

DIREZIONE CENTRALE PROGRAMMAZIONE PROGETTAZIONE

PA 12/09

CORRIDOIO PLURIMODALE TIRRENICO - NORD EUROPA

ITINERARIO AGRIGENTO - CALTANISSETTA - A19

S.S. N° 640 "DI PORTO EMPEDOCLE"

AMMODERNAMENTO E ADEGUAMENTO ALLA CAT. B DEL D.M. 5.11.2001

Dal km 44+000 allo svincolo con l'A19

PROGETTO ESECUTIVO

Contraente Generale:



SISTEMAZIONI IDRAULICHE

VALLONE ARENELLA III - VIADOTTO ARENELLA III

Relazione di calcolo ed elaborati grafici moto permanente del Vallone

Codice Unico Progetto (CUP) : F91B09000070001

Codice Elaborato:

PA12_09 - E 1 9 2 0 I 2 1 0 V A 1 0 I C L 0 0 1 B

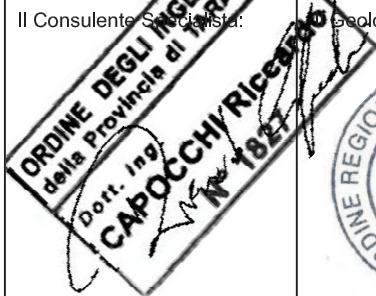
Scala: -

F						
E						
D						
C						
B	Luglio 2011	Revisione a seguito di incontri con il Committente	A. SALVAGO	R. CAPOCCHI	M. LITI	P. PAGLINI
A	Aprile 2011	EMISSIONE	A. SALVAGO	A. TURSO	M. LITI	P. PAGLINI
REV.	DATA	DESCRIZIONE	REDATTO	VERIFICATO	APPROVATO	AUTORIZZATO
Responsabile del procedimento:			Ing. MAURIZIO ARAMINI			

Il Progettista:



Il Consulente Societario:



Il Geologo:



Il Coordinatore per la sicurezza in fase di progetto:



Il Direttore dei lavori:



Premessa

La verifica idraulica del Vallone Arenella con il viadotto Arenella III in progetto, valuta il rispetto di un adeguato franco tra la quota del pelo libero dell'acqua e la quota sottotrave dei manufatti. Tale verifica è stata eseguita effettuando delle simulazioni in moto permanente, di un tratto significativo di asta. La verifica contempla lo stato ante e post operam, per la portata valutata con tempo di ritorno di 200 anni.

La descrizione geometrica dell'alveo, funzionale alle valutazioni idrauliche, è stata effettuata integrando alle informazioni assunte da un supporto planimetrico a scala 1: 1.000 un rilievo di dettaglio delle sezioni trasversali. Tutte le sezioni in alveo vengono segnate in pianta nelle planimetrie idrauliche ANTE e POST OPERAM e riportate qui di seguito in dettaglio.

Nella definizione delle sezioni si è cercato rispettare le seguenti linee guida:

- giacitura planimetrica ubicata in modo tale da rappresentare le singolarità dell'alveo e le variazioni delle dimensioni dello stesso lungo il tratto di indagine;
- devono essere estese per l'intero alveo di piena, sino al limite della fascia interessata dalle piene con tempo di ritorno > 200 anni;
- devono essere utilizzate e, se necessario, aggiornate, le sezioni di rilievo costituenti punti di calcolo per la delimitazione delle fasce fluviali; gli infittimenti eventuali devono essere collegati agli stessi capisaldi;
- numero e interasse delle sezioni necessarie per la rappresentazione della geometria dell'alveo vanno commisurati alle esigenze di dettaglio delle analisi idrauliche.

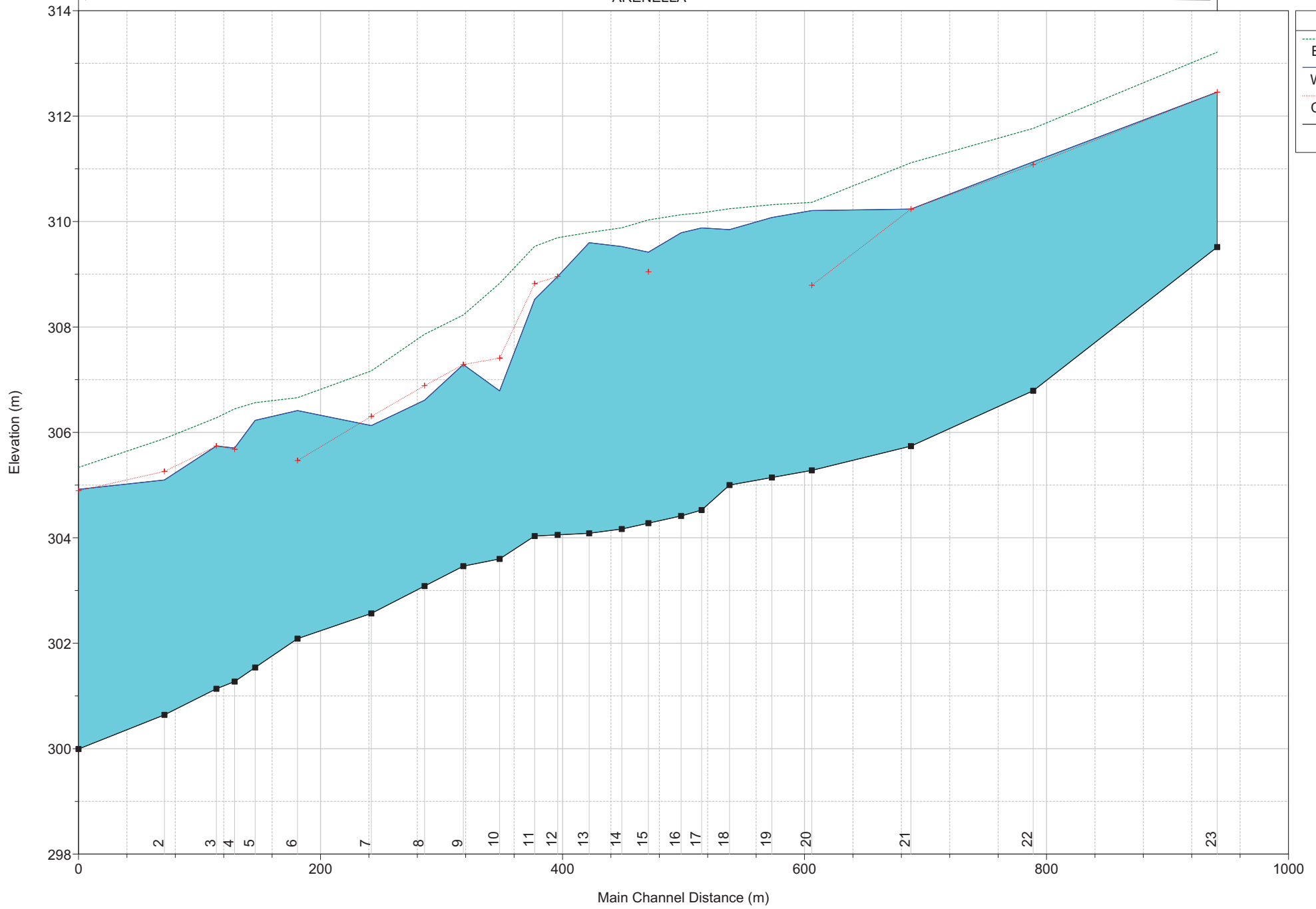
Il codice di calcolo utilizzato per il profilo idrico in piena della corrente nel tratto di corso d'acqua fa riferimento alle condizioni di moto stazionario monodimensionale (portata costante e geometria dell'alveo variabile). Tale schema che tiene conto della variazione delle dimensioni dell'alveo e delle singolarità localizzate (rappresentate da manufatti, bruschi restringimenti o allargamenti, variazioni di scabrezza, salti di fondo), ed è generalmente adatto ad affrontare tutte le situazioni in cui la valutazione degli effetti degli interventi in progetto sulle condizioni di deflusso è rappresentabile in termini di modificazione del profilo idrico. A tal proposito ci si è avvalsi del programma di calcolo Hec-Ras (messo a punto dal Hec-Usace), nel quale è implementata una procedura di calcolo nota in letteratura con il nome di Standard Step Method.

River: ARENELLA ANTE OPERAM

Reach	River Sta	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl	Hydr Radius (m)	Hydr Radius C (m)
1	23	365.33	309.52	312.46	312.46	313.21	0.012533	5.25	97.61	63.68	1.07	1.49	2.10
1	22	365.33	306.79	311.13	311.08	311.77	0.006479	5.09	122.36	77.15	0.84	1.56	3.29
1	21	365.33	305.74	310.24	310.24	311.11	0.005958	4.83	106.58	62.11	0.84	1.68	3.24
1	20	365.33	305.28	310.21	308.79	310.36	0.000897	2.02	238.75	107.23	0.34	2.21	3.62
1	19	365.33	305.14	310.08		310.32	0.001356	2.49	192.65	85.85	0.41	2.22	3.63
1	18	365.33	305.00	309.85		310.24	0.002366	3.43	154.20	77.34	0.54	1.95	3.88
1	17	365.33	304.53	309.88		310.17	0.001566	2.50	170.61	79.04	0.43	2.09	3.29
1	16	365.33	304.41	309.79		310.13	0.002045	3.23	176.45	103.43	0.50	1.67	3.96
1	15	365.33	304.28	309.42	309.04	310.03	0.003655	4.57	141.14	84.53	0.68	1.63	4.31
1	14	365.33	304.17	309.53		309.88	0.002919	2.99	152.19	81.61	0.56	1.80	2.69
1	13	365.33	304.08	309.60		309.79	0.000882	2.09	209.42	84.28	0.33	2.44	3.87
1	12	365.33	304.06	308.96	308.96	309.69	0.004991	4.95	124.40	91.69	0.77	1.32	3.85
1	11	365.33	304.03	308.52	308.82	309.53	0.010949	5.93	102.18	77.97	1.01	1.24	2.79
1	10	365.33	303.60	306.79	307.41	308.83	0.053215	7.47	58.97	50.75	1.63	1.05	1.21
1	9	365.33	303.46	307.29	307.29	308.23	0.008295	5.28	94.29	49.04	0.97	1.88	2.89
1	8	365.33	303.08	306.61	306.89	307.86	0.013554	6.01	81.67	50.16	1.20	1.60	2.43
1	7	365.33	302.57	306.13	306.30	307.17	0.015229	5.84	85.01	54.34	1.15	1.52	2.13
1	6	365.33	302.09	306.41	305.47	306.66	0.002026	2.52	177.67	81.49	0.48	2.13	2.74
1	5	365.33	301.54	306.23		306.56	0.003143	3.57	159.85	85.00	0.59	1.85	3.32
1	4	365.33	301.27	305.70	305.68	306.45	0.007081	4.74	115.87	82.95	0.87	1.37	2.77
1	3	365.33	301.14	305.74	305.74	306.28	0.006980	4.70	131.78	105.34	0.77	1.22	2.76
1	2	365.33	300.64	305.10	305.26	305.88	0.010811	4.22	106.02	101.13	1.00	1.02	1.69
1	1	365.33	299.99	304.92	304.89	305.34	0.004298	3.90	174.21	174.54	0.67	0.98	3.01

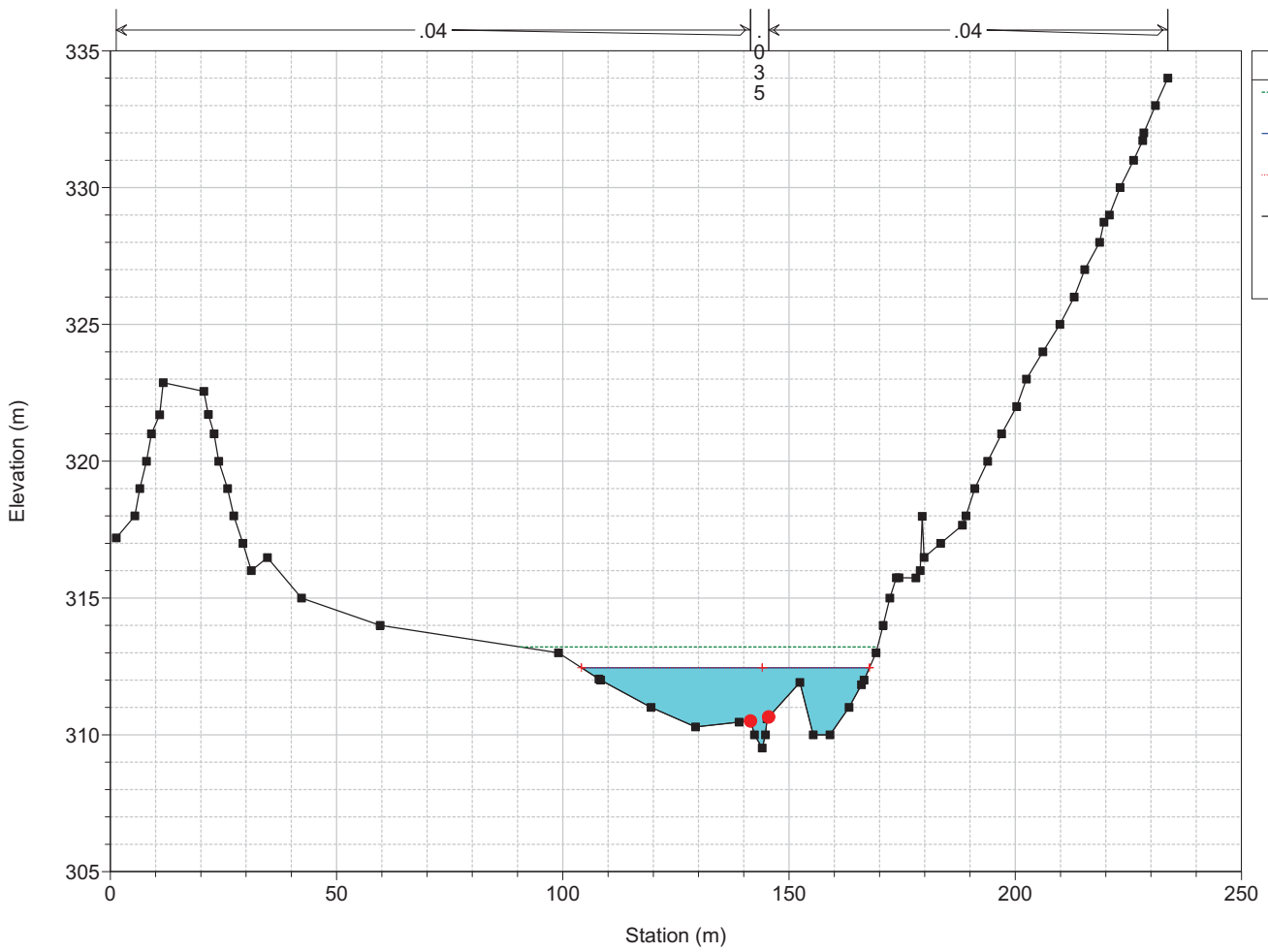
ARENELLA III_AO

ARENELLA



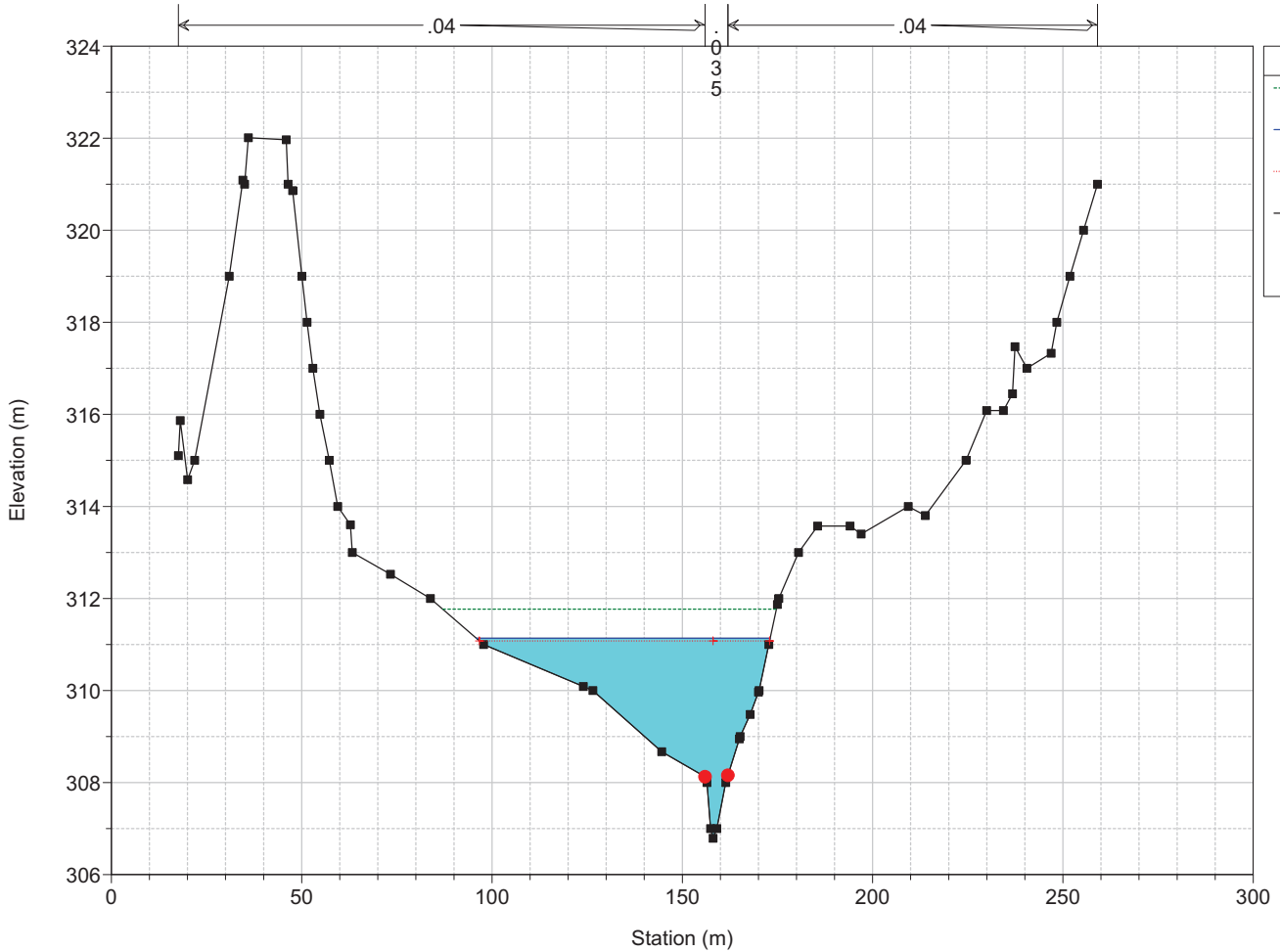
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 23



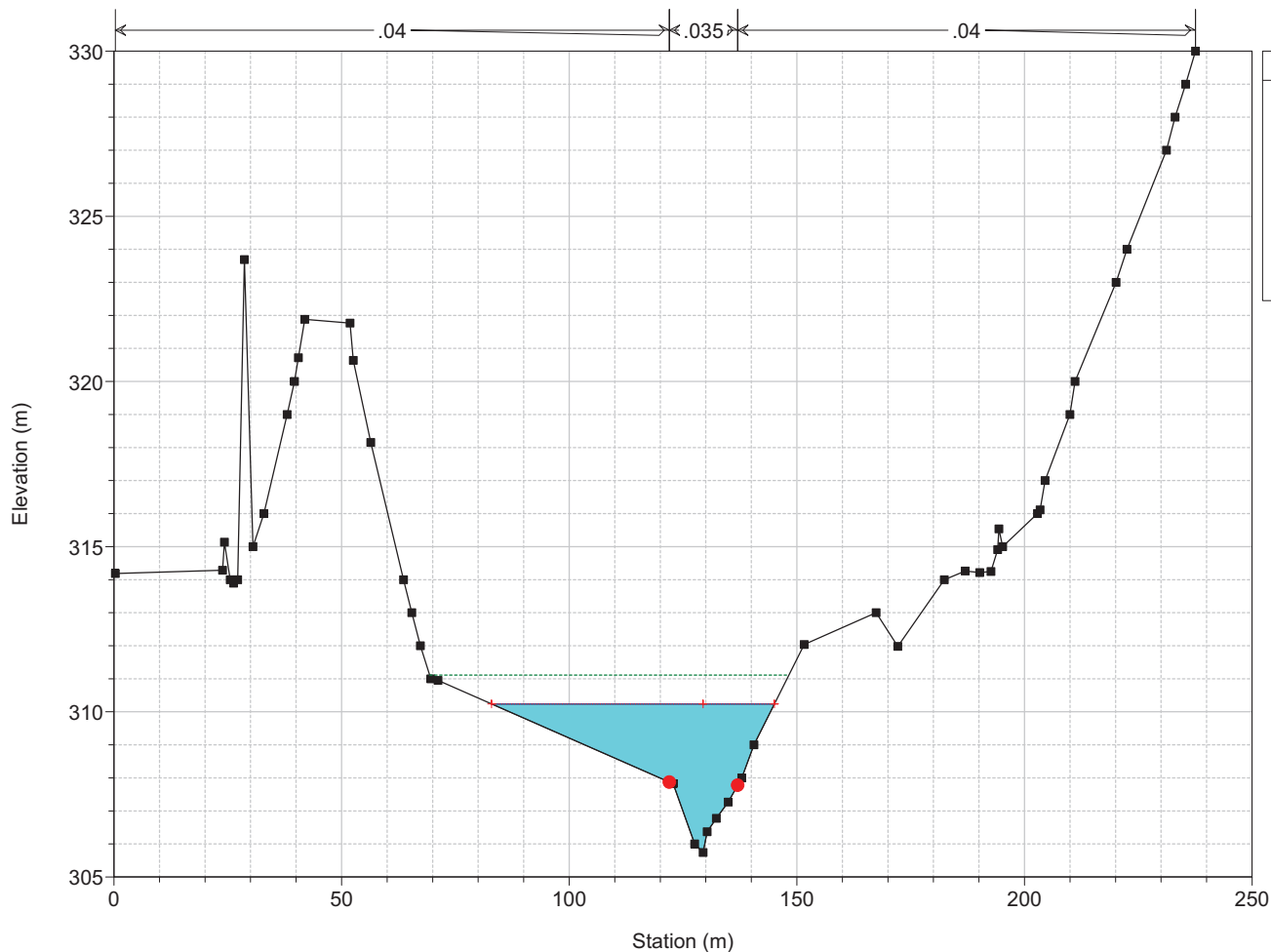
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 22



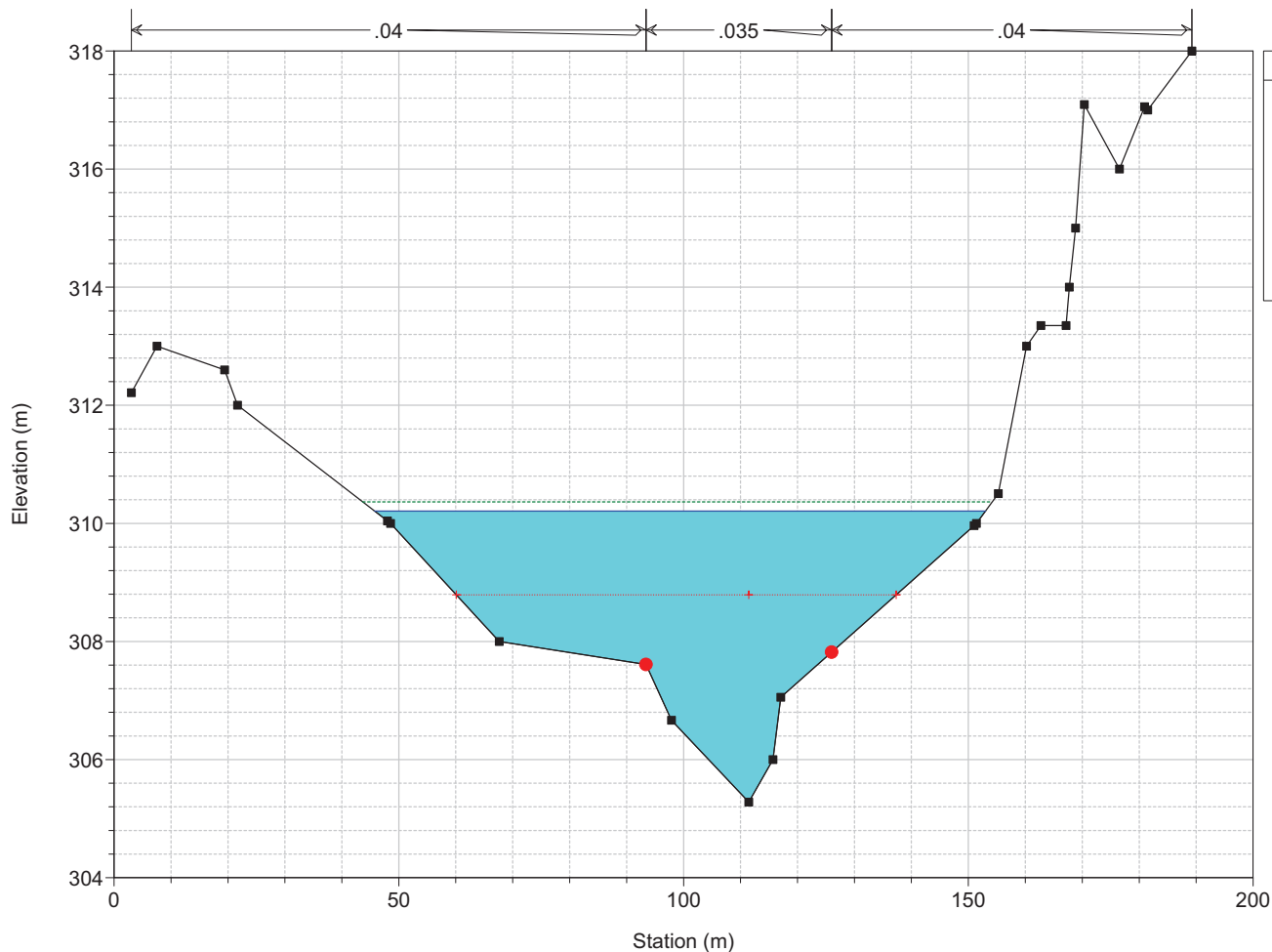
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 21



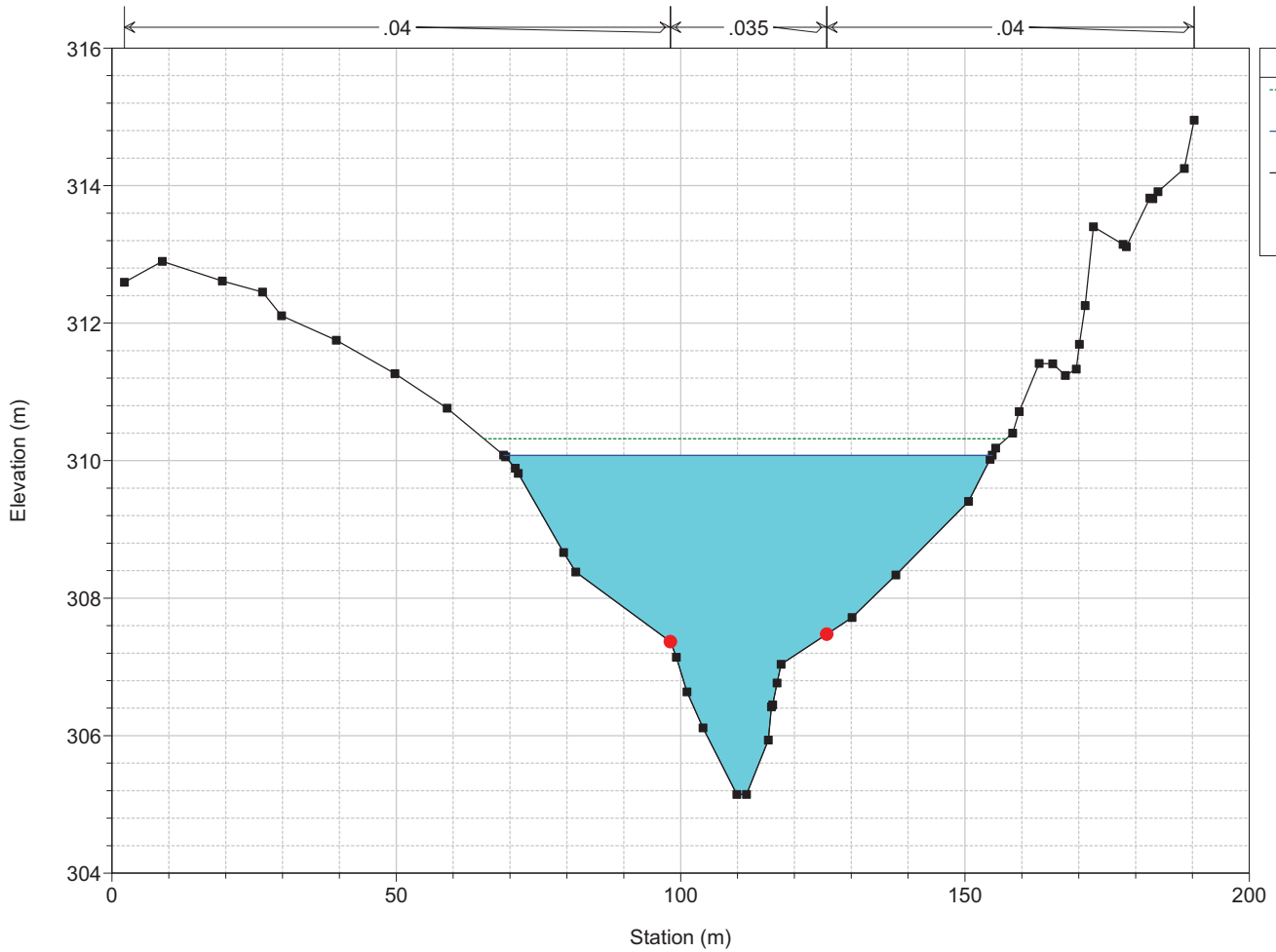
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 20



ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 19

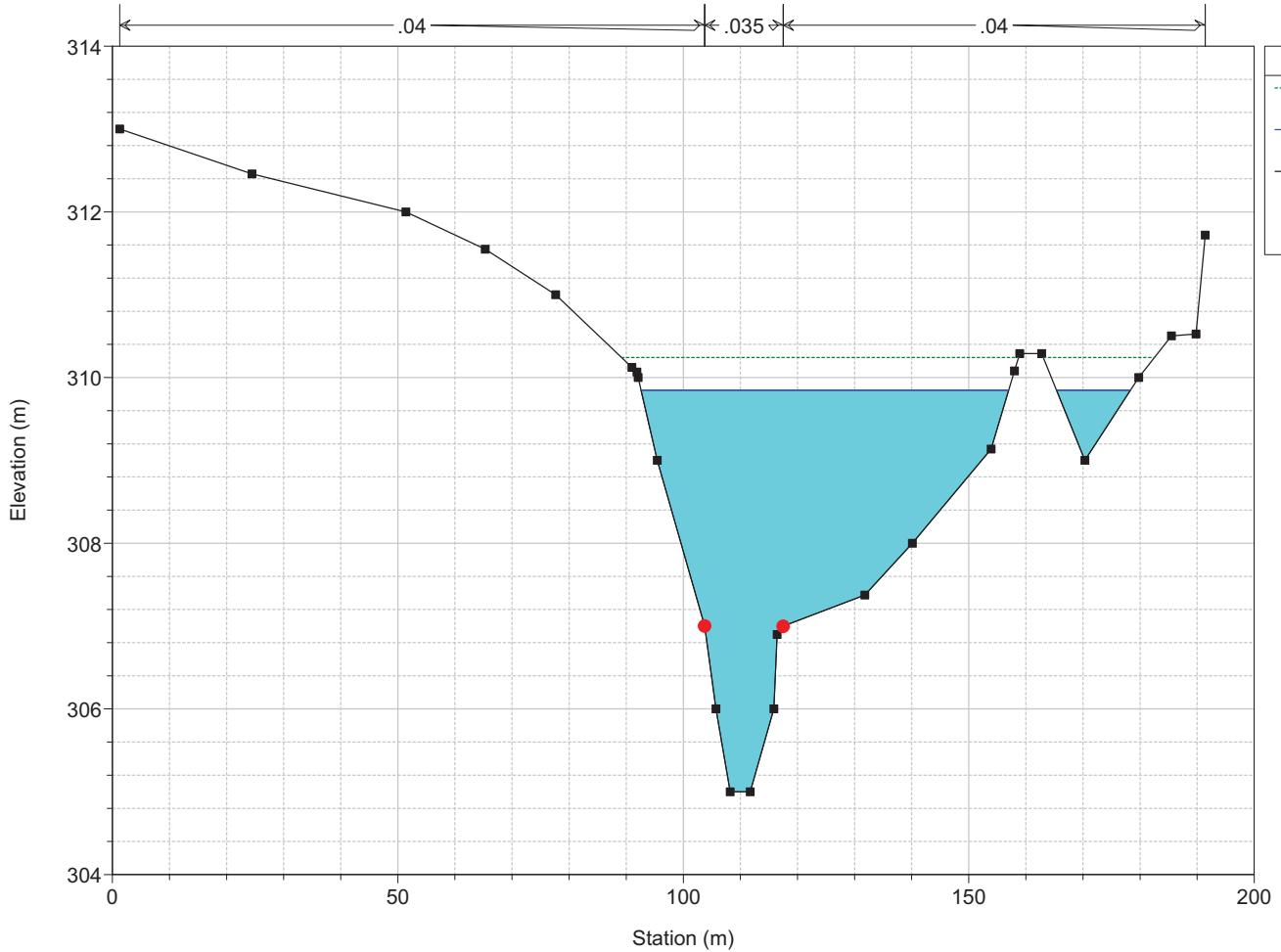


Legend

- EG PF 1
- WS PF 1
- Ground
- Bank Sta

ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 18

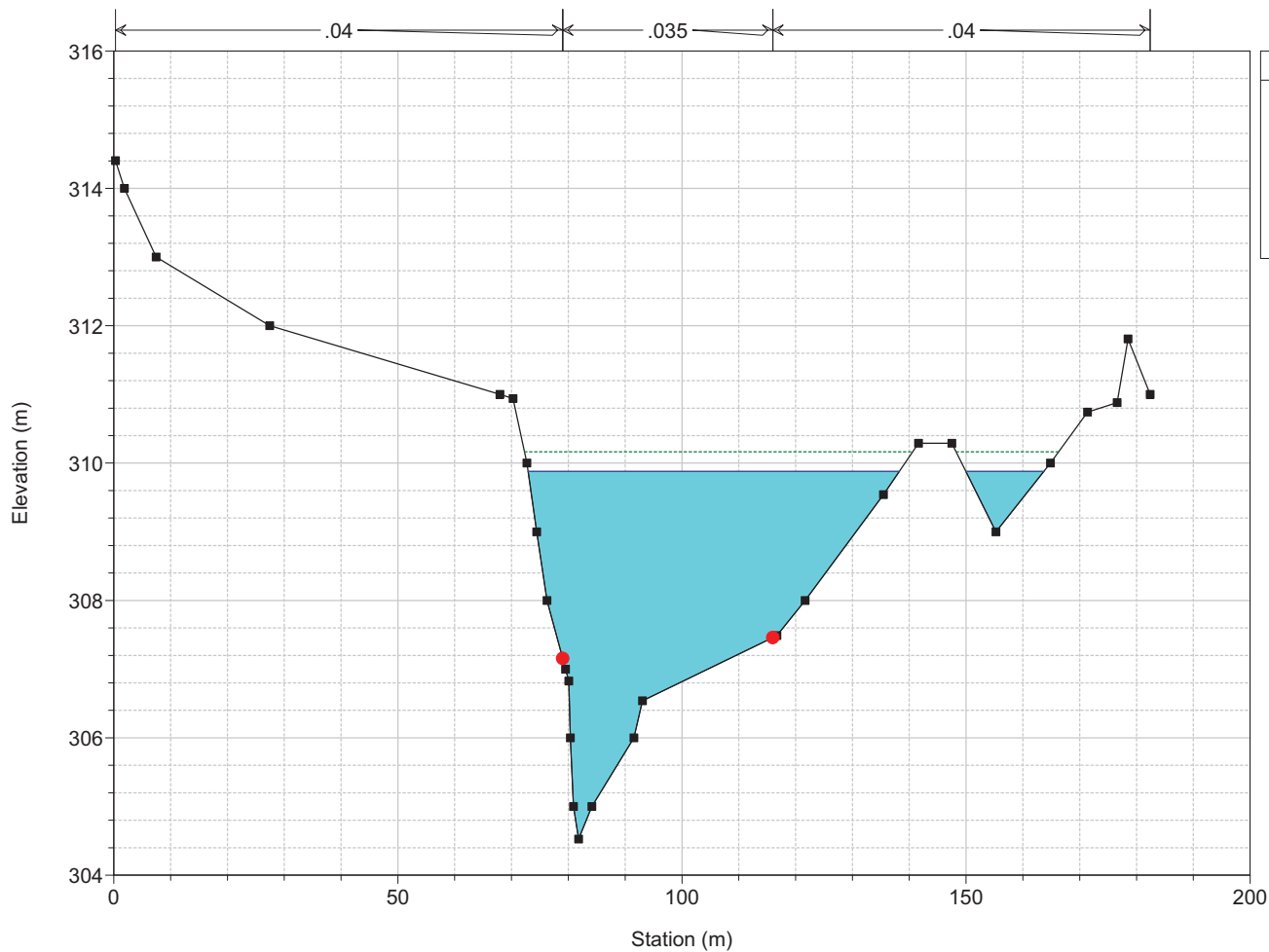


Legend

- EG PF 1
- WS PF 1
- Ground
- Bank Sta

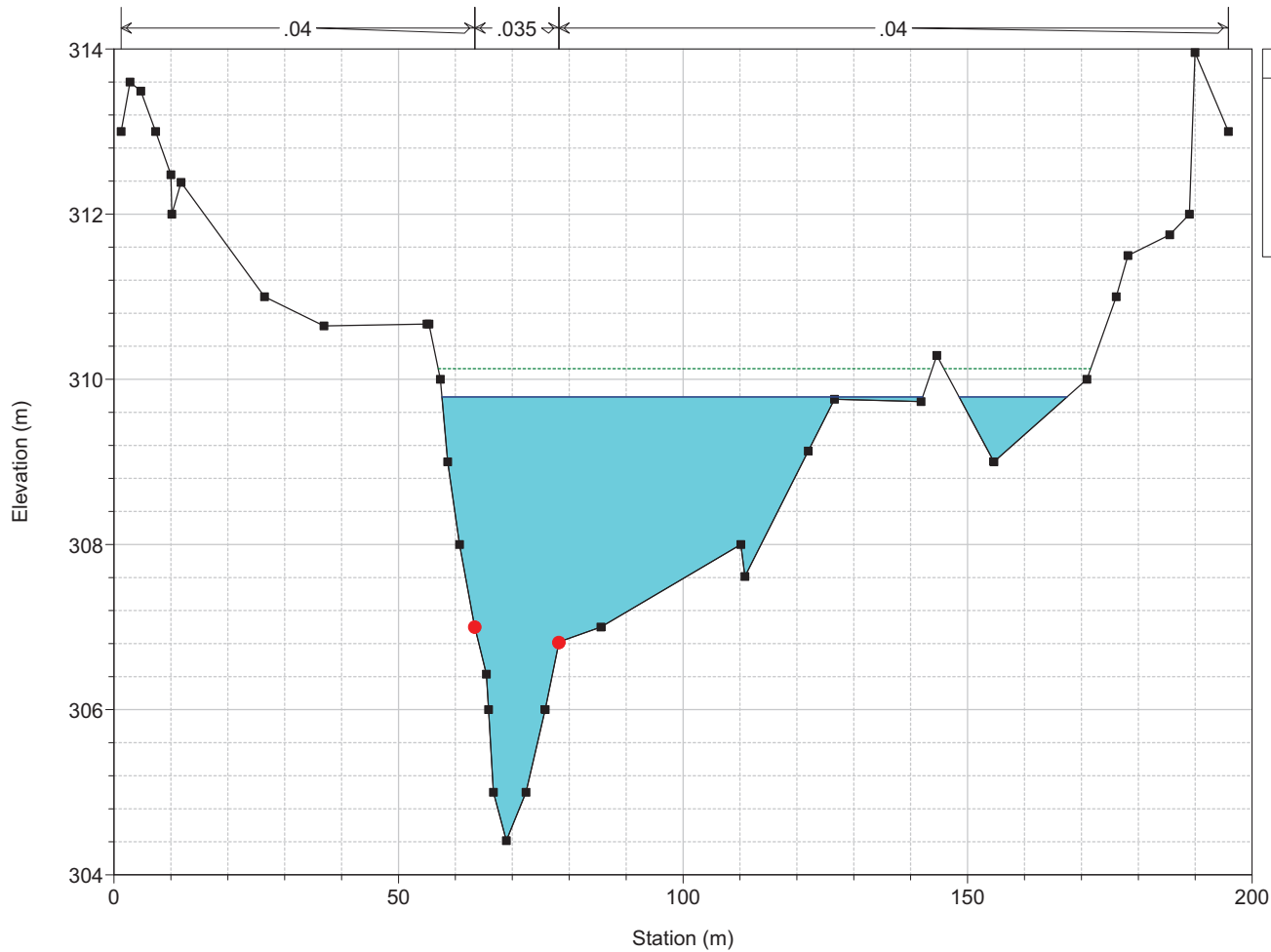
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 17



