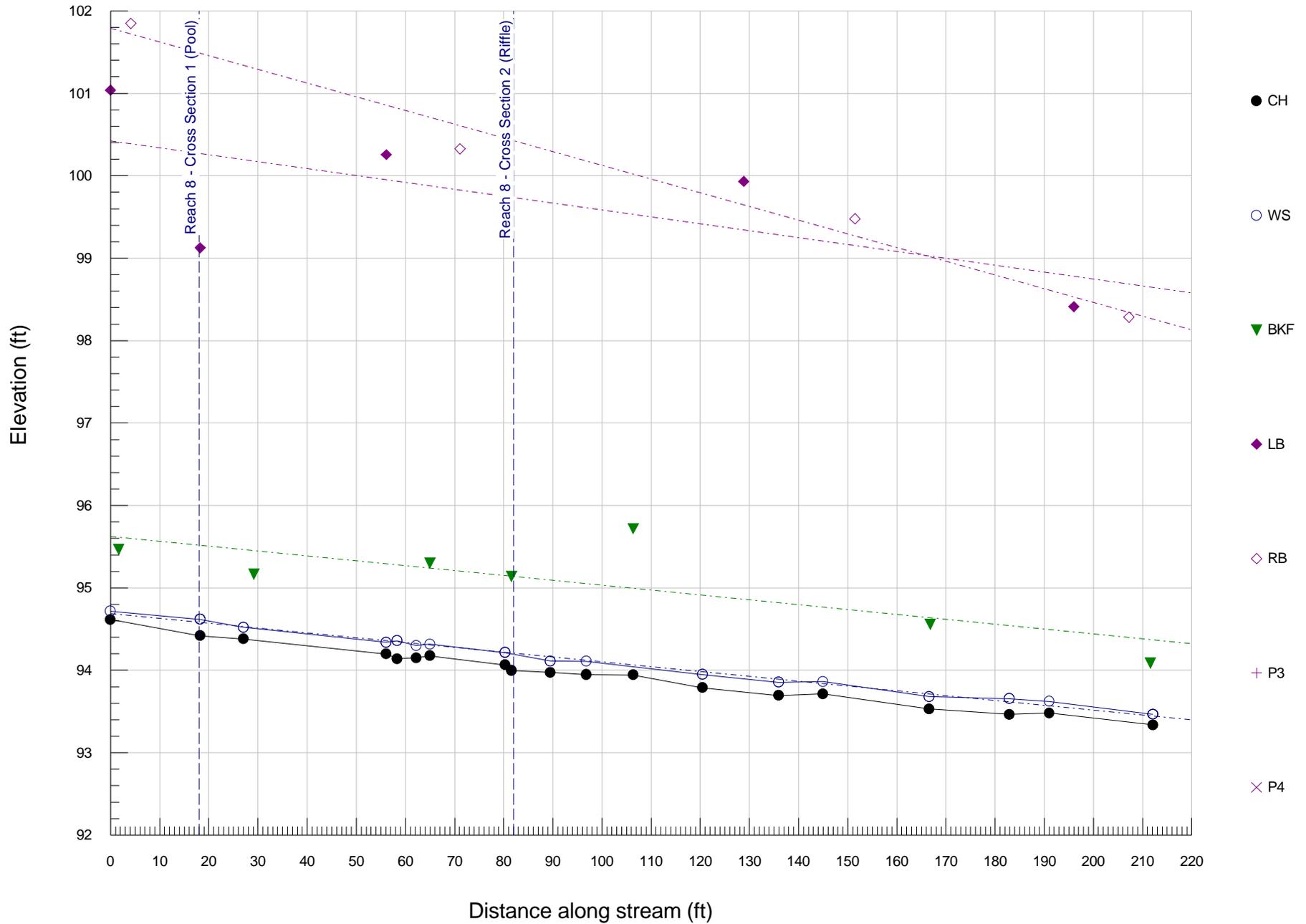
$wbkf = 7.52$

$Dbkf = .93$

$Abkf = 6.99$

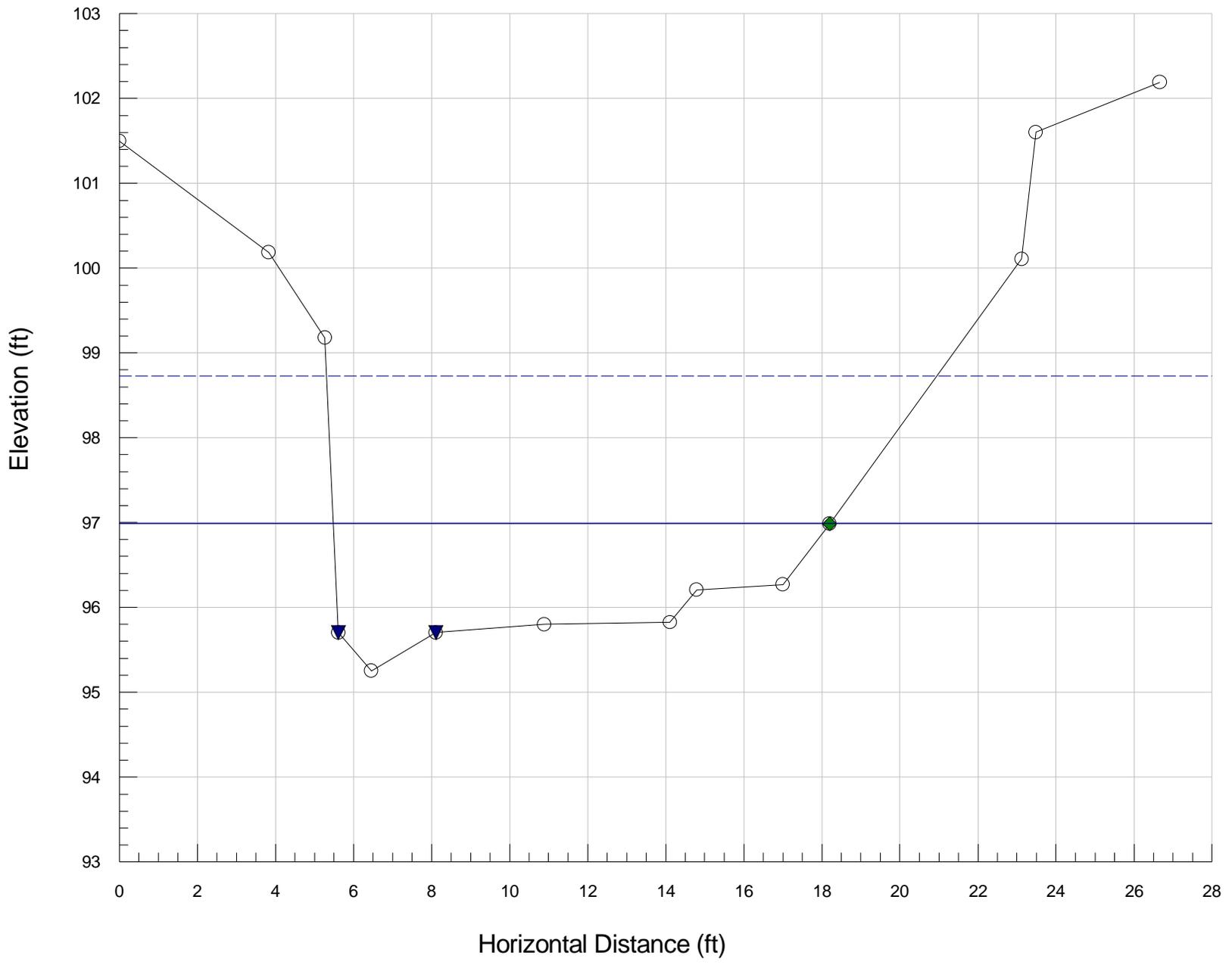


Reach 8 - Profile



