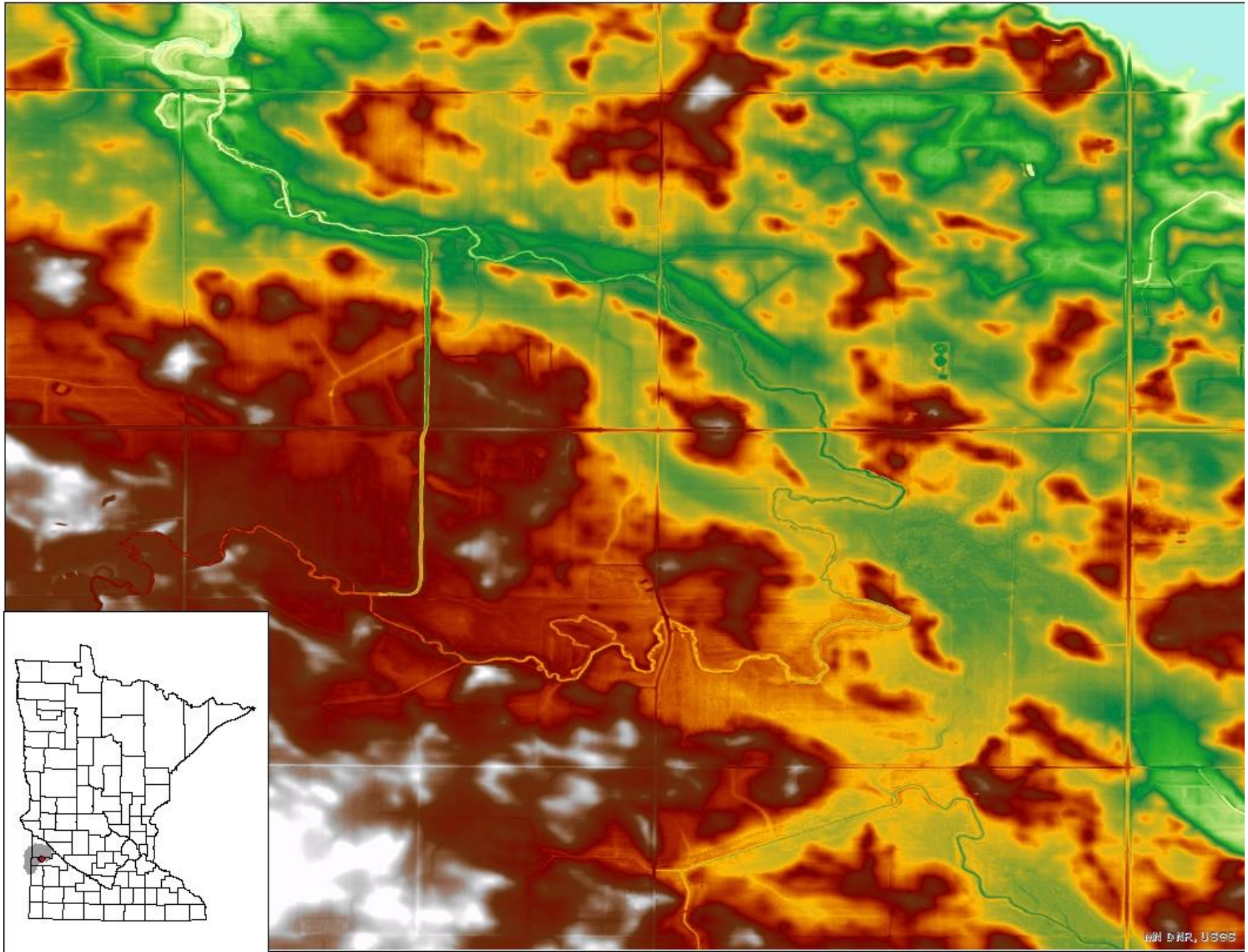
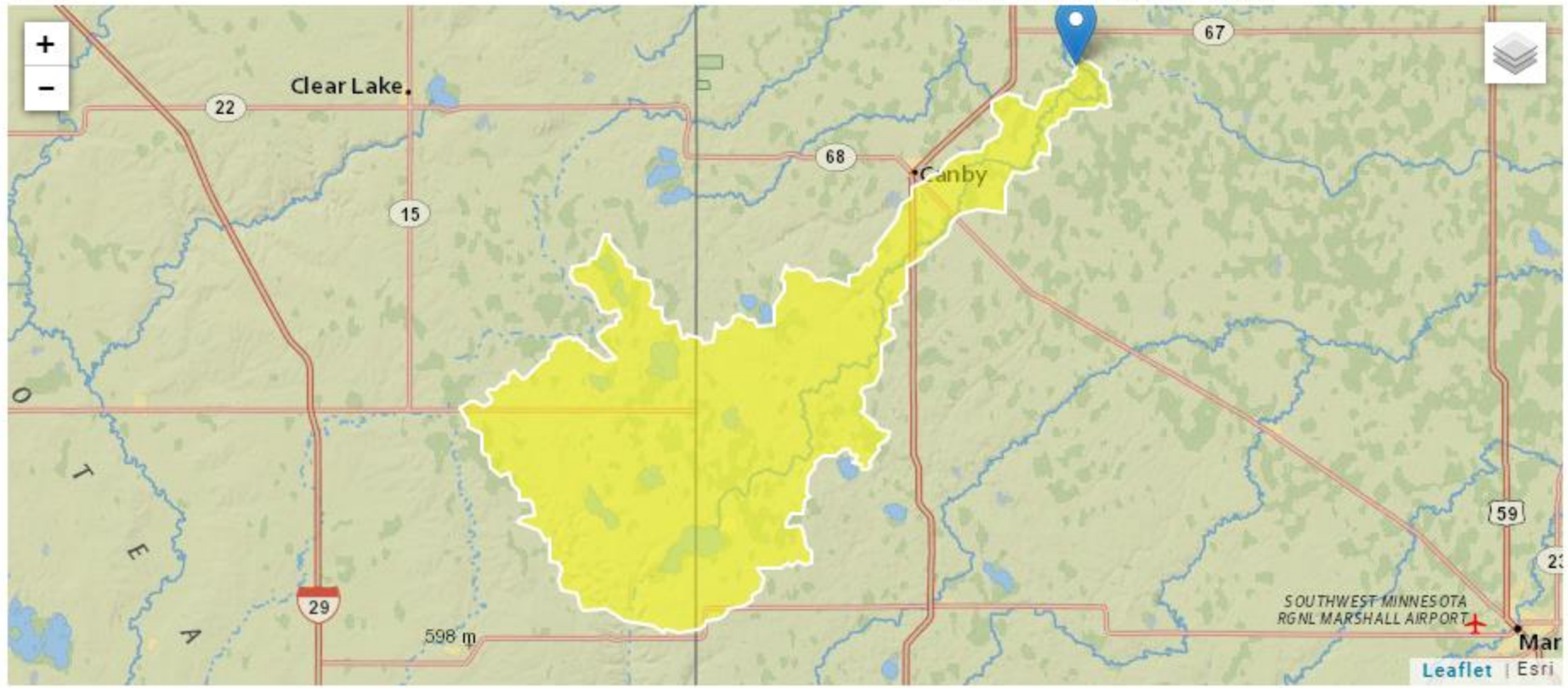
Lac qui Parle River Floodway: Survey Results


MN DNR, USGS

StreamStats Report

Region ID:	MN
Workspace ID:	MN20191126204452733000
Clicked Point (Latitude, Longitude):	44.76961, -96.14528
Time:	2019-11-26 14:45:10 -0600



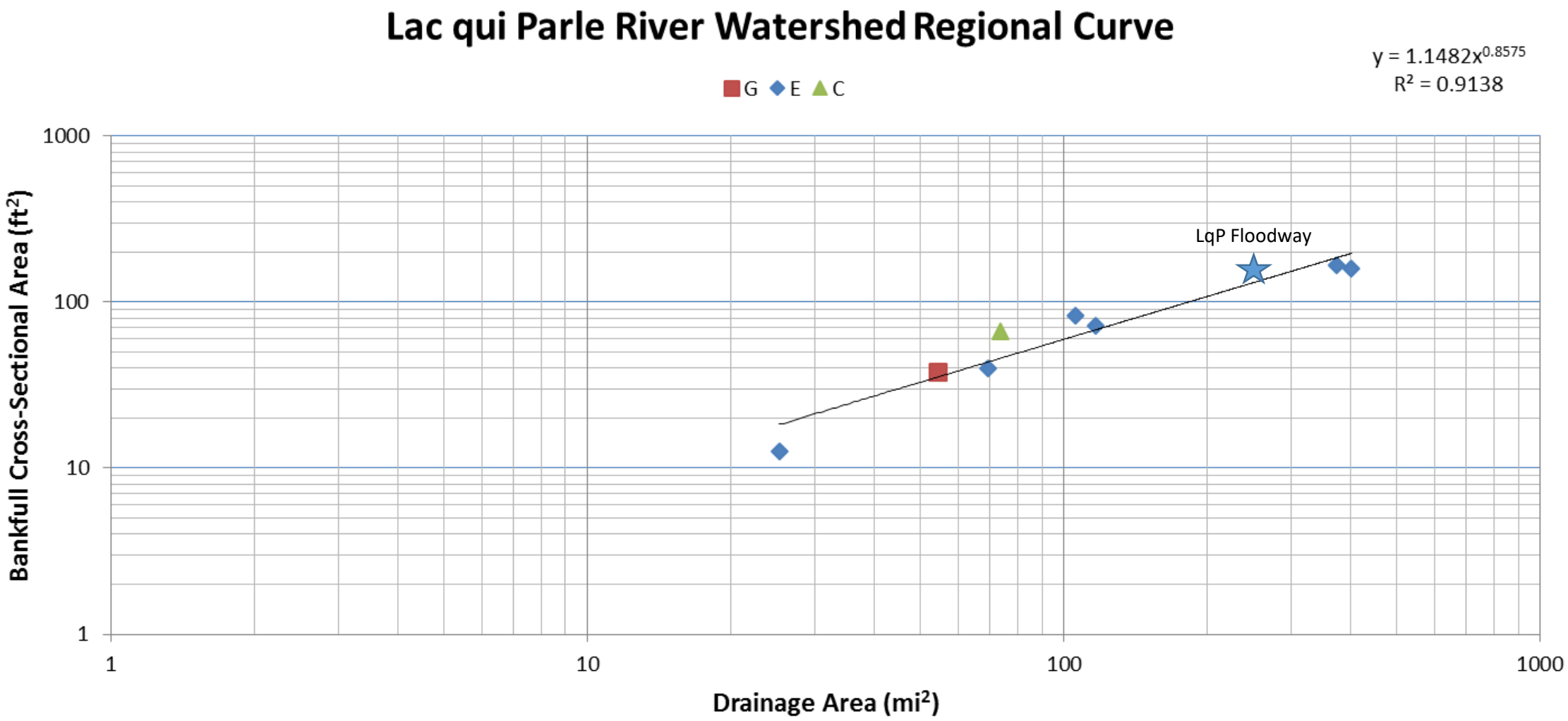
Peak-Flow Statistics Parameters[100 Percent (177 square miles) Region D]