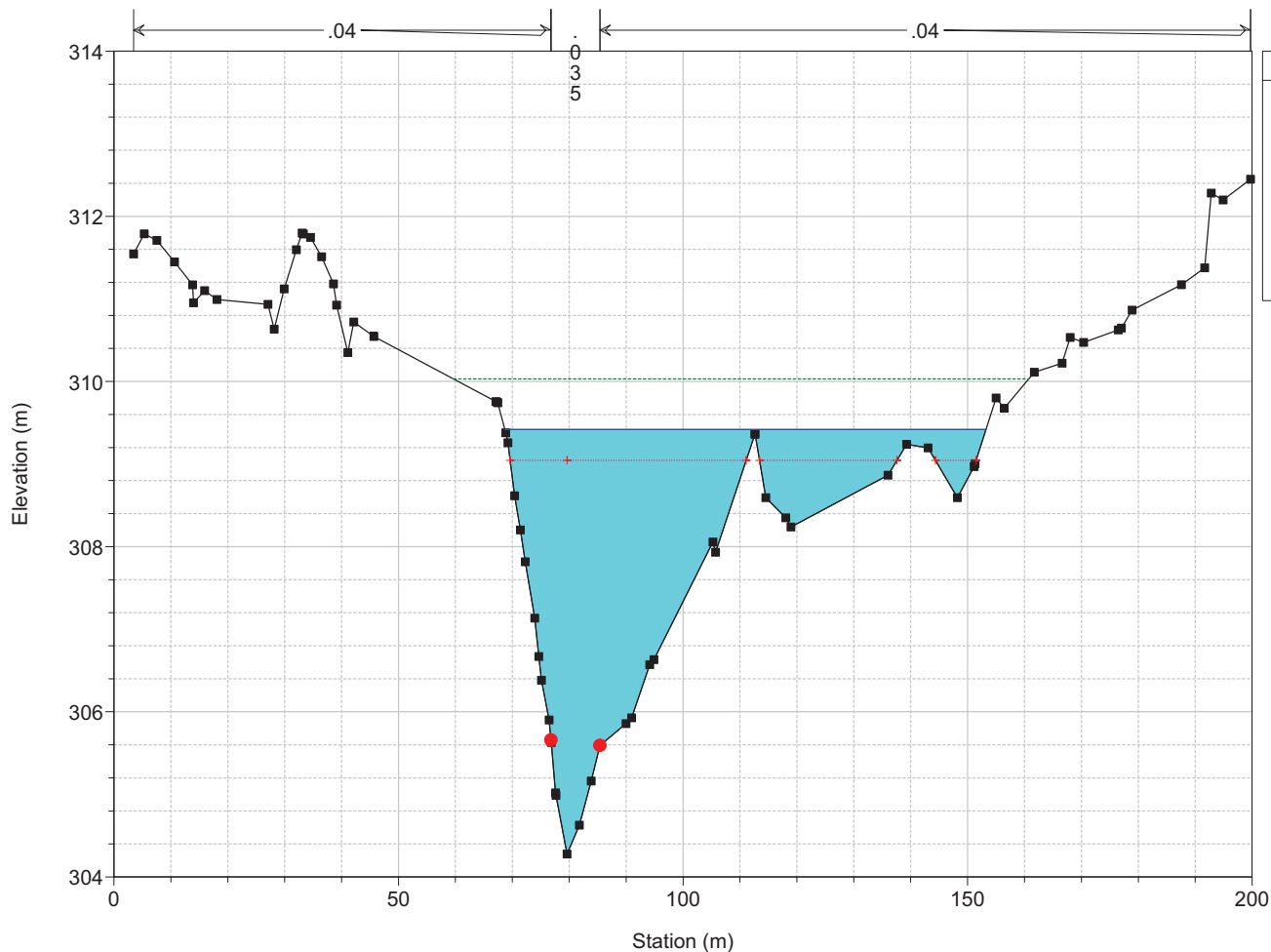
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 16



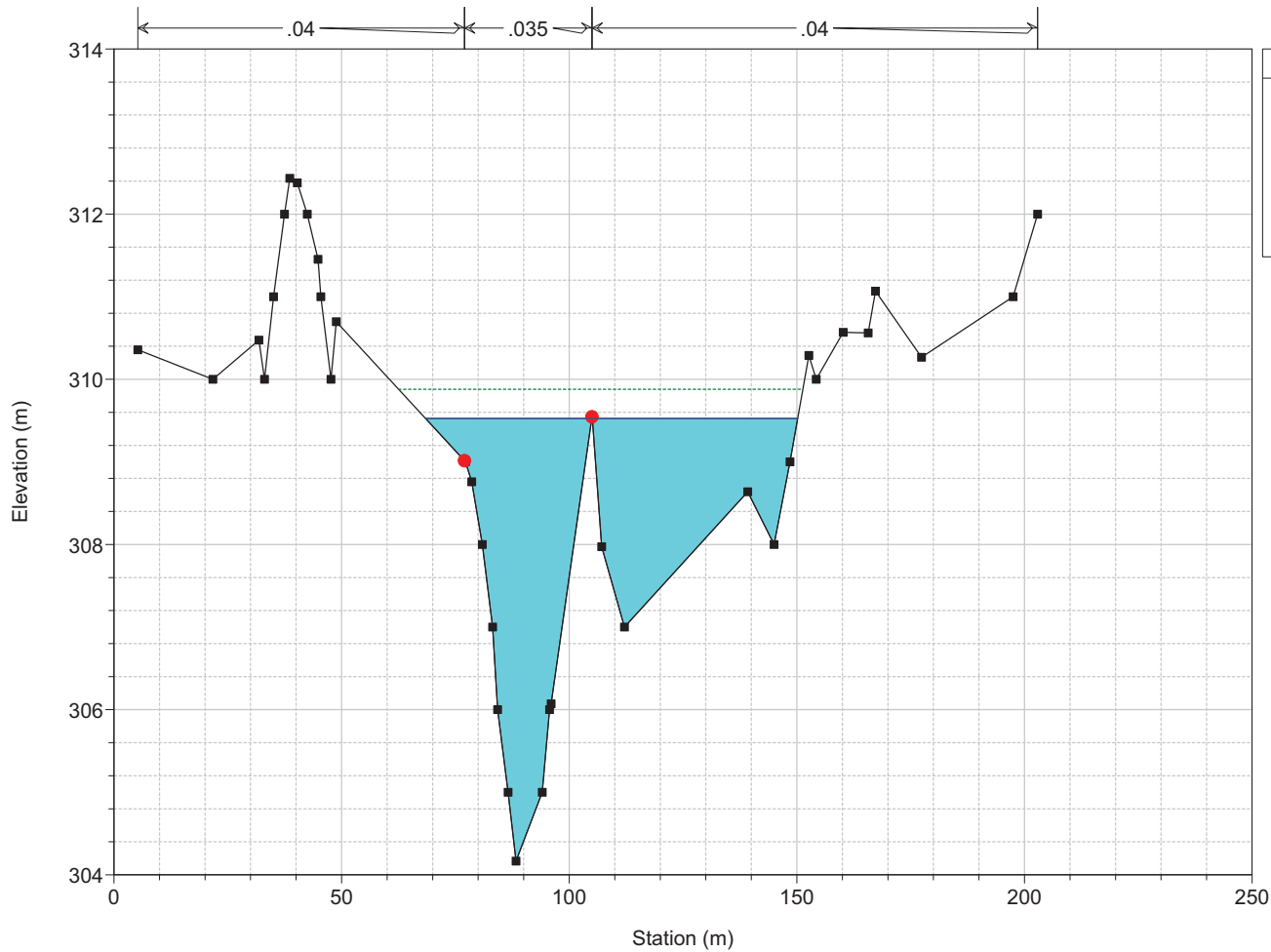
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 15



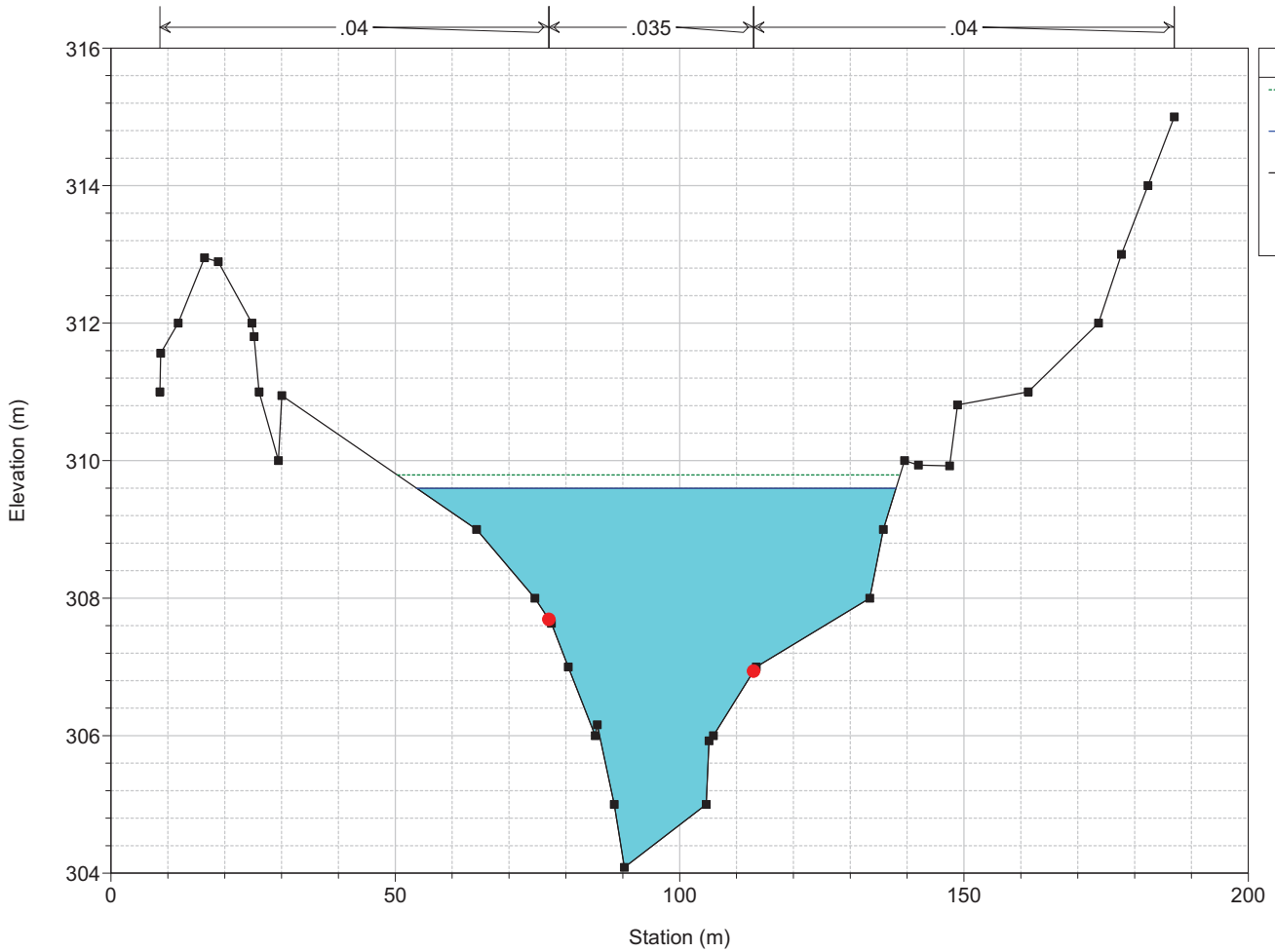
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 14



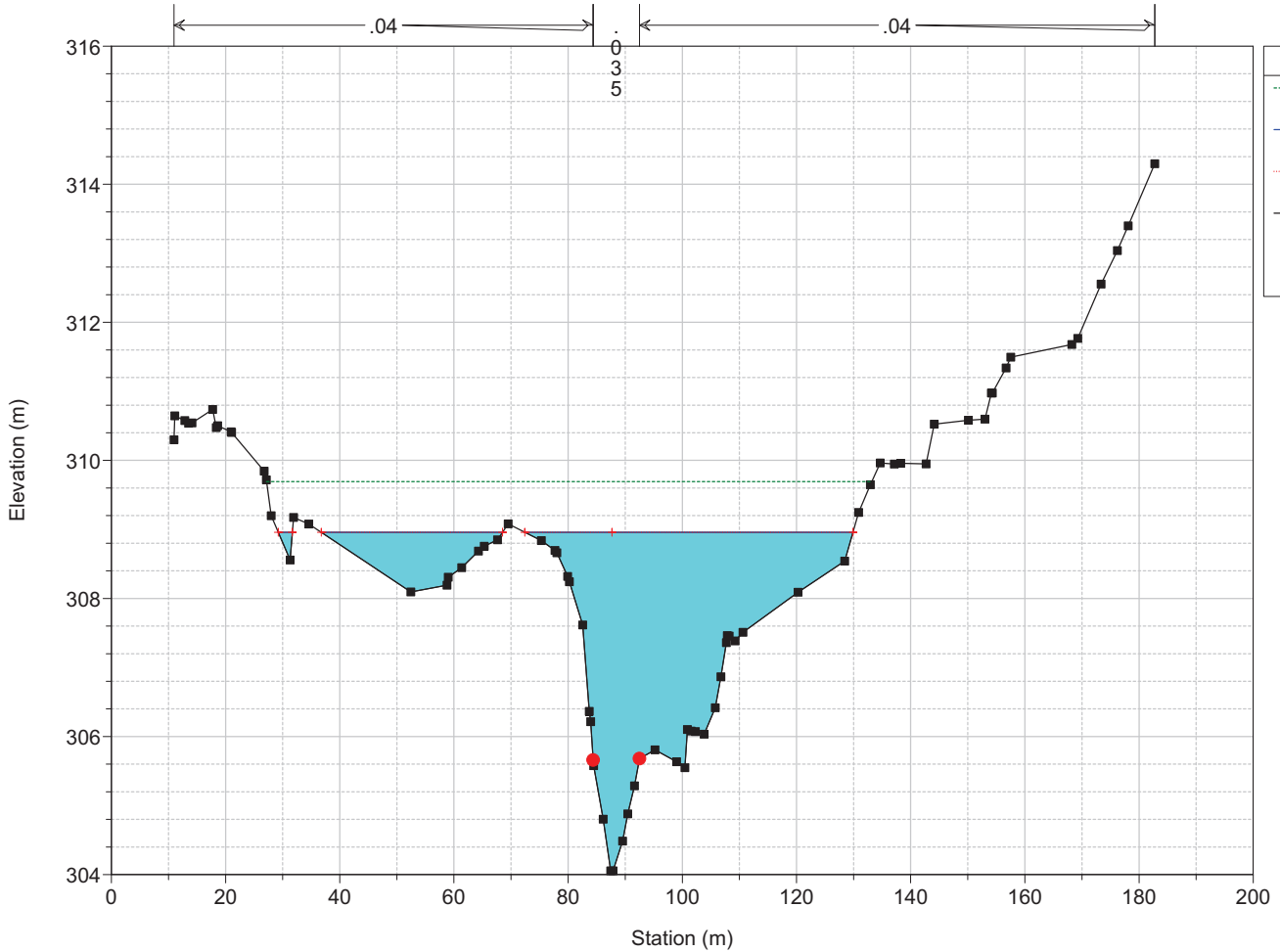
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 13



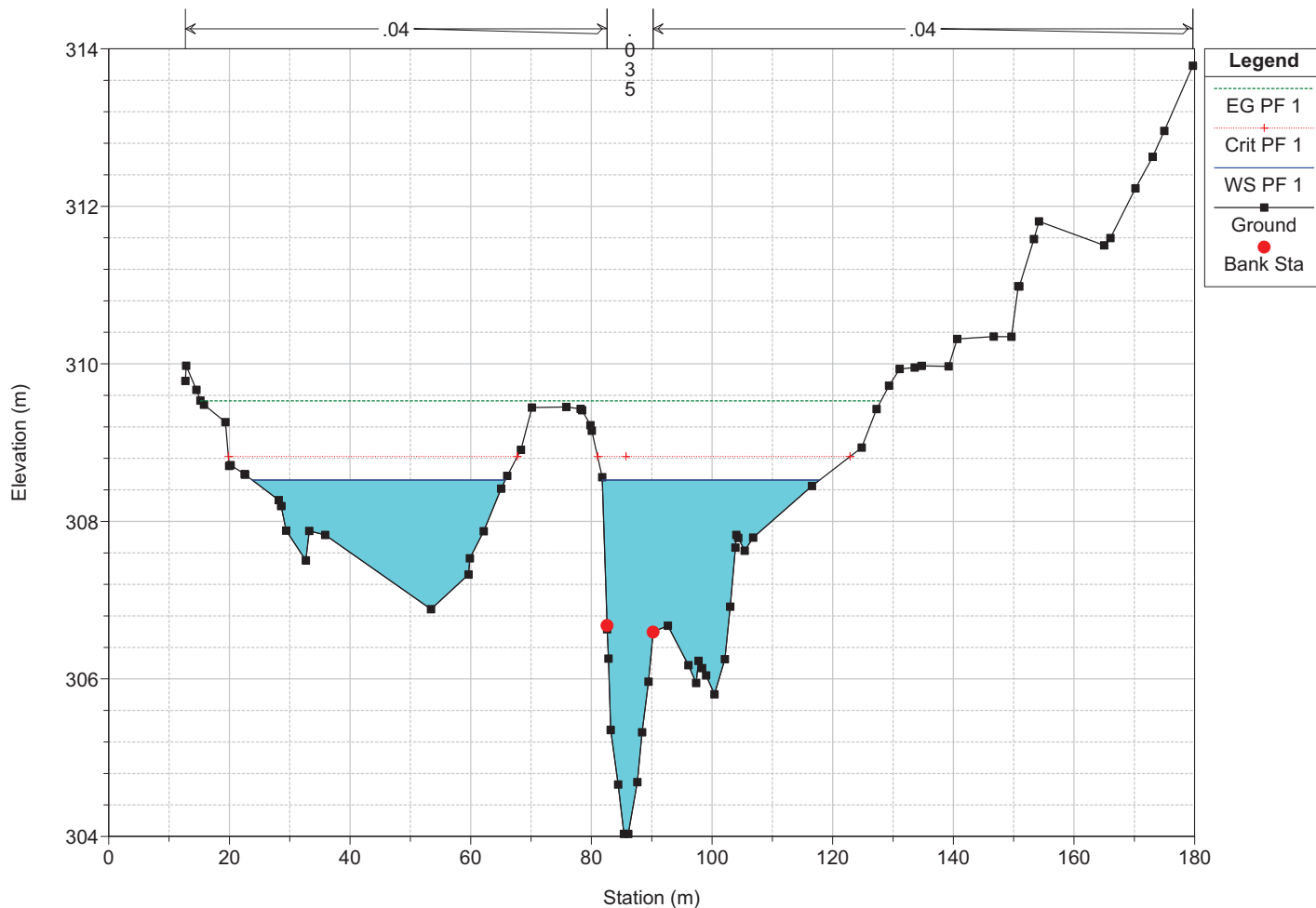
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River = ARENELLA Reach = 1 RS = 12



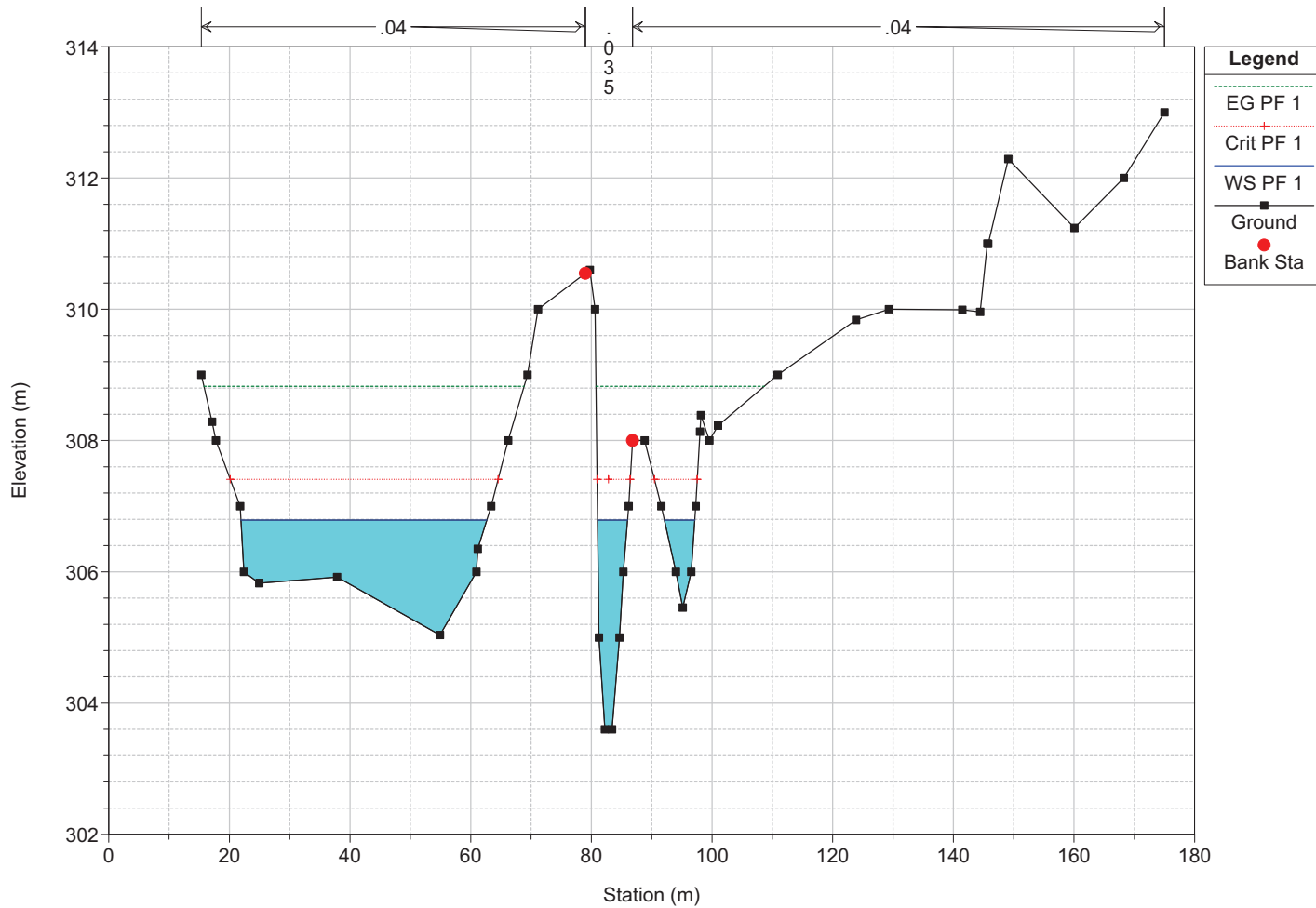
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 11



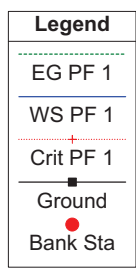
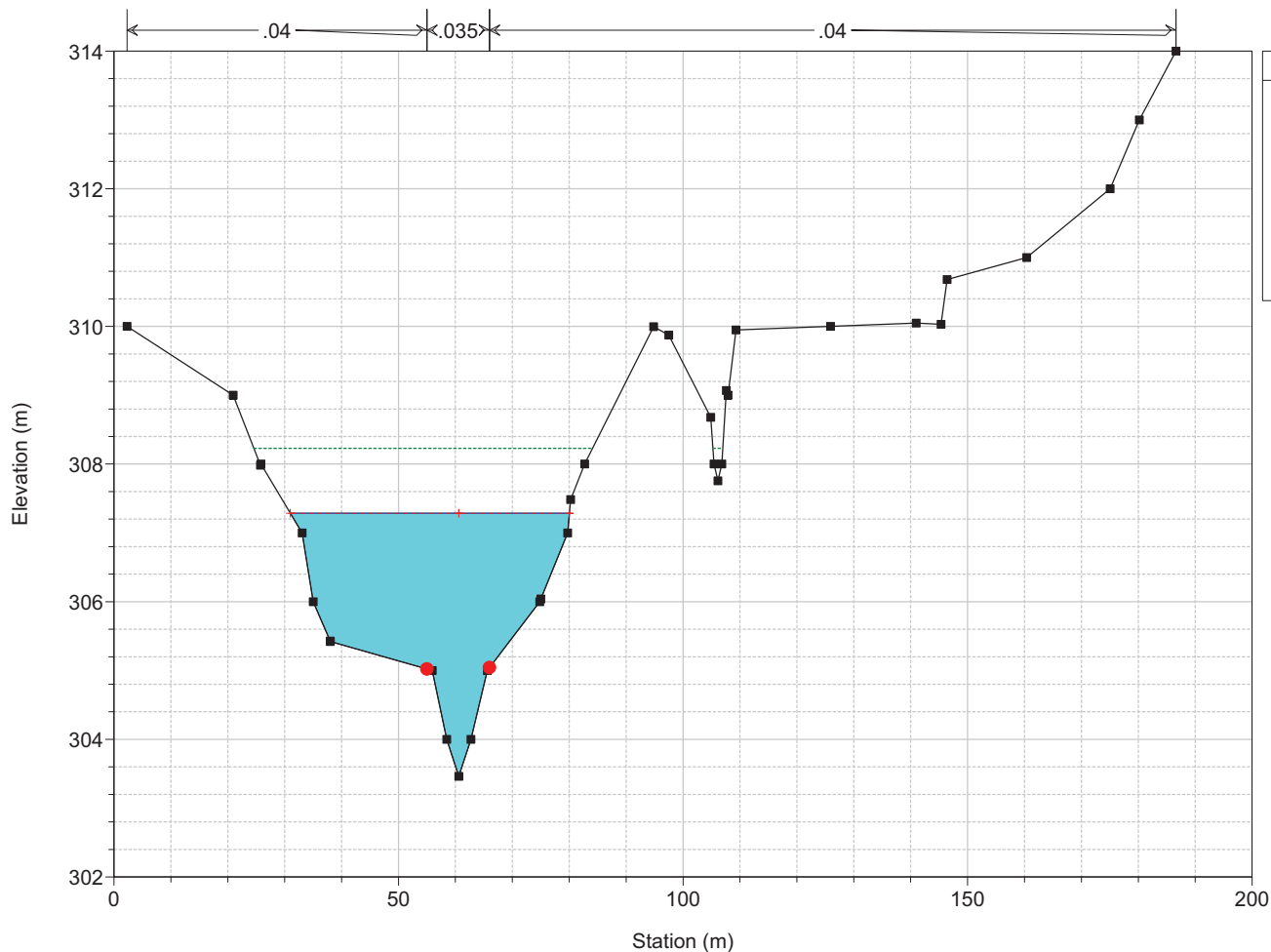
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 10



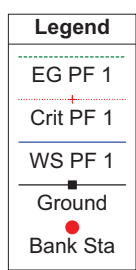
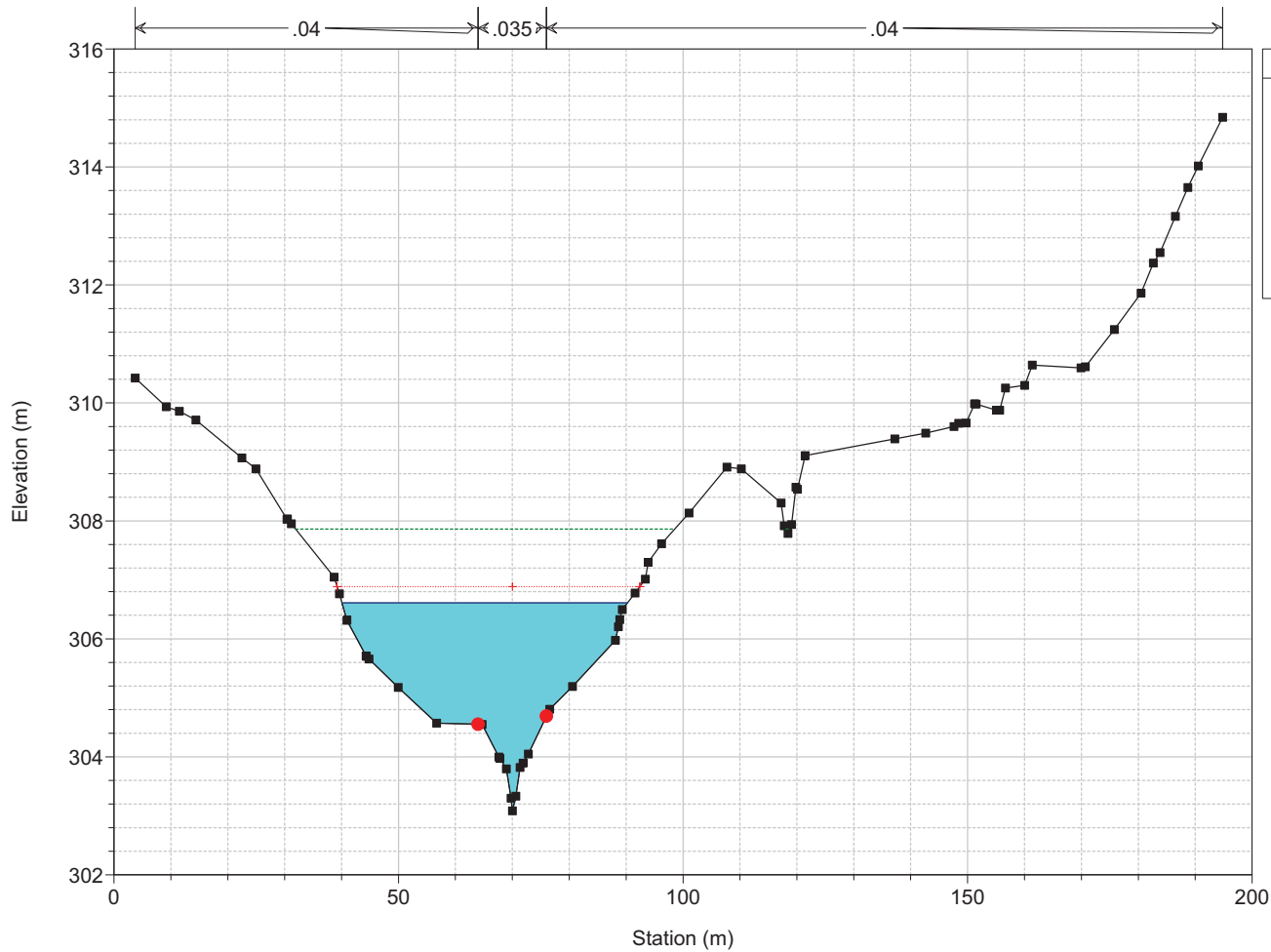
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 9



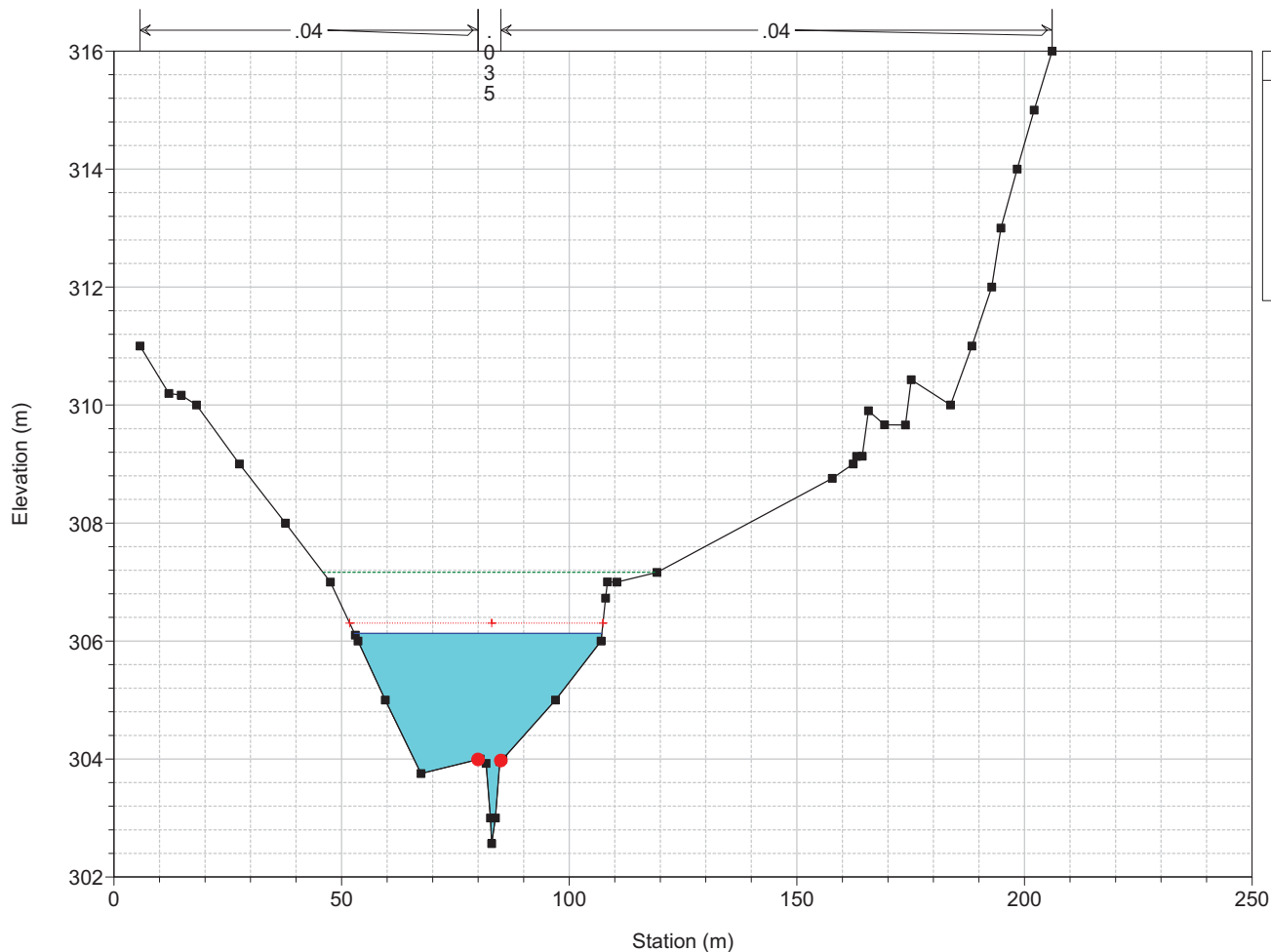
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 8



