REGIONE PIEMONTE

Provincia di Cuneo

COMUNE DI ALBA

IMPIANTO IDROELETTRICO SUL FIUME TANARO NEL COMUNE DI ALBA

PROGETTO DEFINITIVO

Elaborato n.

A1-2

"Relazione idrologico idraulica"

8 luglio 2015

IL COMMITTENTE:

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SOMMARIO

1. PREMESSA

La presente relazione viene redatta dagli scriventi su incarico della società Tanaro Power S.p.A. ed analizza gli aspetti idrologici e idraulici necessari alla valutazione del comportamento del Fiume Tanaro nel Comune di Alba, relativamente alle portate a cui corrispondono i tempi di ritorno tecnici caratteristici dell'idraulica di piena ed alle portate di utilizzo idroelettrico del corso d'acqua.

L'impianto si compone di una traversa fluviale di tipo mobile ad assetto variabile costituita da una platea fissa in c.a. avente una quota in sommità di 152.00 m s.l.m., sormontata da uno sbarramento mobile a doppia falda completamente abbattibile, da una centrale realizzata in area golenale sinistra, da un canale di adduzione e da un canale di scarico. Sono inoltre previsti manufatti accessori quali la rampa di risalita per l'ittiofauna e le opere per la regimazione delle portate.

Per portate in alveo comprese tra 15.9 e 300.0 m^3/s il sistema di ritenuta mobile consentirà il mantenimento della quota di regolazione di 156.50 m s.l.m, mentre in caso di portate defluenti superiori a 300 m^3/s lo sbarramento mobile verrà abbattuto sul fondo; in questo modo sarà possibile ridurre in modo significativo i fenomeni di rigurgito.

2. CARATTERISTICHE IDROLOGICHE DEL BACINO DEL FIUME TANARO NELLA SEZIONE DI CHIUSURA

Le caratteristiche idrologiche del bacino del Fiume Tanaro che vengono adottate nei calcoli delle portate idrologiche sono riferite alla sezione di chiusura posta in corrispondenza della sezione di presa ubicata ad Alba (Fig. 2.1), circa 200 m a monte dell'immissione in Tanaro del Torrente Cherasca.

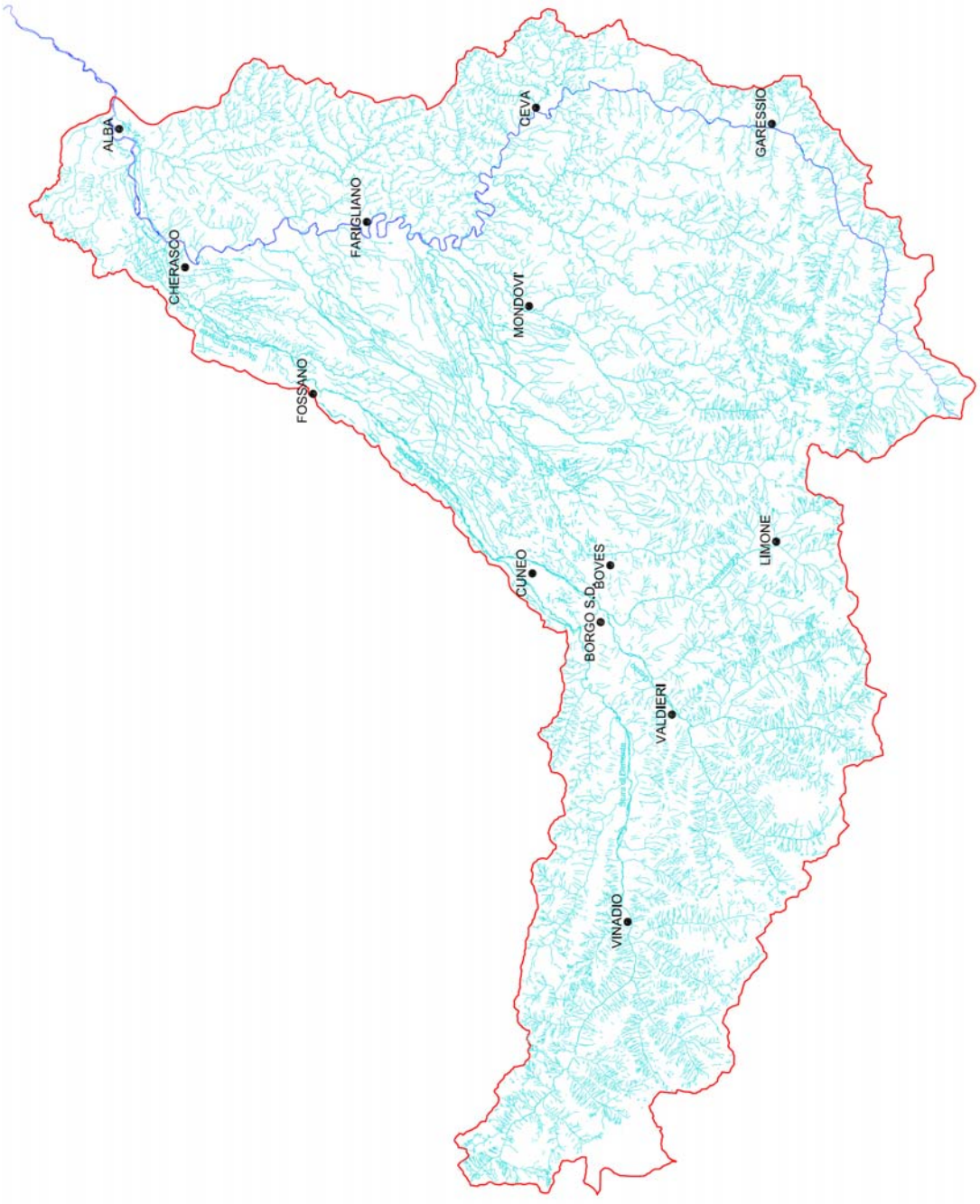


Fig. 2.1 Bacino idrografico del Fiume Tanaro chiuso ad Alba, in corrispondenza dello sbarramento in progetto.

Corpo idrico	Superficie bacino (km^2)	Quota media(m s.l.m.)
Tanaro	3380	1051

Tab. 2.1 Caratteristiche idrologiche del Fiume Tanaro ad Alba, in corrispondenza della sezione di chiusura considerata.

3. VALUTAZIONE DELLE PORTATE MASSIME ANNUE AL COLMO

3.1 DIRETTIVA PIENA DI PROGETTO DELL'AUTORITA' DI BACINO DEL FIUME PO

Per la valutazione delle portate di piena a cui corrispondono i tempi di ritorno "tecnici", di 20, 100 e 200 anni, si utilizzano i dati contenuti nel *Piano Stralcio delle Fasce Fluviali* dell'Autorità di Bacino del Fiume Po, riferiti alla sezione di chiusura di Alba che è ubicata poche centinaia di metri a monte della sezione di presa.

Tali valori sono riportati nella seguente tabella:

$T_{ritorno}$ (anni)	Q_c (m^3/s)
20	2050
100	2750
200	3050

Tab. 3.1. Portate al colmo del Fiume Tanaro in corrispondenza della sezione di chiusura di Alba, posta poco a monte rispetto alla sezione di presa.

I valori delle portate di piena che si assumono per la modellizzazione idraulica del tratto di fiume in corrispondenza del sito sono, dunque, quelli derivanti dalla Direttiva Piena di Progetto dell'Autorità di Bacino del Fiume Po in quanto riportate in un documento ufficiale.

4. DESCRIZIONE DEI RILIEVI TOPOGRAFICI UTILIZZATI

Per valutare i livelli raggiunti dall'acqua sulle aree circostanti il corso d'acqua, è condizione essenziale disporre di rilievi topografici dettagliati e sufficientemente estesi. Anche le batimetrie devono essere, per quanto possibile, accurate.

Il caso in esame richiede una grande mole di rilievi, in quanto si fa riferimento ad un tratto abbastanza considerevole del Fiume.

Si è pertanto utilizzato un accurato rilievo delle sezioni del corso d'acqua della porzione di fiume e delle aree ad esso circostanti, a valle ed a monte dell'area in oggetto. Inoltre, per l'estensione del modello idraulico-numerico del F. Tanaro nel tratto a monte e a valle della zona di intervento, sono stati utilizzati rilievi effettuati nell'ambito di studi pregressi e il DTM ICE realizzato nel 2012 con volo laser scanner LIDAR, disponibile sul sito internet della Regione Piemonte. Tale DTM presenta una risoluzione di 5 m e una precisione sulle quote di ±30 cm.

Il poter disporre di tali rilievi di dettaglio ha permesso di calcolare i livelli idraulici di piena sia nell'alveo sia nelle aree latistanti con una buona attendibilità lungo tutto il tratto d'asta in studio, per poter meglio valutare gli effetti dell'opera in progetto sulle sezioni idrauliche nella zona a ridosso dell'intervento.

5. VALUTAZIONE DEI LIVELLI DI PIENA IN CONDIZIONI DI MOTO PERMANENTE ASSOCIATI AI VALORI DI Q_{cmax} CON I TEMPI DI RITORNO ASSEGNATI

La valutazione dei livelli di piena viene effettuata in moto permanente in quanto questo tipo di moto rappresenta una buona approssimazione del moto che si manifesta negli alvei naturali dei corsi d'acqua.

Con un modello monodimensionale di moto permanente è stato simulato il comportamento idraulico del tratto di Fiume Tanaro compreso tra il comune di Roddi (località cascina Ambrogio) e il comune di Neive (località cascina Boschi), per una lunghezza complessiva di circa 16.9 km.

Le simulazioni in moto permanente consentono una rappresentazione dei livelli di piena nelle sezioni del fiume più raffinata di quanto non lo permetta la

schematizzazione del moto uniforme nelle singole sezioni dell'alveo, in quanto con esso è possibile calcolare i livelli tenendo in conto anche le altre sezioni di verifica e le singolarità idrauliche che ci possono essere nel tratto considerato.

Il problema del tracciamento del profilo di superficie libera di un corso d'acqua naturale in moto permanente con una data portata Q si risolve con procedimenti di calcolo numerico.

L'operazione richiede preliminarmente un rilievo dettagliato dell'alveo per suddividere il corso d'acqua in tronchi di lunghezza Δs, tali da poter confondere i valori medi della sezione e della velocità in ciascun tronco con i valori ad un estremo. Anche la natura dell'alveo deve conservarsi, entro certi limiti, in ciascun tronco. Eseguita la suddivisione, è necessario il rilievo dettagliato delle caratteristiche geometriche di tutte le sezioni di separazione dei vari tratti.

Siano (i) e (i+1) due sezioni consecutive, distanti Δx in asse, nella prima delle quali siano note tutte le grandezze idrauliche.

La variazione di carico idraulico ΔH tra le due sezioni si può calcolare mediante la seguente relazione alle differenze finite:

$$\Delta H = -[j]_i \cdot \Delta x$$

Si può ottenere così il carico H_{i+1} della sezione i+1 e conseguentemente il carico piezometrico h_{i+1}, che rappresenta la quota del pelo libero rispetto ad un piano di riferimento orizzontale, risolvendo l'equazione:

$$H_{i+1} = h_{i+1} + \frac{Q^2}{2g \cdot \Omega_{i+1}^2}$$

E' possibile in questo modo ricavare il carico piezometrico della corrente nelle sezioni di rilievo e da questo calcolare le caratteristiche idrauliche che il fiume ha nel tratto in esame.

Questa trattazione teorica relativa ad alvei omogenei è stata generalizzata considerando anche il deflusso golenale che si manifesta per portate al colmo dell'entità di quelle in oggetto.

Per il calcolo dei livelli e delle principali caratteristiche del moto è stato utilizzato il software HEC-RAS sviluppato dall'U.S. ArmyCorps of Engineers, nella versione 4.1.

Venendo nel dettaglio del modello idraulico-numerico si è compiuta la modellazione del moto permanente del Fiume Tanaro lungo un tratto di asta avente una lunghezza di circa 16.9 km. Nel modello sono state implementate circa 70 sezioni trasversali del Fiume Tanaro, rappresentative sia dell'alveo che delle zone golenali, come indicato nella planimetria in Allegato.

Le scabrezze adottate hanno un significato globale all'interno della schematizzazione in alveo principale e in aree golenali e sono state dedotte dall'analisi del terreno e dalla letteratura tecnica dalla Direttiva "*Criteri per la valutazione della compatibilità idraulica delle infrastrutture pubbliche e di interesse pubblico all'interno delle fasce A e B*" dell'Autorità di bacino del Fiume Po e cioè:

per l'alveo principale:

n	$=0.06 m^{-1/3} s$	secondo Manning
C	$= 1/n = 16.67\ m^{1/3}/s$	secondo GaucklerStrickler

per le aree golenali:

n	$=0.125 m^{-1/3} s$	secondo Manning
C	$= 1/n = 8\ m^{1/3}/s$	secondo GaucklerStrickler

I valori di scabrezza possono sembrare piuttosto elevati (secondo la definizione di Manning), ma derivano direttamente da operazioni di taratura effettuate con riferimento alle portate di piena del Fiume Tanaro ed eseguite in seguito all'evento alluvionale del 1994.

Da tali studi emerge, infatti, che per portate di piena di notevole entità i coefficienti di scabrezza, intesi nella definizione di Manning, che si osservano

sono relativamente elevati. Da quanto sopra, ne deriva che i valori del coefficiente di scabrezza che si calcolano in fase di taratura sono da ritenersi corretti, a condizione di svincolarsi dal significato fisico del coefficiente di

scabrezza. In tal modo essi sono da considerarsi come una sorta di "coefficienti globali" in grado di tenere conto dell'insieme dei complessi fenomeni dissipativi che si verificano durante il passaggio di un evento di piena di notevole importanza.

Occorre, pertanto, considerare alcuni dei meccanismi reali non simulati dal modello che possono aver contribuito a produrre livelli idrici maggiori a parità di portate, e che quindi si traducono in una riduzione del coefficiente *c* di Strikler rispetto ai valori standard comunemente reperibili in letteratura tecnica.

Questi meccanismi sommariamente sono i seguenti:

- presenza notevolissima di trasporto solido in sospensione, capace di modificare la densità della corrente e di incrementare i meccanismi dissipativi all'interno della massa fluida, indipendentemente dalla scabrezza fisica del contorno bagnato;
- presenza di trasporto solido flottante, soprattutto tronchi d'albero, interferente con le pile dei ponti, con conseguenti temporanei effetti di rigurgito a monte superiori rispetto a quelli desumibili dalla geometria delle pile stesse;
- dinamica fluviale tutt'altro che gradualmente variata, caratterizzata da vorticosità, effetti dovuti alla curvatura dei meandri e irregolarità causate da bruschi restringimenti.

L'elaborazione è stata compiuta partendo da valle e risalendo verso monte; infatti il Fiume Tanaro, nel tratto esaminato e nelle condizioni di piena ipotizzate, è un corso d'acqua a regime fluviale ed il moto dell'acqua avviene in corrente lenta con il profilo liquido che dipende dalle condizioni di valle.

A proposito delle condizioni al contorno del modello, e cioè del livello dell'acqua nella sezione di partenza, si è imposto per le portate di riferimento che tale livello fosse pari a quello di moto uniforme. Si precisa comunque che l’ipotesi sul livello di partenza, sebbene importante per le caratteristiche del moto nel tratto in studio, non influenza in modo significativo i livelli dell’acqua nel tratto di fiume a ridosso della zona di intervento. Questo perché la sezione di partenza della simulazione idraulica è relativamente lontana a valle, e sono numerose le

sezioni d'alveo frapposte tra essa e quelle che sono significative per lo studio delle aree in oggetto, pertanto in queste condizioni il livello dell'acqua in quella prima sezione ha poca influenza, come si può osservare facilmente facendolo variare all'interno di una tolleranza ragionevole, tale da non cambiare le caratteristiche idrauliche del moto.

Le simulazioni effettuate sono rappresentative sia della situazione attuale, sia della situazione di progetto; in questo modo è possibile valutare, con riferimento alla componente idraulica, gli effetti prodotti dalla realizzazione dello sbarramento in progetto.

La verifica idraulica è stata effettuata con riferimento alle portate di piena più significative, ovvero quelle con tempo di ritorno pari a 20, 100 e 200 anni.

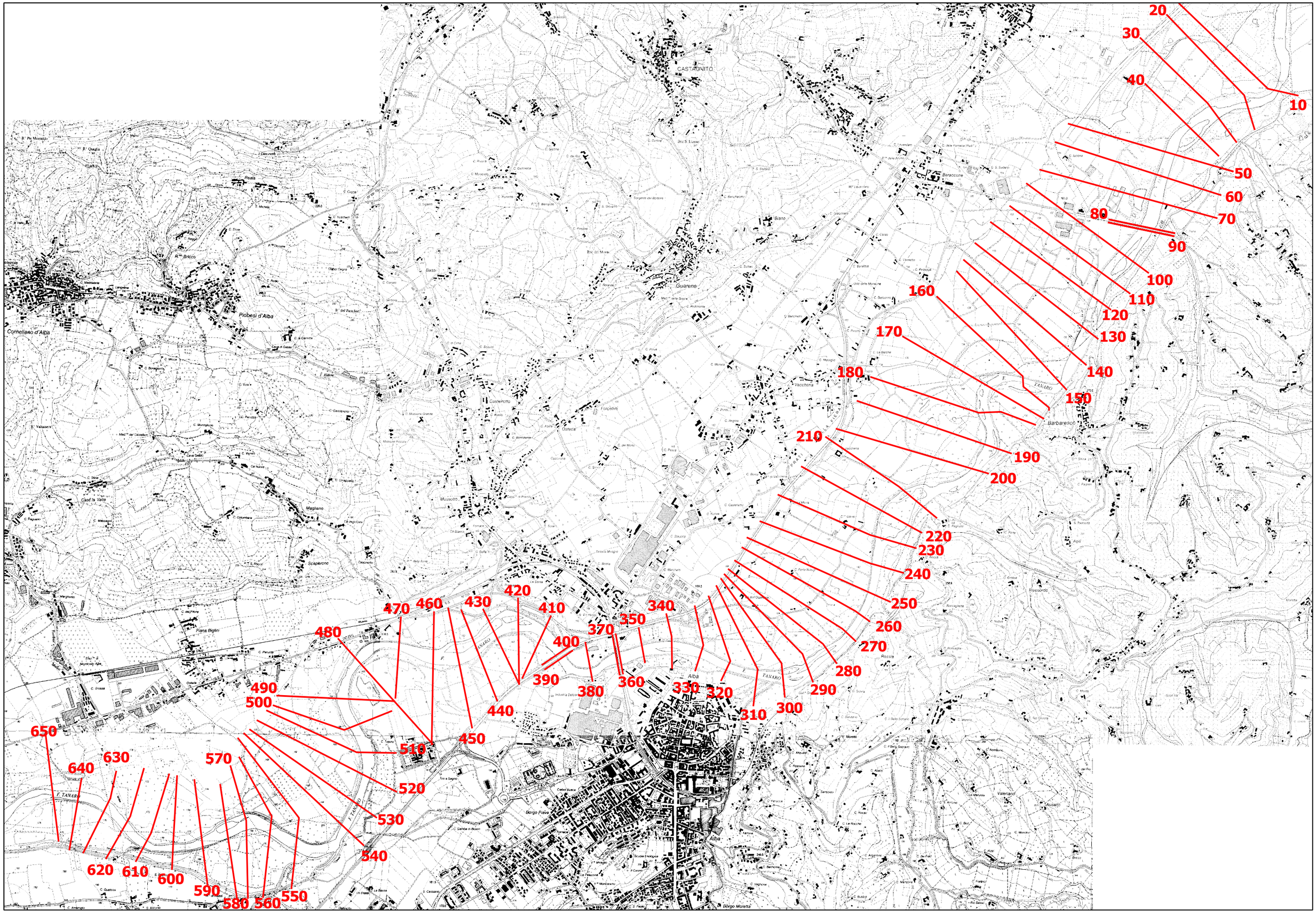
Come precedentemente illustrato, per portate superiori a 300 m^3/s lo sbarramento mobile viene completamente abbattuto; le simulazioni in condizioni di piena sono pertanto state eseguite considerando la presenza della sola soglia di fondo in c.a. (quota in sommità di 152.0 m s.l.m.) su cui è ancorato lo sbarramento mobile.

Nello scenario rappresentativo della situazione attuale è stata considerata la presenza dello sbarramento in progetto di Barbaresco avente una quota in sommità di 149.20 m s.l.m. in condizioni ordinarie e di 148.40 m s.l.m. in caso di piena (cioè per portate superiori a 300 m^3/s).

I valori numerici delle varie grandezze specificate in legenda, relativi alle portate di verifica, sono riportati nelle seguenti tabelle. Anche i livelli del pelo libero per le portate considerate sono riportati nelle sezioni schematiche e nel profilo longitudinale allegati nelle pagine seguenti.

LEGENDA

River sta.	=	sezione di calcolo
Q total	=	portata in m^3/s
MinChEl	=	quota del fondo alveo in m
W.S. Elev.	=	livello del pelo libero dell'acqua in m
CritW.S.	=	livello di moto critico dell'acqua in m
E.G.Elev	=	livello energetico globale in m
E.G.Slope	=	pendenza motrice
VelChnl	=	velocità nell'alveo in m/s
Flow Area	=	area liquida in m^2
Top Width	=	larghezza sezione liquida in sommità in m
Froude # Chl	=	numero di Froude della corrente in alveo



PLANIMETRIA Scala 1:30000

SITUAZIONE ATTUALE

SIMULAZIONE 1

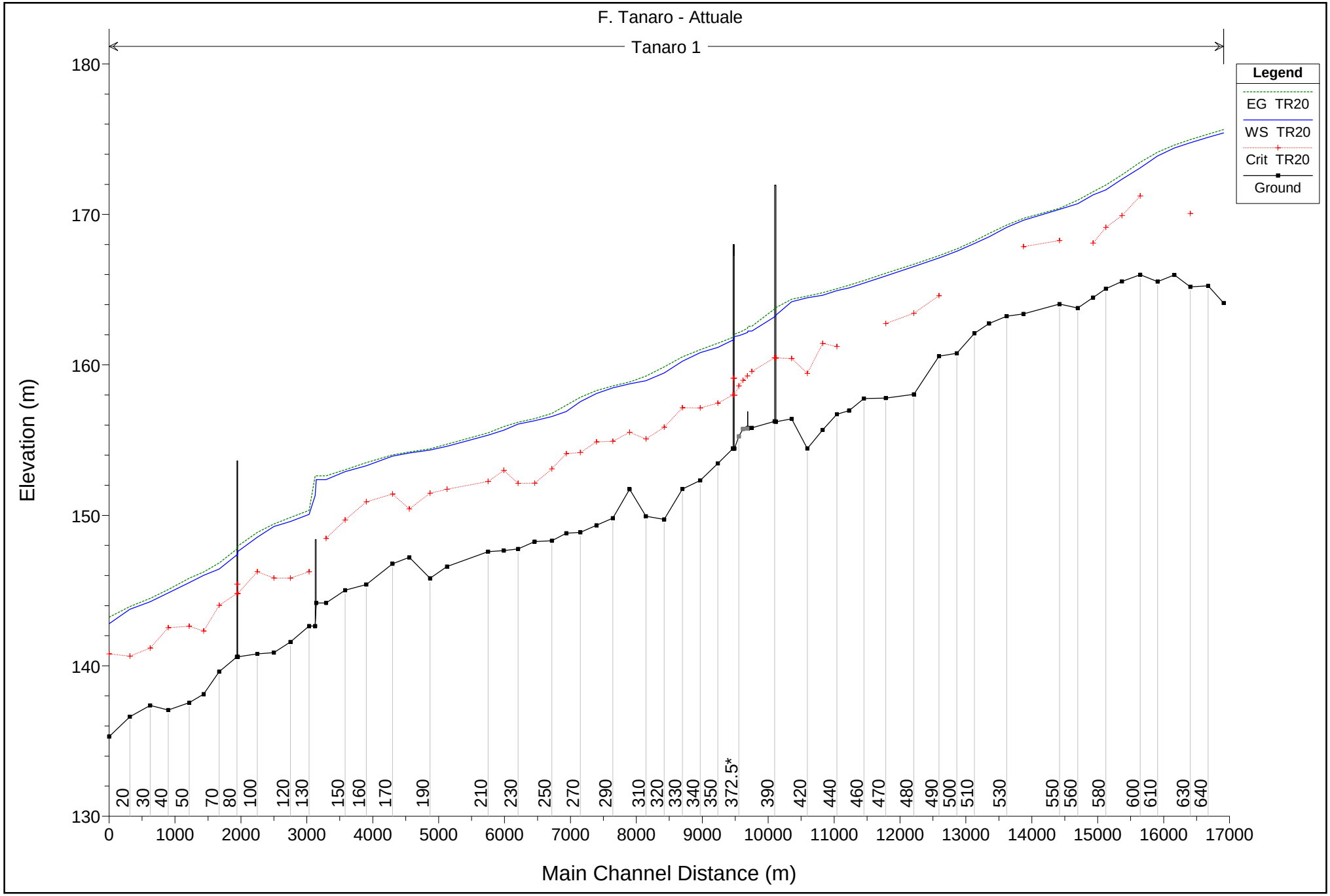
corso d'acqua	**portata al colmo Q_c m^3/s**	**tempo di ritorno anni**
Fiume Tanaro	2050	20

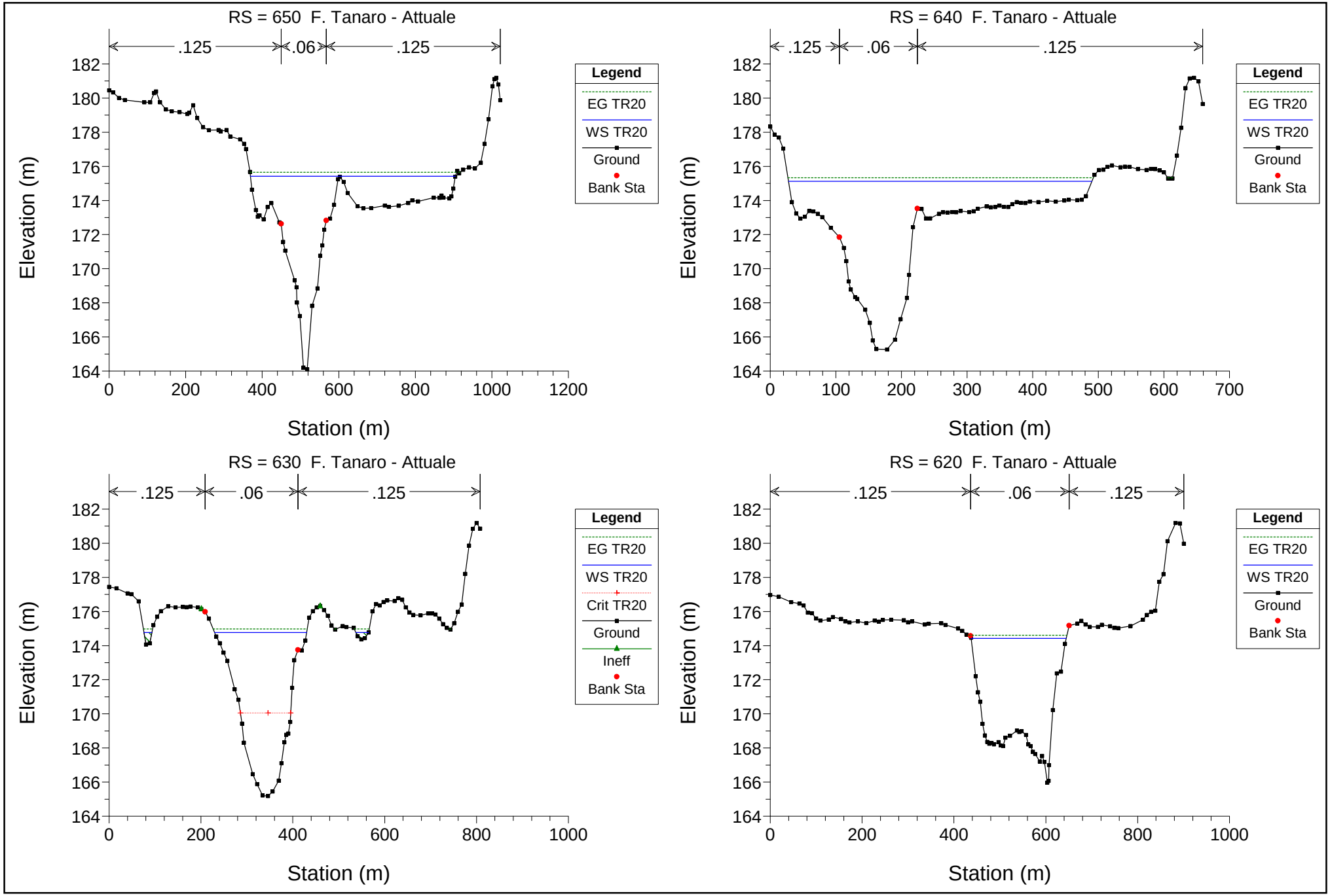
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20

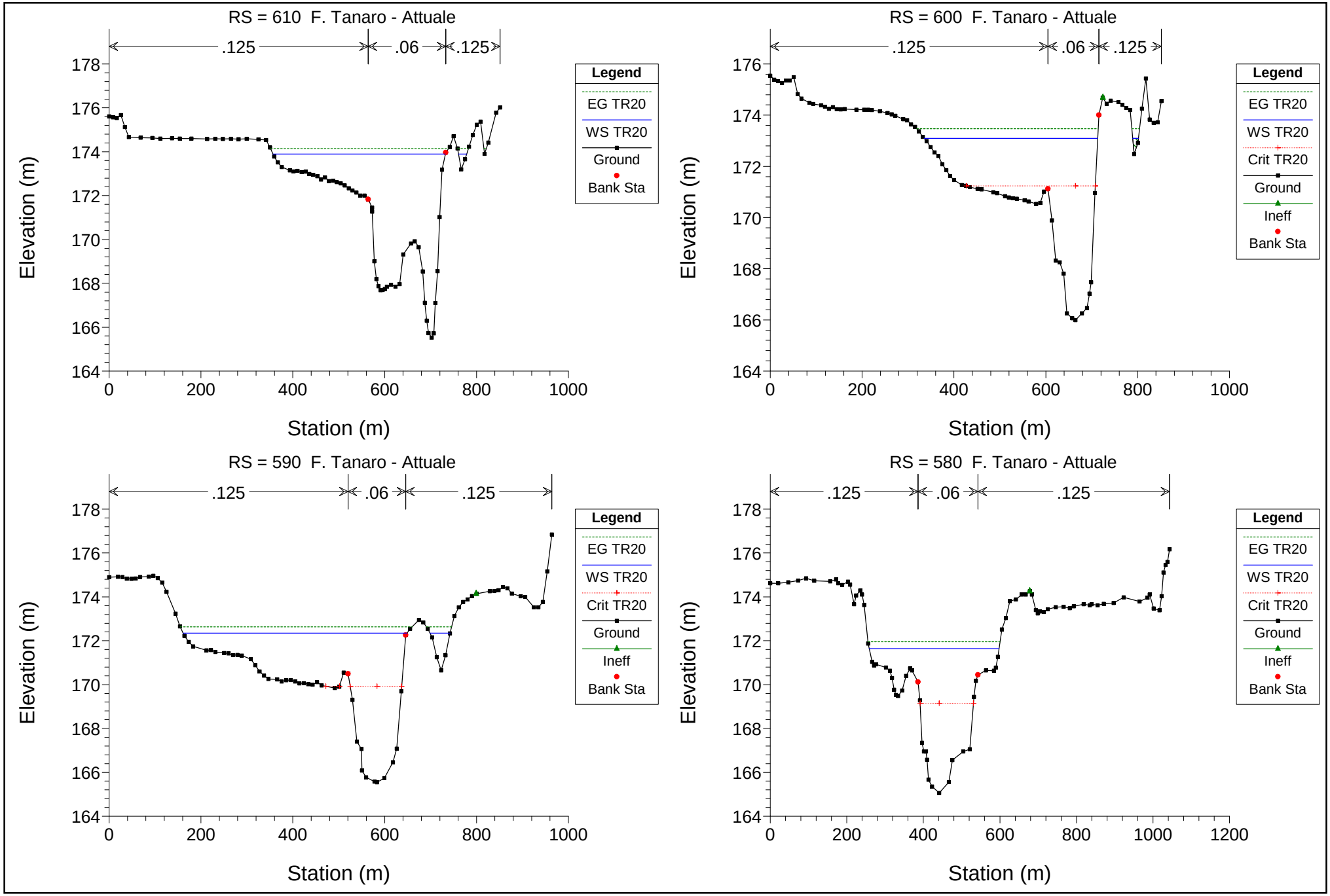
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	TR20	2050.00	164.11	175.42		175.65	0.001504	2.26	1437.50	535.68	0.28
1	640	TR20	2050.00	165.26	175.12		175.33	0.001197	2.14	1404.93	462.49	0.25
1	630	TR20	2050.00	165.18	174.77	170.06	174.97	0.001459	2.00	1037.42	246.03	0.27
1	620	TR20	2050.00	165.98	174.42		174.61	0.001524	1.92	1065.02	207.07	0.27
1	610	TR20	2050.00	165.53	173.89		174.14	0.002184	2.28	1093.81	393.46	0.32
1	600	TR20	2050.00	165.99	173.10	171.23	173.47	0.003380	2.94	1074.72	390.67	0.41
1	590	TR20	2050.00	165.55	172.34	169.92	172.63	0.002720	2.60	1266.37	530.60	0.36
1	580	TR20	2050.00	165.06	171.64	169.14	171.95	0.002824	2.55	969.76	339.26	0.37
1	570	TR20	2050.00	164.47	171.30	168.10	171.51	0.001682	2.13	1304.38	497.35	0.29
1	560	TR20	2050.00	163.78	170.72		170.95	0.003478	2.33	1273.10	626.04	0.39
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.44	1104.77	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001917	2.05	2272.19	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001723	1.89	1695.94	656.64	0.28
1	520	TR20	2050.00	162.75	168.51		168.73	0.002552	2.29	1533.96	916.40	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002340	2.02	1648.56	699.68	0.32
1	500	TR20	2050.00	160.77	167.55		167.71	0.001694	1.97	1549.02	539.58	0.28
1	490	TR20	2050.00	160.58	167.10	164.60	167.26	0.001705	1.83	1420.12	495.11	0.28
1	480	TR20	2050.00	158.04	166.54	163.44	166.69	0.001416	1.84	1665.46	673.69	0.26
1	470	TR20	2050.00	157.79	165.91	162.75	166.10	0.001574	2.07	1543.19	508.68	0.28
1	460	TR20	2050.00	157.77	165.43		165.60	0.001406	1.92	1509.59	635.38	0.26
1	450	TR20	2050.00	156.96	165.12		165.29	0.001354	1.91	1448.72	517.23	0.26
1	440	TR20	2050.00	156.72	164.94	161.21	165.06	0.001030	1.73	1944.93	640.91	0.23
1	430	TR20	2050.00	155.68	164.63	161.42	164.79	0.001461	2.06	1857.90	649.36	0.27
1	420	TR20	2050.00	154.44	164.47	159.43	164.57	0.000665	1.57	2132.99	647.64	0.19
1	410	TR20	2050.00	156.41	164.20	160.42	164.36	0.001288	1.96	1612.34	486.85	0.26
1	400	TR20	2050.00	156.22	163.31	160.47	163.81	0.003453	3.16	713.26	160.85	0.41
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.20	160.48	163.72	0.003681	3.23	695.45	160.54	0.42
1	380	TR20	2050.00	155.82	162.25	159.56	162.56	0.002575	2.49	823.28	159.24	0.35
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	161.88	157.99	162.04	0.001118	1.78	1152.84	198.50	0.24
1	365		Bridge									
1	360	TR20	2050.00	154.43	161.65	157.99	161.83	0.001263	1.85	1108.46	197.14	0.25
1	350	TR20	2050.00	153.45	161.16	157.46	161.45	0.001858	2.38	863.78	143.65	0.31
1	340	TR20	2050.00	152.32	160.82	157.14	161.00	0.001297	1.89	1084.60	195.62	0.25
1	330	TR20	2050.00	151.75	160.24	157.15	160.53	0.002277	2.40	870.30	234.47	0.33
1	320	TR20	2050.00	149.73	159.46	155.86	159.87	0.002478	2.93	952.02	366.56	0.36
1	310	TR20	2050.00	149.94	158.95	155.07	159.25	0.001908	2.61	1291.56	481.49	0.31
1	300	TR20	2050.00	151.73	158.73	155.53	158.86	0.001090	1.77	1945.47	629.41	0.23
1	290	TR20	2050.00	149.81	158.47	154.92	158.60	0.001026	1.63	1604.83	570.74	0.22

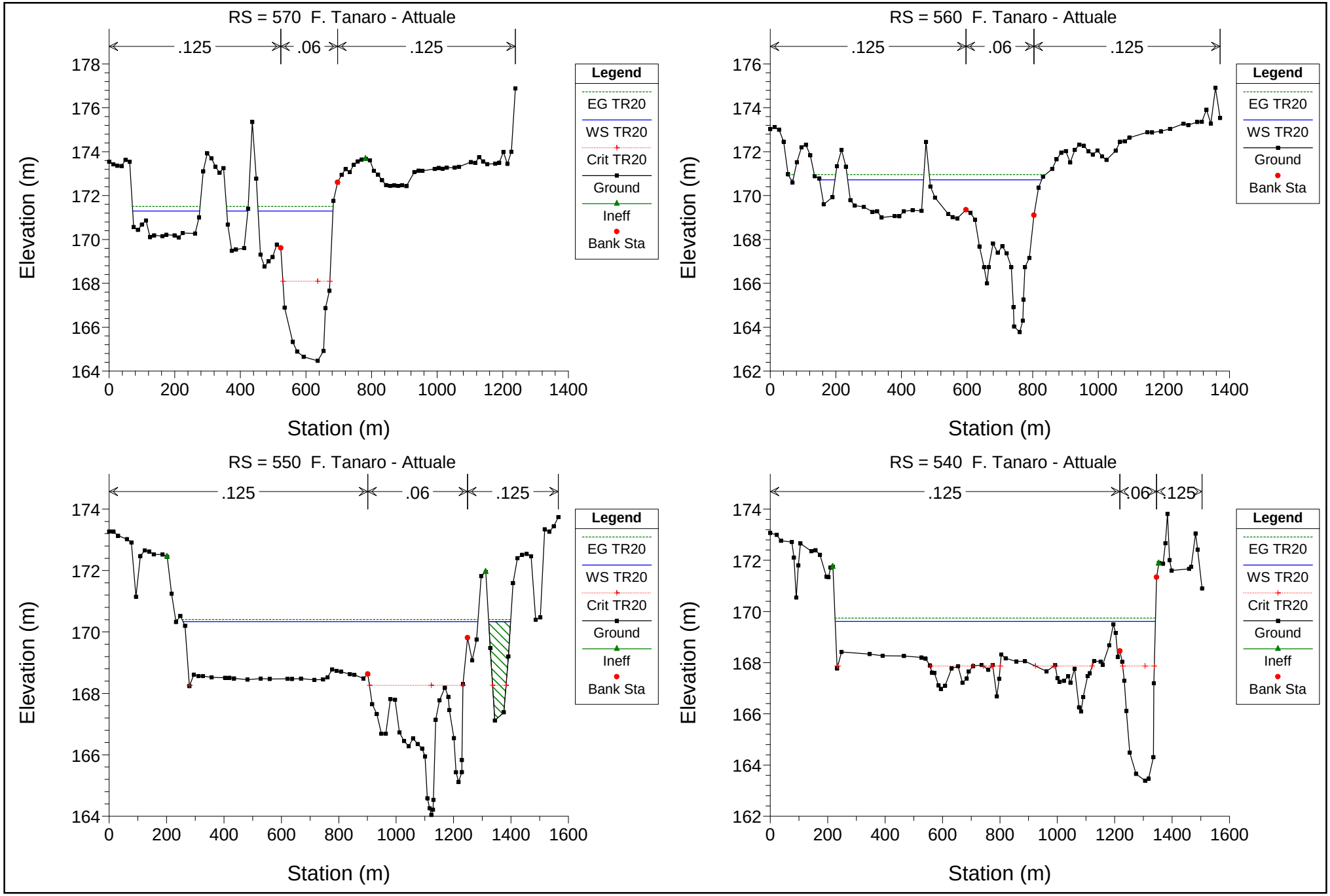
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (Continued)

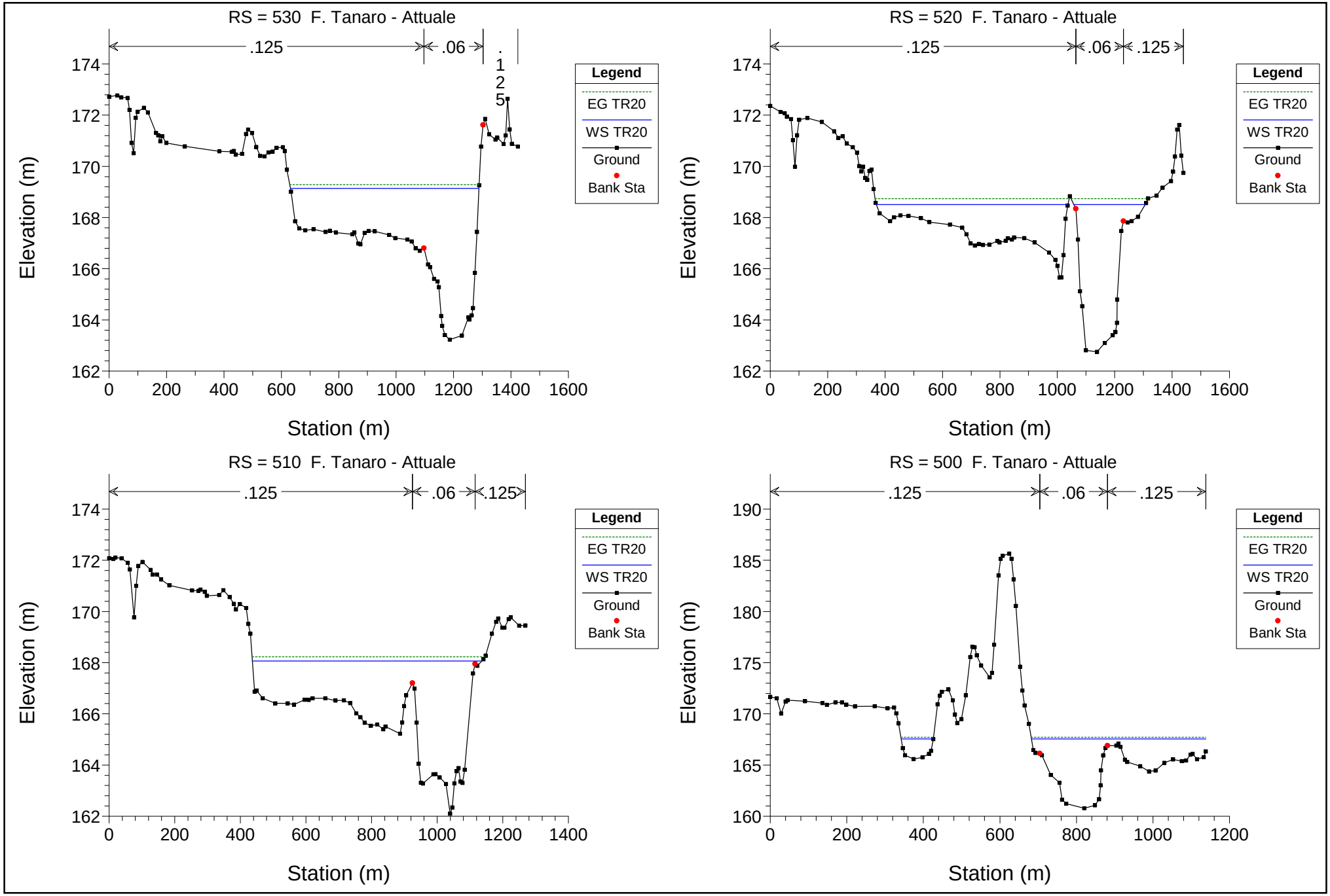
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	280	TR20	2050.00	149.34	158.10	154.88	158.29	0.001569	2.14	1491.33	439.35	0.28
1	270	TR20	2050.00	148.86	157.56	154.17	157.85	0.002073	2.57	1252.47	447.36	0.32
1	260	TR20	2050.00	148.81	156.90	154.10	157.32	0.003029	3.01	926.11	280.75	0.39
1	250	TR20	2050.00	148.31	156.57	153.08	156.77	0.001710	2.14	1407.89	503.96	0.29
1	240	TR20	2050.00	148.26	156.28	152.13	156.43	0.000956	1.77	1672.14	728.56	0.22
1	230	TR20	2050.00	147.77	156.07	152.13	156.19	0.000906	1.61	1684.74	453.61	0.21
1	220	TR20	2050.00	147.66	155.66	152.99	155.90	0.002003	2.36	1300.66	396.95	0.32
1	210	TR20	2050.00	147.59	155.33	152.25	155.48	0.001325	1.86	1532.85	542.37	0.26
1	200	TR20	2050.00	146.60	154.59	151.73	154.72	0.001319	1.97	2301.47	1060.77	0.26
1	190	TR20	2050.00	145.82	154.34	151.46	154.42	0.000920	1.50	2618.22	1163.86	0.21
1	180	TR20	2050.00	147.21	154.15	150.42	154.21	0.000586	1.34	3180.99	1431.49	0.17
1	170	TR20	2050.00	146.78	153.94	151.42	154.02	0.001053	1.46	2564.96	1361.59	0.22
1	160	TR20	2050.00	145.40	153.29	150.90	153.50	0.001845	2.39	2058.26	1358.23	0.31
1	150	TR20	2050.00	145.03	152.91	149.69	153.03	0.001183	1.76	2325.03	1345.72	0.24
1	140	TR20	2050.00	144.17	152.37	148.46	152.62	0.001673	2.20	932.33	1278.40	0.29
1	135		Inl Struct									
1	130	TR20	2050.00	142.64	150.07	146.24	150.33	0.001633	2.27	904.82	143.56	0.29
1	120	TR20	2050.00	141.58	149.59	145.83	149.85	0.001714	2.26	916.41	288.46	0.29
1	110	TR20	2050.00	140.88	149.25	145.83	149.42	0.001532	1.95	1529.53	461.32	0.27
1	100	TR20	2050.00	140.79	148.54	146.25	148.86	0.003219	2.51	817.61	322.95	0.38
1	90	TR20	2050.00	140.59	147.59	144.80	147.96	0.002795	2.67	766.74	146.16	0.37
1	85		Bridge									
1	80	TR20	2050.00	140.59	147.37	144.80	147.77	0.003189	2.79	735.22	142.81	0.39
1	70	TR20	2050.00	139.61	146.42	144.02	146.83	0.003745	2.84	722.77	282.30	0.42
1	60	TR20	2050.00	138.12	146.02	142.31	146.23	0.001552	2.17	1402.39	539.70	0.28
1	50	TR20	2050.00	137.54	145.52	142.62	145.81	0.002265	2.55	1169.69	411.90	0.34
1	40	TR20	2050.00	137.06	144.84	142.53	145.07	0.002439	2.13	961.38	268.40	0.33
1	30	TR20	2050.00	137.37	144.26	141.18	144.48	0.001906	2.09	980.88	475.93	0.30
1	20	TR20	2050.00	136.62	143.76	140.64	143.93	0.001535	2.06	1684.57	670.10	0.28
1	10	TR20	2050.00	135.29	142.79	140.78	143.23	0.004002	3.16	1096.50	620.31	0.44

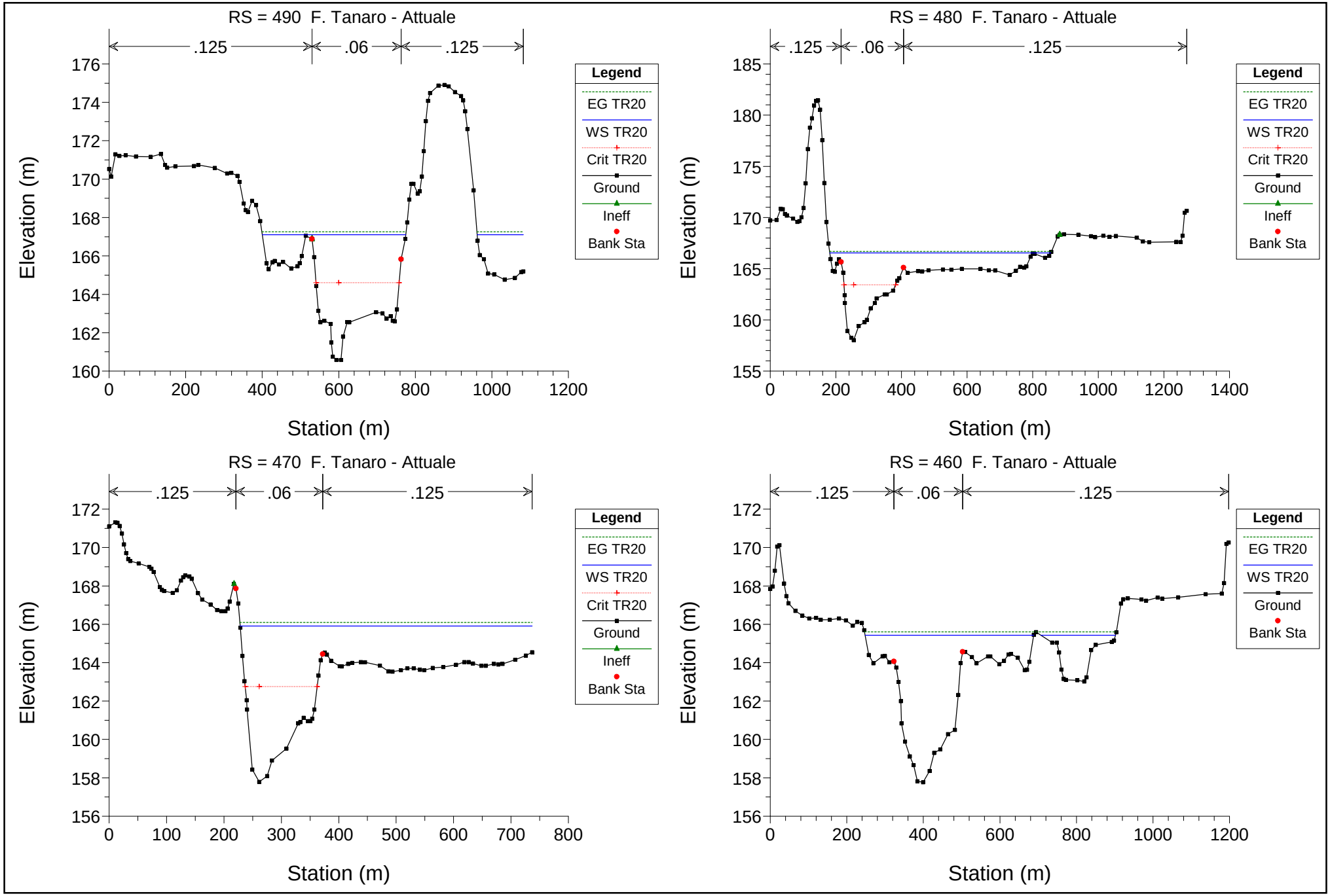

F. Tanaro - Attuale
Tanaro 1
Legend
EG TR20
WS TR20
Crit TR20
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
610
630
640

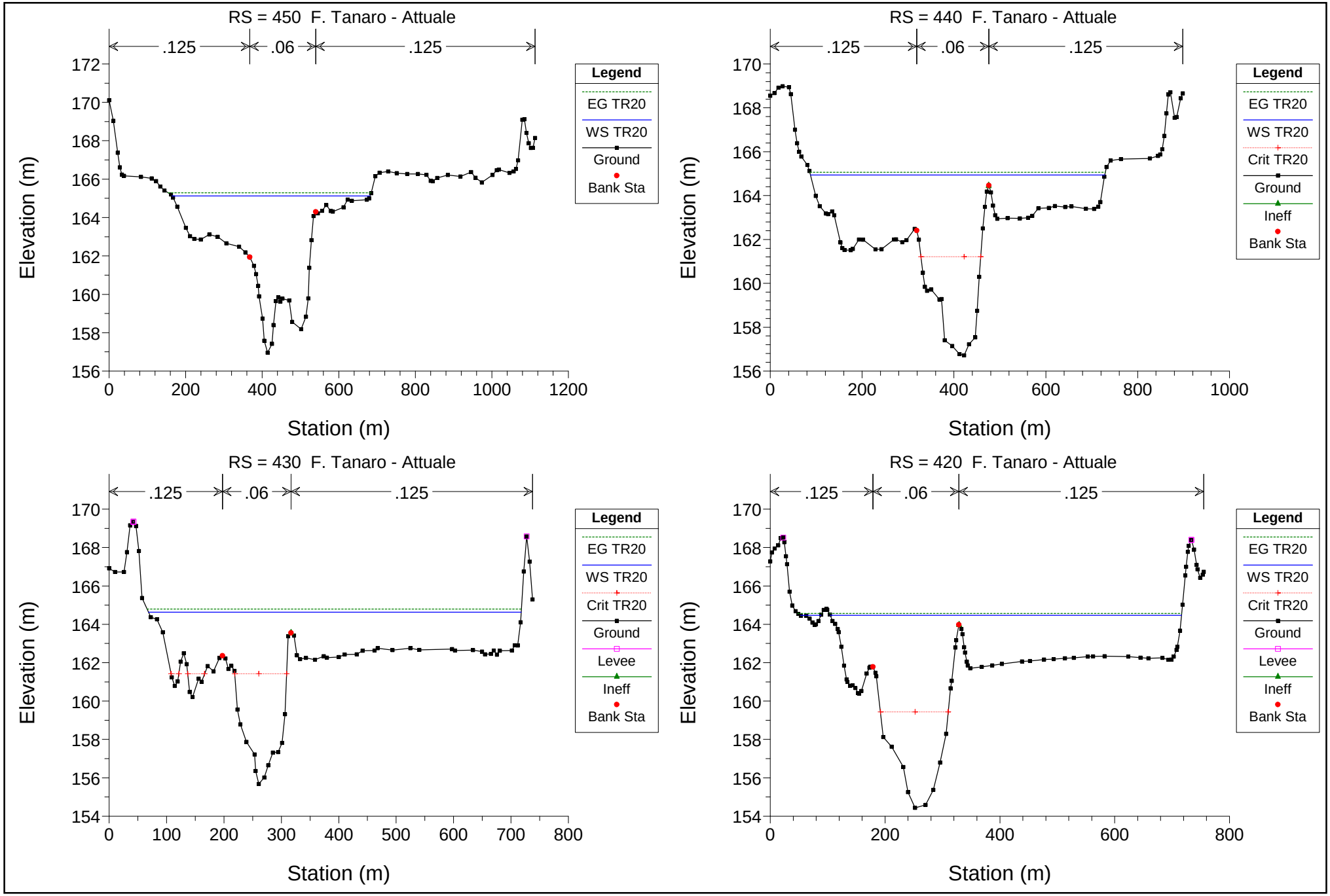

RS = 650 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 640 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 630 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta

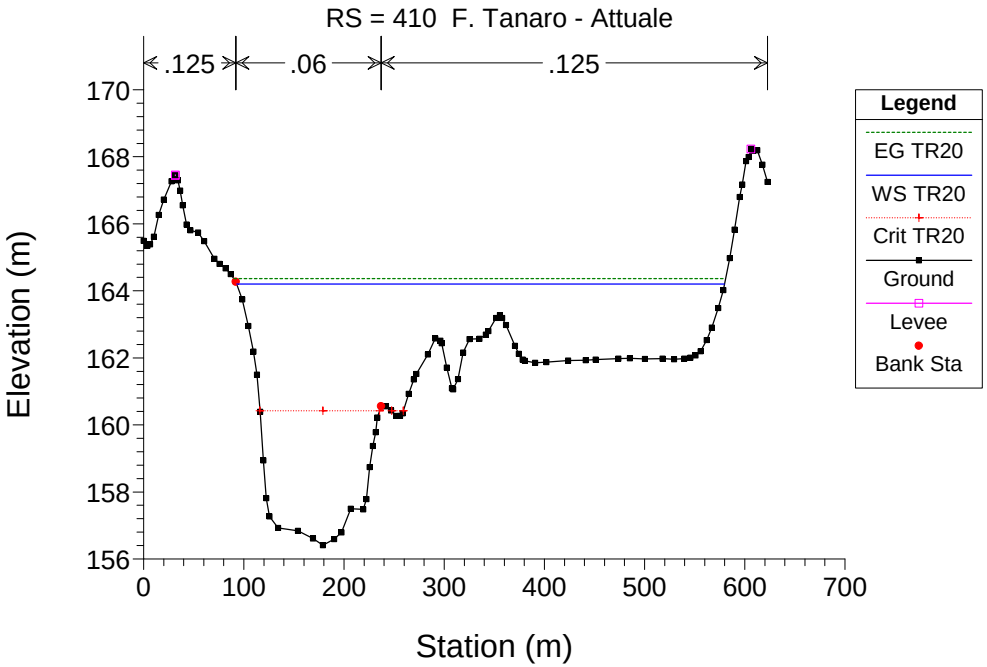

RS = 610 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 600 F. Tanaro - Attuale
Crit TR20
Ineff
RS = 590 F. Tanaro - Attuale
RS = 580 F. Tanaro - Attuale

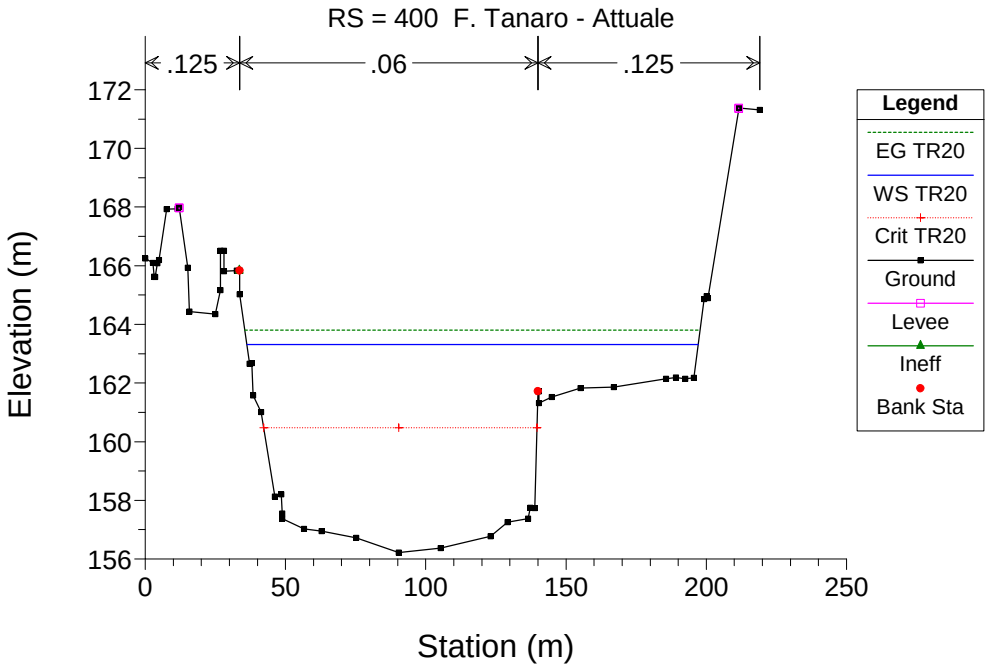

RS = 570 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Attuale
RS = 550 F. Tanaro - Attuale
RS = 540 F. Tanaro - Attuale

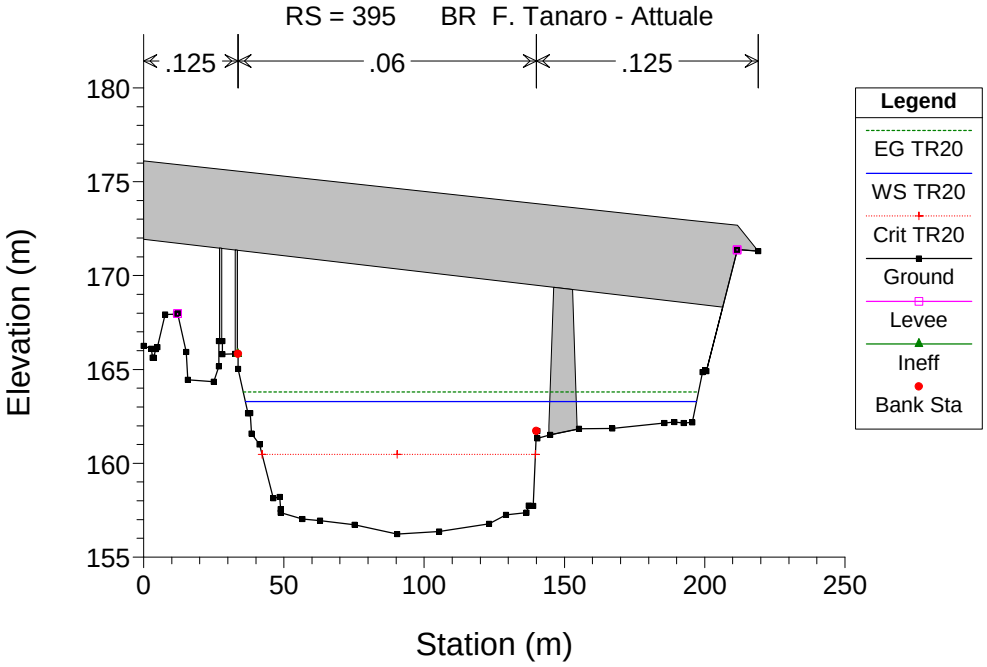

RS = 530 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)

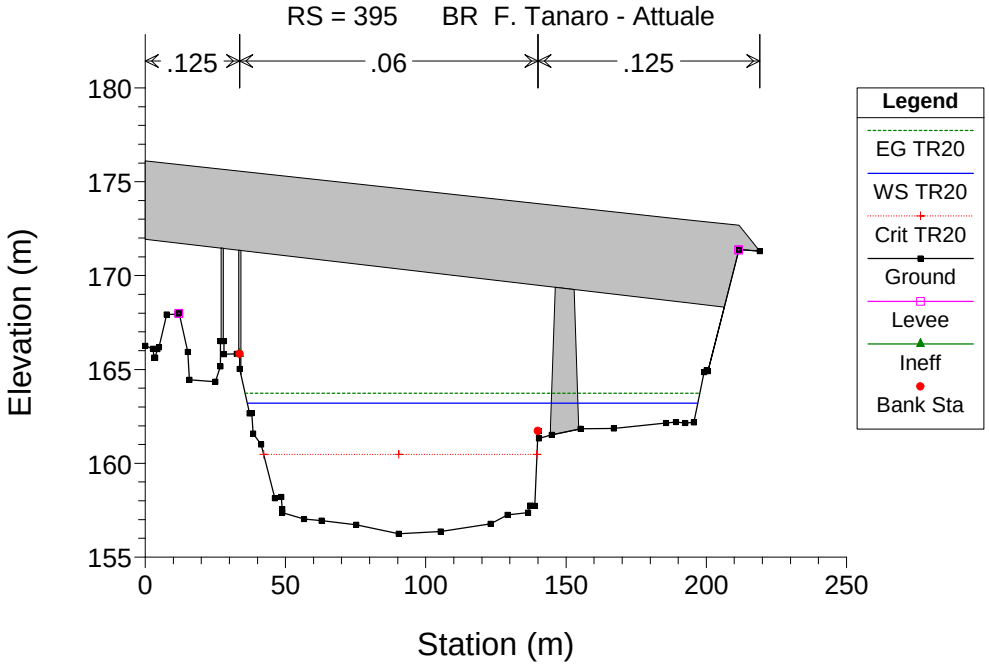

RS = 490 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 470 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 460 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta

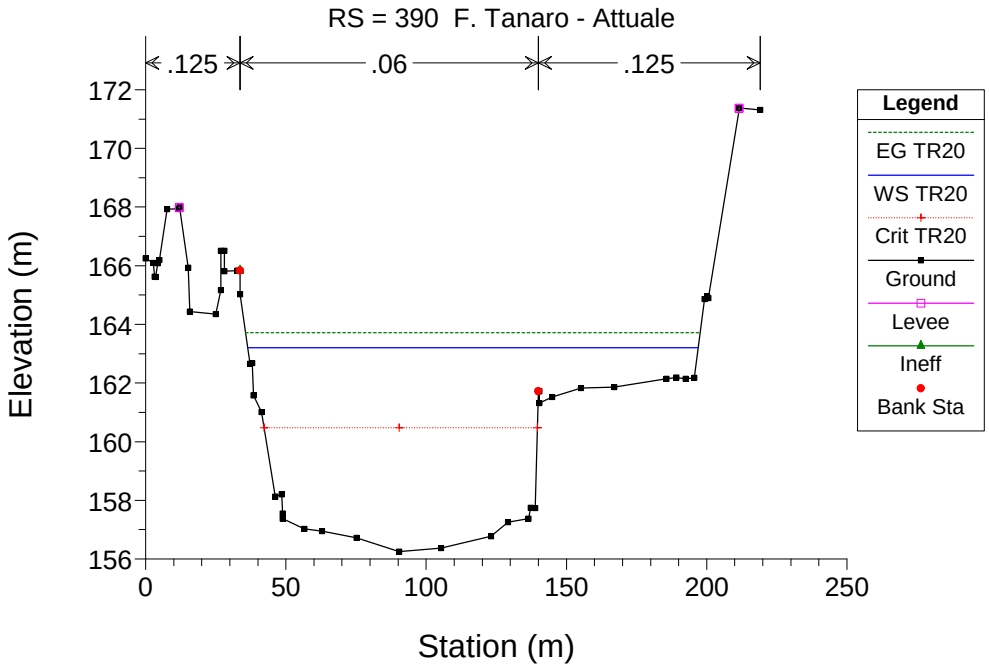

RS = 450 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 440 F. Tanaro - Attuale
Crit TR20
Ineff
RS = 430 F. Tanaro - Attuale
Levee
RS = 420 F. Tanaro - Attuale

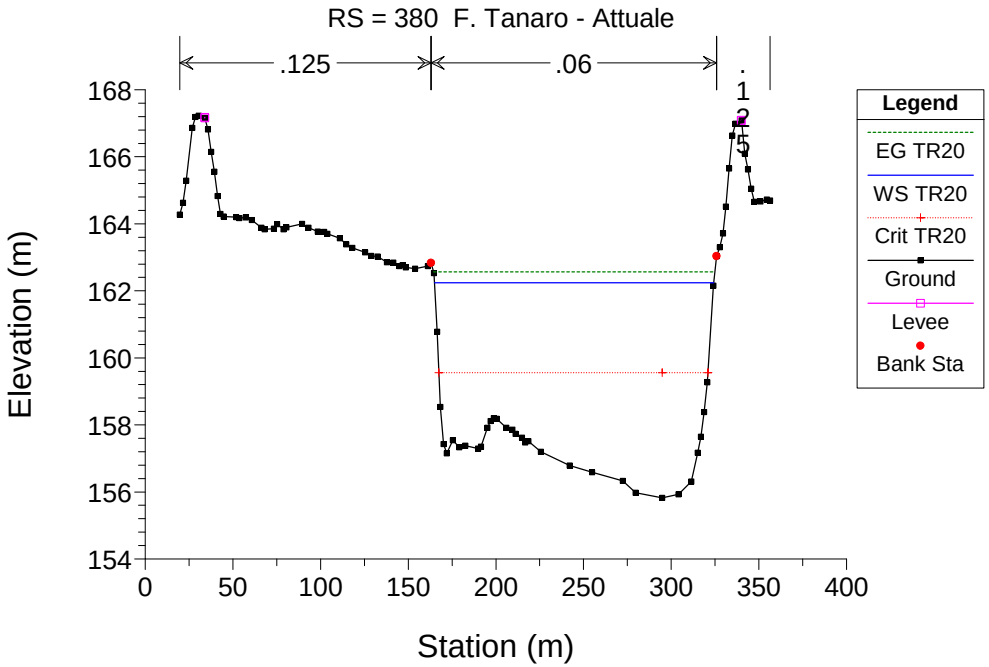

RS = 410 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

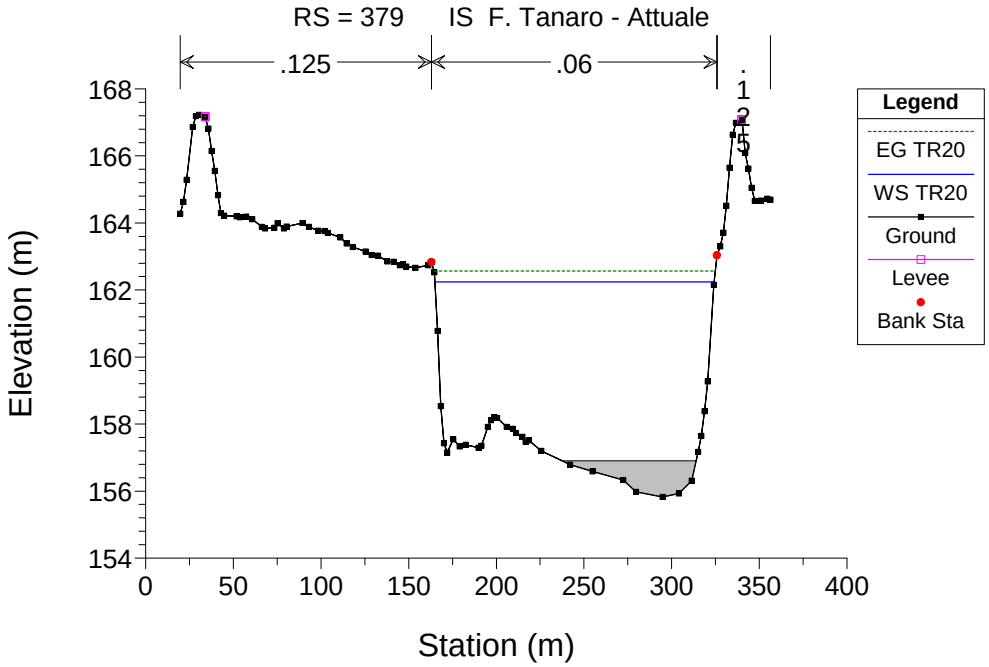

RS = 400 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

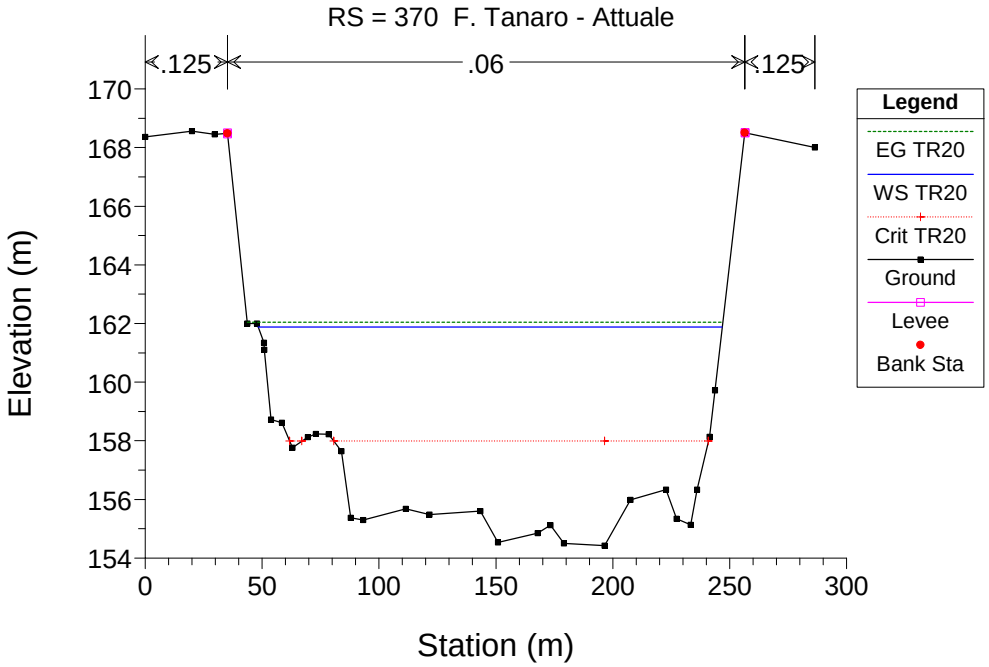

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

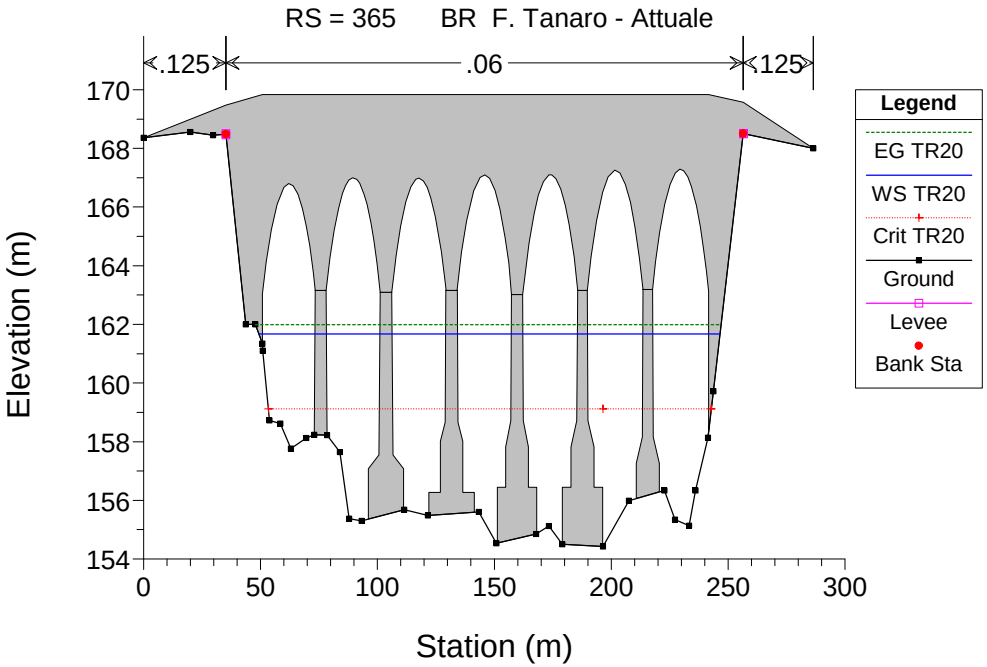

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

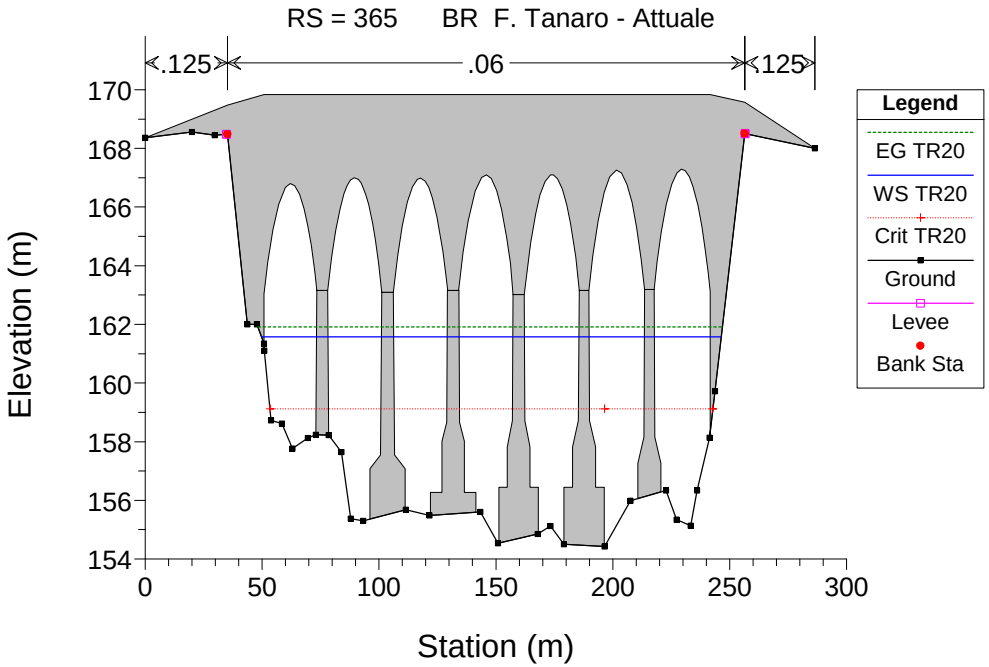

RS = 390 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

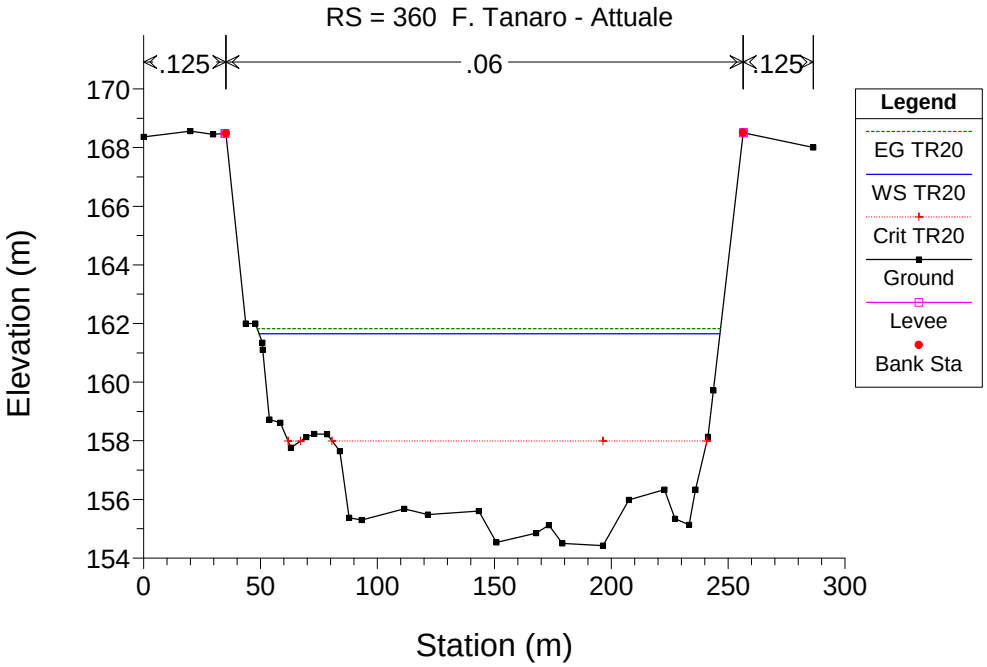

RS = 380 F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

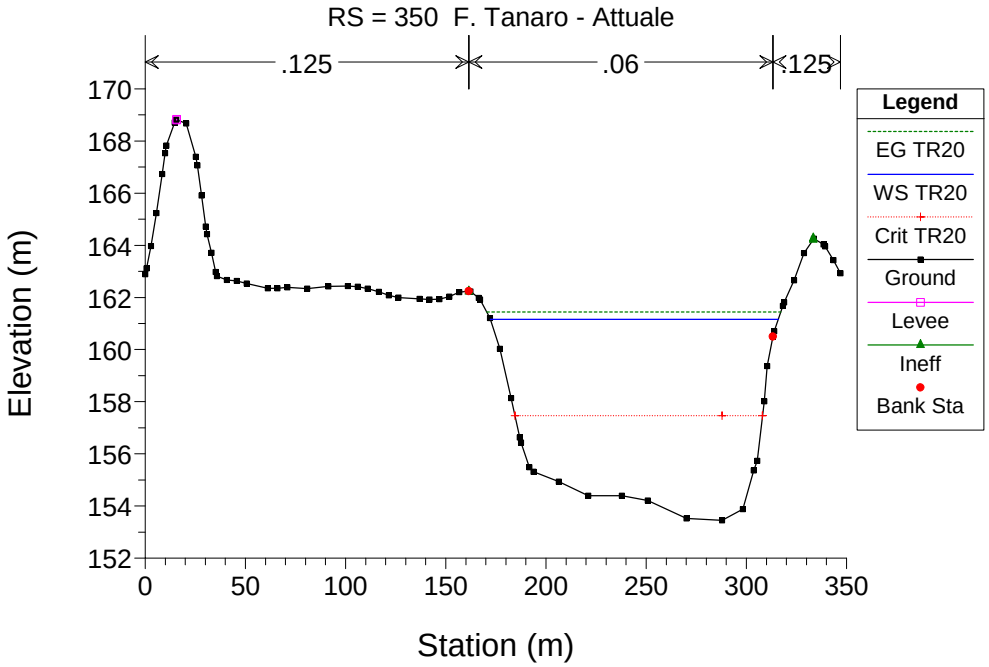

RS = 379 IS F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Levee
Bank Sta

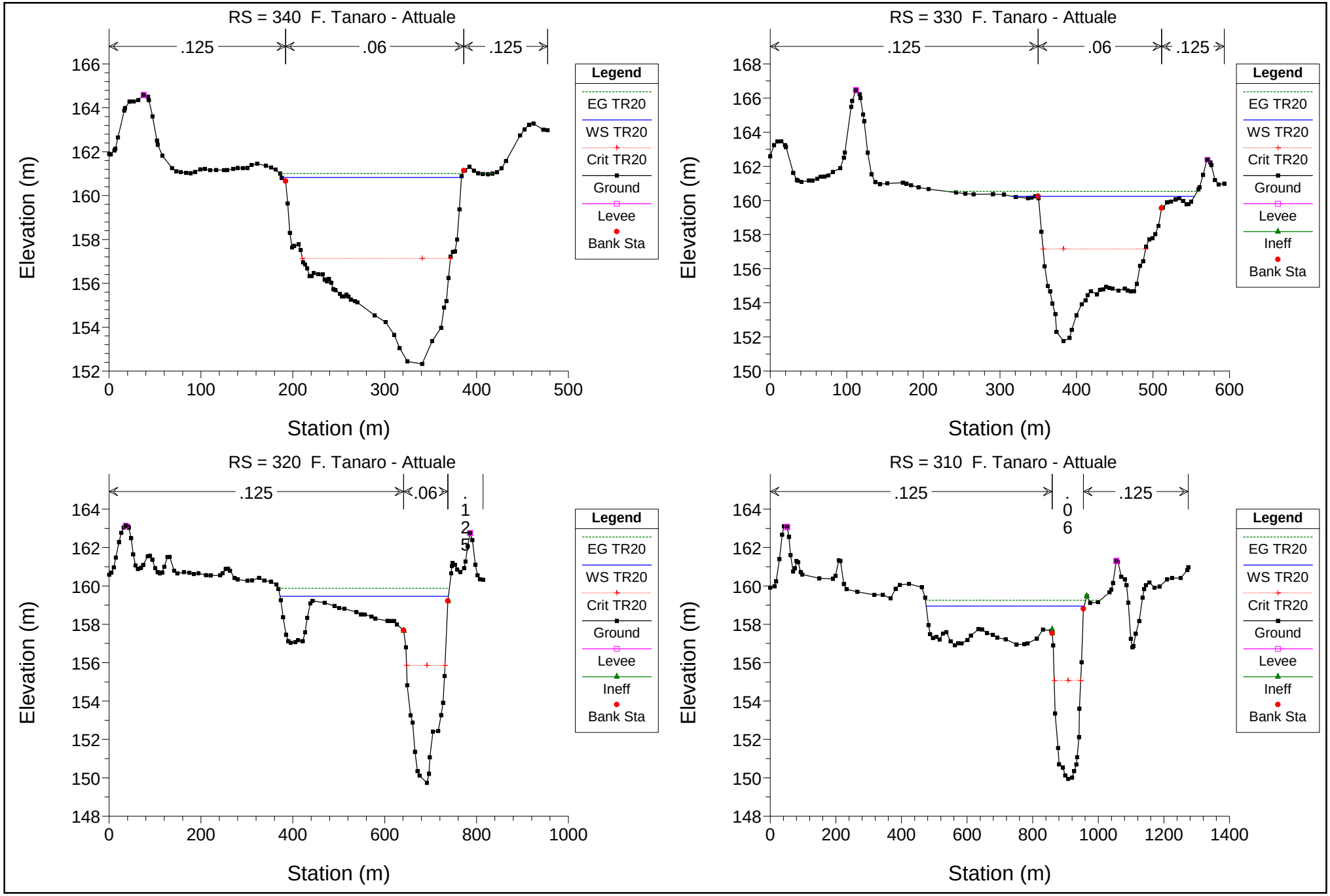

RS = 370 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

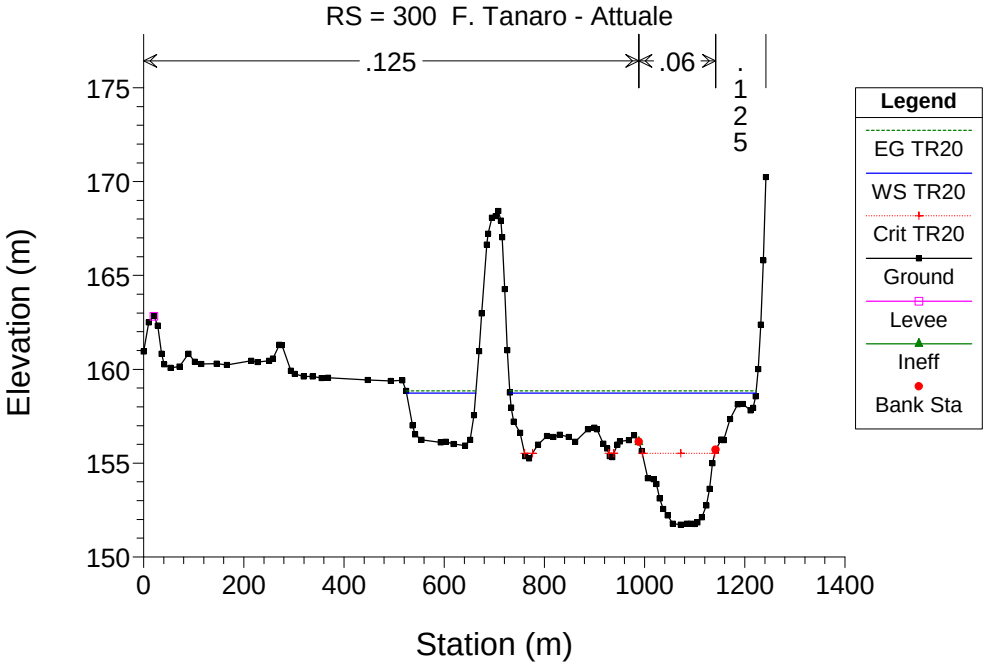

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

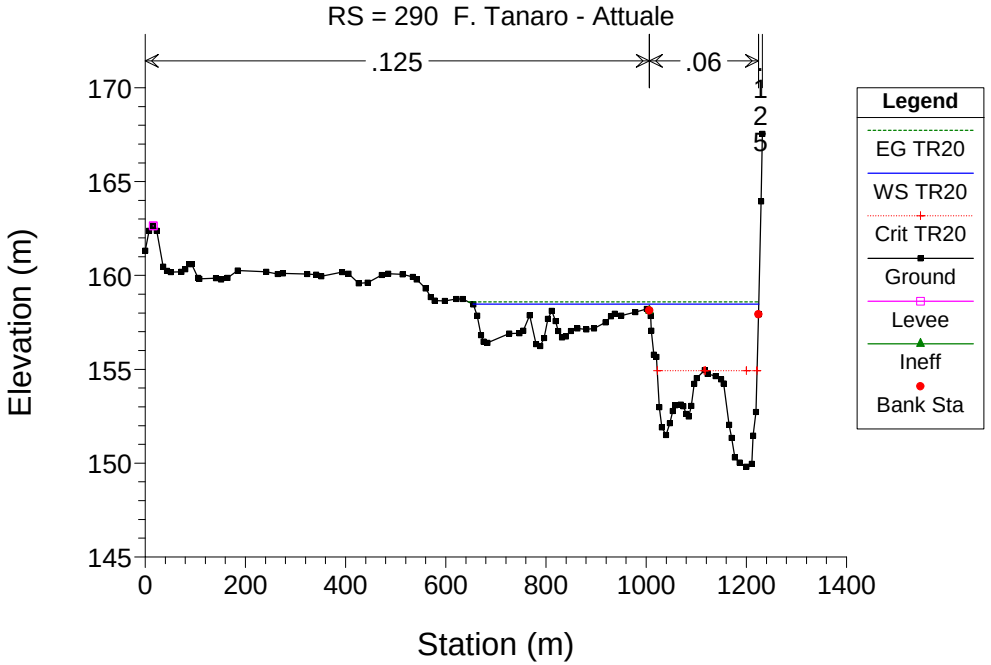

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

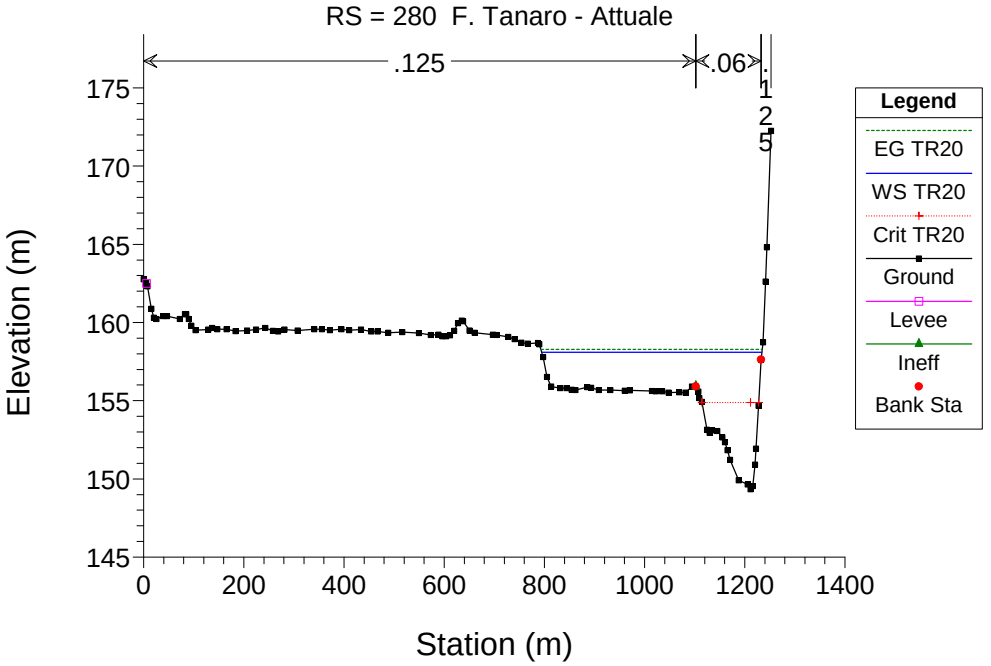

RS = 360 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

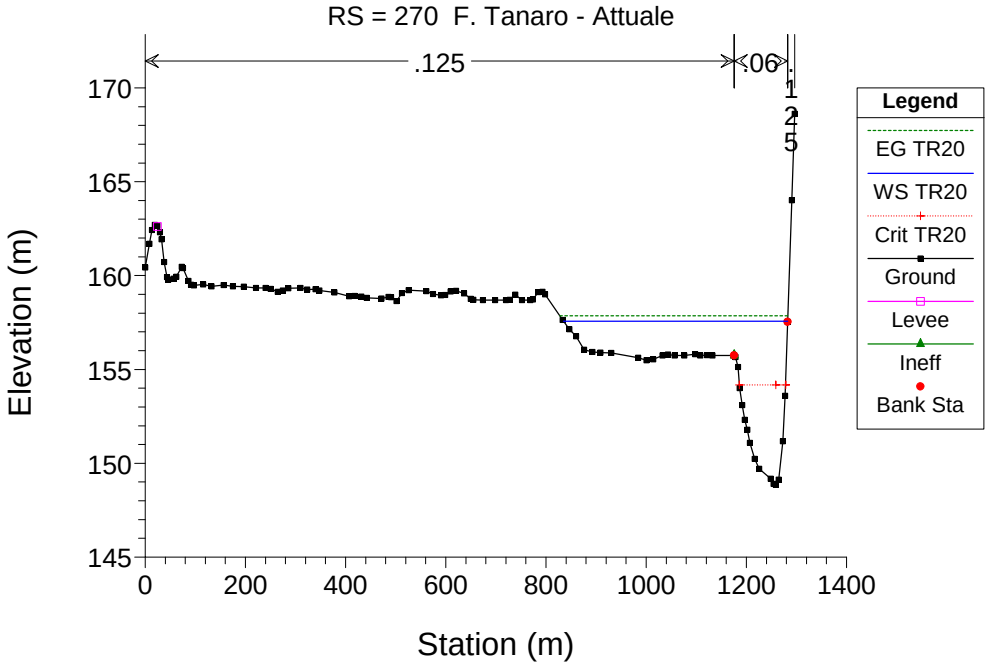

RS = 350 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

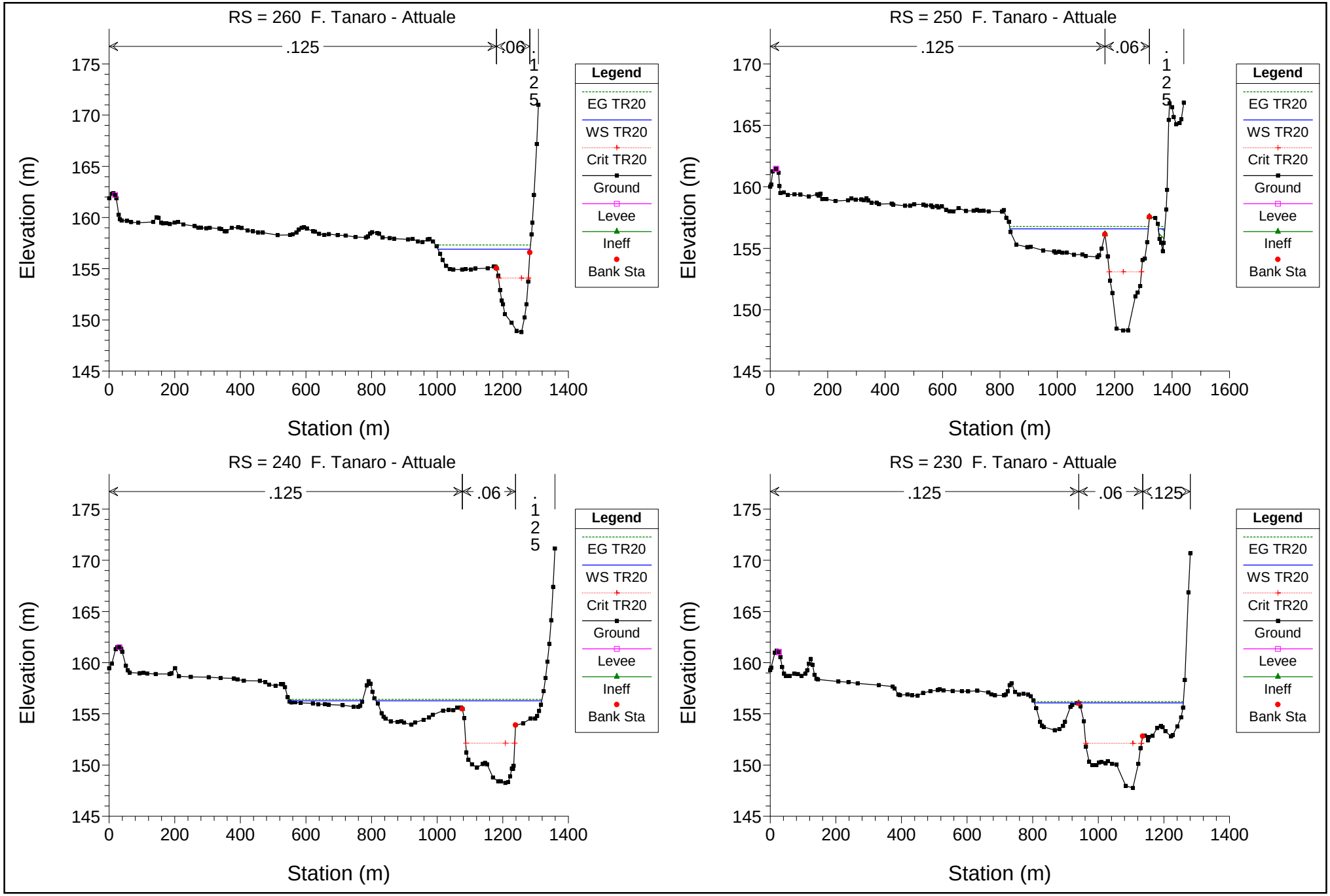

RS = 340 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 310 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

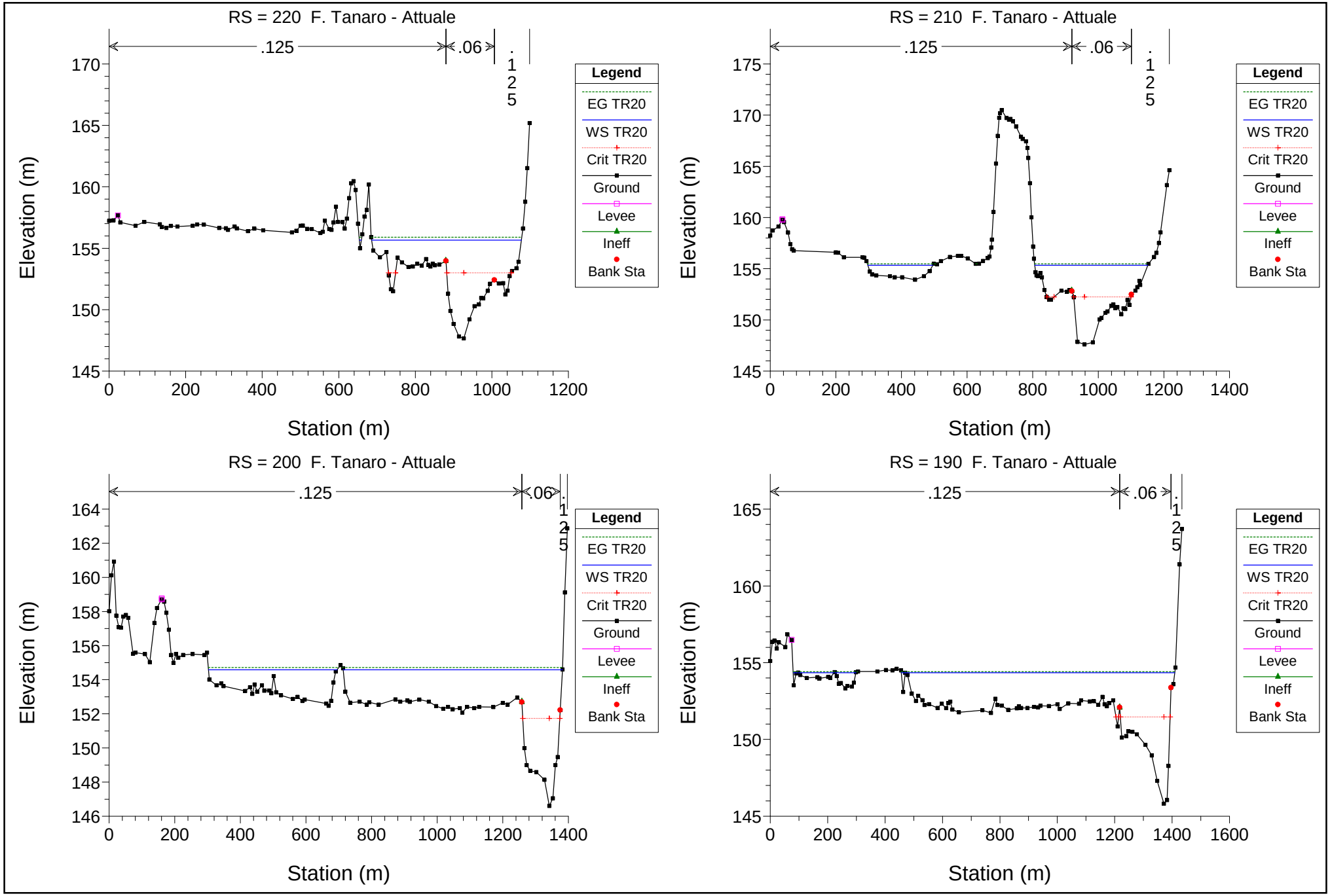

RS = 300 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

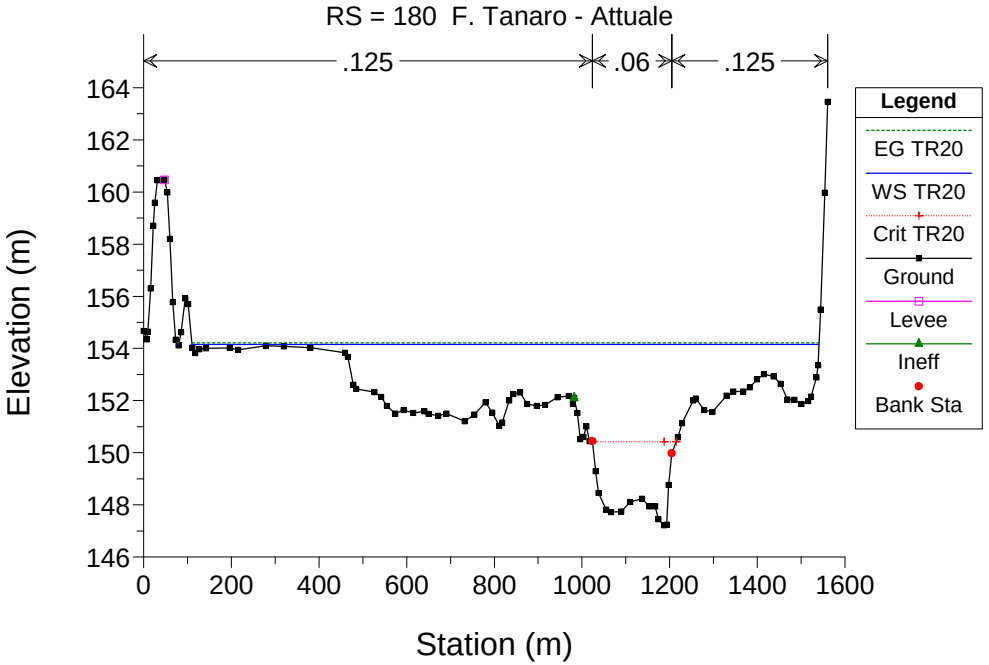

RS = 290 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

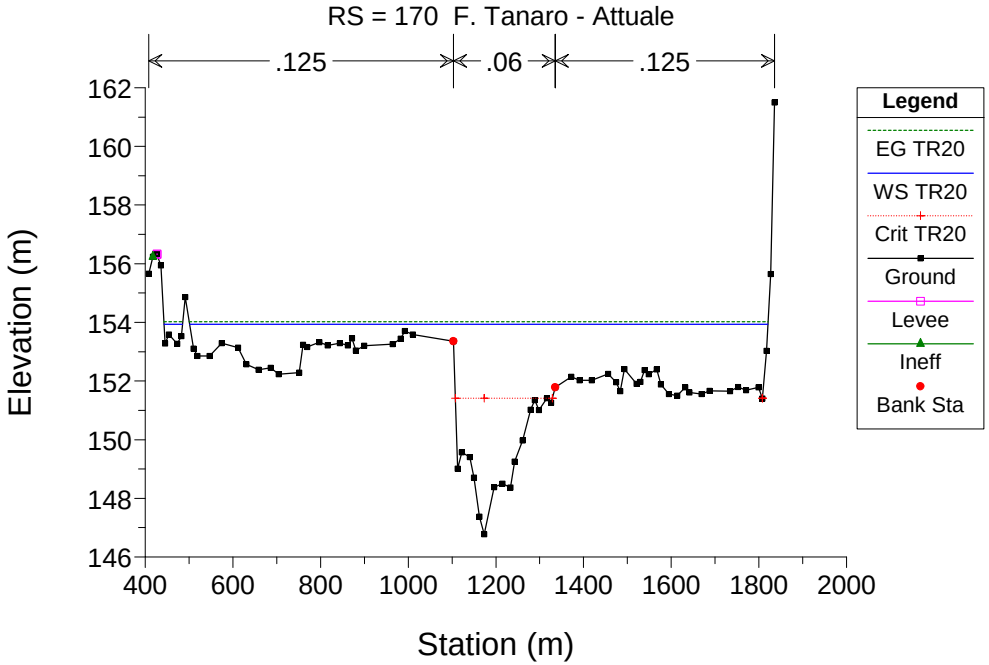

RS = 280 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

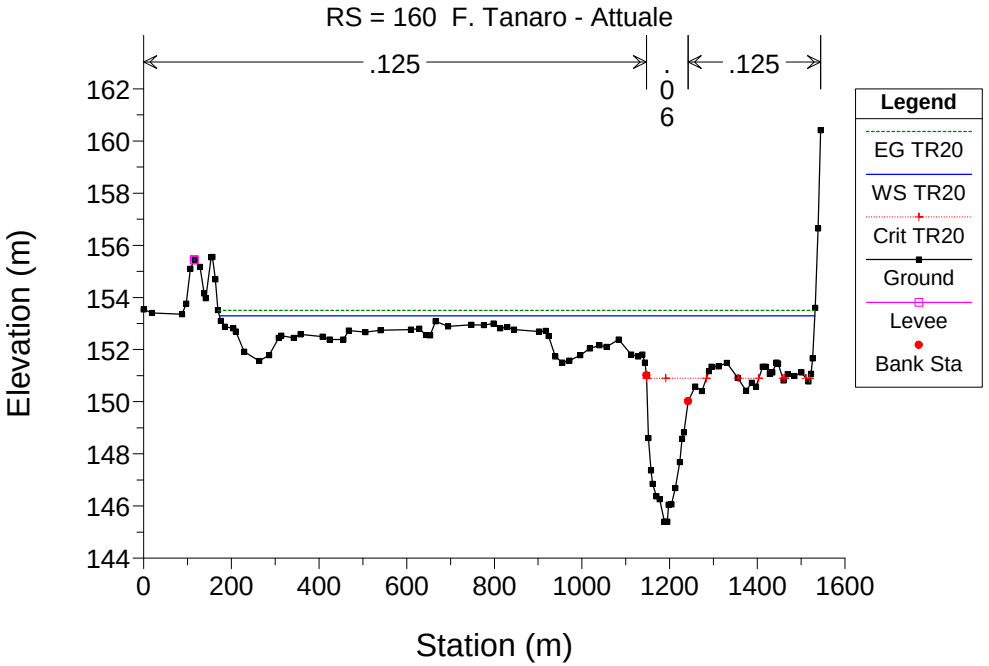

RS = 270 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

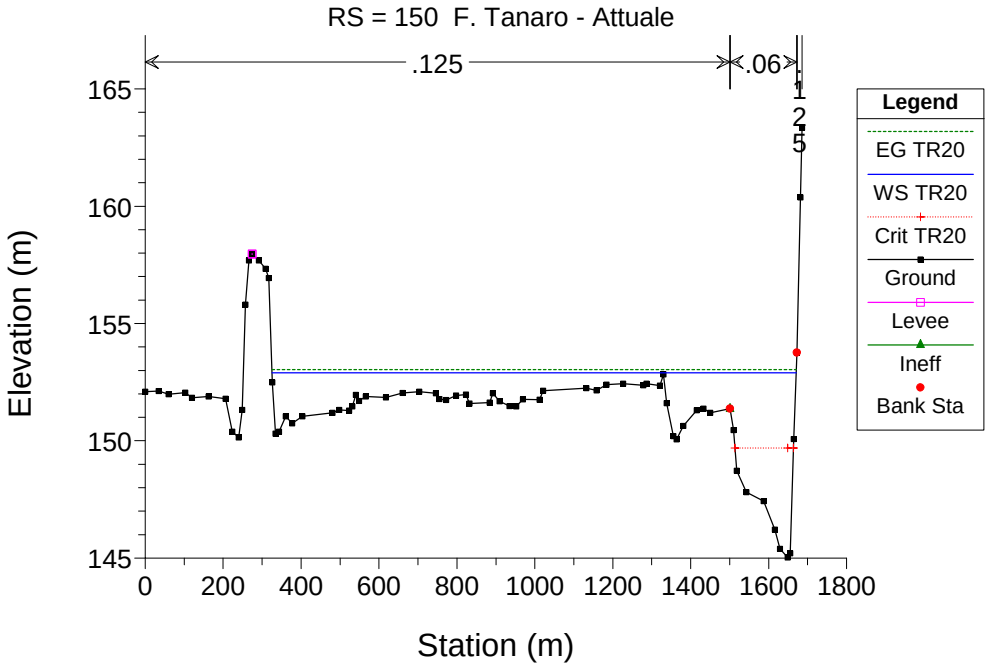

RS = 260 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 230 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

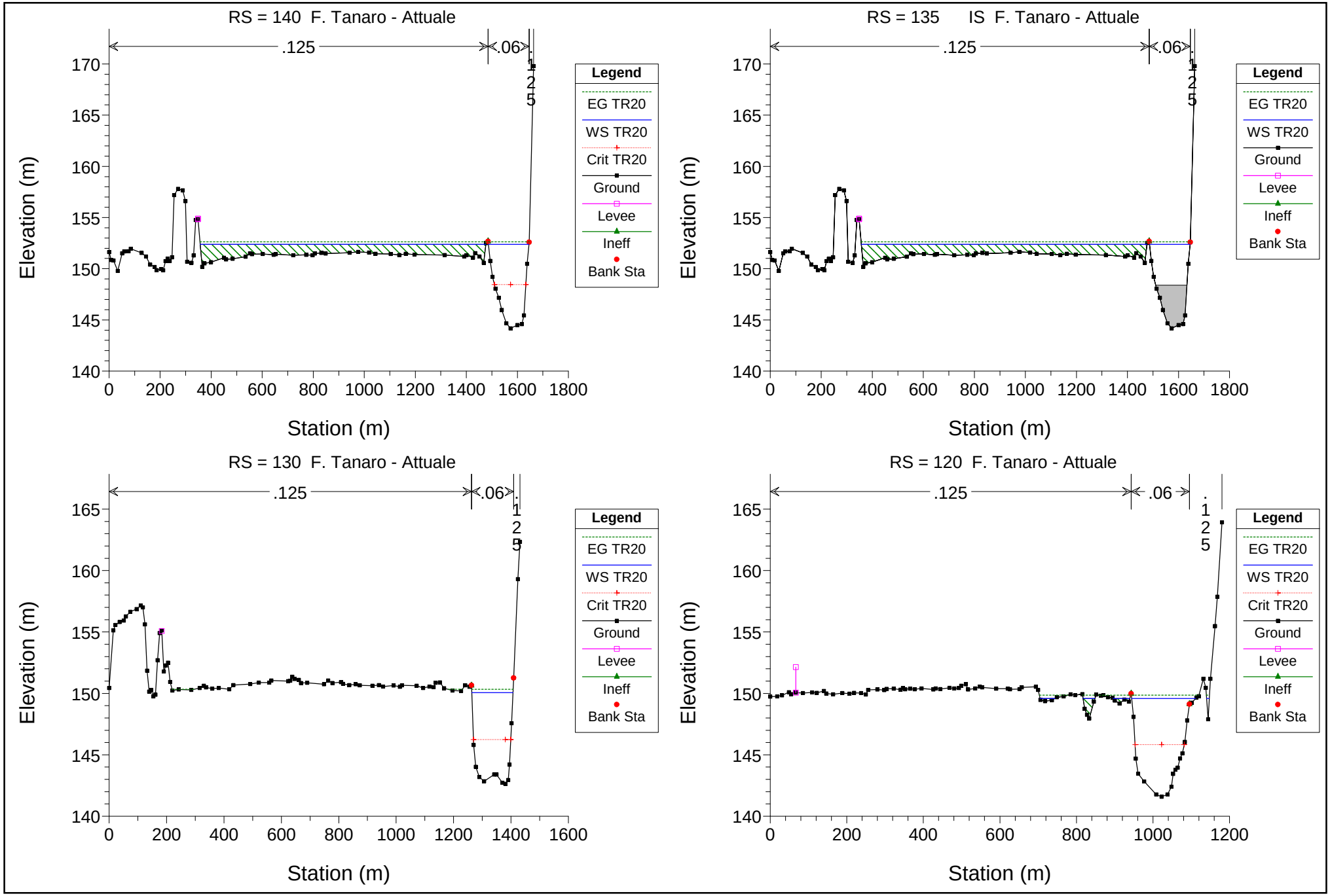

RS = 220 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Attuale
RS = 200 F. Tanaro - Attuale
RS = 190 F. Tanaro - Attuale

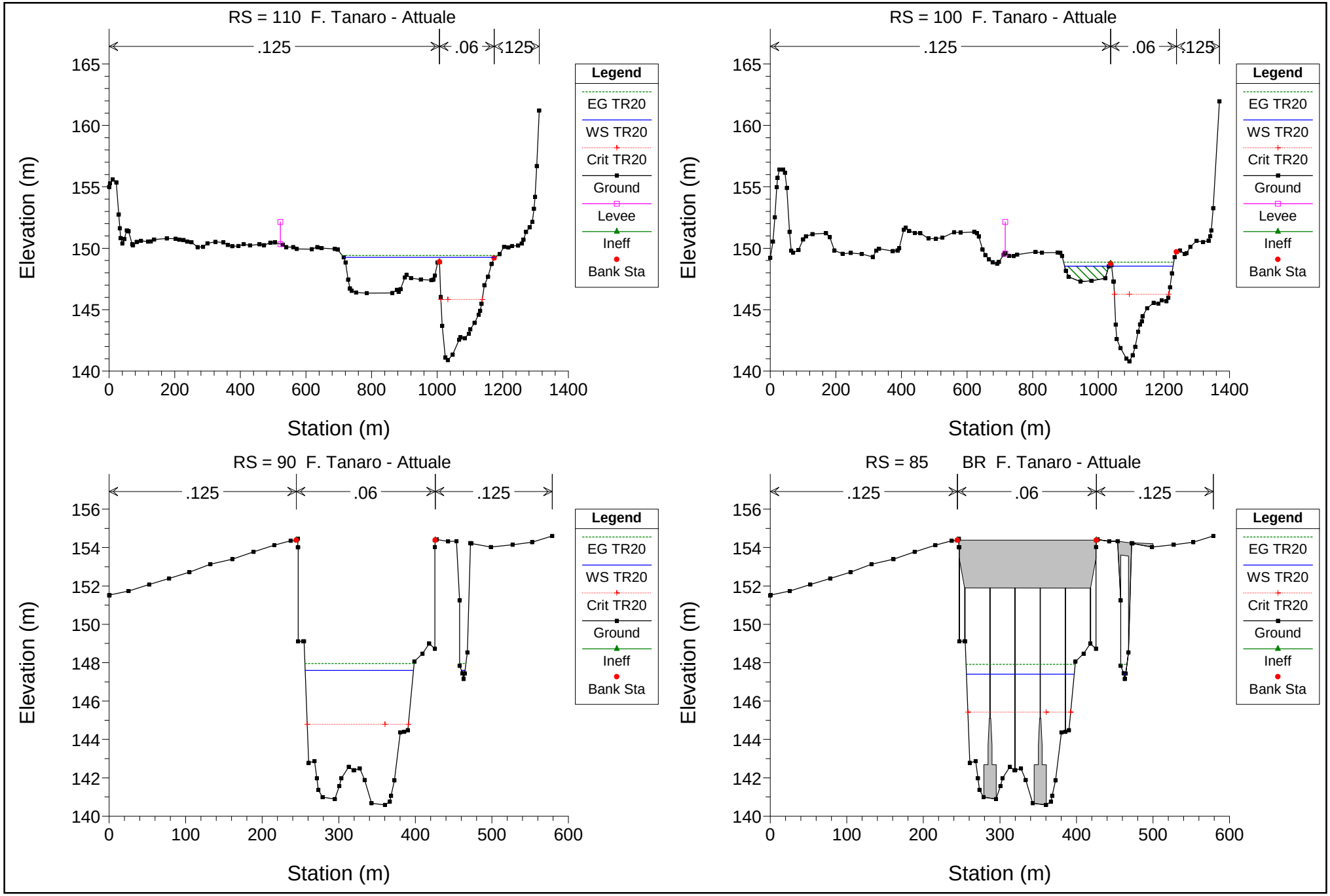

RS = 180 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

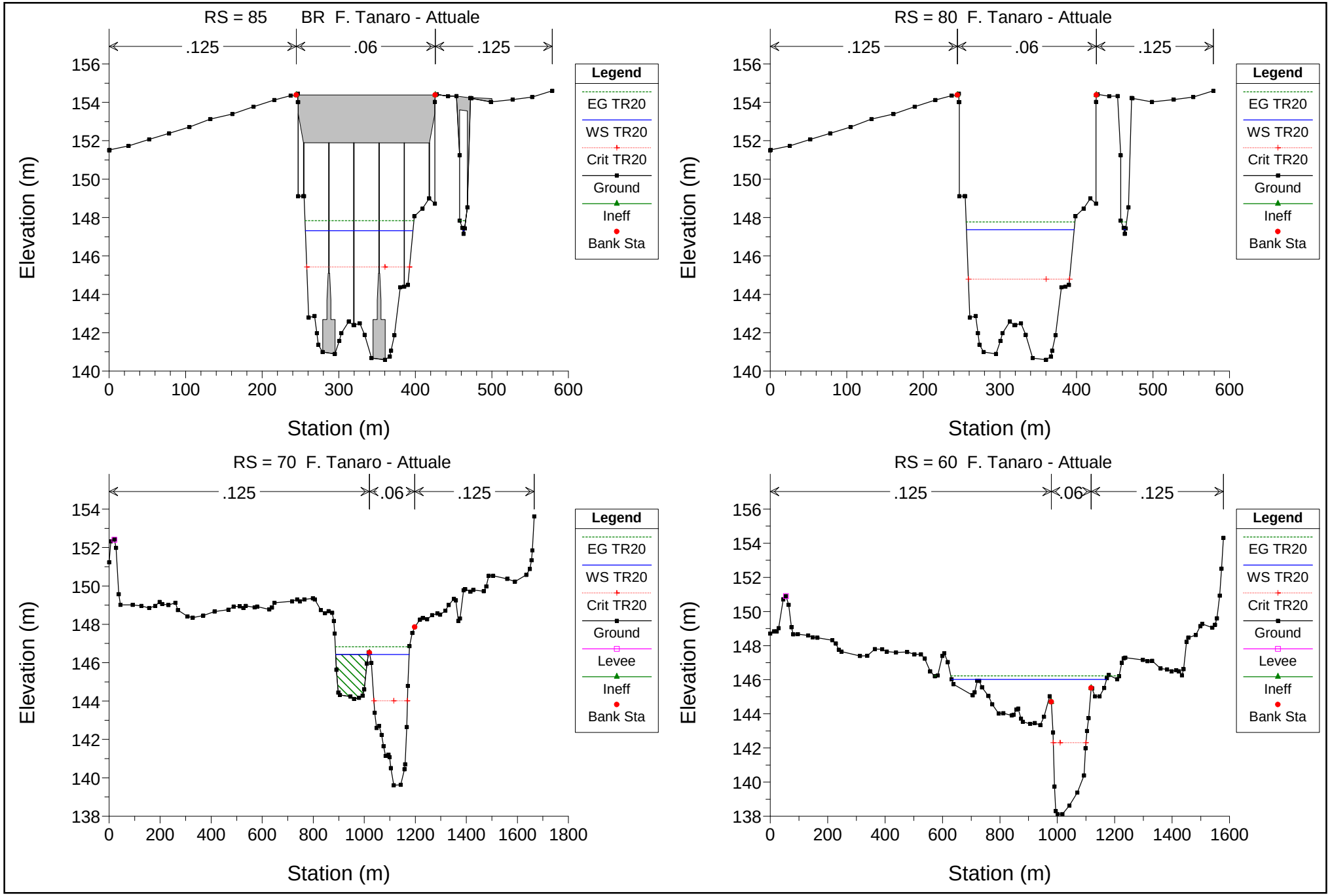

RS = 170 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

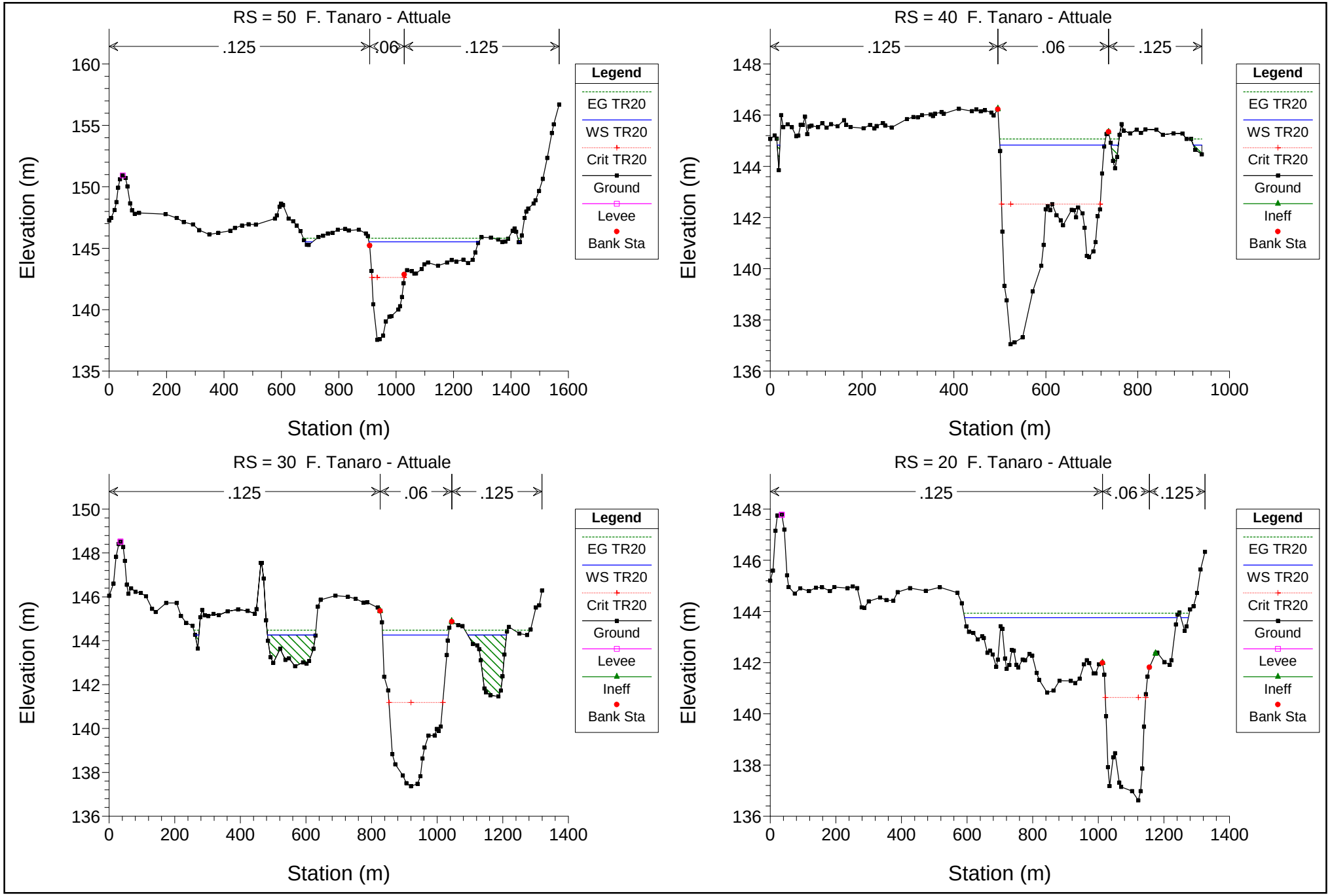

RS = 160 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

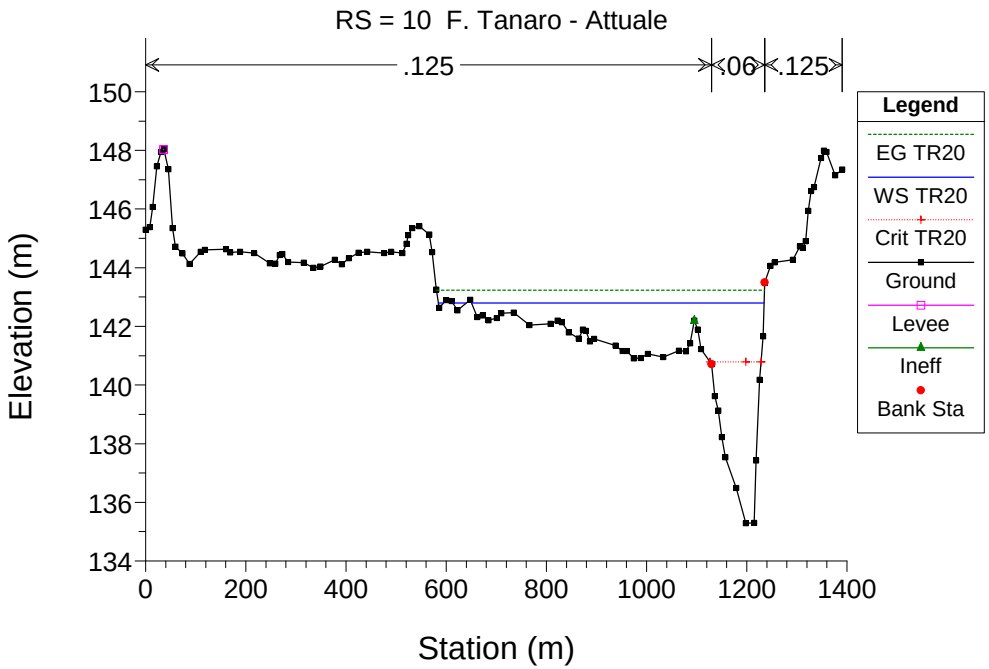

RS = 150 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 140 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 135 IS F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG TR20
WS TR20
Ground
Levee
Ineff
Bank Sta
RS = 130 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 120 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 110 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Attuale
RS = 90 F. Tanaro - Attuale
RS = 85 BR F. Tanaro - Attuale


RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Attuale
RS = 70 F. Tanaro - Attuale
Levee
RS = 60 F. Tanaro - Attuale


RS = 50 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta
RS = 40 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 30 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 20 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

SITUAZIONE ATTUALE
SIMULAZIONE 2

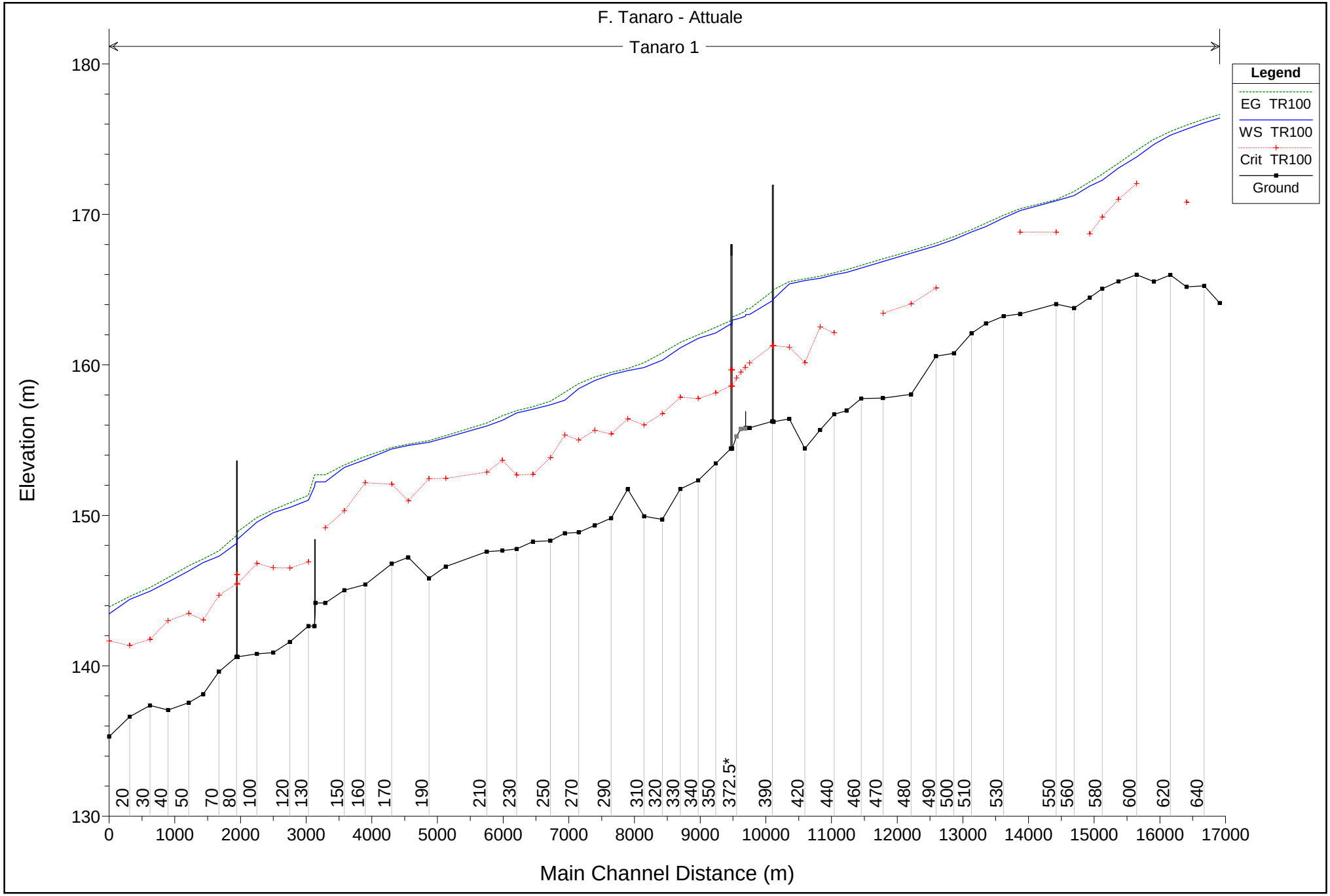
corso d'acqua	**portata al colmo Q_c m^3/s**	**tempo di ritorno anni**
Fiume Tanaro	2750	100

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100

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)	
1	650	TR100	2750.00	164.11	176.40		176.64	0.001428	2.42	2003.76	610.25	0.28
1	640	TR100	2750.00	165.26	176.08		176.33	0.001272	2.40	1887.15	593.14	0.27
1	630	TR100	2750.00	165.18	175.67	170.81	175.93	0.001730	2.30	1225.75	387.85	0.30
1	620	TR100	2750.00	165.98	175.26		175.51	0.001711	2.21	1277.14	402.20	0.29
1	610	TR100	2750.00	165.53	174.66		174.99	0.002425	2.63	1439.63	751.25	0.35
1	600	TR100	2750.00	165.99	173.82	172.05	174.26	0.003649	3.28	1361.75	458.50	0.43
1	590	TR100	2750.00	165.55	173.08	171.00	173.40	0.002671	2.82	1688.00	604.09	0.37
1	580	TR100	2750.00	165.06	172.27	169.82	172.68	0.003179	2.93	1189.61	349.90	0.40
1	570	TR100	2750.00	164.47	171.88	168.71	172.16	0.002028	2.47	1600.73	513.59	0.32
1	560	TR100	2750.00	163.78	171.26		171.54	0.003521	2.57	1640.43	714.78	0.40
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3000.58	1171.46	0.23
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001698	2.08	2997.94	1119.84	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001802	2.09	2113.74	670.06	0.30
1	520	TR100	2750.00	162.75	169.20		169.41	0.002251	2.37	2201.82	1011.61	0.33
1	510	TR100	2750.00	162.10	168.83		168.99	0.001992	2.10	2194.41	727.71	0.31
1	500	TR100	2750.00	160.77	168.34		168.52	0.001636	2.14	1979.63	549.47	0.29
1	490	TR100	2750.00	160.58	167.92	165.12	168.10	0.001601	1.99	1828.78	509.82	0.28
1	480	TR100	2750.00	158.04	167.42	164.06	167.58	0.001258	1.93	2268.47	689.11	0.25
1	470	TR100	2750.00	157.79	166.87	163.43	167.06	0.001451	2.18	2030.77	535.28	0.27
1	460	TR100	2750.00	157.77	166.44		166.62	0.001209	2.00	2216.01	825.61	0.25
1	450	TR100	2750.00	156.96	166.14		166.33	0.001268	2.07	2030.07	721.05	0.26
1	440	TR100	2750.00	156.72	165.99	162.13	166.12	0.000931	1.84	2669.89	787.97	0.22
1	430	TR100	2750.00	155.68	165.75	162.53	165.89	0.001141	2.04	2594.29	663.83	0.25
1	420	TR100	2750.00	154.44	165.60	160.15	165.71	0.000607	1.66	2901.90	685.77	0.18
1	410	TR100	2750.00	156.41	165.37	161.17	165.53	0.001075	2.01	2206.65	524.65	0.24
1	400	TR100	2750.00	156.22	164.39	161.27	165.00	0.003516	3.52	889.52	168.54	0.42
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.27	161.28	164.90	0.003751	3.60	868.22	163.59	0.43
1	380	TR100	2750.00	155.82	163.34	160.13	163.72	0.002491	2.74	1020.87	211.67	0.35
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	162.97	158.59	163.18	0.001177	2.00	1375.63	205.93	0.25
1	365		Bridge									
1	360	TR100	2750.00	154.43	162.72	158.59	162.94	0.001331	2.08	1323.56	205.23	0.26
1	350	TR100	2750.00	153.45	162.12	158.14	162.50	0.002190	2.74	1007.03	190.70	0.34
1	340	TR100	2750.00	152.32	161.76	157.77	162.00	0.001393	2.15	1369.19	375.41	0.27
1	330	TR100	2750.00	151.75	161.14	157.85	161.50	0.002339	2.69	1180.90	426.78	0.35
1	320	TR100	2750.00	149.73	160.31	156.76	160.80	0.002677	3.29	1272.98	435.24	0.38
1	310	TR100	2750.00	149.94	159.83	156.01	160.15	0.001899	2.82	1796.48	725.31	0.32
1	300	TR100	2750.00	151.73	159.61	156.41	159.76	0.001112	1.96	2533.06	824.26	0.24
1	290	TR100	2750.00	149.81	159.36	155.41	159.50	0.001005	1.78	2171.35	667.43	0.23

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (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)	
1	280	TR100	2750.00	149.34	158.96	155.65	159.19	0.001640	2.39	1887.89	499.03	0.29
1	270	TR100	2750.00	148.86	158.43	155.01	158.75	0.002082	2.80	1649.80	470.91	0.33
1	260	TR100	2750.00	148.81	157.66	155.34	158.18	0.003381	3.44	1144.89	310.83	0.42
1	250	TR100	2750.00	148.31	157.35	153.83	157.58	0.001787	2.35	1786.77	527.30	0.30
1	240	TR100	2750.00	148.26	157.05	152.72	157.22	0.001029	1.98	2241.19	758.74	0.24
1	230	TR100	2750.00	147.77	156.80	152.69	156.95	0.001029	1.86	2021.41	483.86	0.23
1	220	TR100	2750.00	147.66	156.32	153.66	156.62	0.002275	2.71	1567.39	433.11	0.34
1	210	TR100	2750.00	147.59	155.94	152.87	156.14	0.001539	2.15	1897.58	658.06	0.28
1	200	TR100	2750.00	146.60	155.16	152.46	155.30	0.001406	2.17	2915.17	1087.62	0.27
1	190	TR100	2750.00	145.82	154.86	152.43	154.97	0.001109	1.76	3289.48	1333.11	0.24
1	180	TR100	2750.00	147.21	154.65	150.97	154.73	0.000673	1.52	3901.53	1448.97	0.19
1	170	TR100	2750.00	146.78	154.40	152.07	154.50	0.001153	1.63	3206.29	1373.10	0.23
1	160	TR100	2750.00	145.40	153.69	152.17	153.93	0.002150	2.69	2598.81	1363.64	0.34
1	150	TR100	2750.00	145.03	153.18	150.30	153.35	0.001607	2.11	2690.51	1346.87	0.28
1	140	TR100	2750.00	144.17	152.22	149.18	152.69	0.003249	3.03	908.20	1275.87	0.40
1	135		Inl Struct									
1	130	TR100	2750.00	142.64	151.01	146.90	151.34	0.001793	2.57	1422.69	1103.76	0.31
1	120	TR100	2750.00	141.58	150.52	146.50	150.83	0.001773	2.52	1478.75	1026.92	0.31
1	110	TR100	2750.00	140.88	150.17	146.51	150.38	0.001576	2.20	2009.59	692.31	0.28
1	100	TR100	2750.00	140.79	149.55	146.81	149.86	0.002686	2.54	1300.15	403.89	0.36
1	90	TR100	2750.00	140.59	148.41	145.44	148.91	0.003450	3.11	885.23	162.30	0.41
1	85		Bridge									
1	80	TR100	2750.00	140.59	148.13	145.44	148.67	0.003787	3.26	843.01	153.53	0.43
1	70	TR100	2750.00	139.61	147.28	144.68	147.65	0.003220	2.84	1218.52	298.84	0.40
1	60	TR100	2750.00	138.12	146.86	143.05	147.09	0.001540	2.35	1941.33	740.77	0.29
1	50	TR100	2750.00	137.54	146.31	143.47	146.66	0.002427	2.87	1598.63	711.76	0.36
1	40	TR100	2750.00	137.06	145.57	142.99	145.86	0.002661	2.41	1217.14	582.53	0.35
1	30	TR100	2750.00	137.37	144.95	141.76	145.21	0.002128	2.31	1457.32	664.24	0.32
1	20	TR100	2750.00	136.62	144.41	141.35	144.61	0.001661	2.30	2138.86	740.06	0.29
1	10	TR100	2750.00	135.29	143.45	141.65	143.91	0.004005	3.39	1523.40	656.99	0.45


F. Tanaro - Attuale
Tanaro 1
Legend
EG TR100
WS TR100
Crit TR100
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
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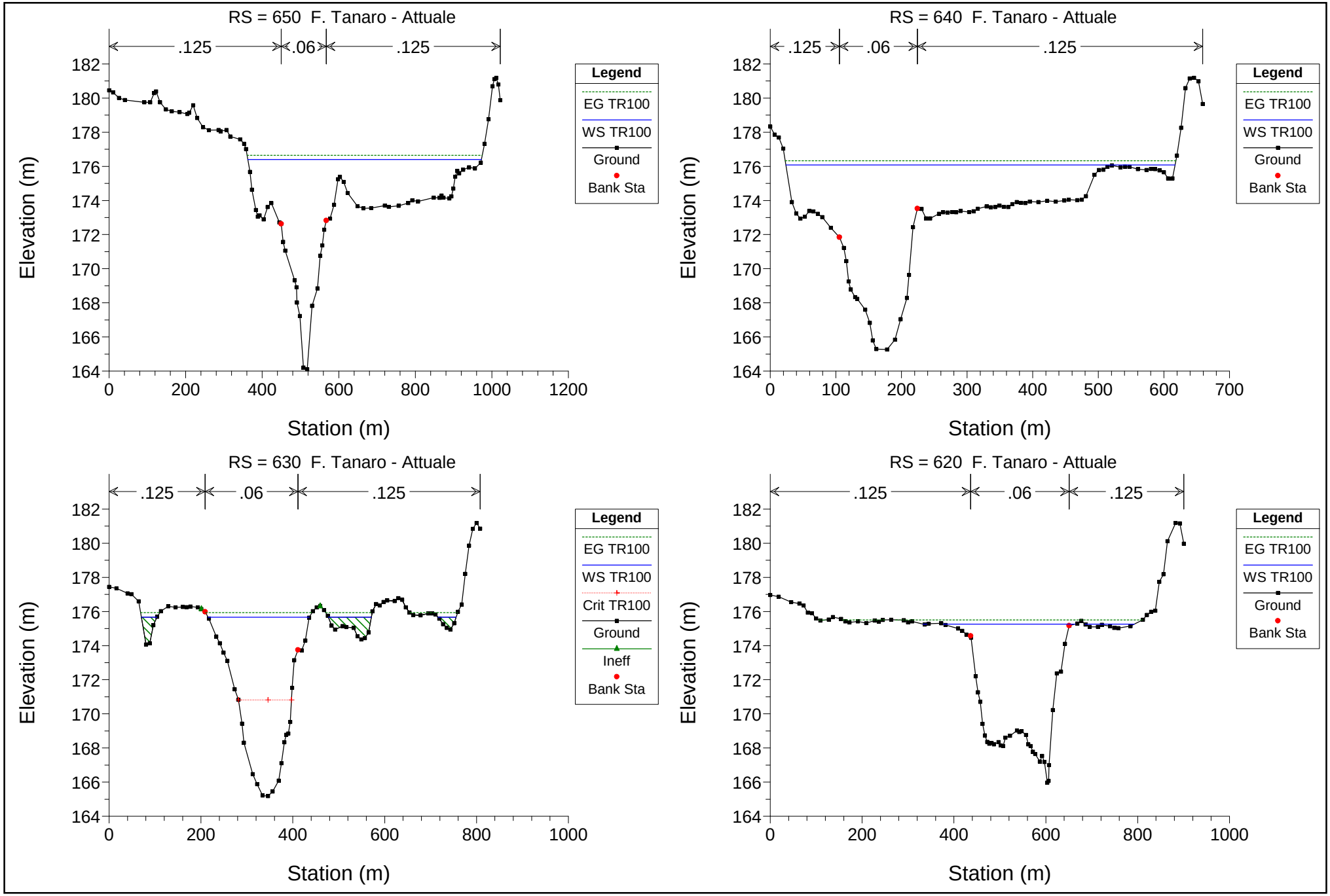
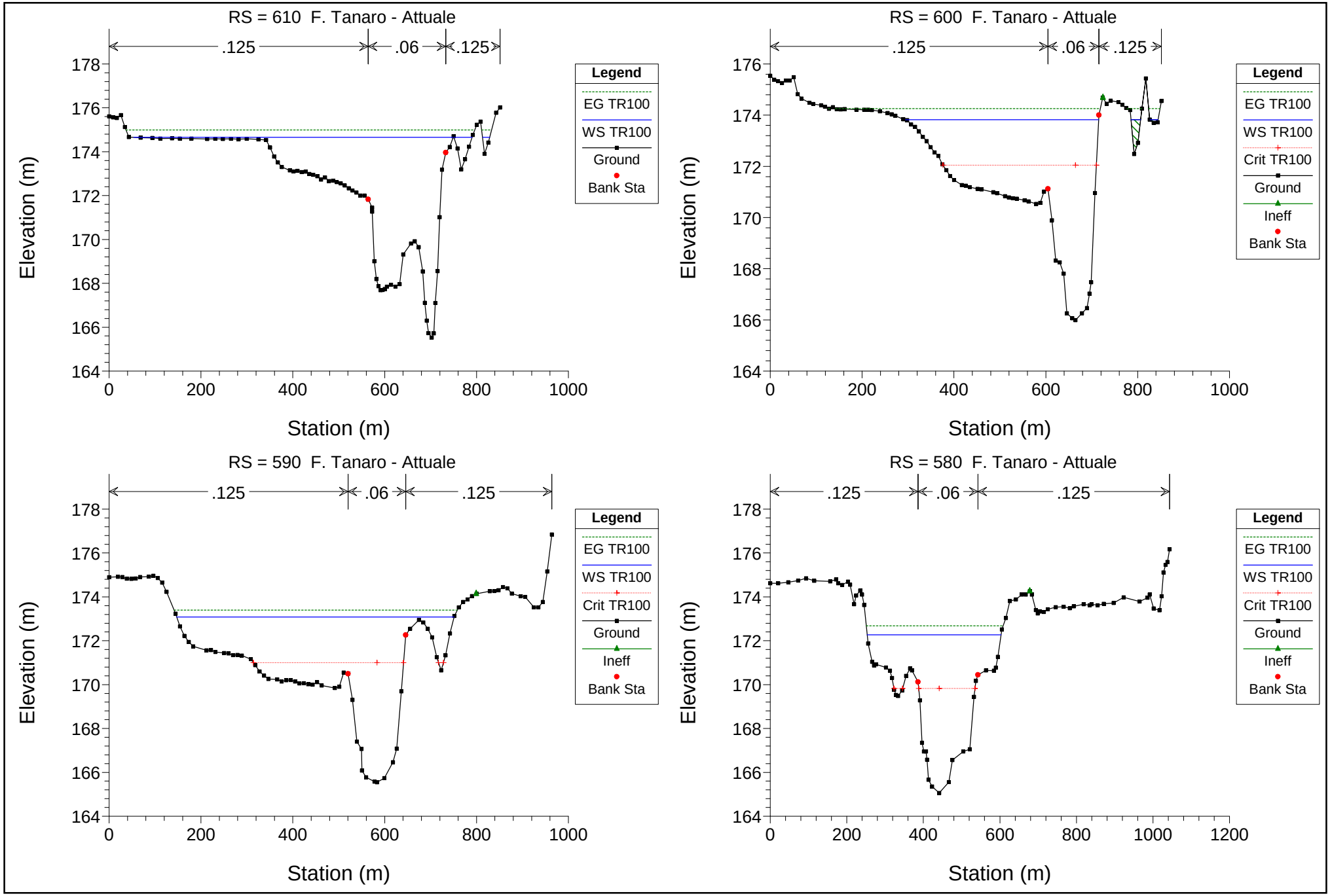
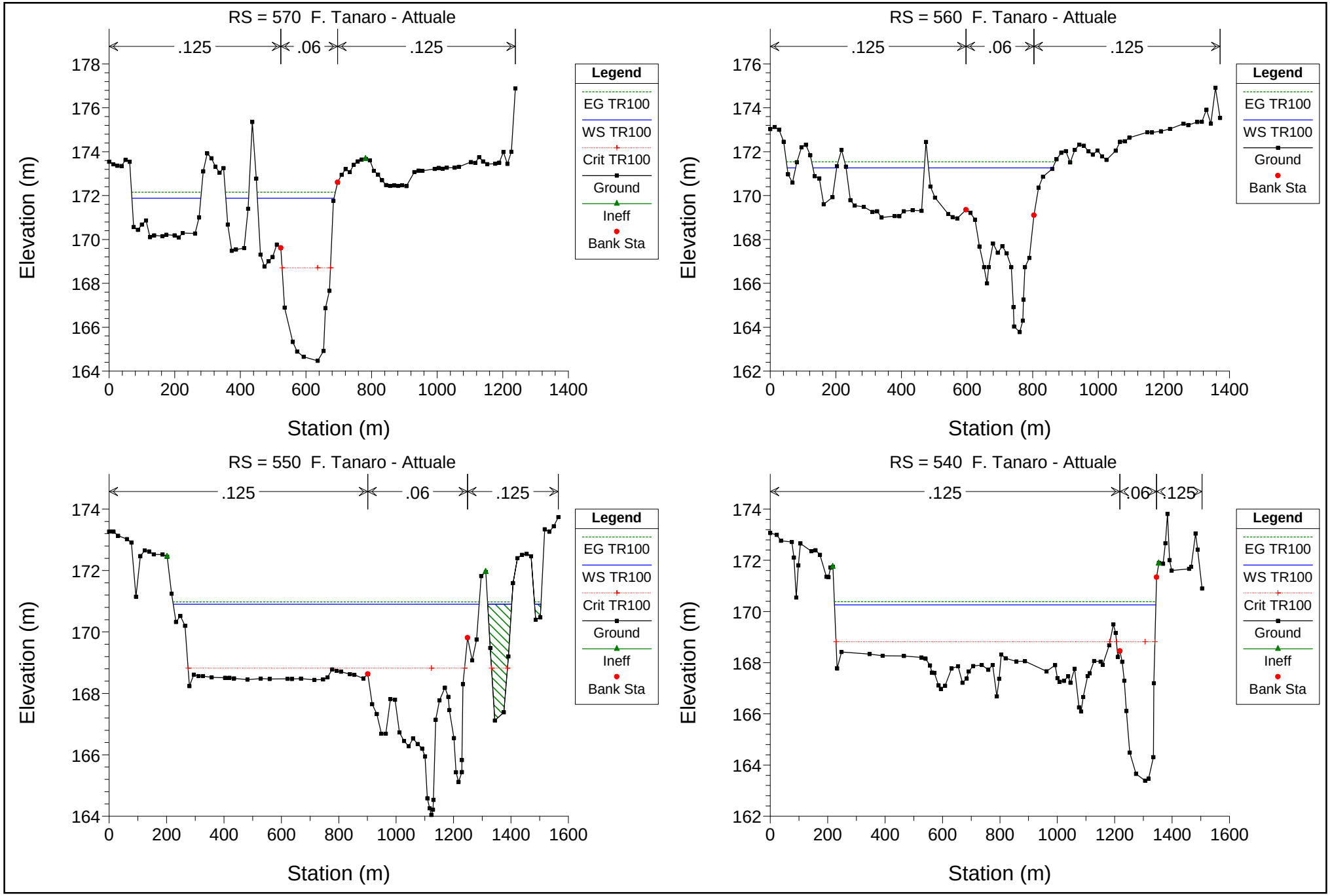
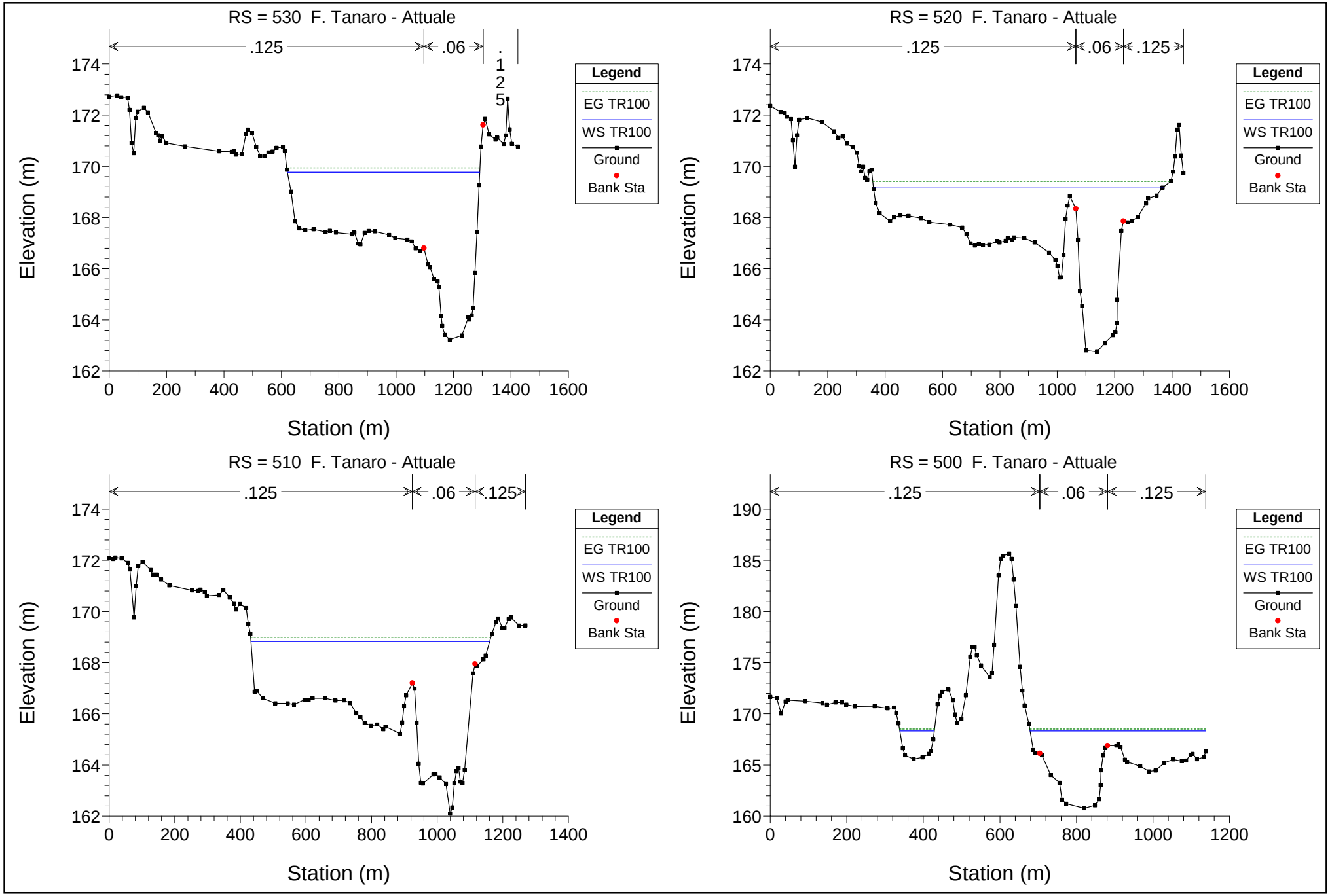
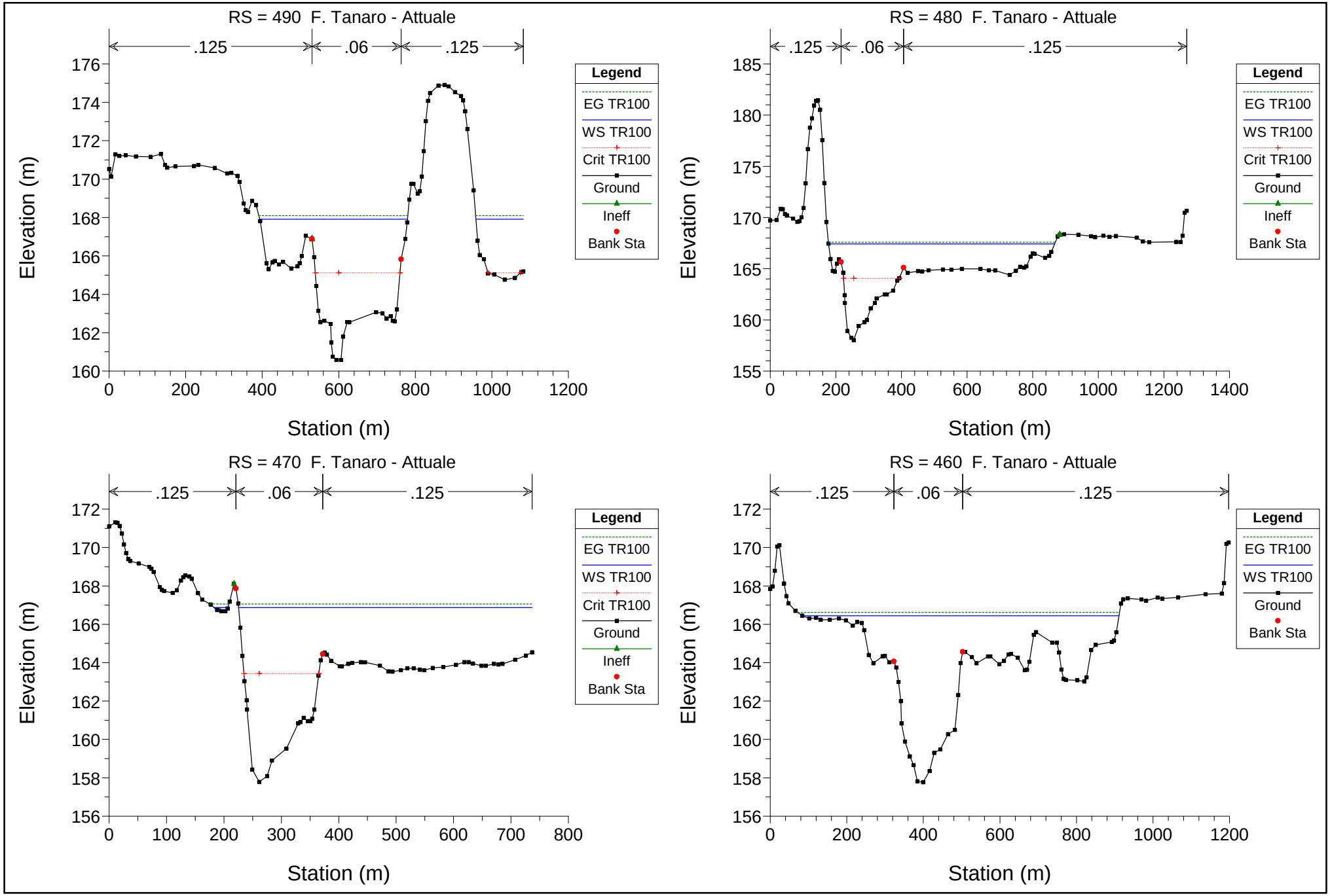
510
530
550
560
580
600
620
640