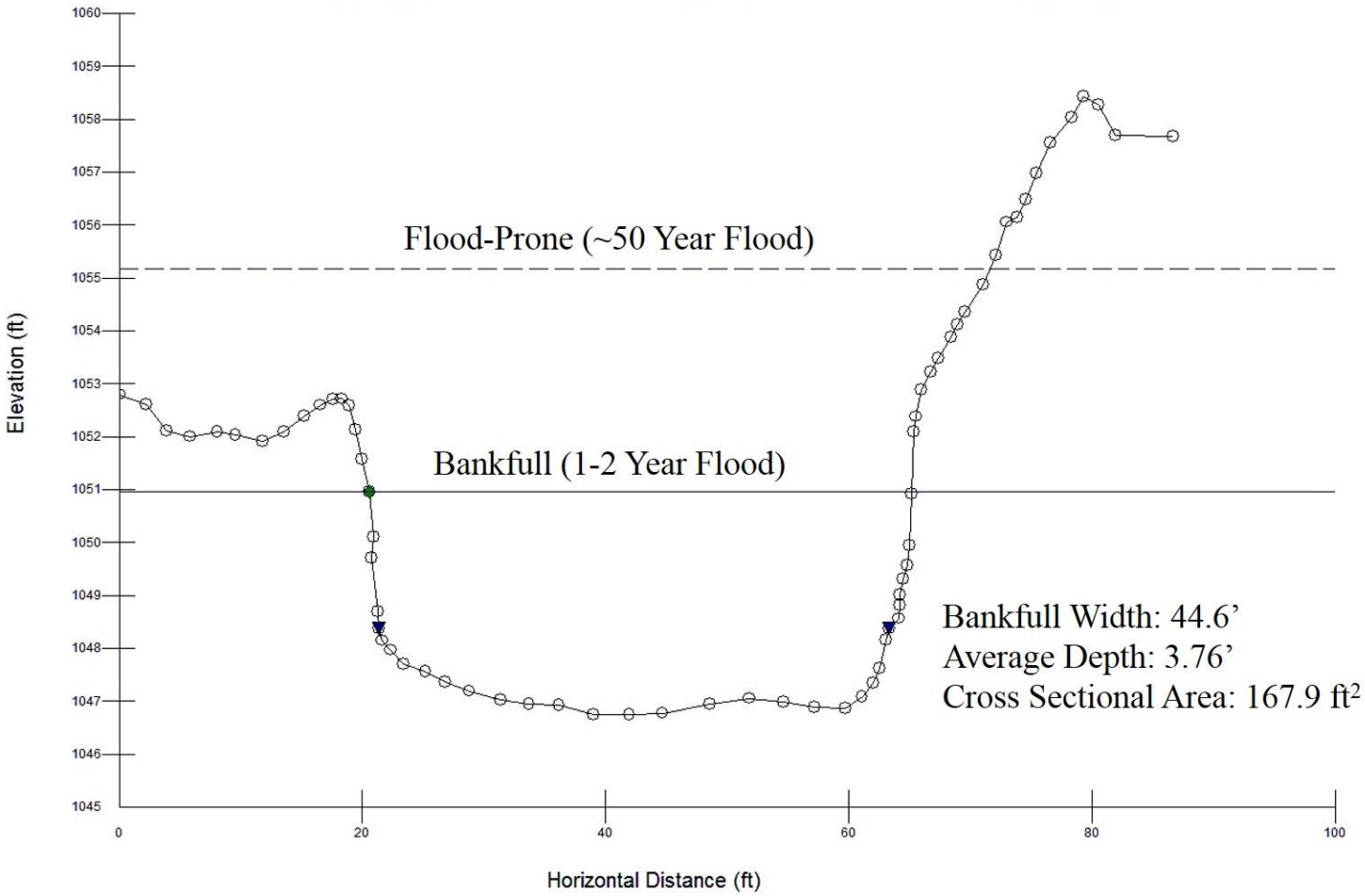
Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	177.69	square miles	0.15	2640
CSL10_85	Stream Slope 10 and 85 Method	11.3	feet per mi	1.49	77.2
LAKEAREA	Percent Lakes and Ponds	2.9	percent	0	14
GENRO	Generalized Runoff	2.89	inches	2.15	7.8

Peak-Flow Statistics Flow Report[100 Percent (177 square miles) Region D]

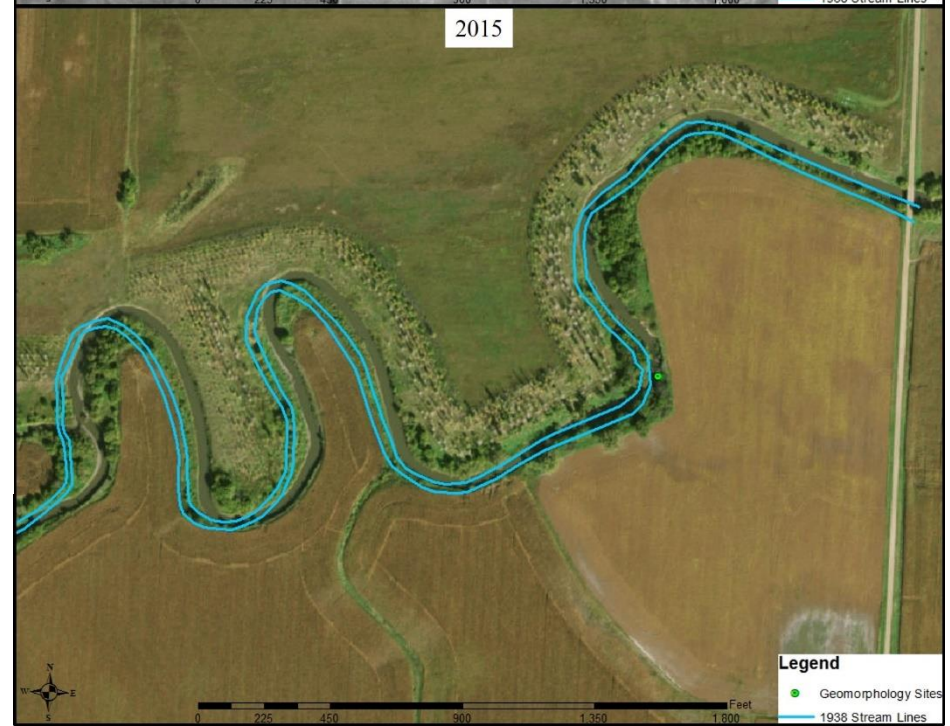
PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp	SE	Equiv. Yrs.
1.5 Year Peak Flood	317	ft^3/s	112	684	63.5	63.5	3.1
2 Year Peak Flood	496	ft^3/s	197	1000	56.2	56.2	3.5
5 Year Peak Flood	1140	ft^3/s	515	2150	49.7	49.7	6.3
10 Year Peak Flood	1740	ft^3/s	791	3260	50.8	50.8	8.8
25 Year Peak Flood	2690	ft^3/s	1180	5150	55.2	55.2	11.4
50 Year Peak Flood	3530	ft^3/s	1480	6940	59.7	59.7	12.8
100 Year Peak Flood	4510	ft^3/s	1800	9160	64.8	64.8	13.8
500 Year Peak Flood	7140	ft^3/s	2470	15800	78	78	14.8


Lac qui Parle River Watershed Regional Curve
y = 1.1482x^0.8575
R² = 0.9138
G
E
C
LqP Floodway
Bankfull Cross-Sectional Area (ft²)
Drainage Area (mi²)
1000
100
10
1
1
10
100
1000

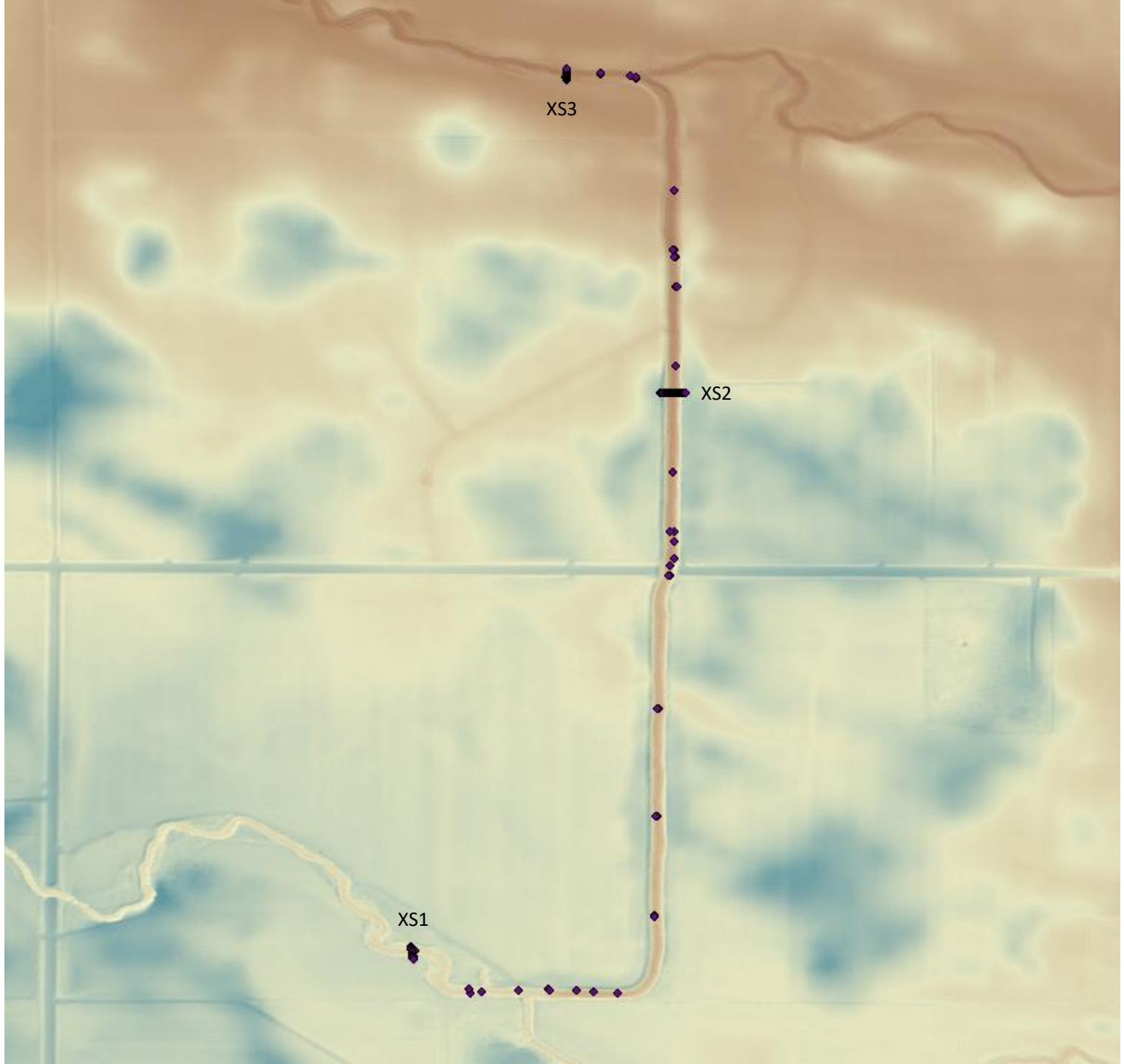

Flood-Prone (~50 Year Flood)
Bankfull (1-2 Year Flood)
Bankfull Width: 44.6’
Average Depth: 3.76’
Cross Sectional Area: 167.9 ft²
Elevation (ft)
Horizontal Distance (ft)
1060
1059
1058
1057
1056
1055
1054
1053
1052
1051
1050
1049
1048
1047
1046
1045
0
20
40
60
80
100