ARENELLA III_AO

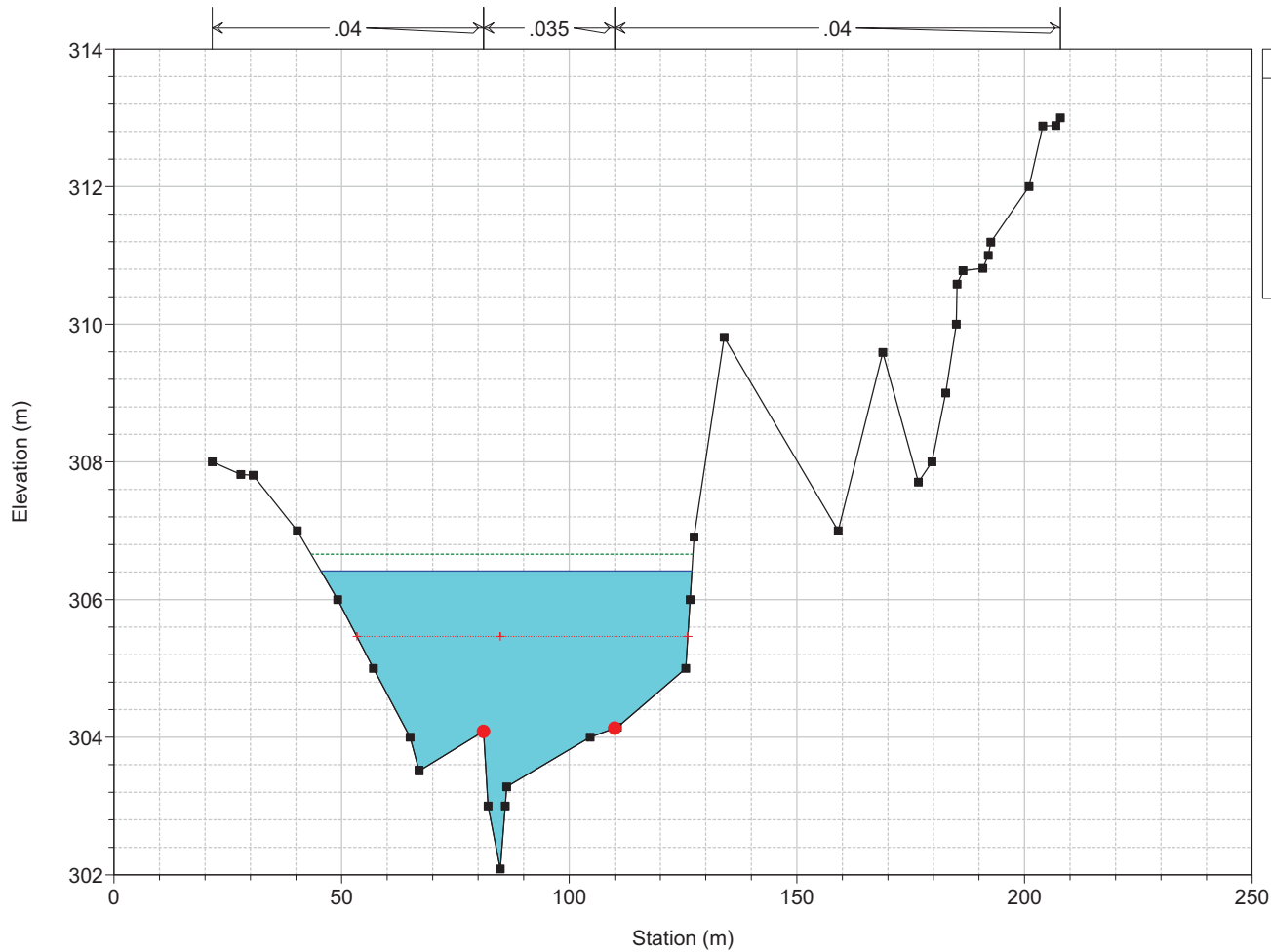
River = ARENELLA Reach = 1 RS = 7



Legend	
EG PF 1	
Crit PF 1	
WS PF 1	
Ground	
Bank Sta	

ARENELLA III_AO

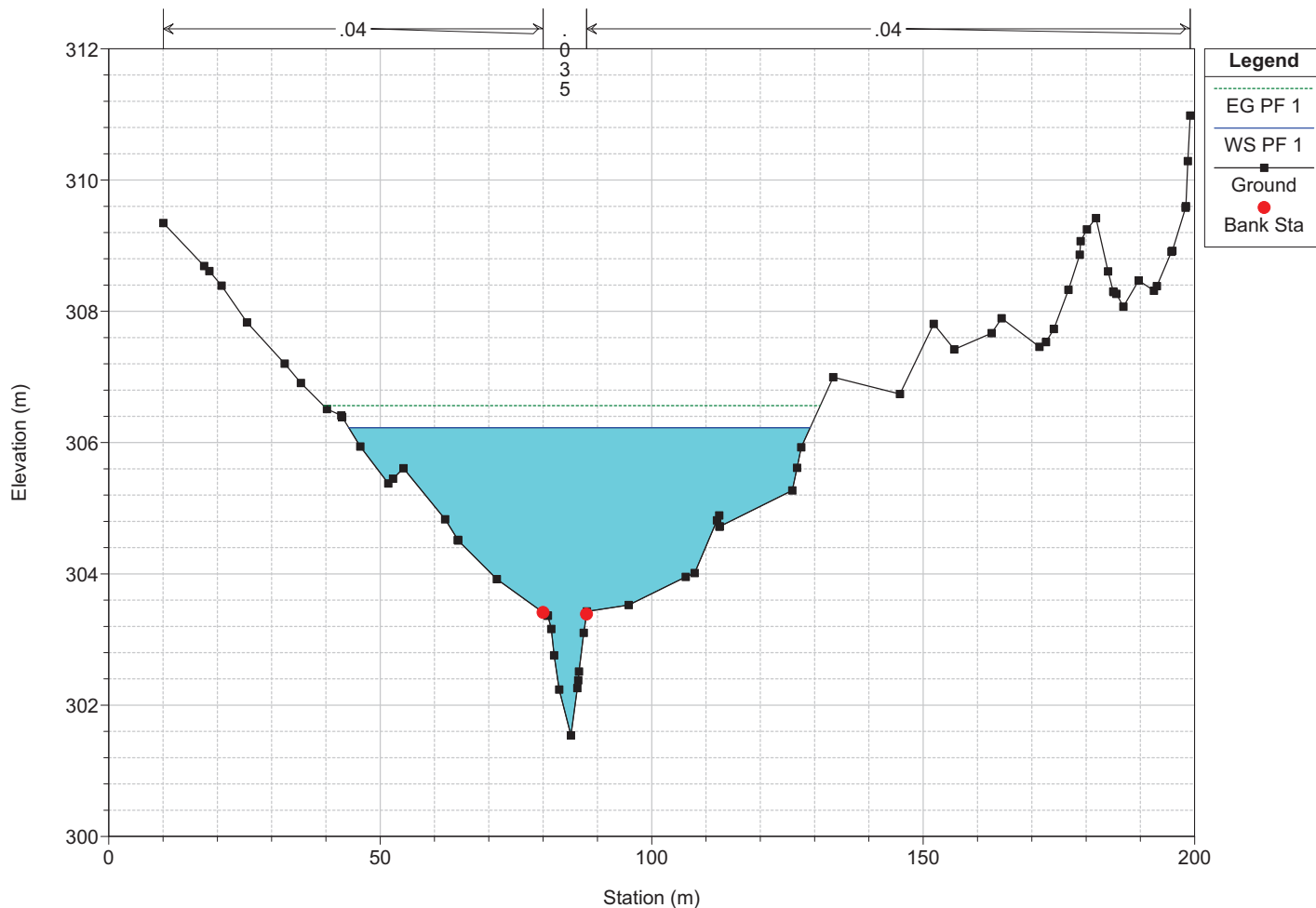
River = ARENELLA Reach = 1 RS = 6



Legend	
EG PF 1	
WS PF 1	
Crit PF 1	
Ground	
Bank Sta	

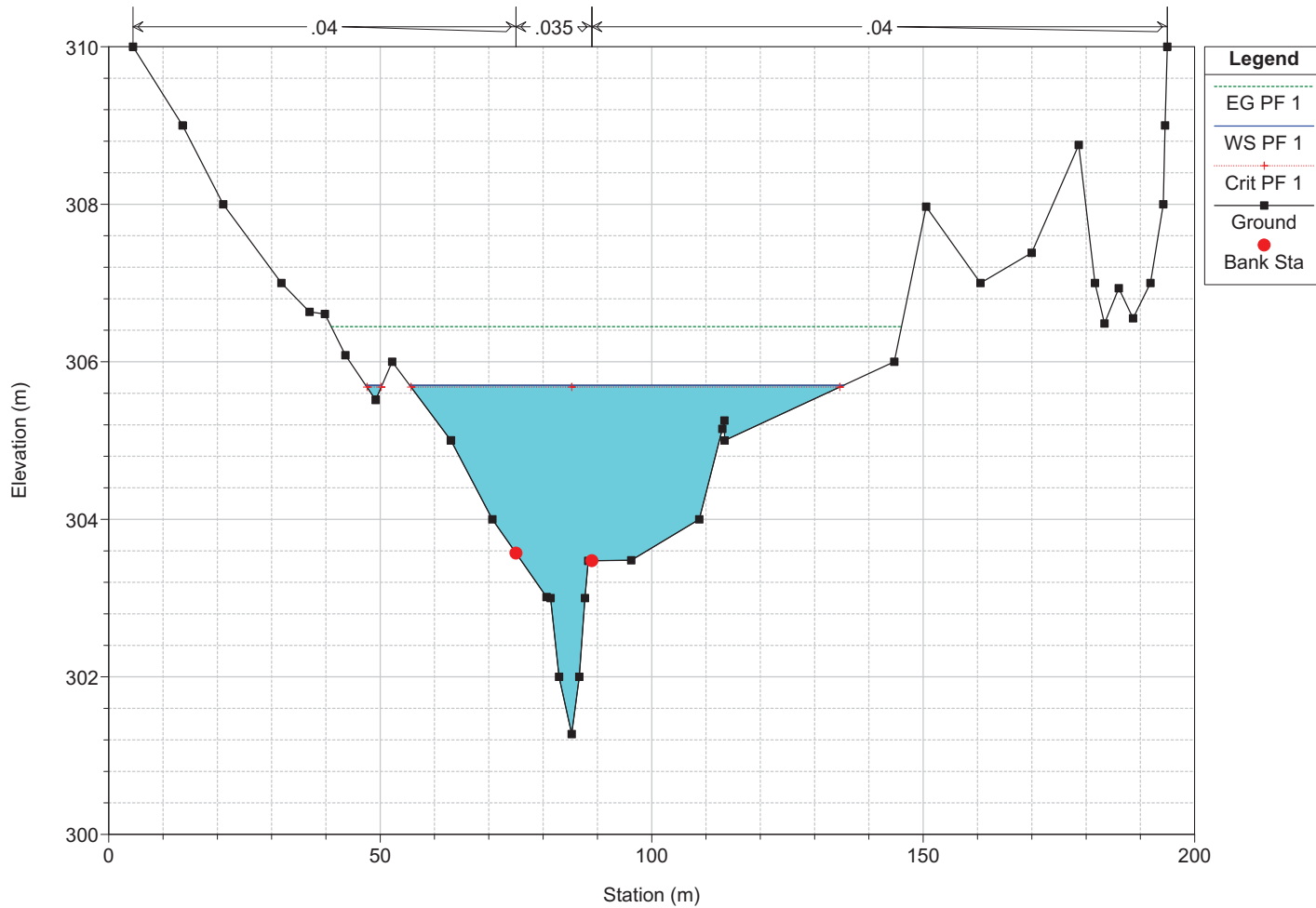
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 5



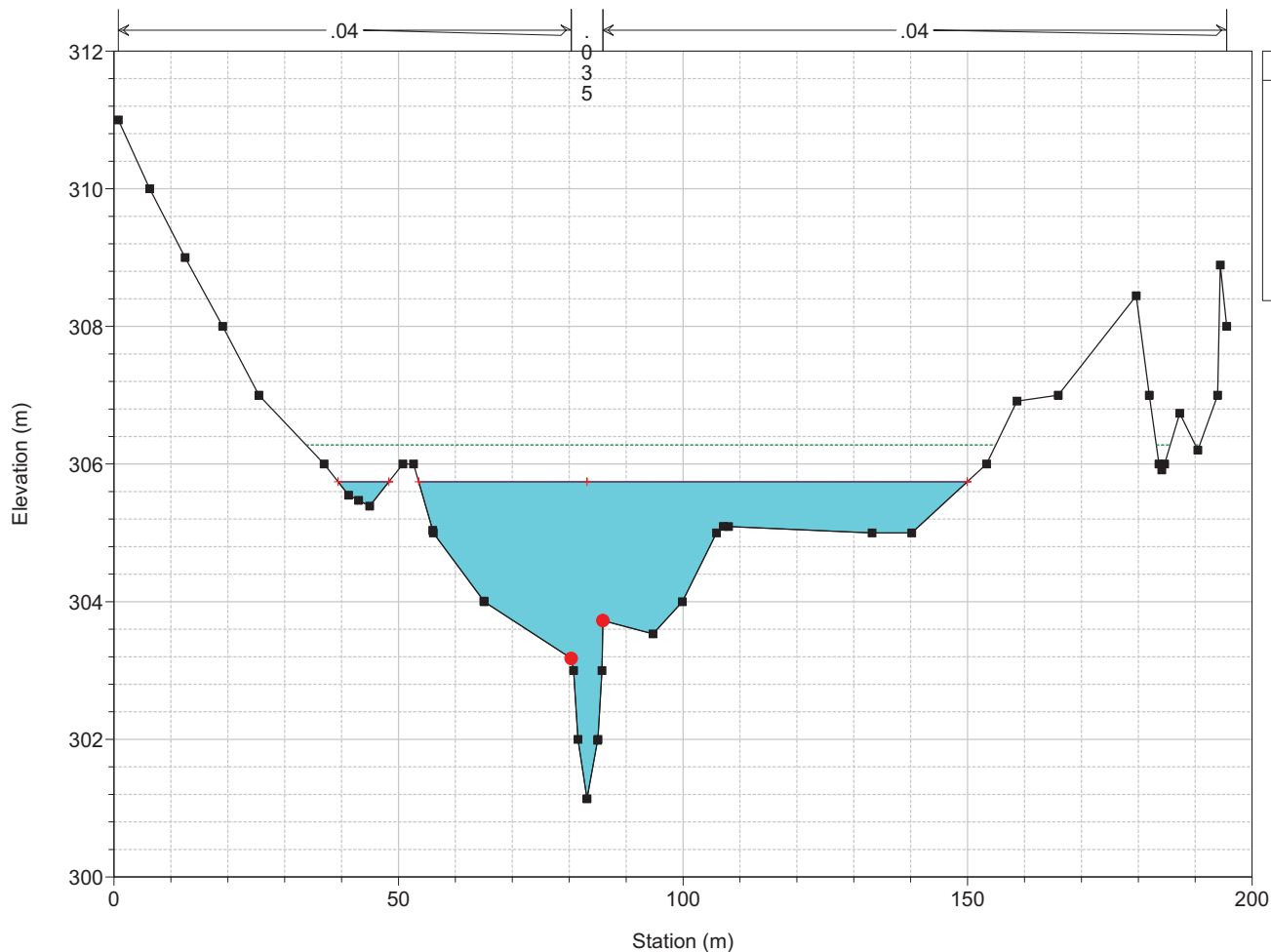
ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 4



ARENELLA III_AO

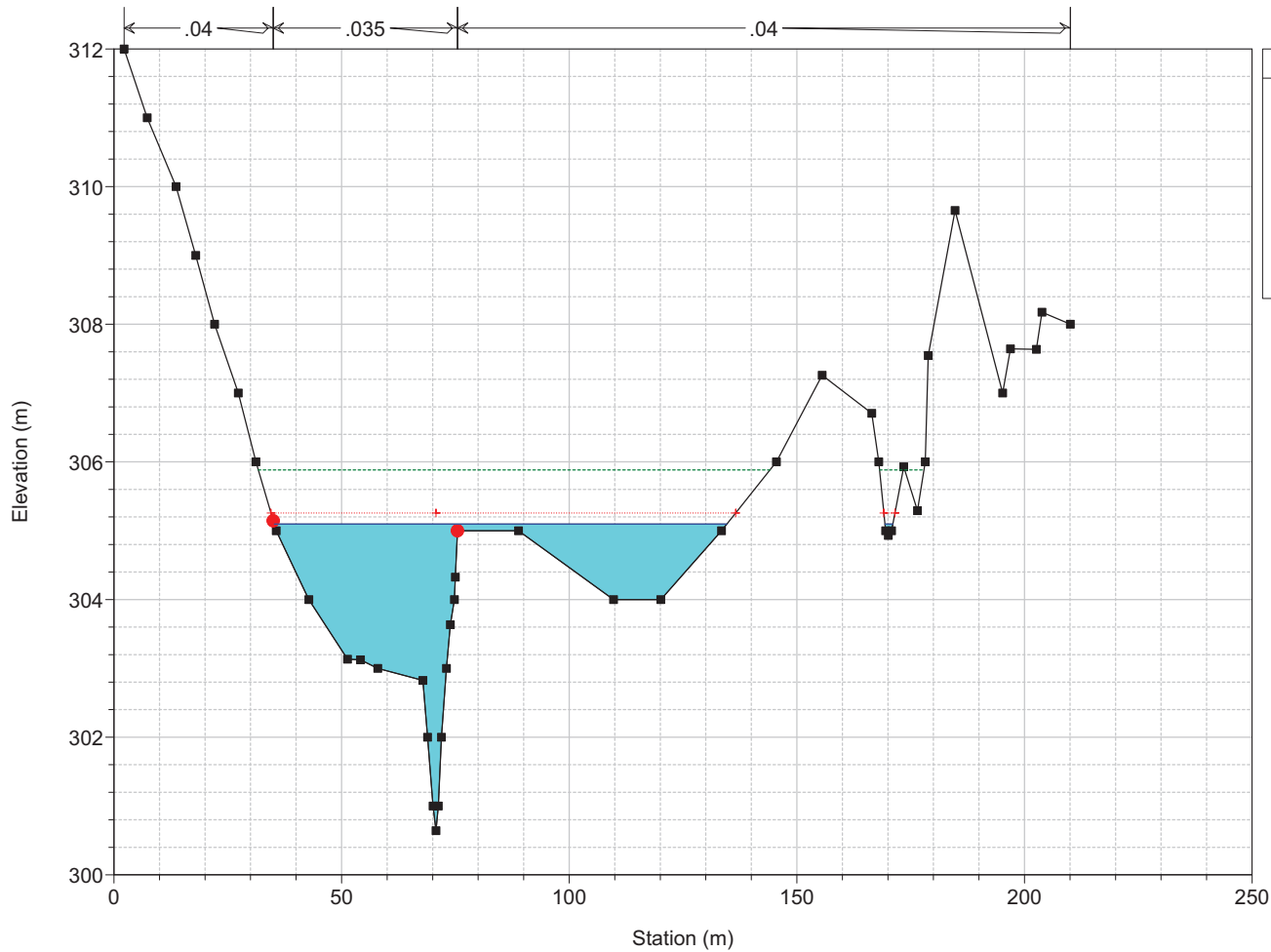
River = ARENELLA Reach = 1 RS = 3



Legend	
EG PF 1	(Dashed Green Line)
WS PF 1	(Solid Blue Line)
Crit PF 1	(Dotted Red Line)
Ground	(Solid Black Line with Square Markers)
Bank Sta	(Red Dot)

ARENELLA III_AO

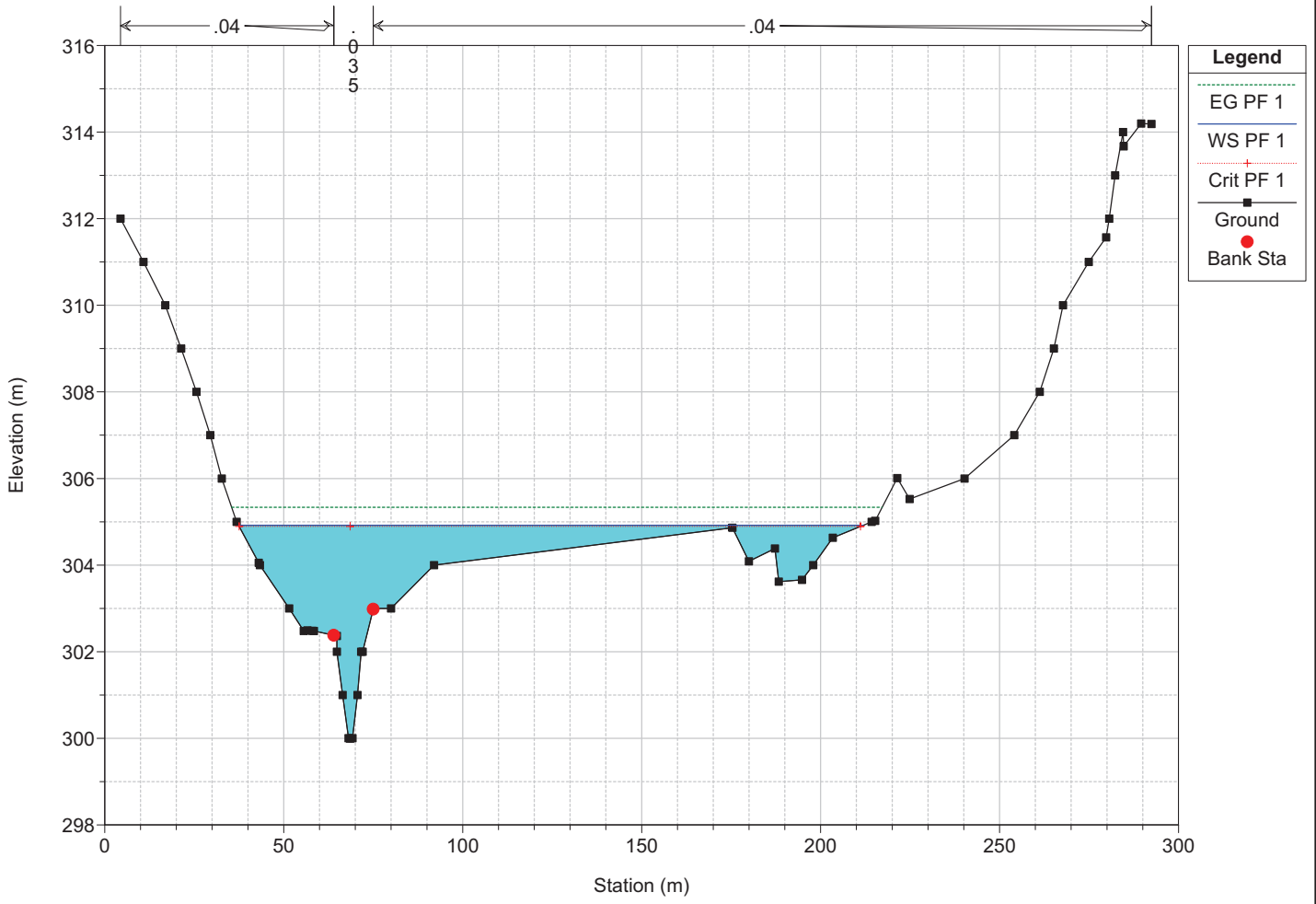
River = ARENELLA Reach = 1 RS = 2



Legend	
EG PF 1	(Dashed Green Line)
Crit PF 1	(Dotted Red Line)
WS PF 1	(Solid Blue Line)
Ground	(Solid Black Line with Square Markers)
Bank Sta	(Red Dot)

ARENELLA III_AO

River = ARENELLA Reach = 1 RS = 1

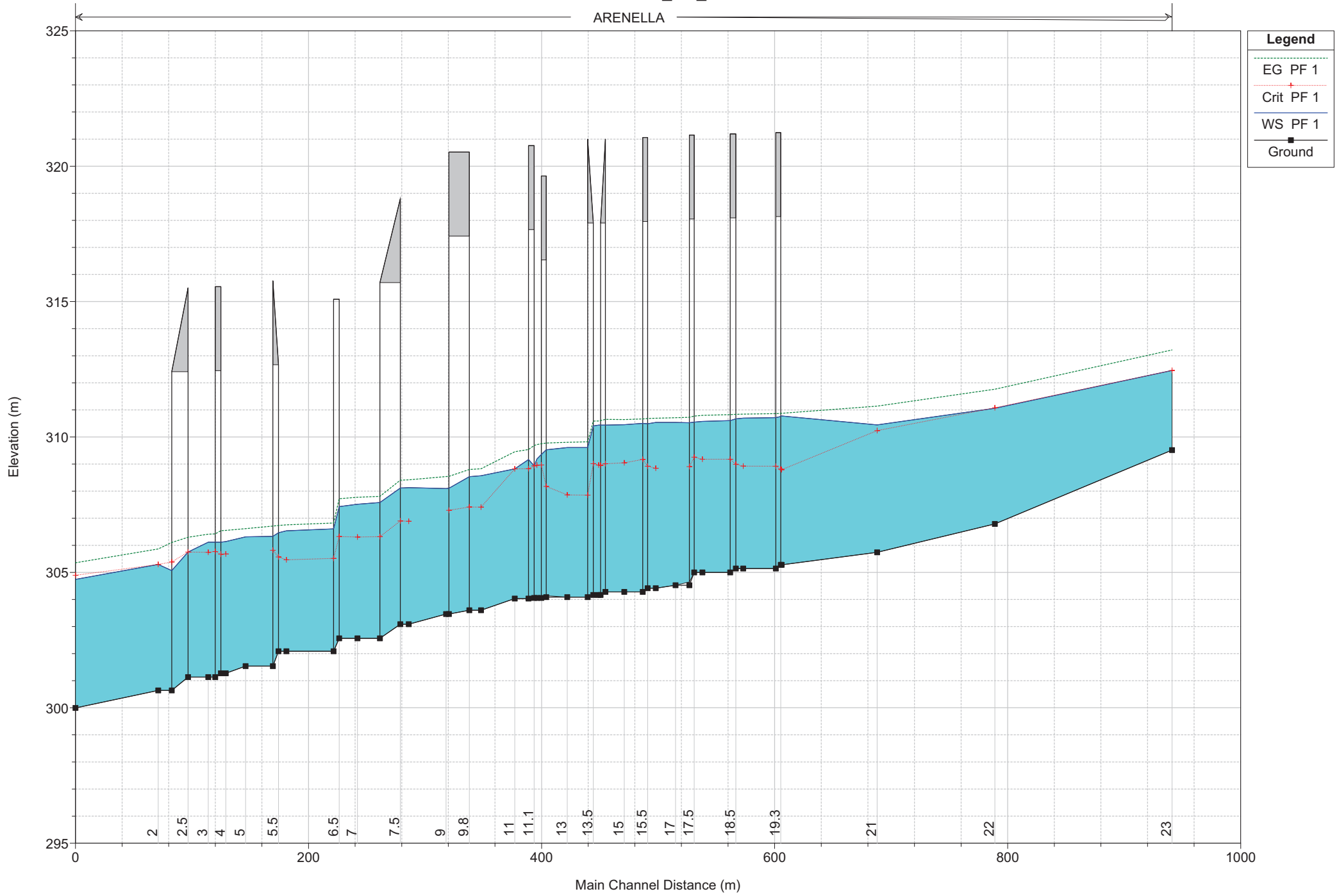


ARENELLA III POST OPERAM

Reach	River Sta	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl	Hydr Radius (m)	Hydr Radius C (m)	Vel Left (m/s)	Vel Right (m/s)
1	23	365.33	309.52	312.46	312.46	313.21	0.012533	5.25	97.61	63.68	1.07	1.49	2.10	3.59	3.55
1	22	365.33	306.79	311.06	311.08	311.76	0.007351	5.35	116.74	75.93	0.90	1.51	3.23	2.57	2.84
1	21	365.33	305.74	310.45	310.24	311.14	0.004467	4.36	120.16	66.37	0.73	1.78	3.44	1.97	1.91
1	20	365.33	305.28	310.78	308.79	310.87	0.000479	1.62	302.66	116.98	0.25	2.57	4.18	0.89	0.76
1	19.3	Bridge													
1	19	365.33	305.14	310.70	308.93	310.84	0.000701	1.98	250.41	99.57	0.30	2.49	4.24	0.97	1.00
1	18.5	Bridge													
1	18	365.33	305.00	310.57	309.18	310.80	0.001189	2.71	219.31	105.74	0.39	2.04	4.56	1.05	1.23
1	17.5	Bridge													
1	17	365.33	304.53	310.54		310.71	0.000785	1.99	229.22	98.26	0.31	2.27	3.92	0.98	0.78
1	16	365.33	304.41	310.54	308.85	310.69	0.000815	2.27	261.14	118.00	0.32	2.17	4.66	1.00	1.06
1	15.5	Bridge													
1	15	365.33	304.28	310.45	309.04	310.64	0.001016	2.76	243.76	120.23	0.37	1.99	5.29	0.82	1.26
1	14.5	Bridge													
1	14	365.33	304.17	310.44	308.96	310.59	0.000919	2.01	244.41	142.16	0.33	1.67	3.54	0.51	1.22
1	13.5	Bridge													
1	13	365.33	304.08	309.61	307.86	309.80	0.000871	2.08	210.48	84.55	0.33	2.44	3.88	0.64	1.11
1	12.5	Bridge													
1	12	365.33	304.06	309.18	308.96	309.72	0.003535	4.32	146.54	102.60	0.66	1.39	4.05	1.09	2.30
1	11.1	Bridge													
1	11	365.33	304.03	308.82	308.82	309.46	0.006608	4.86	127.29	89.77	0.79	1.35	3.03	2.11	2.47
1	10	365.33	303.60	308.57	307.41	308.83	0.002695	2.12	168.19	76.19	0.37	1.96	1.71	2.32	1.30
1	9.8	Bridge													
1	9	365.33	303.46	308.10		308.54	0.003022	3.73	137.73	59.60	0.61	2.26	3.67	2.26	2.02
1	8	365.33	303.08	308.13	306.89	308.42	0.001855	3.04	172.60	73.13	0.48	2.32	3.88	1.86	1.56
1	7.5	Bridge													
1	7	365.33	302.57	307.52	306.30	307.77	0.002463	3.12	174.31	85.34	0.50	2.00	3.27	2.21	1.62
1	6.5	Bridge													
1	6	365.33	302.09	306.54	305.47	306.75	0.001729	2.39	187.55	82.67	0.44	2.22	2.86	1.59	1.54
1	5.5	Bridge													
1	5	365.33	301.54	306.31		306.62	0.002775	3.40	167.09	86.09	0.56	1.91	3.40	1.75	2.03
1	4	365.33	301.27	306.14	305.68	306.55	0.003560	3.68	157.00	101.87	0.63	1.51	3.17	1.51	1.82
1	3.5	Bridge													
1	3	365.33	301.14	306.12	305.74	306.41	0.003765	3.67	173.93	119.49	0.58	1.43	3.03	1.91	1.83
1	2.5	Bridge													
1	2	365.33	300.64	305.29	305.29	305.87	0.008031	4.27	124.02	102.40	0.80	1.18	2.16	3.35	1.80
1	1	365.33	299.99	304.74	304.89	305.36	0.006339	4.58	144.41	155.92	0.80	0.91	2.85	2.65	1.37

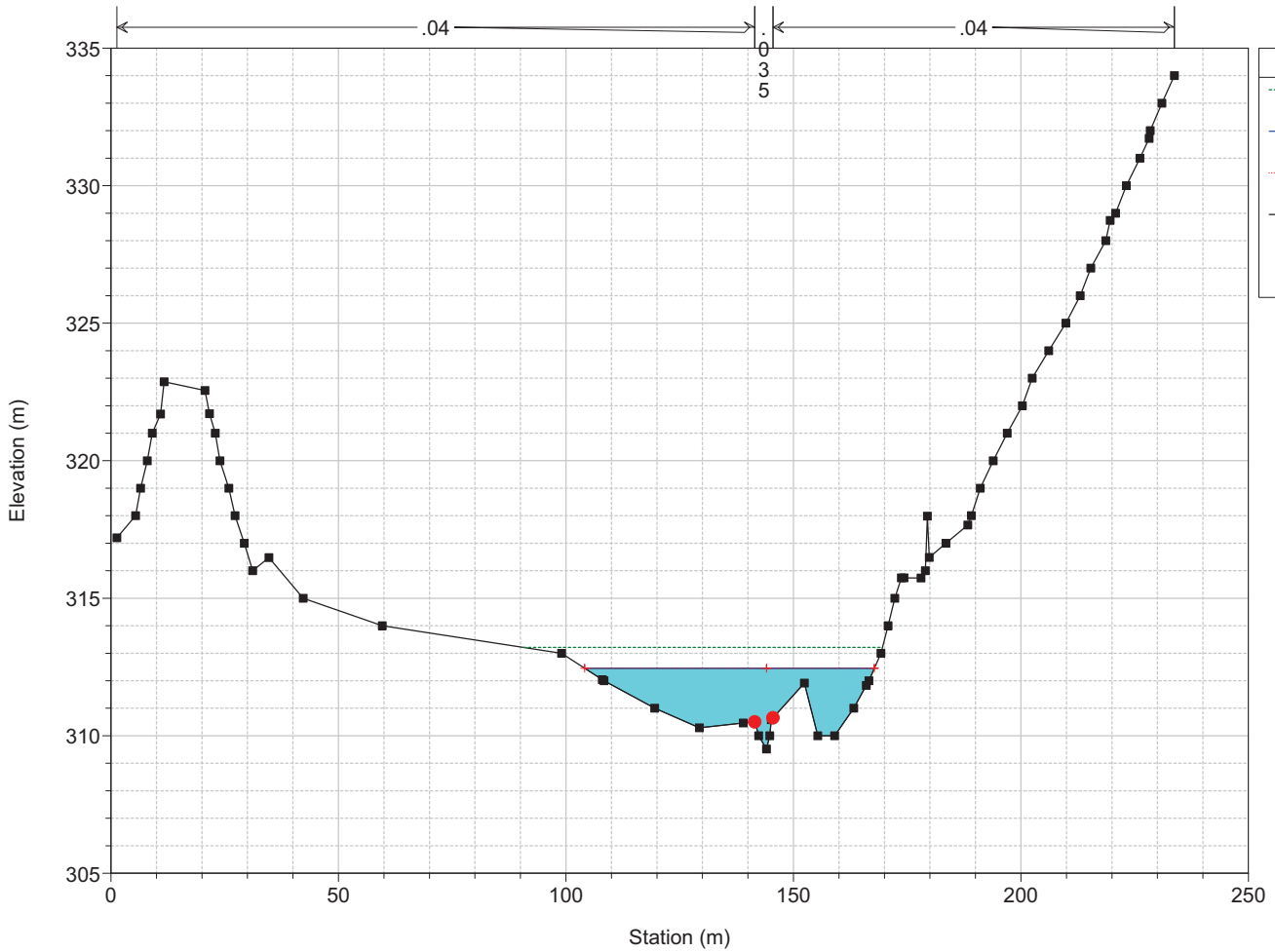
ARENELLAIII_PO_variante

ARENELLA



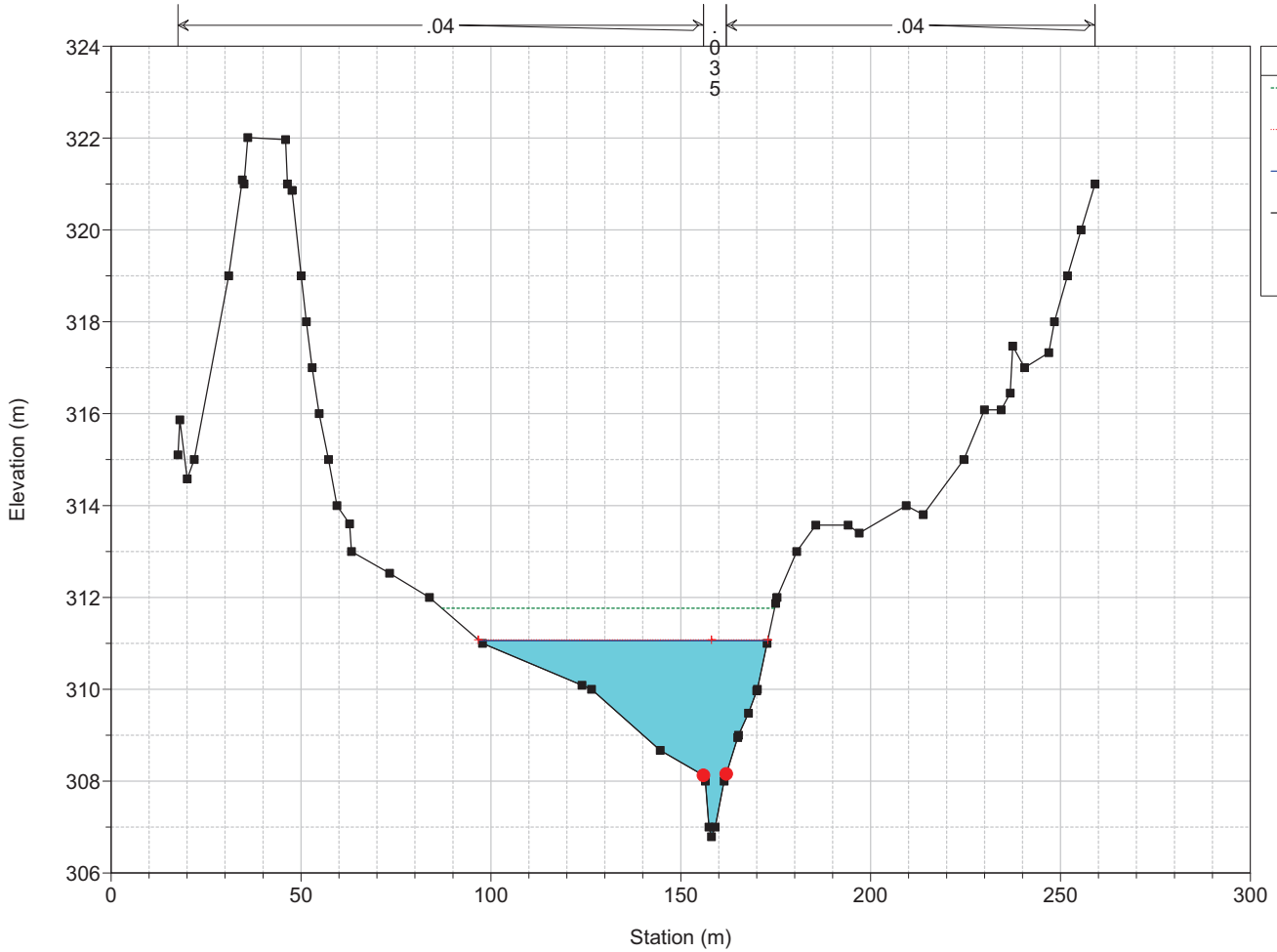
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 23