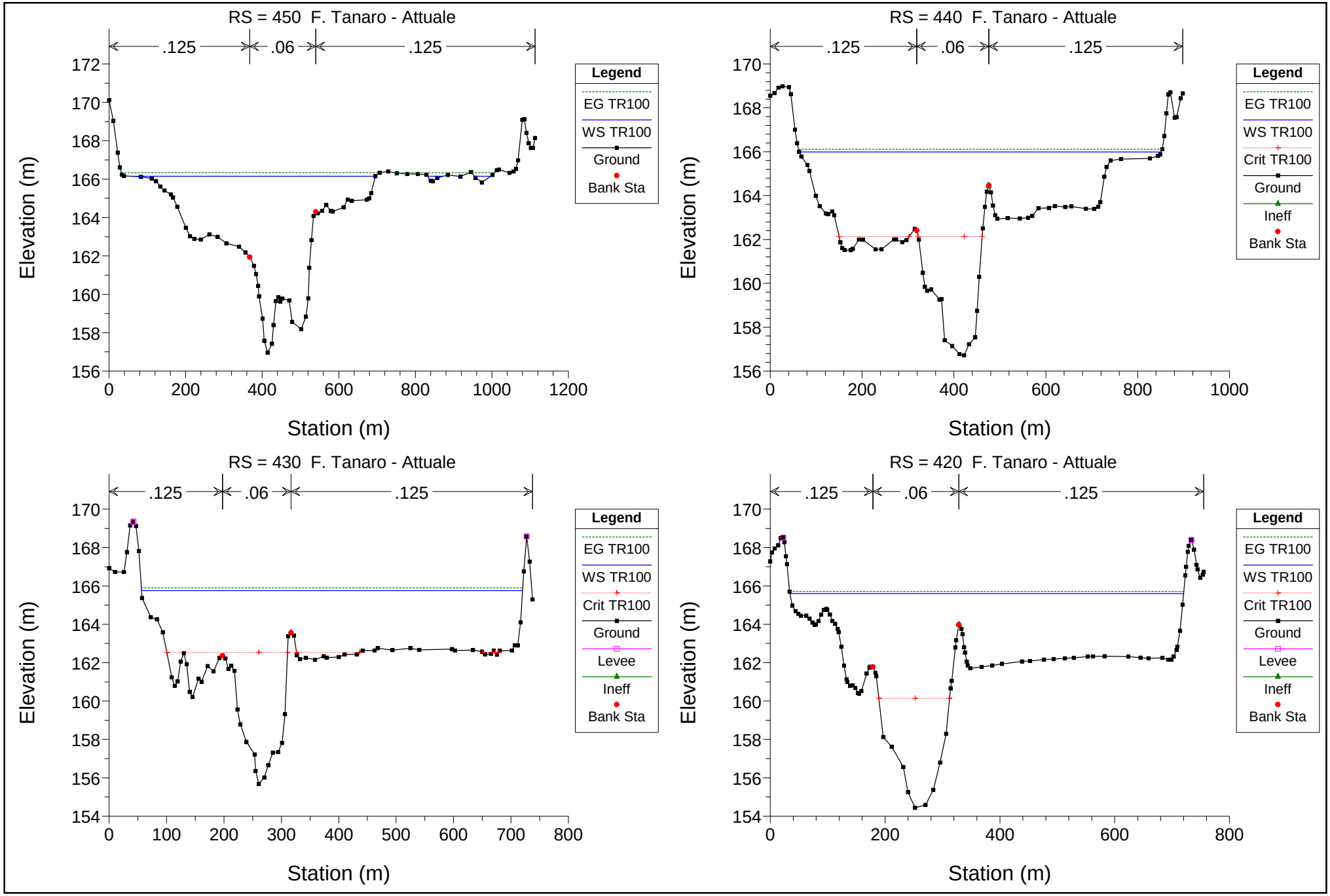

RS = 650 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta
RS = 640 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta
RS = 630 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta

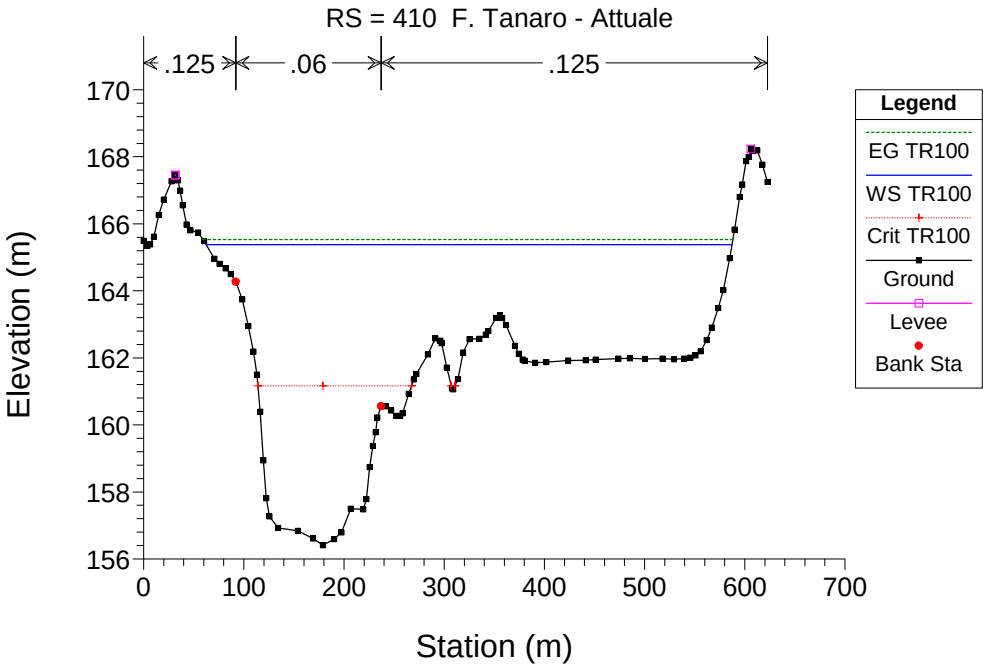

RS = 610 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 600 F. Tanaro - Attuale
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 590 F. Tanaro - Attuale
RS = 580 F. Tanaro - Attuale

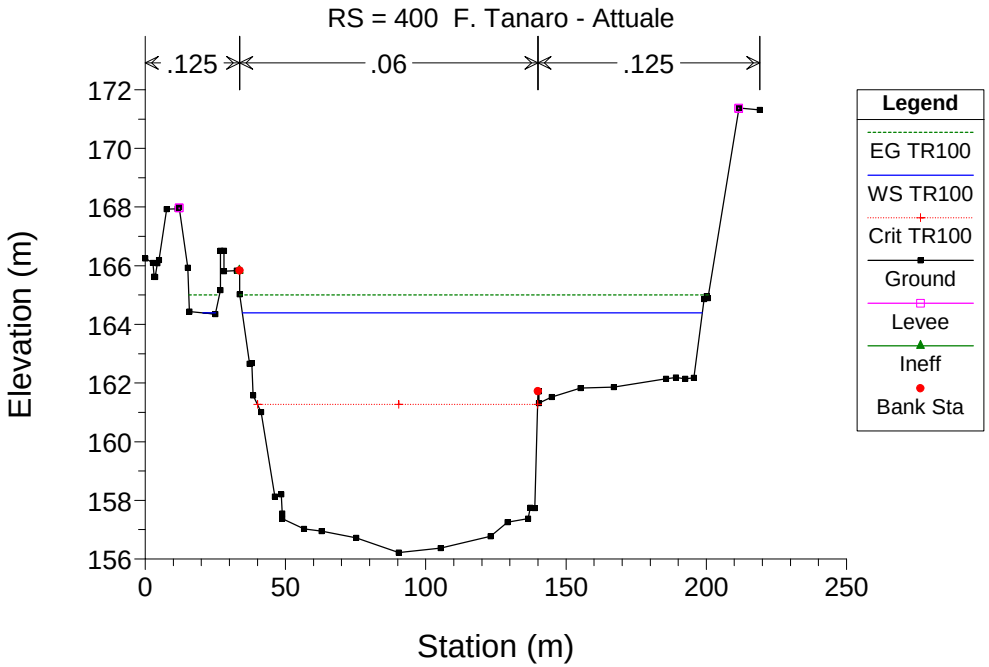

RS = 570 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Attuale
RS = 550 F. Tanaro - Attuale
RS = 540 F. Tanaro - Attuale

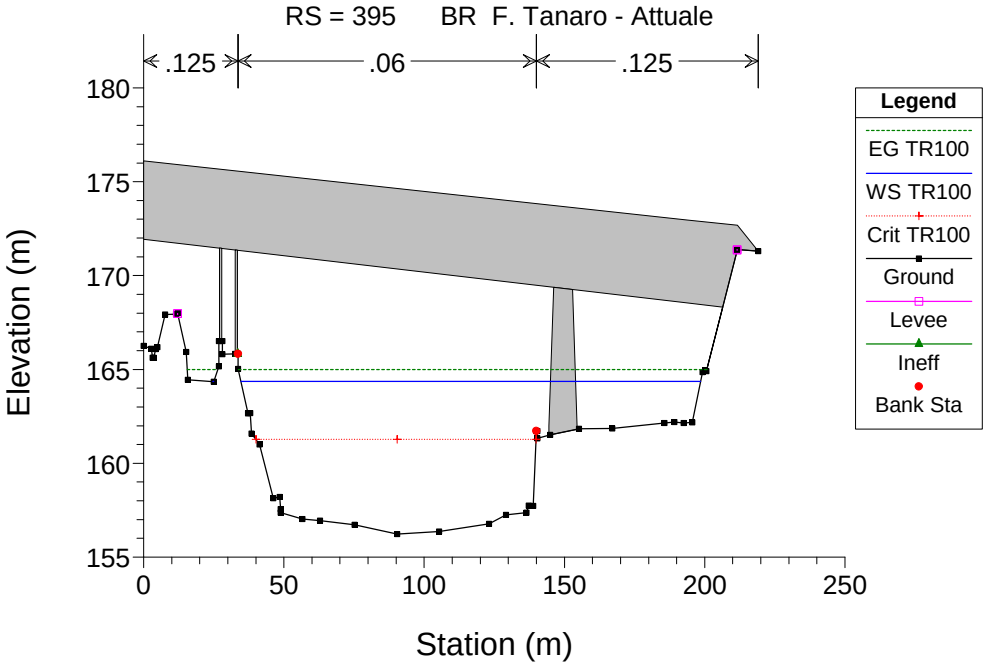

RS = 530 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)

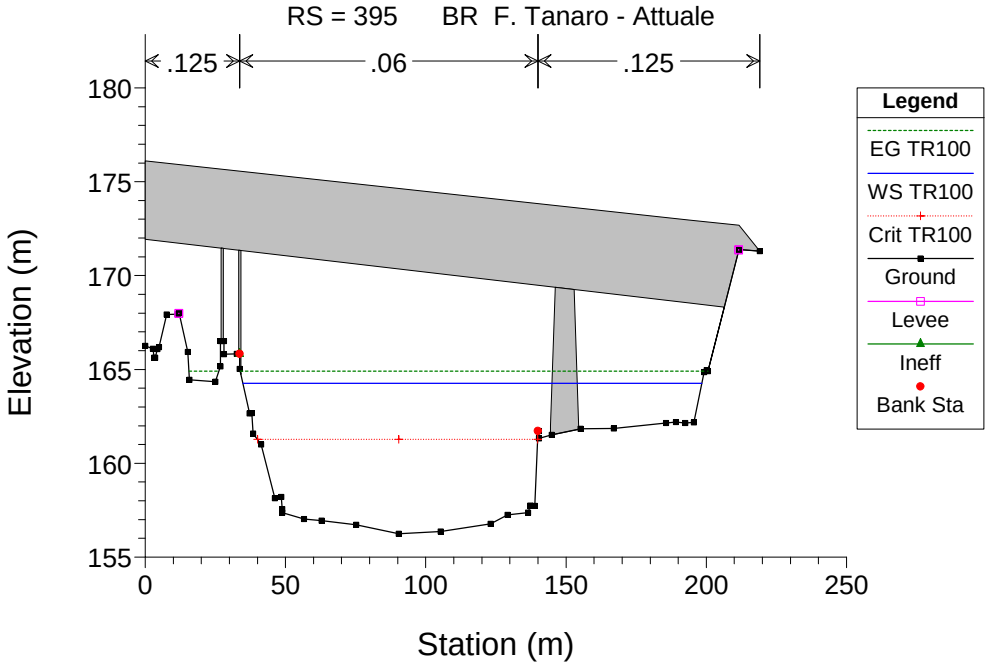

RS = 490 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 470 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 460 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta


RS = 450 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta
RS = 440 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 430 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 420 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 410 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta


RS = 400 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 395 BR F. Tanaro - Attuale
.125
.06
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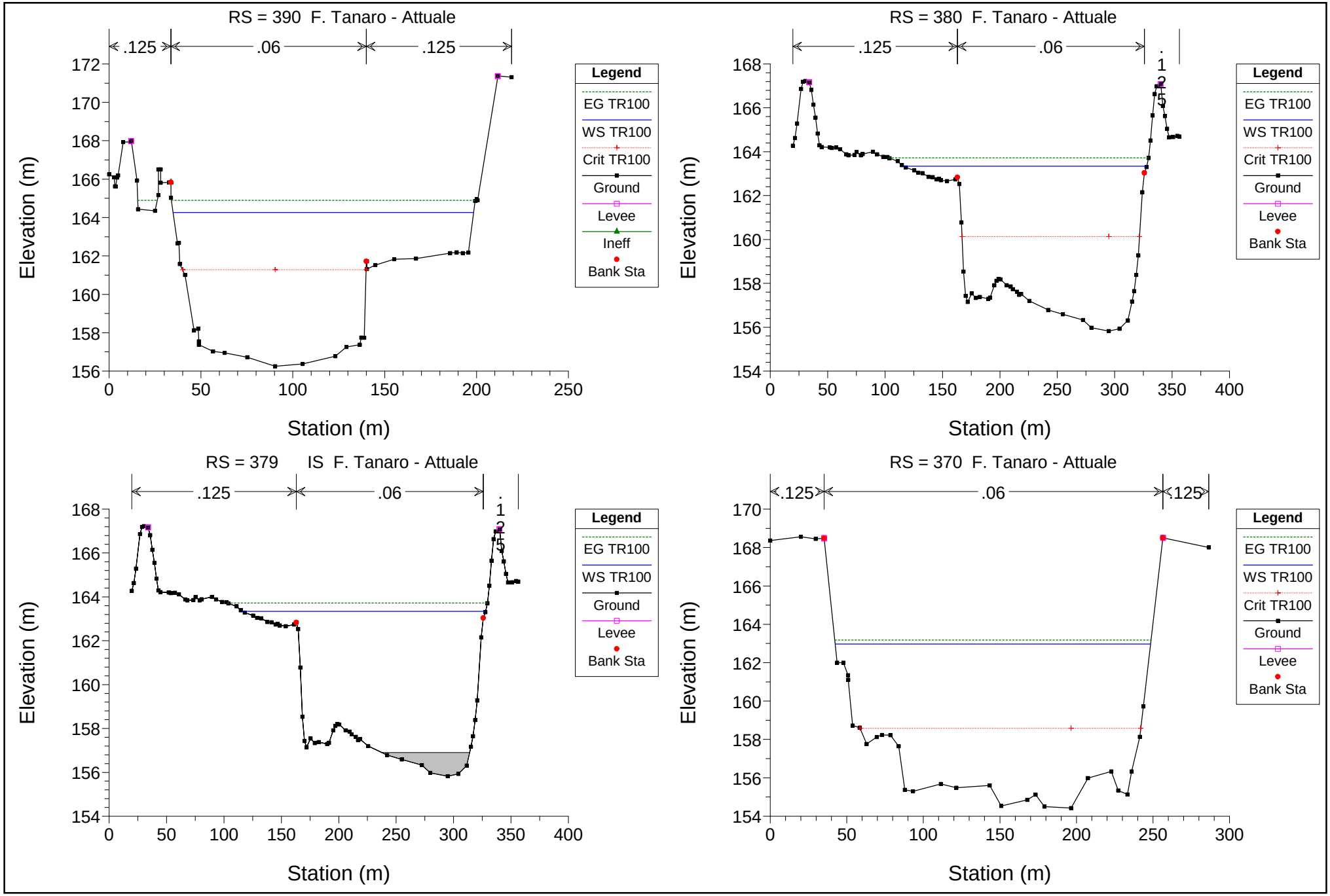
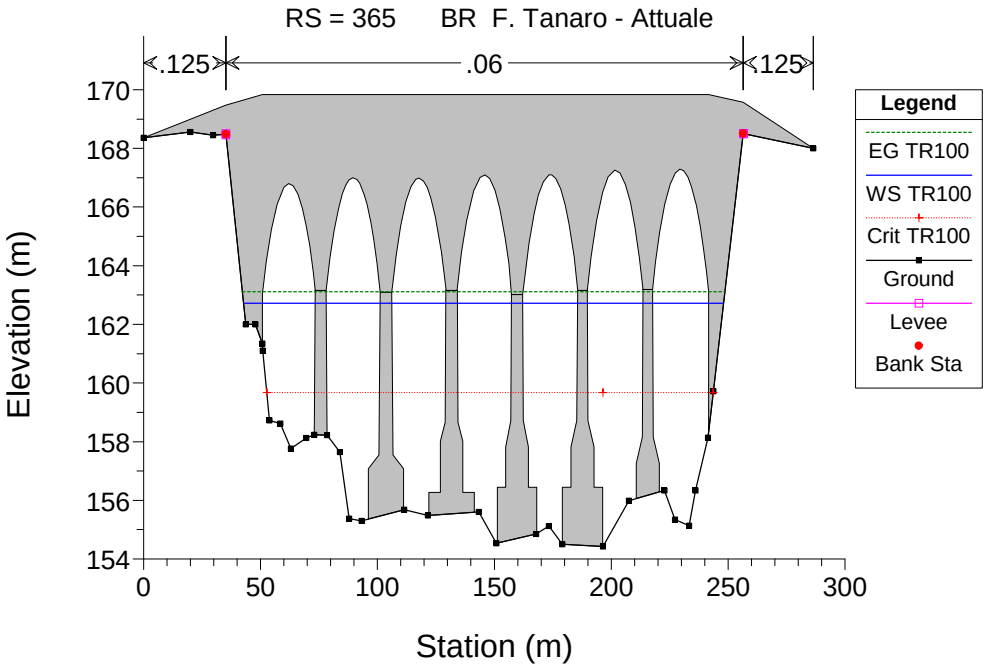
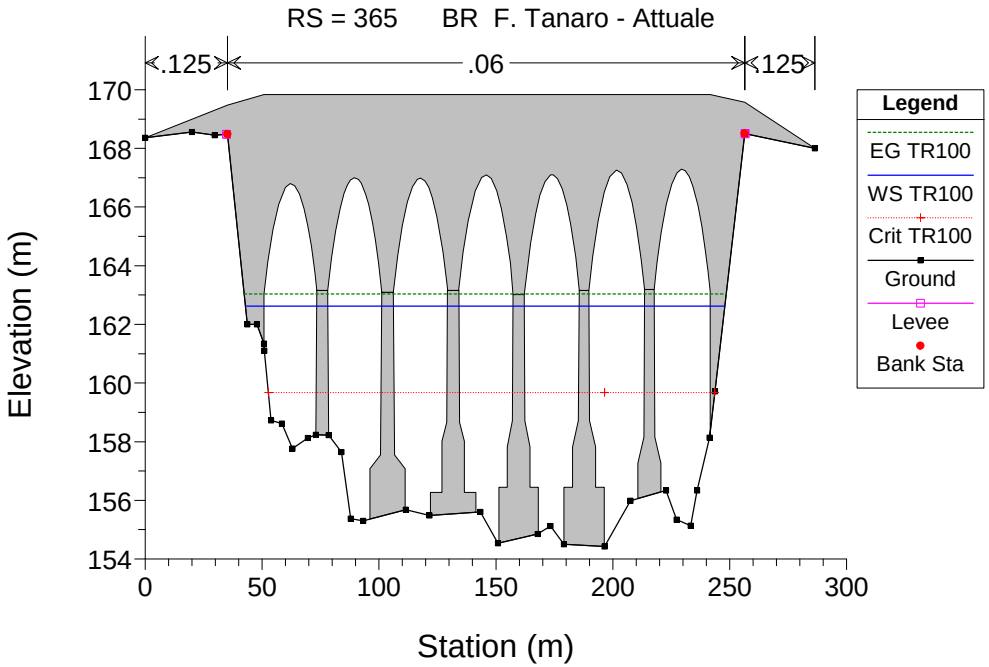
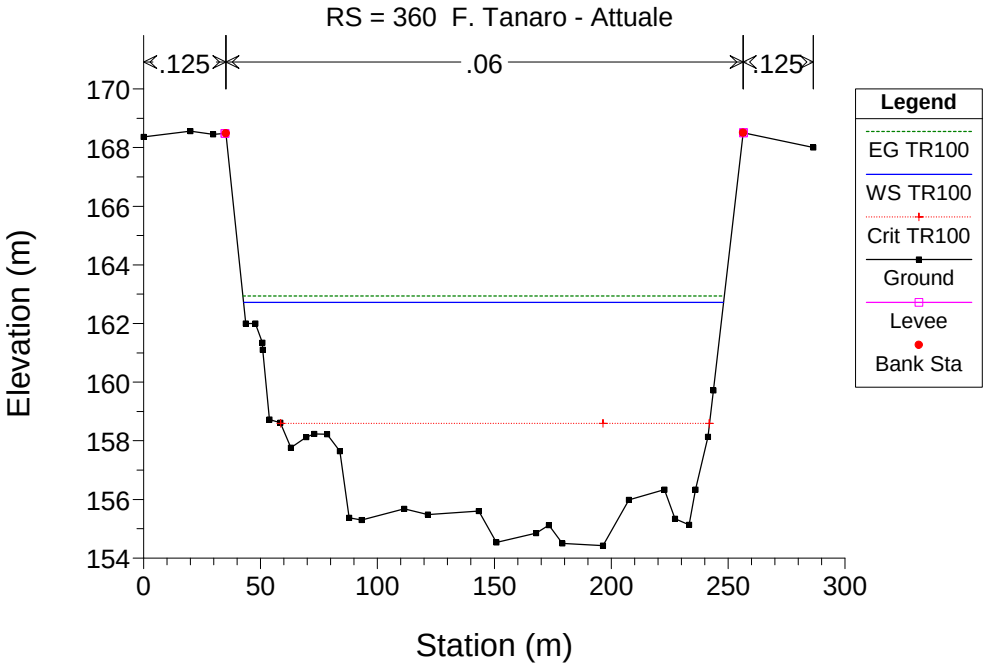
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 390 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 380 F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 379 IS F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Levee
Bank Sta
RS = 370 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta


RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta


RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta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.06
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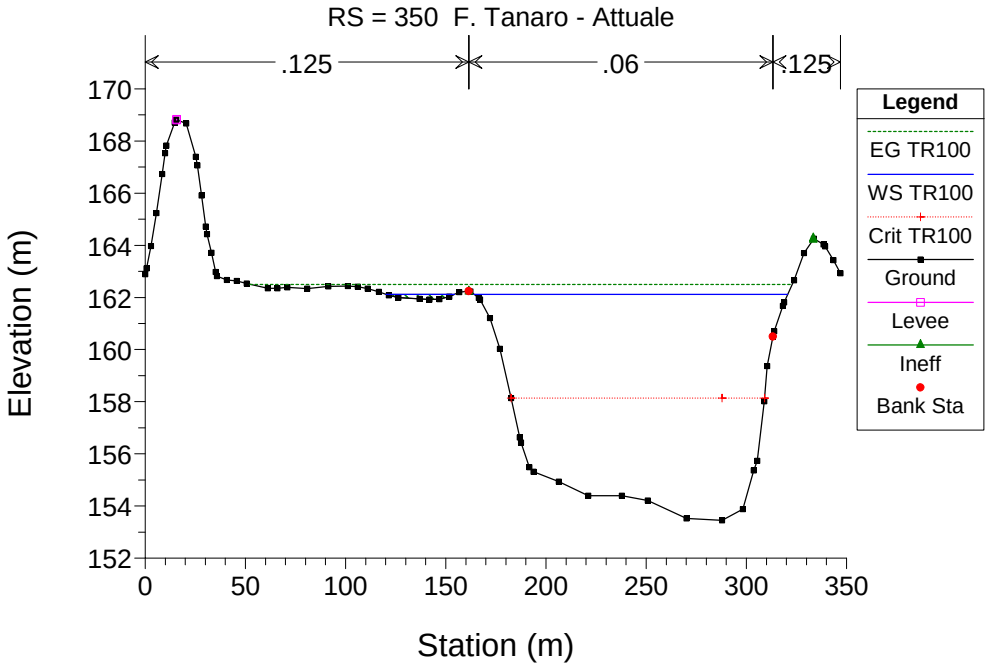
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta


RS = 350 F. Tanaro - Attuale
.125
.06
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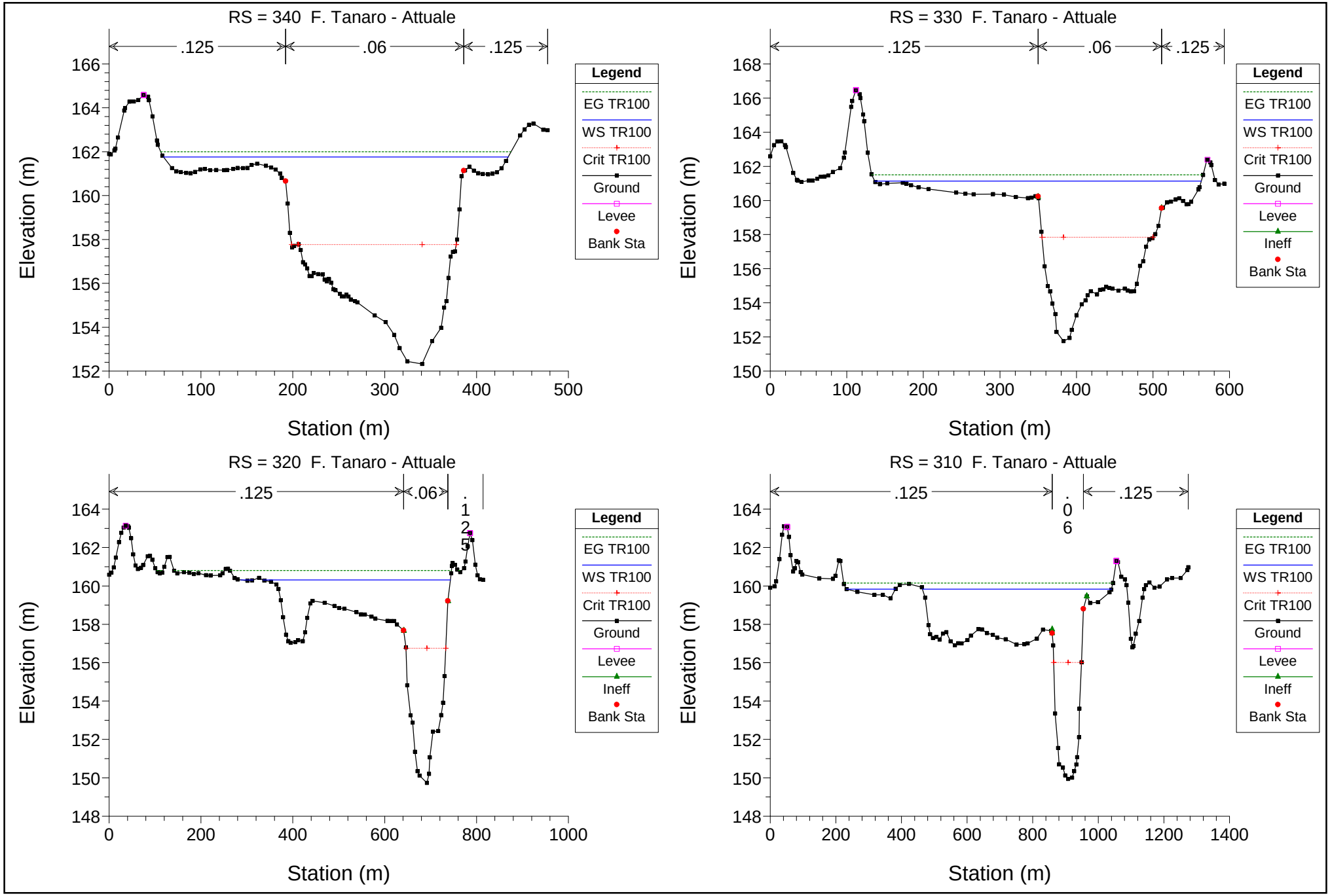
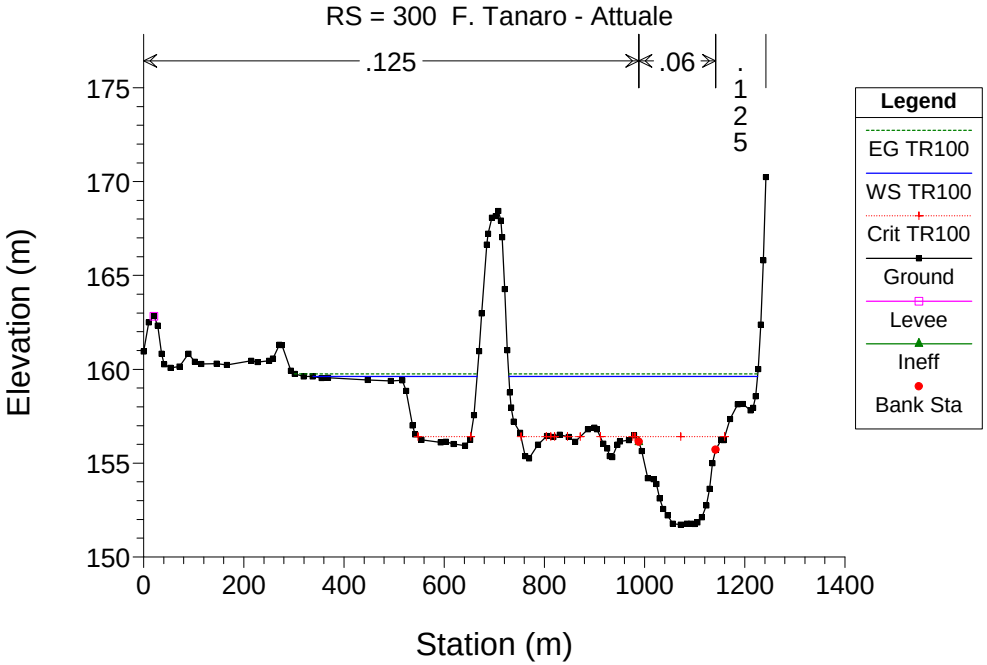
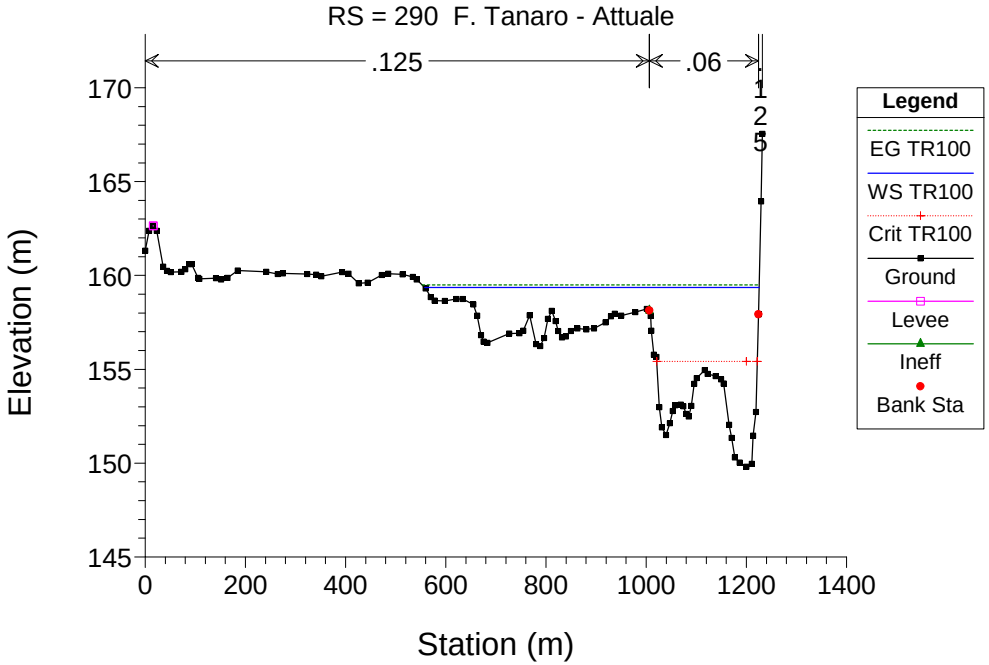
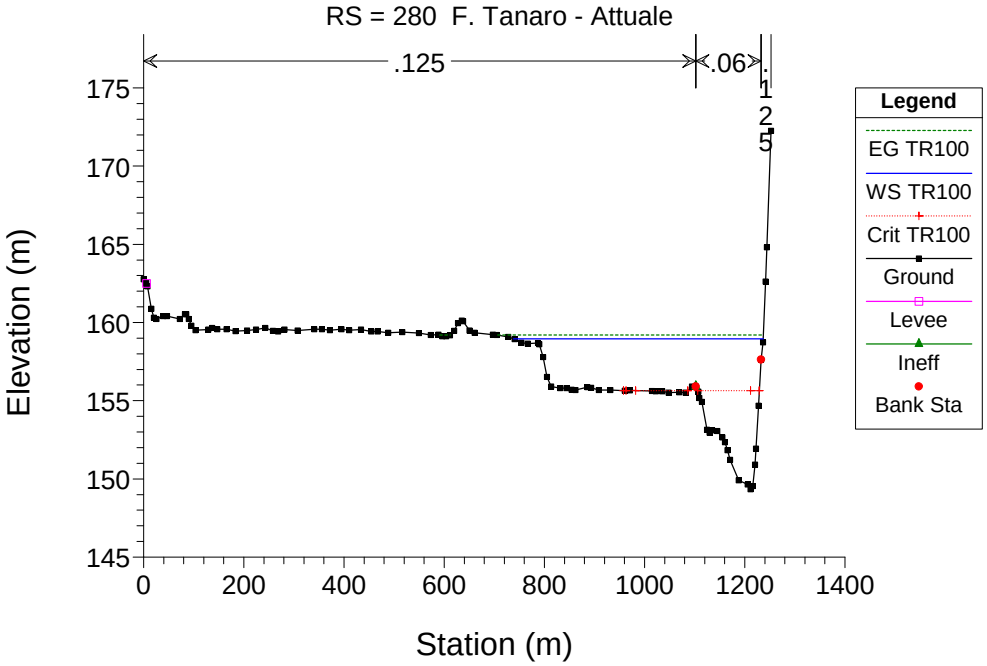
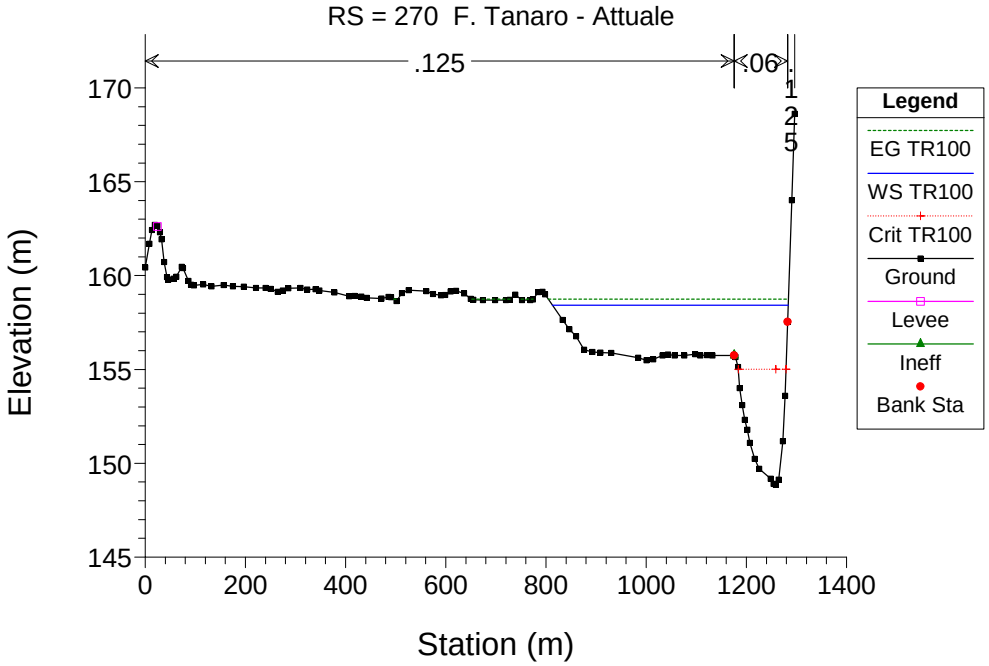
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

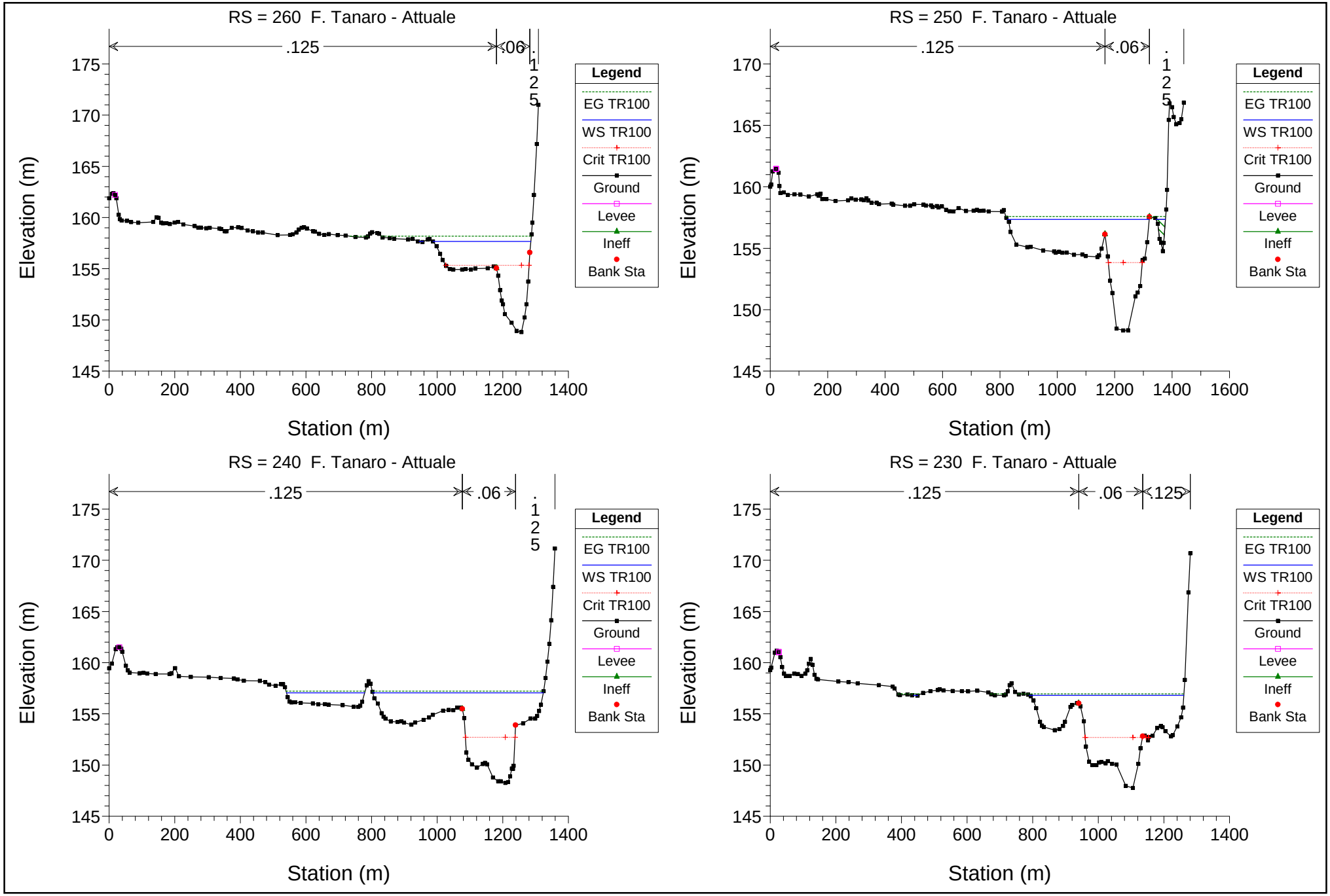

RS = 340 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 310 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

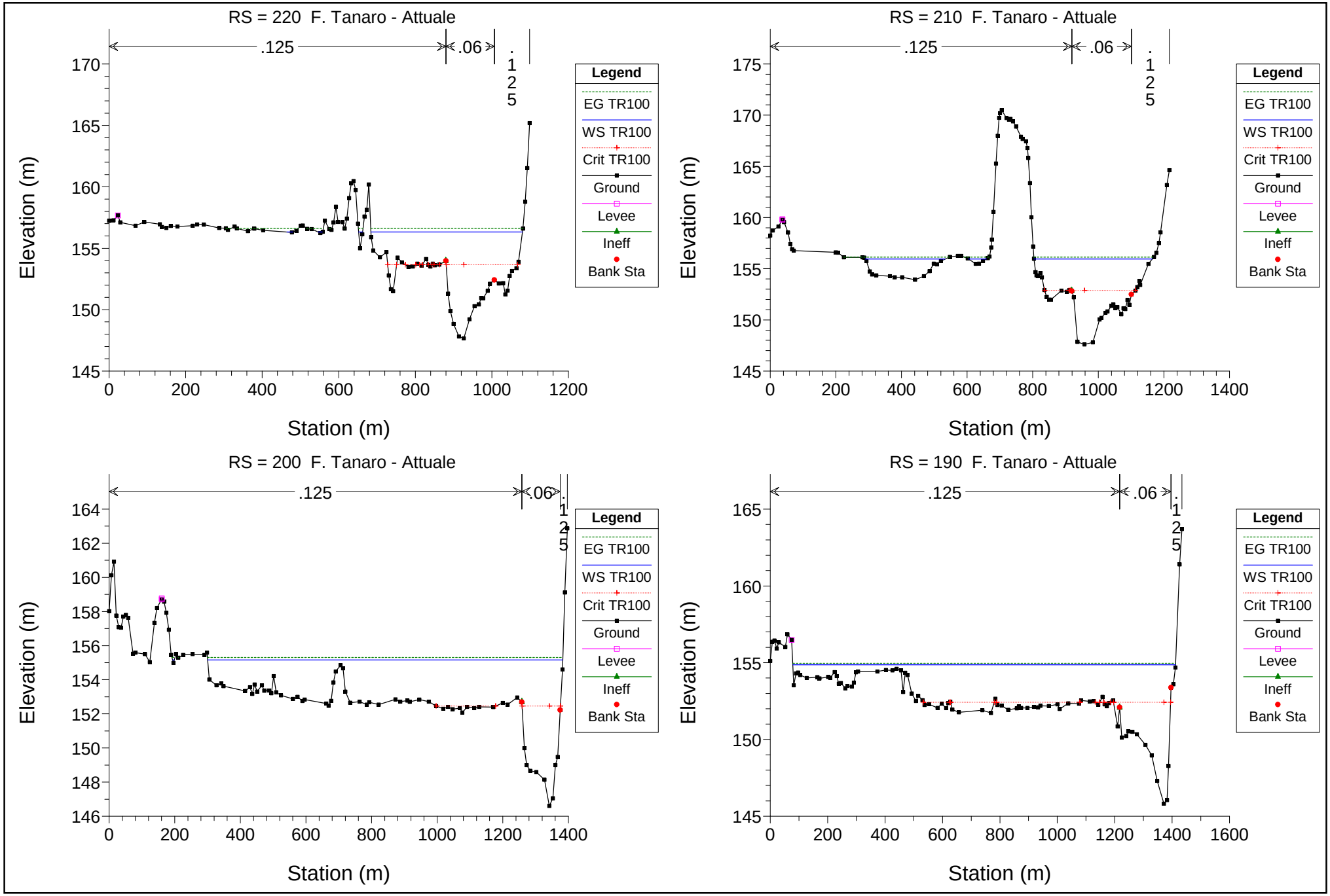

RS = 300 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

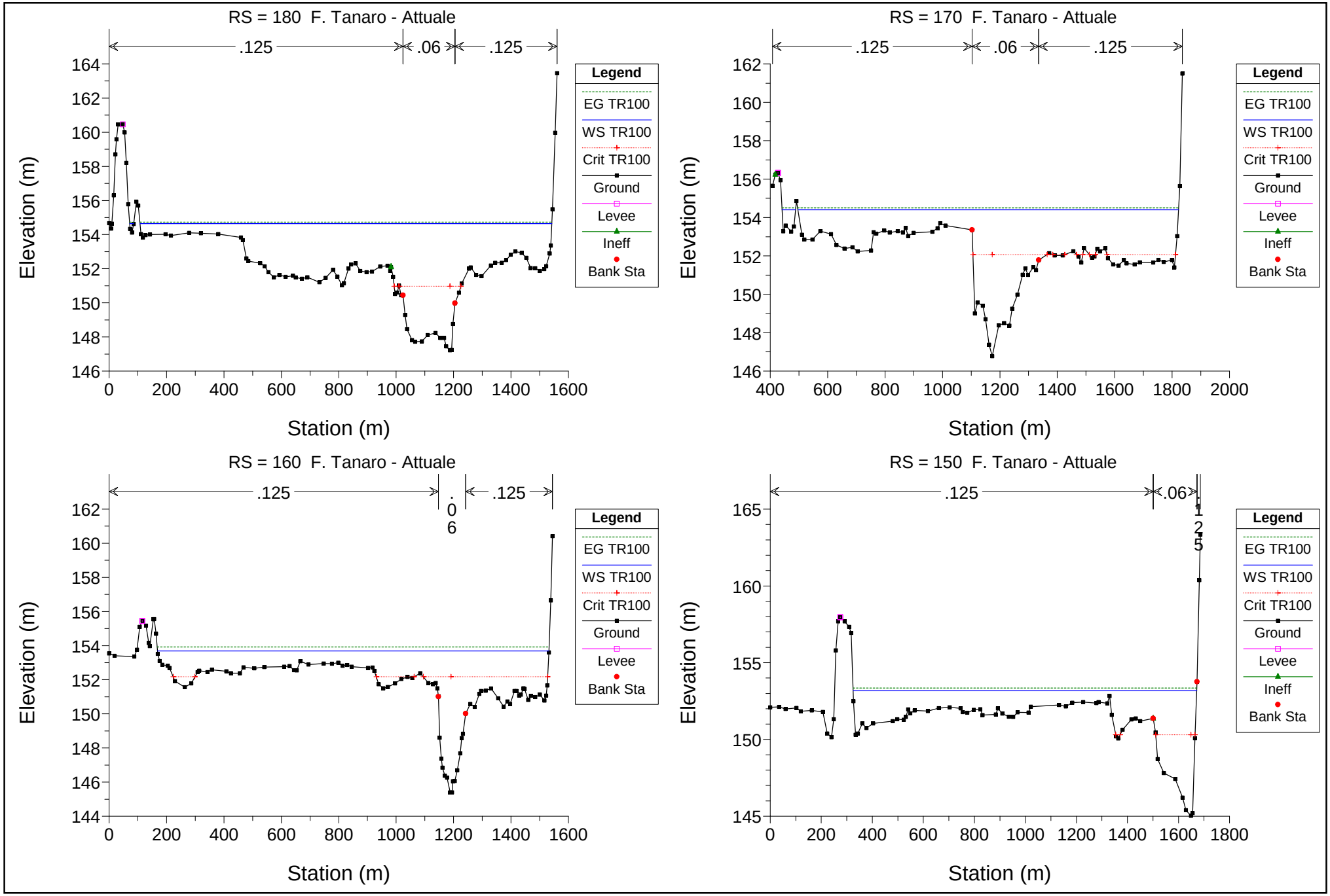

RS = 290 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

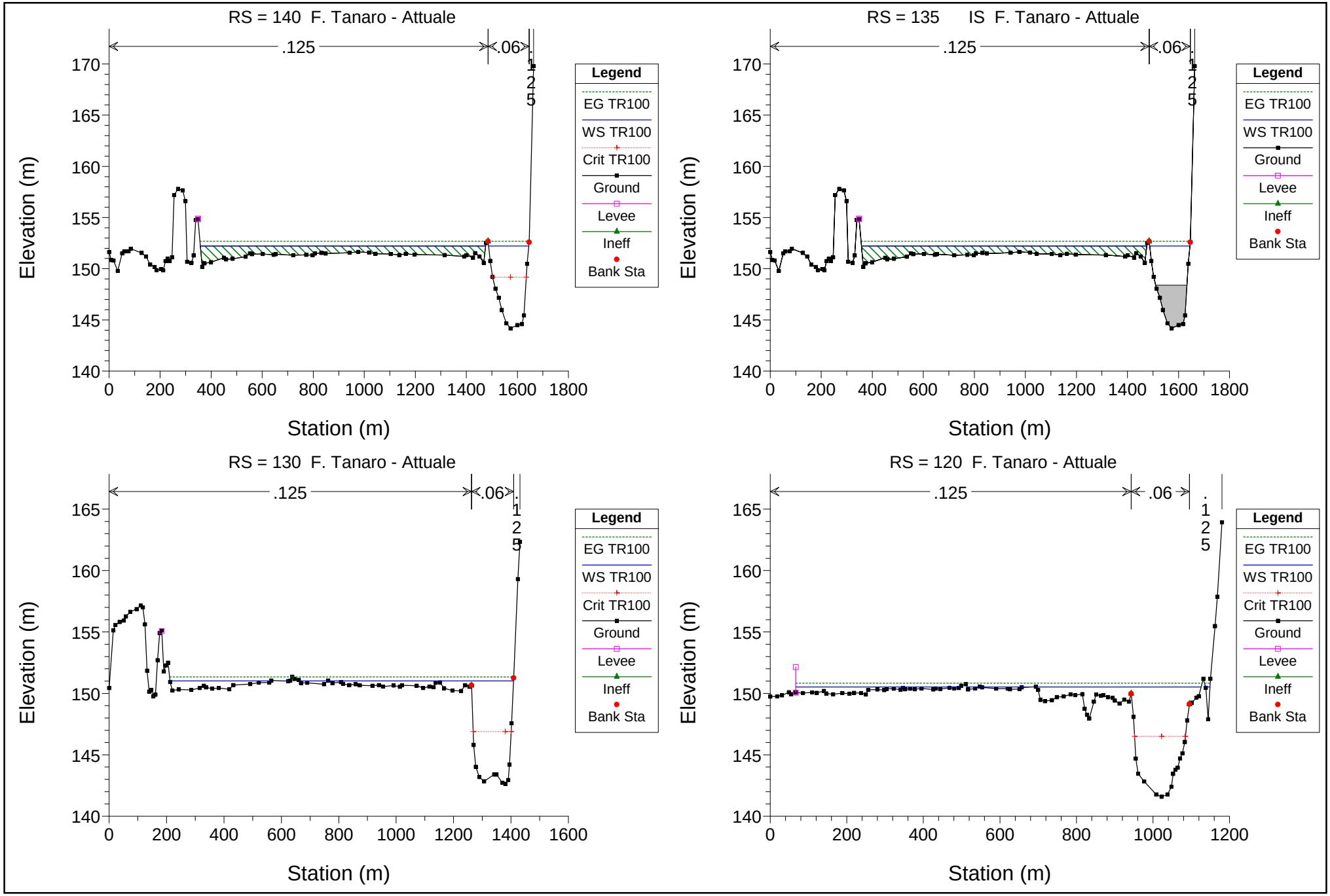

RS = 280 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

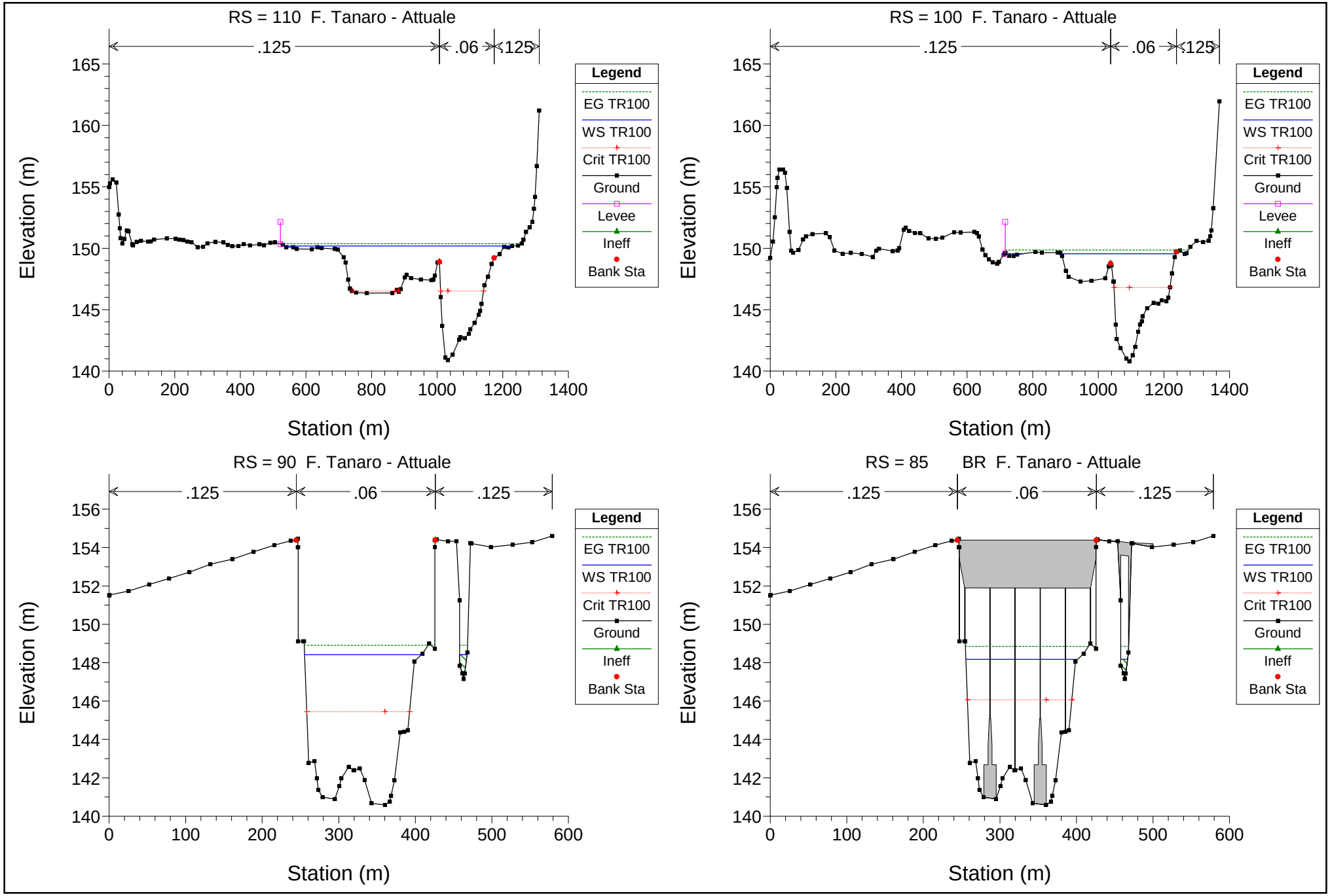

RS = 270 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

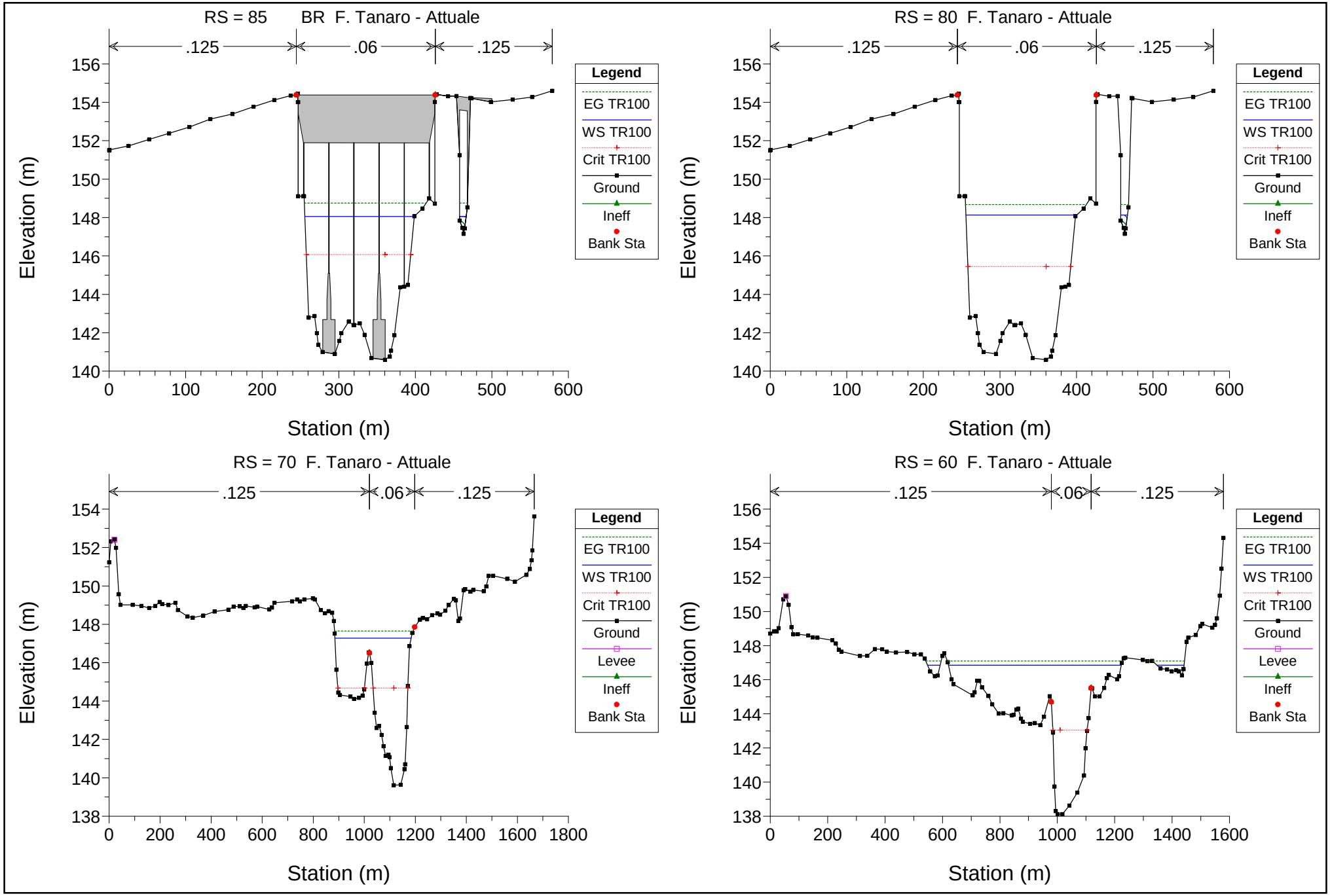

RS = 260 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 250 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 240 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 230 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)

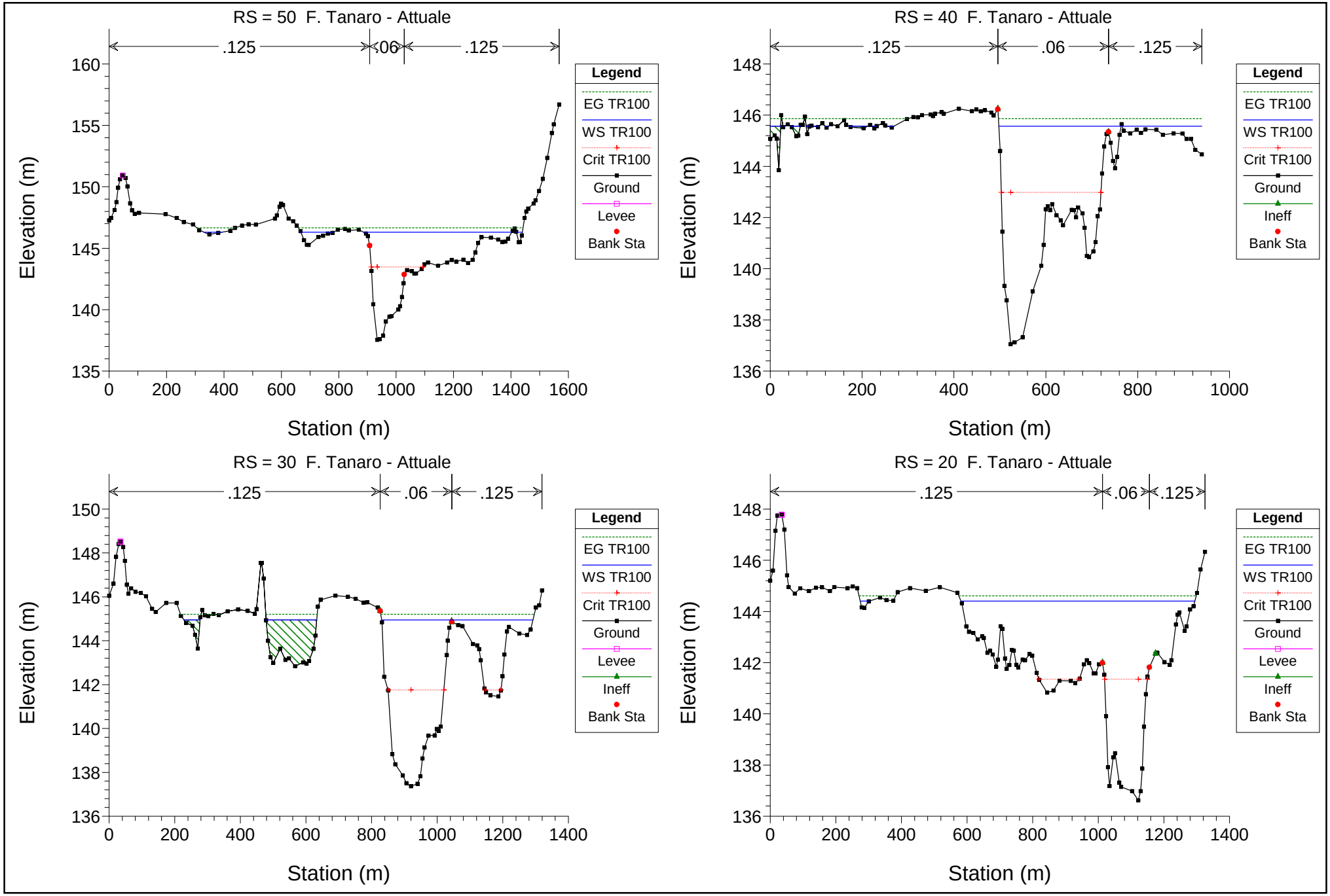

RS = 220 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Attuale
RS = 200 F. Tanaro - Attuale
RS = 190 F. Tanaro - Attuale

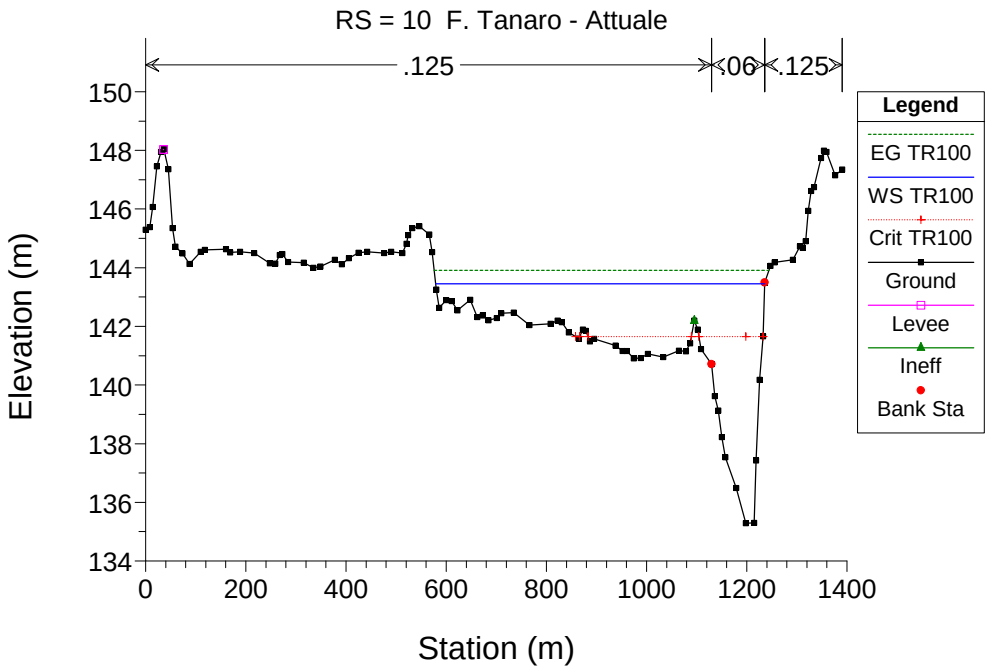

RS = 180 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 170 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 160 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 150 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 140 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 135 IS F. Tanaro - Attuale
RS = 130 F. Tanaro - Attuale
RS = 120 F. Tanaro - Attuale


RS = 110 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Attuale
RS = 90 F. Tanaro - Attuale
RS = 85 BR F. Tanaro - Attuale


RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Attuale
RS = 70 F. Tanaro - Attuale
Levee
RS = 60 F. Tanaro - Attuale


RS = 50 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 40 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 30 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 20 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

SITUAZIONE ATTUALE

SIMULAZIONE 3

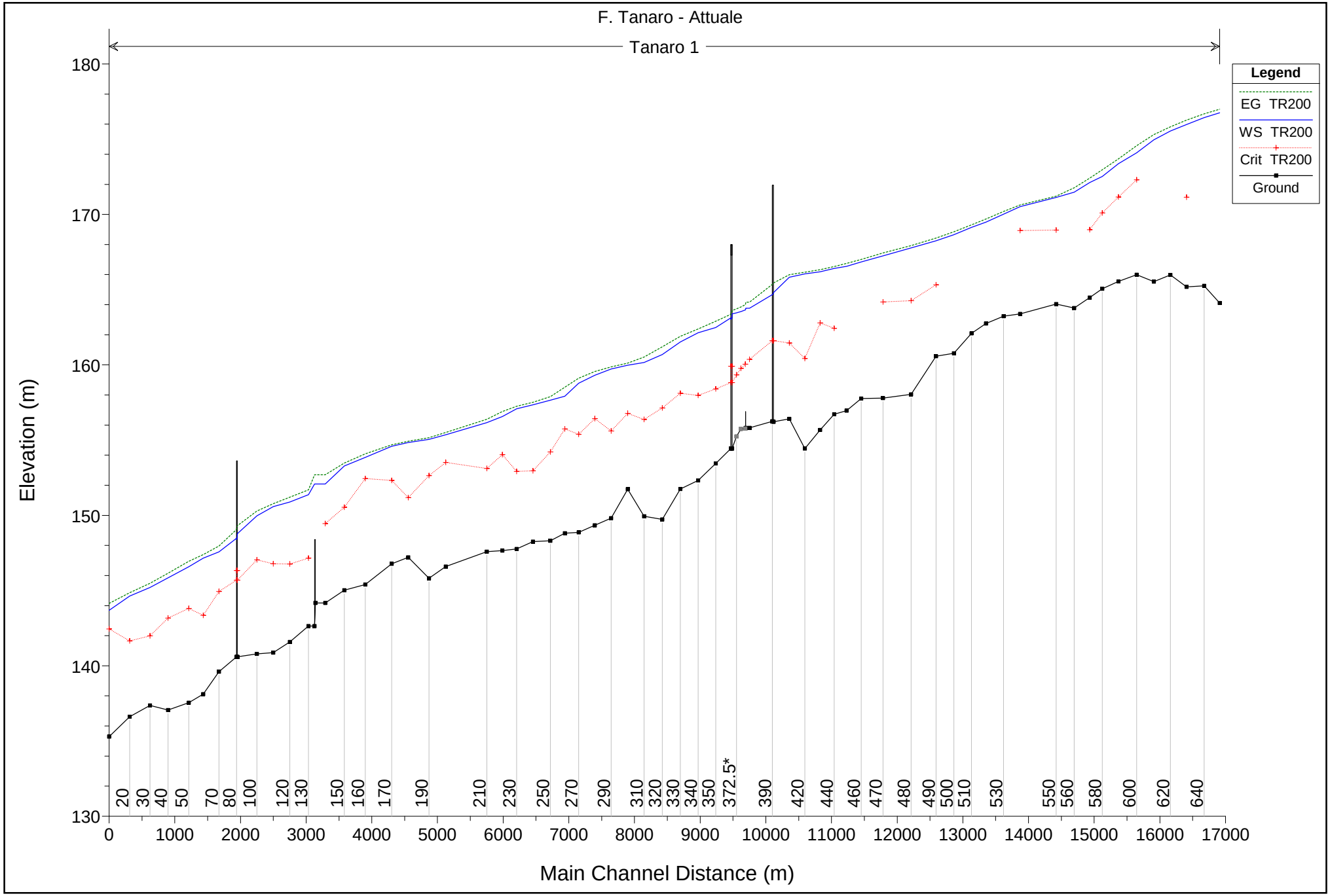
corso d'acqua	**portata al colmo Q_c m^3/s**	**tempo di ritorno anni**
Fiume Tanaro	3050	200

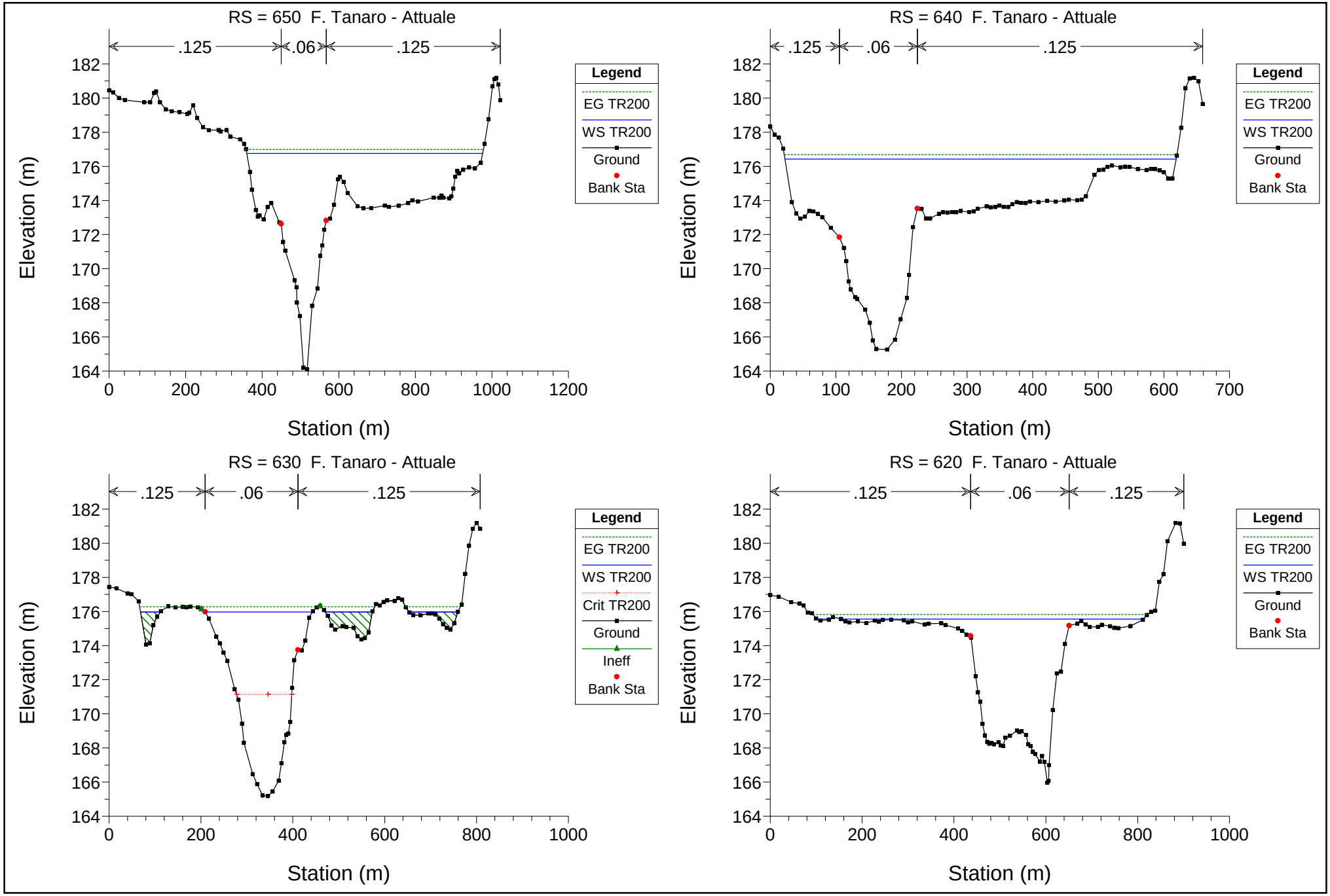
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200

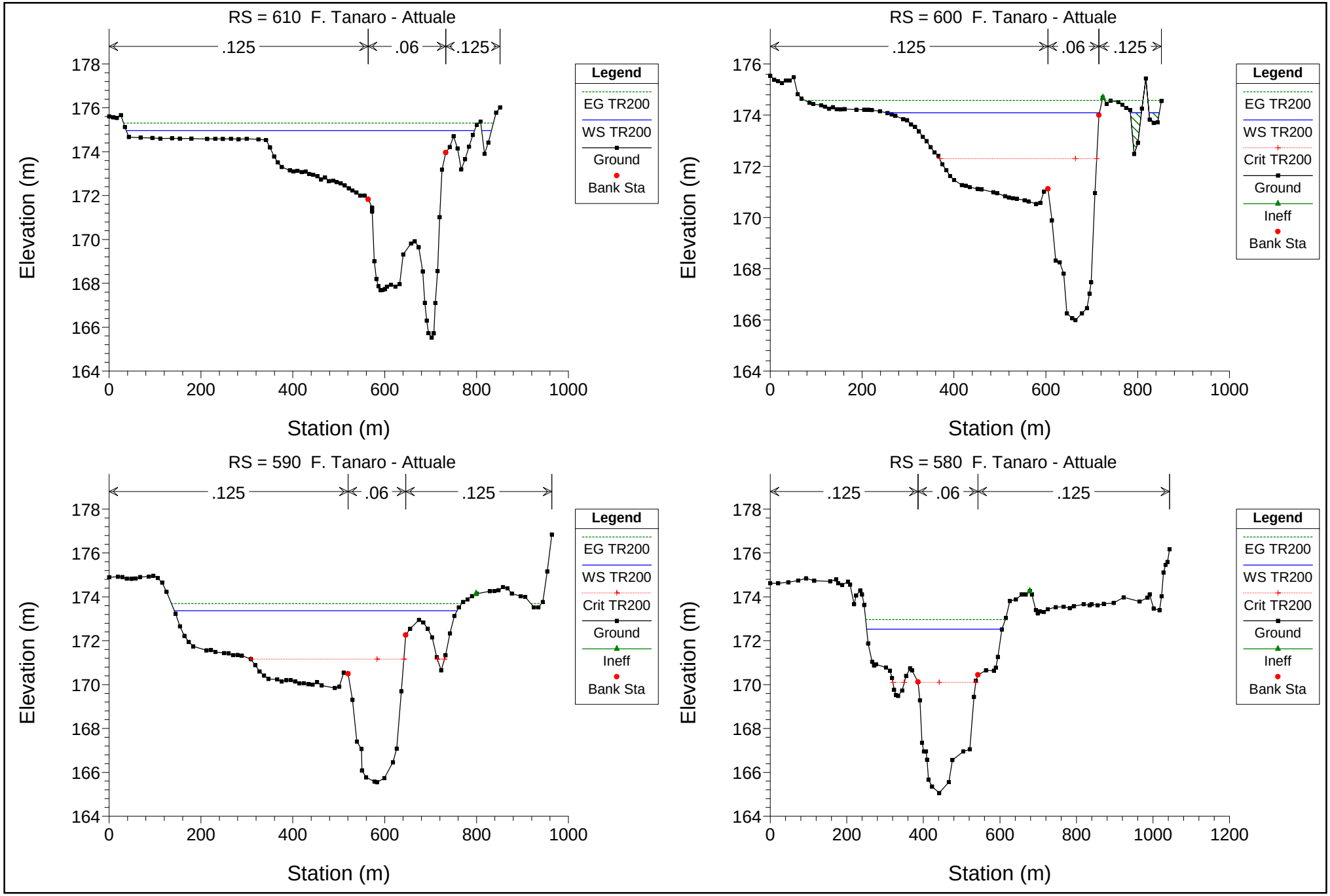
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	TR200	3050.00	164.11	176.75		177.00	0.001411	2.48	2218.23	616.16	0.28
1	640	TR200	3050.00	165.26	176.43		176.69	0.001278	2.47	2094.11	596.31	0.27
1	630	TR200	3050.00	165.18	175.98	171.15	176.27	0.001869	2.42	1296.17	485.29	0.31
1	620	TR200	3050.00	165.98	175.55		175.82	0.001772	2.32	1434.20	682.52	0.30
1	610	TR200	3050.00	165.53	174.97		175.30	0.002358	2.69	1678.61	779.86	0.35
1	600	TR200	3050.00	165.99	174.09	172.30	174.57	0.003811	3.45	1482.85	509.97	0.44
1	590	TR200	3050.00	165.55	173.37	171.16	173.70	0.002635	2.89	1864.37	615.80	0.37
1	580	TR200	3050.00	165.06	172.52	170.10	172.97	0.003293	3.07	1278.00	353.61	0.41
1	570	TR200	3050.00	164.47	172.12	168.98	172.41	0.002174	2.59	1721.78	522.06	0.33
1	560	TR200	3050.00	163.78	171.48		171.77	0.003509	2.65	1798.01	738.77	0.40
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001114	1.47	3244.08	1183.00	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.63	0.001630	2.09	3285.45	1121.43	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001818	2.16	2283.49	674.36	0.30
1	520	TR200	3050.00	162.75	169.48		169.69	0.002107	2.37	2495.17	1042.34	0.32
1	510	TR200	3050.00	162.10	169.14		169.30	0.001880	2.12	2420.12	736.50	0.30
1	500	TR200	3050.00	160.77	168.66		168.85	0.001608	2.19	2155.59	553.46	0.29
1	490	TR200	3050.00	160.58	168.25	165.33	168.43	0.001560	2.05	1997.37	516.92	0.28
1	480	TR200	3050.00	158.04	167.78	164.27	167.93	0.001204	1.96	2513.22	816.14	0.25
1	470	TR200	3050.00	157.79	167.24	164.19	167.44	0.001415	2.23	2222.76	559.16	0.27
1	460	TR200	3050.00	157.77	166.85		167.01	0.001120	2.00	2555.27	855.16	0.24
1	450	TR200	3050.00	156.96	166.55		166.75	0.001228	2.12	2405.65	1034.29	0.26
1	440	TR200	3050.00	156.72	166.41	162.43	166.54	0.000868	1.85	3004.58	797.41	0.22
1	430	TR200	3050.00	155.68	166.19	162.79	166.33	0.001053	2.04	2886.12	665.62	0.24
1	420	TR200	3050.00	154.44	166.05	160.43	166.16	0.000584	1.69	3208.80	688.86	0.18
1	410	TR200	3050.00	156.41	165.83	161.45	165.99	0.001016	2.04	2448.65	543.66	0.24
1	400	TR200	3050.00	156.22	164.81	161.61	165.46	0.003555	3.66	957.51	175.54	0.43
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.67	161.61	165.35	0.003796	3.74	934.56	174.79	0.44
1	380	TR200	3050.00	155.82	163.76	160.36	164.17	0.002446	2.84	1112.46	227.59	0.35
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.39	158.82	163.61	0.001193	2.09	1461.89	207.09	0.25
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.12	158.82	163.36	0.001349	2.17	1406.47	206.34	0.27
1	350	TR200	3050.00	153.45	162.49	158.40	162.91	0.002291	2.88	1093.15	269.74	0.35
1	340	TR200	3050.00	152.32	162.13	157.98	162.39	0.001401	2.24	1510.62	384.55	0.27
1	330	TR200	3050.00	151.75	161.52	158.11	161.89	0.002283	2.77	1343.61	433.23	0.34
1	320	TR200	3050.00	149.73	160.68	157.14	161.20	0.002693	3.41	1454.54	565.75	0.38
1	310	TR200	3050.00	149.94	160.16	156.38	160.52	0.002059	3.02	2049.22	820.90	0.34
1	300	TR200	3050.00	151.73	159.97	156.77	160.12	0.001070	1.99	2841.81	871.70	0.24
1	290	TR200	3050.00	149.81	159.72	155.61	159.87	0.000978	1.83	2420.02	712.31	0.23

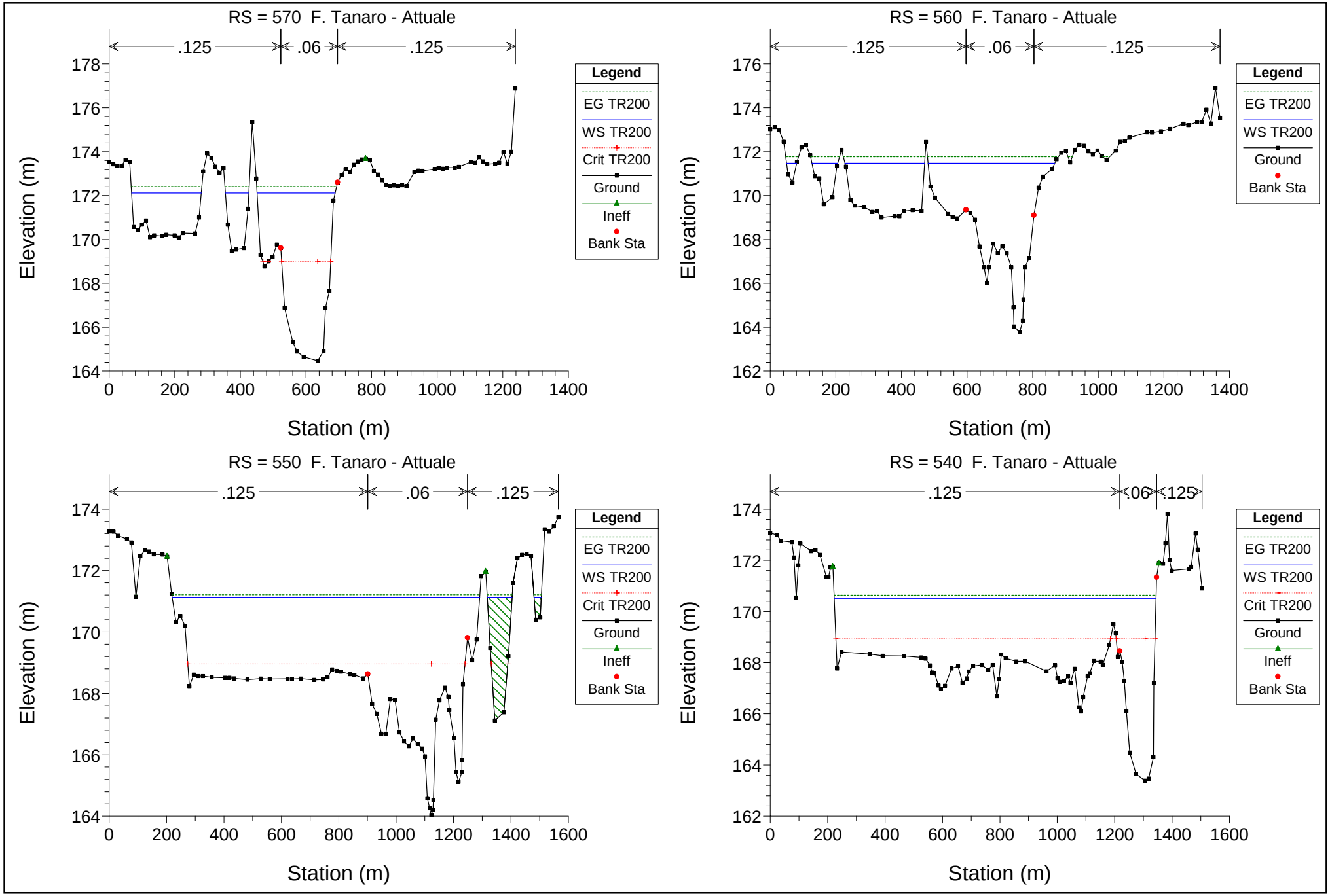
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

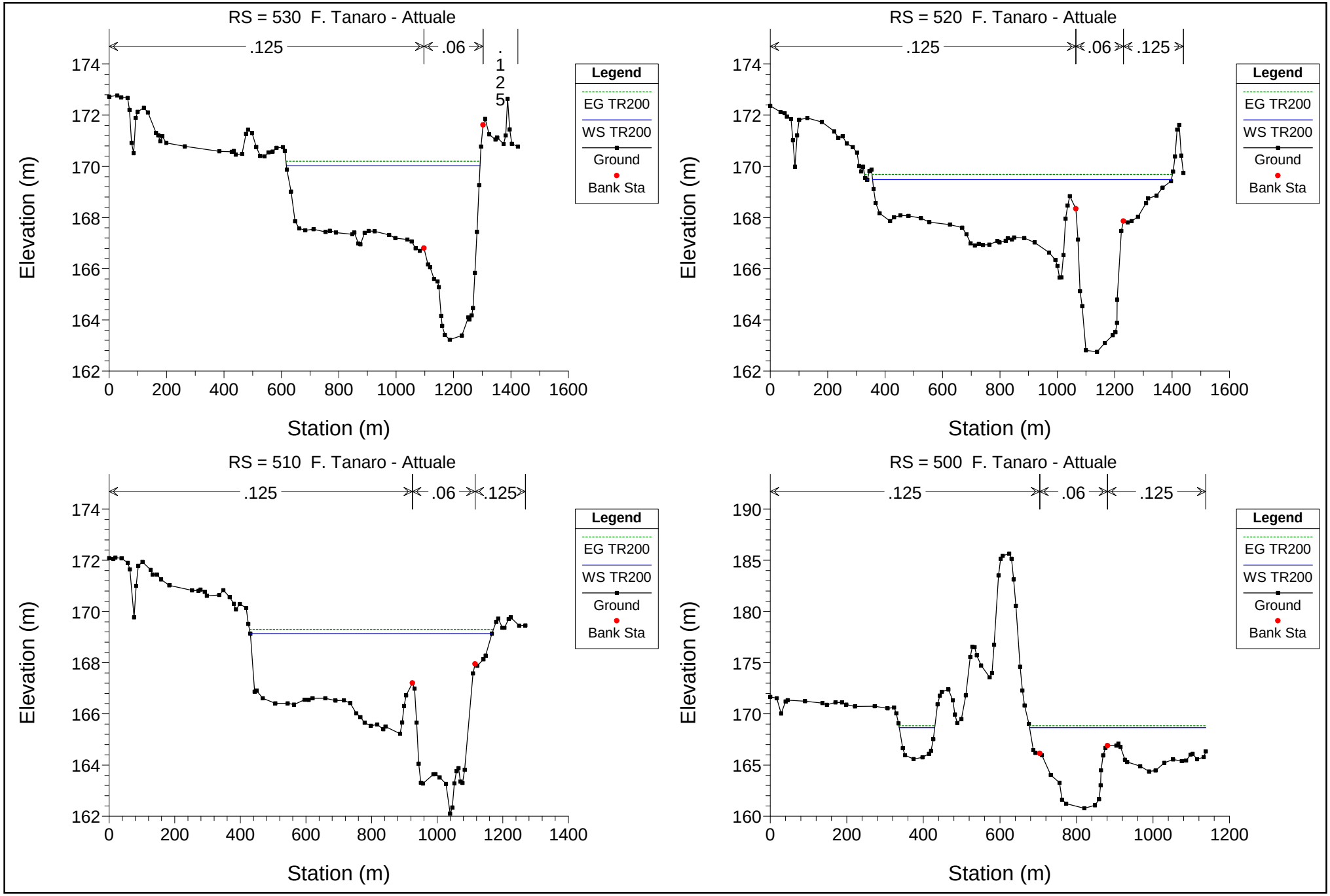
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	280	TR200	3050.00	149.34	159.31	156.43	159.56	0.001699	2.52	2074.89	629.50	0.30
1	270	TR200	3050.00	148.86	158.78	155.38	159.11	0.002056	2.88	1828.43	599.89	0.33
1	260	TR200	3050.00	148.81	157.91	155.75	158.52	0.003719	3.70	1231.29	404.55	0.44
1	250	TR200	3050.00	148.31	157.65	154.21	157.89	0.001793	2.43	1990.50	557.58	0.31
1	240	TR200	3050.00	148.26	157.34	152.95	157.52	0.001050	2.05	2464.71	767.80	0.24
1	230	TR200	3050.00	147.77	157.08	152.92	157.25	0.001089	1.97	2186.77	650.48	0.24
1	220	TR200	3050.00	147.66	156.57	154.03	156.90	0.002377	2.84	1697.24	602.77	0.35
1	210	TR200	3050.00	147.59	156.16	153.11	156.39	0.001647	2.28	2054.55	771.20	0.29
1	200	TR200	3050.00	146.60	155.36	153.52	155.51	0.001444	2.24	3137.99	1102.83	0.28
1	190	TR200	3050.00	145.82	155.06	152.64	155.17	0.001134	1.82	3551.35	1334.04	0.24
1	180	TR200	3050.00	147.21	154.84	151.18	154.92	0.000706	1.58	4177.40	1452.85	0.19
1	170	TR200	3050.00	146.78	154.58	152.32	154.68	0.001190	1.70	3451.70	1377.47	0.24
1	160	TR200	3050.00	145.40	153.85	152.44	154.09	0.002245	2.80	2812.10	1364.80	0.34
1	150	TR200	3050.00	145.03	153.29	150.54	153.47	0.001771	2.24	2838.67	1347.34	0.30
1	140	TR200	3050.00	144.17	152.09	149.45	152.69	0.004278	3.44	887.23	1273.65	0.46
1	135		Inl Struct									
1	130	TR200	3050.00	142.64	151.37	147.16	151.69	0.001732	2.61	1844.79	1198.64	0.30
1	120	TR200	3050.00	141.58	150.89	146.76	151.20	0.001705	2.56	1879.06	1077.61	0.30
1	110	TR200	3050.00	140.88	150.58	146.78	150.77	0.001454	2.20	2303.82	738.97	0.28
1	100	TR200	3050.00	140.79	149.96	147.04	150.29	0.002579	2.61	1513.98	560.84	0.36
1	90	TR200	3050.00	140.59	148.78	145.69	149.31	0.003712	3.24	942.48	171.71	0.43
1	85		Bridge									
1	80	TR200	3050.00	140.59	148.47	145.69	149.06	0.004162	3.41	894.06	164.06	0.45
1	70	TR200	3050.00	139.61	147.57	144.94	147.96	0.003351	2.95	1306.12	304.63	0.41
1	60	TR200	3050.00	138.12	147.15	143.35	147.39	0.001561	2.44	2161.93	808.92	0.29
1	50	TR200	3050.00	137.54	146.58	143.82	146.95	0.002450	2.96	1823.04	903.93	0.36
1	40	TR200	3050.00	137.06	145.84	143.17	146.16	0.002700	2.51	1335.66	734.96	0.36
1	30	TR200	3050.00	137.37	145.20	141.99	145.48	0.002222	2.42	1574.30	727.26	0.33
1	20	TR200	3050.00	136.62	144.64	141.66	144.86	0.001718	2.40	2328.51	839.27	0.30
1	10	TR200	3050.00	135.29	143.69	142.45	144.15	0.004002	3.48	1679.28	662.46	0.45

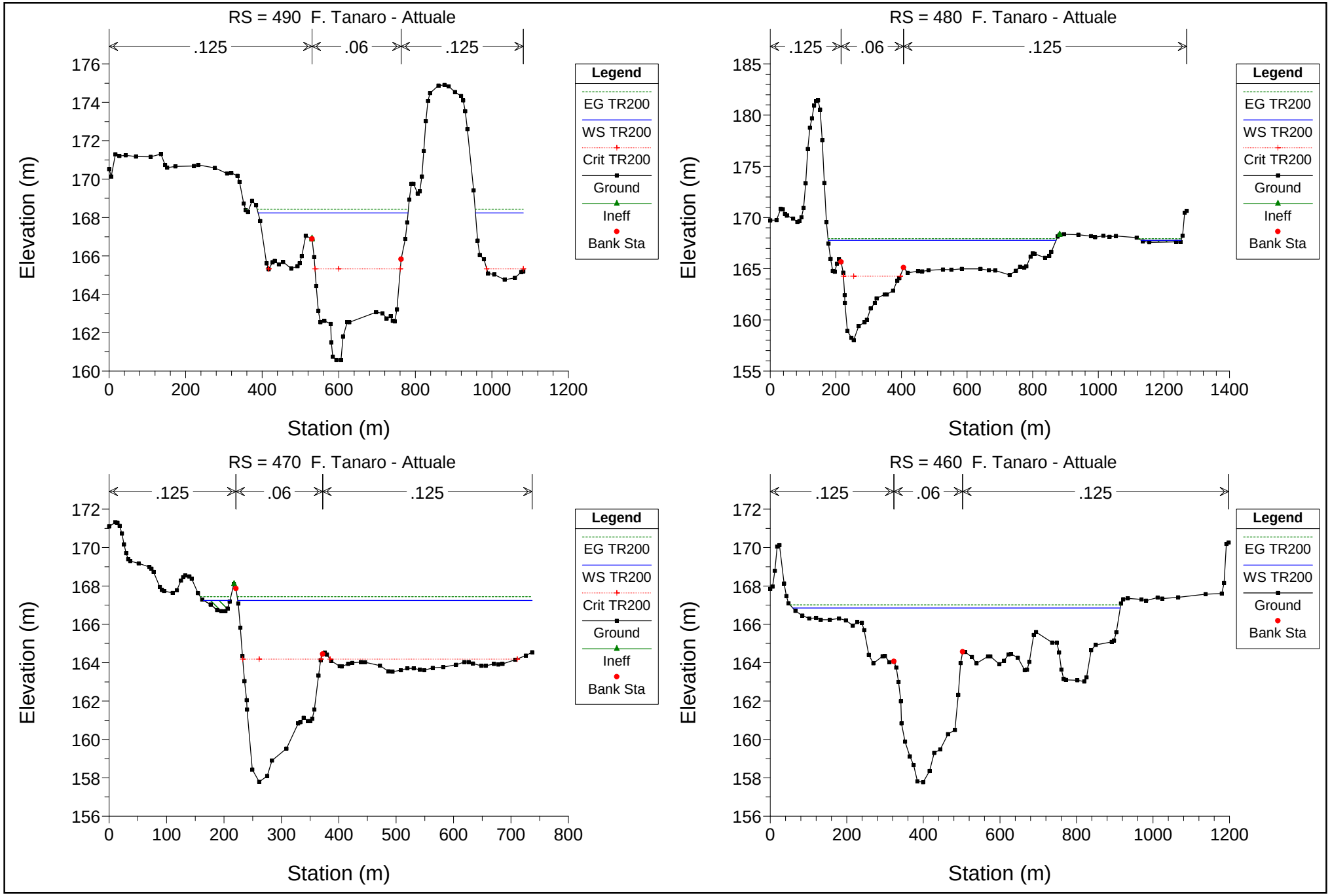

F. Tanaro - Attuale
Tanaro 1
Legend
EG TR200
WS TR200
Crit TR200
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
620
640

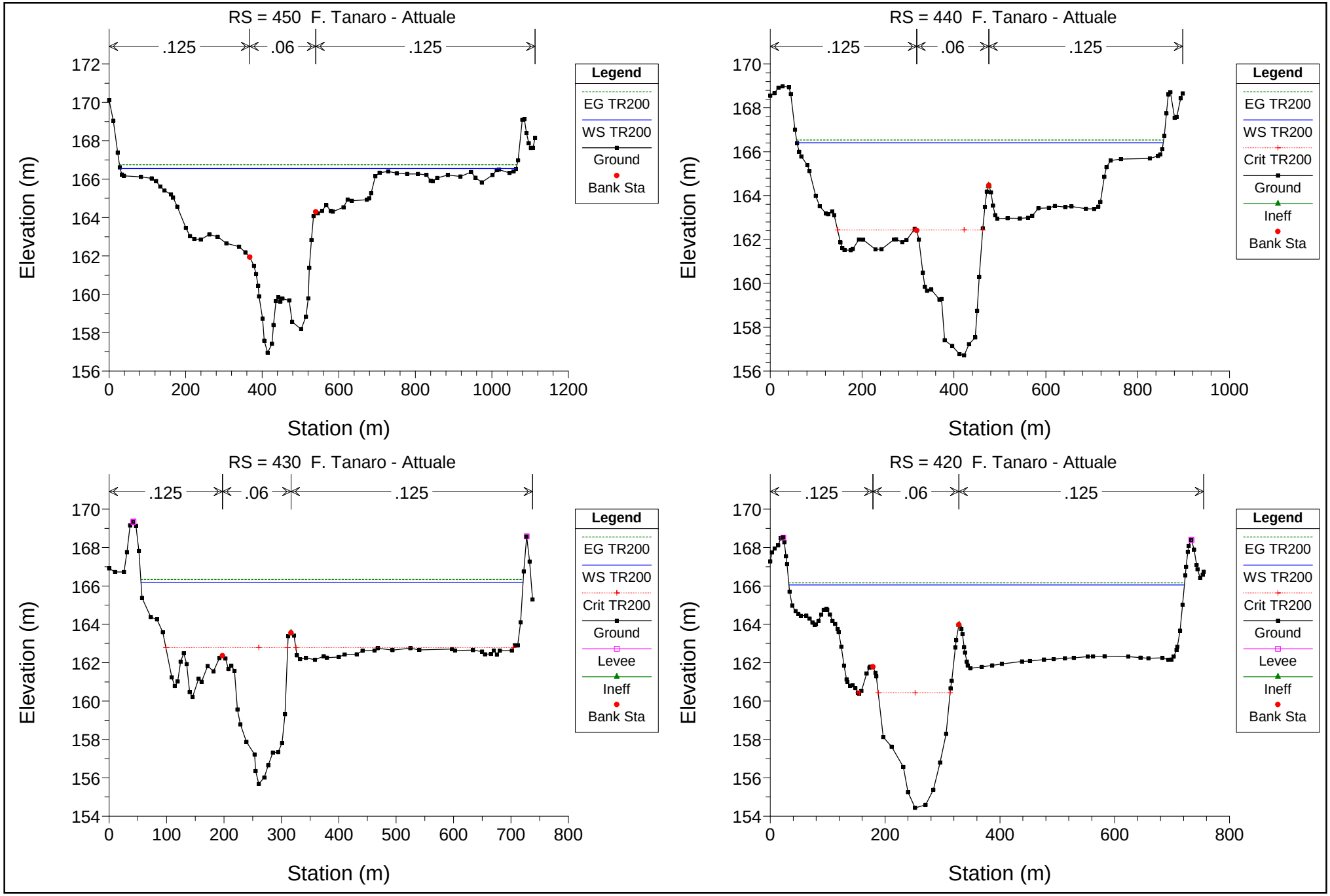

RS = 650 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 640 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 630 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta

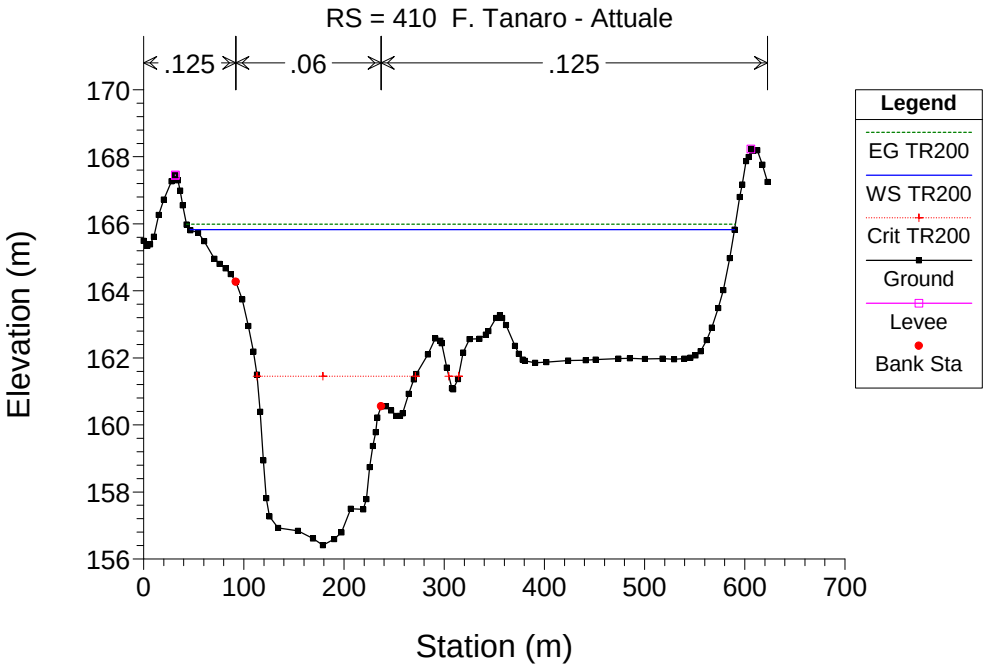

RS = 610 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 600 F. Tanaro - Attuale
Crit TR200
Ineff
RS = 590 F. Tanaro - Attuale
RS = 580 F. Tanaro - Attuale

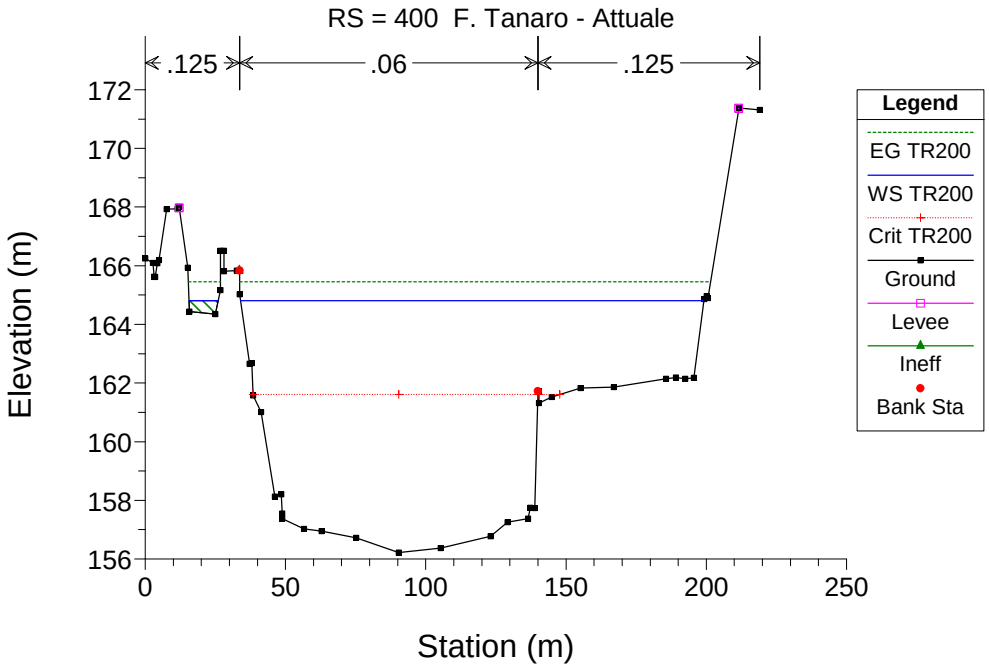

RS = 570 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Attuale
RS = 550 F. Tanaro - Attuale
RS = 540 F. Tanaro - Attuale

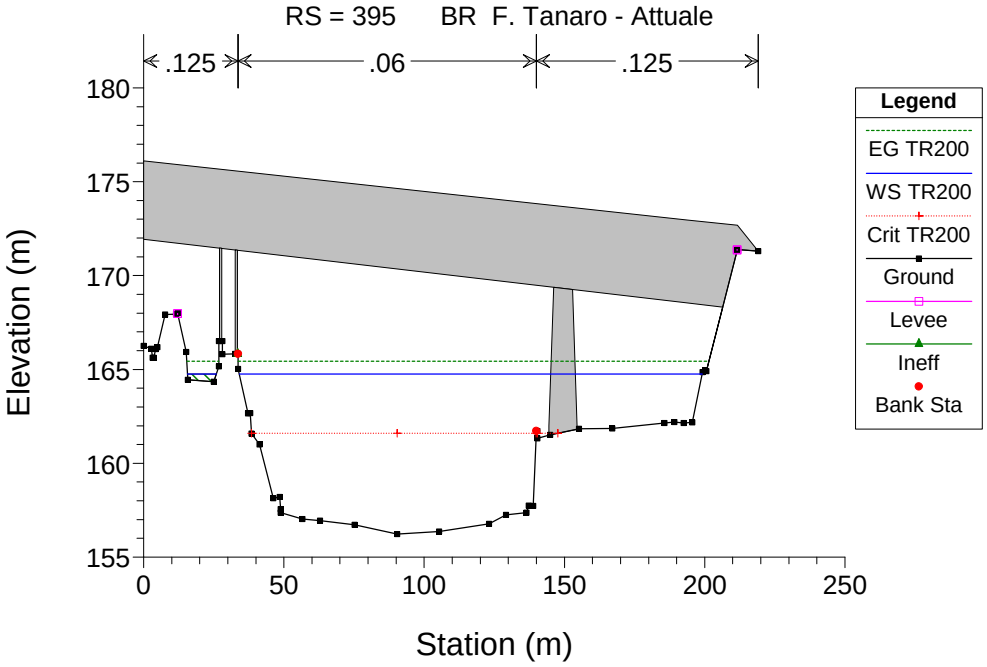

RS = 530 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)

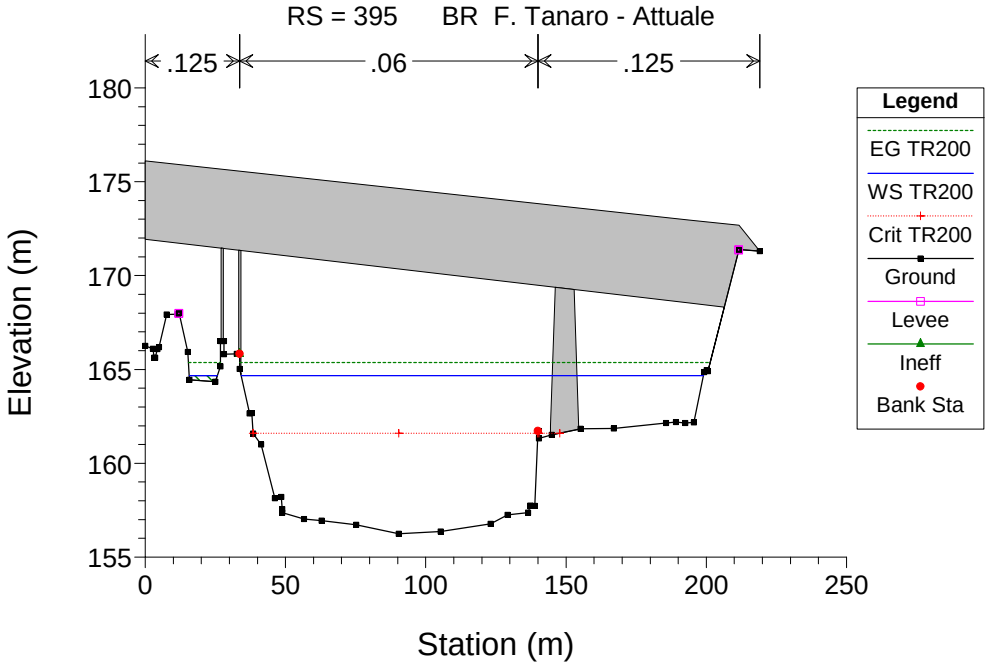

RS = 490 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 470 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 460 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta

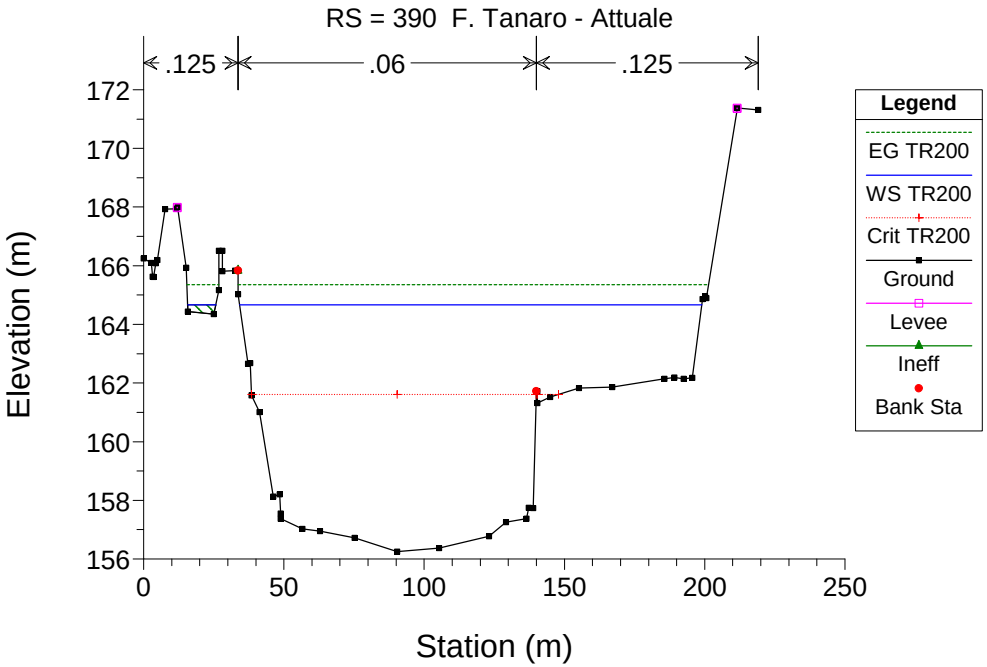

RS = 450 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 440 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 430 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 420 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

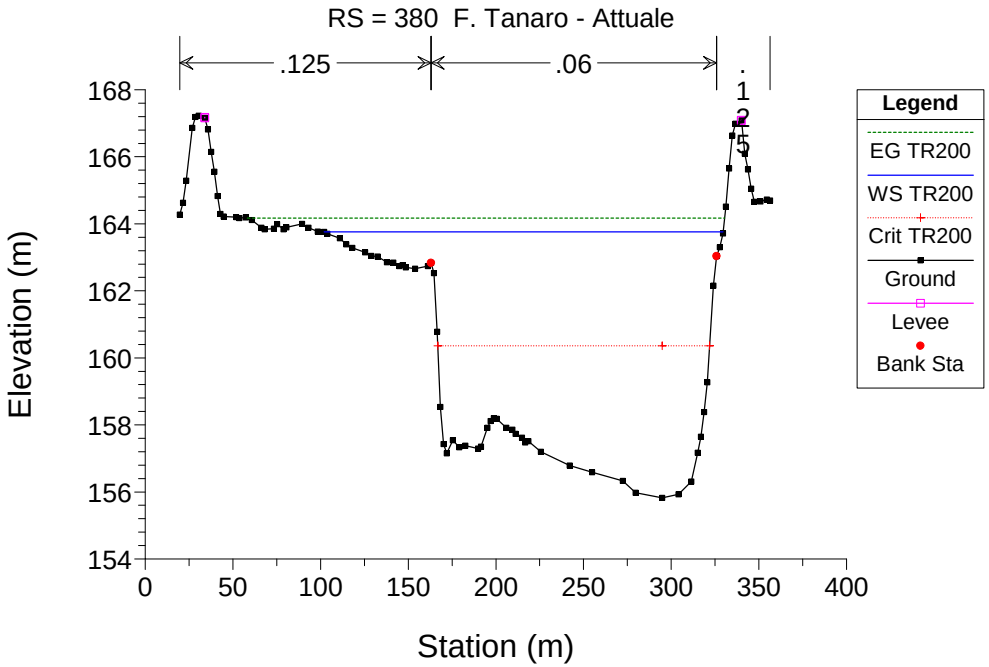

RS = 410 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

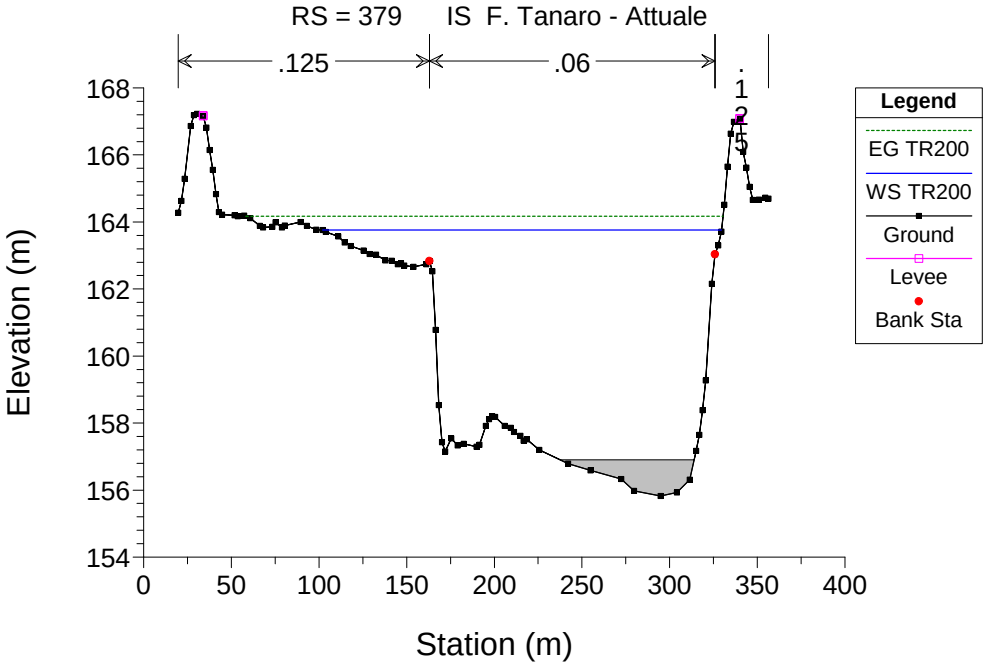

RS = 400 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

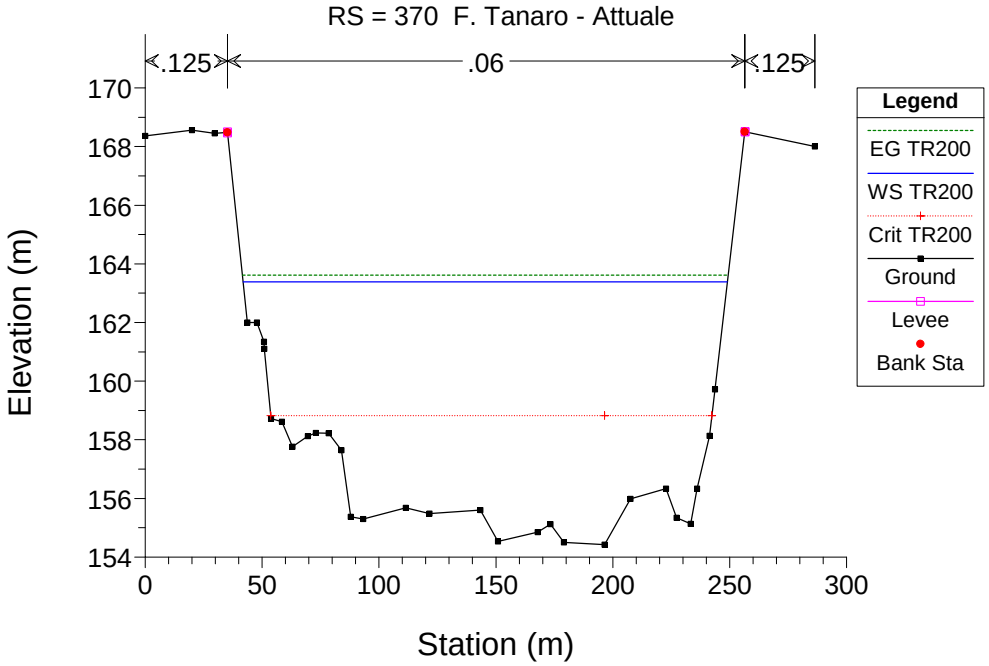

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

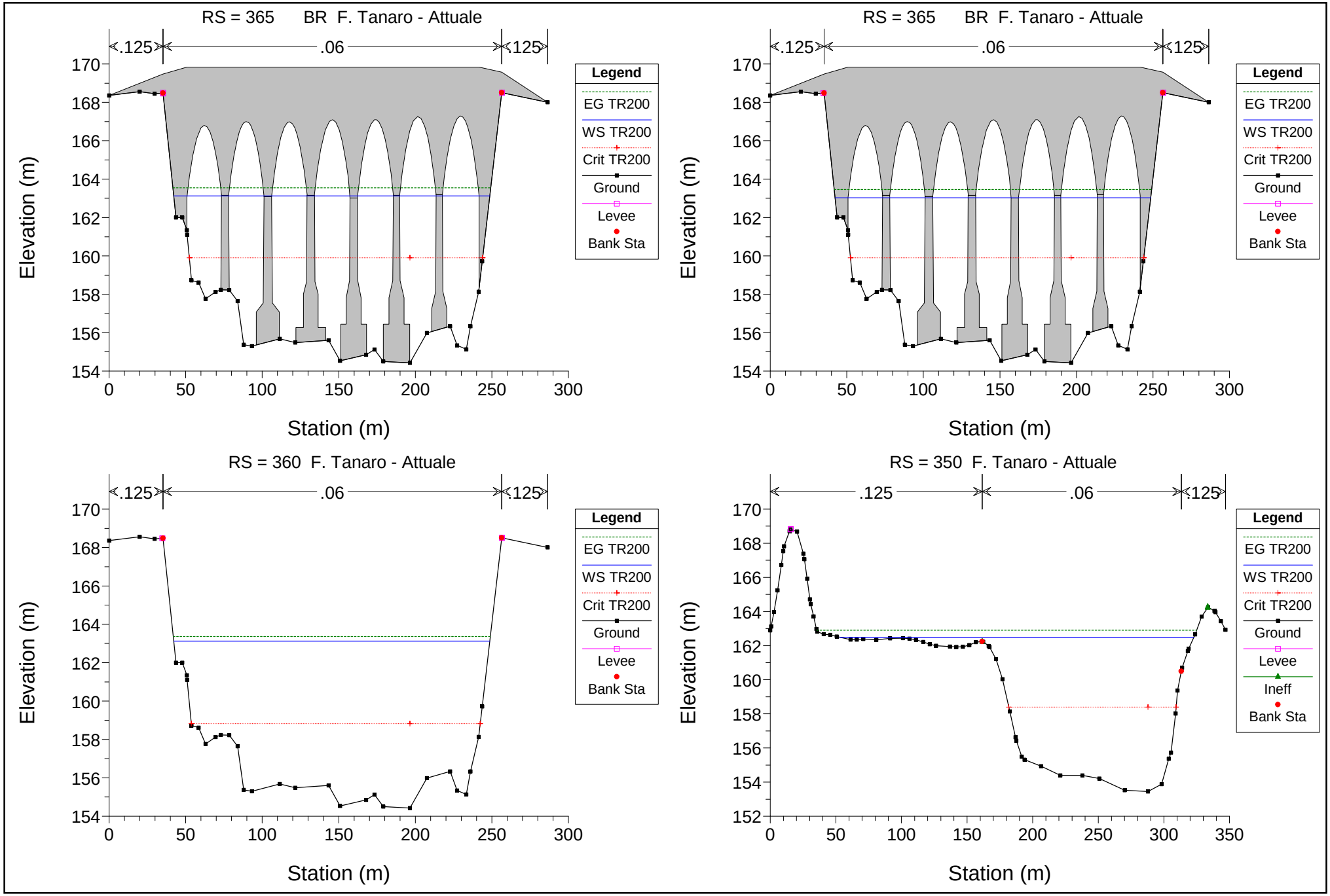

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

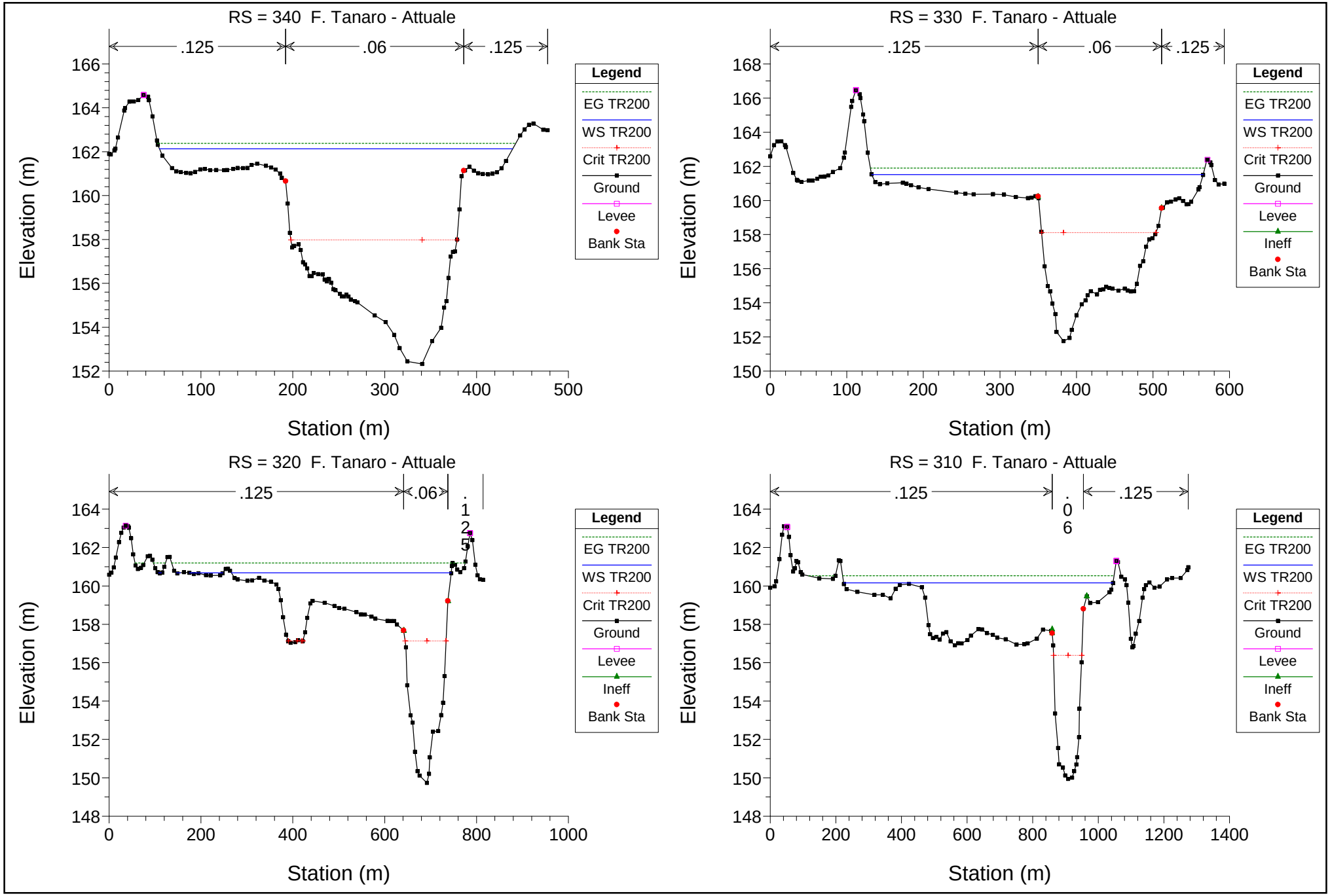

RS = 390 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

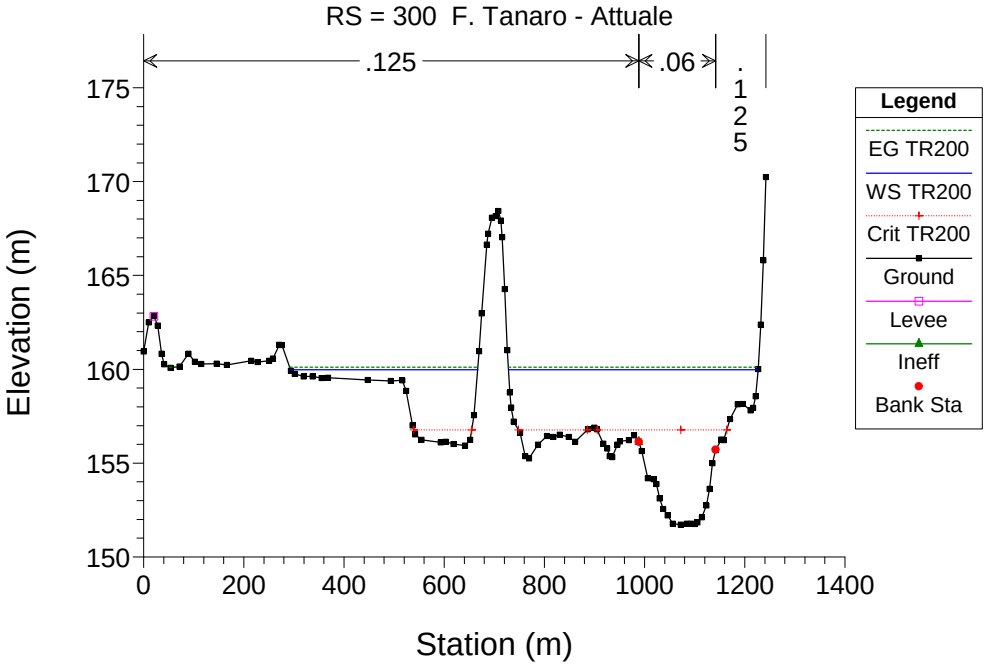

RS = 380 F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

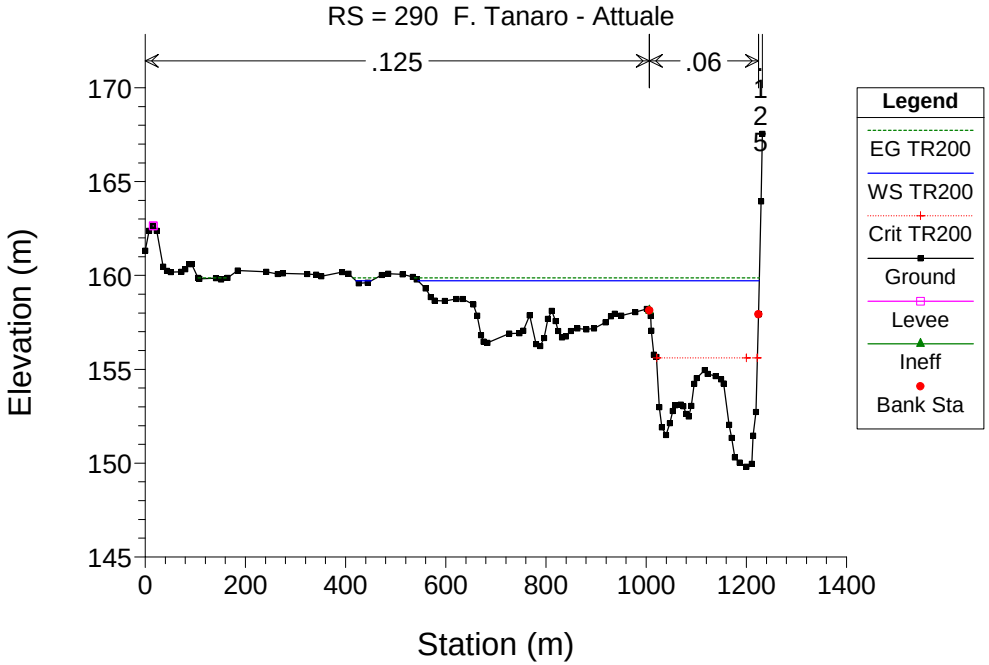

RS = 379 IS F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Levee
Bank Sta

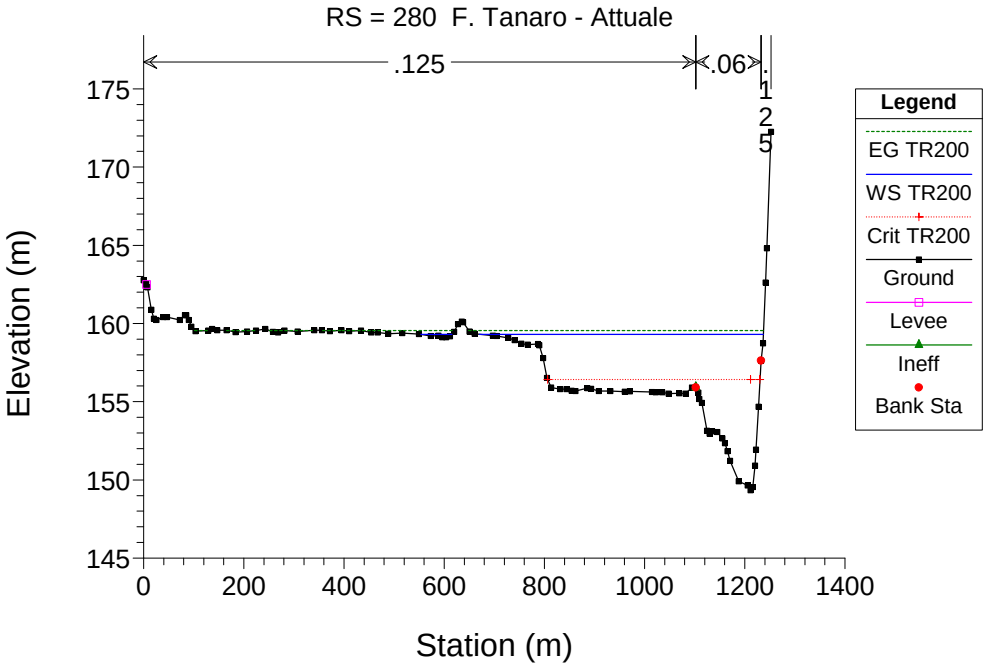

RS = 370 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

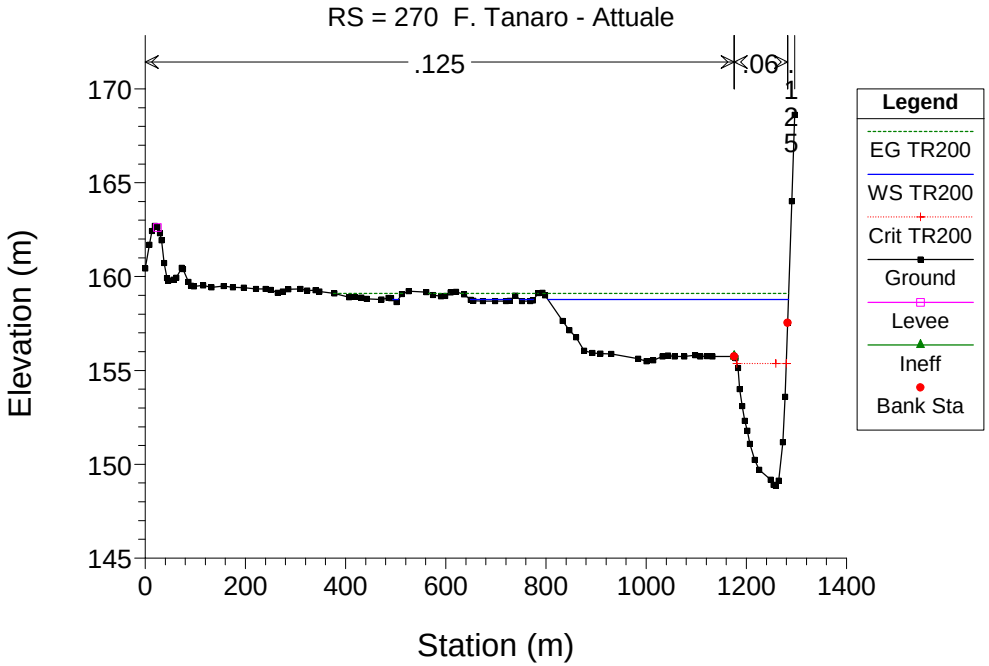

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Attuale
RS = 360 F. Tanaro - Attuale
RS = 350 F. Tanaro - Attuale
Ineff

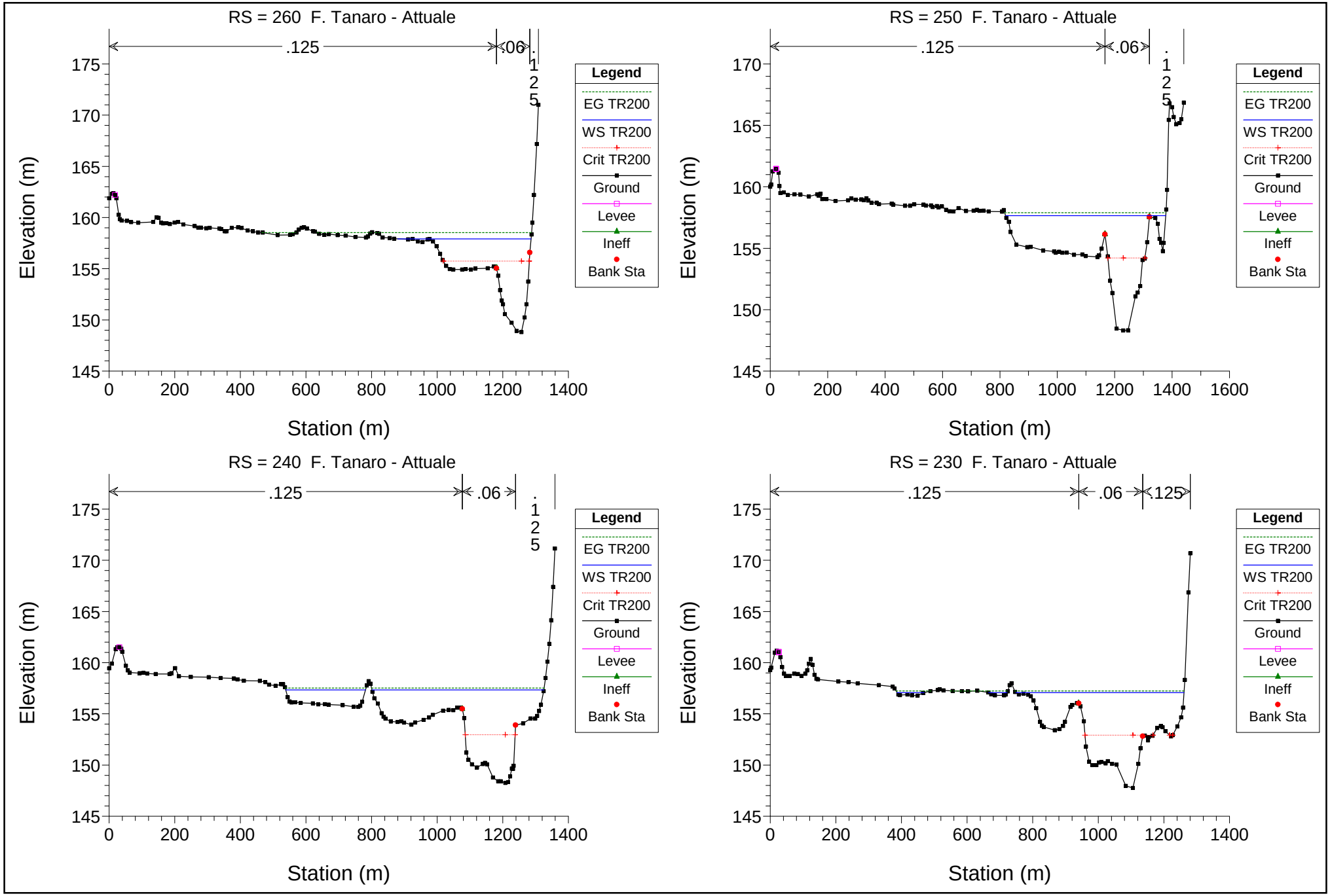

RS = 340 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 310 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