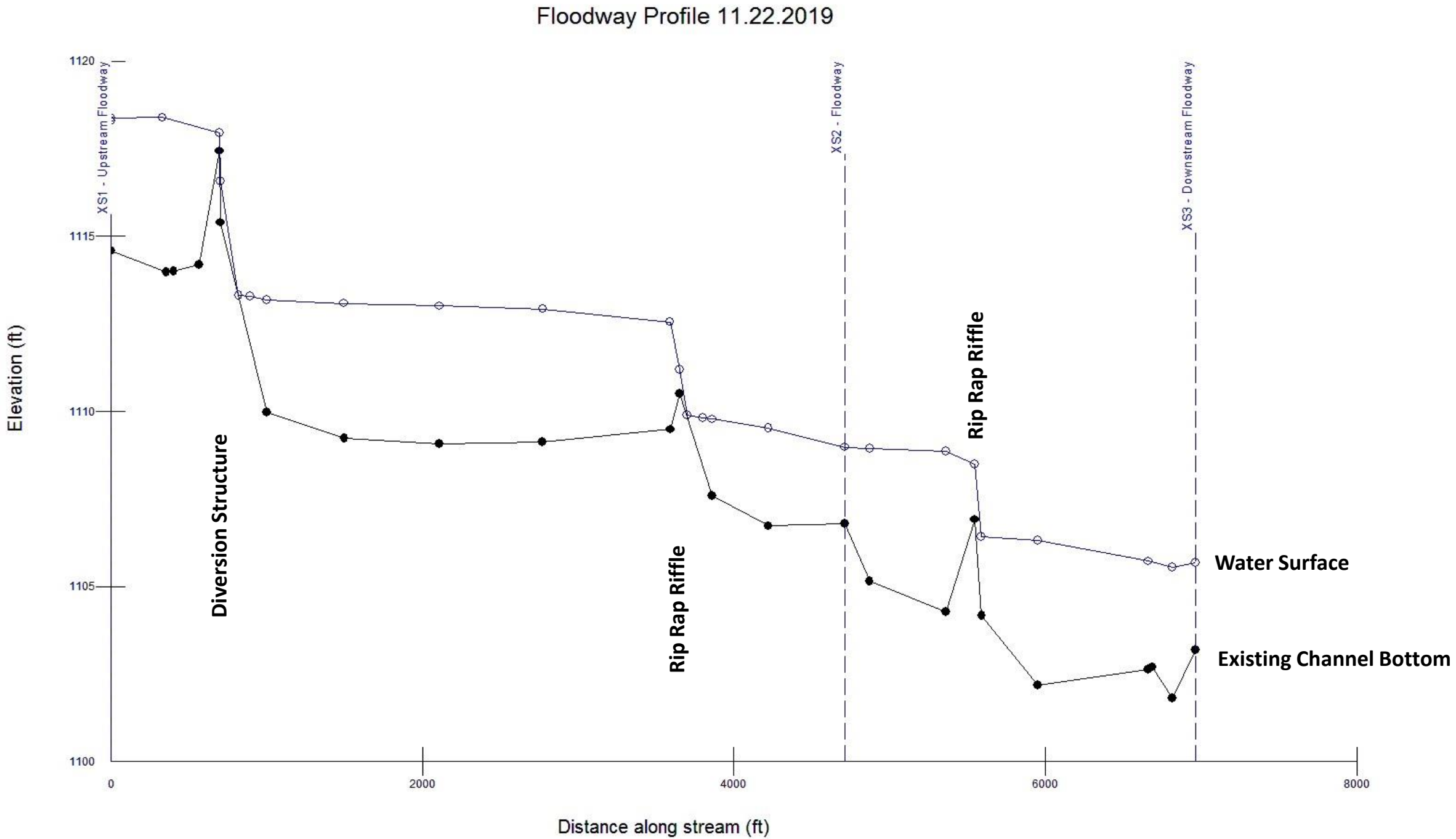

1938
Legend
Geomorphology Sites
1938 Stream Lines
Feet

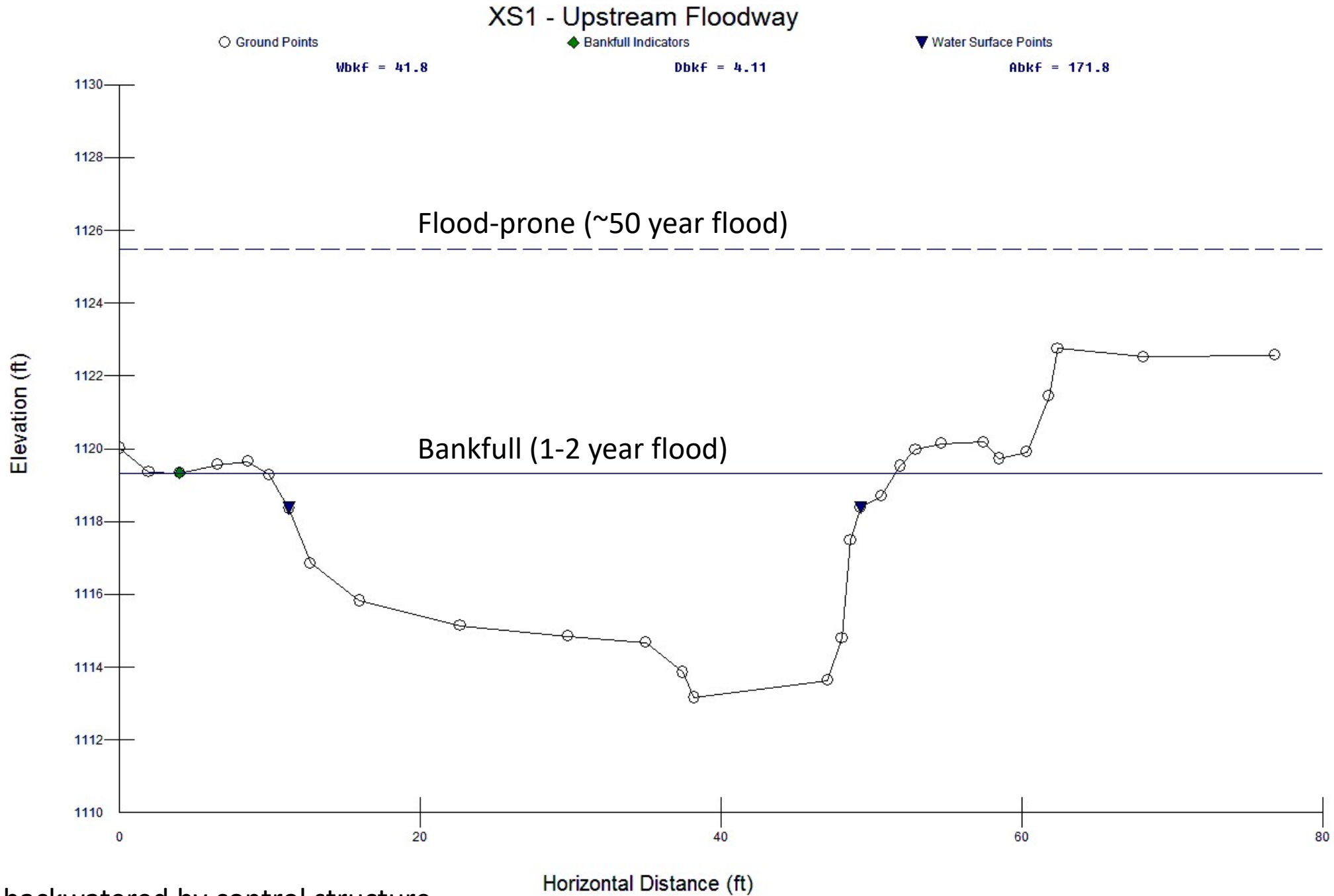

2015
Legend
Geomorphology Sites
1938 Stream Lines
Feet

- 10/28-29/2019 Historic Channel
- 11/22/2019 Floodway

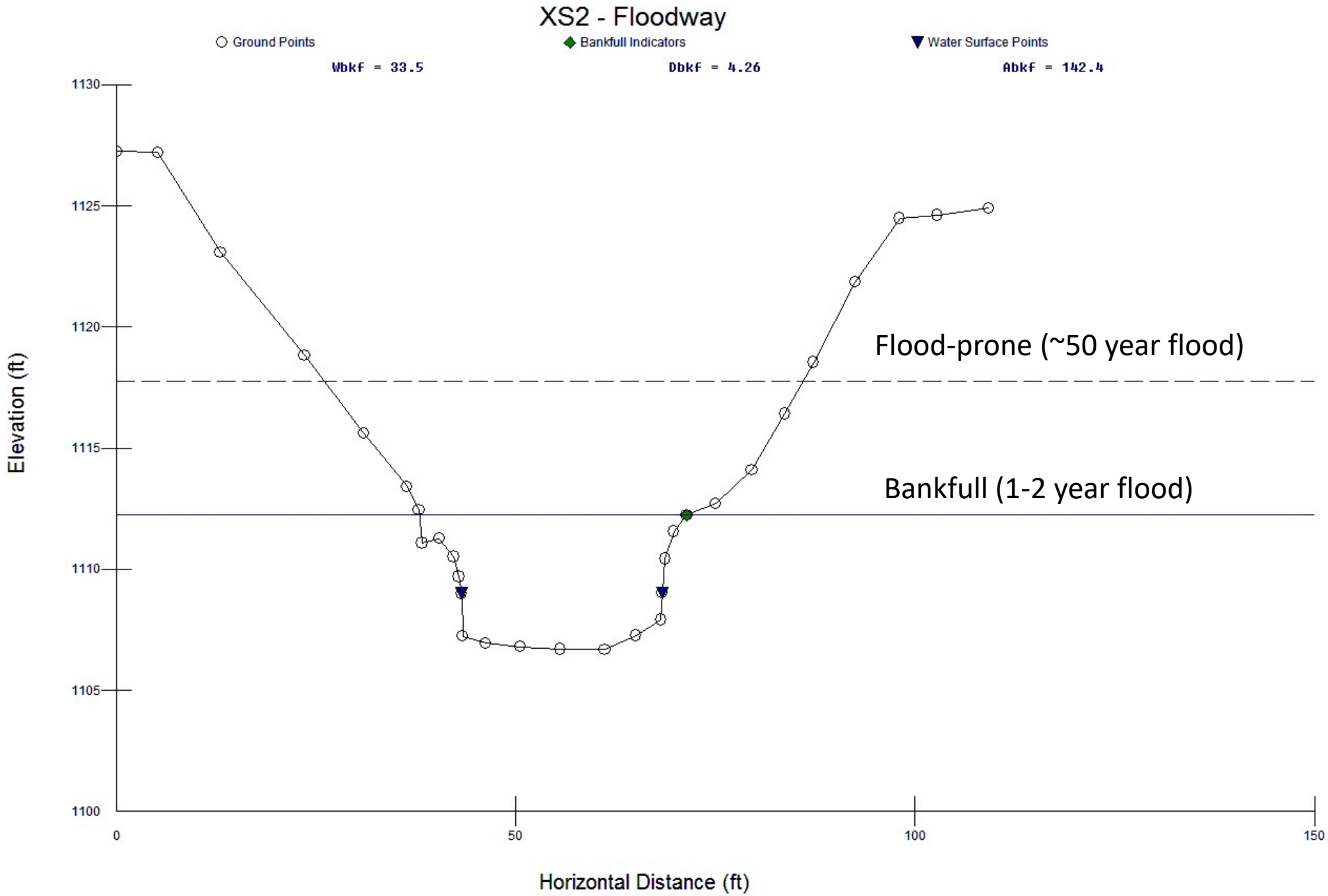
Floodway Channel Survey Points
11/26/2019