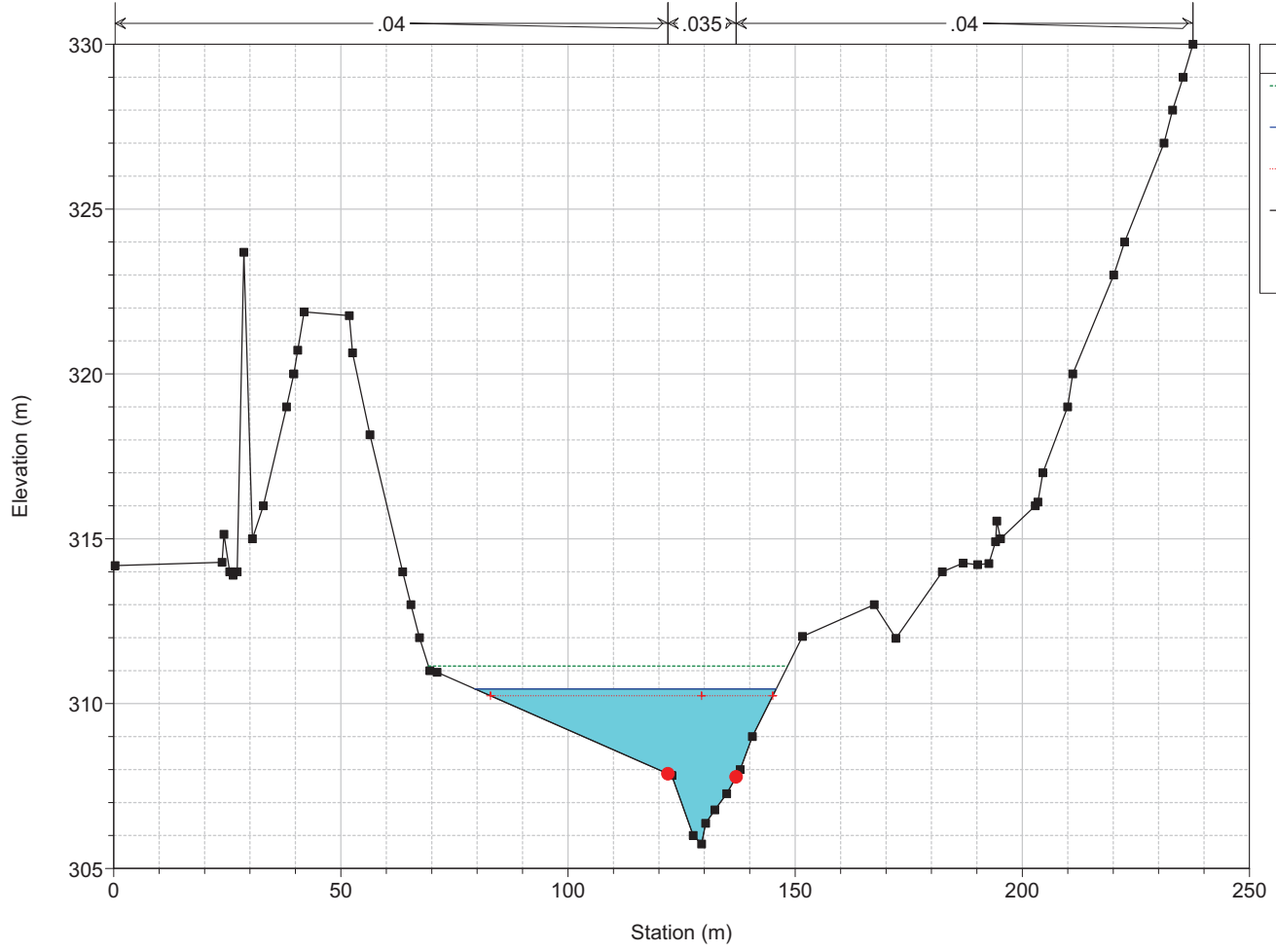


ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 22



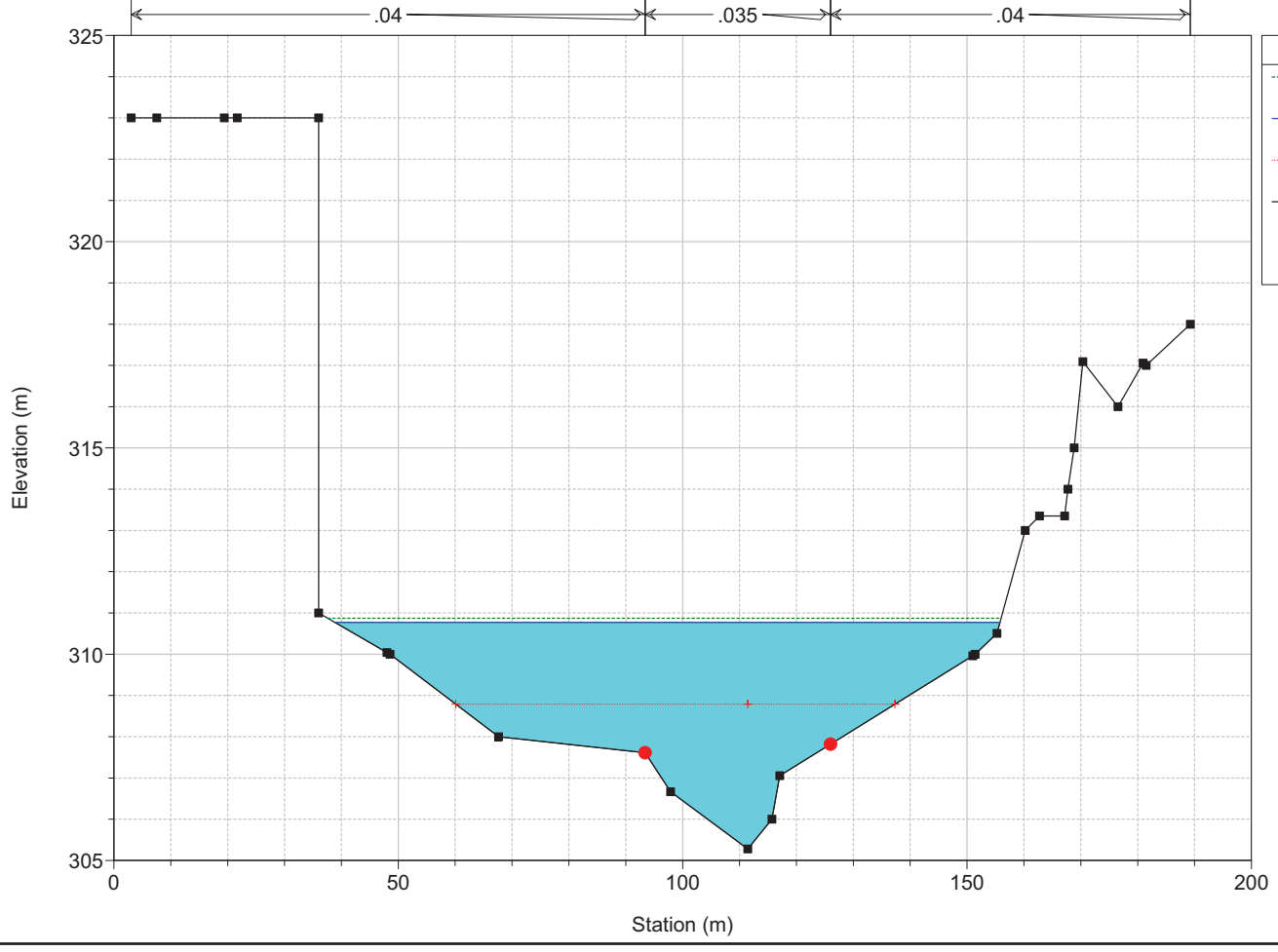
ARENELLAIII_PO_variante
 River = ARENELLA Reach = 1 RS = 21



Legend

- EG PF 1
- WS PF 1
- Crit PF 1
- Ground
- Bank Sta

ARENELLAIII_PO_variante
 River = ARENELLA Reach = 1 RS = 20

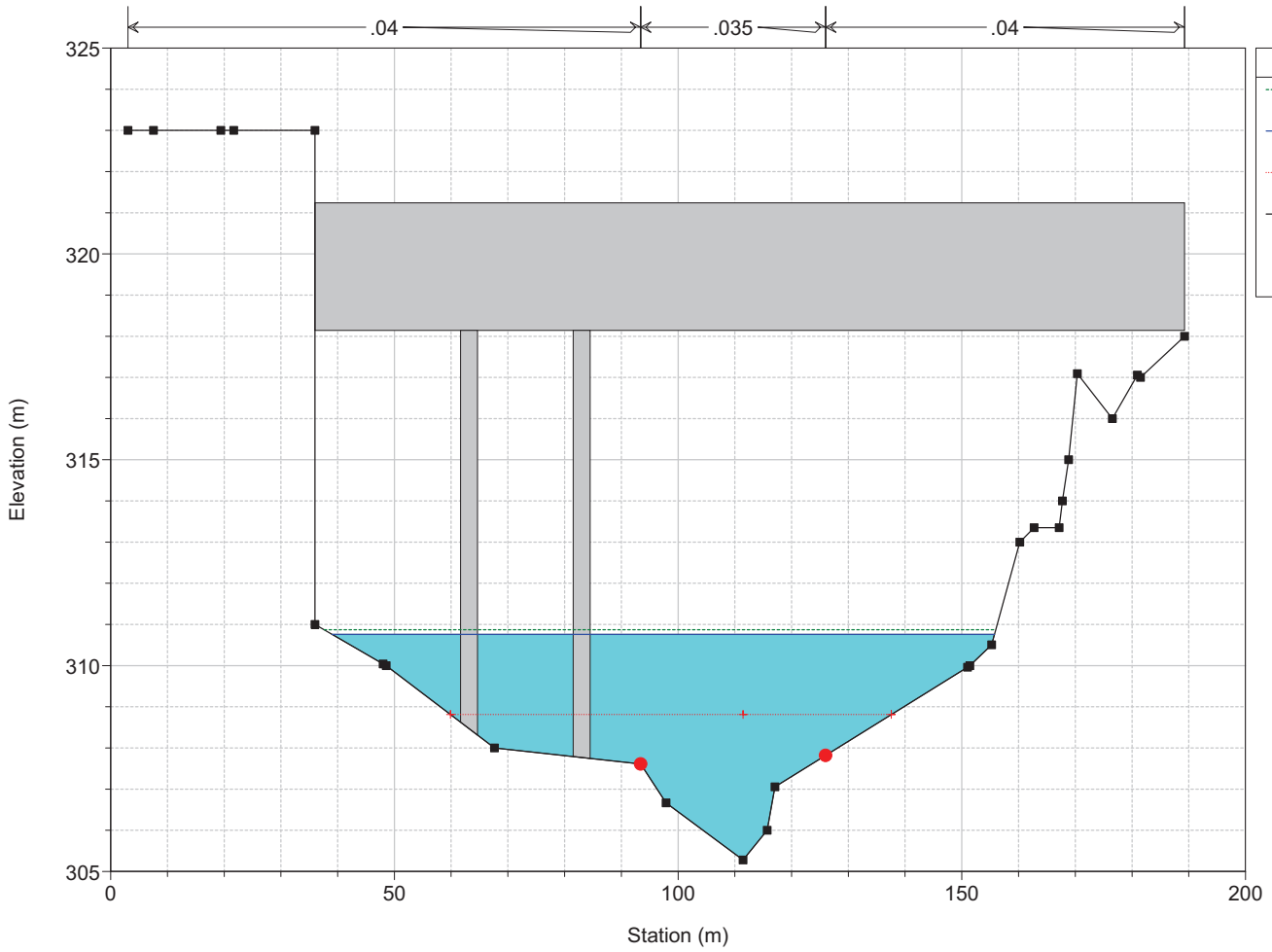


Legend

- EG PF 1
- WS PF 1
- Crit PF 1
- Ground
- Bank Sta

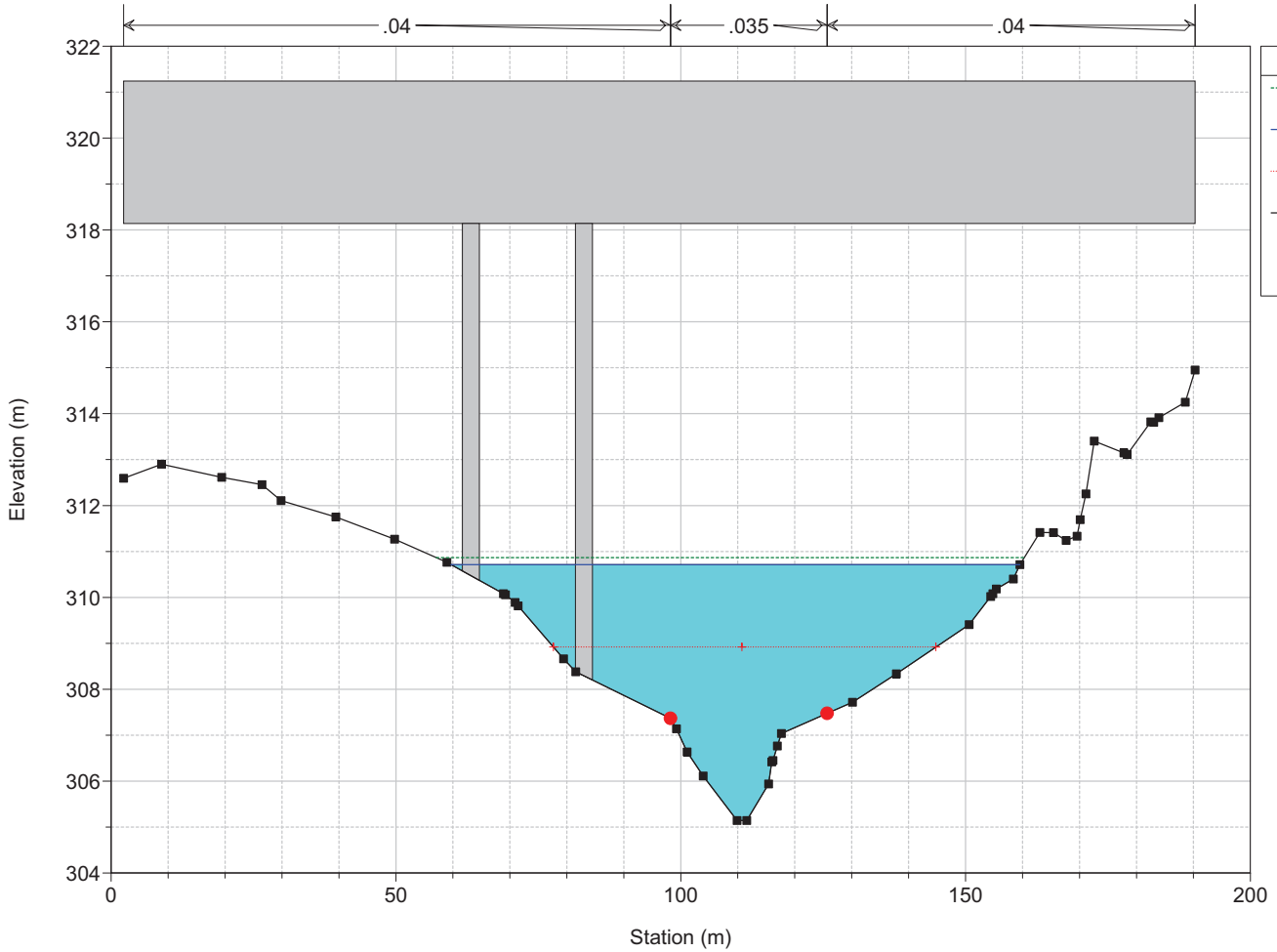
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 19.3 BR



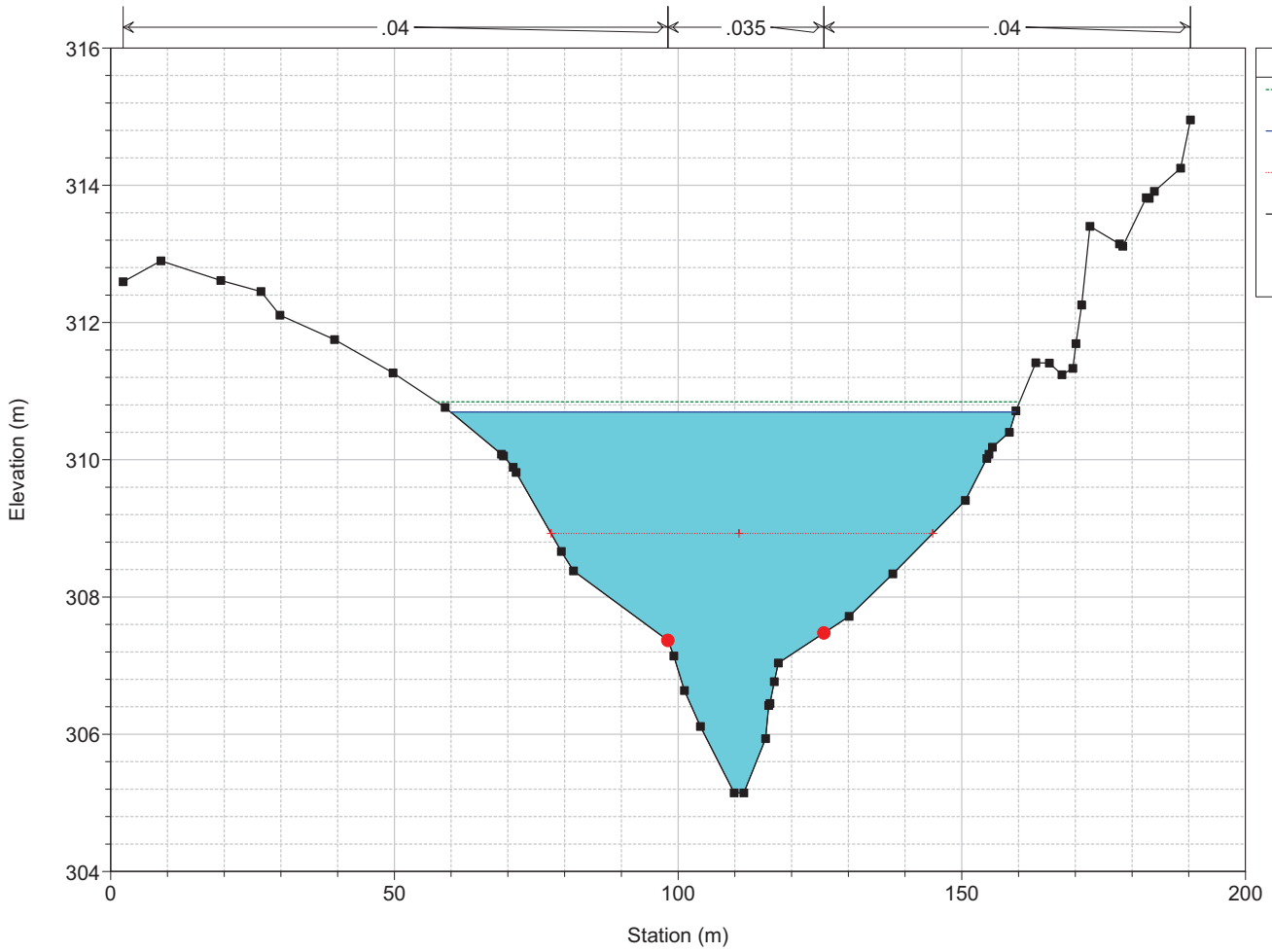
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 19.3 BR



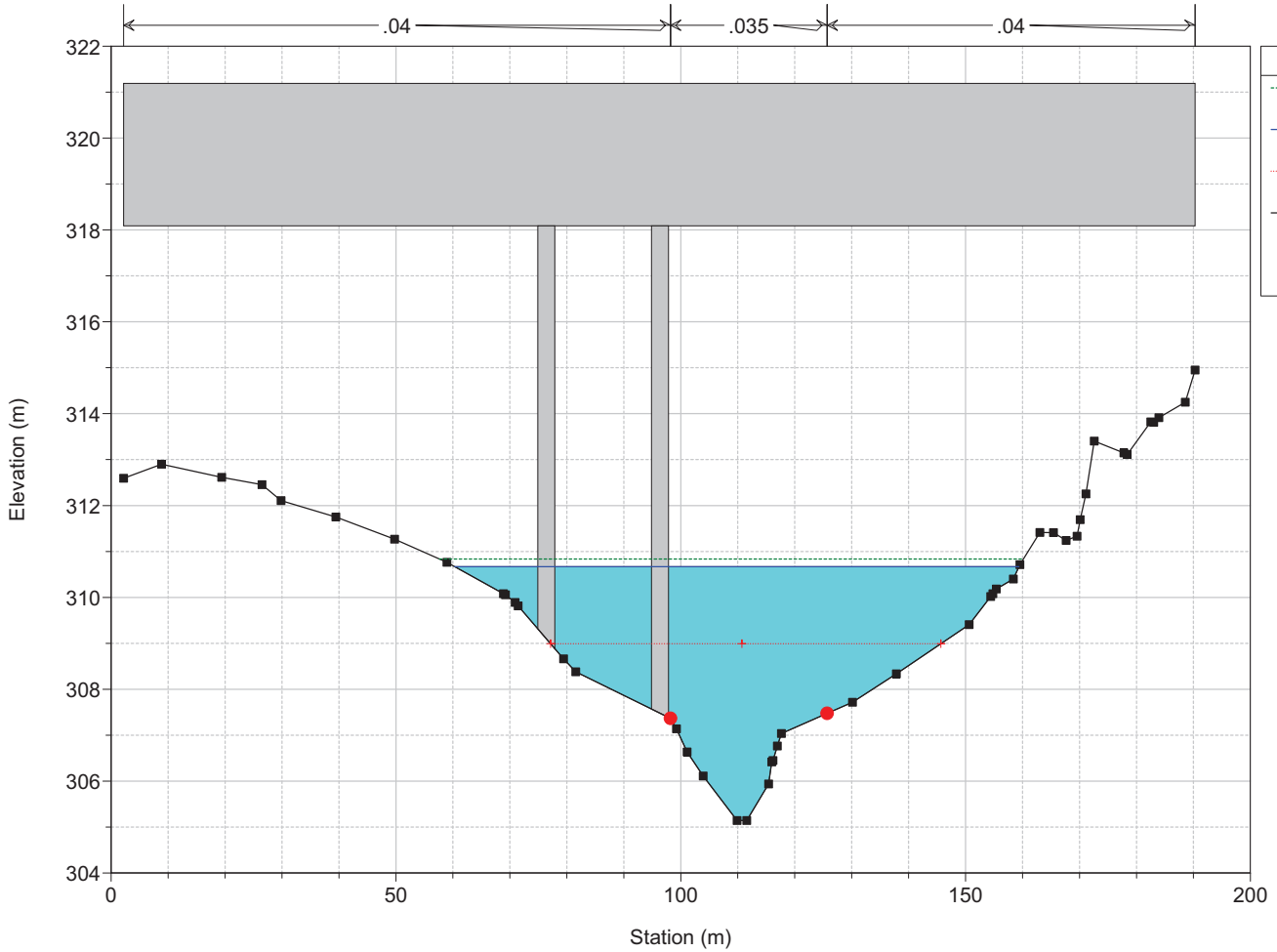
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 19



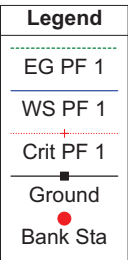
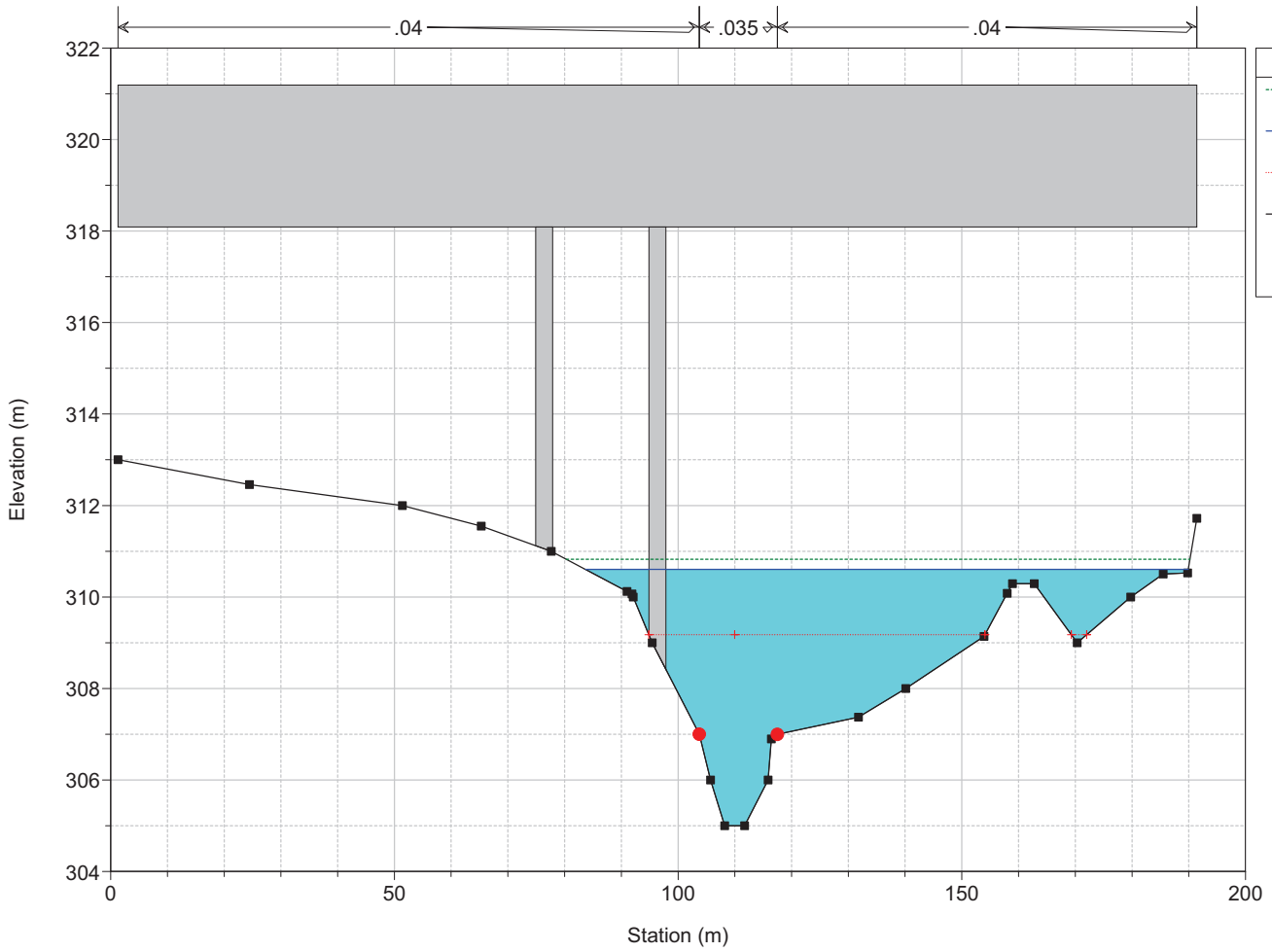
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 18.5 BR



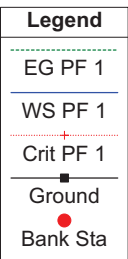
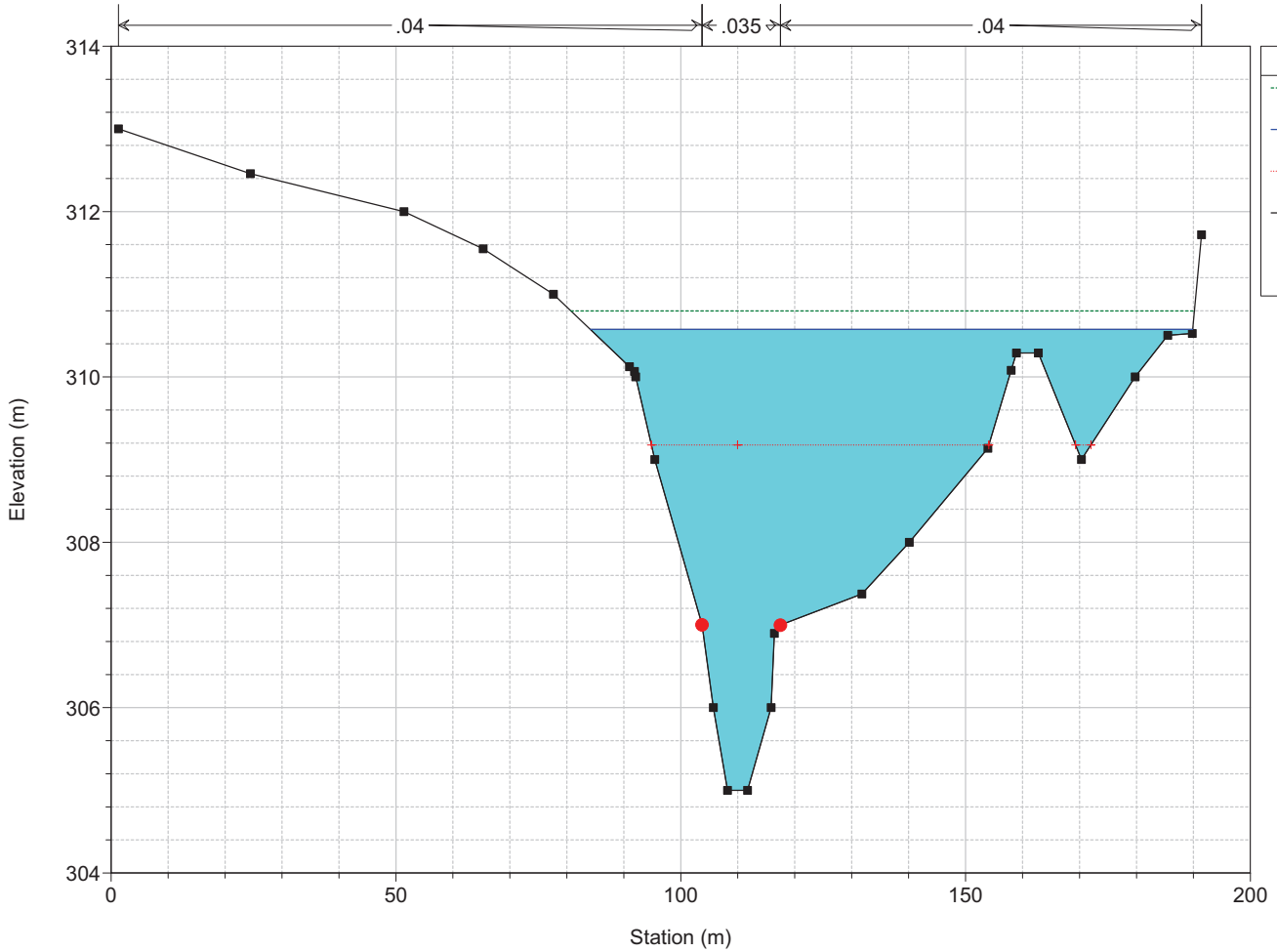
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 18.5 BR



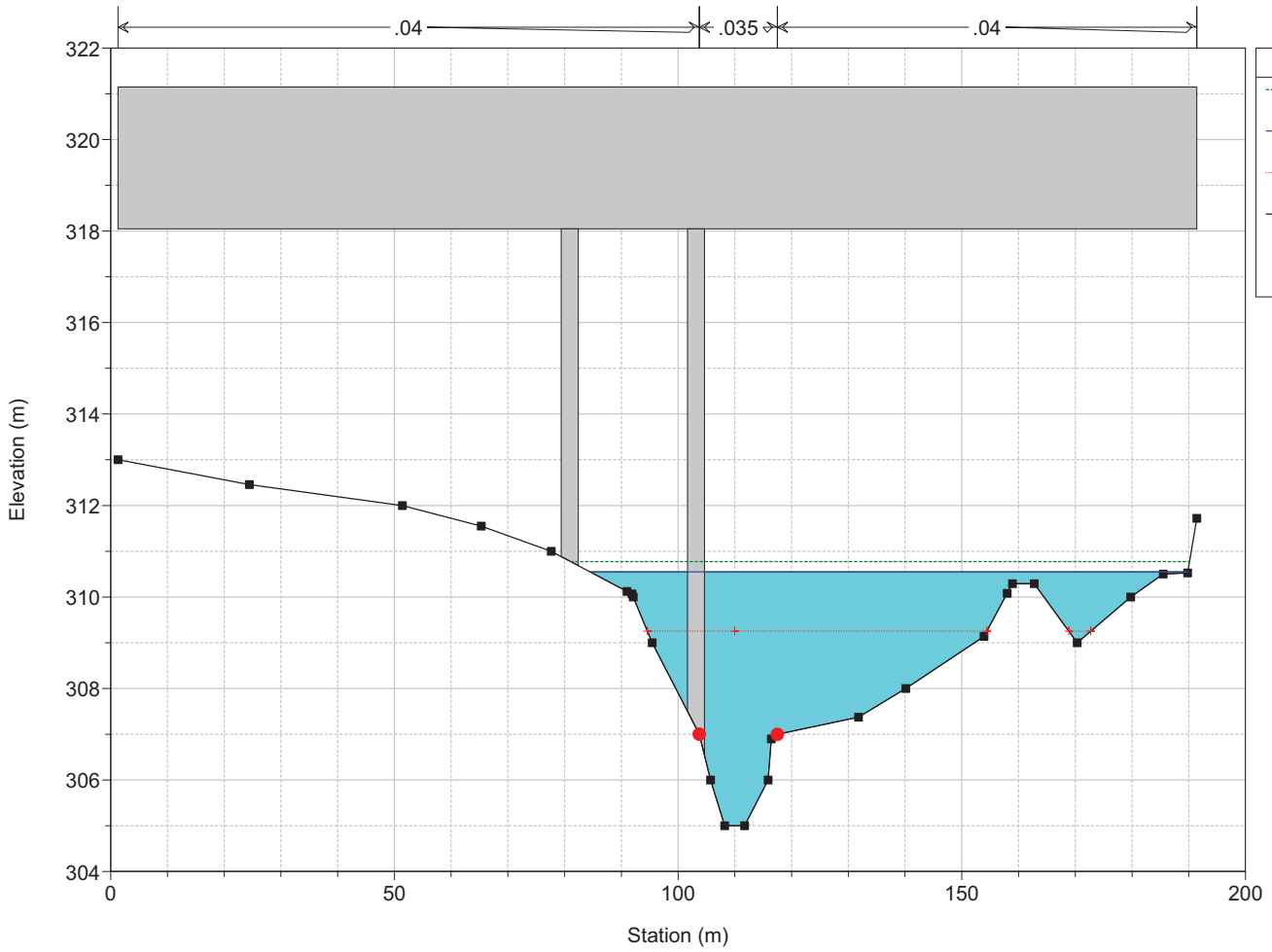
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 18