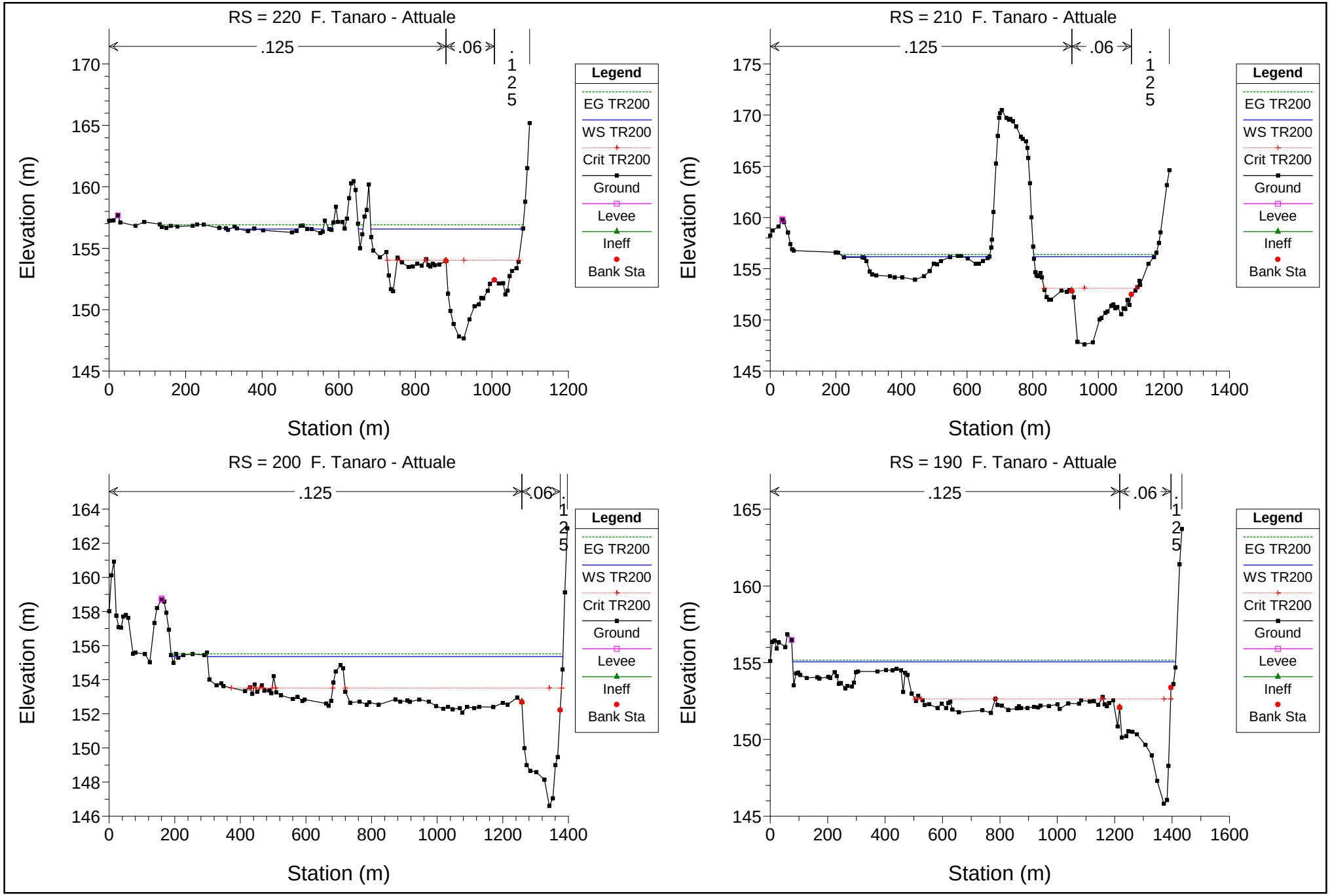

RS = 300 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

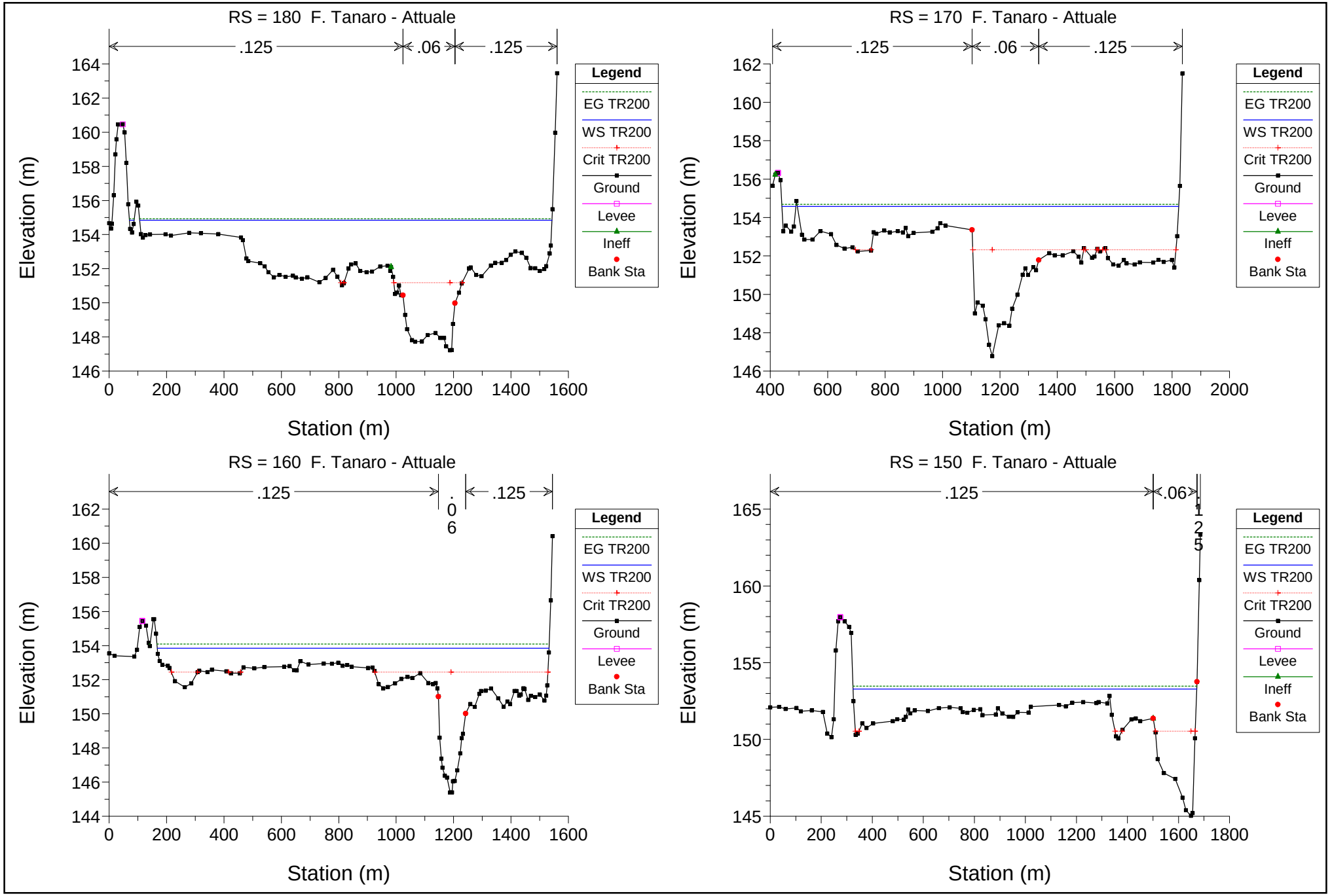

RS = 290 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

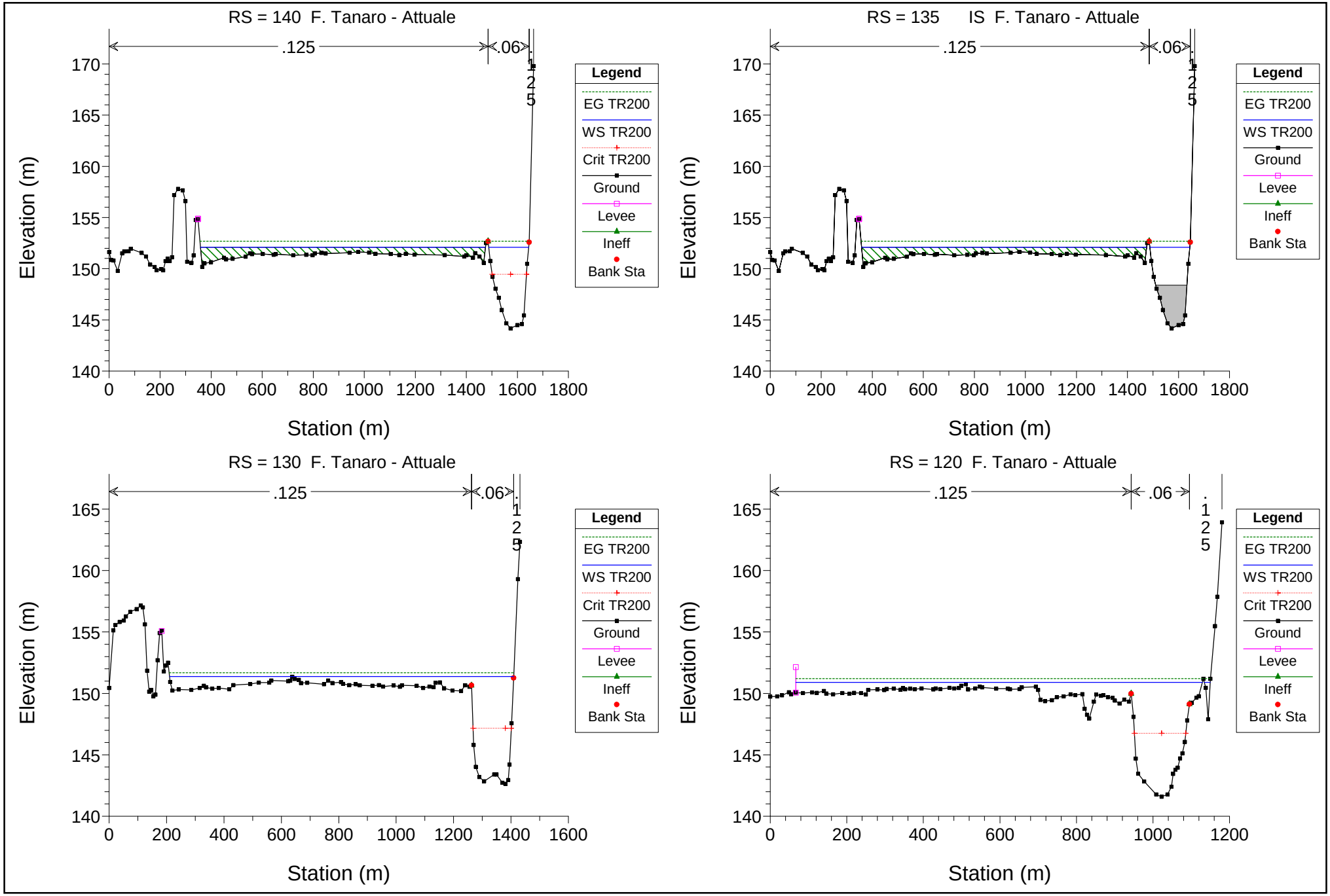

RS = 280 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

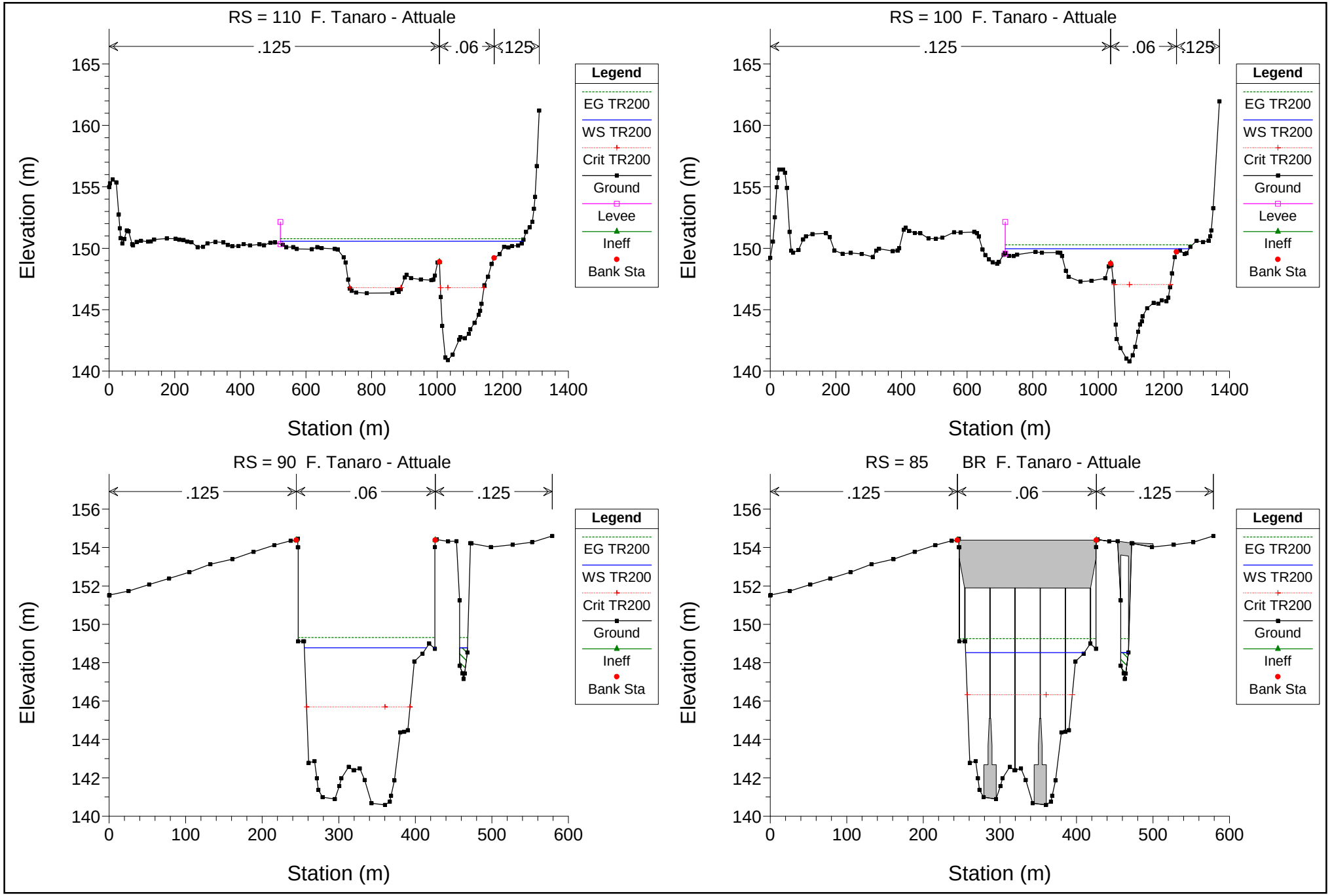

RS = 270 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

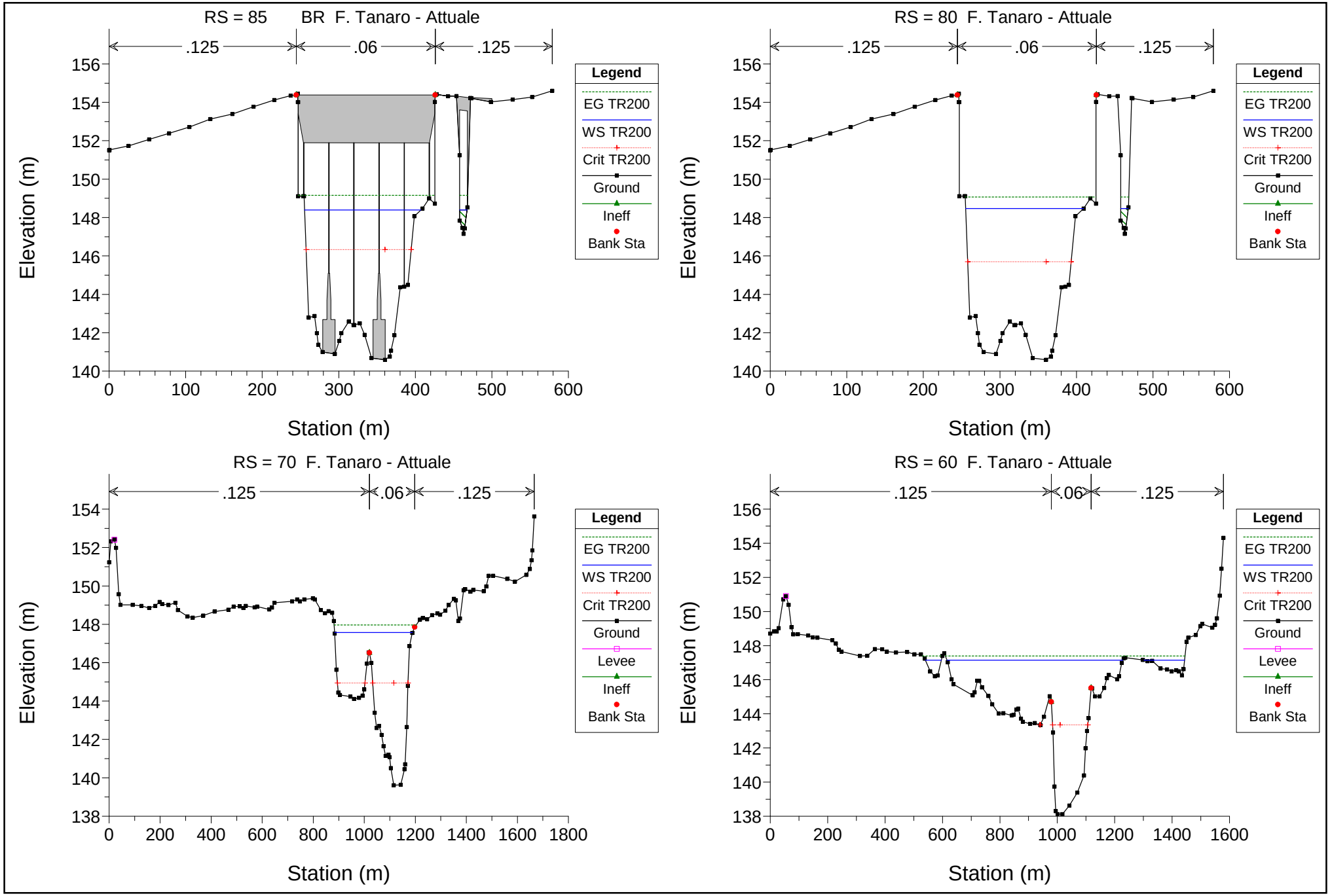

RS = 260 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 230 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

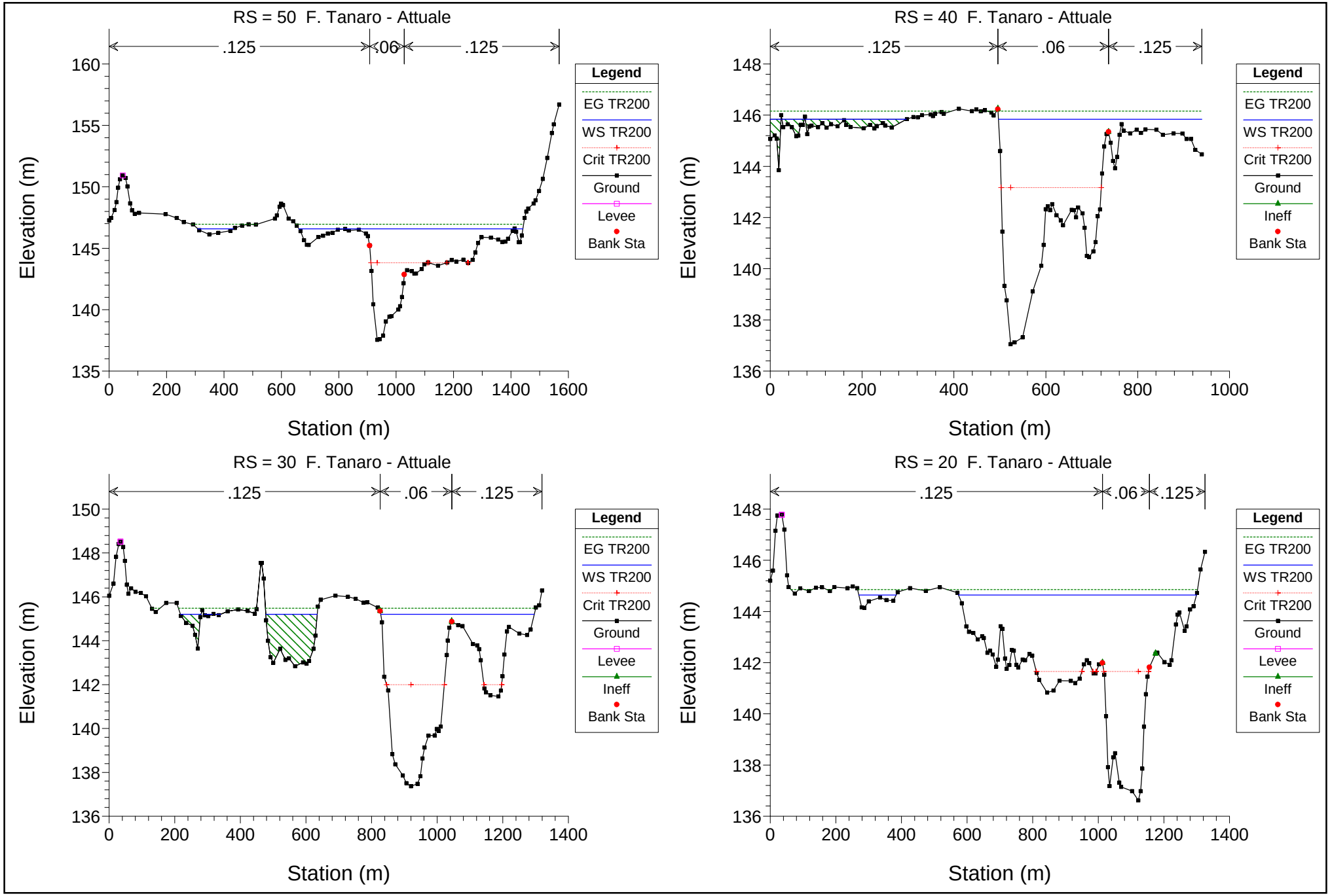

RS = 220 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Attuale
RS = 200 F. Tanaro - Attuale
RS = 190 F. Tanaro - Attuale

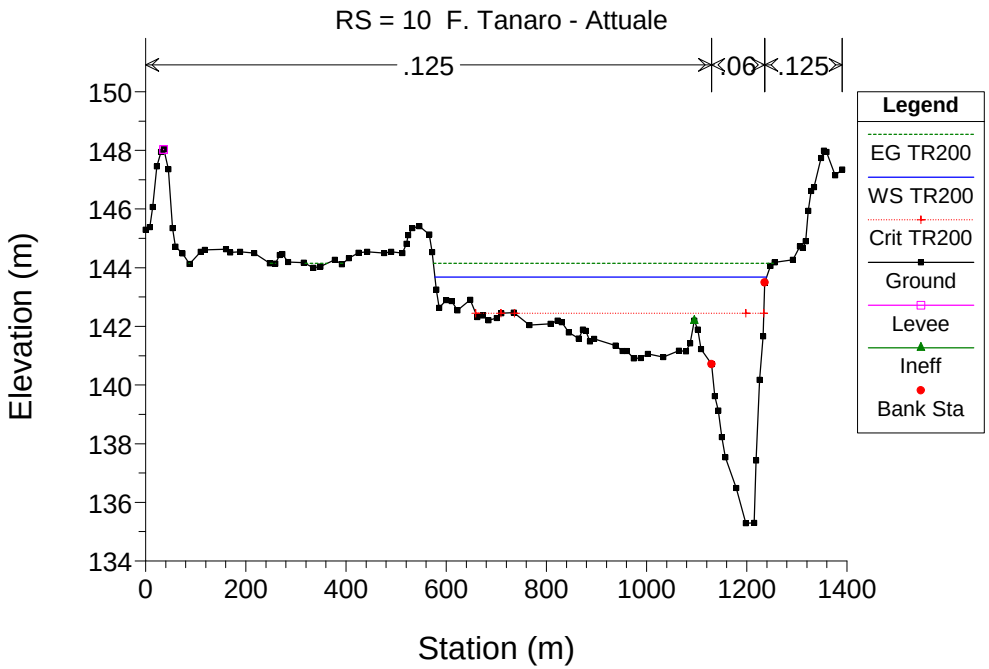

RS = 180 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 170 F. Tanaro - Attuale
RS = 160 F. Tanaro - Attuale
RS = 150 F. Tanaro - Attuale


RS = 140 F. Tanaro - Attuale
RS = 135 IS F. Tanaro - Attuale
RS = 130 F. Tanaro - Attuale
RS = 120 F. Tanaro - Attuale
.125
.06
.125
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
140
145
150
155
160
165
170
0
200
400
600
800
1000
1200
1400
1600
1800


RS = 110 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Attuale
RS = 90 F. Tanaro - Attuale
RS = 85 BR F. Tanaro - Attuale


RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Attuale
RS = 70 F. Tanaro - Attuale
Levee
RS = 60 F. Tanaro - Attuale


RS = 50 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 40 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 30 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 20 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO

SIMULAZIONE 4

Sbarramento mobile abbassato

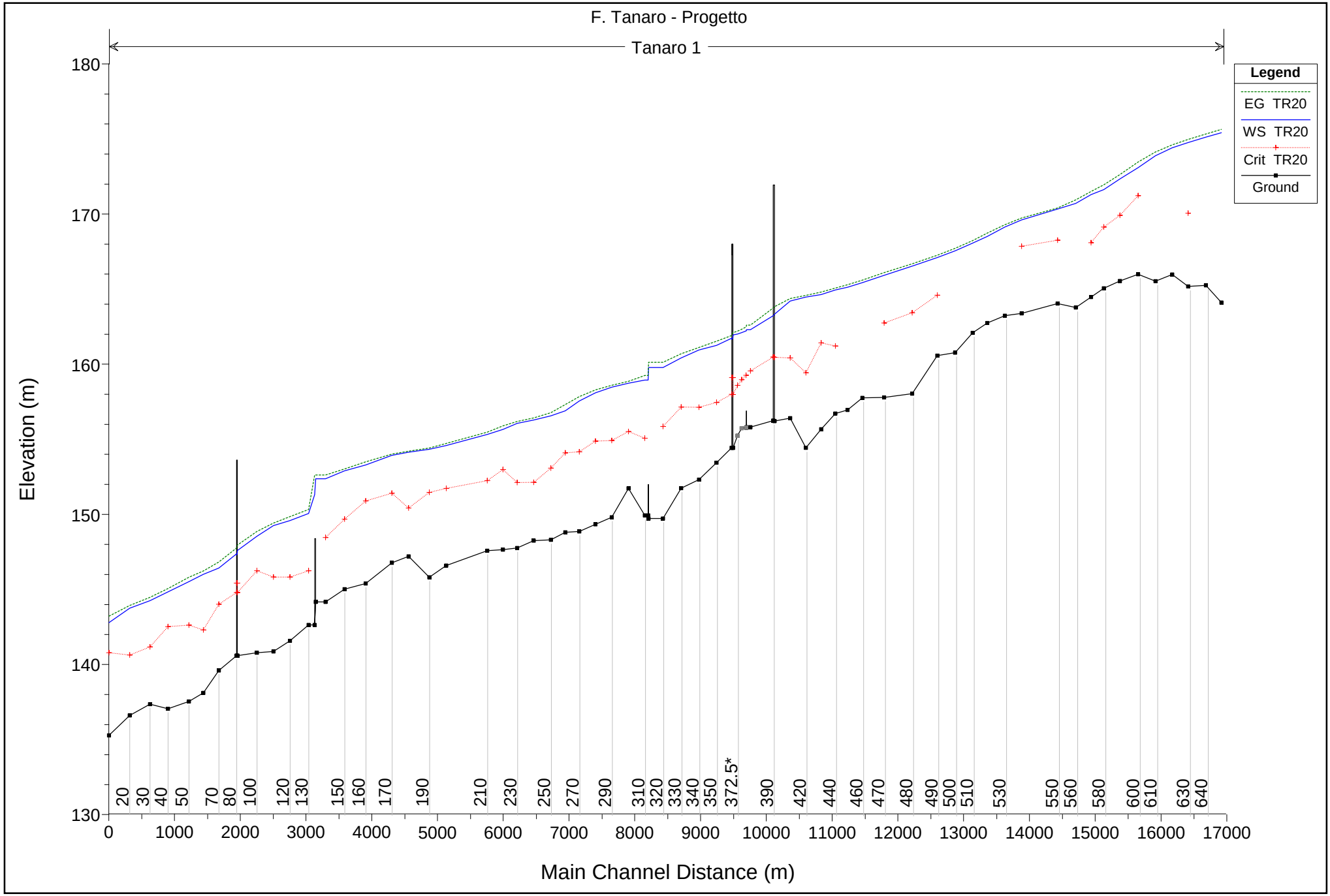
corso d'acqua	portata al colmo Q_c m^3/s	tempo di ritorno anni
Fiume Tanaro	2050	20

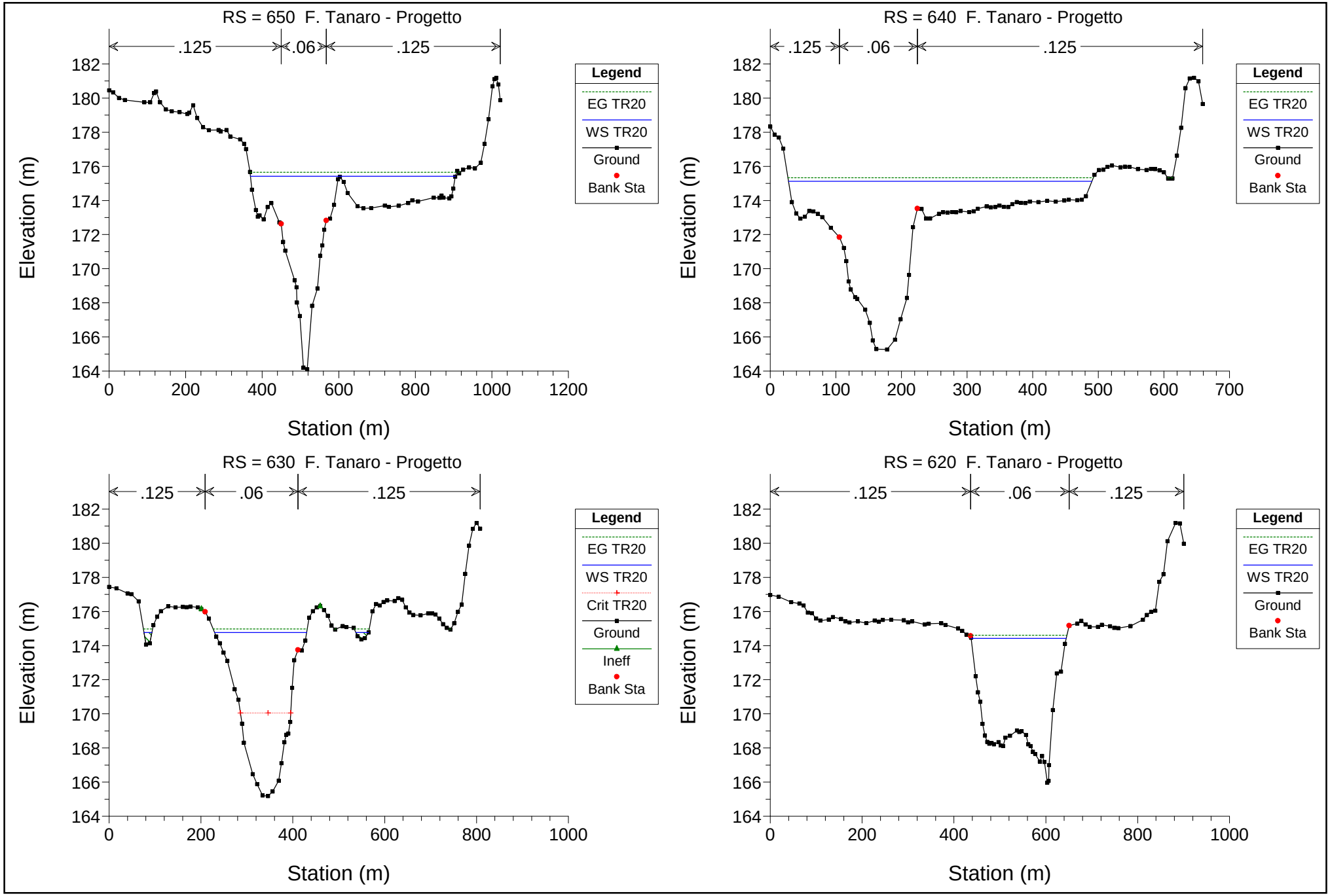
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20

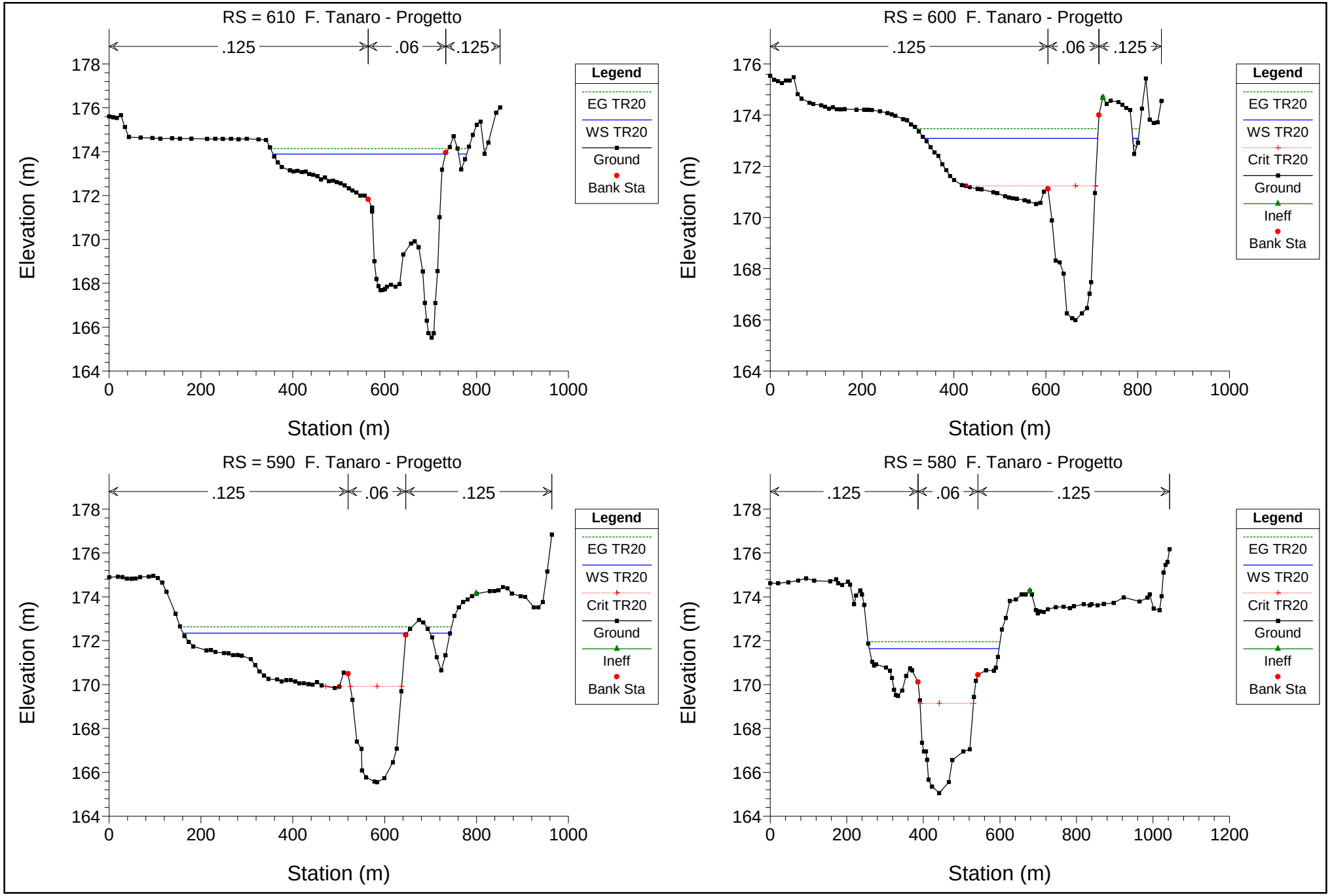
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	TR20	2050.00	164.11	175.42		175.65	0.001504	2.26	1437.50	535.68	0.28
1	640	TR20	2050.00	165.26	175.12		175.33	0.001197	2.14	1404.93	462.49	0.25
1	630	TR20	2050.00	165.18	174.77	170.06	174.97	0.001459	2.00	1037.42	246.03	0.27
1	620	TR20	2050.00	165.98	174.42		174.61	0.001524	1.92	1065.02	207.07	0.27
1	610	TR20	2050.00	165.53	173.89		174.14	0.002184	2.28	1093.81	393.46	0.32
1	600	TR20	2050.00	165.99	173.10	171.23	173.47	0.003380	2.94	1074.72	390.67	0.41
1	590	TR20	2050.00	165.55	172.34	169.92	172.63	0.002720	2.60	1266.37	530.60	0.36
1	580	TR20	2050.00	165.06	171.64	169.14	171.95	0.002824	2.55	969.76	339.26	0.37
1	570	TR20	2050.00	164.47	171.30	168.10	171.51	0.001682	2.13	1304.38	497.35	0.29
1	560	TR20	2050.00	163.78	170.72		170.95	0.003478	2.33	1273.10	626.04	0.39
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.46	1104.77	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001917	2.05	2272.27	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001723	1.89	1696.03	656.64	0.28
1	520	TR20	2050.00	162.75	168.51		168.73	0.002552	2.29	1534.25	916.45	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002339	2.02	1648.94	699.72	0.32
1	500	TR20	2050.00	160.77	167.55		167.71	0.001693	1.97	1549.53	539.59	0.28
1	490	TR20	2050.00	160.58	167.10	164.60	167.26	0.001703	1.83	1420.83	495.13	0.28
1	480	TR20	2050.00	158.04	166.54	163.44	166.69	0.001413	1.84	1667.15	673.74	0.26
1	470	TR20	2050.00	157.79	165.92	162.75	166.10	0.001568	2.07	1545.48	508.69	0.28
1	460	TR20	2050.00	157.77	165.44		165.61	0.001399	1.92	1513.90	636.13	0.26
1	450	TR20	2050.00	156.96	165.13		165.30	0.001346	1.91	1453.16	517.73	0.26
1	440	TR20	2050.00	156.72	164.95	161.21	165.07	0.001023	1.73	1951.36	641.13	0.23
1	430	TR20	2050.00	155.68	164.65	161.42	164.80	0.001445	2.05	1866.48	649.59	0.27
1	420	TR20	2050.00	154.44	164.48	159.43	164.58	0.000659	1.57	2142.65	648.80	0.19
1	410	TR20	2050.00	156.41	164.22	160.42	164.38	0.001273	1.95	1621.16	487.19	0.25
1	400	TR20	2050.00	156.22	163.34	160.47	163.83	0.003396	3.15	718.00	160.93	0.41
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.23	160.48	163.75	0.003615	3.21	700.51	160.63	0.42
1	380	TR20	2050.00	155.82	162.31	159.56	162.62	0.002479	2.46	833.16	159.43	0.34
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	161.95	157.99	162.11	0.001076	1.76	1167.52	198.95	0.23
1	365		Bridge									
1	360	TR20	2050.00	154.43	161.74	157.99	161.91	0.001206	1.82	1125.10	197.65	0.24
1	350	TR20	2050.00	153.45	161.27	157.46	161.54	0.001763	2.33	879.22	144.72	0.30
1	340	TR20	2050.00	152.32	160.95	157.14	161.12	0.001208	1.85	1110.33	197.73	0.25
1	330	TR20	2050.00	151.75	160.43	157.15	160.70	0.002025	2.31	918.93	307.41	0.32
1	320	TR20	2050.00	149.73	159.79	155.86	160.14	0.002012	2.72	1073.72	371.05	0.32
1	315		Inl Struct									
1	310	TR20	2050.00	149.94	158.95	155.07	159.25	0.001908	2.61	1291.56	481.49	0.31
1	300	TR20	2050.00	151.73	158.73	155.53	158.86	0.001090	1.77	1945.47	629.41	0.23

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (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)	
1	290	TR20	2050.00	149.81	158.47	154.92	158.60	0.001026	1.63	1604.83	570.74	0.22
1	280	TR20	2050.00	149.34	158.10	154.88	158.29	0.001569	2.14	1491.33	439.35	0.28
1	270	TR20	2050.00	148.86	157.56	154.17	157.85	0.002073	2.57	1252.47	447.36	0.32
1	260	TR20	2050.00	148.81	156.90	154.10	157.32	0.003029	3.01	926.11	280.75	0.39
1	250	TR20	2050.00	148.31	156.57	153.08	156.77	0.001710	2.14	1407.89	503.96	0.29
1	240	TR20	2050.00	148.26	156.28	152.13	156.43	0.000956	1.77	1672.14	728.56	0.22
1	230	TR20	2050.00	147.77	156.07	152.13	156.19	0.000906	1.61	1684.74	453.61	0.21
1	220	TR20	2050.00	147.66	155.66	152.99	155.90	0.002003	2.36	1300.66	396.95	0.32
1	210	TR20	2050.00	147.59	155.33	152.25	155.48	0.001325	1.86	1532.85	542.37	0.26
1	200	TR20	2050.00	146.60	154.59	151.73	154.72	0.001319	1.97	2301.47	1060.77	0.26
1	190	TR20	2050.00	145.82	154.34	151.46	154.42	0.000920	1.50	2618.22	1163.86	0.21
1	180	TR20	2050.00	147.21	154.15	150.42	154.21	0.000586	1.34	3180.99	1431.49	0.17
1	170	TR20	2050.00	146.78	153.94	151.42	154.02	0.001053	1.46	2564.96	1361.59	0.22
1	160	TR20	2050.00	145.40	153.29	150.90	153.50	0.001845	2.39	2058.26	1358.23	0.31
1	150	TR20	2050.00	145.03	152.91	149.69	153.03	0.001183	1.76	2325.03	1345.72	0.24
1	140	TR20	2050.00	144.17	152.37	148.46	152.62	0.001673	2.20	932.33	1278.40	0.29
1	135		Inl Struct									
1	130	TR20	2050.00	142.64	150.07	146.24	150.33	0.001633	2.27	904.82	143.56	0.29
1	120	TR20	2050.00	141.58	149.59	145.83	149.85	0.001714	2.26	916.41	288.46	0.29
1	110	TR20	2050.00	140.88	149.25	145.83	149.42	0.001532	1.95	1529.53	461.32	0.27
1	100	TR20	2050.00	140.79	148.54	146.25	148.86	0.003219	2.51	817.61	322.95	0.38
1	90	TR20	2050.00	140.59	147.59	144.80	147.96	0.002795	2.67	766.74	146.16	0.37
1	85		Bridge									
1	80	TR20	2050.00	140.59	147.37	144.80	147.77	0.003189	2.79	735.22	142.81	0.39
1	70	TR20	2050.00	139.61	146.42	144.02	146.83	0.003745	2.84	722.77	282.30	0.42
1	60	TR20	2050.00	138.12	146.02	142.31	146.23	0.001552	2.17	1402.39	539.70	0.28
1	50	TR20	2050.00	137.54	145.52	142.62	145.81	0.002265	2.55	1169.69	411.90	0.34
1	40	TR20	2050.00	137.06	144.84	142.53	145.07	0.002439	2.13	961.38	268.40	0.33
1	30	TR20	2050.00	137.37	144.26	141.18	144.48	0.001906	2.09	980.88	475.93	0.30
1	20	TR20	2050.00	136.62	143.76	140.64	143.93	0.001535	2.06	1684.57	670.10	0.28
1	10	TR20	2050.00	135.29	142.79	140.78	143.23	0.004002	3.16	1096.50	620.31	0.44


F. Tanaro - Progetto
Tanaro 1
Legend
EG TR20
WS TR20
Crit TR20
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
610
630
640


RS = 650 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 640 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 630 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta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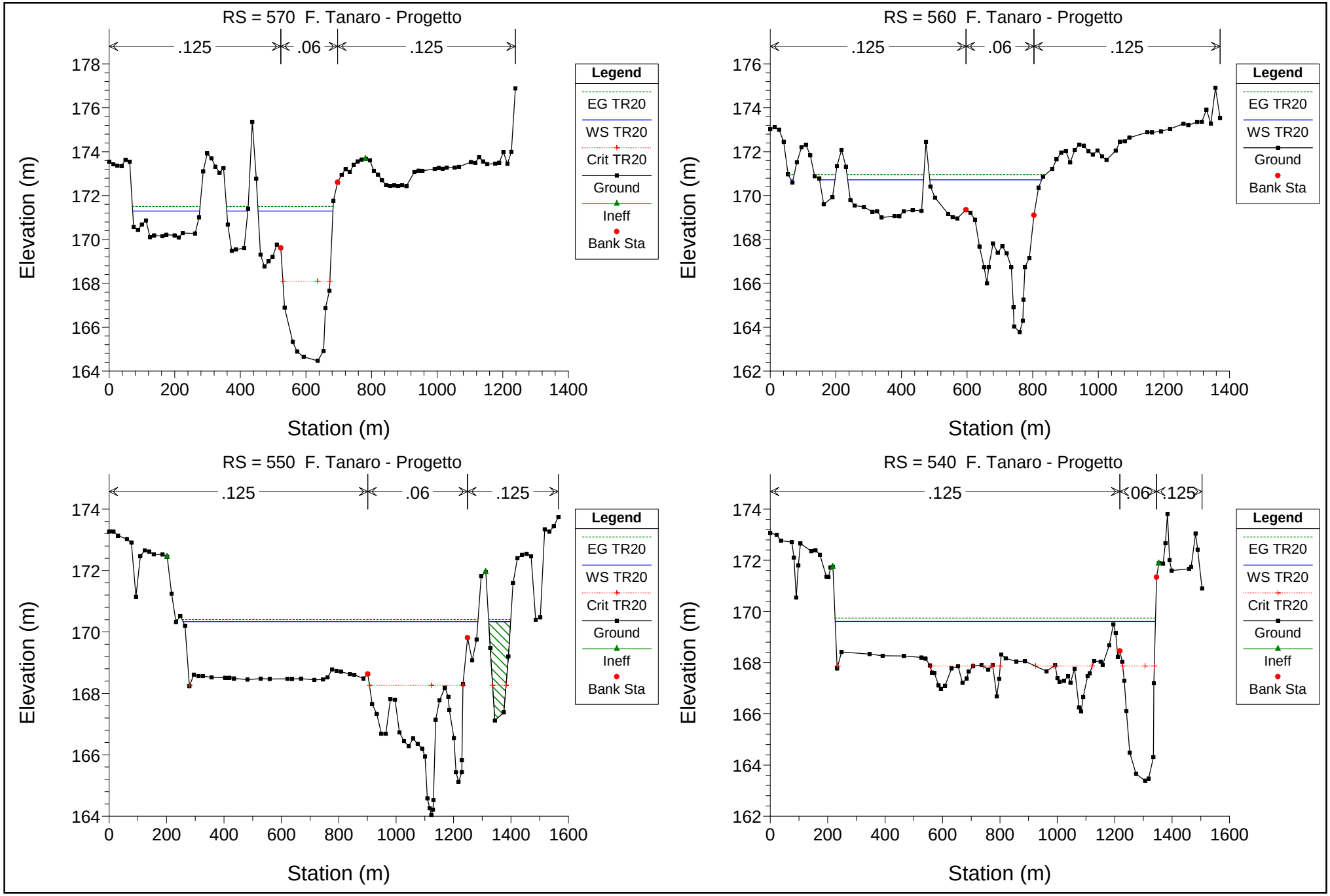
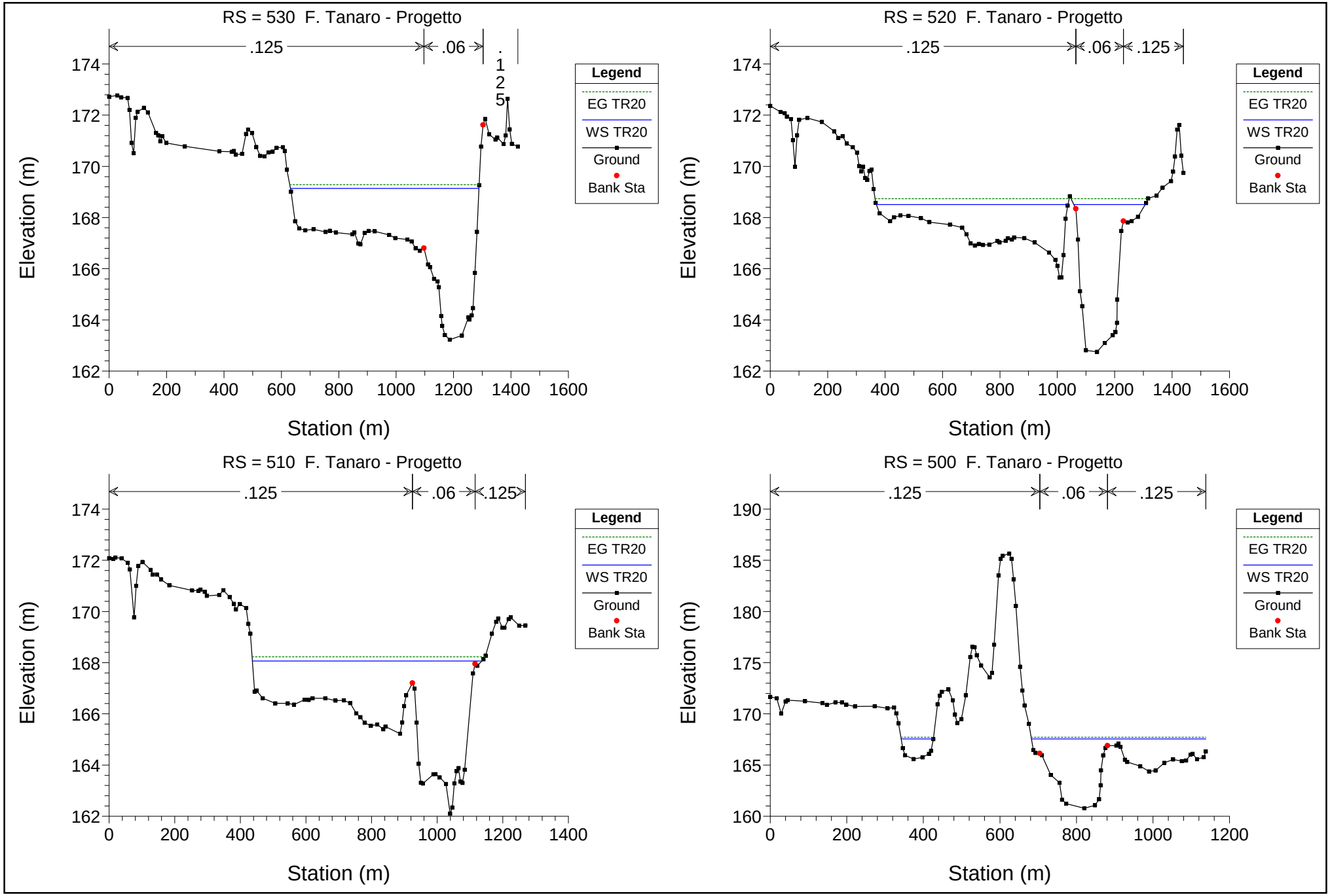
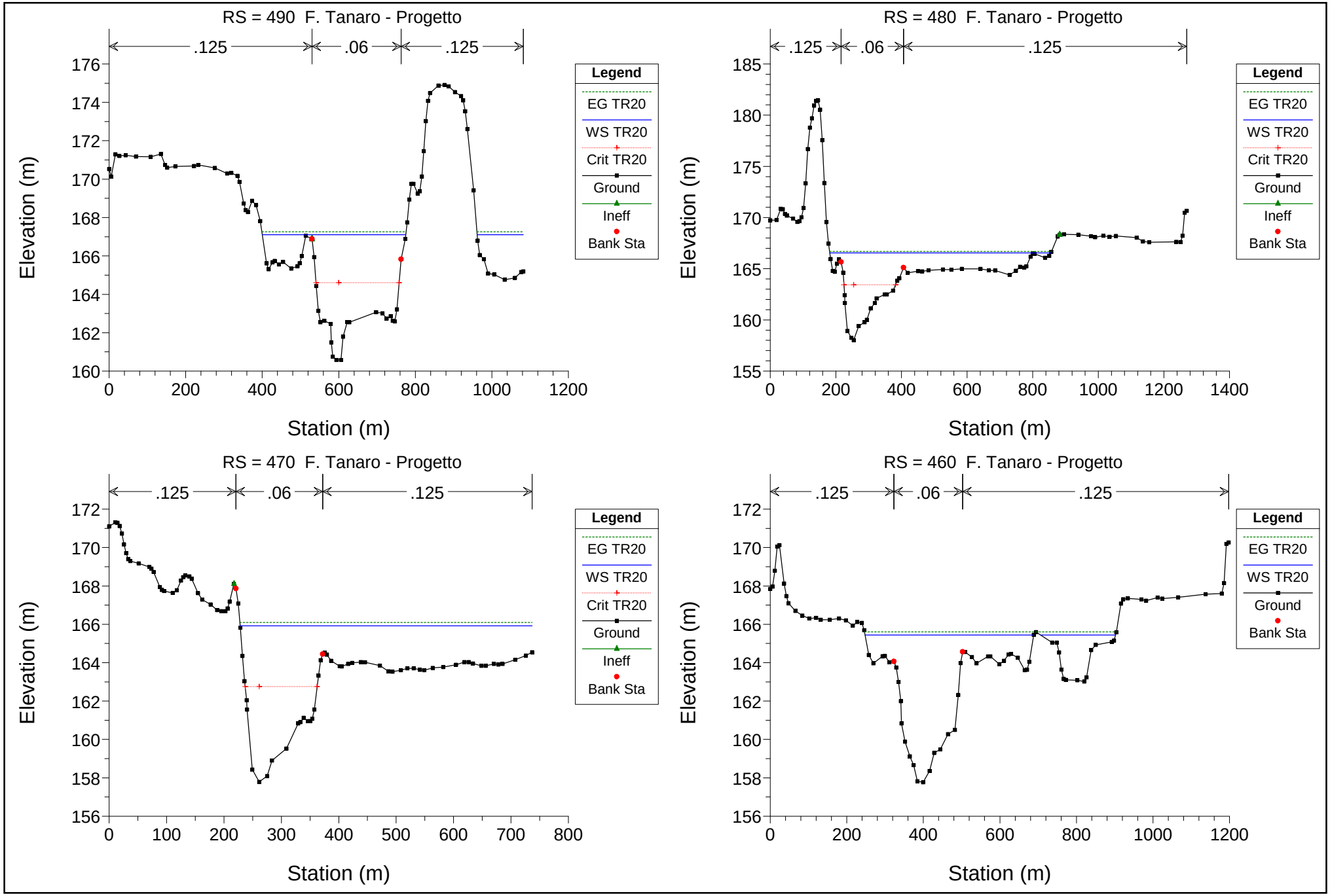
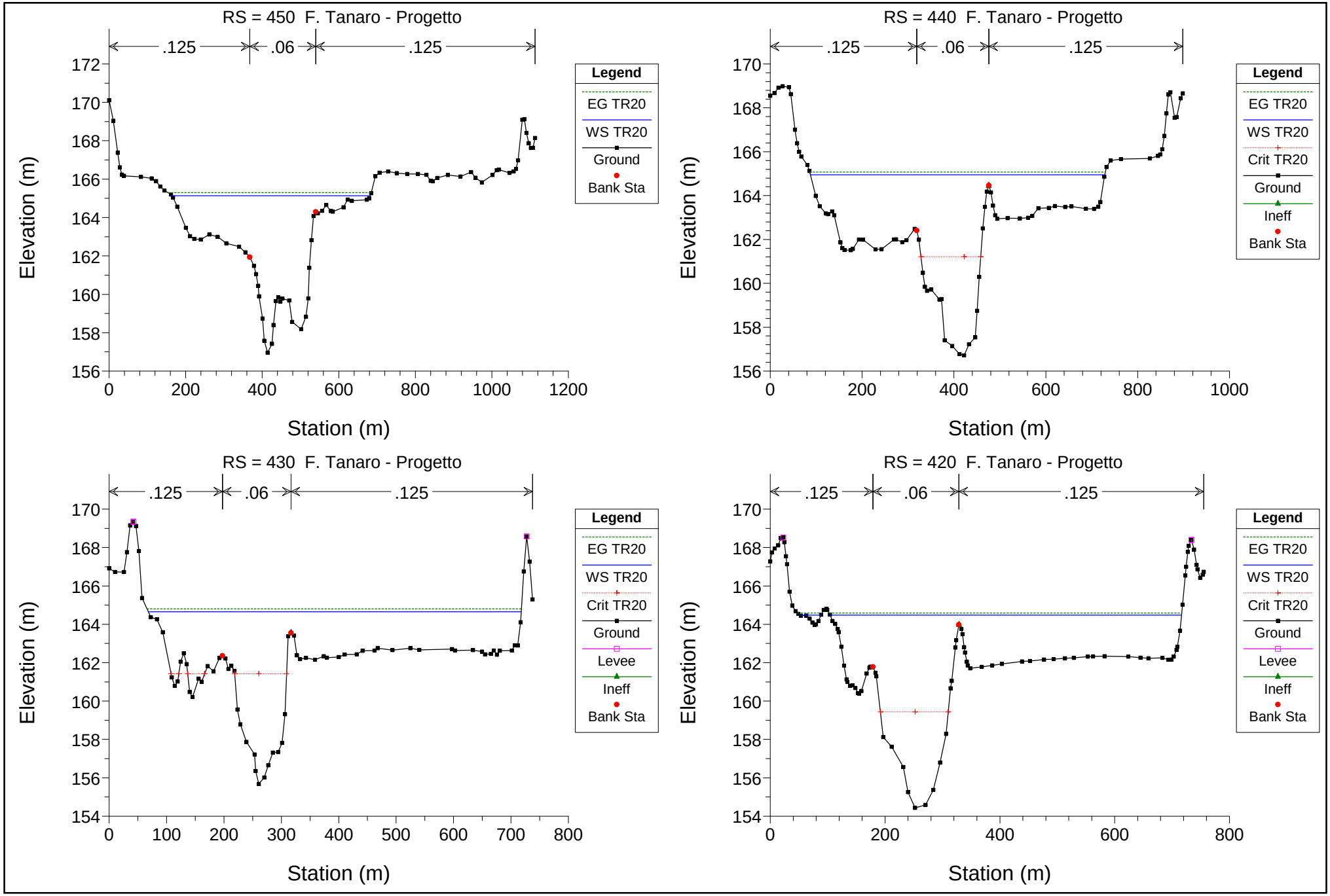
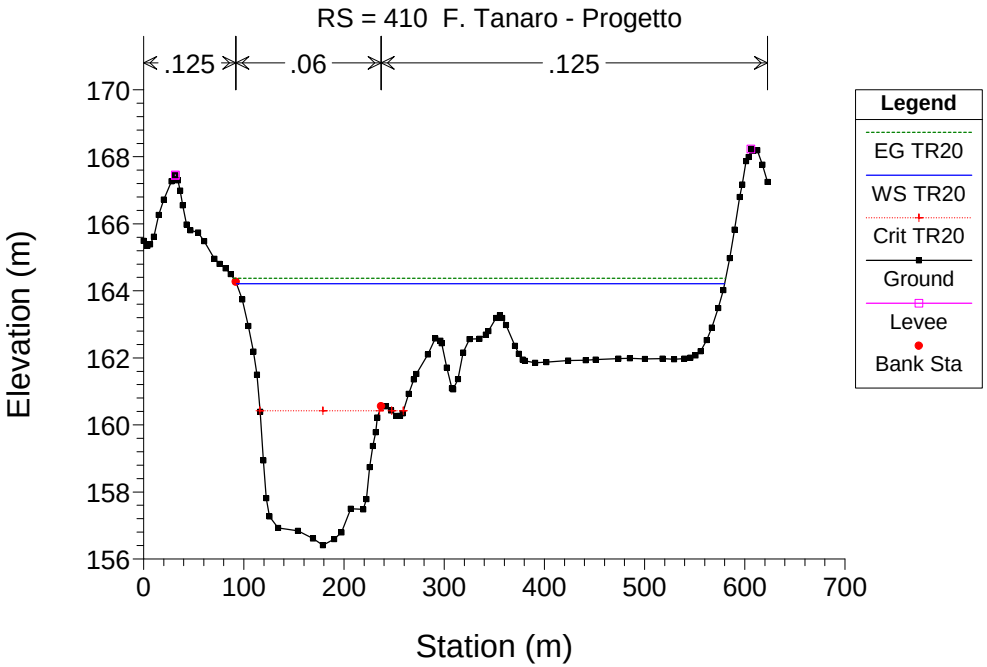
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 600 F. Tanaro - Progetto
Crit TR20
Ineff
RS = 590 F. Tanaro - Progetto
RS = 580 F. Tanaro - Progetto

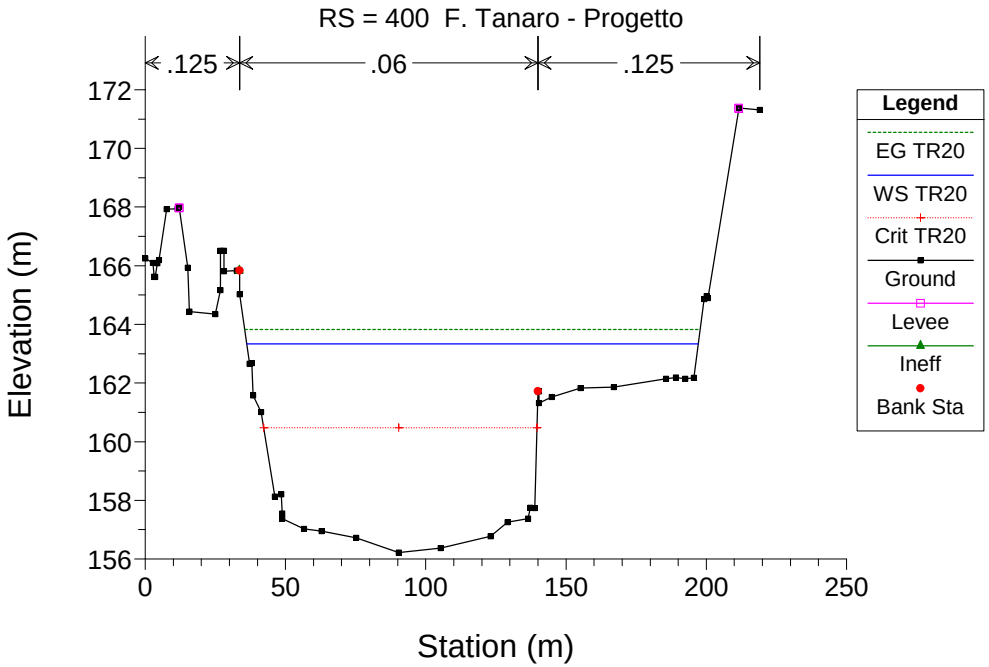

RS = 570 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Progetto
RS = 550 F. Tanaro - Progetto
RS = 540 F. Tanaro - Progetto


RS = 530 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR20
WS TR20
Ground
Bank Sta
Elevation (m)
Station (m)


RS = 490 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Progetto
RS = 470 F. Tanaro - Progetto
RS = 460 F. Tanaro - Progetto


RS = 450 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Bank Sta
RS = 440 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 430 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 420 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 410 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta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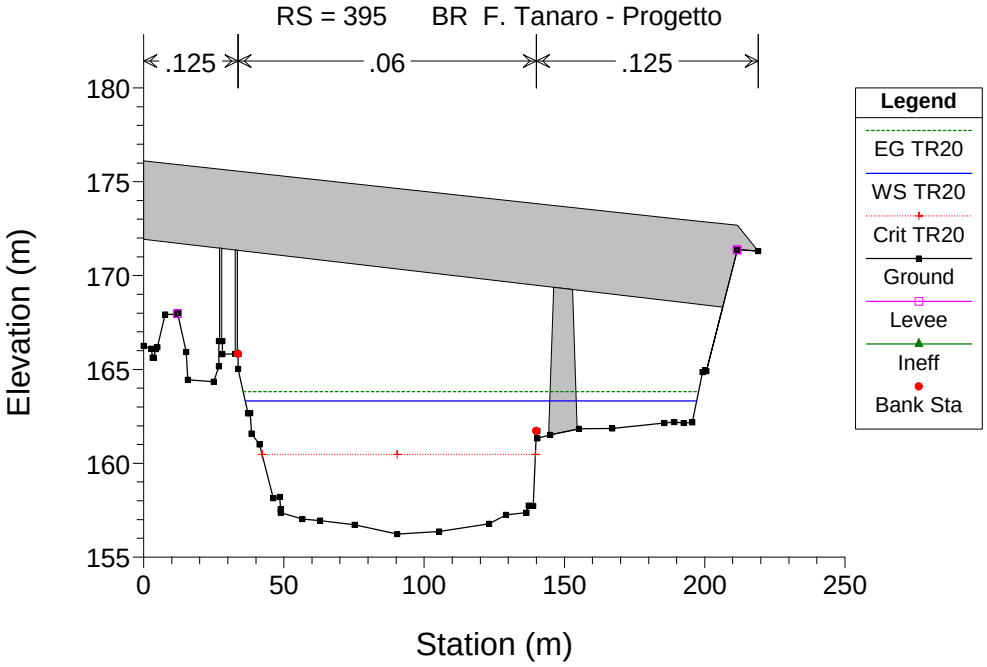
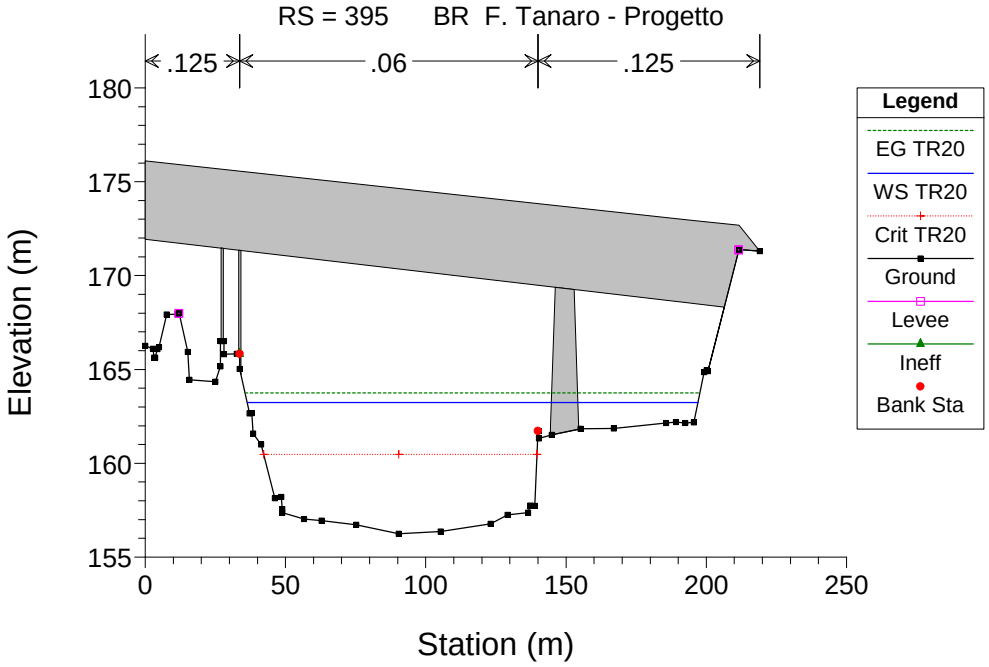
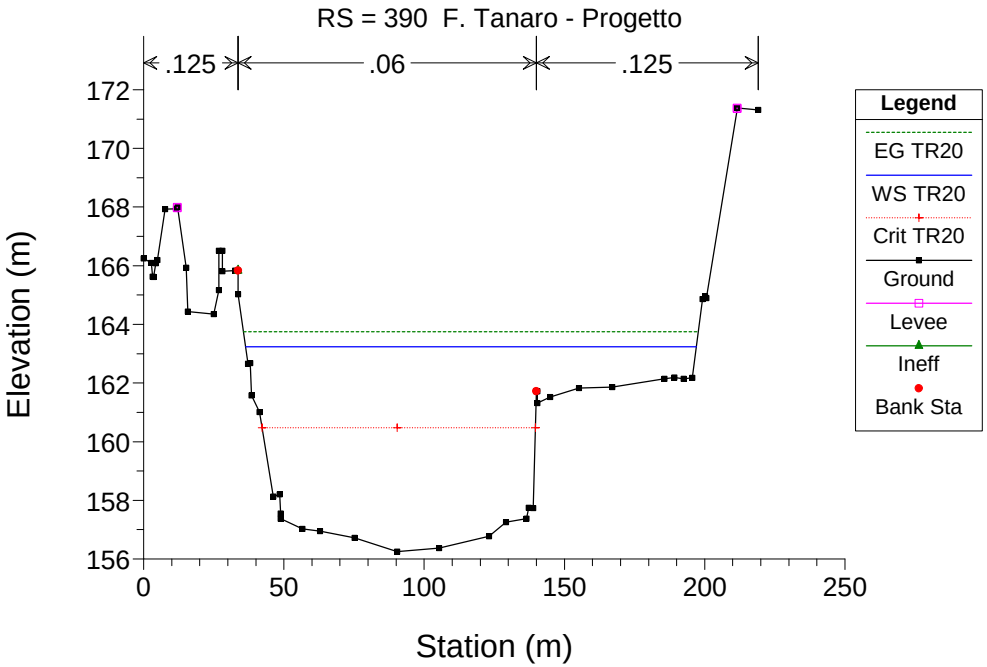
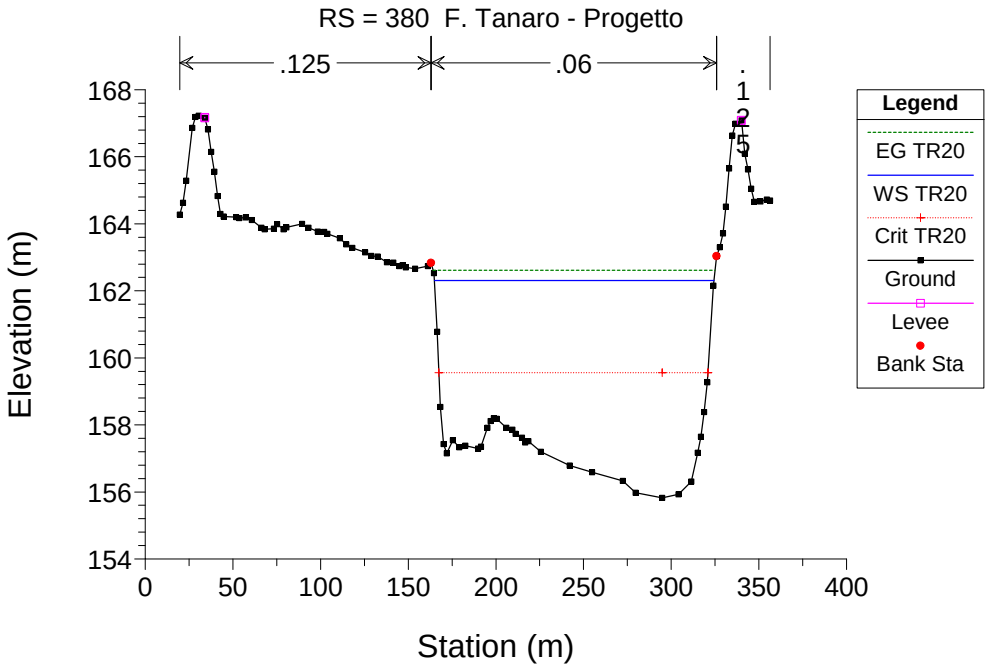
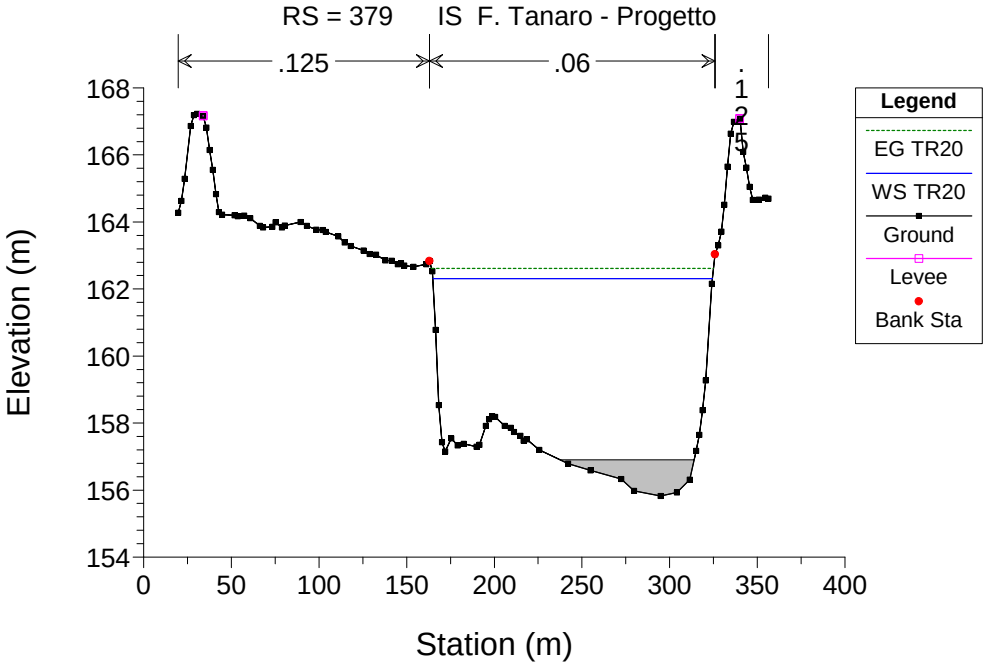
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 390 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 380 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta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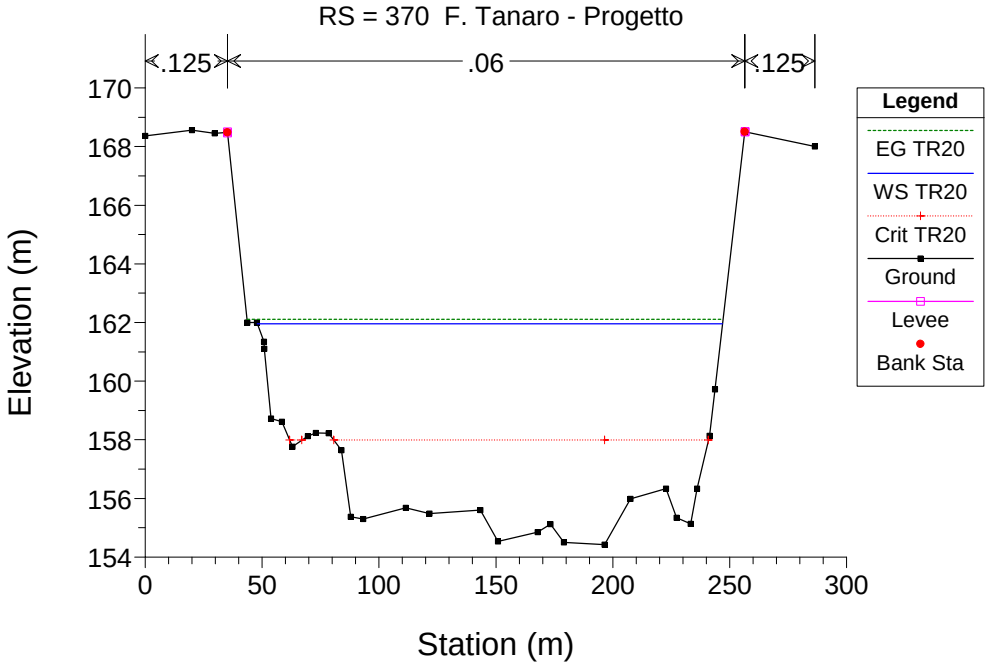
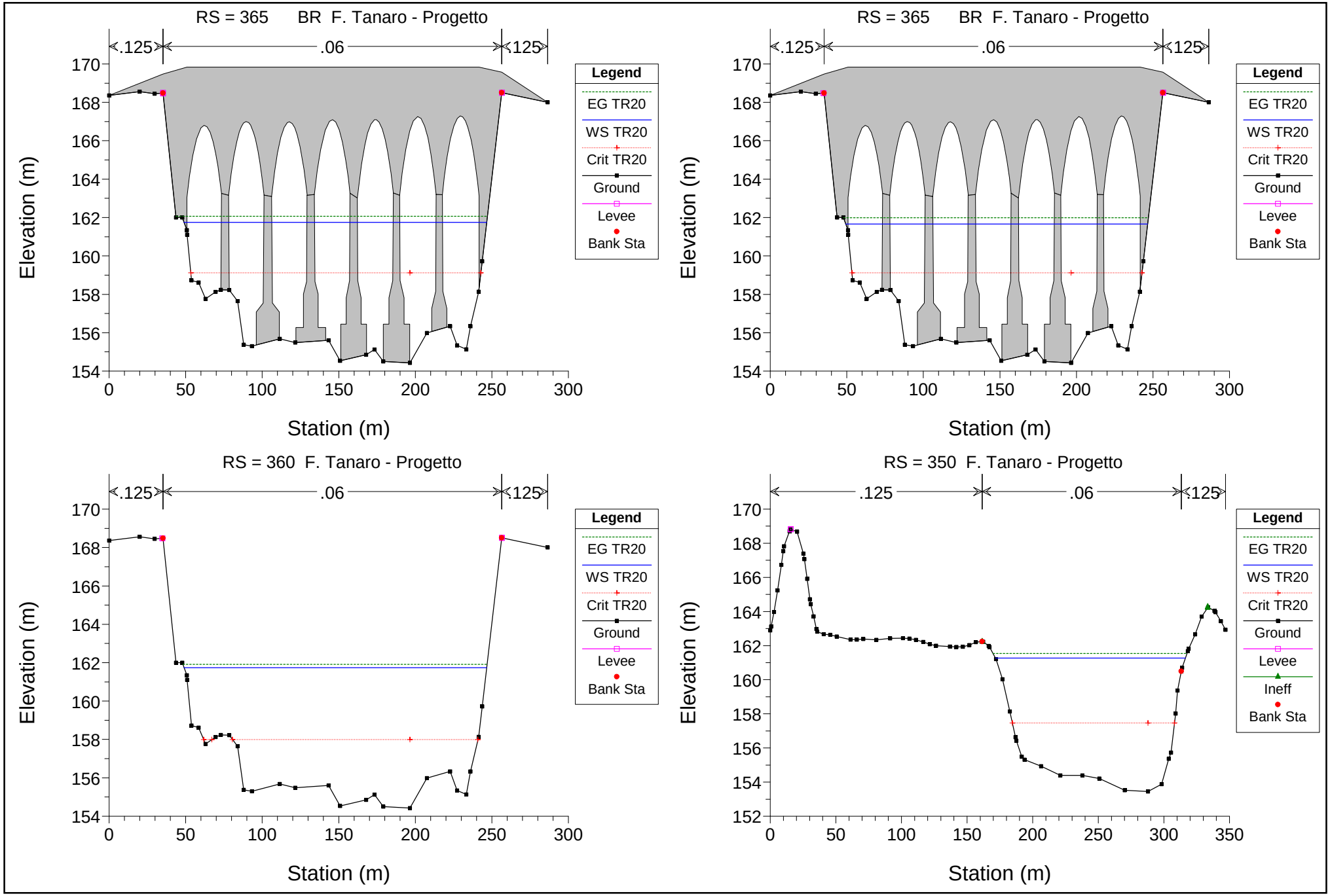
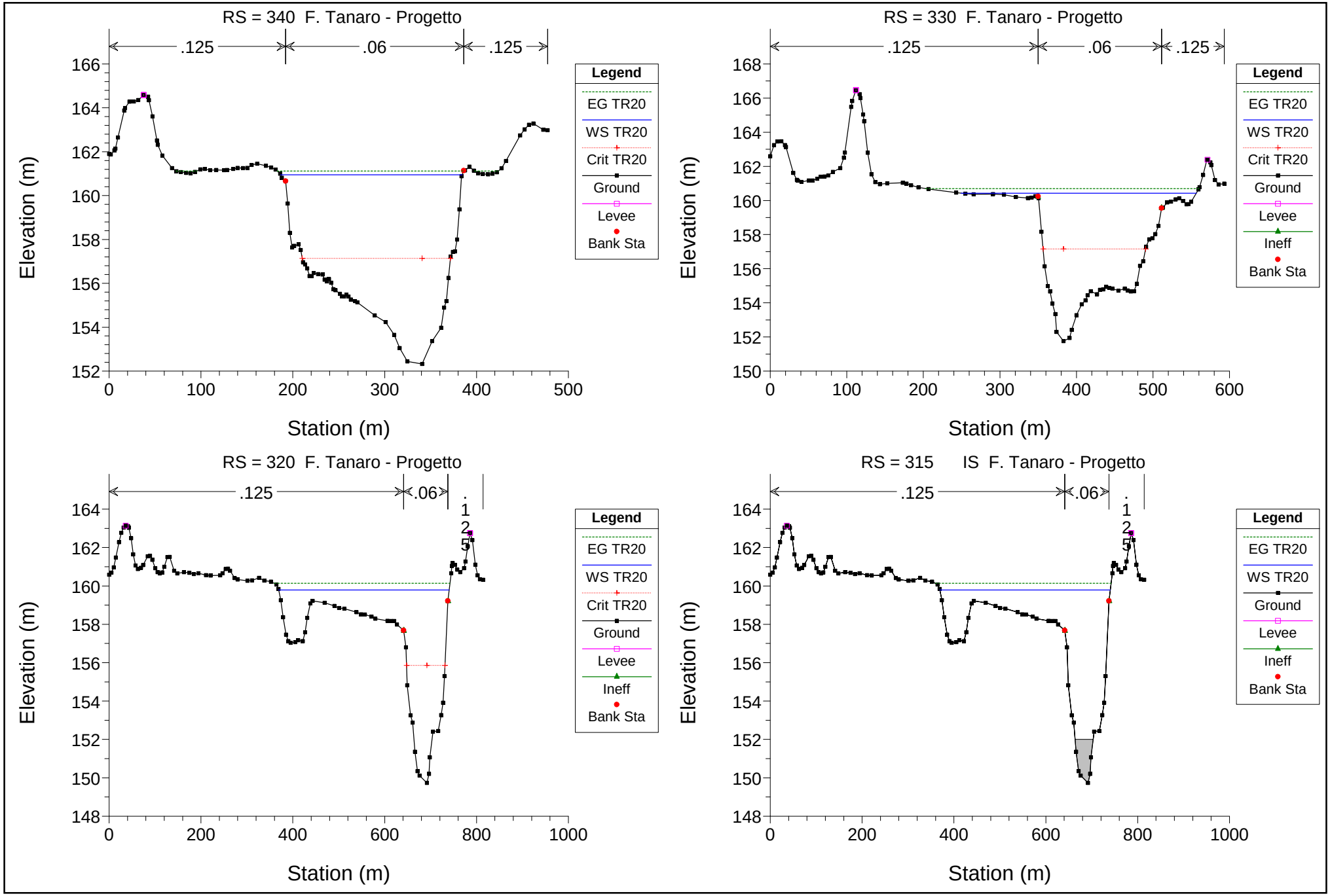
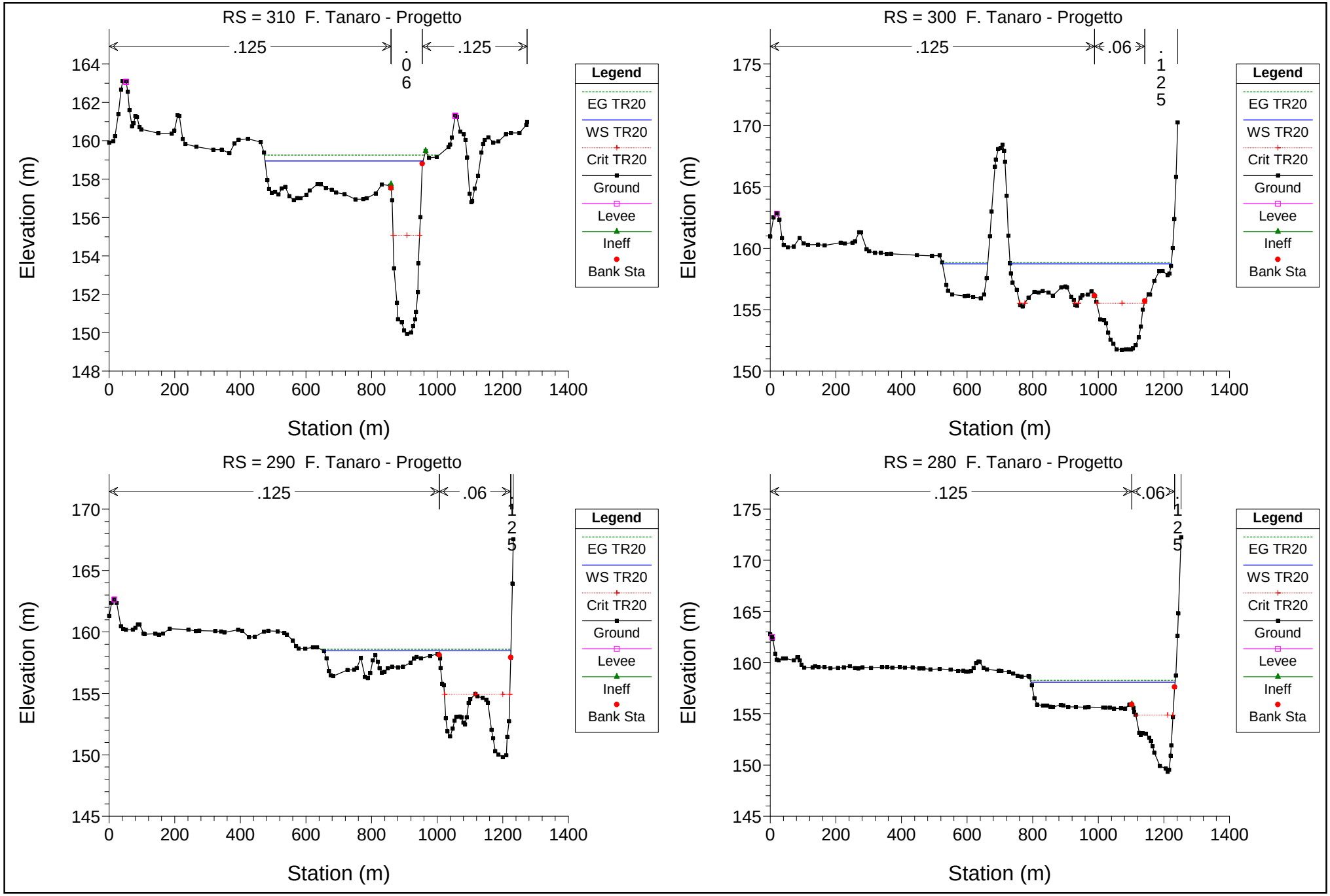
.125
.06
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Levee
Bank Sta


RS = 370 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta


RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Progetto
RS = 360 F. Tanaro - Progetto
RS = 350 F. Tanaro - Progetto
Ineff


RS = 340 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 315 IS F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Ground
Levee
Ineff
Bank Sta


RS = 310 F. Tanaro - Progetto
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.06
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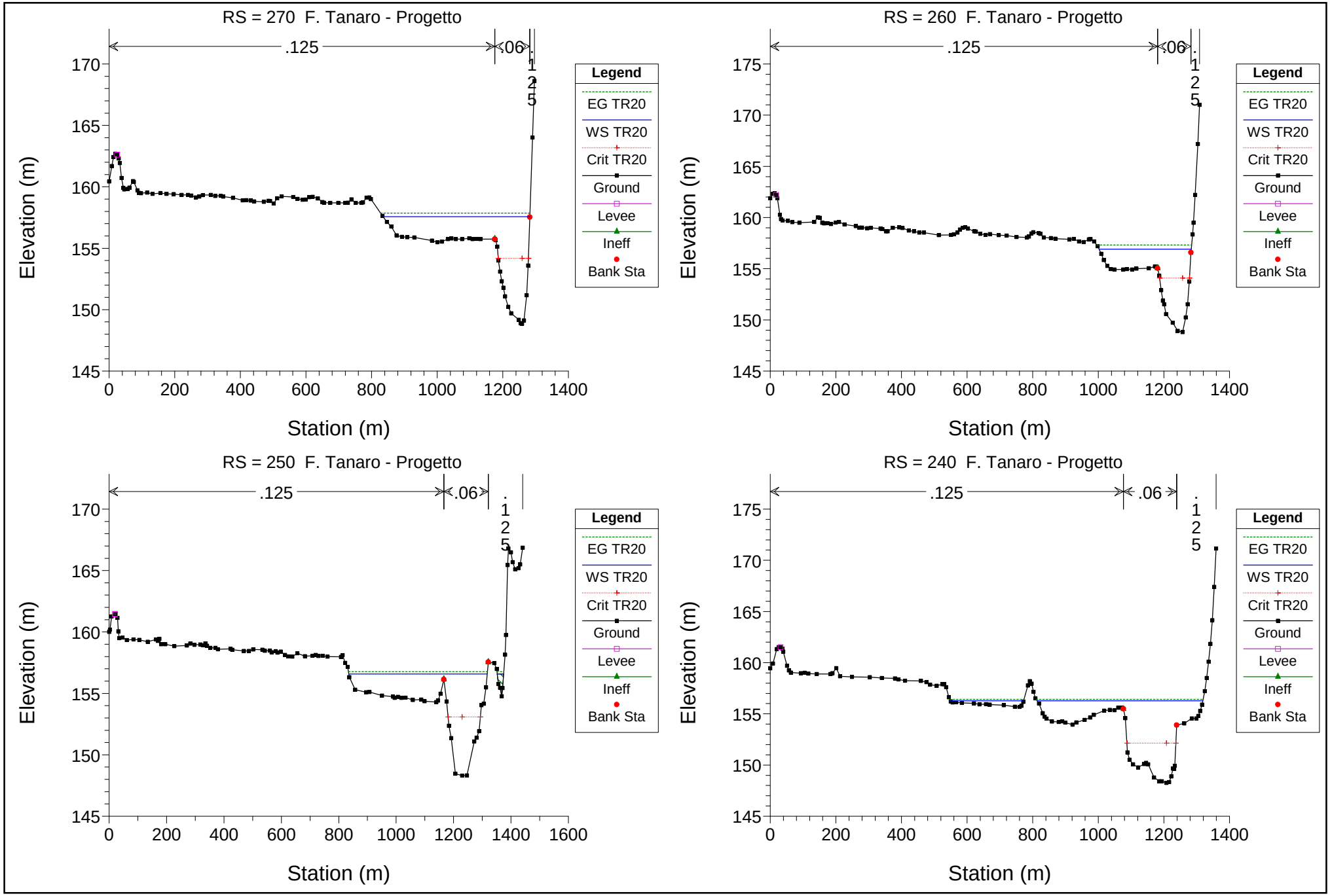
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 300 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 290 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 280 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta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.125
.06
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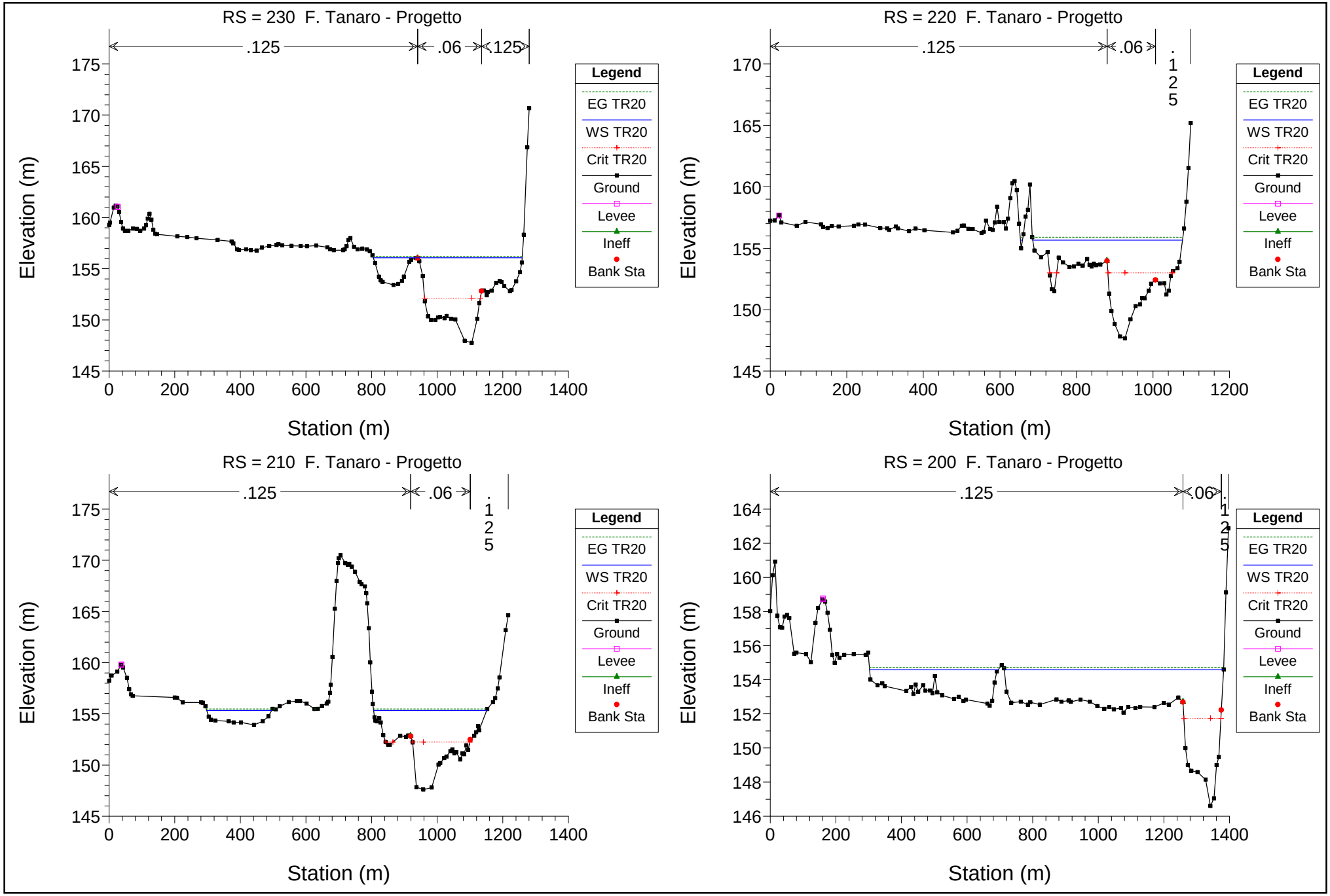
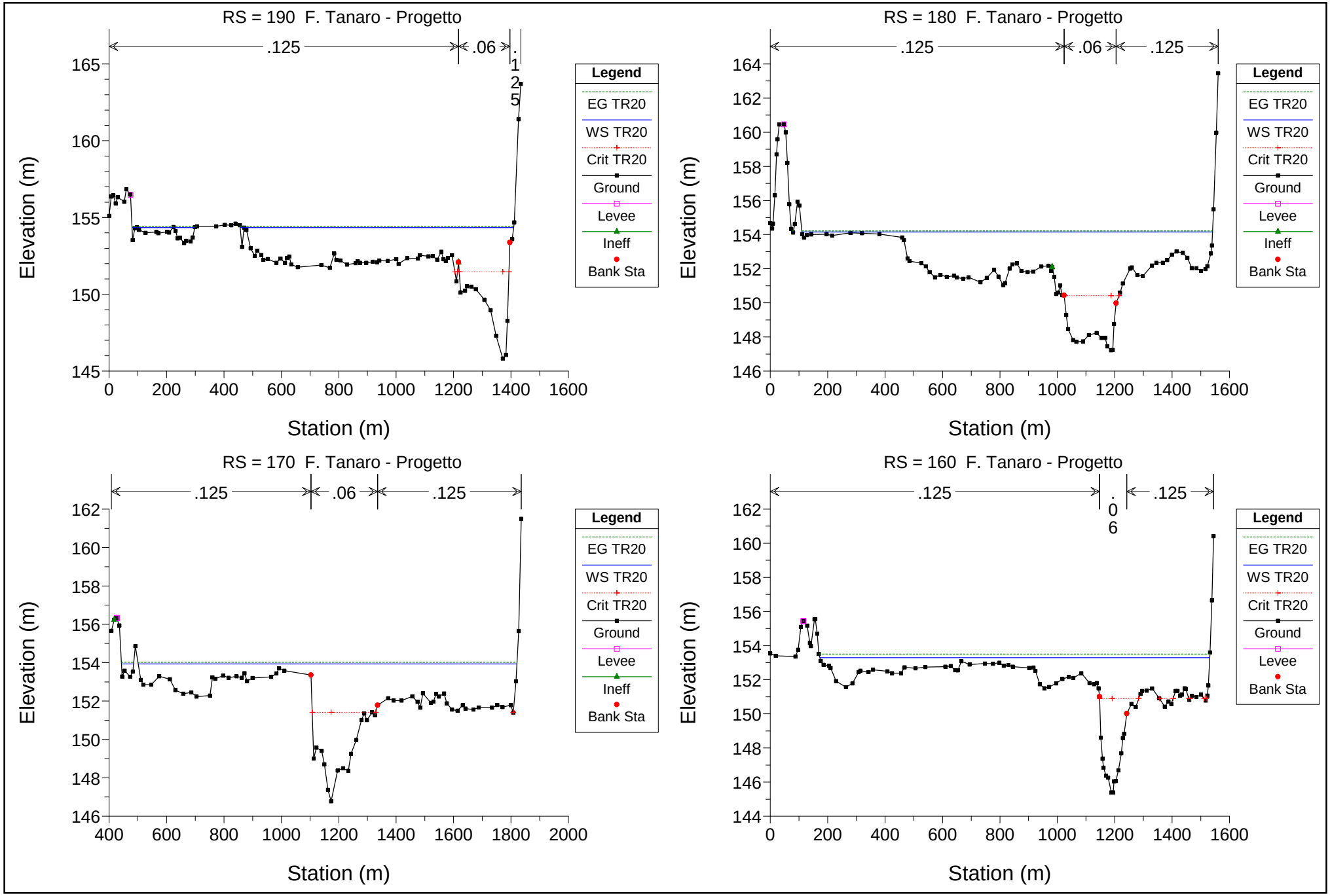
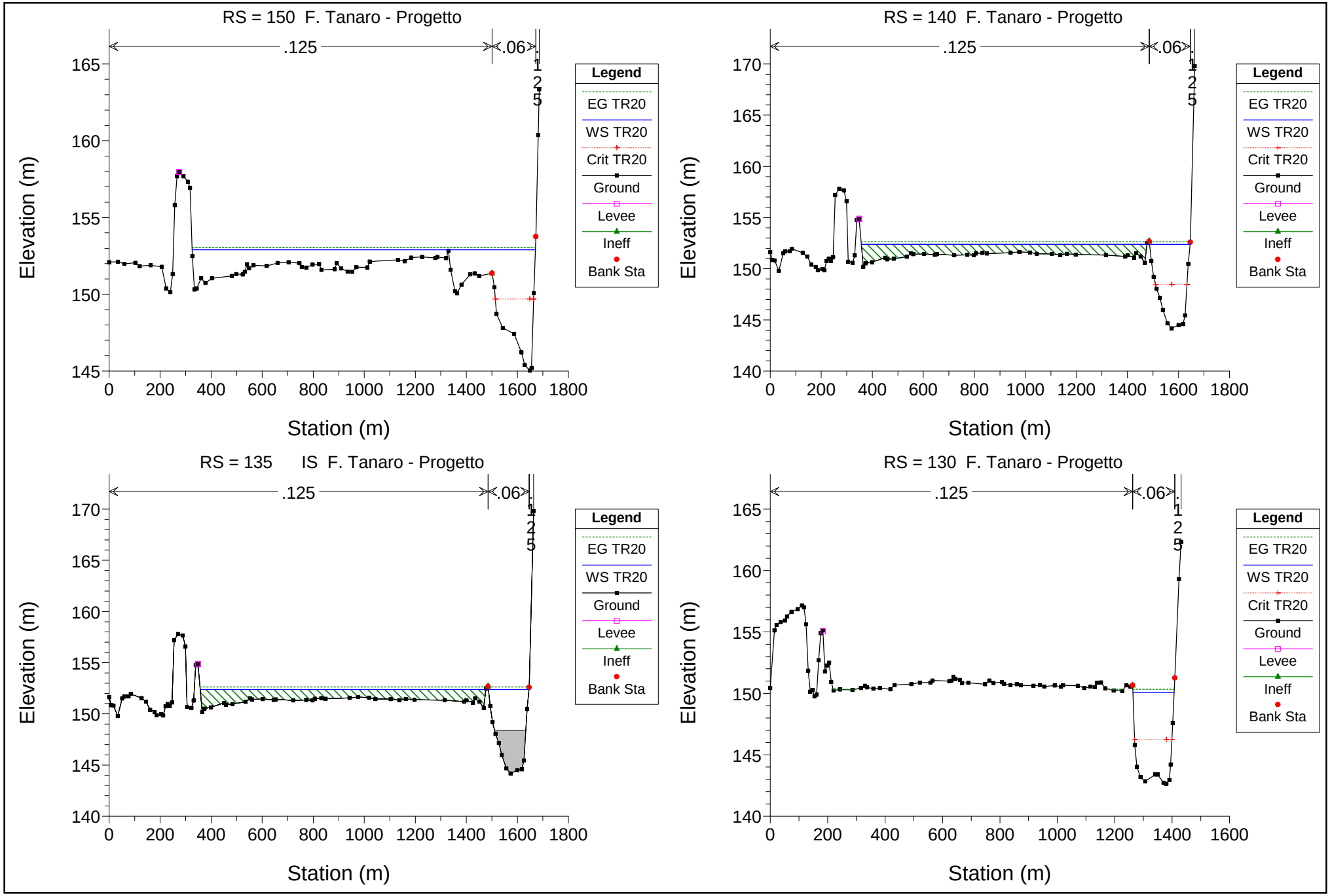
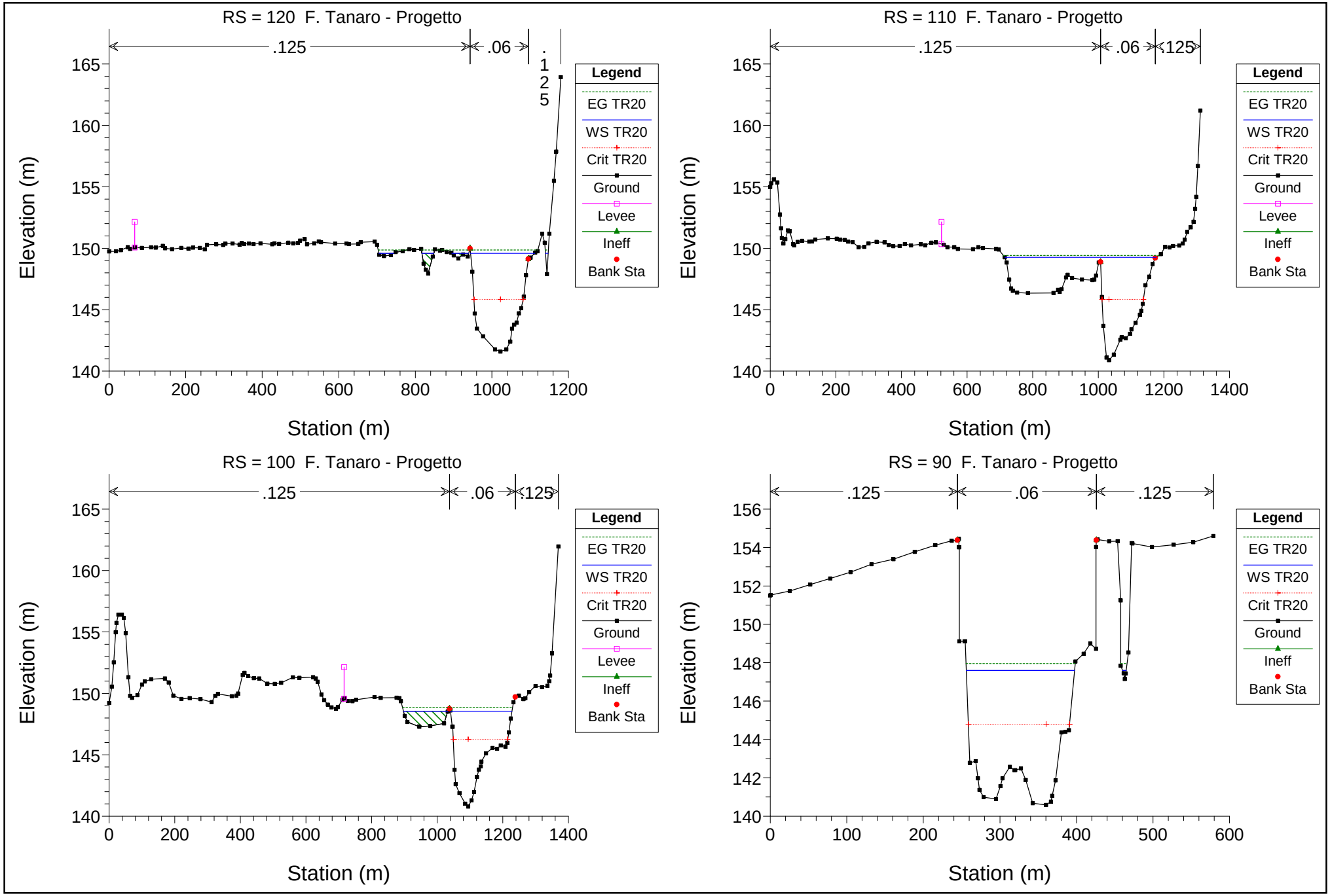
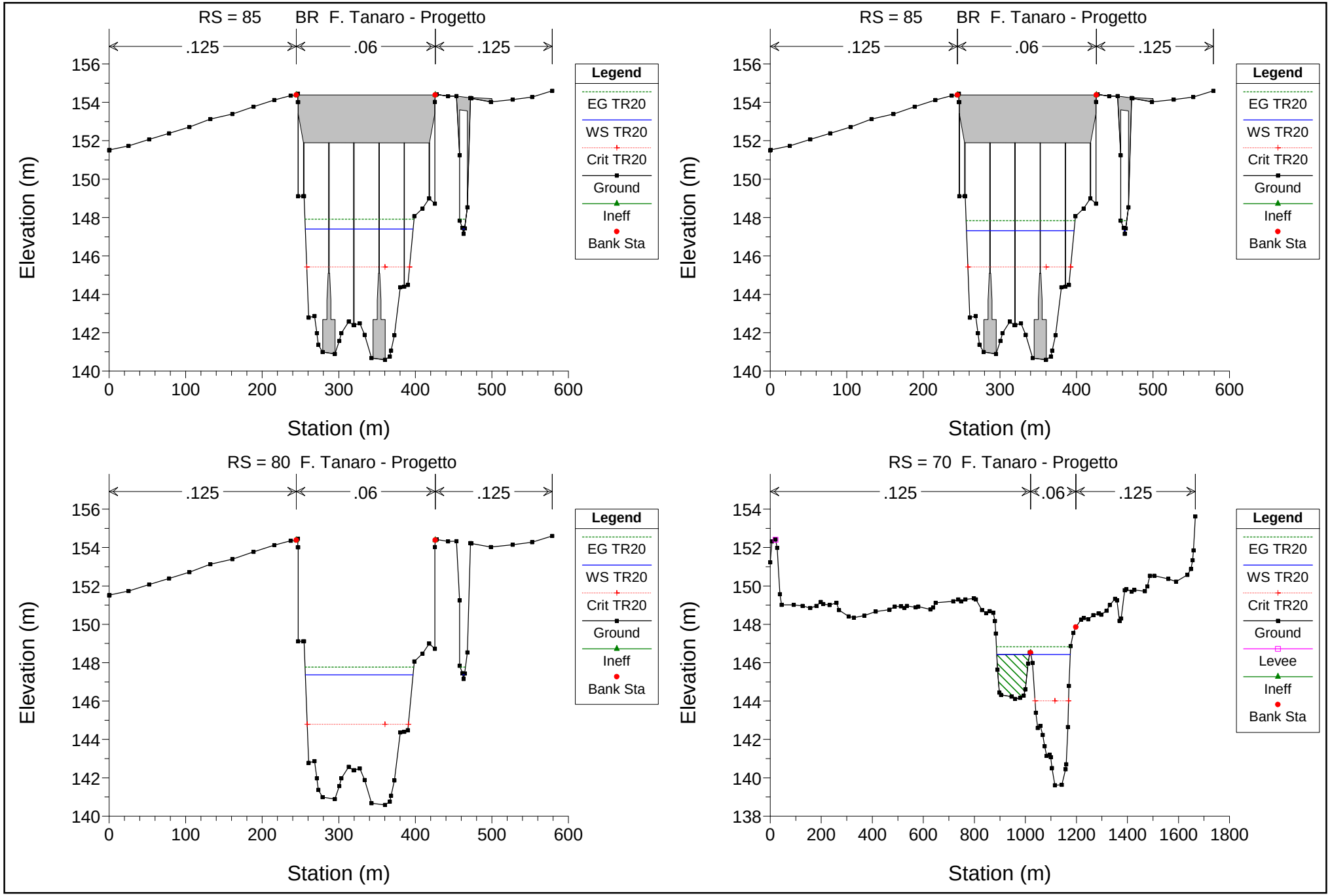
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 260 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

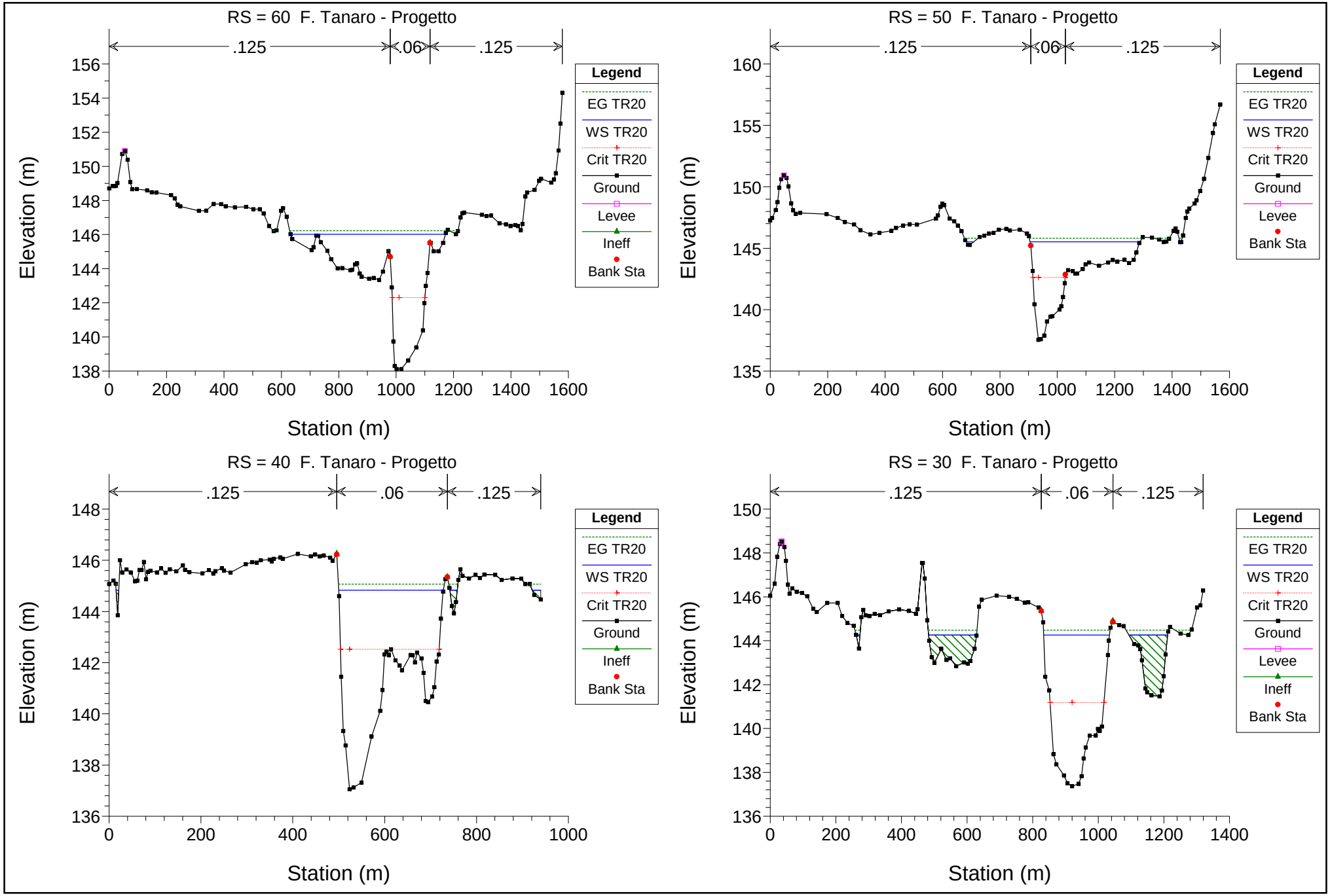

RS = 230 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 220 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

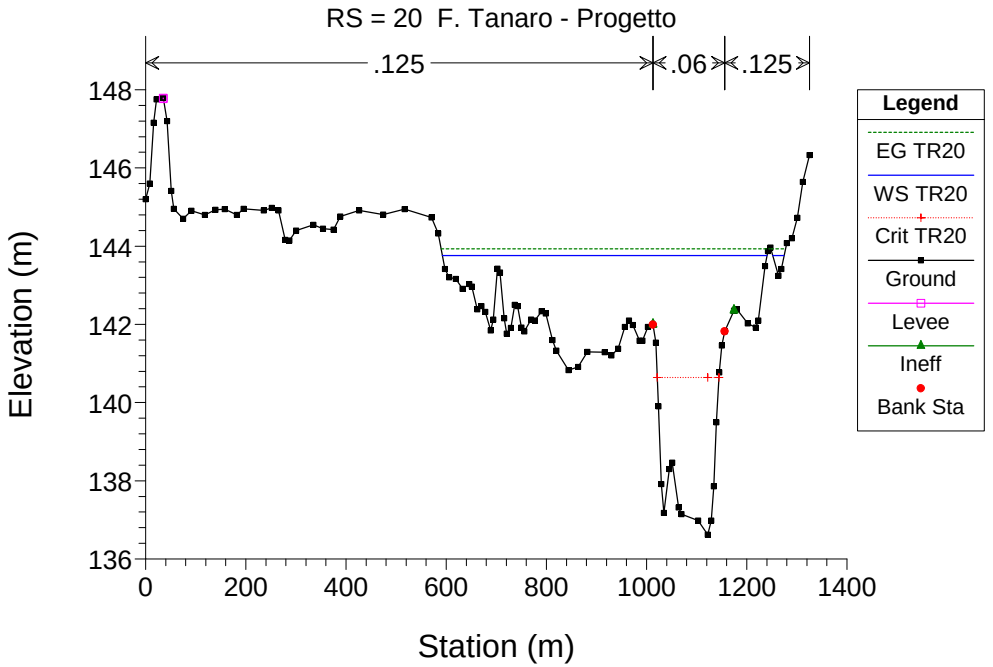

RS = 190 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 180 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 170 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 160 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Bank Sta

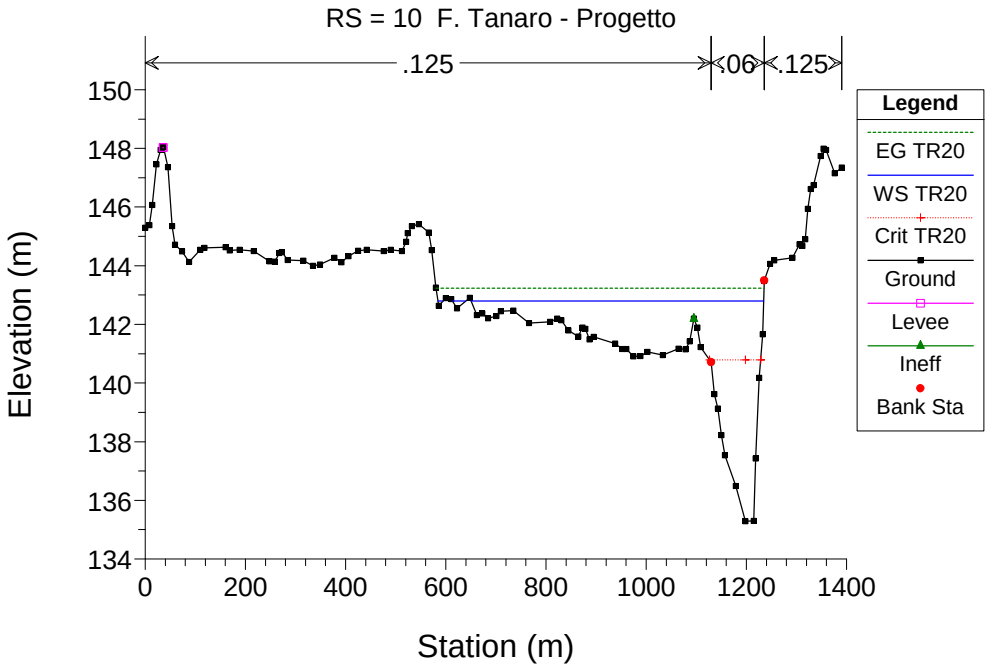

RS = 150 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 140 F. Tanaro - Progetto
RS = 135 IS F. Tanaro - Progetto
RS = 130 F. Tanaro - Progetto


RS = 120 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 110 F. Tanaro - Progetto
RS = 100 F. Tanaro - Progetto
RS = 90 F. Tanaro - Progetto


RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Ineff
Bank Sta
RS = 70 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 60 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta
RS = 50 F. Tanaro - Progetto
RS = 40 F. Tanaro - Progetto
RS = 30 F. Tanaro - Progetto


RS = 20 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
148
146
144
142
140
138
136
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR20
WS TR20
Crit TR20
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO

SIMULAZIONE 5

Sbarramento mobile abbassato

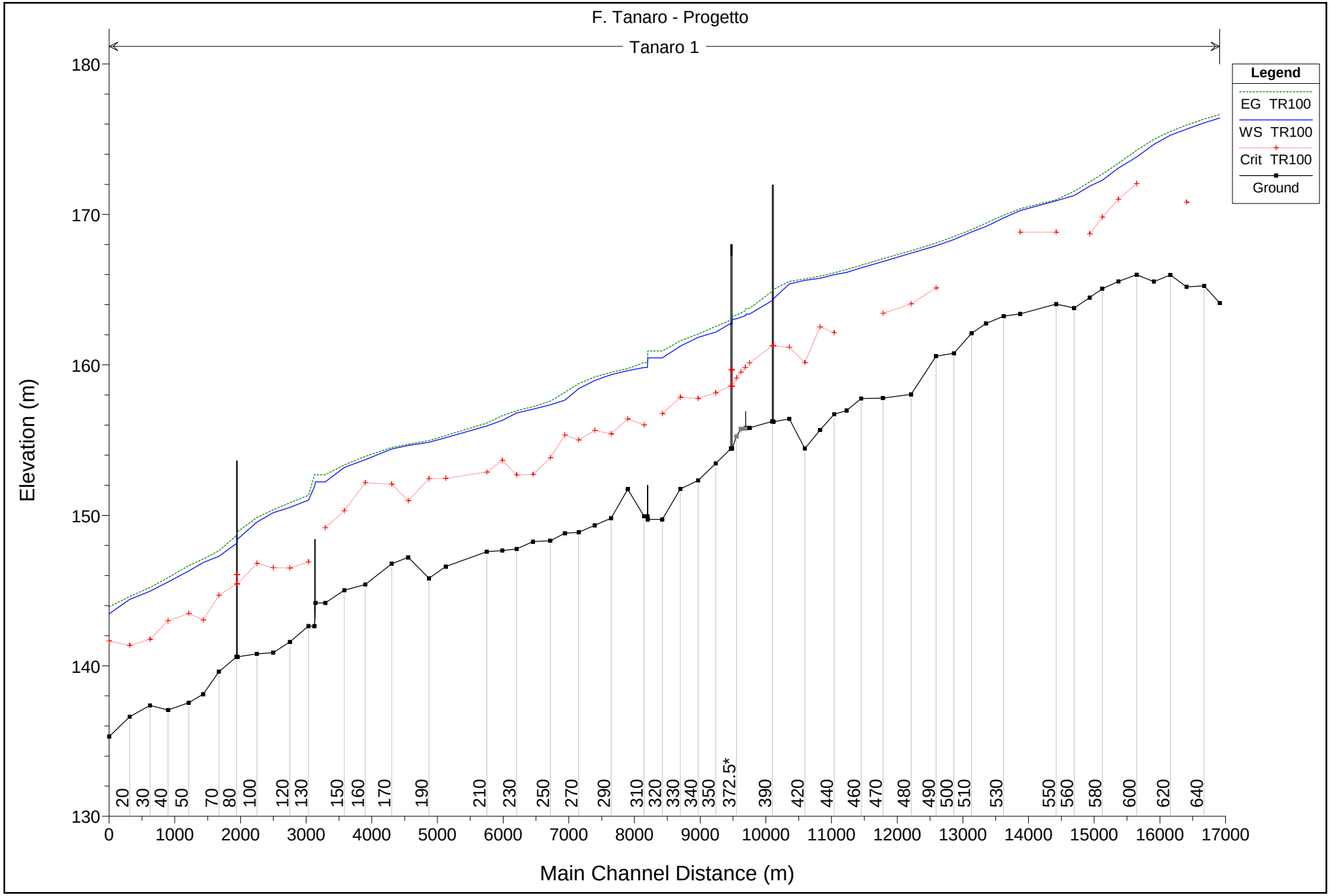
corso d'acqua	portata al colmo Q_c m^3/s	tempo di ritorno anni
Fiume Tanaro	2750	100

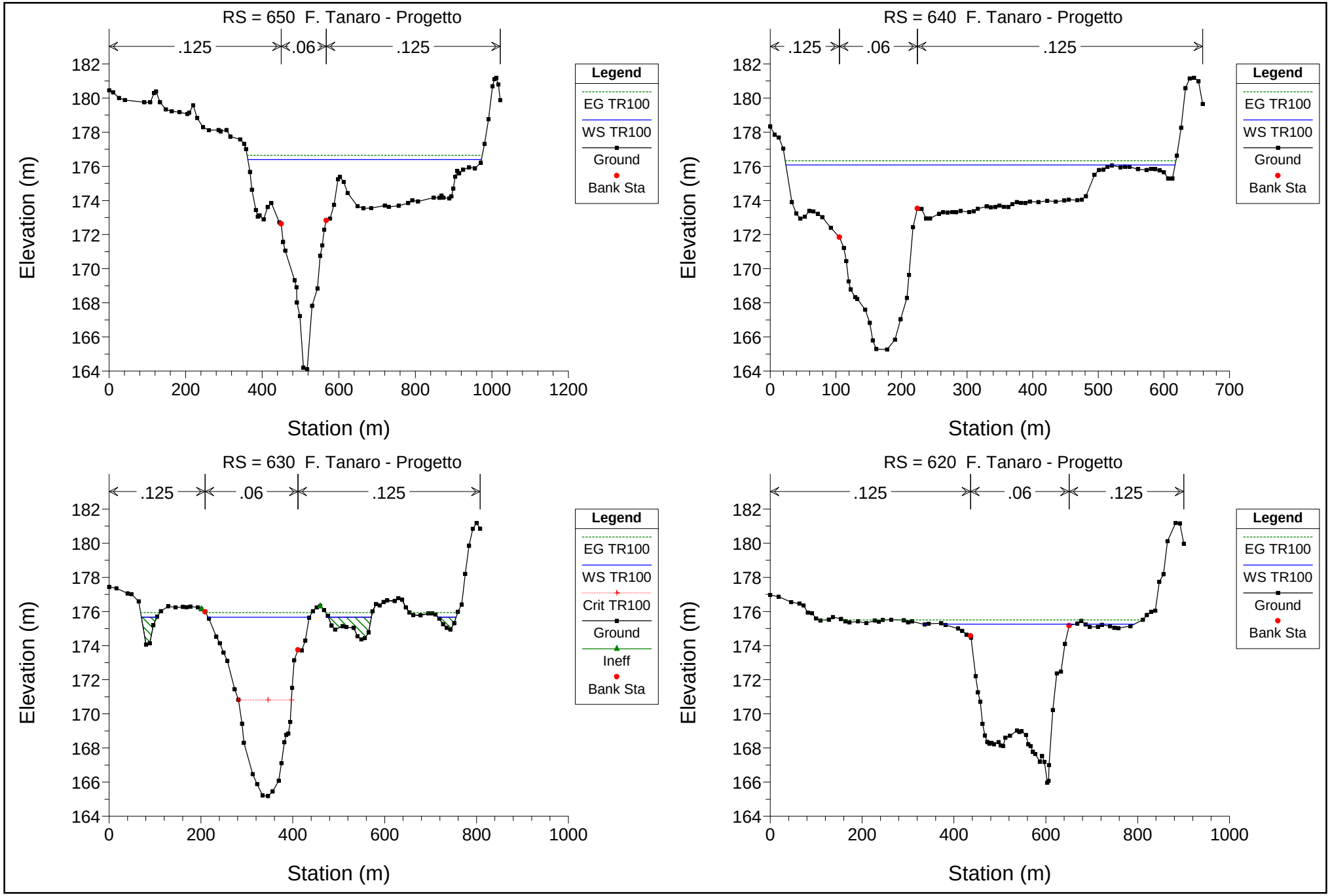
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100

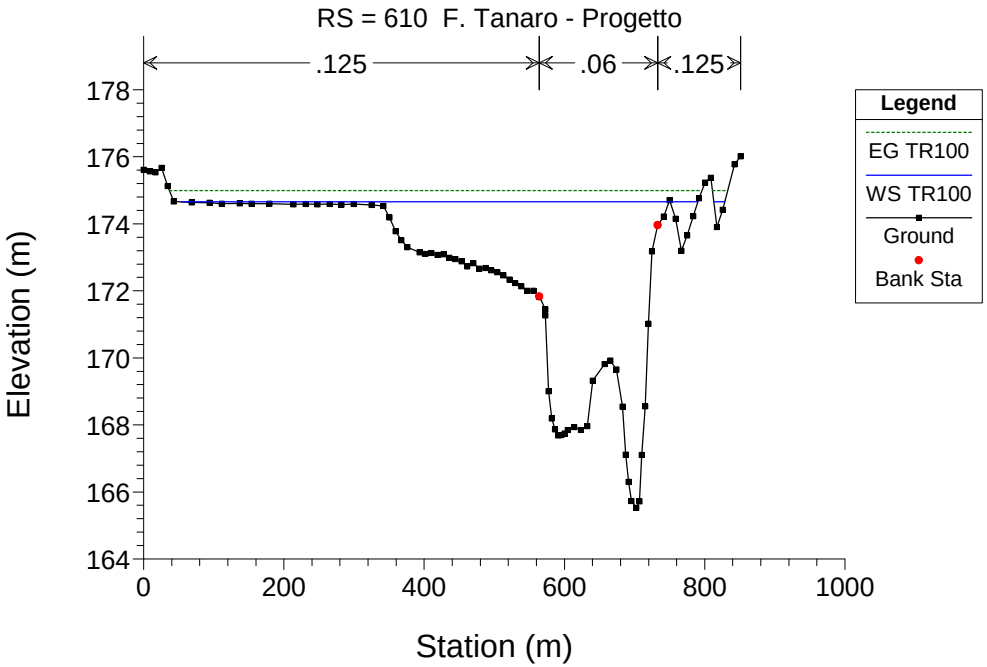
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	TR100	2750.00	164.11	176.40		176.64	0.001428	2.42	2003.76	610.25	0.28
1	640	TR100	2750.00	165.26	176.08		176.33	0.001272	2.40	1887.15	593.14	0.27
1	630	TR100	2750.00	165.18	175.67	170.81	175.93	0.001730	2.30	1225.75	387.85	0.30
1	620	TR100	2750.00	165.98	175.26		175.51	0.001711	2.21	1277.14	402.20	0.29
1	610	TR100	2750.00	165.53	174.66		174.99	0.002425	2.63	1439.63	751.25	0.35
1	600	TR100	2750.00	165.99	173.82	172.05	174.26	0.003649	3.28	1361.75	458.50	0.43
1	590	TR100	2750.00	165.55	173.08	171.00	173.40	0.002671	2.82	1688.02	604.09	0.37
1	580	TR100	2750.00	165.06	172.27	169.82	172.68	0.003178	2.93	1189.63	349.90	0.40
1	570	TR100	2750.00	164.47	171.88	168.71	172.16	0.002028	2.47	1600.76	513.59	0.32
1	560	TR100	2750.00	163.78	171.26		171.54	0.003521	2.57	1640.49	714.79	0.40
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3000.70	1171.47	0.23
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001698	2.08	2998.14	1119.84	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001802	2.09	2113.94	670.06	0.30
1	520	TR100	2750.00	162.75	169.20		169.41	0.002249	2.37	2202.41	1011.68	0.33
1	510	TR100	2750.00	162.10	168.83		168.99	0.001991	2.10	2195.05	727.74	0.31
1	500	TR100	2750.00	160.77	168.34		168.52	0.001634	2.13	1980.37	549.49	0.29
1	490	TR100	2750.00	160.58	167.92	165.12	168.10	0.001598	1.99	1829.73	509.86	0.28
1	480	TR100	2750.00	158.04	167.43	164.06	167.58	0.001256	1.93	2270.40	689.15	0.25
1	470	TR100	2750.00	157.79	166.87	163.43	167.06	0.001447	2.18	2032.93	535.50	0.27
1	460	TR100	2750.00	157.77	166.45		166.62	0.001204	1.99	2220.85	826.36	0.25
1	450	TR100	2750.00	156.96	166.15		166.34	0.001266	2.07	2034.53	731.13	0.26
1	440	TR100	2750.00	156.72	166.00	162.13	166.12	0.000926	1.84	2675.51	788.25	0.22
1	430	TR100	2750.00	155.68	165.76	162.53	165.90	0.001134	2.04	2599.89	663.86	0.24
1	420	TR100	2750.00	154.44	165.61	160.15	165.72	0.000604	1.66	2908.24	685.86	0.18
1	410	TR100	2750.00	156.41	165.38	161.17	165.54	0.001068	2.01	2212.23	524.92	0.24
1	400	TR100	2750.00	156.22	164.41	161.27	165.01	0.003488	3.51	892.30	170.36	0.42
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.28	161.28	164.91	0.003717	3.58	871.20	163.64	0.43
1	380	TR100	2750.00	155.82	163.37	160.13	163.75	0.002446	2.73	1027.89	212.89	0.35
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	163.01	158.59	163.21	0.001156	1.99	1383.51	206.04	0.24
1	365		Bridge									
1	360	TR100	2750.00	154.43	162.76	158.59	162.98	0.001303	2.06	1332.44	205.35	0.26
1	350	TR100	2750.00	153.45	162.17	158.14	162.55	0.002148	2.72	1015.76	195.65	0.33
1	340	TR100	2750.00	152.32	161.83	157.77	162.06	0.001342	2.13	1394.98	377.55	0.26
1	330	TR100	2750.00	151.75	161.24	157.85	161.59	0.002195	2.64	1224.89	428.55	0.34
1	320	TR100	2750.00	149.73	160.46	156.76	160.93	0.002505	3.23	1342.00	471.73	0.37
1	315		Inl Struct									
1	310	TR100	2750.00	149.94	159.83	156.01	160.15	0.001899	2.82	1796.48	725.31	0.32
1	300	TR100	2750.00	151.73	159.61	156.41	159.76	0.001112	1.96	2533.06	824.26	0.24

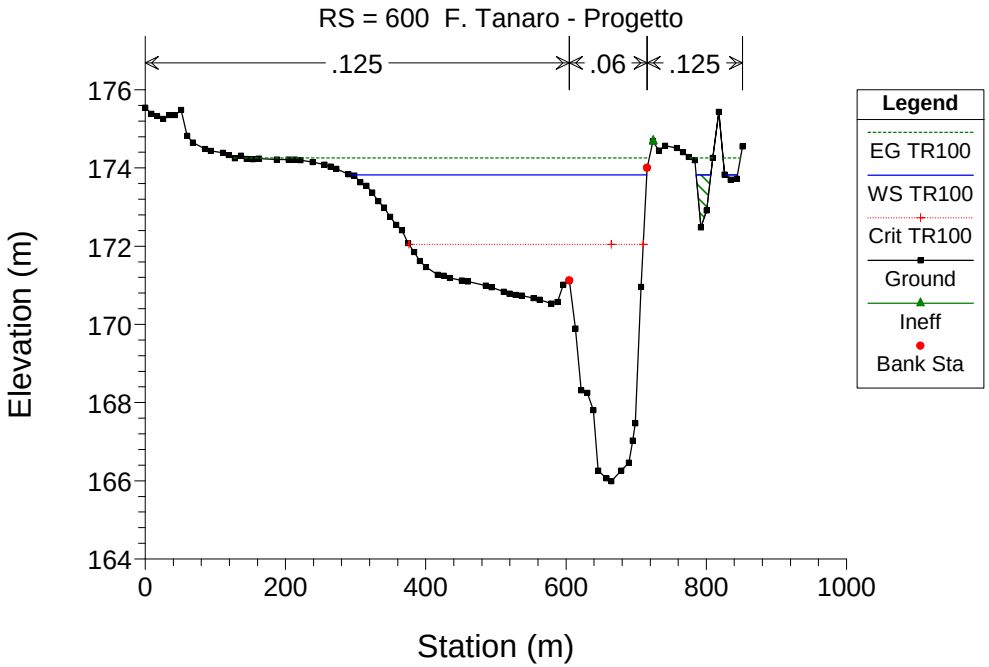
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (Continued)

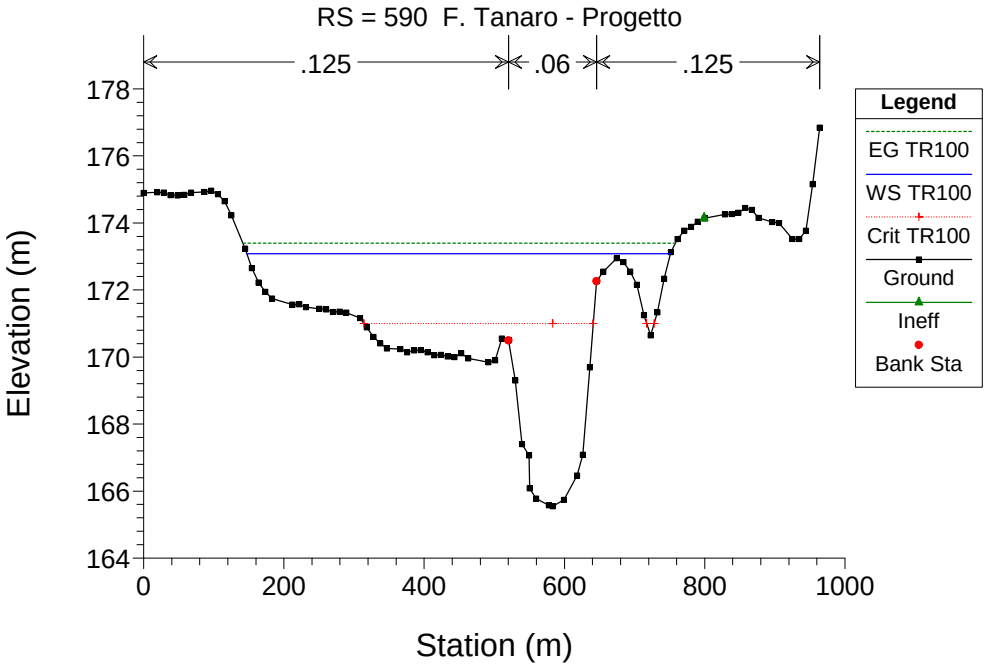
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	290	TR100	2750.00	149.81	159.36	155.41	159.50	0.001005	1.78	2171.35	667.43	0.23
1	280	TR100	2750.00	149.34	158.96	155.65	159.19	0.001640	2.39	1887.89	499.03	0.29
1	270	TR100	2750.00	148.86	158.43	155.01	158.75	0.002082	2.80	1649.80	470.91	0.33
1	260	TR100	2750.00	148.81	157.66	155.34	158.18	0.003381	3.44	1144.89	310.83	0.42
1	250	TR100	2750.00	148.31	157.35	153.83	157.58	0.001787	2.35	1786.77	527.30	0.30
1	240	TR100	2750.00	148.26	157.05	152.72	157.22	0.001029	1.98	2241.19	758.74	0.24
1	230	TR100	2750.00	147.77	156.80	152.69	156.95	0.001029	1.86	2021.41	483.86	0.23
1	220	TR100	2750.00	147.66	156.32	153.66	156.62	0.002275	2.71	1567.39	433.11	0.34
1	210	TR100	2750.00	147.59	155.94	152.87	156.14	0.001539	2.15	1897.58	658.06	0.28
1	200	TR100	2750.00	146.60	155.16	152.46	155.30	0.001406	2.17	2915.17	1087.62	0.27
1	190	TR100	2750.00	145.82	154.86	152.43	154.97	0.001109	1.76	3289.48	1333.11	0.24
1	180	TR100	2750.00	147.21	154.65	150.97	154.73	0.000673	1.52	3901.53	1448.97	0.19
1	170	TR100	2750.00	146.78	154.40	152.07	154.50	0.001153	1.63	3206.29	1373.10	0.23
1	160	TR100	2750.00	145.40	153.69	152.17	153.93	0.002150	2.69	2598.81	1363.64	0.34
1	150	TR100	2750.00	145.03	153.18	150.30	153.35	0.001607	2.11	2690.51	1346.87	0.28
1	140	TR100	2750.00	144.17	152.22	149.18	152.69	0.003249	3.03	908.20	1275.87	0.40
1	135		Inl Struct									
1	130	TR100	2750.00	142.64	151.01	146.90	151.34	0.001793	2.57	1422.69	1103.76	0.31
1	120	TR100	2750.00	141.58	150.52	146.50	150.83	0.001773	2.52	1478.75	1026.92	0.31
1	110	TR100	2750.00	140.88	150.17	146.51	150.38	0.001576	2.20	2009.59	692.31	0.28
1	100	TR100	2750.00	140.79	149.55	146.81	149.86	0.002686	2.54	1300.15	403.89	0.36
1	90	TR100	2750.00	140.59	148.41	145.44	148.91	0.003450	3.11	885.23	162.30	0.41
1	85		Bridge									
1	80	TR100	2750.00	140.59	148.13	145.44	148.67	0.003787	3.26	843.01	153.53	0.43
1	70	TR100	2750.00	139.61	147.28	144.68	147.65	0.003220	2.84	1218.52	298.84	0.40
1	60	TR100	2750.00	138.12	146.86	143.05	147.09	0.001540	2.35	1941.33	740.77	0.29
1	50	TR100	2750.00	137.54	146.31	143.47	146.66	0.002427	2.87	1598.63	711.76	0.36
1	40	TR100	2750.00	137.06	145.57	142.99	145.86	0.002661	2.41	1217.14	582.53	0.35
1	30	TR100	2750.00	137.37	144.95	141.76	145.21	0.002128	2.31	1457.32	664.24	0.32
1	20	TR100	2750.00	136.62	144.41	141.35	144.61	0.001661	2.30	2138.86	740.06	0.29
1	10	TR100	2750.00	135.29	143.45	141.65	143.91	0.004005	3.39	1523.40	656.99	0.45

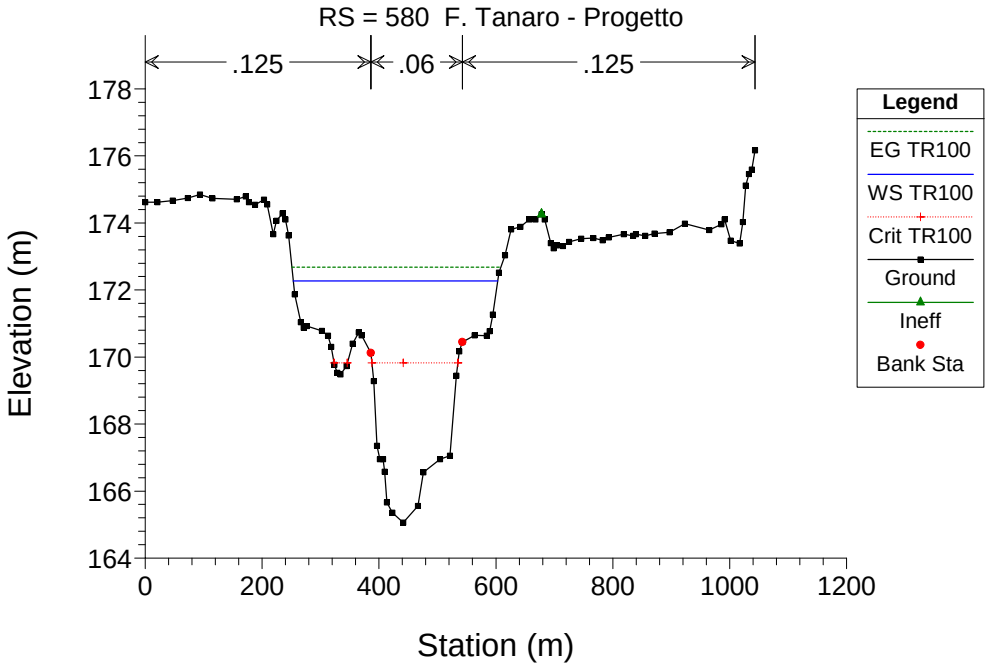

F. Tanaro - Progetto
Tanaro 1
Legend
EG TR100
WS TR100
Crit TR100
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
620
640

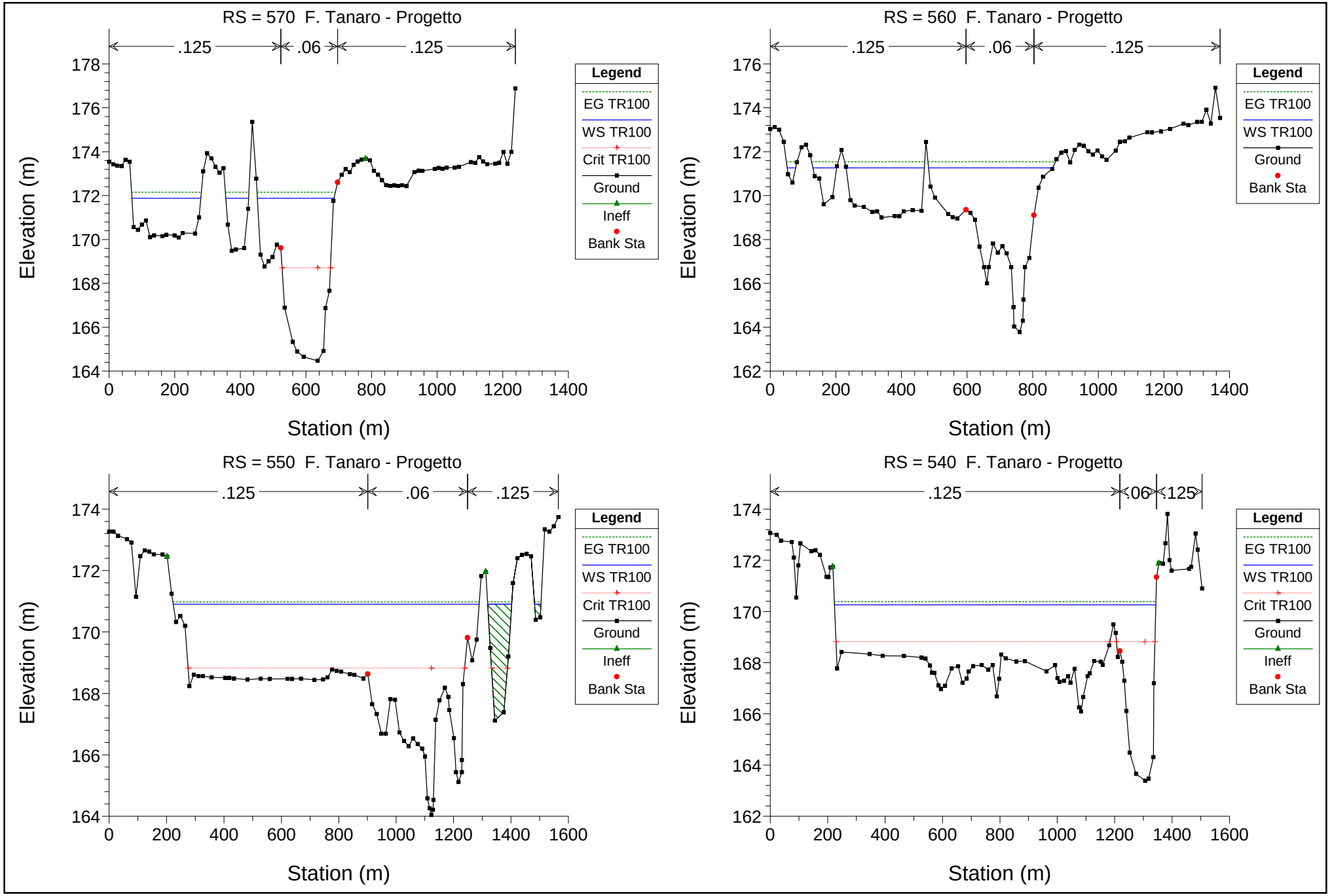

RS = 650 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta
RS = 640 F. Tanaro - Progetto
RS = 630 F. Tanaro - Progetto
Crit TR100
Ineff
RS = 620 F. Tanaro - Progetto

