ANNEXURE F:

HECRAS Hydraulic Information

Utility Programs for Drainage
Flood calculations

Sinotech

Project name: Montana Spruit
Analysed by: IGEE
Name of river: Monata Spruit - Node A1
Description of site: A5 BEGINING OF MODELED CHANNEL
Filename: C:\02 igee\000000 PROJECTS\0414 Montana Spruit channel improvement\Design\Runoff\A1.fld
Date: 22 August 2018

Flood Frequency Analysis: Rational Method

Project	= Montana Spruit
Analysed by	= IGEE
Name of river	= Monata Spruit - Node A1
Description of site	= A5 BEGINING OF MODELED CHANNEL
Date	= 2018-08-22
Area of catchment	= 9.73 km²
Dolomitic area	= 0.0 %
Mean annual rainfall (MAR)	= 630.00 mm
Length of longest watercourse	= 4.458 km
Flow of water	= Defined water course
Height difference along 10-85 slope	= 72.41 m
Rainfall region	= Inland
Area distribution	= Rural: 8 %, Urban: 92 %, Lakes: 0 %

Catchment description - Urban area (%)

Lawns		Residential and industry		Business	
Sandy, flat (<2%)	0	Houses	65	City centre	0
Sandy, steep (>7%)	0	Flats	10	Suburban	3
Heavy soil, flat (<2%)	3	Light industry	12	Streets	0
Heavy soil, steep (>7%)	0	Heavy industry	0	Maximum flood	7

Catchment description - Rural area (%)

Surface slopes		Permeability		Vegetation	
Lakes and pans	0	Very permeable	0	Thick bush & forests	5
Flat area	0	Permeable	50	Light bush & cultivated land	30
Hilly	80	Semi-permeable	50	Grasslands	60
Steep areas	20	Impermeable	0	Bare	5

Average slope	= 0.02166 m/m
Time of concentration	= 55.0 min
Run-off factor	
Rural - C1	= 0.475
Urban - C2	= 0.407
Lakes - C3	= 0.000
Combined - C	= 0.413

The HRU, Report 2/78, Depth-Duration-Frequency diagram was used to determine the point rainfall.

Return Period (years)	Time of concentration (hours)	Point rainfall (mm)	ARF (%)	Average intensity (mm)	Factor Ft	Runoff coefficient (%)	Peak flow (m³/s)
1:2	0.92	29.5	99.2	31.9	0.75	40.3	34.71
1:5	0.92	40.1	98.8	43.3	0.80	40.5	47.34
1:10	0.92	50.8	98.5	54.6	0.85	40.7	60.01
1:20	0.92	62.7	98.2	67.1	0.90	40.9	74.18
1:50	0.92	81.5	97.7	86.8	0.95	41.1	96.35
1:100	0.92	100.3	97.1	106.3	1.00	41.3	118.47

Run-off coefficient percentage includes adjustment saturation factors (Ft) for steep and impermeable catchments

Calculated using Utility Programs for Drainage 1.0.2

Utility Programs for Drainage
Flood calculations

Sinotech

Project name: Montana Spruit
Analysed by: IGEE
Name of river: Monata Spruit
Description of site: A5 BEGINING OF MODELED CHANNEL
Filename: C:\02 igee\000000 PROJECTS\0414 Montana Spruit channel improvement\Design\Runoff\A5.fld
Date: 5 July 2018

Flood Frequency Analysis: Rational Method

Project	= Montana Spruit
Analysed by	= IGEE
Name of river	= Monata Spruit
Description of site	= A5 BEGINING OF MODELED CHANNEL
Date	= 2018-07-05
Area of catchment	= 8.745 km²
Dolomitic area	= 0.0 %
Mean annual rainfall (MAR)	= 630.00 mm
Length of longest watercourse	= 3.981 km
Flow of water	= Defined water course
Height difference along 10-85 slope	= 72.41 m
Rainfall region	= Inland
Area distribution	= Rural: 8 %, Urban: 92 %, Lakes: 0 %

Catchment description - Urban area (%)

Lawns		Residential and industry		Business	
Sandy, flat (<2%)	0	Houses	65	City centre	0
Sandy, steep (>7%)	0	Flats	10	Suburban	3
Heavy soil, flat (<2%)	3	Light industry	12	Streets	0
Heavy soil, steep (>7%)	0	Heavy industry	0	Maximum flood	7

Catchment description - Rural area (%)

Surface slopes		Permeability		Vegetation	
Lakes and pans	0	Very permeable	0	Thick bush & forests	5
Flat area	0	Permeable	50	Light bush & cultivated land	30
Hilly	80	Semi-permeable	50	Grasslands	60
Steep areas	20	Impermeable	0	Bare	5

Average slope	= 0.02425 m/m
Time of concentration	= 48.3 min
Run-off factor	
Rural - C1	= 0.475
Urban - C2	= 0.407
Lakes - C3	= 0.000
Combined - C	= 0.413

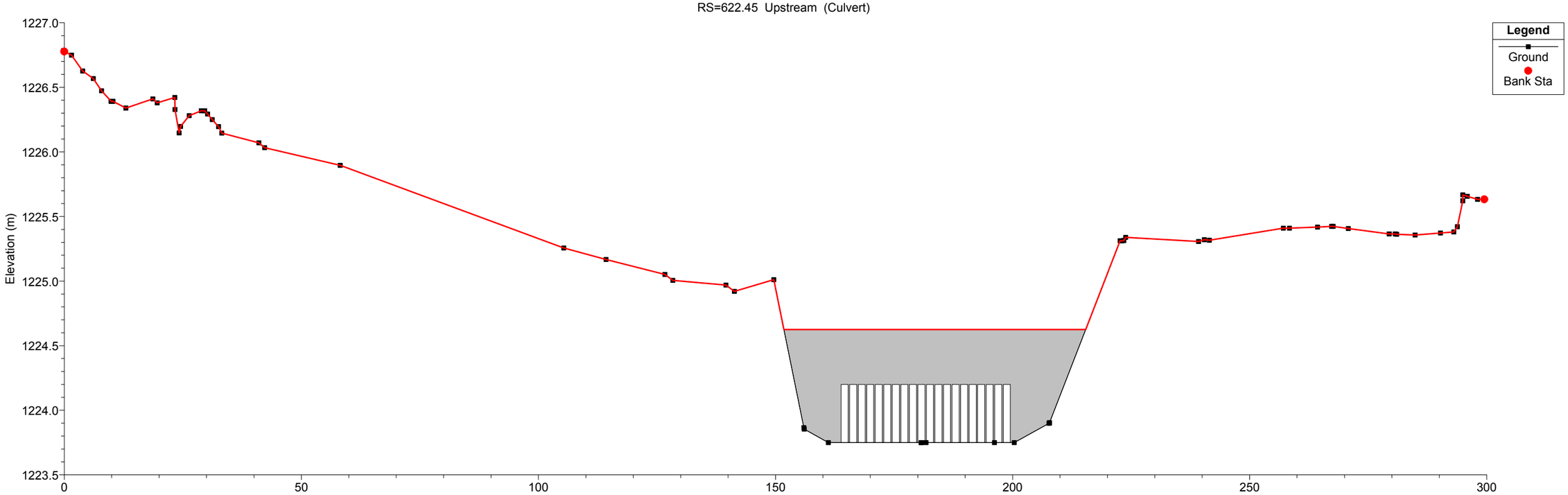
The HRU, Report 2/78, Depth-Duration-Frequency diagram was used to determine the point rainfall.

Return Period (years)	Time of concentration (hours)	Point rainfall (mm)	ARF (%)	Average intensity (mm)	Factor Ft	Runoff coefficient (%)	Peak flow (m³/s)
1:2	0.80	28.3	99.2	34.9	0.75	40.3	34.15
1:5	0.80	38.5	98.9	47.4	0.80	40.5	46.58
1:10	0.80	48.8	98.6	59.7	0.85	40.7	59.04
1:20	0.80	60.2	98.2	73.5	0.90	40.9	72.98
1:50	0.80	78.3	97.7	95.0	0.95	41.1	94.80
1:100	0.80	96.3	97.2	116.3	1.00	41.3	116.59

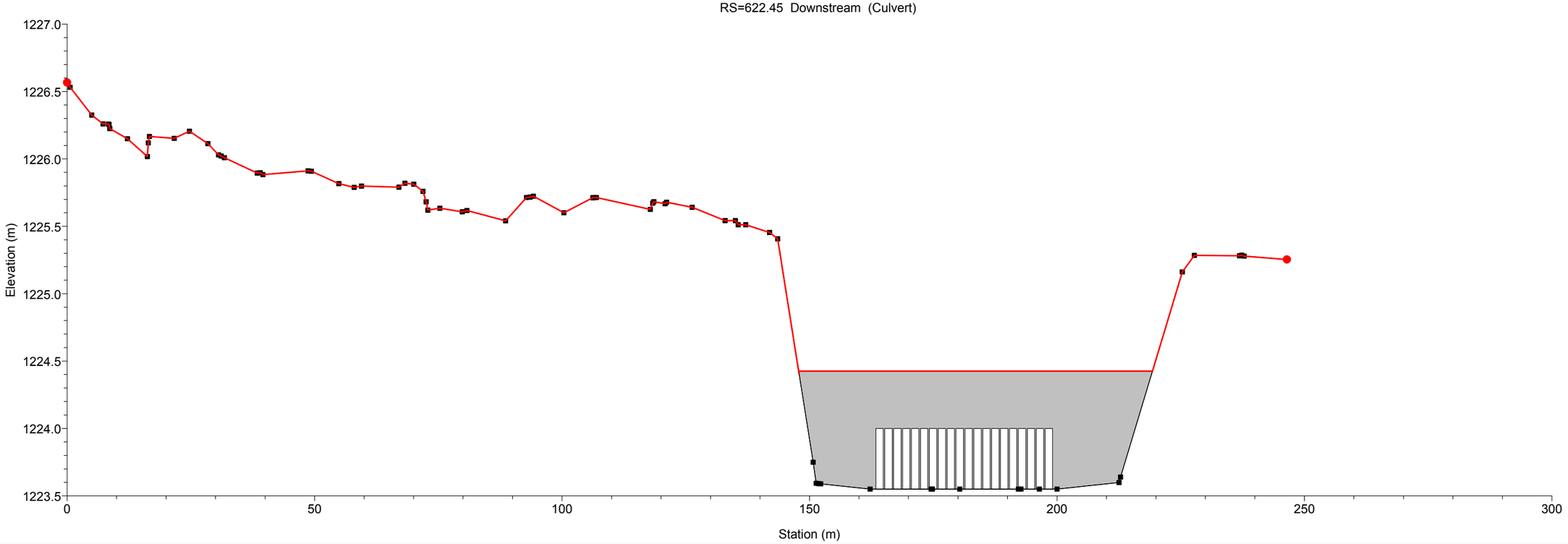
Run-off coefficient percentage includes adjustment saturation factors (Ft) for steep and impermeable catchments

Calculated using Utility Programs for Drainage 1.0.2

RS=622.45 Upstream (Culvert)



RS=622.45 Downstream (Culvert)



UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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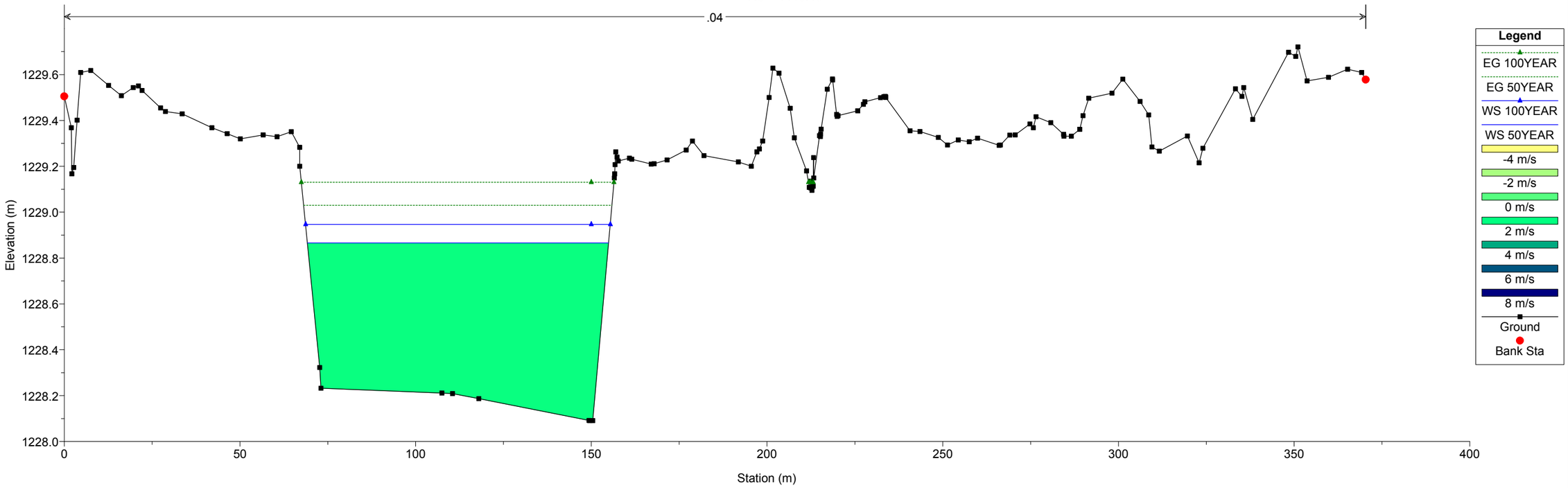

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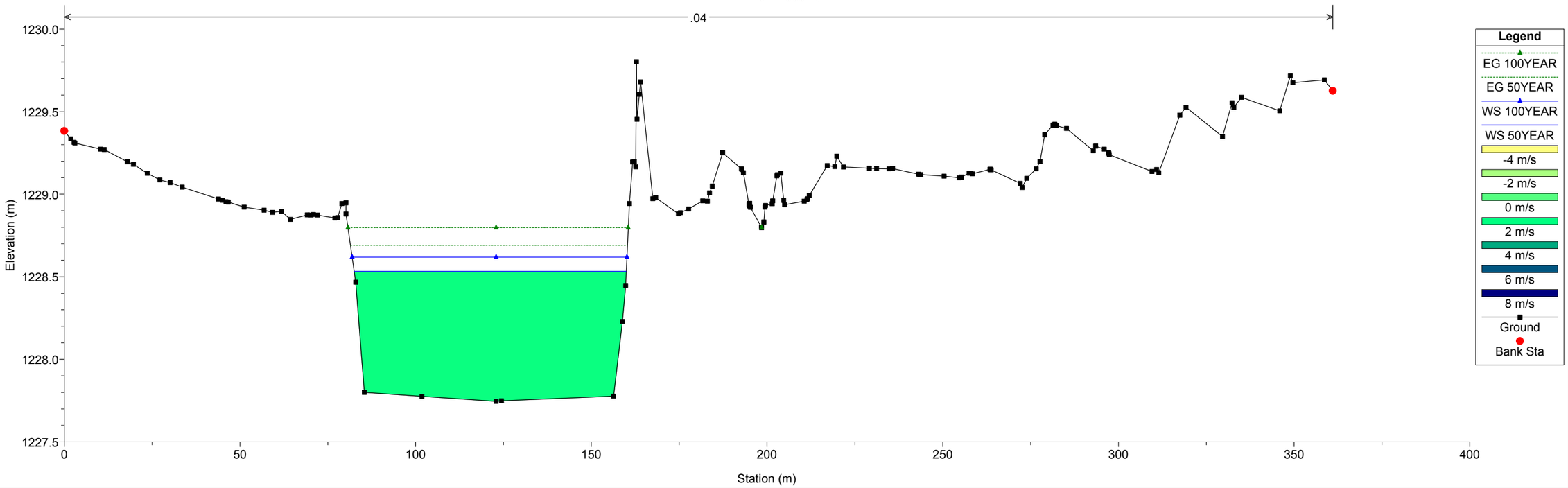

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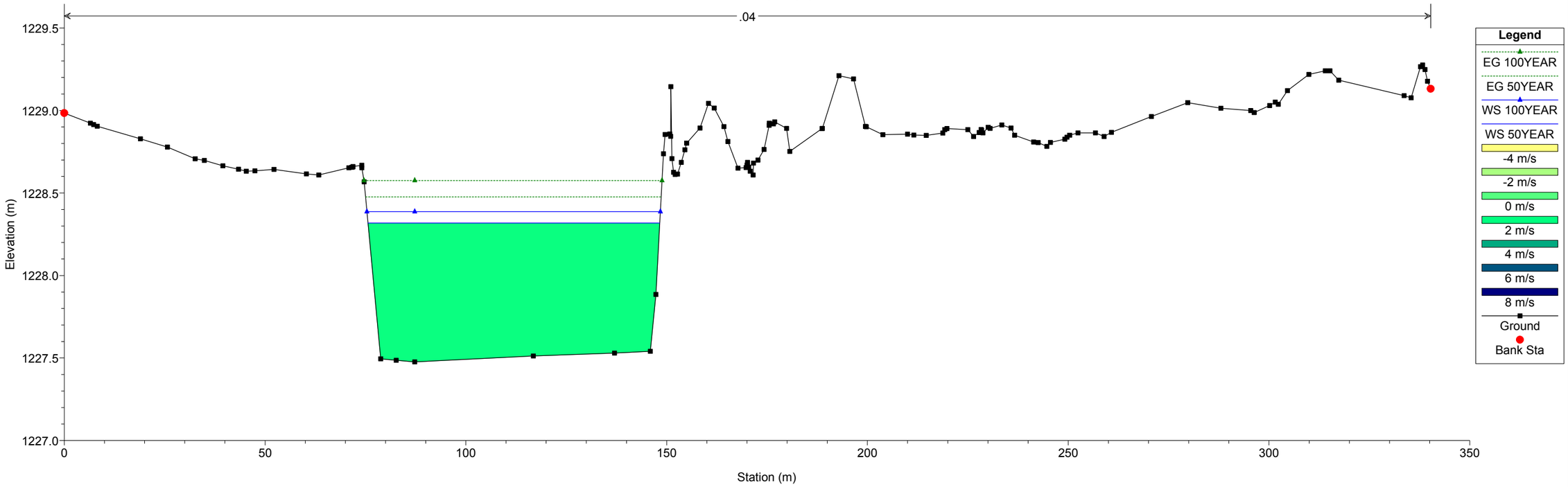

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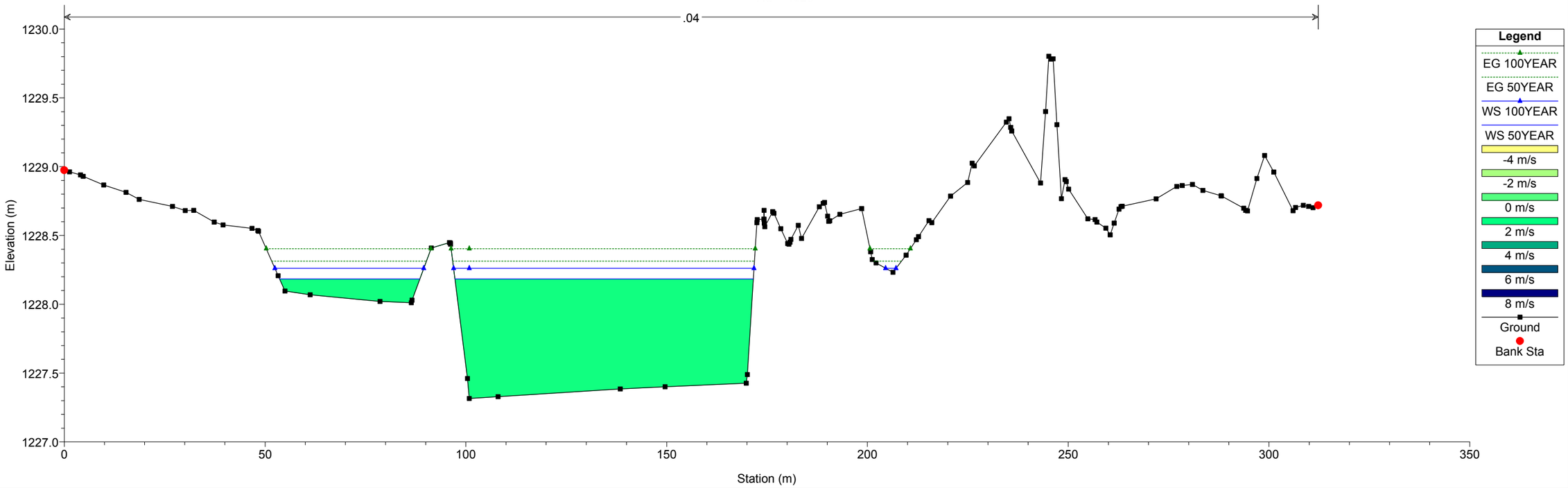