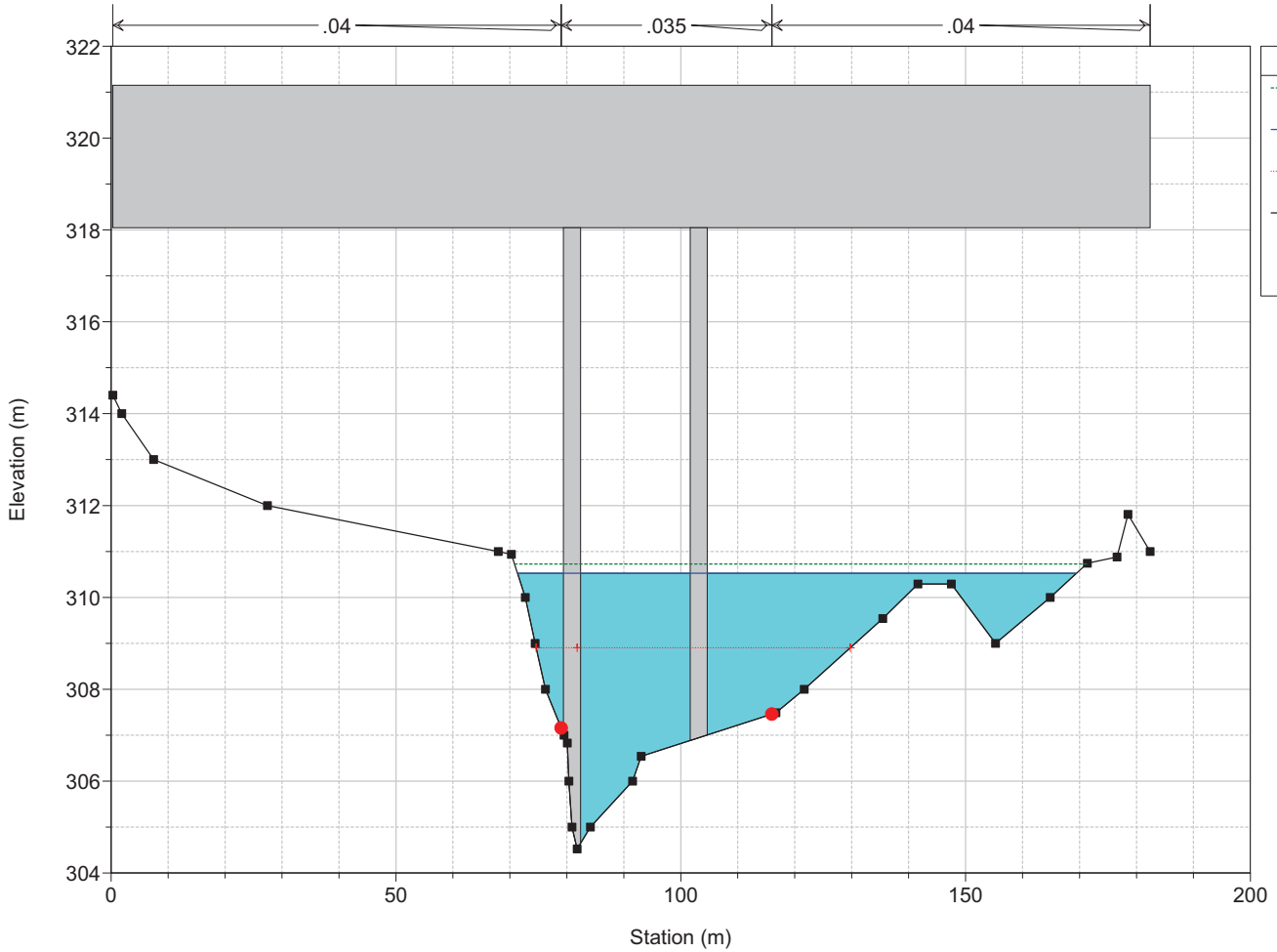
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 17.5 BR



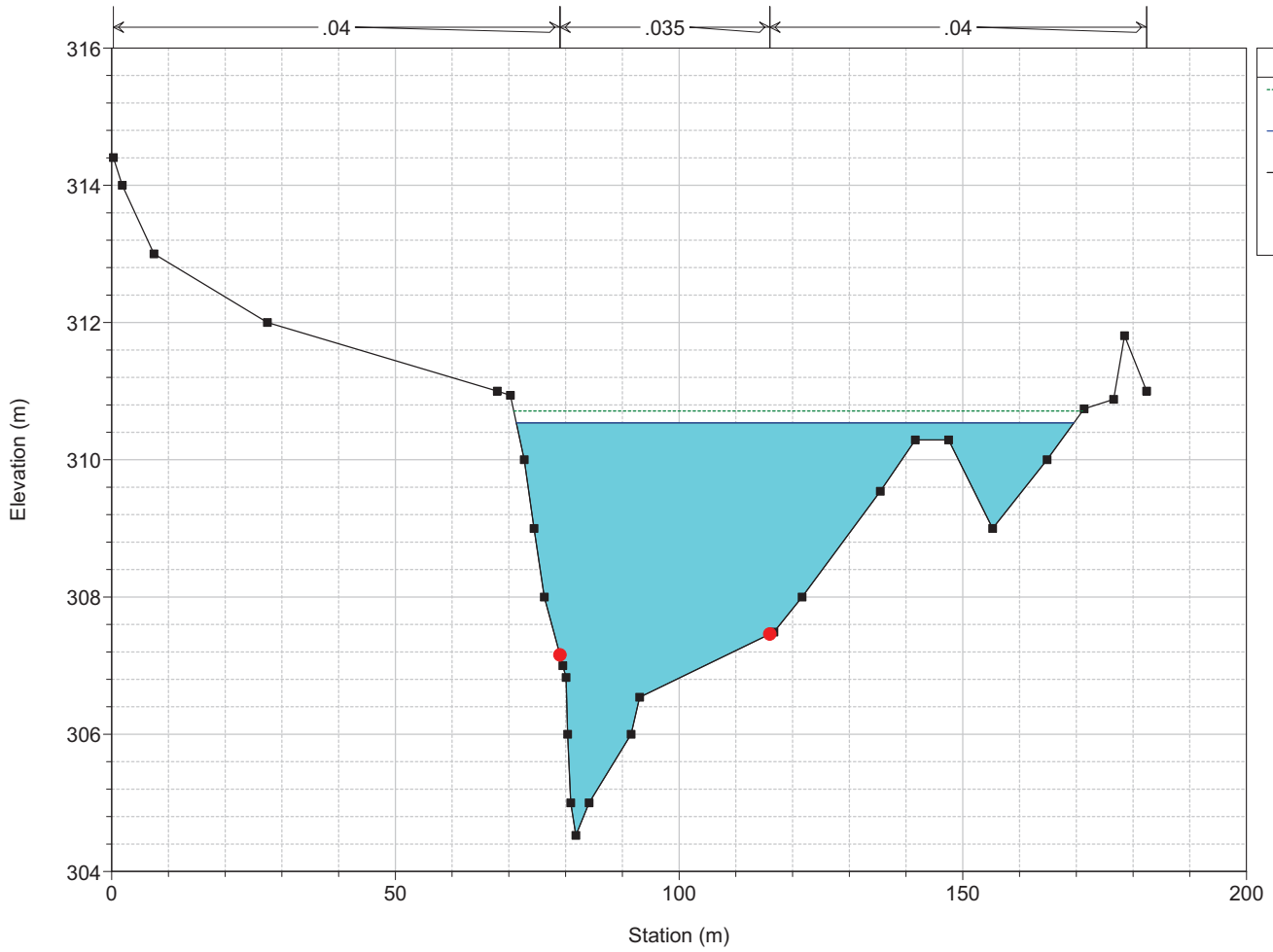
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 17.5 BR



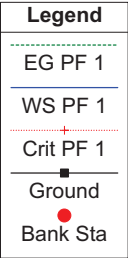
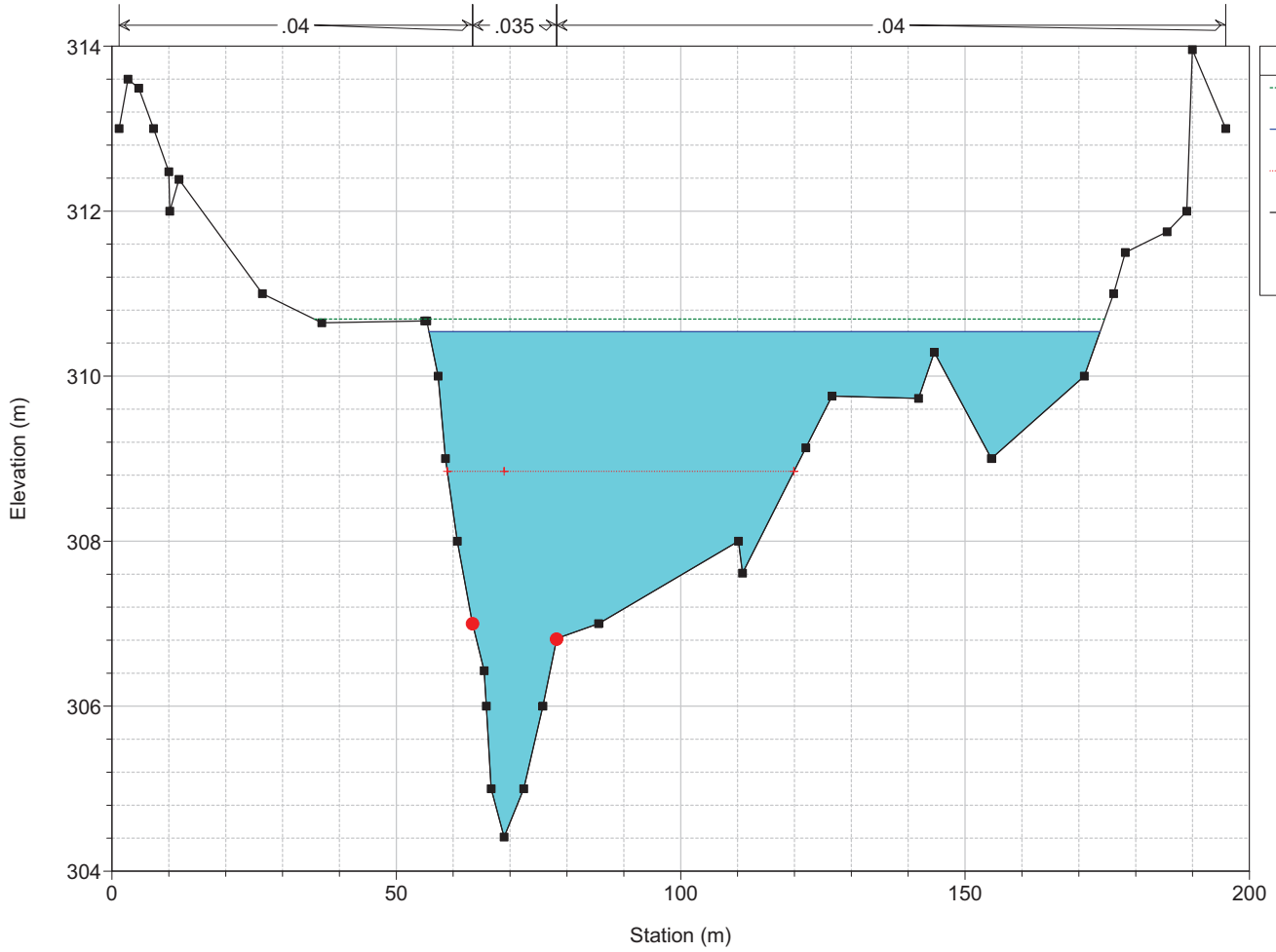
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 17



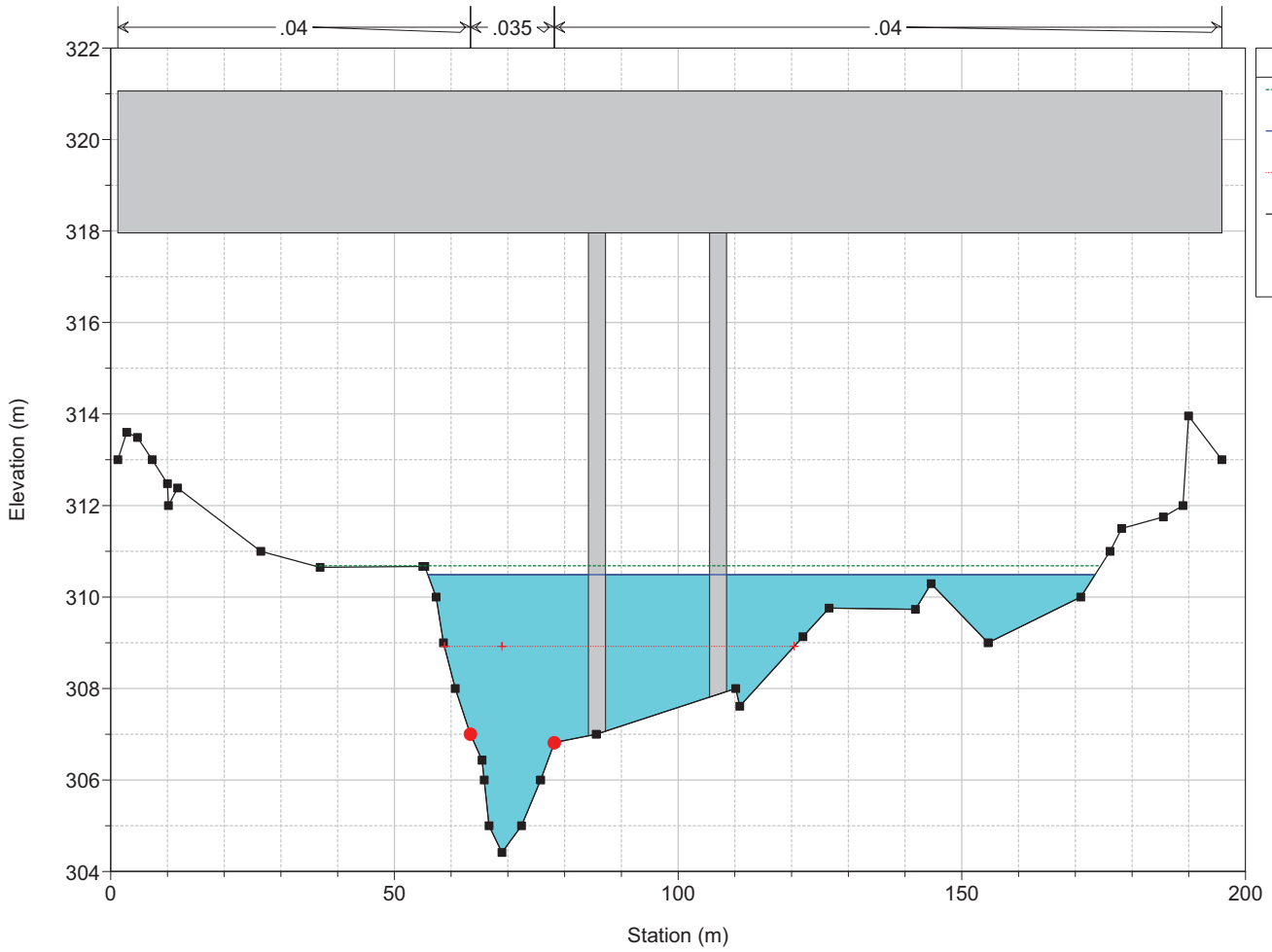
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 16



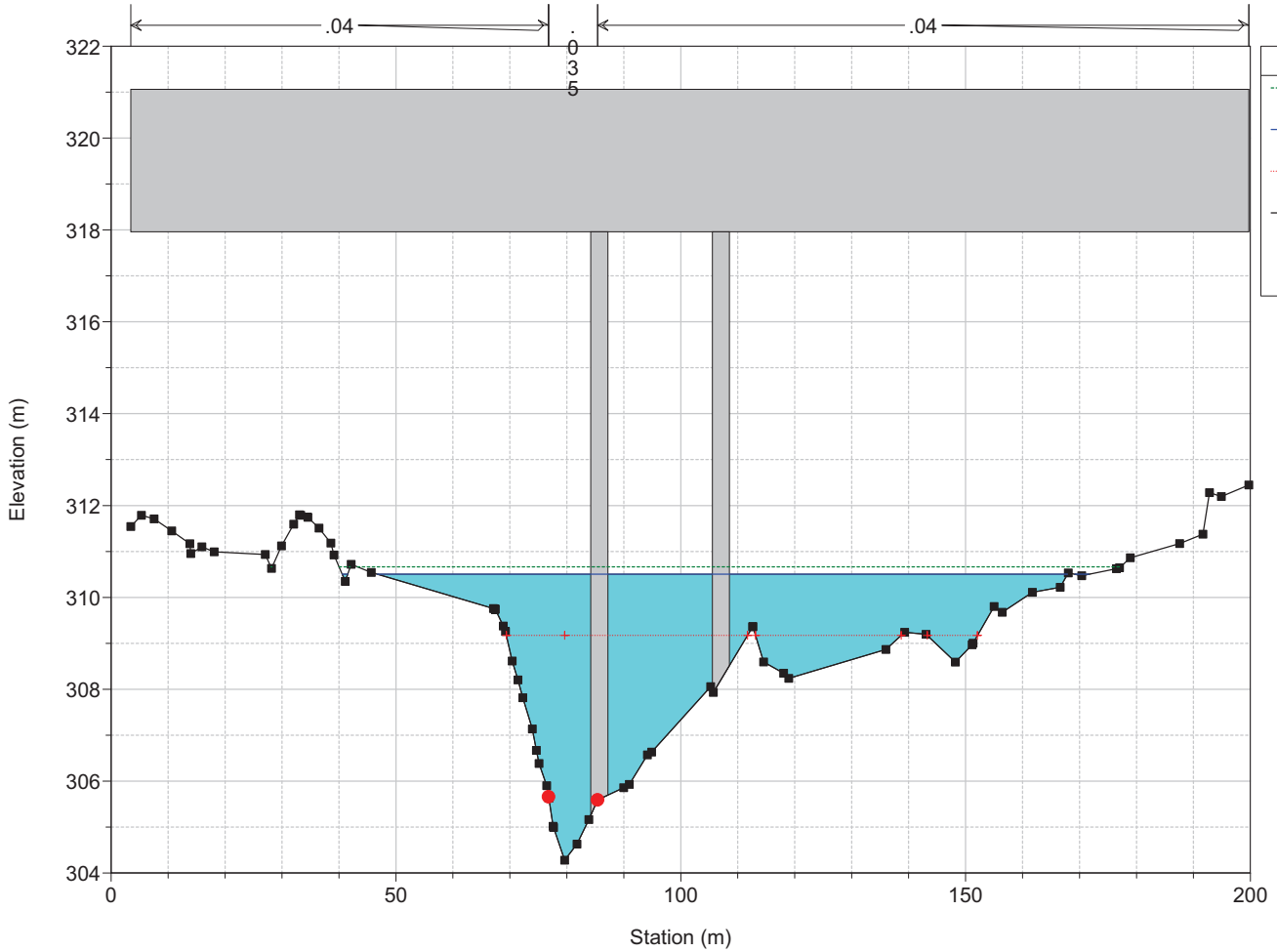
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 15.5 BR



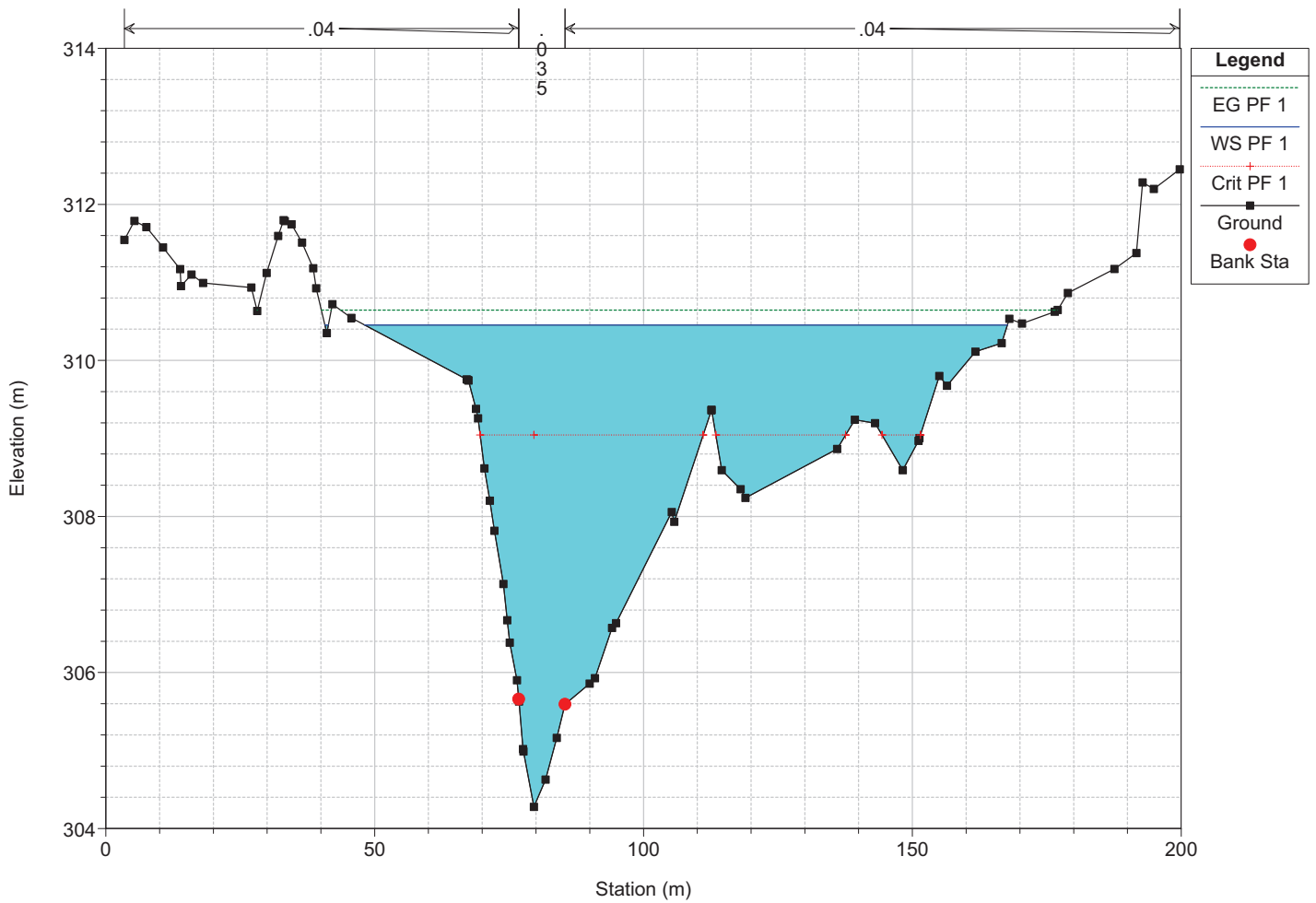
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 15.5 BR



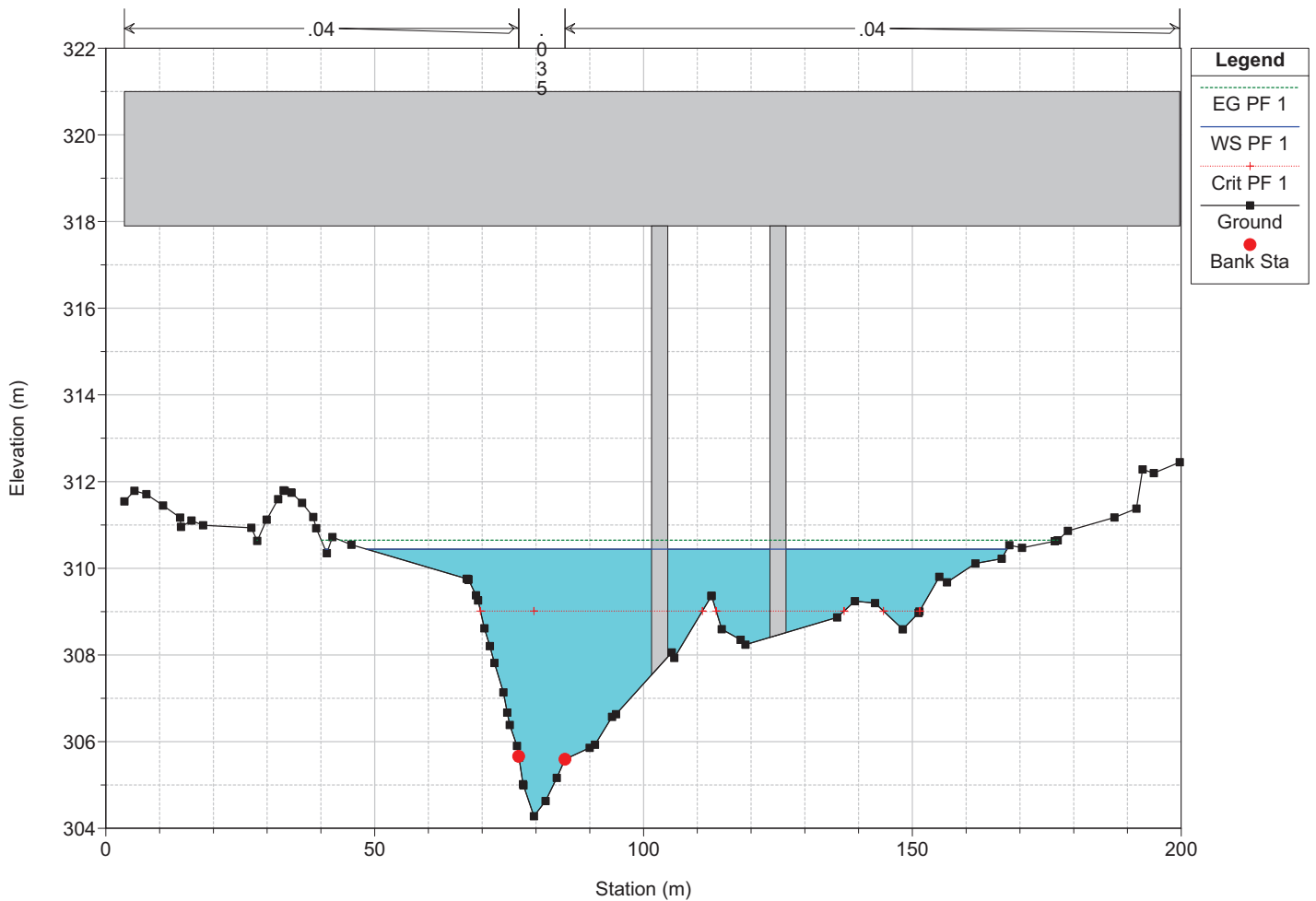
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 15



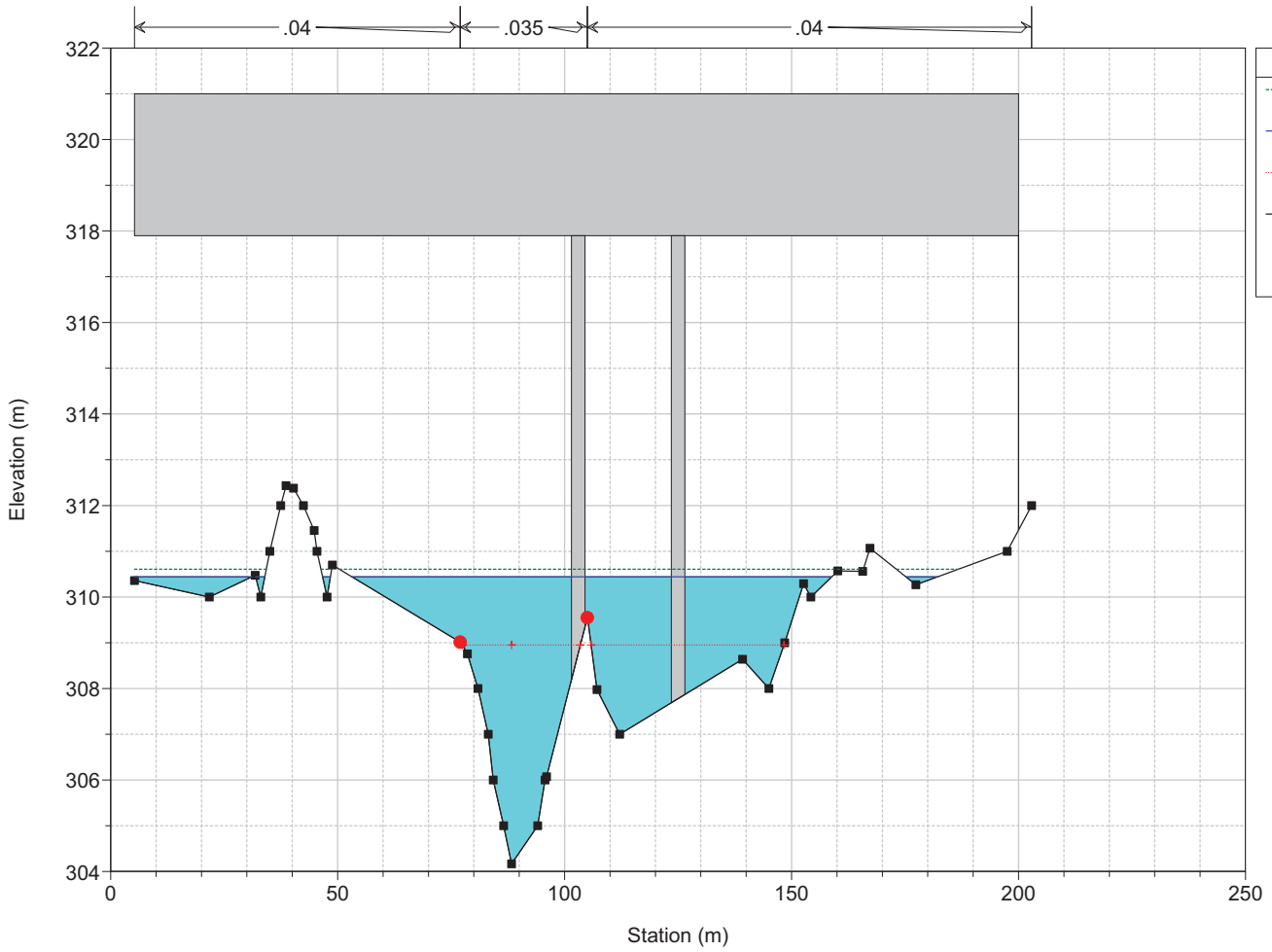
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 14.5 BR



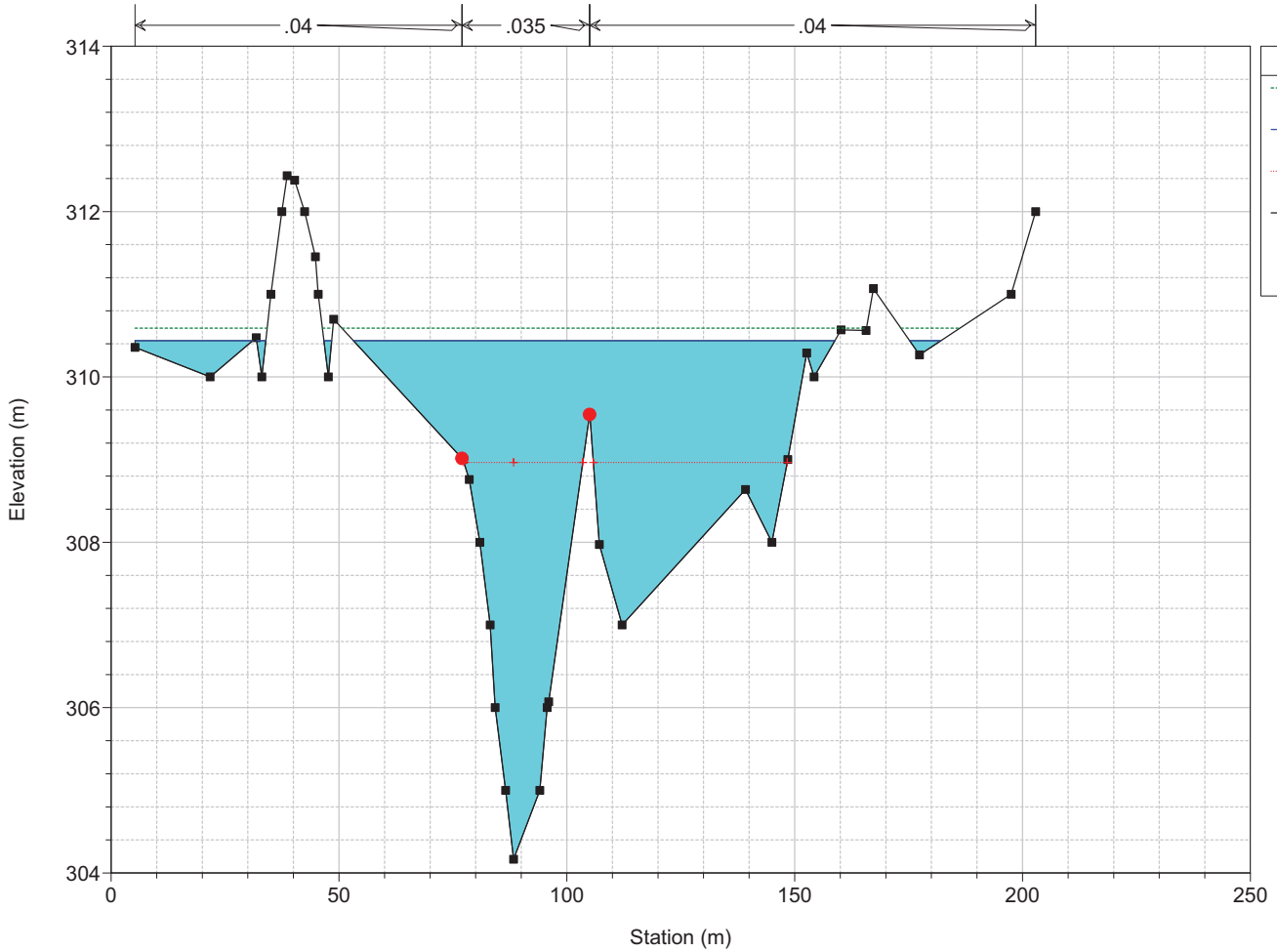
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 14.5 BR



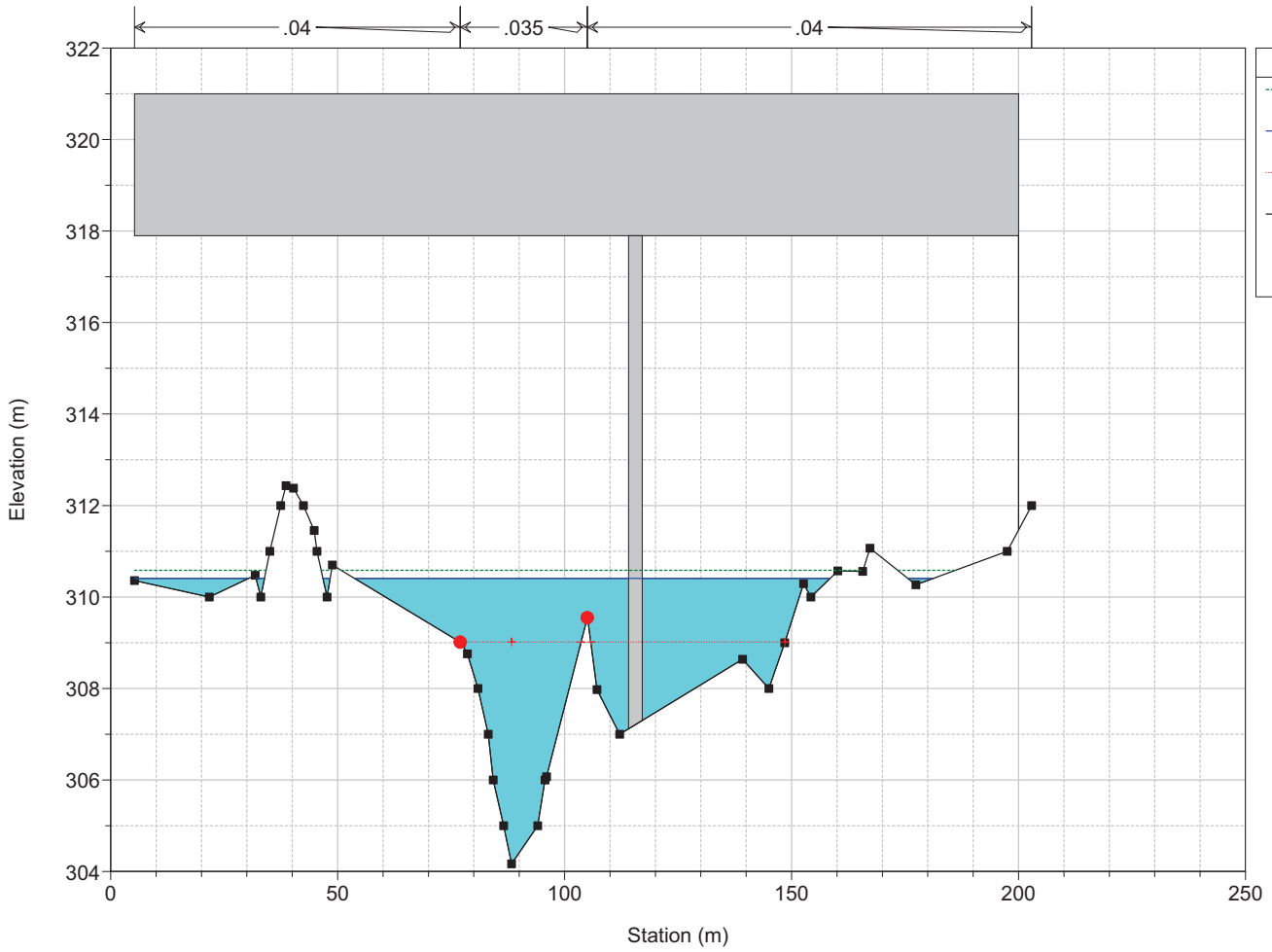
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 14



