

REGIONE PIEMONTE
Provincia di Cuneo
COMUNE DI ALBA

**IMPIANTO IDROELETTRICO
SUL FIUME TANARO
NEL COMUNE DI ALBA**

PROGETTO DEFINITIVO

Elaborato n.
A1-2-R1

"Relazione idrologico idraulica"

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IL COMMITTENTE:

Tanaro Power S.p.A.
Via Vivaro 2
12051 - Alba (CN)

I TECNICI INCARICATI:

Dott. Ing. Sergio SORDO

Dott. Ing. Piercarlo BOASSO

SR STUDIO

STUDIO DI INGEGNERIA

Dott. Ing. Sergio Sordo

C.so Langhe, 10 - 12051 Alba (CN)

tel: 0173 364823

e-mail: sordosergio@srstudio.info

ORDINE DEGLI INGEGNERI
DELLA PROVINCIA DI CUNEO
769 Dott. Ing. Sergio Sordo

GAPE s.a.s.

Dott. Ing. Piercarlo Boasso

Via Accame, 20 - 17027 Pietra Ligure (SV)

tel: 335 6422389

e-mail: piercarlo.boasso@alice.it



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ORDINE DEGLI INGEGNERI
DELLA PROVINCIA DI CUNEO

Dott. Ing. Piercarlo Boasso

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1. PREMESSA

La presente revisione della relazione idrologico idraulica 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'aggiornamento è stato effettuato a seguito della disponibilità di un nuovo rilievo topografico, finalizzato alla costruzione del modello idraulico-numerico bidimensionale, che è stato eseguito nel mese di agosto 2016.

Nella presente relazione vengono inoltre sviluppati gli aspetti idrologico-idraulici in funzione di quanto contenuto nelle richieste di integrazioni pervenute.

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. La restituzione delle portate derivare avviene circa 800 m a valle della sezione di presa.

Per portate in alveo comprese tra 15.9 e 300.0 m³/s il sistema di ritenuta mobile consente il mantenimento della quota di regolazione di 156.50 m s.l.m, mentre in caso di portate defluenti superiori a 300 m³/s lo sbarramento mobile viene abbattuto sul fondo; in questo modo è possibile ridurre in modo significativo i fenomeni di rigurgito.

Nel seguito sono inoltre riportate alcune simulazioni con lo sbarramento mobile completamente alzato anche per portate in alveo superiori a 300 m³/s (scenario 2); si tratta di uno scenario teorico che è stato analizzato in quanto oggetto di richiesta di integrazioni da parte di AIPo, ma che nella situazione reale non si può verificare poichè lo sbarramento mobile si abbassa per portate superiori a 300 m³/s.

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 PAI di Alba, alla sezione di chiusura localizzata immediatamente a valle della confluenza con il Torrente Riddone ed alla sezione di chiusura posta a valle della confluenza con il Torrente Cherasca.

Corpo idrico	Sezione di chiusura	Superficie bacino (km ²)
Tanaro	Sez PAI	3374
	valle T. Riddone	3402
	valle T. Cherasca	3440

Tab. 2.1 Bacino idrografico del Fiume Tanaro in corrispondenza delle sezioni di chiusura considerate.

3. VALUTAZIONE DELLE PORTATE MASSIME ANNUE AL COLMO

L' Autorità di Bacino del Fiume Po ha emesso la "Direttiva Piena di Progetto" del Progetto di Piano Stralcio per l'Assetto Idrogeologico (PAI) in cui sono contenuti i valori delle portate di piena da assumere negli studi idraulici; nelle tabelle allegate alla sopraccitata Direttiva vengono definite, per i principali corsi d'acqua del bacino idrografico del Po, le portate al colmo per i tempi di ritorno tecnici di 20, 100, 200 e 500 anni.

Per il caso in esame la sezione di calcolo di dette portate più vicina è quella di Alba, localizzata poche centinaia di metri a monte della traversa in progetto, in corrispondenza del ponte sul Fiume Tanaro della S.R. 29, ed avente un bacino sotteso di superficie pari a 3374 km².

Tali valori sono riportati nella seguente tabella:

T_{ritorno} (anni)	Q_c (m^3/s)
20	2050
100	2750
200	3050
500	3400

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

Nel tratto di Fiume Tanaro in esame sono presenti due affluenti degni di nota: il T. Riddone in sponda sinistra a monte della traversa in progetto (bacino di circa 28 km²) ed il T. Cherasca in sponda destra a valle dello sbarramento in progetto (bacino di circa 38 km²).

Nella definizione delle portate al colmo di piena occorre quindi considerare anche il contributo dei sopraccitati corsi d'acqua.

A tal proposito, come precedentemente illustrato, oltre alla sezione PAI di Alba sono state considerate altre due sezioni di chiusura del F. Tanaro: la prima è localizzata immediatamente a valle della confluenza con il T. Riddone, mentre la seconda è ubicata immediatamente a valle della confluenza con il T. Cherasca. Le superfici dei bacini idrografici del Fiume Tanaro sottesi dalle sopraccitate sezioni di chiusura sono state delimitate utilizzando il DTM ICE della Regione Piemonte.

È possibile ricondursi alle corrispondenti portate al colmo nelle sezioni di chiusura considerate utilizzando il metodo di Gherardelli - Marchetti, valido per bacini aventi caratteristiche idrologiche simili. Con un'indagine effettuata prendendo in considerazione le massime portate di piena al colmo verificatesi nei corsi d'acqua italiani fino al 1938, Gherardelli ha dedotto una formula che lega il contributo unitario di massima piena u alla superficie S del bacino; tale formula è stata successivamente aggiornata da Marchetti che ha esteso l'elaborazione agli eventi verificatesi fino al 1953.

Questa formula, sebbene risalente a parecchi anni fa, è tuttora frequentemente utilizzata.

$$u = u_{100} \left(\frac{S}{100} \right)^{-2/3}$$

dove:

u = contributo chilometrico del bacino in esame [$m^3/(s \text{ km}^2)$];

S = superficie del bacino [km^2];

u_{100} = parametro caratteristico della regione idrologica in esame.

Applicando la formula di Gherardelli - Marchetti si ottengono così i valori di portata nelle sezioni di chiusura considerate per i tempi di ritorno tecnici, riassunti nella seguente tabella:

T_{ritorno} (anni)	Q_c Sezione PAI (m^3/s)	Q_c valle Riddone (m^3/s)	Q_c valle Cherasca (m^3/s)
20	2050	2056	2063
100	2750	2757	2768
200	3050	3058	3070
500	3400	3409	3422

Tab. 3.2. Portate al colmo del Fiume Tanaro in corrispondenza delle sezioni di chiusura considerate.

I progetti delle principali opere di difesa idraulica dell'abitato di Alba, realizzati a seguito dell'evento alluvionale del 1994, sono stati redatti da ACQUATER S.p.A. e da POLARIS Studio Associato. Esaminando i sopraccitati elaborati si evidenzia che le succitate opere sono state dimensionate con riferimento alle portate di 3050 m^3/s e 3700 m^3/s . In tali elaborati è infatti indicato che 3700 m^3/s è la "portata bicentenaria ritenuta cautelativamente più adeguata in assenza di opere di laminazione a monte dell'abitato di Alba".

Per completezza di calcolo si è pertanto deciso di eseguire le simulazioni idraulico-numeriche monodimensionali di moto permanente anche con riferimento alla portata di 3700 m^3/s ; tali simulazioni sono state condotte analizzando sia lo scenario attuale che quelli di progetto (con sbarramento abbattuto e completamente alzato). Anche in questo caso è stata applicata la formula di Gherardelli - Marchetti per calcolare il

contributo dei bacini del T. Riddone e del T. Cherasca, ottenendo una portata di 3710 m³/s nella sezione di chiusura posta a valle del Riddone ed una portata di 3724 m³/s nella sezione di chiusura posta a valle del Cherasca.

Inoltre nelle richieste di integrazioni pervenute si chiede di eseguire delle simulazioni idraulico-numeriche per una portata avente tempo di ritorno di 50 anni. Tale valore è stato ottenuto mediante un'operazione di interpolazione a partire dai valori di portata PAI della sezione di Alba; quindi, applicando la formula di Gheradelli - Marchetti, sono stati definiti i valori di portata nelle restanti sezioni di chiusura considerate.

Riassumendo i valori di portata al colmo utilizzati nelle simulazioni idraulico numeriche nel seguito riportate sono i seguenti:

T _{ritorno} (anni)	Q _c Sezione PAI (m ³ /s)	Q _c valle Riddone (m ³ /s)	Q _c valle Cherasca (m ³ /s)
20	2050	2056	2063
50	2412	2419	2428
100	2750	2757	2768
200	3050	3058	3070
500	3400	3409	3422
-	3700	3710	3724

Tab. 3.3. Portate al colmo del Fiume Tanaro in corrispondenza delle sezioni di chiusura considerate utilizzate nelle simulazioni idraulico numeriche.

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 Tanaro.

Per costruire la mesh di calcolo da utilizzare nelle simulazioni bidimensionali (oggetto di richiesta di integrazione) è stato eseguito, nel mese di agosto 2016, un rilievo topografico stato attuale dal topografo Ing. Marco Carretto di Monchiero. Tale rilievo

è relativo all'alveo ed alle sponde del F. Tanaro ed alle opere di difesa idraulica presenti nella zona a ridosso delle opere in progetto.

Per la costruzione della geometria implementata nei modelli idraulico numerici monodimensionali si è pertanto utilizzato tale rilievo che è stato integrato, per quanto concerne la parte golenale, utilizzando il DTM ICE realizzato nel 2012 con volo laser scanner LIDAR e 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 latitanti 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 la confluenza con il Torrente Talloria (ubicata a monte del centro abitato di Alba) ed il comune di Neive (località cascina Boschi), per una lunghezza complessiva di circa 14.4 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. Army Corps of Engineers, nella versione 4.1. Nel modello sono state implementate oltre 50 sezioni 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	=0.06m ^{-1/3} s	secondo Manning
C	= 1/n = 16.67 m ^{1/3} /s	secondo GaucklerStrickler

per le aree golenali:

n	=0.125m ^{-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 Strickler 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 fraposte 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 dei seguenti scenari:

- Scenario 0: situazione attuale;
- Scenario 1: situazione di progetto con lo sbarramento mobile abbattuto;
- Scenario 2: situazione di progetto con lo sbarramento mobile completamente alzato;
- Scenario 3: situazione di progetto con una parzializzazione della sezione di deflusso pari al 30%.

La verifica idraulica è stata effettuata con riferimento alle portate di piena con tempo di ritorno pari a 20, 50, 100, 200 e 500 anni ed alla portata di 3700 m³/s.

Come precedentemente illustrato, per portate superiori a 300 m³/s lo sbarramento mobile viene completamente abbattuto; le simulazioni in condizioni di piena dovrebbero pertanto essere eseguite considerando la sola 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 (scenario 1). Lo scenario 2 è stato analizzato in quanto oggetto di richiesta di integrazione da parte di AIPo; si tratta tuttavia di uno scenario teorico che non può verificarsi nella situazione reale.

La traversa in progetto non presenta pile in alveo, pertanto la probabilità che possano verificarsi ostruzioni di materiale flottante tali da determinare una parzializzazione della sezione di deflusso è estremamente contenuta. In ogni caso è stato comunque analizzato lo scenario 3 in cui si ipotizza una parzializzazione della sezione di deflusso pari al 30%, in accordo a quanto previsto dal D.M. 26.06.2014.

Nei sopraccitati scenari è stata considerata la presenza dello sbarramento di Barbaresco secondo il progetto della Tanaro Power S.p.A., avente una quota in sommità che in condizioni di piena è pari a 148.40 m s.l.m. (sbarramento mobile abbattuto). Non è necessario eseguire ulteriori simulazioni relative allo stato attuale (con traversa in parte dissestata) e considerando uno sbarramento avente una quota in sommità di 144.50 m s.l.m. (come da progetto Edison) in quanto il rigurgito provocato dalle sopraccitate traverse di Barbaresco in progetto si estende verso monte per un tratto limitato e pertanto non è in grado di influenzare il comportamento idraulico del F. Tanaro nella zona a ridosso della centrale di Alba in progetto.

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

**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 1

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2050	20
F. Tanaro valle Riddone	2056	
F. Tanaro valle Cherasca	2063	

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

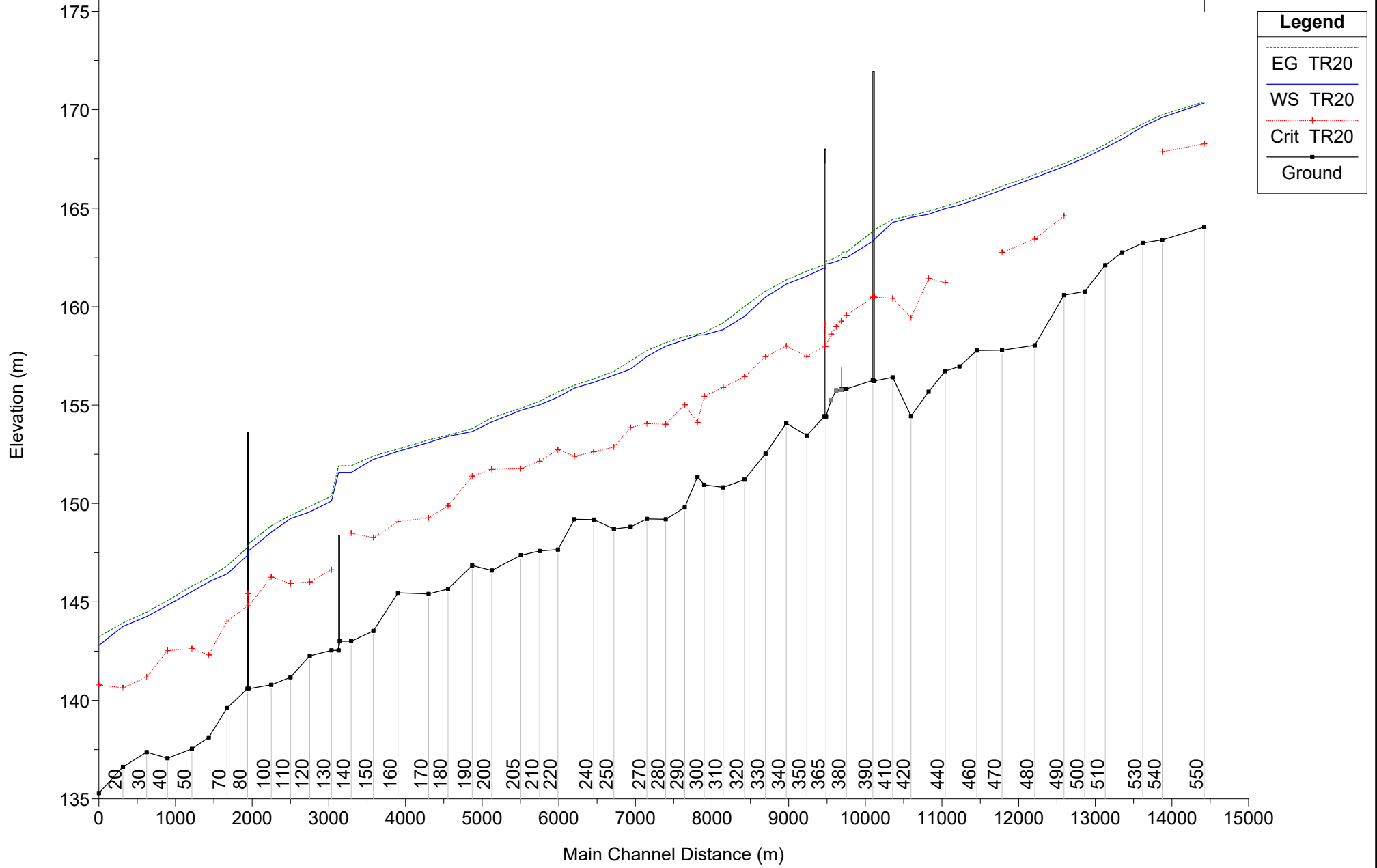
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.53	1104.78	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001917	2.05	2272.54	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001722	1.89	1696.30	656.65	0.28
1	520	TR20	2050.00	162.75	168.51		168.73	0.002549	2.29	1535.12	916.59	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002334	2.02	1650.15	699.86	0.32
1	500	TR20	2050.00	160.77	167.55		167.72	0.001688	1.96	1551.16	539.63	0.28
1	490	TR20	2050.00	160.58	167.11	164.60	167.27	0.001696	1.83	1423.09	495.21	0.28
1	480	TR20	2050.00	158.04	166.55	163.44	166.70	0.001403	1.84	1672.59	673.91	0.26
1	470	TR20	2050.00	157.79	165.93	162.75	166.11	0.001551	2.06	1552.79	508.73	0.28
1	460	TR20	2050.00	157.77	165.46		165.63	0.001375	1.91	1527.59	638.84	0.26
1	450	TR20	2050.00	156.96	165.16		165.32	0.001320	1.90	1467.18	519.30	0.26
1	440	TR20	2050.00	156.72	164.98	161.21	165.10	0.000998	1.71	1971.66	641.83	0.22
1	430	TR20	2050.00	155.68	164.69	161.42	164.84	0.001397	2.03	1893.36	650.32	0.26
1	420	TR20	2050.00	154.44	164.53	159.43	164.63	0.000639	1.55	2172.93	652.65	0.19
1	410	TR20	2050.00	156.41	164.27	160.42	164.43	0.001228	1.92	1648.62	488.31	0.25
1	400	TR20	2050.00	156.22	163.43	160.47	163.90	0.003230	3.09	732.49	161.19	0.40
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.33	160.48	163.82	0.003423	3.15	715.94	160.90	0.41
1	380	TR20	2050.00	155.82	162.49	159.56	162.77	0.002228	2.38	861.63	159.98	0.33
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	162.17	157.99	162.31	0.000984	1.69	1210.49	203.70	0.22
1	365		Bridge									
1	360	TR20	2050.00	154.43	161.98	157.99	162.13	0.001062	1.75	1172.26	199.10	0.23
1	350	TR20	2050.00	153.45	161.56	157.46	161.81	0.001538	2.23	922.19	148.01	0.28
1	340	TR20	2056.00	154.08	161.15	158.01	161.36	0.001723	2.05	1014.43	295.12	0.29
1	330	TR20	2056.00	152.53	160.49	157.45	160.80	0.002451	2.48	867.12	307.79	0.34
1	320	TR20	2056.00	151.21	159.52	156.45	160.02	0.003193	3.24	906.10	362.23	0.40
1	310	TR20	2056.00	150.82	158.85	155.90	159.18	0.002656	2.81	1222.74	481.46	0.36
1	300	TR20	2063.00	150.95	158.58	155.45	158.70	0.001251	1.70	1894.68	640.59	0.24
1	295	TR20	2063.00	151.36	158.57	154.14	158.62	0.000380	1.00	2362.37	687.63	0.14
1	290	TR20	2063.00	149.80	158.33	155.02	158.50	0.001367	1.83	1130.24	535.41	0.25
1	280	TR20	2063.00	149.20	158.01	154.04	158.18	0.001238	2.00	1549.23	453.81	0.25
1	270	TR20	2063.00	149.22	157.49	154.07	157.79	0.002127	2.61	1229.00	445.24	0.33
1	260	TR20	2063.00	148.81	156.84	153.87	157.26	0.002905	2.99	929.93	279.75	0.38
1	250	TR20	2063.00	148.71	156.53	152.88	156.73	0.001644	2.12	1412.59	503.20	0.29
1	240	TR20	2063.00	149.18	156.16	152.64	156.34	0.001327	1.95	1511.41	720.33	0.26
1	230	TR20	2063.00	149.20	155.88	152.42	156.02	0.001154	1.75	1556.08	429.00	0.24
1	220	TR20	2063.00	147.66	155.42	152.75	155.68	0.002132	2.44	1238.18	392.68	0.33
1	210	TR20	2063.00	147.59	155.03	152.16	155.21	0.001608	1.99	1388.20	529.67	0.28
1	205	TR20	2063.00	147.37	154.74	151.78	154.85	0.001154	1.61	2146.51	949.86	0.23

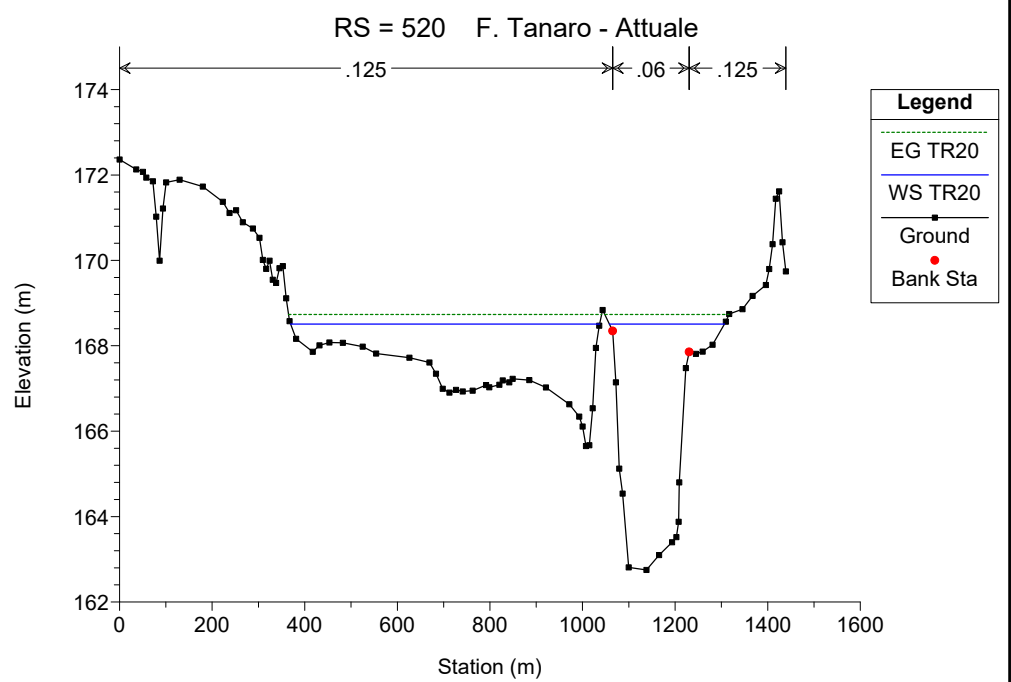
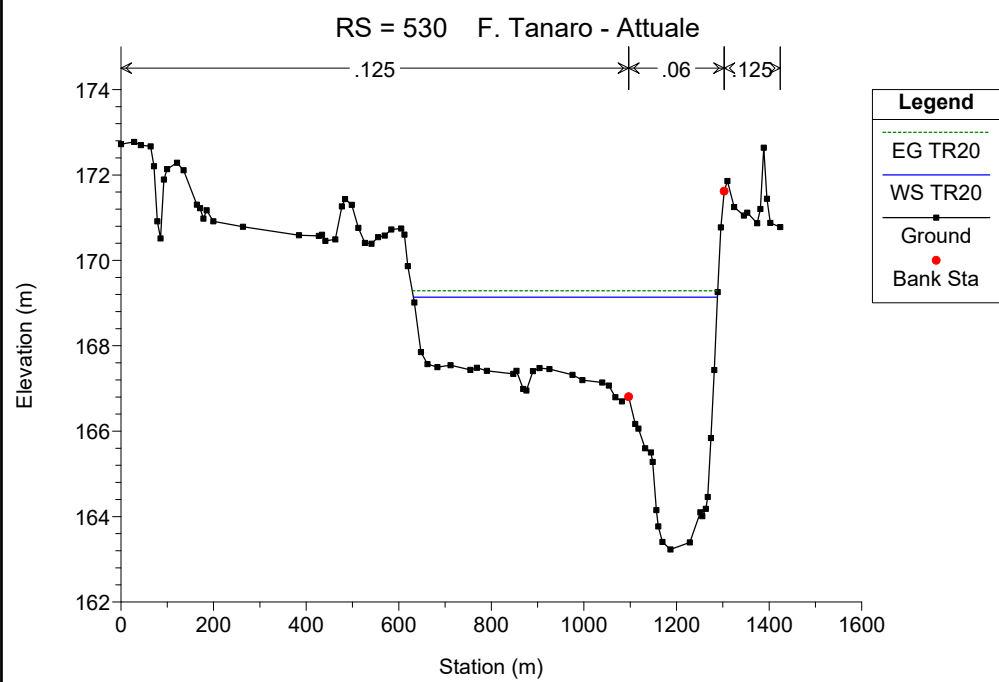
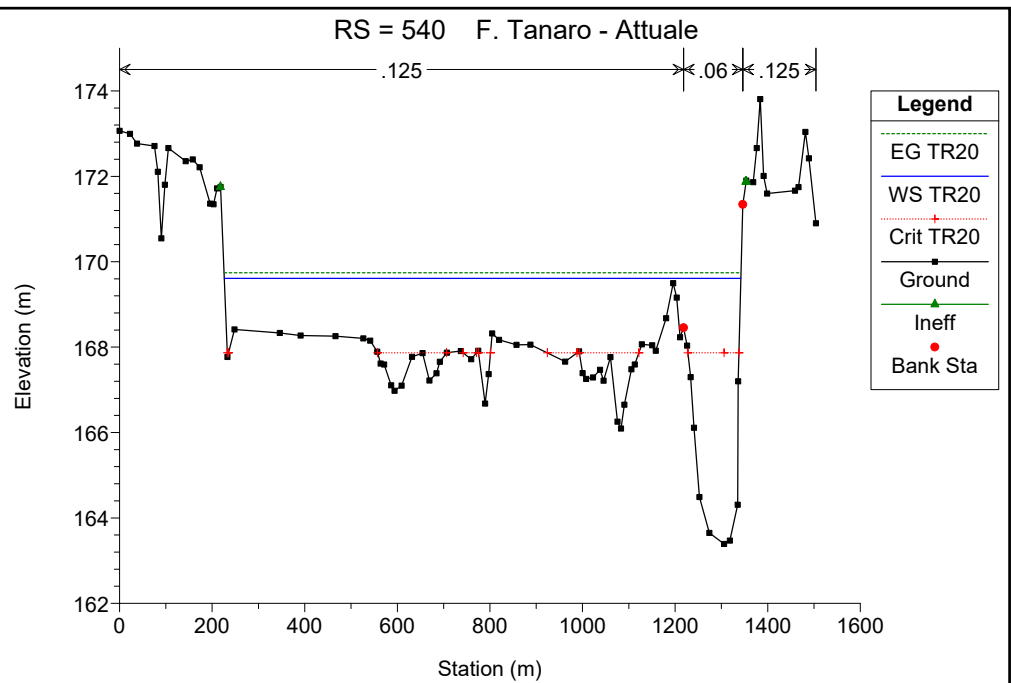
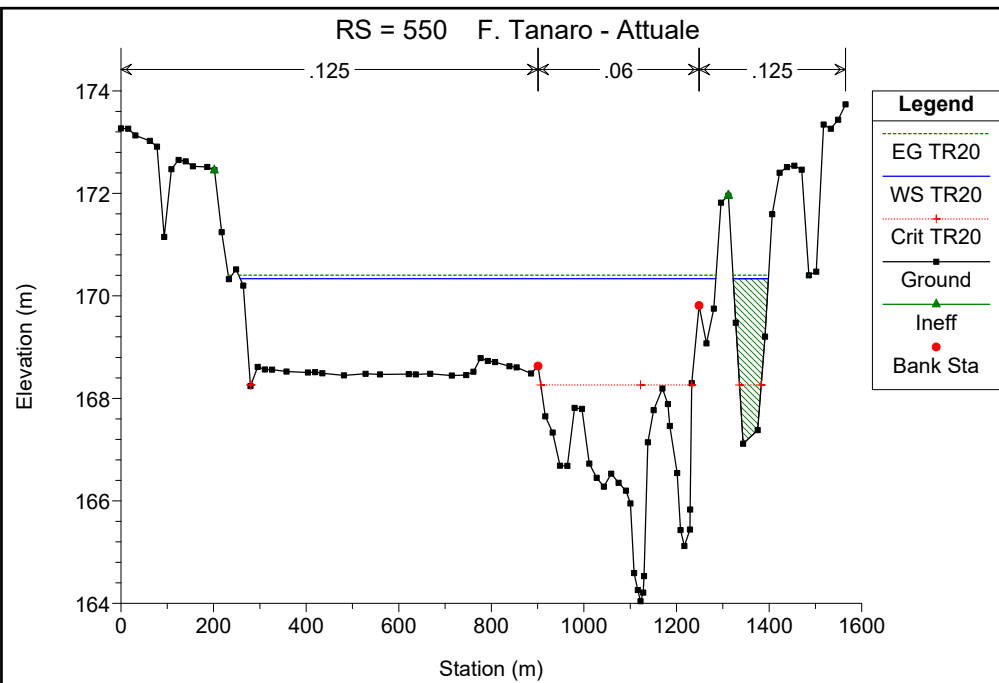
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (Continued)

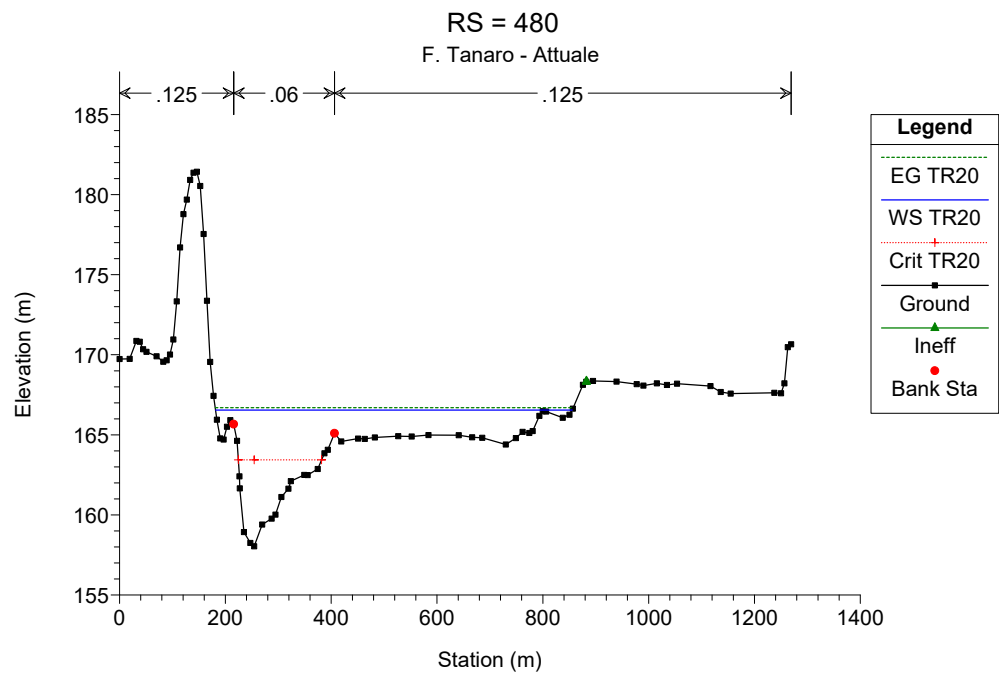
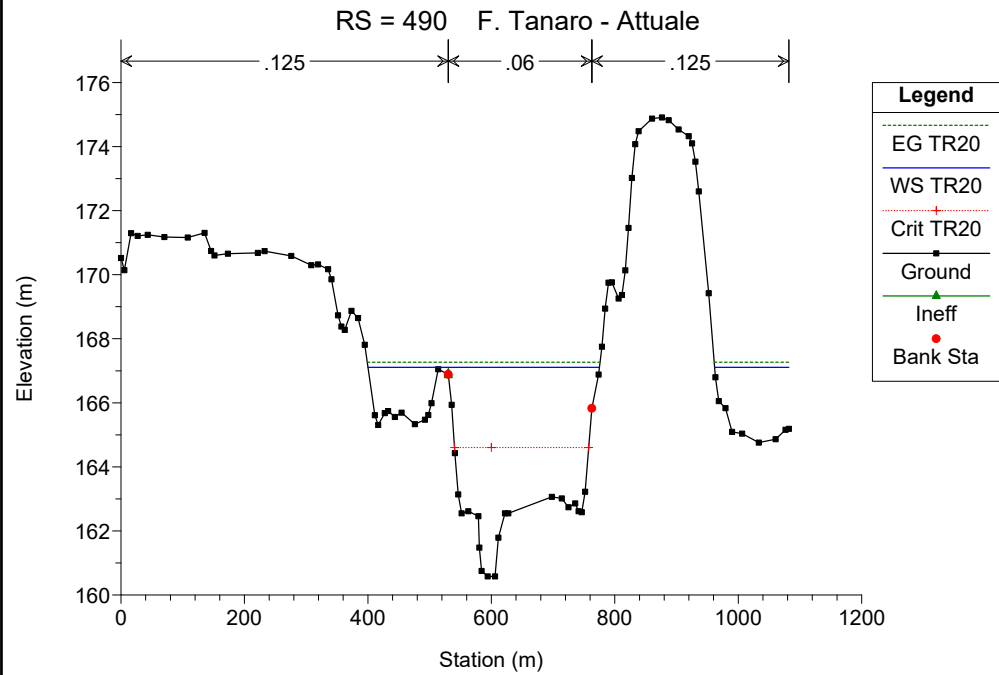
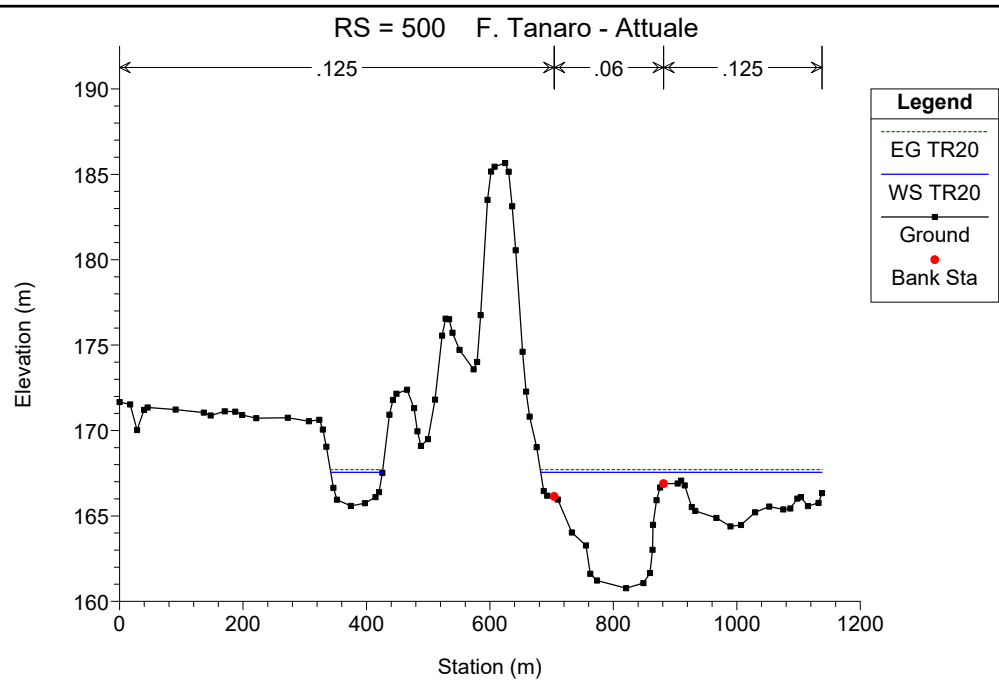
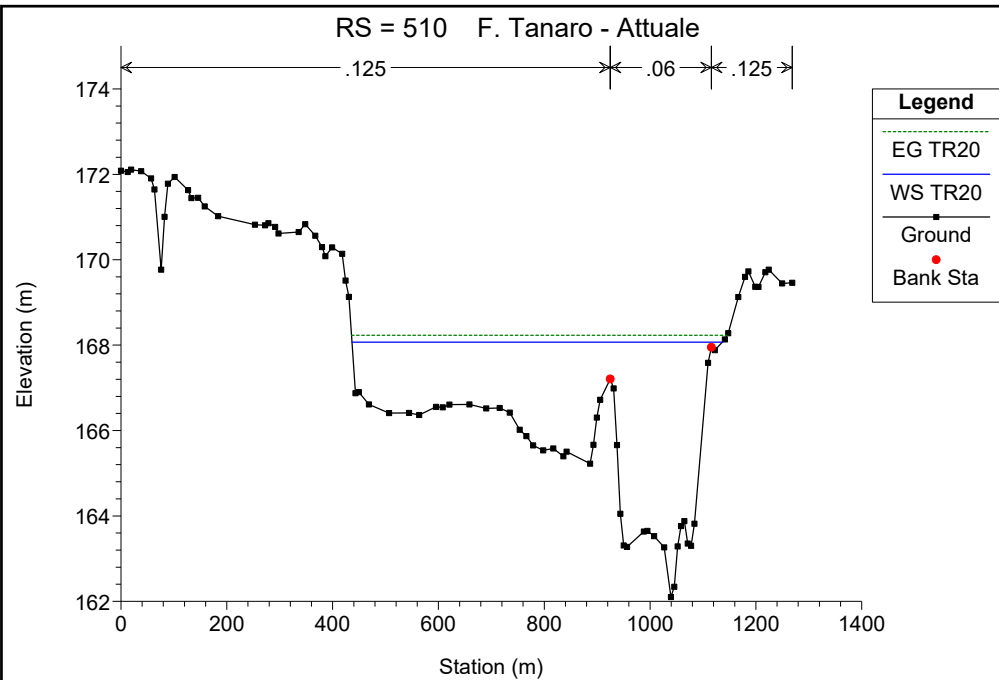
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	TR20	2063.00	146.60	154.16	151.75	154.37	0.002071	2.35	1849.52	1046.66	0.32
1	190	TR20	2063.00	146.85	153.67	151.41	153.82	0.002019	1.93	1796.20	938.82	0.30
1	180	TR20	2063.00	145.66	153.42	149.88	153.48	0.000654	1.18	2576.55	1068.32	0.18
1	170	TR20	2063.00	145.40	153.11	149.28	153.24	0.001369	1.68	1661.55	877.65	0.25
1	160	TR20	2063.00	145.46	152.66	149.08	152.77	0.001038	1.55	1768.38	905.63	0.22
1	150	TR20	2063.00	143.53	152.25	148.27	152.42	0.001133	1.87	1519.32	1054.73	0.24
1	140	TR20	2063.00	143.00	151.58	148.51	151.92	0.002745	2.60	929.04	832.43	0.36
1	135		Inl Struct									
1	130	TR20	2063.00	142.54	150.14	146.65	150.41	0.001856	2.26	912.61	161.29	0.30
1	120	TR20	2063.00	142.27	149.59	146.03	149.87	0.001892	2.34	887.59	193.33	0.31
1	110	TR20	2063.00	141.17	149.25	145.94	149.42	0.001467	2.00	1529.16	466.11	0.27
1	100	TR20	2063.00	140.79	148.56	146.26	148.88	0.003214	2.51	821.45	323.82	0.38
1	90	TR20	2063.00	140.59	147.61	144.81	147.98	0.002800	2.68	769.47	146.47	0.37
1	85		Bridge									
1	80	TR20	2063.00	140.59	147.39	144.81	147.79	0.003193	2.80	737.87	143.05	0.39
1	70	TR20	2063.00	139.61	146.44	144.03	146.85	0.003756	2.84	725.34	282.82	0.42
1	60	TR20	2063.00	138.12	146.03	142.33	146.25	0.001552	2.17	1411.65	540.42	0.28
1	50	TR20	2063.00	137.54	145.54	142.63	145.83	0.002266	2.56	1176.52	420.93	0.34
1	40	TR20	2063.00	137.06	144.85	142.54	145.08	0.002442	2.14	965.03	269.25	0.33
1	30	TR20	2063.00	137.37	144.27	141.20	144.49	0.001914	2.10	983.72	482.78	0.30
1	20	TR20	2063.00	136.62	143.77	140.65	143.95	0.001537	2.06	1693.50	671.01	0.28
1	10	TR20	2063.00	135.29	142.81	140.80	143.25	0.004002	3.17	1104.88	622.92	0.44

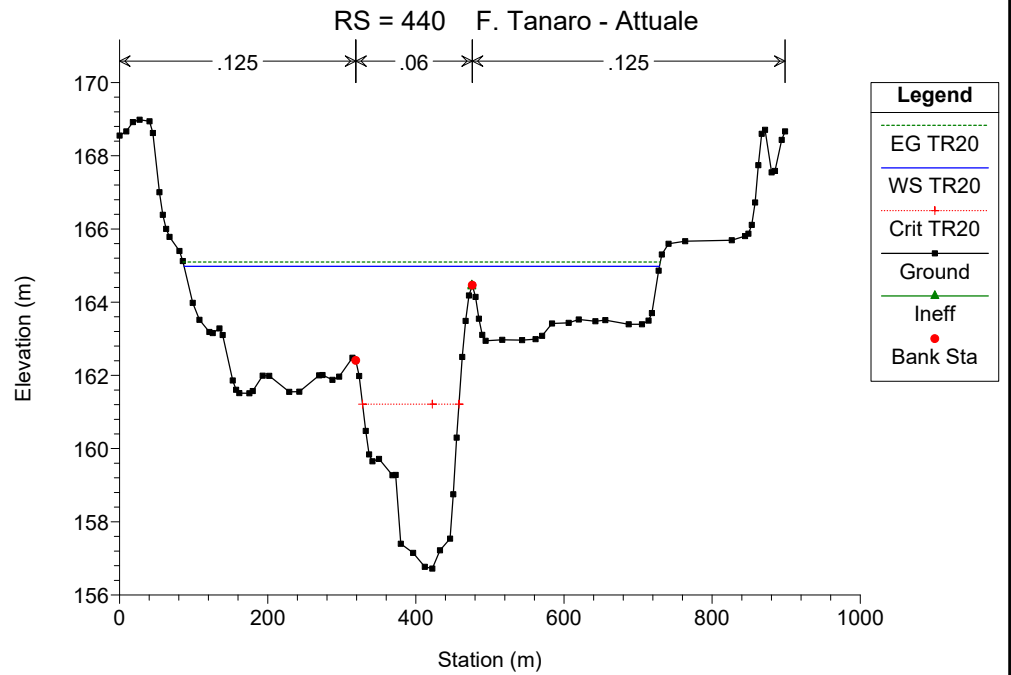
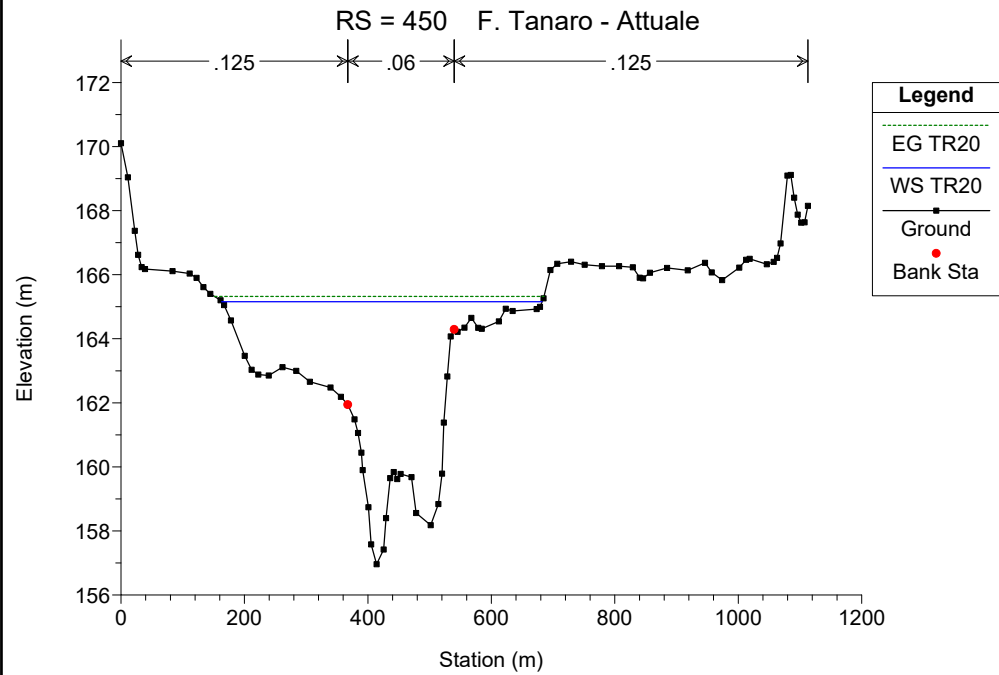
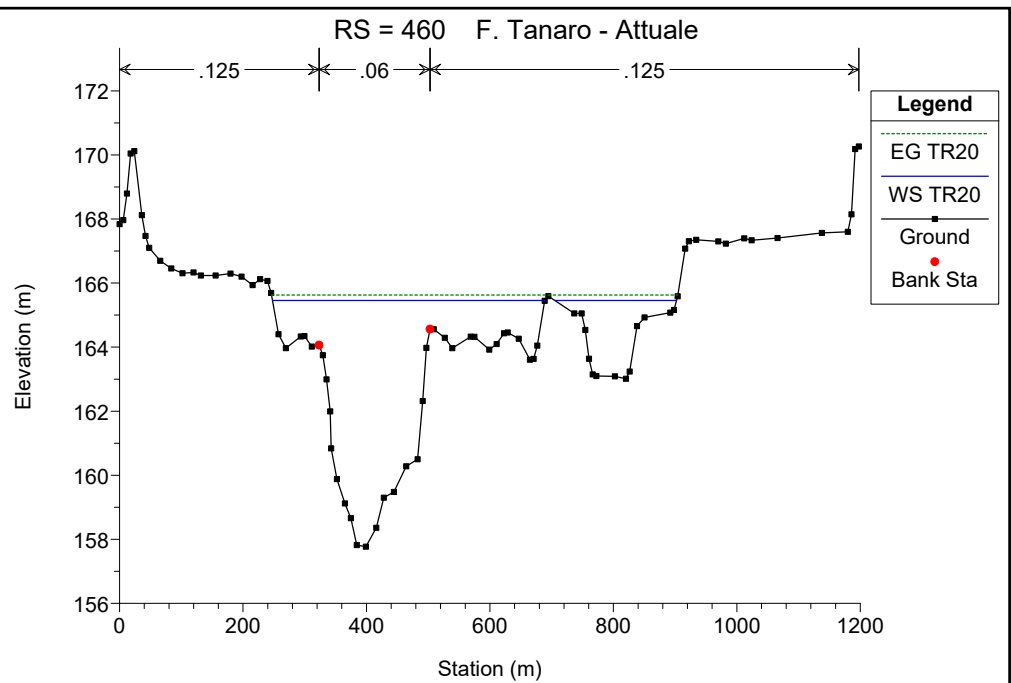
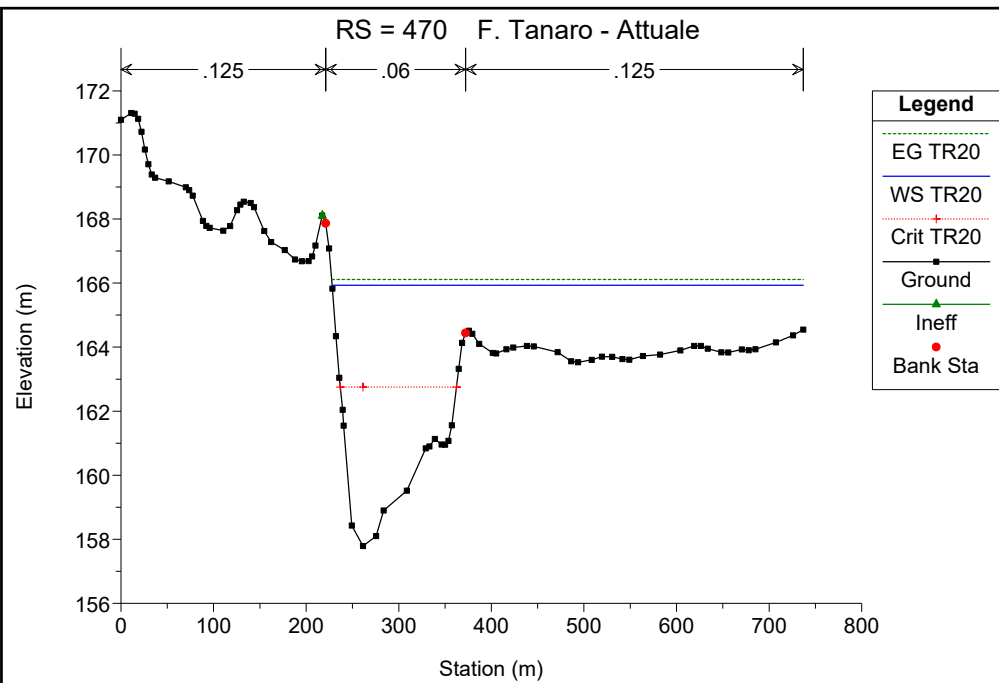
F. Tanaro - Attuale

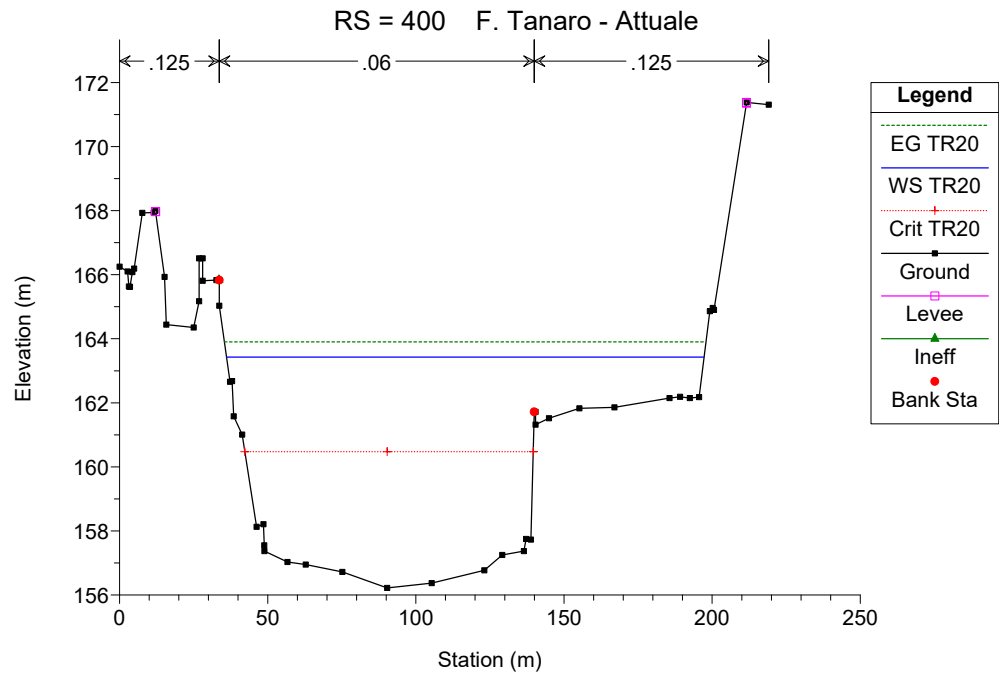
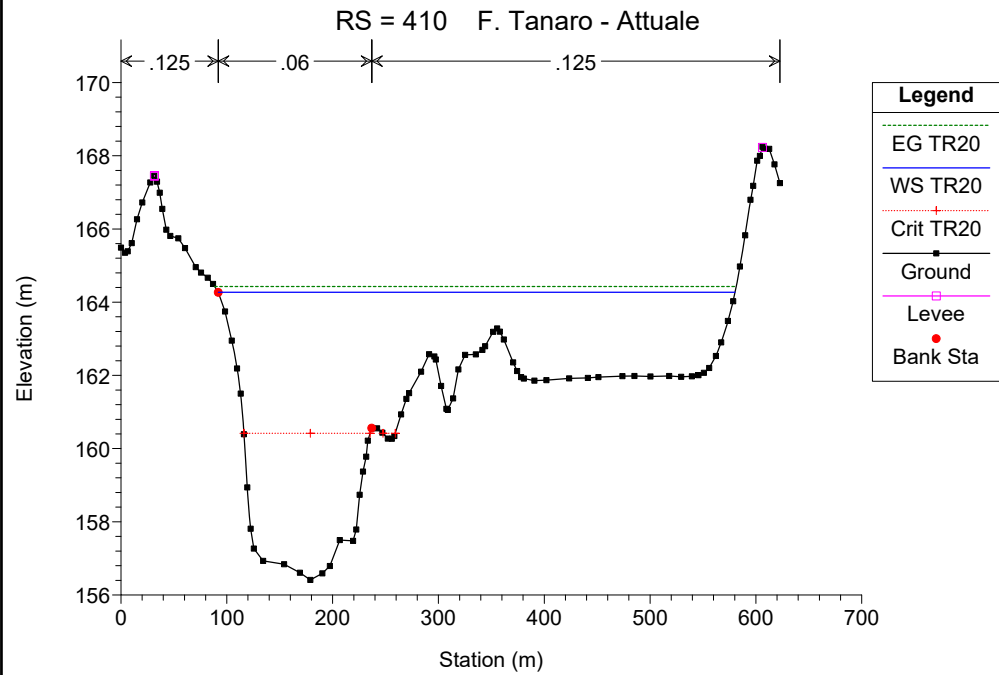
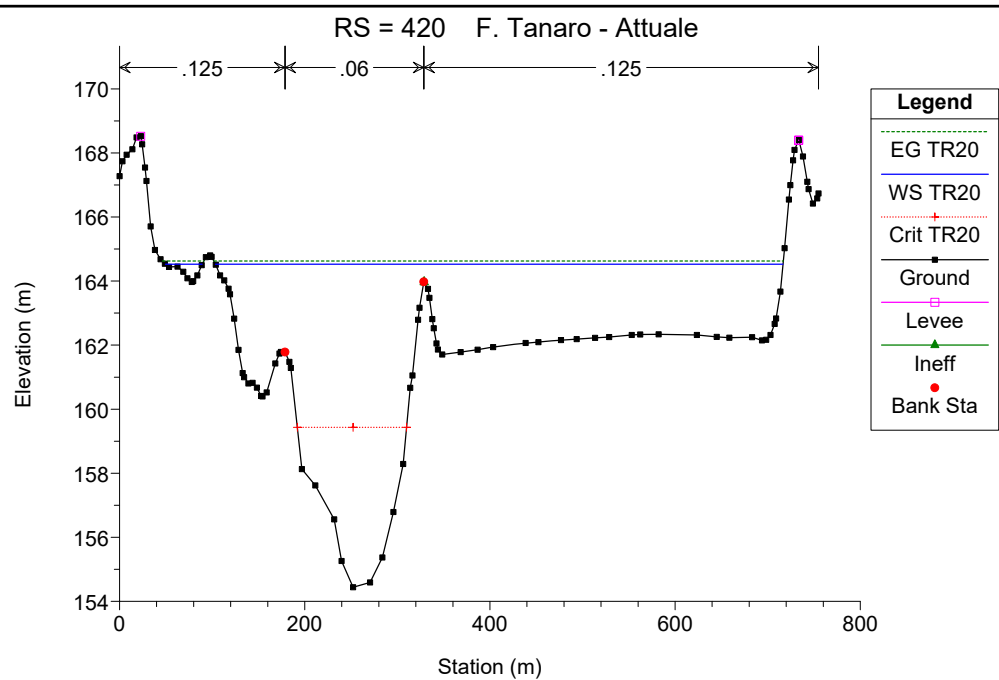
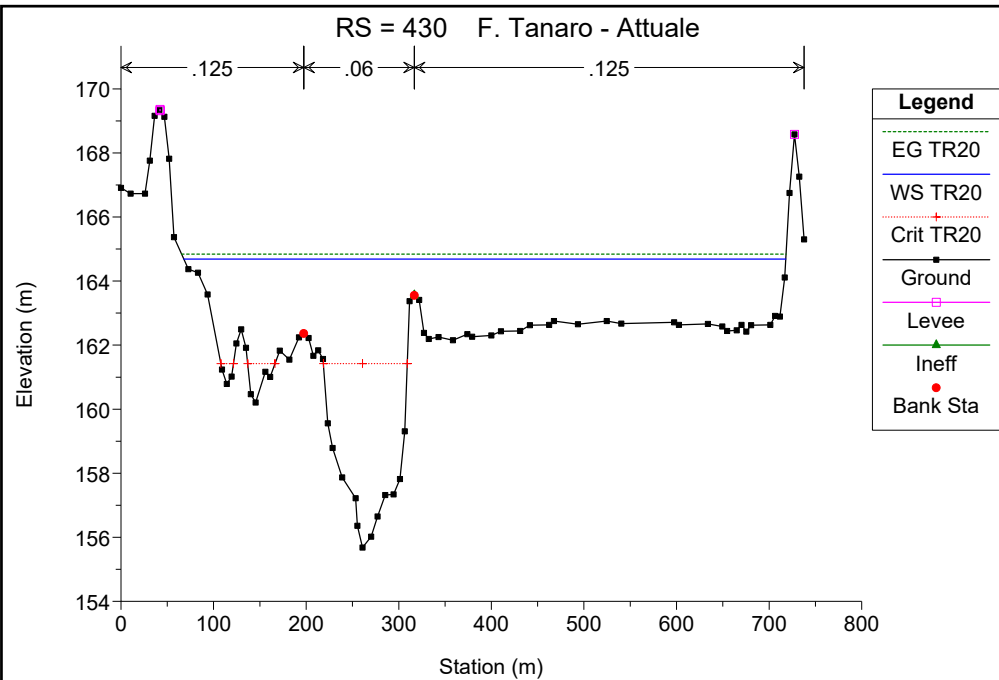
Tanaro 1

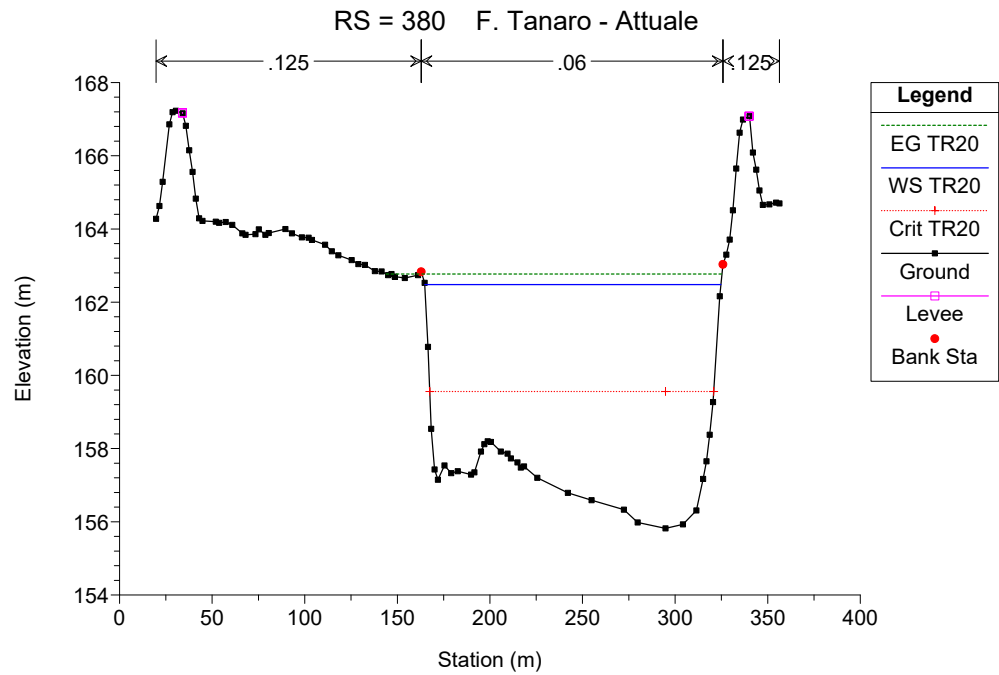
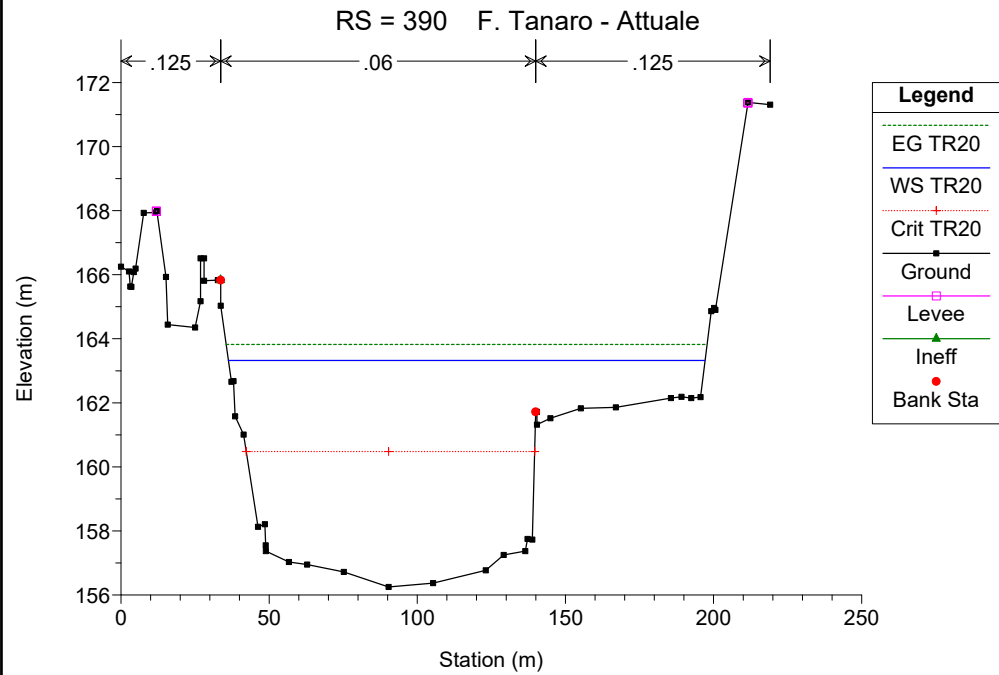
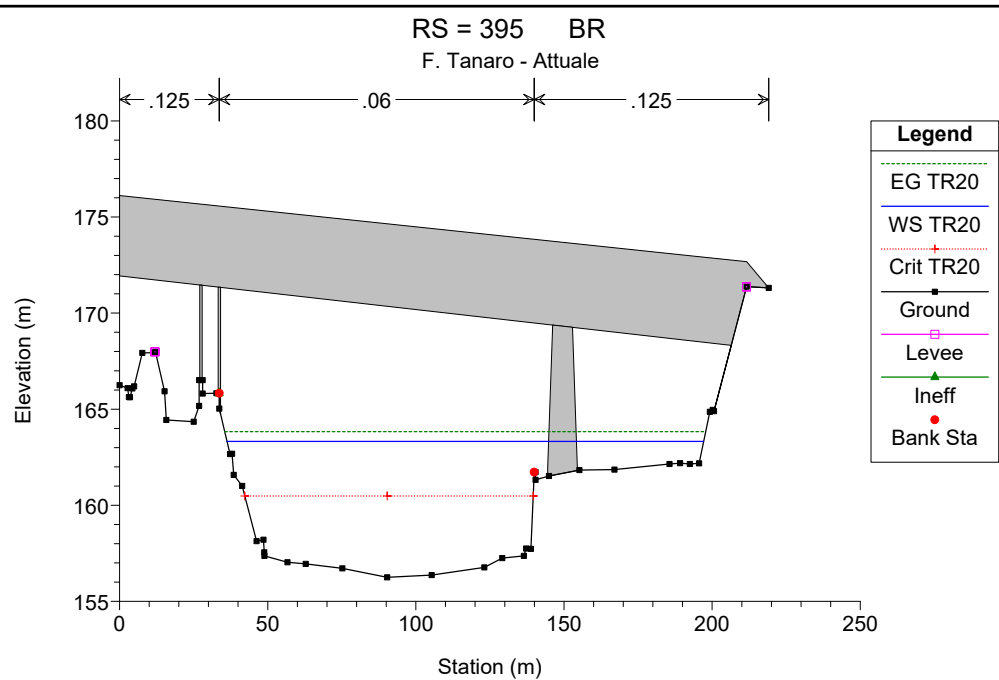
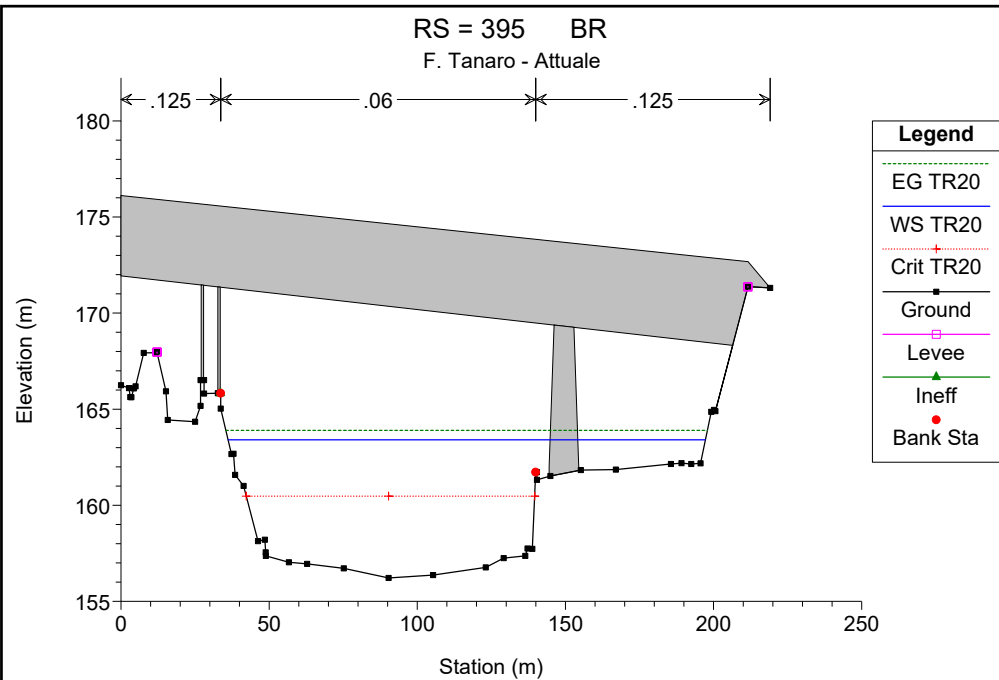


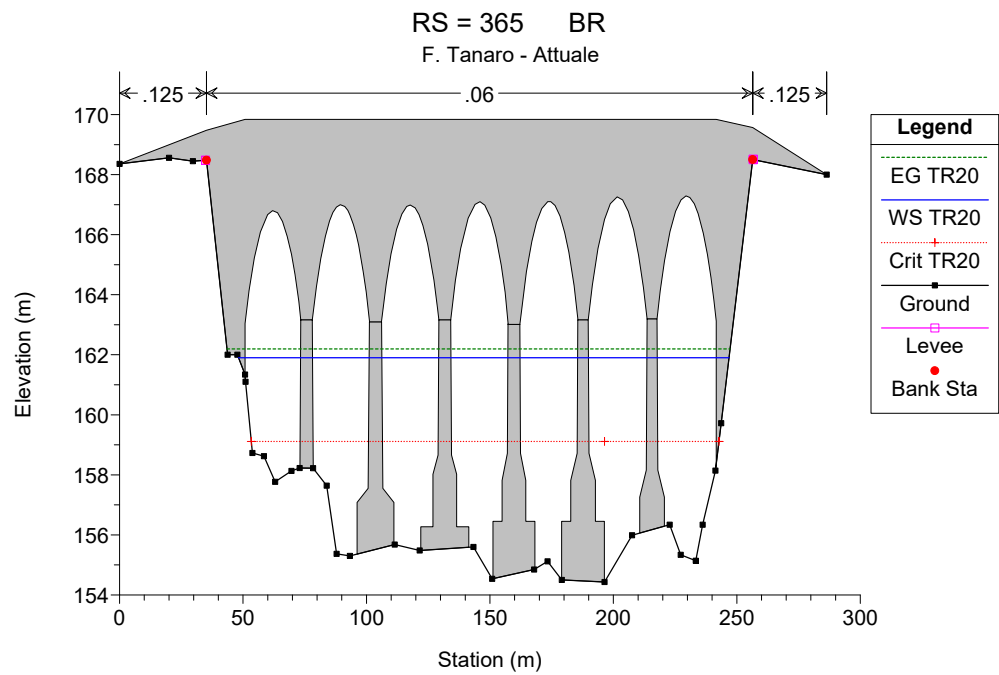
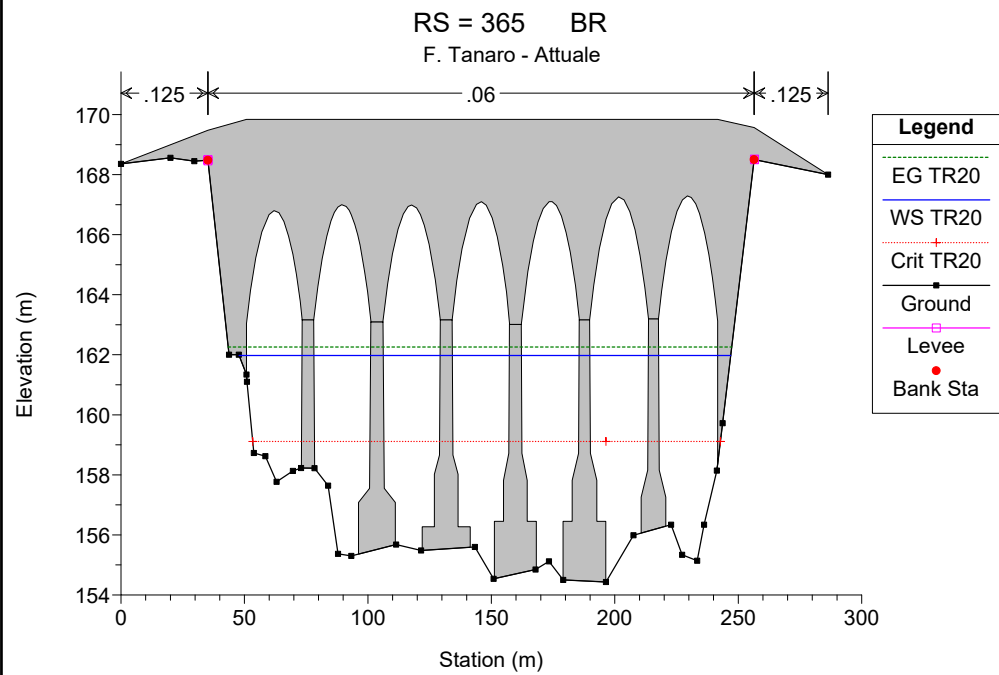
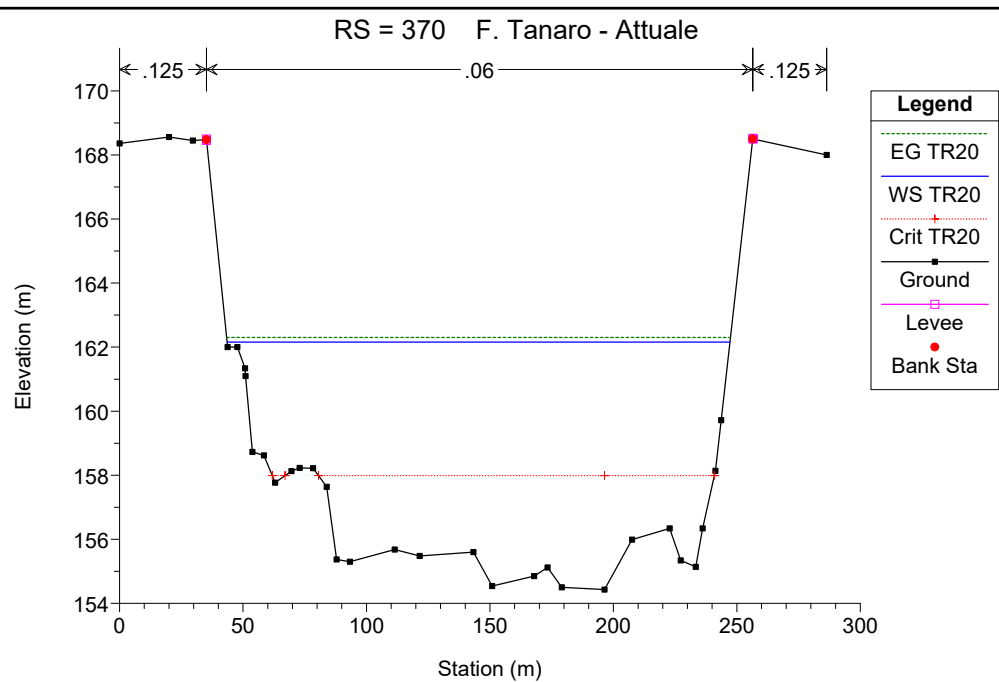
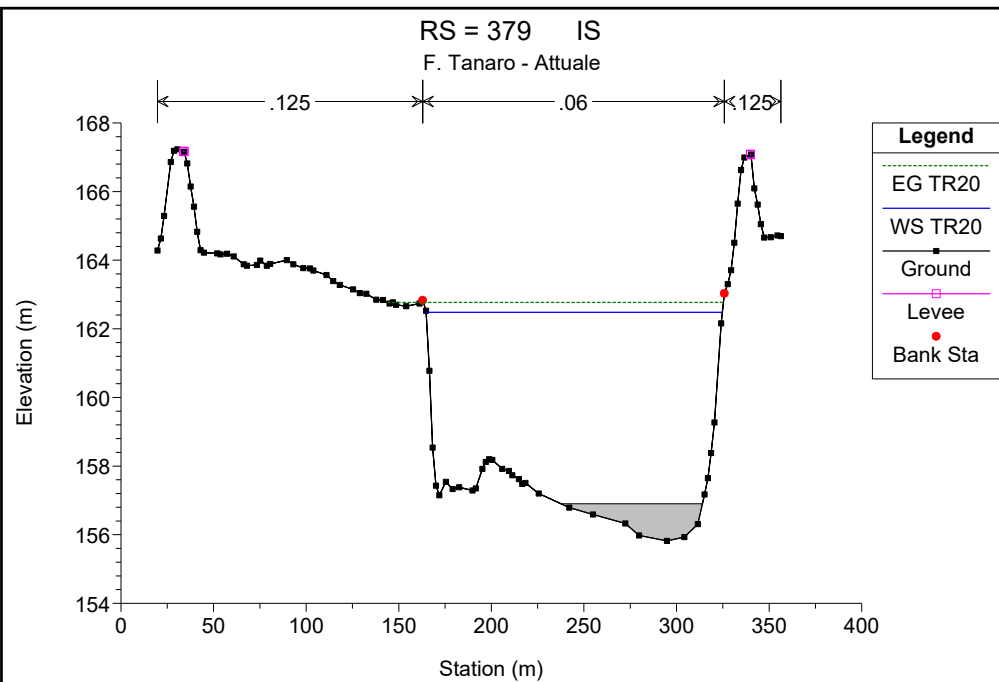


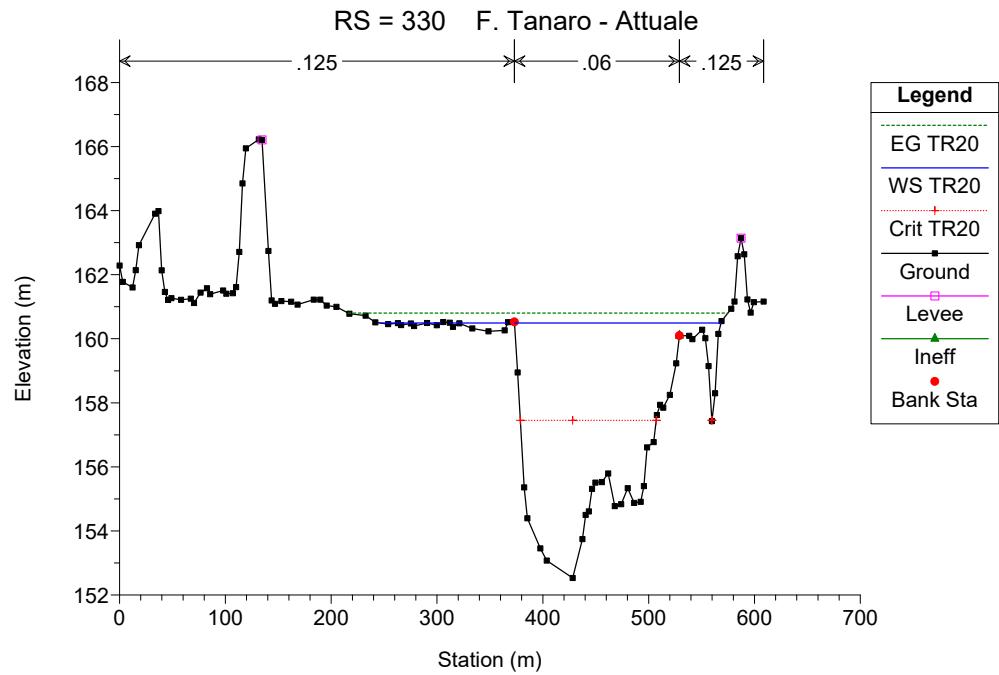
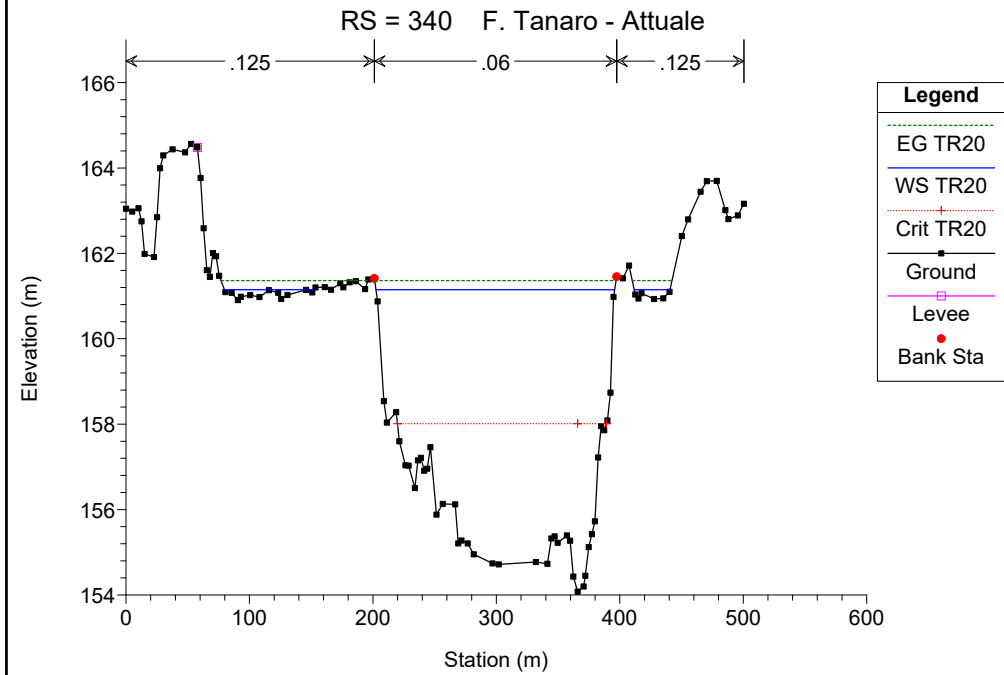
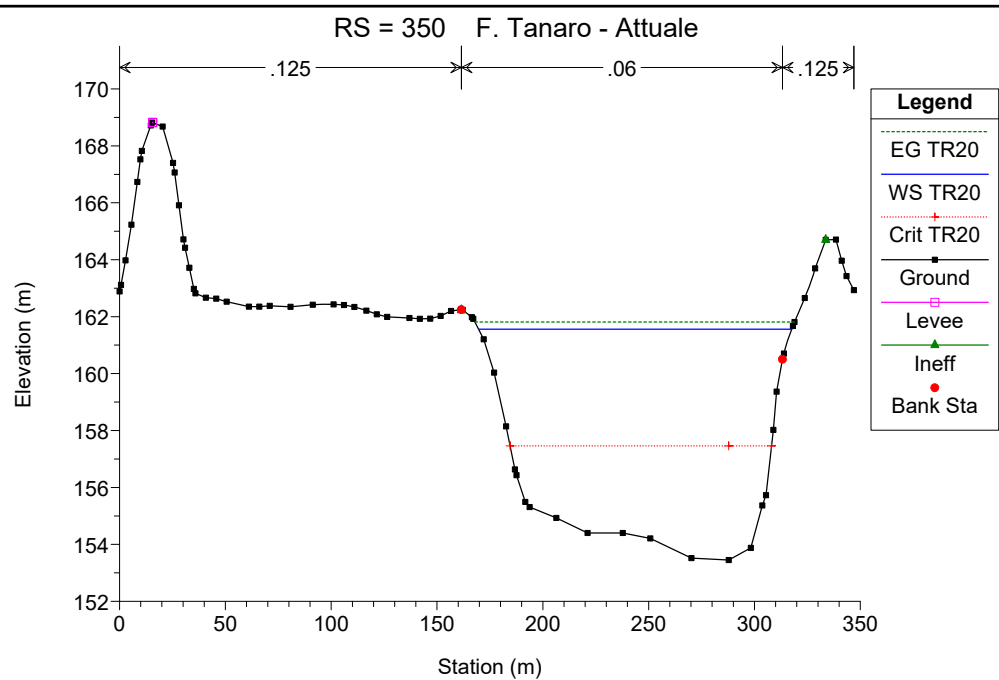
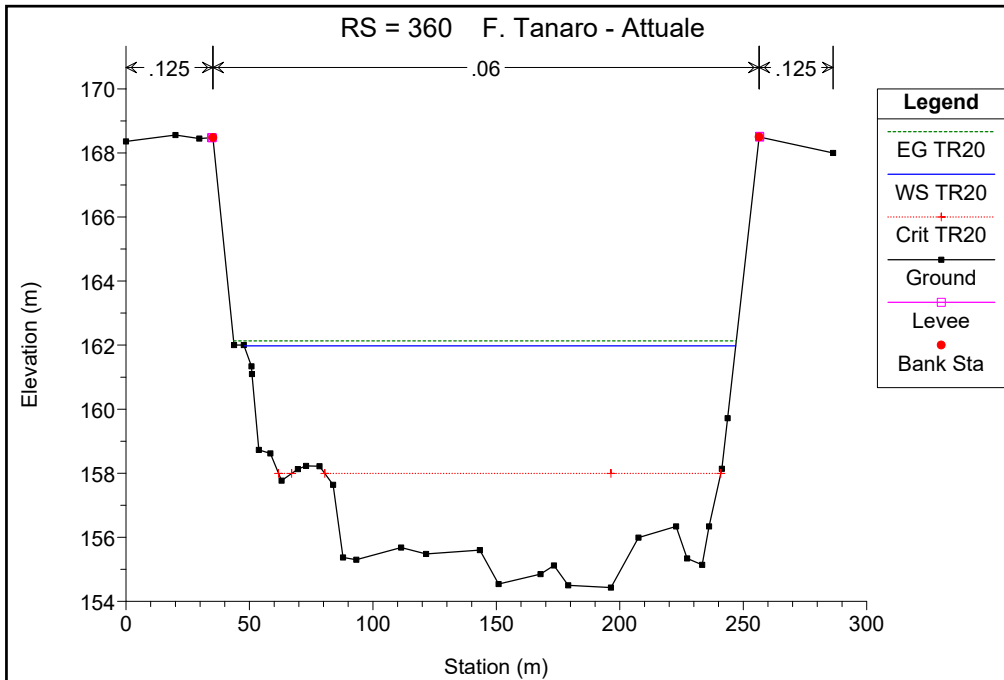


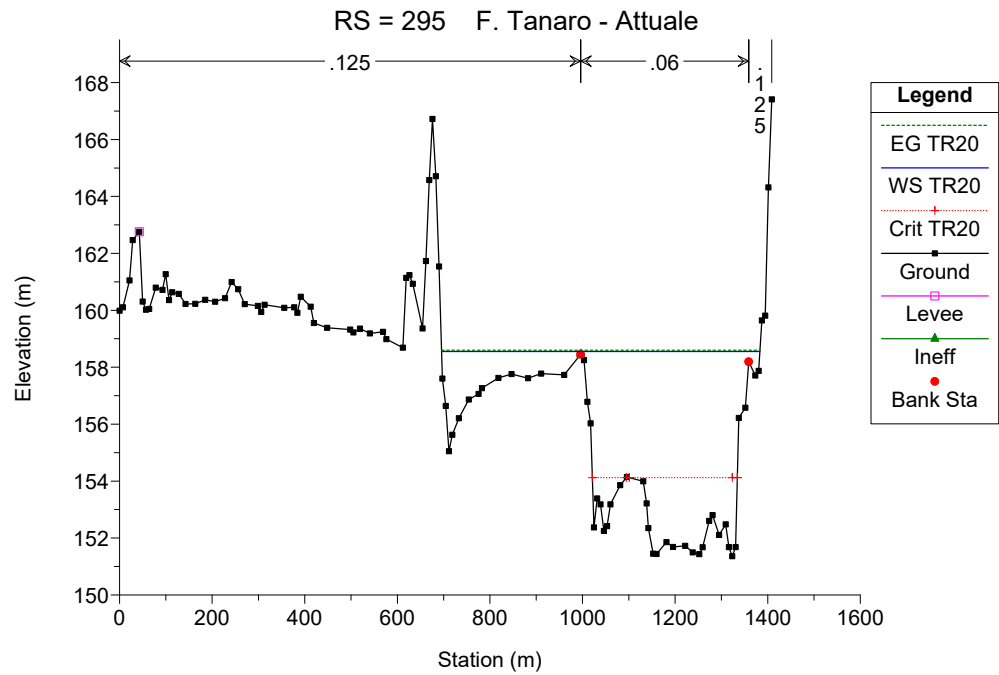
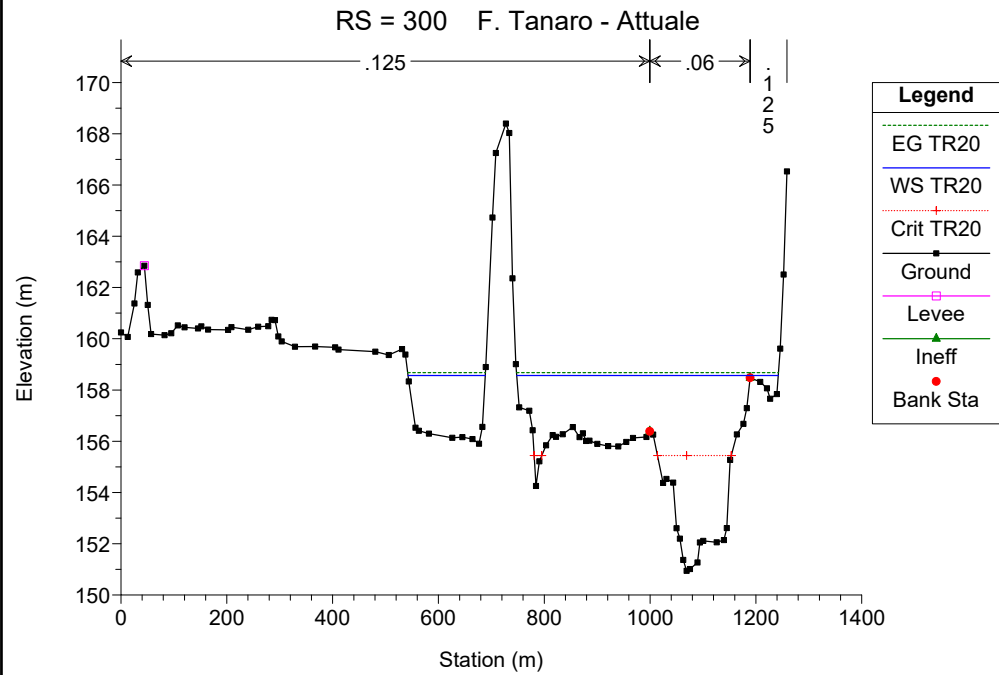
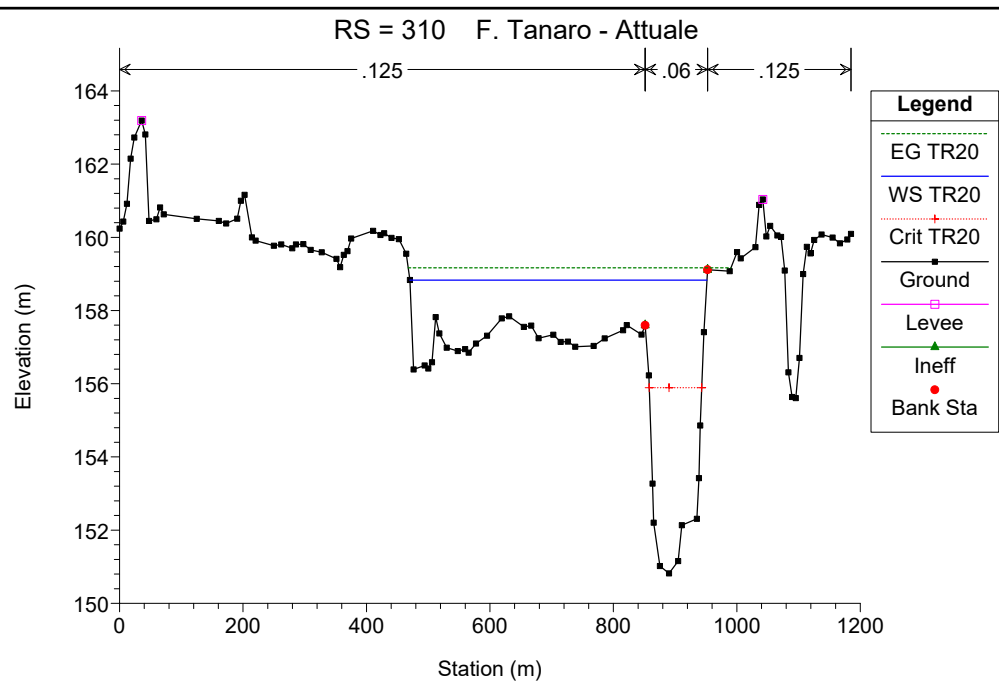
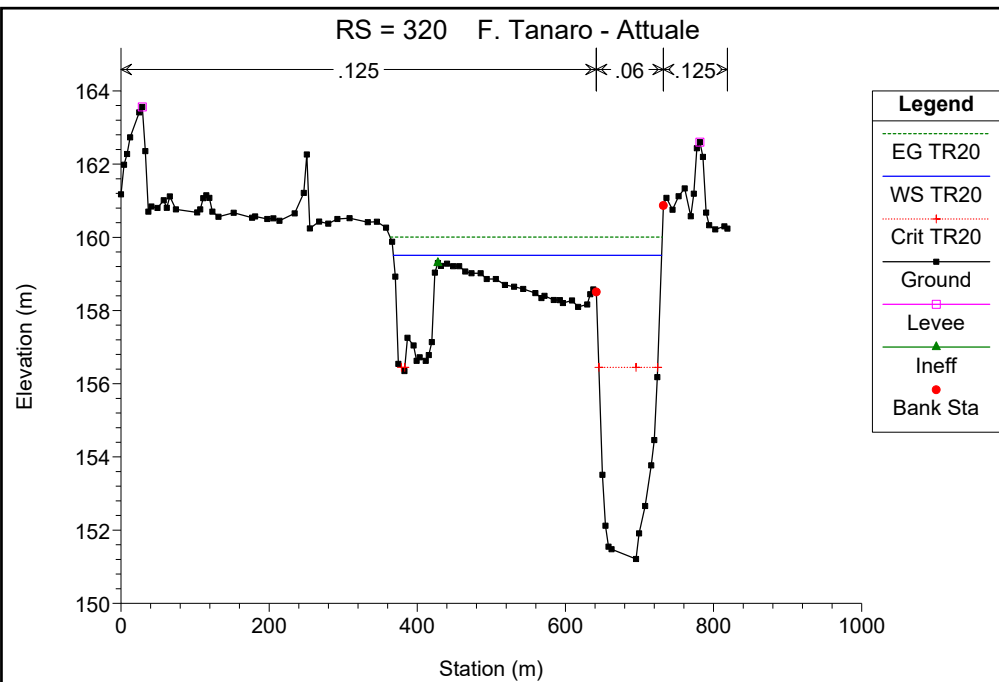


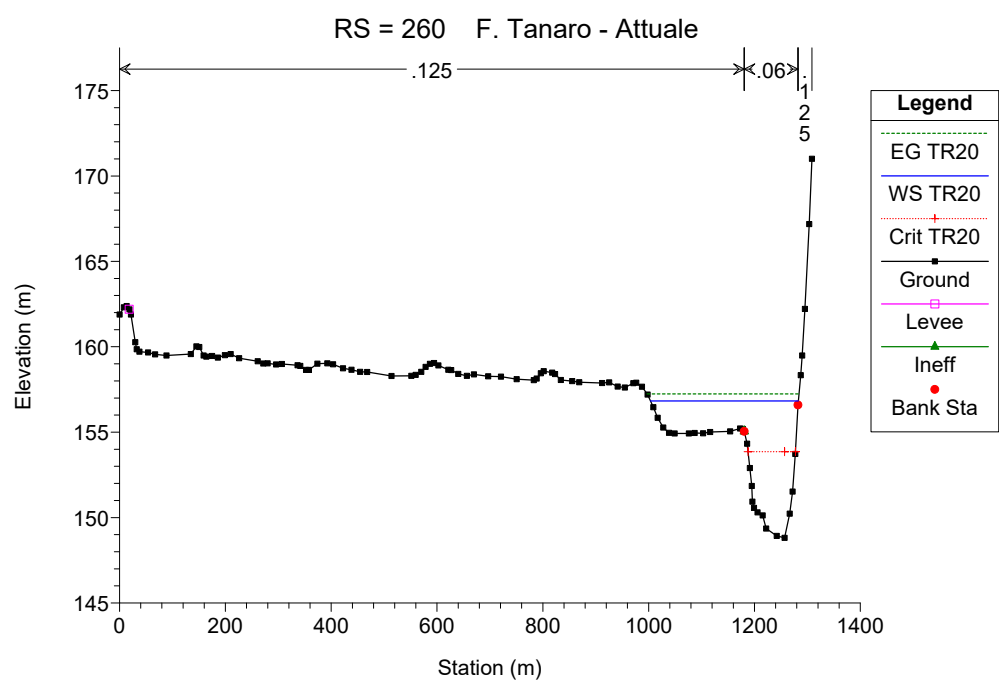
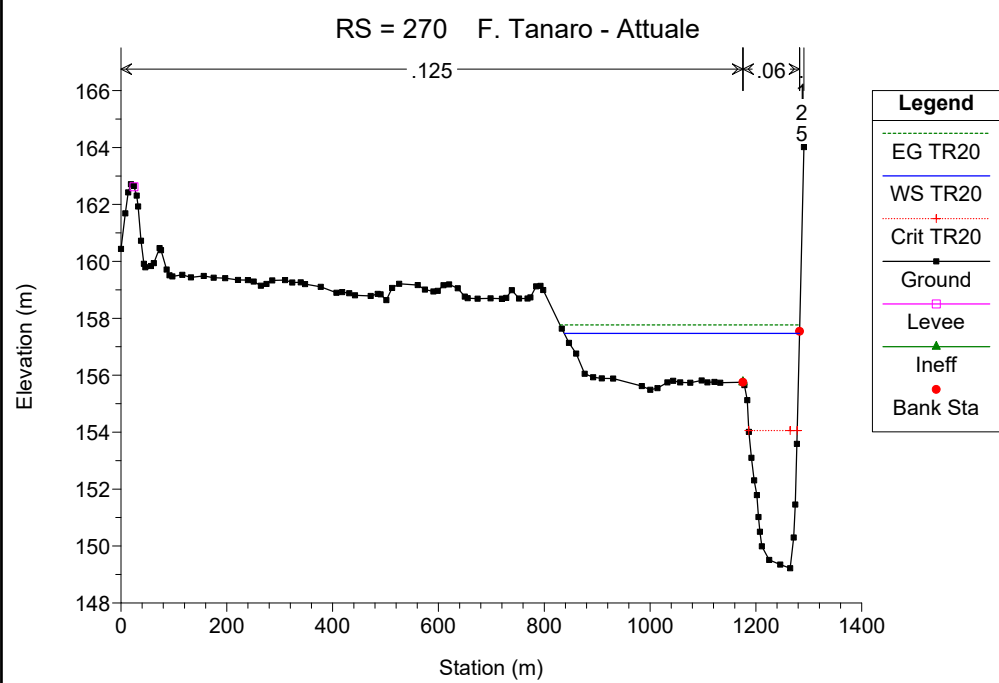
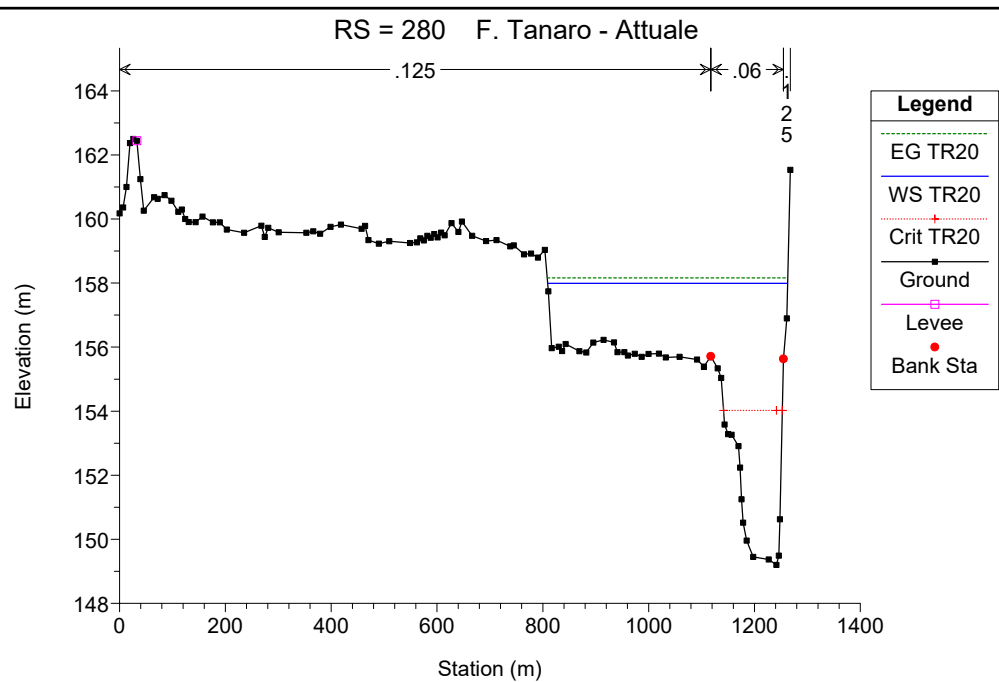
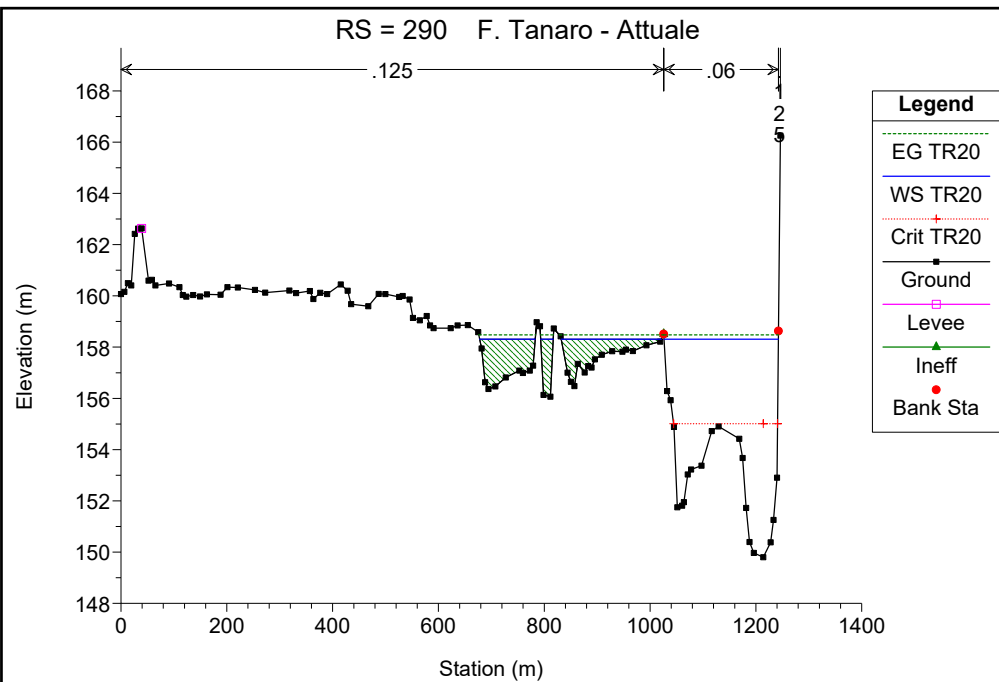


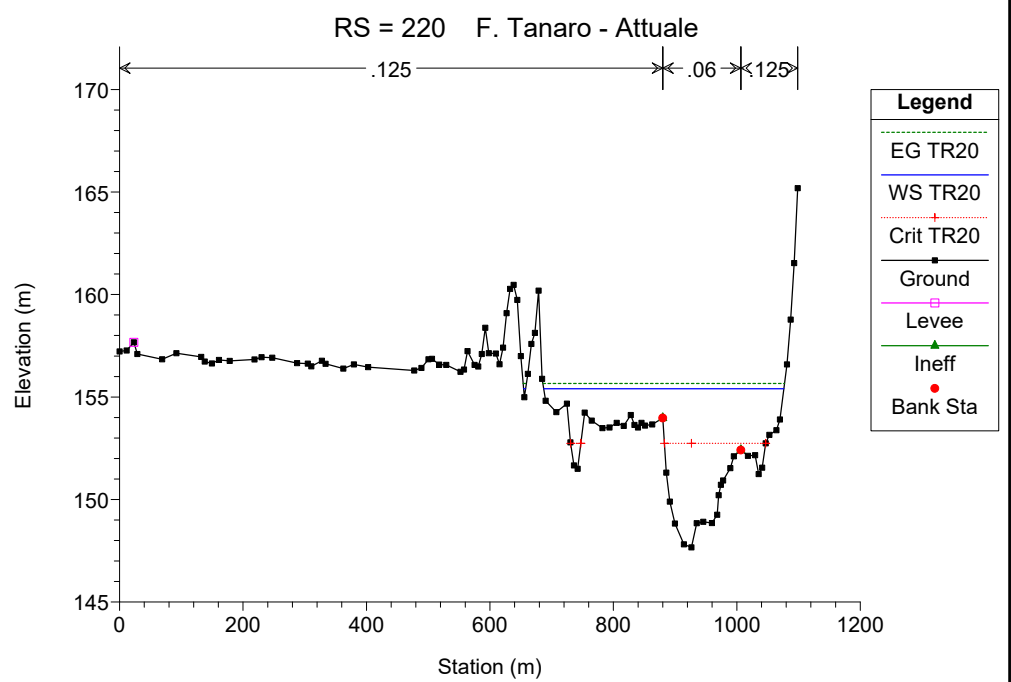
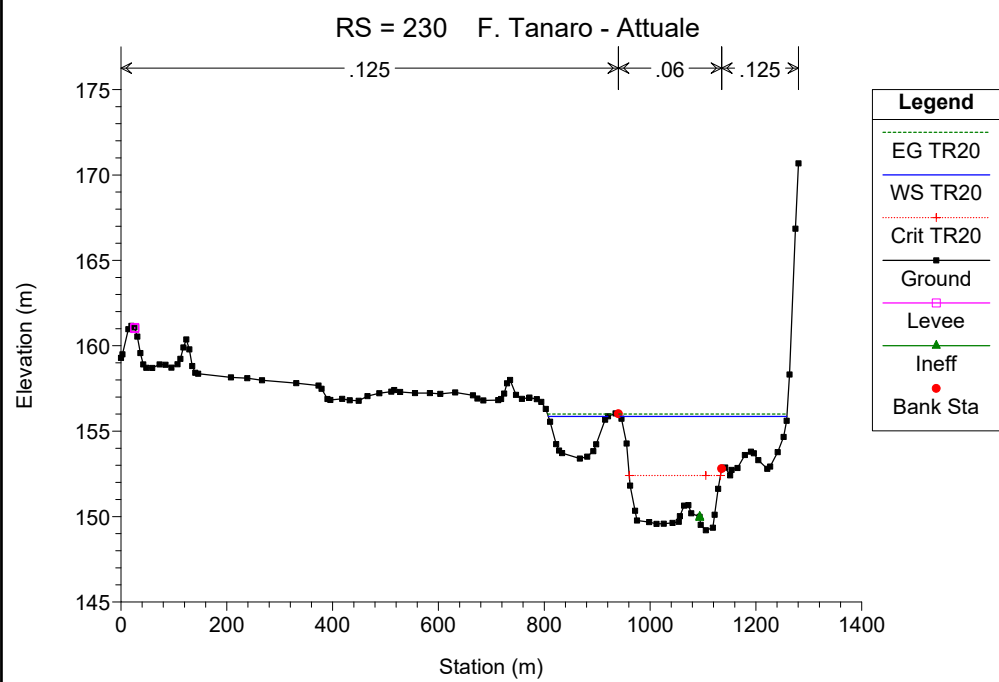
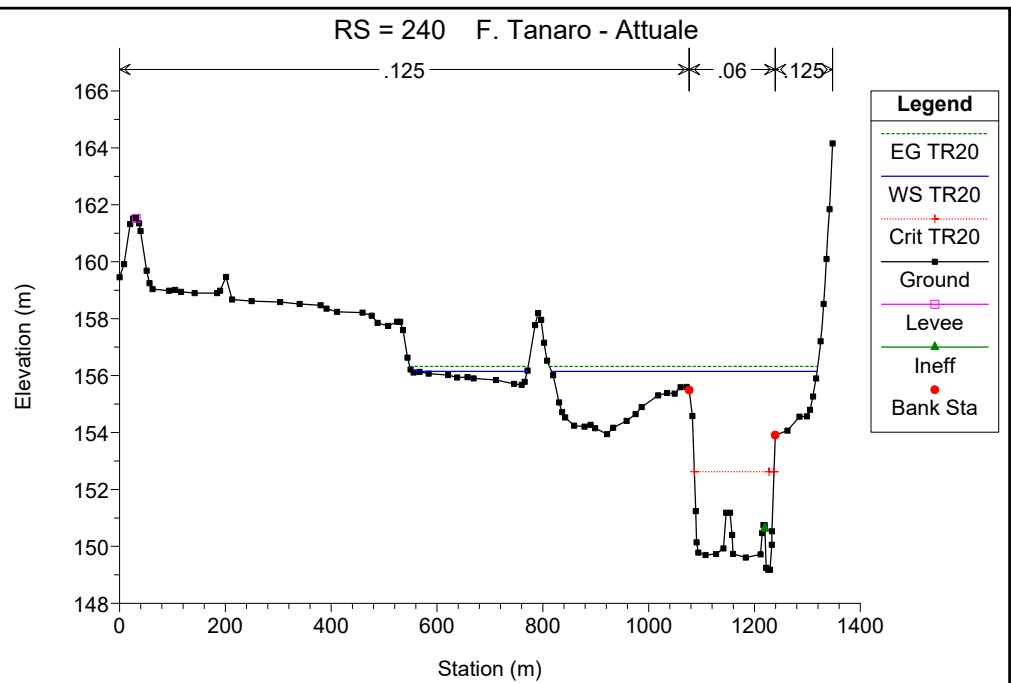
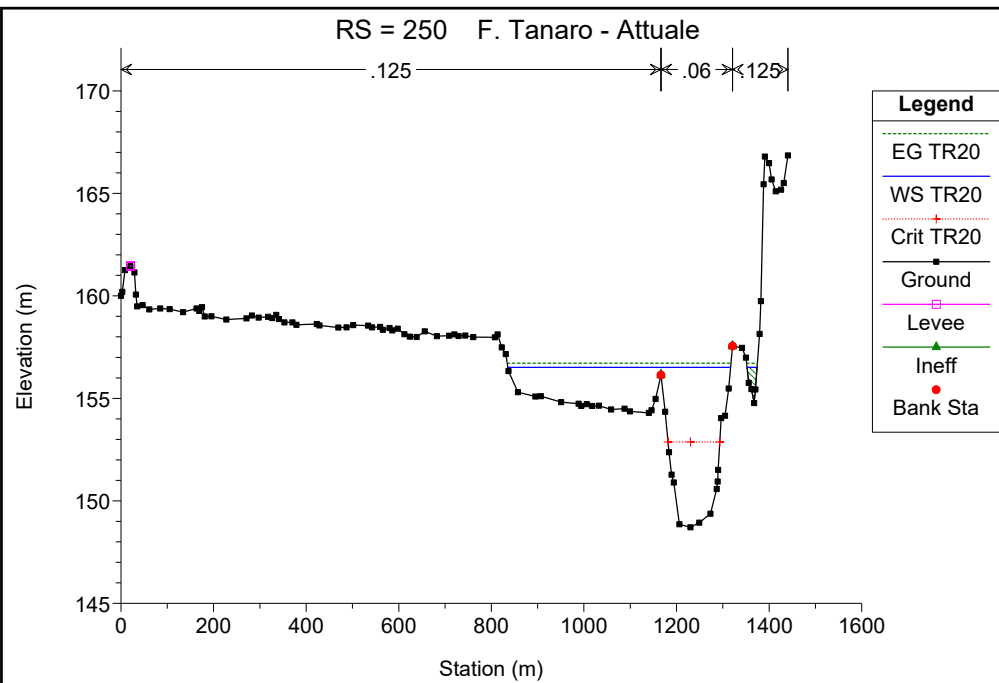


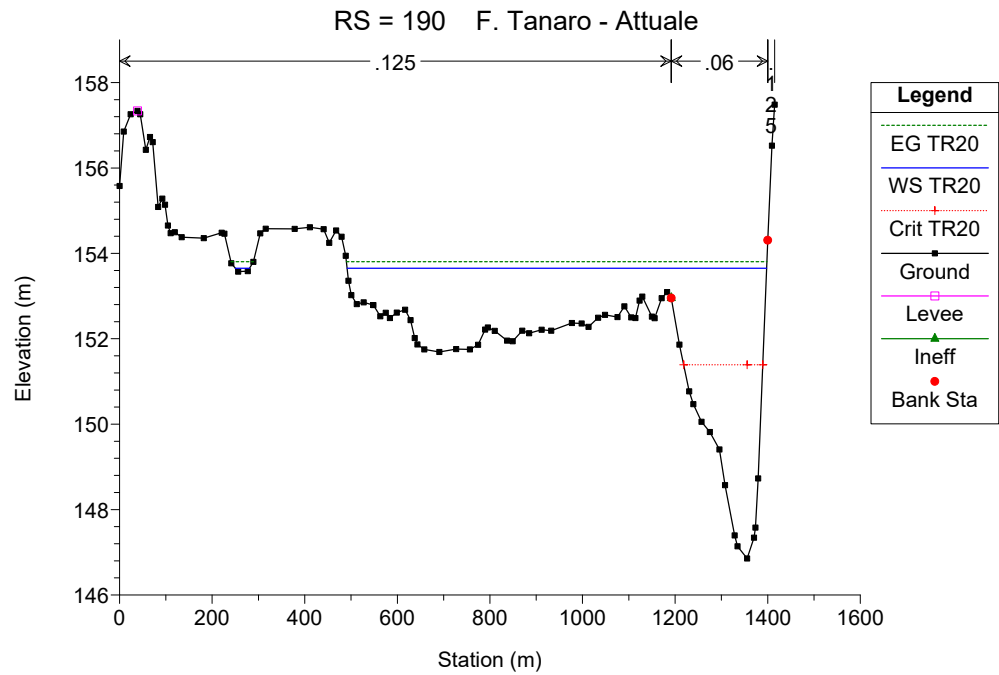
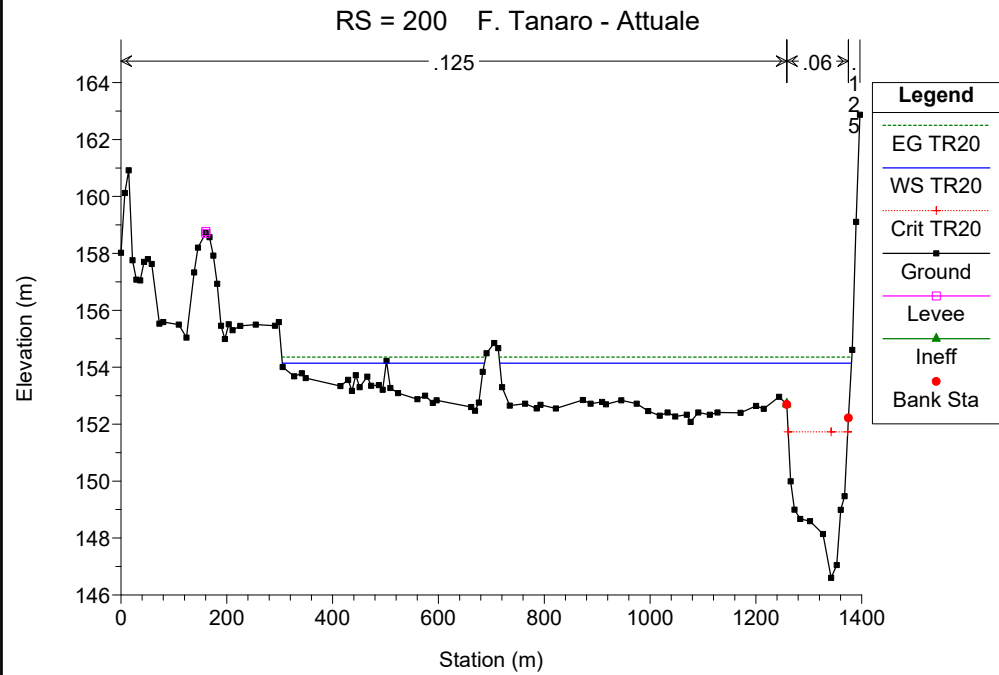
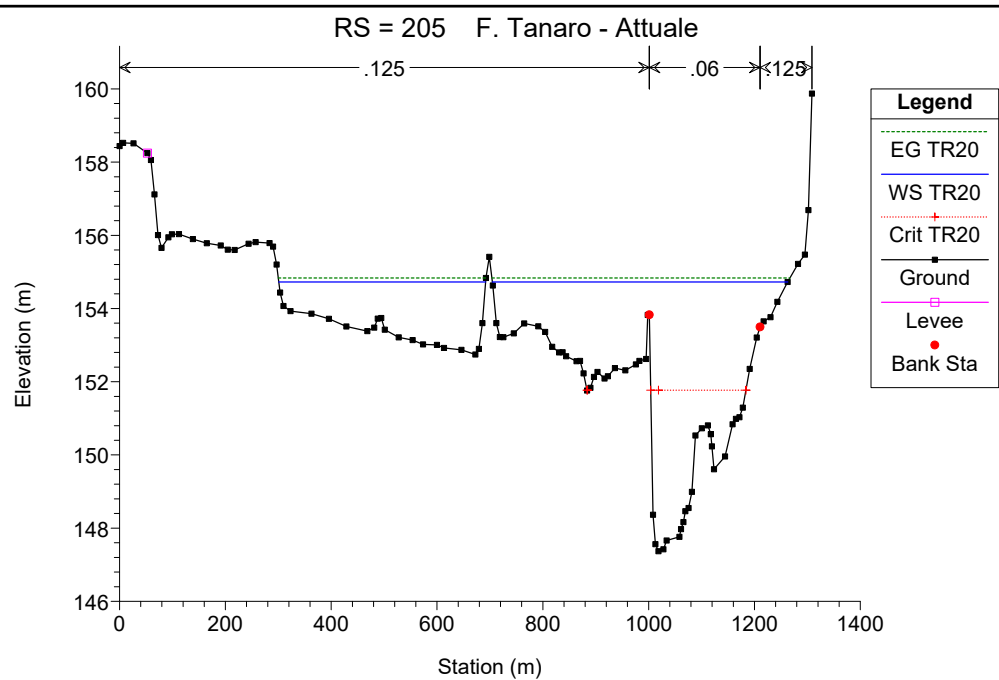
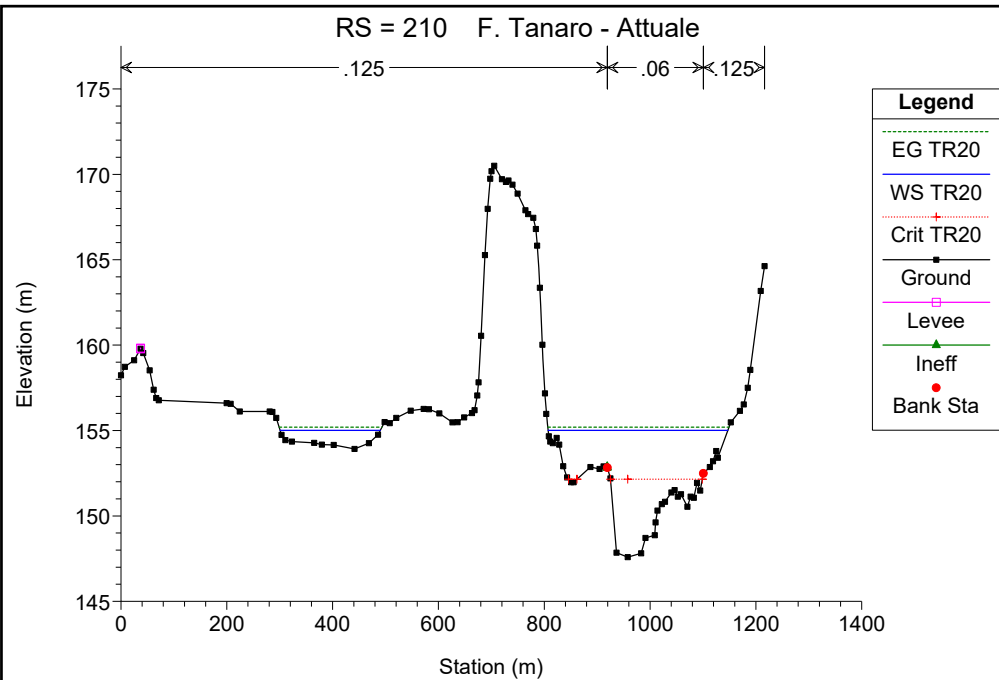


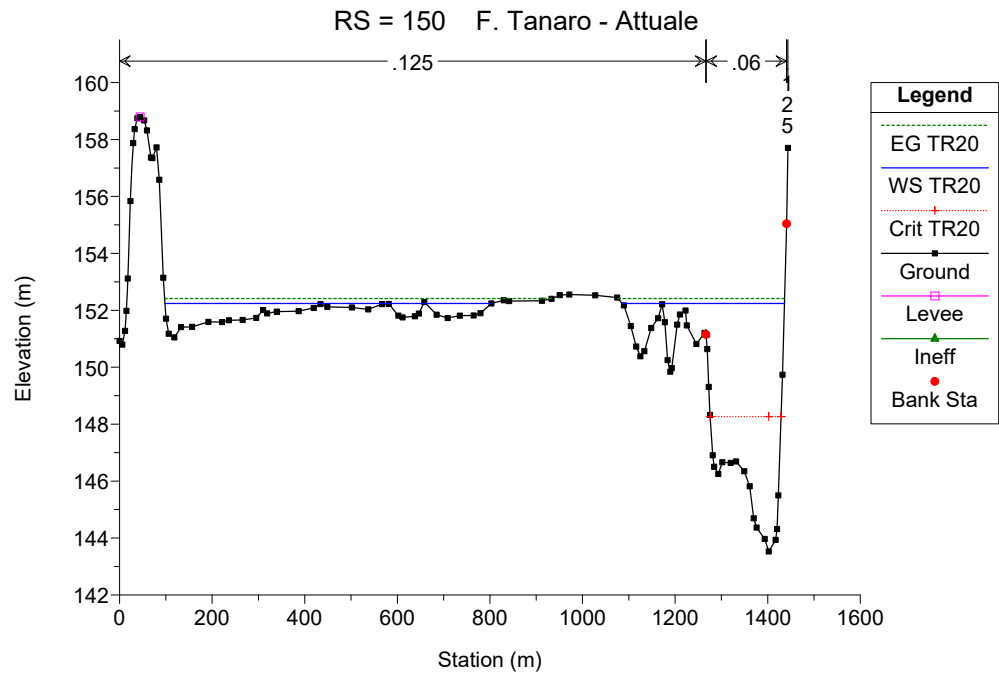
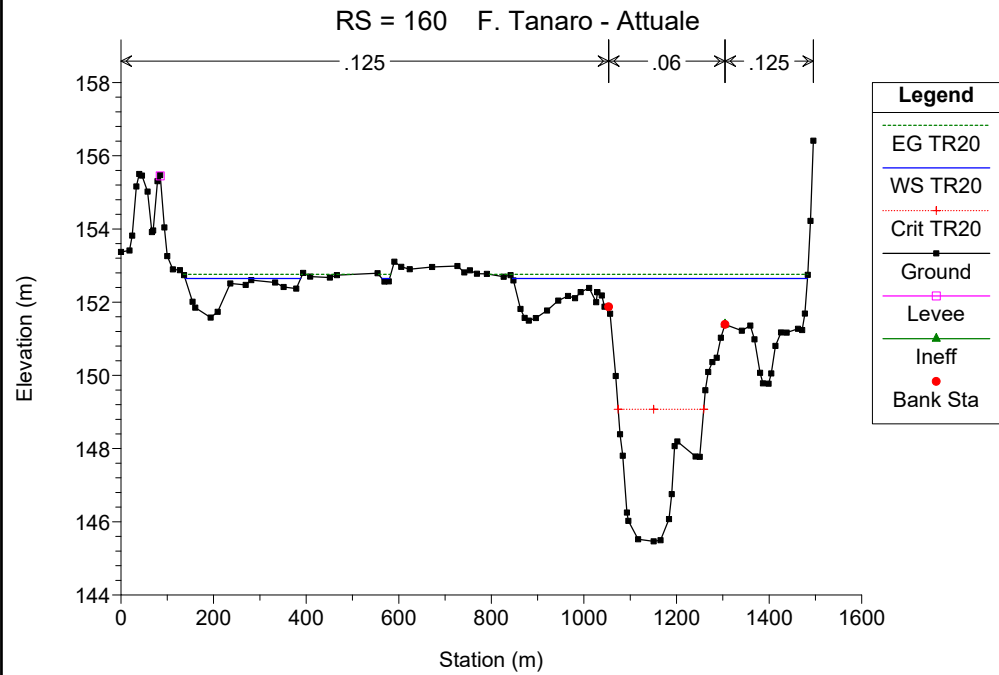
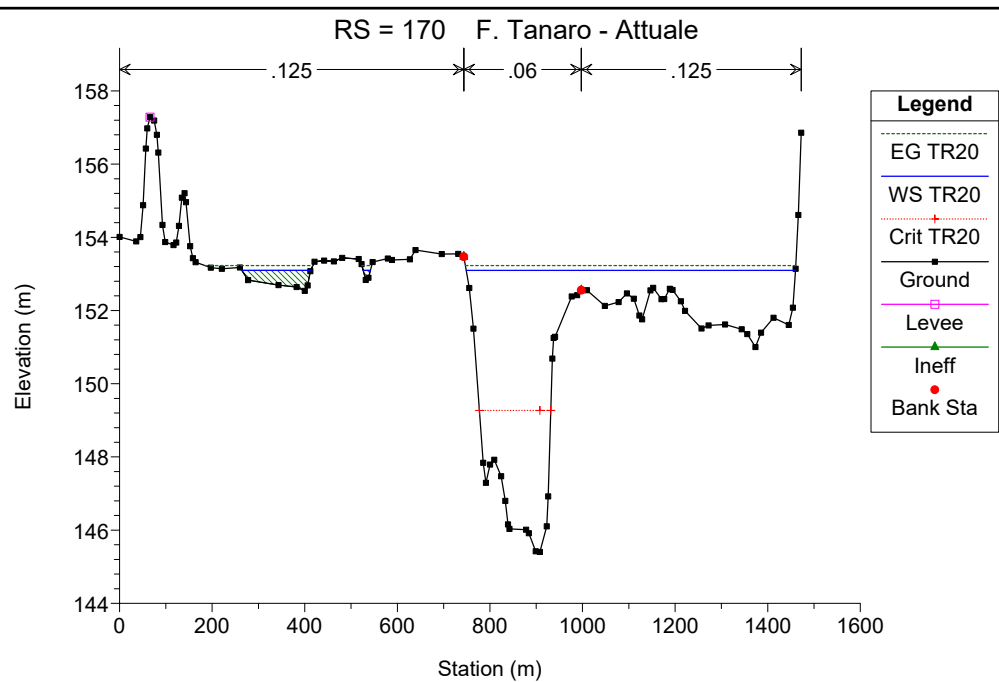
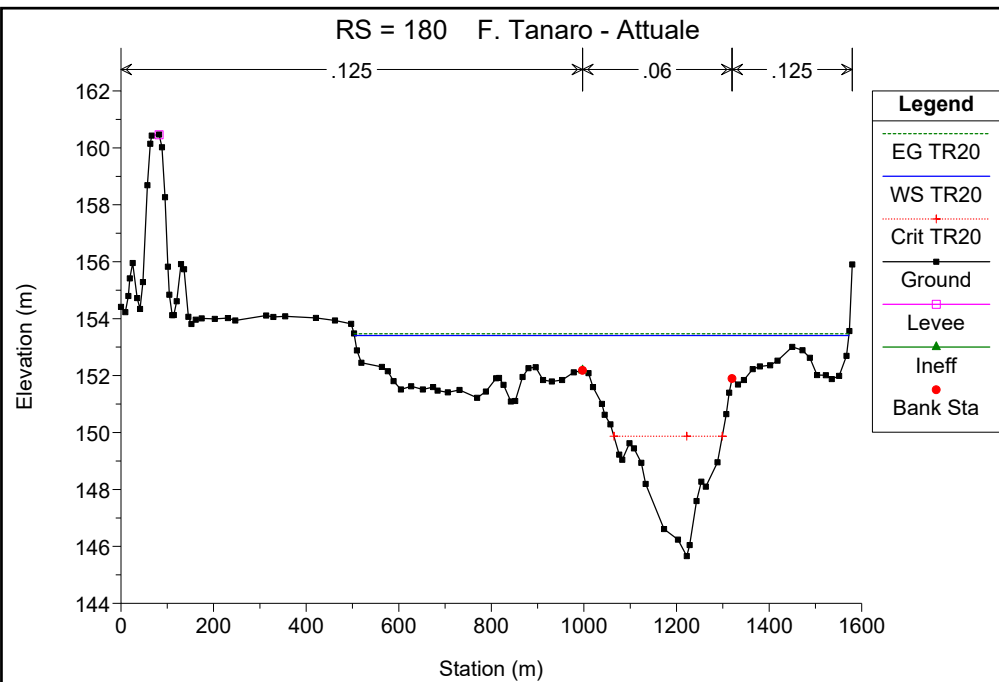


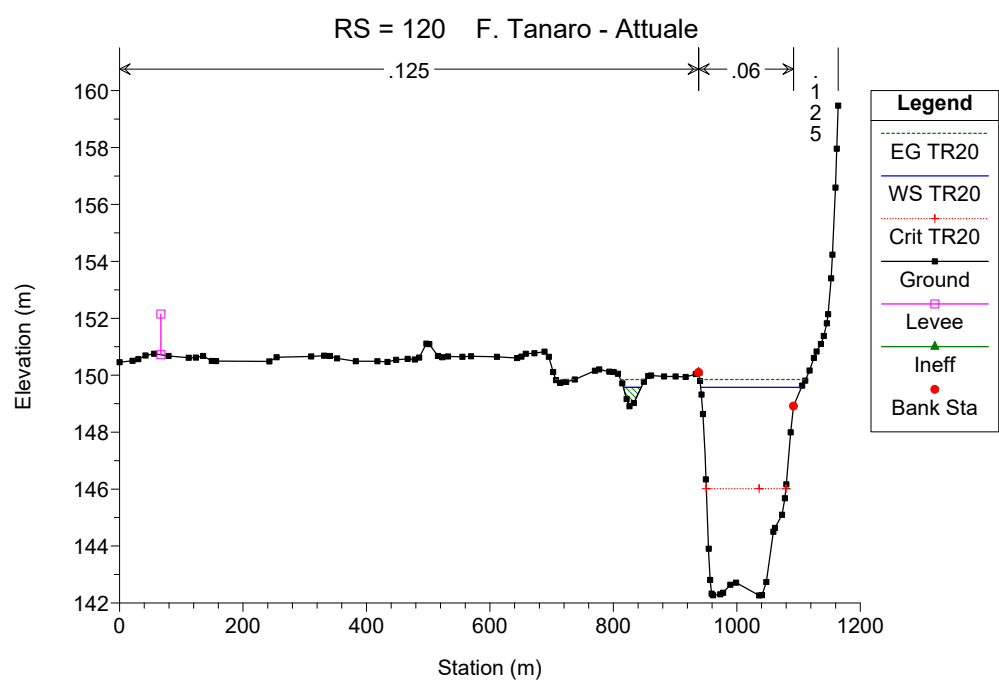
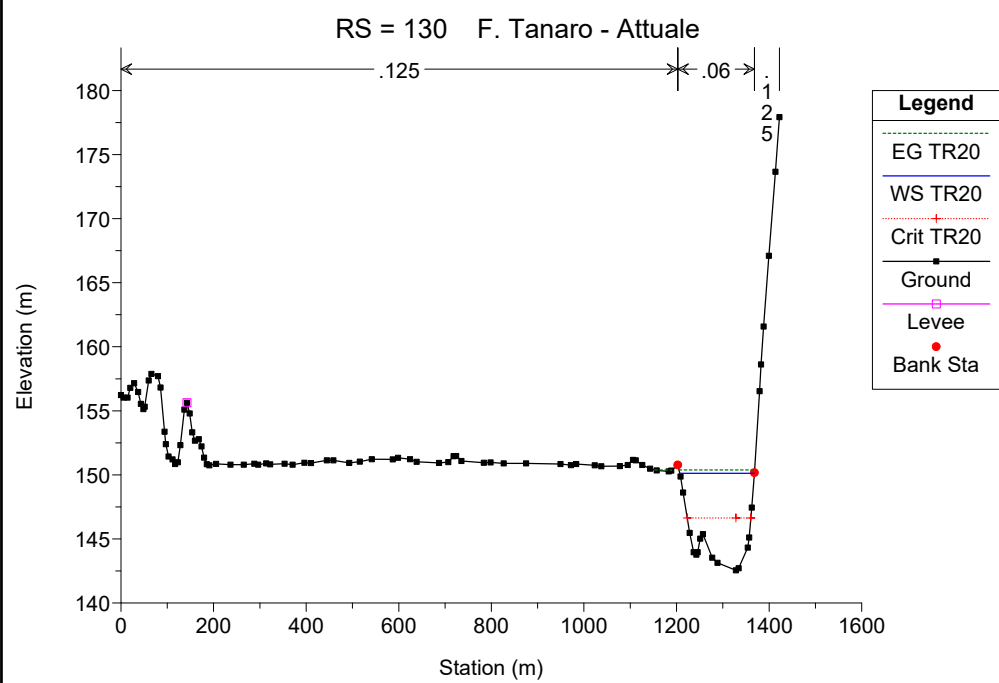
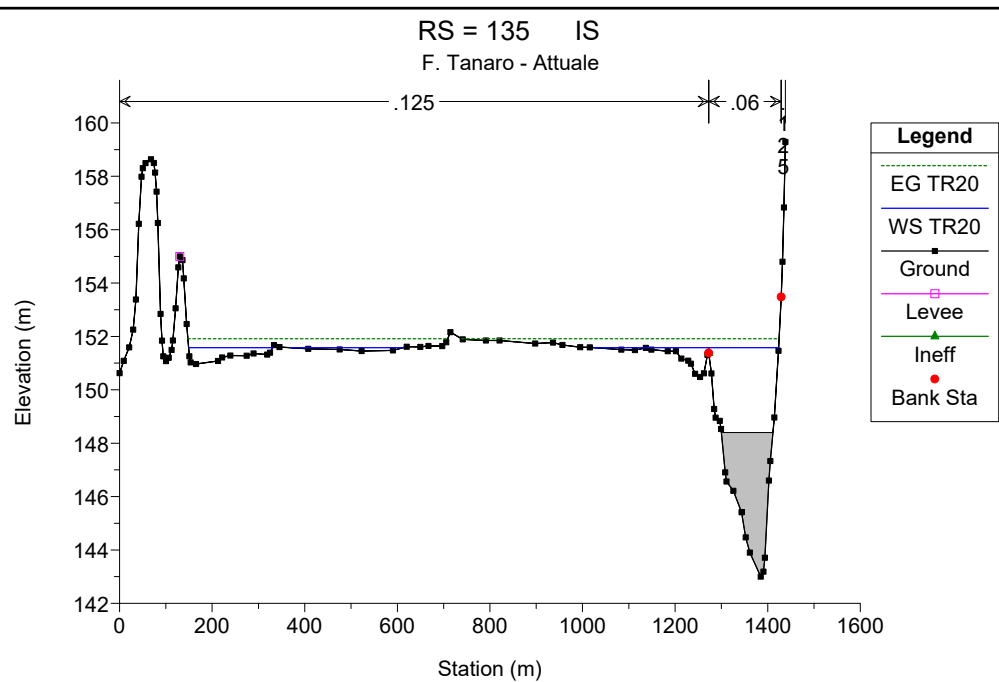
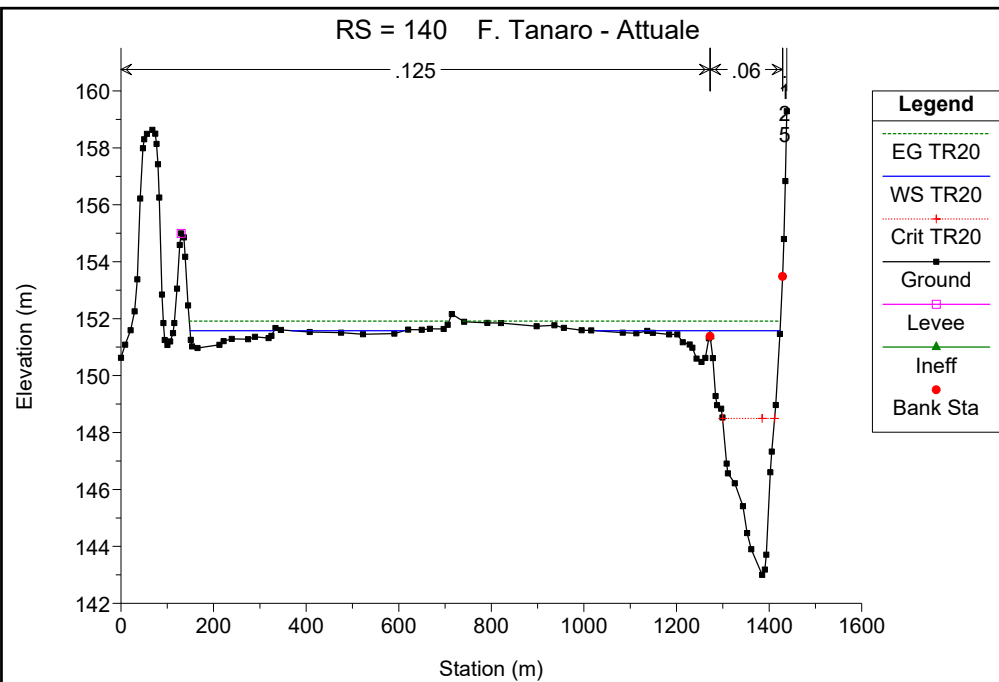


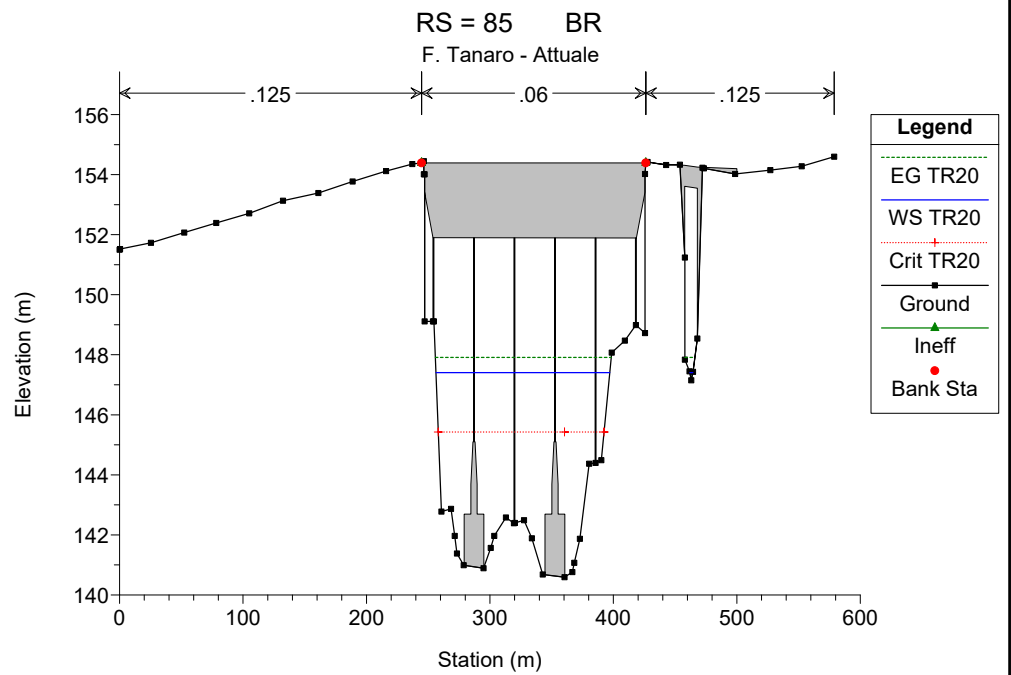
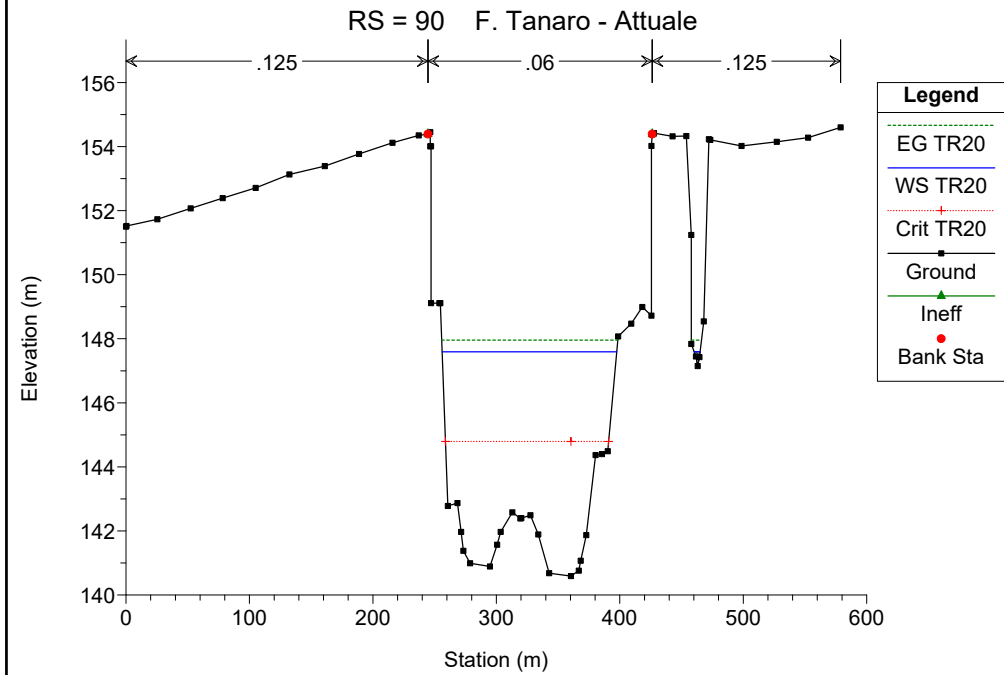
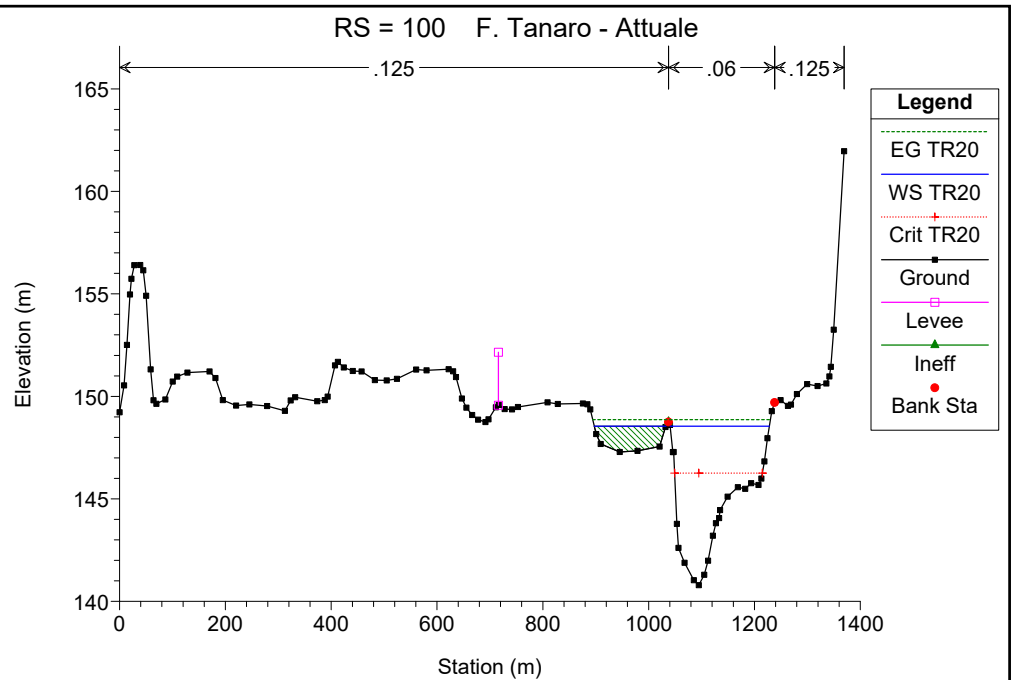
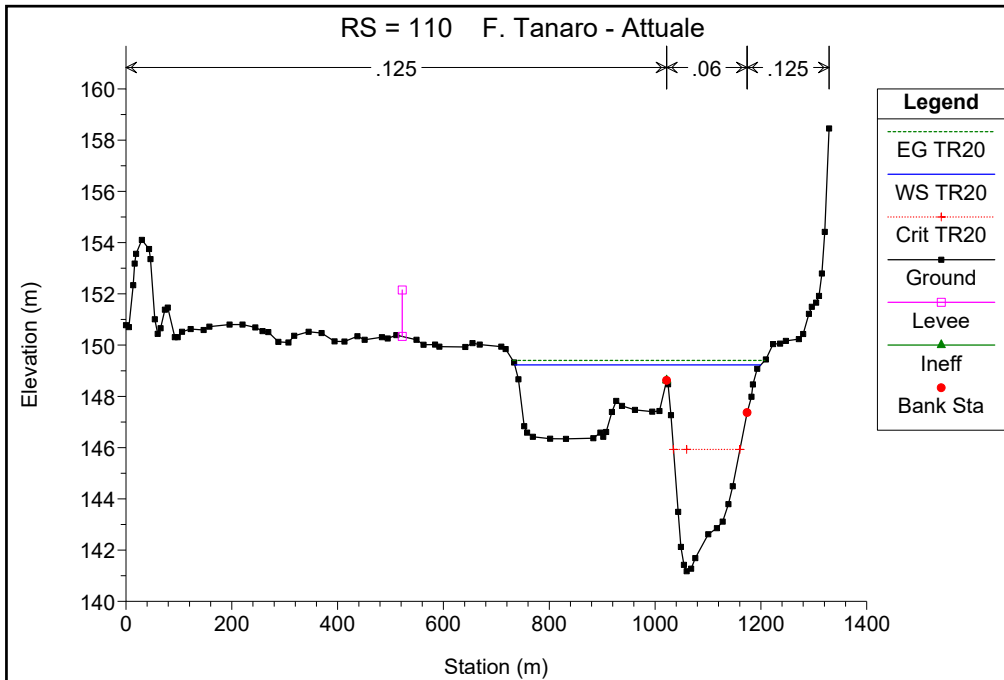


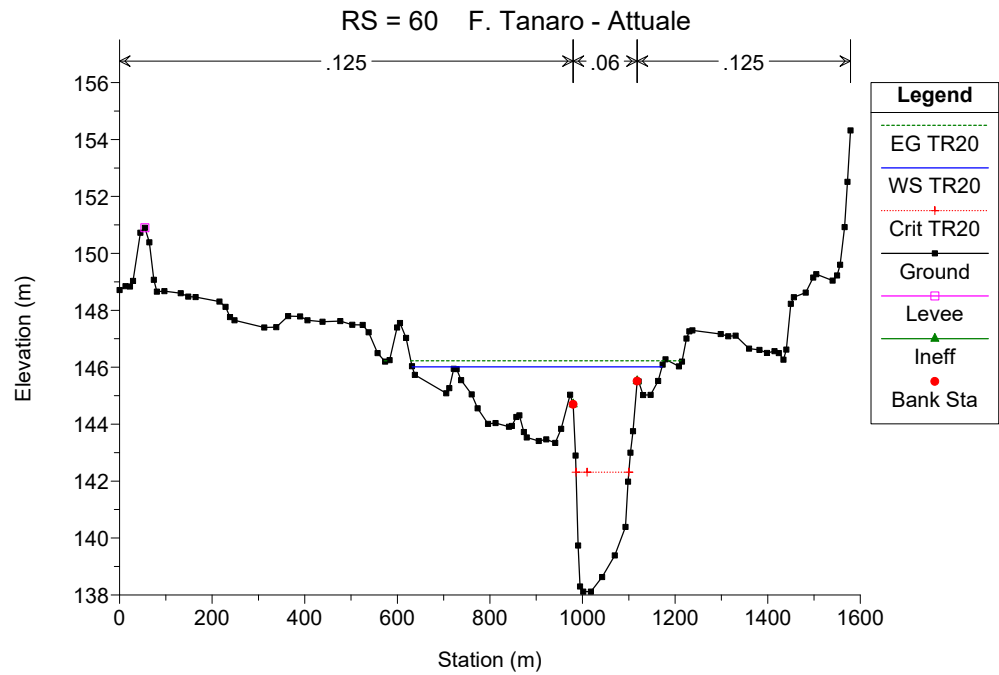
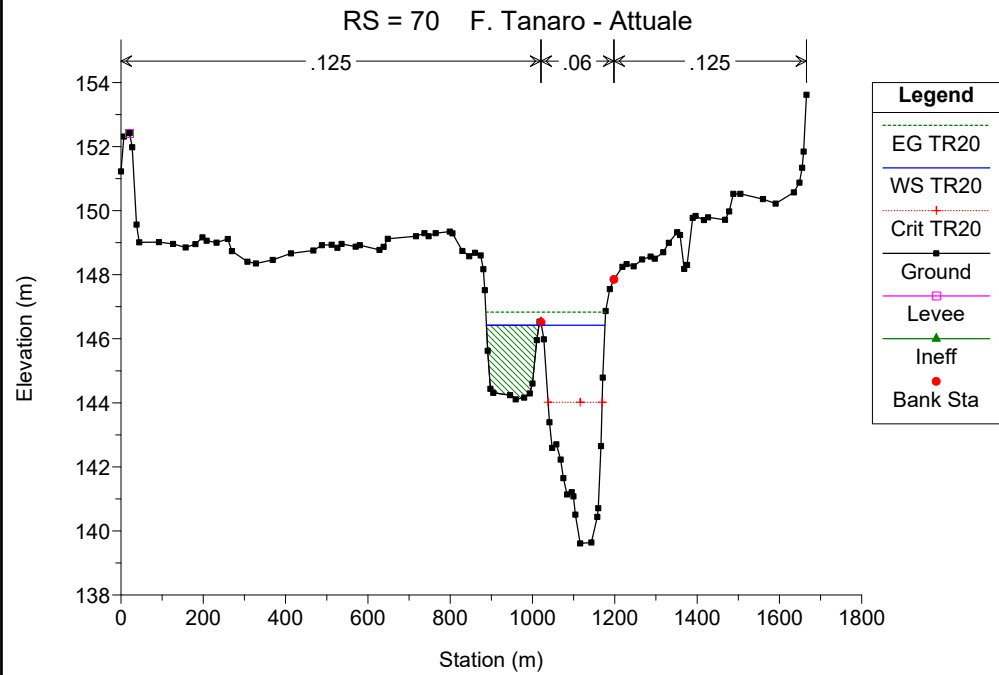
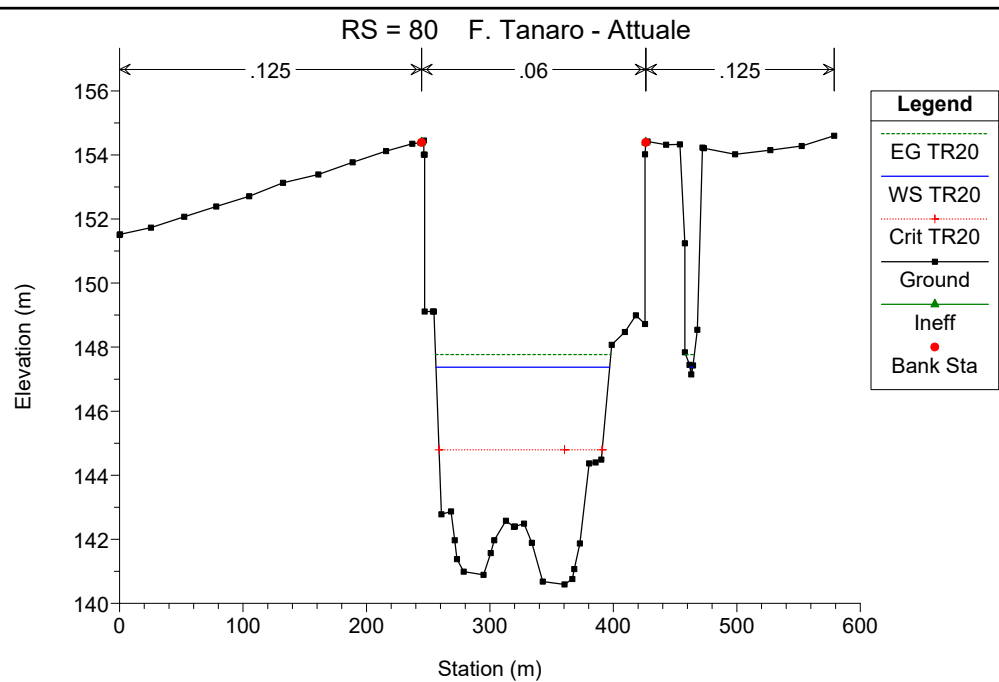
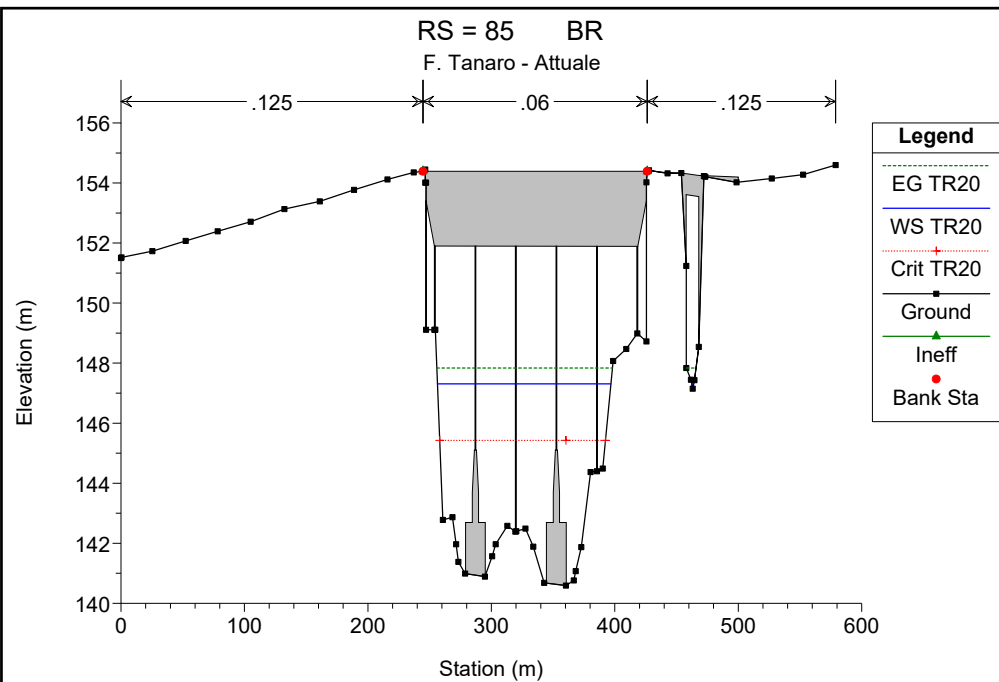


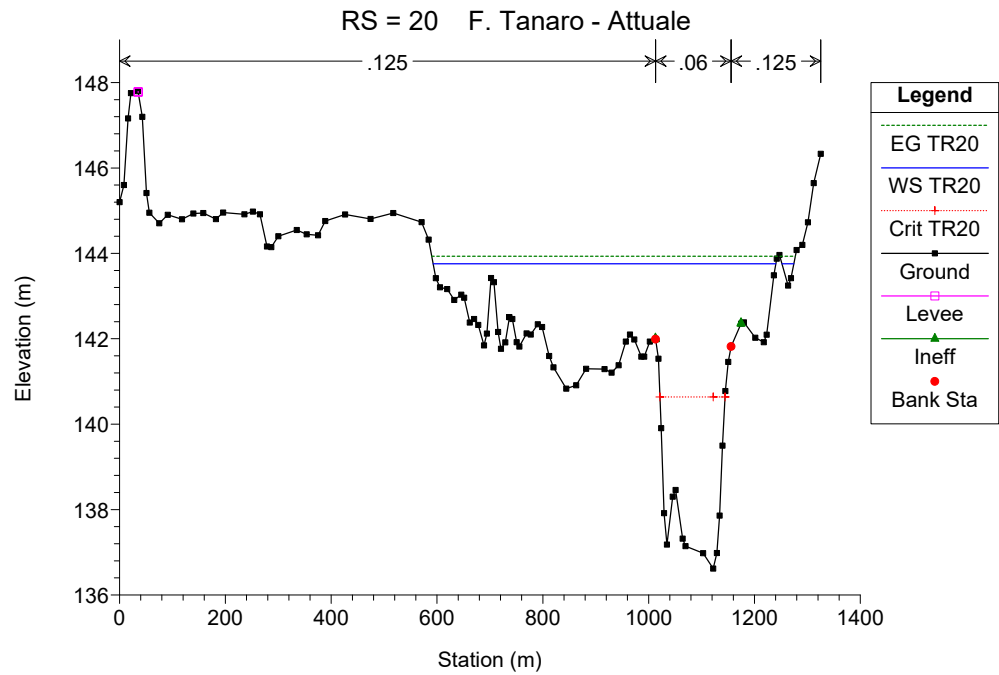
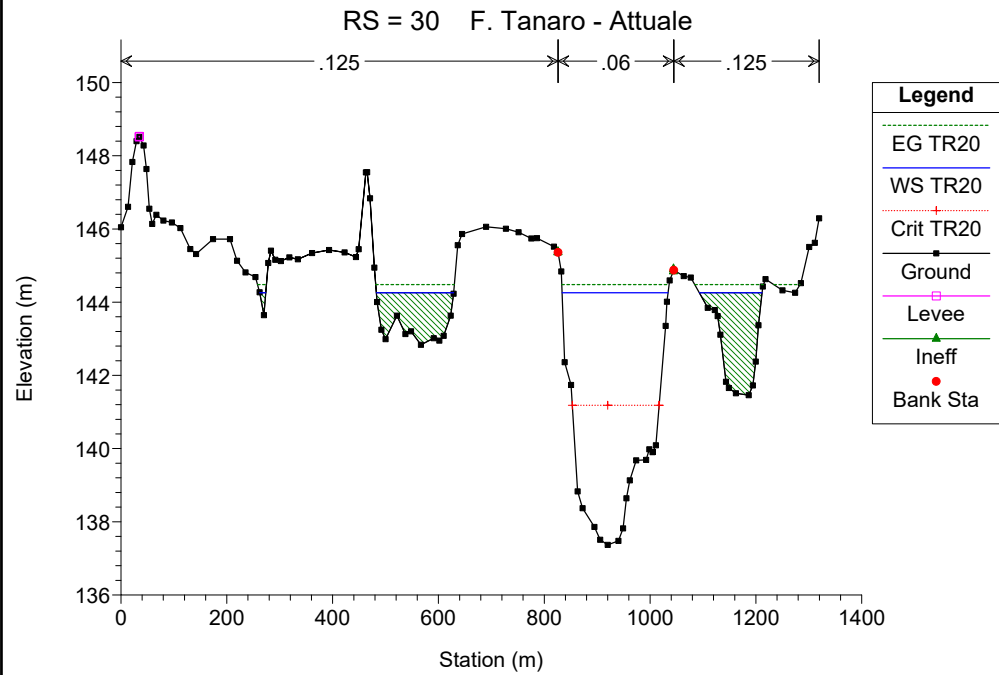
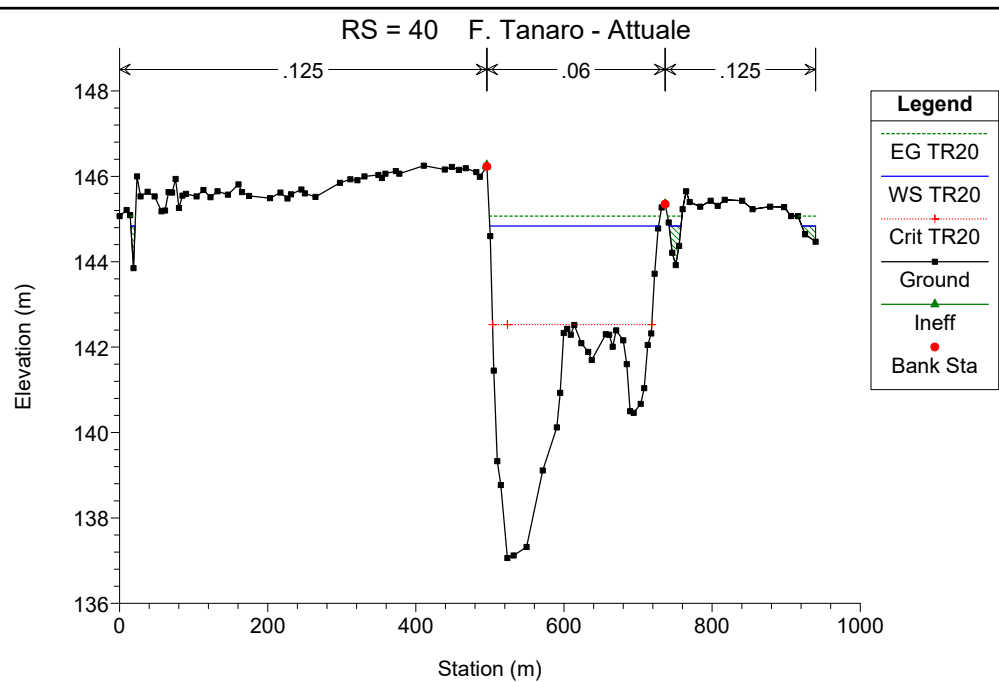
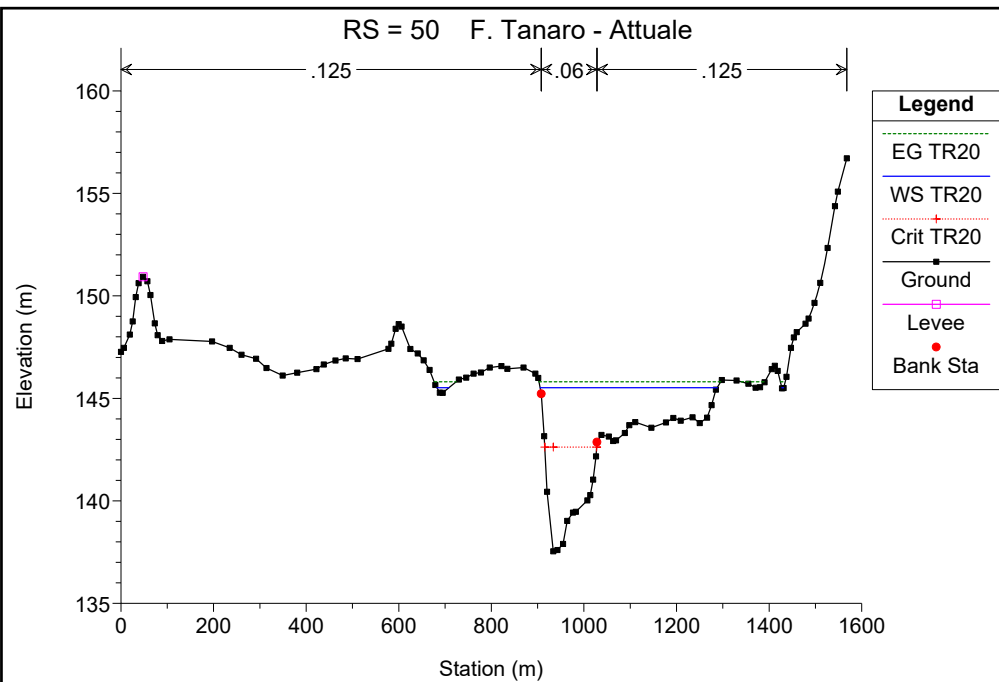




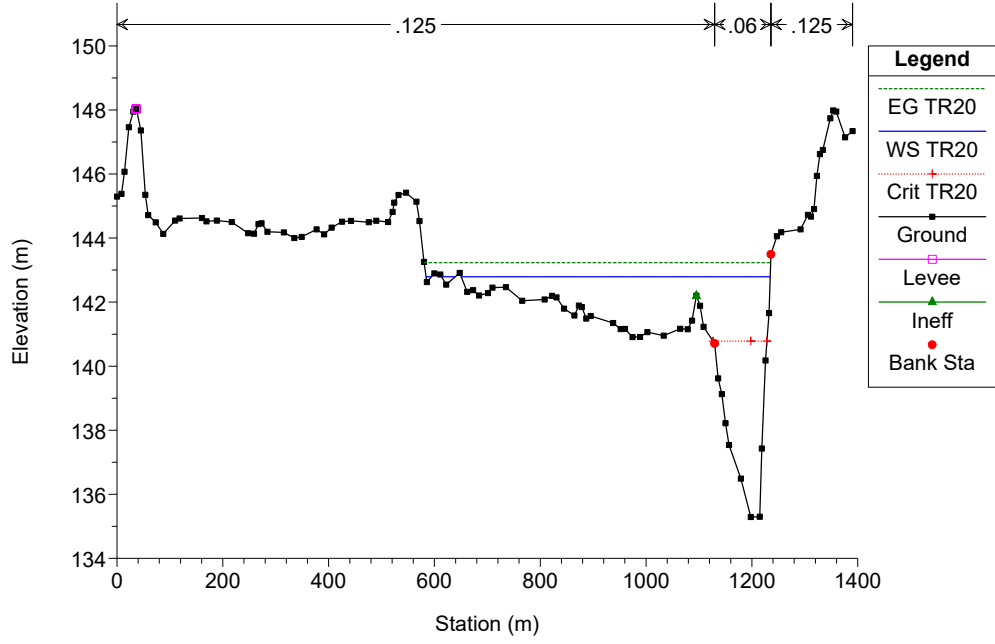








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO**

SIMULAZIONE 2

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2050	20
F. Tanaro valle Riddone	2056	
F. Tanaro valle Cherasca	2063	

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

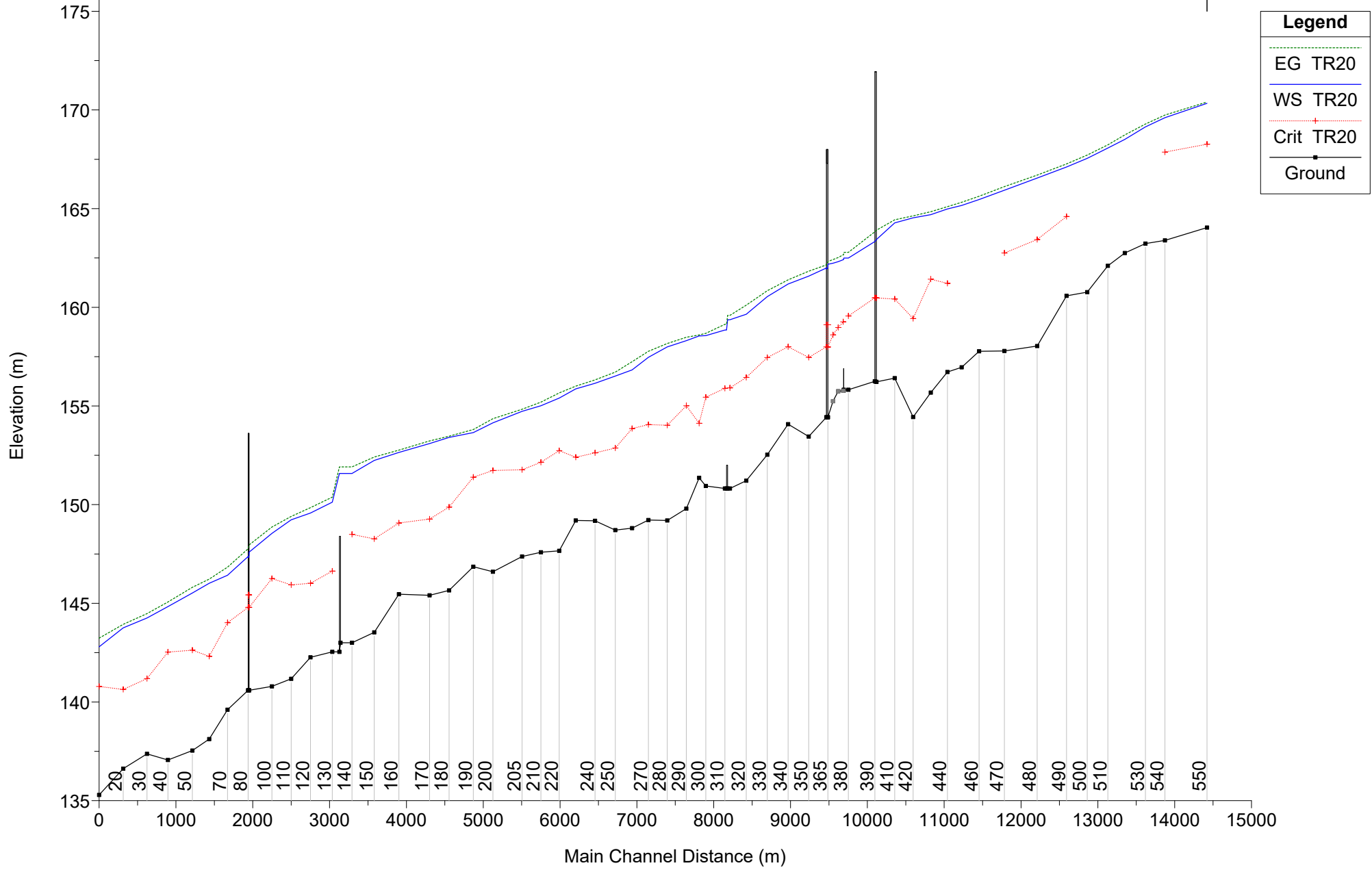
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.57	1104.79	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001917	2.05	2272.59	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001722	1.89	1696.33	656.65	0.28
1	520	TR20	2050.00	162.75	168.51		168.73	0.002548	2.29	1535.25	916.61	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002334	2.02	1650.31	699.88	0.32
1	500	TR20	2050.00	160.77	167.55		167.72	0.001688	1.96	1551.37	539.63	0.28
1	490	TR20	2050.00	160.58	167.11	164.60	167.27	0.001695	1.83	1423.38	495.22	0.28
1	480	TR20	2050.00	158.04	166.55	163.44	166.70	0.001402	1.84	1673.30	673.93	0.26
1	470	TR20	2050.00	157.79	165.93	162.75	166.11	0.001549	2.06	1553.72	508.74	0.28
1	460	TR20	2050.00	157.77	165.46		165.63	0.001373	1.90	1529.35	639.23	0.26
1	450	TR20	2050.00	156.96	165.16		165.33	0.001317	1.90	1468.96	519.50	0.26
1	440	TR20	2050.00	156.72	164.98	161.21	165.10	0.000995	1.71	1974.22	641.92	0.22
1	430	TR20	2050.00	155.68	164.69	161.42	164.85	0.001391	2.02	1896.74	650.41	0.26
1	420	TR20	2050.00	154.44	164.53	159.43	164.63	0.000637	1.55	2176.72	653.15	0.18
1	410	TR20	2050.00	156.41	164.28	160.42	164.44	0.001222	1.92	1652.02	488.50	0.25
1	400	TR20	2050.00	156.22	163.44	160.47	163.91	0.003210	3.09	734.30	161.22	0.39
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.34	160.48	163.83	0.003400	3.15	717.86	160.94	0.41
1	380	TR20	2050.00	155.82	162.51	159.56	162.79	0.002201	2.37	865.03	160.04	0.33
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	162.19	157.99	162.33	0.000971	1.69	1215.52	203.76	0.22
1	365		Bridge									
1	360	TR20	2050.00	154.43	162.00	157.99	162.16	0.001075	1.74	1177.71	203.25	0.23
1	350	TR20	2050.00	153.45	161.59	157.46	161.84	0.001518	2.22	926.36	148.32	0.28
1	340	TR20	2056.00	154.08	161.19	158.01	161.40	0.001687	2.04	1025.21	303.26	0.28
1	330	TR20	2056.00	152.53	160.55	157.45	160.85	0.002365	2.45	884.98	328.78	0.34
1	320	TR20	2056.00	151.21	159.65	156.45	160.11	0.002930	3.14	953.60	363.02	0.39
1	315	TR20	2056.00	150.82	159.38	155.92	159.60	0.001703	2.36	1571.88	572.41	0.30
1	312.5		Inl Struct									
1	310	TR20	2056.00	150.82	158.85	155.90	159.14	0.002395	2.67	1339.54	481.47	0.35
1	300	TR20	2063.00	150.95	158.56	155.45	158.68	0.001304	1.73	1856.07	640.17	0.25
1	295	TR20	2063.00	151.36	158.52	153.61	158.58	0.000514	1.25	2427.12	687.33	0.16
1	290	TR20	2063.00	149.62	158.32	154.07	158.47	0.001069	1.69	1219.49	534.84	0.23
1	280	TR20	2063.00	149.20	158.01	154.04	158.18	0.001238	2.00	1549.23	453.81	0.25
1	270	TR20	2063.00	149.22	157.49	154.07	157.79	0.002127	2.61	1229.00	445.24	0.33
1	260	TR20	2063.00	148.81	156.84	153.87	157.26	0.002905	2.99	929.93	279.75	0.38
1	250	TR20	2063.00	148.71	156.53	152.88	156.73	0.001644	2.12	1412.59	503.20	0.29
1	240	TR20	2063.00	149.18	156.16	152.64	156.34	0.001327	1.95	1511.41	720.33	0.26
1	230	TR20	2063.00	149.20	155.88	152.42	156.02	0.001154	1.75	1556.08	429.00	0.24
1	220	TR20	2063.00	147.66	155.42	152.75	155.68	0.002132	2.44	1238.18	392.68	0.33

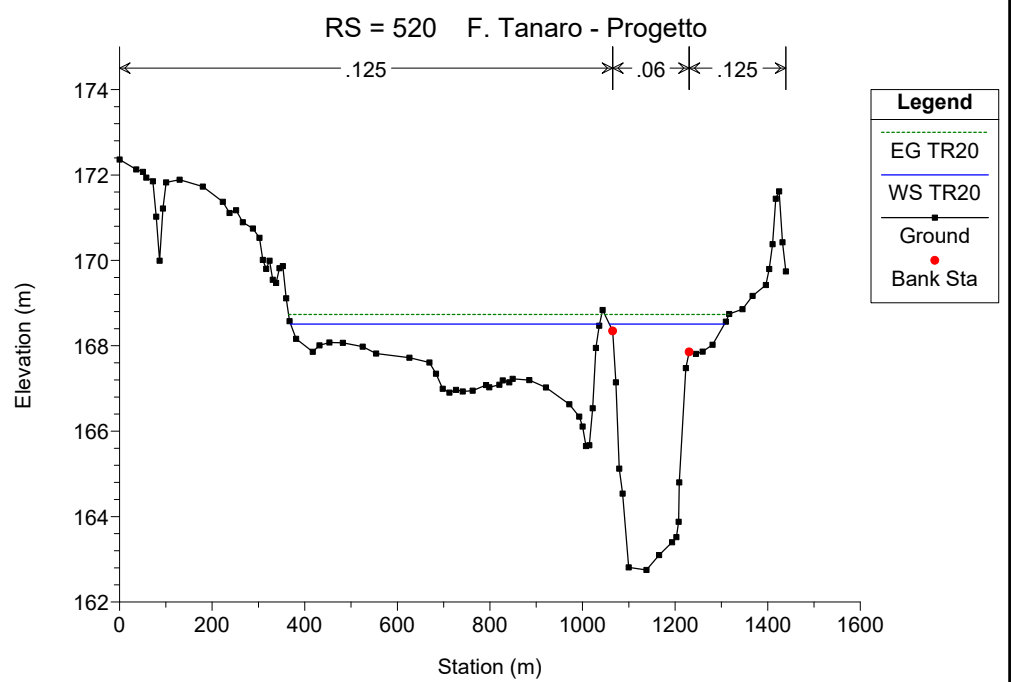
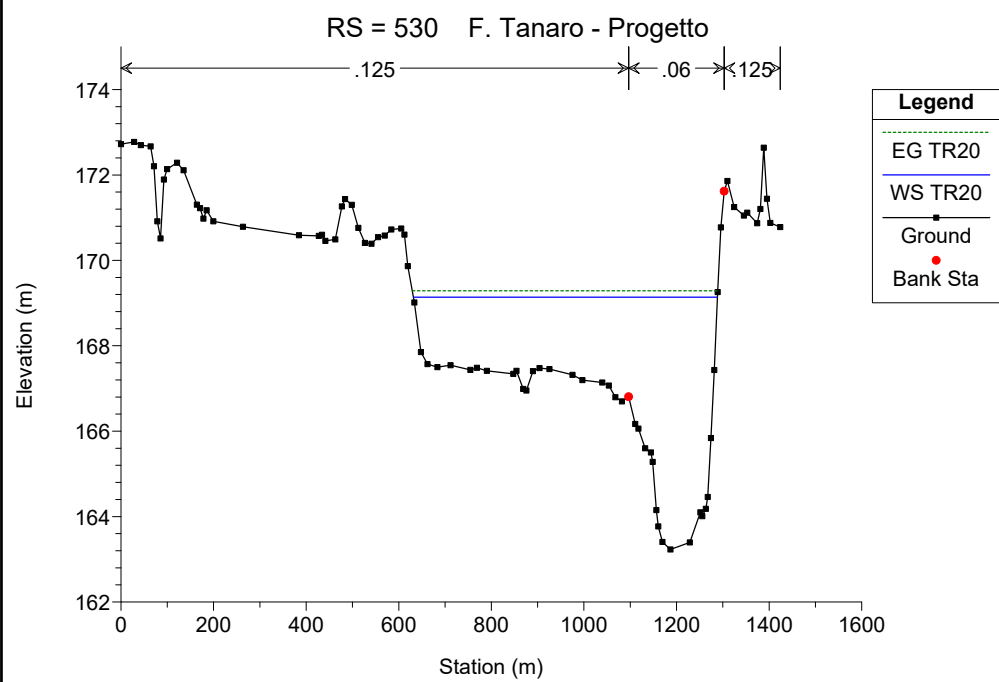
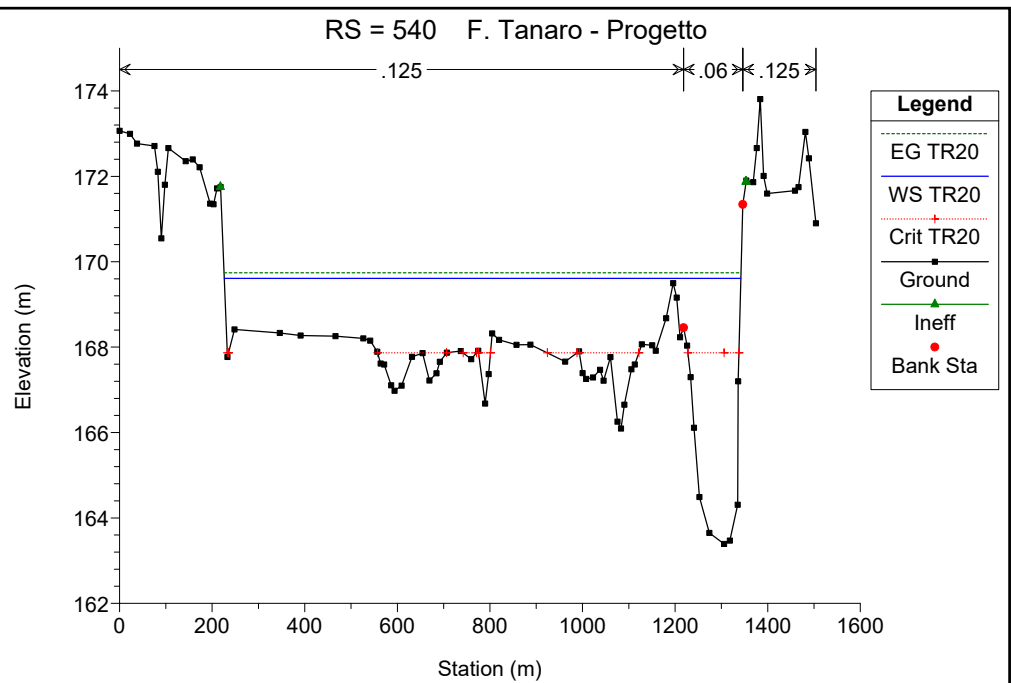
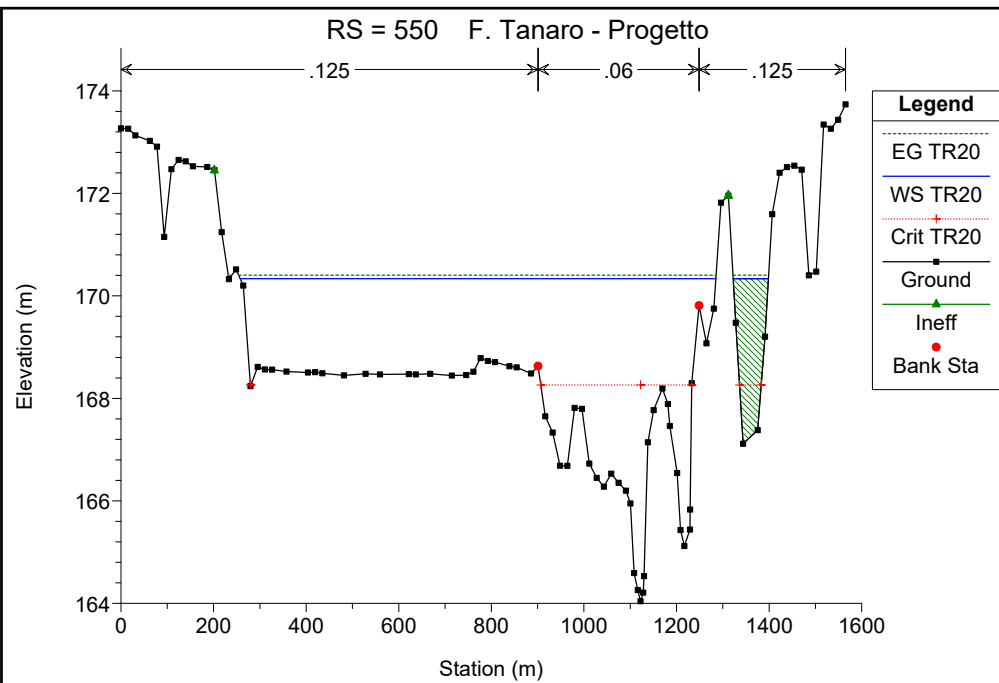
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (Continued)

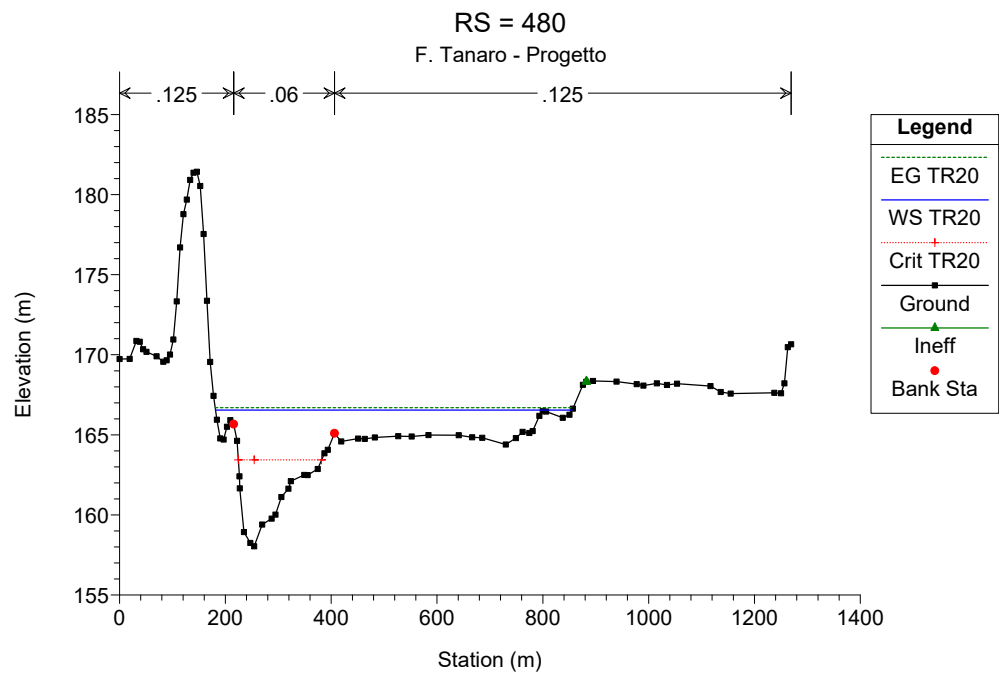
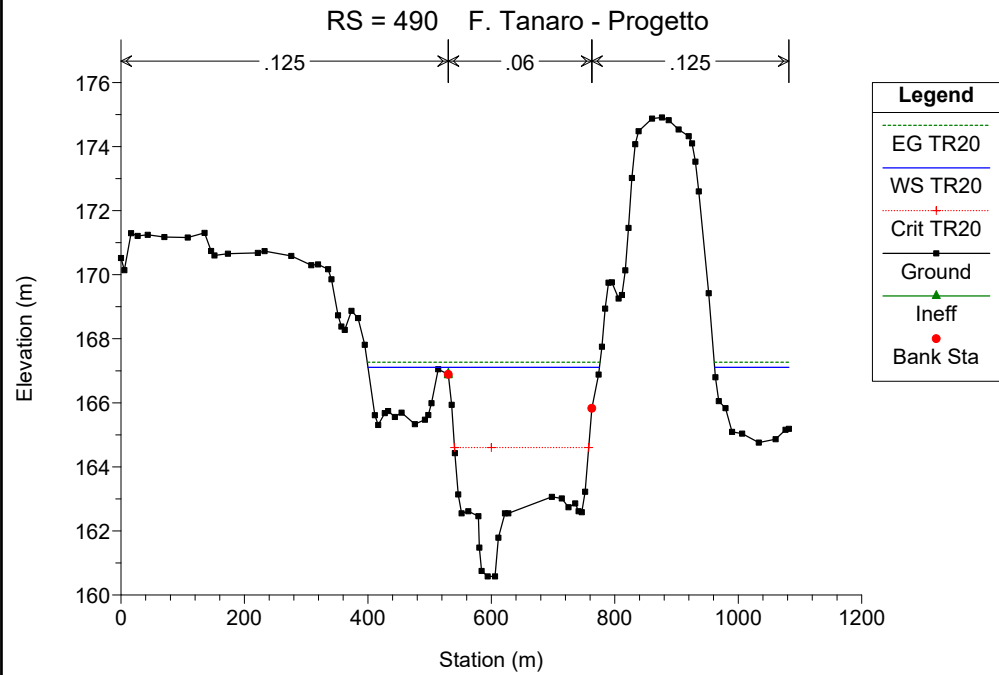
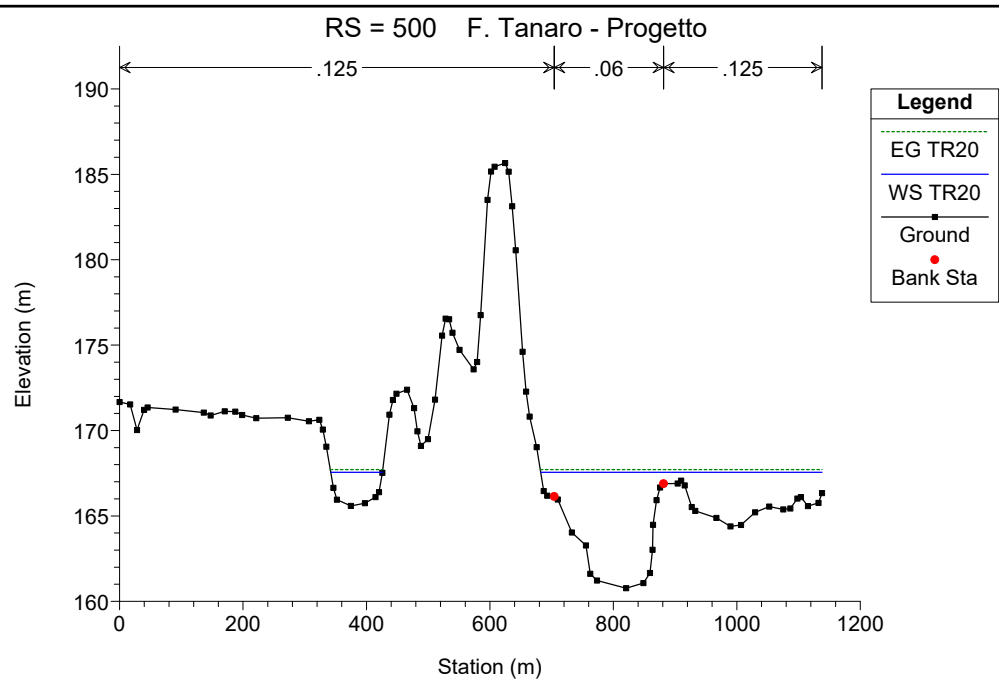
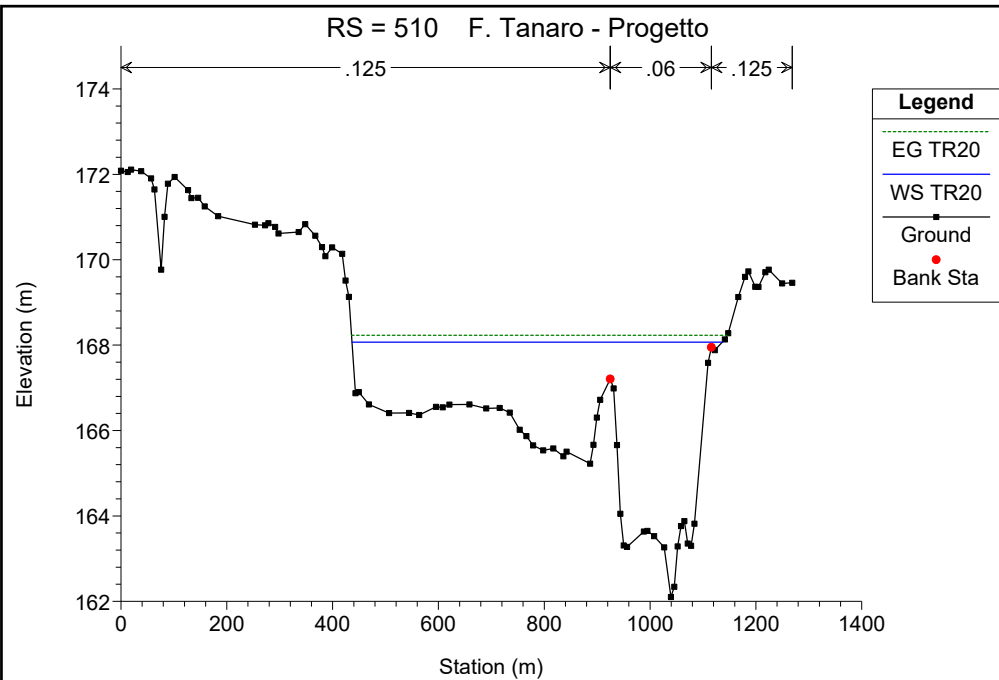
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR20	2063.00	147.59	155.03	152.16	155.21	0.001608	1.99	1388.20	529.67	0.28
1	205	TR20	2063.00	147.37	154.74	151.78	154.85	0.001154	1.61	2146.51	949.86	0.23
1	200	TR20	2063.00	146.60	154.16	151.75	154.37	0.002071	2.35	1849.52	1046.66	0.32
1	190	TR20	2063.00	146.85	153.67	151.41	153.82	0.002019	1.93	1796.20	938.82	0.30
1	180	TR20	2063.00	145.66	153.42	149.88	153.48	0.000654	1.18	2576.55	1068.32	0.18
1	170	TR20	2063.00	145.40	153.11	149.28	153.24	0.001369	1.68	1661.55	877.65	0.25
1	160	TR20	2063.00	145.46	152.66	149.08	152.77	0.001038	1.55	1768.38	905.63	0.22
1	150	TR20	2063.00	143.53	152.25	148.27	152.42	0.001133	1.87	1519.32	1054.73	0.24
1	140	TR20	2063.00	143.00	151.58	148.51	151.92	0.002745	2.60	929.04	832.43	0.36
1	135		Inl Struct									
1	130	TR20	2063.00	142.54	150.14	146.65	150.41	0.001856	2.26	912.61	161.29	0.30
1	120	TR20	2063.00	142.27	149.59	146.03	149.87	0.001892	2.34	887.59	193.33	0.31
1	110	TR20	2063.00	141.17	149.25	145.94	149.42	0.001467	2.00	1529.16	466.11	0.27
1	100	TR20	2063.00	140.79	148.56	146.26	148.88	0.003214	2.51	821.45	323.82	0.38
1	90	TR20	2063.00	140.59	147.61	144.81	147.98	0.002800	2.68	769.47	146.47	0.37
1	85		Bridge									
1	80	TR20	2063.00	140.59	147.39	144.81	147.79	0.003193	2.80	737.87	143.05	0.39
1	70	TR20	2063.00	139.61	146.44	144.03	146.85	0.003756	2.84	725.34	282.82	0.42
1	60	TR20	2063.00	138.12	146.03	142.33	146.25	0.001552	2.17	1411.65	540.42	0.28
1	50	TR20	2063.00	137.54	145.54	142.63	145.83	0.002266	2.56	1176.52	420.93	0.34
1	40	TR20	2063.00	137.06	144.85	142.54	145.08	0.002442	2.14	965.03	269.25	0.33
1	30	TR20	2063.00	137.37	144.27	141.20	144.49	0.001914	2.10	983.72	482.78	0.30
1	20	TR20	2063.00	136.62	143.77	140.65	143.95	0.001537	2.06	1693.50	671.01	0.28
1	10	TR20	2063.00	135.29	142.81	140.80	143.25	0.004002	3.17	1104.88	622.92	0.44

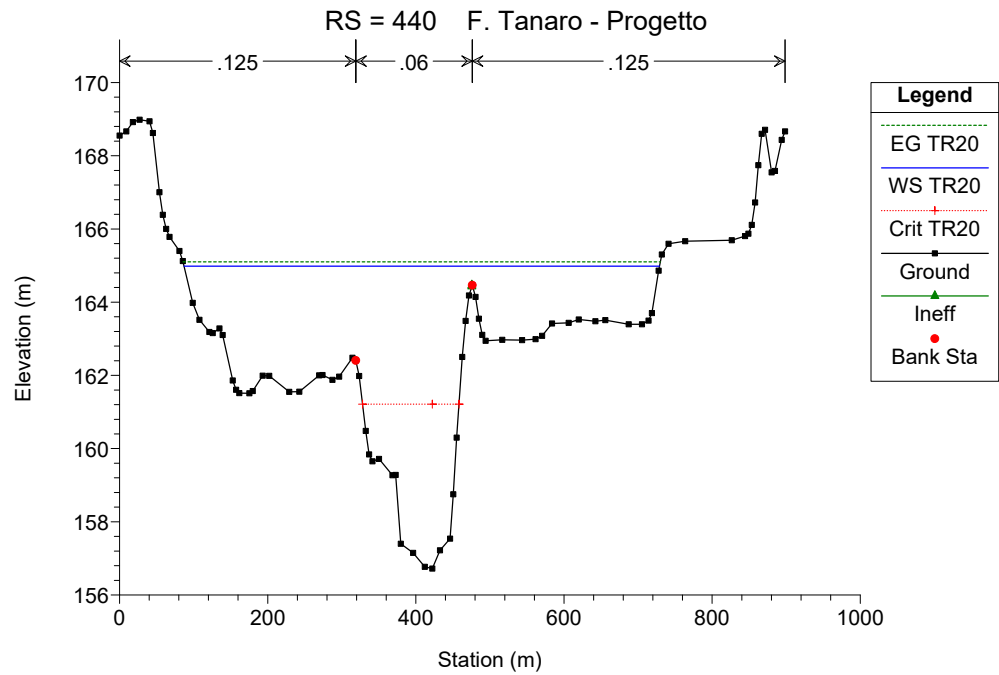
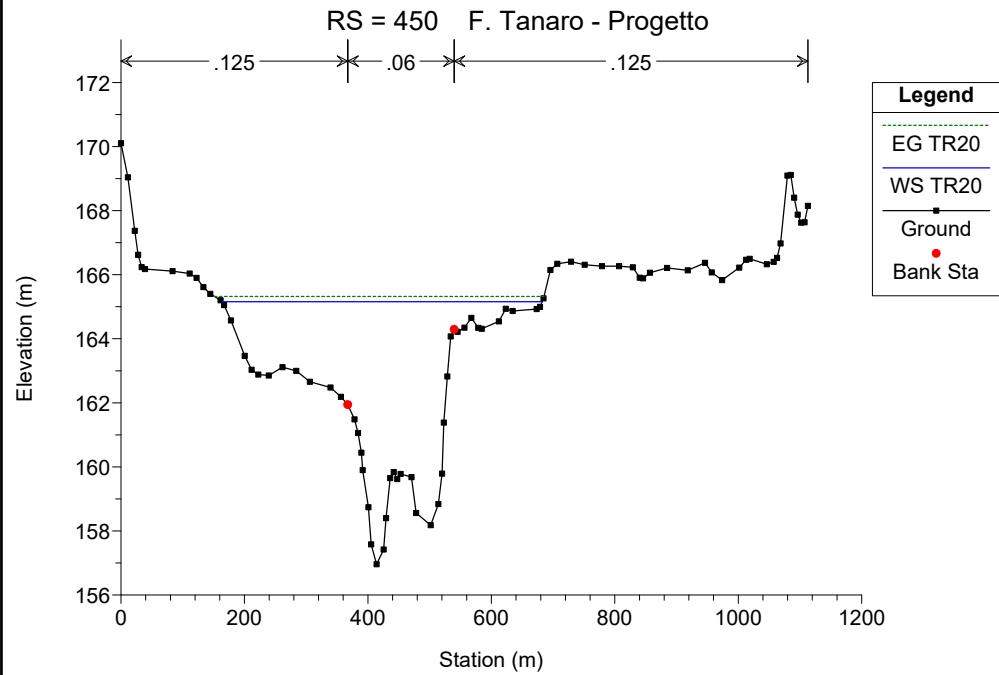
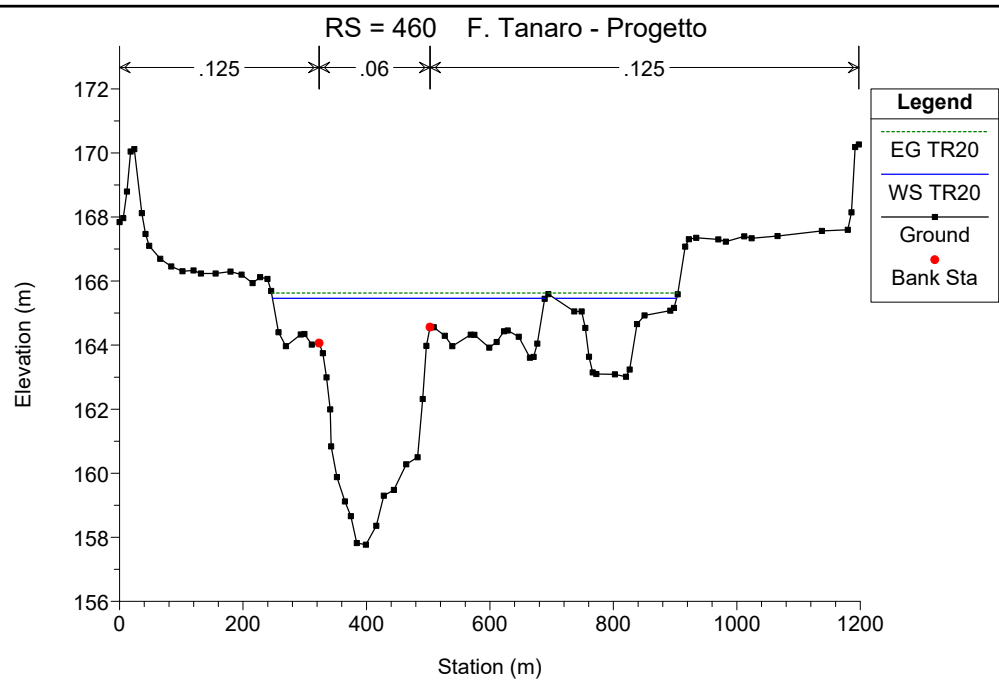
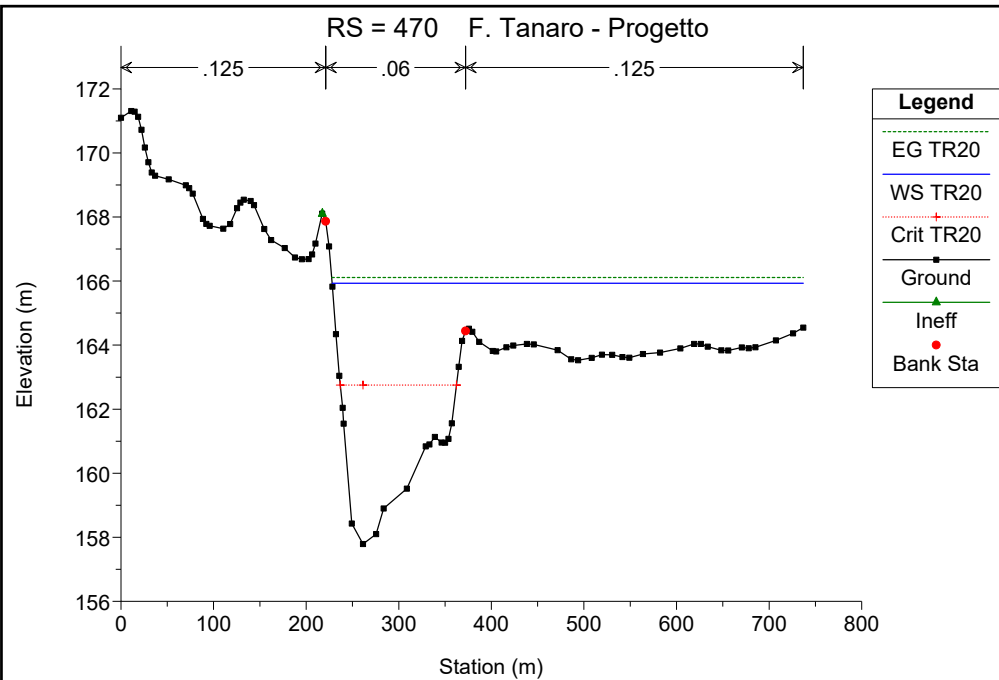
F. Tanaro - Progetto

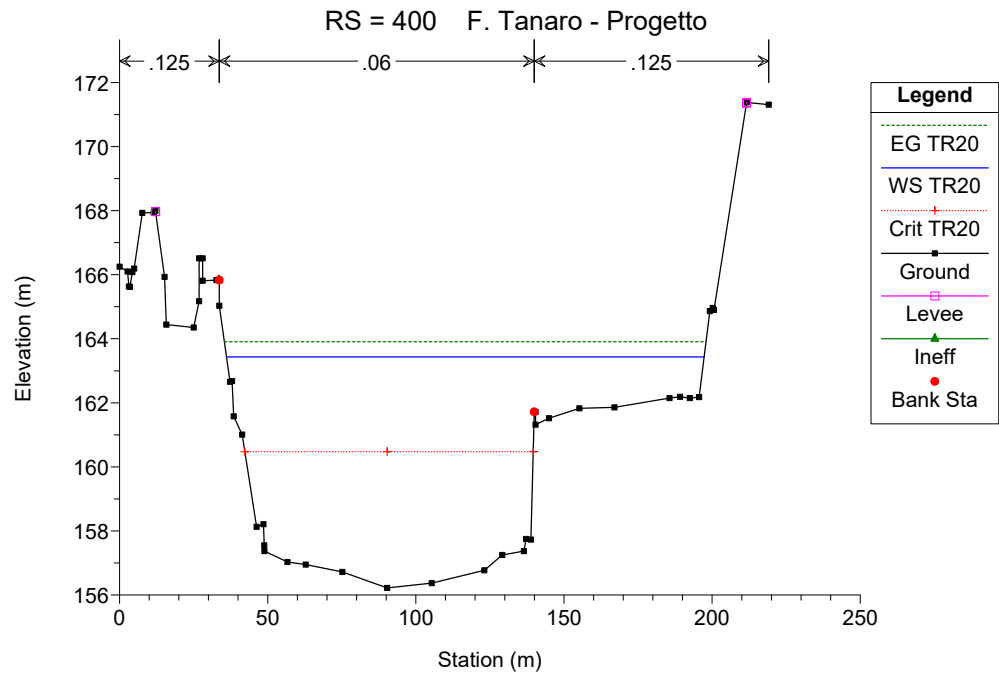
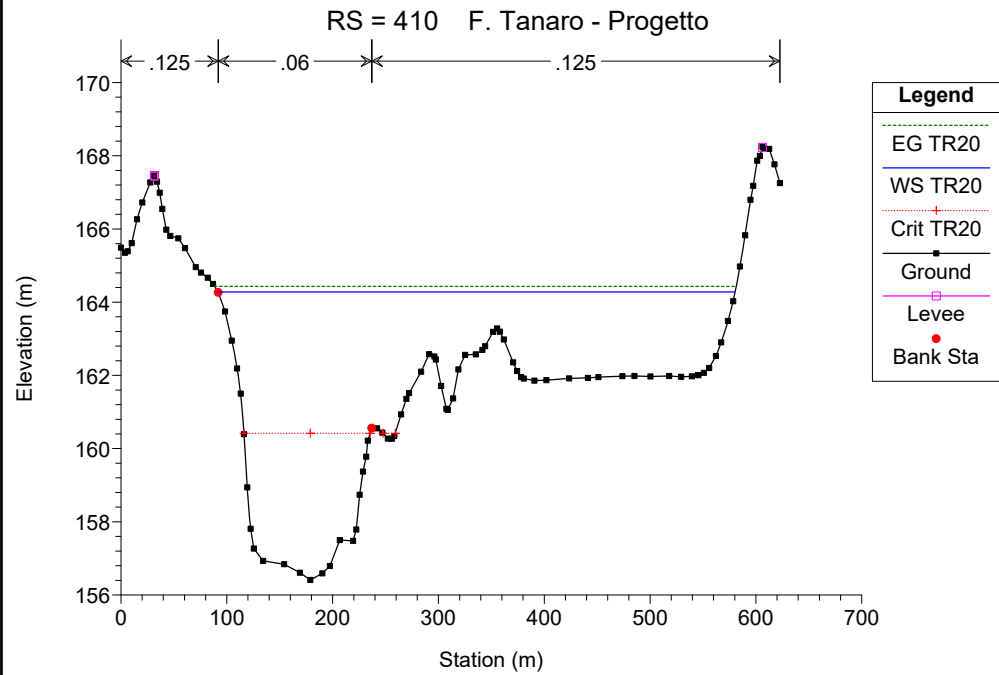
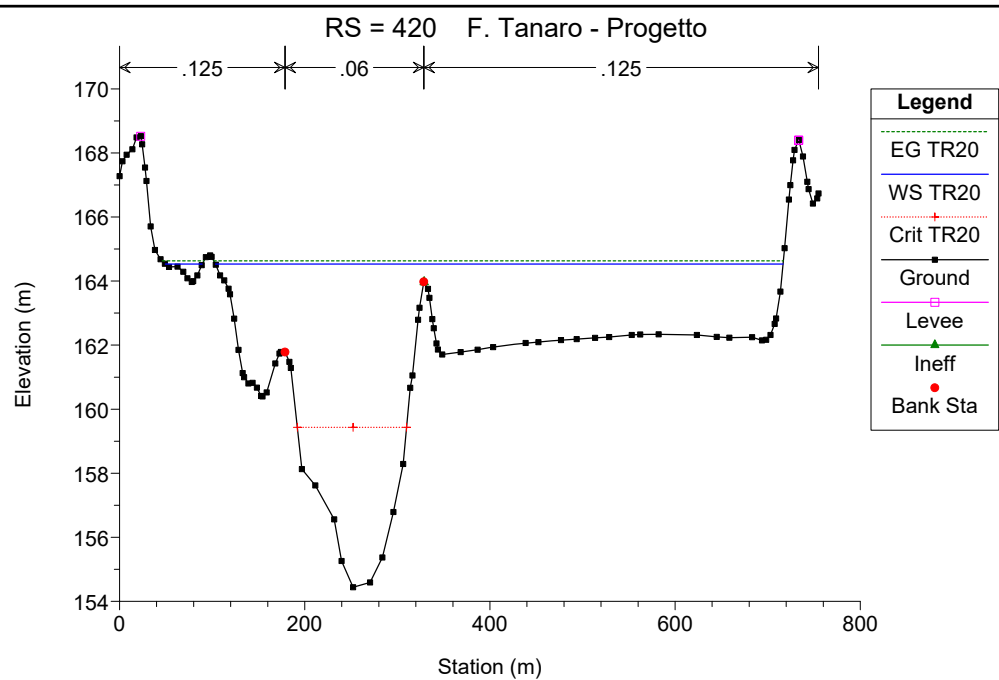
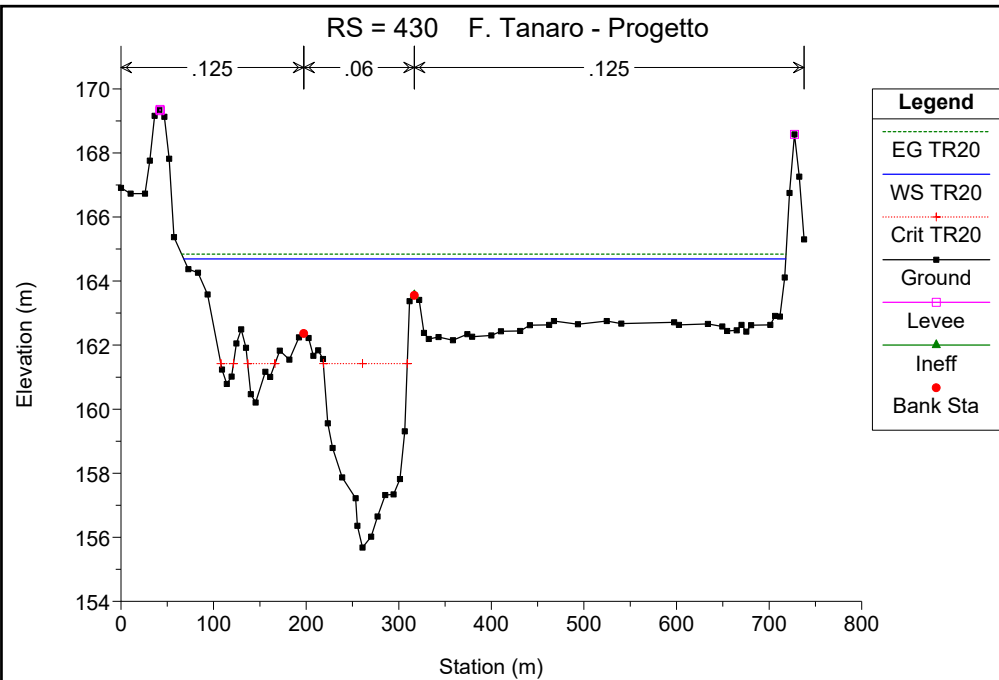
Tanaro 1

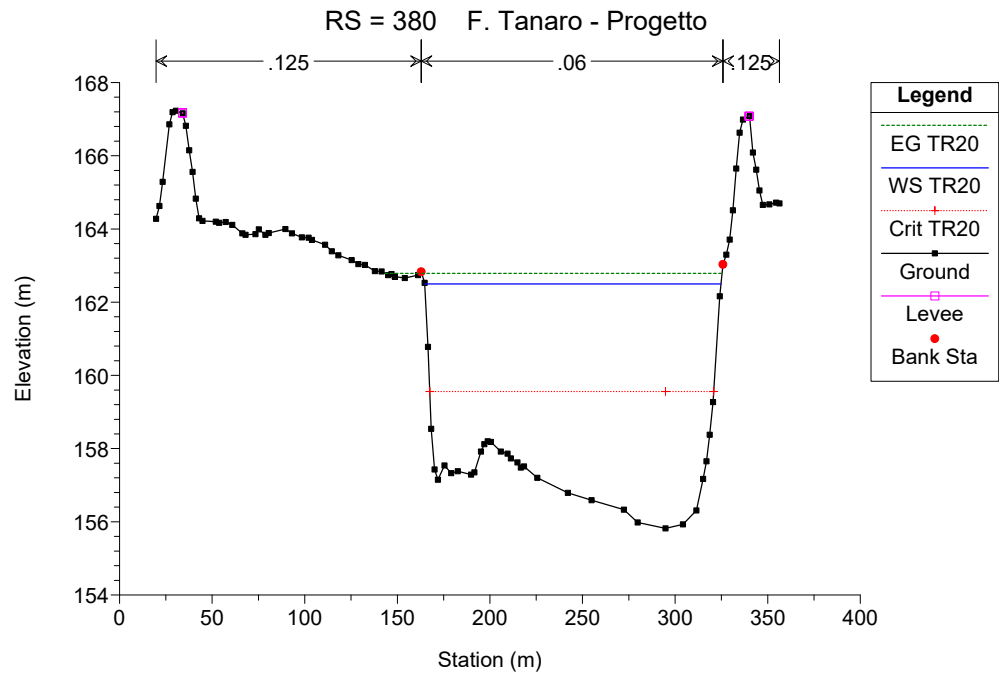
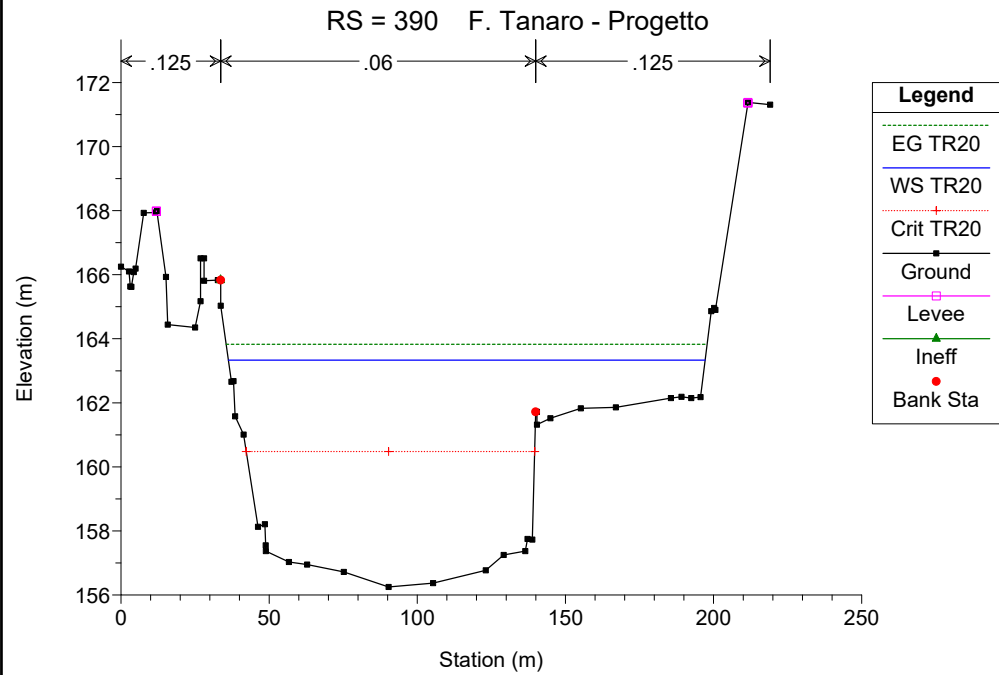
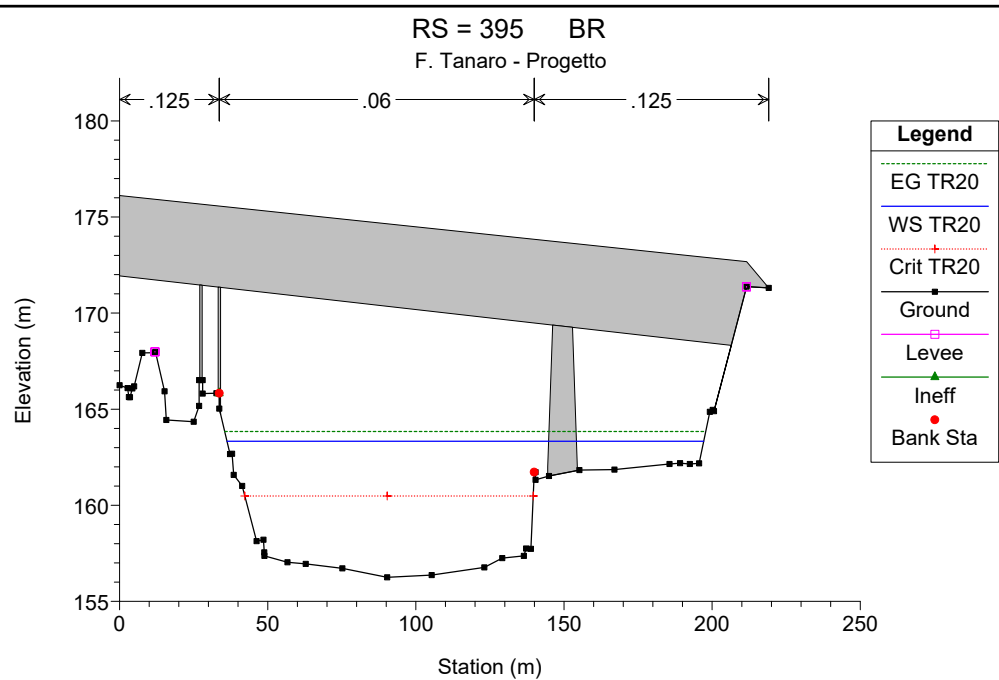
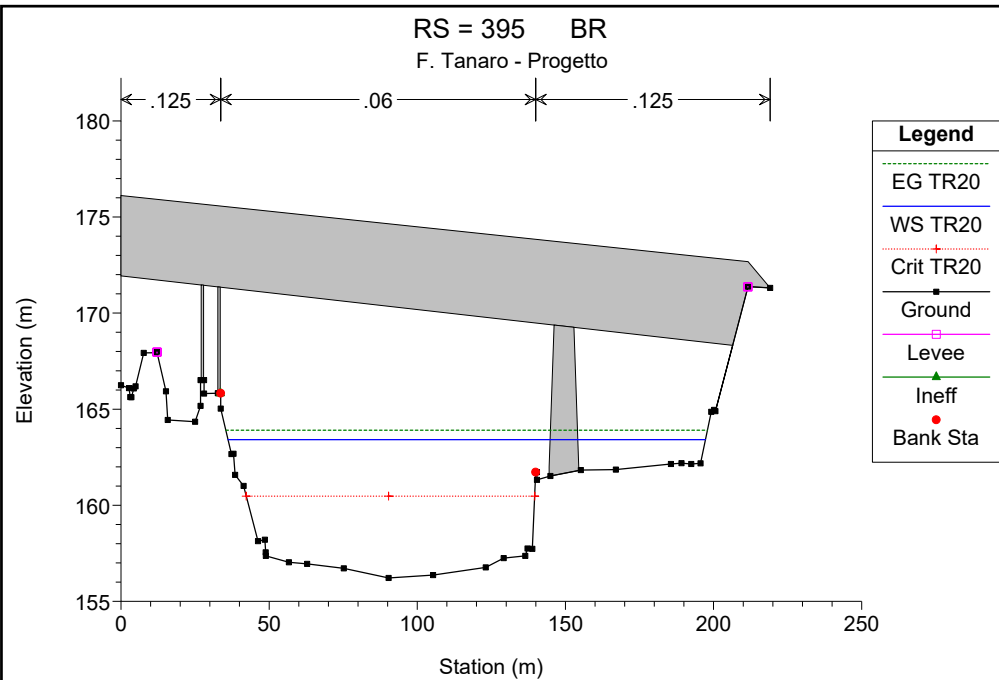