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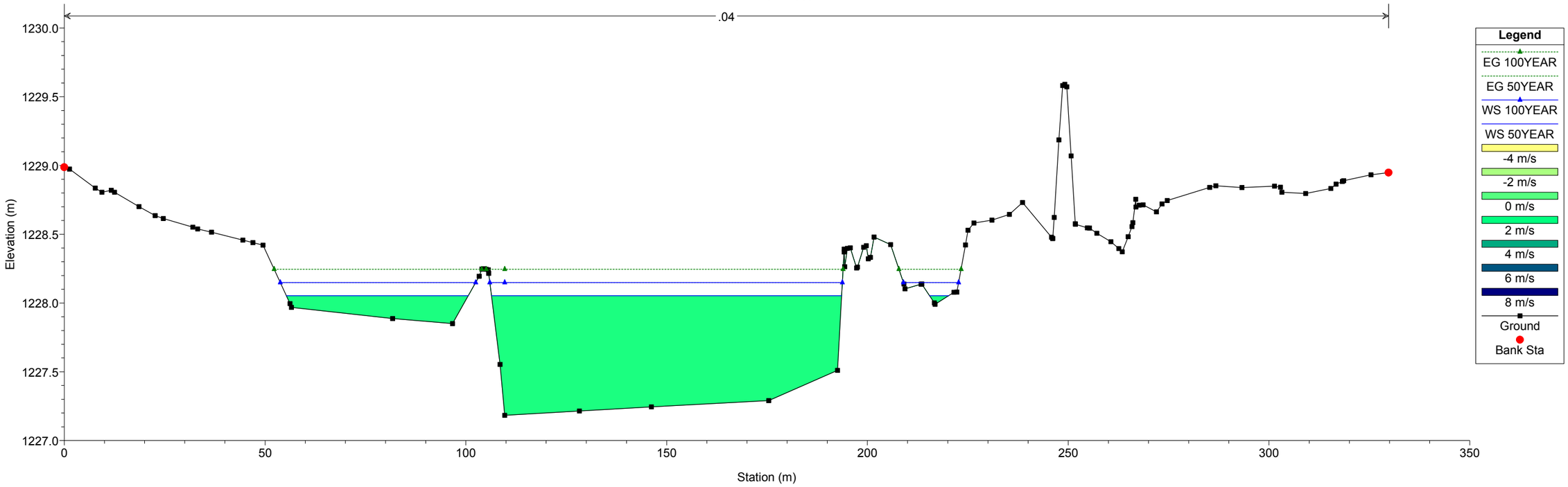

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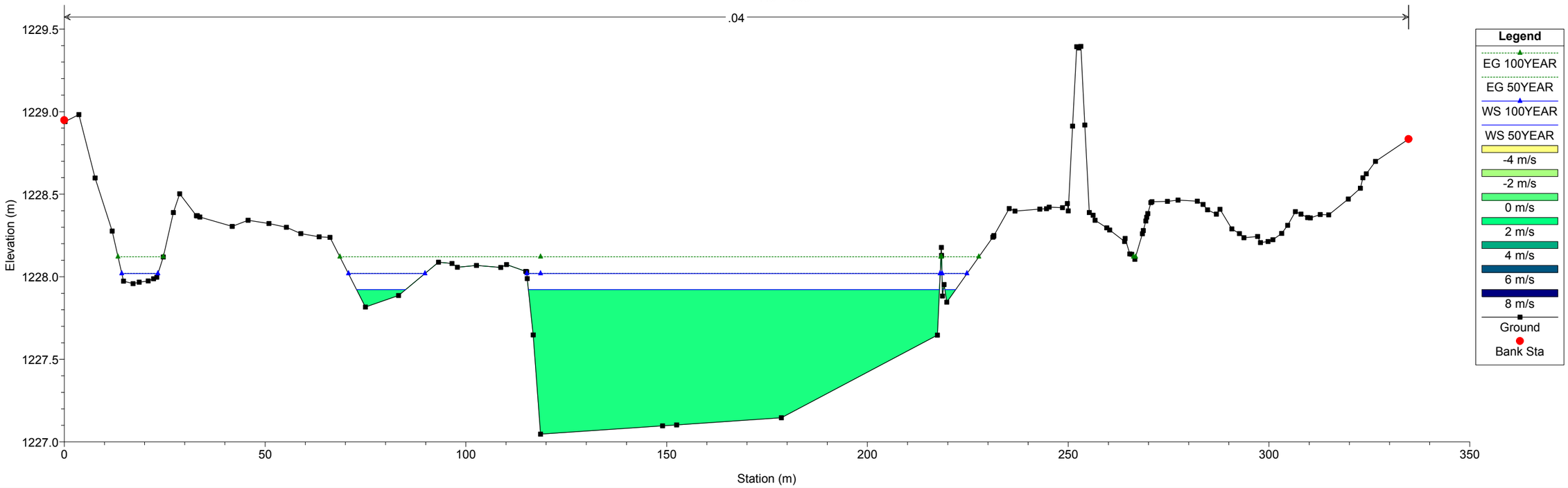

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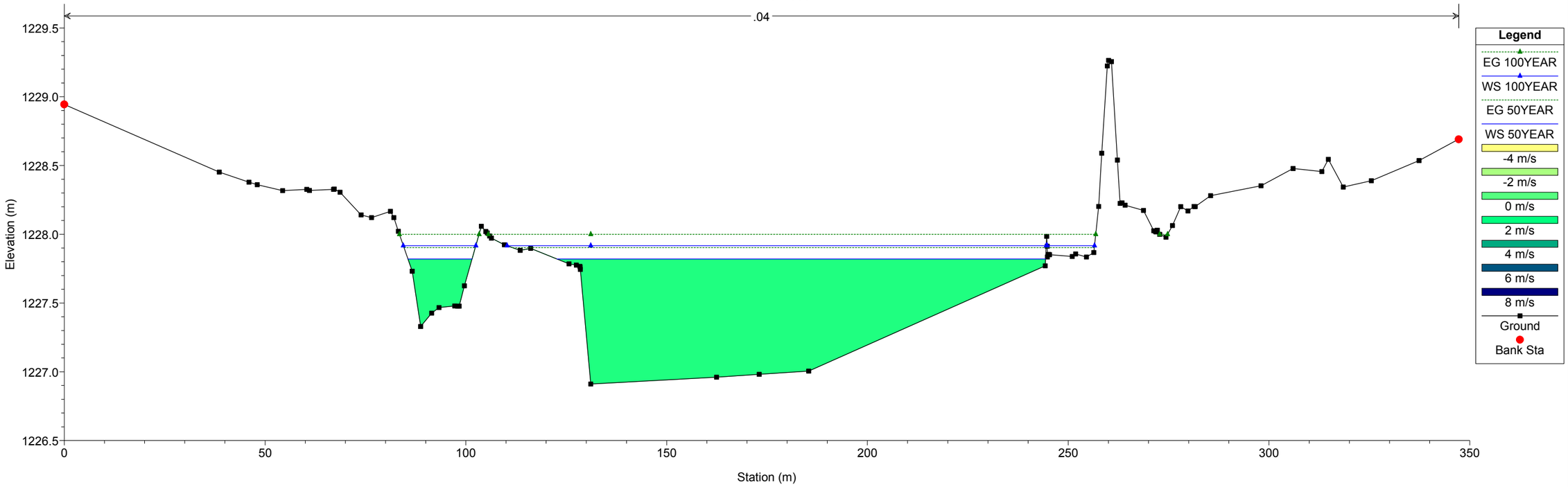

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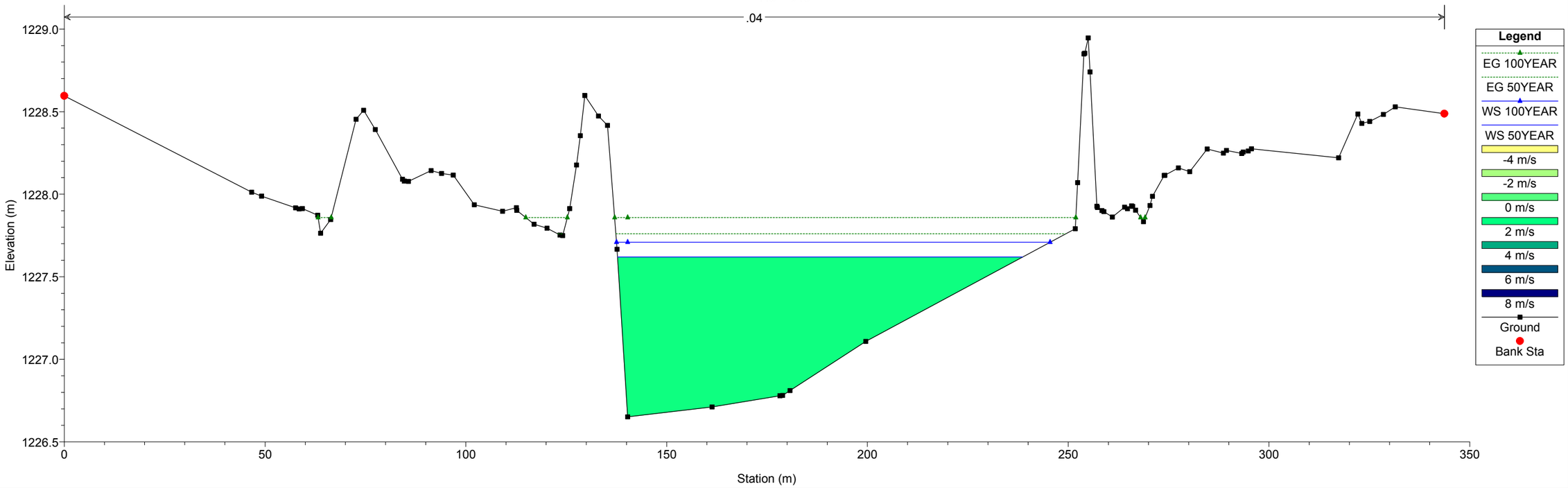

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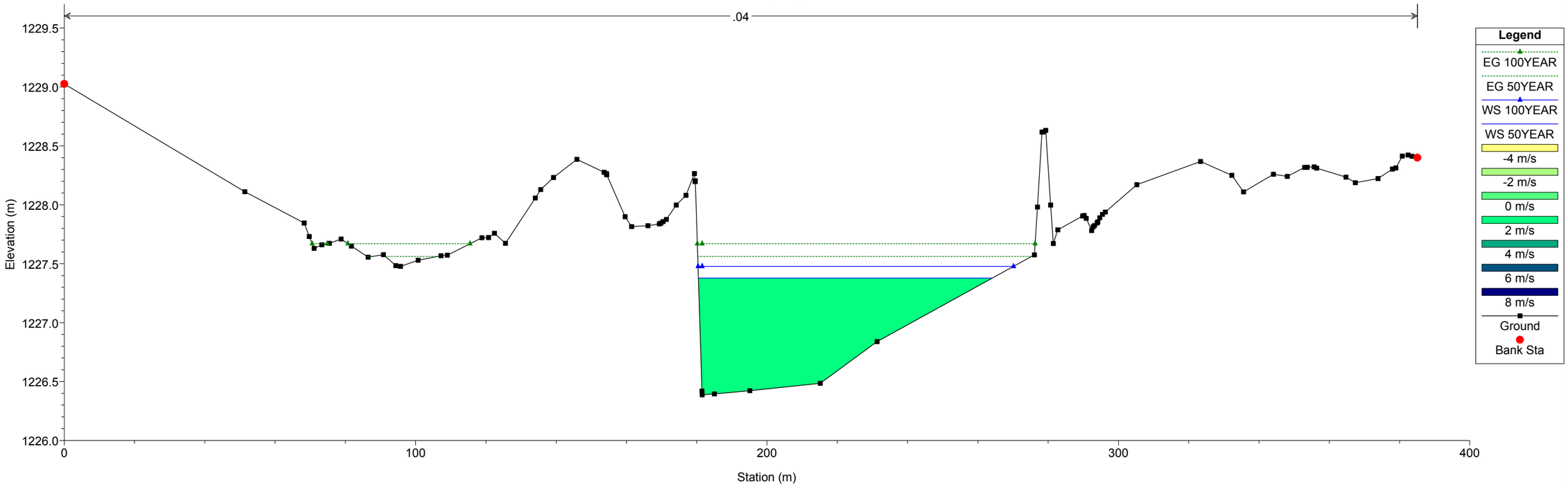

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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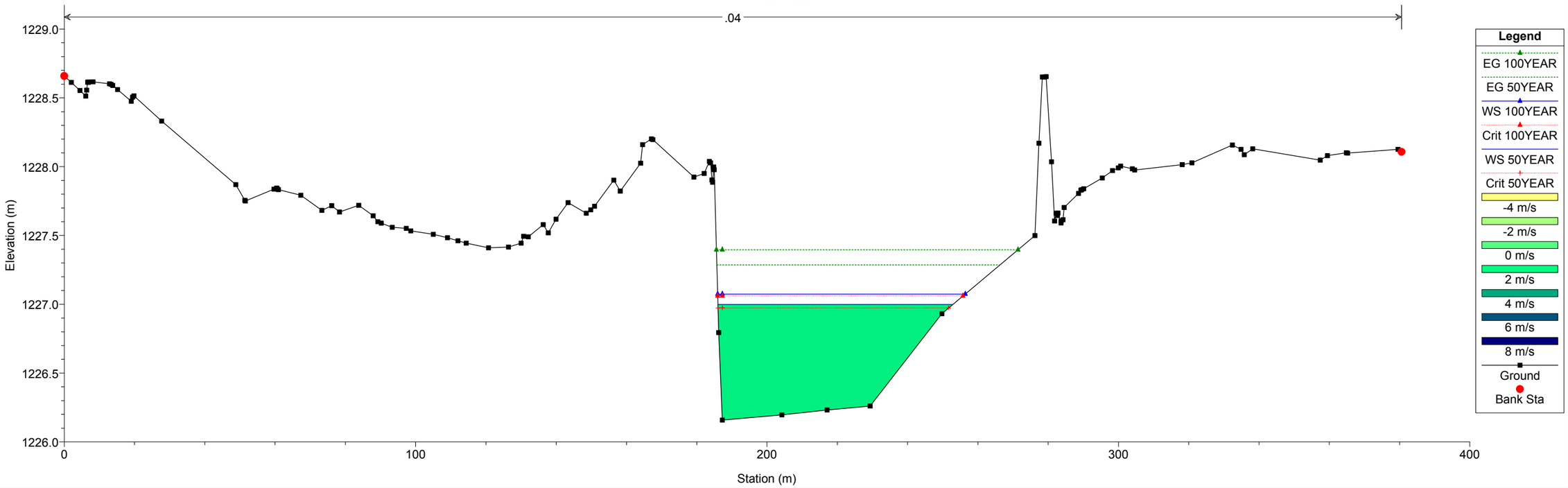

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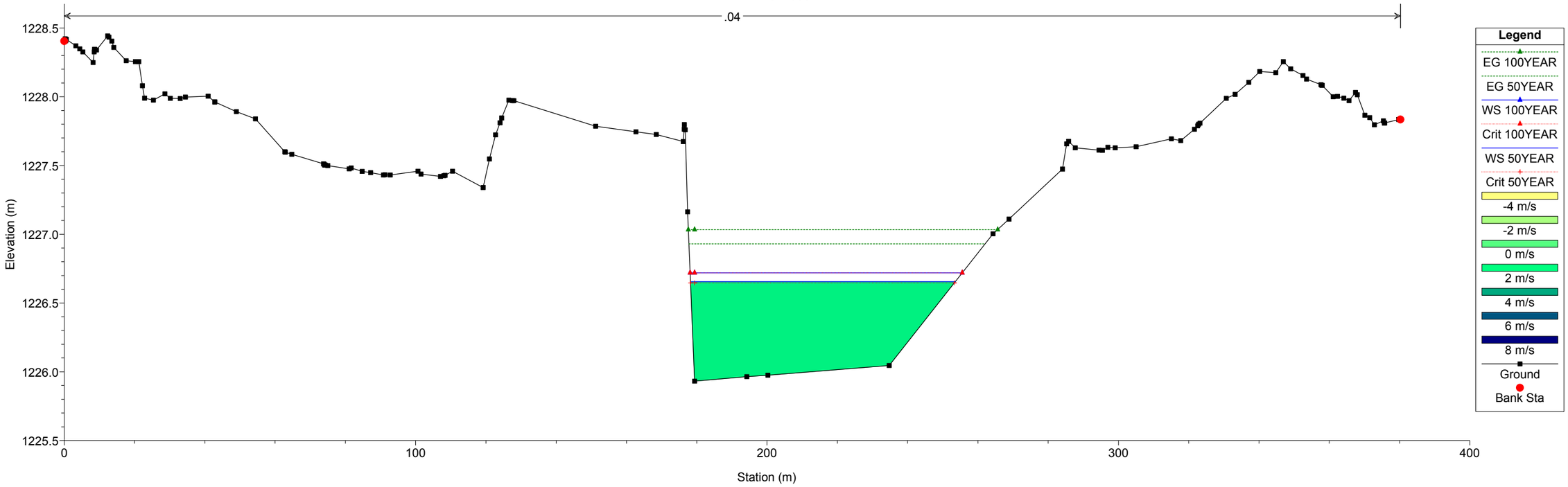

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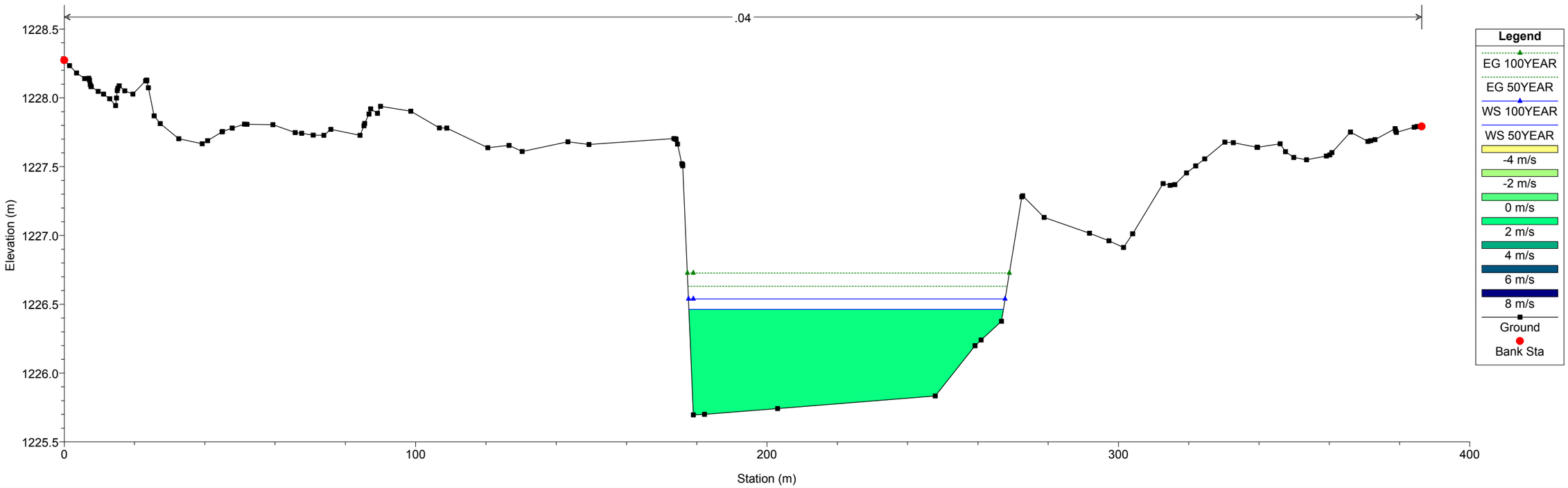

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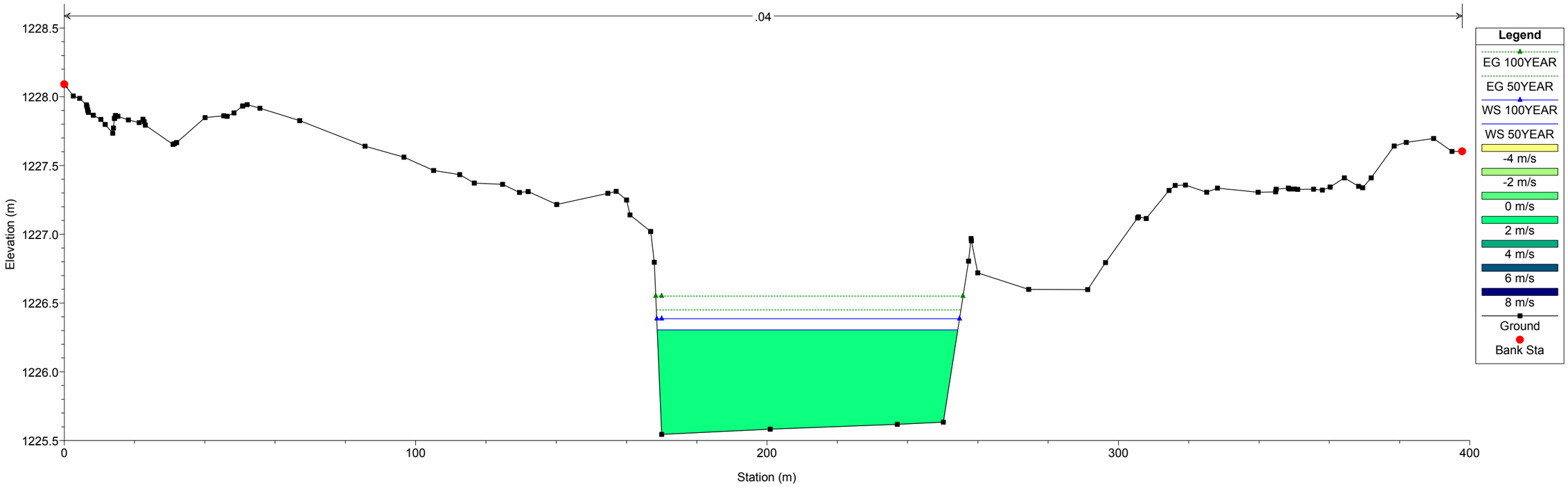