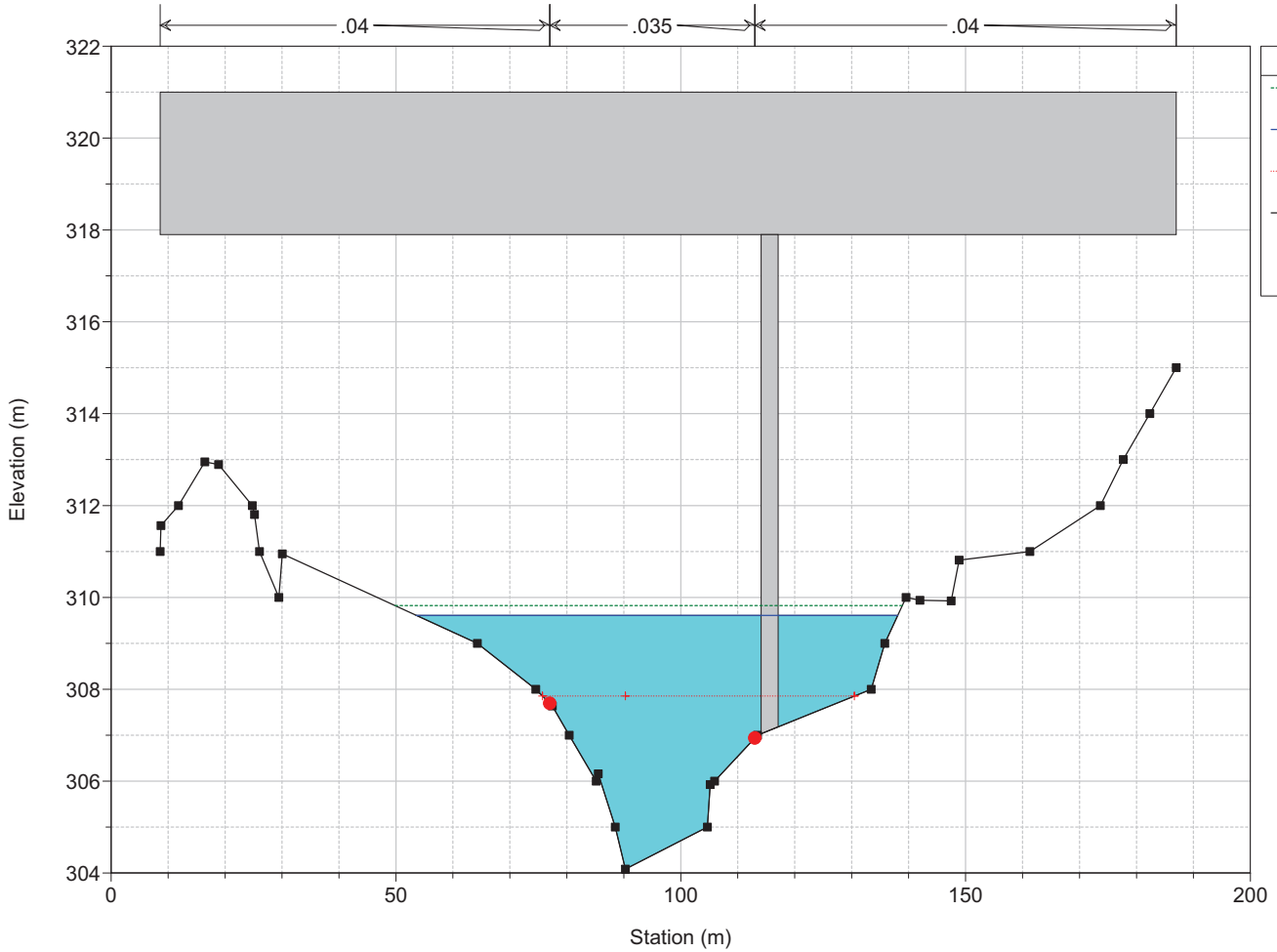
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 13.5 BR



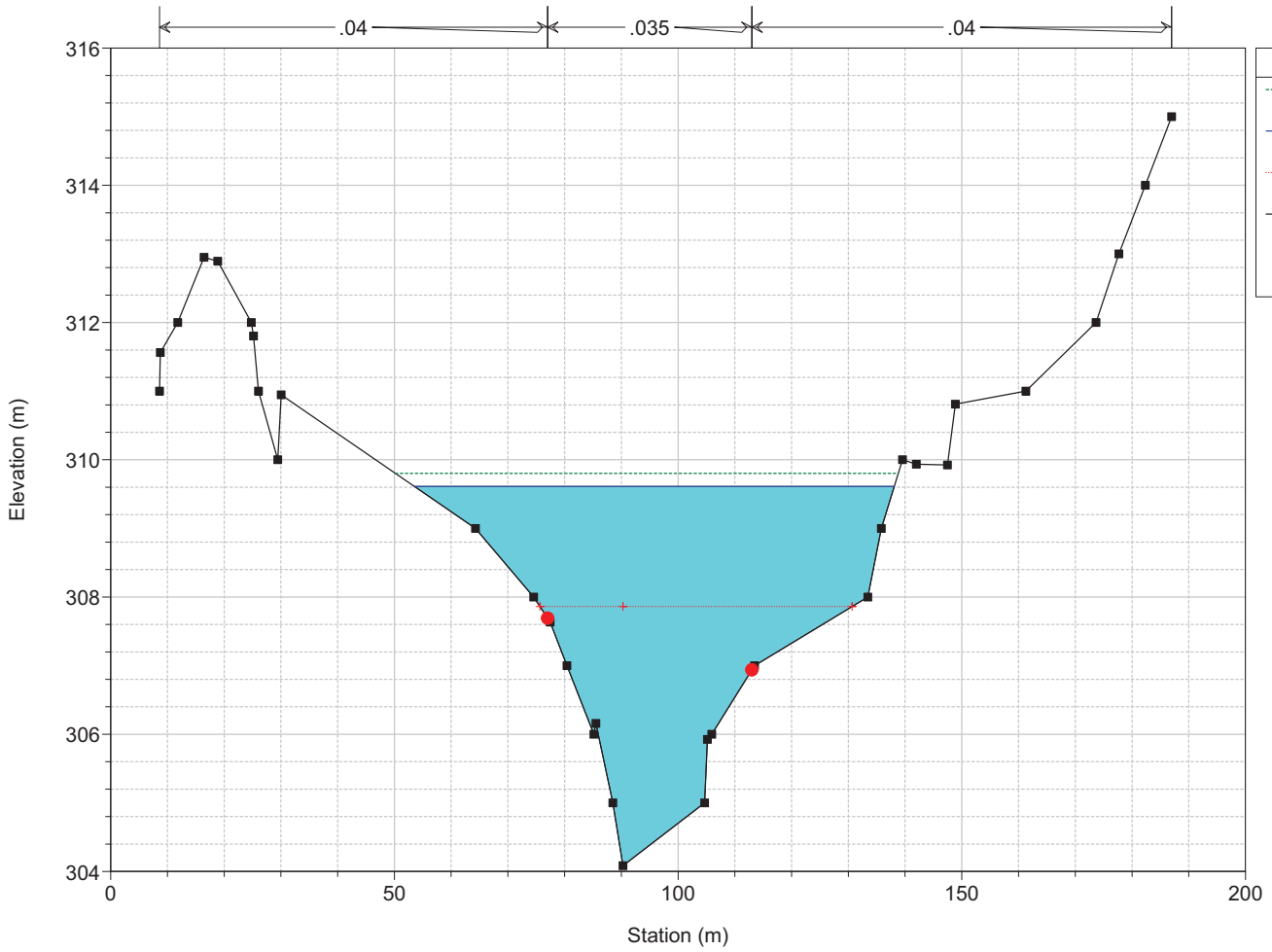
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 13.5 BR



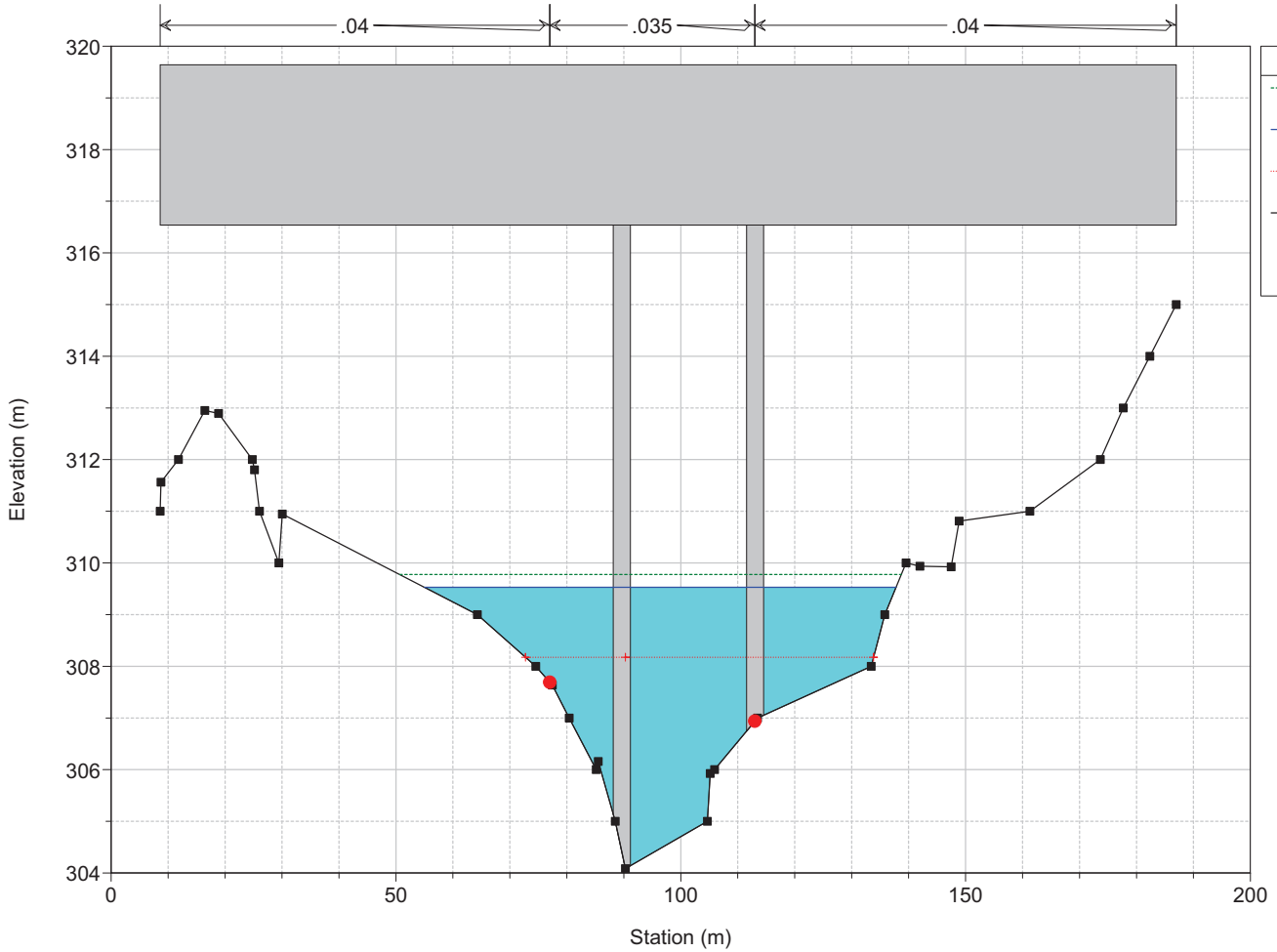
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 13



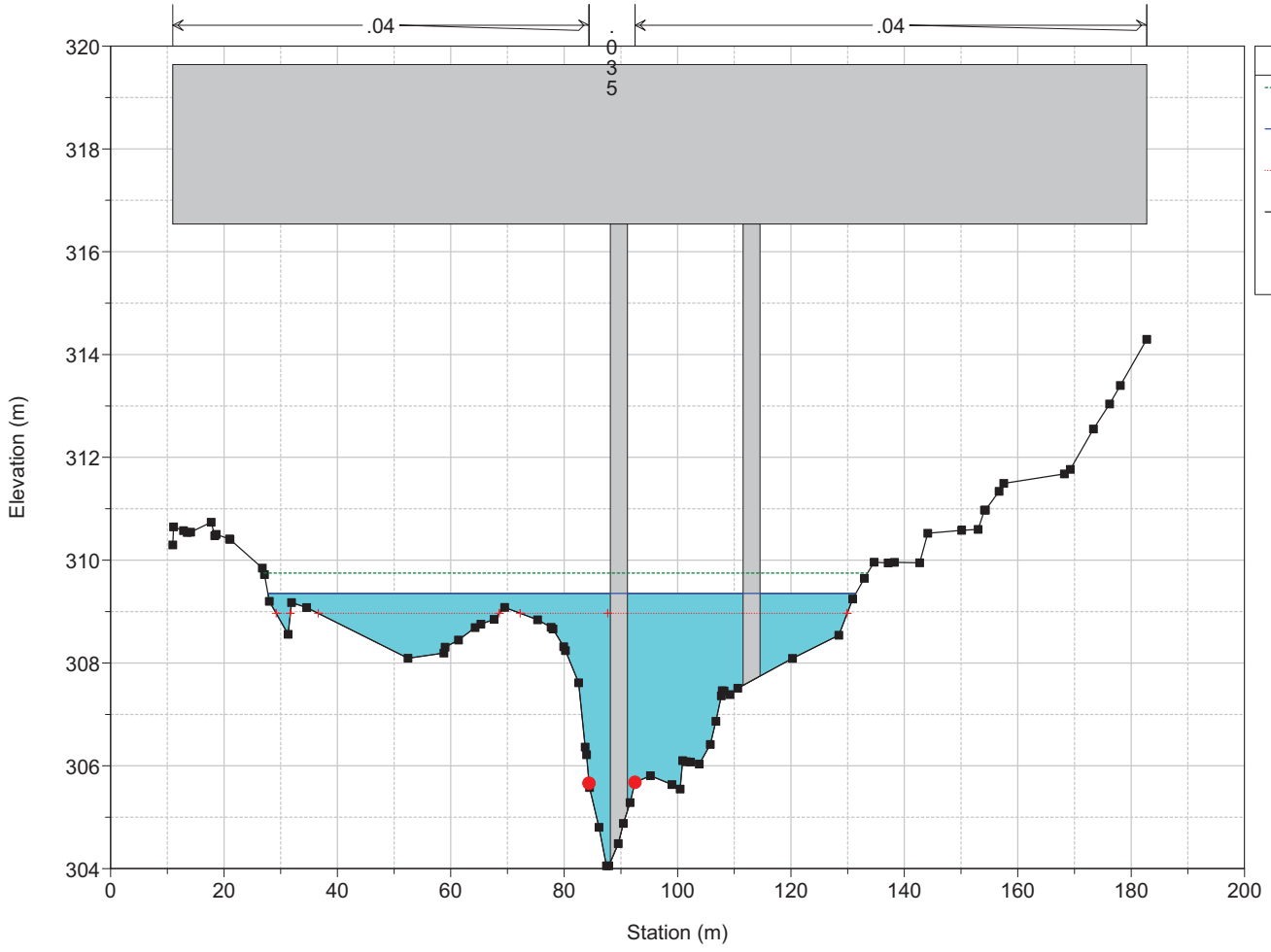
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 12.5 BR



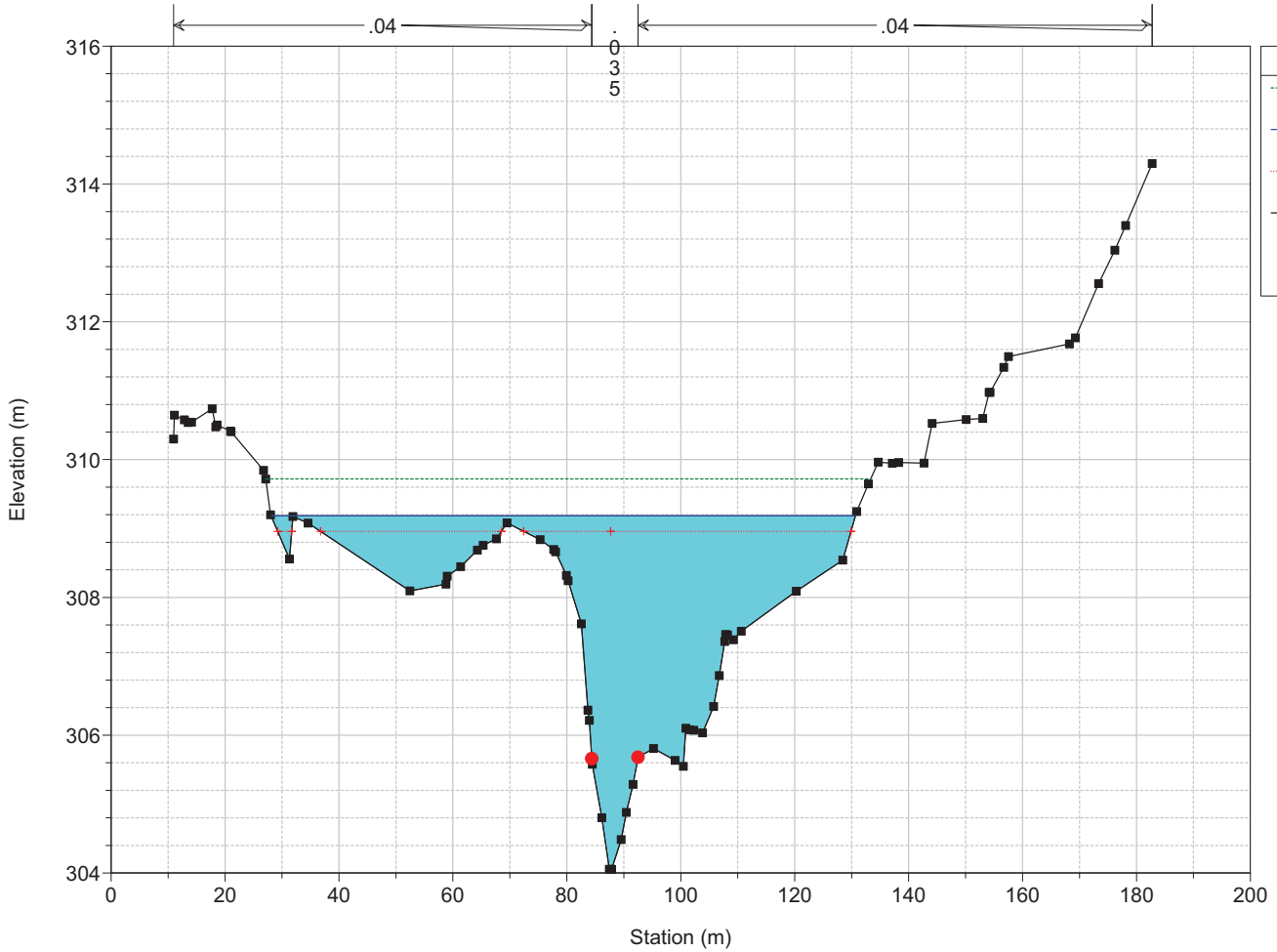
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 12.5 BR



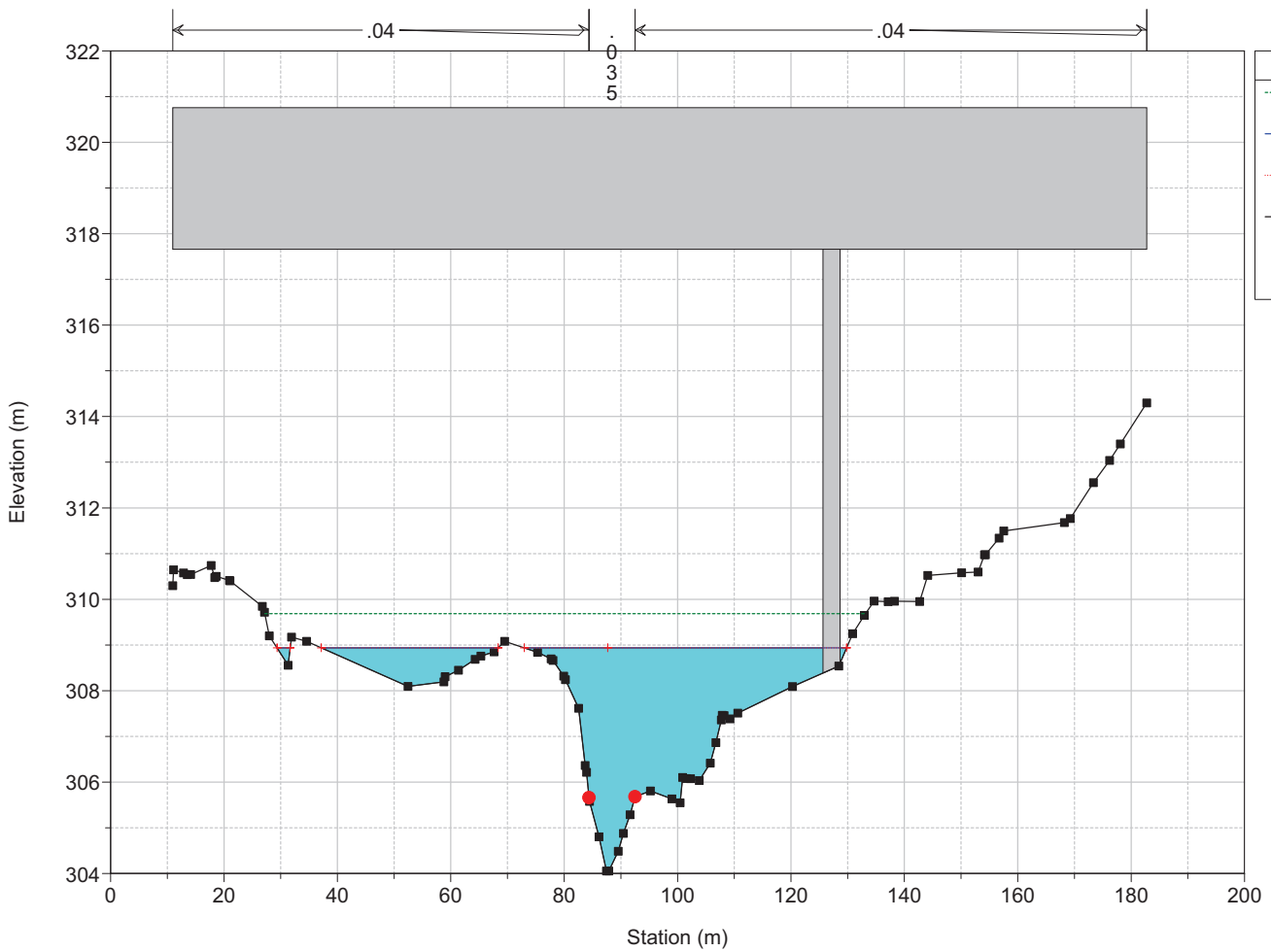
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 12



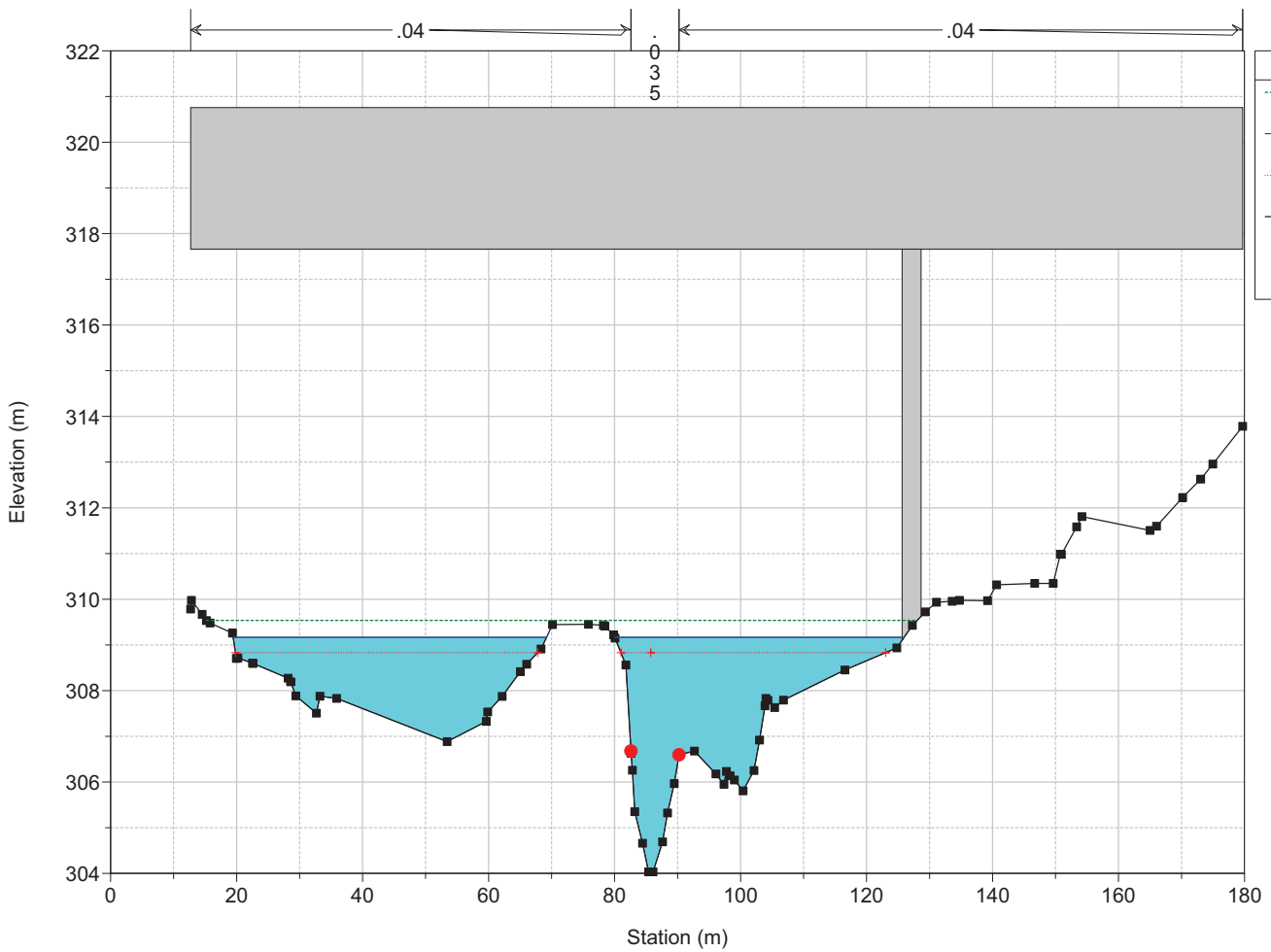
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 11.1 BR



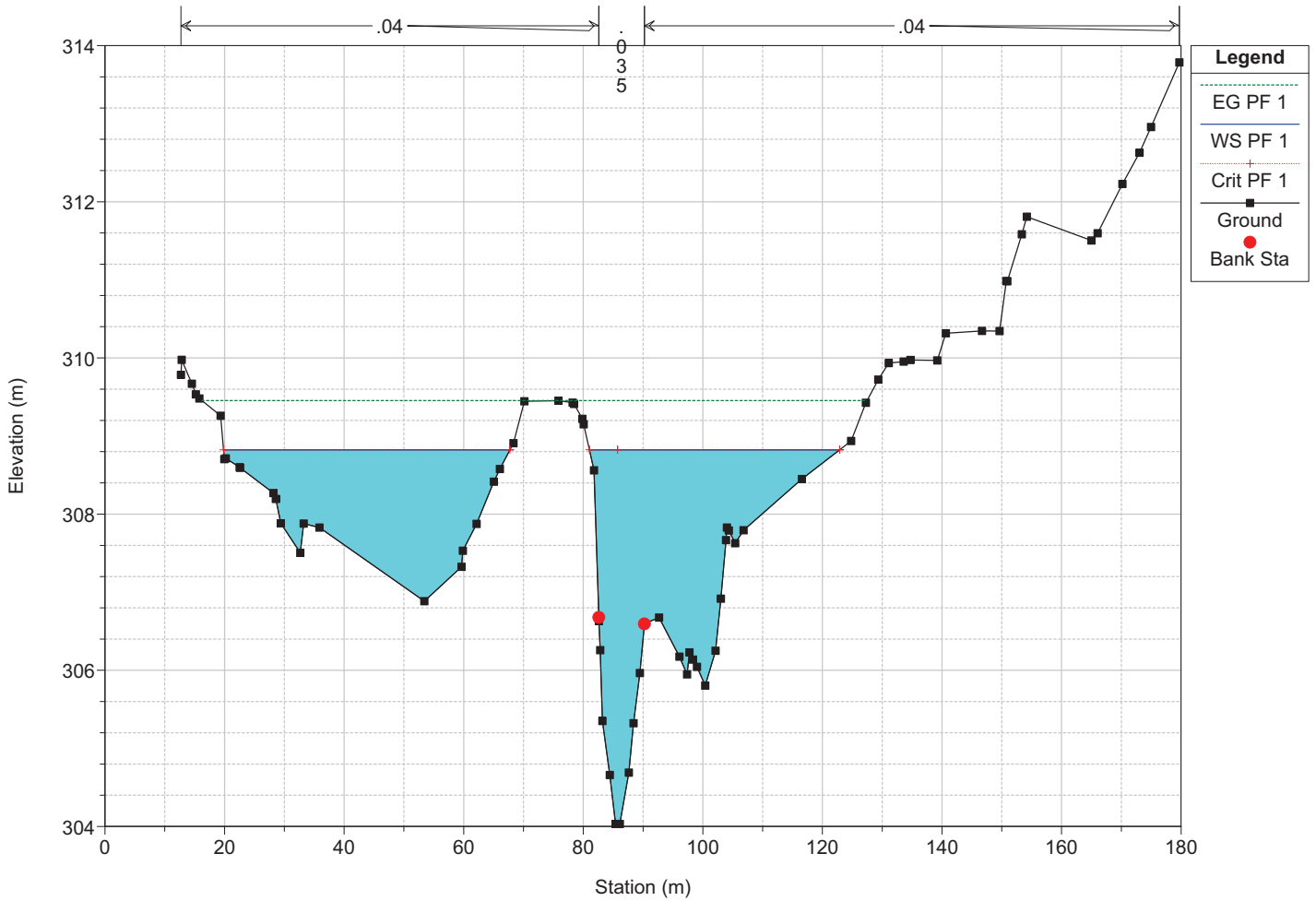
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 11.1 BR



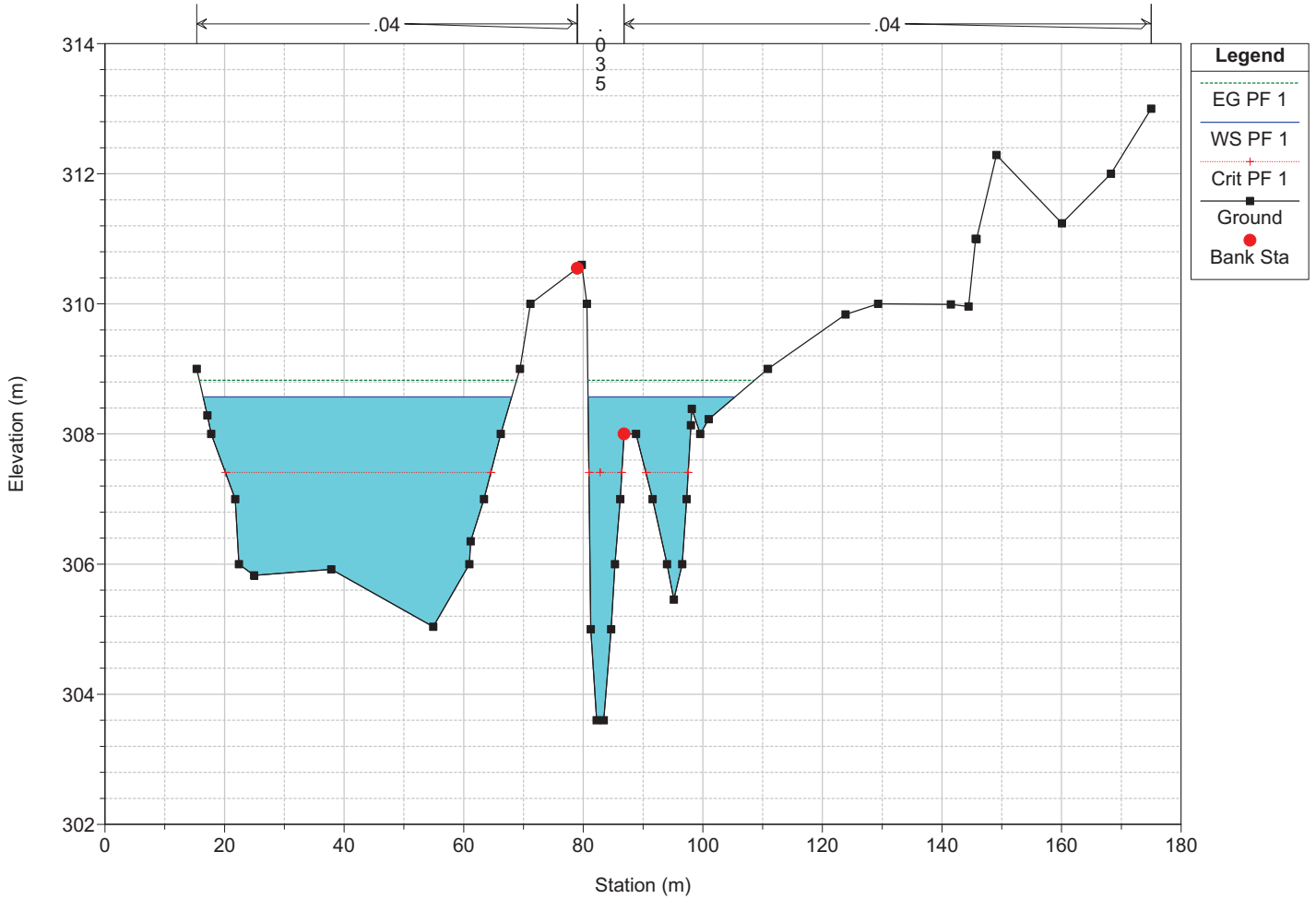
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 11



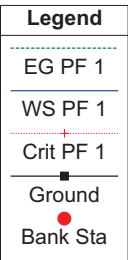
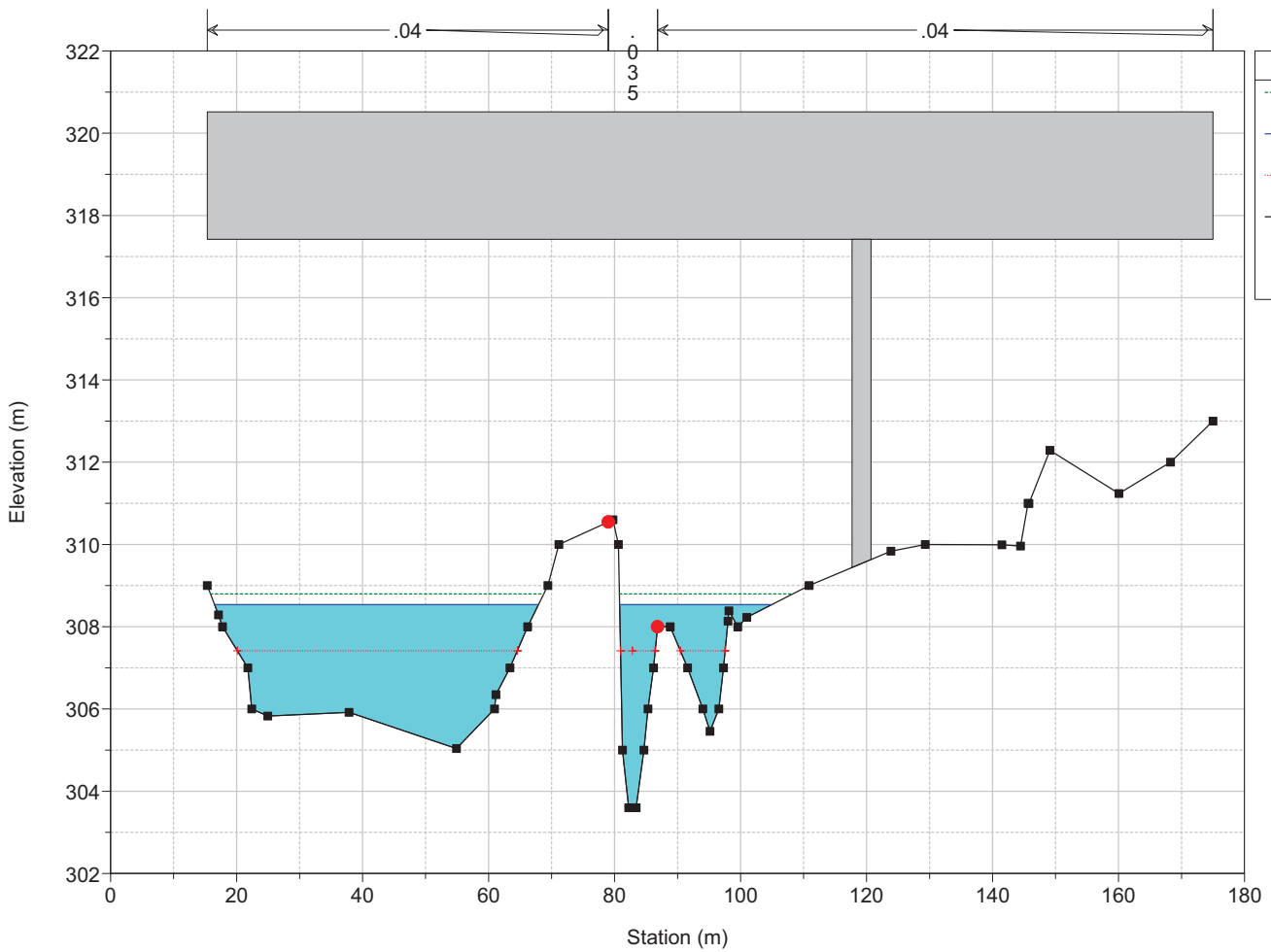
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 10