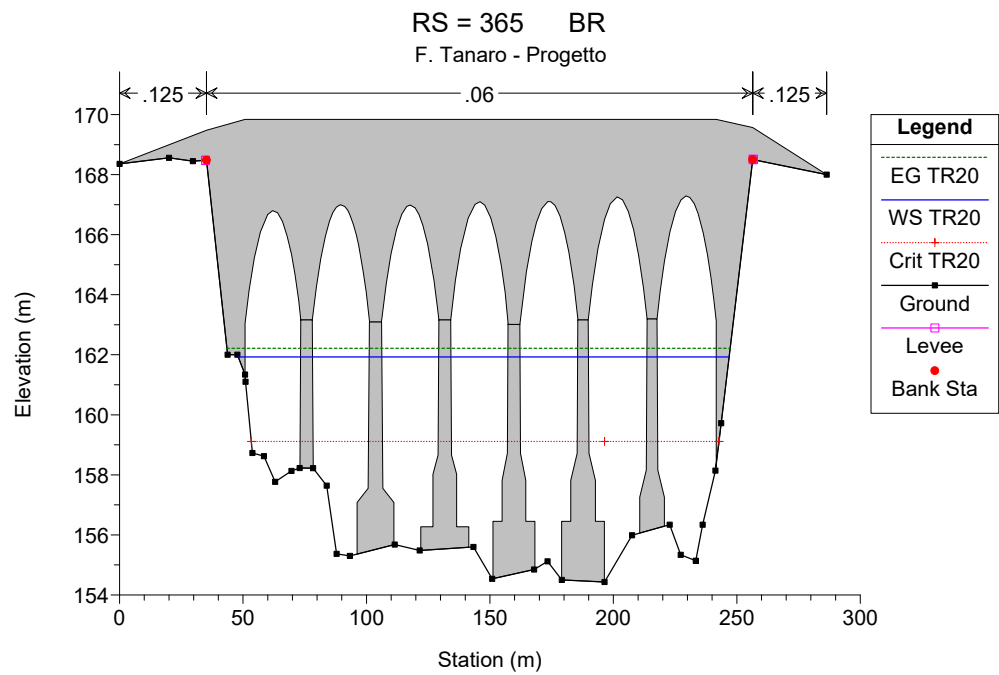
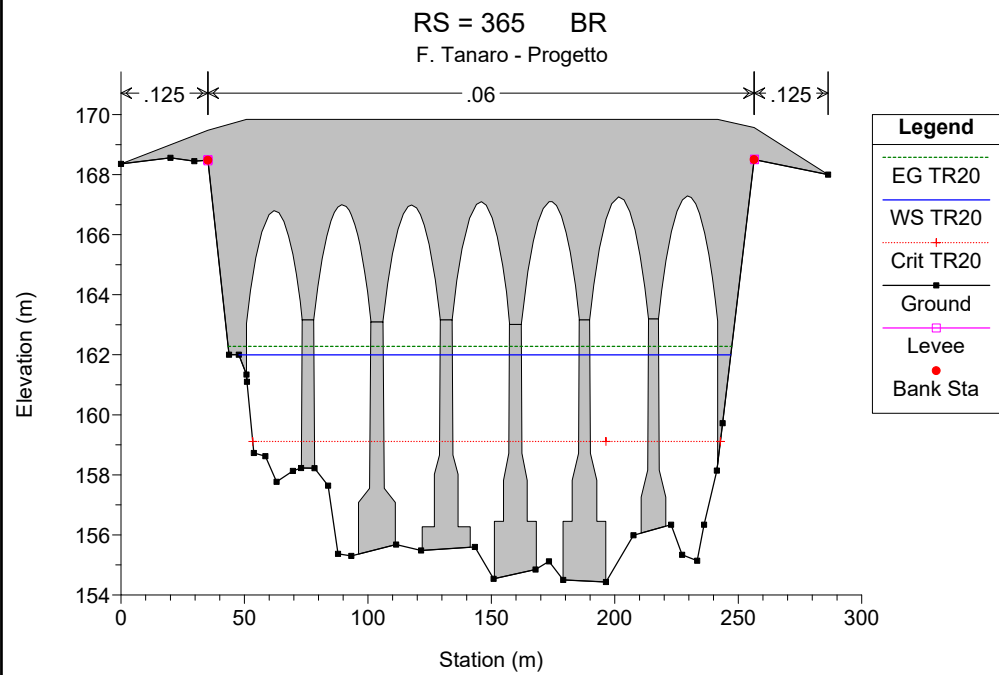
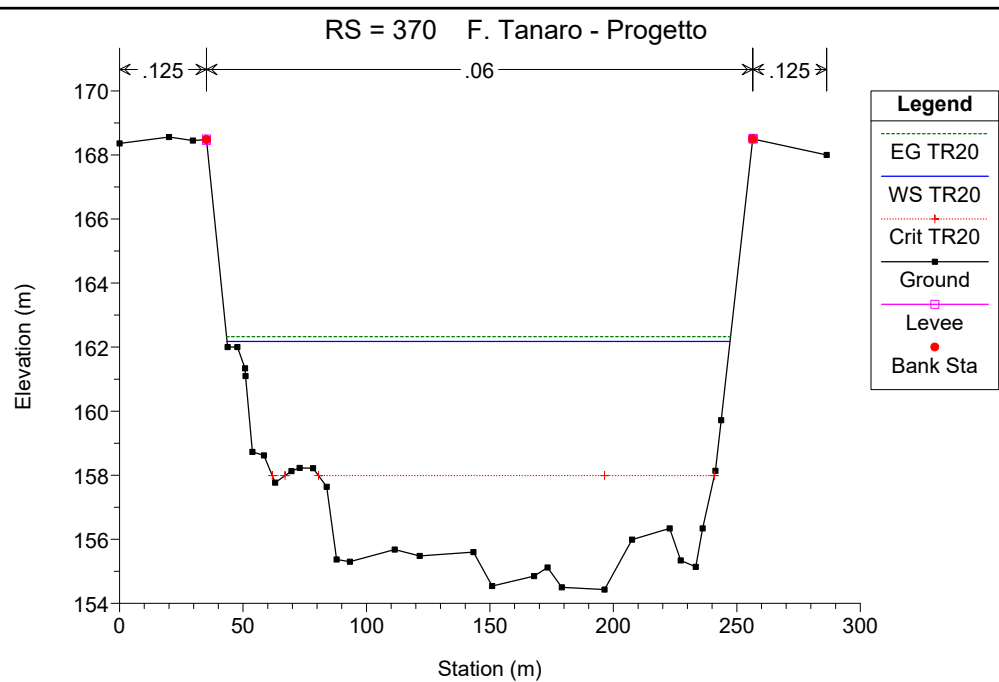
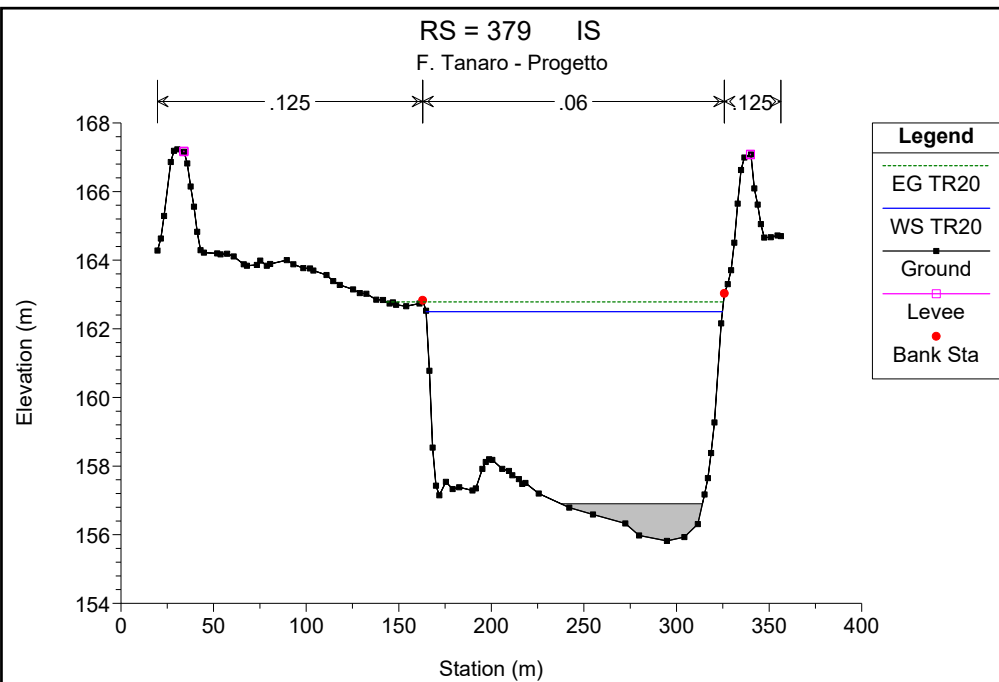


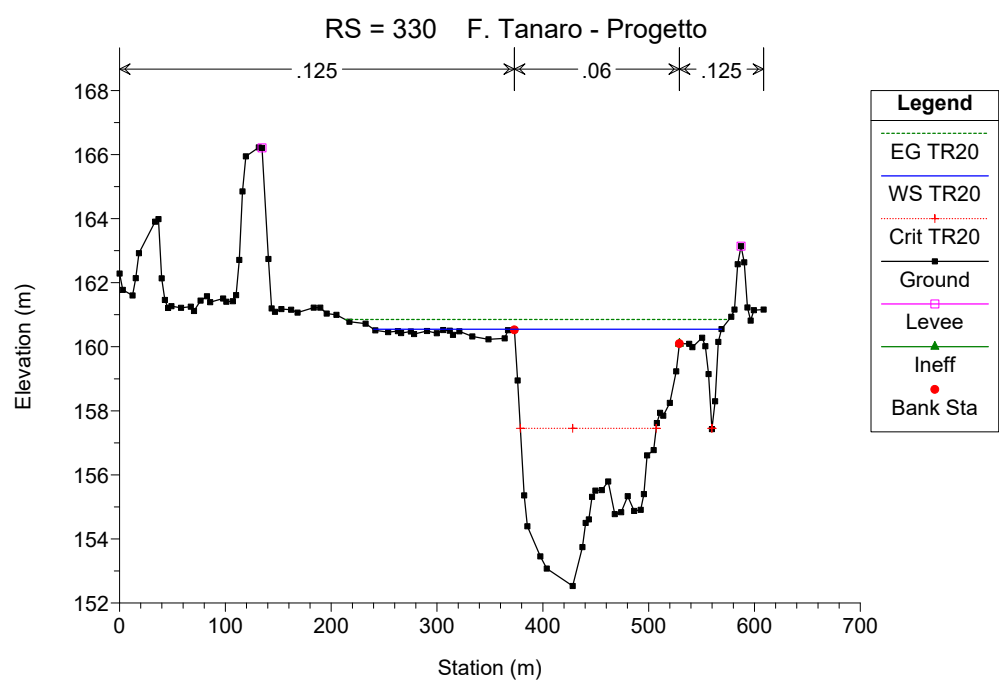
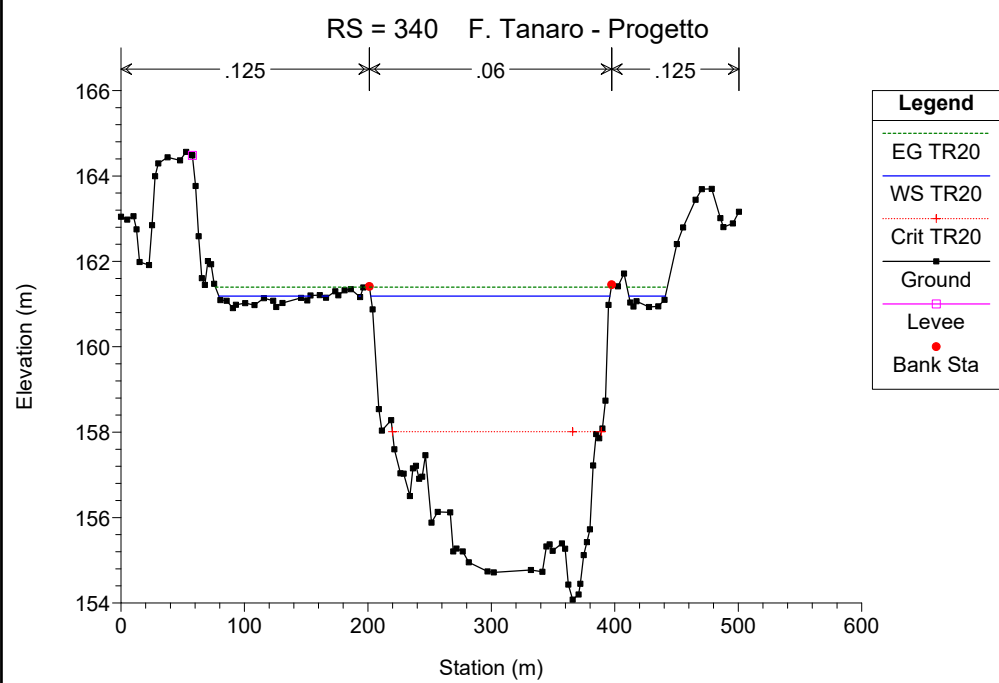
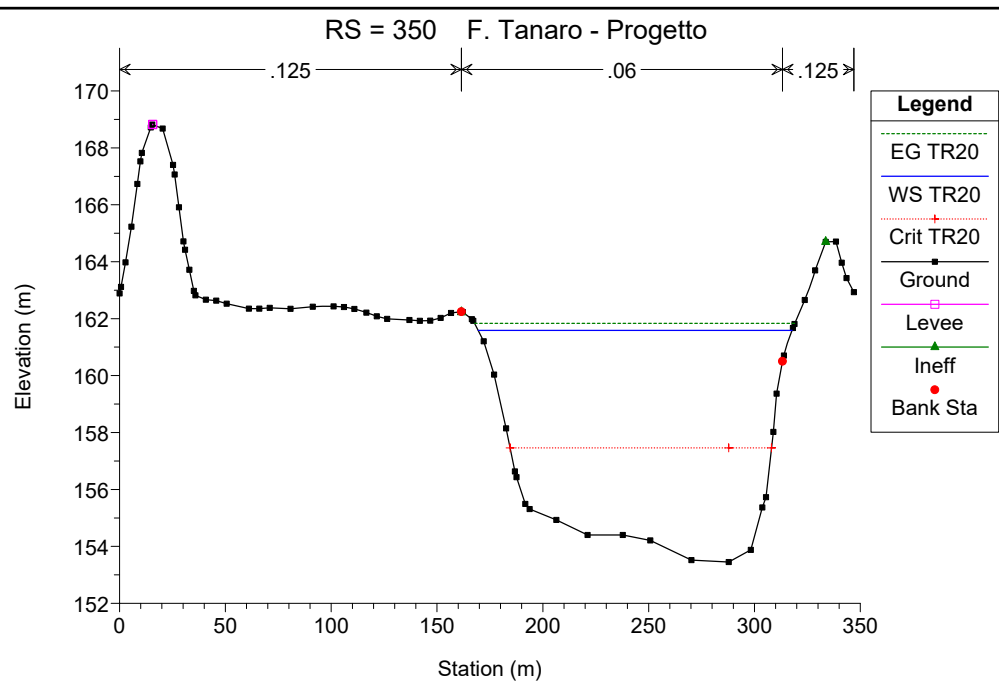
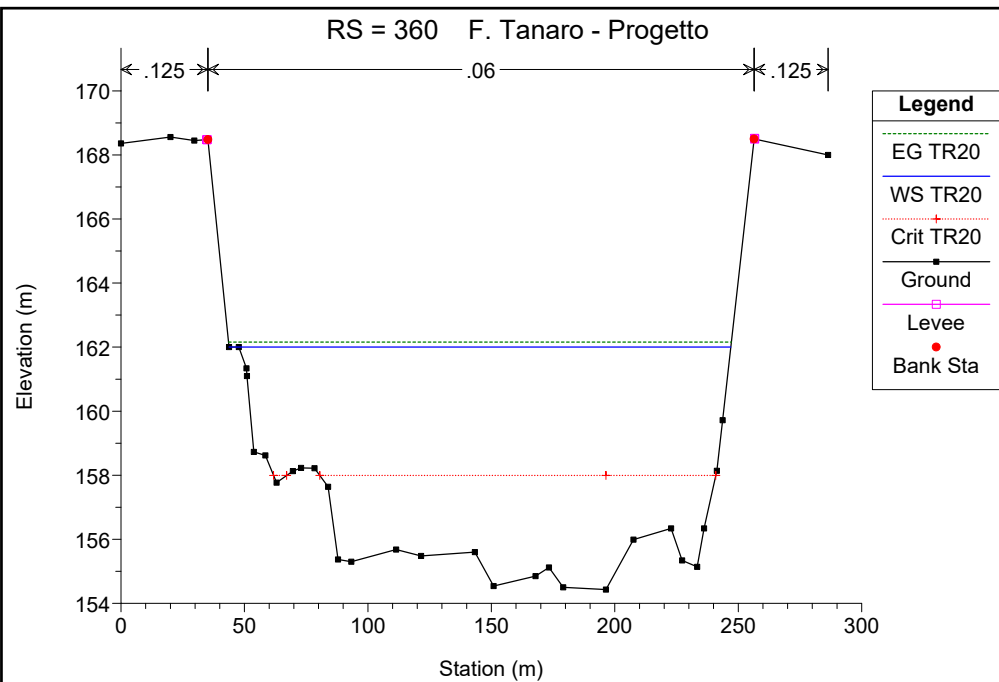


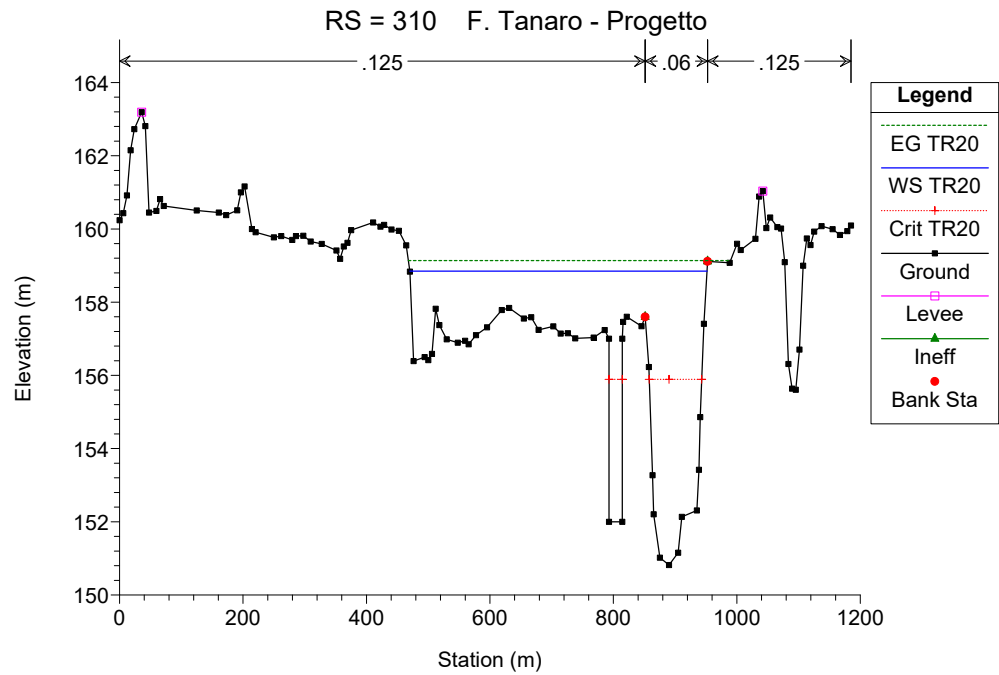
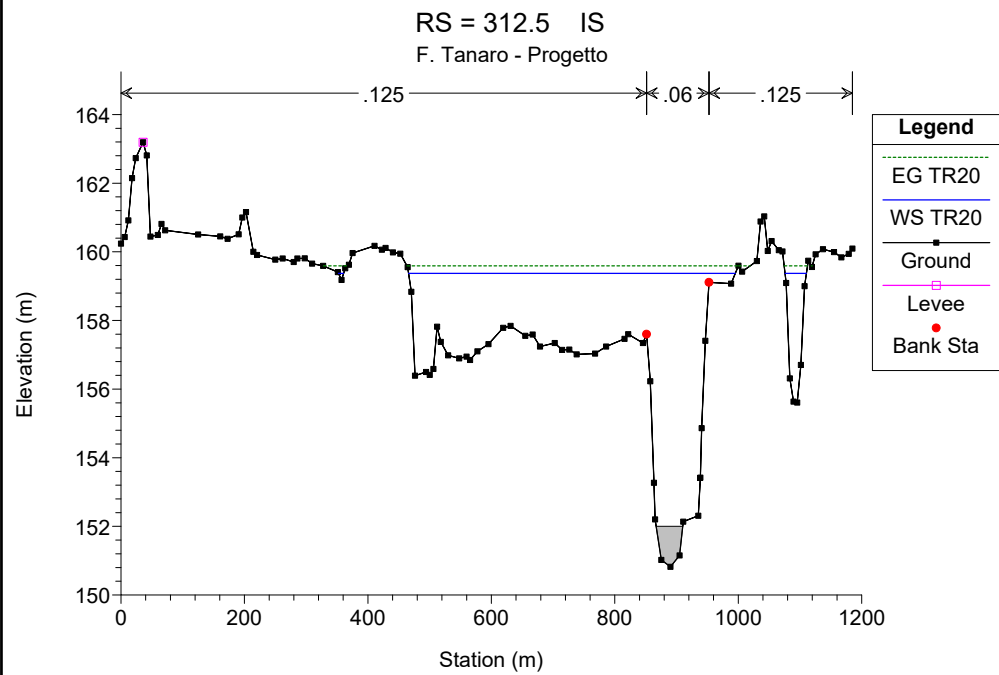
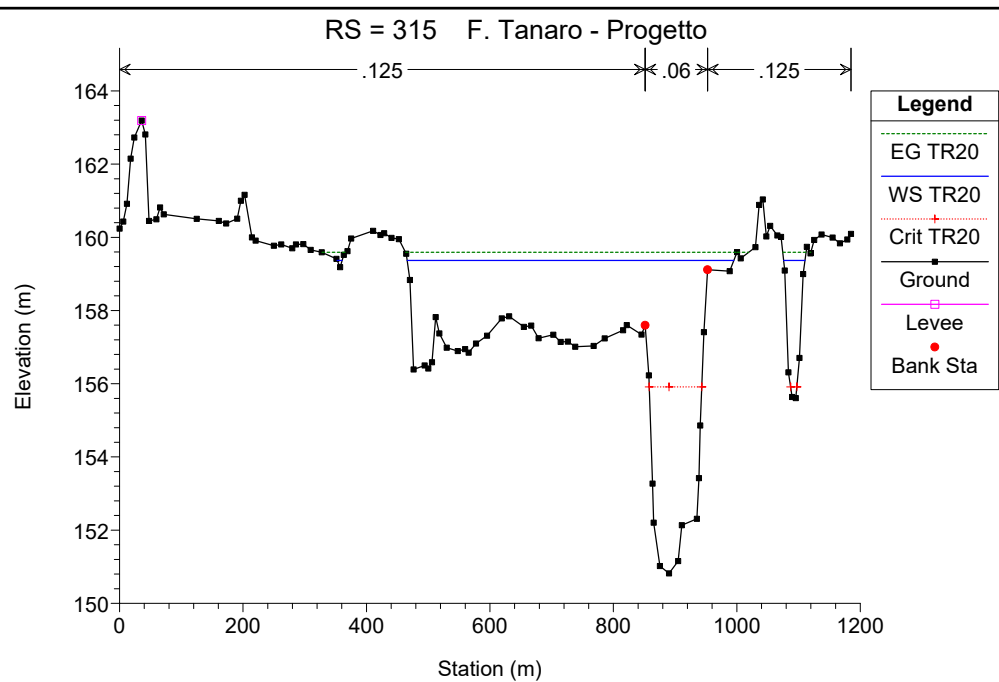
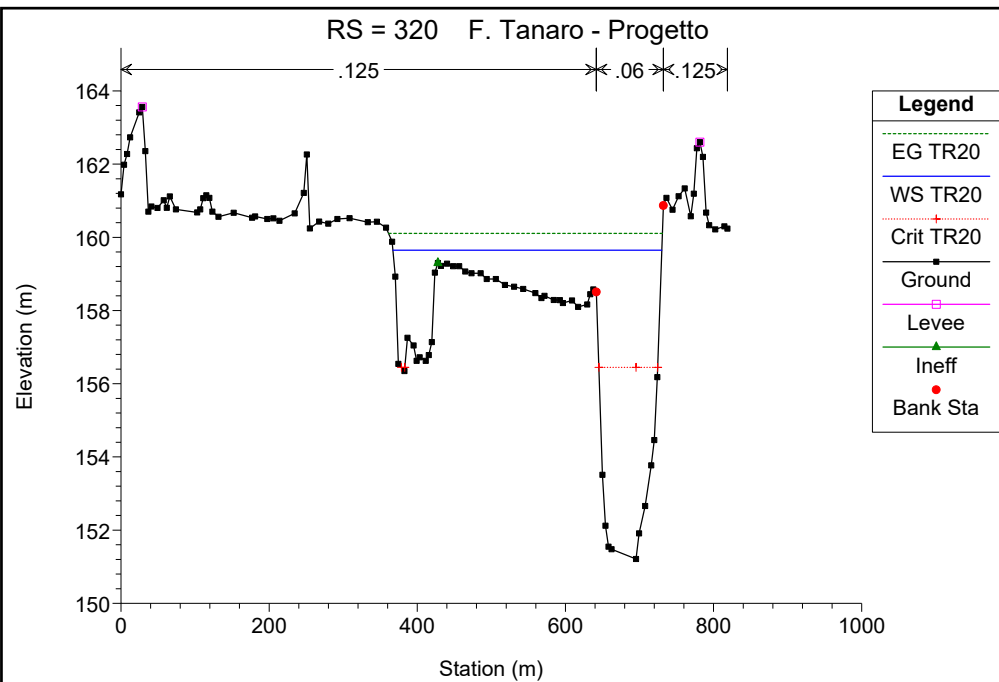


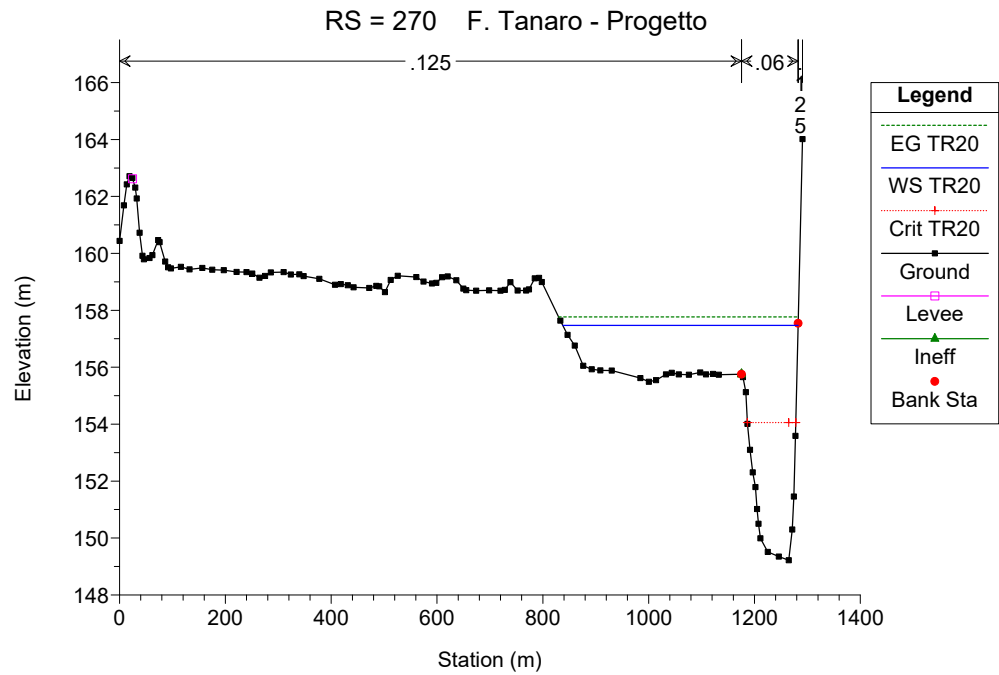
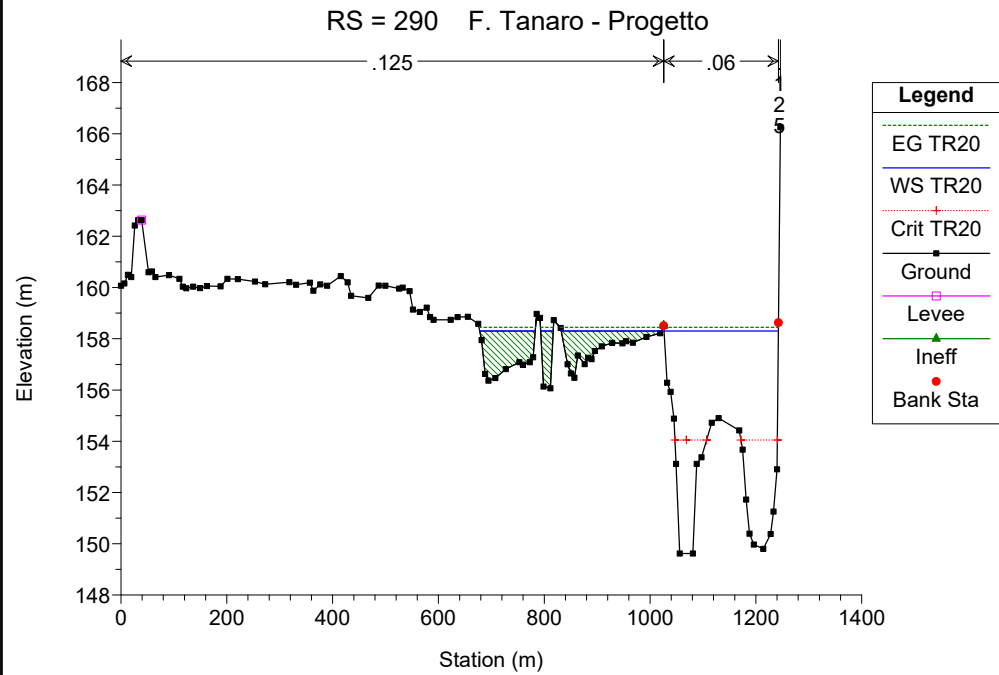
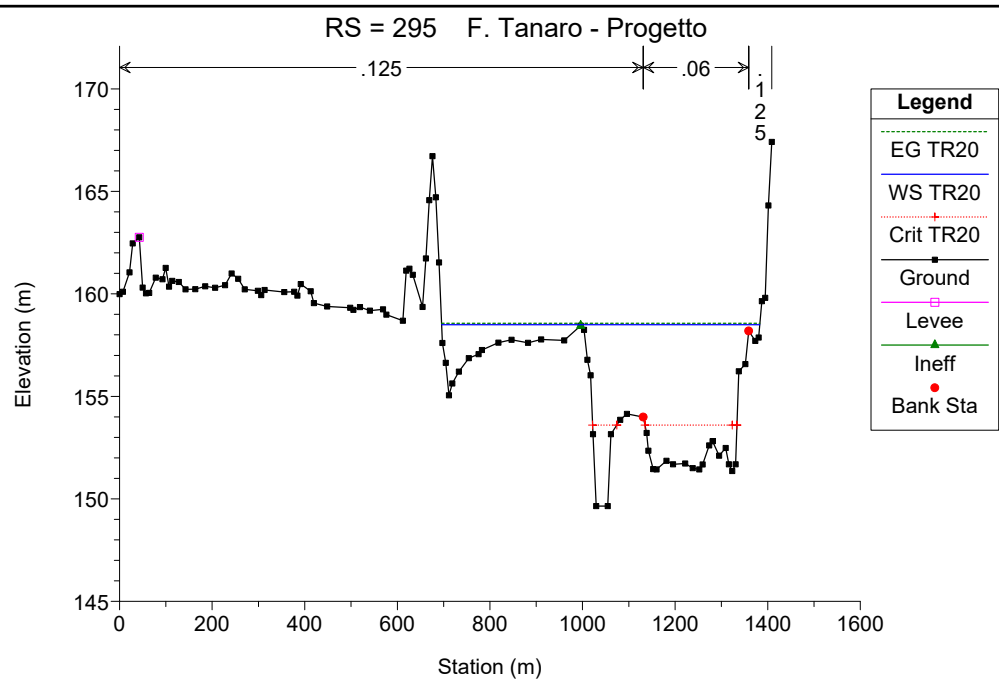
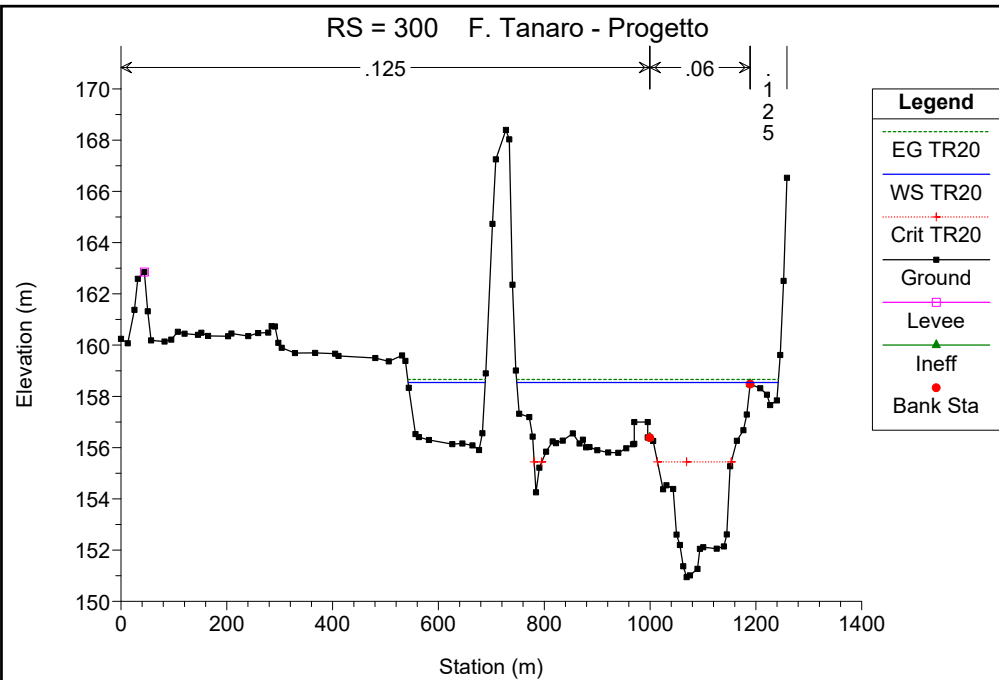




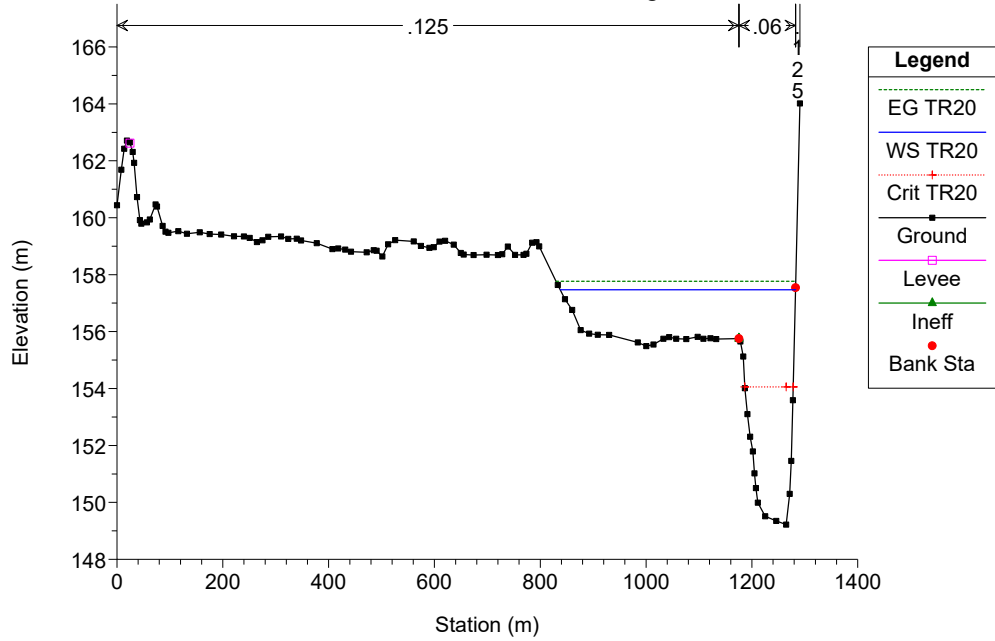




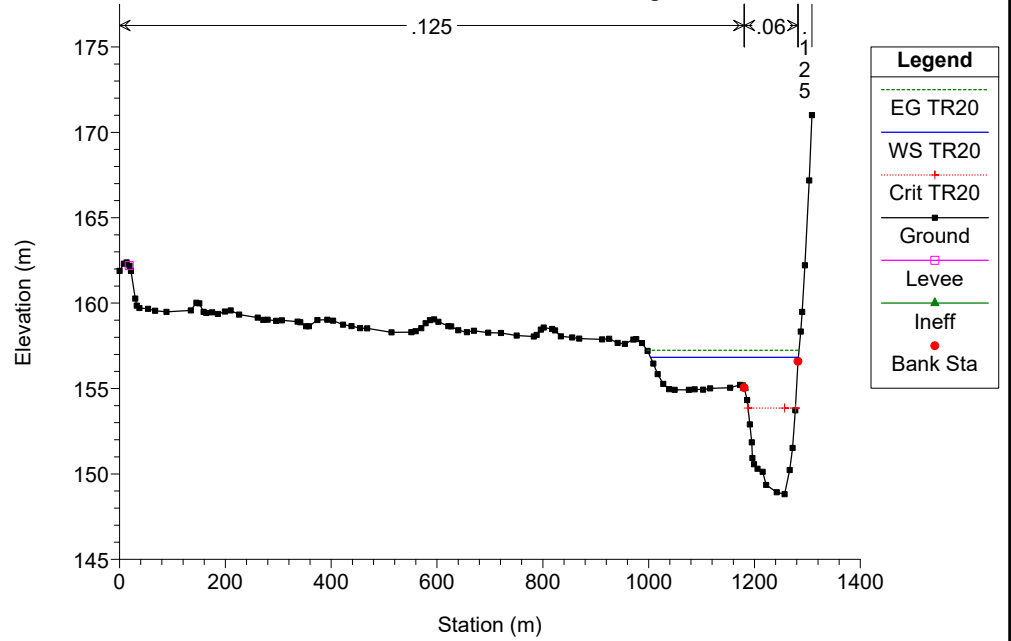




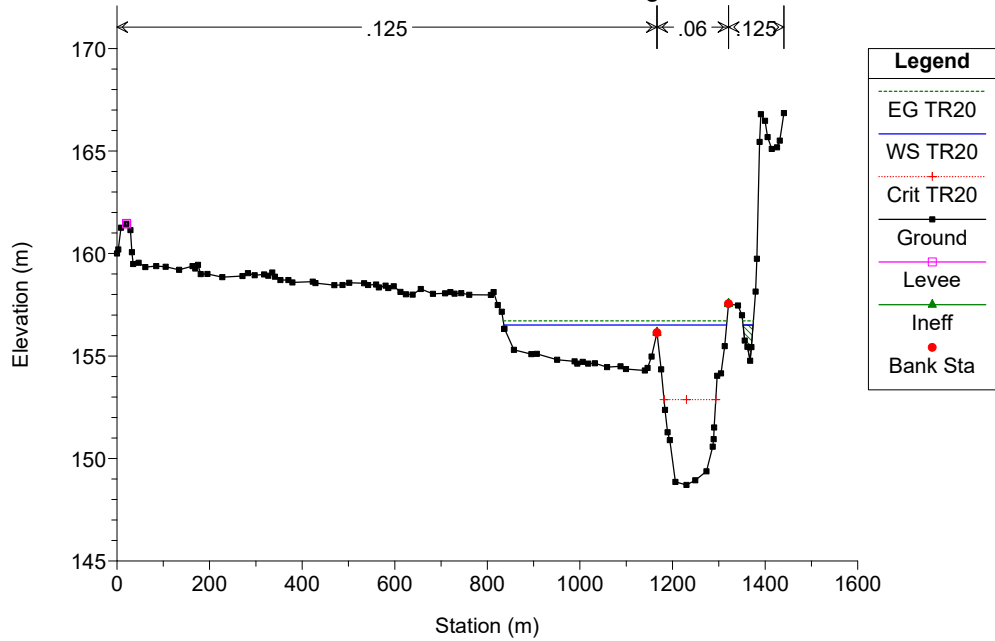
RS = 270 F. Tanaro - Progetto



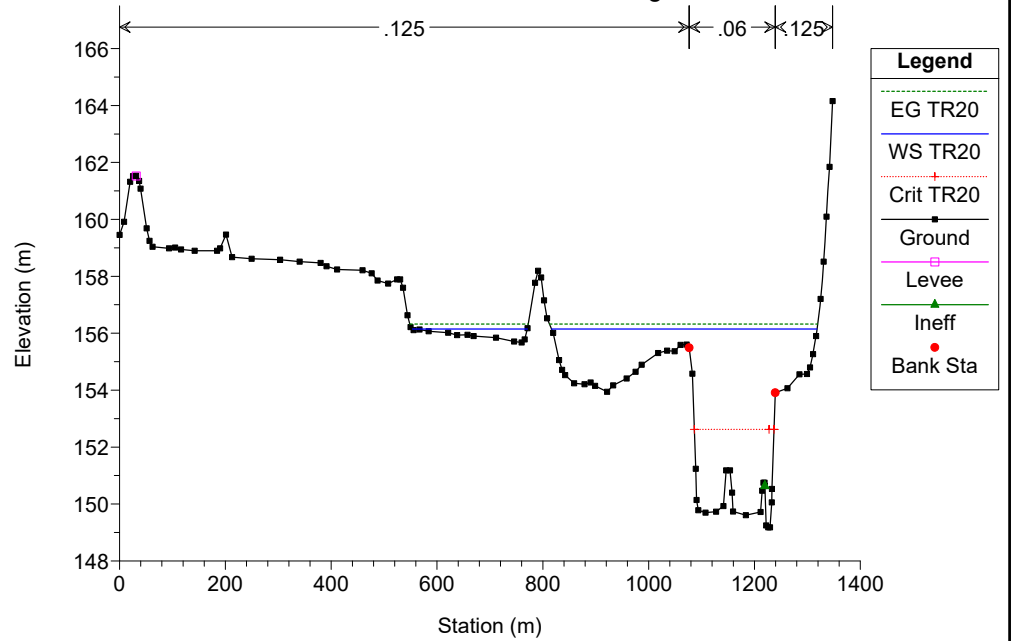
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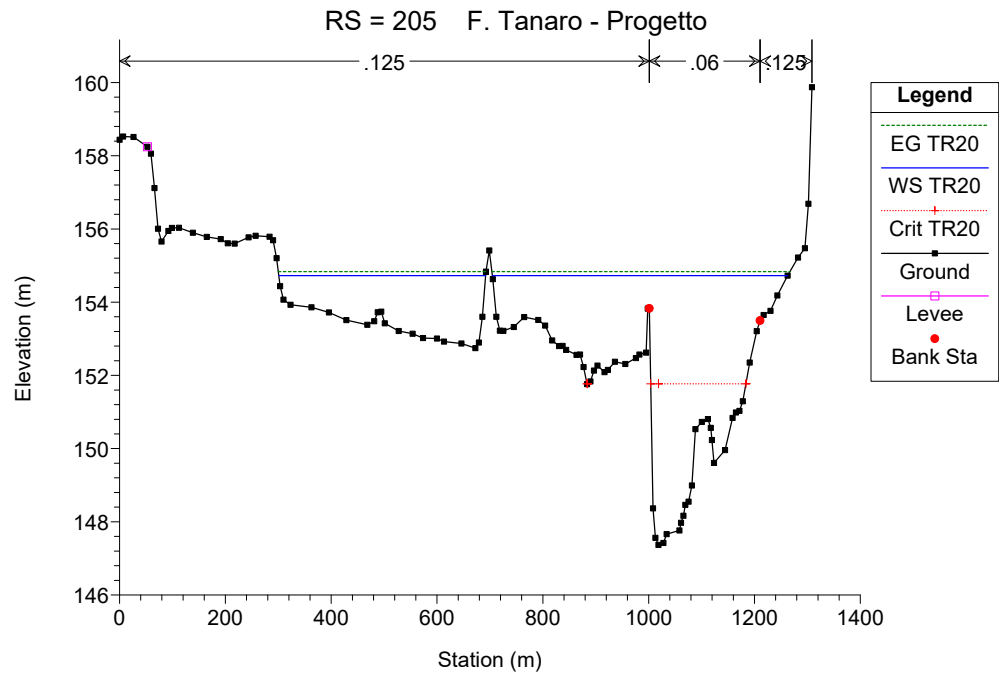
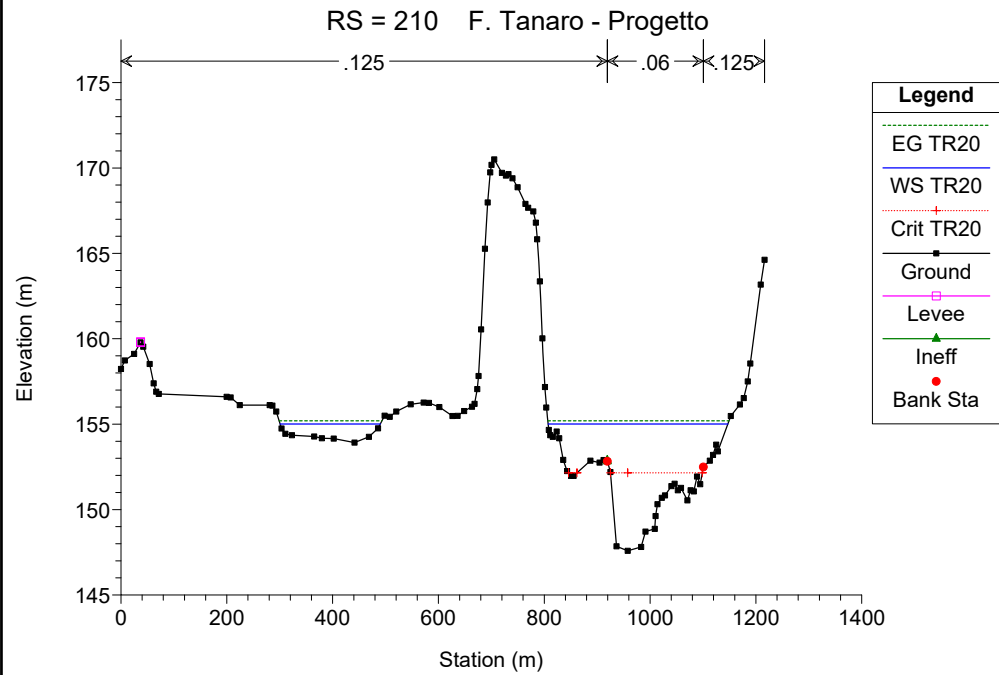
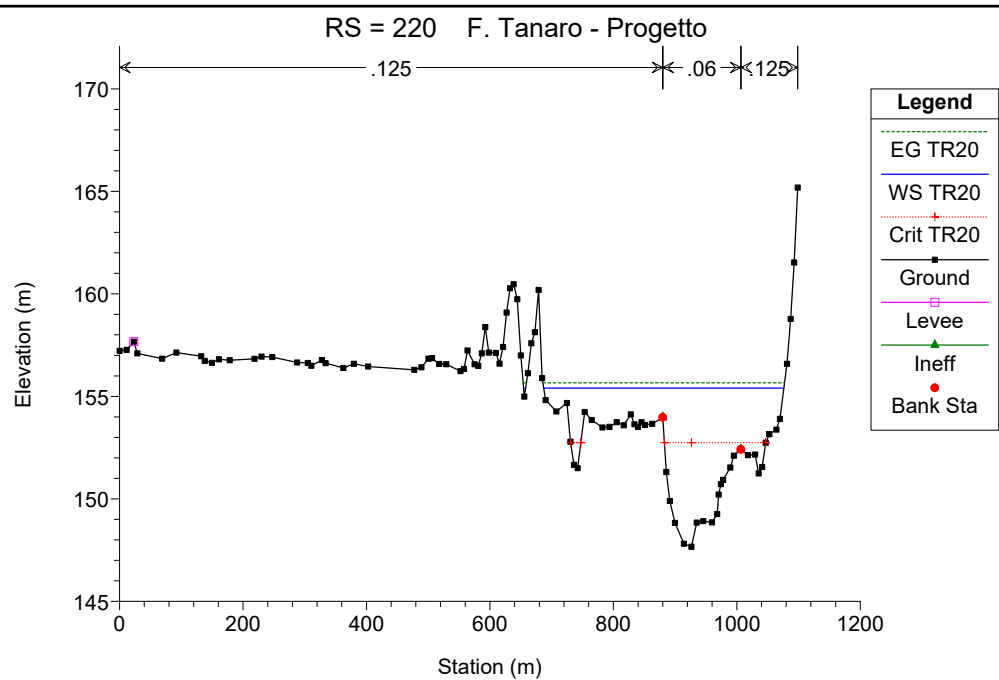
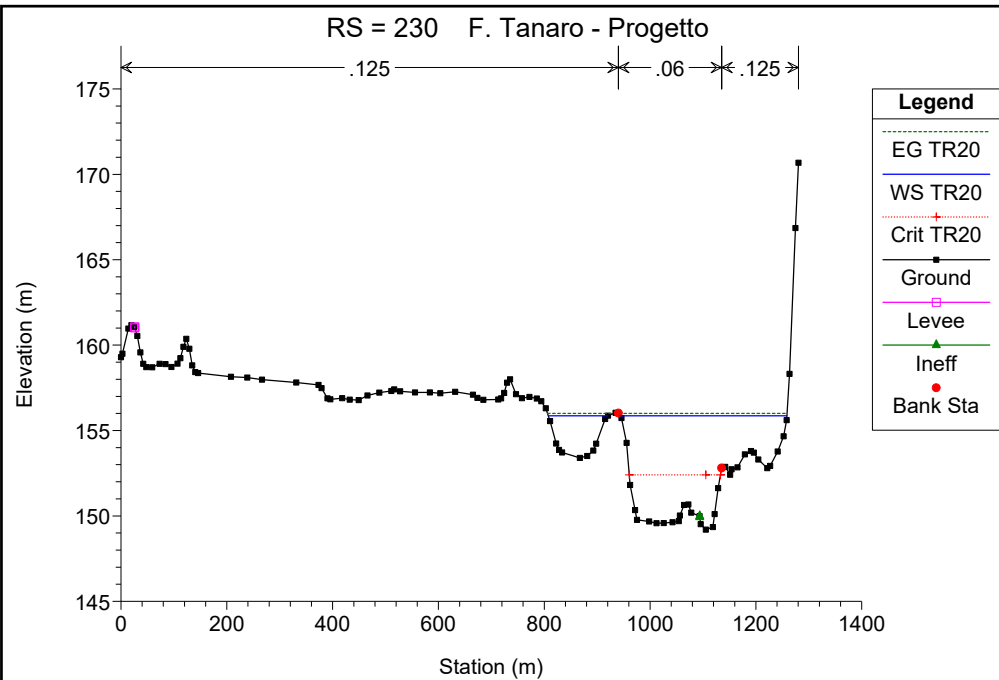


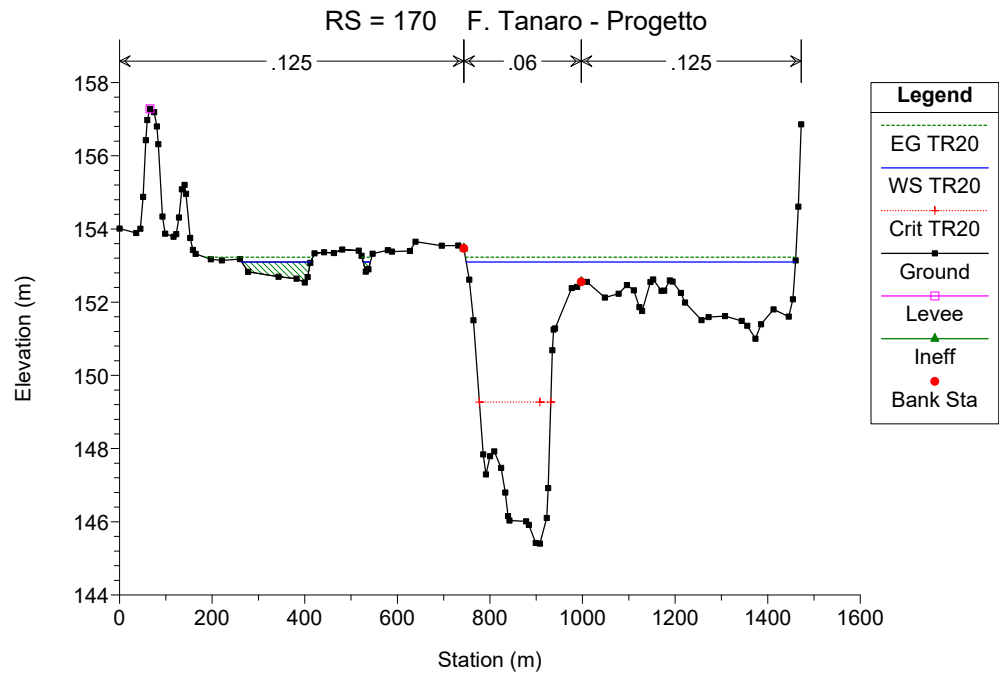
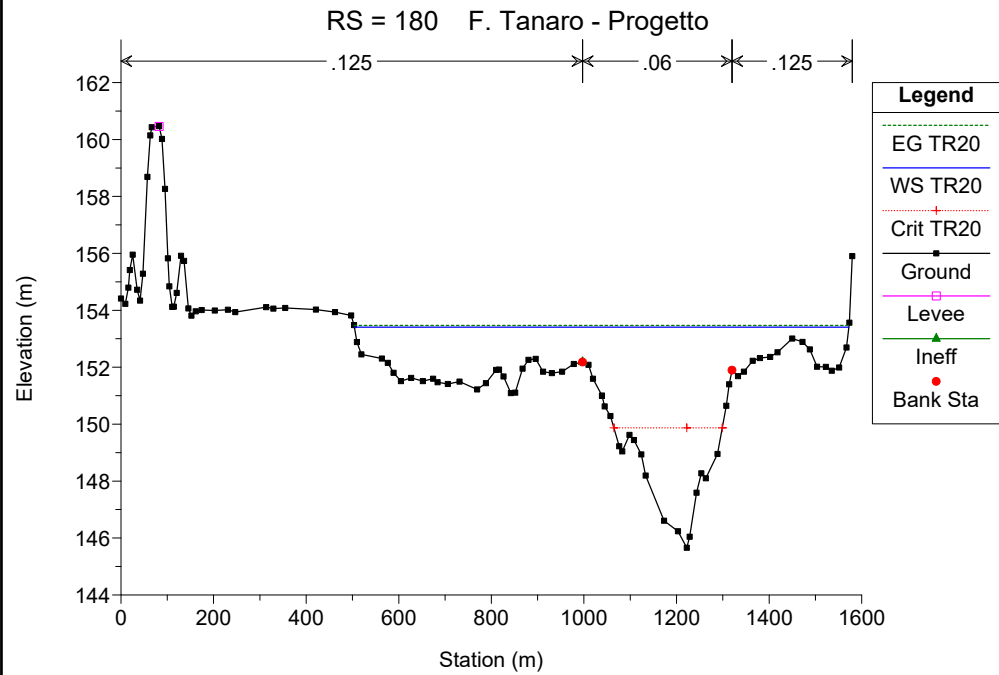
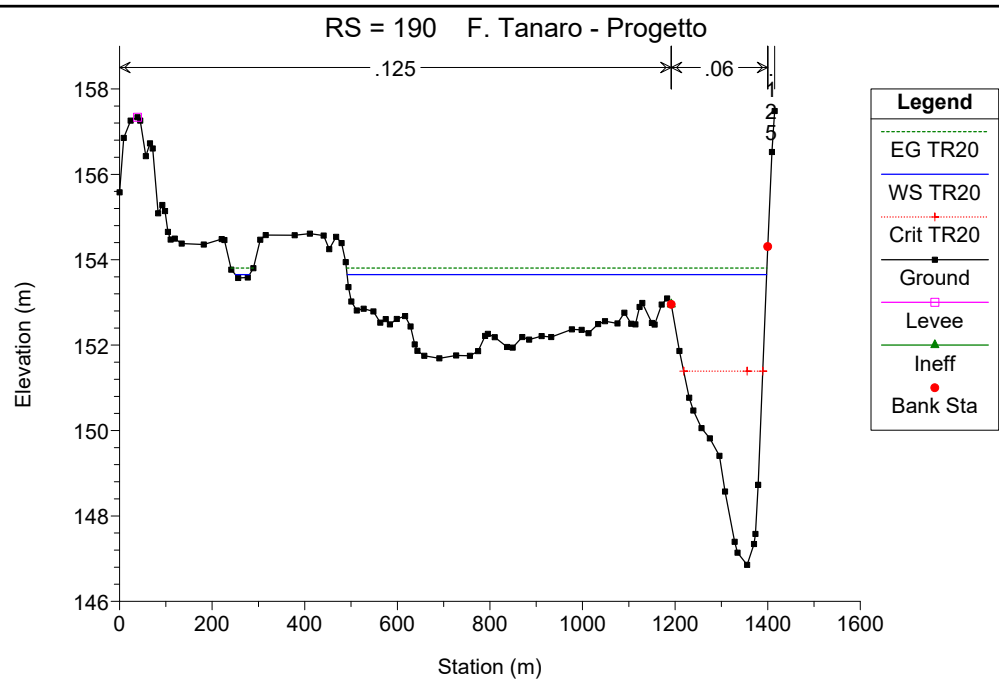
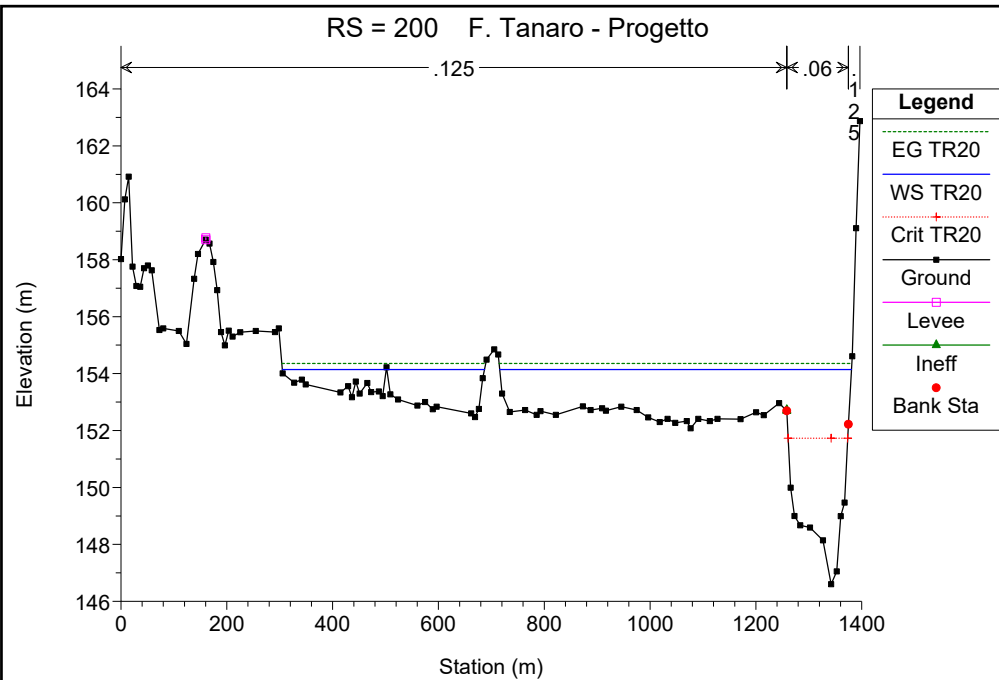
RS = 250 F. Tanaro - Progetto

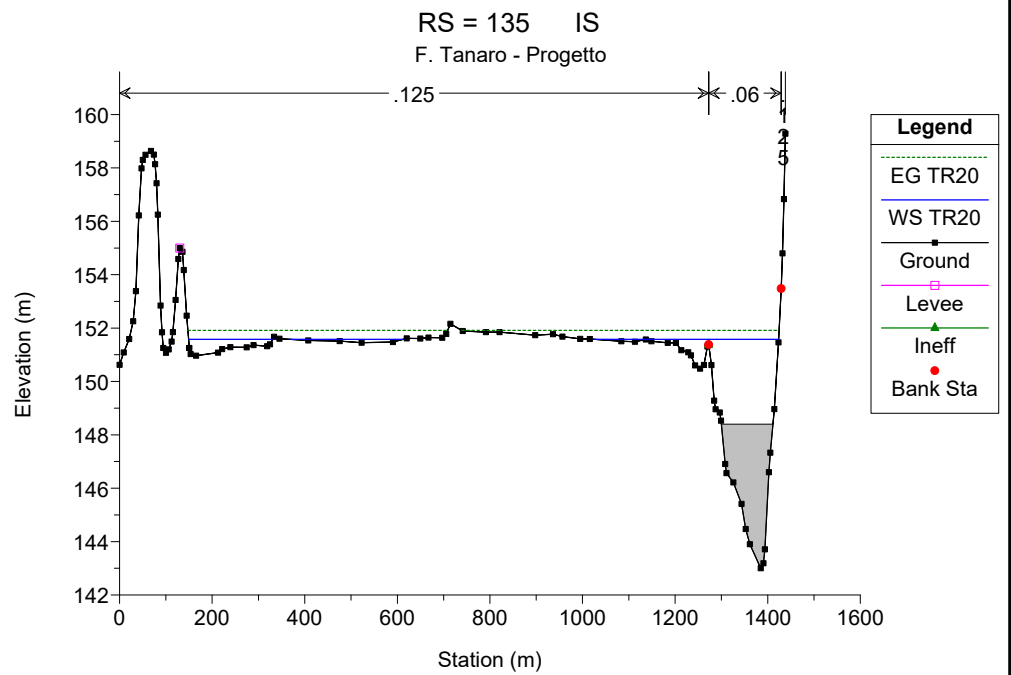
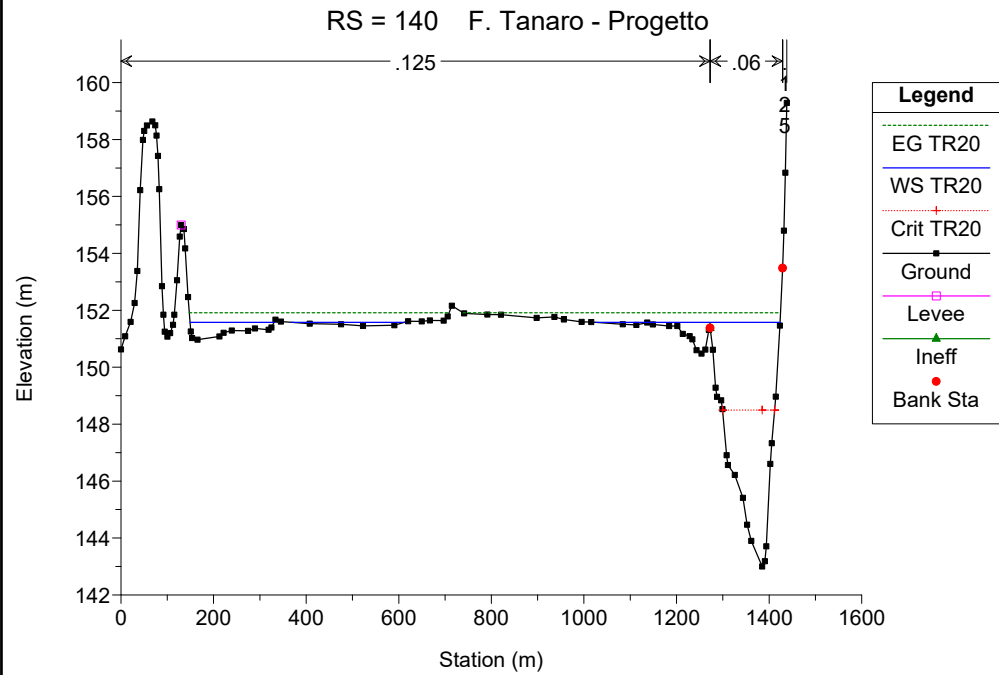
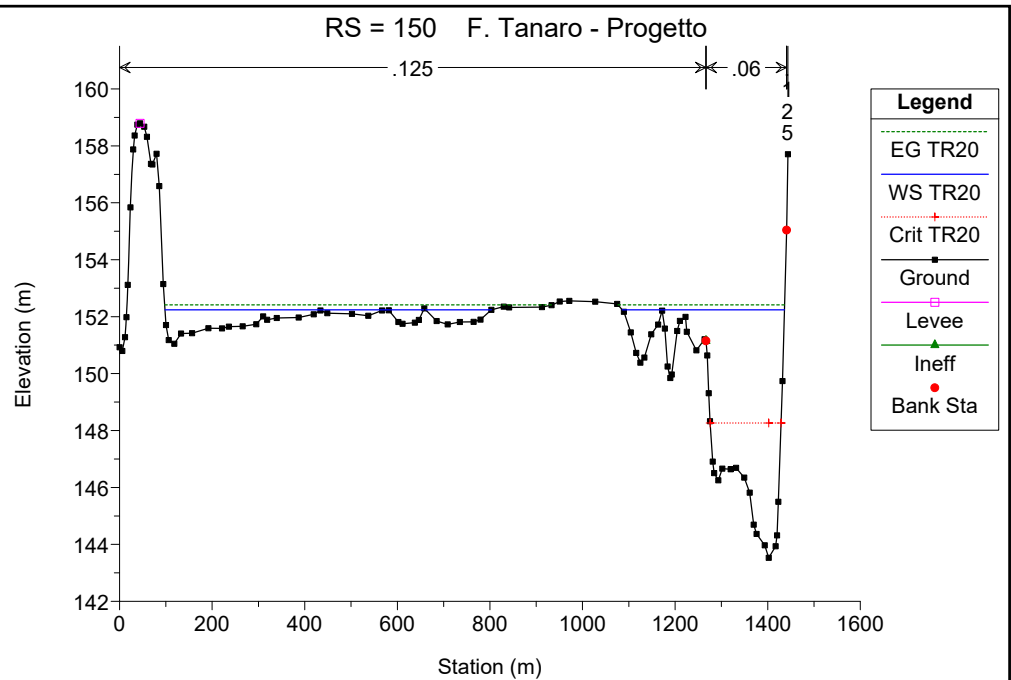
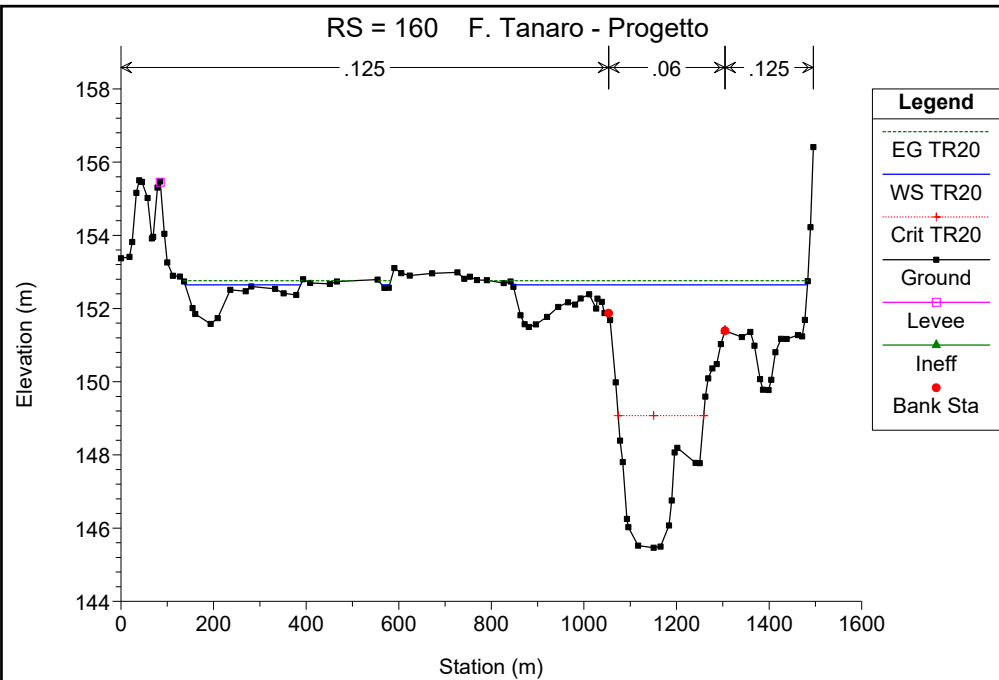


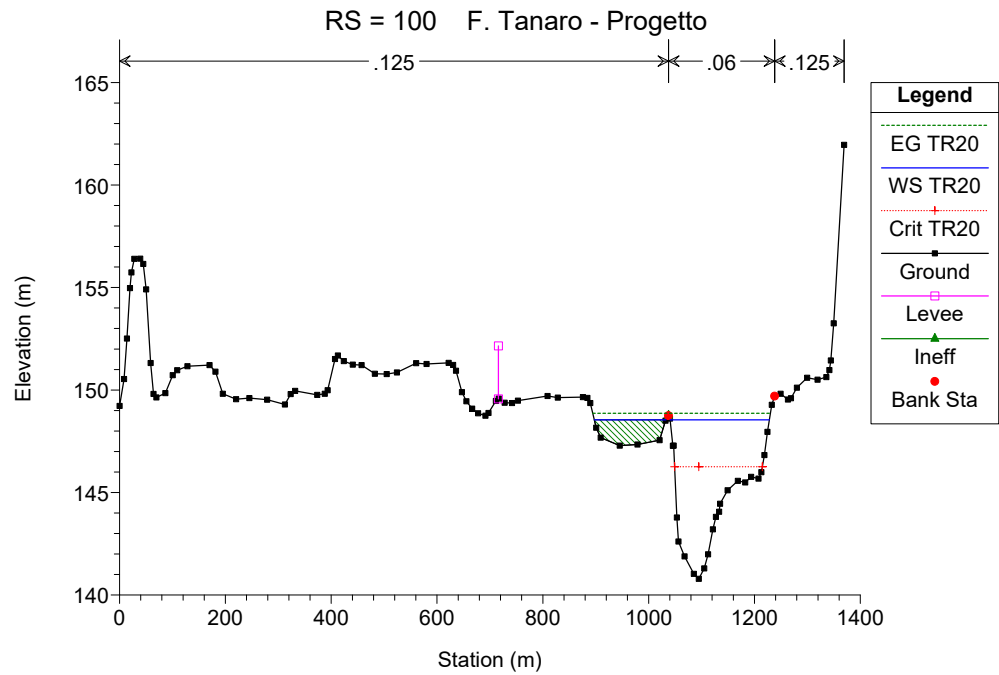
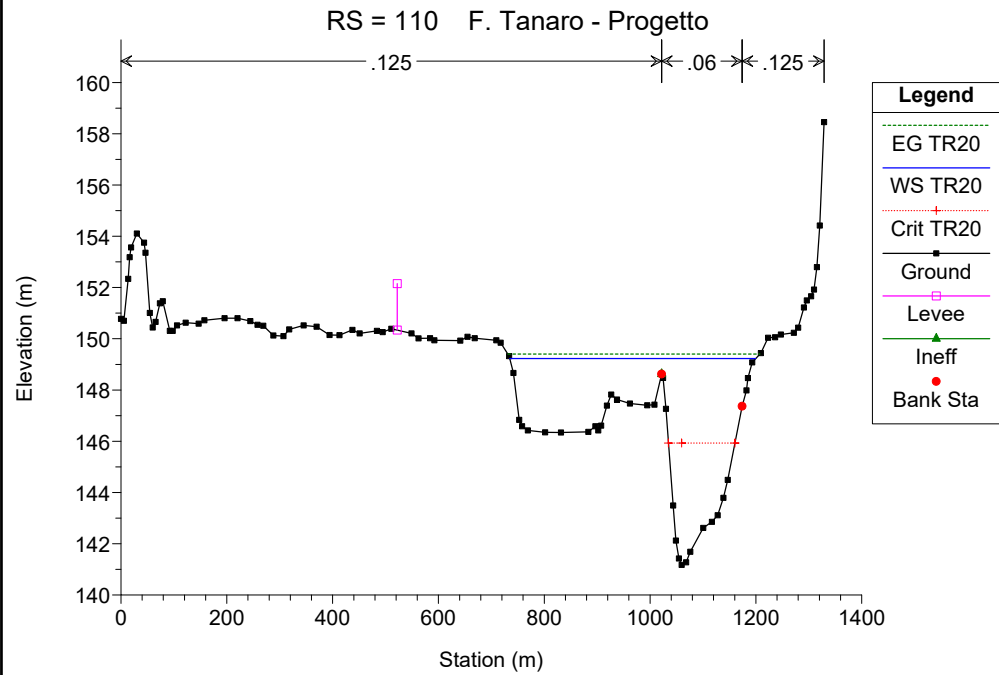
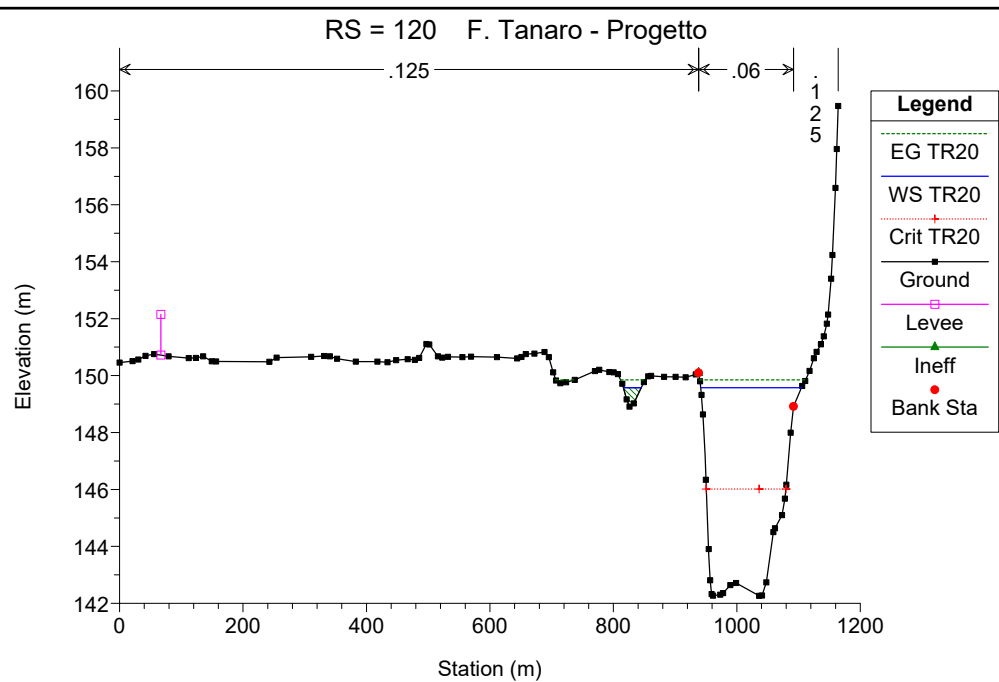
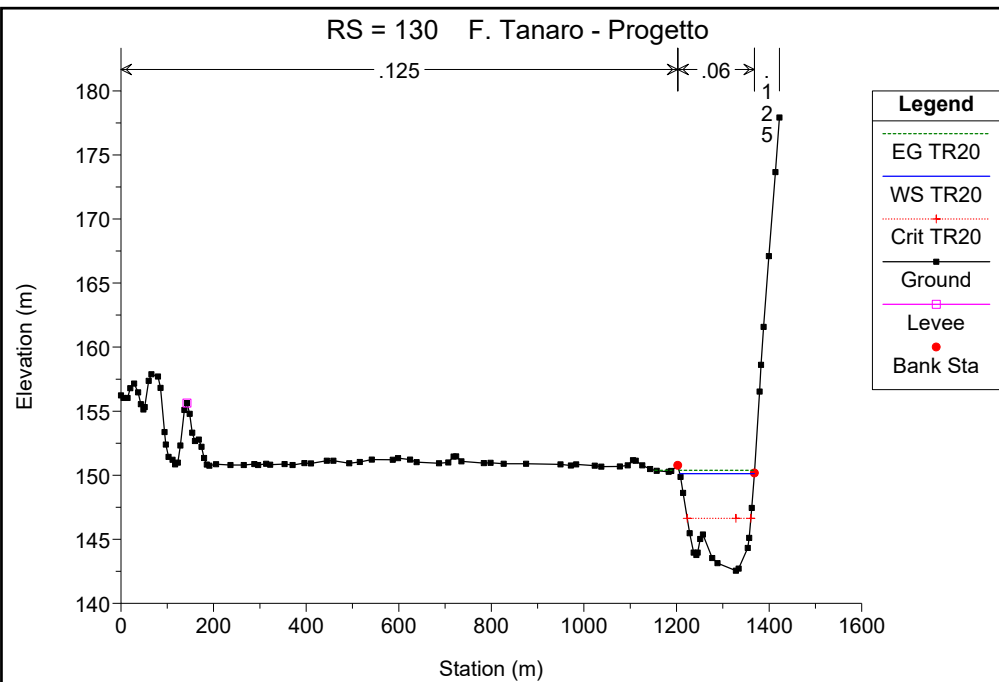
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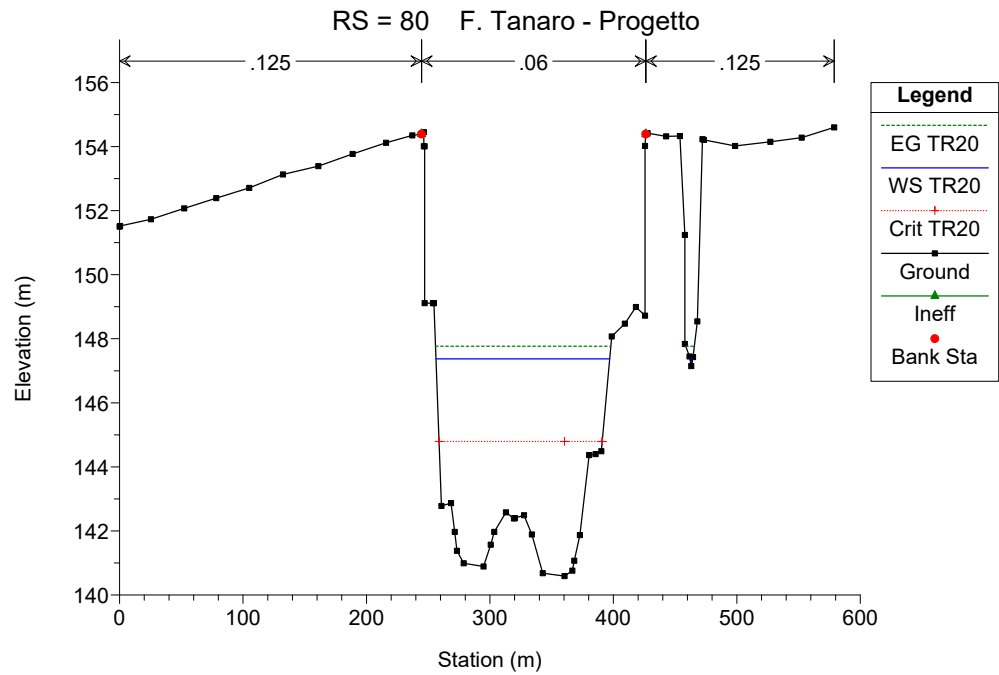
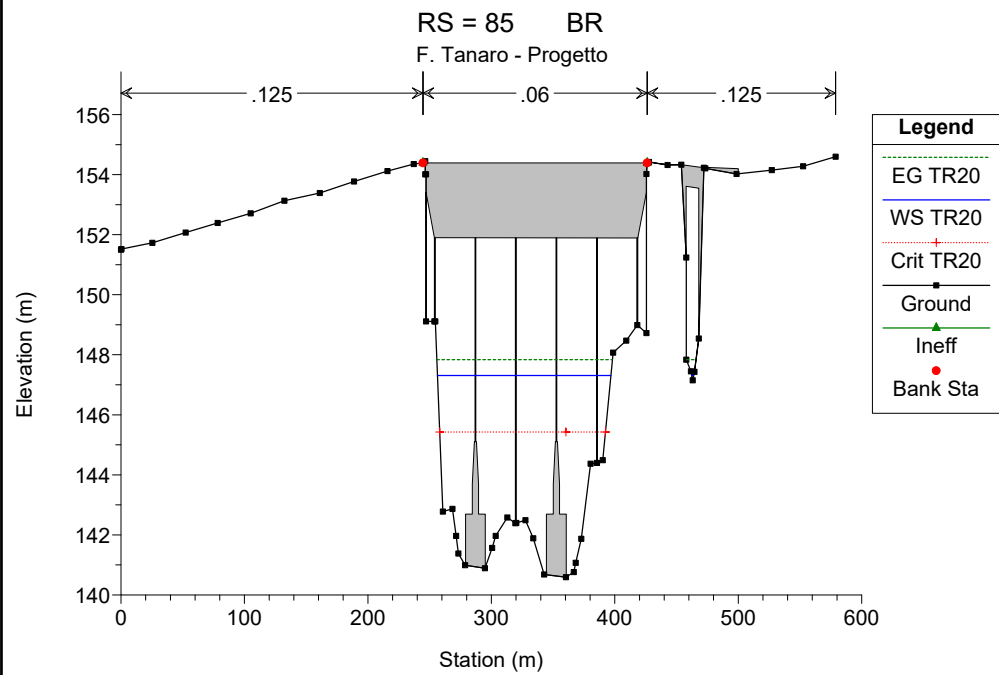
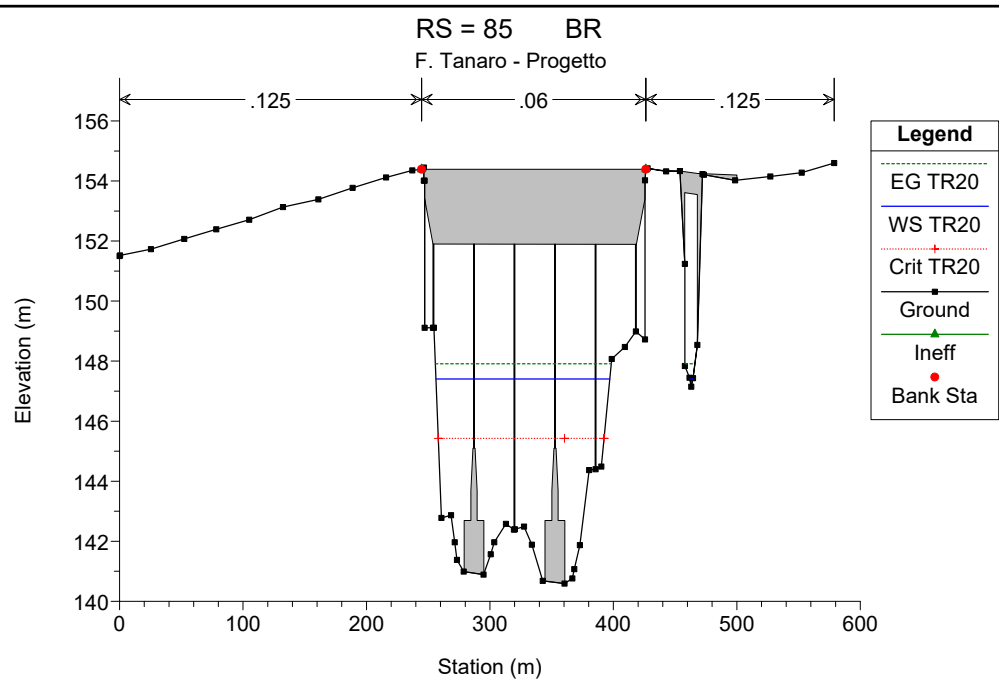
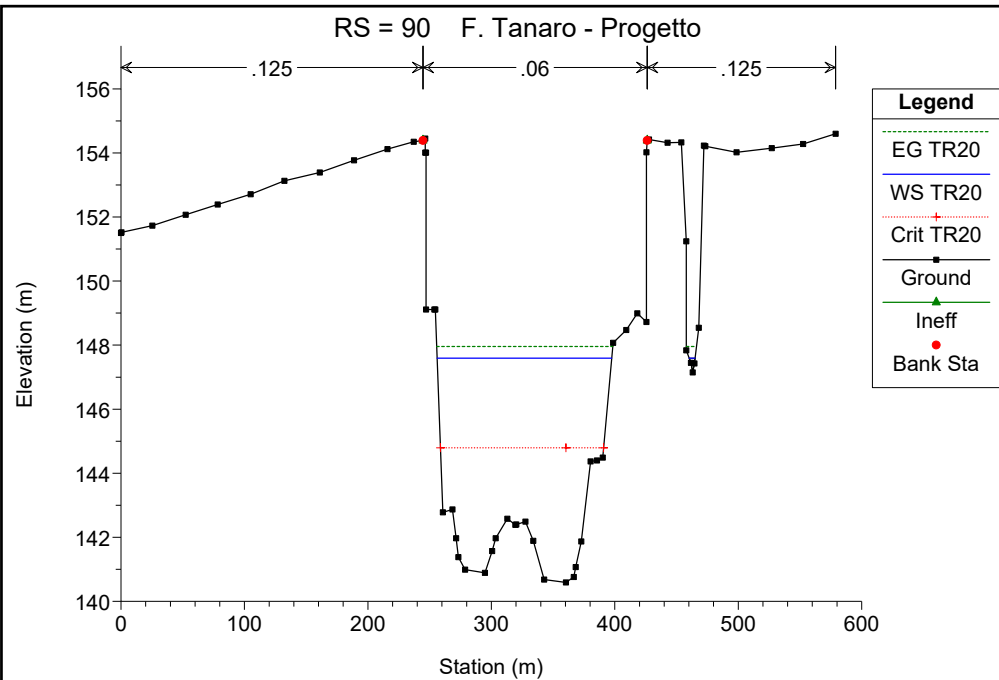


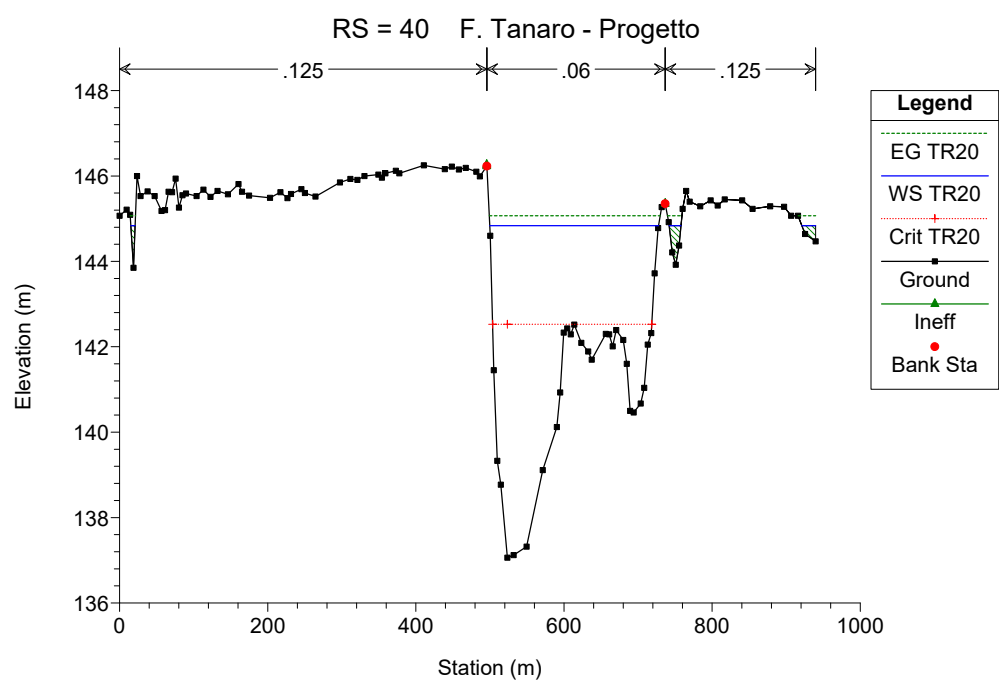
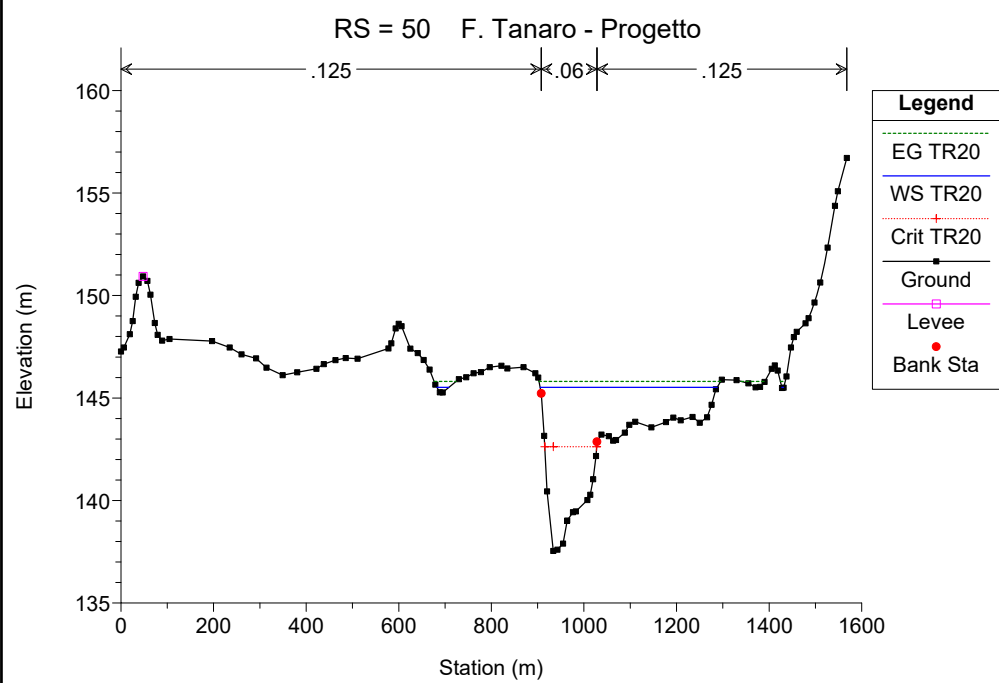
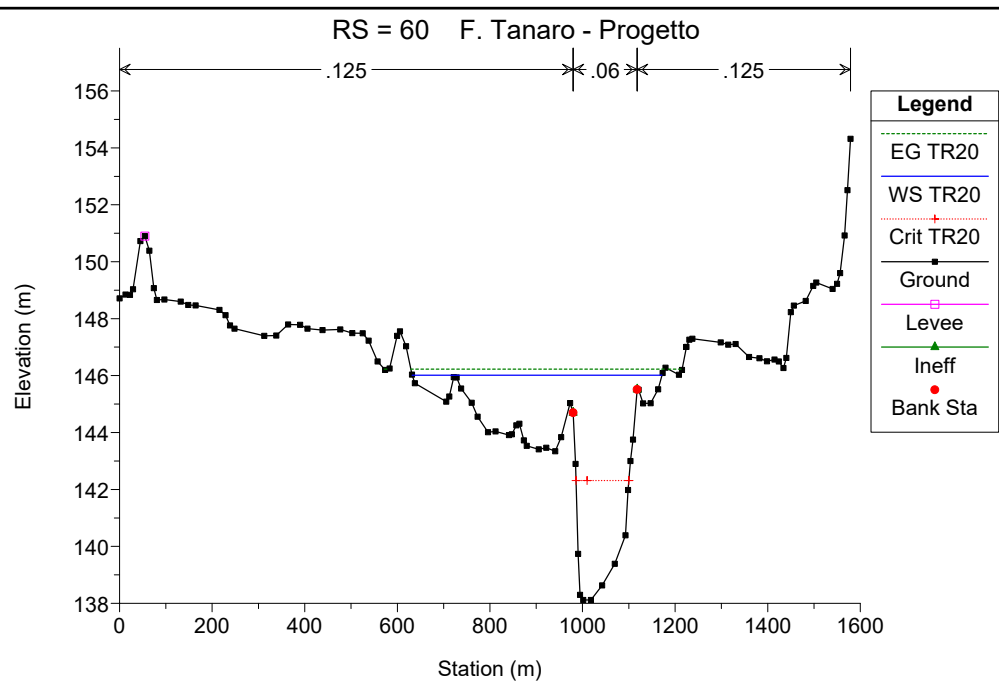
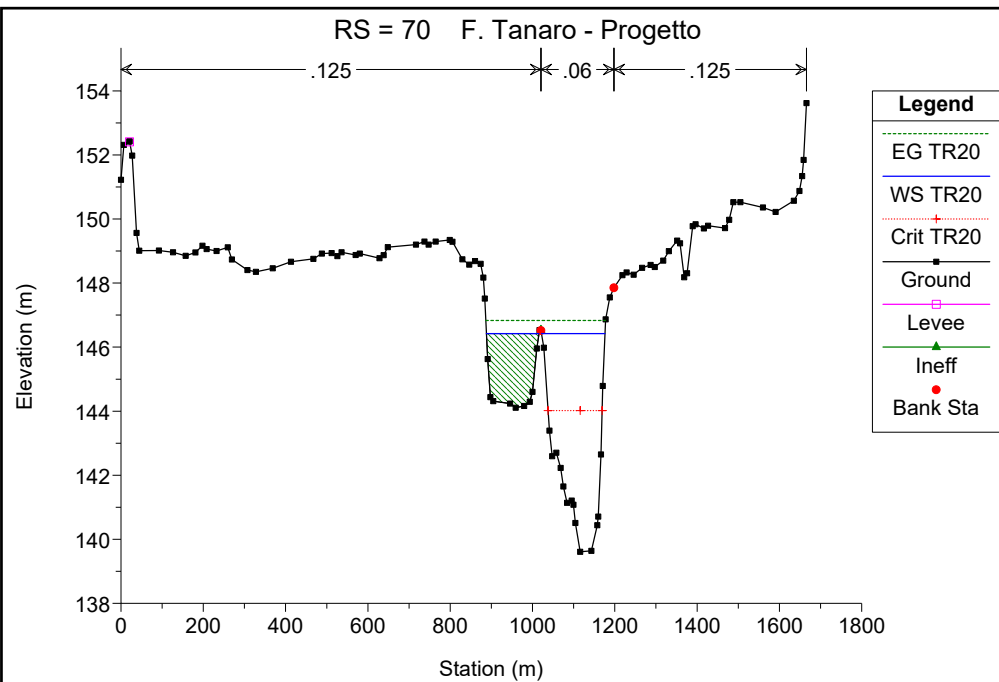


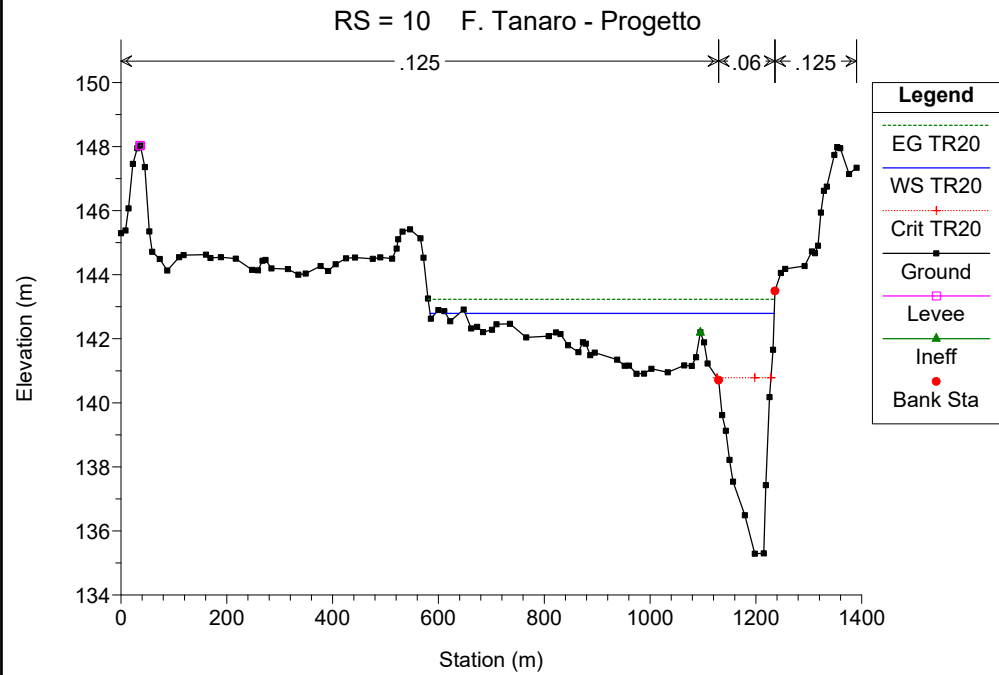
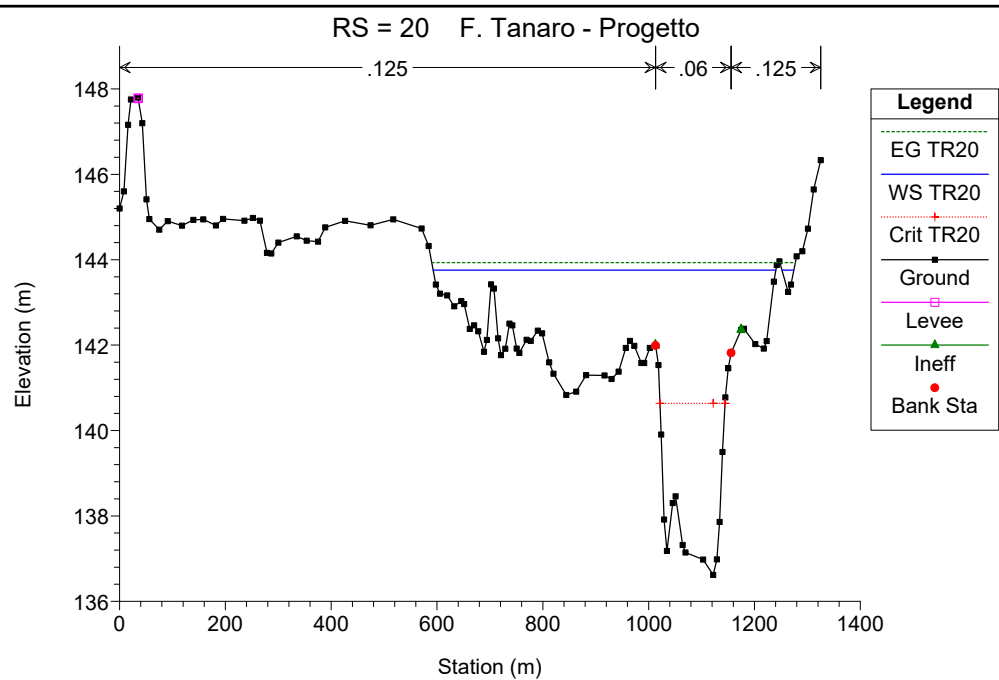
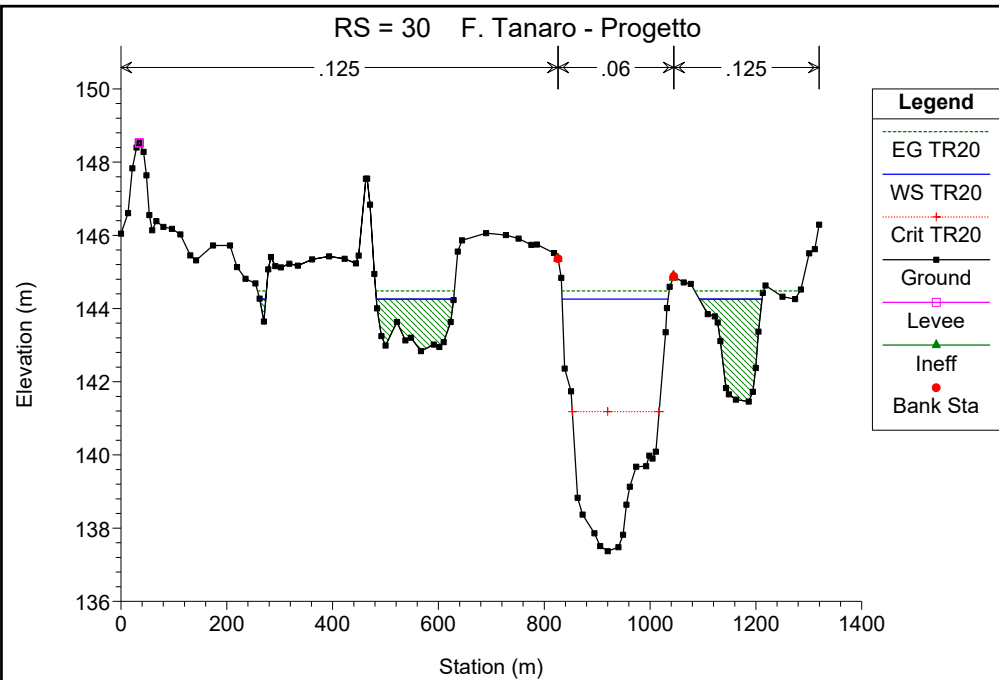












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 3

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2050	20
F. Tanaro valle Riddone	2056	
F. Tanaro valle Cherasca	2063	

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

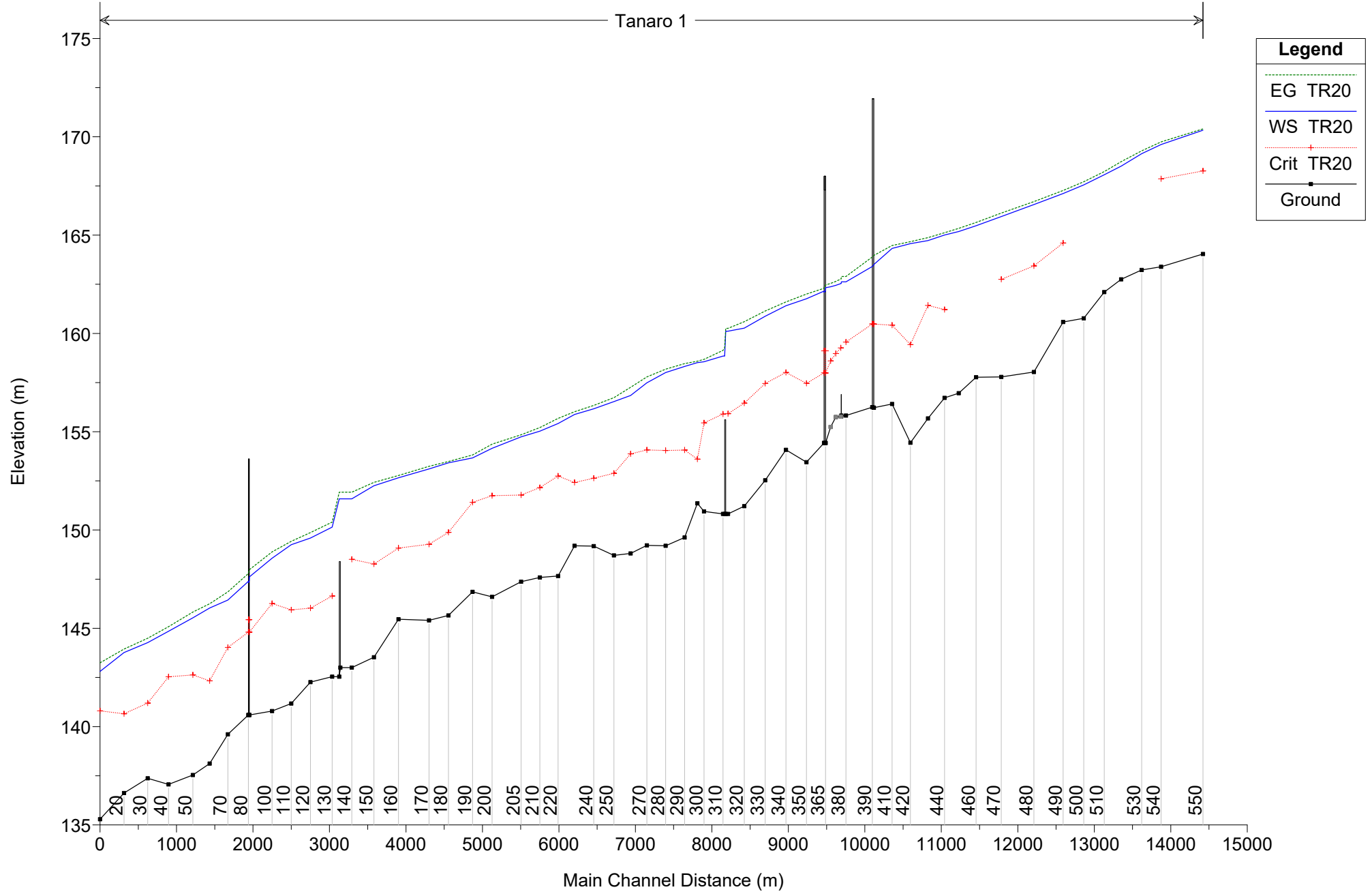
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.63	1104.80	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001916	2.05	2272.79	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001721	1.89	1696.54	656.66	0.28
1	520	TR20	2050.00	162.75	168.51		168.74	0.002546	2.29	1535.95	916.73	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002330	2.02	1651.29	700.00	0.32
1	500	TR20	2050.00	160.77	167.55		167.72	0.001684	1.96	1552.66	539.66	0.28
1	490	TR20	2050.00	160.58	167.11	164.60	167.27	0.001690	1.83	1425.19	495.29	0.28
1	480	TR20	2050.00	158.04	166.56	163.44	166.71	0.001394	1.83	1677.65	674.07	0.26
1	470	TR20	2050.00	157.79	165.95	162.75	166.12	0.001536	2.06	1559.53	508.77	0.28
1	460	TR20	2050.00	157.77	165.48		165.65	0.001355	1.90	1540.15	641.64	0.26
1	450	TR20	2050.00	156.96	165.18		165.34	0.001297	1.89	1479.96	520.73	0.25
1	440	TR20	2050.00	156.72	165.01	161.21	165.13	0.000977	1.70	1990.02	642.46	0.22
1	430	TR20	2050.00	155.68	164.73	161.42	164.87	0.001356	2.00	1917.39	650.96	0.26
1	420	TR20	2050.00	154.44	164.57	159.43	164.67	0.000623	1.54	2199.99	655.85	0.18
1	410	TR20	2050.00	156.41	164.32	160.42	164.47	0.001185	1.90	1672.91	489.72	0.25
1	400	TR20	2050.00	156.22	163.51	160.47	163.97	0.003091	3.05	745.26	161.42	0.39
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.41	160.48	163.89	0.003266	3.11	729.46	161.14	0.40
1	380	TR20	2050.00	155.82	162.63	159.56	162.90	0.002058	2.32	884.53	160.90	0.32
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	162.33	157.99	162.47	0.000902	1.65	1243.94	204.15	0.21
1	365		Bridge									
1	360	TR20	2050.00	154.43	162.16	157.99	162.30	0.000988	1.70	1208.89	203.67	0.22
1	350	TR20	2050.00	153.45	161.77	157.46	162.01	0.001397	2.16	953.94	150.46	0.27
1	340	TR20	2056.00	154.08	161.42	158.01	161.61	0.001473	1.94	1102.90	354.83	0.27
1	330	TR20	2056.00	152.53	160.89	157.45	161.15	0.001889	2.28	1004.10	366.15	0.31
1	320	TR20	2056.00	151.21	160.29	156.45	160.62	0.001967	2.71	1187.93	378.66	0.32
1	315	TR20	2056.00	150.82	160.14	155.92	160.28	0.001027	1.98	2126.87	935.63	0.23
1	312.5		Inl Struct									
1	310	TR20	2056.00	150.82	158.85	155.90	159.14	0.002395	2.67	1339.54	481.47	0.35
1	300	TR20	2063.00	150.95	158.56	155.45	158.68	0.001304	1.73	1856.07	640.17	0.25
1	295	TR20	2063.00	151.36	158.52	153.61	158.58	0.000514	1.25	2427.12	687.33	0.16
1	290	TR20	2063.00	149.62	158.32	154.07	158.47	0.001069	1.69	1219.49	534.84	0.23
1	280	TR20	2063.00	149.20	158.01	154.04	158.18	0.001238	2.00	1549.23	453.81	0.25
1	270	TR20	2063.00	149.22	157.49	154.07	157.79	0.002127	2.61	1229.00	445.24	0.33
1	260	TR20	2063.00	148.81	156.84	153.87	157.26	0.002905	2.99	929.93	279.75	0.38
1	250	TR20	2063.00	148.71	156.53	152.88	156.73	0.001644	2.12	1412.59	503.20	0.29
1	240	TR20	2063.00	149.18	156.16	152.64	156.34	0.001327	1.95	1511.41	720.33	0.26
1	230	TR20	2063.00	149.20	155.88	152.42	156.02	0.001154	1.75	1556.08	429.00	0.24
1	220	TR20	2063.00	147.66	155.42	152.75	155.68	0.002132	2.44	1238.18	392.68	0.33

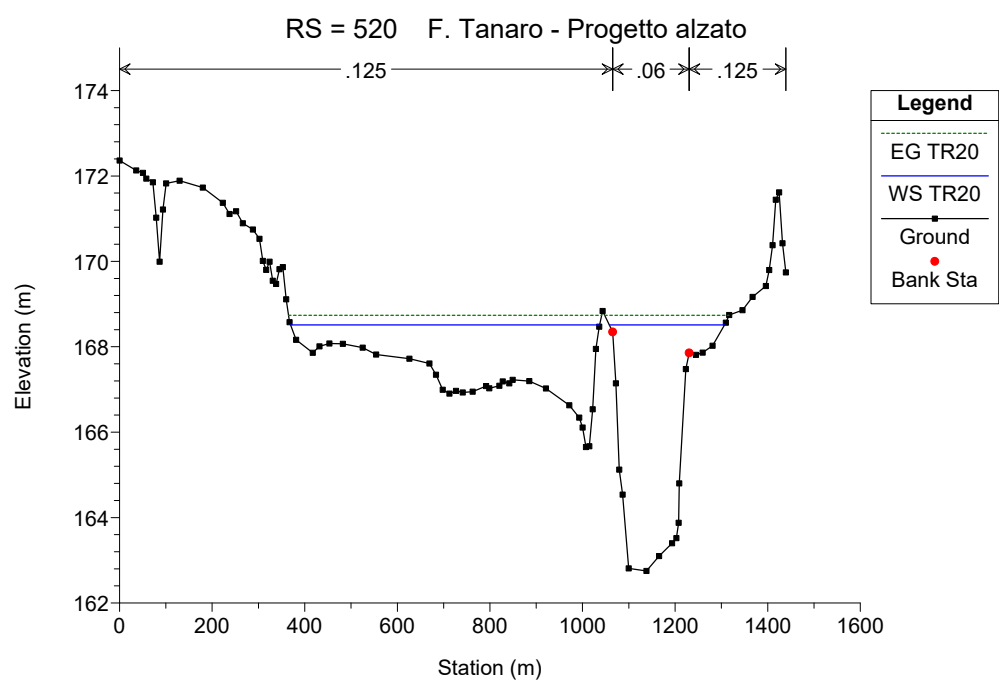
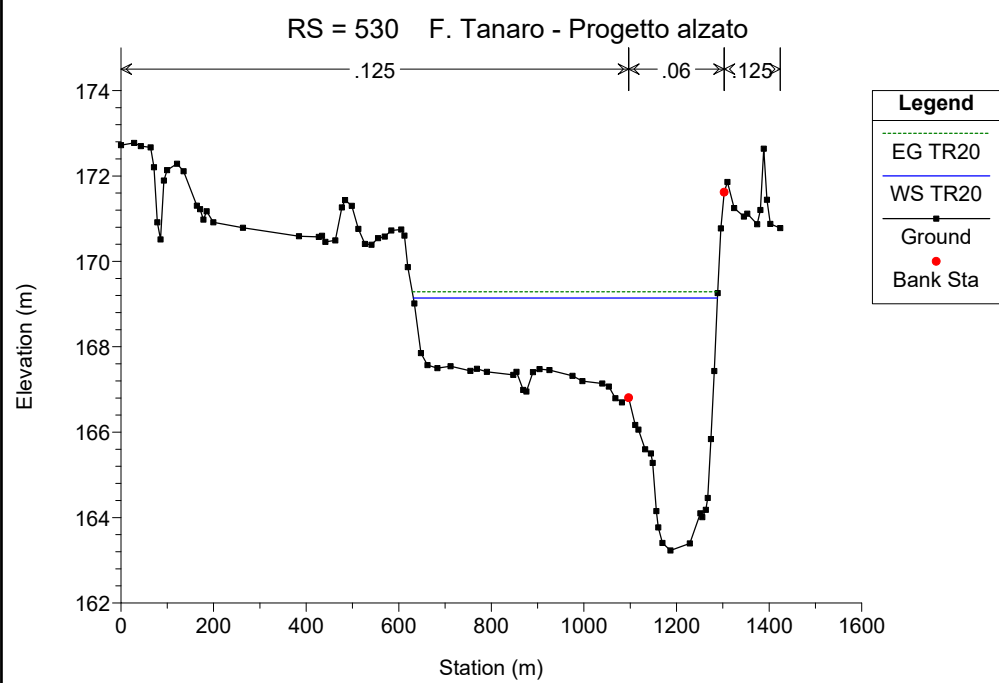
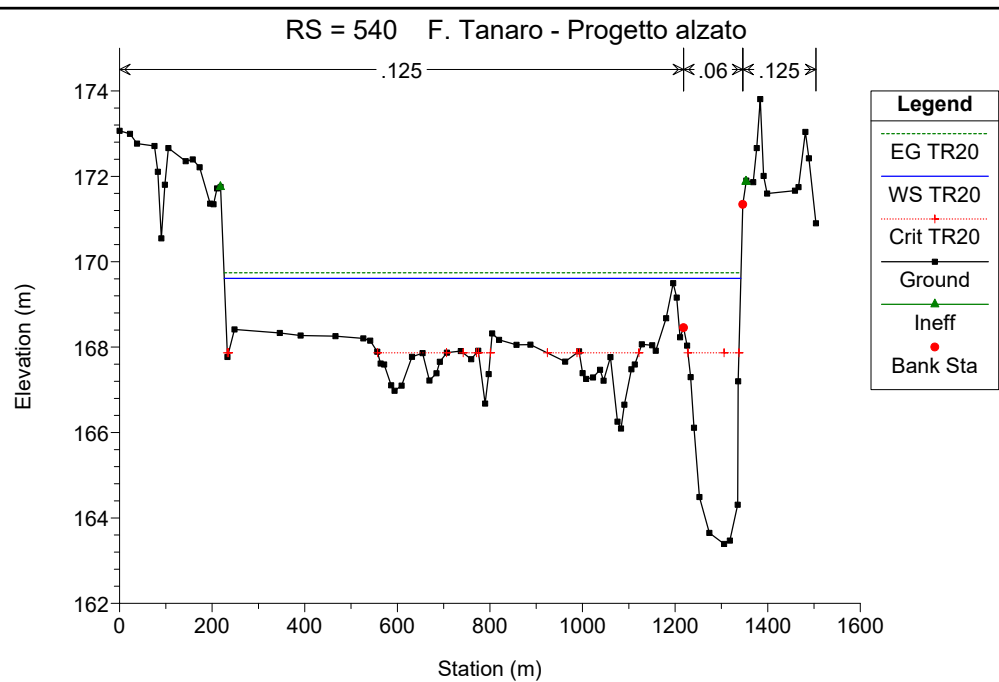
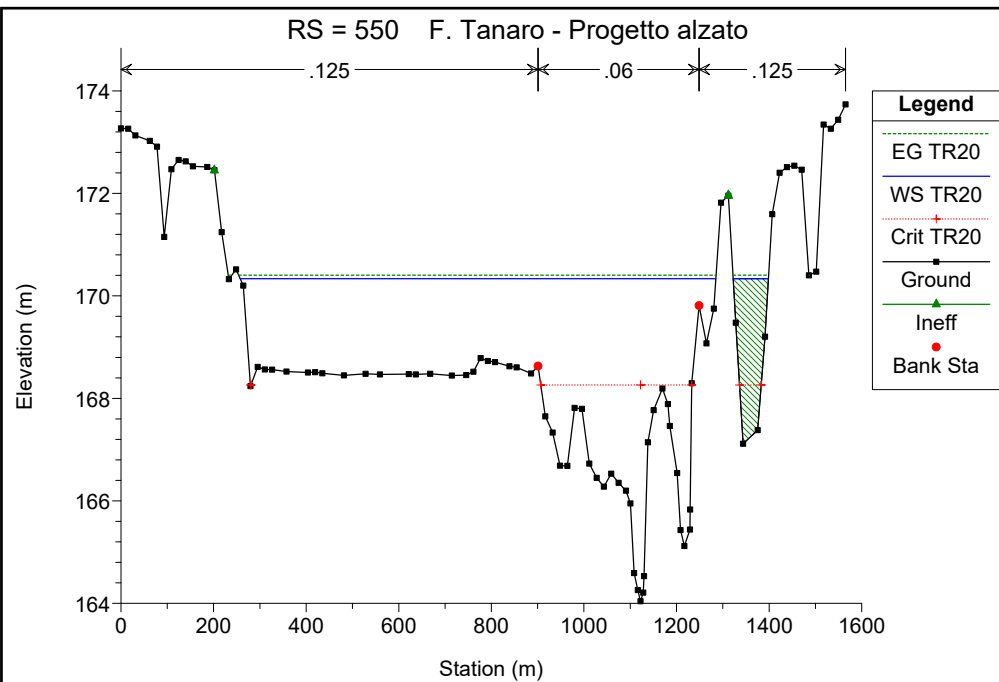
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (Continued)

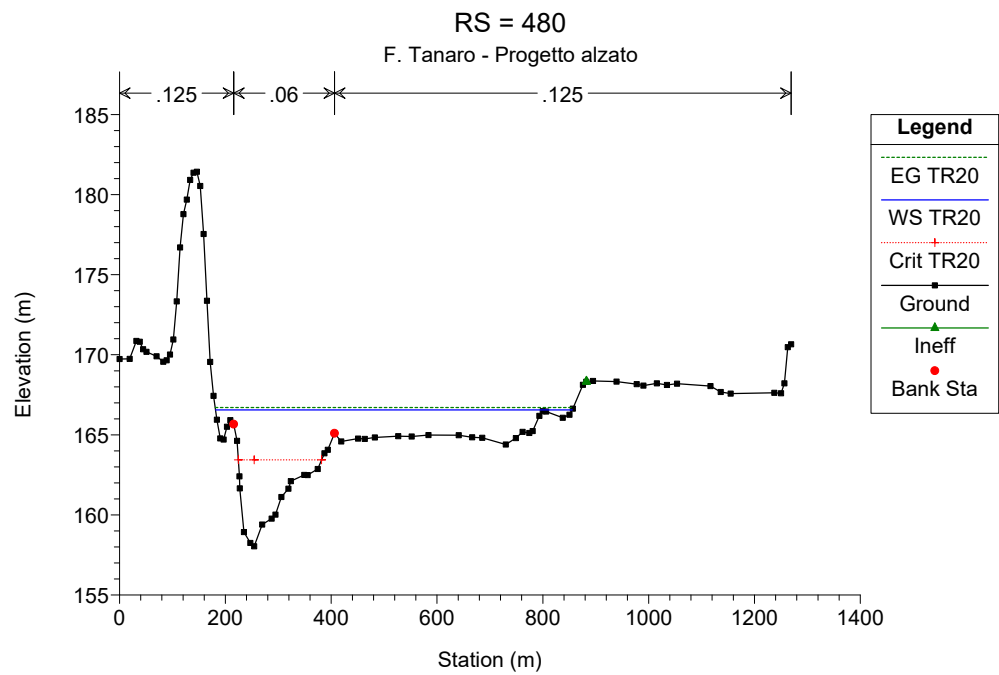
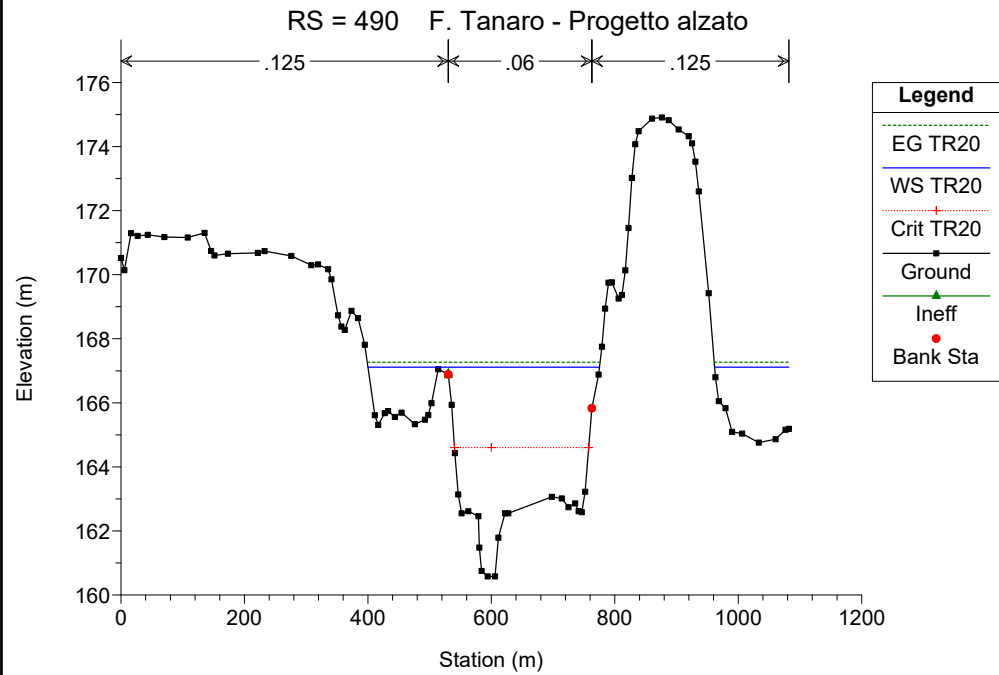
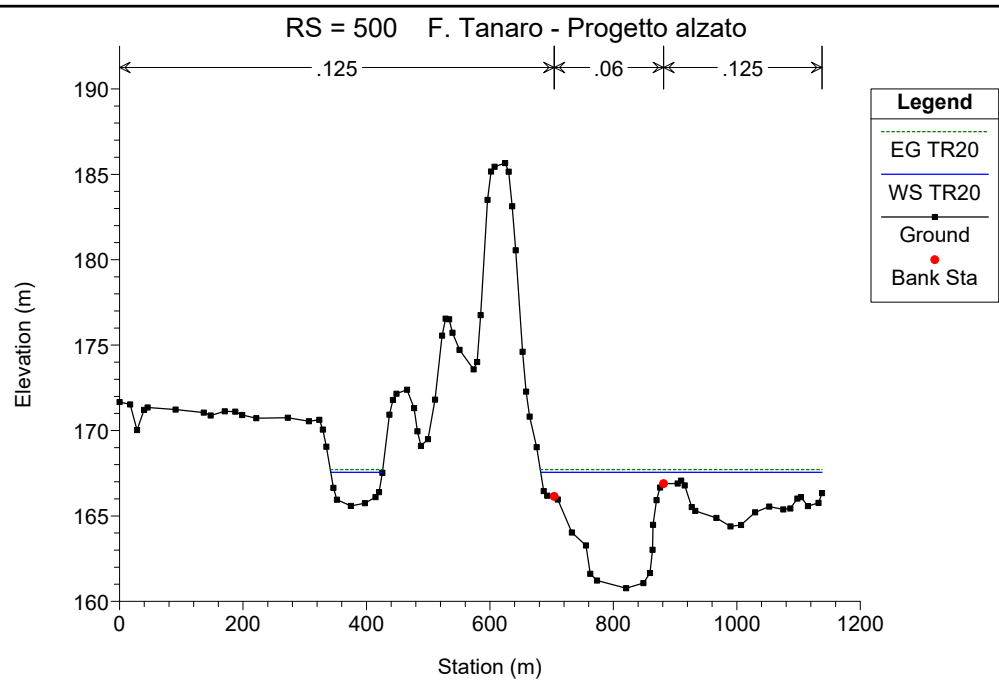
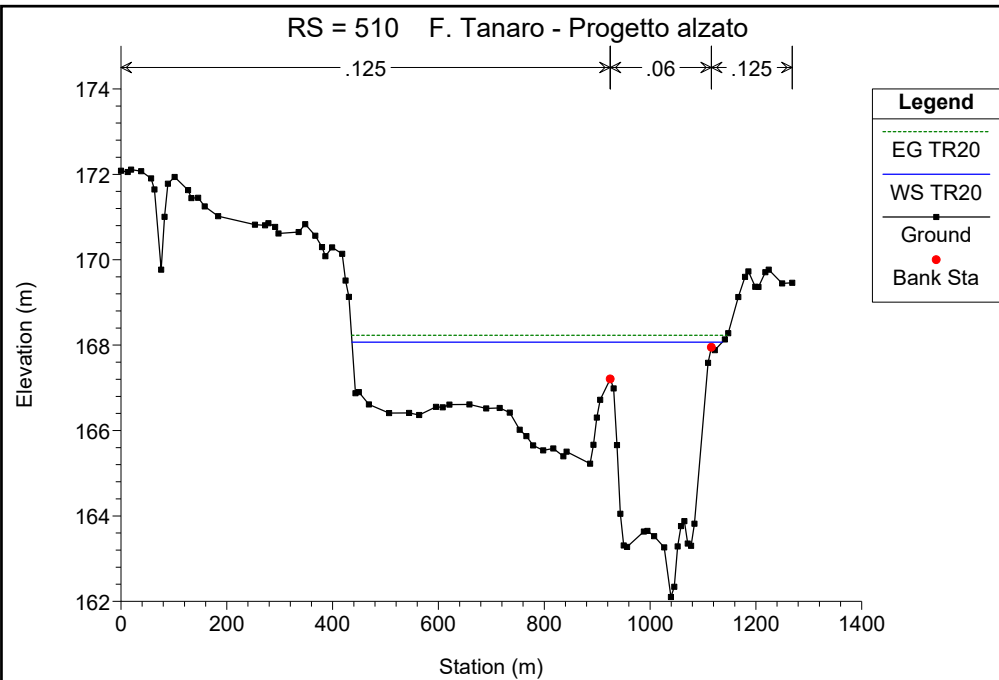
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR20	2063.00	147.59	155.03	152.16	155.21	0.001608	1.99	1388.20	529.67	0.28
1	205	TR20	2063.00	147.37	154.74	151.78	154.85	0.001154	1.61	2146.51	949.86	0.23
1	200	TR20	2063.00	146.60	154.16	151.75	154.37	0.002071	2.35	1849.52	1046.66	0.32
1	190	TR20	2063.00	146.85	153.67	151.41	153.82	0.002019	1.93	1796.20	938.82	0.30
1	180	TR20	2063.00	145.66	153.42	149.88	153.48	0.000654	1.18	2576.55	1068.32	0.18
1	170	TR20	2063.00	145.40	153.11	149.28	153.24	0.001369	1.68	1661.55	877.65	0.25
1	160	TR20	2063.00	145.46	152.66	149.08	152.77	0.001038	1.55	1768.38	905.63	0.22
1	150	TR20	2063.00	143.53	152.25	148.27	152.42	0.001133	1.87	1519.32	1054.73	0.24
1	140	TR20	2063.00	143.00	151.58	148.51	151.92	0.002745	2.60	929.04	832.43	0.36
1	135		Inl Struct									
1	130	TR20	2063.00	142.54	150.14	146.65	150.41	0.001856	2.26	912.61	161.29	0.30
1	120	TR20	2063.00	142.27	149.59	146.03	149.87	0.001892	2.34	887.59	193.33	0.31
1	110	TR20	2063.00	141.17	149.25	145.94	149.42	0.001467	2.00	1529.16	466.11	0.27
1	100	TR20	2063.00	140.79	148.56	146.26	148.88	0.003214	2.51	821.45	323.82	0.38
1	90	TR20	2063.00	140.59	147.61	144.81	147.98	0.002800	2.68	769.47	146.47	0.37
1	85		Bridge									
1	80	TR20	2063.00	140.59	147.39	144.81	147.79	0.003193	2.80	737.87	143.05	0.39
1	70	TR20	2063.00	139.61	146.44	144.03	146.85	0.003756	2.84	725.34	282.82	0.42
1	60	TR20	2063.00	138.12	146.03	142.33	146.25	0.001552	2.17	1411.65	540.42	0.28
1	50	TR20	2063.00	137.54	145.54	142.63	145.83	0.002266	2.56	1176.52	420.93	0.34
1	40	TR20	2063.00	137.06	144.85	142.54	145.08	0.002442	2.14	965.03	269.25	0.33
1	30	TR20	2063.00	137.37	144.27	141.20	144.49	0.001914	2.10	983.72	482.78	0.30
1	20	TR20	2063.00	136.62	143.77	140.65	143.95	0.001537	2.06	1693.50	671.01	0.28
1	10	TR20	2063.00	135.29	142.81	140.80	143.25	0.004002	3.17	1104.88	622.92	0.44

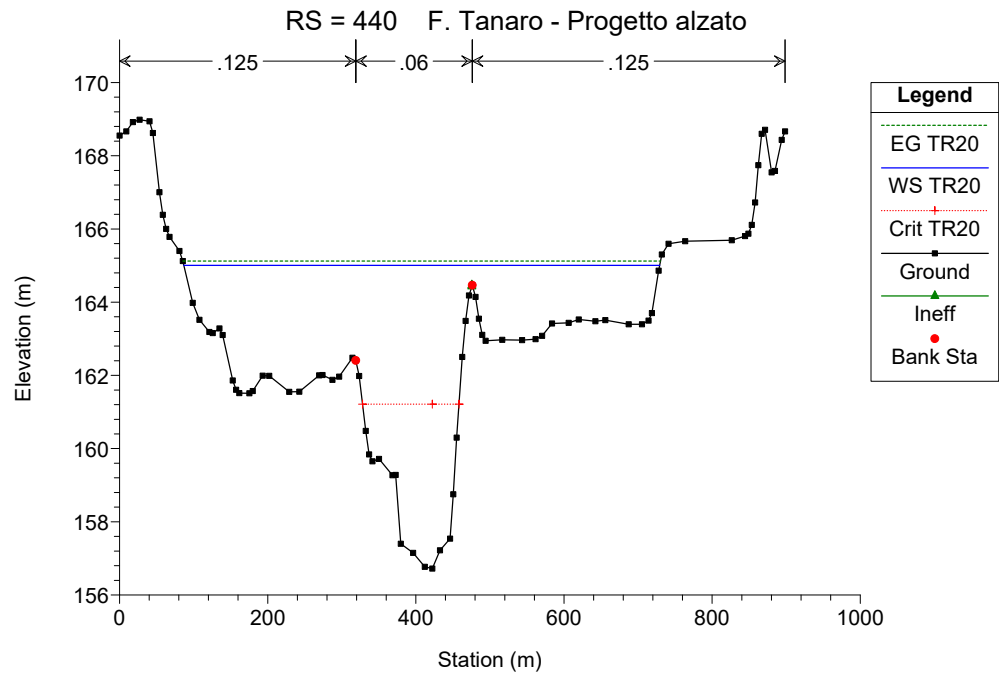
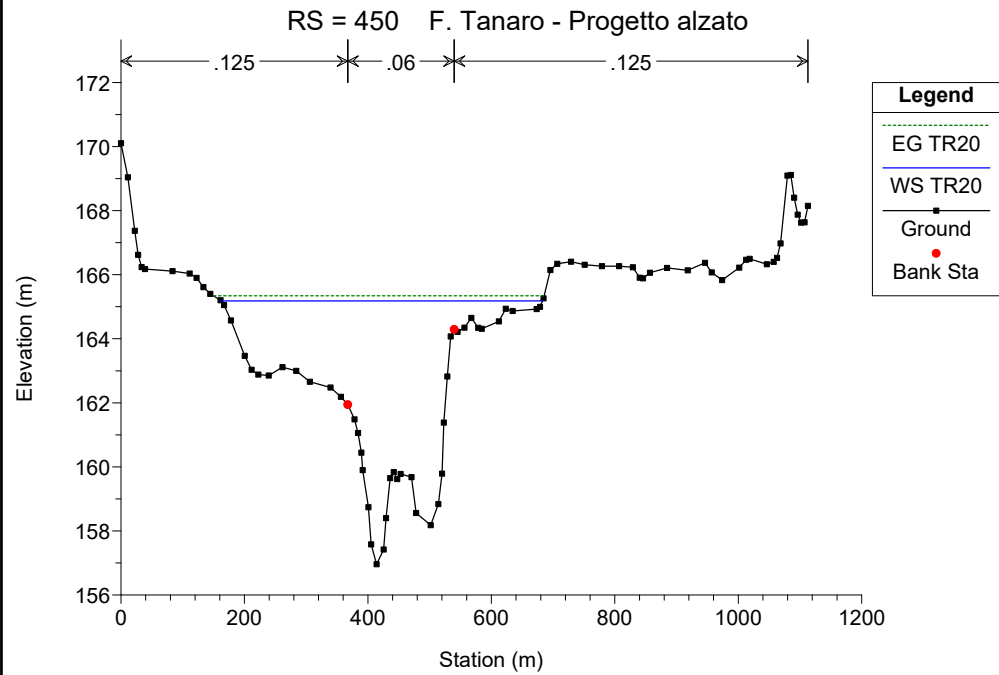
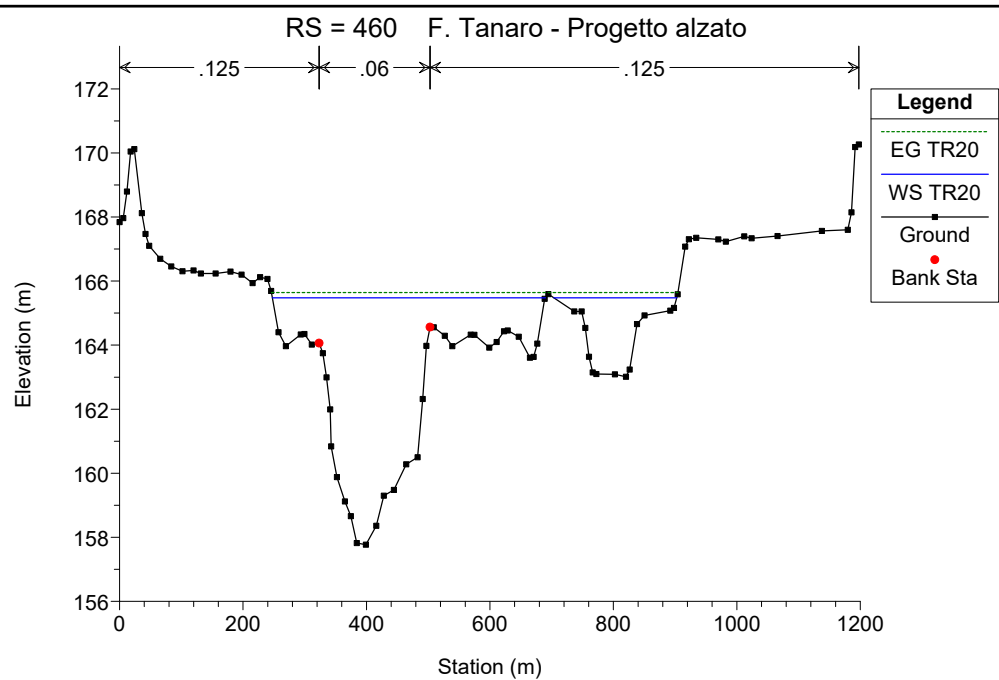
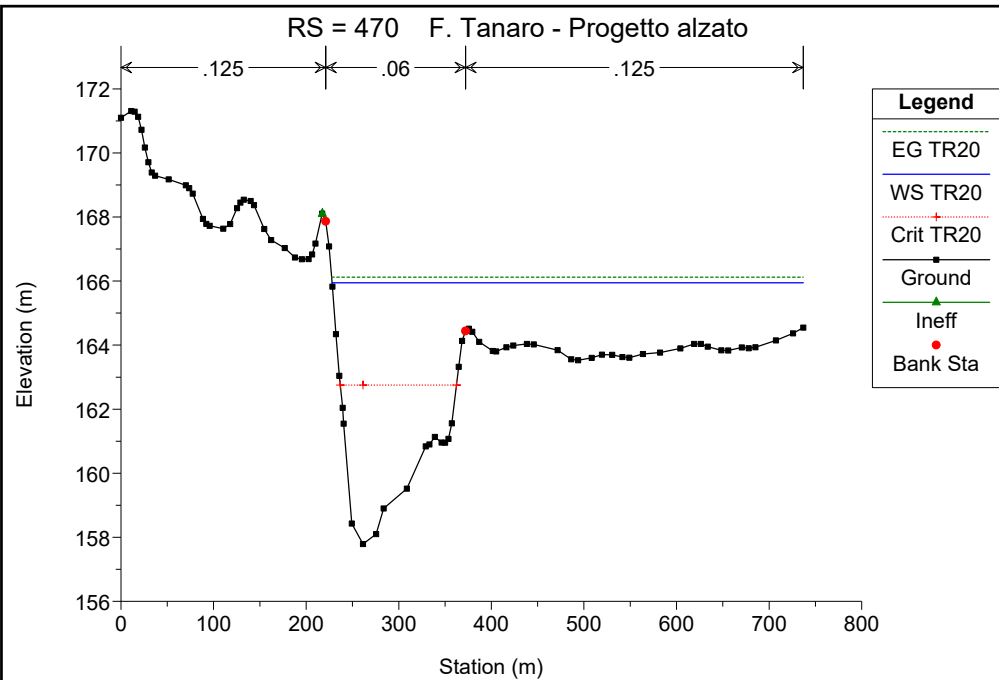
F. Tanaro - Progetto alzato

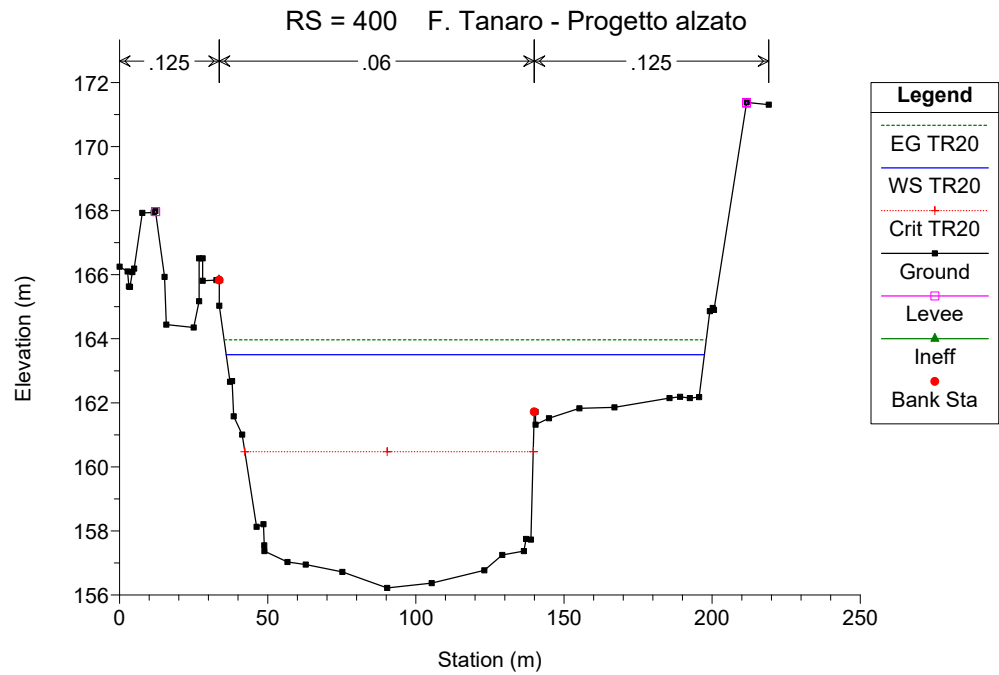
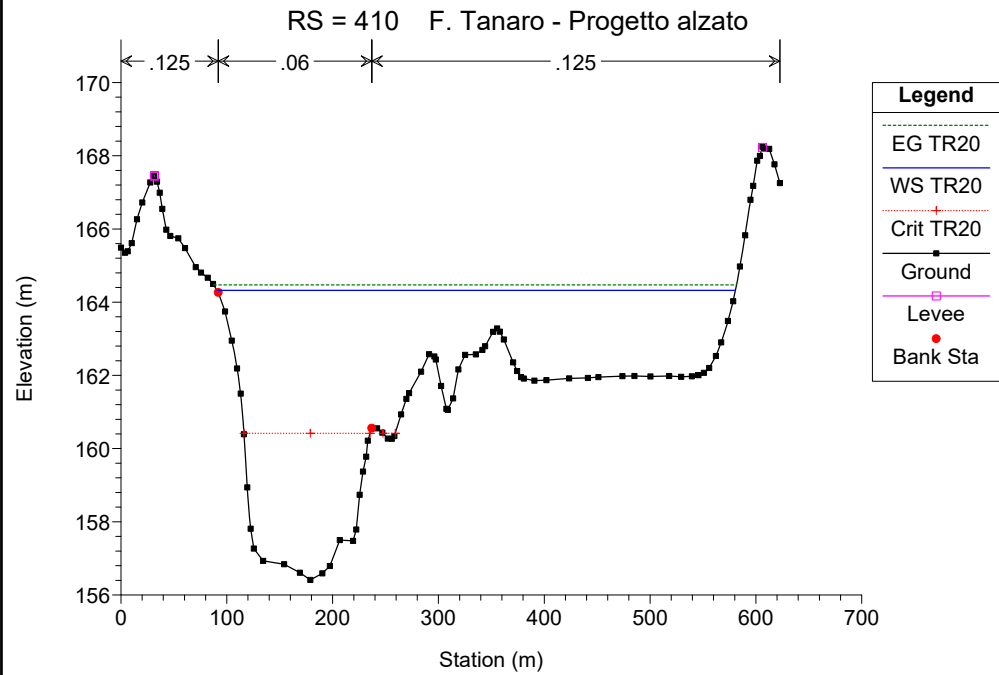
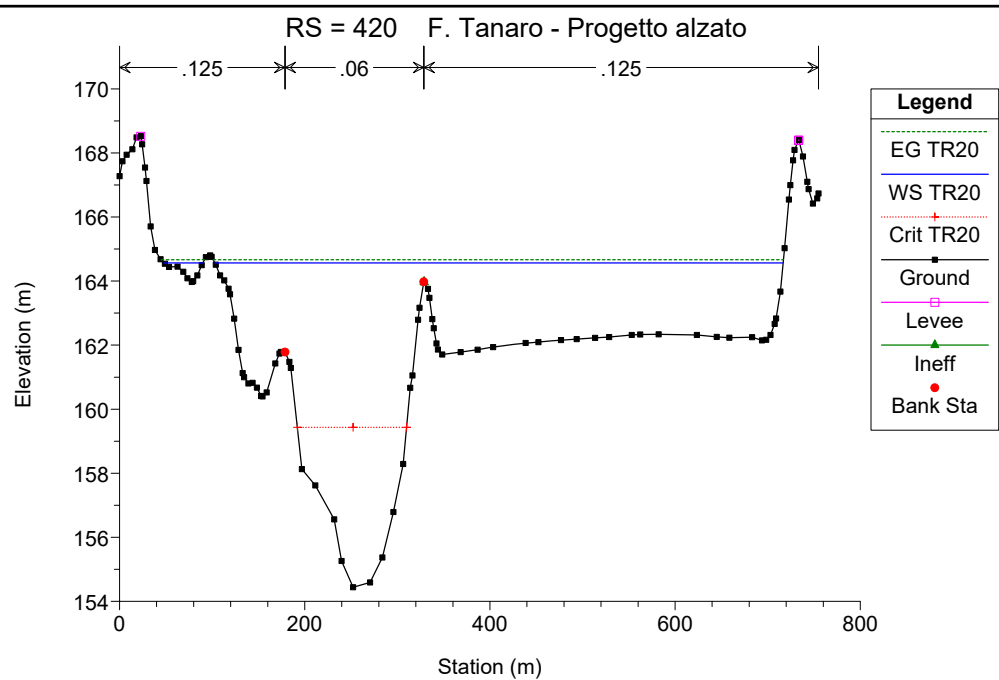
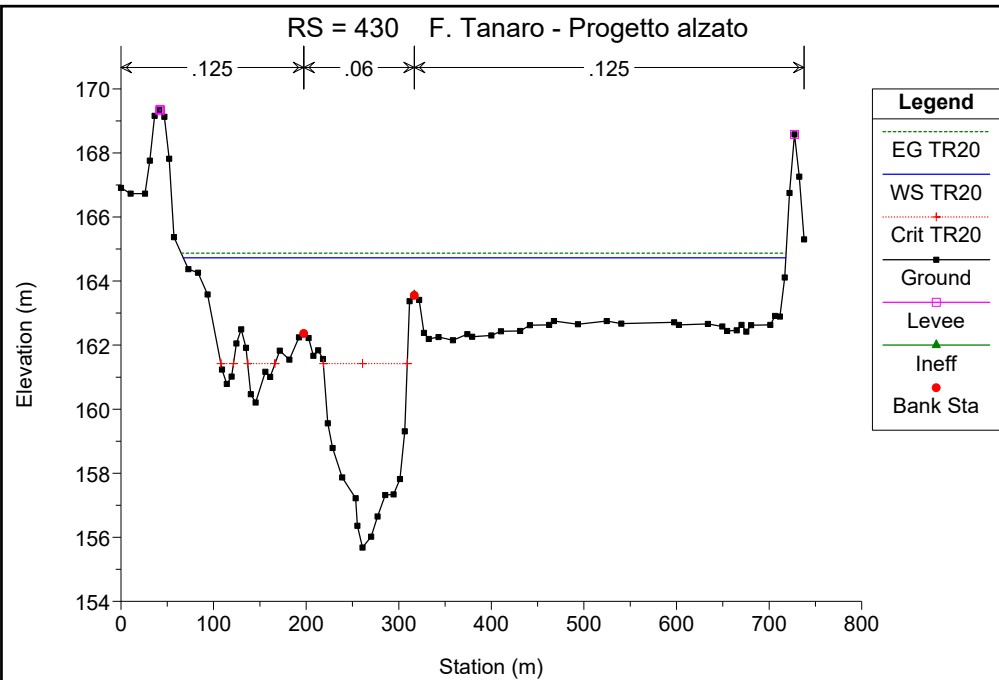
Tanaro 1

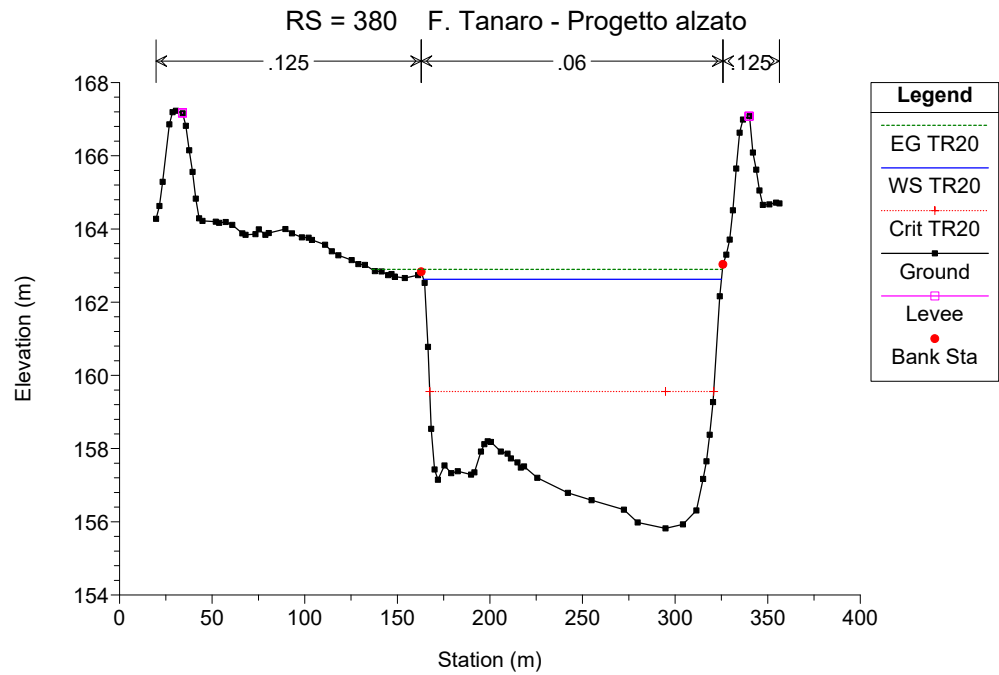
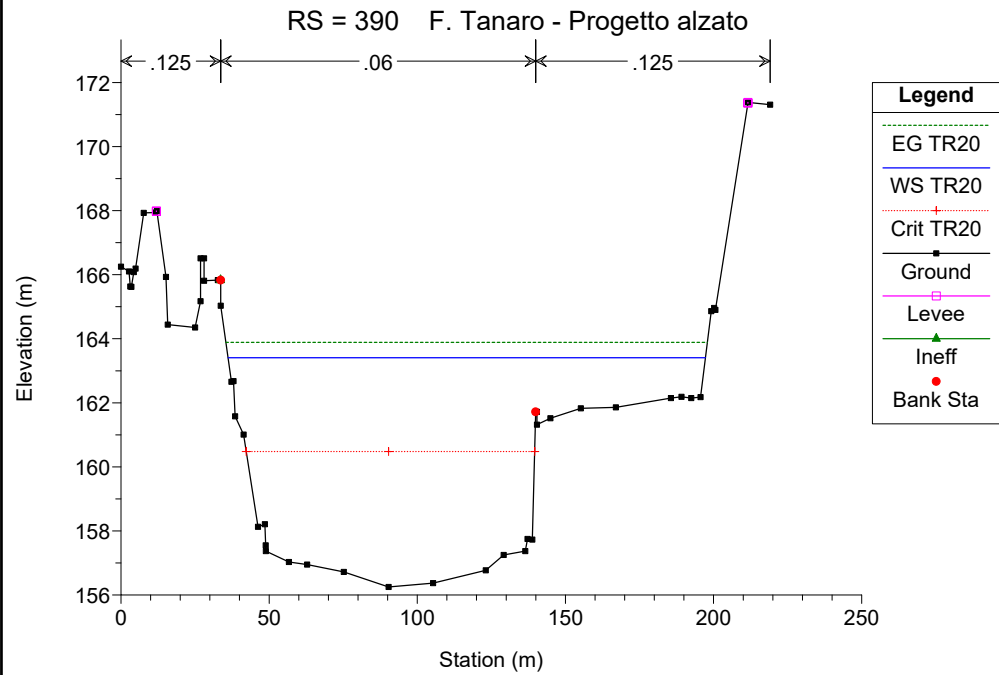
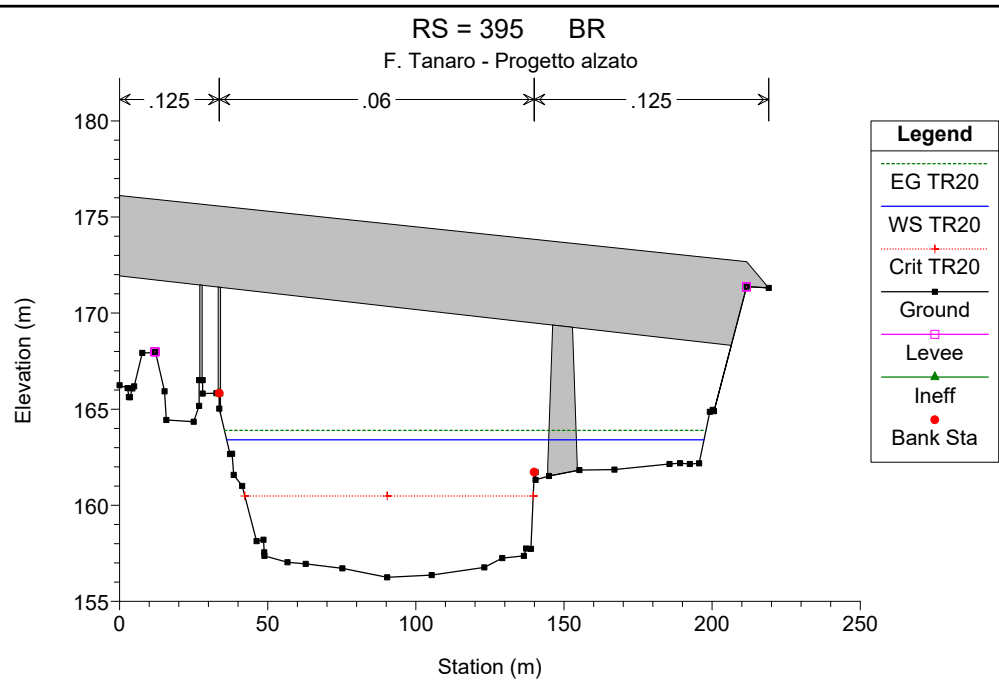
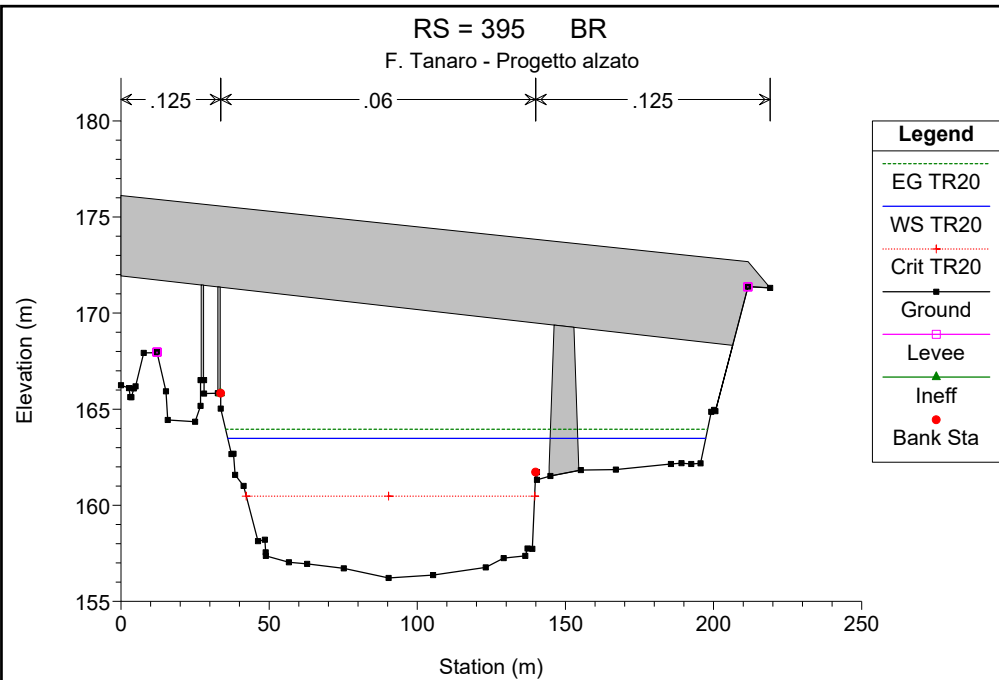


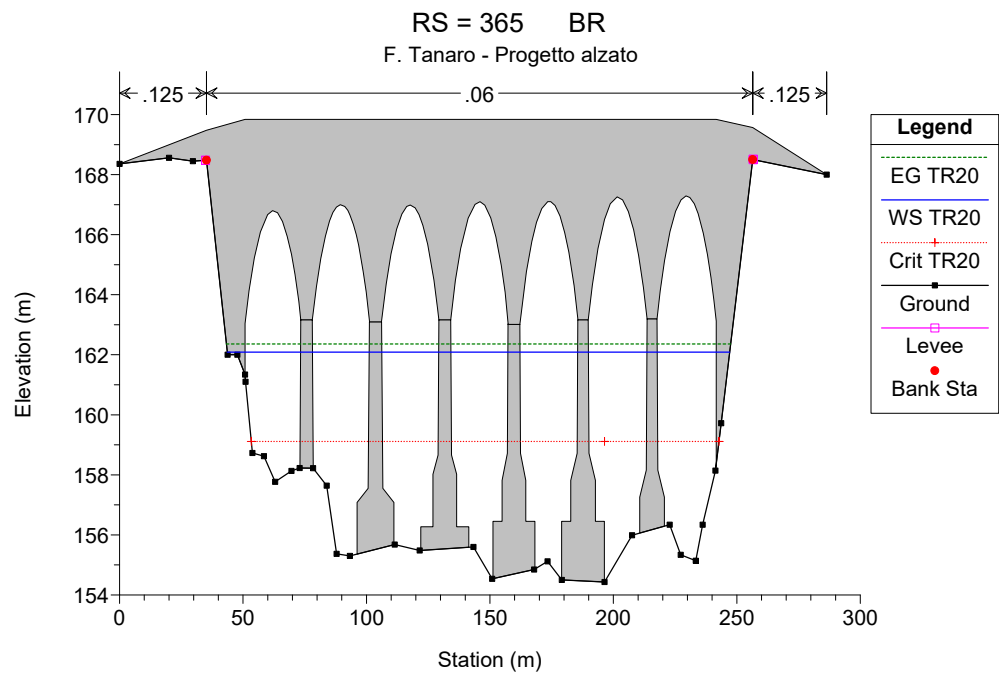
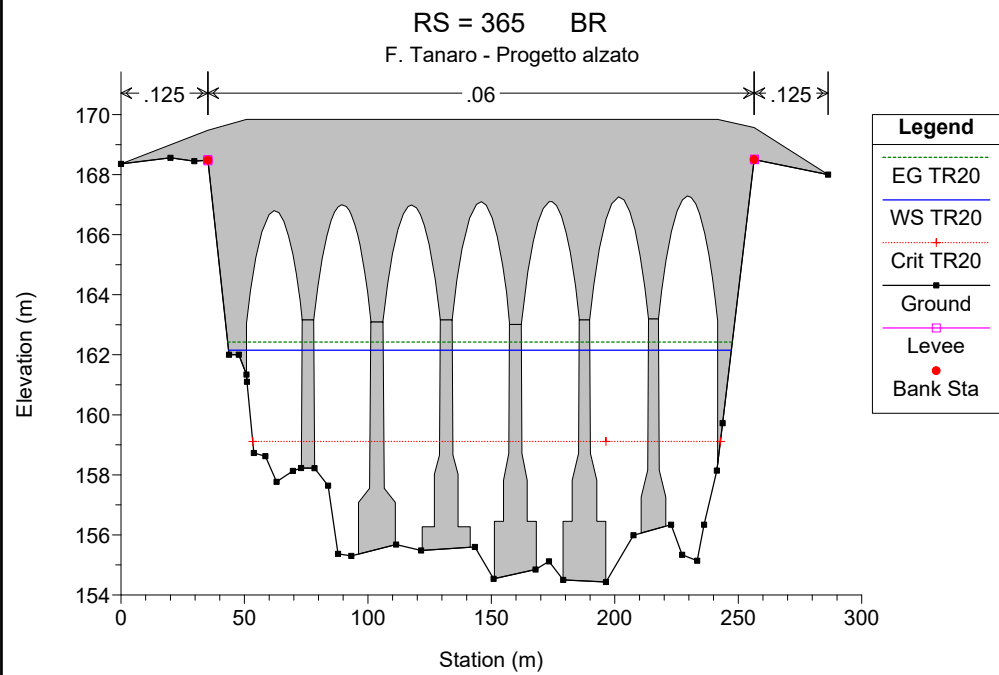
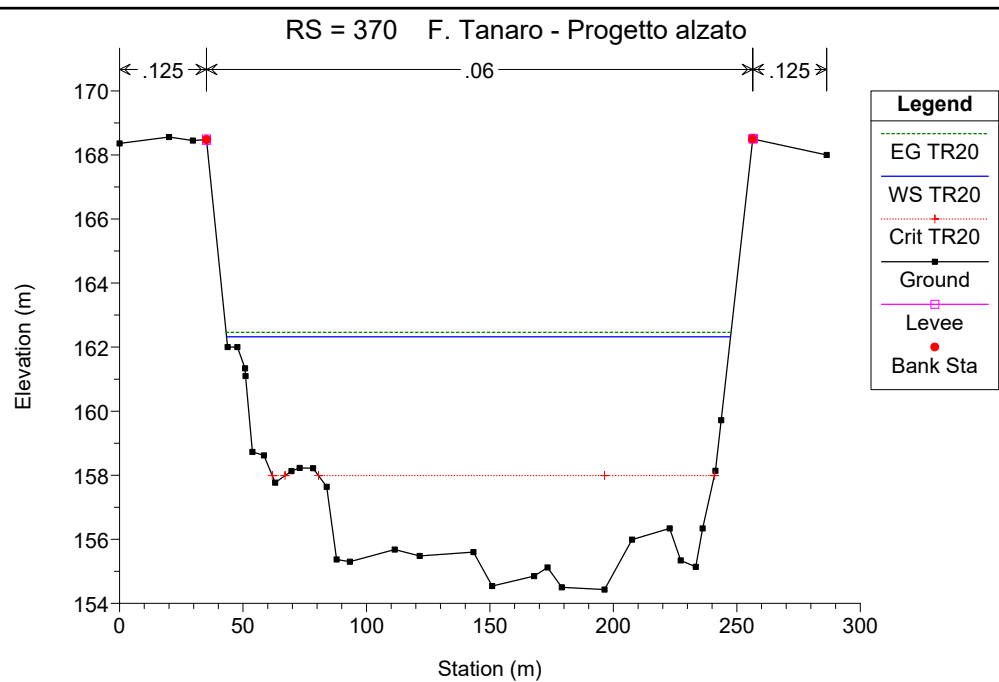
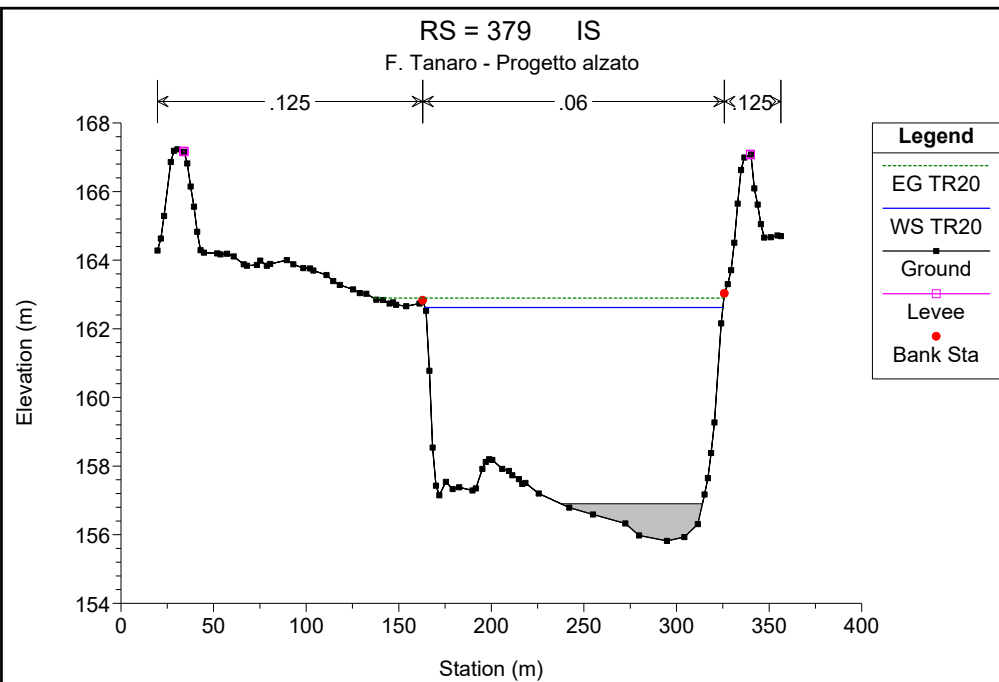


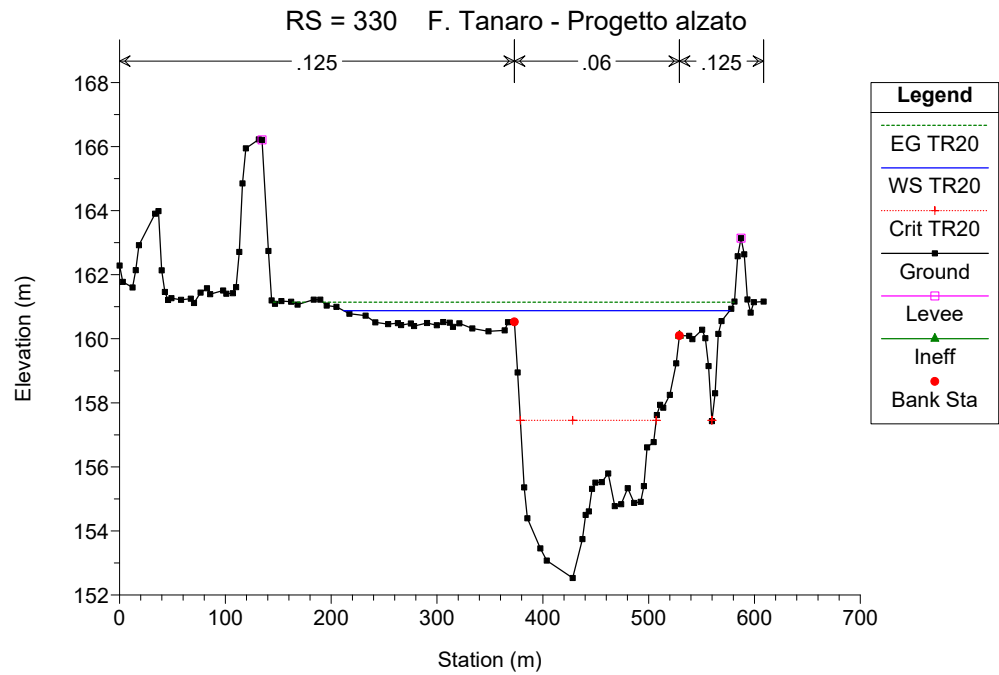
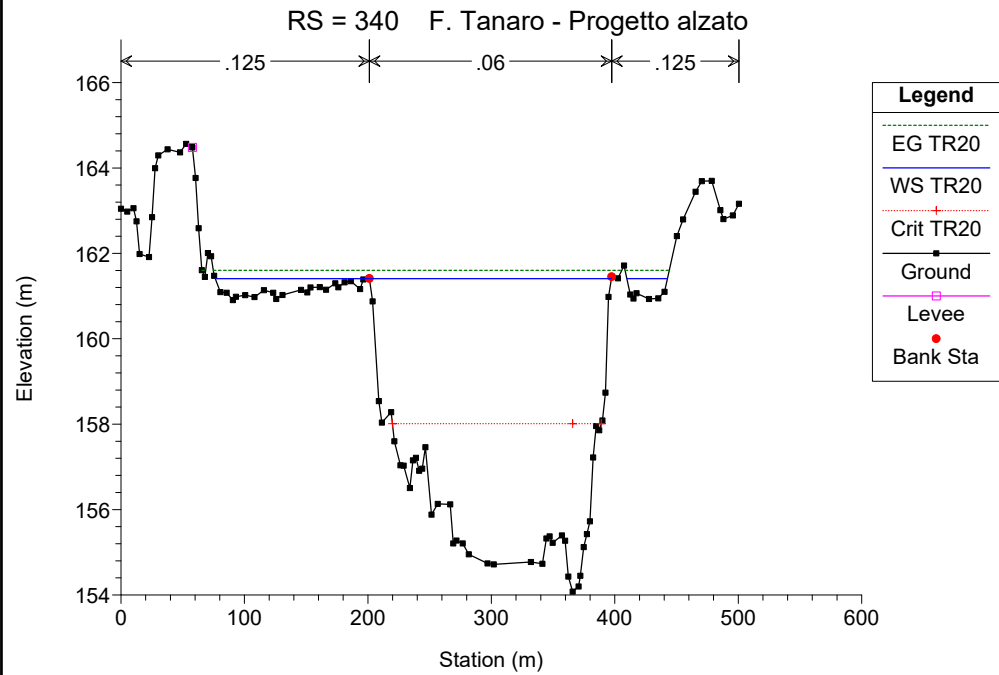
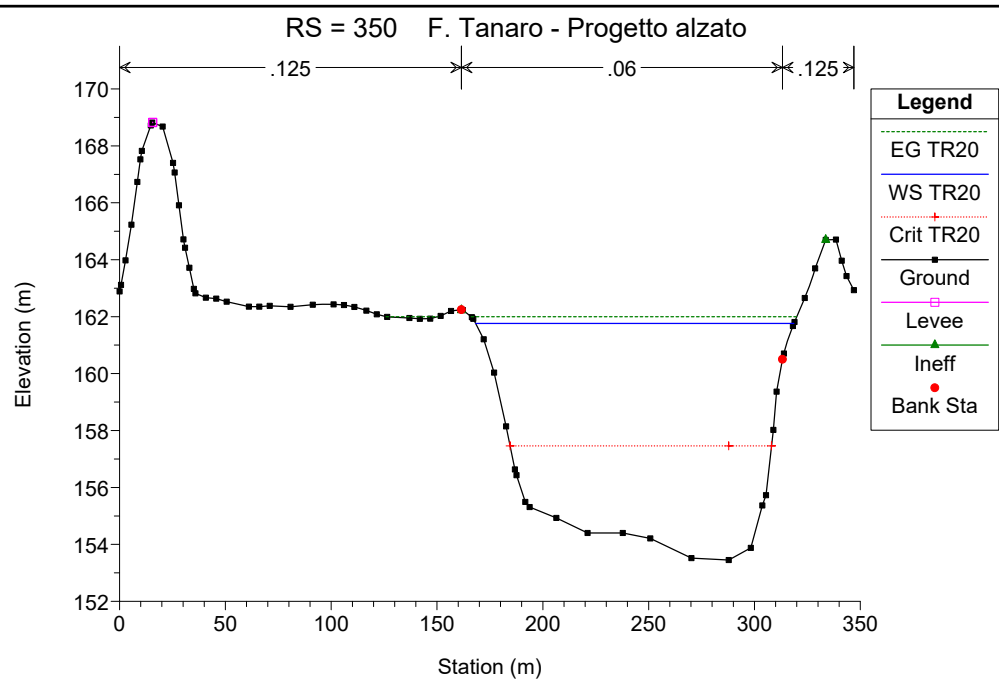
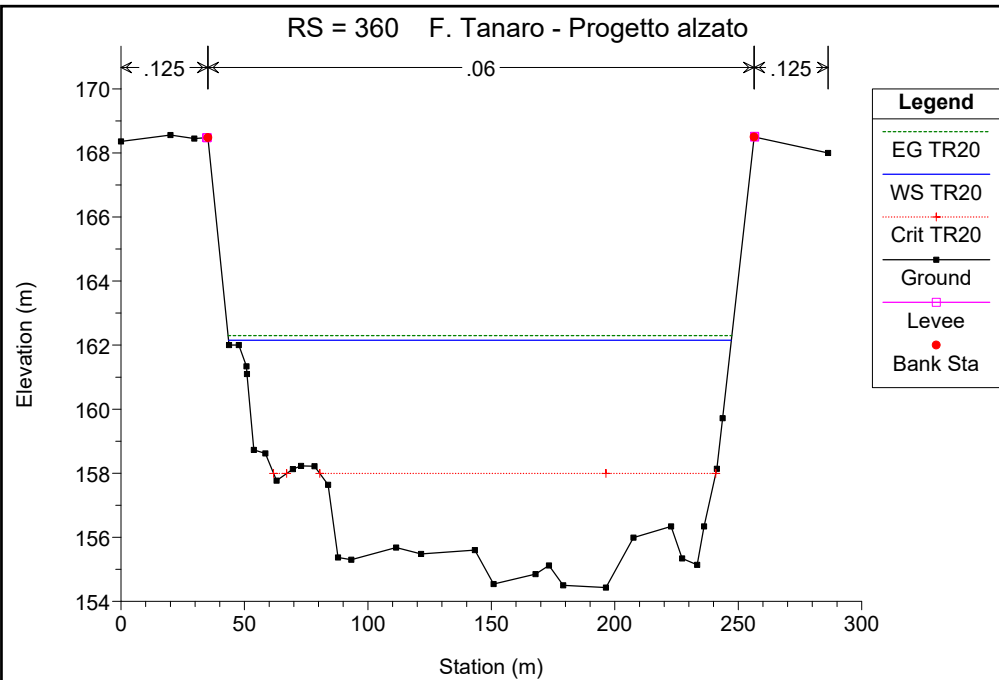


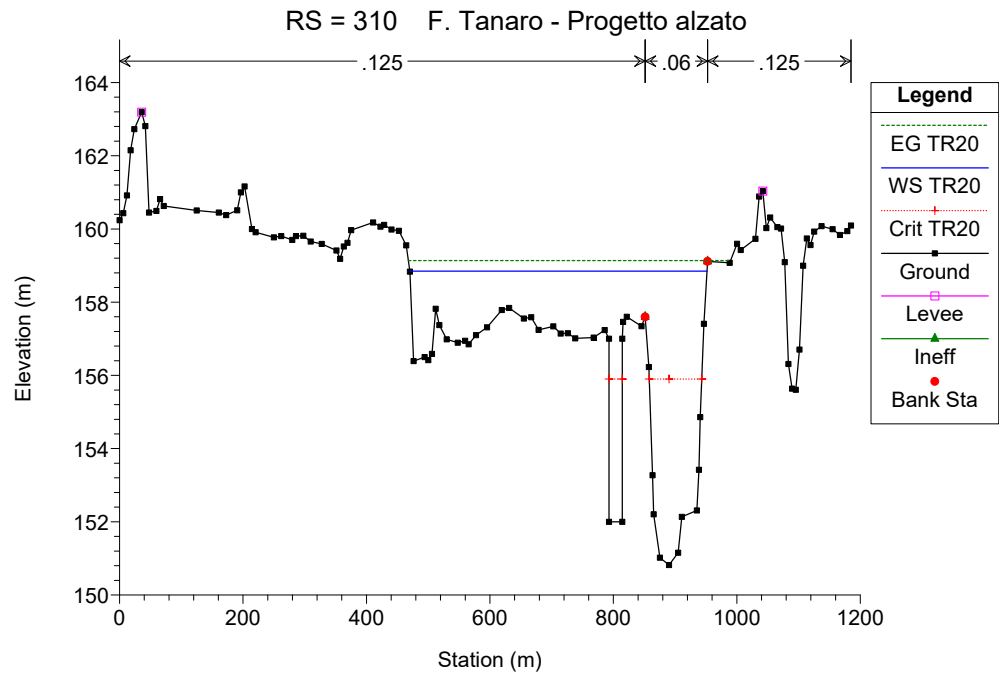
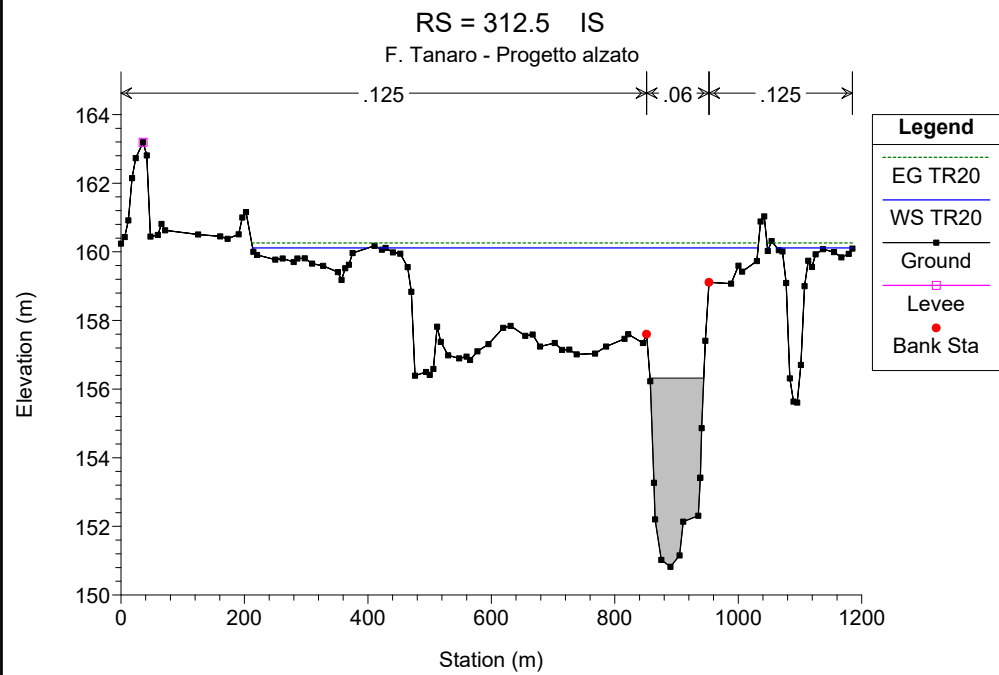
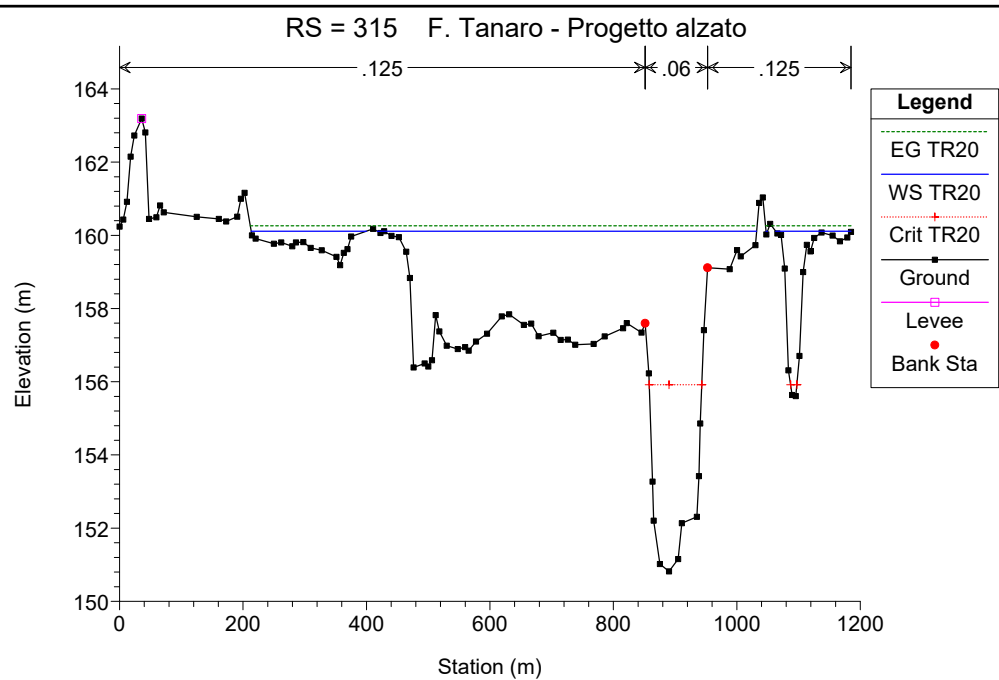
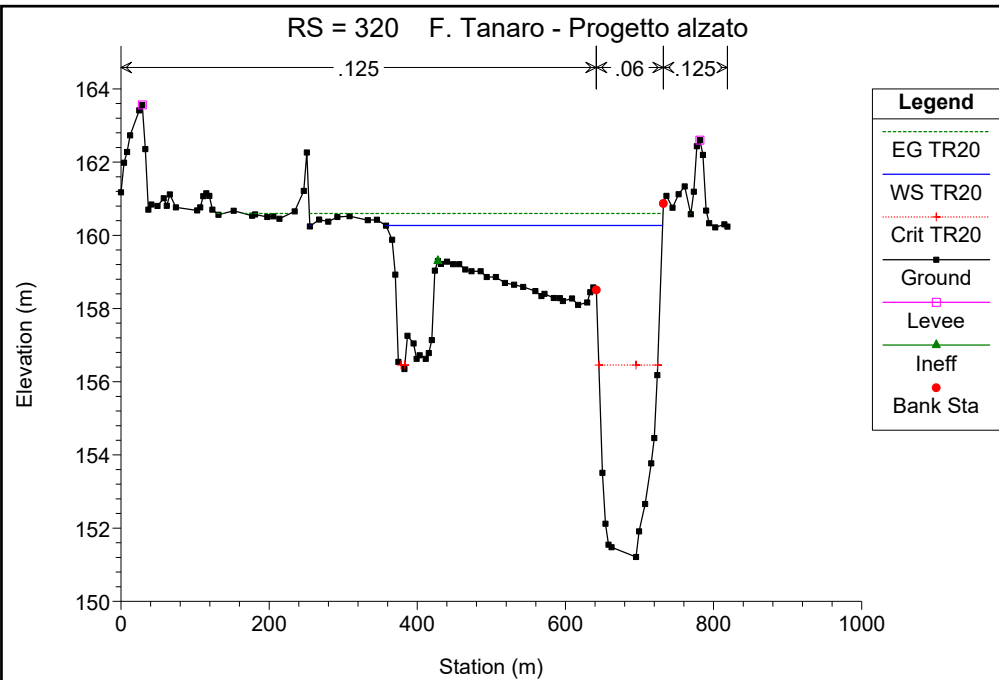


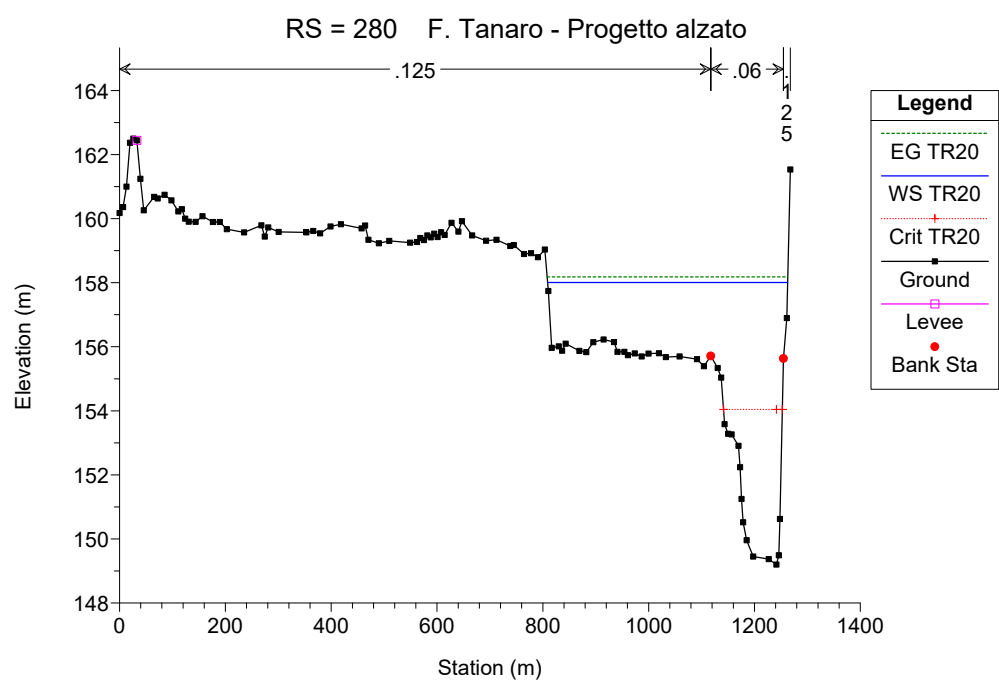
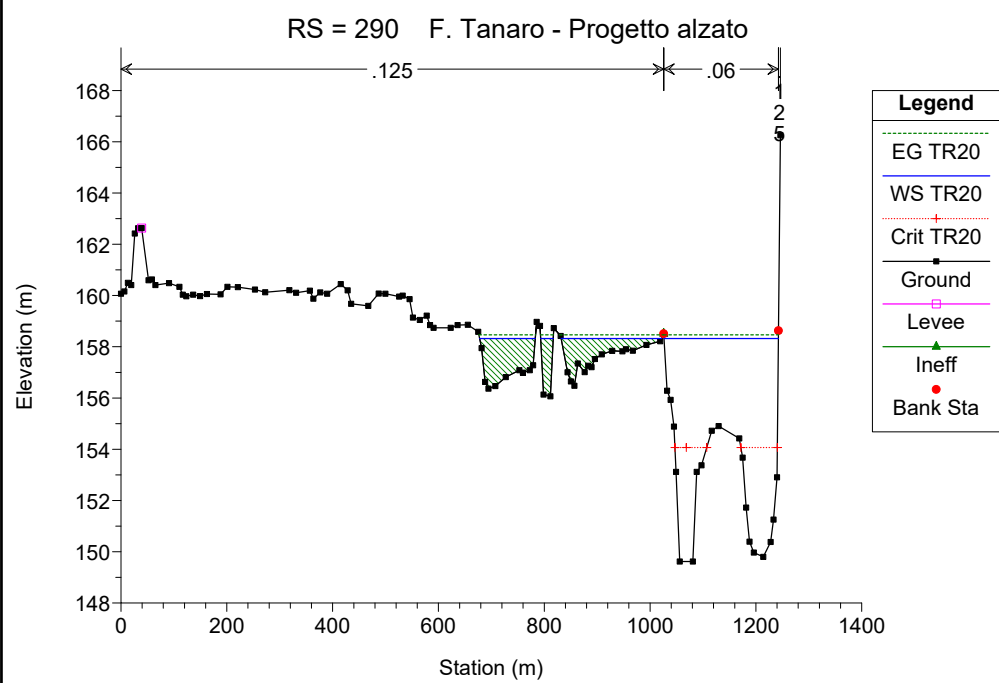
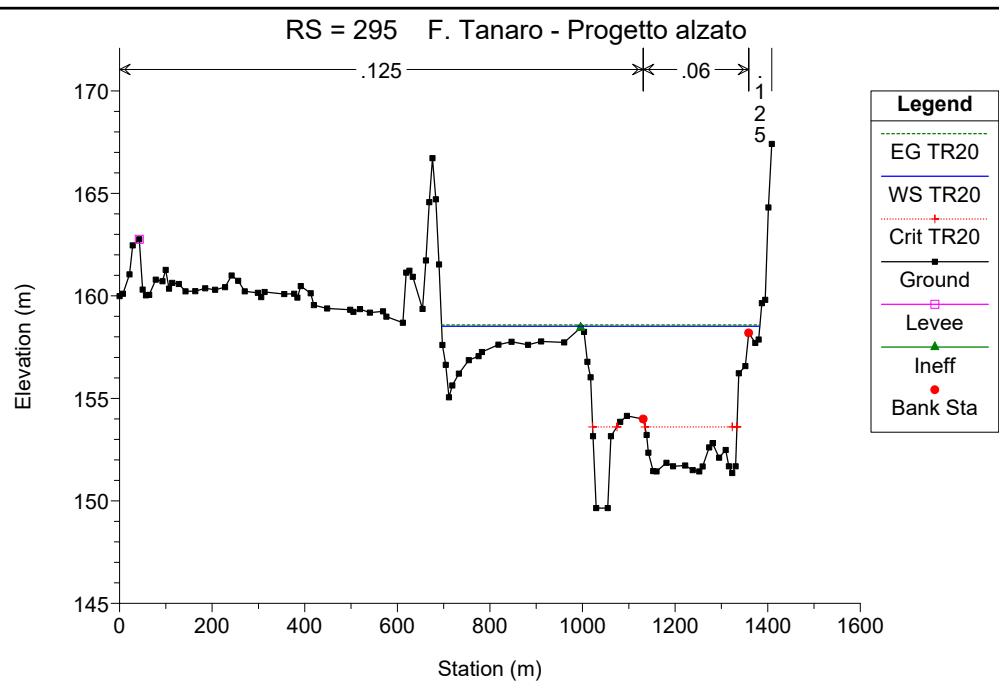
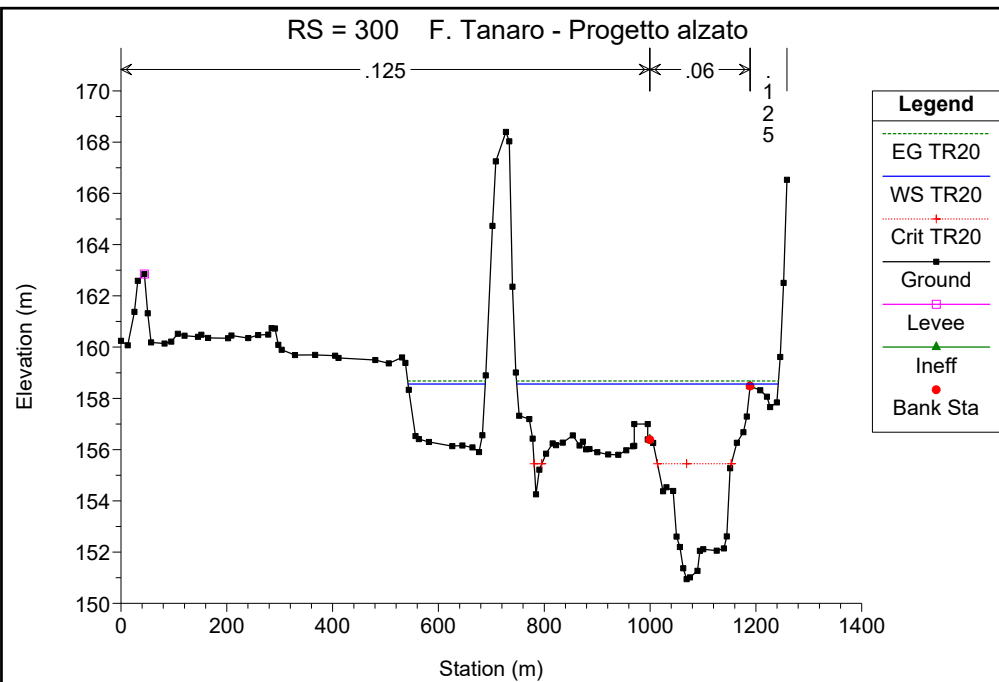


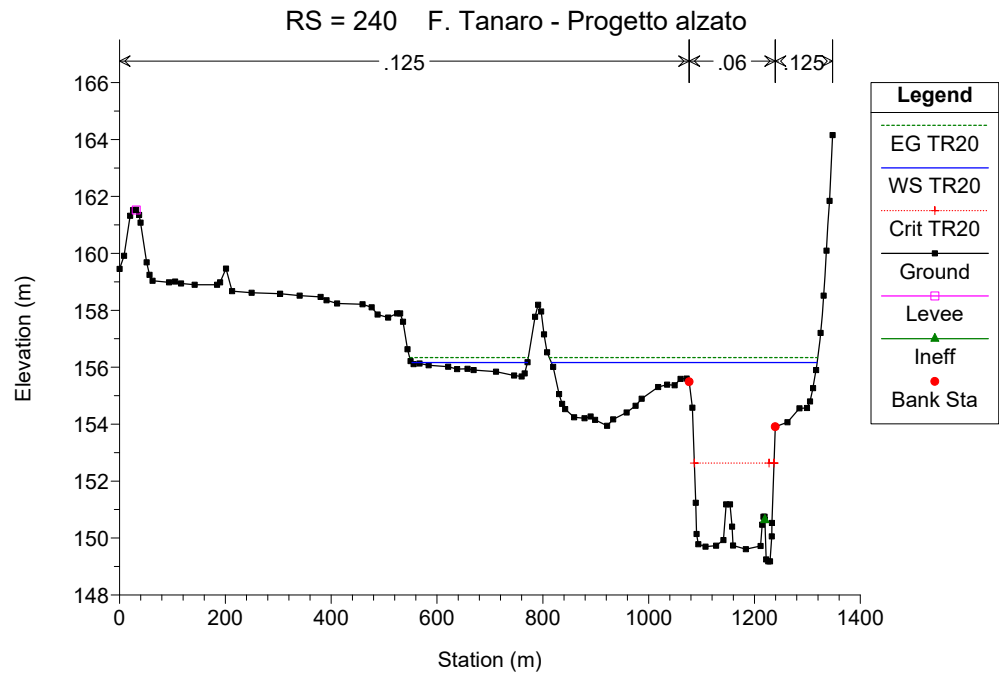
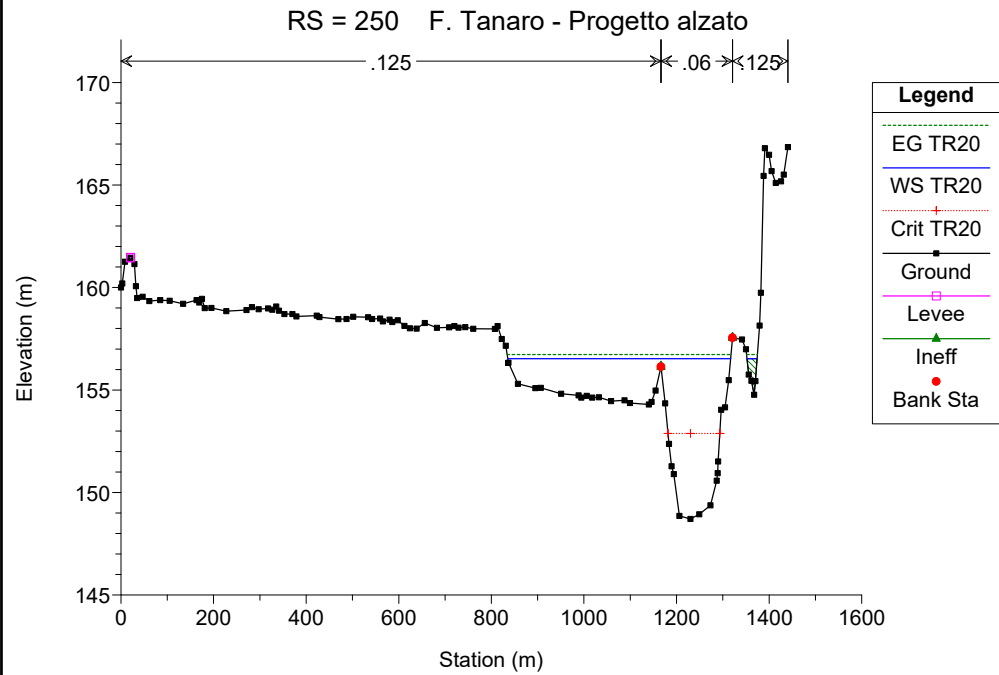
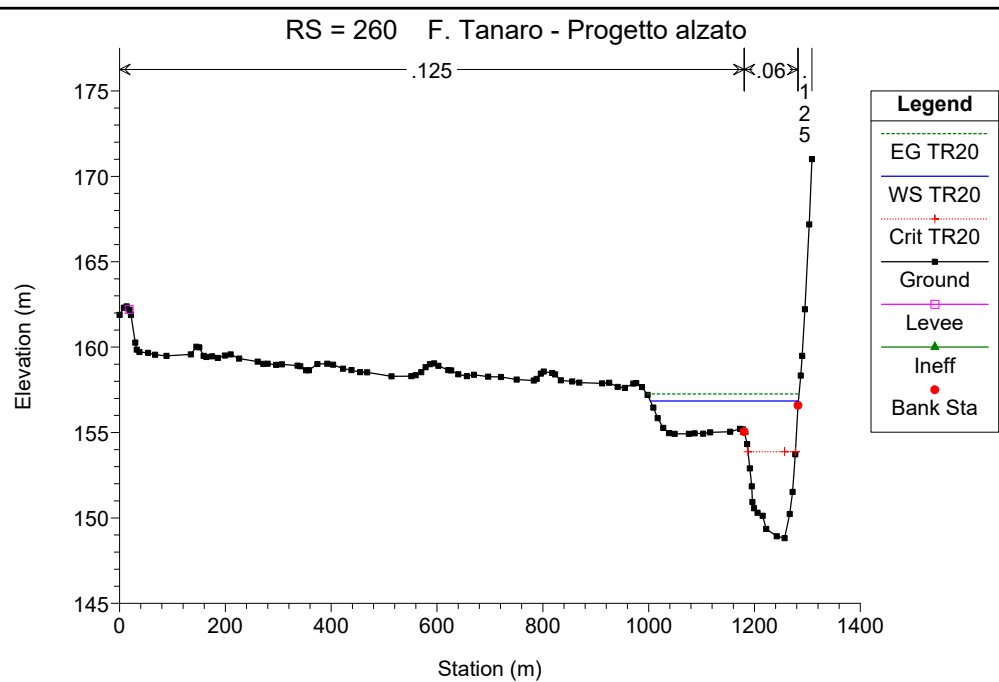
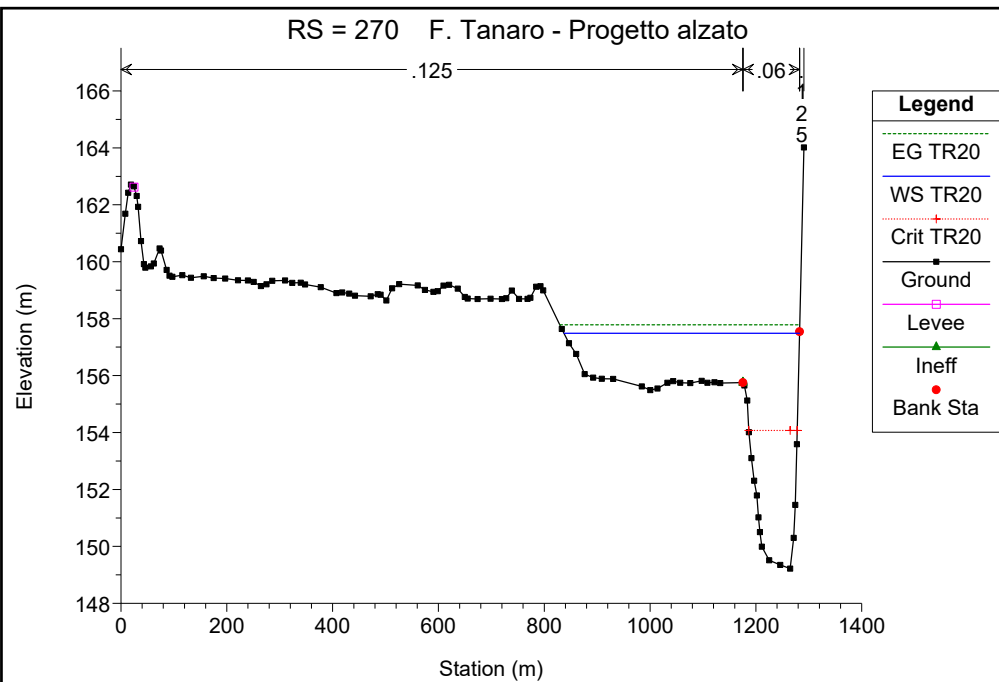


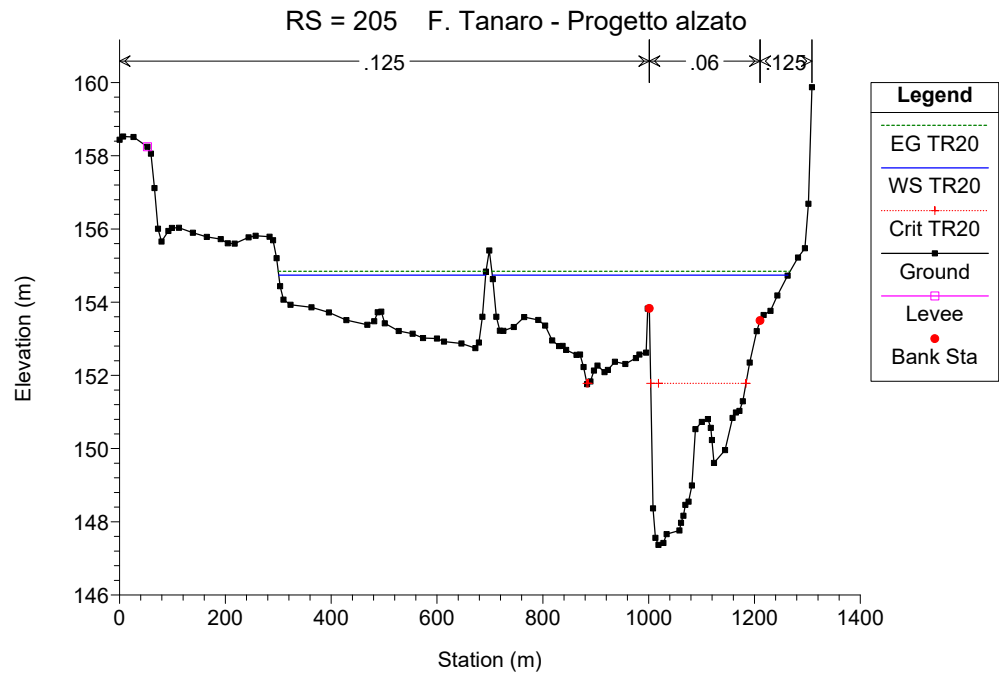
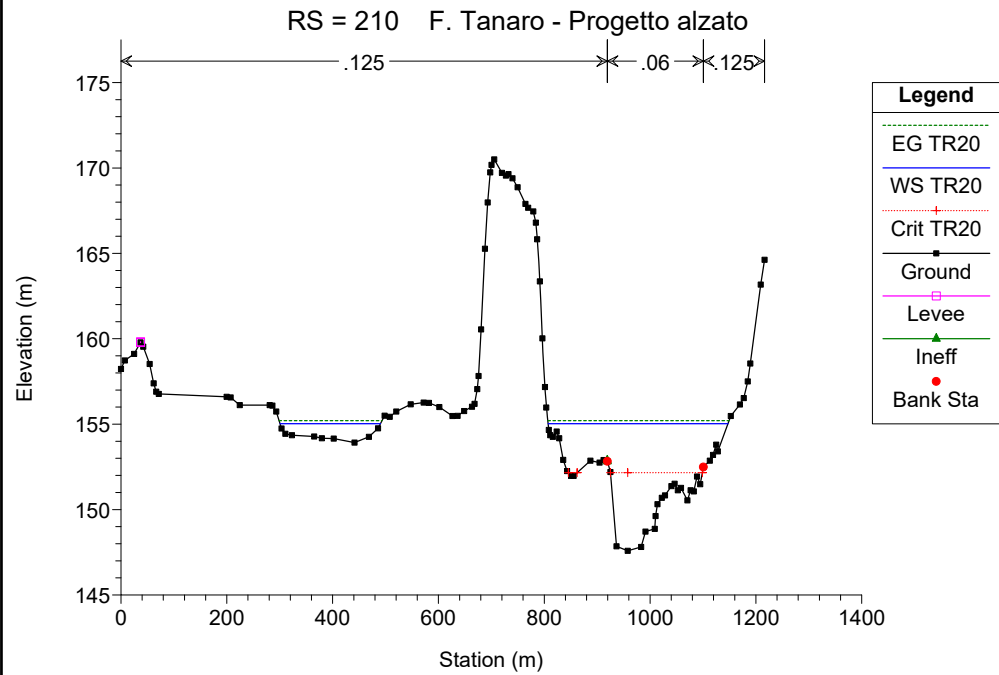
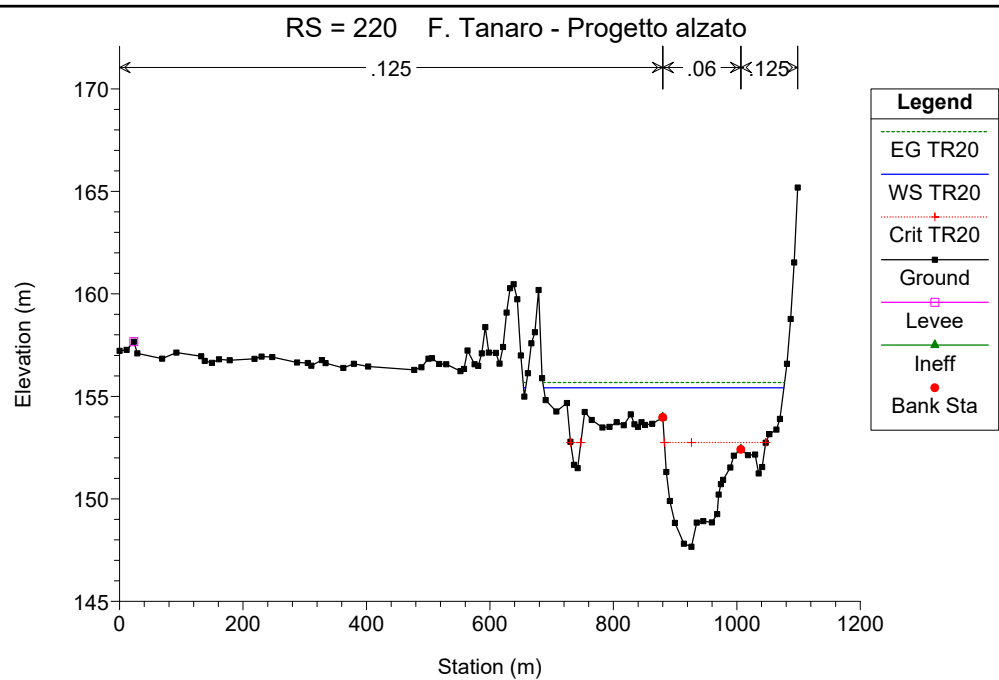
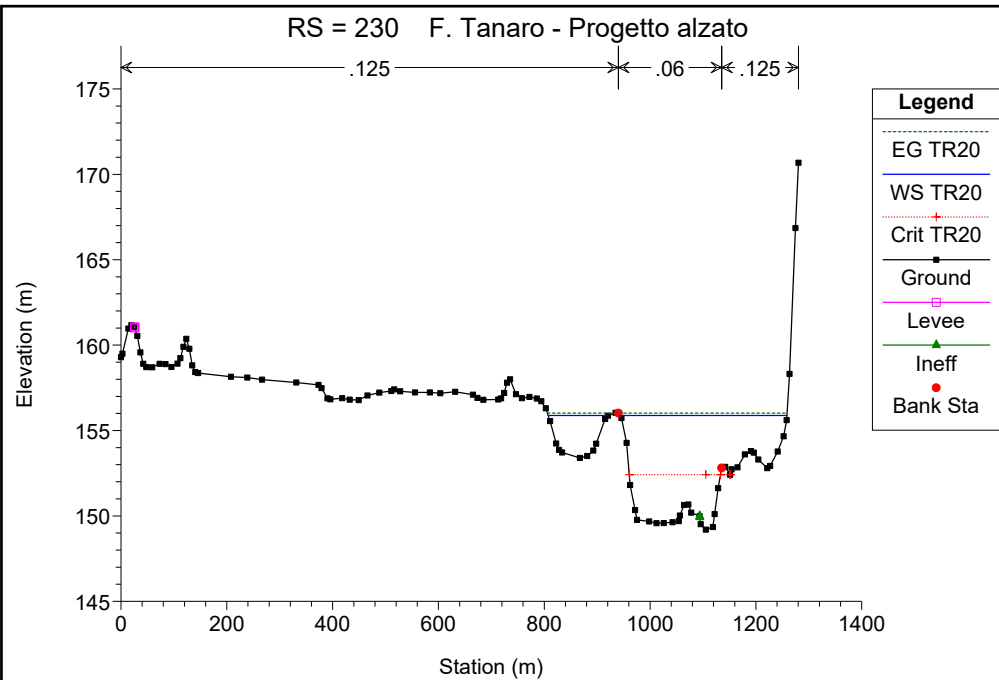


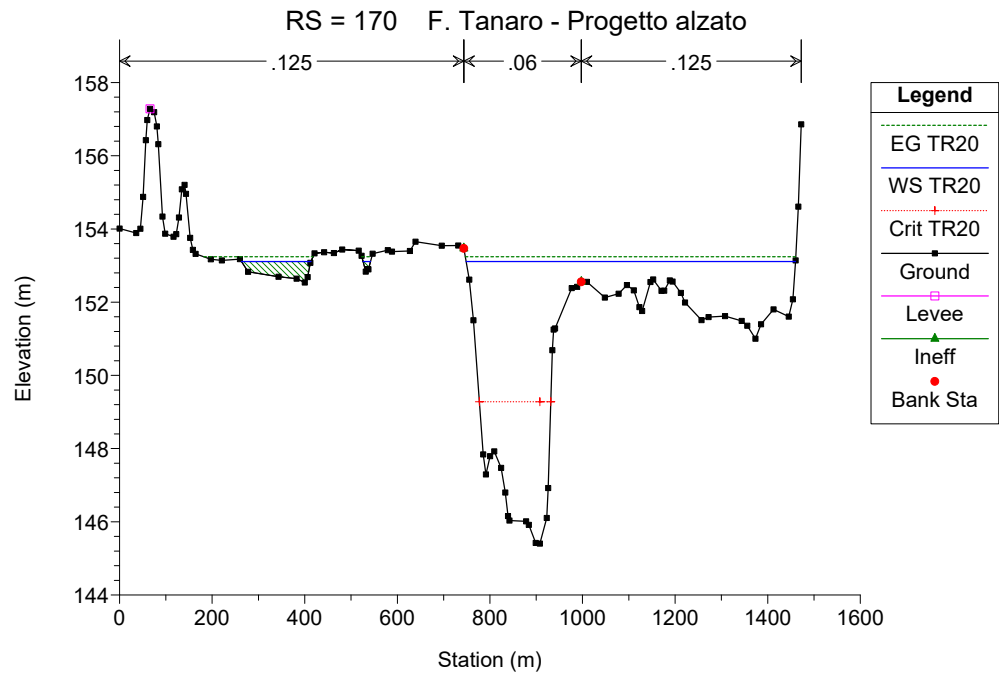
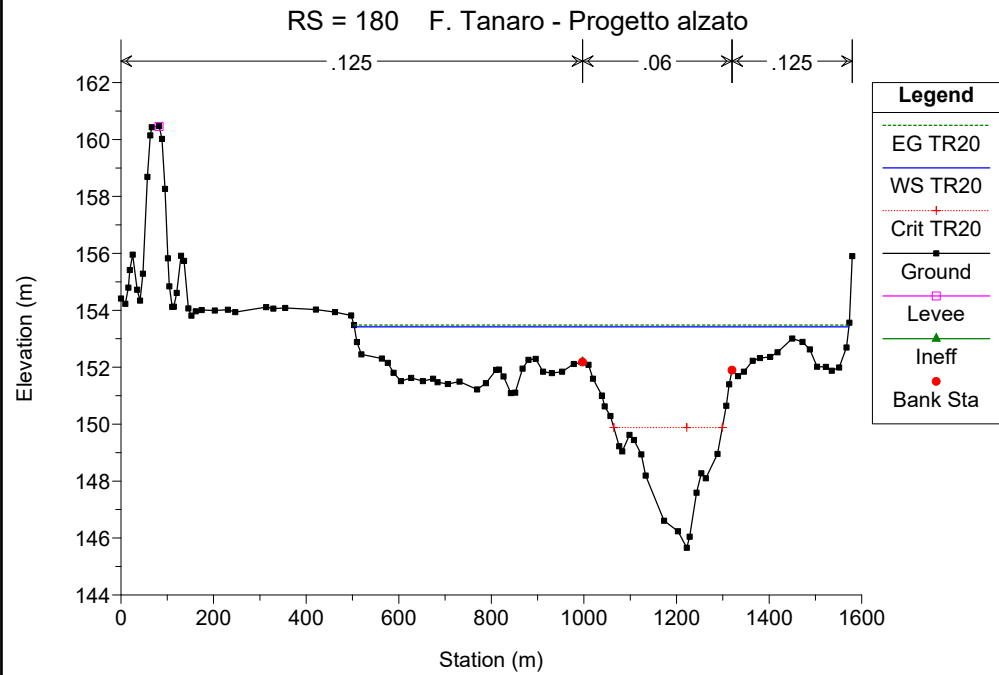
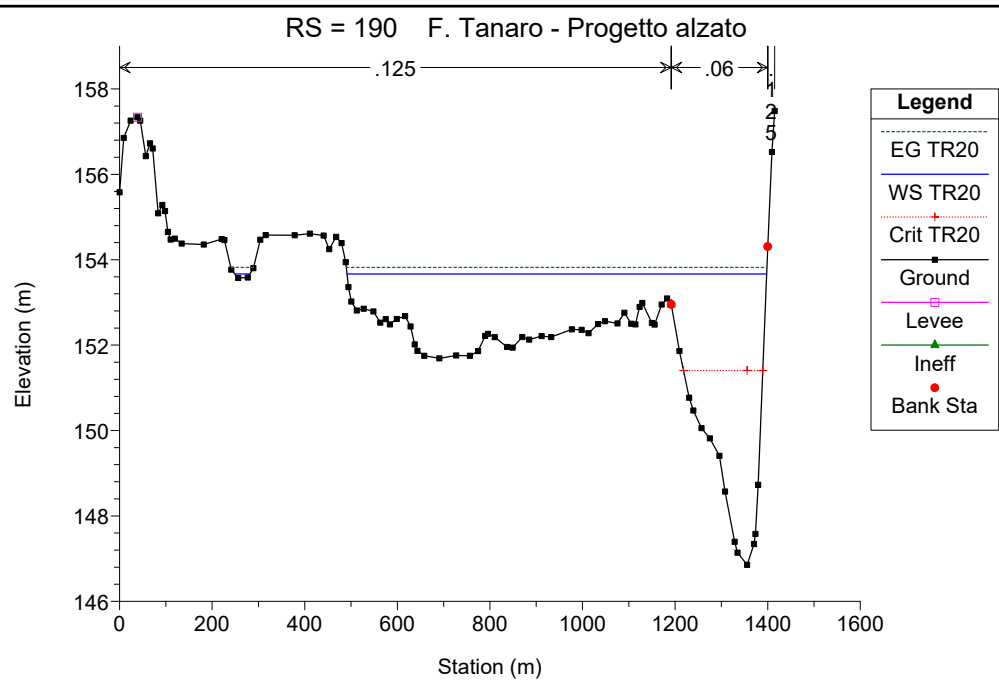
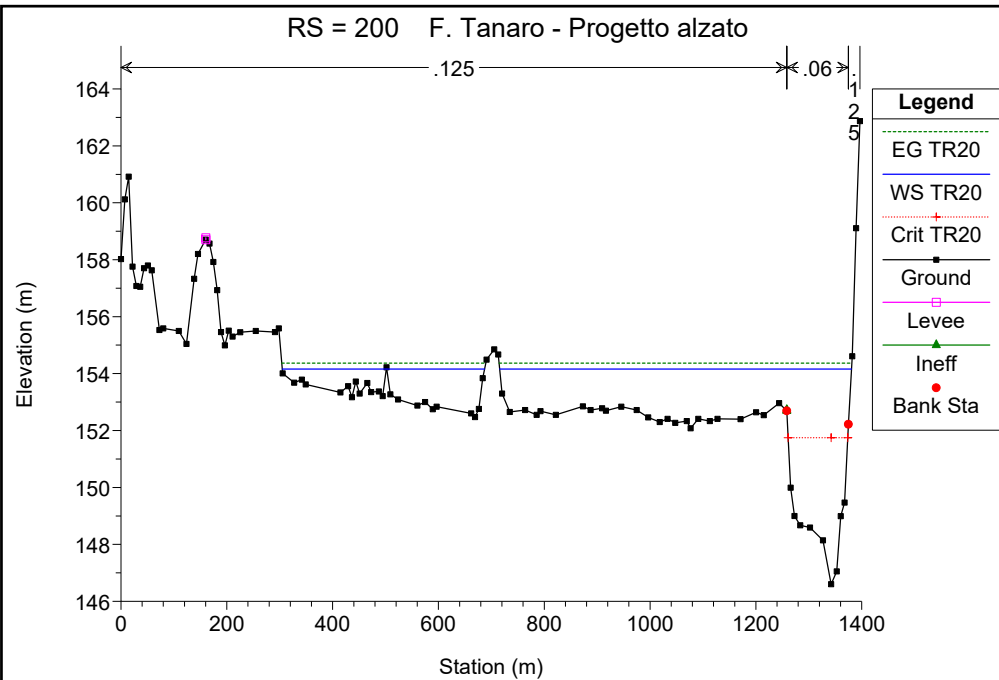


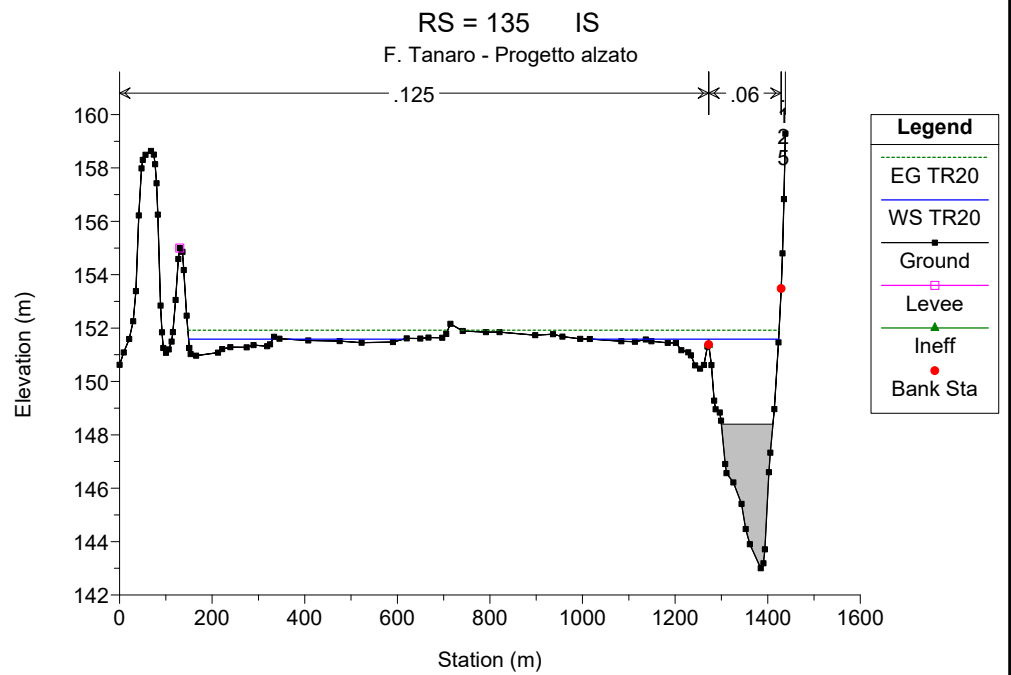
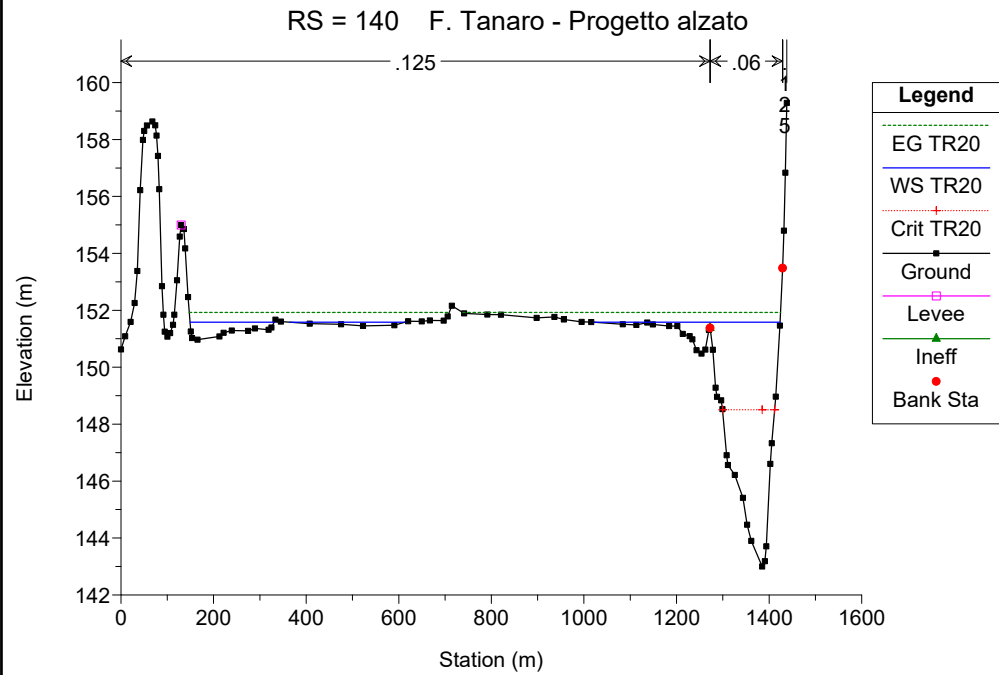
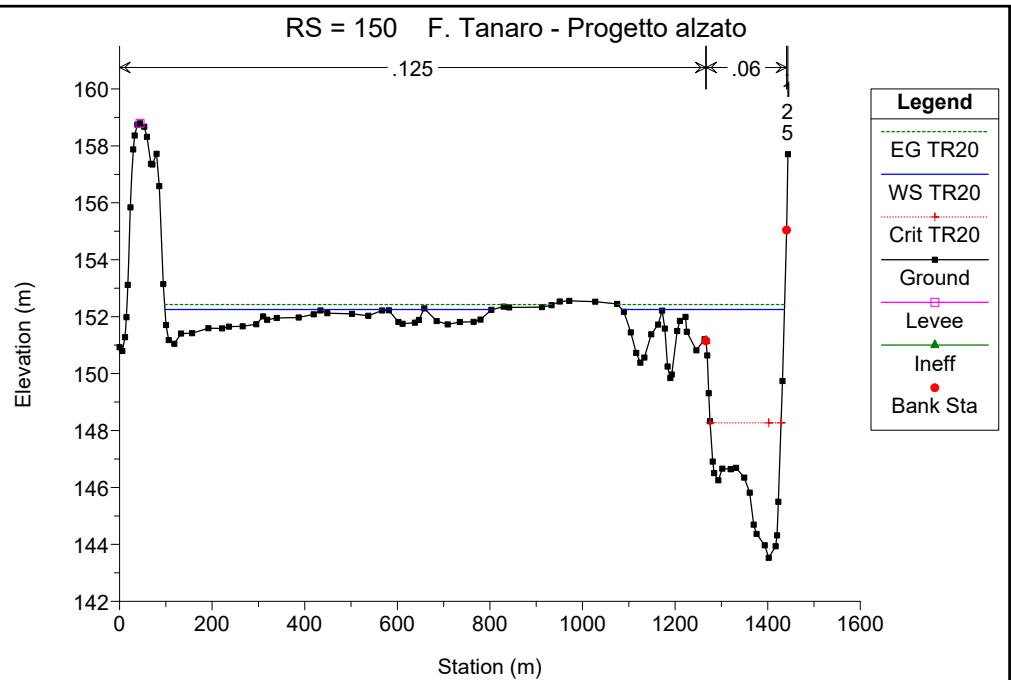
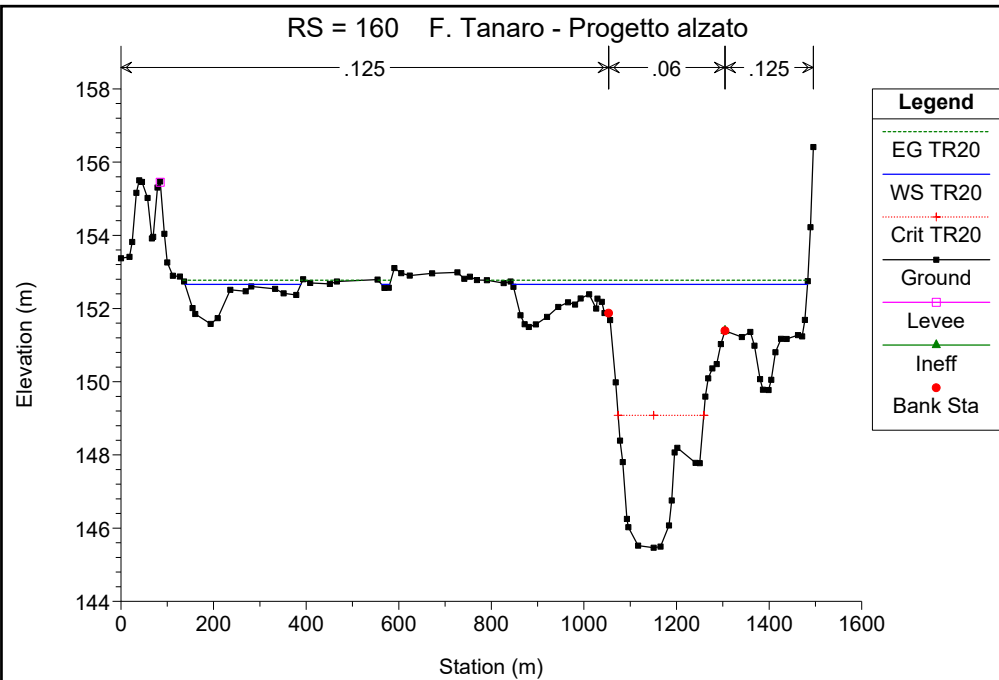