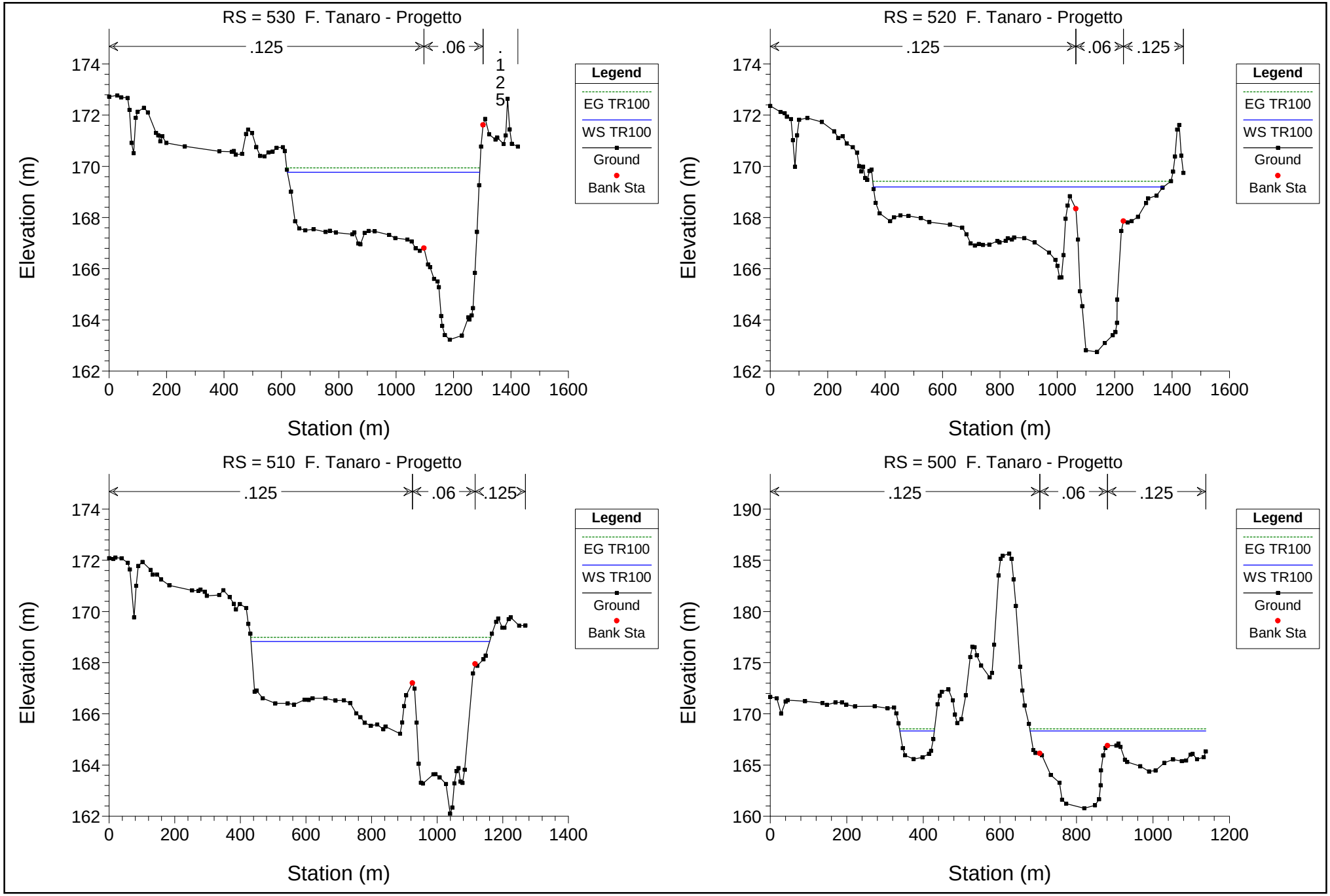

RS = 610 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta

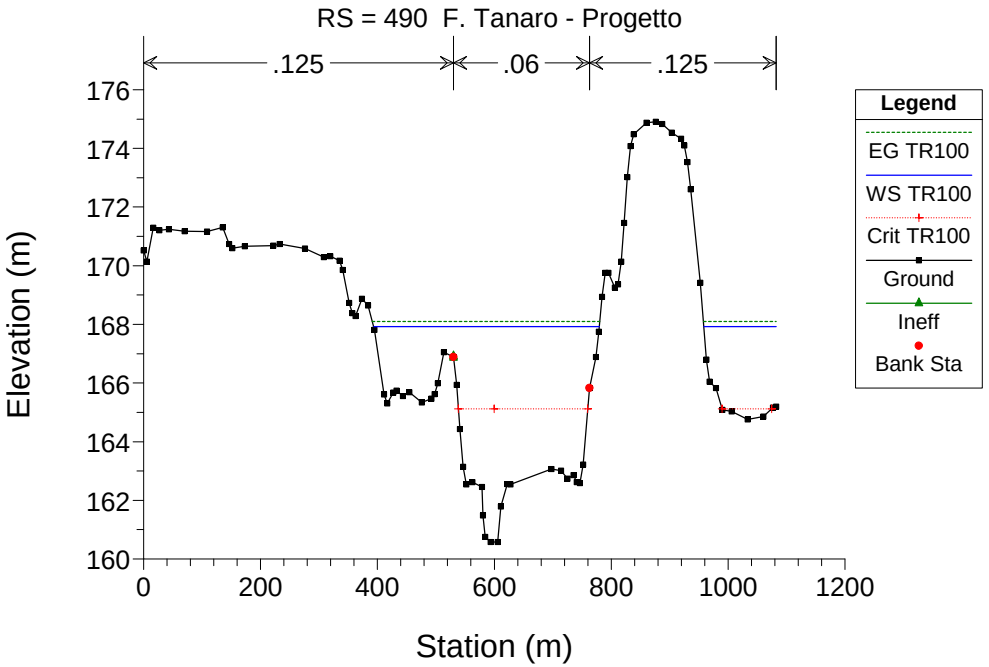

RS = 600 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

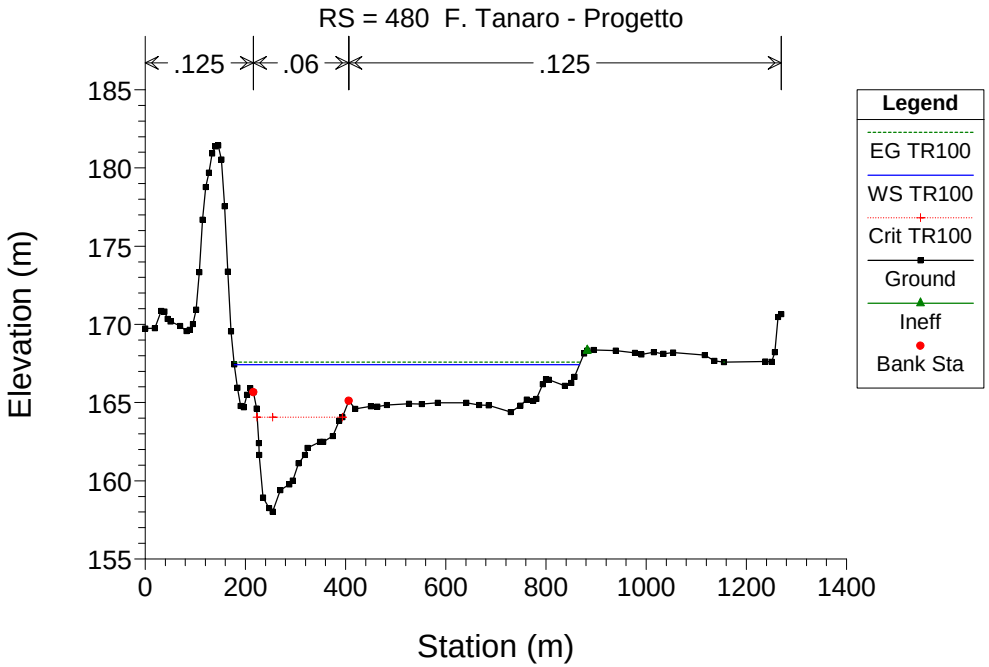

RS = 590 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

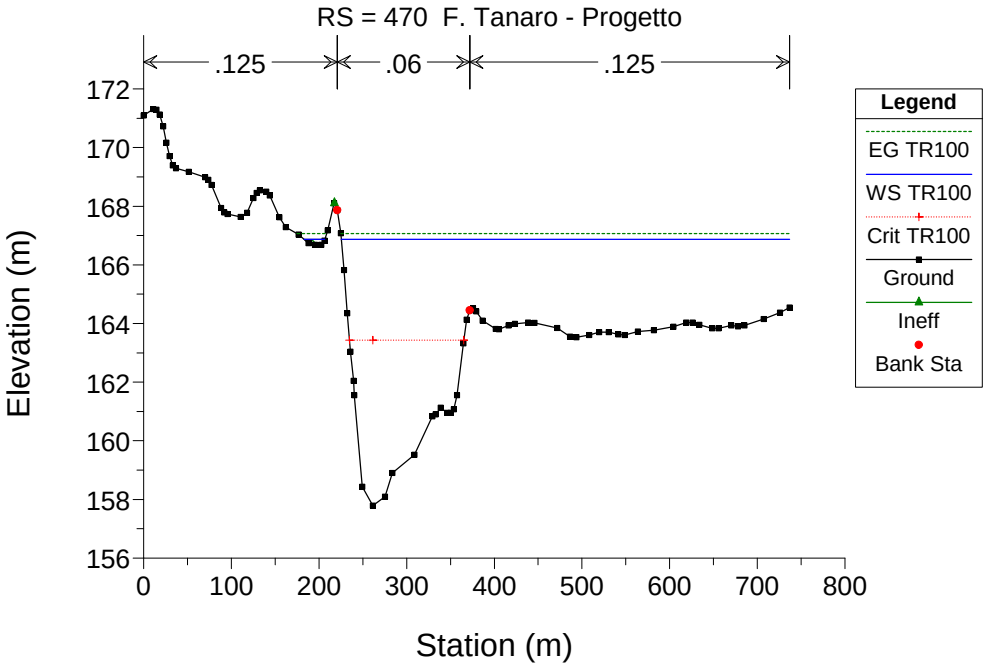

RS = 580 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

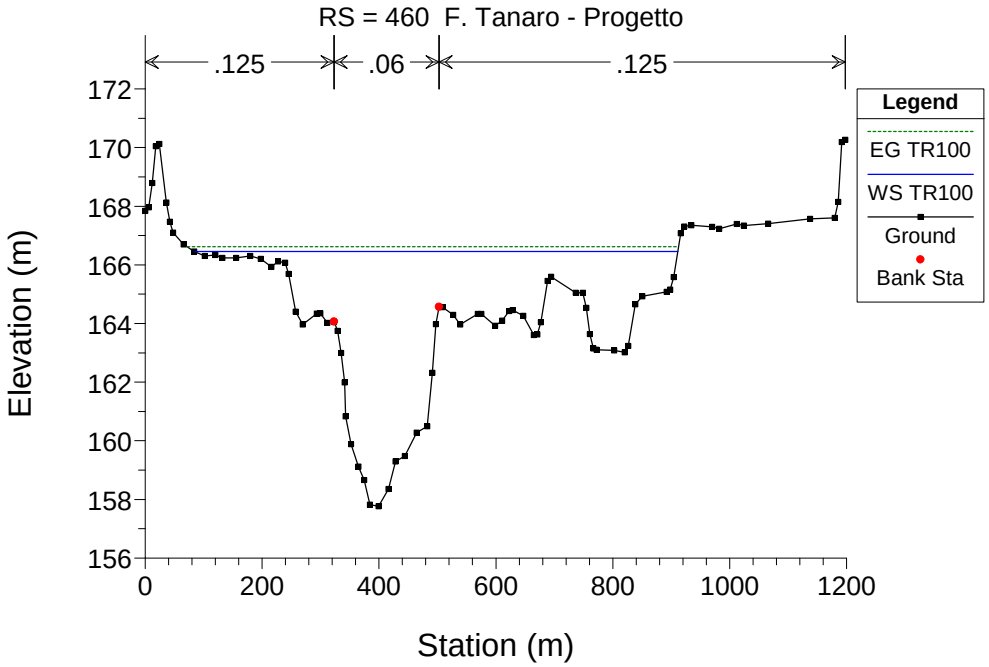

RS = 570 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Progetto
RS = 550 F. Tanaro - Progetto
RS = 540 F. Tanaro - Progetto

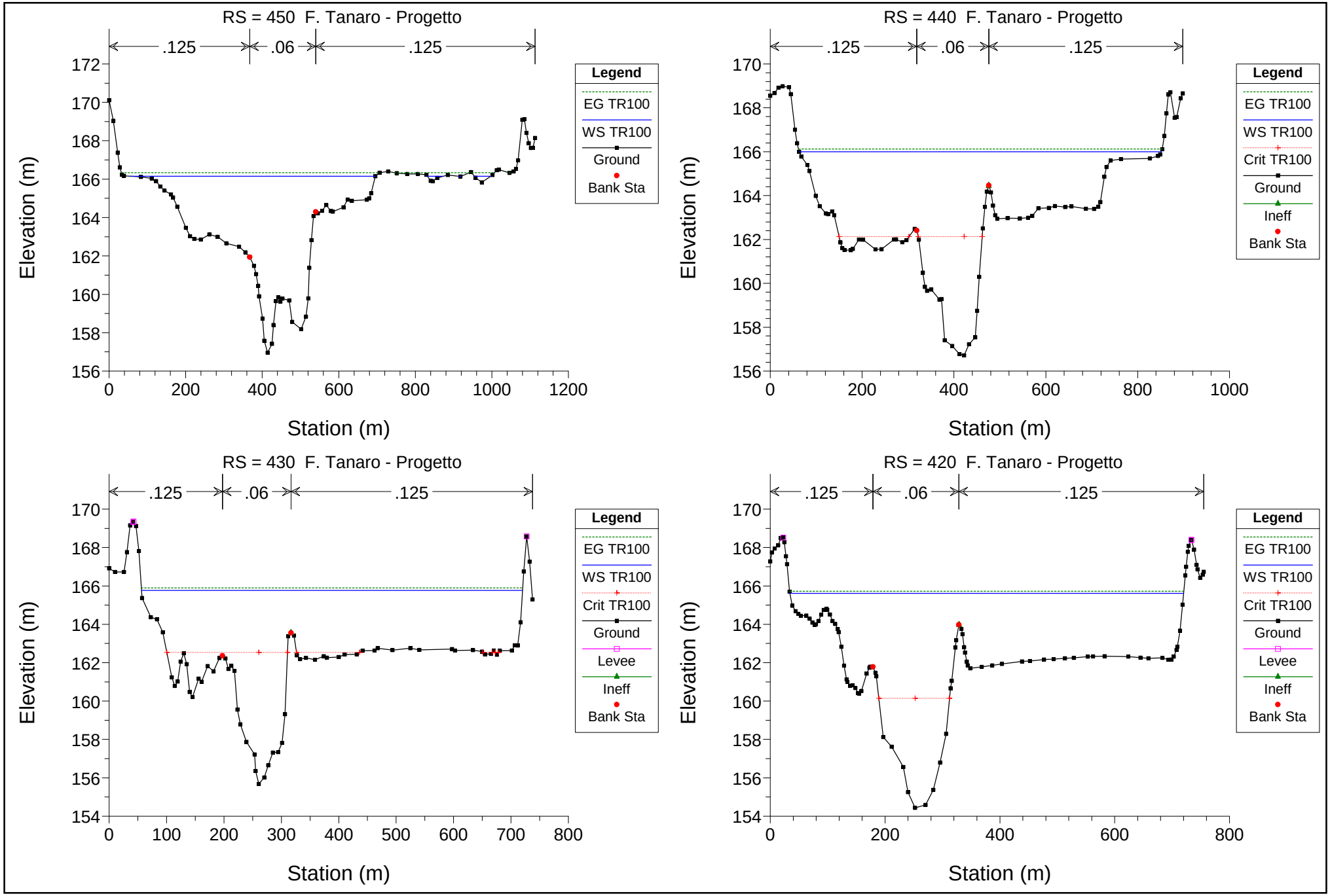

RS = 530 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR100
WS TR100
Ground
Bank Sta
Elevation (m)
Station (m)

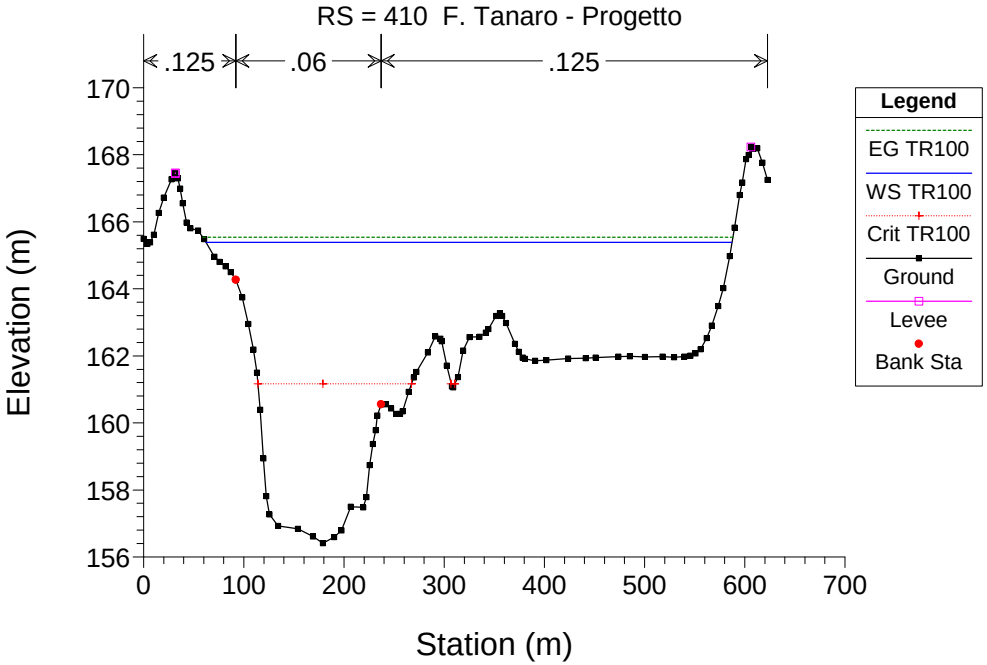

RS = 490 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

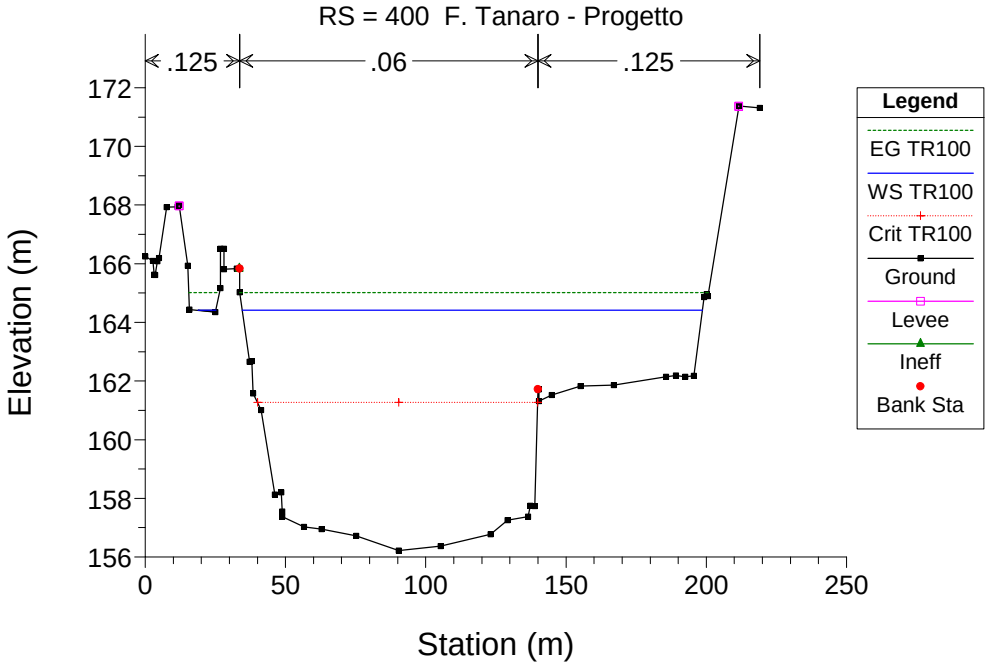

RS = 480 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

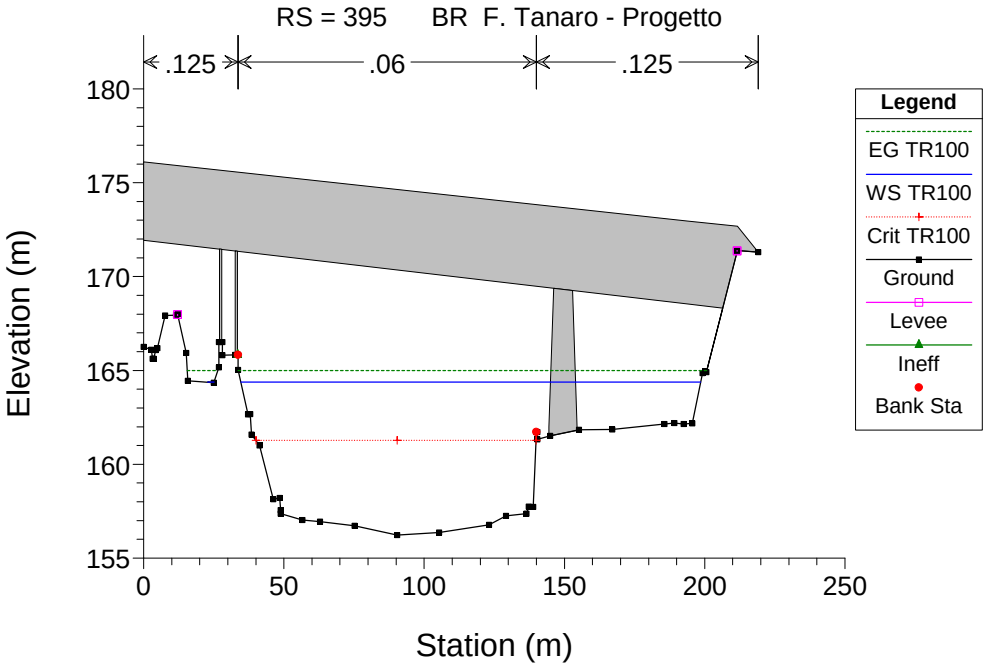

RS = 470 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

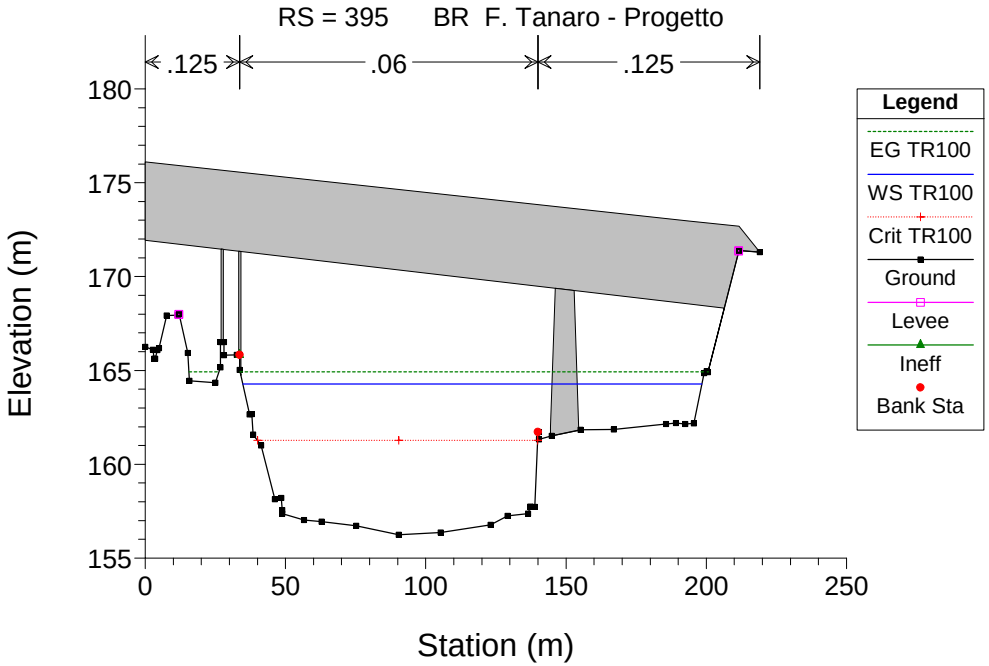

RS = 460 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta

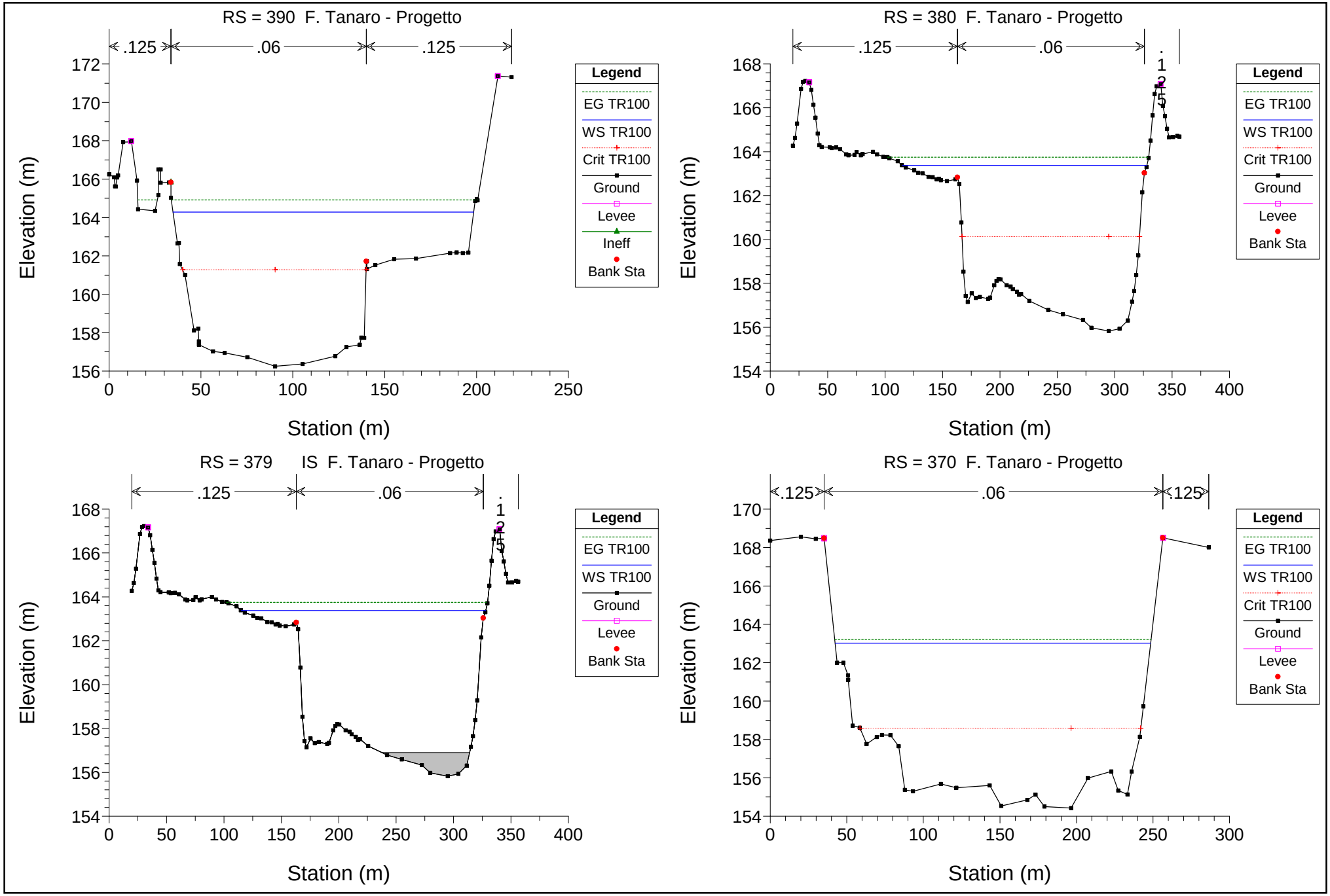

RS = 450 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Bank Sta
RS = 440 F. Tanaro - Progetto
Crit TR100
Ineff
RS = 430 F. Tanaro - Progetto
Levee
RS = 420 F. Tanaro - Progetto

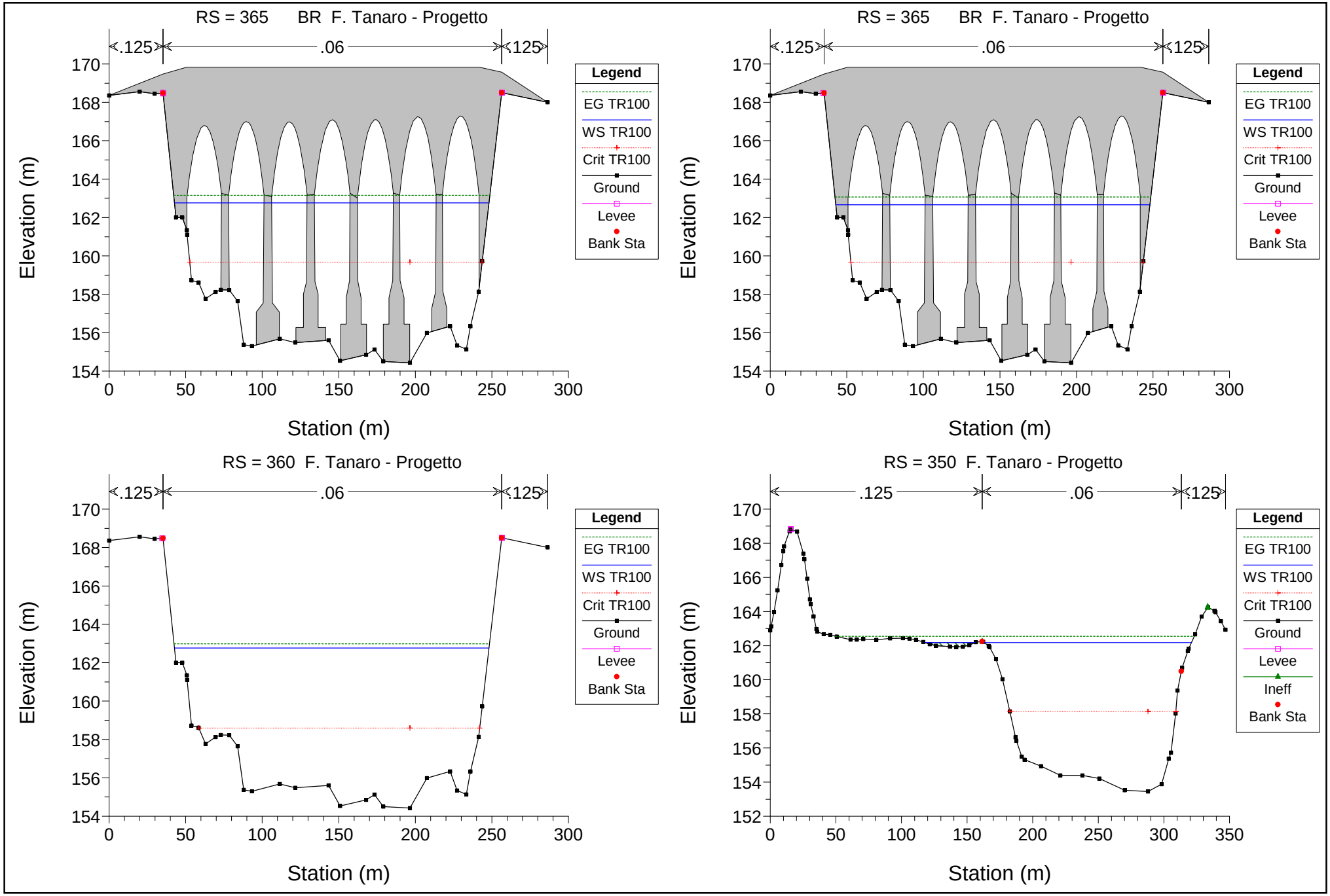

RS = 410 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta

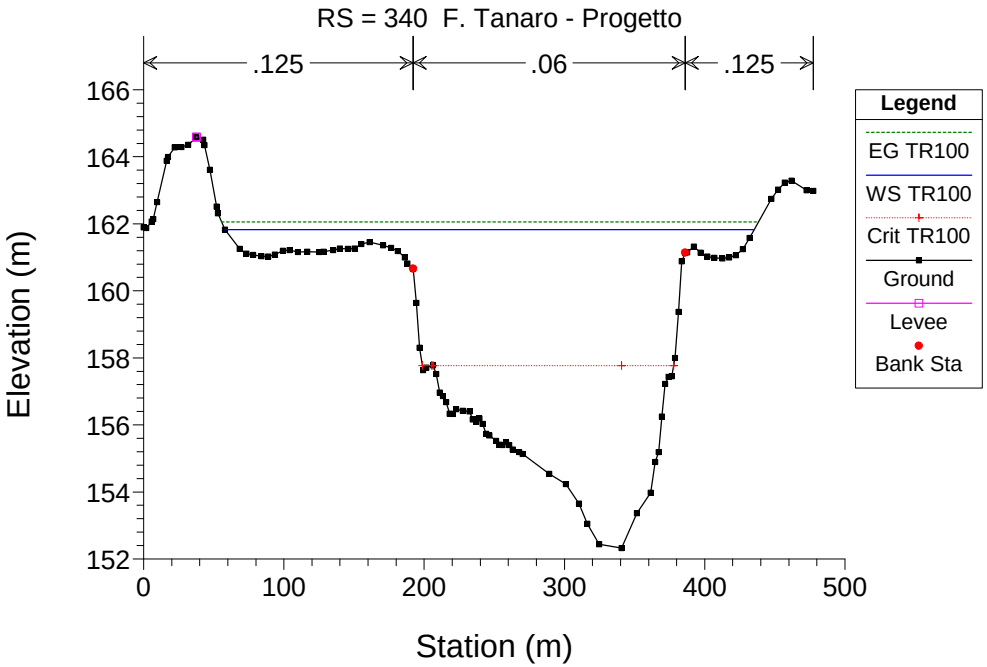

RS = 400 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

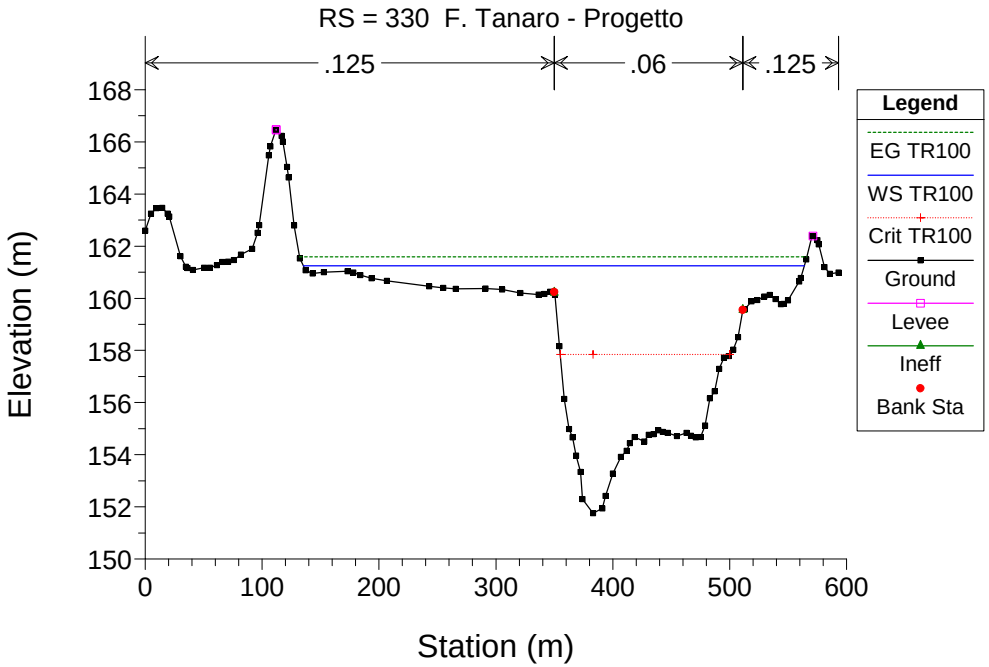

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

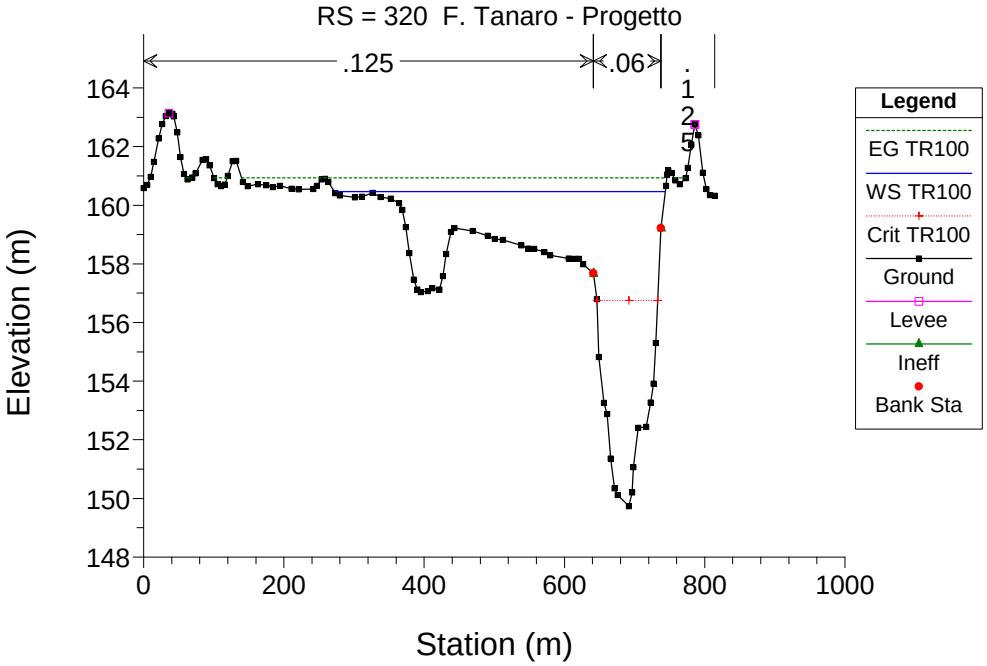

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

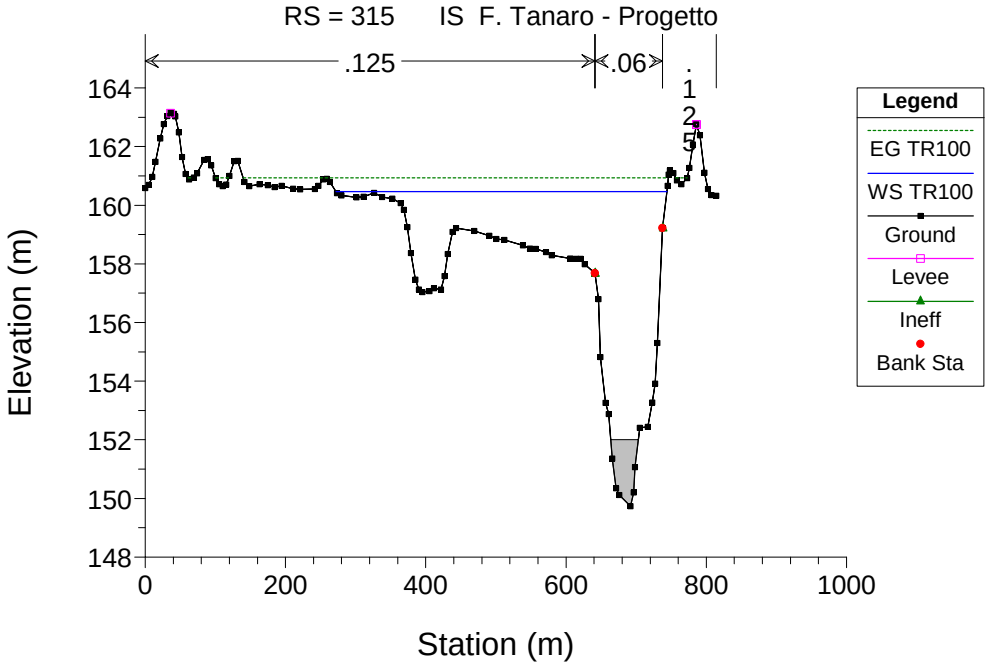

RS = 390 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 380 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 379 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Levee
Bank Sta
RS = 370 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta

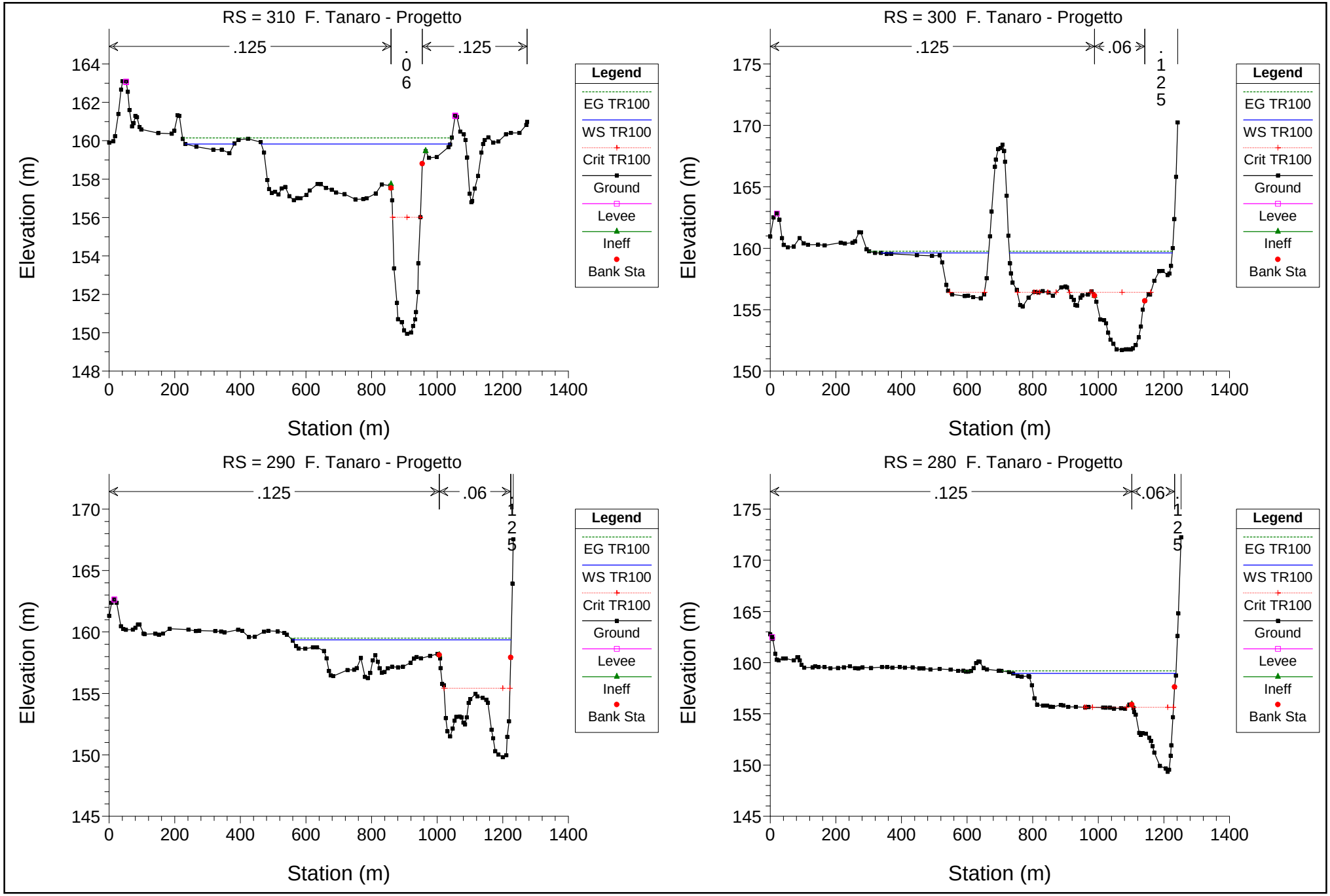

RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Progetto
RS = 360 F. Tanaro - Progetto
RS = 350 F. Tanaro - Progetto
Ineff

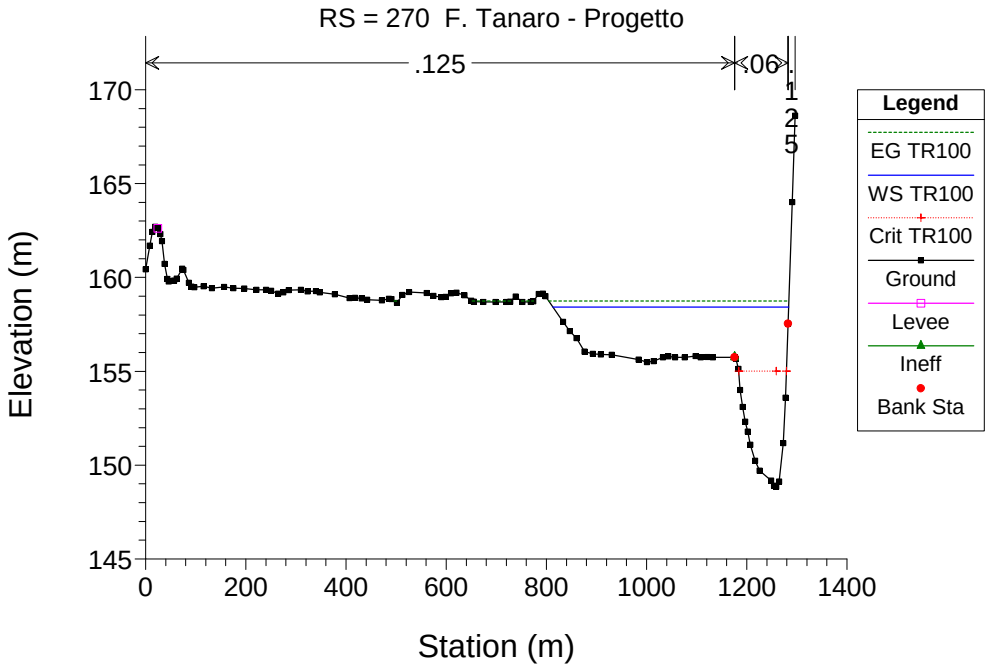

RS = 340 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta

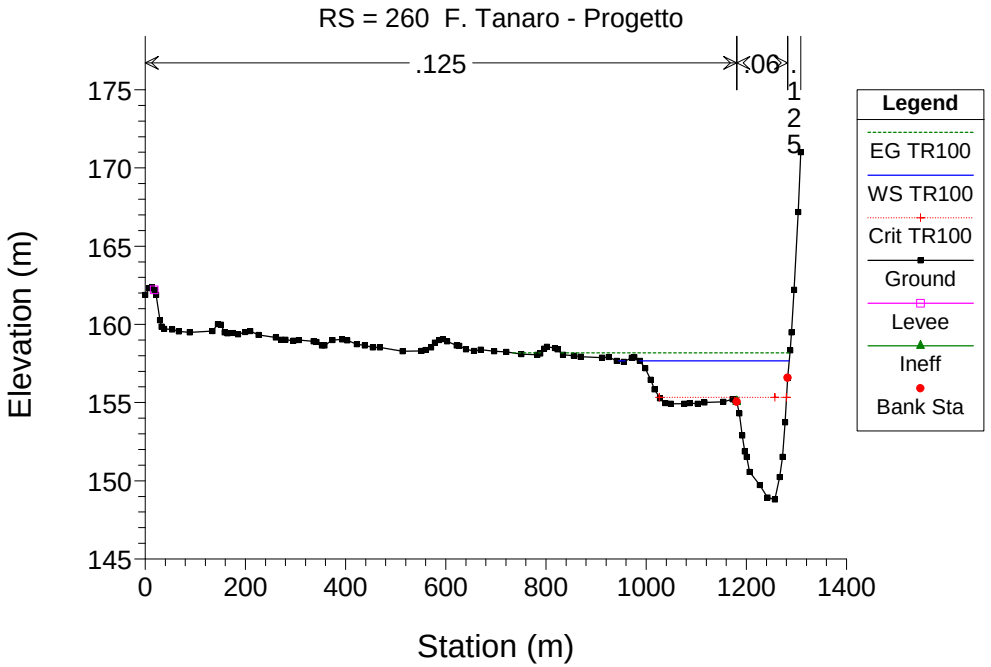

RS = 330 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

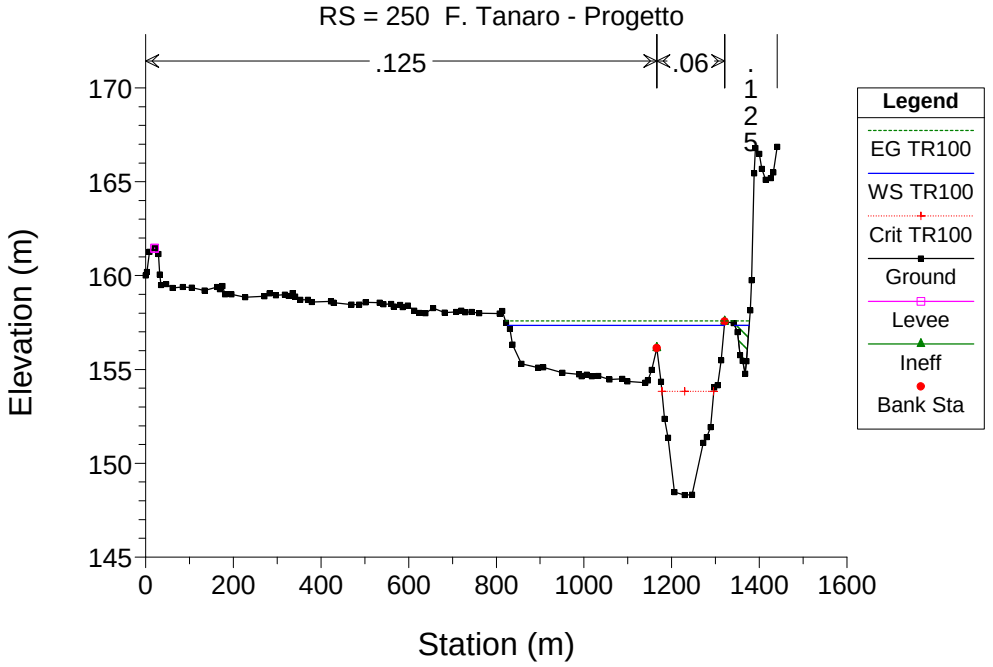

RS = 320 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

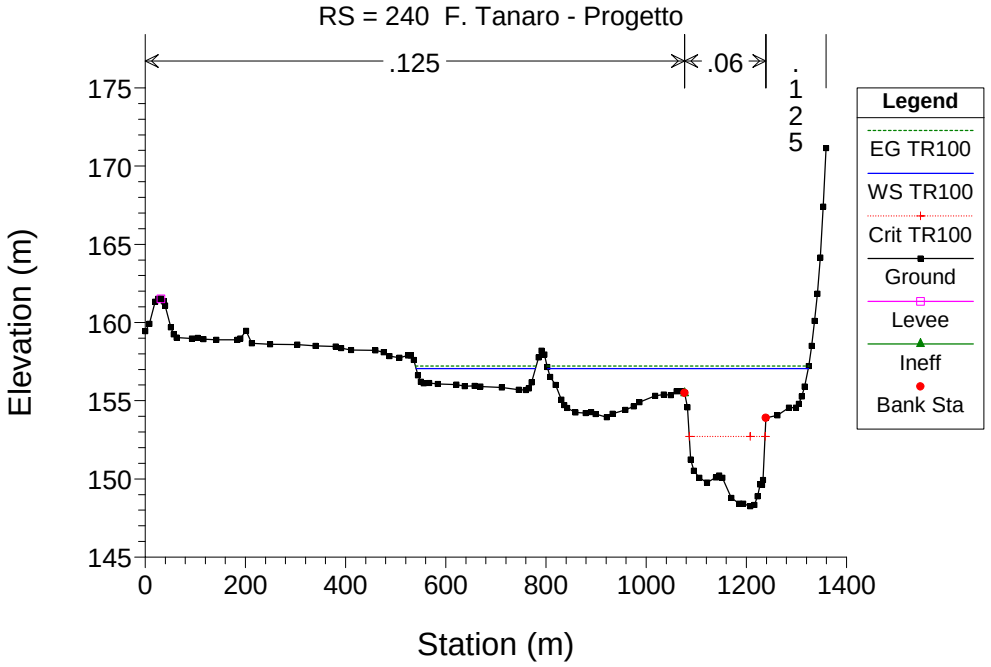

RS = 315 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Ground
Levee
Ineff
Bank Sta

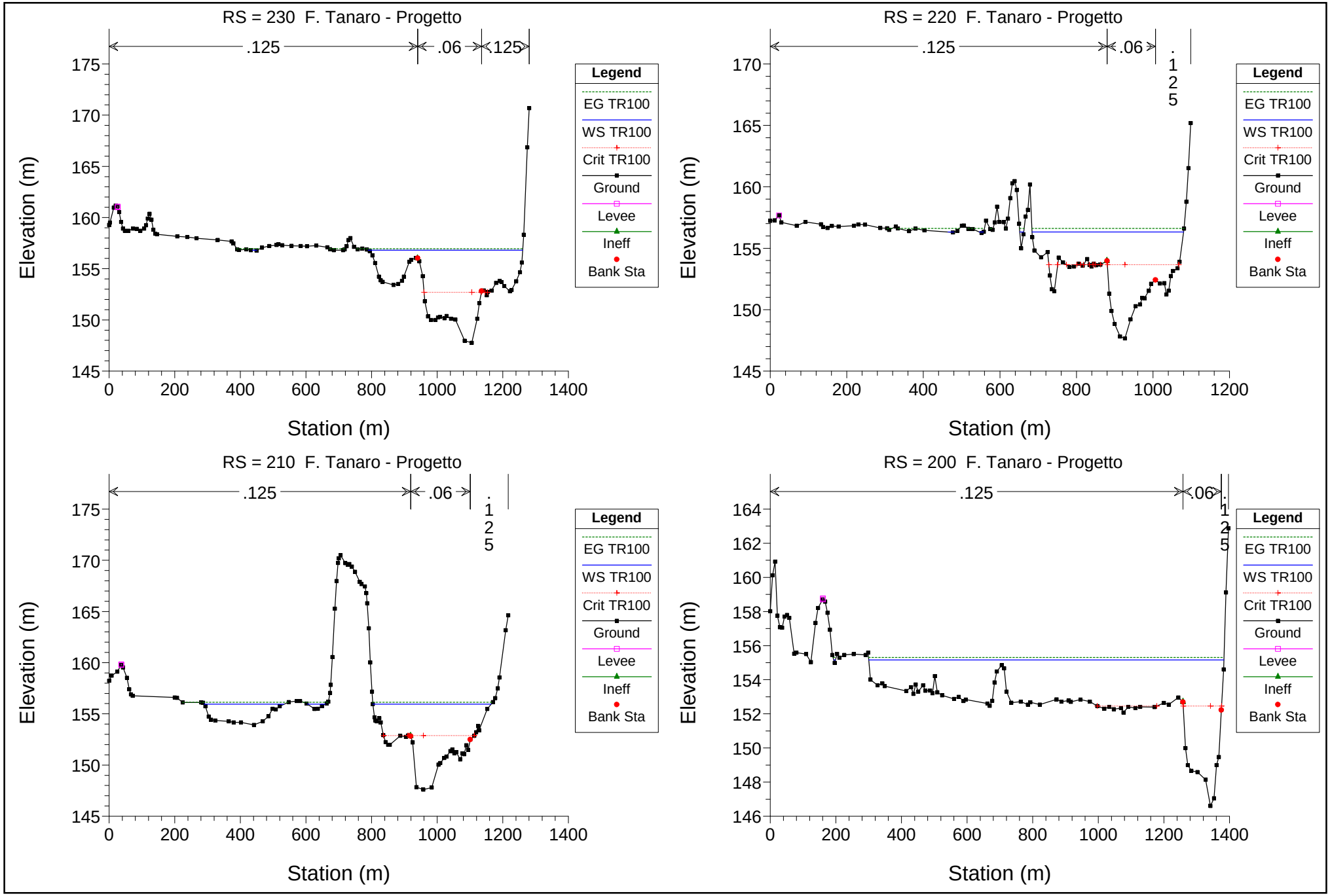

RS = 310 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 300 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 290 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 280 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

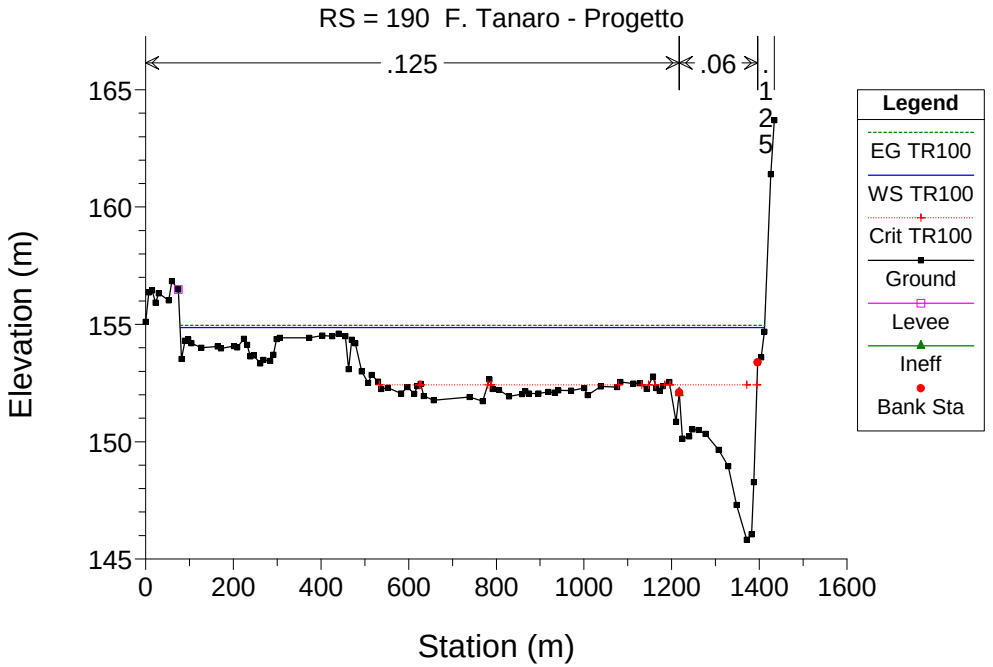

RS = 270 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

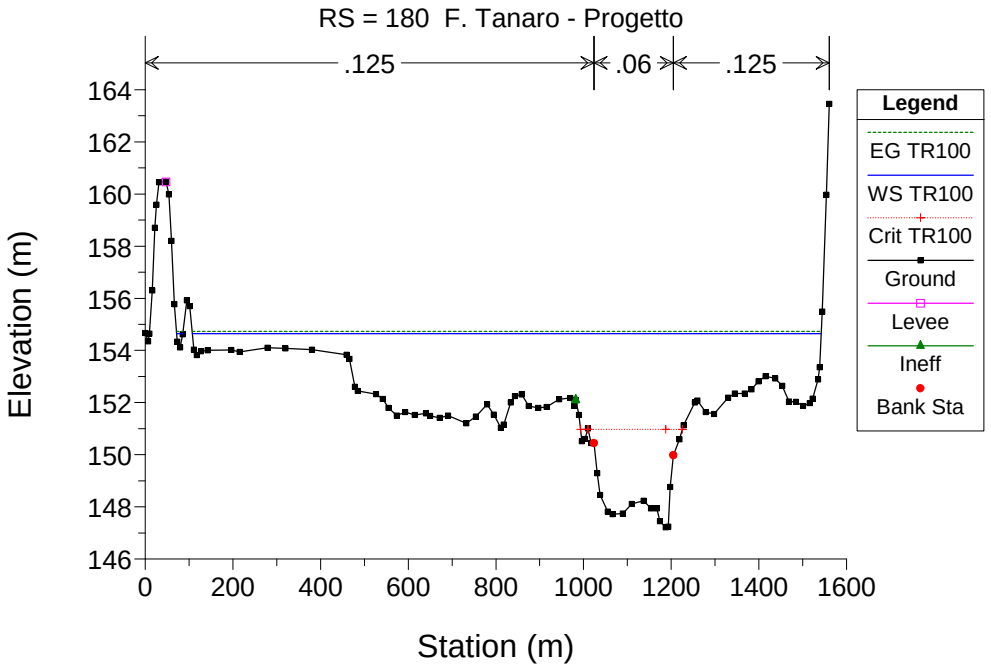

RS = 260 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

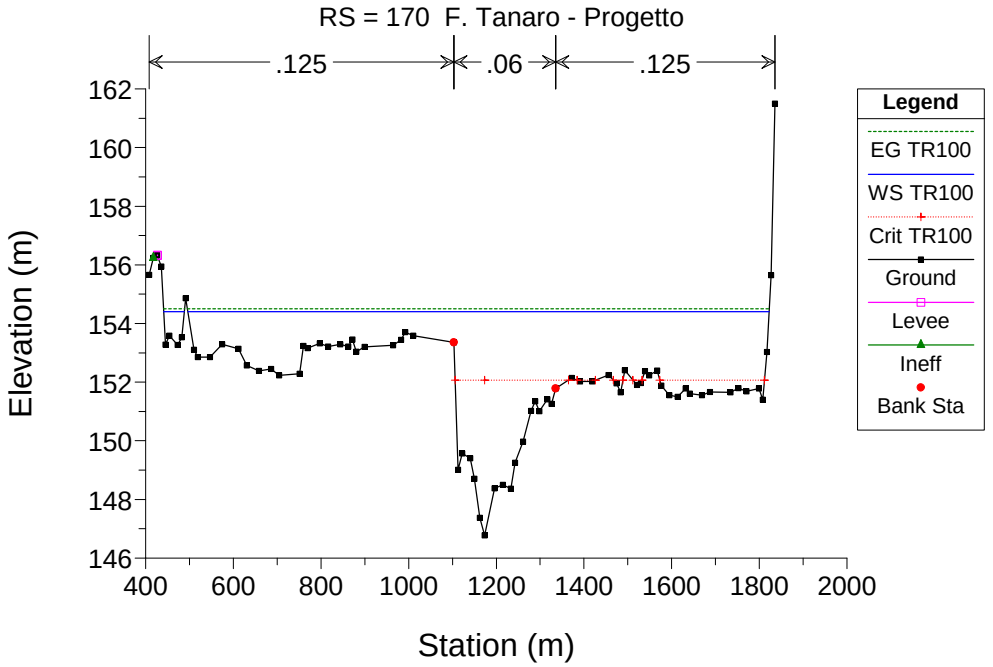

RS = 250 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

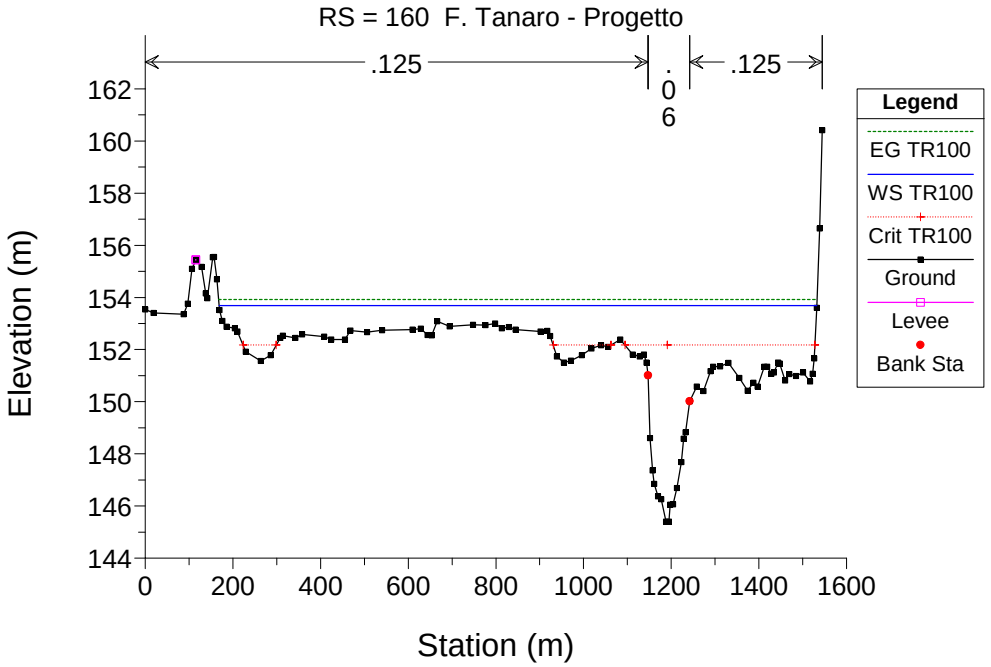

RS = 240 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

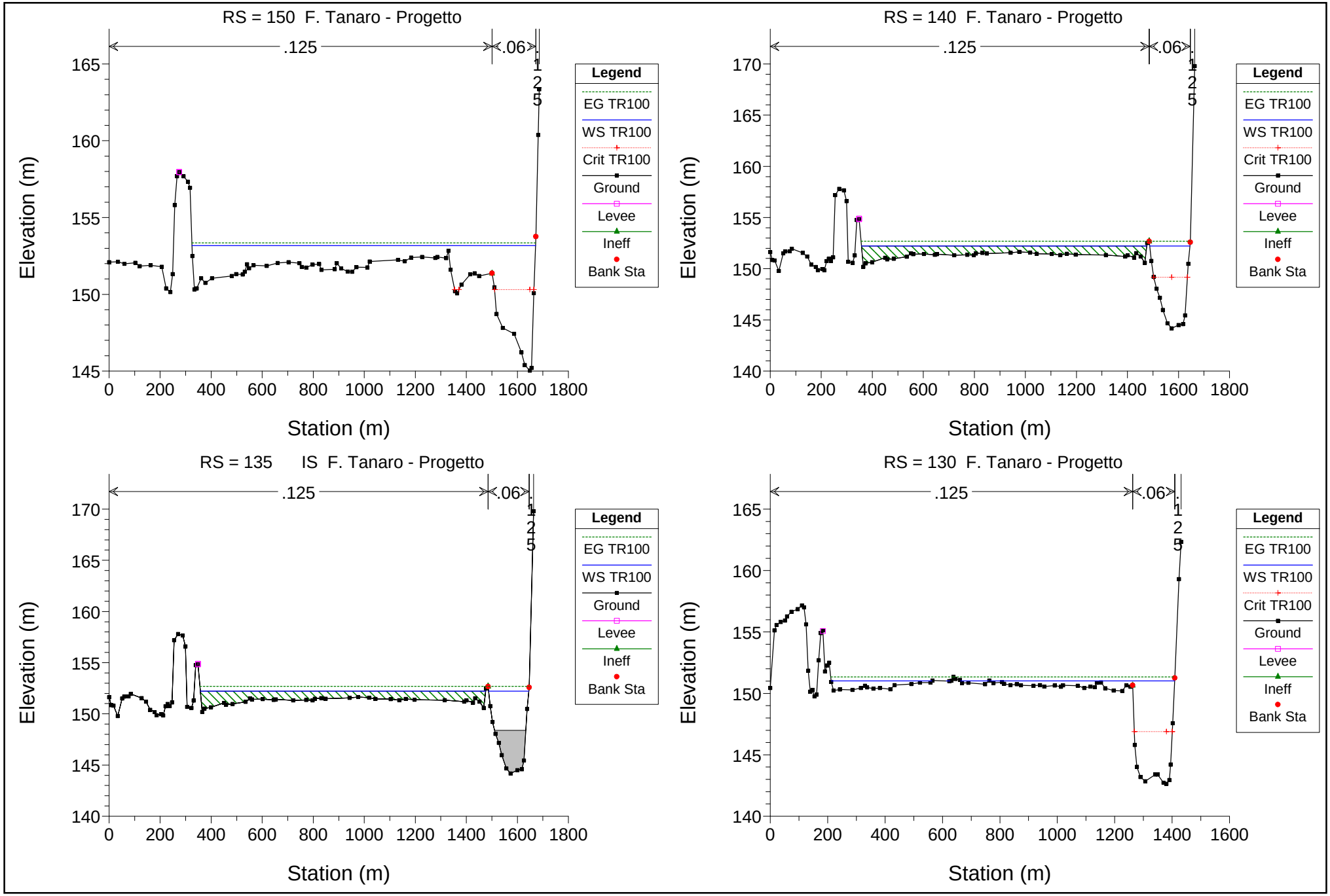

RS = 230 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 220 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

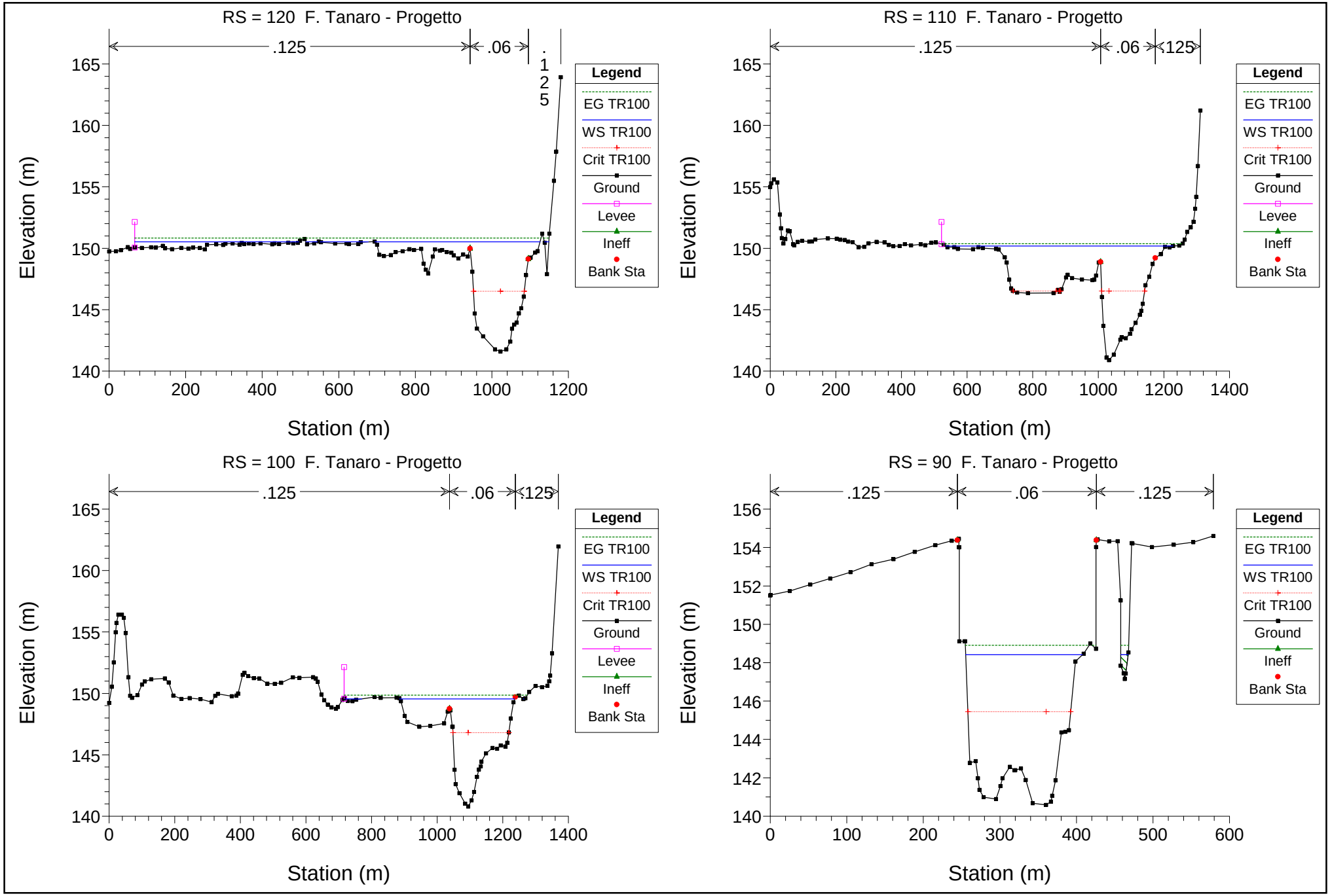

RS = 190 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

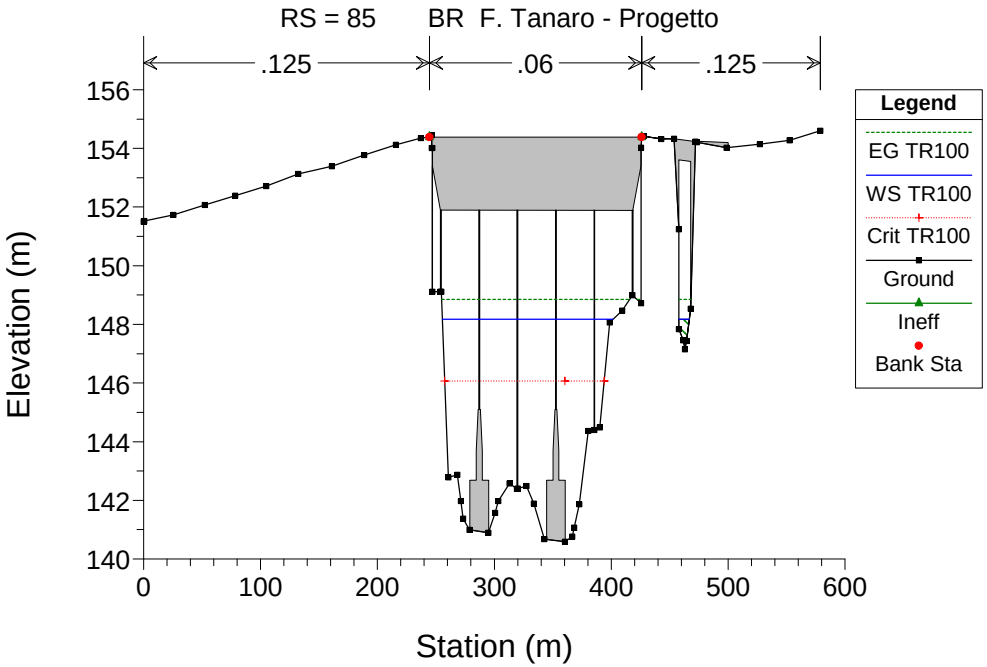

RS = 180 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

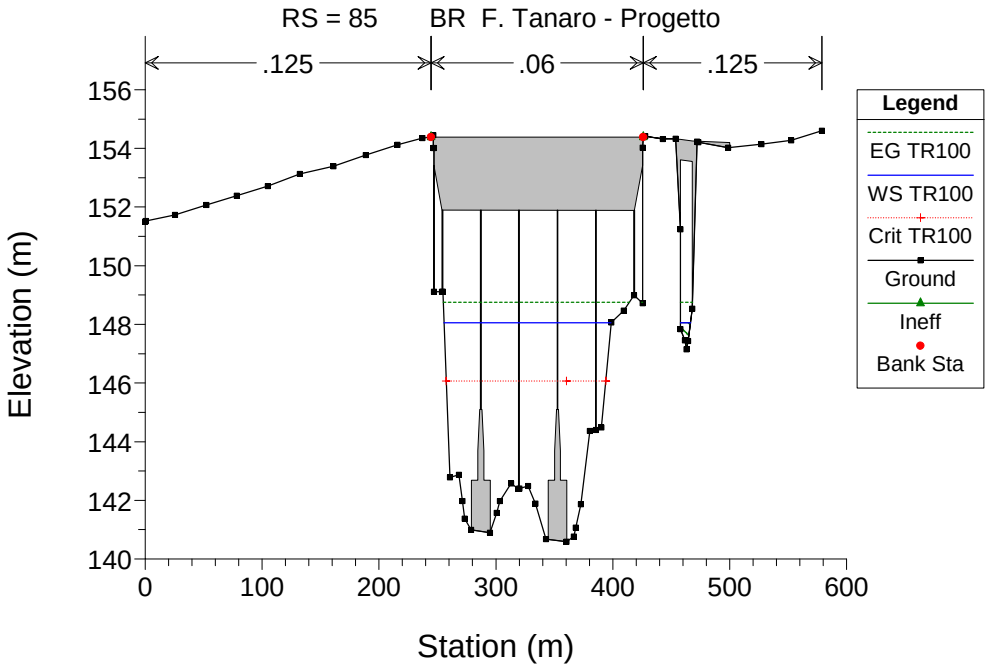

RS = 170 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

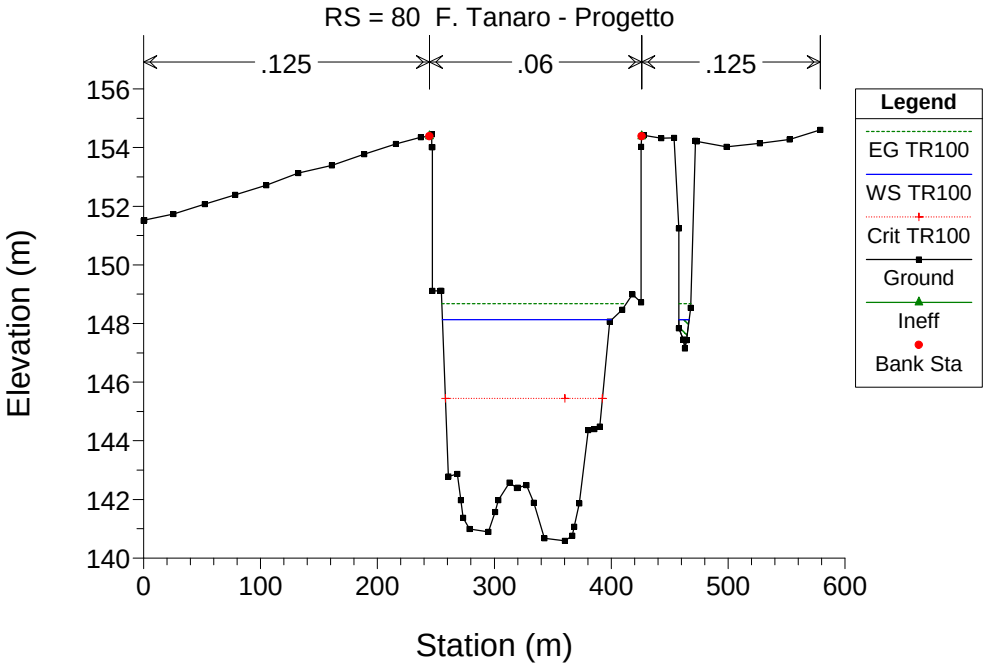

RS = 160 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Bank Sta

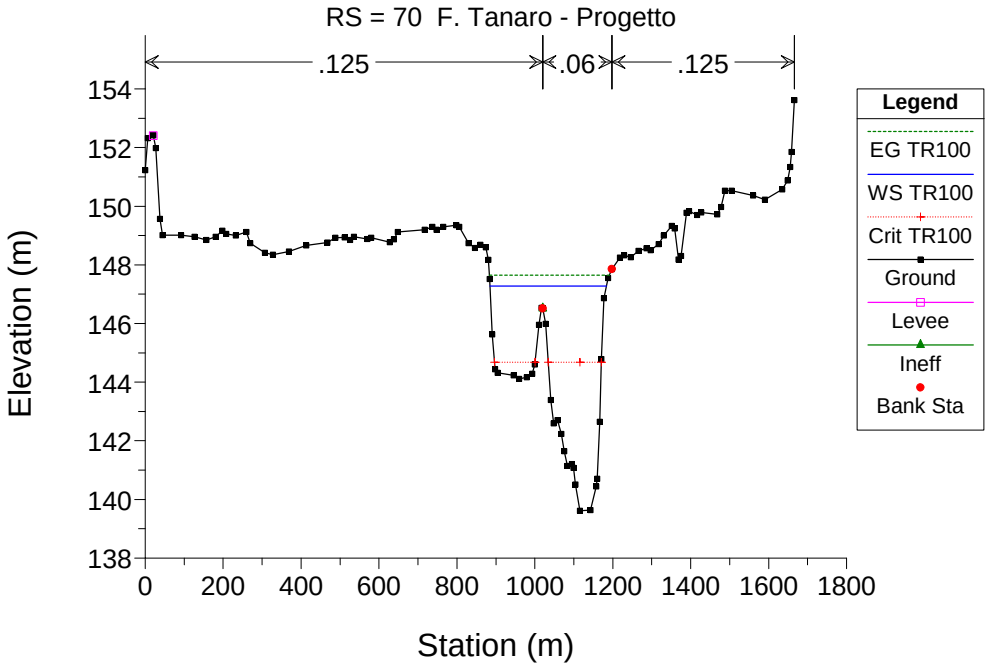

RS = 150 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 140 F. Tanaro - Progetto
RS = 135 IS F. Tanaro - Progetto
RS = 130 F. Tanaro - Progetto

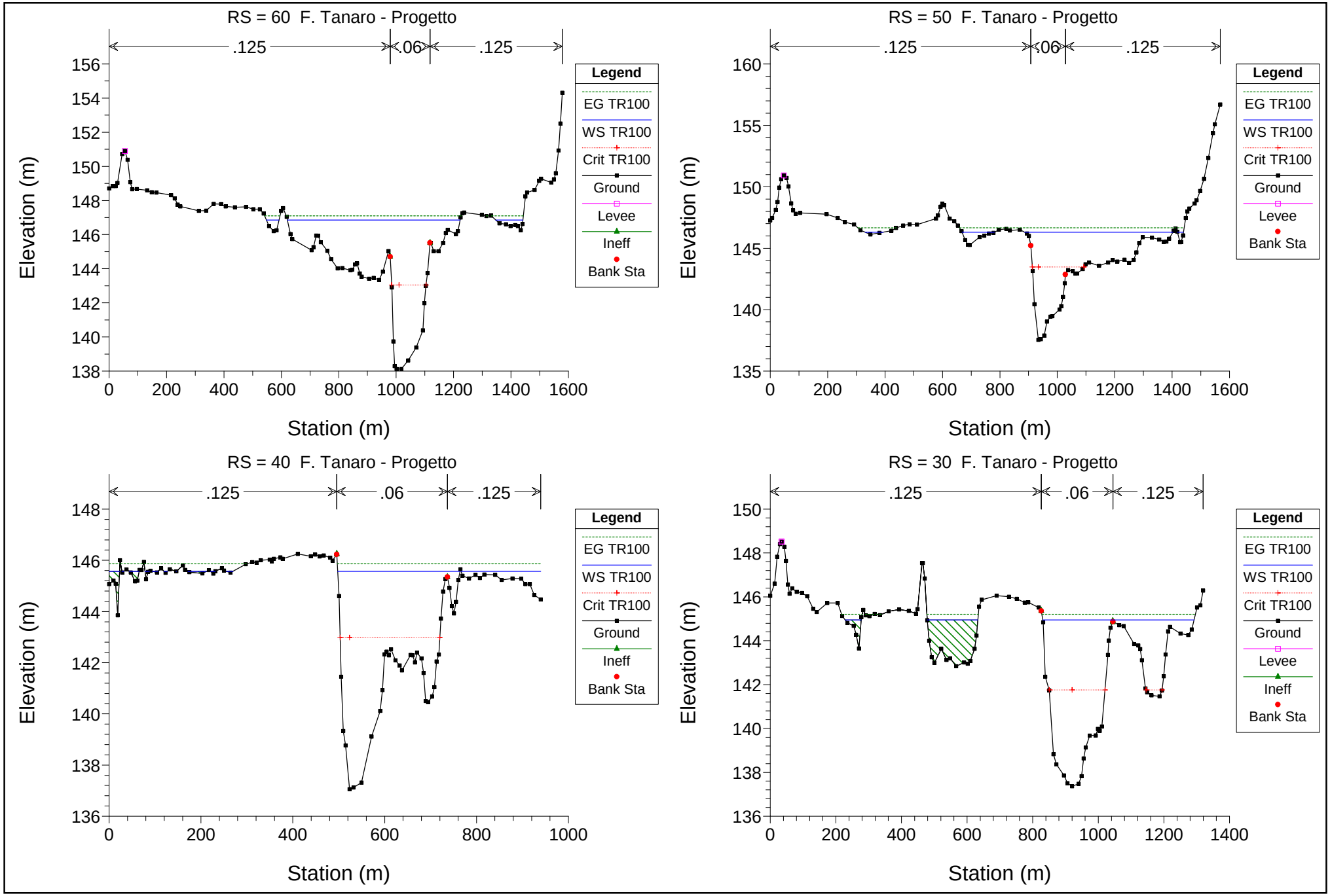

RS = 120 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 110 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 90 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

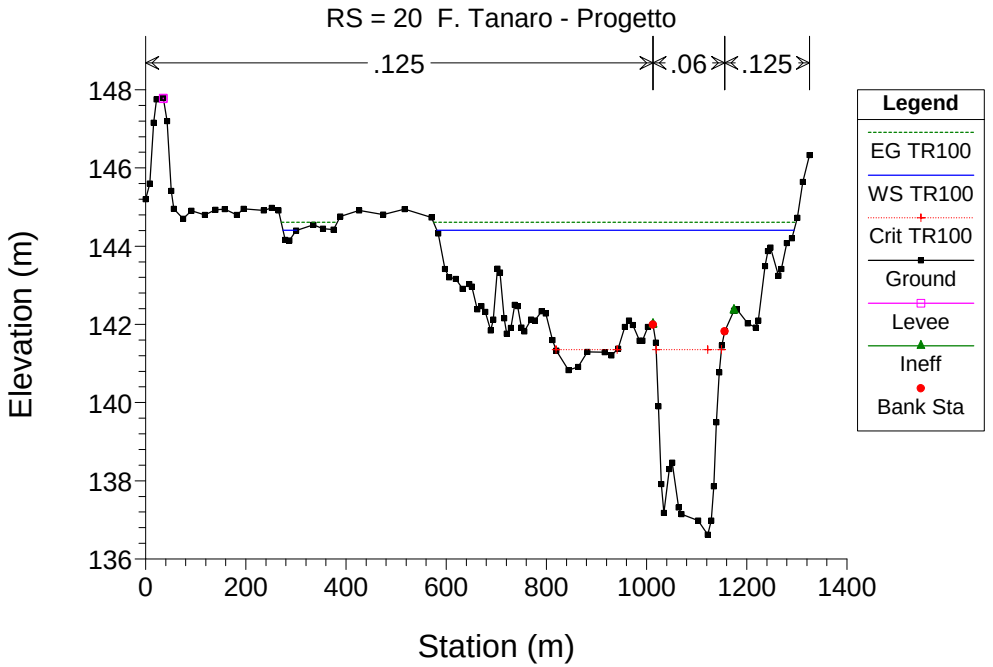

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta

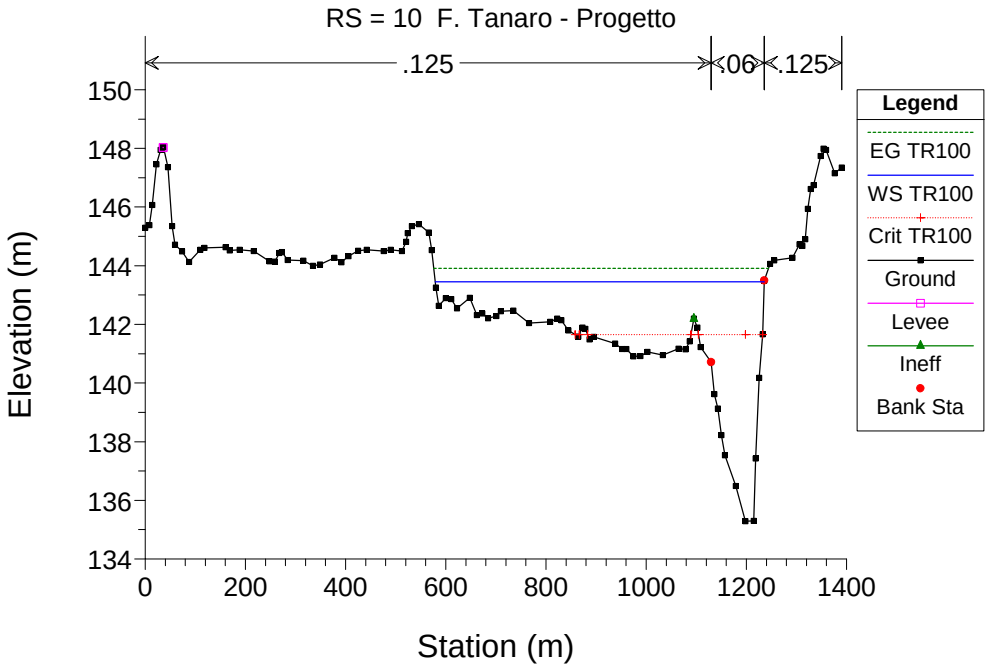

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta


RS = 80 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Ineff
Bank Sta


RS = 70 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 60 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta
RS = 50 F. Tanaro - Progetto
RS = 40 F. Tanaro - Progetto
RS = 30 F. Tanaro - Progetto


RS = 20 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
148
146
144
142
140
138
136
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR100
WS TR100
Crit TR100
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO

SIMULAZIONE 6

Sbarramento mobile abbassato

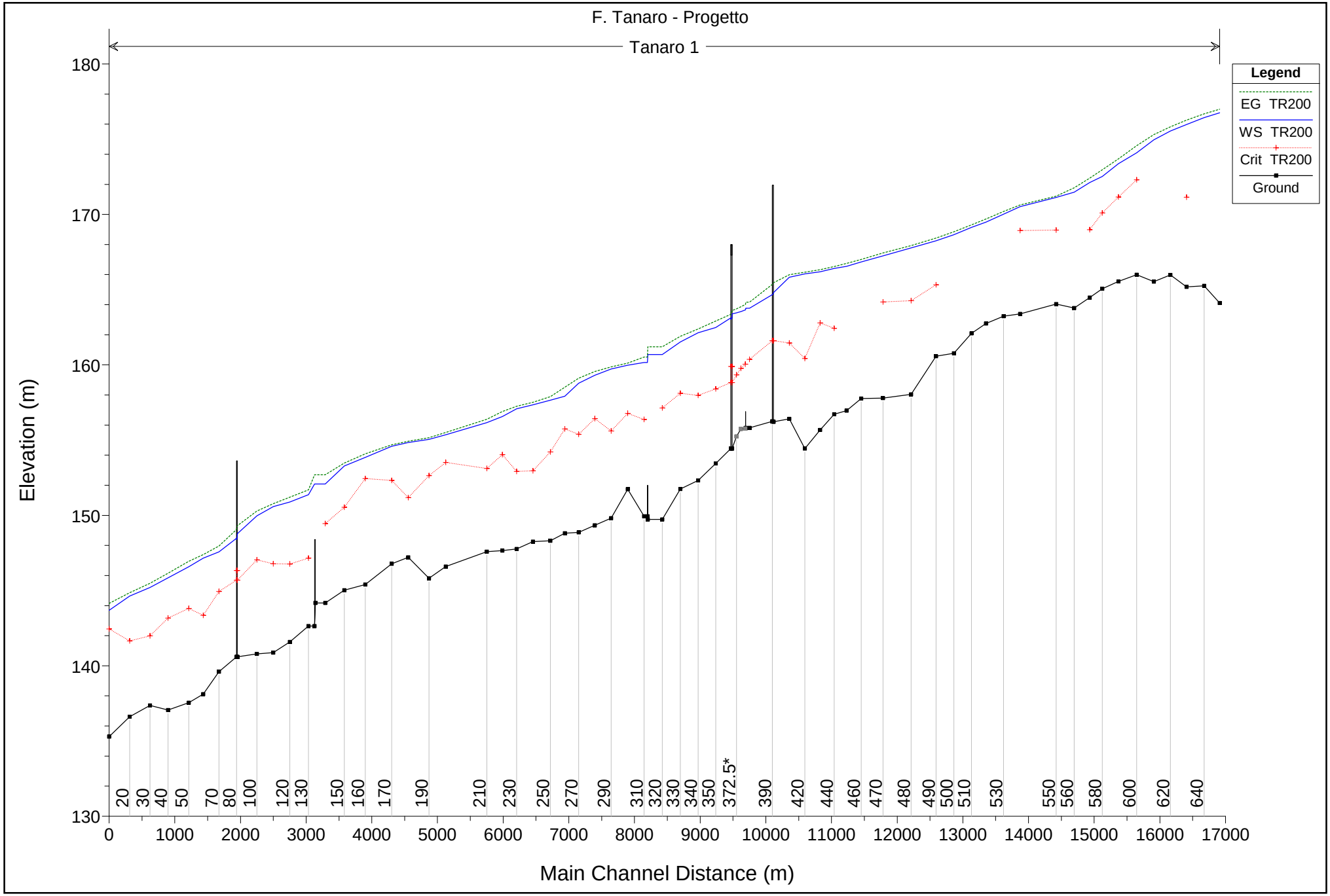
corso d'acqua	portata al colmo Q_c m^3/s	tempo di ritorno anni
Fiume Tanaro	3050	200

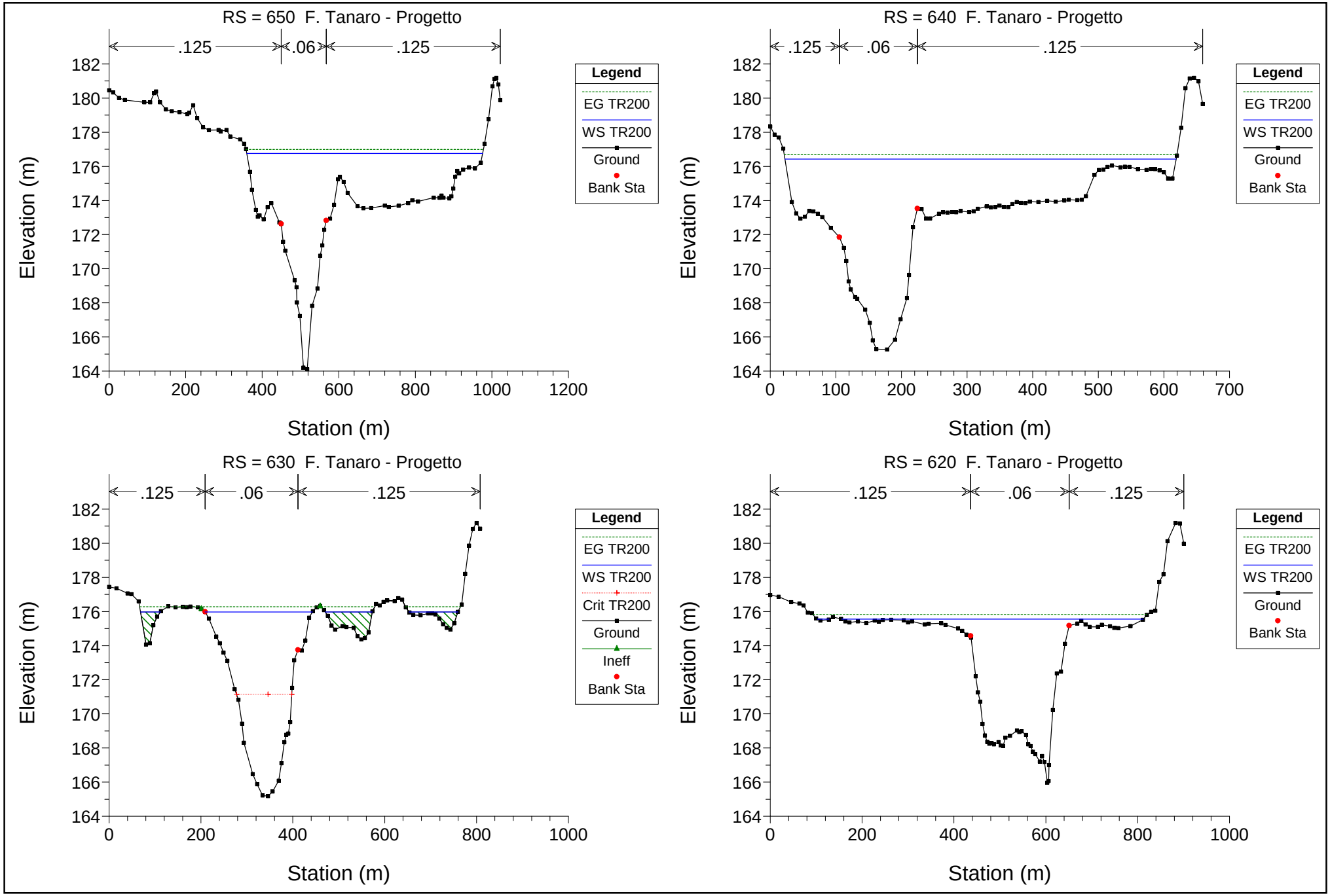
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200

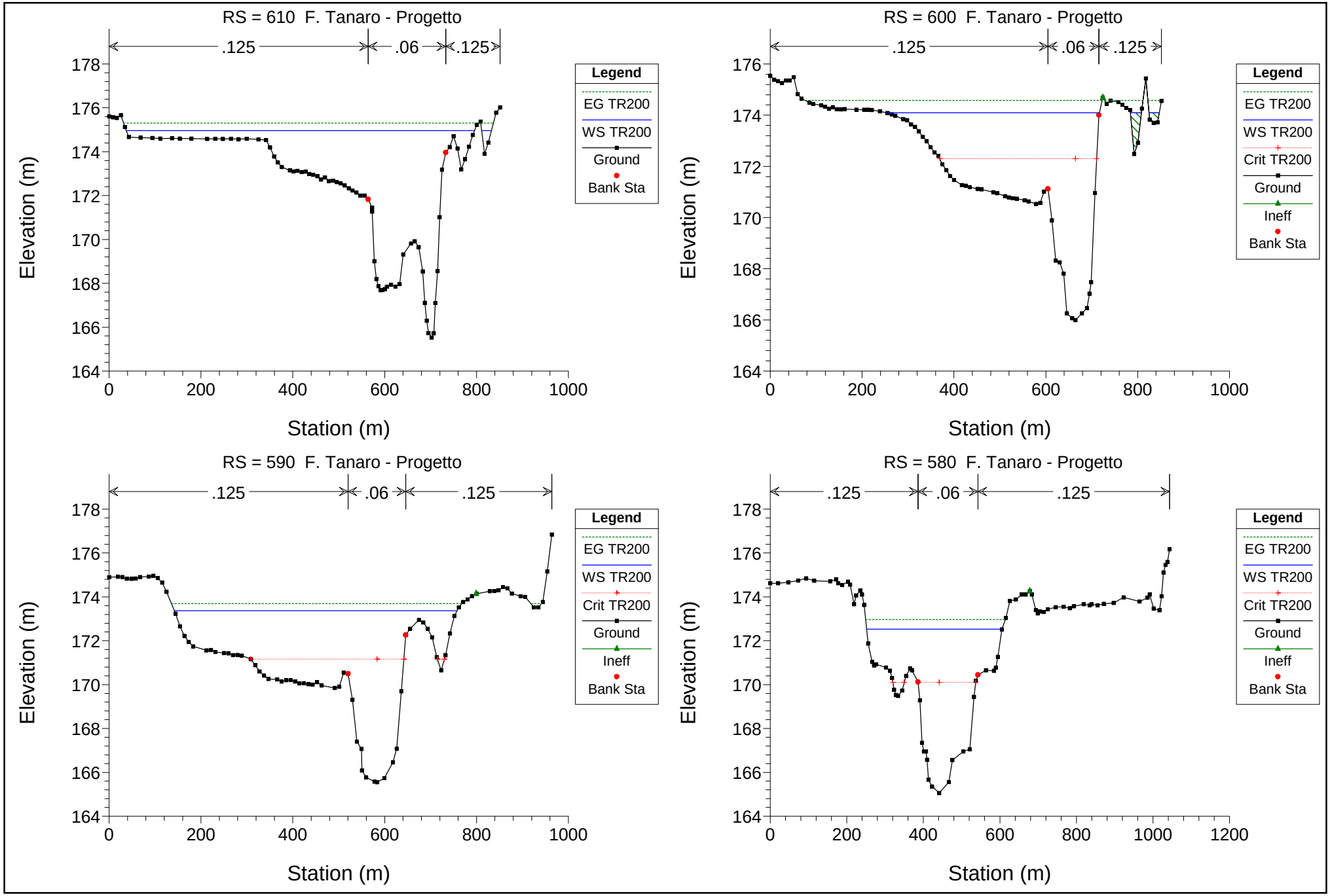
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	TR200	3050.00	164.11	176.75		177.00	0.001411	2.48	2218.23	616.16	0.28
1	640	TR200	3050.00	165.26	176.43		176.69	0.001278	2.47	2094.11	596.31	0.27
1	630	TR200	3050.00	165.18	175.98	171.15	176.27	0.001869	2.42	1296.17	485.29	0.31
1	620	TR200	3050.00	165.98	175.55		175.82	0.001772	2.32	1434.20	682.52	0.30
1	610	TR200	3050.00	165.53	174.97		175.30	0.002358	2.69	1678.61	779.86	0.35
1	600	TR200	3050.00	165.99	174.09	172.30	174.57	0.003811	3.45	1482.85	509.97	0.44
1	590	TR200	3050.00	165.55	173.37	171.16	173.70	0.002635	2.89	1864.37	615.80	0.37
1	580	TR200	3050.00	165.06	172.52	170.10	172.97	0.003293	3.07	1278.00	353.61	0.41
1	570	TR200	3050.00	164.47	172.12	168.98	172.41	0.002174	2.59	1721.78	522.06	0.33
1	560	TR200	3050.00	163.78	171.48		171.77	0.003509	2.65	1798.01	738.77	0.40
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001114	1.47	3244.08	1183.00	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.63	0.001630	2.09	3285.47	1121.43	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001818	2.16	2283.51	674.36	0.30
1	520	TR200	3050.00	162.75	169.48		169.69	0.002107	2.37	2495.23	1042.34	0.32
1	510	TR200	3050.00	162.10	169.14		169.30	0.001880	2.12	2420.17	736.50	0.30
1	500	TR200	3050.00	160.77	168.66		168.85	0.001608	2.19	2155.66	553.46	0.29
1	490	TR200	3050.00	160.58	168.25	165.33	168.43	0.001560	2.05	1997.45	516.92	0.28
1	480	TR200	3050.00	158.04	167.78	164.27	167.93	0.001203	1.96	2513.37	816.16	0.25
1	470	TR200	3050.00	157.79	167.24	164.19	167.44	0.001414	2.23	2222.93	559.19	0.27
1	460	TR200	3050.00	157.77	166.85		167.01	0.001120	2.00	2555.67	855.19	0.24
1	450	TR200	3050.00	156.96	166.55		166.75	0.001227	2.12	2406.26	1034.31	0.26
1	440	TR200	3050.00	156.72	166.41	162.43	166.54	0.000868	1.85	3005.10	797.42	0.22
1	430	TR200	3050.00	155.68	166.19	162.79	166.33	0.001053	2.04	2886.62	665.62	0.24
1	420	TR200	3050.00	154.44	166.05	160.43	166.16	0.000583	1.69	3209.35	688.86	0.18
1	410	TR200	3050.00	156.41	165.83	161.45	165.99	0.001016	2.04	2449.13	543.69	0.24
1	400	TR200	3050.00	156.22	164.81	161.61	165.46	0.003553	3.66	957.75	175.55	0.43
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.67	161.61	165.35	0.003793	3.74	934.81	174.80	0.44
1	380	TR200	3050.00	155.82	163.76	160.36	164.17	0.002443	2.84	1113.04	228.50	0.35
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.39	158.82	163.61	0.001191	2.09	1462.49	207.09	0.25
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.12	158.82	163.36	0.001348	2.17	1406.93	206.35	0.27
1	350	TR200	3050.00	153.45	162.49	158.40	162.91	0.002288	2.88	1093.98	269.94	0.35
1	340	TR200	3050.00	152.32	162.14	157.98	162.39	0.001399	2.24	1512.13	384.65	0.27
1	330	TR200	3050.00	151.75	161.52	158.11	161.90	0.002275	2.77	1346.17	433.32	0.34
1	320	TR200	3050.00	149.73	160.69	157.14	161.21	0.002673	3.40	1461.40	575.52	0.38
1	315		Inl Struct									
1	310	TR200	3050.00	149.94	160.16	156.38	160.52	0.002059	3.02	2049.22	820.90	0.34
1	300	TR200	3050.00	151.73	159.97	156.77	160.12	0.001070	1.99	2841.81	871.70	0.24

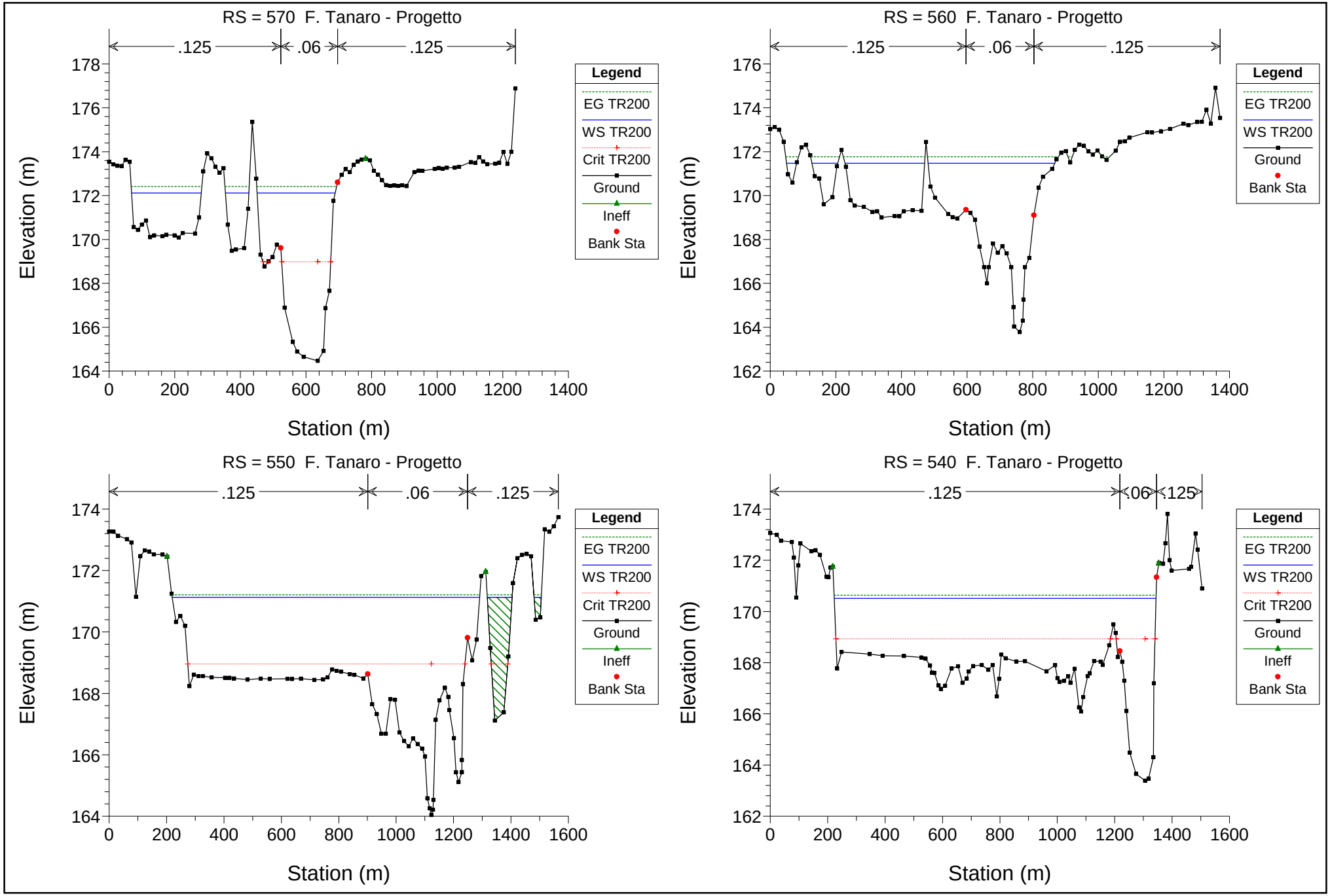
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

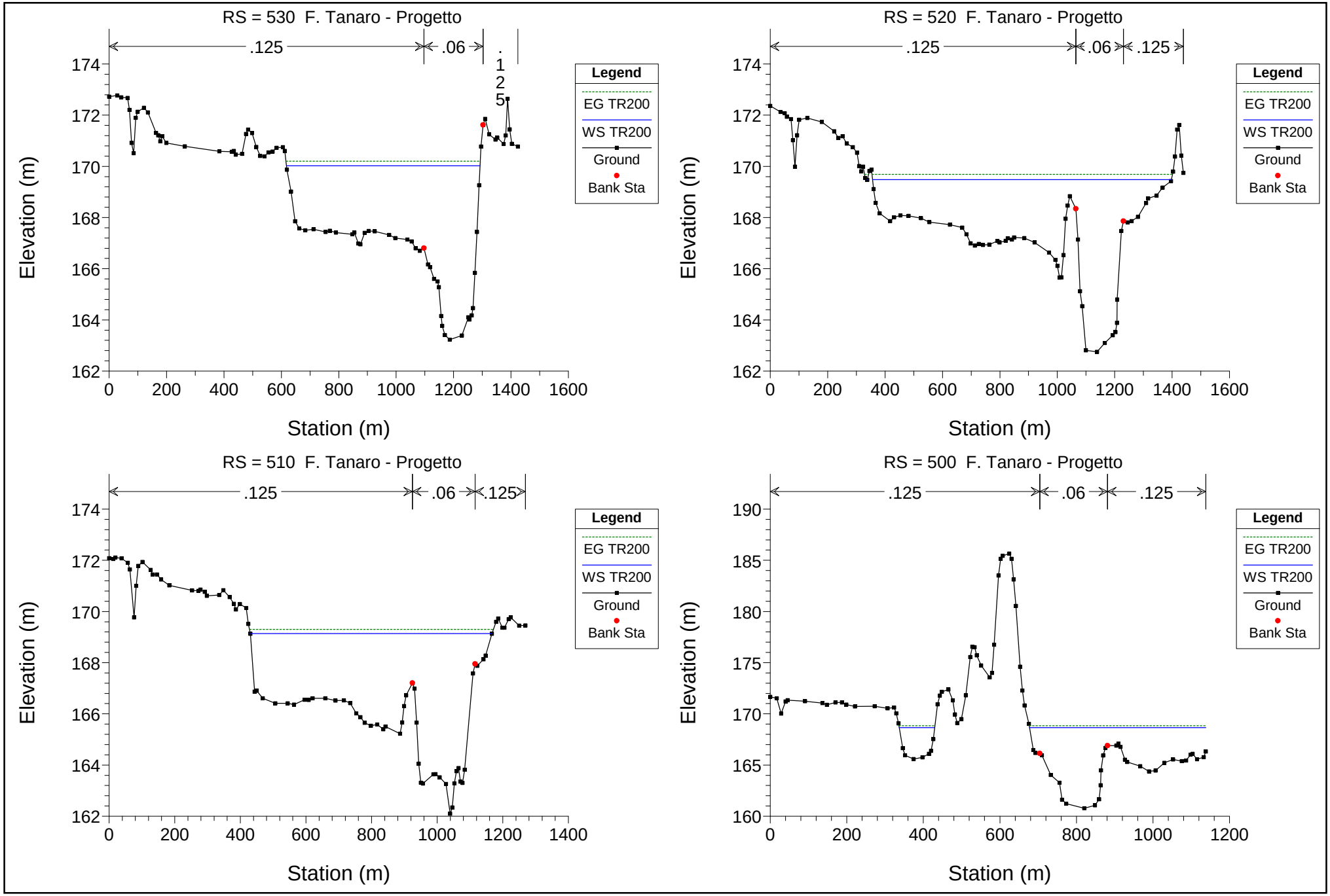
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	290	TR200	3050.00	149.81	159.72	155.61	159.87	0.000978	1.83	2420.02	712.31	0.23
1	280	TR200	3050.00	149.34	159.31	156.43	159.56	0.001699	2.52	2074.89	629.50	0.30
1	270	TR200	3050.00	148.86	158.78	155.38	159.11	0.002056	2.88	1828.43	599.89	0.33
1	260	TR200	3050.00	148.81	157.91	155.75	158.52	0.003719	3.70	1231.29	404.55	0.44
1	250	TR200	3050.00	148.31	157.65	154.21	157.89	0.001793	2.43	1990.50	557.58	0.31
1	240	TR200	3050.00	148.26	157.34	152.95	157.52	0.001050	2.05	2464.71	767.80	0.24
1	230	TR200	3050.00	147.77	157.08	152.92	157.25	0.001089	1.97	2186.77	650.48	0.24
1	220	TR200	3050.00	147.66	156.57	154.03	156.90	0.002377	2.84	1697.24	602.77	0.35
1	210	TR200	3050.00	147.59	156.16	153.11	156.39	0.001647	2.28	2054.55	771.20	0.29
1	200	TR200	3050.00	146.60	155.36	153.52	155.51	0.001444	2.24	3137.99	1102.83	0.28
1	190	TR200	3050.00	145.82	155.06	152.64	155.17	0.001134	1.82	3551.35	1334.04	0.24
1	180	TR200	3050.00	147.21	154.84	151.18	154.92	0.000706	1.58	4177.40	1452.85	0.19
1	170	TR200	3050.00	146.78	154.58	152.32	154.68	0.001190	1.70	3451.70	1377.47	0.24
1	160	TR200	3050.00	145.40	153.85	152.44	154.09	0.002245	2.80	2812.10	1364.80	0.34
1	150	TR200	3050.00	145.03	153.29	150.54	153.47	0.001771	2.24	2838.67	1347.34	0.30
1	140	TR200	3050.00	144.17	152.09	149.45	152.69	0.004278	3.44	887.23	1273.65	0.46
1	135		Inl Struct									
1	130	TR200	3050.00	142.64	151.37	147.16	151.69	0.001732	2.61	1844.79	1198.64	0.30
1	120	TR200	3050.00	141.58	150.89	146.76	151.20	0.001705	2.56	1879.06	1077.61	0.30
1	110	TR200	3050.00	140.88	150.58	146.78	150.77	0.001454	2.20	2303.82	738.97	0.28
1	100	TR200	3050.00	140.79	149.96	147.04	150.29	0.002579	2.61	1513.98	560.84	0.36
1	90	TR200	3050.00	140.59	148.78	145.69	149.31	0.003712	3.24	942.48	171.71	0.43
1	85		Bridge									
1	80	TR200	3050.00	140.59	148.47	145.69	149.06	0.004162	3.41	894.06	164.06	0.45
1	70	TR200	3050.00	139.61	147.57	144.94	147.96	0.003351	2.95	1306.12	304.63	0.41
1	60	TR200	3050.00	138.12	147.15	143.35	147.39	0.001561	2.44	2161.93	808.92	0.29
1	50	TR200	3050.00	137.54	146.58	143.82	146.95	0.002450	2.96	1823.04	903.93	0.36
1	40	TR200	3050.00	137.06	145.84	143.17	146.16	0.002700	2.51	1335.66	734.96	0.36
1	30	TR200	3050.00	137.37	145.20	141.99	145.48	0.002222	2.42	1574.30	727.26	0.33
1	20	TR200	3050.00	136.62	144.64	141.66	144.86	0.001718	2.40	2328.51	839.27	0.30
1	10	TR200	3050.00	135.29	143.69	142.45	144.15	0.004002	3.48	1679.28	662.46	0.45

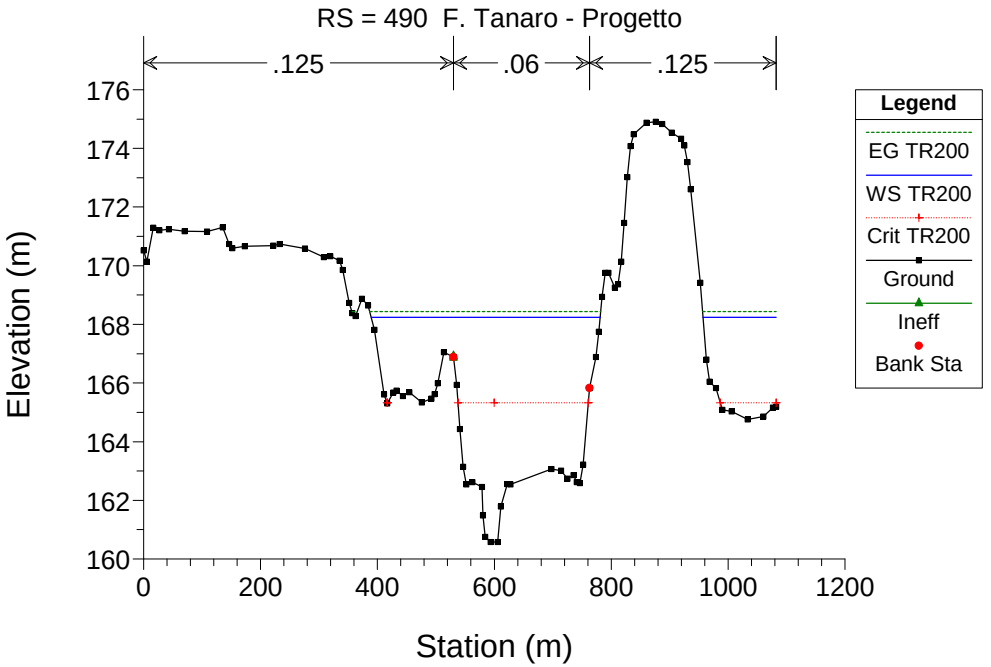

F. Tanaro - Progetto
Tanaro 1
Legend
EG TR200
WS TR200
Crit TR200
Ground
Elevation (m)
Main Channel Distance (m)
180
170
160
150
140
130
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
620
640

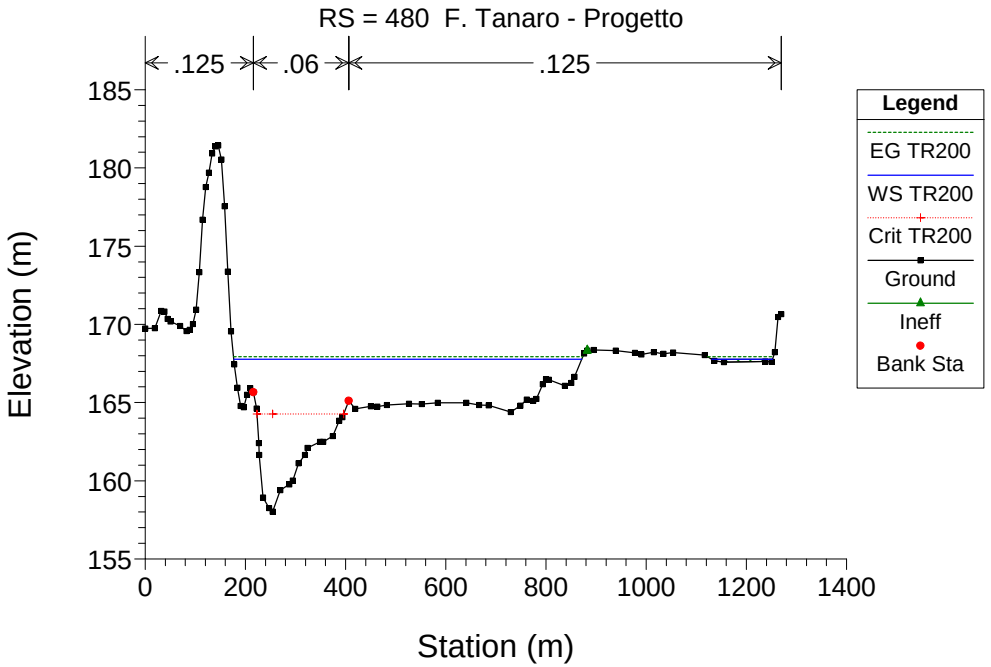

RS = 650 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 640 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 630 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta

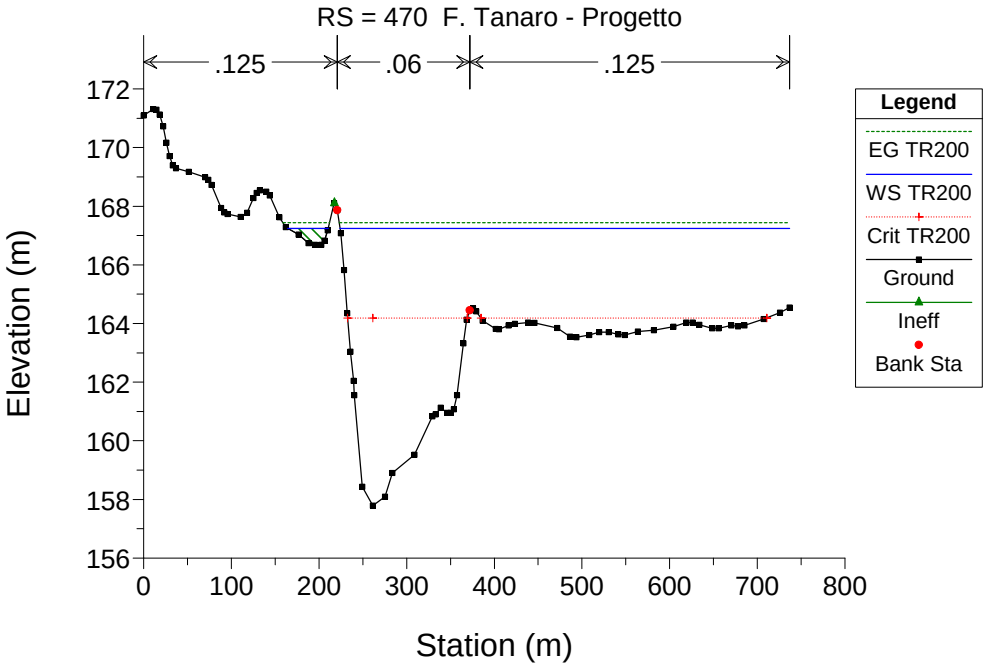

RS = 610 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 600 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 590 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 580 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

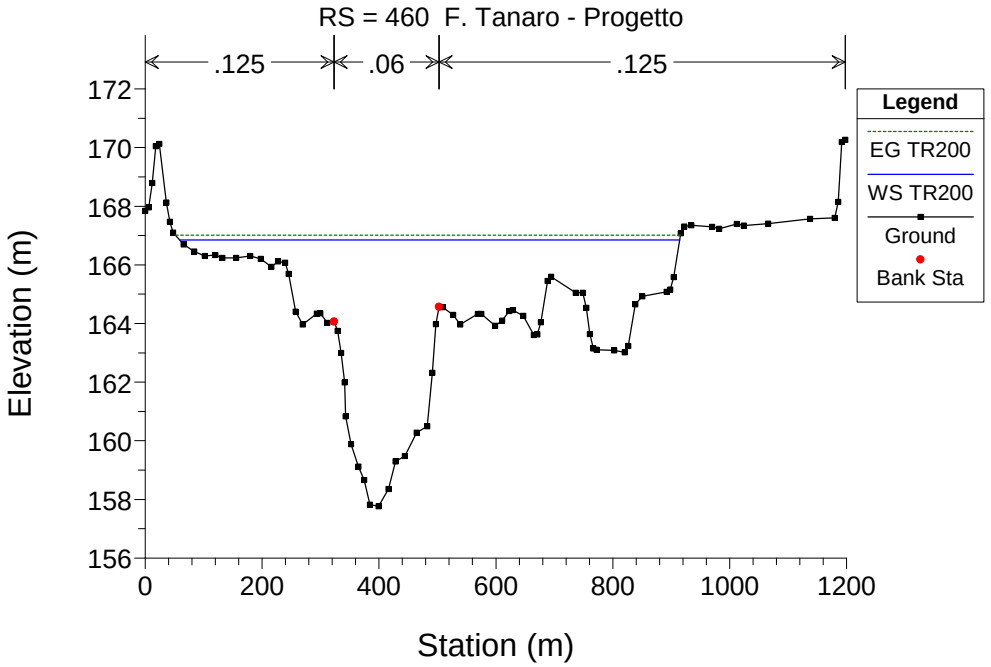

RS = 570 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Progetto
RS = 550 F. Tanaro - Progetto
RS = 540 F. Tanaro - Progetto

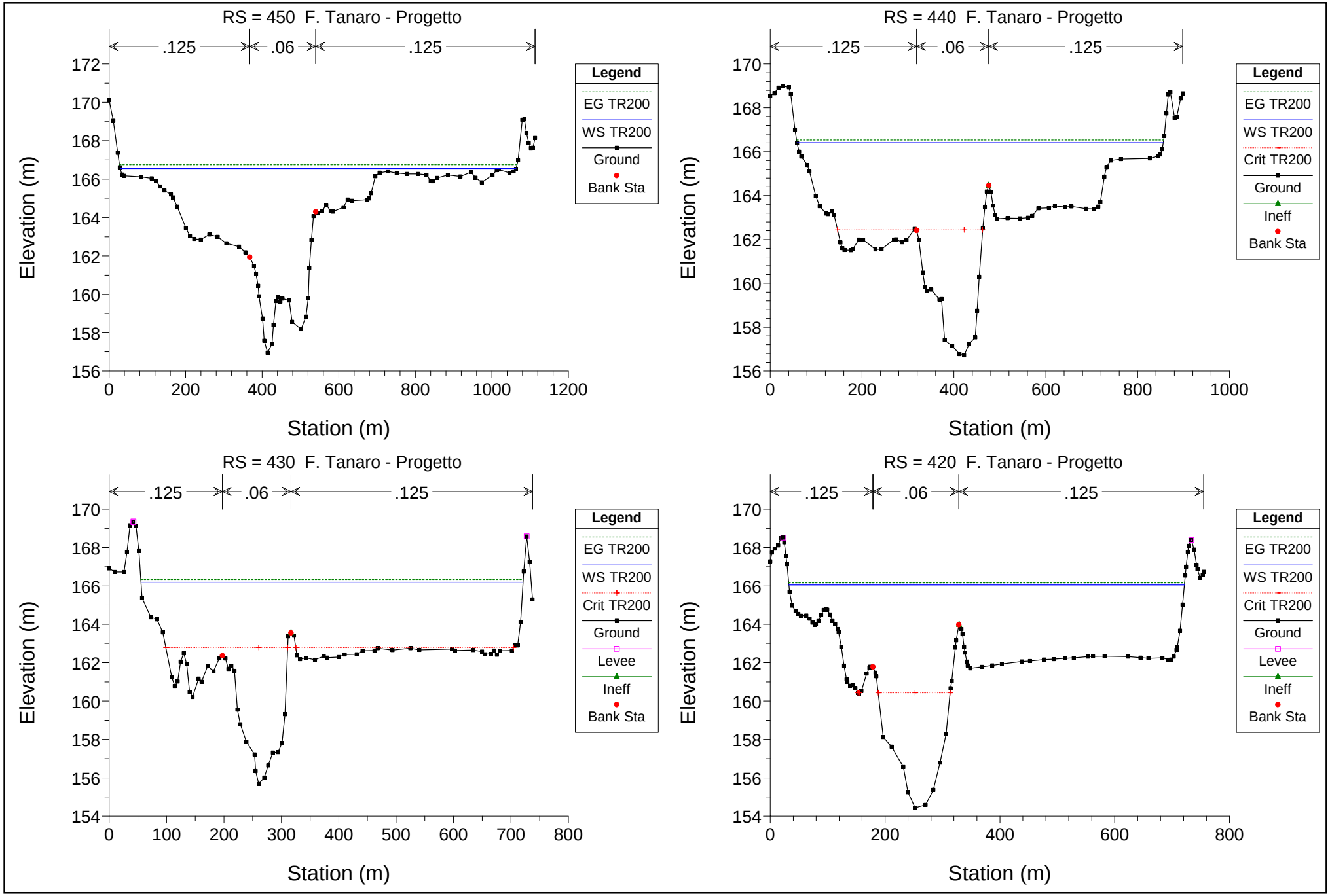

RS = 530 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Progetto
.125
.06
.125
Legend
EG TR200
WS TR200
Ground
Bank Sta
Elevation (m)
Station (m)

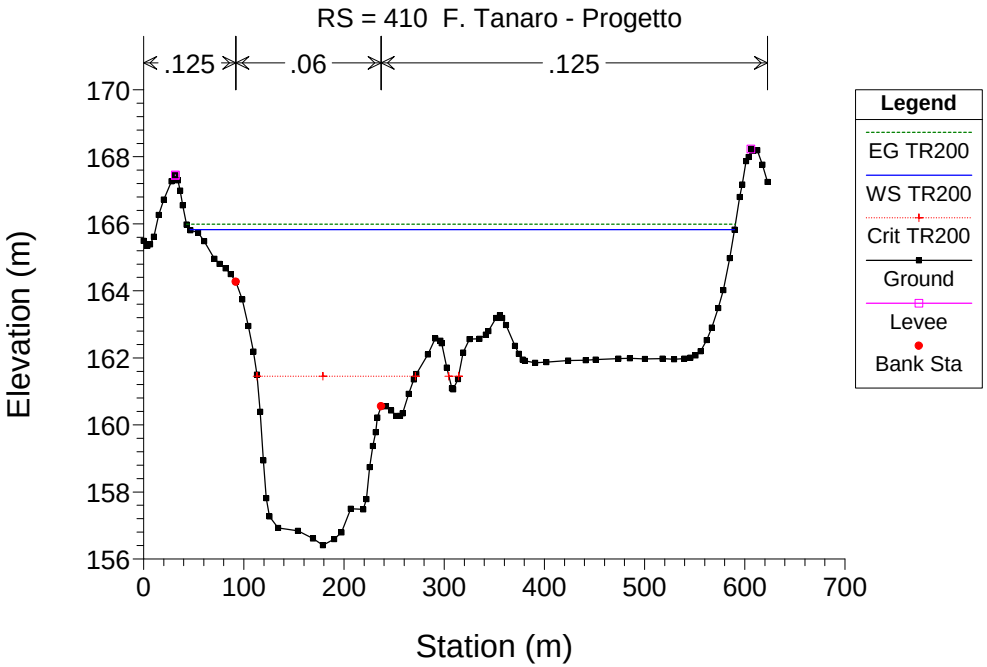

RS = 490 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

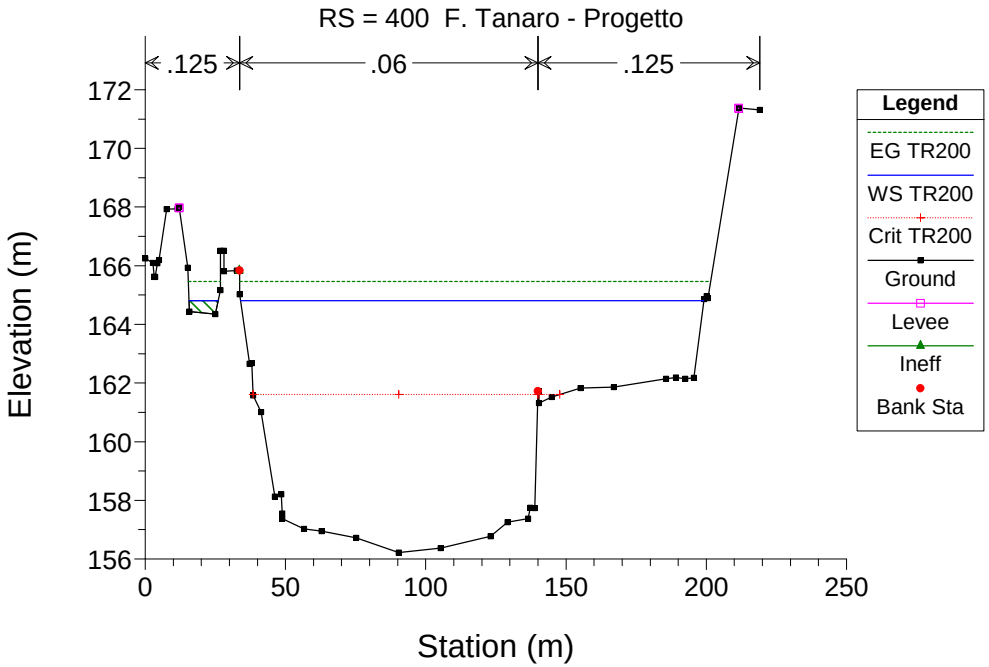

RS = 480 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

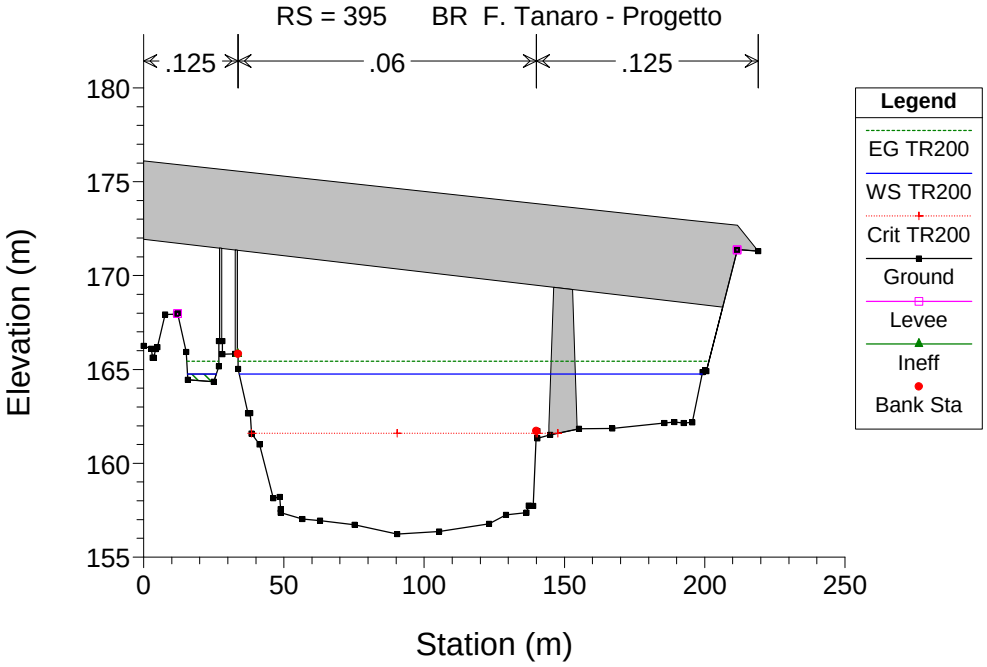

RS = 470 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

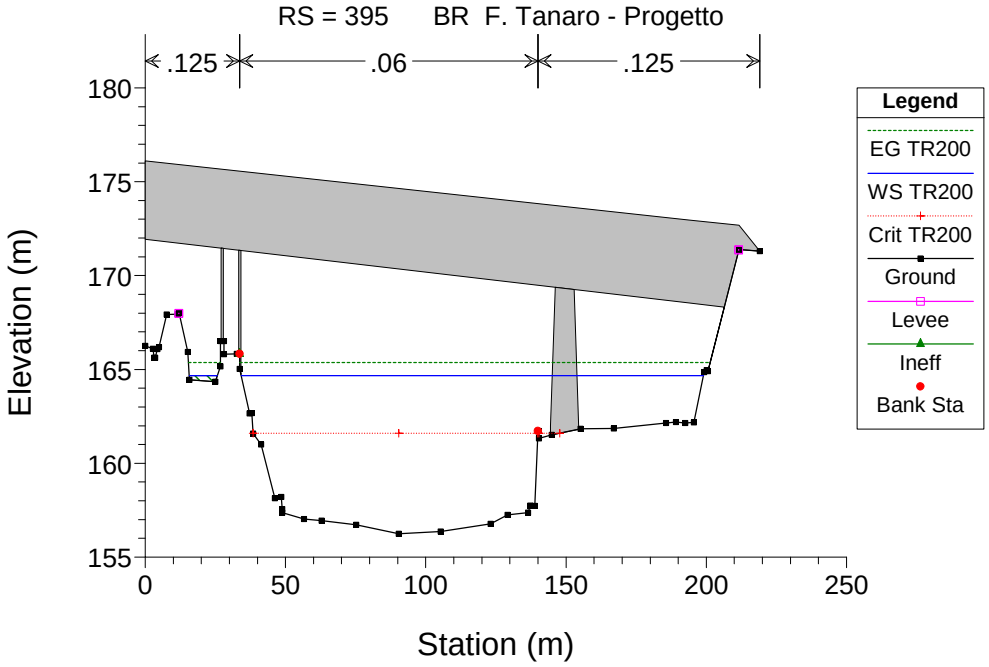

RS = 460 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta

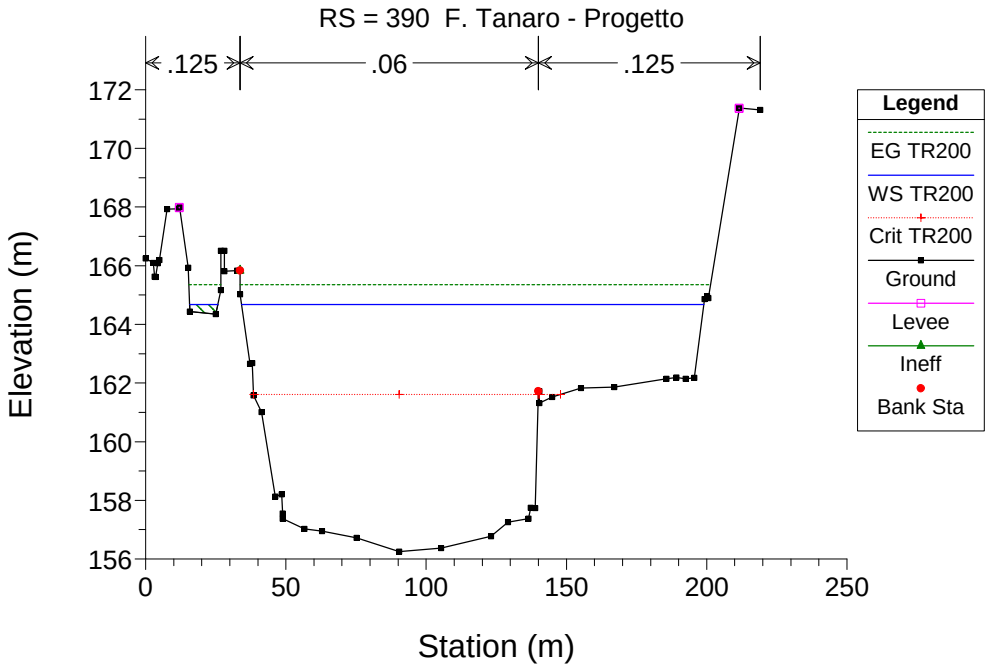

RS = 450 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Bank Sta
RS = 440 F. Tanaro - Progetto
Crit TR200
Ineff
RS = 430 F. Tanaro - Progetto
Levee
RS = 420 F. Tanaro - Progetto