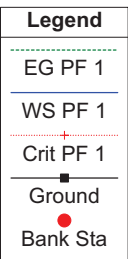
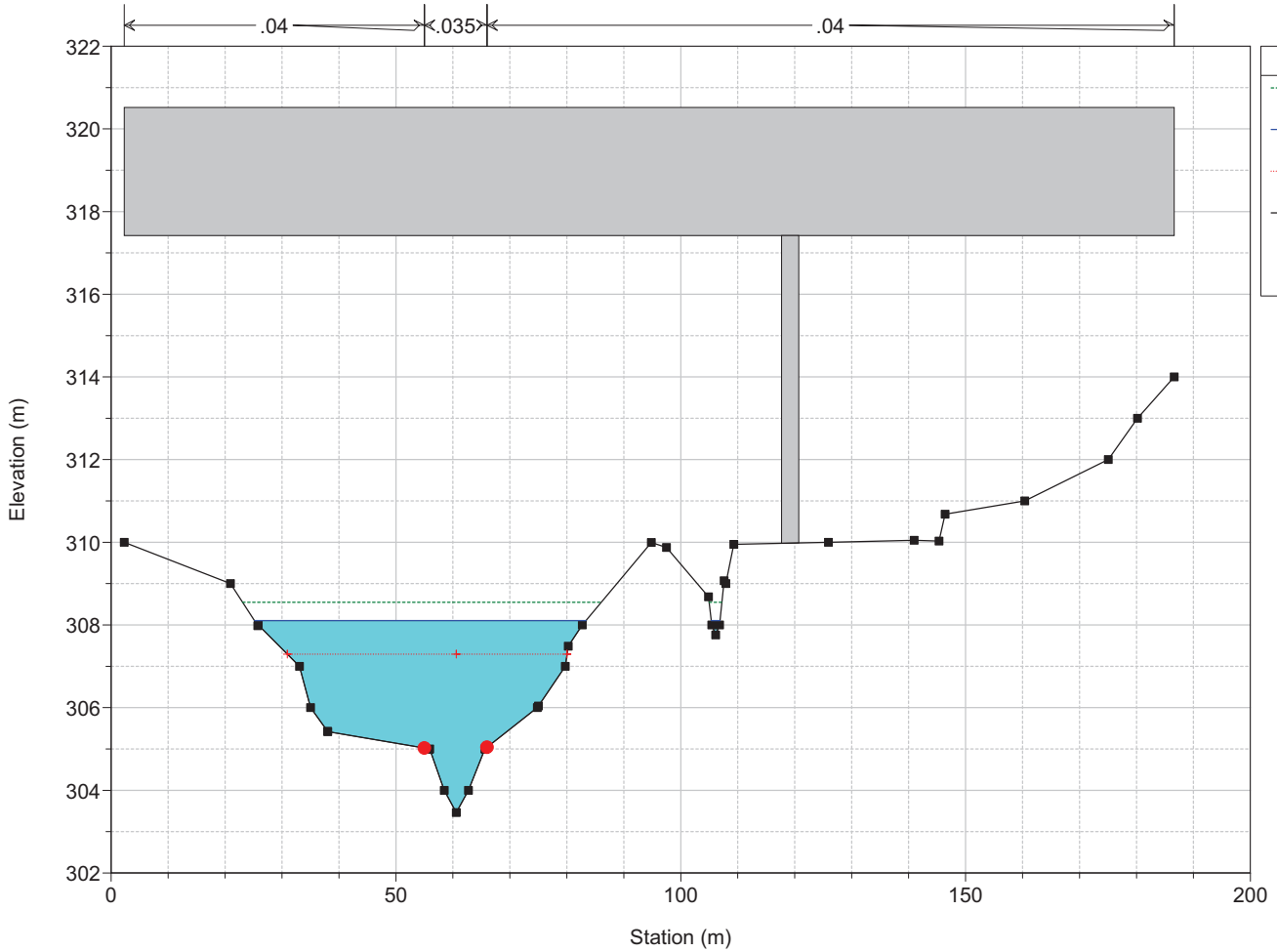
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 9.8 BR



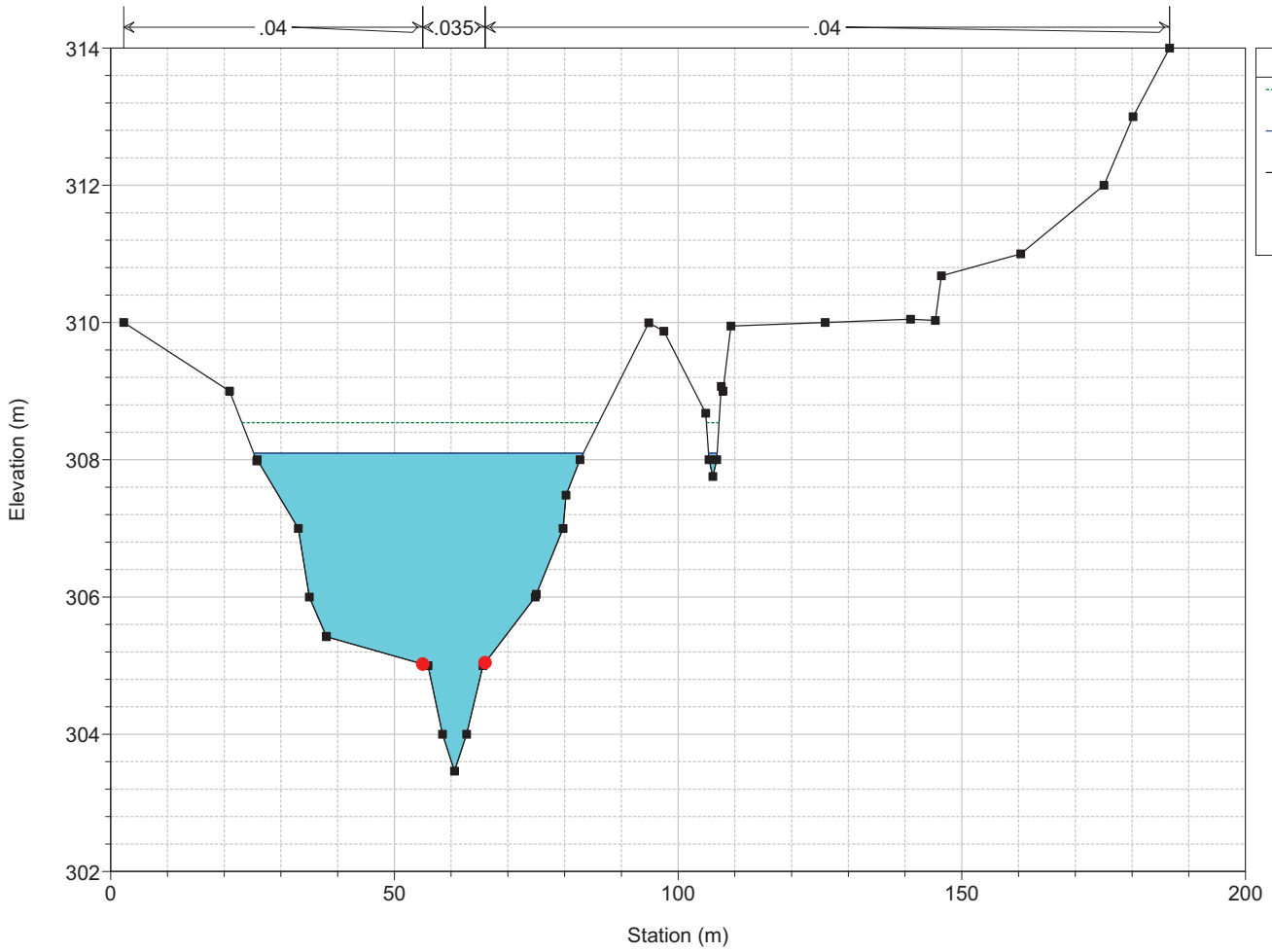
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 9.8 BR



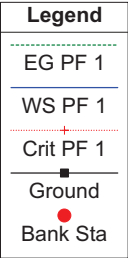
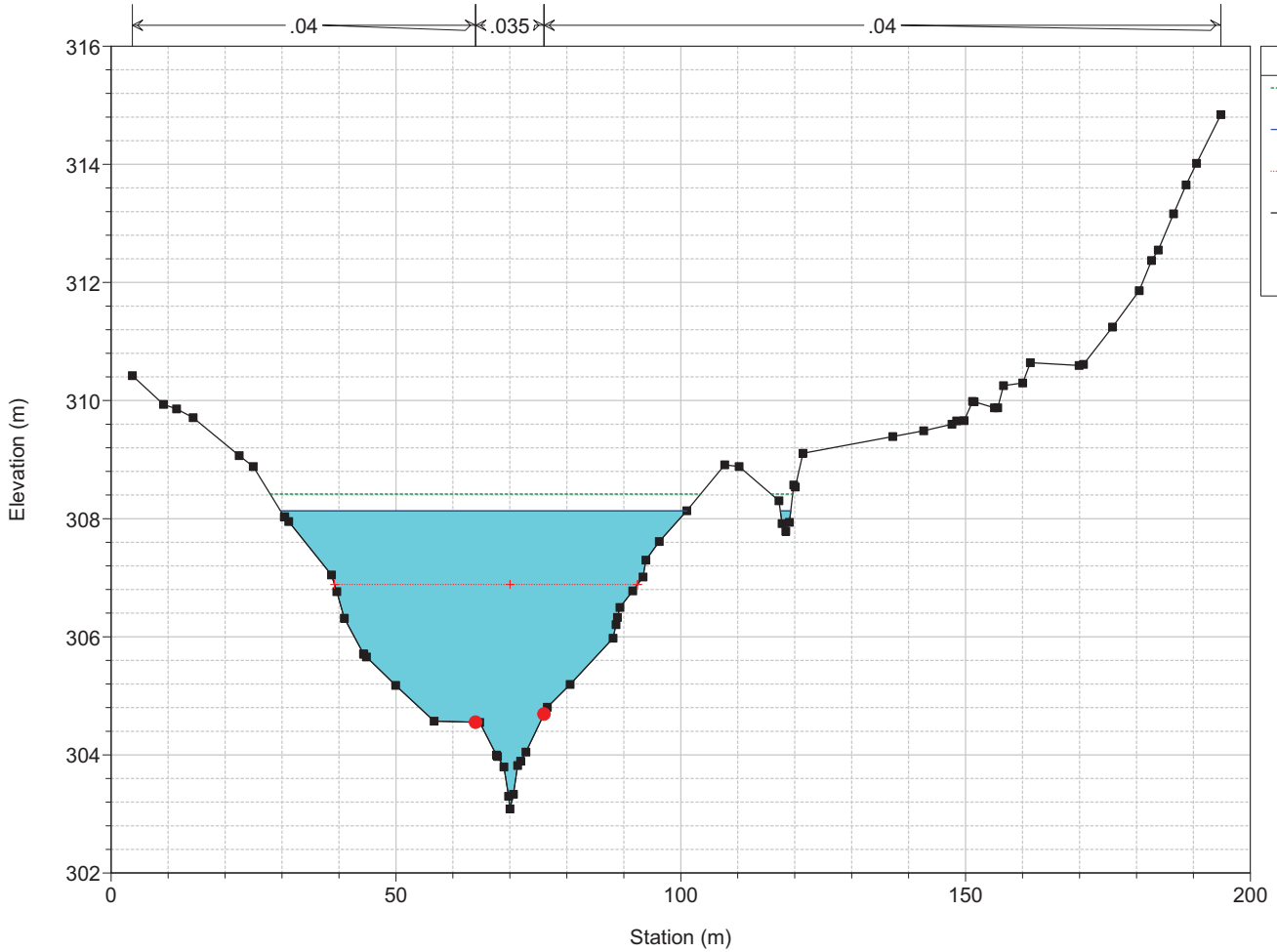
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 9



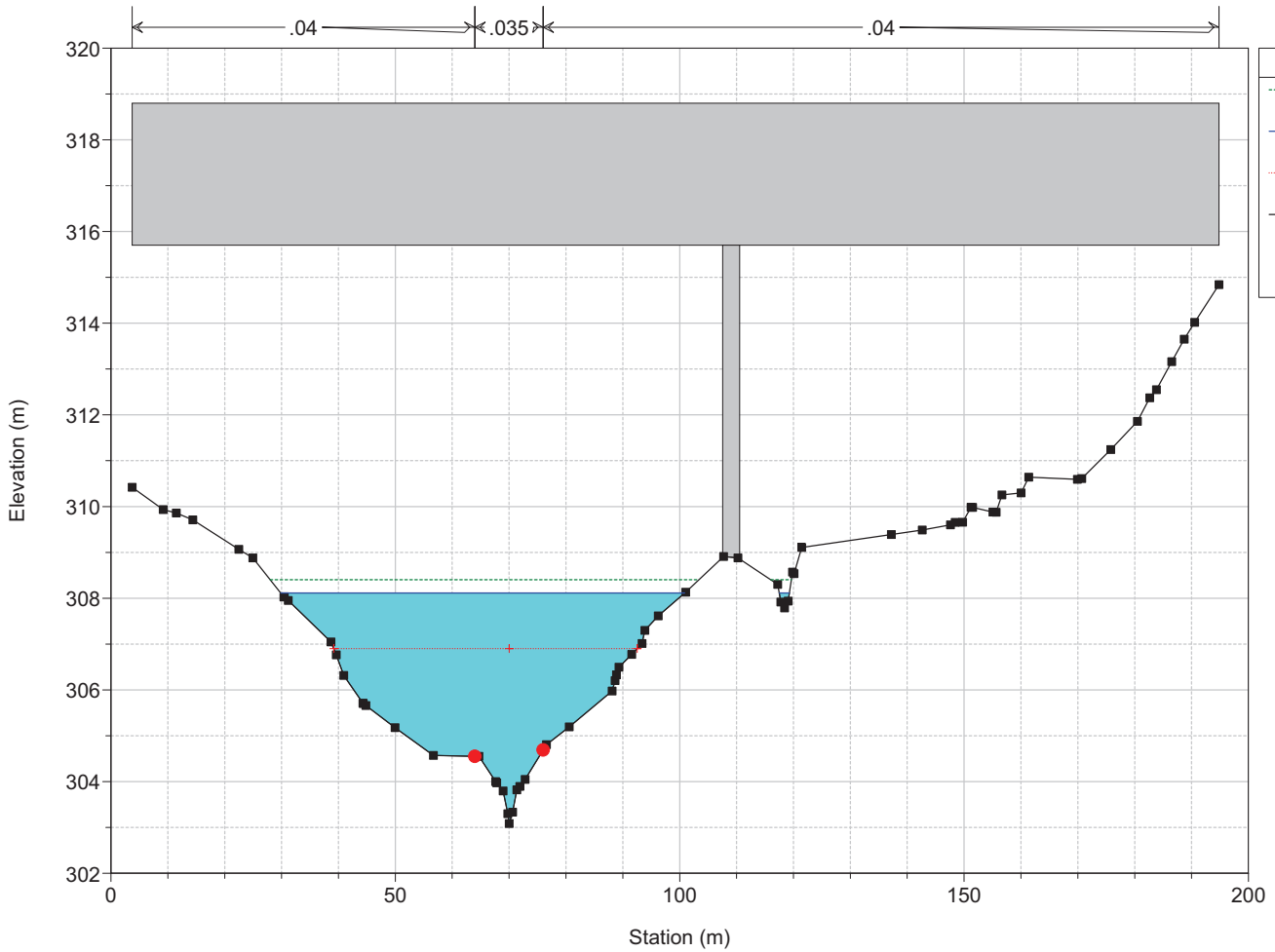
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 8



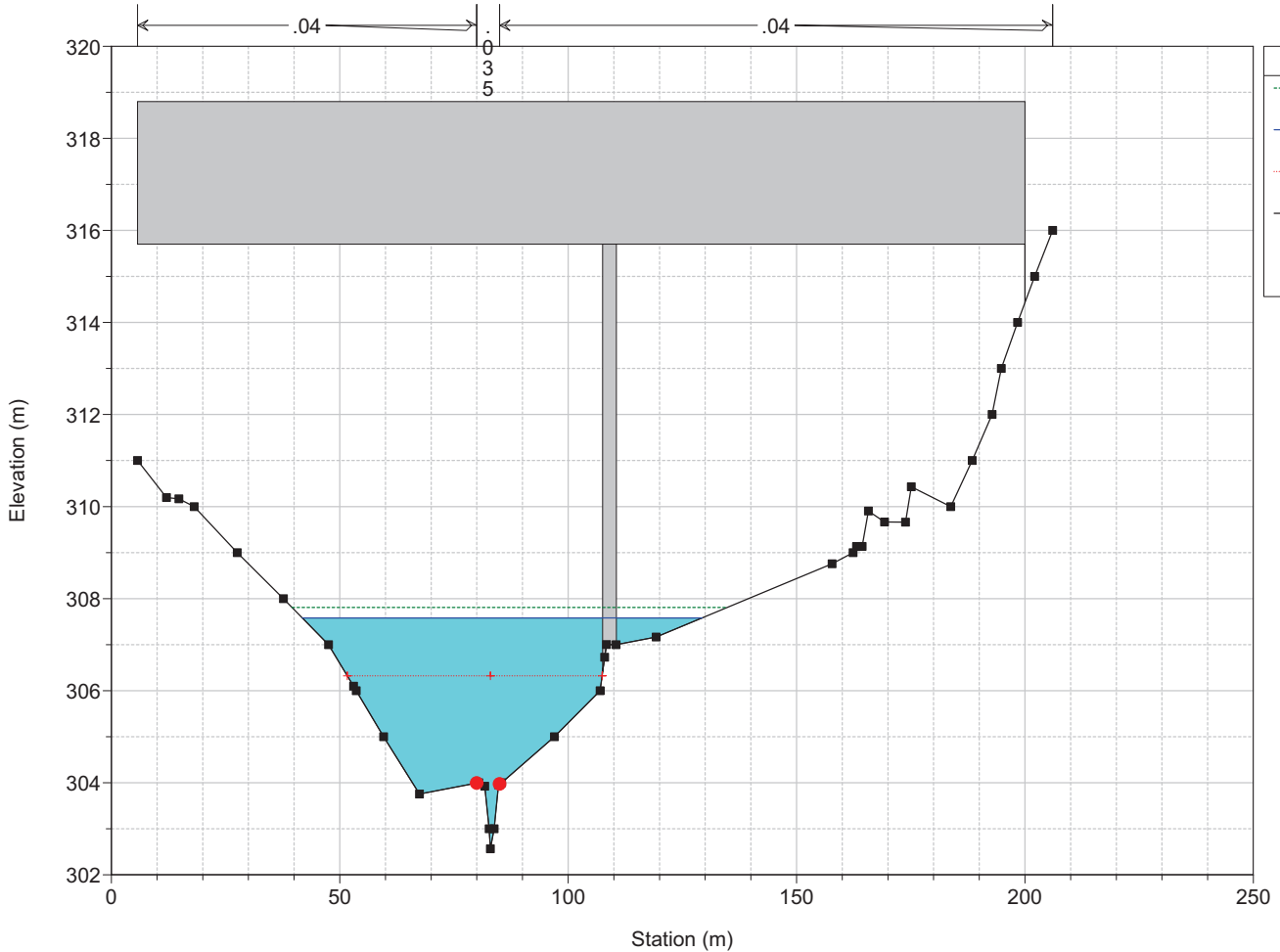
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 7.5 BR



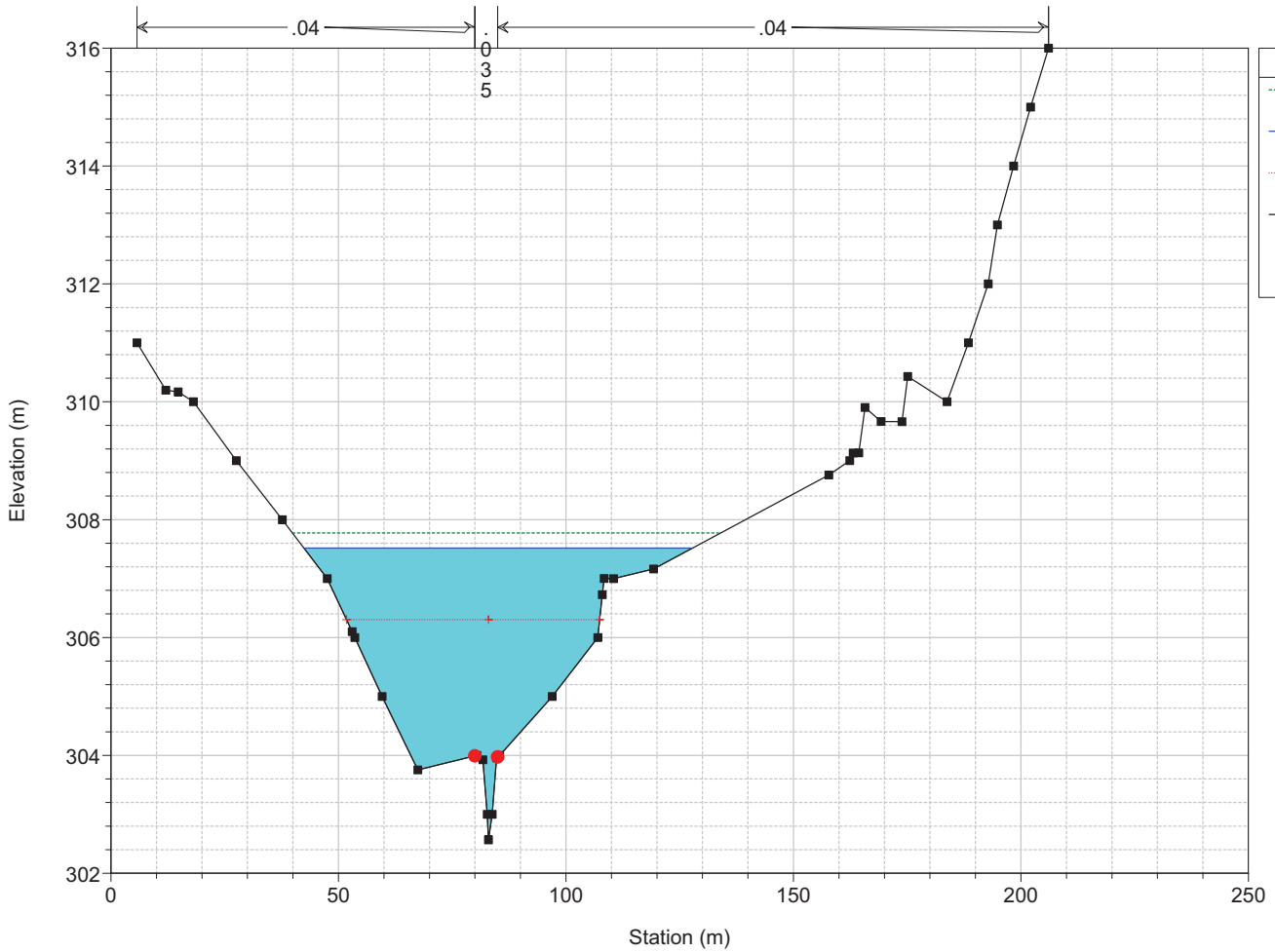
ARENELLAIIII_PO_variante

River = ARENELLA Reach = 1 RS = 7.5 BR



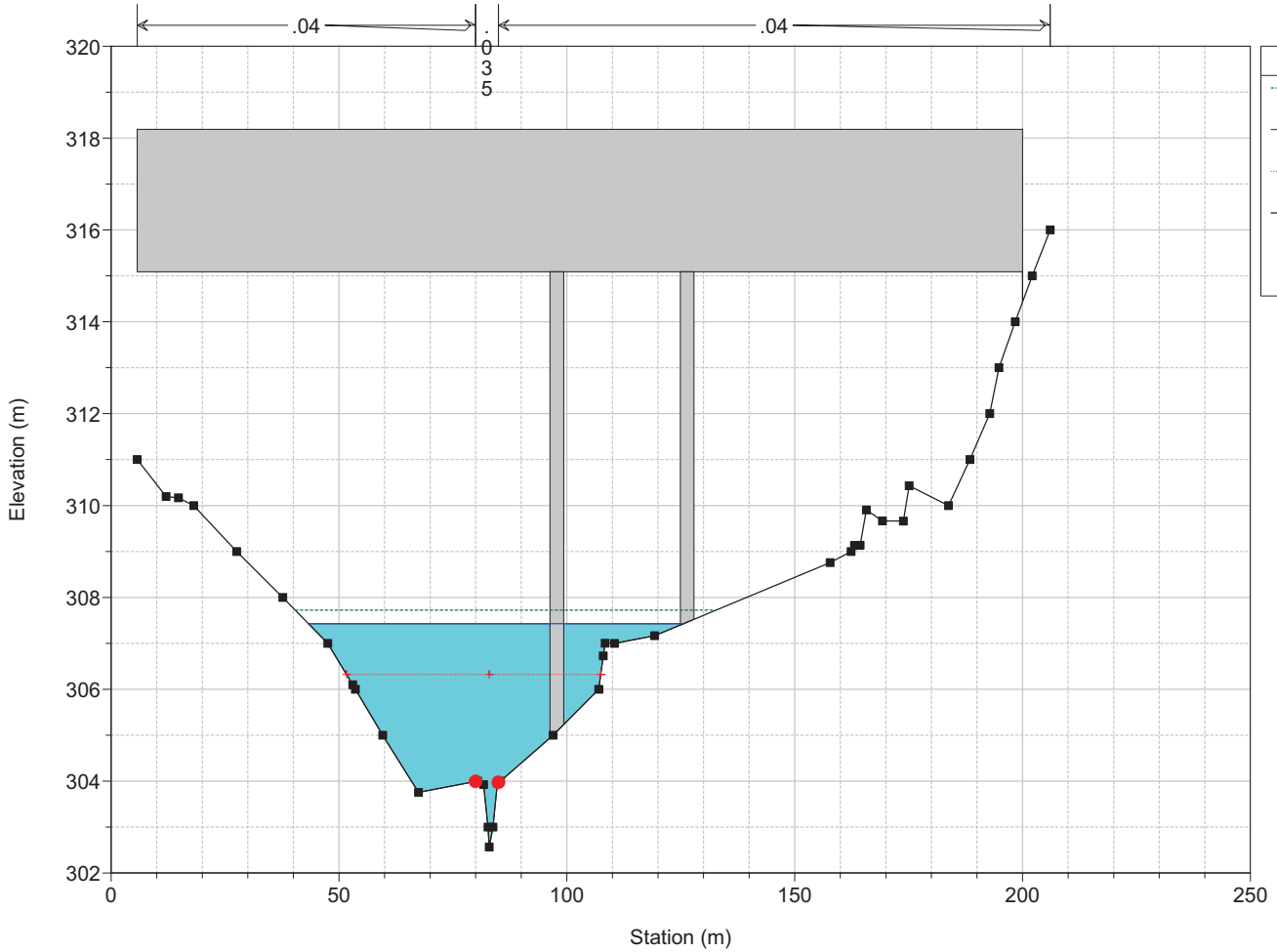
ARENELLAIII_PO_variante

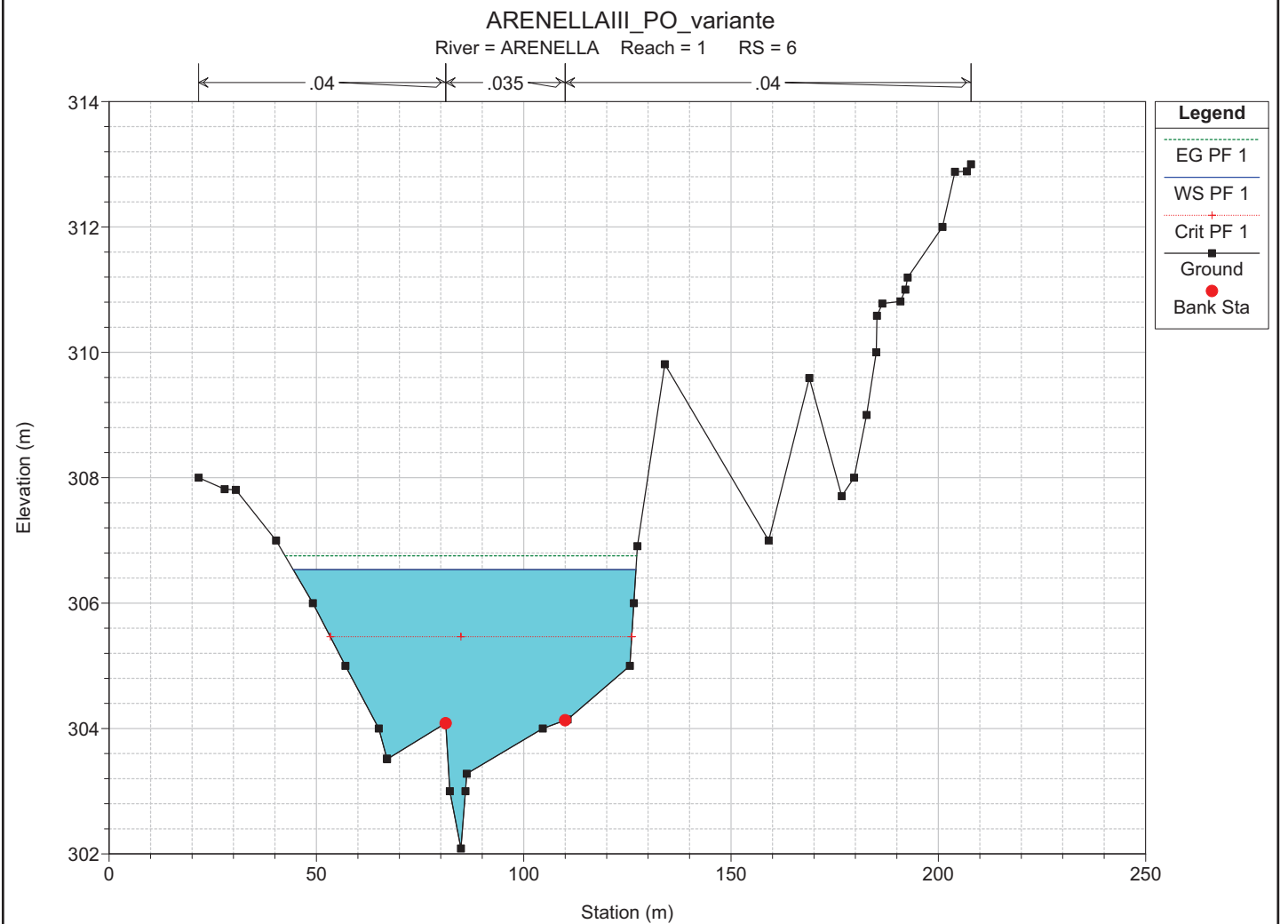
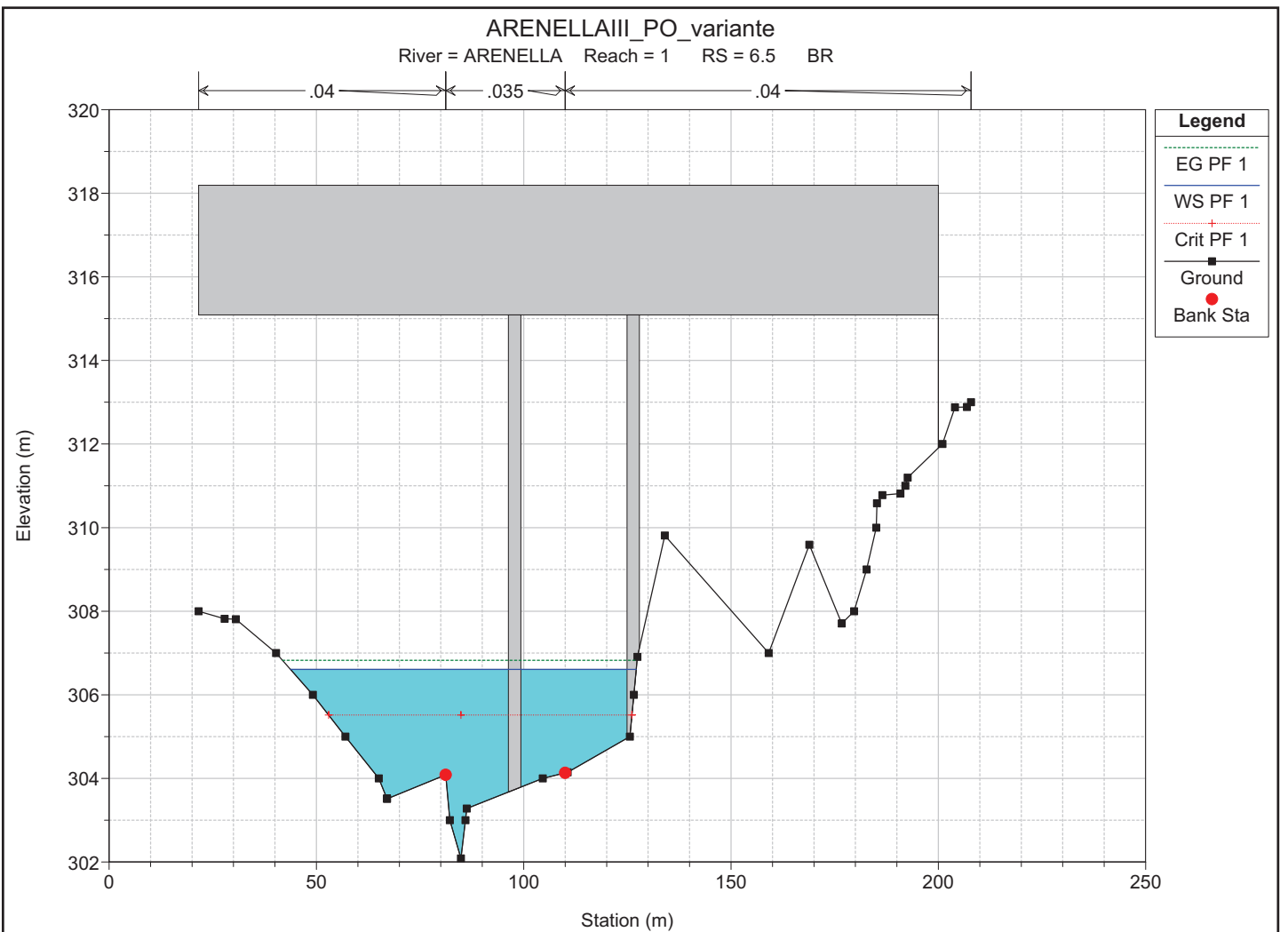
River = ARENELLA Reach = 1 RS = 7