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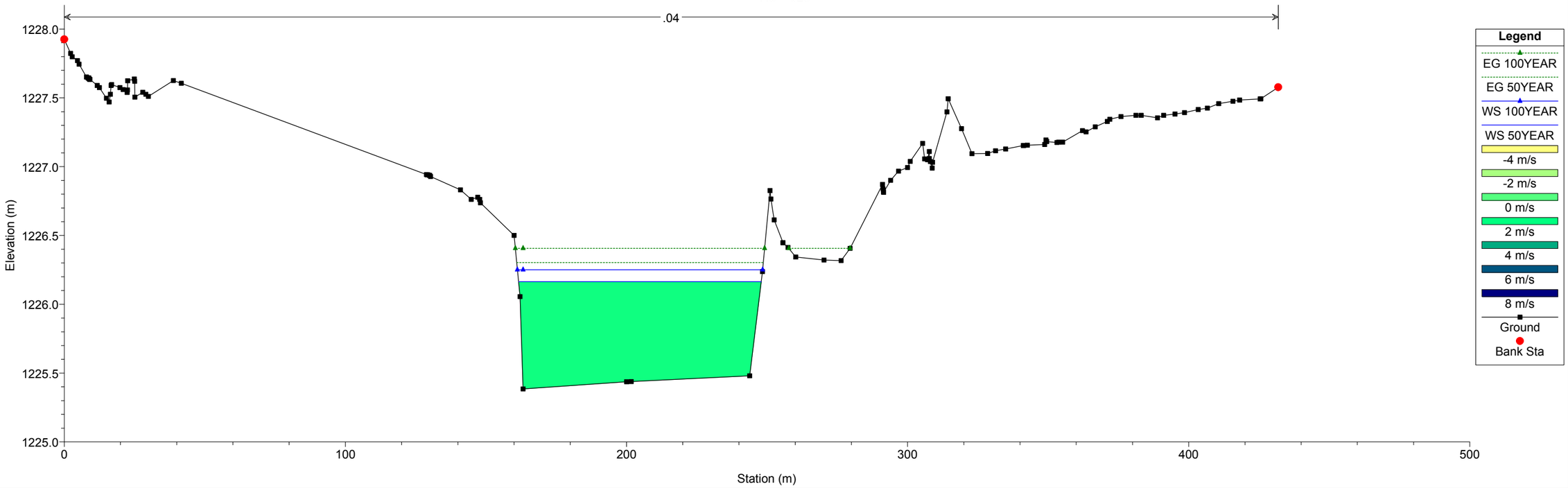

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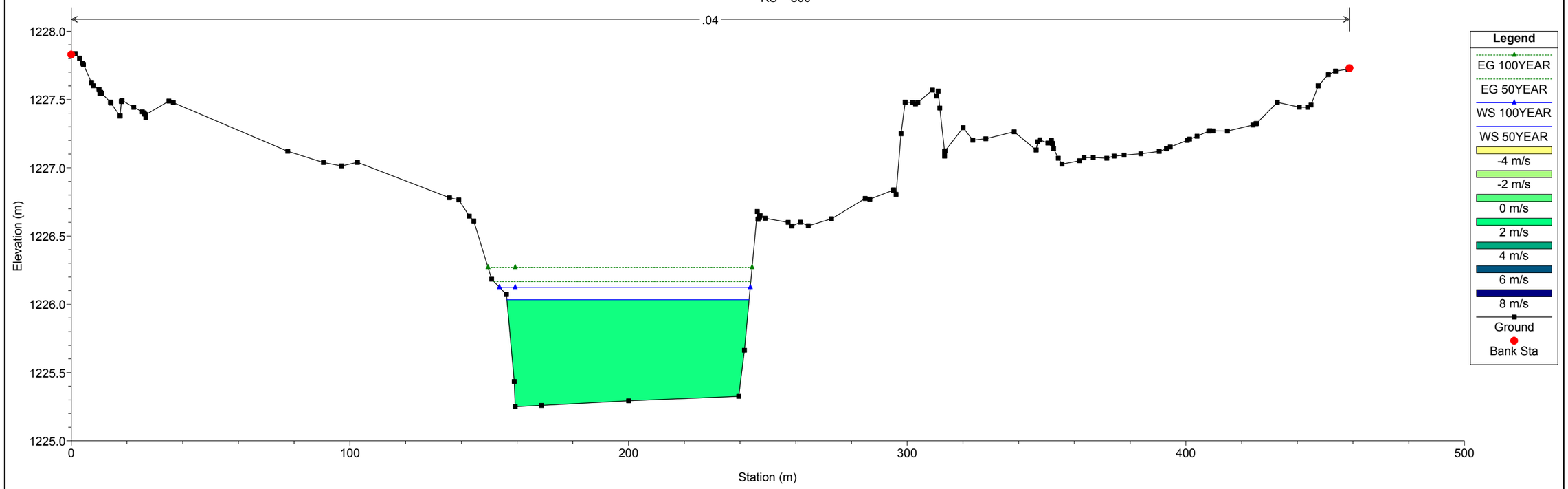

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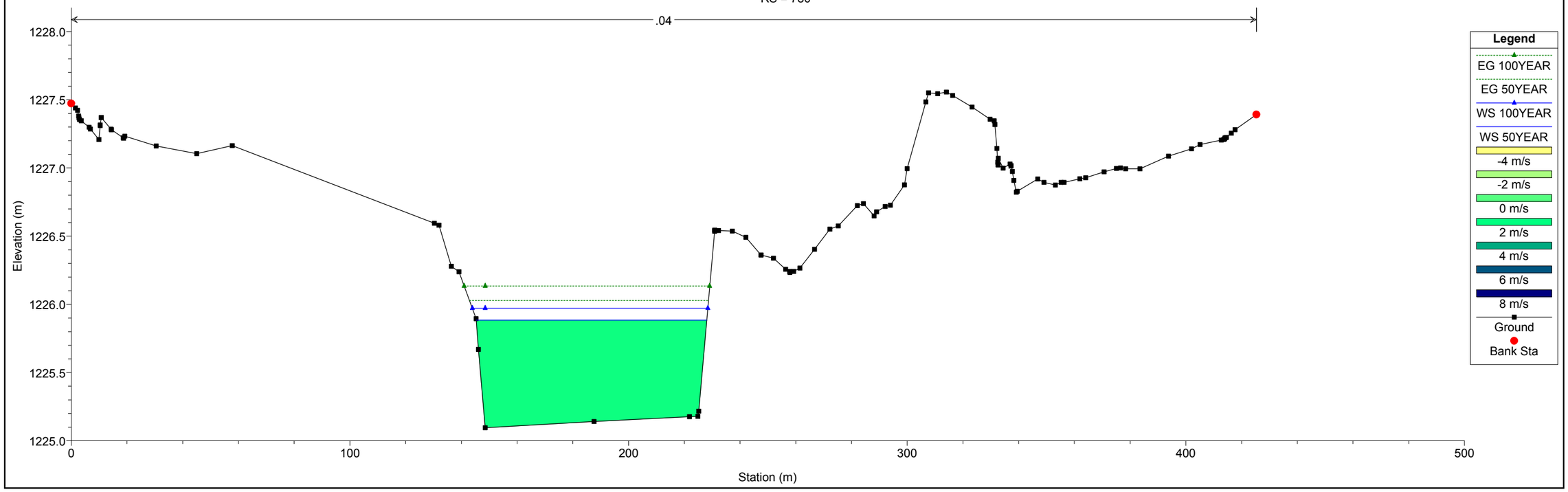

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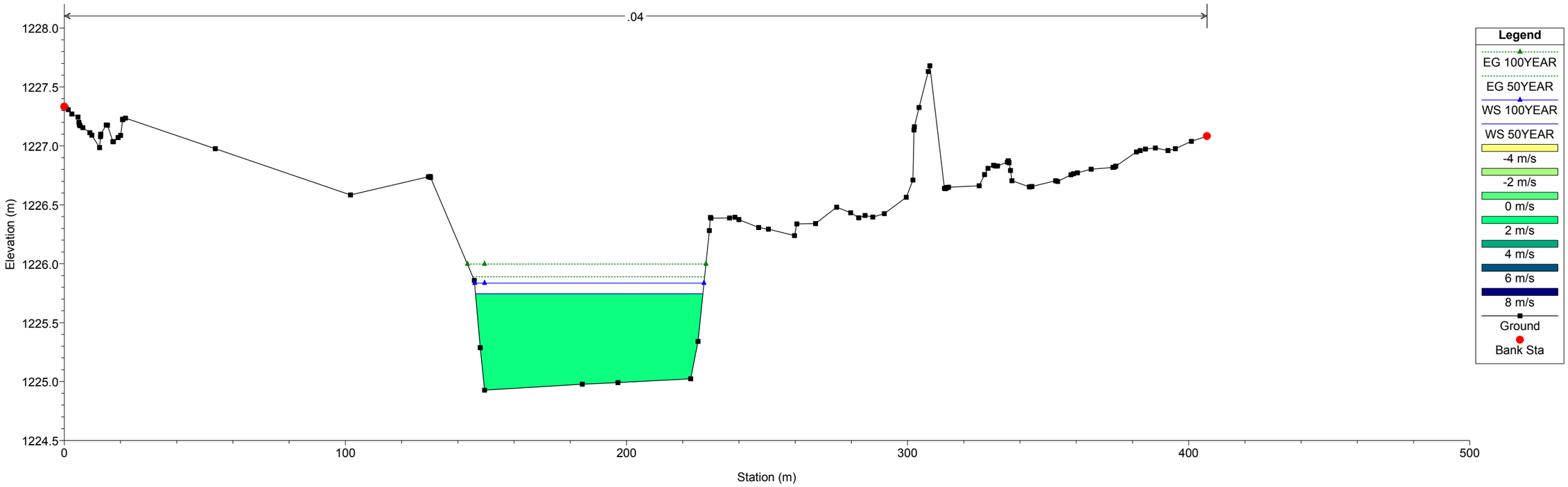

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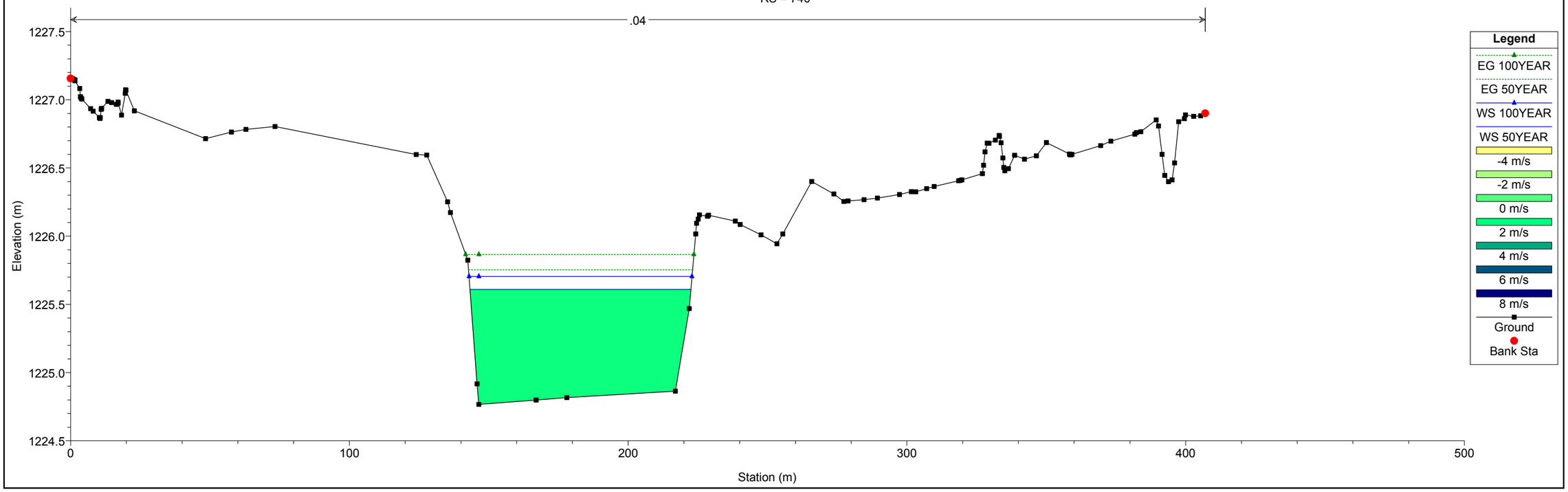

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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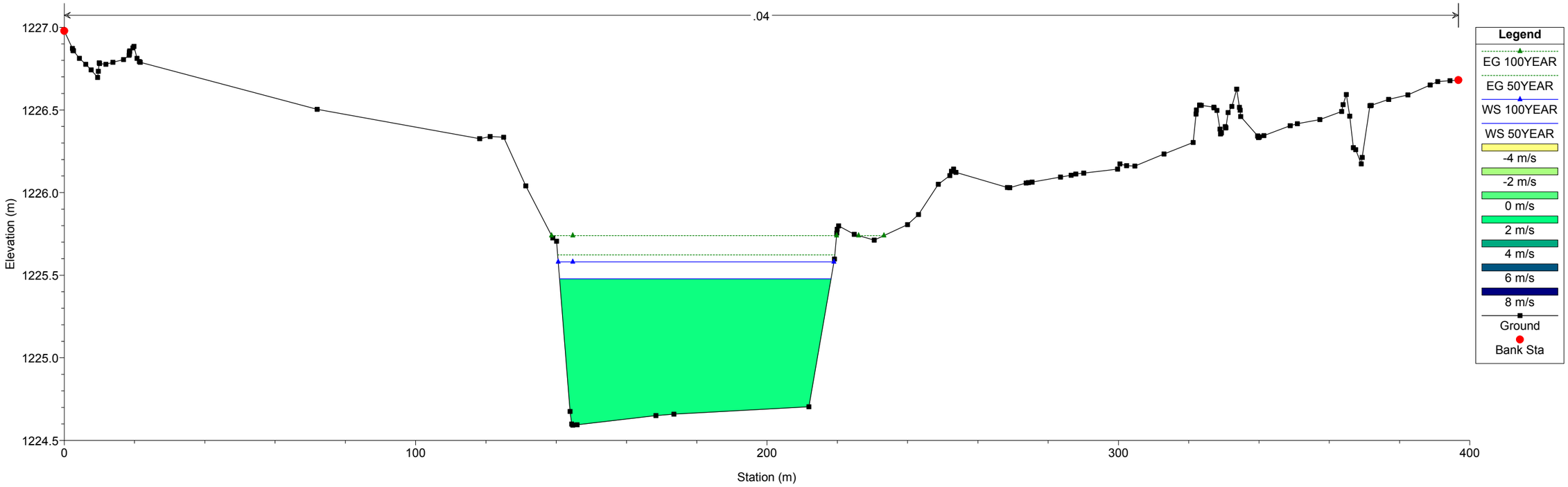

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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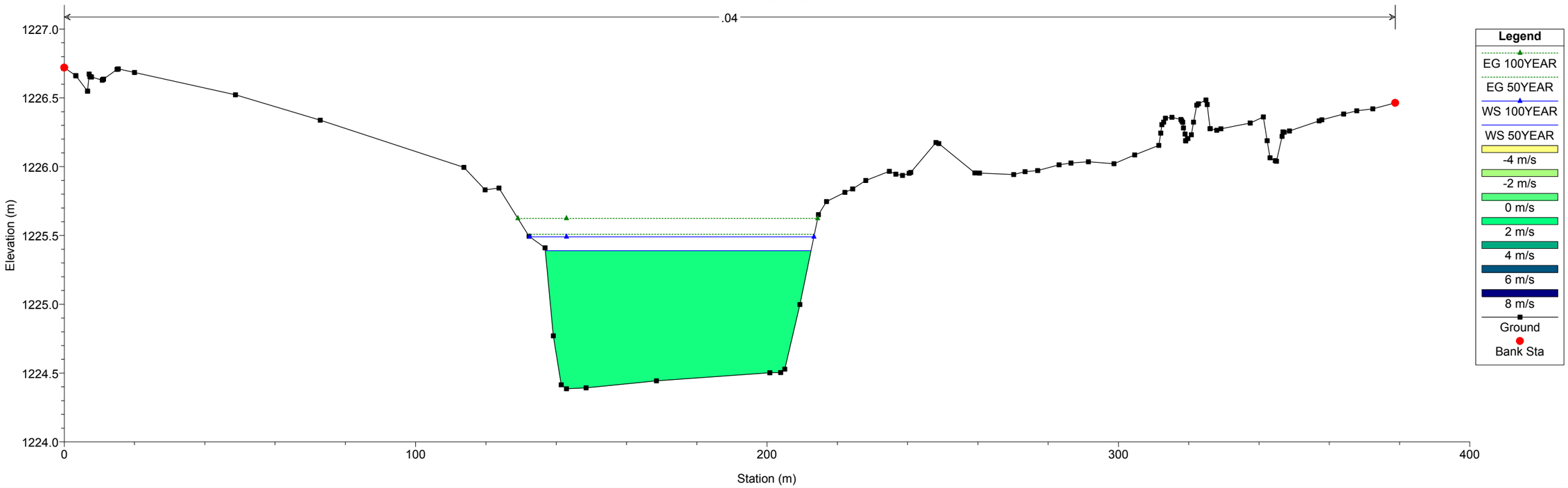

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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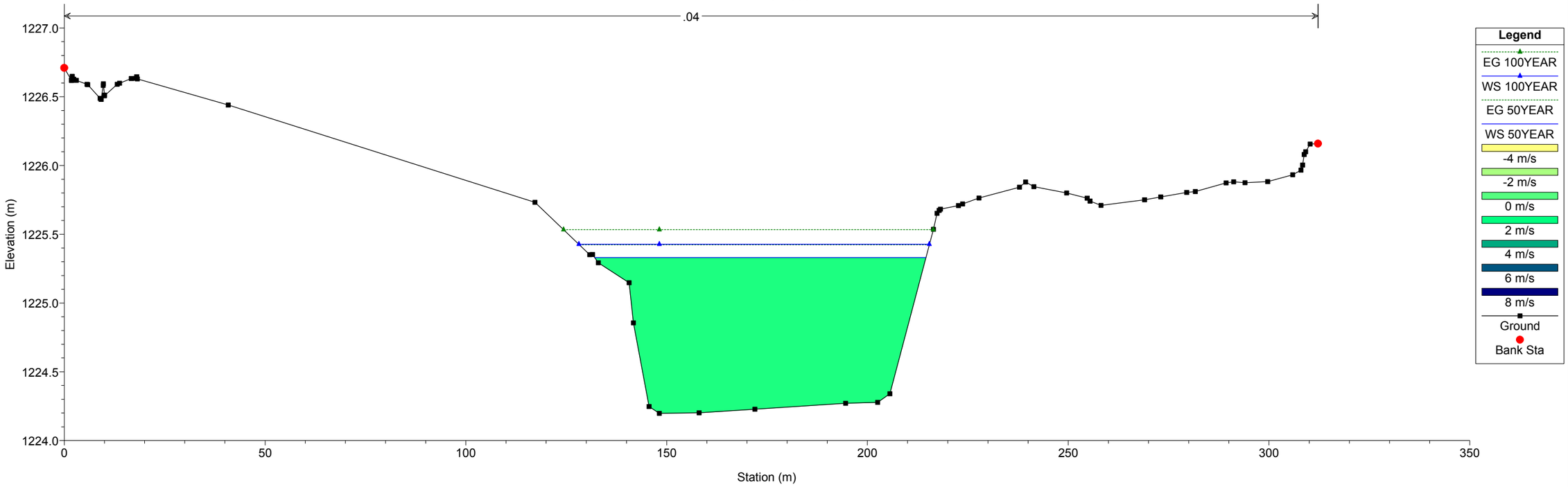

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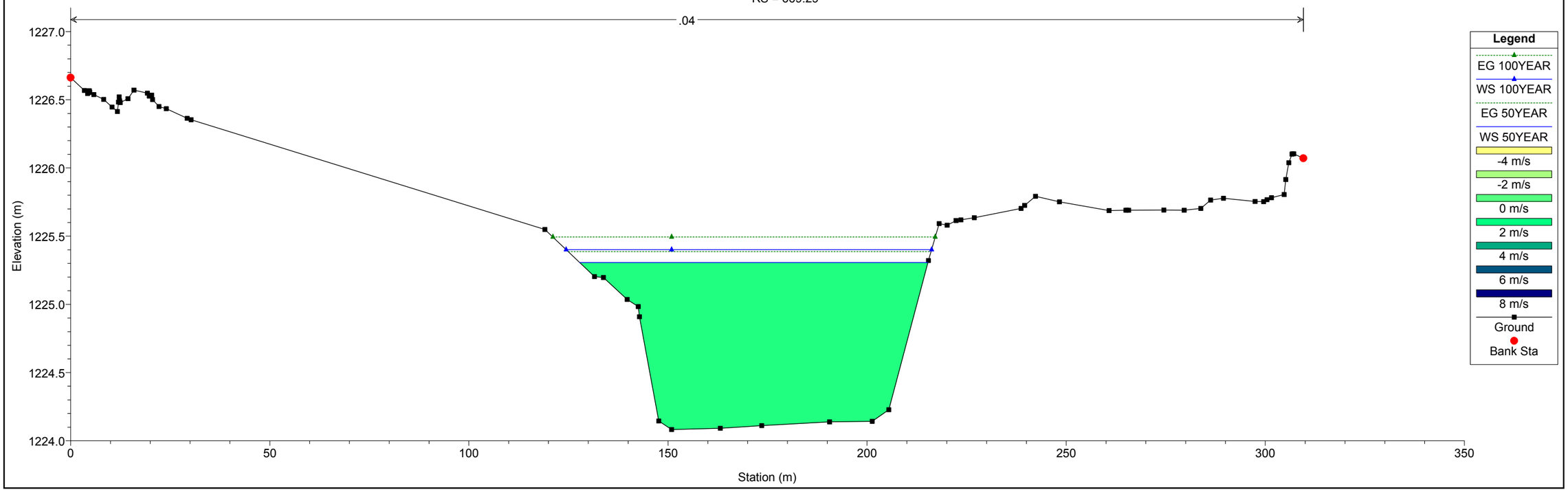