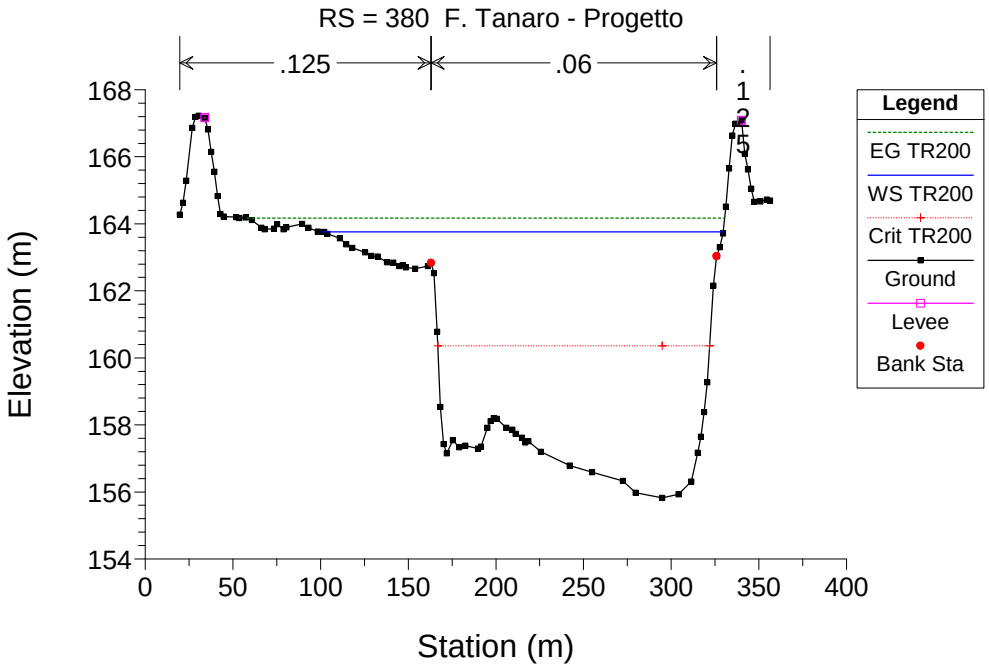

RS = 410 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

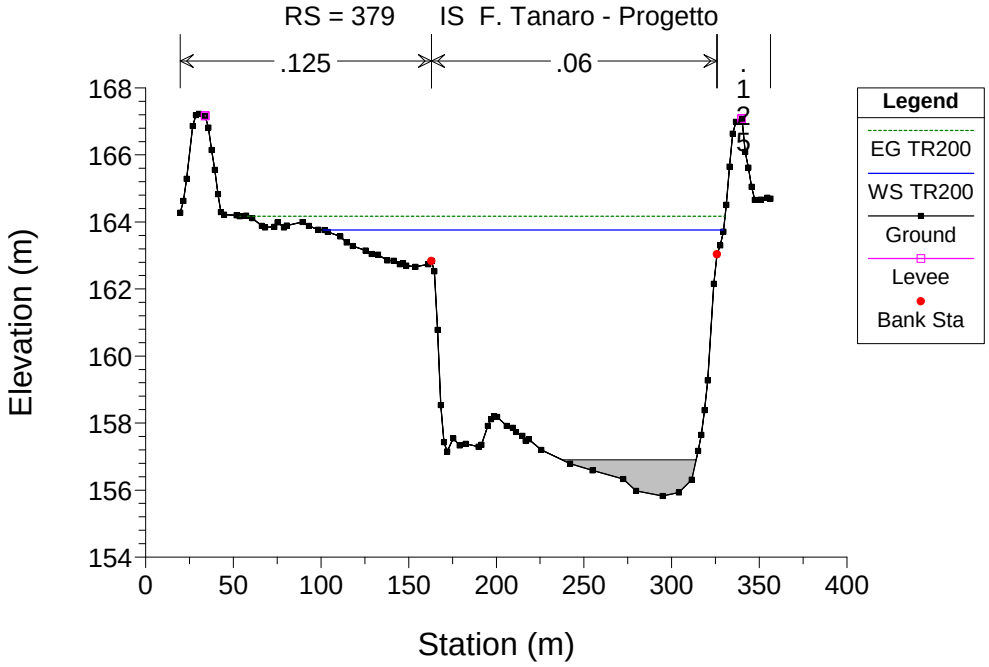

RS = 400 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

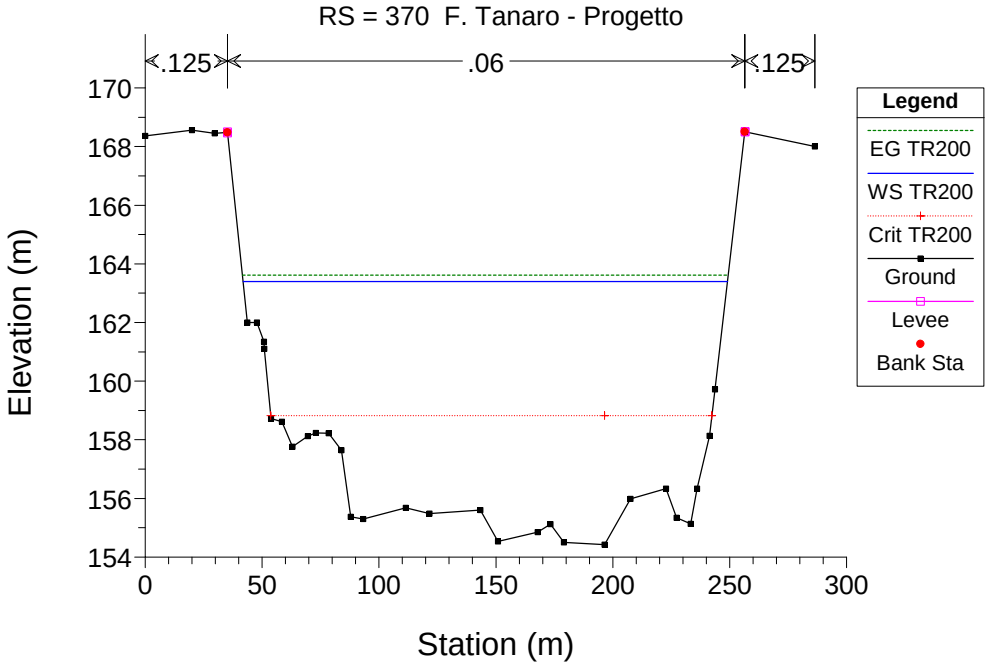

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

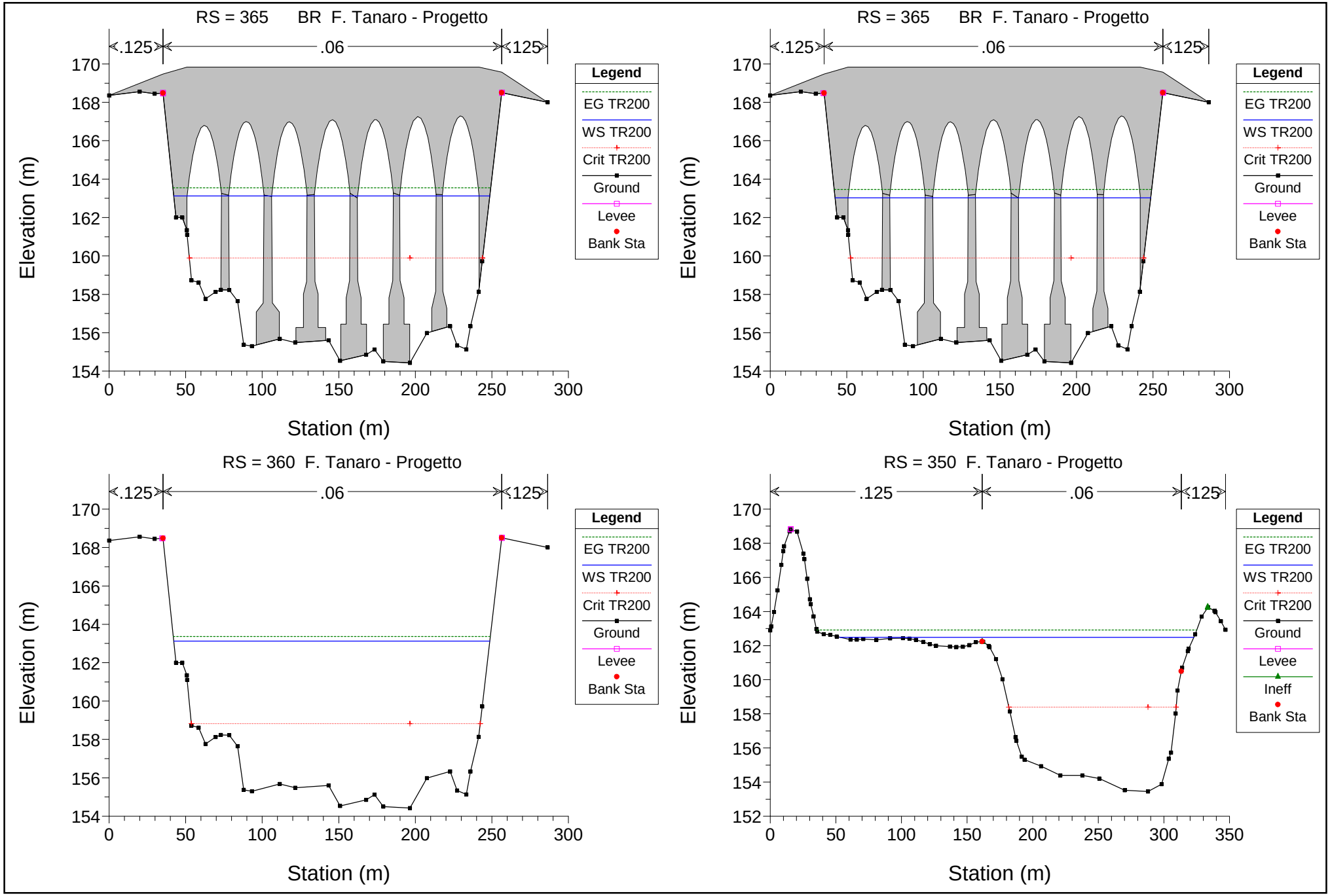

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

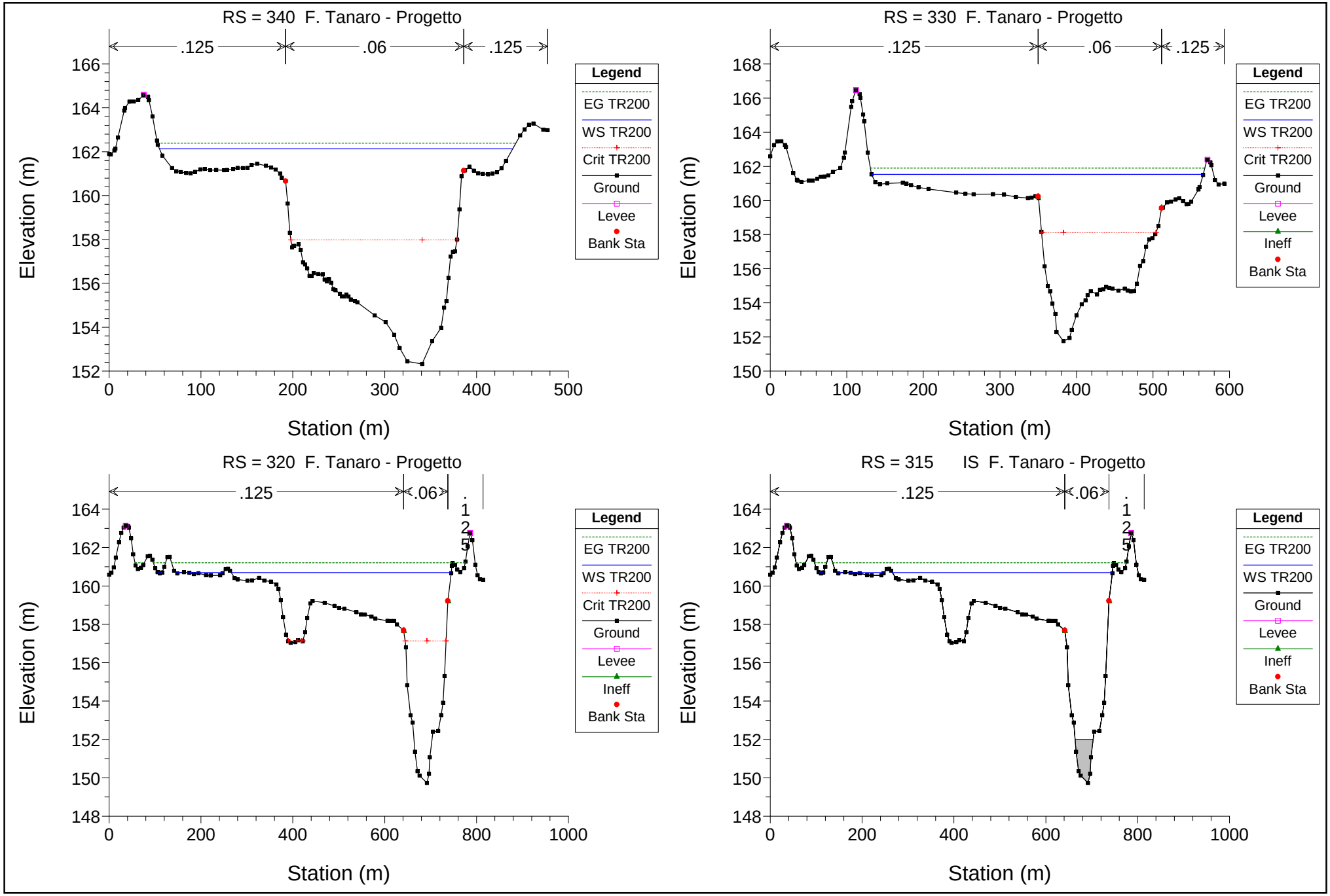

RS = 390 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

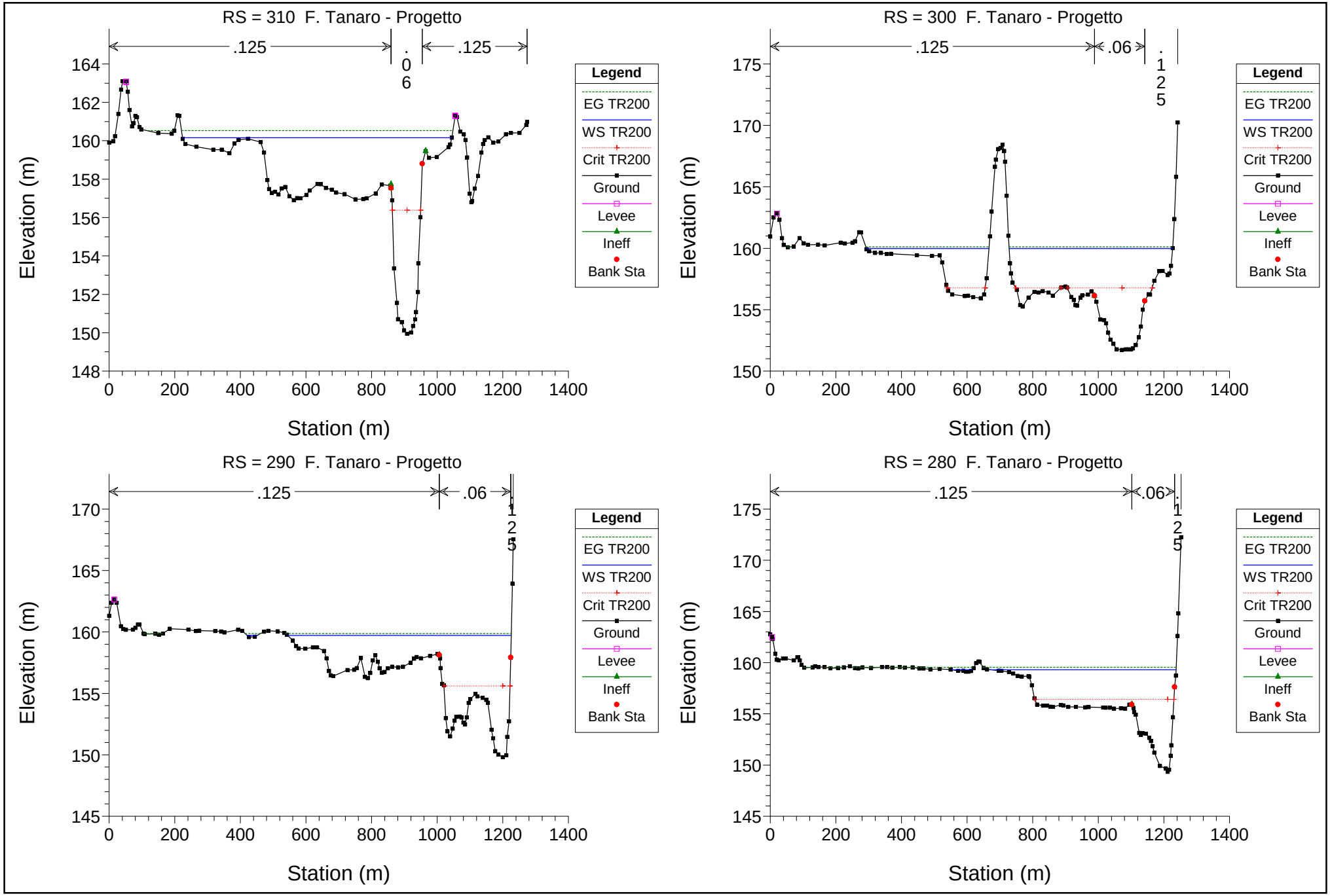

RS = 380 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

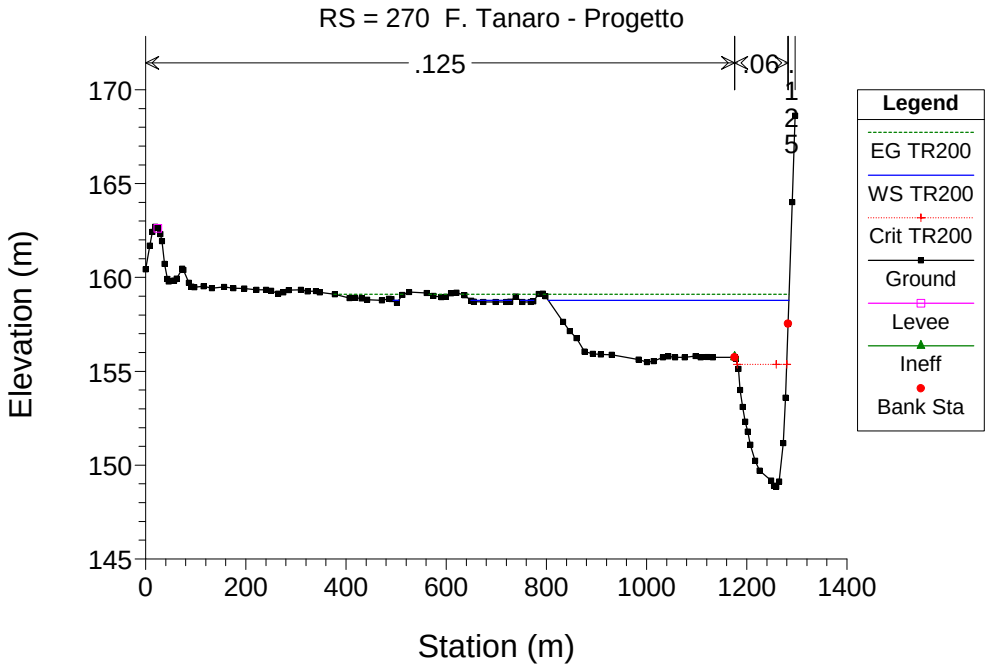

RS = 379 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Levee
Bank Sta

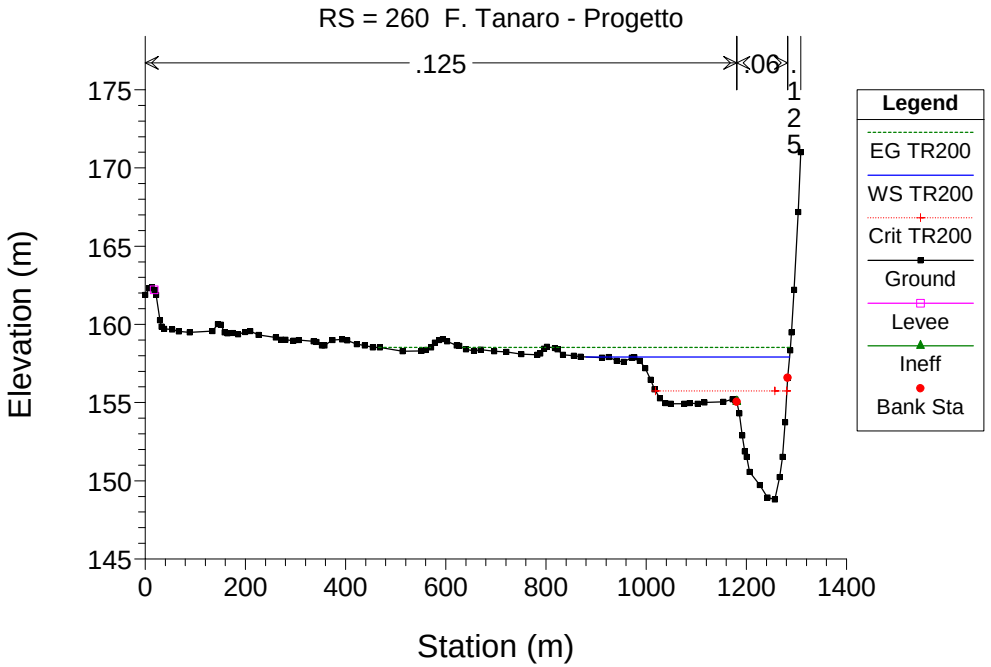

RS = 370 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

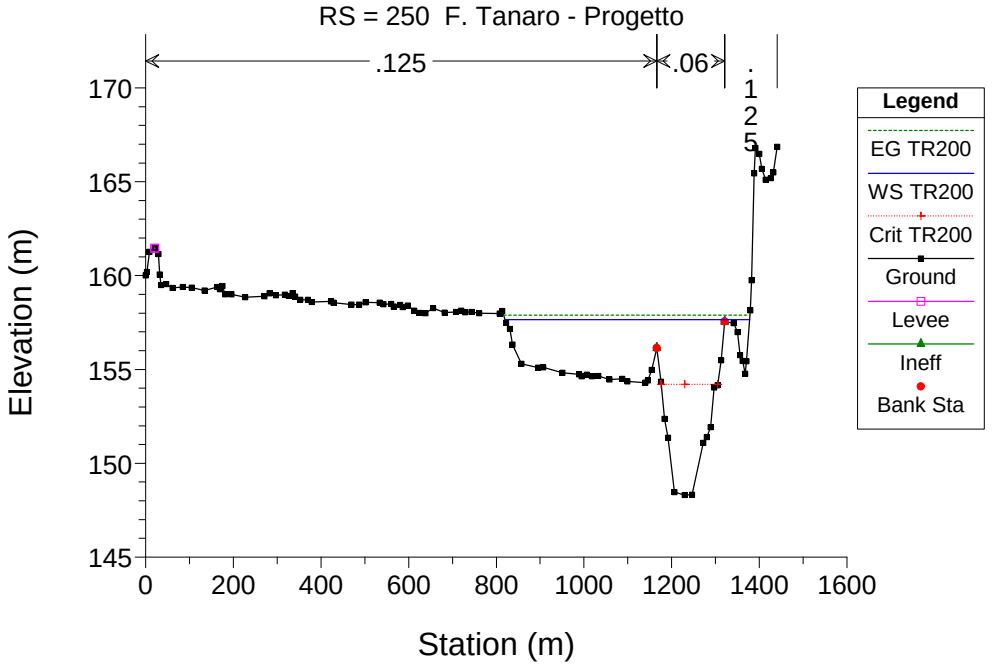

RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 360 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 350 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

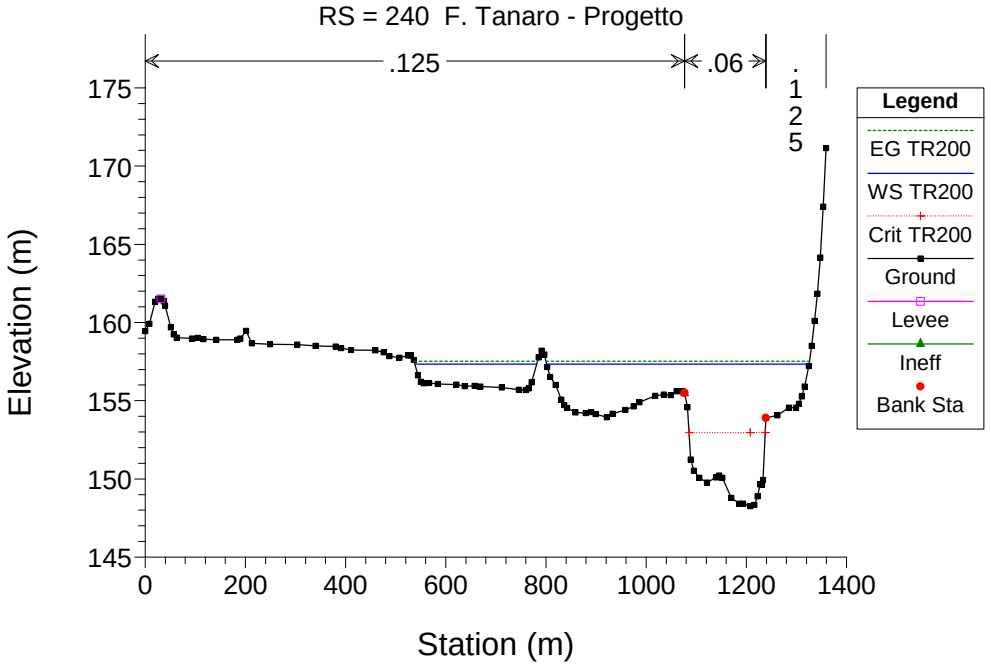

RS = 340 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 315 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Ground
Levee
Ineff
Bank Sta

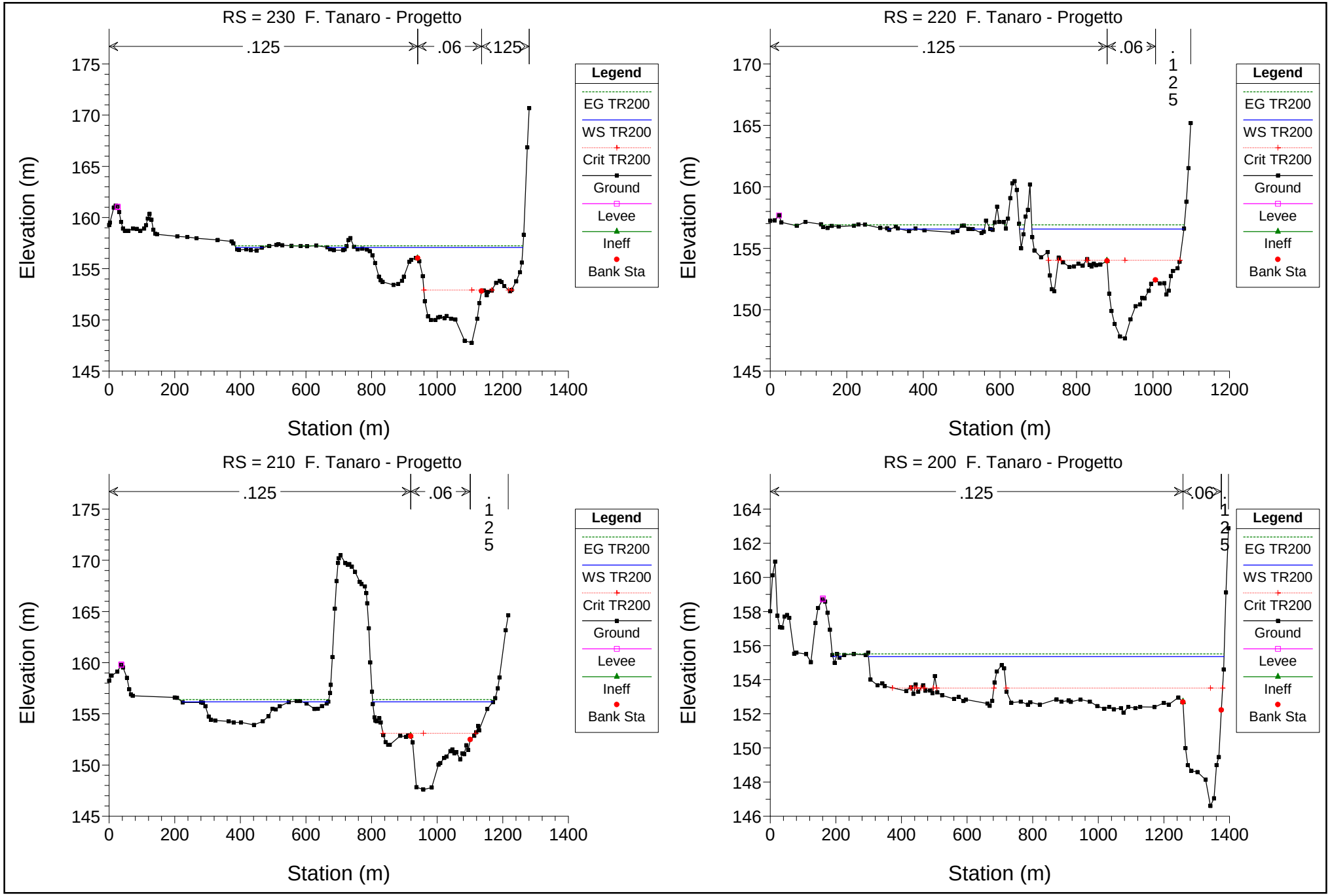

RS = 310 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 300 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 290 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 280 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

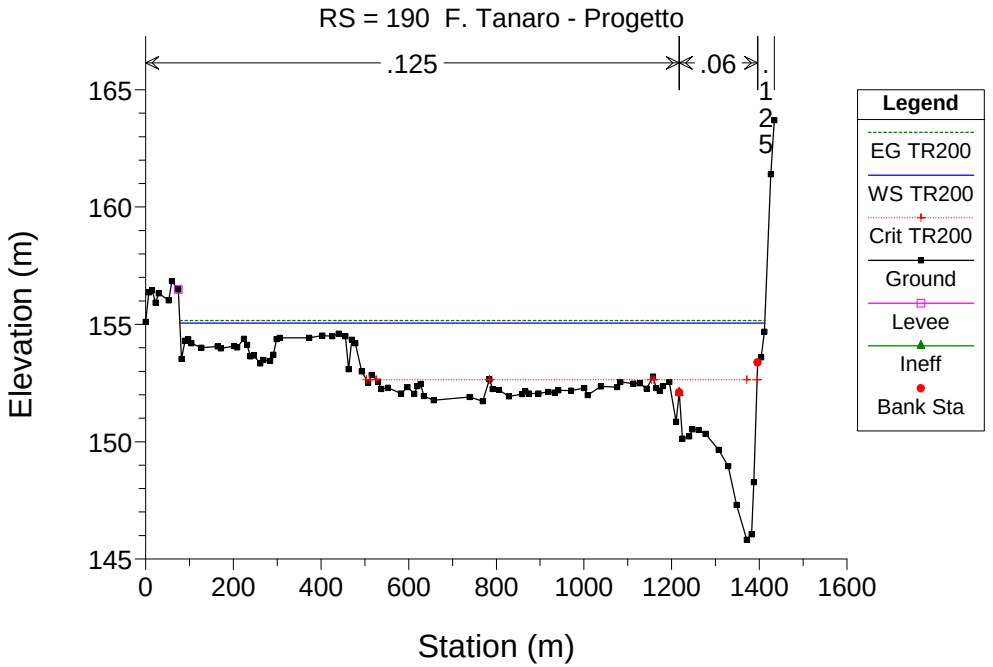

RS = 270 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

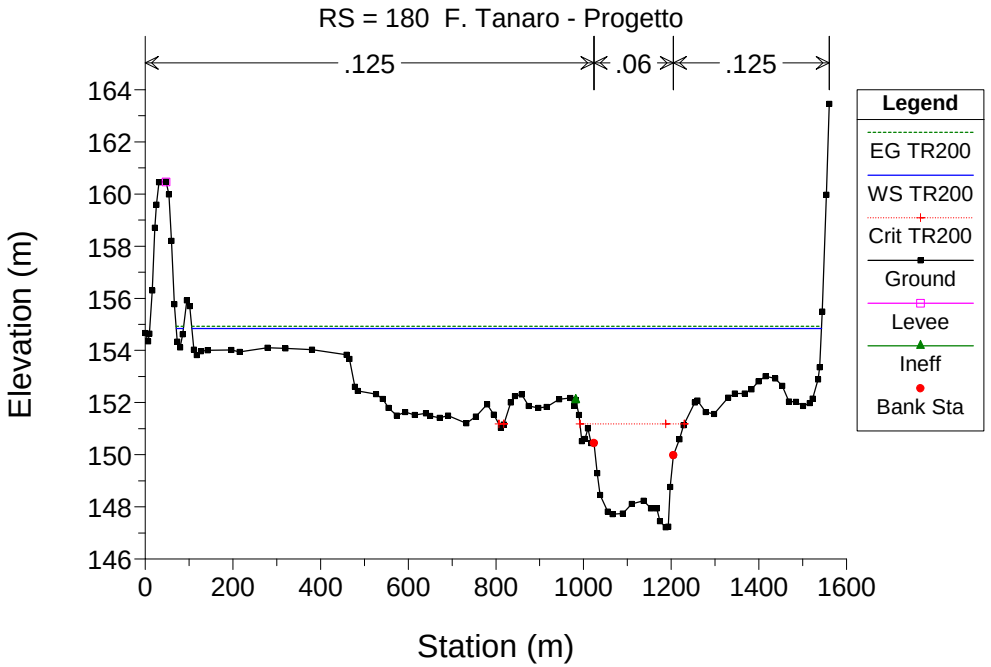

RS = 260 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
175
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

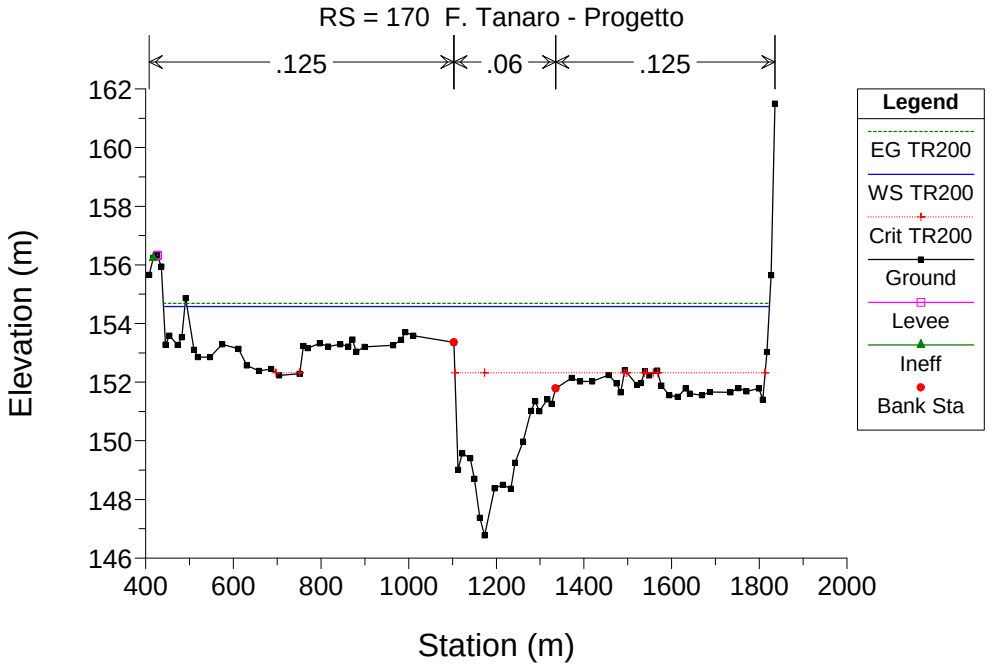

RS = 250 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
1600
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

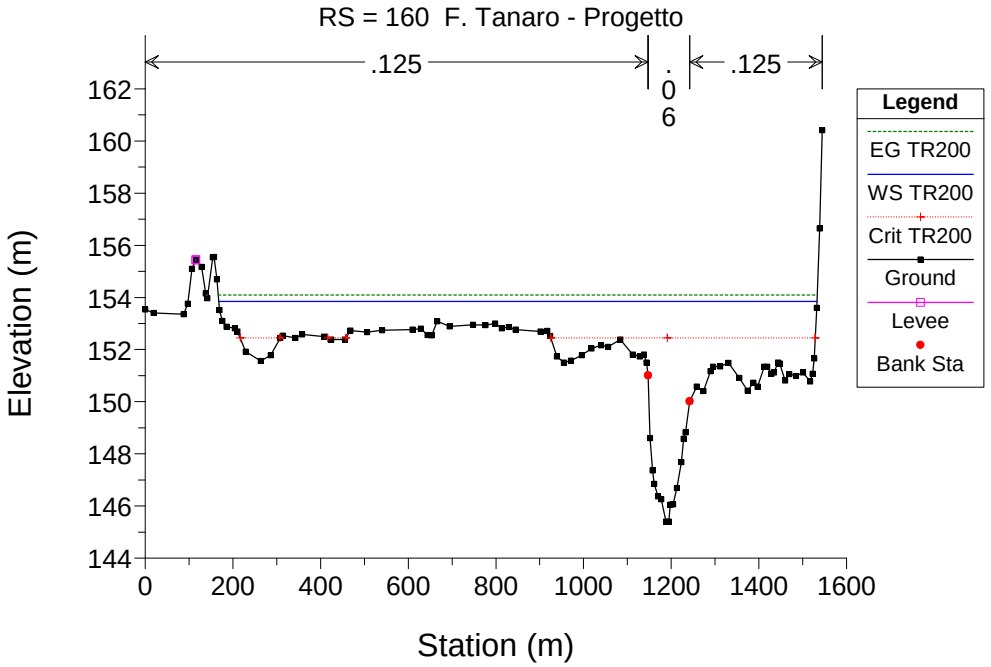

RS = 240 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
175
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

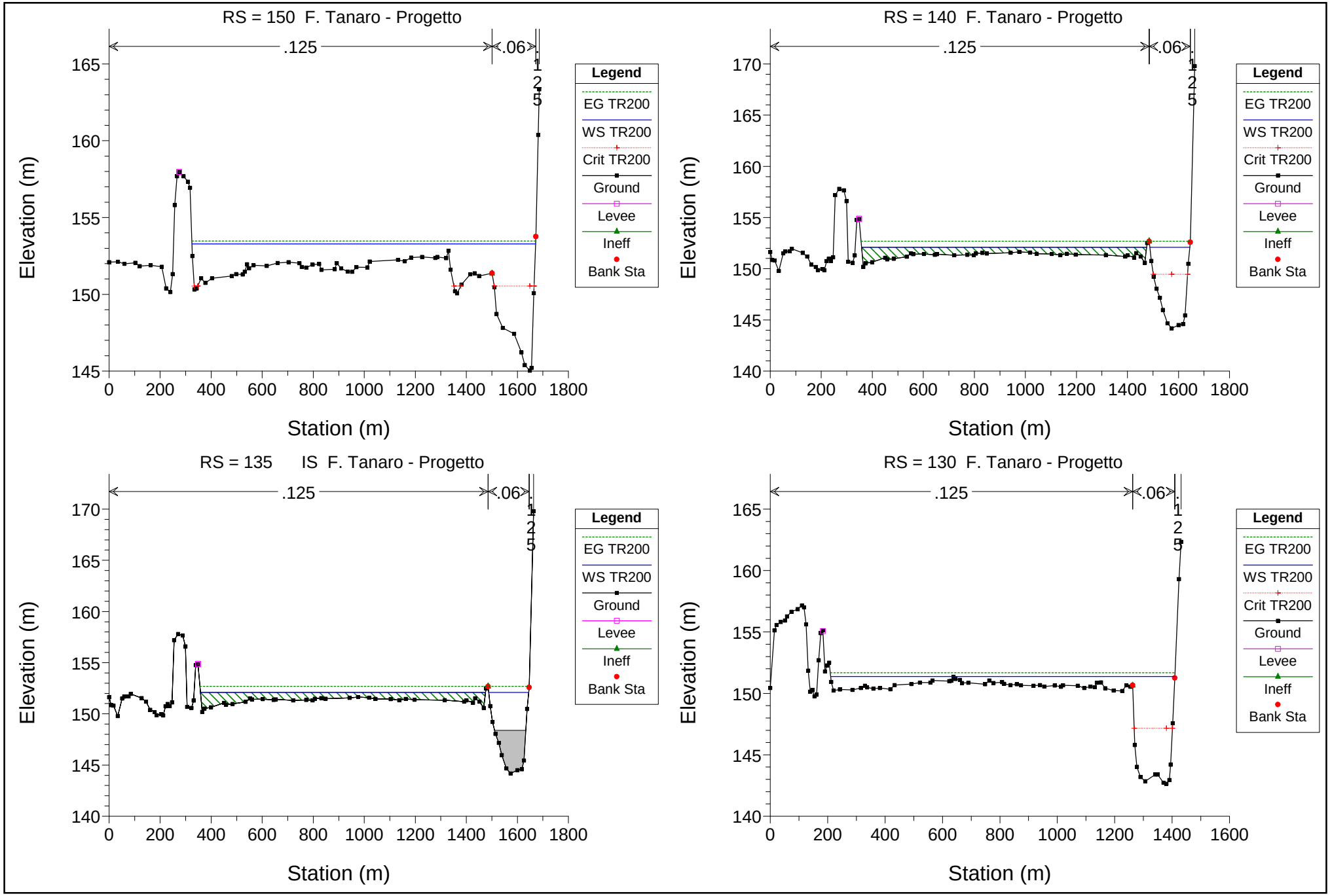

RS = 230 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 220 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

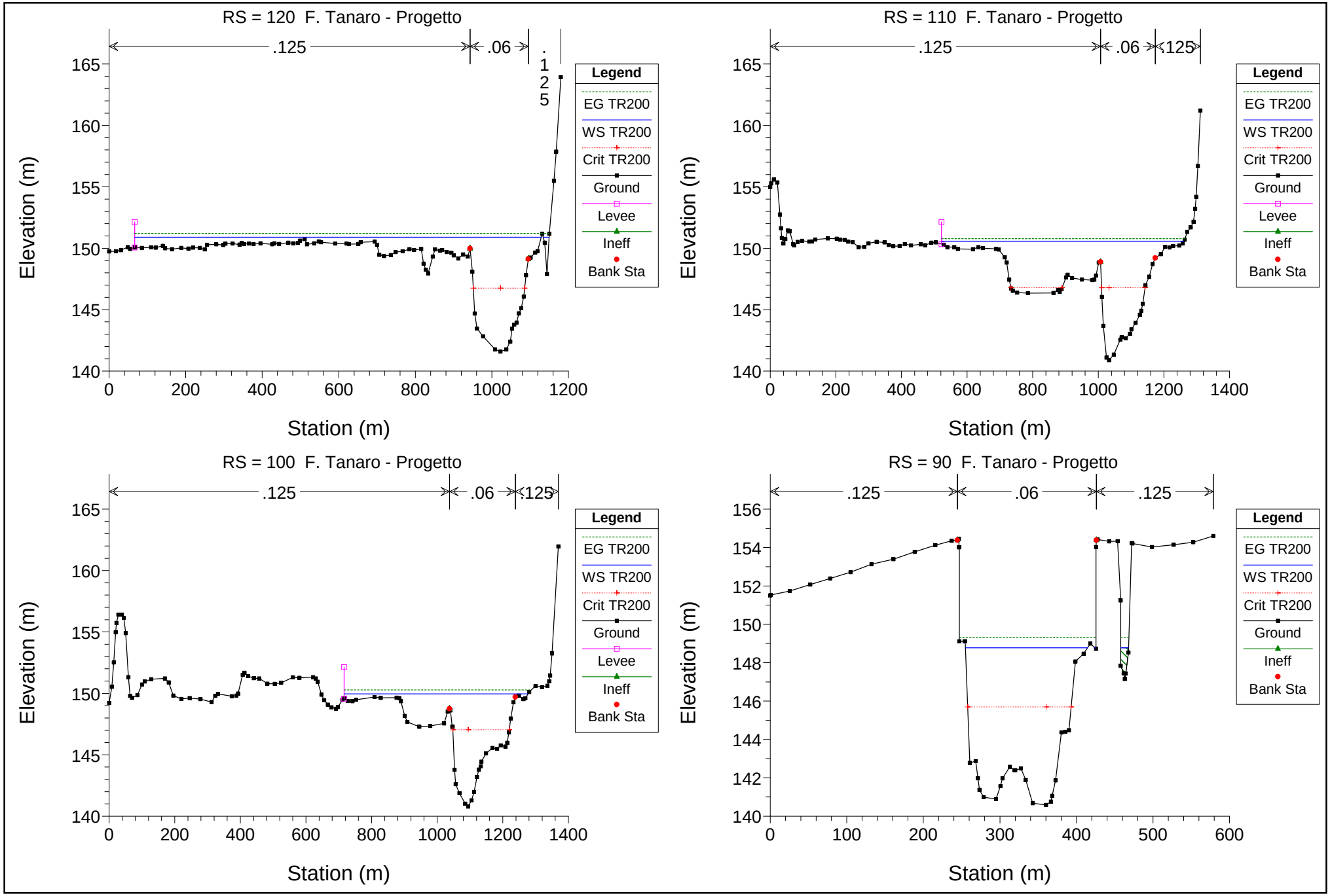

RS = 190 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

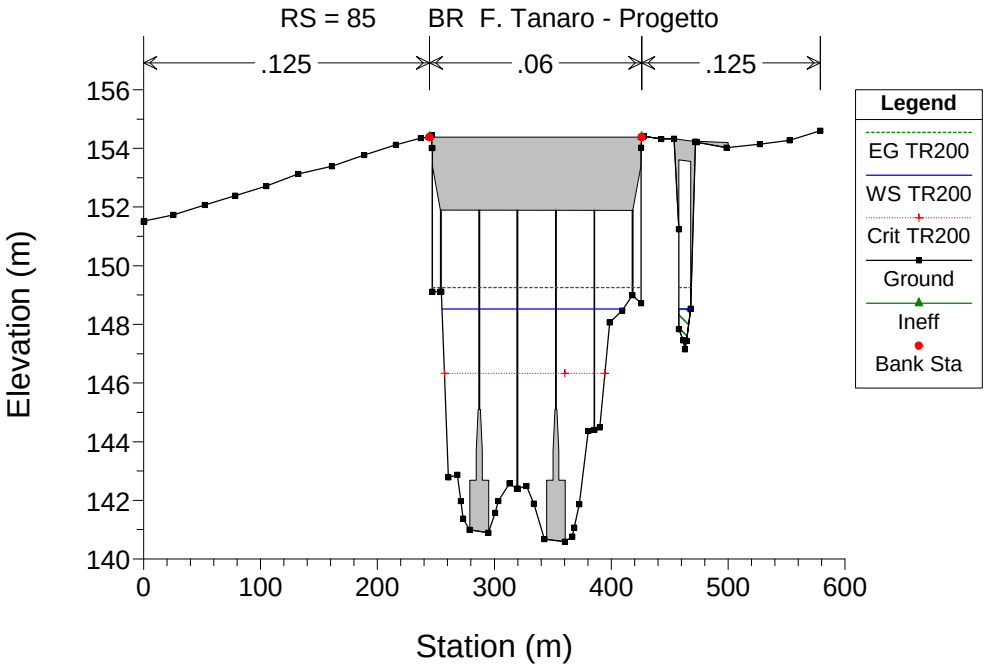

RS = 180 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

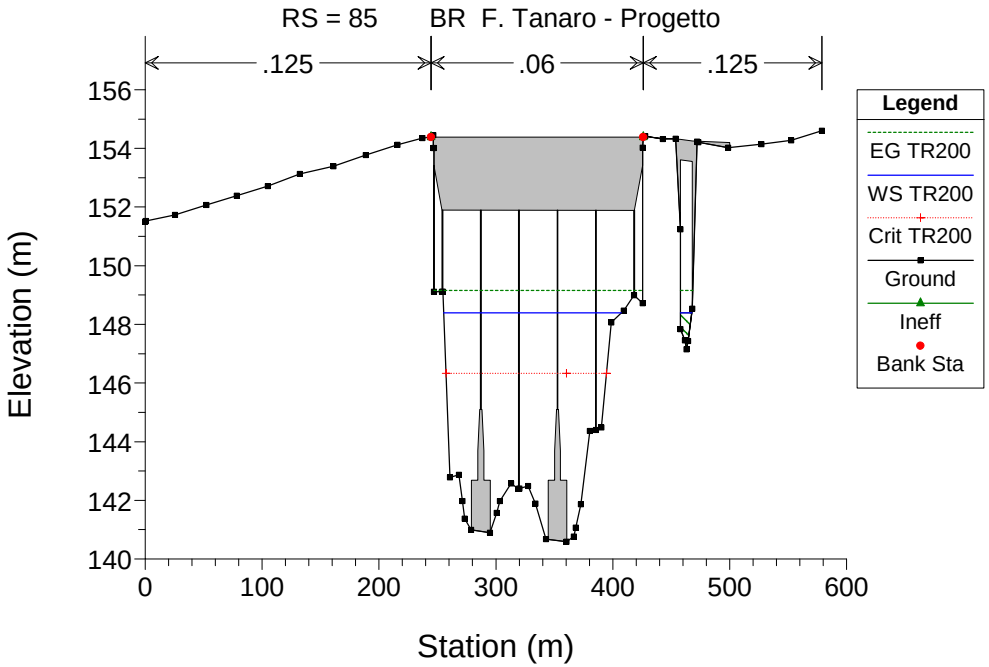

RS = 170 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

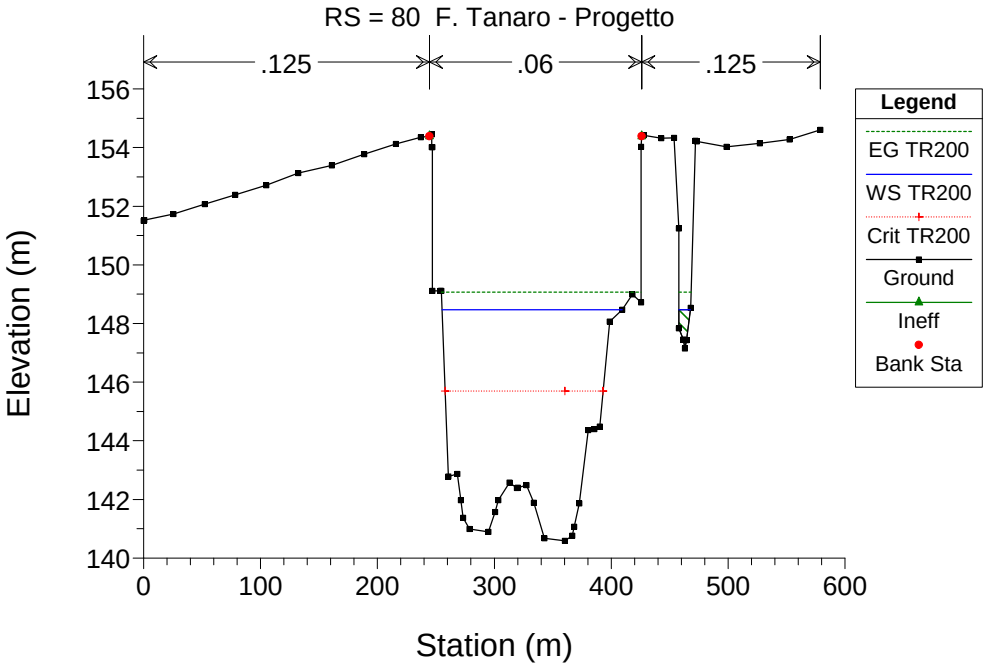

RS = 160 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Bank Sta

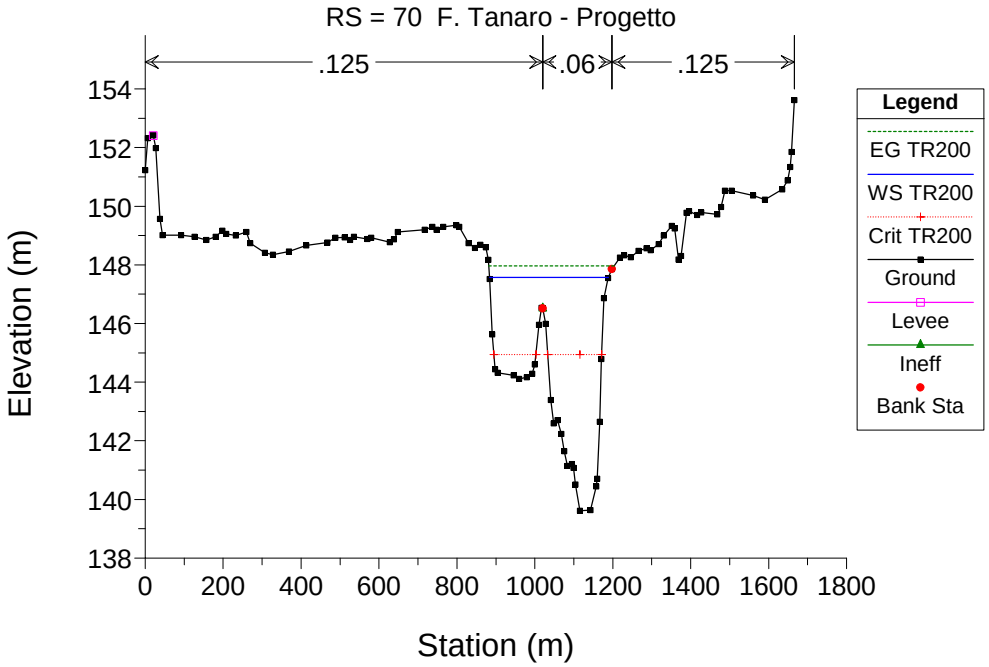

RS = 150 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 140 F. Tanaro - Progetto
RS = 135 IS F. Tanaro - Progetto
RS = 130 F. Tanaro - Progetto

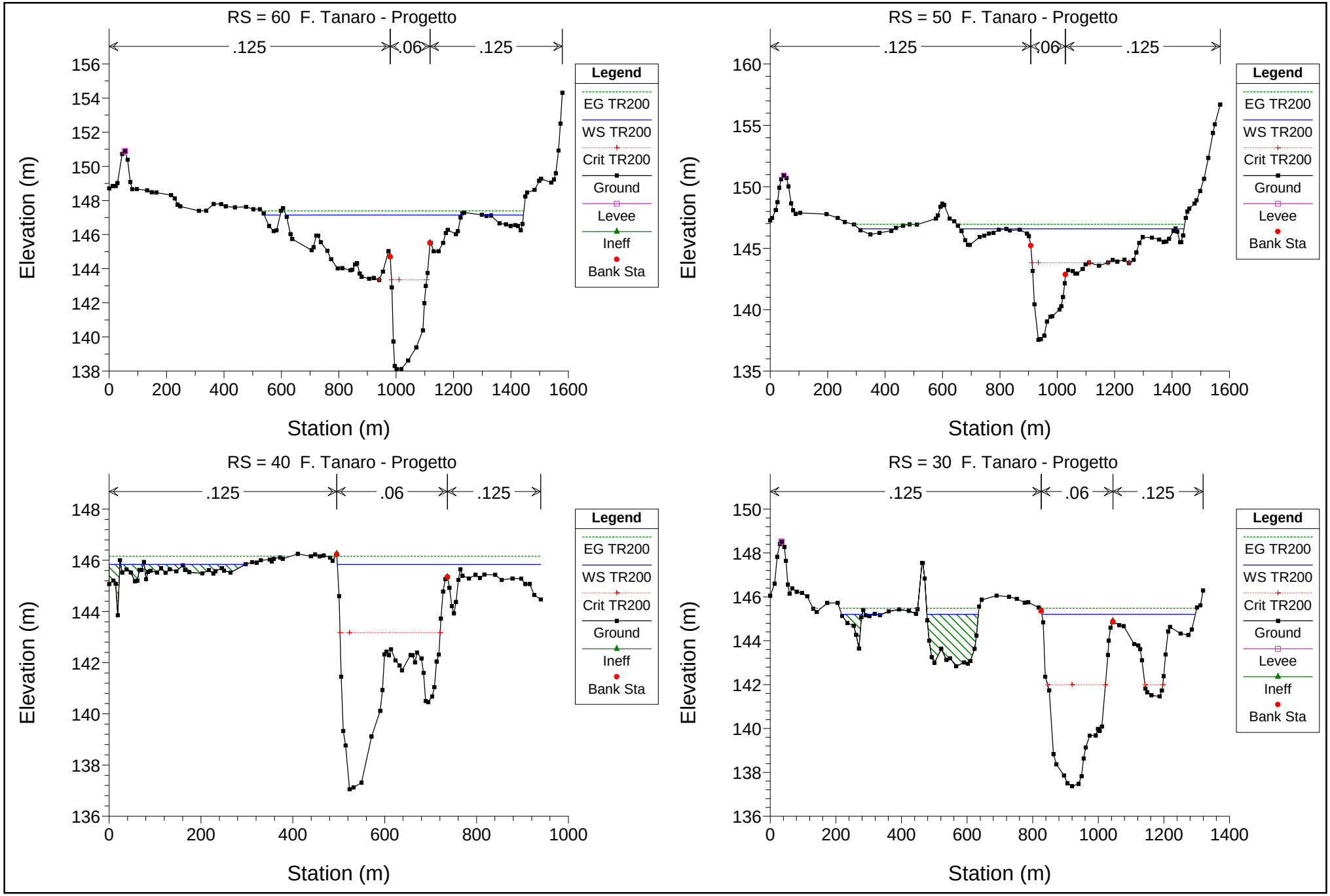

RS = 120 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 110 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 90 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

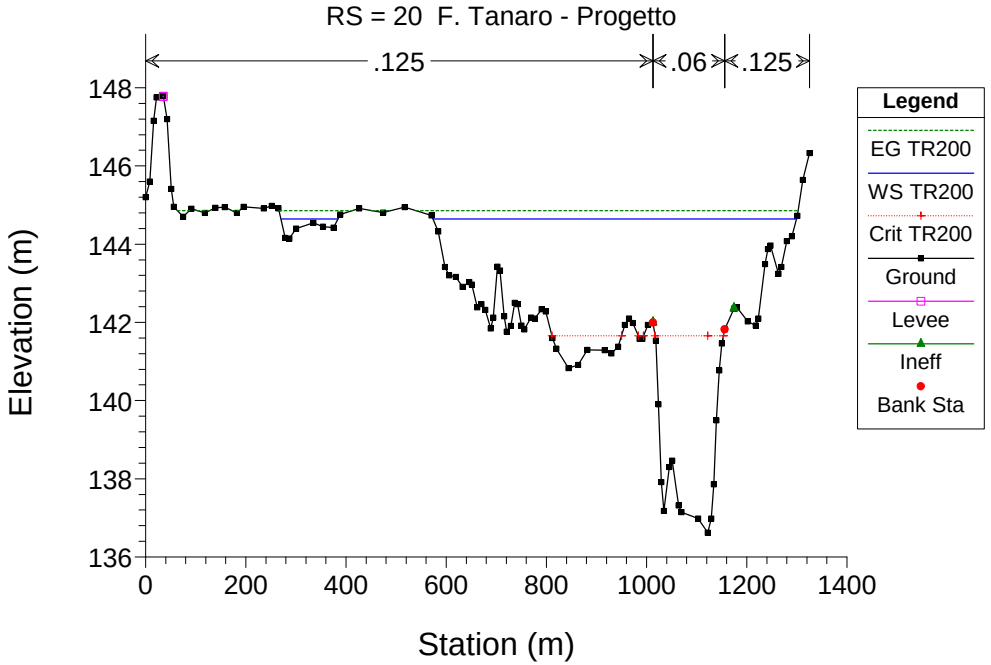

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta

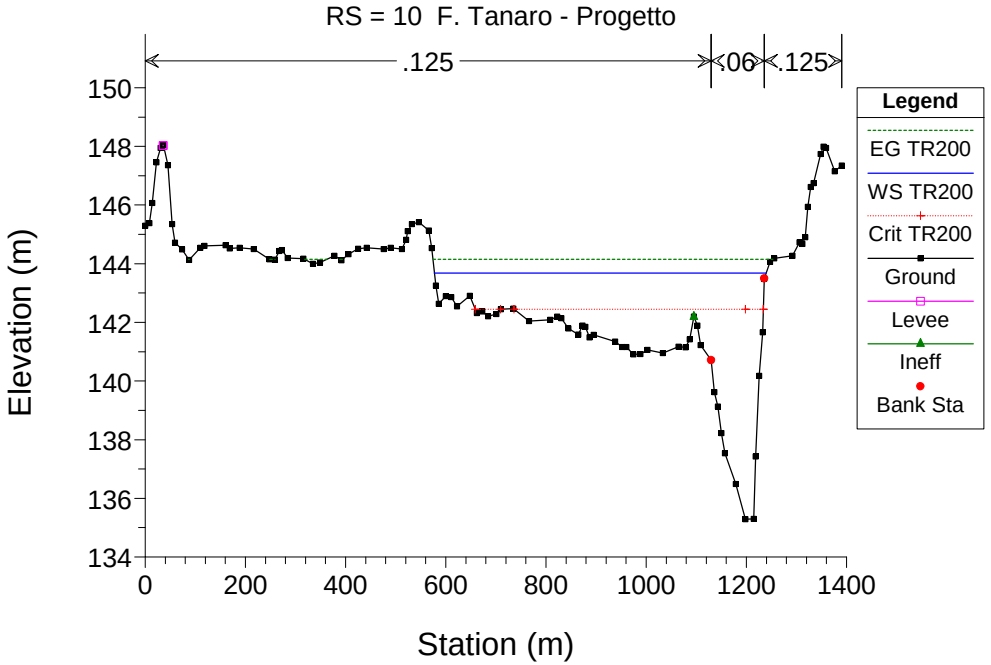

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta


RS = 80 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Ineff
Bank Sta


RS = 70 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta


RS = 60 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta
RS = 50 F. Tanaro - Progetto
RS = 40 F. Tanaro - Progetto
RS = 30 F. Tanaro - Progetto


RS = 20 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG TR200
WS TR200
Crit TR200
Ground
Levee
Ineff
Bank Sta

6. COMMENTO AI RISULTATI IDRAULICI

L'esame dei risultati del calcolo dei livelli idrici associati alle portate di piena con i tempi di ritorno tecnici del Fiume Tanaro (Tab. 6.1÷ Tab. 6.3) evidenzia che, nella zona immediatamente a monte della traversa, i livelli di piena in presenza dell'opera in progetto sono:

- superiori a quelli attuali di circa 30 cm con riferimento alla portata avente tempo di ritorno di 20 anni;
- superiori a quelli attuali di circa 15 cm con riferimento alla portata avente tempo di ritorno di 100 anni;
- sostanzialmente invariati con riferimento alla portata avente tempo di ritorno di 200 anni.

Per quanto concerne le velocità in alveo si evidenzia, nella zona immediatamente a monte dello sbarramento in progetto, un decremento rispetto alla situazione attuale di circa 0.20 m/s con riferimento alla portata avente tempo di ritorno di 20 anni. Analizzando invece i risultati delle simulazioni relative alla portata centennale e duecentennale si osserva come la variazione di velocità in alveo tra la situazione attuale e quella di progetto sia sostanzialmente trascurabile.

Nelle seguenti tabelle si riporta un confronto tra situazione attuale e situazione di progetto con riferimento alle principali grandezze idrauliche (livello del pelo libero e velocità in alveo) nella zona a ridosso dello sbarramento in progetto.

TR = 20 anni						
Sez	Livello [m s.l.m.]			Velocità [m/s]		
	Attuale	Progetto	Δ	Attuale	Progetto	Δ
550	170.34	170.34	0.00	1.29	1.29	0.00
540	169.61	169.61	0.00	2.05	2.05	0.00
530	169.14	169.14	0.00	1.89	1.89	0.00
520	168.51	168.51	0.00	2.29	2.29	0.00
510	168.07	168.07	0.00	2.02	2.02	0.00
500	167.55	167.55	0.00	1.97	1.97	0.00
490	167.10	167.1	0.00	1.83	1.83	0.00
480	166.54	166.54	0.00	1.84	1.84	0.00
470	165.91	165.92	0.01	2.07	2.07	0.00
460	165.43	165.44	0.01	1.92	1.92	0.00
450	165.12	165.13	0.01	1.91	1.91	0.00
440	164.94	164.95	0.01	1.73	1.73	0.00
430	164.63	164.65	0.02	2.06	2.05	-0.01
420	164.47	164.48	0.01	1.57	1.57	0.00
410	164.20	164.22	0.02	1.96	1.95	-0.01
400	163.31	163.34	0.03	3.16	3.15	-0.01
395	Ponte tangenziale					
390	163.20	163.23	0.03	3.23	3.21	-0.02
380	162.25	162.31	0.06	2.49	2.46	-0.03
379	Traversa Ferrero S.p.A.					
370	161.88	161.95	0.07	1.78	1.76	-0.02
365	Ponte S.R.29					
360	161.65	161.74	0.09	1.85	1.82	-0.03
350	161.16	161.27	0.11	2.38	2.33	-0.05
340	160.82	160.95	0.13	1.89	1.85	-0.04
330	160.24	160.43	0.19	2.40	2.31	-0.09
320	159.46	159.79	0.33	2.93	2.72	-0.21
315	Traversa in progetto					
310	158.95	158.95	0.00	2.61	2.61	0.00
300	158.73	158.73	0.00	1.77	1.77	0.00
290	158.47	158.47	0.00	1.63	1.63	0.00
280	158.10	158.1	0.00	2.14	2.14	0.00
270	157.56	157.56	0.00	2.57	2.57	0.00
260	156.90	156.9	0.00	3.01	3.01	0.00
250	156.57	156.57	0.00	2.14	2.14	0.00

Tab 6.1 Confronto livelli e velocità in alveo situazione attuale – progetto (T_R=20 anni)

TR = 100 anni						
Sez	Livello [m s.l.m.]			Velocità [m/s]		
	Attuale	Progetto	Δ	Attuale	Progetto	Δ
550	170.90	170.90	0.00	1.43	1.43	0.00
540	170.26	170.26	0.00	2.08	2.08	0.00
530	169.77	169.77	0.00	2.09	2.09	0.00
520	169.20	169.20	0.00	2.37	2.37	0.00
510	168.83	168.83	0.00	2.10	2.1	0.00
500	168.34	168.34	0.00	2.14	2.13	-0.01
490	167.92	167.92	0.00	1.99	1.99	0.00
480	167.42	167.43	0.01	1.93	1.93	0.00
470	166.87	166.87	0.00	2.18	2.18	0.00
460	166.44	166.45	0.01	2.00	1.99	-0.01
450	166.14	166.15	0.01	2.07	2.07	0.00
440	165.99	166.00	0.01	1.84	1.84	0.00
430	165.75	165.76	0.01	2.04	2.04	0.00
420	165.60	165.61	0.01	1.66	1.66	0.00
410	165.37	165.38	0.01	2.01	2.01	0.00
400	164.39	164.41	0.02	3.52	3.51	-0.01
395	Ponte tangenziale					
390	164.27	164.28	0.01	3.60	3.58	-0.02
380	163.34	163.37	0.03	2.74	2.73	-0.01
379	Traversa Ferrero S.p.A.					
370	162.97	163.01	0.04	2.00	1.99	-0.01
365	Ponte S.R.29					
360	162.72	162.76	0.04	2.08	2.06	-0.02
350	162.12	162.17	0.05	2.74	2.72	-0.02
340	161.76	161.83	0.07	2.15	2.13	-0.02
330	161.14	161.24	0.10	2.69	2.64	-0.05
320	160.31	160.46	0.15	3.29	3.23	-0.06
315	Traversa in progetto					
310	159.83	159.83	0.00	2.82	2.82	0.00
300	159.61	159.61	0.00	1.96	1.96	0.00
290	159.36	159.36	0.00	1.78	1.78	0.00
280	158.96	158.96	0.00	2.39	2.39	0.00
270	158.43	158.43	0.00	2.80	2.8	0.00
260	157.66	157.66	0.00	3.44	3.44	0.00
250	157.35	157.35	0.00	2.35	2.35	0.00

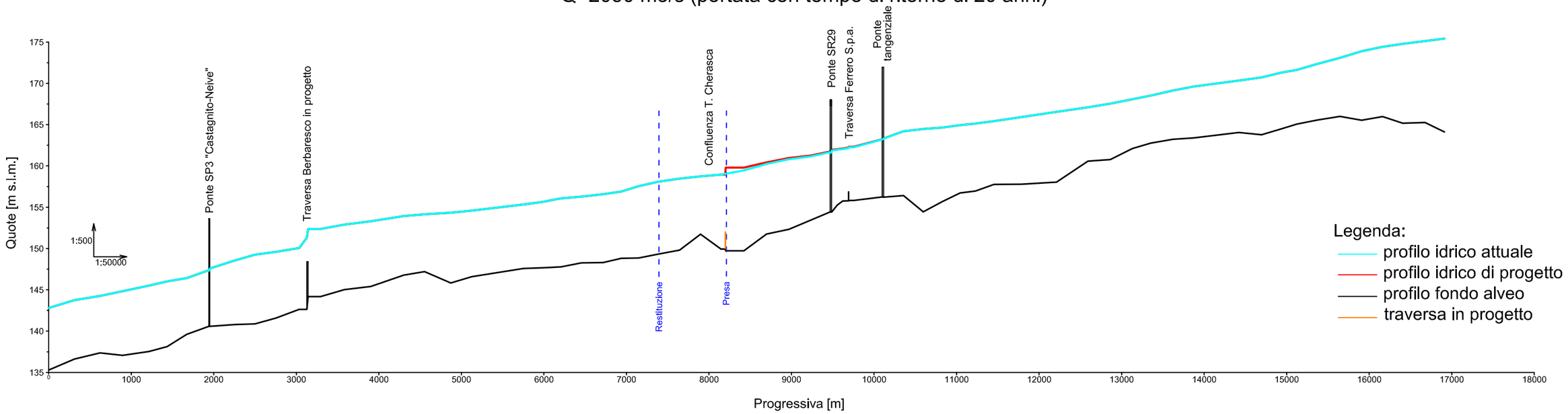
Tab 6.2 Confronto livelli e velocità in alveo situazione attuale – progetto (T_R=100 anni)

TR = 200 anni						
Sez	Livello [m s.l.m.]			Velocità [m/s]		
	Attuale	Progetto	Δ	Attuale	Progetto	Δ
550	171.13	171.13	0.00	1.47	1.47	0.00
540	170.52	170.52	0.00	2.09	2.09	0.00
530	170.02	170.02	0.00	2.16	2.16	0.00
520	169.48	169.48	0.00	2.37	2.37	0.00
510	169.14	169.14	0.00	2.12	2.12	0.00
500	168.66	168.66	0.00	2.19	2.19	0.00
490	168.25	168.25	0.00	2.05	2.05	0.00
480	167.78	167.78	0.00	1.96	1.96	0.00
470	167.24	167.24	0.00	2.23	2.23	0.00
460	166.85	166.85	0.00	2.00	2.00	0.00
450	166.55	166.55	0.00	2.12	2.12	0.00
440	166.41	166.41	0.00	1.85	1.85	0.00
430	166.19	166.19	0.00	2.04	2.04	0.00
420	166.05	166.05	0.00	1.69	1.69	0.00
410	165.83	165.83	0.00	2.04	2.04	0.00
400	164.81	164.81	0.00	3.66	3.66	0.00
395	Ponte tangenziale					
390	164.67	164.67	0.00	3.74	3.74	0.02
380	163.76	163.76	0.00	2.84	2.84	0.03
379	Traversa Ferrero S.p.A.					
370	163.39	163.39	0.00	2.09	2.09	0.02
365	Ponte S.R.29					
360	163.12	163.12	0.00	2.17	2.17	0.00
350	162.49	162.49	0.00	2.88	2.88	0.00
340	162.13	162.14	0.01	2.24	2.24	0.00
330	161.52	161.52	0.00	2.77	2.77	0.00
320	160.68	160.69	0.01	3.41	3.40	-0.01
315	Traversa in progetto					
310	160.16	160.16	0.00	3.02	3.02	0.00
300	159.97	159.97	0.00	1.99	1.99	0.00
290	159.72	159.72	0.00	1.83	1.83	0.00
280	159.31	159.31	0.00	2.52	2.52	0.00
270	158.78	158.78	0.00	2.88	2.88	0.00
260	157.91	157.91	0.00	3.70	3.70	0.00
250	157.65	157.65	0.00	2.43	2.43	0.00

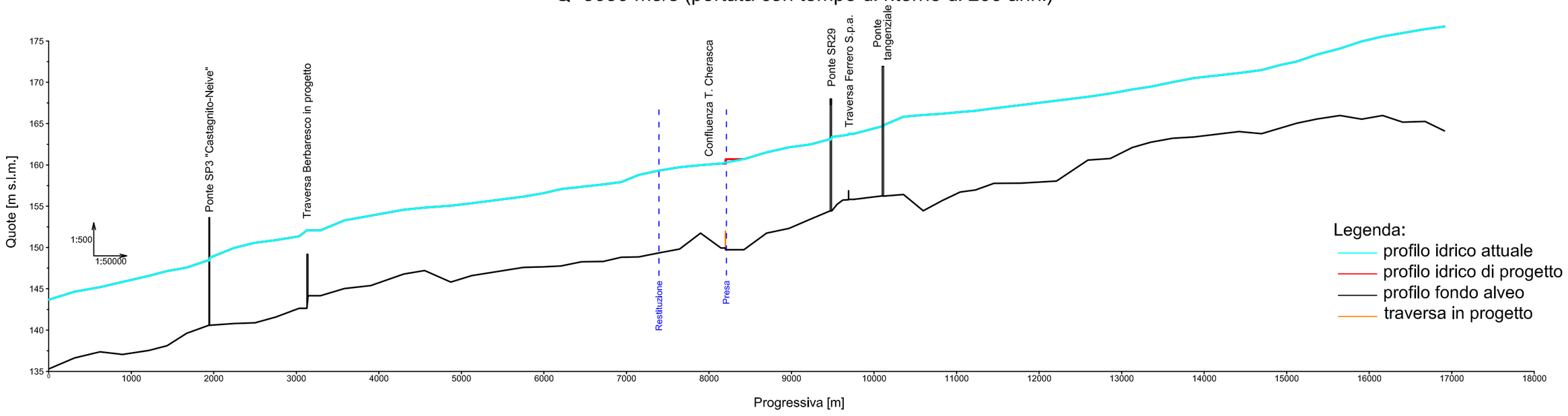
Tab 6.3 Confronto livelli e velocità in alveo situazione attuale – progetto (T_R=200 anni)

Nella pagina seguente si riportano i profili di rigurgito con riferimento alle portate di piena aventi tempo di ritorno di 20 e 200 anni..

Confronto profili idrici attuale-progetto
Q=2050 m3/s (portata con tempo di ritorno di 20 anni)



Confronto profili idrici attuale-progetto
Q=3050 m3/s (portata con tempo di ritorno di 200 anni)



7. VALUTAZIONE DEI LIVELLI IN ALVEO IN CONDIZIONI DI ESERCIZIO CON LA PORTATA DI MAGRA, CON LA PORTATA ORDINARIA E CON LE PORTATE DELLA CURVA DI DURATA.

Si effettuano le simulazioni nella condizione attuale e di progetto con riferimento alle portate di funzionamento dell'impianto.

Alla portata di minimo funzionamento dell'impianto (6.66 m^3/s) corrisponde la portata naturale in alveo di 15.90 m^3/s (6.66 m^3/s + 9.24 m^3/s di DMV modulato), mentre a quella massima di funzionamento dell'impianto (100.00 m^3/s) corrispondono portate naturali in alveo variabili tra 120.0 m^3/s e 300.00 m^3/s. Per portate superiori a 300 m^3/s lo sbarramento mobile viene completamente abbattuto e viene interrotta la derivazione.

Le portate in alveo utilizzate nelle simulazioni sono le seguenti:

15.9 m^3/s, 20 m^3/s, 30 m^3/s, 40 m^3/s, 50 m^3/s, 60 m^3/s, 80 m^3/s, 100 m^3/s, 120 m^3/s, 140 m^3/s, 160 m^3/s, 180 m^3/s, 200 m^3/s, 220 m^3/s, 240 m^3/s, 260 m^3/s, 280 m^3/s, 300 m^3/s.

Nel seguito si riportano i risultati completi delle simulazioni idraulico-numeriche per la portata minima di funzionamento (15.90 m^3/s in alveo e 6.66 m^3/s derivati) e per la portata massima di funzionamento (300.0 m^3/s in alveo e 100.0 m^3/s derivati). Per i valori intermedi di portata si riportano i livelli idrici immediatamente a monte e immediatamente a valle della traversa. Si riportano inoltre i risultati delle simulazioni idraulico numeriche del modello rappresentativo del canale di scarico utilizzato per la valutazione delle perdite di carico nel canale di restituzione relativi alla portata minima e massima di funzionamento dell'impianto e quelli rappresentativi della situazione intermedia di funzionamento in cui le perdite di carico sono massime (Q derivata di 100 m^3/s e Q in alveo di 119.5 m^3/s).

Nello scenario rappresentativo della situazione attuale è stata considerata la presenza dello sbarramento in progetto di Barbaresco avente una quota in sommità, in condizioni ordinarie, di 149.20 m s.l.m..

SITUAZIONE ATTUALE
SIMULAZIONE 7

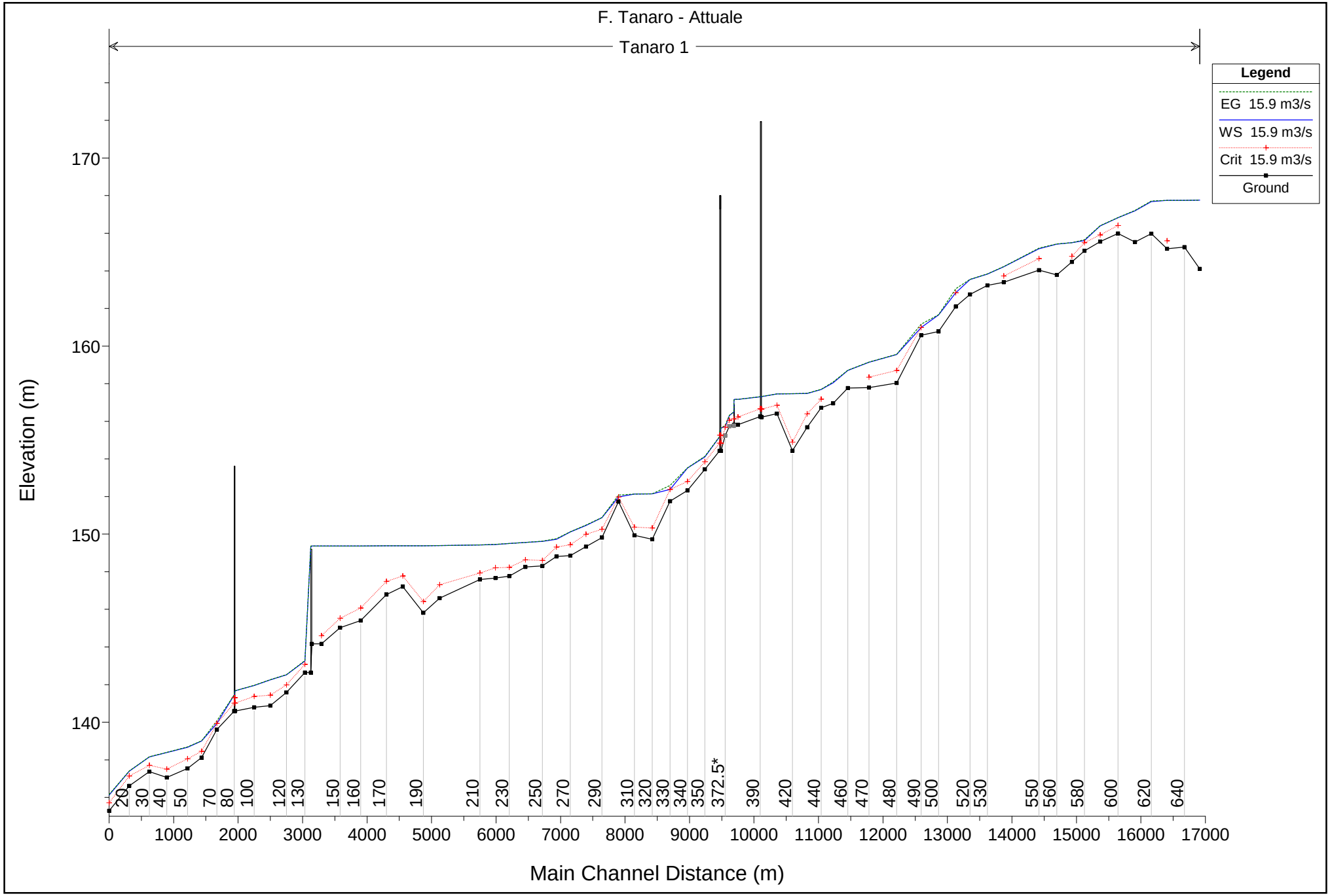
Corso d'acqua	**Portata Q m^3/s**	**Portata**
Fiume Tanaro	15.90 in alveo	Minima di funzionamento dell'impianto

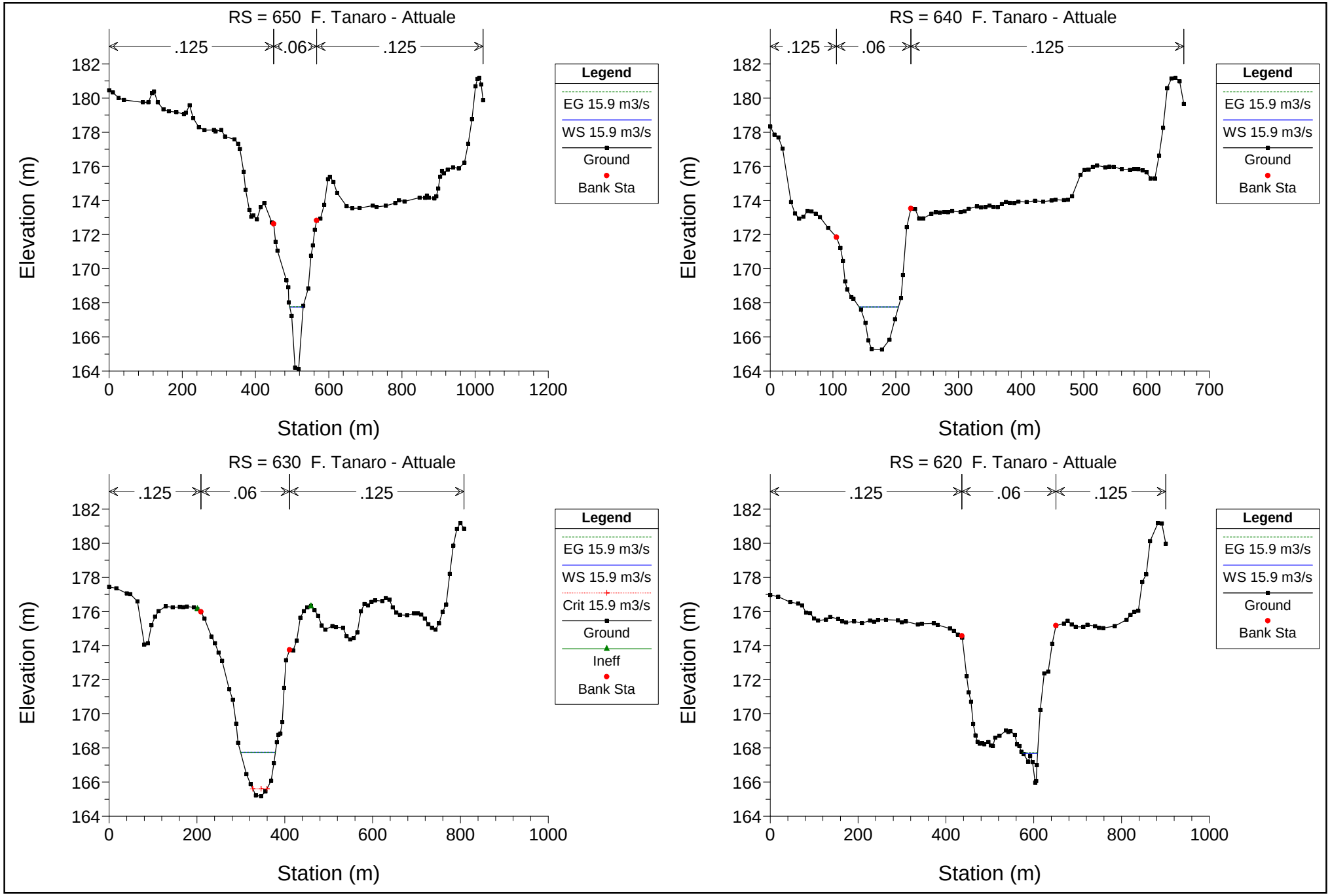
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 15.9 m3/s

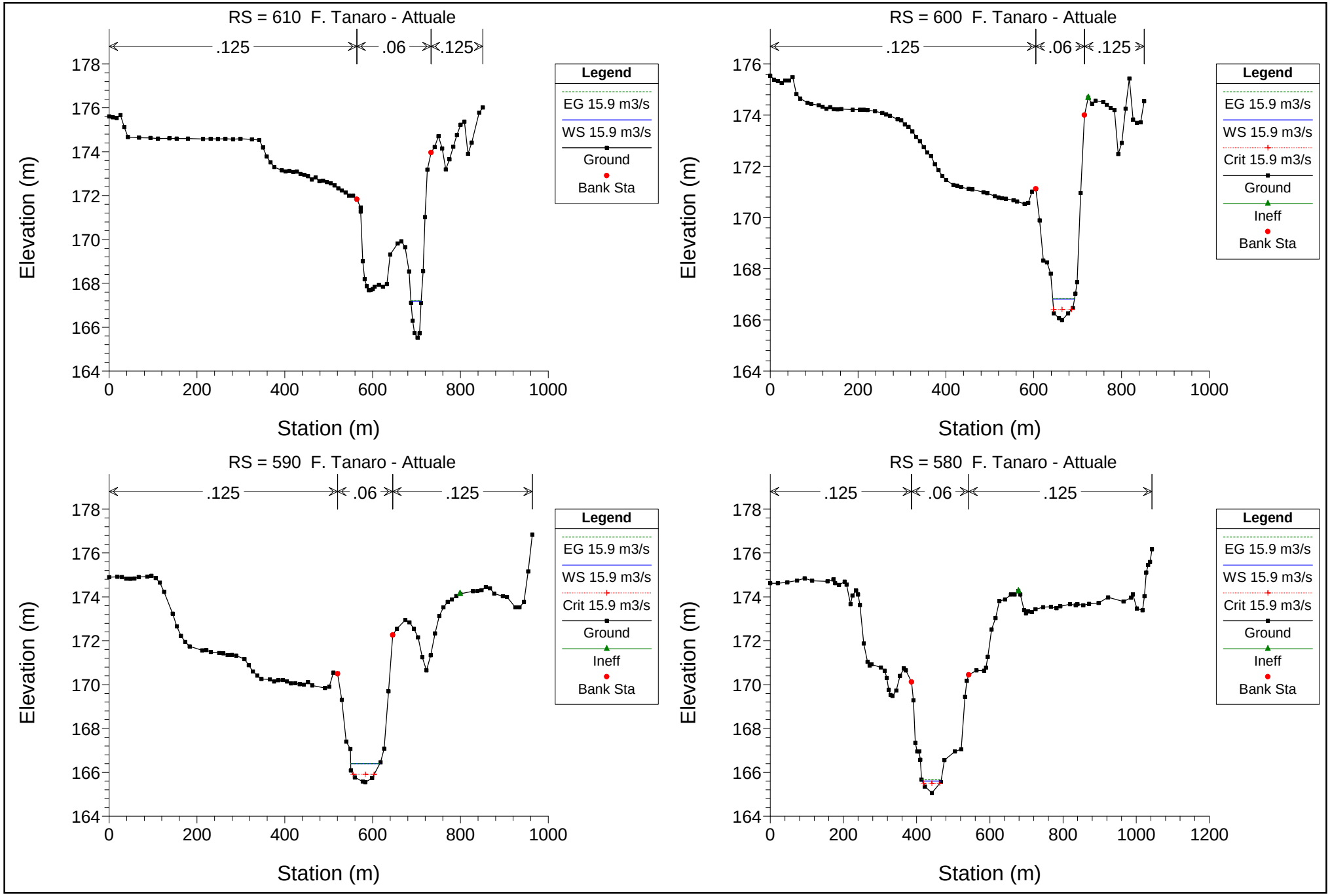
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	15.9 m3/s	15.90	164.11	167.76		167.76	0.000056	0.20	78.32	36.70	0.04
1	640	15.9 m3/s	15.90	165.26	167.75		167.75	0.000045	0.15	102.81	62.42	0.04
1	630	15.9 m3/s	15.90	165.18	167.74	165.60	167.74	0.000023	0.12	138.20	79.11	0.03
1	620	15.9 m3/s	15.90	165.98	167.68		167.72	0.005505	0.84	18.89	33.01	0.36
1	610	15.9 m3/s	15.90	165.53	167.19		167.21	0.001018	0.58	27.33	23.48	0.17
1	600	15.9 m3/s	15.90	165.99	166.82	166.41	166.83	0.002129	0.54	29.38	49.69	0.22
1	590	15.9 m3/s	15.90	165.55	166.39	165.91	166.40	0.001191	0.41	39.21	66.11	0.17
1	580	15.9 m3/s	15.90	165.06	165.61	165.50	165.66	0.017868	1.01	15.76	51.71	0.58
1	570	15.9 m3/s	15.90	164.47	165.49	164.78	165.50	0.000235	0.21	74.89	98.60	0.08
1	560	15.9 m3/s	15.90	163.78	165.42		165.43	0.000356	0.37	42.90	33.02	0.10
1	550	15.9 m3/s	15.90	164.04	165.18	164.65	165.21	0.003252	0.74	21.41	30.80	0.28
1	540	15.9 m3/s	15.90	163.39	164.22	163.73	164.22	0.001122	0.38	41.72	73.93	0.16
1	530	15.9 m3/s	15.90	163.23	163.83		163.84	0.002141	0.44	36.00	83.03	0.21
1	520	15.9 m3/s	15.90	162.75	163.54		163.55	0.000665	0.28	57.01	108.97	0.12
1	510	15.9 m3/s	15.90	162.10	162.83	162.83	163.05	0.047989	2.08	7.64	17.66	1.01
1	500	15.9 m3/s	15.90	160.77	161.66		161.66	0.000542	0.28	57.81	96.89	0.11
1	490	15.9 m3/s	15.90	160.58	160.99	160.99	161.17	0.050276	1.85	8.61	24.71	1.00
1	480	15.9 m3/s	15.90	158.04	159.55	158.70	159.56	0.000964	0.45	35.32	43.34	0.16
1	470	15.9 m3/s	15.90	157.79	159.14	158.34	159.15	0.000940	0.44	36.48	46.14	0.16
1	460	15.9 m3/s	15.90	157.77	158.70		158.72	0.001932	0.54	29.48	46.61	0.22
1	450	15.9 m3/s	15.90	156.96	158.05		158.09	0.004388	0.89	17.88	24.55	0.33
1	440	15.9 m3/s	15.90	156.72	157.69	157.17	157.70	0.001175	0.40	39.84	68.16	0.17
1	430	15.9 m3/s	15.90	155.68	157.48	156.40	157.49	0.000837	0.41	38.61	48.60	0.15
1	420	15.9 m3/s	15.90	154.44	157.47	154.89	157.47	0.000016	0.10	158.62	86.24	0.02
1	410	15.9 m3/s	15.90	156.41	157.46	156.85	157.46	0.000543	0.29	53.97	81.69	0.12
1	400	15.9 m3/s	15.90	156.22	157.32	156.66	157.32	0.000616	0.30	52.33	83.14	0.12
1	395		Bridge									
1	390	15.9 m3/s	15.90	156.25	157.30	156.67	157.31	0.000669	0.31	50.79	82.03	0.13
1	380	15.9 m3/s	15.90	155.82	157.17	156.23	157.17	0.000263	0.23	69.35	88.53	0.08
1	379		Inl Struct									
1	370	15.9 m3/s	15.90	154.43	155.64	154.84	155.64	0.000513	0.25	64.64	122.39	0.11
1	365		Bridge									
1	360	15.9 m3/s	15.90	154.43	155.17	154.84	155.19	0.003417	0.59	26.81	56.32	0.27
1	350	15.9 m3/s	15.90	153.45	154.10	153.85	154.13	0.006390	0.78	20.36	45.32	0.37
1	340	15.9 m3/s	15.90	152.32	153.52	152.80	153.53	0.001137	0.48	33.26	42.28	0.17
1	330	15.9 m3/s	15.90	151.75	152.38	152.38	152.58	0.048092	2.00	7.94	19.49	1.00
1	320	15.9 m3/s	15.90	149.73	152.14	150.33	152.15	0.000100	0.23	68.00	40.52	0.06
1	310	15.9 m3/s	15.90	149.94	152.13	150.37	152.13	0.000042	0.15	107.15	66.36	0.04
1	300	15.9 m3/s	15.90	151.73	151.98	151.98	152.08	0.061852	1.39	11.41	58.55	1.01
1	290	15.9 m3/s	15.90	149.81	150.88	150.26	150.89	0.001182	0.50	31.82	38.82	0.18

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 15.9 m3/s (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)	
1	280	15.9 m3/s	15.90	149.34	150.46	149.99	150.48	0.002413	0.62	25.50	38.21	0.24
1	270	15.9 m3/s	15.90	148.86	150.11	149.44	150.12	0.000969	0.43	37.21	49.66	0.16
1	260	15.9 m3/s	15.90	148.81	149.73	149.31	149.76	0.003919	0.74	21.62	36.47	0.30
1	250	15.9 m3/s	15.90	148.31	149.62	148.60	149.62	0.000218	0.26	62.09	58.25	0.08
1	240	15.9 m3/s	15.90	148.26	149.56	148.64	149.56	0.000248	0.25	63.46	67.93	0.08
1	230	15.9 m3/s	15.90	147.77	149.50	148.23	149.51	0.000198	0.25	62.42	54.99	0.08
1	220	15.9 m3/s	15.90	147.66	149.45	148.21	149.46	0.000269	0.29	54.60	49.50	0.09
1	210	15.9 m3/s	15.90	147.59	149.43	147.94	149.43	0.000061	0.17	95.38	65.73	0.04
1	200	15.9 m3/s	15.90	146.60	149.39	147.31	149.39	0.000053	0.14	115.74	96.26	0.04
1	190	15.9 m3/s	15.90	145.82	149.38	146.41	149.39	0.000019	0.11	141.31	73.75	0.03
1	180	15.9 m3/s	15.90	147.21	149.38	147.77	149.38	0.000010	0.07	243.52	170.98	0.02
1	170	15.9 m3/s	15.90	146.78	149.38	147.49	149.38	0.000047	0.12	127.67	111.74	0.04
1	160	15.9 m3/s	15.90	145.40	149.37	146.07	149.37	0.000006	0.07	219.71	86.93	0.01
1	150	15.9 m3/s	15.90	145.03	149.37	145.53	149.37	0.000002	0.05	351.05	147.75	0.01
1	140	15.9 m3/s	15.90	144.17	149.37	144.61	149.37	0.000001	0.03	492.55	134.02	0.01
1	135		Inl Struct									
1	130	15.9 m3/s	15.90	142.64	143.25	143.07	143.27	0.008179	0.67	23.84	80.97	0.39
1	120	15.9 m3/s	15.90	141.58	142.52	141.98	142.53	0.001272	0.42	37.61	62.64	0.17
1	110	15.9 m3/s	15.90	140.88	142.25	141.44	142.26	0.000866	0.44	35.76	41.23	0.15
1	100	15.9 m3/s	15.90	140.79	141.95	141.37	141.97	0.001720	0.53	30.22	45.43	0.21
1	90	15.9 m3/s	15.90	140.59	141.67	141.01	141.67	0.000624	0.34	47.34	65.10	0.13
1	85		Bridge									
1	80	15.9 m3/s	15.90	140.59	141.45	141.01	141.46	0.001752	0.47	33.57	59.84	0.20
1	70	15.9 m3/s	15.90	139.61	139.93	139.93	140.07	0.054651	1.62	9.83	36.74	1.00
1	60	15.9 m3/s	15.90	138.12	139.00	138.46	139.01	0.001211	0.42	38.27	63.02	0.17
1	50	15.9 m3/s	15.90	137.54	138.67	138.05	138.69	0.001781	0.61	26.16	32.39	0.22
1	40	15.9 m3/s	15.90	137.06	138.39	137.51	138.40	0.000543	0.37	42.92	45.86	0.12
1	30	15.9 m3/s	15.90	137.37	138.15	137.70	138.16	0.001635	0.44	36.33	69.37	0.19
1	20	15.9 m3/s	15.90	136.62	137.39	137.14	137.41	0.003947	0.56	28.26	71.65	0.29
1	10	15.9 m3/s	15.90	135.29	136.13	135.71	136.16	0.004003	0.78	20.35	31.66	0.31


F. Tanaro - Attuale
Tanaro 1
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Elevation (m)
170
160
150
140
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
520
530
550
560
580
600
620
640
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
Main Channel Distance (m)


RS = 650 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
RS = 640 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
RS = 630 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta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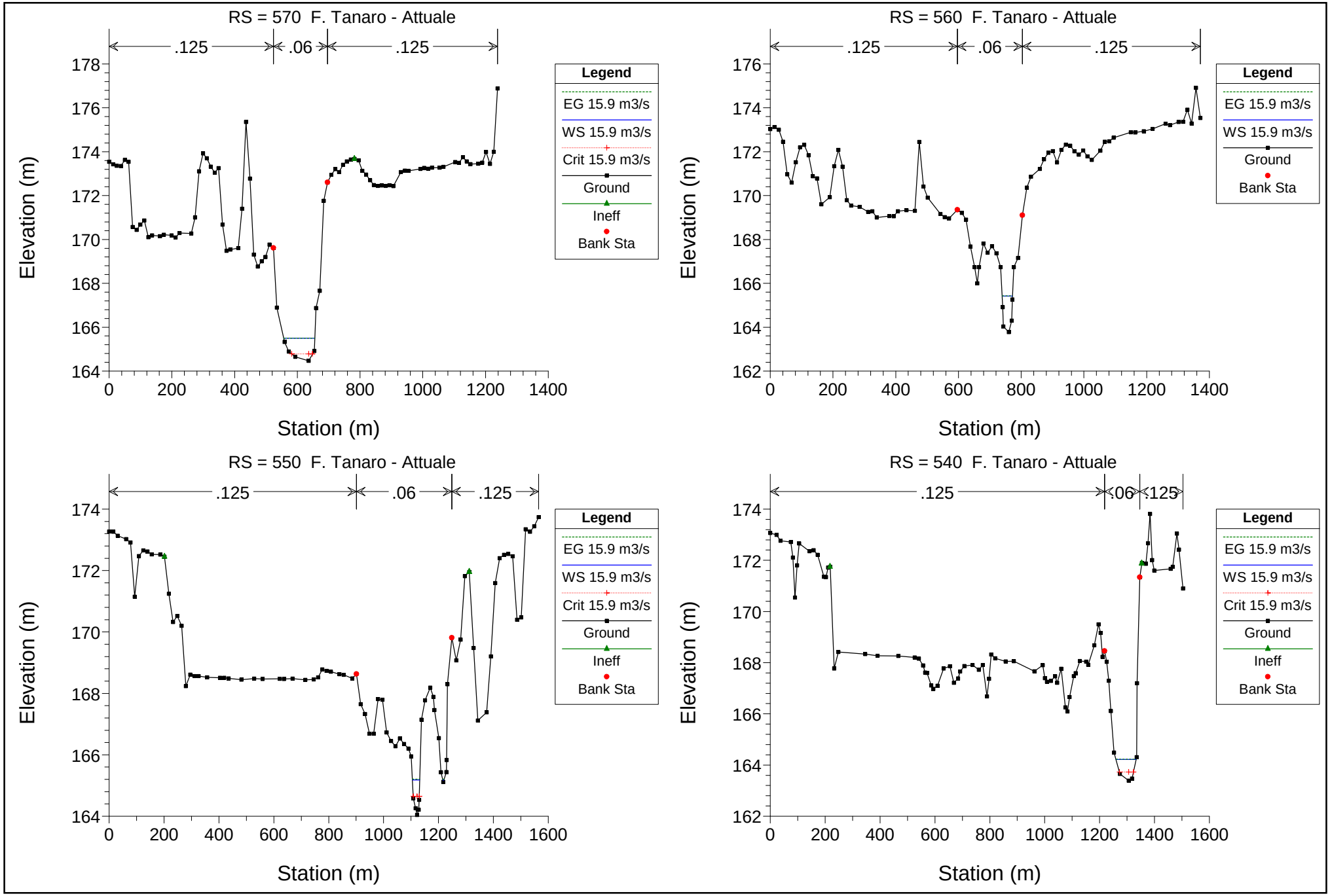
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
RS = 600 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 590 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 580 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta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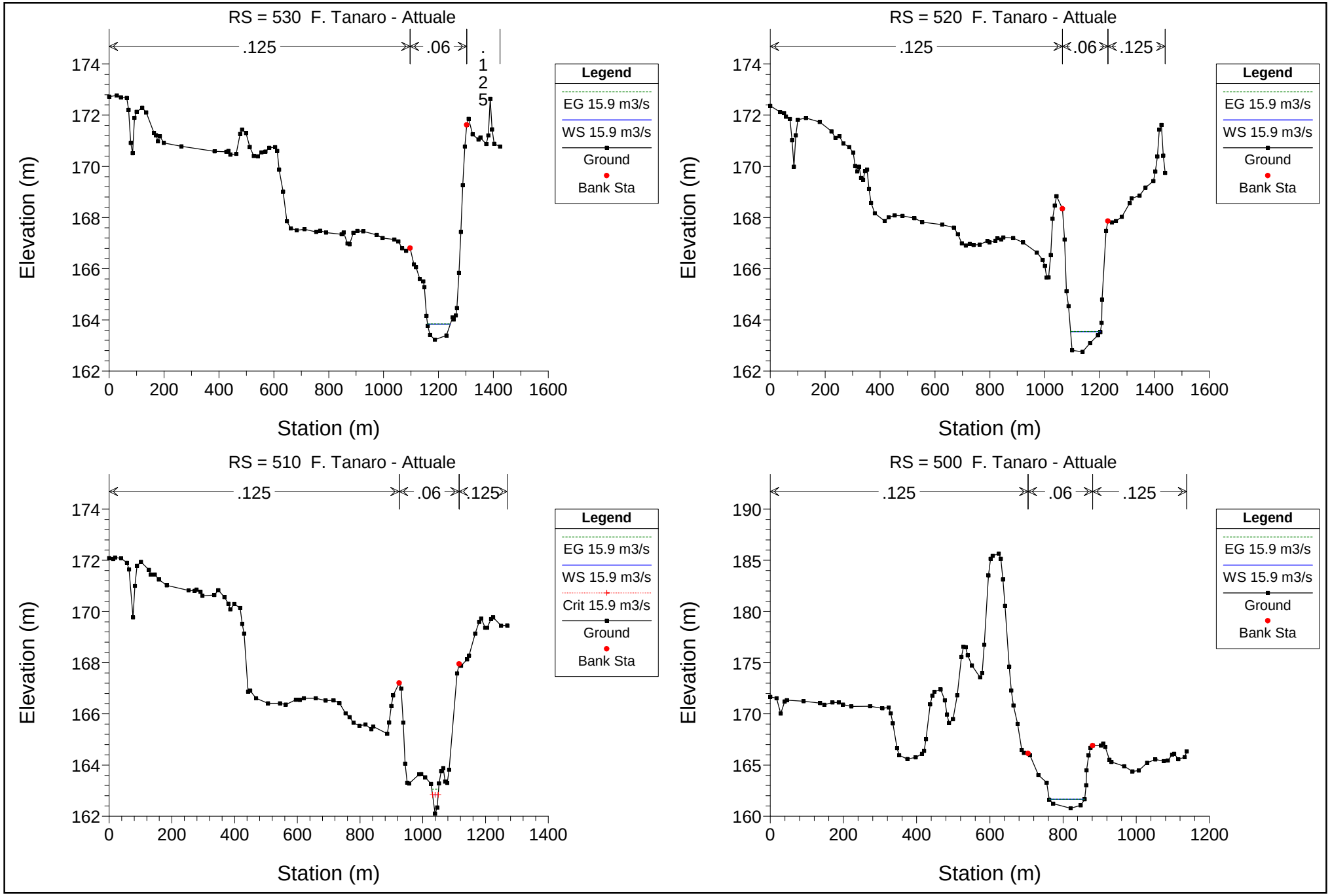
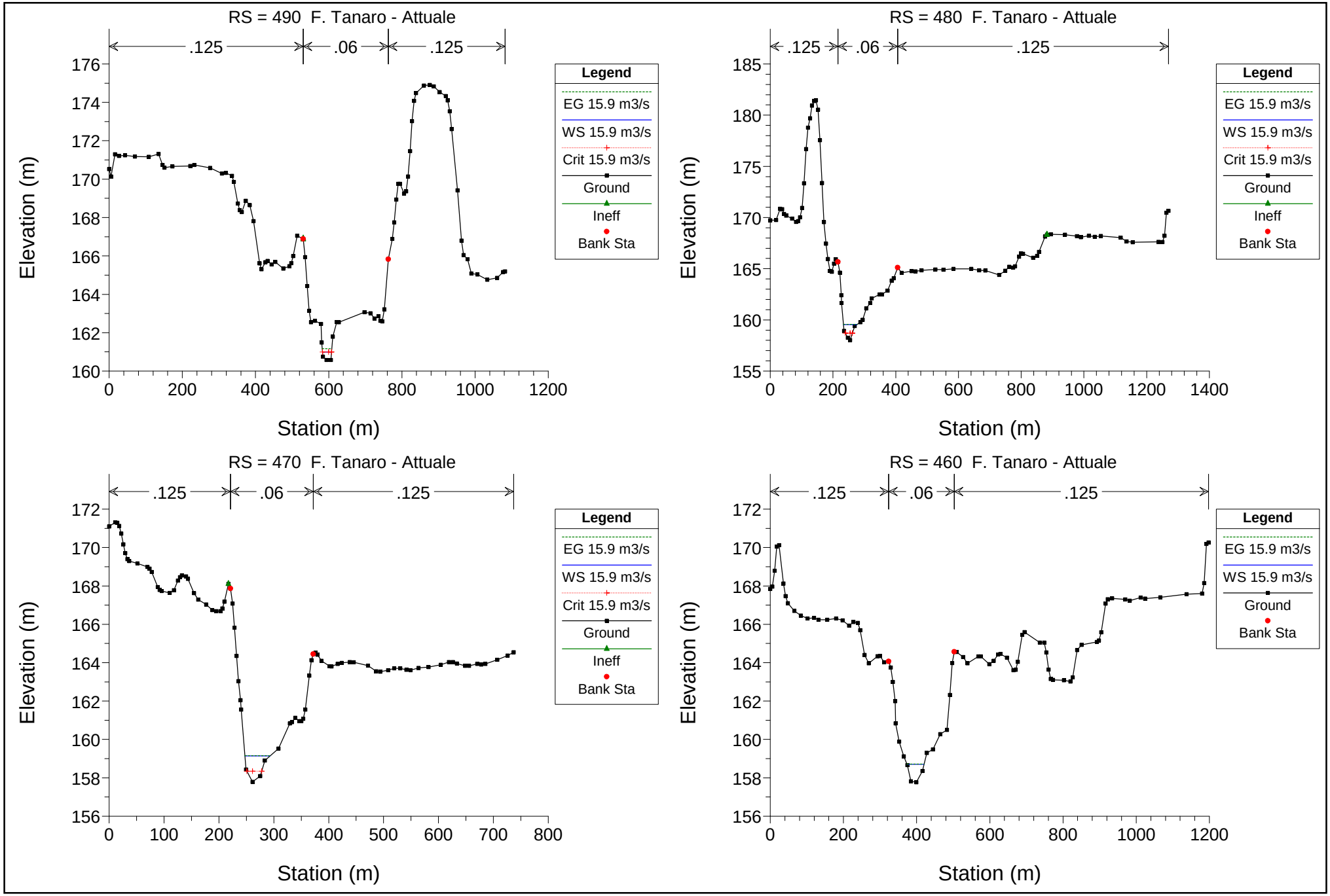
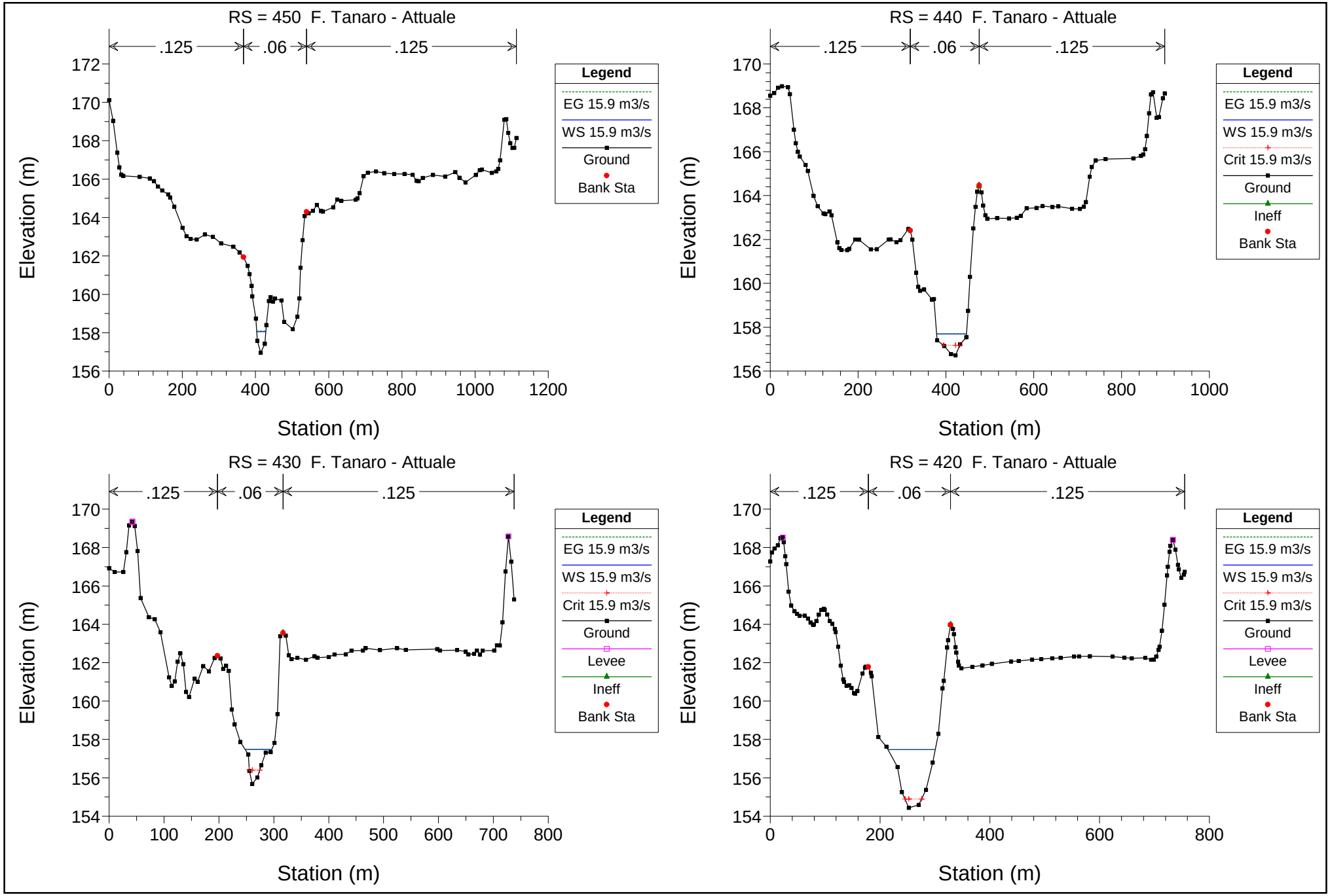
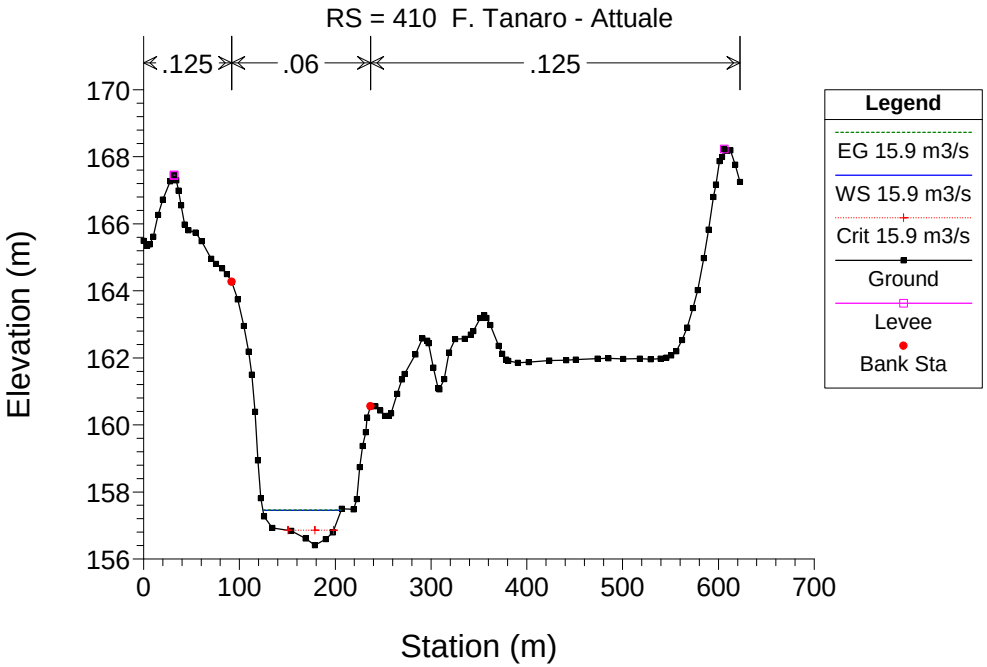
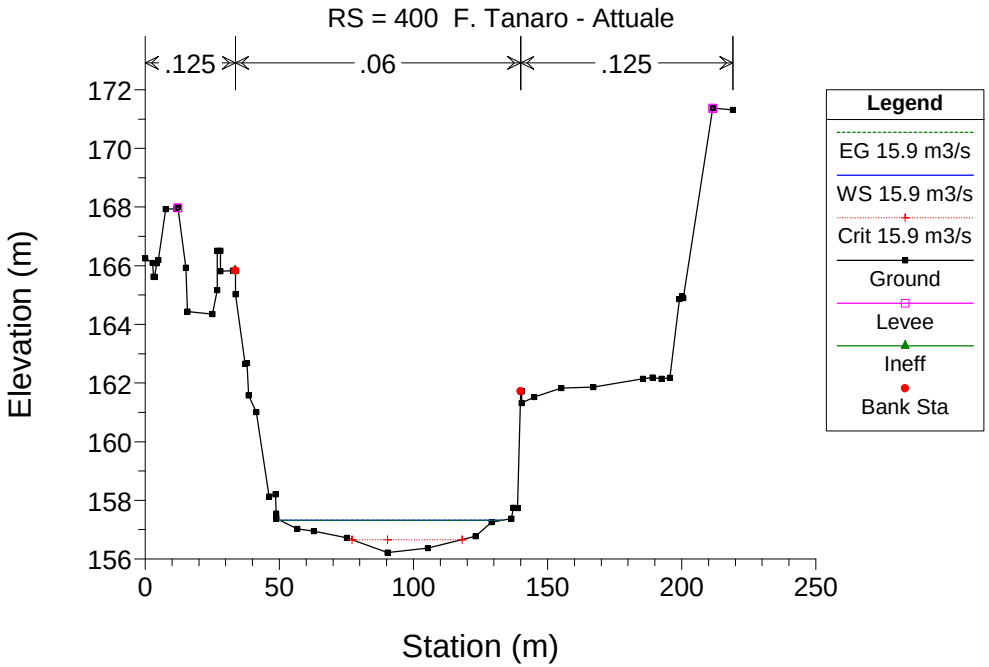
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Attuale
RS = 550 F. Tanaro - Attuale
RS = 540 F. Tanaro - Attuale

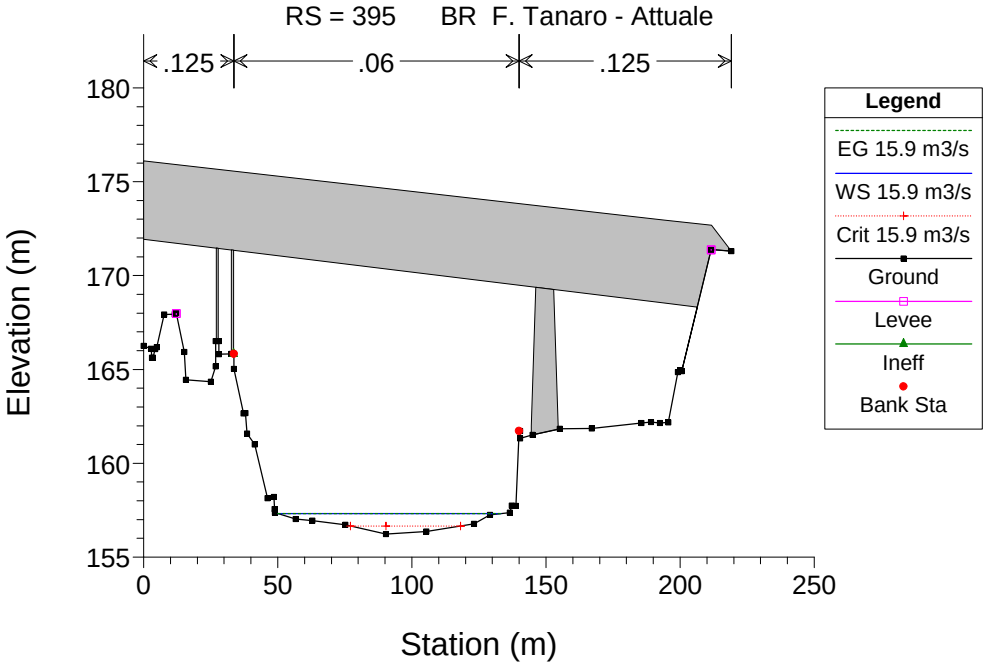

RS = 530 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)

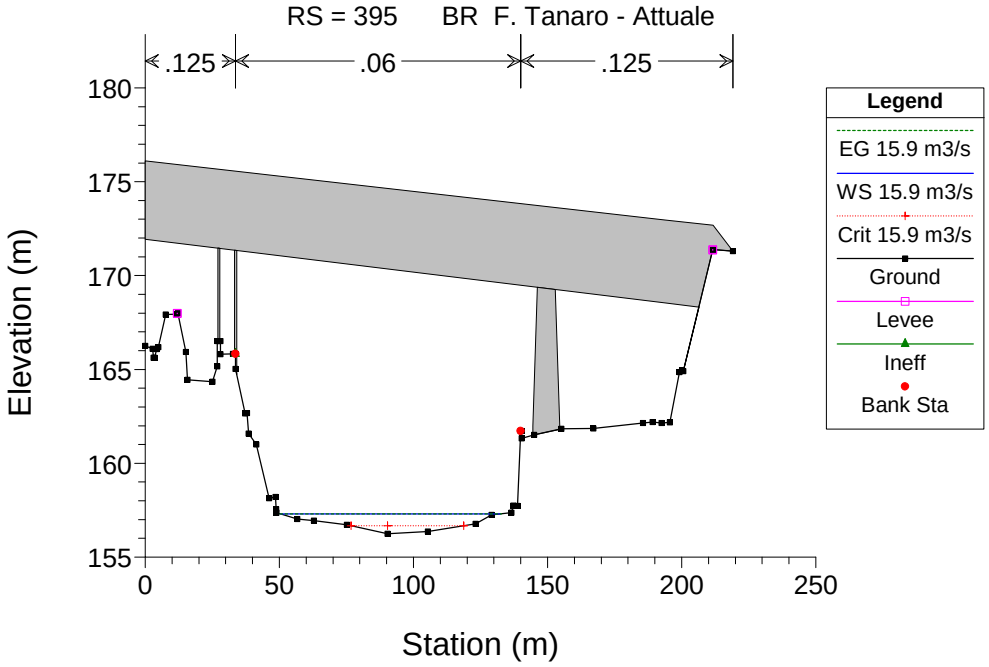

RS = 490 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Attuale
RS = 470 F. Tanaro - Attuale
RS = 460 F. Tanaro - Attuale

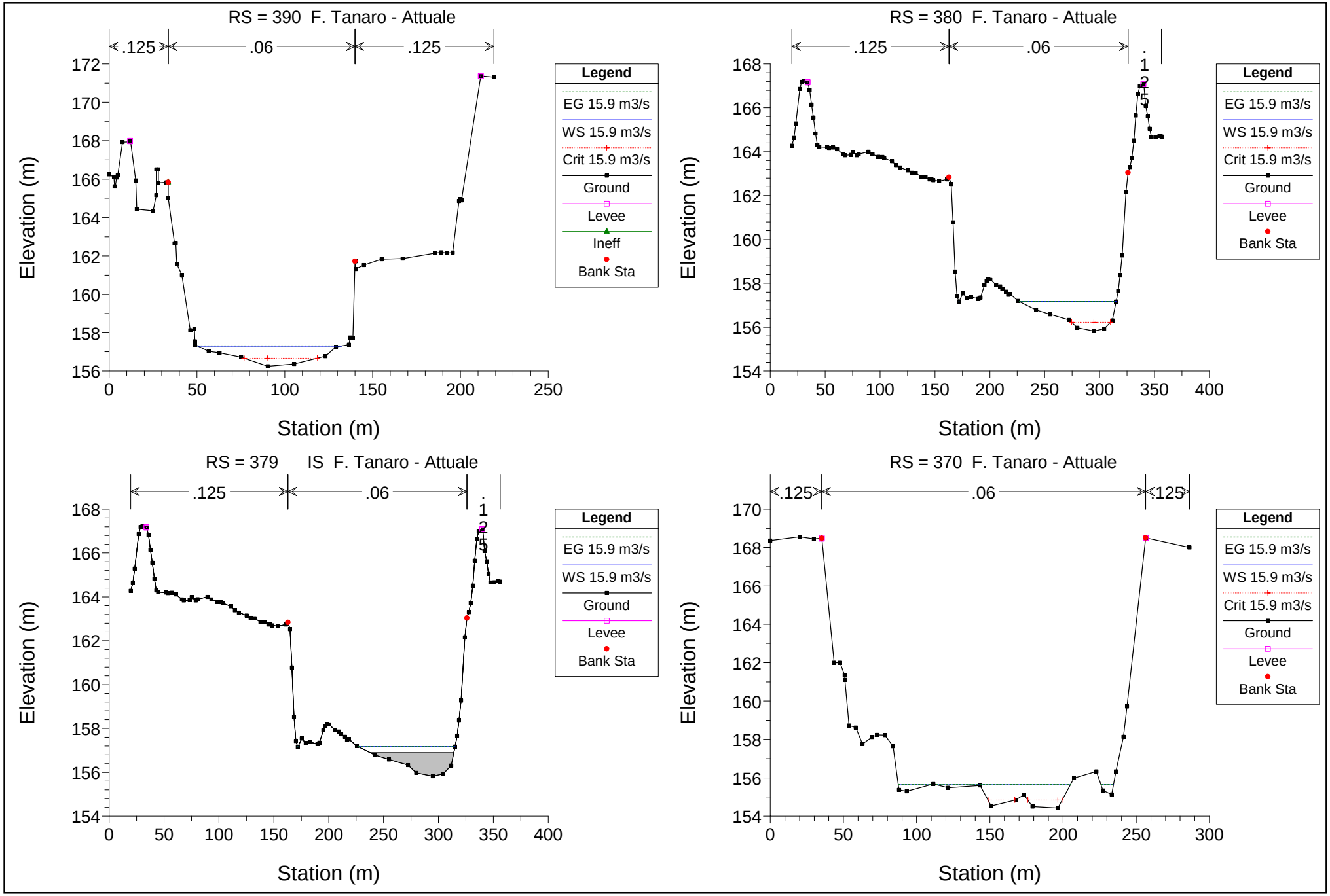

RS = 450 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Bank Sta
RS = 440 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 430 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 420 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

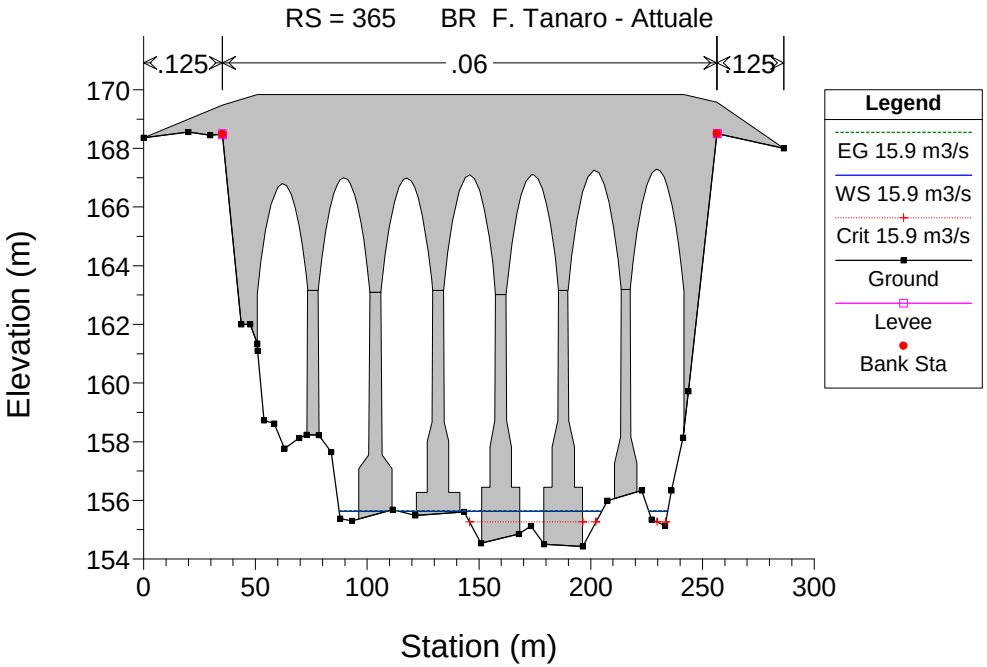

RS = 410 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta

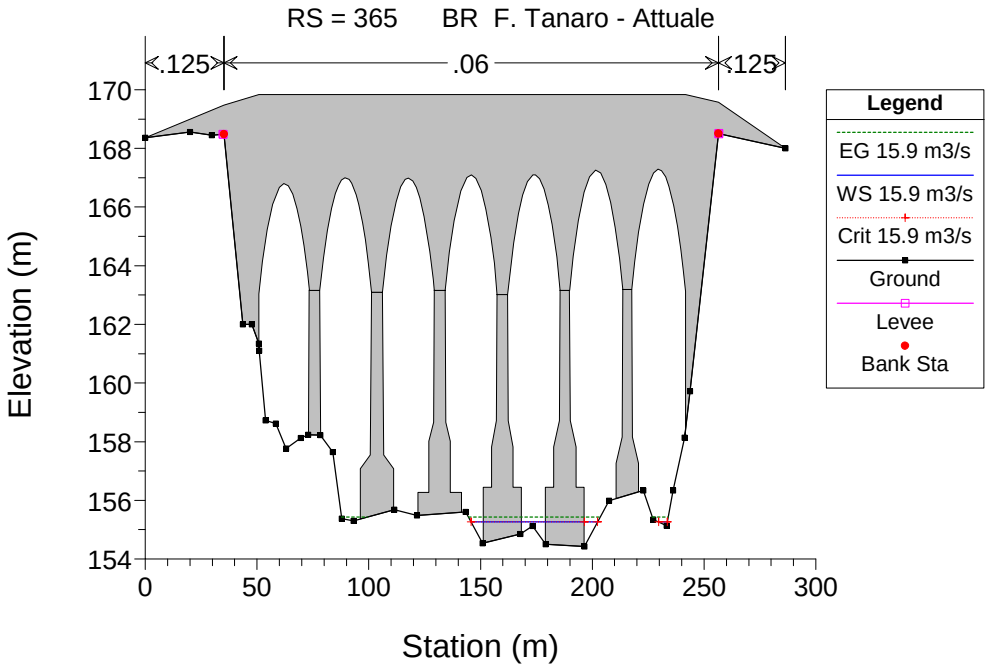

RS = 400 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

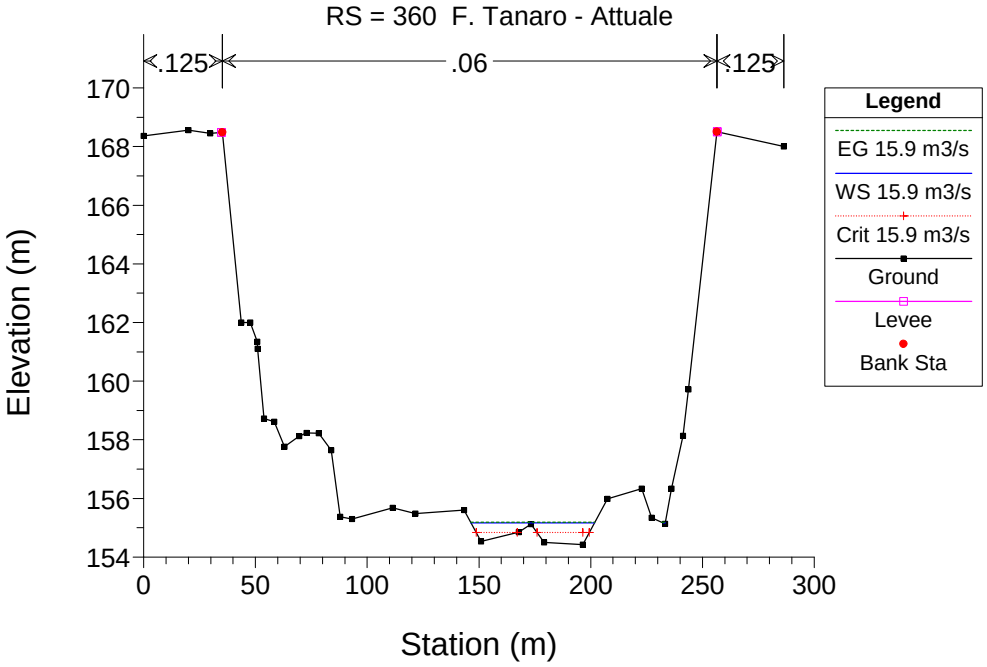

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

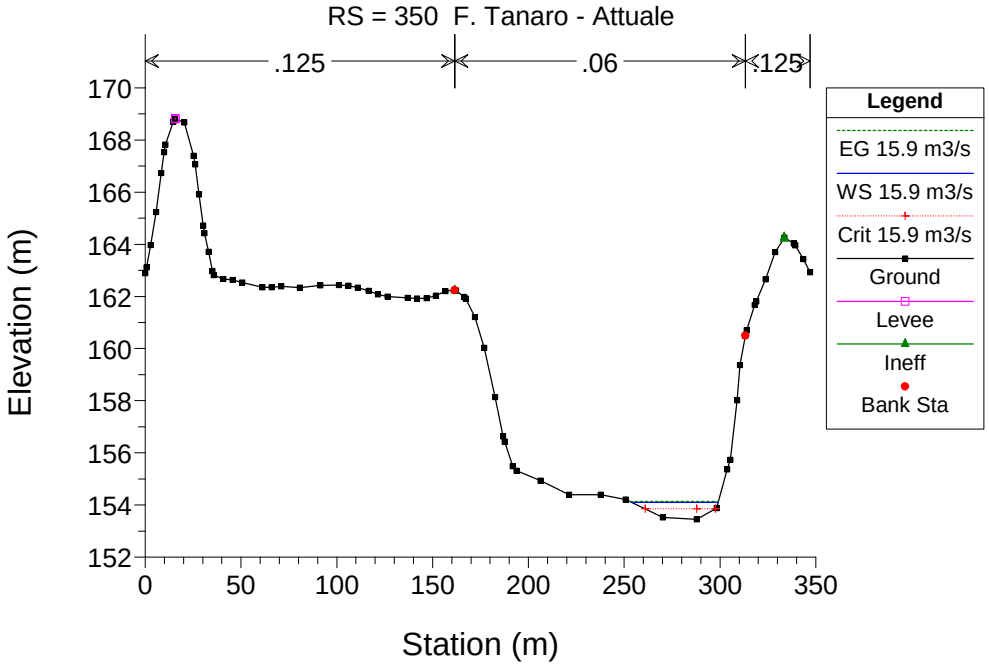

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

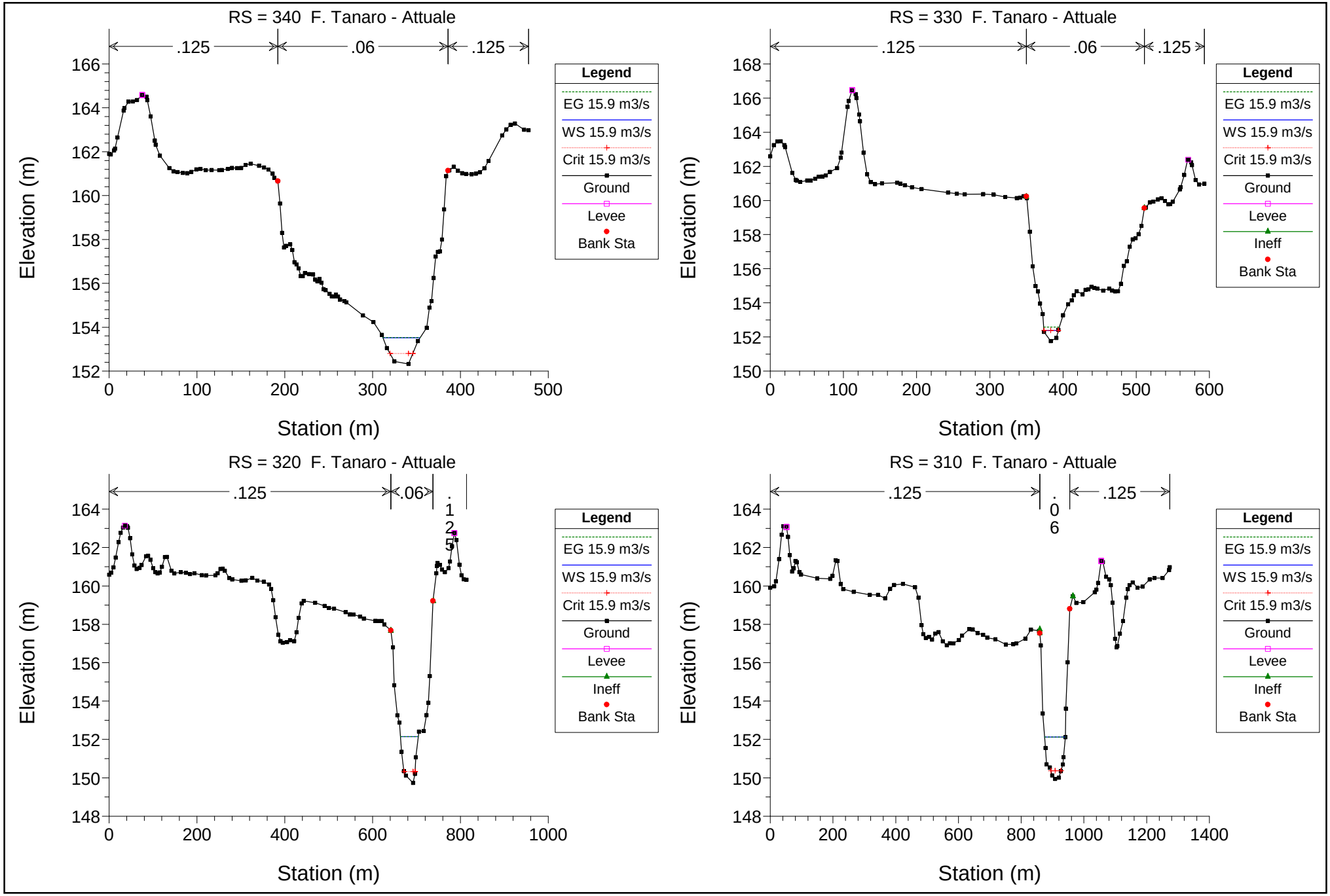

RS = 390 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 380 F. Tanaro - Attuale
.125
.06
.1
2
5
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta
RS = 379 IS F. Tanaro - Attuale
.125
.06
.1
2
5
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Levee
Bank Sta
RS = 370 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta

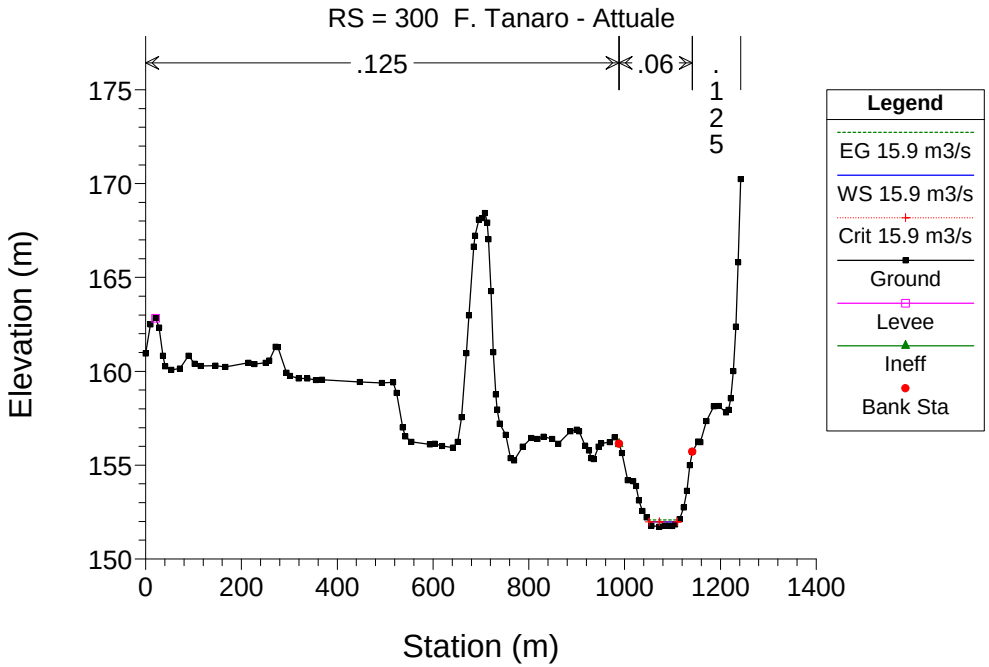

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta

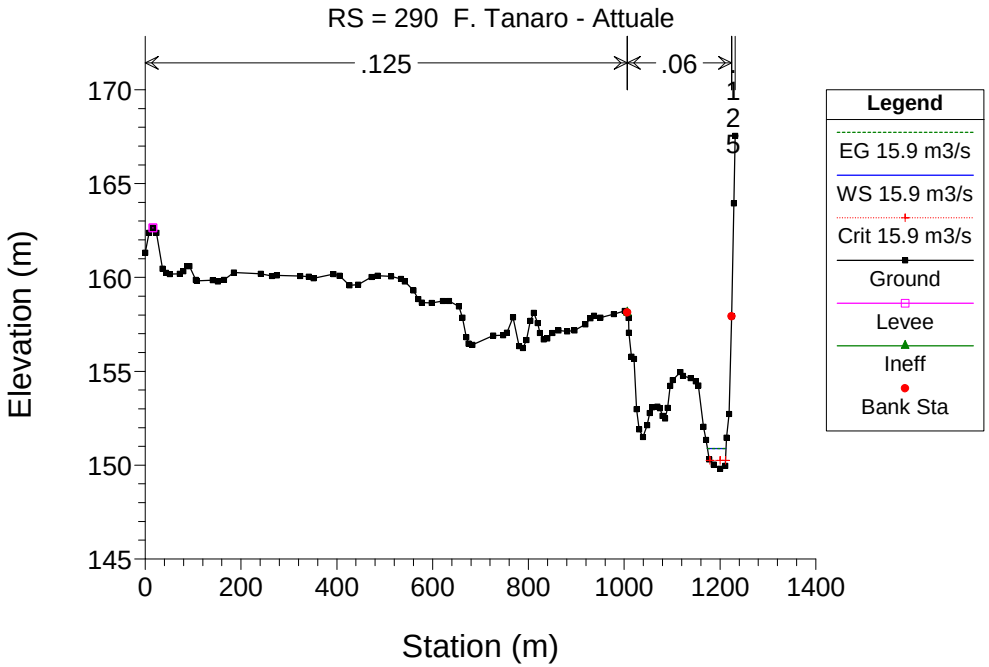

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta

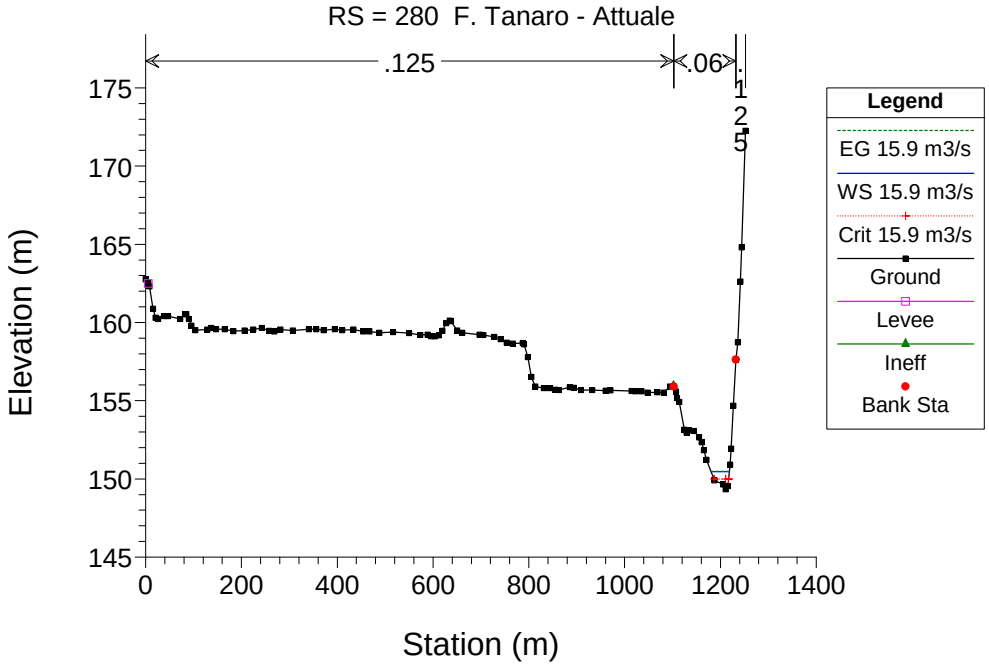

RS = 360 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta

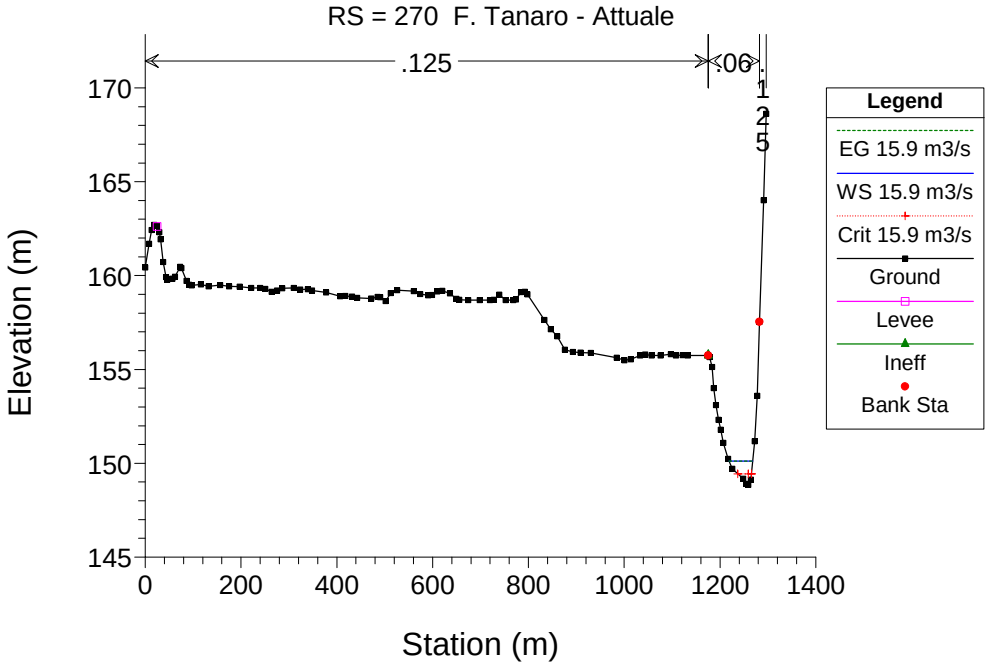

RS = 350 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

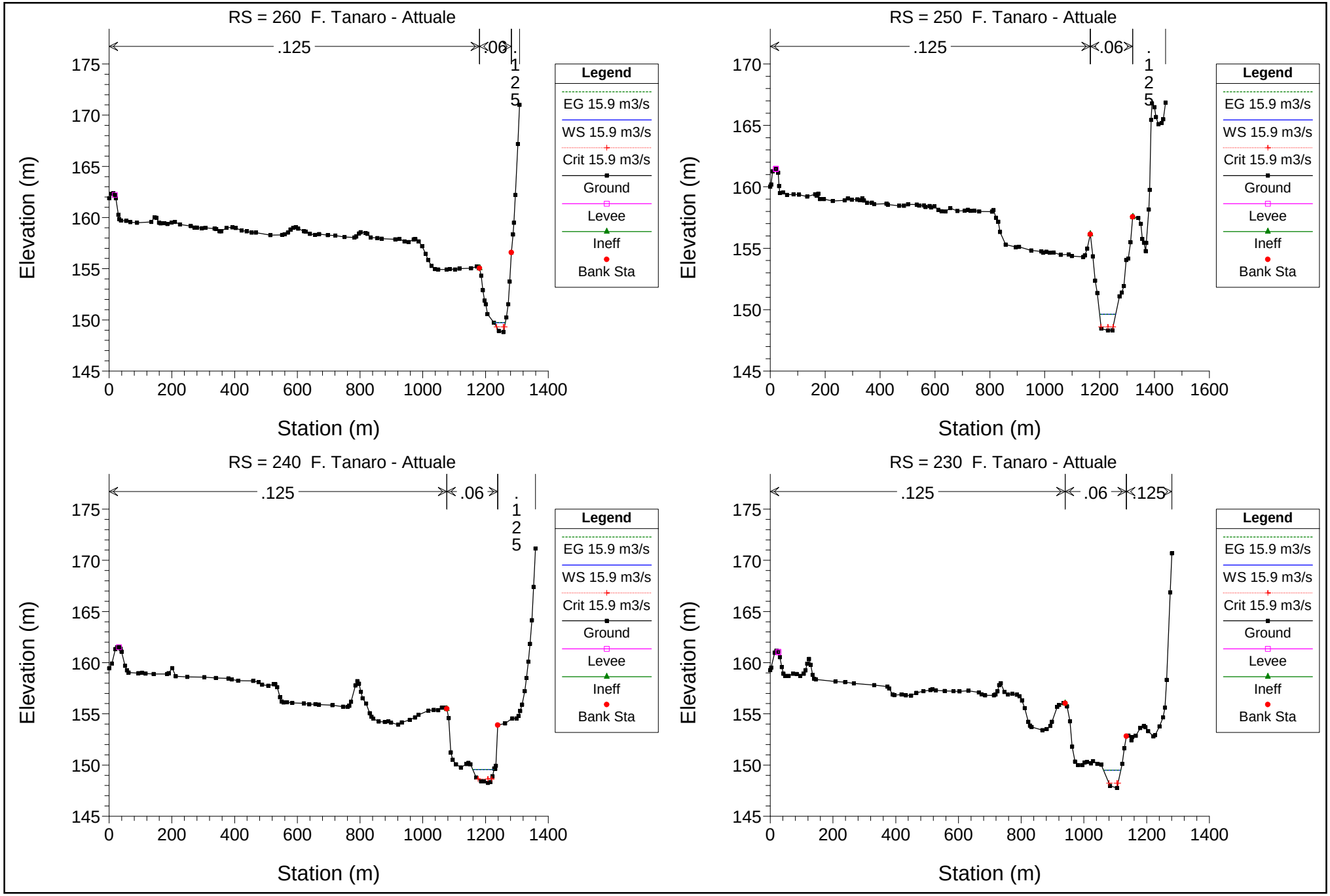

RS = 340 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 310 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

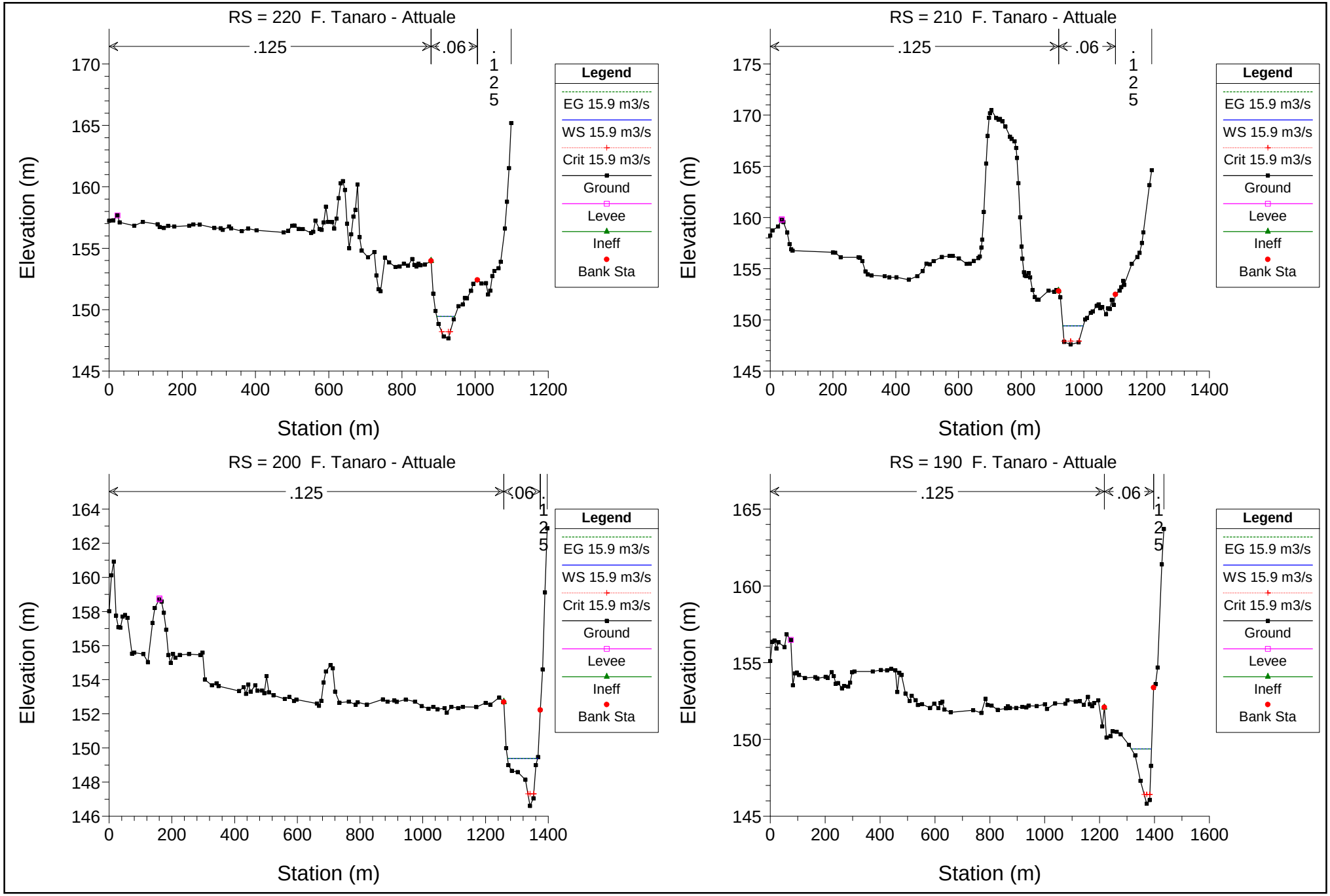

RS = 300 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
175
170
165
160
155
150
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

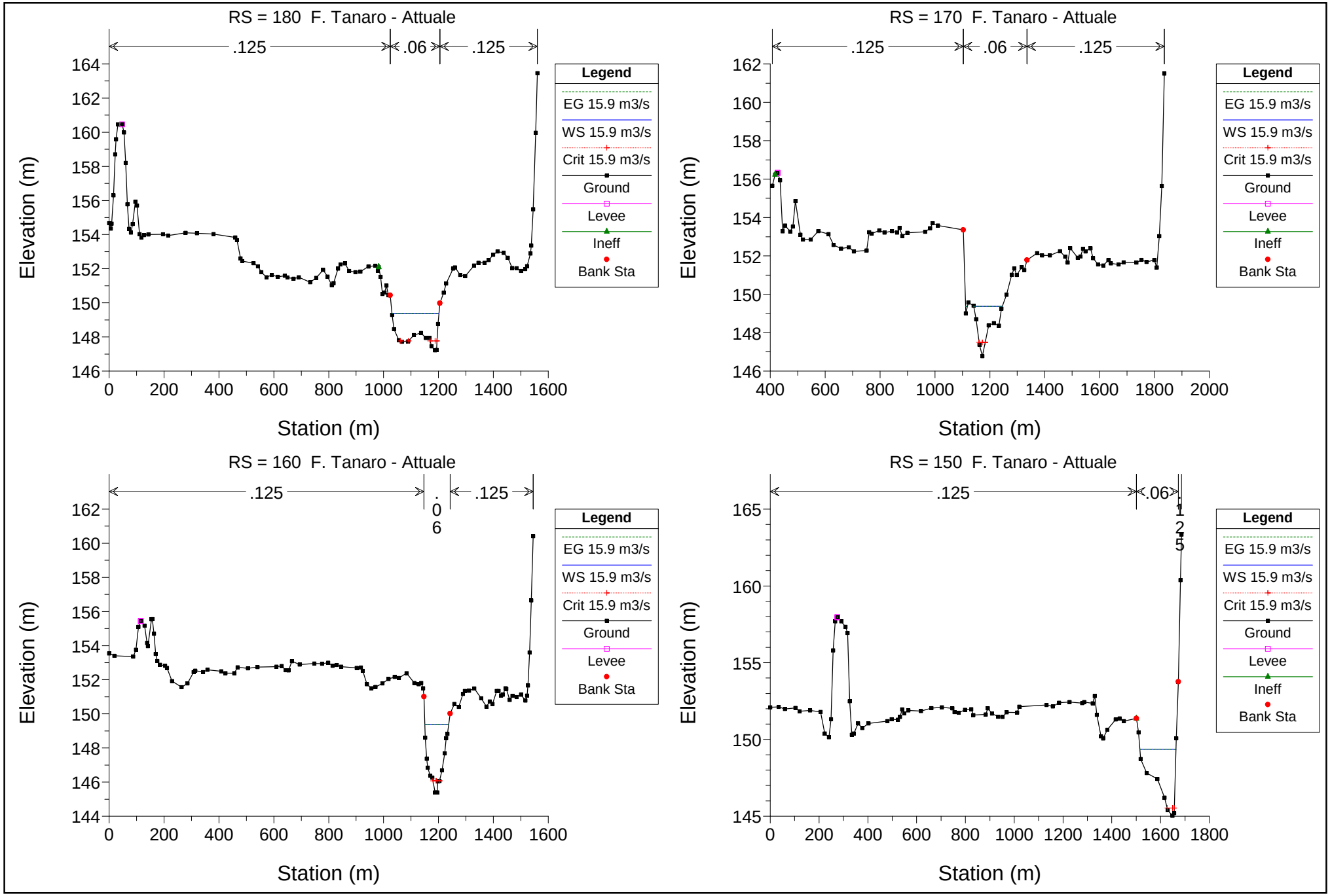

RS = 290 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

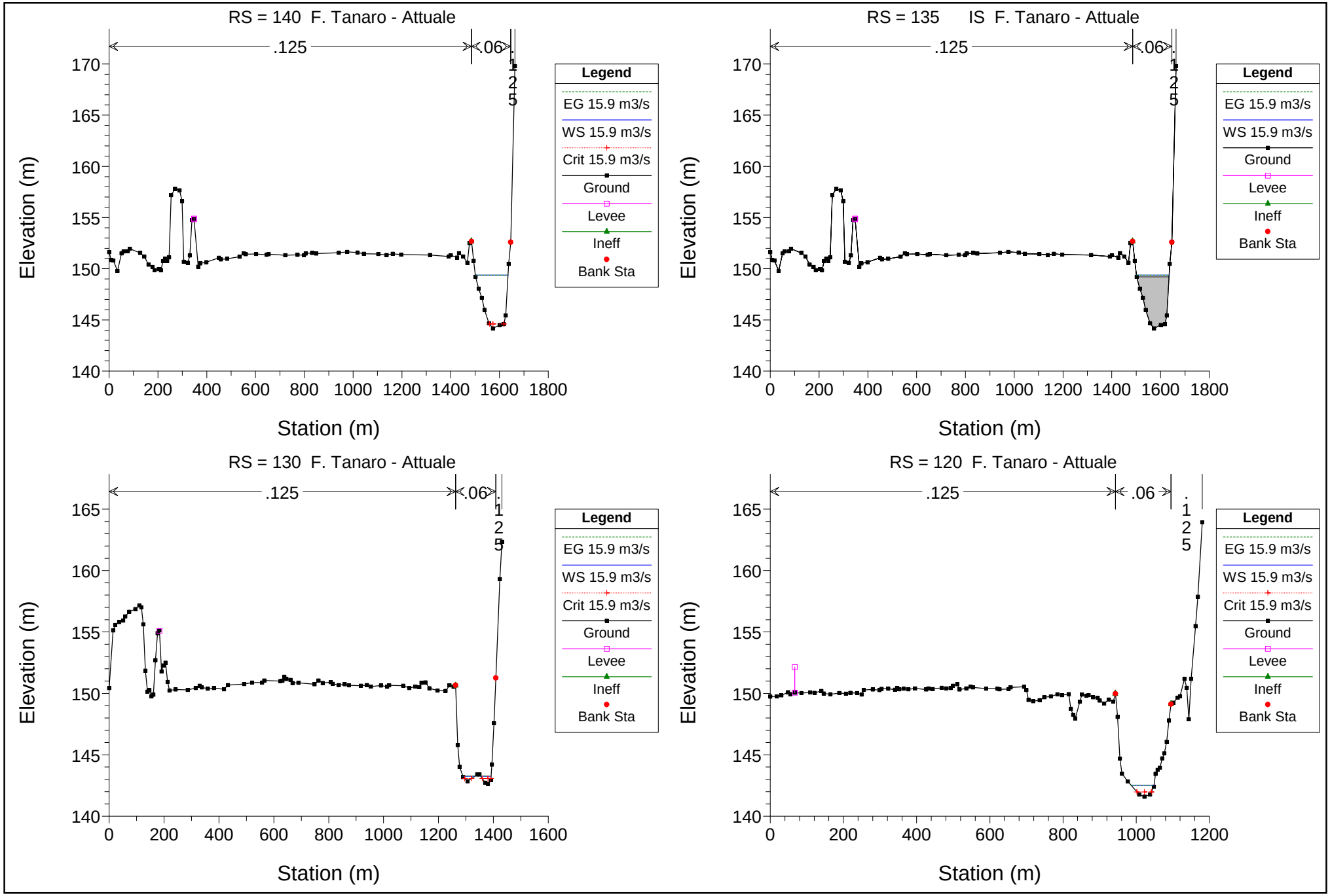

RS = 280 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
175
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