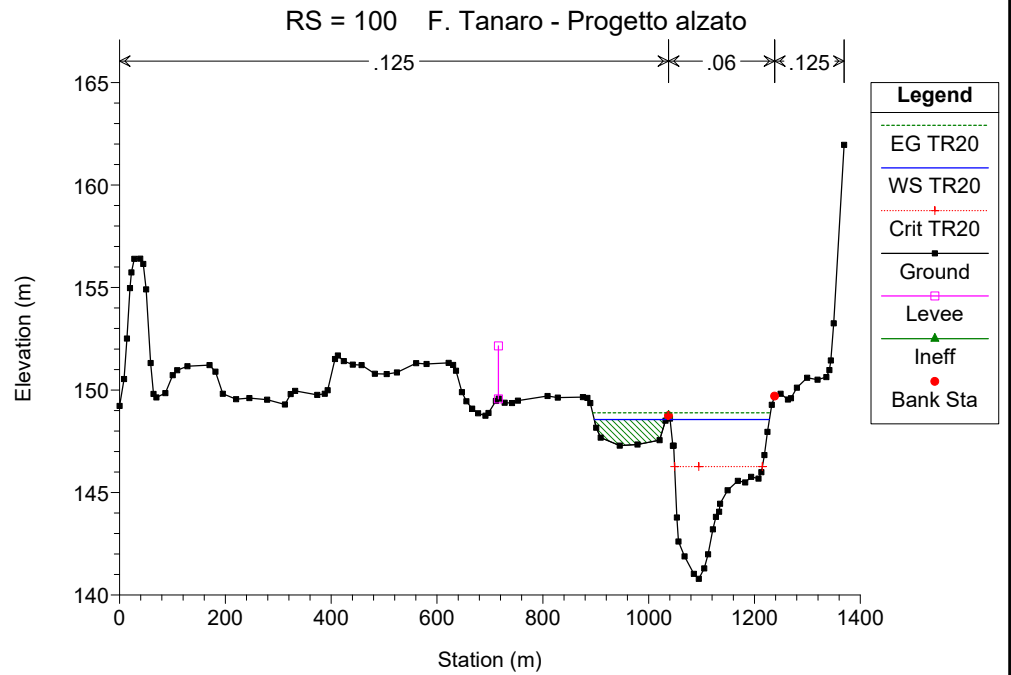
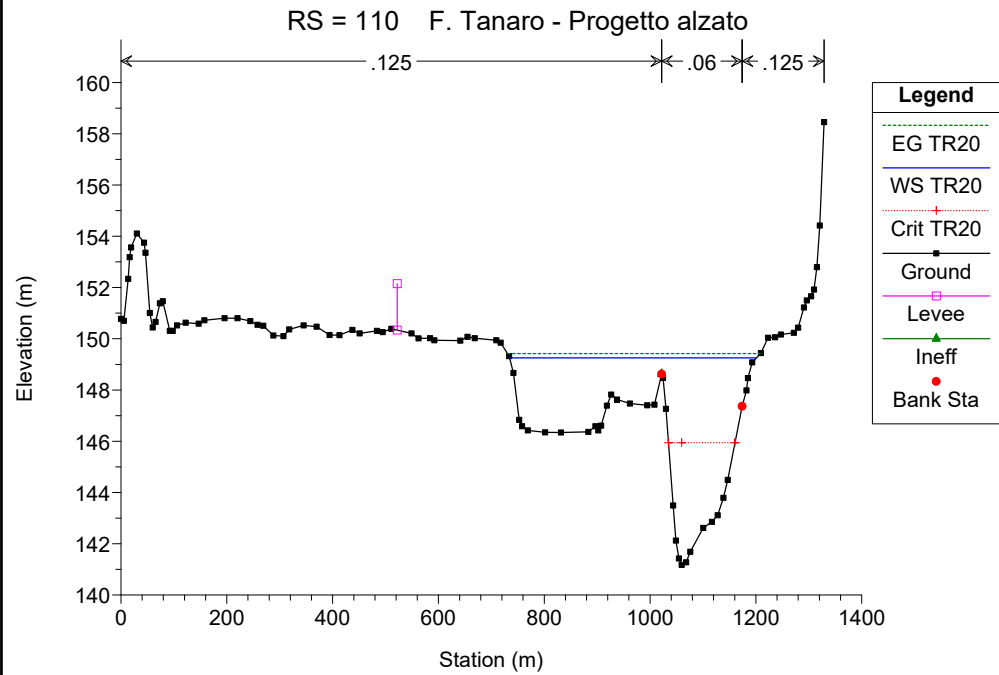
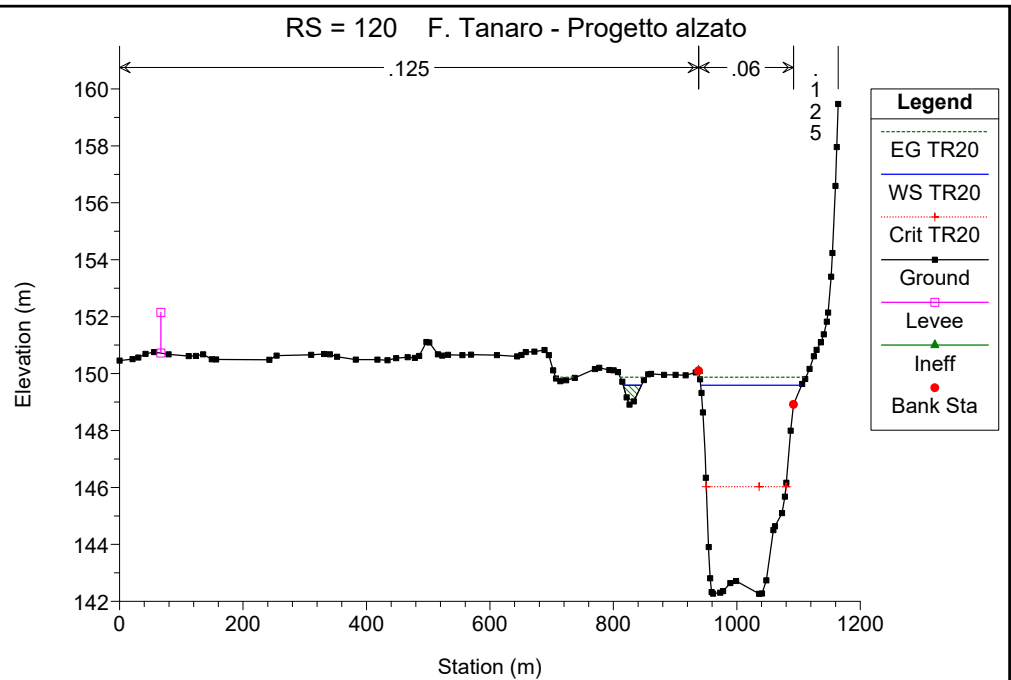
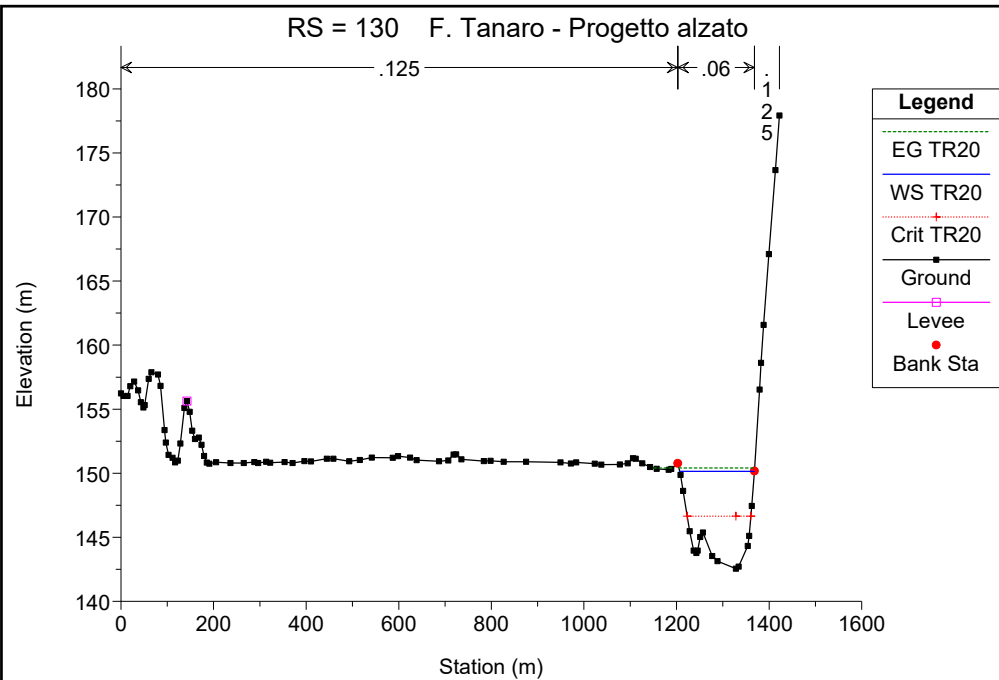


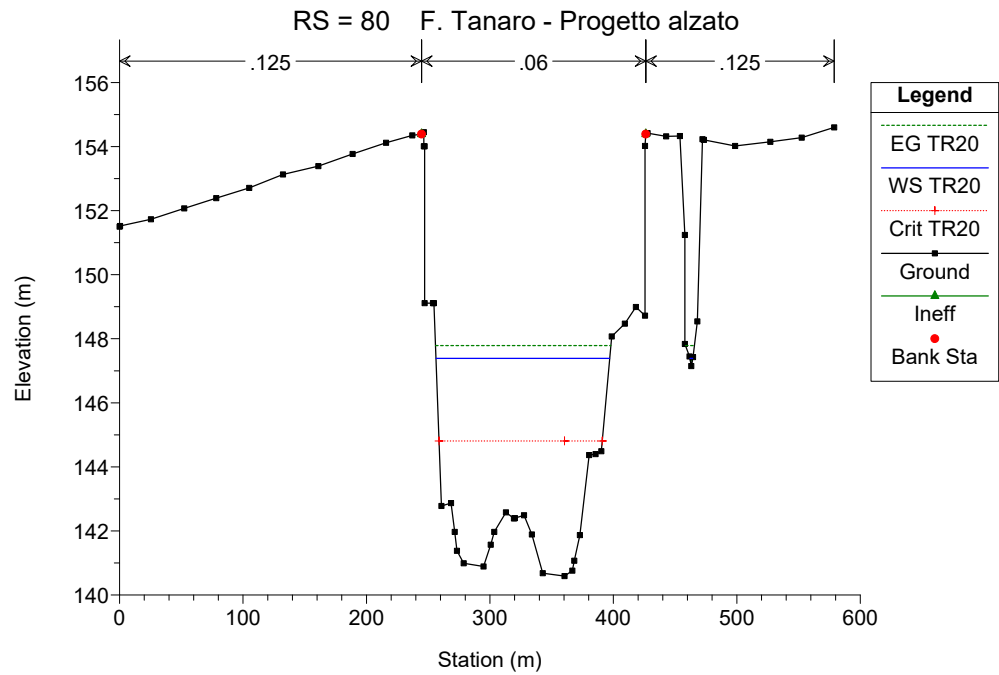
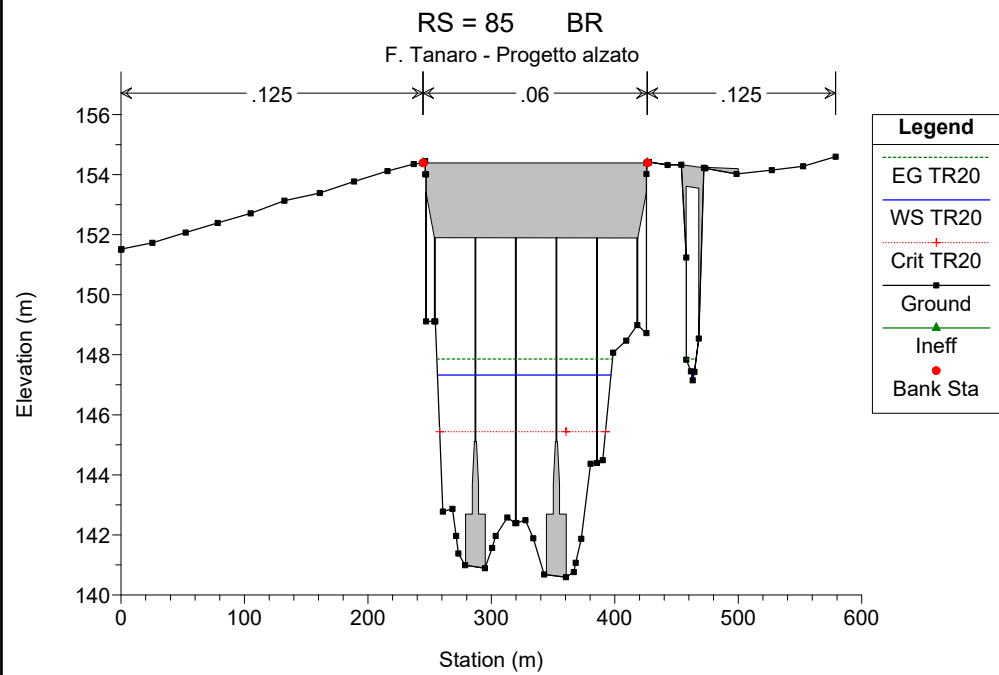
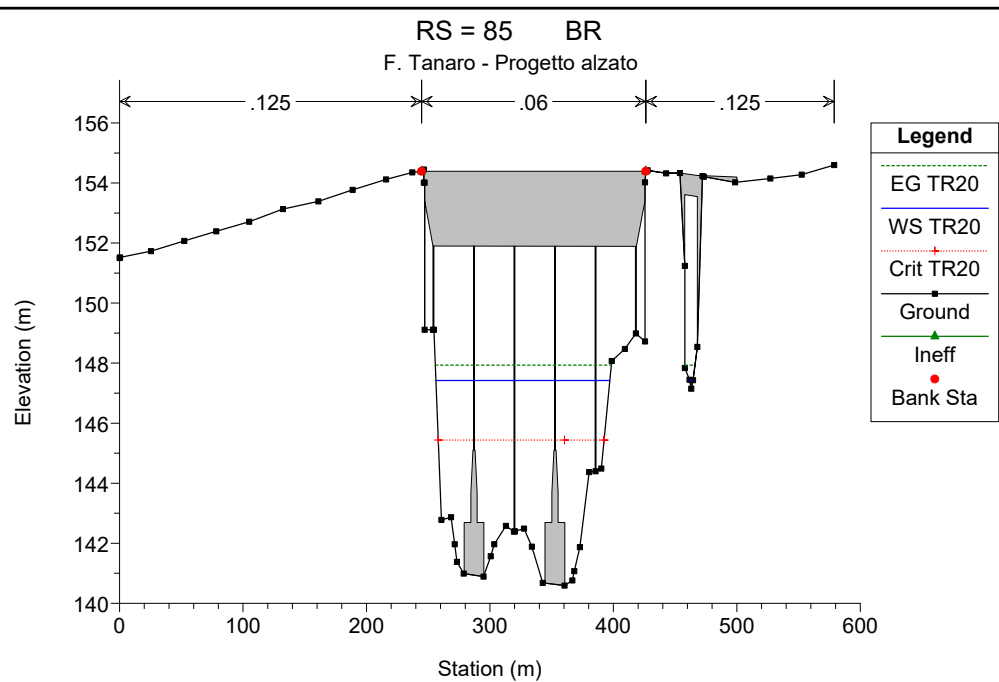
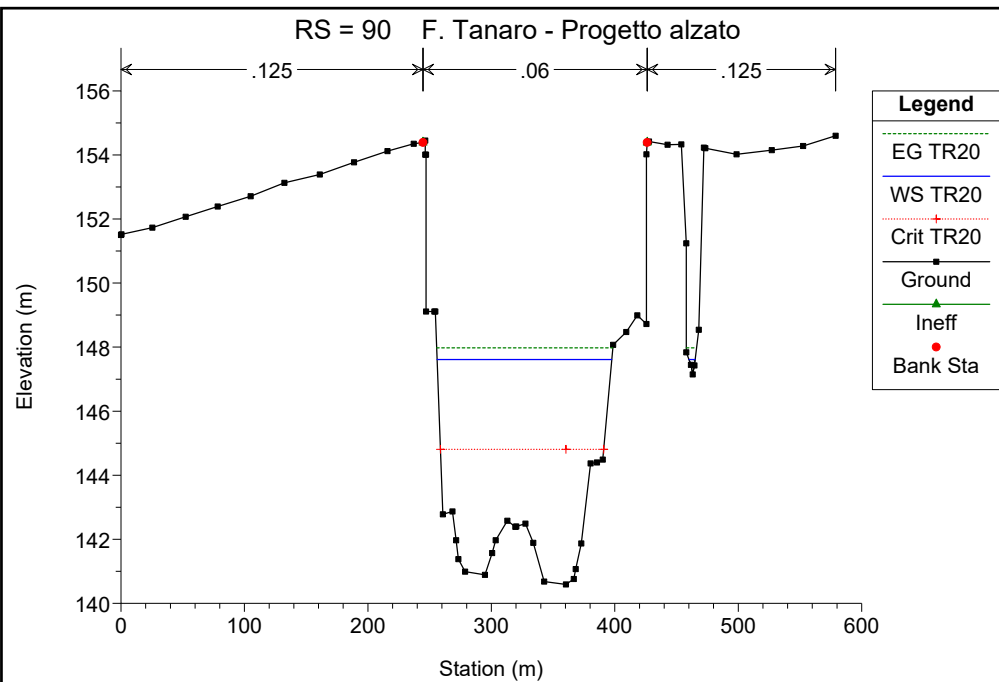


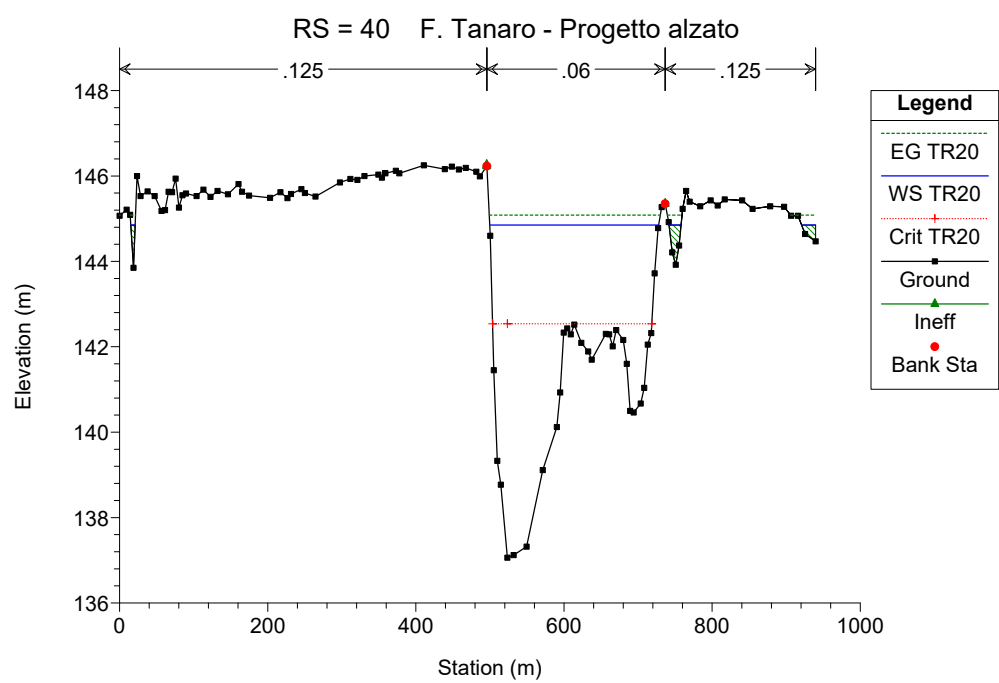
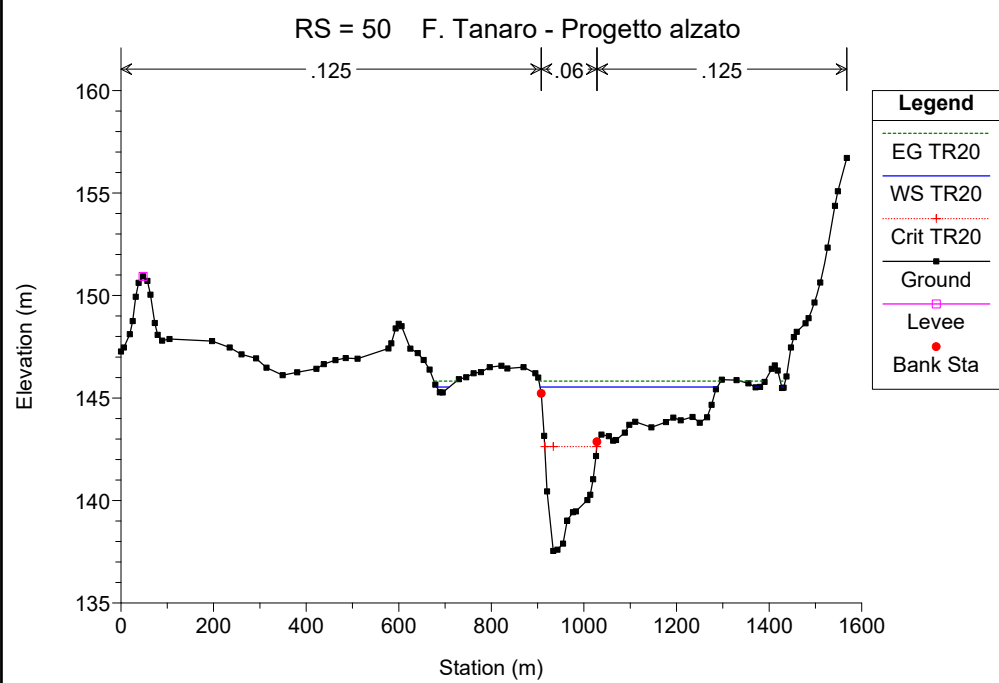
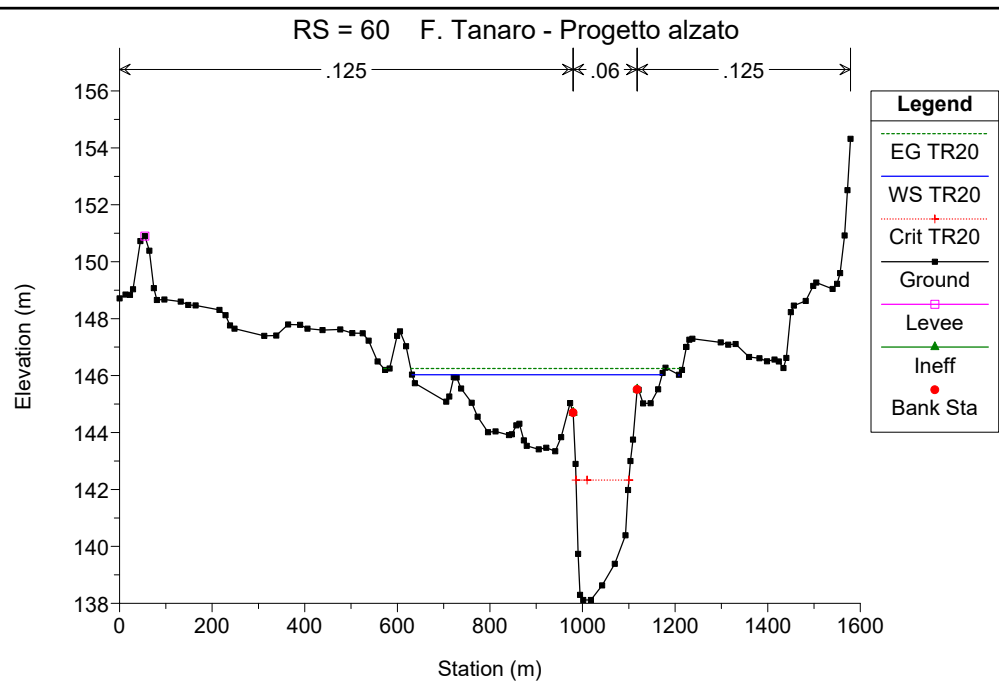
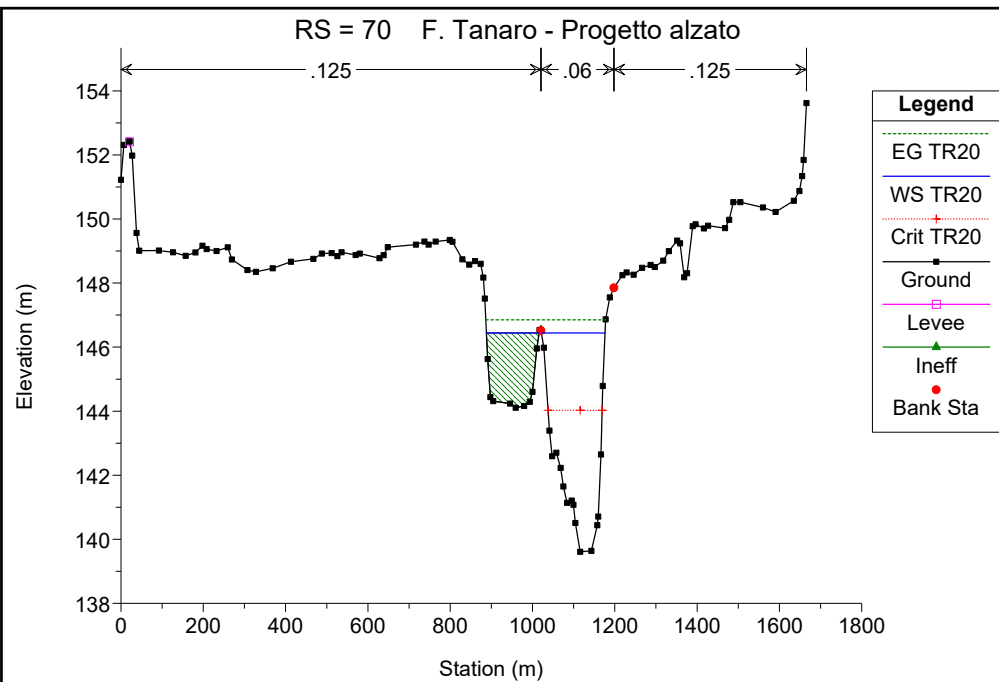


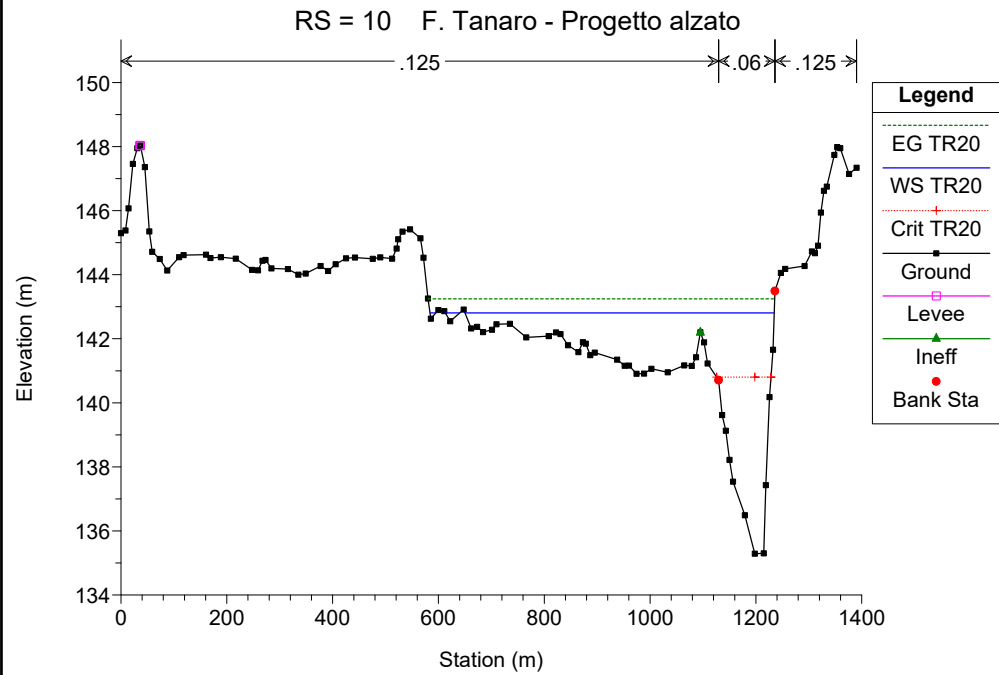
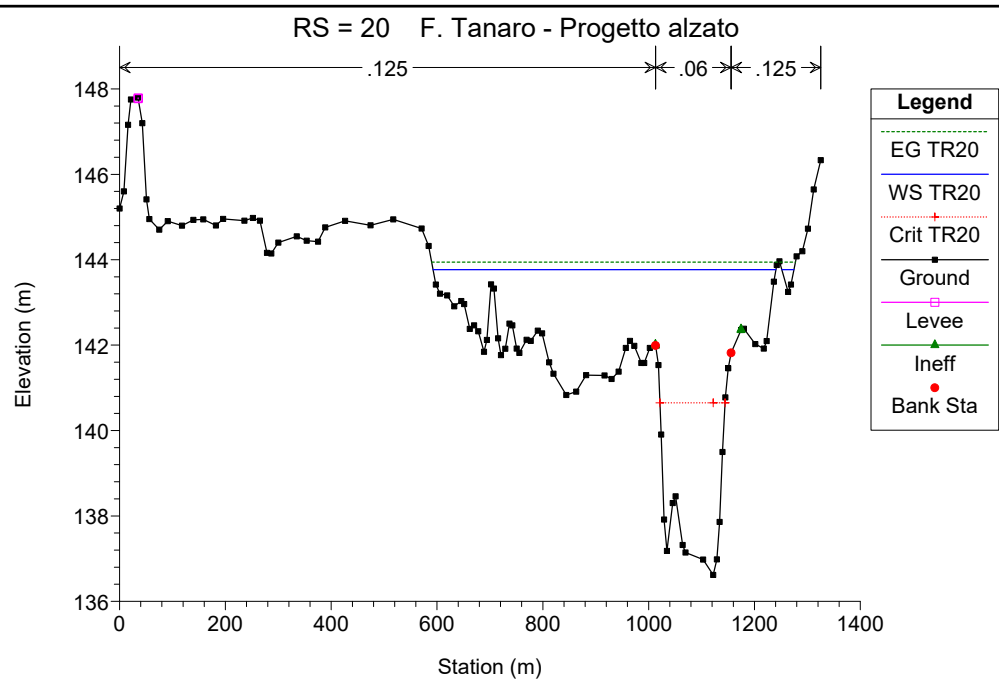
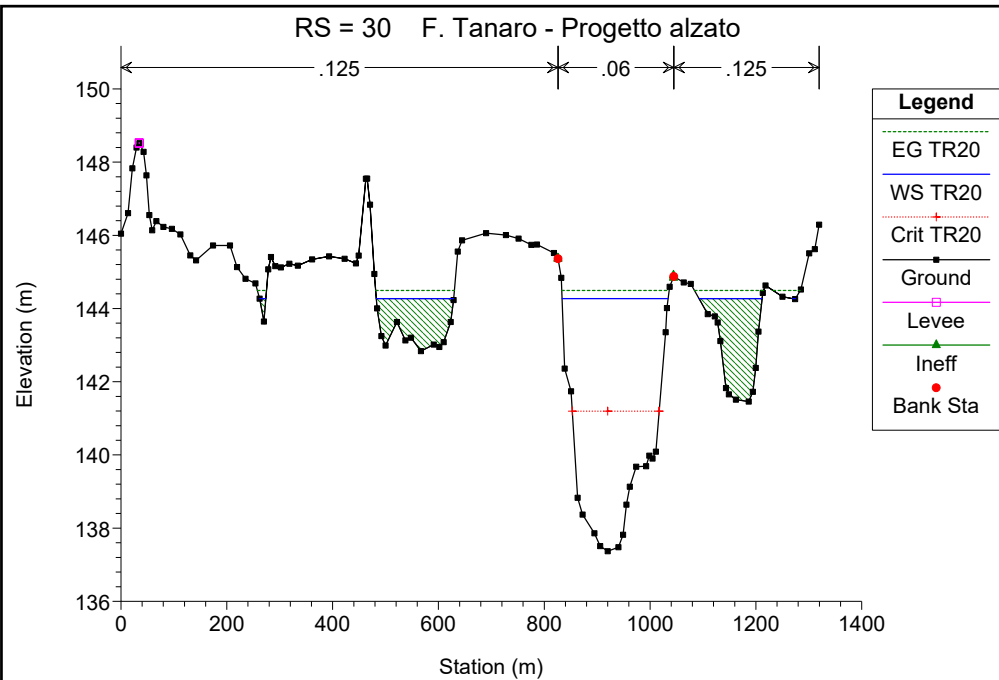












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 4

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2050	20
F. Tanaro valle Riddone	2056	
F. Tanaro valle Cherasca	2063	

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

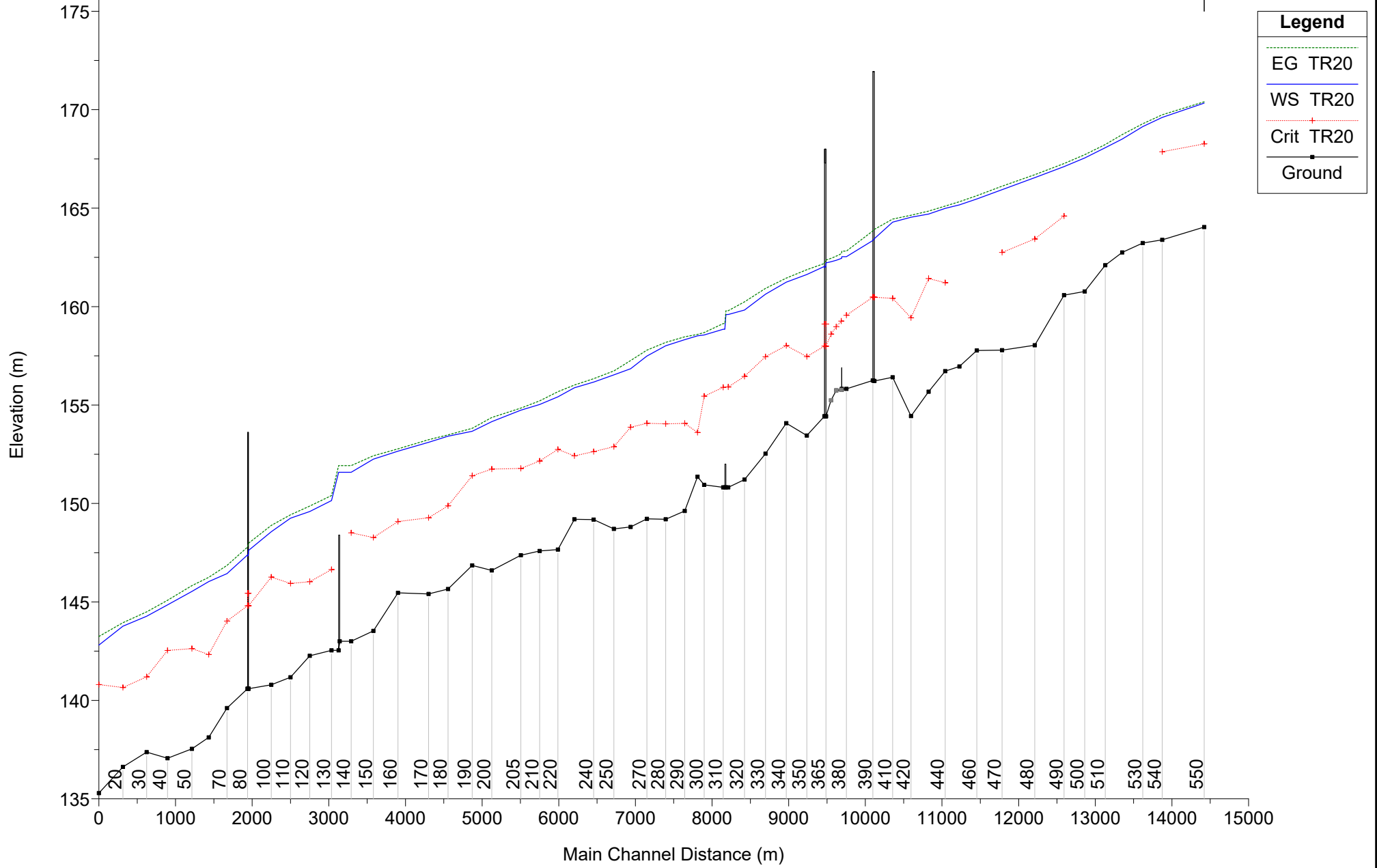
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR20	2050.00	164.04	170.34	168.26	170.40	0.001132	1.29	2404.59	1104.79	0.22
1	540	TR20	2050.00	163.39	169.61	167.87	169.74	0.001917	2.05	2272.63	1115.82	0.30
1	530	TR20	2050.00	163.23	169.14		169.29	0.001722	1.89	1696.37	656.65	0.28
1	520	TR20	2050.00	162.75	168.51		168.73	0.002548	2.29	1535.41	916.64	0.34
1	510	TR20	2050.00	162.10	168.07		168.23	0.002333	2.02	1650.51	699.91	0.32
1	500	TR20	2050.00	160.77	167.55		167.72	0.001687	1.96	1551.63	539.64	0.28
1	490	TR20	2050.00	160.58	167.11	164.60	167.27	0.001694	1.83	1423.75	495.24	0.28
1	480	TR20	2050.00	158.04	166.55	163.44	166.70	0.001401	1.83	1674.19	673.96	0.26
1	470	TR20	2050.00	157.79	165.94	162.75	166.12	0.001546	2.06	1554.93	508.75	0.28
1	460	TR20	2050.00	157.77	165.46		165.63	0.001369	1.90	1531.58	639.73	0.26
1	450	TR20	2050.00	156.96	165.17		165.33	0.001313	1.89	1471.25	519.76	0.26
1	440	TR20	2050.00	156.72	164.99	161.21	165.11	0.000992	1.71	1977.51	642.03	0.22
1	430	TR20	2050.00	155.68	164.70	161.42	164.85	0.001384	2.02	1901.03	650.52	0.26
1	420	TR20	2050.00	154.44	164.54	159.43	164.64	0.000634	1.55	2181.57	653.80	0.18
1	410	TR20	2050.00	156.41	164.29	160.42	164.44	0.001214	1.91	1656.41	488.76	0.25
1	400	TR20	2050.00	156.22	163.45	160.47	163.92	0.003184	3.08	736.62	161.26	0.39
1	395		Bridge									
1	390	TR20	2050.00	156.25	163.36	160.48	163.85	0.003371	3.14	720.33	160.98	0.40
1	380	TR20	2050.00	155.82	162.53	159.56	162.82	0.002167	2.36	869.32	160.14	0.32
1	379		Inl Struct									
1	370	TR20	2050.00	154.43	162.22	157.99	162.36	0.000955	1.68	1221.83	203.85	0.22
1	365		Bridge									
1	360	TR20	2050.00	154.43	162.04	157.99	162.19	0.001055	1.73	1184.66	203.34	0.23
1	350	TR20	2050.00	153.45	161.63	157.46	161.88	0.001490	2.20	932.54	148.79	0.28
1	340	TR20	2056.00	154.08	161.24	158.01	161.45	0.001636	2.01	1041.86	322.91	0.28
1	330	TR20	2056.00	152.53	160.63	157.45	160.92	0.002242	2.41	911.84	334.17	0.33
1	320	TR20	2056.00	151.21	159.83	156.45	160.24	0.002621	3.02	1016.37	364.07	0.37
1	315	TR20	2056.00	150.82	159.60	155.92	159.79	0.001445	2.23	1706.12	638.59	0.27
1	312.5		Inl Struct									
1	310	TR20	2056.00	150.82	158.85	155.90	159.14	0.002395	2.67	1339.54	481.47	0.35
1	300	TR20	2063.00	150.95	158.56	155.45	158.68	0.001304	1.73	1856.07	640.17	0.25
1	295	TR20	2063.00	151.36	158.52	153.61	158.58	0.000514	1.25	2427.12	687.33	0.16
1	290	TR20	2063.00	149.62	158.32	154.07	158.47	0.001069	1.69	1219.49	534.84	0.23
1	280	TR20	2063.00	149.20	158.01	154.04	158.18	0.001238	2.00	1549.23	453.81	0.25
1	270	TR20	2063.00	149.22	157.49	154.07	157.79	0.002127	2.61	1229.00	445.24	0.33
1	260	TR20	2063.00	148.81	156.84	153.87	157.26	0.002905	2.99	929.93	279.75	0.38
1	250	TR20	2063.00	148.71	156.53	152.88	156.73	0.001644	2.12	1412.59	503.20	0.29
1	240	TR20	2063.00	149.18	156.16	152.64	156.34	0.001327	1.95	1511.41	720.33	0.26
1	230	TR20	2063.00	149.20	155.88	152.42	156.02	0.001154	1.75	1556.08	429.00	0.24
1	220	TR20	2063.00	147.66	155.42	152.75	155.68	0.002132	2.44	1238.18	392.68	0.33

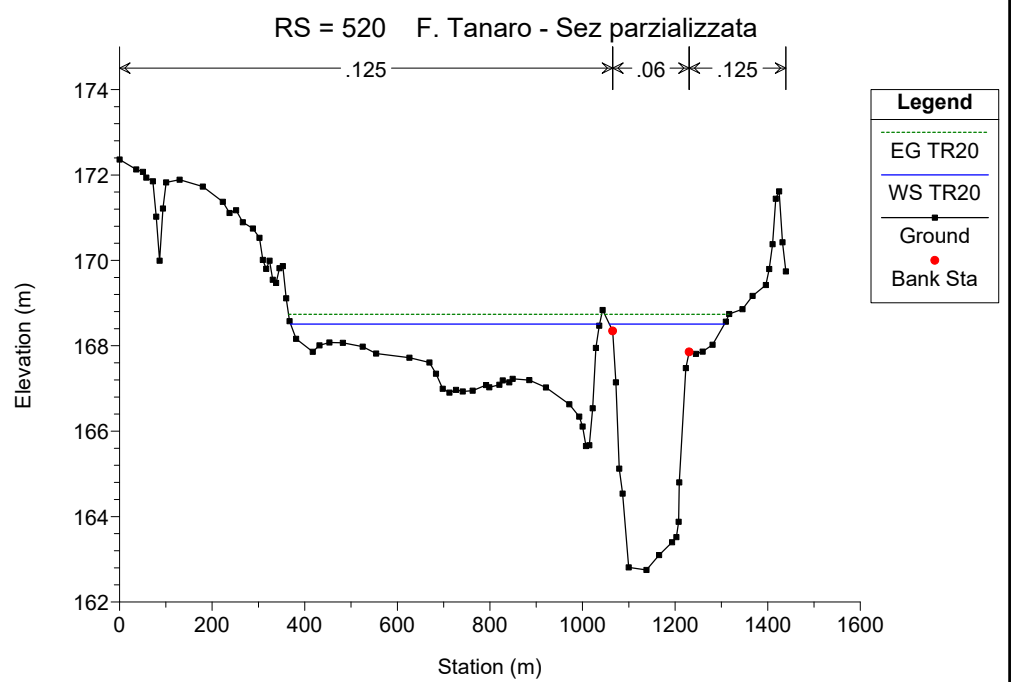
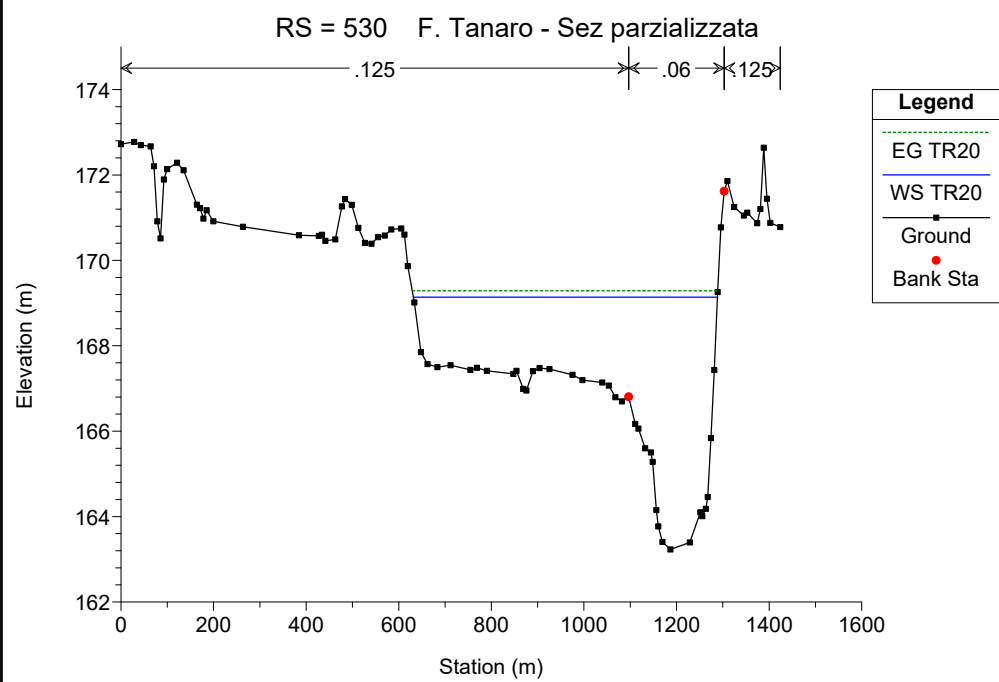
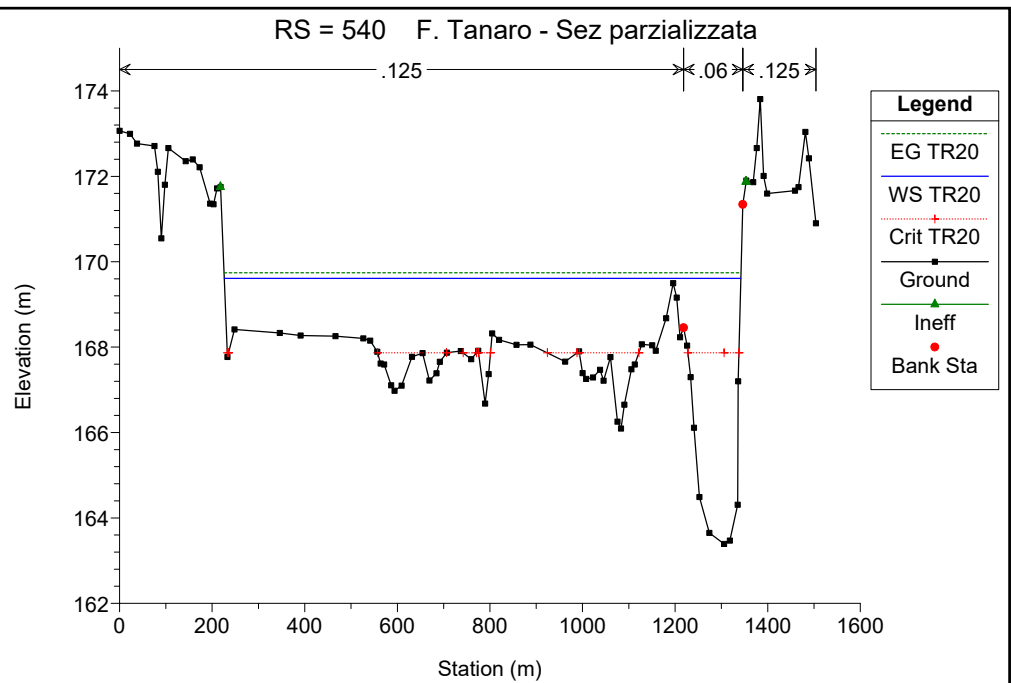
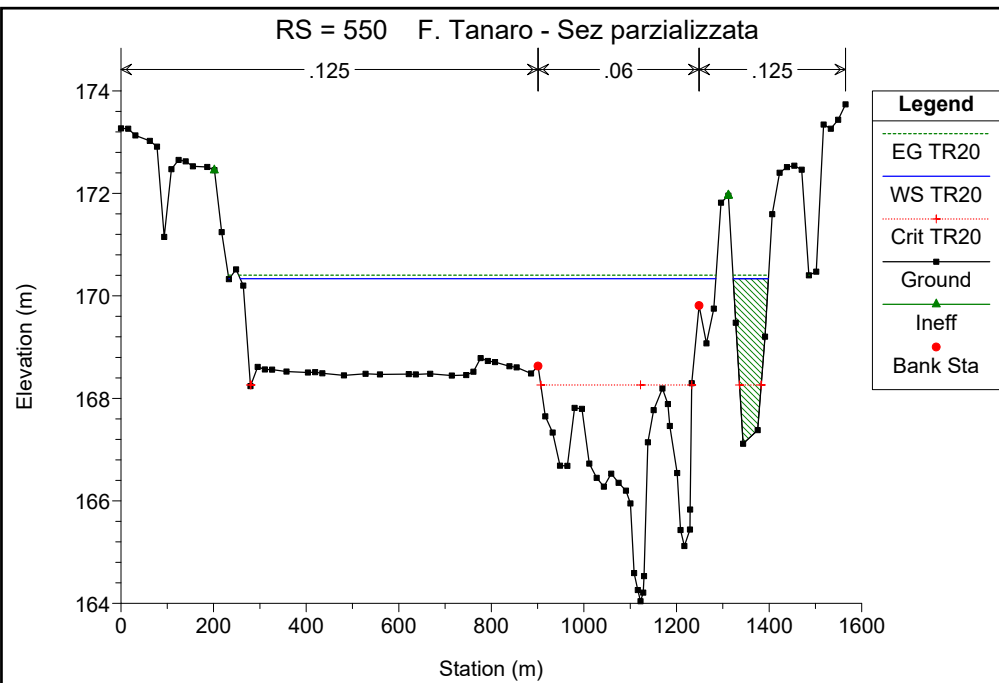
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR20 (Continued)

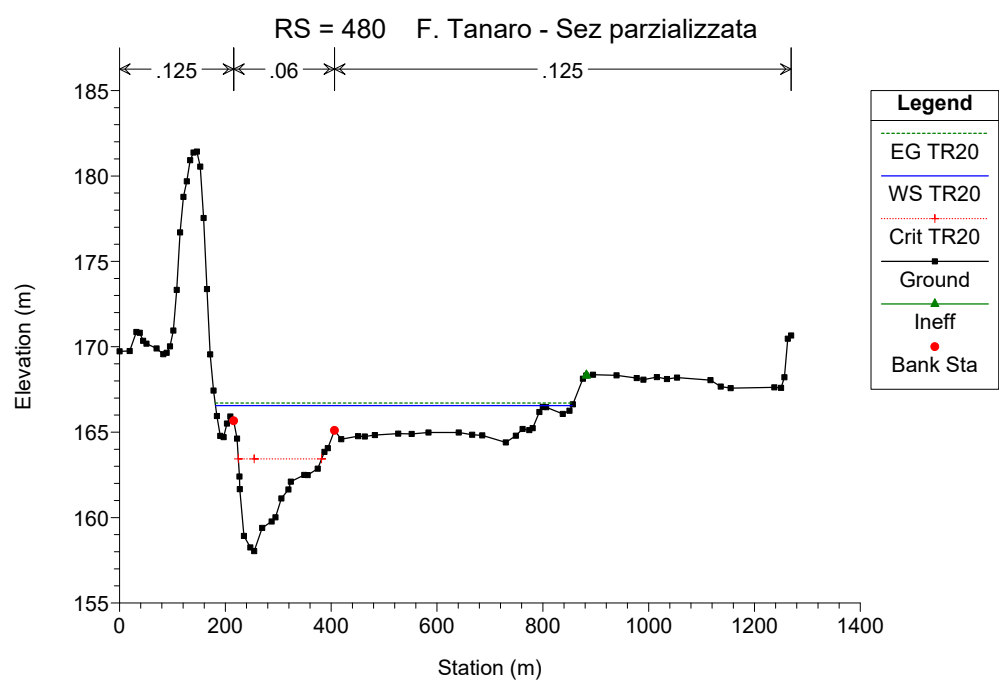
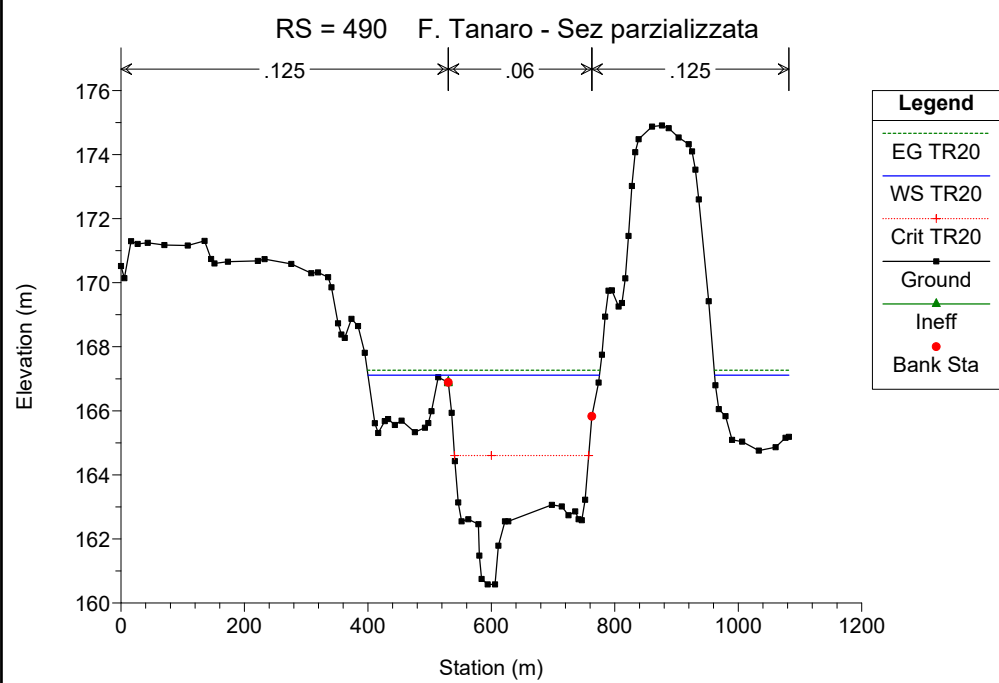
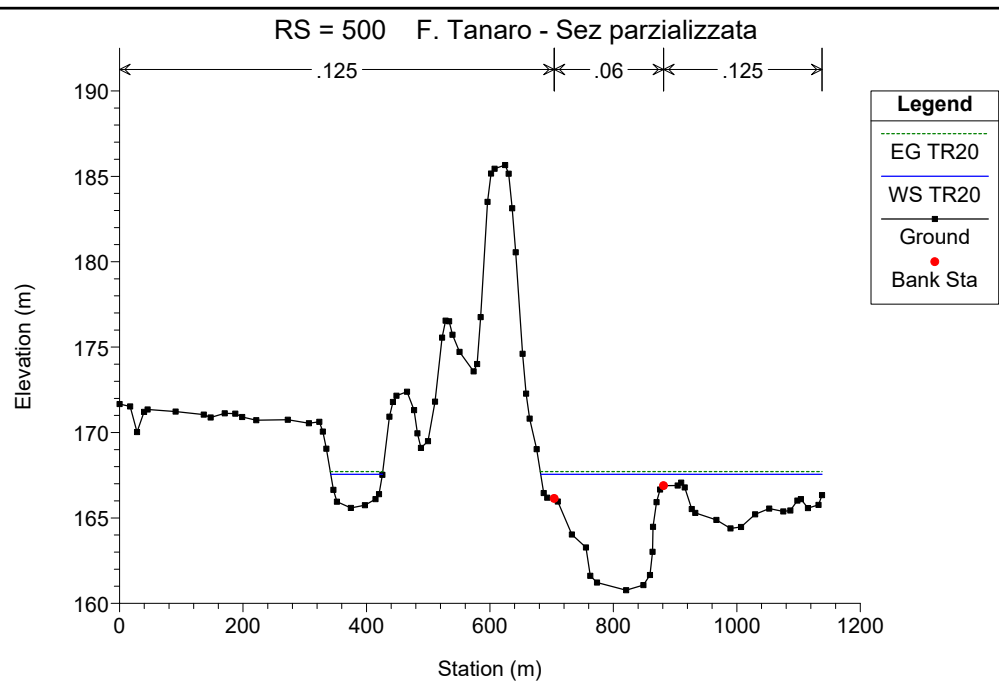
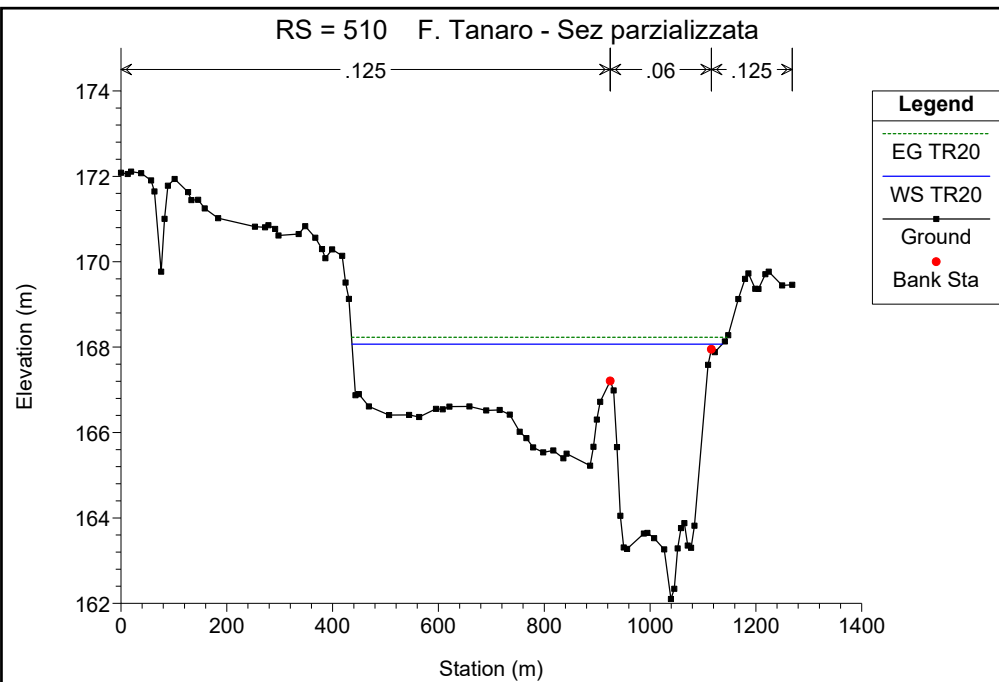
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR20	2063.00	147.59	155.03	152.16	155.21	0.001608	1.99	1388.20	529.67	0.28
1	205	TR20	2063.00	147.37	154.74	151.78	154.85	0.001154	1.61	2146.51	949.86	0.23
1	200	TR20	2063.00	146.60	154.16	151.75	154.37	0.002071	2.35	1849.52	1046.66	0.32
1	190	TR20	2063.00	146.85	153.67	151.41	153.82	0.002019	1.93	1796.20	938.82	0.30
1	180	TR20	2063.00	145.66	153.42	149.88	153.48	0.000654	1.18	2576.55	1068.32	0.18
1	170	TR20	2063.00	145.40	153.11	149.28	153.24	0.001369	1.68	1661.55	877.65	0.25
1	160	TR20	2063.00	145.46	152.66	149.08	152.77	0.001038	1.55	1768.38	905.63	0.22
1	150	TR20	2063.00	143.53	152.25	148.27	152.42	0.001133	1.87	1519.32	1054.73	0.24
1	140	TR20	2063.00	143.00	151.58	148.51	151.92	0.002745	2.60	929.04	832.43	0.36
1	135		Inl Struct									
1	130	TR20	2063.00	142.54	150.14	146.65	150.41	0.001856	2.26	912.61	161.29	0.30
1	120	TR20	2063.00	142.27	149.59	146.03	149.87	0.001892	2.34	887.59	193.33	0.31
1	110	TR20	2063.00	141.17	149.25	145.94	149.42	0.001467	2.00	1529.16	466.11	0.27
1	100	TR20	2063.00	140.79	148.56	146.26	148.88	0.003214	2.51	821.45	323.82	0.38
1	90	TR20	2063.00	140.59	147.61	144.81	147.98	0.002800	2.68	769.47	146.47	0.37
1	85		Bridge									
1	80	TR20	2063.00	140.59	147.39	144.81	147.79	0.003193	2.80	737.87	143.05	0.39
1	70	TR20	2063.00	139.61	146.44	144.03	146.85	0.003756	2.84	725.34	282.82	0.42
1	60	TR20	2063.00	138.12	146.03	142.33	146.25	0.001552	2.17	1411.65	540.42	0.28
1	50	TR20	2063.00	137.54	145.54	142.63	145.83	0.002266	2.56	1176.52	420.93	0.34
1	40	TR20	2063.00	137.06	144.85	142.54	145.08	0.002442	2.14	965.03	269.25	0.33
1	30	TR20	2063.00	137.37	144.27	141.20	144.49	0.001914	2.10	983.72	482.78	0.30
1	20	TR20	2063.00	136.62	143.77	140.65	143.95	0.001537	2.06	1693.50	671.01	0.28
1	10	TR20	2063.00	135.29	142.81	140.80	143.25	0.004002	3.17	1104.88	622.92	0.44

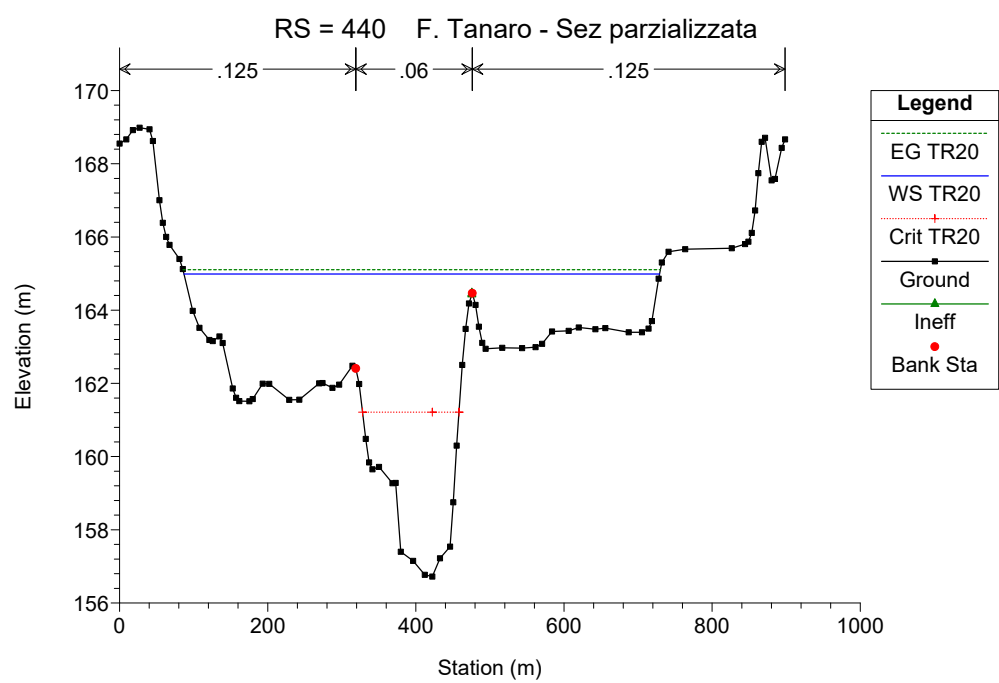
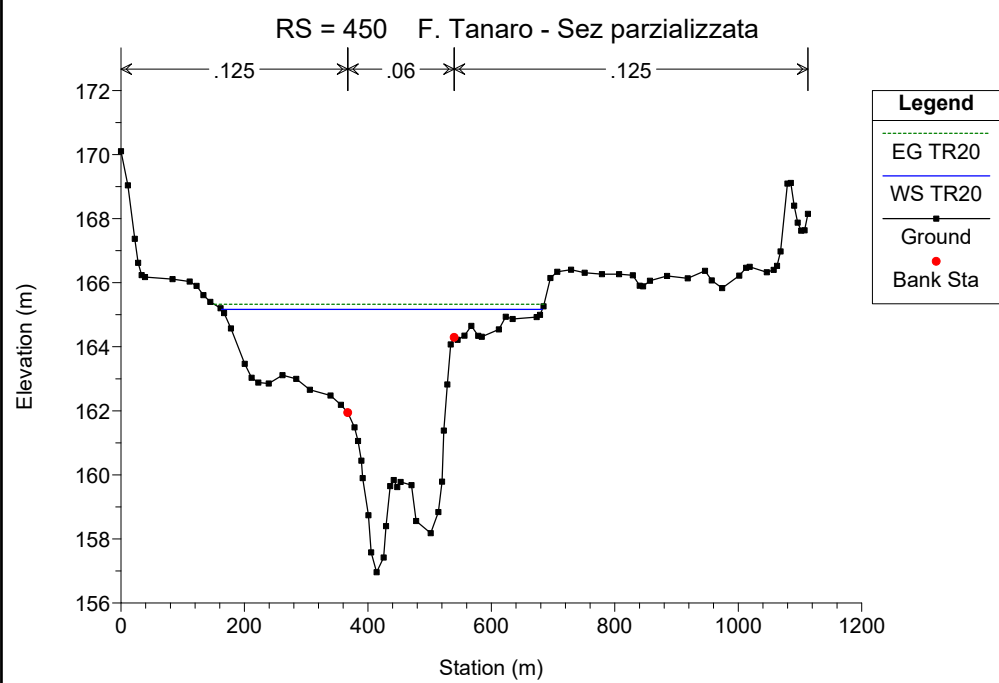
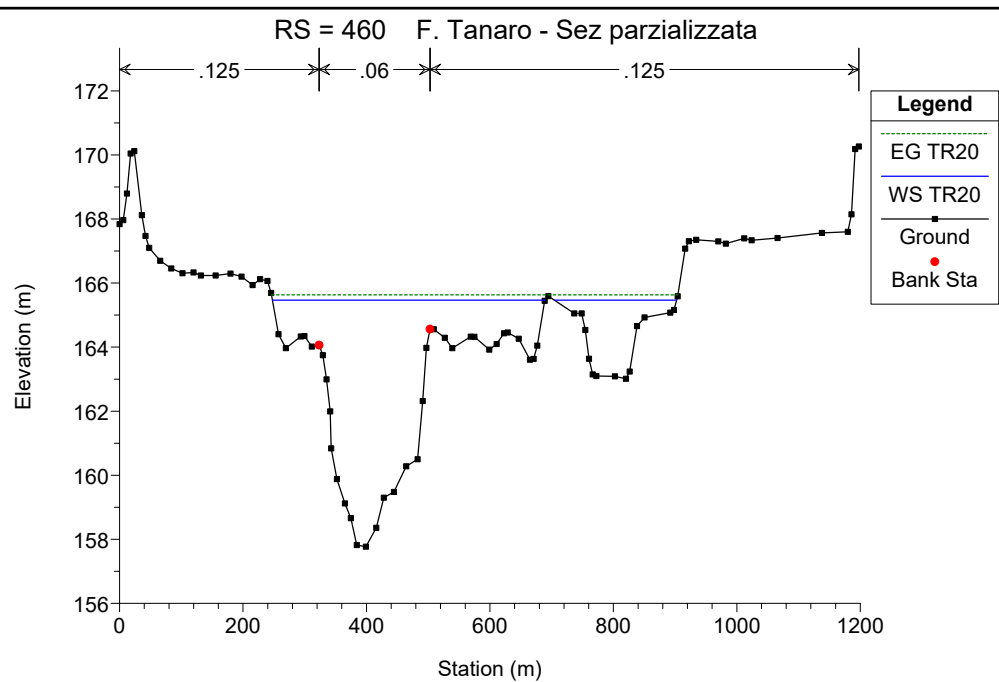
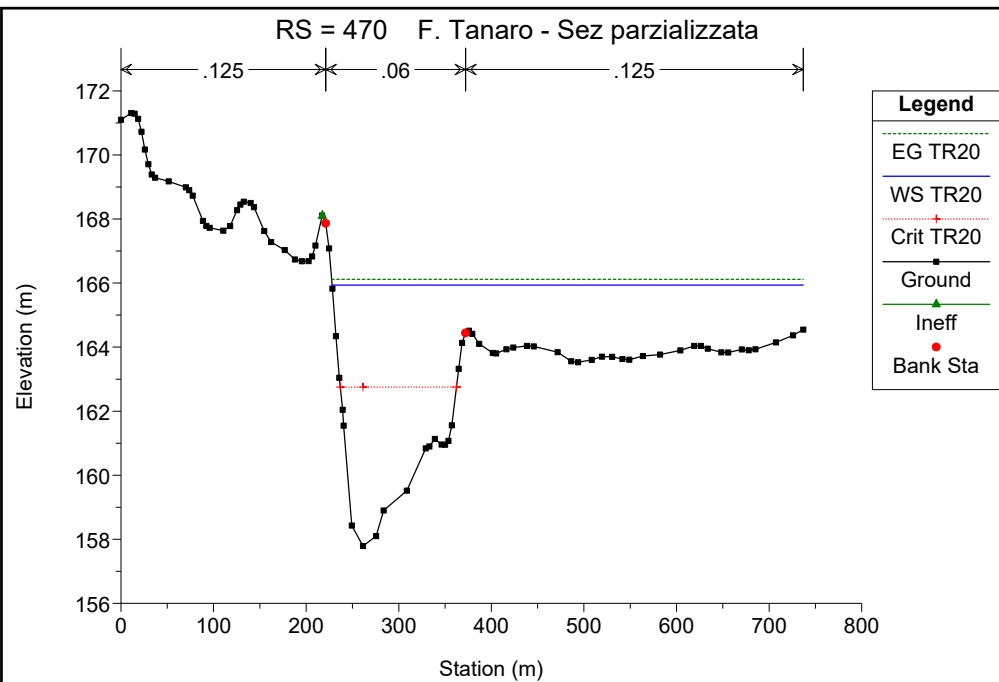
F. Tanaro - Sez parzializzata

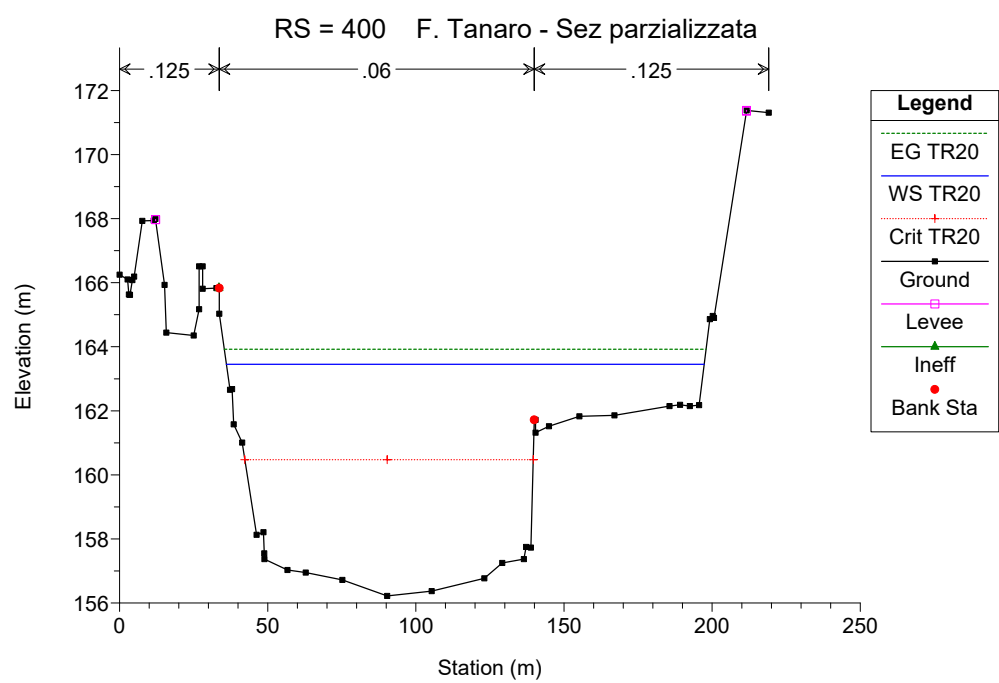
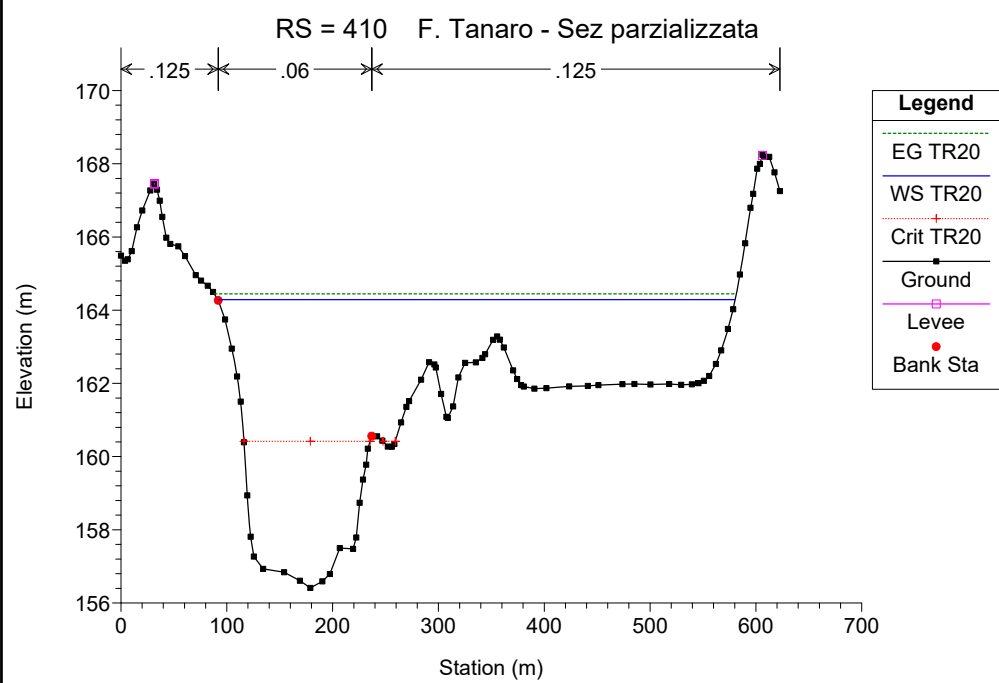
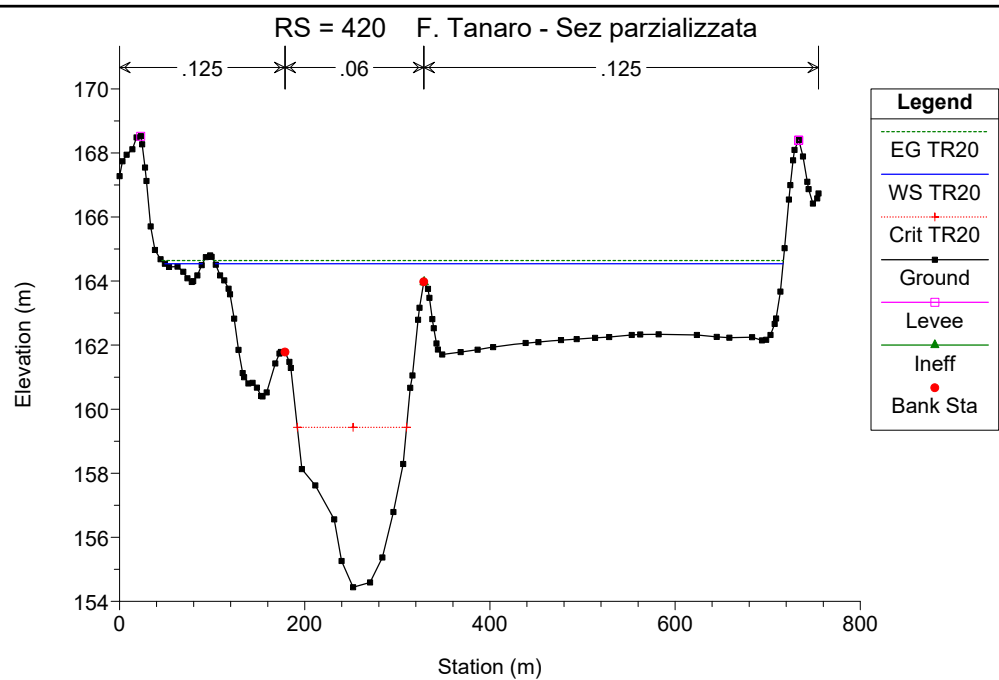
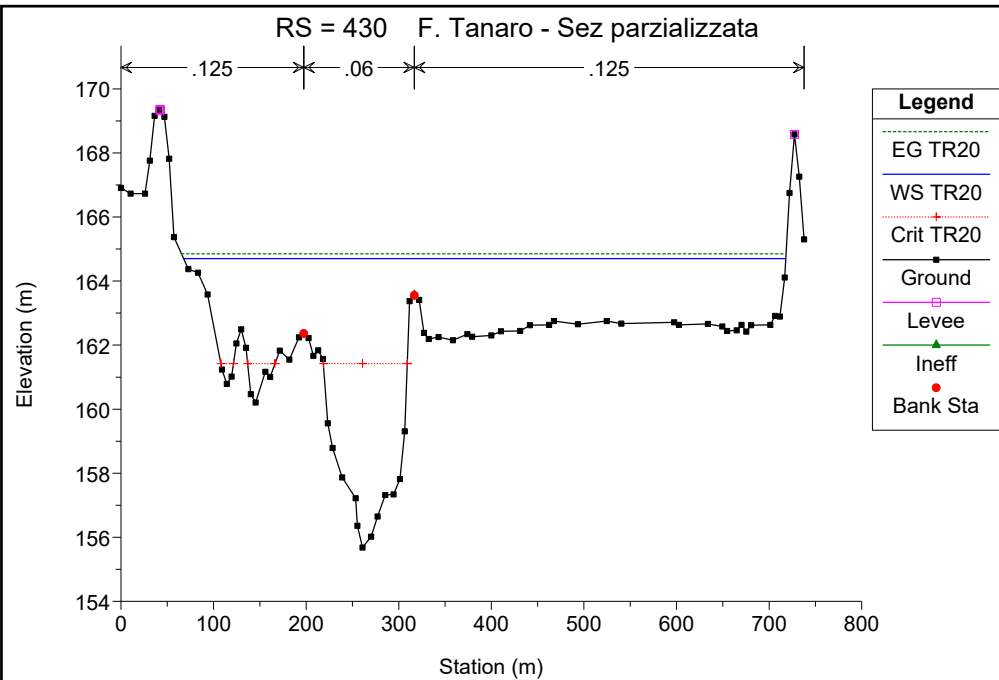
Tanaro 1

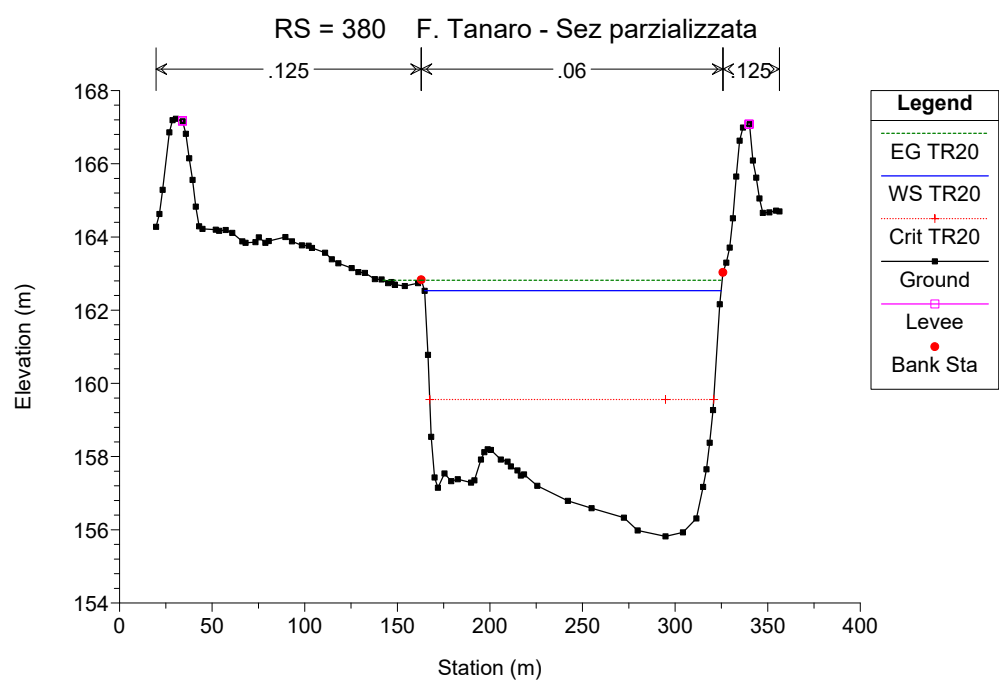
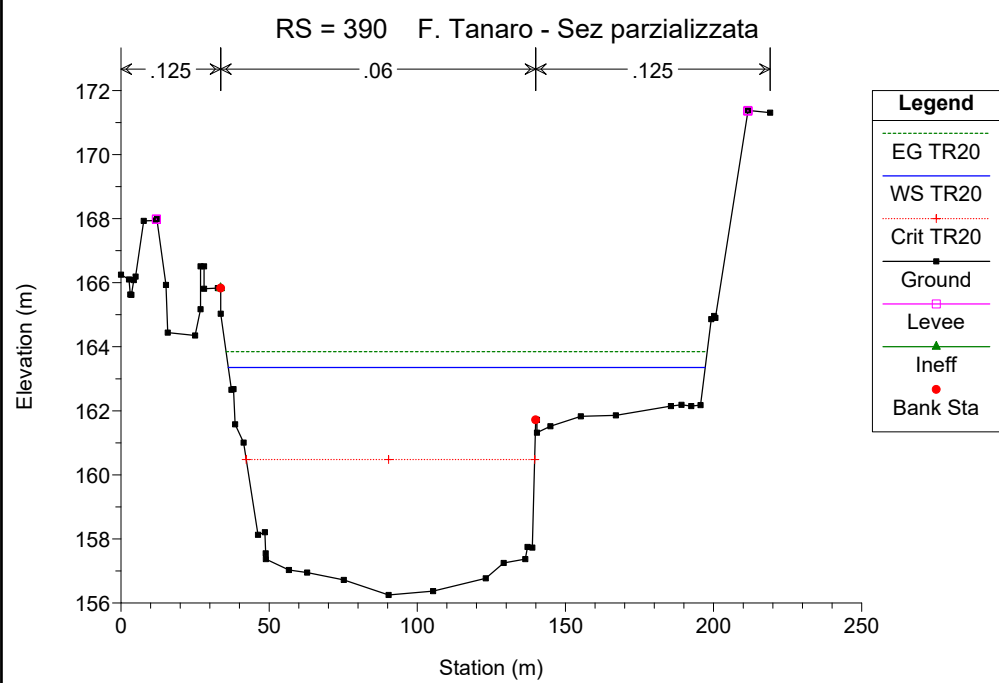
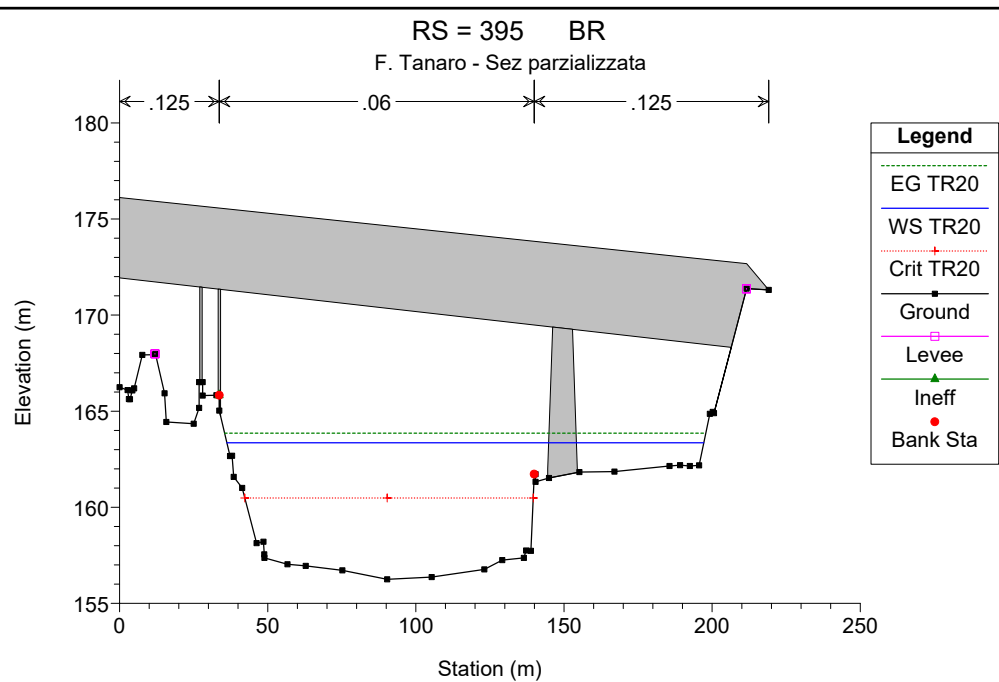
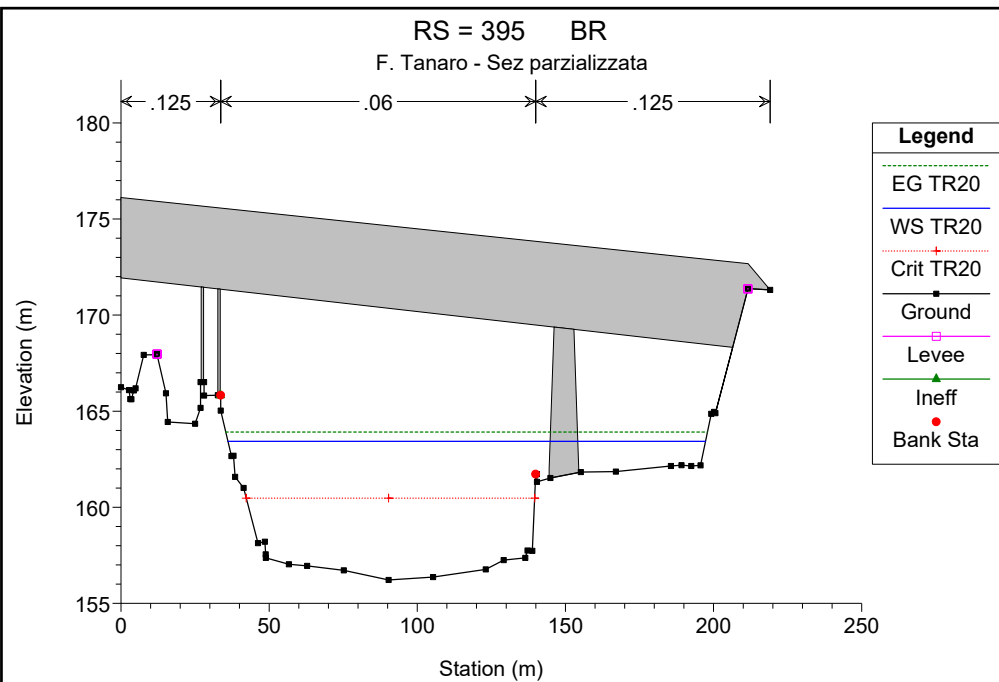


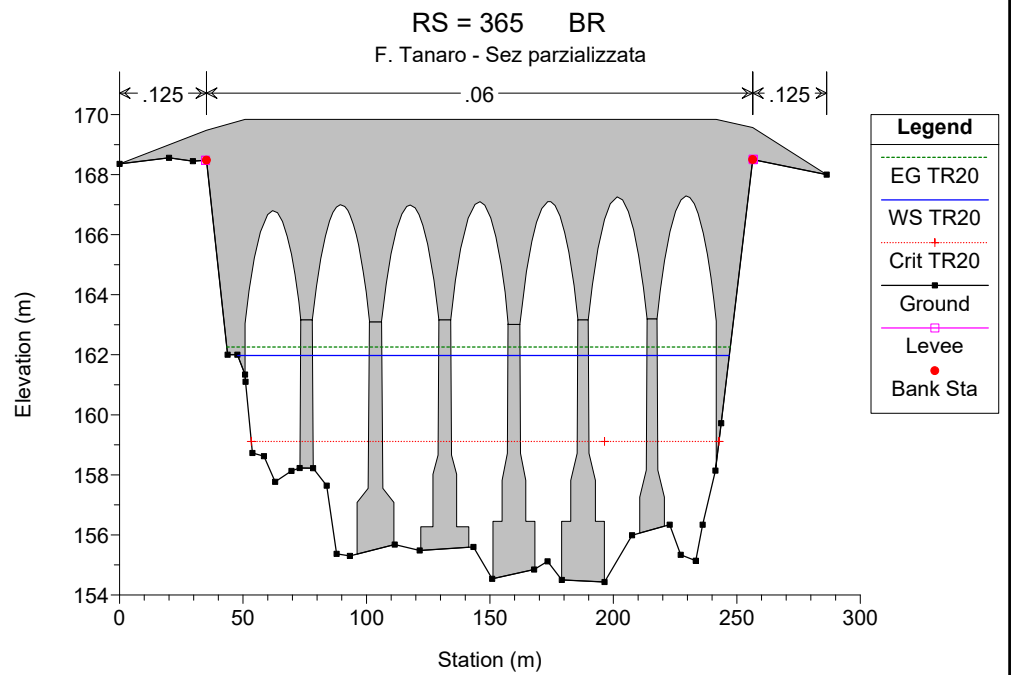
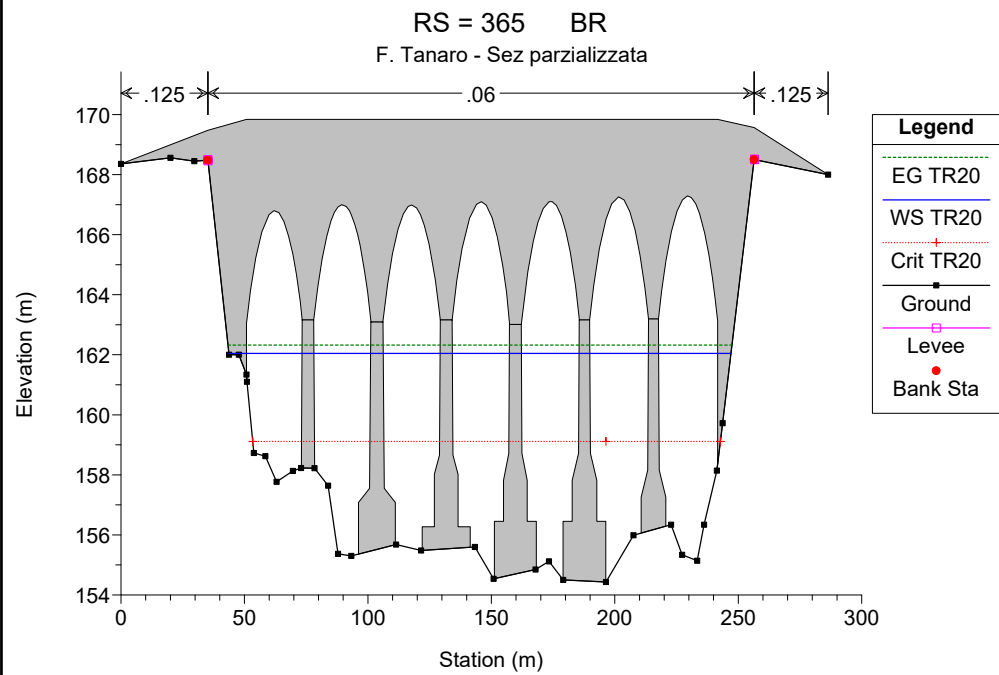
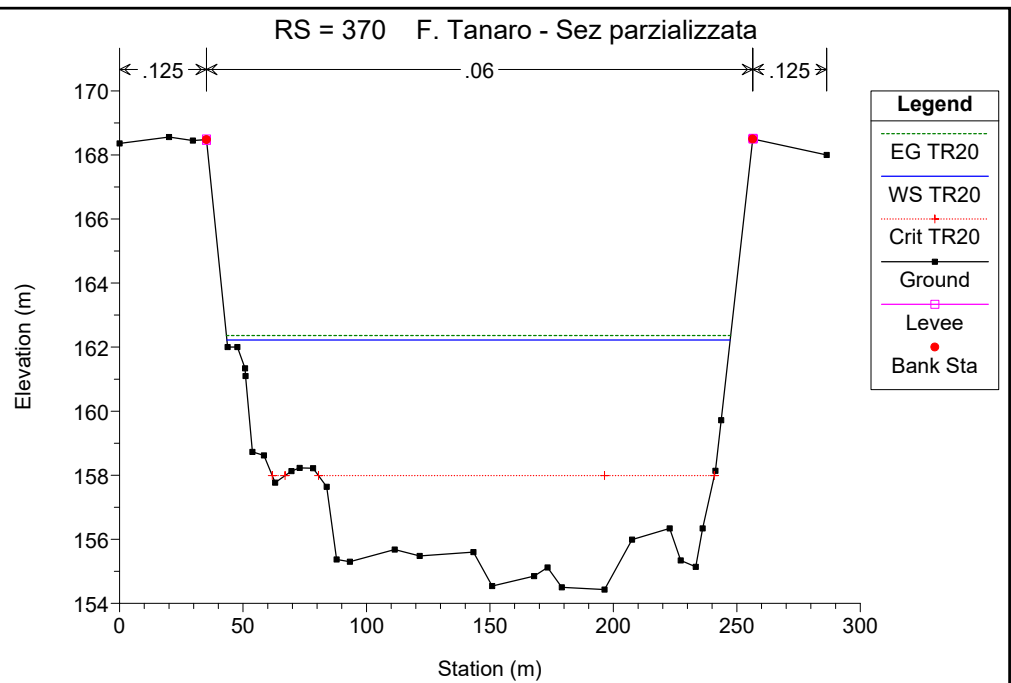
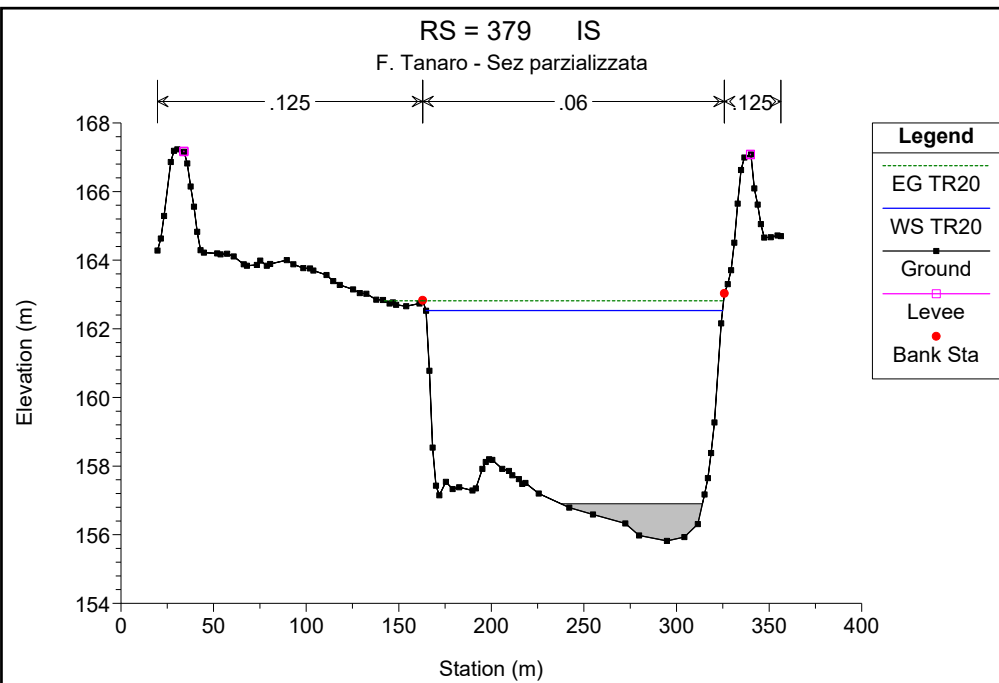


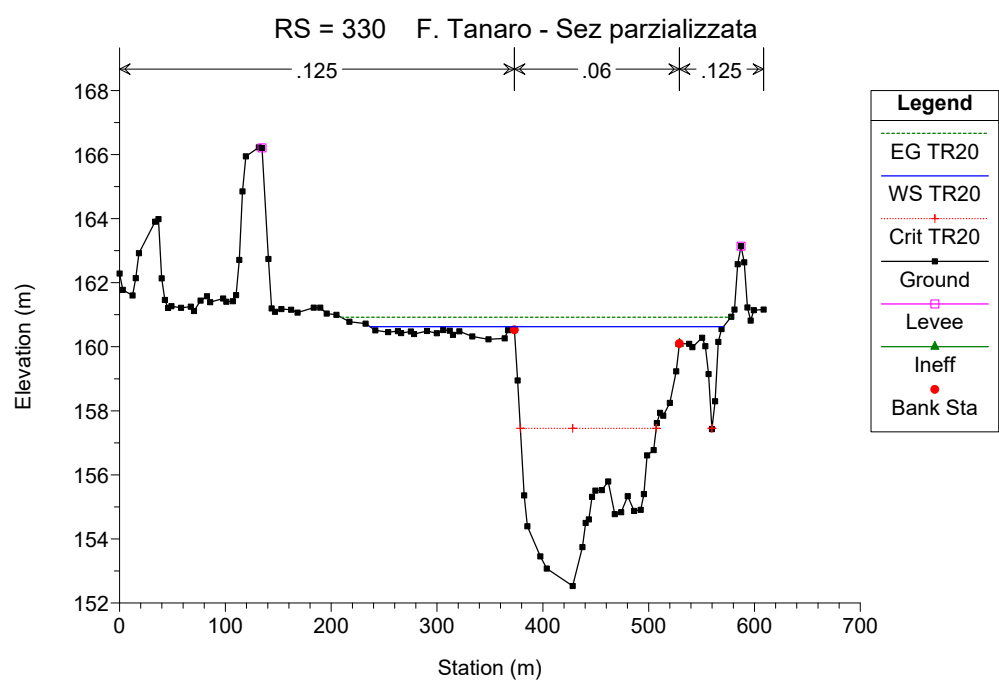
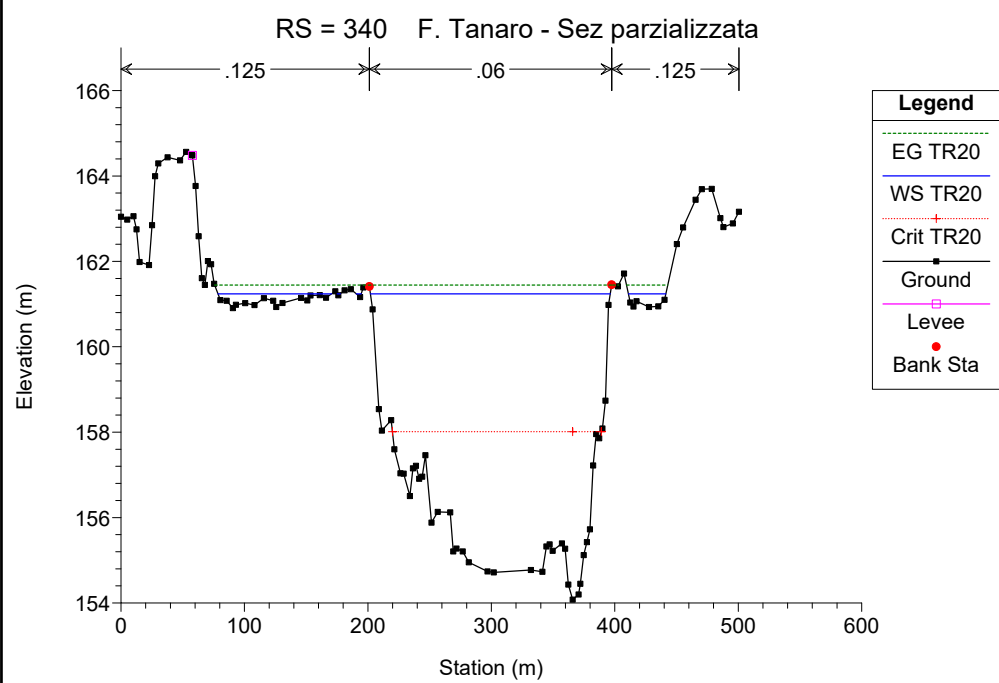
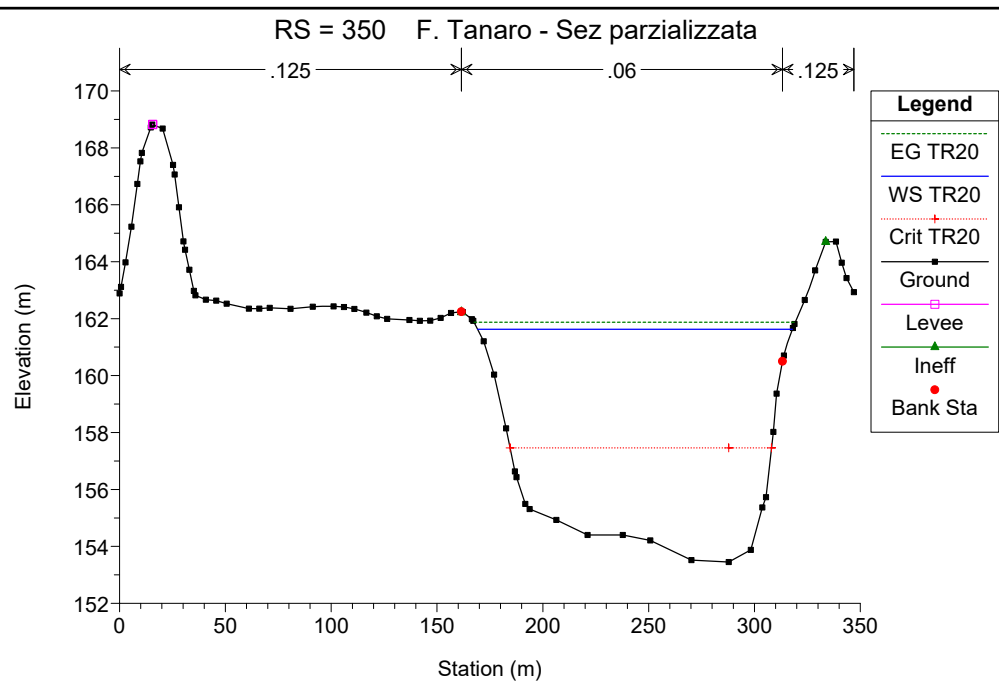
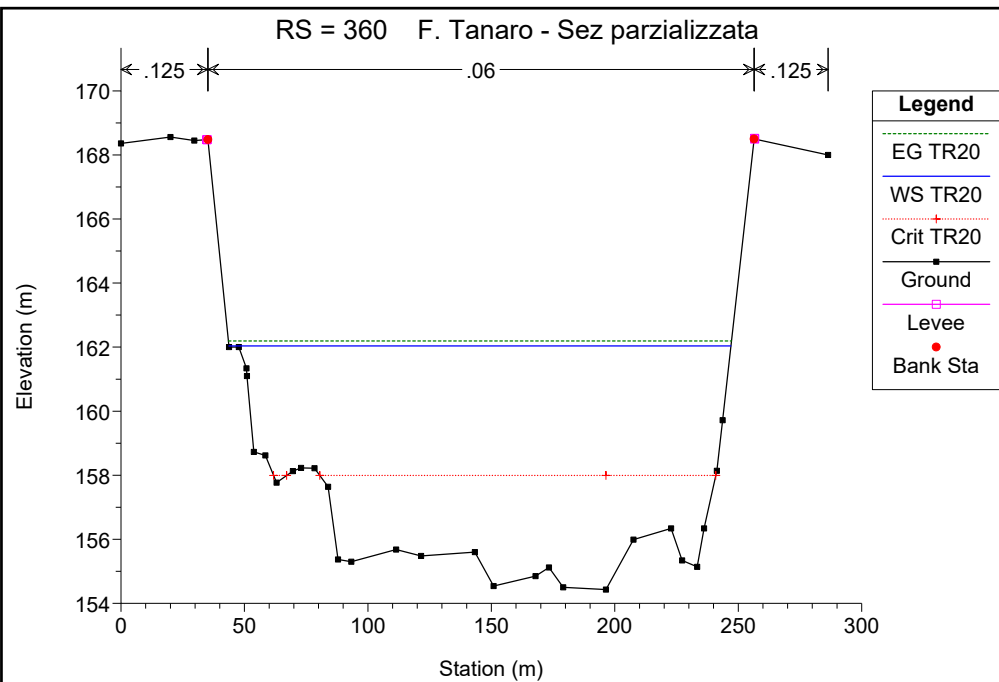


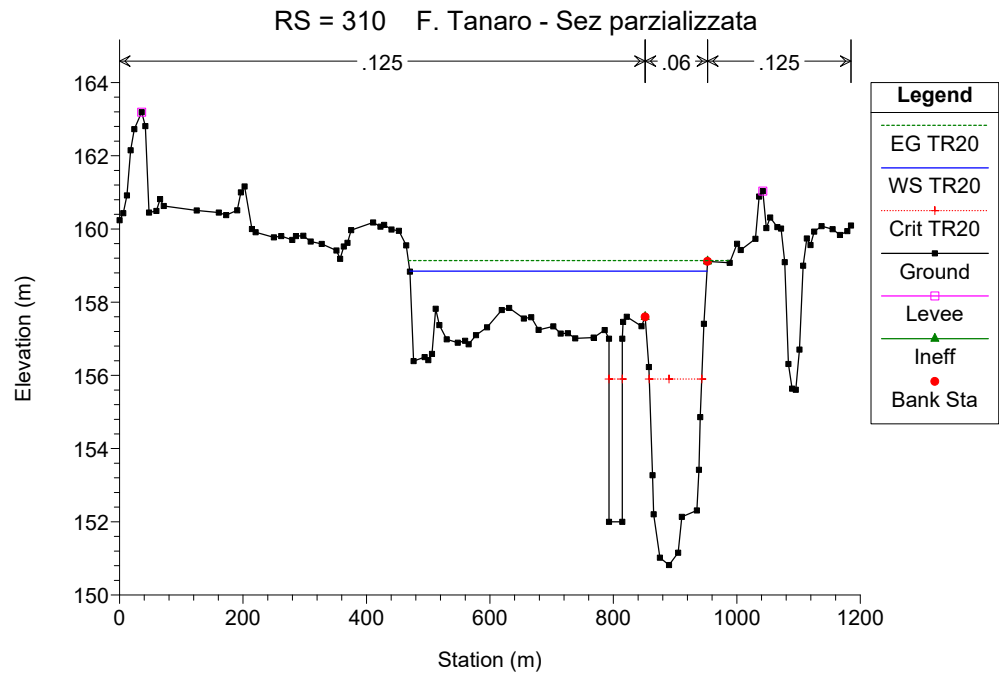
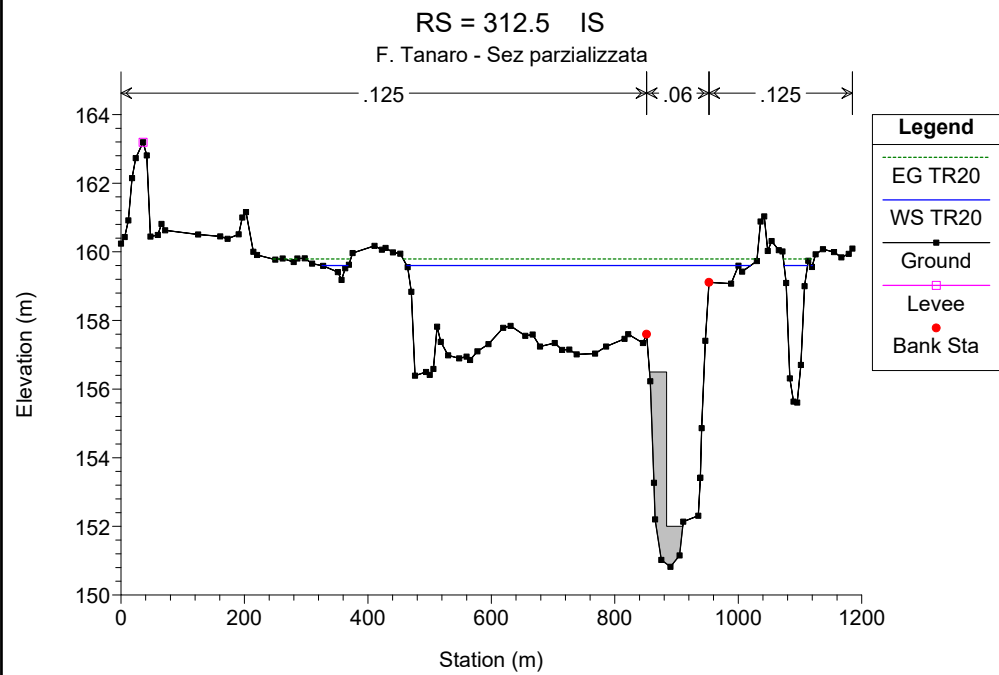
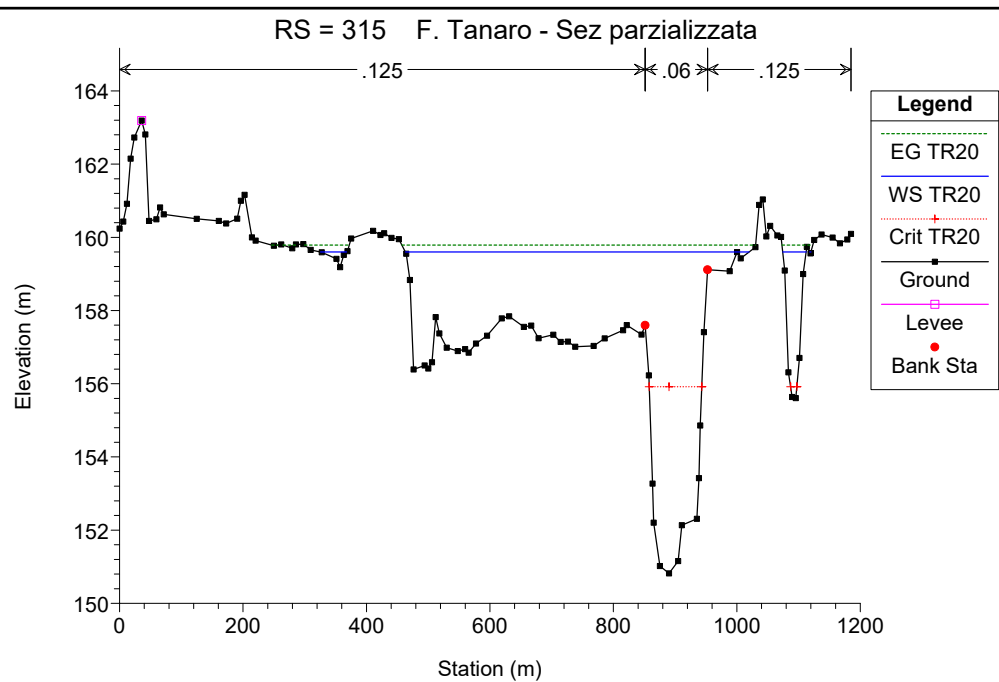
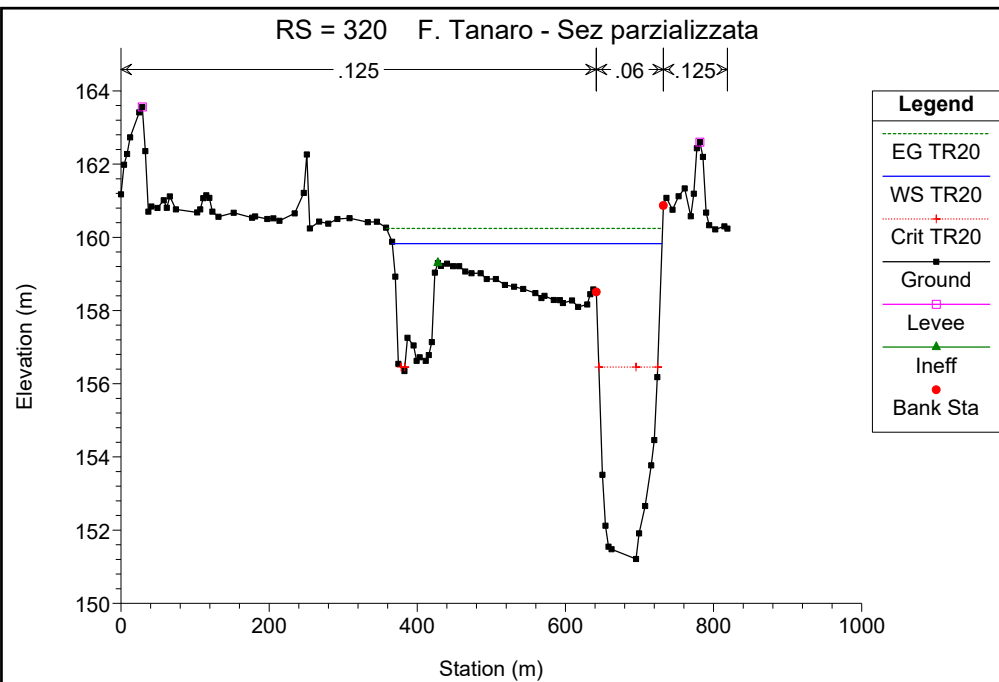


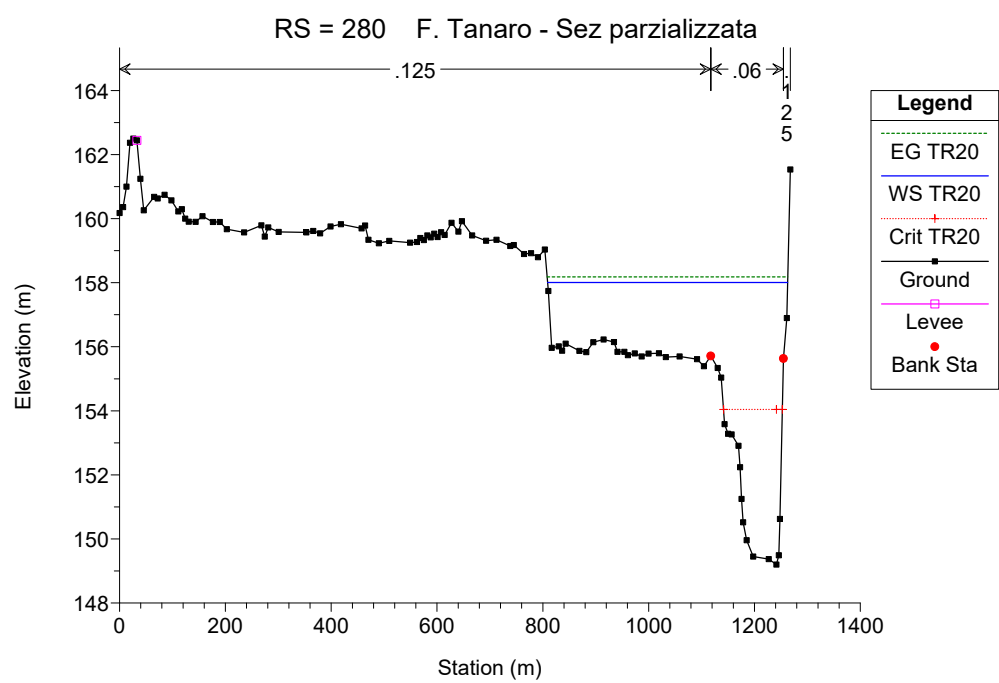
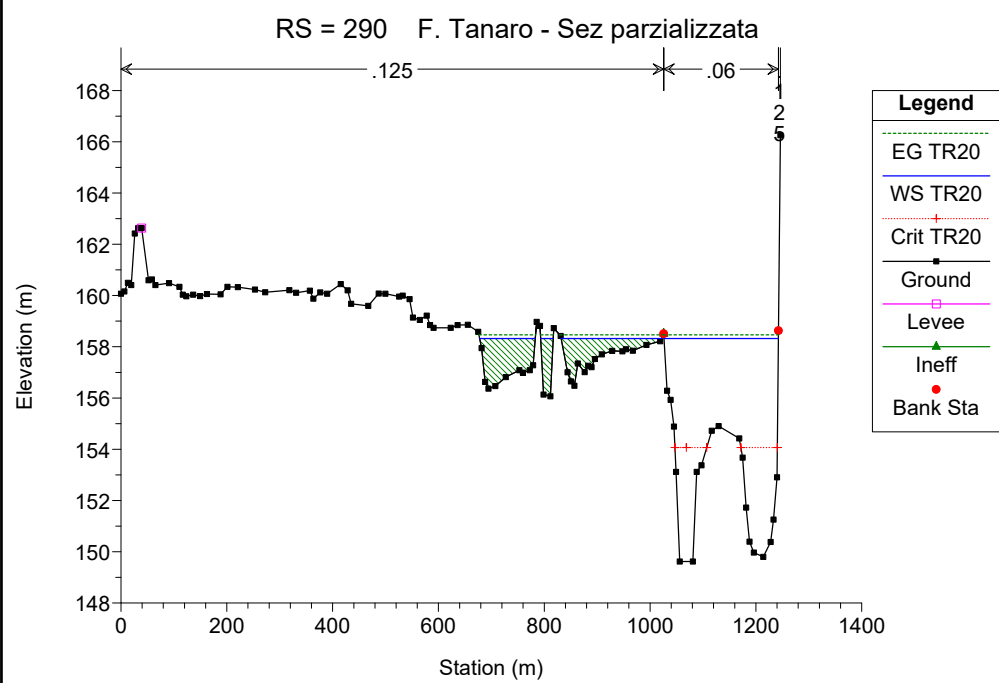
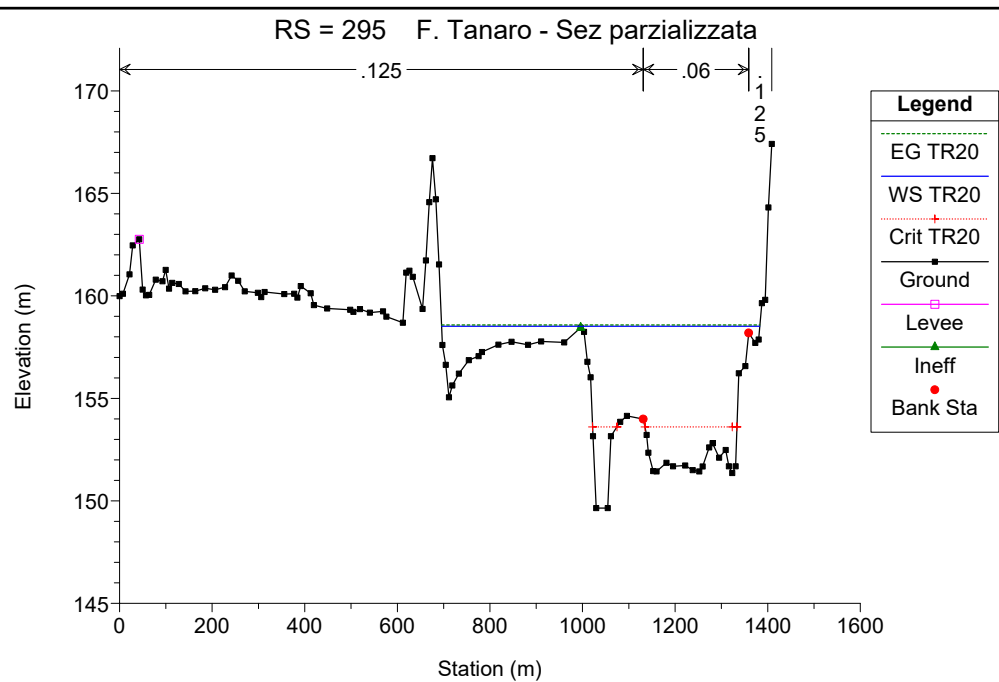
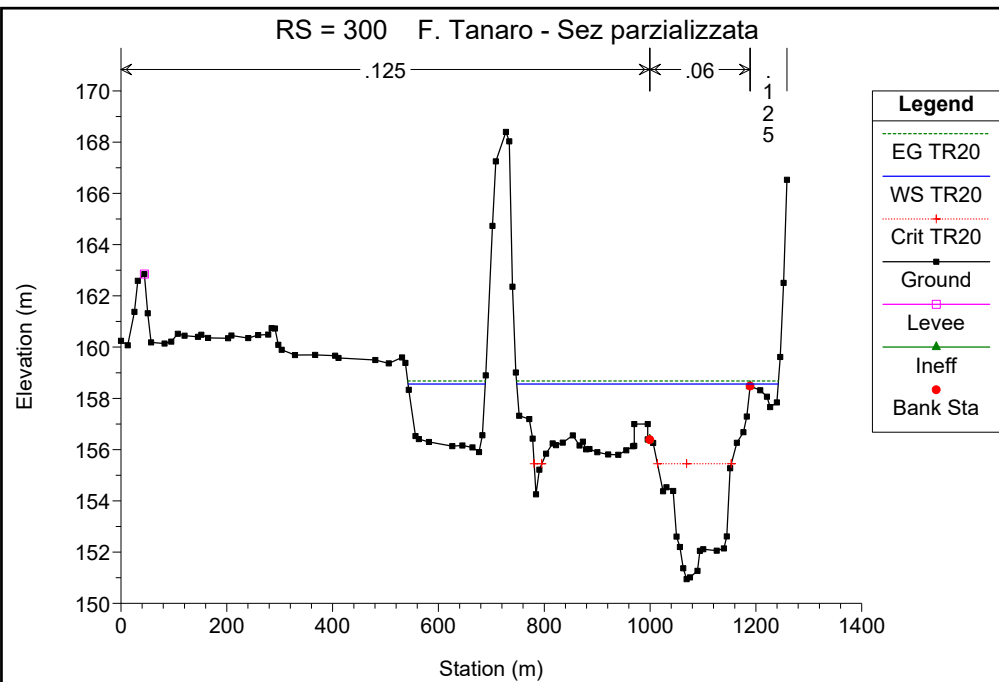


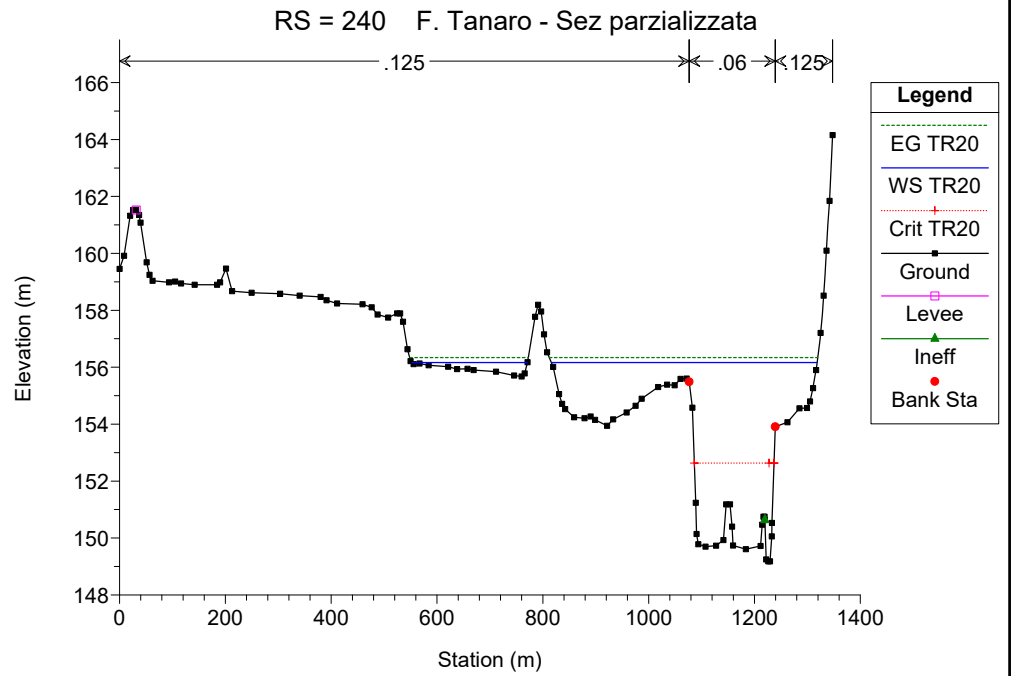
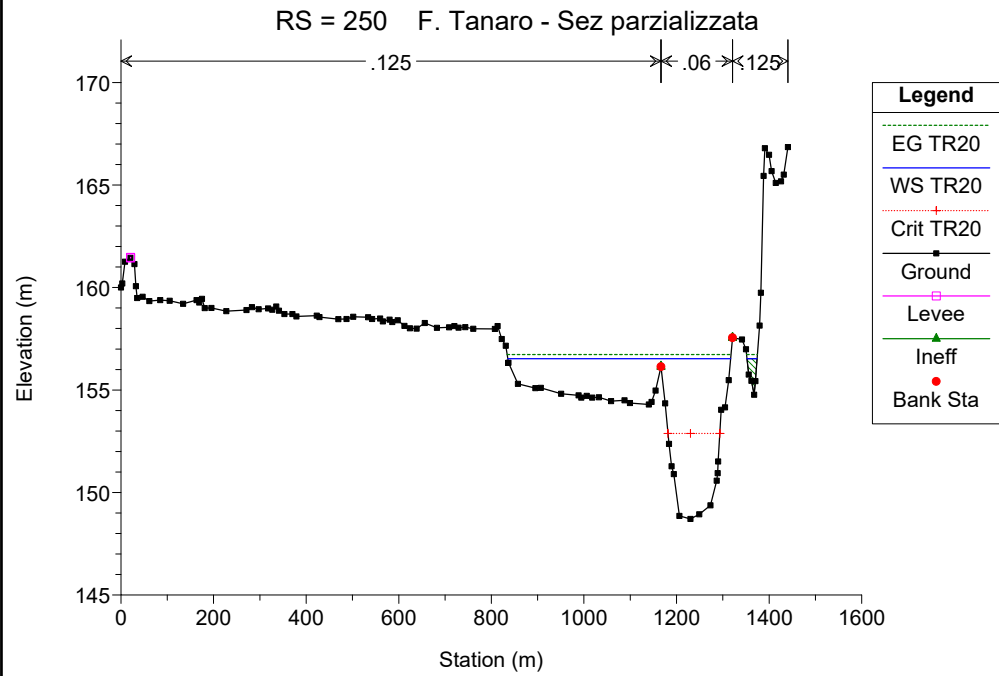
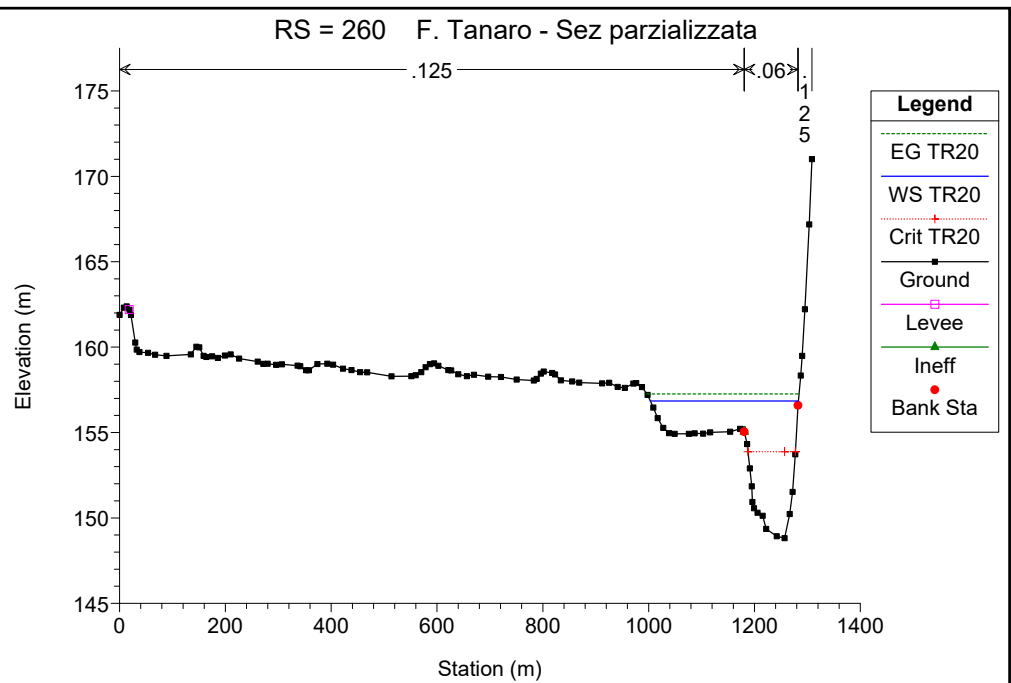
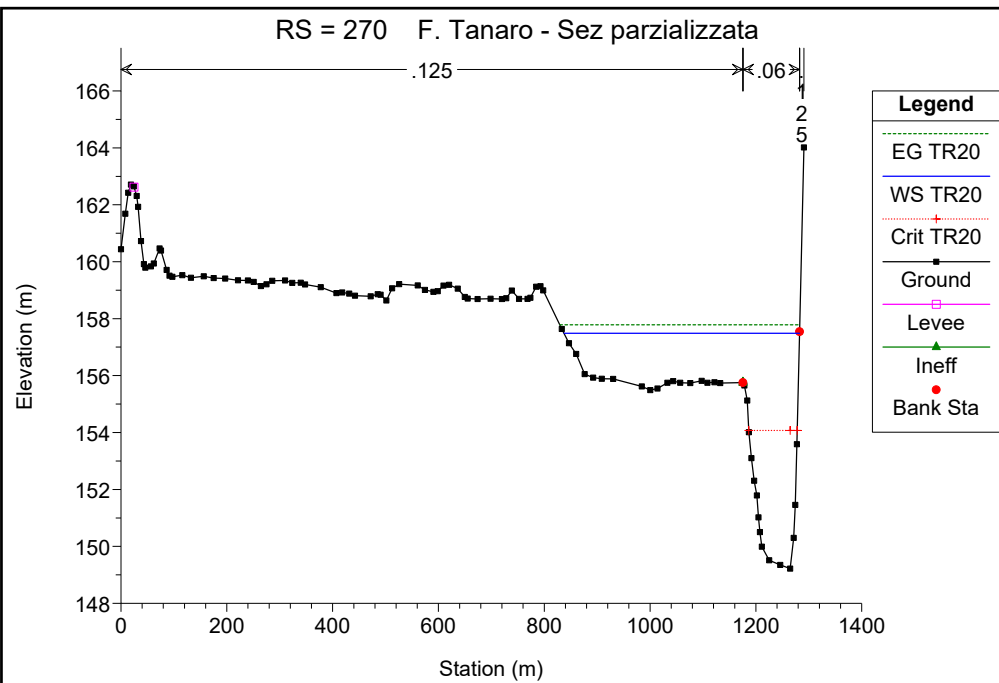


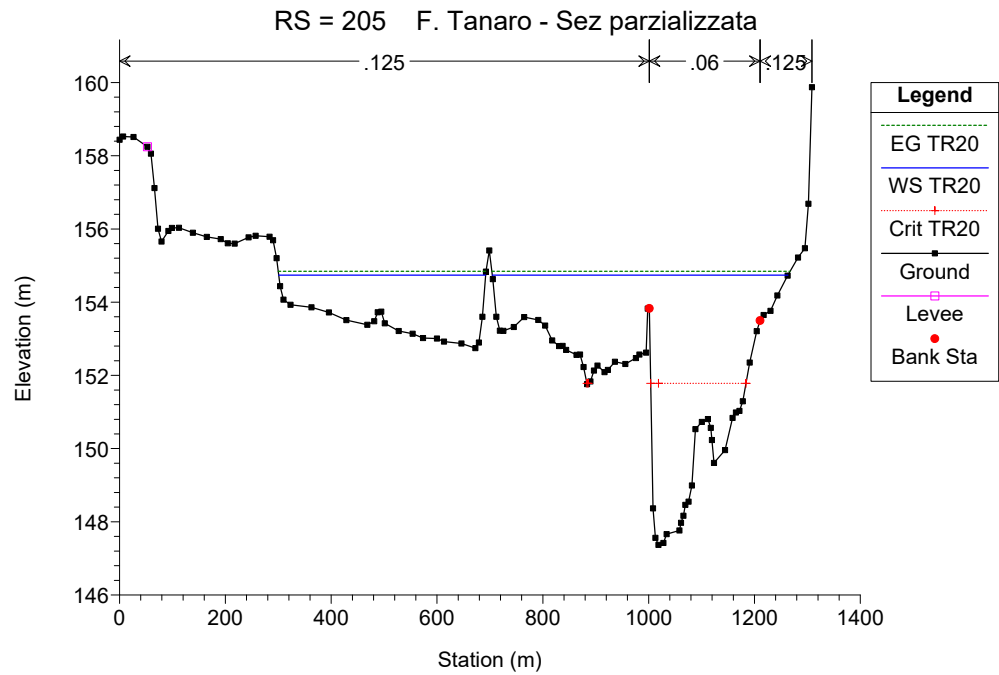
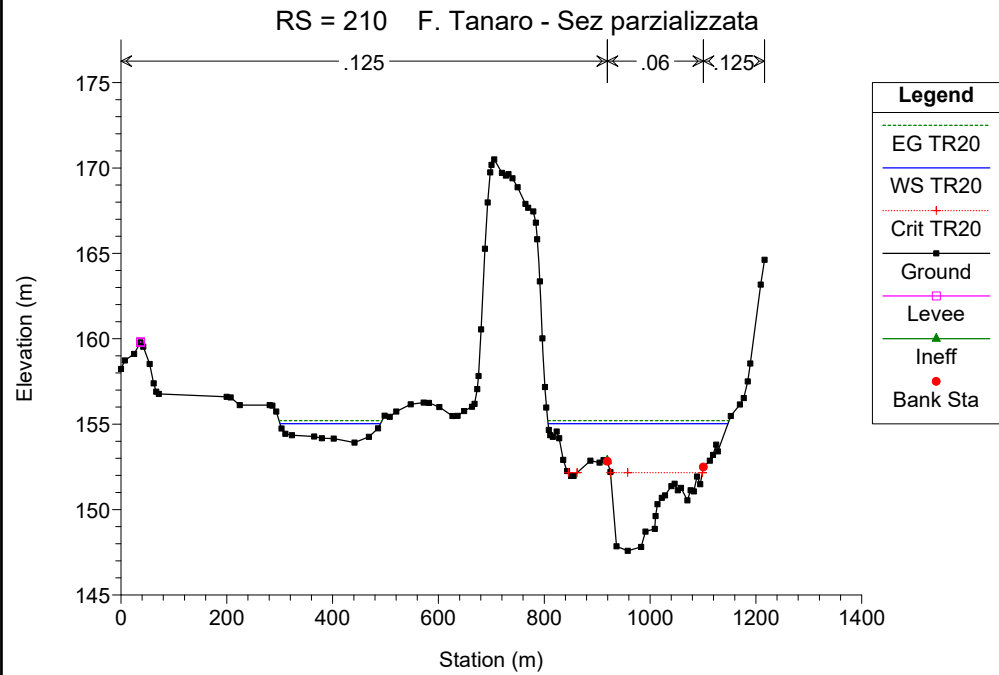
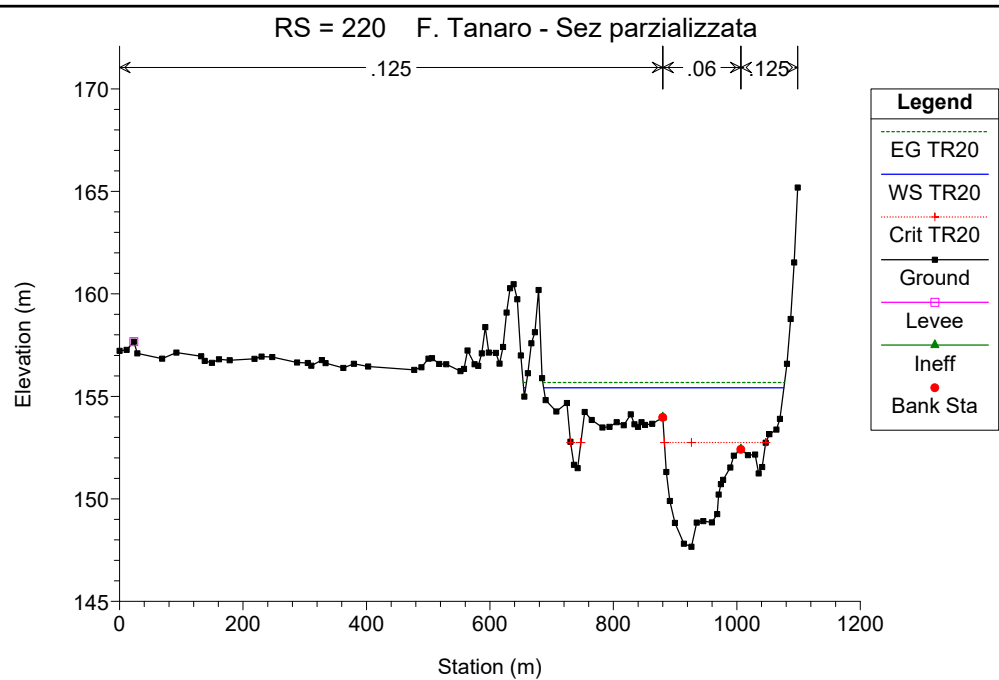
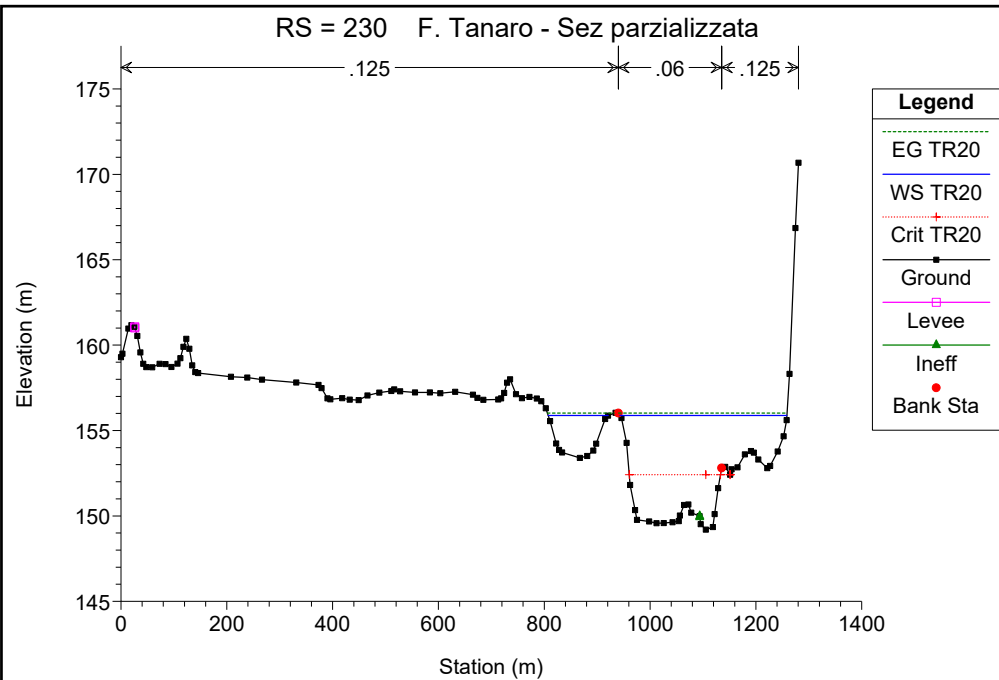


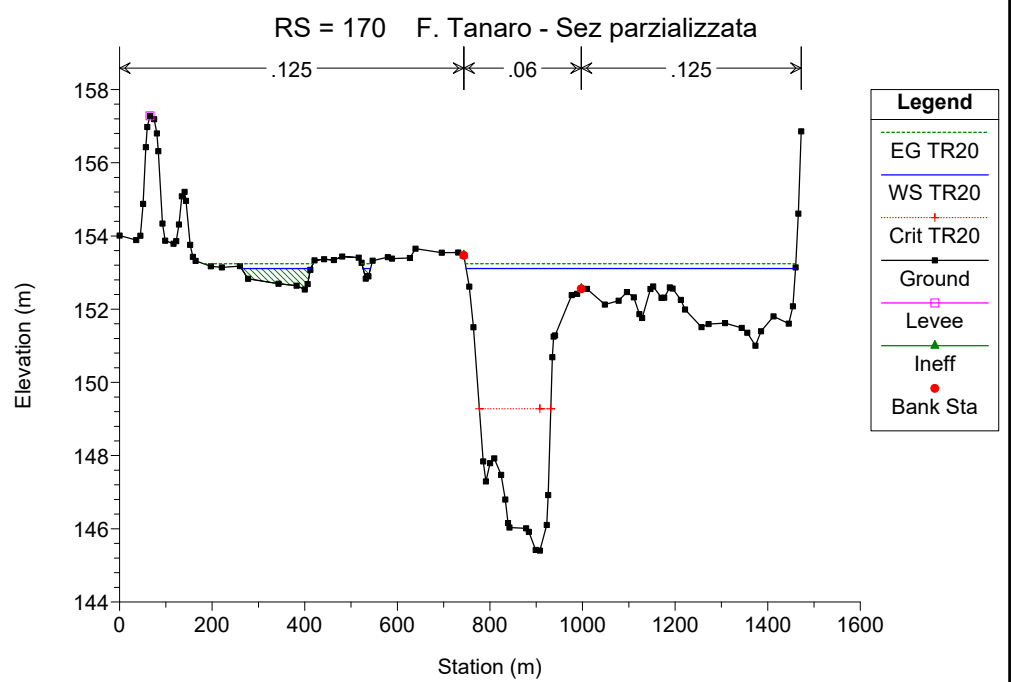
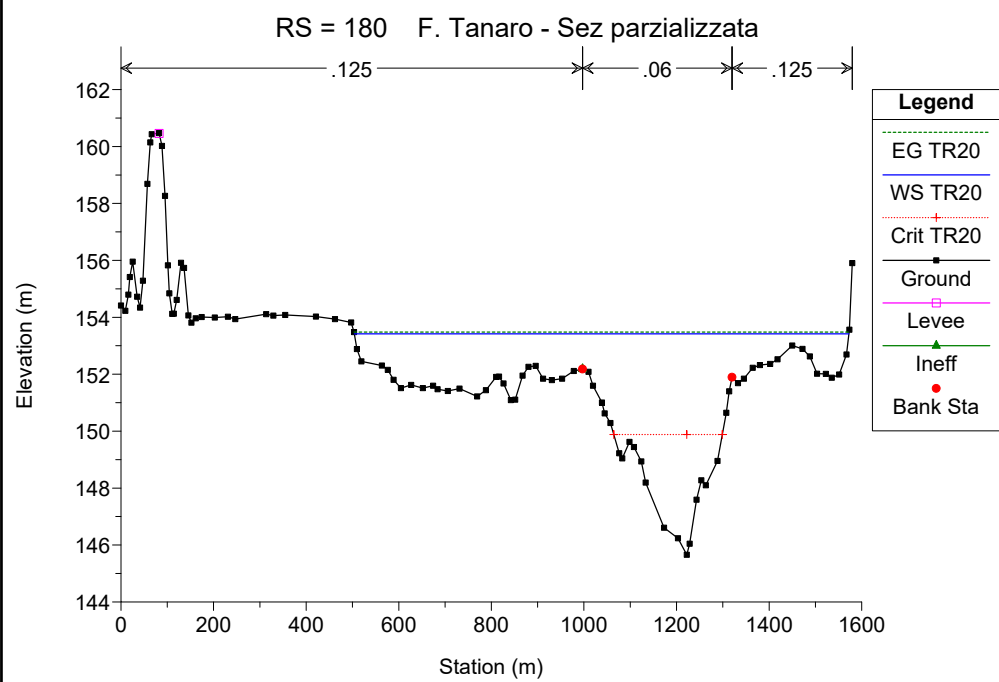
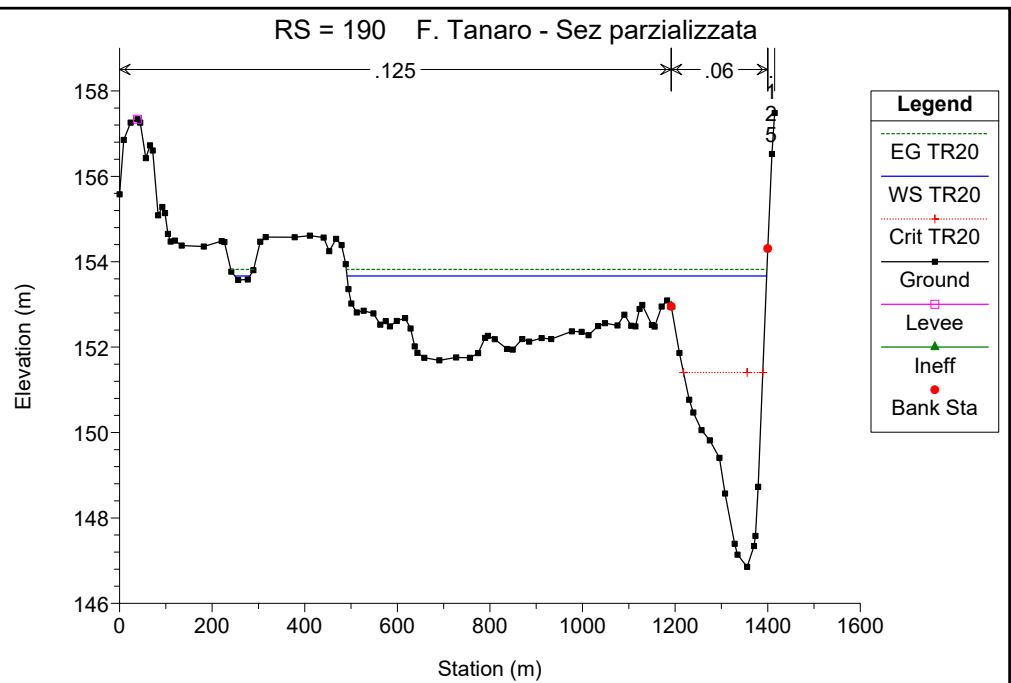
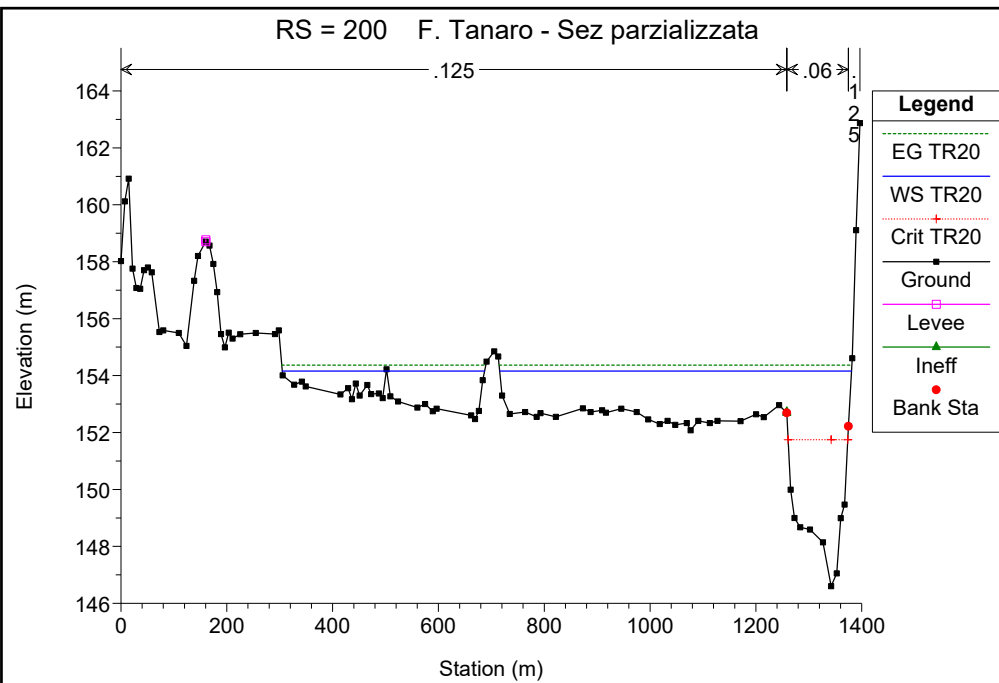


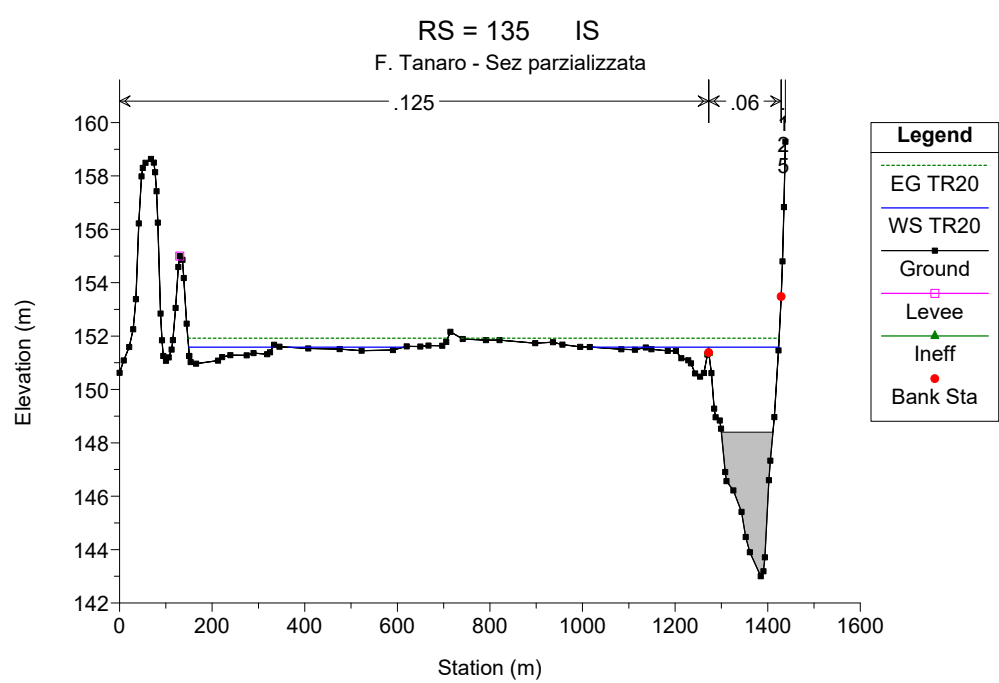
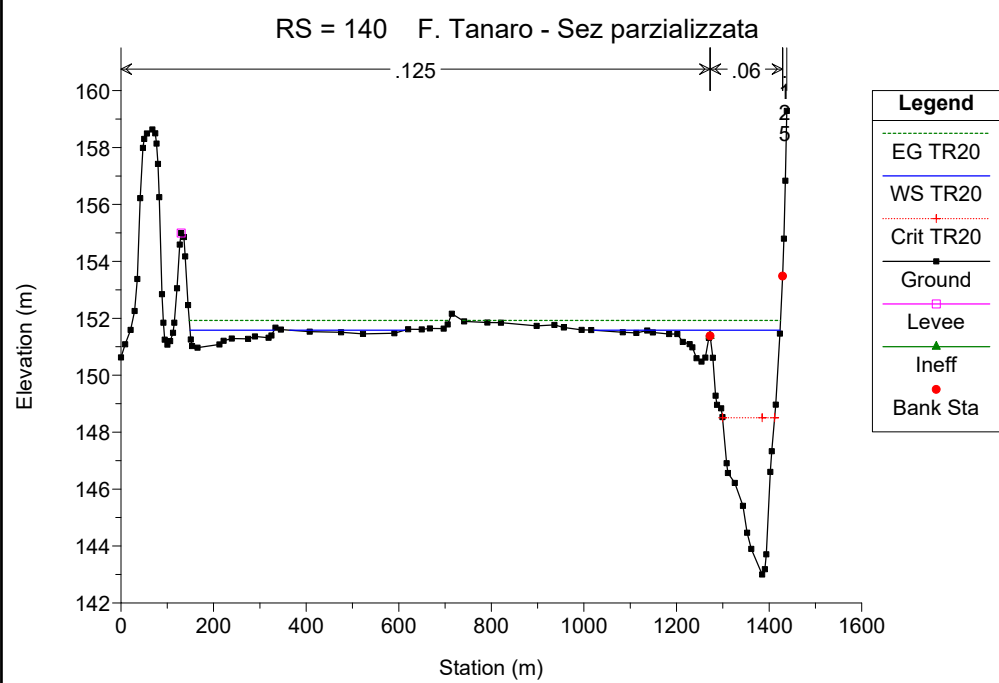
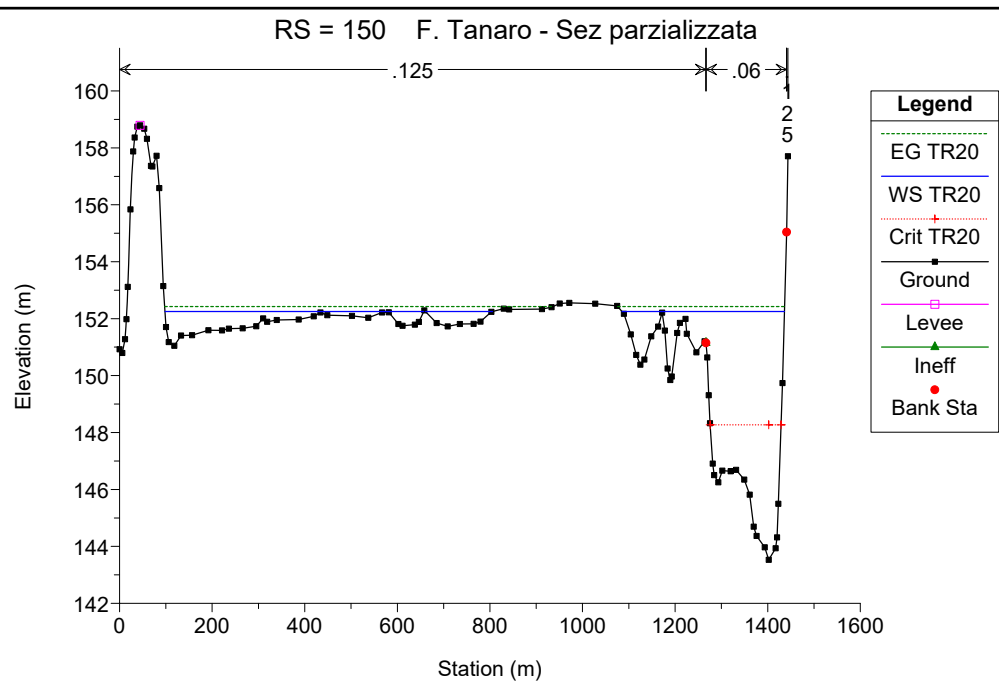
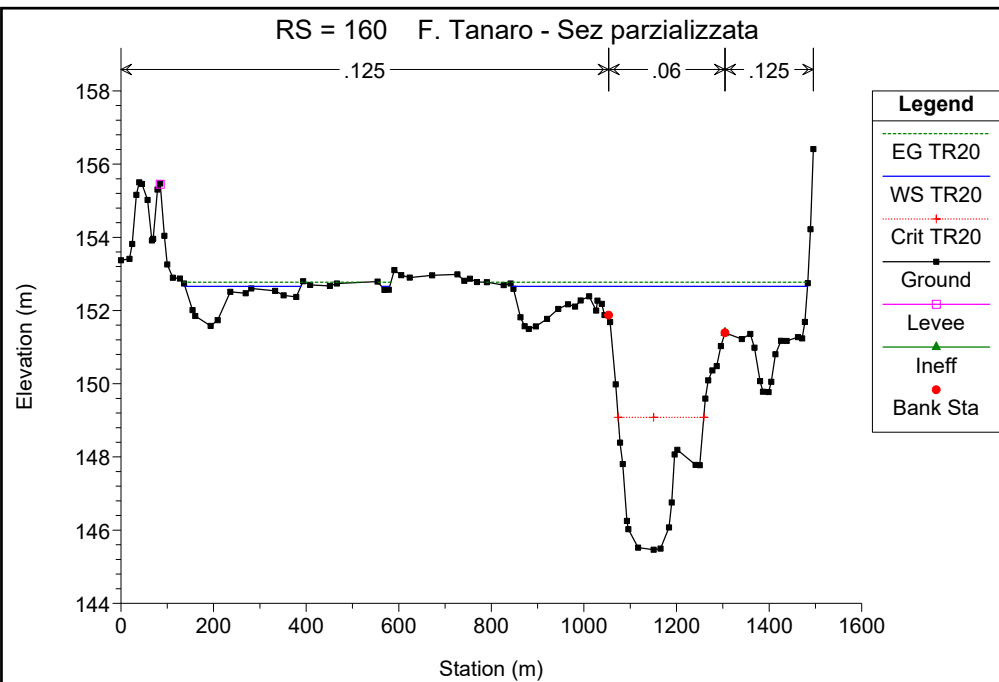


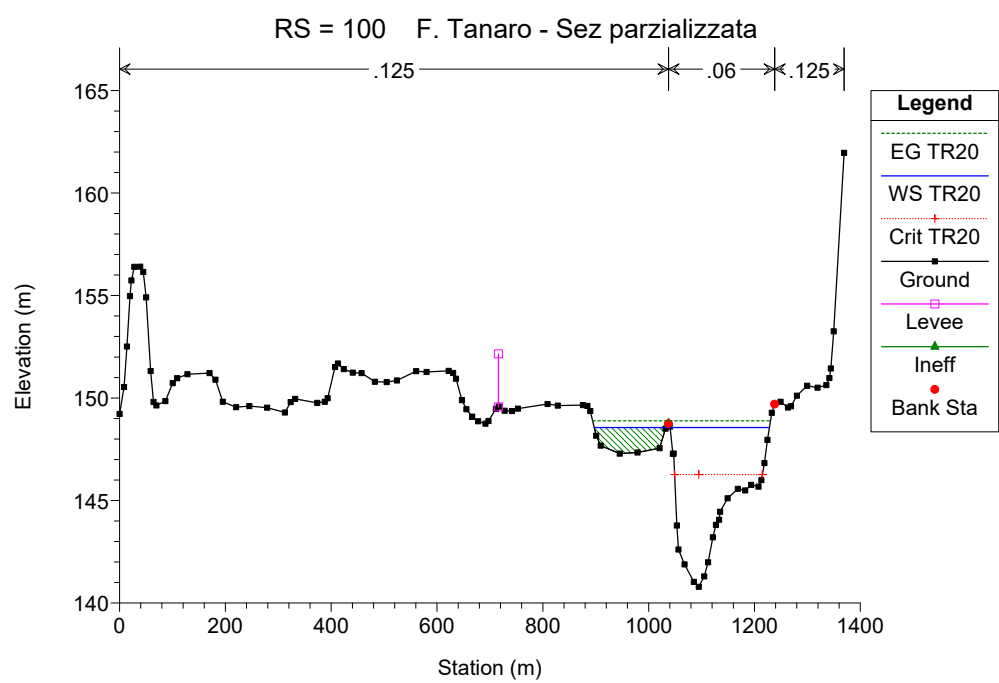
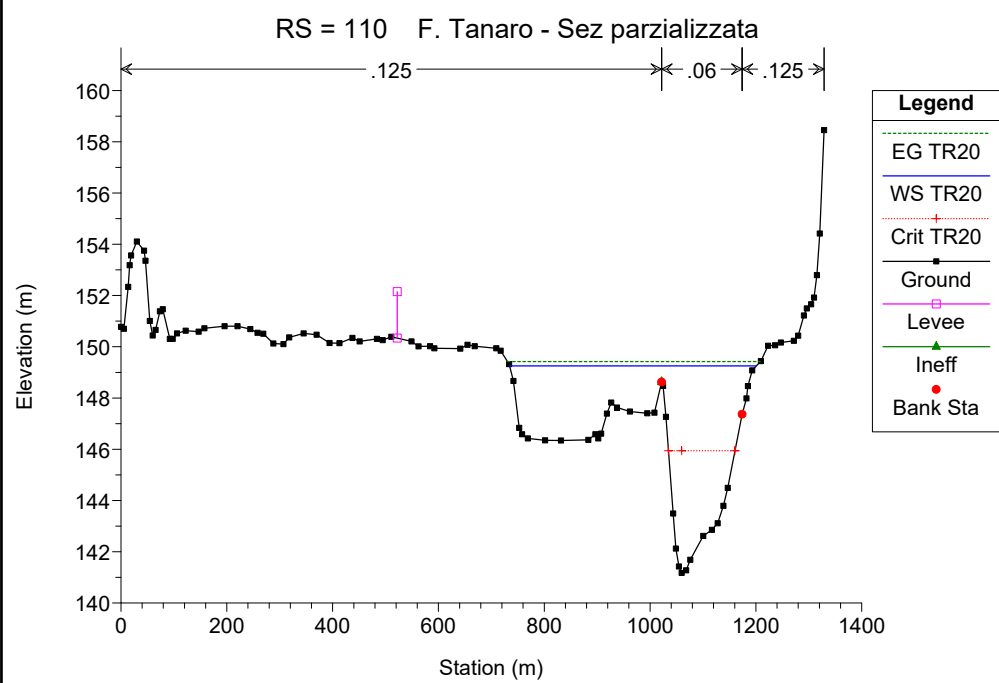
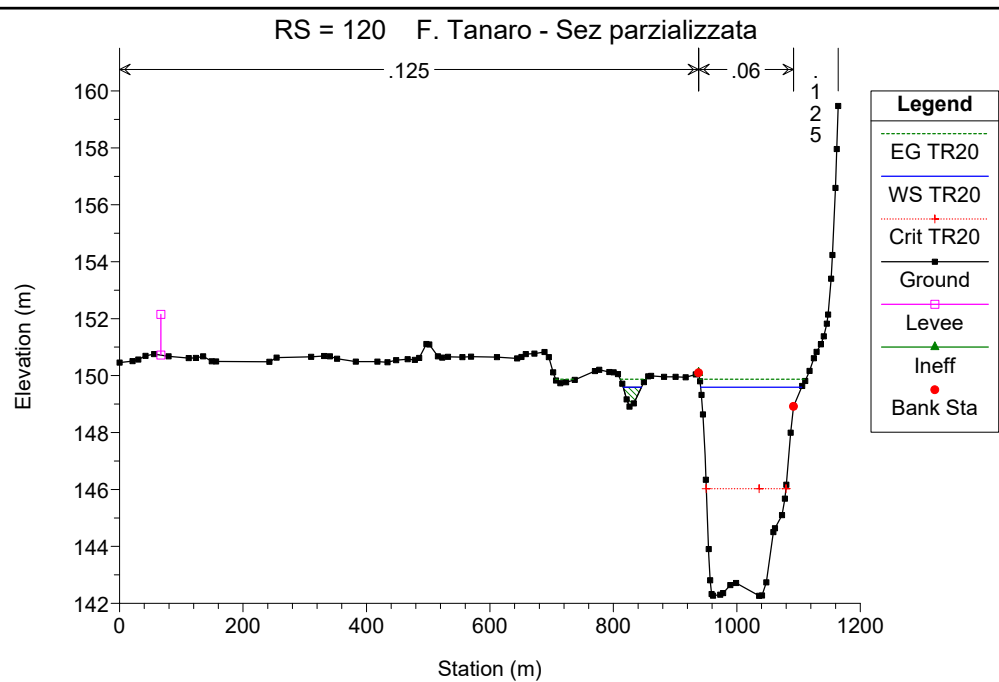
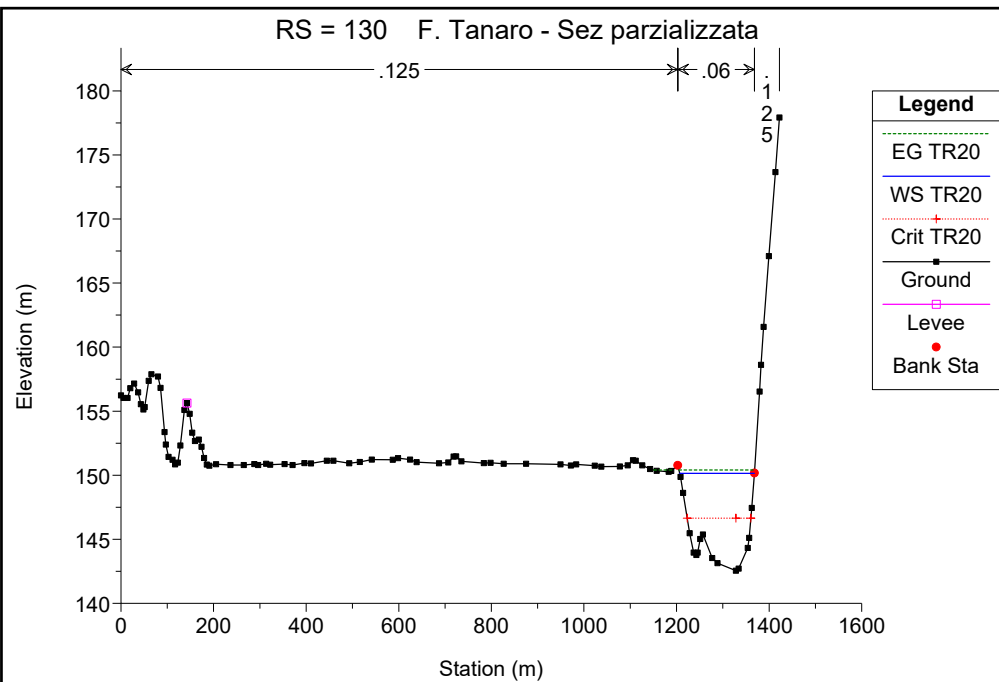


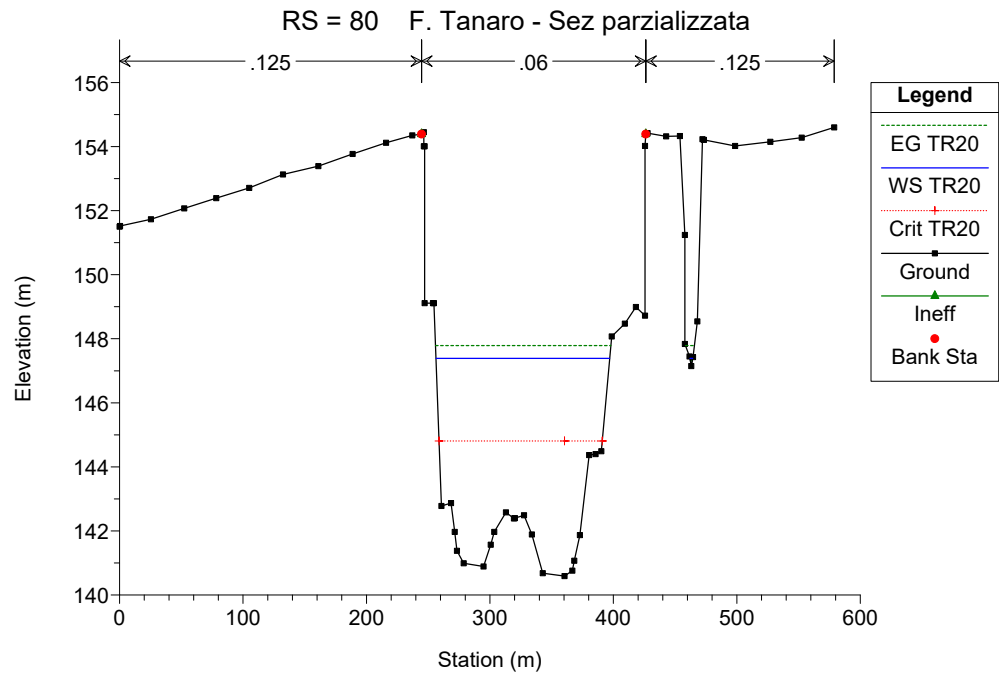
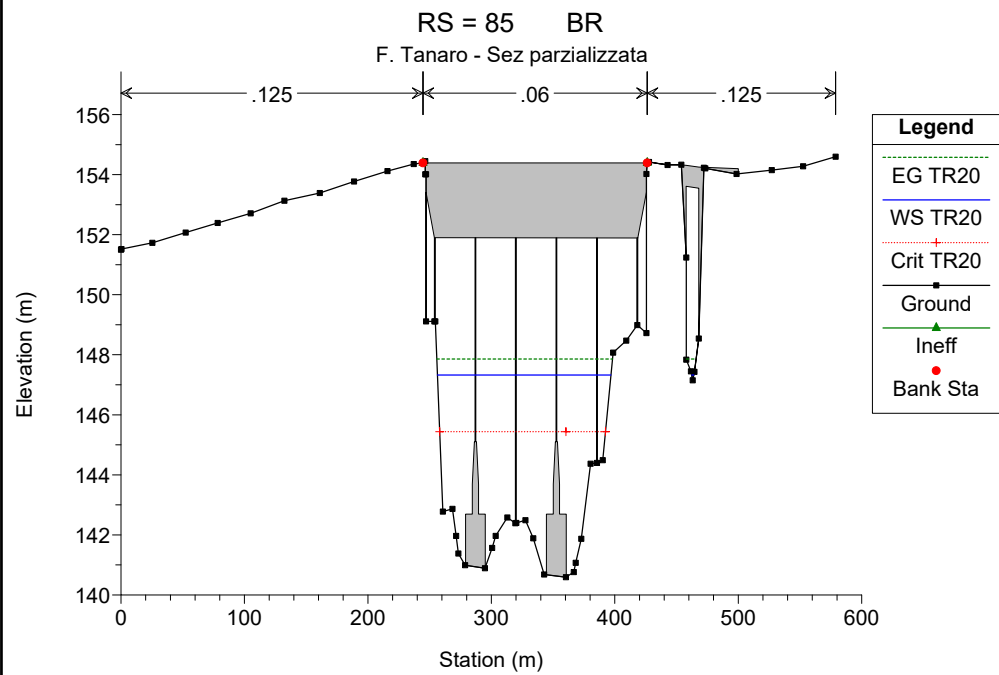
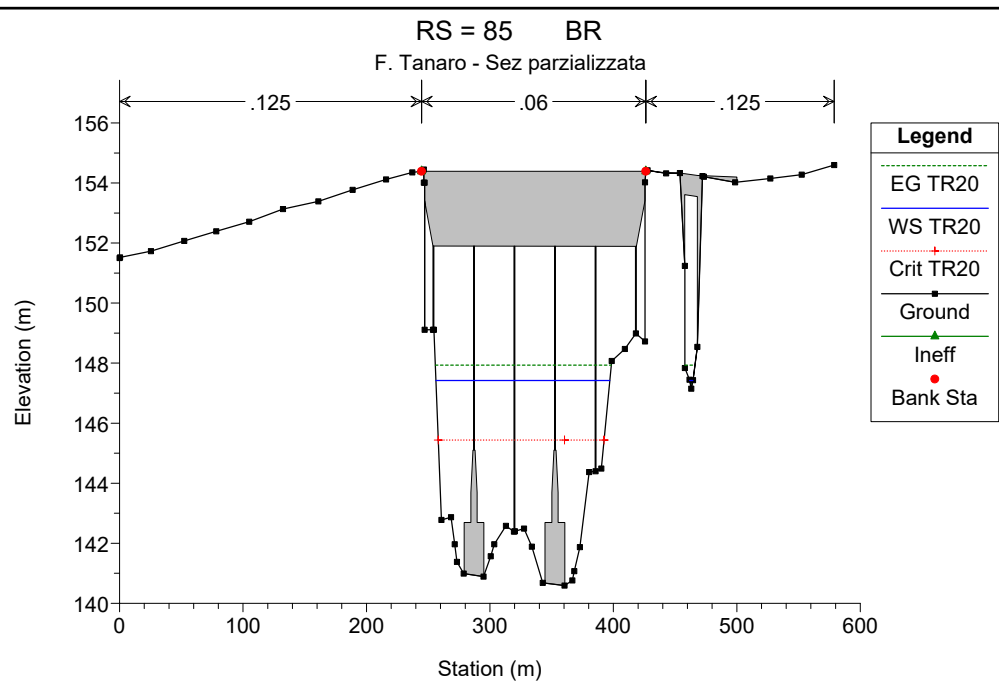
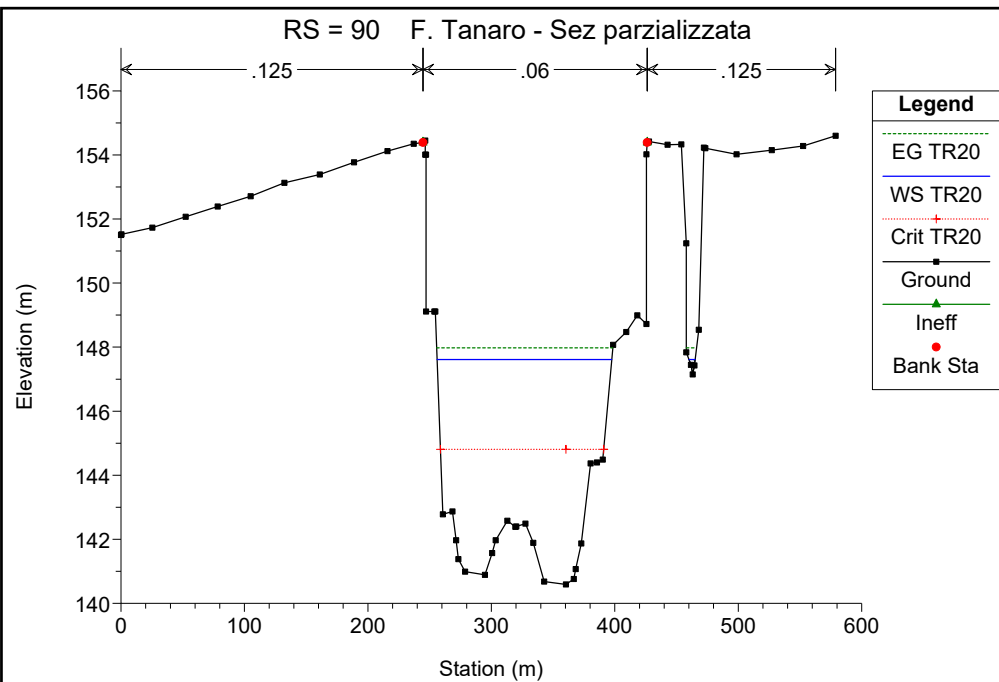


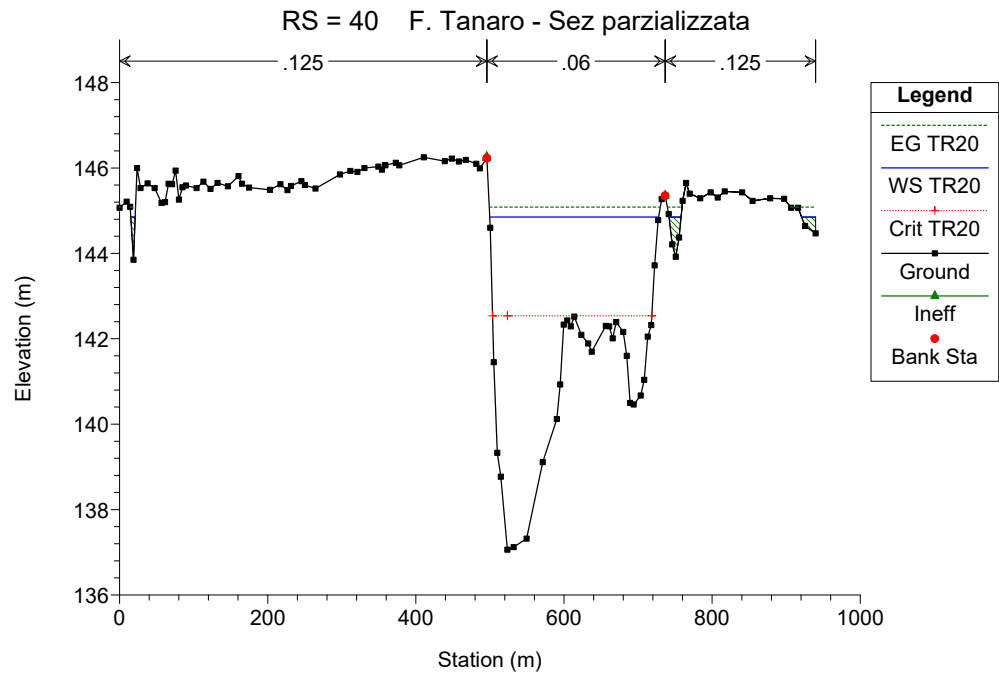
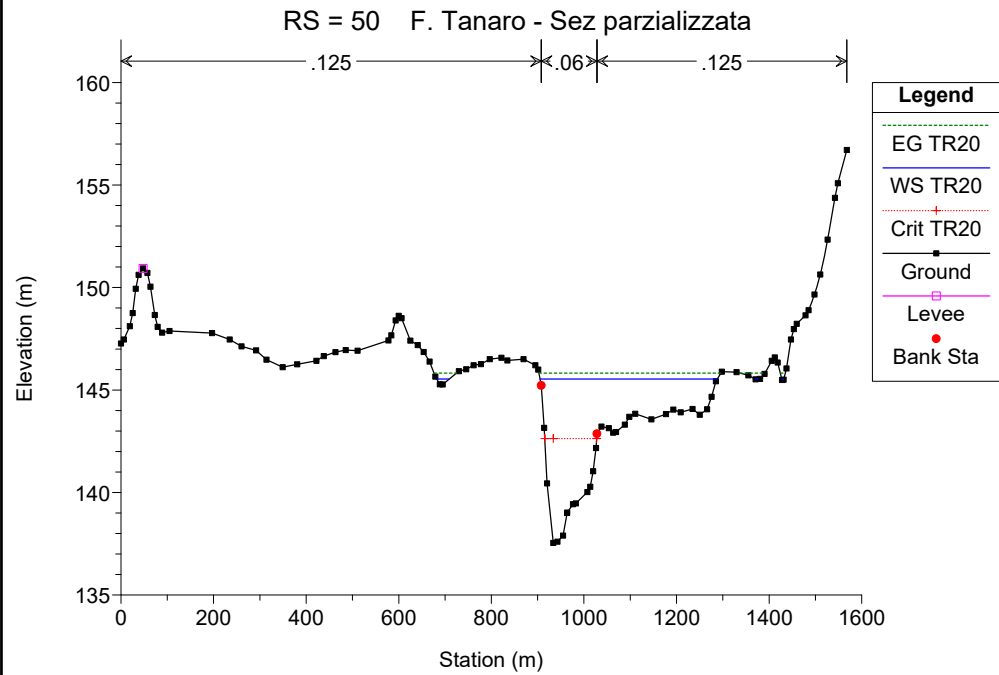
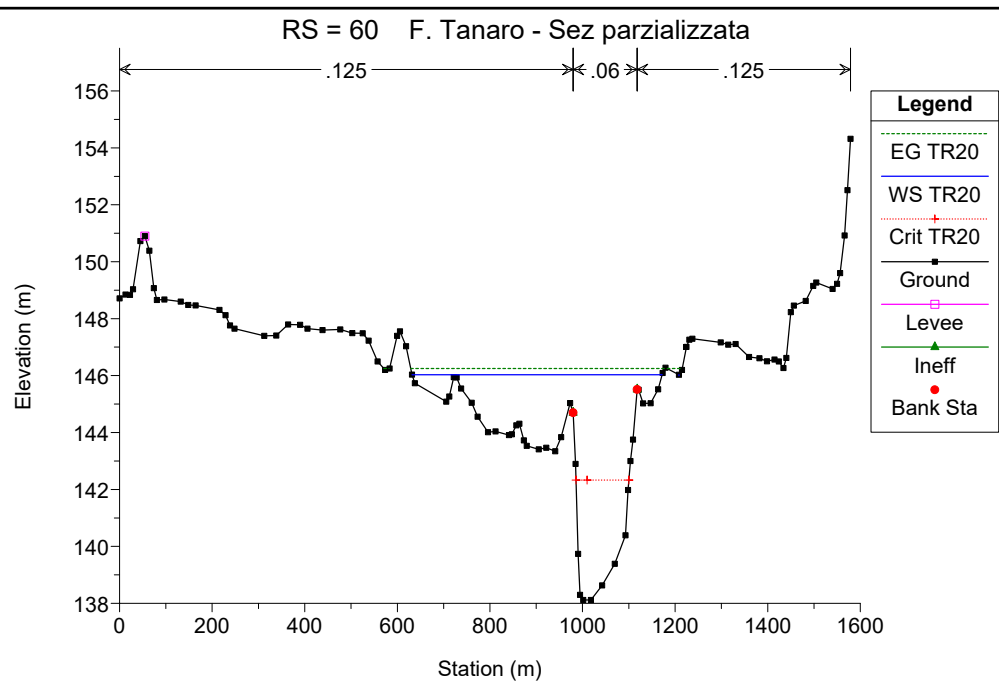
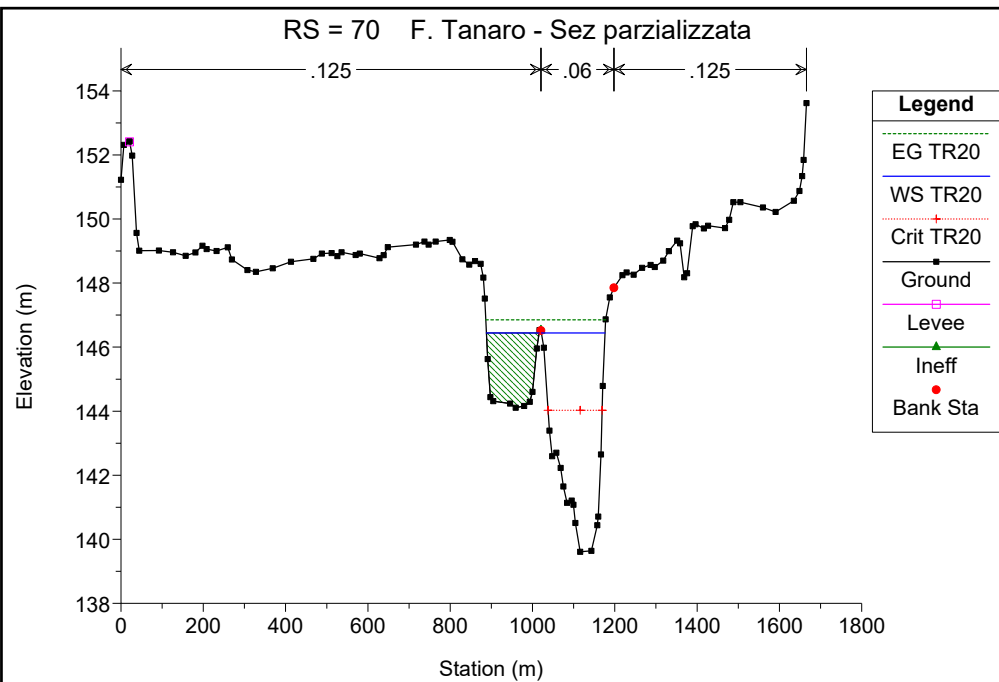


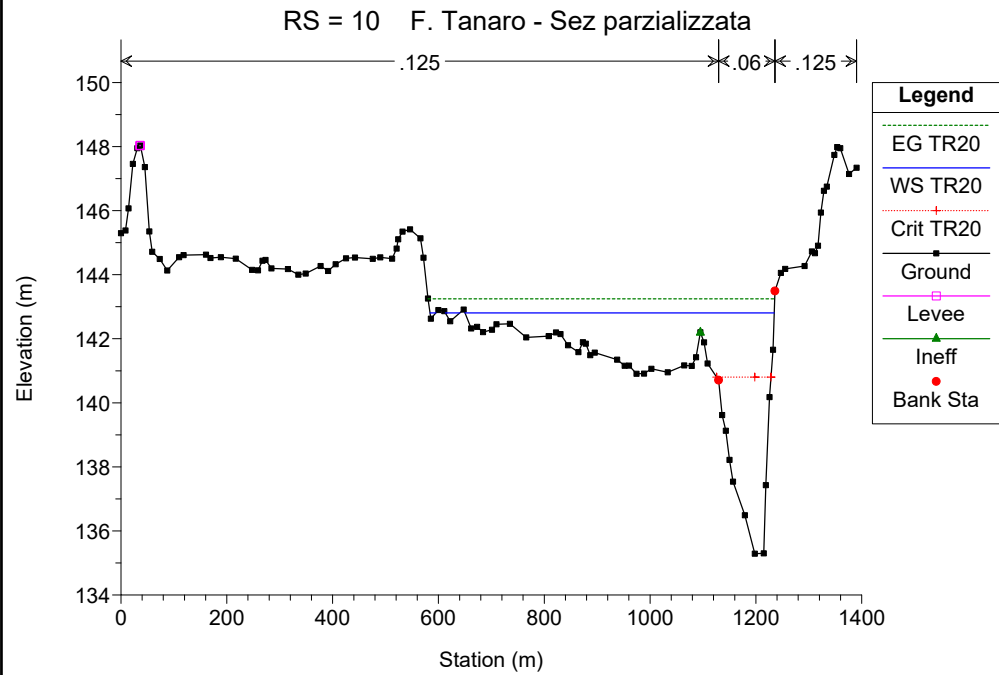
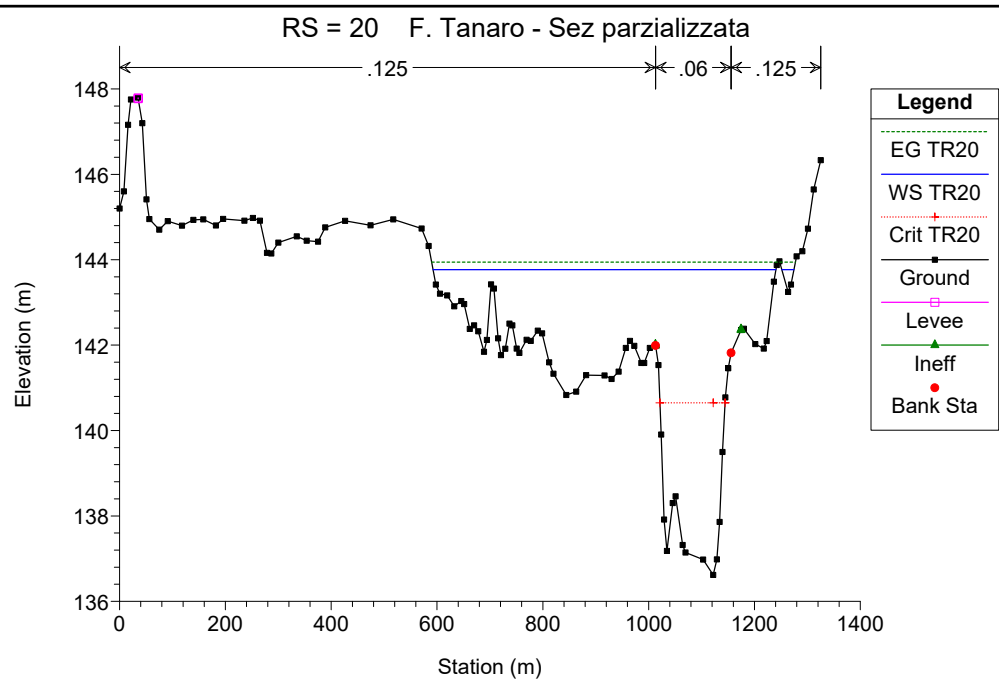
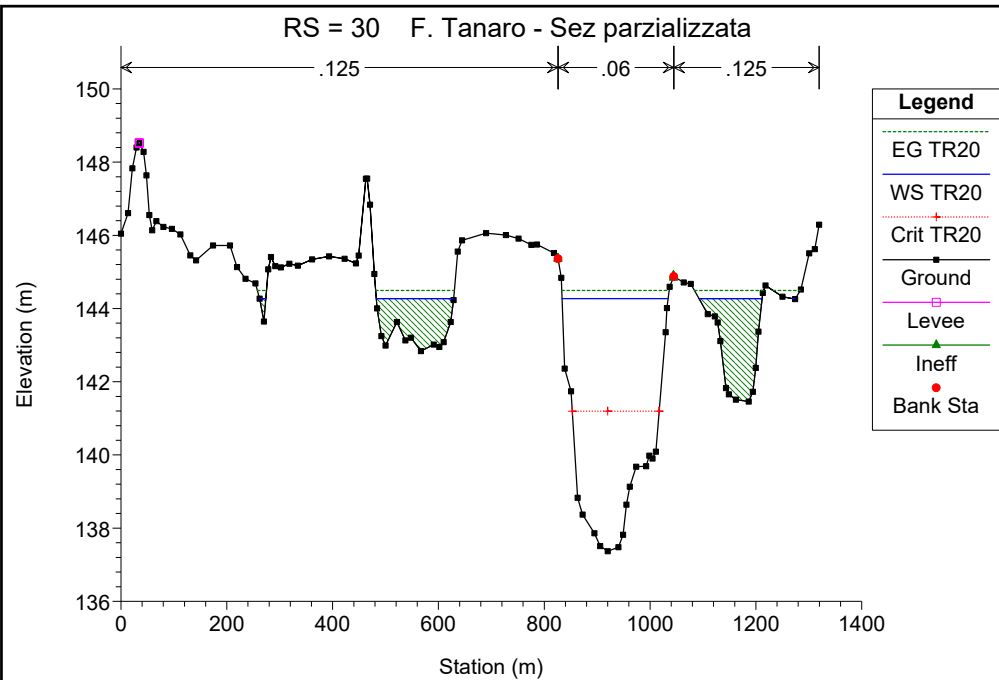












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 5

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2412	50
F. Tanaro valle Riddone	2419	
F. Tanaro valle Cherasca	2428	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50

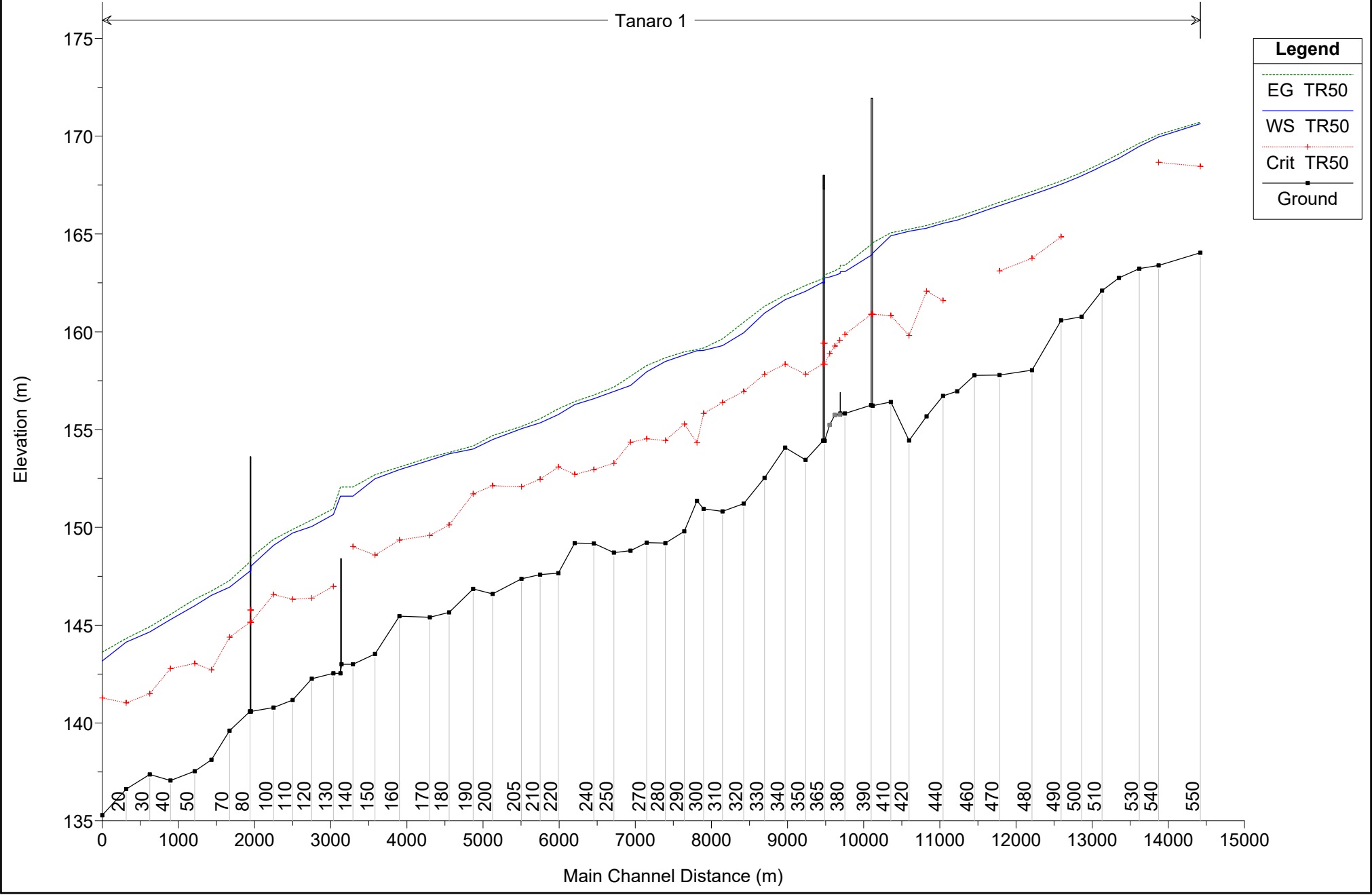
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR50	2412.00	164.04	170.64	168.46	170.71	0.001136	1.37	2719.57	1158.07	0.22
1	540	TR50	2412.00	163.39	169.96	168.66	170.08	0.001786	2.06	2661.03	1117.98	0.29
1	530	TR50	2412.00	163.23	169.48		169.64	0.001766	2.00	1918.80	663.79	0.29
1	520	TR50	2412.00	162.75	168.87		169.09	0.002414	2.35	1876.43	983.47	0.34
1	510	TR50	2412.00	162.10	168.47		168.63	0.002137	2.06	1936.48	717.67	0.31
1	500	TR50	2412.00	160.77	167.97		168.14	0.001661	2.06	1777.93	544.86	0.28
1	490	TR50	2412.00	160.58	167.54	164.86	167.71	0.001643	1.92	1637.49	502.83	0.28
1	480	TR50	2412.00	158.04	167.02	163.76	167.17	0.001320	1.89	1989.64	682.19	0.26
1	470	TR50	2412.00	157.79	166.44	163.11	166.62	0.001488	2.13	1810.39	510.21	0.28
1	460	TR50	2412.00	157.77	166.00		166.17	0.001261	1.94	1883.14	674.95	0.25
1	450	TR50	2412.00	156.96	165.71		165.88	0.001262	1.97	1764.39	560.11	0.25
1	440	TR50	2412.00	156.72	165.55	161.59	165.67	0.000926	1.76	2340.09	663.96	0.22
1	430	TR50	2412.00	155.68	165.29	162.07	165.43	0.001215	2.01	2289.28	660.91	0.25
1	420	TR50	2412.00	154.44	165.14	159.81	165.24	0.000614	1.60	2584.90	681.48	0.18
1	410	TR50	2412.00	156.41	164.91	160.83	165.06	0.001105	1.95	1965.01	512.15	0.24
1	400	TR50	2412.00	156.22	164.02	160.89	164.55	0.003261	3.28	828.36	162.88	0.40
1	395		Bridge									
1	390	TR50	2412.00	156.25	163.91	160.89	164.46	0.003457	3.35	810.13	162.57	0.41
1	380	TR50	2412.00	155.82	163.07	159.87	163.40	0.002229	2.52	965.89	198.32	0.33
1	379		Inl Struct									
1	370	TR50	2412.00	154.43	162.74	158.35	162.91	0.001011	1.82	1328.81	205.30	0.23
1	365		Bridge									
1	360	TR50	2412.00	154.43	162.54	158.35	162.72	0.001120	1.87	1286.79	204.73	0.24
1	350	TR50	2412.00	153.45	162.07	157.83	162.37	0.001715	2.43	998.90	185.81	0.30
1	340	TR50	2419.00	154.08	161.64	158.34	161.88	0.001769	2.19	1183.77	371.52	0.29
1	330	TR50	2419.00	152.53	160.95	157.83	161.30	0.002517	2.65	1025.71	370.76	0.35
1	320	TR50	2419.00	151.21	159.95	156.95	160.49	0.003357	3.45	1061.12	366.01	0.42
1	310	TR50	2419.00	150.82	159.29	156.38	159.64	0.002629	2.91	1445.45	531.50	0.37
1	300	TR50	2428.00	150.95	159.05	155.83	159.17	0.001193	1.76	2192.58	647.84	0.24
1	295	TR50	2428.00	151.36	159.03	154.33	159.09	0.000389	1.07	2686.90	728.11	0.14
1	290	TR50	2428.00	149.80	158.81	155.28	158.97	0.001230	1.83	1718.66	622.74	0.25
1	280	TR50	2428.00	149.20	158.48	154.44	158.67	0.001259	2.11	1765.09	456.87	0.26
1	270	TR50	2428.00	149.22	157.95	154.53	158.27	0.002132	2.73	1441.16	458.16	0.33
1	260	TR50	2428.00	148.81	157.26	154.35	157.73	0.003098	3.22	1046.56	287.48	0.40
1	250	TR50	2428.00	148.71	156.95	153.28	157.17	0.001692	2.25	1616.17	511.14	0.29
1	240	TR50	2428.00	149.18	156.58	152.95	156.77	0.001352	2.06	1815.71	742.94	0.26
1	230	TR50	2428.00	149.20	156.27	152.71	156.43	0.001245	1.88	1733.00	456.34	0.25
1	220	TR50	2428.00	147.66	155.76	153.09	156.06	0.002303	2.64	1376.41	398.82	0.34
1	210	TR50	2428.00	147.59	155.34	152.46	155.56	0.001749	2.16	1558.25	543.07	0.29
1	205	TR50	2428.00	147.37	155.05	152.08	155.16	0.001201	1.71	2441.54	970.21	0.24

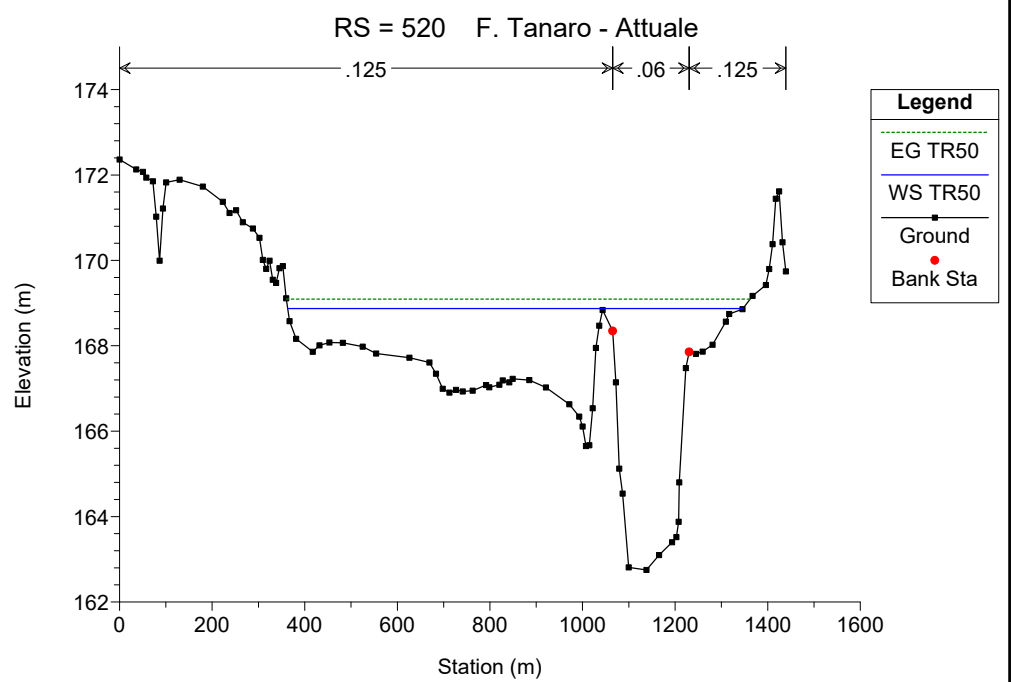
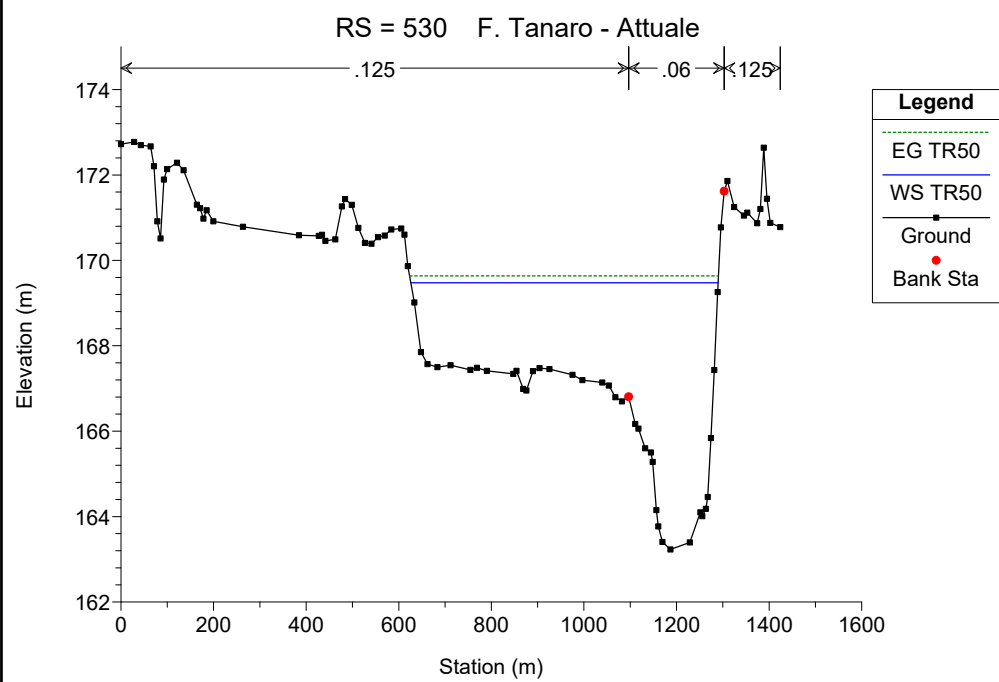
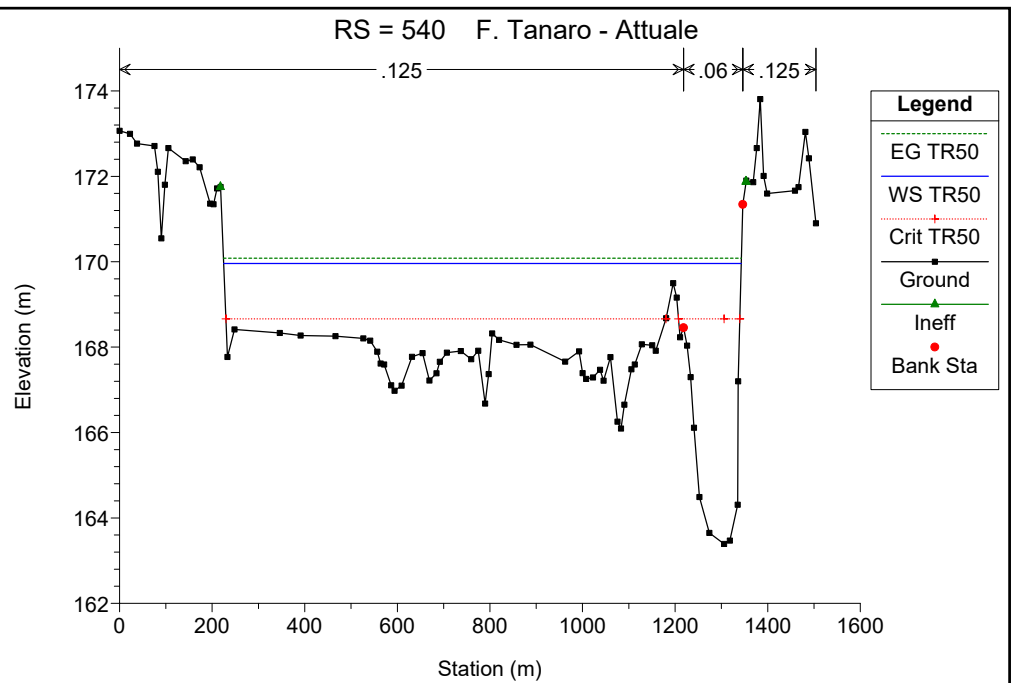
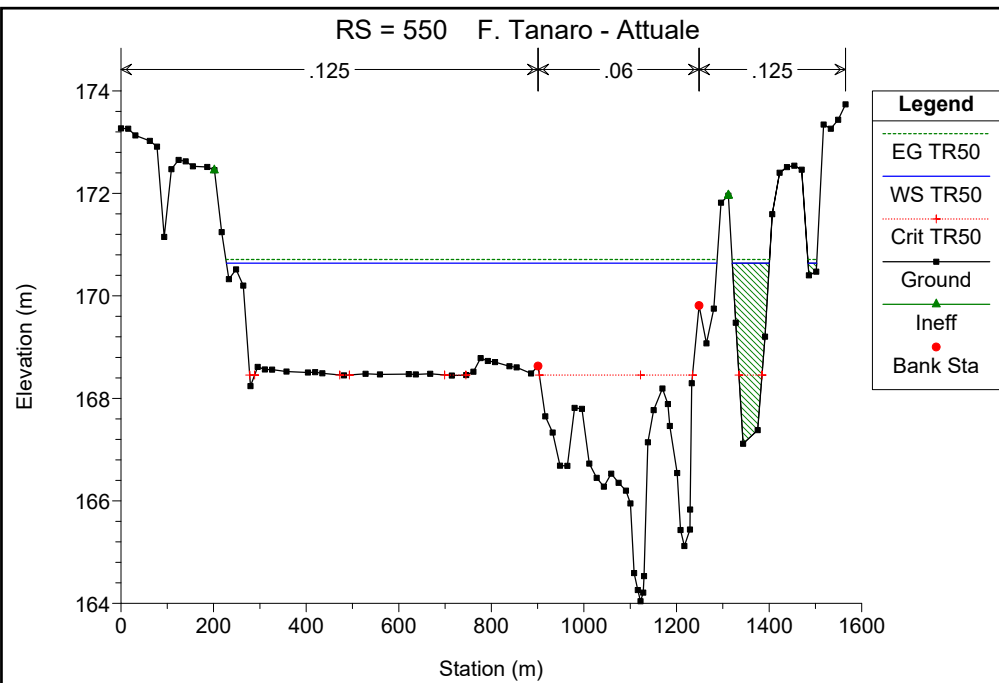
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50 (Continued)

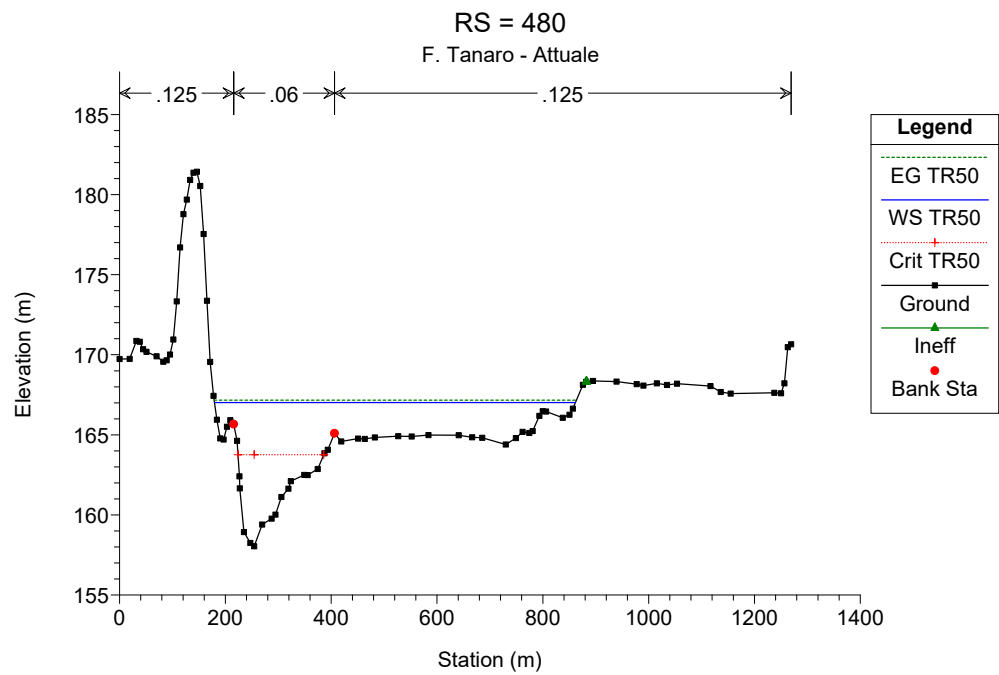
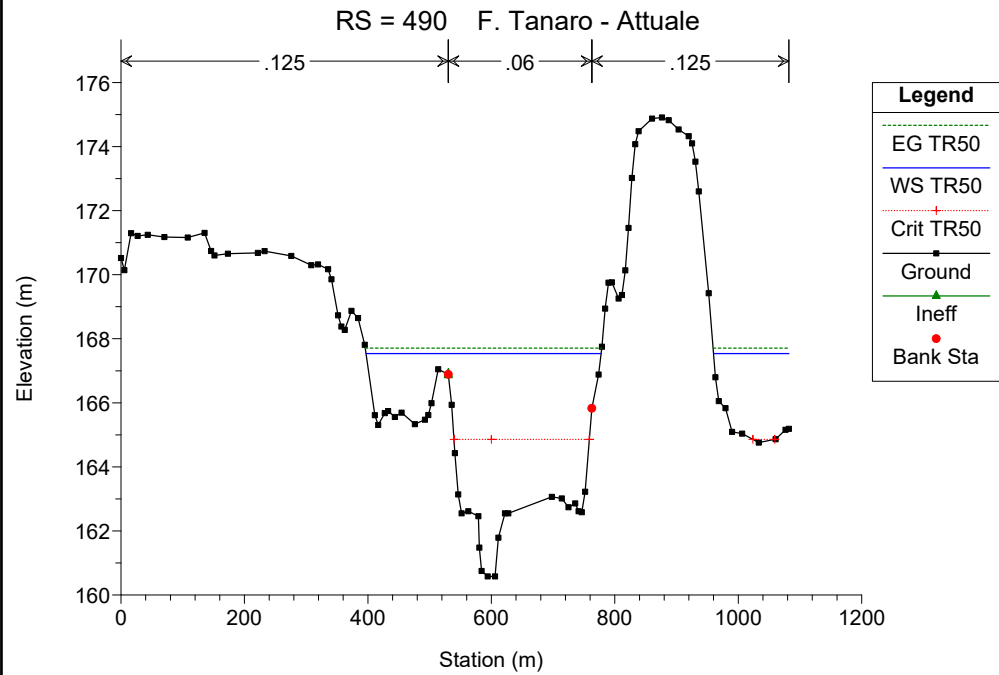
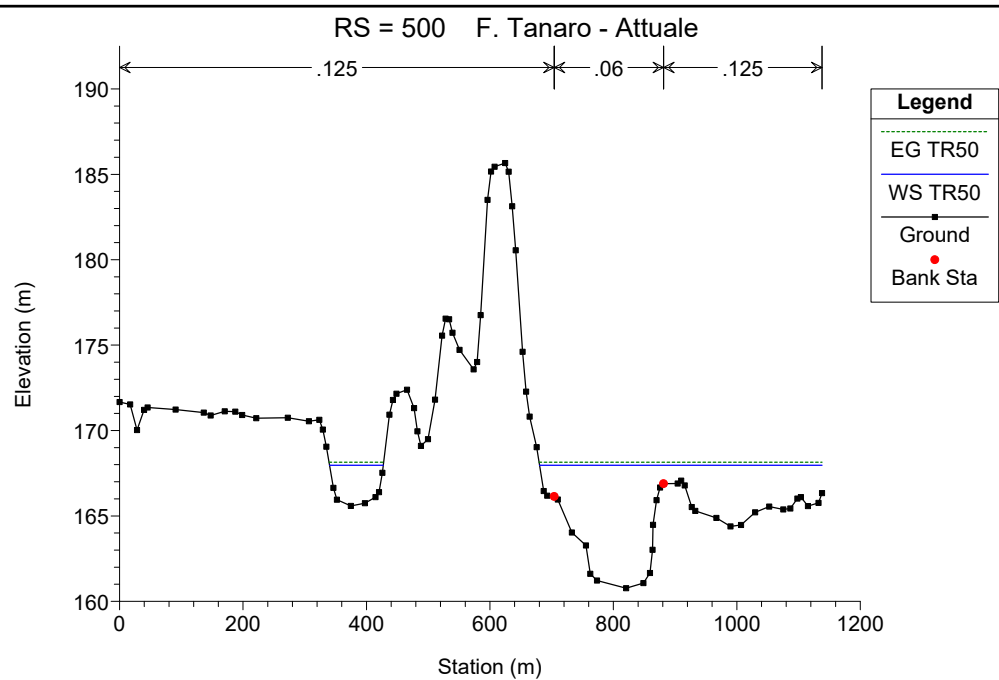
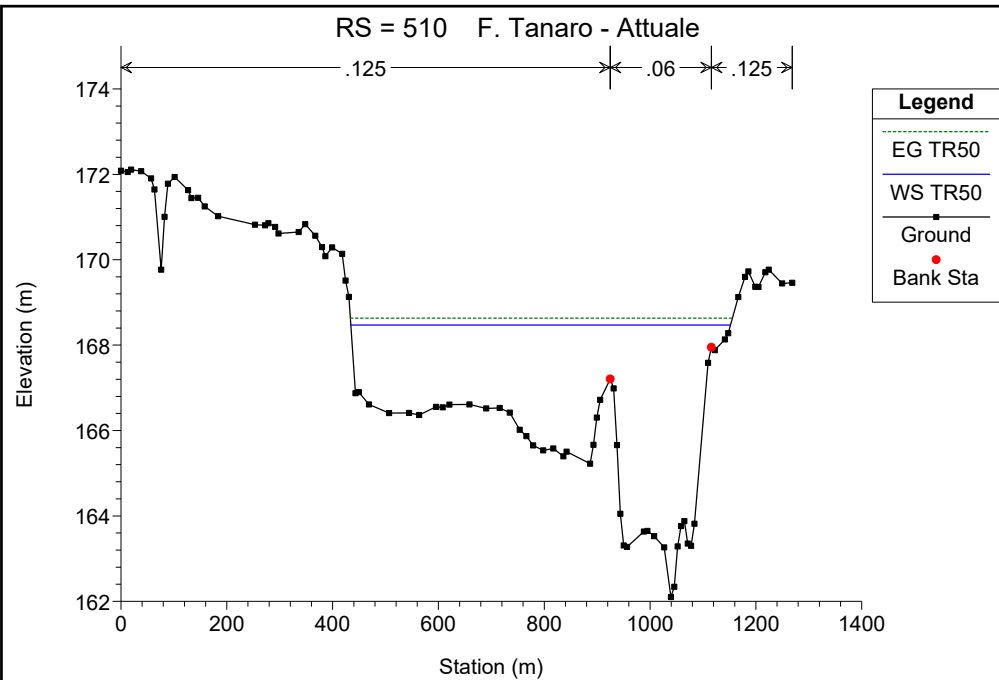
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	TR50	2428.00	146.60	154.49	152.13	154.70	0.002044	2.43	2196.13	1055.55	0.32
1	190	TR50	2428.00	146.85	154.01	151.71	154.16	0.001940	1.99	2121.97	969.08	0.30
1	180	TR50	2428.00	145.66	153.76	150.13	153.83	0.000667	1.25	2944.86	1075.92	0.18
1	170	TR50	2428.00	145.40	153.44	149.59	153.58	0.001445	1.79	1895.57	1184.26	0.26
1	160	TR50	2428.00	145.46	152.95	149.35	153.08	0.001129	1.68	2099.14	1288.81	0.23
1	150	TR50	2428.00	143.53	152.49	148.59	152.69	0.001330	2.08	1787.82	1232.09	0.26
1	140	TR50	2428.00	143.00	151.59	149.01	152.06	0.003770	3.05	938.95	872.60	0.43
1	135		Inl Struct									
1	130	TR50	2428.00	142.54	150.66	146.98	150.96	0.001970	2.44	1013.08	231.51	0.32
1	120	TR50	2428.00	142.27	150.05	146.38	150.38	0.002088	2.55	965.31	358.53	0.33
1	110	TR50	2428.00	141.17	149.71	146.33	149.90	0.001474	2.12	1750.86	493.87	0.27
1	100	TR50	2428.00	140.79	149.08	146.56	149.39	0.002881	2.51	1133.10	339.10	0.37
1	90	TR50	2428.00	140.59	148.02	145.15	148.46	0.003086	2.93	827.72	151.38	0.39
1	85		Bridge									
1	80	TR50	2428.00	140.59	147.76	145.15	148.24	0.003561	3.07	790.65	148.92	0.42
1	70	TR50	2428.00	139.61	146.94	144.39	147.28	0.003072	2.71	1119.75	292.63	0.38
1	60	TR50	2428.00	138.12	146.53	142.72	146.75	0.001510	2.26	1707.35	654.89	0.28
1	50	TR50	2428.00	137.54	145.99	143.04	146.33	0.002371	2.75	1402.93	577.29	0.35
1	40	TR50	2428.00	137.06	145.29	142.78	145.55	0.002519	2.28	1066.03	377.43	0.34
1	30	TR50	2428.00	137.37	144.66	141.50	144.92	0.002133	2.29	1061.84	587.34	0.32
1	20	TR50	2428.00	136.62	144.13	141.03	144.32	0.001596	2.19	1942.48	697.53	0.28
1	10	TR50	2428.00	135.29	143.17	141.28	143.63	0.004006	3.30	1342.28	654.46	0.44