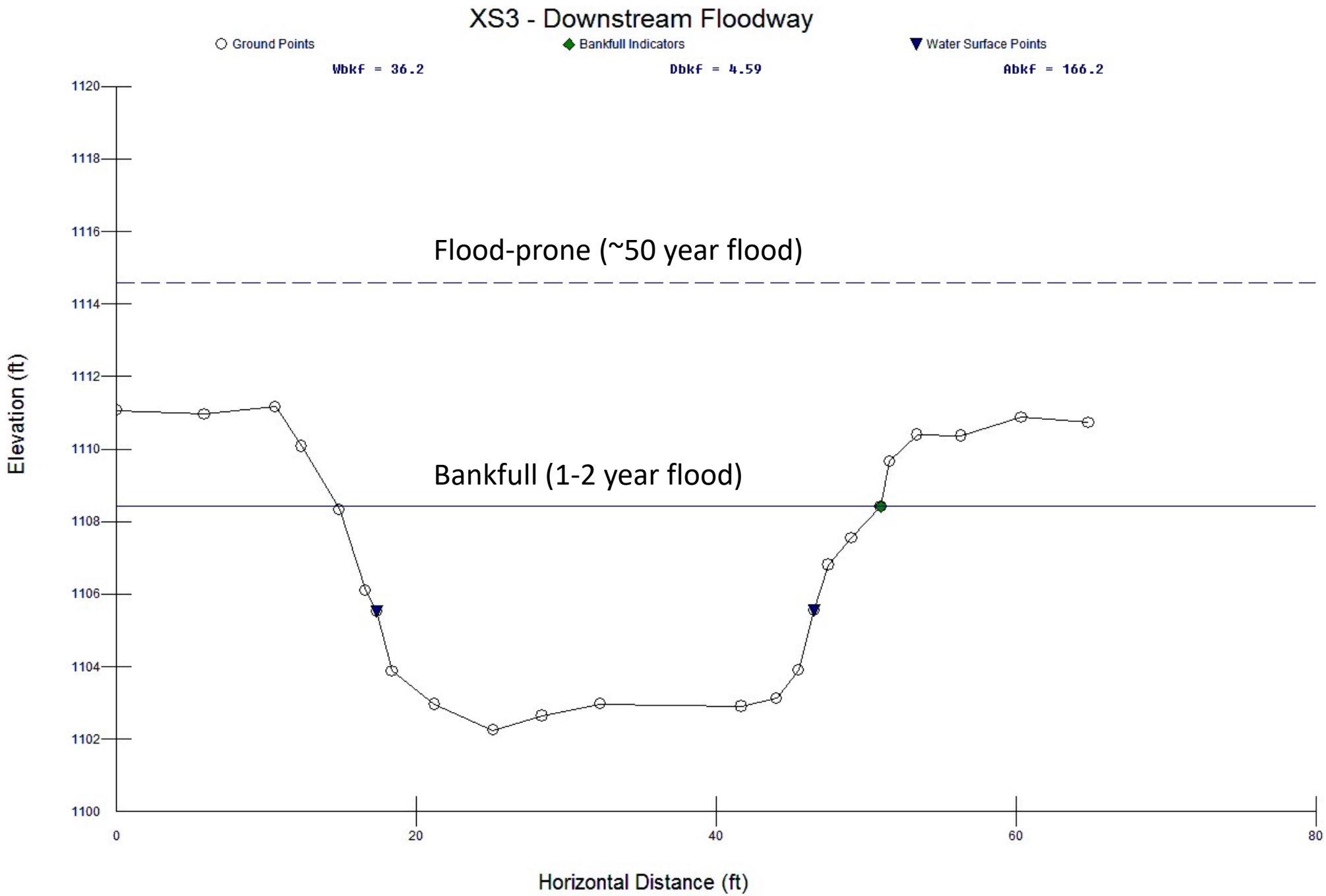



Floodway Profile 11.22.2019
Elevation (ft)
1120
1115
1110
1105
1100
0
2000
4000
6000
8000
Distance along stream (ft)
XS1 - Upstream Floodway
XS2 - Floodway
XS3 - Downstream Floodway
Diversion Structure
Rip Rap Riffle
Rip Rap Riffle
Water Surface
Existing Channel Bottom

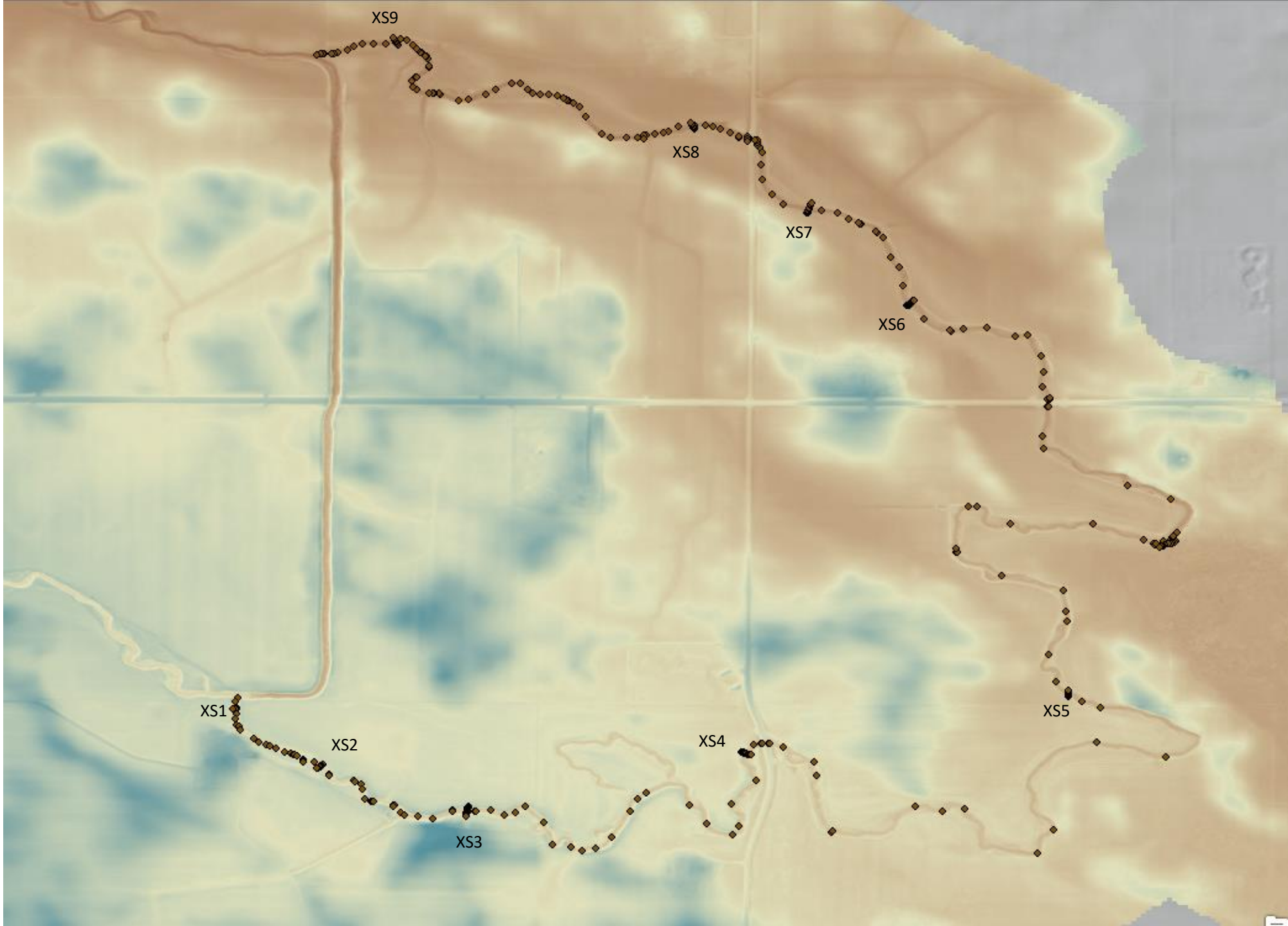


Note: Cross section backwatered by control structure

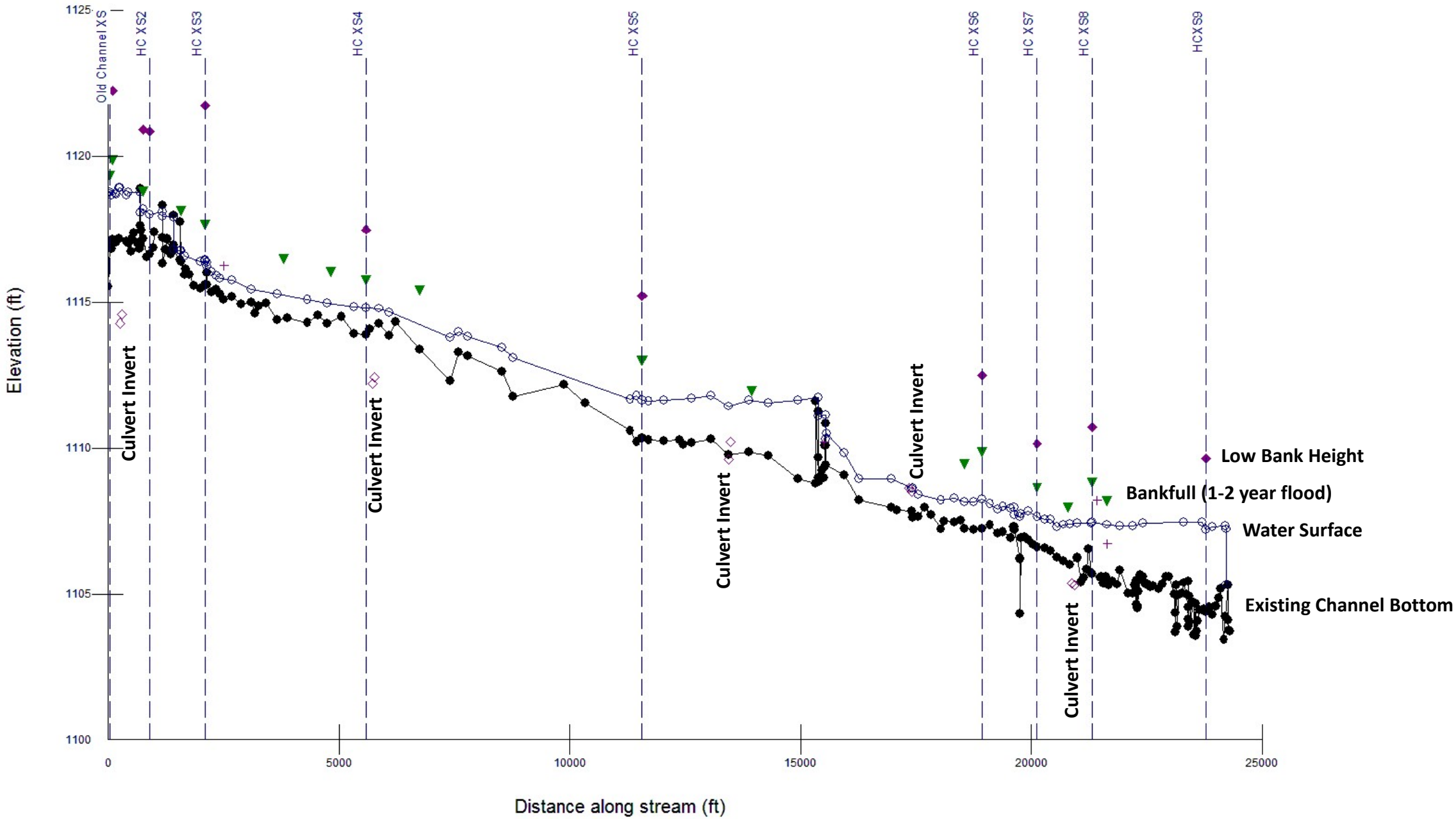

XS2 - Floodway
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 33.5
Dbkf = 4.26
Abkf = 142.4
Flood-prone (~50 year flood)
Bankfull (1-2 year flood)
Elevation (ft)
Horizontal Distance (ft)
1130
1125
1120
1115
1110
1105
1100
0
50
100
150