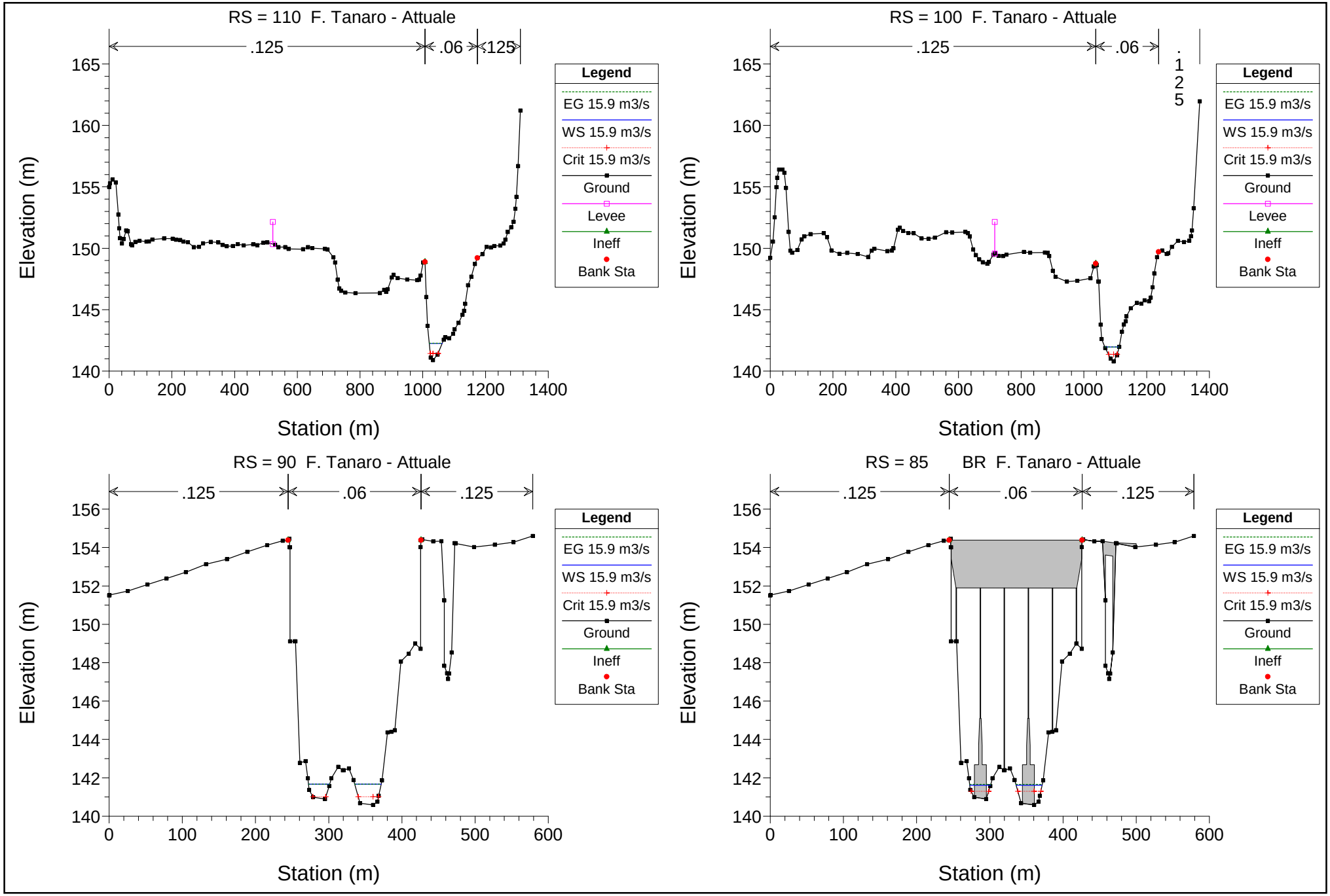

RS = 270 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

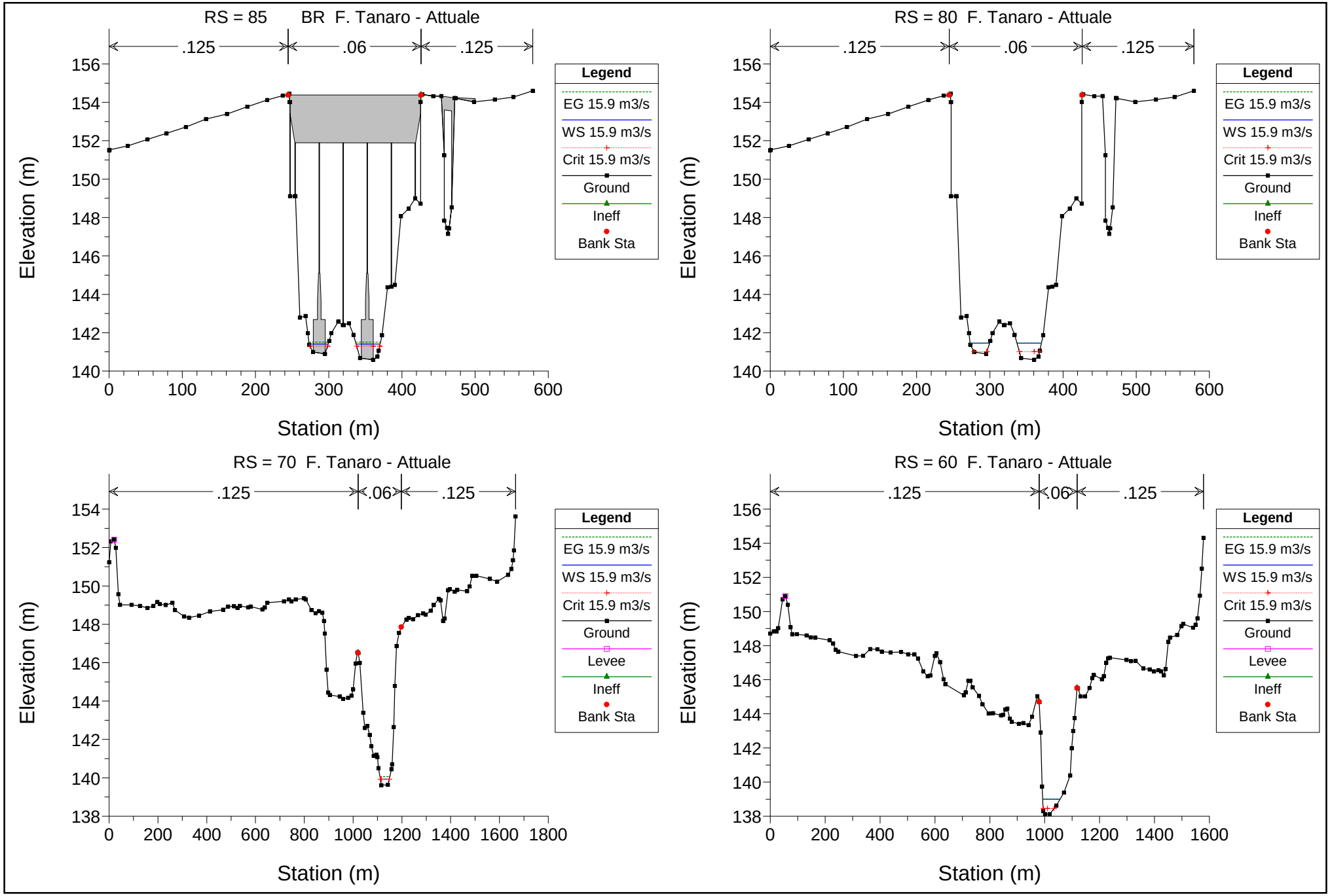

RS = 260 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 250 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 240 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)
RS = 230 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
Elevation (m)
Station (m)

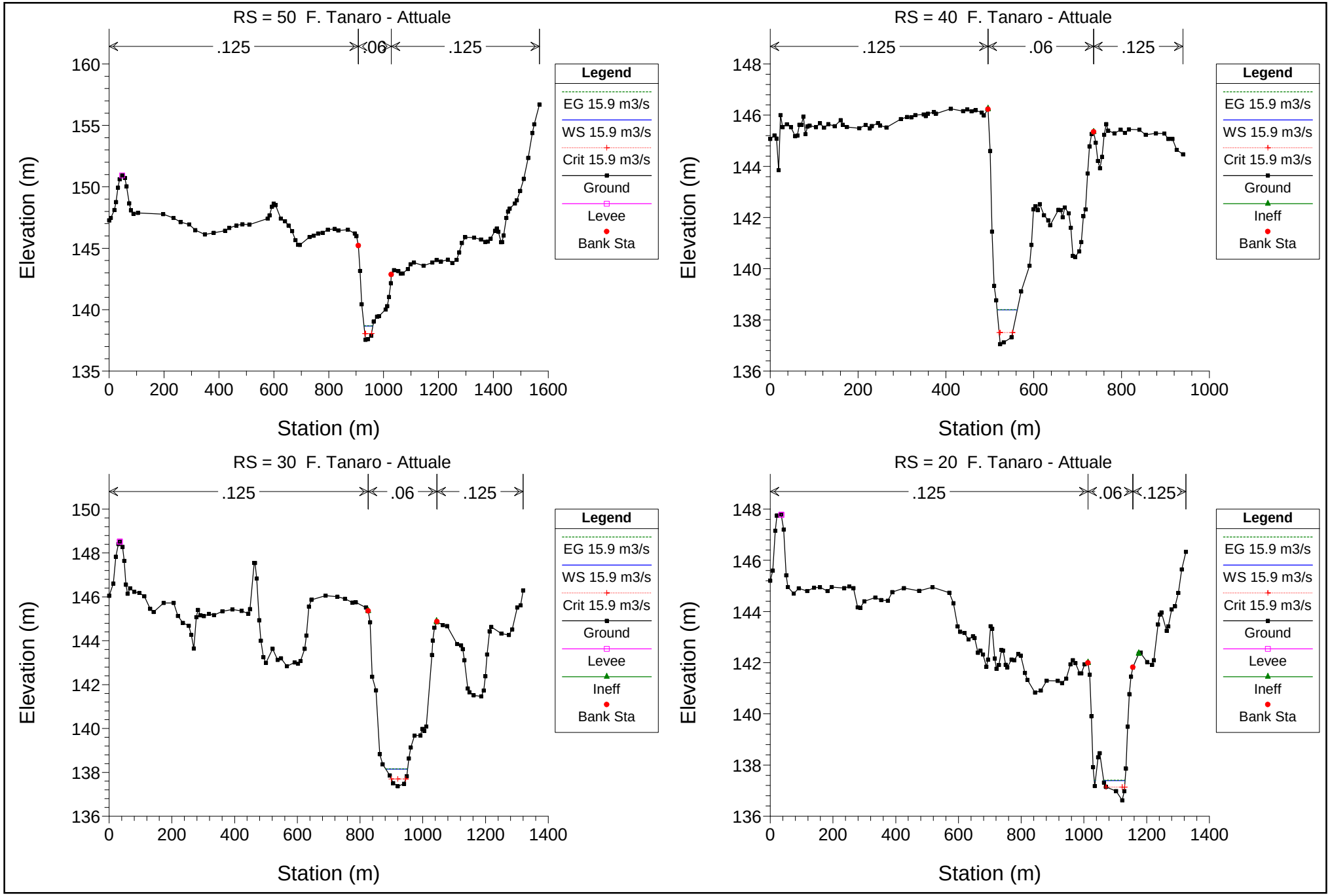

RS = 220 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 190 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

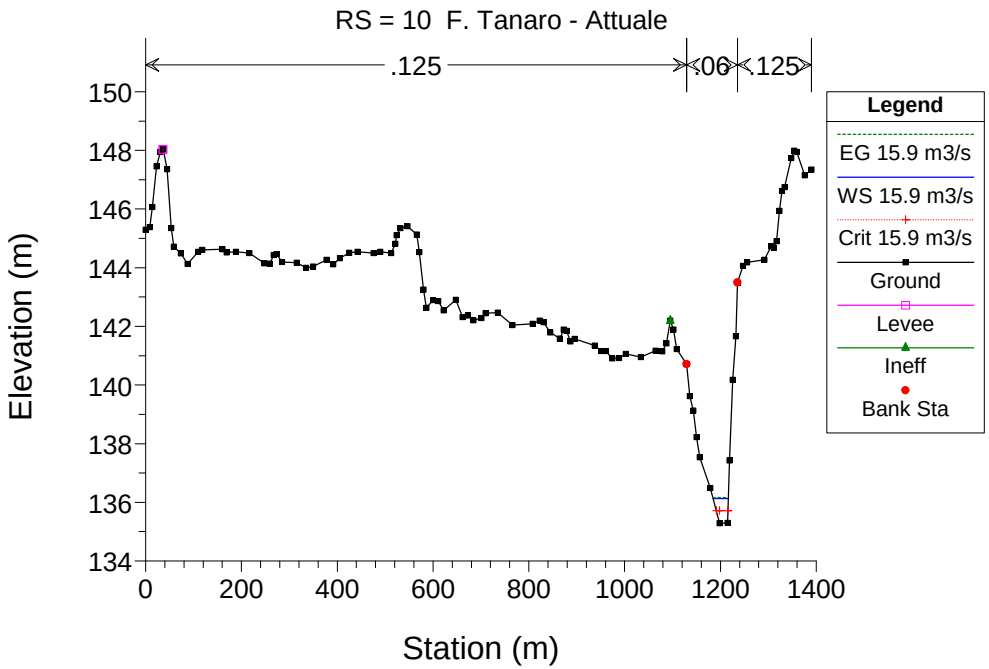

RS = 180 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 170 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 160 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta
RS = 150 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 140 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 135 IS F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 130 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 120 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 110 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 90 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta


RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Attuale
RS = 70 F. Tanaro - Attuale
Levee
RS = 60 F. Tanaro - Attuale


RS = 50 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Bank Sta
RS = 40 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Ineff
Bank Sta
RS = 30 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 20 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 15.9 m3/s
WS 15.9 m3/s
Crit 15.9 m3/s
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO
SIMULAZIONE 8
Sbarramento mobile alzato

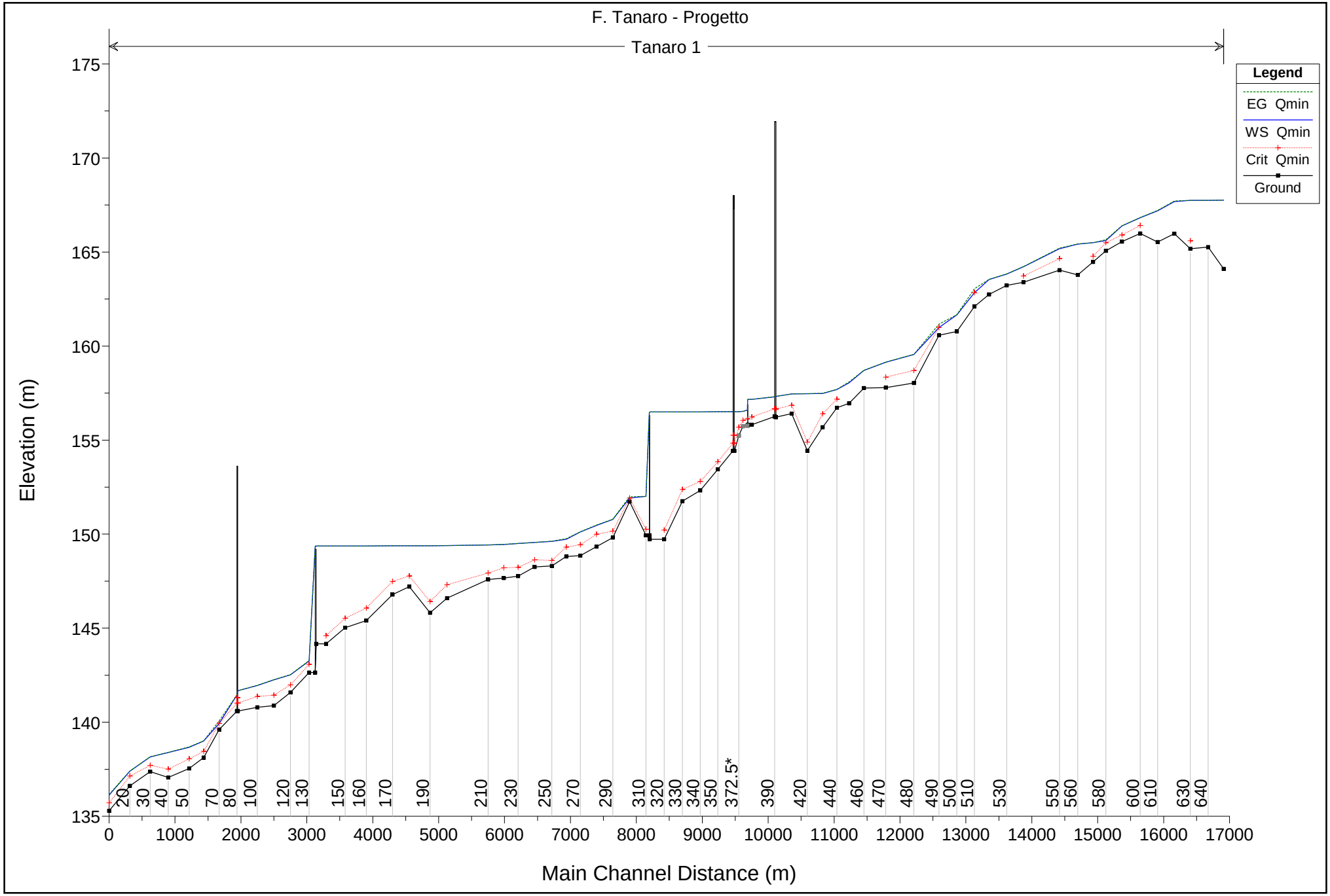
Corso d'acqua	Portata Q m^3/s	Portata
Fiume Tanaro	15.90 in alveo (6.66 turbinati)	Minima di funzionamento dell'impianto

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Qmin

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)	
1	650	Qmin	15.90	164.11	167.76		167.76	0.000056	0.20	78.32	36.70	0.04
1	640	Qmin	15.90	165.26	167.75		167.75	0.000045	0.15	102.81	62.42	0.04
1	630	Qmin	15.90	165.18	167.74	165.60	167.74	0.000023	0.12	138.20	79.11	0.03
1	620	Qmin	15.90	165.98	167.68		167.72	0.005505	0.84	18.89	33.01	0.36
1	610	Qmin	15.90	165.53	167.19		167.21	0.001018	0.58	27.33	23.48	0.17
1	600	Qmin	15.90	165.99	166.82	166.41	166.83	0.002129	0.54	29.38	49.69	0.22
1	590	Qmin	15.90	165.55	166.39	165.91	166.40	0.001191	0.41	39.21	66.11	0.17
1	580	Qmin	15.90	165.06	165.61	165.50	165.66	0.017868	1.01	15.76	51.71	0.58
1	570	Qmin	15.90	164.47	165.49	164.78	165.50	0.000235	0.21	74.89	98.60	0.08
1	560	Qmin	15.90	163.78	165.42		165.43	0.000356	0.37	42.90	33.02	0.10
1	550	Qmin	15.90	164.04	165.18	164.65	165.21	0.003252	0.74	21.41	30.80	0.28
1	540	Qmin	15.90	163.39	164.22	163.73	164.22	0.001122	0.38	41.72	73.93	0.16
1	530	Qmin	15.90	163.23	163.83		163.84	0.002141	0.44	36.00	83.03	0.21
1	520	Qmin	15.90	162.75	163.54		163.55	0.000665	0.28	57.01	108.97	0.12
1	510	Qmin	15.90	162.10	162.83	162.83	163.05	0.047989	2.08	7.64	17.66	1.01
1	500	Qmin	15.90	160.77	161.66		161.66	0.000542	0.28	57.81	96.89	0.11
1	490	Qmin	15.90	160.58	160.99	160.99	161.17	0.050276	1.85	8.61	24.71	1.00
1	480	Qmin	15.90	158.04	159.55	158.70	159.56	0.000964	0.45	35.32	43.34	0.16
1	470	Qmin	15.90	157.79	159.14	158.34	159.15	0.000940	0.44	36.48	46.14	0.16
1	460	Qmin	15.90	157.77	158.71		158.72	0.001931	0.54	29.49	46.61	0.22
1	450	Qmin	15.90	156.96	158.05		158.09	0.004389	0.89	17.87	24.55	0.33
1	440	Qmin	15.90	156.72	157.69	157.17	157.70	0.001174	0.40	39.86	68.16	0.17
1	430	Qmin	15.90	155.68	157.48	156.40	157.49	0.000836	0.41	38.63	48.62	0.15
1	420	Qmin	15.90	154.44	157.47	154.89	157.47	0.000016	0.10	158.66	86.25	0.02
1	410	Qmin	15.90	156.41	157.46	156.85	157.46	0.000542	0.29	54.01	81.70	0.12
1	400	Qmin	15.90	156.22	157.32	156.66	157.32	0.000614	0.30	52.41	83.22	0.12
1	395		Bridge									
1	390	Qmin	15.90	156.25	157.30	156.67	157.31	0.000666	0.31	50.87	82.11	0.13
1	380	Qmin	15.90	155.82	157.17	156.23	157.17	0.000263	0.23	69.35	88.53	0.08
1	379		Inl Struct									
1	370	Qmin	15.90	154.43	156.51	154.84	156.51	0.000021	0.09	184.50	150.72	0.02
1	365		Bridge									
1	360	Qmin	15.90	154.43	156.51	154.84	156.51	0.000021	0.09	183.81	150.70	0.03
1	350	Qmin	15.90	153.45	156.50	153.85	156.50	0.000005	0.06	259.25	119.35	0.01
1	340	Qmin	15.90	152.32	156.50	152.80	156.50	0.000004	0.05	311.36	153.15	0.01
1	330	Qmin	15.90	151.75	156.50	152.38	156.50	0.000003	0.05	300.26	129.64	0.01
1	320	Qmin	9.24	149.73	156.50	150.21	156.50	0.000000	0.02	383.91	85.56	0.00
1	315		Inl Struct									
1	310	Qmin	9.24	149.94	152.01	150.26	152.01	0.000018	0.09	99.55	65.22	0.02
1	300	Qmin	9.24	151.73	151.91	151.91	151.99	0.069722	1.19	7.74	54.76	1.01

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Qmin (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)	
1	290	Qmin	9.24	149.81	150.79	150.16	150.79	0.000567	0.33	28.42	38.10	0.12
1	280	Qmin	15.90	149.34	150.46	149.99	150.48	0.002413	0.62	25.50	38.21	0.24
1	270	Qmin	15.90	148.86	150.11	149.44	150.12	0.000969	0.43	37.21	49.66	0.16
1	260	Qmin	15.90	148.81	149.73	149.31	149.76	0.003919	0.74	21.62	36.47	0.30
1	250	Qmin	15.90	148.31	149.62	148.60	149.62	0.000218	0.26	62.09	58.25	0.08
1	240	Qmin	15.90	148.26	149.56	148.64	149.56	0.000248	0.25	63.46	67.93	0.08
1	230	Qmin	15.90	147.77	149.50	148.23	149.51	0.000198	0.25	62.42	54.99	0.08
1	220	Qmin	15.90	147.66	149.45	148.21	149.46	0.000269	0.29	54.60	49.50	0.09
1	210	Qmin	15.90	147.59	149.43	147.94	149.43	0.000061	0.17	95.38	65.73	0.04
1	200	Qmin	15.90	146.60	149.39	147.31	149.39	0.000053	0.14	115.74	96.26	0.04
1	190	Qmin	15.90	145.82	149.38	146.41	149.39	0.000019	0.11	141.31	73.75	0.03
1	180	Qmin	15.90	147.21	149.38	147.77	149.38	0.000010	0.07	243.52	170.98	0.02
1	170	Qmin	15.90	146.78	149.38	147.49	149.38	0.000047	0.12	127.67	111.74	0.04
1	160	Qmin	15.90	145.40	149.37	146.07	149.37	0.000006	0.07	219.71	86.93	0.01
1	150	Qmin	15.90	145.03	149.37	145.53	149.37	0.000002	0.05	351.05	147.75	0.01
1	140	Qmin	15.90	144.17	149.37	144.61	149.37	0.000001	0.03	492.55	134.02	0.01
1	135		Inl Struct									
1	130	Qmin	15.90	142.64	143.25	143.07	143.27	0.008179	0.67	23.84	80.97	0.39
1	120	Qmin	15.90	141.58	142.52	141.98	142.53	0.001272	0.42	37.61	62.64	0.17
1	110	Qmin	15.90	140.88	142.25	141.44	142.26	0.000866	0.44	35.76	41.23	0.15
1	100	Qmin	15.90	140.79	141.95	141.37	141.97	0.001720	0.53	30.22	45.43	0.21
1	90	Qmin	15.90	140.59	141.67	141.01	141.67	0.000624	0.34	47.34	65.10	0.13
1	85		Bridge									
1	80	Qmin	15.90	140.59	141.45	141.01	141.46	0.001752	0.47	33.57	59.84	0.20
1	70	Qmin	15.90	139.61	139.93	139.93	140.07	0.054651	1.62	9.83	36.74	1.00
1	60	Qmin	15.90	138.12	139.00	138.46	139.01	0.001211	0.42	38.27	63.02	0.17
1	50	Qmin	15.90	137.54	138.67	138.05	138.69	0.001781	0.61	26.16	32.39	0.22
1	40	Qmin	15.90	137.06	138.39	137.51	138.40	0.000543	0.37	42.92	45.86	0.12
1	30	Qmin	15.90	137.37	138.15	137.70	138.16	0.001635	0.44	36.33	69.37	0.19
1	20	Qmin	15.90	136.62	137.39	137.14	137.41	0.003947	0.56	28.26	71.65	0.29
1	10	Qmin	15.90	135.29	136.13	135.71	136.16	0.004003	0.78	20.35	31.66	0.31


F. Tanaro - Progetto
Tanaro 1
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Elevation (m)
Main Channel Distance (m)
175
170
165
160
155
150
145
140
135
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
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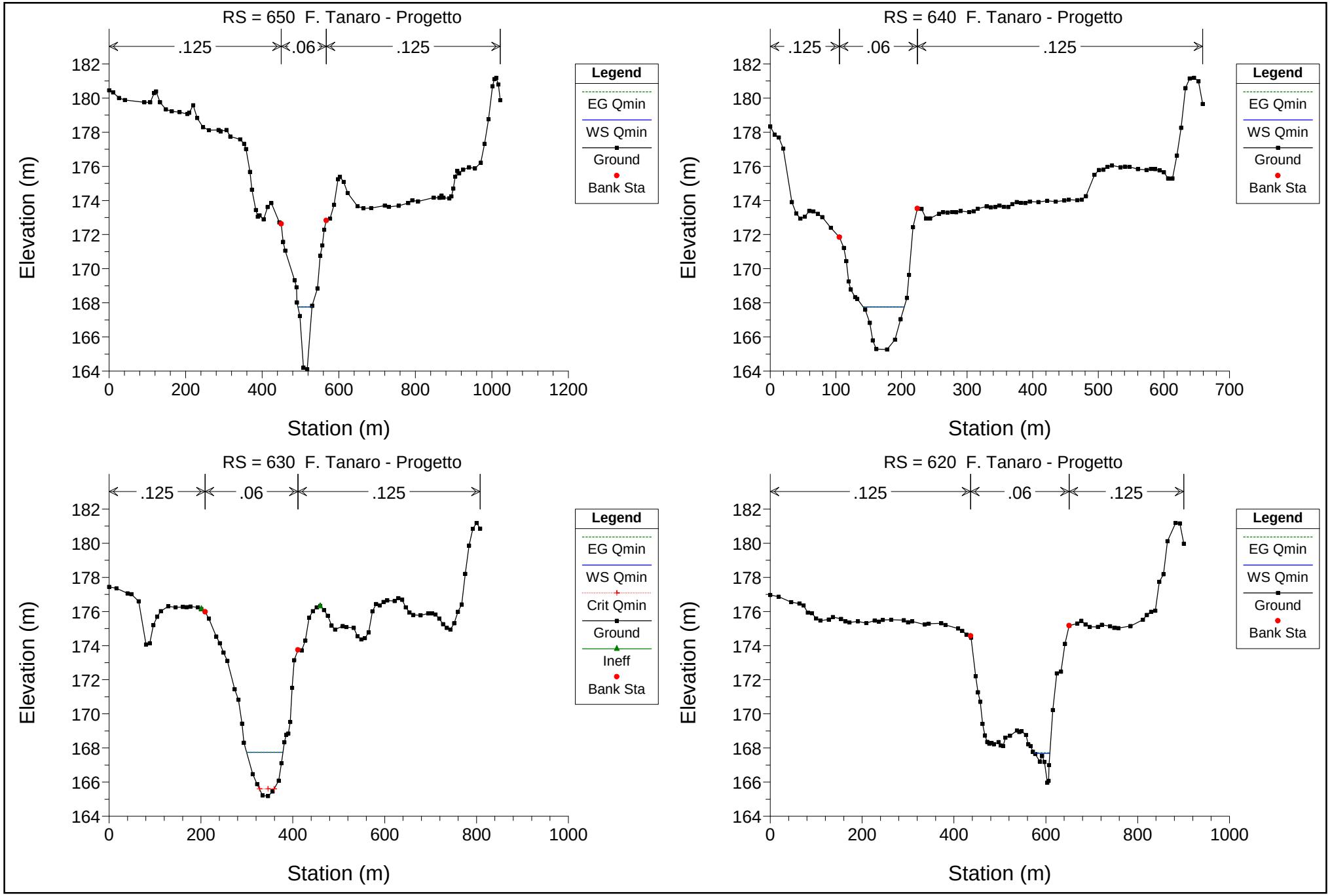
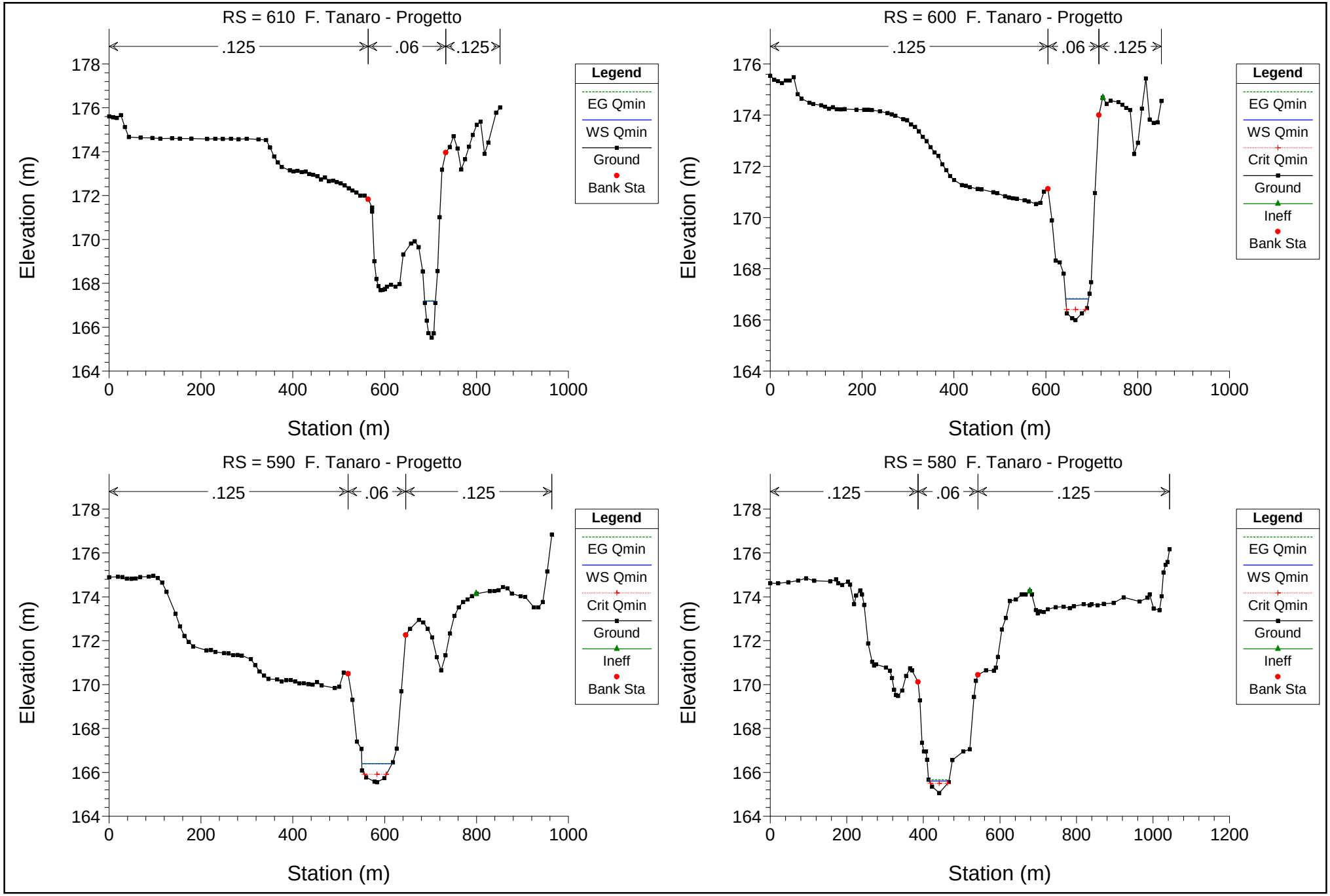
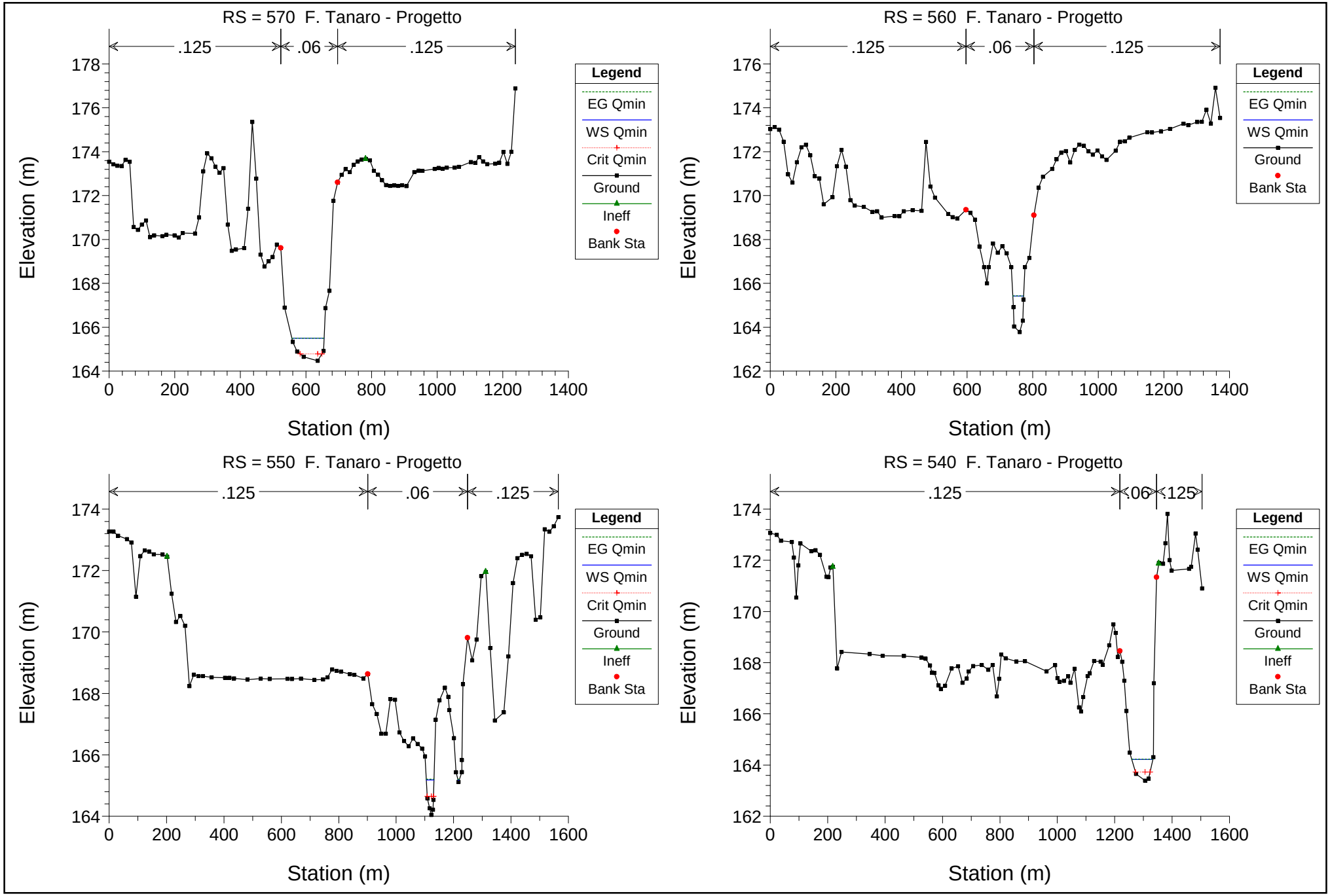
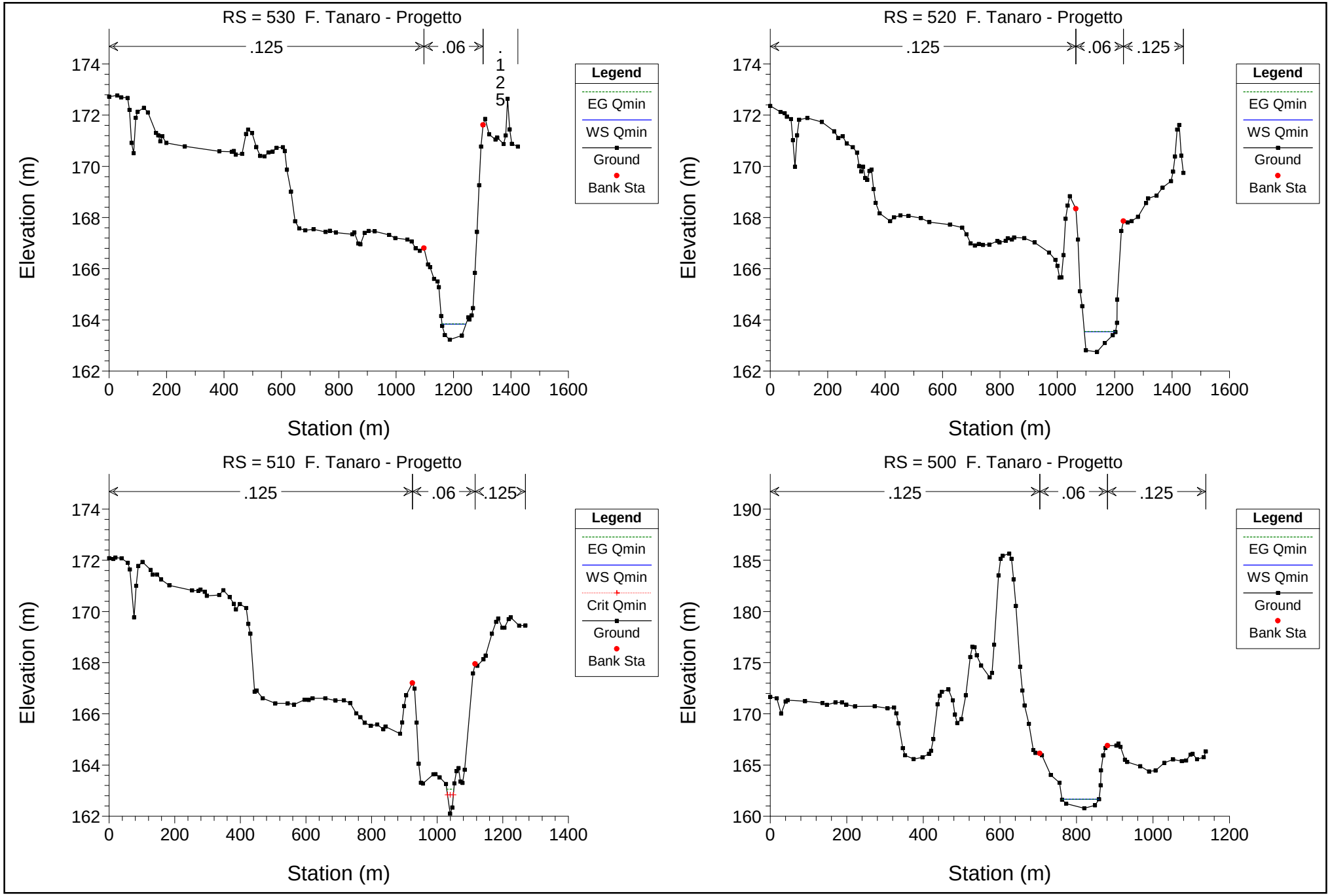
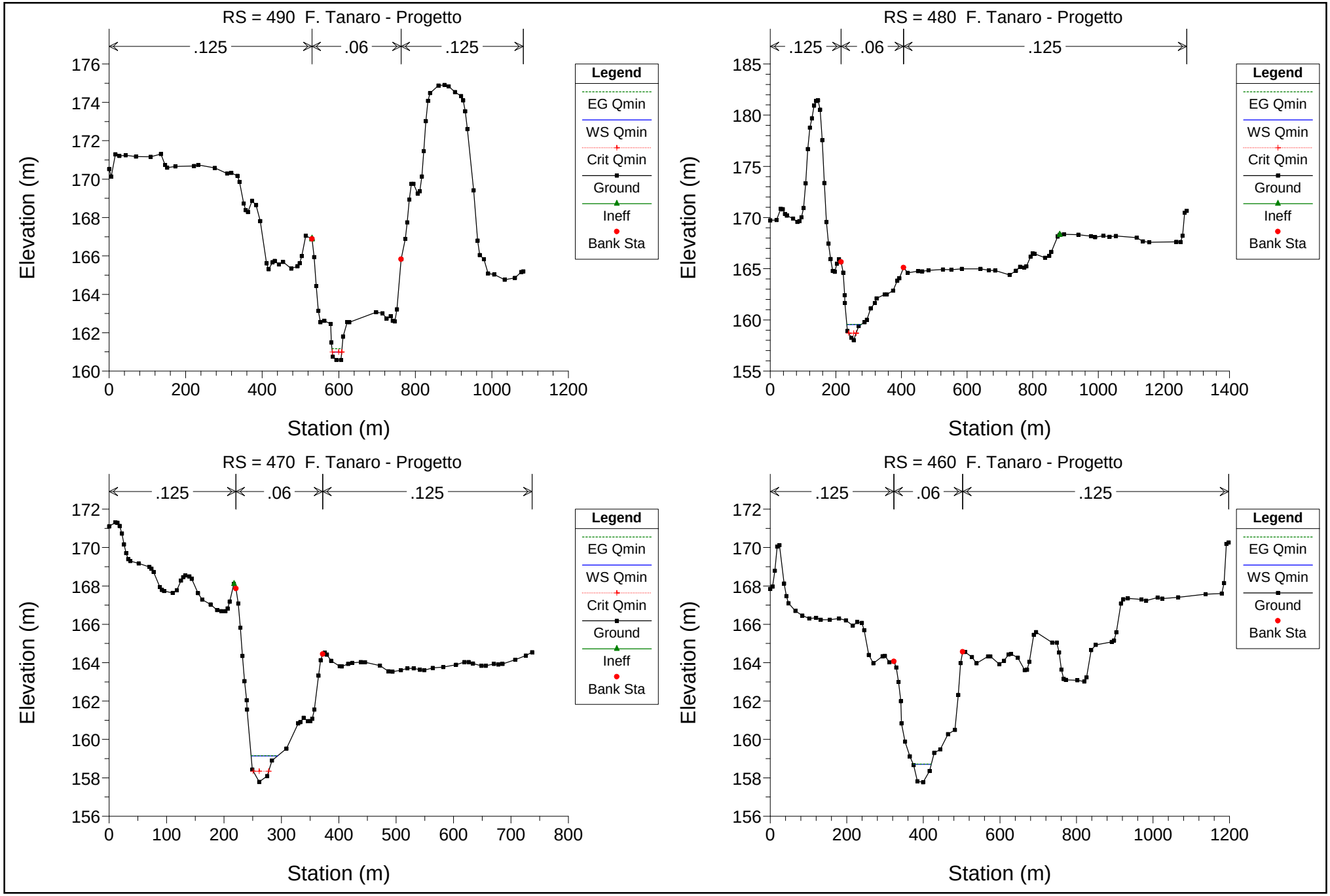
470
480
490
500
510
530
550
560
580
600
610
630
640

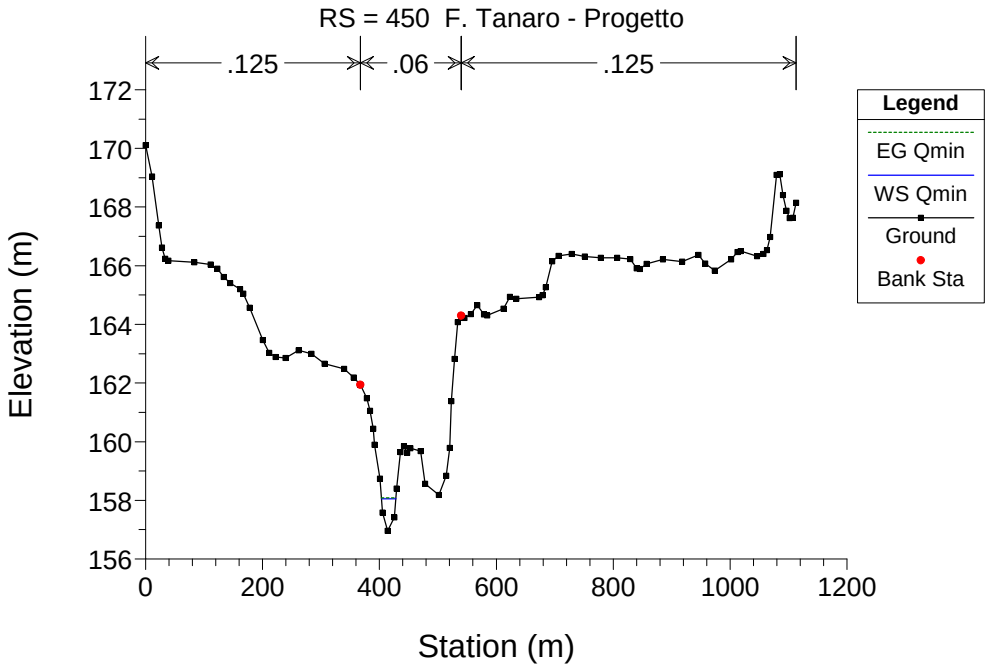

RS = 650 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
RS = 640 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
RS = 630 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Bank Sta

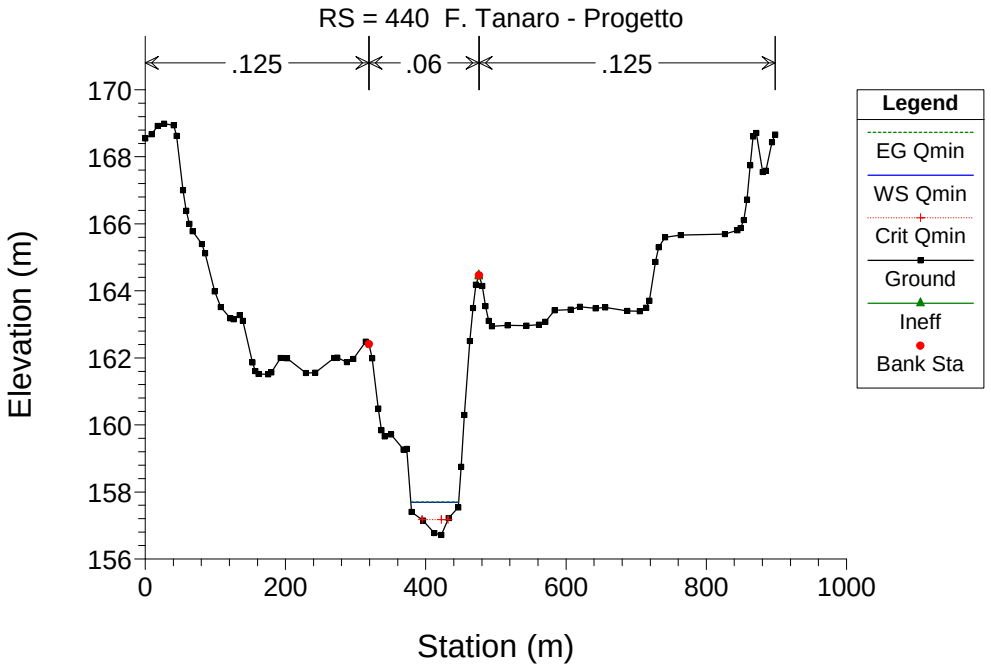

RS = 610 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
RS = 600 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 590 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 580 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta

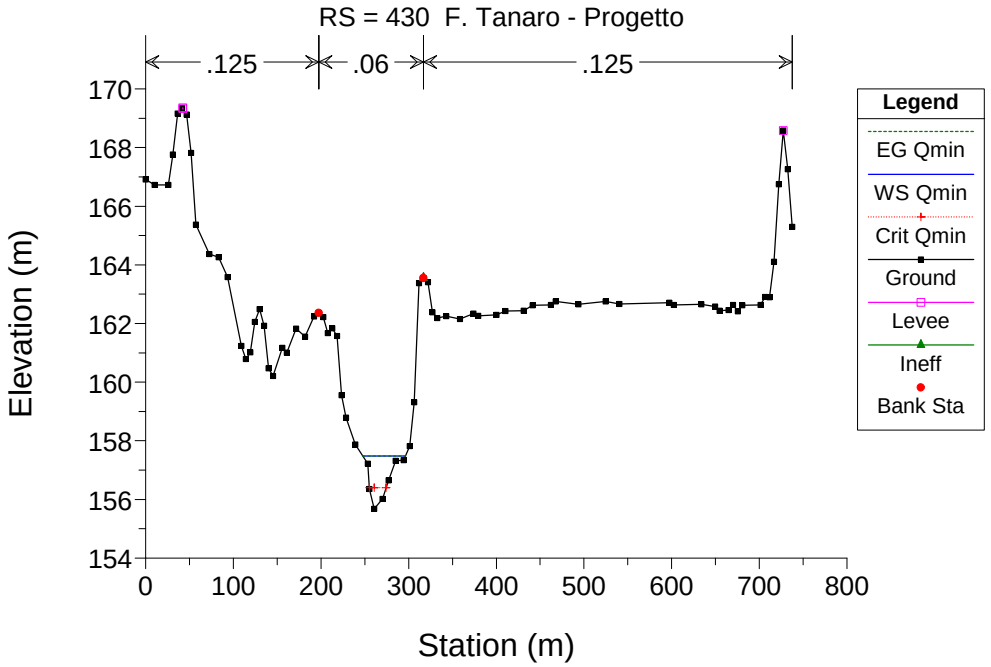

RS = 570 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Progetto
RS = 550 F. Tanaro - Progetto
RS = 540 F. Tanaro - Progetto

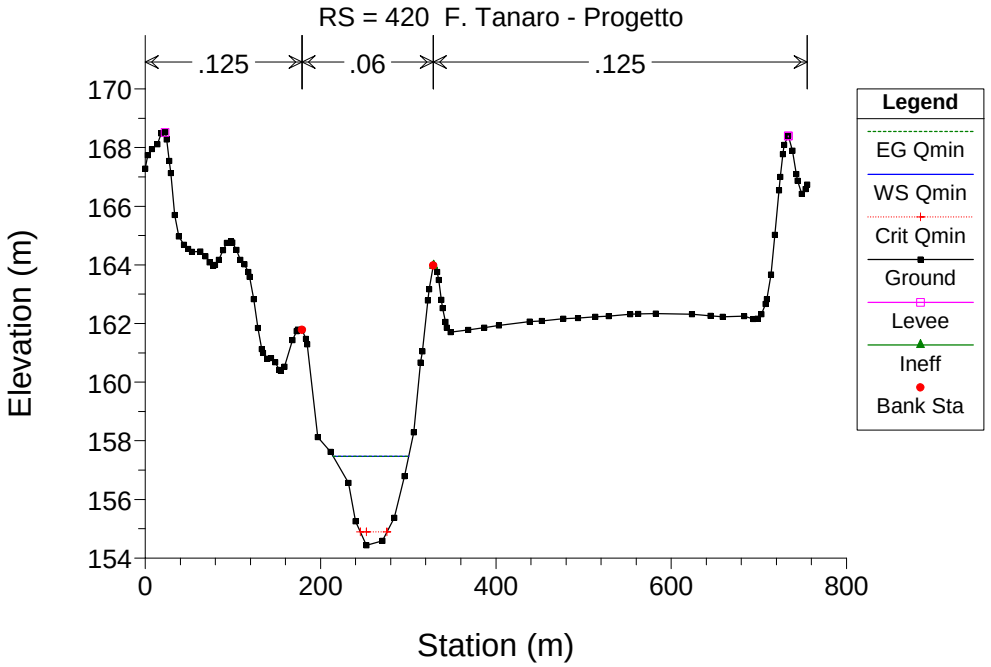

RS = 530 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmin
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)

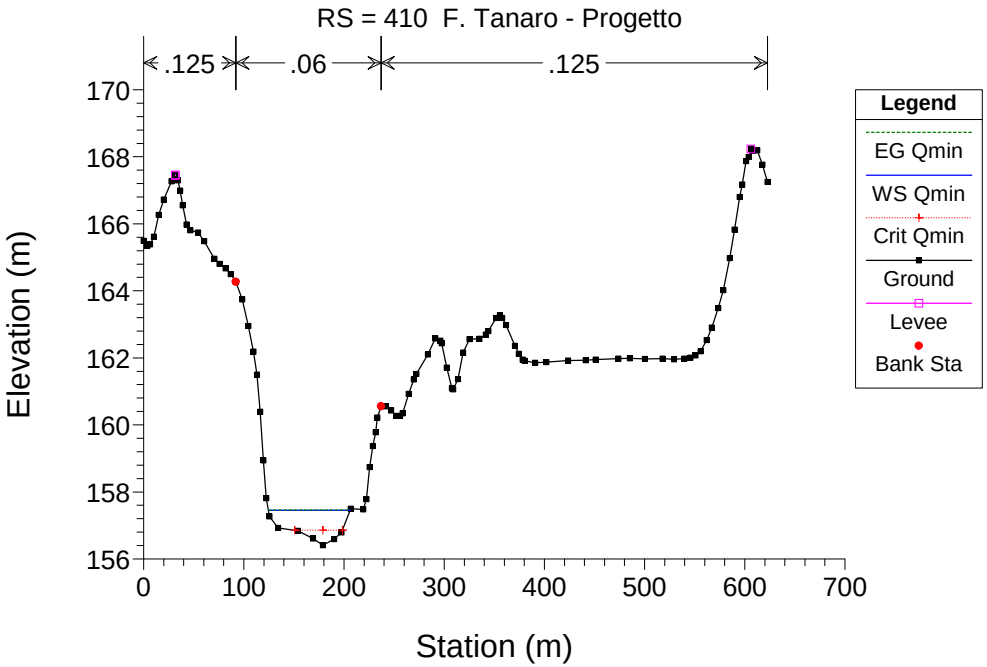

RS = 490 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Progetto
RS = 470 F. Tanaro - Progetto
RS = 460 F. Tanaro - Progetto

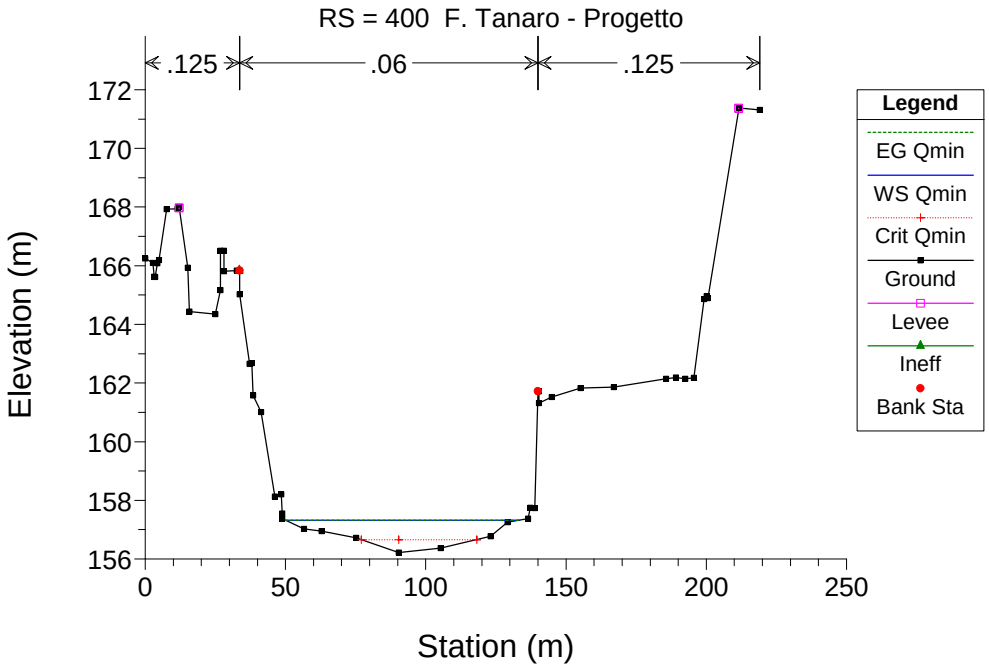

RS = 450 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Bank Sta

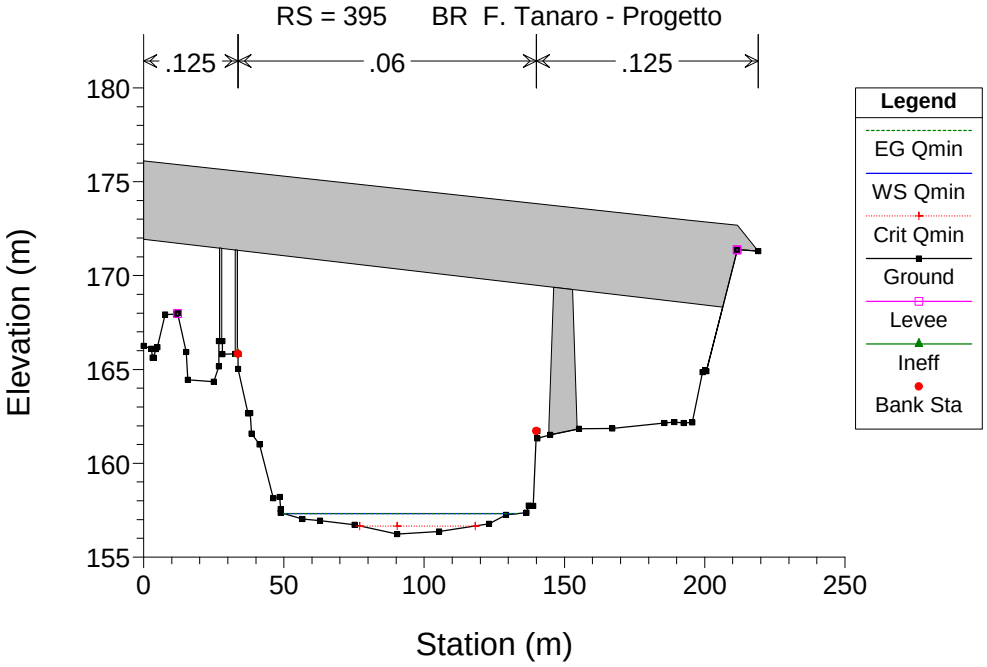

RS = 440 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta

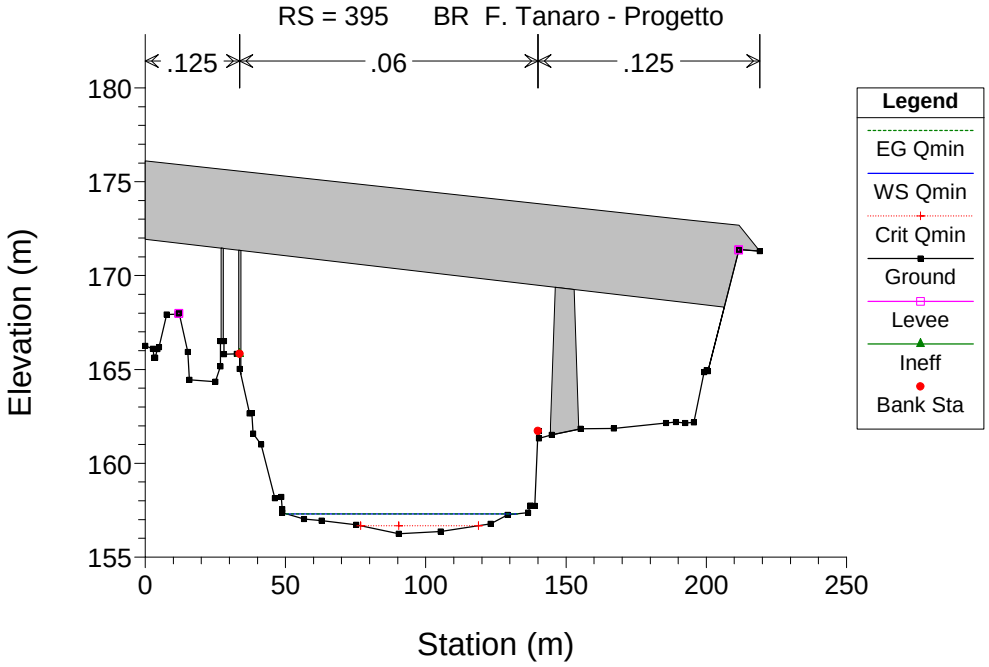

RS = 430 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta

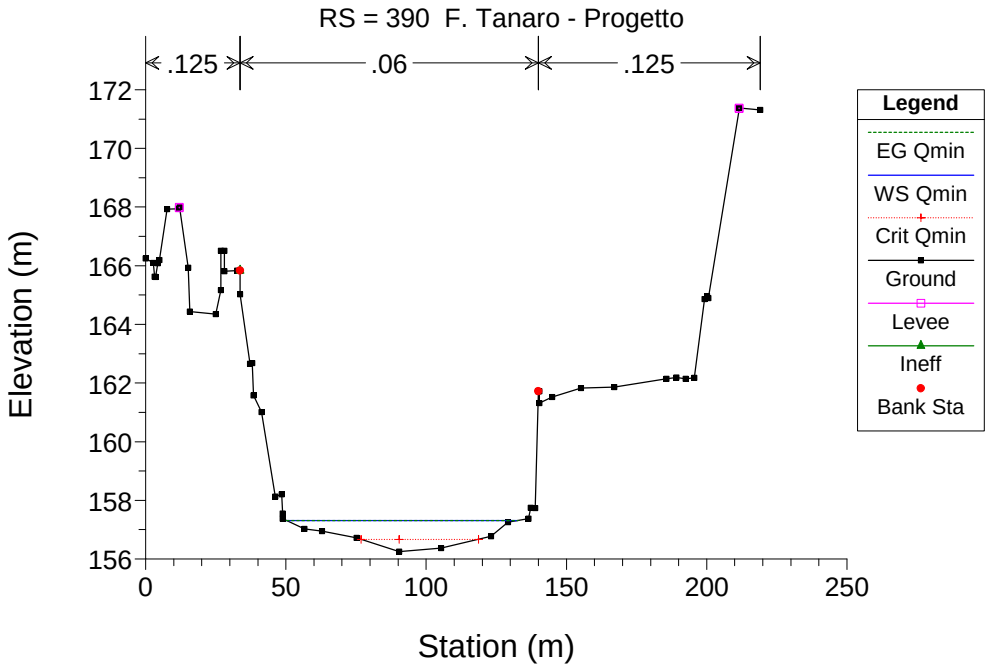

RS = 420 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta

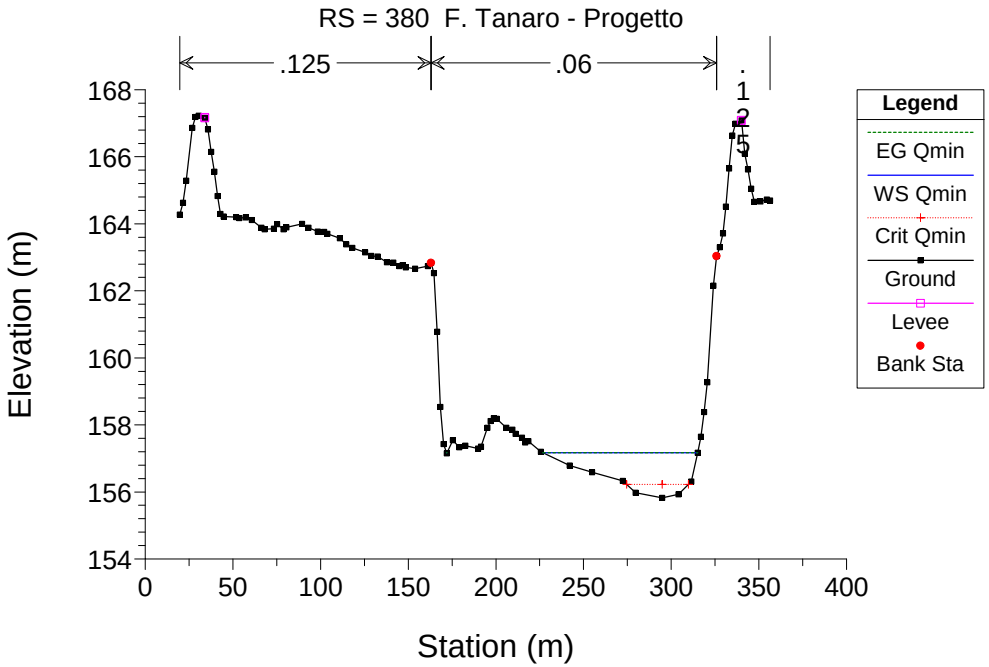

RS = 410 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta

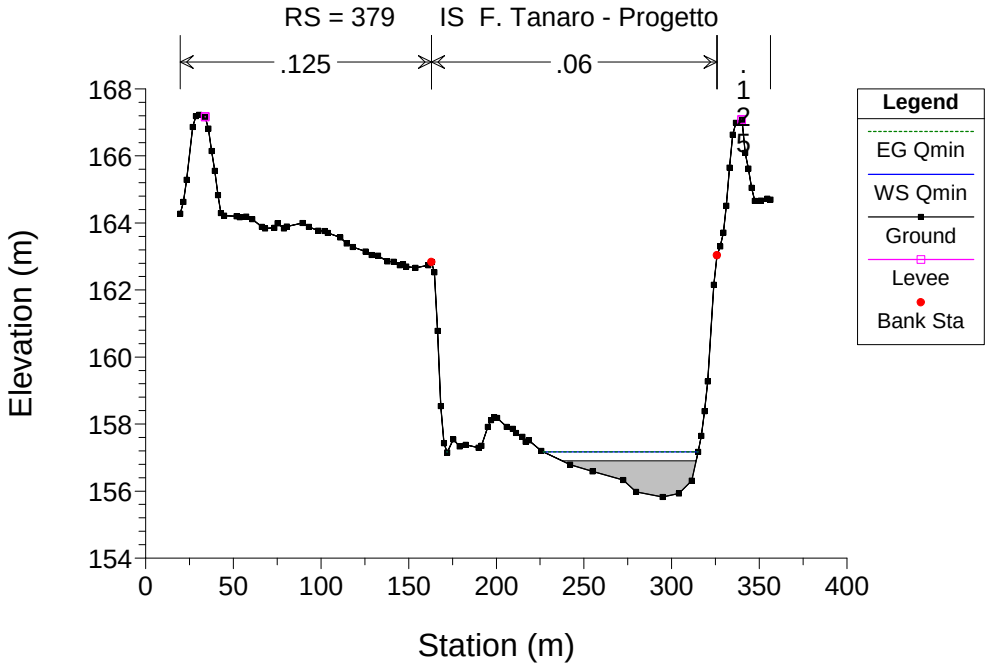

RS = 400 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta

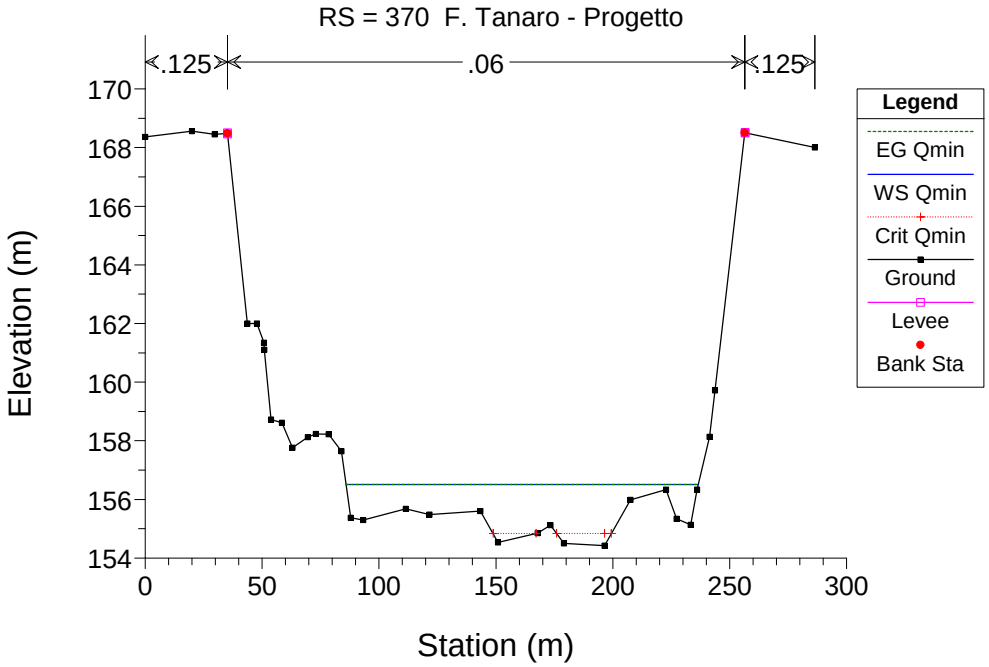

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta

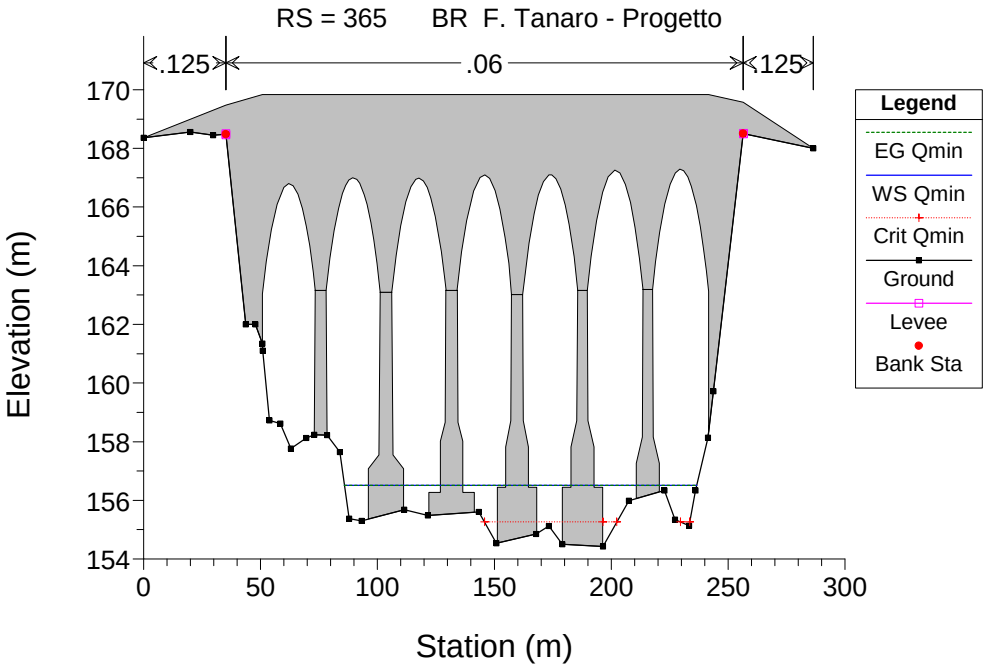

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta


RS = 390 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta


RS = 380 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta


RS = 379 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Levee
Bank Sta


RS = 370 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta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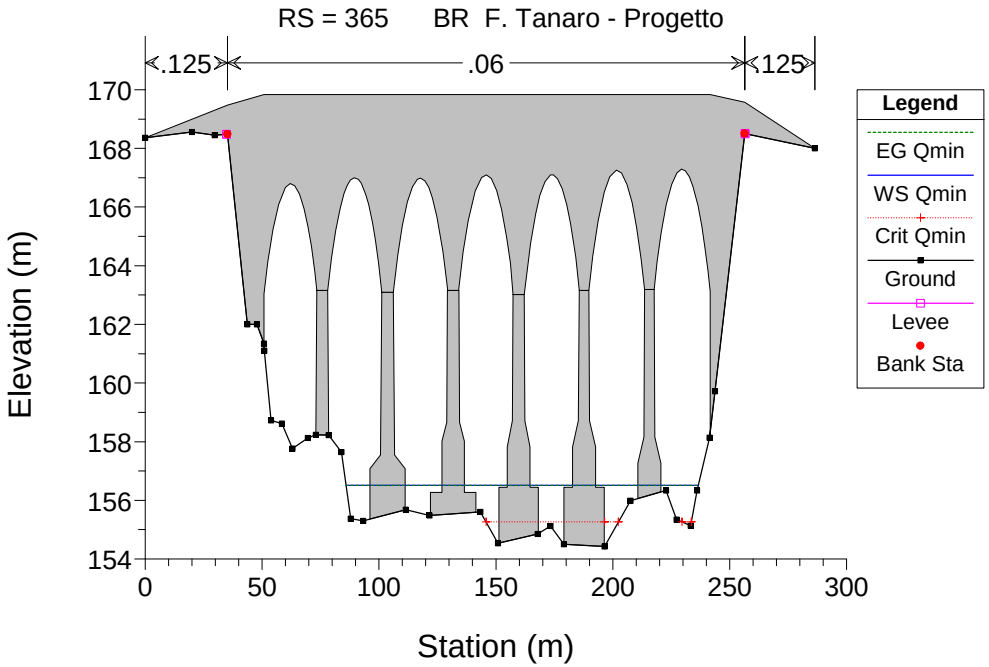
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta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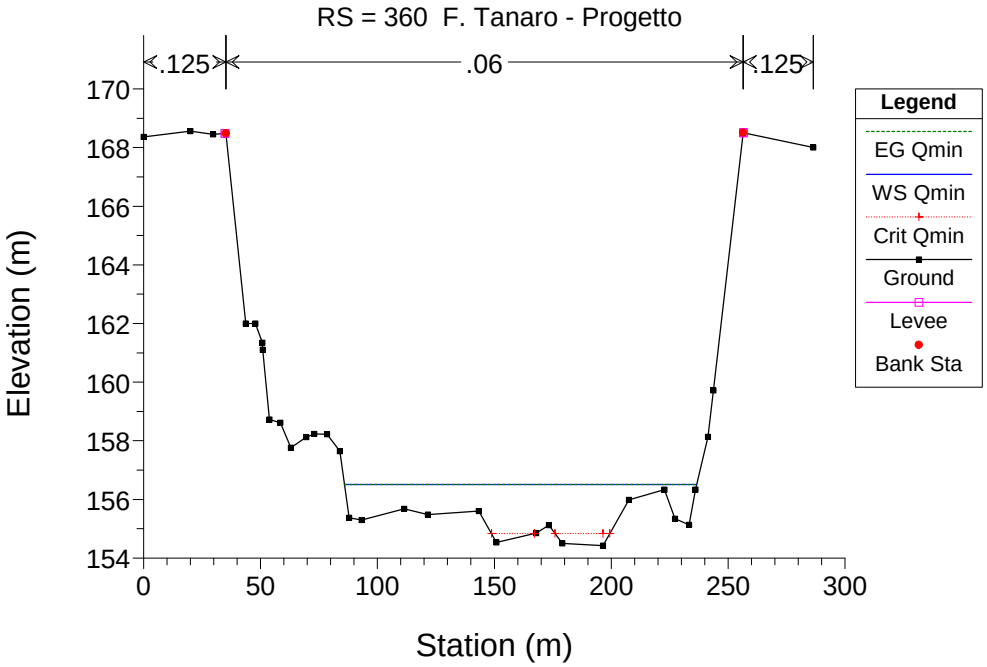
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta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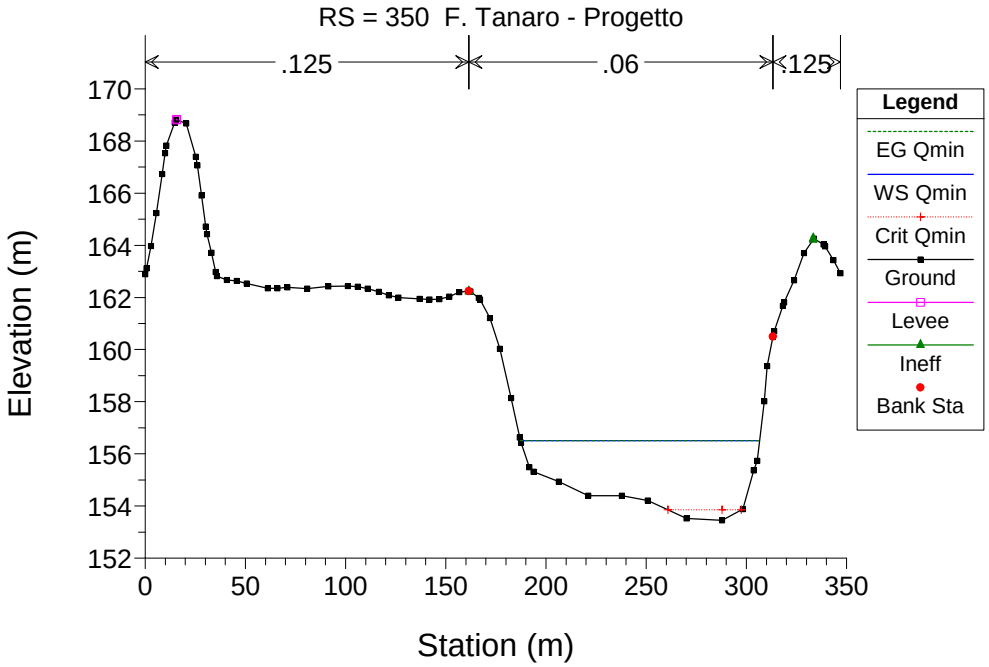
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta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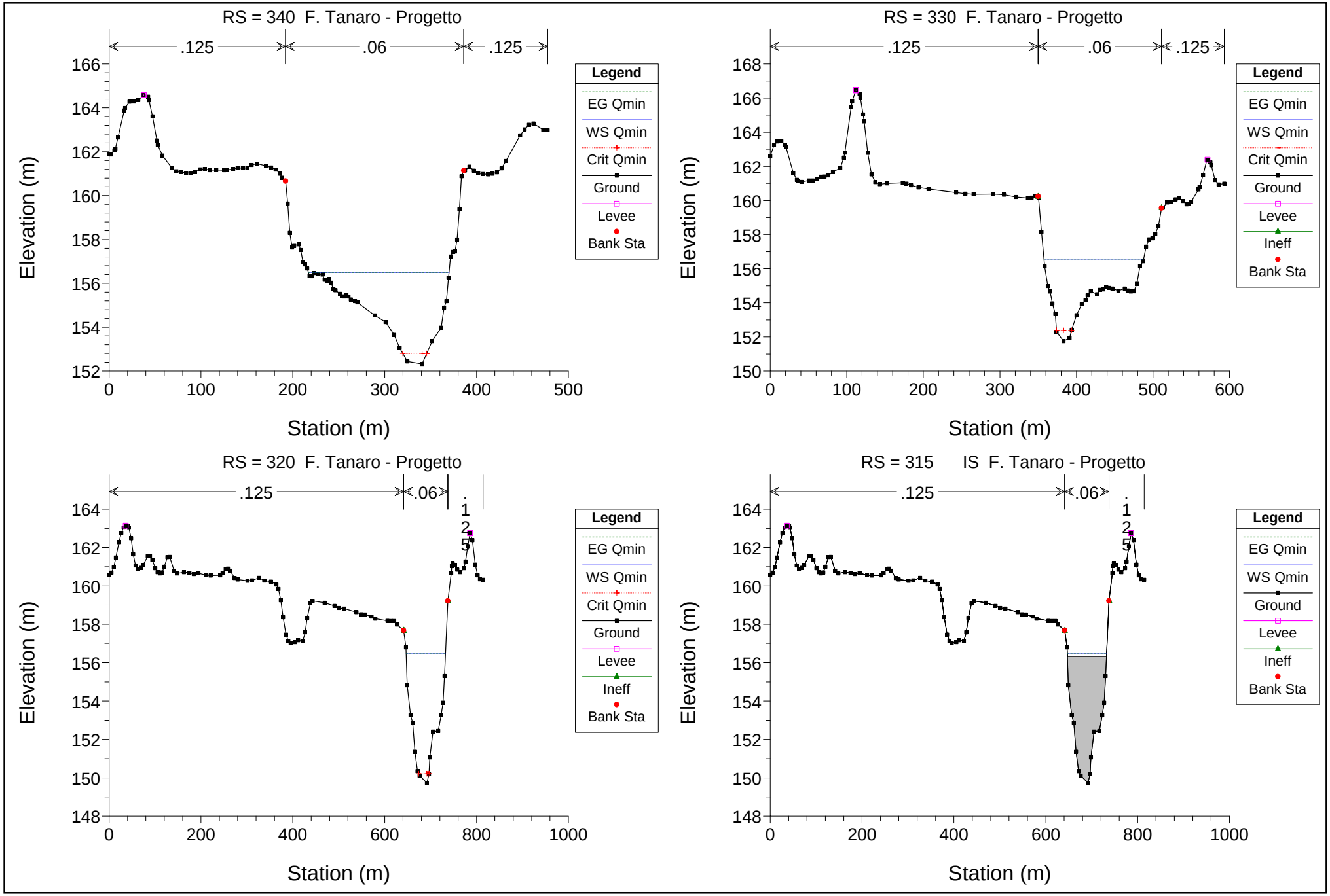
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta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Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 315 IS F. Tanaro - Progetto
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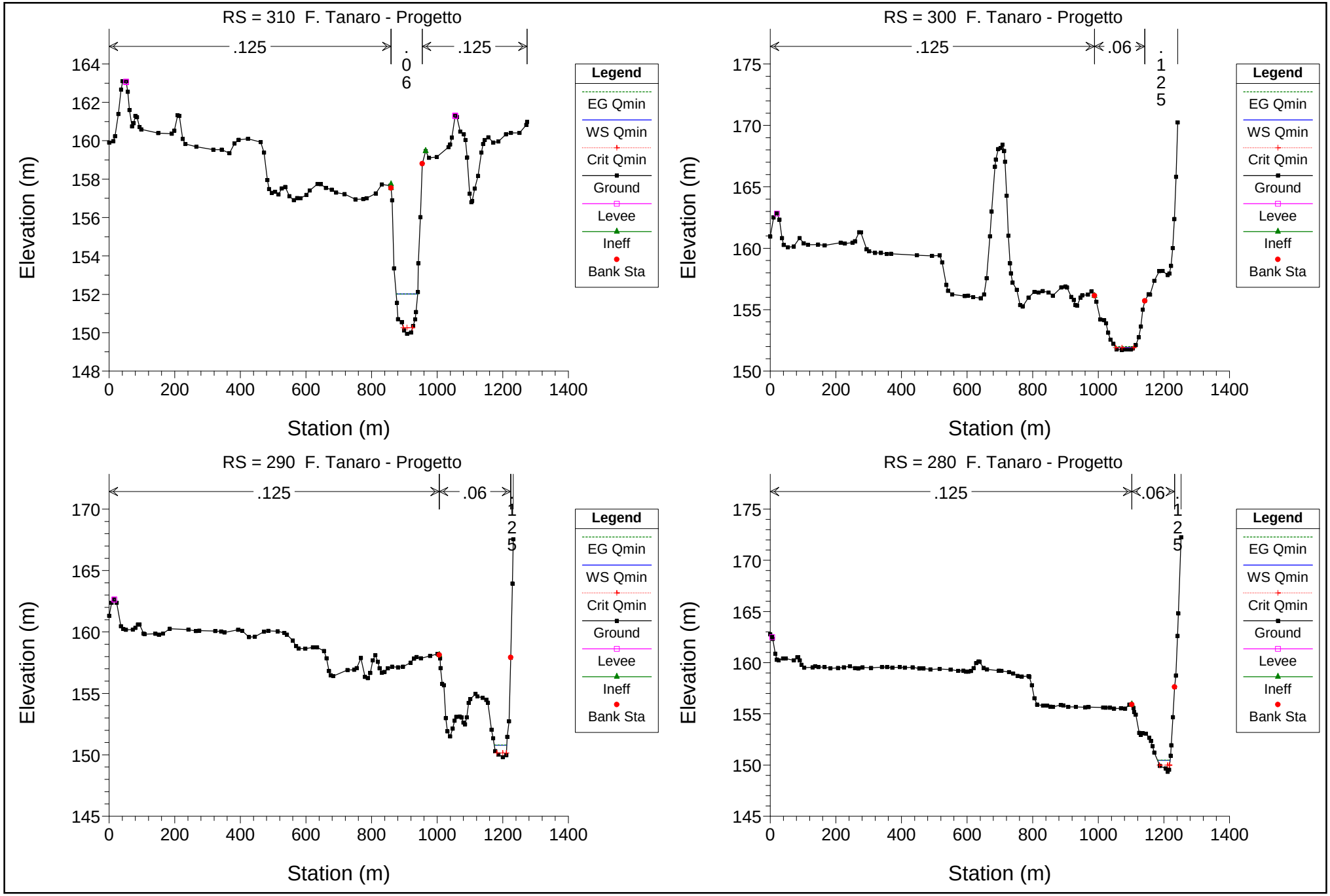
.06
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Ground
Levee
Ineff
Bank Sta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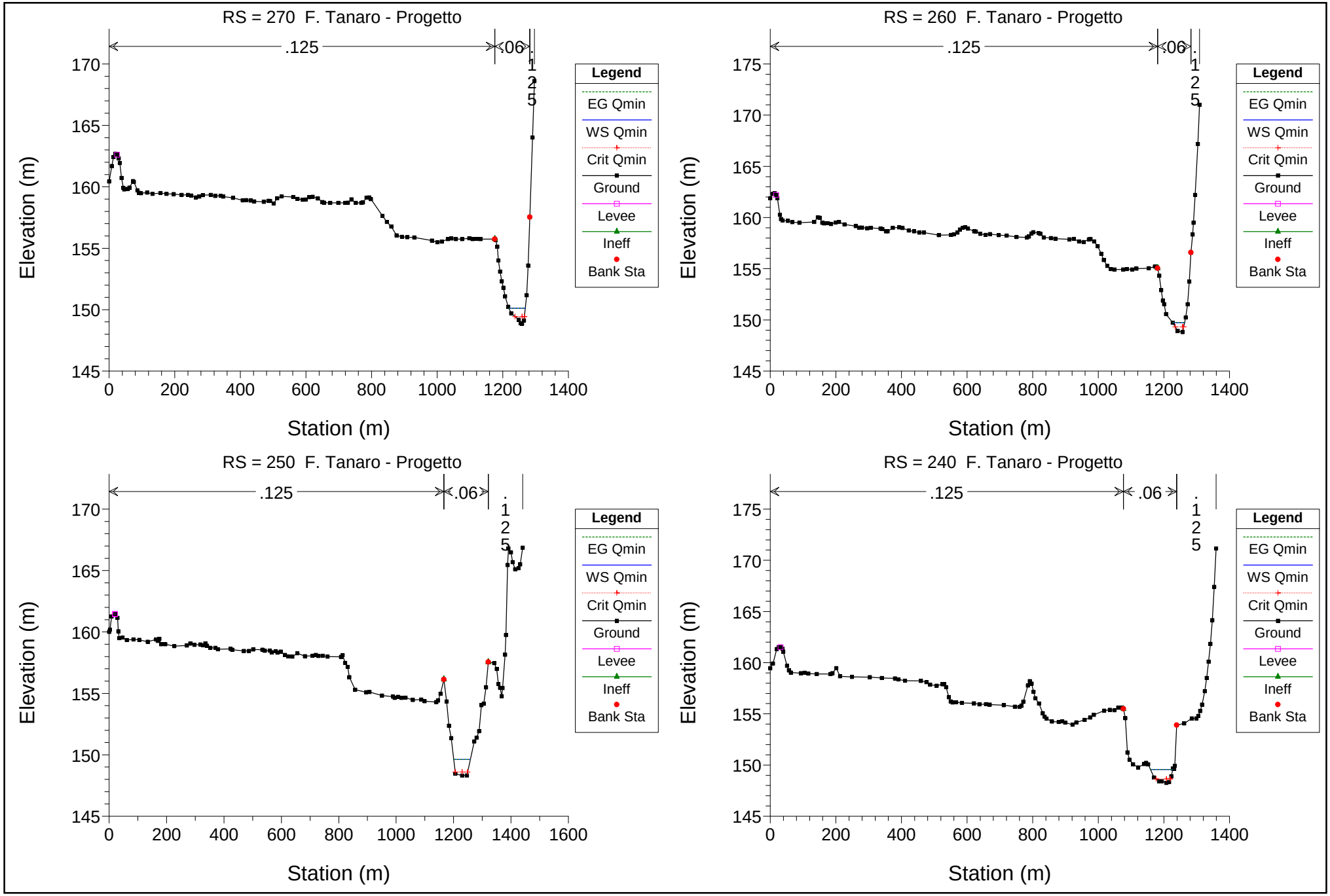
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 300 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 290 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 280 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)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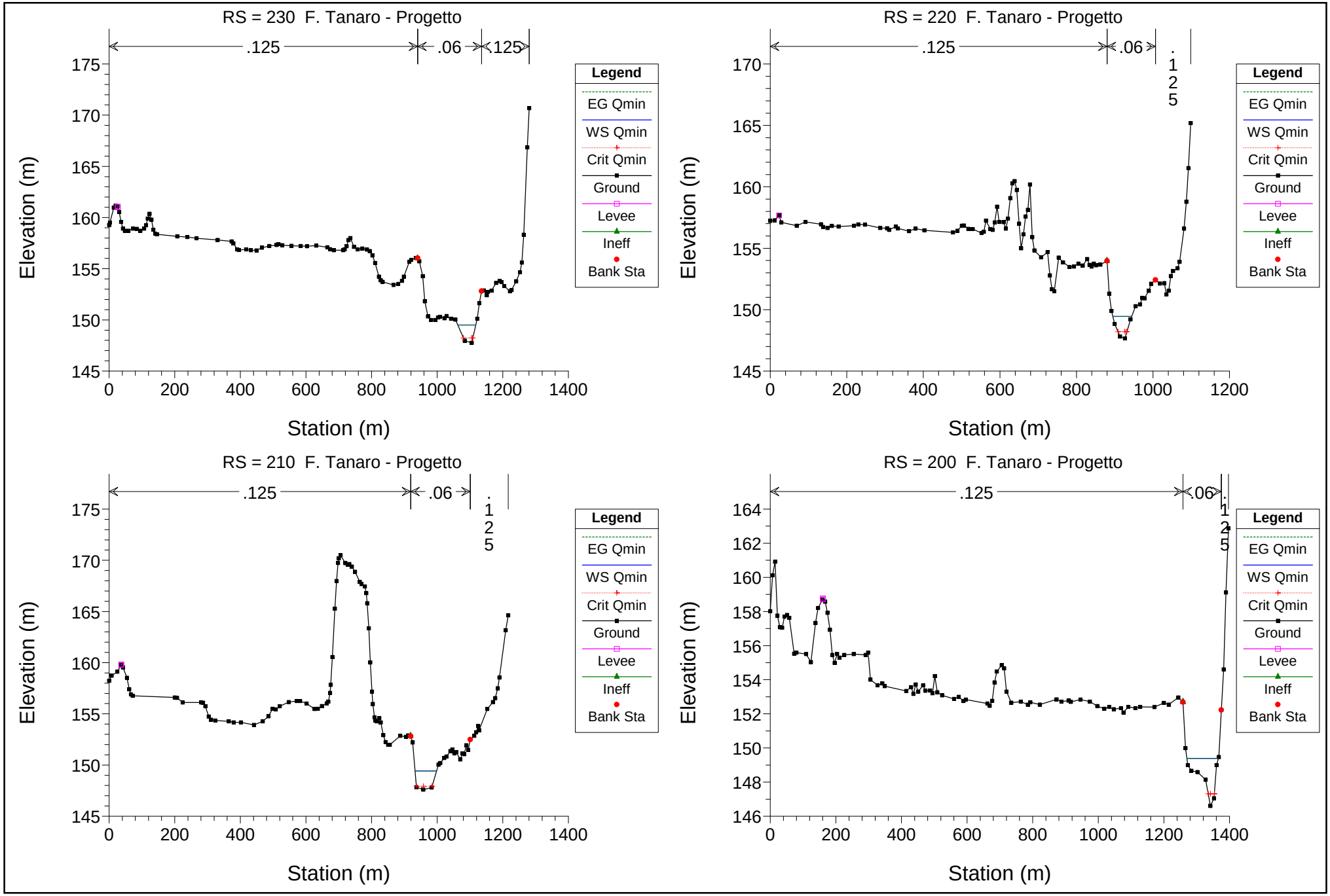
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 260 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta


RS = 230 F. Tanaro - Progetto
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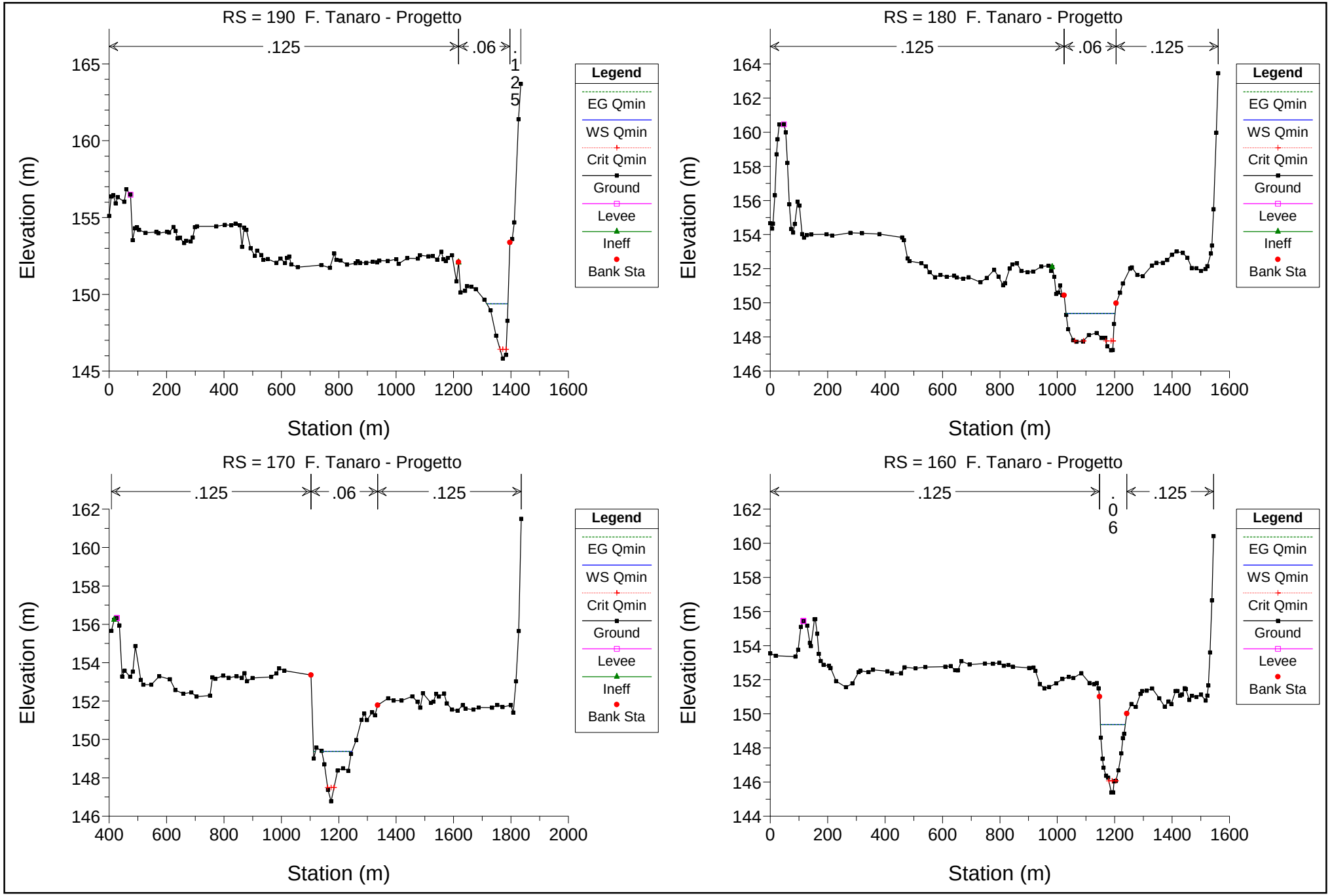
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 220 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta


RS = 190 F. Tanaro - Progetto
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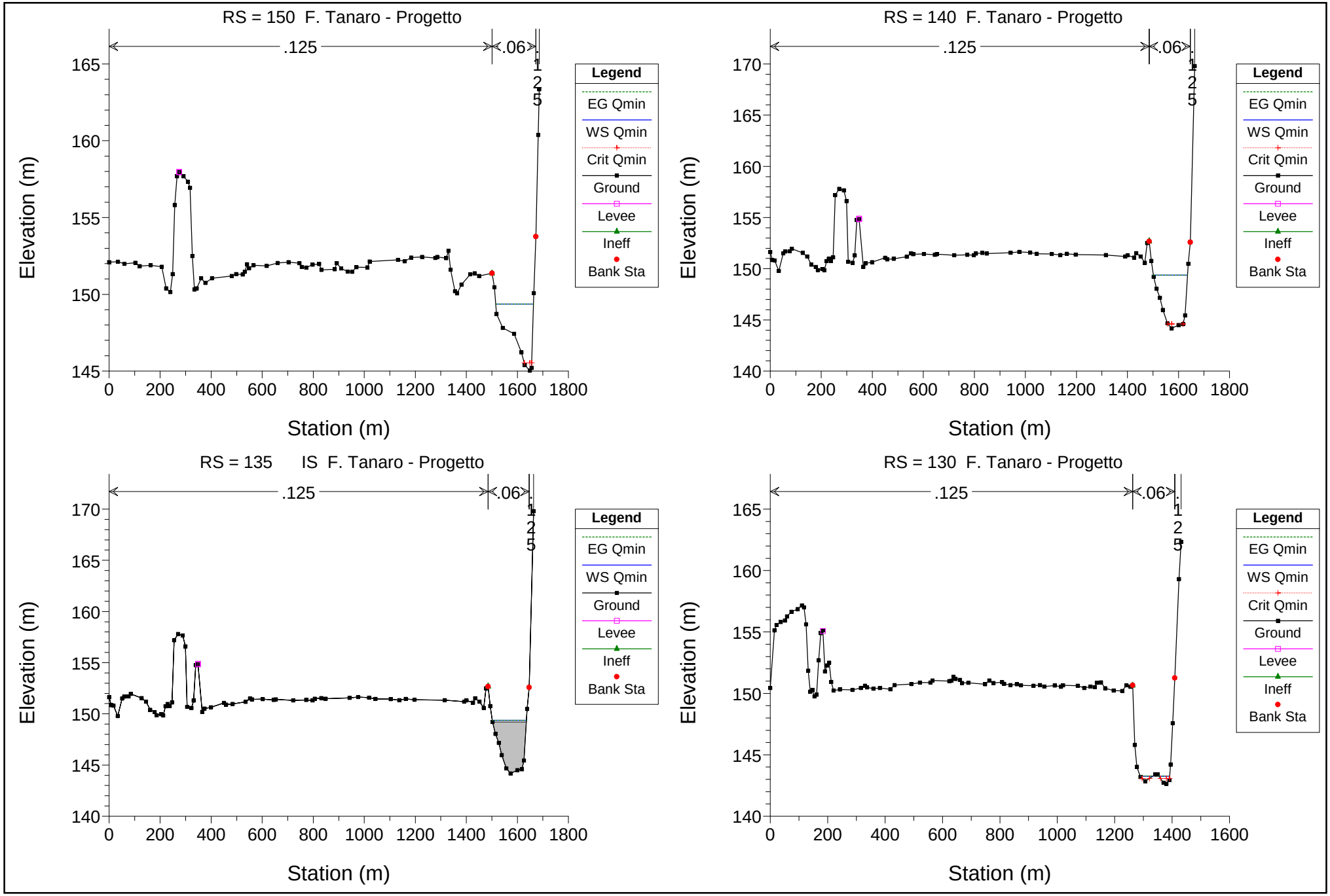
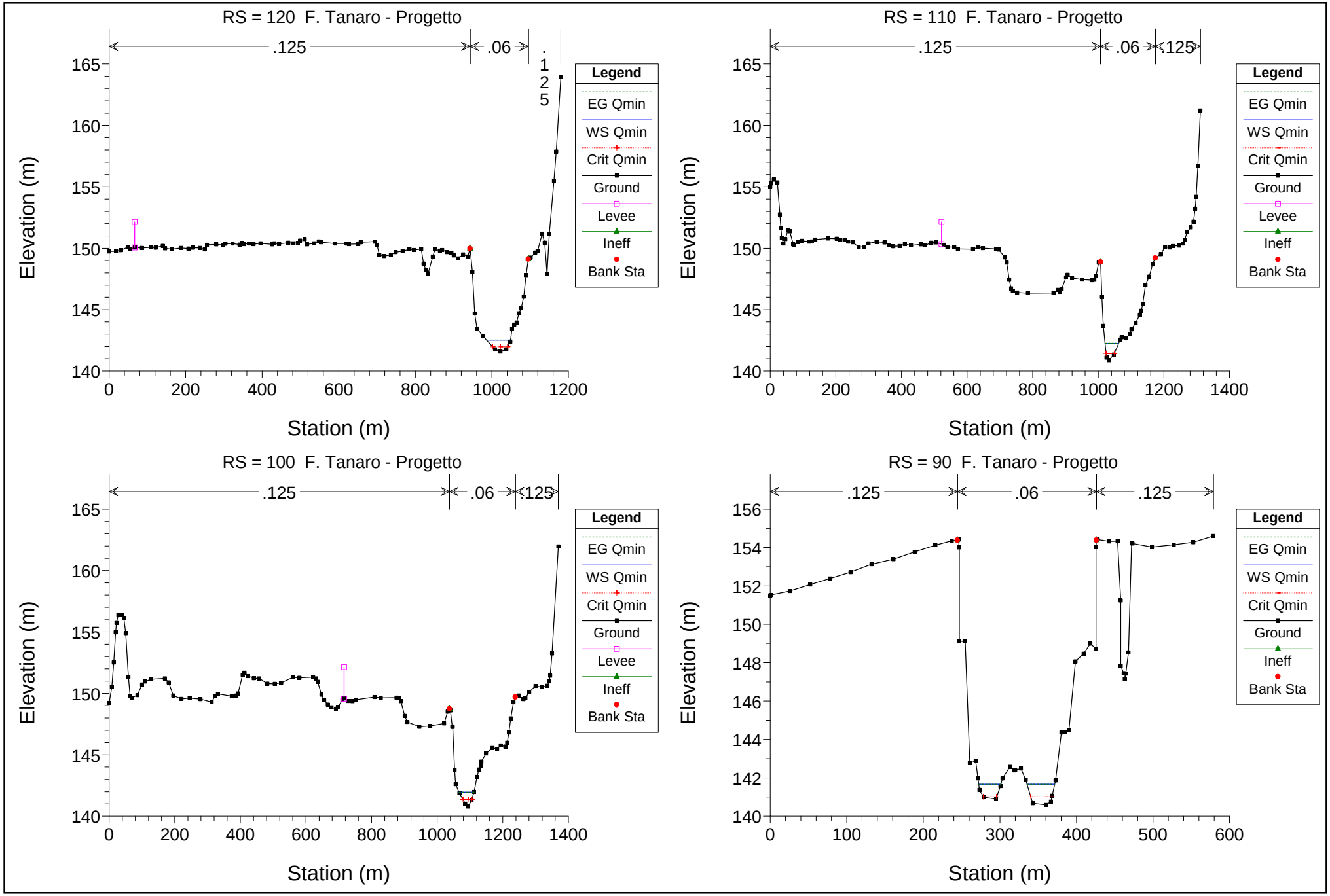
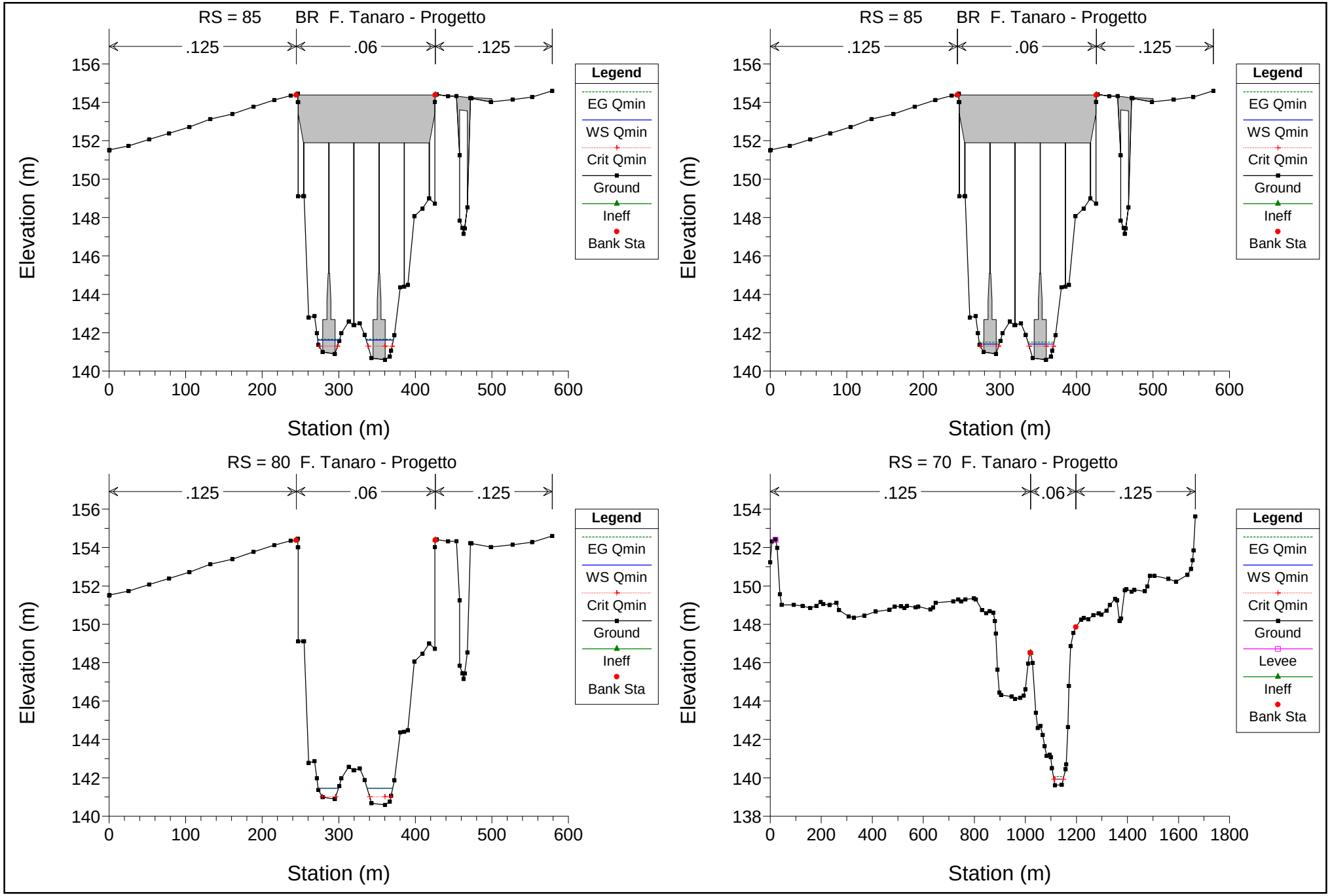
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 180 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 170 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 160 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)


RS = 150 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 140 F. Tanaro - Progetto
RS = 135 IS F. Tanaro - Progetto
RS = 130 F. Tanaro - Progetto


RS = 120 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 110 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 100 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
RS = 90 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)


RS = 85 BR F. Tanaro - Progetto
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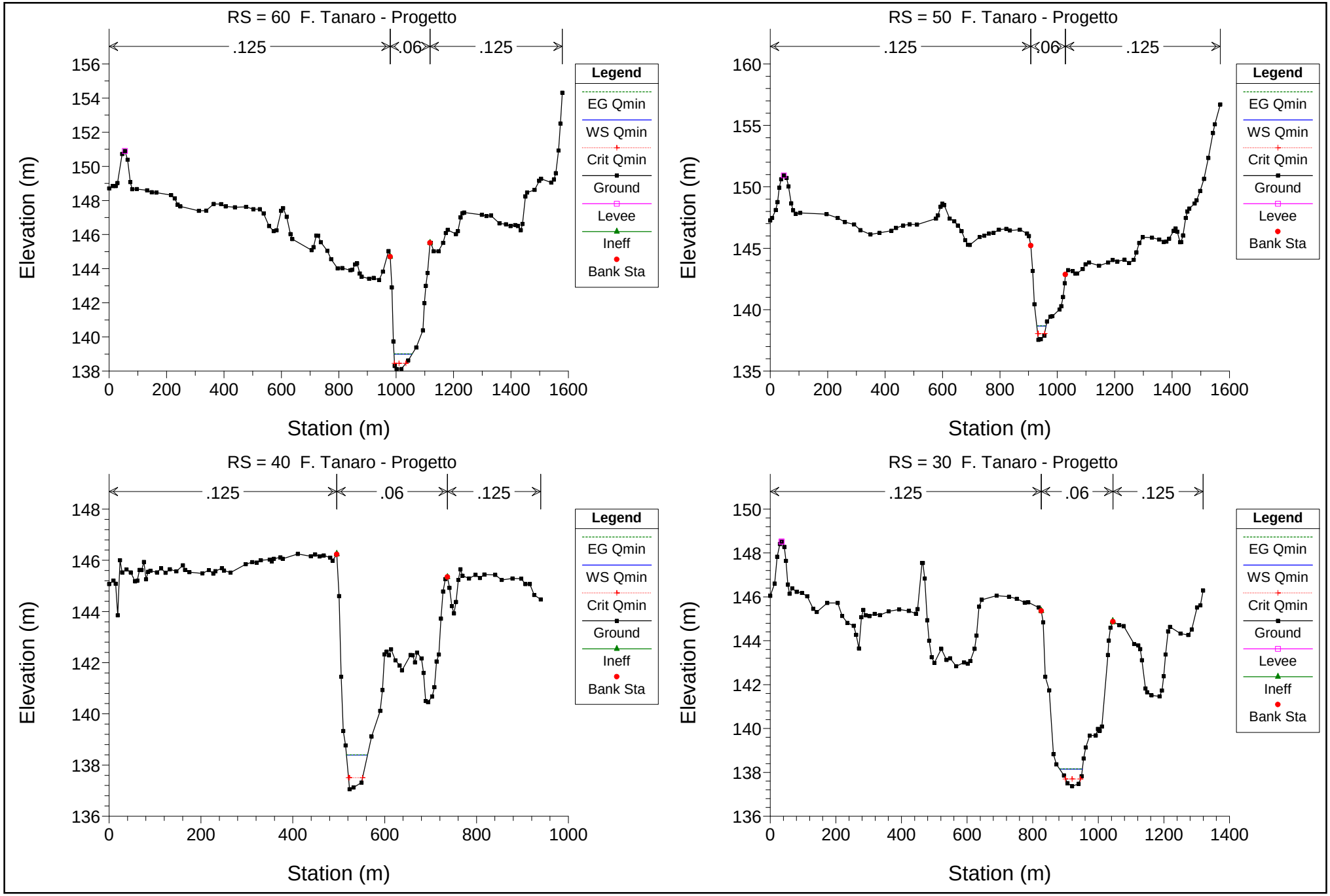
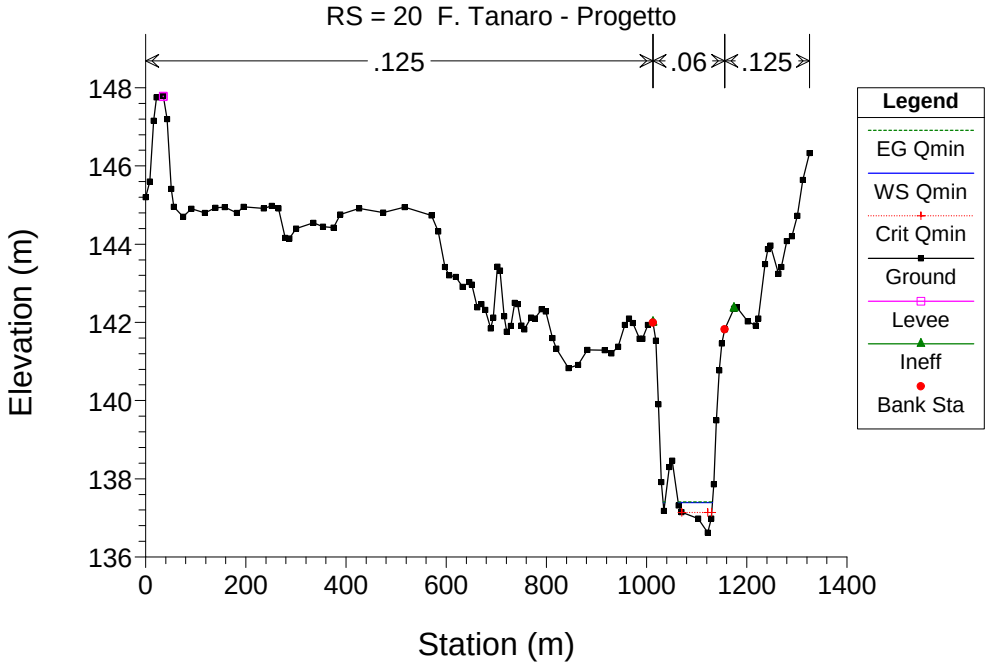
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Ineff
Bank Sta
RS = 85 BR F. Tanaro - Progetto
RS = 80 F. Tanaro - Progetto
RS = 70 F. Tanaro - Progetto
Levee


RS = 60 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta
RS = 50 F. Tanaro - Progetto
RS = 40 F. Tanaro - Progetto
RS = 30 F. Tanaro - Progetto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.06
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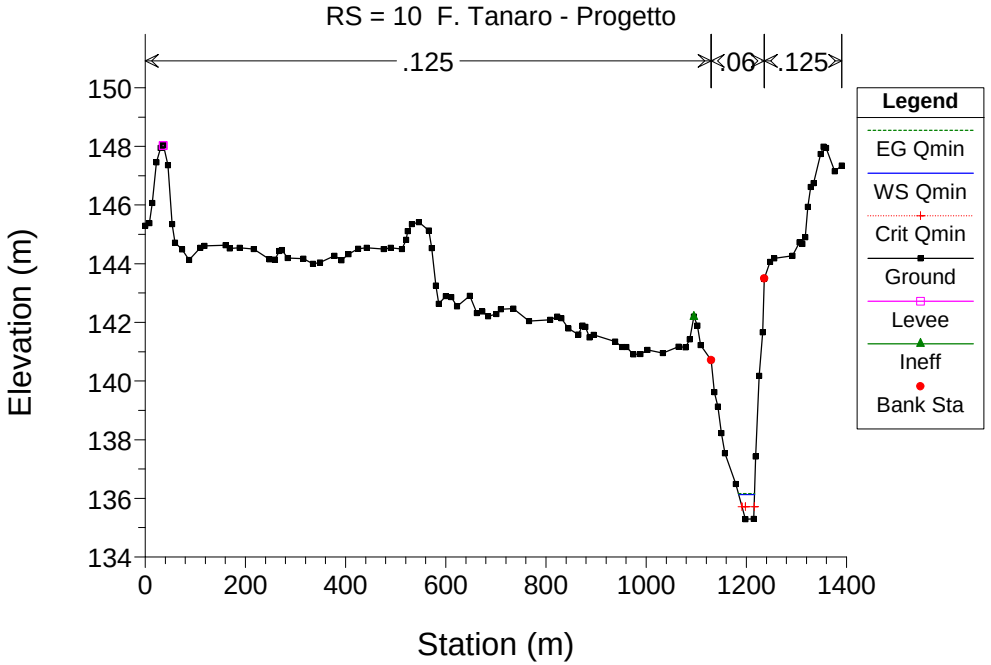
Elevation (m)
148
146
144
142
140
138
136
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG Qmin
WS Qmin
Crit Qmin
Ground
Levee
Ineff
Bank Sta

SITUAZIONE ATTUALE
SIMULAZIONE 9

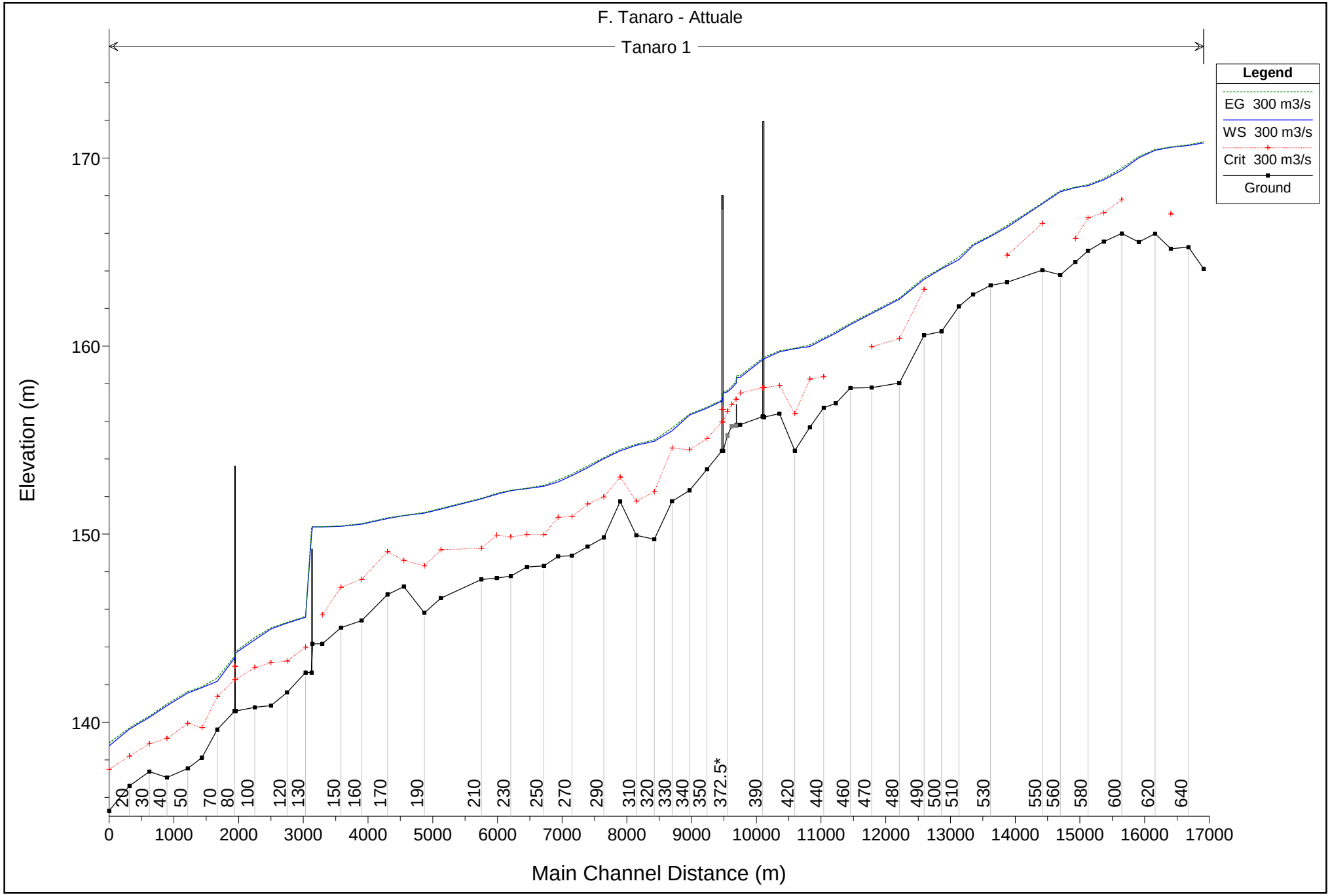
Corso d'acqua	**Portata Q m^3/s**	**Portata**
Fiume Tanaro	300.00 in alveo	Massima di funzionamento dell'impianto

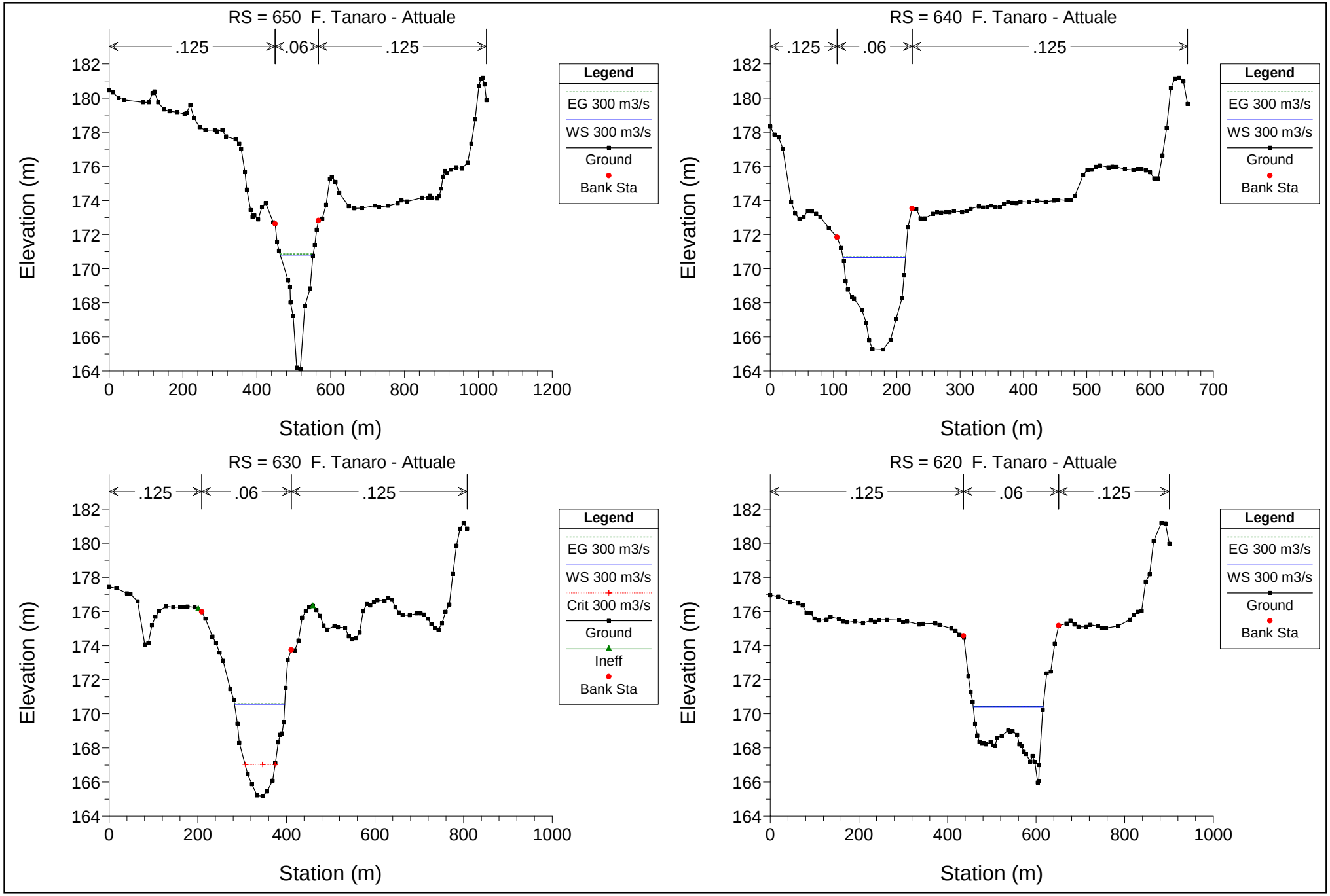
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 300 m3/s

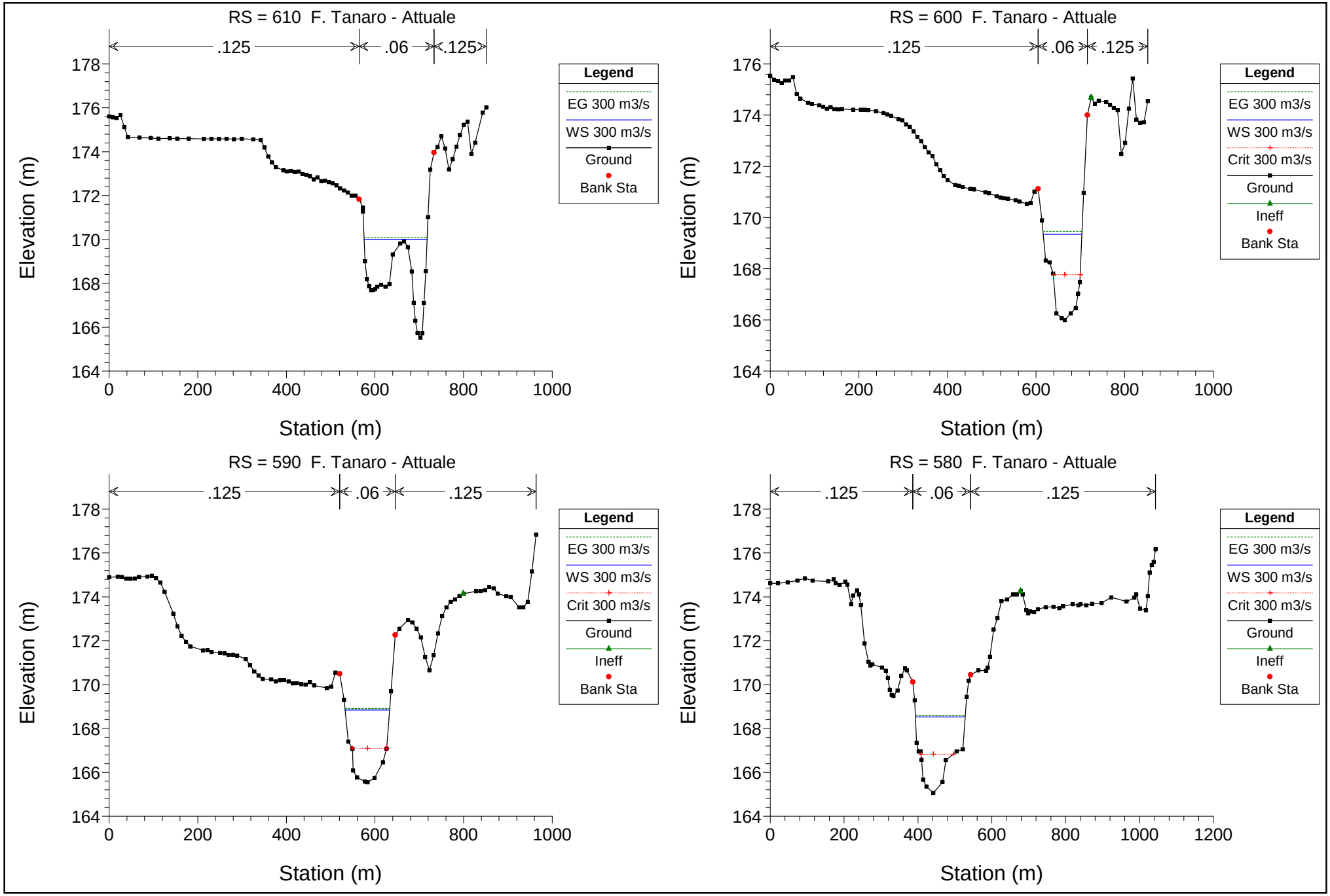
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	300 m3/s	300.00	164.11	170.80		170.87	0.001074	1.13	266.48	88.33	0.21
1	640	300 m3/s	300.00	165.26	170.66		170.70	0.000467	0.84	356.86	98.89	0.14
1	630	300 m3/s	300.00	165.18	170.56	167.03	170.59	0.000331	0.72	417.27	113.30	0.12
1	620	300 m3/s	300.00	165.98	170.42		170.46	0.001060	0.89	335.77	157.52	0.20
1	610	300 m3/s	300.00	165.53	170.01		170.08	0.002192	1.16	259.59	142.32	0.27
1	600	300 m3/s	300.00	165.99	169.35	167.77	169.46	0.002512	1.47	204.32	86.96	0.31
1	590	300 m3/s	300.00	165.55	168.84	167.09	168.91	0.001540	1.20	250.69	100.51	0.24
1	580	300 m3/s	300.00	165.06	168.53	166.82	168.58	0.001153	0.98	307.09	134.83	0.21
1	570	300 m3/s	300.00	164.47	168.43	165.72	168.45	0.000378	0.68	442.60	145.52	0.12
1	560	300 m3/s	300.00	163.78	168.21		168.27	0.002317	1.11	270.74	165.54	0.28
1	550	300 m3/s	300.00	164.04	167.57	166.52	167.62	0.002382	0.95	316.96	287.32	0.27
1	540	300 m3/s	300.00	163.39	166.32	164.83	166.41	0.002028	1.32	229.24	107.70	0.27
1	530	300 m3/s	300.00	163.23	165.83		165.89	0.002007	1.11	270.75	149.52	0.26
1	520	300 m3/s	300.00	162.75	165.36		165.41	0.001582	1.08	278.01	133.31	0.24
1	510	300 m3/s	300.00	162.10	164.60		164.74	0.007899	1.68	178.63	147.59	0.49
1	500	300 m3/s	300.00	160.77	164.11		164.15	0.000940	0.93	324.32	132.02	0.19
1	490	300 m3/s	300.00	160.58	163.55	163.01	163.64	0.005450	1.31	229.41	208.70	0.40
1	480	300 m3/s	300.00	158.04	162.50	160.40	162.56	0.001720	1.12	268.35	129.45	0.25
1	470	300 m3/s	300.00	157.79	161.73	159.96	161.80	0.001833	1.18	253.54	118.00	0.26
1	460	300 m3/s	300.00	157.77	161.15		161.21	0.001767	1.08	276.67	143.31	0.25
1	450	300 m3/s	300.00	156.96	160.69		160.76	0.002198	1.19	253.11	134.48	0.28
1	440	300 m3/s	300.00	156.72	160.37	158.37	160.43	0.001453	1.09	275.58	122.08	0.23
1	430	300 m3/s	300.00	155.68	159.97	158.25	160.07	0.001896	1.36	220.57	85.03	0.27
1	420	300 m3/s	300.00	154.44	159.86	156.41	159.89	0.000349	0.71	421.41	120.96	0.12
1	410	300 m3/s	300.00	156.41	159.69	157.90	159.75	0.001140	1.04	287.70	113.40	0.21
1	400	300 m3/s	300.00	156.22	159.32	157.79	159.40	0.001776	1.27	236.40	95.08	0.26
1	395		Bridge									
1	390	300 m3/s	300.00	156.25	159.28	157.79	159.37	0.001884	1.29	232.11	95.00	0.26
1	380	300 m3/s	300.00	155.82	158.33	157.50	158.43	0.004179	1.38	217.80	149.96	0.36
1	379		Inl Struct									
1	370	300 m3/s	300.00	154.43	157.49	155.96	157.53	0.001063	0.90	333.53	155.26	0.20
1	365		Bridge									
1	360	300 m3/s	300.00	154.43	157.08	155.97	157.14	0.002102	1.11	270.38	153.35	0.27
1	350	300 m3/s	300.00	153.45	156.70	155.09	156.76	0.001303	1.06	283.00	120.29	0.22
1	340	300 m3/s	300.00	152.32	156.33	154.48	156.39	0.001489	1.05	286.24	137.02	0.23
1	330	300 m3/s	300.00	151.75	155.49	154.59	155.64	0.006444	1.72	174.90	119.71	0.45
1	320	300 m3/s	300.00	149.73	154.94	152.25	155.01	0.001096	1.18	254.57	80.31	0.21
1	310	300 m3/s	300.00	149.94	154.73	151.75	154.78	0.000642	1.01	297.71	79.09	0.17
1	300	300 m3/s	300.00	151.73	154.43	153.03	154.51	0.002247	1.22	246.70	128.91	0.28
1	290	300 m3/s	300.00	149.81	154.02	151.98	154.07	0.001320	1.01	296.49	135.34	0.22

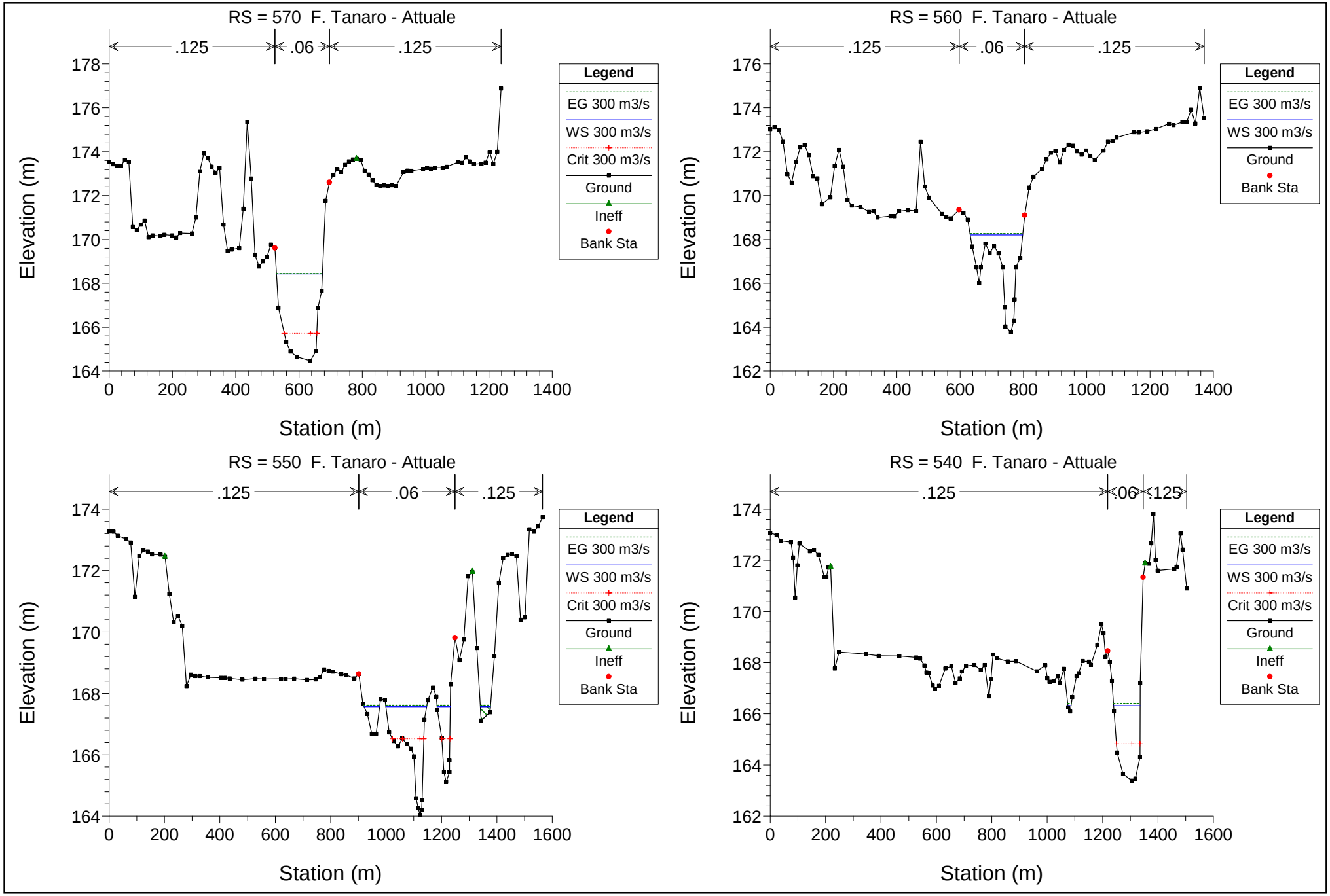
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 300 m3/s (Continued)

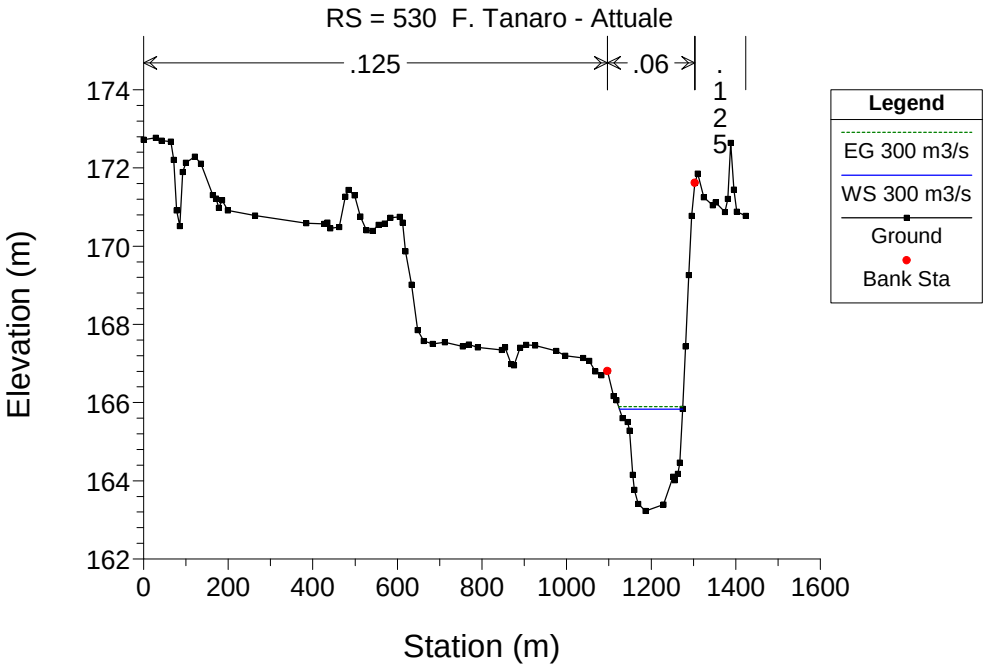
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	280	300 m3/s	300.00	149.34	153.53	151.61	153.63	0.002478	1.37	219.50	102.75	0.30
1	270	300 m3/s	300.00	148.86	153.11	150.93	153.19	0.001307	1.22	246.56	85.03	0.23
1	260	300 m3/s	300.00	148.81	152.78	150.90	152.87	0.001717	1.33	224.81	82.96	0.26
1	250	300 m3/s	300.00	148.31	152.55	149.97	152.60	0.000879	0.98	305.11	108.06	0.19
1	240	300 m3/s	300.00	148.26	152.42	149.99	152.44	0.000395	0.68	442.84	150.14	0.13
1	230	300 m3/s	300.00	147.77	152.31	149.85	152.34	0.000447	0.67	449.40	171.57	0.13
1	220	300 m3/s	300.00	147.66	152.12	149.95	152.18	0.001284	1.09	282.30	136.15	0.22
1	210	300 m3/s	300.00	147.59	151.88	149.25	151.91	0.000949	0.84	357.50	170.02	0.18
1	200	300 m3/s	300.00	146.60	151.33	149.16	151.37	0.000788	0.94	318.32	110.35	0.18
1	190	300 m3/s	300.00	145.82	151.11	148.31	151.15	0.000945	0.83	359.33	175.22	0.18
1	180	300 m3/s	300.00	147.21	150.98	148.60	151.00	0.000276	0.56	549.50	231.71	0.11
1	170	300 m3/s	300.00	146.78	150.83	149.07	150.87	0.001023	0.86	347.14	167.50	0.19
1	160	300 m3/s	300.00	145.40	150.52	147.60	150.57	0.000594	0.92	330.21	129.92	0.16
1	150	300 m3/s	300.00	145.03	150.42	147.18	150.44	0.000258	0.59	510.05	186.99	0.10
1	140	300 m3/s	300.00	144.17	150.38	145.71	150.39	0.000112	0.47	631.63	147.43	0.07
1	135		Inl Struct									
1	130	300 m3/s	300.00	142.64	145.58	143.98	145.63	0.001200	1.01	296.34	126.92	0.21
1	120	300 m3/s	300.00	141.58	145.27	143.25	145.32	0.000994	0.97	310.30	123.78	0.19
1	110	300 m3/s	300.00	140.88	144.96	143.16	145.02	0.001471	1.11	271.17	118.31	0.23
1	100	300 m3/s	300.00	140.79	144.38	142.91	144.51	0.002933	1.57	190.88	82.44	0.33
1	90	300 m3/s	300.00	140.59	143.68	142.26	143.76	0.002052	1.22	245.87	118.45	0.27
1	85		Bridge									
1	80	300 m3/s	300.00	140.59	143.42	142.26	143.52	0.003171	1.40	214.91	117.40	0.33
1	70	300 m3/s	300.00	139.61	142.17	141.37	142.35	0.006051	1.84	162.81	95.73	0.45
1	60	300 m3/s	300.00	138.12	141.84	139.71	141.88	0.000849	0.96	312.09	110.96	0.18
1	50	300 m3/s	300.00	137.54	141.55	139.93	141.62	0.001712	1.21	246.99	104.93	0.25
1	40	300 m3/s	300.00	137.06	140.88	139.13	140.97	0.002465	1.35	222.83	106.64	0.30
1	30	300 m3/s	300.00	137.37	140.25	138.86	140.32	0.002277	1.13	264.36	154.78	0.28
1	20	300 m3/s	300.00	136.62	139.63	138.19	139.70	0.001753	1.18	254.96	115.63	0.25
1	10	300 m3/s	300.00	135.29	138.74	137.49	138.90	0.004001	1.78	168.56	75.91	0.38

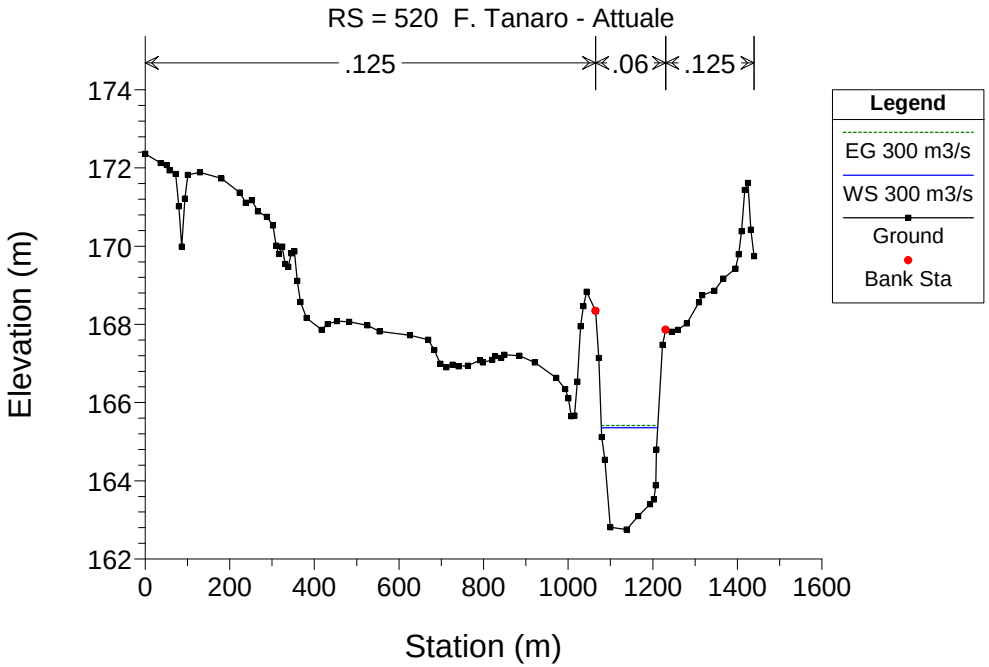

F. Tanaro - Attuale
Tanaro 1
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Elevation (m)
170
160
150
140
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
620
640
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
Main Channel Distance (m)