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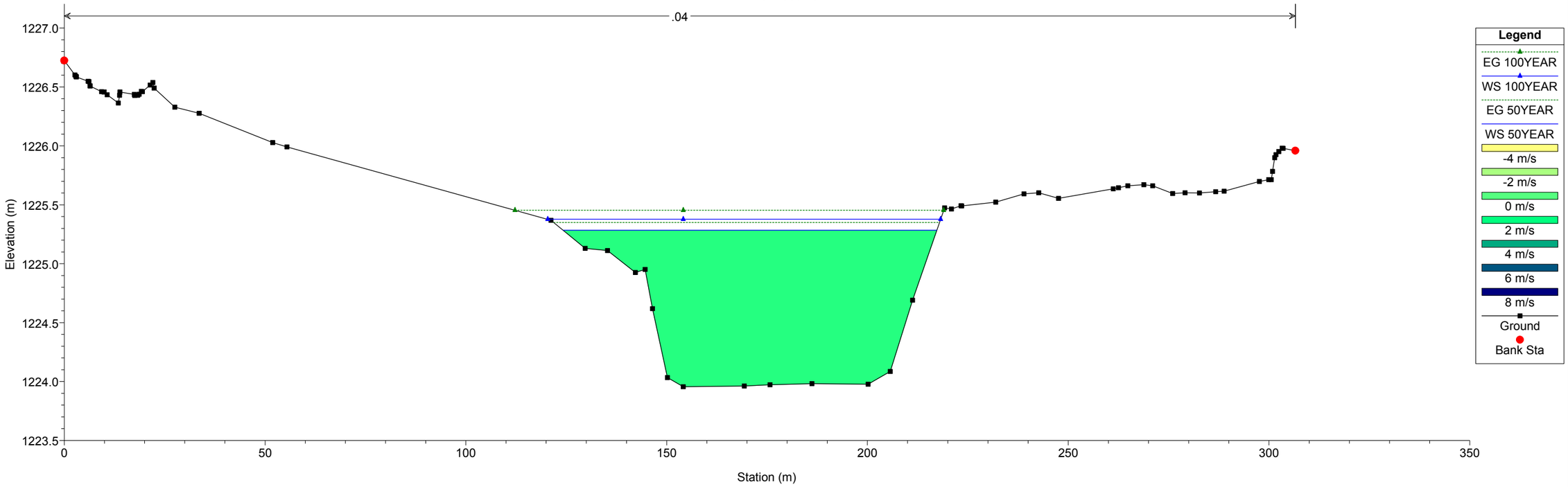

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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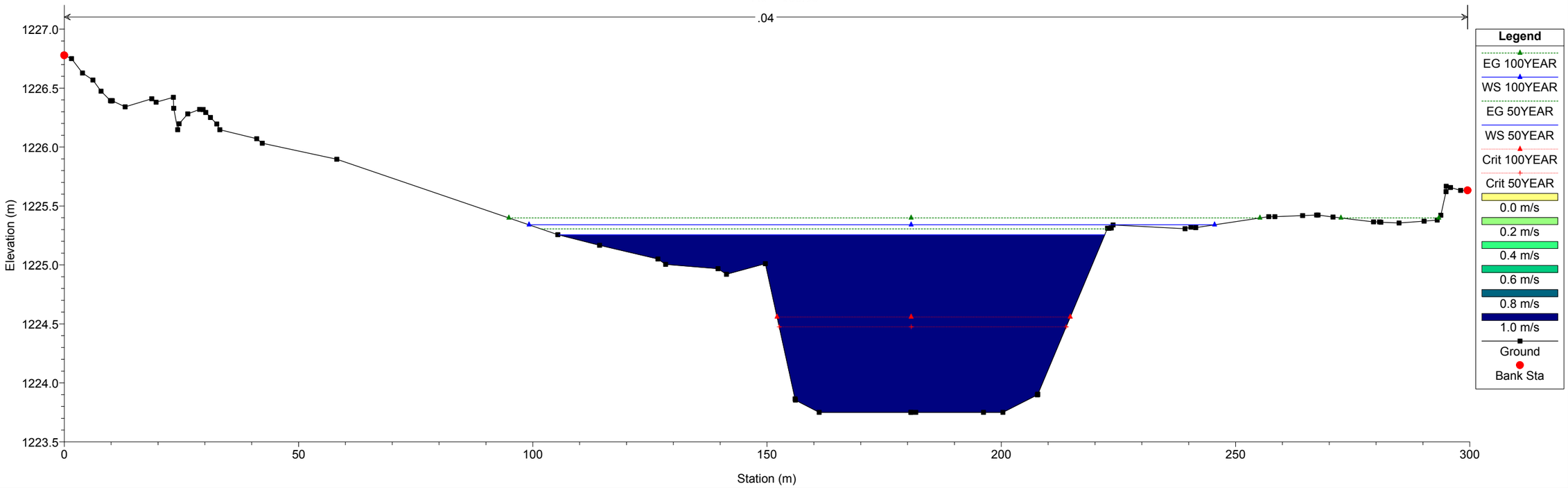

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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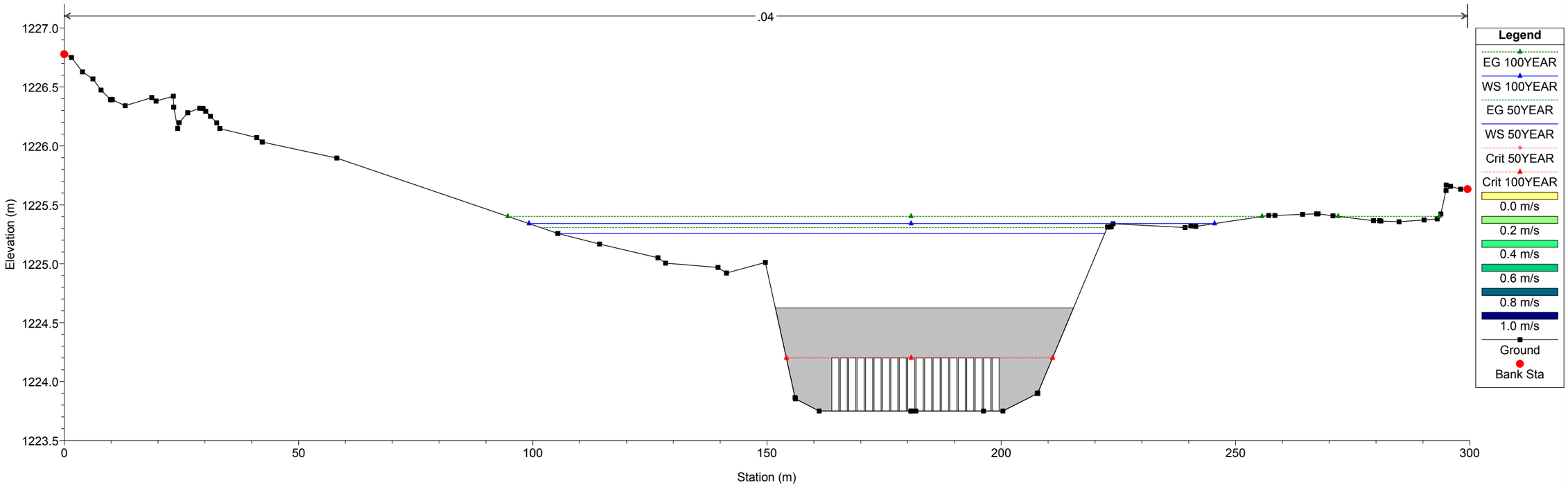

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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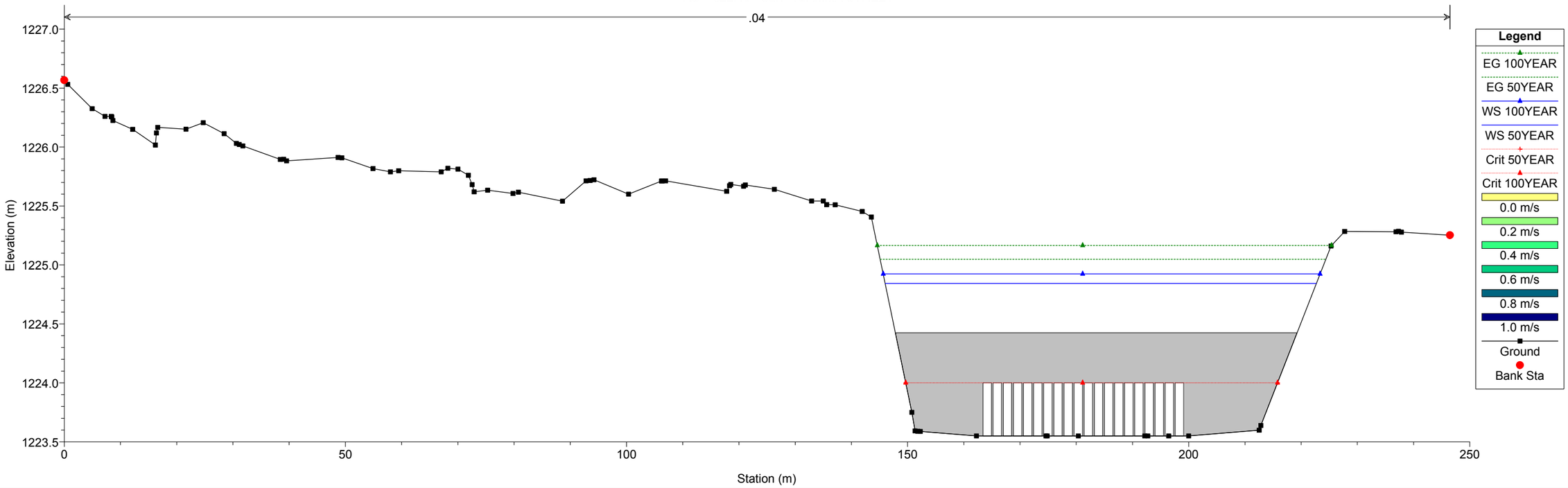

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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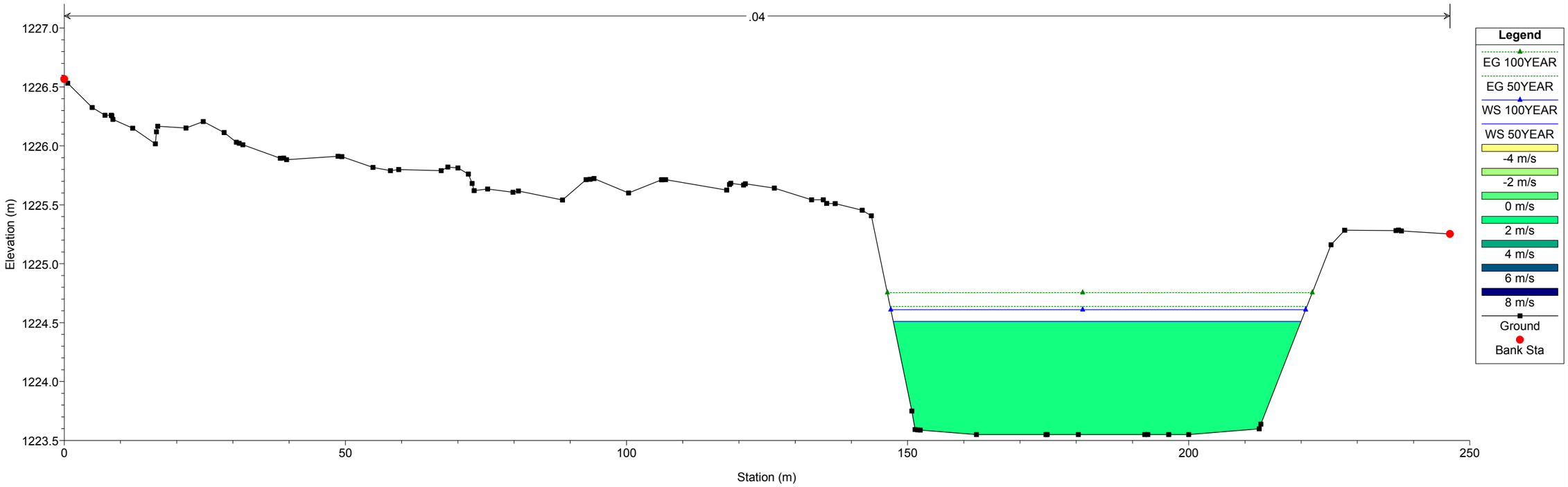

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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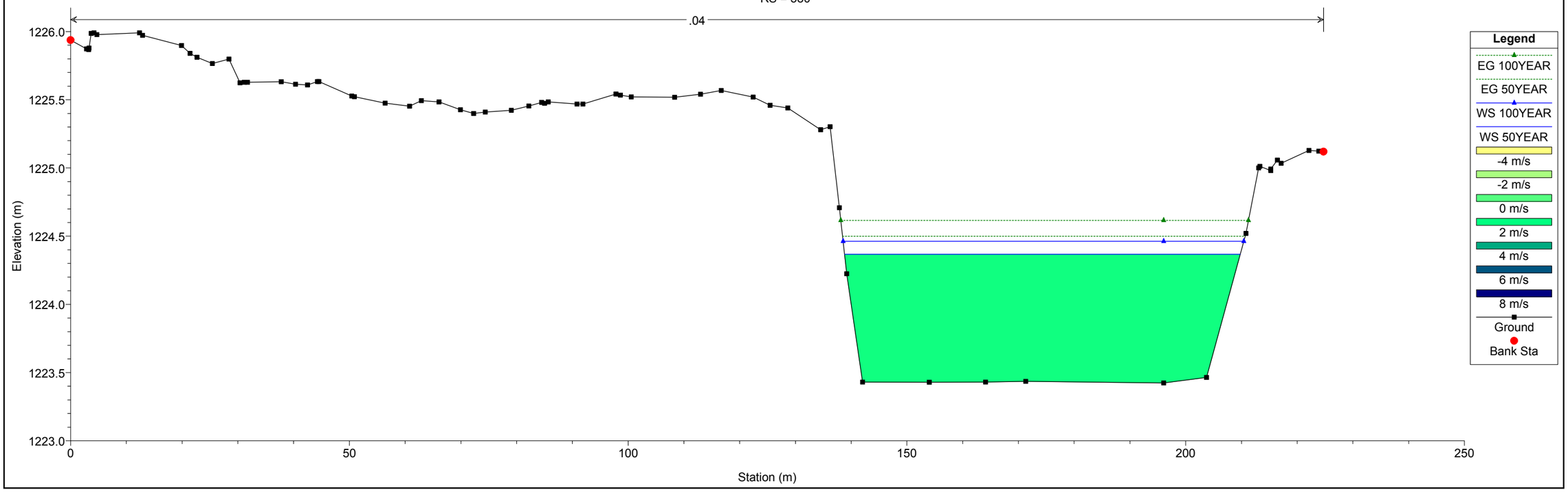

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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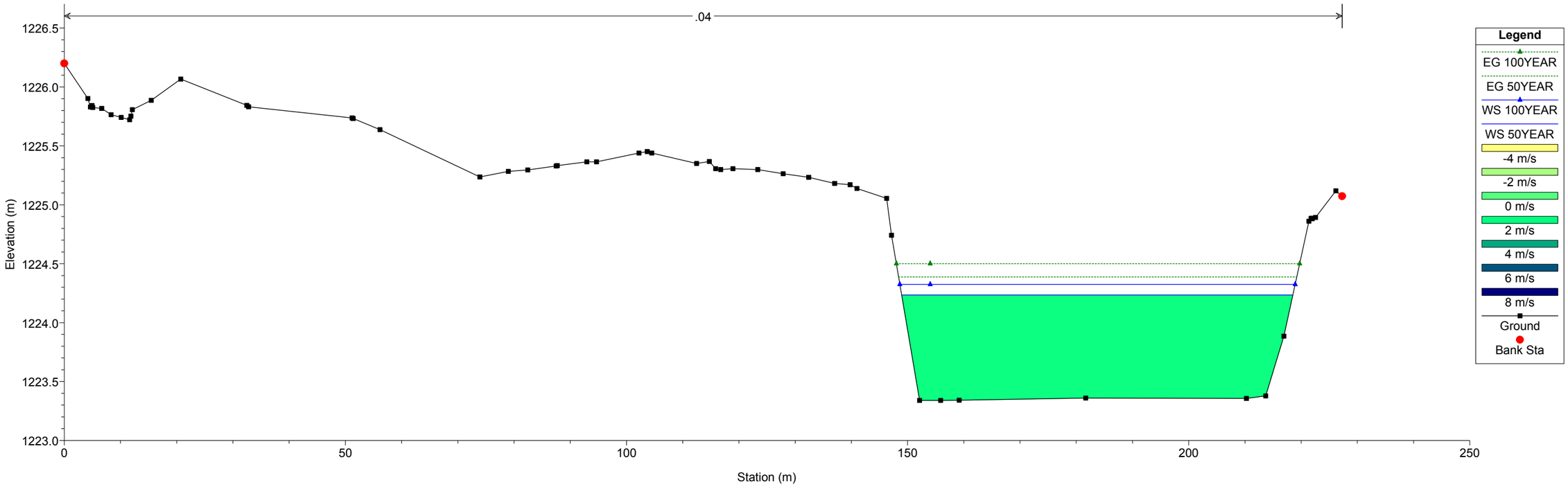

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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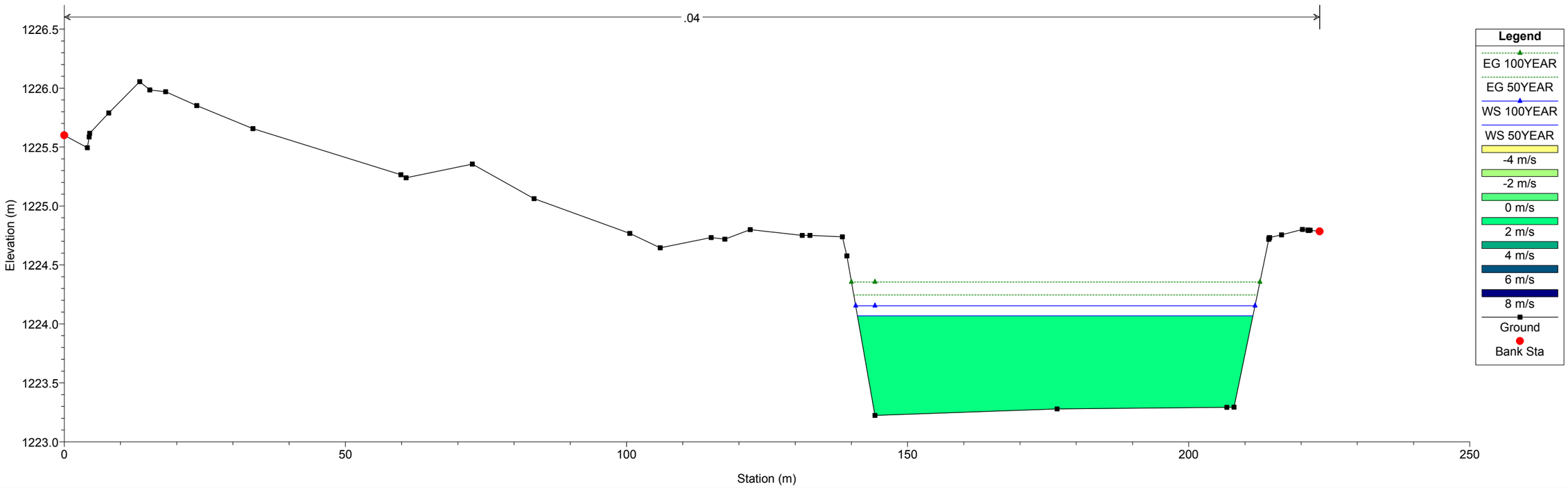

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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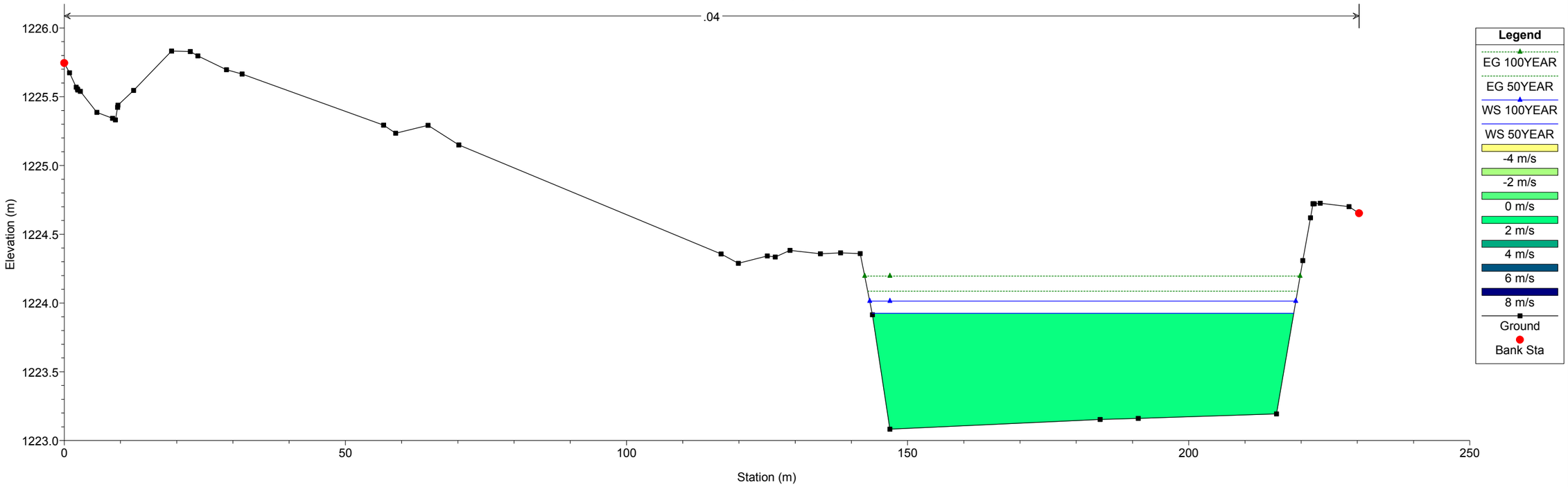