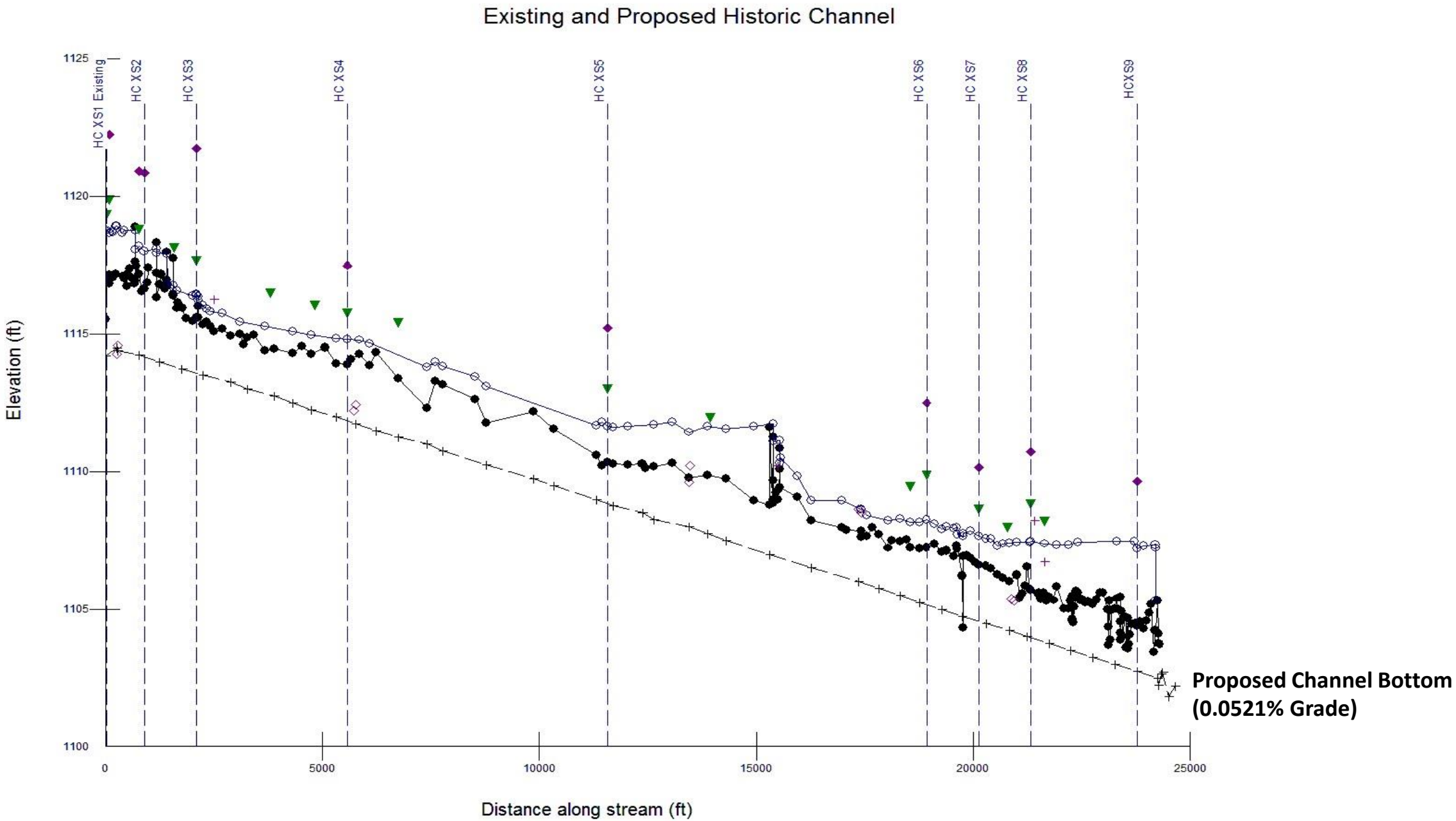

XS3 - Downstream Floodway
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 36.2
Dbkf = 4.59
Abkf = 166.2
Flood-prone (~50 year flood)
Bankfull (1-2 year flood)
Elevation (ft)
Horizontal Distance (ft)
1120
1118
1116
1114
1112
1110
1108
1106
1104
1102
1100
0
20
40
60
80