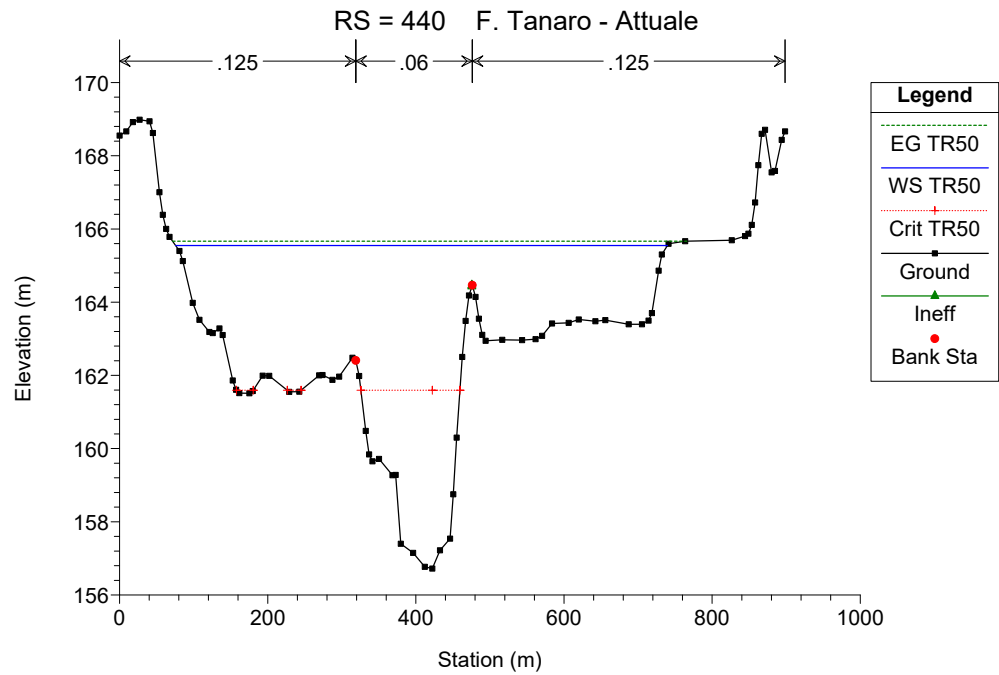
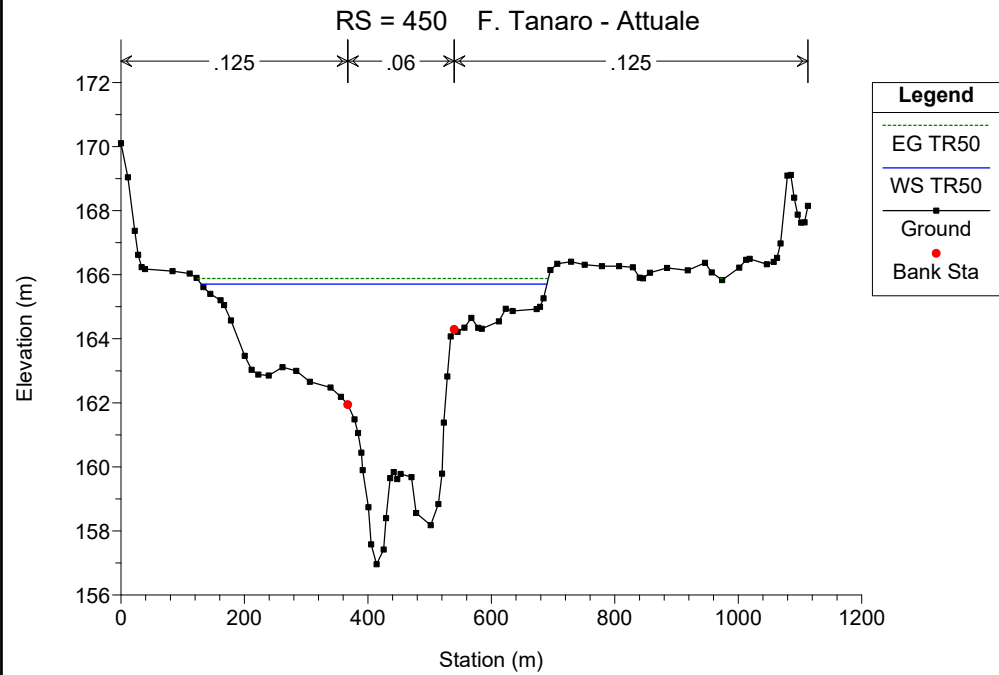
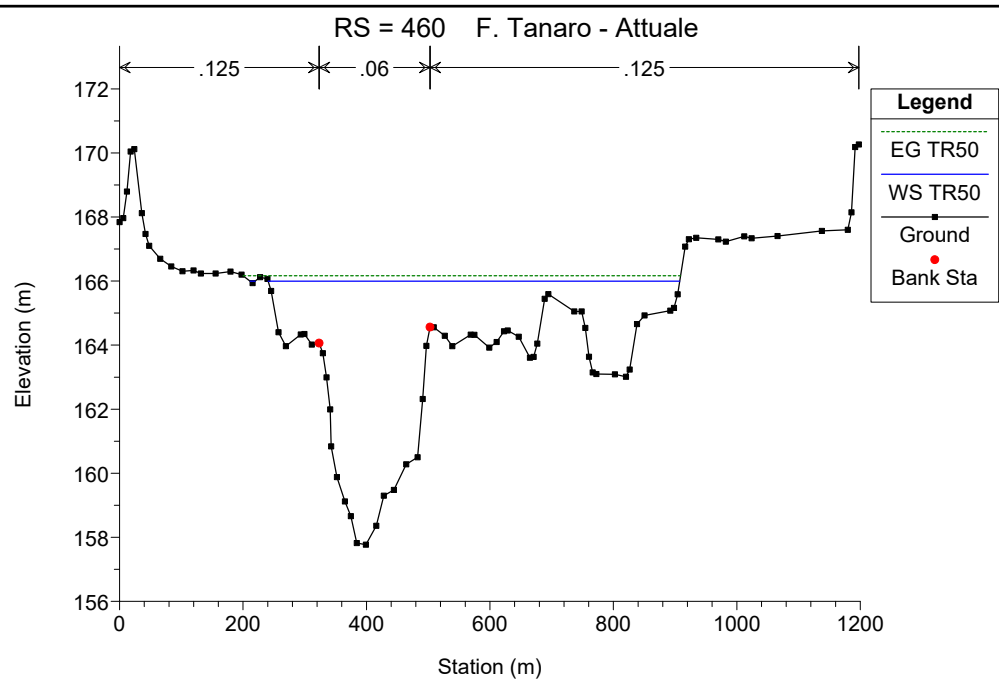
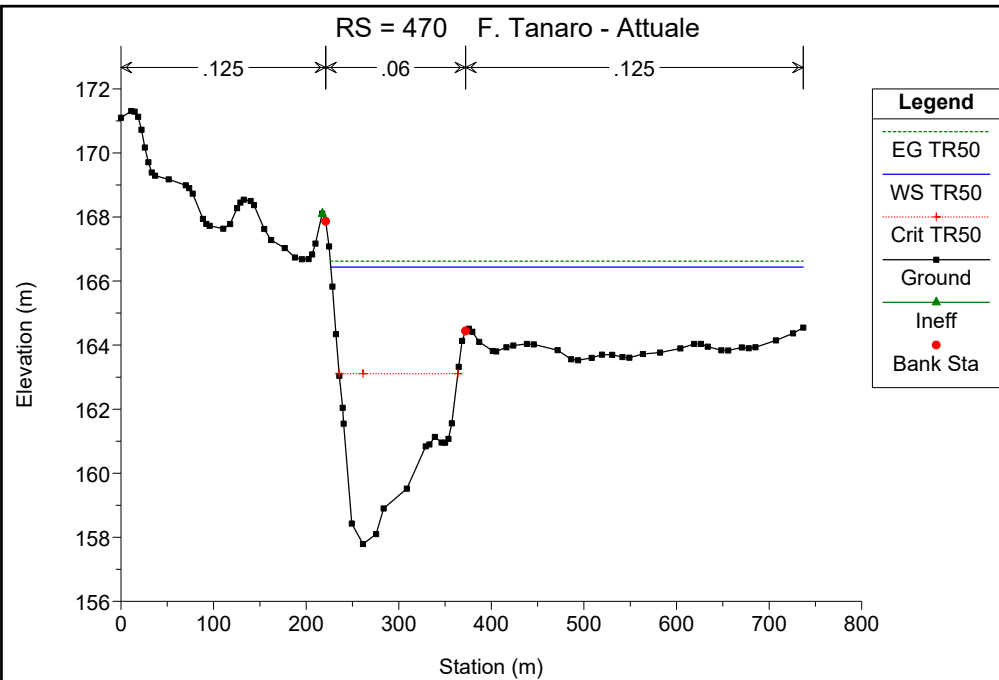
F. Tanaro - Attuale

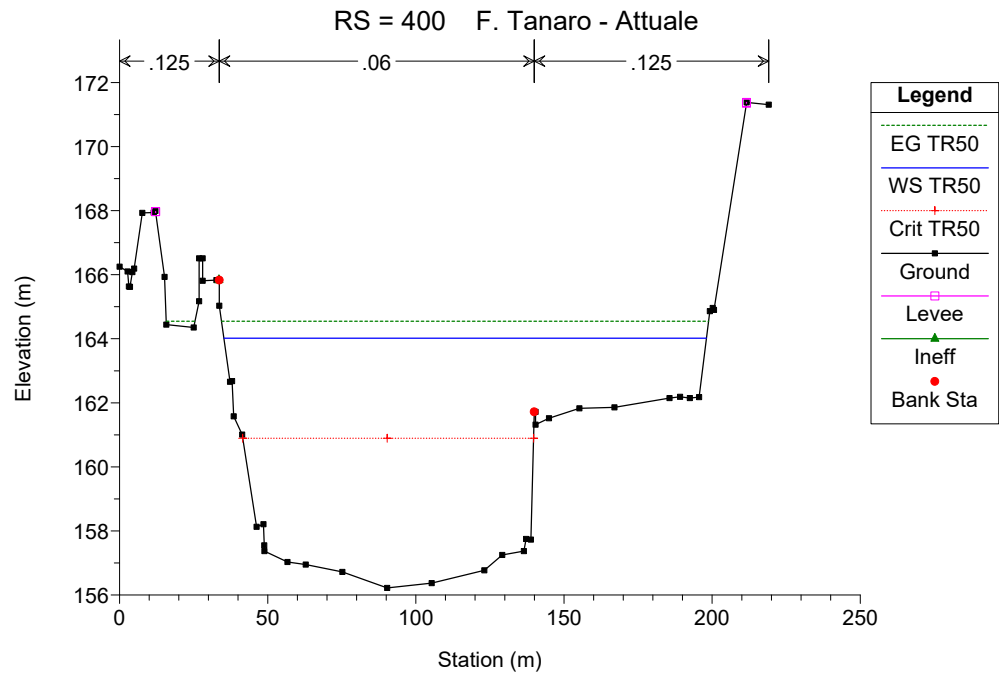
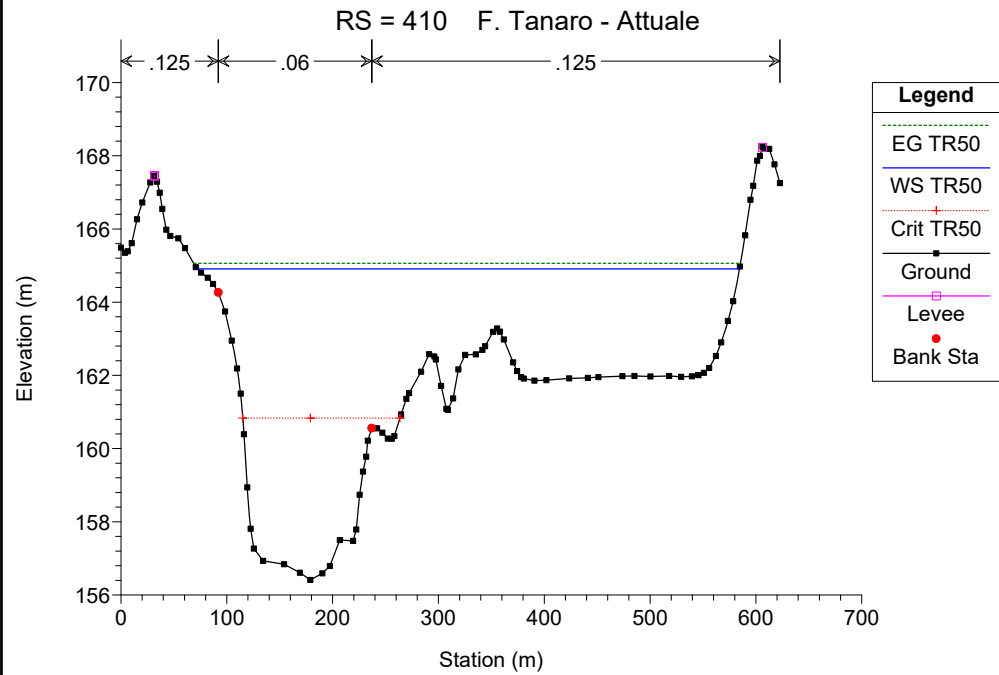
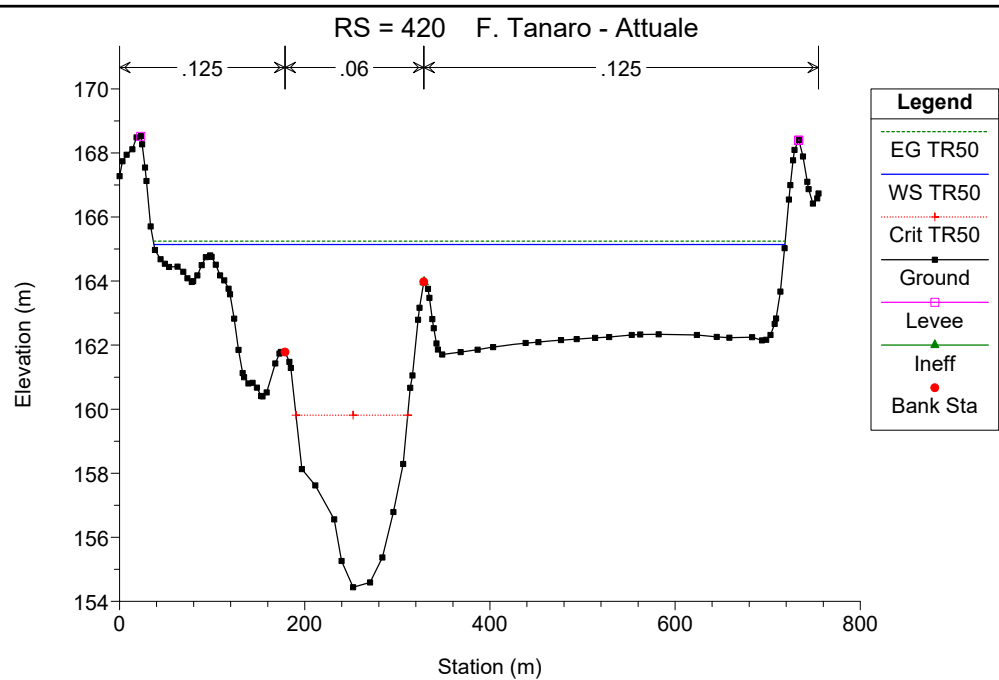
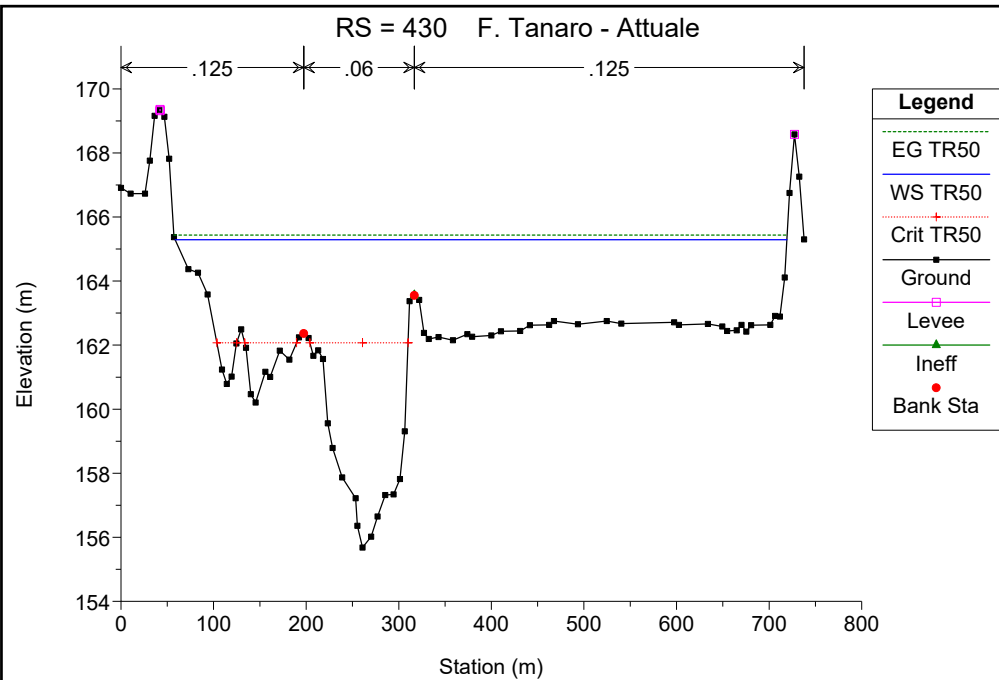
Tanaro 1

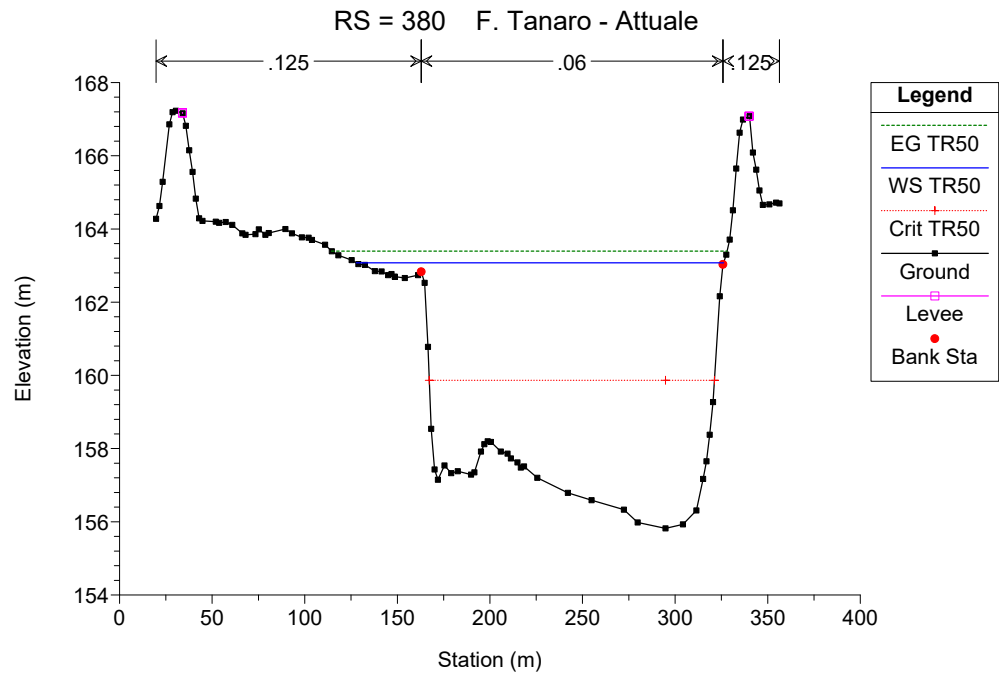
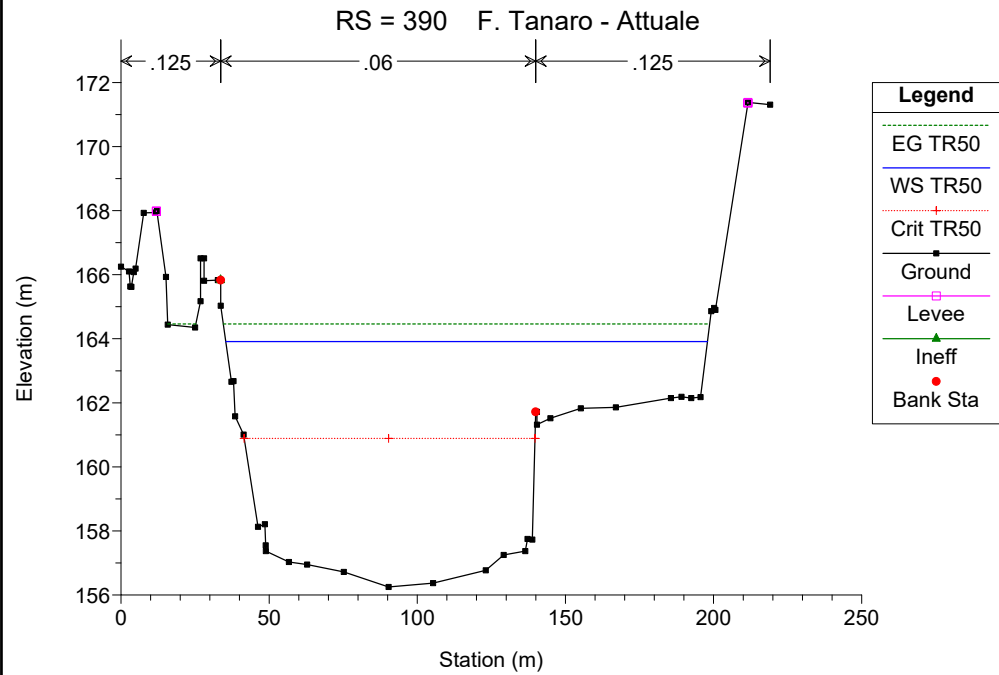
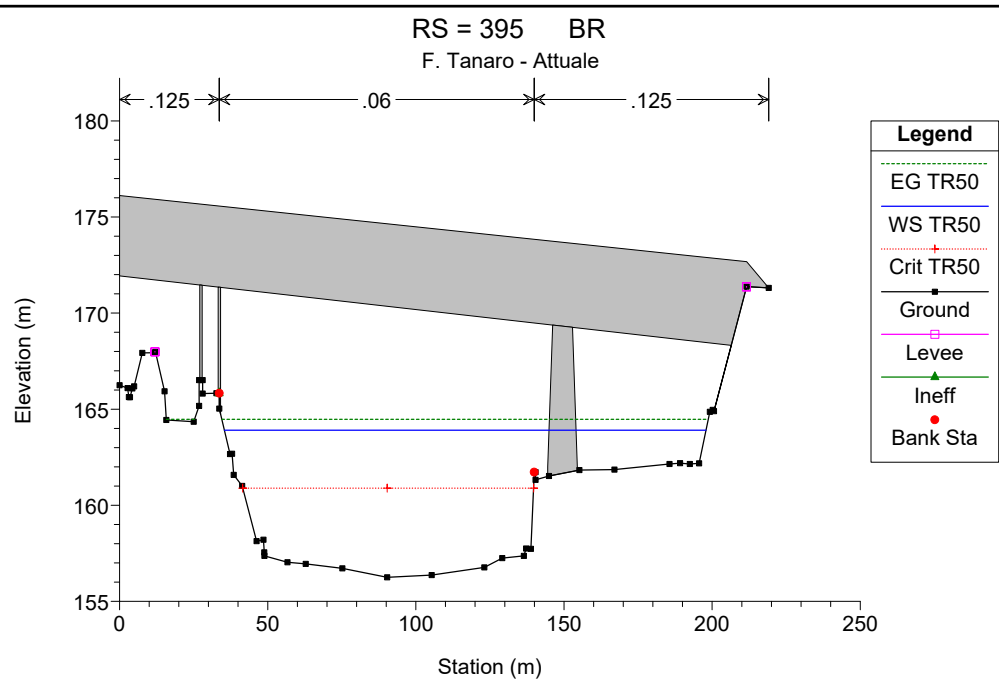
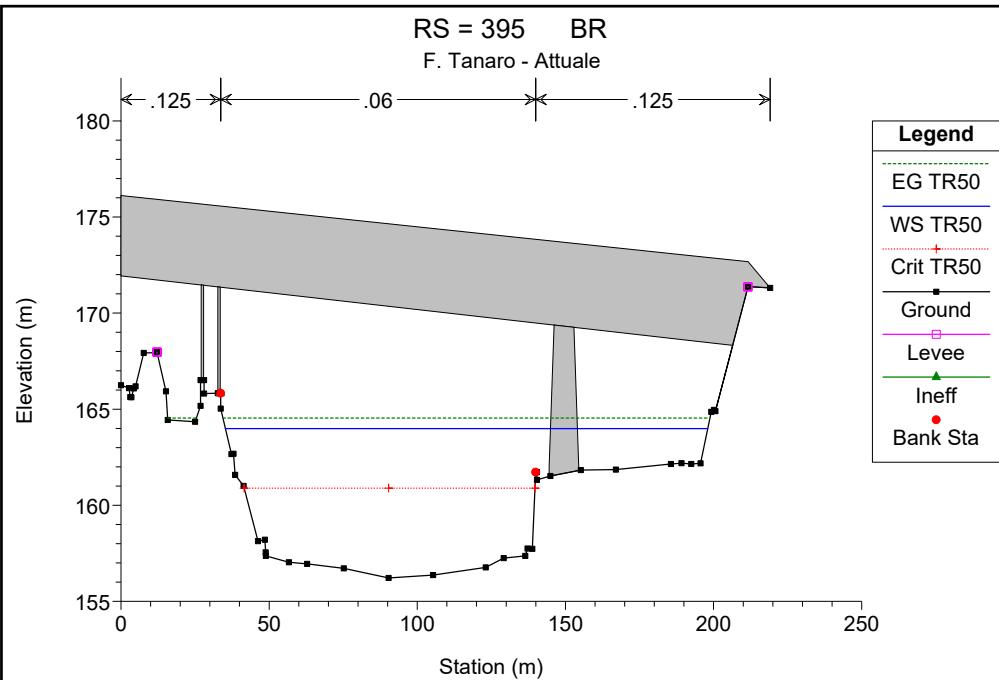


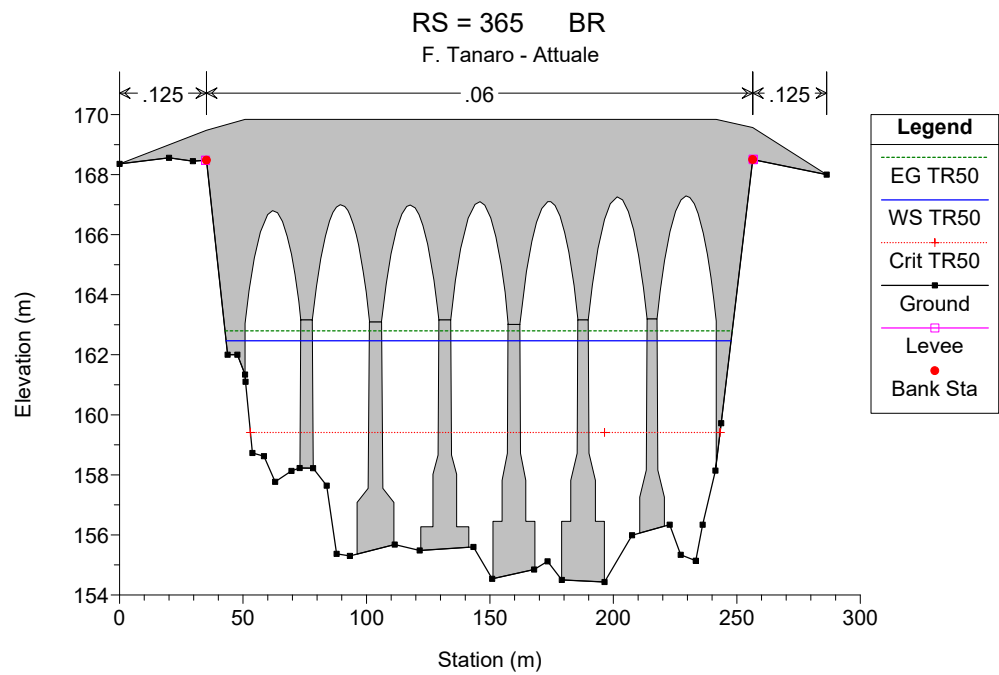
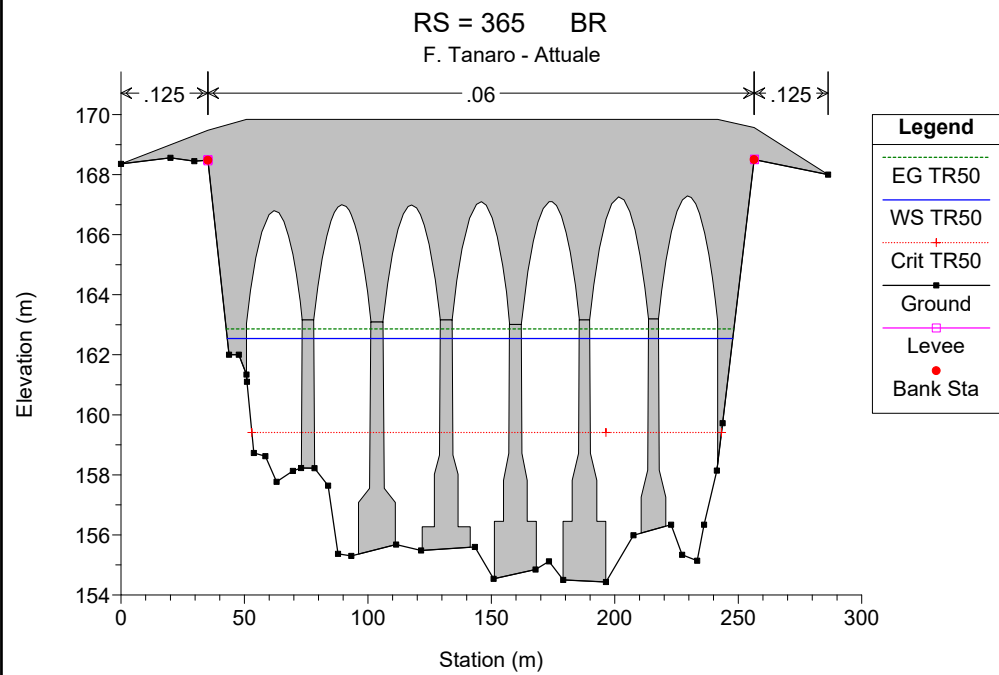
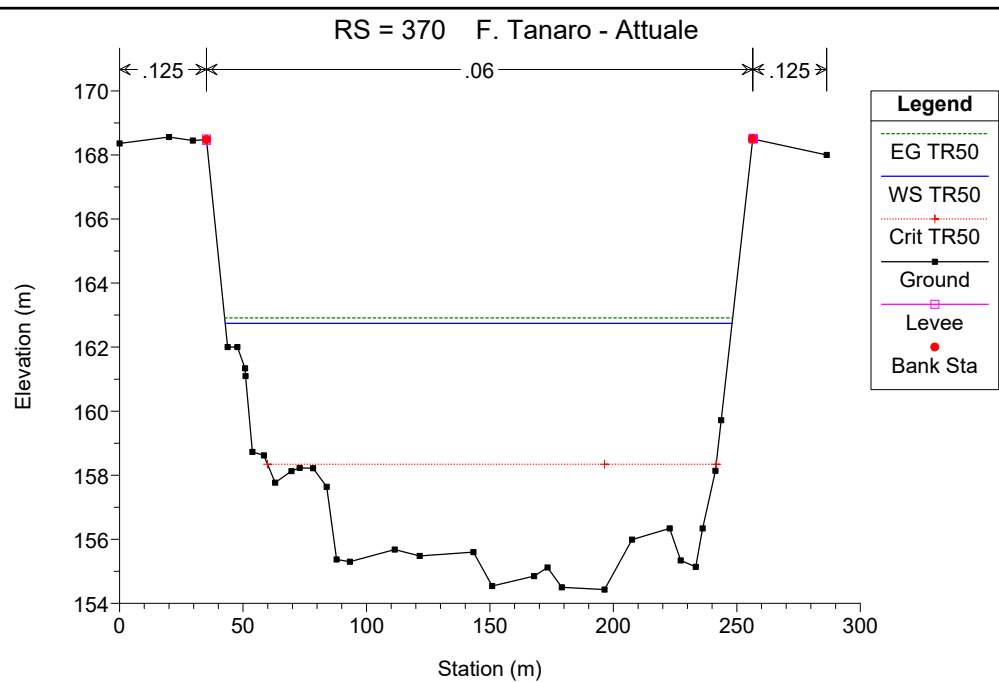
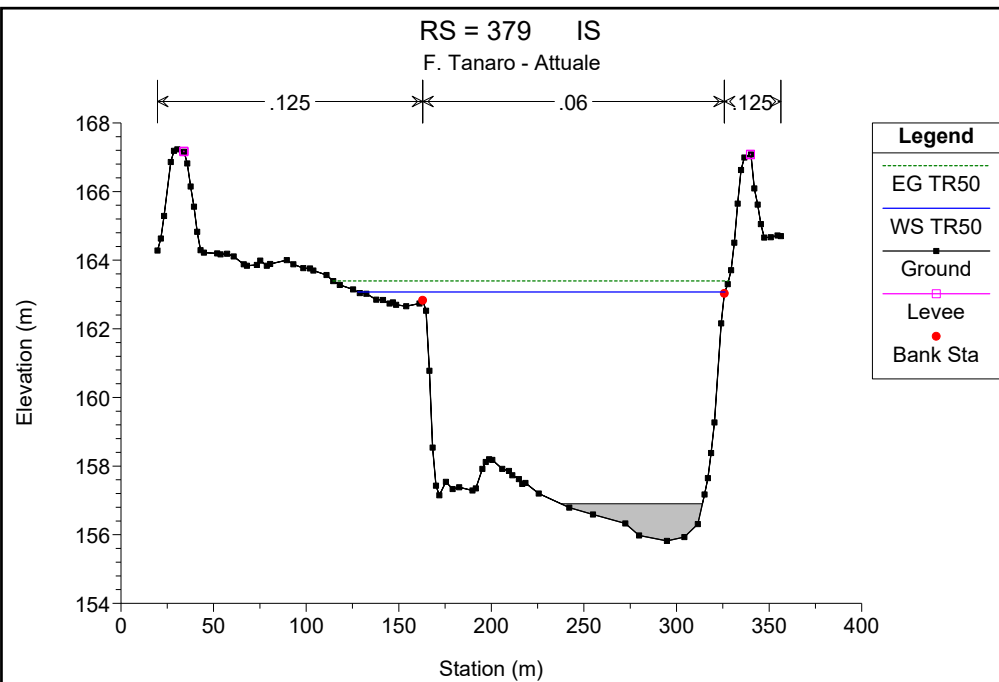


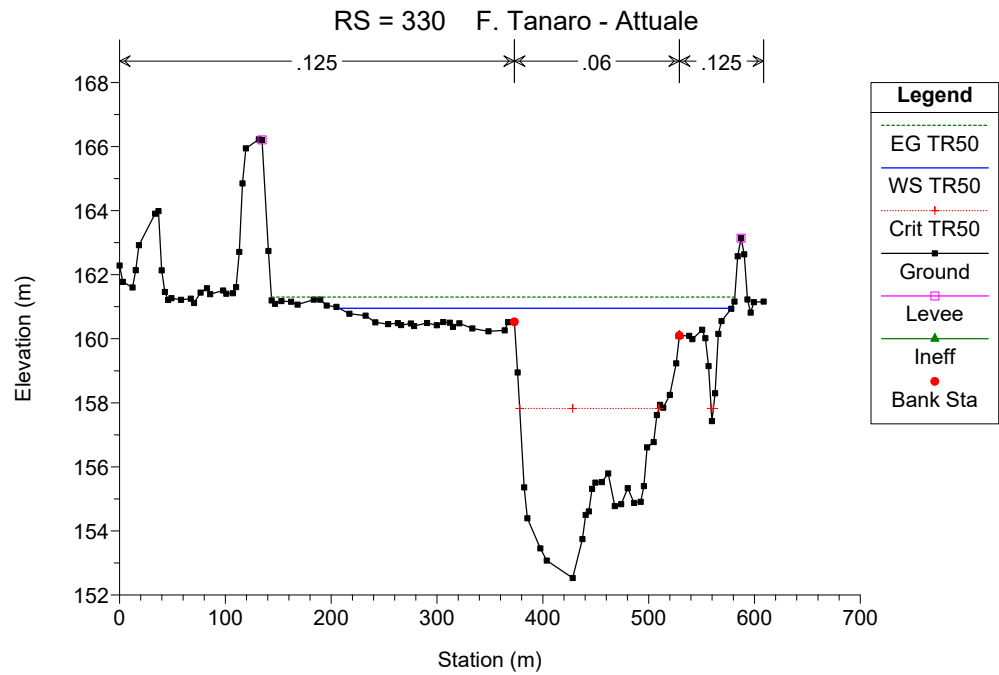
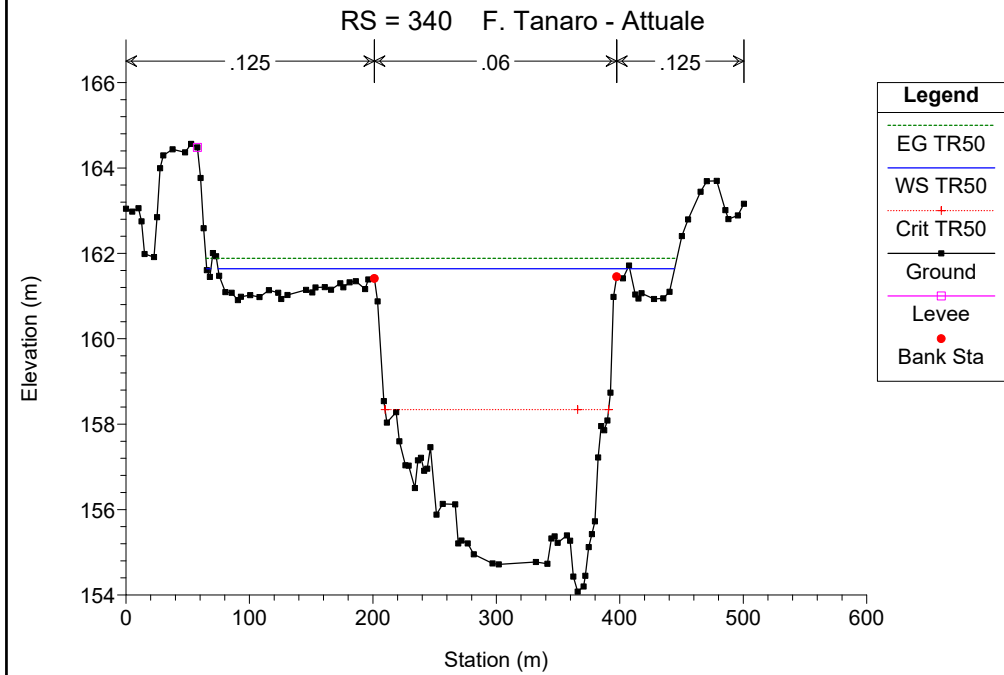
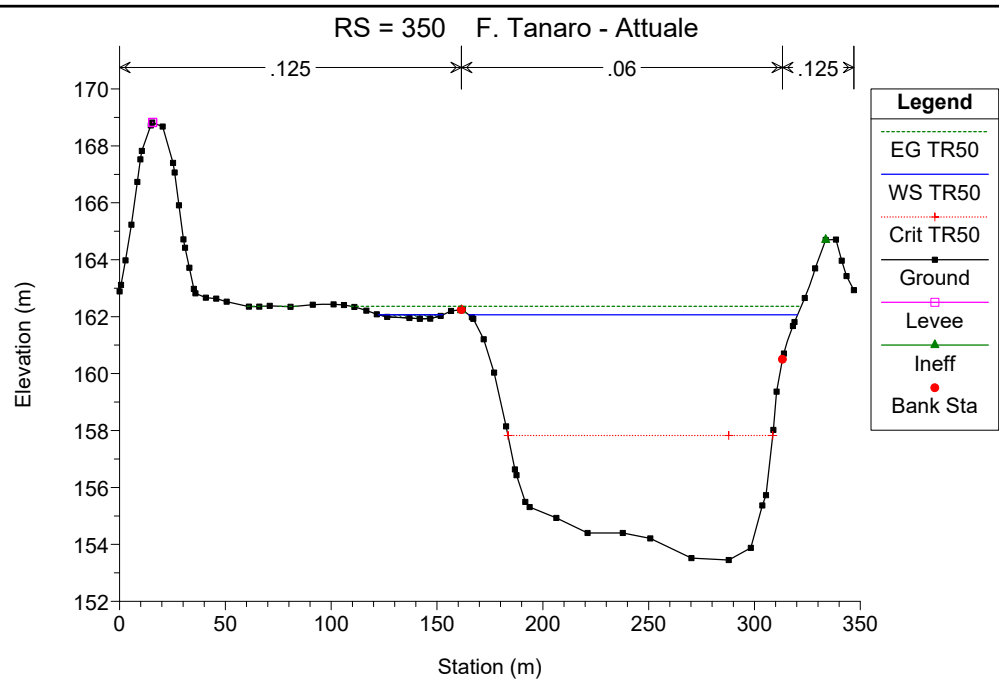
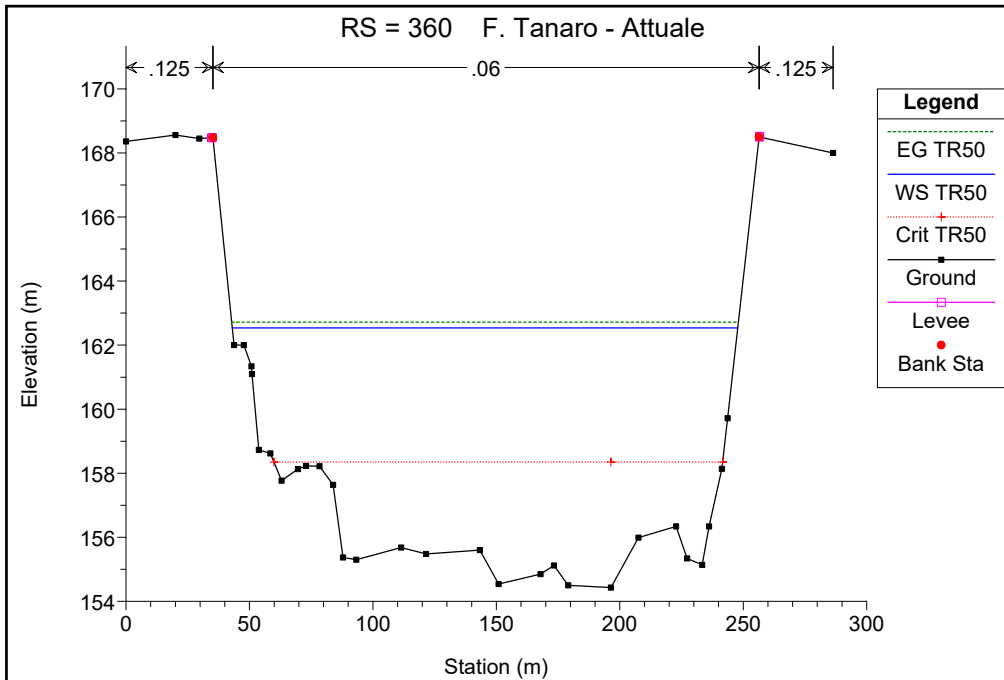


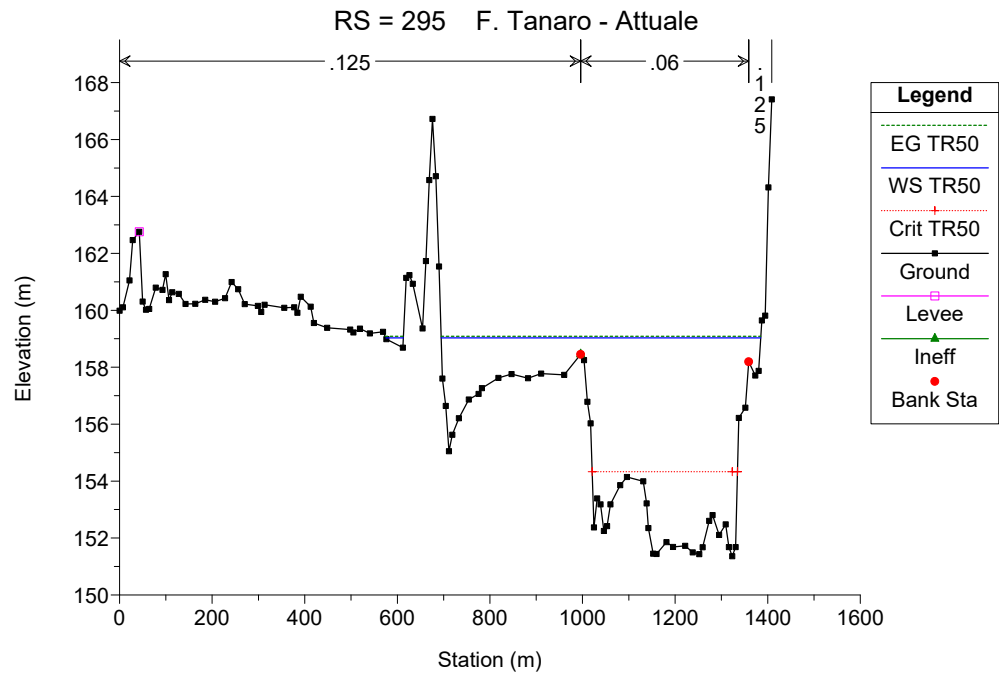
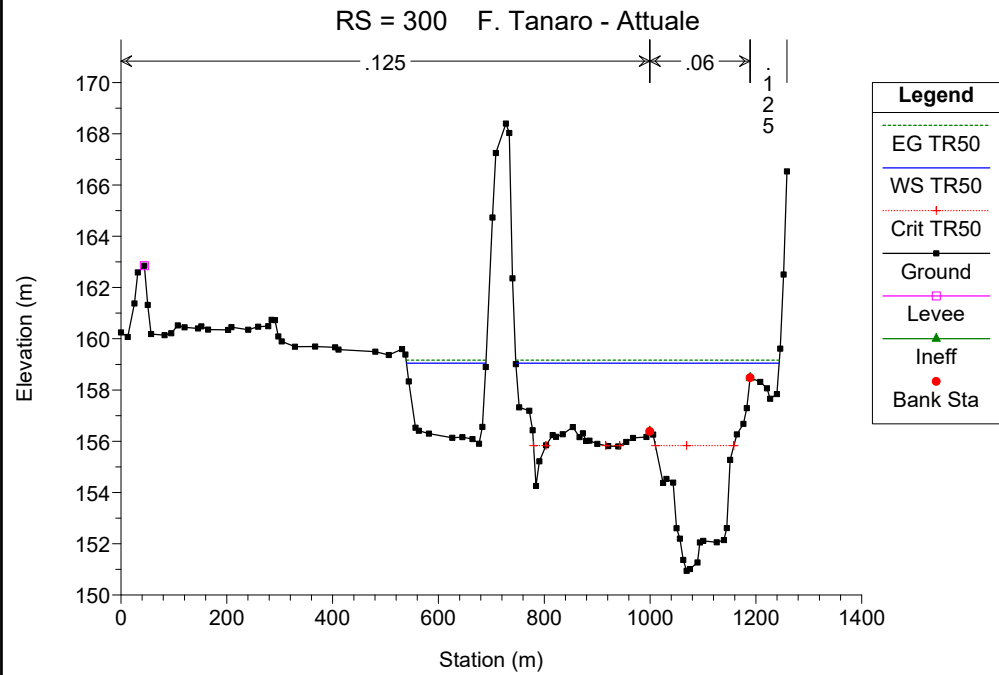
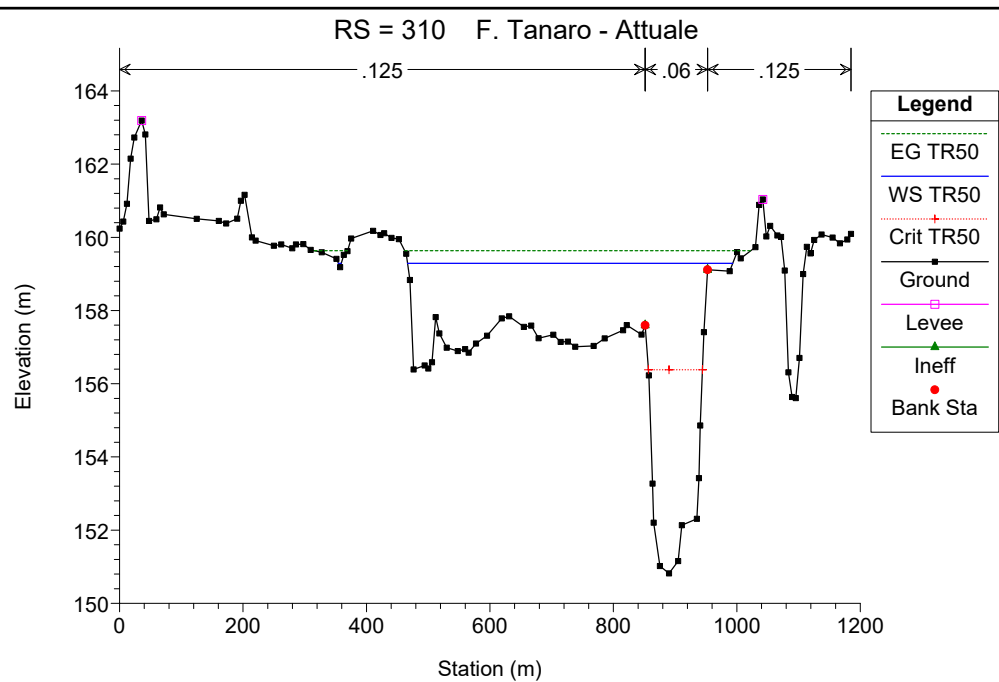
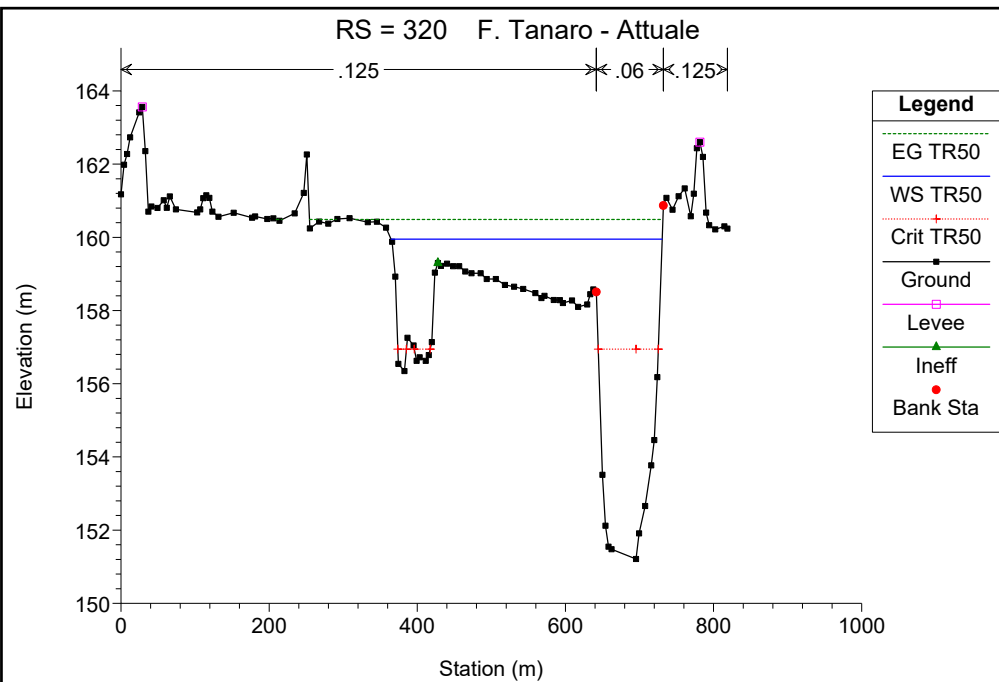


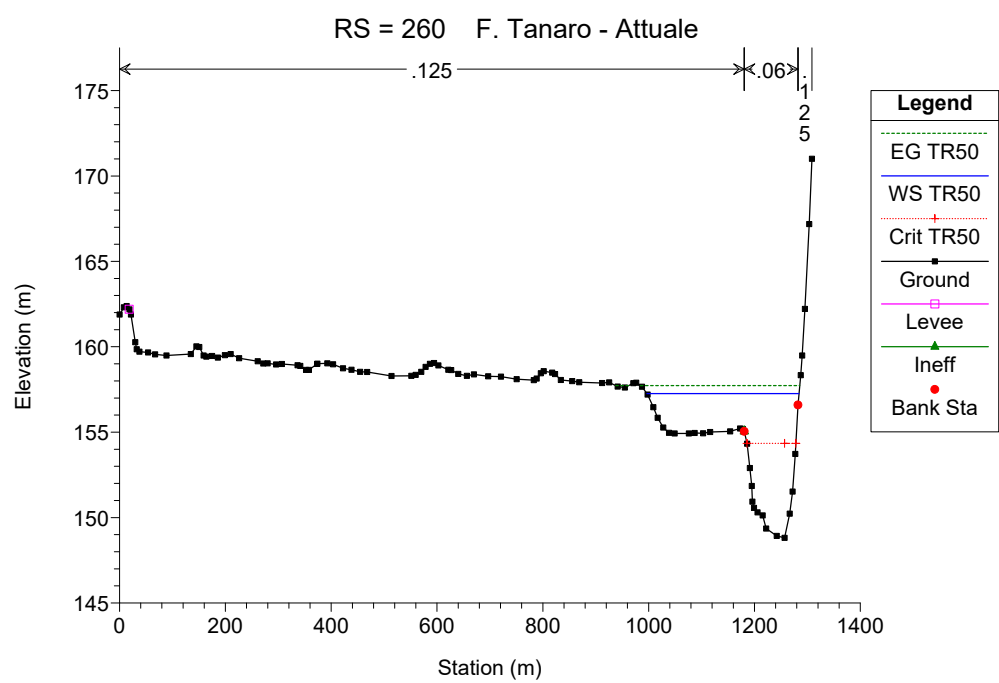
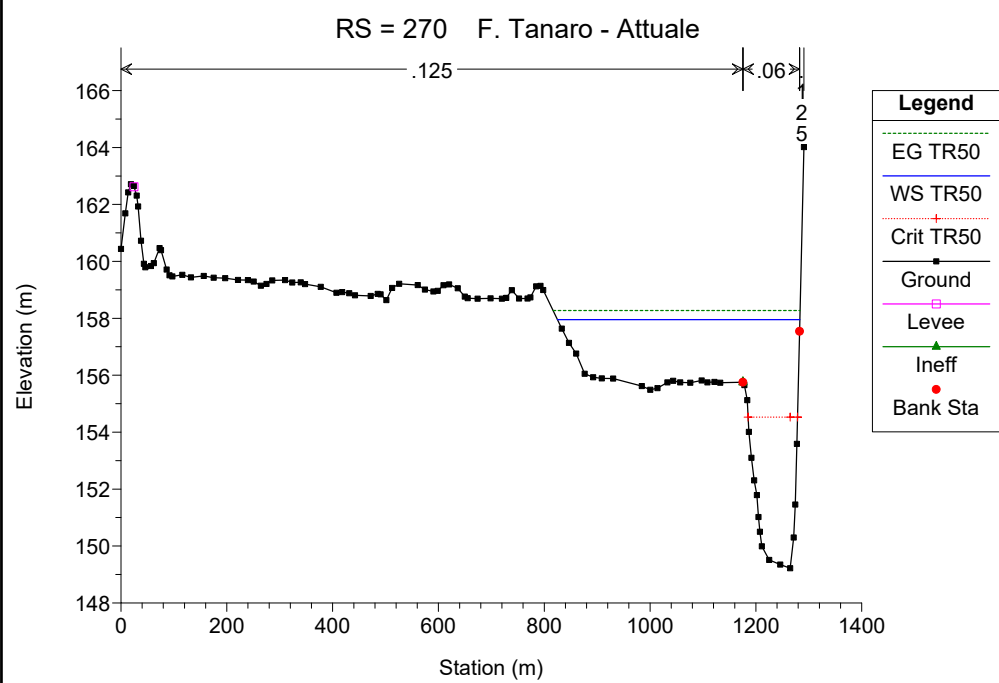
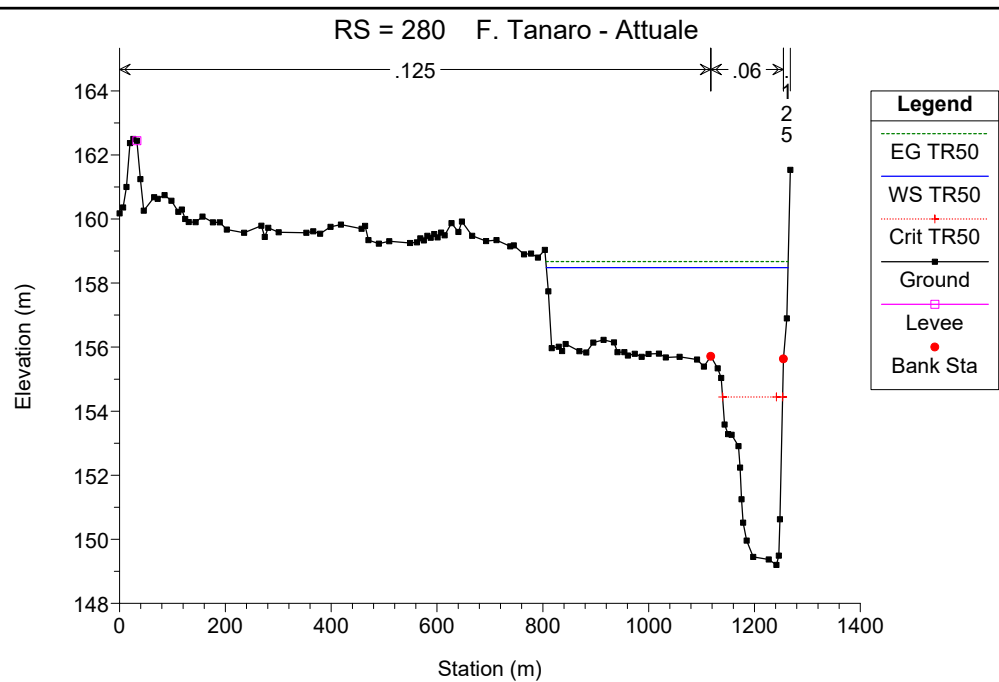
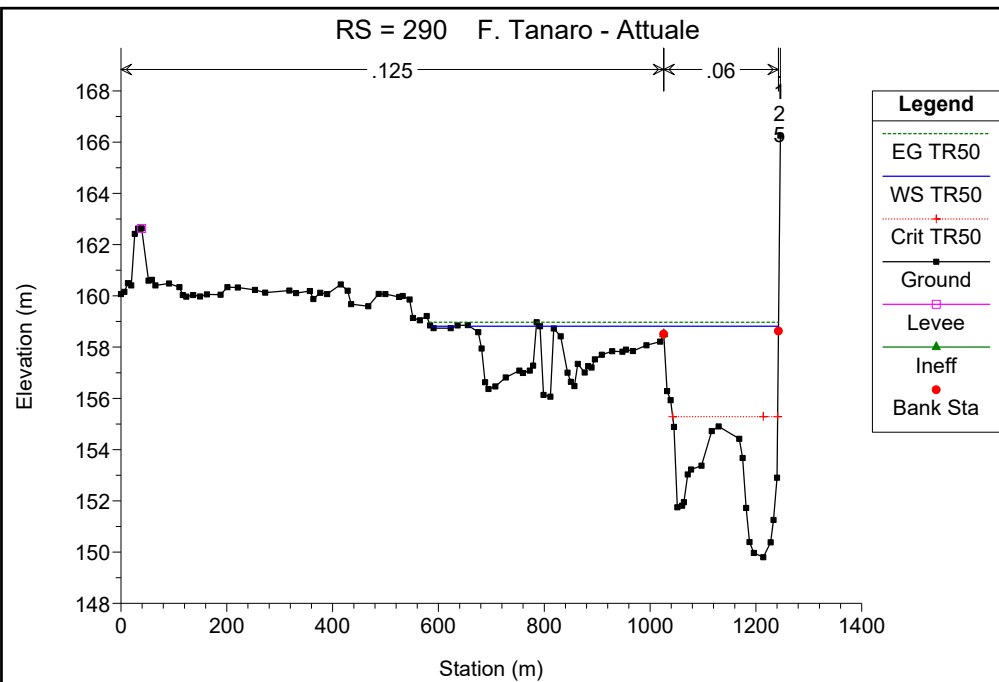


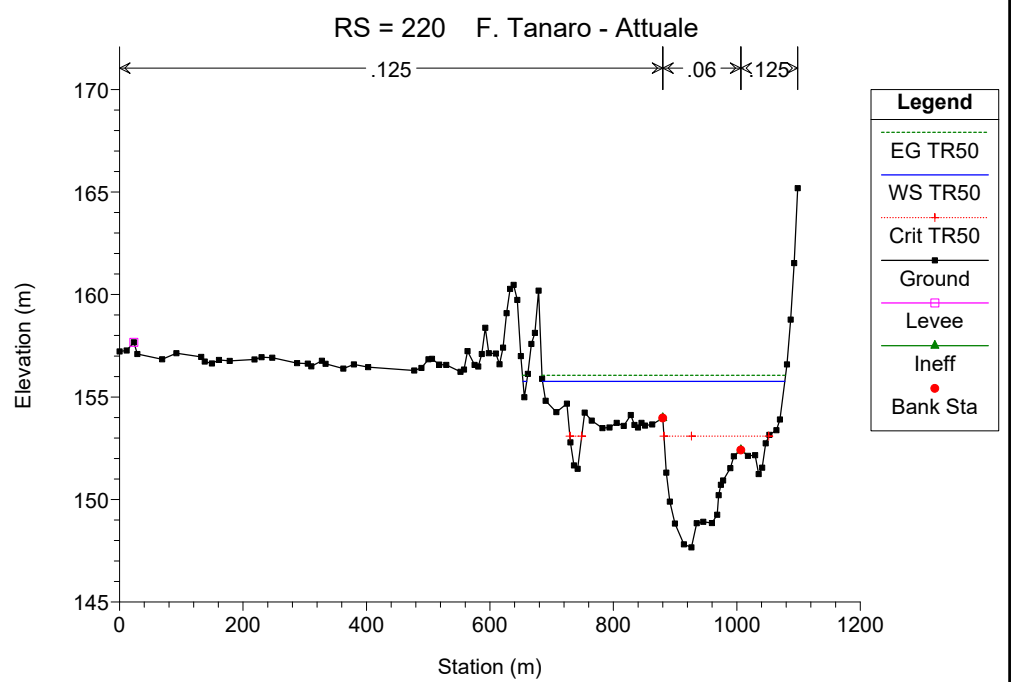
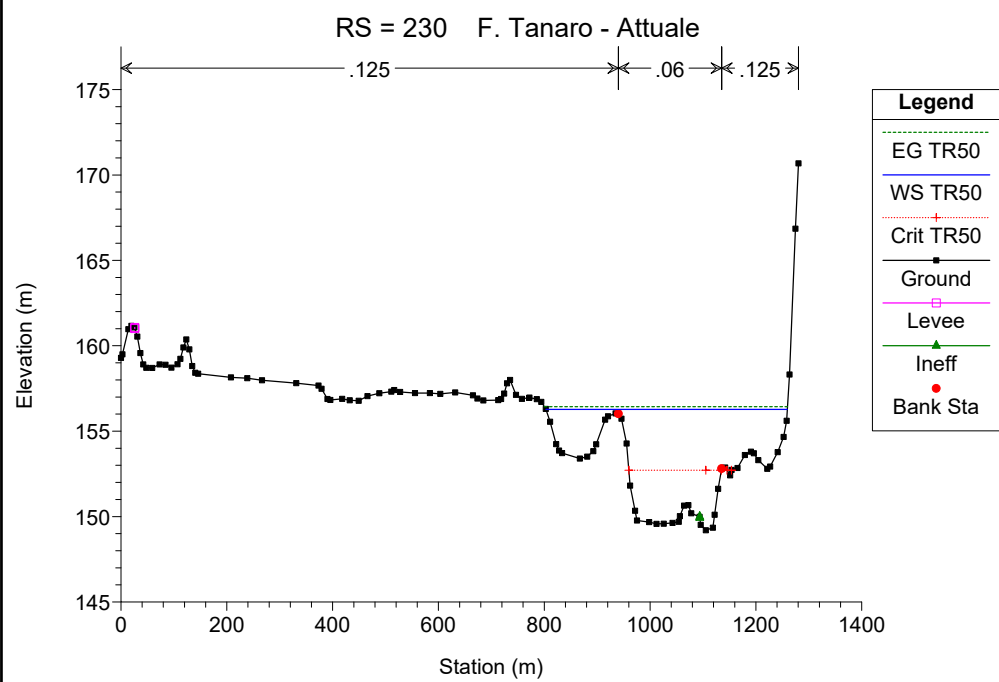
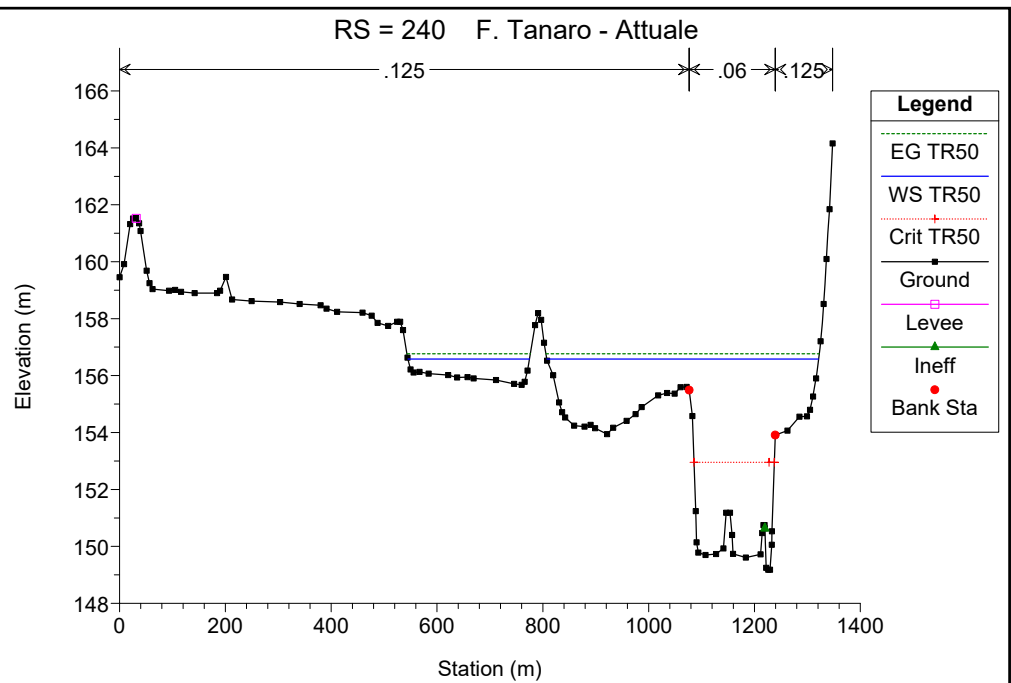
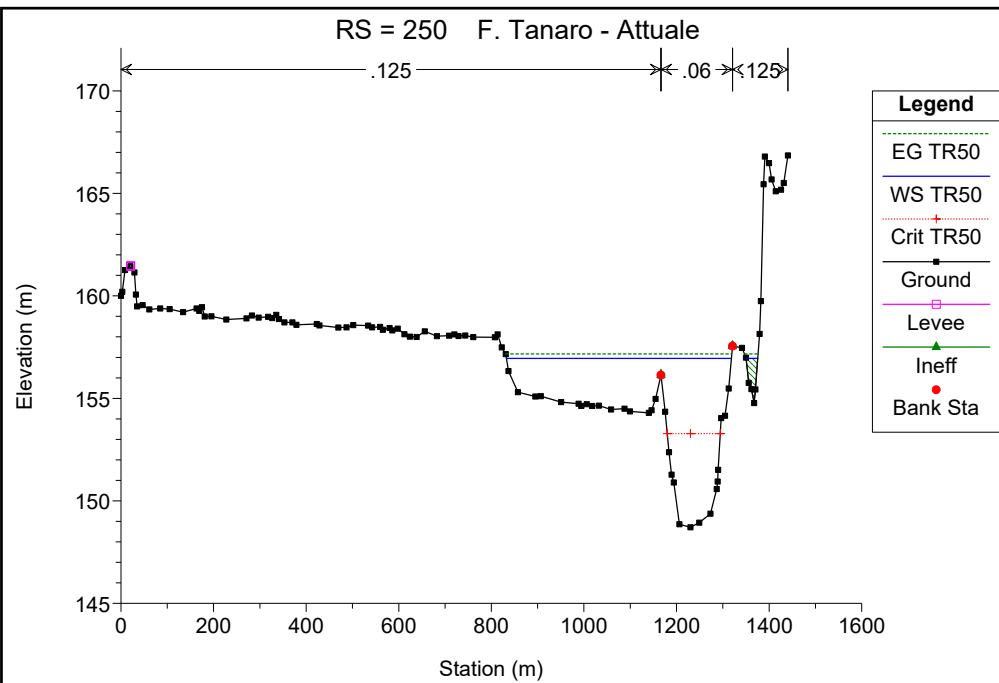


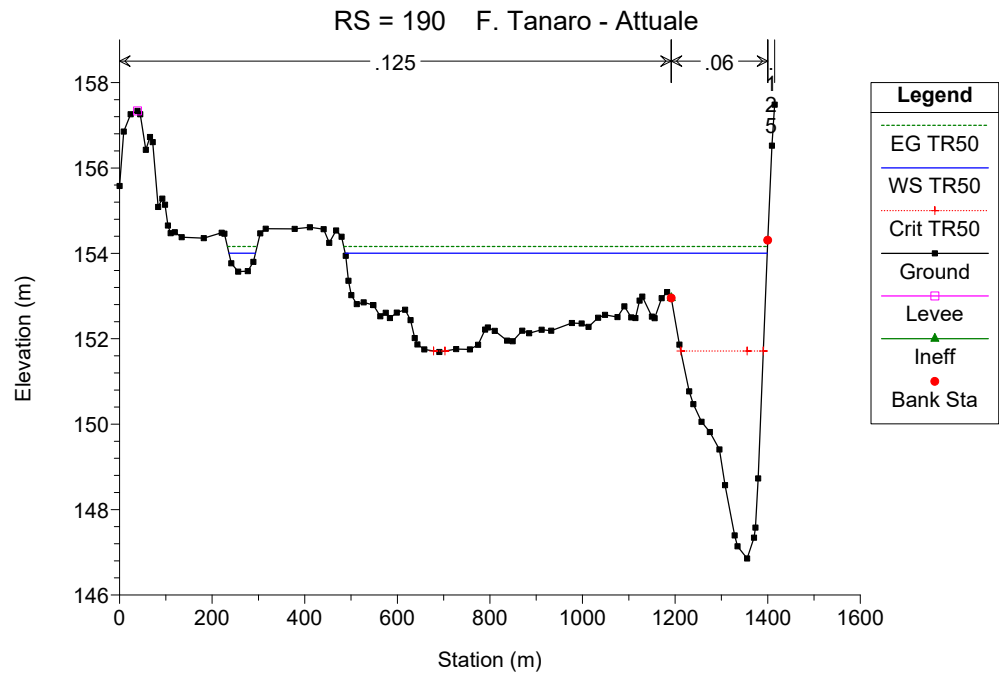
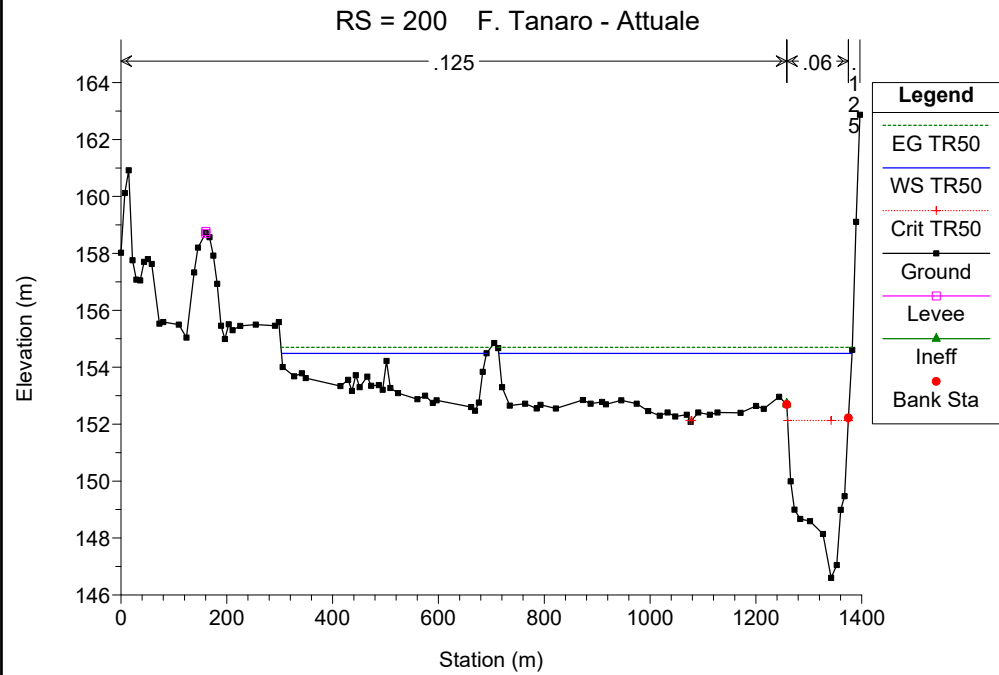
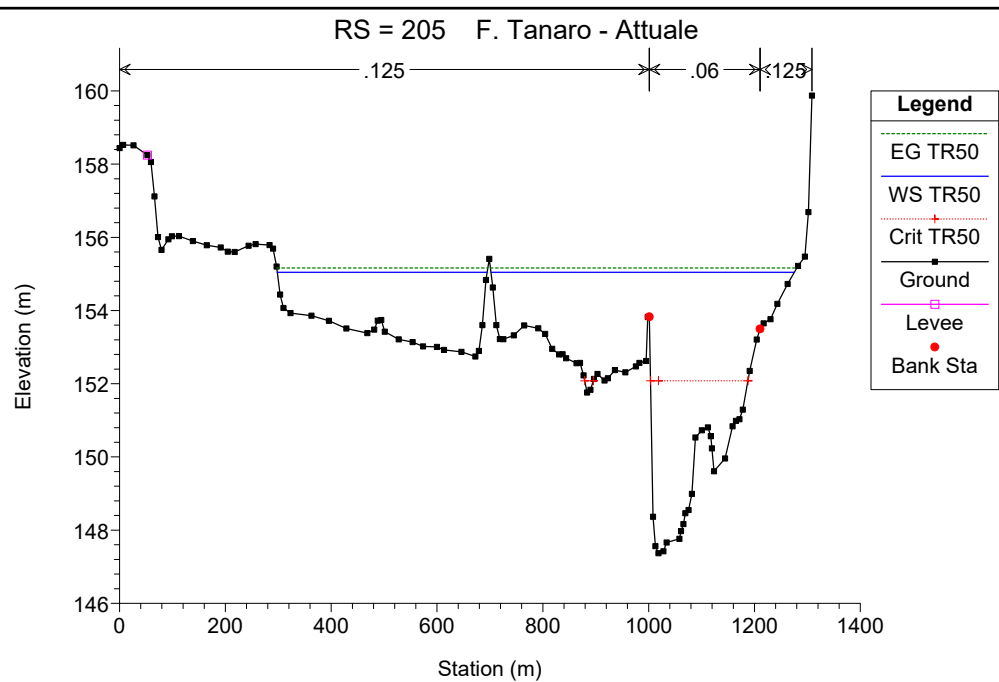
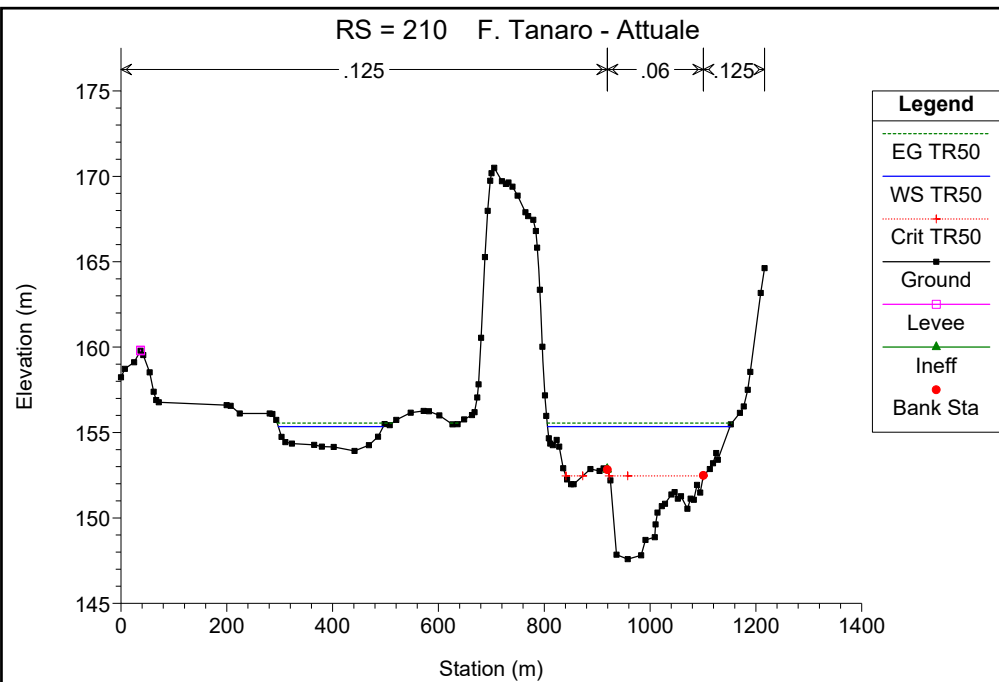


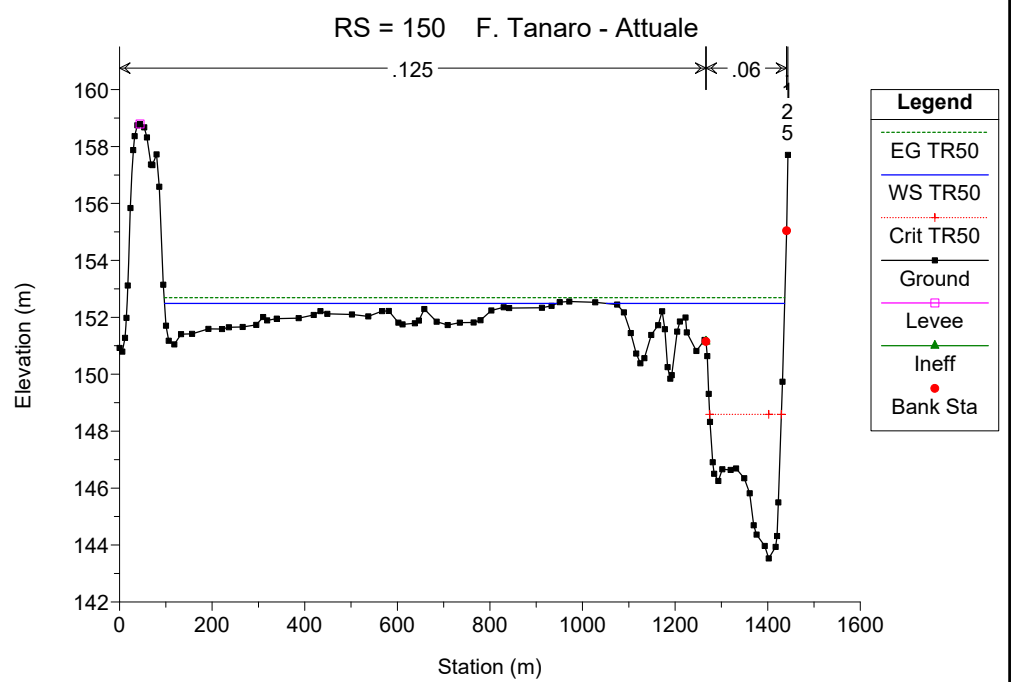
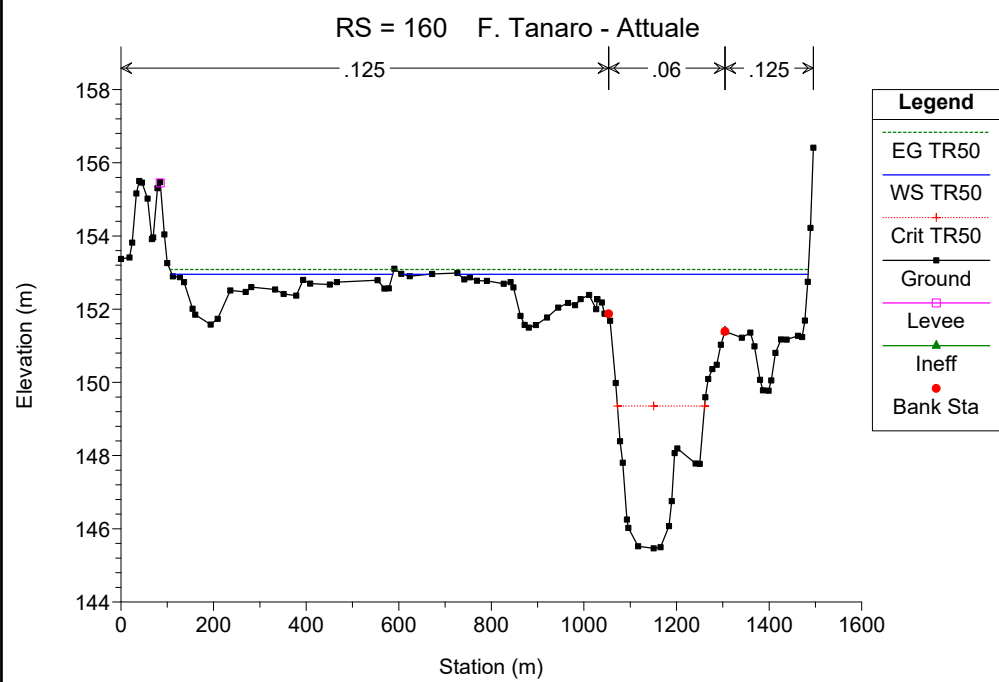
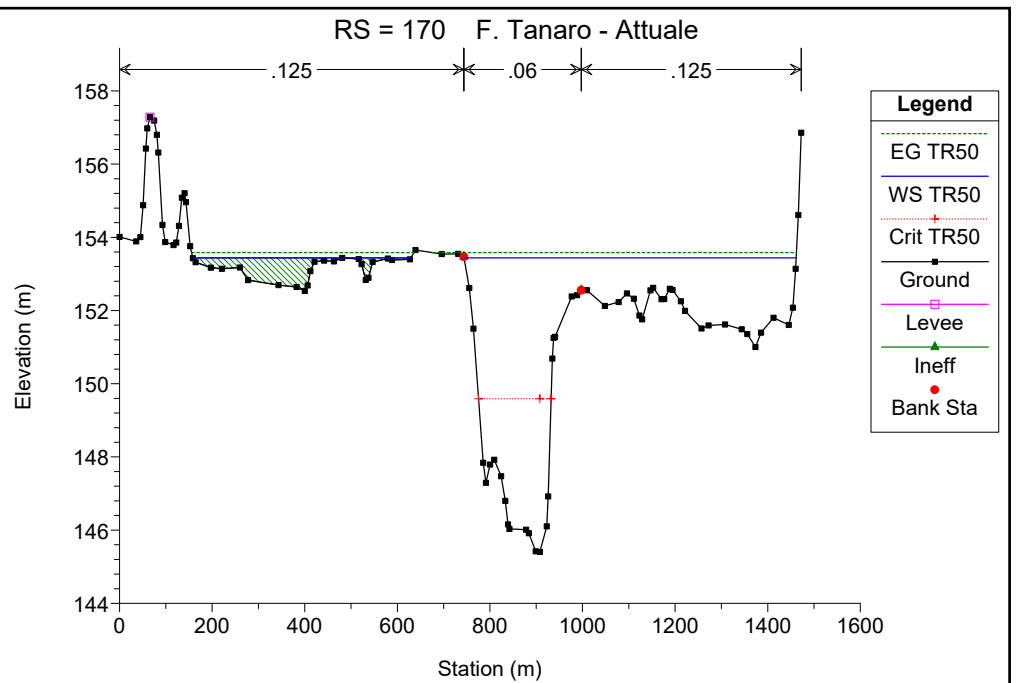
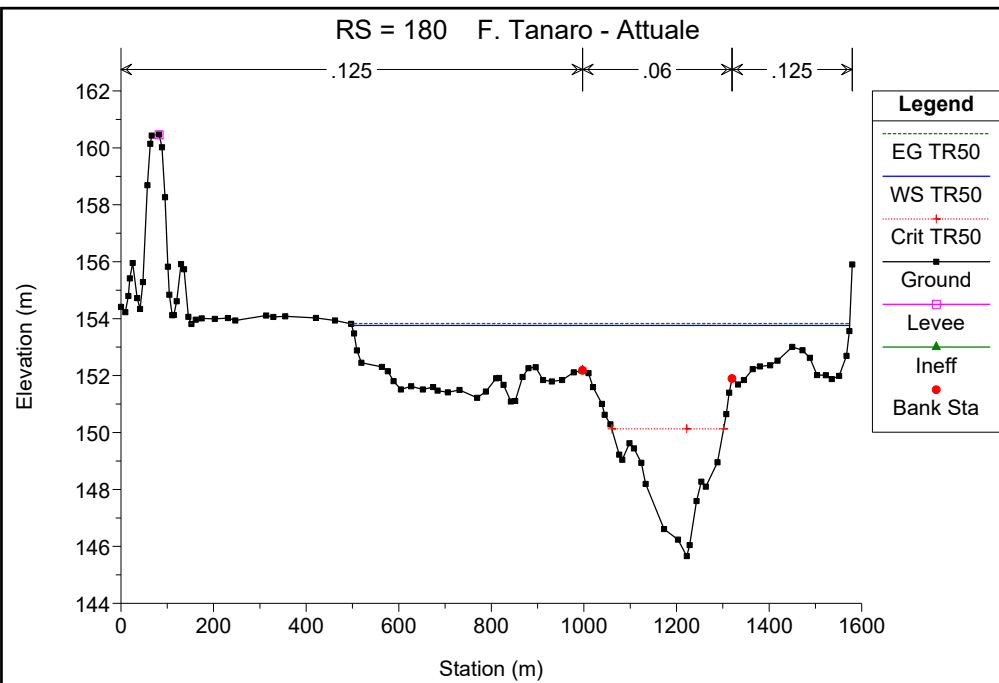


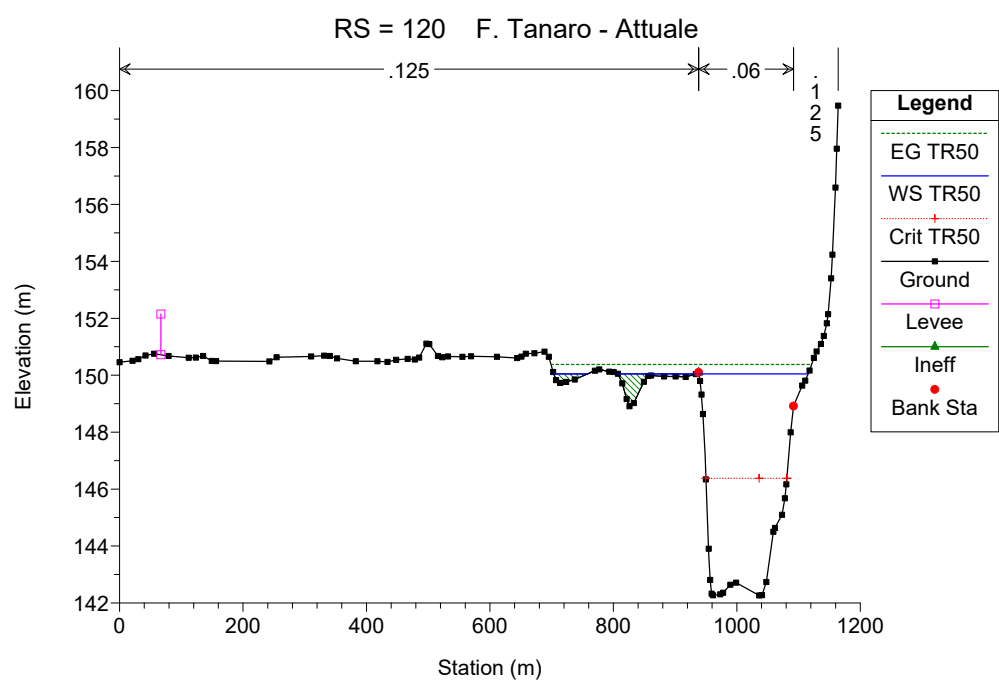
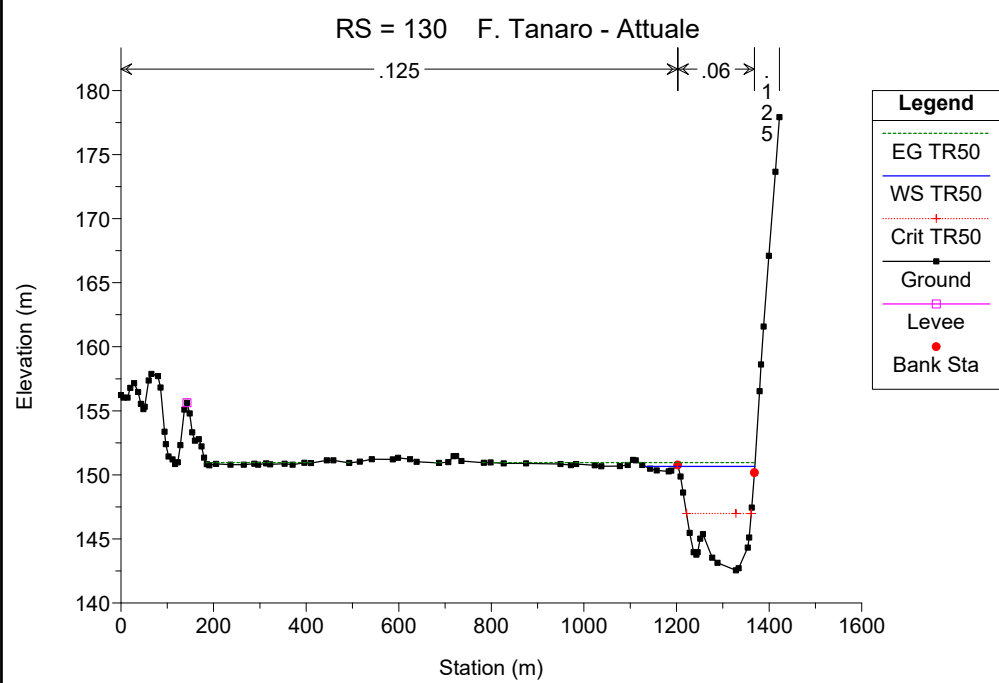
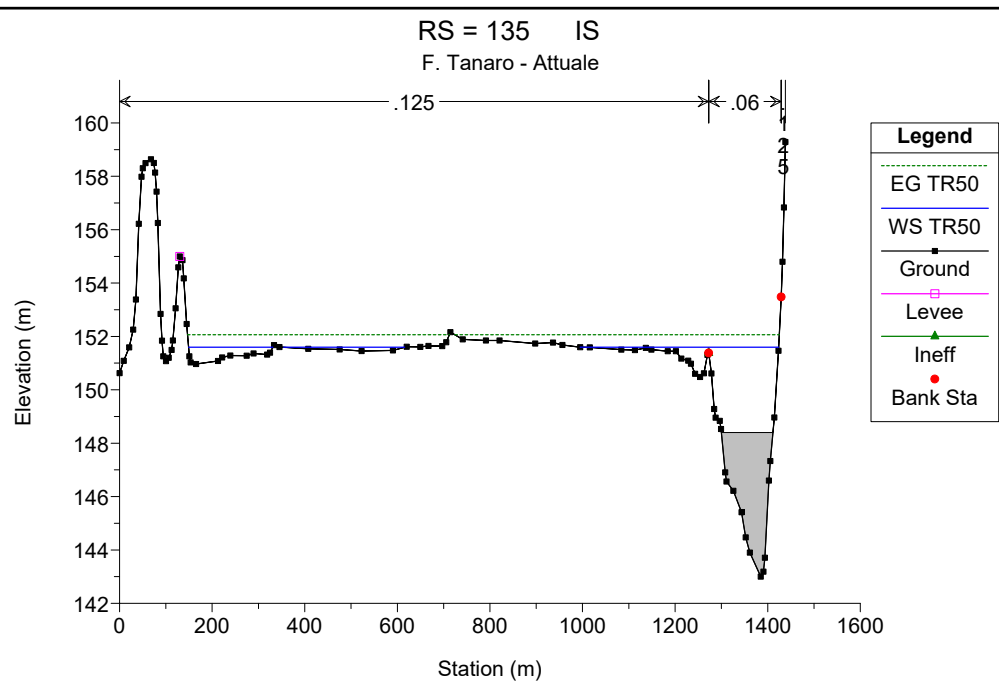
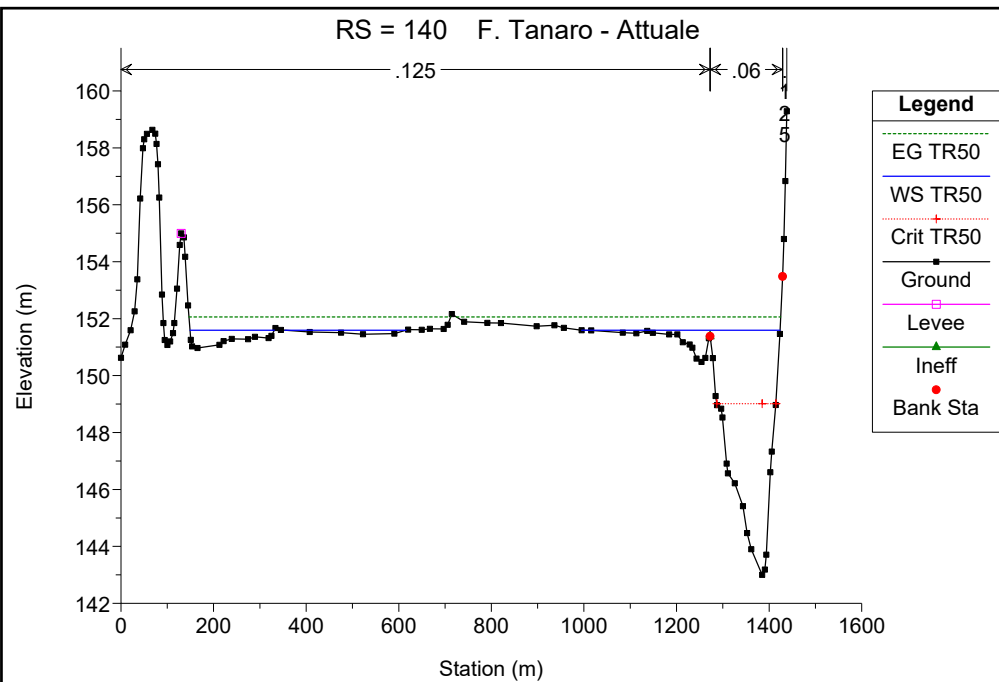


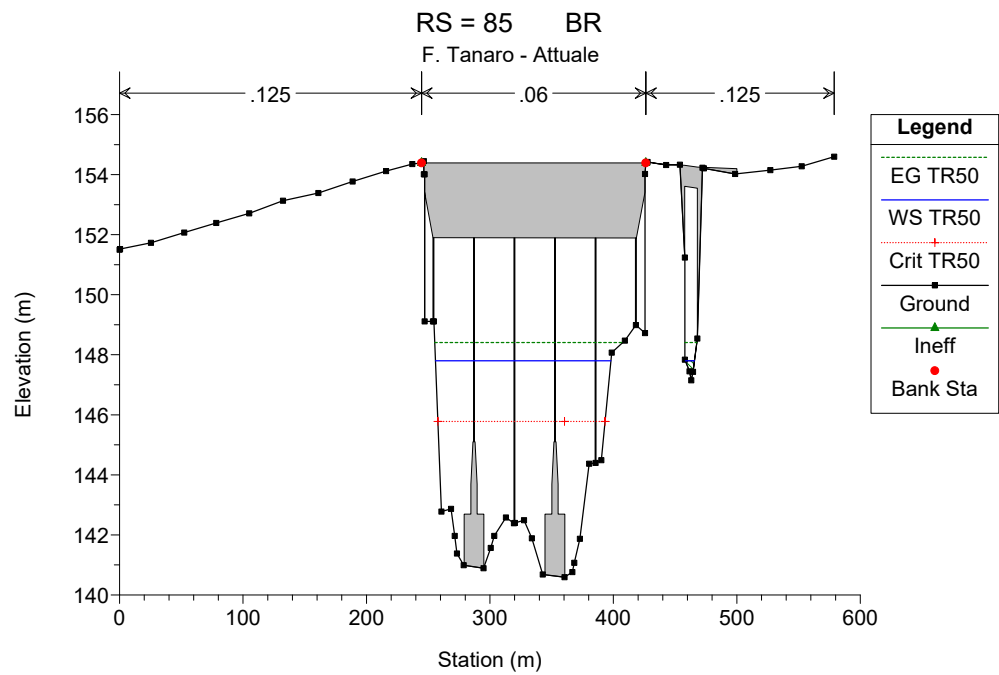
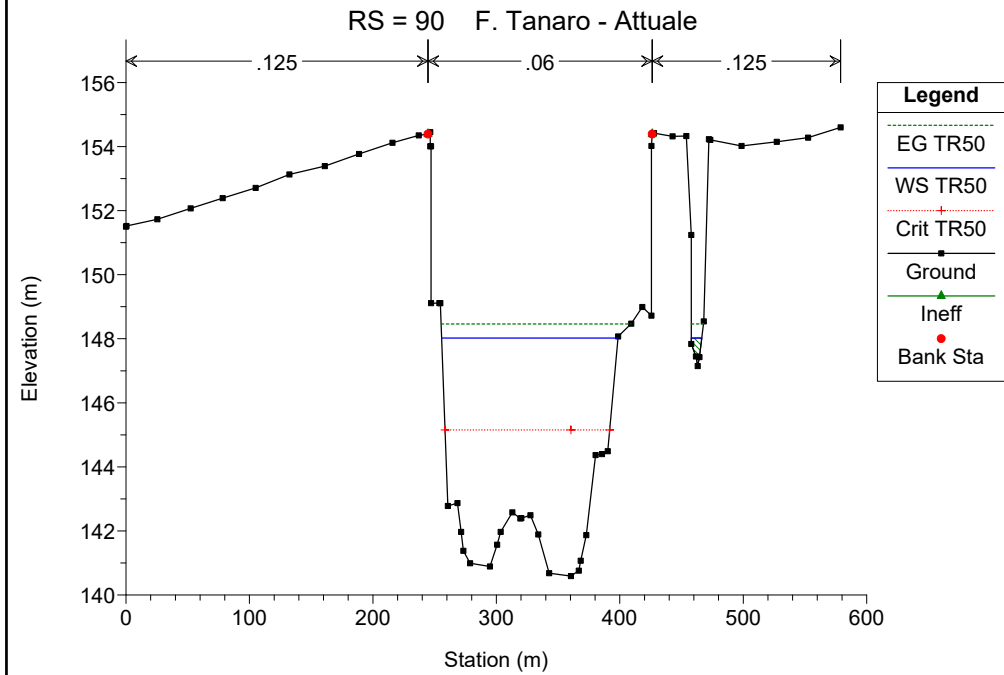
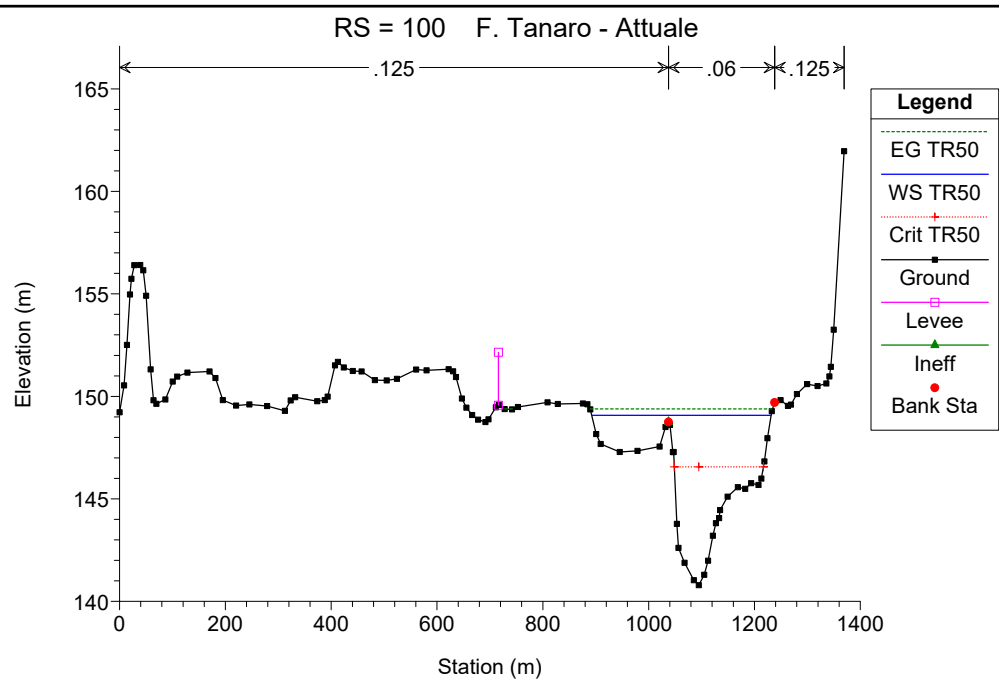
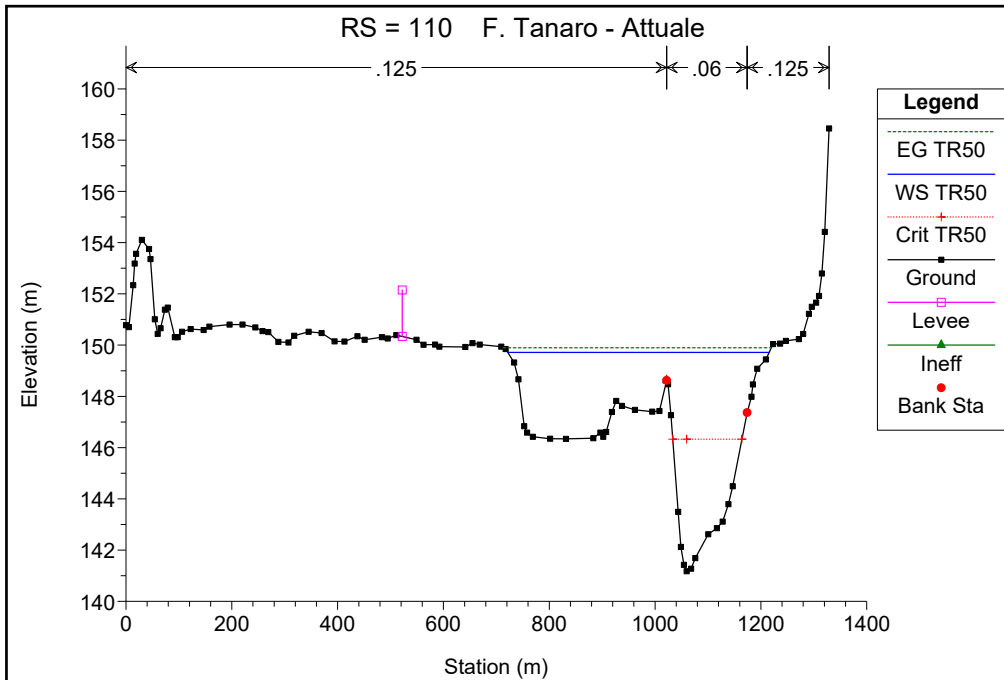


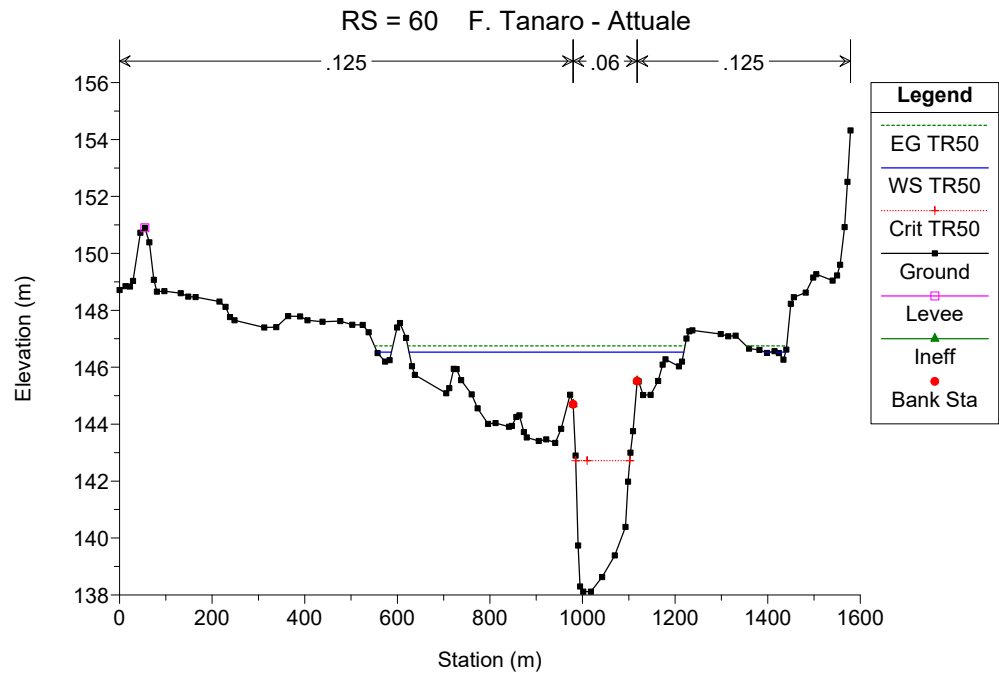
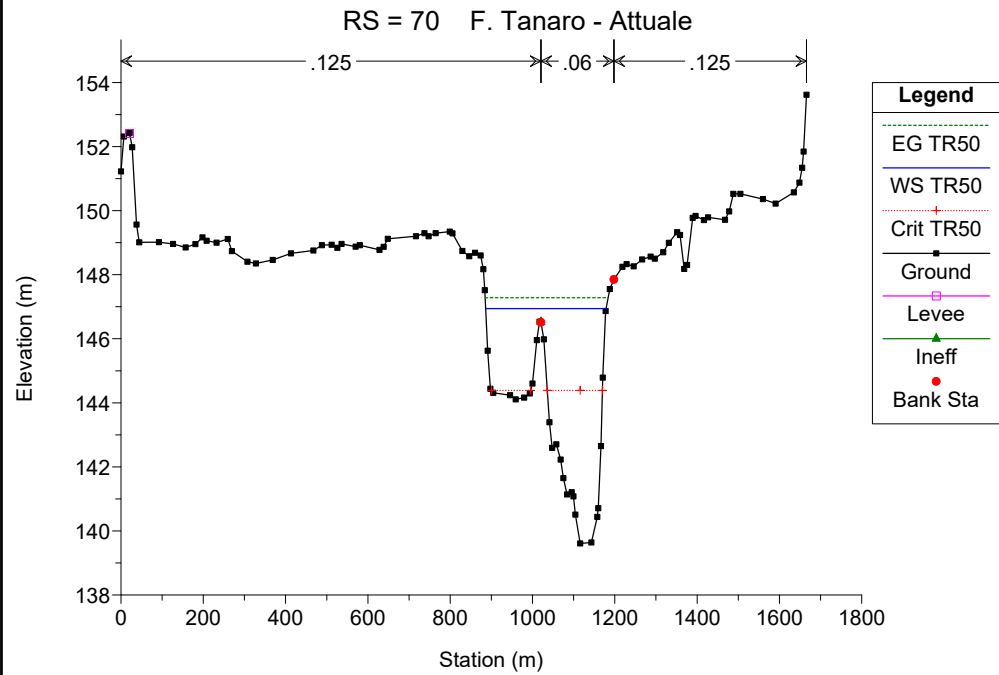
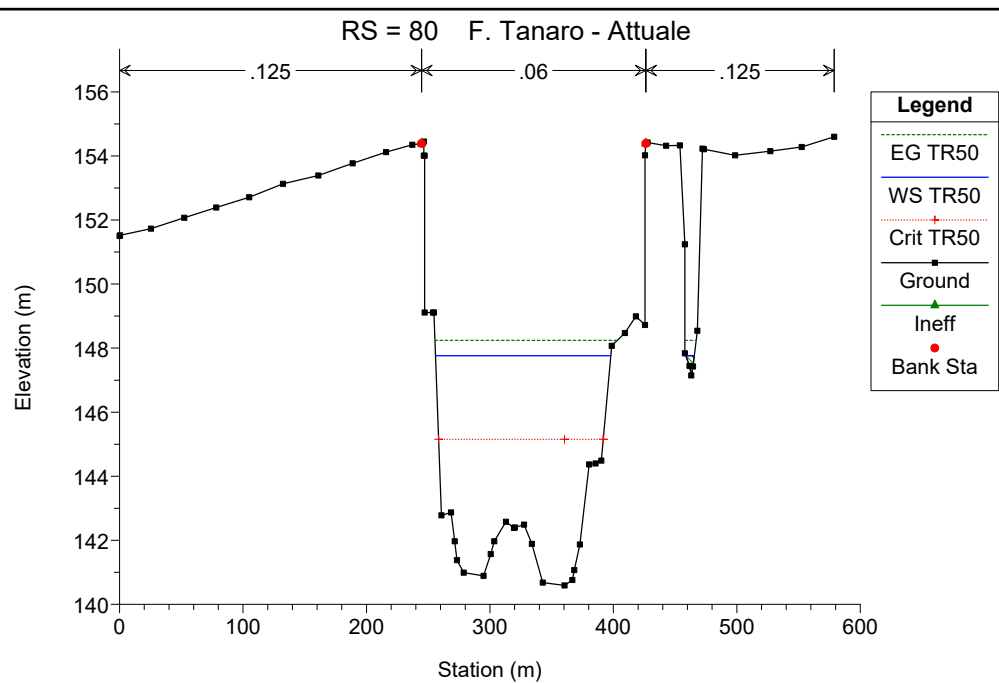
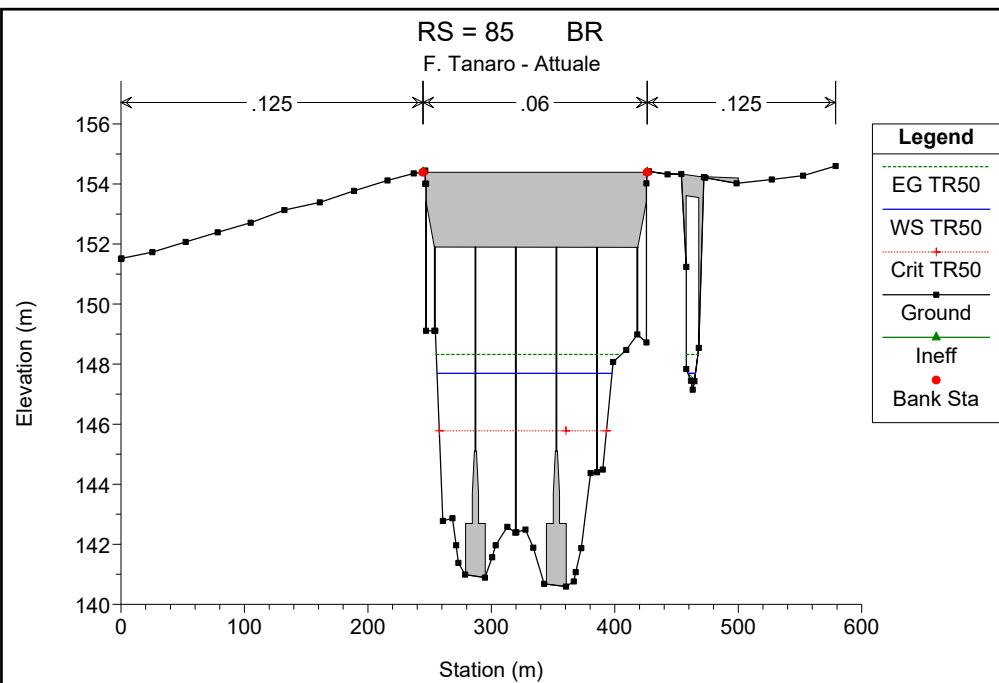


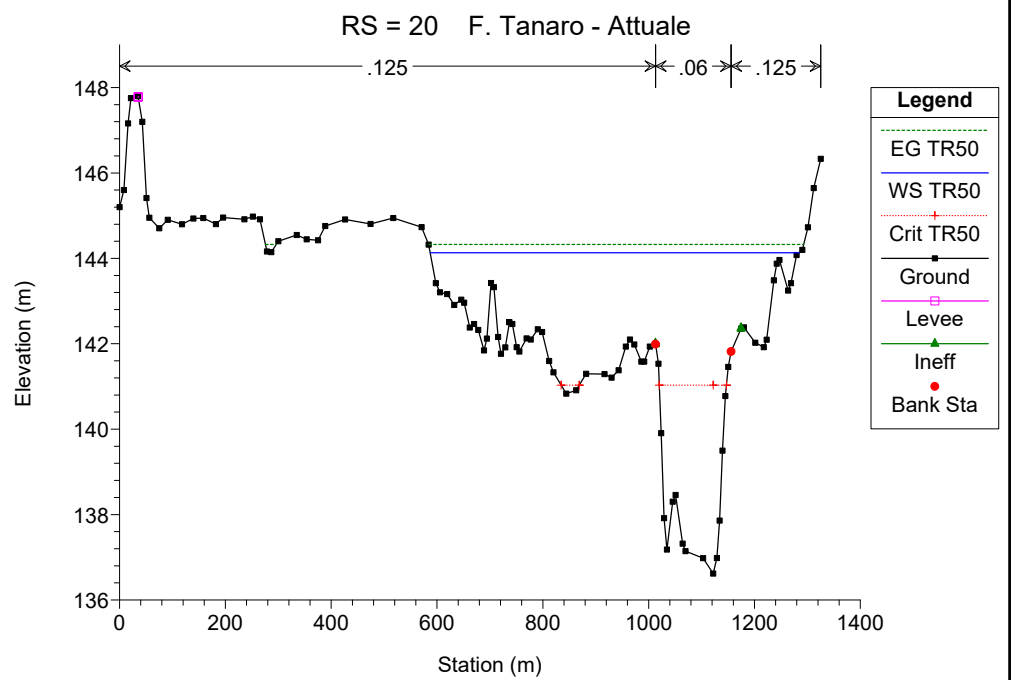
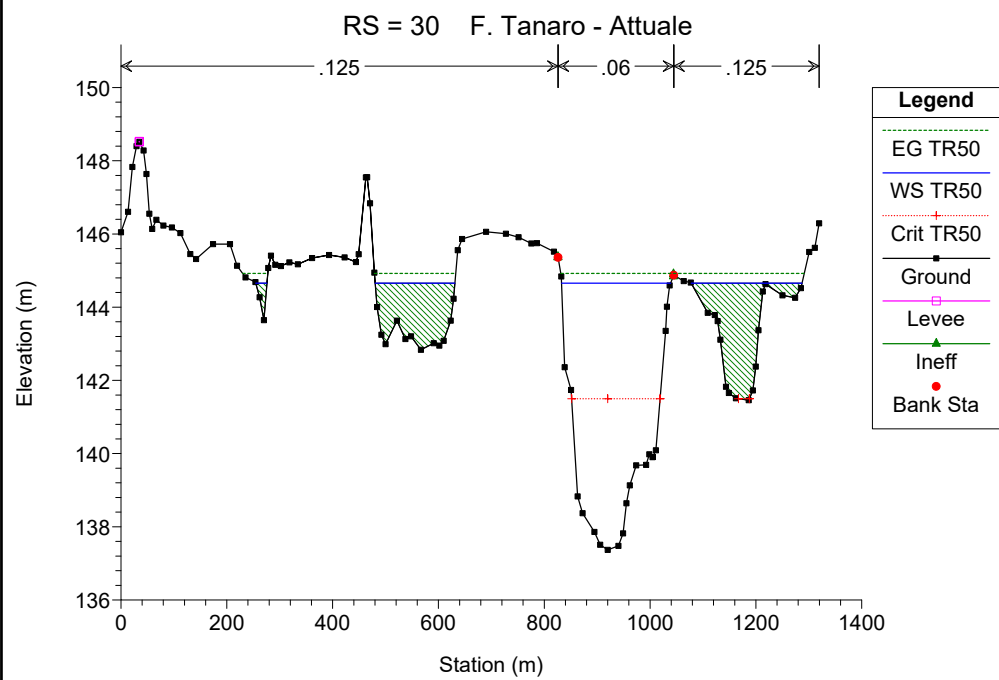
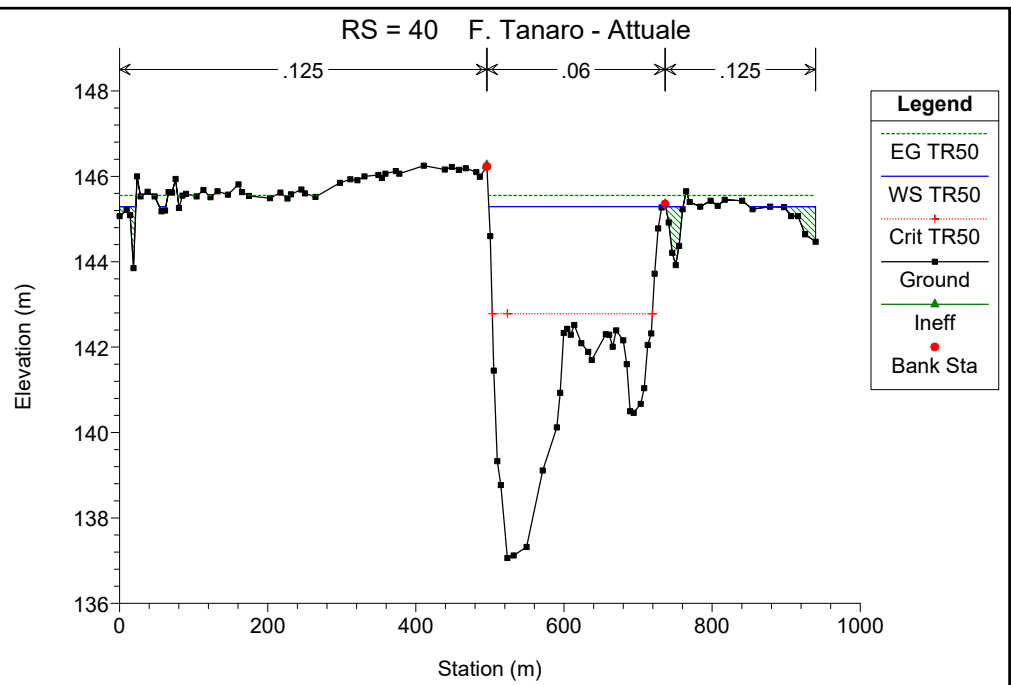
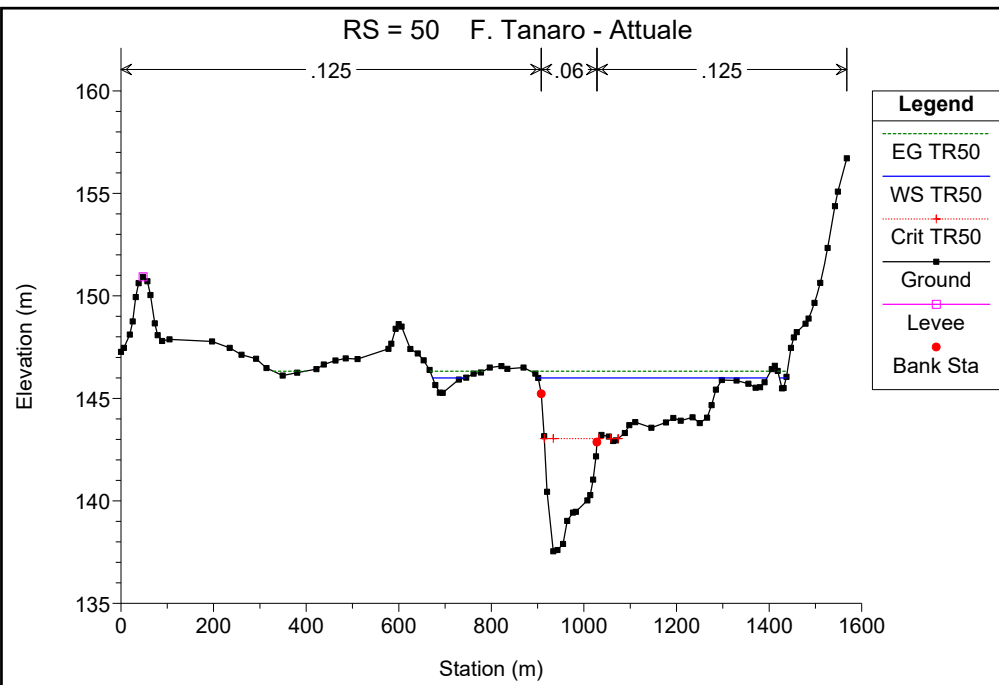




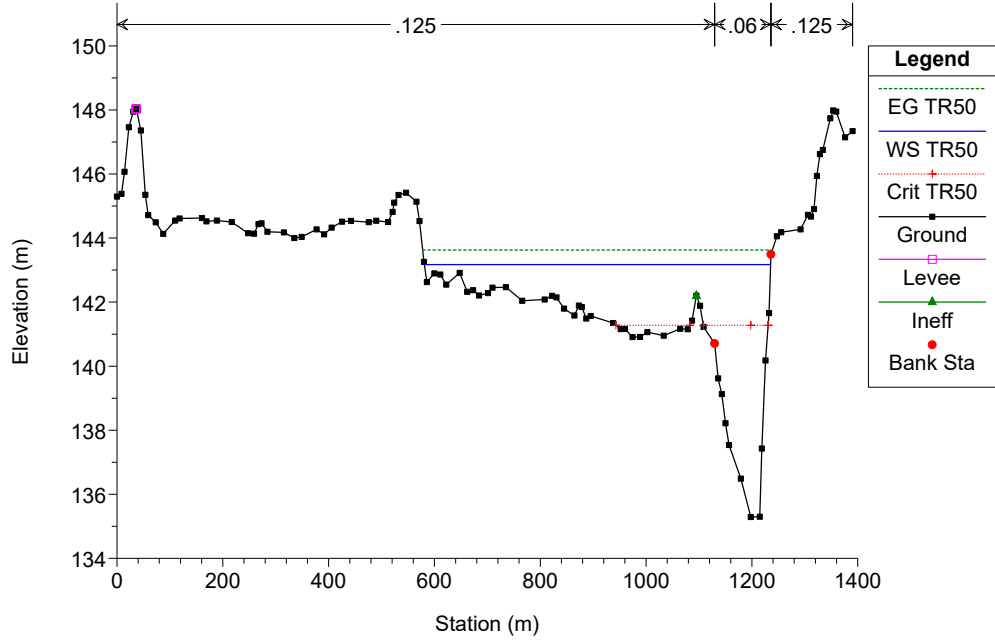








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO**

SIMULAZIONE 6

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2412	50
F. Tanaro valle Riddone	2419	
F. Tanaro valle Cherasca	2428	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50

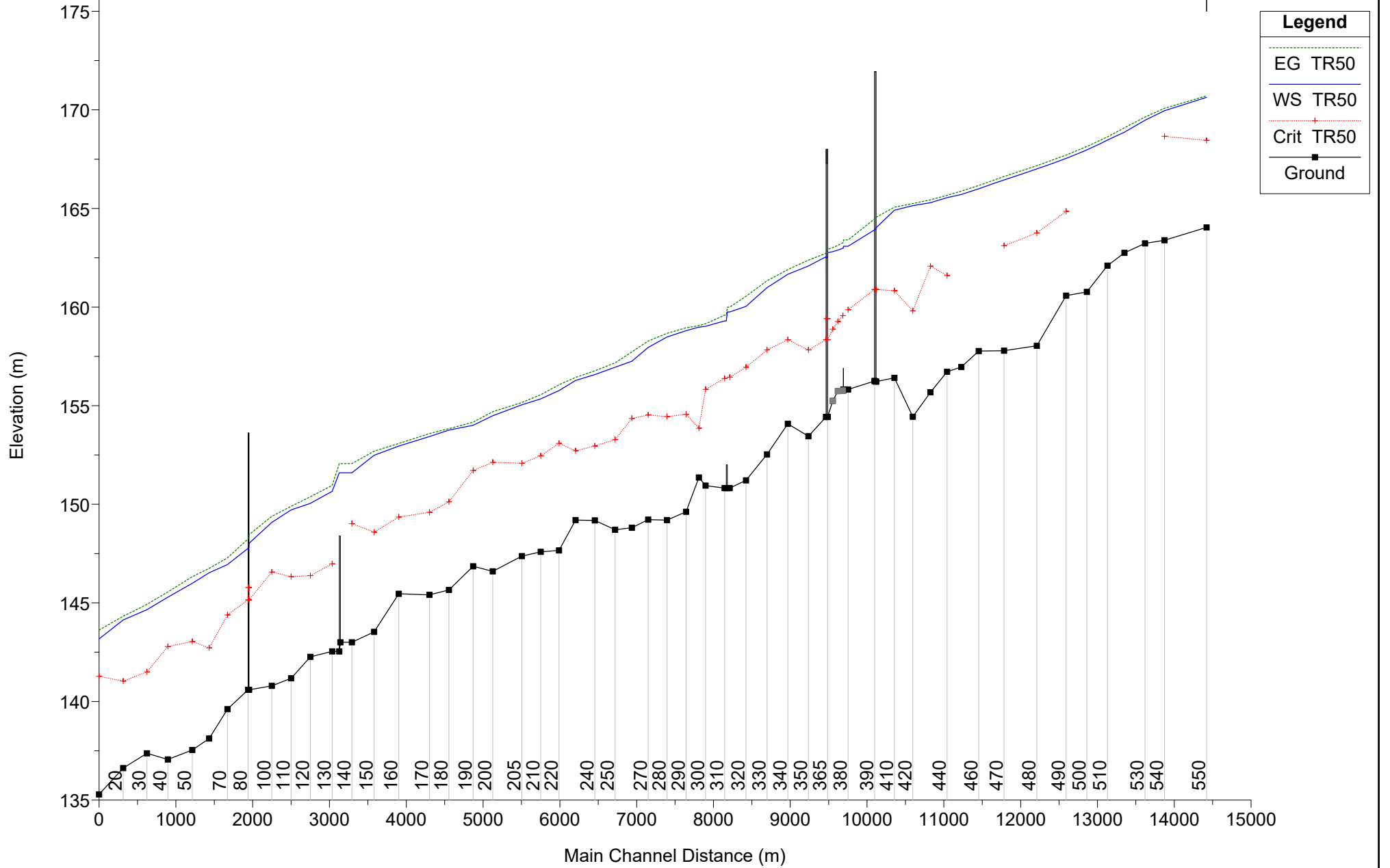
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR50	2412.00	164.04	170.64	168.46	170.71	0.001136	1.37	2719.57	1158.07	0.22
1	540	TR50	2412.00	163.39	169.96	168.66	170.08	0.001786	2.06	2661.08	1117.98	0.29
1	530	TR50	2412.00	163.23	169.48		169.64	0.001766	2.00	1918.83	663.79	0.29
1	520	TR50	2412.00	162.75	168.87		169.09	0.002413	2.35	1876.58	983.48	0.34
1	510	TR50	2412.00	162.10	168.47		168.63	0.002136	2.06	1936.63	717.68	0.31
1	500	TR50	2412.00	160.77	167.97		168.14	0.001661	2.06	1778.10	544.86	0.28
1	490	TR50	2412.00	160.58	167.54	164.86	167.71	0.001642	1.92	1637.73	502.83	0.28
1	480	TR50	2412.00	158.04	167.02	163.76	167.17	0.001319	1.89	1990.16	682.21	0.26
1	470	TR50	2412.00	157.79	166.44	163.11	166.62	0.001487	2.13	1811.03	510.22	0.27
1	460	TR50	2412.00	157.77	166.00		166.17	0.001259	1.94	1884.33	675.22	0.25
1	450	TR50	2412.00	156.96	165.71		165.88	0.001260	1.97	1765.60	560.22	0.25
1	440	TR50	2412.00	156.72	165.55	161.59	165.67	0.000925	1.75	2341.71	664.12	0.22
1	430	TR50	2412.00	155.68	165.30	162.07	165.44	0.001212	2.01	2291.25	660.97	0.25
1	420	TR50	2412.00	154.44	165.14	159.81	165.25	0.000612	1.60	2587.15	681.51	0.18
1	410	TR50	2412.00	156.41	164.91	160.83	165.06	0.001102	1.95	1966.95	512.30	0.24
1	400	TR50	2412.00	156.22	164.03	160.89	164.55	0.003251	3.28	829.33	162.90	0.40
1	395		Bridge									
1	390	TR50	2412.00	156.25	163.92	160.89	164.47	0.003446	3.34	811.16	162.59	0.41
1	380	TR50	2412.00	155.82	163.08	159.87	163.41	0.002215	2.51	968.09	198.75	0.33
1	379		Inl Struct									
1	370	TR50	2412.00	154.43	162.76	158.35	162.92	0.001005	1.81	1331.42	205.33	0.23
1	365		Bridge									
1	360	TR50	2412.00	154.43	162.55	158.35	162.73	0.001112	1.87	1289.67	204.77	0.24
1	350	TR50	2412.00	153.45	162.08	157.83	162.38	0.001705	2.42	1001.57	187.59	0.30
1	340	TR50	2419.00	154.08	161.66	158.34	161.90	0.001744	2.18	1192.07	372.51	0.29
1	330	TR50	2419.00	152.53	160.99	157.83	161.33	0.002459	2.63	1039.28	373.34	0.35
1	320	TR50	2419.00	151.21	160.04	156.95	160.55	0.003181	3.38	1092.98	368.02	0.41
1	315	TR50	2419.00	150.82	159.75	156.44	160.00	0.001800	2.52	1809.92	702.16	0.31
1	312.5		Inl Struct									
1	310	TR50	2419.00	150.82	159.30	156.38	159.59	0.002371	2.77	1564.82	531.93	0.35
1	300	TR50	2428.00	150.95	159.03	155.83	159.15	0.001233	1.79	2157.91	647.57	0.25
1	295	TR50	2428.00	151.36	158.98	153.85	159.06	0.000522	1.33	2754.02	726.35	0.17
1	290	TR50	2428.00	149.62	158.80	154.56	158.95	0.000998	1.72	1803.22	619.84	0.22
1	280	TR50	2428.00	149.20	158.48	154.44	158.67	0.001259	2.11	1765.09	456.87	0.26
1	270	TR50	2428.00	149.22	157.95	154.53	158.27	0.002132	2.73	1441.16	458.16	0.33
1	260	TR50	2428.00	148.81	157.26	154.35	157.73	0.003098	3.22	1046.56	287.48	0.40
1	250	TR50	2428.00	148.71	156.95	153.28	157.17	0.001692	2.25	1616.17	511.14	0.29
1	240	TR50	2428.00	149.18	156.58	152.95	156.77	0.001352	2.06	1815.71	742.94	0.26
1	230	TR50	2428.00	149.20	156.27	152.71	156.43	0.001245	1.88	1733.00	456.34	0.25
1	220	TR50	2428.00	147.66	155.76	153.09	156.06	0.002303	2.64	1376.41	398.82	0.34

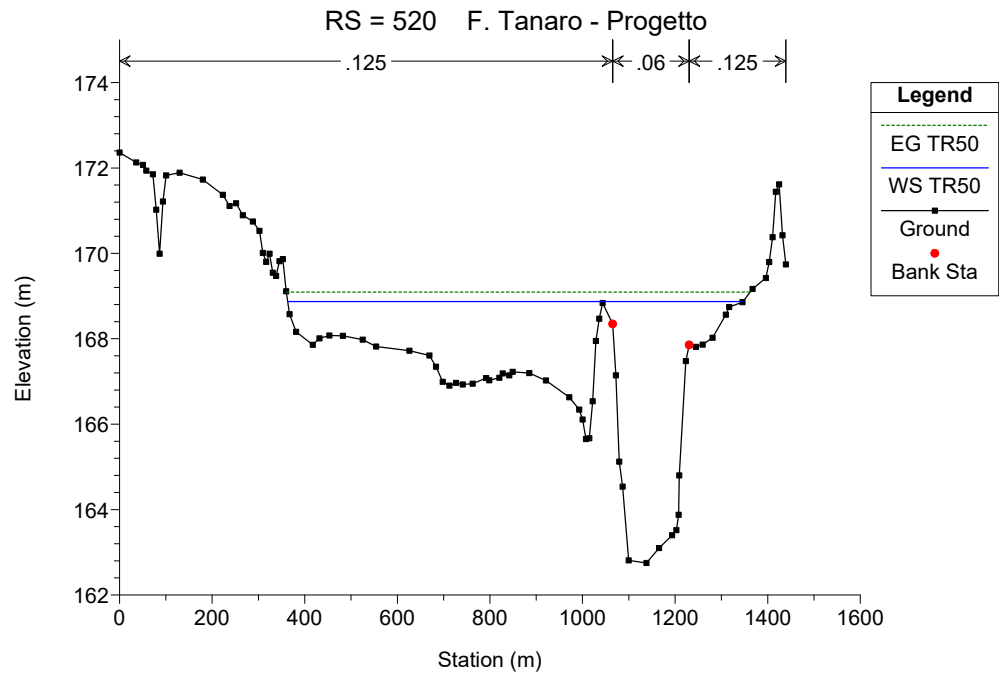
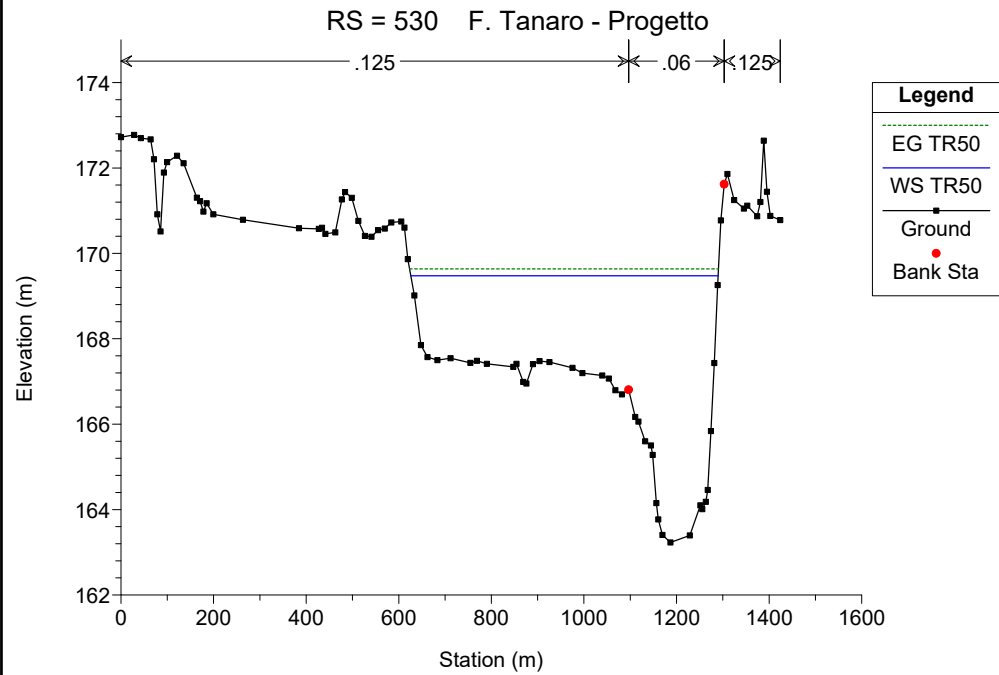
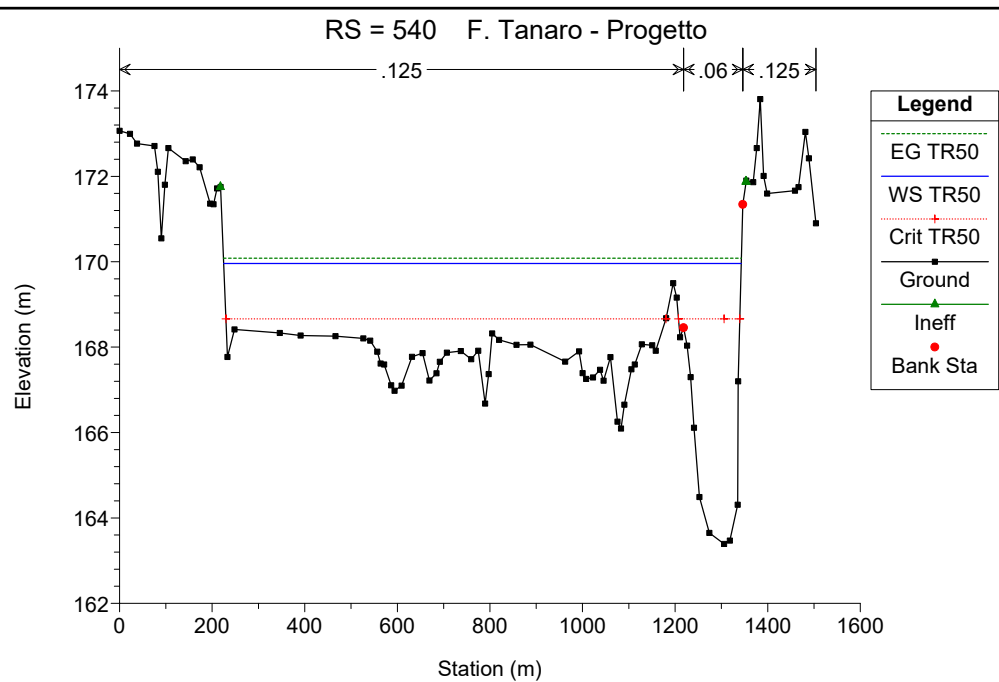
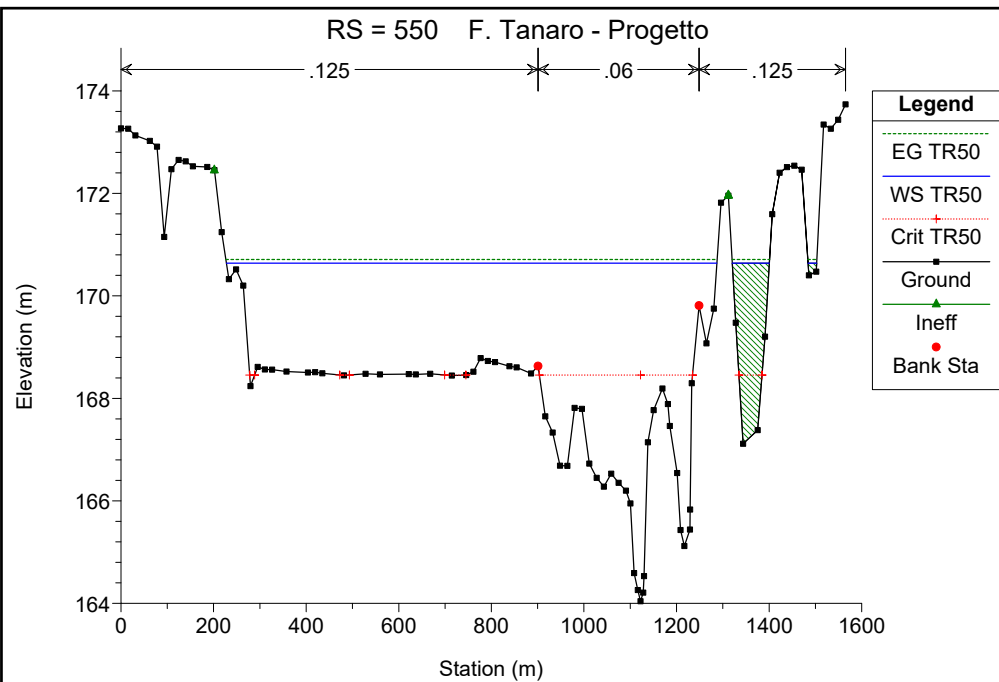
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50 (Continued)

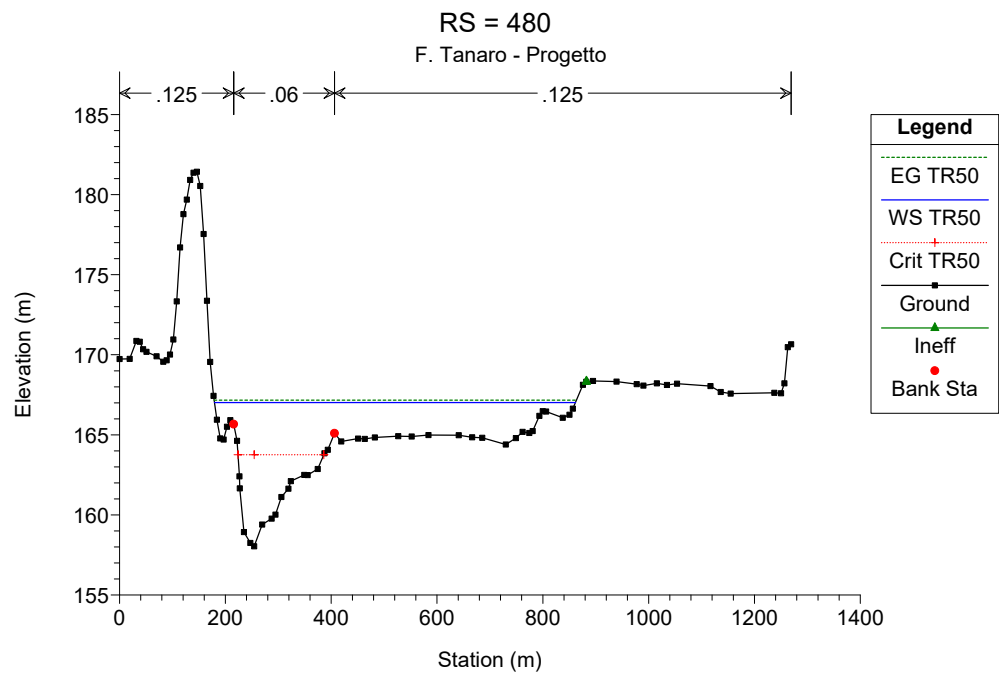
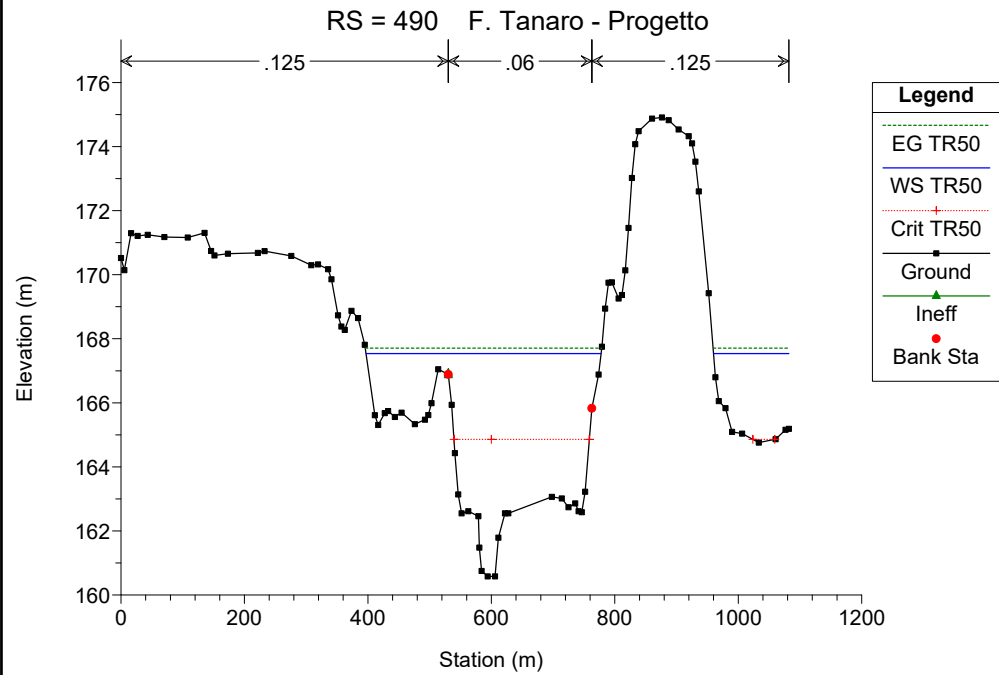
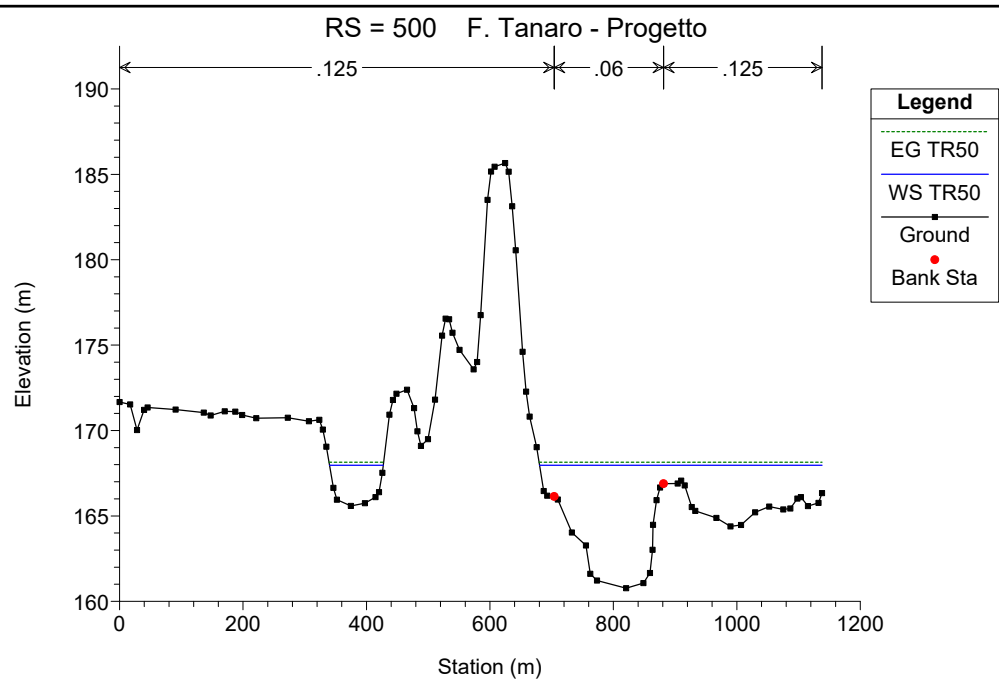
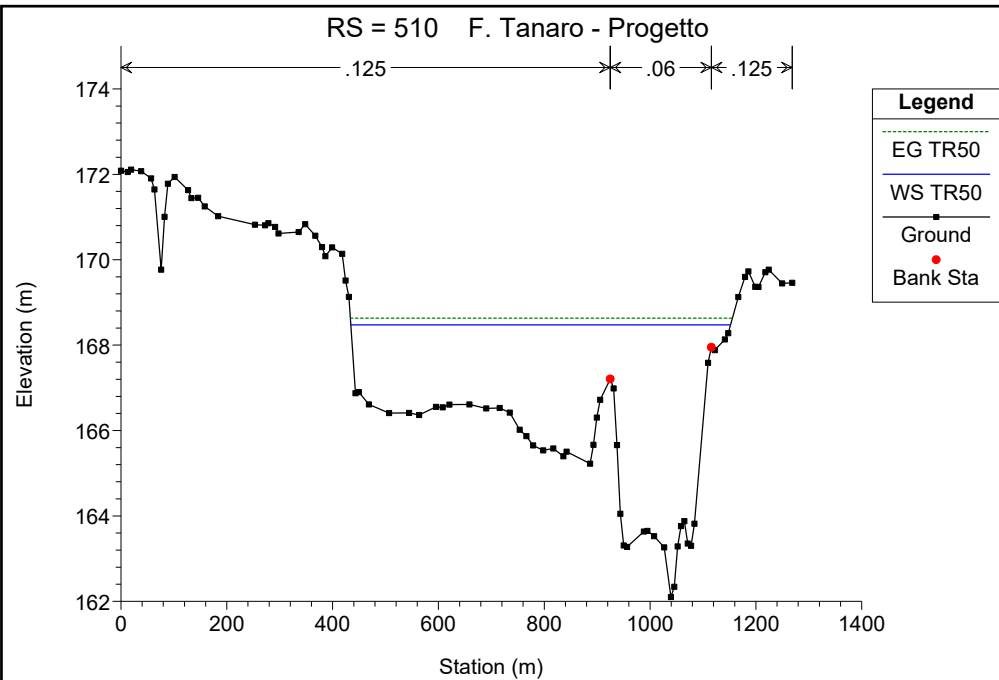
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR50	2428.00	147.59	155.34	152.46	155.56	0.001749	2.16	1558.25	543.07	0.29
1	205	TR50	2428.00	147.37	155.05	152.08	155.16	0.001201	1.71	2441.54	970.21	0.24
1	200	TR50	2428.00	146.60	154.49	152.13	154.70	0.002044	2.43	2196.13	1055.55	0.32
1	190	TR50	2428.00	146.85	154.01	151.71	154.16	0.001940	1.99	2121.97	969.08	0.30
1	180	TR50	2428.00	145.66	153.76	150.13	153.83	0.000667	1.25	2944.86	1075.92	0.18
1	170	TR50	2428.00	145.40	153.44	149.59	153.58	0.001445	1.79	1895.57	1184.26	0.26
1	160	TR50	2428.00	145.46	152.95	149.35	153.08	0.001129	1.68	2099.14	1288.81	0.23
1	150	TR50	2428.00	143.53	152.49	148.59	152.69	0.001330	2.08	1787.82	1232.09	0.26
1	140	TR50	2428.00	143.00	151.59	149.01	152.06	0.003770	3.05	938.95	872.60	0.43
1	135		Inl Struct									
1	130	TR50	2428.00	142.54	150.66	146.98	150.96	0.001970	2.44	1013.08	231.51	0.32
1	120	TR50	2428.00	142.27	150.05	146.38	150.38	0.002088	2.55	965.31	358.53	0.33
1	110	TR50	2428.00	141.17	149.71	146.33	149.90	0.001474	2.12	1750.86	493.87	0.27
1	100	TR50	2428.00	140.79	149.08	146.56	149.39	0.002881	2.51	1133.10	339.10	0.37
1	90	TR50	2428.00	140.59	148.02	145.15	148.46	0.003086	2.93	827.72	151.38	0.39
1	85		Bridge									
1	80	TR50	2428.00	140.59	147.76	145.15	148.24	0.003561	3.07	790.65	148.92	0.42
1	70	TR50	2428.00	139.61	146.94	144.39	147.28	0.003072	2.71	1119.75	292.63	0.38
1	60	TR50	2428.00	138.12	146.53	142.72	146.75	0.001510	2.26	1707.35	654.89	0.28
1	50	TR50	2428.00	137.54	145.99	143.04	146.33	0.002371	2.75	1402.93	577.29	0.35
1	40	TR50	2428.00	137.06	145.29	142.78	145.55	0.002519	2.28	1066.03	377.43	0.34
1	30	TR50	2428.00	137.37	144.66	141.50	144.92	0.002133	2.29	1061.84	587.34	0.32
1	20	TR50	2428.00	136.62	144.13	141.03	144.32	0.001596	2.19	1942.48	697.53	0.28
1	10	TR50	2428.00	135.29	143.17	141.28	143.63	0.004006	3.30	1342.28	654.46	0.44

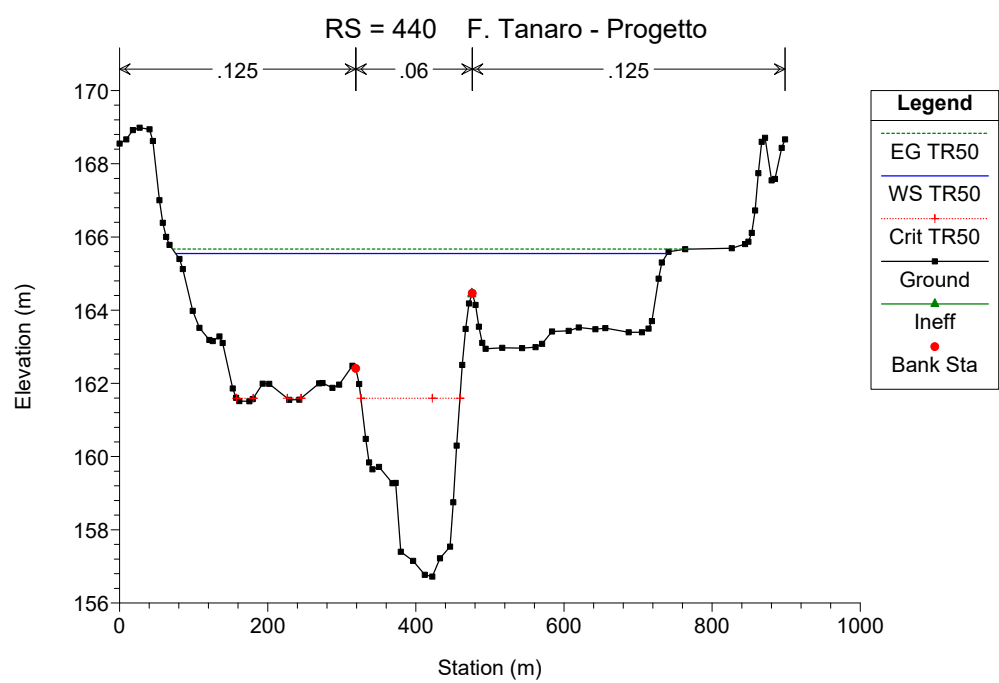
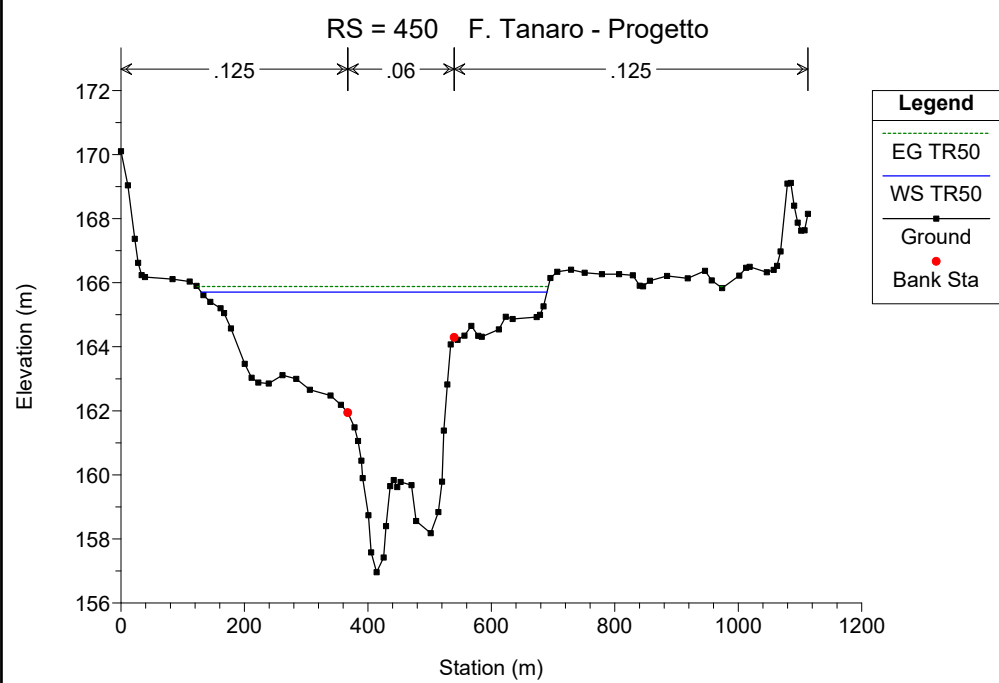
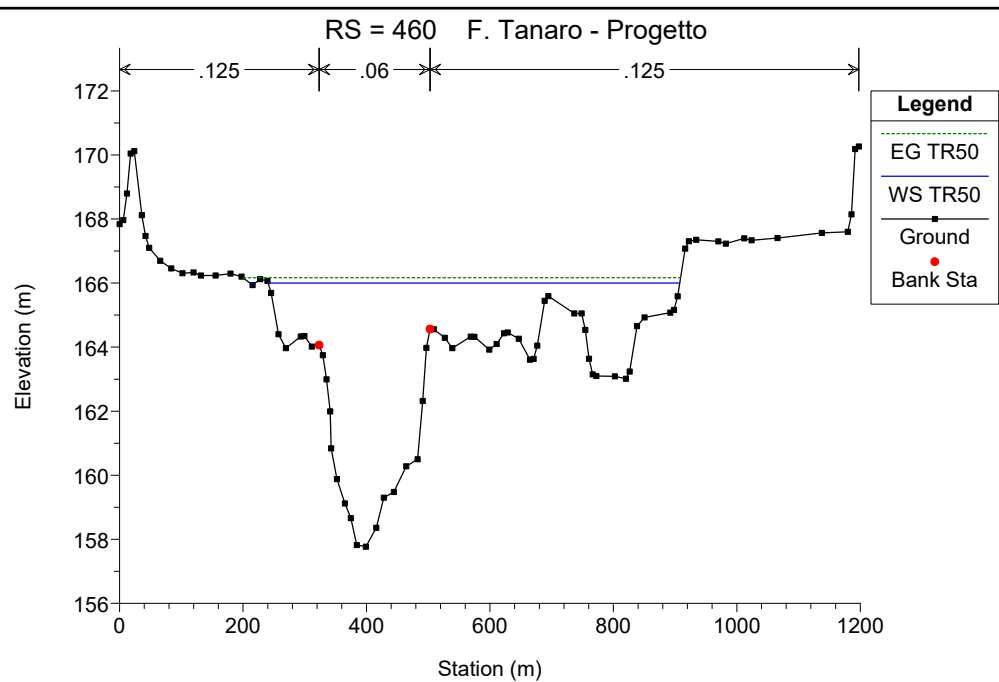
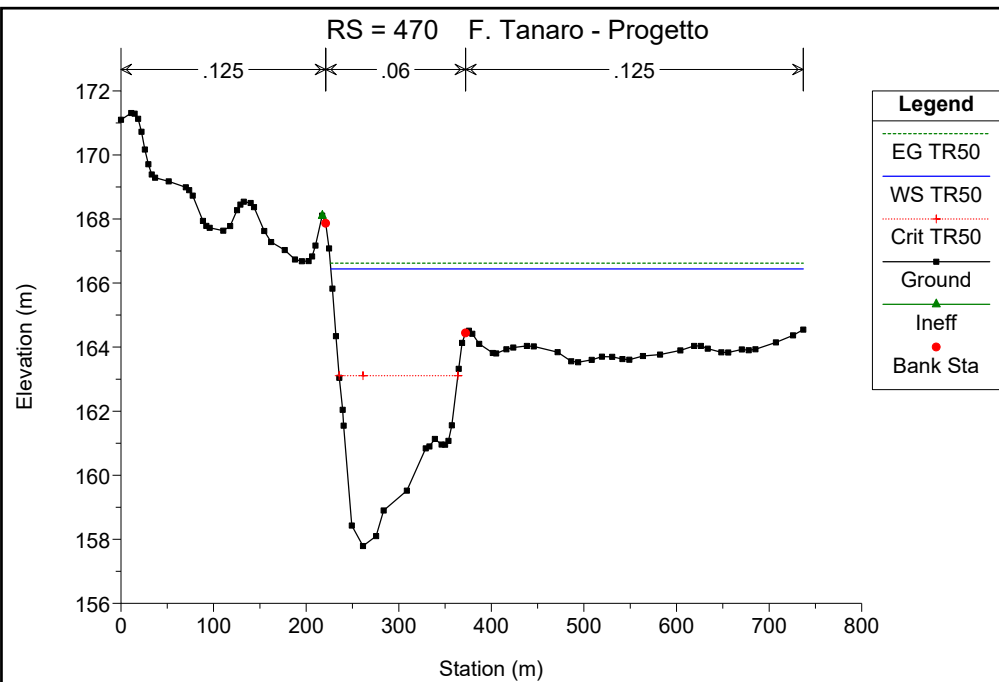
F. Tanaro - Progetto

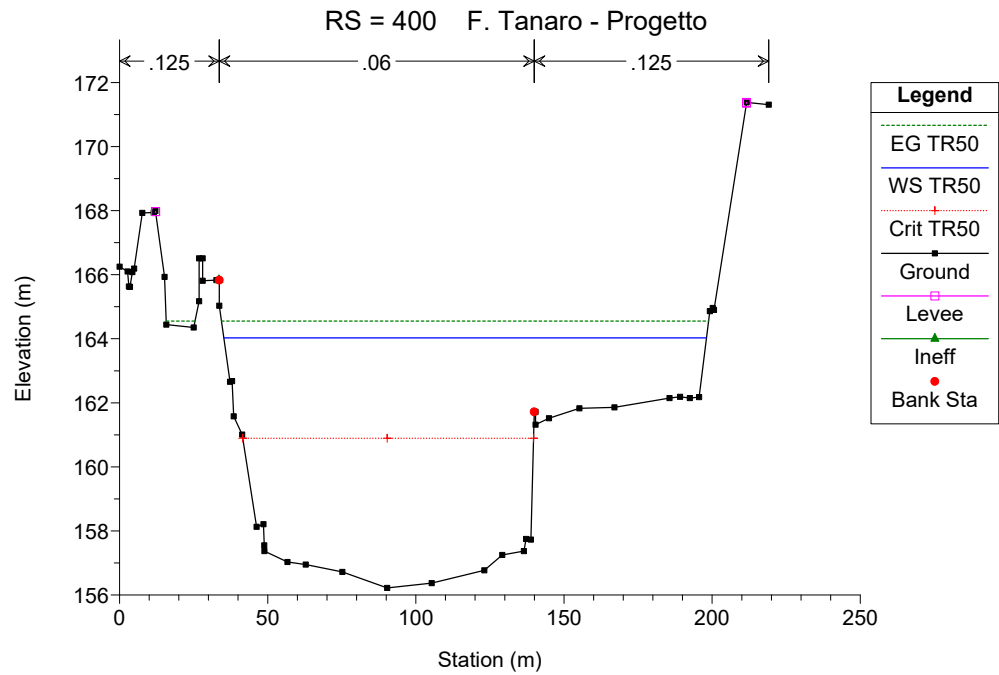
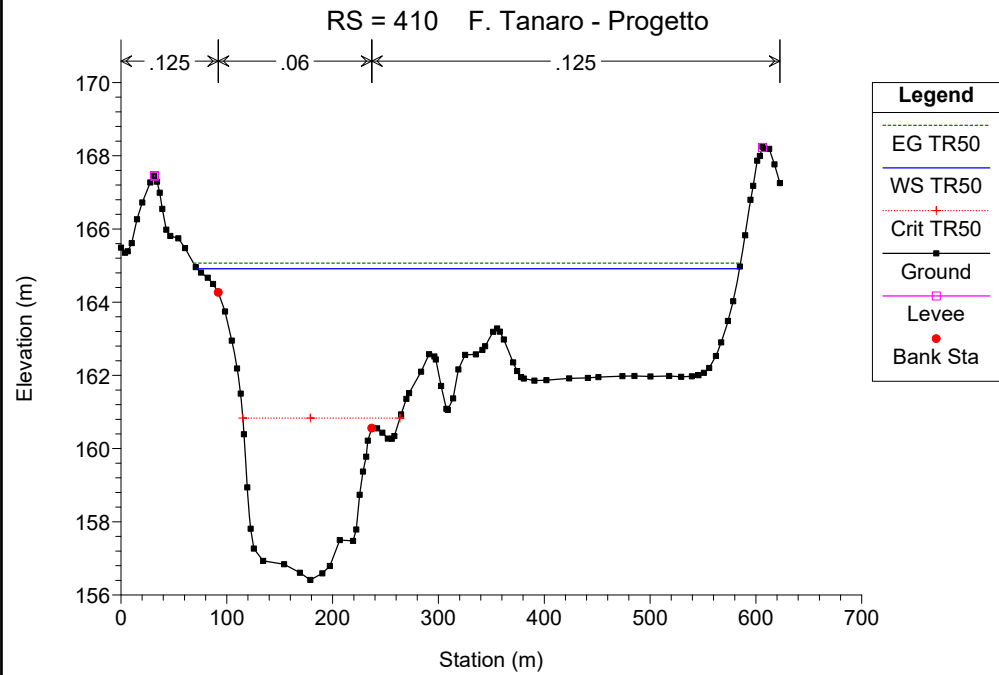
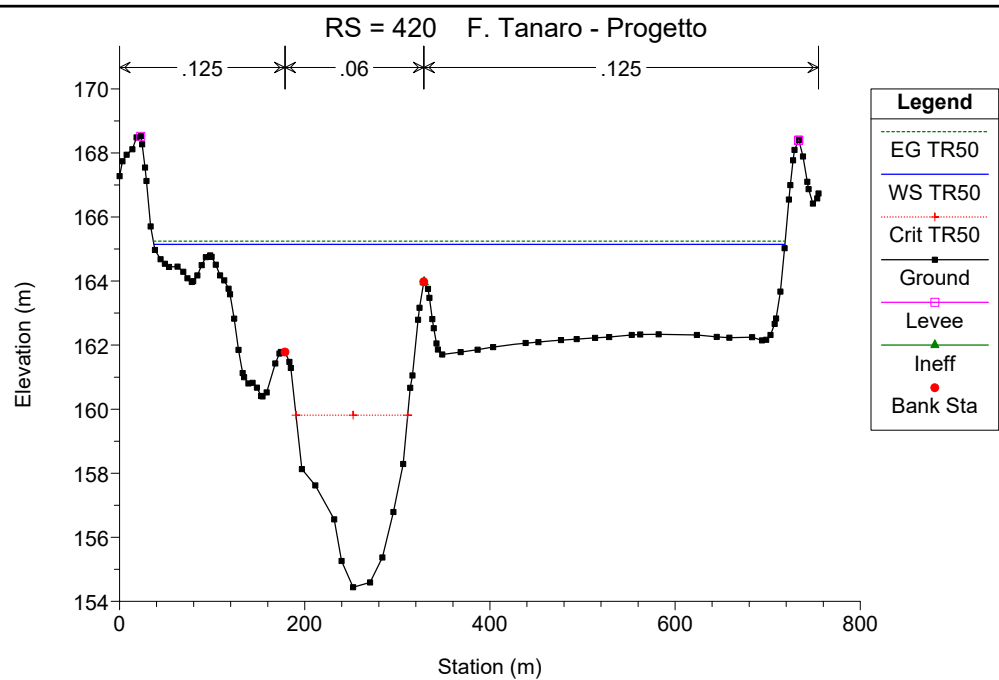
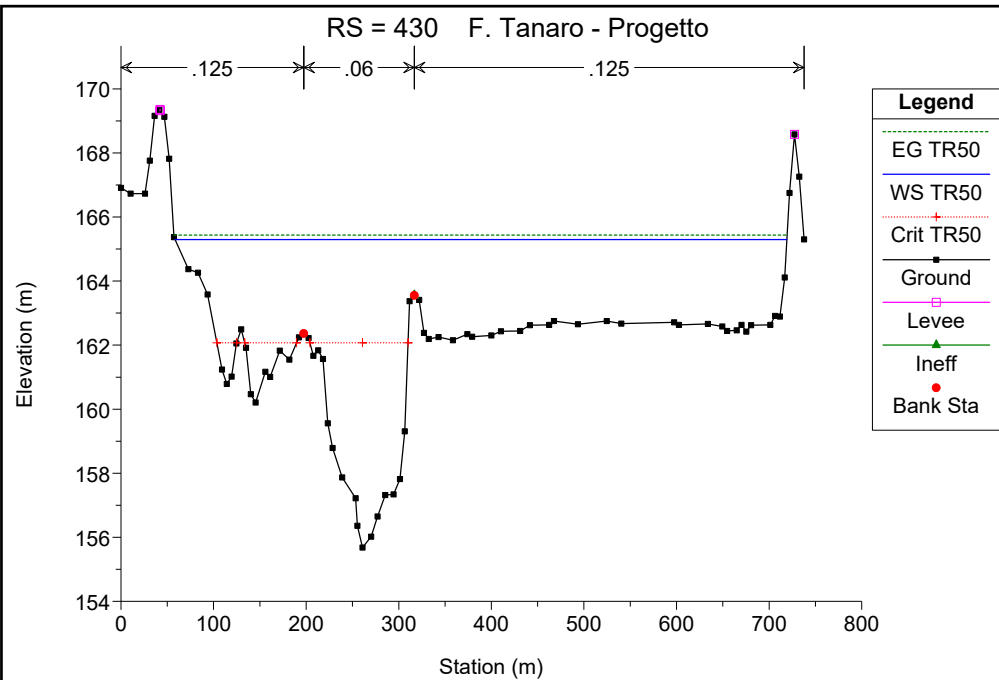
Tanaro 1

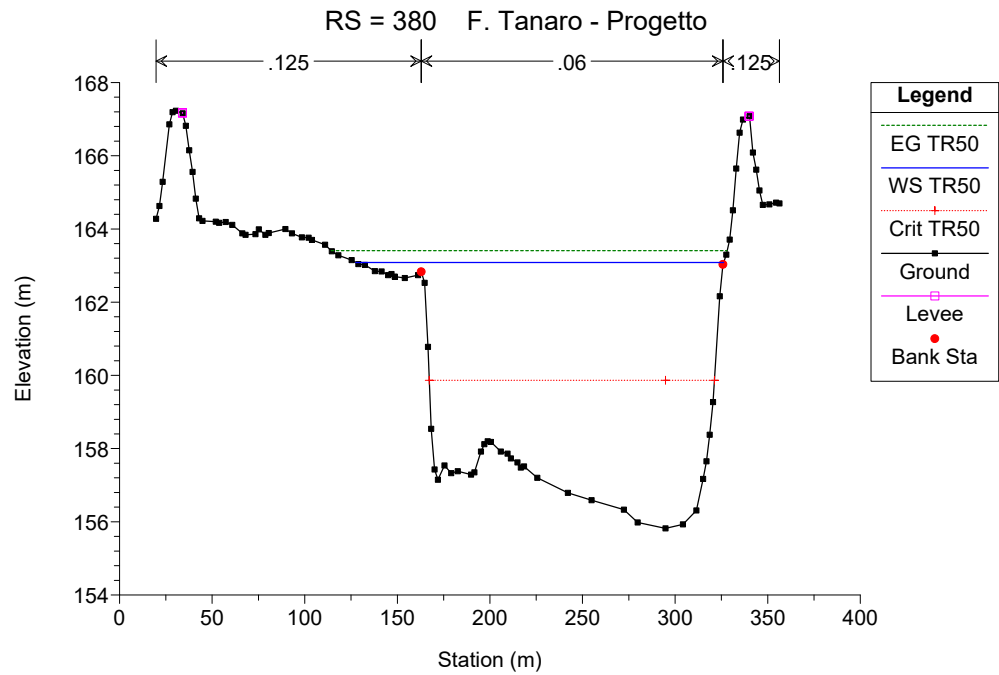
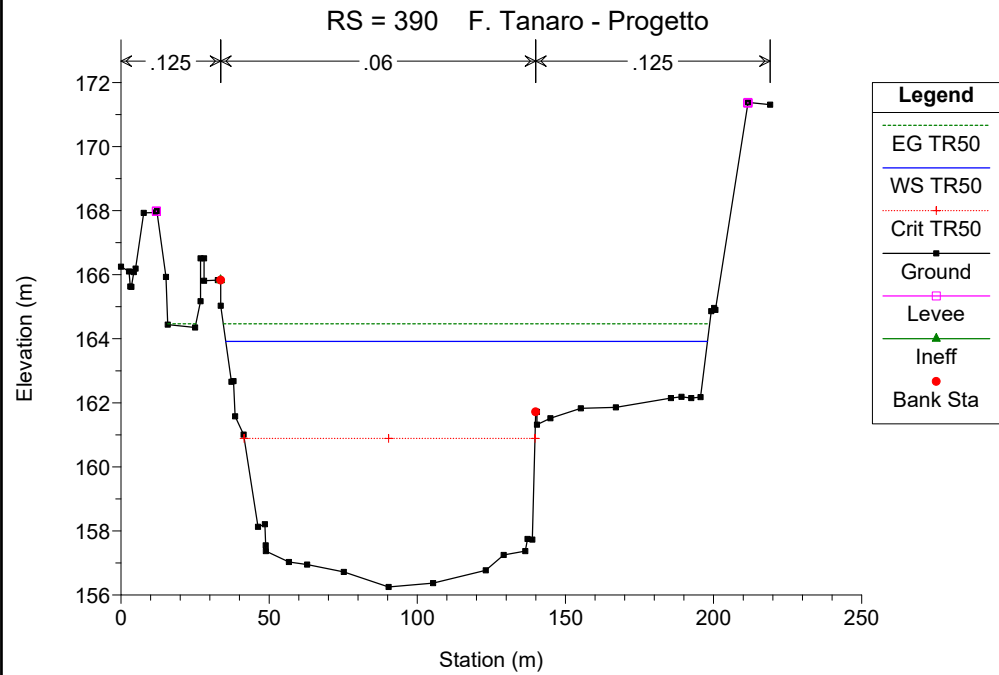
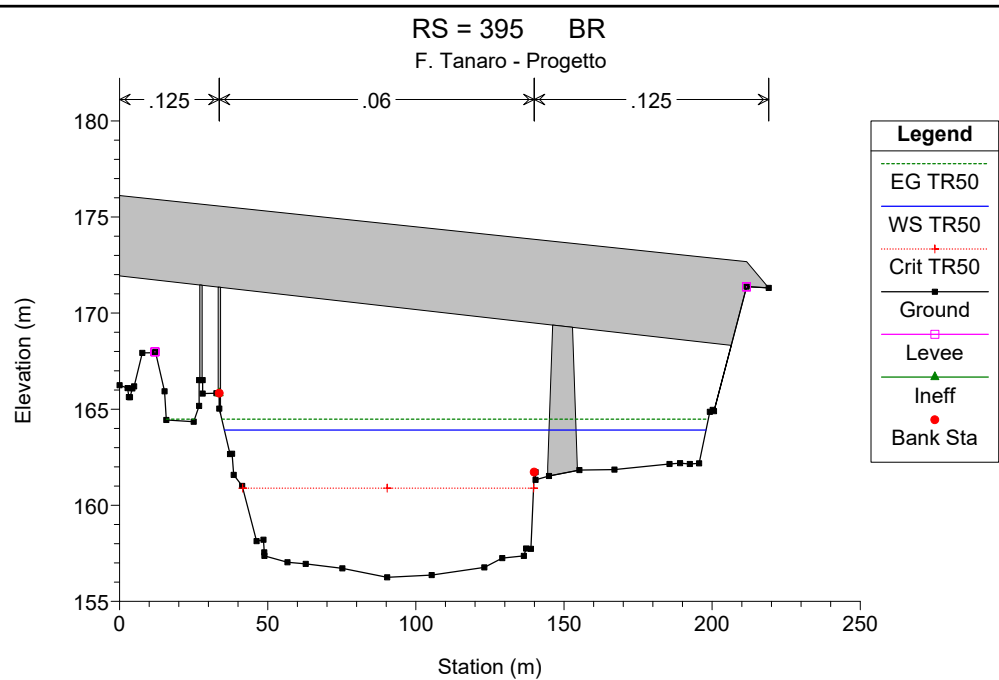
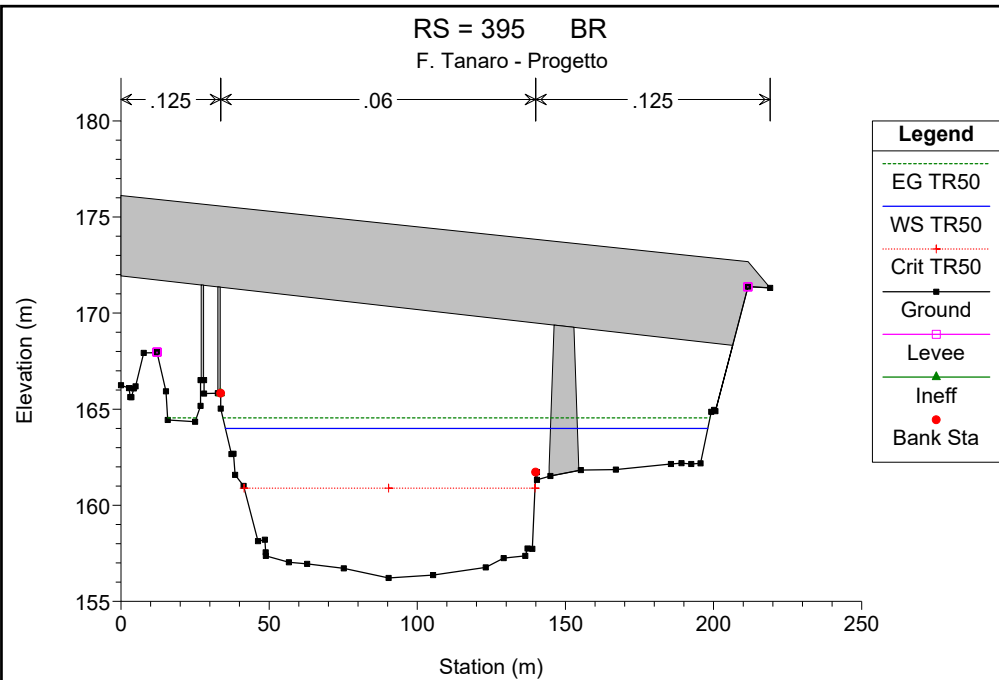


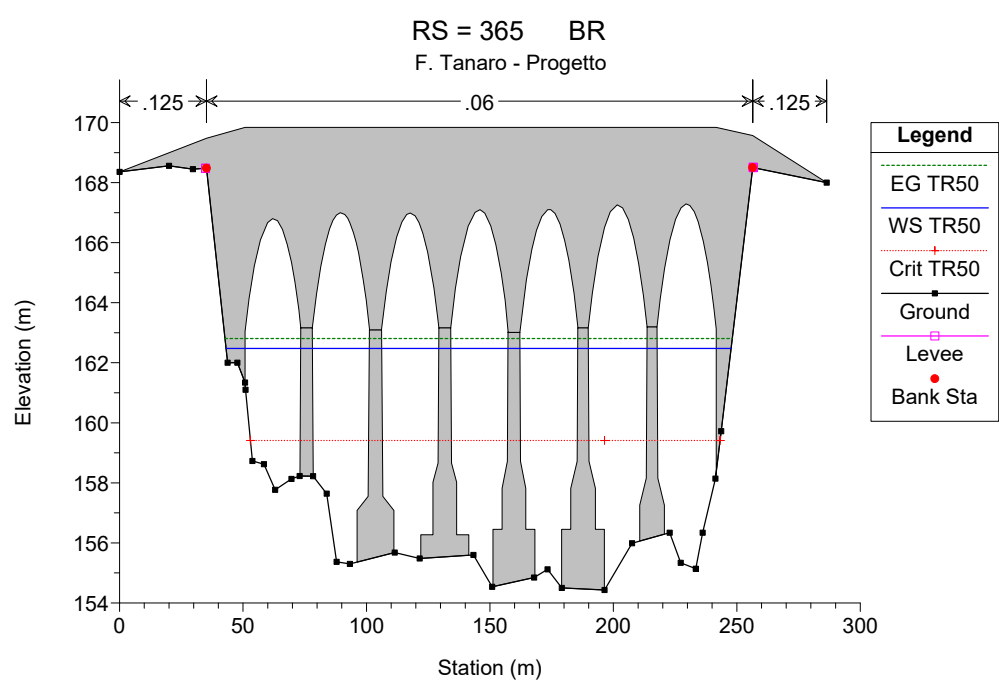
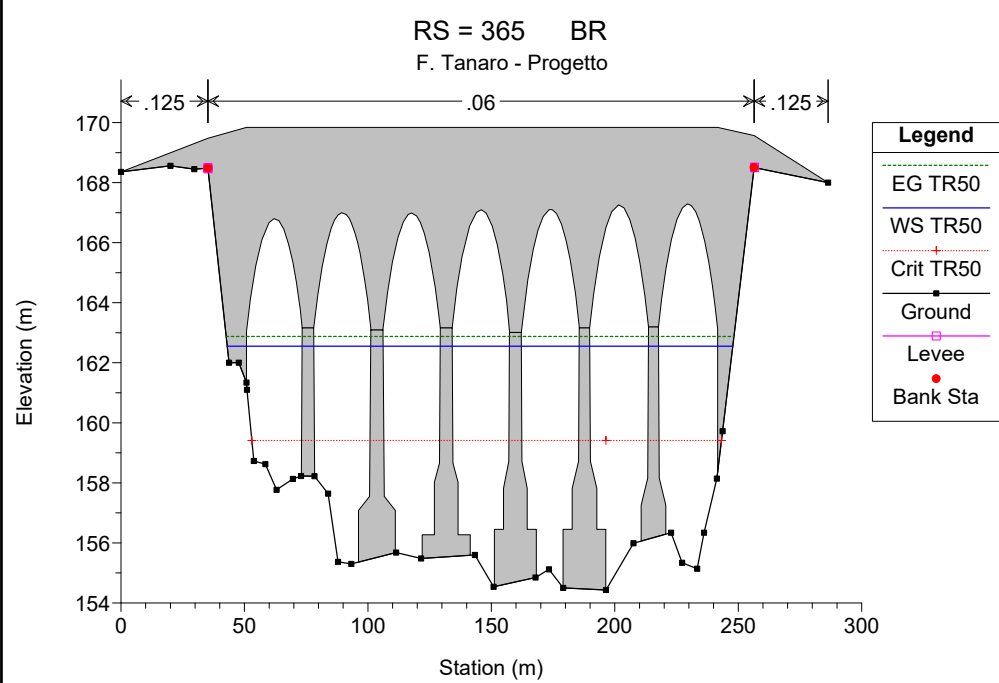
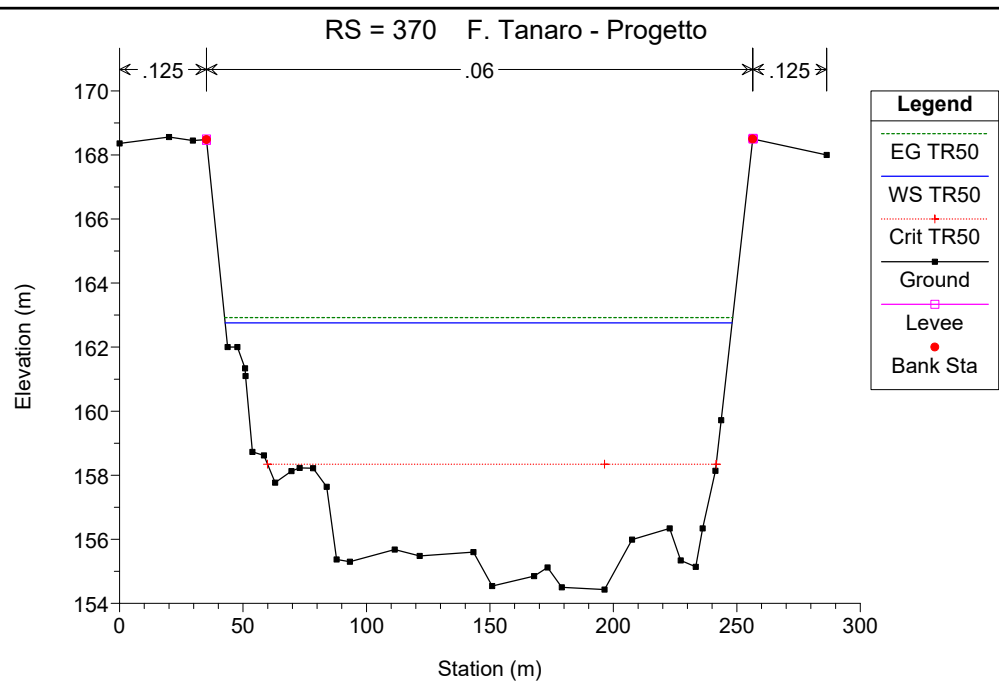
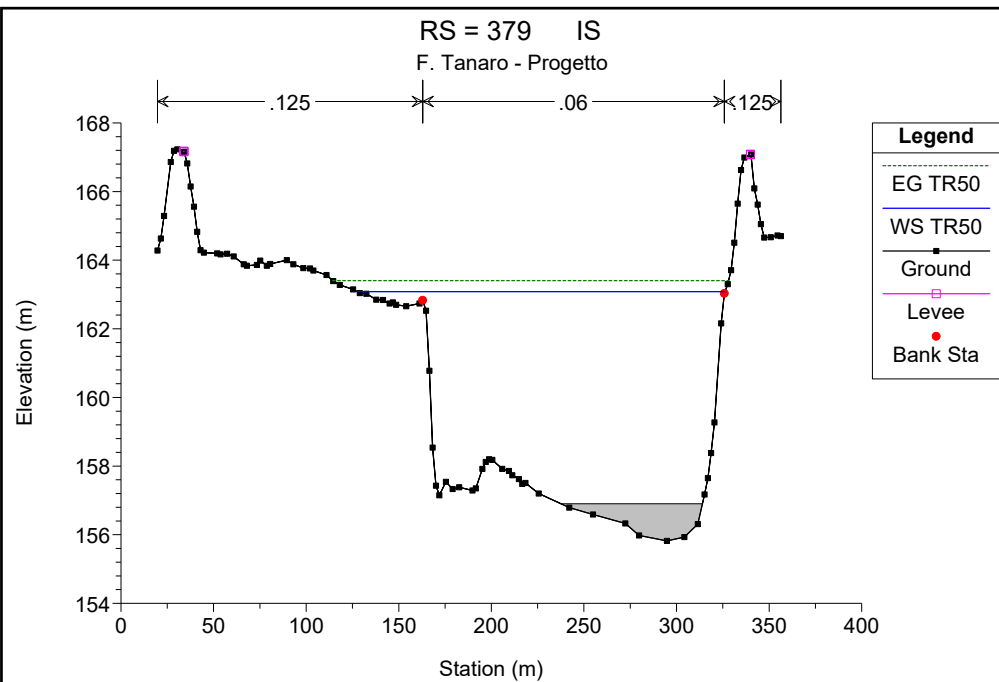


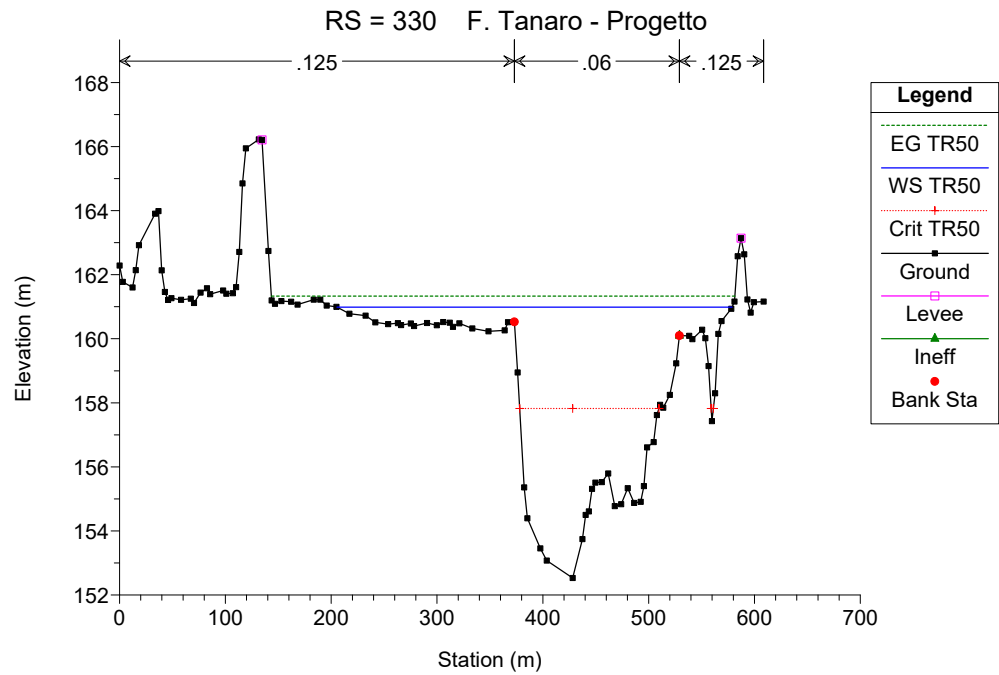
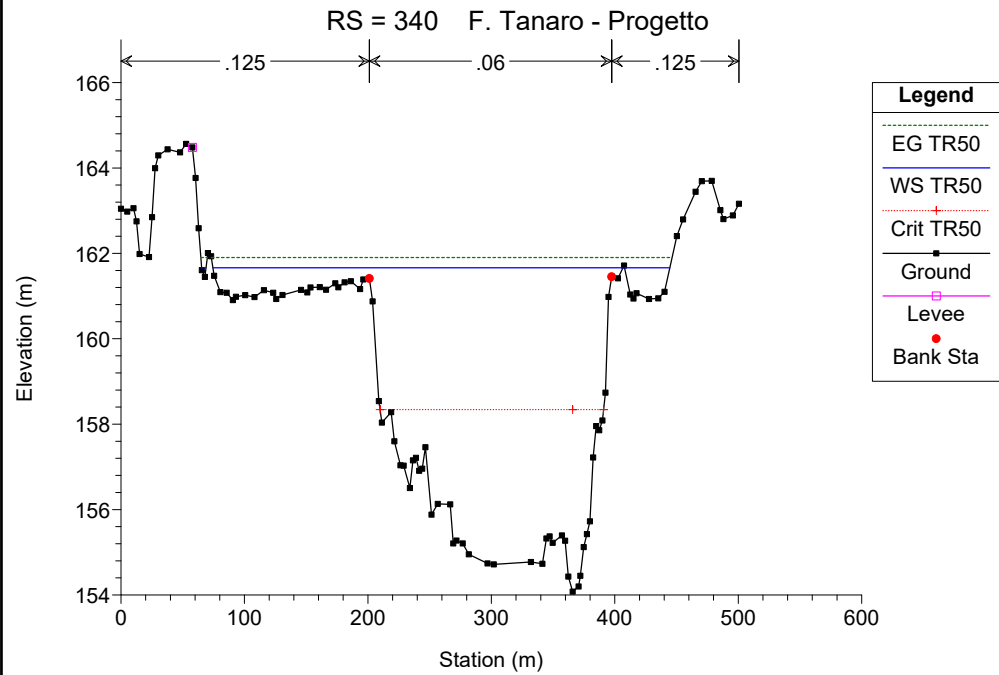
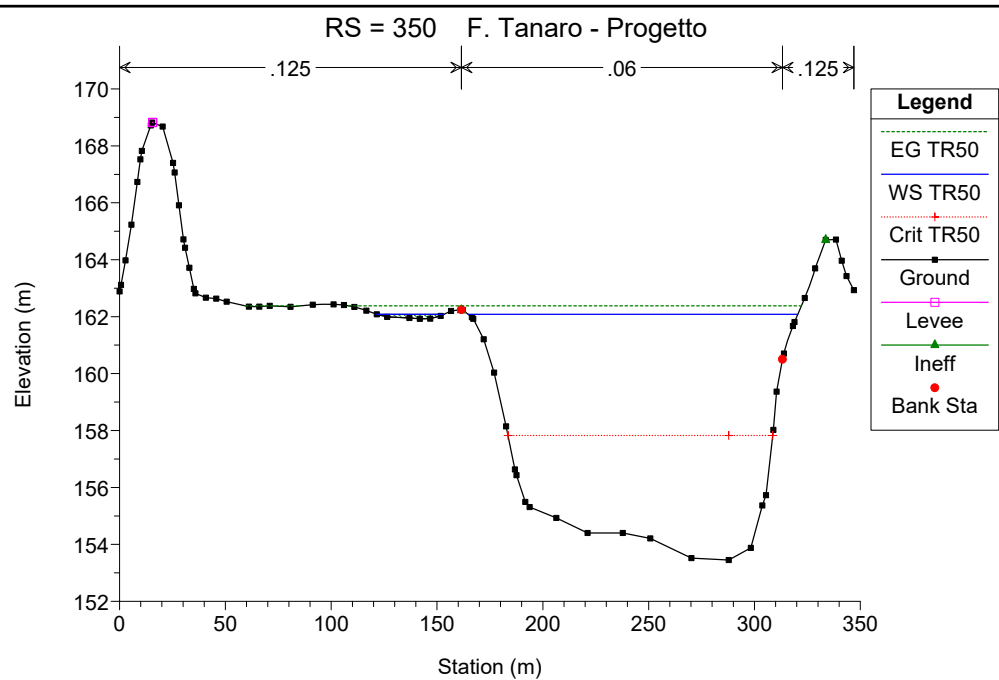
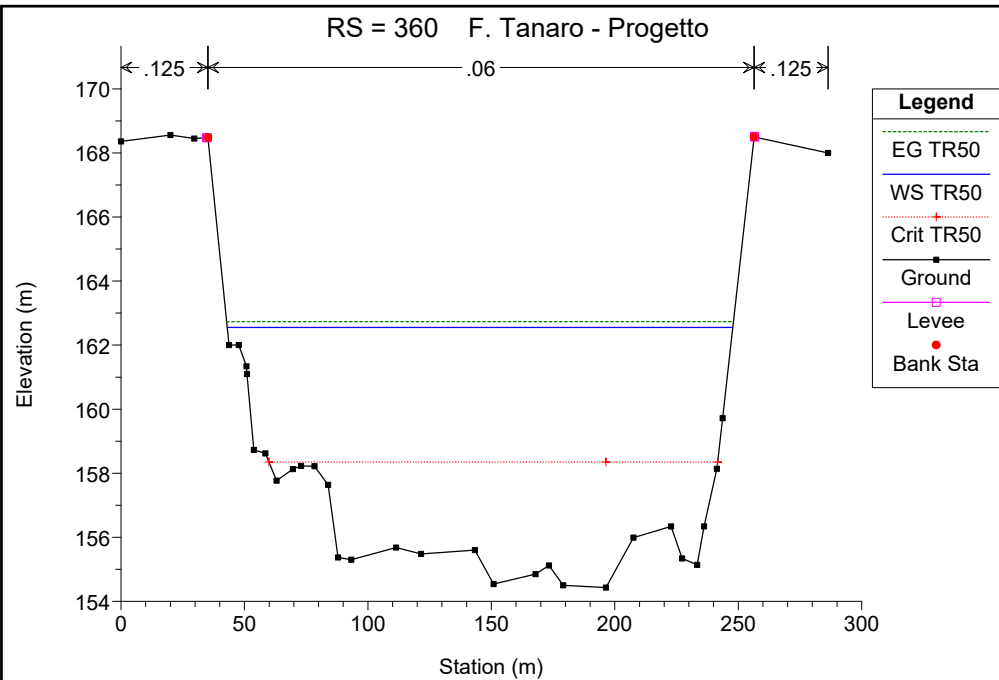


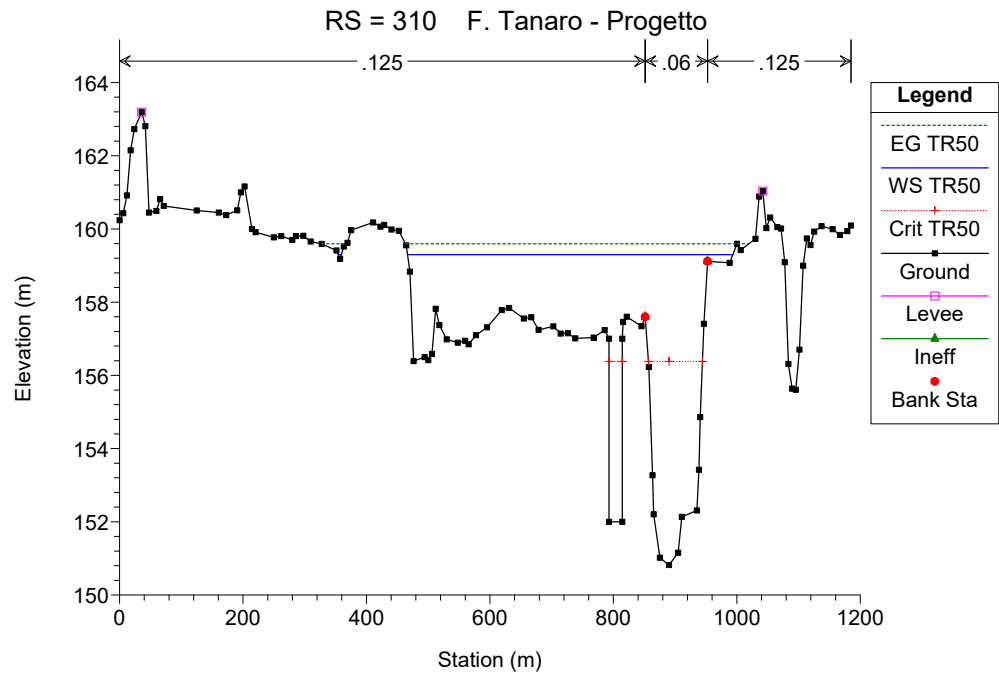
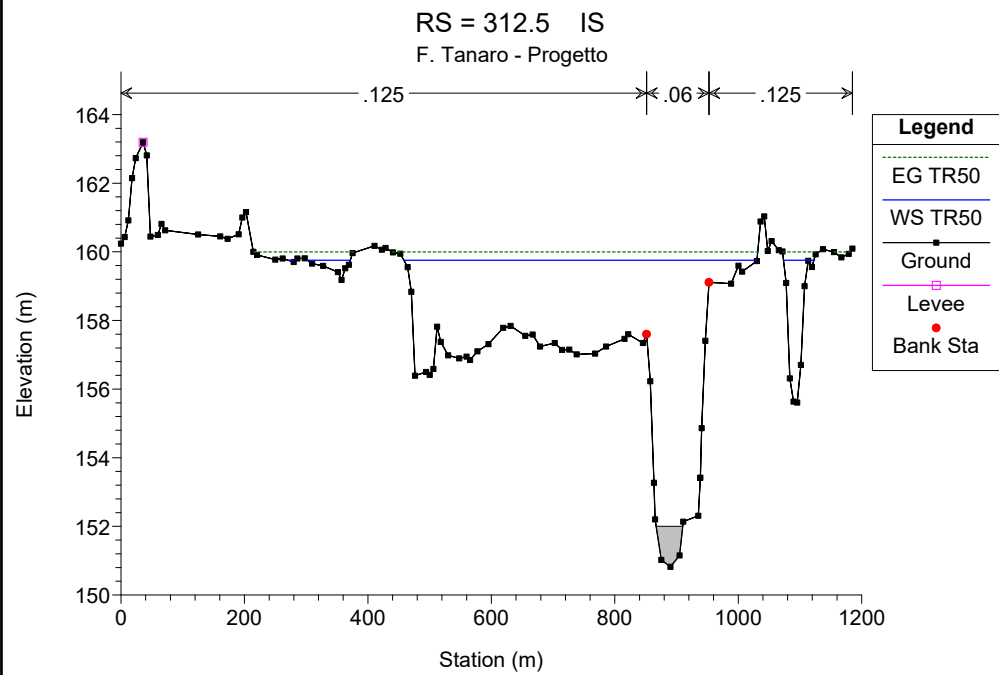
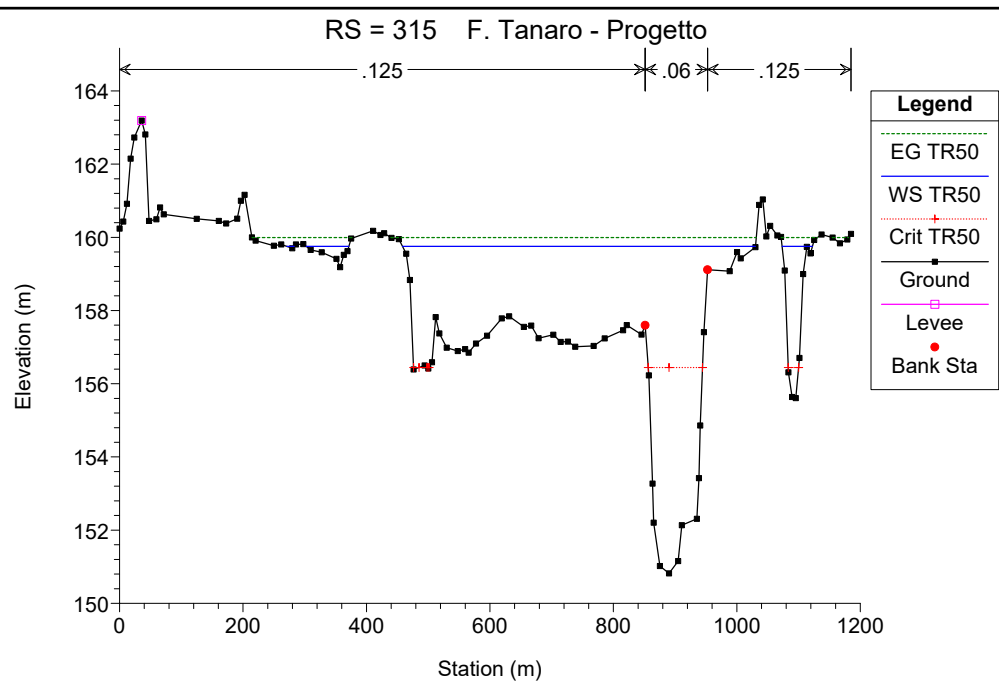
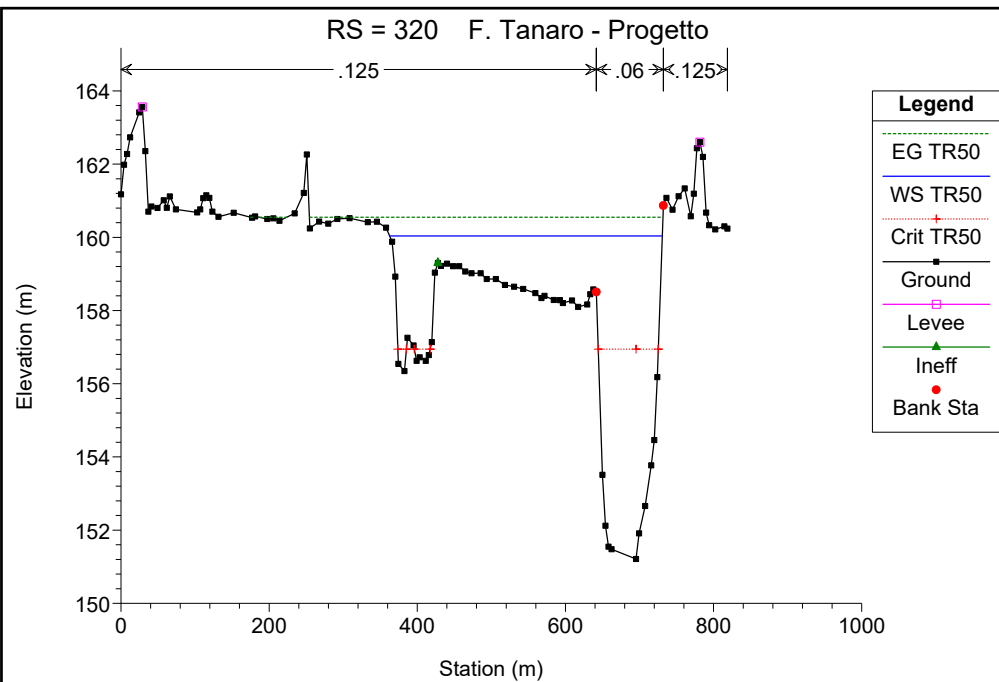


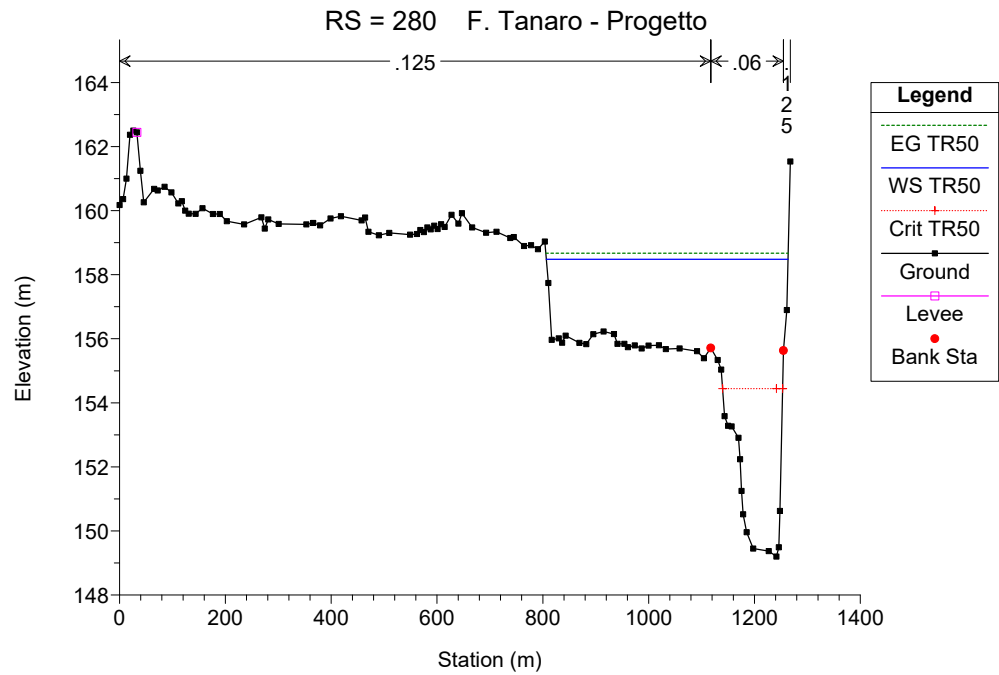
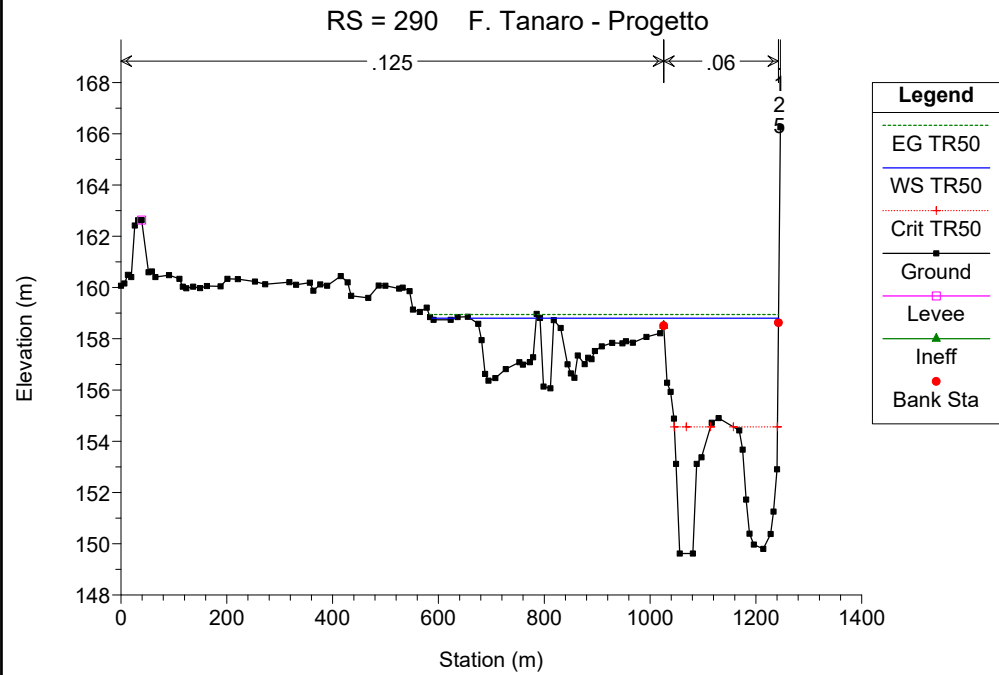
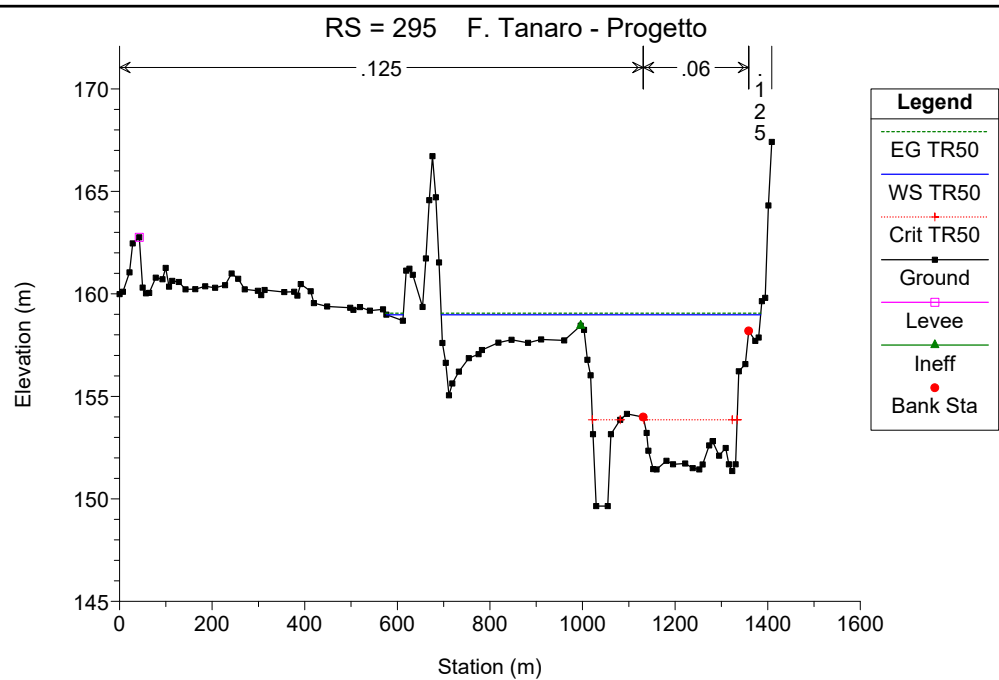
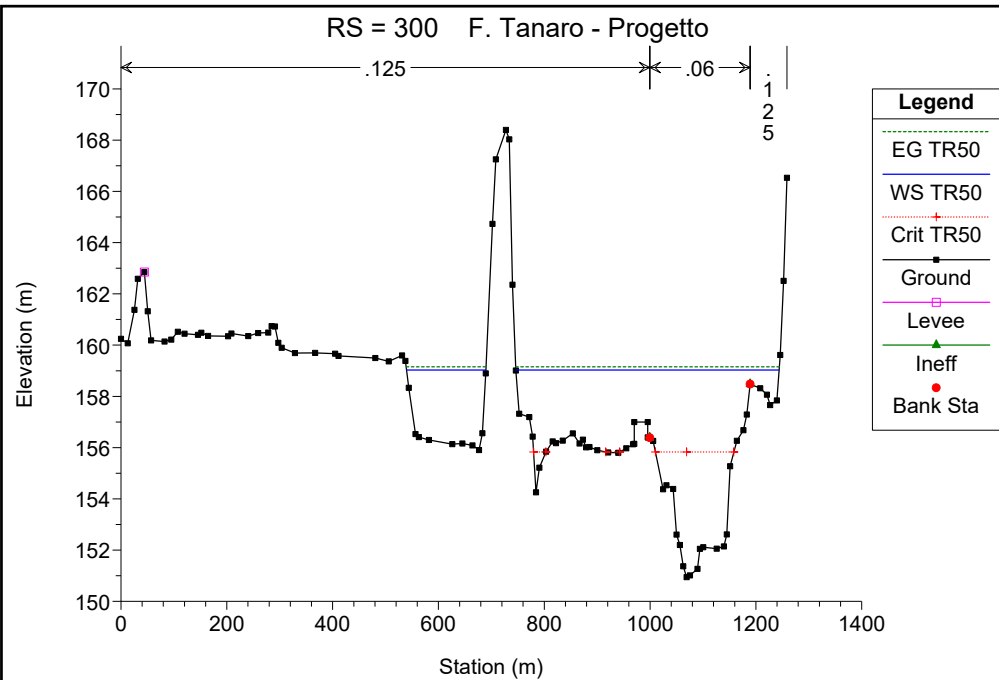


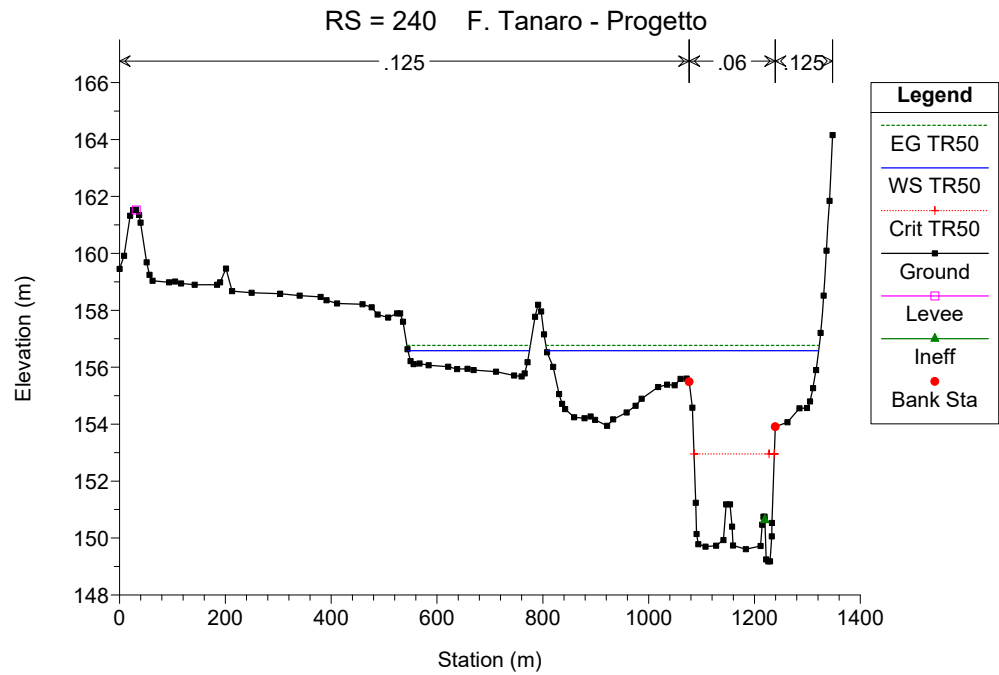
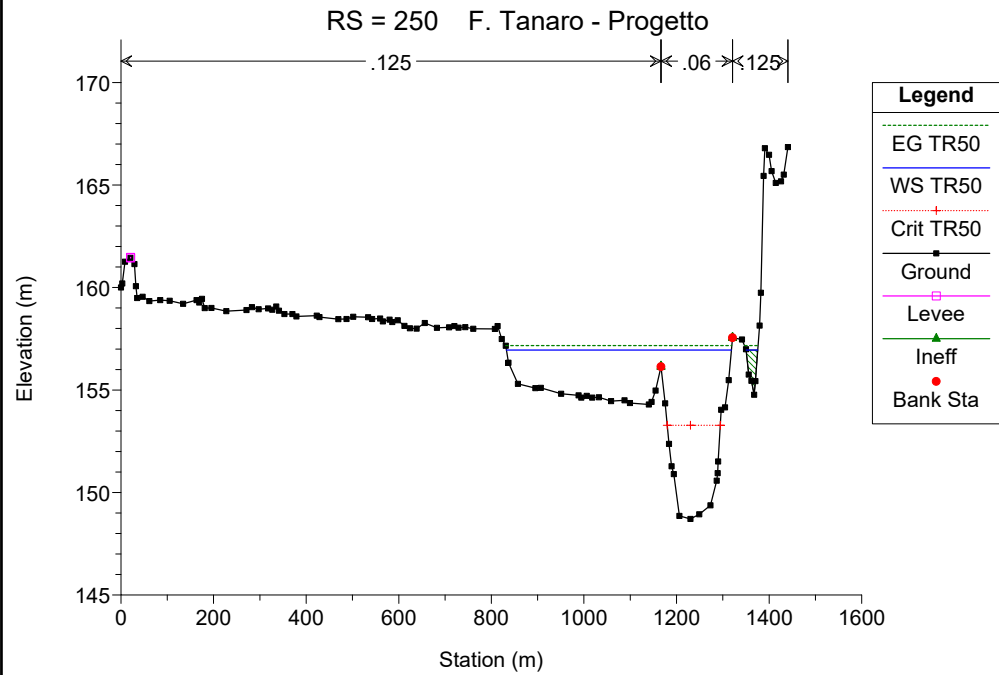
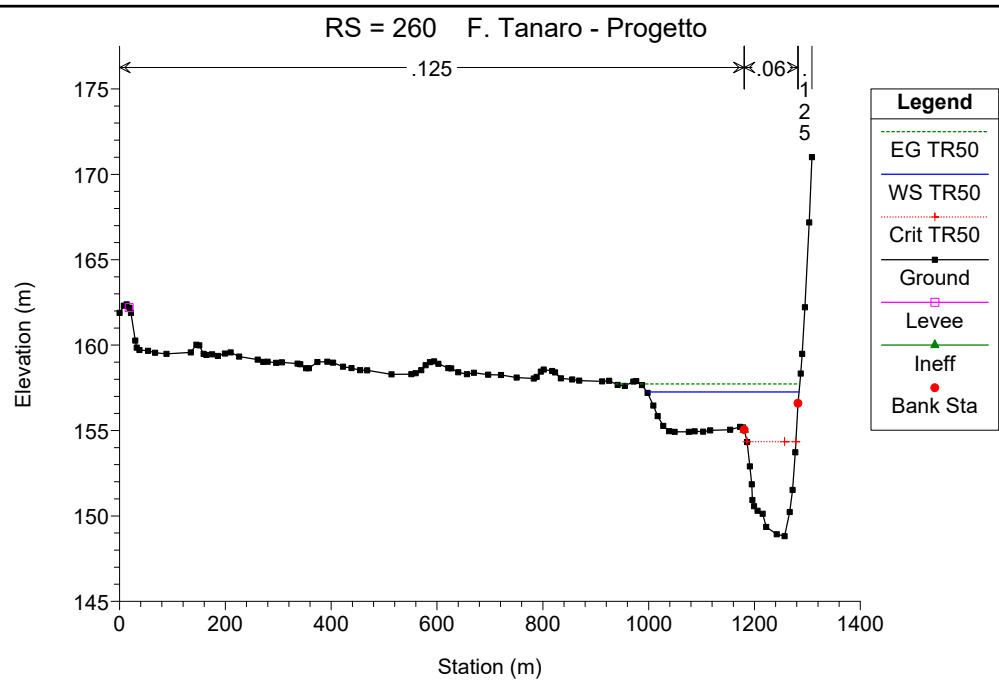
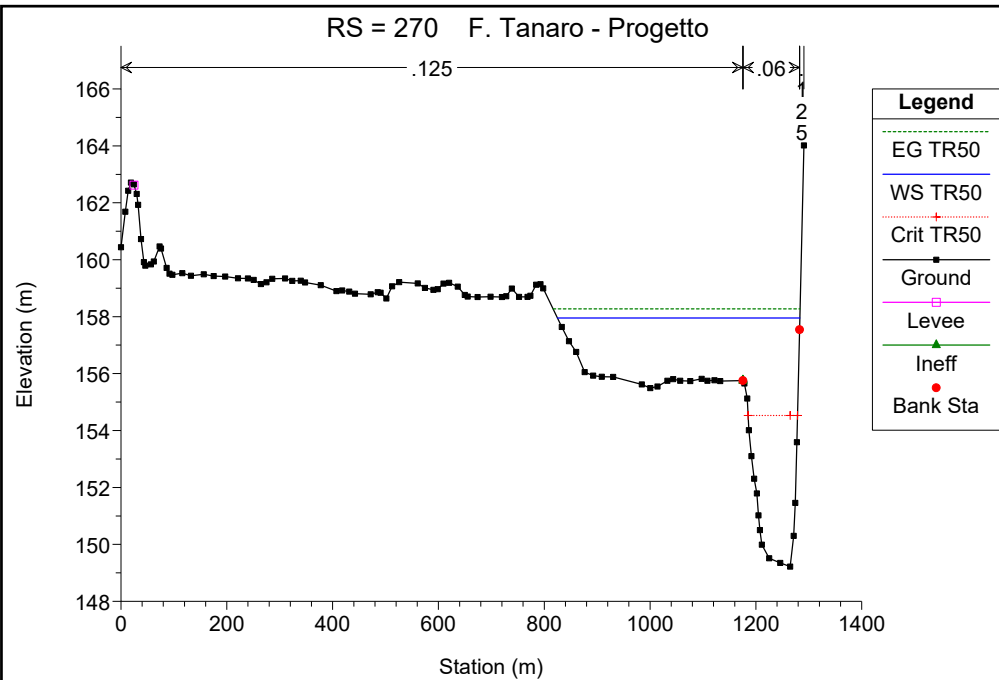