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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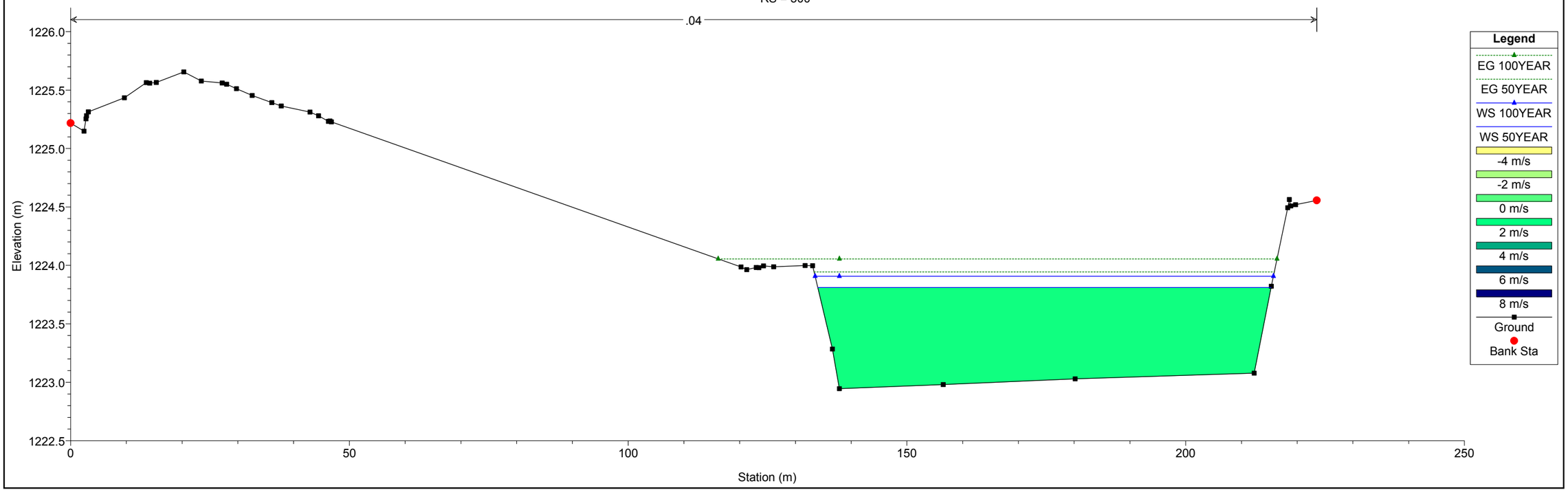

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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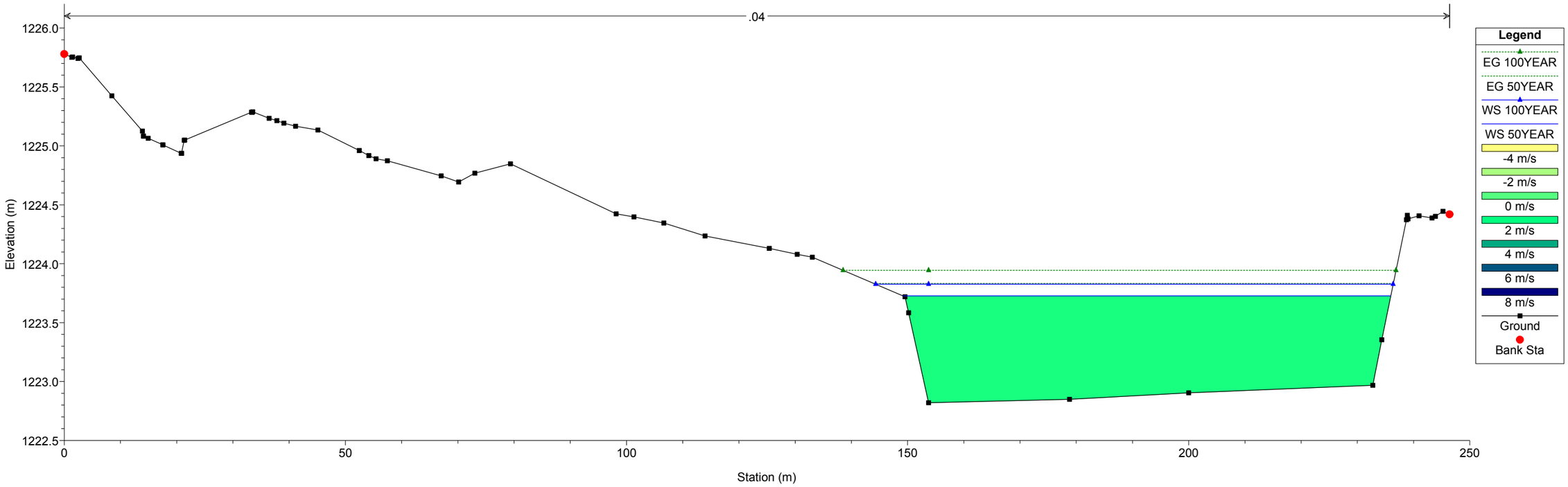

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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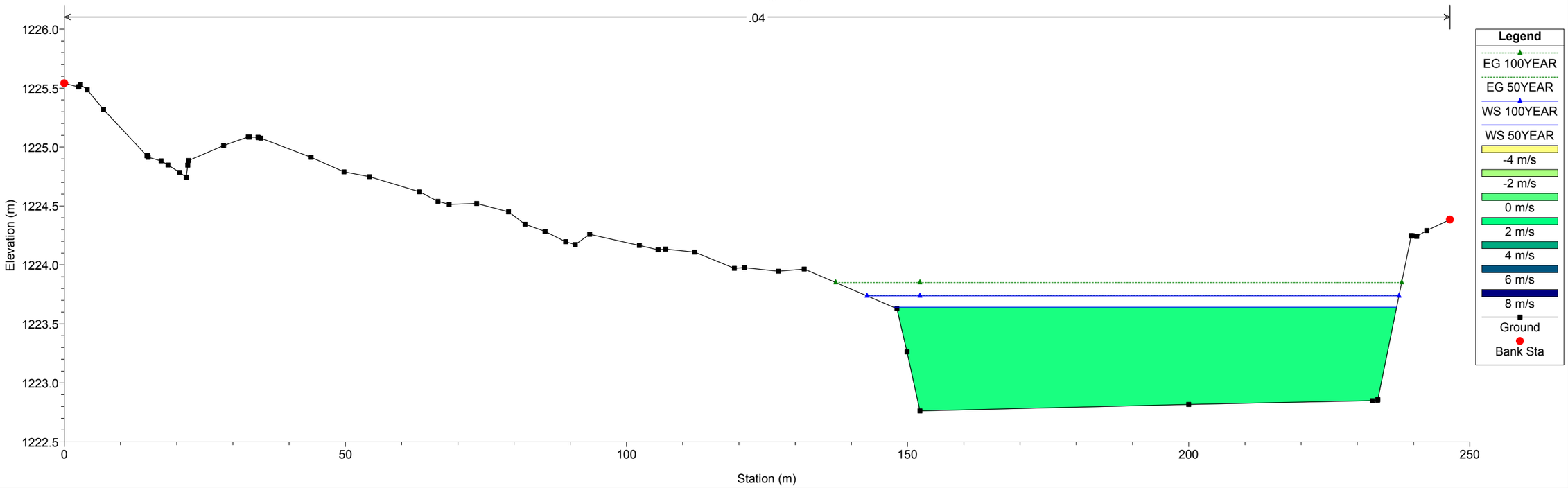

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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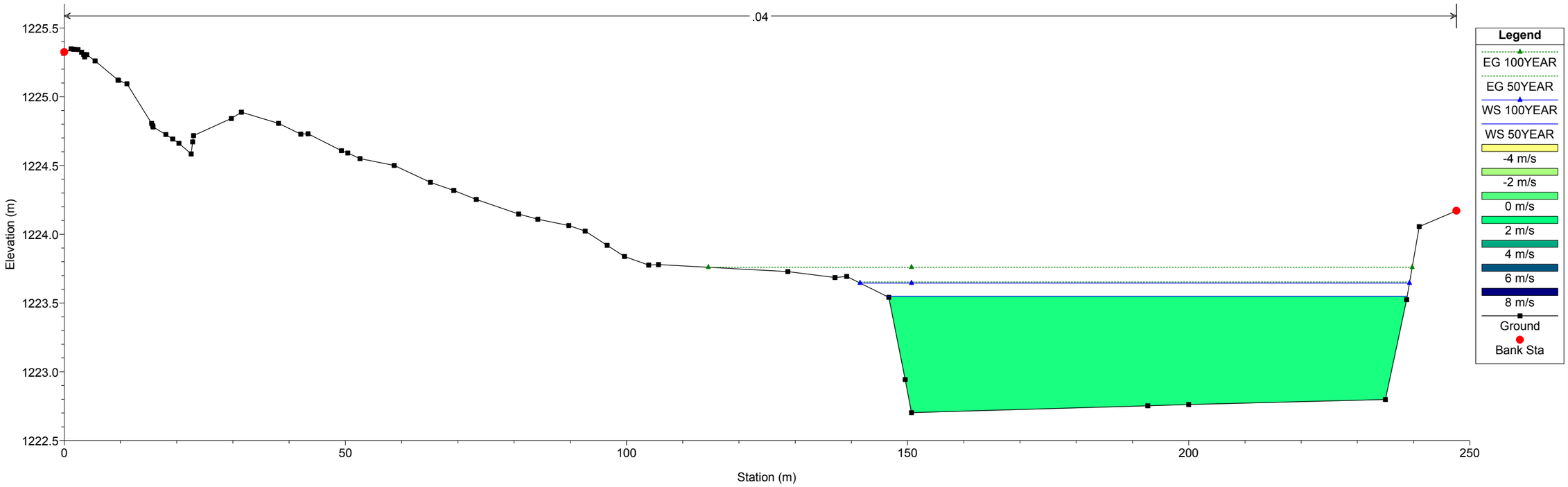

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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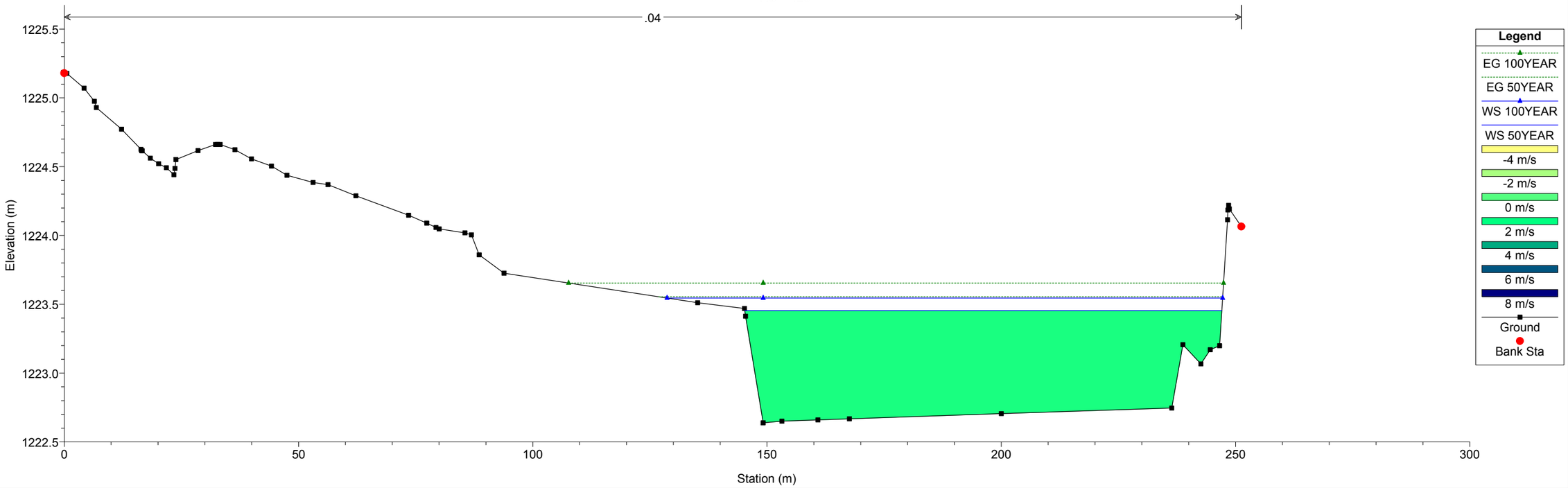

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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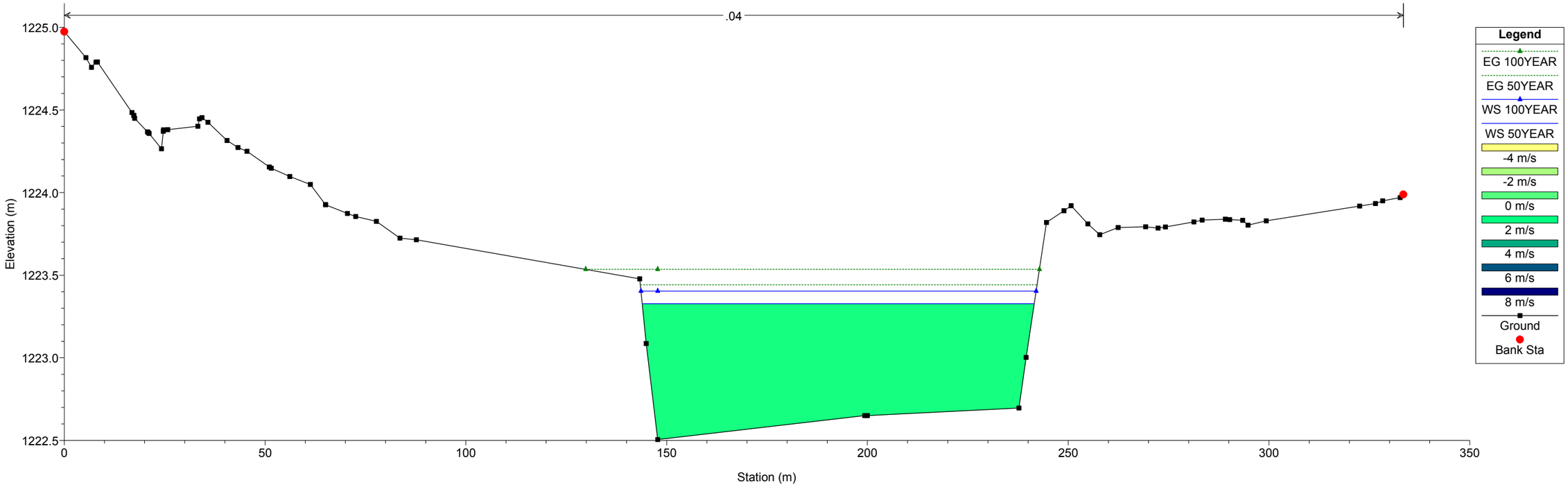

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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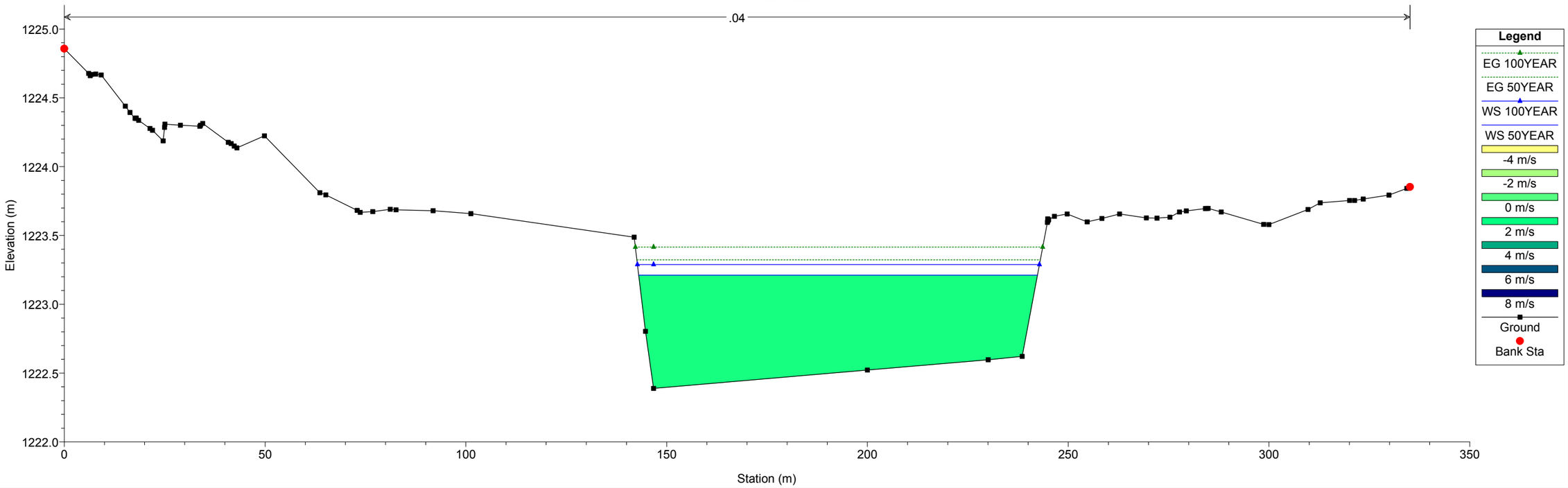
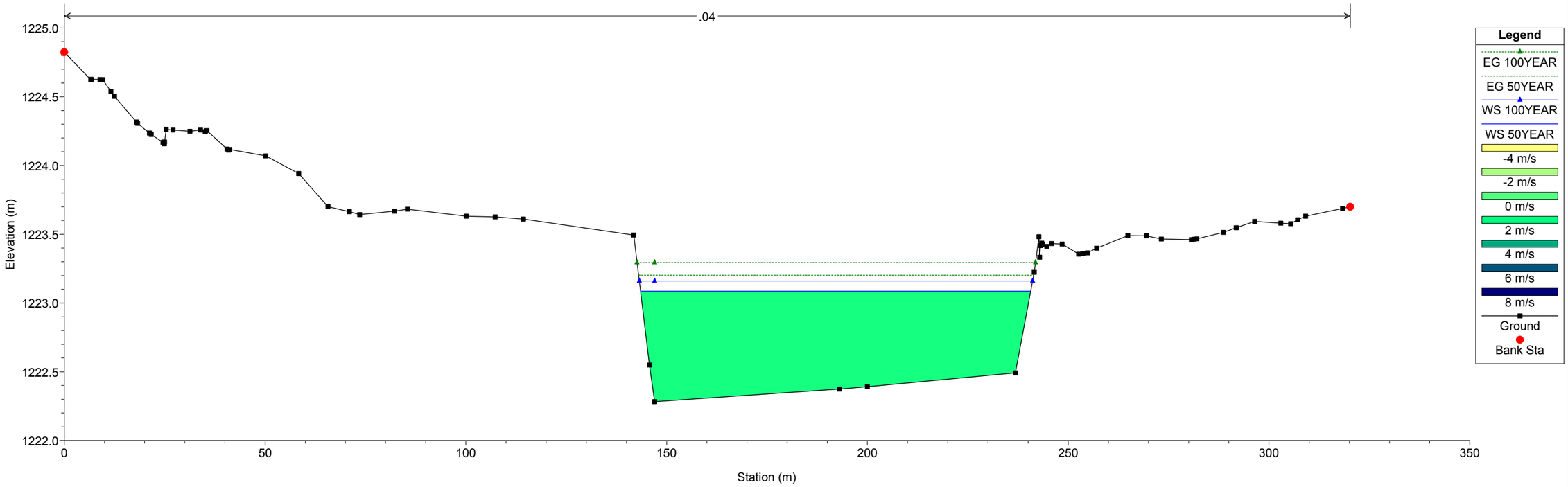


UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

RS = 360



UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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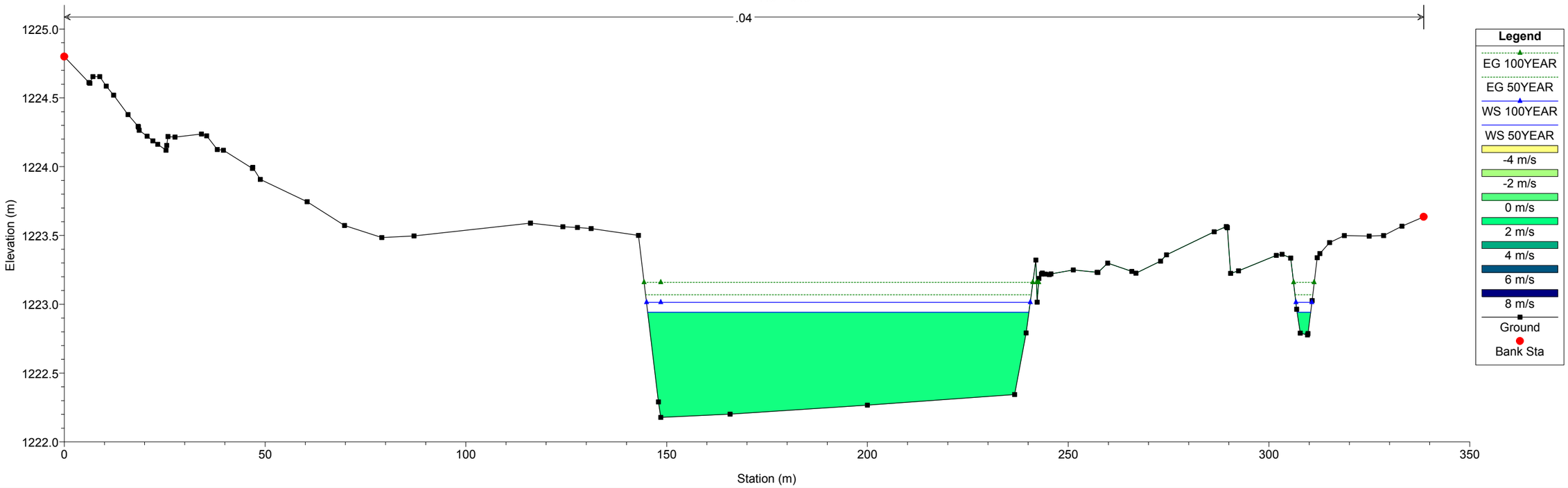

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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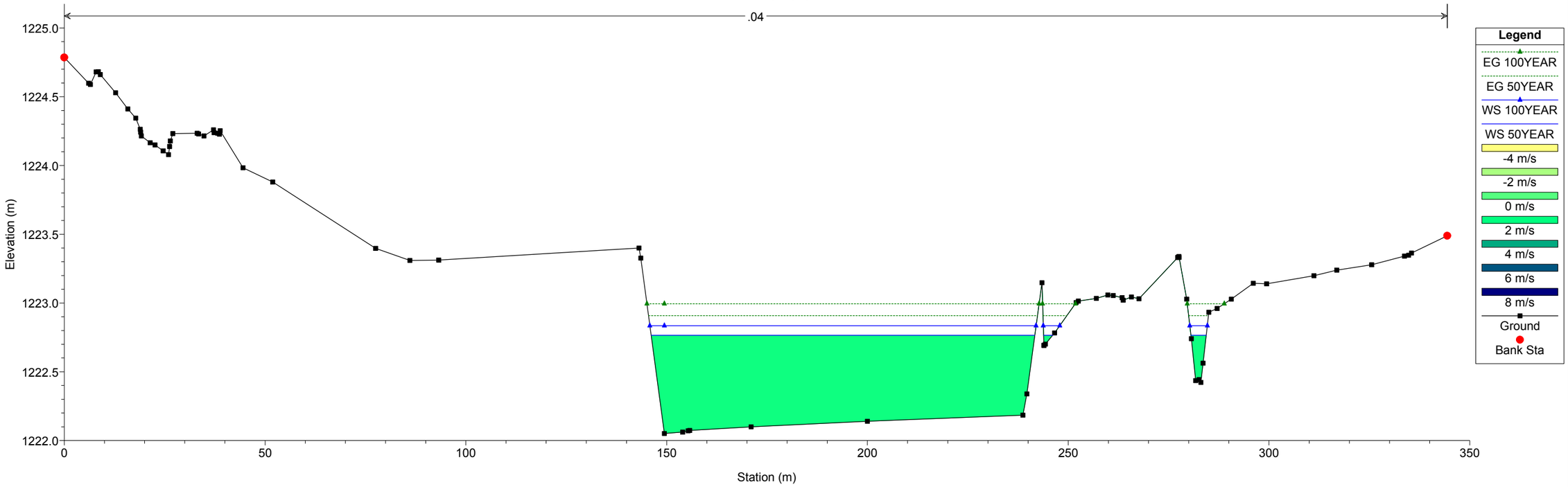

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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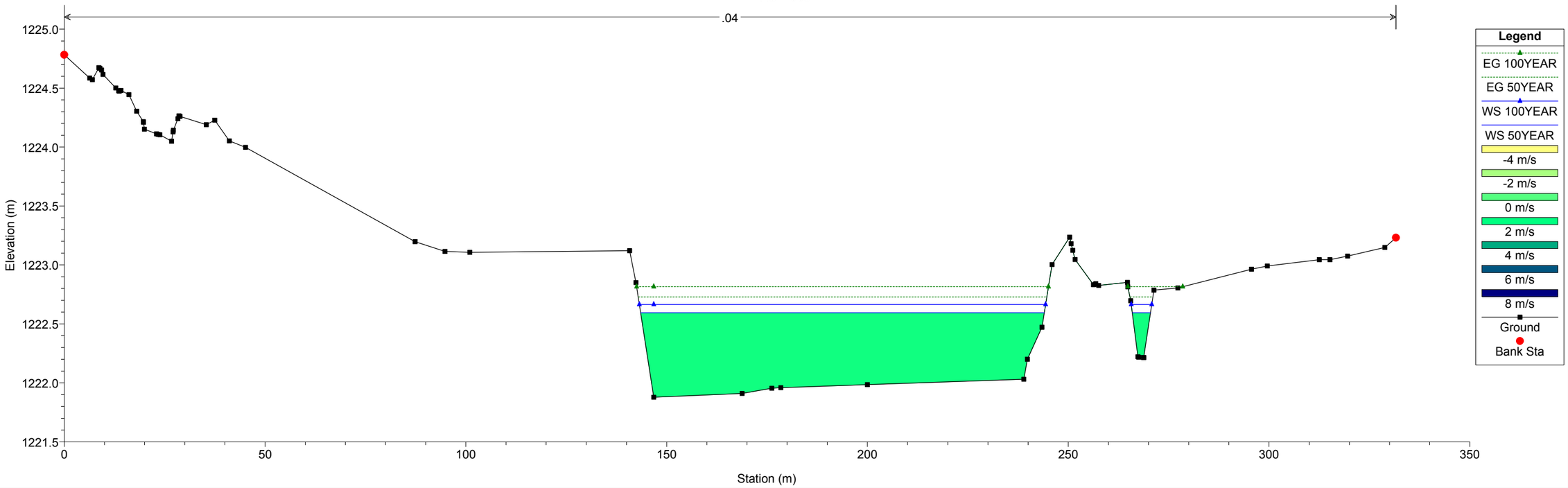

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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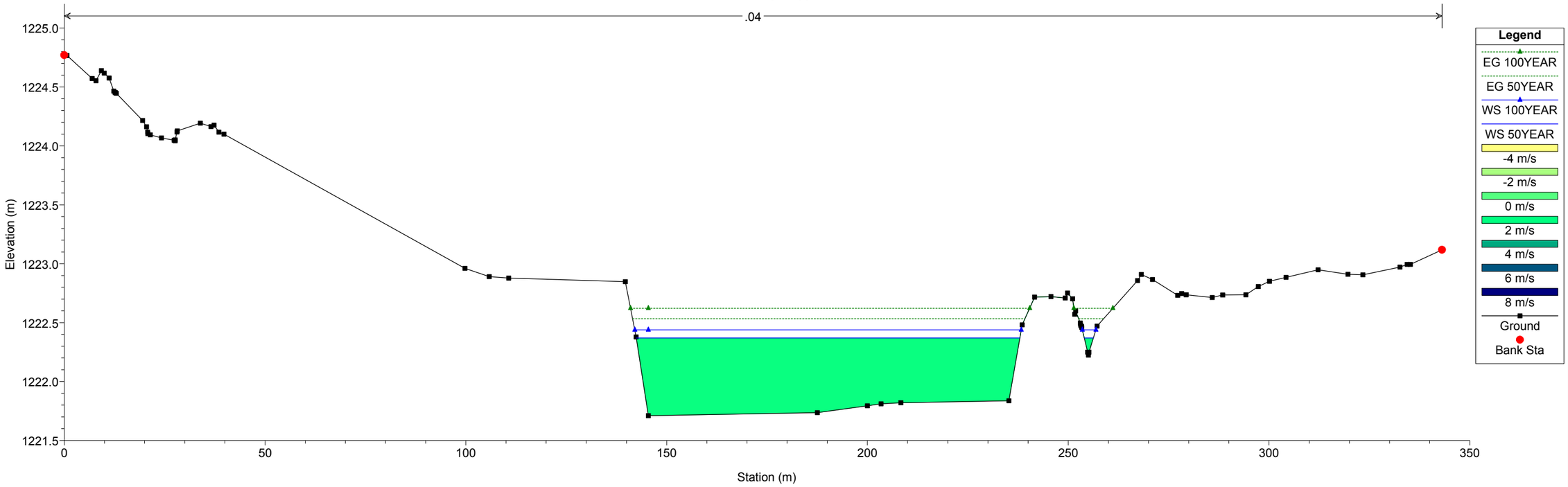
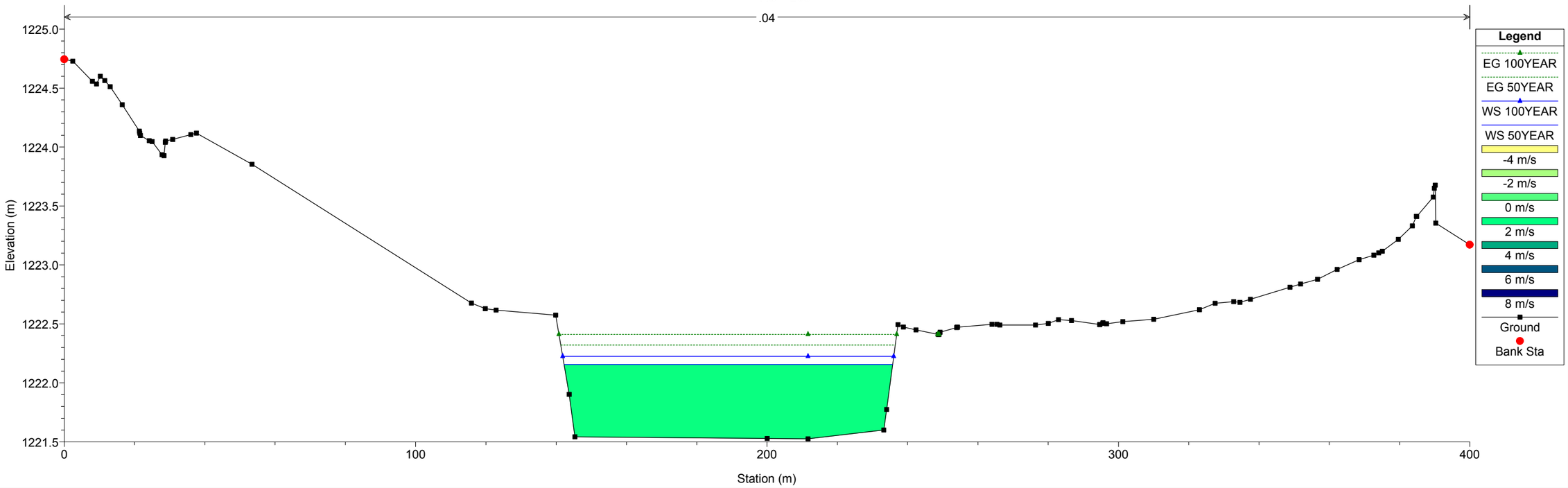


UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

RS = 260



UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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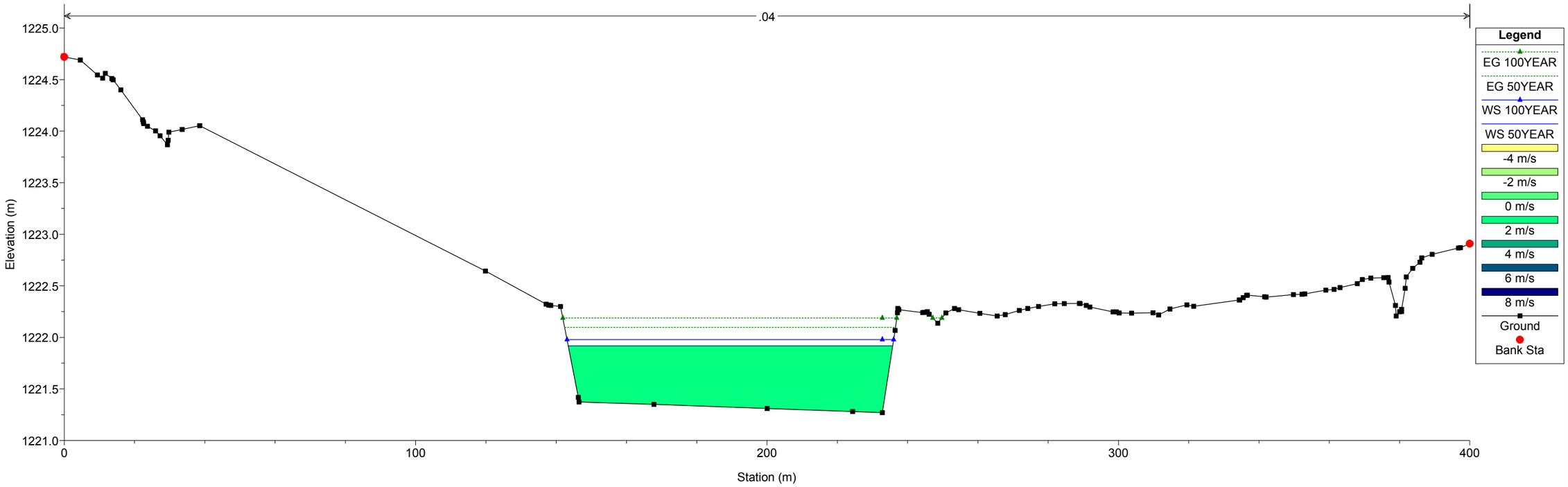

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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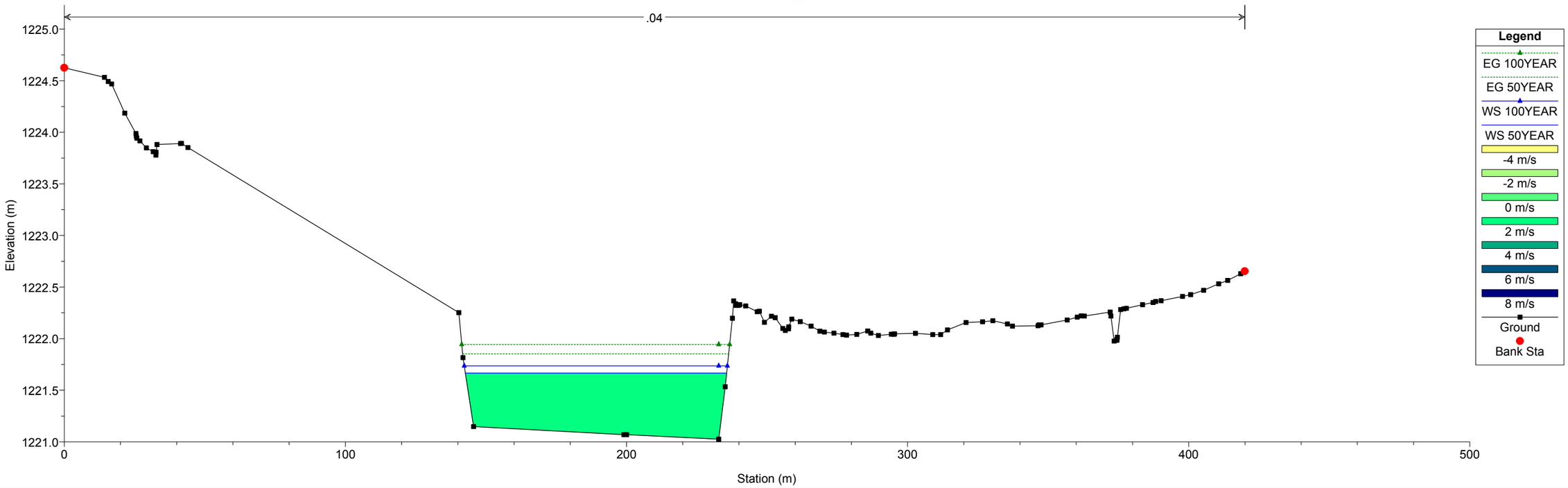

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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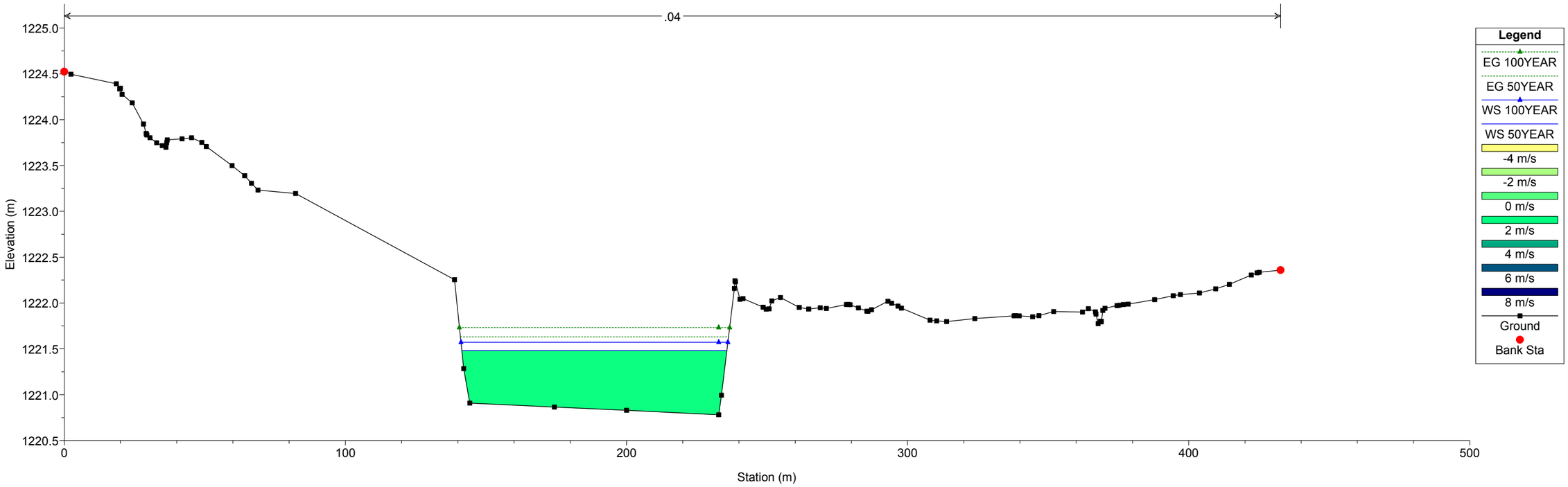

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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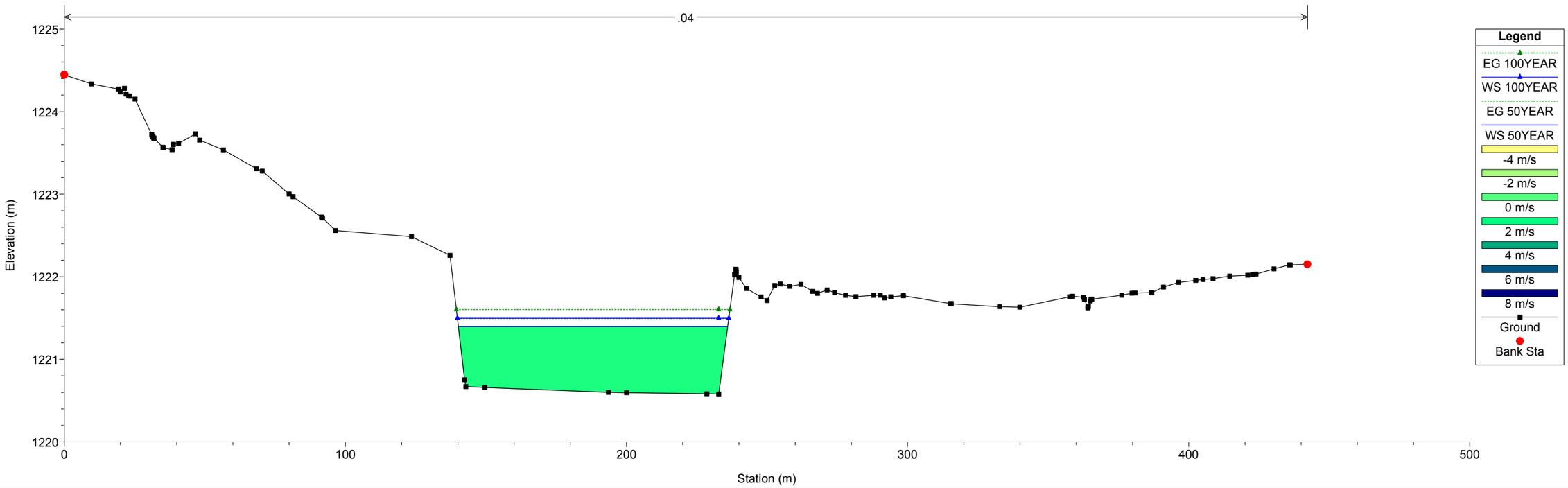