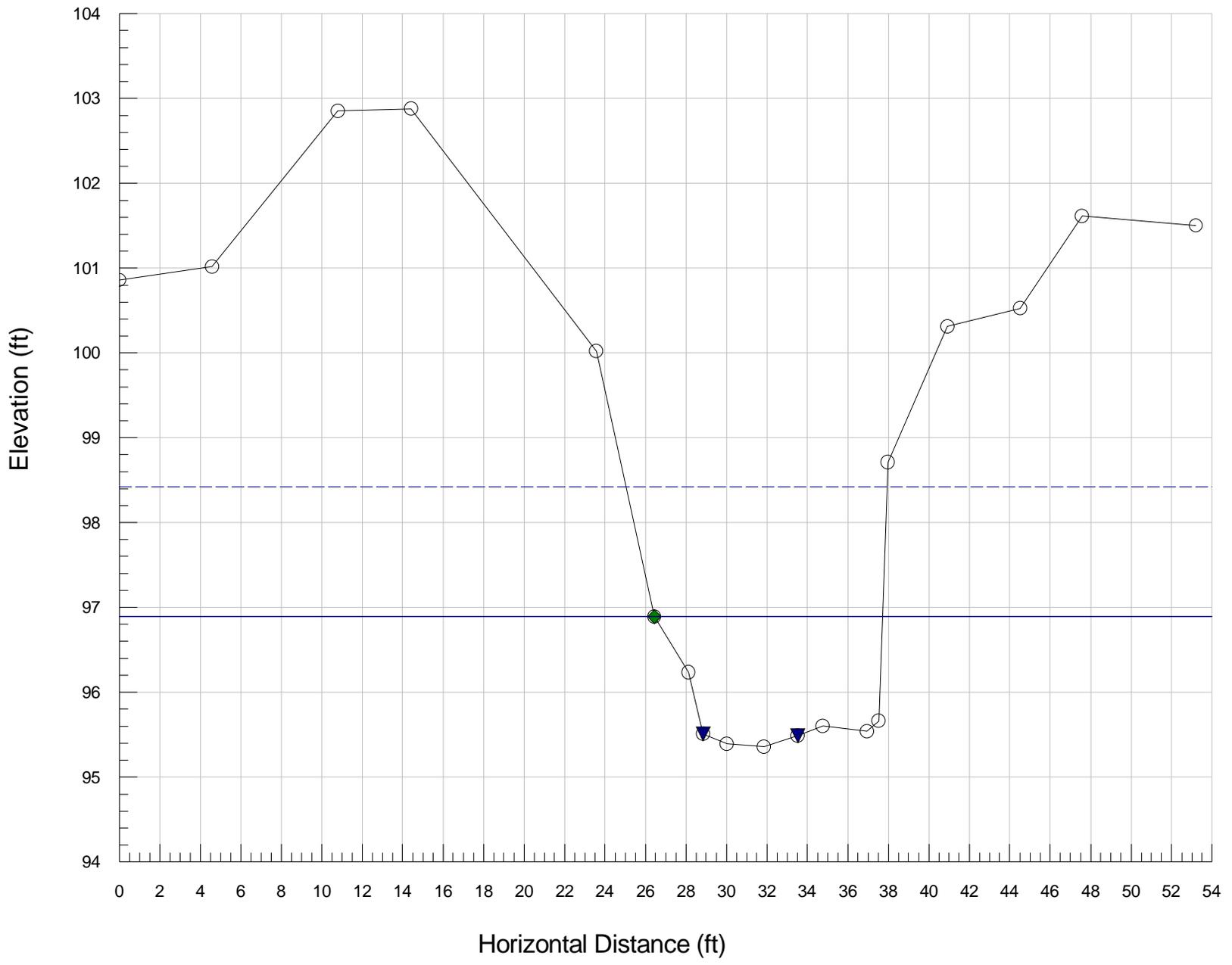
Reach 9 - Cross Section 1 (Pool)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 12.7 Dbkf = 1.09 Abkf = 13.8



Reach 9 - Cross Section 2 (Riffle)

○ Ground Points ◆ Bankfull Indicators ▼ Water Surface Points
wbkf = 11.3 dbkf = 1.21 abkf = 13.6



Reach 9 - Profile