Historic Channel Survey Points
10/28-29/2019

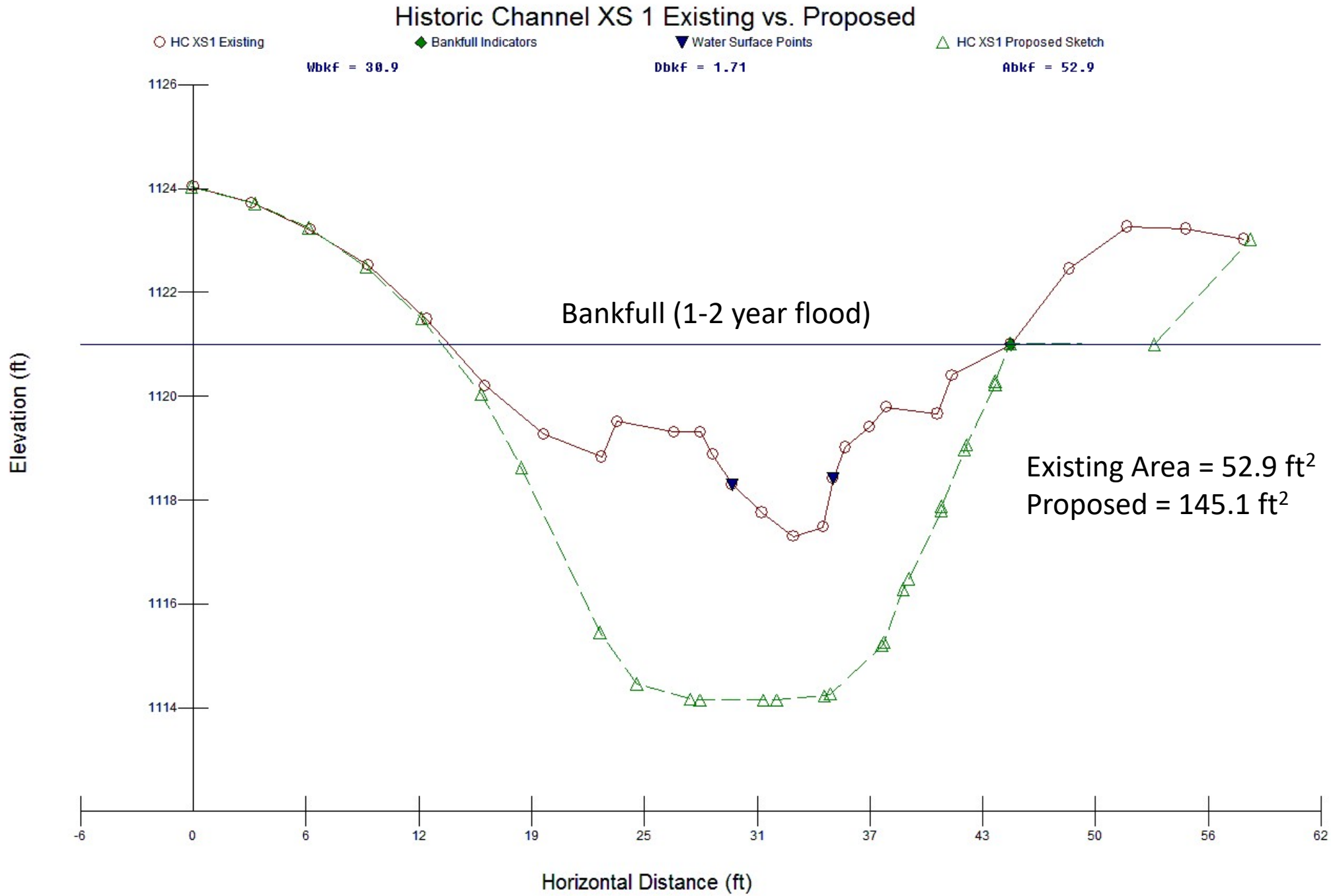


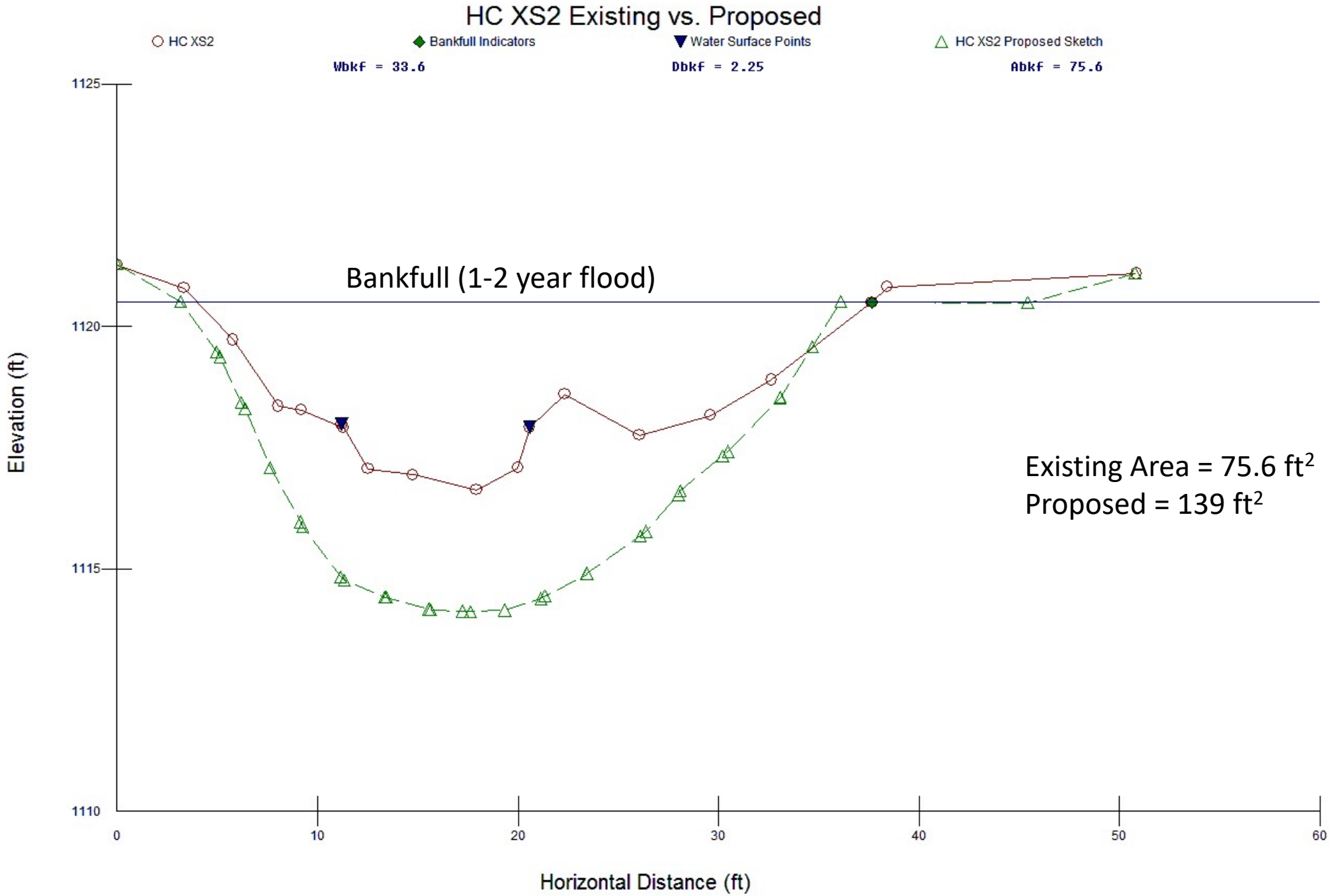
Historic Channel Profile

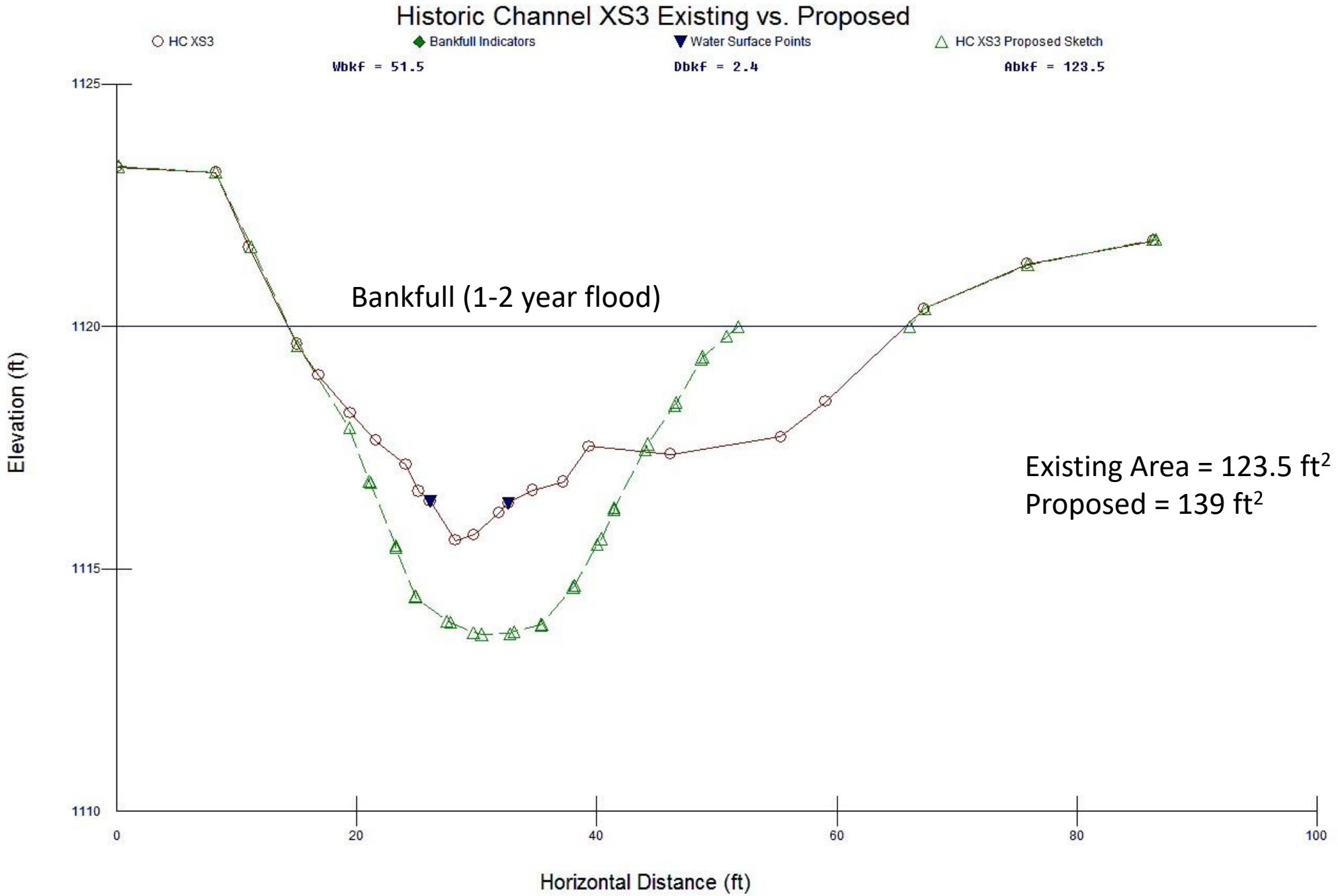


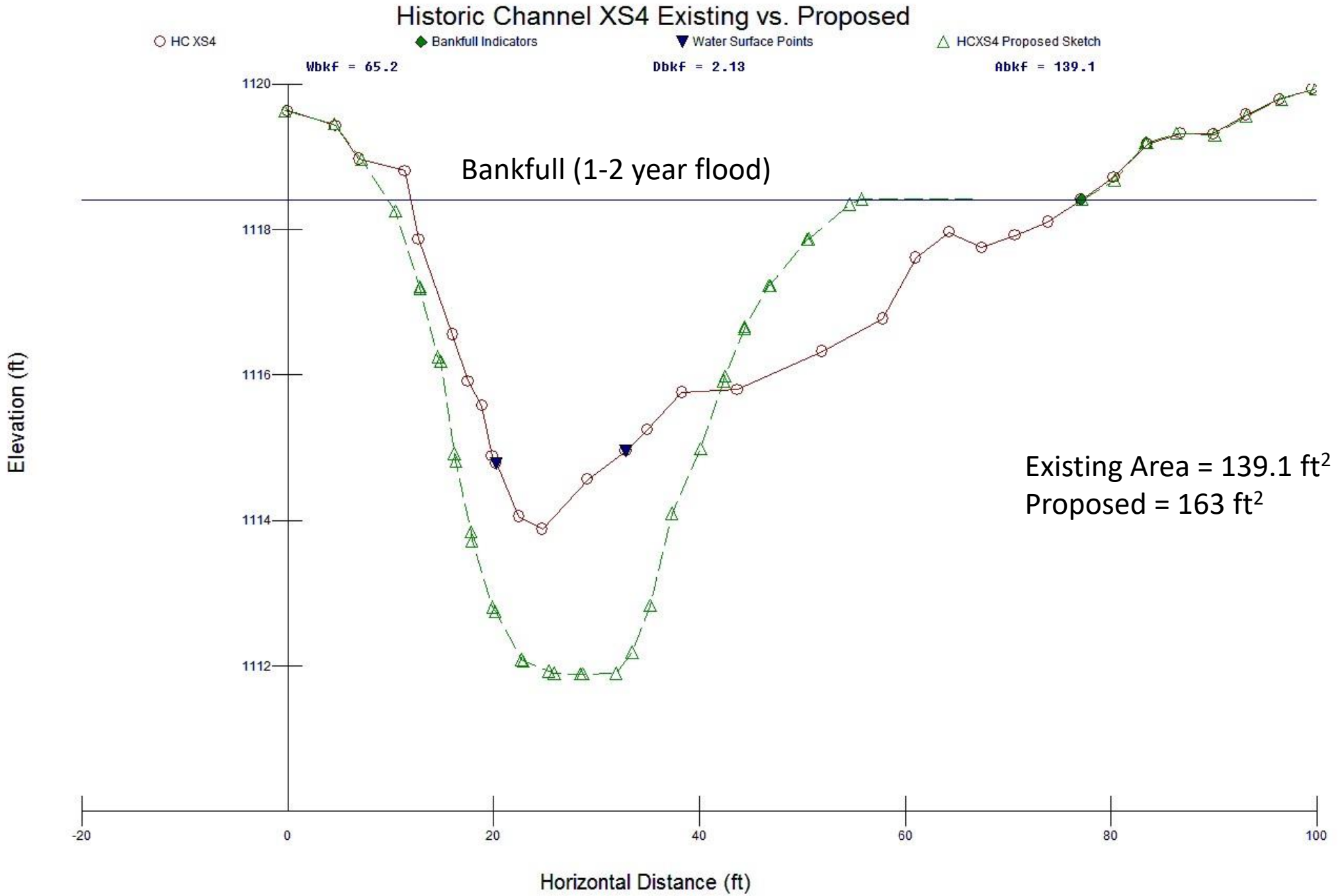


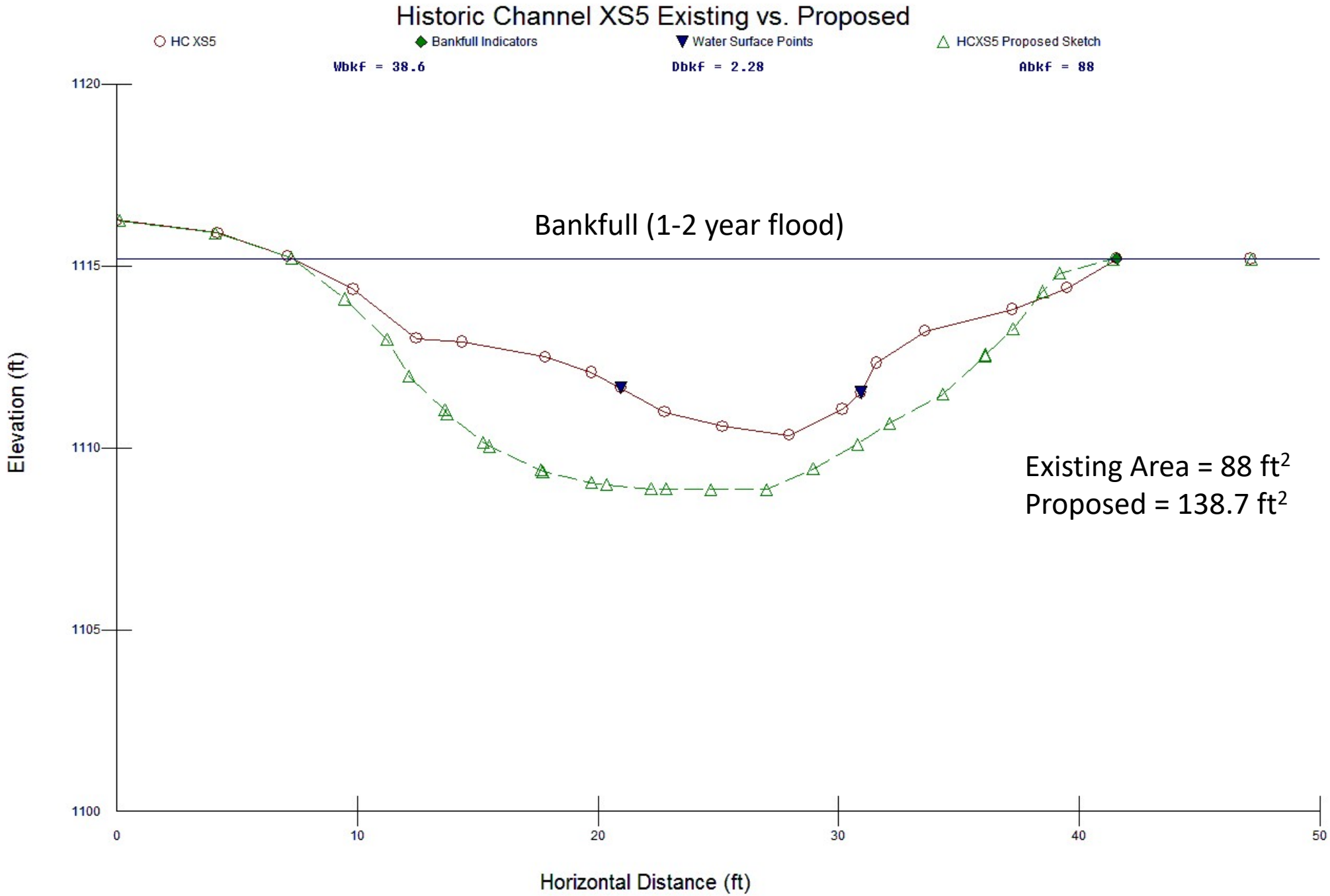
Note: New profile will have deeper cuts where pools should be, the proposed gradient is where riffle elevations would be.