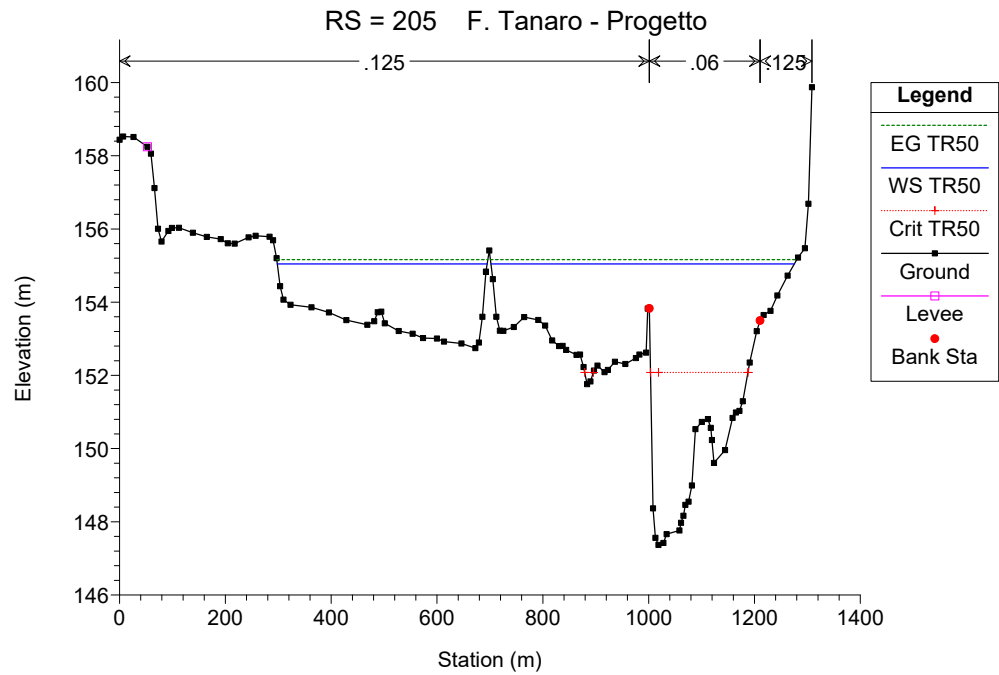
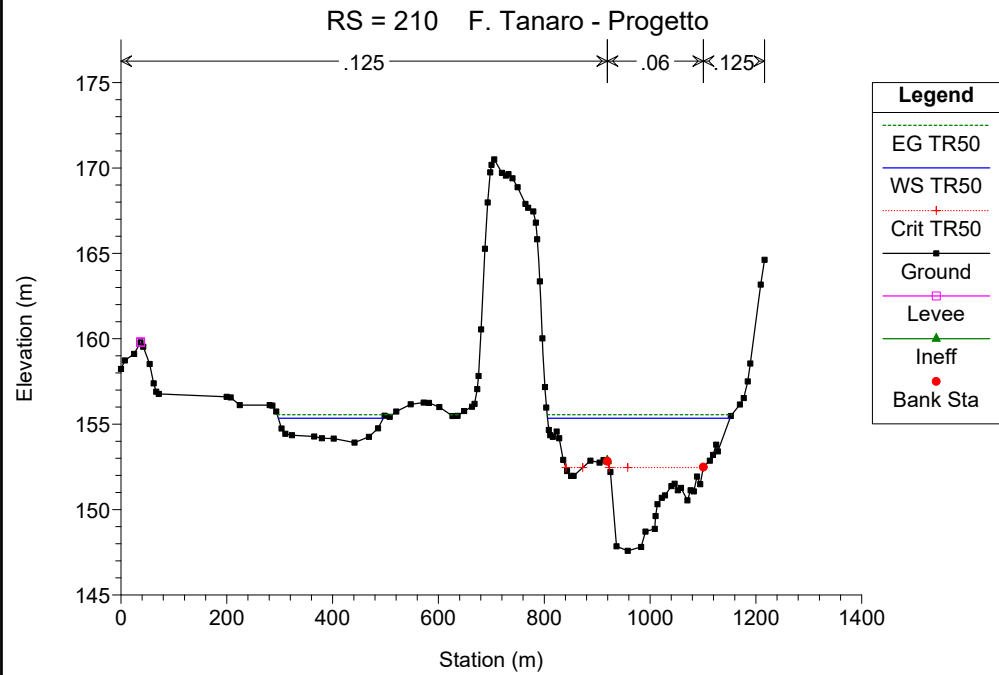
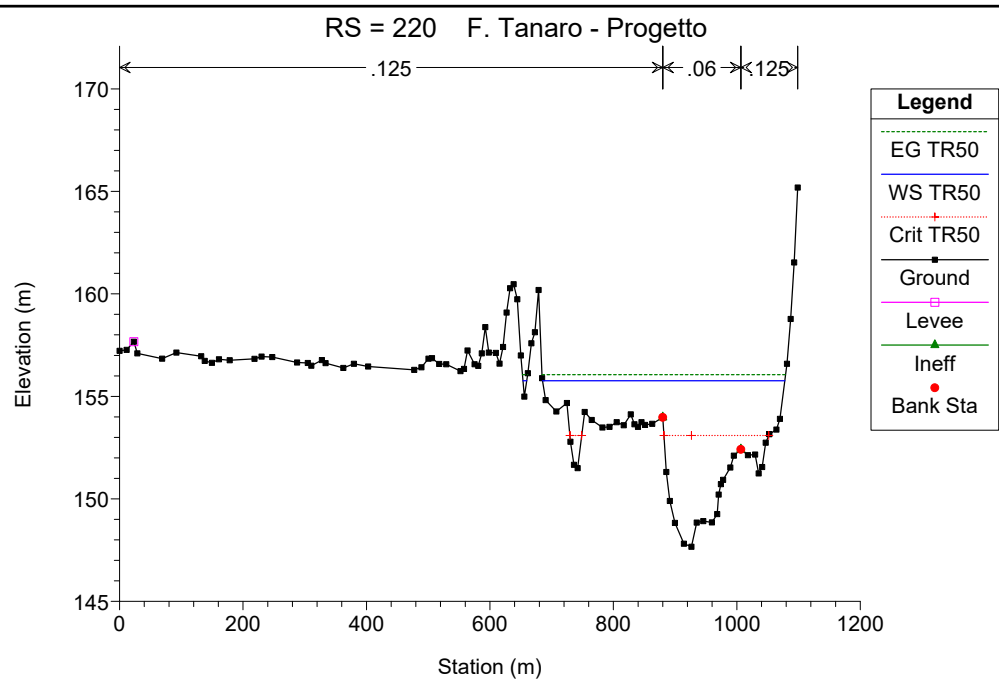
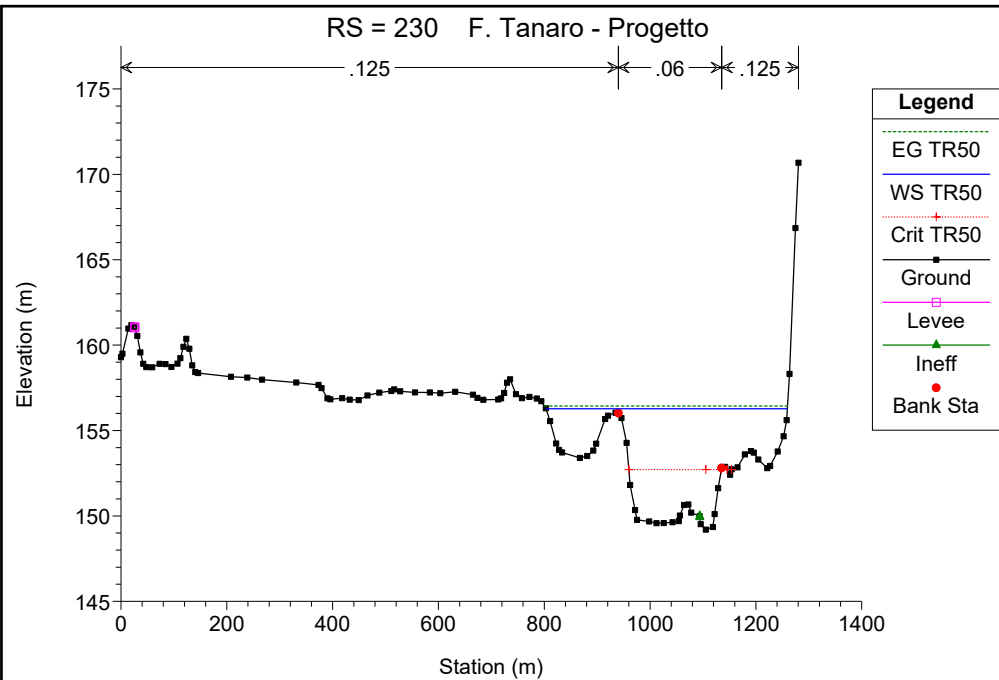


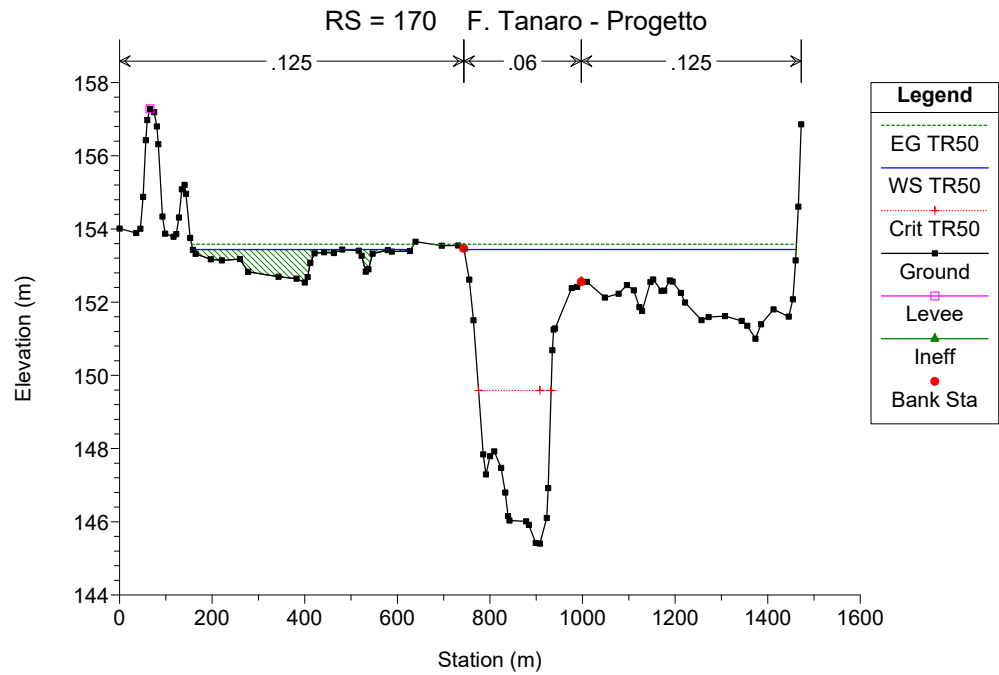
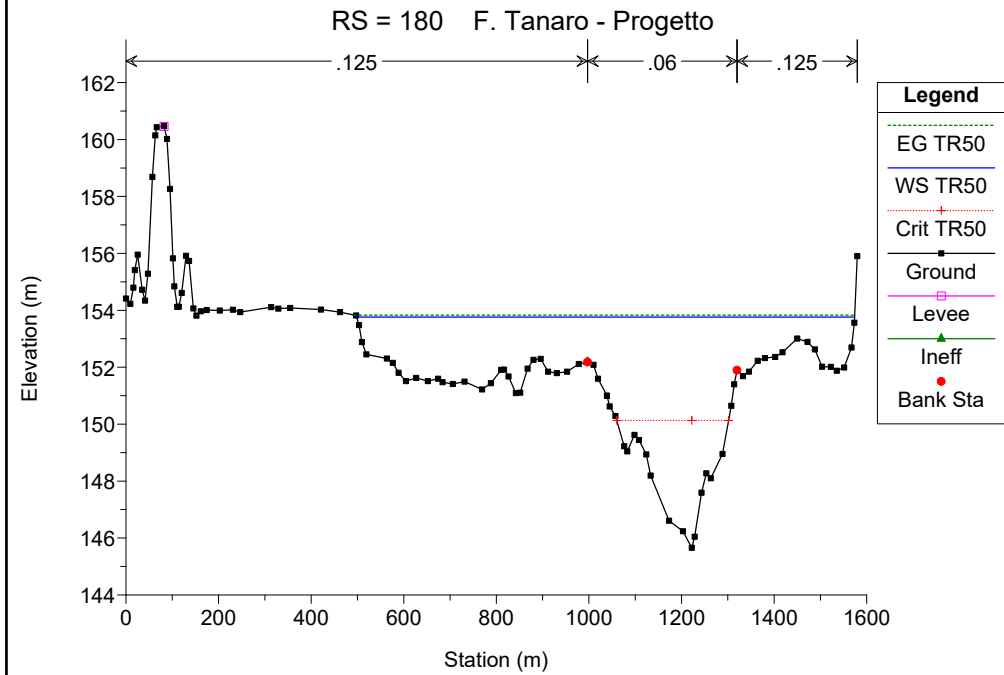
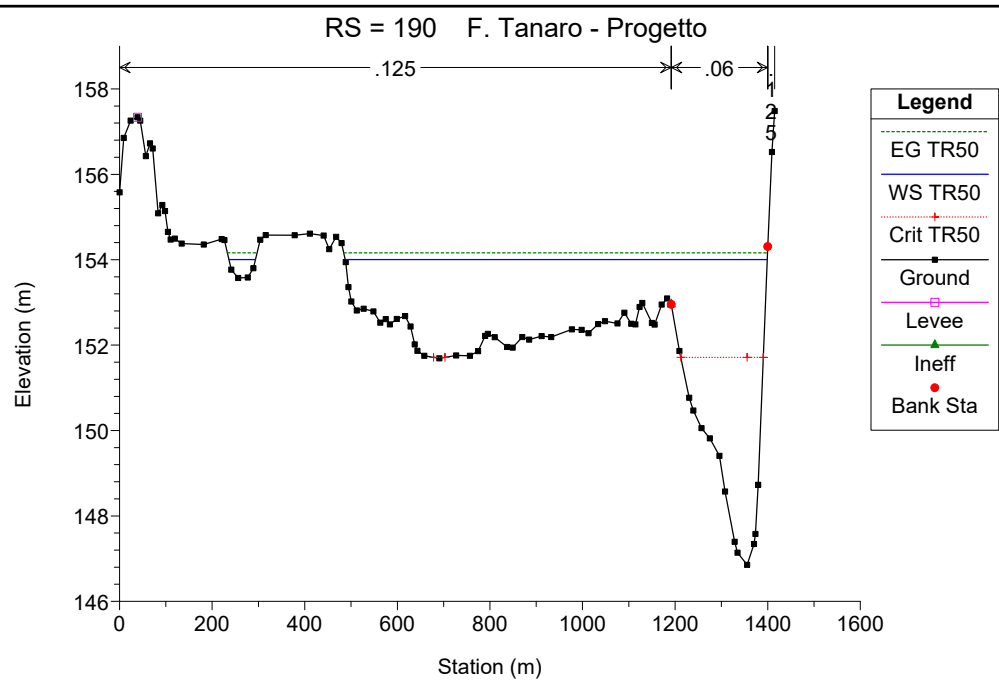
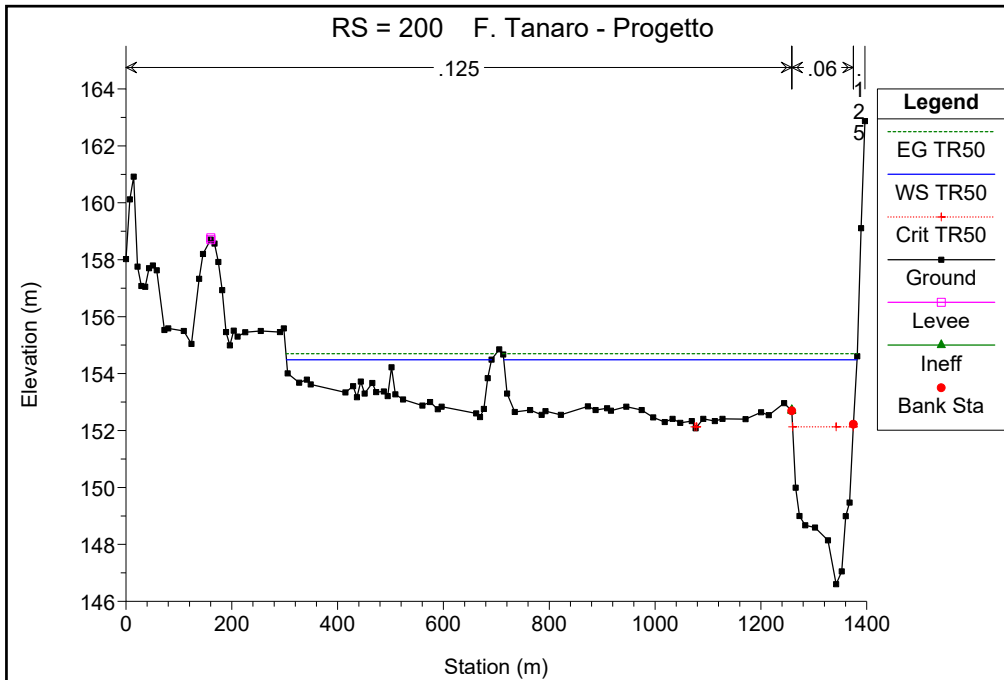


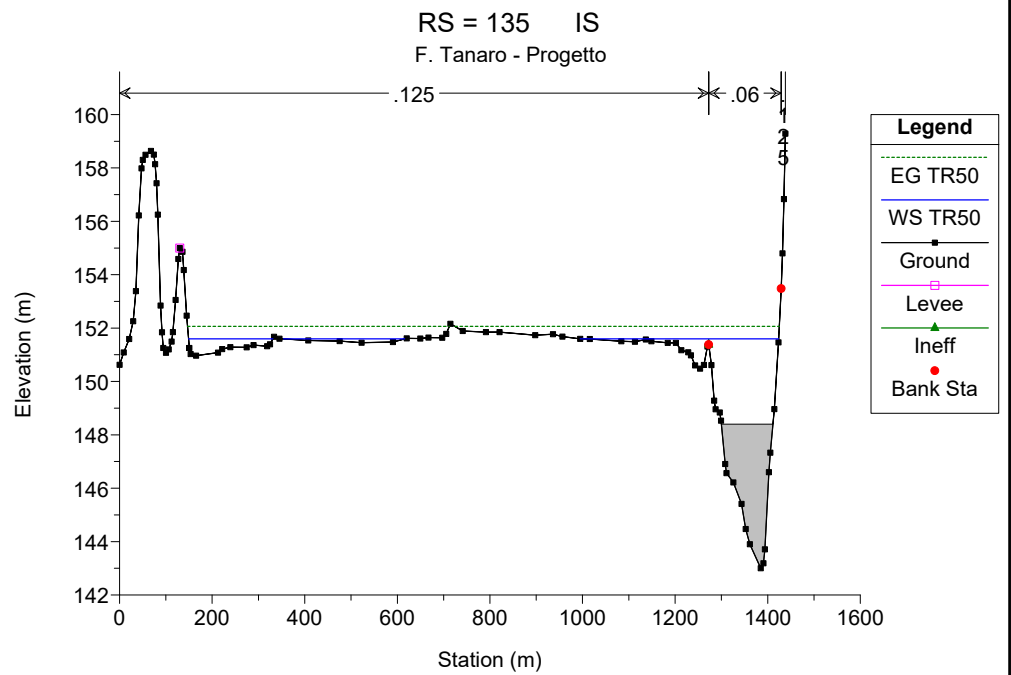
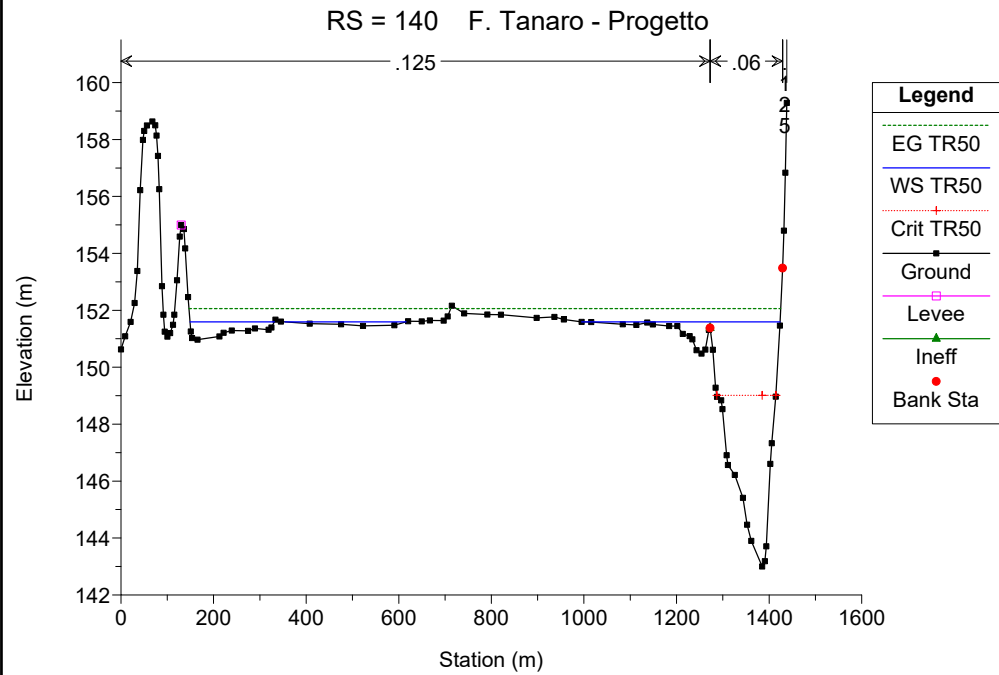
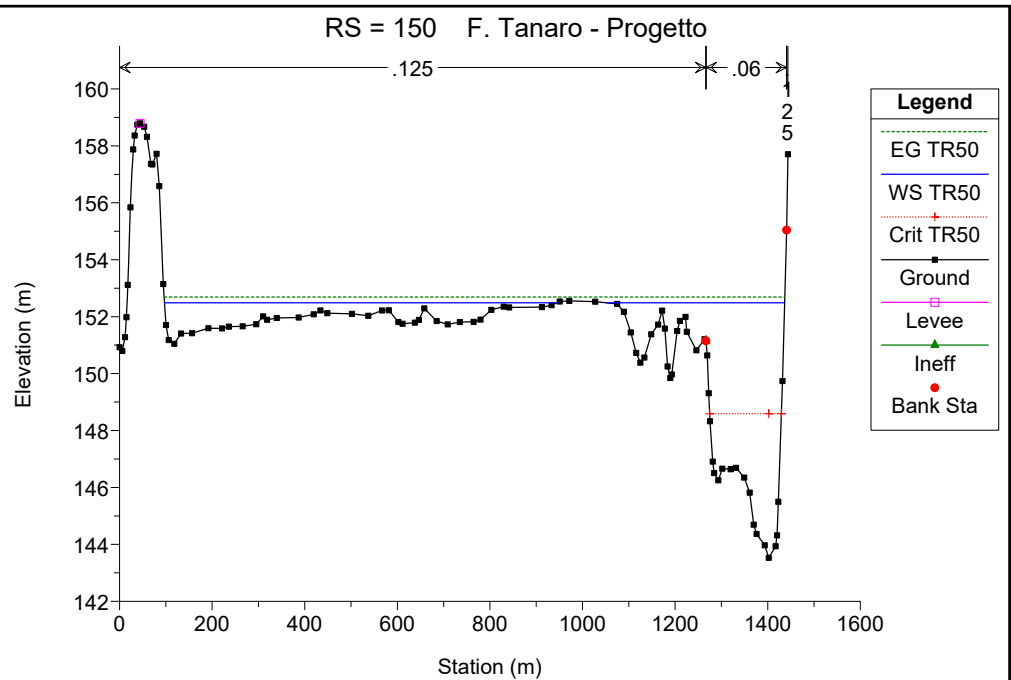
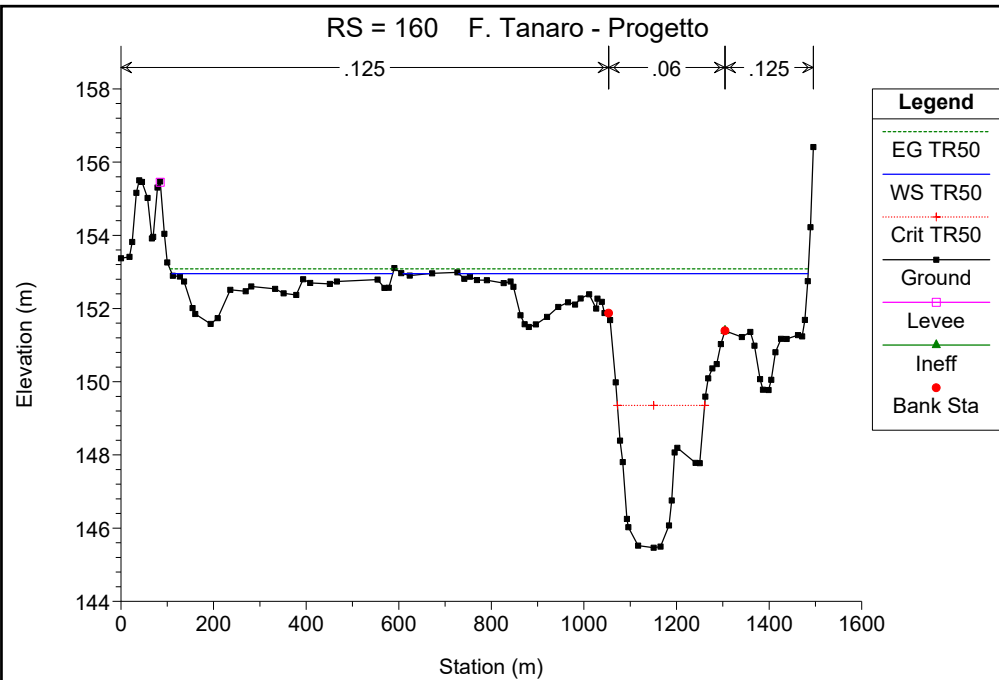


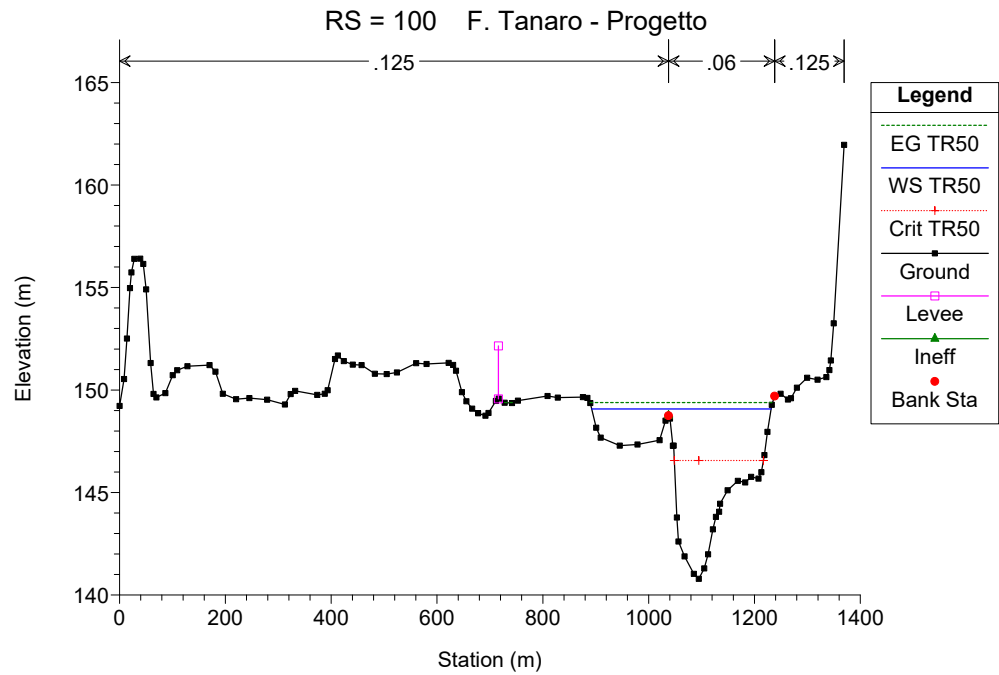
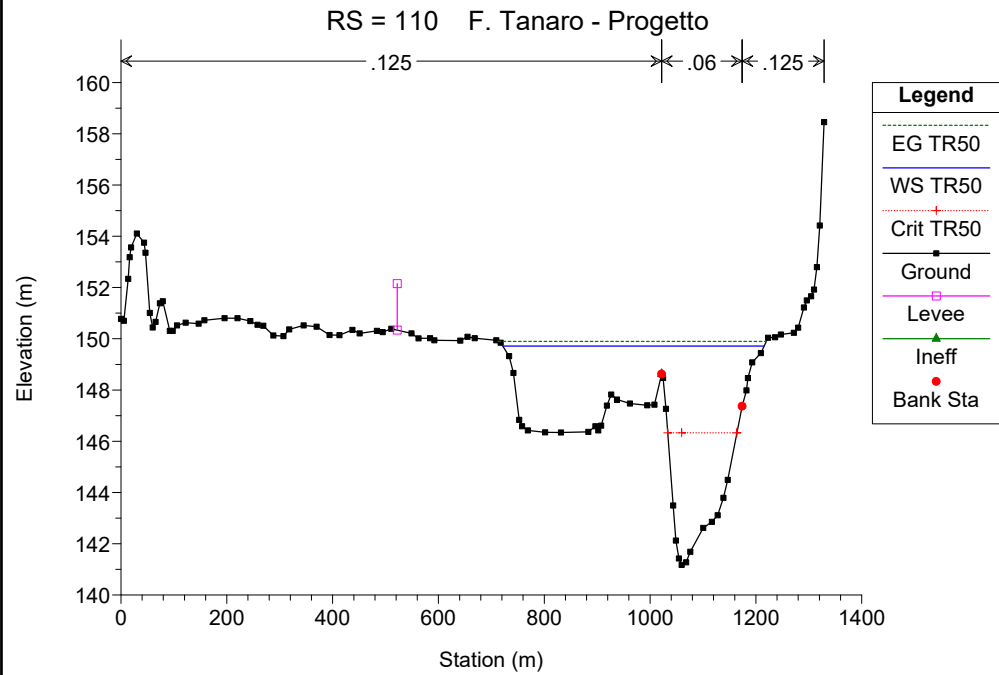
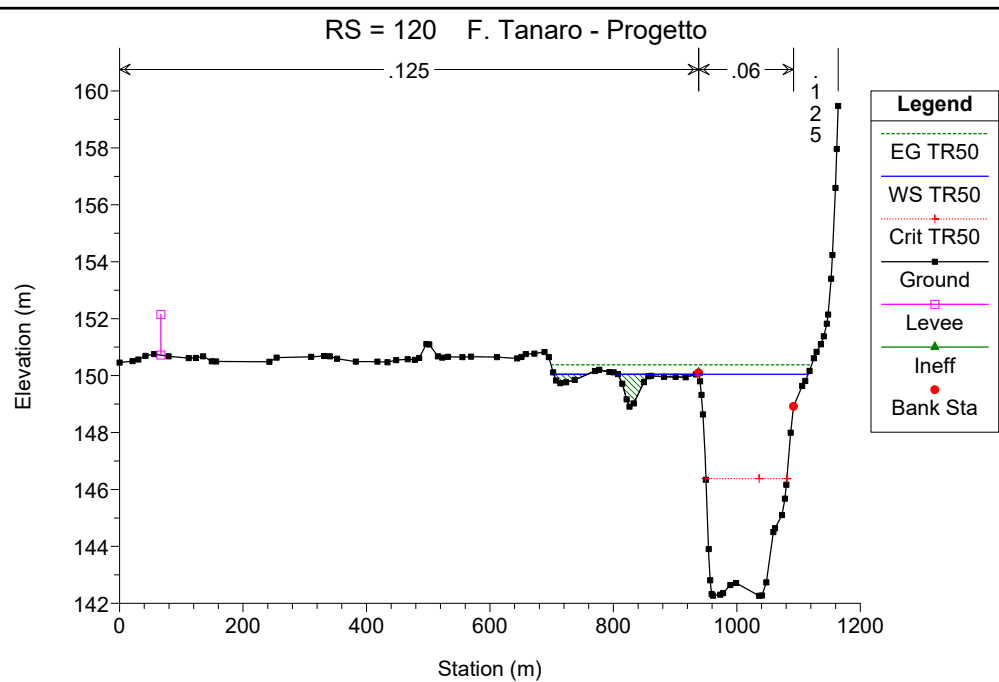
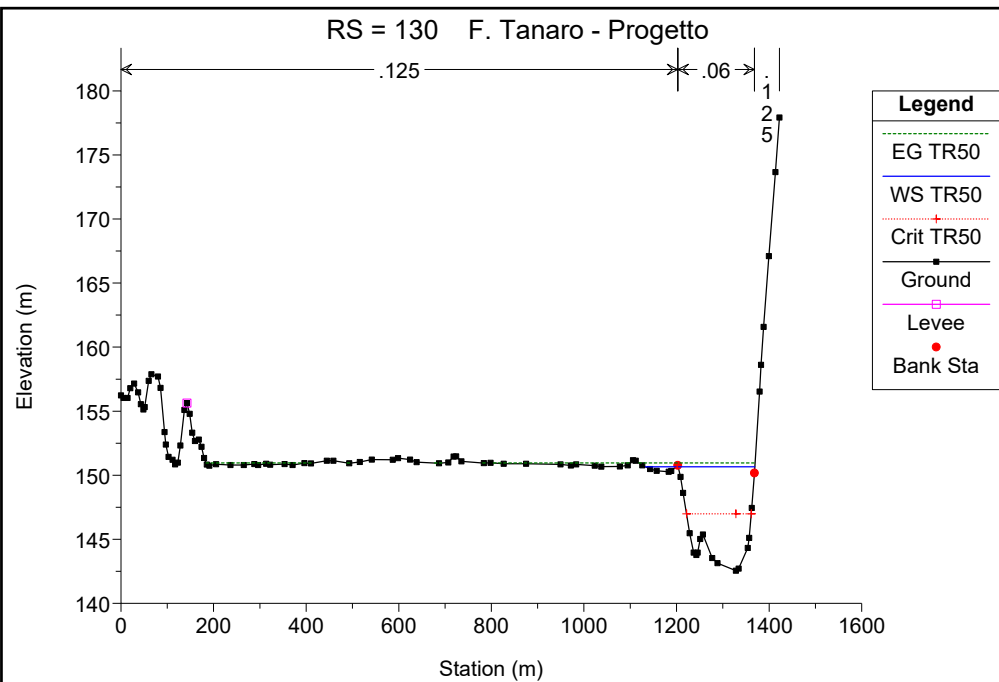


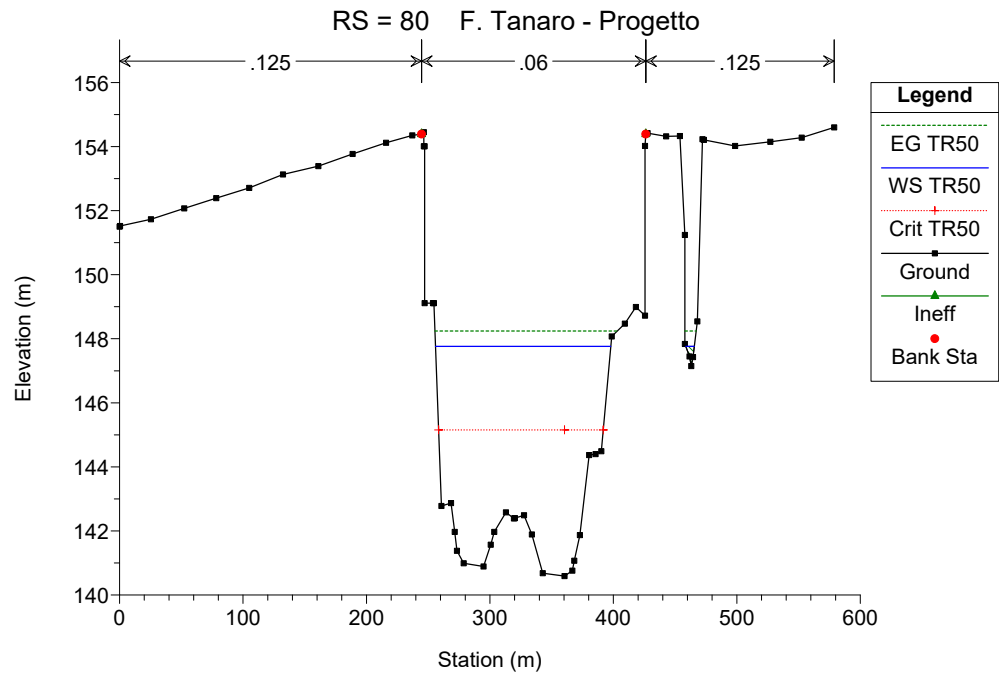
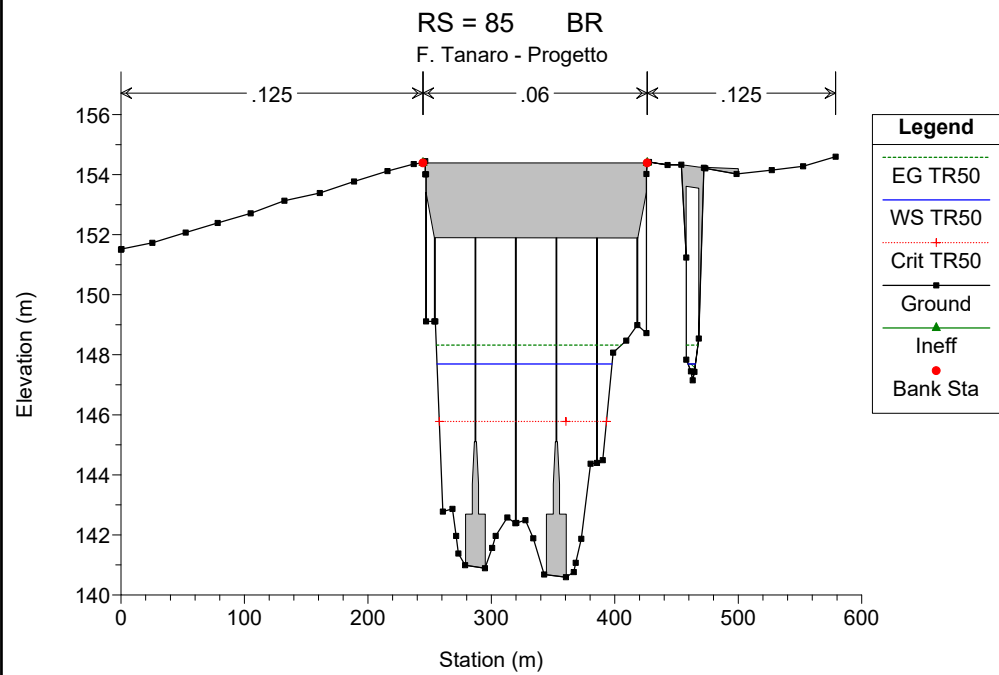
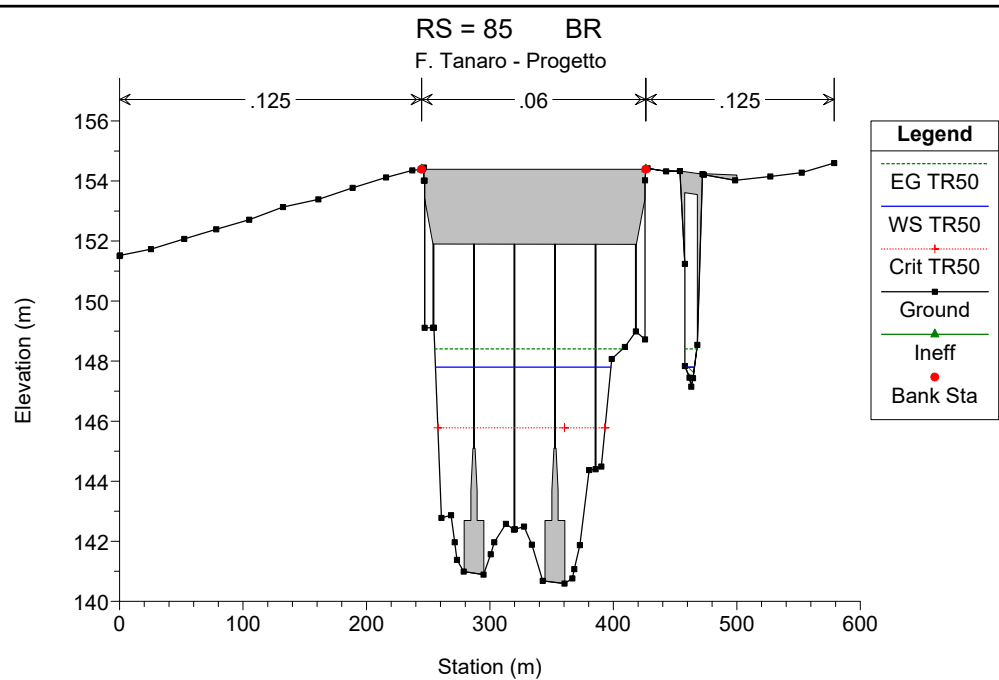
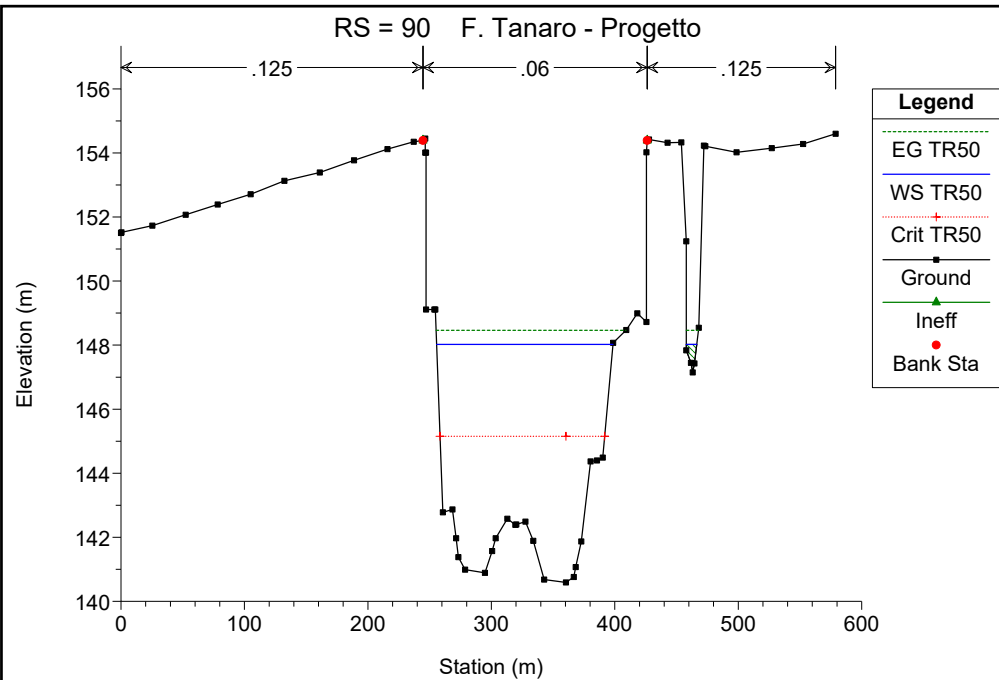


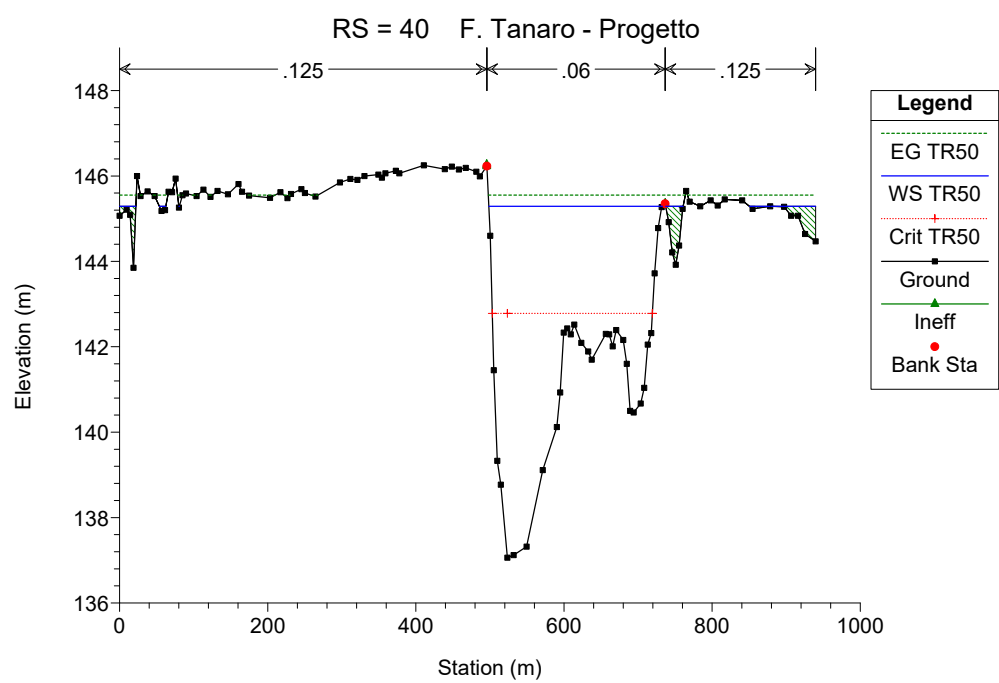
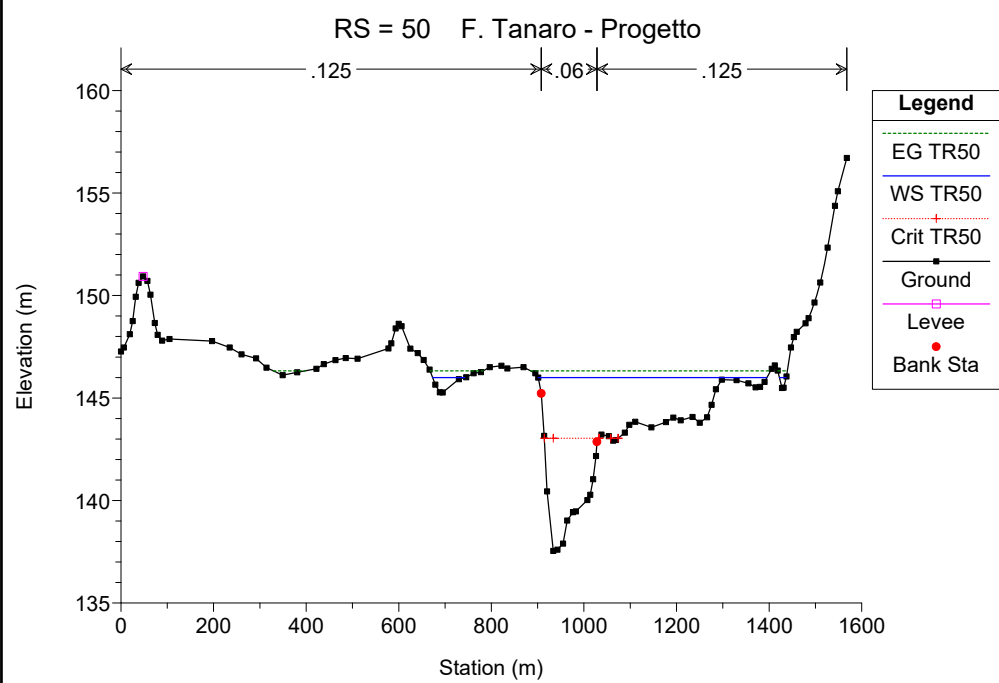
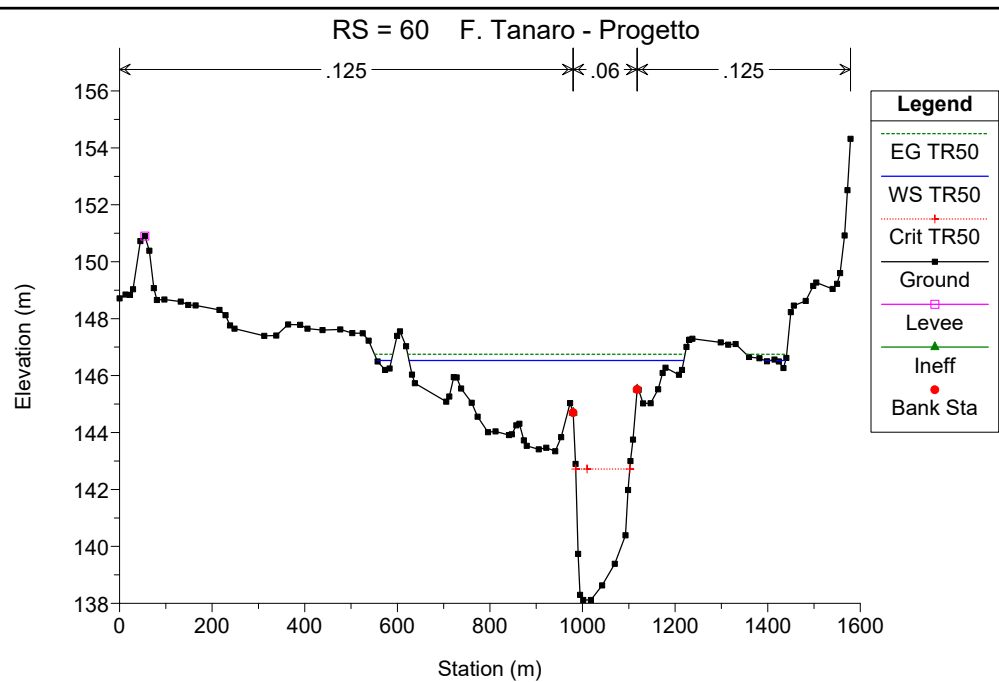
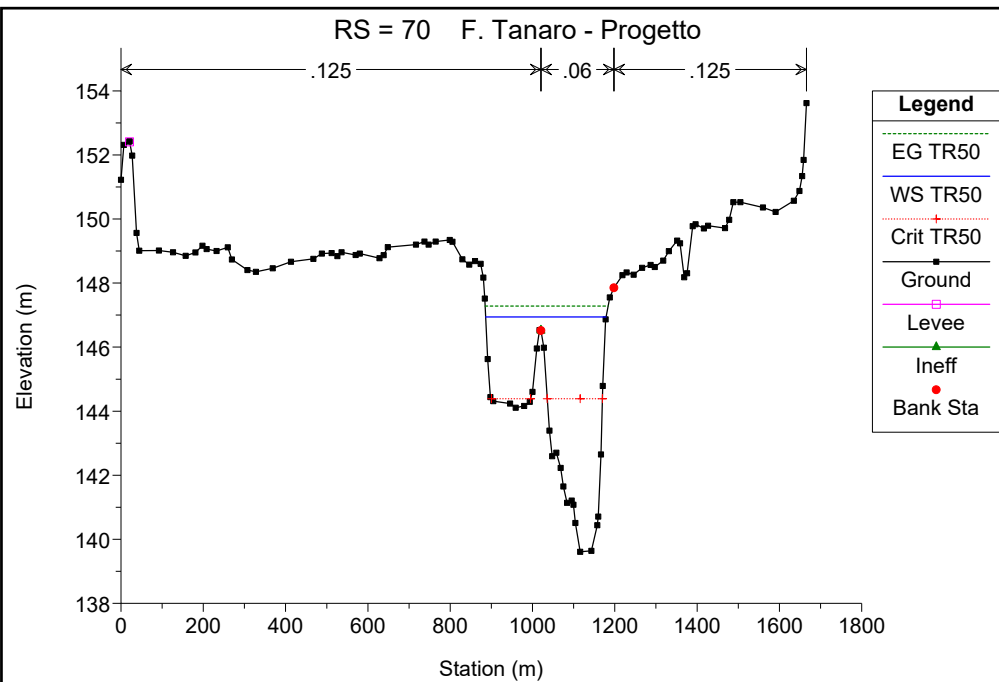


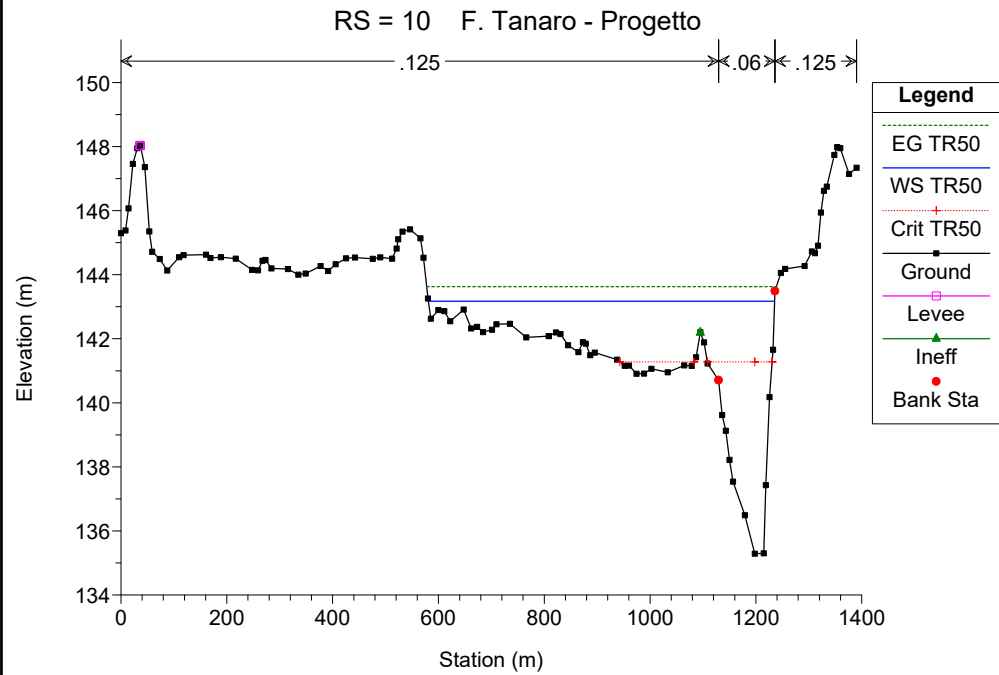
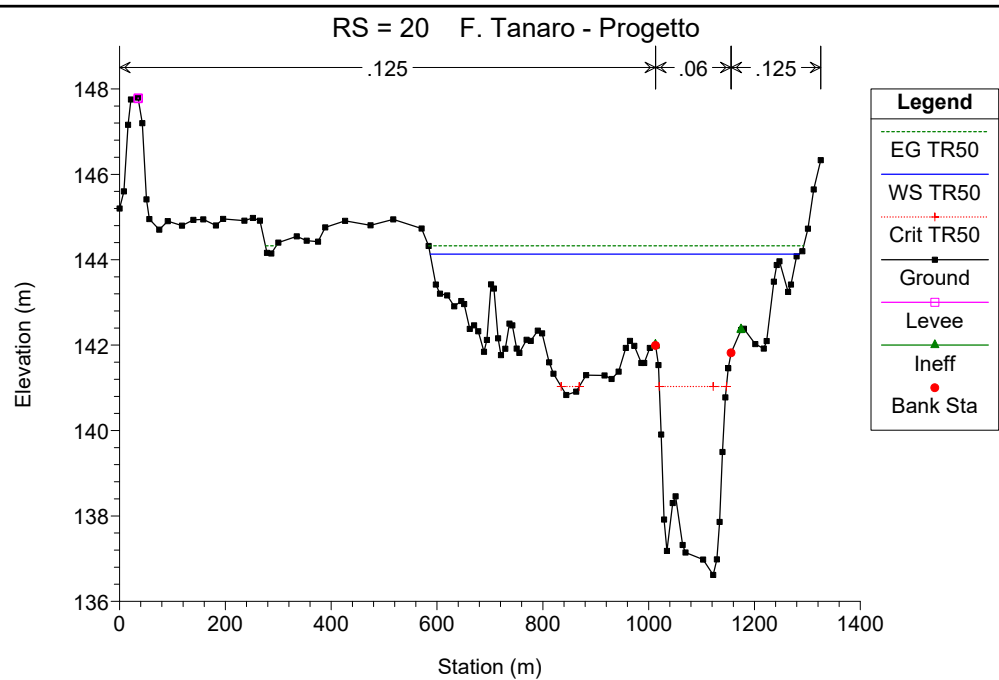
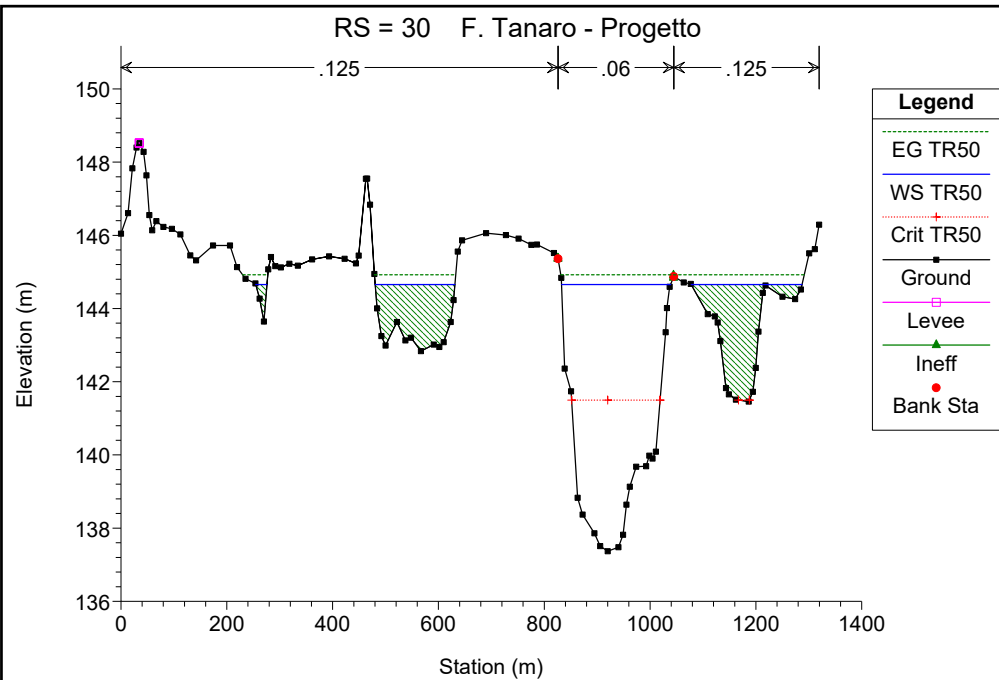












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 7

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2412	50
F. Tanaro valle Riddone	2419	
F. Tanaro valle Cherasca	2428	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50

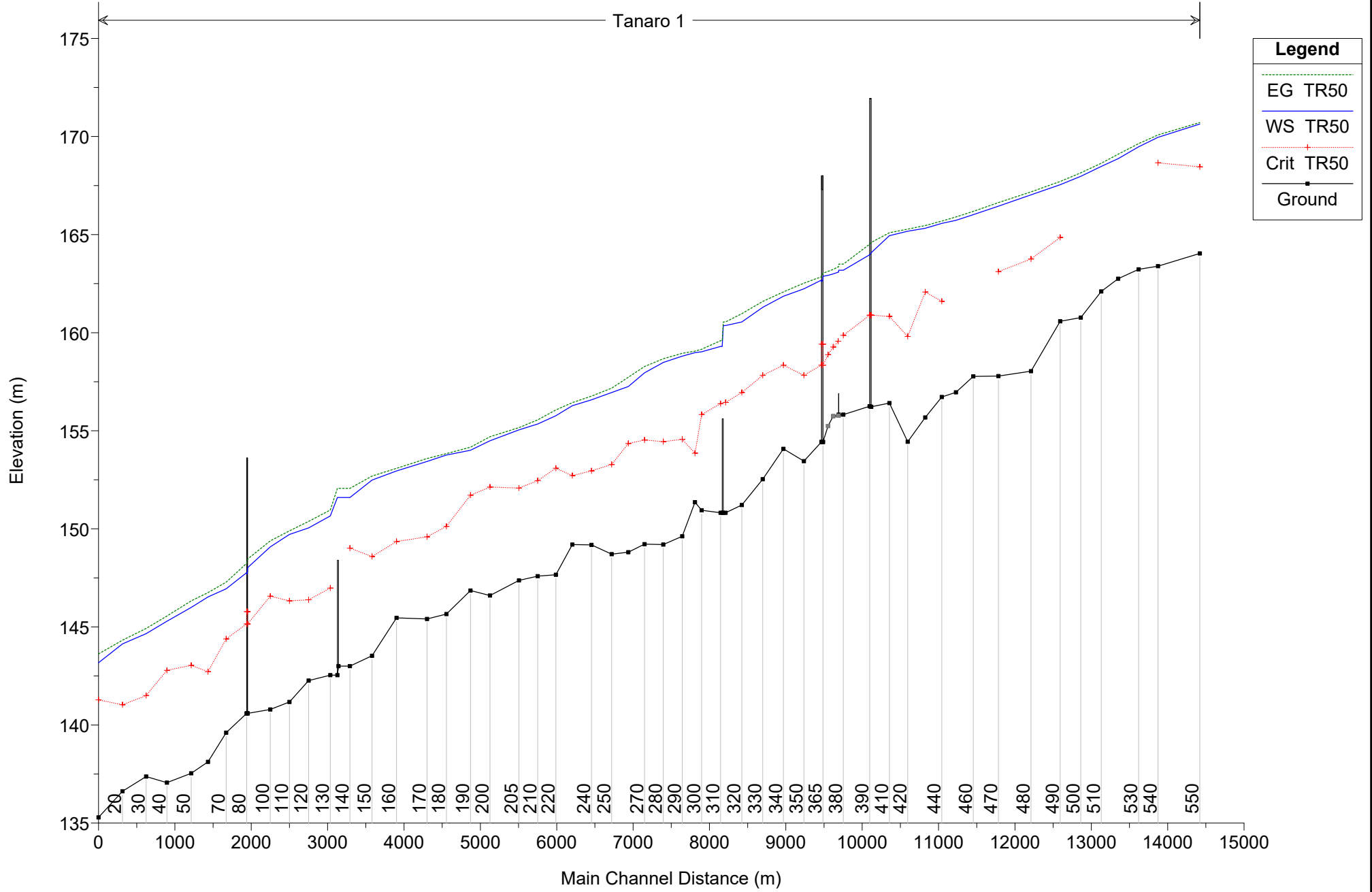
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR50	2412.00	164.04	170.64	168.46	170.71	0.001136	1.37	2719.71	1158.07	0.22
1	540	TR50	2412.00	163.39	169.96	168.66	170.08	0.001786	2.06	2661.45	1117.98	0.29
1	530	TR50	2412.00	163.23	169.48		169.64	0.001766	2.00	1919.19	663.80	0.29
1	520	TR50	2412.00	162.75	168.87		169.10	0.002410	2.35	1877.75	983.58	0.34
1	510	TR50	2412.00	162.10	168.47		168.64	0.002132	2.06	1938.01	717.73	0.31
1	500	TR50	2412.00	160.77	167.97		168.15	0.001657	2.06	1779.80	544.90	0.28
1	490	TR50	2412.00	160.58	167.54	164.86	167.71	0.001636	1.92	1639.99	502.91	0.28
1	480	TR50	2412.00	158.04	167.02	163.76	167.18	0.001311	1.88	1995.12	682.33	0.25
1	470	TR50	2412.00	157.79	166.45	163.11	166.63	0.001475	2.12	1817.01	510.25	0.27
1	460	TR50	2412.00	157.77	166.02		166.18	0.001243	1.93	1895.62	677.83	0.25
1	450	TR50	2412.00	156.96	165.73		165.90	0.001243	1.96	1777.09	561.26	0.25
1	440	TR50	2412.00	156.72	165.57	161.59	165.69	0.000911	1.75	2357.01	665.64	0.22
1	430	TR50	2412.00	155.68	165.32	162.07	165.46	0.001188	2.00	2309.82	661.46	0.25
1	420	TR50	2412.00	154.44	165.18	159.81	165.28	0.000601	1.59	2608.35	681.80	0.18
1	410	TR50	2412.00	156.41	164.95	160.83	165.10	0.001077	1.93	1985.48	513.75	0.24
1	400	TR50	2412.00	156.22	164.08	160.89	164.60	0.003159	3.25	838.49	163.06	0.40
1	395		Bridge									
1	390	TR50	2412.00	156.25	163.98	160.89	164.51	0.003341	3.31	820.87	162.76	0.41
1	380	TR50	2412.00	155.82	163.19	159.87	163.50	0.002090	2.47	988.55	203.55	0.32
1	379		Inl Struct									
1	370	TR50	2412.00	154.43	162.88	158.35	163.04	0.000948	1.78	1356.04	205.67	0.22
1	365		Bridge									
1	360	TR50	2412.00	154.43	162.68	158.35	162.86	0.001041	1.83	1316.68	205.13	0.23
1	350	TR50	2412.00	153.45	162.24	157.83	162.53	0.001616	2.36	1036.13	205.62	0.29
1	340	TR50	2419.00	154.08	161.87	158.34	162.09	0.001534	2.09	1268.39	377.90	0.28
1	330	TR50	2419.00	152.53	161.30	157.83	161.60	0.002018	2.47	1167.32	437.89	0.32
1	320	TR50	2419.00	151.21	160.57	156.95	160.98	0.002418	3.07	1308.34	531.16	0.36
1	315	TR50	2419.00	150.82	160.39	156.44	160.57	0.001262	2.24	2364.17	965.34	0.26
1	312.5		Inl Struct									
1	310	TR50	2419.00	150.82	159.30	156.38	159.59	0.002371	2.77	1564.82	531.93	0.35
1	300	TR50	2428.00	150.95	159.03	155.83	159.15	0.001233	1.79	2157.91	647.57	0.25
1	295	TR50	2428.00	151.36	158.98	153.85	159.06	0.000522	1.33	2754.02	726.35	0.17
1	290	TR50	2428.00	149.62	158.80	154.56	158.95	0.000998	1.72	1803.22	619.84	0.22
1	280	TR50	2428.00	149.20	158.48	154.44	158.67	0.001259	2.11	1765.09	456.87	0.26
1	270	TR50	2428.00	149.22	157.95	154.53	158.27	0.002132	2.73	1441.16	458.16	0.33
1	260	TR50	2428.00	148.81	157.26	154.35	157.73	0.003098	3.22	1046.56	287.48	0.40
1	250	TR50	2428.00	148.71	156.95	153.28	157.17	0.001692	2.25	1616.17	511.14	0.29
1	240	TR50	2428.00	149.18	156.58	152.95	156.77	0.001352	2.06	1815.71	742.94	0.26
1	230	TR50	2428.00	149.20	156.27	152.71	156.43	0.001245	1.88	1733.00	456.34	0.25
1	220	TR50	2428.00	147.66	155.76	153.09	156.06	0.002303	2.64	1376.41	398.82	0.34

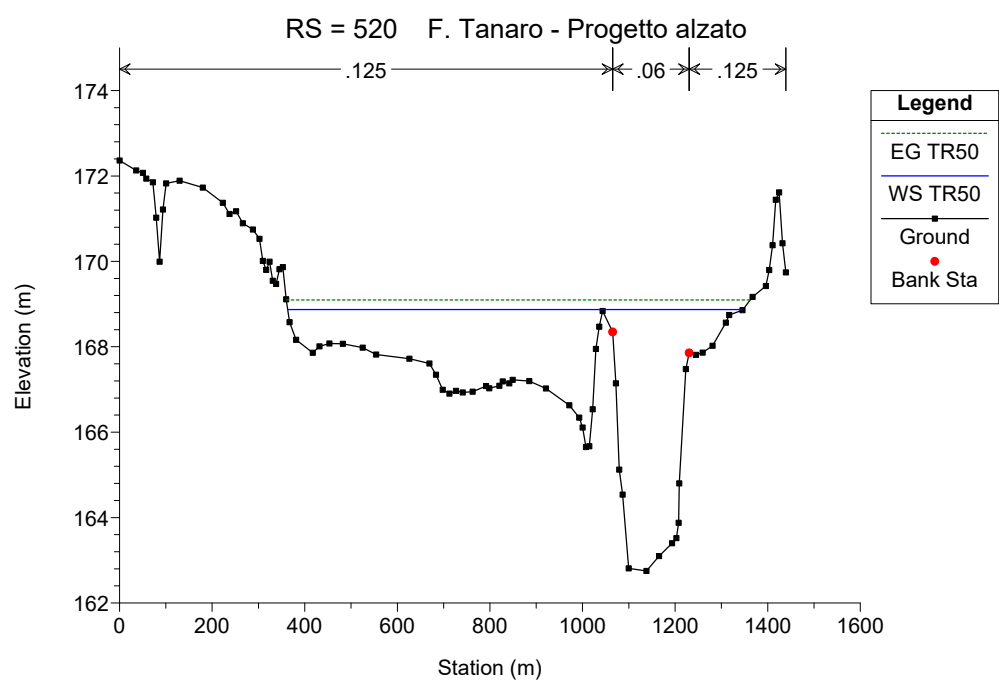
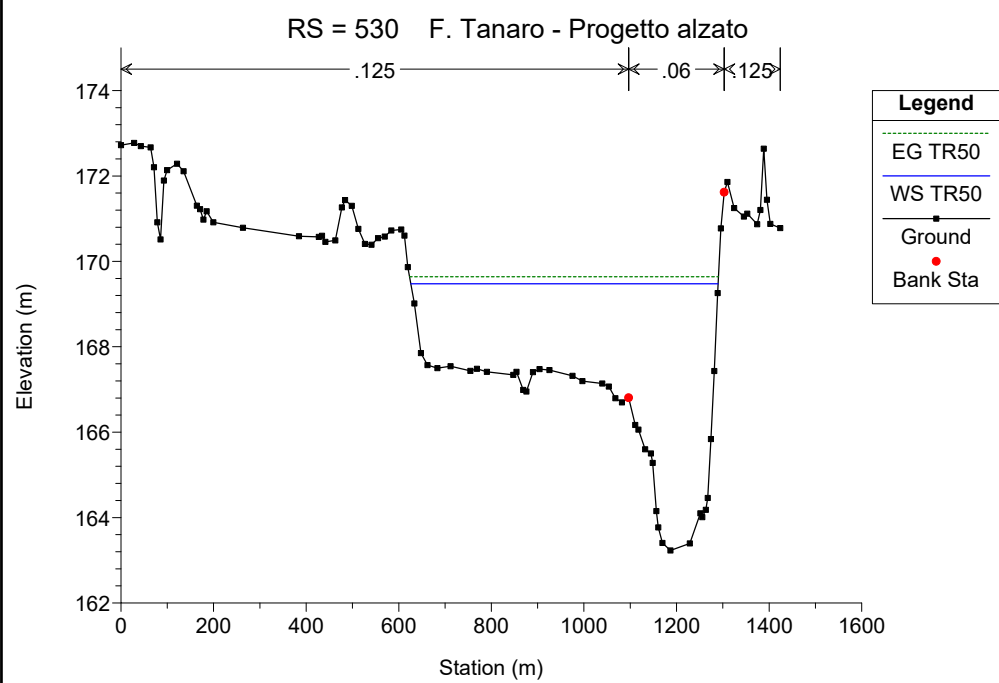
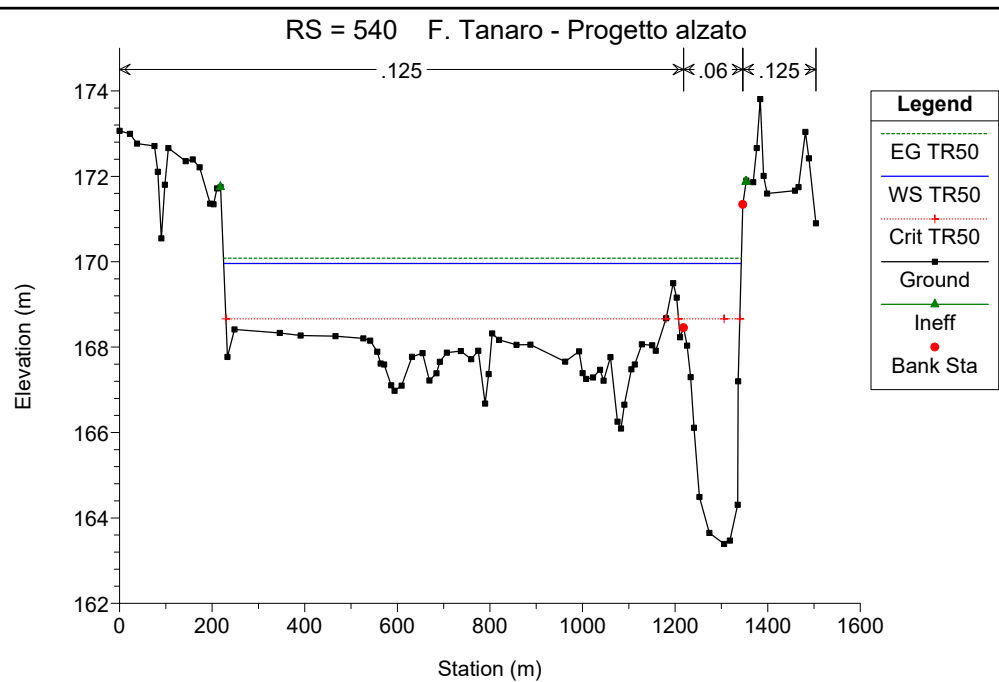
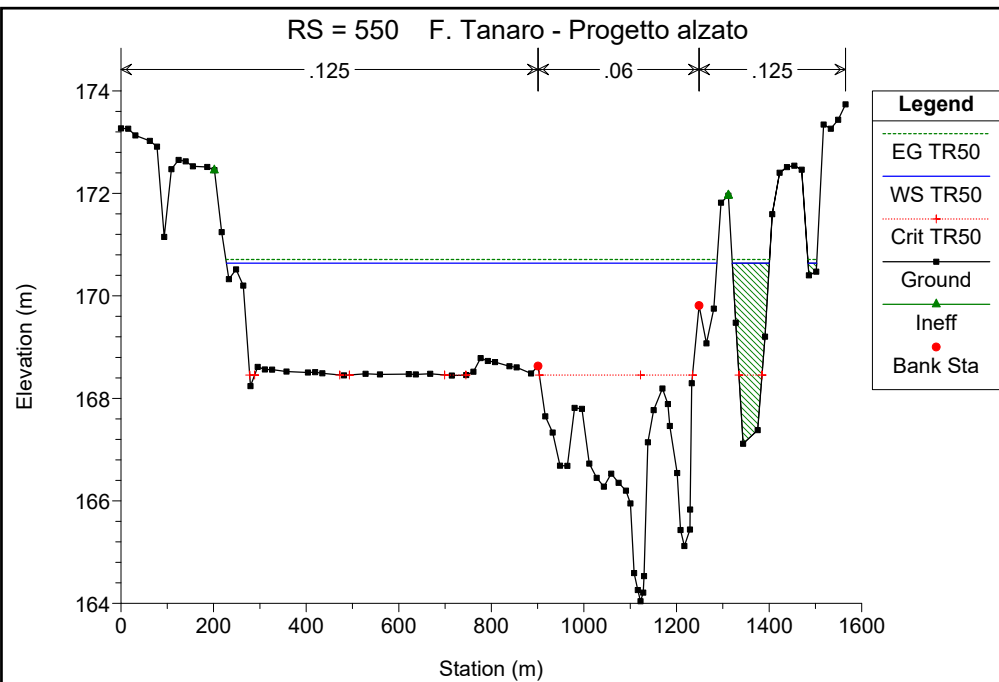
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50 (Continued)

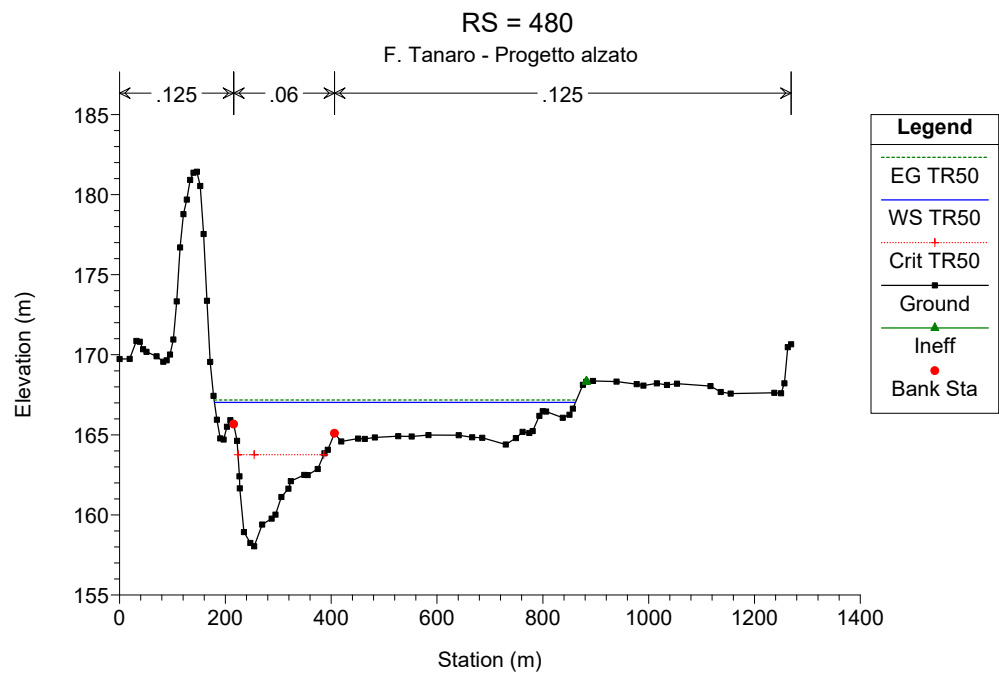
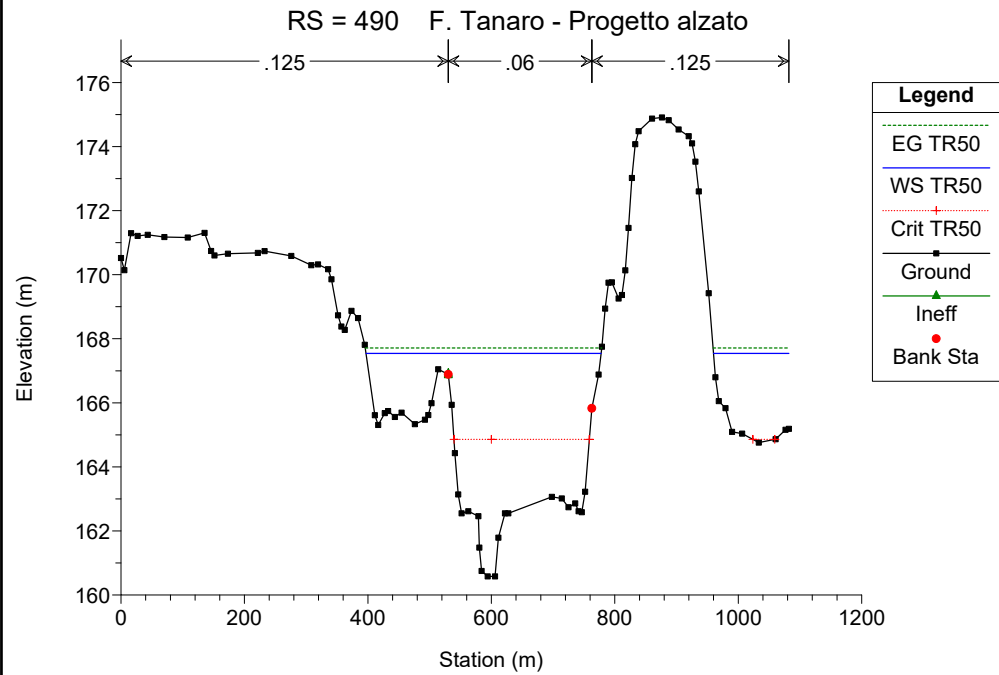
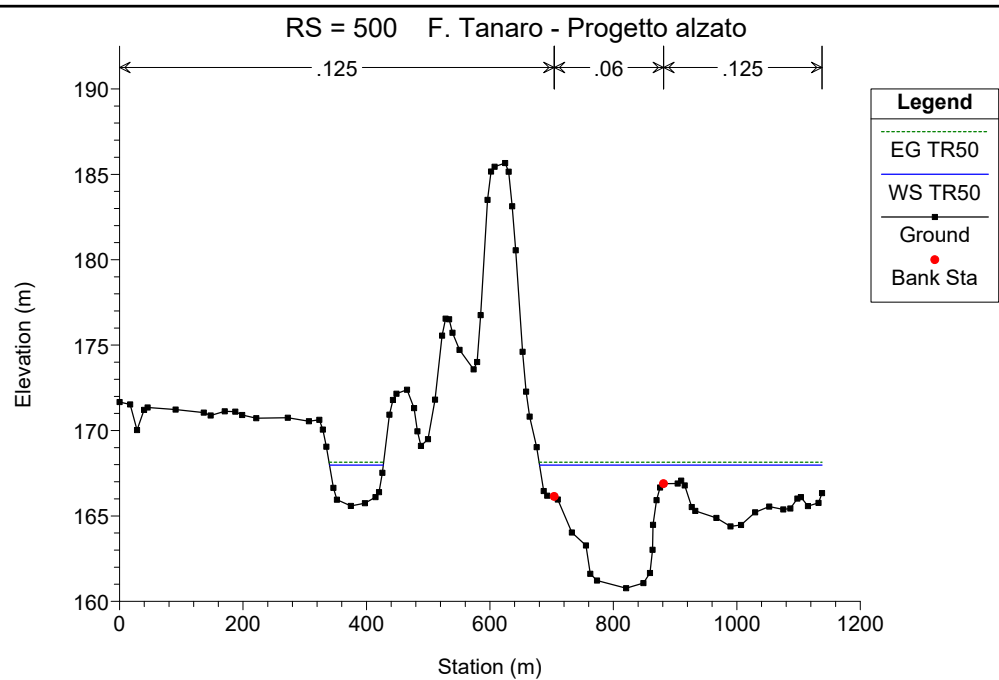
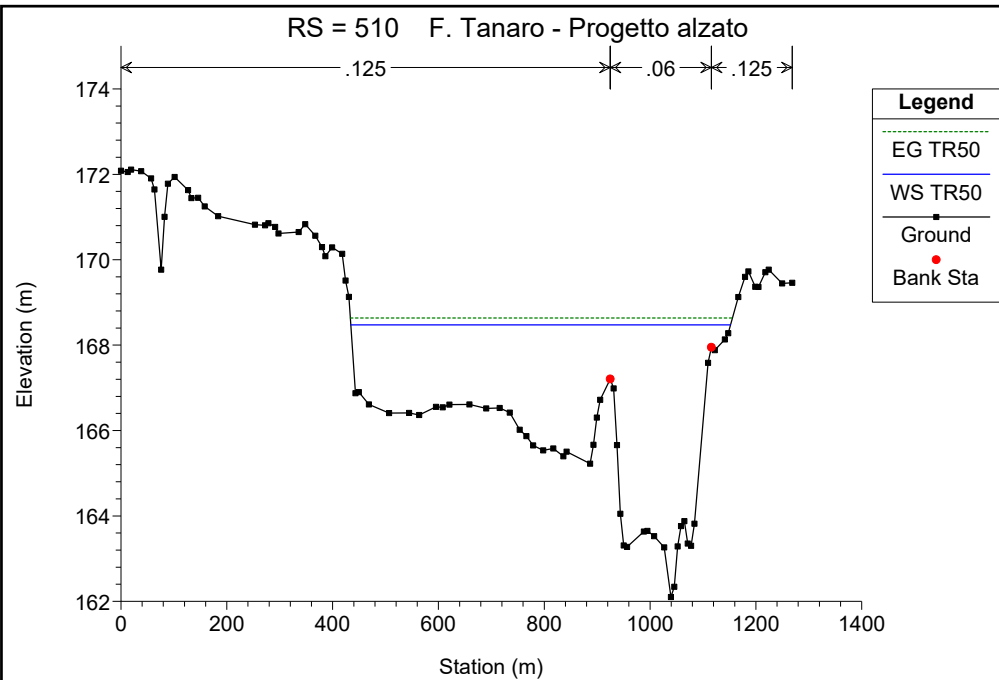
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR50	2428.00	147.59	155.34	152.46	155.56	0.001749	2.16	1558.25	543.07	0.29
1	205	TR50	2428.00	147.37	155.05	152.08	155.16	0.001201	1.71	2441.54	970.21	0.24
1	200	TR50	2428.00	146.60	154.49	152.13	154.70	0.002044	2.43	2196.13	1055.55	0.32
1	190	TR50	2428.00	146.85	154.01	151.71	154.16	0.001940	1.99	2121.97	969.08	0.30
1	180	TR50	2428.00	145.66	153.76	150.13	153.83	0.000667	1.25	2944.86	1075.92	0.18
1	170	TR50	2428.00	145.40	153.44	149.59	153.58	0.001445	1.79	1895.57	1184.26	0.26
1	160	TR50	2428.00	145.46	152.95	149.35	153.08	0.001129	1.68	2099.14	1288.81	0.23
1	150	TR50	2428.00	143.53	152.49	148.59	152.69	0.001330	2.08	1787.82	1232.09	0.26
1	140	TR50	2428.00	143.00	151.59	149.01	152.06	0.003770	3.05	938.95	872.60	0.43
1	135		Inl Struct									
1	130	TR50	2428.00	142.54	150.66	146.98	150.96	0.001970	2.44	1013.08	231.51	0.32
1	120	TR50	2428.00	142.27	150.05	146.38	150.38	0.002088	2.55	965.31	358.53	0.33
1	110	TR50	2428.00	141.17	149.71	146.33	149.90	0.001474	2.12	1750.86	493.87	0.27
1	100	TR50	2428.00	140.79	149.08	146.56	149.39	0.002881	2.51	1133.10	339.10	0.37
1	90	TR50	2428.00	140.59	148.02	145.15	148.46	0.003086	2.93	827.72	151.38	0.39
1	85		Bridge									
1	80	TR50	2428.00	140.59	147.76	145.15	148.24	0.003561	3.07	790.65	148.92	0.42
1	70	TR50	2428.00	139.61	146.94	144.39	147.28	0.003072	2.71	1119.75	292.63	0.38
1	60	TR50	2428.00	138.12	146.53	142.72	146.75	0.001510	2.26	1707.35	654.89	0.28
1	50	TR50	2428.00	137.54	145.99	143.04	146.33	0.002371	2.75	1402.93	577.29	0.35
1	40	TR50	2428.00	137.06	145.29	142.78	145.55	0.002519	2.28	1066.03	377.43	0.34
1	30	TR50	2428.00	137.37	144.66	141.50	144.92	0.002133	2.29	1061.84	587.34	0.32
1	20	TR50	2428.00	136.62	144.13	141.03	144.32	0.001596	2.19	1942.48	697.53	0.28
1	10	TR50	2428.00	135.29	143.17	141.28	143.63	0.004006	3.30	1342.28	654.46	0.44

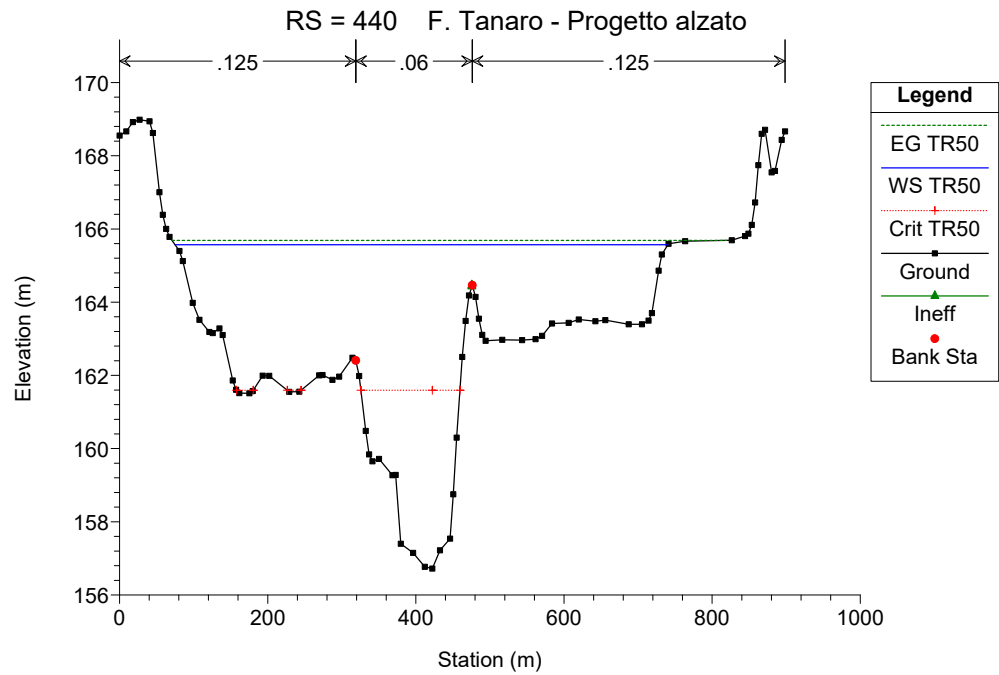
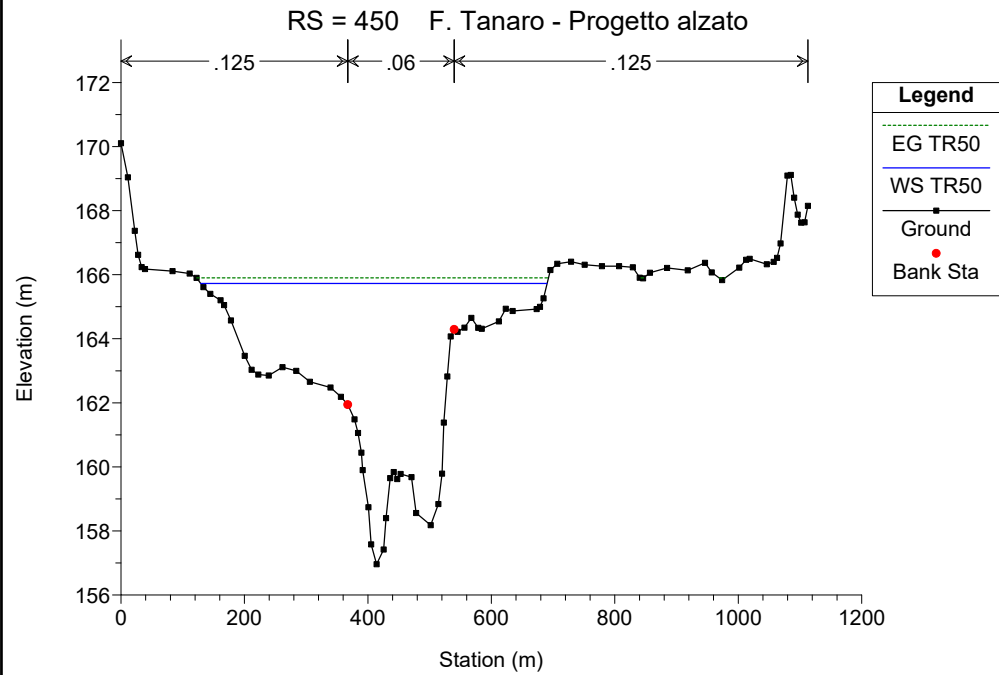
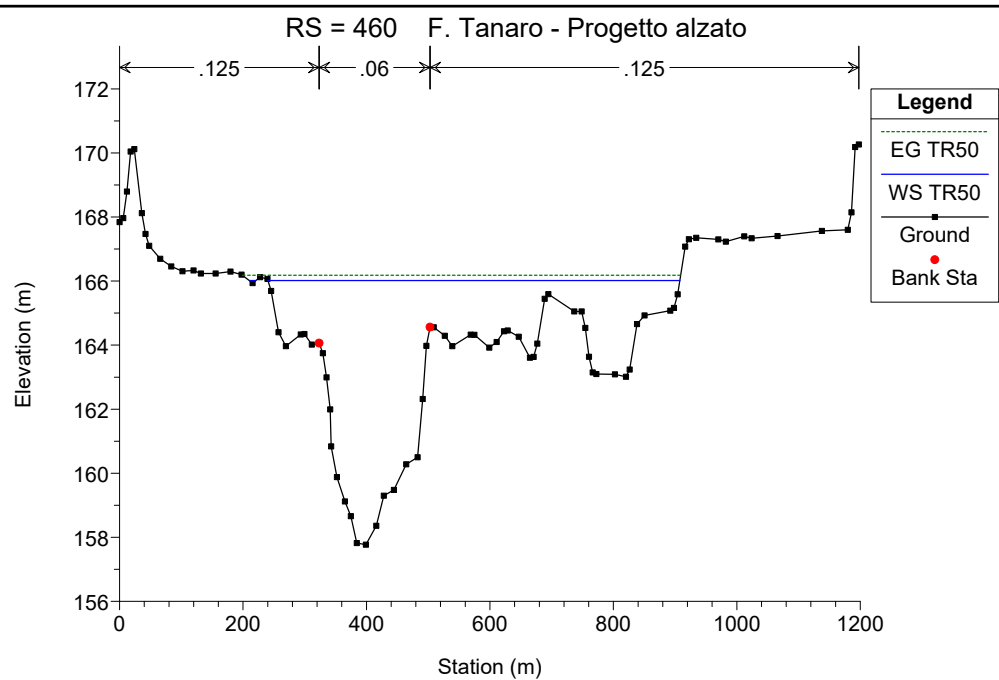
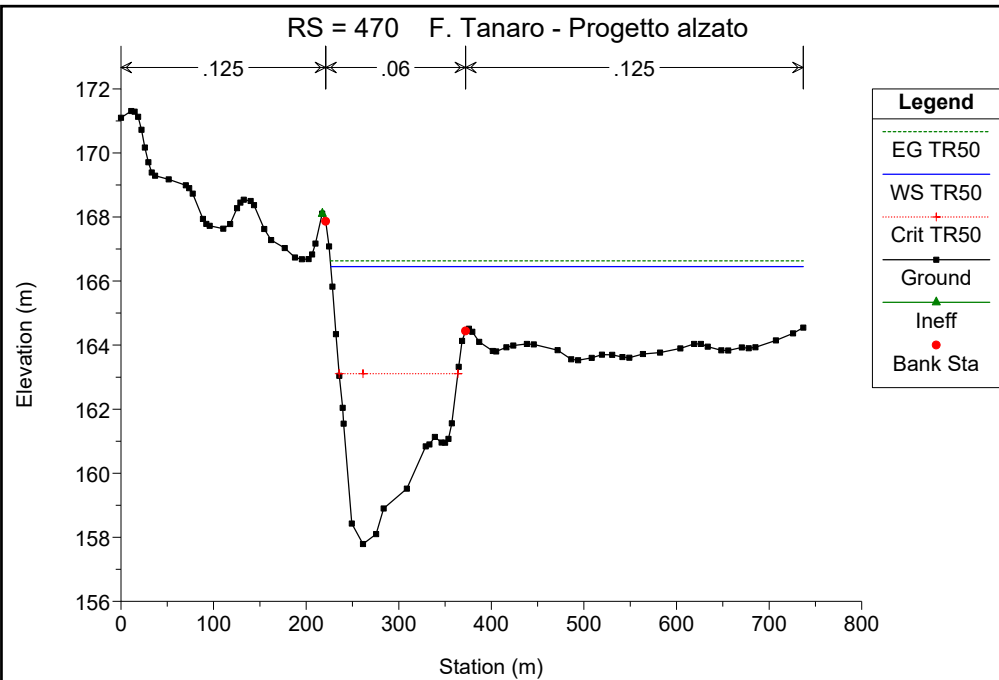
F. Tanaro - Progetto alzato

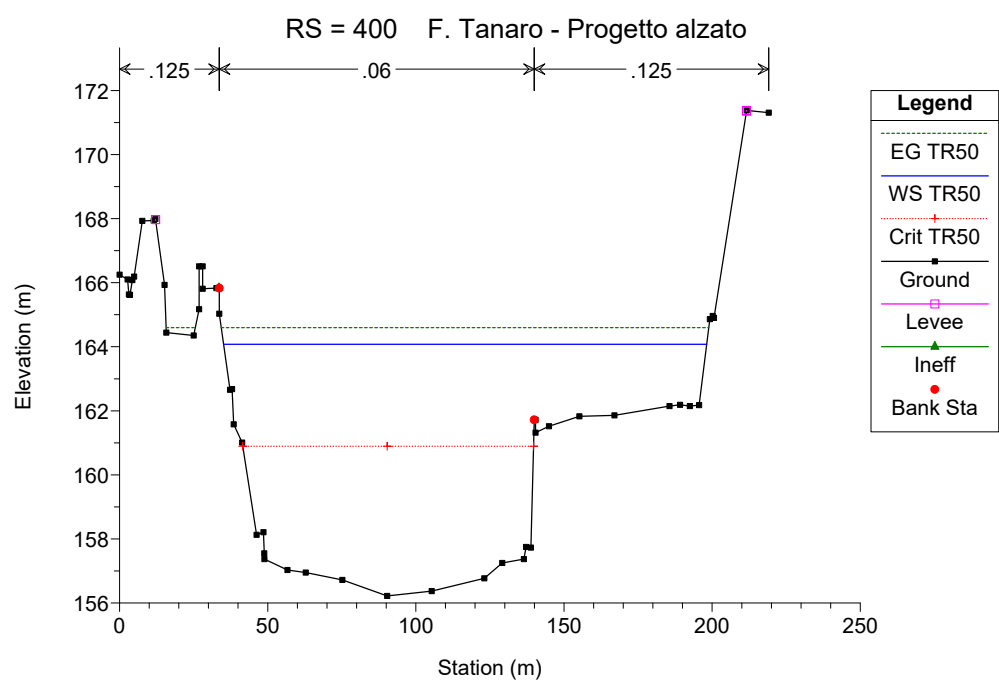
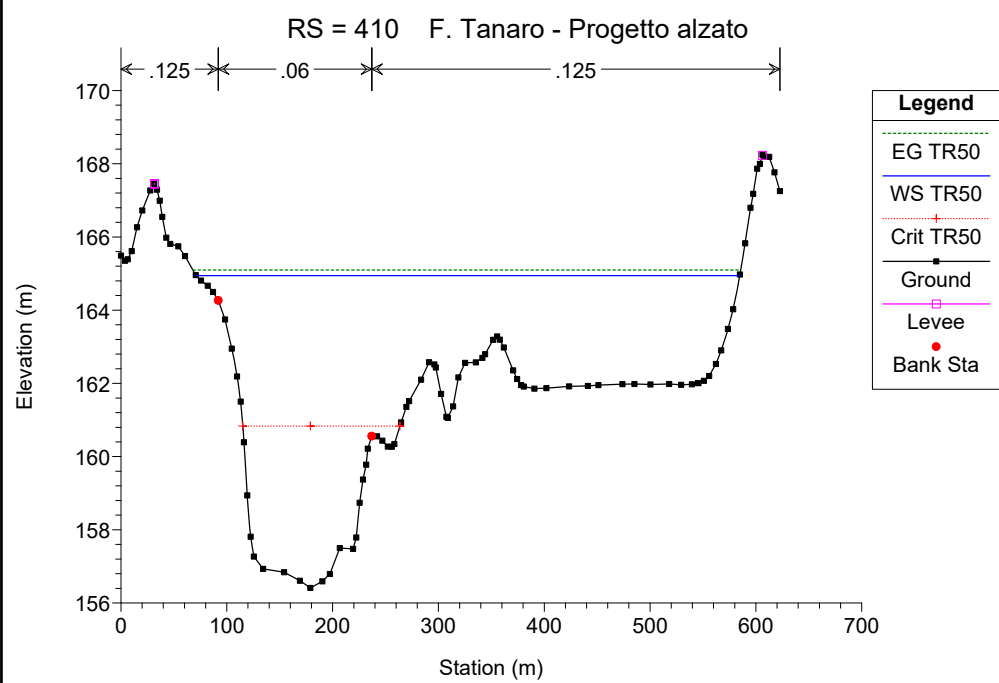
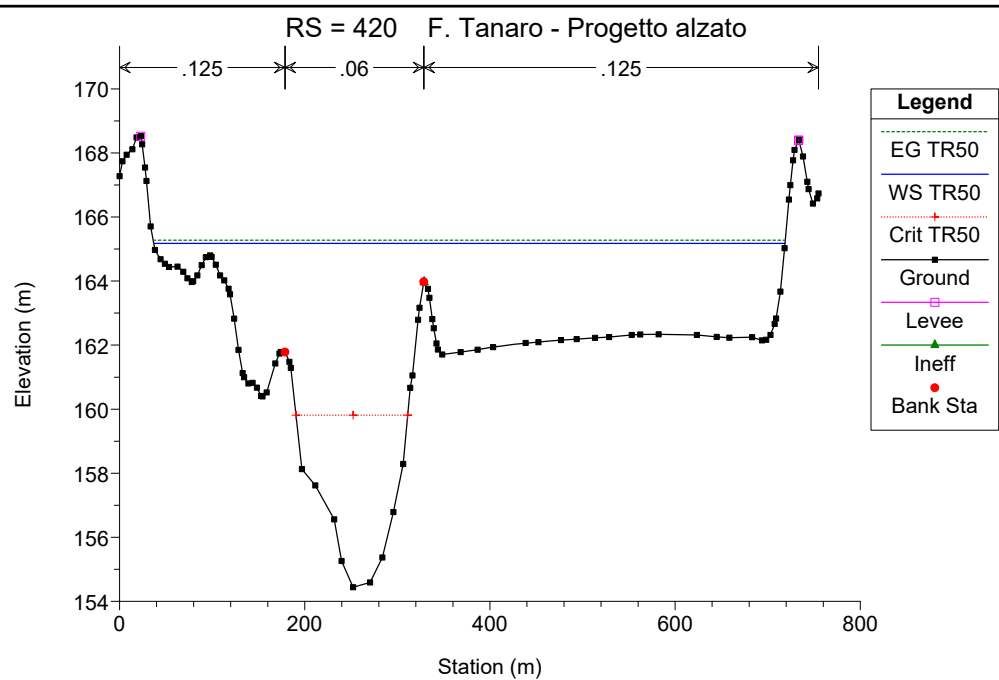
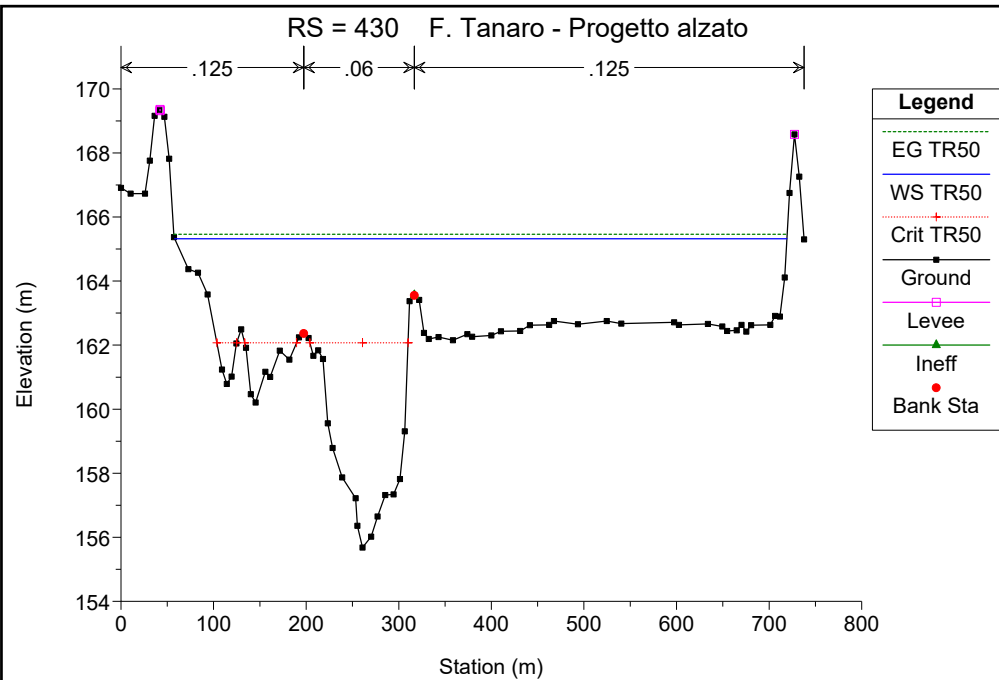
Tanaro 1

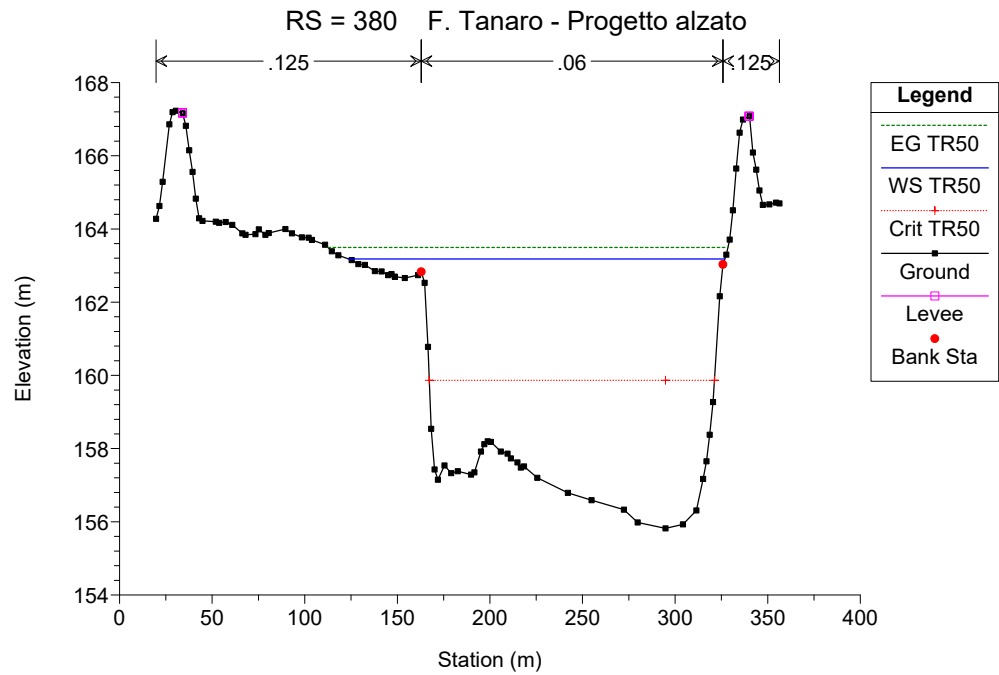
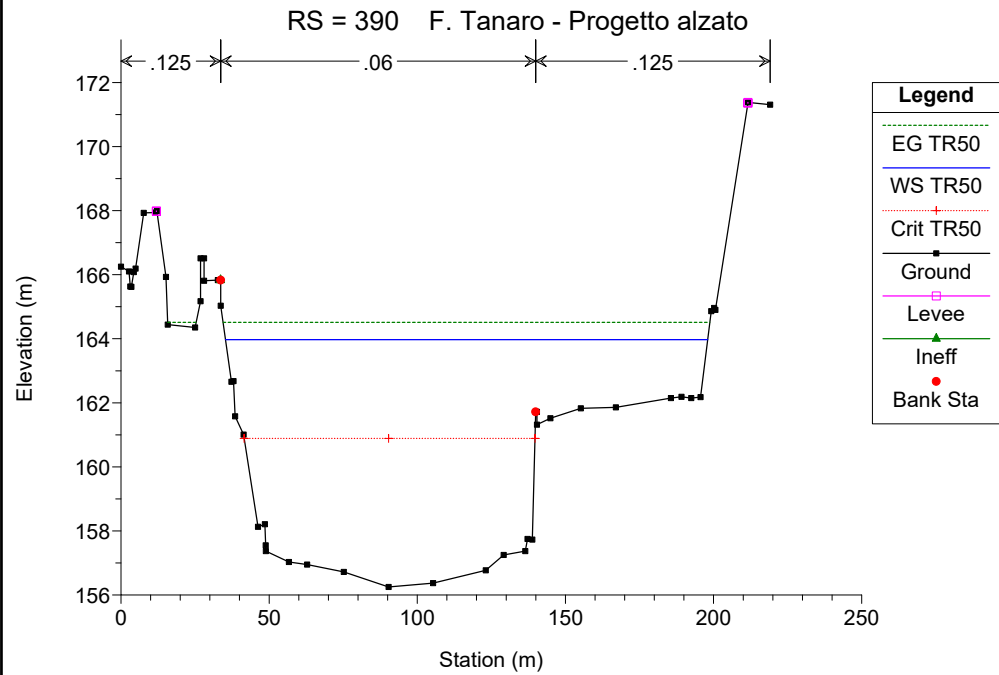
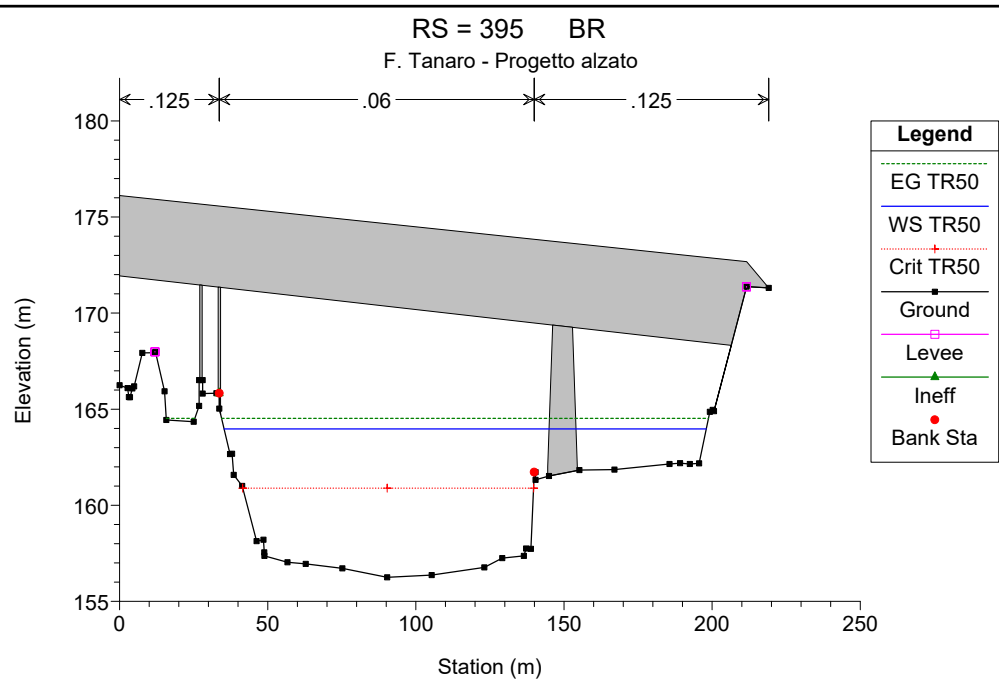
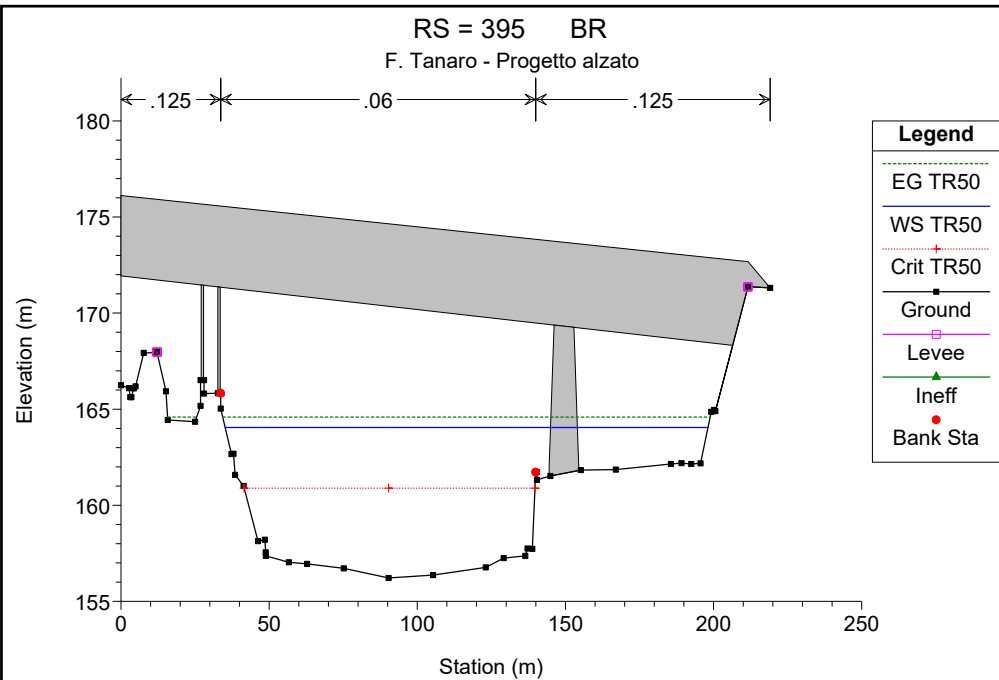


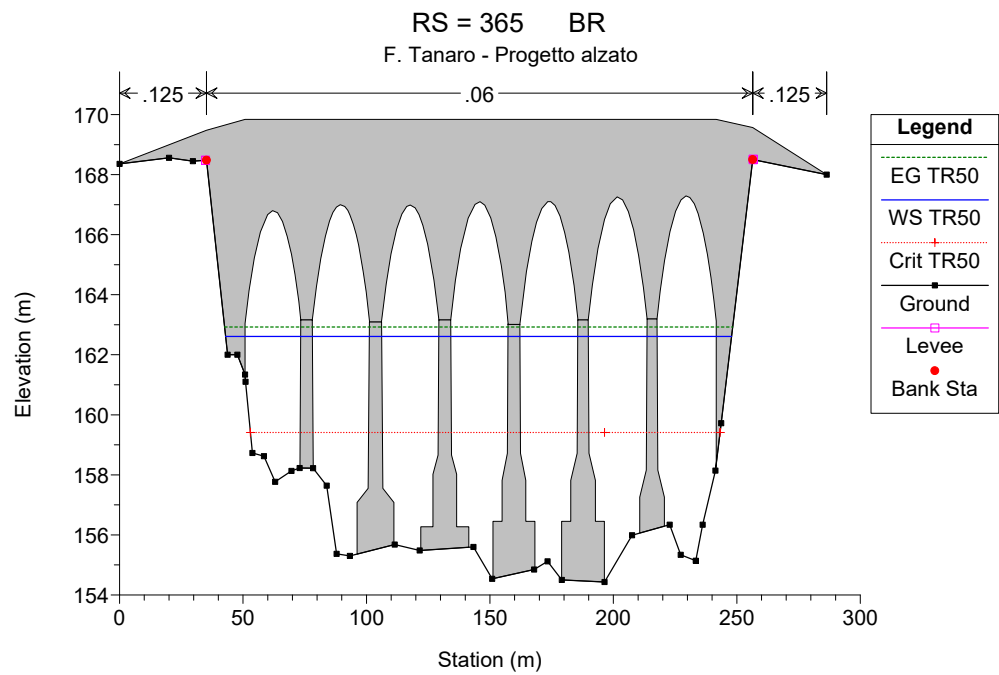
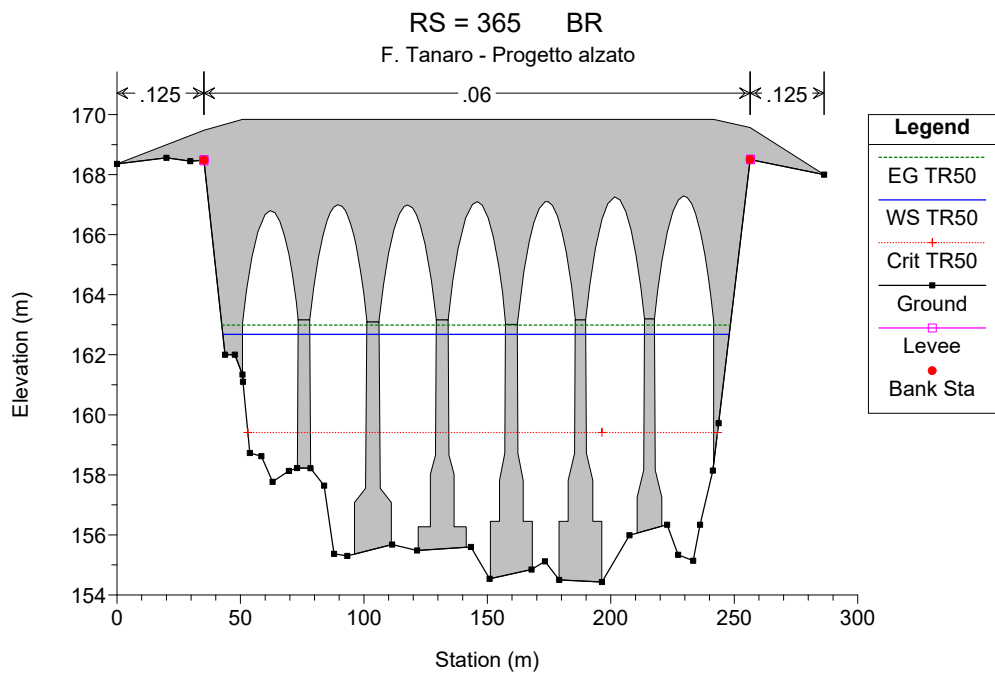
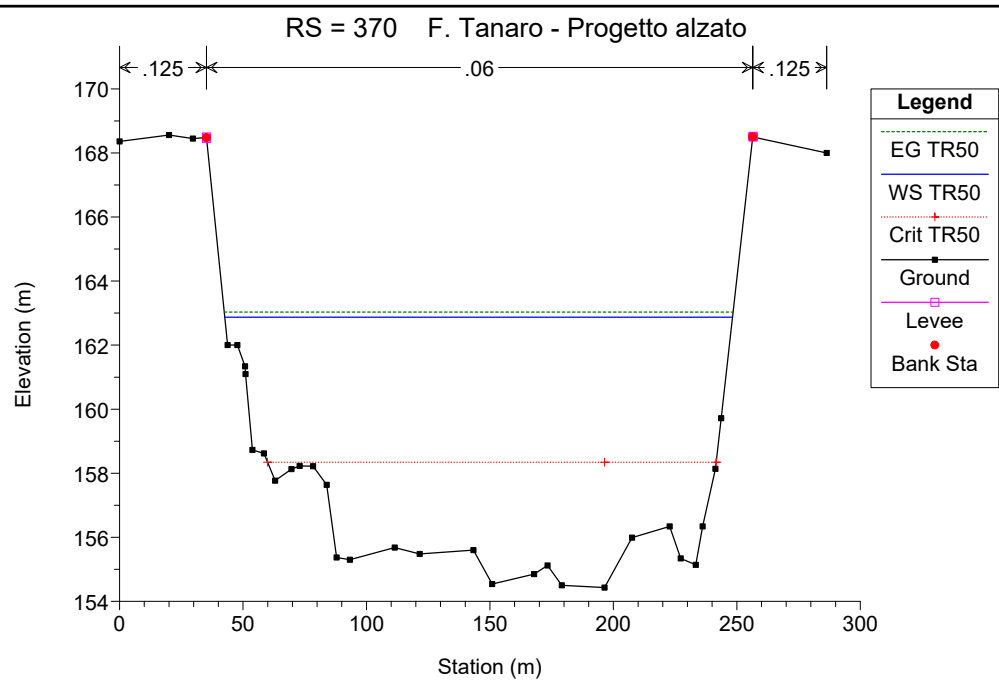
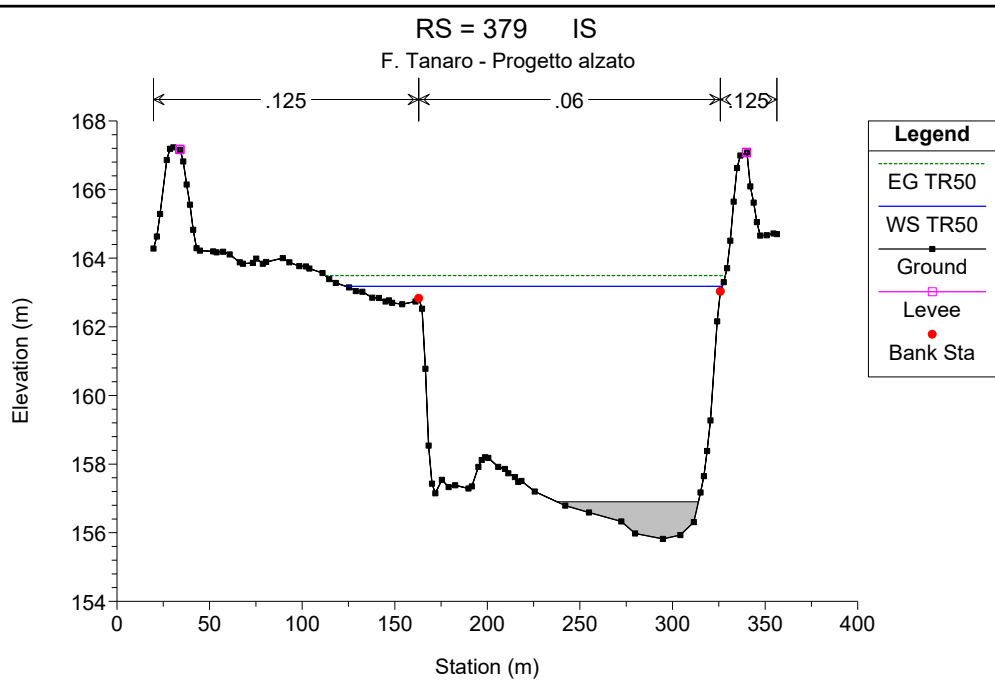


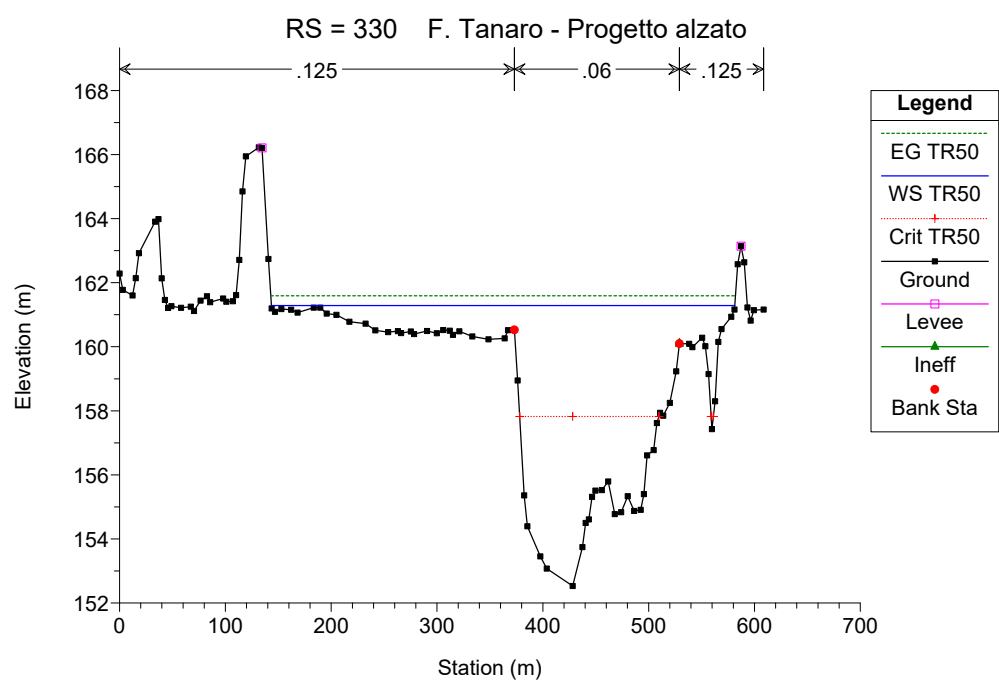
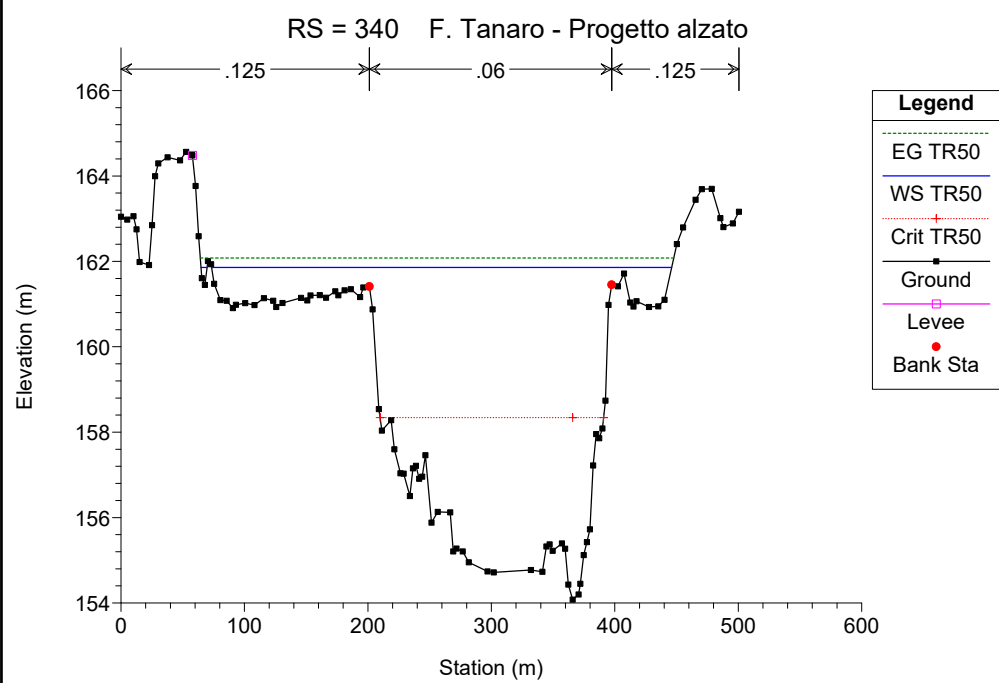
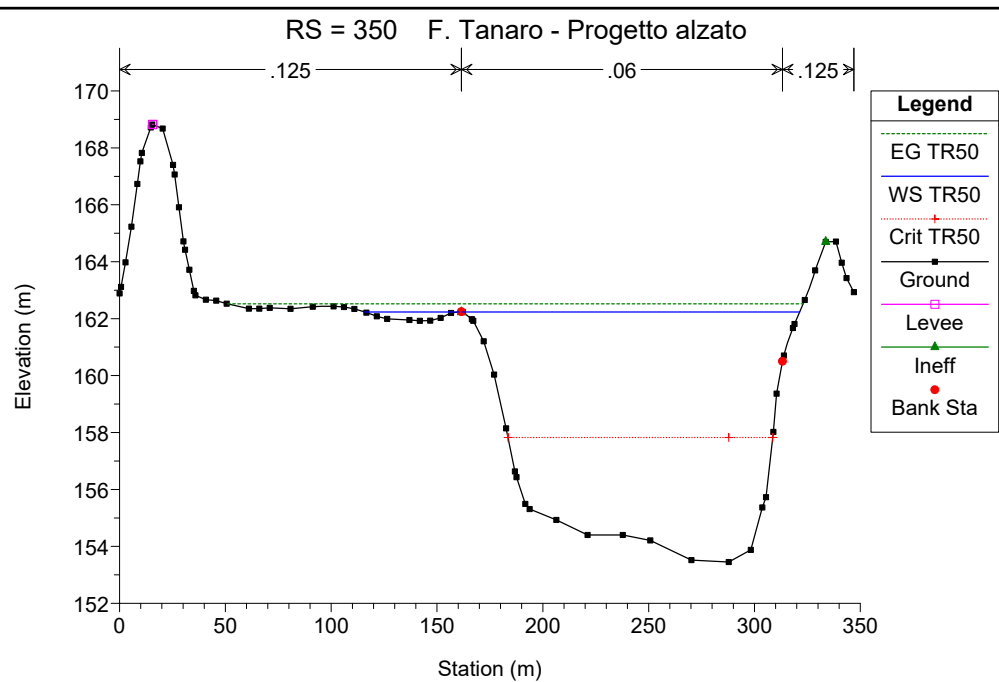
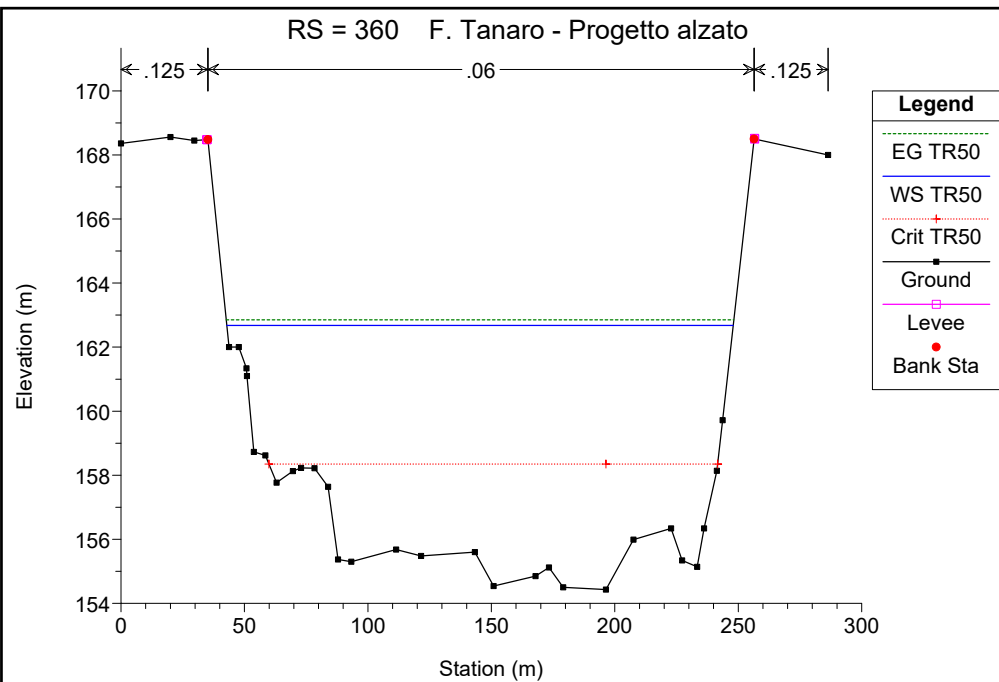


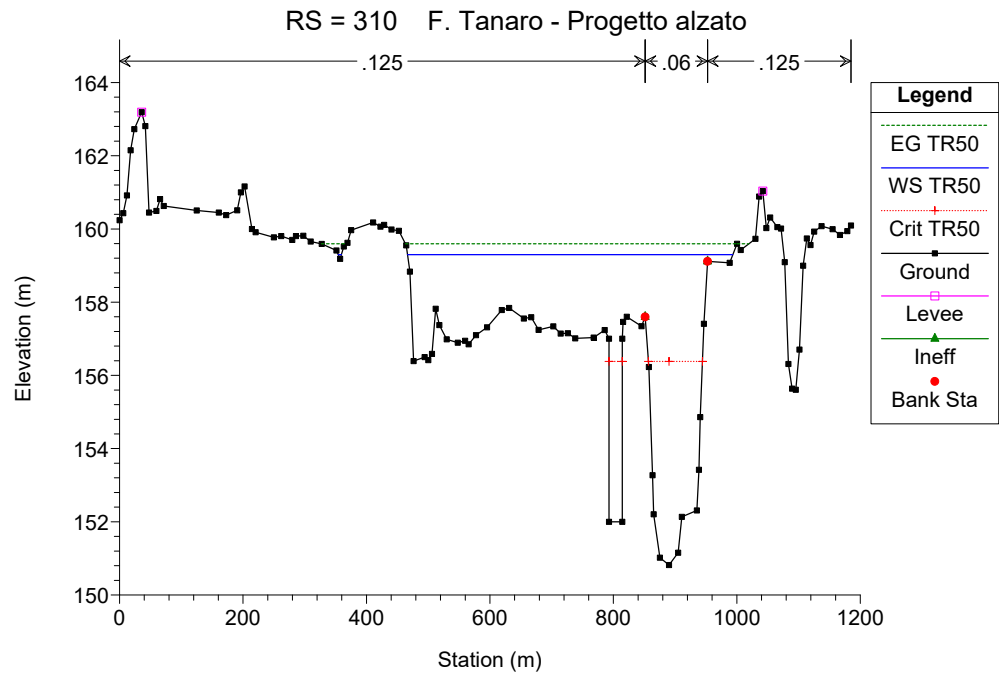
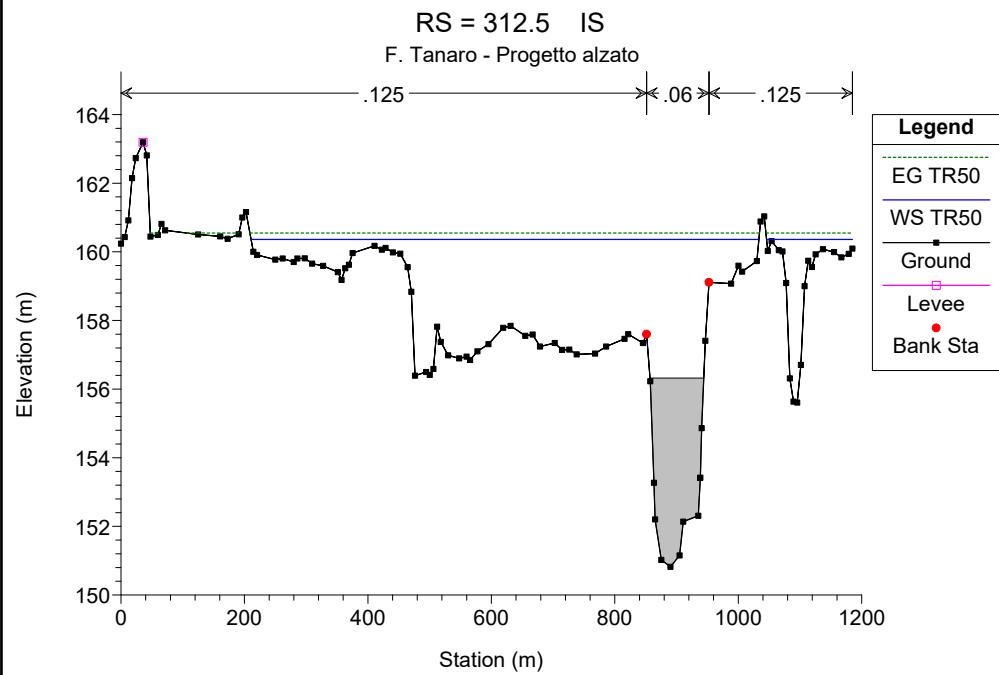
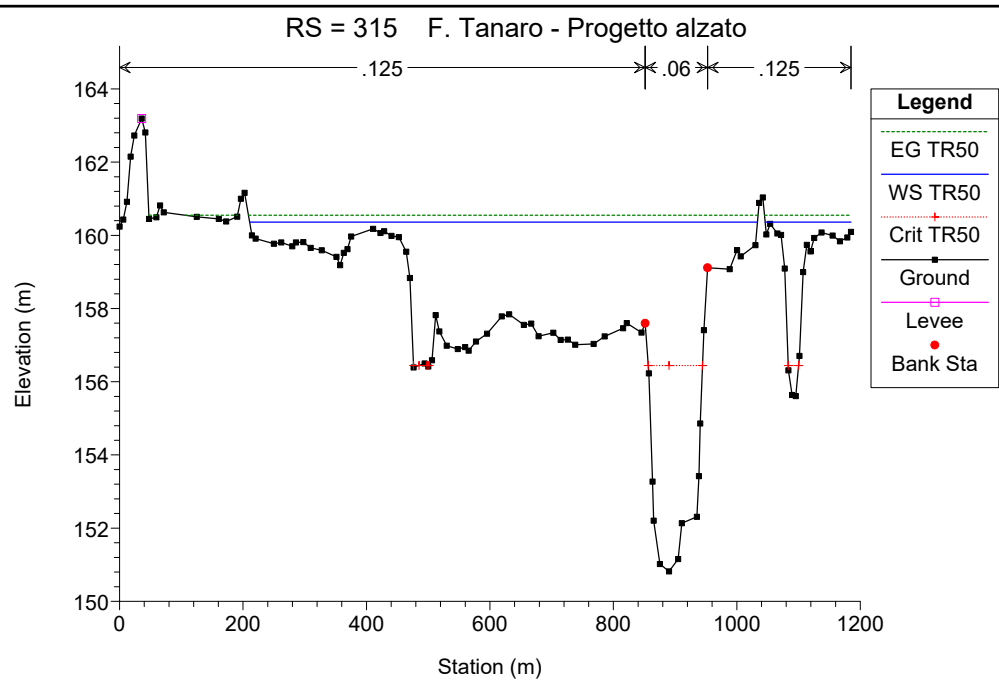
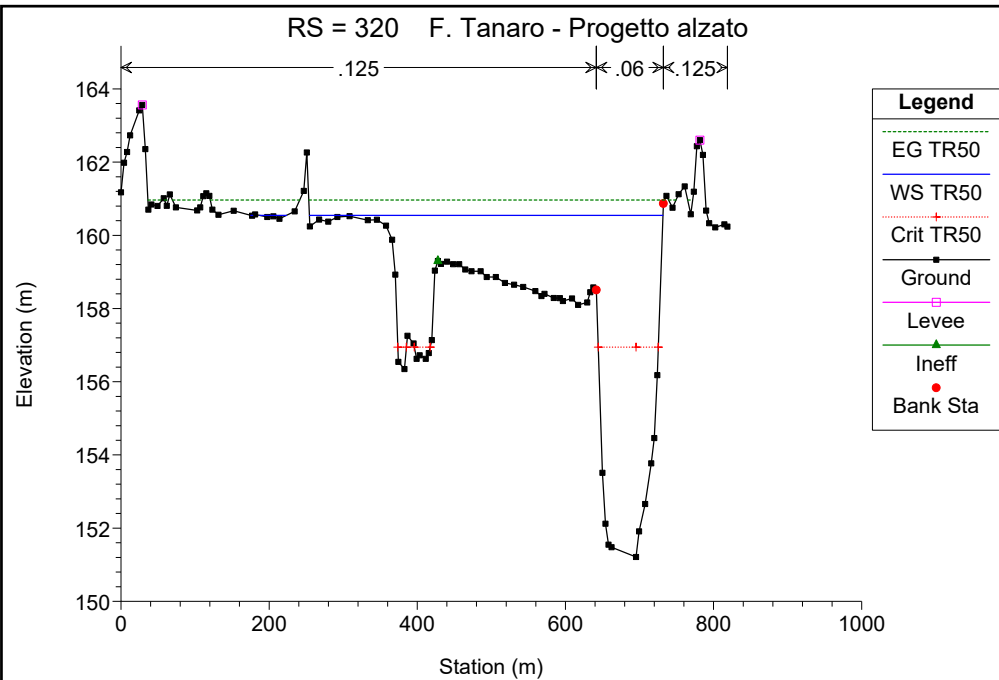


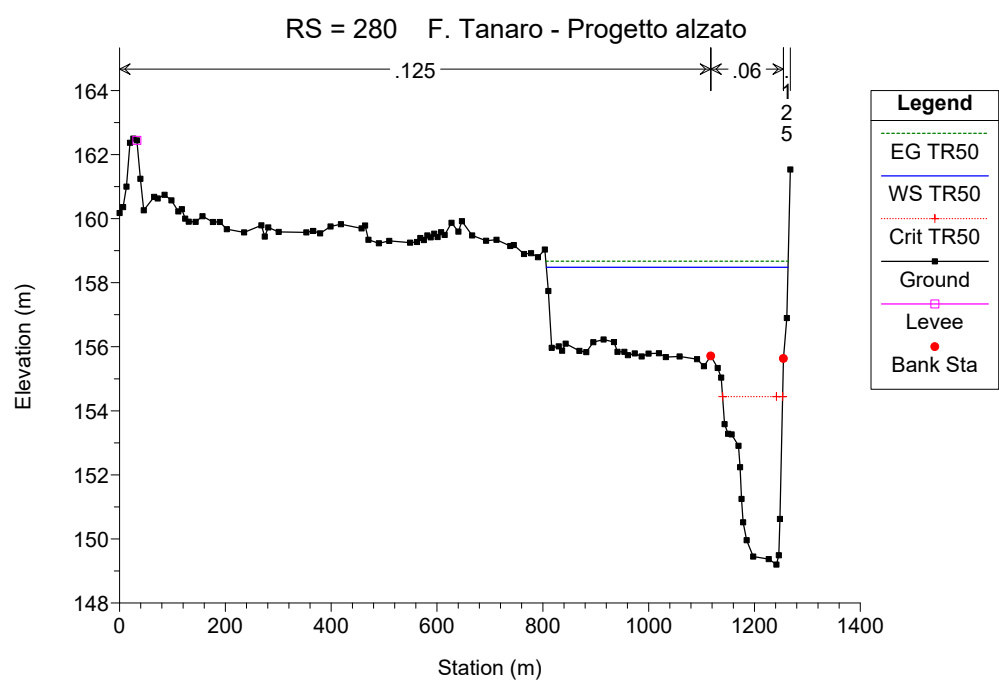
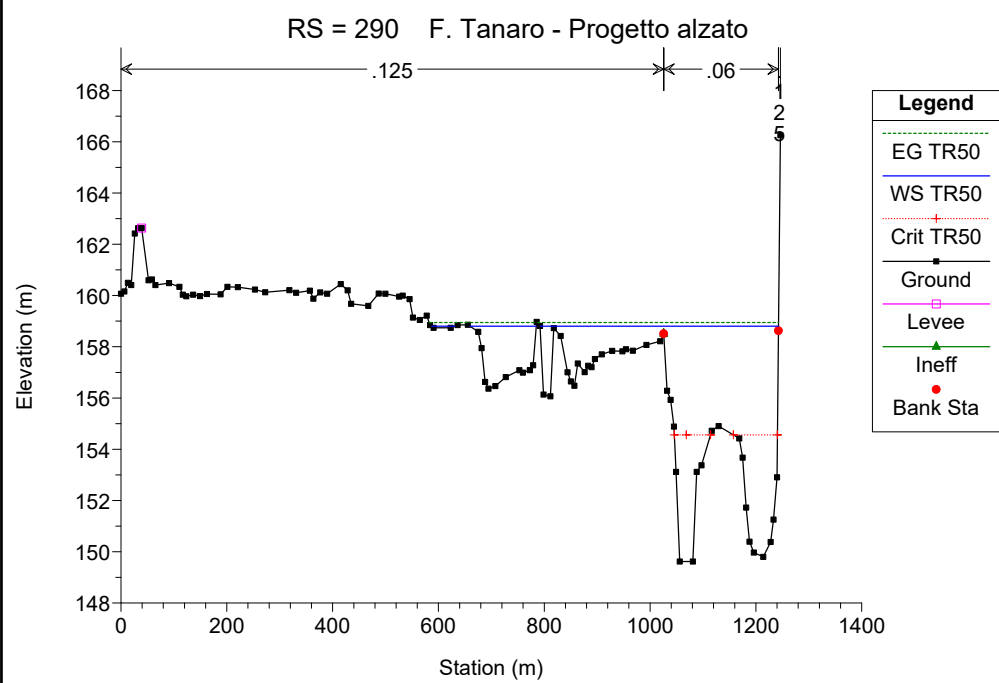
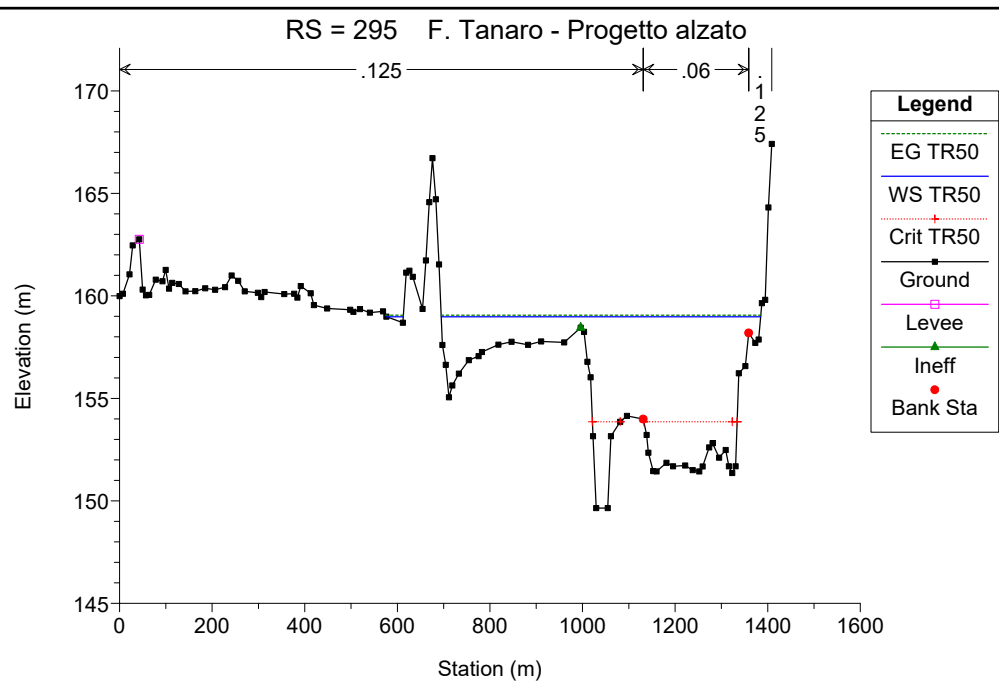
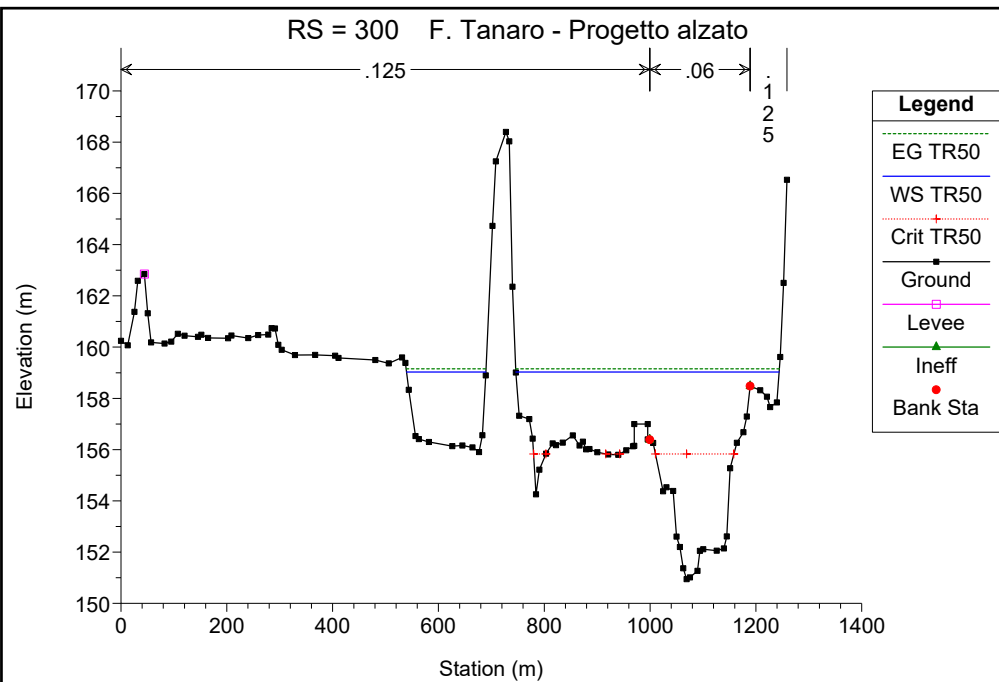


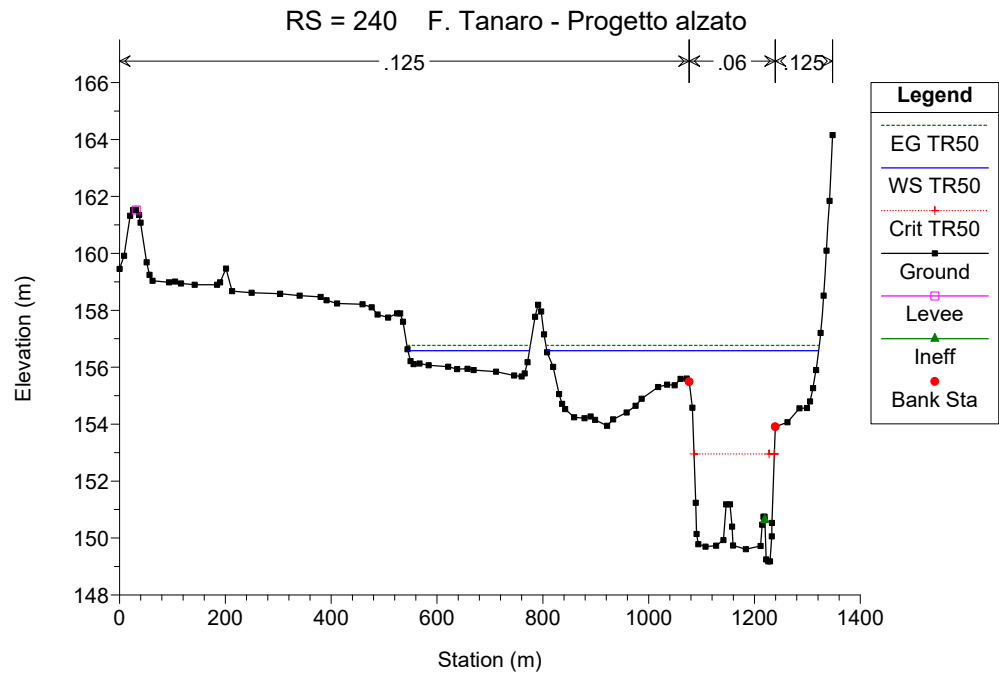
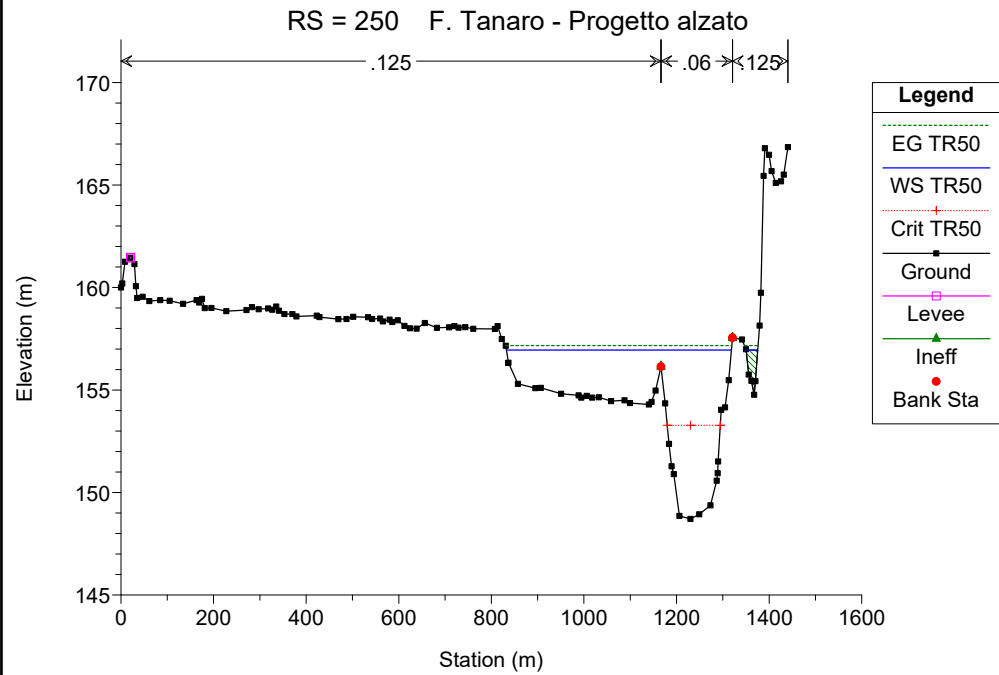
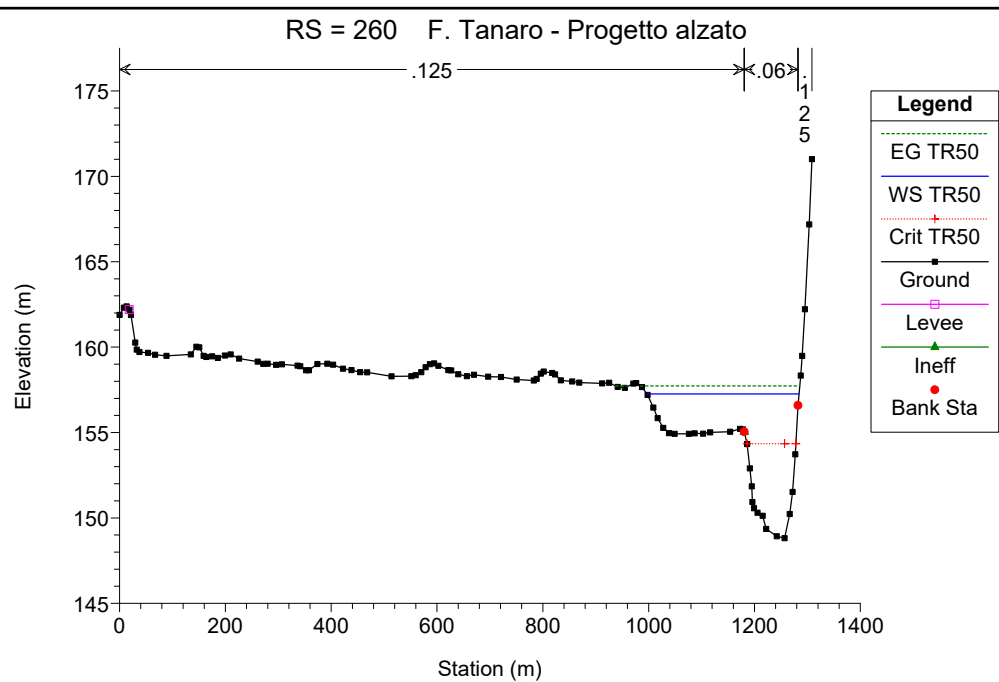
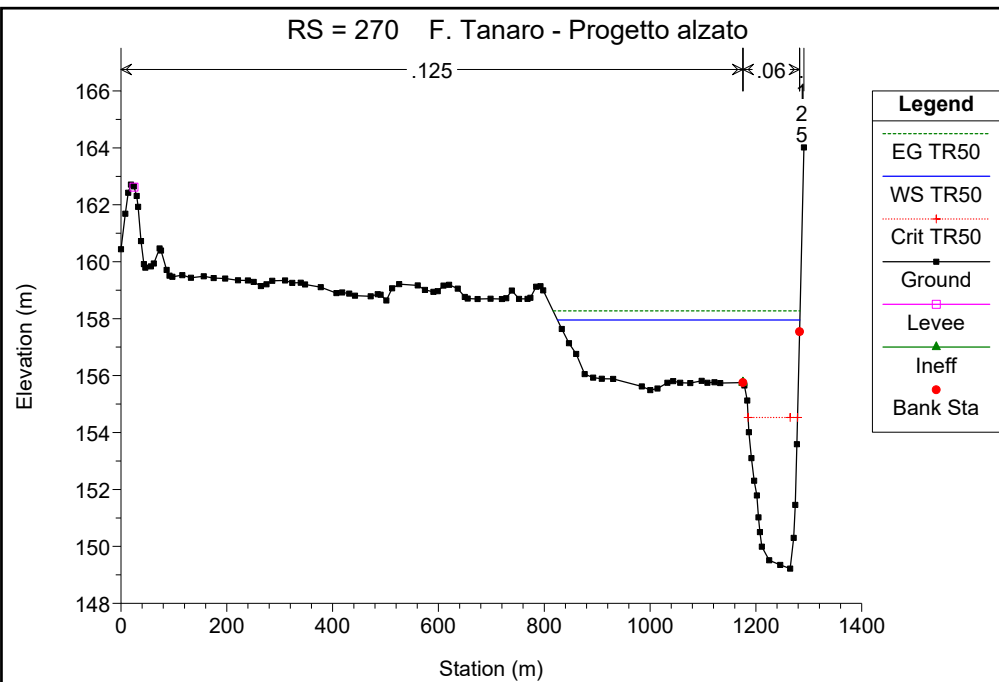


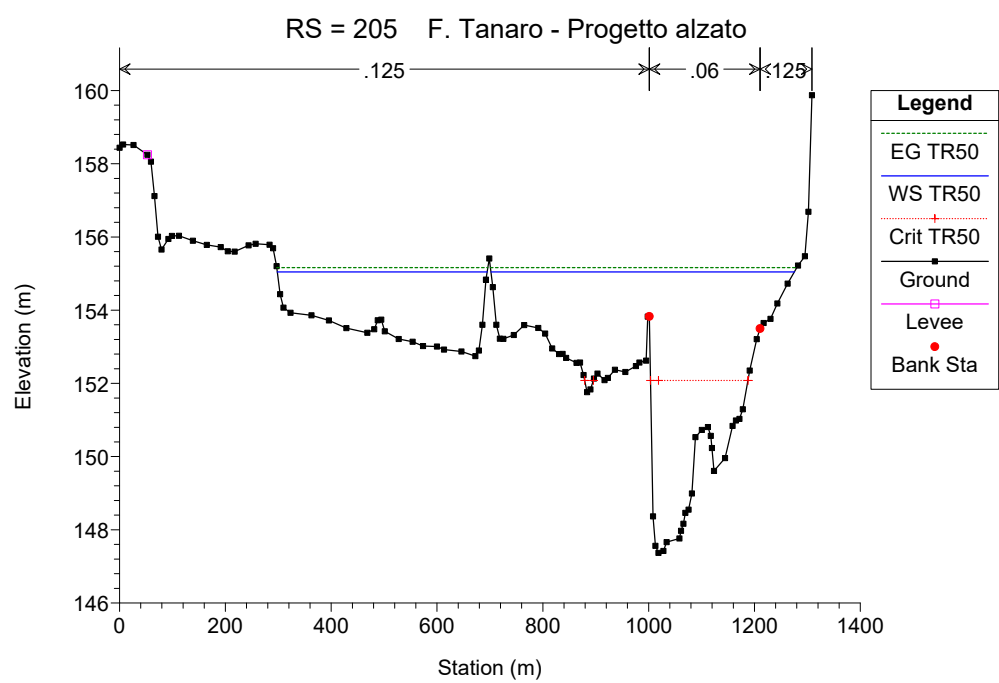
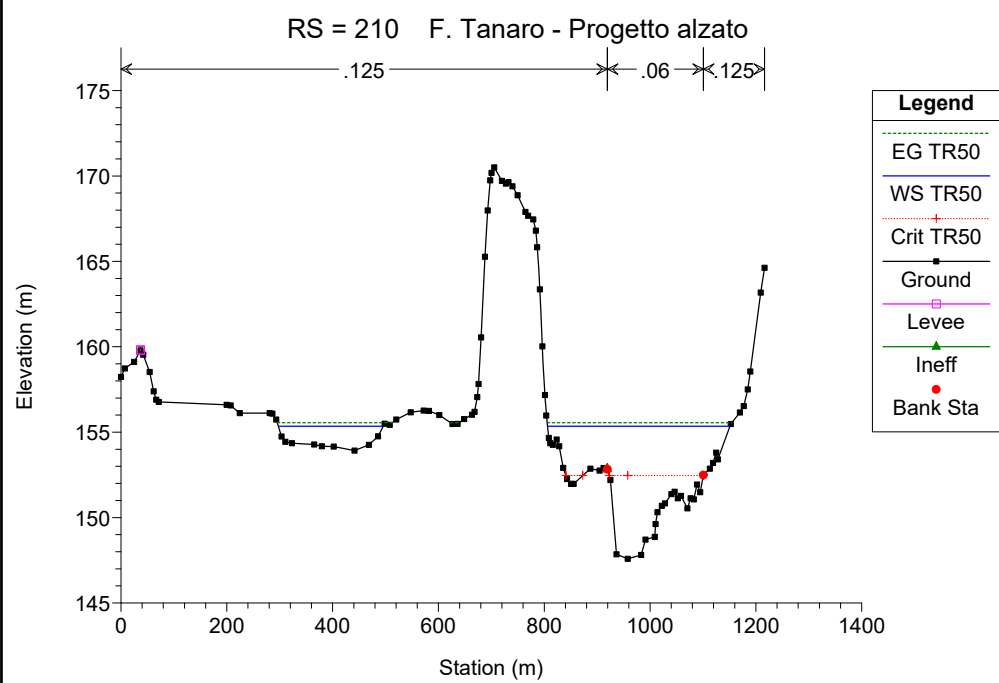
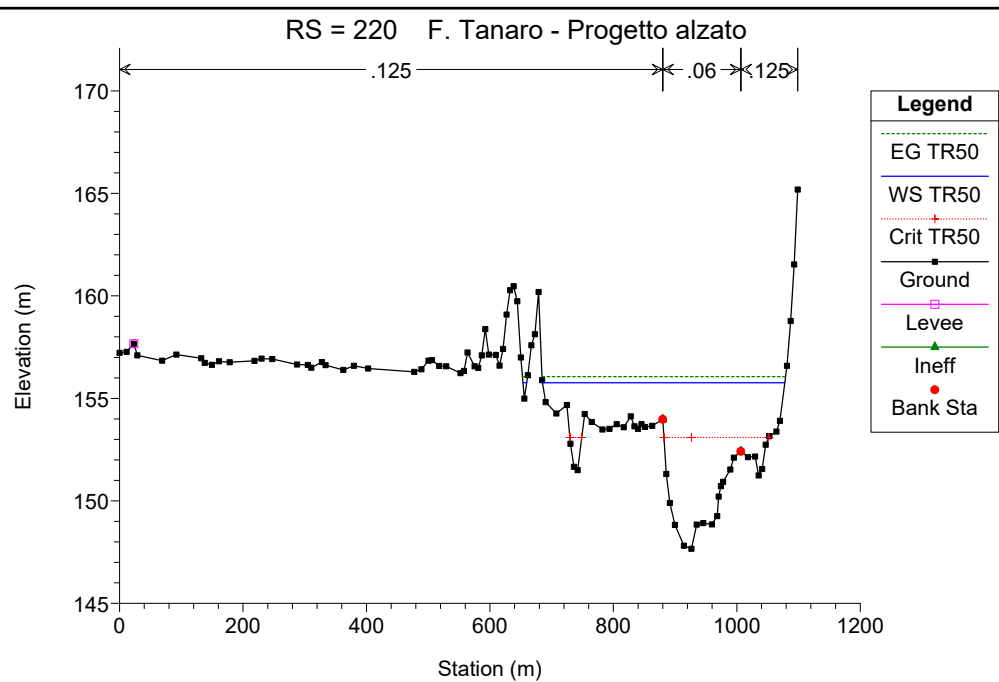
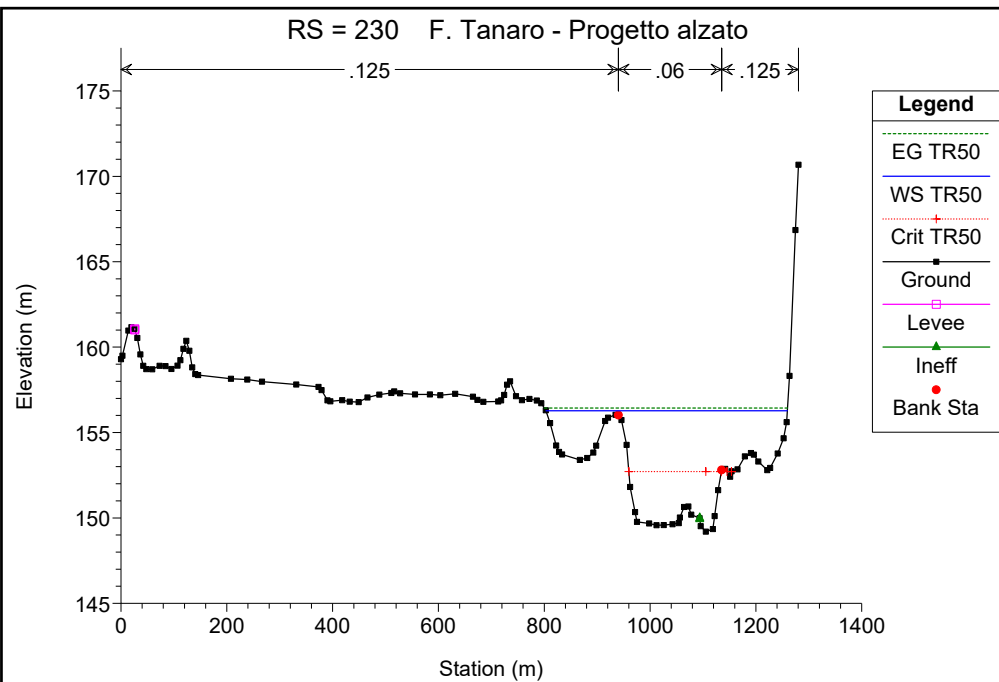


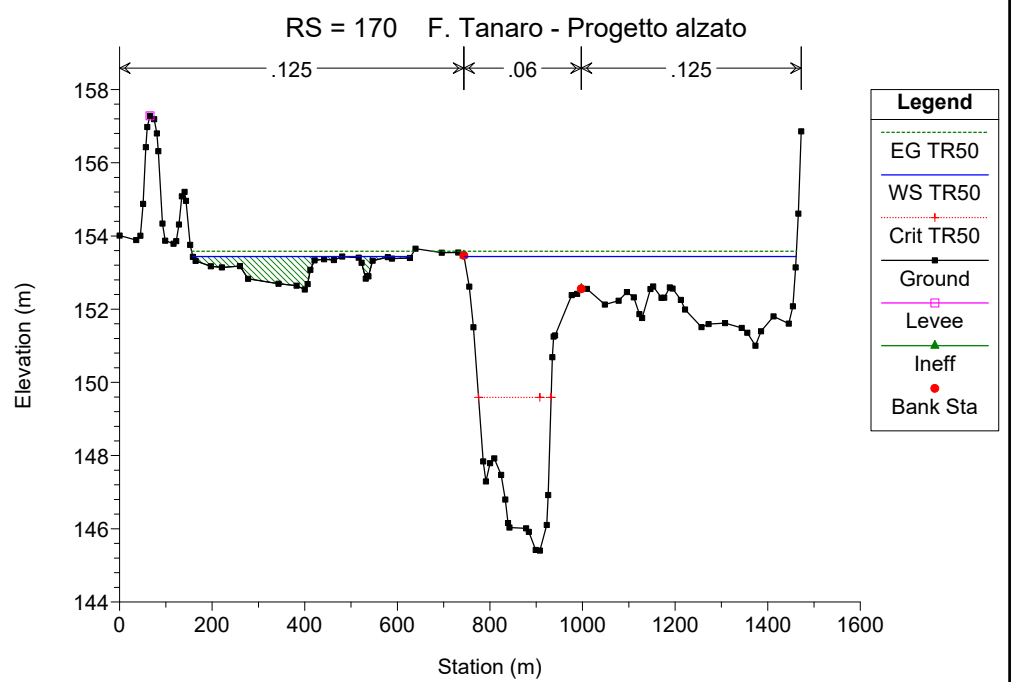
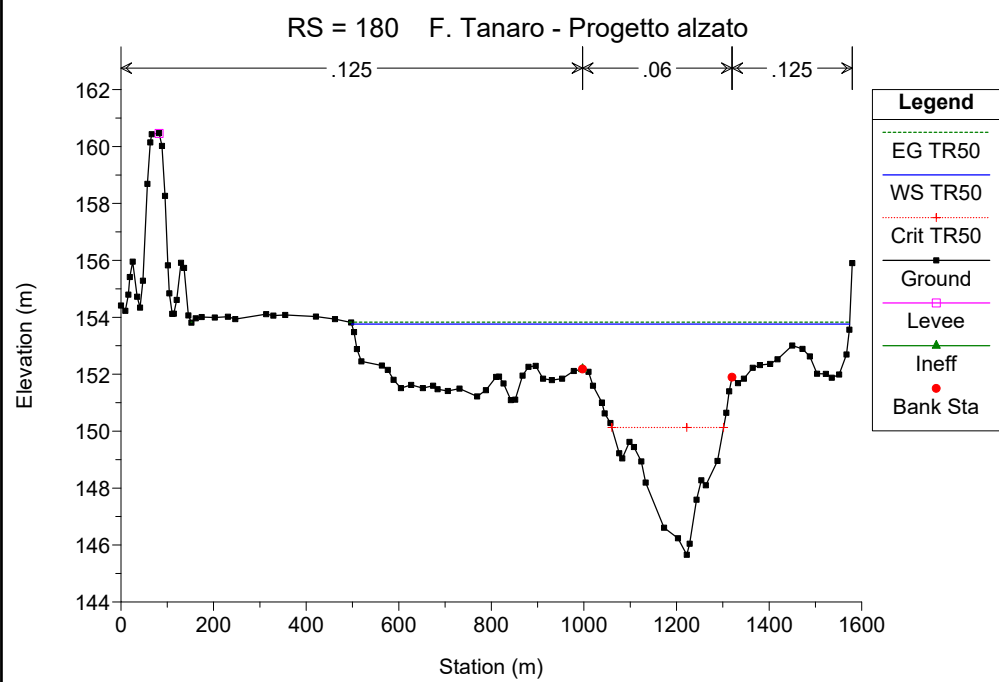
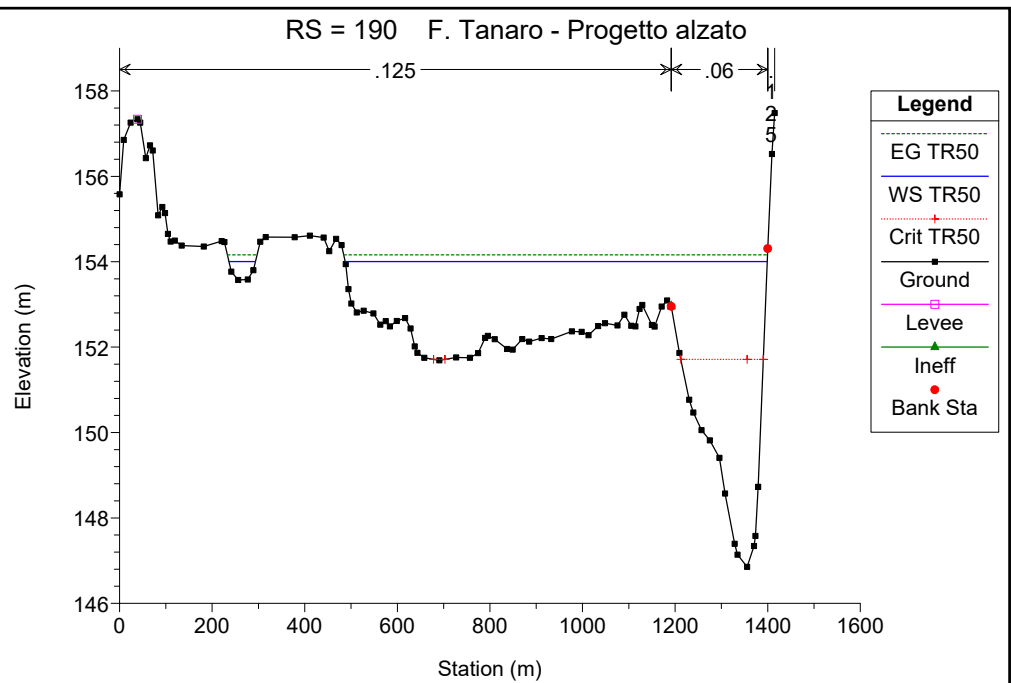
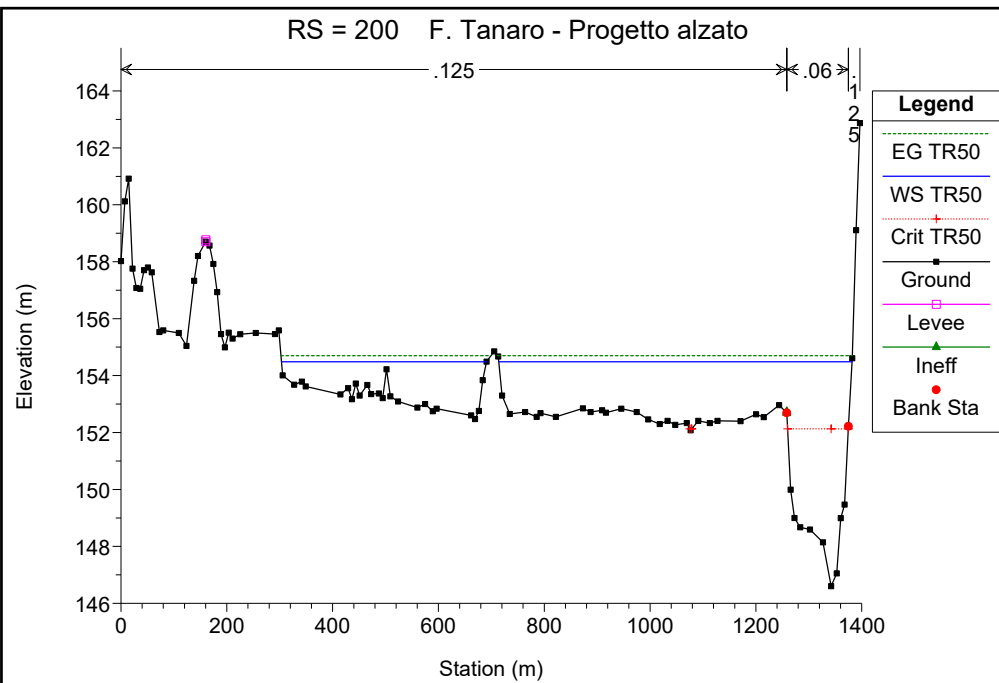


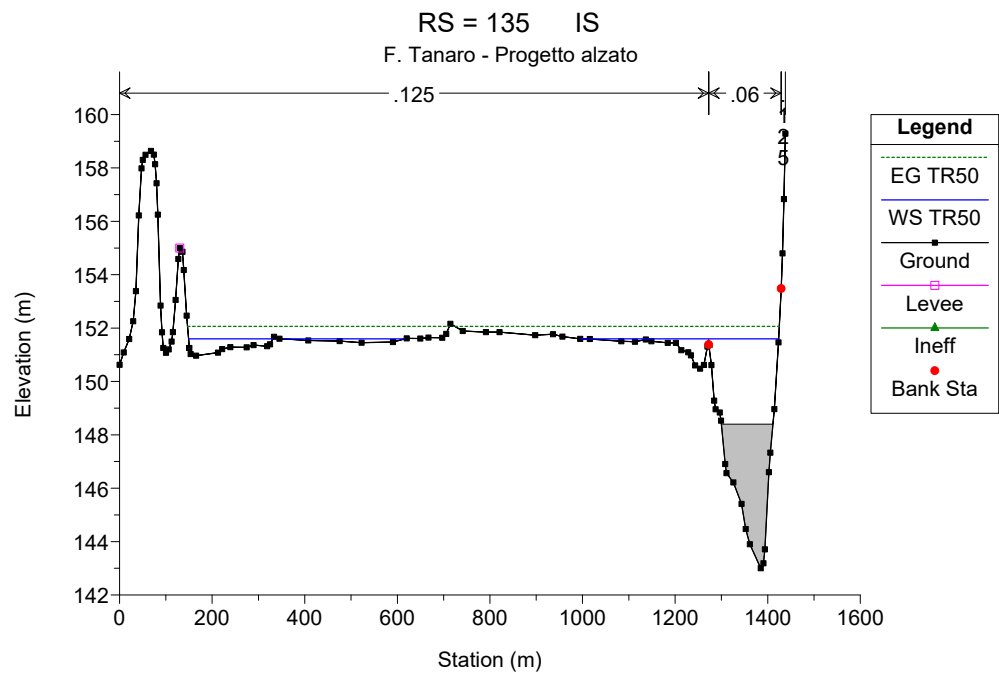
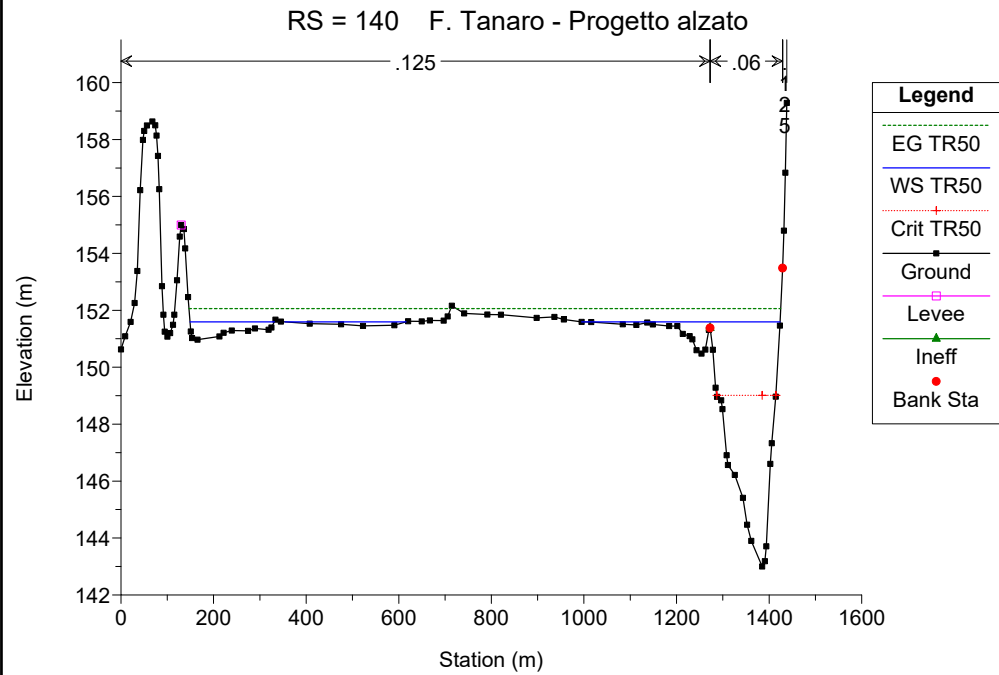
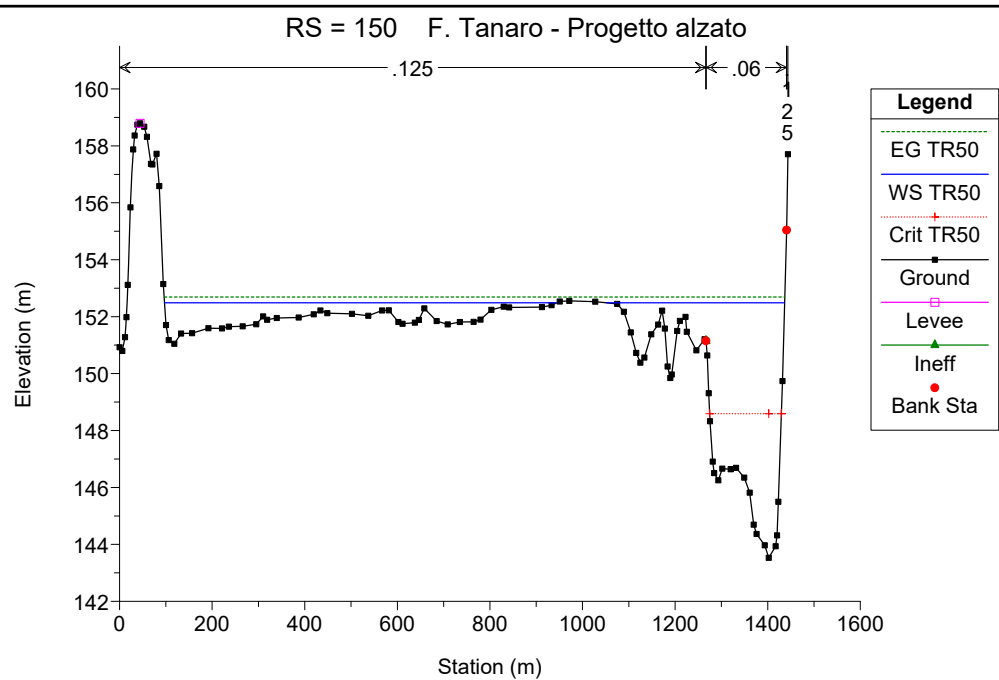
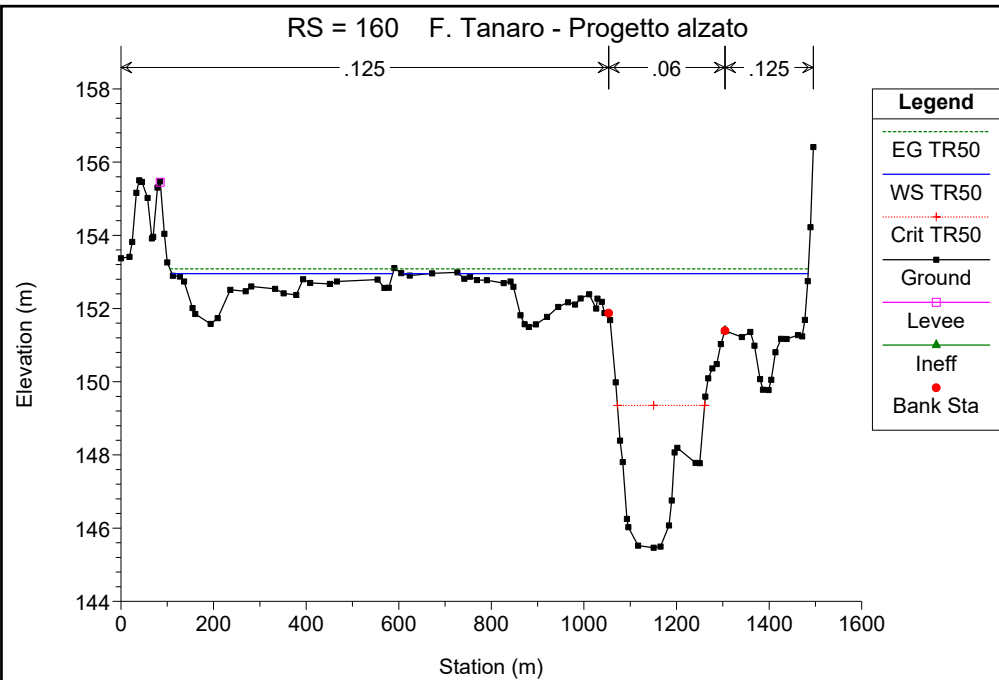


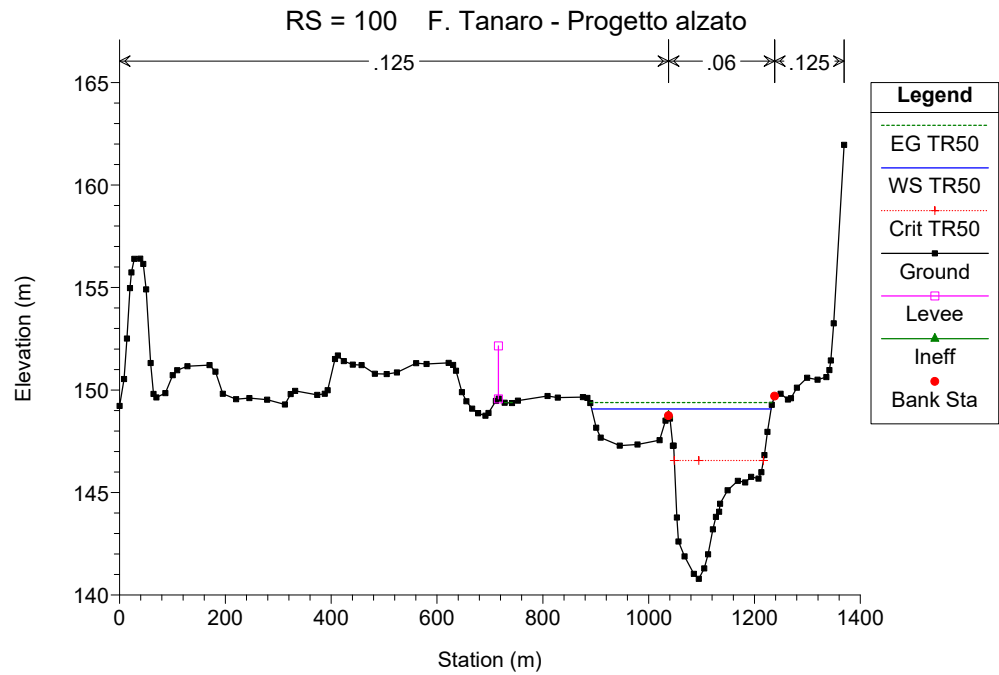
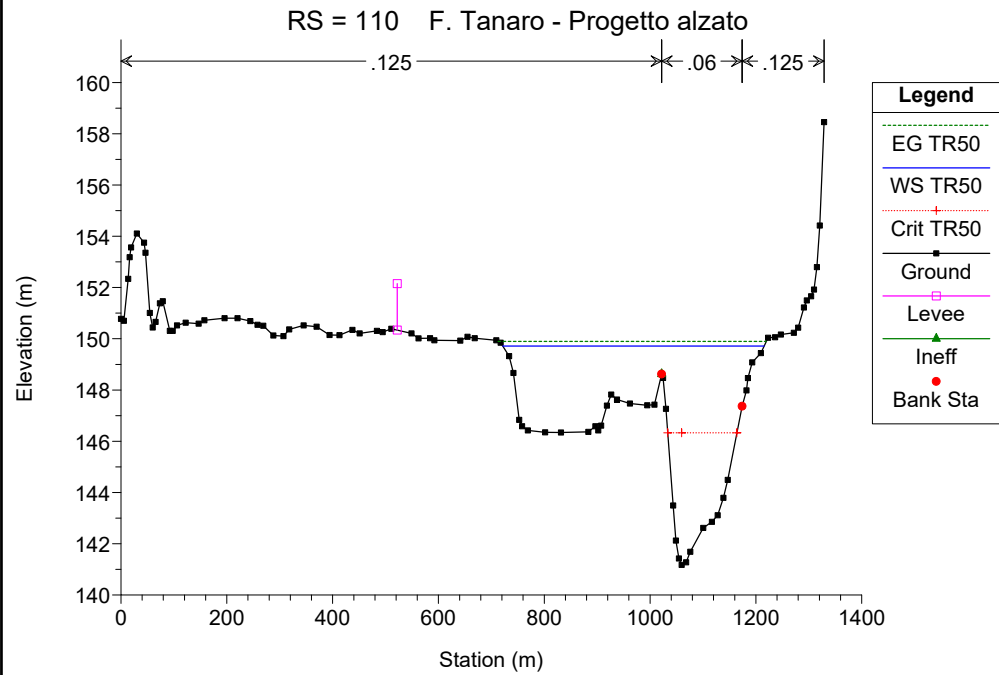
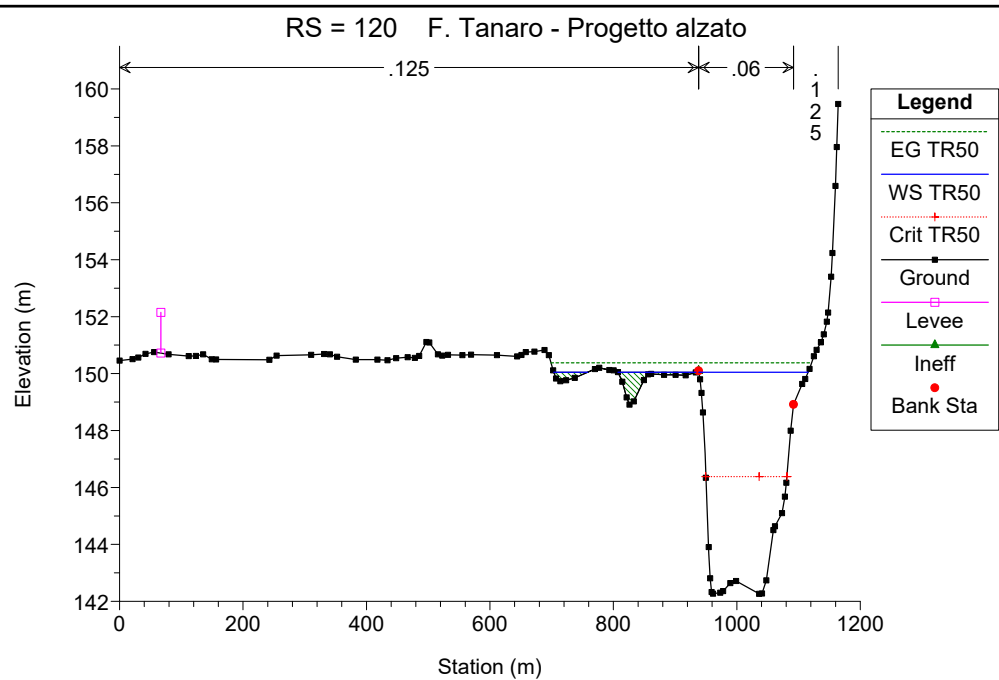
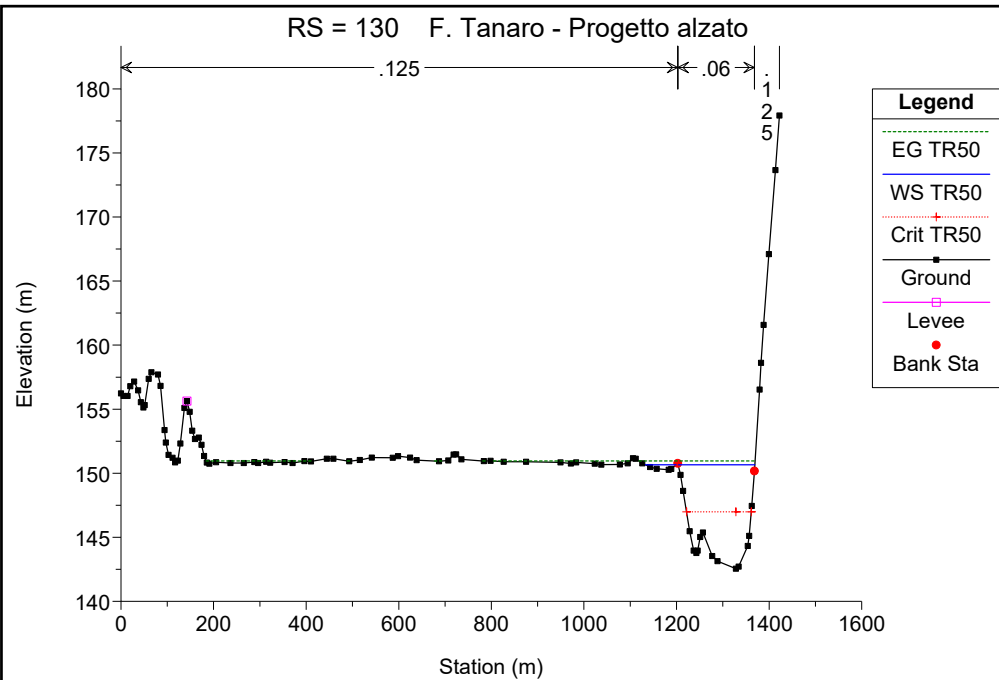


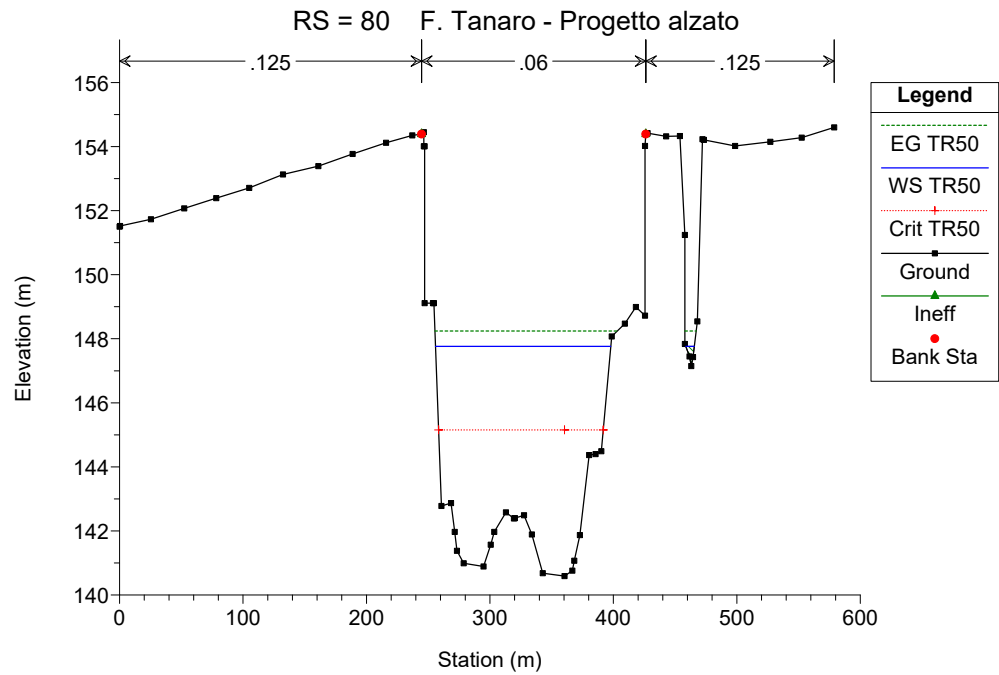
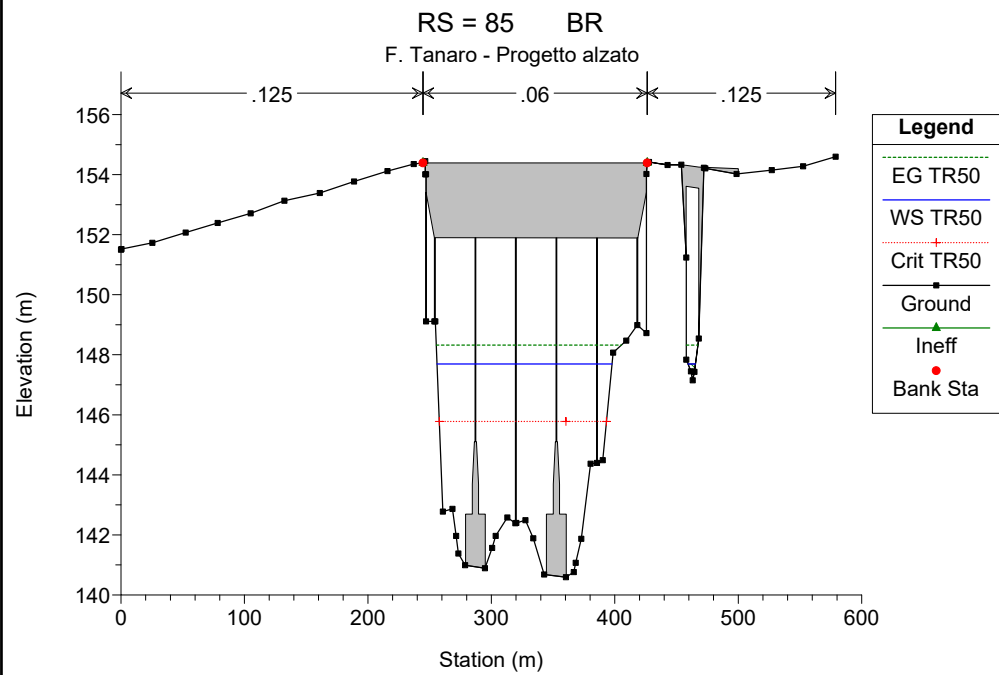
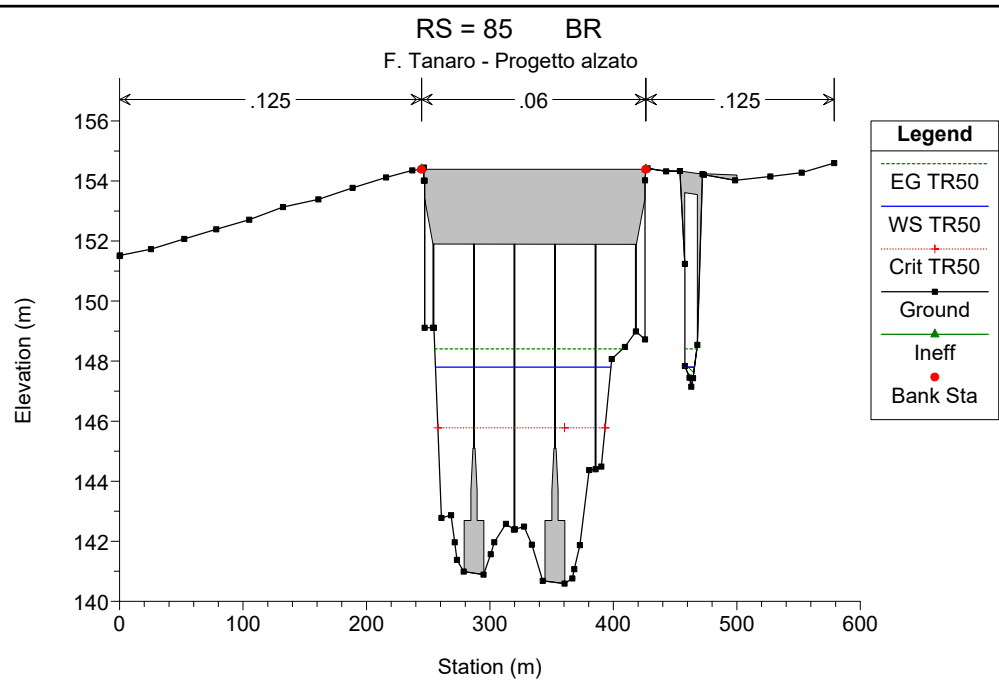
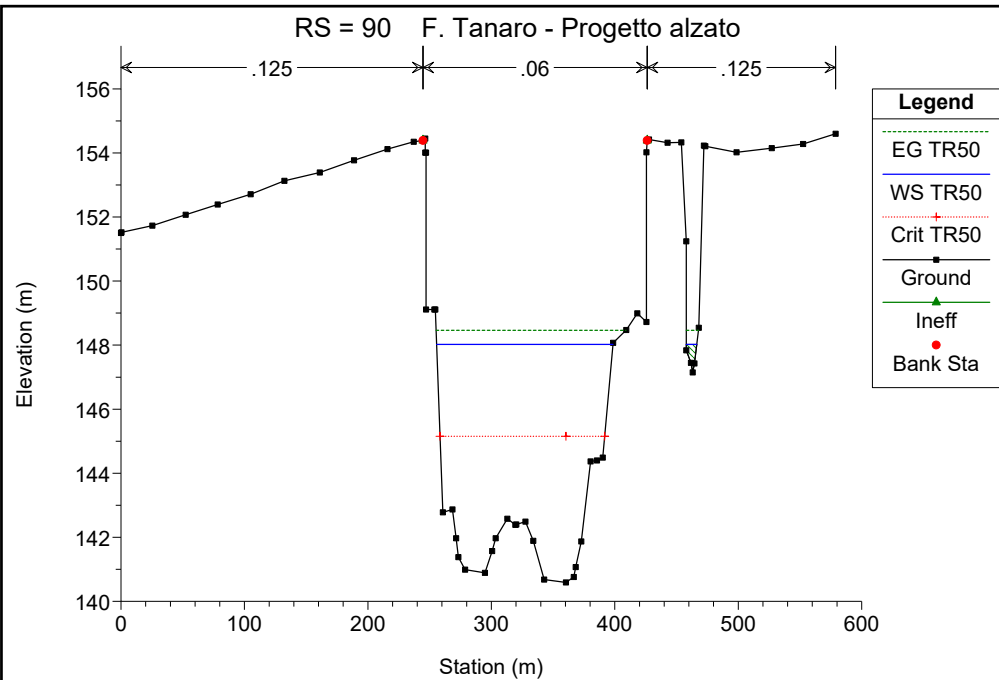


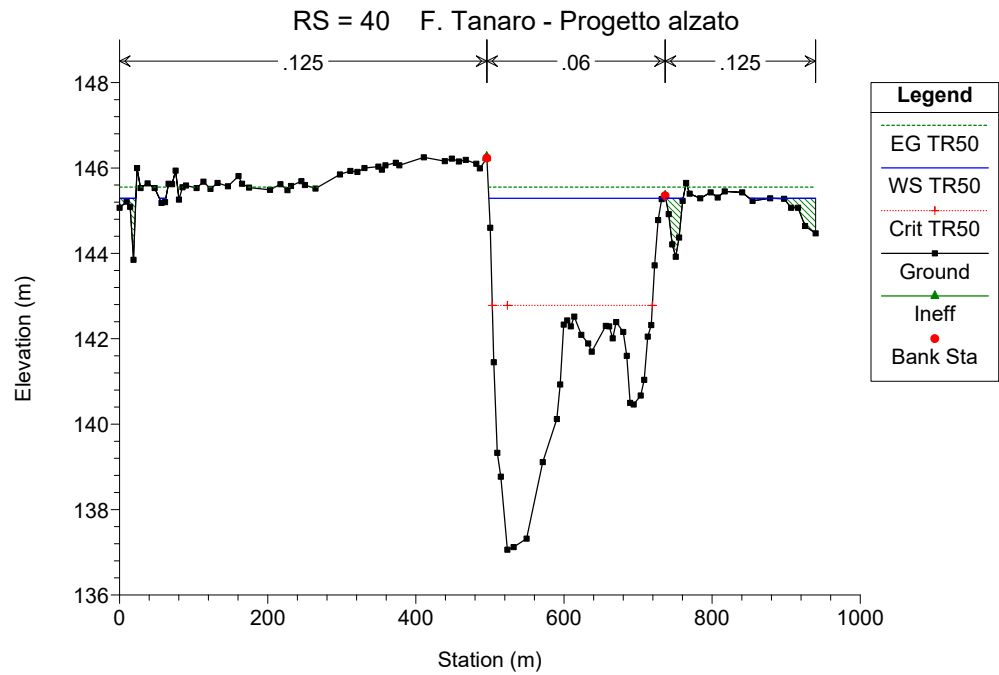
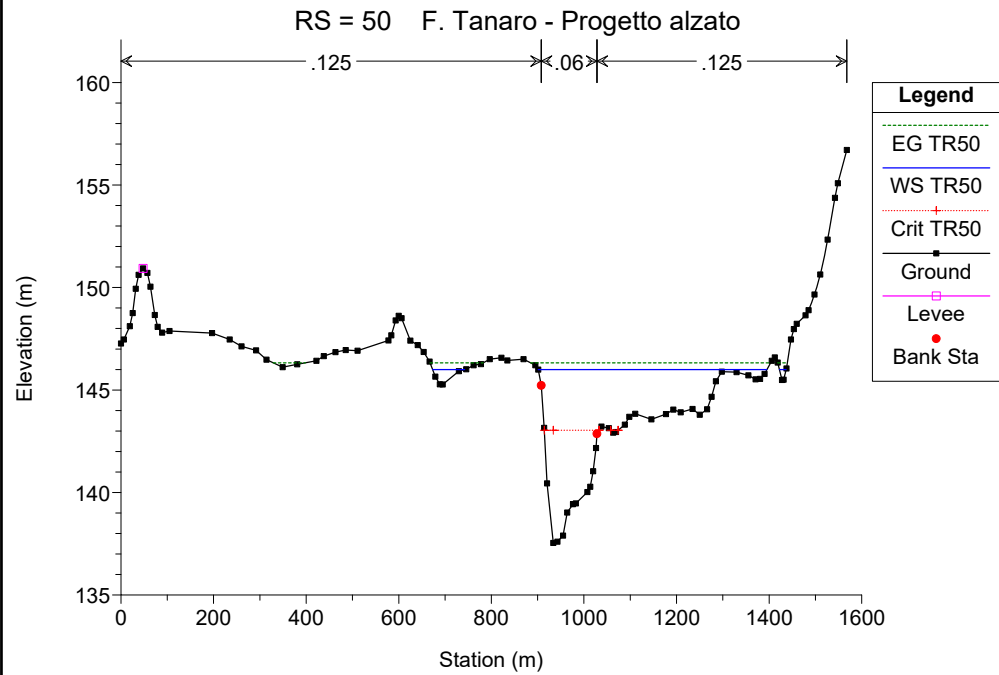
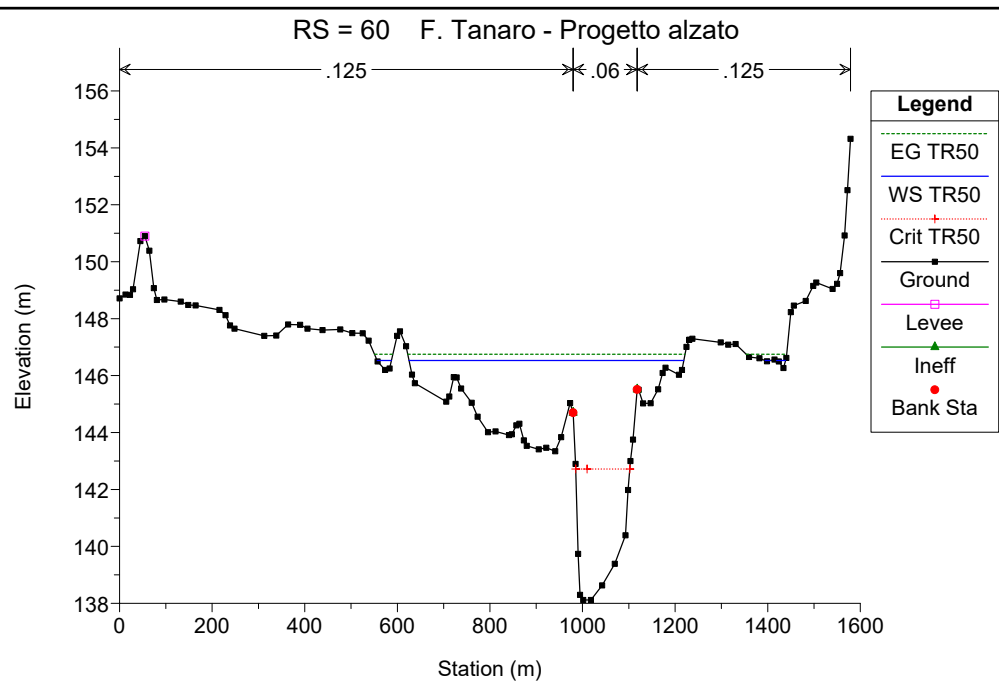
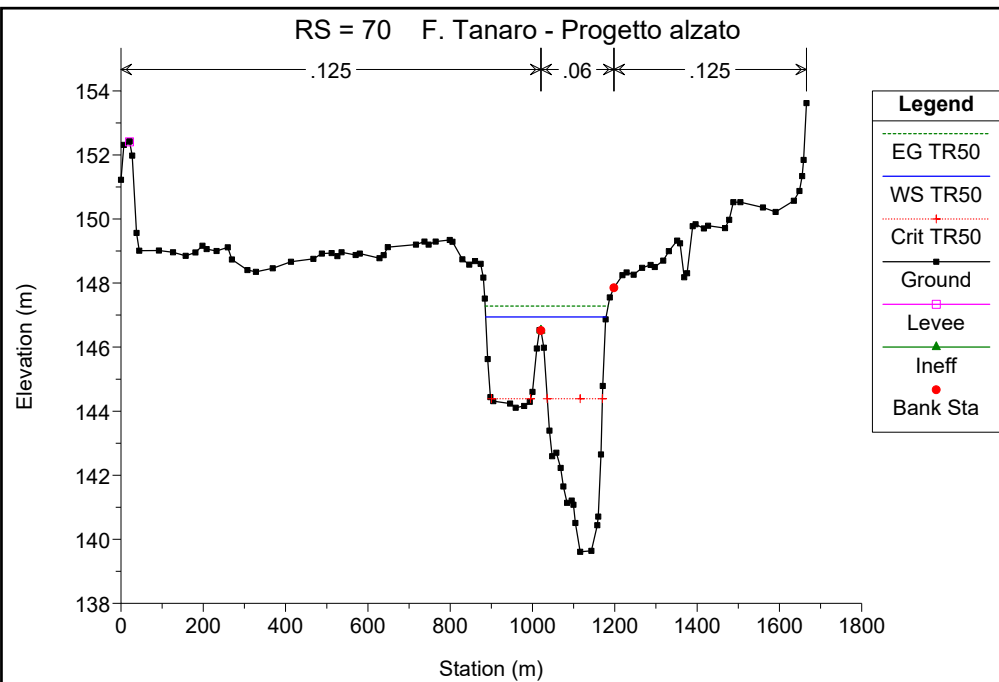


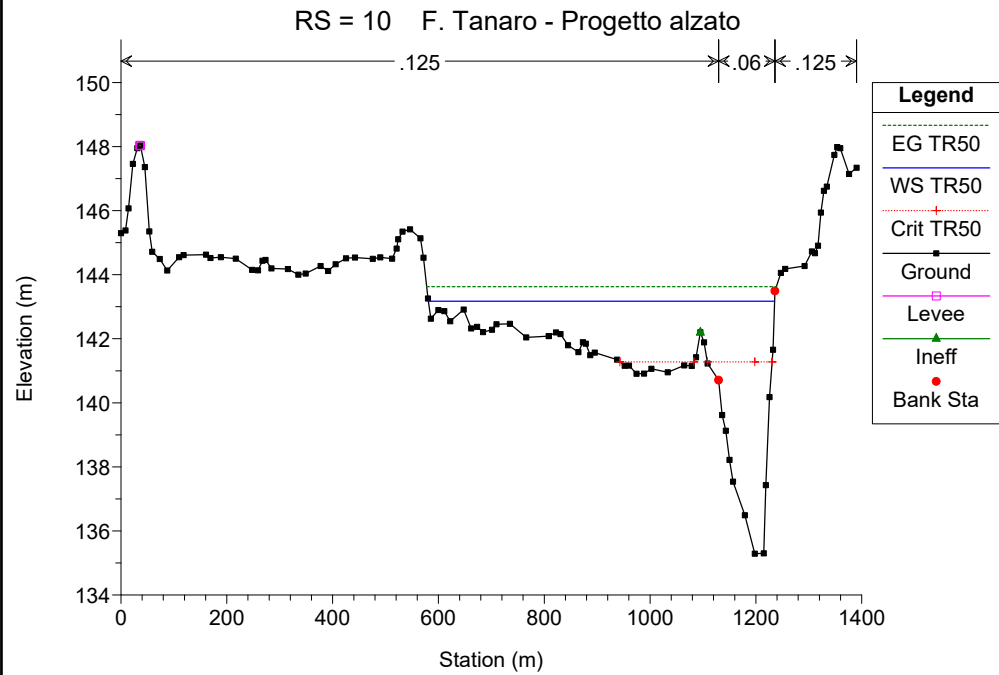
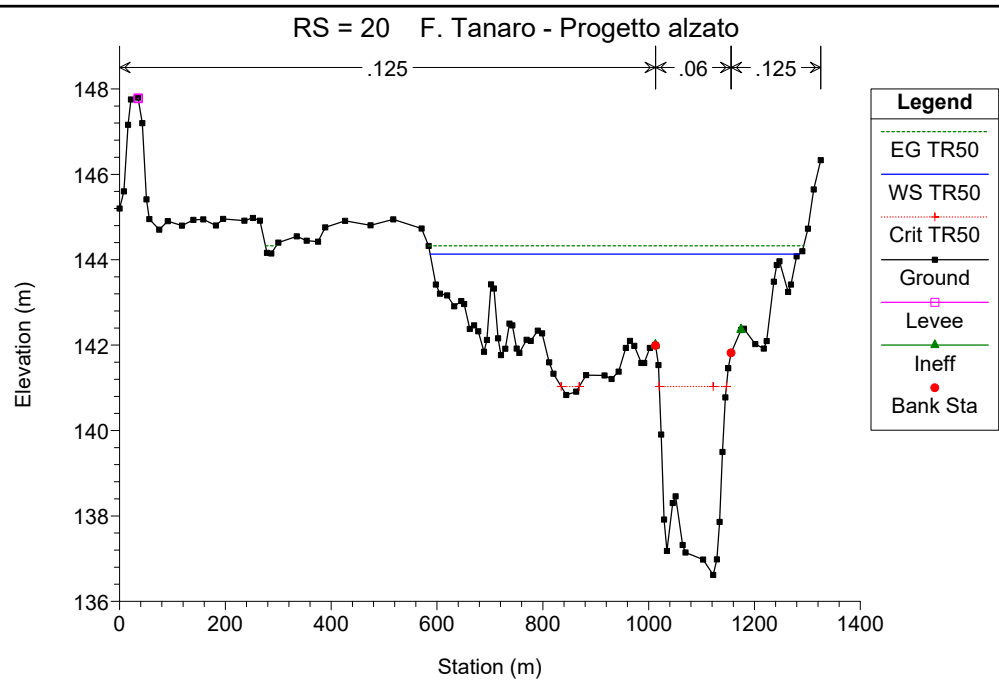
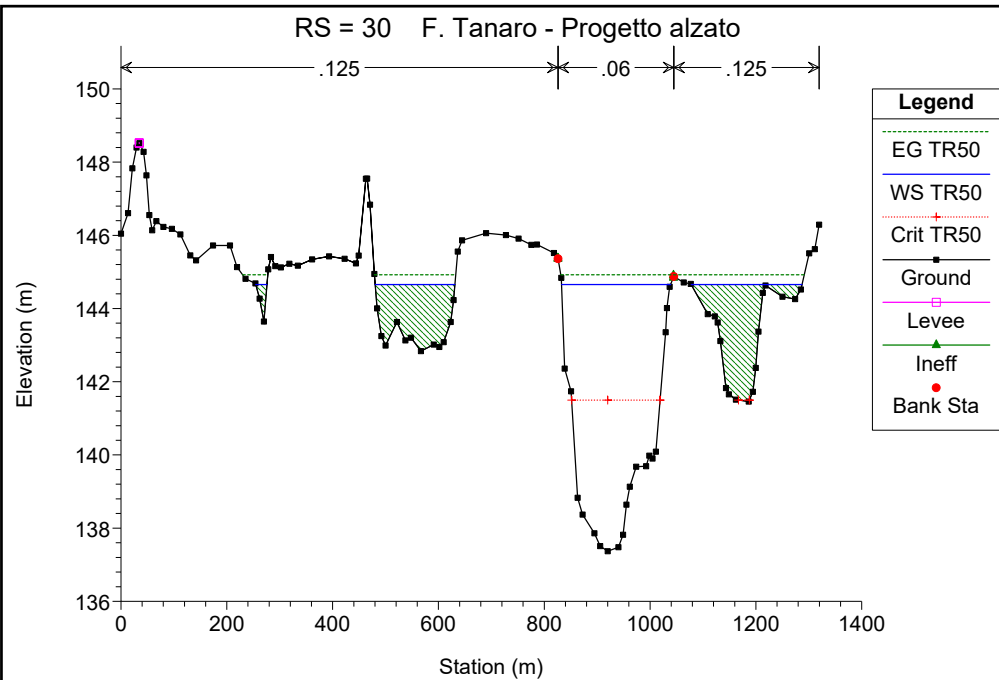












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 8

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2412	50
F. Tanaro valle Riddone	2419	
F. Tanaro valle Cherasca	2428	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50

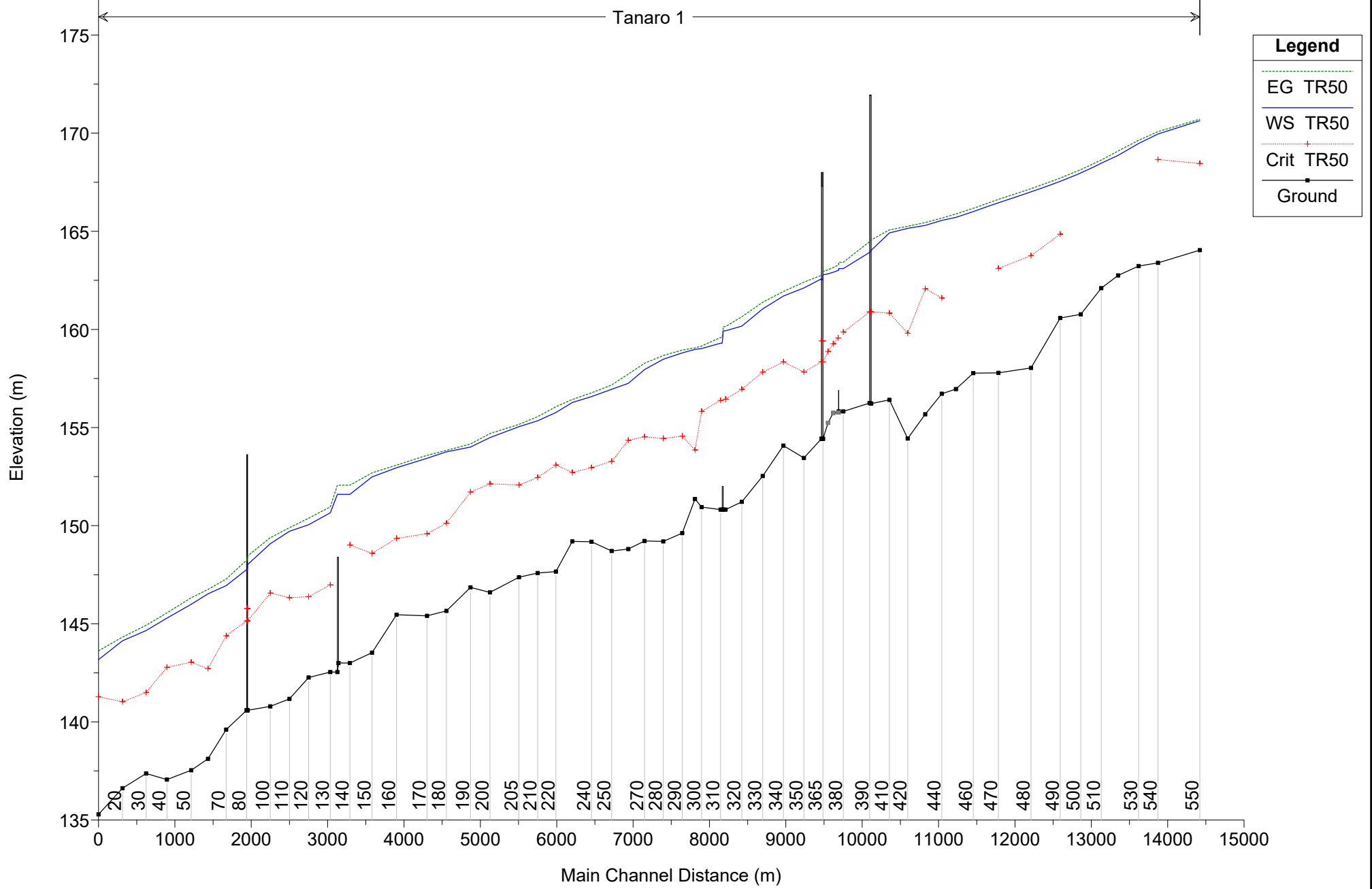
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR50	2412.00	164.04	170.64	168.46	170.71	0.001136	1.37	2719.61	1158.07	0.22
1	540	TR50	2412.00	163.39	169.96	168.66	170.08	0.001786	2.06	2661.16	1117.98	0.29
1	530	TR50	2412.00	163.23	169.48		169.64	0.001766	2.00	1918.91	663.79	0.29
1	520	TR50	2412.00	162.75	168.87		169.09	0.002413	2.35	1876.78	983.50	0.34
1	510	TR50	2412.00	162.10	168.47		168.63	0.002136	2.06	1936.88	717.69	0.31
1	500	TR50	2412.00	160.77	167.97		168.15	0.001660	2.06	1778.43	544.87	0.28
1	490	TR50	2412.00	160.58	167.54	164.86	167.71	0.001641	1.92	1638.16	502.85	0.28
1	480	TR50	2412.00	158.04	167.02	163.76	167.17	0.001317	1.89	1991.07	682.23	0.26
1	470	TR50	2412.00	157.79	166.44	163.11	166.62	0.001485	2.12	1812.13	510.22	0.27
1	460	TR50	2412.00	157.77	166.00		166.17	0.001256	1.94	1886.40	675.70	0.25
1	450	TR50	2412.00	156.96	165.71		165.89	0.001257	1.97	1767.71	560.41	0.25
1	440	TR50	2412.00	156.72	165.55	161.59	165.67	0.000922	1.75	2344.51	664.40	0.22
1	430	TR50	2412.00	155.68	165.30	162.07	165.44	0.001208	2.01	2294.65	661.06	0.25
1	420	TR50	2412.00	154.44	165.15	159.81	165.25	0.000610	1.60	2591.05	681.57	0.18
1	410	TR50	2412.00	156.41	164.92	160.83	165.07	0.001098	1.94	1970.38	512.57	0.24
1	400	TR50	2412.00	156.22	164.04	160.89	164.56	0.003234	3.27	831.04	162.93	0.40
1	395		Bridge									
1	390	TR50	2412.00	156.25	163.93	160.89	164.48	0.003426	3.34	812.97	162.62	0.41
1	380	TR50	2412.00	155.82	163.10	159.87	163.42	0.002191	2.51	971.91	199.50	0.33
1	379		Inl Struct									
1	370	TR50	2412.00	154.43	162.78	158.35	162.94	0.000994	1.81	1335.98	205.40	0.23
1	365		Bridge									
1	360	TR50	2412.00	154.43	162.58	158.35	162.75	0.001099	1.86	1294.70	204.84	0.24
1	350	TR50	2412.00	153.45	162.11	157.83	162.41	0.001687	2.41	1006.22	190.24	0.30
1	340	TR50	2419.00	154.08	161.70	158.34	161.94	0.001702	2.16	1206.48	374.23	0.29
1	330	TR50	2419.00	152.53	161.05	157.83	161.39	0.002364	2.60	1062.62	384.29	0.34
1	320	TR50	2419.00	151.21	160.17	156.95	160.65	0.002926	3.28	1143.13	371.16	0.39
1	315	TR50	2419.00	150.82	159.93	156.44	160.15	0.001587	2.41	1945.19	805.05	0.29
1	312.5		Inl Struct									
1	310	TR50	2419.00	150.82	159.30	156.38	159.59	0.002371	2.77	1564.82	531.93	0.35
1	300	TR50	2428.00	150.95	159.03	155.83	159.15	0.001233	1.79	2157.91	647.57	0.25
1	295	TR50	2428.00	151.36	158.98	153.85	159.06	0.000522	1.33	2754.02	726.35	0.17
1	290	TR50	2428.00	149.62	158.80	154.56	158.95	0.000998	1.72	1803.22	619.84	0.22
1	280	TR50	2428.00	149.20	158.48	154.44	158.67	0.001259	2.11	1765.09	456.87	0.26
1	270	TR50	2428.00	149.22	157.95	154.53	158.27	0.002132	2.73	1441.16	458.16	0.33
1	260	TR50	2428.00	148.81	157.26	154.35	157.73	0.003098	3.22	1046.56	287.48	0.40
1	250	TR50	2428.00	148.71	156.95	153.28	157.17	0.001692	2.25	1616.17	511.14	0.29
1	240	TR50	2428.00	149.18	156.58	152.95	156.77	0.001352	2.06	1815.71	742.94	0.26
1	230	TR50	2428.00	149.20	156.27	152.71	156.43	0.001245	1.88	1733.00	456.34	0.25
1	220	TR50	2428.00	147.66	155.76	153.09	156.06	0.002303	2.64	1376.41	398.82	0.34