ARENELLAIII_PO_variante

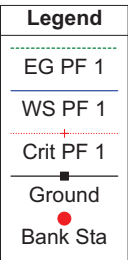
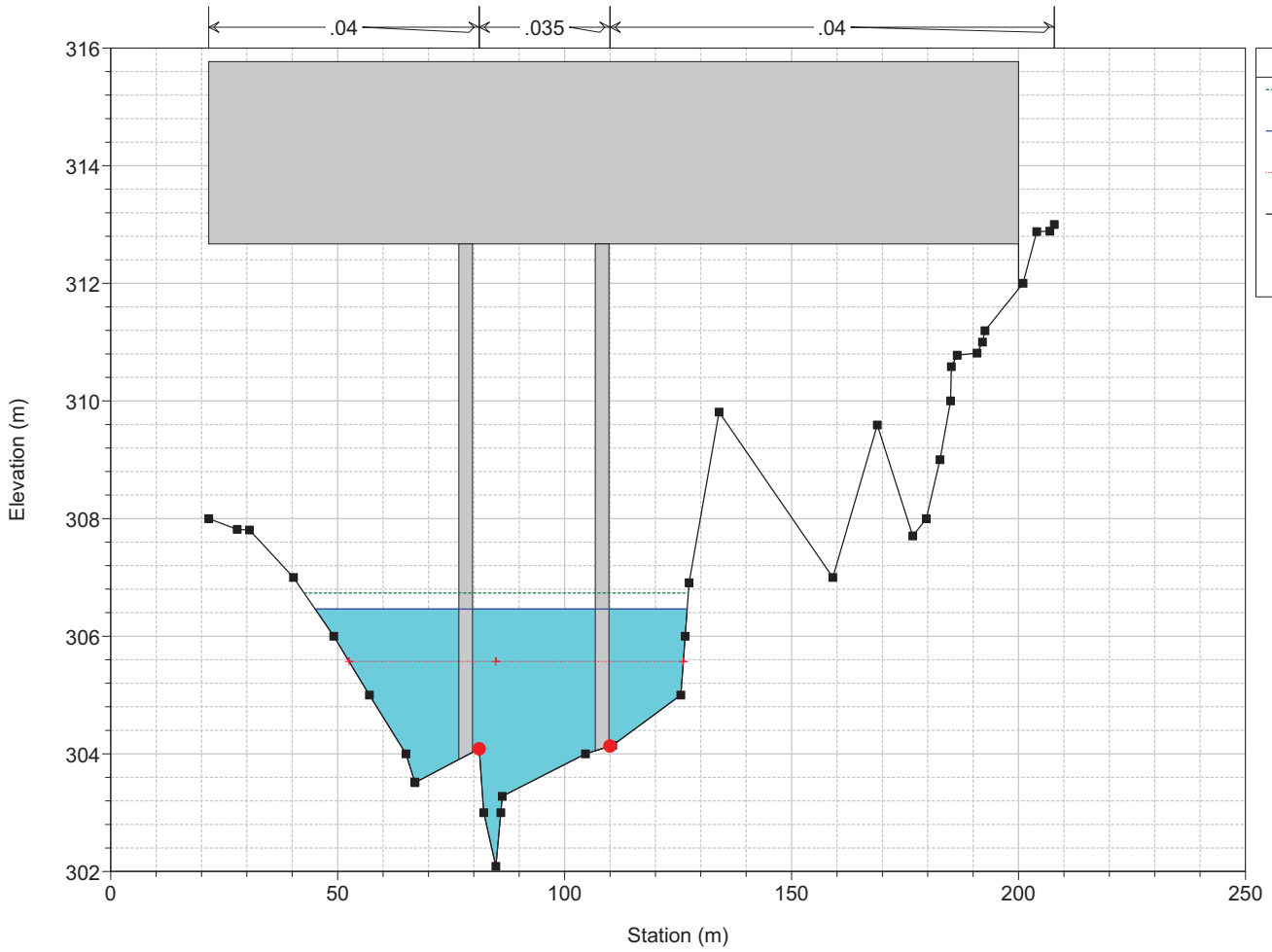
River = ARENELLA Reach = 1 RS = 6.5 BR





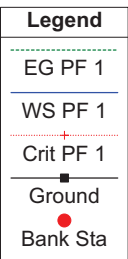
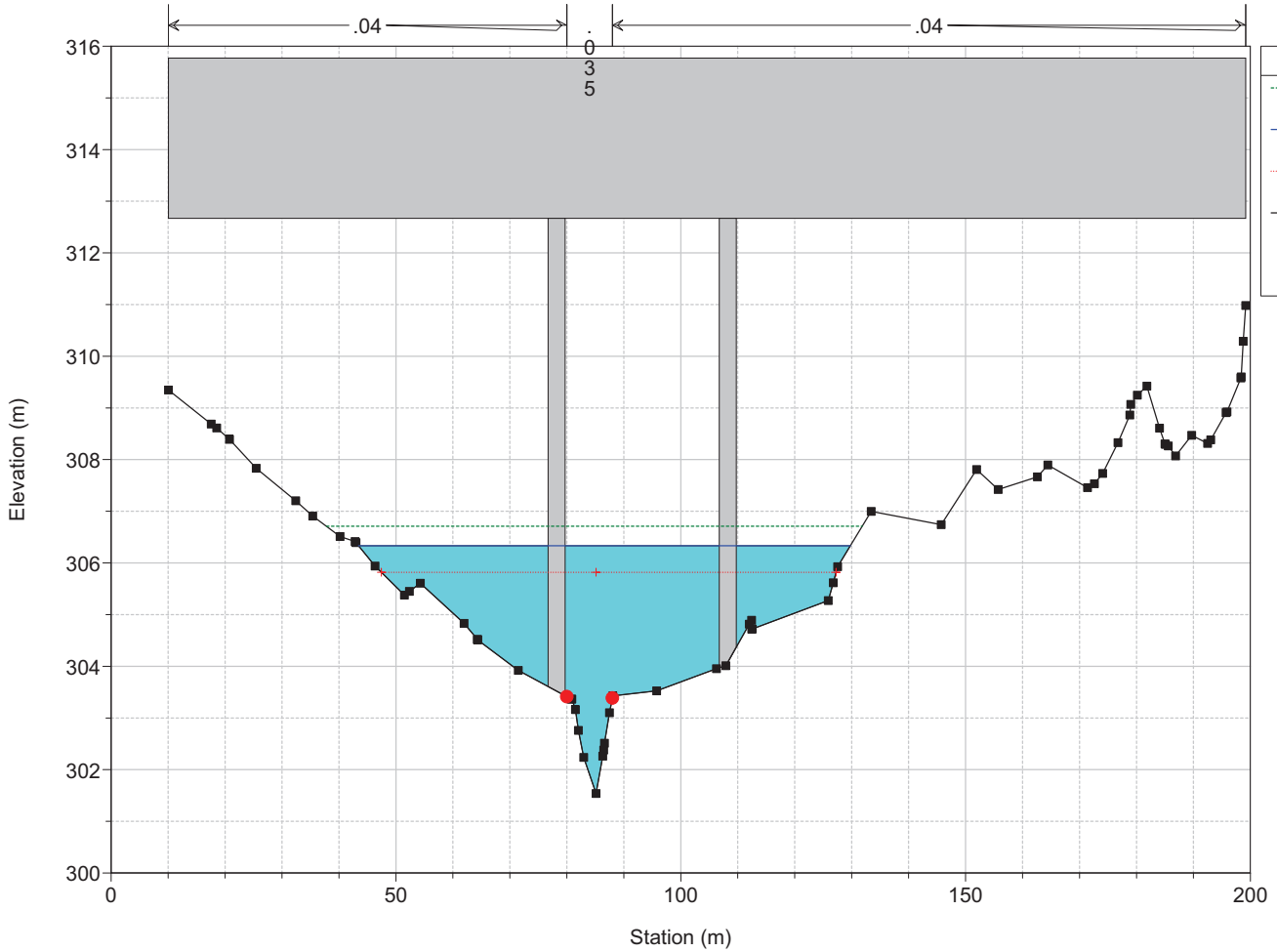
ARENELLAIIII_PO_variante

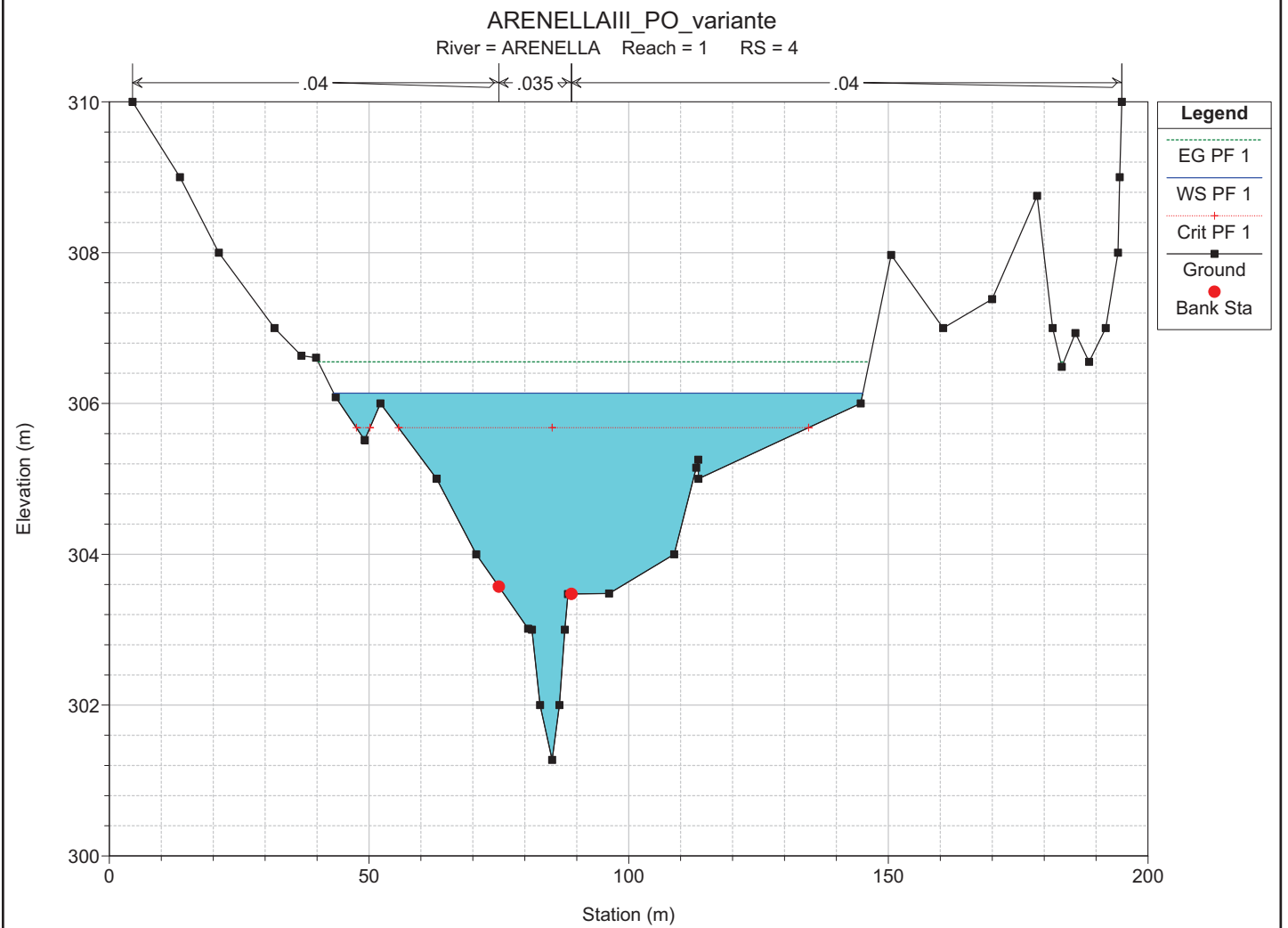
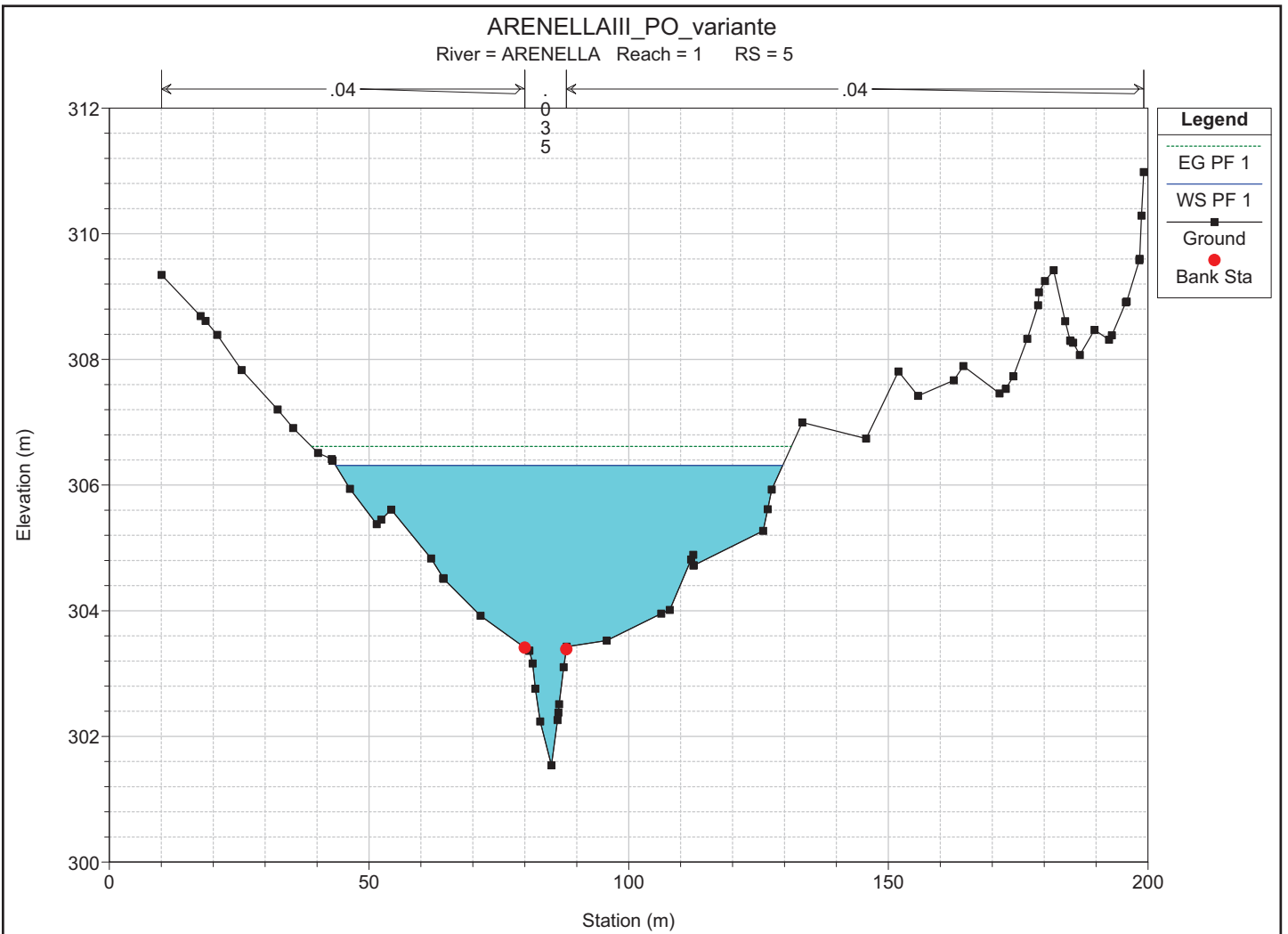
River = ARENELLA Reach = 1 RS = 5.5 BR



ARENELLAIIII_PO_variante

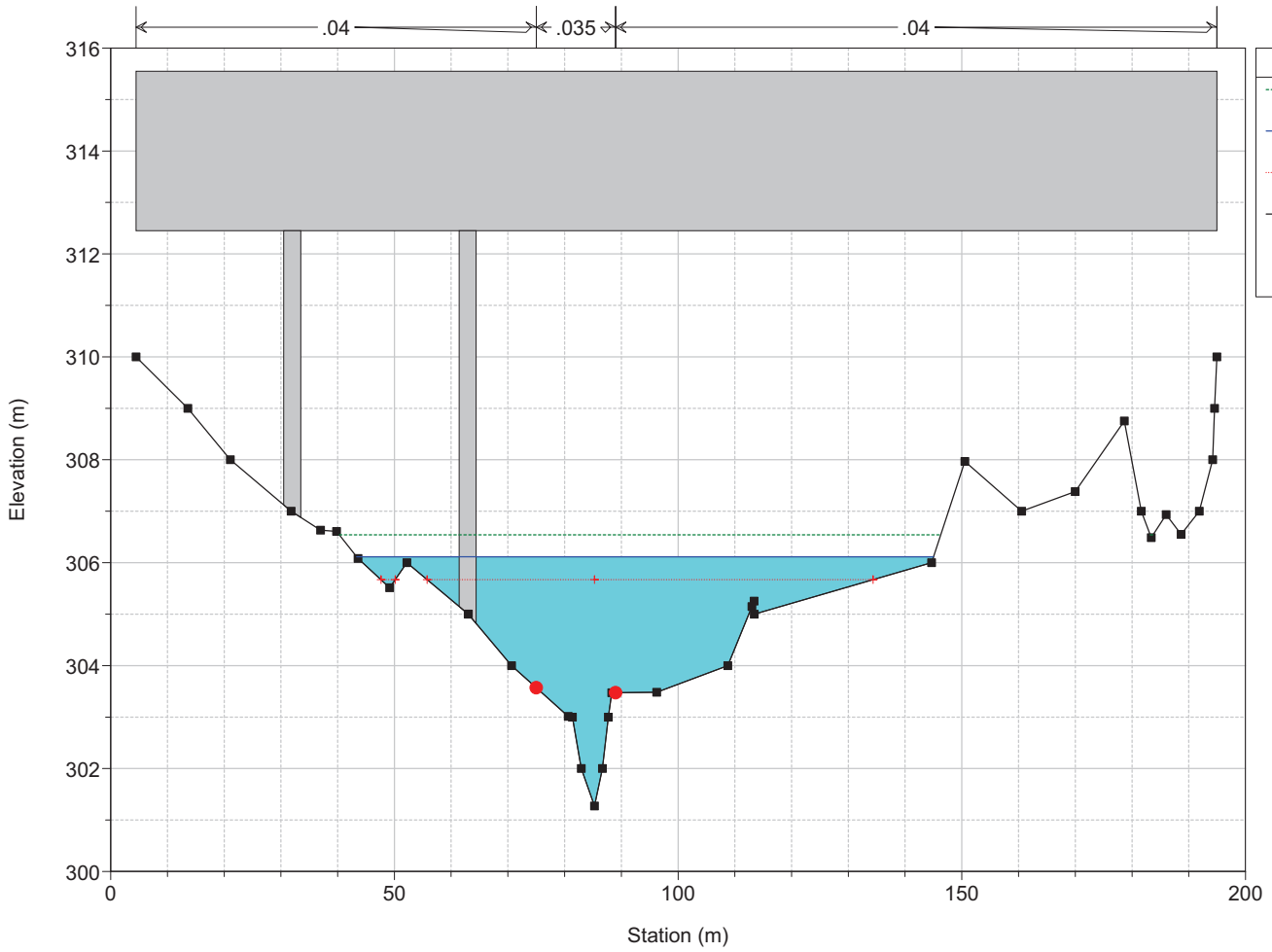
River = ARENELLA Reach = 1 RS = 5.5 BR





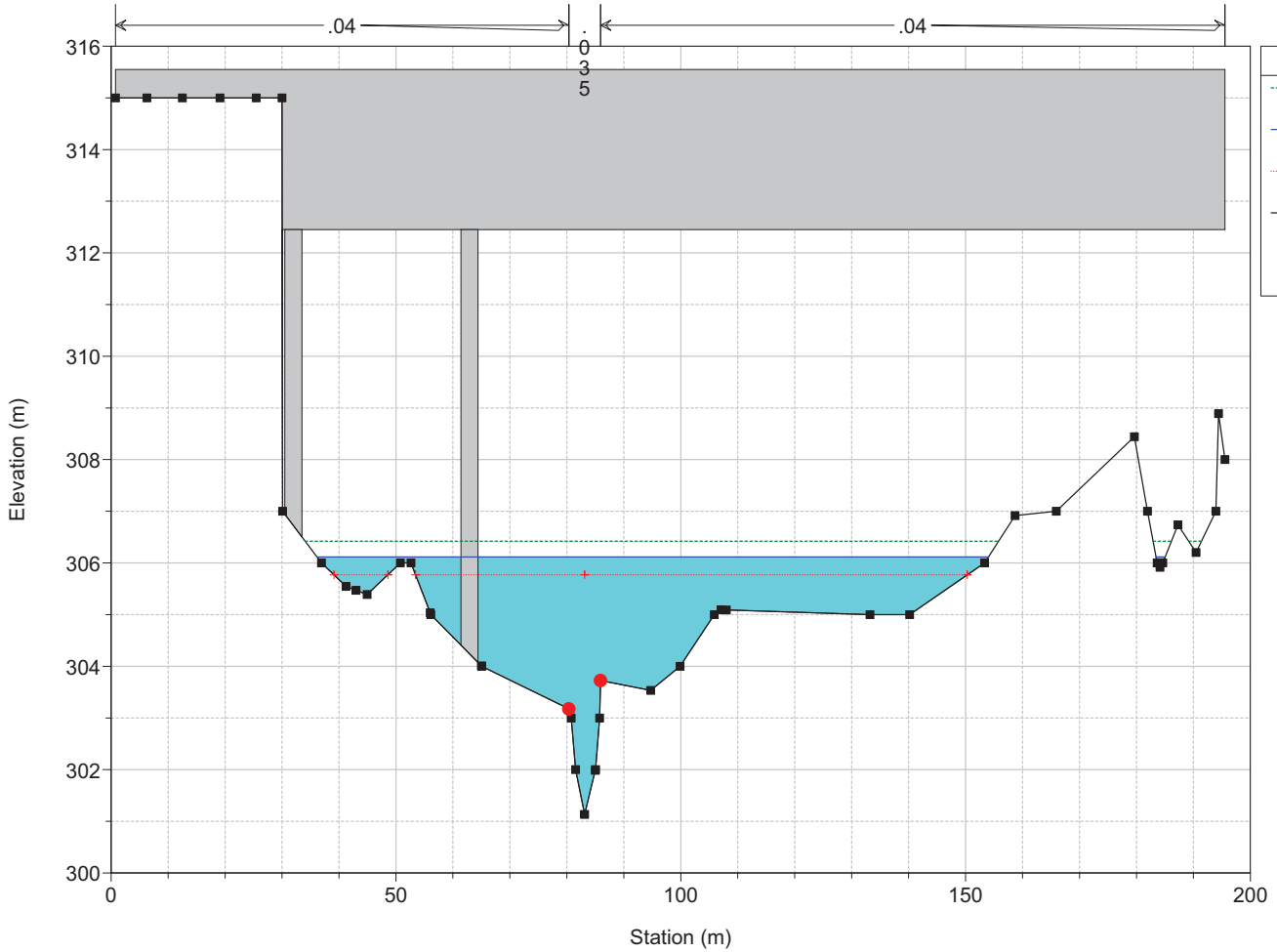
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 3.5 BR



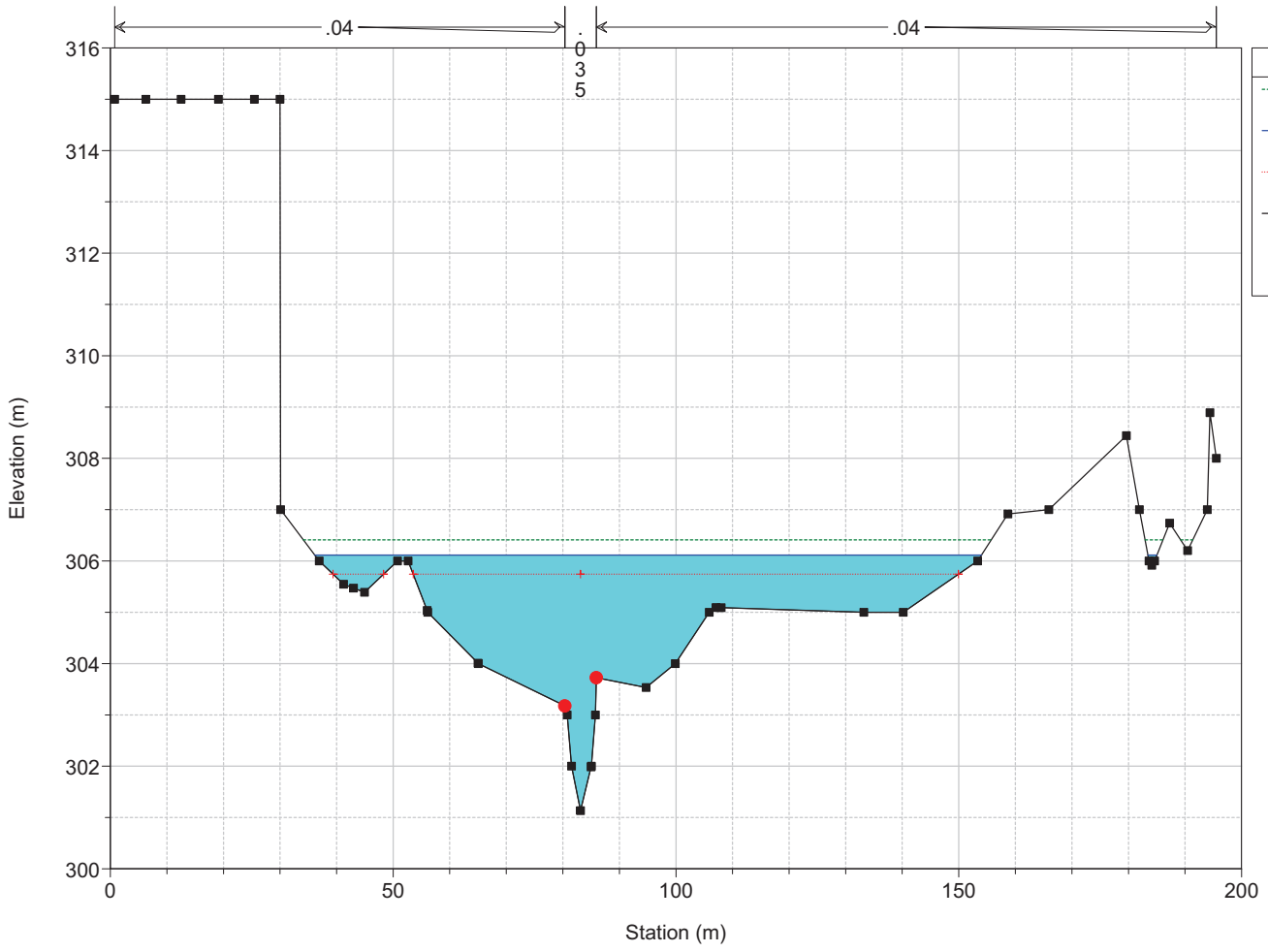
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 3.5 BR



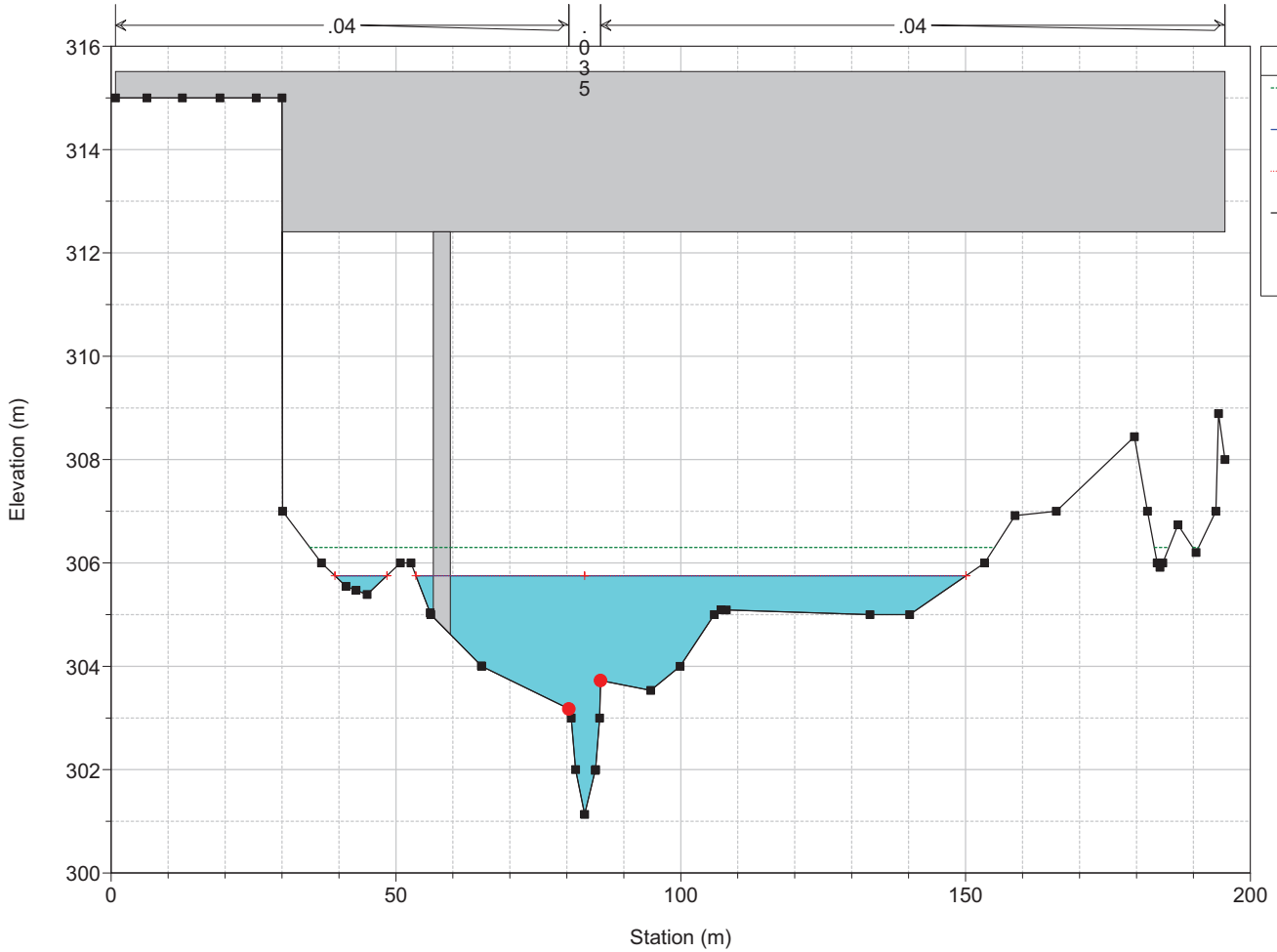
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 3



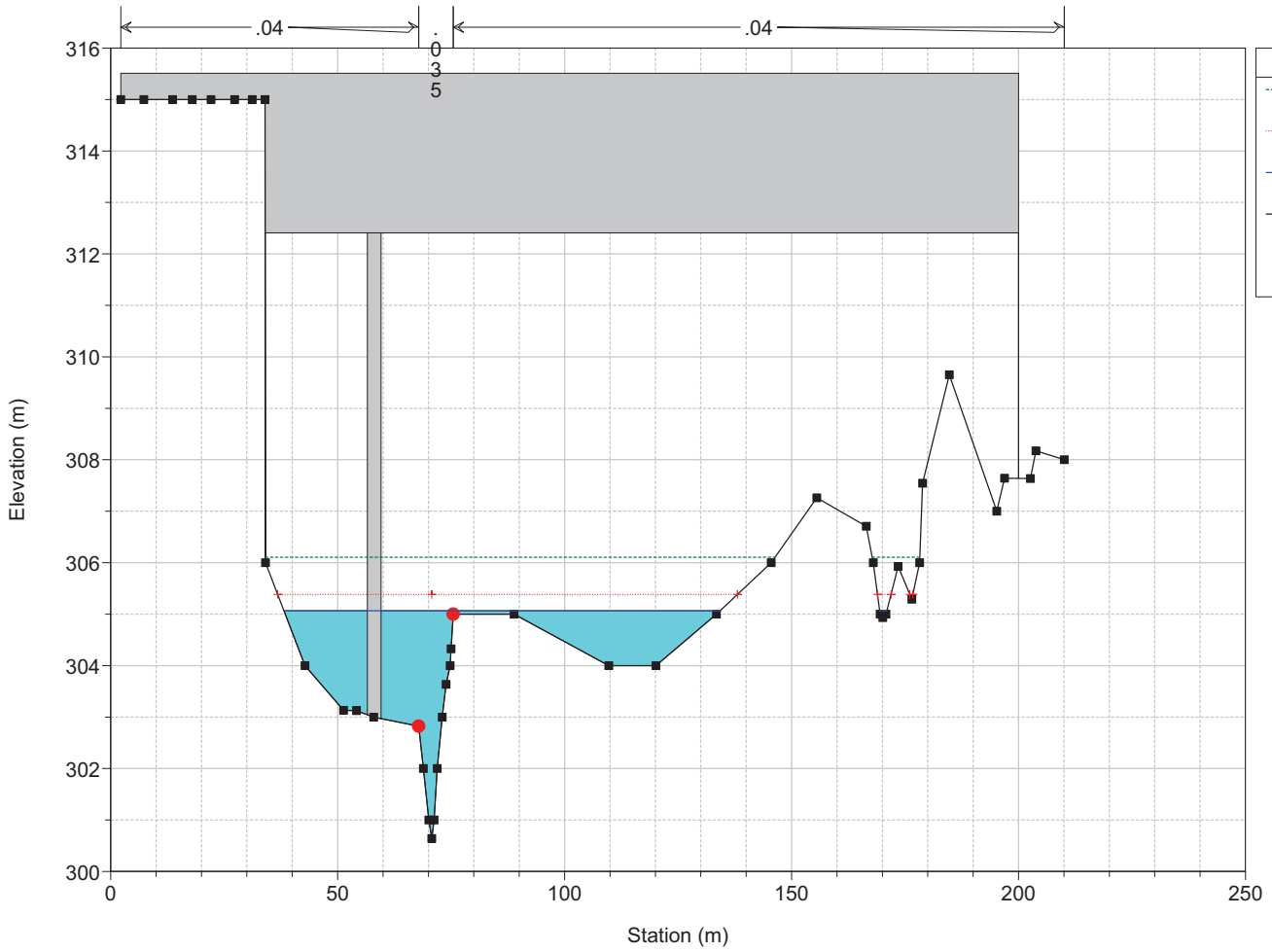
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 2.5 BR



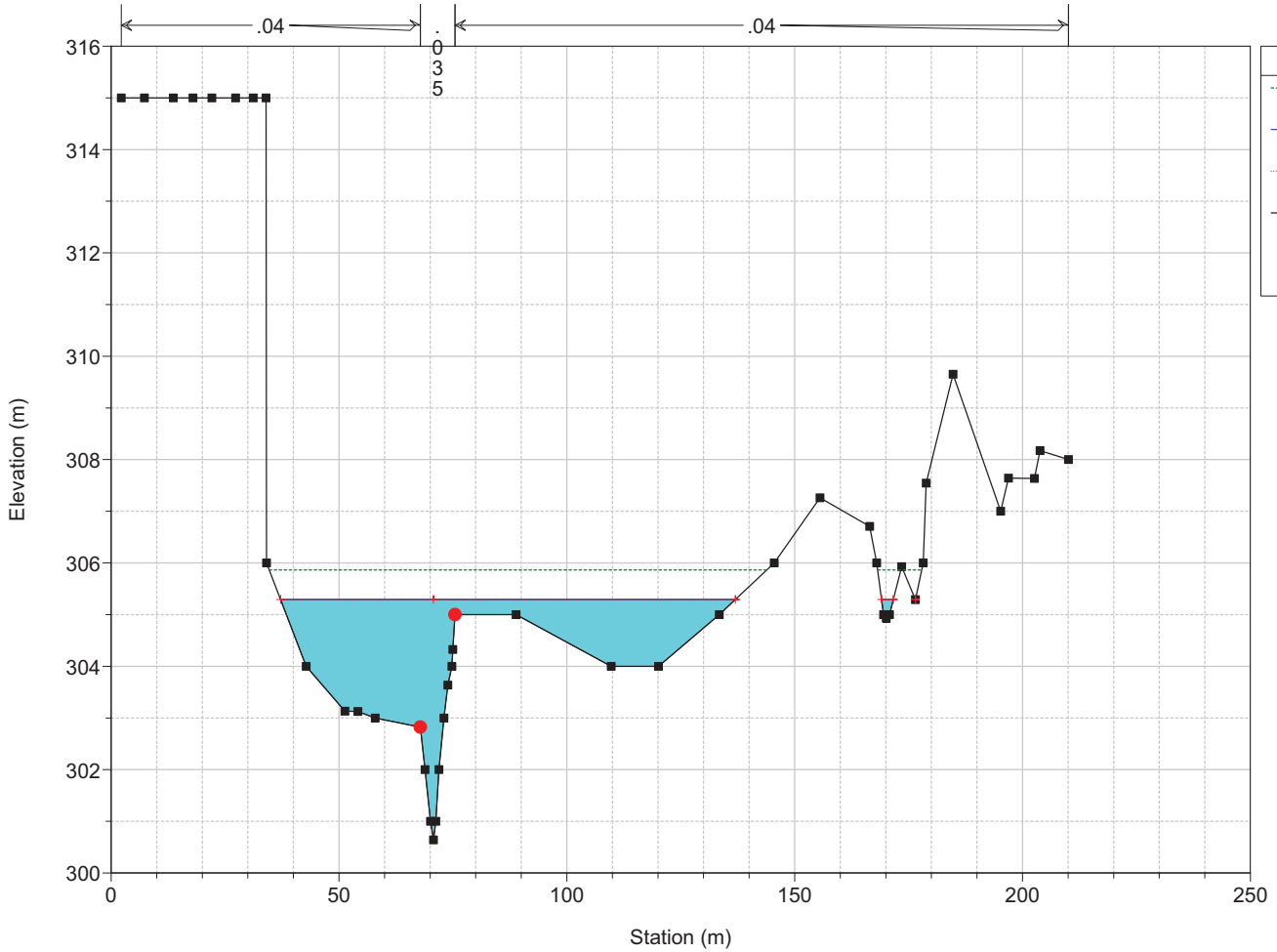
ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 2.5 BR



ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 2



ARENELLAIII_PO_variante

River = ARENELLA Reach = 1 RS = 1