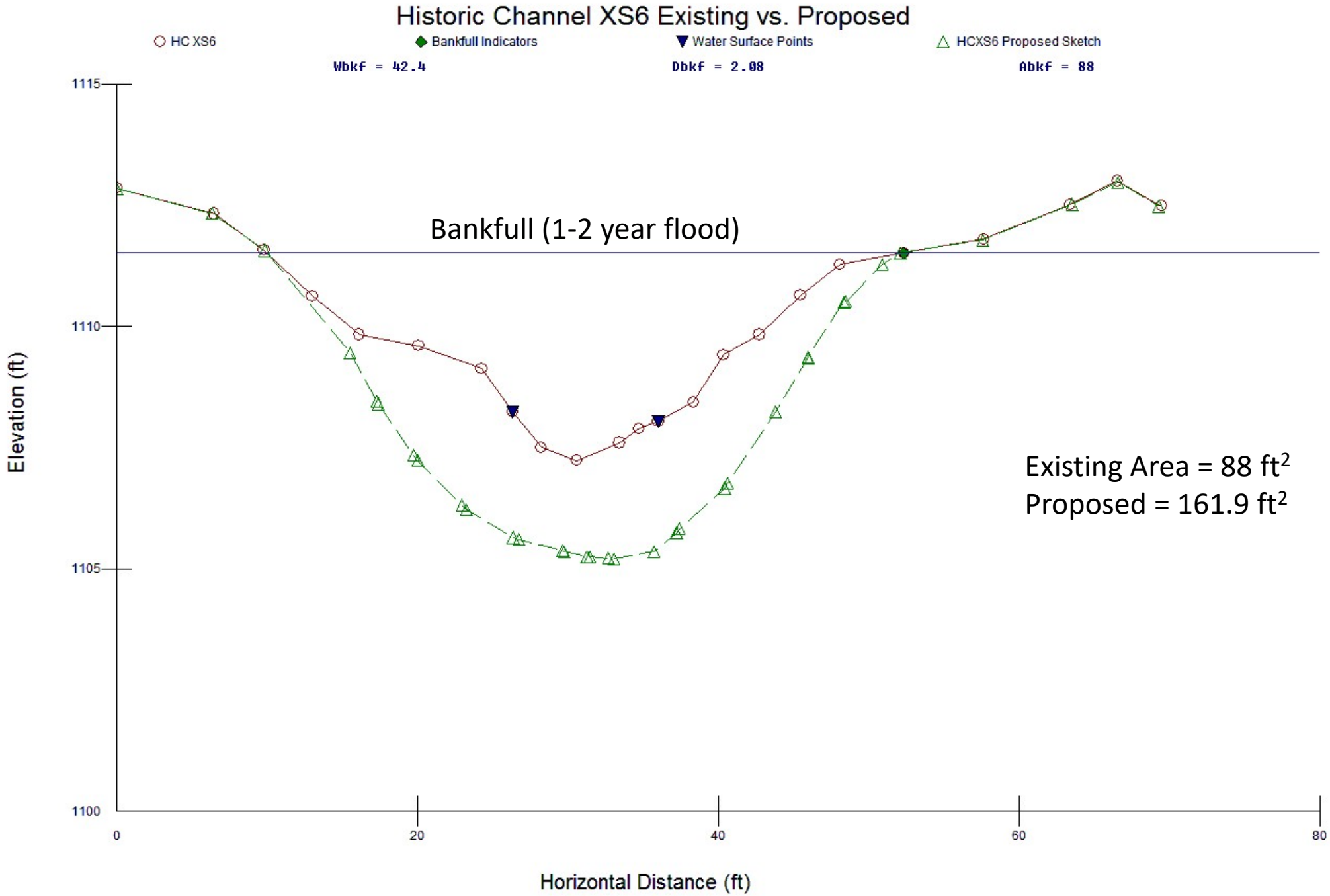

Historic Channel XS 1 Existing vs. Proposed
HC XS1 Existing
Bankfull Indicators
Water Surface Points
HC XS1 Proposed Sketch
Wbkf = 30.9
Dbkf = 1.71
Abkf = 52.9
Bankfull (1-2 year flood)
Existing Area = 52.9 ft2
Proposed = 145.1 ft2
Elevation (ft)
1126
1124
1122
1120
1118
1116
1114
-6
0
6
12
19
25
31
37
43
50
56
62
Horizontal Distance (ft)

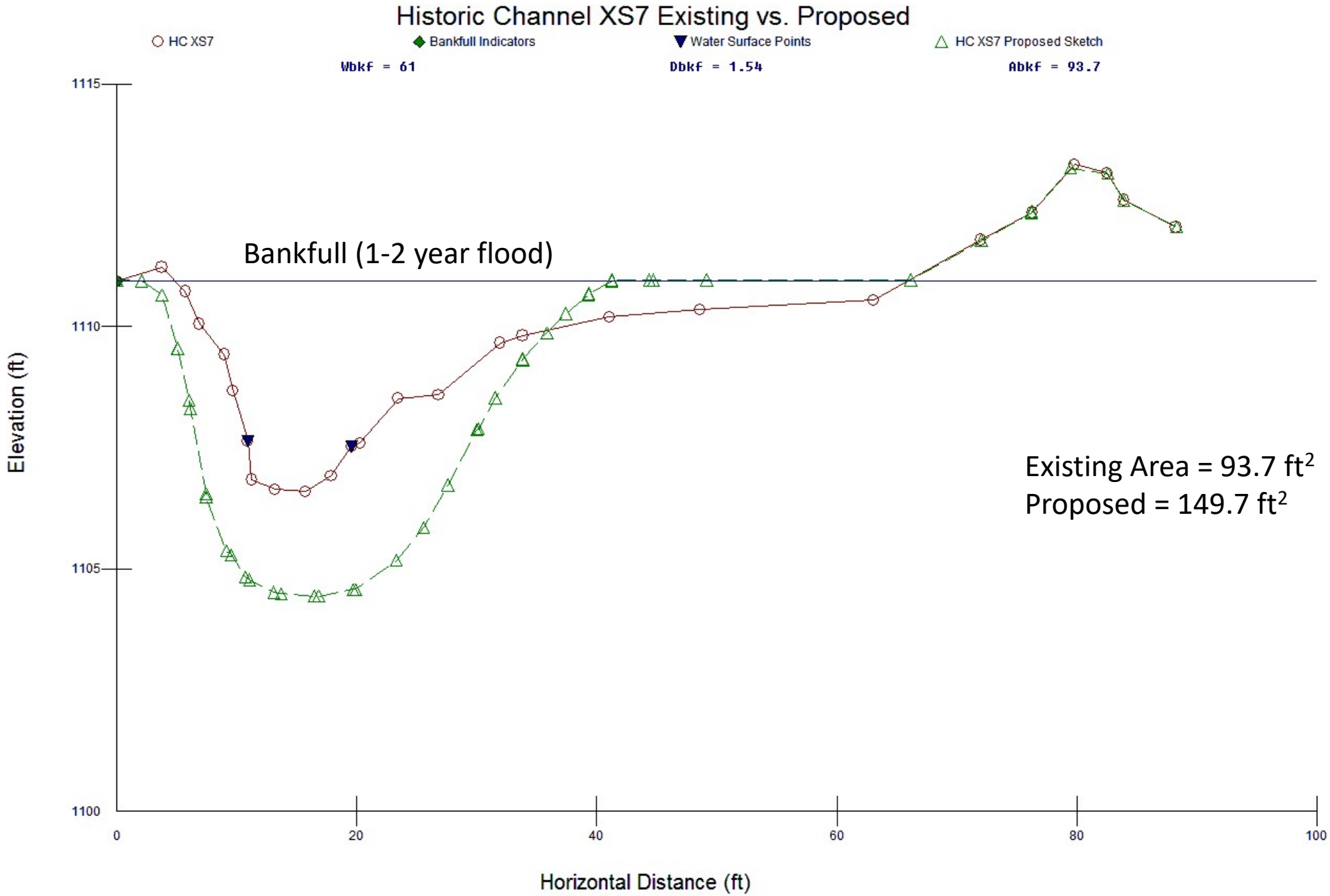

HC XS2 Existing vs. Proposed
HC XS2
Bankfull Indicators
Water Surface Points
HC XS2 Proposed Sketch
Wbkf = 33.6
Dbkf = 2.25
Abkf = 75.6
Bankfull (1-2 year flood)
Existing Area = 75.6 ft2
Proposed = 139 ft2
Elevation (ft)
Horizontal Distance (ft)
1125
1120
1115
1110
0
10
20
30
40
50
60

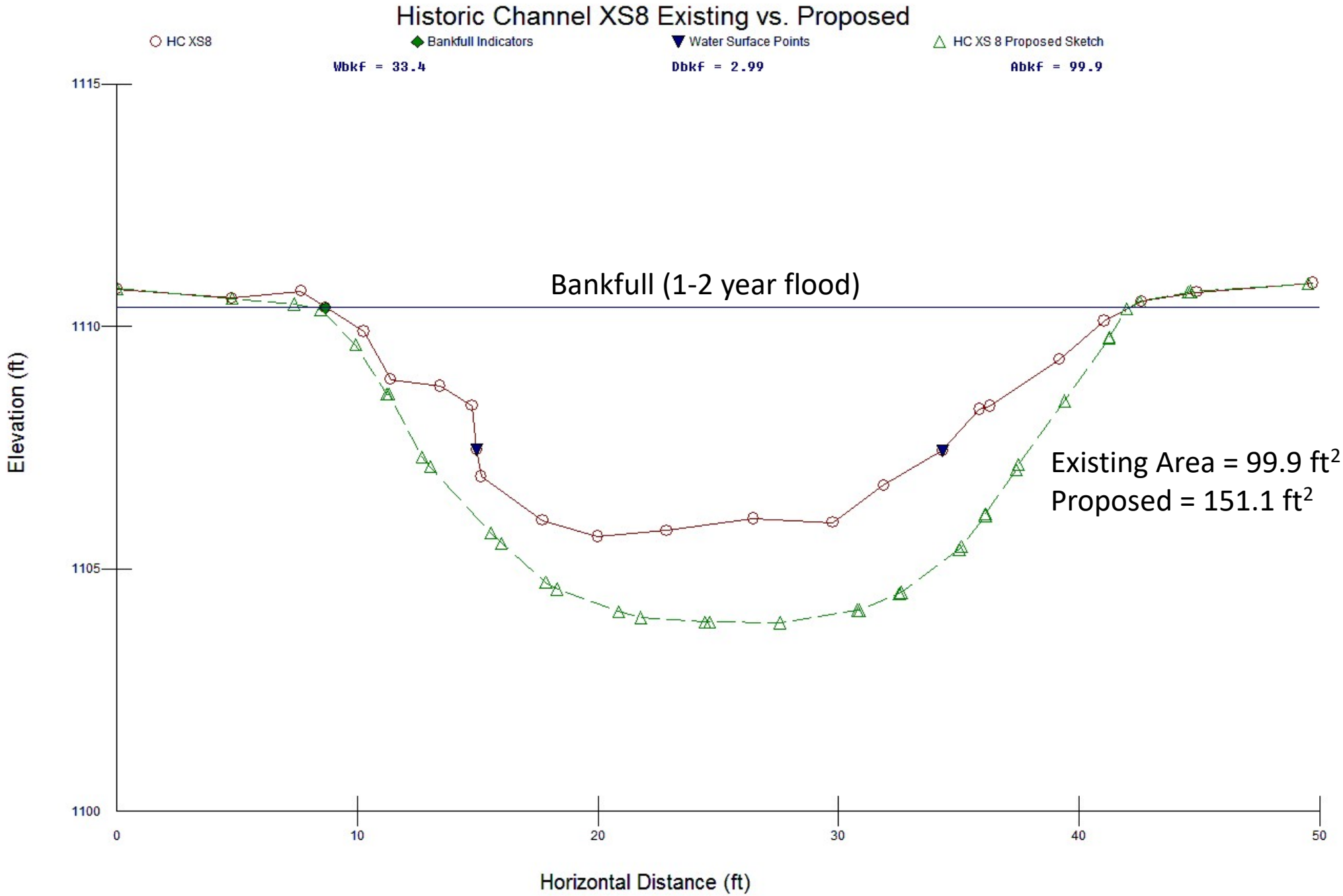

Historic Channel XS3 Existing vs. Proposed
HC XS3
Bankfull Indicators
Water Surface Points
HC XS3 Proposed Sketch
Wbkf = 51.5
Dbkf = 2.4
Abkf = 123.5
Bankfull (1-2 year flood)
Existing Area = 123.5 ft2
Proposed = 139 ft2
Elevation (ft)
Horizontal Distance (ft)
1125
1120
1115
1110
0
20
40
60
80
100