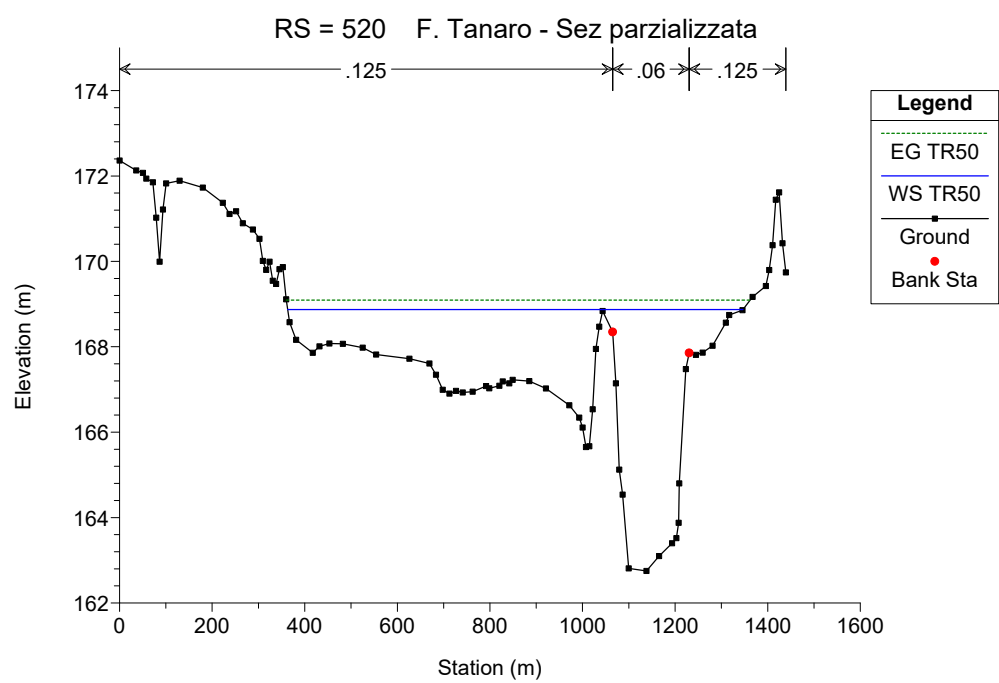
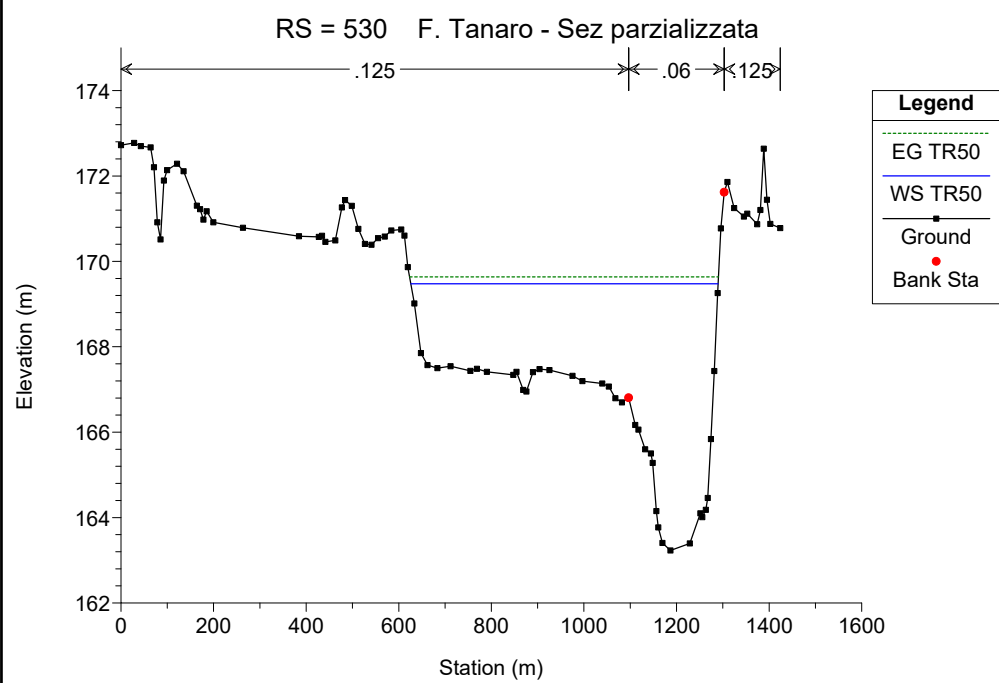
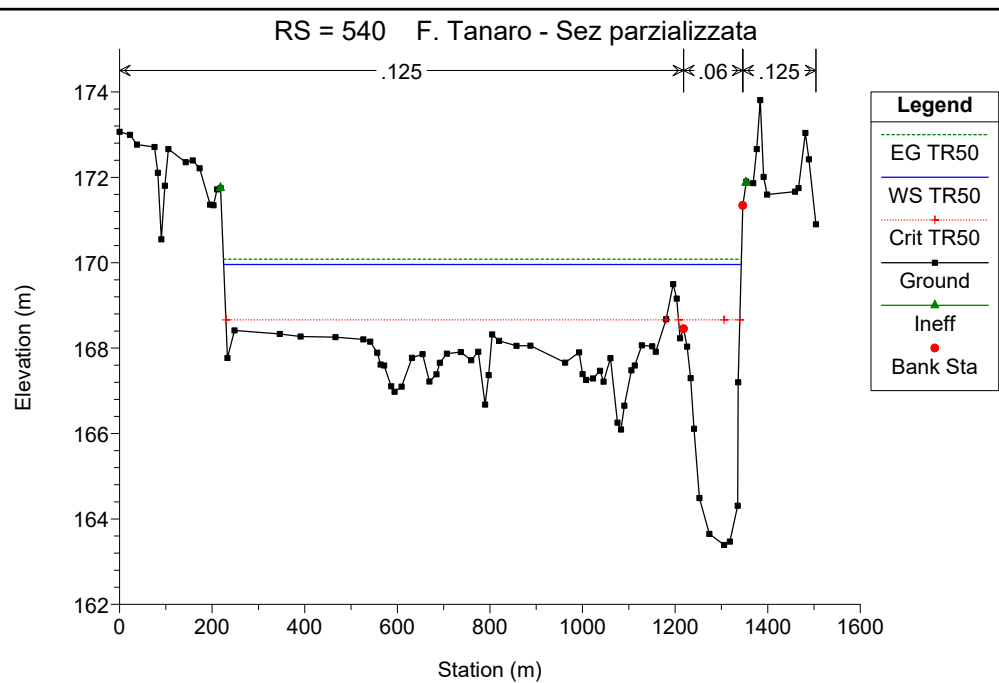
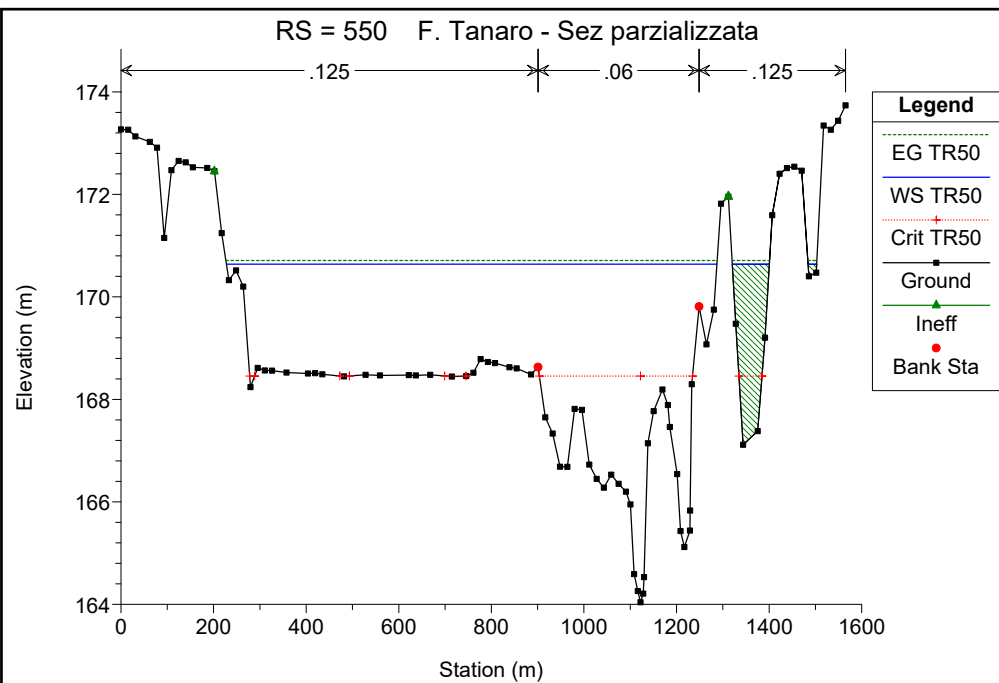
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR50 (Continued)

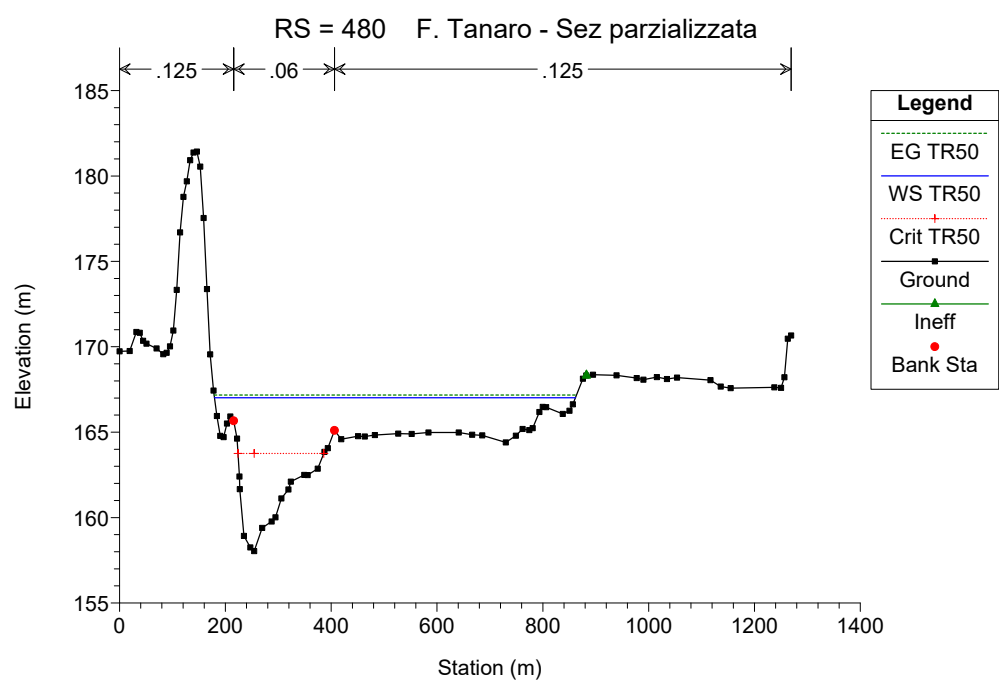
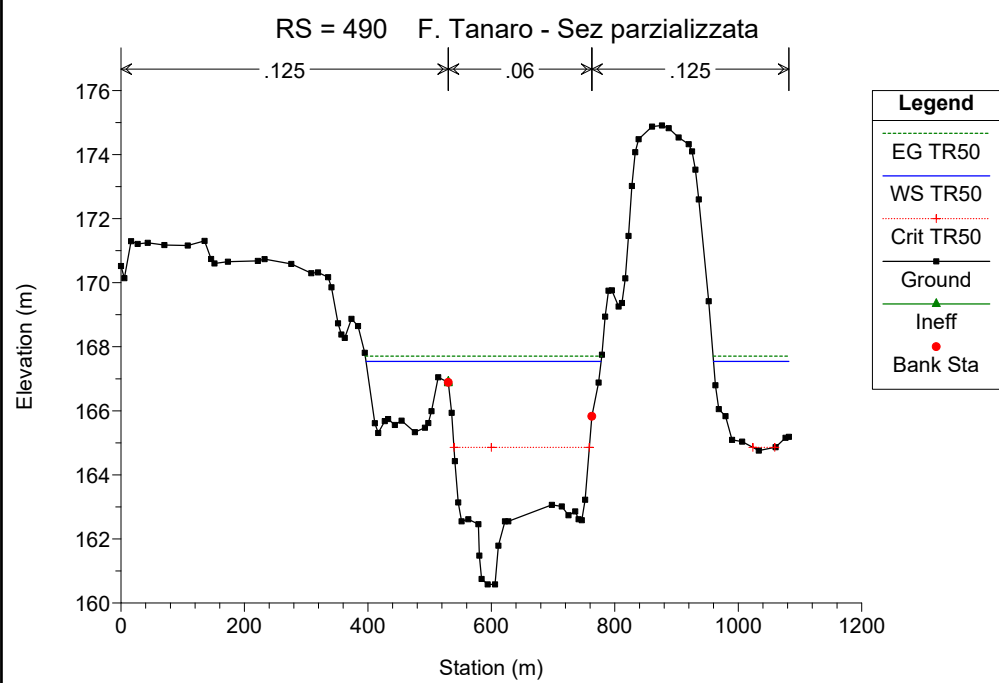
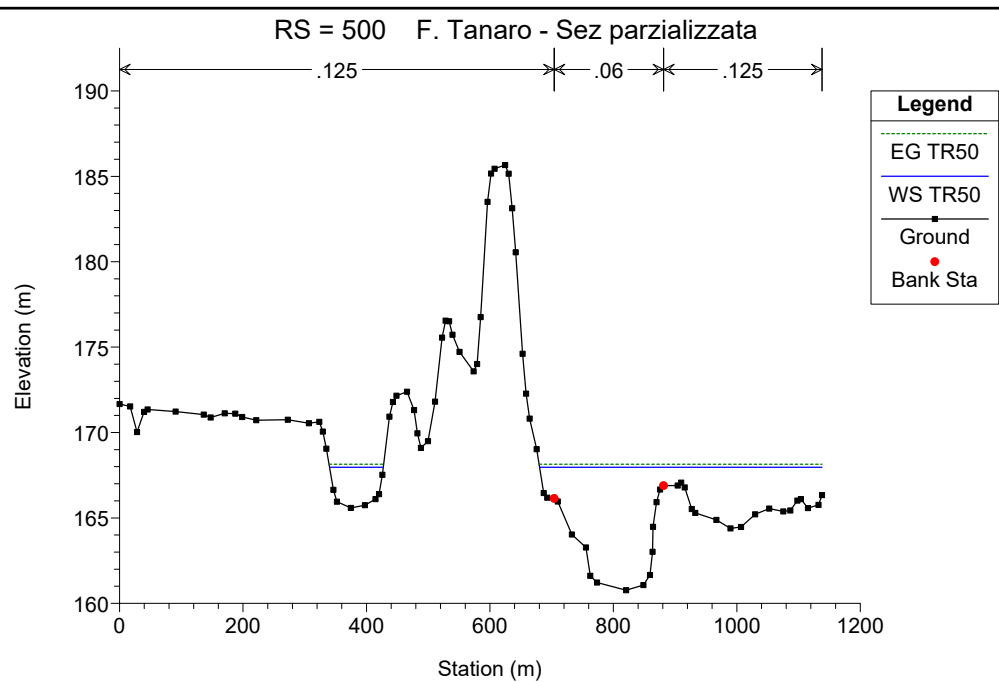
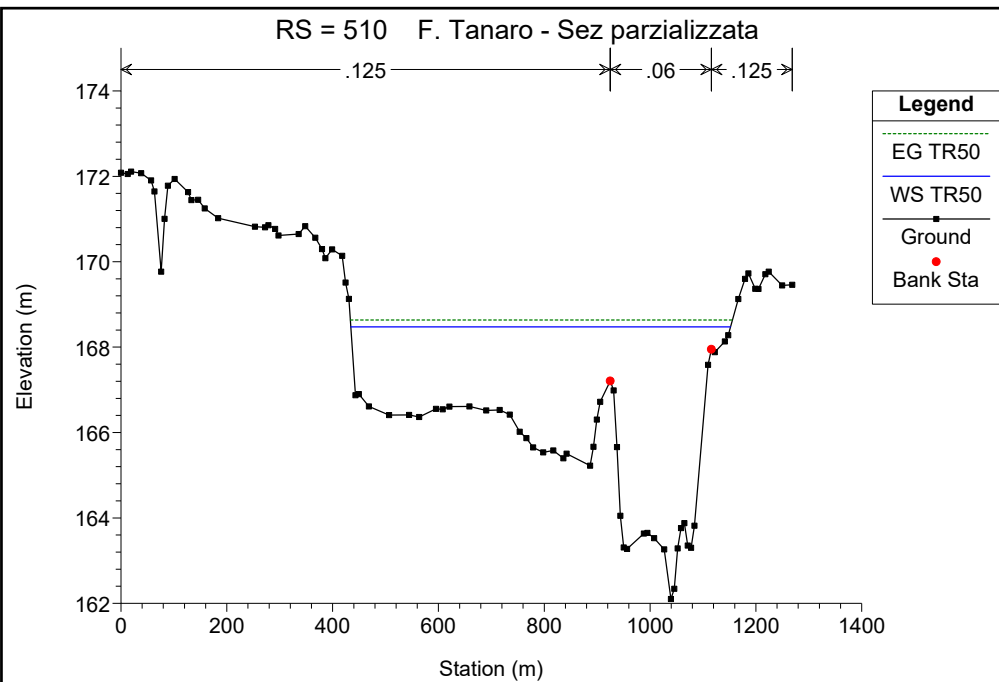
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR50	2428.00	147.59	155.34	152.46	155.56	0.001749	2.16	1558.25	543.07	0.29
1	205	TR50	2428.00	147.37	155.05	152.08	155.16	0.001201	1.71	2441.54	970.21	0.24
1	200	TR50	2428.00	146.60	154.49	152.13	154.70	0.002044	2.43	2196.13	1055.55	0.32
1	190	TR50	2428.00	146.85	154.01	151.71	154.16	0.001940	1.99	2121.97	969.08	0.30
1	180	TR50	2428.00	145.66	153.76	150.13	153.83	0.000667	1.25	2944.86	1075.92	0.18
1	170	TR50	2428.00	145.40	153.44	149.59	153.58	0.001445	1.79	1895.57	1184.26	0.26
1	160	TR50	2428.00	145.46	152.95	149.35	153.08	0.001129	1.68	2099.14	1288.81	0.23
1	150	TR50	2428.00	143.53	152.49	148.59	152.69	0.001330	2.08	1787.82	1232.09	0.26
1	140	TR50	2428.00	143.00	151.59	149.01	152.06	0.003770	3.05	938.95	872.60	0.43
1	135		Inl Struct									
1	130	TR50	2428.00	142.54	150.66	146.98	150.96	0.001970	2.44	1013.08	231.51	0.32
1	120	TR50	2428.00	142.27	150.05	146.38	150.38	0.002088	2.55	965.31	358.53	0.33
1	110	TR50	2428.00	141.17	149.71	146.33	149.90	0.001474	2.12	1750.86	493.87	0.27
1	100	TR50	2428.00	140.79	149.08	146.56	149.39	0.002881	2.51	1133.10	339.10	0.37
1	90	TR50	2428.00	140.59	148.02	145.15	148.46	0.003086	2.93	827.72	151.38	0.39
1	85		Bridge									
1	80	TR50	2428.00	140.59	147.76	145.15	148.24	0.003561	3.07	790.65	148.92	0.42
1	70	TR50	2428.00	139.61	146.94	144.39	147.28	0.003072	2.71	1119.75	292.63	0.38
1	60	TR50	2428.00	138.12	146.53	142.72	146.75	0.001510	2.26	1707.35	654.89	0.28
1	50	TR50	2428.00	137.54	145.99	143.04	146.33	0.002371	2.75	1402.93	577.29	0.35
1	40	TR50	2428.00	137.06	145.29	142.78	145.55	0.002519	2.28	1066.03	377.43	0.34
1	30	TR50	2428.00	137.37	144.66	141.50	144.92	0.002133	2.29	1061.84	587.34	0.32
1	20	TR50	2428.00	136.62	144.13	141.03	144.32	0.001596	2.19	1942.48	697.53	0.28
1	10	TR50	2428.00	135.29	143.17	141.28	143.63	0.004006	3.30	1342.28	654.46	0.44

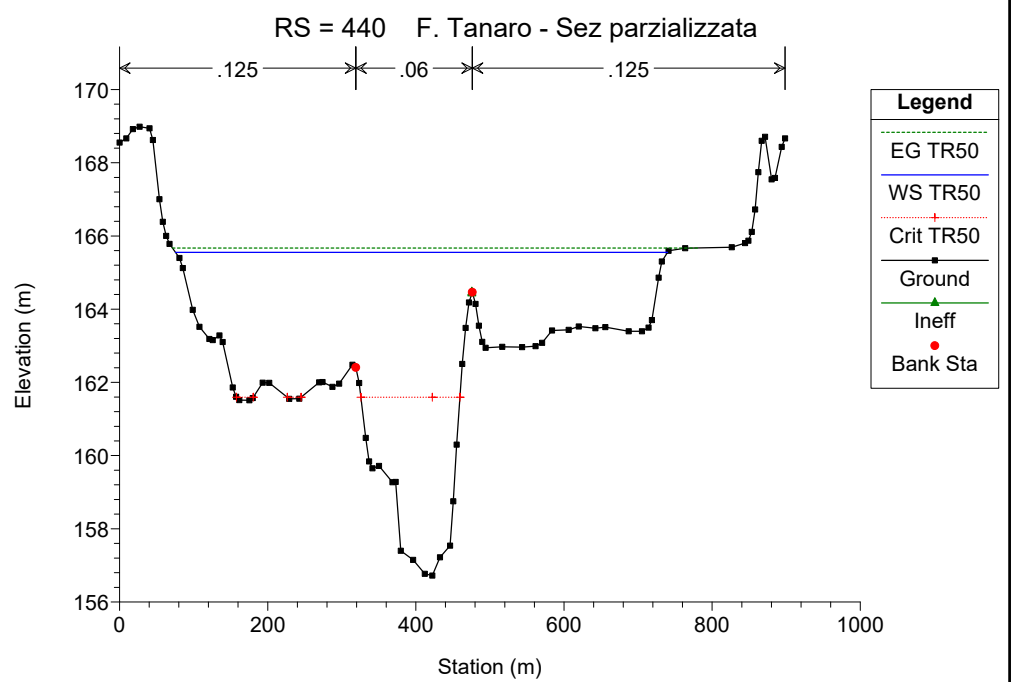
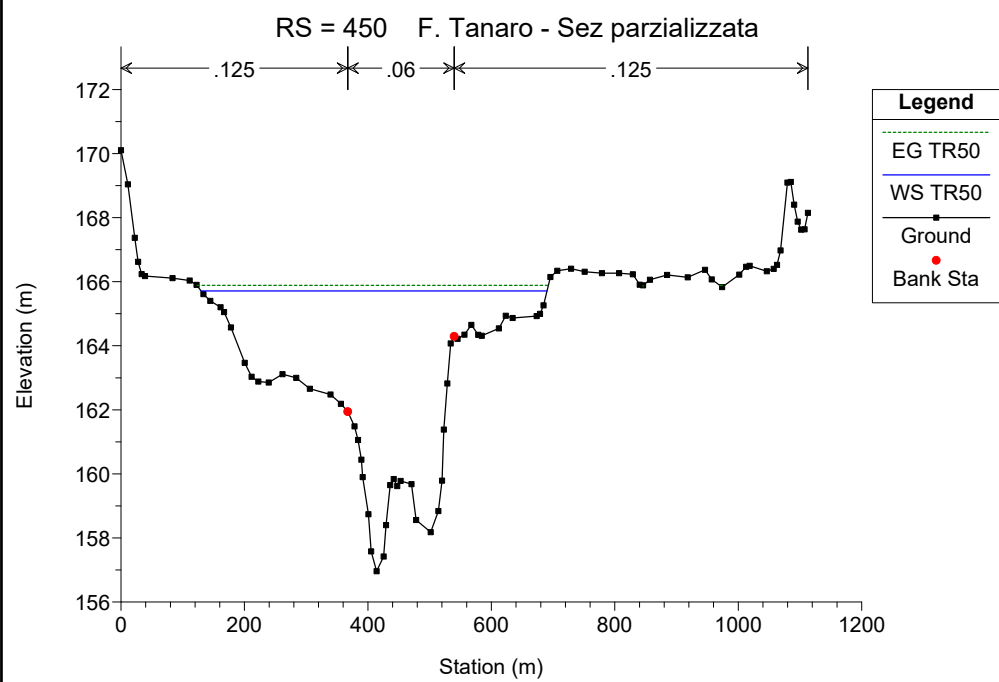
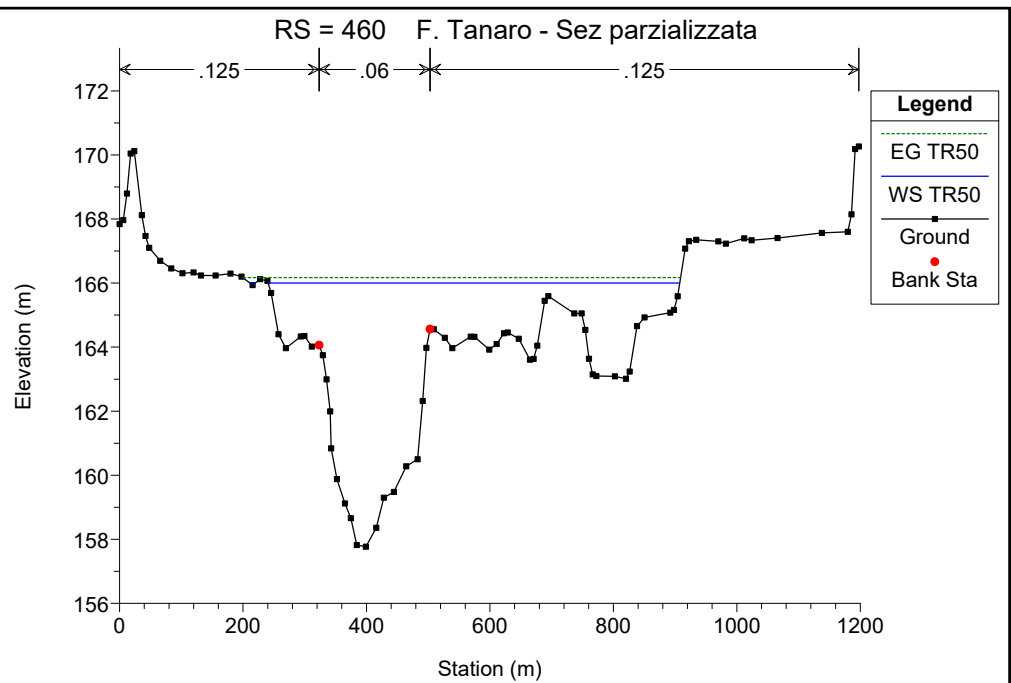
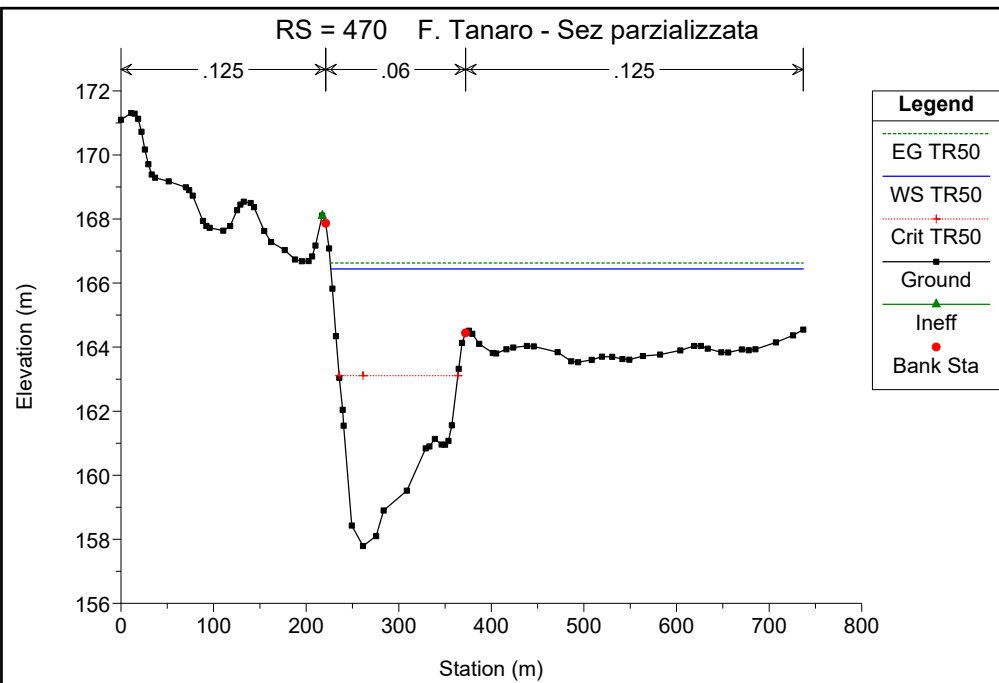
F. Tanaro - Sez parzializzata

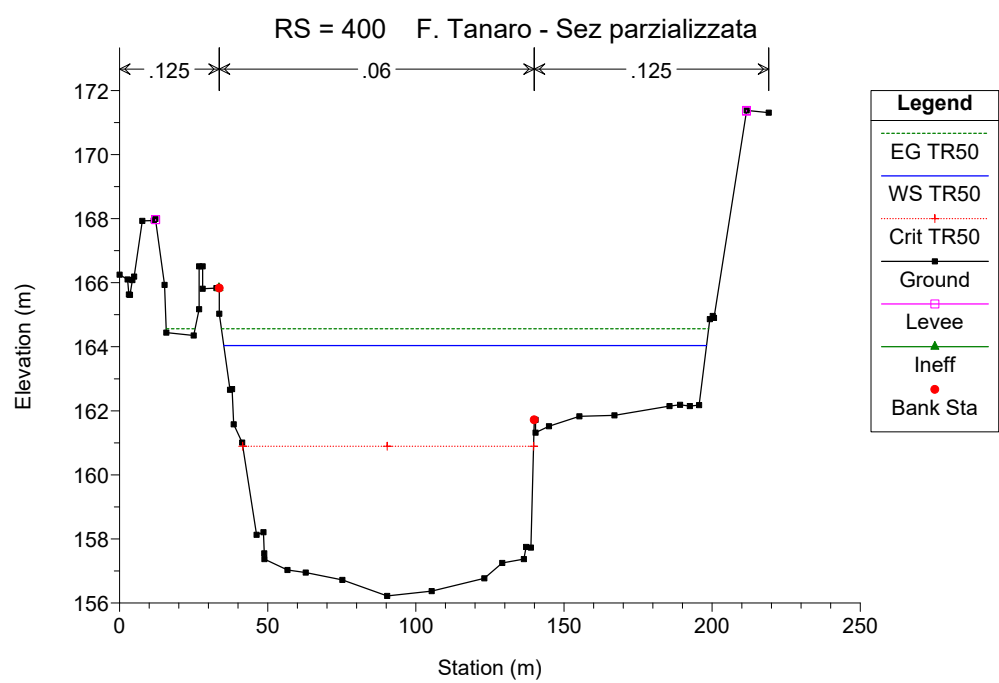
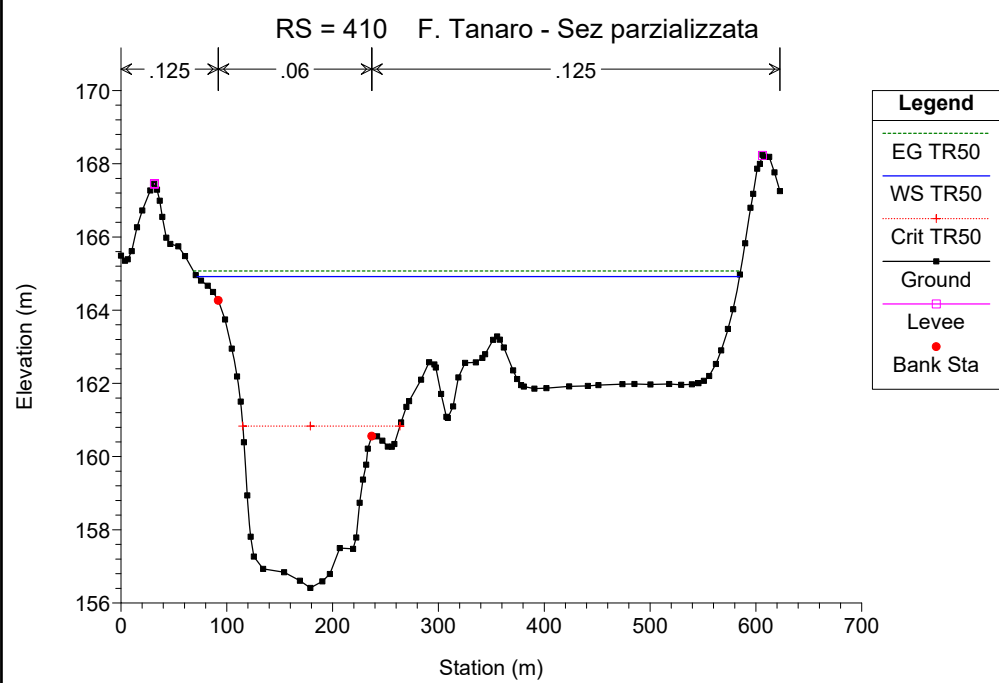
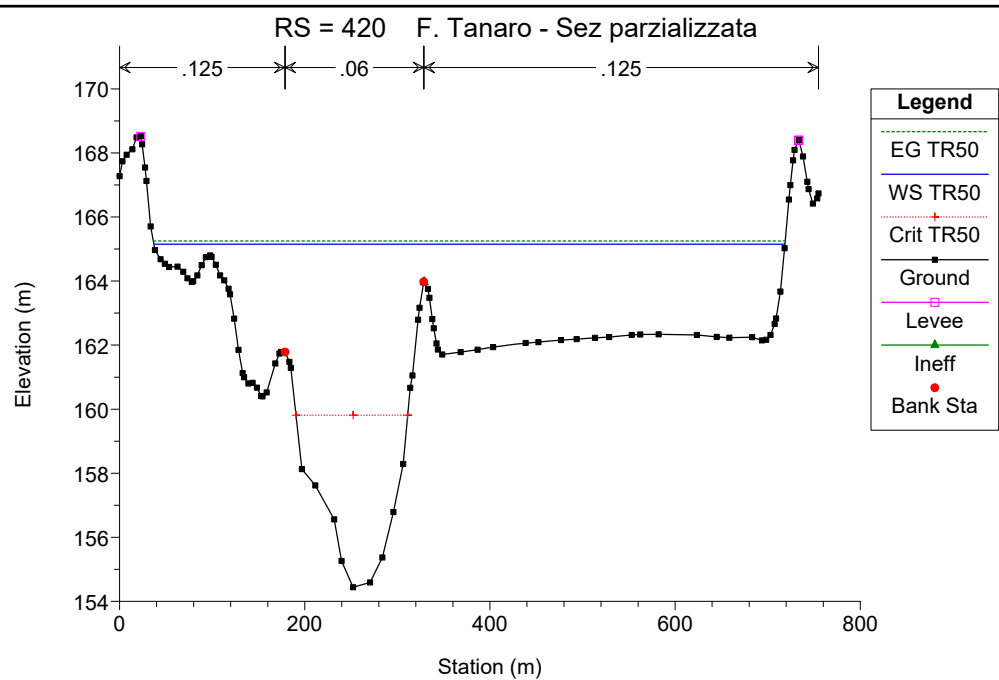
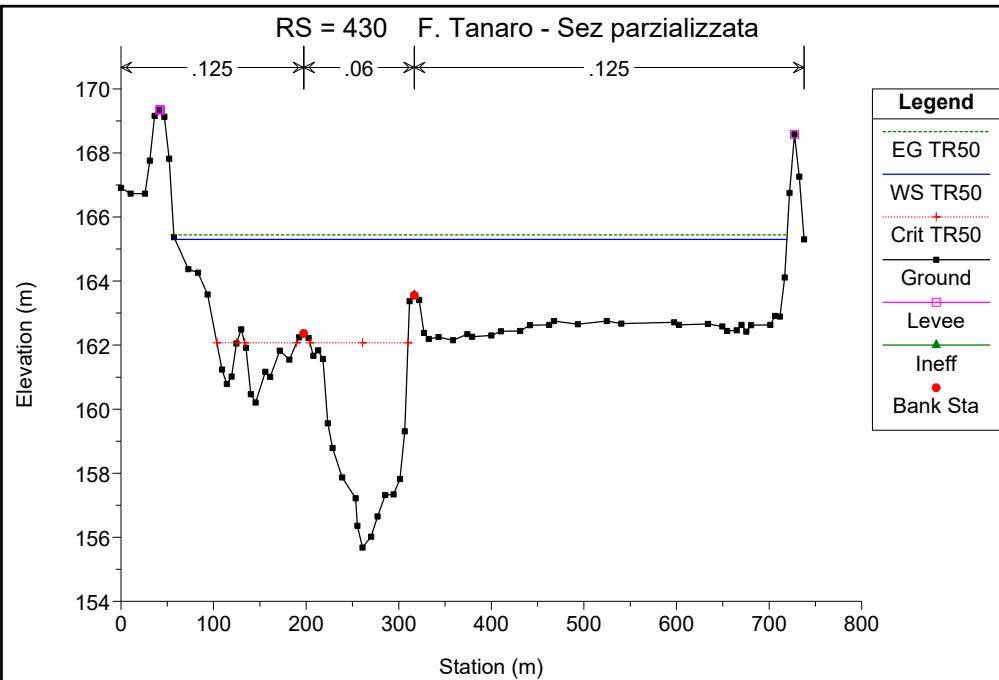
Tanaro 1

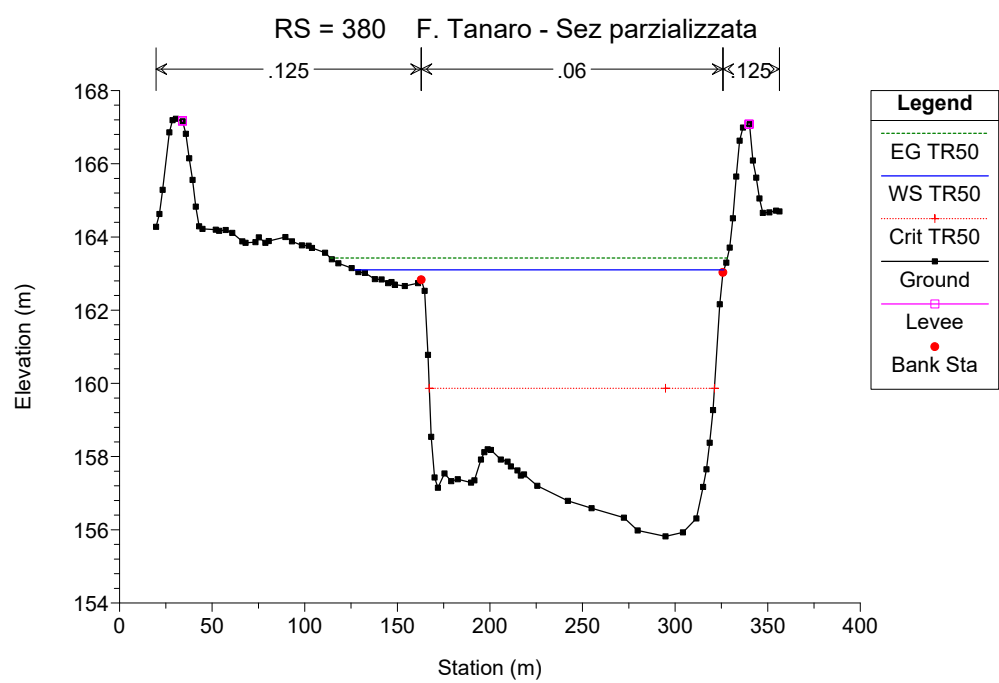
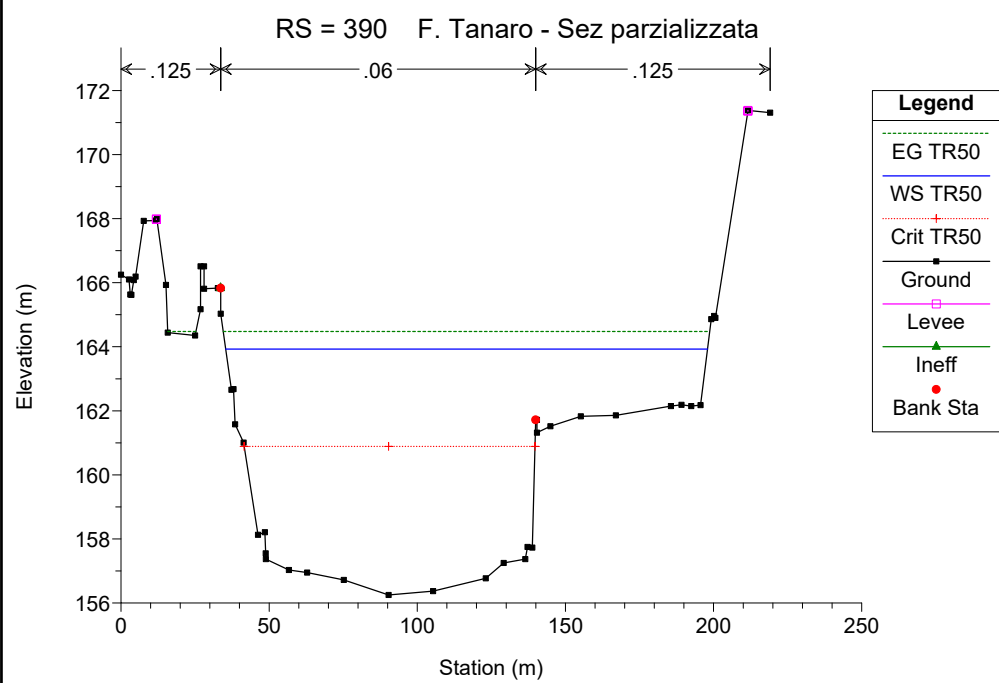
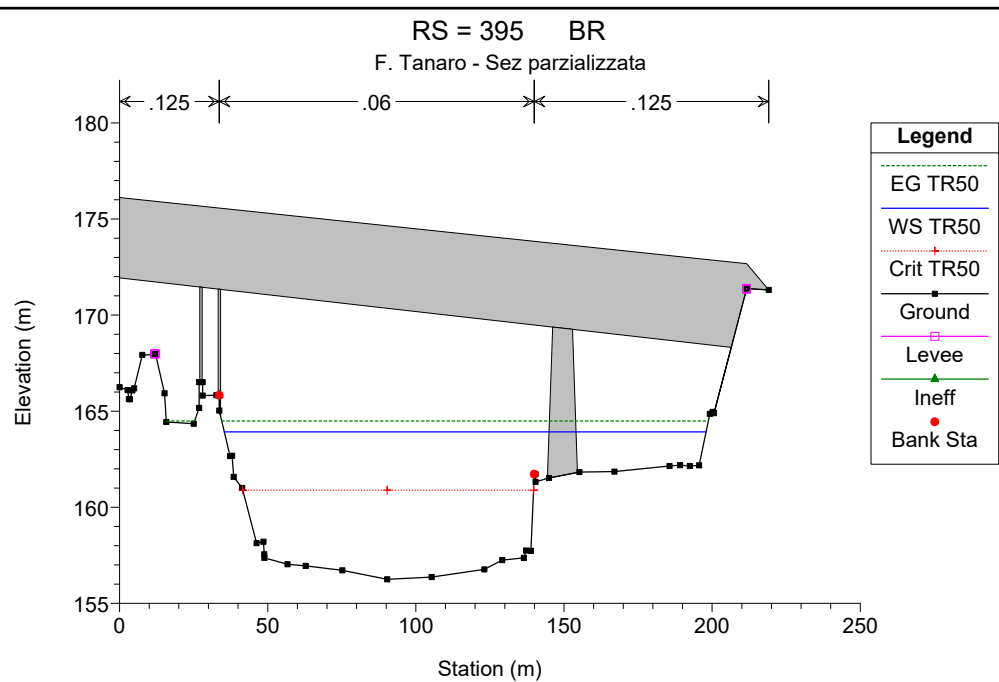
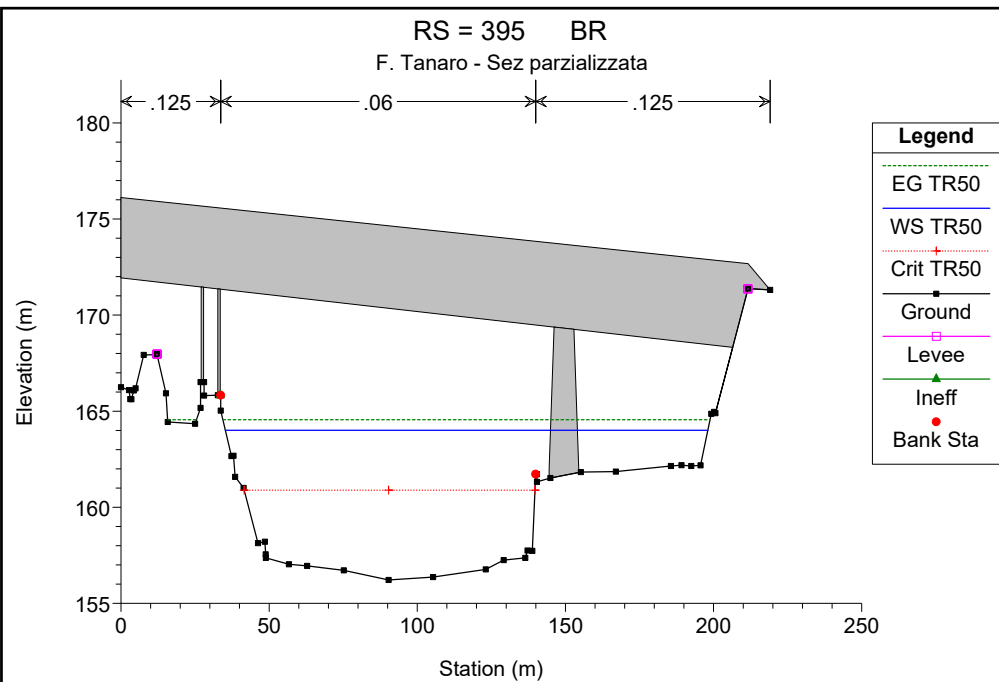


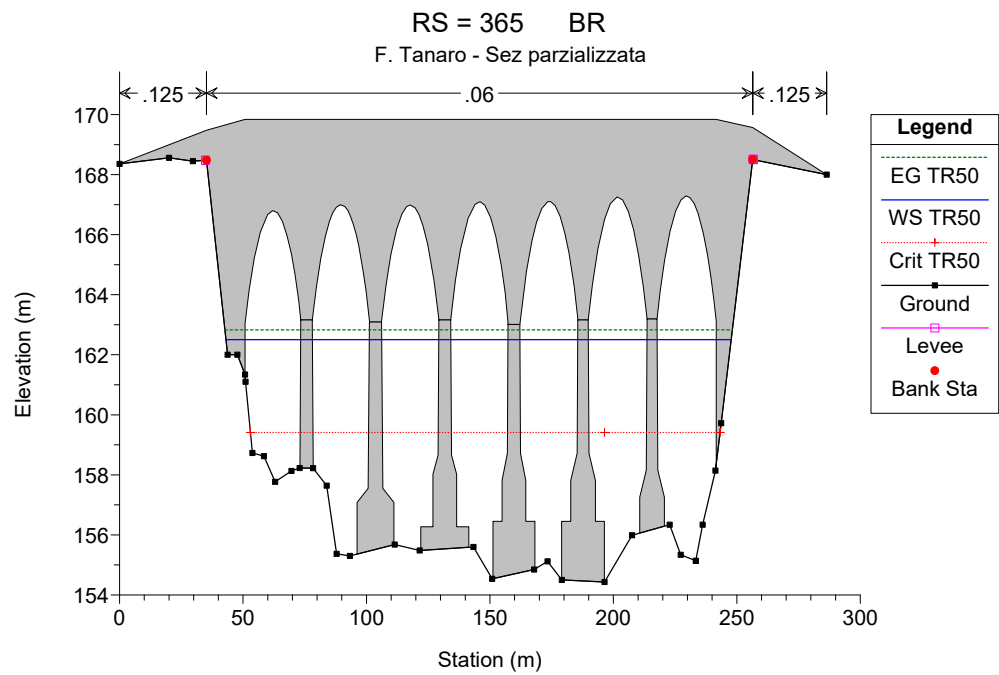
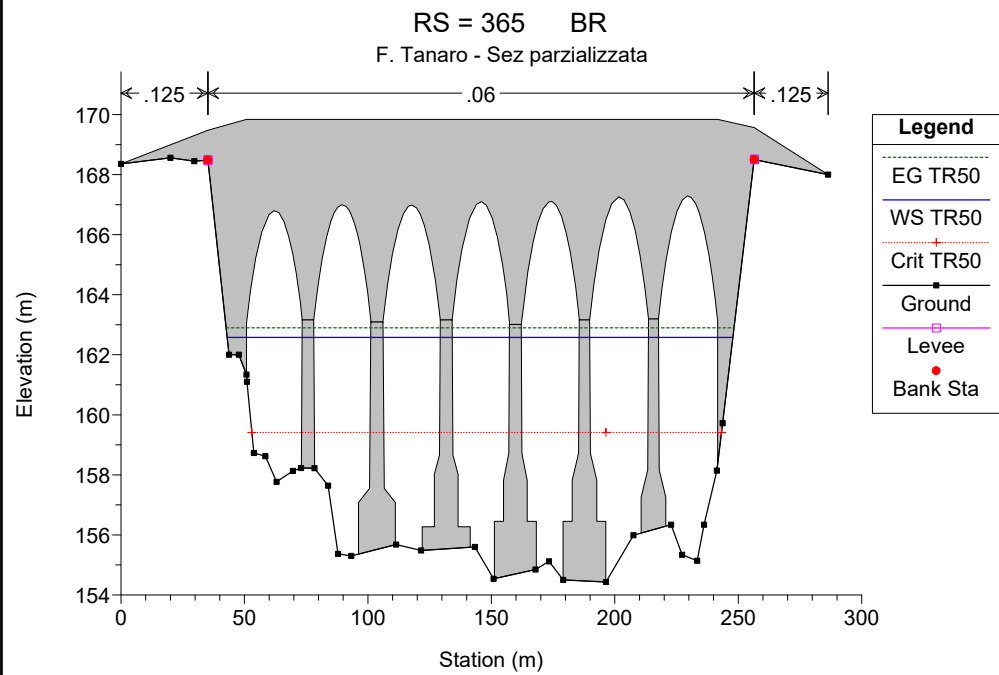
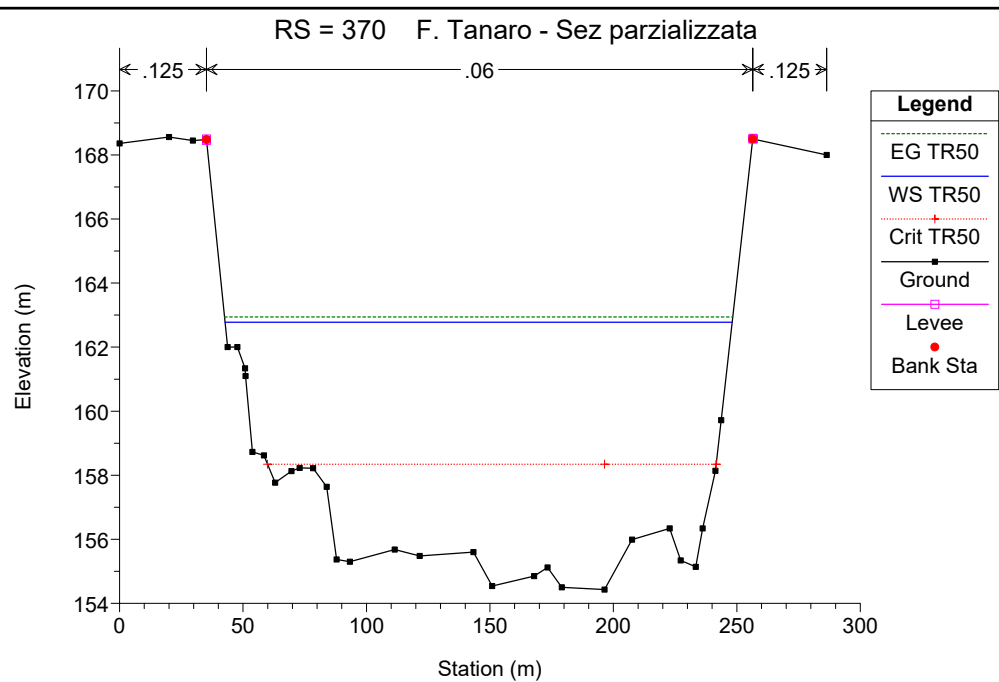
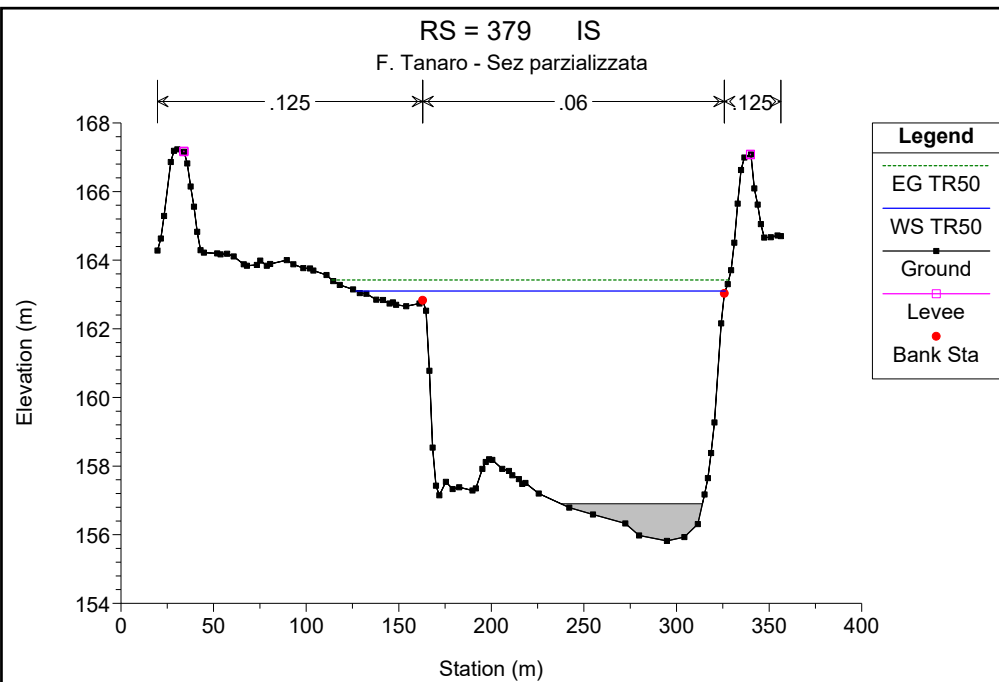


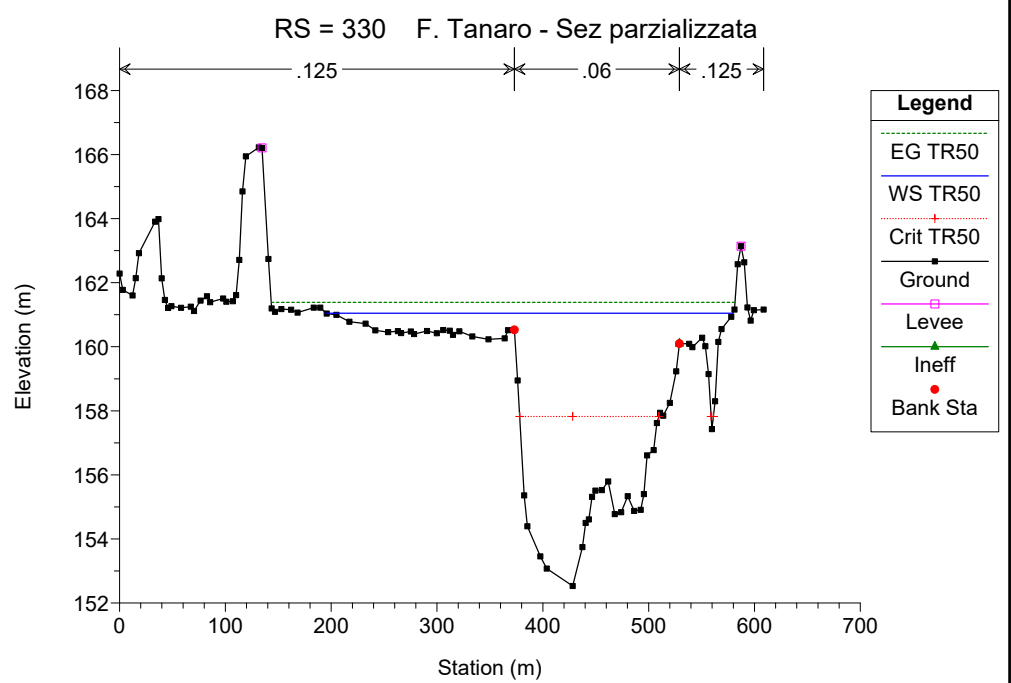
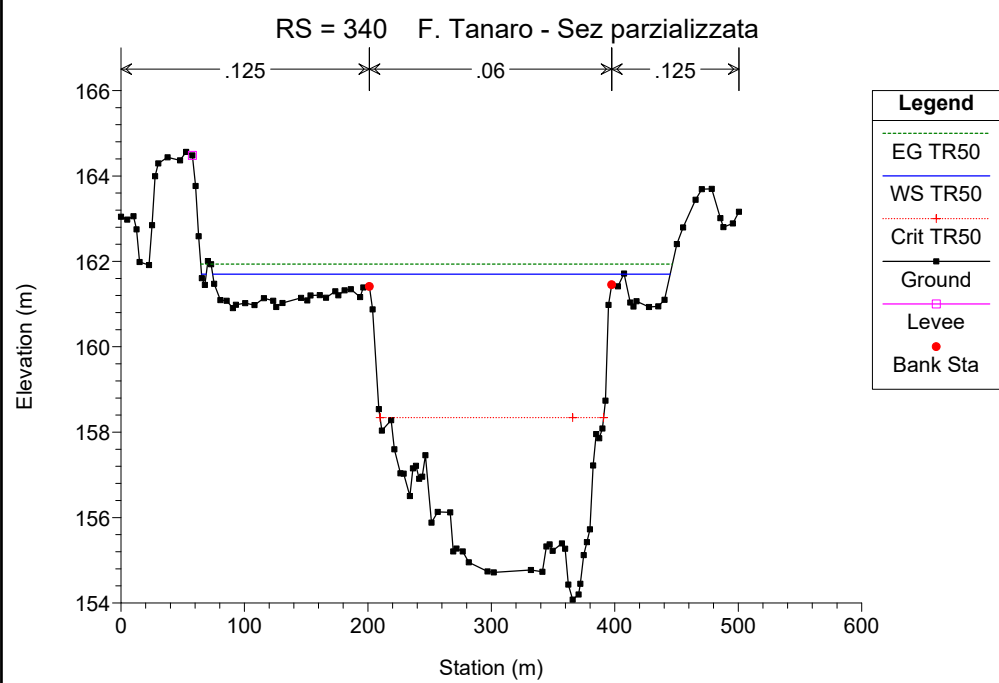
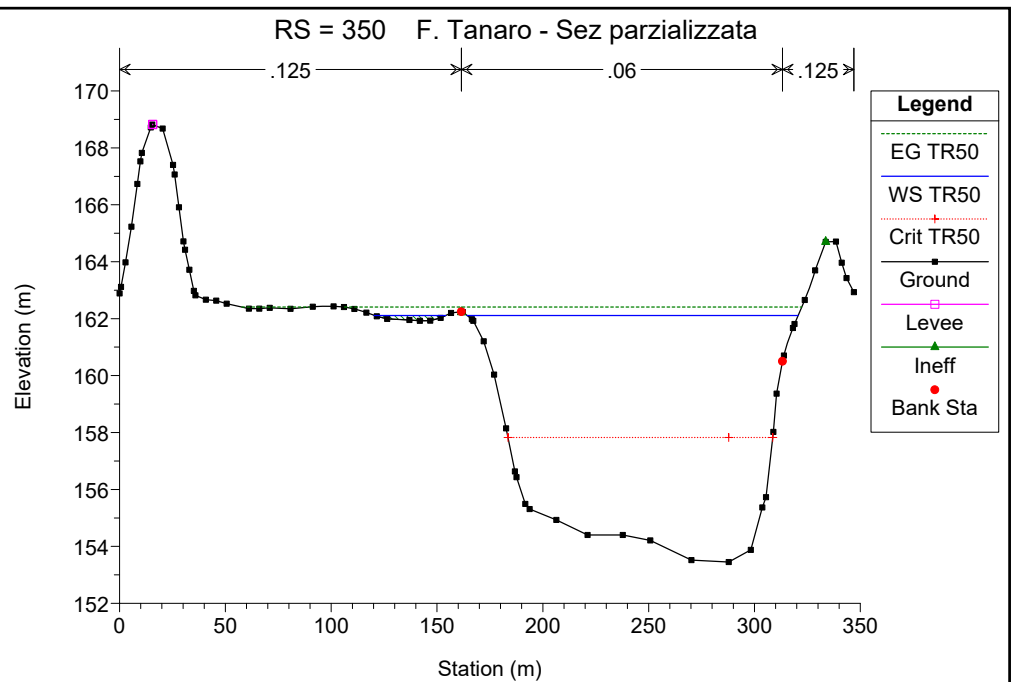
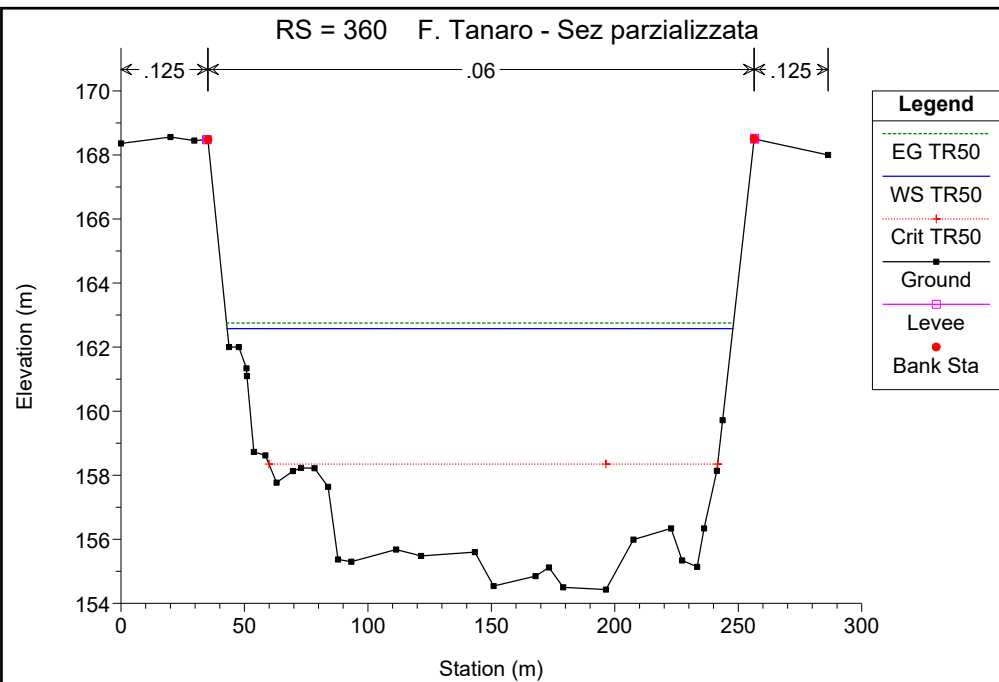


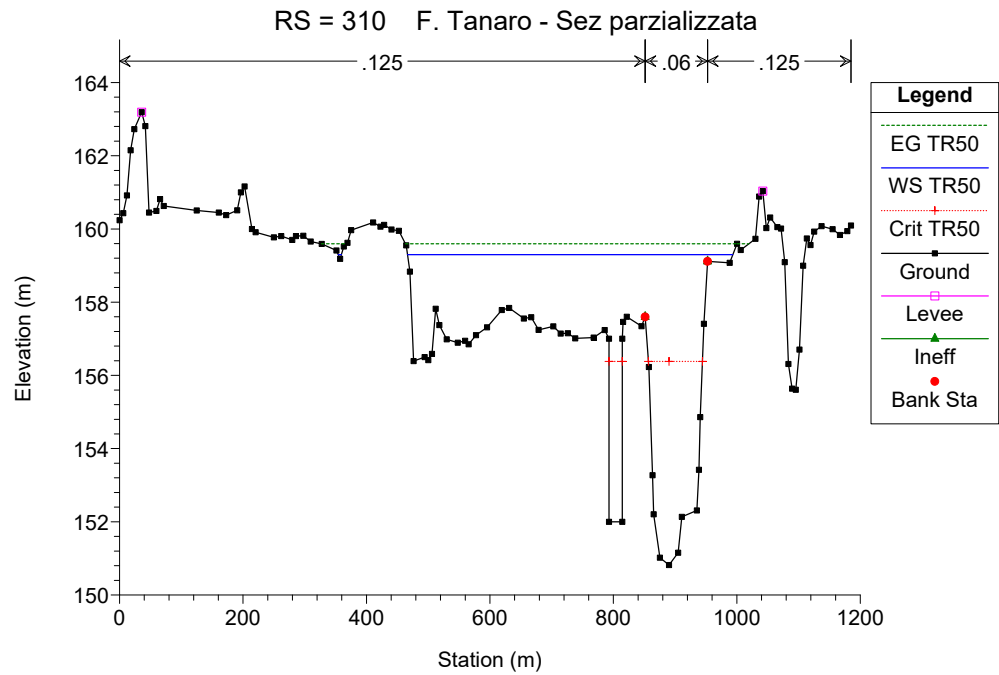
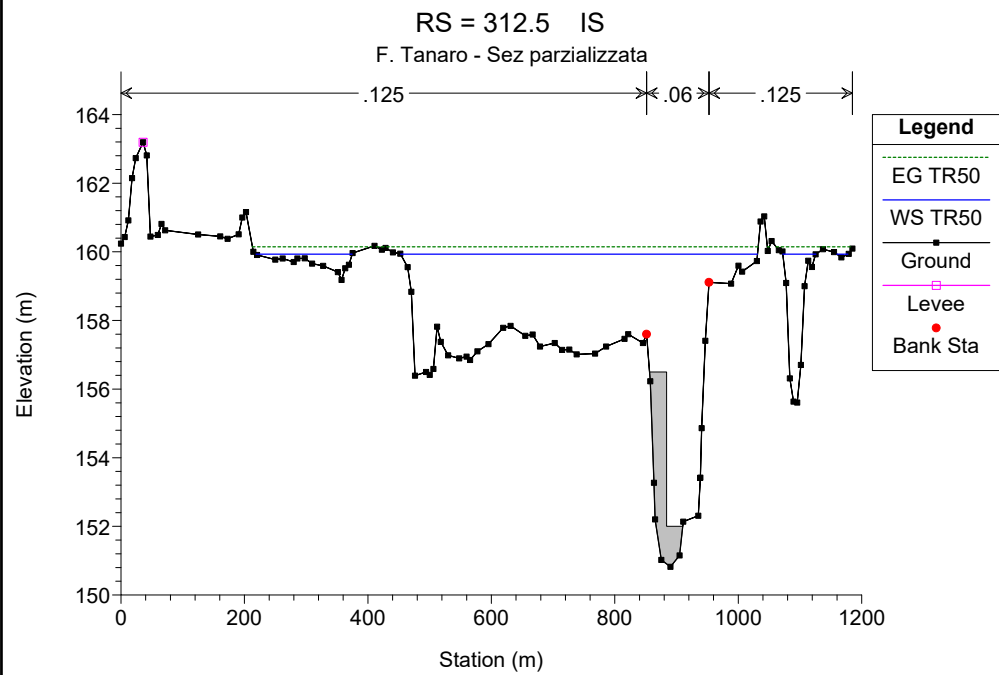
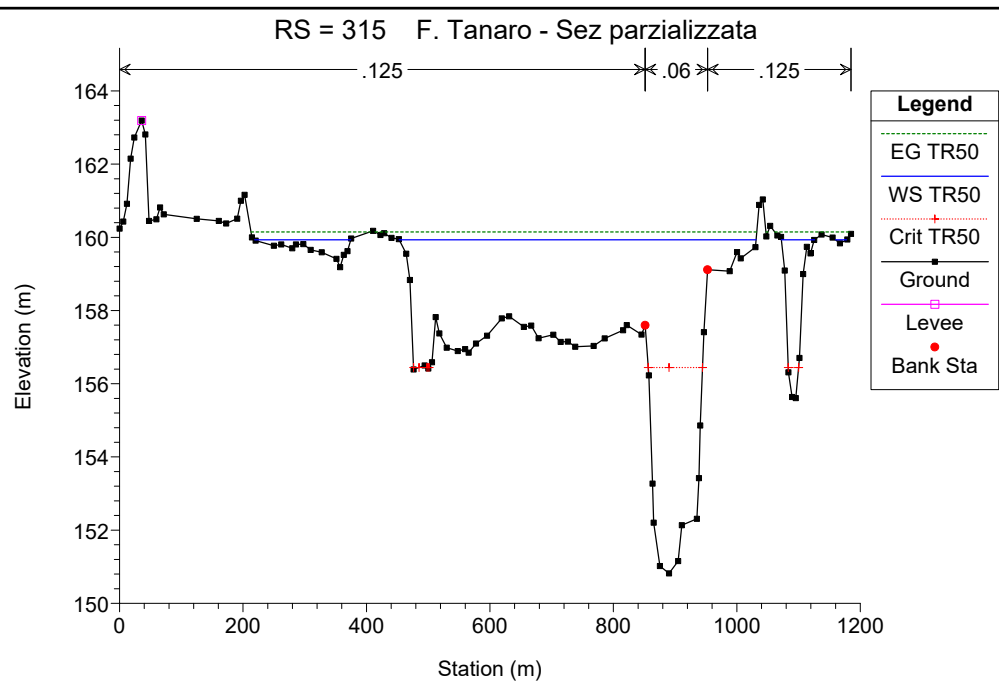
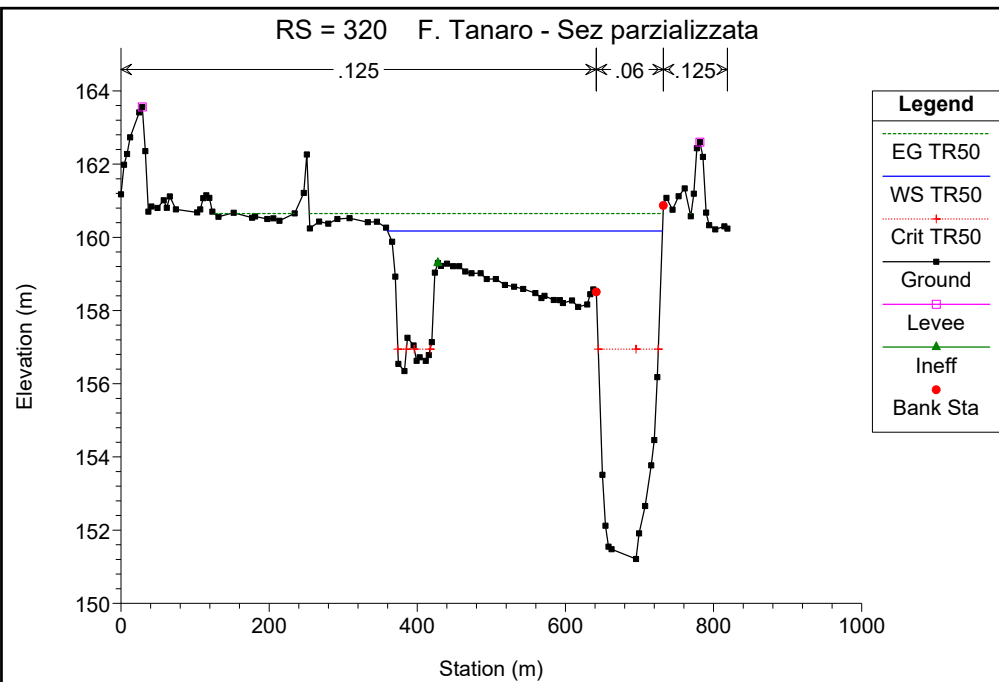


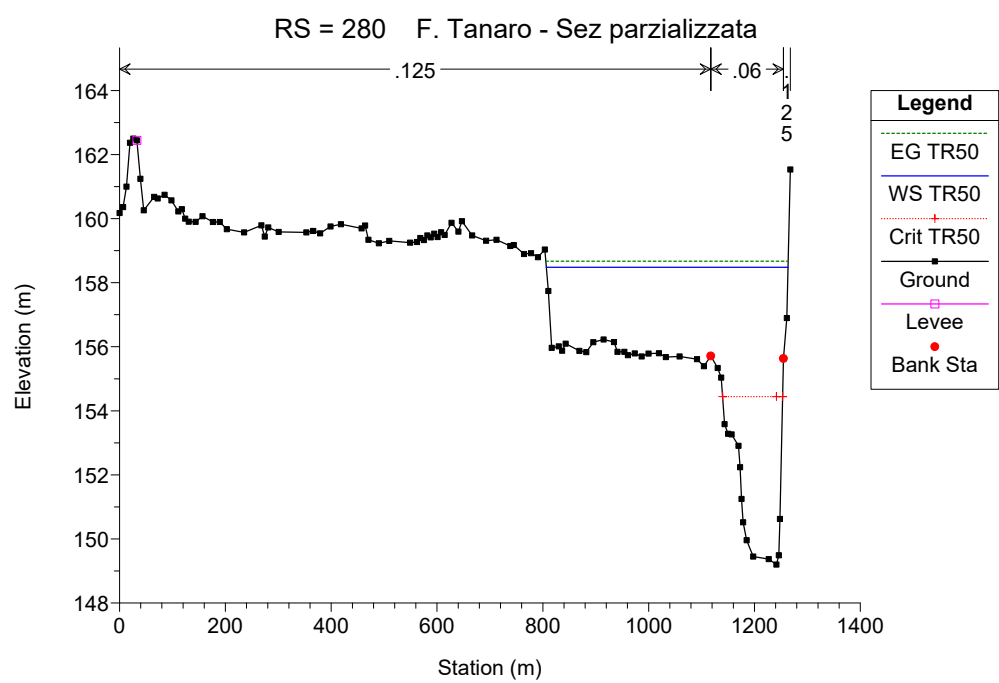
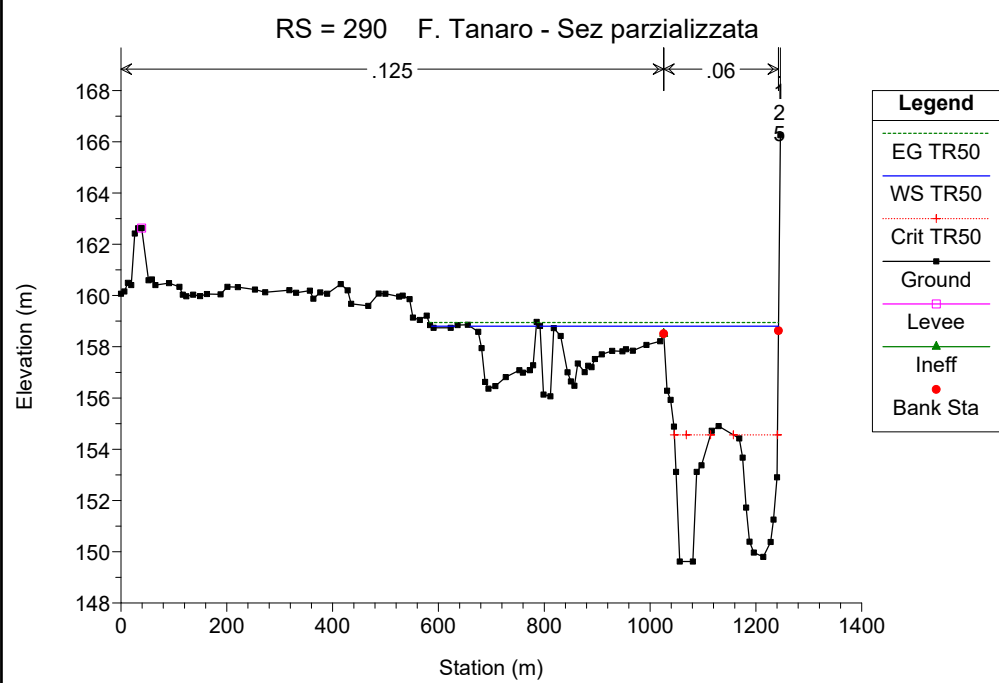
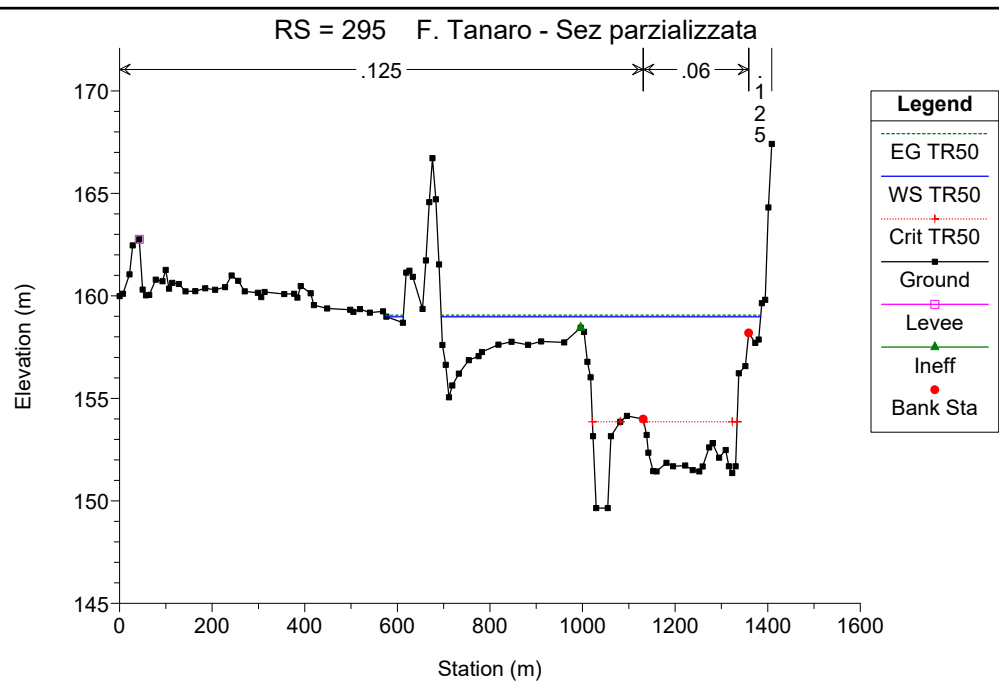
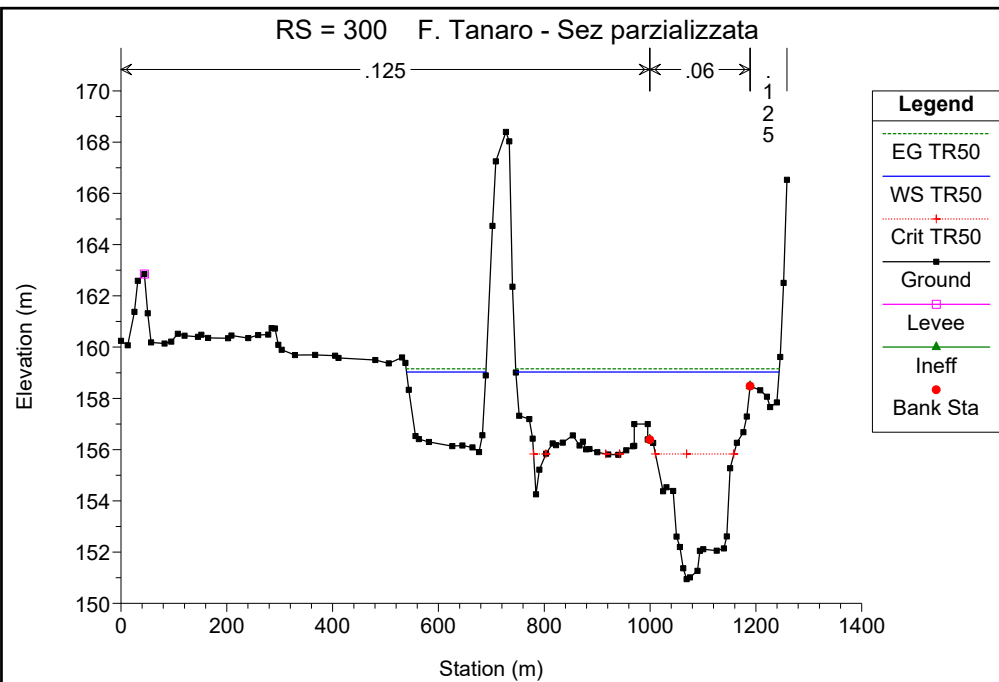


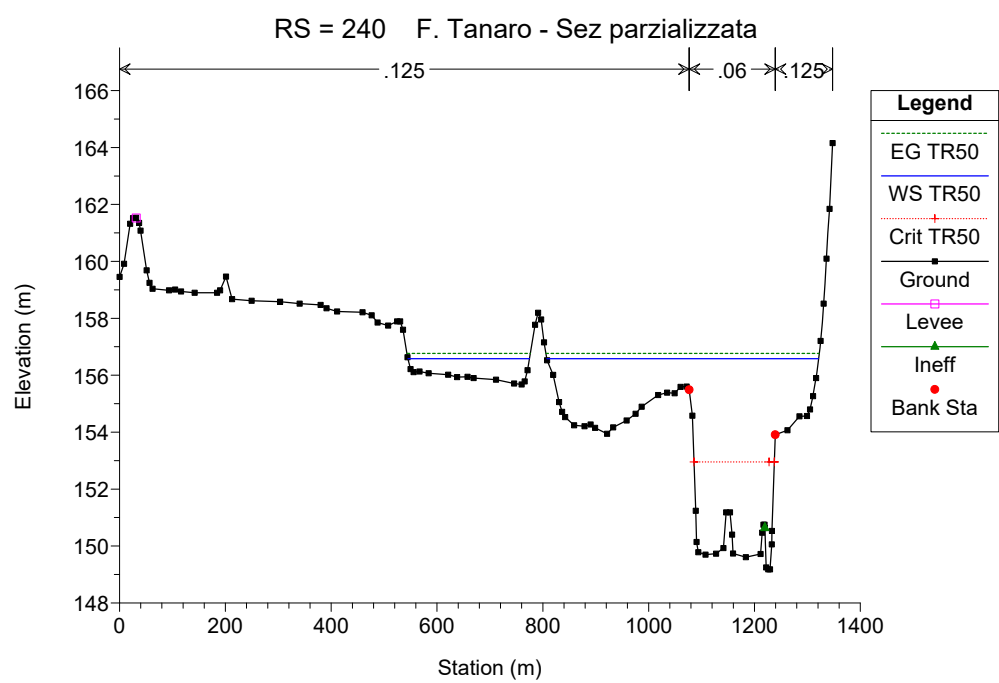
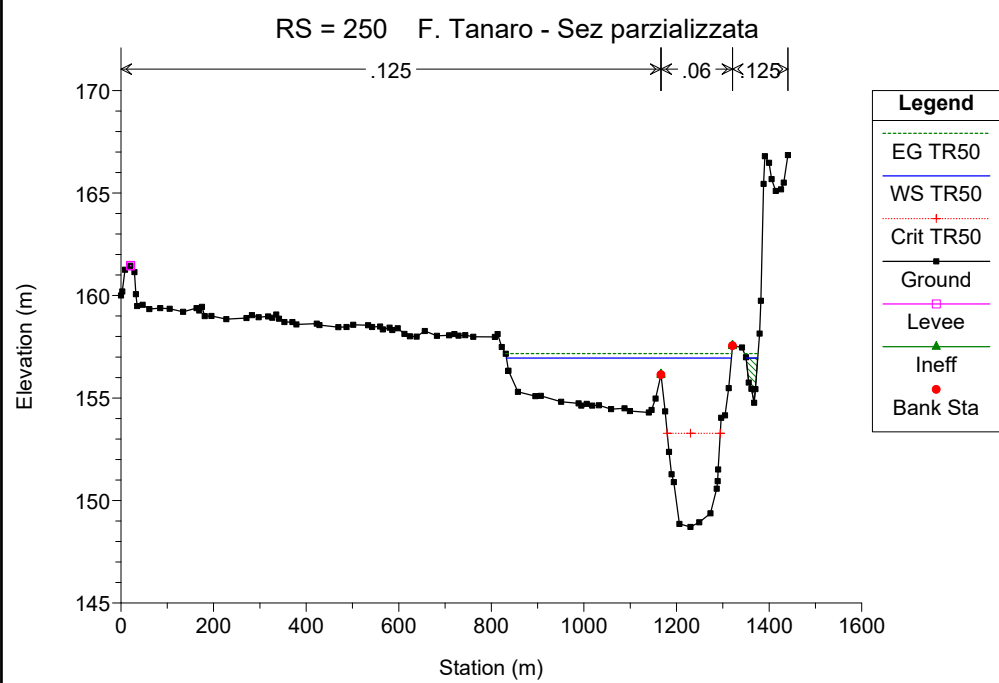
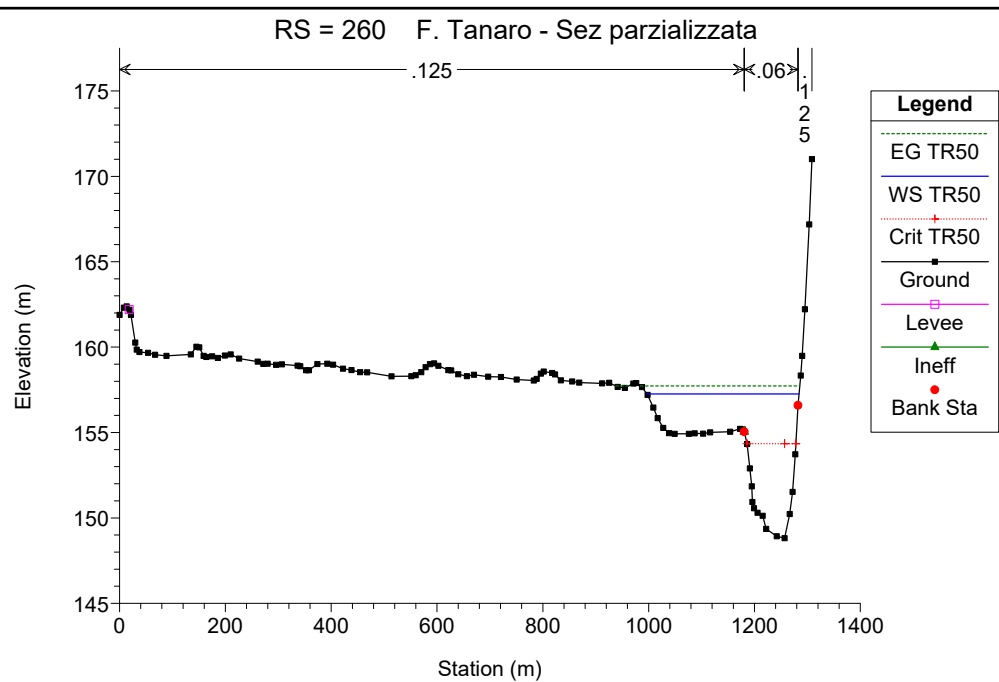
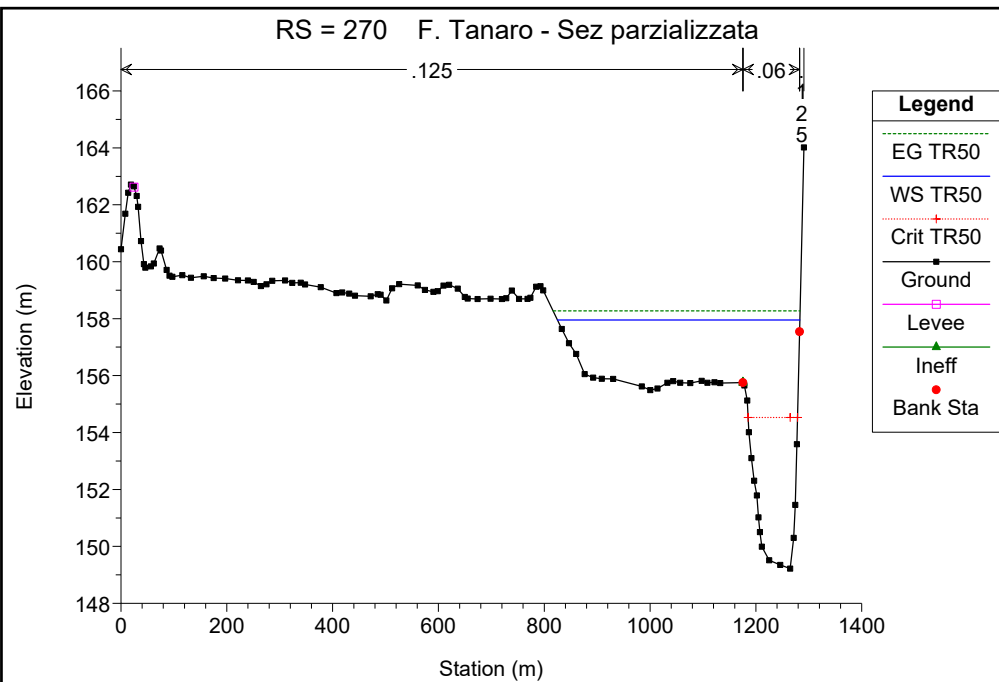


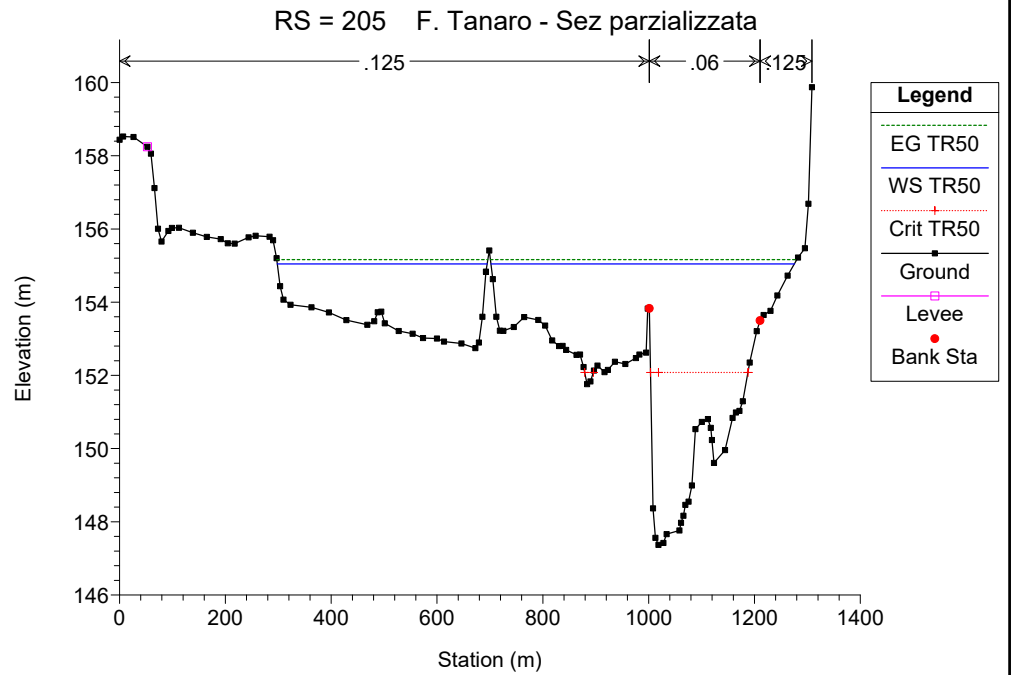
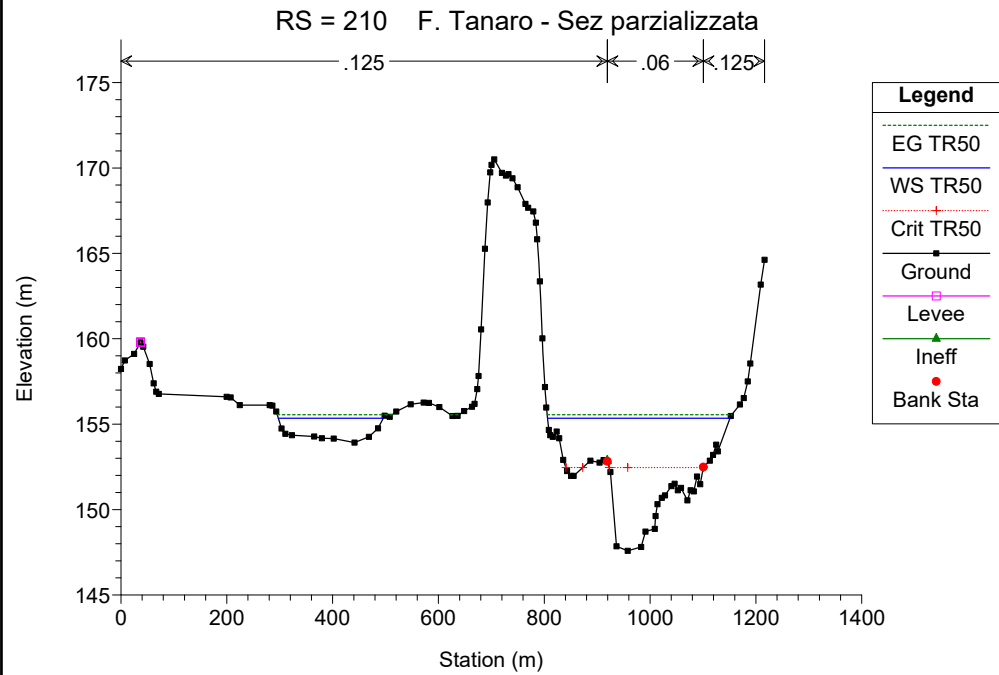
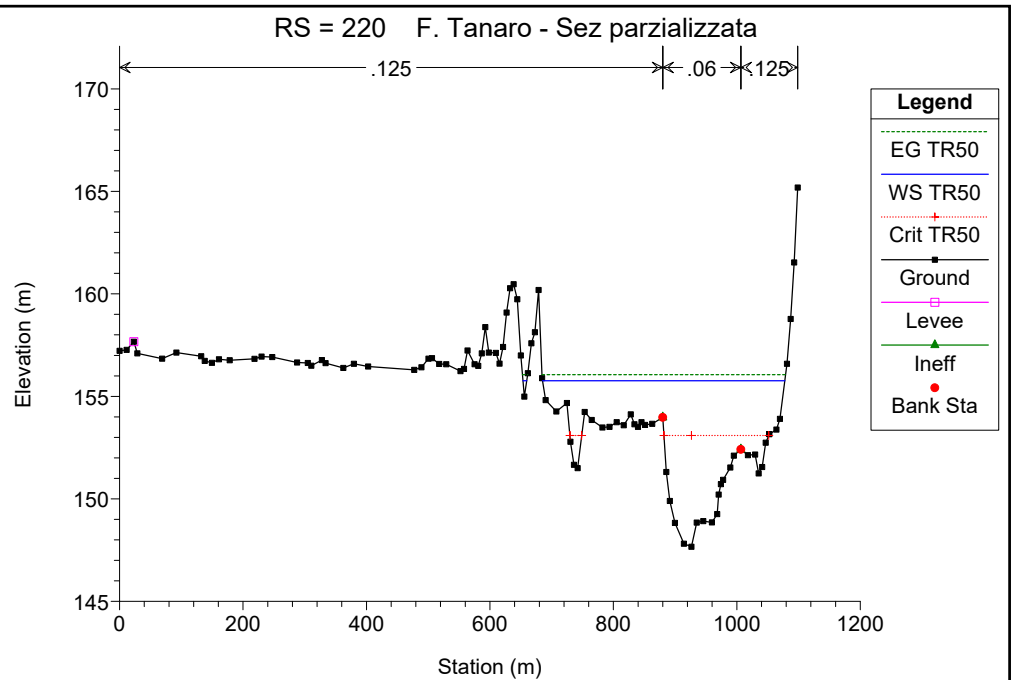
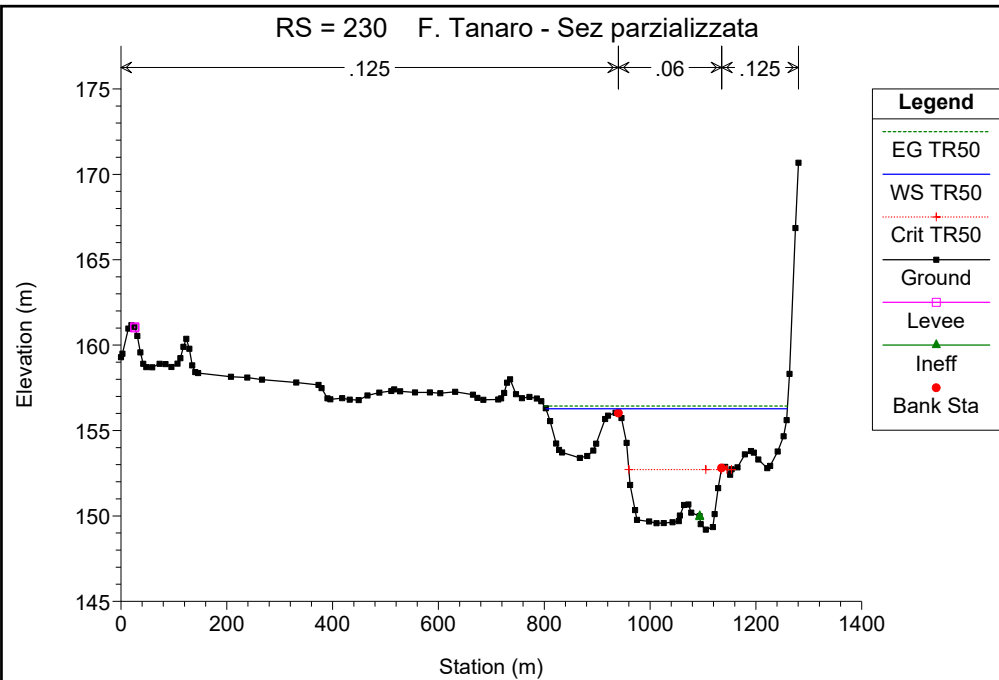


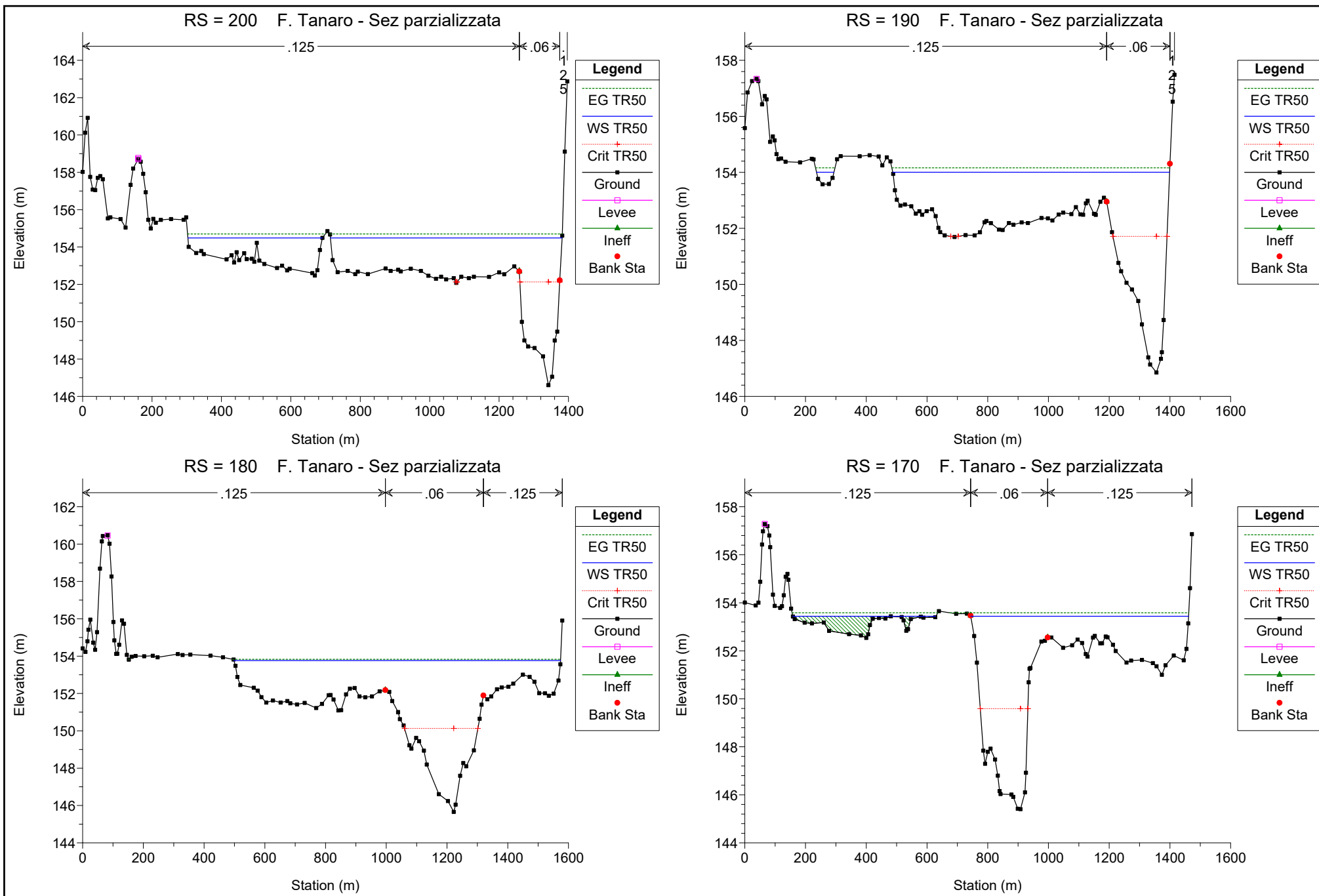


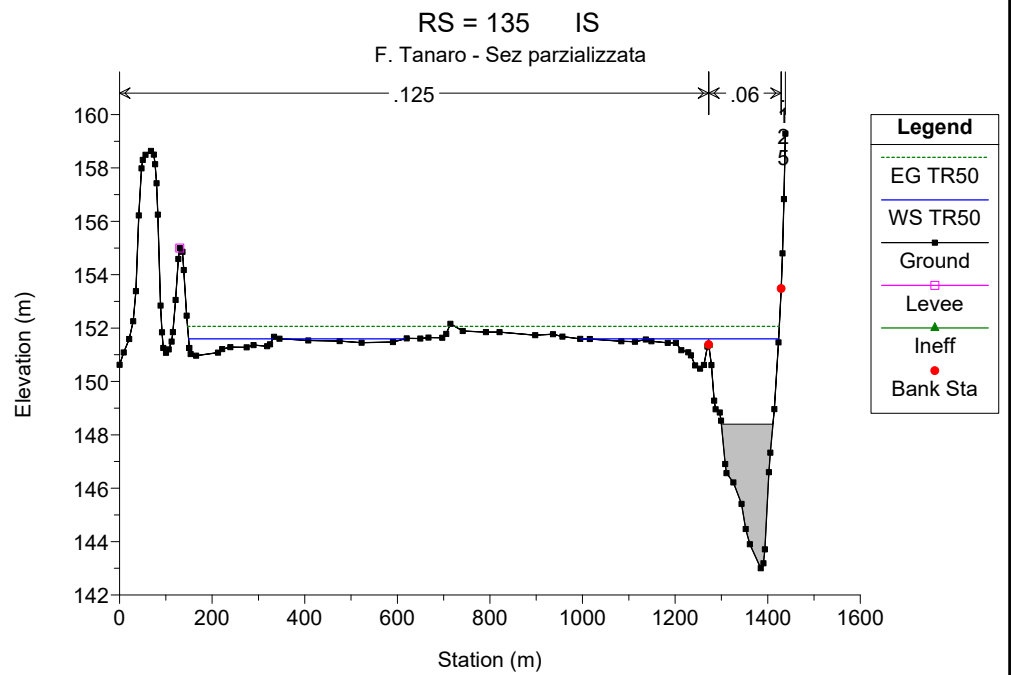
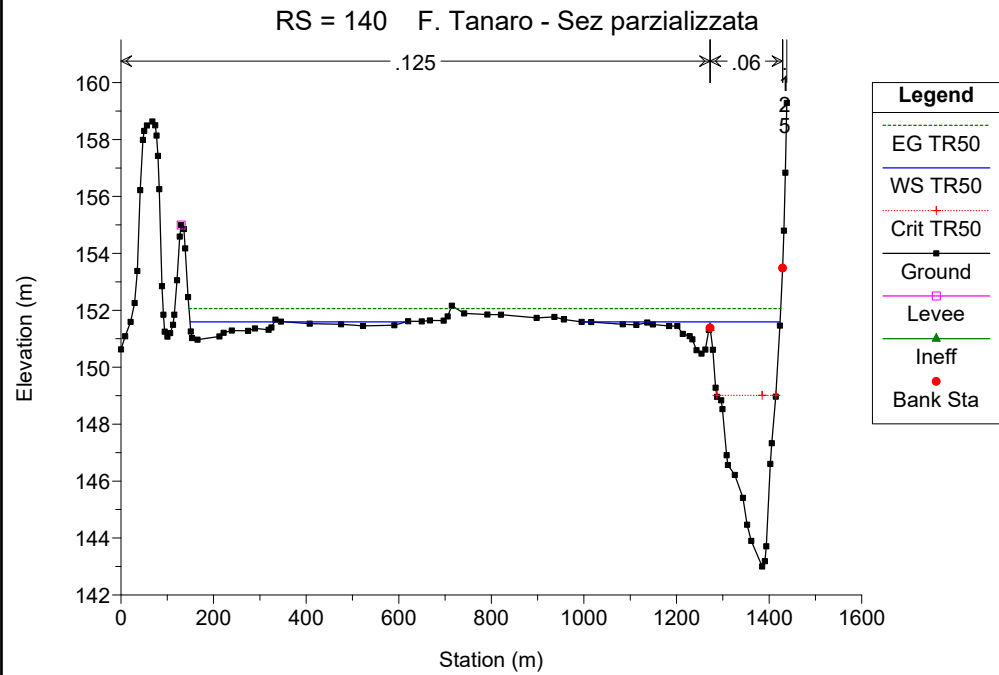
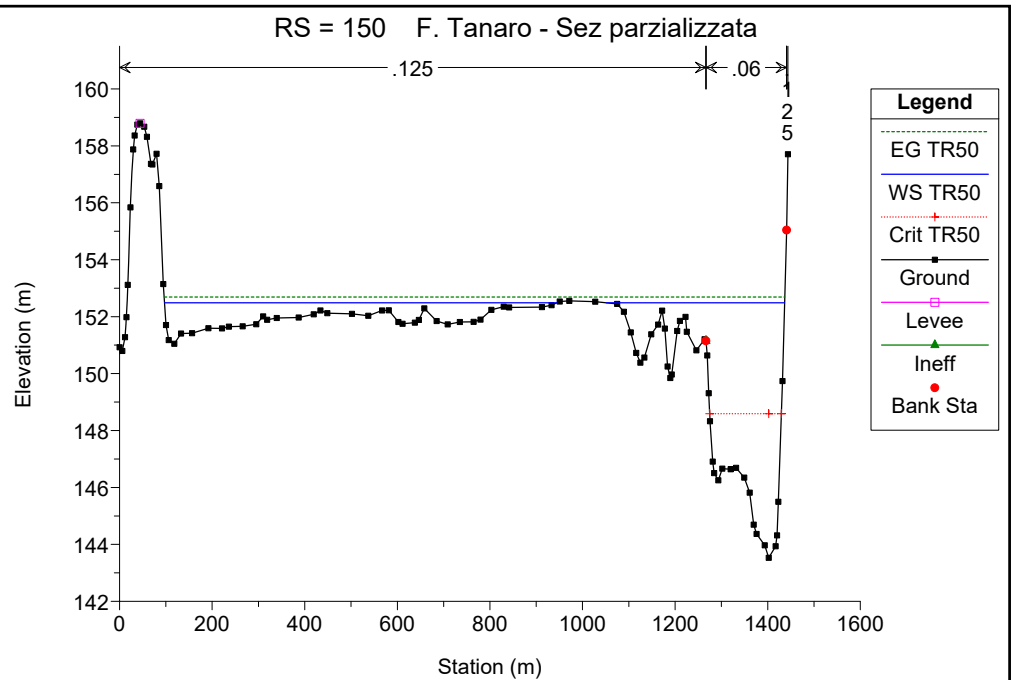
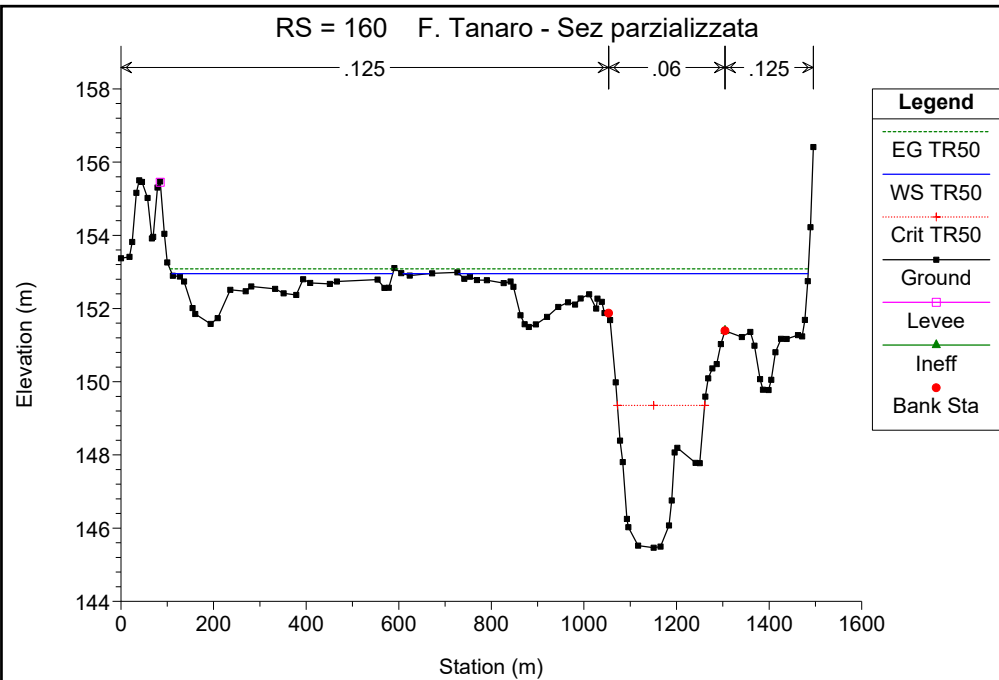


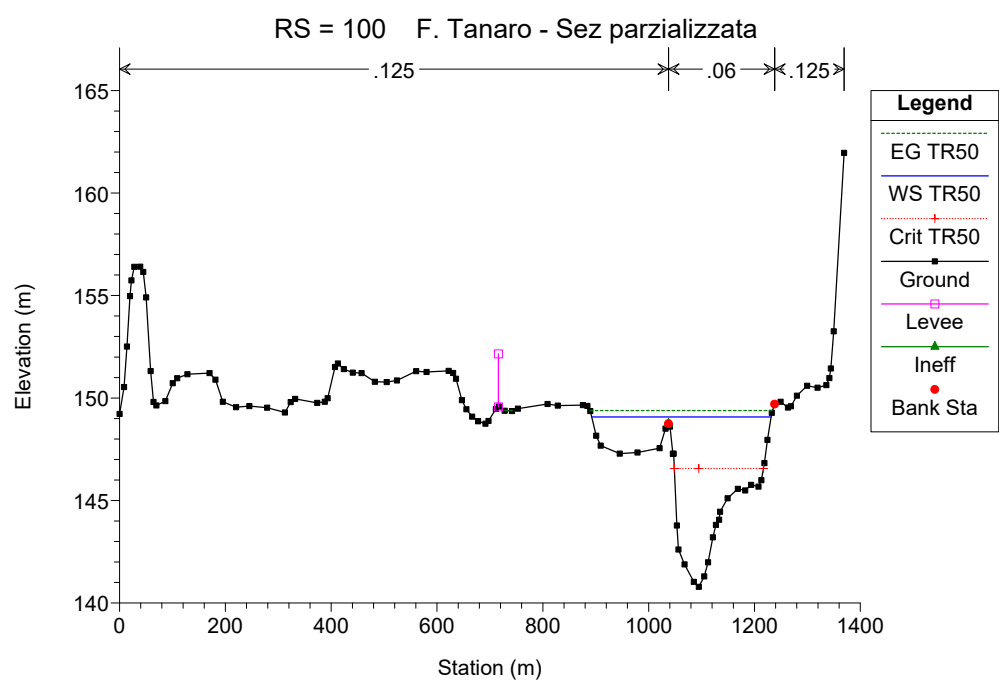
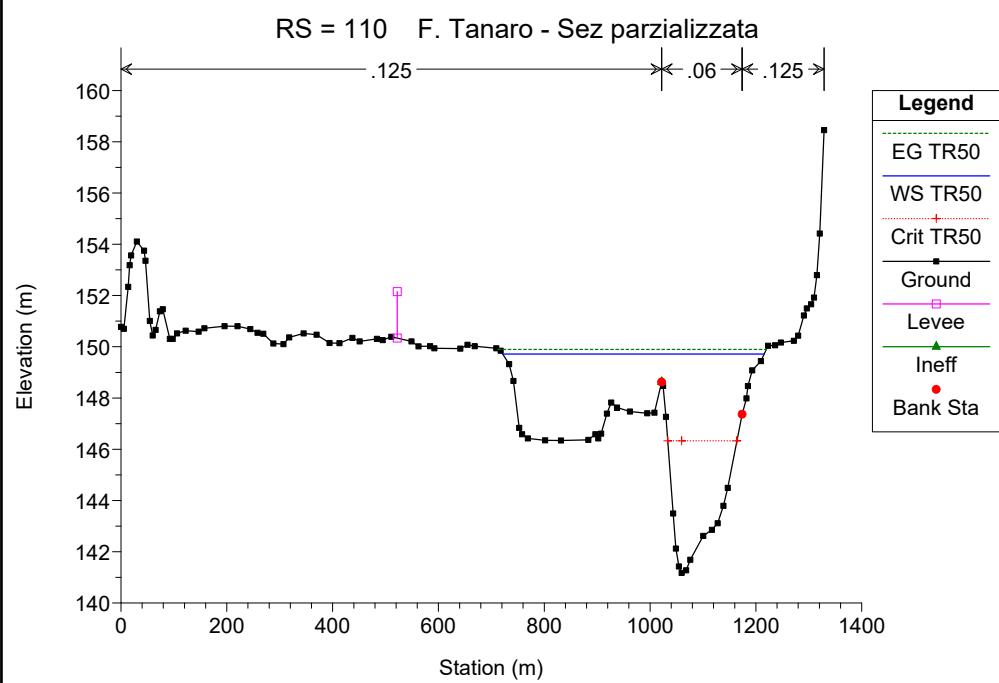
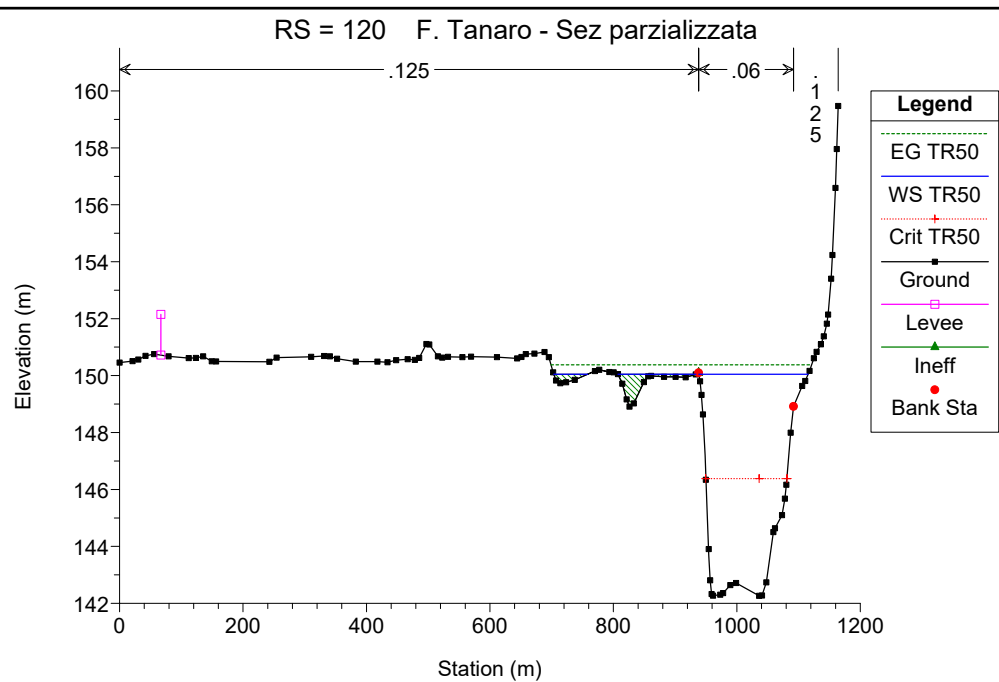
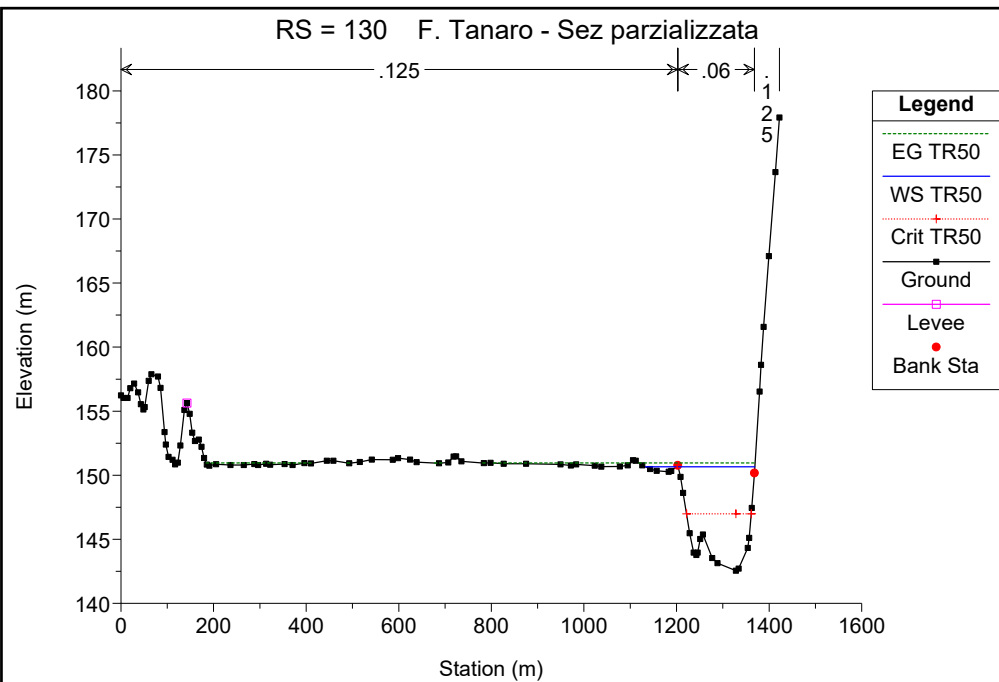


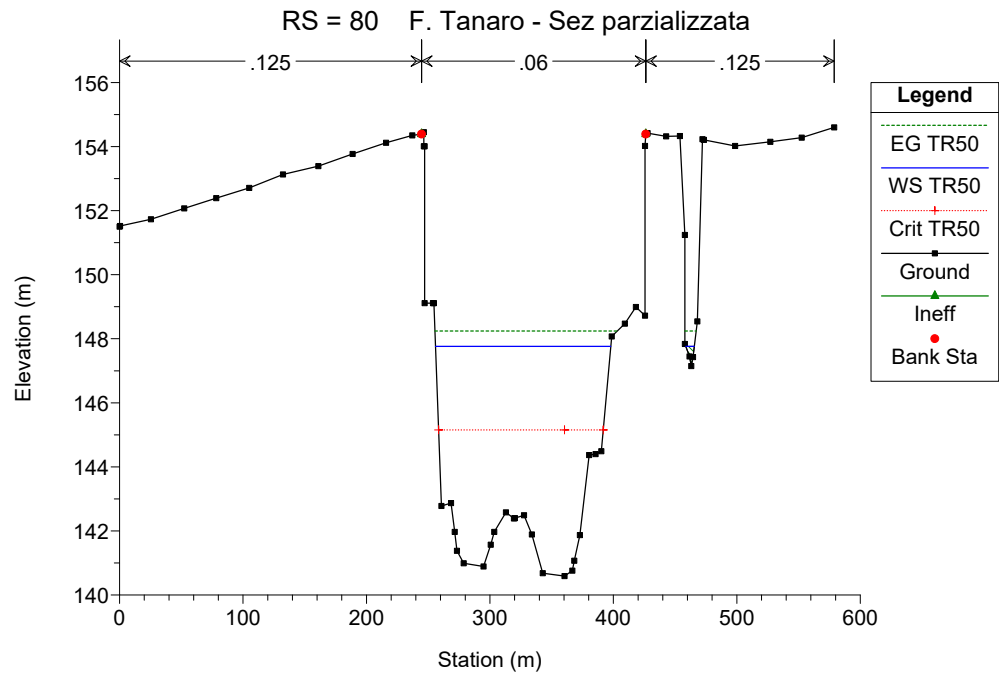
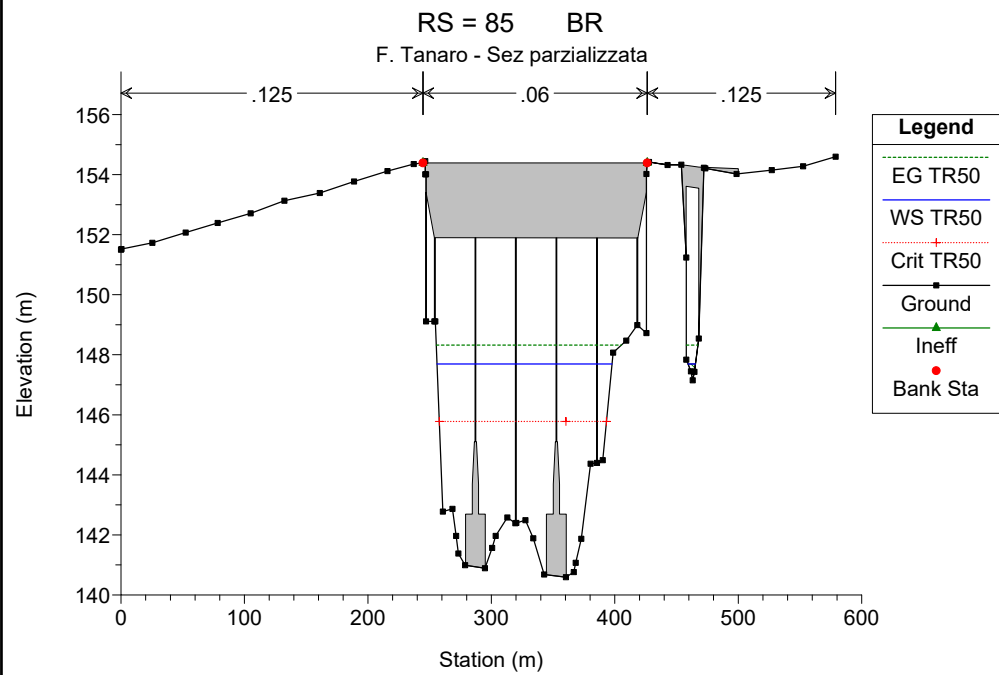
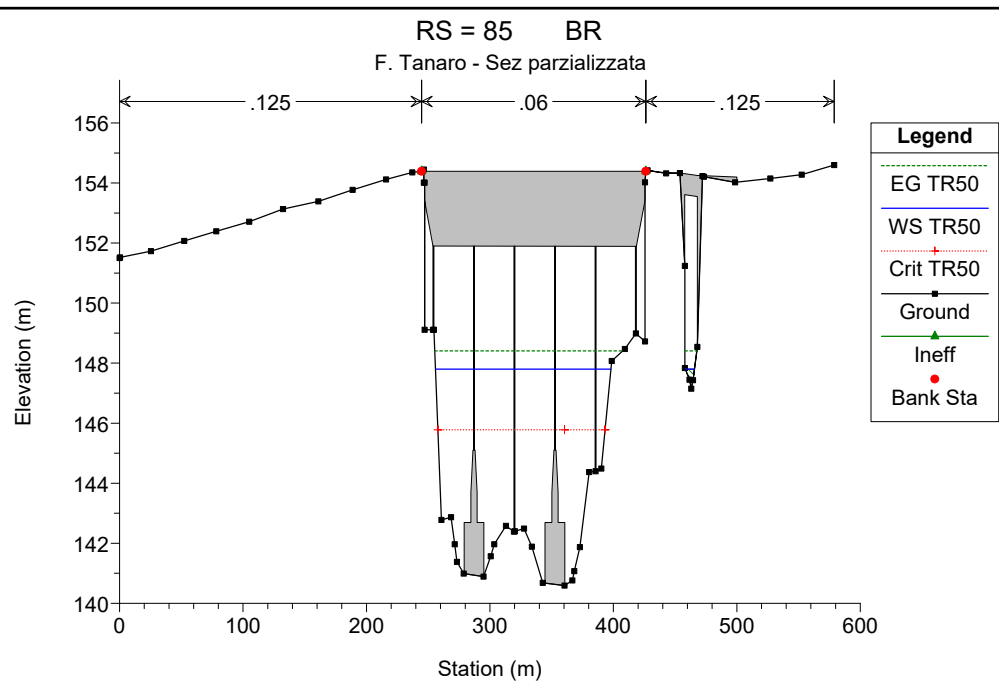
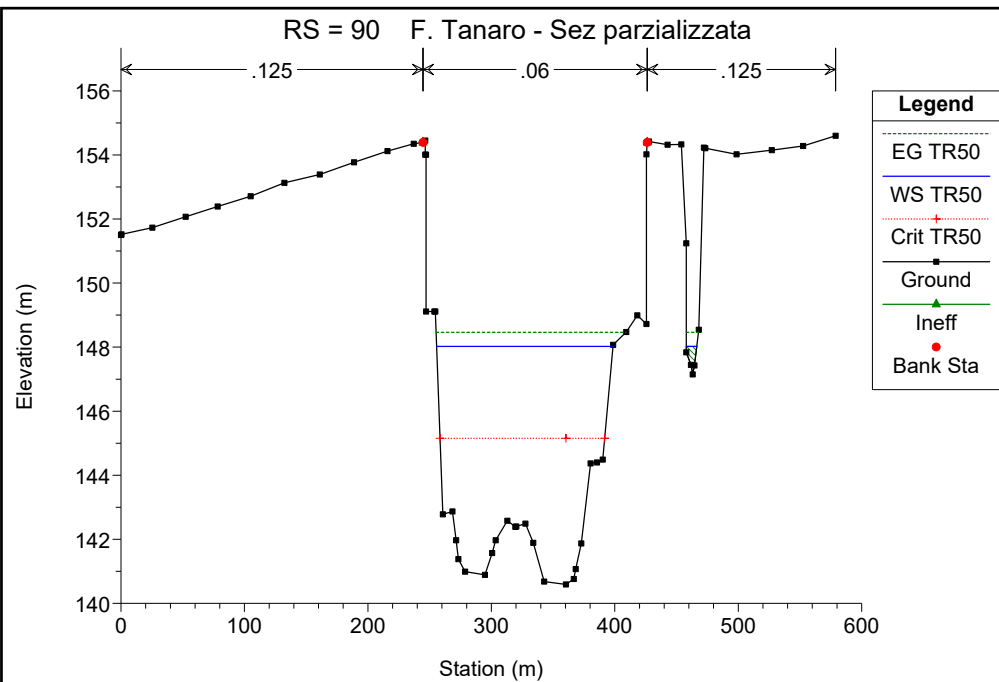


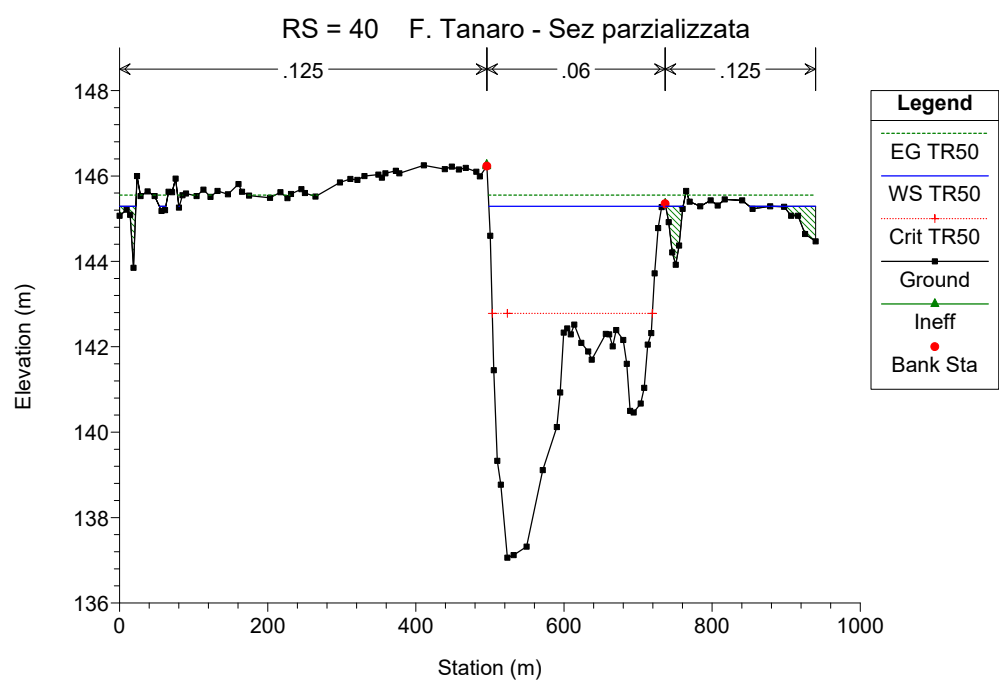
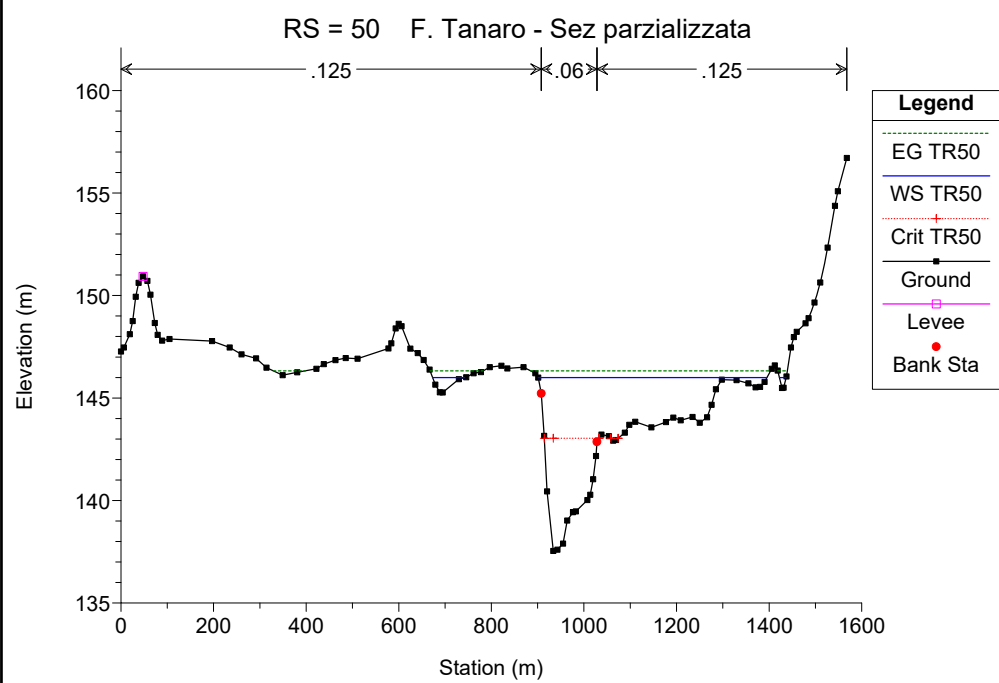
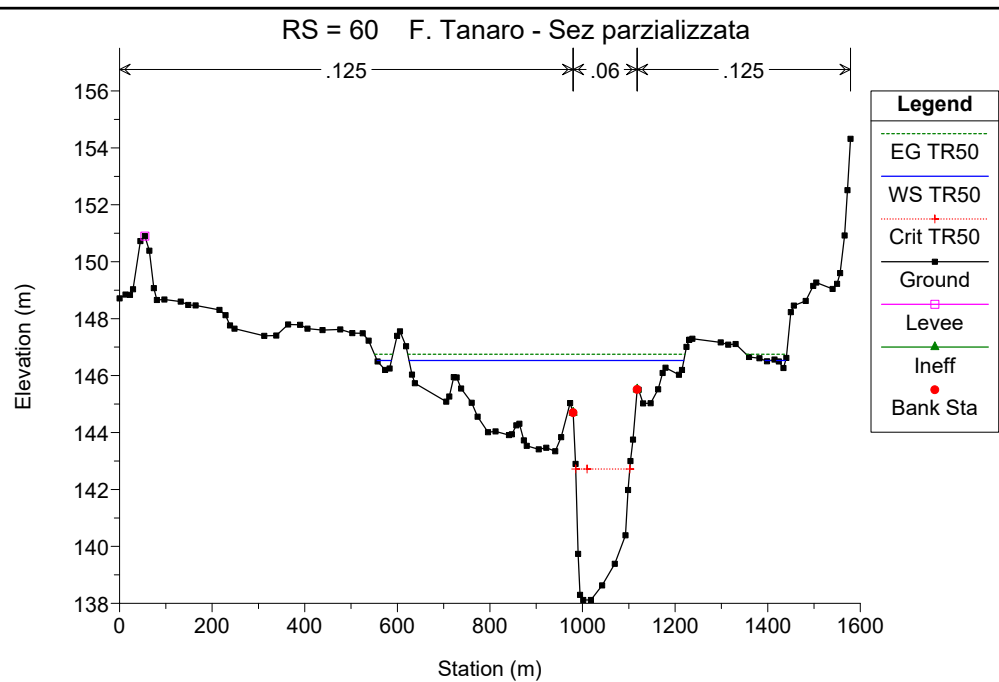
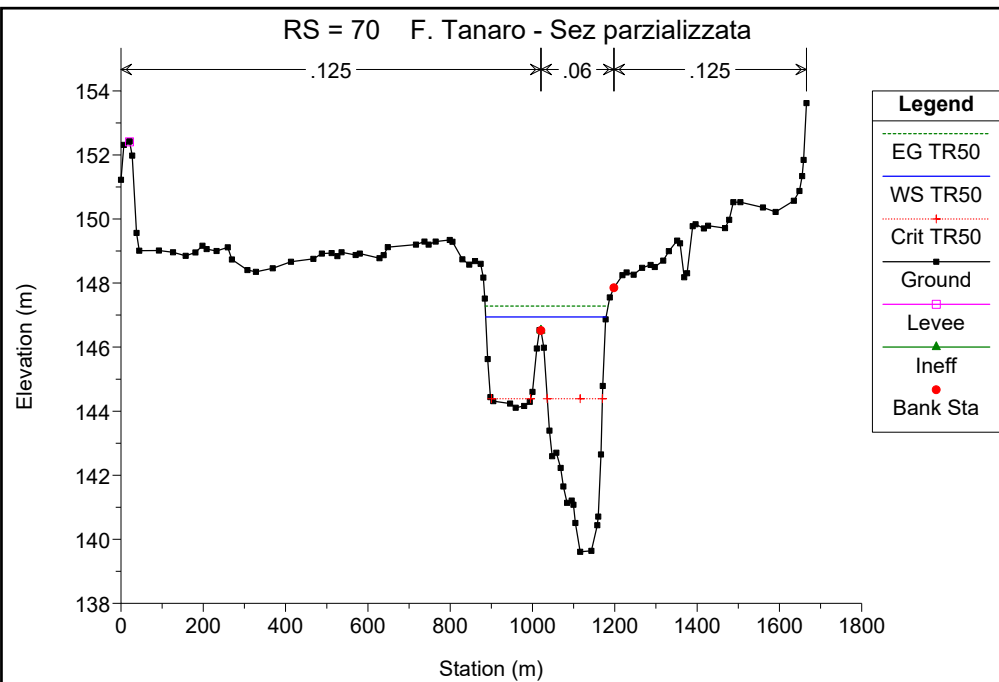


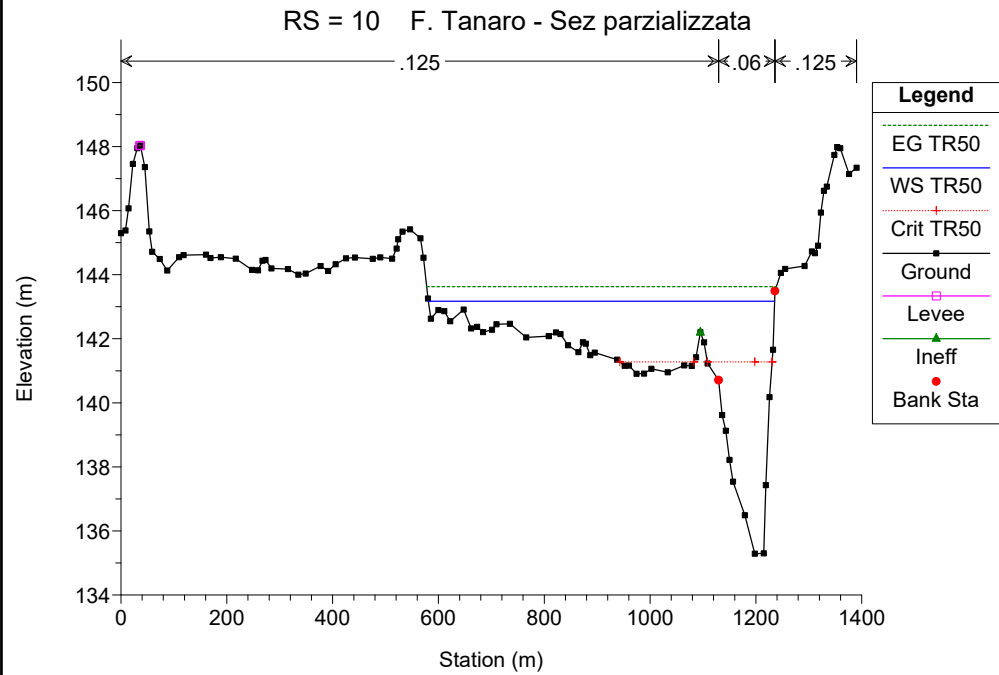
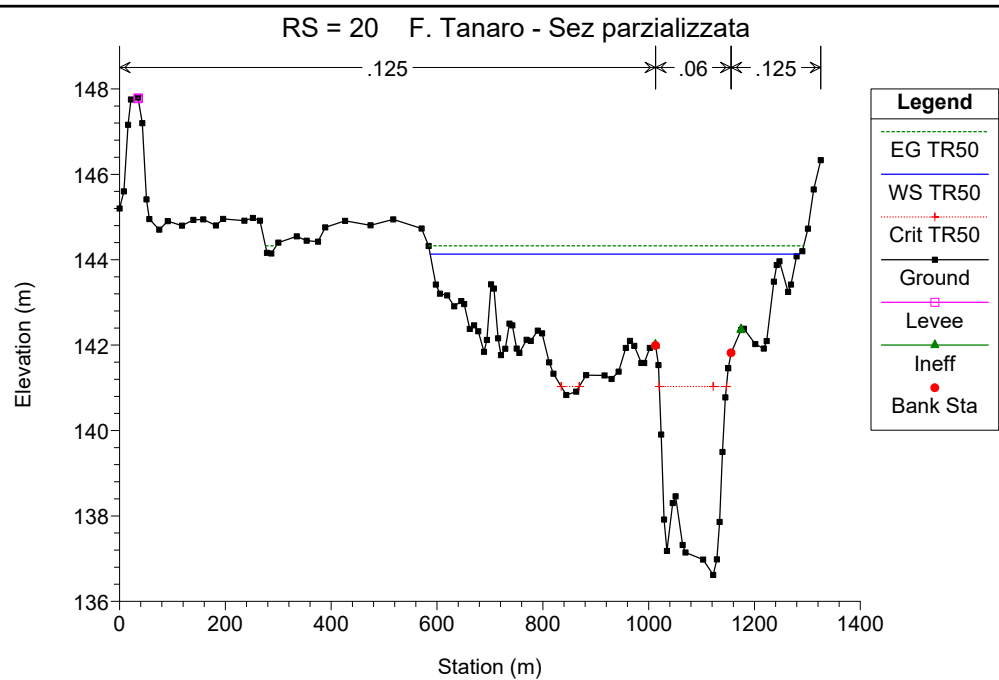
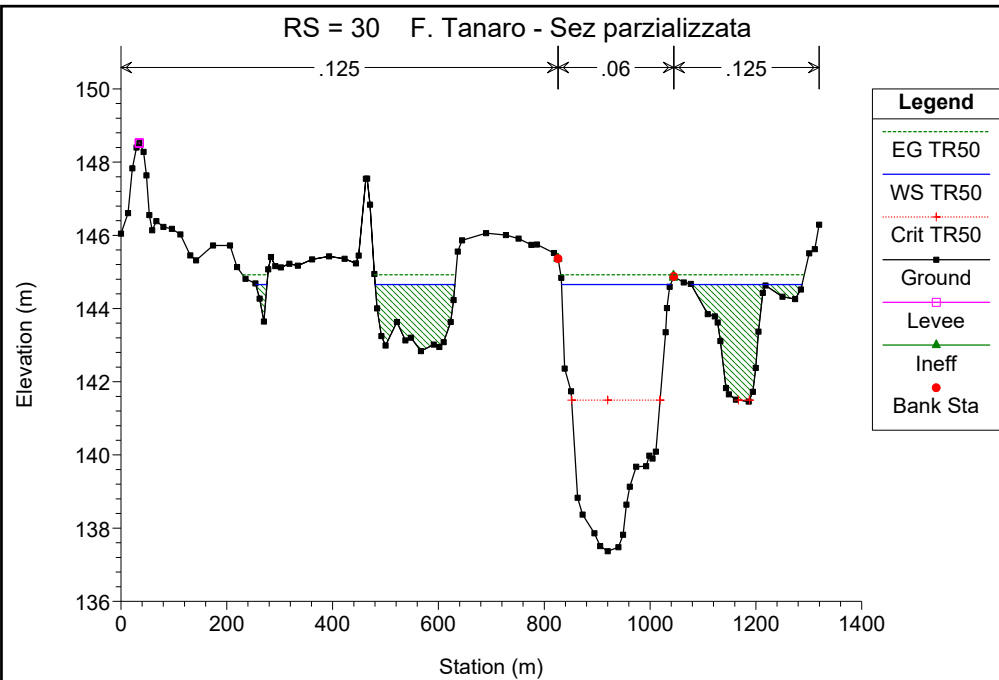












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 9

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2750	100
F. Tanaro valle Riddone	2757	
F. Tanaro valle Cherasca	2768	

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

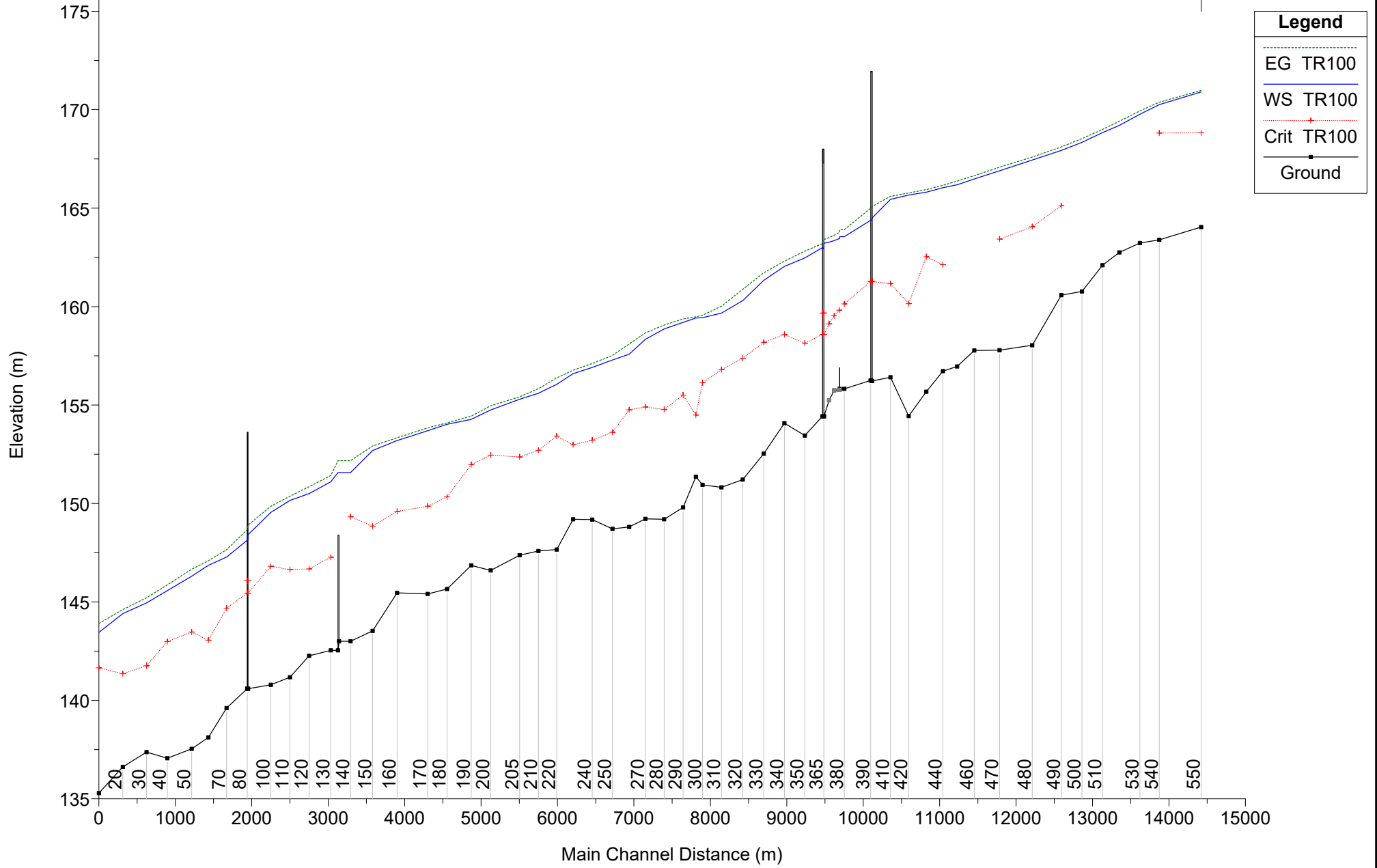
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3001.19	1171.49	0.22
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001696	2.08	2999.35	1119.85	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001799	2.09	2115.07	670.10	0.30
1	520	TR100	2750.00	162.75	169.20		169.42	0.002242	2.36	2205.85	1012.10	0.33
1	510	TR100	2750.00	162.10	168.84		169.00	0.001982	2.09	2198.68	727.88	0.31
1	500	TR100	2750.00	160.77	168.35		168.53	0.001626	2.13	1984.52	549.58	0.28
1	490	TR100	2750.00	160.58	167.93	165.12	168.11	0.001586	1.99	1835.07	510.09	0.28
1	480	TR100	2750.00	158.04	167.44	164.06	167.59	0.001241	1.92	2281.35	689.42	0.25
1	470	TR100	2750.00	157.79	166.90	163.43	167.08	0.001424	2.17	2045.23	536.74	0.27
1	460	TR100	2750.00	157.77	166.48		166.65	0.001176	1.98	2248.47	829.50	0.25
1	450	TR100	2750.00	156.96	166.19		166.38	0.001246	2.06	2062.50	785.03	0.26
1	440	TR100	2750.00	156.72	166.04	162.13	166.16	0.000900	1.82	2708.81	789.60	0.22
1	430	TR100	2750.00	155.68	165.81	162.53	165.95	0.001097	2.01	2633.03	664.06	0.24
1	420	TR100	2750.00	154.44	165.67	160.15	165.77	0.000586	1.64	2945.74	686.36	0.18
1	410	TR100	2750.00	156.41	165.45	161.17	165.60	0.001029	1.98	2245.09	526.49	0.24
1	400	TR100	2750.00	156.22	164.51	161.27	165.09	0.003326	3.46	908.44	173.90	0.41
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.39	161.28	165.00	0.003530	3.52	888.42	168.10	0.42
1	380	TR100	2750.00	155.82	163.56	160.13	163.91	0.002214	2.65	1067.40	217.54	0.34
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	163.22	158.59	163.41	0.001046	1.93	1427.70	206.63	0.23
1	365		Bridge									
1	360	TR100	2750.00	154.43	163.00	158.59	163.20	0.001161	1.99	1381.68	206.01	0.25
1	350	TR100	2750.00	153.45	162.48	158.14	162.83	0.001866	2.60	1092.12	269.49	0.31
1	340	TR100	2757.00	154.08	162.05	158.59	162.31	0.001779	2.30	1338.61	383.31	0.30
1	330	TR100	2757.00	152.53	161.35	158.19	161.73	0.002545	2.79	1187.33	438.08	0.36
1	320	TR100	2757.00	151.21	160.32	157.38	160.89	0.003482	3.61	1198.54	382.70	0.43
1	310	TR100	2757.00	150.82	159.69	156.82	160.04	0.002554	2.99	1671.58	629.57	0.36
1	300	TR100	2768.00	150.95	159.46	156.15	159.59	0.001142	1.81	2463.37	683.57	0.24
1	295	TR100	2768.00	151.36	159.44	154.50	159.50	0.000393	1.13	3008.71	869.77	0.14
1	290	TR100	2768.00	149.80	159.22	155.52	159.39	0.001227	1.92	1988.90	691.88	0.25
1	280	TR100	2768.00	149.20	158.89	154.79	159.09	0.001281	2.21	1950.79	473.77	0.26
1	270	TR100	2768.00	149.22	158.35	154.92	158.69	0.002137	2.84	1626.67	469.01	0.34
1	260	TR100	2768.00	148.81	157.60	154.78	158.13	0.003278	3.43	1147.14	296.45	0.41
1	250	TR100	2768.00	148.71	157.30	153.63	157.54	0.001744	2.35	1788.12	524.90	0.30
1	240	TR100	2768.00	149.18	156.93	153.22	157.13	0.001367	2.15	2077.30	754.78	0.27
1	230	TR100	2768.00	149.20	156.61	152.99	156.79	0.001301	2.00	1886.66	463.56	0.26
1	220	TR100	2768.00	147.66	156.06	153.44	156.39	0.002448	2.81	1495.72	403.34	0.36
1	210	TR100	2768.00	147.59	155.61	152.72	155.85	0.001875	2.31	1709.74	592.79	0.31
1	205	TR100	2768.00	147.37	155.31	152.37	155.43	0.001242	1.80	2697.42	989.53	0.25

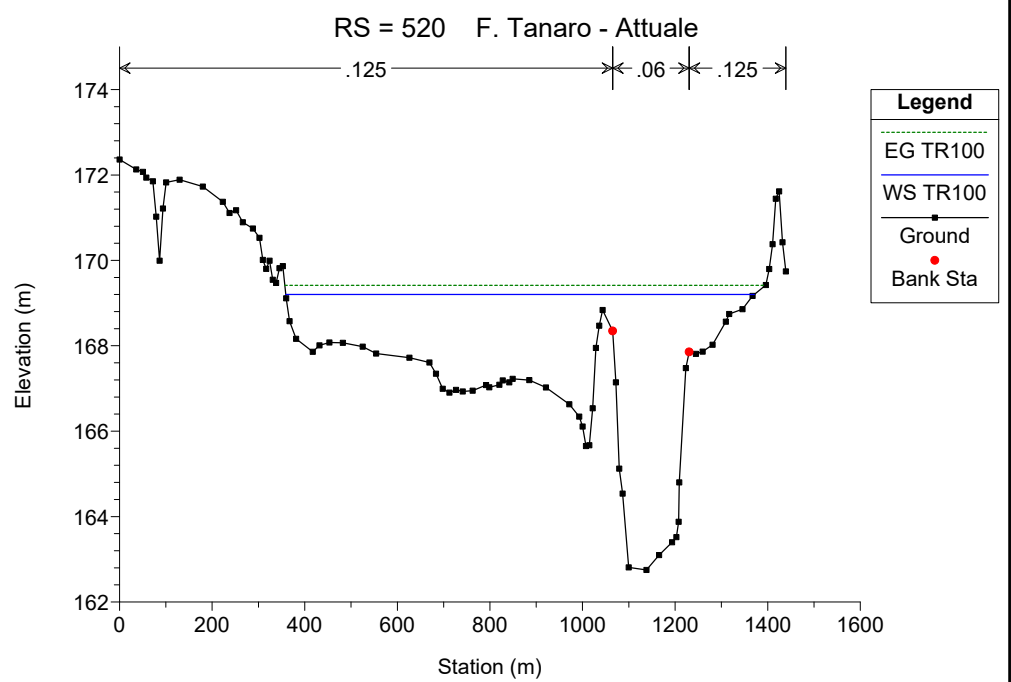
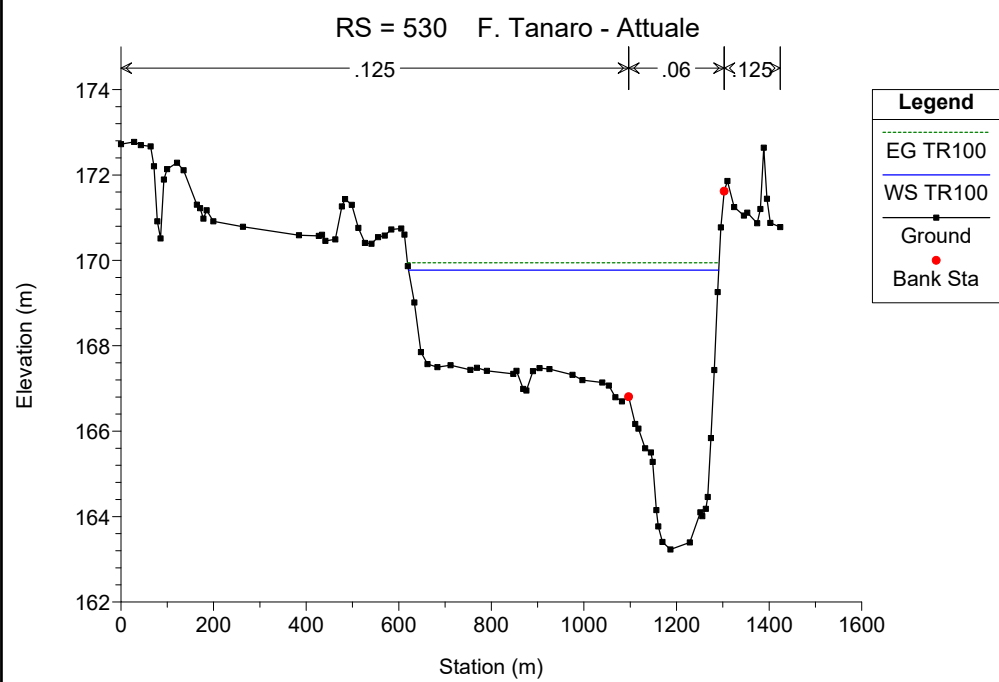
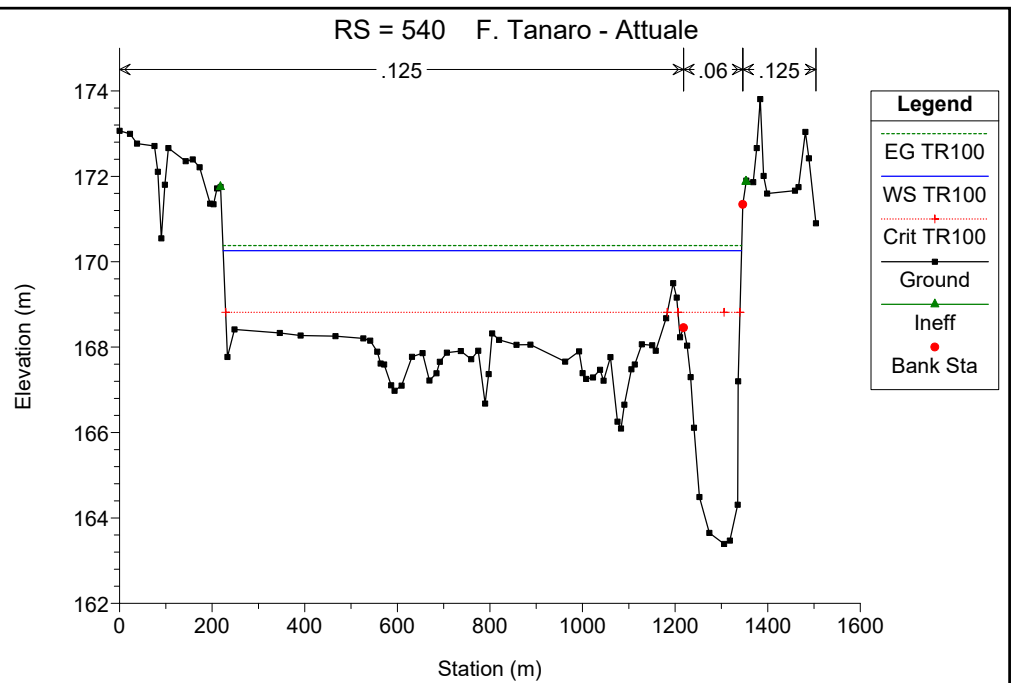
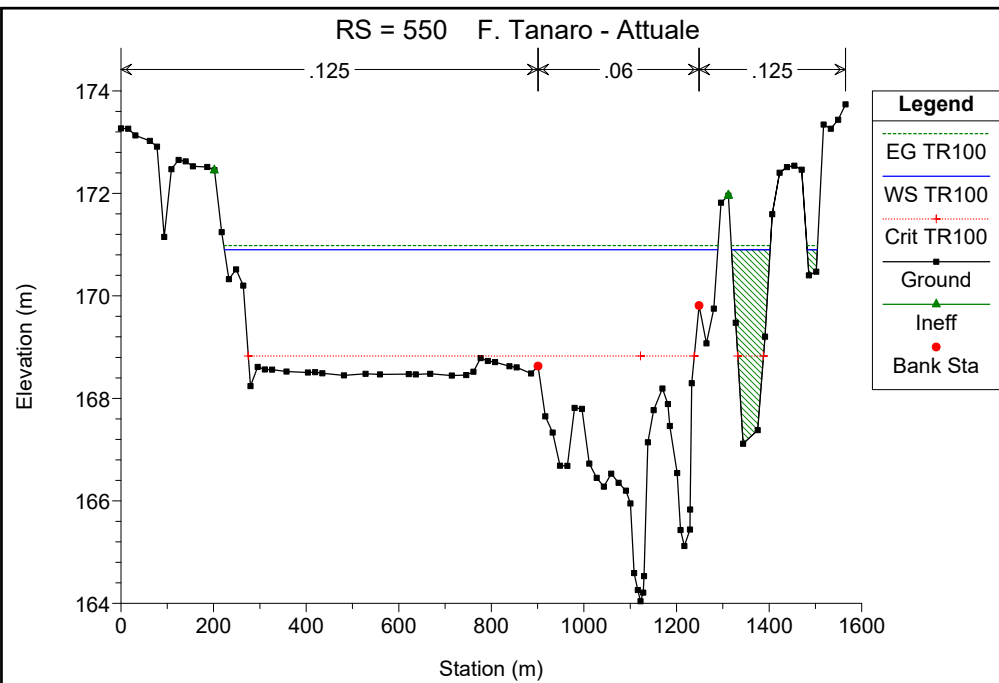
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (Continued)

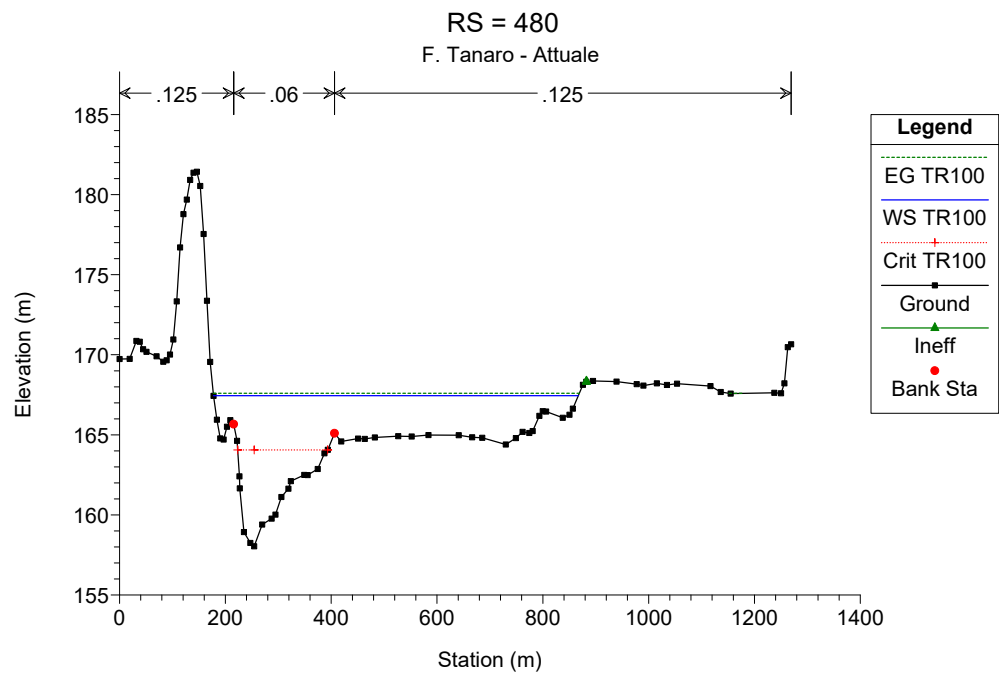
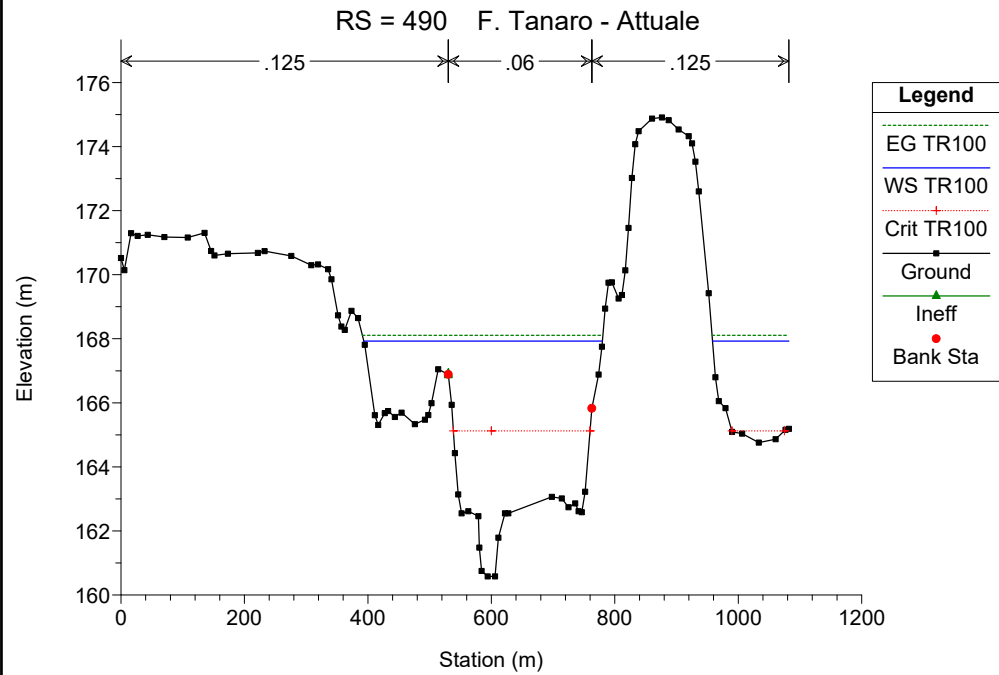
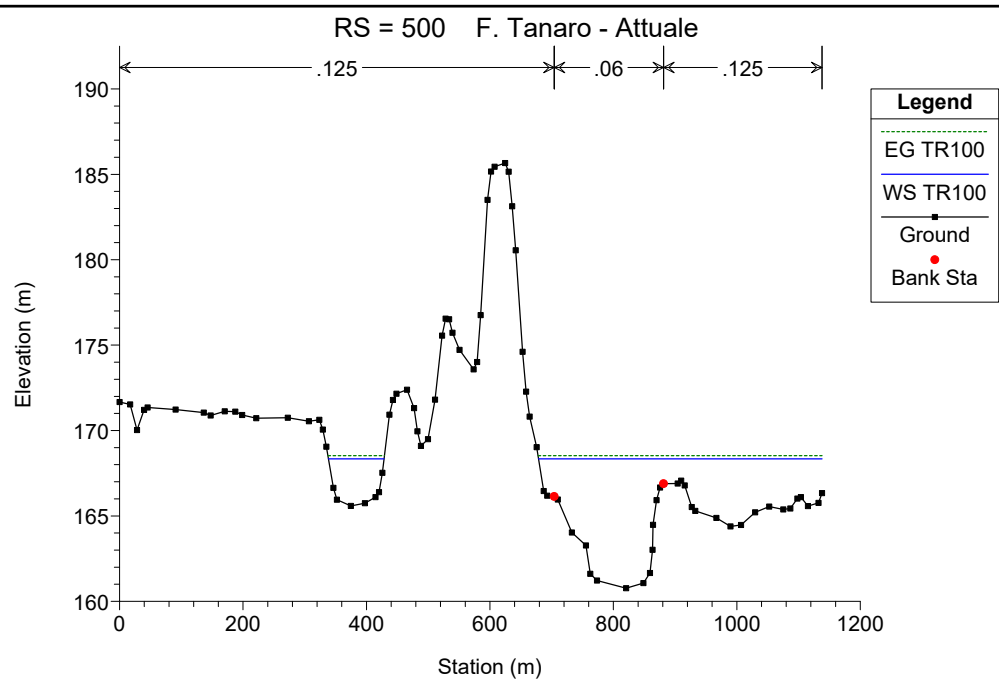
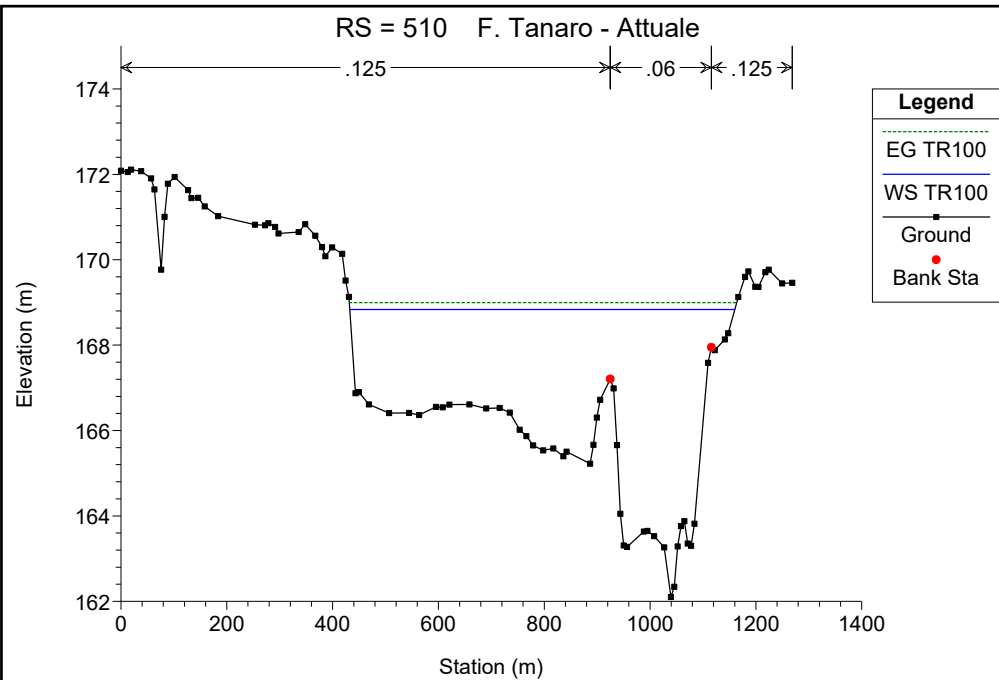
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	TR100	2768.00	146.60	154.76	152.48	154.98	0.002026	2.50	2491.78	1073.40	0.32
1	190	TR100	2768.00	146.85	154.29	151.99	154.45	0.001904	2.04	2397.80	991.67	0.30
1	180	TR100	2768.00	145.66	154.04	150.35	154.11	0.000707	1.34	3252.90	1300.54	0.19
1	170	TR100	2768.00	145.40	153.71	149.87	153.85	0.001438	1.85	2382.39	1309.38	0.26
1	160	TR100	2768.00	145.46	153.21	149.61	153.35	0.001178	1.77	2451.19	1383.79	0.24
1	150	TR100	2768.00	143.53	152.70	148.86	152.93	0.001478	2.23	2067.92	1340.55	0.28
1	140	TR100	2768.00	143.00	151.56	149.34	152.18	0.005004	3.50	912.46	787.18	0.49
1	135		Inl Struct									
1	130	TR100	2768.00	142.54	151.12	147.29	151.45	0.001954	2.54	1313.27	1035.49	0.32
1	120	TR100	2768.00	142.27	150.53	146.69	150.88	0.002051	2.65	1214.45	598.77	0.33
1	110	TR100	2768.00	141.17	150.18	146.66	150.40	0.001546	2.28	2018.37	700.82	0.28
1	100	TR100	2768.00	140.79	149.58	146.83	149.88	0.002676	2.54	1311.01	416.69	0.36
1	90	TR100	2768.00	140.59	148.44	145.45	148.93	0.003469	3.11	888.69	163.00	0.41
1	85		Bridge									
1	80	TR100	2768.00	140.59	148.15	145.45	148.70	0.003811	3.27	846.08	154.19	0.43
1	70	TR100	2768.00	139.61	147.30	144.70	147.67	0.003227	2.85	1223.89	299.18	0.40
1	60	TR100	2768.00	138.12	146.88	143.07	147.11	0.001542	2.36	1954.59	743.18	0.29
1	50	TR100	2768.00	137.54	146.32	143.49	146.68	0.002428	2.88	1611.04	721.36	0.36
1	40	TR100	2768.00	137.06	145.59	143.00	145.88	0.002663	2.41	1224.48	610.14	0.35
1	30	TR100	2768.00	137.37	144.97	141.77	145.23	0.002134	2.32	1464.55	665.72	0.32
1	20	TR100	2768.00	136.62	144.42	141.37	144.63	0.001665	2.31	2149.72	744.59	0.29
1	10	TR100	2768.00	135.29	143.46	141.67	143.92	0.004005	3.40	1533.14	657.12	0.45

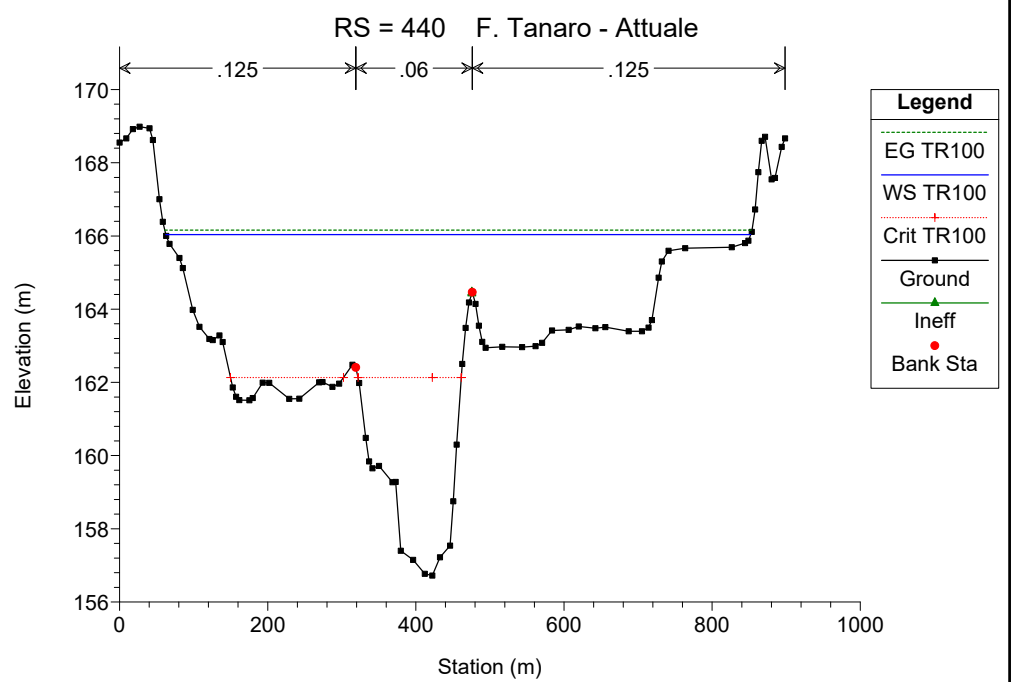
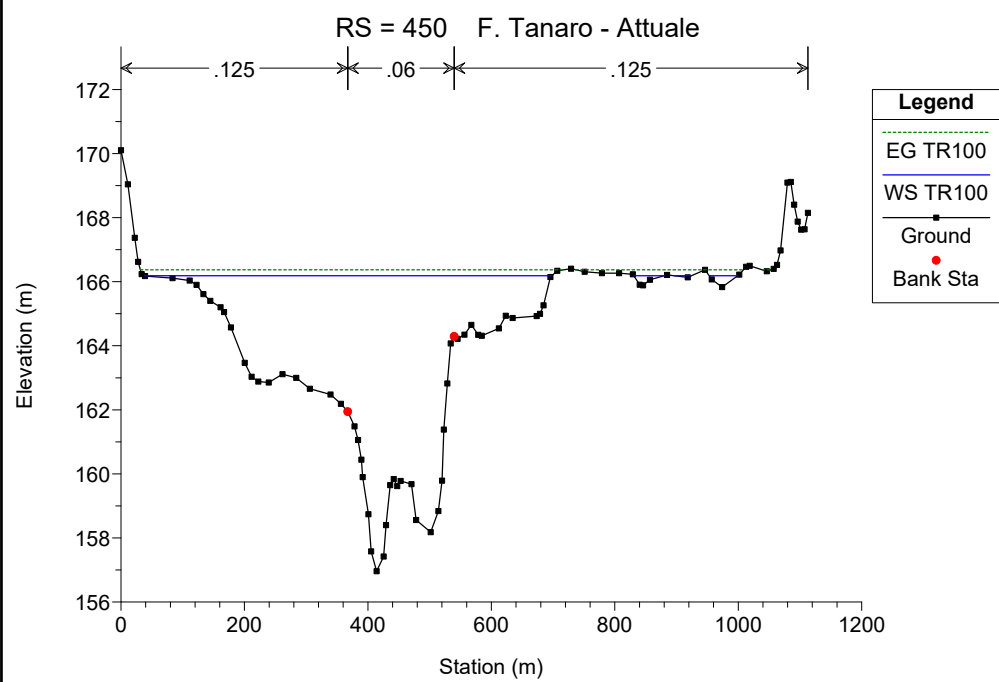
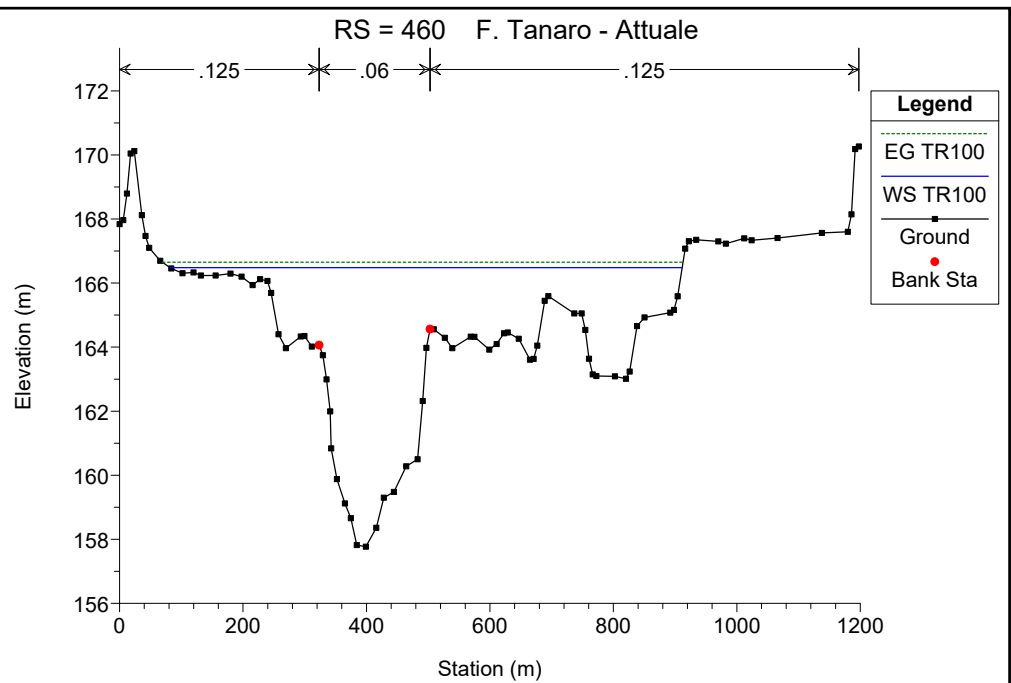
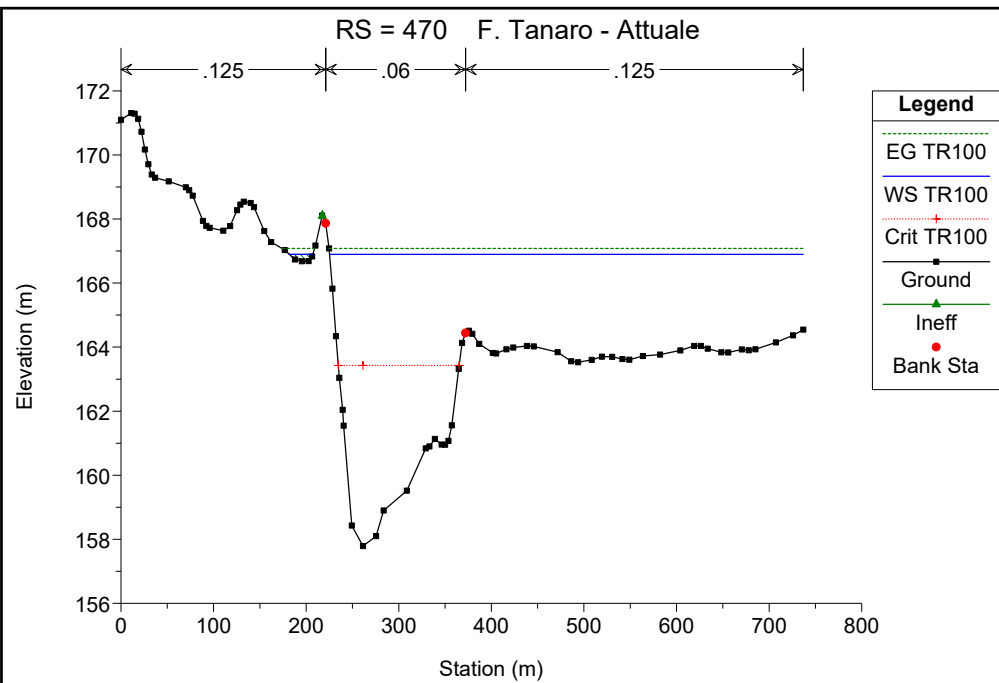
F. Tanaro - Attuale

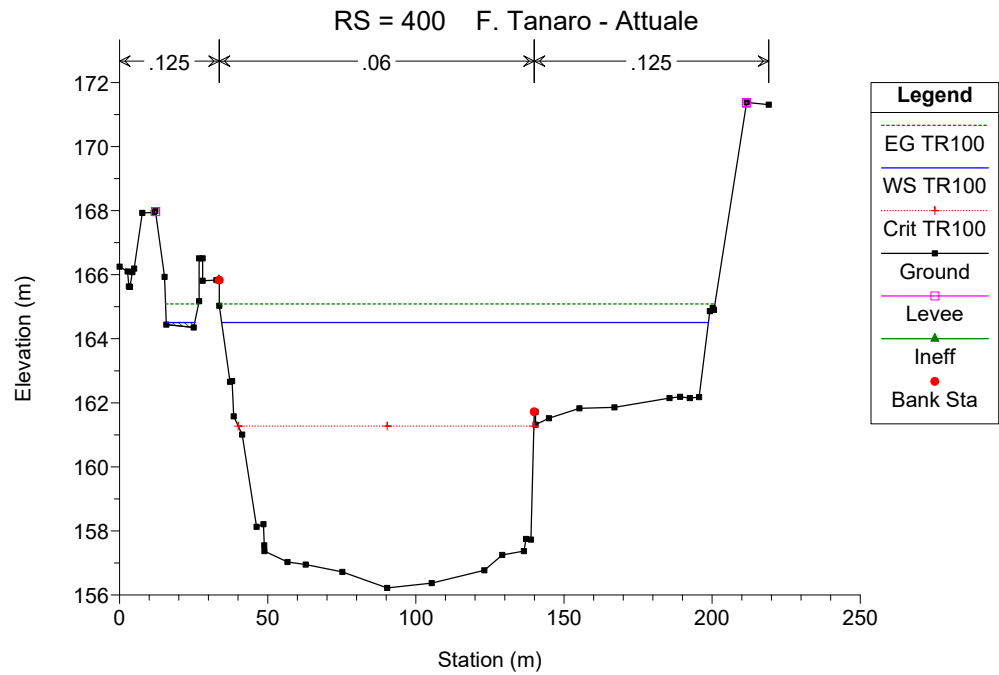
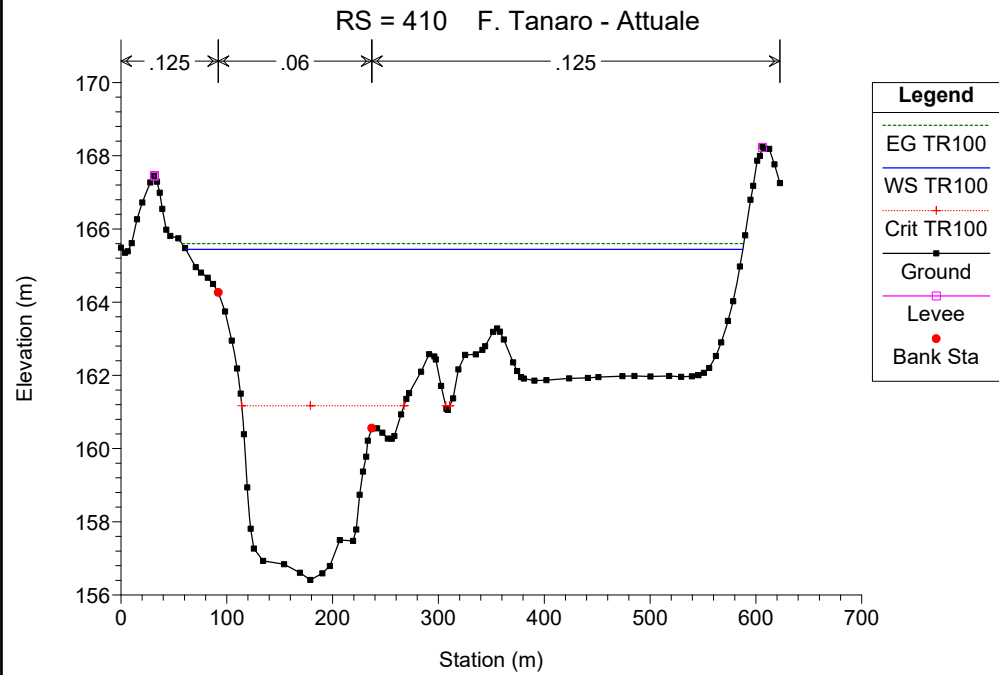
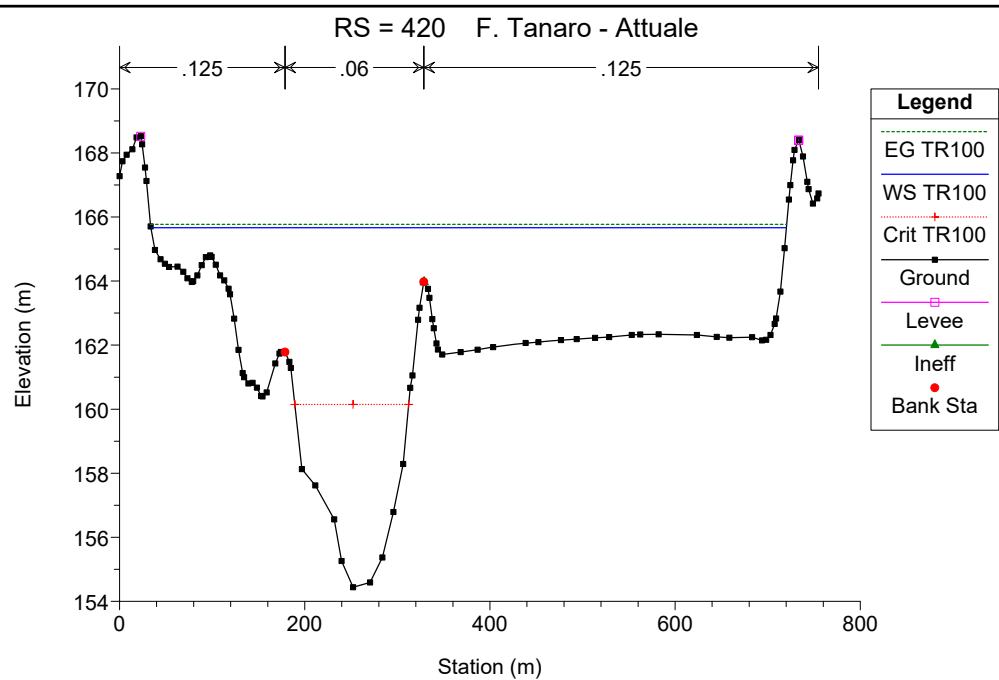
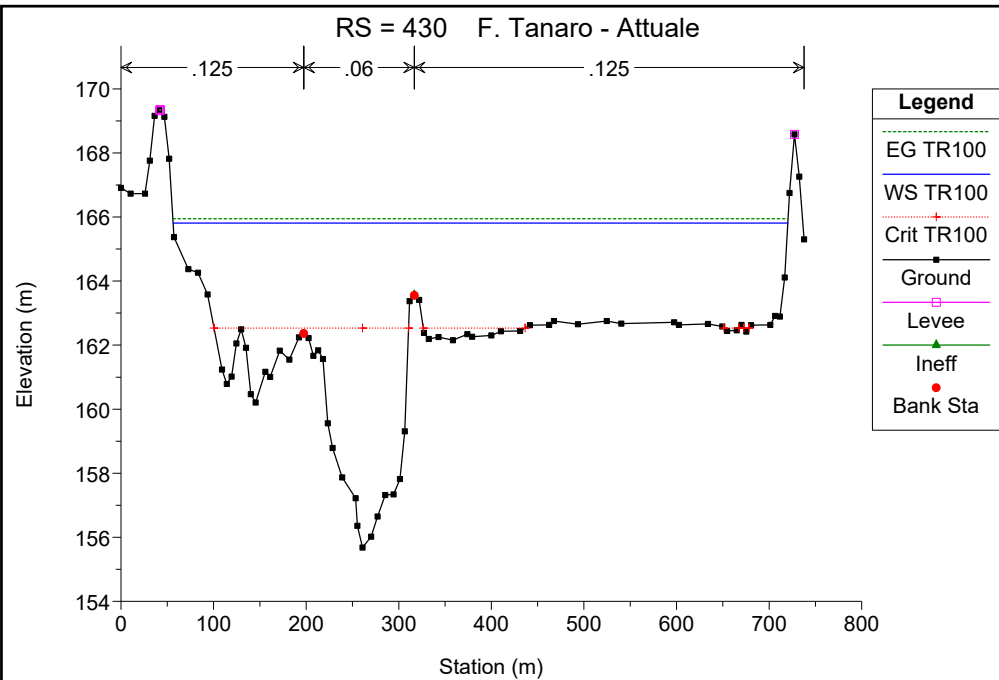
Tanaro 1

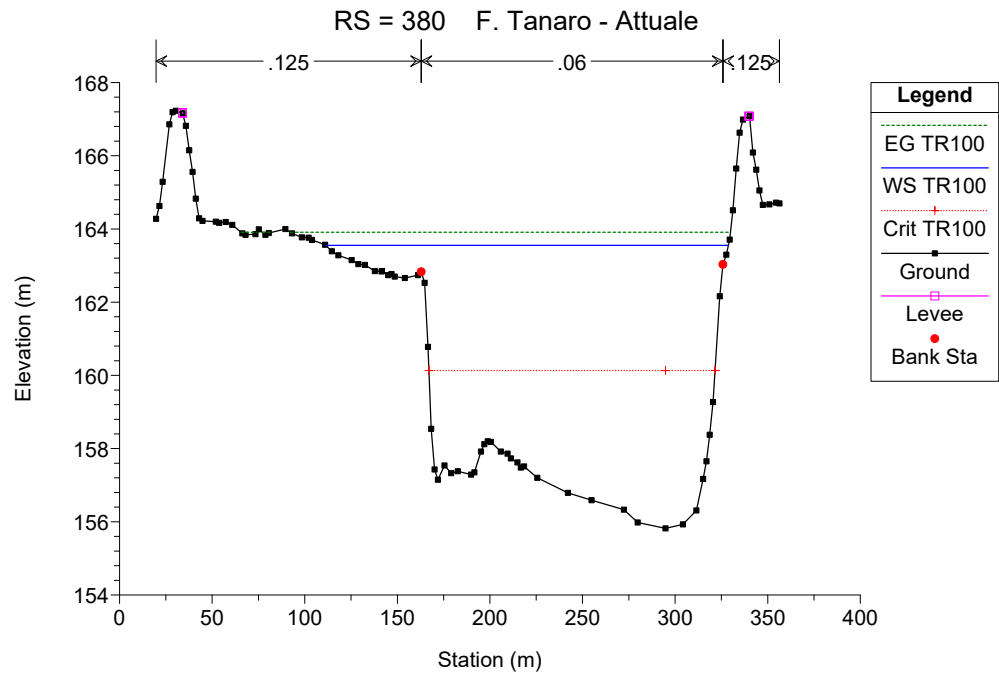
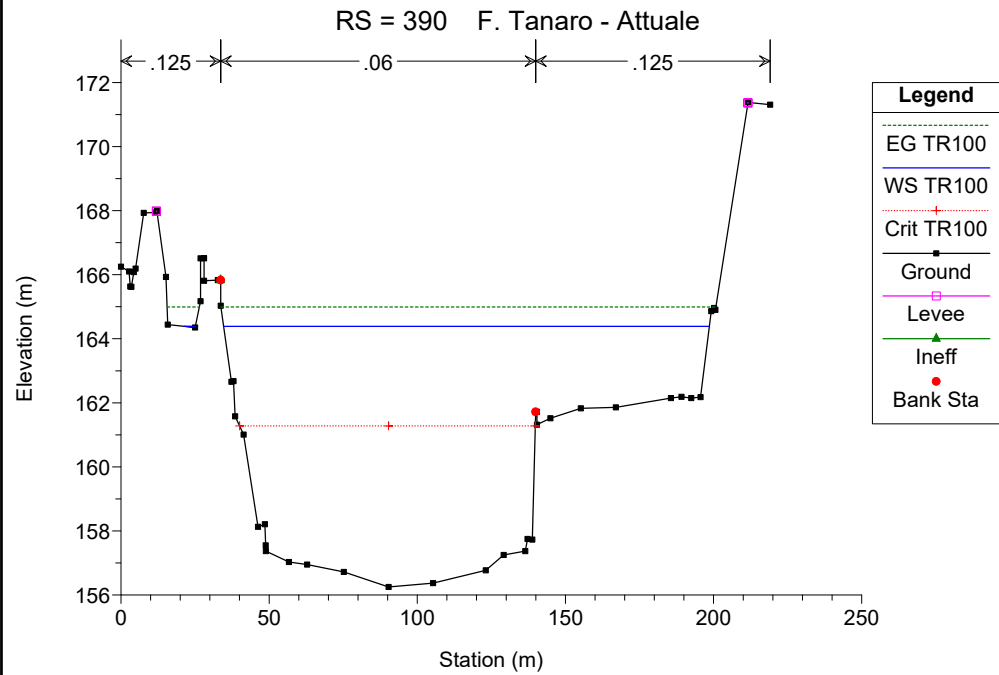
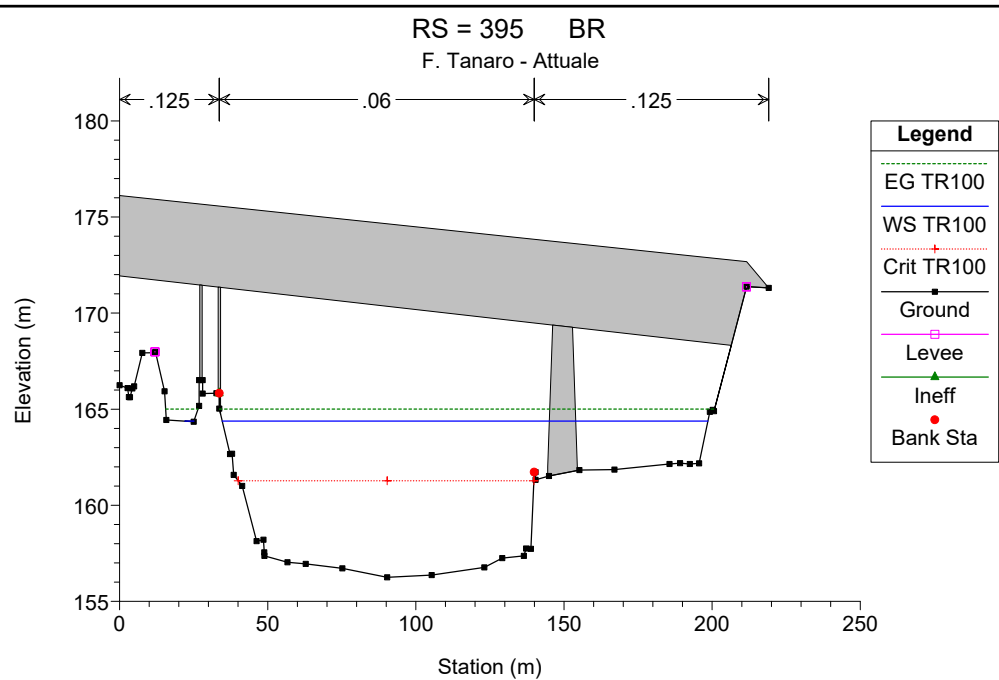
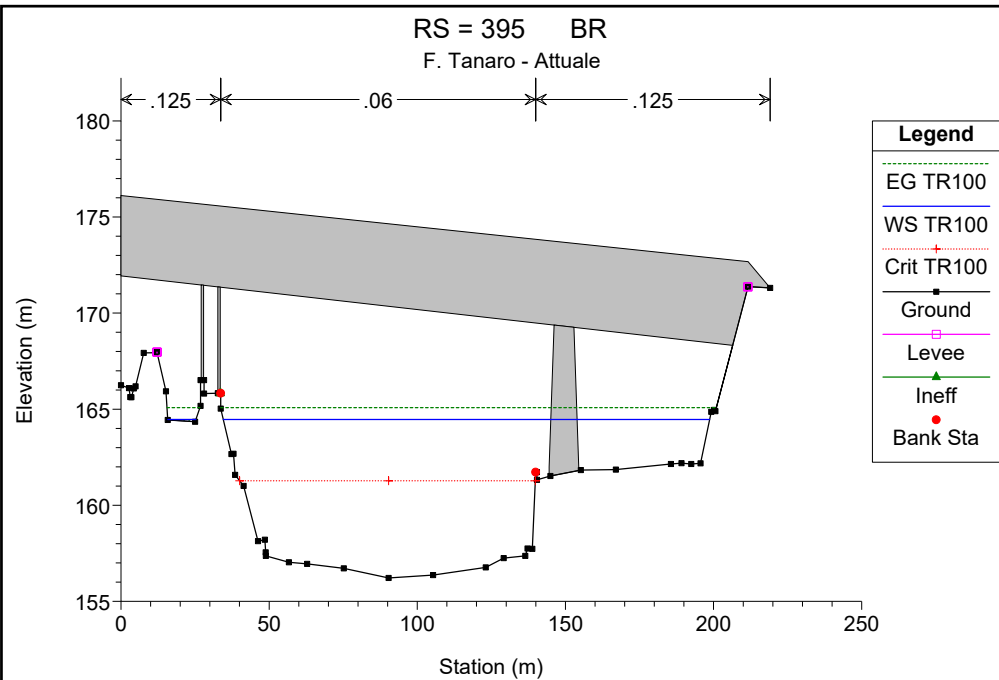


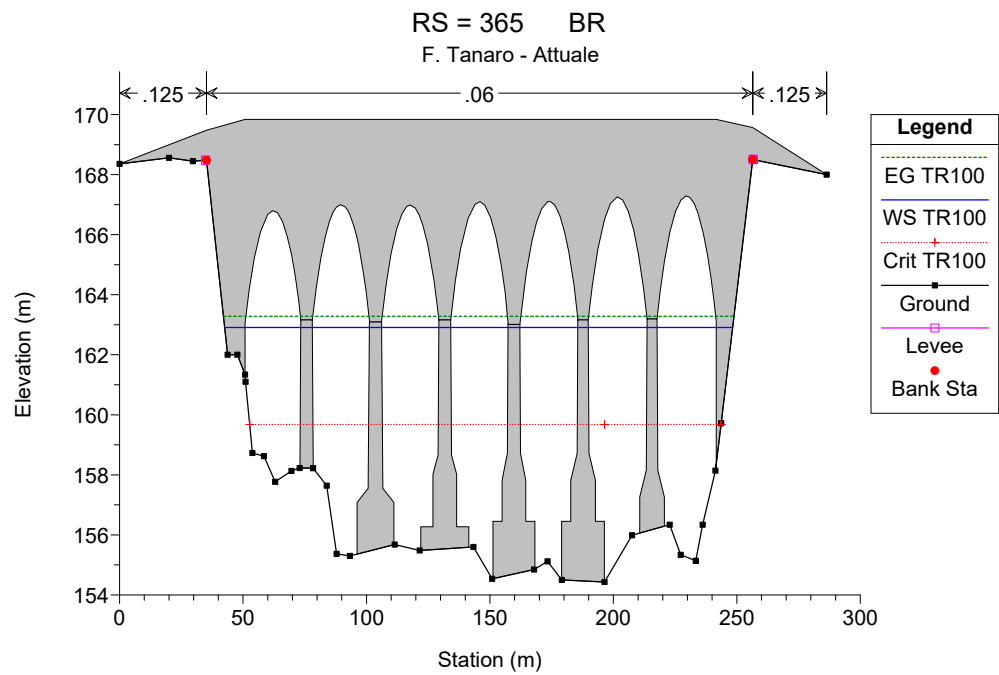
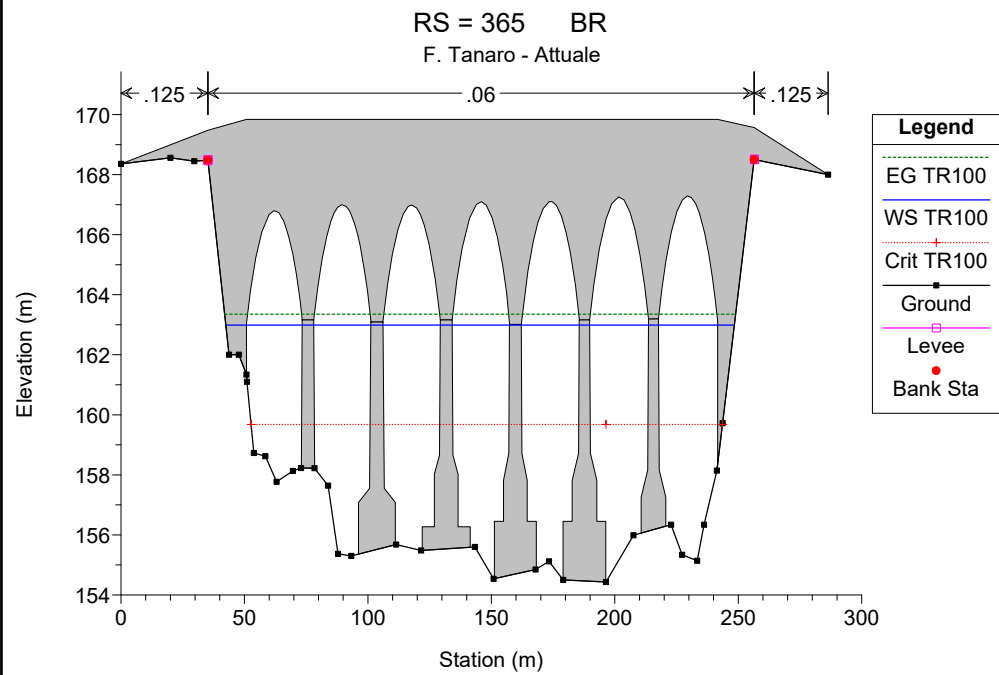
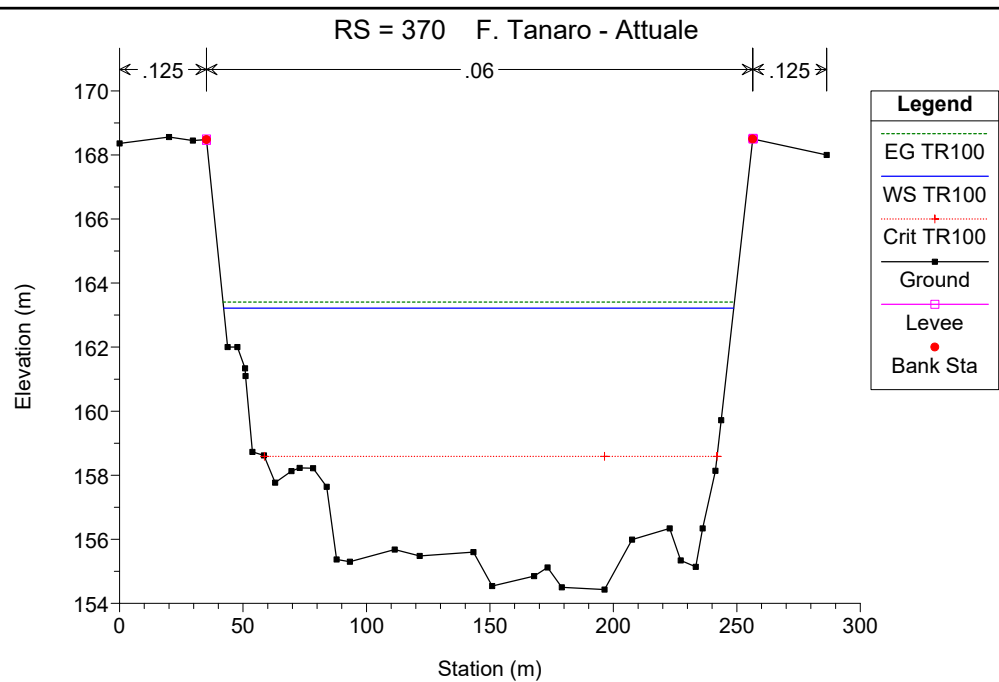
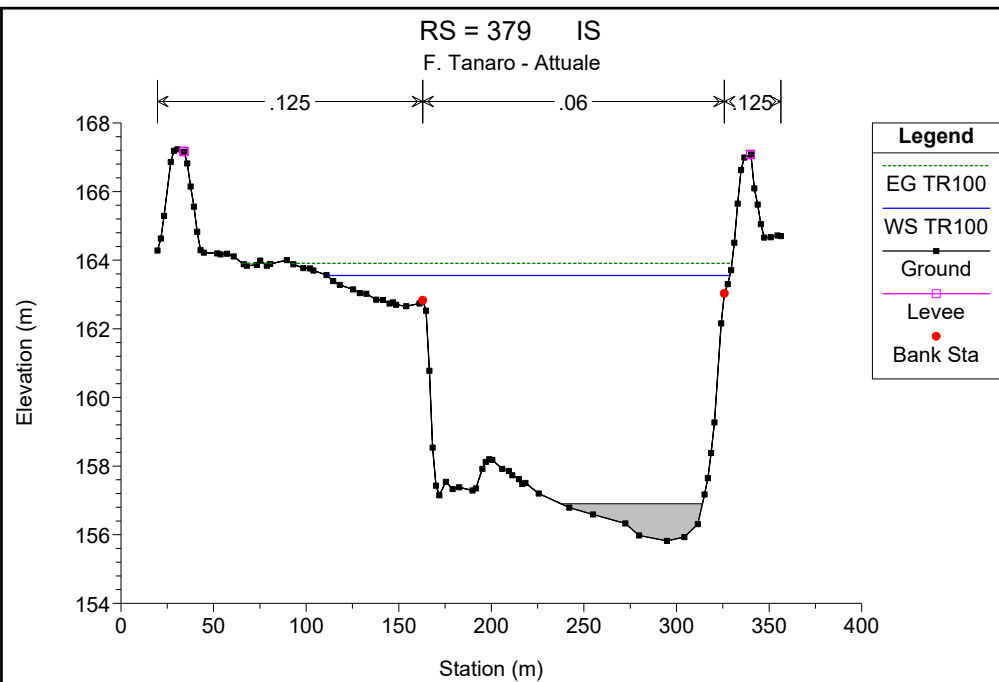


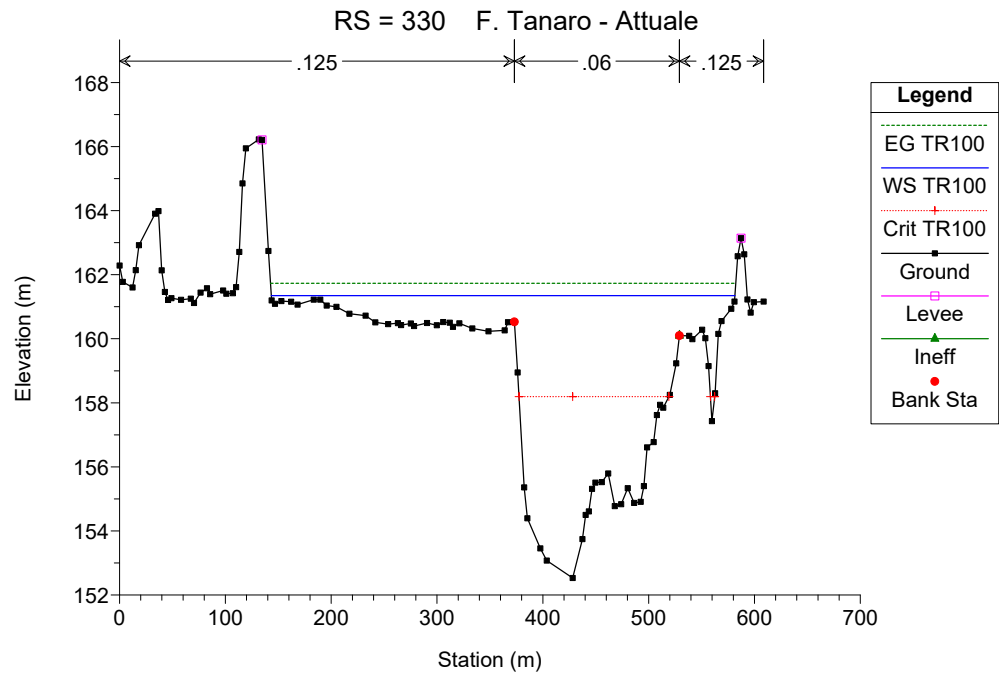
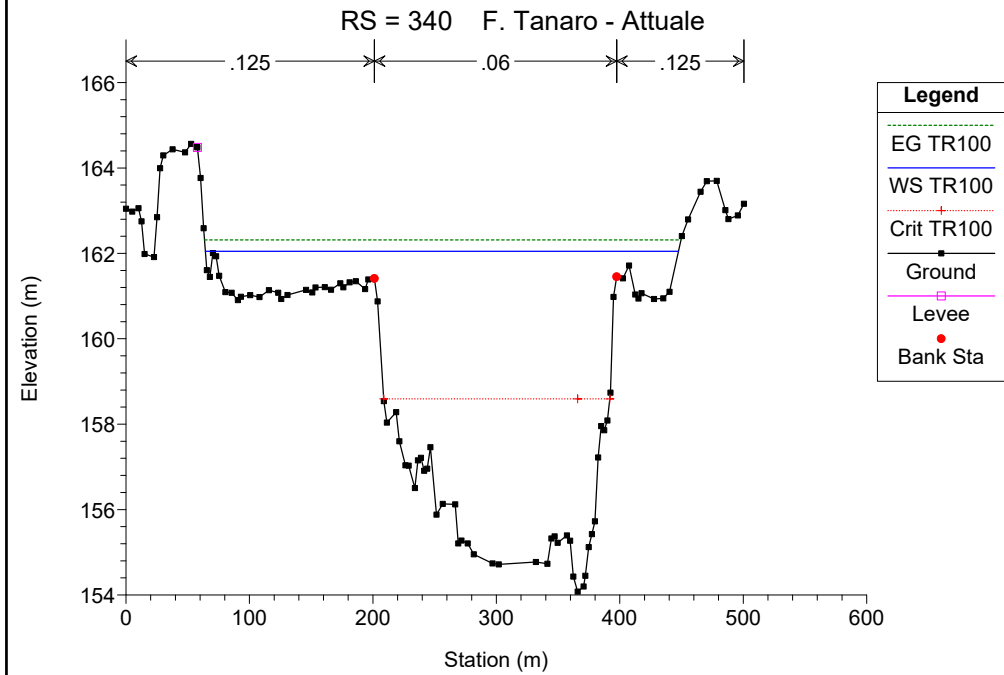
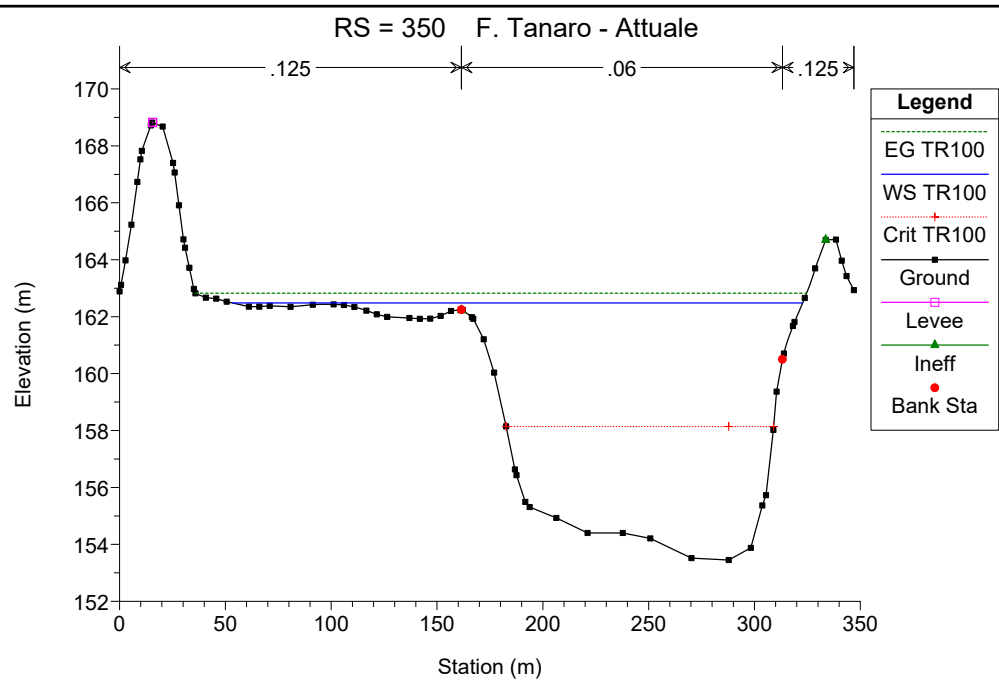
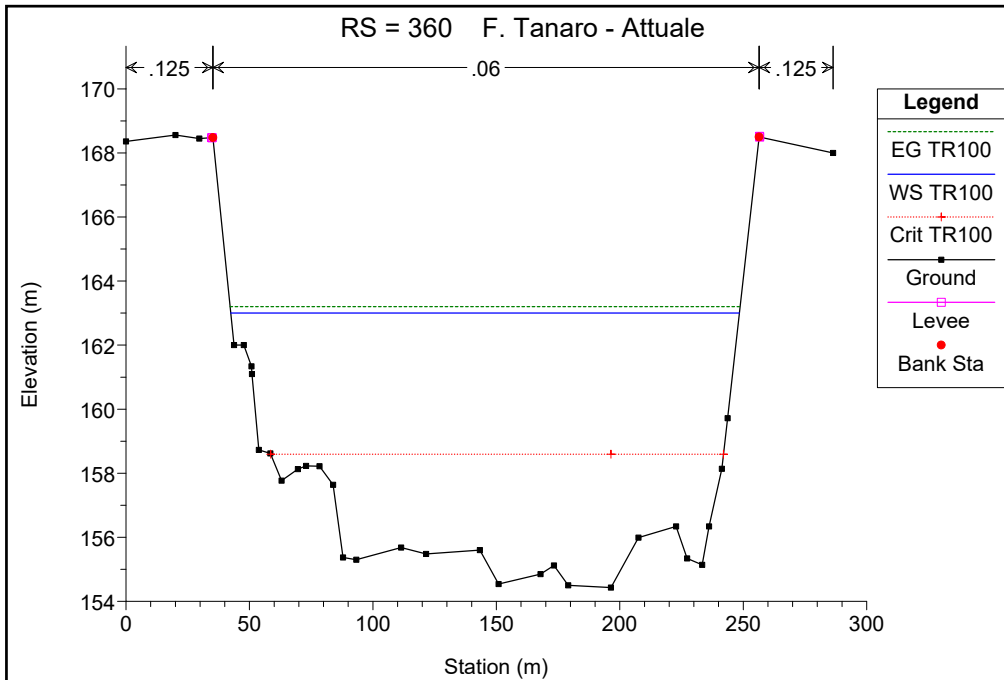


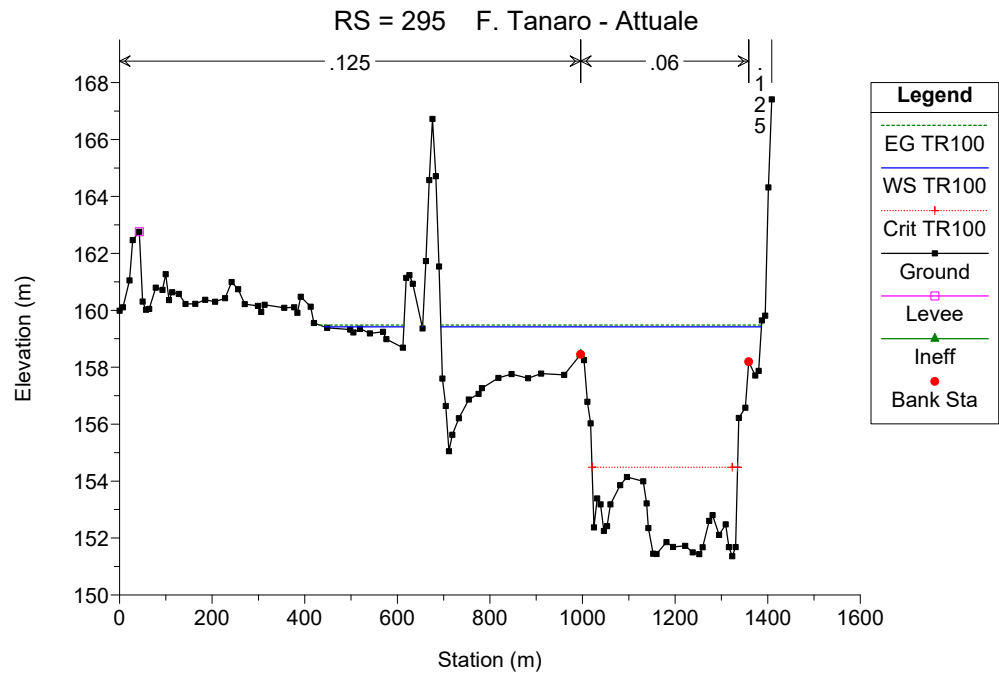
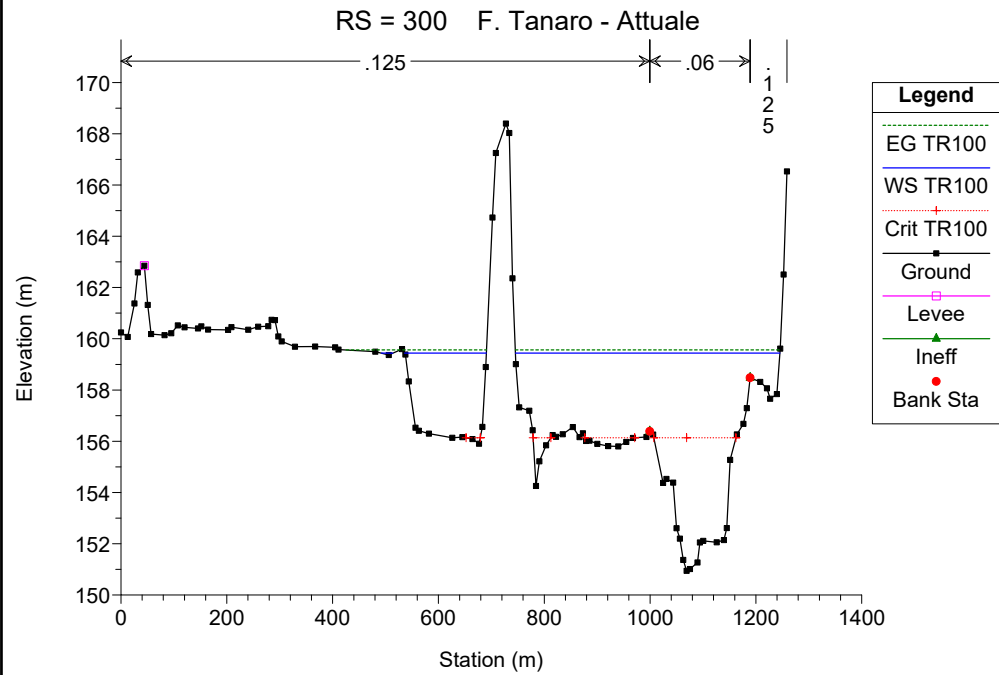
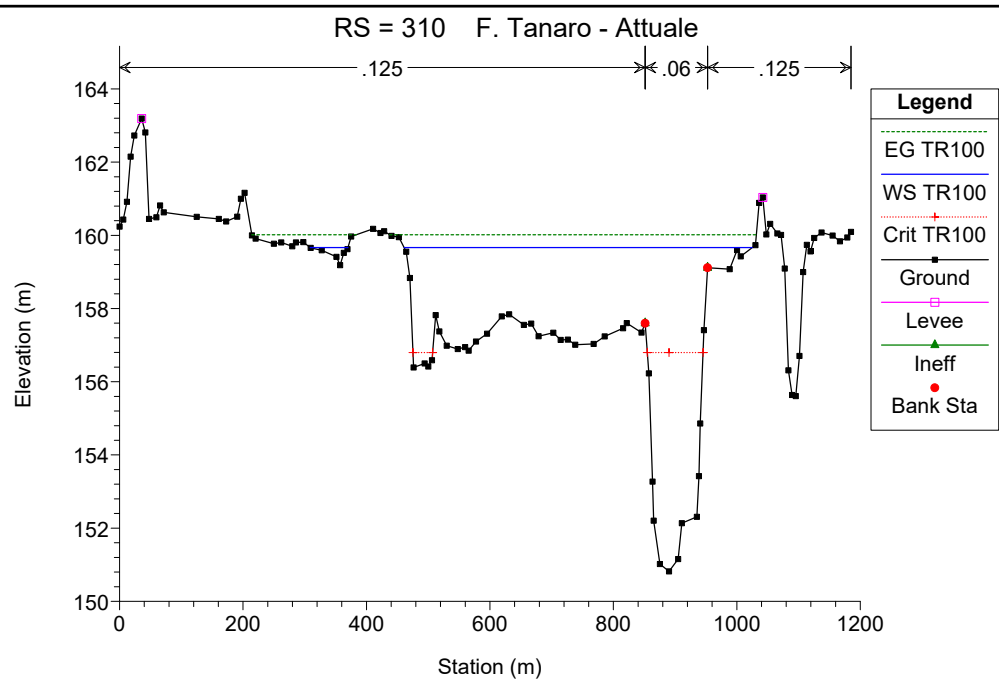
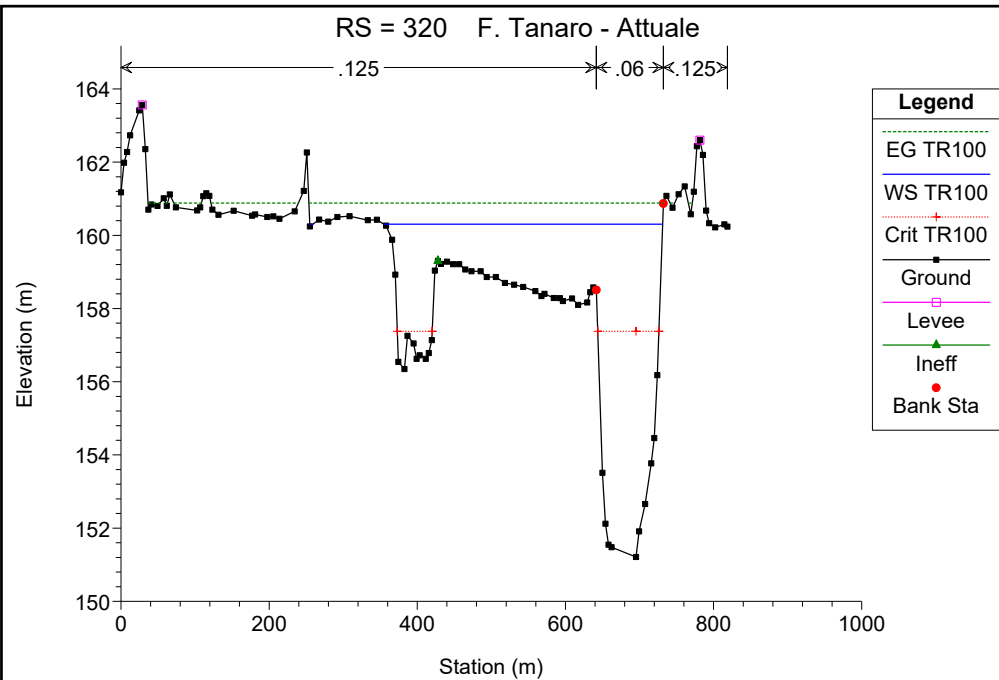