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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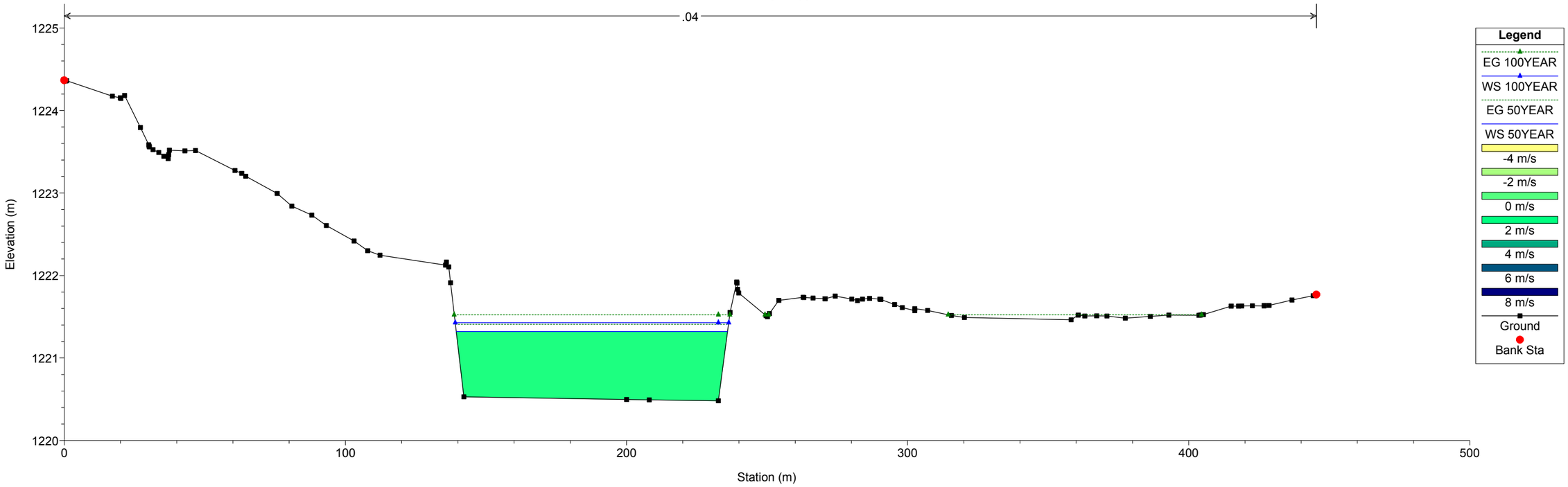

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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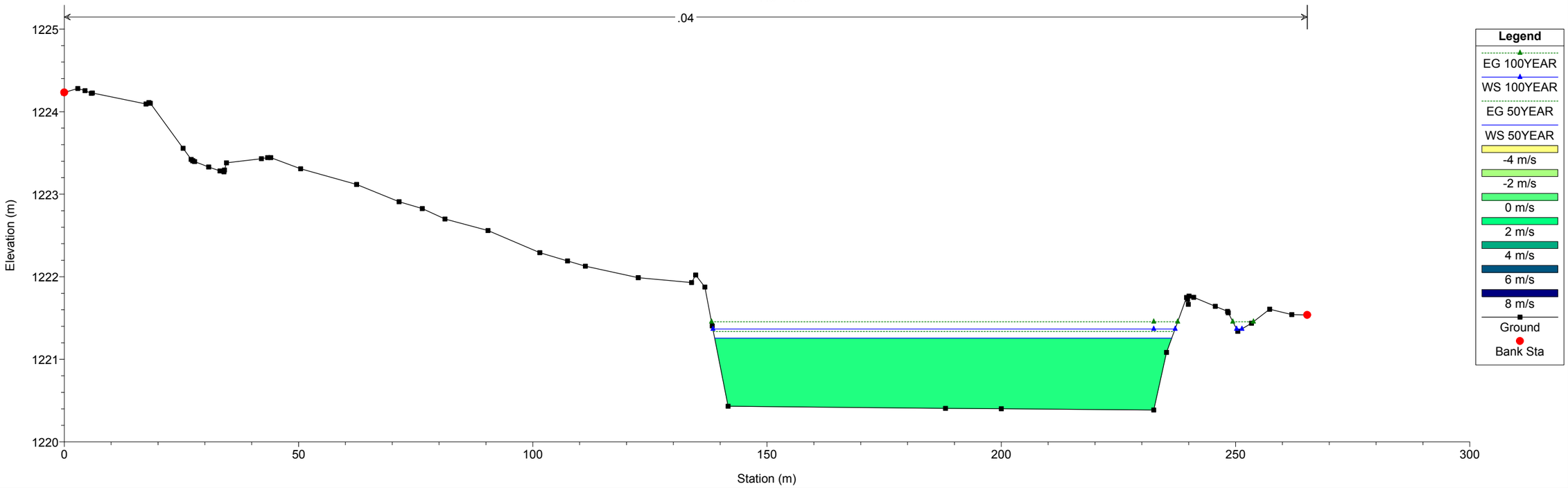

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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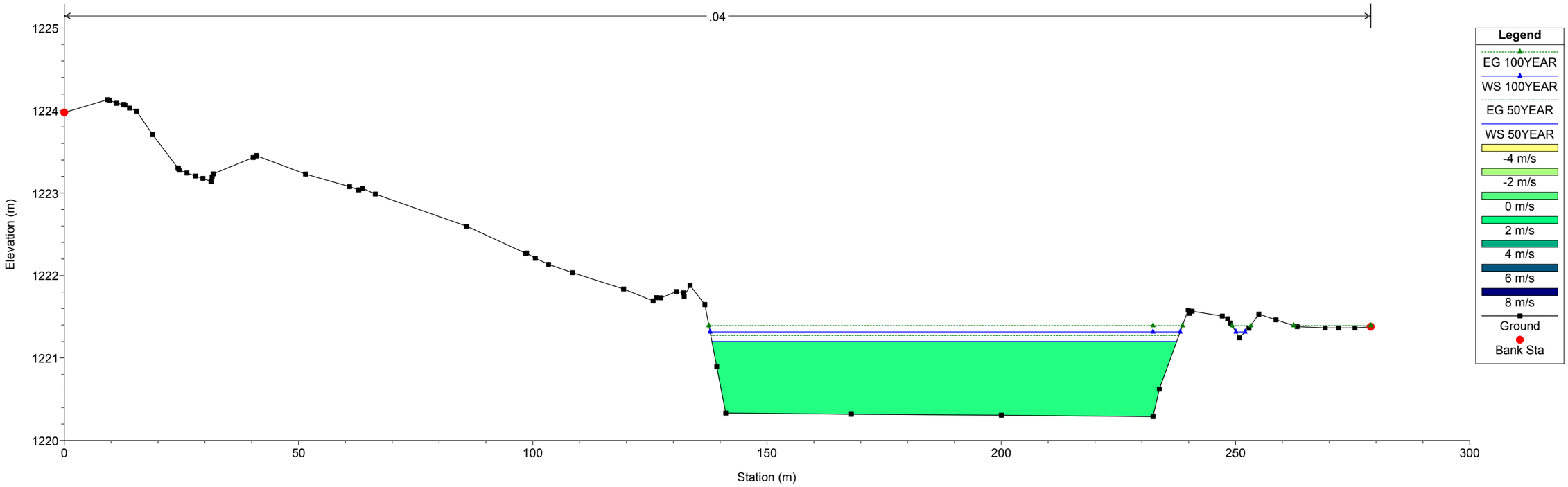

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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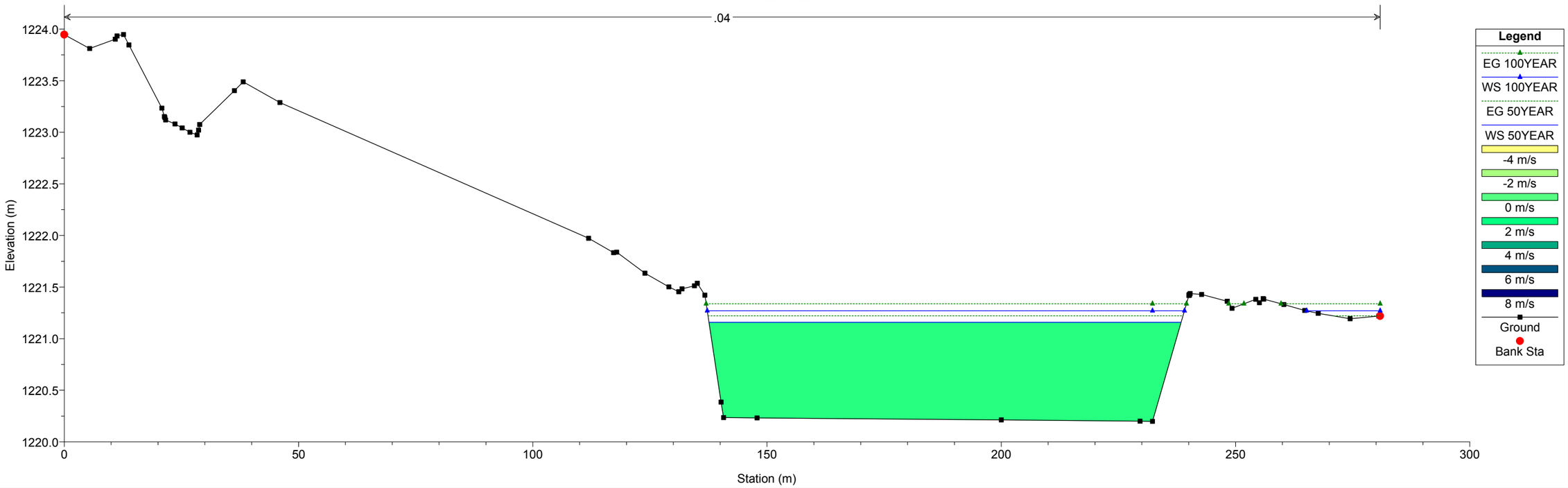

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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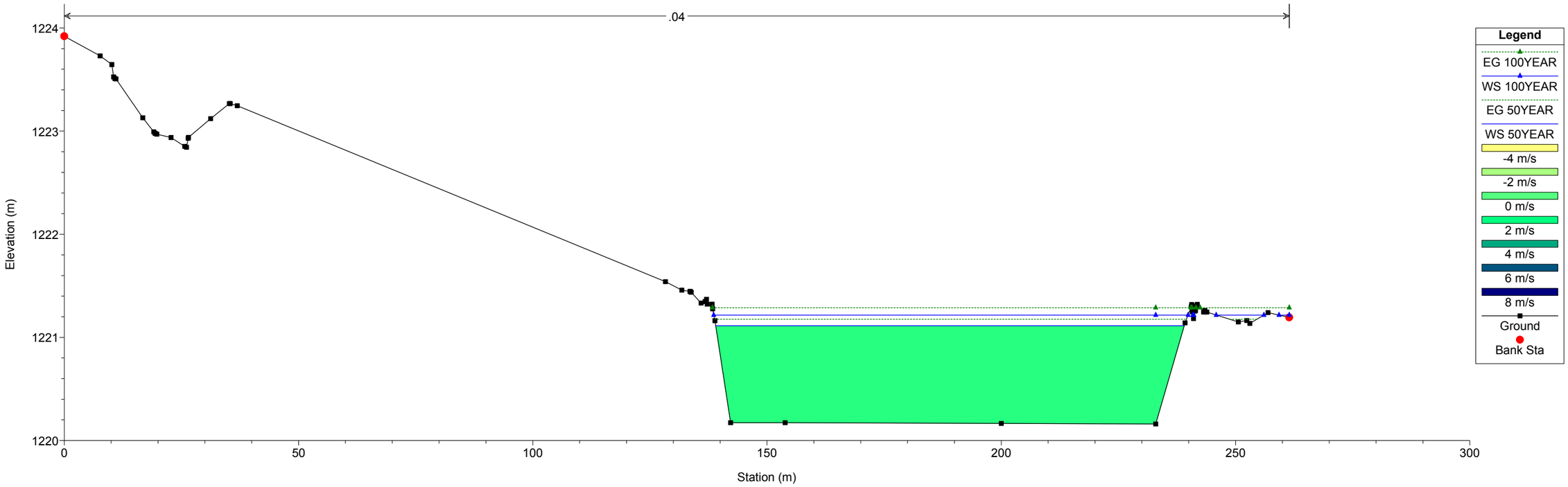

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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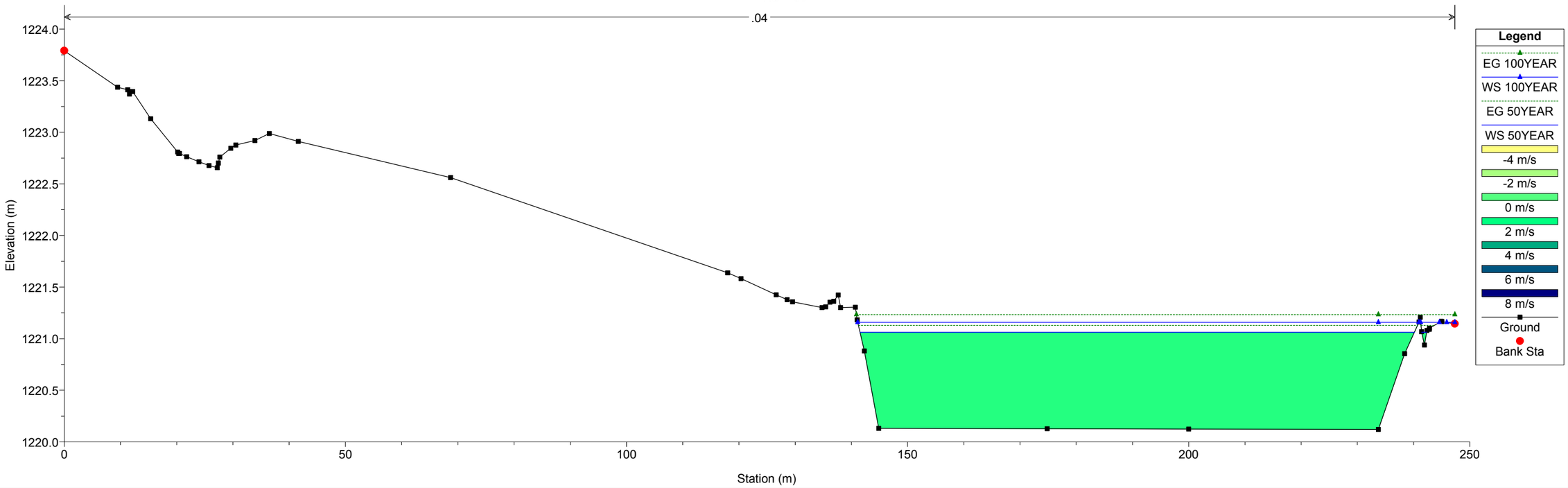

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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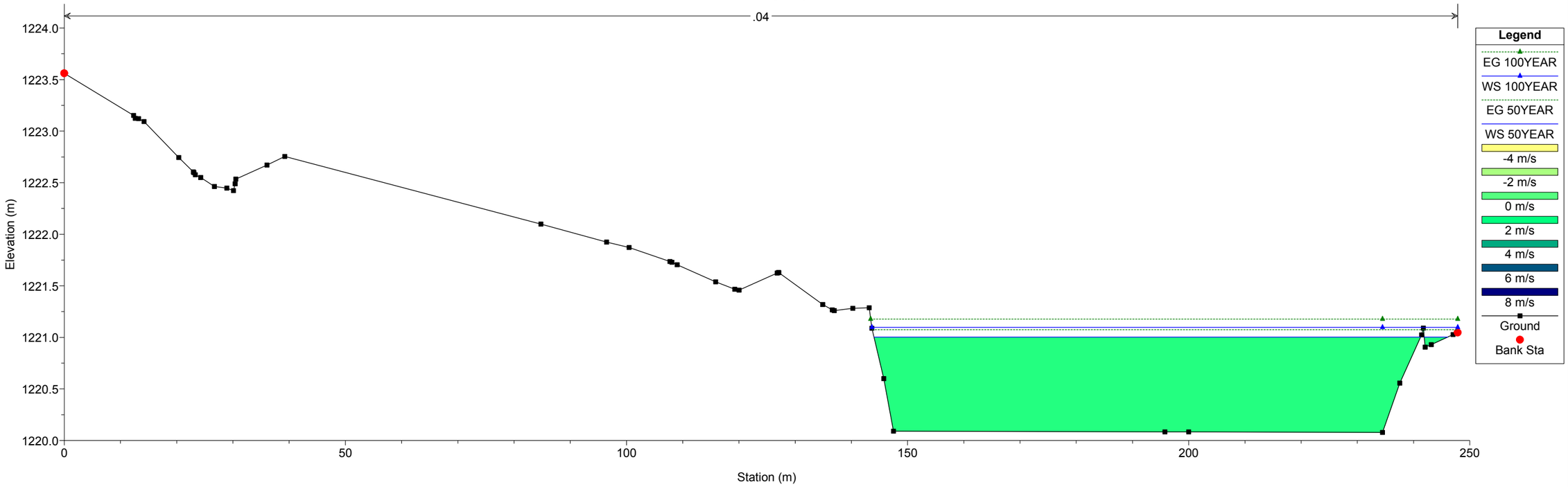

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

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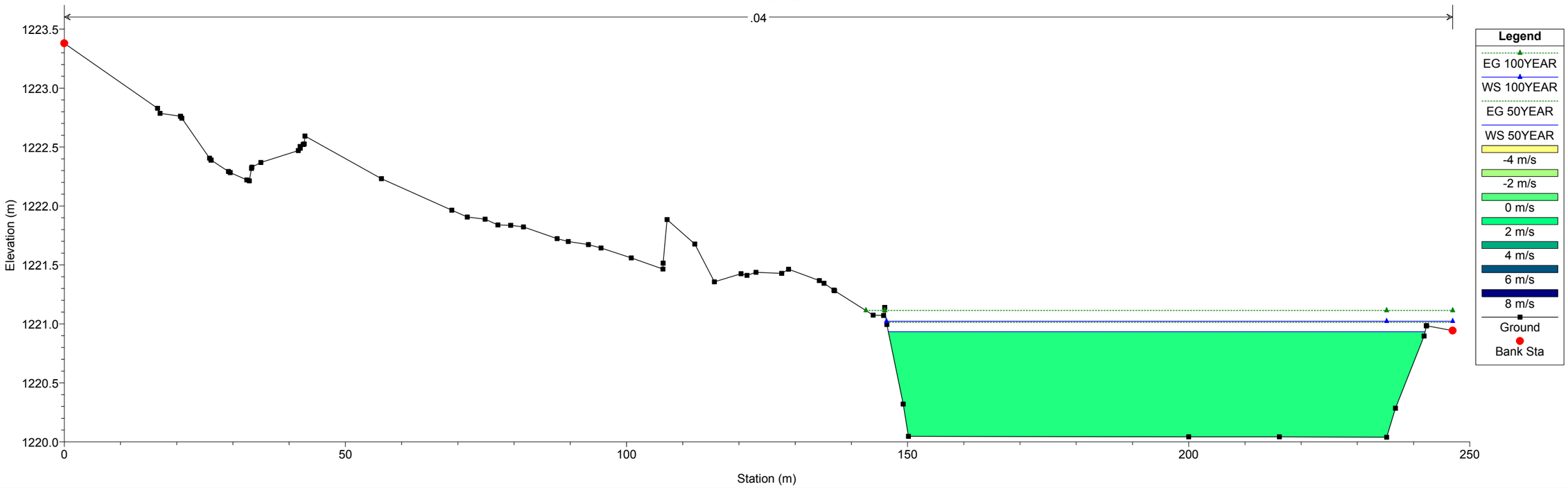

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

RS = 0

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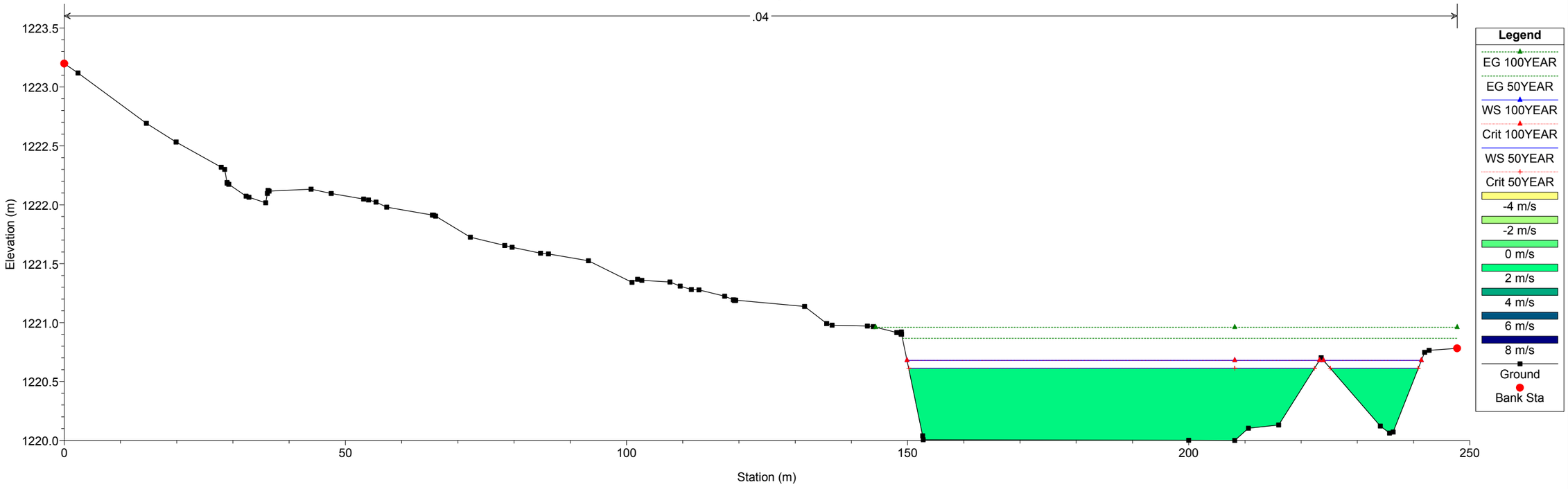