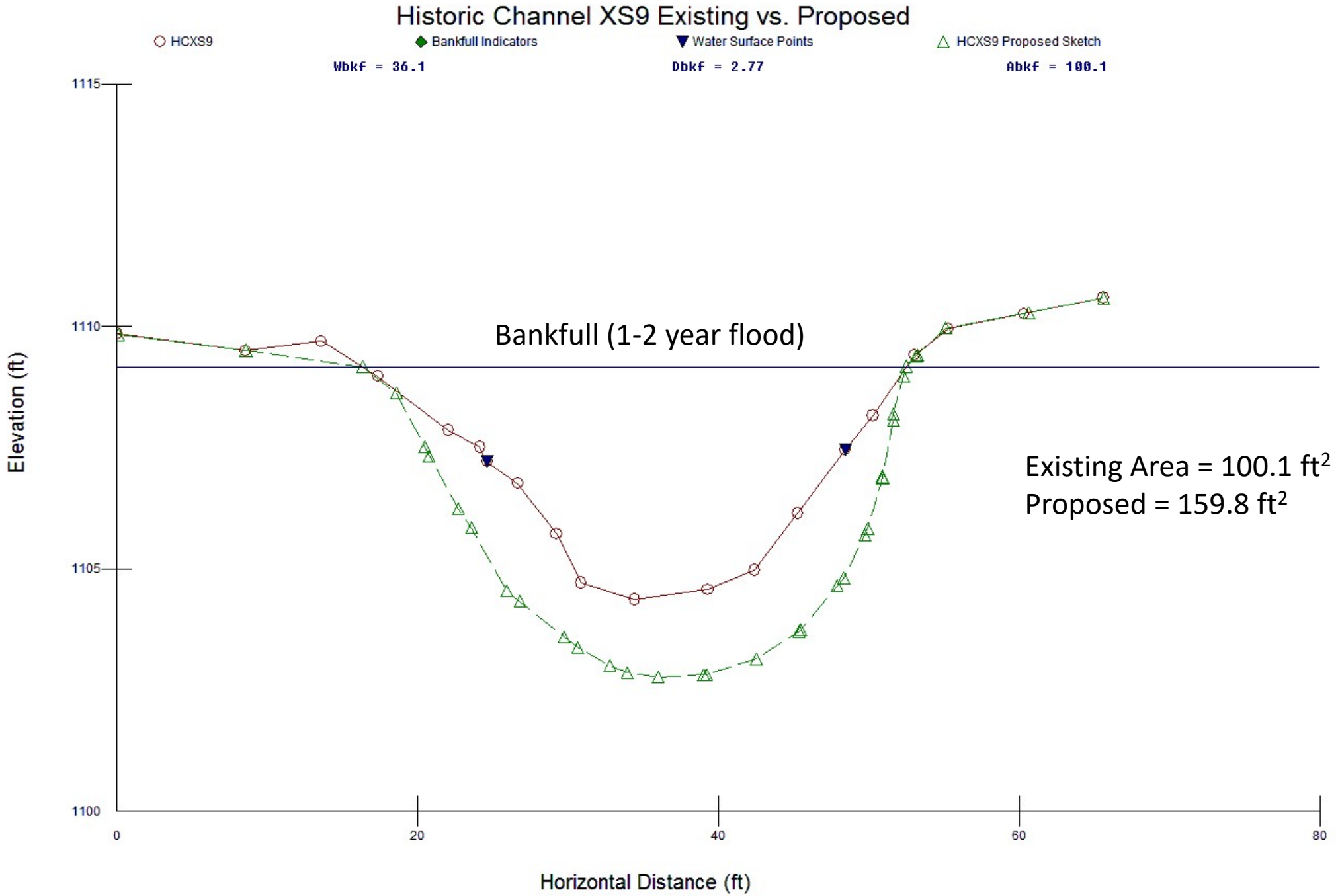

Historic Channel XS4 Existing vs. Proposed
HC XS4
Bankfull Indicators
Water Surface Points
HCXS4 Proposed Sketch
Wbkf = 65.2
Dbkf = 2.13
Abkf = 139.1
Bankfull (1-2 year flood)
Existing Area = 139.1 ft2
Proposed = 163 ft2
Elevation (ft)
Horizontal Distance (ft)
1120
1118
1116
1114
1112
-20
0
20
40
60
80
100


Historic Channel XS5 Existing vs. Proposed
HC XS5
Bankfull Indicators
Water Surface Points
HCXS5 Proposed Sketch
Wbkf = 38.6
Dbkf = 2.28
Abkf = 88
Bankfull (1-2 year flood)
Existing Area = 88 ft2
Proposed = 138.7 ft2
Elevation (ft)
Horizontal Distance (ft)
1120
1115
1110
1105
1100
0
10
20
30
40
50


Historic Channel XS6 Existing vs. Proposed
HC XS6
Bankfull Indicators
Water Surface Points
HCXS6 Proposed Sketch
Wbkf = 42.4
Dbkf = 2.08
Abkf = 88
Bankfull (1-2 year flood)
Existing Area = 88 ft²
Proposed = 161.9 ft²
Elevation (ft)
1115
1110
1105
1100
0
20
40
60
80
Horizontal Distance (ft)


Historic Channel XS7 Existing vs. Proposed
HC XS7
Bankfull Indicators
Water Surface Points
HC XS7 Proposed Sketch
Wbkf = 61
Dbkf = 1.54
Abkf = 93.7
Bankfull (1-2 year flood)
Existing Area = 93.7 ft2
Proposed = 149.7 ft2
Elevation (ft)
1115
1110
1105
1100
0
20
40
60
80
100
Horizontal Distance (ft)


Historic Channel XS8 Existing vs. Proposed
HC XS8
Bankfull Indicators
Water Surface Points
HC XS 8 Proposed Sketch
Wbkf = 33.4
Dbkf = 2.99
Abkf = 99.9
Bankfull (1-2 year flood)
Existing Area = 99.9 ft2
Proposed = 151.1 ft2
Elevation (ft)
Horizontal Distance (ft)
1115
1110
1105
1100
0
10
20
30
40
50


Historic Channel XS9 Existing vs. Proposed
HCXS9
Bankfull Indicators
Water Surface Points
HCXS9 Proposed Sketch
Wbkf = 36.1
Dbkf = 2.77
Abkf = 100.1
1115
1110
1105
1100
Elevation (ft)
Bankfull (1-2 year flood)
Existing Area = 100.1 ft2
Proposed = 159.8 ft2
0
20
40
60
80
Horizontal Distance (ft)

Simple Excavation Calculation

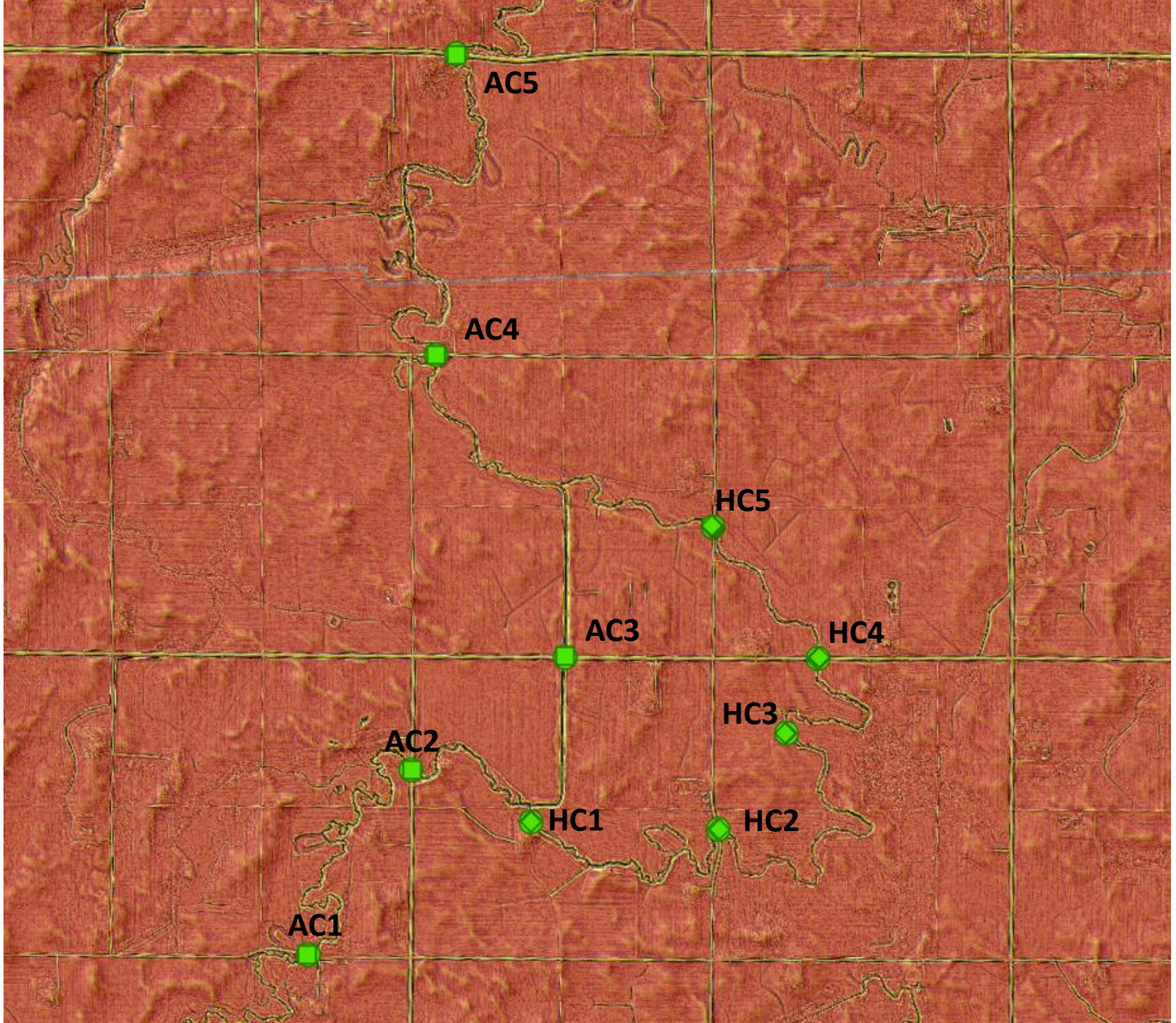
Riffle #	Change in Sq. Feet	Stream Length	Cubic Feet	Cubic Yards
1	93	900	83,700	3,100.00
2	64	1,200	76,800	2,844.44
3	16	3,500	56,000	2,074.07
4	24	6,000	144,000	5,333.33
5	50	7,300	365,000	13,518.52
6	73	1,200	87,600	3,244.44
7	56	1,200	67,200	2,488.89
8	51	2,400	122,400	4,533.33
9	60	600	36,000	1,333.33
Total		24,300	**1,038,700**	**38,470.37**

Survey conclusions

- Significant excavation will be needed throughout historic channel to properly size it for existing hydrology.
- Culverts are generally set too high for proposed excavated channel.
- Some areas have significant tree jams, could be used for bank protection.

Road Crossings

AC = Active Channel
HC = Historic Channel



AC1 – Span Bridge

- 95 foot span bridge
- Upstream Floodway
- Stream bankfull width ~35’

AC2 – Span Bridge

- 75 foot span bridge
- Upstream Floodway
- Stream bankfull width ~40’

AC3 – Span Bridge

- 75 foot span bridge
- Spans the floodway
- Stream bankfull width ~30’

AC4 – Span Bridge

- 82 foot span bridge
- Downstream floodway
- Stream bankfull width 33 feet

AC5 – Span Bridge

- 67 foot span bridge
- Downstream floodway
- Stream bankfull width 33’

HC1 – 2 culverts

- Private crossing
- 2 – 48” cmp culverts
- 4 foot rise, 8 foot span
- Nearly full of sediment; difficult to find inverts.

HC2 – Pipe arch culvert

- 7 foot rise, 11 foot span
- Single concrete arch culvert
- 10% plugged with sediment

HC3 – 2 culverts

- State owned - WMA
- 2 – 36” cmp culverts
- 3 foot rise, 6 foot span
- 0% plugged with sediment

HC4 – 2 culverts

- 5 foot rise, 10 foot span
- 2 – 5’X5’ circular concrete culverts
- Left culvert perched on downstream side
- 0% plugged with sediment

HC5 – 3 culverts

- 3 – 7’ rise X 11’ span concrete arch culverts
- 7’ rise, 33’ span crossing
- Each culvert 10-20% plugged with sediment.

Crossings conclusions

- Active channel crossings have appropriate hydraulic capacity for 30-40 foot channel.
- Historic channel has inadequate capacity for reconnection.
- Non-road crossings may need to be converted to low-ford crossings.
- Culverts set higher than proposed excavated channel; would need to be lowered and have increased hydraulic capacity.

Other thoughts/concerns

- Diversion structure – what needs to be done? New structure? New alignment?
- Public crossing culverts in historic channel
  - 2/3 public crossings need more capacity
  - Get county engineer involved
  - Township vs County?
- Landowner concerns
  - Crossover flooding
  - Culvert connecting historic channel to nearby wetland
  - Flooding adjacent to historic channel, will there be more than now?
  - Private Crossings