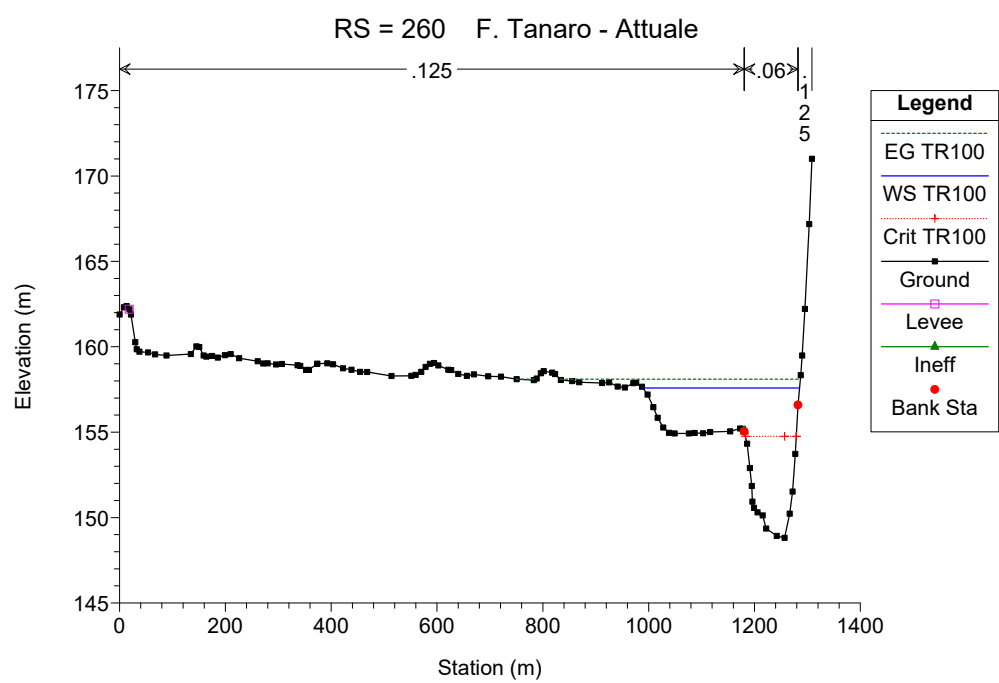
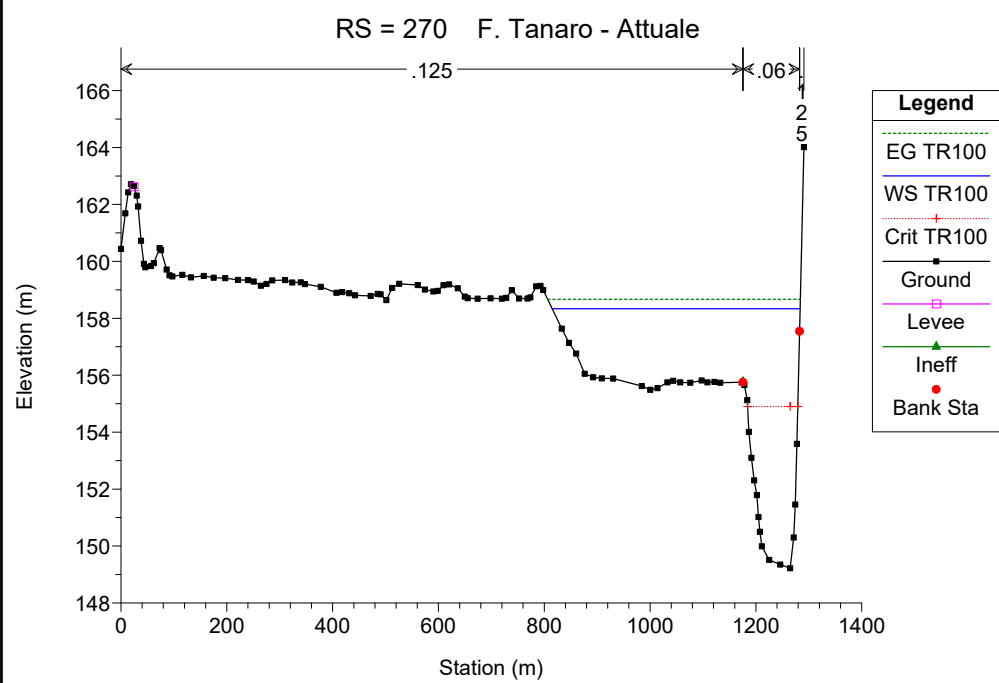
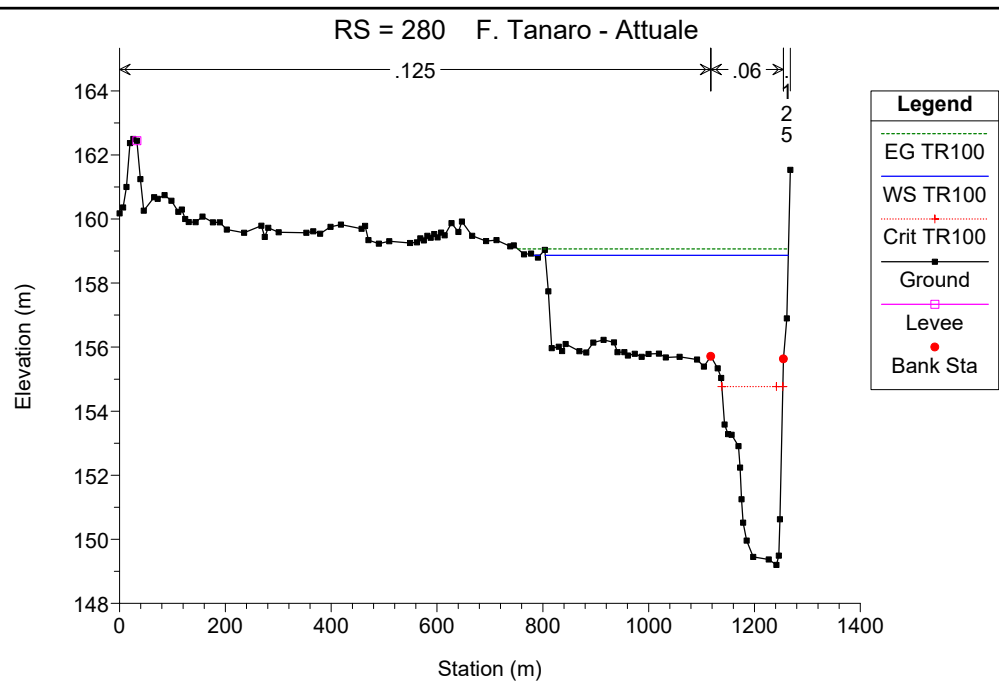
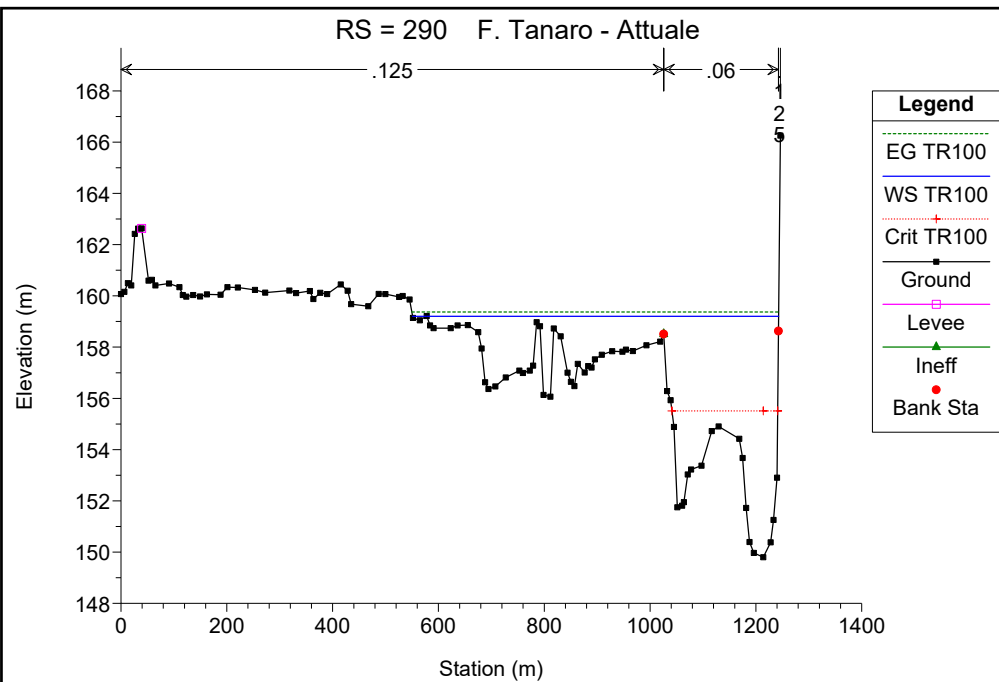


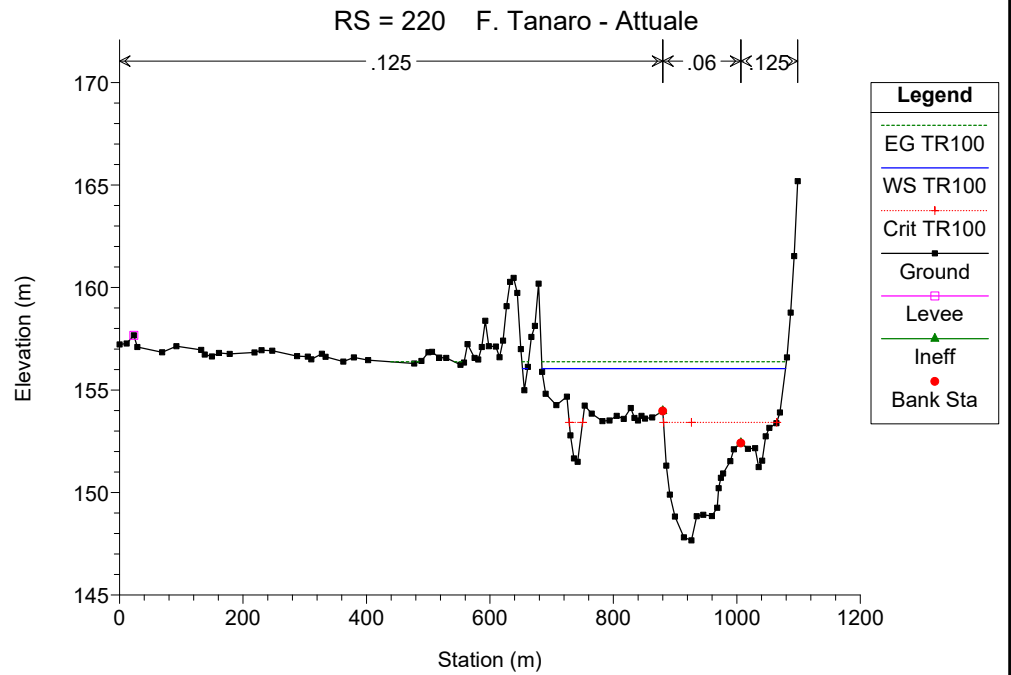
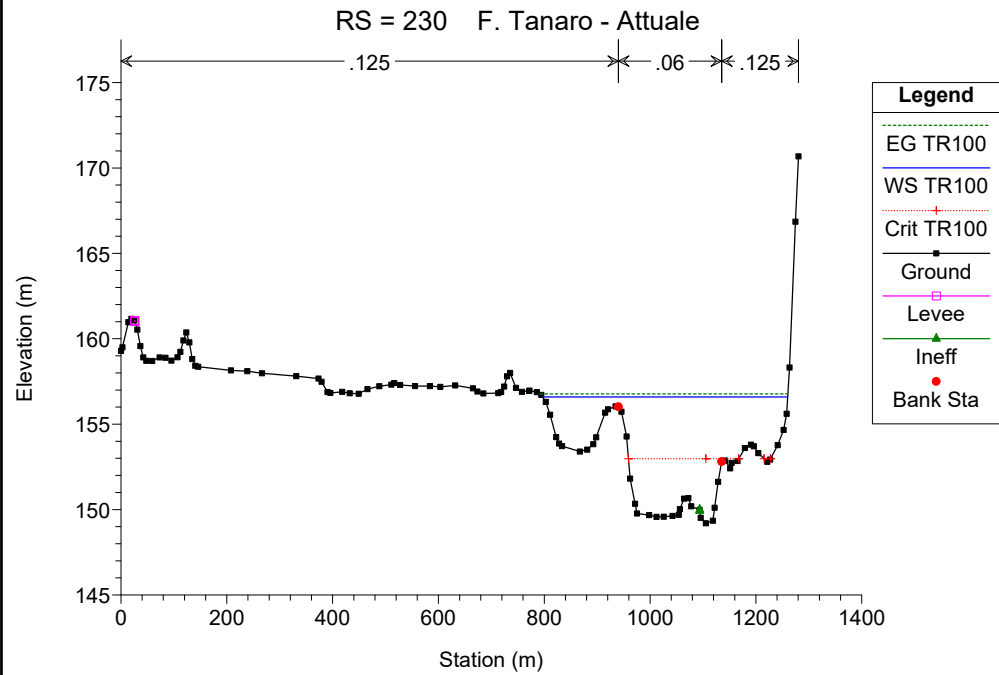
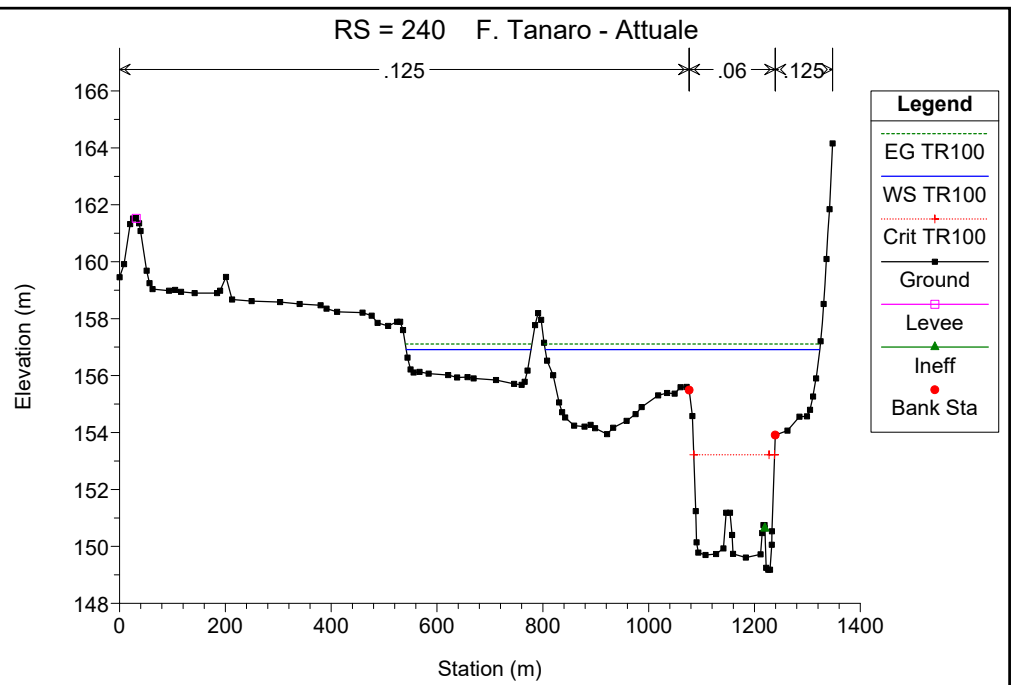
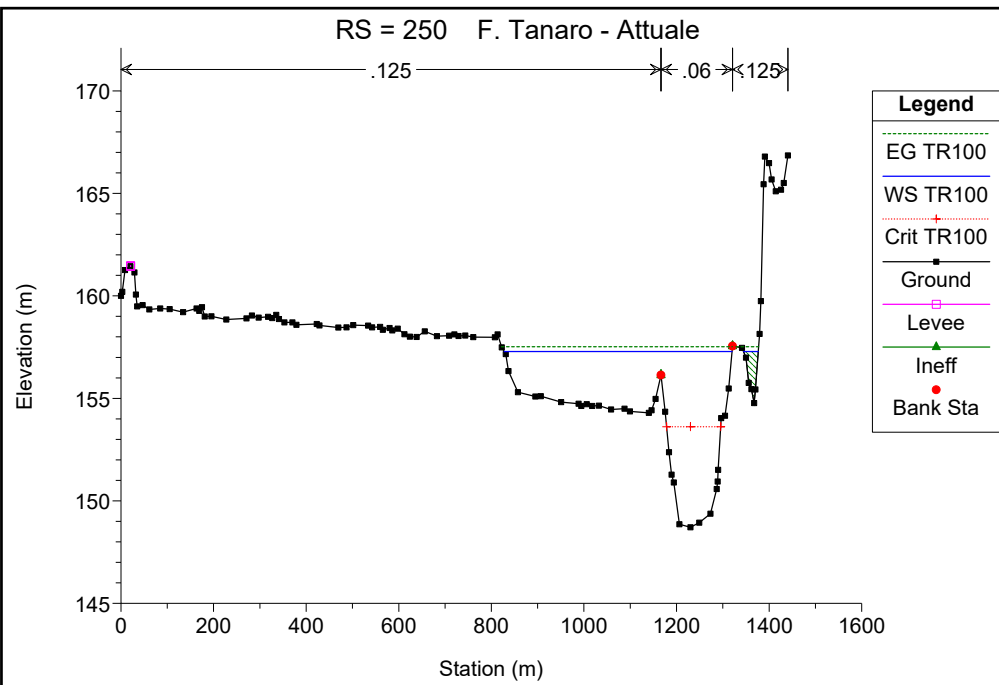


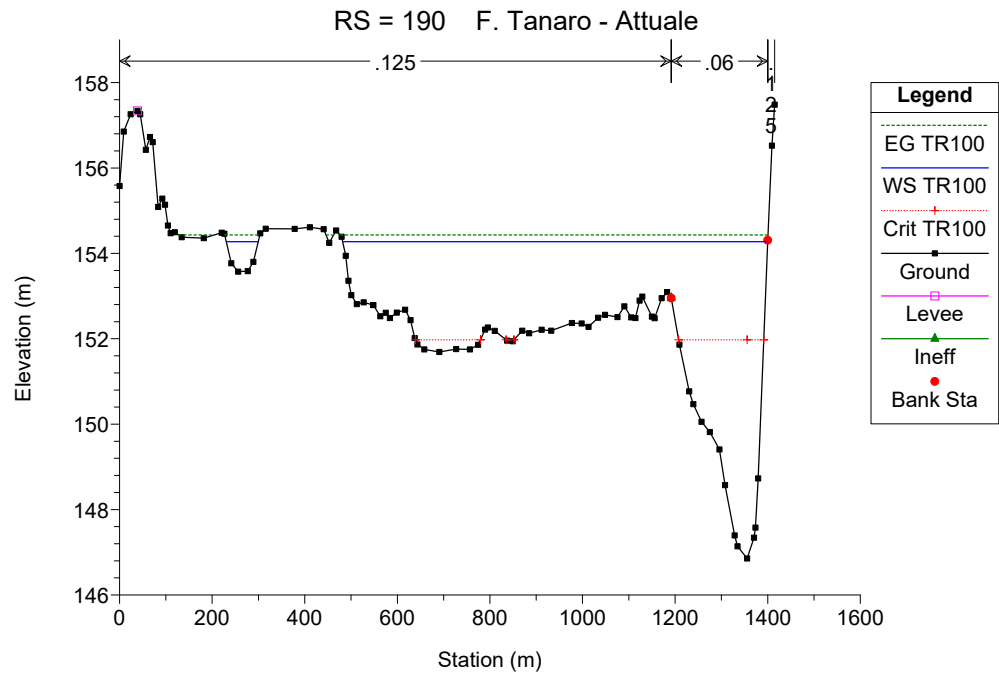
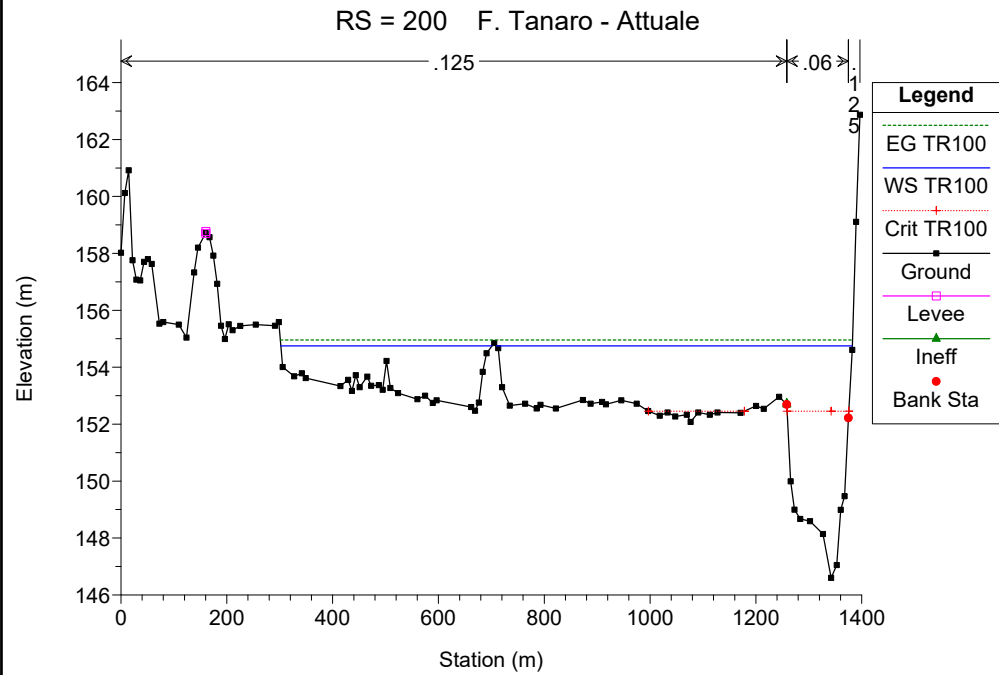
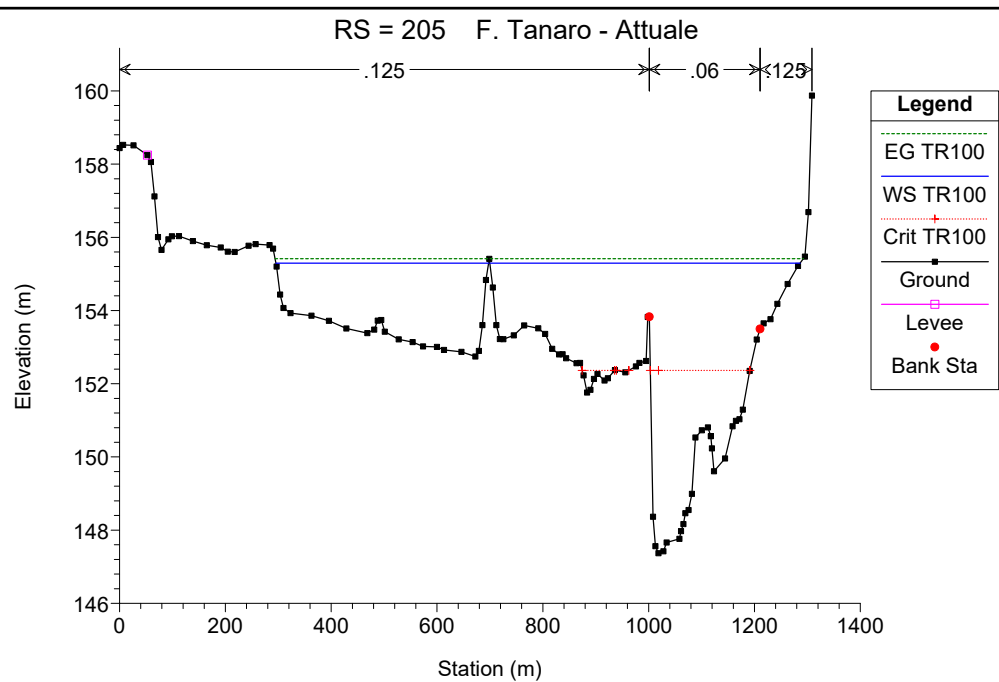
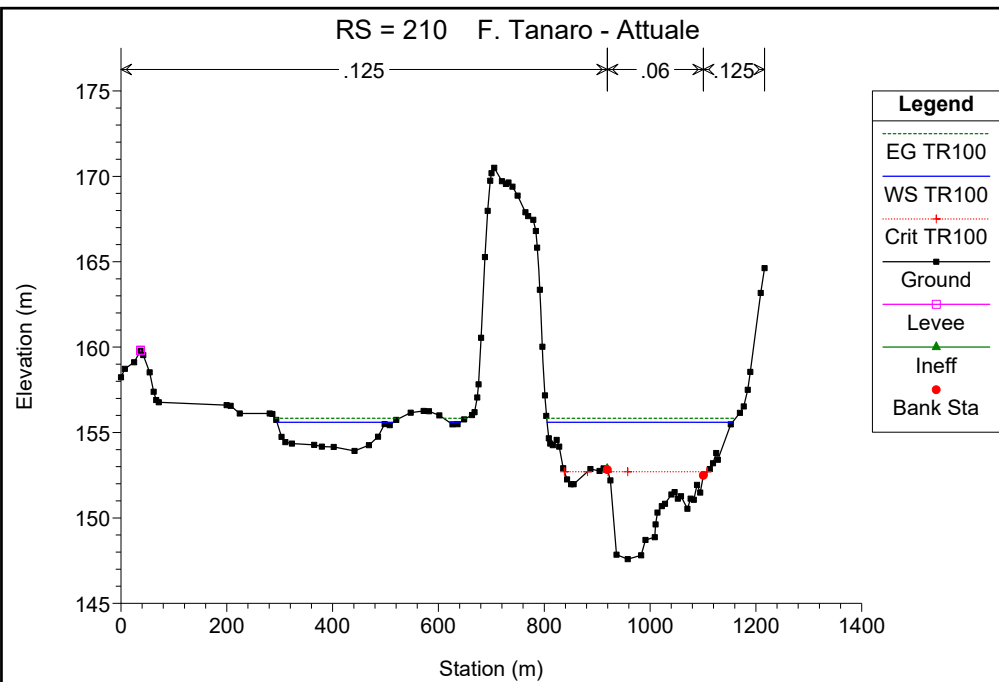


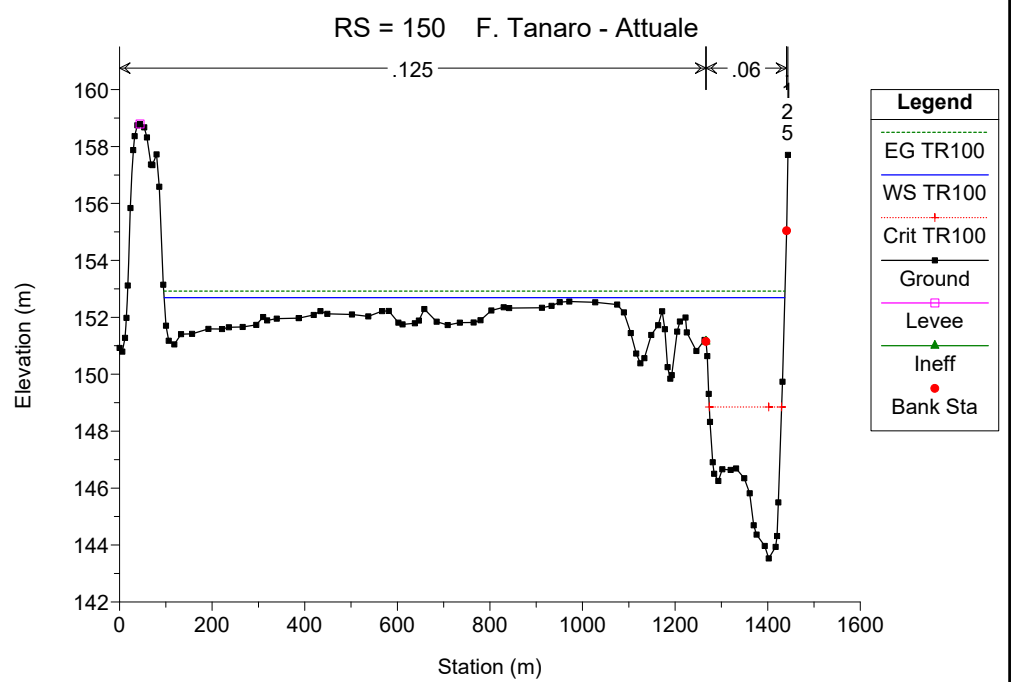
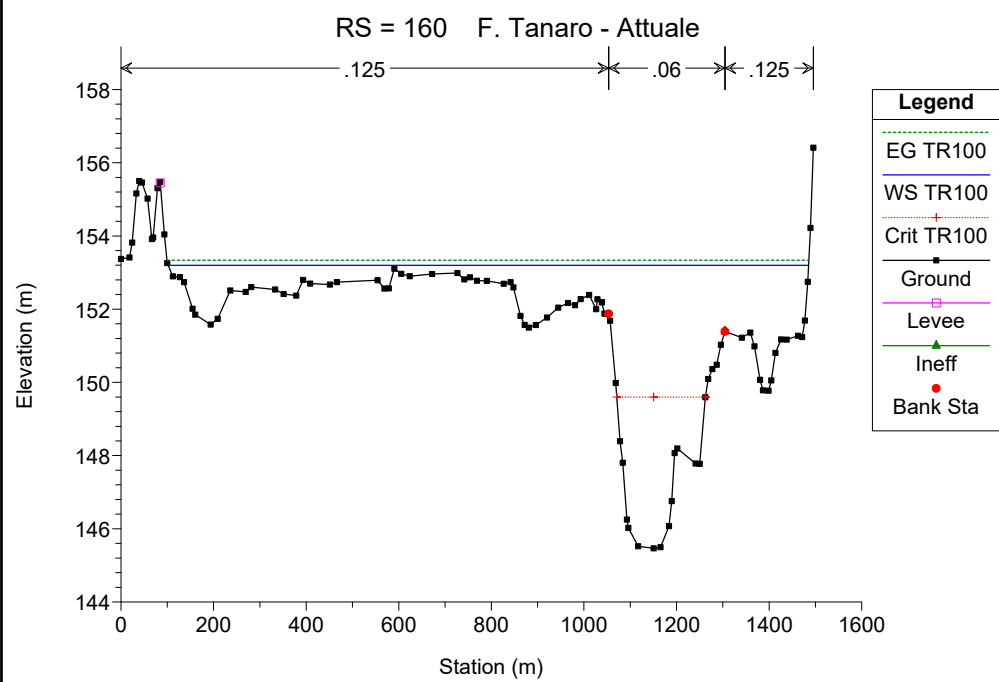
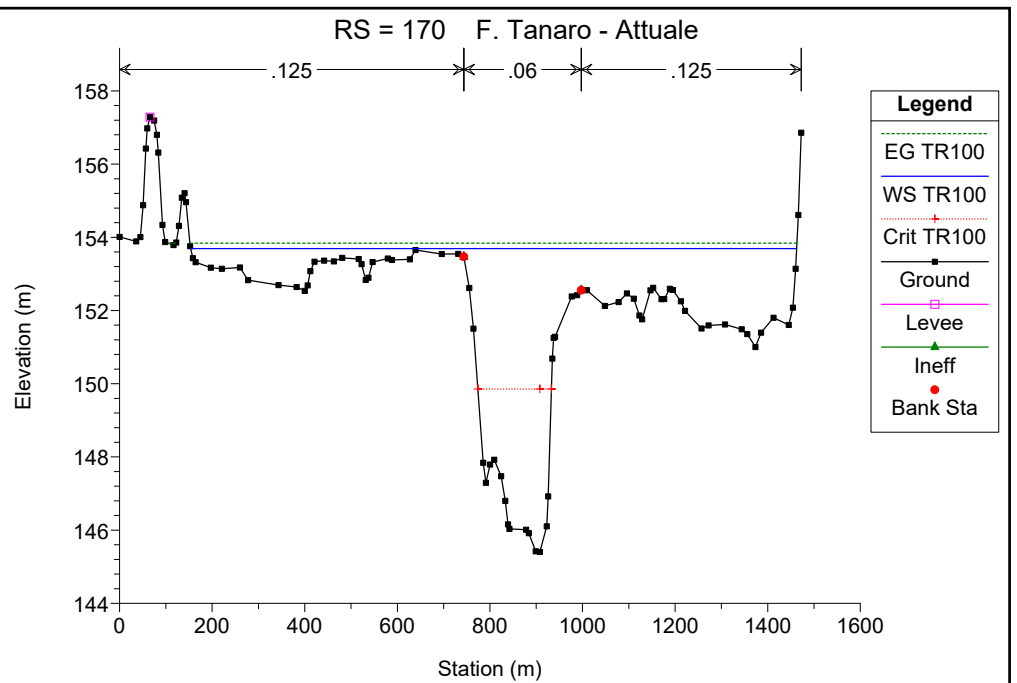
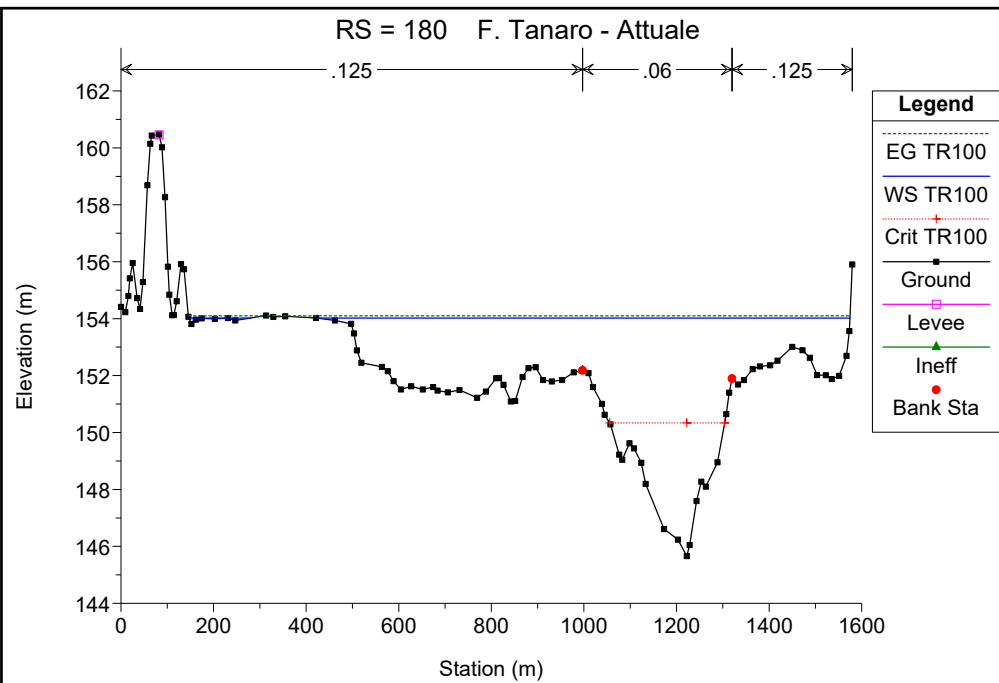


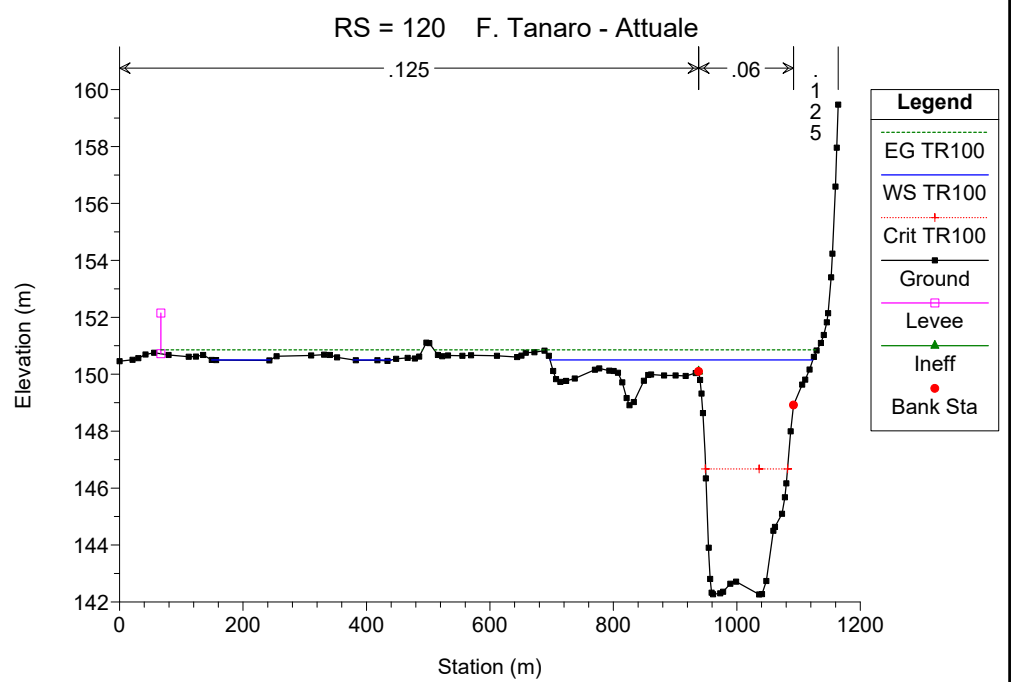
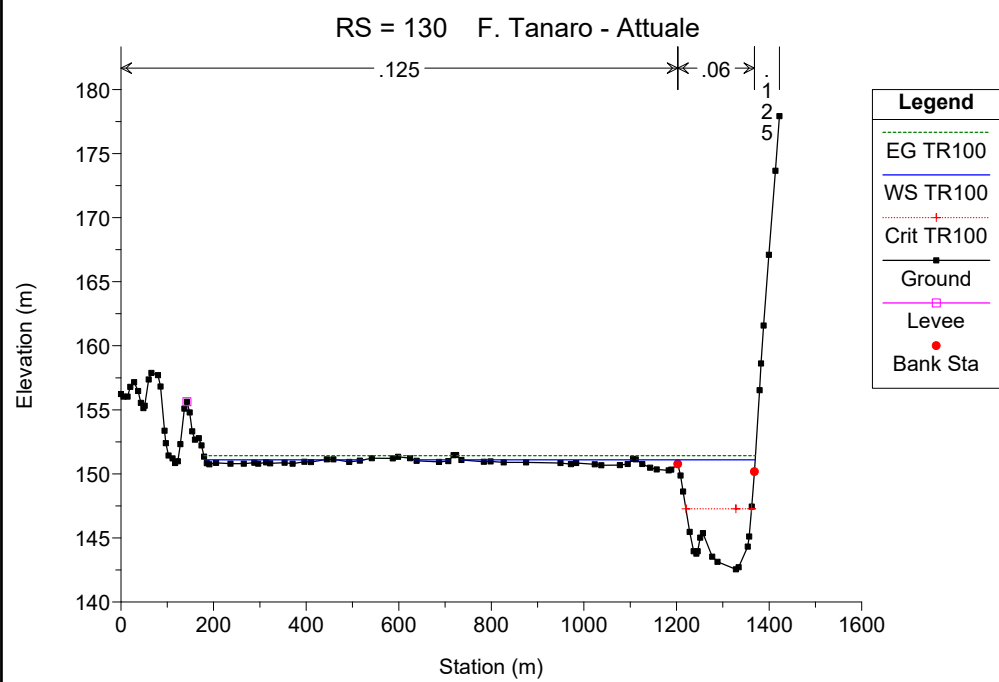
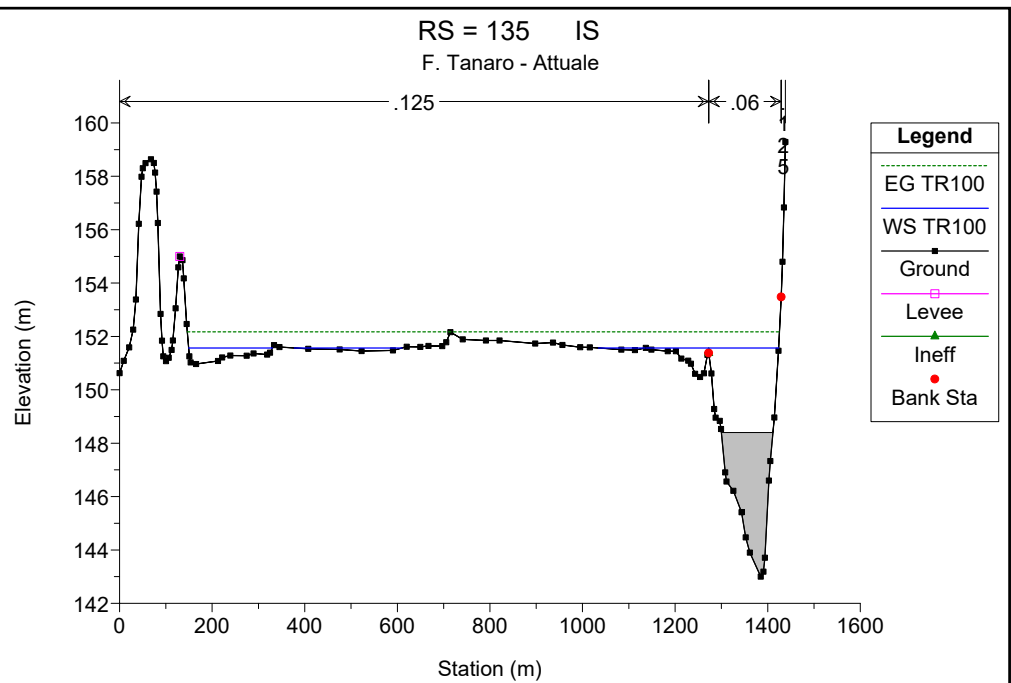
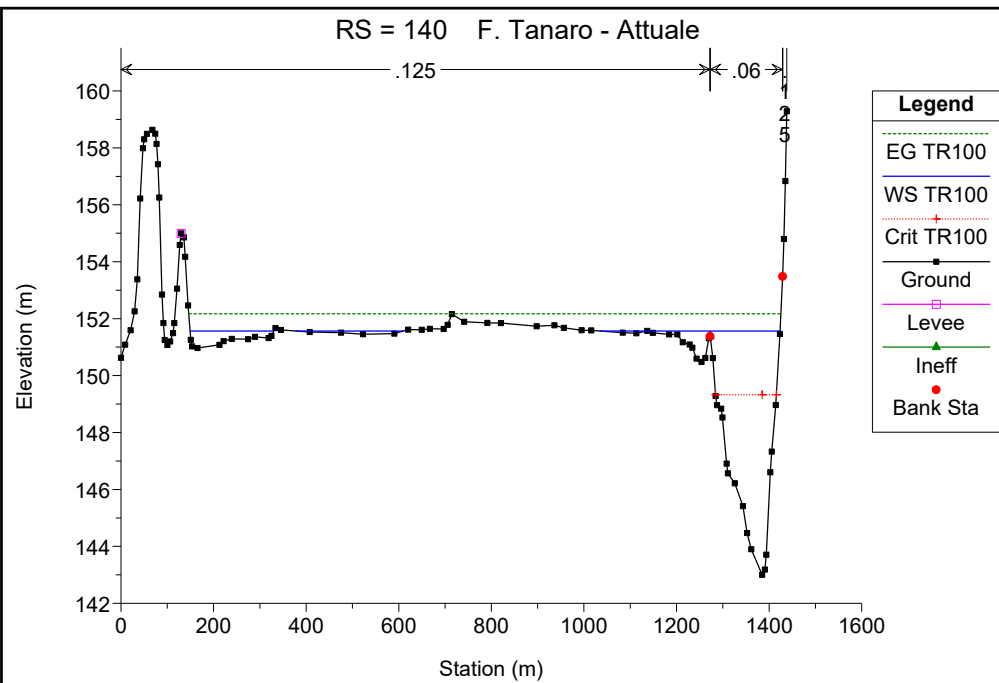


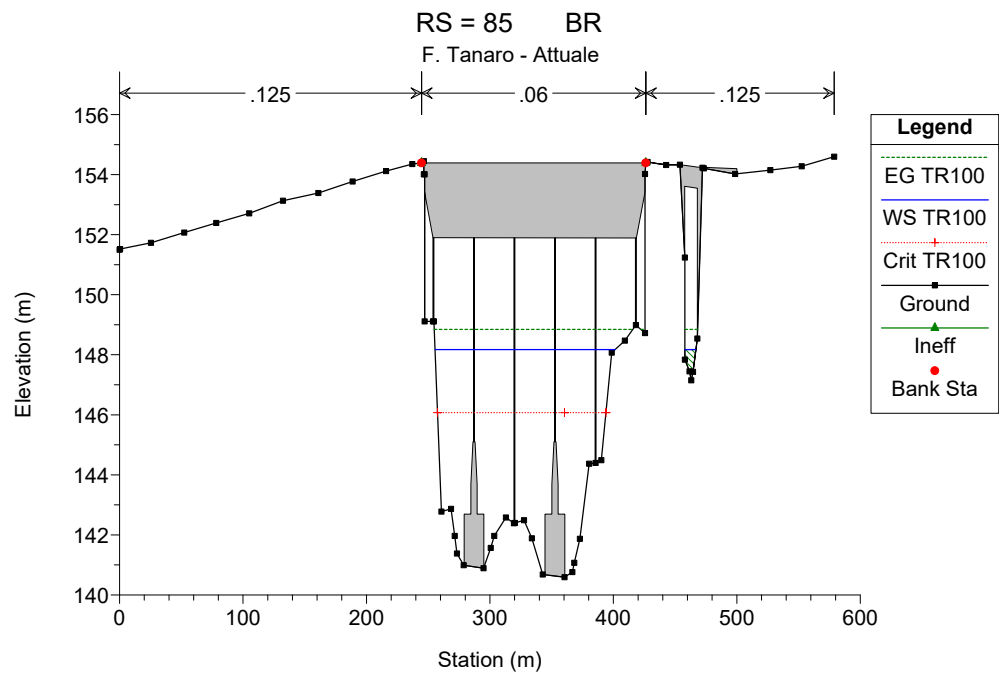
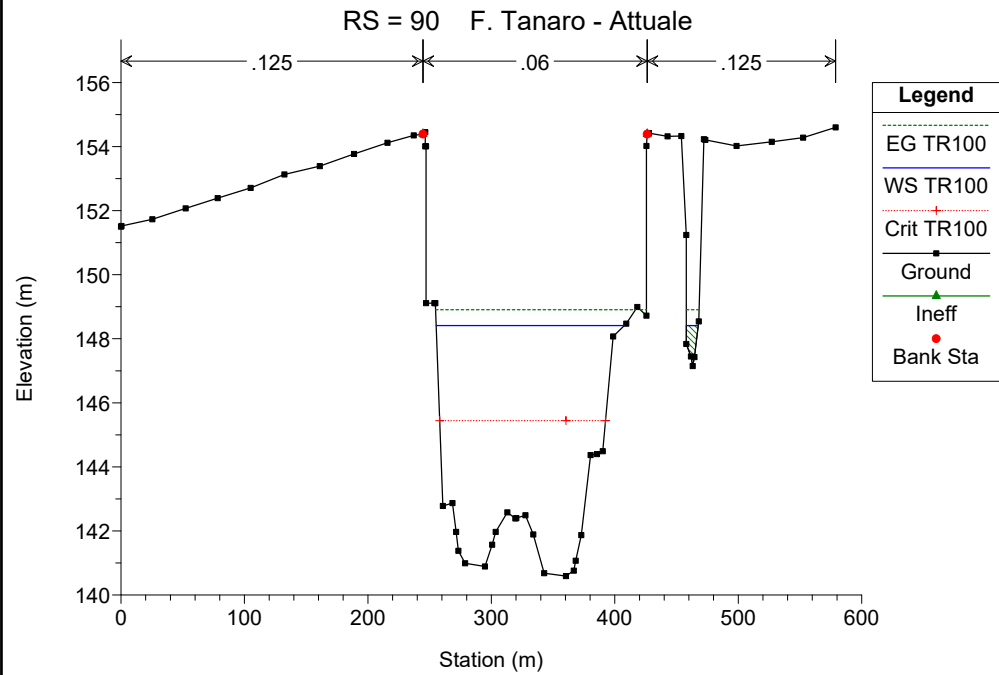
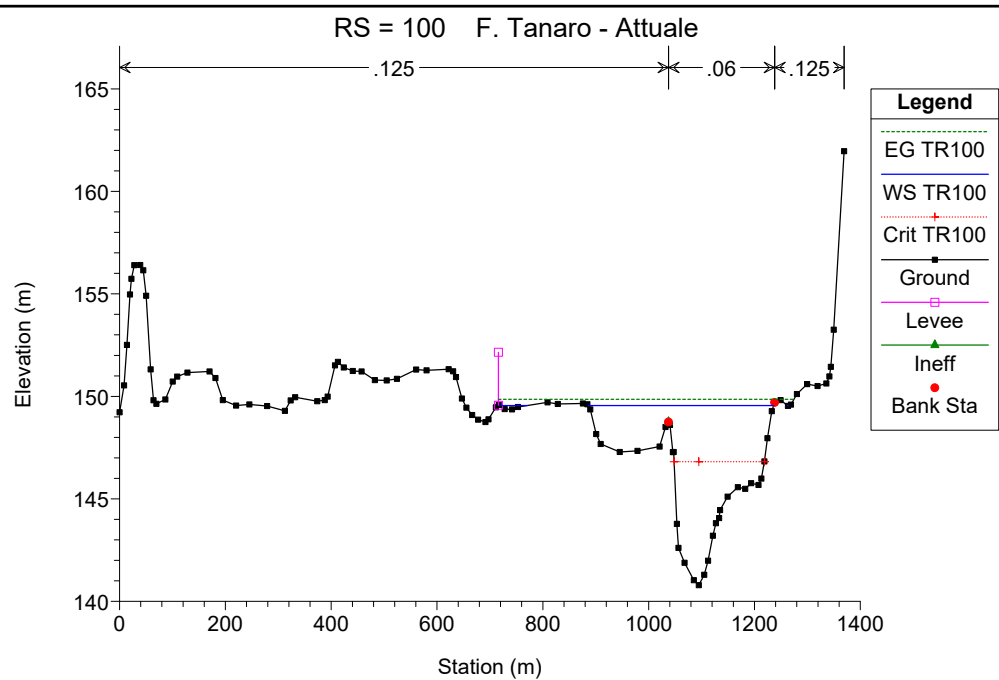
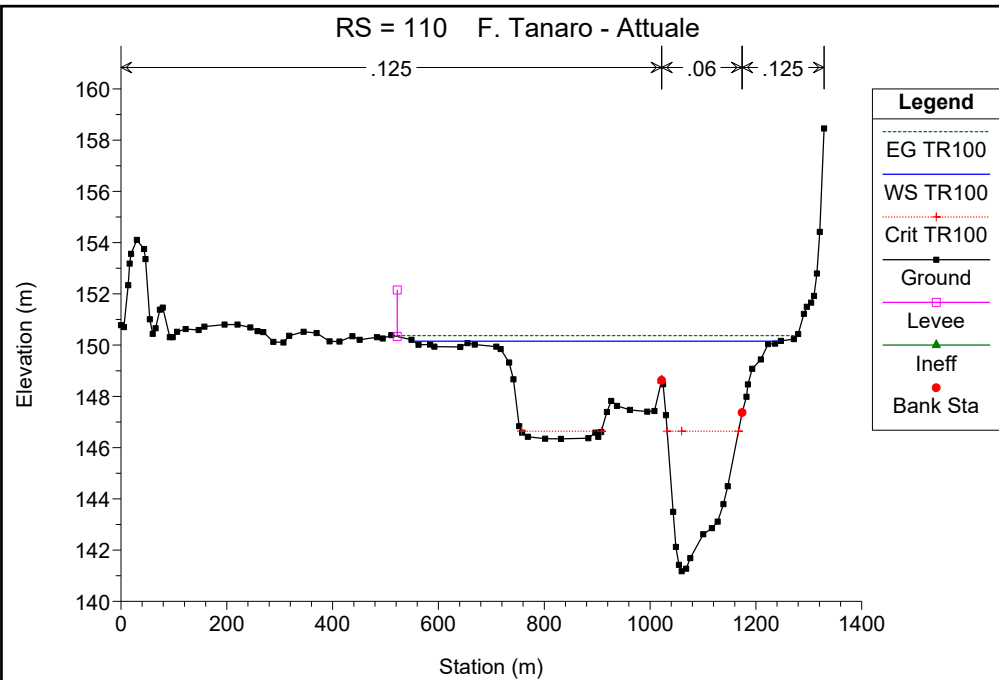


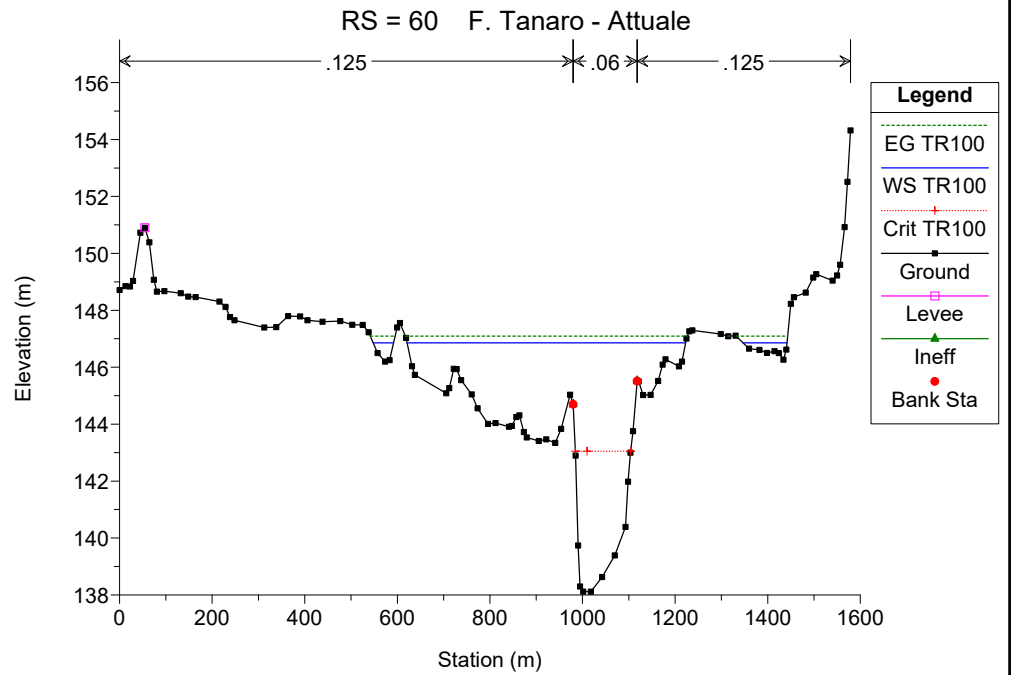
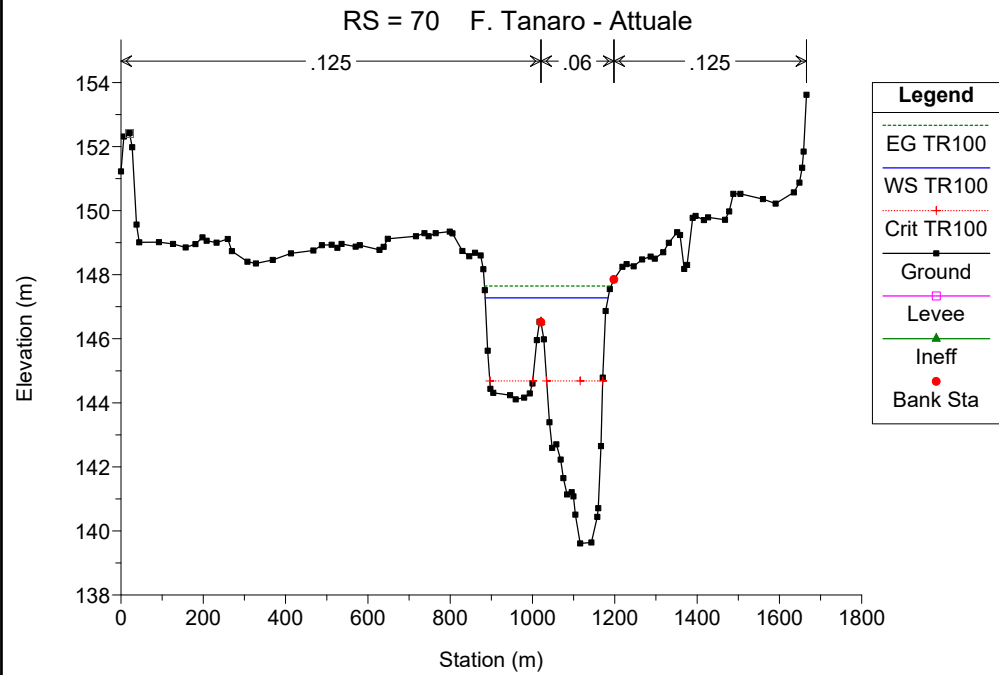
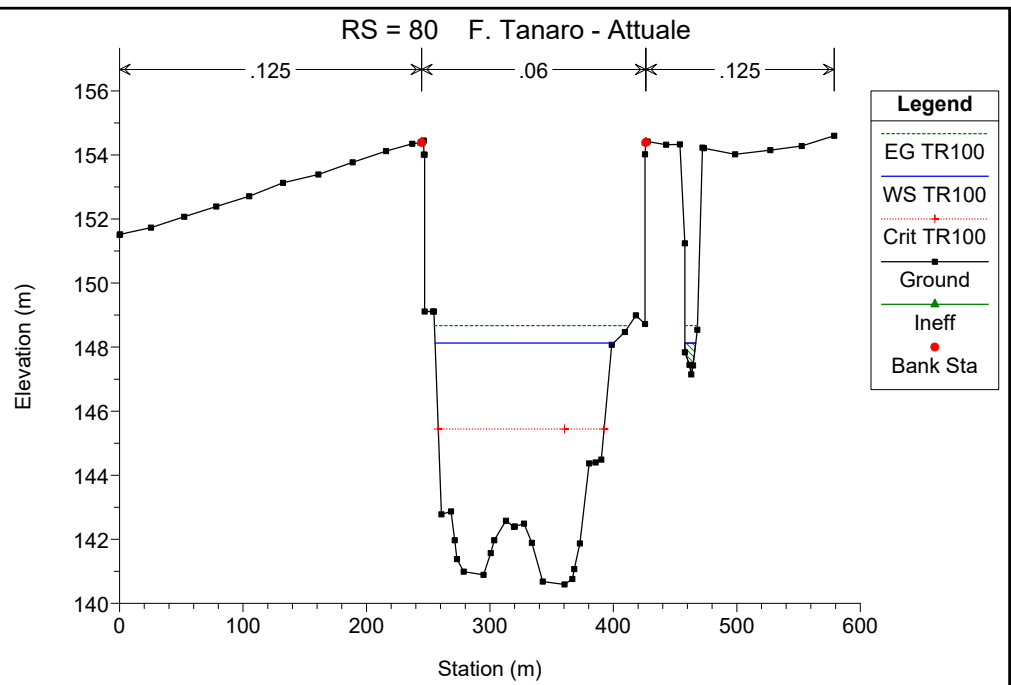
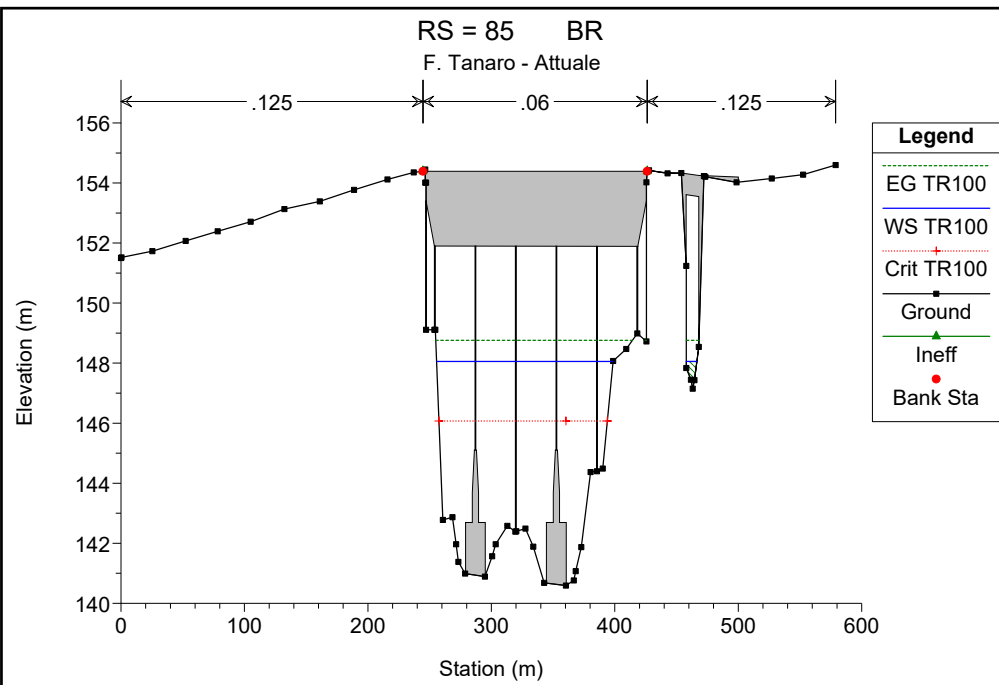


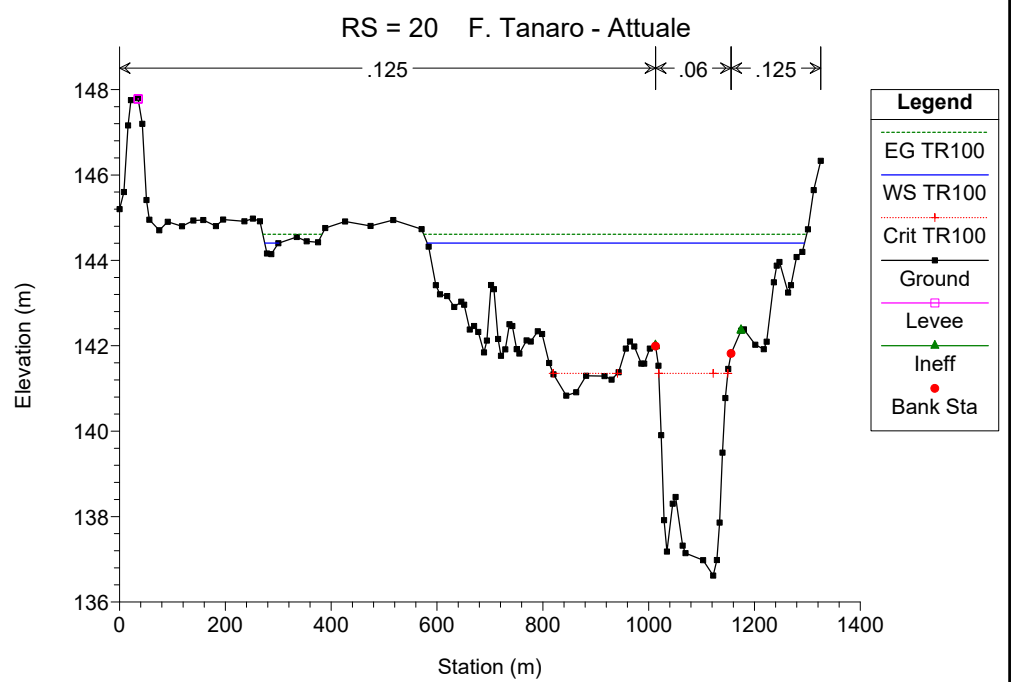
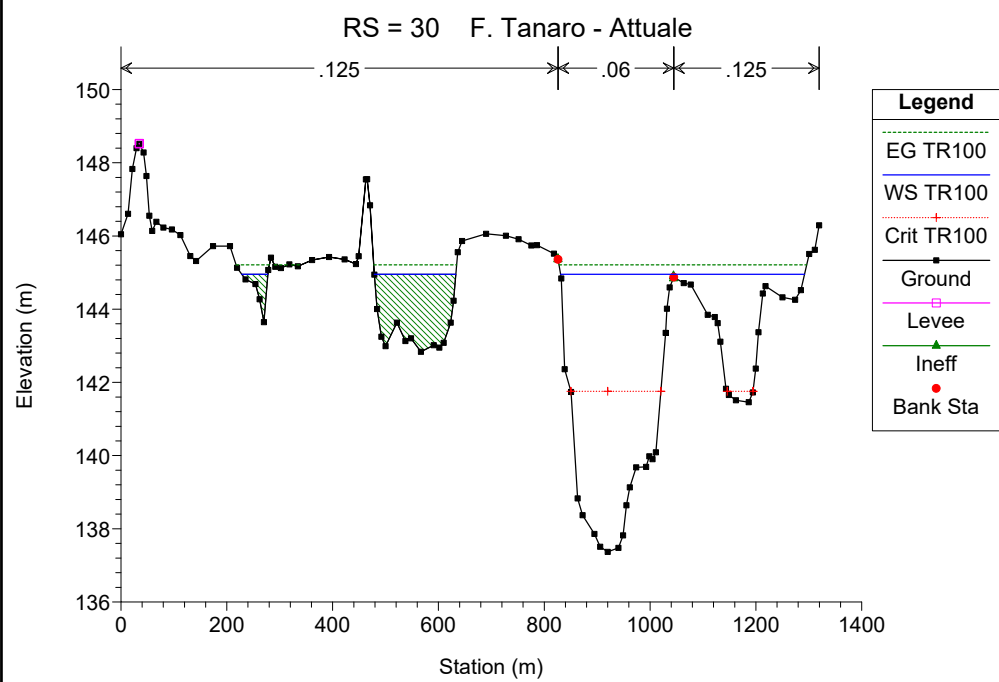
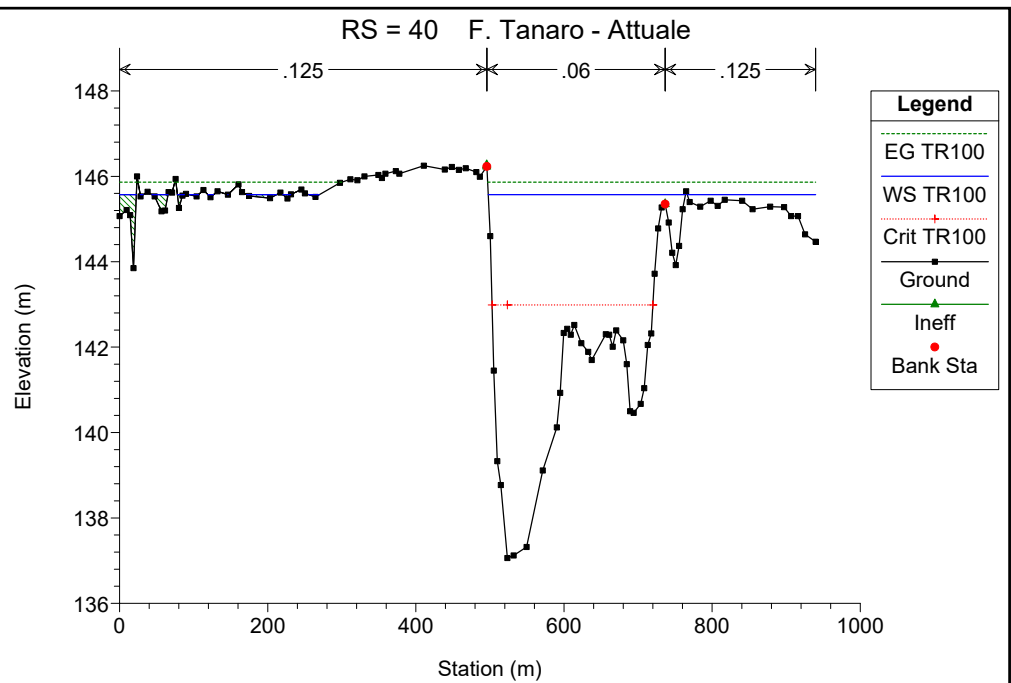
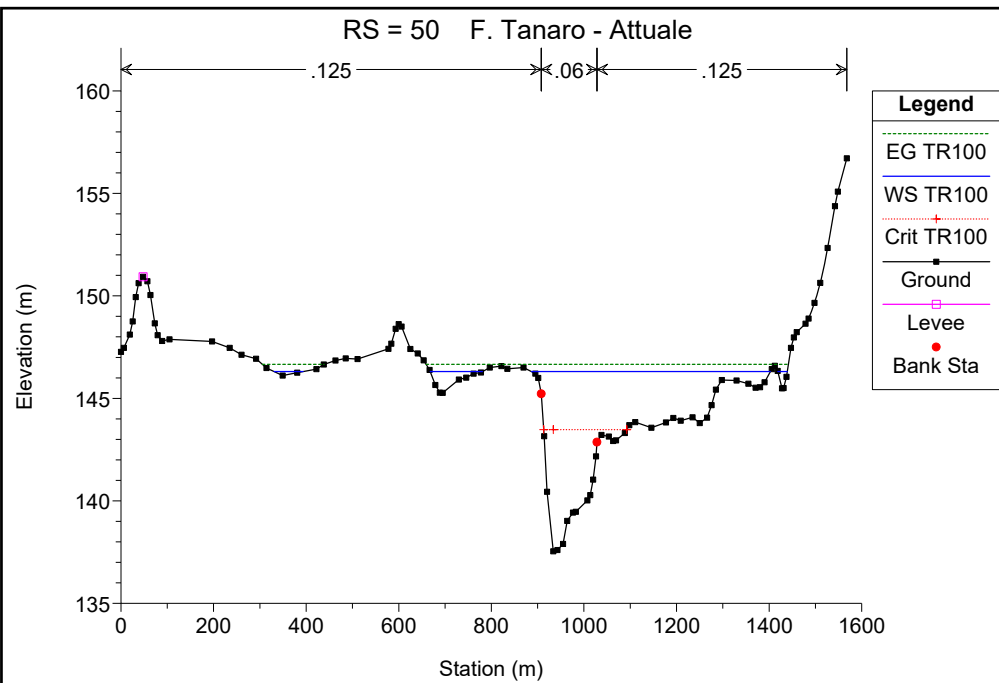




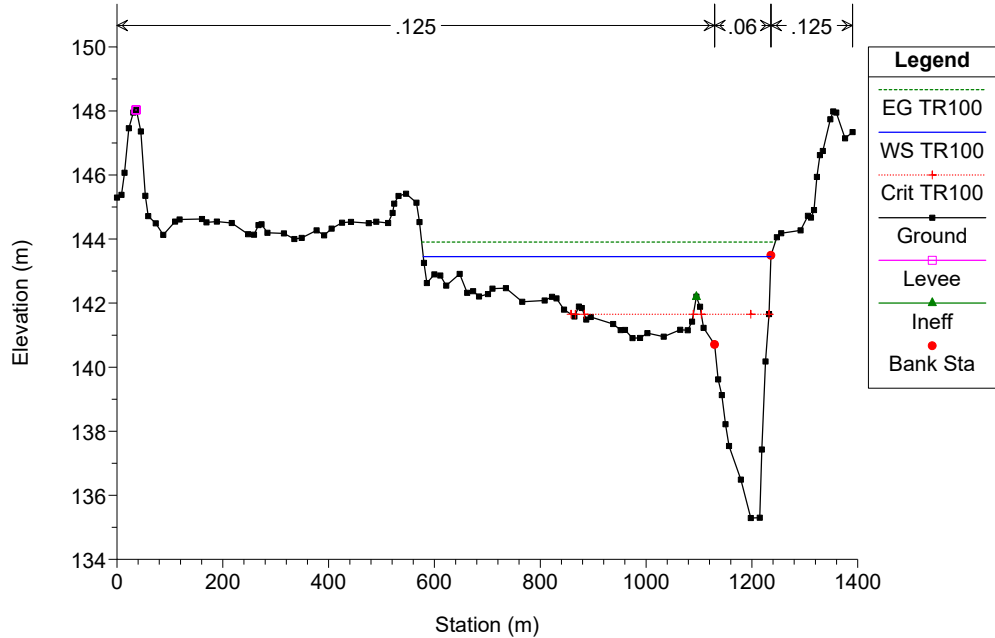








RS = 10 F. Tanaro - Attuale



MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO

SIMULAZIONE 10

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2750	100
F. Tanaro valle Riddone	2757	
F. Tanaro valle Cherasca	2768	

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

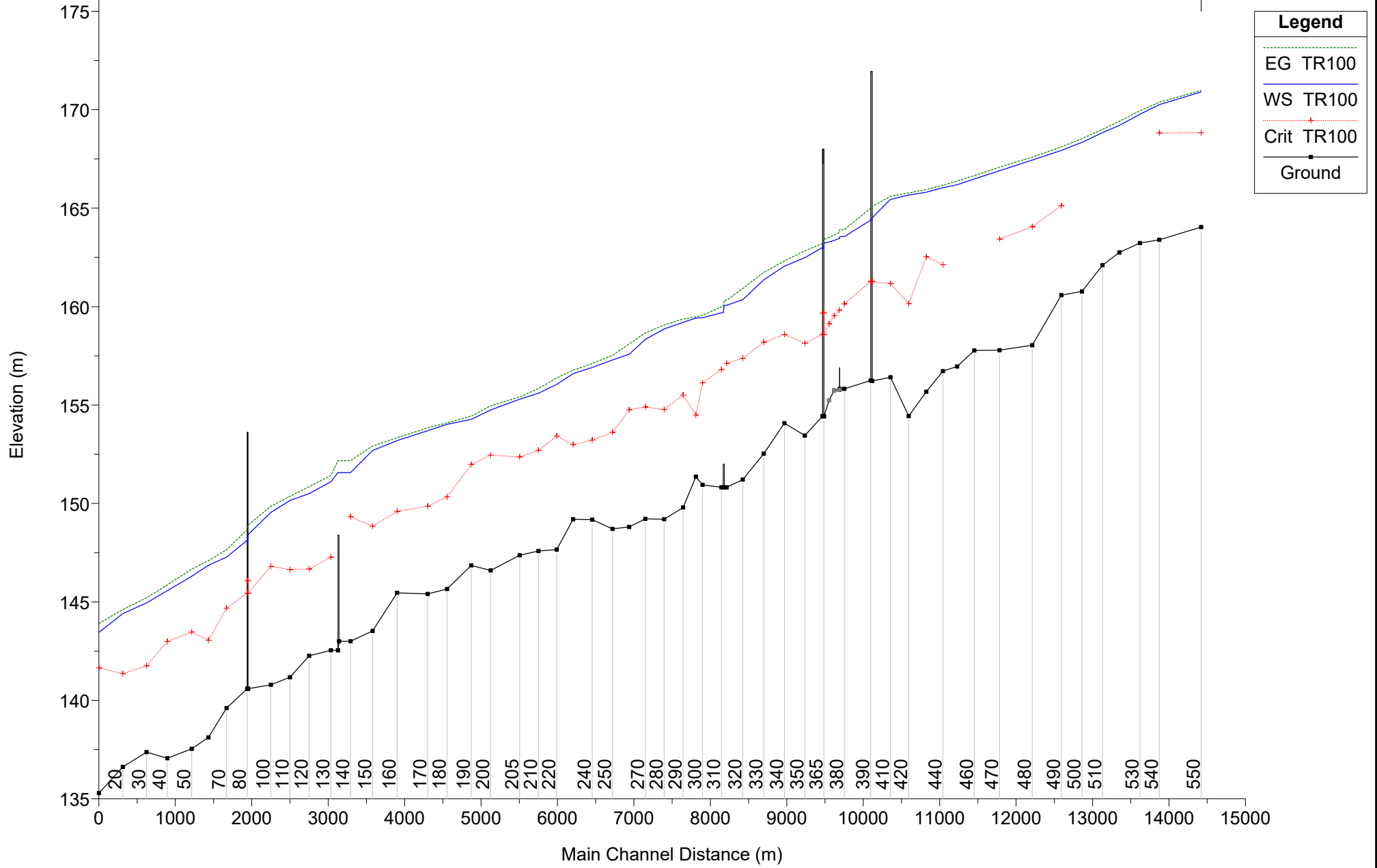
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3001.23	1171.49	0.22
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001696	2.08	2999.42	1119.85	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001799	2.09	2115.12	670.10	0.30
1	520	TR100	2750.00	162.75	169.20		169.42	0.002242	2.36	2205.94	1012.11	0.33
1	510	TR100	2750.00	162.10	168.84		169.00	0.001982	2.09	2198.76	727.88	0.31
1	500	TR100	2750.00	160.77	168.35		168.53	0.001625	2.13	1984.62	549.58	0.28
1	490	TR100	2750.00	160.58	167.93	165.12	168.11	0.001586	1.99	1835.21	510.09	0.28
1	480	TR100	2750.00	158.04	167.44	164.06	167.59	0.001241	1.92	2281.64	689.42	0.25
1	470	TR100	2750.00	157.79	166.90	163.43	167.08	0.001424	2.17	2045.56	536.77	0.27
1	460	TR100	2750.00	157.77	166.48		166.65	0.001175	1.98	2249.24	829.58	0.25
1	450	TR100	2750.00	156.96	166.19		166.38	0.001245	2.06	2063.38	786.20	0.26
1	440	TR100	2750.00	156.72	166.04	162.13	166.16	0.000900	1.82	2709.78	789.64	0.22
1	430	TR100	2750.00	155.68	165.81	162.53	165.95	0.001096	2.01	2633.98	664.07	0.24
1	420	TR100	2750.00	154.44	165.67	160.15	165.77	0.000585	1.64	2946.82	686.38	0.18
1	410	TR100	2750.00	156.41	165.45	161.17	165.60	0.001028	1.98	2246.04	526.54	0.24
1	400	TR100	2750.00	156.22	164.51	161.27	165.09	0.003321	3.45	908.90	173.92	0.41
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.39	161.28	165.00	0.003525	3.52	888.91	168.43	0.42
1	380	TR100	2750.00	155.82	163.56	160.13	163.92	0.002208	2.65	1068.50	217.66	0.33
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	163.23	158.59	163.42	0.001043	1.92	1428.90	206.64	0.23
1	365		Bridge									
1	360	TR100	2750.00	154.43	163.01	158.59	163.21	0.001157	1.99	1383.01	206.03	0.24
1	350	TR100	2750.00	153.45	162.49	158.14	162.83	0.001859	2.59	1094.36	270.03	0.31
1	340	TR100	2757.00	154.08	162.06	158.59	162.32	0.001767	2.29	1342.90	383.42	0.30
1	330	TR100	2757.00	152.53	161.36	158.19	161.75	0.002514	2.78	1195.57	438.16	0.36
1	320	TR100	2757.00	151.21	160.36	157.38	160.92	0.003401	3.58	1214.56	388.71	0.42
1	315	TR100	2757.00	150.82	160.07	157.15	160.34	0.001900	2.67	2064.73	900.91	0.32
1	312.5		Inl Struct									
1	310	TR100	2757.00	150.82	159.69	156.82	160.00	0.002316	2.85	1791.63	630.75	0.35
1	300	TR100	2768.00	150.95	159.44	156.15	159.57	0.001177	1.84	2428.87	677.11	0.24
1	295	TR100	2768.00	151.36	159.40	154.05	159.48	0.000525	1.38	3070.44	860.98	0.17
1	290	TR100	2768.00	149.62	159.21	155.04	159.37	0.001007	1.81	2074.08	691.66	0.23
1	280	TR100	2768.00	149.20	158.89	154.79	159.09	0.001281	2.21	1950.79	473.77	0.26
1	270	TR100	2768.00	149.22	158.35	154.92	158.69	0.002137	2.84	1626.67	469.01	0.34
1	260	TR100	2768.00	148.81	157.60	154.78	158.13	0.003278	3.43	1147.14	296.45	0.41
1	250	TR100	2768.00	148.71	157.30	153.63	157.54	0.001744	2.35	1788.12	524.90	0.30
1	240	TR100	2768.00	149.18	156.93	153.22	157.13	0.001367	2.15	2077.30	754.78	0.27
1	230	TR100	2768.00	149.20	156.61	152.99	156.79	0.001301	2.00	1886.66	463.56	0.26
1	220	TR100	2768.00	147.66	156.06	153.44	156.39	0.002448	2.81	1495.72	403.34	0.36

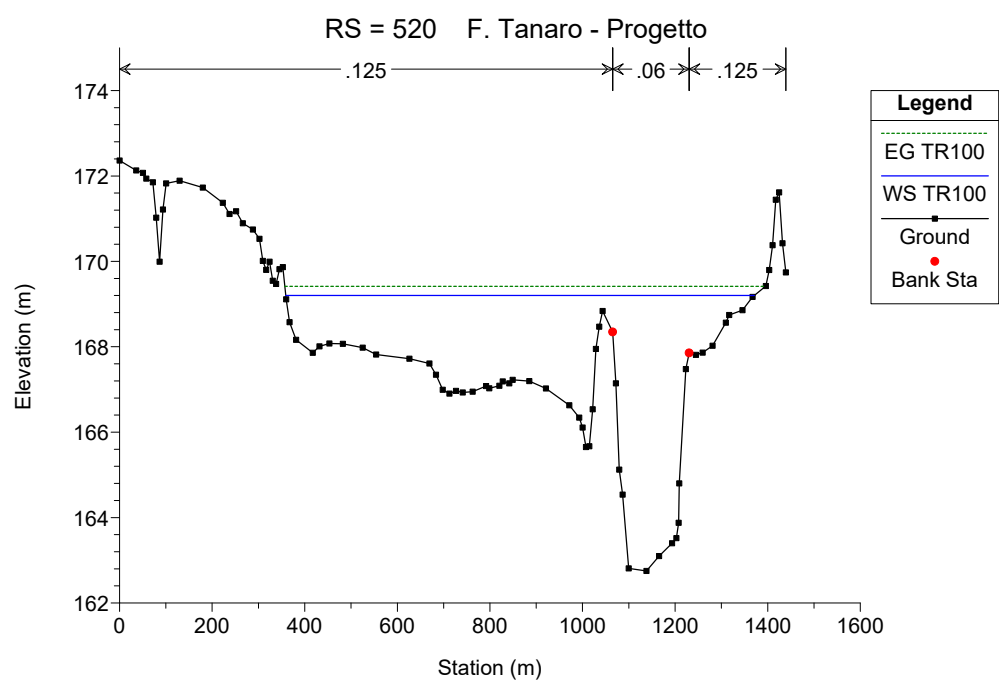
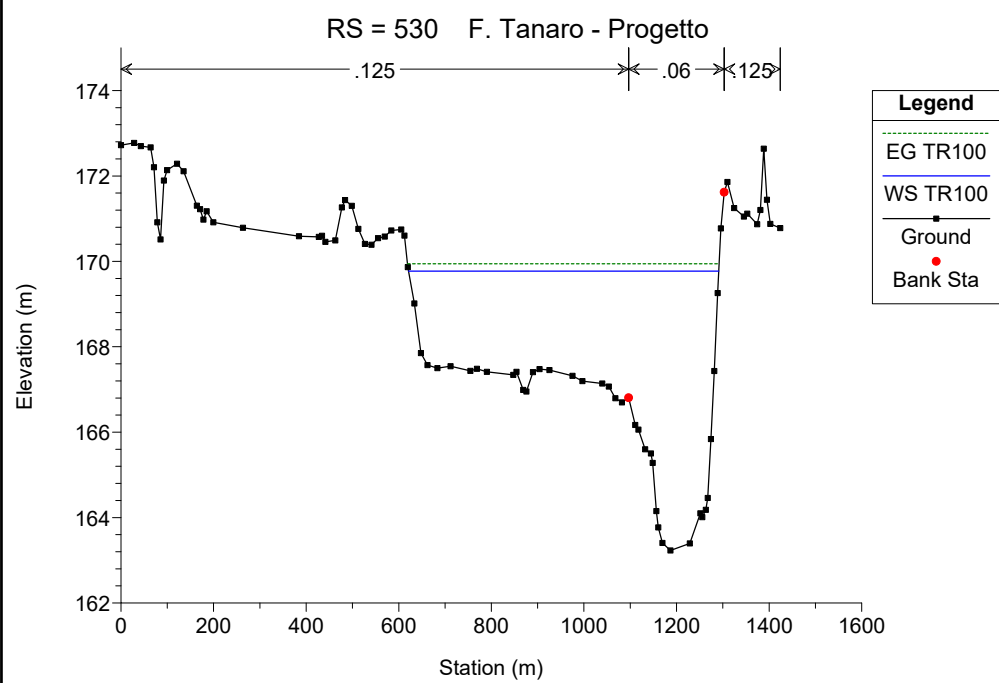
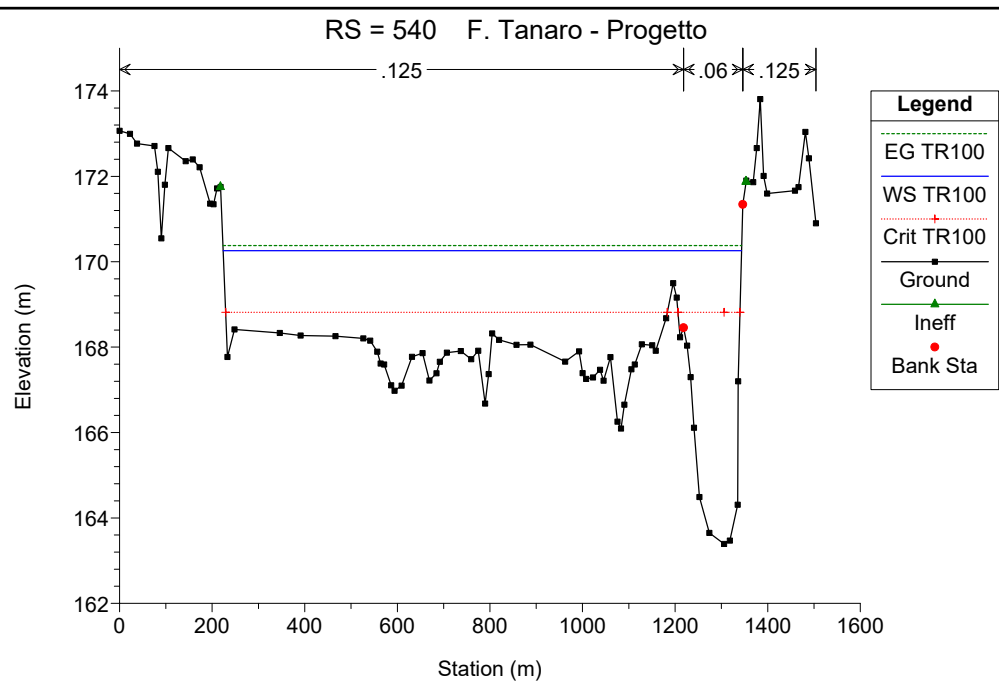
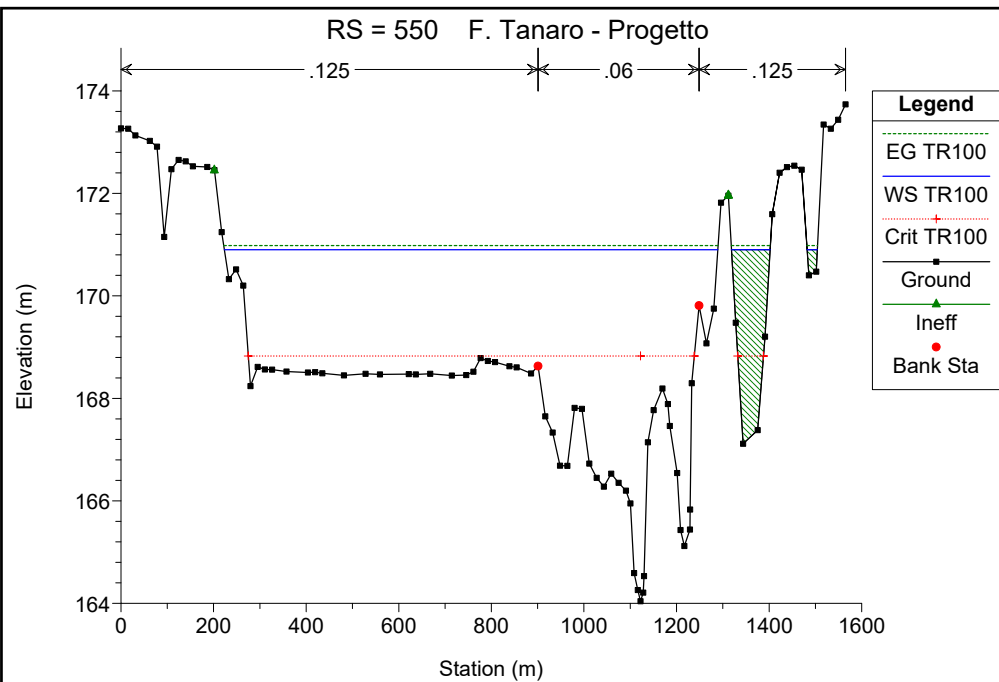
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (Continued)

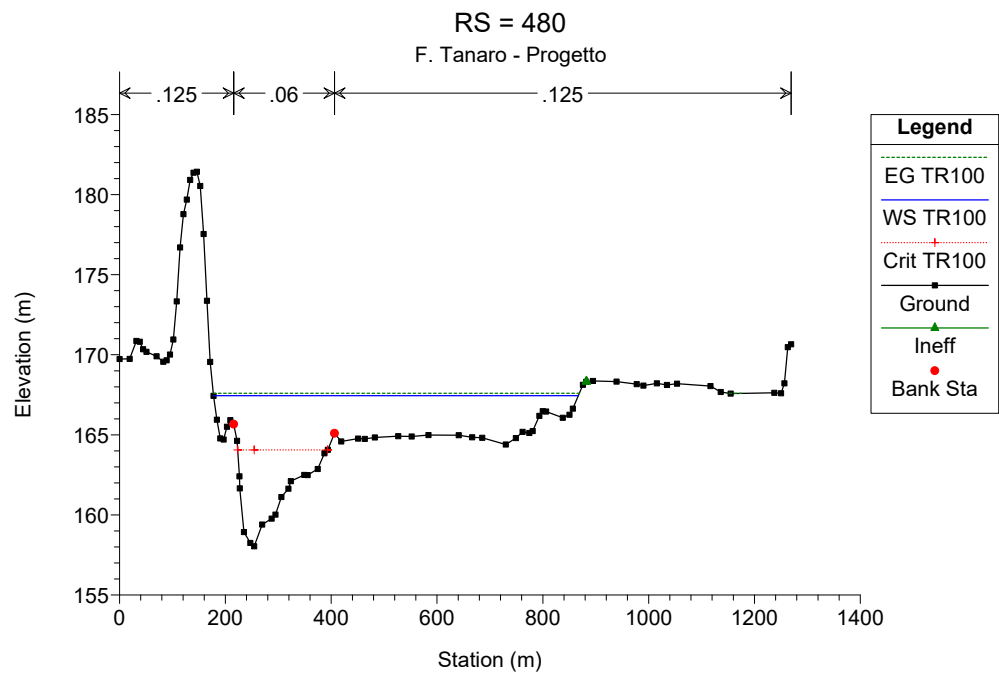
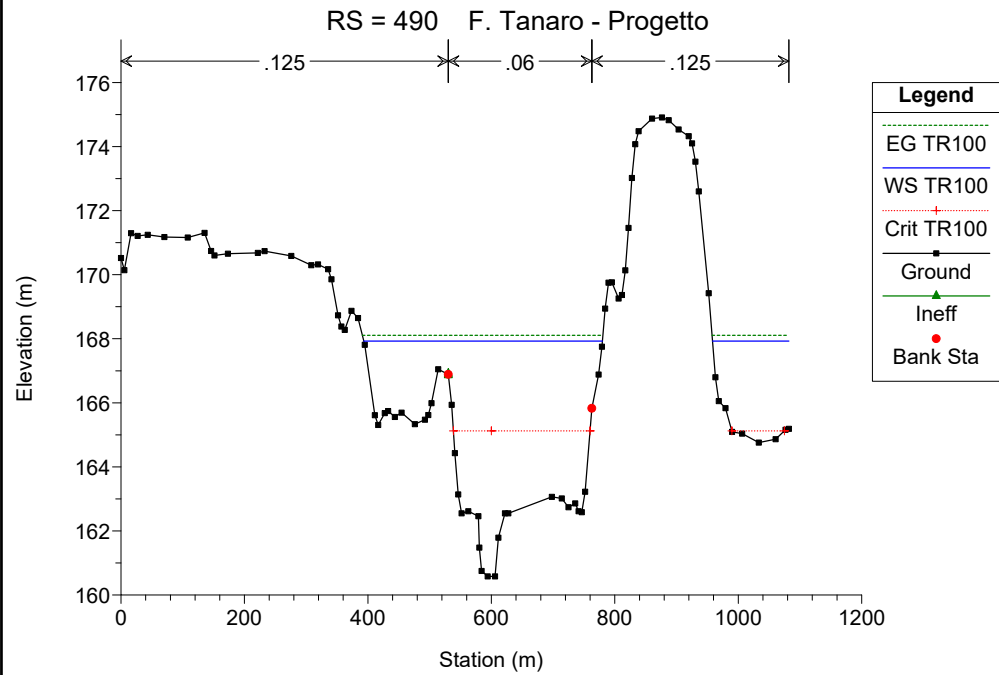
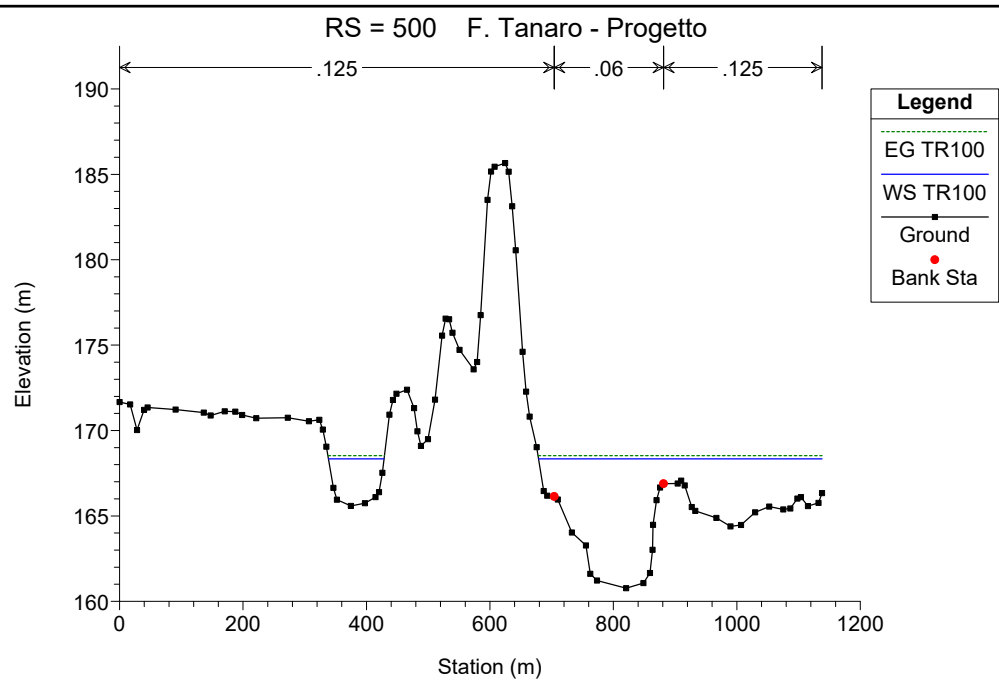
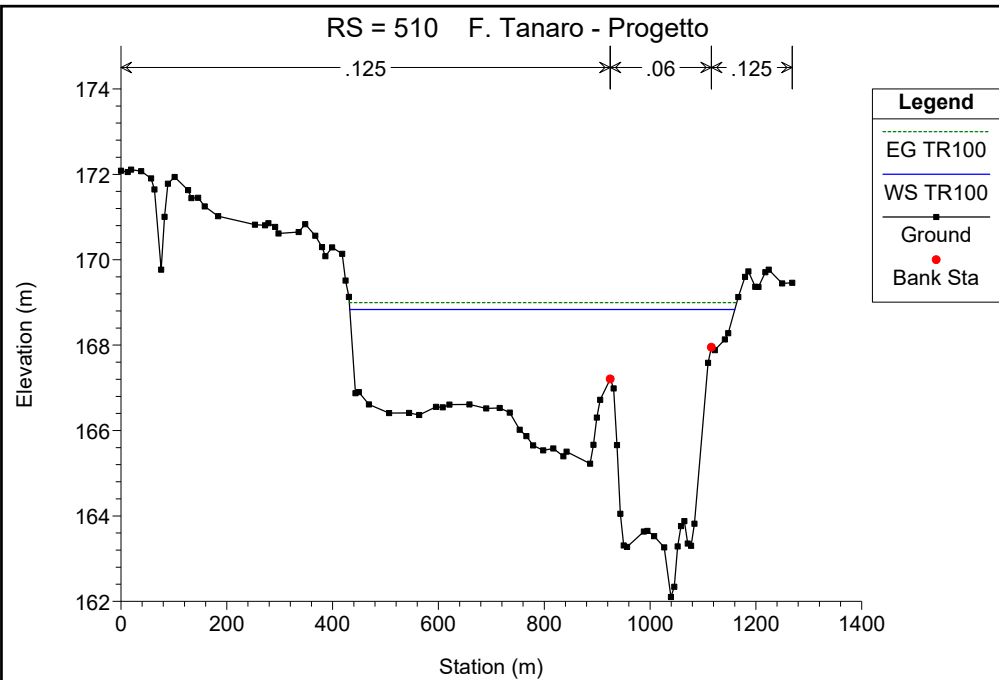
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR100	2768.00	147.59	155.61	152.72	155.85	0.001875	2.31	1709.74	592.79	0.31
1	205	TR100	2768.00	147.37	155.31	152.37	155.43	0.001242	1.80	2697.42	989.53	0.25
1	200	TR100	2768.00	146.60	154.76	152.48	154.98	0.002026	2.50	2491.78	1073.40	0.32
1	190	TR100	2768.00	146.85	154.29	151.99	154.45	0.001904	2.04	2397.80	991.67	0.30
1	180	TR100	2768.00	145.66	154.04	150.35	154.11	0.000707	1.34	3252.90	1300.54	0.19
1	170	TR100	2768.00	145.40	153.71	149.87	153.85	0.001438	1.85	2382.39	1309.38	0.26
1	160	TR100	2768.00	145.46	153.21	149.61	153.35	0.001178	1.77	2451.19	1383.79	0.24
1	150	TR100	2768.00	143.53	152.70	148.86	152.93	0.001478	2.23	2067.92	1340.55	0.28
1	140	TR100	2768.00	143.00	151.56	149.34	152.18	0.005004	3.50	912.46	787.18	0.49
1	135		Inl Struct									
1	130	TR100	2768.00	142.54	151.12	147.29	151.45	0.001954	2.54	1313.27	1035.49	0.32
1	120	TR100	2768.00	142.27	150.53	146.69	150.88	0.002051	2.65	1214.45	598.77	0.33
1	110	TR100	2768.00	141.17	150.18	146.66	150.40	0.001546	2.28	2018.37	700.82	0.28
1	100	TR100	2768.00	140.79	149.58	146.83	149.88	0.002676	2.54	1311.01	416.69	0.36
1	90	TR100	2768.00	140.59	148.44	145.45	148.93	0.003469	3.11	888.69	163.00	0.41
1	85		Bridge									
1	80	TR100	2768.00	140.59	148.15	145.45	148.70	0.003811	3.27	846.08	154.19	0.43
1	70	TR100	2768.00	139.61	147.30	144.70	147.67	0.003227	2.85	1223.89	299.18	0.40
1	60	TR100	2768.00	138.12	146.88	143.07	147.11	0.001542	2.36	1954.59	743.18	0.29
1	50	TR100	2768.00	137.54	146.32	143.49	146.68	0.002428	2.88	1611.04	721.36	0.36
1	40	TR100	2768.00	137.06	145.59	143.00	145.88	0.002663	2.41	1224.48	610.14	0.35
1	30	TR100	2768.00	137.37	144.97	141.77	145.23	0.002134	2.32	1464.55	665.72	0.32
1	20	TR100	2768.00	136.62	144.42	141.37	144.63	0.001665	2.31	2149.72	744.59	0.29
1	10	TR100	2768.00	135.29	143.46	141.67	143.92	0.004005	3.40	1533.14	657.12	0.45

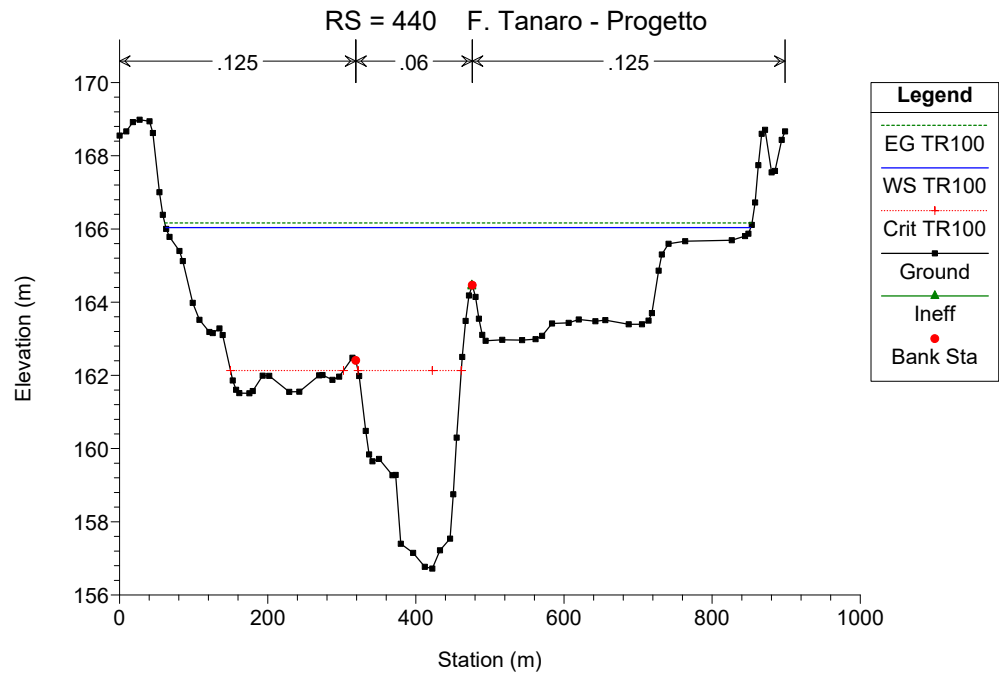
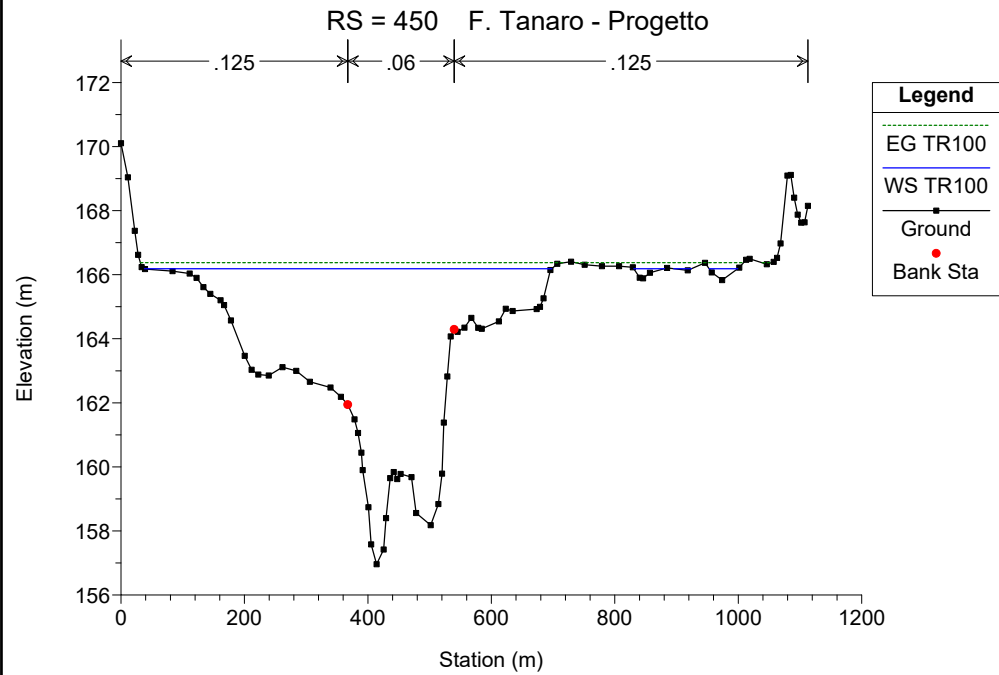
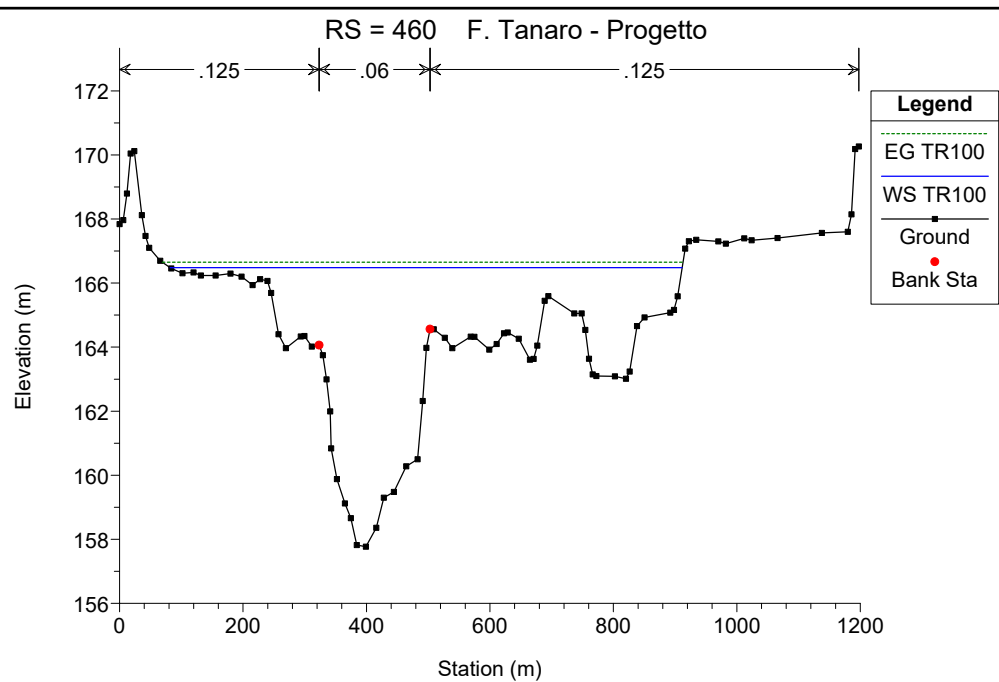
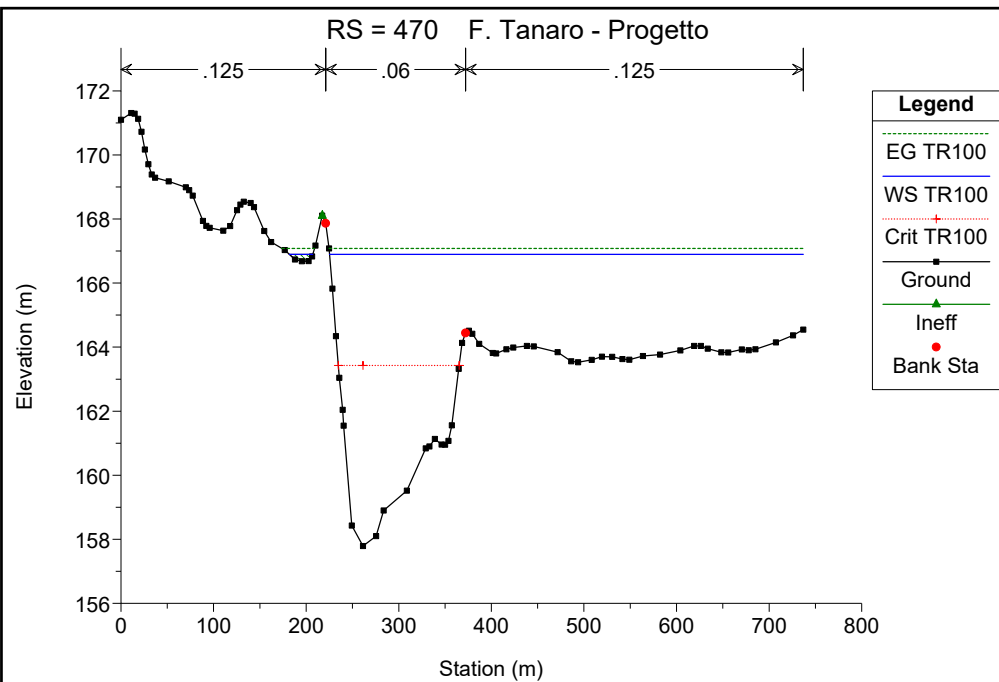
F. Tanaro - Progetto

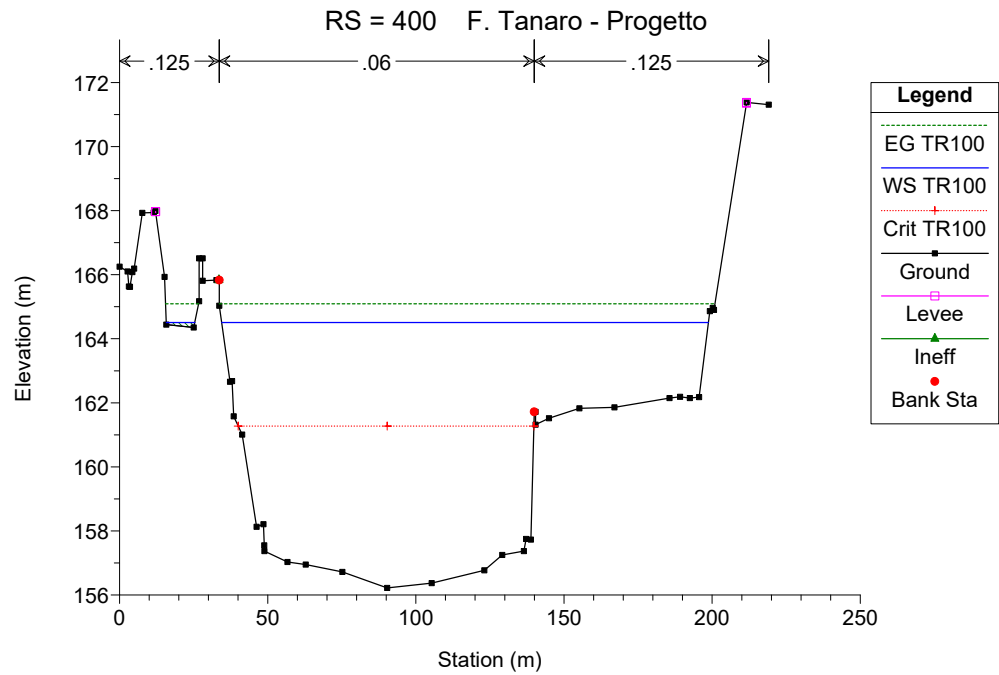
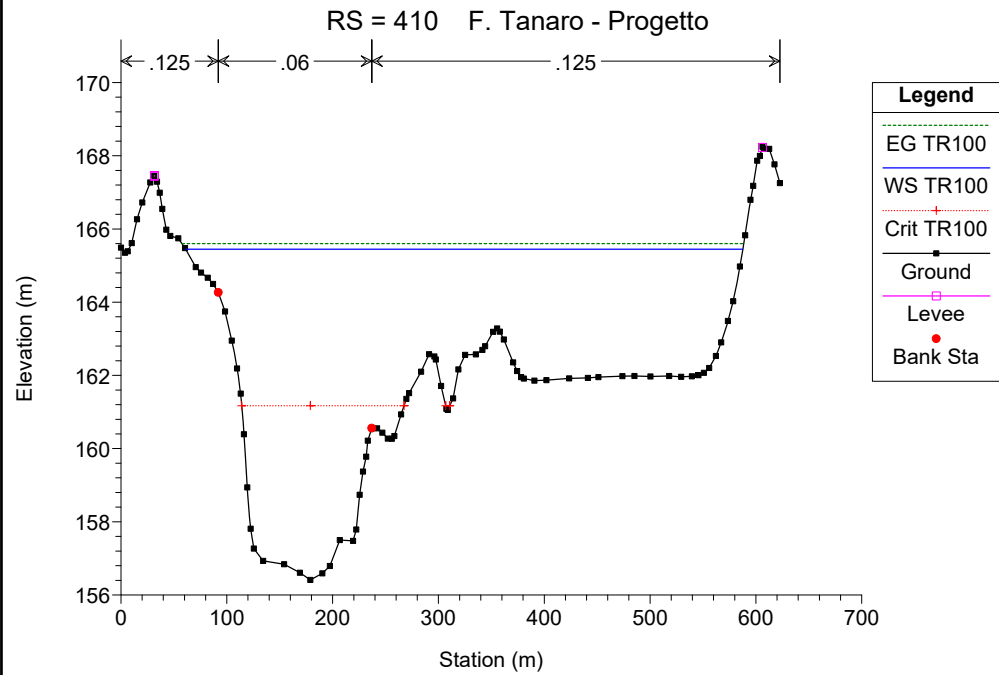
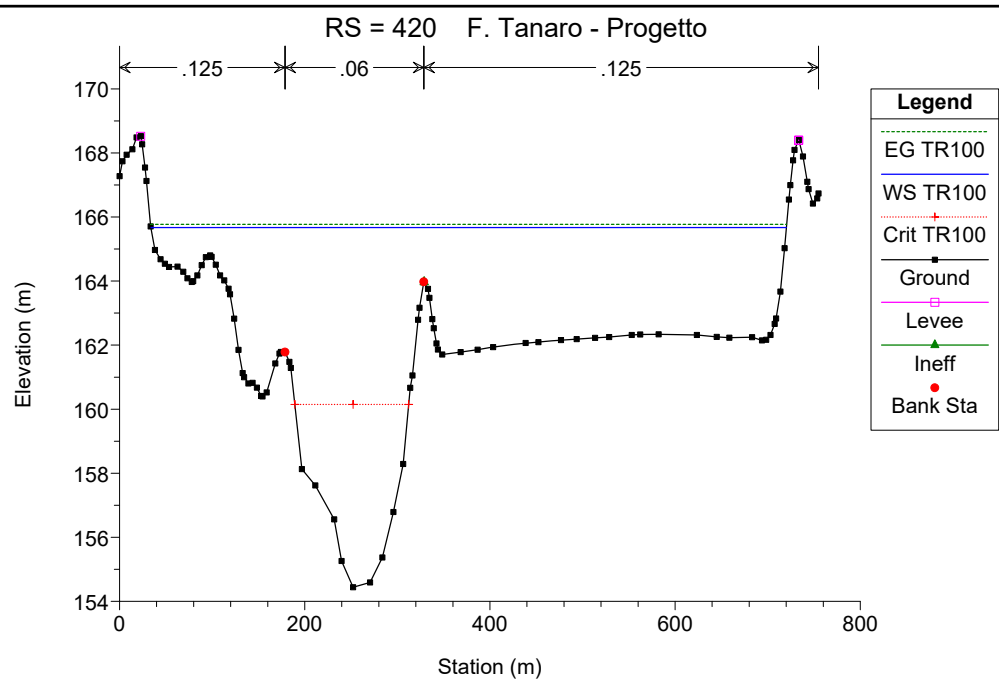
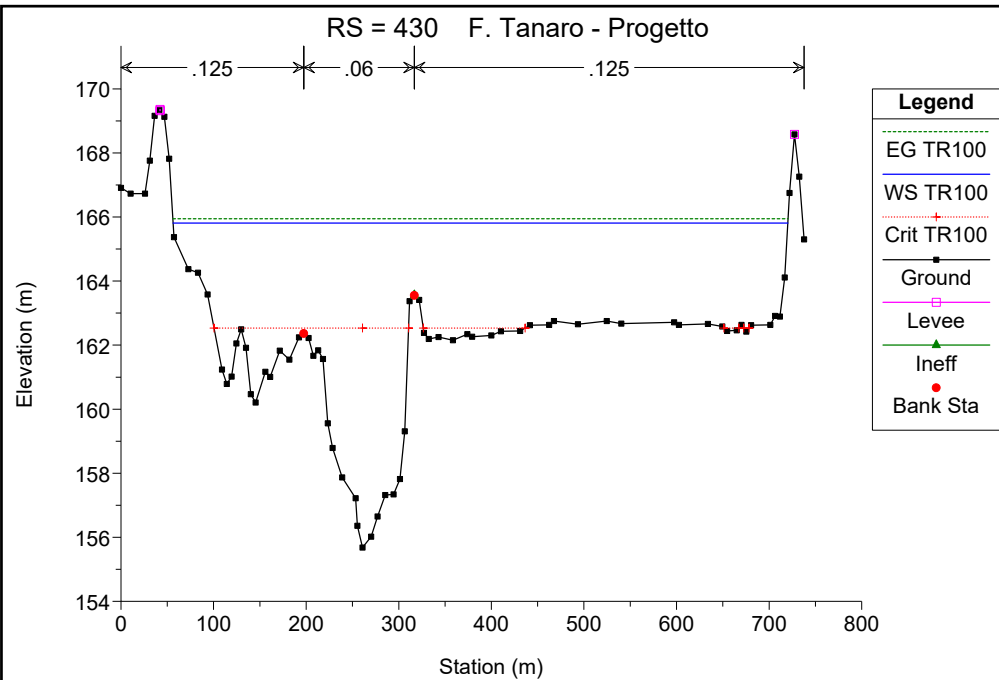
Tanaro 1

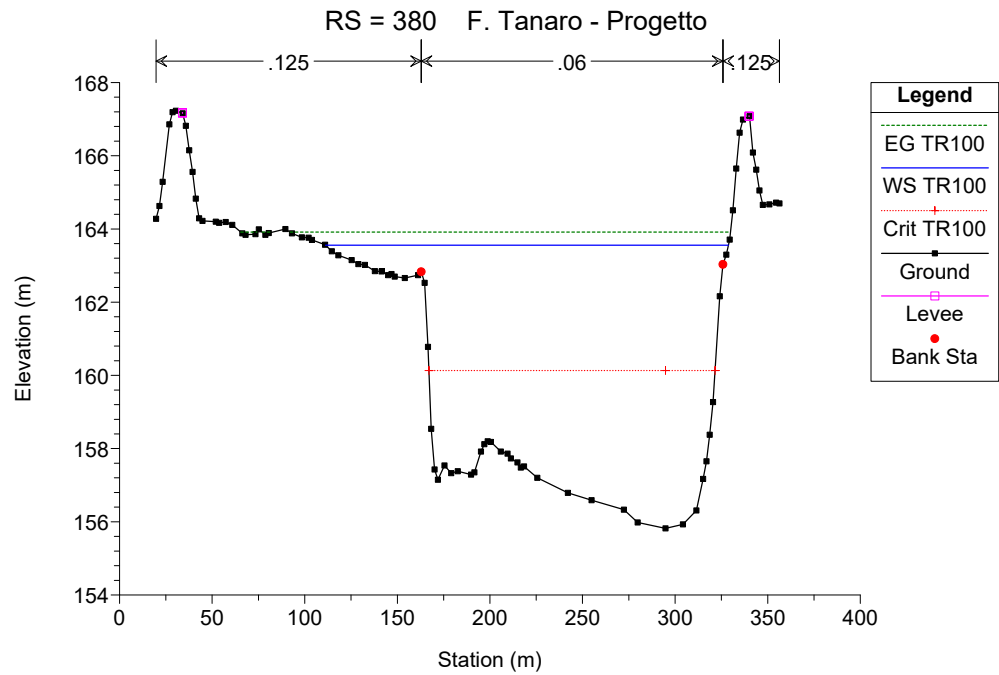
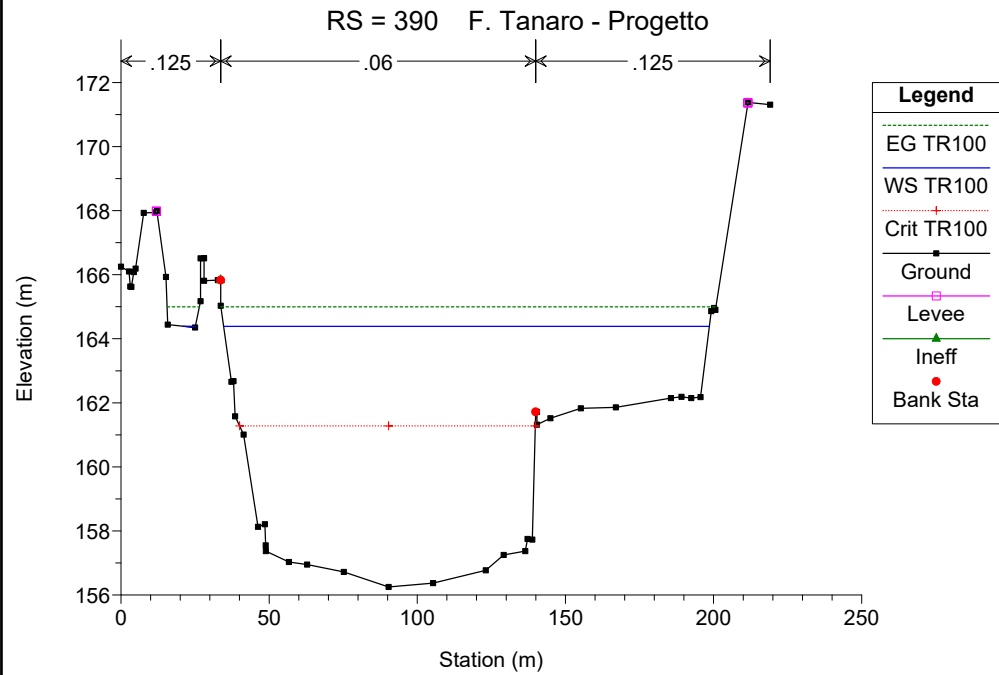
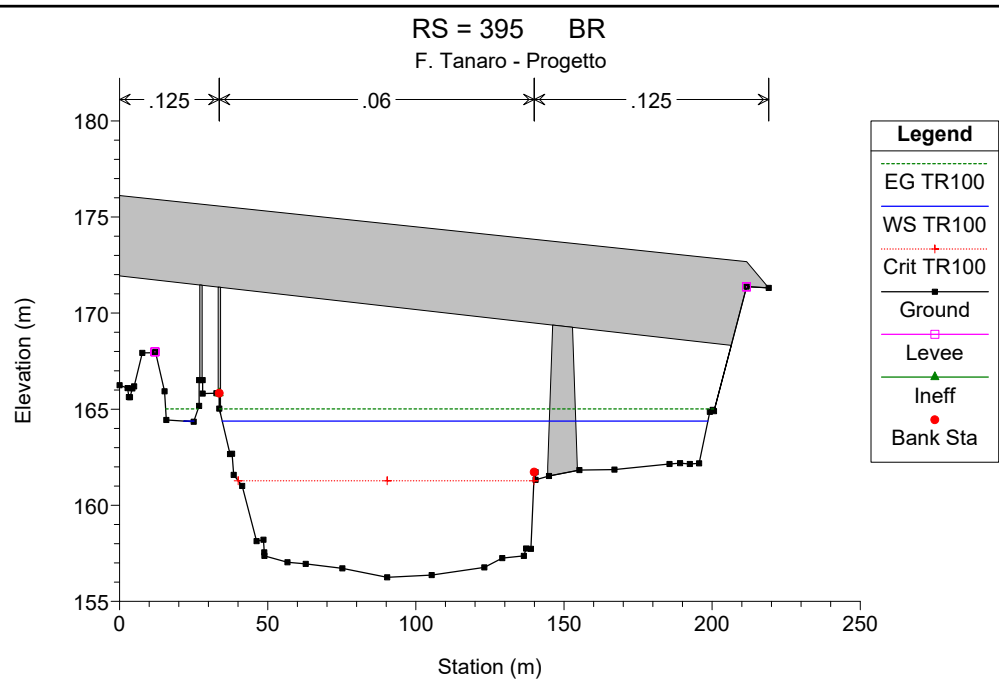
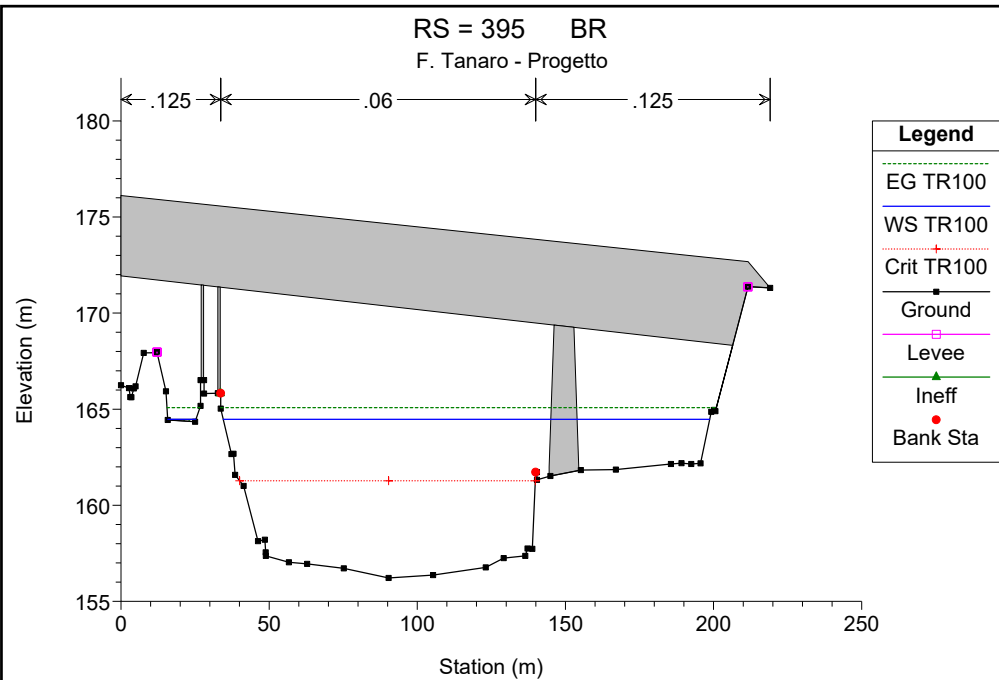


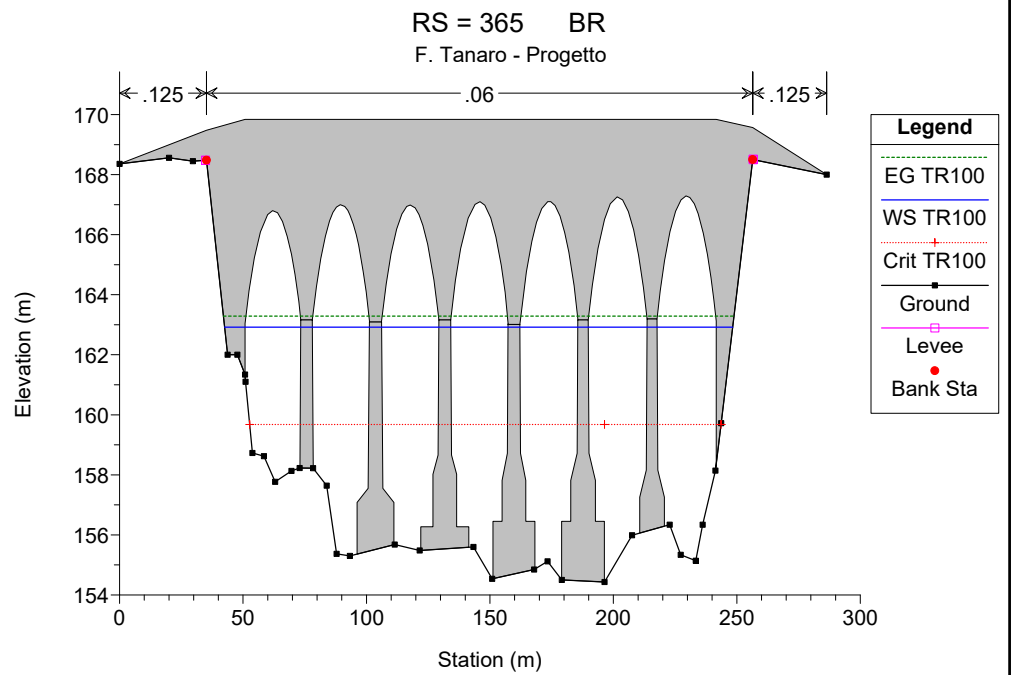
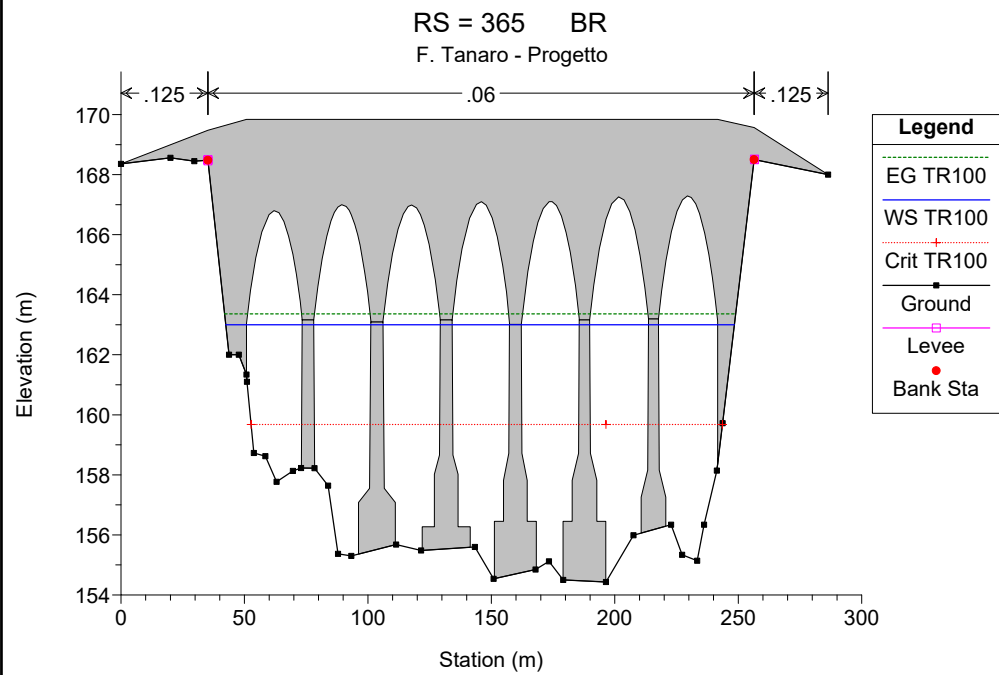
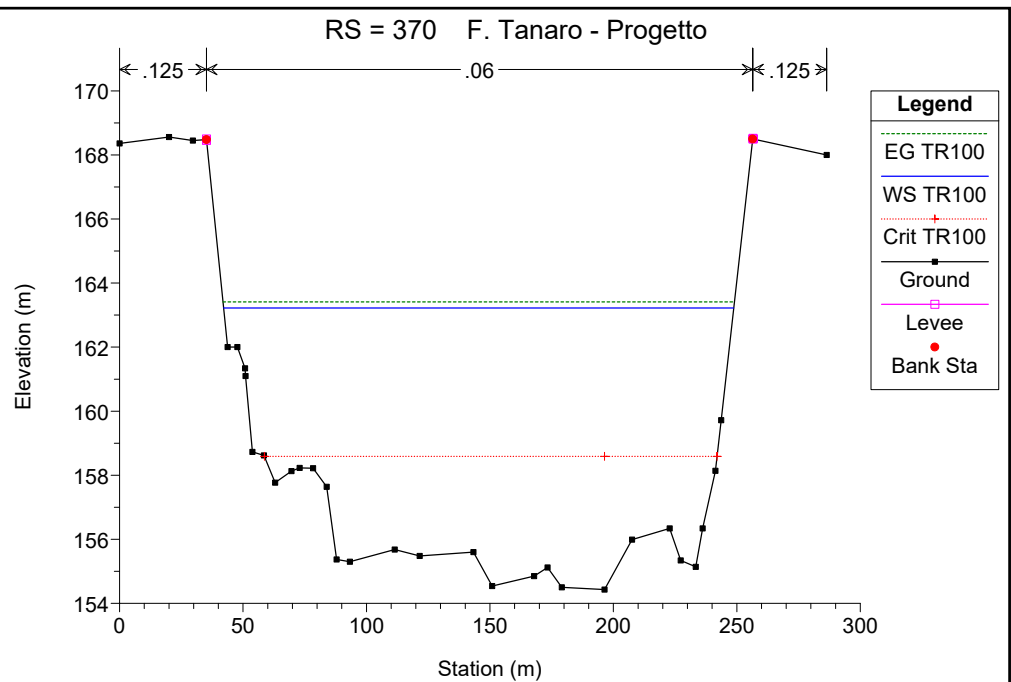
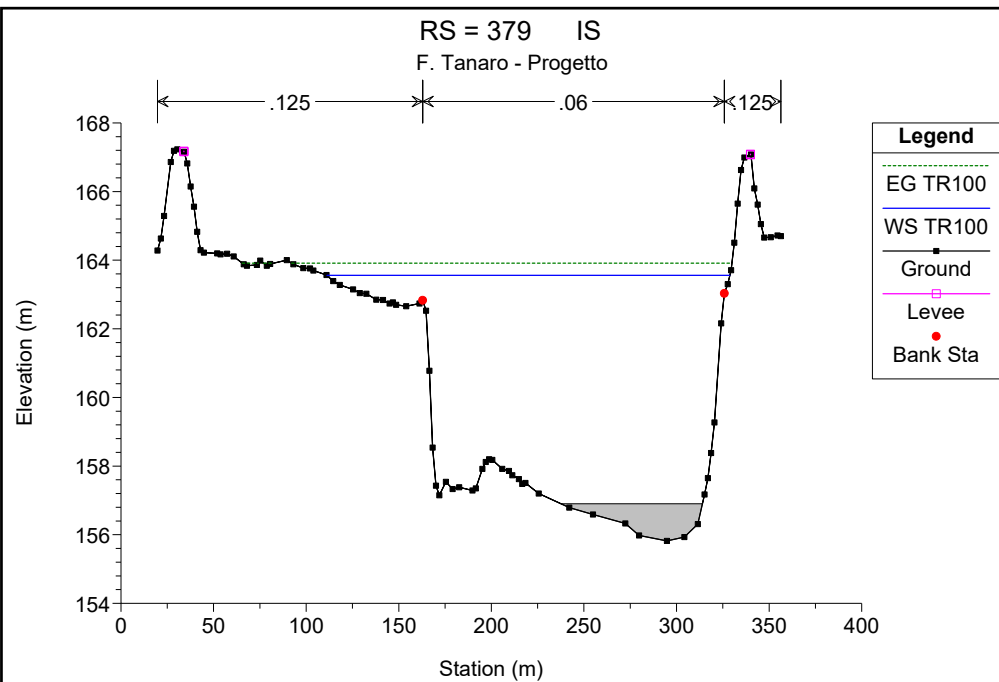


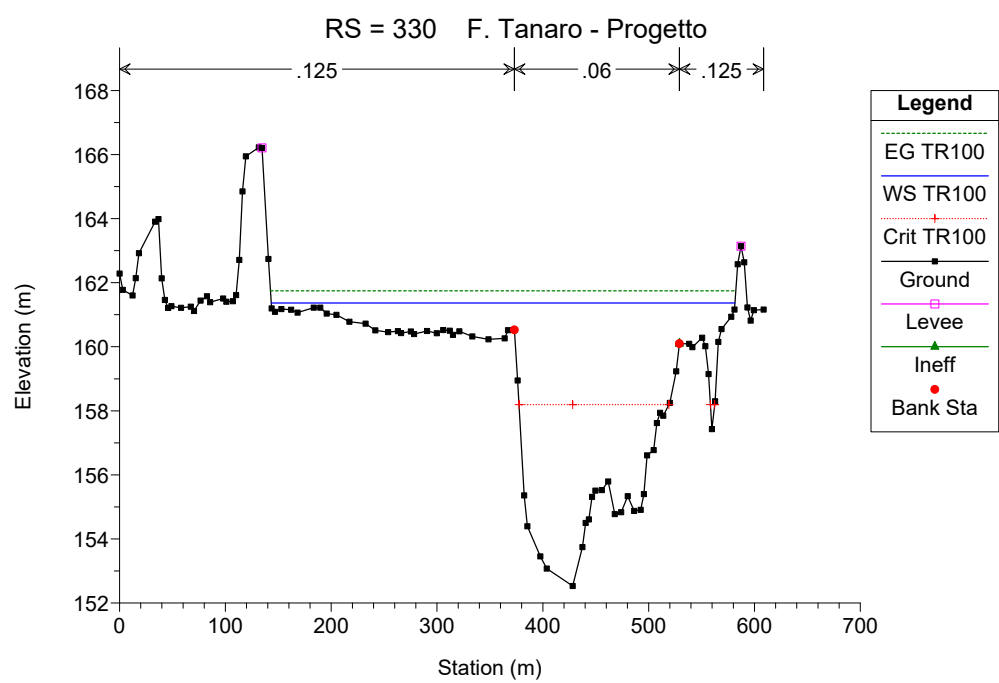
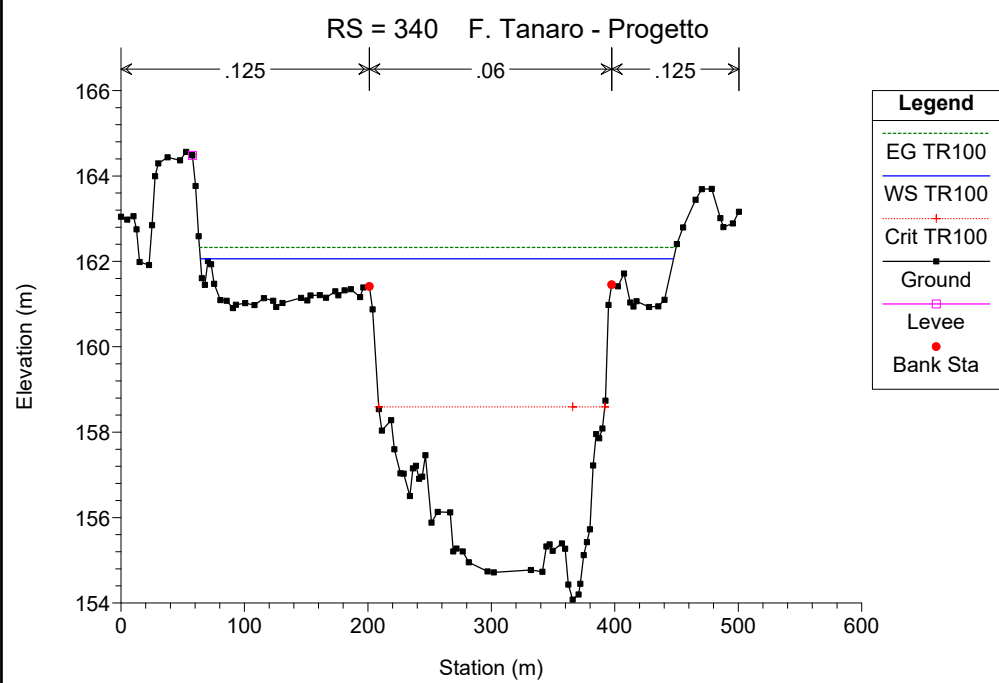
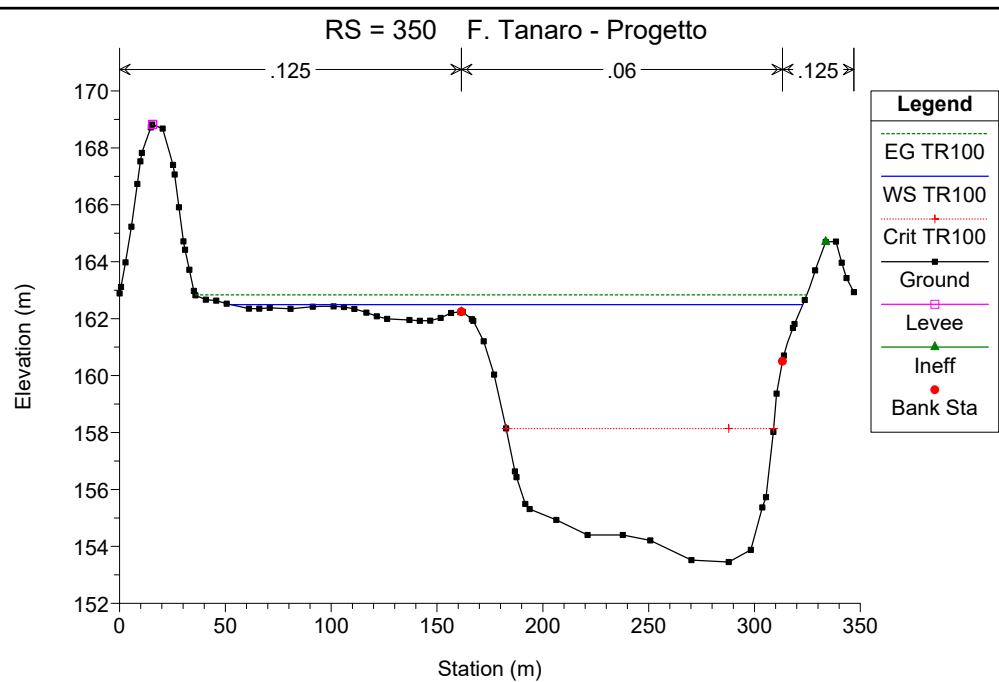
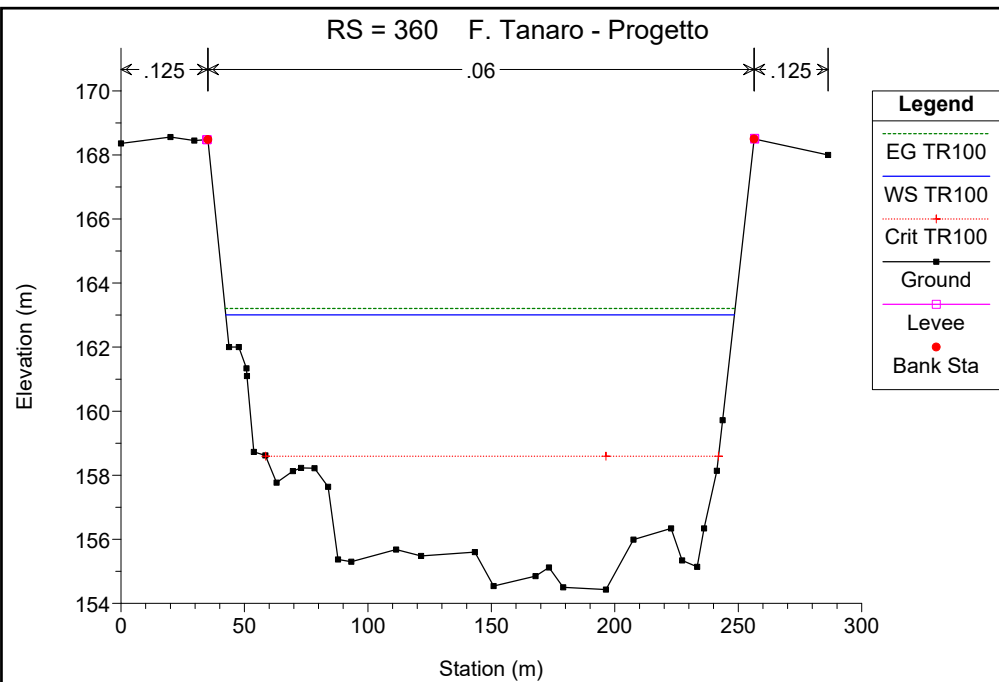


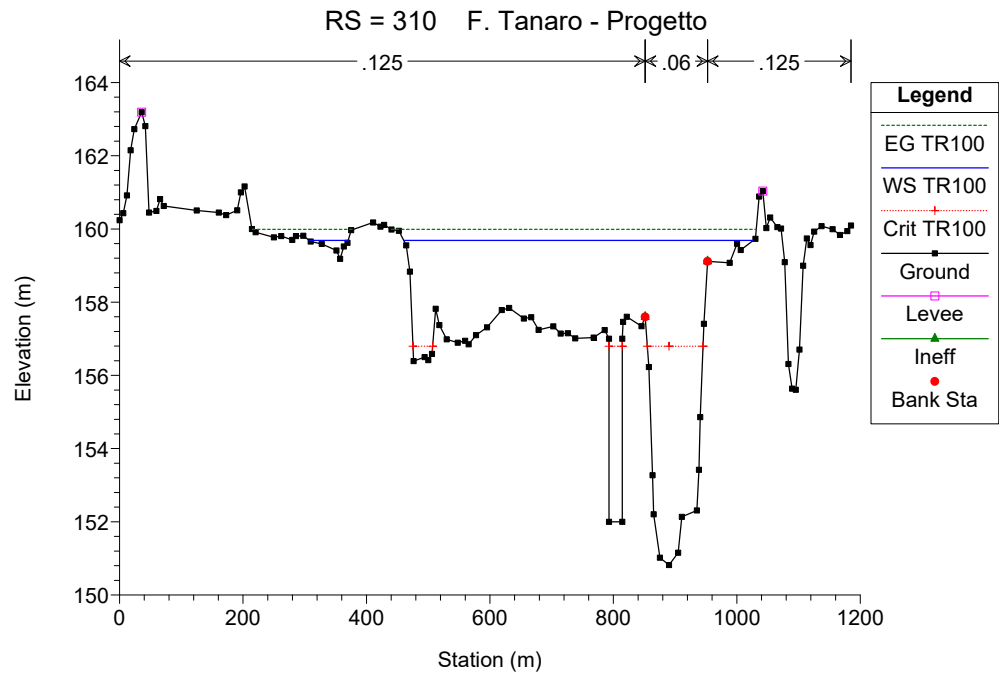
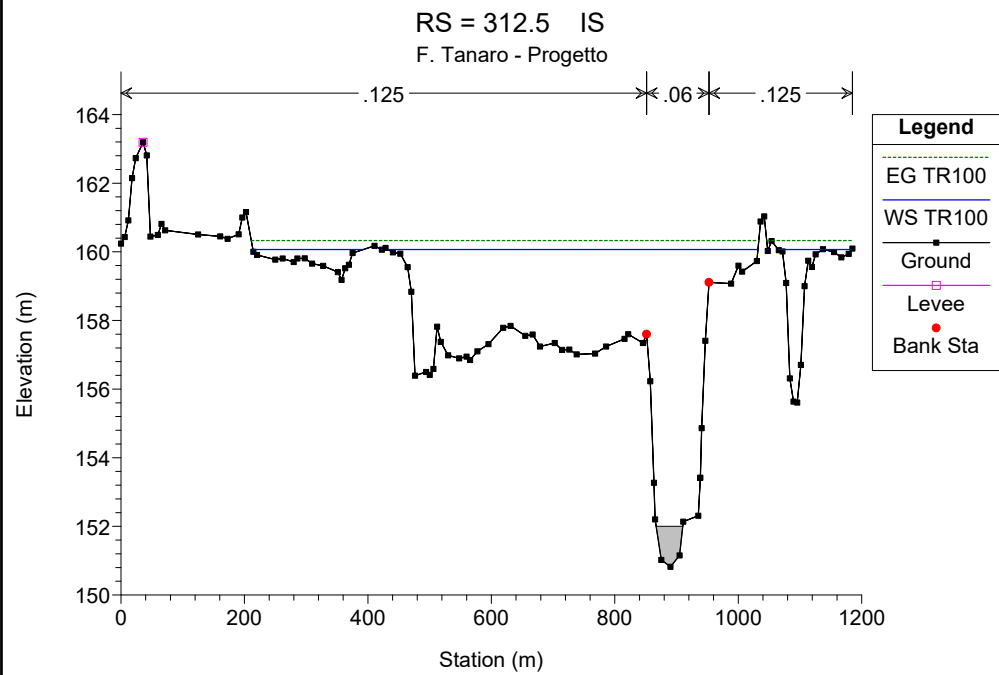
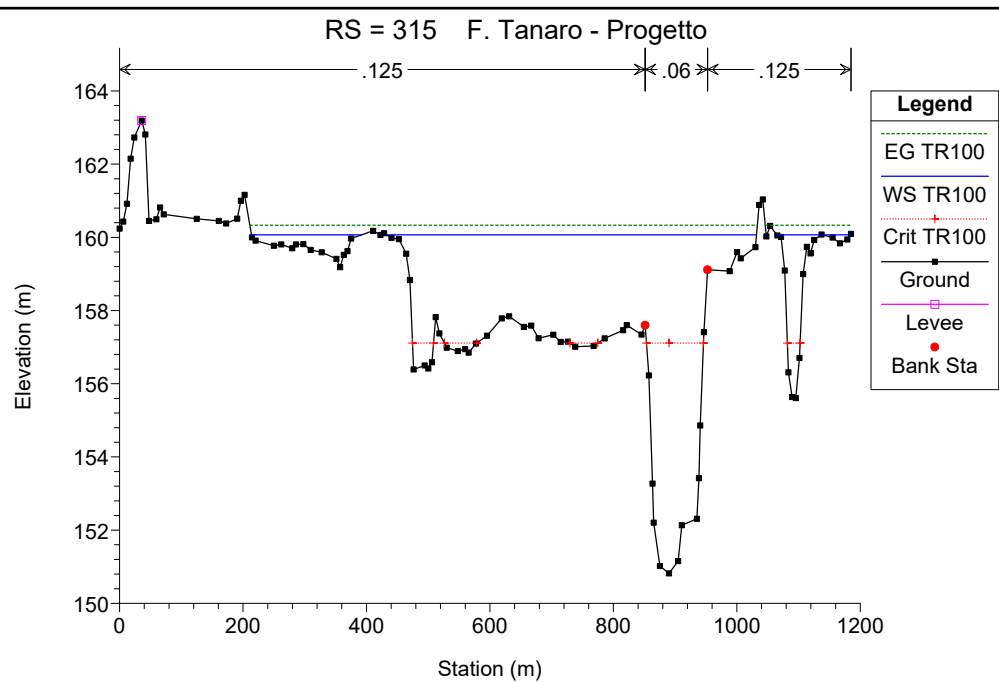
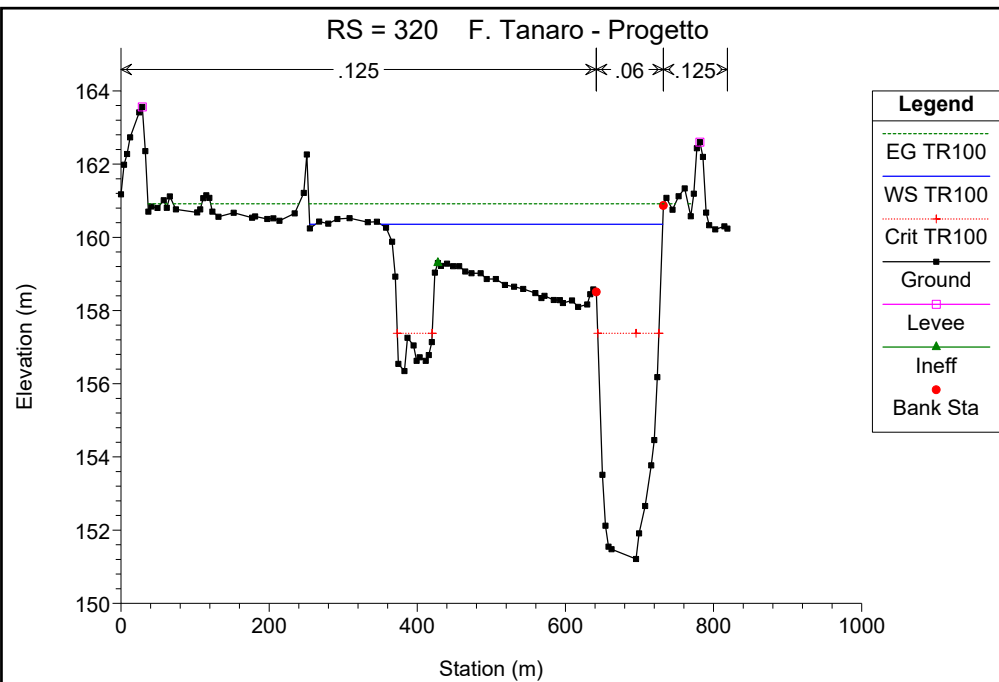


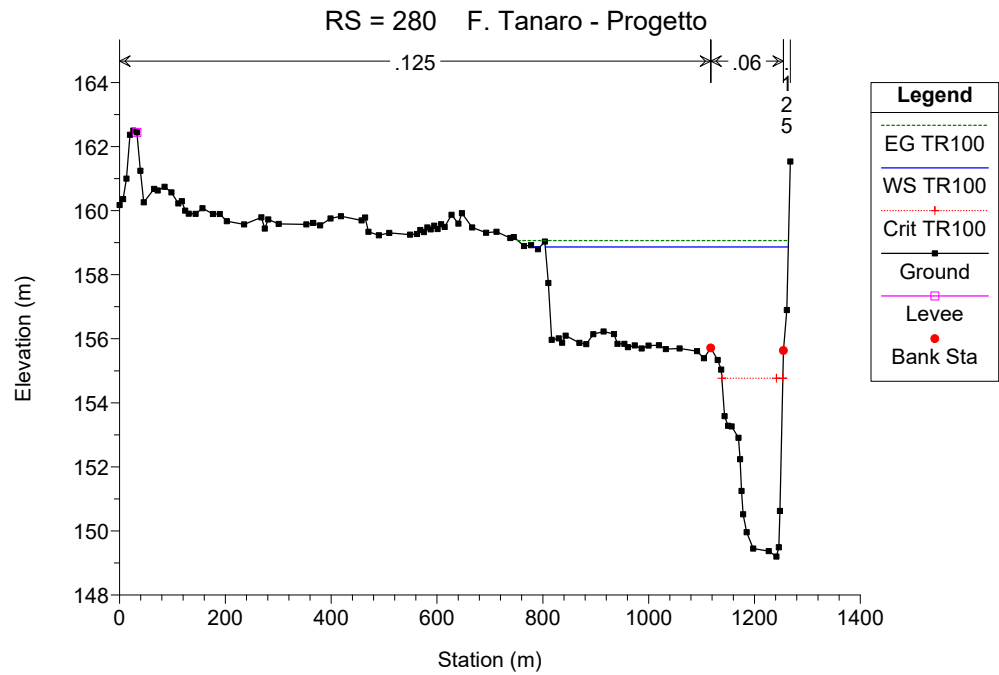
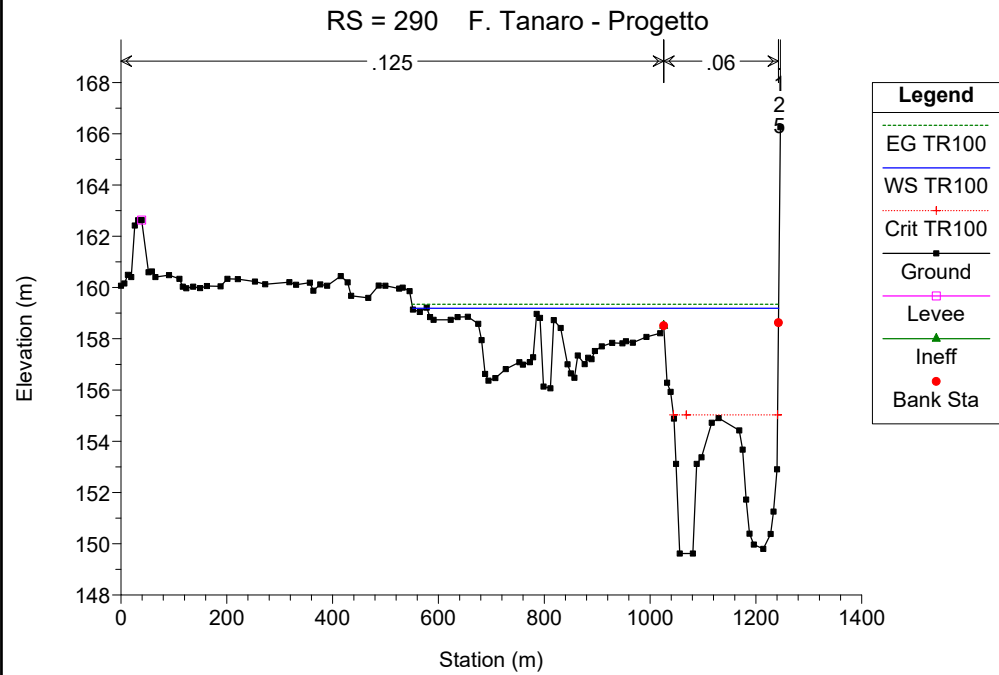
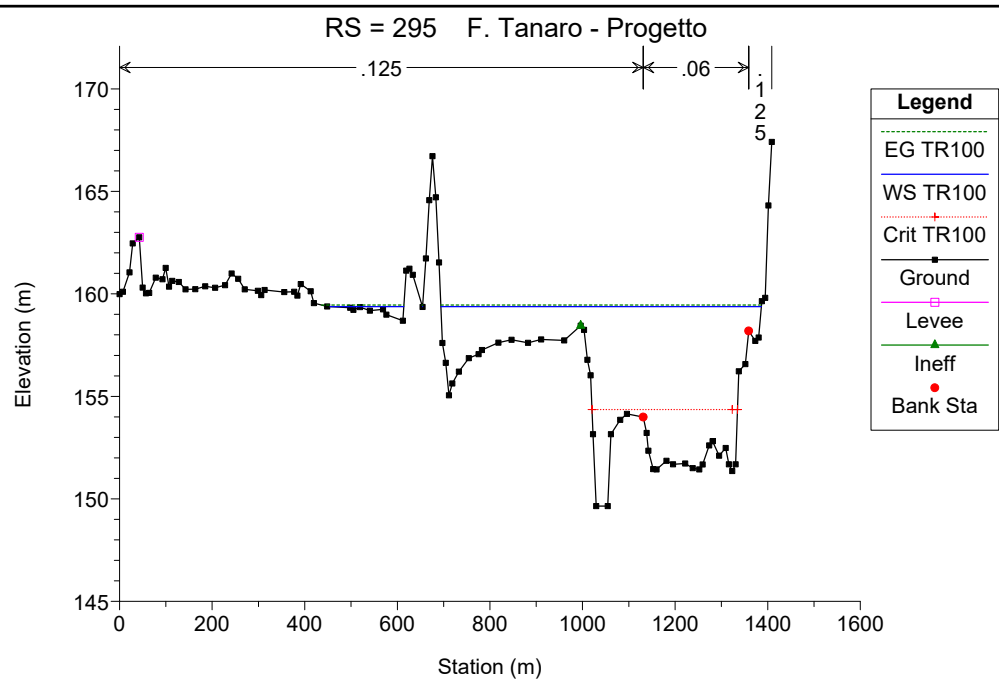
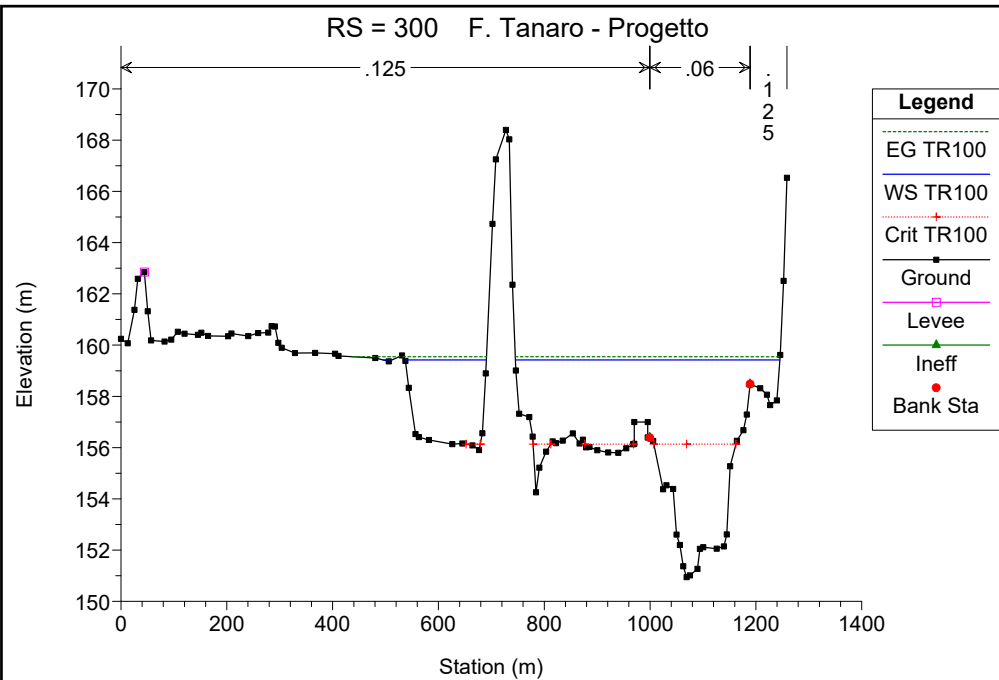


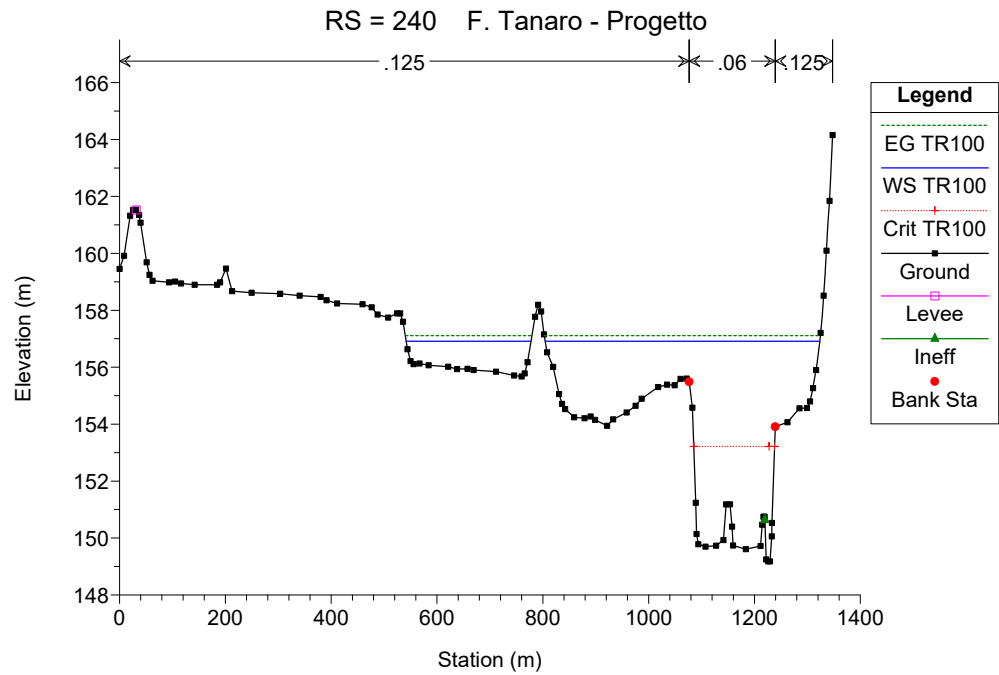
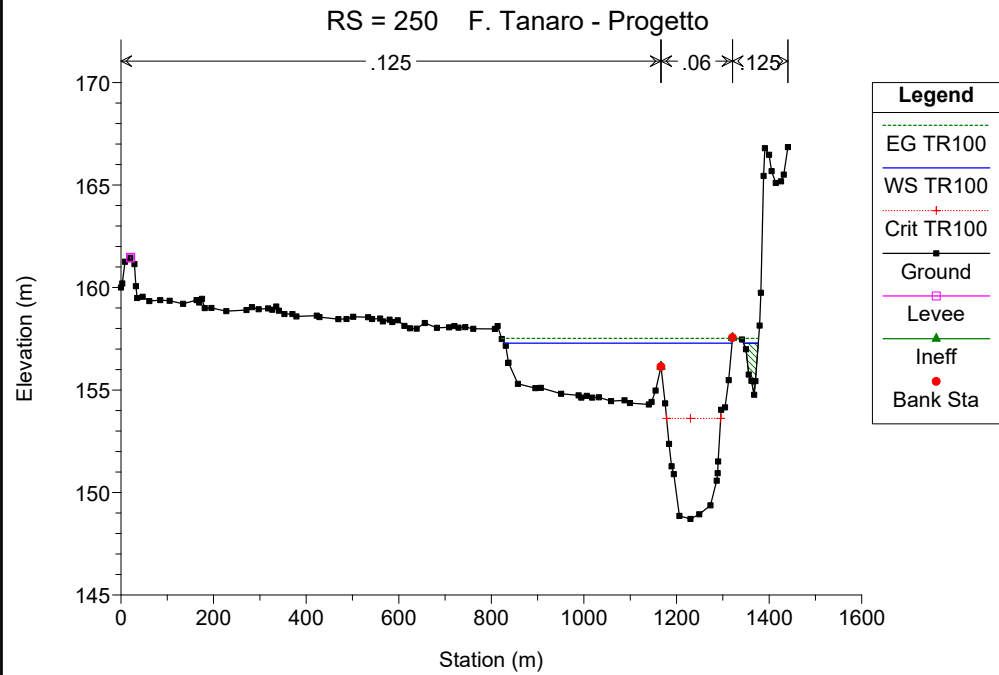
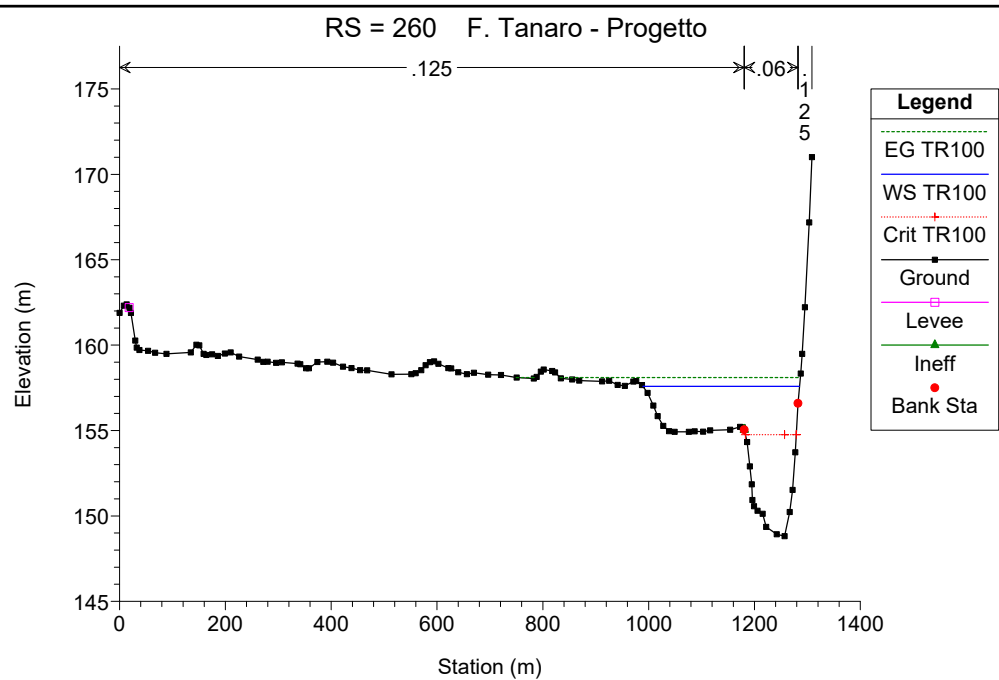
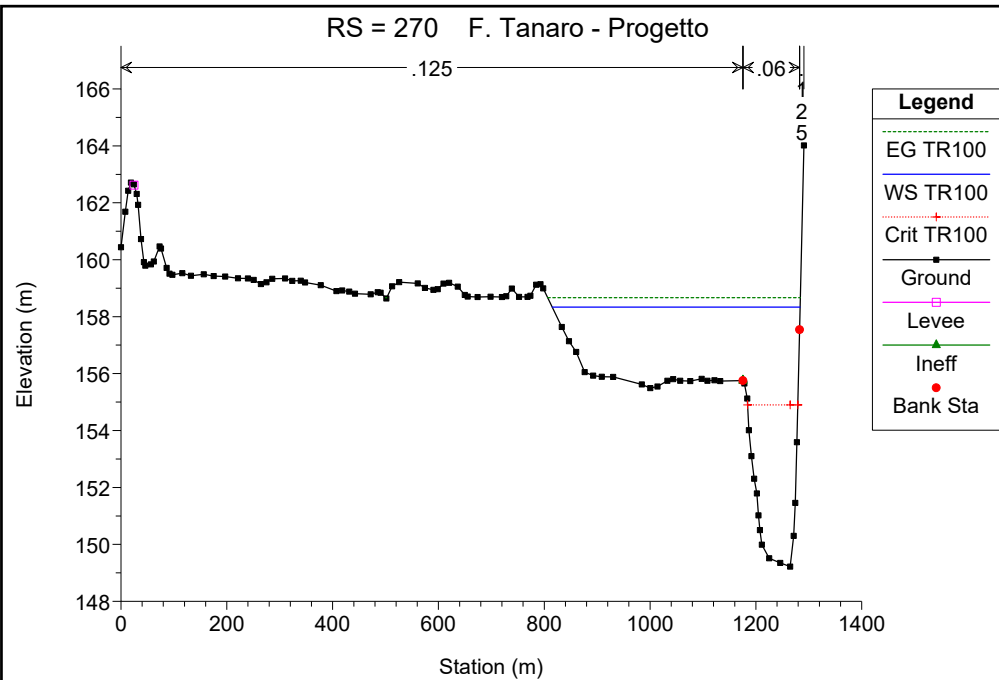


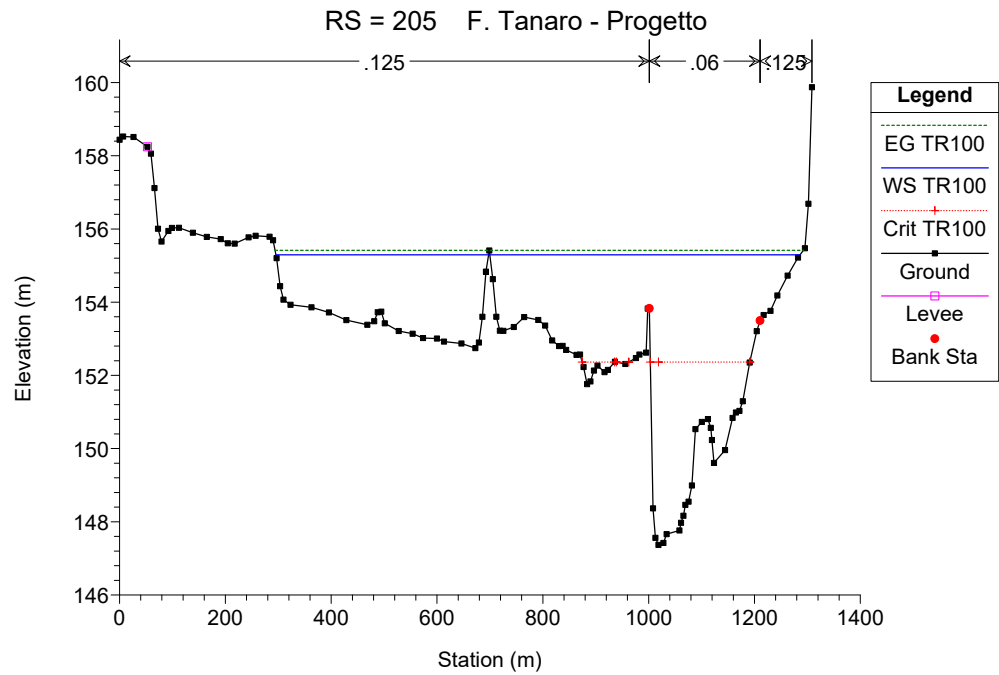
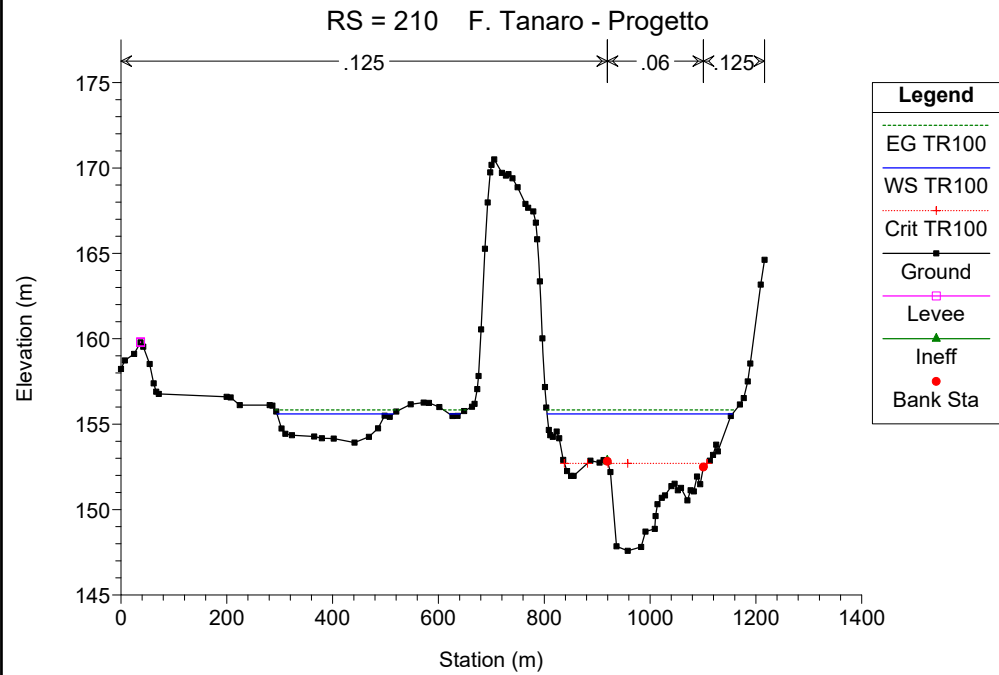
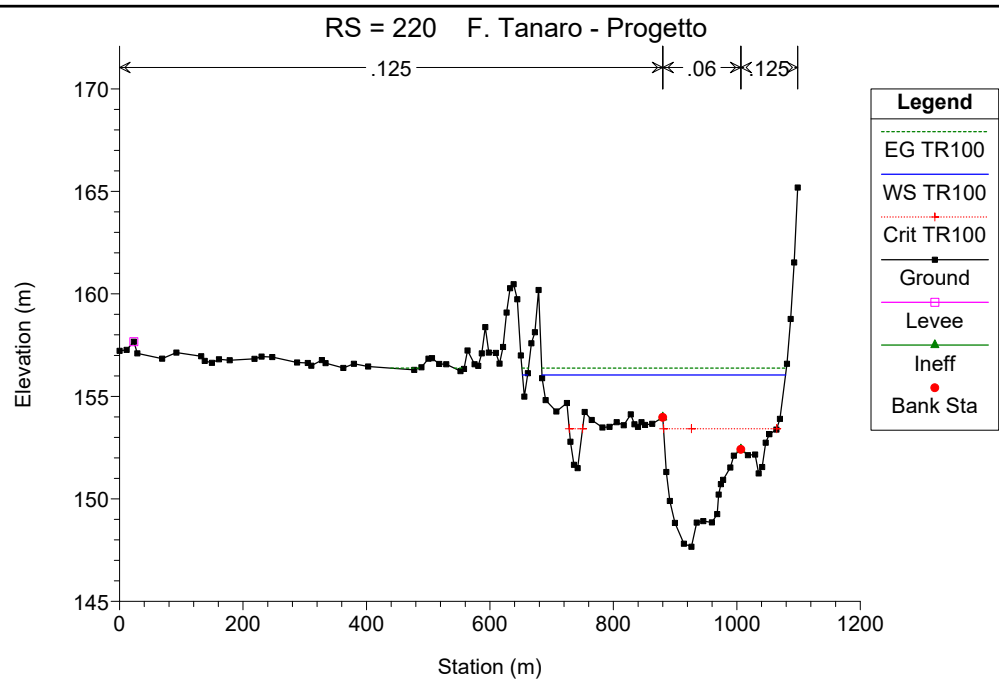
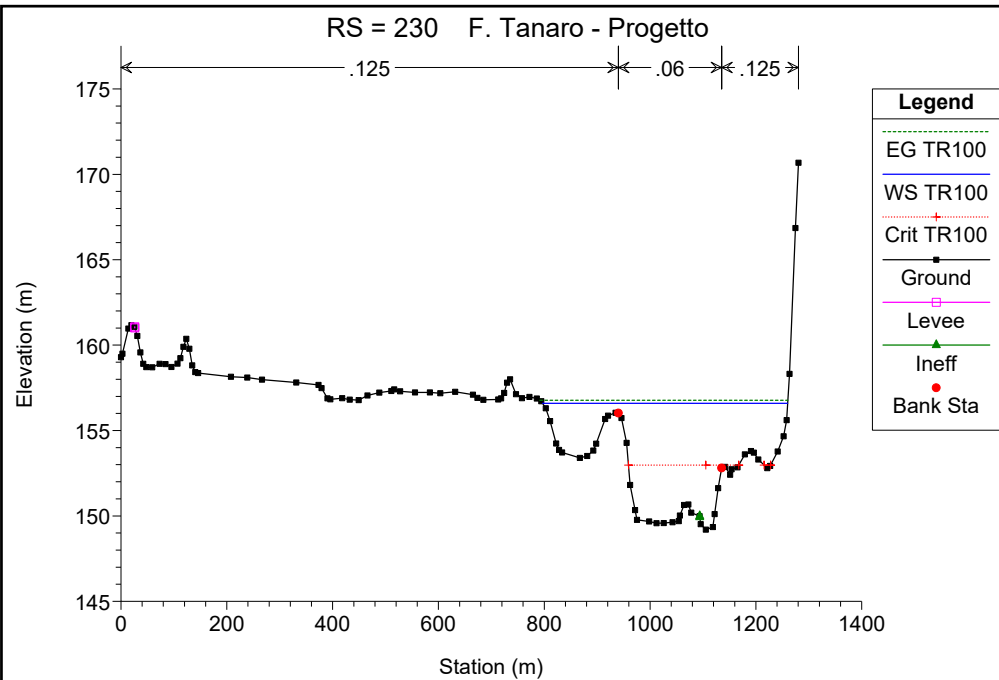


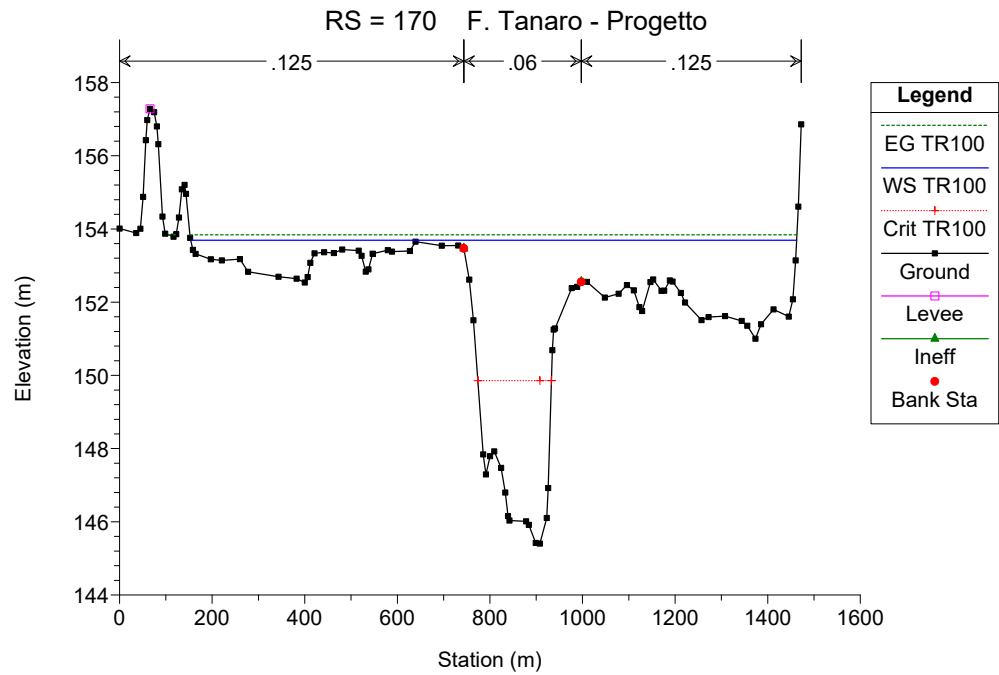
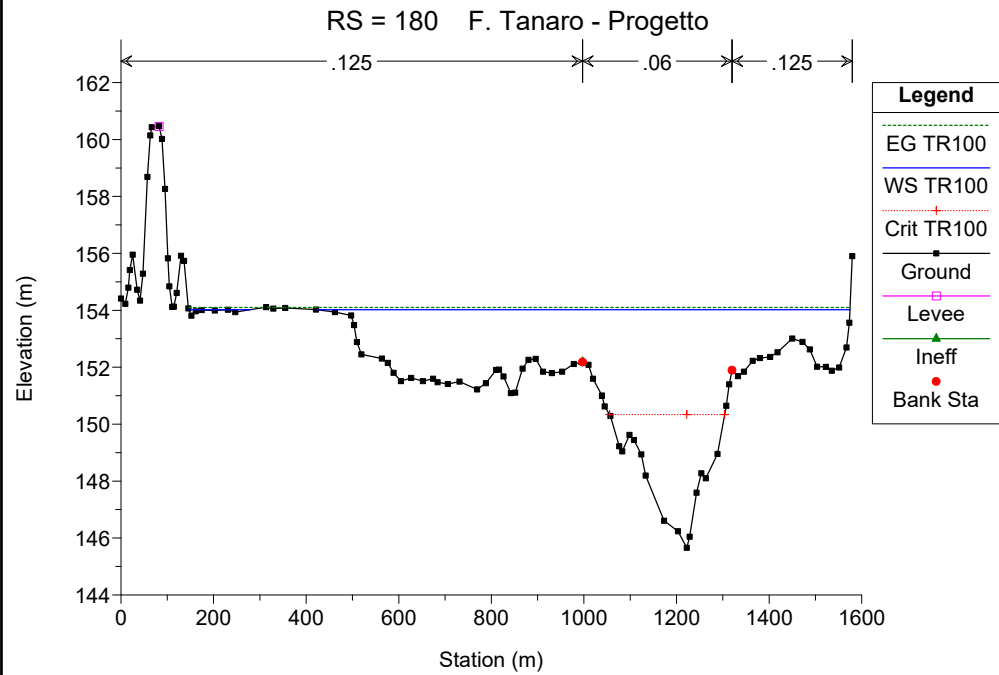
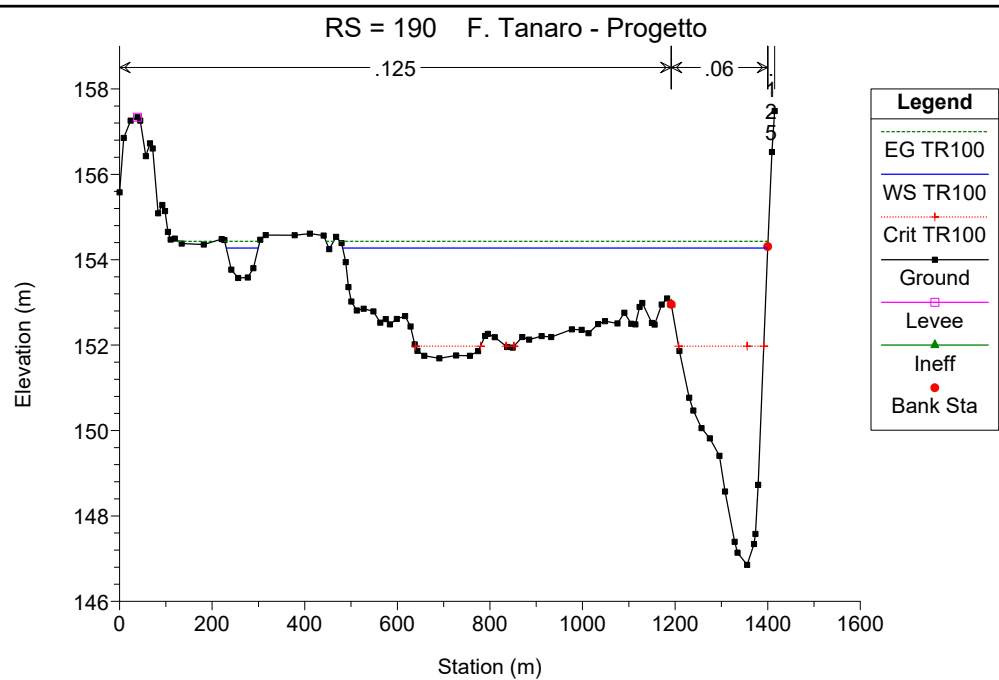
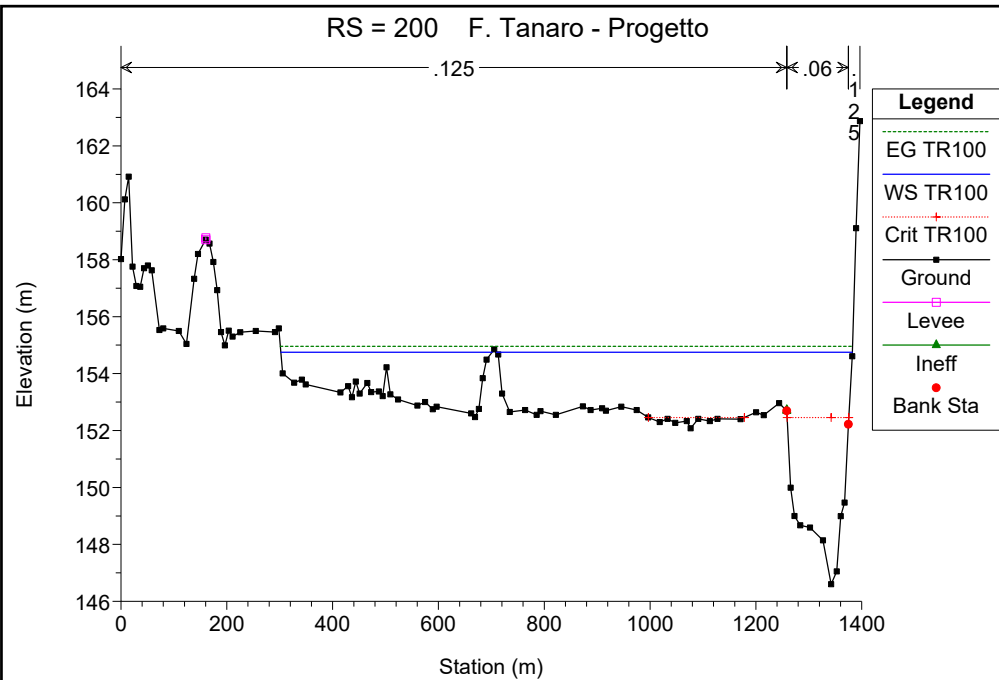


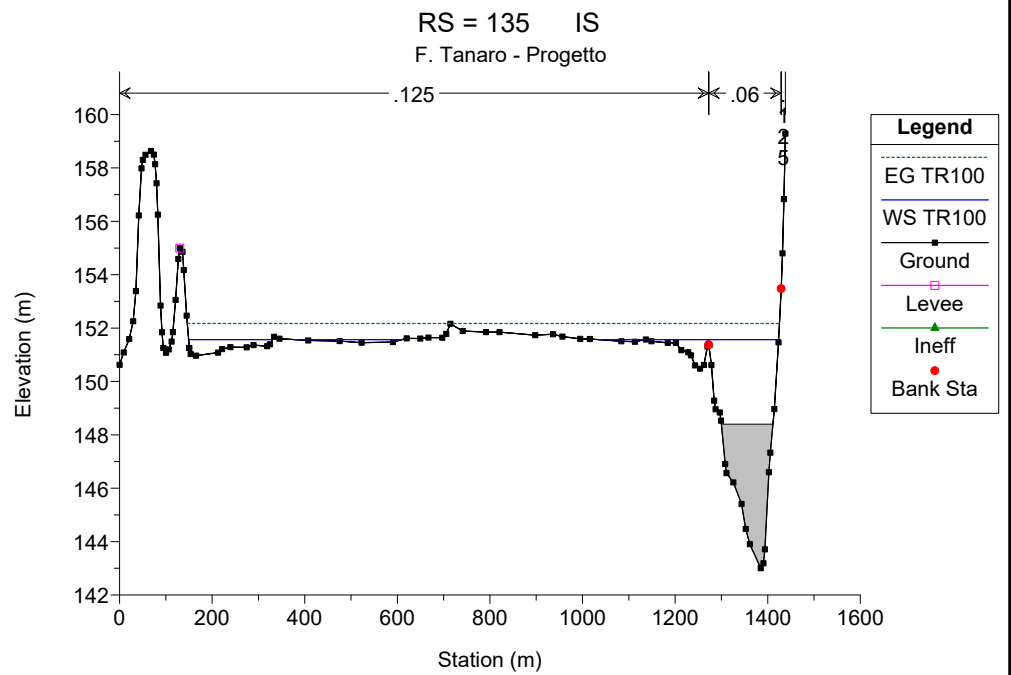
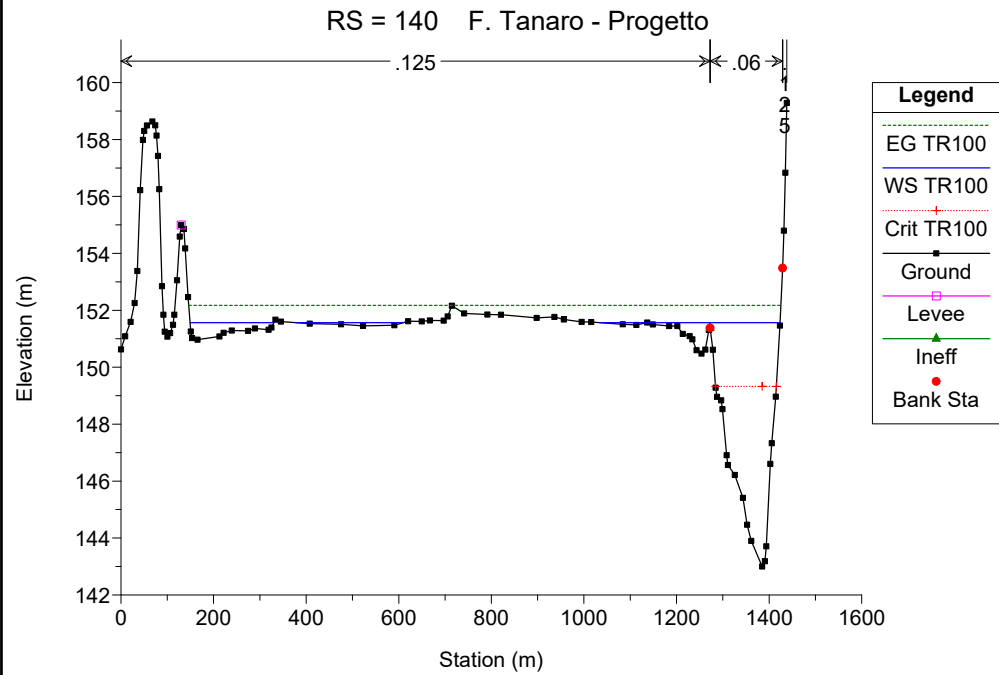
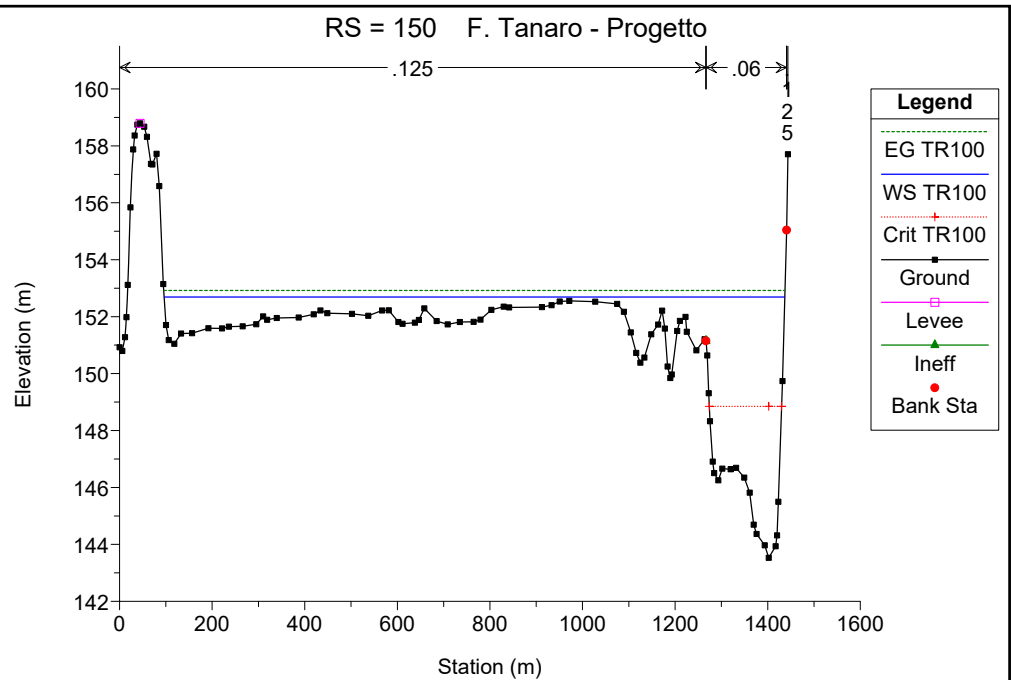
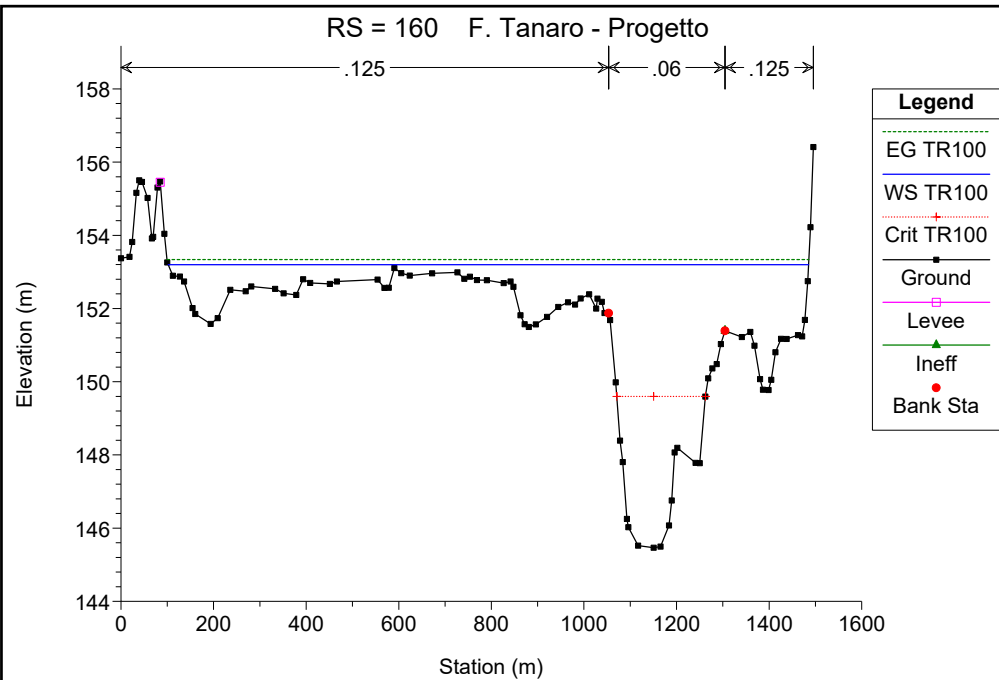


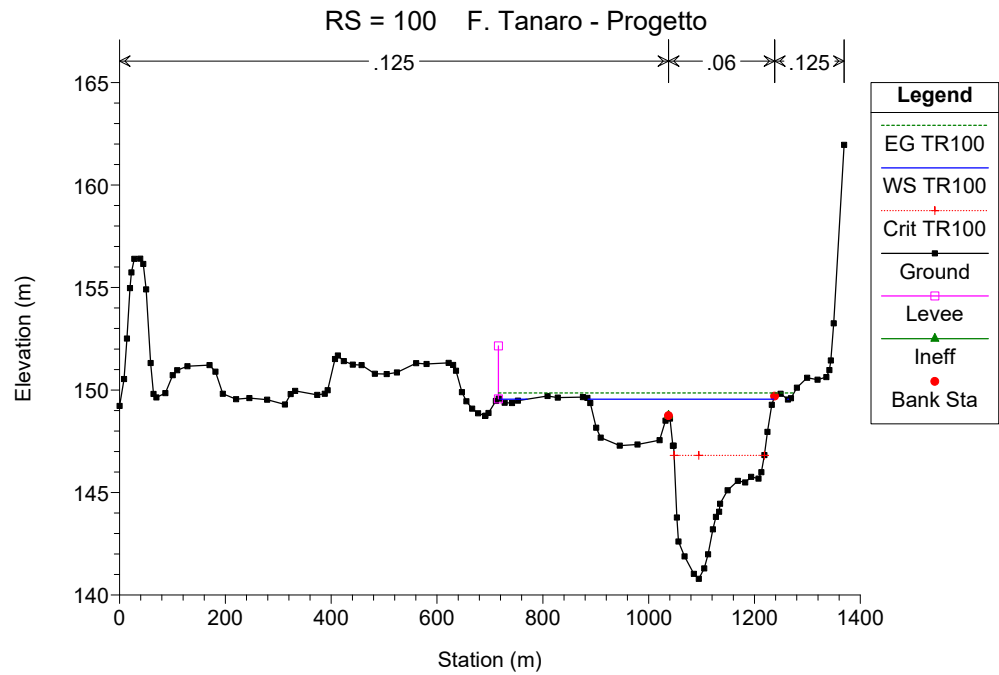
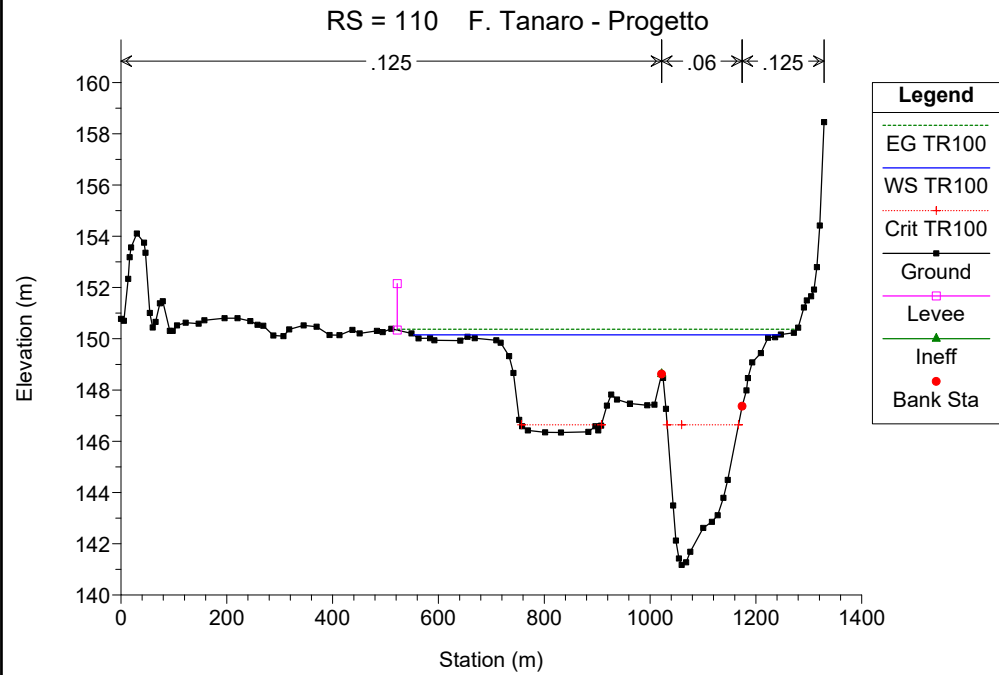
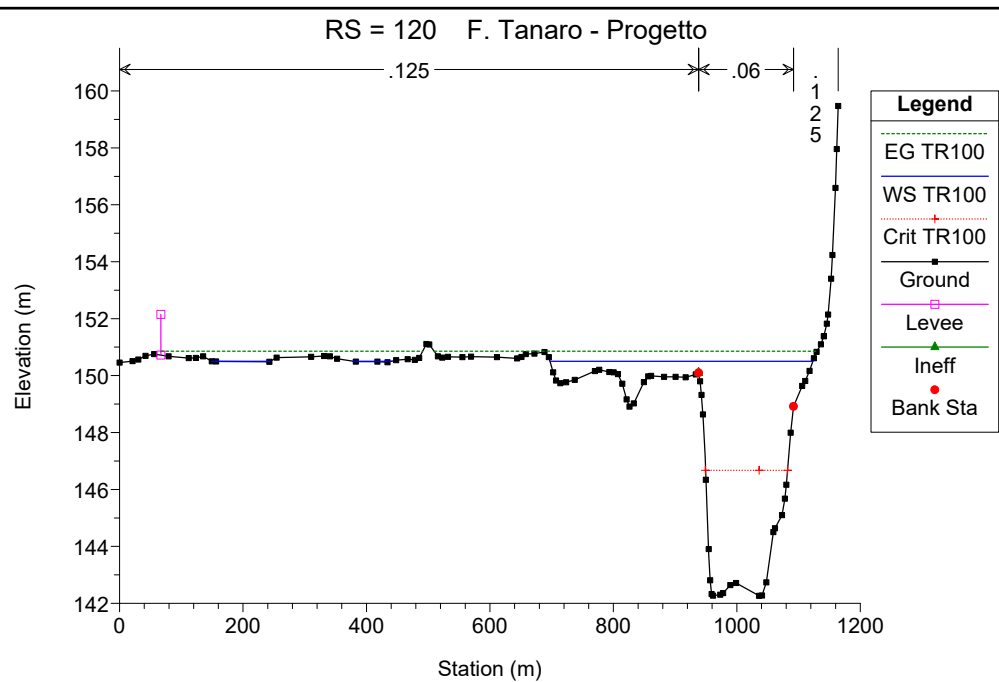
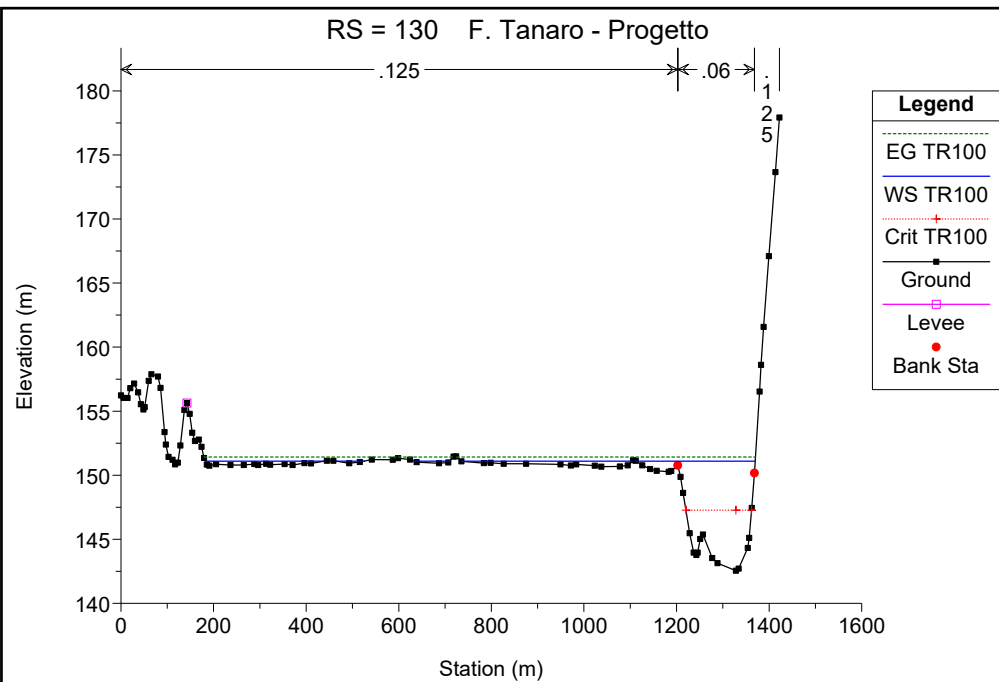


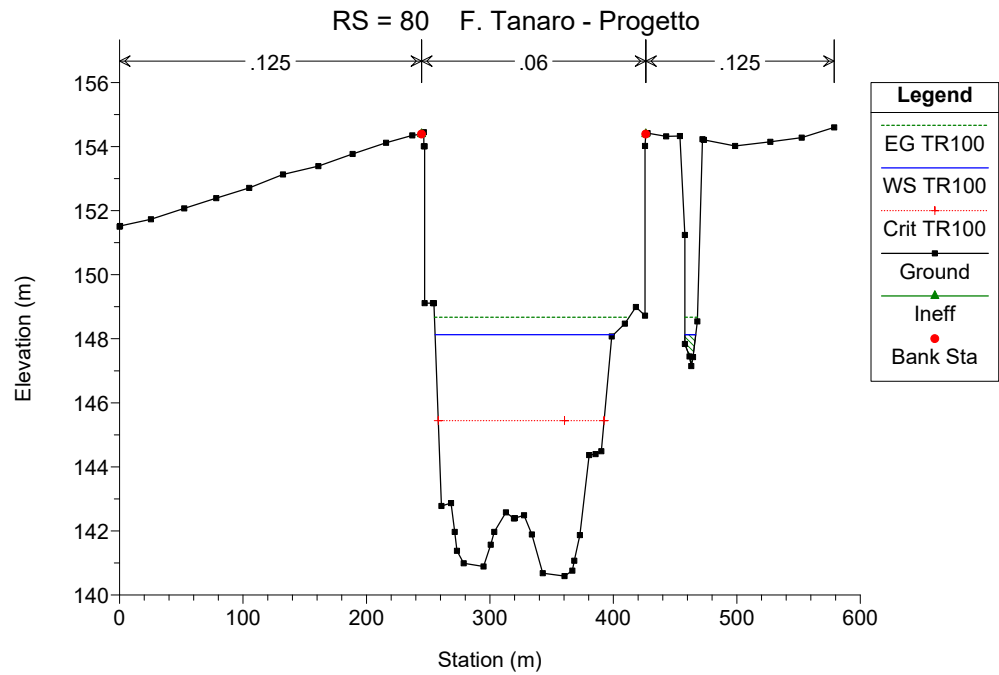
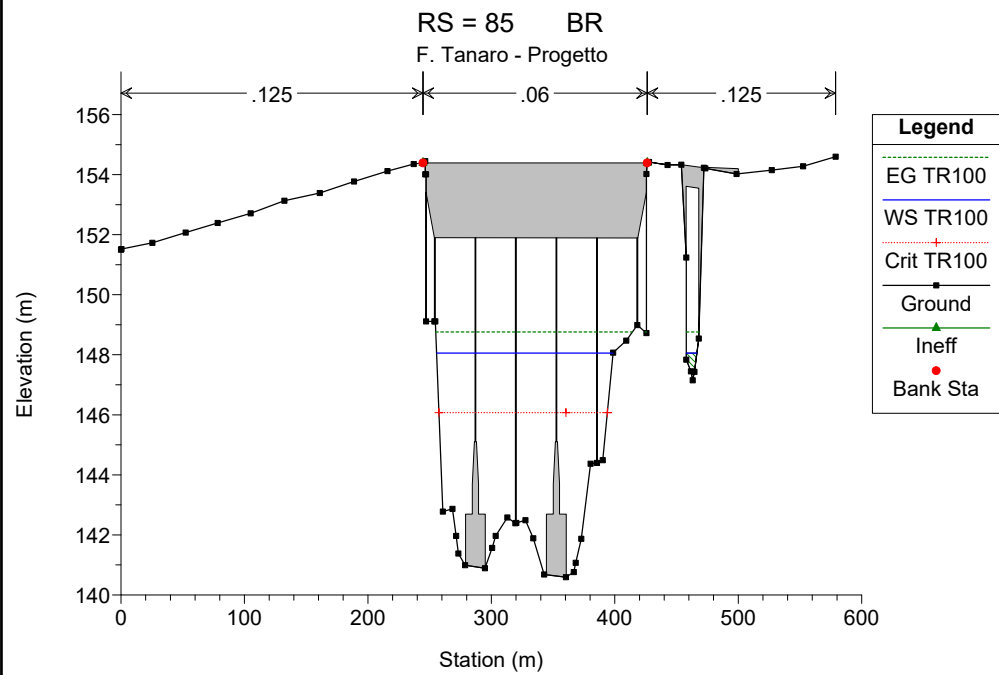
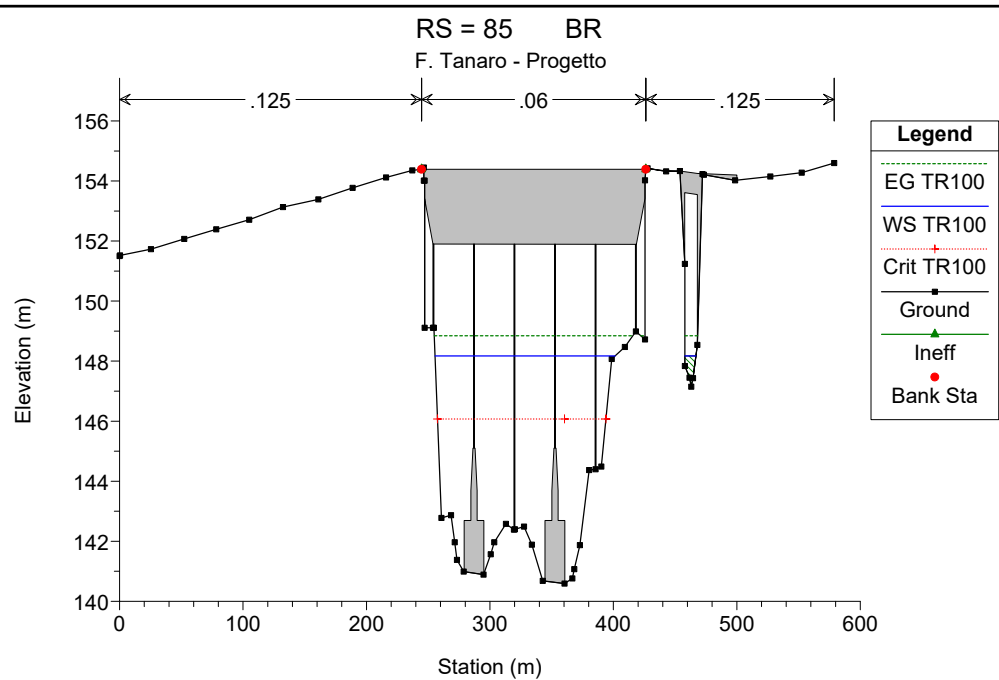
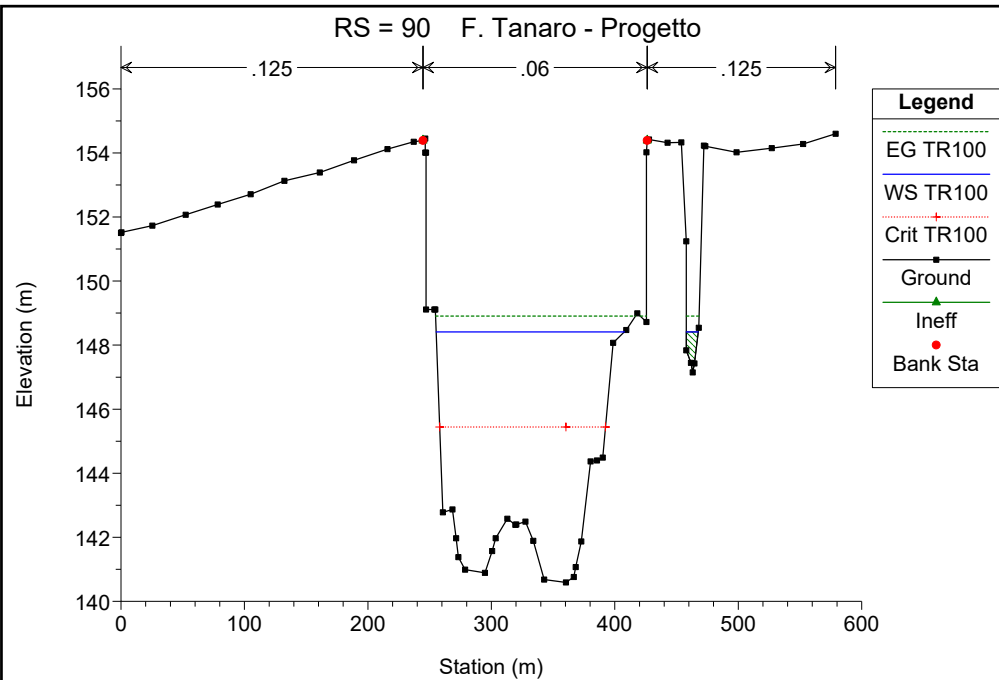


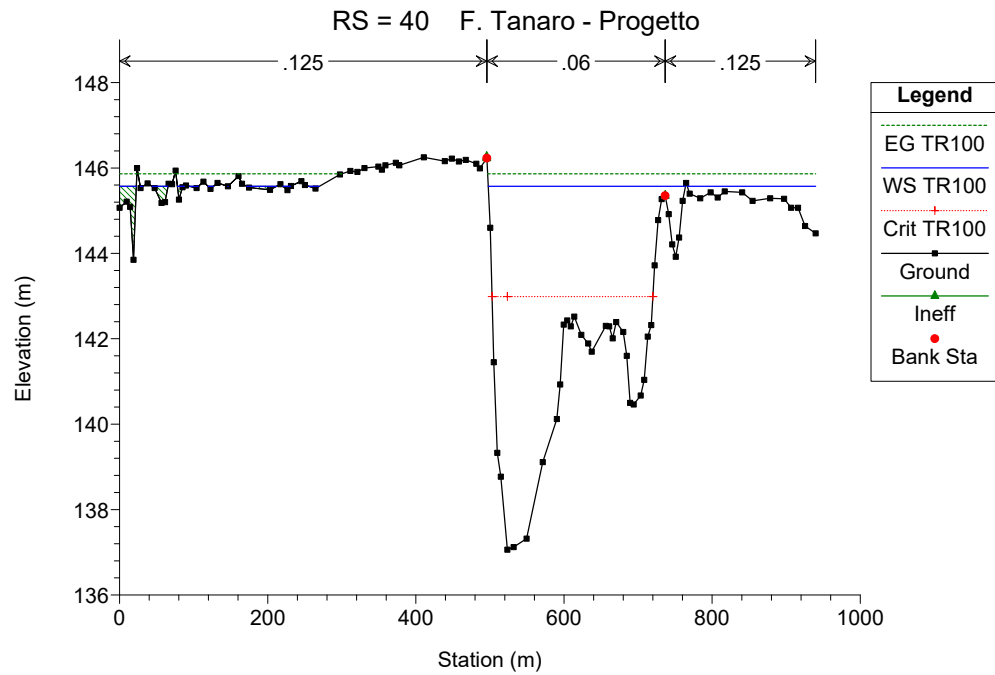
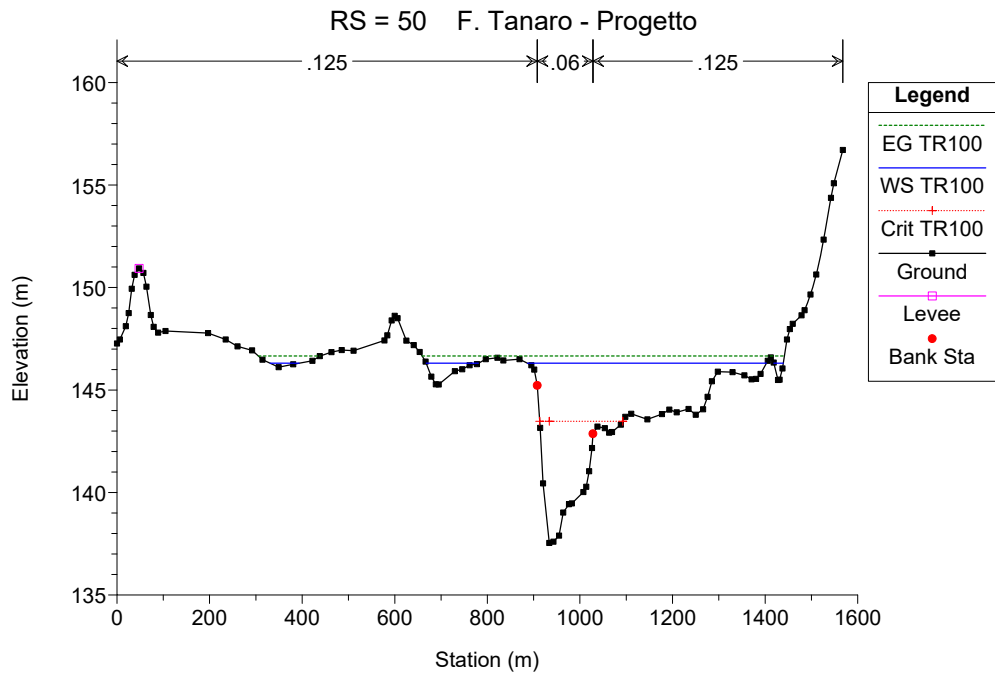
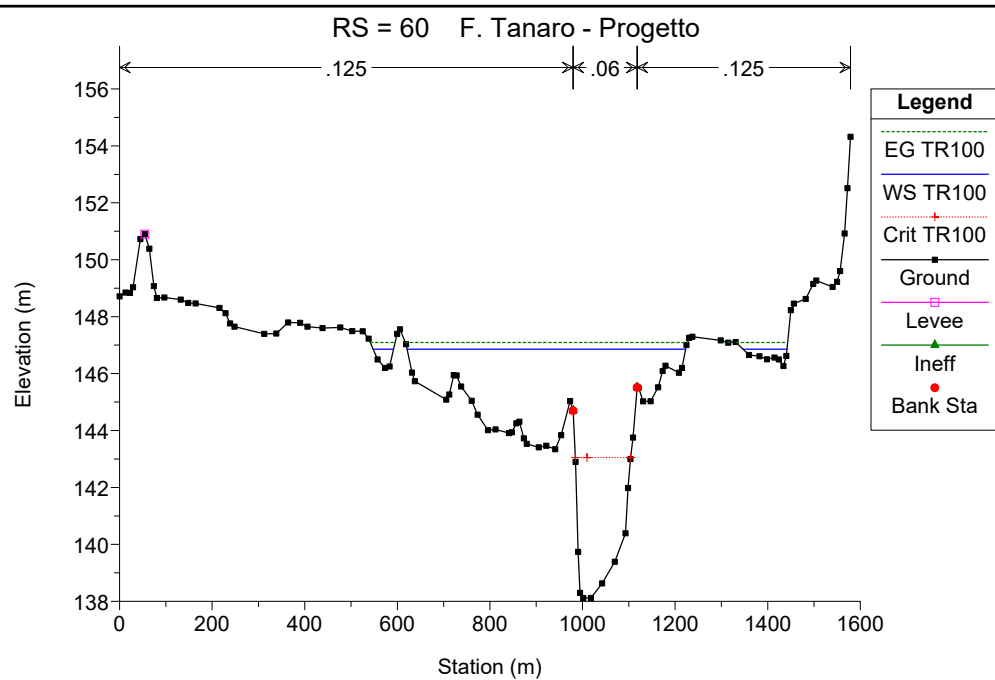
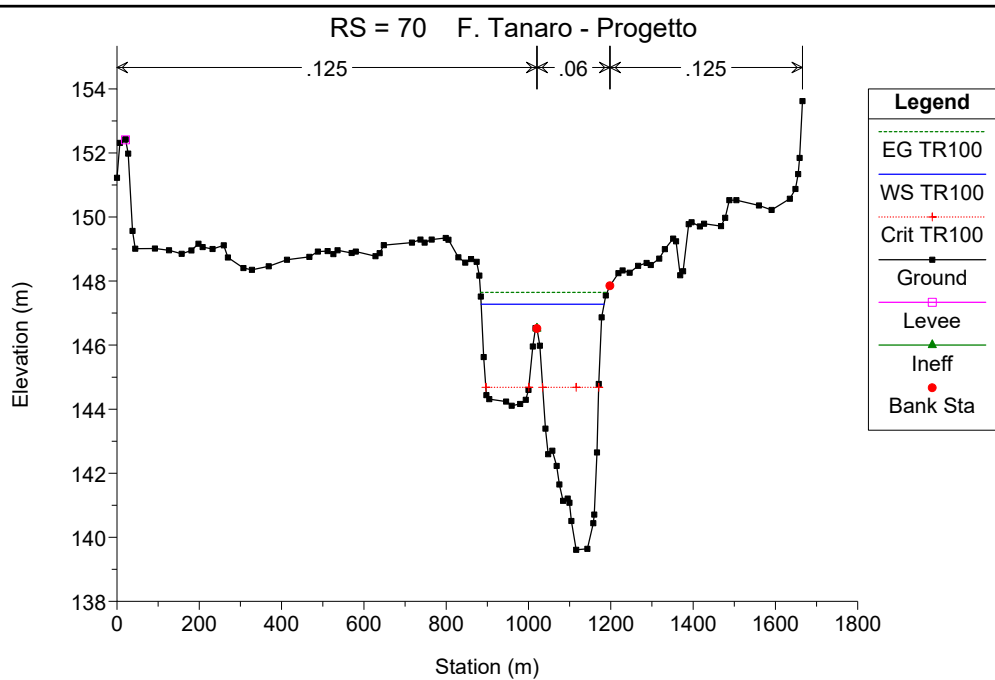