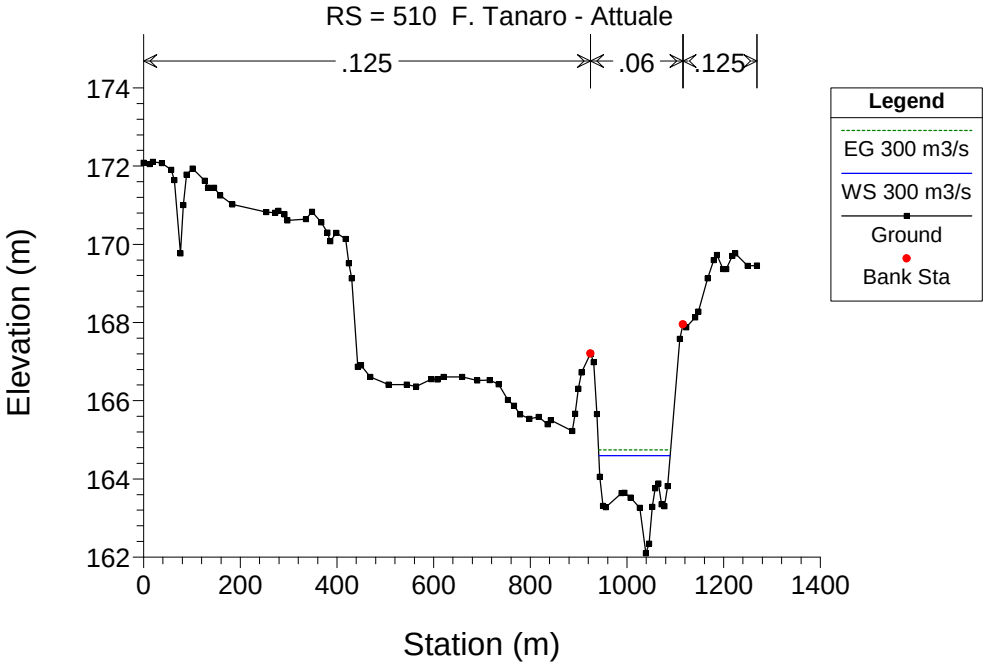

RS = 650 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
RS = 640 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
RS = 630 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta

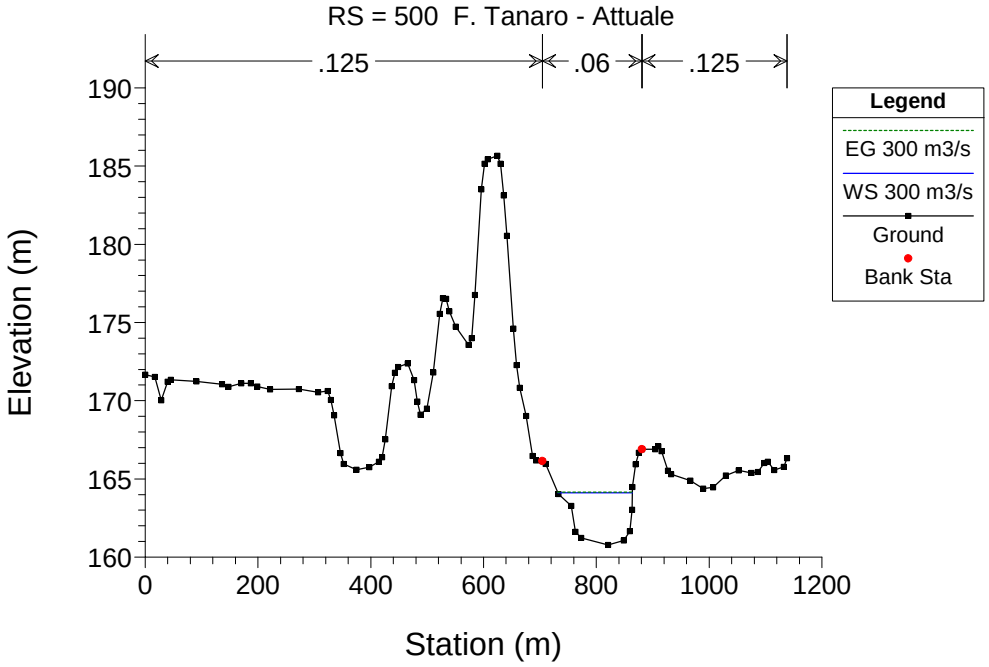

RS = 610 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
RS = 600 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 590 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 580 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta

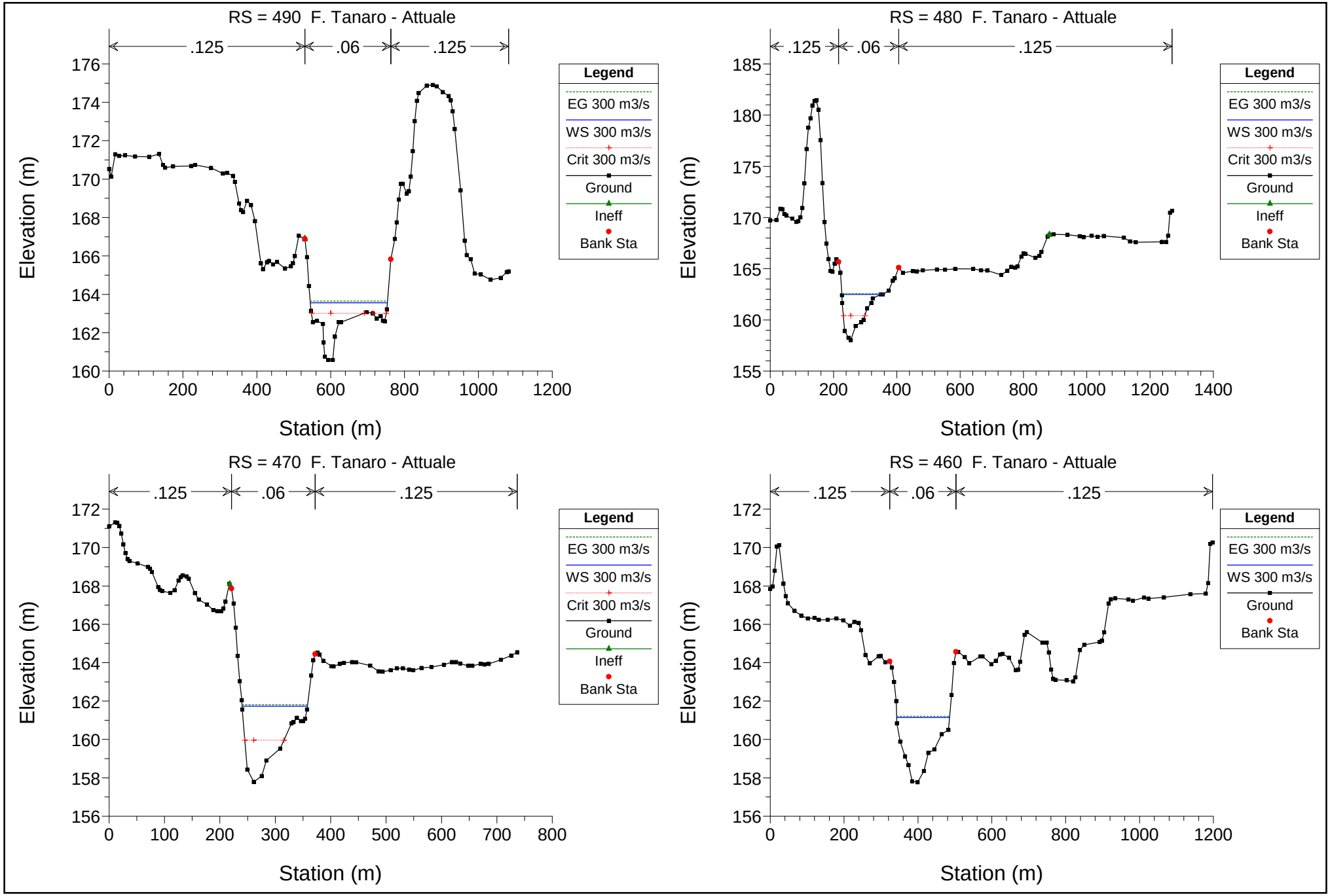

RS = 570 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Attuale
RS = 550 F. Tanaro - Attuale
RS = 540 F. Tanaro - Attuale

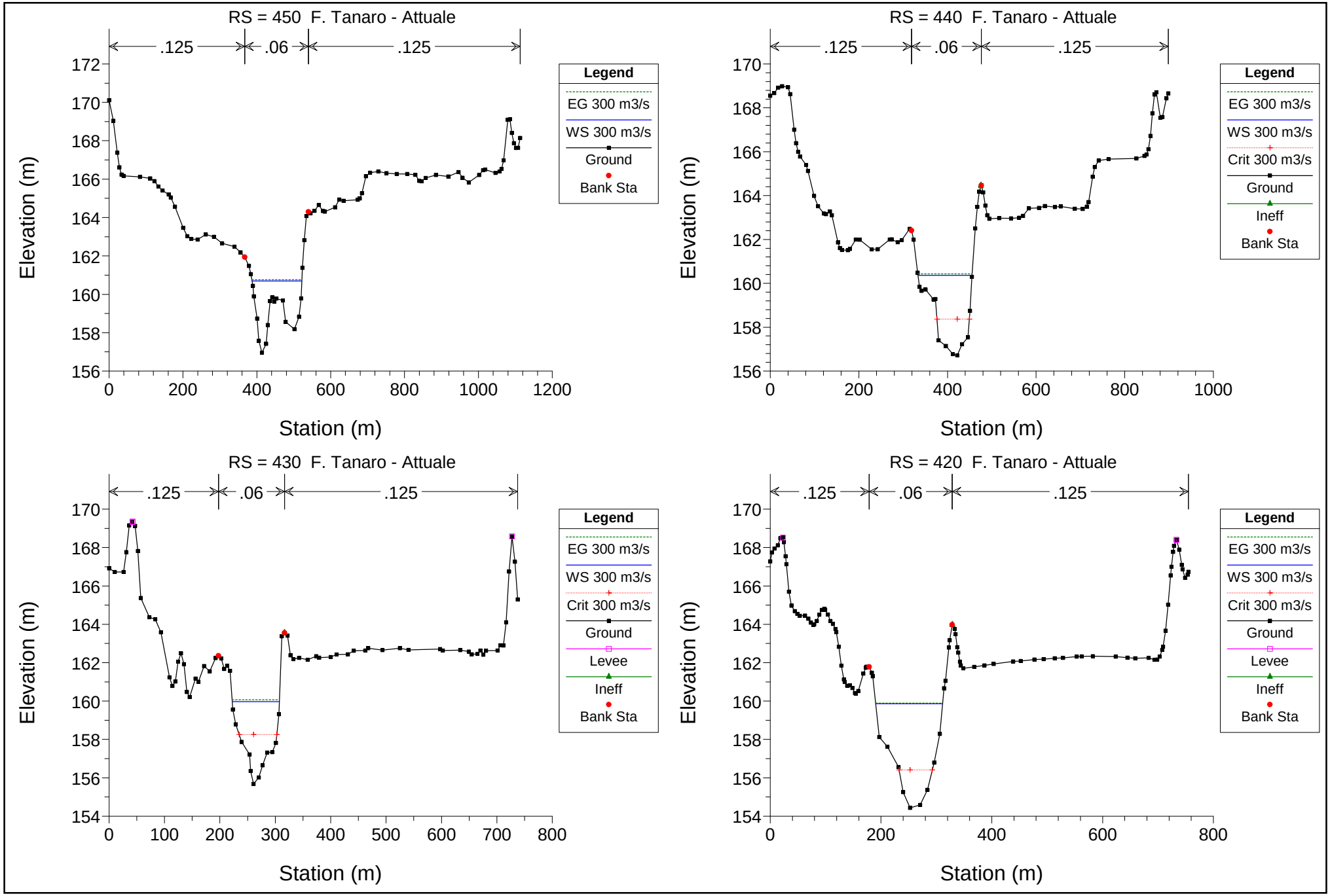

RS = 530 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)

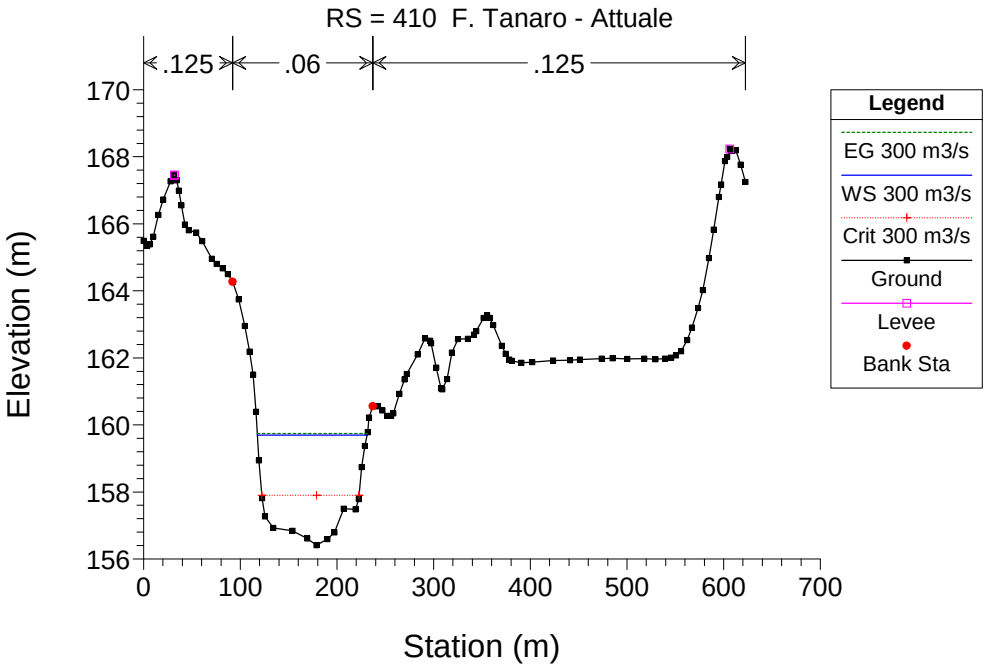

RS = 520 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)

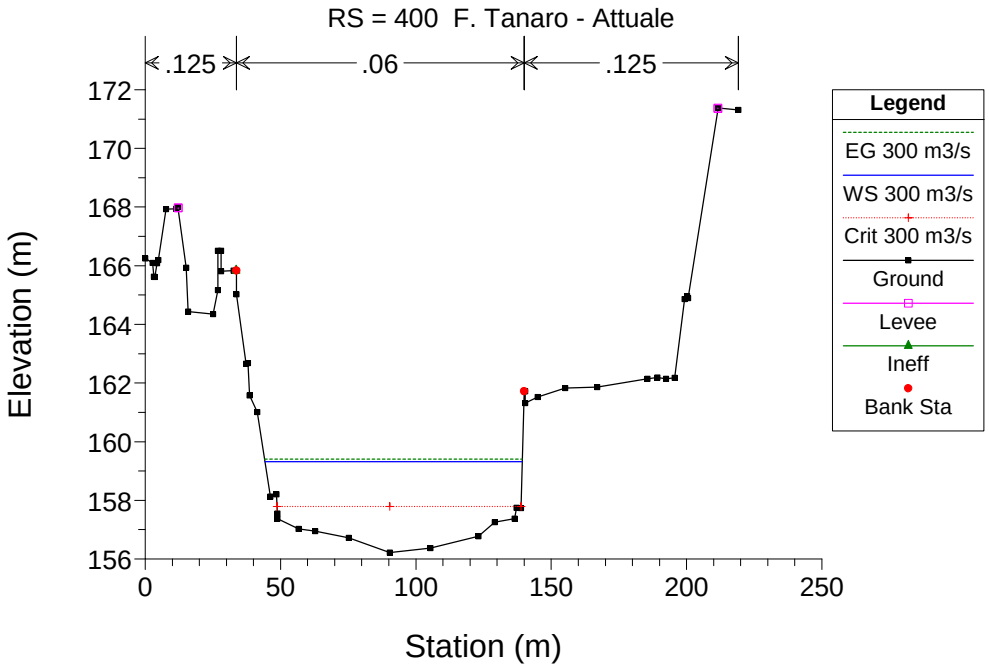

RS = 510 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)

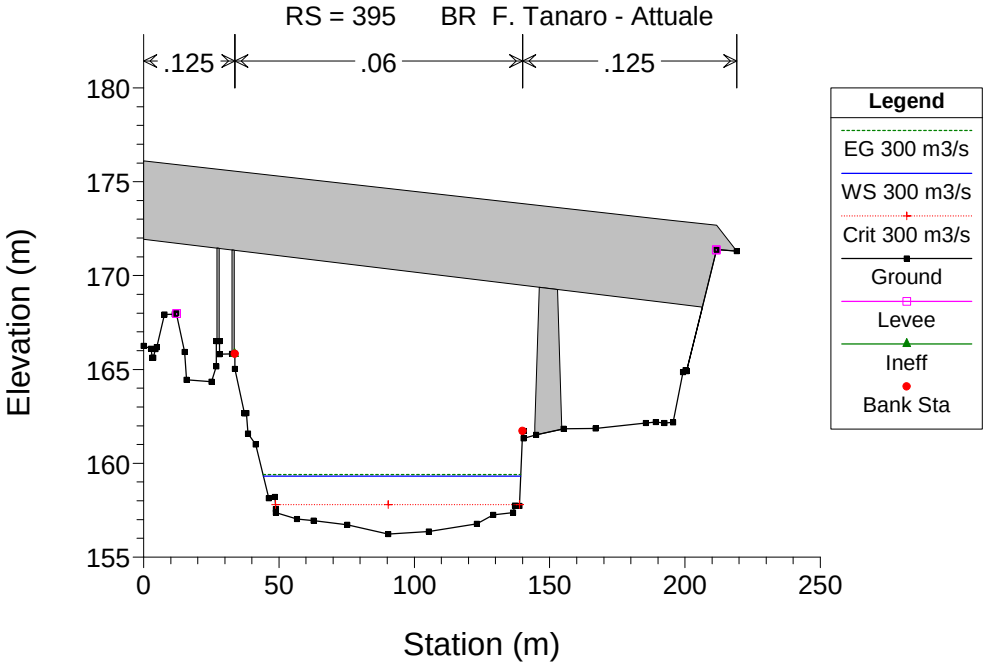

RS = 500 F. Tanaro - Attuale
.125
.06
.125
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
Elevation (m)
Station (m)

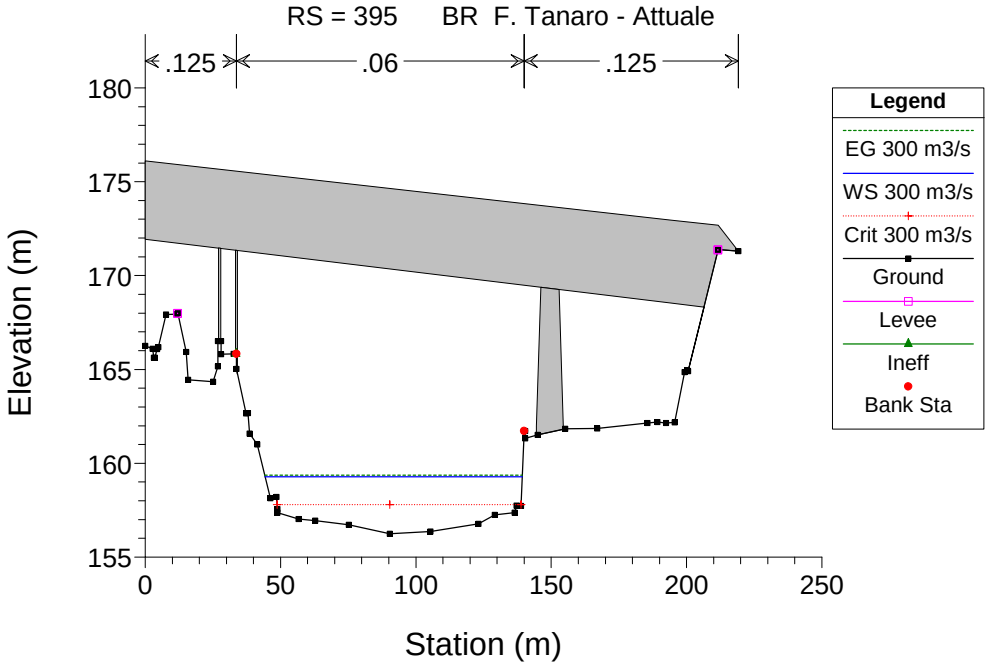

RS = 490 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 480 F. Tanaro - Attuale
RS = 470 F. Tanaro - Attuale
RS = 460 F. Tanaro - Attuale

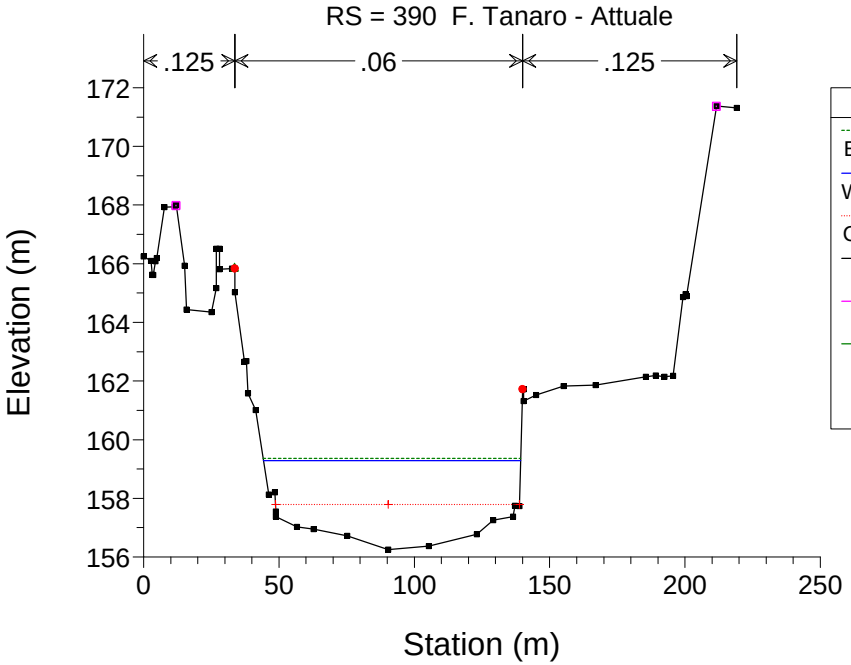

RS = 450 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Bank Sta
RS = 440 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 430 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 420 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

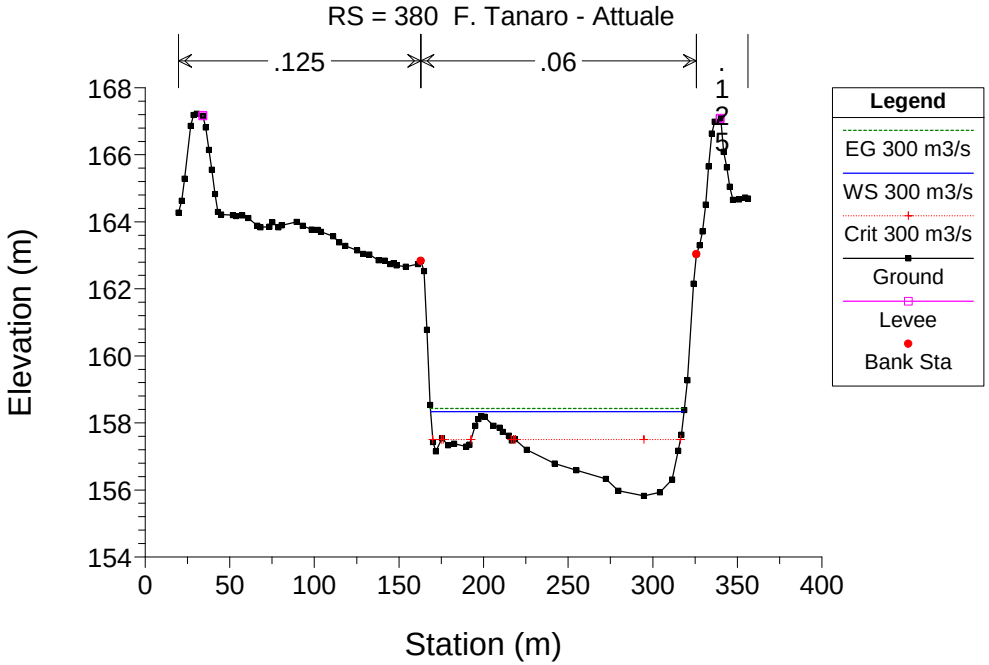

RS = 410 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta

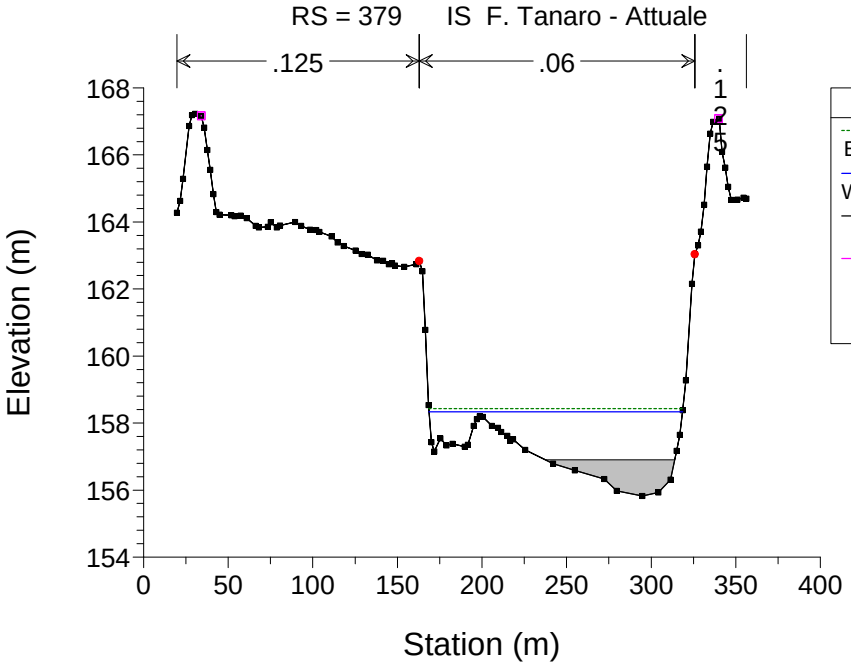

RS = 400 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

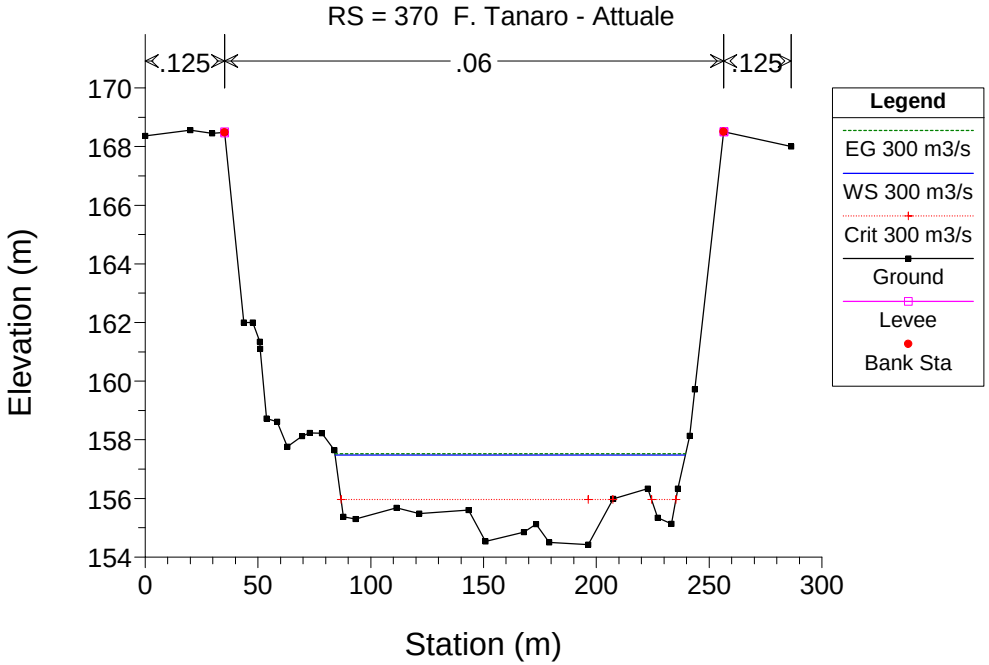

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

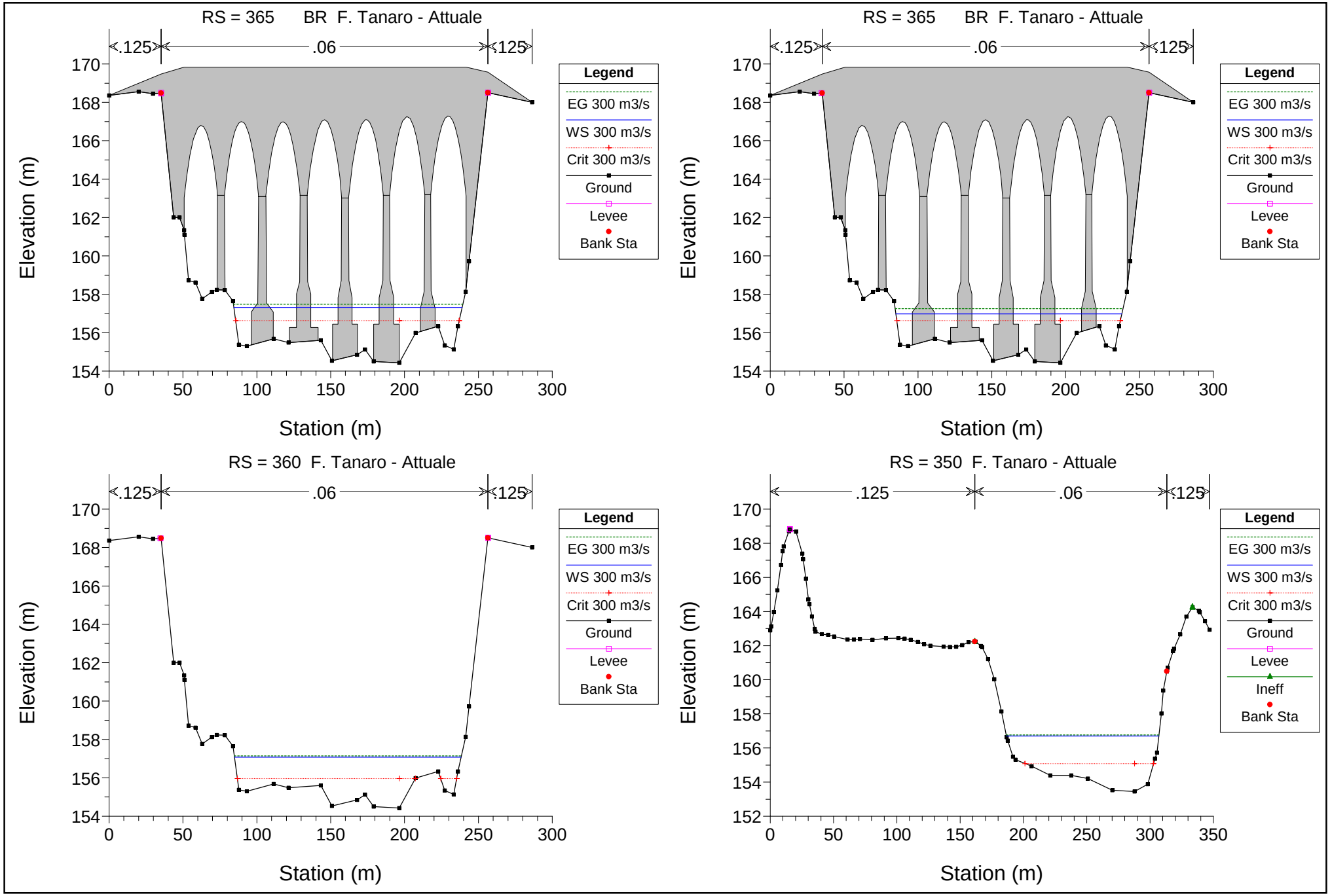

RS = 395 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

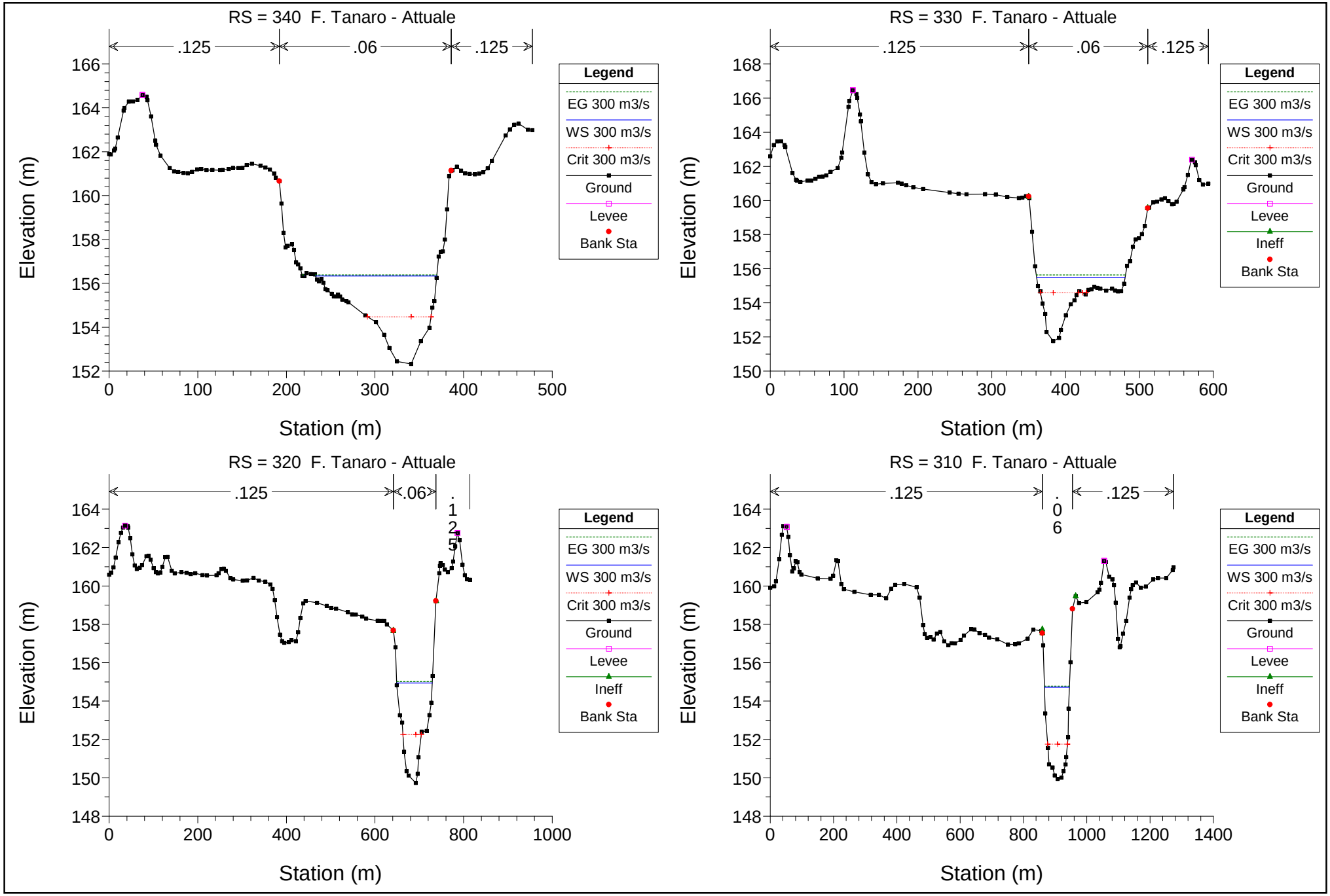

RS = 390 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

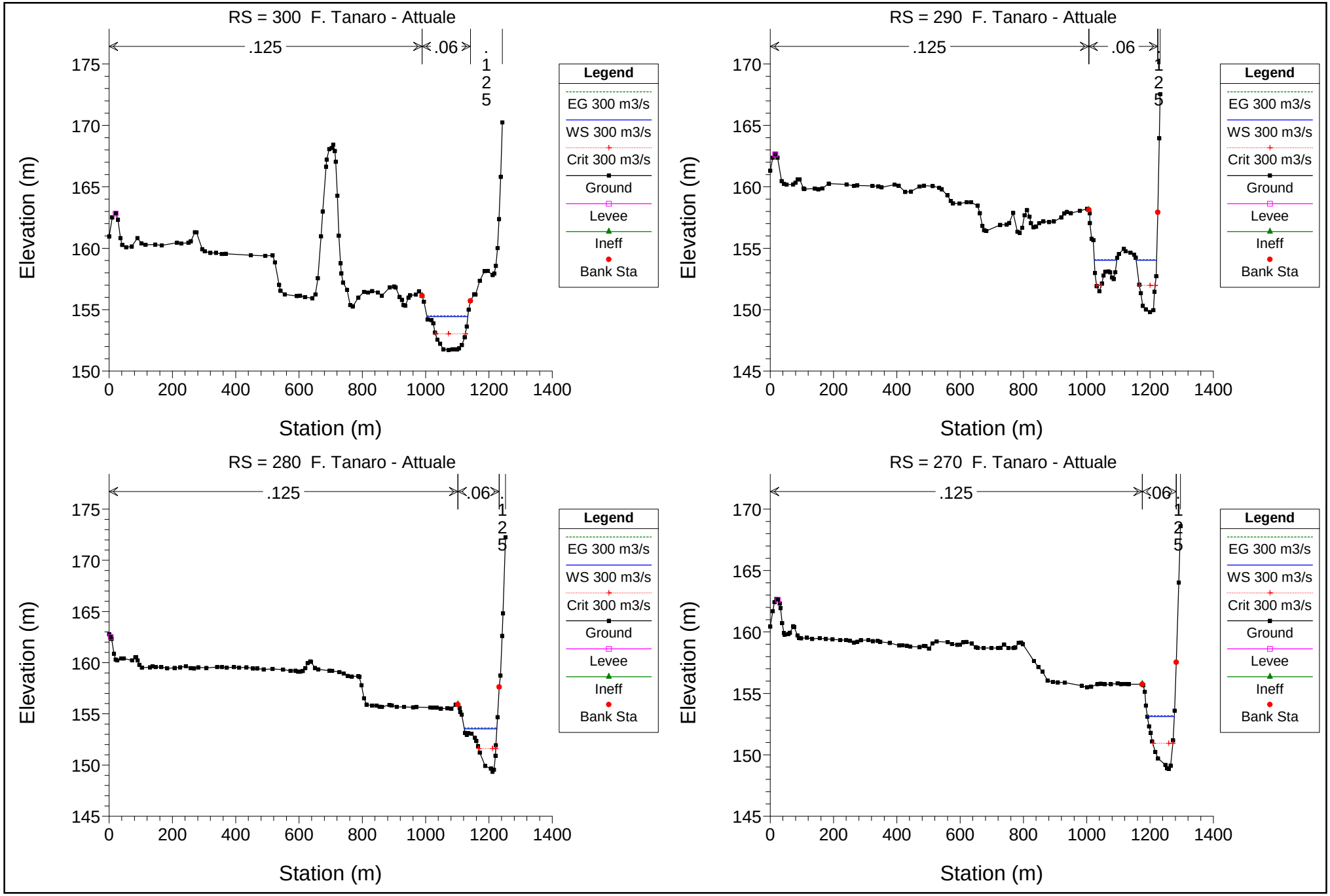

RS = 380 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta

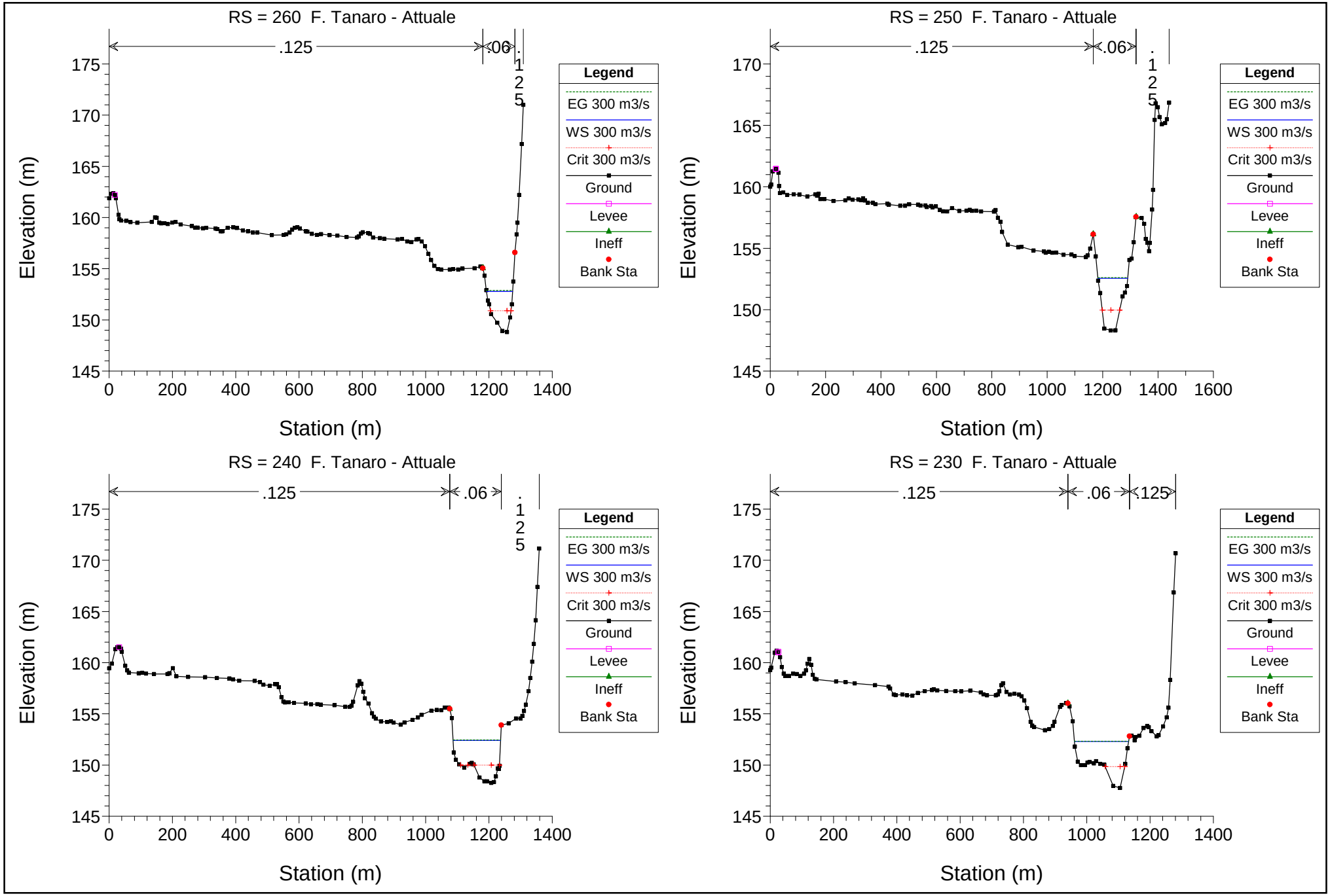

RS = 379 IS F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Levee
Bank Sta

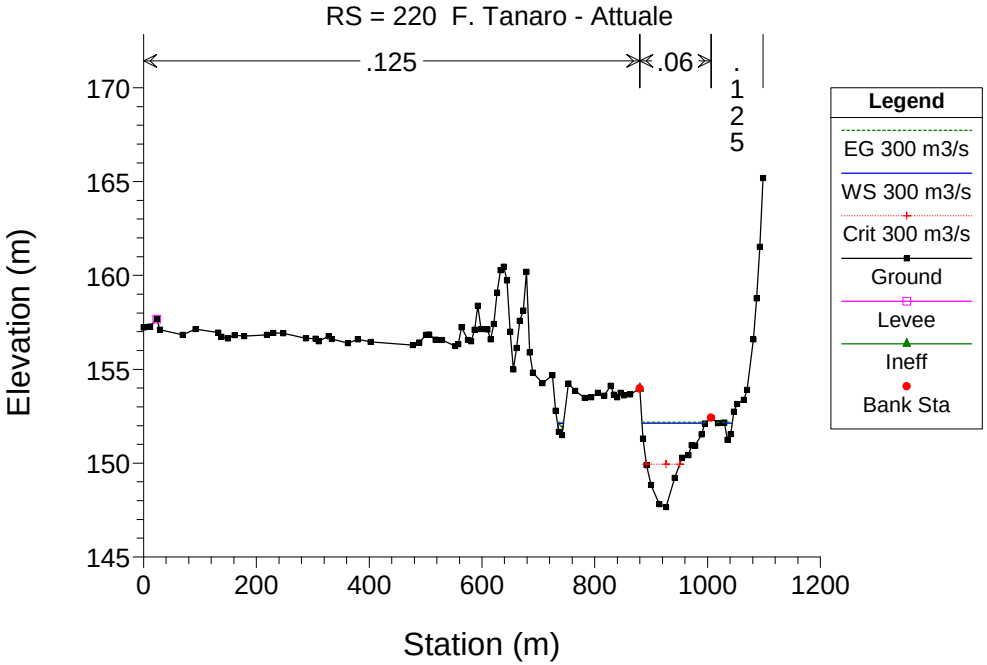

RS = 370 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta

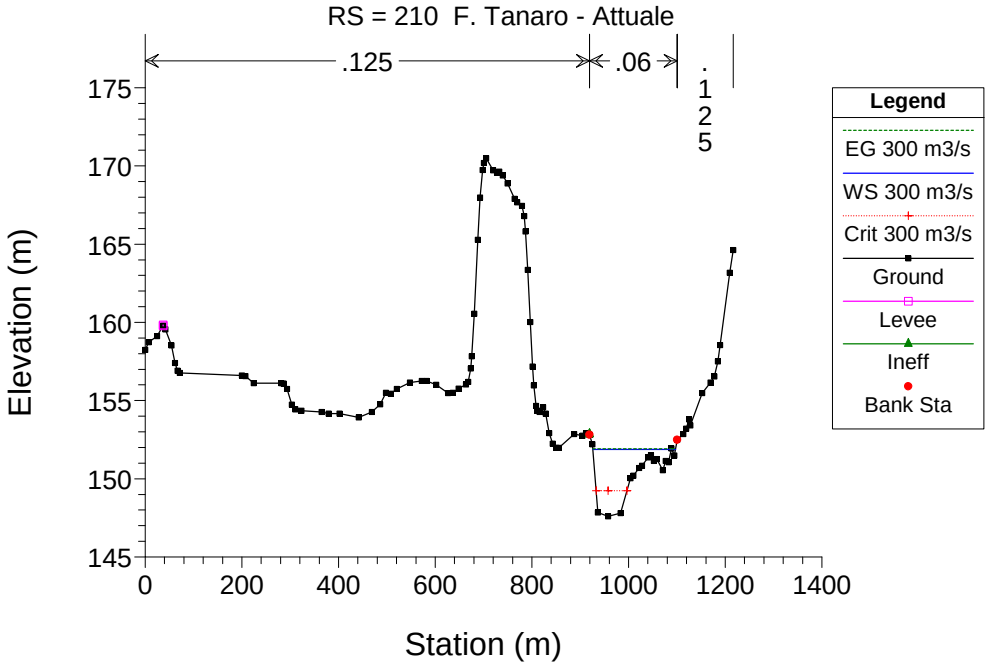

RS = 365 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Attuale
RS = 360 F. Tanaro - Attuale
RS = 350 F. Tanaro - Attuale
Ineff

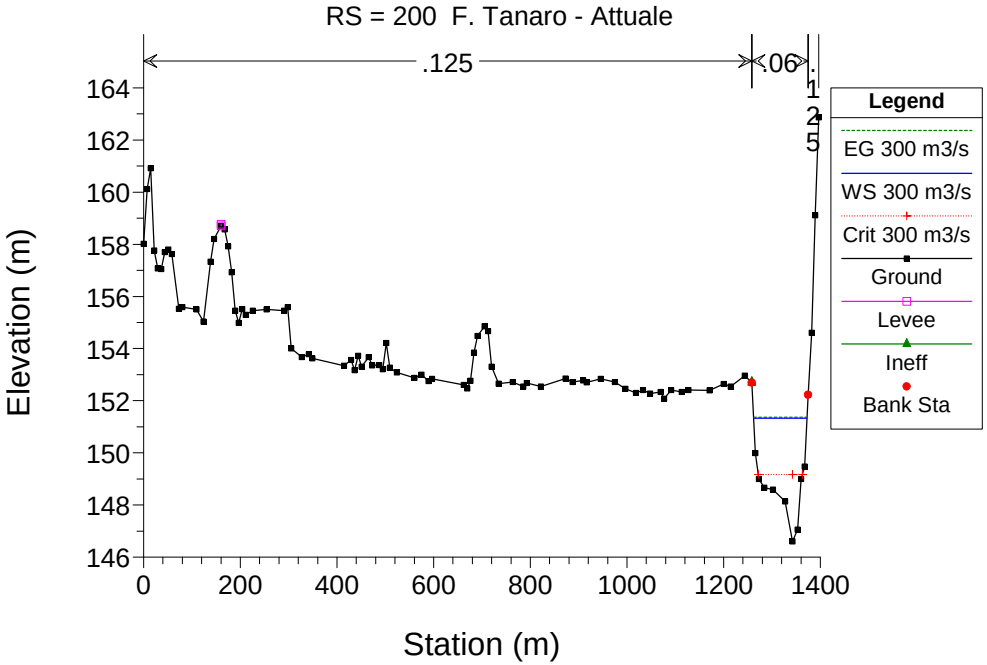

RS = 340 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 310 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

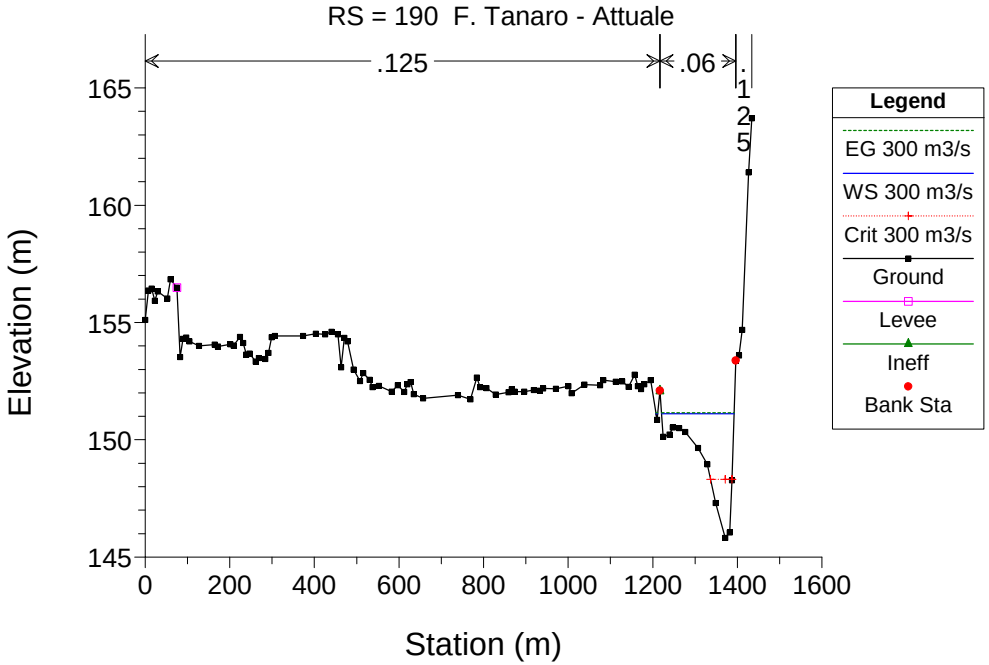

RS = 300 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 290 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 280 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 270 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

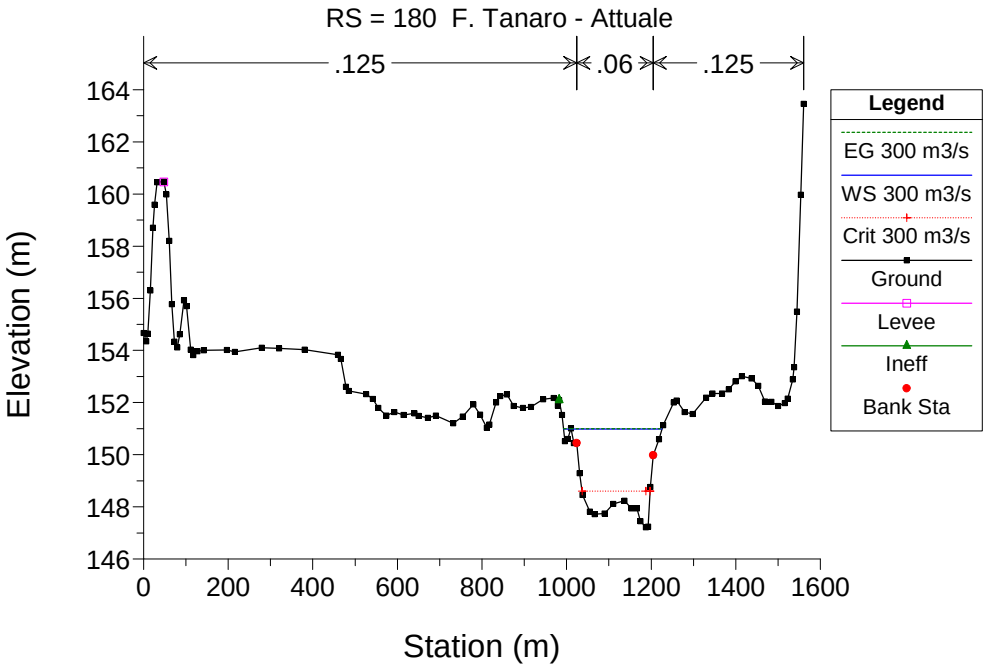

RS = 260 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 230 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

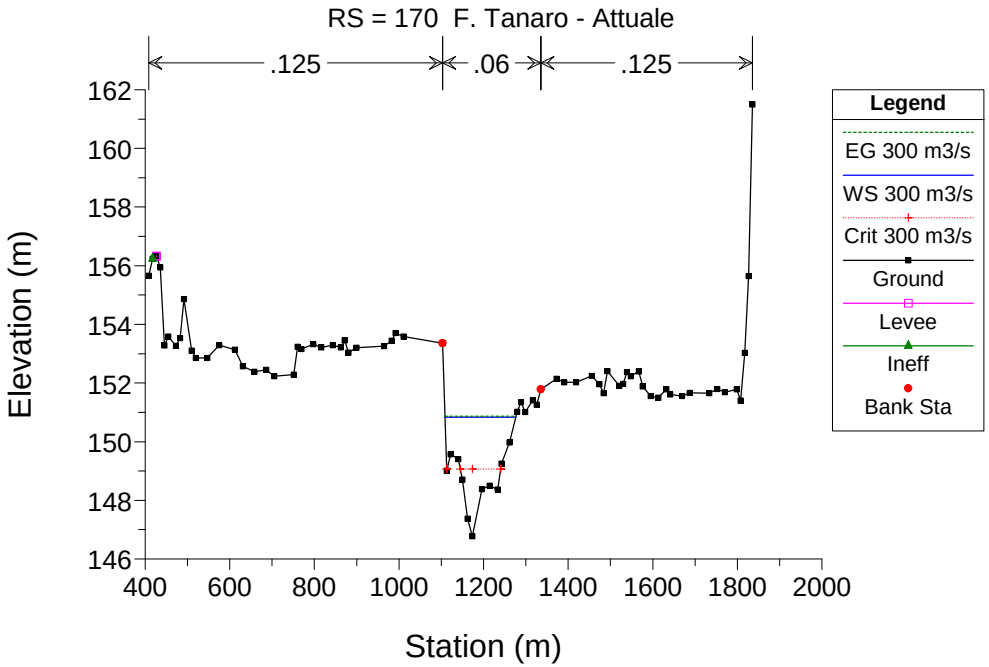

RS = 220 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
0
200
400
600
800
1000
1200
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

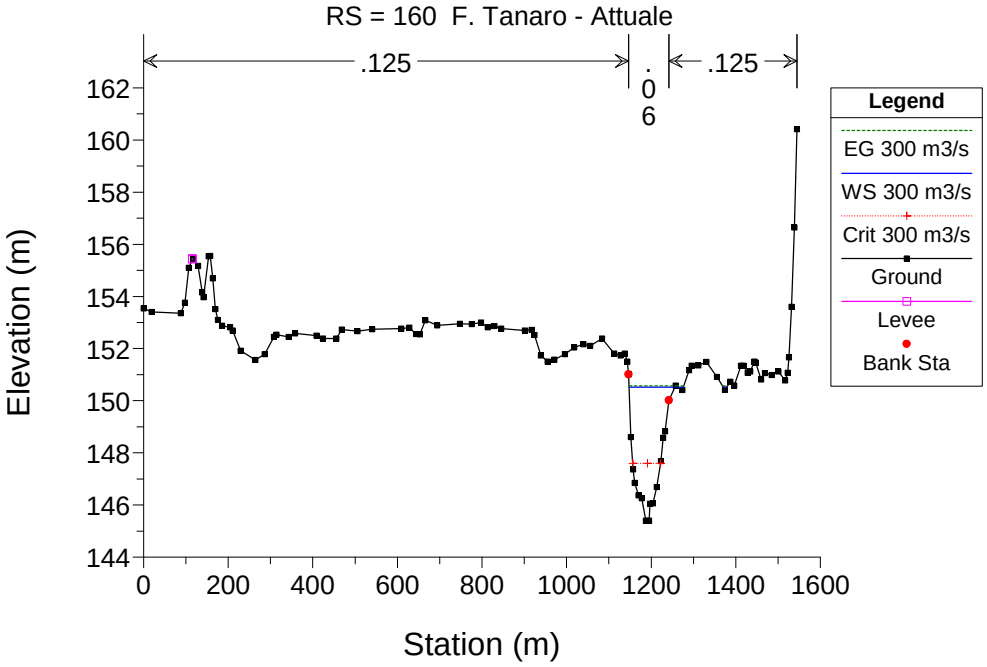

RS = 210 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
175
170
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

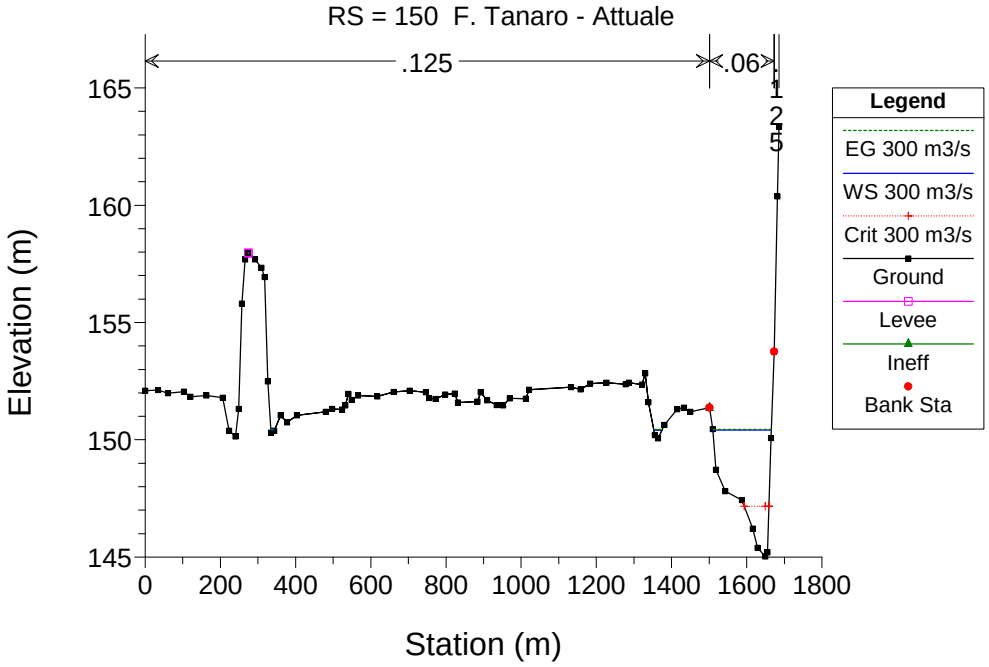

RS = 200 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
164
162
160
158
156
154
152
150
148
146
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

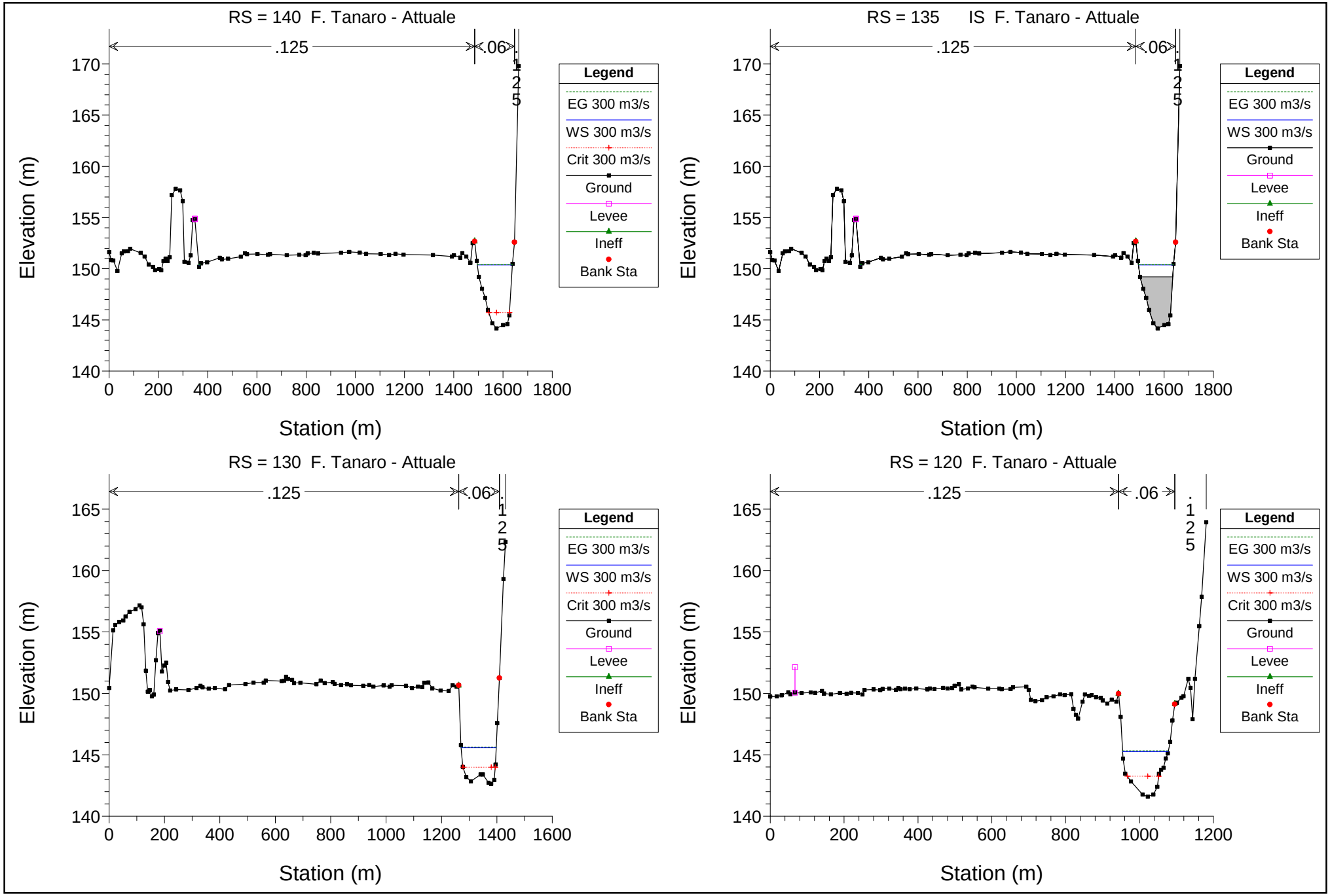

RS = 190 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
0
200
400
600
800
1000
1200
1400
1600
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

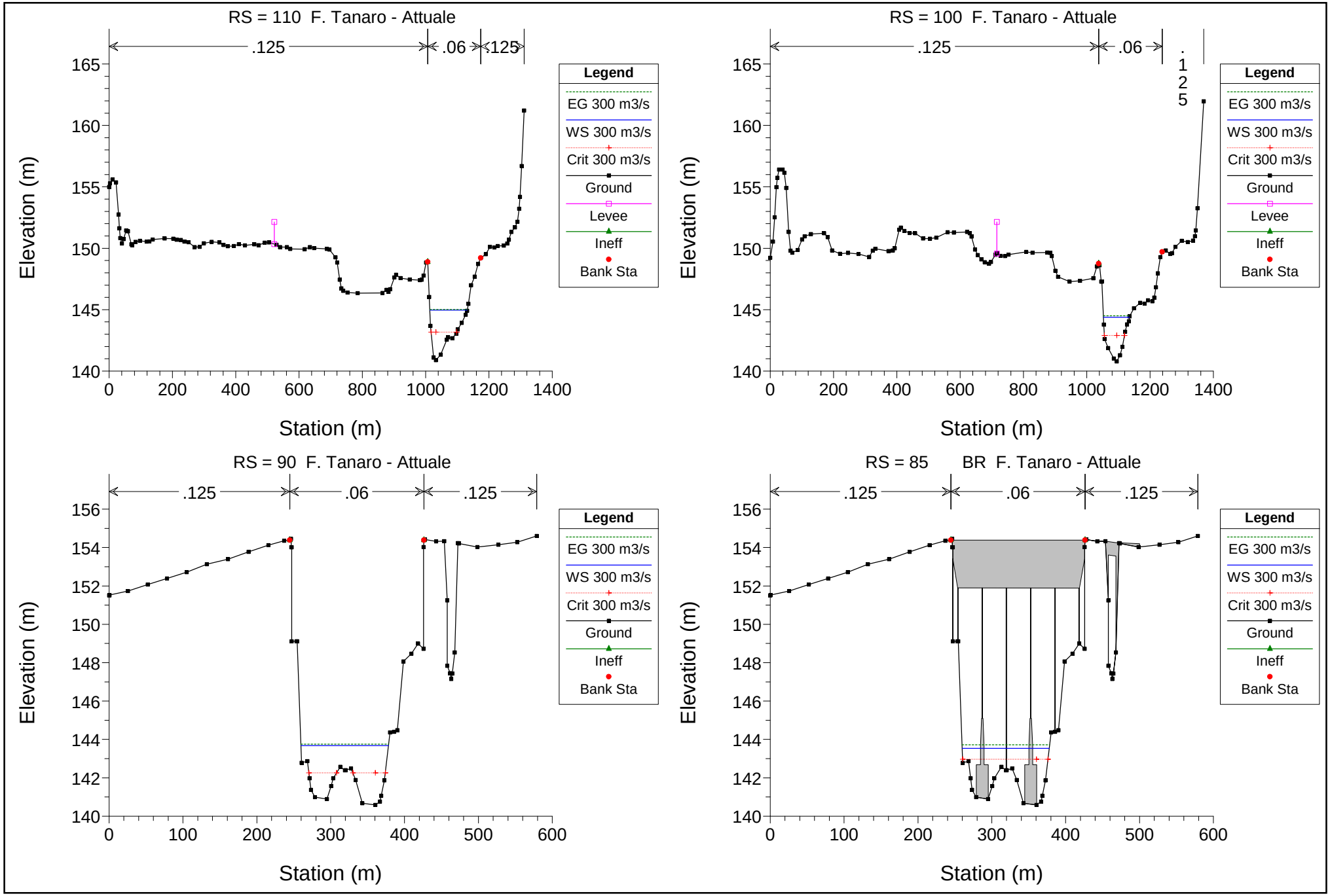

RS = 180 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

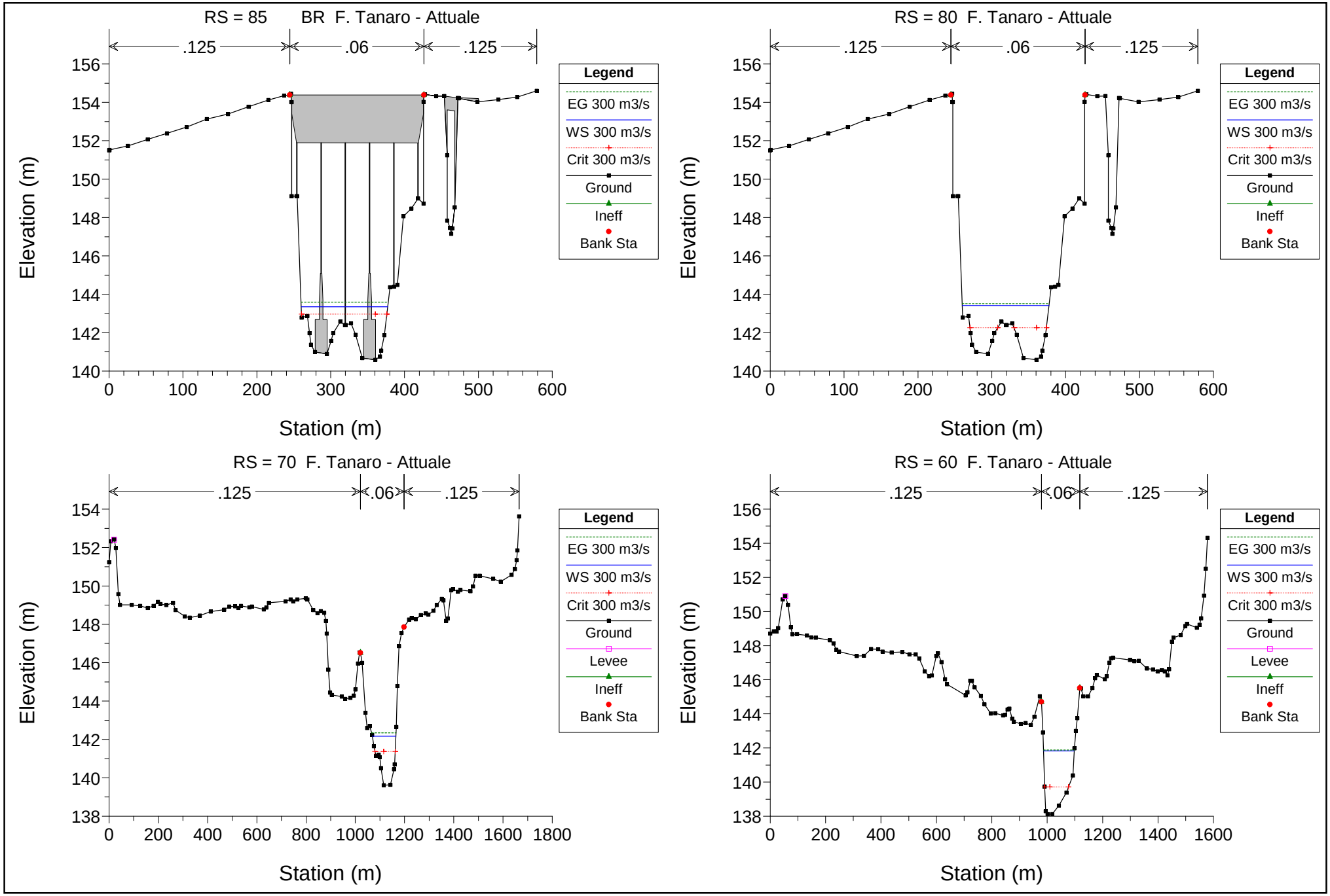

RS = 170 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

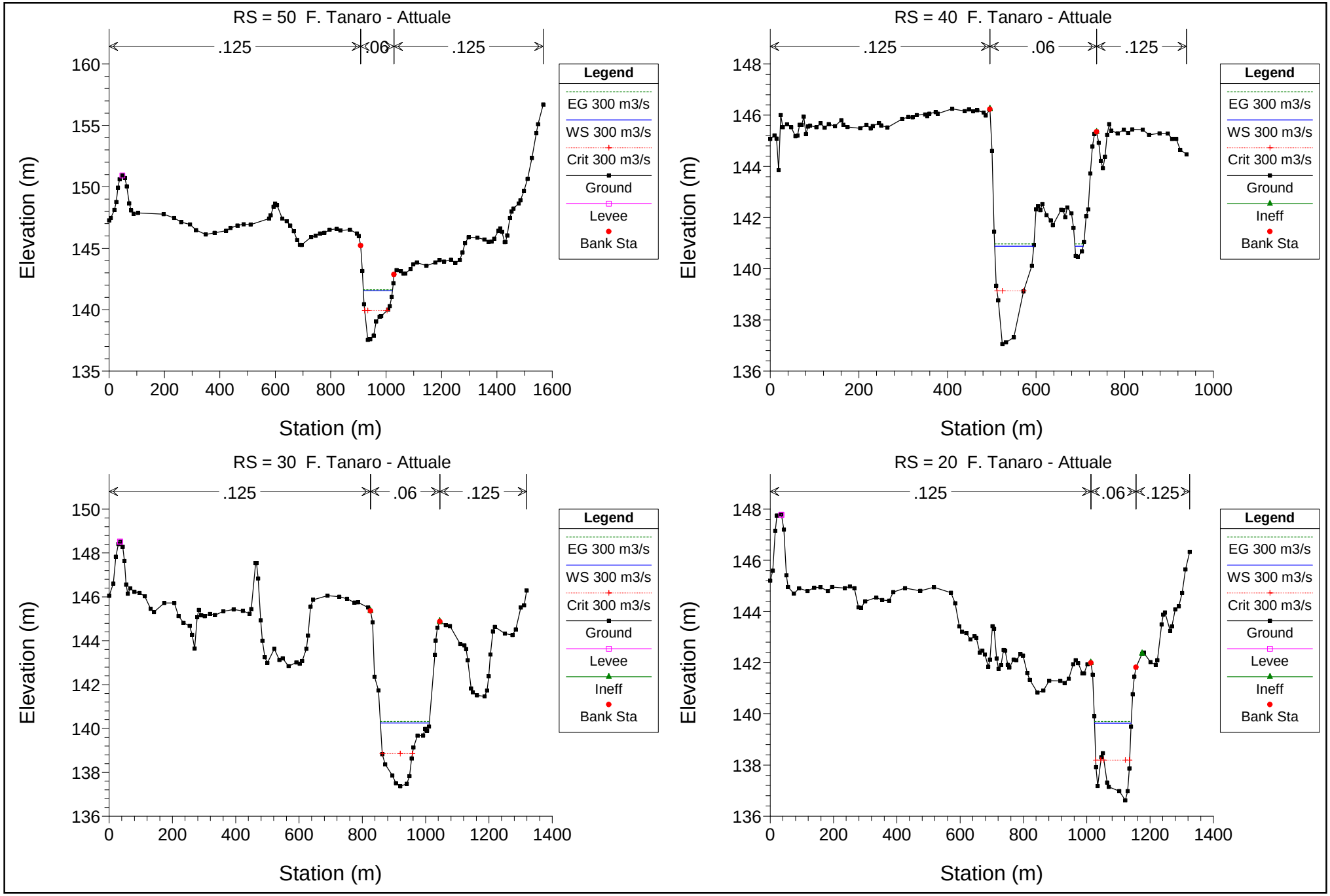

RS = 160 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta

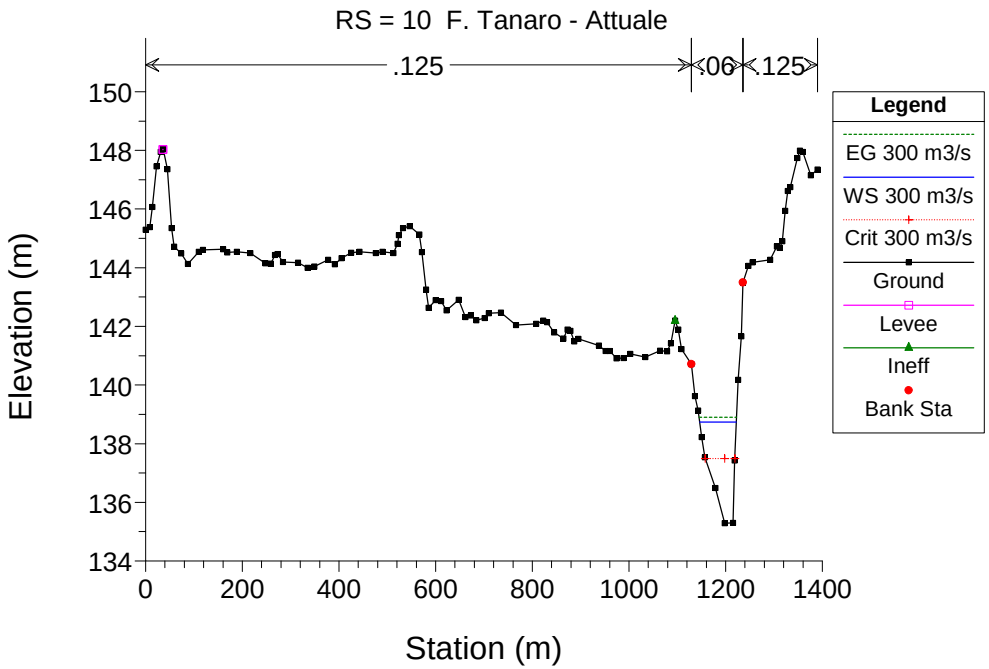

RS = 150 F. Tanaro - Attuale
.125
.06
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 140 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 135 IS F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
170
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
1800
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 130 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
1400
1600
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 120 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
165
160
155
150
145
140
0
200
400
600
800
1000
1200
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 110 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 90 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta


RS = 85 BR F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 80 F. Tanaro - Attuale
RS = 70 F. Tanaro - Attuale
Levee
RS = 60 F. Tanaro - Attuale


RS = 50 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Bank Sta
RS = 40 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Ineff
Bank Sta
RS = 30 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta
RS = 20 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Attuale
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG 300 m3/s
WS 300 m3/s
Crit 300 m3/s
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO
SIMULAZIONE 10
Sbarramento mobile alzato

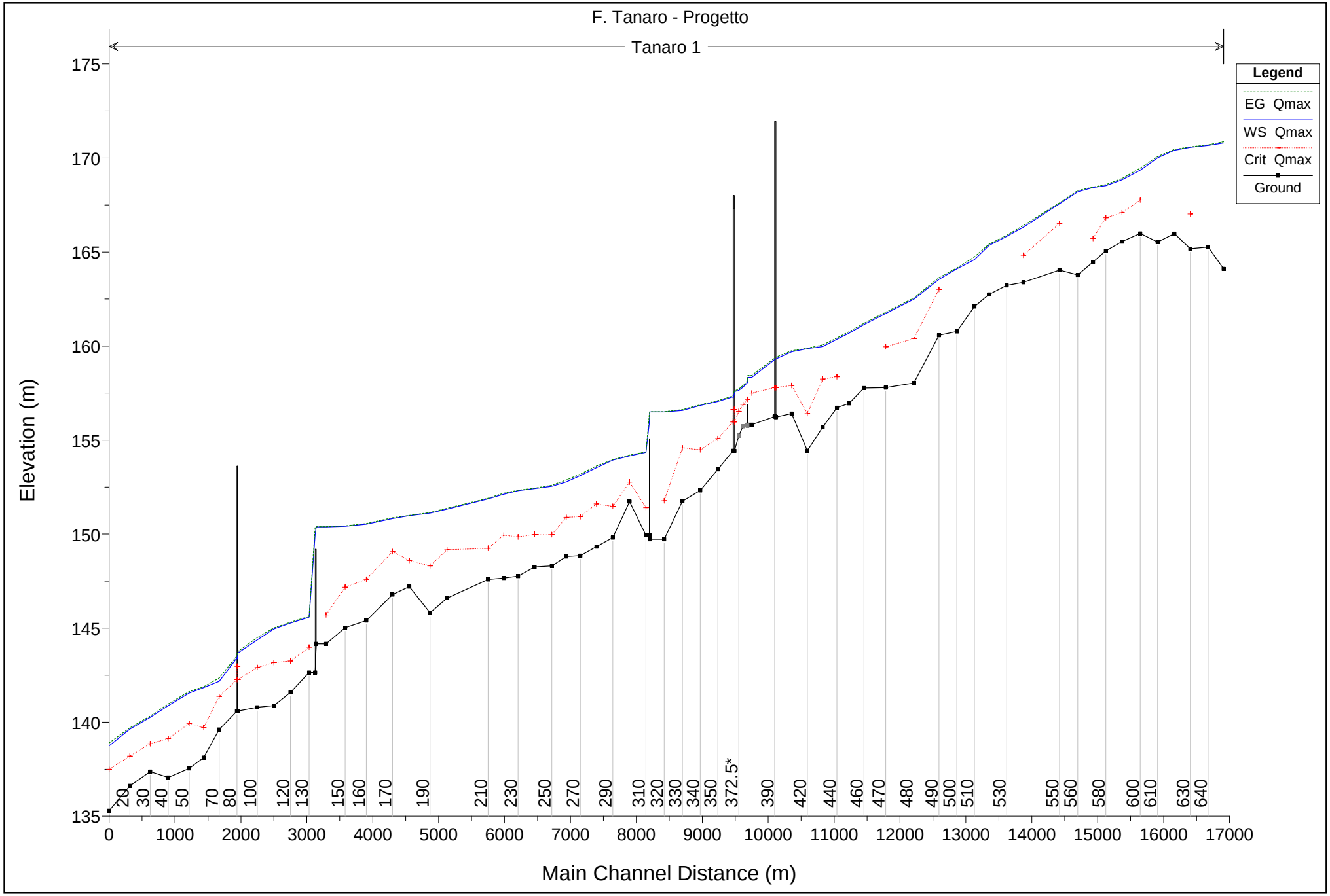
Corso d'acqua	**Portata Q m^3/s**	**Portata**
Fiume Tanaro	300.00 in alveo (100.00 turbinati)	Massima di funzionamento dell'impianto

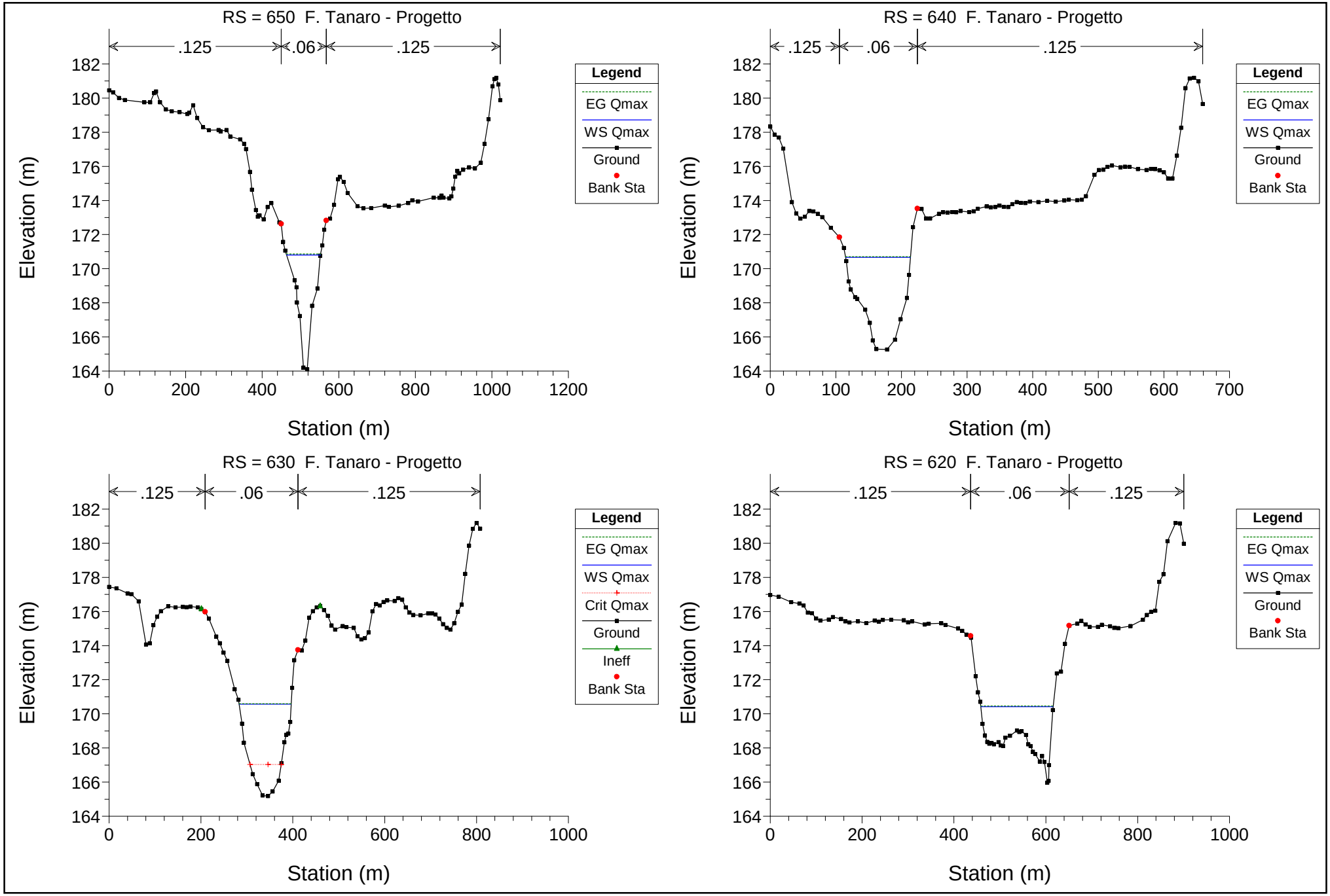
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Qmax

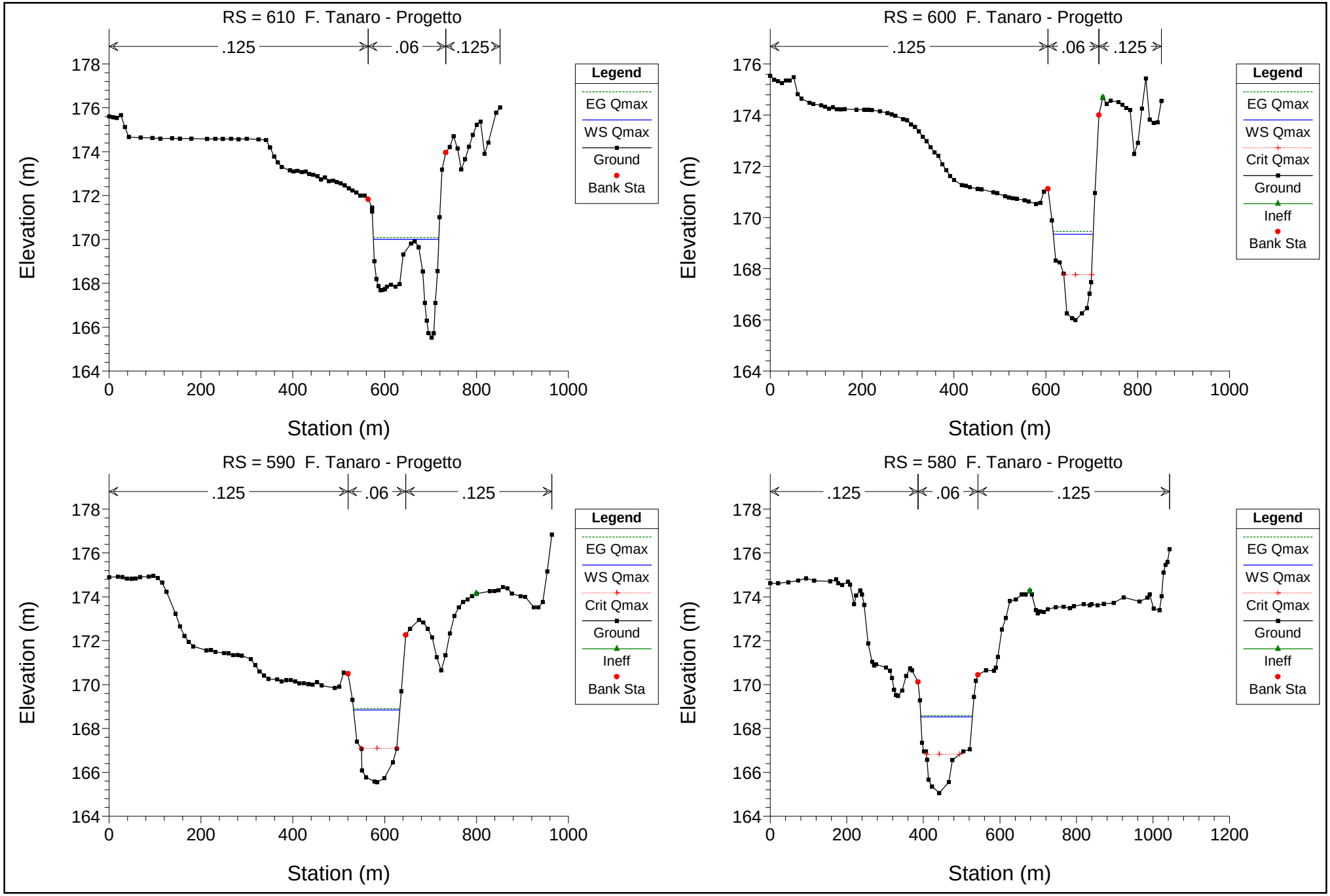
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	650	Qmax	300.00	164.11	170.80		170.87	0.001074	1.13	266.48	88.33	0.21
1	640	Qmax	300.00	165.26	170.66		170.70	0.000467	0.84	356.86	98.89	0.14
1	630	Qmax	300.00	165.18	170.56	167.03	170.59	0.000331	0.72	417.27	113.30	0.12
1	620	Qmax	300.00	165.98	170.42		170.46	0.001060	0.89	335.77	157.52	0.20
1	610	Qmax	300.00	165.53	170.01		170.08	0.002192	1.16	259.59	142.32	0.27
1	600	Qmax	300.00	165.99	169.35	167.77	169.46	0.002512	1.47	204.32	86.96	0.31
1	590	Qmax	300.00	165.55	168.84	167.09	168.91	0.001540	1.20	250.69	100.51	0.24
1	580	Qmax	300.00	165.06	168.53	166.82	168.58	0.001153	0.98	307.09	134.83	0.21
1	570	Qmax	300.00	164.47	168.43	165.72	168.45	0.000378	0.68	442.60	145.52	0.12
1	560	Qmax	300.00	163.78	168.21		168.27	0.002317	1.11	270.74	165.54	0.28
1	550	Qmax	300.00	164.04	167.57	166.52	167.62	0.002382	0.95	316.96	287.32	0.27
1	540	Qmax	300.00	163.39	166.32	164.83	166.41	0.002028	1.32	229.24	107.70	0.27
1	530	Qmax	300.00	163.23	165.83		165.89	0.002007	1.11	270.75	149.52	0.26
1	520	Qmax	300.00	162.75	165.36		165.41	0.001582	1.08	278.01	133.31	0.24
1	510	Qmax	300.00	162.10	164.60		164.74	0.007899	1.68	178.63	147.59	0.49
1	500	Qmax	300.00	160.77	164.11		164.15	0.000940	0.93	324.32	132.02	0.19
1	490	Qmax	300.00	160.58	163.55	163.01	163.64	0.005450	1.31	229.41	208.70	0.40
1	480	Qmax	300.00	158.04	162.50	160.40	162.56	0.001720	1.12	268.35	129.45	0.25
1	470	Qmax	300.00	157.79	161.73	159.96	161.80	0.001833	1.18	253.54	118.00	0.26
1	460	Qmax	300.00	157.77	161.15		161.20	0.001767	1.08	276.67	143.31	0.25
1	450	Qmax	300.00	156.96	160.69		160.76	0.002198	1.19	253.09	134.48	0.28
1	440	Qmax	300.00	156.72	160.37	158.37	160.43	0.001453	1.09	275.56	122.07	0.23
1	430	Qmax	300.00	155.68	159.97	158.25	160.07	0.001897	1.36	220.55	85.03	0.27
1	420	Qmax	300.00	154.44	159.86	156.41	159.89	0.000349	0.71	421.37	120.95	0.12
1	410	Qmax	300.00	156.41	159.69	157.90	159.75	0.001141	1.04	287.66	113.40	0.21
1	400	Qmax	300.00	156.22	159.32	157.79	159.40	0.001777	1.27	236.34	95.07	0.26
1	395		Bridge									
1	390	Qmax	300.00	156.25	159.28	157.79	159.37	0.001886	1.29	232.04	94.99	0.26
1	380	Qmax	300.00	155.82	158.34	157.50	158.43	0.004164	1.38	218.04	149.97	0.36
1	379		Inl Struct									
1	370	Qmax	300.00	154.43	157.58	155.96	157.61	0.000929	0.86	347.72	155.69	0.18
1	365		Bridge									
1	360	Qmax	300.00	154.43	157.30	155.97	157.35	0.001431	0.99	304.31	154.38	0.22
1	350	Qmax	300.00	153.45	157.05	155.09	157.10	0.000834	0.92	325.31	121.79	0.18
1	340	Qmax	300.00	152.32	156.84	154.48	156.87	0.000809	0.83	363.29	157.28	0.17
1	330	Qmax	300.00	151.75	156.57	154.59	156.62	0.001079	0.97	309.34	130.10	0.20
1	320	Qmax	200.00	149.73	156.50	151.77	156.51	0.000137	0.52	383.41	85.54	0.08
1	315		Inl Struct									
1	310	Qmax	200.00	149.94	154.34	151.41	154.37	0.000394	0.75	267.73	77.45	0.13
1	300	Qmax	200.00	151.73	154.16	152.77	154.20	0.001434	0.94	212.15	115.94	0.22

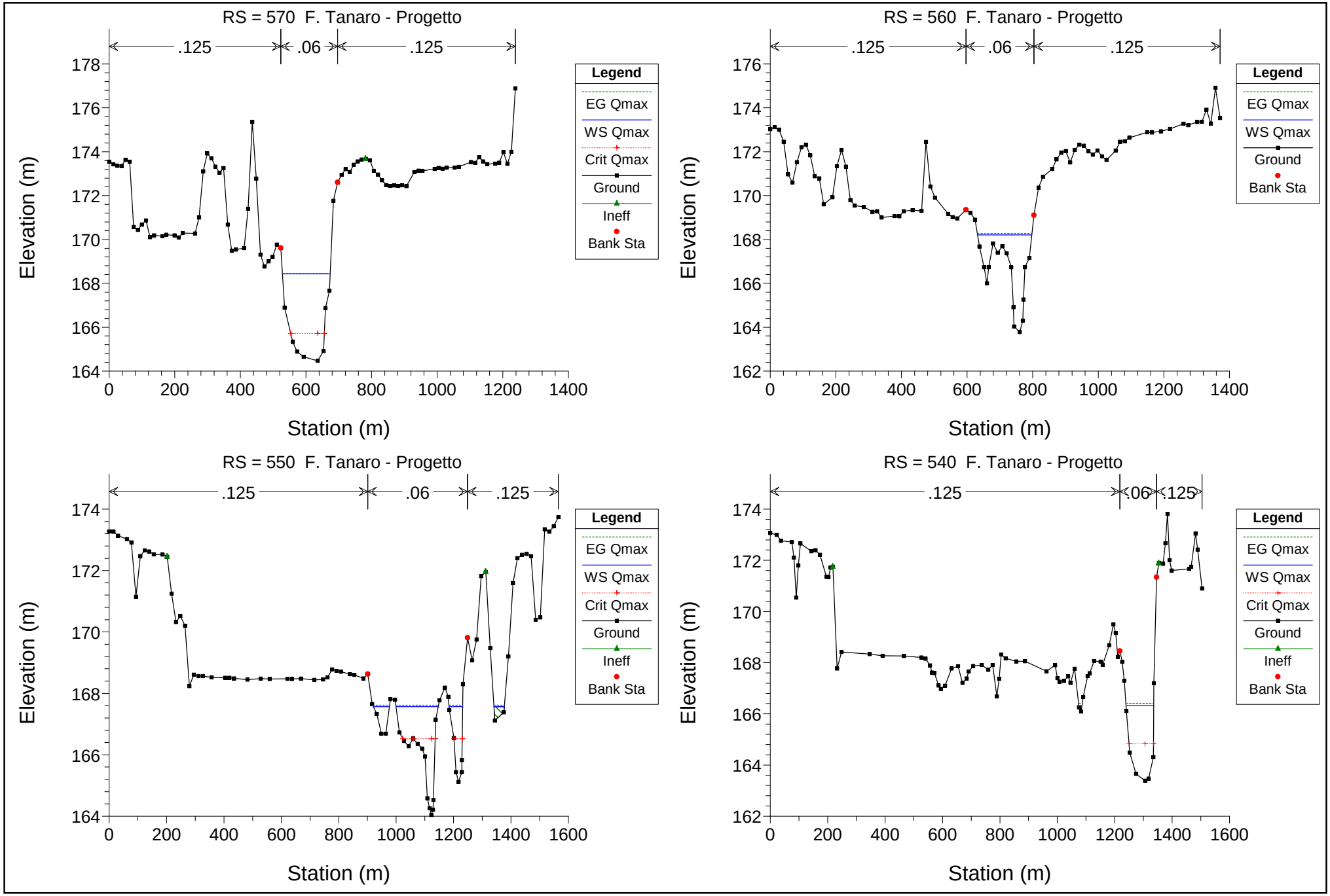
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Qmax (Continued)

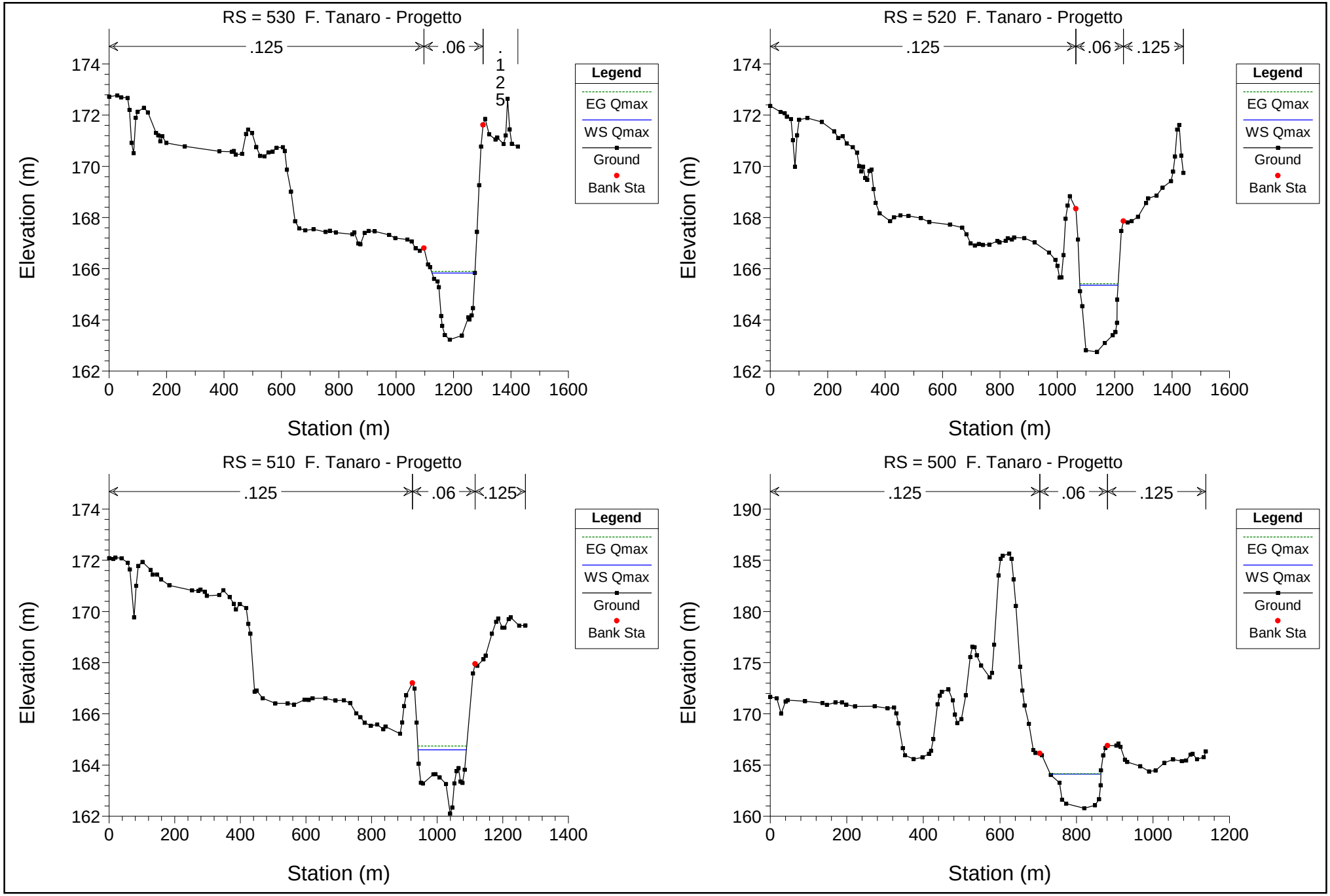
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	290	Qmax	200.00	149.81	153.93	151.47	153.96	0.000660	0.70	285.26	134.30	0.15
1	280	Qmax	300.00	149.34	153.53	151.61	153.63	0.002478	1.37	219.50	102.75	0.30
1	270	Qmax	300.00	148.86	153.11	150.93	153.19	0.001307	1.22	246.56	85.03	0.23
1	260	Qmax	300.00	148.81	152.78	150.90	152.87	0.001717	1.33	224.81	82.96	0.26
1	250	Qmax	300.00	148.31	152.55	149.97	152.60	0.000879	0.98	305.11	108.06	0.19
1	240	Qmax	300.00	148.26	152.42	149.99	152.44	0.000395	0.68	442.84	150.14	0.13
1	230	Qmax	300.00	147.77	152.31	149.85	152.34	0.000447	0.67	449.40	171.57	0.13
1	220	Qmax	300.00	147.66	152.12	149.95	152.18	0.001284	1.09	282.30	136.15	0.22
1	210	Qmax	300.00	147.59	151.88	149.25	151.91	0.000949	0.84	357.50	170.02	0.18
1	200	Qmax	300.00	146.60	151.33	149.16	151.37	0.000788	0.94	318.32	110.35	0.18
1	190	Qmax	300.00	145.82	151.11	148.31	151.15	0.000945	0.83	359.33	175.22	0.18
1	180	Qmax	300.00	147.21	150.98	148.60	151.00	0.000276	0.56	549.50	231.71	0.11
1	170	Qmax	300.00	146.78	150.83	149.07	150.87	0.001023	0.86	347.14	167.50	0.19
1	160	Qmax	300.00	145.40	150.52	147.60	150.57	0.000594	0.92	330.21	129.92	0.16
1	150	Qmax	300.00	145.03	150.42	147.18	150.44	0.000258	0.59	510.05	186.99	0.10
1	140	Qmax	300.00	144.17	150.38	145.71	150.39	0.000112	0.47	631.63	147.43	0.07
1	135		Inl Struct									
1	130	Qmax	300.00	142.64	145.58	143.98	145.63	0.001200	1.01	296.34	126.92	0.21
1	120	Qmax	300.00	141.58	145.27	143.25	145.32	0.000994	0.97	310.30	123.78	0.19
1	110	Qmax	300.00	140.88	144.96	143.16	145.02	0.001471	1.11	271.17	118.31	0.23
1	100	Qmax	300.00	140.79	144.38	142.91	144.51	0.002933	1.57	190.88	82.44	0.33
1	90	Qmax	300.00	140.59	143.68	142.26	143.76	0.002052	1.22	245.87	118.45	0.27
1	85		Bridge									
1	80	Qmax	300.00	140.59	143.42	142.26	143.52	0.003171	1.40	214.91	117.40	0.33
1	70	Qmax	300.00	139.61	142.17	141.37	142.35	0.006051	1.84	162.81	95.73	0.45
1	60	Qmax	300.00	138.12	141.84	139.71	141.88	0.000849	0.96	312.09	110.96	0.18
1	50	Qmax	300.00	137.54	141.55	139.93	141.62	0.001712	1.21	246.99	104.93	0.25
1	40	Qmax	300.00	137.06	140.88	139.13	140.97	0.002465	1.35	222.83	106.64	0.30
1	30	Qmax	300.00	137.37	140.25	138.86	140.32	0.002277	1.13	264.36	154.78	0.28
1	20	Qmax	300.00	136.62	139.63	138.19	139.70	0.001753	1.18	254.96	115.63	0.25
1	10	Qmax	300.00	135.29	138.74	137.49	138.90	0.004001	1.78	168.56	75.91	0.38

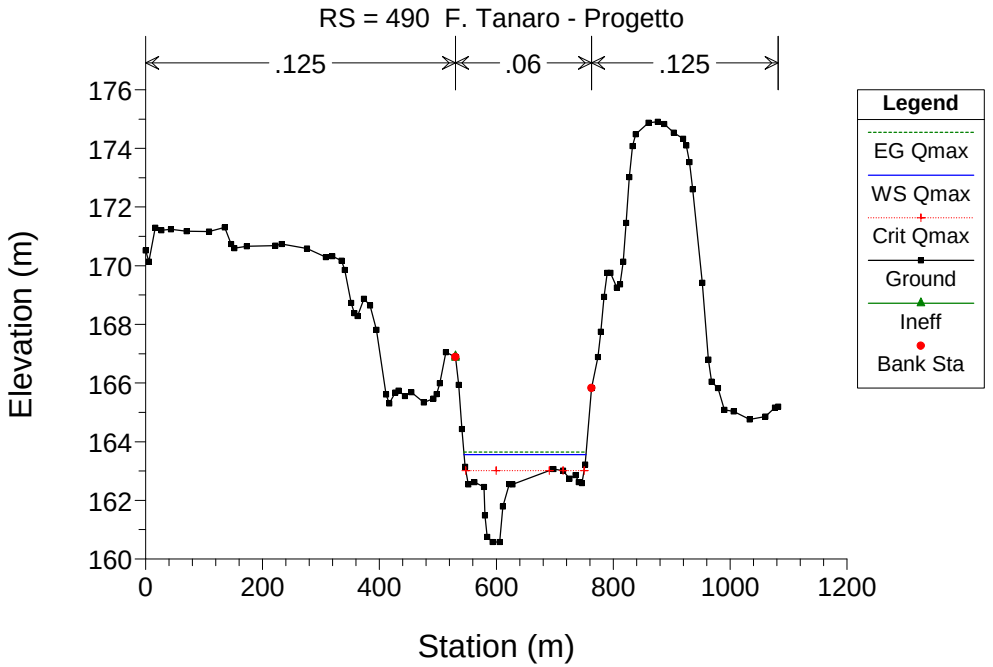

F. Tanaro - Progetto
Tanaro 1
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Elevation (m)
Main Channel Distance (m)
175
170
165
160
155
150
145
140
135
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
20
30
40
50
70
80
100
120
130
150
160
170
190
210
230
250
270
290
310
320
330
340
350
372.5*
390
420
440
460
470
480
490
500
510
530
550
560
580
600
610
630
640

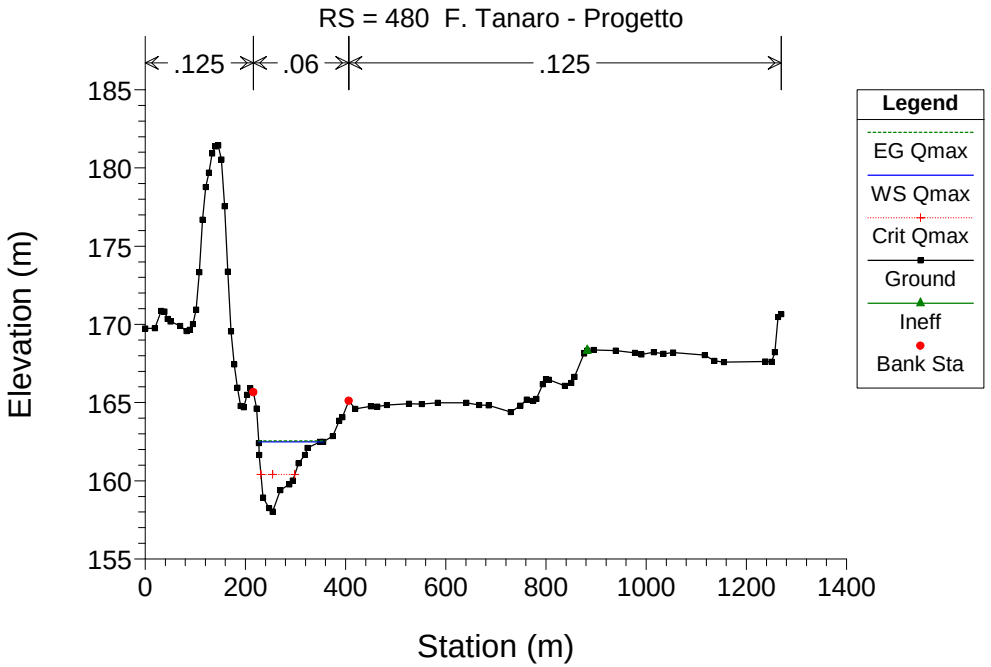

RS = 650 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
RS = 640 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
RS = 630 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta
RS = 620 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta

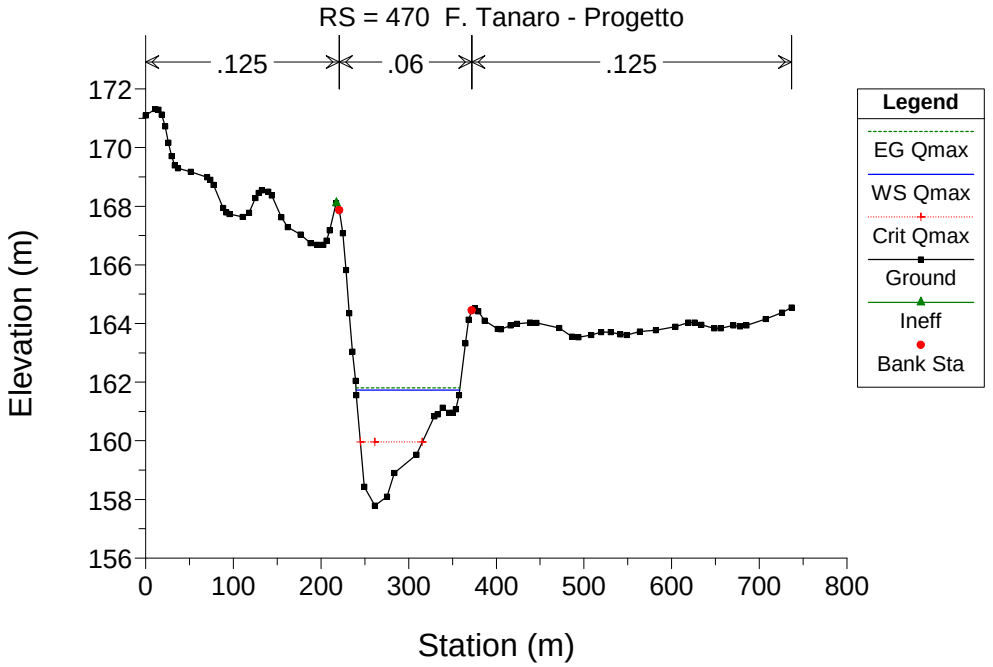

RS = 610 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
RS = 600 F. Tanaro - Progetto
Crit Qmax
Ineff
RS = 590 F. Tanaro - Progetto
RS = 580 F. Tanaro - Progetto

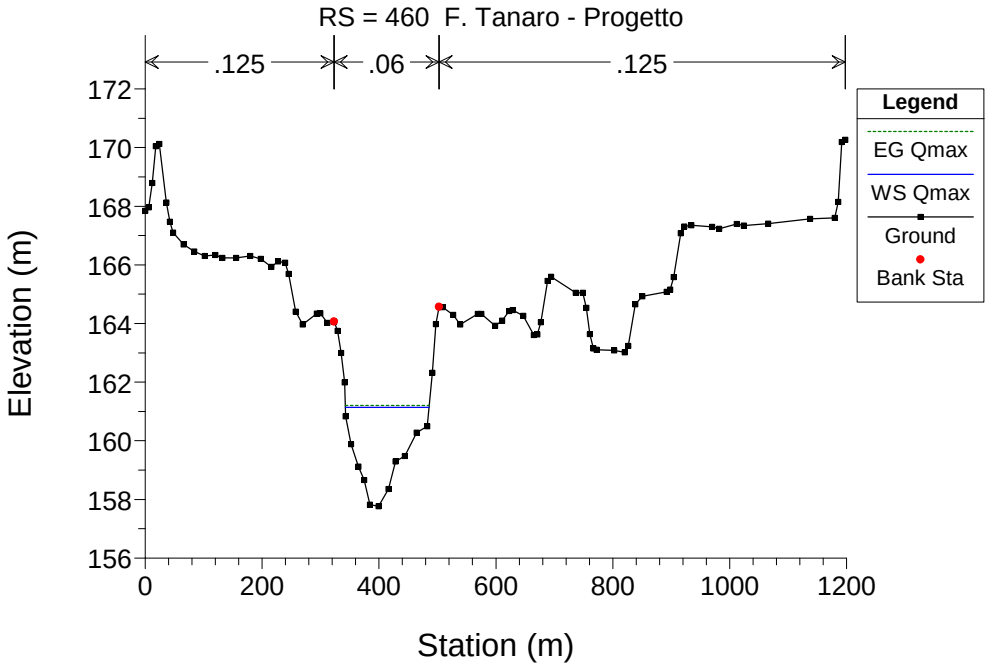

RS = 570 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta
RS = 560 F. Tanaro - Progetto
RS = 550 F. Tanaro - Progetto
RS = 540 F. Tanaro - Progetto

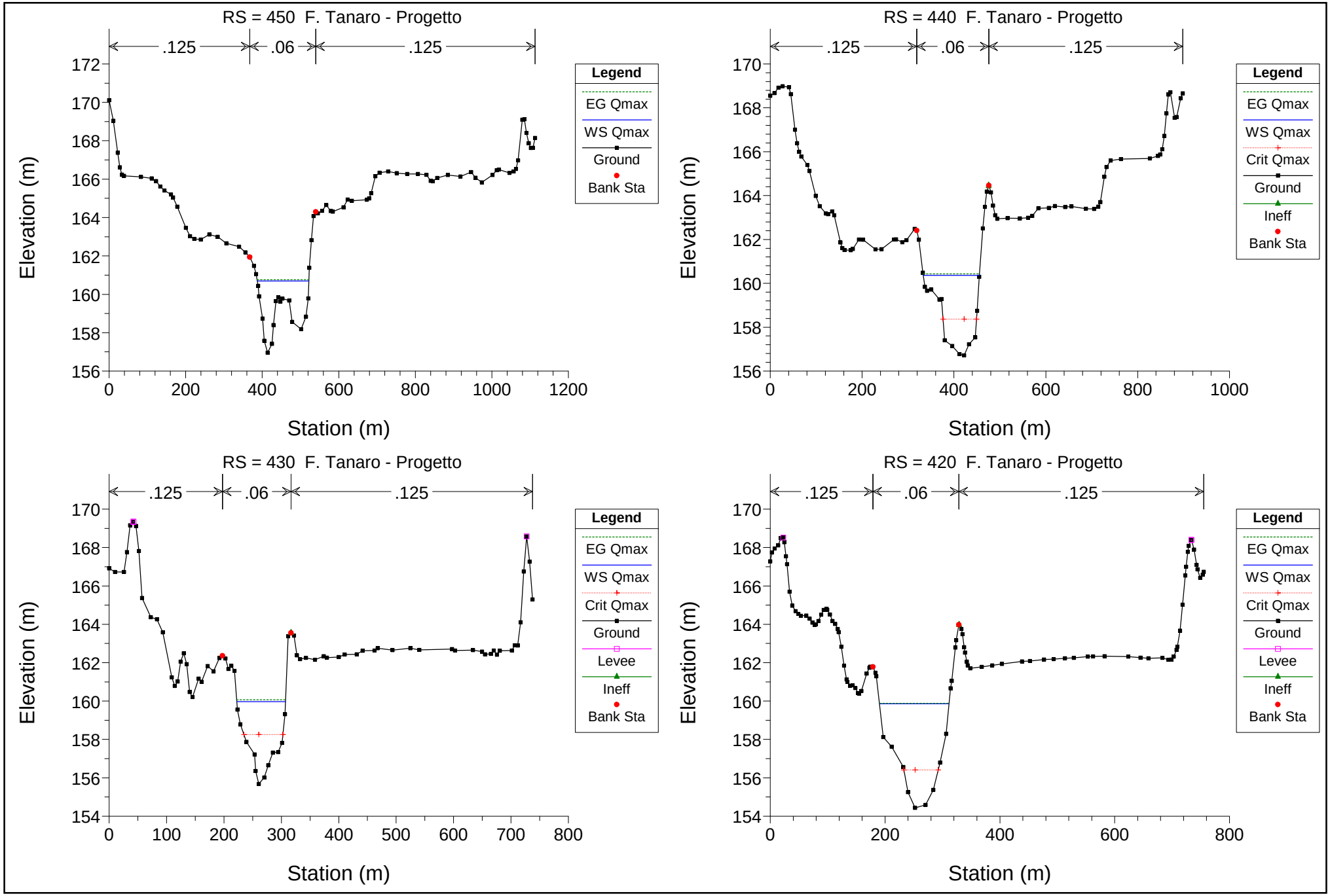

RS = 530 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 520 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 510 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 500 F. Tanaro - Progetto
.125
.06
.125
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)

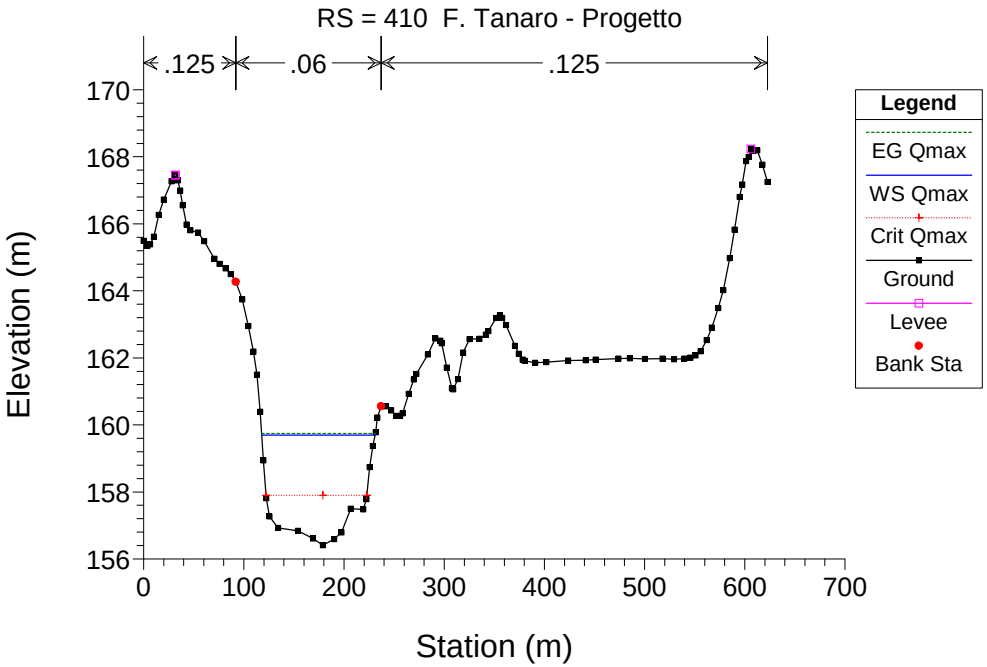

RS = 490 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta

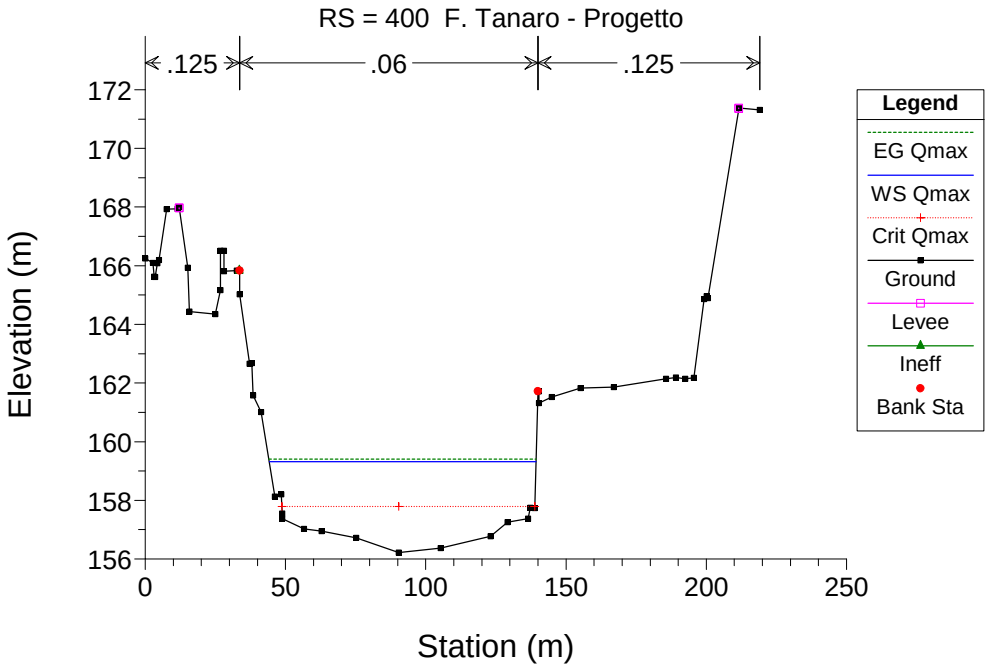

RS = 480 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta

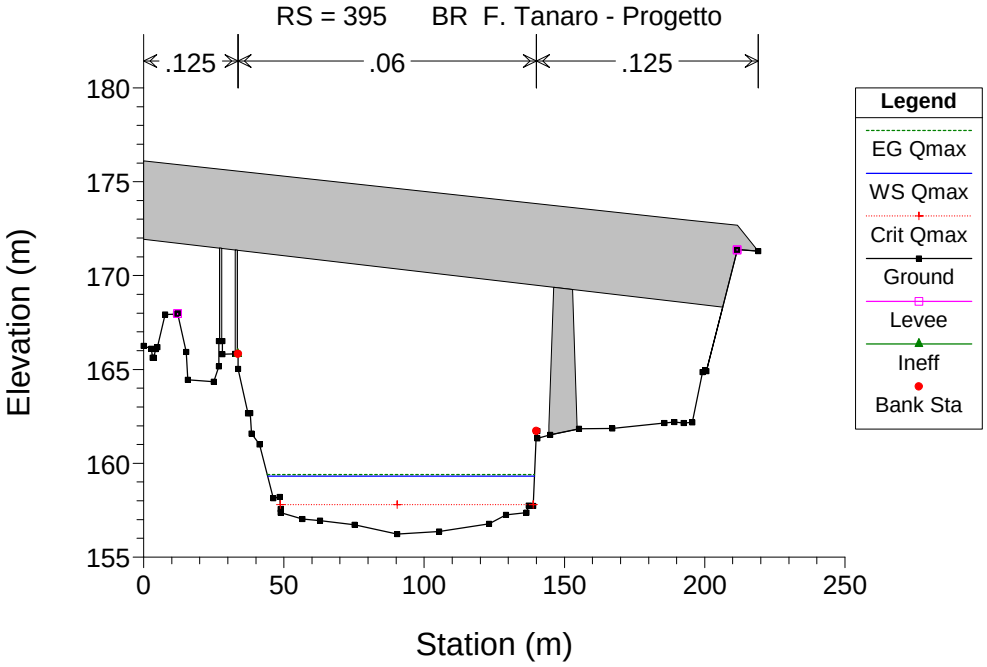

RS = 470 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta

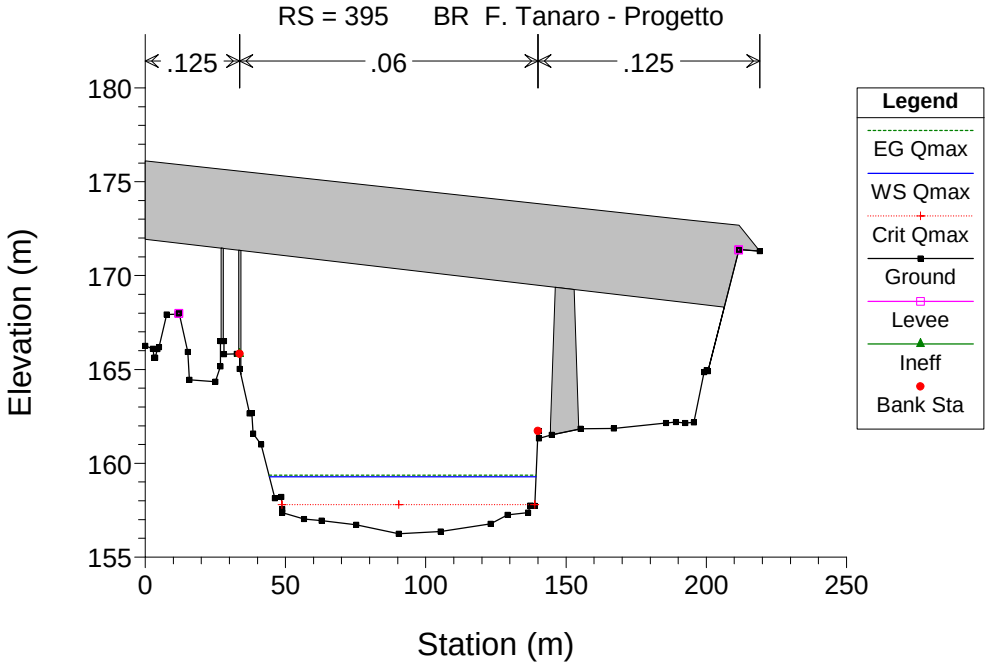

RS = 460 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta

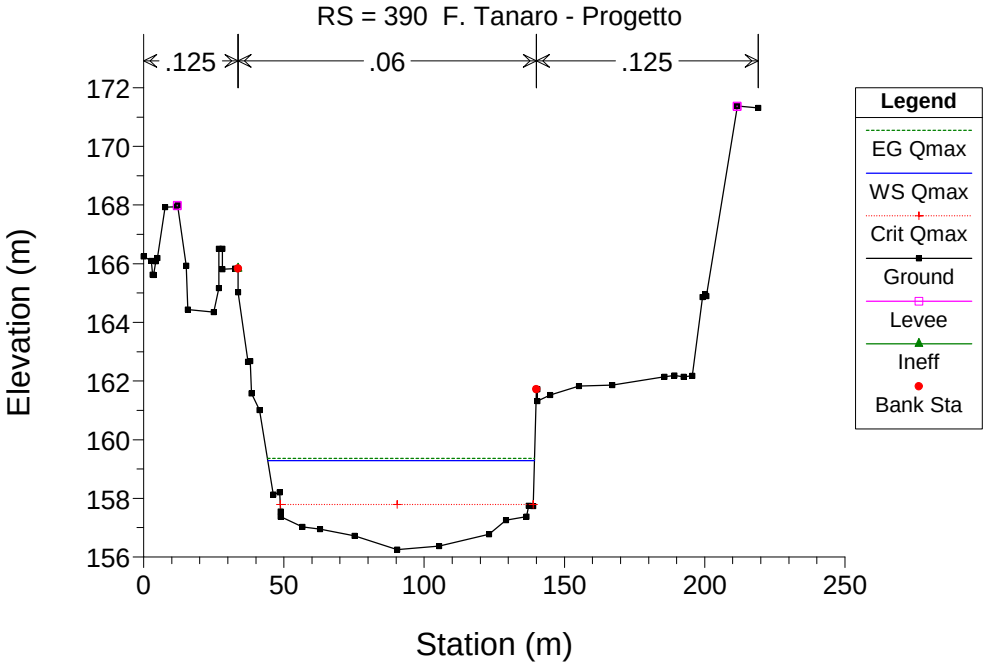

RS = 450 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Bank Sta
RS = 440 F. Tanaro - Progetto
Crit Qmax
Ineff
RS = 430 F. Tanaro - Progetto
Levee
RS = 420 F. Tanaro - Progetto

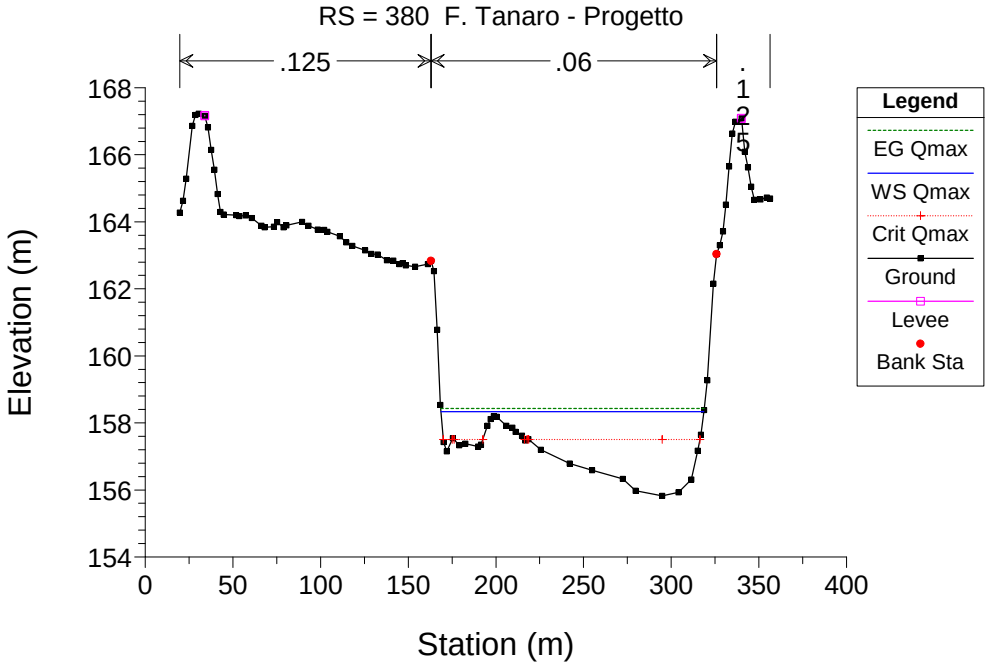

RS = 410 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta

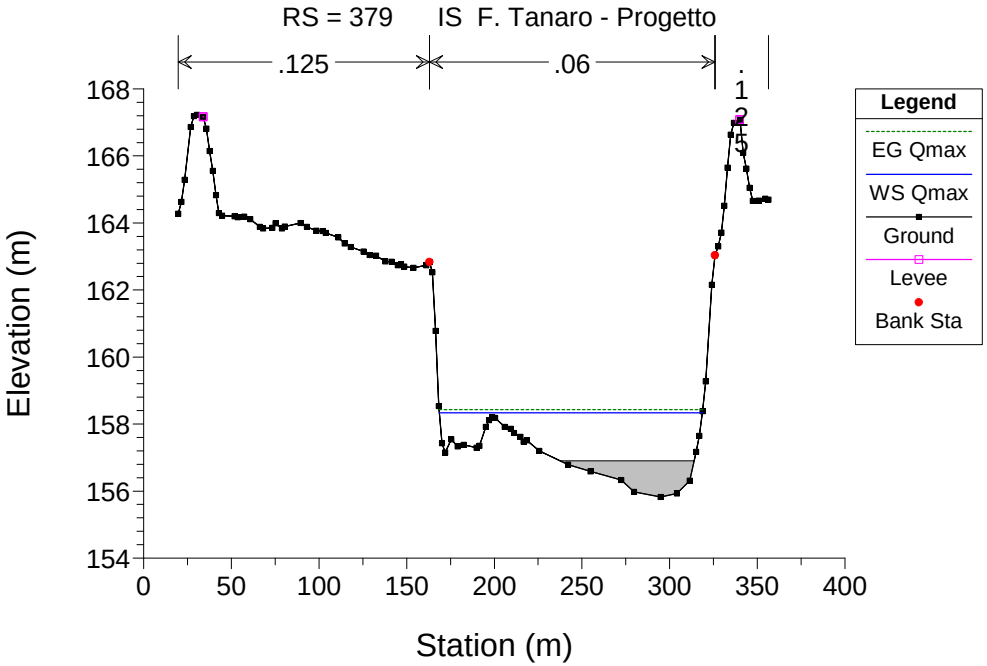

RS = 400 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

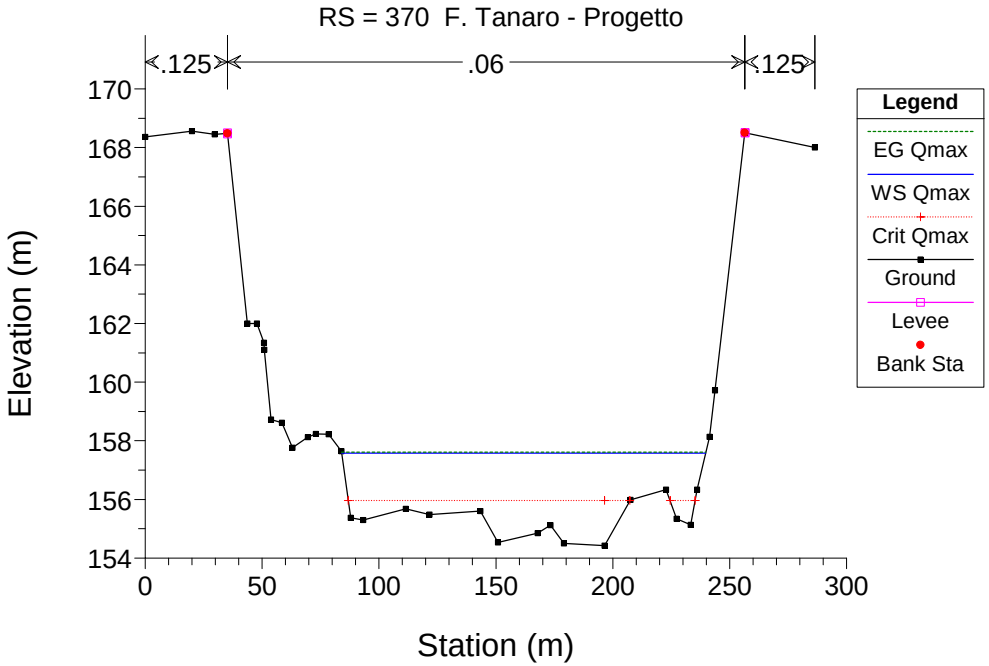

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

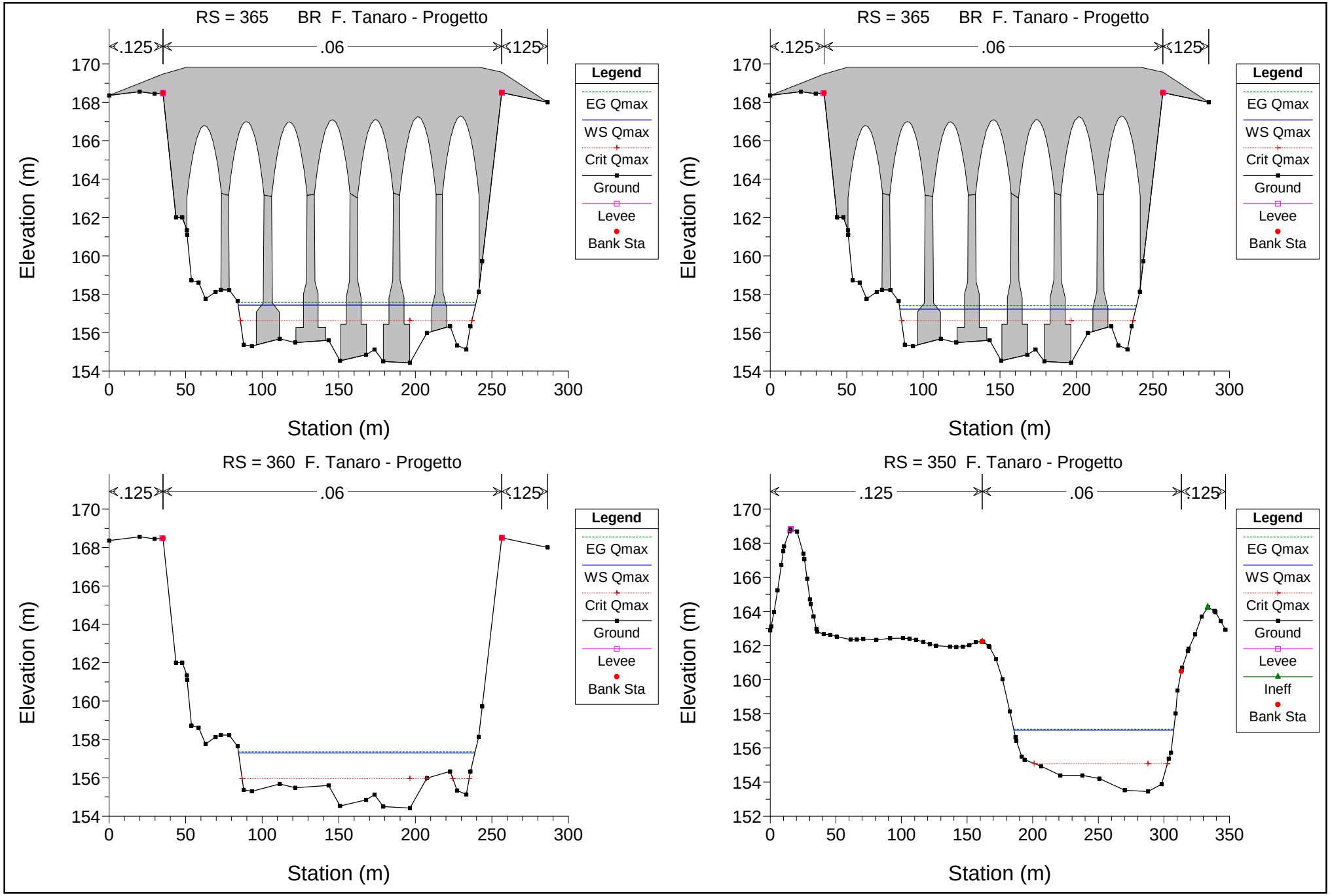

RS = 395 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

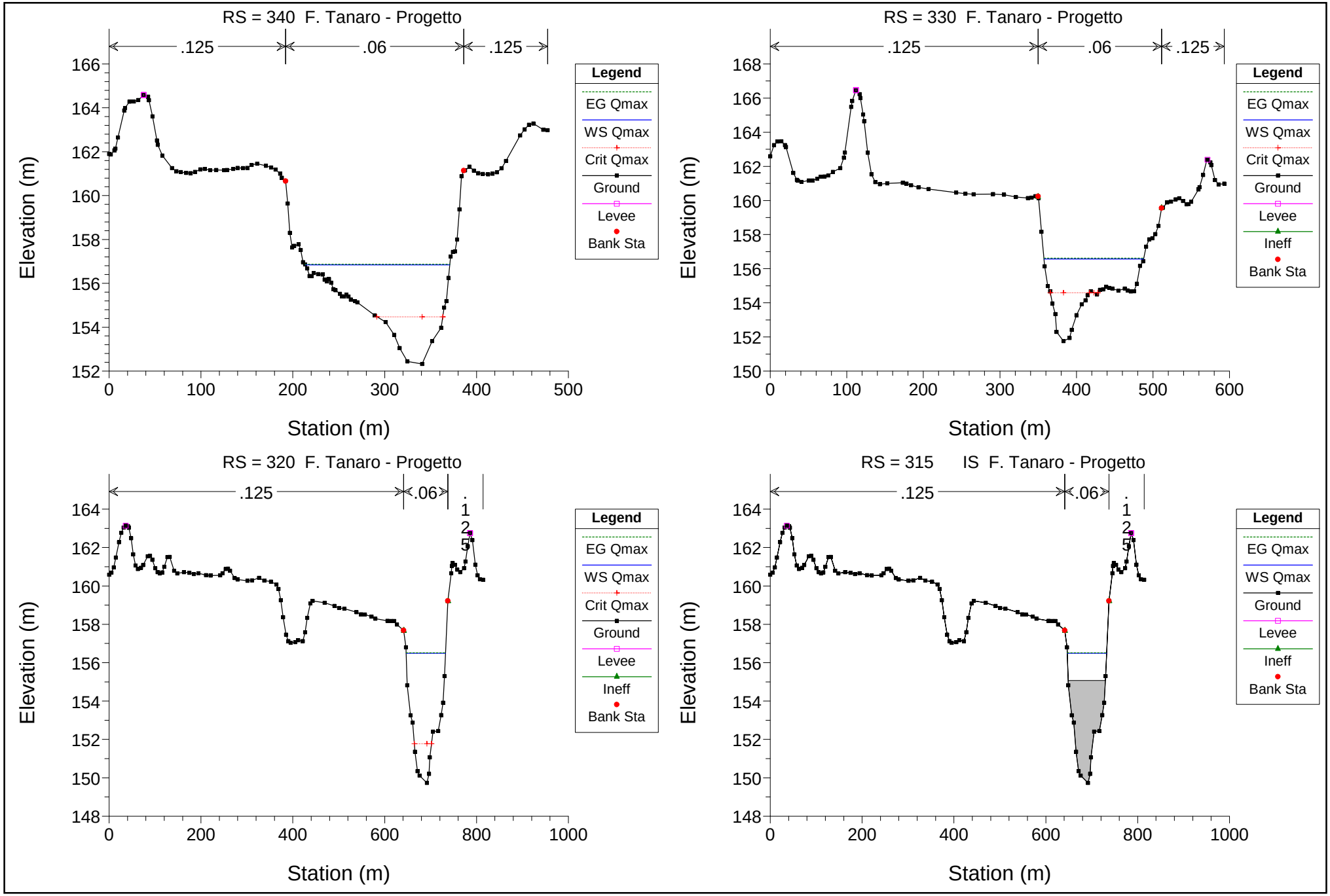

RS = 390 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

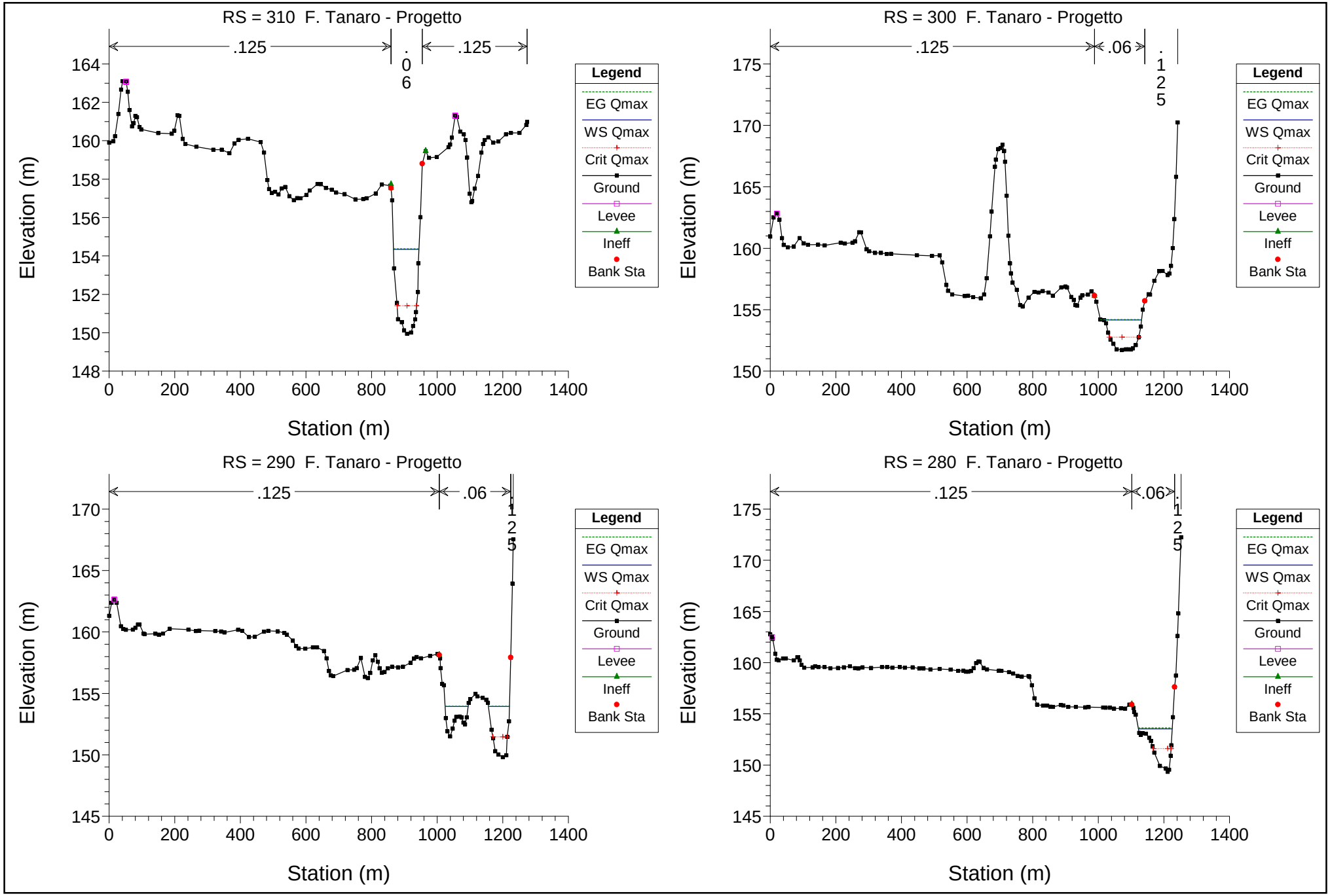

RS = 380 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta

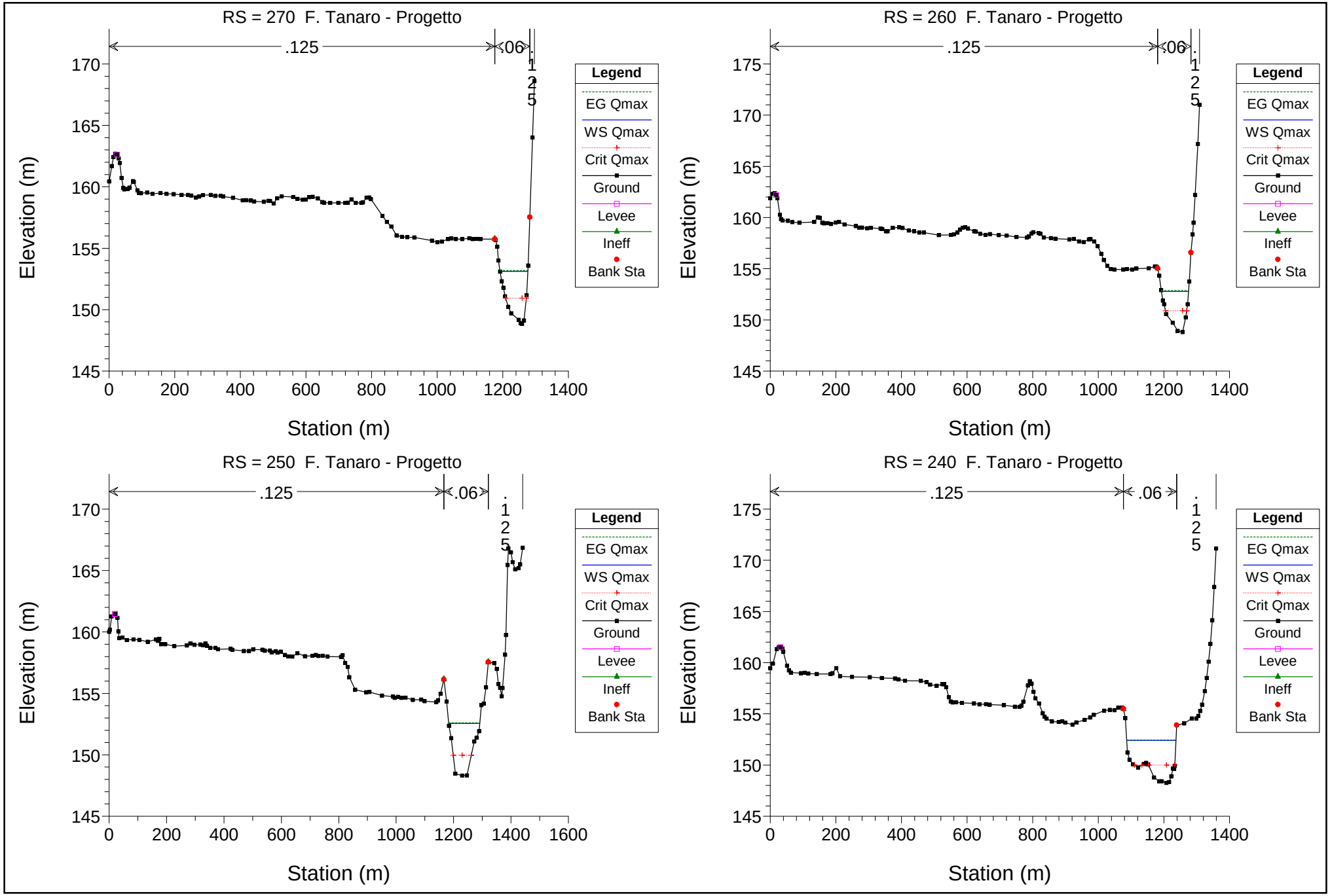

RS = 379 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Levee
Bank Sta

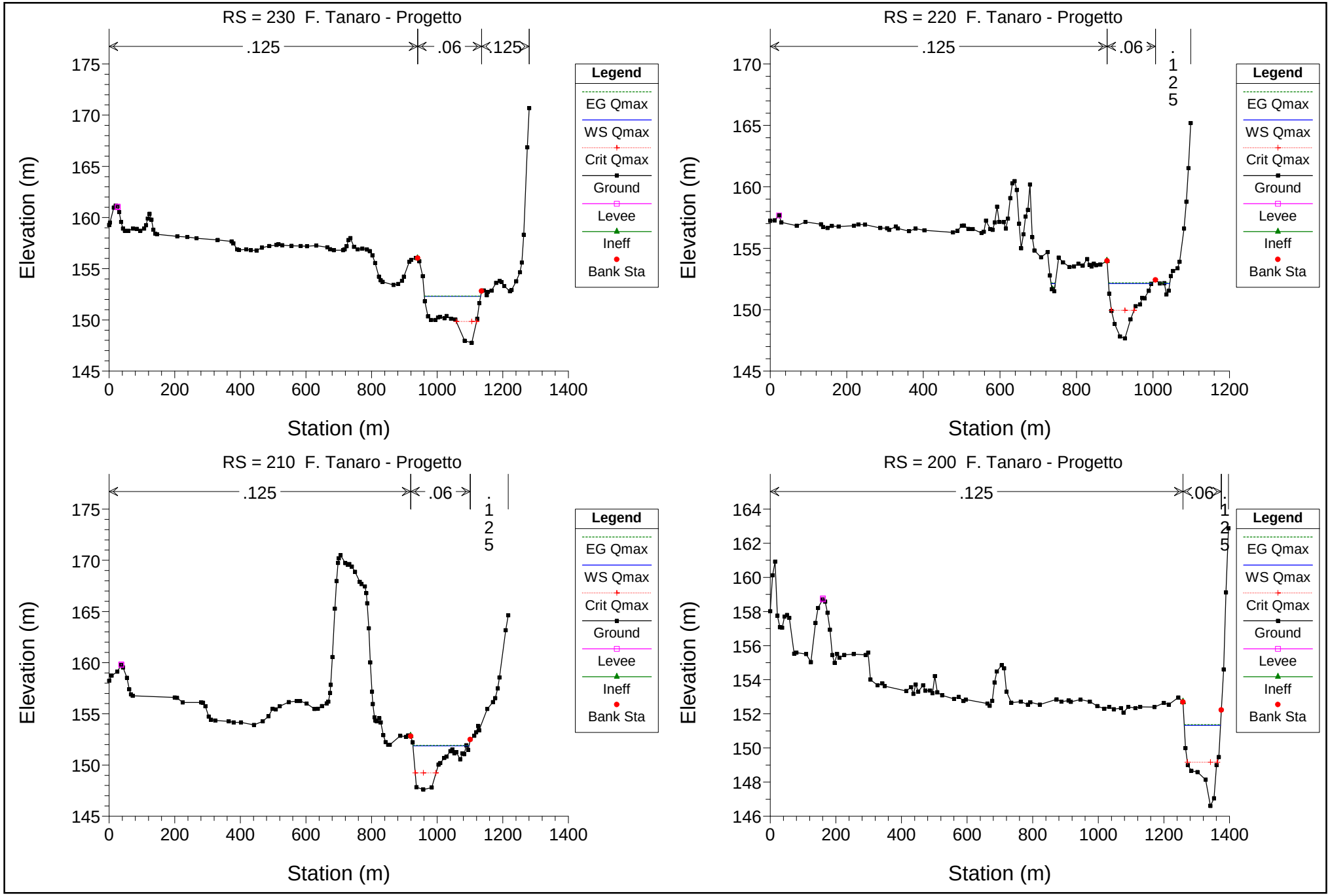

RS = 370 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta

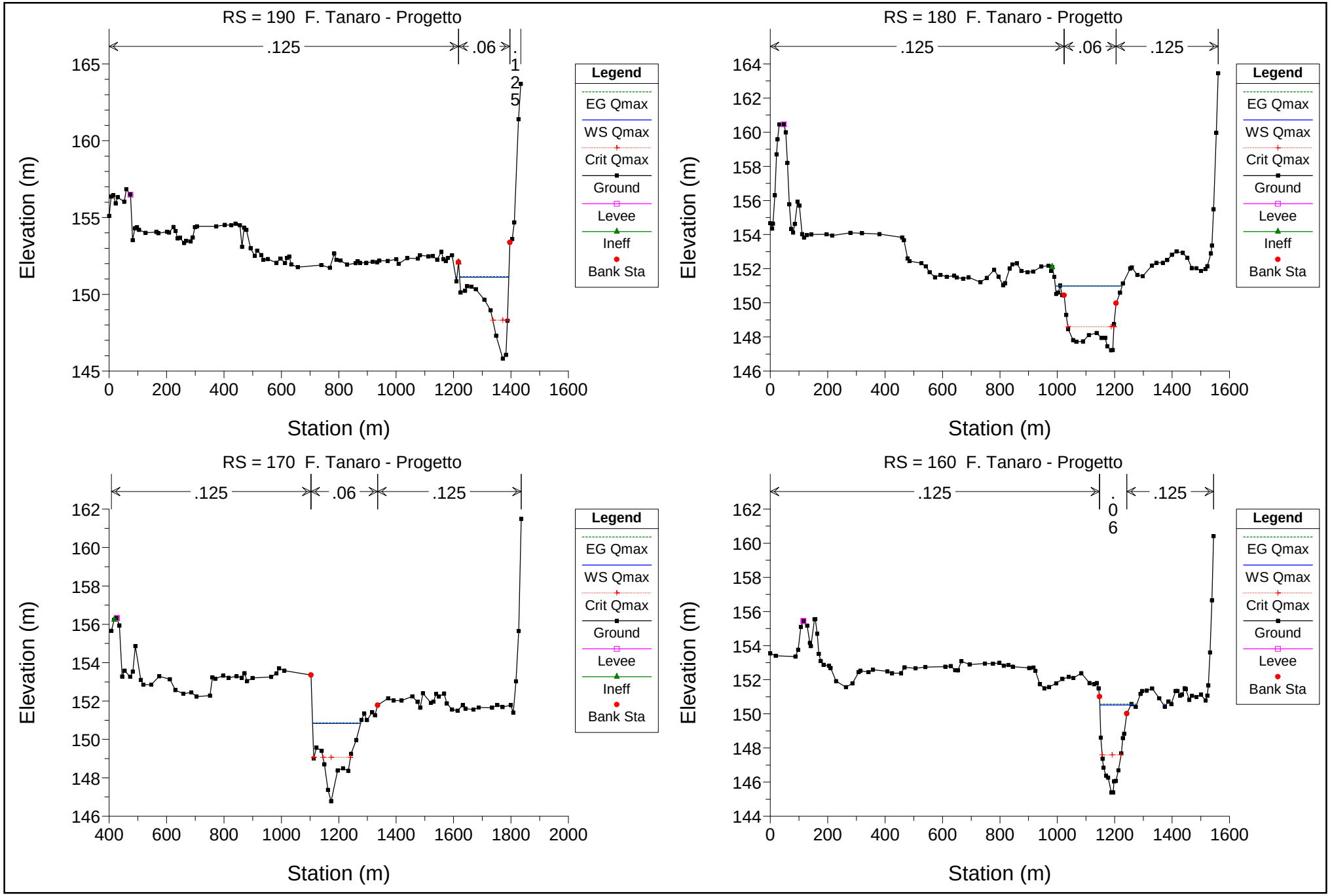

RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta
RS = 365 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta
RS = 360 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta
RS = 350 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