Plan: Plan20180820 V2 08-17 07-12 RS: 622.45 Culv Group: Culvert #1 Profile: 100YEAR

Q Culv Group (m3/s)	37.94	Culv Full Len (m)	18.00
# Barrels	20	Culv Vel US (m/s)	2.81
Q Barrel (m3/s)	1.90	Culv Vel DS (m/s)	2.81
E.G. US. (m)	1225.40	Culv Inv El Up (m)	1223.75
W.S. US. (m)	1225.34	Culv Inv El Dn (m)	1223.55
E.G. DS (m)	1224.76	Culv Frctn Ls (m)	0.23
W.S. DS (m)	1224.61	Culv Exit Loss (m)	0.26
Delta EG (m)	0.65	Culv Entr Loss (m)	0.16
Delta WS (m)	0.73	Q Weir (m3/s)	81.06
E.G. IC (m)	1225.38	Weir Sta Lft (m)	94.02
E.G. OC (m)	1225.40	Weir Sta Rgt (m)	293.63
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (m)	1224.20	Weir Max Depth (m)	0.79
Culv WS Outlet (m)	1224.00	Weir Avg Depth (m)	0.39
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	73.98
Culv Crt Depth (m)	0.45	Min El Weir Flow (m)	1224.63

Plan: Plan20180820 V2 08-17 07-12 RS: 622.45 Culv Group: Culvert #1 Profile: 50YEAR

Q Culv Group (m3/s)	38.06	Culv Full Len (m)	18.00
# Barrels	20	Culv Vel US (m/s)	2.82
Q Barrel (m3/s)	1.90	Culv Vel DS (m/s)	2.82
E.G. US. (m)	1225.31	Culv Inv El Up (m)	1223.75
W.S. US. (m)	1225.26	Culv Inv El Dn (m)	1223.55
E.G. DS (m)	1224.64	Culv Frctn Ls (m)	0.23
W.S. DS (m)	1224.51	Culv Exit Loss (m)	0.28
Delta EG (m)	0.67	Culv Entr Loss (m)	0.16
Delta WS (m)	0.74	Q Weir (m3/s)	61.94
E.G. IC (m)	1225.28	Weir Sta Lft (m)	101.35
E.G. OC (m)	1225.31	Weir Sta Rgt (m)	239.57
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (m)	1224.20	Weir Max Depth (m)	0.69
Culv WS Outlet (m)	1224.00	Weir Avg Depth (m)	0.47
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	58.32
Culv Crt Depth (m)	0.45	Min El Weir Flow (m)	1224.63

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

08-17 07-12

Legend

Vel Chnl 100YEAR

Vel Chnl 50YEAR

Vel Left (m/s), Vel Chnl (m/s), Vel Right (m/s)

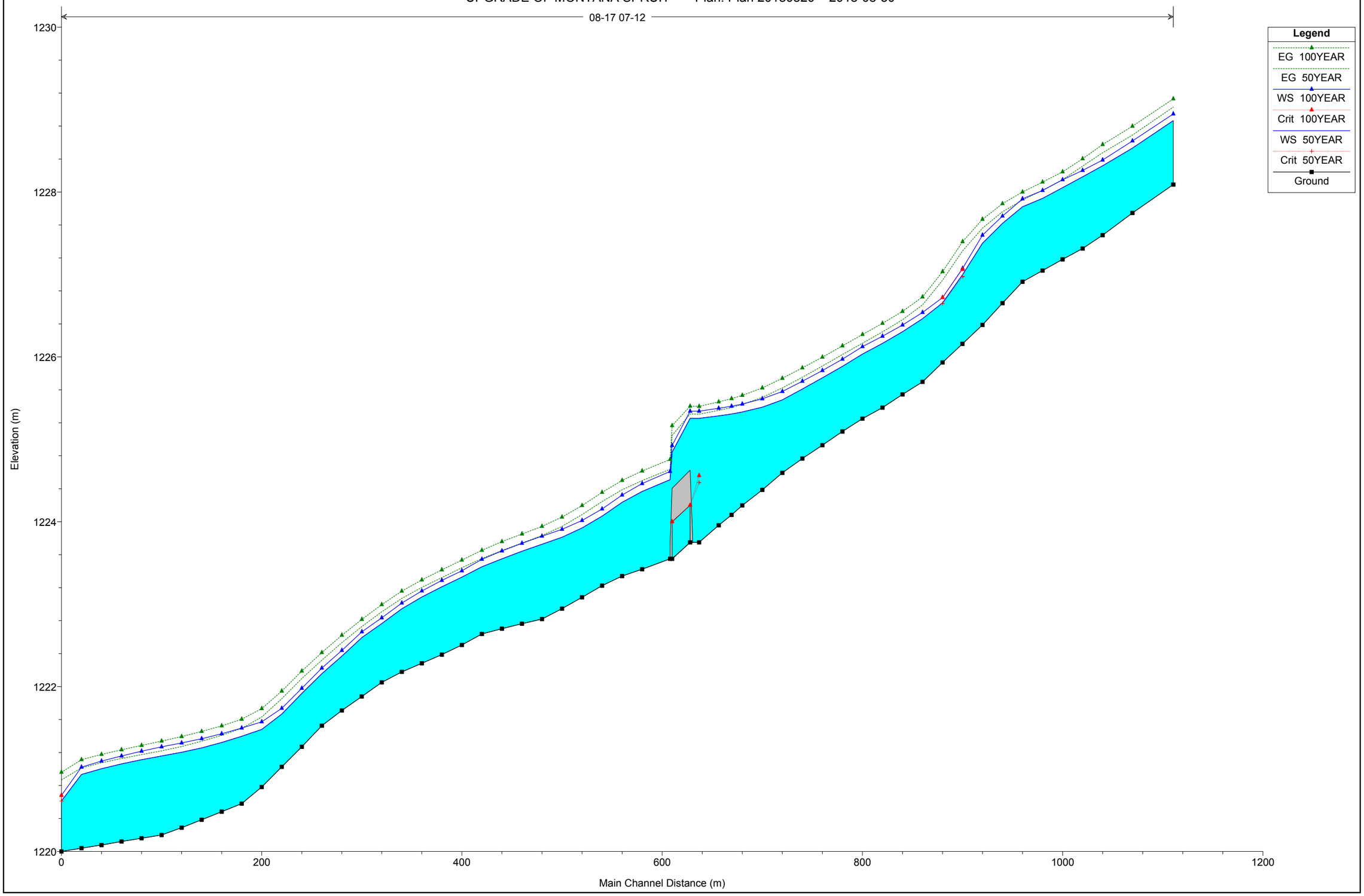
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8

0
200
400
600
800
1000
1200

Main Channel Distance (m)

UPGRADE OF MONTANA SPRUIT Plan: Plan 20180820 2018-08-30

08-17 07-12



HEC-RAS Plan: Plan20180820 V2 River: 08-17 Reach: 07-12

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
07-12	1110.46	50YEAR	100.00	1228.09	1228.87		1229.03	0.009197	1.80	55.67	85.73	0.71
07-12	1110.46	100YEAR	119.00	1228.09	1228.95		1229.13	0.008932	1.90	62.63	86.72	0.71
07-12	1069.76	50YEAR	100.00	1227.75	1228.53		1228.69	0.007532	1.76	56.78	77.45	0.66
07-12	1069.76	100YEAR	119.00	1227.75	1228.62		1228.80	0.007435	1.87	63.52	78.21	0.66
07-12	1040	50YEAR	100.00	1227.48	1228.32		1228.48	0.006902	1.76	56.84	72.66	0.63
07-12	1040	100YEAR	119.00	1227.48	1228.39		1228.58	0.007423	1.92	61.88	73.07	0.67
07-12	1020	50YEAR	100.00	1227.32	1228.18		1228.31	0.008598	1.60	62.62	109.26	0.67
07-12	1020	100YEAR	119.00	1227.32	1228.26		1228.40	0.008435	1.67	71.24	114.52	0.68
07-12	1000	50YEAR	100.00	1227.18	1228.05		1228.15	0.006985	1.37	73.01	137.31	0.60
07-12	1000	100YEAR	119.00	1227.18	1228.15		1228.25	0.006290	1.37	86.70	150.22	0.58
07-12	980	50YEAR	100.00	1227.05	1227.92		1228.02	0.005906	1.39	72.17	117.61	0.56
07-12	980	100YEAR	119.00	1227.05	1228.02		1228.12	0.006076	1.41	84.50	137.20	0.57
07-12	960	50YEAR	100.00	1226.91	1227.82		1227.90	0.005455	1.27	78.70	137.65	0.54
07-12	960	100YEAR	119.00	1226.91	1227.92		1228.00	0.005514	1.27	93.44	164.16	0.54
07-12	940	50YEAR	100.00	1226.65	1227.62		1227.76	0.008805	1.66	60.20	100.85	0.69
07-12	940	100YEAR	119.00	1226.65	1227.71		1227.86	0.008444	1.71	69.53	107.93	0.68
07-12	920	50YEAR	100.00	1226.39	1227.38		1227.56	0.010734	1.90	52.71	83.69	0.76
07-12	920	100YEAR	119.00	1226.39	1227.48		1227.67	0.010104	1.94	61.29	89.81	0.75
07-12	900	50YEAR	100.00	1226.16	1227.00	1226.97	1227.29	0.016848	2.38	42.07	66.82	0.96
07-12	900	100YEAR	119.00	1226.16	1227.07	1227.06	1227.40	0.017310	2.51	47.32	70.48	0.98
07-12	880	50YEAR	100.00	1225.93	1226.66	1226.65	1226.93	0.018377	2.33	42.99	75.37	0.98
07-12	880	100YEAR	119.00	1225.93	1226.72	1226.72	1227.03	0.018828	2.48	47.89	77.46	1.01
07-12	860	50YEAR	100.00	1225.70	1226.46		1226.63	0.010159	1.82	55.00	89.51	0.74
07-12	860	100YEAR	119.00	1225.70	1226.54		1226.73	0.009796	1.92	61.90	90.13	0.74

HEC-RAS Plan: Plan20180820 V2 River: 08-17 Reach: 07-12 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
07-12	840	50YEAR	100.00	1225.54	1226.31		1226.45	0.007507	1.69	59.15	85.53	0.65
07-12	840	100YEAR	119.00	1225.54	1226.39		1226.55	0.007393	1.80	66.17	86.16	0.66
07-12	820	50YEAR	100.00	1225.38	1226.16		1226.30	0.007015	1.65	60.60	86.37	0.63
07-12	820	100YEAR	119.00	1225.38	1226.25		1226.41	0.006827	1.75	68.10	87.27	0.63
07-12	800	50YEAR	100.00	1225.25	1226.03		1226.17	0.006511	1.61	62.12	86.97	0.61
07-12	800	100YEAR	119.00	1225.25	1226.12		1226.27	0.006480	1.70	70.01	90.00	0.62
07-12	780	50YEAR	100.00	1225.10	1225.88		1226.03	0.007077	1.68	59.38	82.71	0.63
07-12	780	100YEAR	119.00	1225.10	1225.97		1226.13	0.007010	1.78	66.67	84.50	0.64
07-12	760	50YEAR	100.00	1224.93	1225.75		1225.89	0.006851	1.68	59.43	80.86	0.63
07-12	760	100YEAR	119.00	1224.93	1225.84		1226.00	0.006677	1.78	66.72	81.58	0.63
07-12	740	50YEAR	100.00	1224.77	1225.61		1225.75	0.006691	1.68	59.37	79.25	0.62
07-12	740	100YEAR	119.00	1224.77	1225.71		1225.87	0.006430	1.78	66.95	80.01	0.62
07-12	720	50YEAR	100.00	1224.59	1225.48		1225.62	0.006452	1.68	59.41	77.26	0.61
07-12	720	100YEAR	119.00	1224.59	1225.58		1225.74	0.006136	1.77	67.37	78.47	0.61
07-12	700	50YEAR	100.00	1224.39	1225.39		1225.51	0.004483	1.52	65.70	75.61	0.52
07-12	700	100YEAR	119.00	1224.39	1225.49		1225.62	0.004774	1.62	73.52	80.89	0.54
07-12	680	50YEAR	100.00	1224.20	1225.33		1225.42	0.003351	1.35	74.23	82.49	0.45
07-12	680	100YEAR	119.00	1224.20	1225.43		1225.53	0.003611	1.44	82.40	87.27	0.47
07-12	669.29	50YEAR	100.00	1224.08	1225.31		1225.39	0.002793	1.25	80.23	87.44	0.42
07-12	669.29	100YEAR	119.00	1224.08	1225.40		1225.49	0.003021	1.34	88.69	91.78	0.44
07-12	656.43	50YEAR	100.00	1223.96	1225.28		1225.35	0.002253	1.14	87.74	93.05	0.37
07-12	656.43	100YEAR	119.00	1223.96	1225.38		1225.45	0.002480	1.23	96.52	97.80	0.40
07-12	636.98	50YEAR	100.00	1223.75	1225.26	1224.48	1225.31	0.001933	0.99	100.50	116.53	0.34

HEC-RAS Plan: Plan20180820 V2 River: 08-17 Reach: 07-12 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
07-12	636.98	100YEAR	119.00	1223.75	1225.34	1224.56	1225.40	0.002650	1.07	111.15	146.32	0.39
07-12	622.45		Culvert									
07-12	607.93	50YEAR	100.00	1223.55	1224.51		1224.64	0.004790	1.58	63.34	72.52	0.54
07-12	607.93	100YEAR	119.00	1223.55	1224.61		1224.76	0.004828	1.68	70.63	73.77	0.55
07-12	580	50YEAR	100.00	1223.42	1224.37		1224.50	0.005000	1.61	62.02	70.99	0.55
07-12	580	100YEAR	119.00	1223.42	1224.46		1224.62	0.005085	1.73	68.85	71.89	0.56
07-12	560	50YEAR	100.00	1223.34	1224.24		1224.39	0.006138	1.73	57.86	69.60	0.61
07-12	560	100YEAR	119.00	1223.34	1224.33		1224.50	0.006254	1.86	64.14	70.33	0.62
07-12	540	50YEAR	100.00	1223.23	1224.07		1224.25	0.007999	1.86	53.67	70.35	0.68
07-12	540	100YEAR	119.00	1223.23	1224.15		1224.36	0.008047	1.99	59.70	71.04	0.69
07-12	520	50YEAR	100.00	1223.08	1223.93		1224.09	0.007436	1.78	56.27	74.98	0.65
07-12	520	100YEAR	119.00	1223.08	1224.01		1224.20	0.007340	1.89	62.98	75.79	0.66
07-12	500	50YEAR	100.00	1222.95	1223.81		1223.94	0.006026	1.62	61.90	81.31	0.59
07-12	500	100YEAR	119.00	1222.95	1223.91		1224.06	0.005808	1.71	69.79	82.21	0.59
07-12	480	50YEAR	100.00	1222.82	1223.73		1223.83	0.004502	1.44	69.32	86.74	0.52
07-12	480	100YEAR	119.00	1222.82	1223.83		1223.94	0.004621	1.52	78.18	92.04	0.53
07-12	460	50YEAR	100.00	1222.76	1223.64		1223.74	0.004340	1.41	70.96	89.46	0.51
07-12	460	100YEAR	119.00	1222.76	1223.74		1223.85	0.004466	1.49	79.87	94.63	0.52
07-12	440	50YEAR	100.00	1222.70	1223.55		1223.65	0.004668	1.42	70.39	92.63	0.52
07-12	440	100YEAR	119.00	1222.70	1223.65		1223.76	0.004731	1.50	79.51	97.75	0.53
07-12	420	50YEAR	100.00	1222.64	1223.45		1223.55	0.005074	1.40	71.31	101.84	0.53
07-12	420	100YEAR	119.00	1222.64	1223.55		1223.65	0.005695	1.46	81.25	118.55	0.56
07-12	400	50YEAR	100.00	1222.51	1223.33		1223.44	0.006014	1.50	66.61	97.61	0.58

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Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
07-12	400	100YEAR	119.00	1222.51	1223.40		1223.54	0.006028	1.61	74.13	98.40	0.59
07-12	380	50YEAR	100.00	1222.39	1223.21		1223.32	0.005819	1.48	67.73	99.28	0.57
07-12	380	100YEAR	119.00	1222.39	1223.29		1223.42	0.005829	1.58	75.39	100.09	0.58
07-12	360	50YEAR	100.00	1222.28	1223.09		1223.20	0.006125	1.51	66.12	97.15	0.59
07-12	360	100YEAR	119.00	1222.28	1223.16		1223.29	0.006208	1.62	73.33	97.93	0.60
07-12	340	50YEAR	100.00	1222.18	1222.94		1223.07	0.007163	1.58	63.39	98.30	0.63
07-12	340	100YEAR	119.00	1222.18	1223.01		1223.16	0.007271	1.69	70.41	99.52	0.64
07-12	320	50YEAR	100.00	1222.05	1222.77		1222.91	0.009067	1.67	59.88	101.64	0.69
07-12	320	100YEAR	119.00	1222.05	1222.83		1223.00	0.009186	1.78	66.99	104.64	0.71
07-12	300	50YEAR	100.00	1221.88	1222.59		1222.73	0.008593	1.62	61.64	105.03	0.68
07-12	300	100YEAR	119.00	1221.88	1222.66		1222.82	0.008476	1.72	69.03	106.25	0.68
07-12	280	50YEAR	100.00	1221.71	1222.37		1222.53	0.010853	1.79	55.84	97.77	0.76
07-12	280	100YEAR	119.00	1221.71	1222.44		1222.62	0.010714	1.90	62.70	99.64	0.76
07-12	260	50YEAR	100.00	1221.53	1222.16		1222.32	0.010329	1.80	55.66	93.49	0.74
07-12	260	100YEAR	119.00	1221.53	1222.23		1222.41	0.010274	1.92	62.07	94.19	0.75
07-12	240	50YEAR	100.00	1221.27	1221.92		1222.10	0.011910	1.88	53.07	92.32	0.79
07-12	240	100YEAR	119.00	1221.27	1221.98		1222.19	0.012082	2.02	58.82	92.96	0.81
07-12	220	50YEAR	100.00	1221.03	1221.67		1221.85	0.012547	1.91	52.38	92.94	0.81
07-12	220	100YEAR	119.00	1221.03	1221.74		1221.95	0.012202	2.02	58.80	93.60	0.82
07-12	200	50YEAR	100.00	1220.78	1221.48		1221.63	0.008998	1.72	58.21	94.25	0.70
07-12	200	100YEAR	119.00	1220.78	1221.57		1221.73	0.008127	1.78	66.81	94.92	0.68
07-12	180	50YEAR	100.00	1220.58	1221.40		1221.49	0.004398	1.38	72.64	95.81	0.50
07-12	180	100YEAR	119.00	1220.58	1221.50		1221.60	0.004146	1.45	82.33	96.55	0.50

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Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
07-12	160	50YEAR	100.00	1220.48	1221.32		1221.41	0.003762	1.31	76.36	96.54	0.47
07-12	160	100YEAR	119.00	1220.48	1221.43		1221.52	0.003531	1.37	86.68	97.32	0.46
07-12	140	50YEAR	100.00	1220.39	1221.26		1221.34	0.003293	1.25	79.81	97.56	0.44
07-12	140	100YEAR	119.00	1220.39	1221.37		1221.46	0.003138	1.31	90.71	99.79	0.44
07-12	120	50YEAR	100.00	1220.29	1221.20		1221.27	0.002771	1.18	84.62	99.22	0.41
07-12	120	100YEAR	119.00	1220.29	1221.32		1221.39	0.002684	1.24	96.02	102.33	0.41
07-12	100	50YEAR	100.00	1220.20	1221.16		1221.22	0.002256	1.10	90.56	100.78	0.37
07-12	100	100YEAR	119.00	1220.20	1221.27		1221.34	0.002589	1.16	102.60	117.55	0.40
07-12	80	50YEAR	100.00	1220.16	1221.11		1221.18	0.002255	1.11	90.31	100.04	0.37
07-12	80	100YEAR	119.00	1220.16	1221.22		1221.29	0.002603	1.18	101.11	113.81	0.40
07-12	60	50YEAR	100.00	1220.12	1221.06		1221.13	0.002478	1.14	87.60	99.50	0.39
07-12	60	100YEAR	119.00	1220.12	1221.16		1221.23	0.002643	1.22	97.34	104.63	0.40
07-12	40	50YEAR	100.00	1220.08	1221.00		1221.07	0.002859	1.18	84.56	101.39	0.41
07-12	40	100YEAR	119.00	1220.08	1221.10		1221.18	0.002933	1.26	94.20	104.23	0.42
07-12	20	50YEAR	100.00	1220.04	1220.94		1221.01	0.003134	1.25	80.30	95.48	0.43
07-12	20	100YEAR	119.00	1220.04	1221.02		1221.11	0.003386	1.34	89.00	100.74	0.45
07-12	0	50YEAR	100.00	1220.00	1220.61	1220.61	1220.87	0.019891	2.24	44.59	87.78	1.00
07-12	0	100YEAR	119.00	1220.00	1220.68	1220.68	1220.96	0.019235	2.35	50.68	90.78	1.00