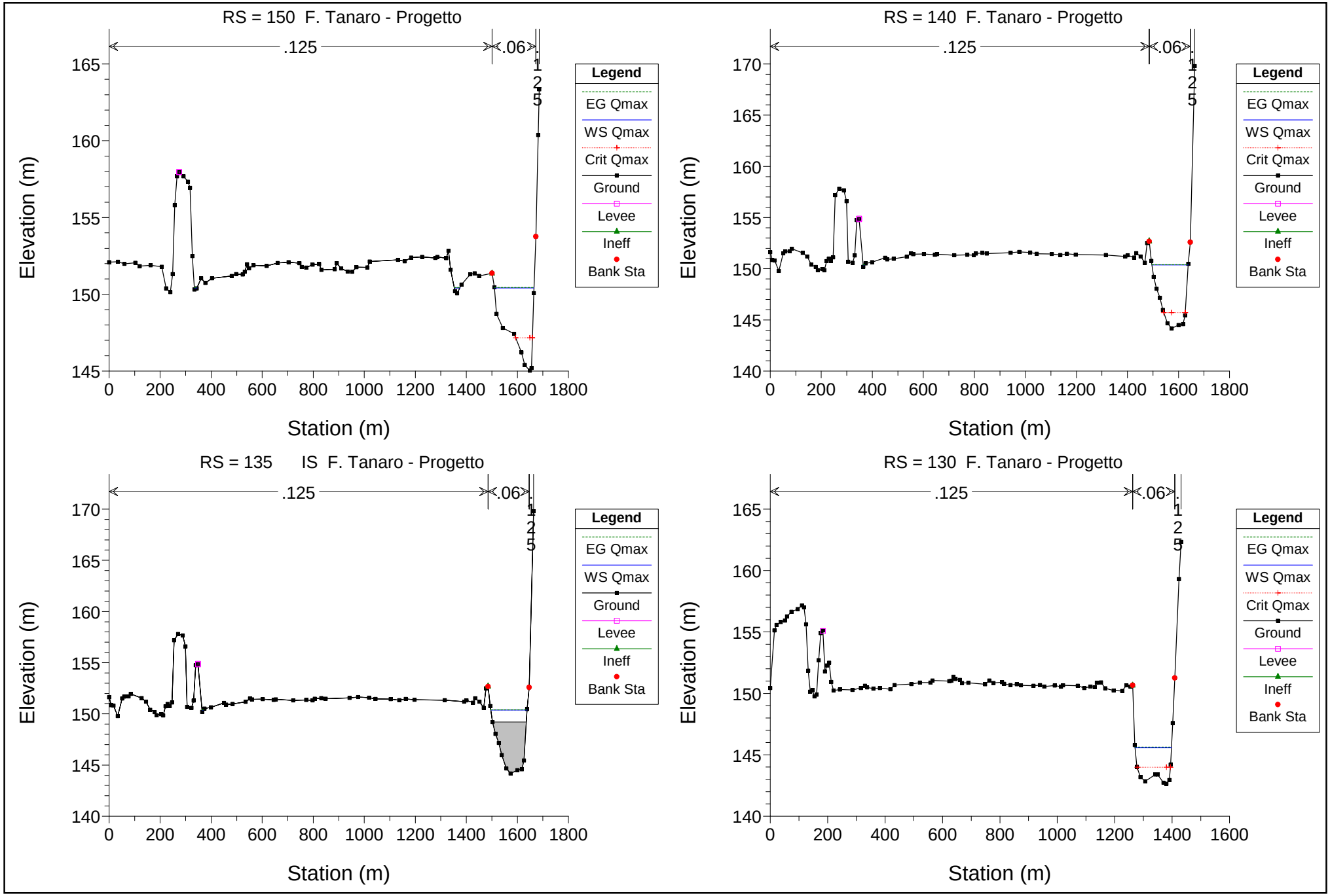

RS = 340 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta
RS = 330 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 320 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 315 IS F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Ground
Levee
Ineff
Bank Sta

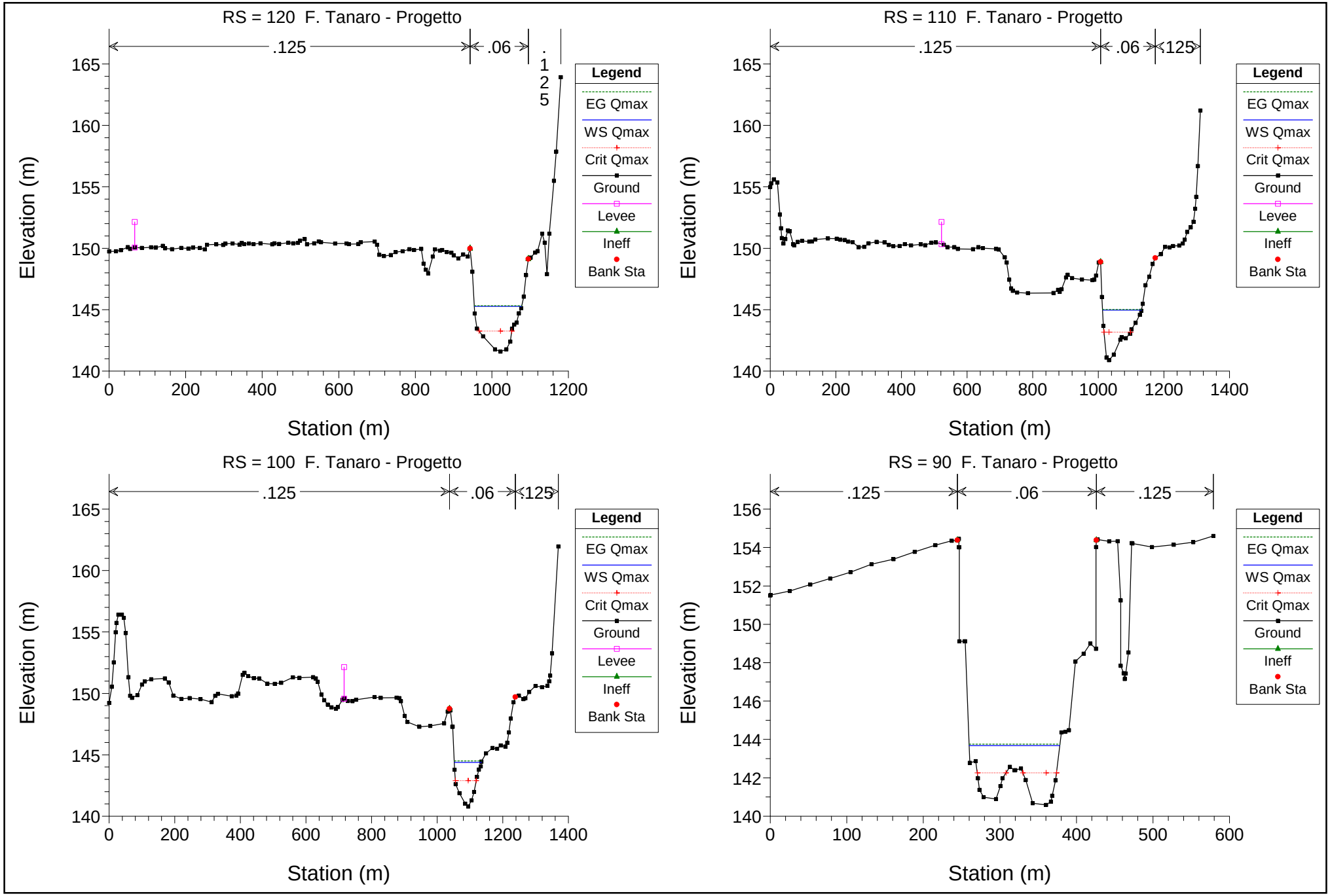

RS = 310 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 300 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 290 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 280 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

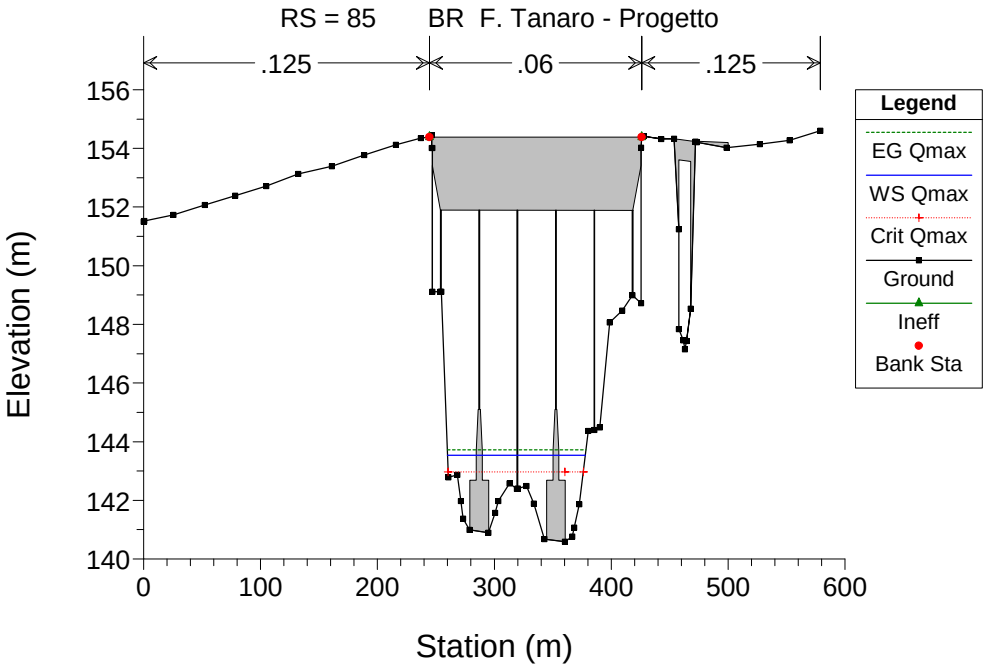

RS = 270 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 260 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 250 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 240 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

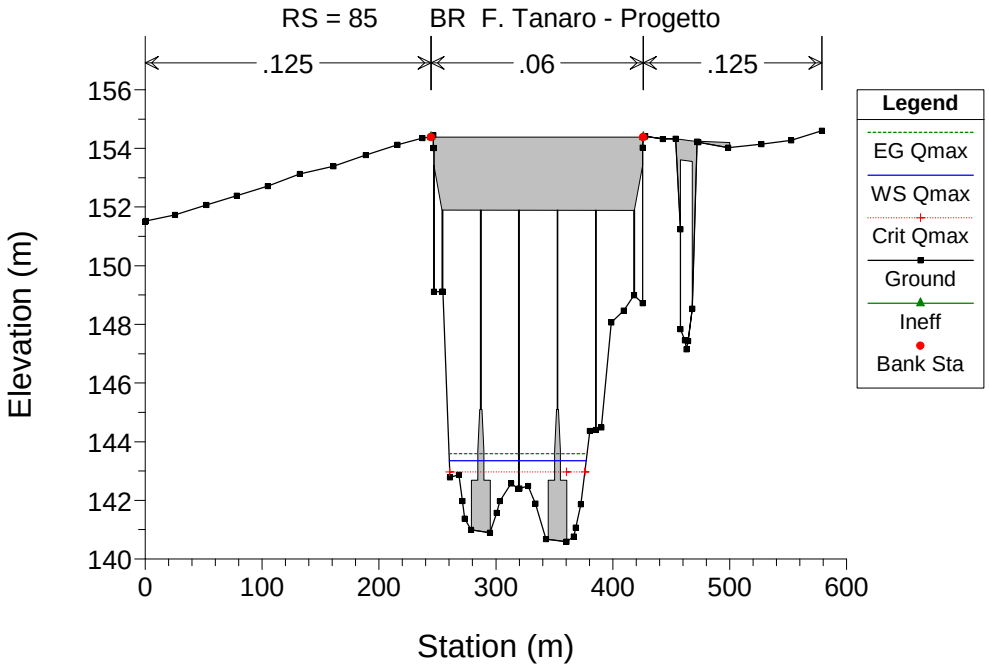

RS = 230 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 220 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 210 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 200 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

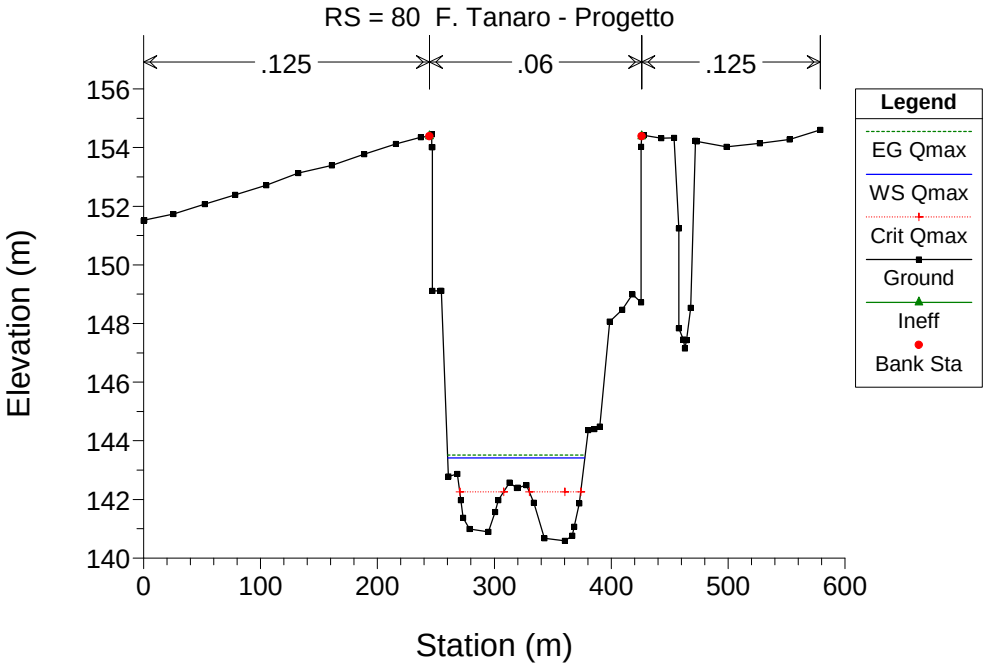

RS = 190 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 180 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 170 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 160 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Bank Sta

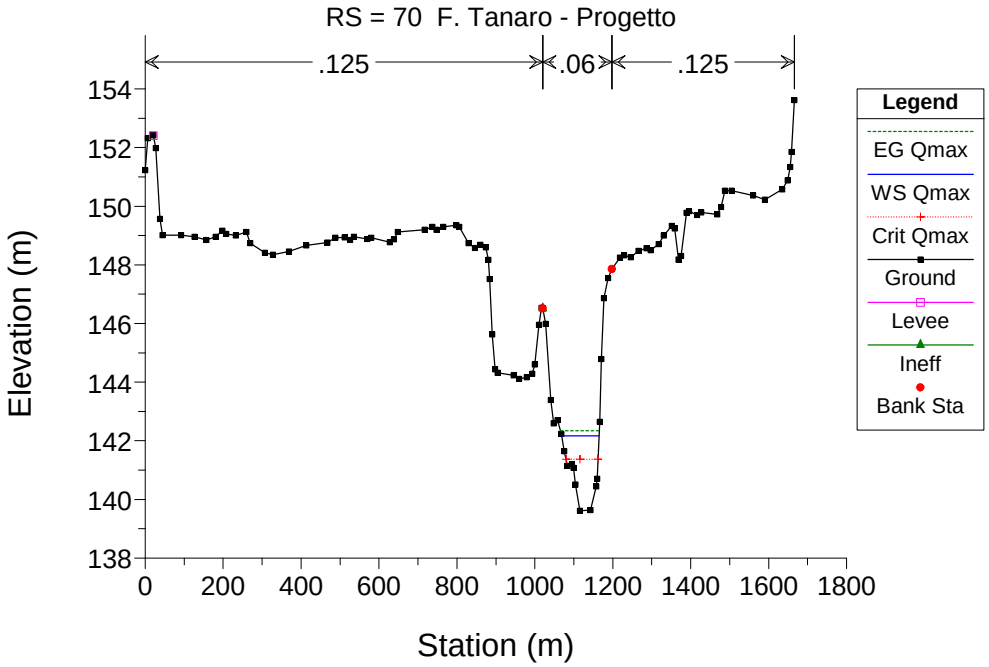

RS = 150 F. Tanaro - Progetto
.125
.06
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 140 F. Tanaro - Progetto
RS = 135 IS F. Tanaro - Progetto
RS = 130 F. Tanaro - Progetto

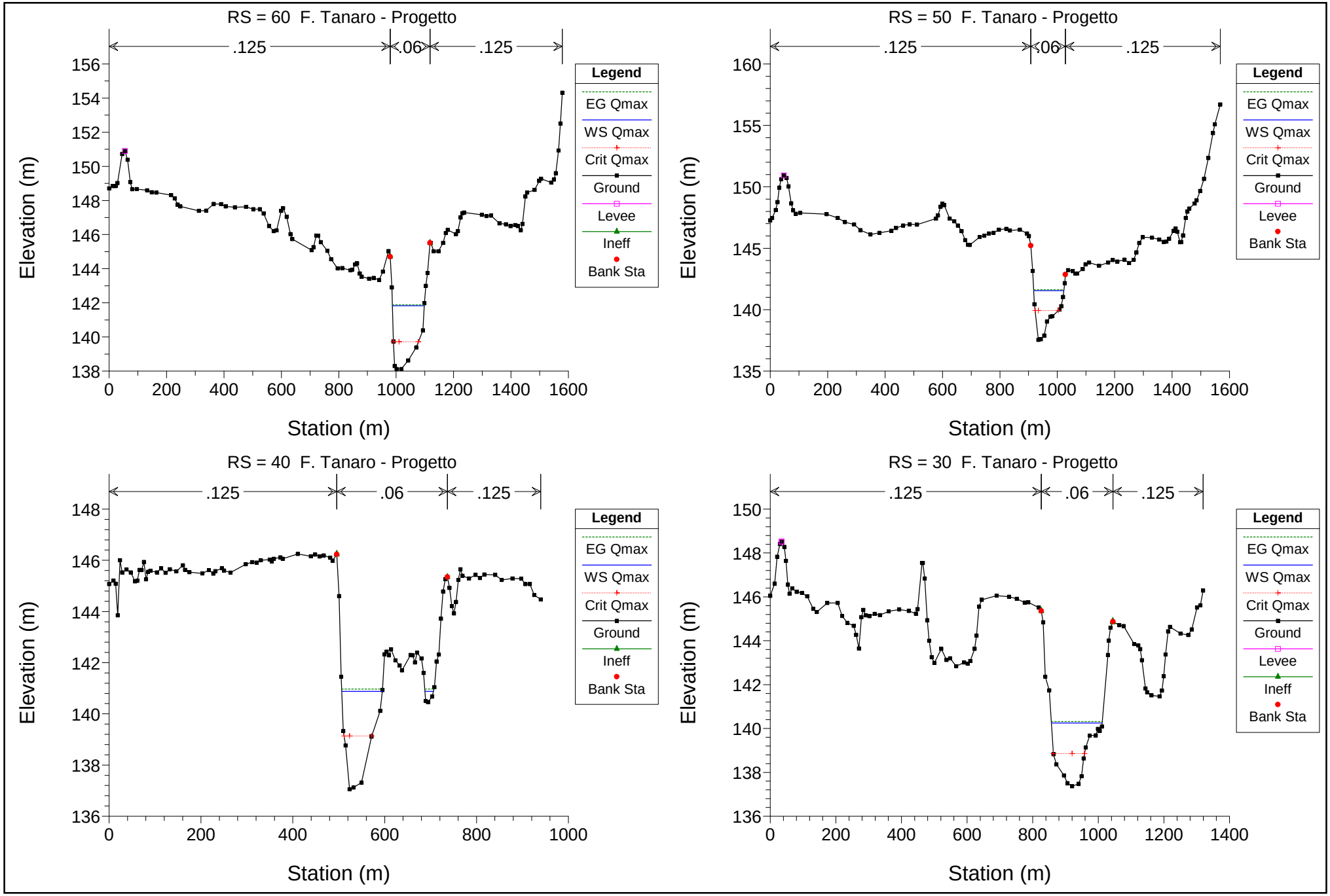

RS = 120 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 110 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 100 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 90 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta

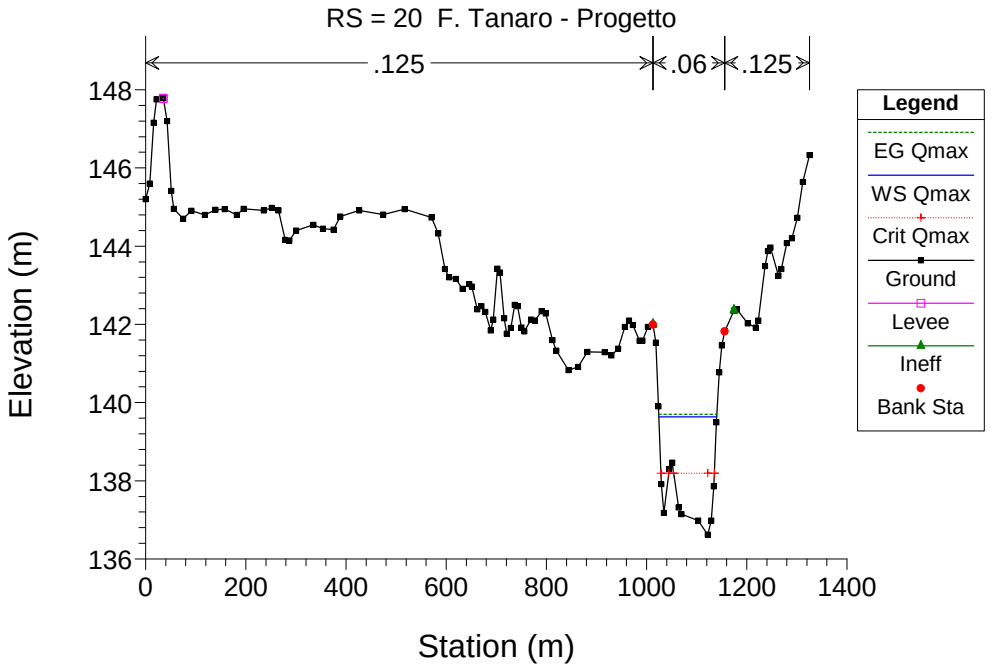

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta

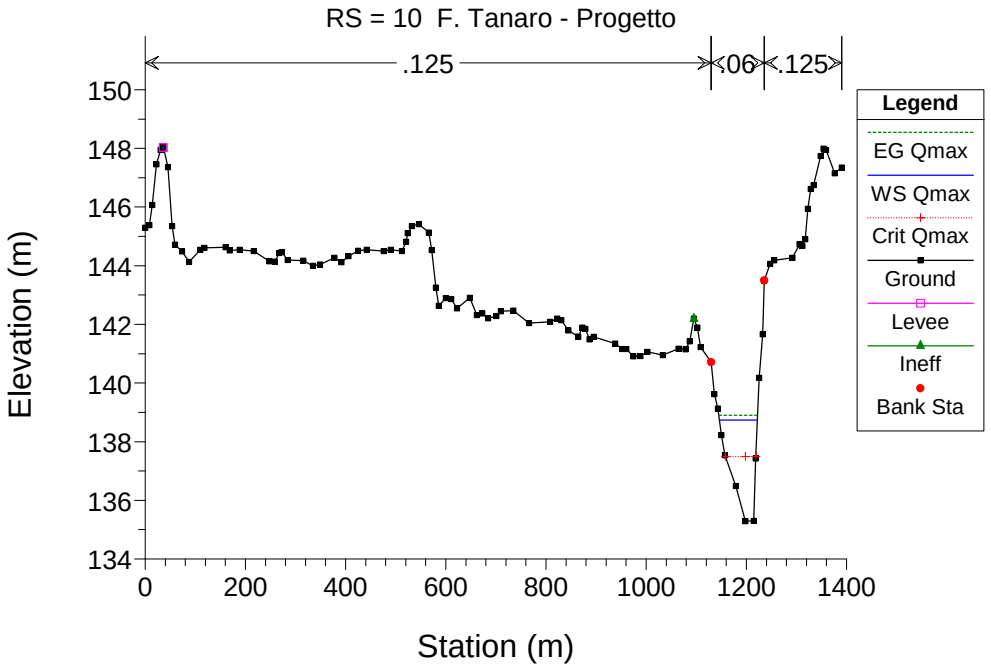

RS = 85 BR F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta


RS = 80 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Ineff
Bank Sta


RS = 70 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta


RS = 60 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta
RS = 50 F. Tanaro - Progetto
RS = 40 F. Tanaro - Progetto
RS = 30 F. Tanaro - Progetto


RS = 20 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
148
146
144
142
140
138
136
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta


RS = 10 F. Tanaro - Progetto
.125
.06
.125
Elevation (m)
150
148
146
144
142
140
138
136
134
0
200
400
600
800
1000
1200
1400
Station (m)
Legend
EG Qmax
WS Qmax
Crit Qmax
Ground
Levee
Ineff
Bank Sta

SITUAZIONE DI PROGETTO

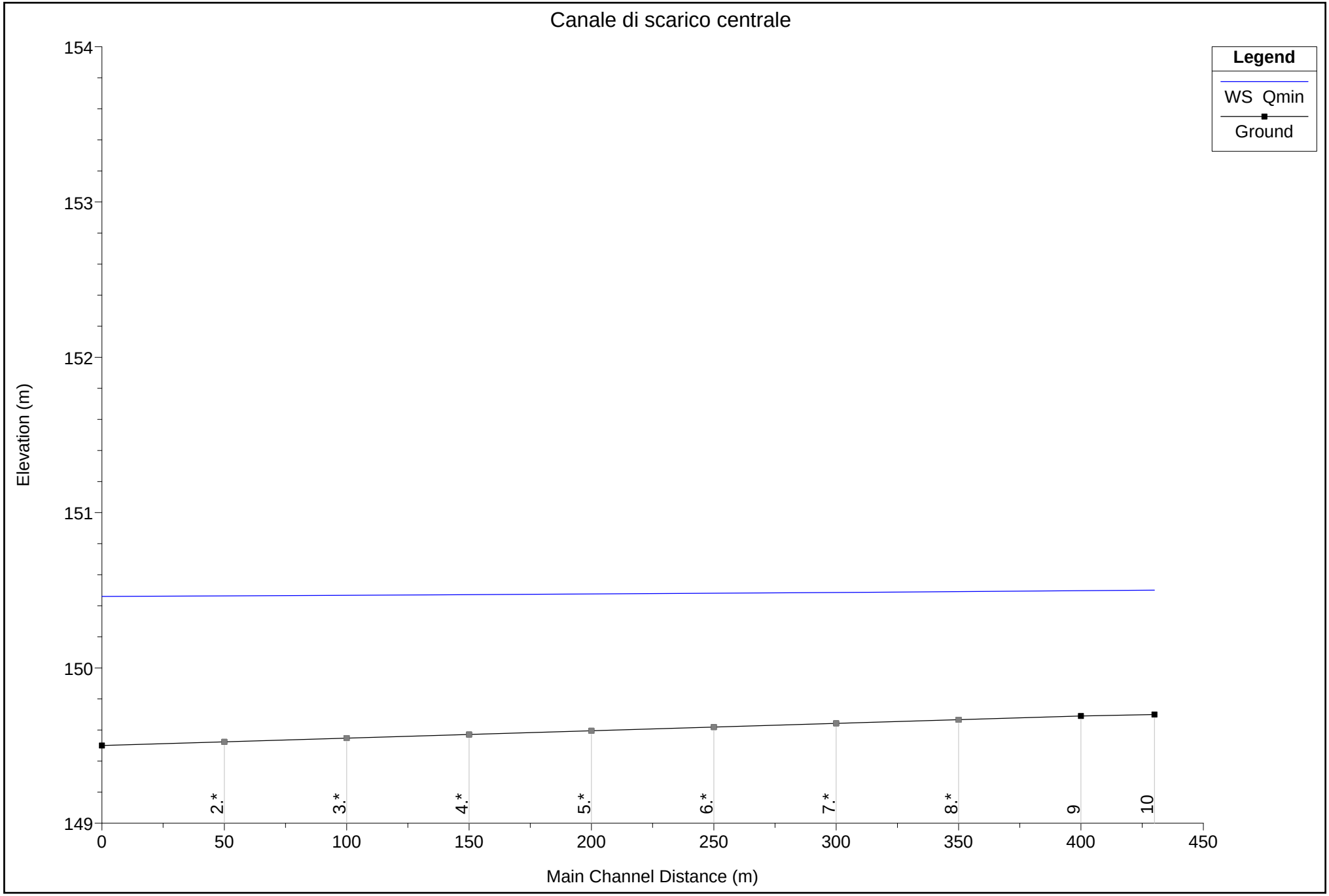
SIMULAZIONE 11

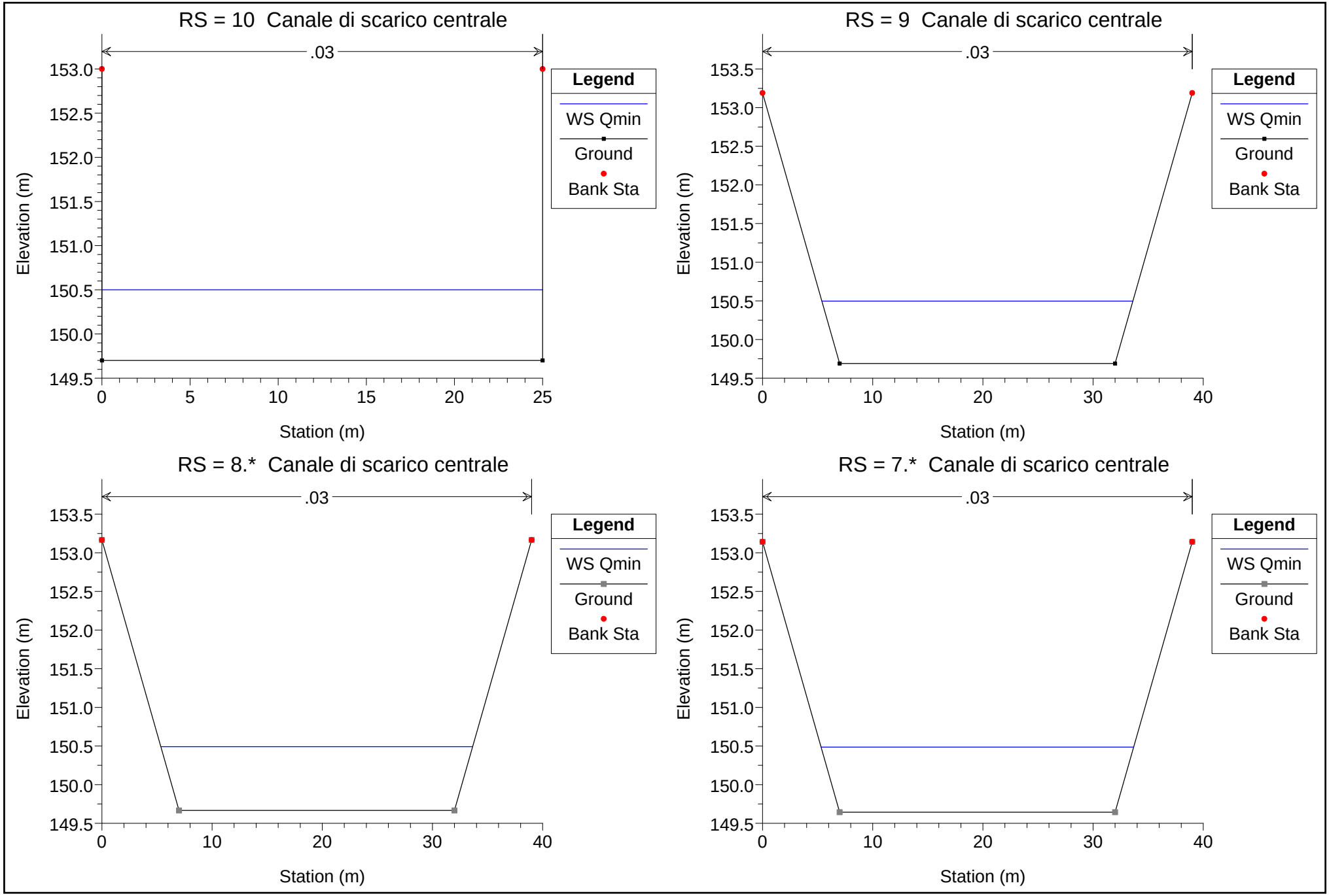
Canale di restituzione

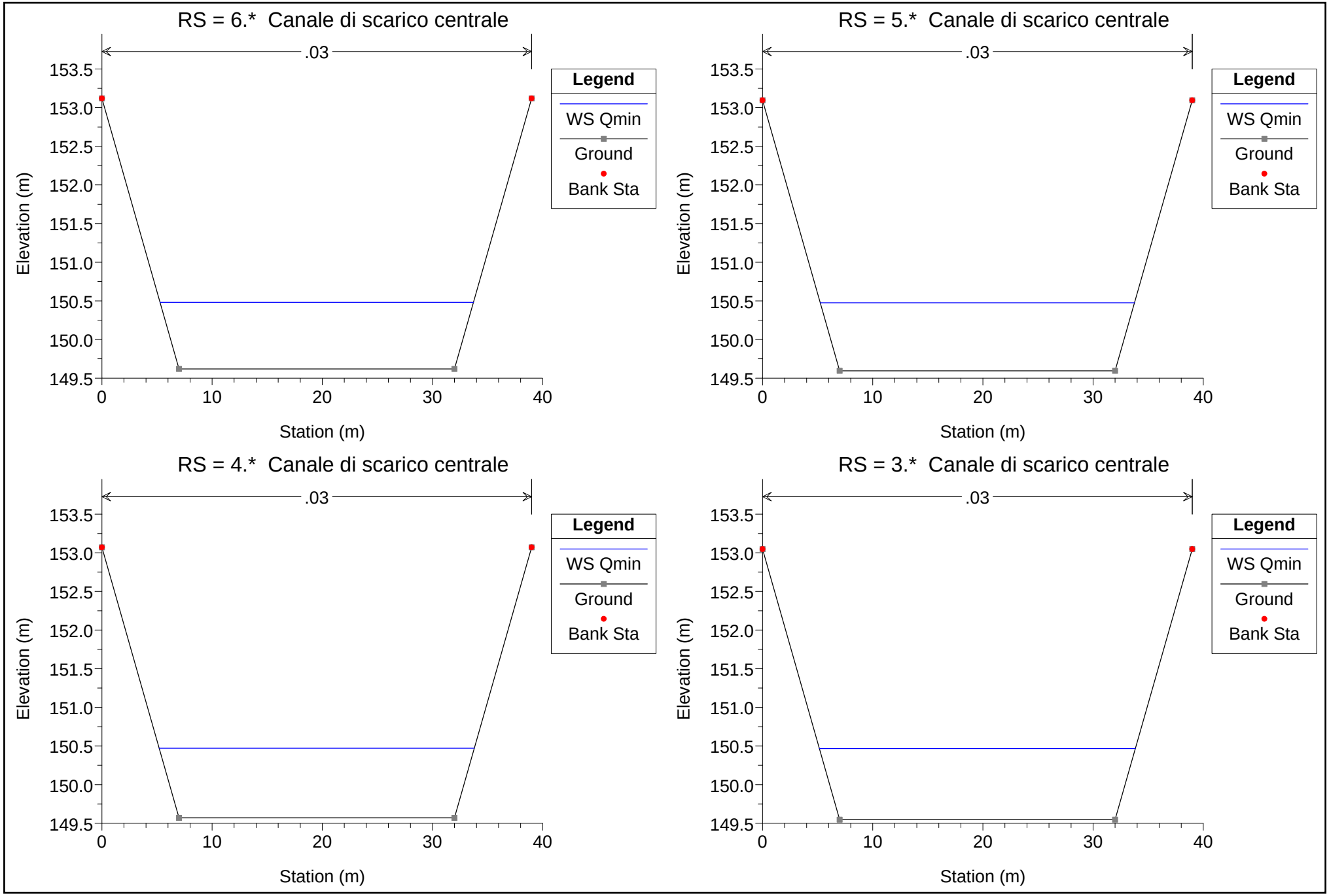
Portata Q m^3/s	**Portata**
6.66 (15.90 m^3/s in alveo)	Minima di funzionamento dell'impianto

HEC-RAS Plan: Plan 01 River: scarico Reach: 1 Profile: Qmin

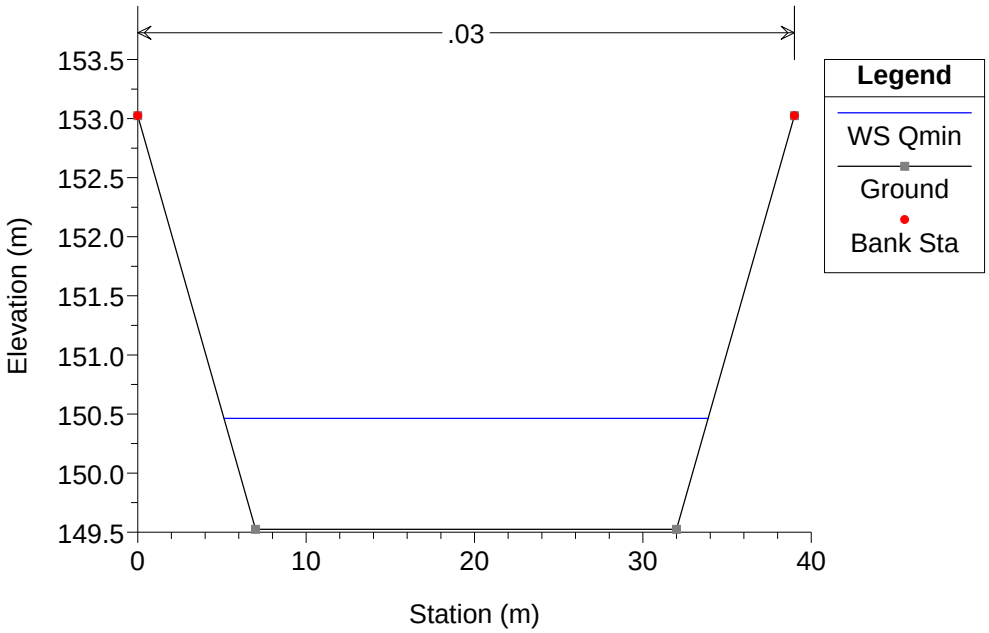
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	10	Qmin	6.66	149.70	150.50		150.51	0.000146	0.33	20.02	25.00	0.12
1	9	Qmin	6.66	149.69	150.50		150.50	0.000127	0.31	21.48	28.23	0.11
1	8.*	Qmin	6.66	149.67	150.49		150.50	0.000118	0.30	22.00	28.30	0.11
1	7.*	Qmin	6.66	149.64	150.49		150.49	0.000110	0.30	22.49	28.37	0.11
1	6.*	Qmin	6.66	149.62	150.48		150.48	0.000102	0.29	23.03	28.45	0.10
1	5.*	Qmin	6.66	149.59	150.48		150.48	0.000094	0.28	23.58	28.52	0.10
1	4.*	Qmin	6.66	149.57	150.47		150.48	0.000088	0.28	24.13	28.60	0.10
1	3.*	Qmin	6.66	149.55	150.47		150.47	0.000082	0.27	24.67	28.68	0.09
1	2.*	Qmin	6.66	149.52	150.46		150.47	0.000076	0.26	25.26	28.76	0.09
1	1	Qmin	6.66	149.50	150.46	149.69	150.46	0.000071	0.26	25.84	28.84	0.09


Canale di scarico centrale
Legend
WS Qmin
Ground
Elevation (m)
154
153
152
151
150
149
0
50
100
150
200
250
300
350
400
450
Main Channel Distance (m)
2.*
3.*
4.*
5.*
6.*
7.*
8.*
9
10

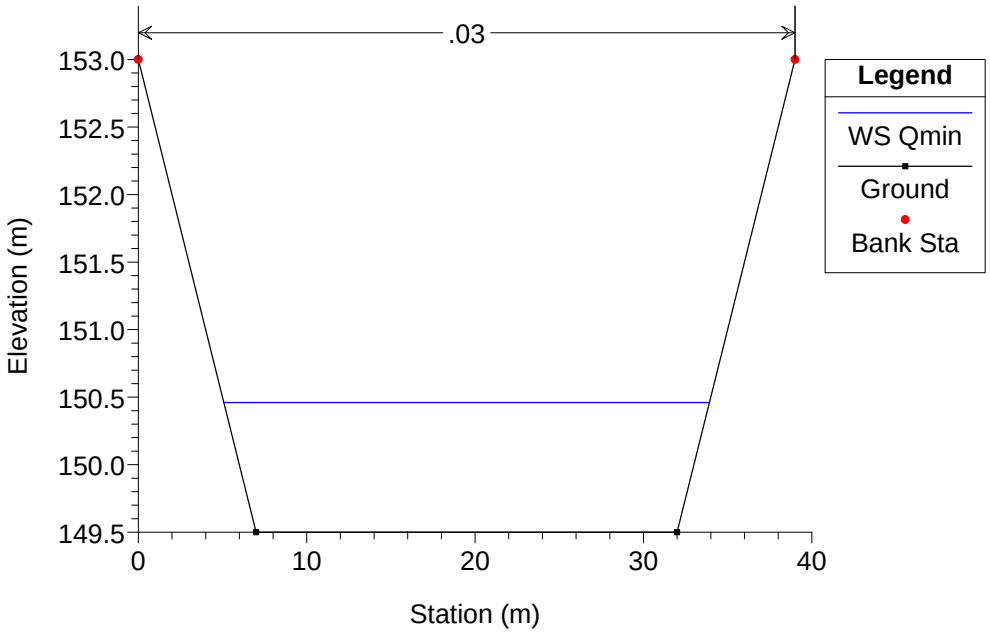

RS = 10 Canale di scarico centrale
.03
Elevation (m)
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
5
10
15
20
25
Station (m)
Legend
WS Qmin
Ground
Bank Sta
RS = 9 Canale di scarico centrale
.03
Elevation (m)
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
10
20
30
40
Station (m)
Legend
WS Qmin
Ground
Bank Sta
RS = 8.* Canale di scarico centrale
.03
Elevation (m)
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
10
20
30
40
Station (m)
Legend
WS Qmin
Ground
Bank Sta
RS = 7.* Canale di scarico centrale
.03
Elevation (m)
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
10
20
30
40
Station (m)
Legend
WS Qmin
Ground
Bank Sta


RS = 6.* Canale di scarico centrale
.03
Legend
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
10
20
30
40
RS = 5.* Canale di scarico centrale
.03
Legend
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 4.* Canale di scarico centrale
.03
Legend
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 3.* Canale di scarico centrale
.03
Legend
WS Qmin
Ground
Bank Sta
Elevation (m)
Station (m)

RS = 2.* Canale di scarico centrale



RS = 1 Canale di scarico centrale



SITUAZIONE DI PROGETTO

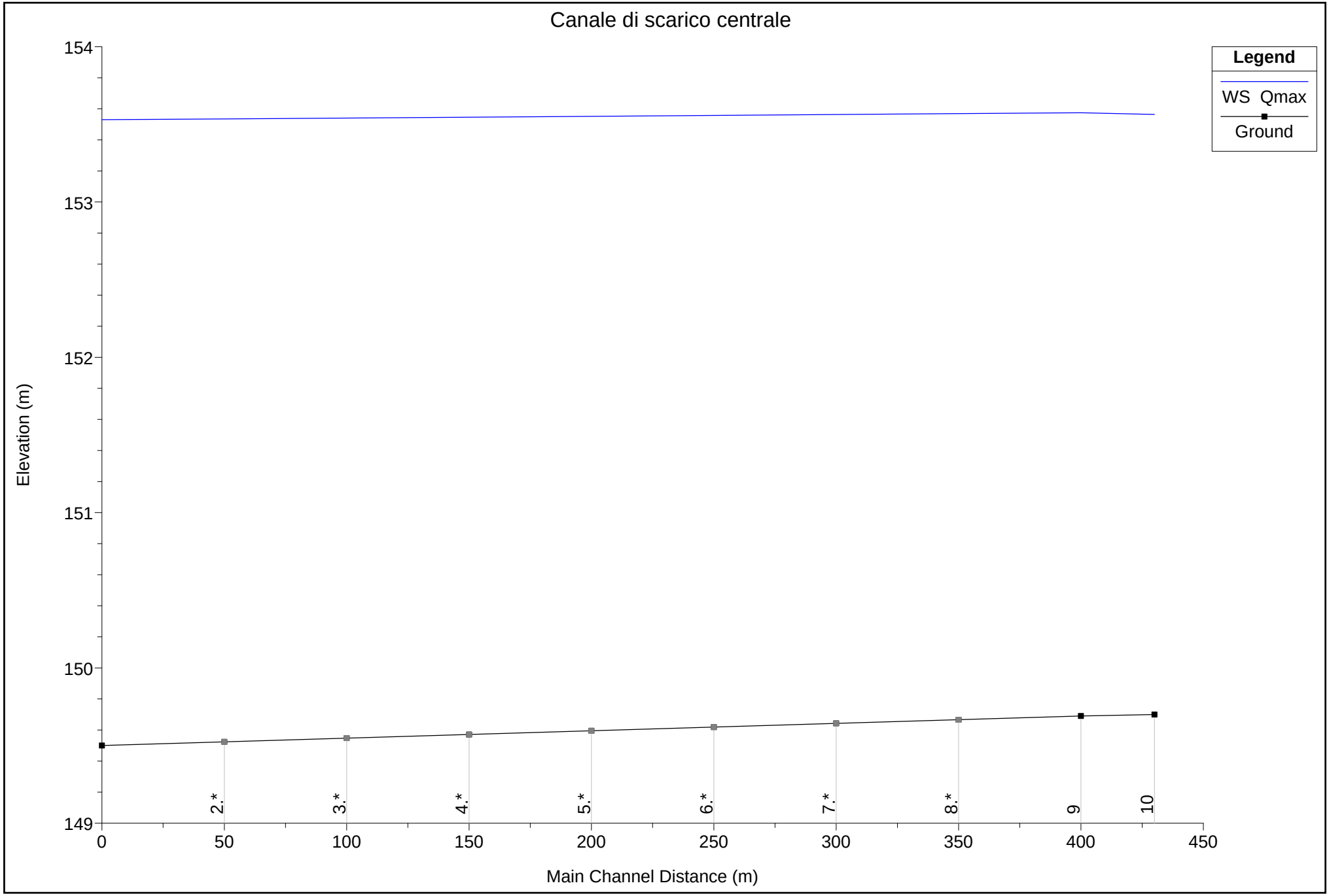
SIMULAZIONE 12

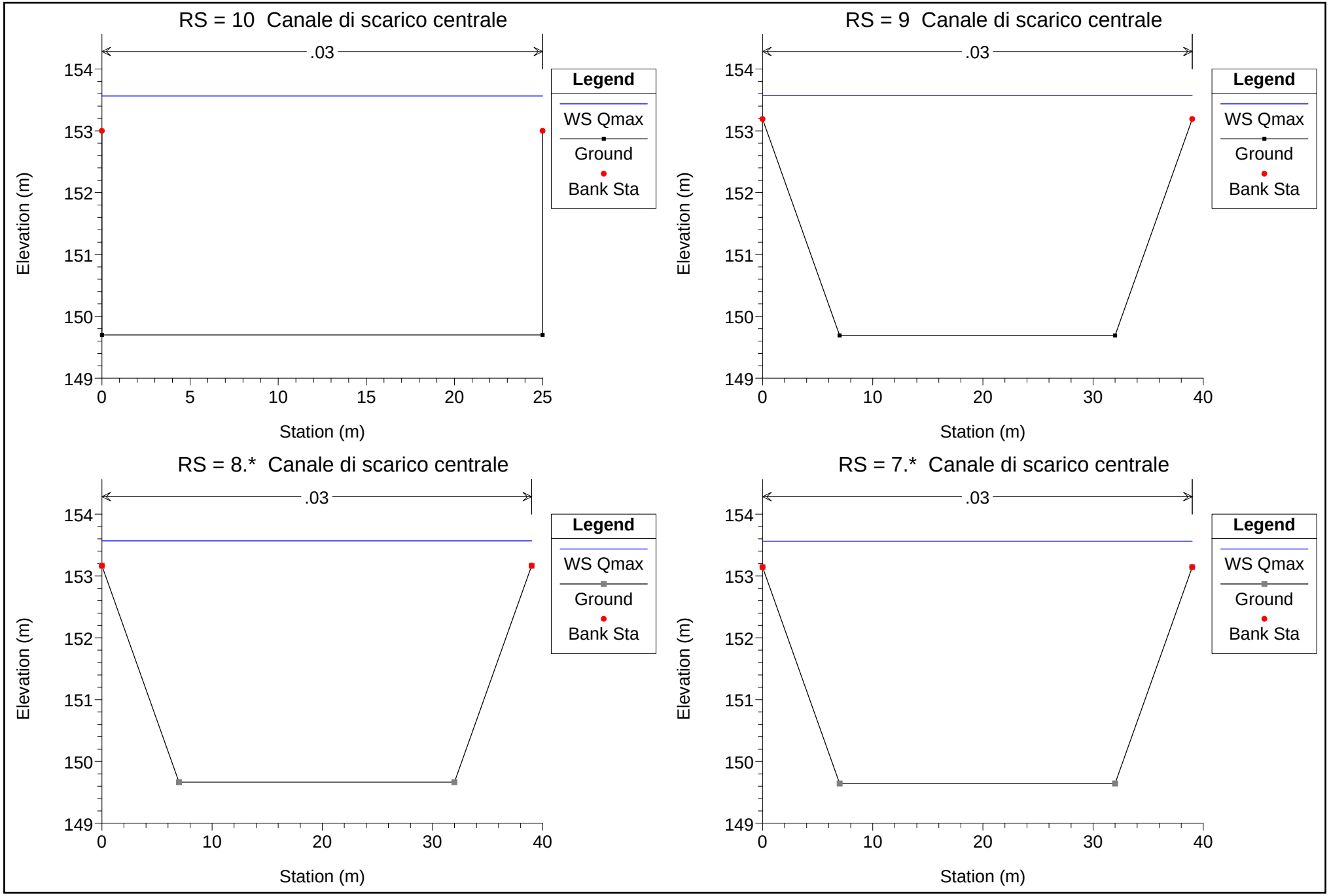
Canale di restituzione

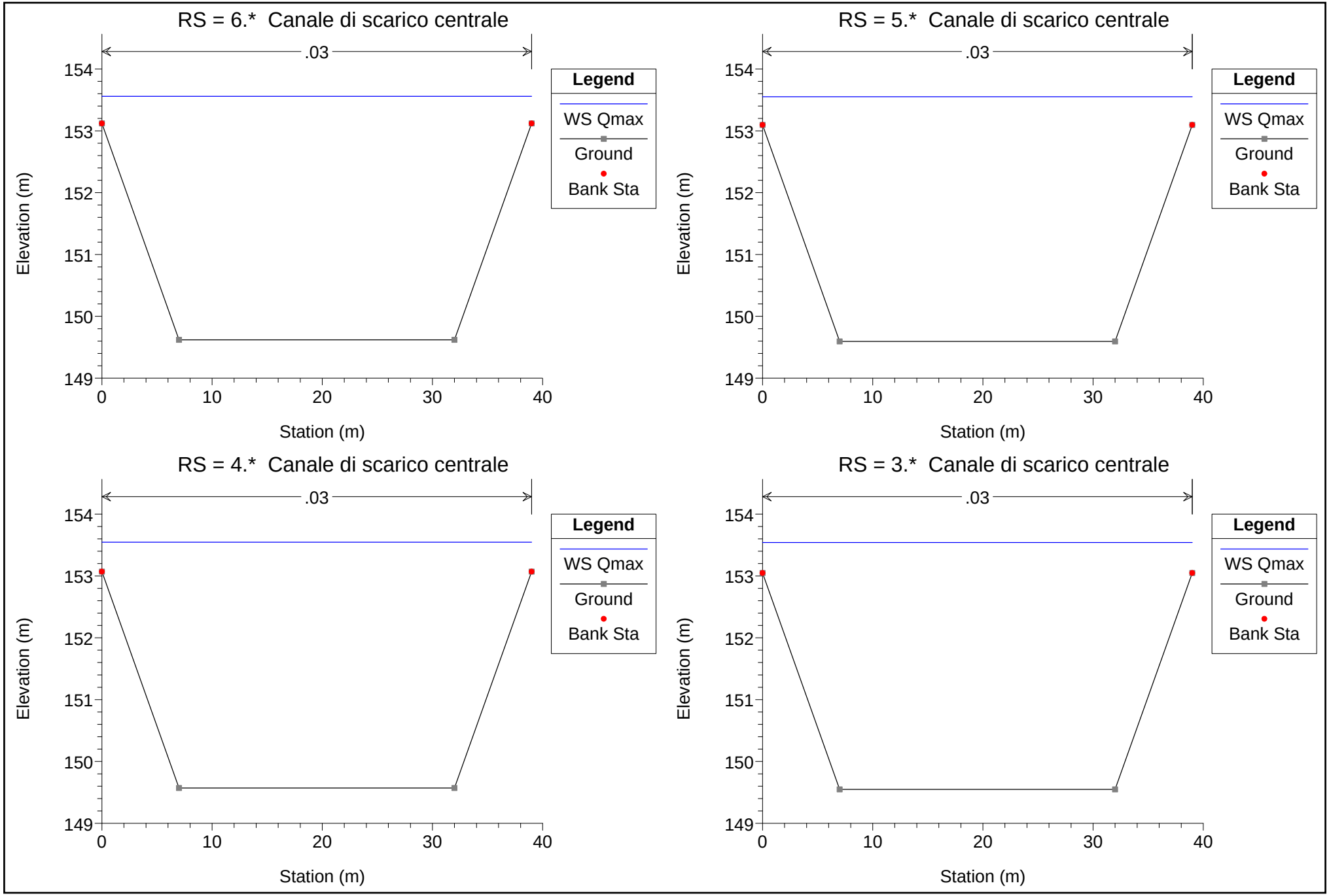
Portata Q m^3/s	**Portata**
100.0 (300 m^3/s in alveo)	Massima di funzionamento dell'impianto

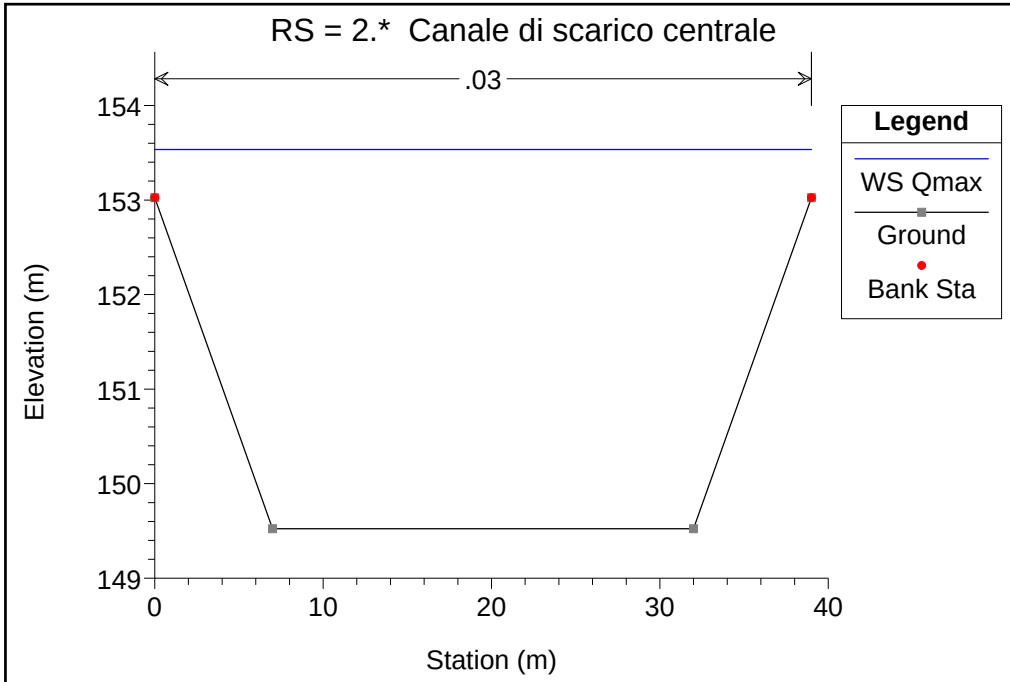
HEC-RAS Plan: Plan 01 River: scarico Reach: 1 Profile: Qmax

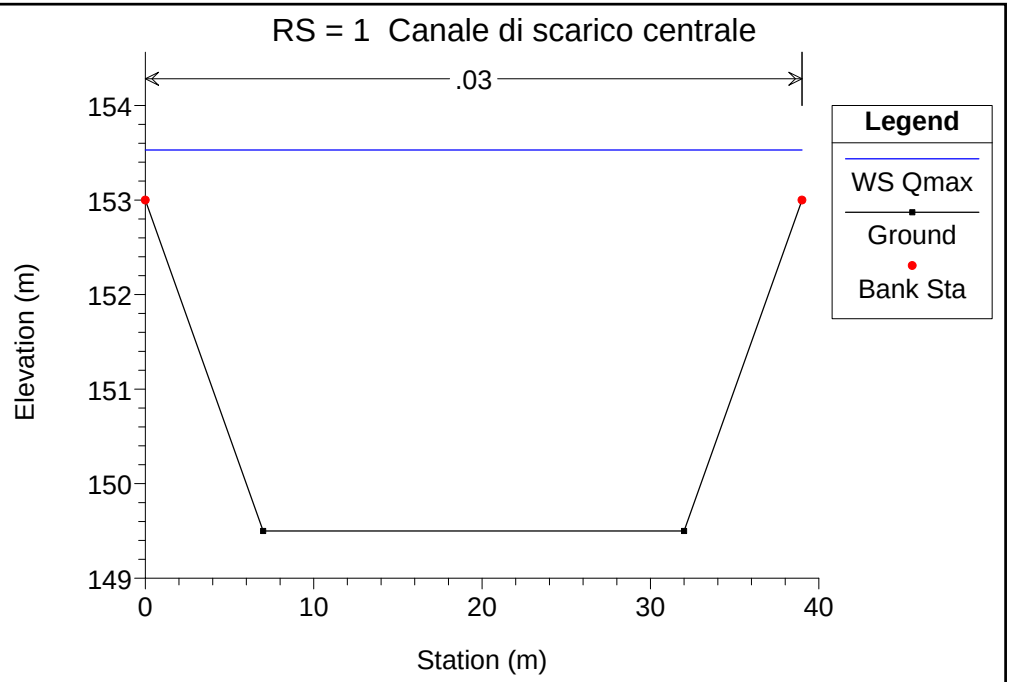
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	10	Qmax	100.00	149.70	153.56		153.62	0.000228	1.04	96.59	25.00	0.17
1	9	Qmax	100.00	149.69	153.57		153.61	0.000125	0.79	127.01	39.00	0.14
1	8.*	Qmax	100.00	149.67	153.57		153.60	0.000123	0.78	127.72	39.00	0.14
1	7.*	Qmax	100.00	149.64	153.56		153.59	0.000121	0.78	128.38	39.00	0.14
1	6.*	Qmax	100.00	149.62	153.56		153.59	0.000119	0.77	129.09	39.00	0.14
1	5.*	Qmax	100.00	149.59	153.55		153.58	0.000117	0.77	129.81	39.00	0.13
1	4.*	Qmax	100.00	149.57	153.55		153.58	0.000115	0.77	130.52	39.00	0.13
1	3.*	Qmax	100.00	149.55	153.54		153.57	0.000113	0.76	131.21	39.00	0.13
1	2.*	Qmax	100.00	149.52	153.54		153.56	0.000111	0.76	131.94	39.00	0.13
1	1	Qmax	100.00	149.50	153.53	150.64	153.56	0.000109	0.75	132.66	39.00	0.13


Canale di scarico centrale
Legend
WS Qmax
Ground
Elevation (m)
154
153
152
151
150
149
0
50
100
150
200
250
300
350
400
450
Main Channel Distance (m)
2.*
3.*
4.*
5.*
6.*
7.*
8.*
9
10


RS = 10 Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
154
153
152
151
150
149
0
5
10
15
20
25
RS = 9 Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
154
153
152
151
150
149
0
10
20
30
40
RS = 8.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
154
153
152
151
150
149
0
10
20
30
40
RS = 7.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
154
153
152
151
150
149
0
10
20
30
40


RS = 6.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
154
153
152
151
150
149
0
10
20
30
40
RS = 5.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 4.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 3.* Canale di scarico centrale
.03
Legend
WS Qmax
Ground
Bank Sta
Elevation (m)
Station (m)


RS = 2.* Canale di scarico centrale
.03
154
153
152
151
150
149
Elevation (m)
0
10
20
30
40
Station (m)
Legend
WS Qmax
Ground
Bank Sta


RS = 1 Canale di scarico centrale
.03
154
153
152
151
150
149
Elevation (m)
0
10
20
30
40
Station (m)
Legend
WS Qmax
Ground
Bank Sta

SITUAZIONE DI PROGETTO

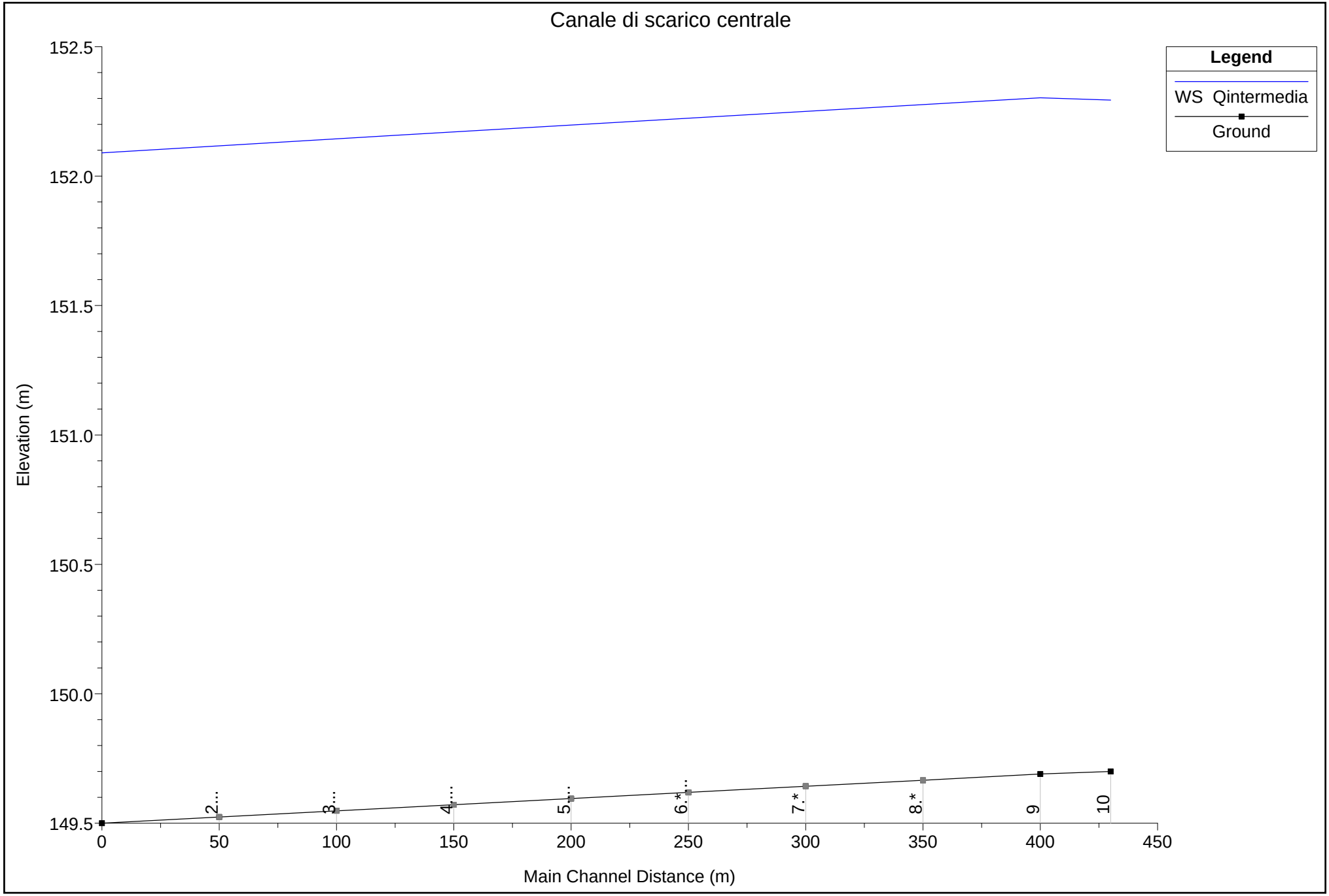
SIMULAZIONE 13

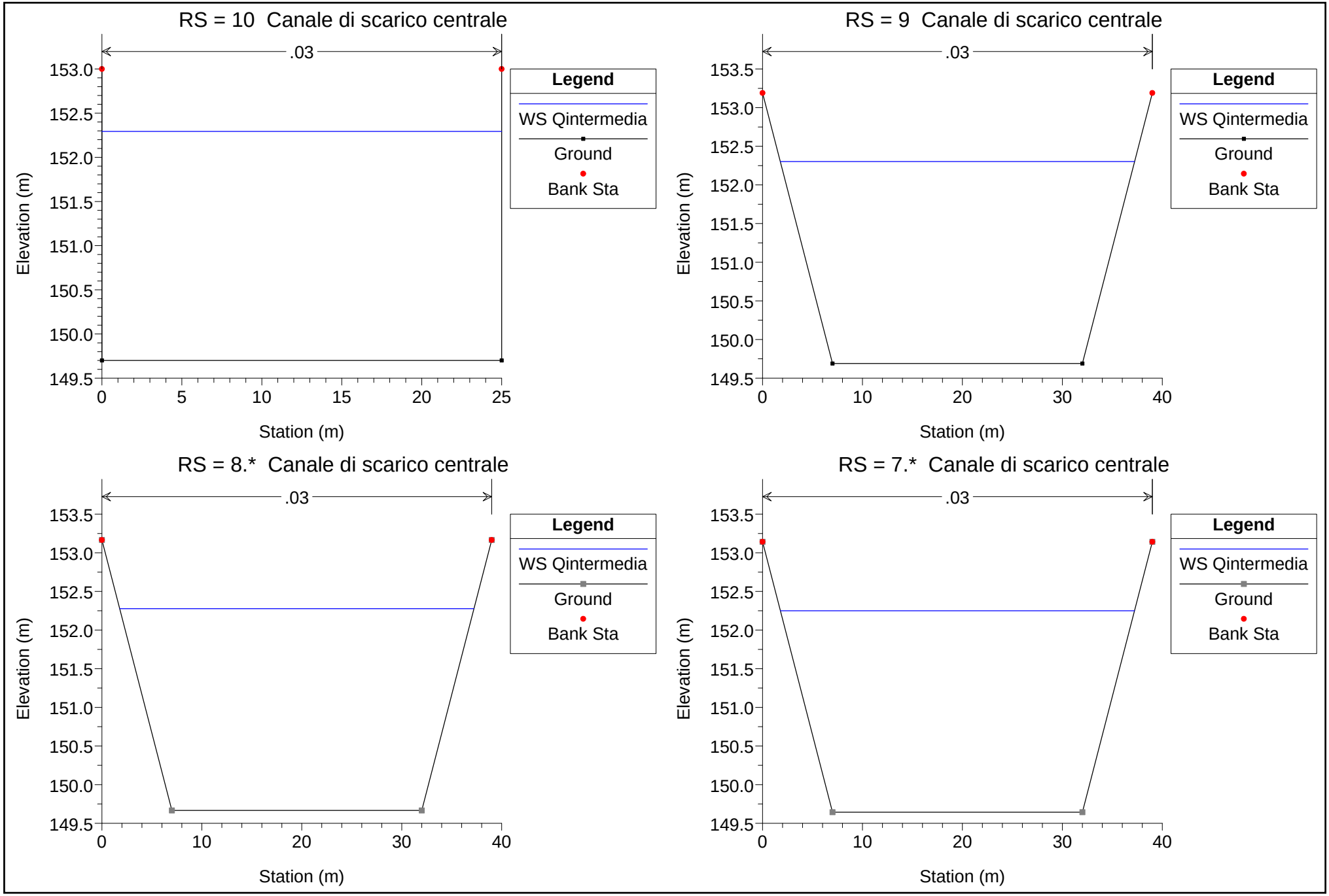
Canale di restituzione

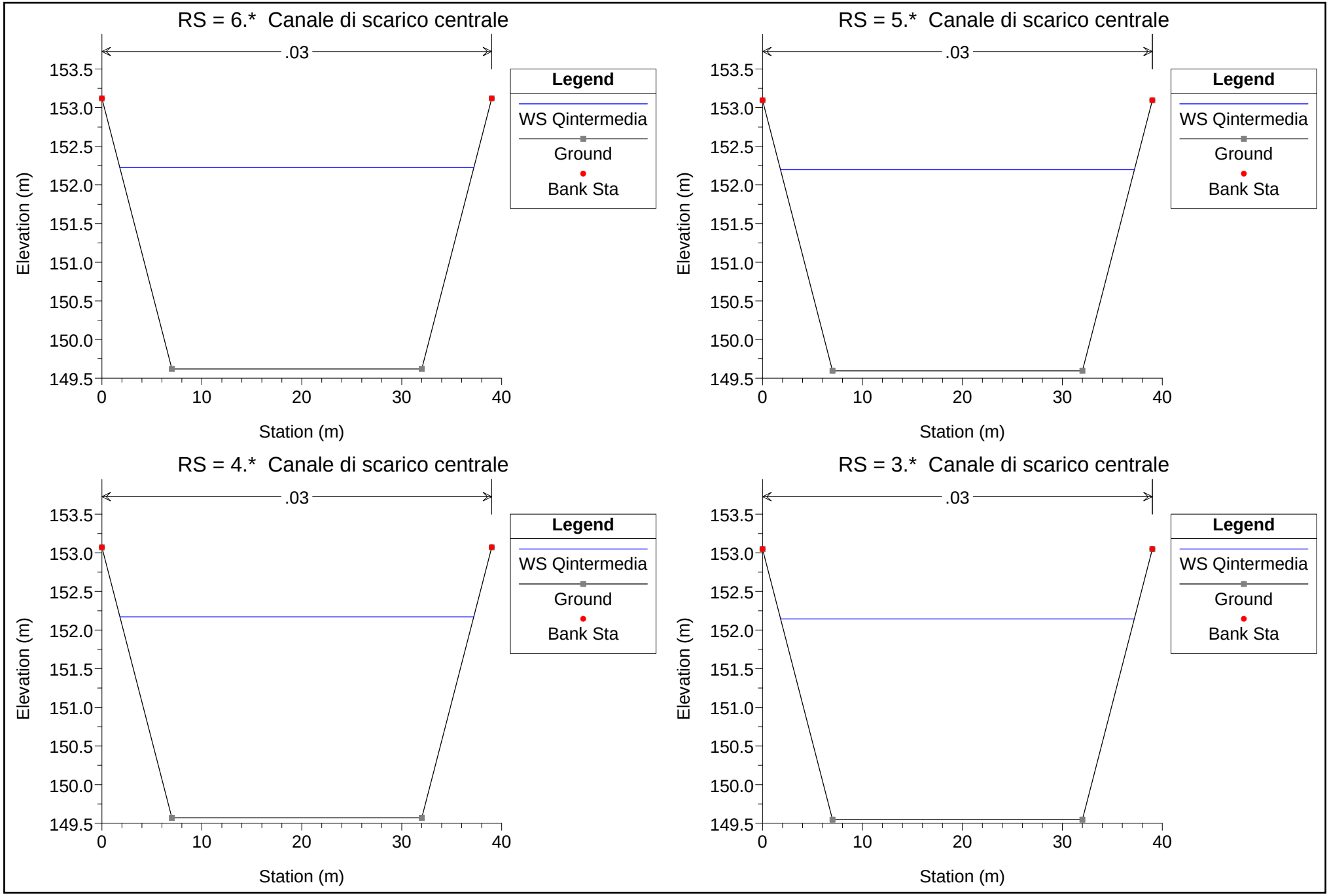
Portata Q m^3/s	**Portata**
100.0 (119.5 m^3/s in alveo)	Intermedia di funzionamento in cui le perdite di carico sono massime

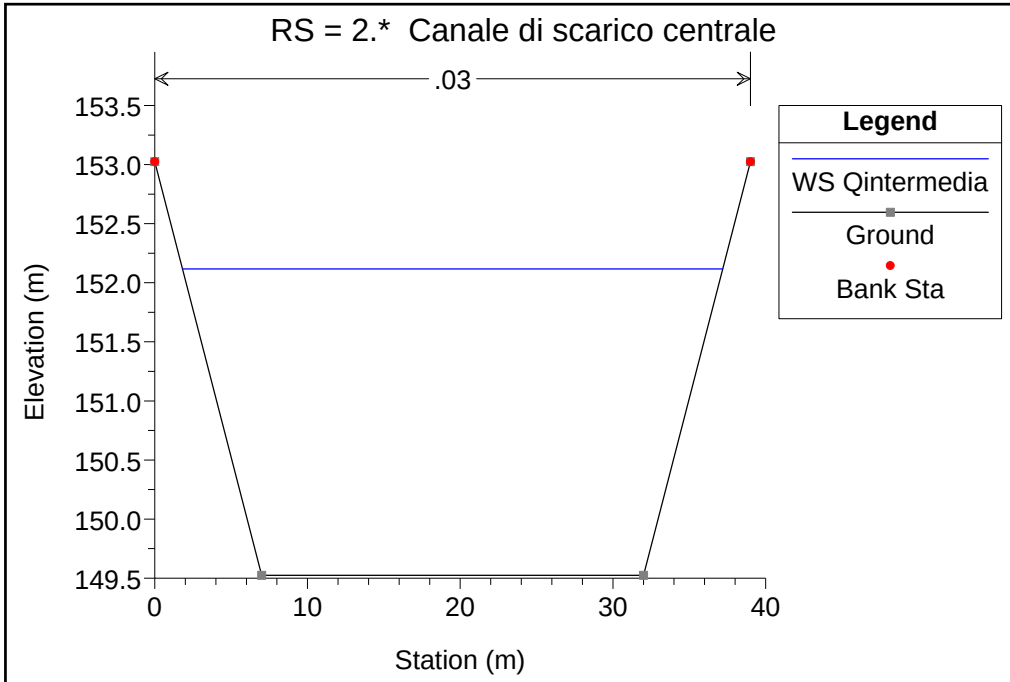
HEC-RAS Plan: Plan 01 River: scarico Reach: 1 Profile: Qintermedia

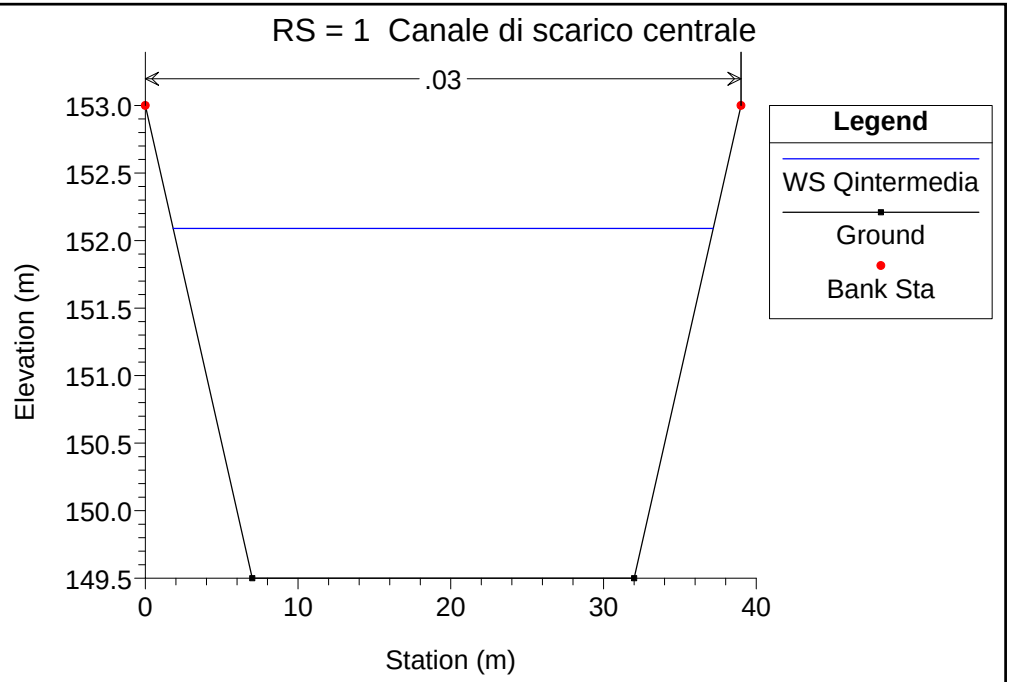
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	10	Qintermedia	100.00	149.70	152.29		152.42	0.000772	1.54	64.84	25.00	0.31
1	9	Qintermedia	100.00	149.69	152.30		152.38	0.000519	1.27	78.97	35.45	0.27
1	8.*	Qintermedia	100.00	149.67	152.28		152.36	0.000521	1.27	78.89	35.44	0.27
1	7.*	Qintermedia	100.00	149.64	152.25		152.33	0.000523	1.27	78.77	35.43	0.27
1	6.*	Qintermedia	100.00	149.62	152.22		152.31	0.000525	1.27	78.69	35.42	0.27
1	5.*	Qintermedia	100.00	149.59	152.20		152.28	0.000526	1.27	78.60	35.41	0.27
1	4.*	Qintermedia	100.00	149.57	152.17		152.25	0.000528	1.27	78.50	35.40	0.27
1	3.*	Qintermedia	100.00	149.55	152.14		152.23	0.000531	1.28	78.38	35.38	0.27
1	2.*	Qintermedia	100.00	149.52	152.12		152.20	0.000533	1.28	78.28	35.37	0.27
1	1	Qintermedia	100.00	149.50	152.09	150.64	152.17	0.000535	1.28	78.16	35.36	0.27


Canale di scarico centrale
Legend
WS Qintermedia
Ground
Elevation (m)
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
50
100
150
200
250
300
350
400
450
Main Channel Distance (m)
2...
3...
4...
5...
6.*...
7.*
8.*
9
10


RS = 10 Canale di scarico centrale
.03
Elevation (m)
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta
RS = 9 Canale di scarico centrale
.03
Elevation (m)
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta
RS = 8.* Canale di scarico centrale
.03
Elevation (m)
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta
RS = 7.* Canale di scarico centrale
.03
Elevation (m)
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta


RS = 6.* Canale di scarico centrale
.03
Legend
WS Qintermedia
Ground
Bank Sta
Elevation (m)
Station (m)
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
0
10
20
30
40
RS = 5.* Canale di scarico centrale
.03
Legend
WS Qintermedia
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 4.* Canale di scarico centrale
.03
Legend
WS Qintermedia
Ground
Bank Sta
Elevation (m)
Station (m)
RS = 3.* Canale di scarico centrale
.03
Legend
WS Qintermedia
Ground
Bank Sta
Elevation (m)
Station (m)


RS = 2.* Canale di scarico centrale
.03
153.5
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
Elevation (m)
0
10
20
30
40
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta


RS = 1 Canale di scarico centrale
.03
153.0
152.5
152.0
151.5
151.0
150.5
150.0
149.5
Elevation (m)
0
10
20
30
40
Station (m)
Legend
WS Qintermedia
Ground
Bank Sta

Nella tabella seguente si riportano i livelli a monte della traversa in progetto in corrispondenza dell'ingresso nel canale di presa ed a valle in corrispondenza della sezione di restituzione, per le portate di esercizio considerate. Si riportano inoltre i valori del salto geodetico e quelli del salto disponibile. Come precedentemente illustrato, per portate comprese tra 15.9 e 300 m^3/s il sistema di ritenuta mobile a doppia falda consente, in corrispondenza della presa, il mantenimento della quota di regolazione di 156.50 m s.l.m.. Il livello nella sezione di scarico invece dipende dalla portata naturale fluente ed è variabile tra 150.46 e 153.53 m s.l.m..

Portata [m^3/s]	Livello monte traversa [m s.l.m.]	Livello sezione di scarico [m s.l.m.]	Salto geodetico [m]	Salto disponibile [m]
15.90	156.50	150.46	6.04	5.97
20	156.50	150.58	5.92	5.84
30	156.50	150.82	5.69	5.54
40	156.50	151.03	5.47	5.30
50	156.50	151.21	5.28	5.09
60	156.50	151.37	5.13	4.91
80	156.50	151.64	4.86	4.60
100	156.50	151.88	4.62	4.34
120	156.50	152.10	4.40	4.12
140	156.50	152.30	4.20	3.97
160	156.50	152.49	4.01	3.82
180	156.50	152.67	3.83	3.66
200	156.50	152.84	3.66	3.50
220	156.50	152.99	3.51	3.35
240	156.50	153.17	3.33	3.20
260	156.50	153.29	3.21	3.07
280	156.50	153.42	3.08	2.94
300	156.50	153.53	2.97	2.83

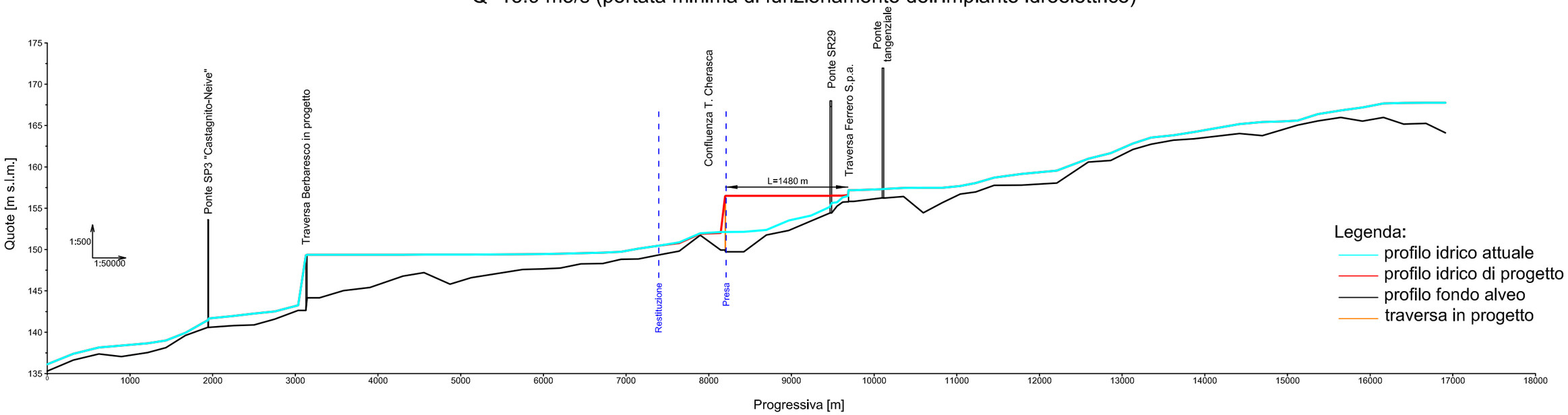
Tab. 7.1. Livelli idrici in corrispondenza della sezione di presa e della sezioni di restituzione durante il funzionamento dell'impianto con lo sbarramento mobile alzato.

Dalle simulazioni idrauliche eseguite è possibile stimare una lunghezza massima del rigurgito provocato dalla traversa (con sbarramento mobile alzato) pari a circa 1480 m. Tale rigurgito si estende fino immediatamente a valle della traversa della Ferrero S.p.A.

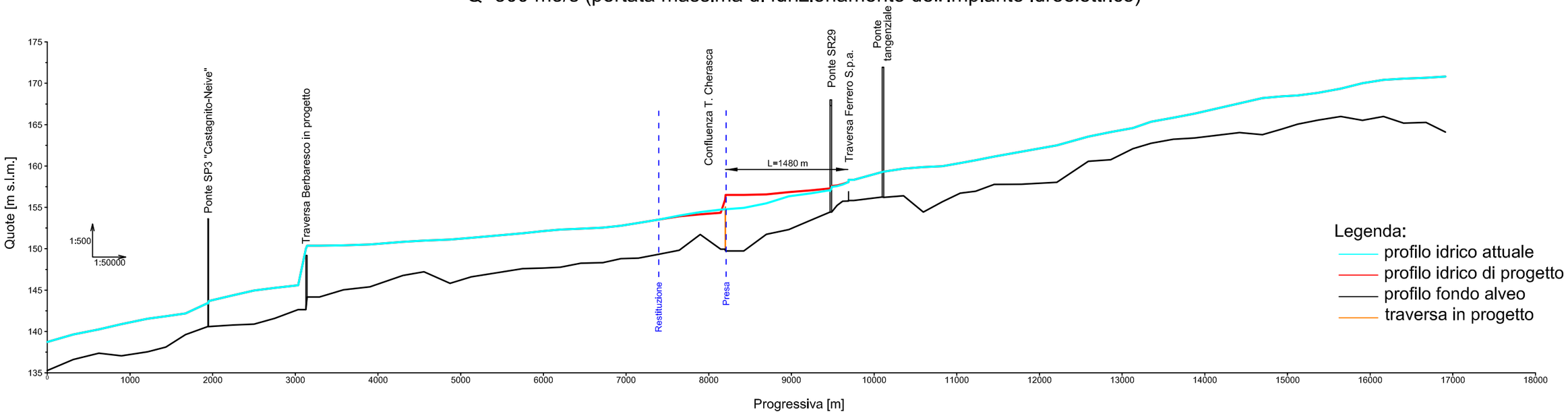
I livelli di rigurgito corrispondenti al range di operatività dell'impianto idroelettrico (portate in alveo comprese tra 15.90 e 300.00 m^3/s), sono sempre ampiamente contenuti all'interno dell'alveo inciso del Fiume Tanaro.

Nella pagina seguente si riportano i profili di rigurgito con riferimento alle portate minima e massima di funzionamento dell'impianto.

Confronto profili idrici attuale-progetto
Q=15.9 m3/s (portata minima di funzionamento dell'impianto idroelettrico)



Confronto profili idrici attuale-progetto
Q=300 m3/s (portata massima di funzionamento dell'impianto idroelettrico)



8. VALUTAZIONE DEL VOLUME INVASATO

Quando l'impianto idroelettrico è in funzione la presenza della traversa fissa sormontata dallo sbarramento mobile determina il massimo rigurgito verso monte, per un'estensione pari a circa 1480 m.

Con riferimento alla minima portata di funzionamento dell'impianto (15.9 m^3/s in alveo e 6.66 m^3/s turbinati), l'innalzamento massimo del pelo libero rispetto alla situazione attuale è pari a 4.4 m.

Se si analizza invece la massima portata di funzionamento dell'impianto (300 m^3/s in alveo e 100 m^3/s turbinati), l'innalzamento massimo del pelo libero rispetto alla situazione attuale è pari a 1.7 m.

I livelli di rigurgito associati alle portate di funzionamento dell'impianto sono sempre ampiamente contenuti all'interno dell'alveo inciso del Fiume Tanaro.

Con riferimento alla minima portata di funzionamento dell'impianto (15.9 m^3/s in alveo e 6.66 m^3/s turbinati), il volume massimo invasato a monte della traversa in progetto con sbarramento mobile alzato, per effetto del rigurgito provocato dall'opera stessa, rispetto alla situazione attuale, è pari a circa 334'300 m^3.

Analizzando invece la massima portata di funzionamento dell'impianto (300 m^3/s in alveo e 100 m^3/s turbinati), si osserva che il volume massimo invasato a monte della traversa in progetto con sbarramento mobile alzato, per effetto del rigurgito provocato dall'opera stessa, rispetto alla situazione attuale, è pari a circa 110'000 m^3.

9. VERIFICA AL SIFONAMENTO

Per sifonamento si intende la rimozione da parte del moto di filtrazione delle particelle più piccole del terreno di appoggio della traversa, con la conseguente formazione di una zona a permeabilità maggiore che agisce da richiamo di acqua con conseguente aumento della velocità di filtrazione che diventa capace di erodere e trasportare via le particelle più grandi del terreno creando veri e propri canali. Il processo di erosione e trasporto del materiale si amplifica determinando il collasso della parte sovrastante.

Utilizzando come verifica la legge di Lane:

$$H_m - H_v < \Delta H = i \cdot \left(\frac{1}{3} L_o + L_v \right)$$

dove:

H_m = livello idrico a monte della traversa;

H_v = livello idrico a valle della traversa;

L_o = lunghezza dei tratti orizzontali di contatto platea-terreno;

L_v = lunghezza dei tratti verticali di contatto platea-terreno;

i = coefficiente empirico relativo al tipo di terreno comprensivo di fattore di sicurezza.

Con riferimento alla figura 10.1 si ha:

$$L_o = l_1 + l_2 + l_3 = 13.6m$$
$$L_v = h_1 + h_2 + h_3 + h_4 = 7.2m$$

Assumendo il parametro empirico relativo all'argilla compatta (i = 0,556) si ottiene il seguente risultato:

$$\Delta H = 0.556 \cdot \left(\frac{1}{3} L_o + L_v \right) = 6.52m$$

Tale condizione è sempre verificata, anche nelle condizioni più critiche, ossia nei periodi di magra, quando si ha il massimo dislivello di pelo libero tra monte e valle della traversa.

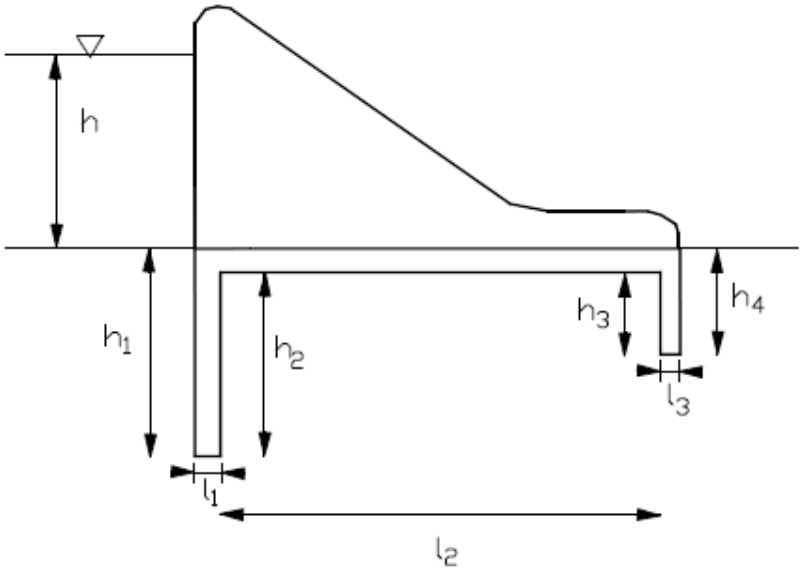


Fig. 9.1. Schema grafico per l'applicazione del criterio di Lane.

10. VERIFICA DEGLI EFFETTI DELL'ONDA DI PIENA CONSEGUENTE AL CROLLO DELLA TRAVERSA FLUVIALE

Si compie la verifica degli effetti dell'onda di piena che si determinerebbe nell'ipotesi che si verifichi il crollo pressoché totale della traversa fluviale in progetto.

10.1. SCELTA DELLE PORTATE DI VERIFICA

Si assumono come portate di verifica le seguenti portate: 15.90 m^3/s (portata minima di funzionamento dell'impianto), 300.00 m^3/s (portata massima di funzionamento dell'impianto) e 3050 m^3/s (che è la portata con tempo di ritorno 200 anni).

10.2. CARATTERISTICHE DELL'ONDA DI PIENA CONSEGUENTE AL COLLASSO DELLO SBARRAMENTO

La Circolare Ministero dei Lavori Pubblici 4 dicembre 1987 prescrive la determinazione delle caratteristiche dell'onda di piena conseguente ad un

ipotetico collasso dello sbarramento e l'individuazione delle aree soggette ad allagamento ai fini della protezione civile.

Le modalità di generazione di un onda di piena conseguente alla rottura dello sbarramento sono complesse.

Le cause che innescano la rottura possono essere eventi di piena, fessurazioni, sismi e queste possono dar luogo a tracimazione o sifonamento che generalmente comportano la distruzione del manufatto.

10.2.1 Stima delle caratteristiche della breccia della diga

Durante i primi anni 80' sia il US Army Corps of Engineers (COE) e il National Weather Service (NWS) hanno pubblicato delle linee guida in cui si indicavano delle raccomandazioni per i parametri della breccia.

DAM TYPE	BREACH WIDTH	SIDE SLOPE OF BREACH	FAILURE TIME
EARTHFILL DAM	0.5 TO 3.0 DAM HEIGHTS	VERTICAL TO 1:1	0.5 To 4.0 HRS (COE) 0.1 To 2.0 HRS (NWS)
CONCRETE GRAVITY DAM	INTEGER MULTIPLE OF MONOLITH WIDTHS	VERTICAL	0.1 TO 0.5 HRS
CONCRETE ARCH DAM	ENTIRE VALLEY WIDTH	VALLEY WALL	0 TO 0.1 HRS

Tab. 10.1 valori raccomandati per le caratteristiche della breccia

In base alla casistica analizzata si sono ipotizzate le caratteristiche idrauliche del fenomeno di rottura del manufatto che è un tipico fenomeno di moto vario.

Le caratteristiche dell'onda di piena conseguente al collasso dello sbarramento sono valutate mediante il software HEC RAS versione 4.1, uno tra i codici di calcolo più utilizzati per le valutazioni del collasso delle dighe tramite l'uso della teoria idrodinamica per stimare la formazione e la propagazione dell'onda di piena. Tale software permette di analizzare regimi di flusso sub-critici, super-critici e misti.

Si prende in esame un tratto di fiume che si sviluppa da circa 8.7 km a monte della traversa a circa 8.2 km a valle della stessa e si valutano gli idrogrammi di piena in sezioni significative all'interno del tratto in studio per individuare le aree che possono essere soggette ad allagamento ai fini della Protezione Civile.

10.3 TEMPO DI ROTTURA DELLO SBARRAMENTO

Si suppone che la rottura dello sbarramento avvenga repentinamente in quanto tale è la condizione peggiore che si possa verificare.

La durata del fenomeno di crollo che si assume, in considerazione sia delle dimensioni del medesimo sia del bacino di invaso, è 18 secondi, ovvero circa 0.005 ore.

10.4 CALCOLI DELLE CARATTERISTICHE DELL'ONDA DI PIENA

Si riportano di seguito i risultati dei calcoli e gli idrogrammi di piena relativi ai livelli ed alle portate conseguenti ad un ipotetico collasso dello sbarramento.

Si riportano nel seguito le principali caratteristiche idrologiche delle onde di piena nelle seguenti sezioni:

- sezione immediatamente a monte della traversa;
- sezione immediatamente a valle della traversa;
- ponte della SP3 Castagnito-Neive;

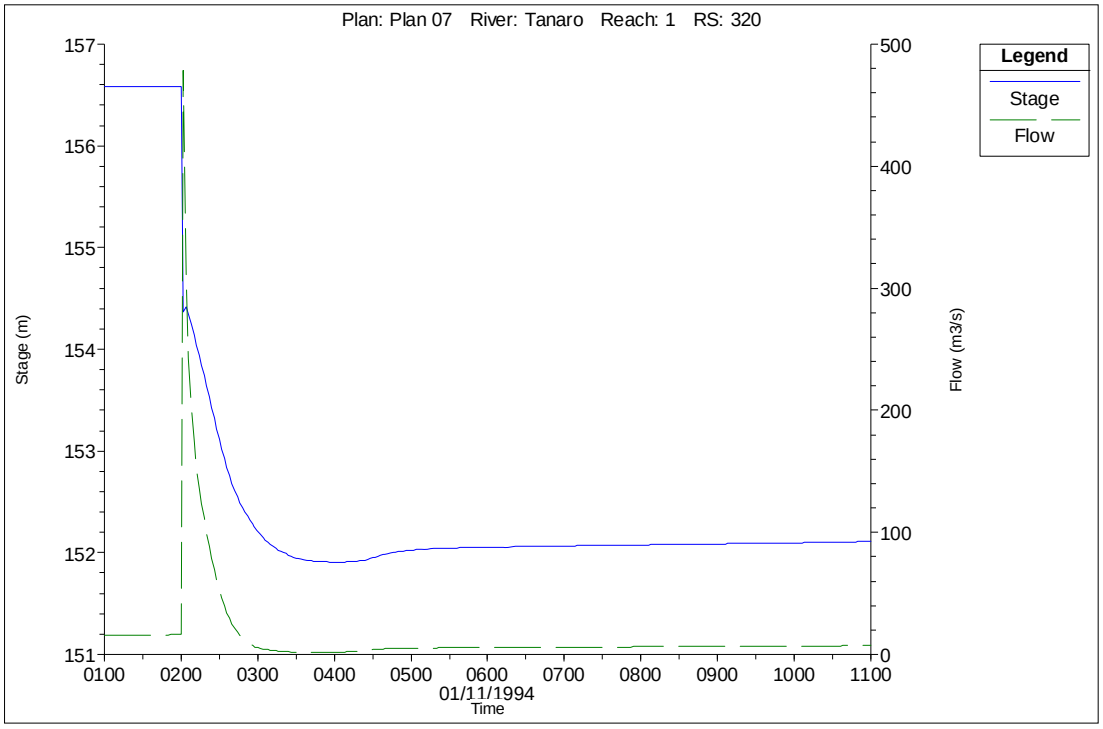
Il collasso dello sbarramento è stato analizzato nelle seguenti condizioni:

A) Q = 15.90 m^3/s – TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO

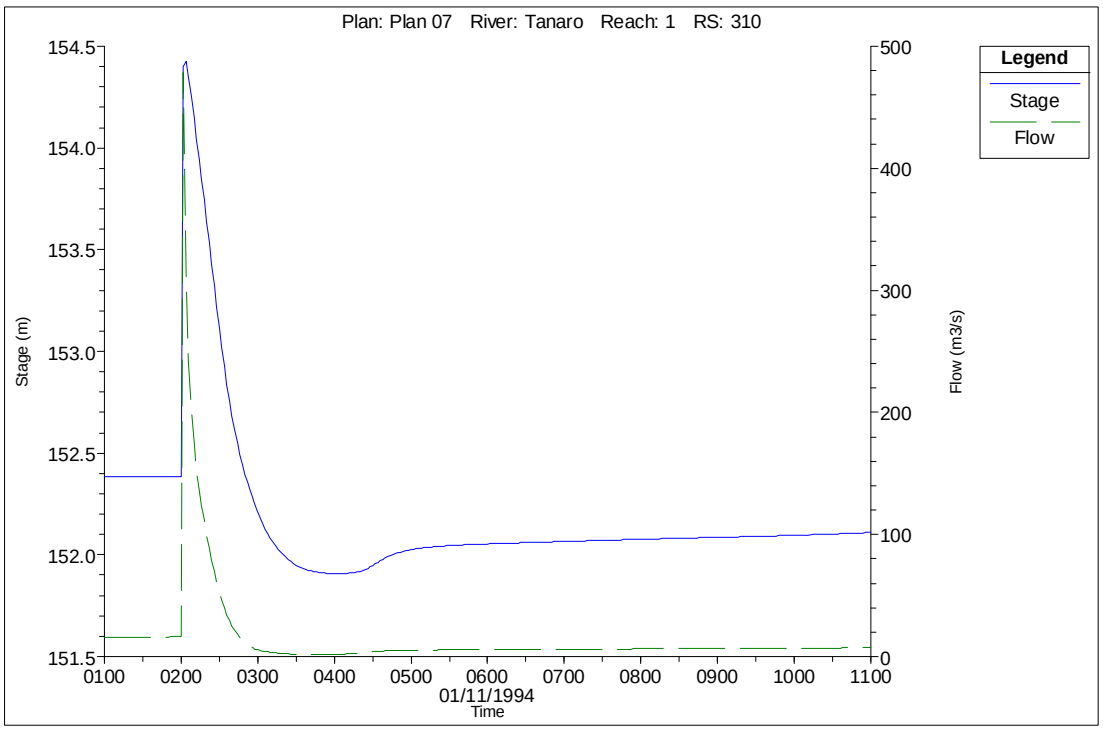
B) Q = 300.00 m^3/s - TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO

C) Q = 3050 m^3/s (TR200) - TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO

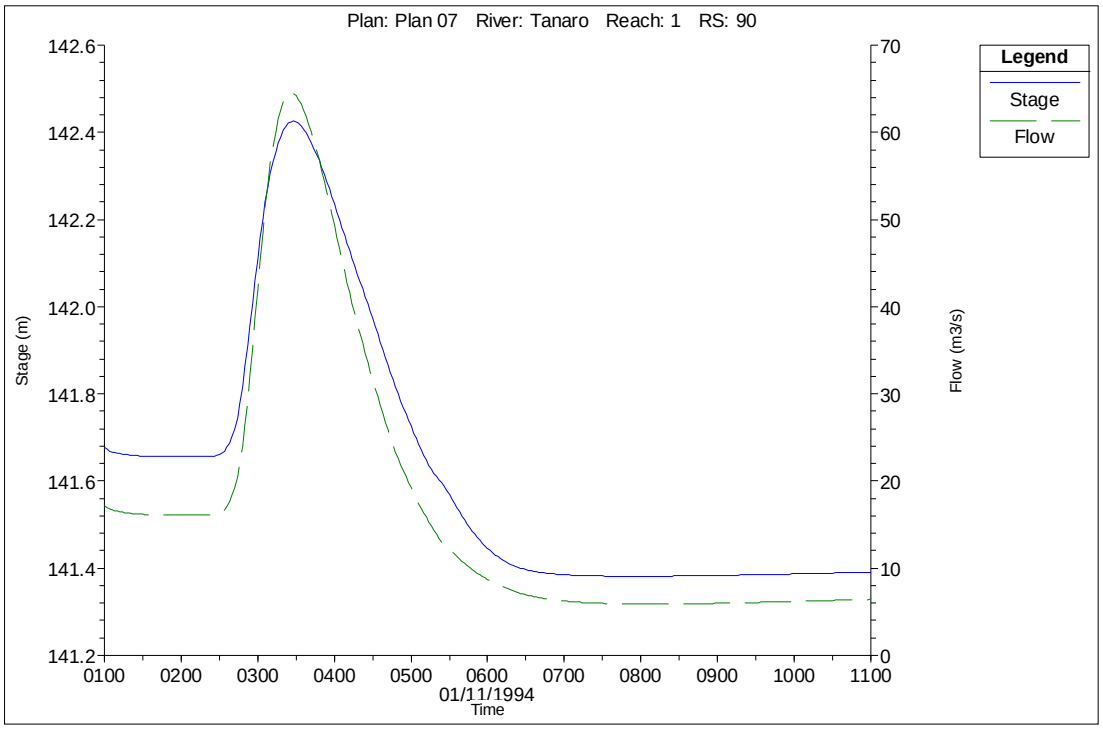
A) Q = 15.90 m^3/s - TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO



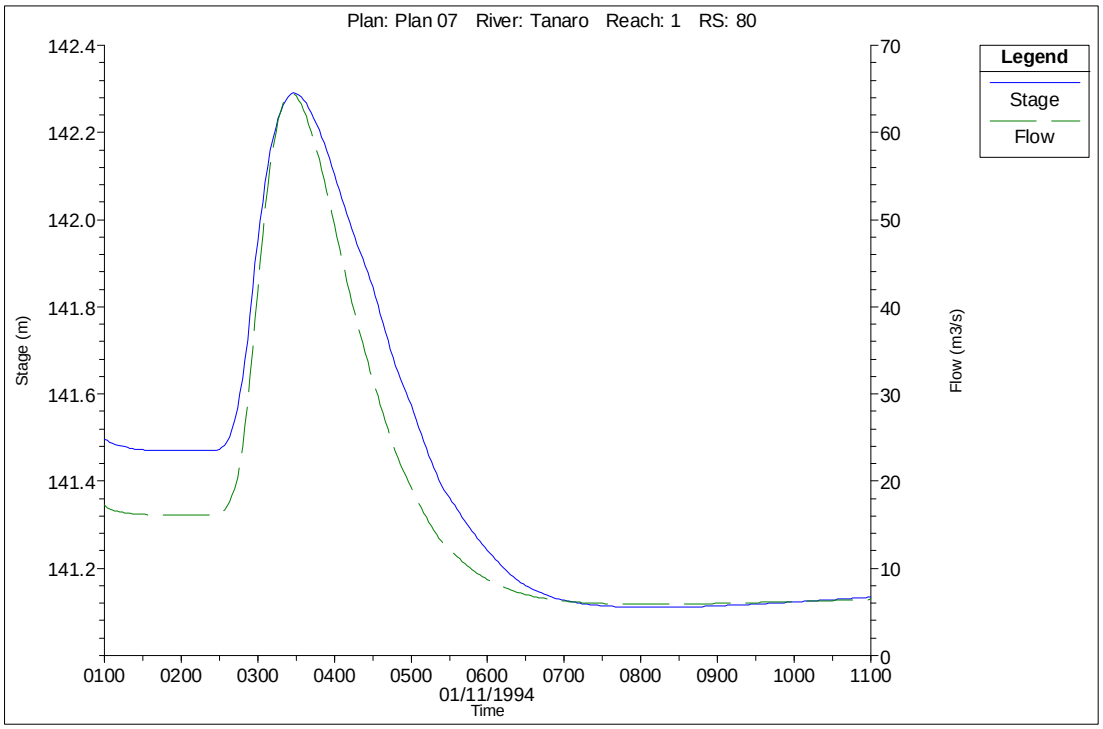
sezione 320 - immediatamente a monte della traversa in progetto



sezione 310 - immediatamente a valle della traversa in progetto

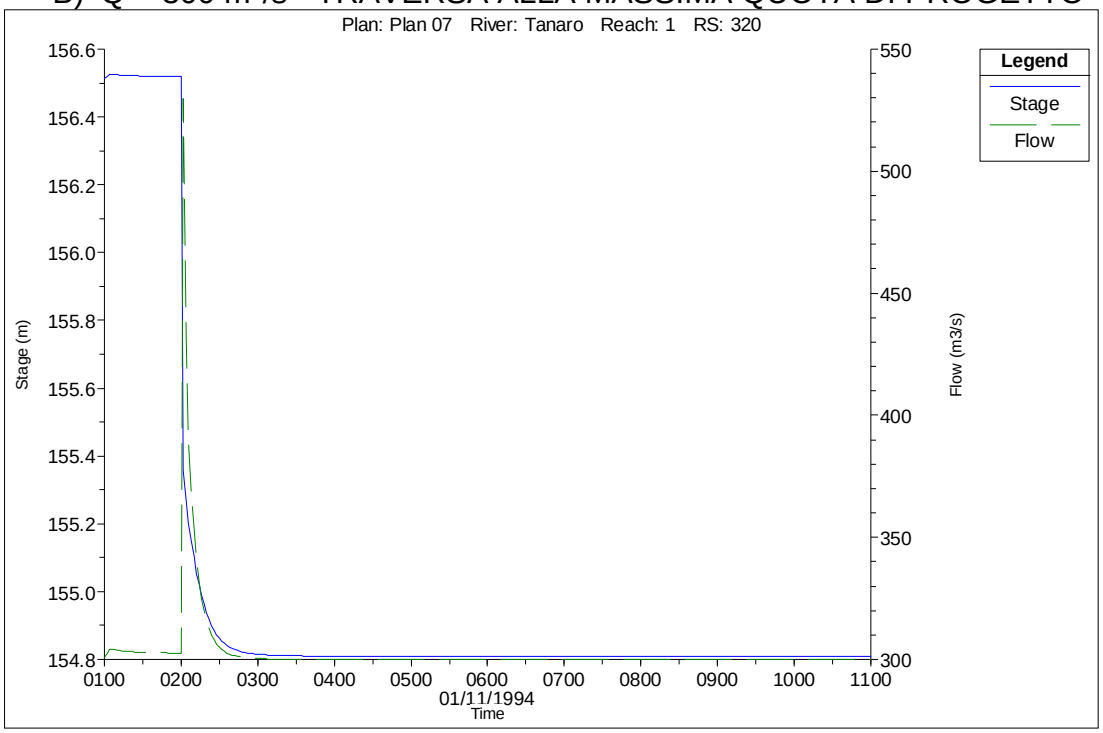


sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".

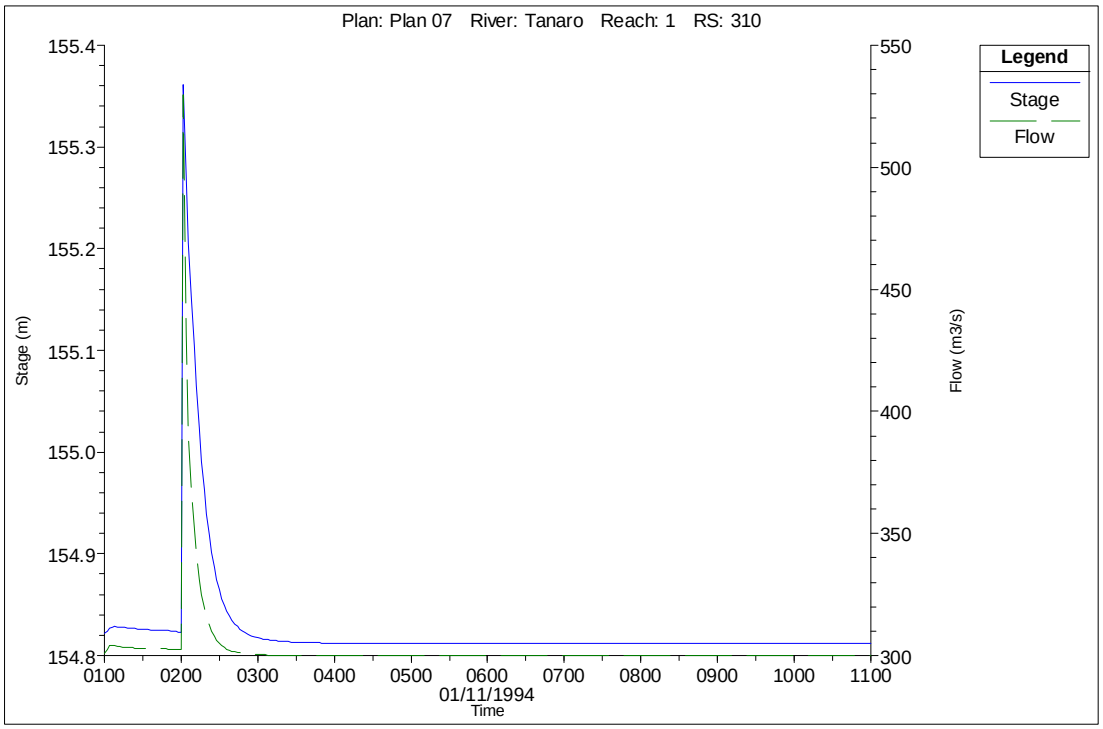


sezione 80 - immediatamente a valle del ponte della S.P. 3.

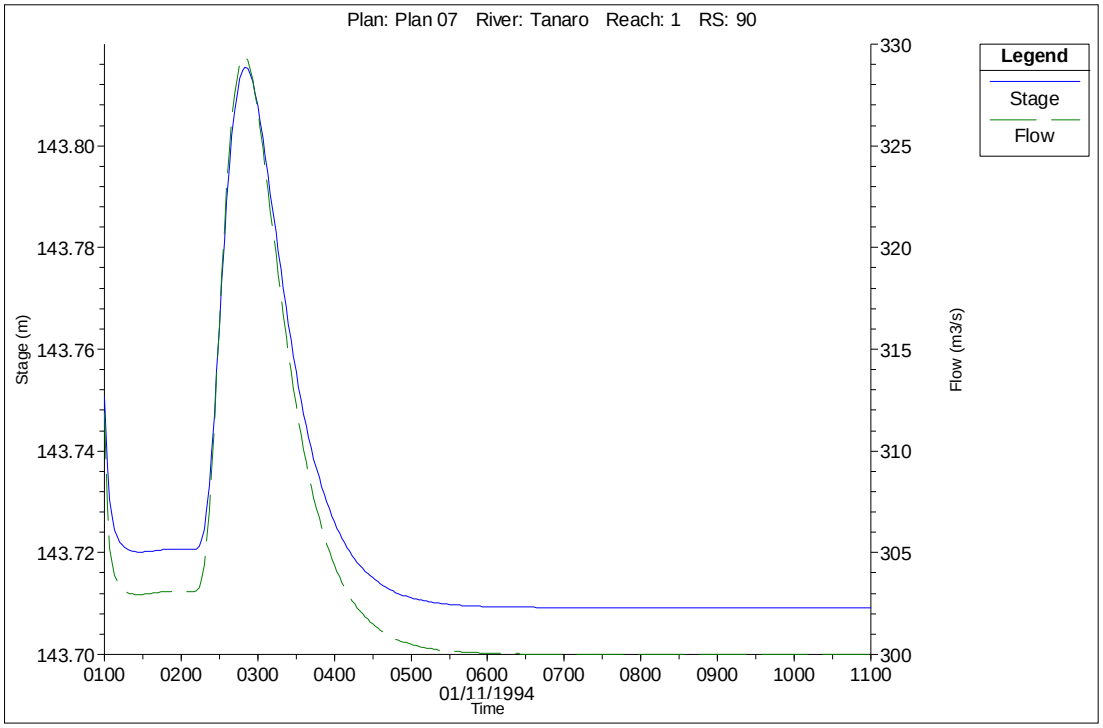
B) Q = 300 m^3/s - TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO



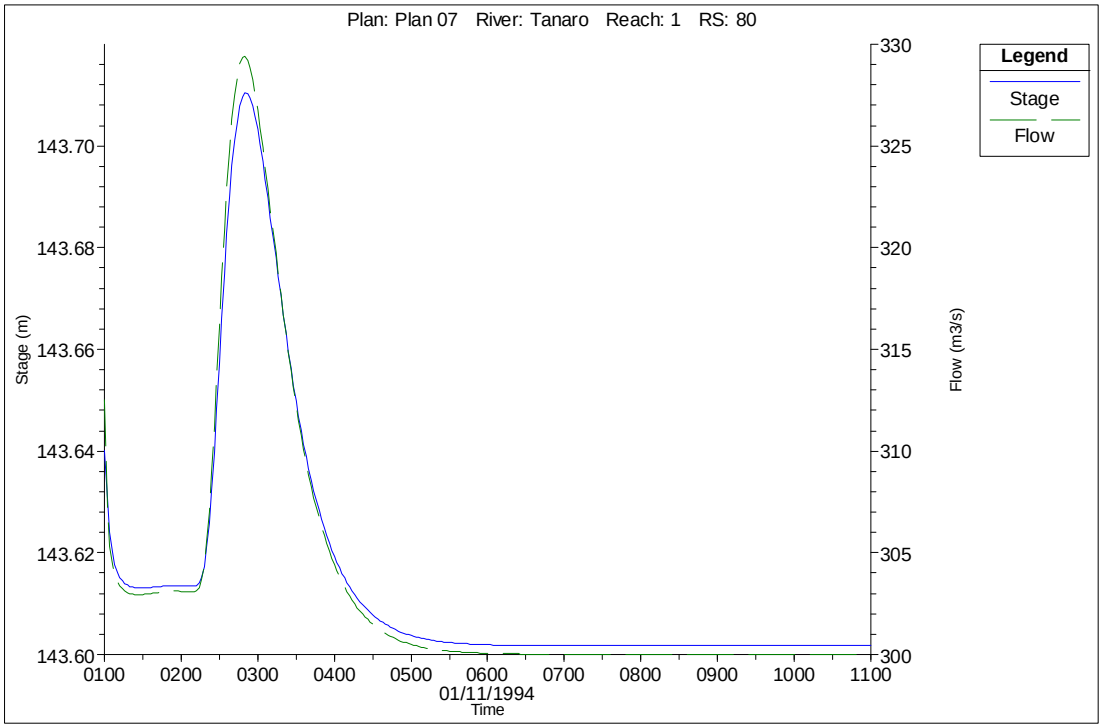
sezione 320 - immediatamente a monte della traversa in progetto



sezione 310 - immediatamente a valle della traversa in progetto

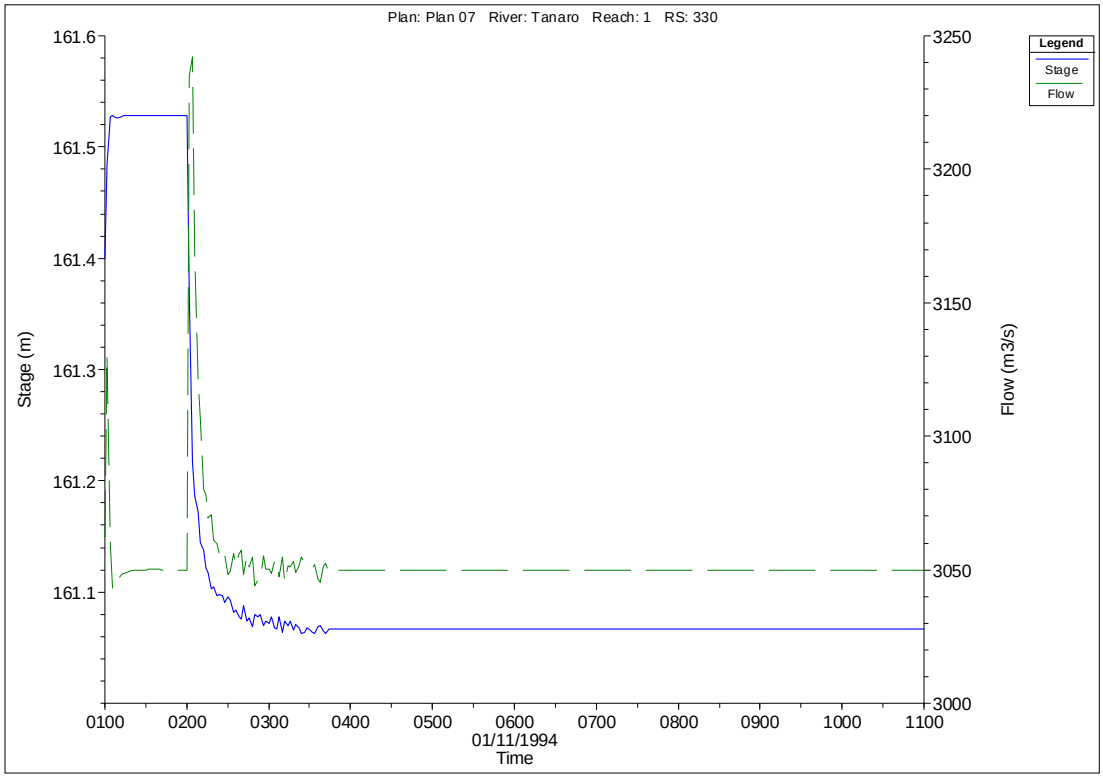


sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".

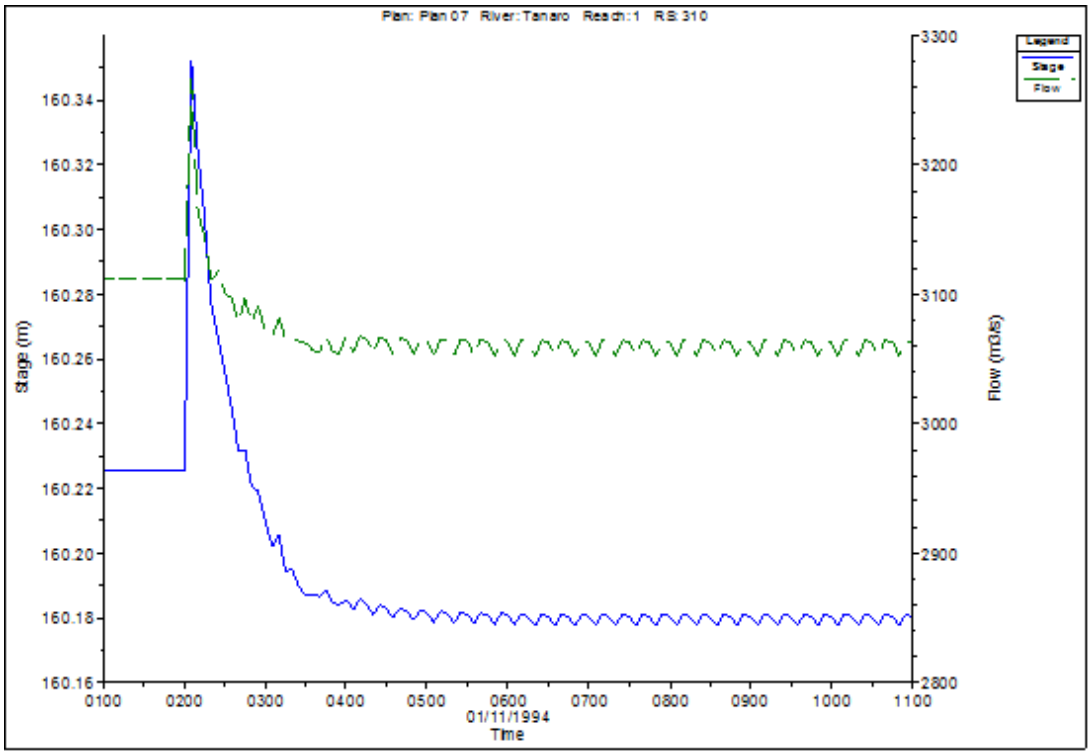


sezione 80 - immediatamente a valle del ponte della S.P. 3.

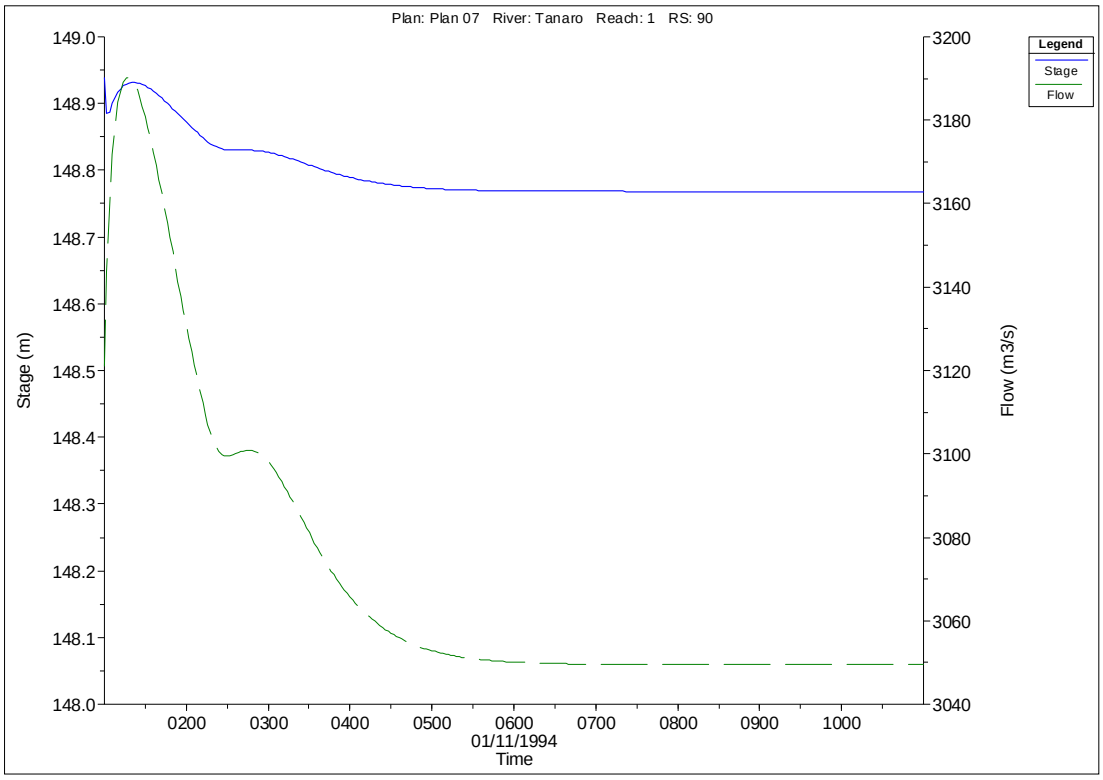
C) Q = 3050 m^3/s - TRAVERSA ALLA MASSIMA QUOTA DI PROGETTO



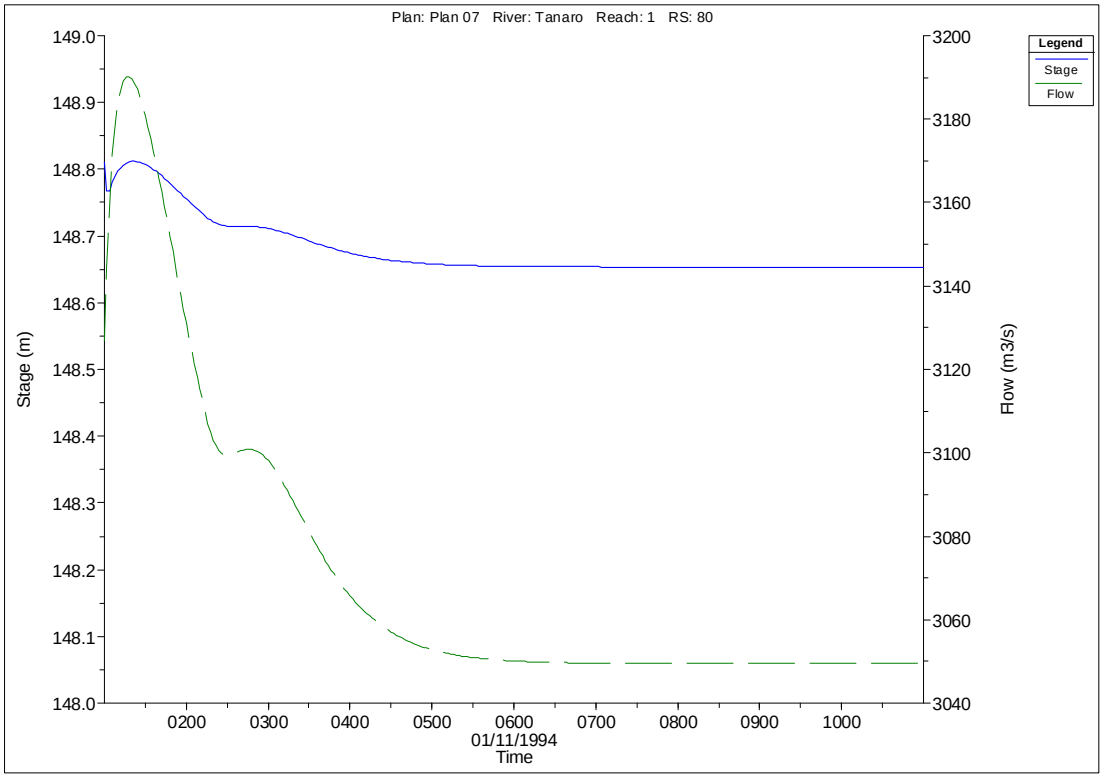
sezione 320 - immediatamente a monte della traversa in progetto



sezione 310 - immediatamente a valle della traversa in progetto



sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".



sezione 80 - immediatamente a valle del ponte della S.P. 3.

10.5. COMMENTO AI RISULTATI IDRAULICI OTTENUTI

L'esame dei risultati idraulici rivela che l'onda di piena conseguente all'ipotetico crollo dello sbarramento transita piuttosto velocemente verso valle con innalzamenti massimi del corso d'acqua che, per il tratto a ridosso dello sbarramento, sono dell'ordine dei 2 m per la portata pari a 15.90 m^3/s , di circa 0.60 m per la portata pari a 300.00 m^3/s e di circa 0.10 m per la portata duecentennale (pari a 3050 m^3/s).

In corrispondenza del ponte di Govone (sez 90) si osserva che il sovralzo del pelo libero generato dall'onda di piena conseguente al dam break è di circa 0.80 m per la portata pari a 15.90 m^3/s e inferiore a 0.10 m per la portata pari a 300.00 m^3/s; se si analizza invece la portata con tempo di ritorno di 200 anni si osserva, invece, come in tale sezione l'onda di piena sia già completamente laminata

Le simulazioni mostrano anche che l'onda di piena impiega 1 ora e 24 min per raggiungere la sezione 90 nel caso di portata pari a 15.90 m^3/s e 48 minuti nel caso di portata pari a 300.00 m^3/s.

10.6 VALUTAZIONE DELLE AREE INONDABILI DALL'ONDA DI PIENA DIPENDENTE DAL COLLASSO DEL MANUFATTO DI SBARRAMENTO

Si compie la valutazione dell'esondabilità del Fiume Tanaro conseguente al crollo della traversa in progetto.

A tal fine si riportano le quote delle sponde dell'alveo inciso nel tratto a valle della traversa e le quote massime dei livelli idraulici conseguenti al crollo per le portate di verifica pari a 15.90 m^3/s, 300.00 m^3/s e 3050 m^3/s (T_R=200 anni).

sezione	quota sponda sinistra	quota sponda destra	livello massimo con Q = 15.9 m^3/s	incremento massimo con Q = 15.9 m^3/s	livello massimo con Q = 300 m^3/s	incremento massimo con Q = 300 m^3/s
	(m s.l.m.)	(m s.l.m.)	(m s.l.m.)	(m s.l.m.)	(m s.l.m.)	(m)
550	168.63	168.63	165.50	0.00	167.59	0.00
540	168.46	168.46	164.23	0.00	166.32	0.00
530	166.81	166.81	163.94	0.00	165.86	0.00
520	168.35	168.35	163.73	0.00	165.40	0.00
510	167.21	167.21	163.36	0.00	164.80	0.00

sezione	quota sponda sinistra	quota sponda destra	livello massimo con Q = 15.9 m^3/s	incremento massimo con Q = 15.9 m^3/s	livello massimo con Q = 300 m^3/s	incremento massimo con Q = 300 m^3/s
500	166.14	166.14	161.88	0.00	164.16	0.00
490	166.89	166.89	161.32	0.00	163.69	0.00
480	165.67	165.67	159.57	0.00	162.54	0.00
470	167.87	167.87	159.12	0.00	161.78	0.00
460	164.06	164.06	158.72	0.00	161.21	0.00
450	161.94	161.94	158.18	0.00	160.80	0.00
440	162.41	162.41	157.74	0.00	160.44	0.00
430	162.36	162.36	157.53	0.00	160.04	0.00
420	161.78	161.78	157.50	0.00	159.89	0.00
410	164.27	164.27	157.47	0.00	159.70	0.00
400	165.83	165.83	157.33	0.00	159.31	0.00
395	Ponte tangenziale					
390	165.83	161.72	157.32	0.00	159.27	0.00
380	162.83	163.03	157.17	0.00	158.34	0.00
379	Traversa Ferrero S.p.a.					
370	168.48	168.5	156.59		157.55	0.00
365	Ponte S.R. 29					
360	168.48	168.5	156.58	0.00	157.34	0.00
350	162.25	160.5	156.58	0.00	157.09	0.00
340	160.66	161.14	156.58	0.00	156.87	0.00
330	160.24	159.55	156.58	0.00	156.64	0.00
320	157.68	159.22	156.58	0.00	156.51	0.00
315	Traversa in progetto					
310	157.54	158.81	154.45	2.06	155.41	0.59
300	156.14	155.72	154.06	1.87	154.99	0.42
290	158.13	157.92	153.30	2.38	154.50	0.37
280	155.92	157.63	152.48	1.96	153.90	0.35
270	155.75	157.54	151.94	1.80	153.43	0.31
260	155.05	156.59	151.47	1.63	153.03	0.25
250	156.14	157.55	151.09	1.46	152.76	0.22
240	155.49	153.91	150.89	1.31	152.60	0.21
230	156.02	152.81	150.7	1.18	152.48	0.20
220	153.97	152.41	150.48	1.02	152.28	0.19
210	152.83	152.49	150.25	0.82	151.99	0.17
200	152.69	152.22	149.97	0.57	151.47	0.13
190	152.09	153.38	149.87	0.48	151.28	0.13
180	150.45	149.98	149.8	0.42	151.12	0.12
170	153.36	151.78	149.74	0.36	150.94	0.11
160	151.01	150.02	149.67	0.30	150.62	0.09
150	151.37	153.76	149.66	0.29	150.51	0.08
140	152.66	152.58	149.66	0.29	150.46	0.08
135	Traversa di Barbaresco					
130	150.65	151.25	143.96	0.57	145.78	0.14

sezione	quota sponda sinistra	quota sponda destra	livello massimo con Q = 15.9 m^3/s	incremento massimo con Q = 15.9 m^3/s	livello massimo con Q = 300 m^3/s	incremento massimo con Q = 300 m^3/s
120	149.97	149.13	143.51	0.98	145.48	0.13
110	148.88	149.2	143.27	0.98	145.20	0.12
100	148.75	149.7	142.87	0.80	144.51	0.09
90	154.39	154.39	142.43	0.75	143.82	0.07
85	Ponte S.P. 3					
80	154.39	154.39	142.29	0.79	143.71	0.07
70	146.52	147.85	140.8	0.60	142.46	0.11
60	144.7	145.51	139.99	0.98	142.05	0.12
50	145.22	142.87	139.69	0.96	141.78	0.12
40	146.23	145.35	139.18	0.77	141.09	0.13
30	145.36	144.87	138.73	0.60	140.54	0.12
20	141.99	141.82	138.07	0.62	140.03	0.14
10	140.71	143.49	137.27	0.96	139.49	0.16

Tab. 10.1 livelli idrici conseguenti al crollo della traversa per le portate di verifica di 15.9 m^3/s e 300 m^3/s.

sezione	quota sponda sinistra	quota sponda destra	livello massimo con Q = 3050 m3/s	incremento massimo con Q = 3050 m3/s
	(m s.l.m.)	(m s.l.m.)	(m s.l.m.)	(m)
550	168.63	168.63	171.26	0.00
540	168.46	168.46	170.69	0.00
530	166.81	166.81	170.21	0.00
520	168.35	168.35	169.75	0.00
510	167.21	167.21	169.43	0.00
500	166.14	166.14	168.87	0.00
490	166.89	166.89	168.41	0.00
480	165.67	165.67	167.85	0.00
470	167.87	167.87	167.34	0.00
460	164.06	164.06	166.92	0.00
450	161.94	161.94	166.62	0.00
440	162.41	162.41	166.48	0.00
430	162.36	162.36	166.27	0.00
420	161.78	161.78	166.11	0.00
410	164.27	164.27	165.87	0.00
400	165.83	165.83	164.89	0.00
395	Ponte tangenziale			
390	165.83	161.72	164.78	0.00
380	162.83	163.03	163.73	0.00
379	Traversa Ferrero S.p.a.			
370	168.48	168.5	163.28	0.00

sezione	quota sponda sinistra	quota sponda destra	livello massimo con Q = 3050 m3/s	incremento massimo con Q = 3050 m3/s
365	Ponte S.R. 29			
360	168.48	168.5	163.18	0.00
350	162.25	160.5	162.57	0.00
340	160.66	161.14	162.24	0.00
330	160.24	159.55	161.64	0.00
320	157.68	159.22	160.89	0.00
315	Traversa in progetto			
310	157.54	158.81	160.37	0.09
300	156.14	155.72	160.09	0.08
290	158.13	157.92	159.8	0.06
280	155.92	157.63	159.41	0.04
270	155.75	157.54	158.9	0.04
260	155.05	156.59	158.11	0.03
250	156.14	157.55	157.81	0.03
240	155.49	153.91	157.47	0.01
230	156.02	152.81	157.19	0.00
220	153.97	152.41	156.76	0.03
210	152.83	152.49	156.31	0.02
200	152.69	152.22	155.43	0.03
190	152.09	153.38	155.1	0.00
180	150.45	149.98	154.86	0.00
170	153.36	151.78	154.6	0.00
160	151.01	150.02	153.99	0.00
150	151.37	153.76	153.44	0.01
140	152.66	152.58	152.85	0.04
135	Traversa di Barbaresco			
130	150.65	151.25	151.62	0.07
120	149.97	149.13	151.07	0.06
110	148.88	149.2	150.75	0.05
100	148.75	149.7	150.22	0.00
90	154.39	154.39	148.95	0.00
85	Ponte S.P. 3			
80	154.39	154.39	148.82	0.01
70	146.52	147.85	147.77	0.04
60	144.7	145.51	147.24	0.05
50	145.22	142.87	146.71	0.08
40	146.23	145.35	146.02	0.05
30	145.36	144.87	145.54	0.06
20	141.99	141.82	145.08	0.04
10	140.71	143.49	144.58	0.01

Tab. 10.2 livelli idrici conseguenti al crollo della traversa per la portate di verifica di 3050 m^3/s (T_R = 200 anni).

Si osserva che i livelli idrici relativi alle portate di 15.9 m^3/s e 300.0 m^3/s sono sempre minori rispetto alla quota delle sponde dell'alveo inciso e pertanto, per i primi due scenari presi in esame, non si originano effetti idraulici significativi.

La simulazione relativa alla portata con tempo di ritorno di 200 anni (3050 m^3/s) evidenzia come in caso di crollo della traversa l'innalzamento dei livelli idrici sia estremamente contenuto; le aree esondabili non subiscono pertanto variazioni apprezzabili rispetto alla situazione attuale.