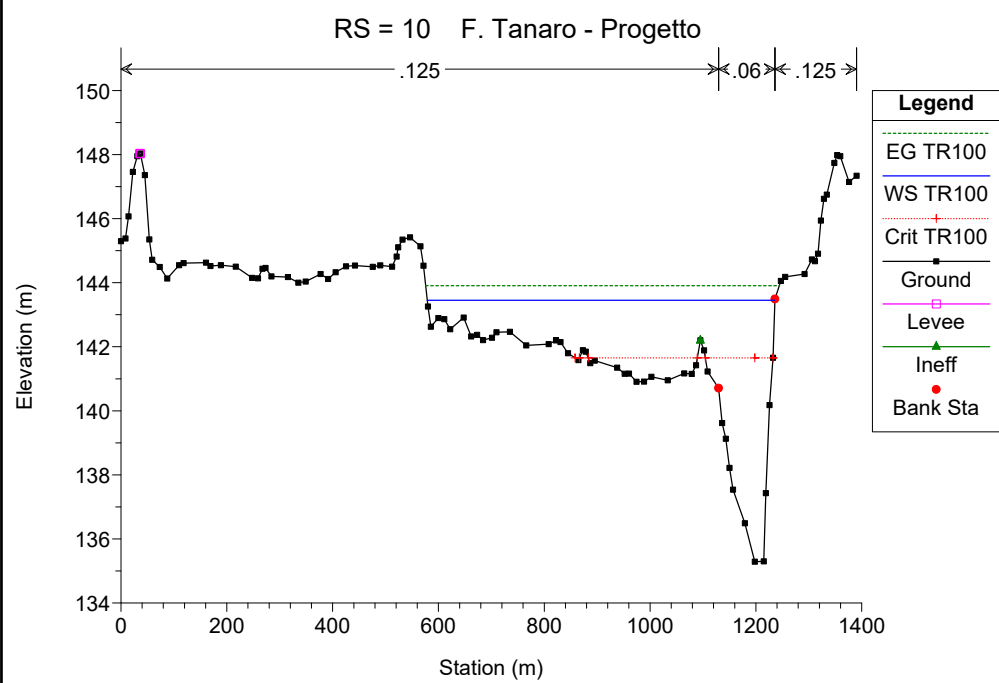
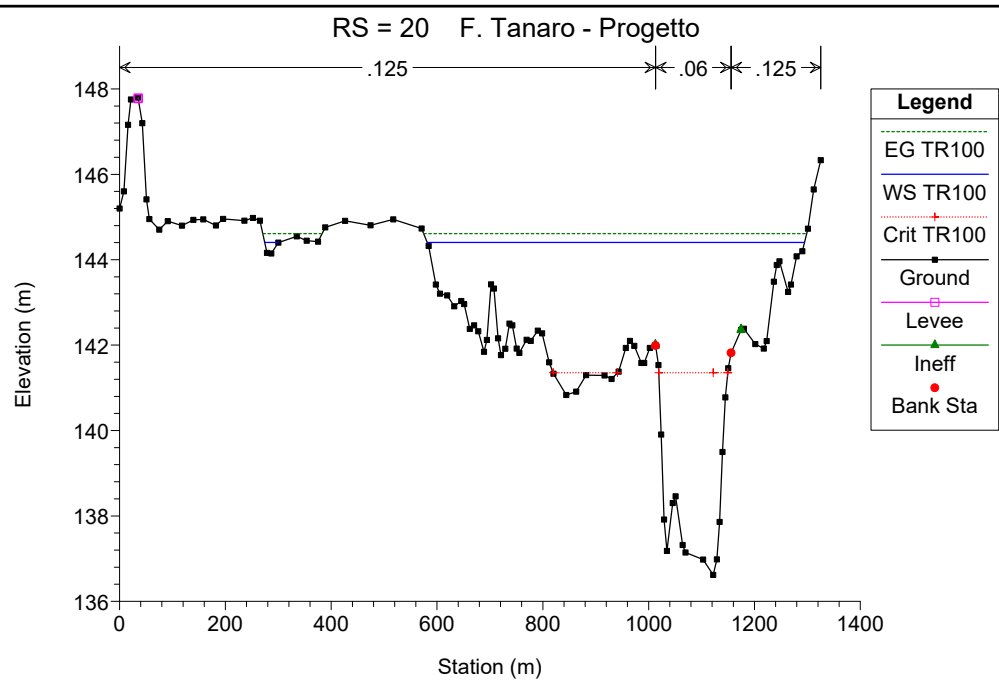
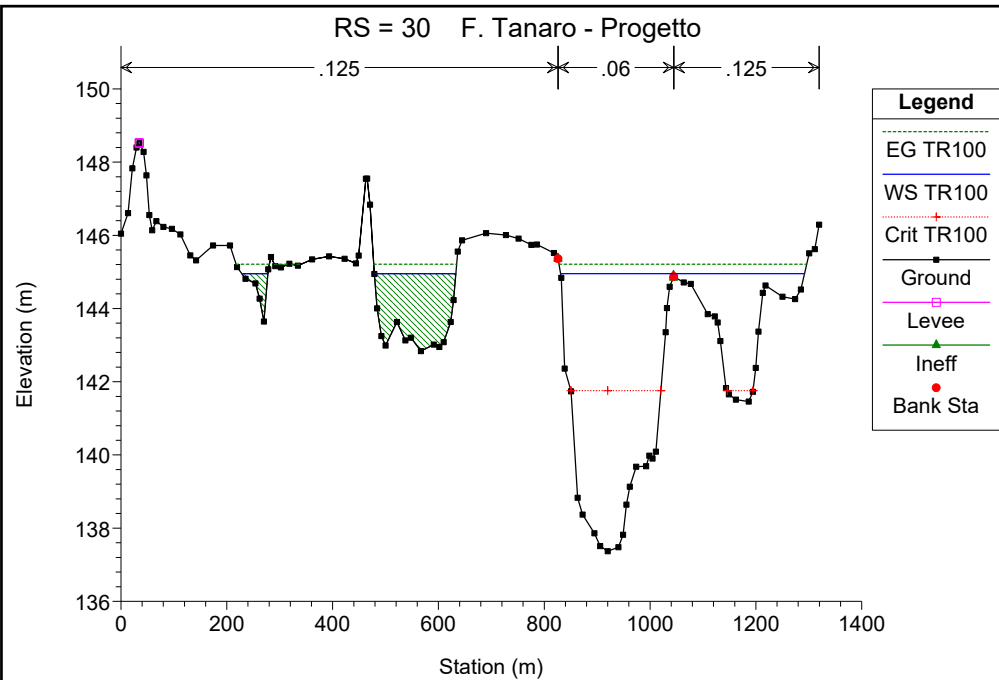












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 11

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2750	100
F. Tanaro valle Riddone	2757	
F. Tanaro valle Cherasca	2768	

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

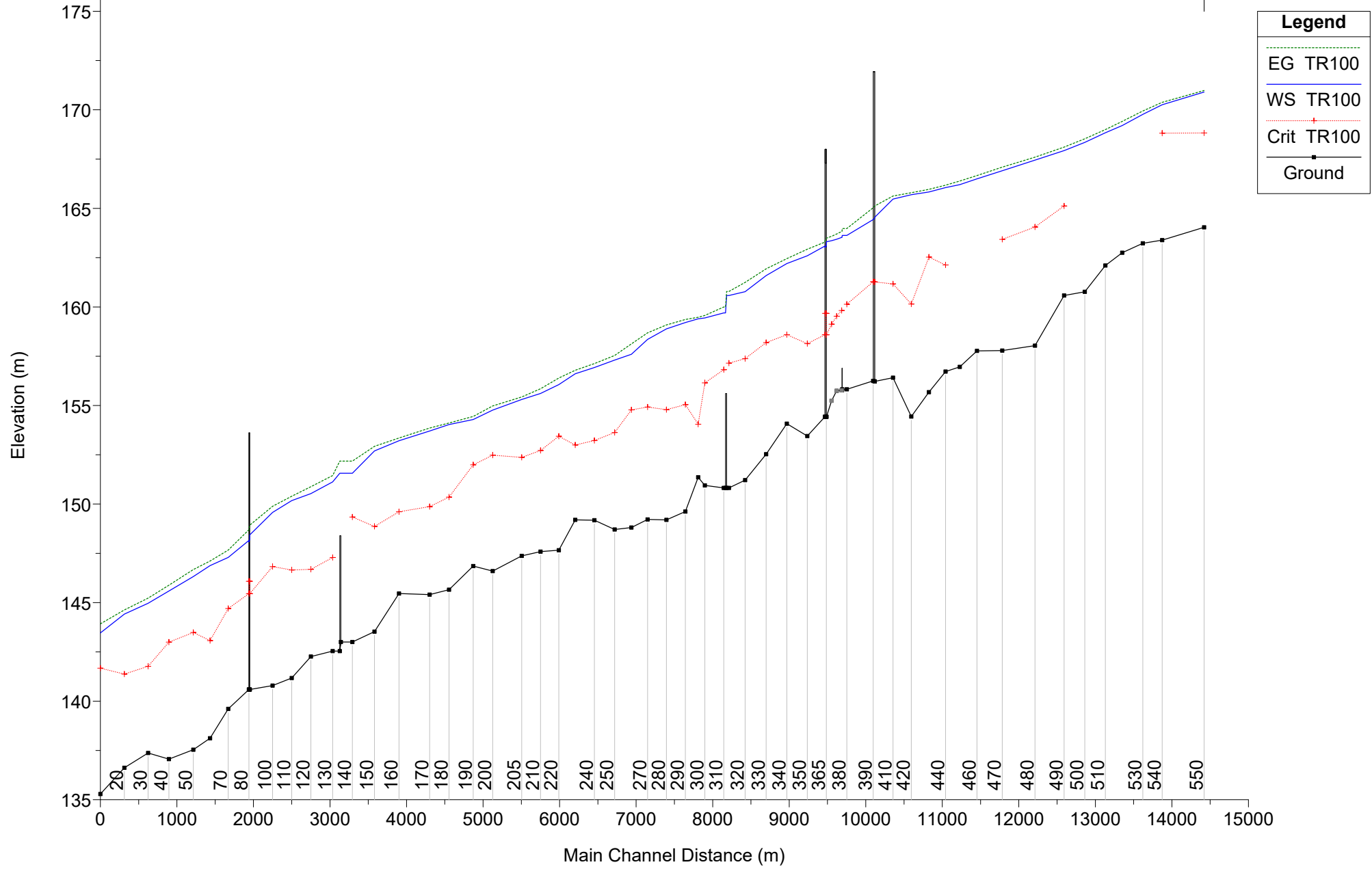
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3001.43	1171.50	0.22
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001695	2.08	2999.89	1119.85	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001798	2.09	2115.56	670.12	0.30
1	520	TR100	2750.00	162.75	169.20		169.42	0.002239	2.36	2207.28	1012.27	0.33
1	510	TR100	2750.00	162.10	168.84		169.00	0.001978	2.09	2200.20	727.94	0.31
1	500	TR100	2750.00	160.77	168.35		168.53	0.001622	2.13	1986.24	549.62	0.28
1	490	TR100	2750.00	160.58	167.93	165.12	168.11	0.001581	1.98	1837.30	510.18	0.28
1	480	TR100	2750.00	158.04	167.45	164.06	167.60	0.001235	1.92	2285.91	689.52	0.25
1	470	TR100	2750.00	157.79	166.91	163.43	167.09	0.001415	2.16	2050.34	537.25	0.27
1	460	TR100	2750.00	157.77	166.50		166.66	0.001164	1.97	2259.91	830.65	0.25
1	450	TR100	2750.00	156.96	166.20		166.39	0.001232	2.06	2075.78	802.66	0.25
1	440	TR100	2750.00	156.72	166.06	162.13	166.18	0.000889	1.81	2723.64	790.18	0.22
1	430	TR100	2750.00	155.68	165.83	162.53	165.97	0.001081	2.00	2647.66	664.15	0.24
1	420	TR100	2750.00	154.44	165.69	160.15	165.80	0.000578	1.63	2962.24	686.59	0.18
1	410	TR100	2750.00	156.41	165.47	161.17	165.63	0.001013	1.97	2259.52	527.18	0.23
1	400	TR100	2750.00	156.22	164.55	161.27	165.13	0.003259	3.43	915.40	174.13	0.41
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.43	161.28	165.03	0.003453	3.50	895.81	172.96	0.42
1	380	TR100	2750.00	155.82	163.63	160.13	163.98	0.002127	2.62	1083.87	221.58	0.33
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	163.31	158.59	163.49	0.001006	1.90	1445.25	206.86	0.23
1	365		Bridge									
1	360	TR100	2750.00	154.43	163.09	158.59	163.29	0.001111	1.96	1400.91	206.27	0.24
1	350	TR100	2750.00	153.45	162.60	158.14	162.93	0.001759	2.55	1124.65	276.28	0.31
1	340	TR100	2757.00	154.08	162.21	158.59	162.46	0.001616	2.23	1399.52	384.94	0.29
1	330	TR100	2757.00	152.53	161.60	158.19	161.94	0.002162	2.64	1299.64	439.14	0.33
1	320	TR100	2757.00	151.21	160.79	157.38	161.26	0.002714	3.31	1441.09	635.89	0.38
1	315	TR100	2757.00	150.82	160.61	157.15	160.81	0.001377	2.38	2587.49	1092.41	0.27
1	312.5		Inl Struct									
1	310	TR100	2757.00	150.82	159.69	156.82	160.00	0.002316	2.85	1791.63	630.75	0.35
1	300	TR100	2768.00	150.95	159.44	156.15	159.57	0.001177	1.84	2428.87	677.11	0.24
1	295	TR100	2768.00	151.36	159.40	154.05	159.48	0.000525	1.38	3070.44	860.98	0.17
1	290	TR100	2768.00	149.62	159.21	155.04	159.37	0.001007	1.81	2074.08	691.66	0.23
1	280	TR100	2768.00	149.20	158.89	154.79	159.09	0.001281	2.21	1950.79	473.77	0.26
1	270	TR100	2768.00	149.22	158.35	154.92	158.69	0.002137	2.84	1626.67	469.01	0.34
1	260	TR100	2768.00	148.81	157.60	154.78	158.13	0.003278	3.43	1147.14	296.45	0.41
1	250	TR100	2768.00	148.71	157.30	153.63	157.54	0.001744	2.35	1788.12	524.90	0.30
1	240	TR100	2768.00	149.18	156.93	153.22	157.13	0.001367	2.15	2077.30	754.78	0.27
1	230	TR100	2768.00	149.20	156.61	152.99	156.79	0.001301	2.00	1886.66	463.56	0.26
1	220	TR100	2768.00	147.66	156.06	153.44	156.39	0.002448	2.81	1495.72	403.34	0.36

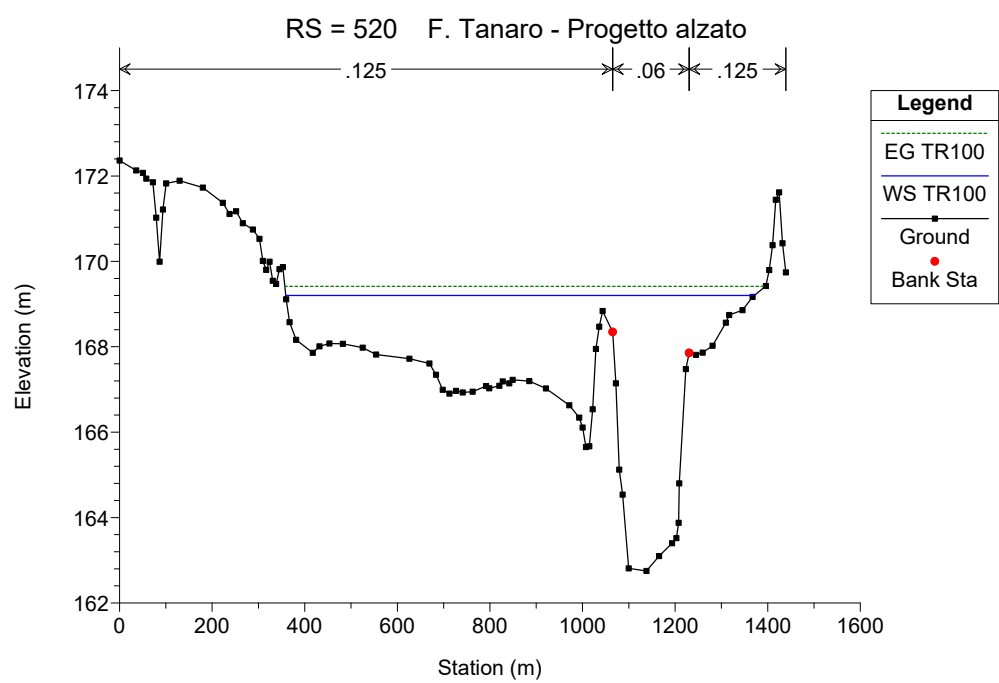
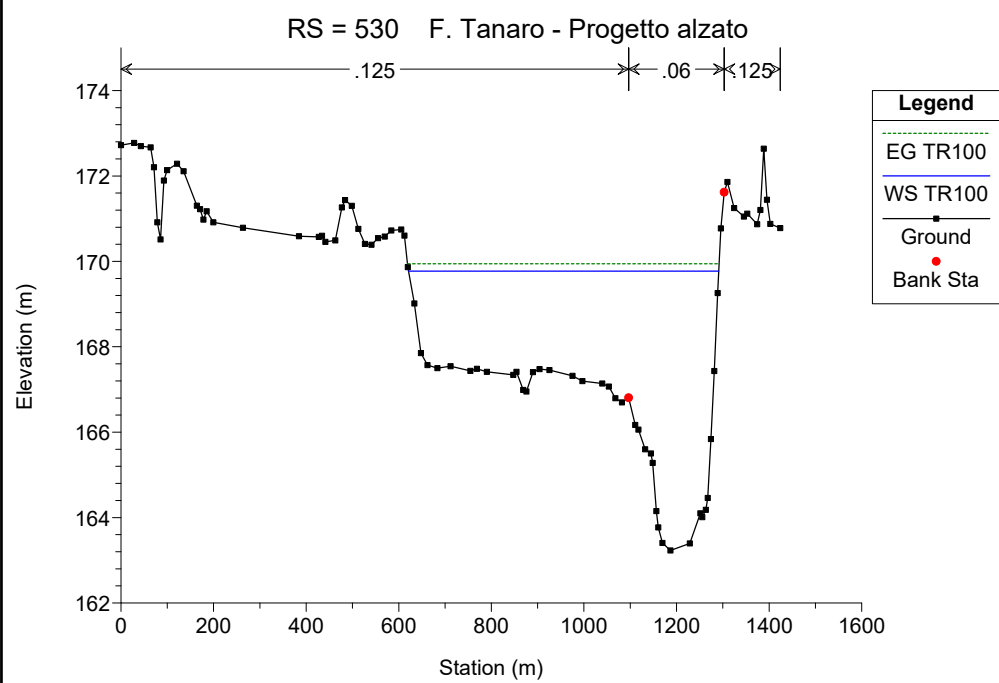
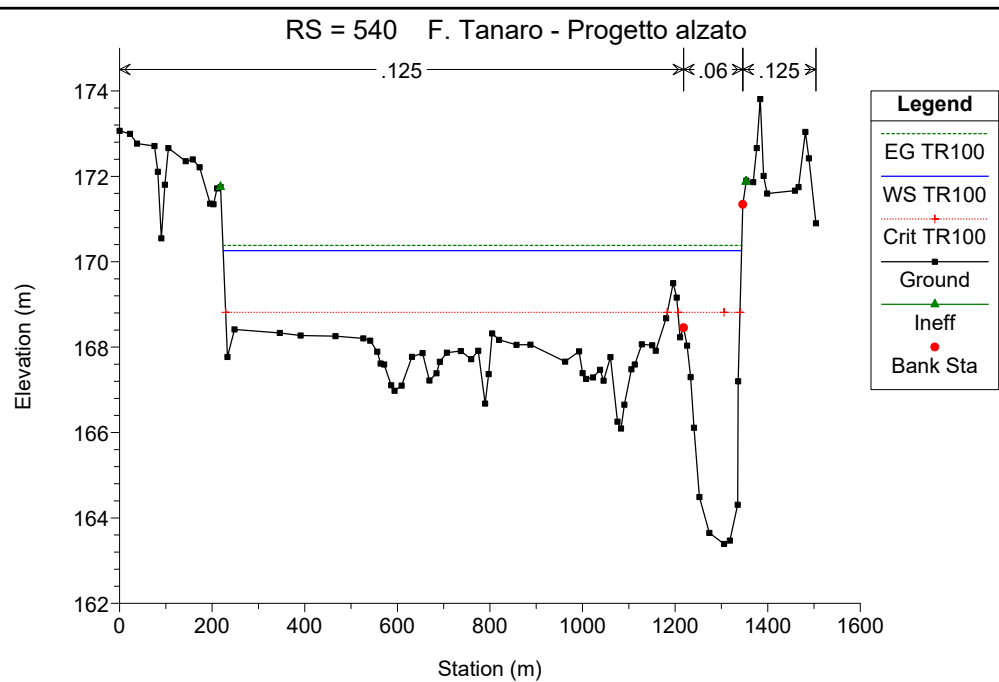
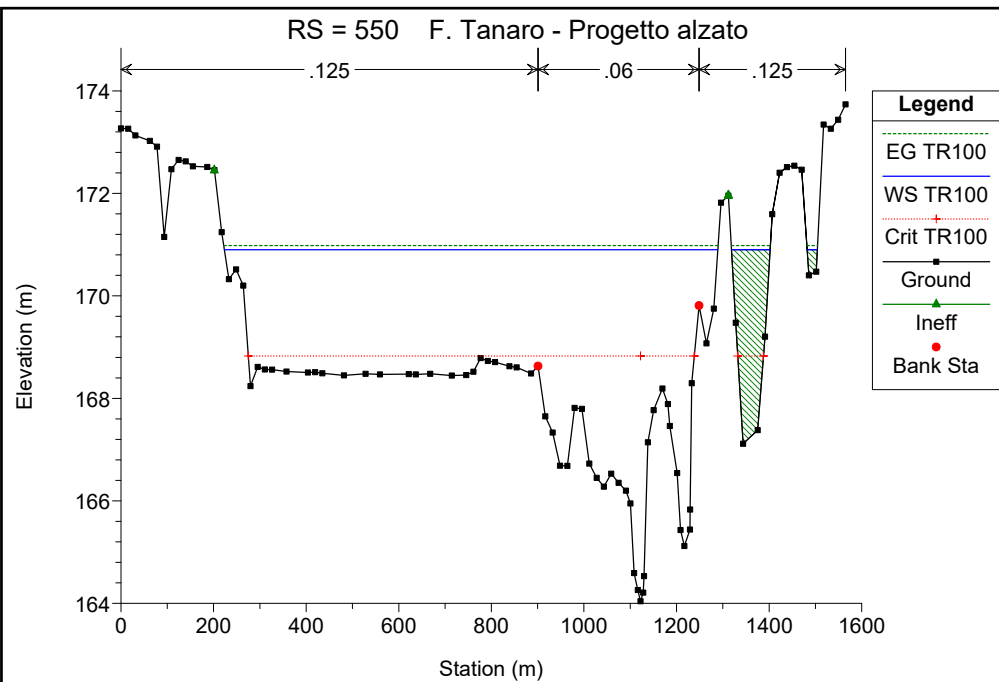
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (Continued)

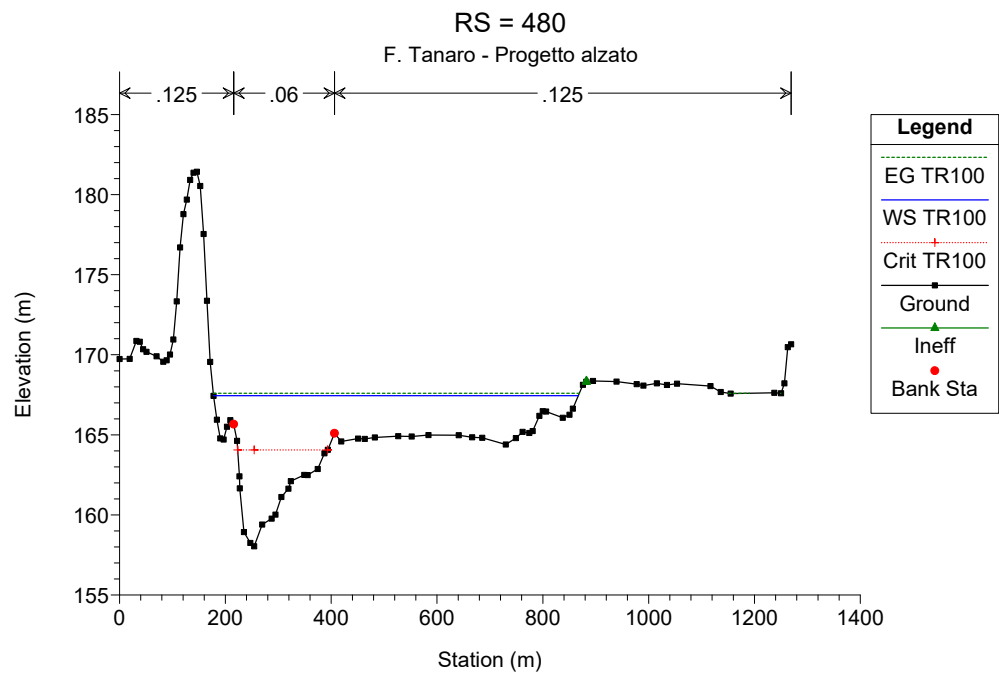
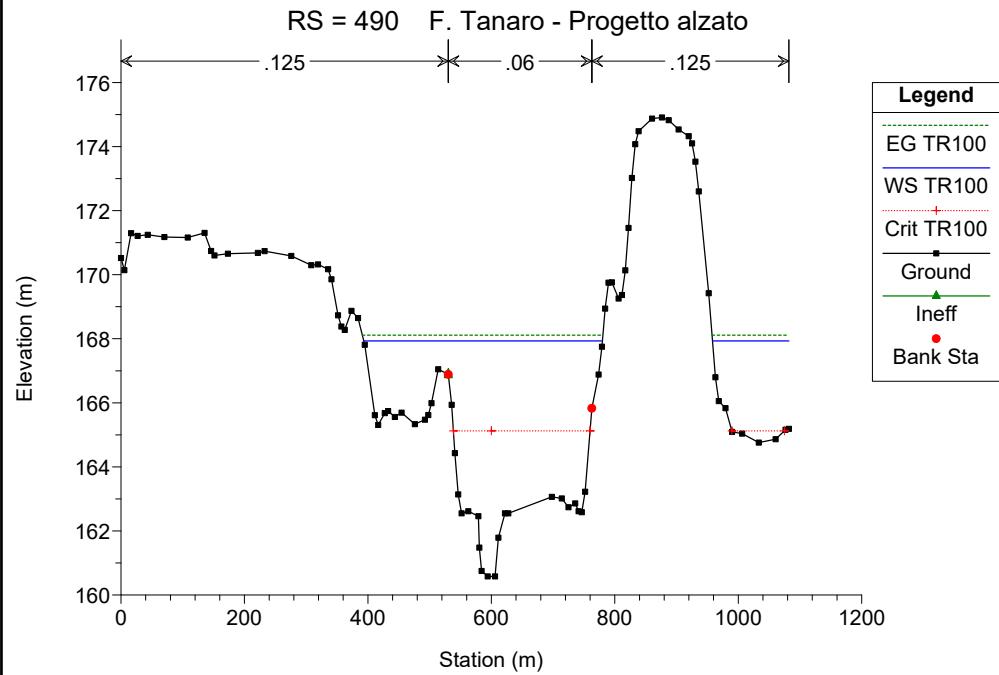
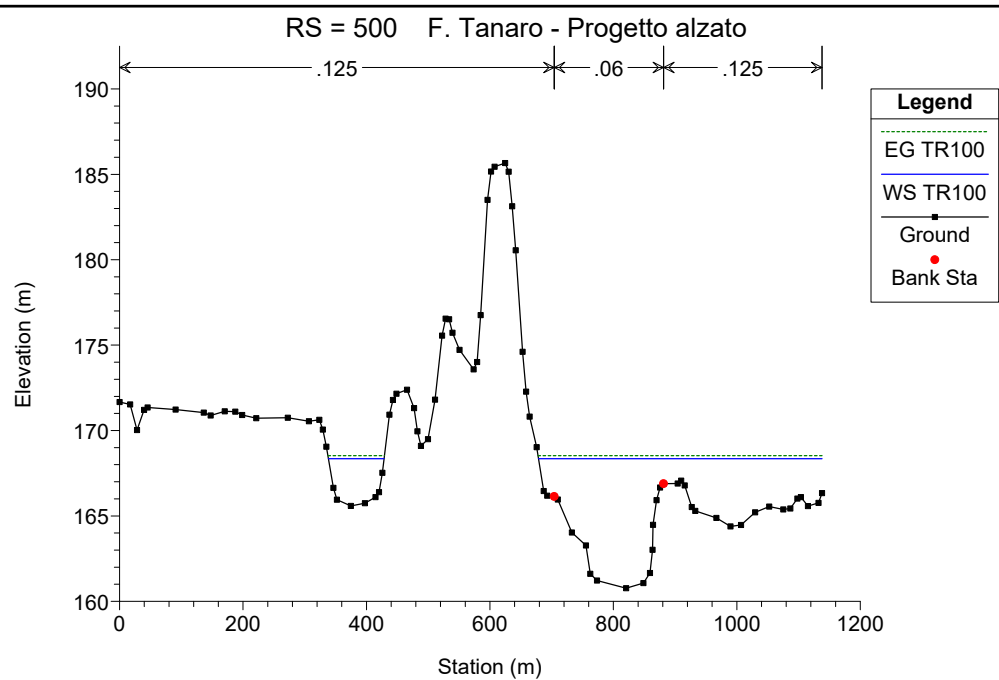
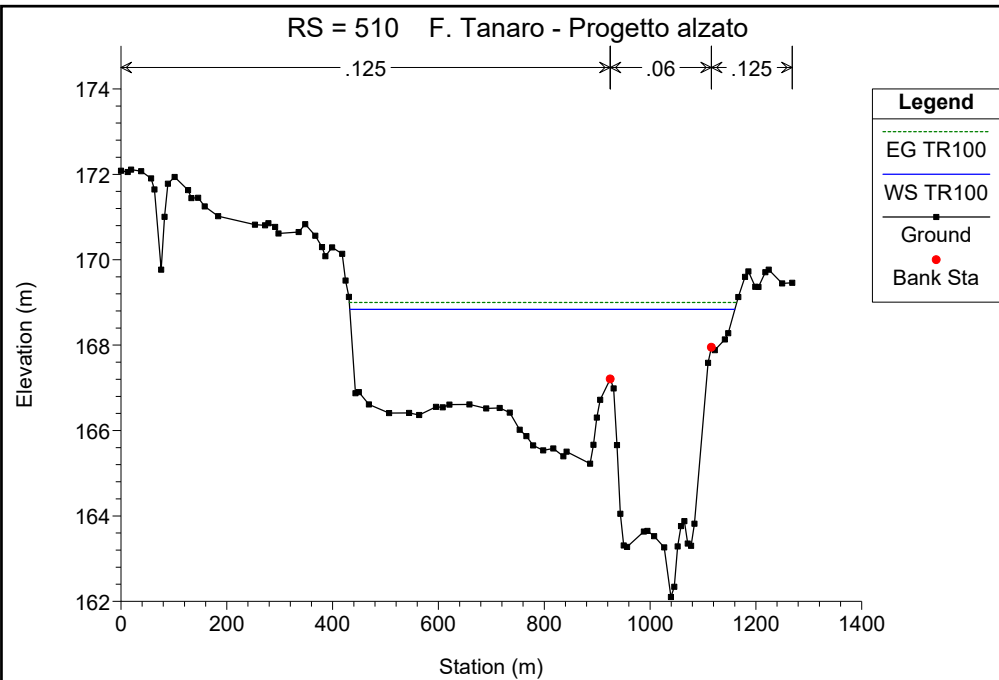
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR100	2768.00	147.59	155.61	152.72	155.85	0.001875	2.31	1709.74	592.79	0.31
1	205	TR100	2768.00	147.37	155.31	152.37	155.43	0.001242	1.80	2697.42	989.53	0.25
1	200	TR100	2768.00	146.60	154.76	152.48	154.98	0.002026	2.50	2491.78	1073.40	0.32
1	190	TR100	2768.00	146.85	154.29	151.99	154.45	0.001904	2.04	2397.80	991.67	0.30
1	180	TR100	2768.00	145.66	154.04	150.35	154.11	0.000707	1.34	3252.90	1300.54	0.19
1	170	TR100	2768.00	145.40	153.71	149.87	153.85	0.001438	1.85	2382.39	1309.38	0.26
1	160	TR100	2768.00	145.46	153.21	149.61	153.35	0.001178	1.77	2451.19	1383.79	0.24
1	150	TR100	2768.00	143.53	152.70	148.86	152.93	0.001478	2.23	2067.92	1340.55	0.28
1	140	TR100	2768.00	143.00	151.56	149.34	152.18	0.005004	3.50	912.46	787.18	0.49
1	135		Inl Struct									
1	130	TR100	2768.00	142.54	151.12	147.29	151.45	0.001954	2.54	1313.27	1035.49	0.32
1	120	TR100	2768.00	142.27	150.53	146.69	150.88	0.002051	2.65	1214.45	598.77	0.33
1	110	TR100	2768.00	141.17	150.18	146.66	150.40	0.001546	2.28	2018.37	700.82	0.28
1	100	TR100	2768.00	140.79	149.58	146.83	149.88	0.002676	2.54	1311.01	416.69	0.36
1	90	TR100	2768.00	140.59	148.44	145.45	148.93	0.003469	3.11	888.69	163.00	0.41
1	85		Bridge									
1	80	TR100	2768.00	140.59	148.15	145.45	148.70	0.003811	3.27	846.08	154.19	0.43
1	70	TR100	2768.00	139.61	147.30	144.70	147.67	0.003227	2.85	1223.89	299.18	0.40
1	60	TR100	2768.00	138.12	146.88	143.07	147.11	0.001542	2.36	1954.59	743.18	0.29
1	50	TR100	2768.00	137.54	146.32	143.49	146.68	0.002428	2.88	1611.04	721.36	0.36
1	40	TR100	2768.00	137.06	145.59	143.00	145.88	0.002663	2.41	1224.48	610.14	0.35
1	30	TR100	2768.00	137.37	144.97	141.77	145.23	0.002134	2.32	1464.55	665.72	0.32
1	20	TR100	2768.00	136.62	144.42	141.37	144.63	0.001665	2.31	2149.72	744.59	0.29
1	10	TR100	2768.00	135.29	143.46	141.67	143.92	0.004005	3.40	1533.14	657.12	0.45

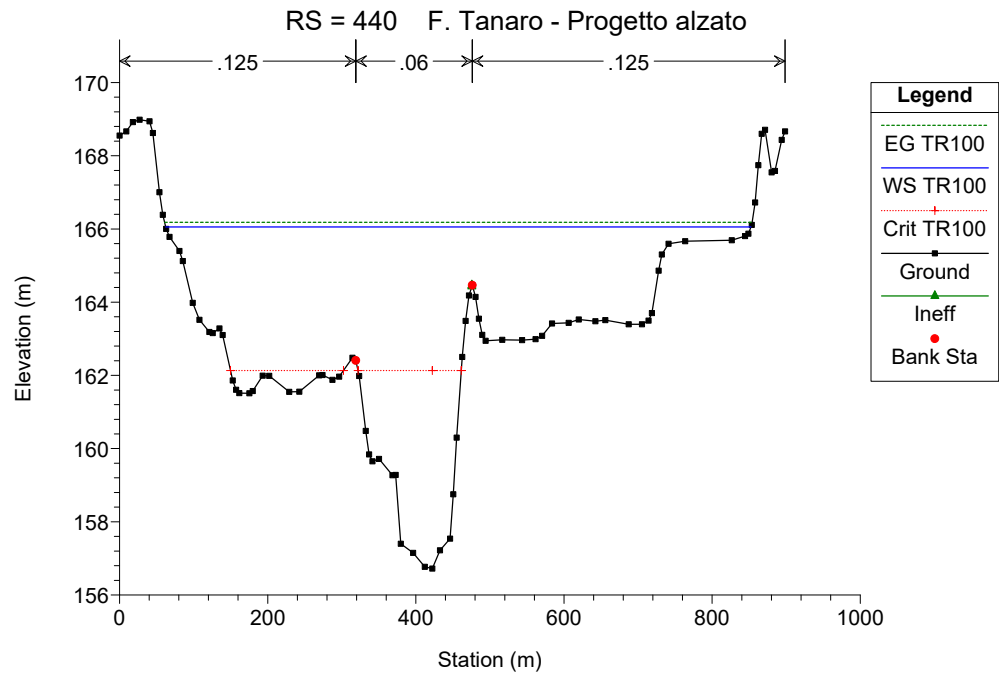
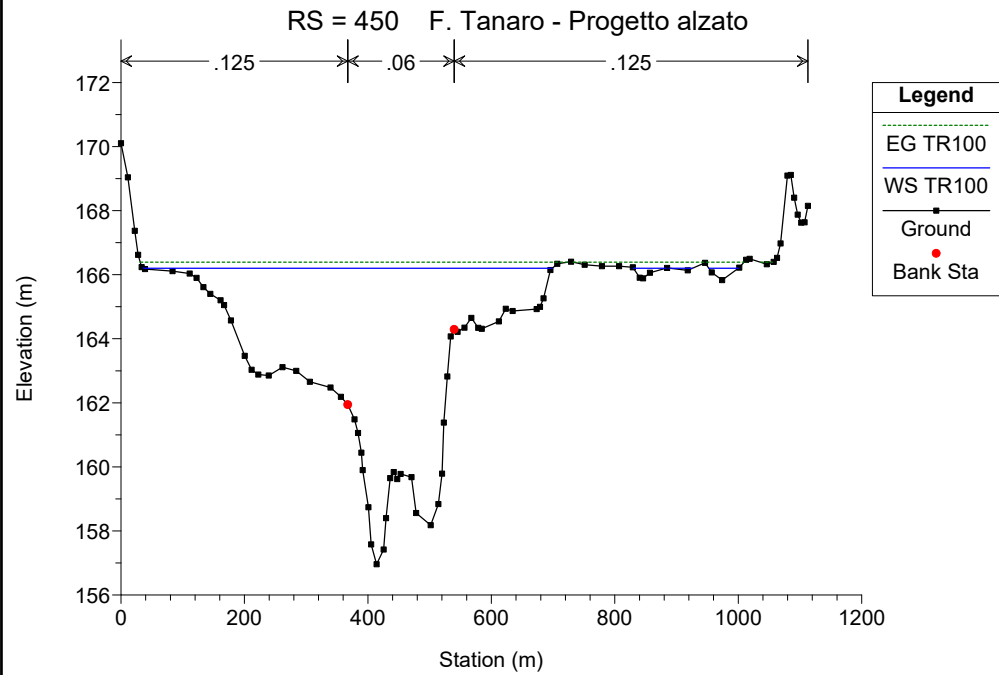
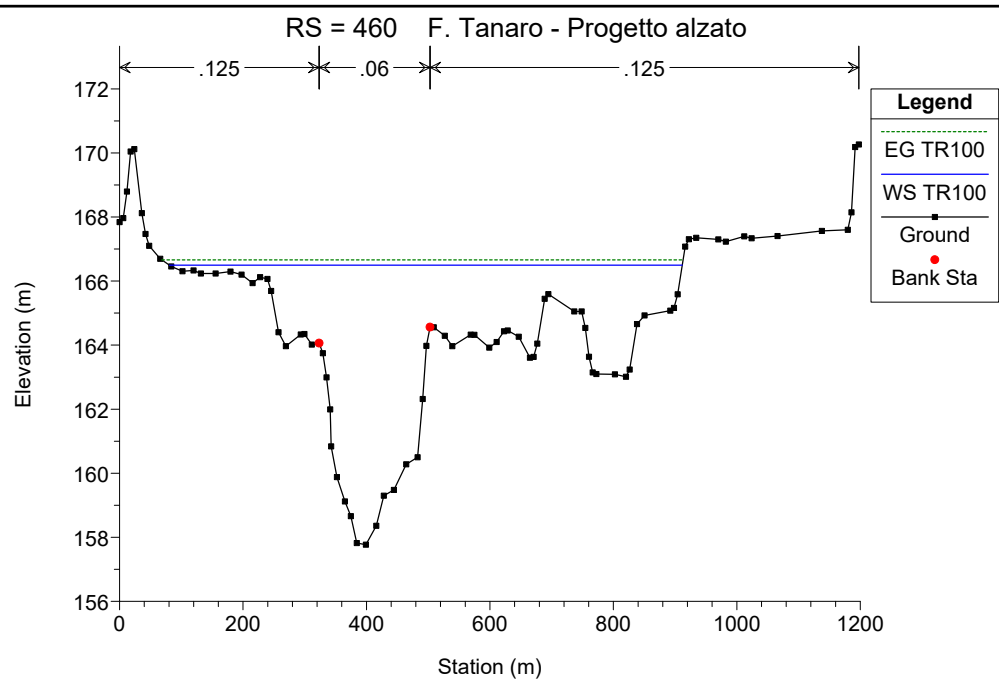
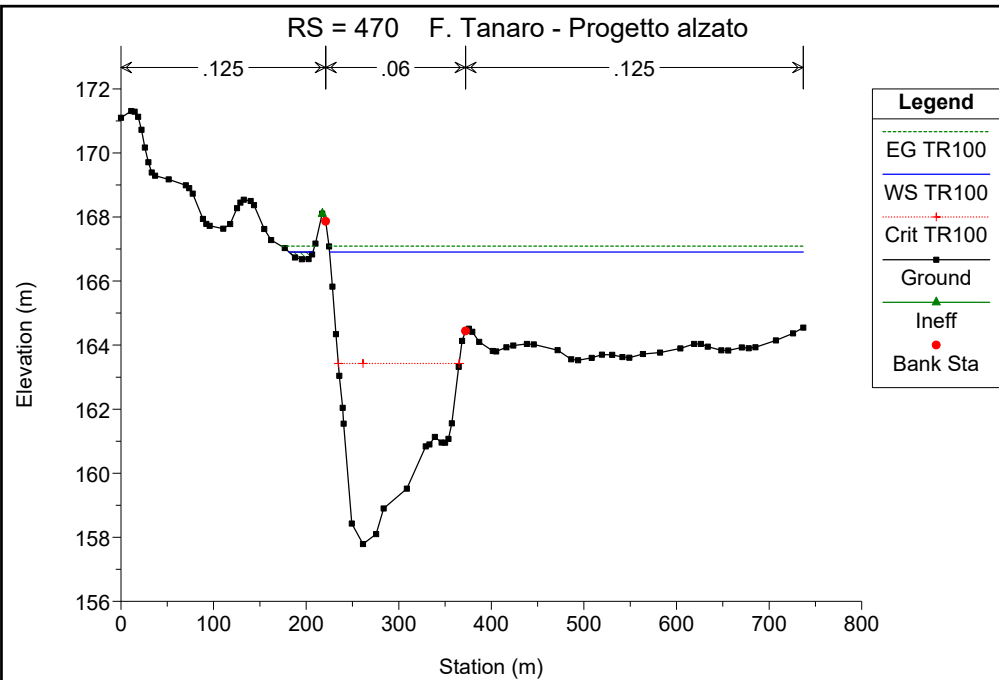
F. Tanaro - Progetto alzato

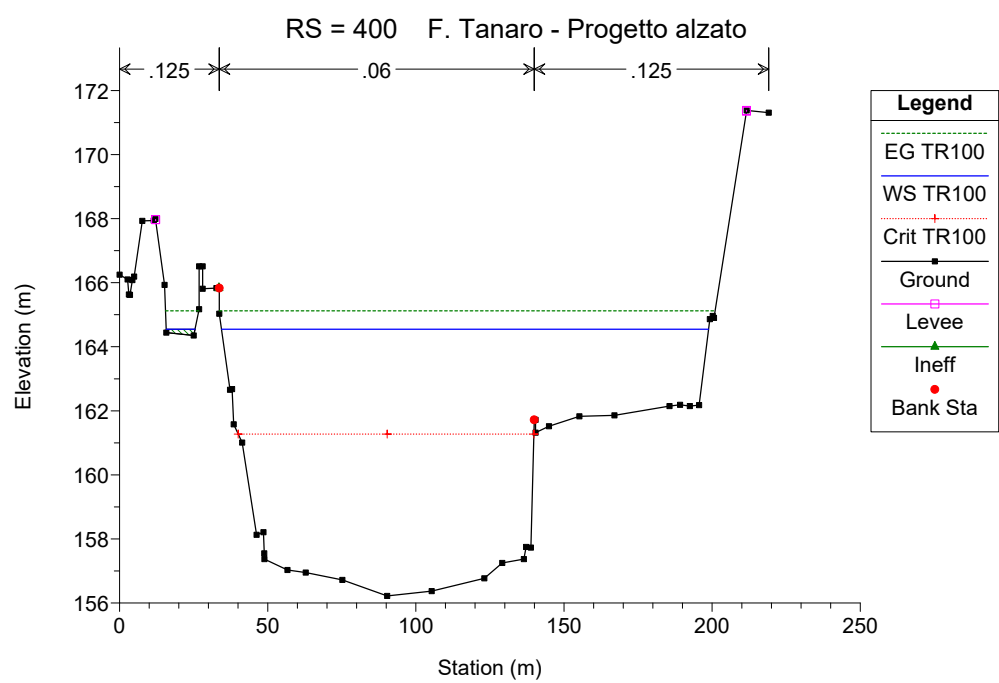
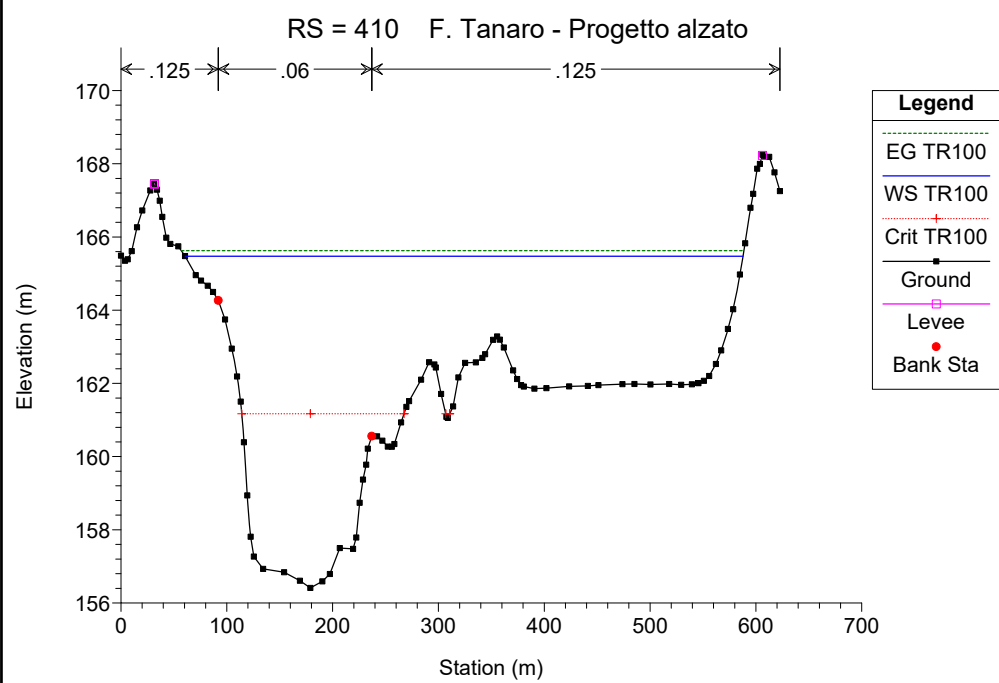
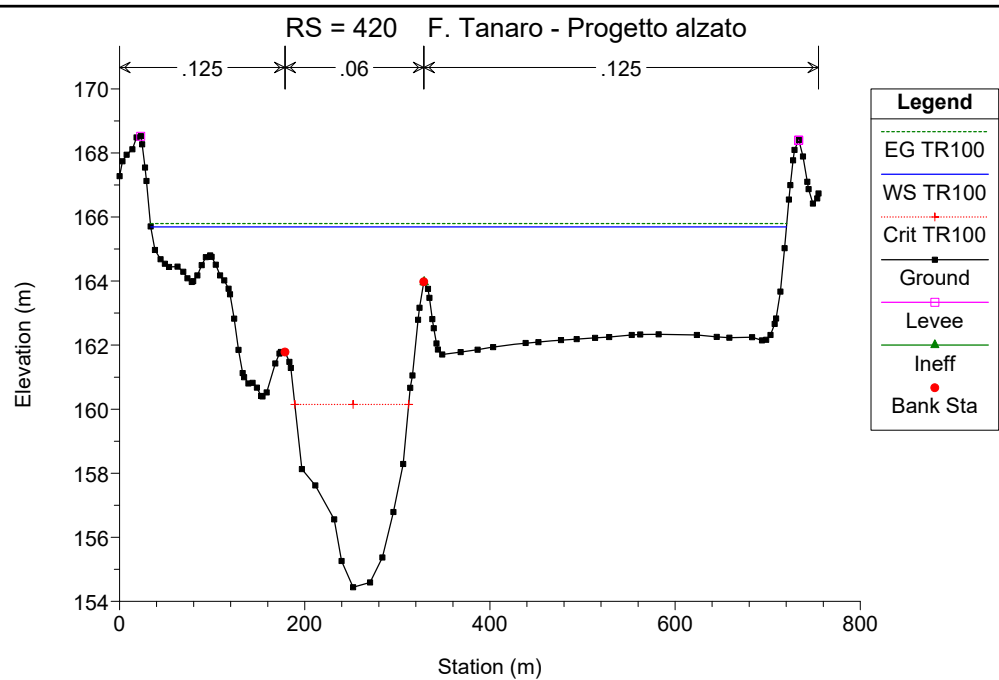
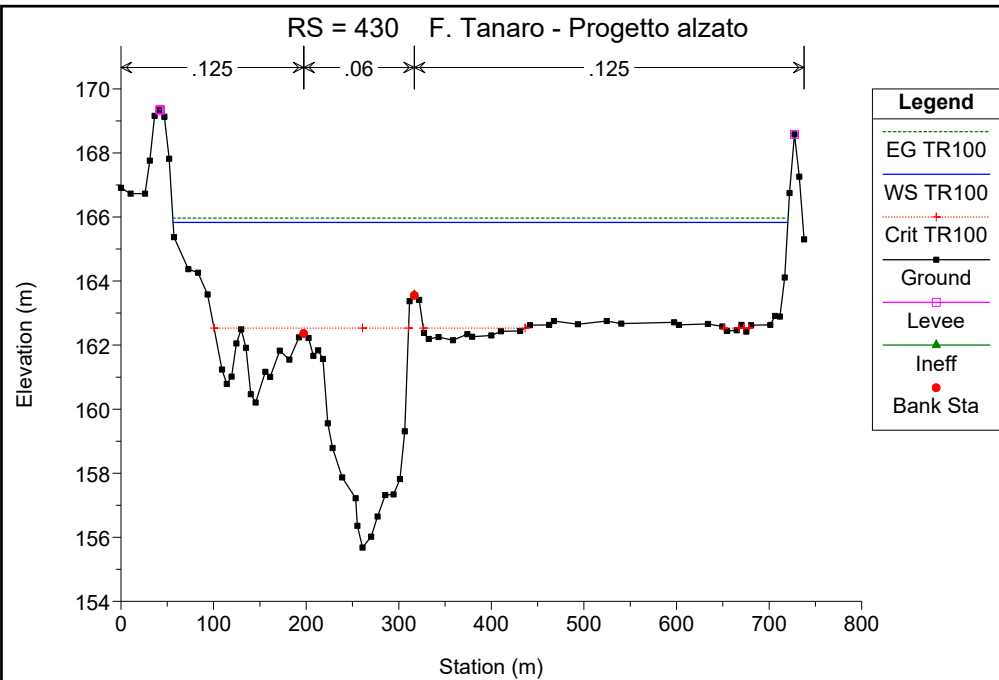
Tanaro 1

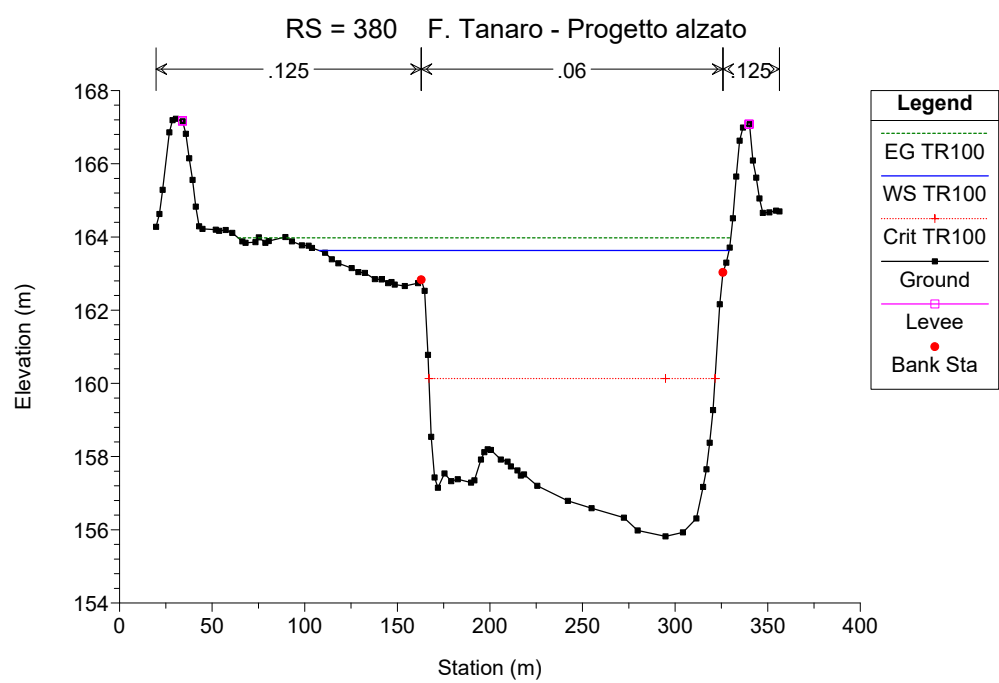
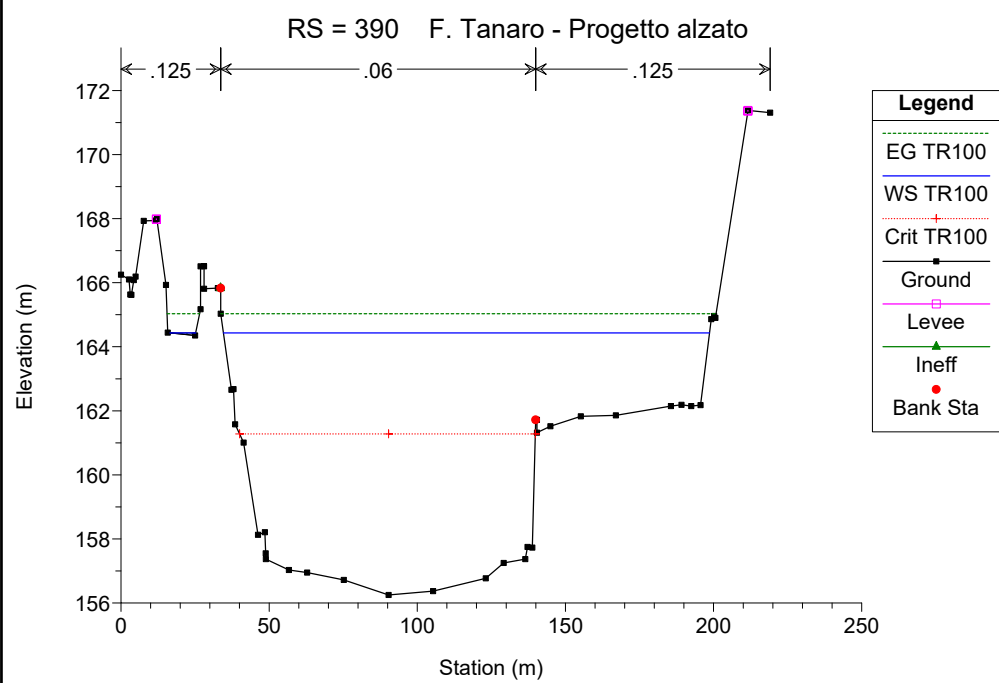
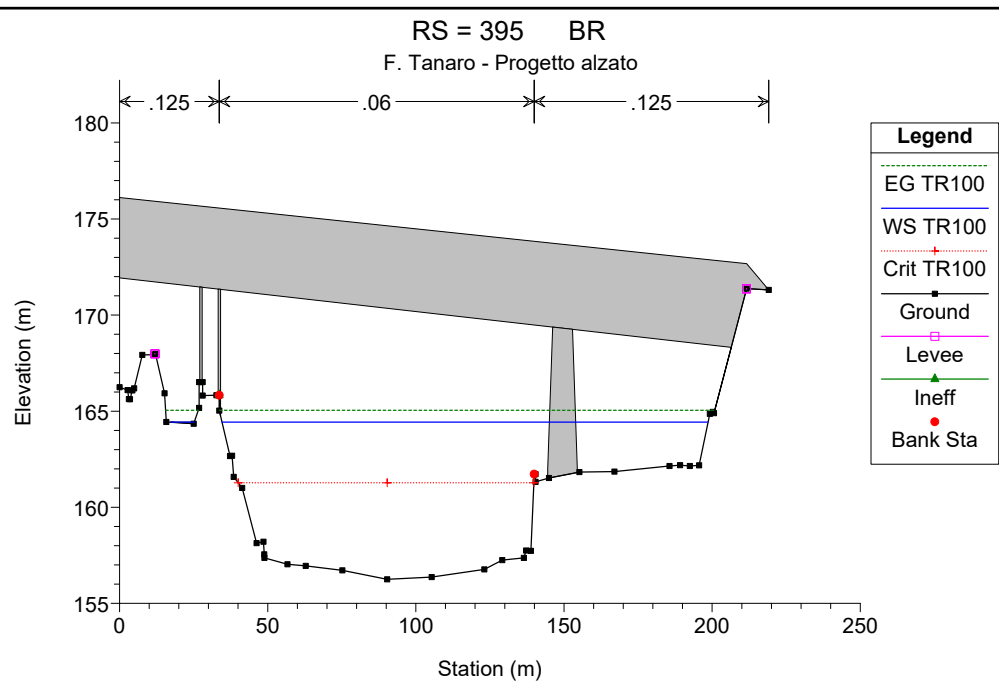
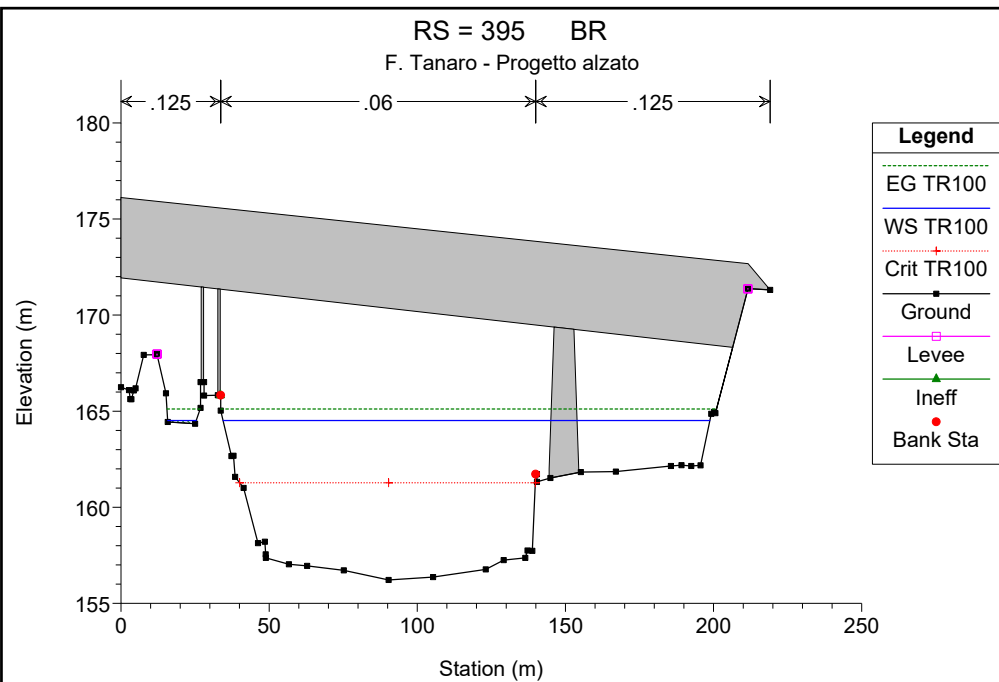


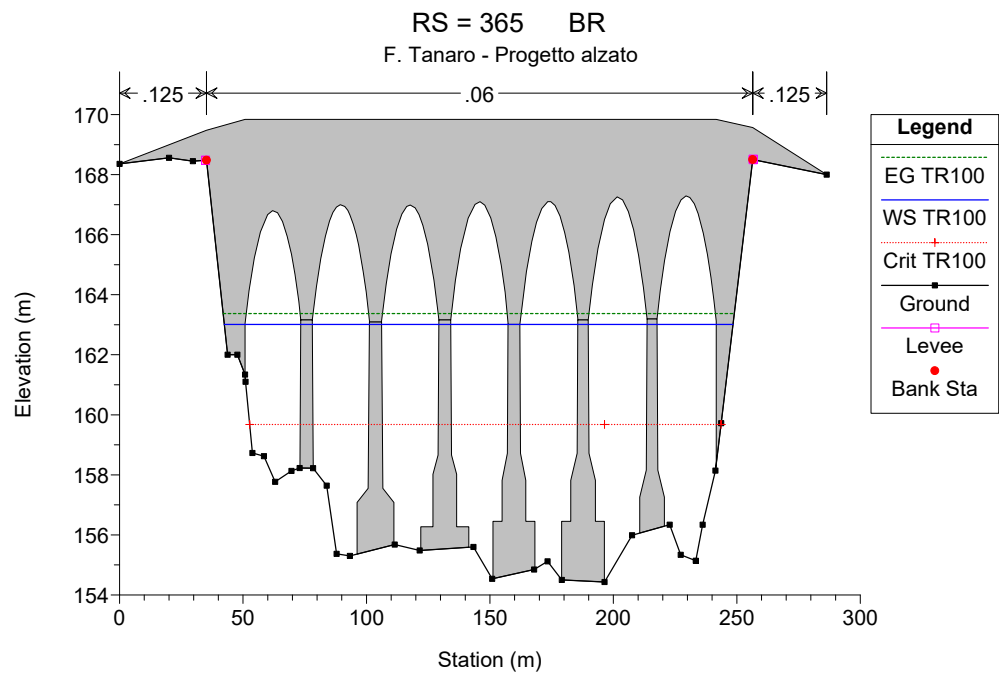
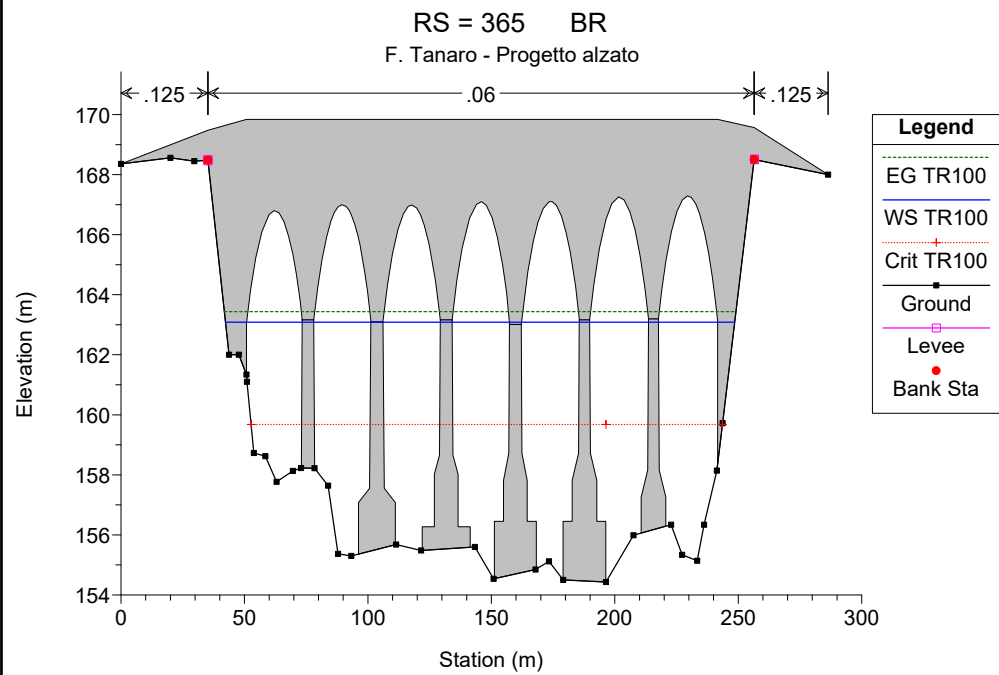
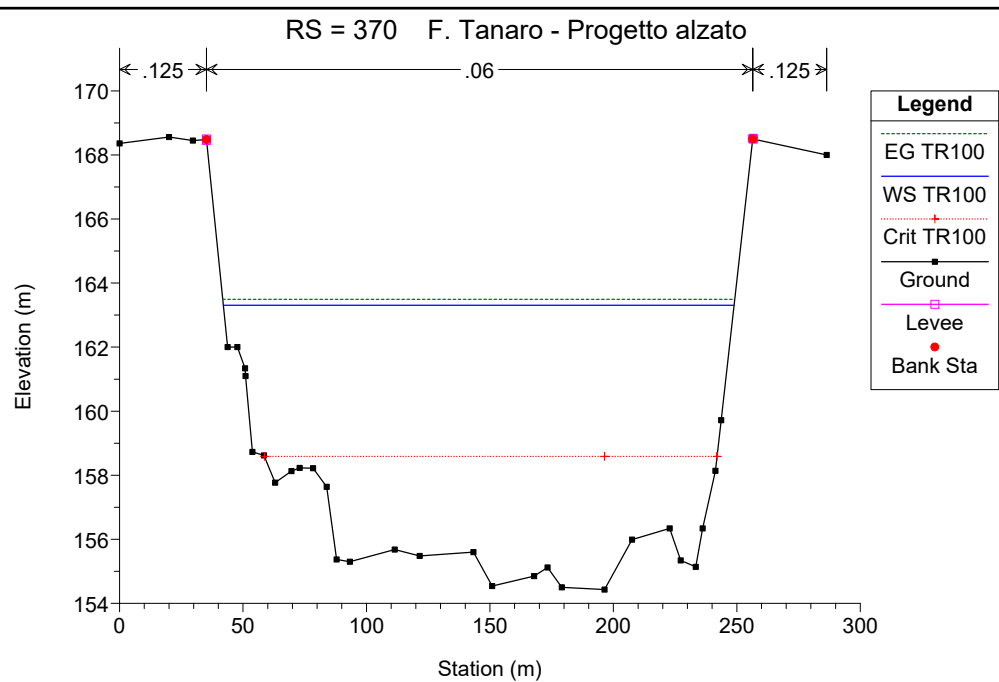
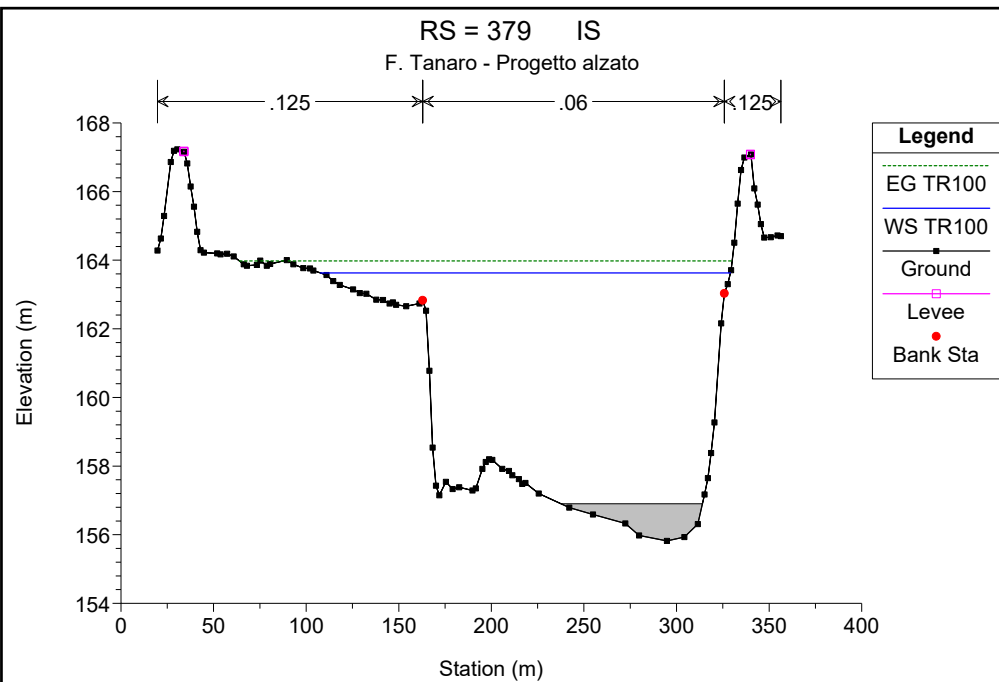


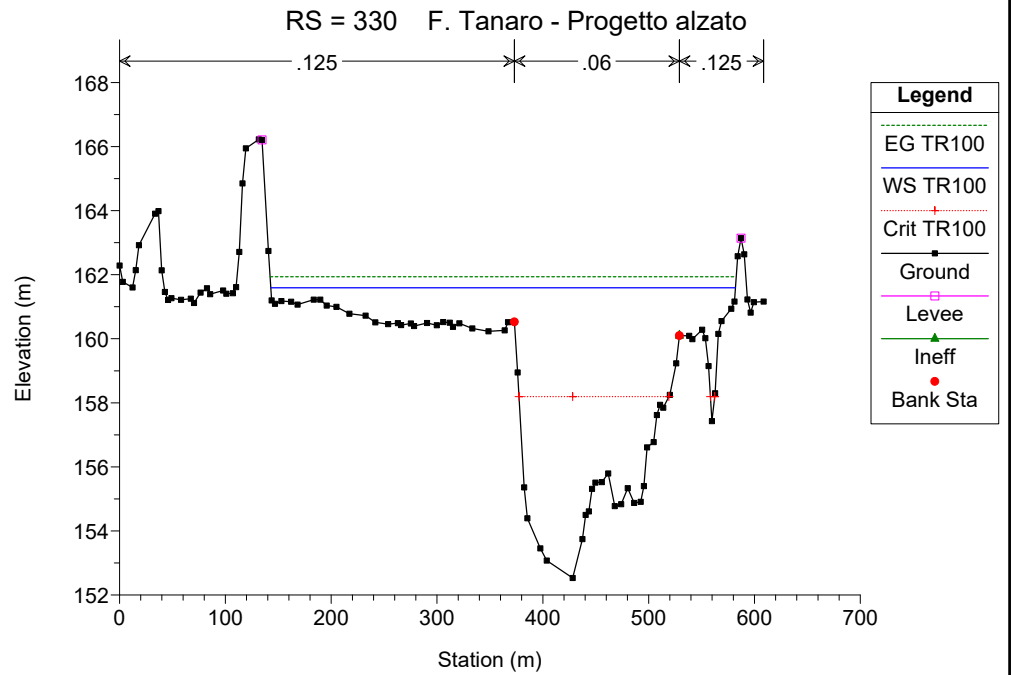
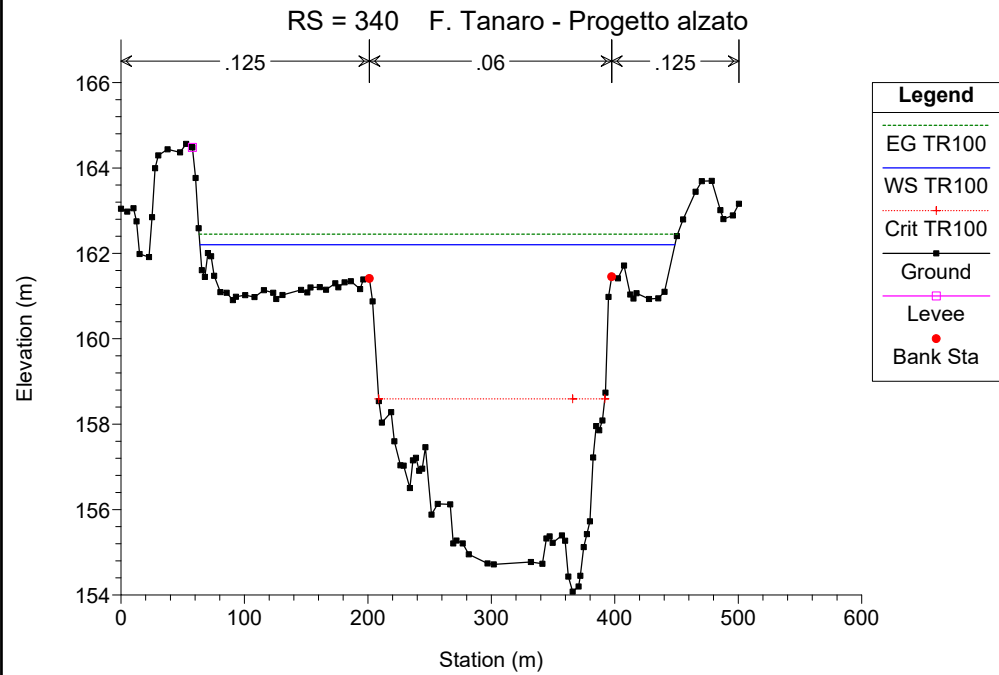
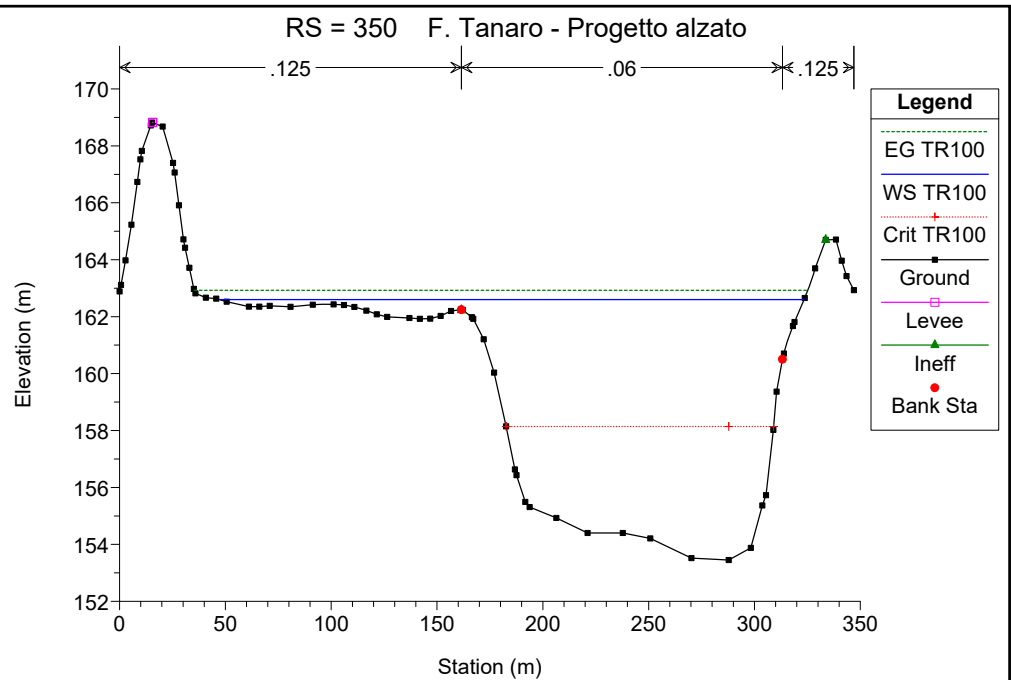
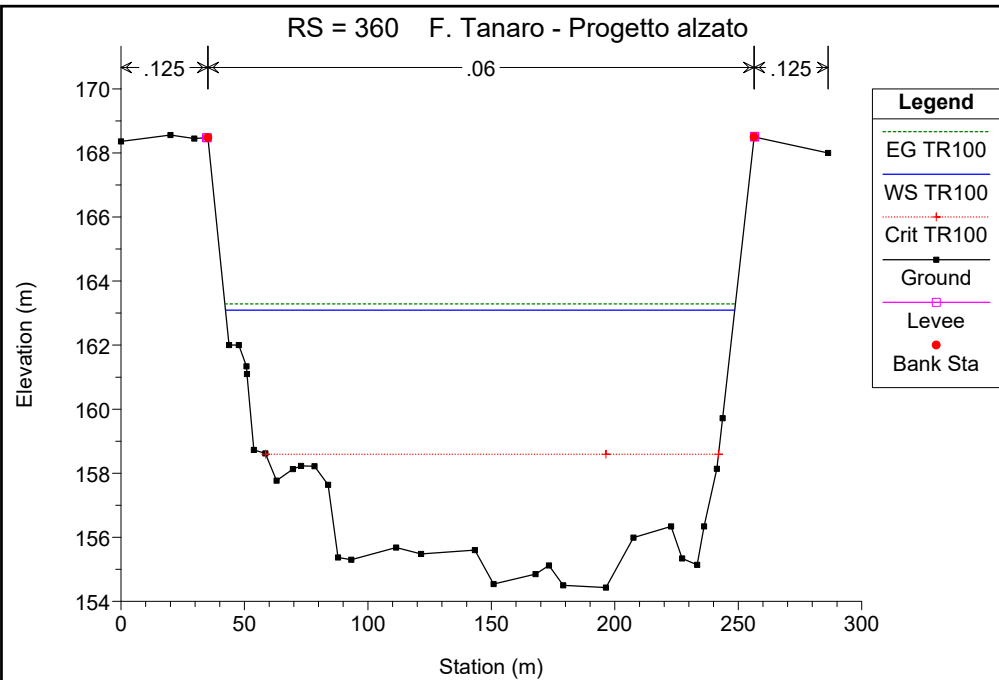


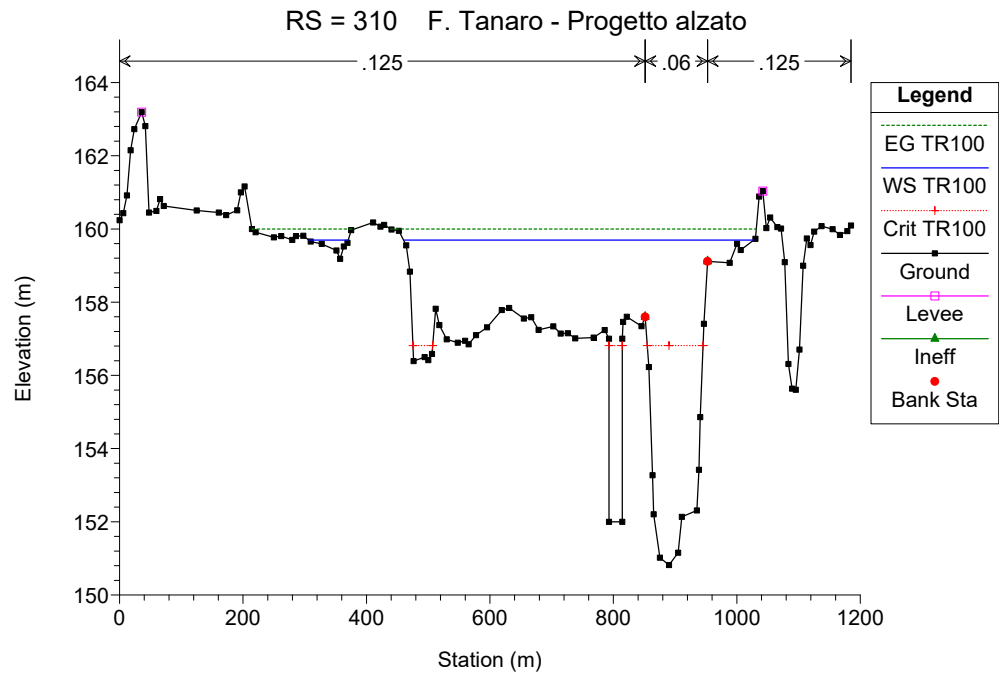
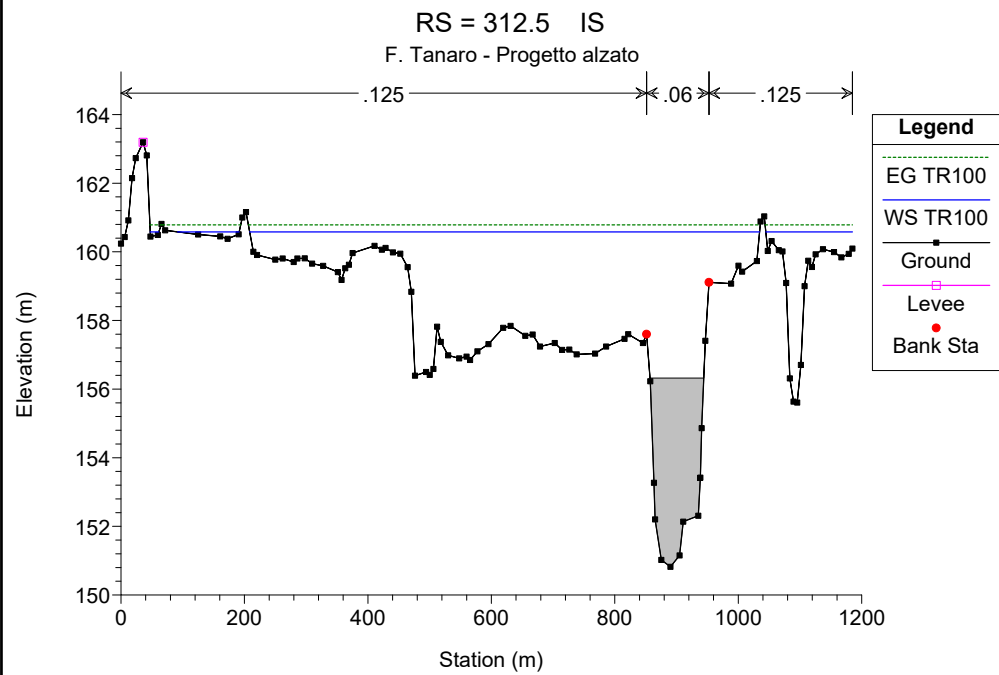
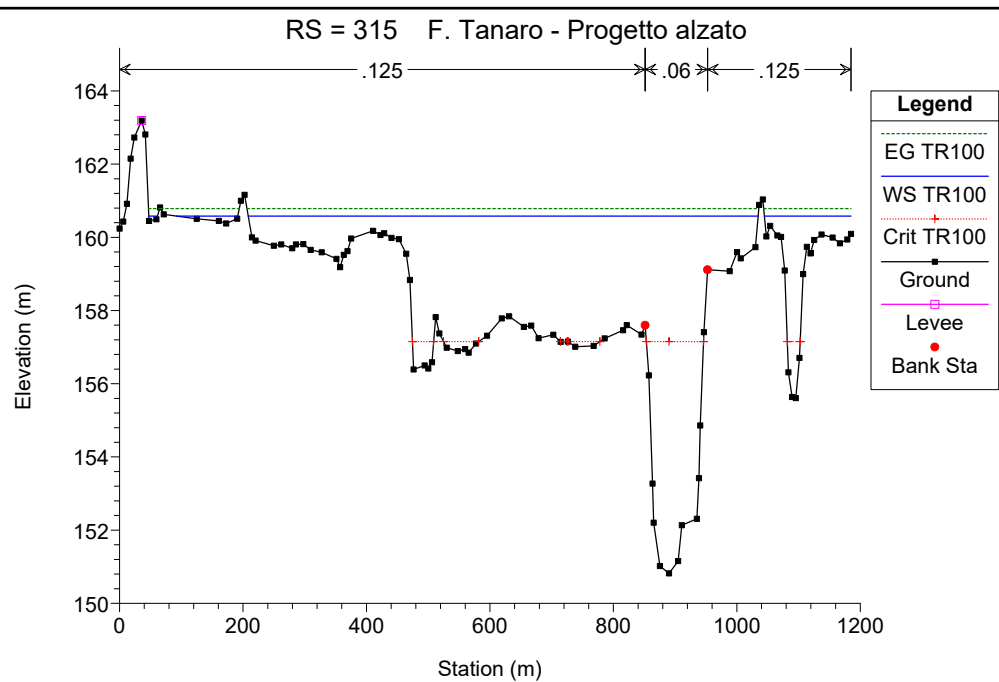
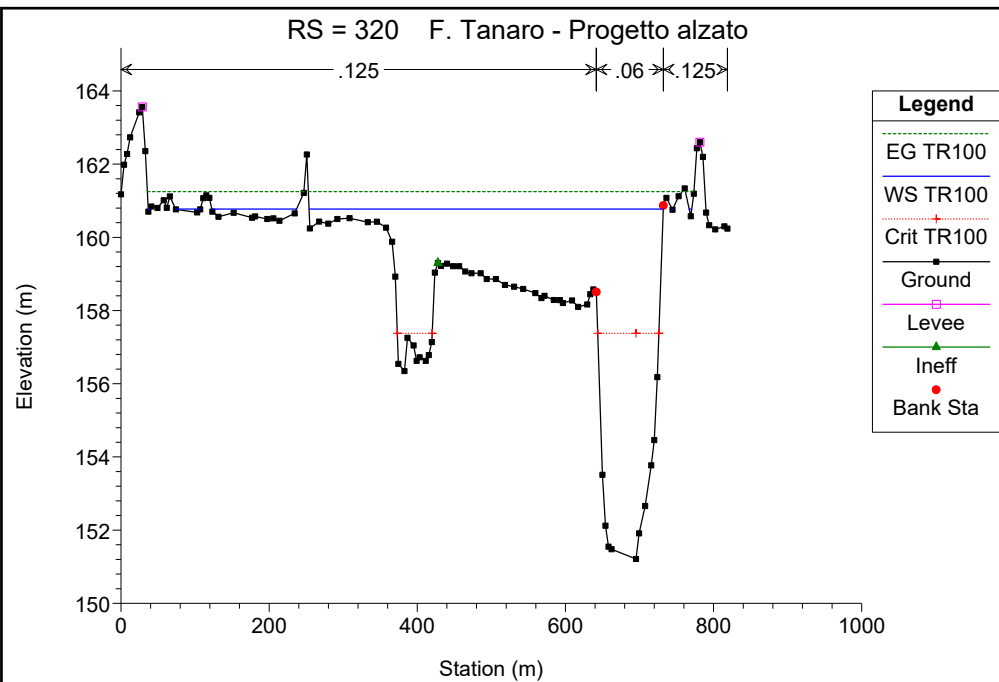


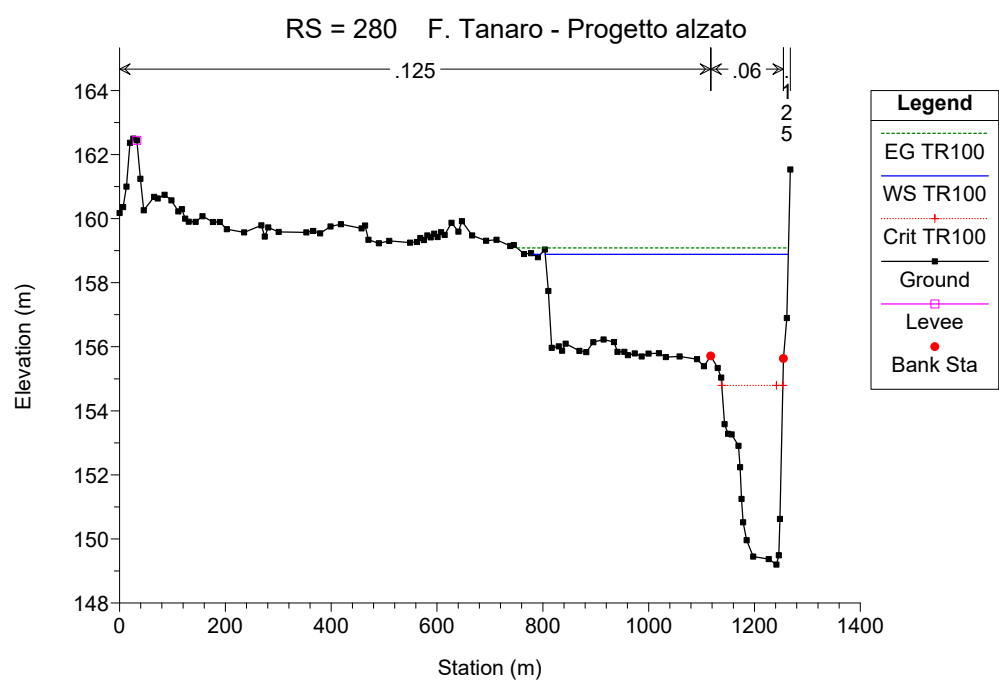
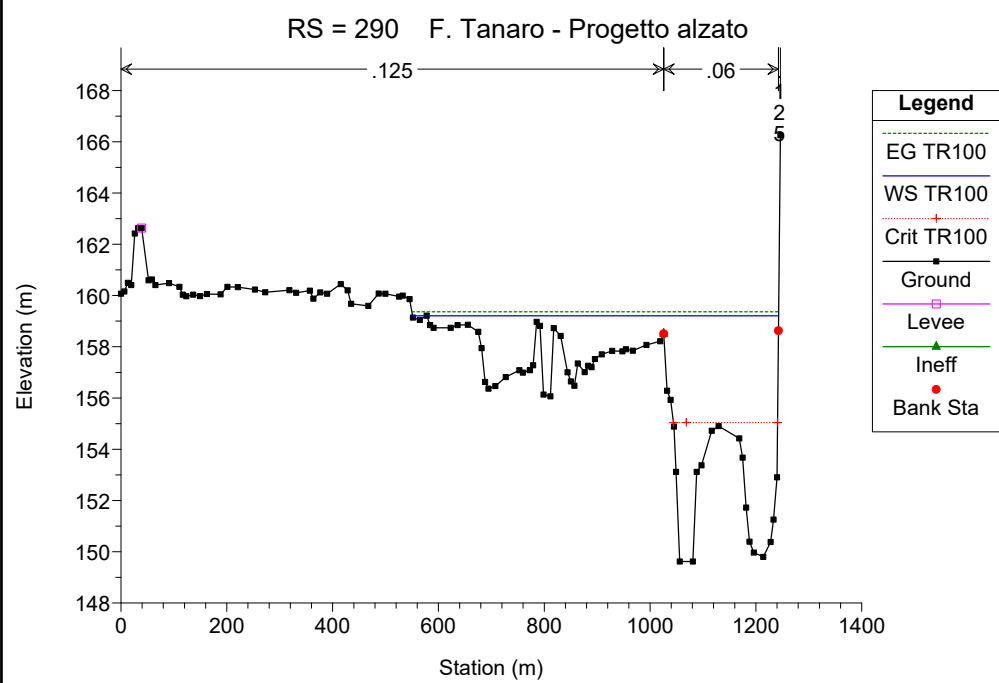
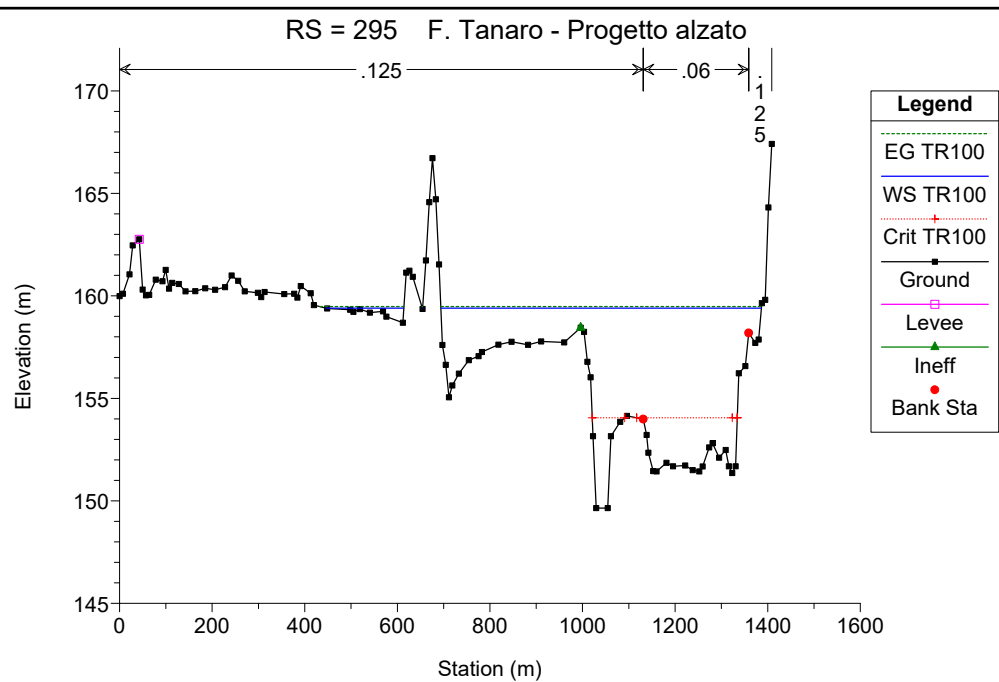
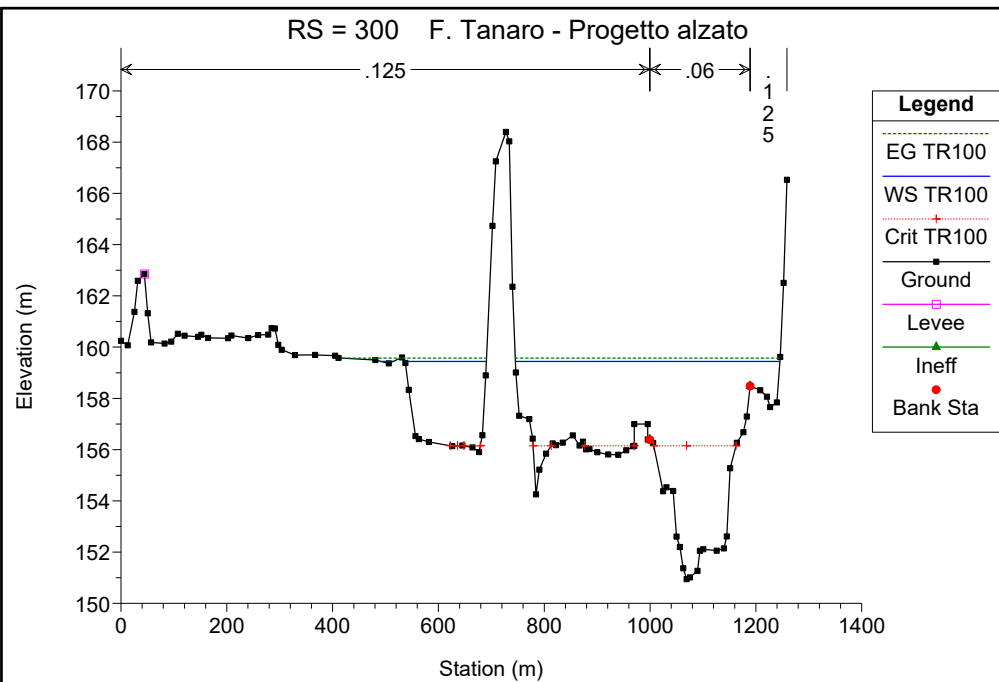


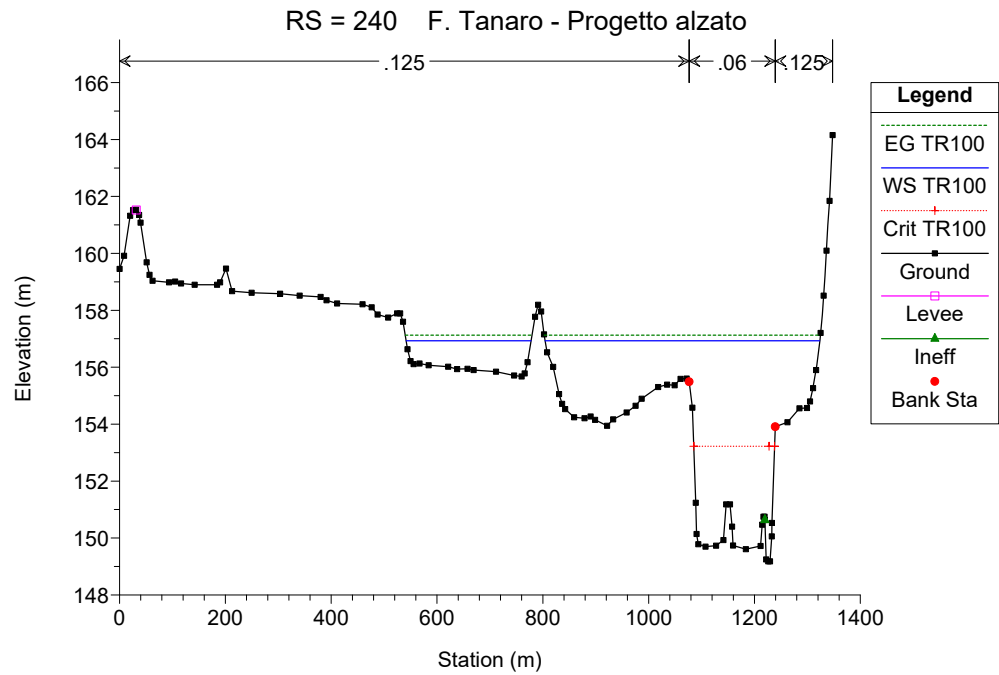
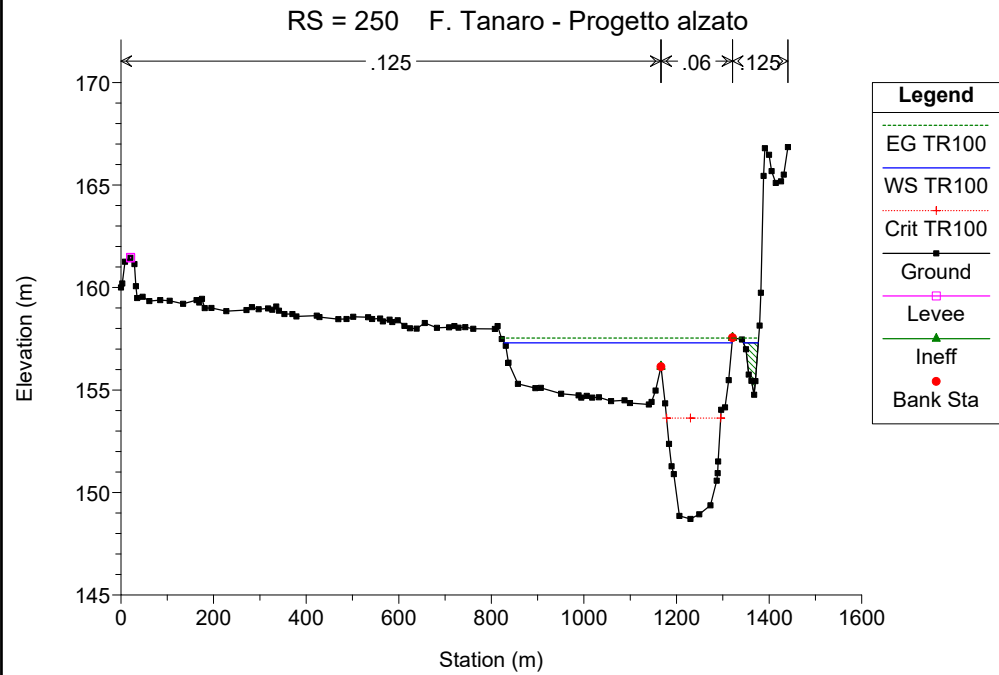
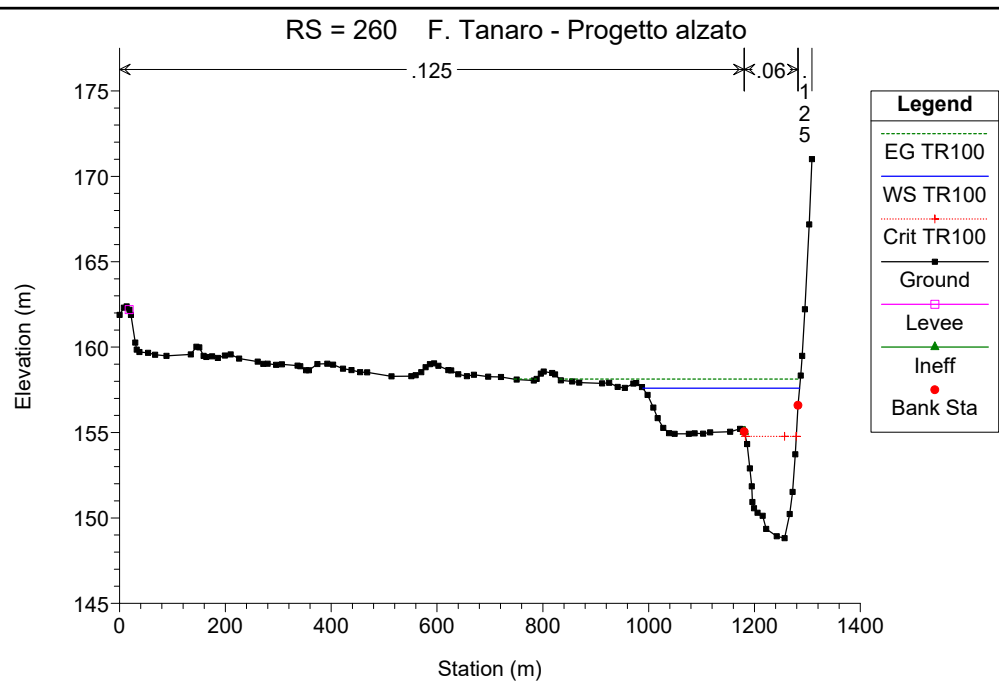
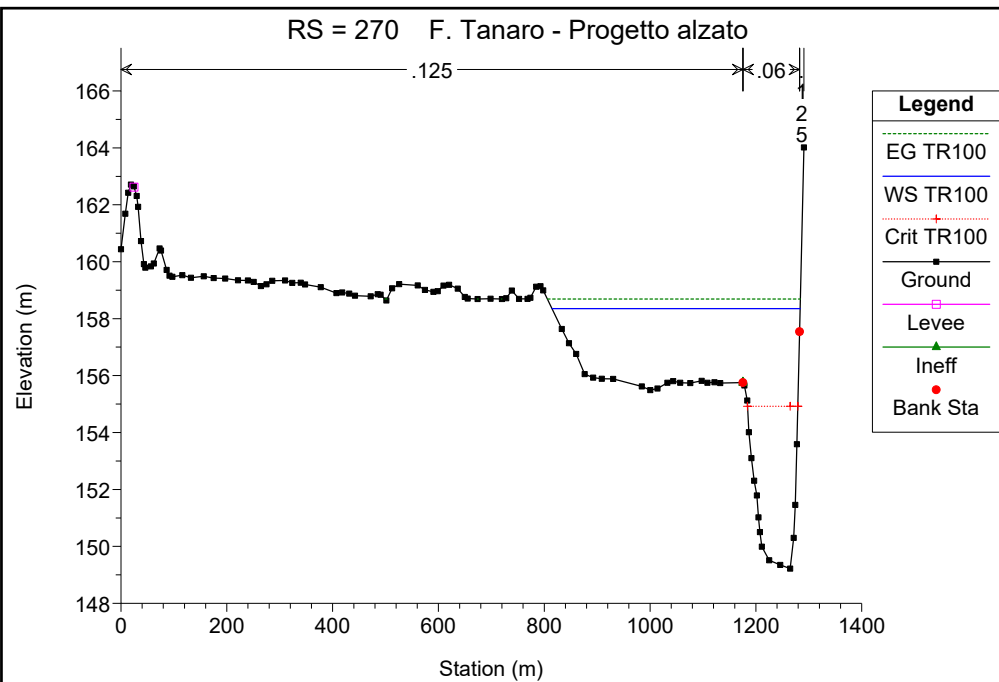


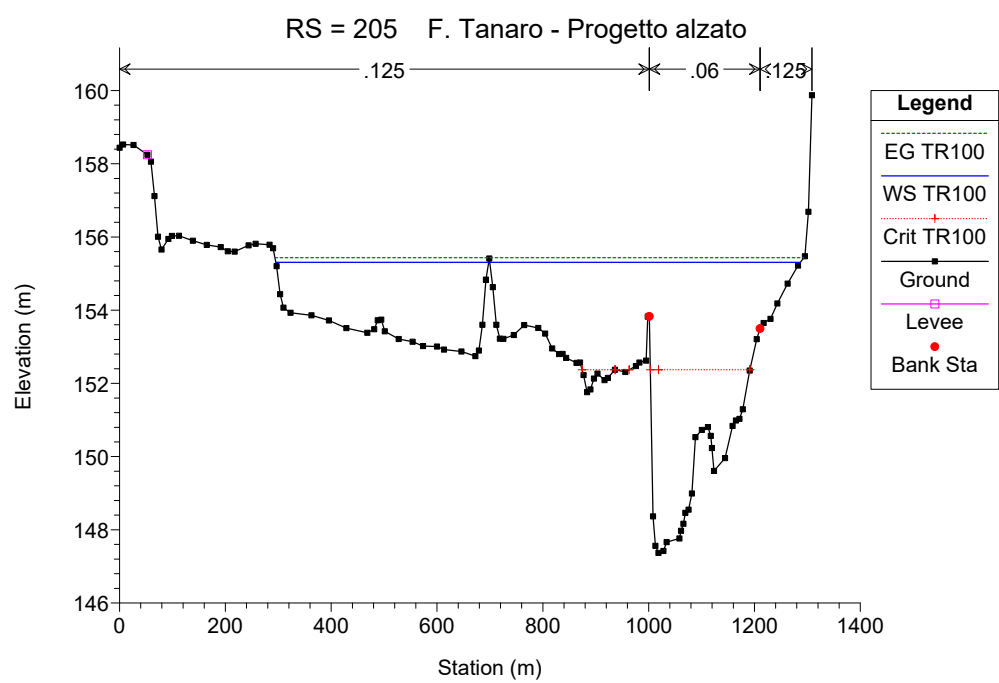
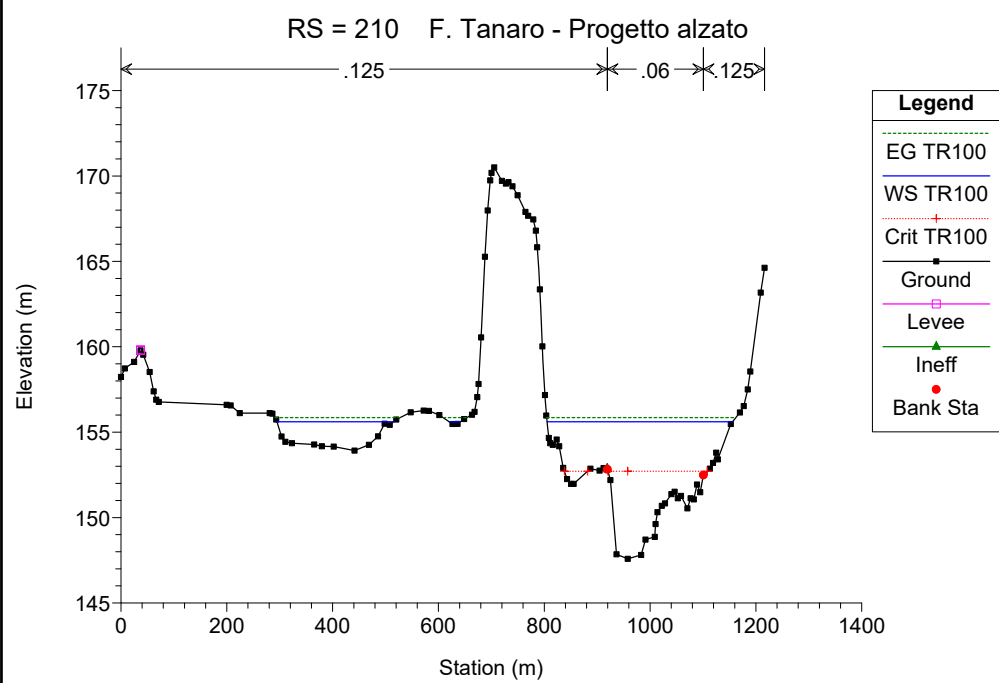
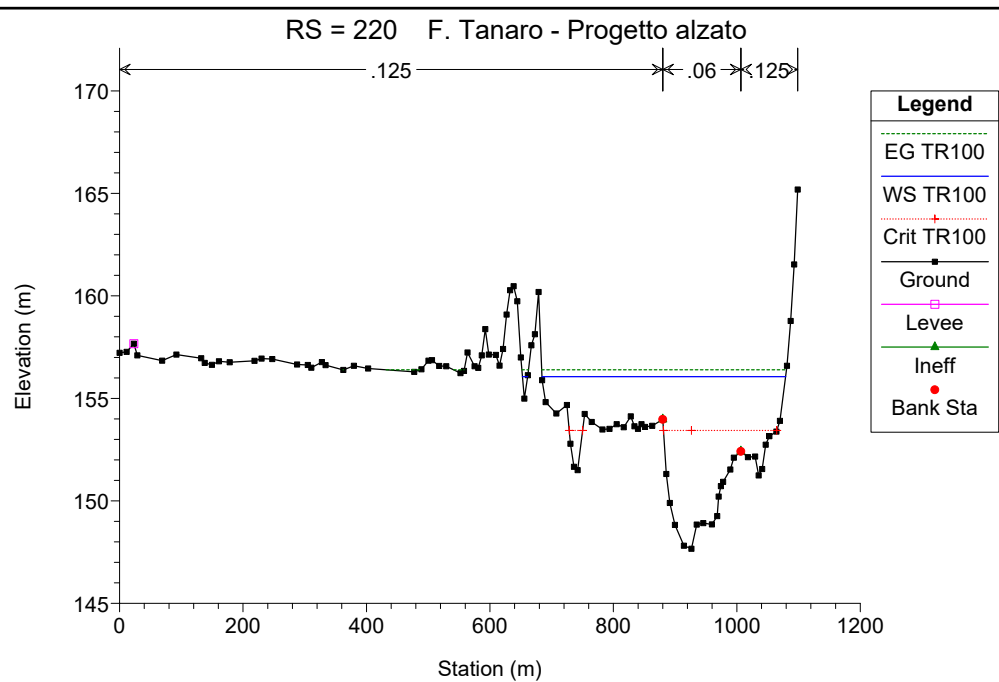
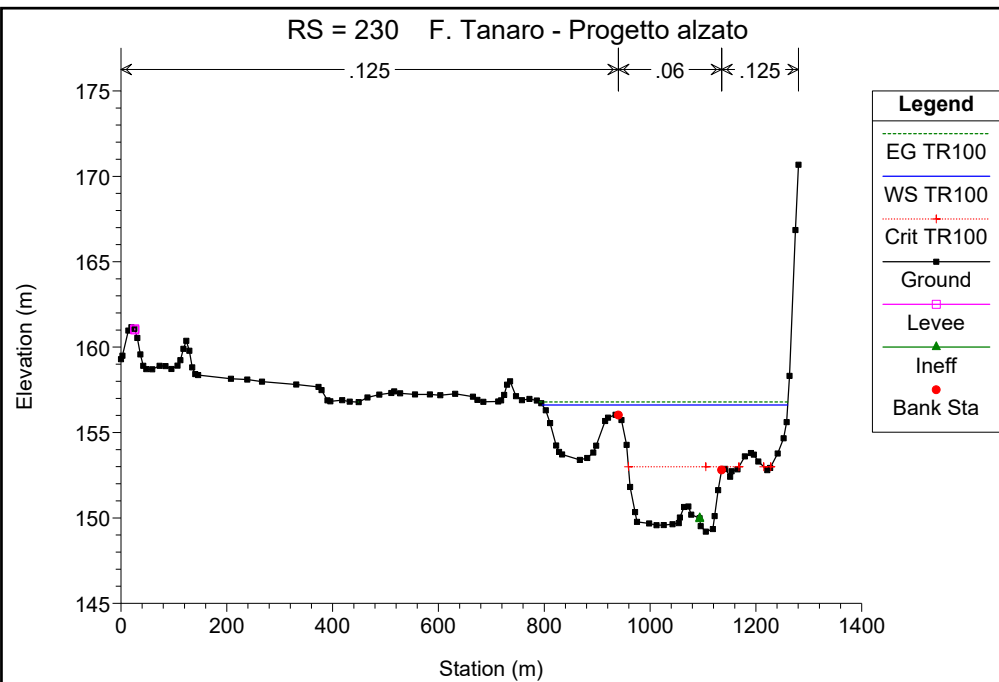


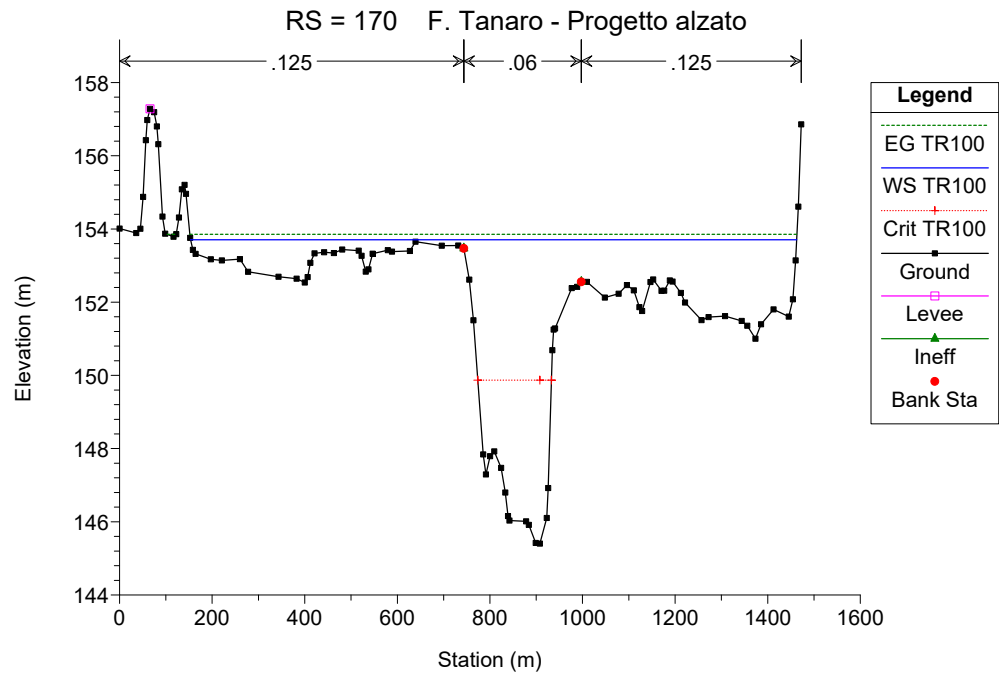
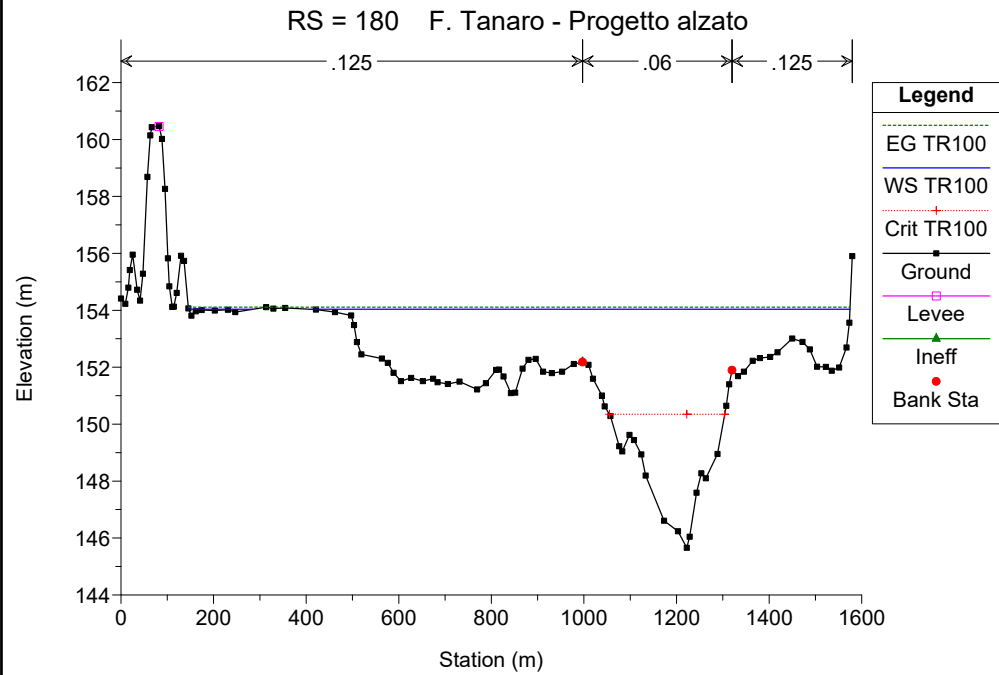
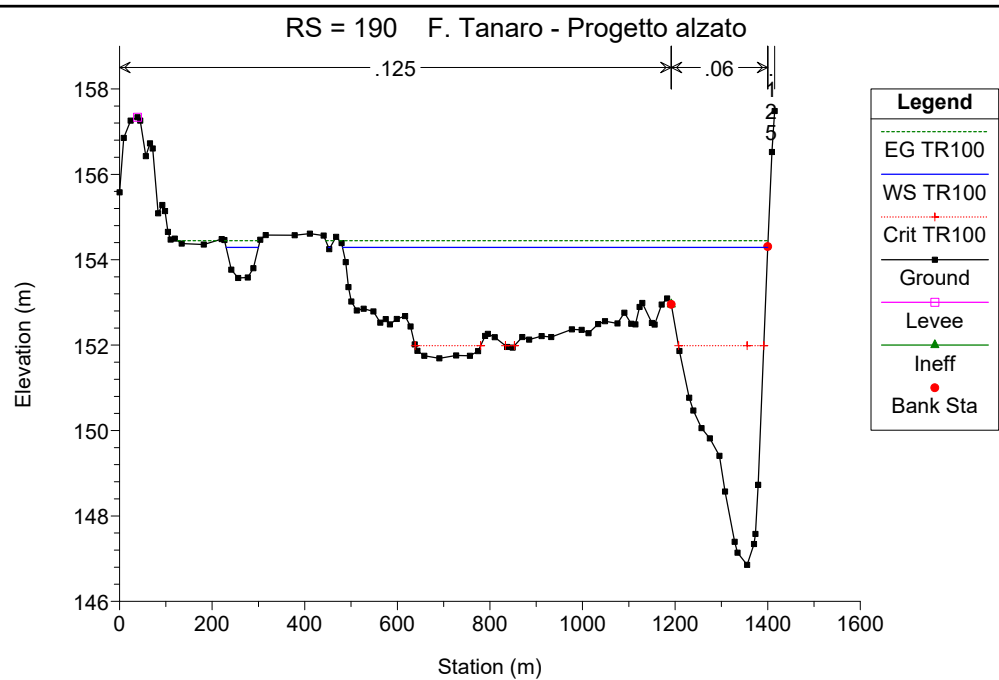
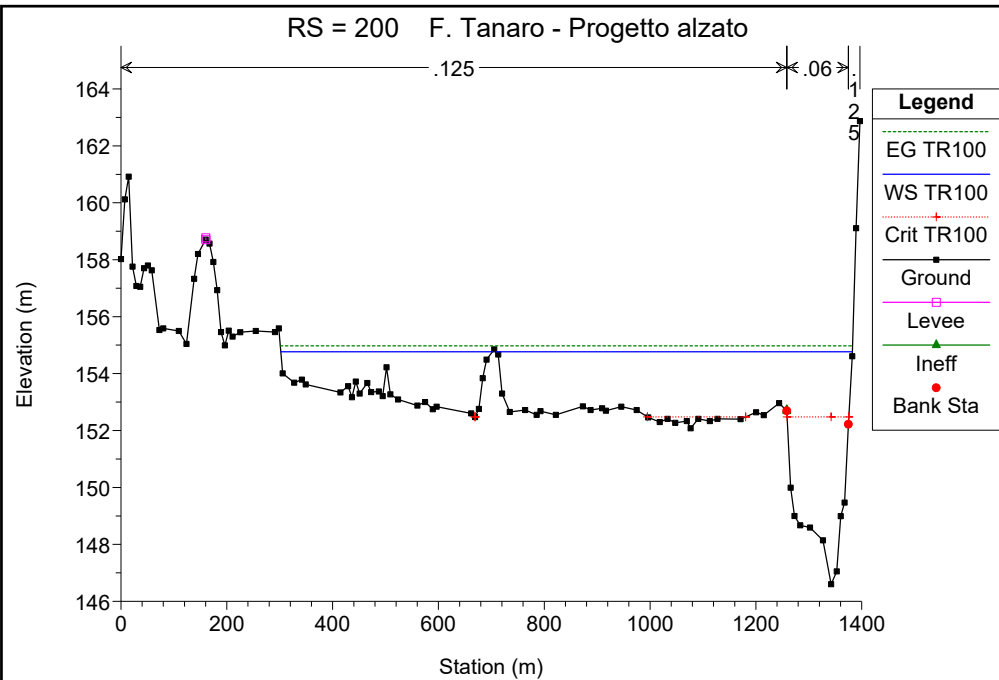


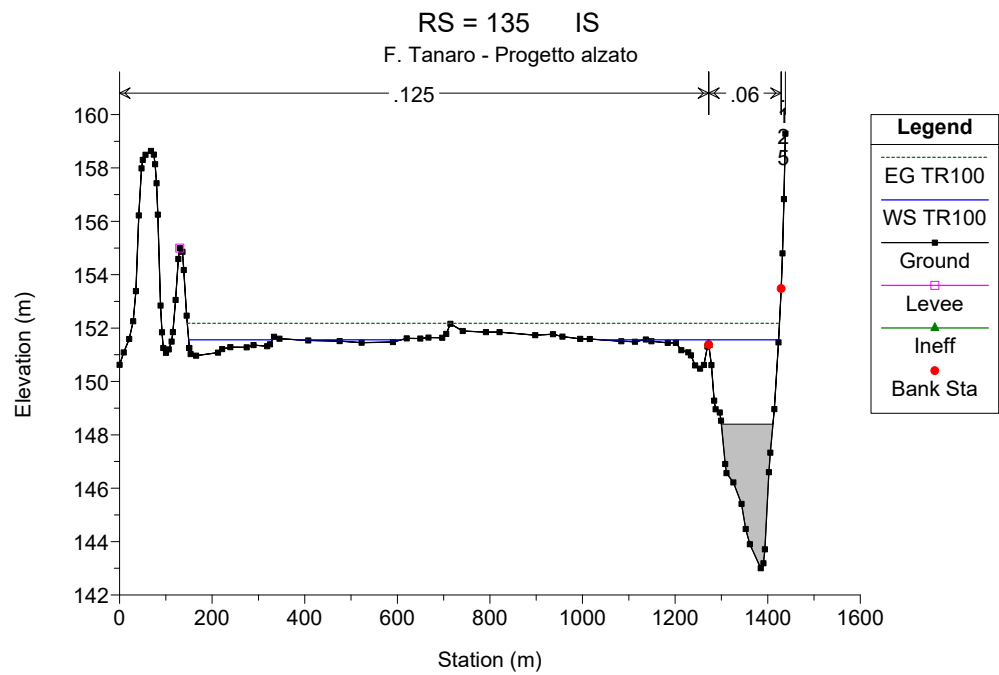
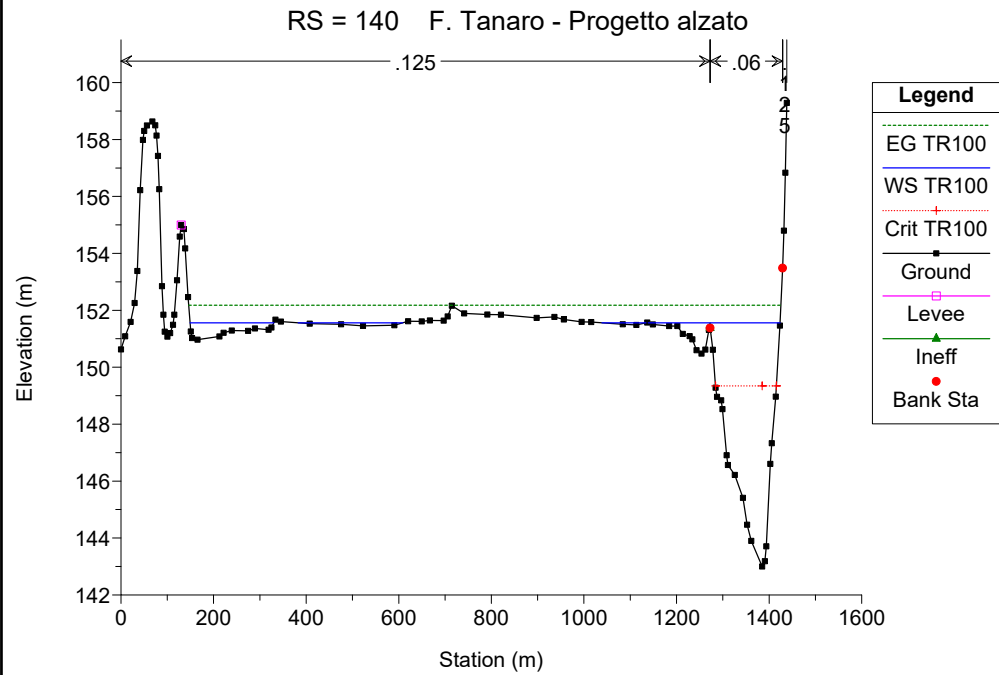
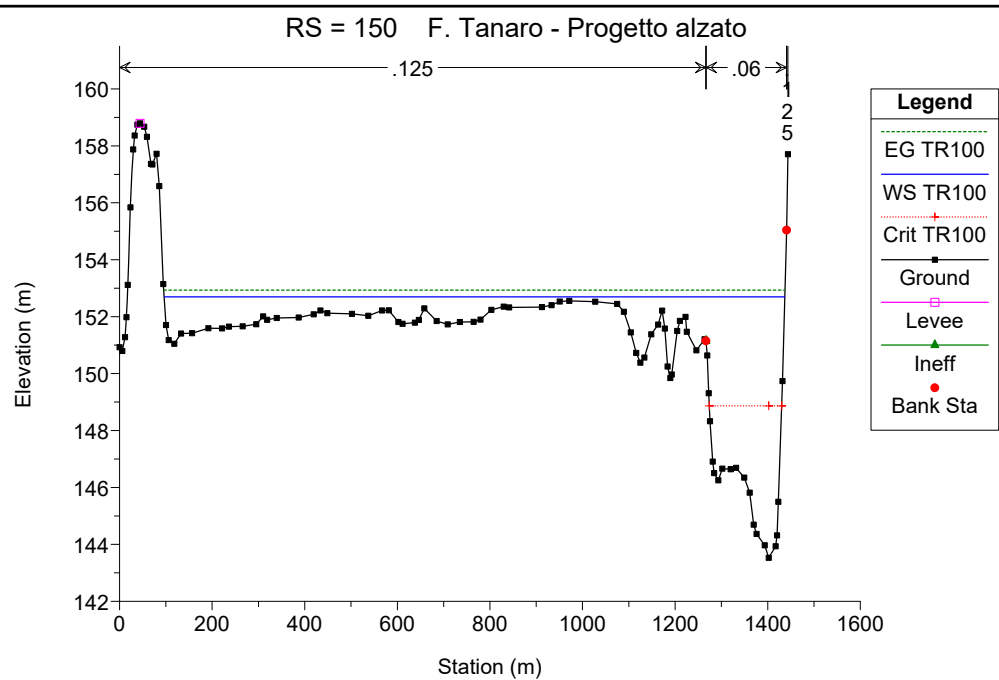
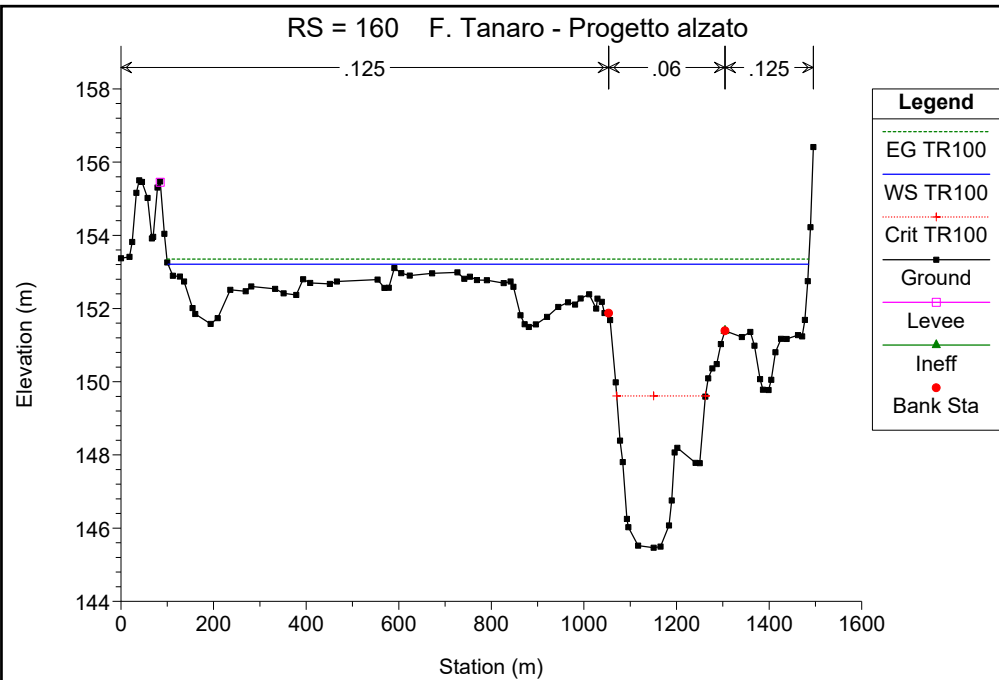


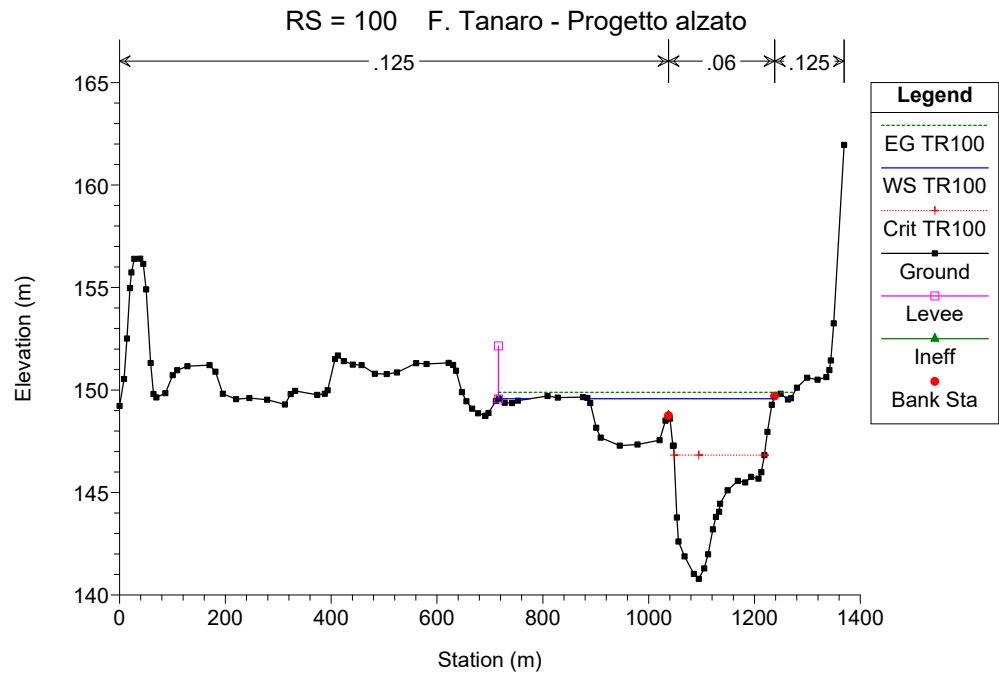
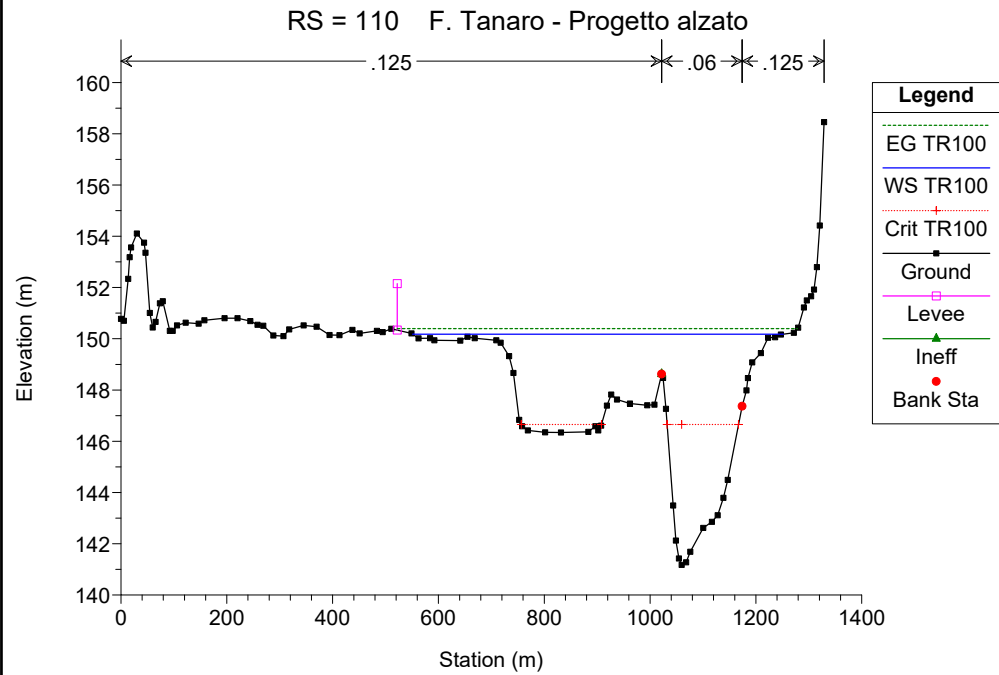
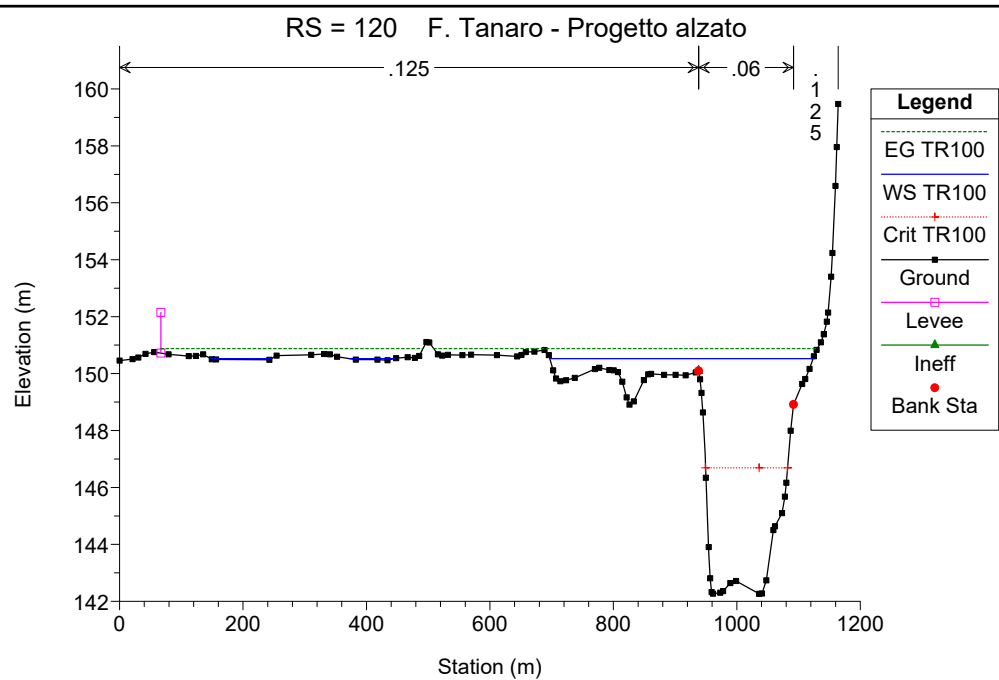
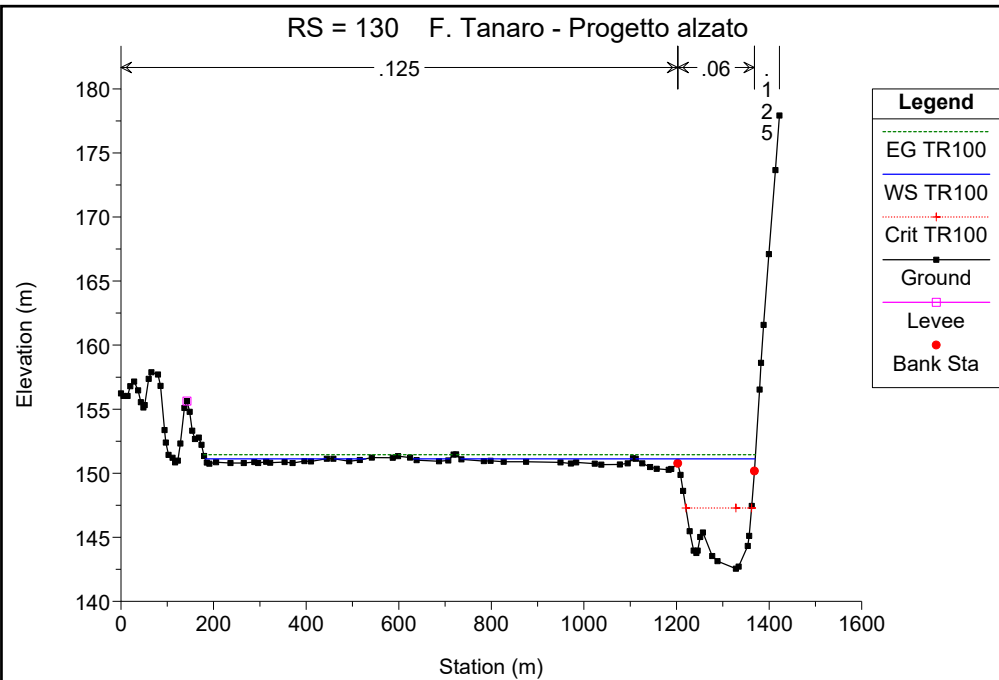


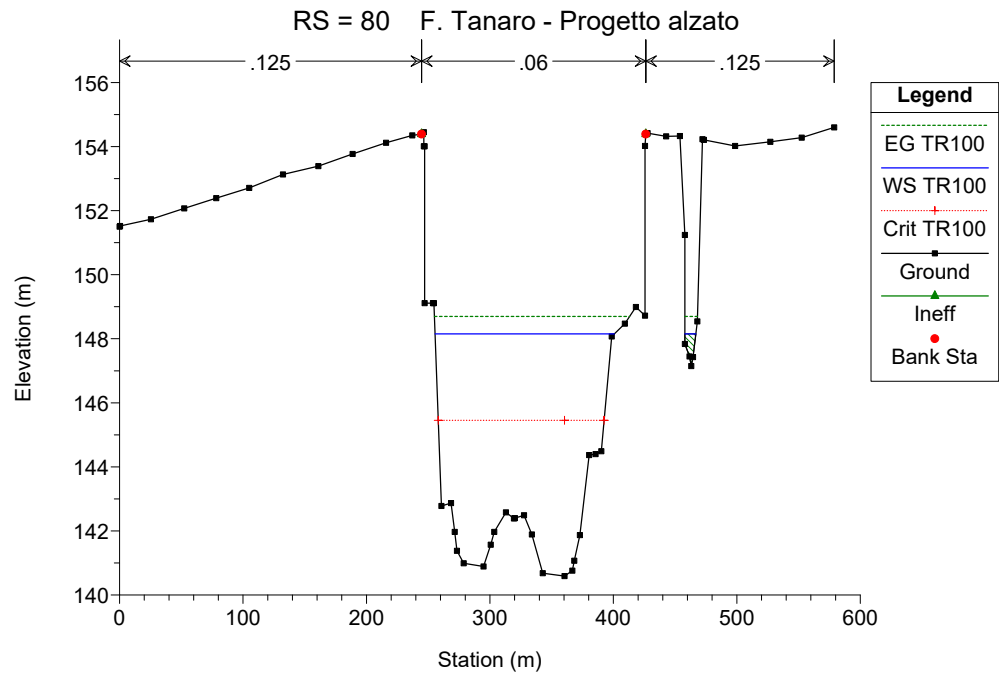
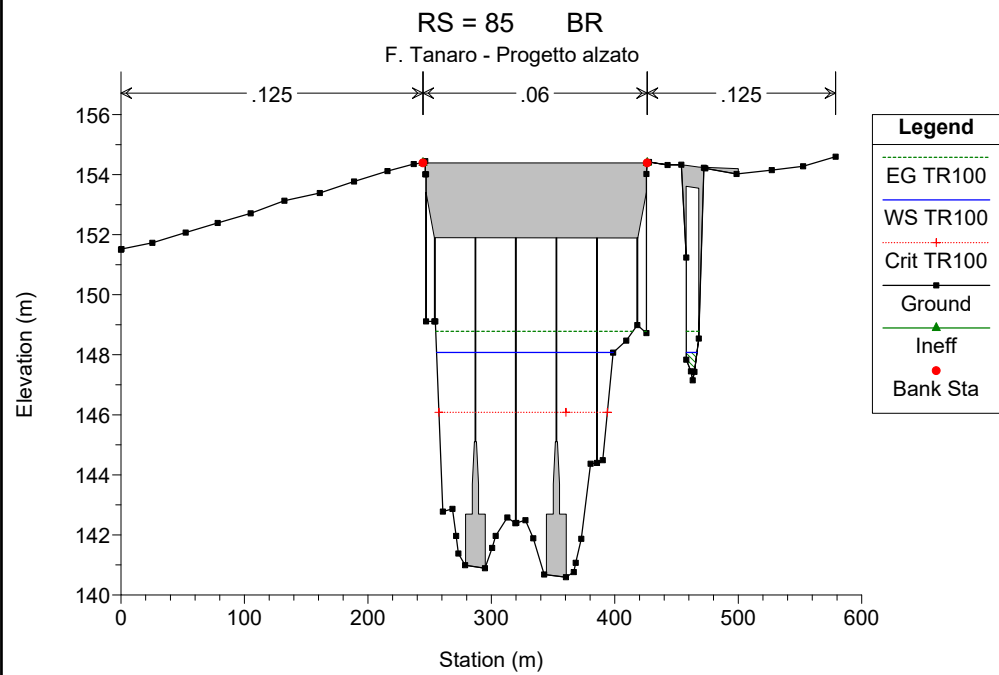
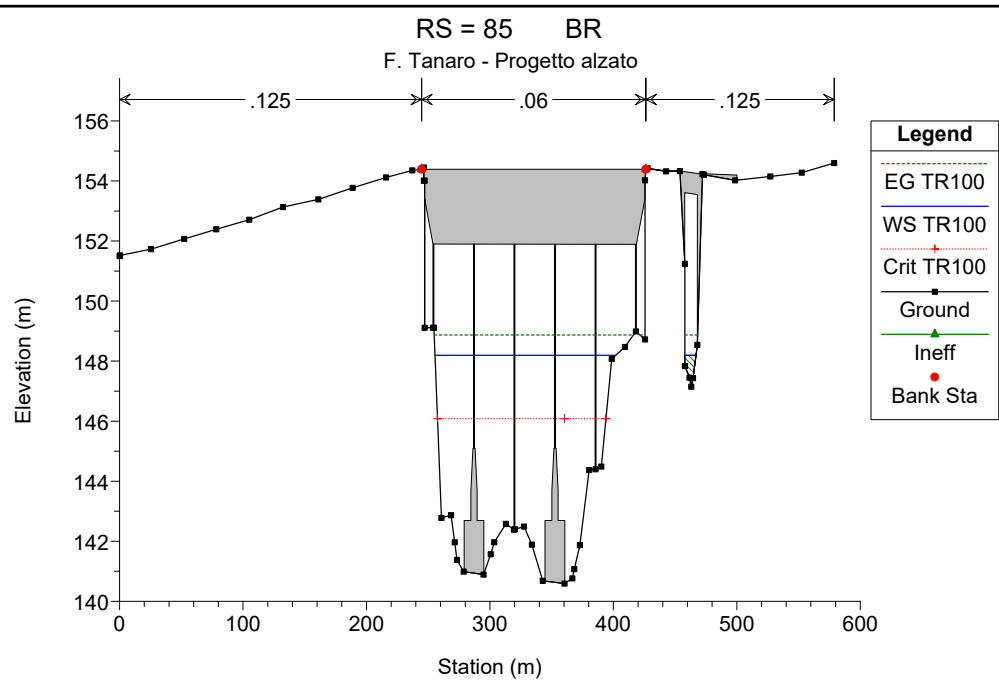
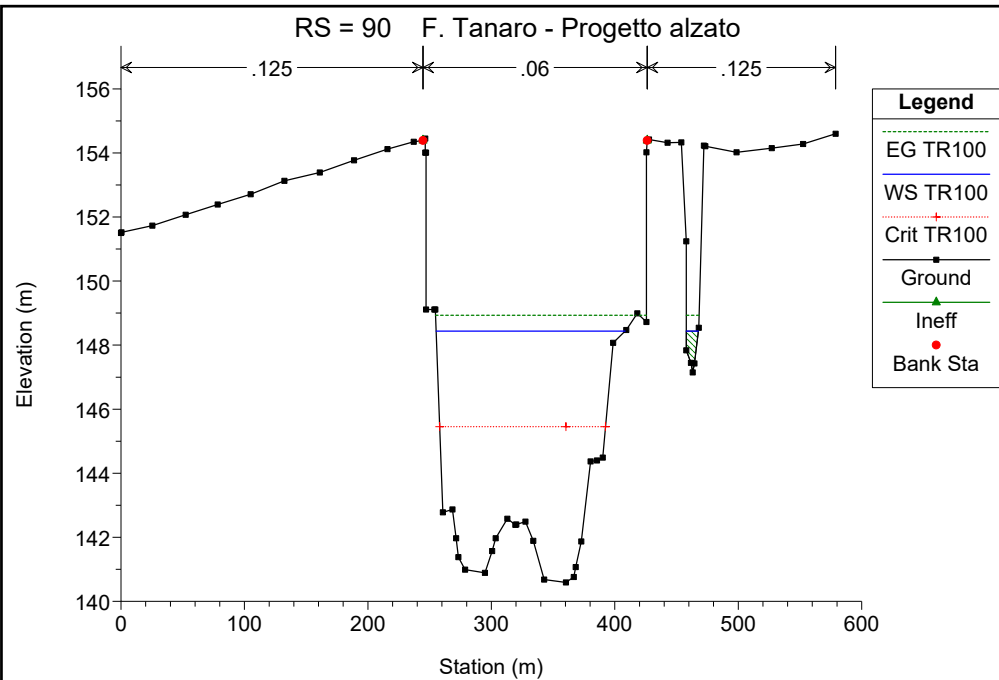


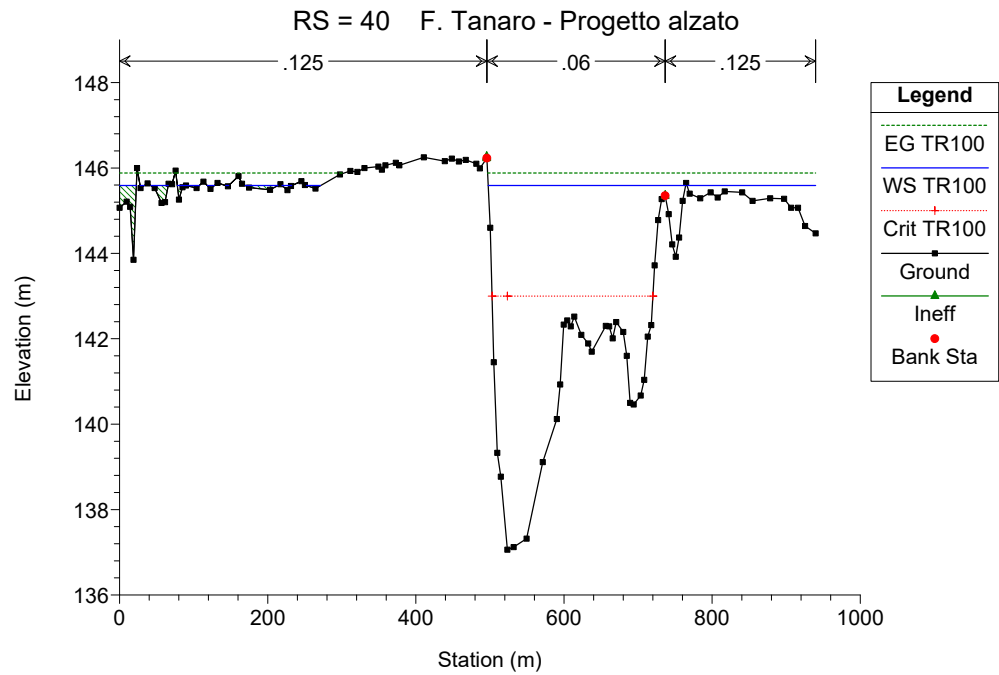
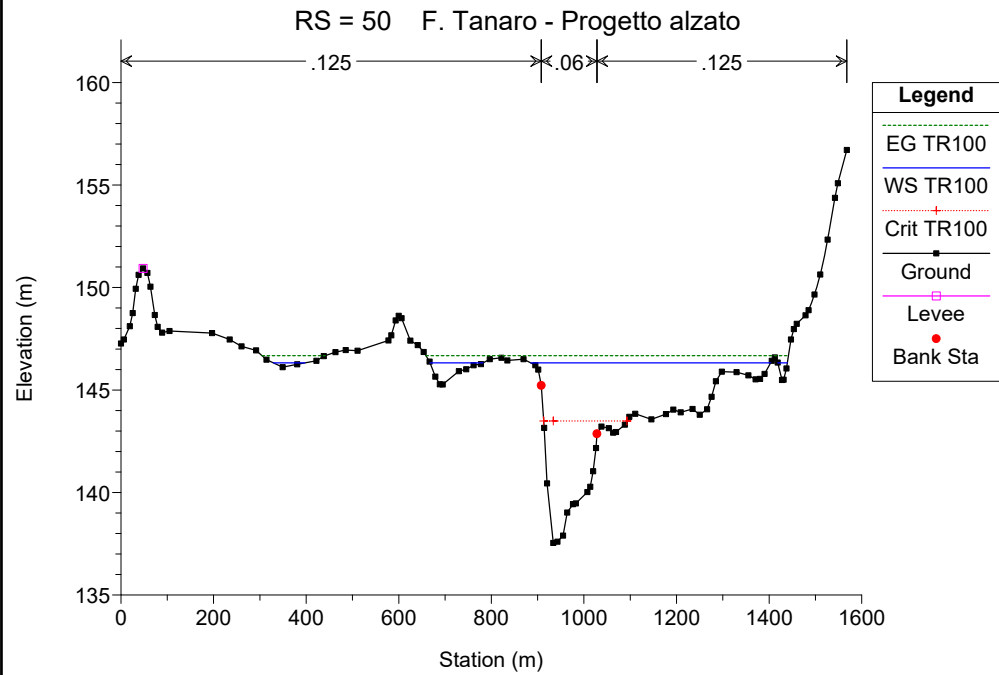
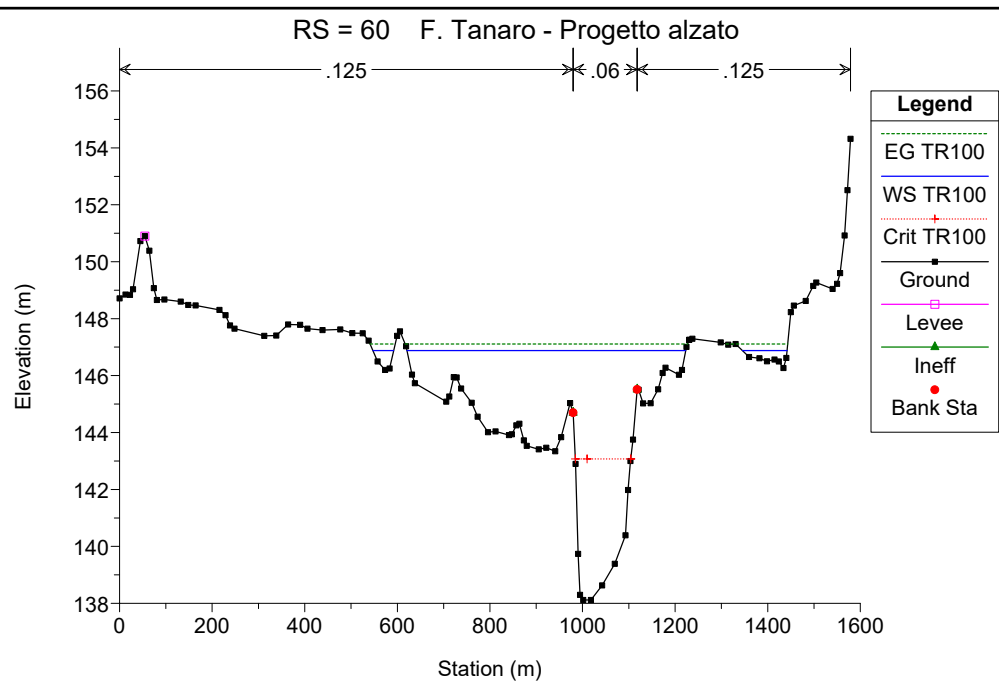
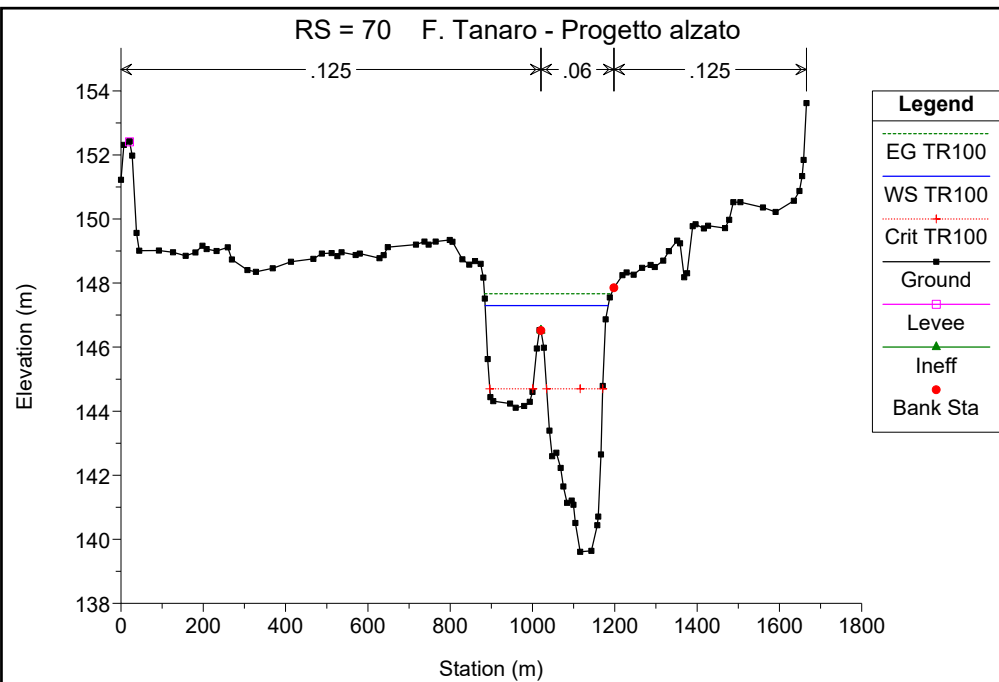


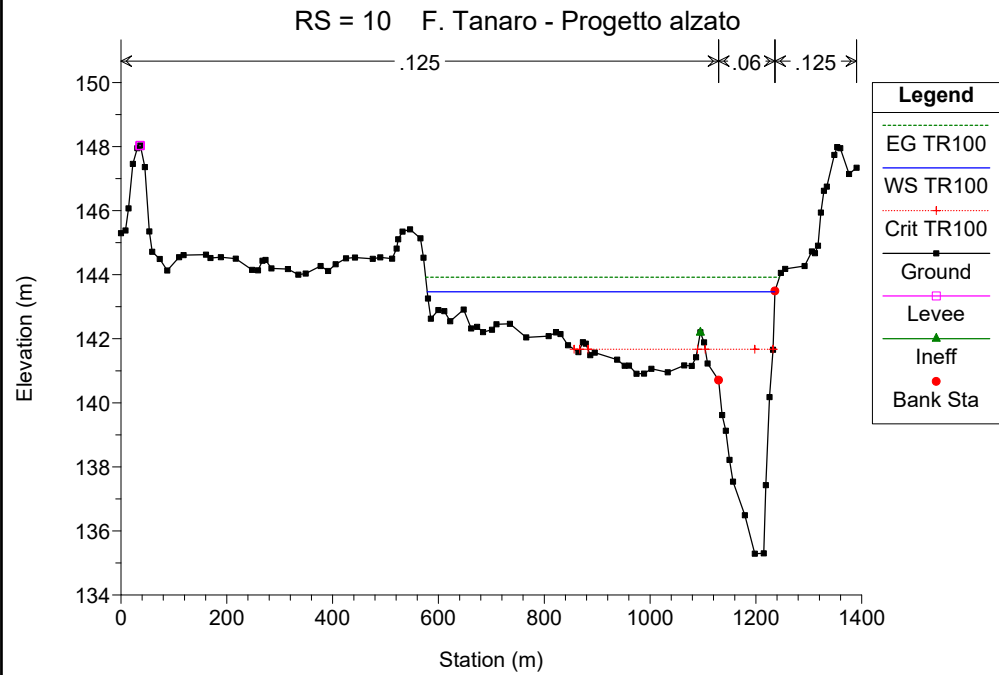
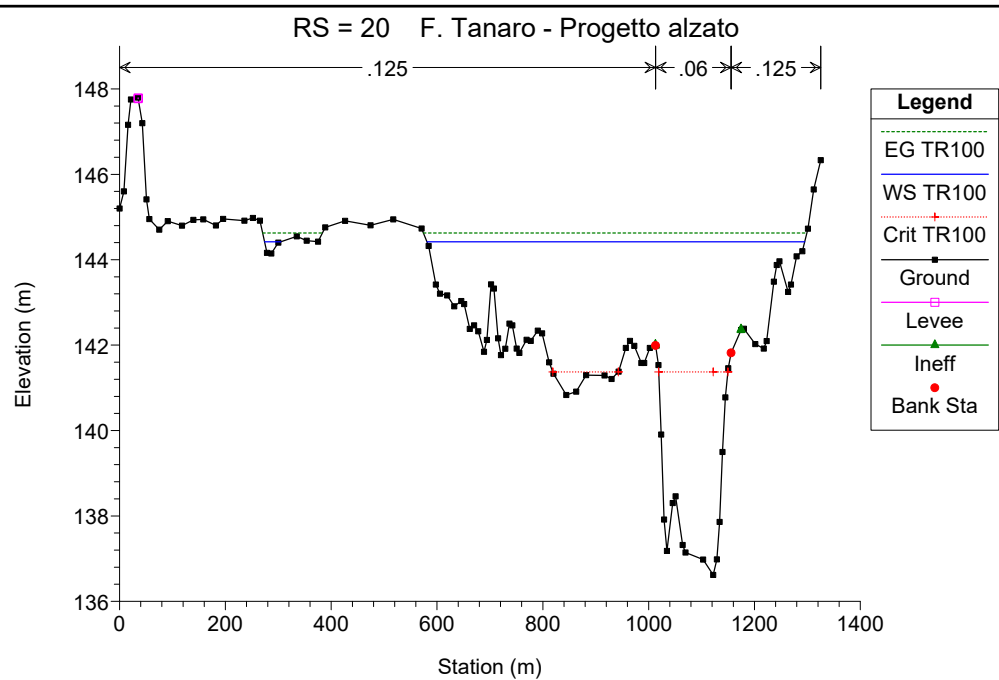
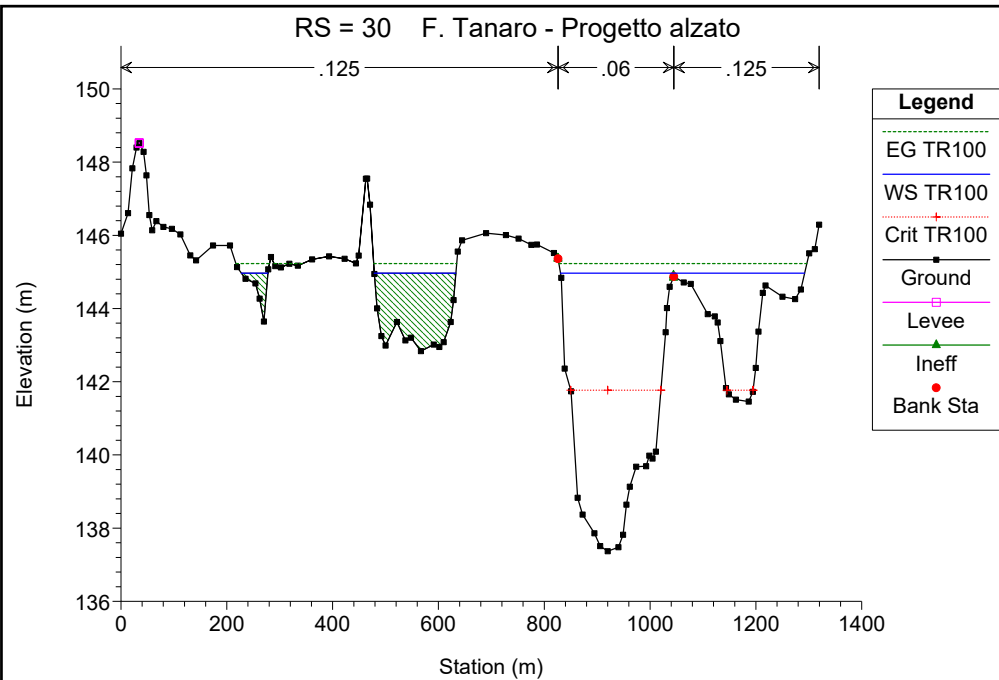












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 12

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	2750	100
F. Tanaro valle Riddone	2757	
F. Tanaro valle Cherasca	2768	

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

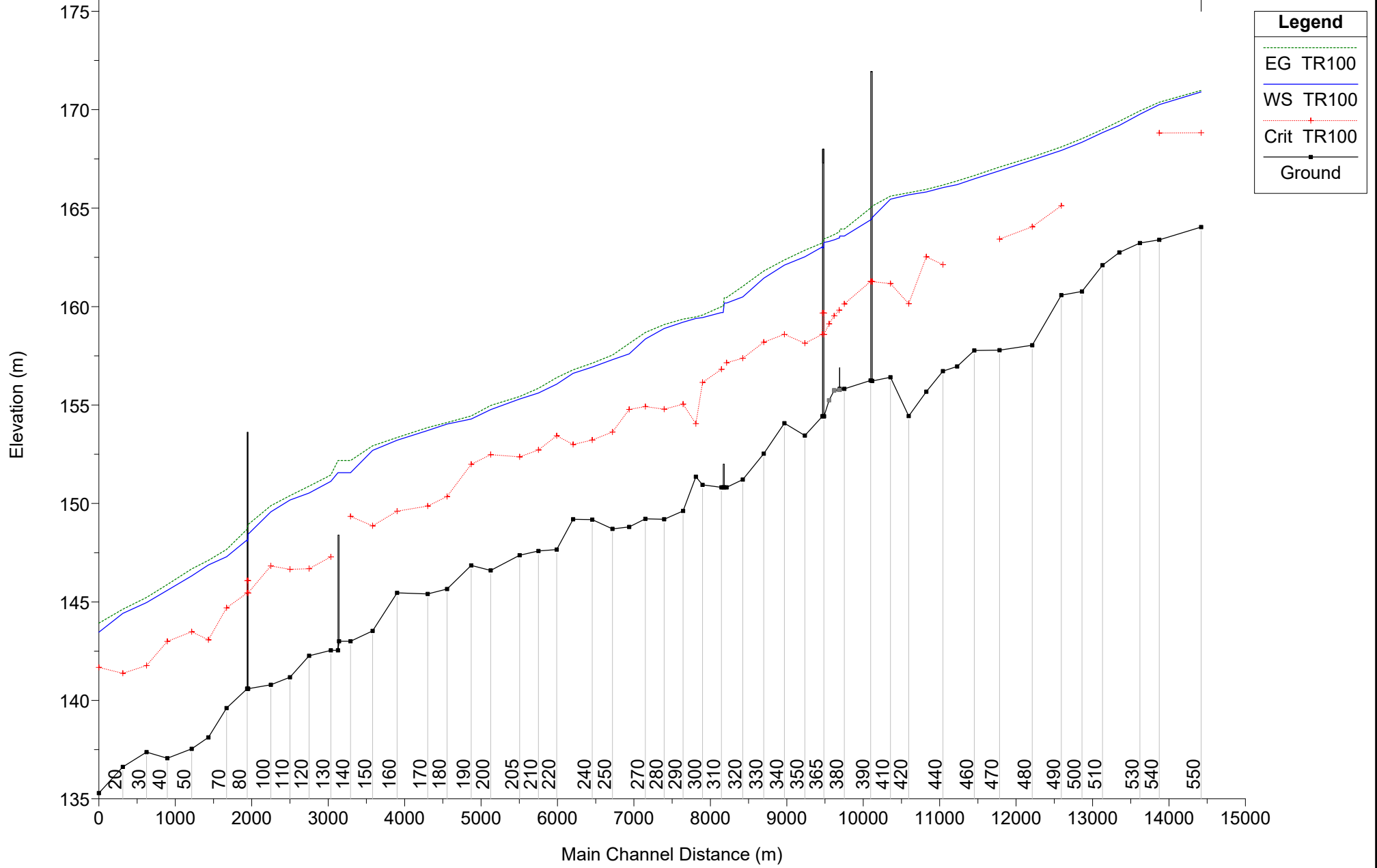
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR100	2750.00	164.04	170.90	168.83	170.98	0.001126	1.43	3001.29	1171.49	0.22
1	540	TR100	2750.00	163.39	170.26	168.82	170.38	0.001696	2.08	2999.58	1119.85	0.29
1	530	TR100	2750.00	163.23	169.77		169.94	0.001799	2.09	2115.26	670.11	0.30
1	520	TR100	2750.00	162.75	169.20		169.42	0.002241	2.36	2206.36	1012.16	0.33
1	510	TR100	2750.00	162.10	168.84		169.00	0.001980	2.09	2199.21	727.90	0.31
1	500	TR100	2750.00	160.77	168.35		168.53	0.001624	2.13	1985.12	549.59	0.28
1	490	TR100	2750.00	160.58	167.93	165.12	168.11	0.001585	1.99	1835.85	510.12	0.28
1	480	TR100	2750.00	158.04	167.44	164.06	167.60	0.001239	1.92	2282.95	689.45	0.25
1	470	TR100	2750.00	157.79	166.90	163.43	167.09	0.001421	2.17	2047.02	536.92	0.27
1	460	TR100	2750.00	157.77	166.49		166.66	0.001172	1.97	2252.48	829.91	0.25
1	450	TR100	2750.00	156.96	166.19		166.38	0.001241	2.06	2067.14	791.22	0.26
1	440	TR100	2750.00	156.72	166.04	162.13	166.17	0.000897	1.81	2714.03	789.80	0.22
1	430	TR100	2750.00	155.68	165.82	162.53	165.95	0.001091	2.01	2638.19	664.10	0.24
1	420	TR100	2750.00	154.44	165.68	160.15	165.78	0.000583	1.64	2951.57	686.44	0.18
1	410	TR100	2750.00	156.41	165.46	161.17	165.61	0.001023	1.98	2250.19	526.74	0.24
1	400	TR100	2750.00	156.22	164.52	161.27	165.10	0.003302	3.45	910.91	173.98	0.41
1	395		Bridge									
1	390	TR100	2750.00	156.25	164.41	161.28	165.01	0.003503	3.52	891.05	169.83	0.42
1	380	TR100	2750.00	155.82	163.59	160.13	163.94	0.002182	2.64	1073.27	218.72	0.33
1	379		Inl Struct									
1	370	TR100	2750.00	154.43	163.25	158.59	163.44	0.001031	1.92	1434.02	206.71	0.23
1	365		Bridge									
1	360	TR100	2750.00	154.43	163.03	158.59	163.23	0.001142	1.98	1388.66	206.10	0.24
1	350	TR100	2750.00	153.45	162.53	158.14	162.86	0.001826	2.58	1103.88	272.33	0.31
1	340	TR100	2757.00	154.08	162.11	158.59	162.37	0.001717	2.27	1360.99	383.91	0.29
1	330	TR100	2757.00	152.53	161.44	158.19	161.81	0.002392	2.73	1229.76	438.48	0.35
1	320	TR100	2757.00	151.21	160.49	157.38	161.03	0.003205	3.51	1269.80	461.34	0.41
1	315	TR100	2757.00	150.82	160.18	157.15	160.46	0.001943	2.73	2163.00	948.89	0.32
1	312.5		Inl Struct									
1	310	TR100	2757.00	150.82	159.69	156.82	160.00	0.002316	2.85	1791.63	630.75	0.35
1	300	TR100	2768.00	150.95	159.44	156.15	159.57	0.001177	1.84	2428.87	677.11	0.24
1	295	TR100	2768.00	151.36	159.40	154.05	159.48	0.000525	1.38	3070.44	860.98	0.17
1	290	TR100	2768.00	149.62	159.21	155.04	159.37	0.001007	1.81	2074.08	691.66	0.23
1	280	TR100	2768.00	149.20	158.89	154.79	159.09	0.001281	2.21	1950.79	473.77	0.26
1	270	TR100	2768.00	149.22	158.35	154.92	158.69	0.002137	2.84	1626.67	469.01	0.34
1	260	TR100	2768.00	148.81	157.60	154.78	158.13	0.003278	3.43	1147.14	296.45	0.41
1	250	TR100	2768.00	148.71	157.30	153.63	157.54	0.001744	2.35	1788.12	524.90	0.30
1	240	TR100	2768.00	149.18	156.93	153.22	157.13	0.001367	2.15	2077.30	754.78	0.27
1	230	TR100	2768.00	149.20	156.61	152.99	156.79	0.001301	2.00	1886.66	463.56	0.26
1	220	TR100	2768.00	147.66	156.06	153.44	156.39	0.002448	2.81	1495.72	403.34	0.36

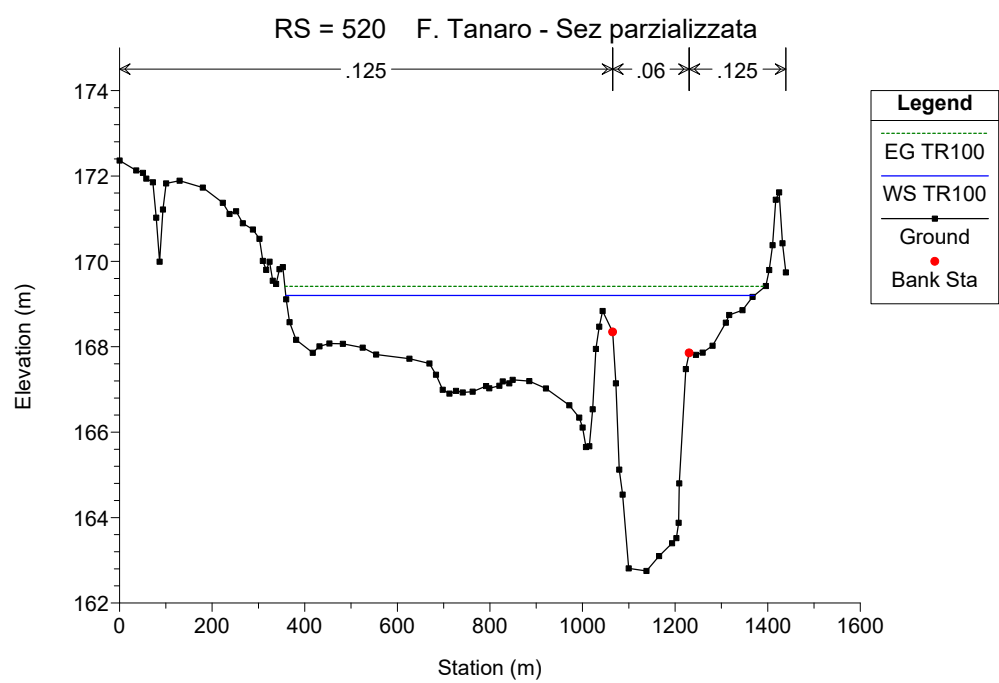
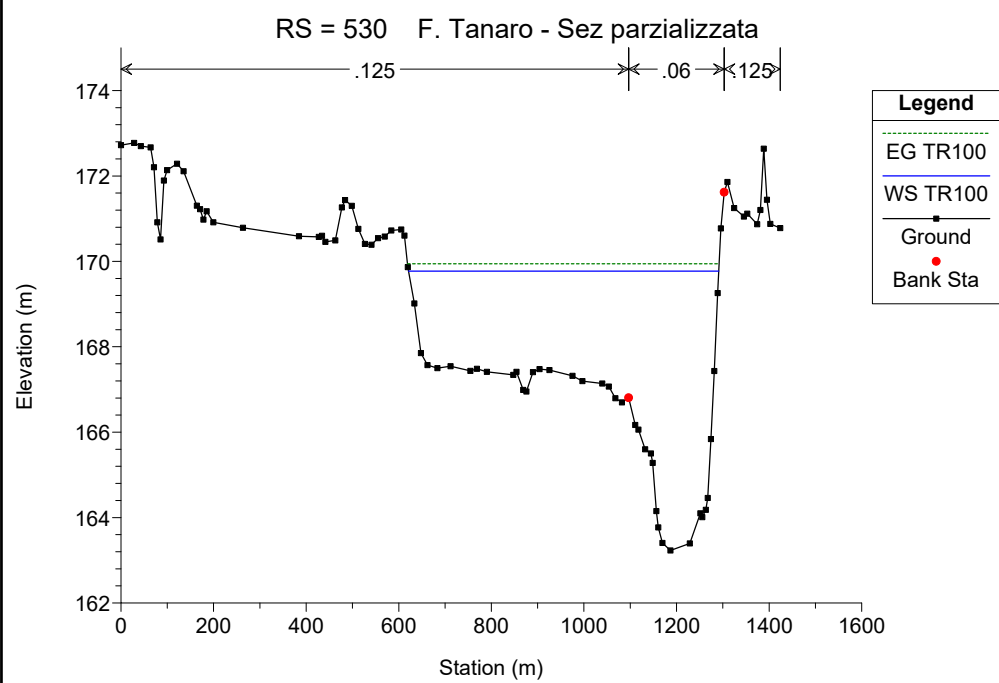
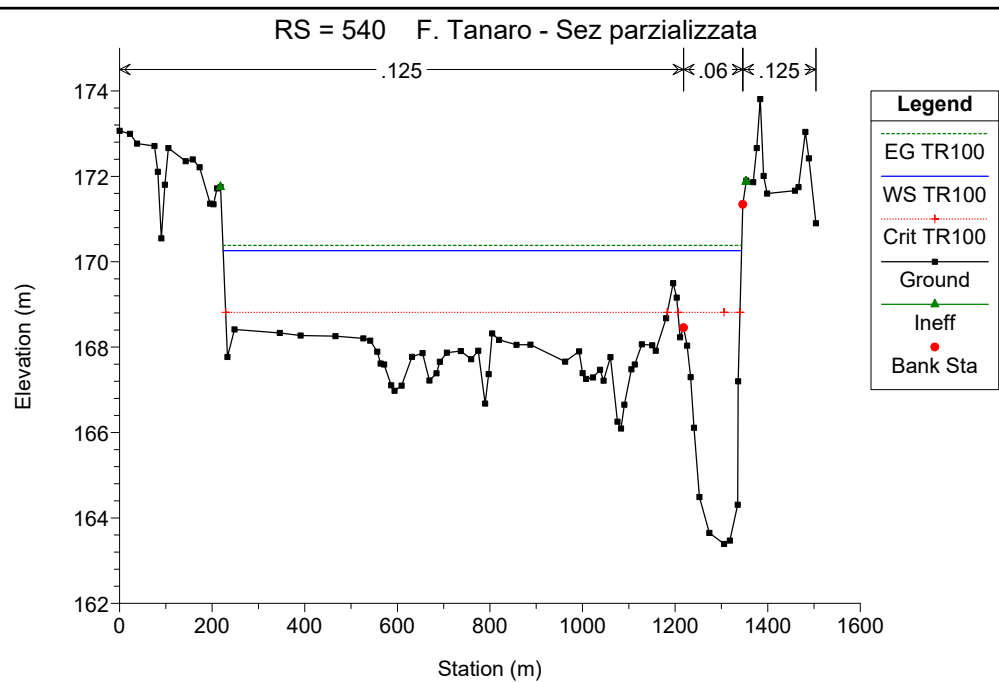
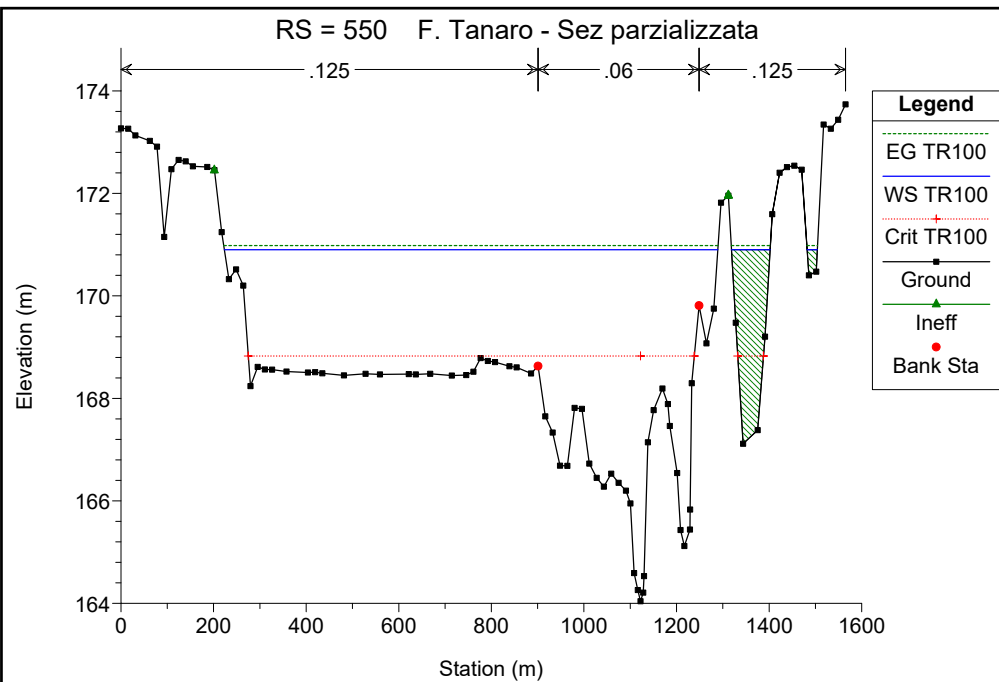
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR100 (Continued)

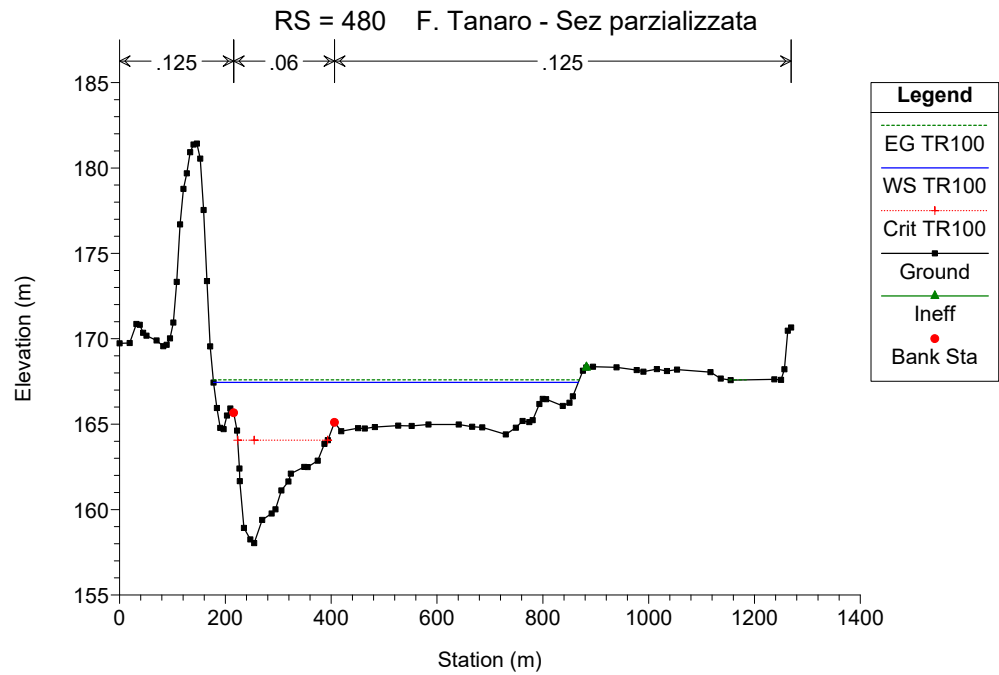
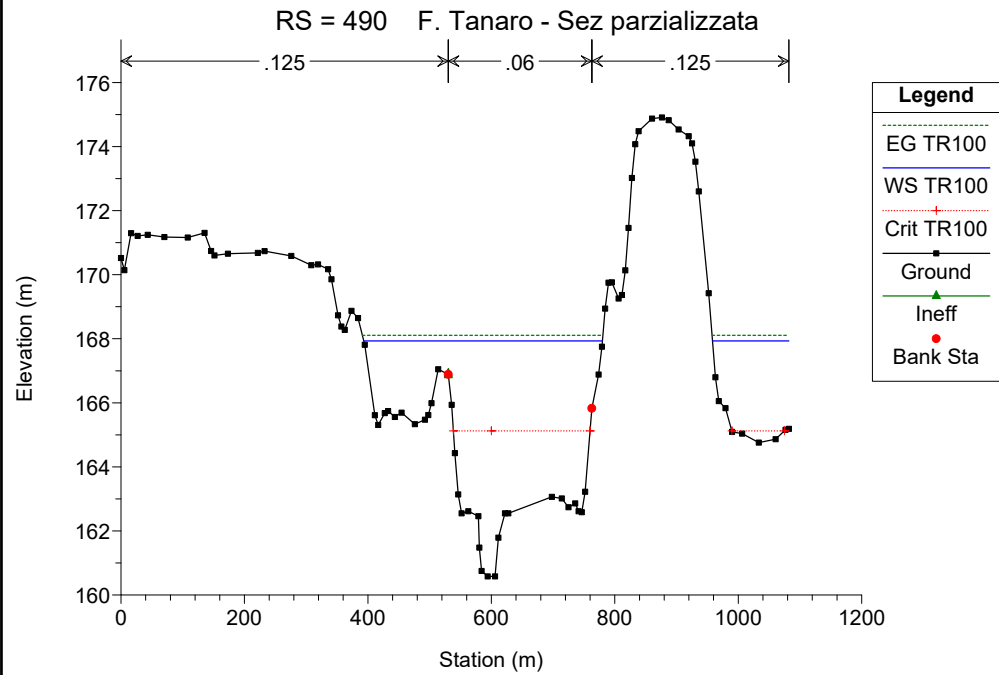
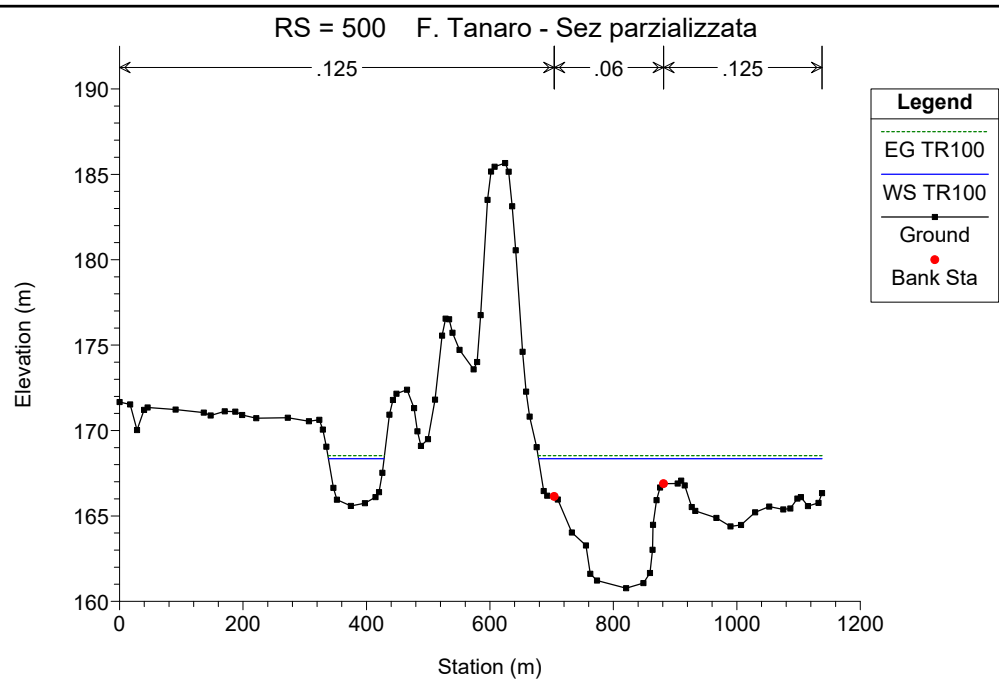
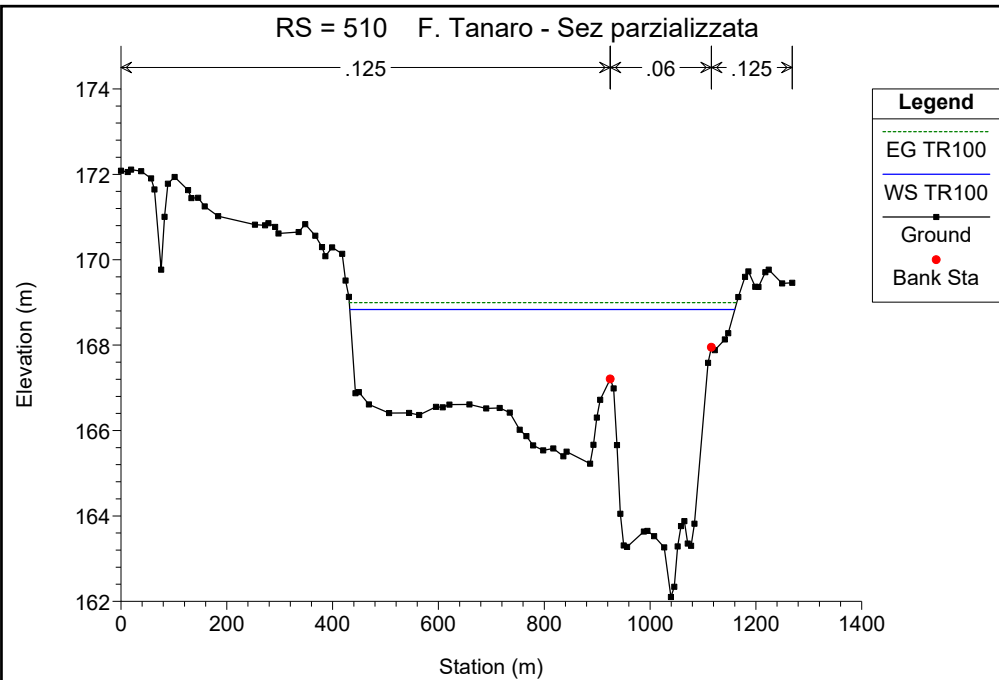
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR100	2768.00	147.59	155.61	152.72	155.85	0.001875	2.31	1709.74	592.79	0.31
1	205	TR100	2768.00	147.37	155.31	152.37	155.43	0.001242	1.80	2697.42	989.53	0.25
1	200	TR100	2768.00	146.60	154.76	152.48	154.98	0.002026	2.50	2491.78	1073.40	0.32
1	190	TR100	2768.00	146.85	154.29	151.99	154.45	0.001904	2.04	2397.80	991.67	0.30
1	180	TR100	2768.00	145.66	154.04	150.35	154.11	0.000707	1.34	3252.90	1300.54	0.19
1	170	TR100	2768.00	145.40	153.71	149.87	153.85	0.001438	1.85	2382.39	1309.38	0.26
1	160	TR100	2768.00	145.46	153.21	149.61	153.35	0.001178	1.77	2451.19	1383.79	0.24
1	150	TR100	2768.00	143.53	152.70	148.86	152.93	0.001478	2.23	2067.92	1340.55	0.28
1	140	TR100	2768.00	143.00	151.56	149.34	152.18	0.005004	3.50	912.46	787.18	0.49
1	135		Inl Struct									
1	130	TR100	2768.00	142.54	151.12	147.29	151.45	0.001954	2.54	1313.27	1035.49	0.32
1	120	TR100	2768.00	142.27	150.53	146.69	150.88	0.002051	2.65	1214.45	598.77	0.33
1	110	TR100	2768.00	141.17	150.18	146.66	150.40	0.001546	2.28	2018.37	700.82	0.28
1	100	TR100	2768.00	140.79	149.58	146.83	149.88	0.002676	2.54	1311.01	416.69	0.36
1	90	TR100	2768.00	140.59	148.44	145.45	148.93	0.003469	3.11	888.69	163.00	0.41
1	85		Bridge									
1	80	TR100	2768.00	140.59	148.15	145.45	148.70	0.003811	3.27	846.08	154.19	0.43
1	70	TR100	2768.00	139.61	147.30	144.70	147.67	0.003227	2.85	1223.89	299.18	0.40
1	60	TR100	2768.00	138.12	146.88	143.07	147.11	0.001542	2.36	1954.59	743.18	0.29
1	50	TR100	2768.00	137.54	146.32	143.49	146.68	0.002428	2.88	1611.04	721.36	0.36
1	40	TR100	2768.00	137.06	145.59	143.00	145.88	0.002663	2.41	1224.48	610.14	0.35
1	30	TR100	2768.00	137.37	144.97	141.77	145.23	0.002134	2.32	1464.55	665.72	0.32
1	20	TR100	2768.00	136.62	144.42	141.37	144.63	0.001665	2.31	2149.72	744.59	0.29
1	10	TR100	2768.00	135.29	143.46	141.67	143.92	0.004005	3.40	1533.14	657.12	0.45

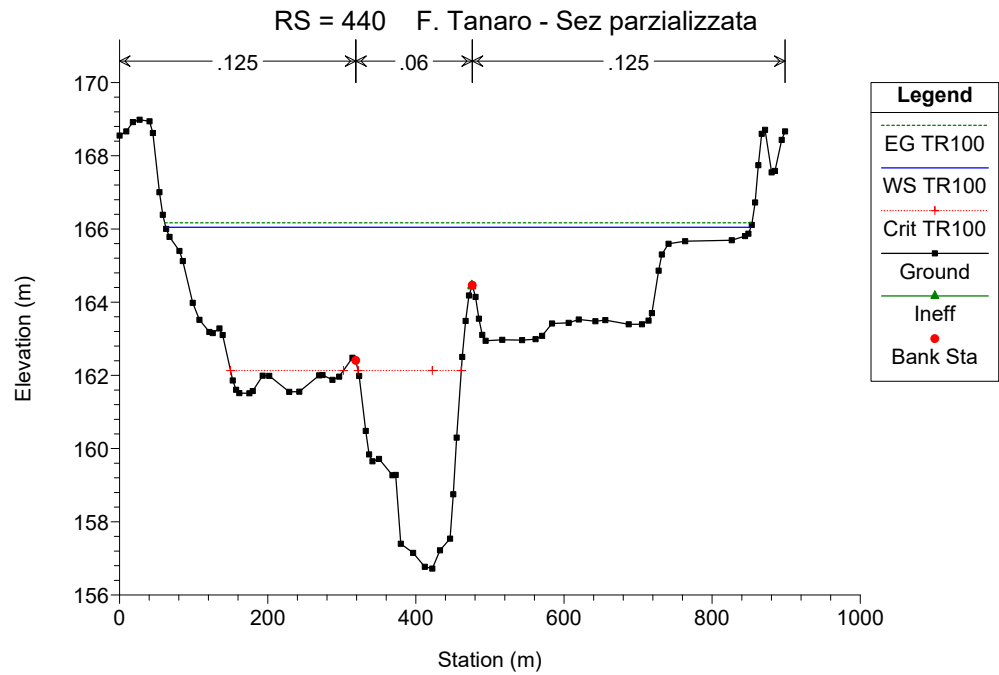
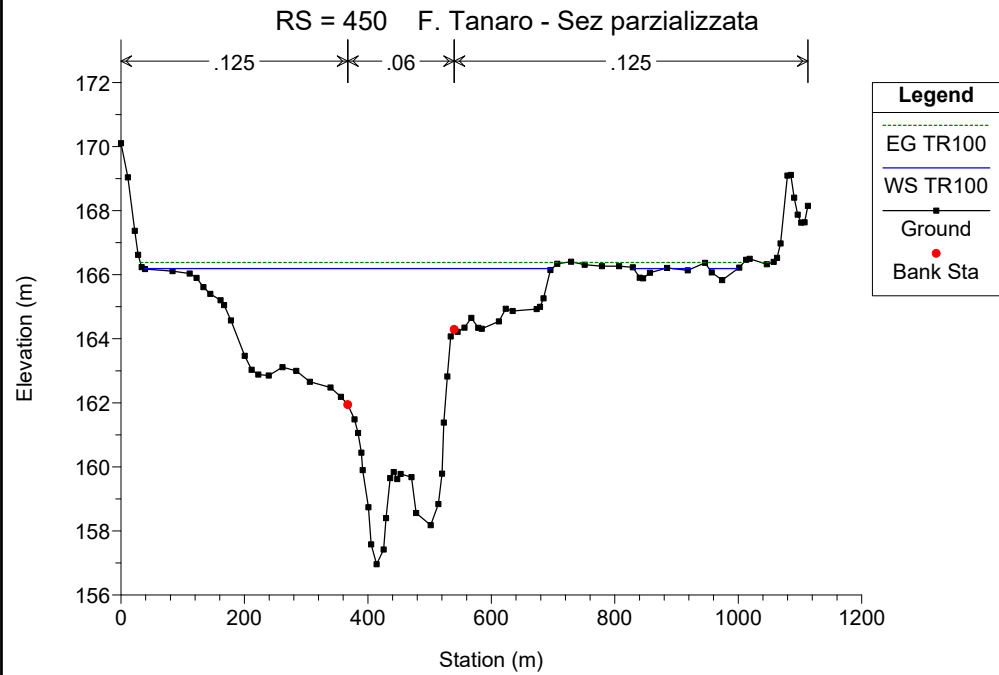
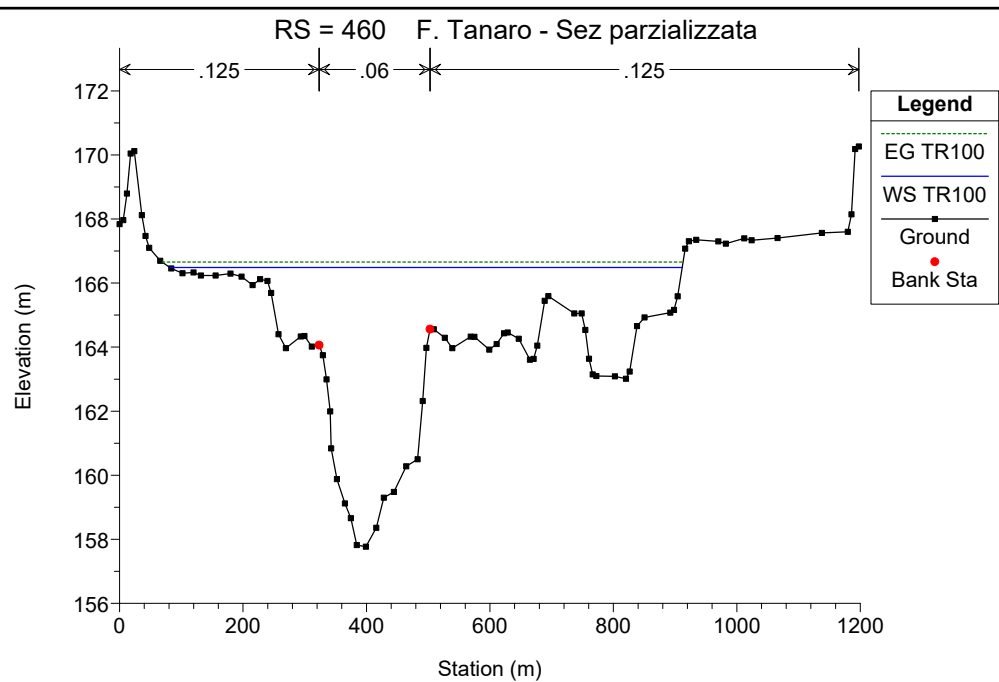
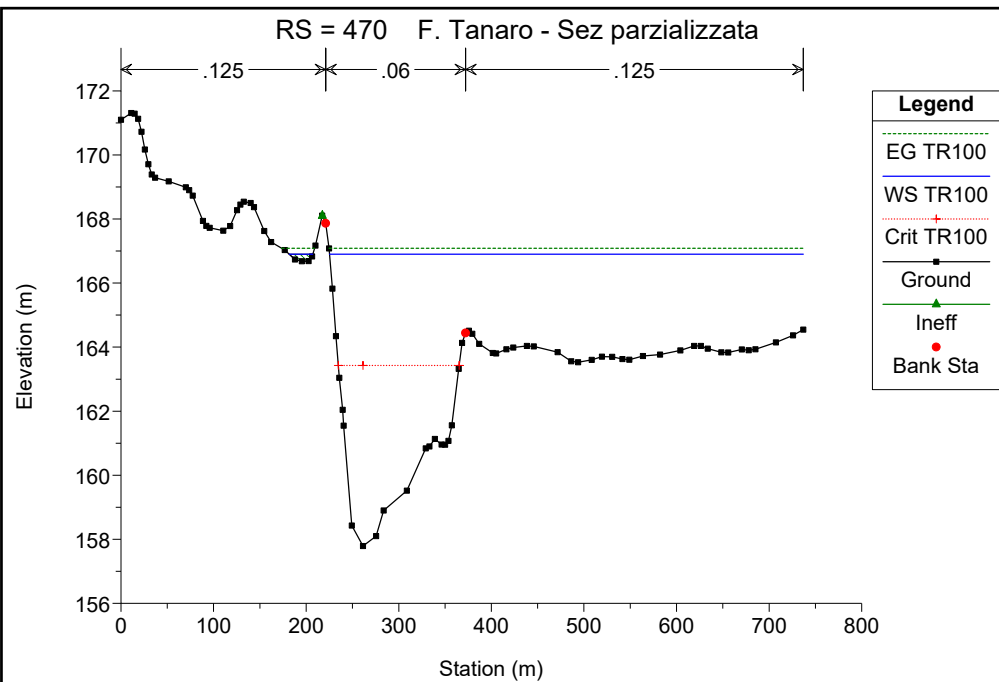
F. Tanaro - Sez parzializzata

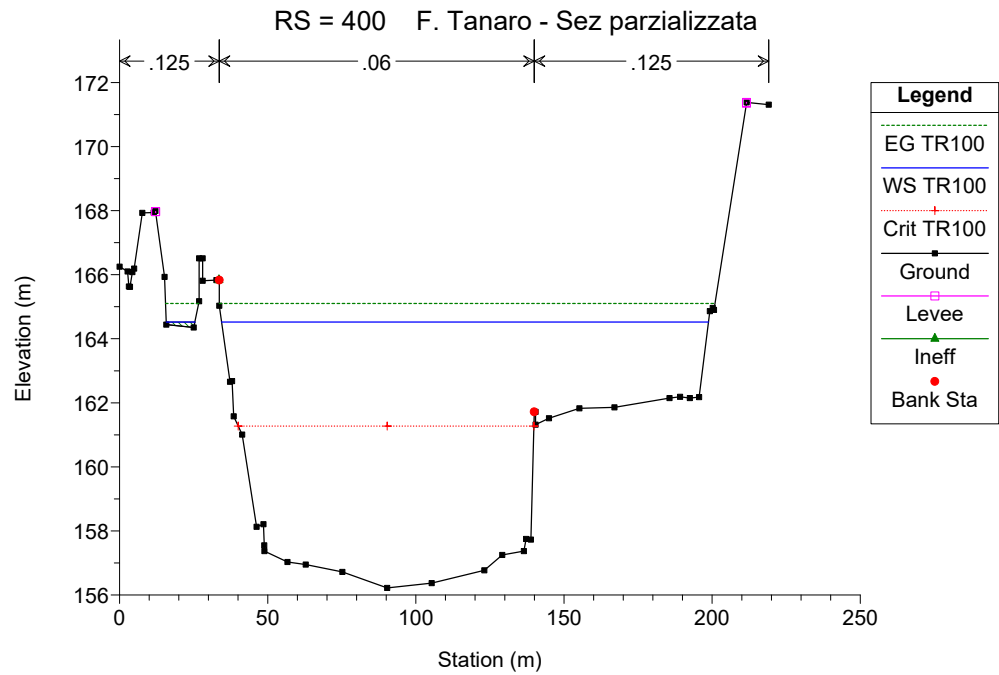
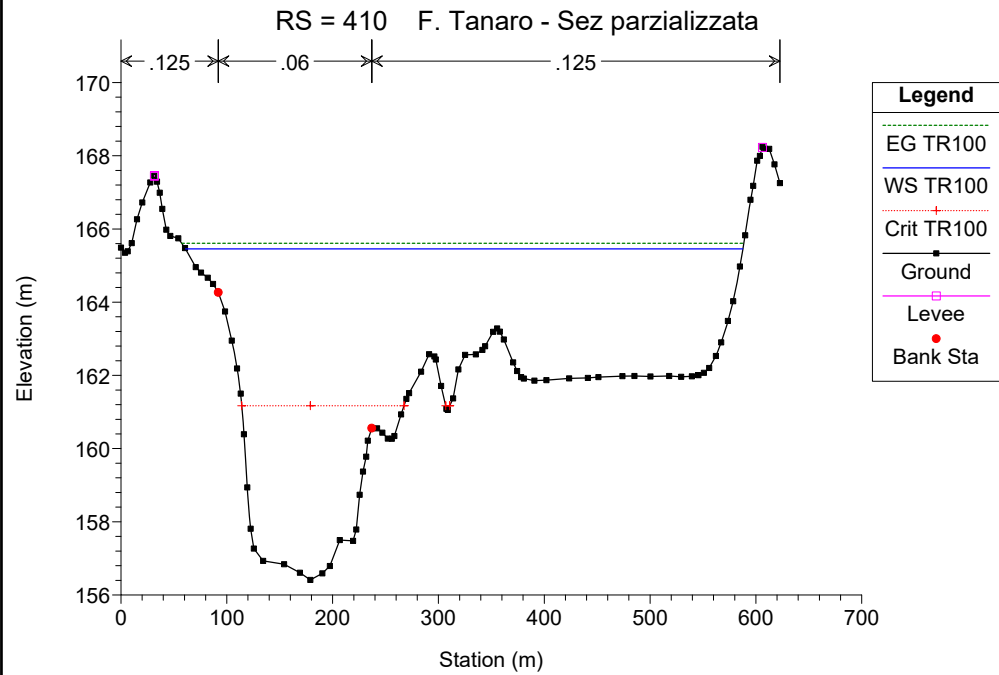
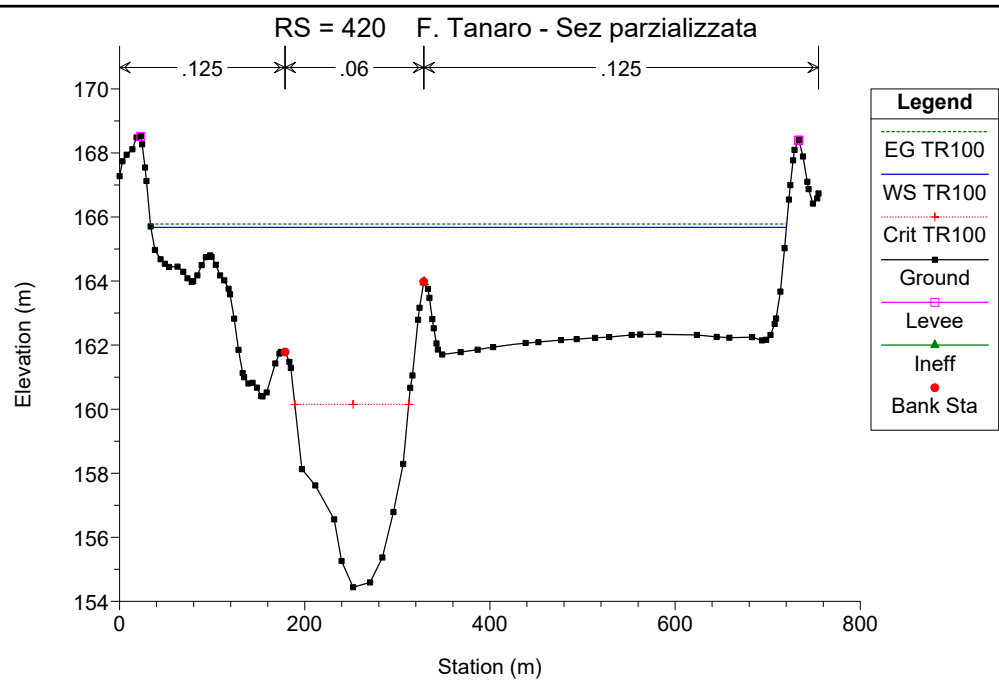
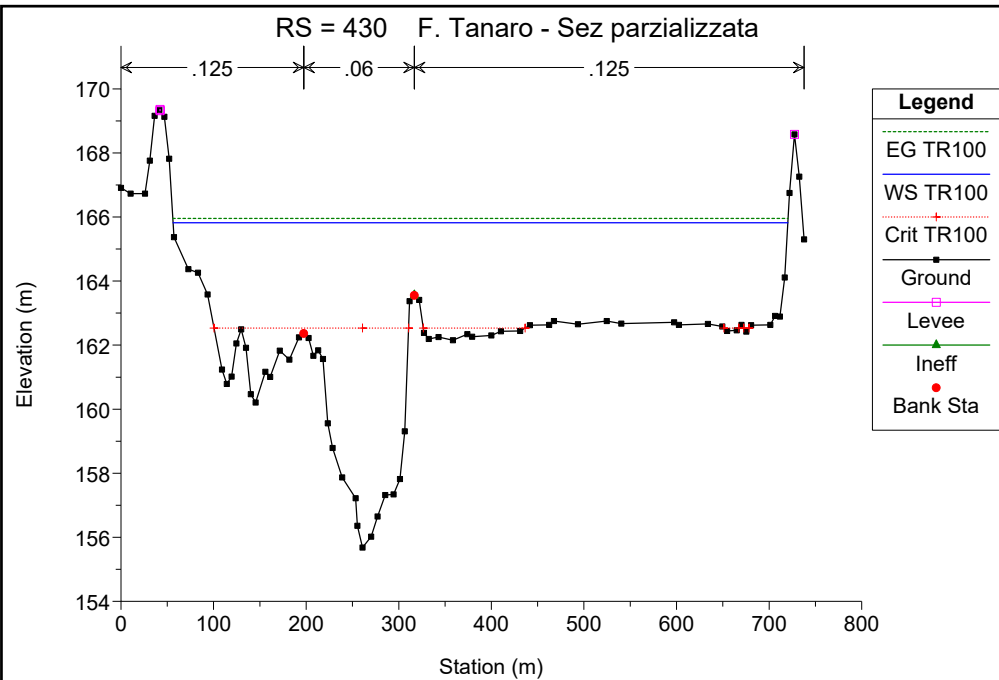
Tanaro 1

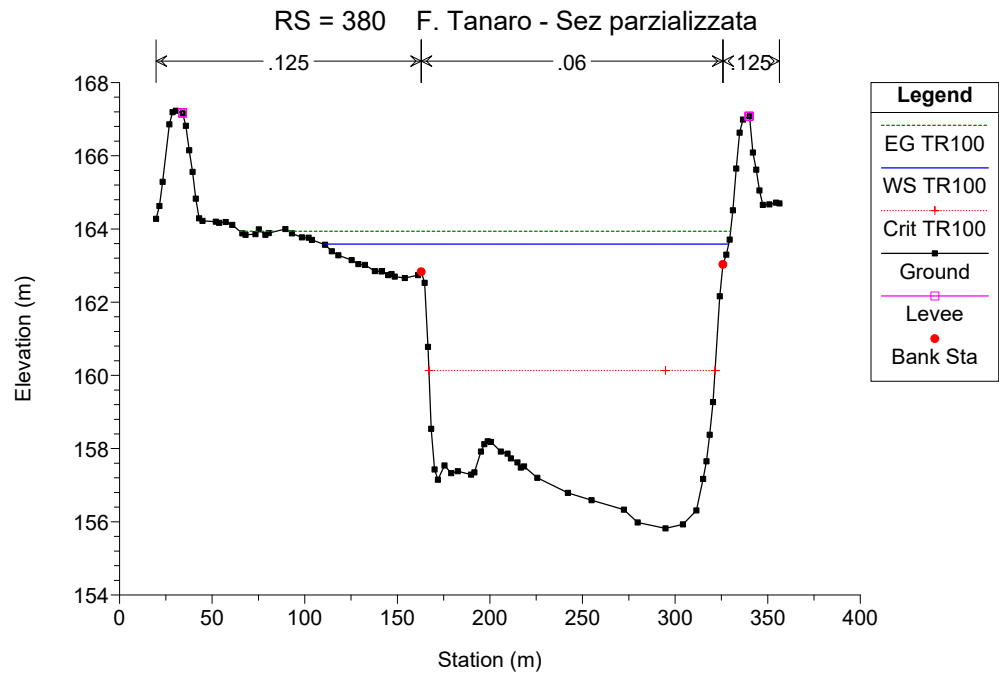
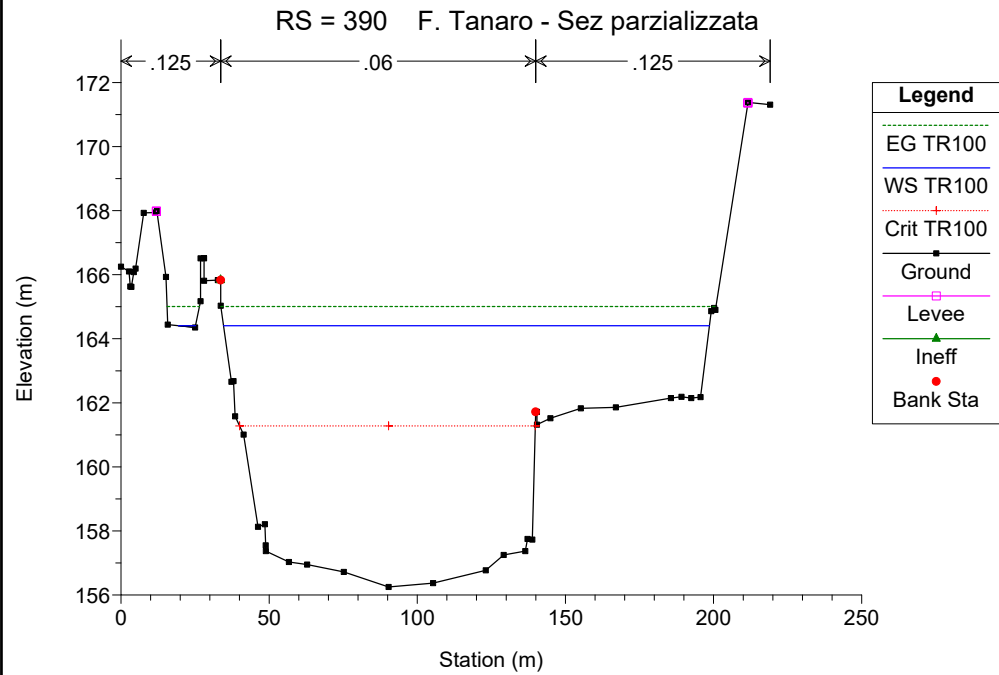
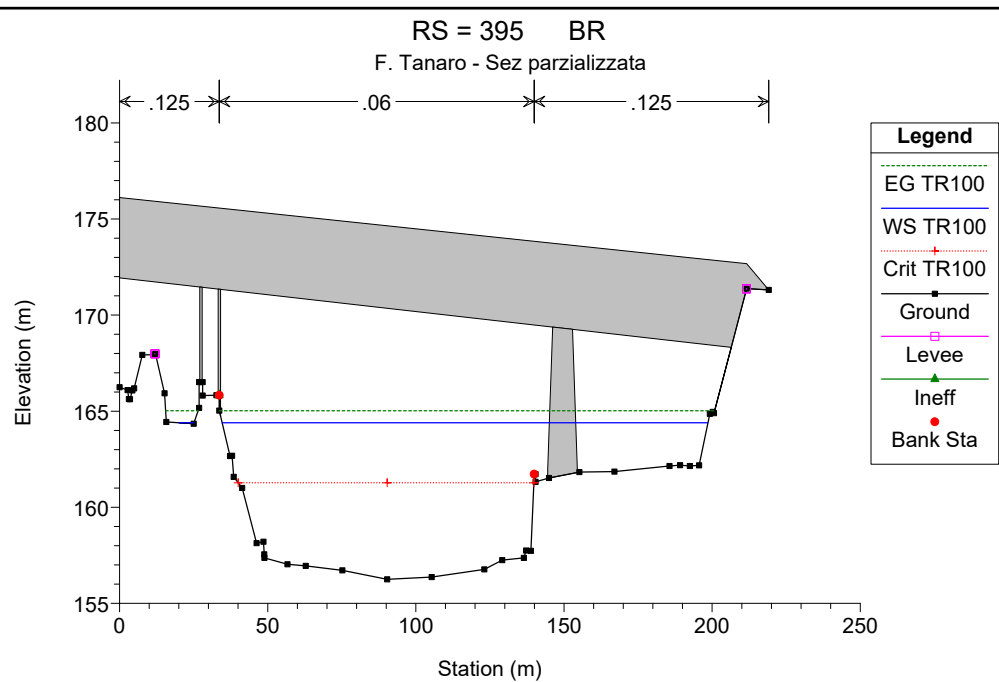
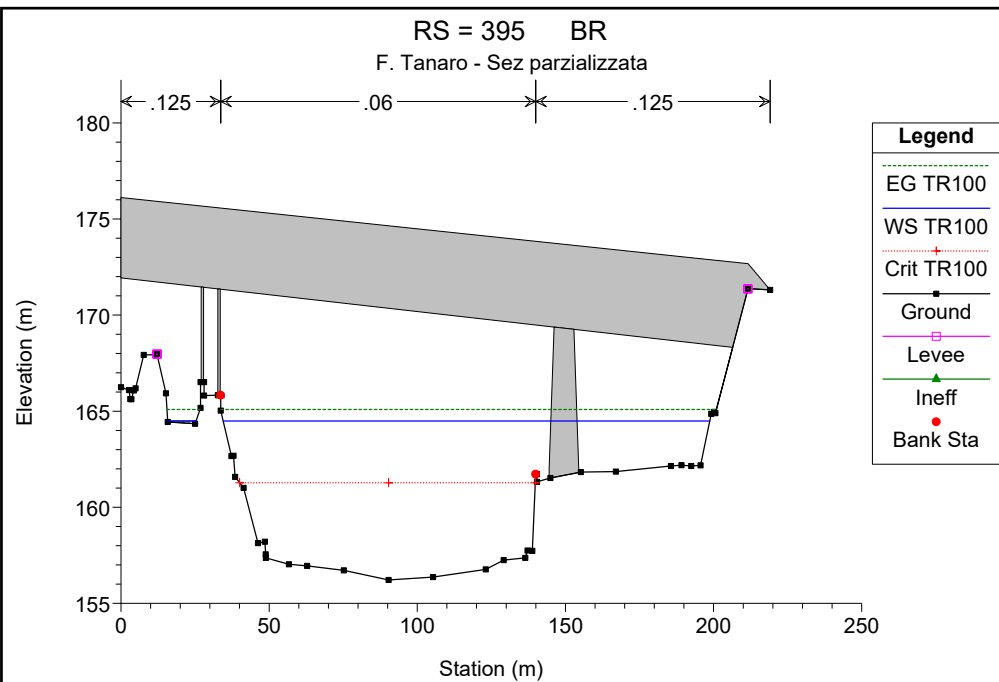


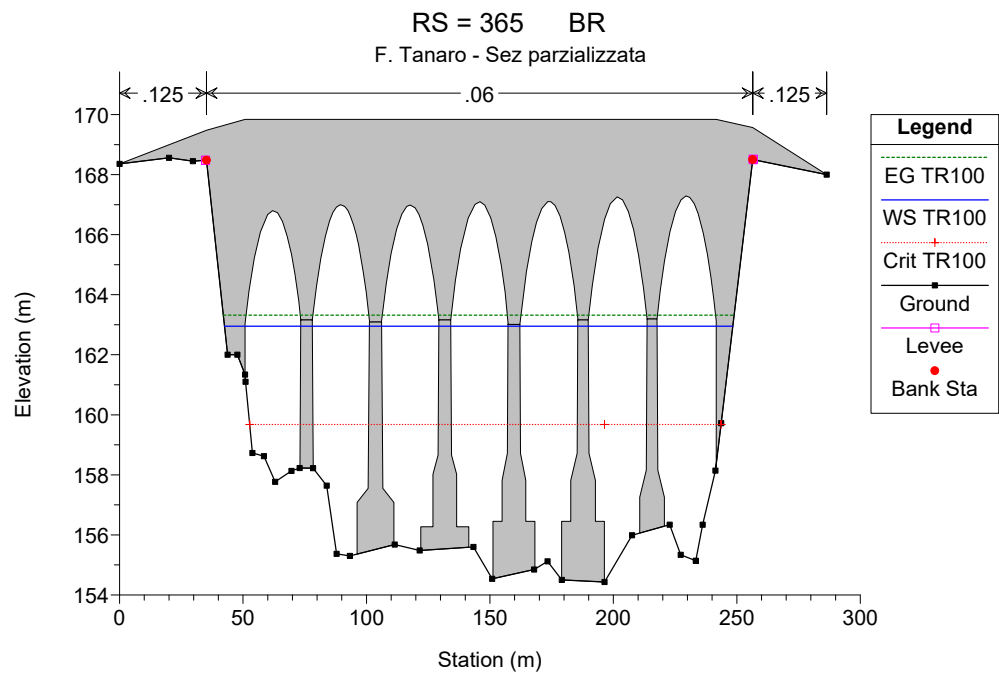
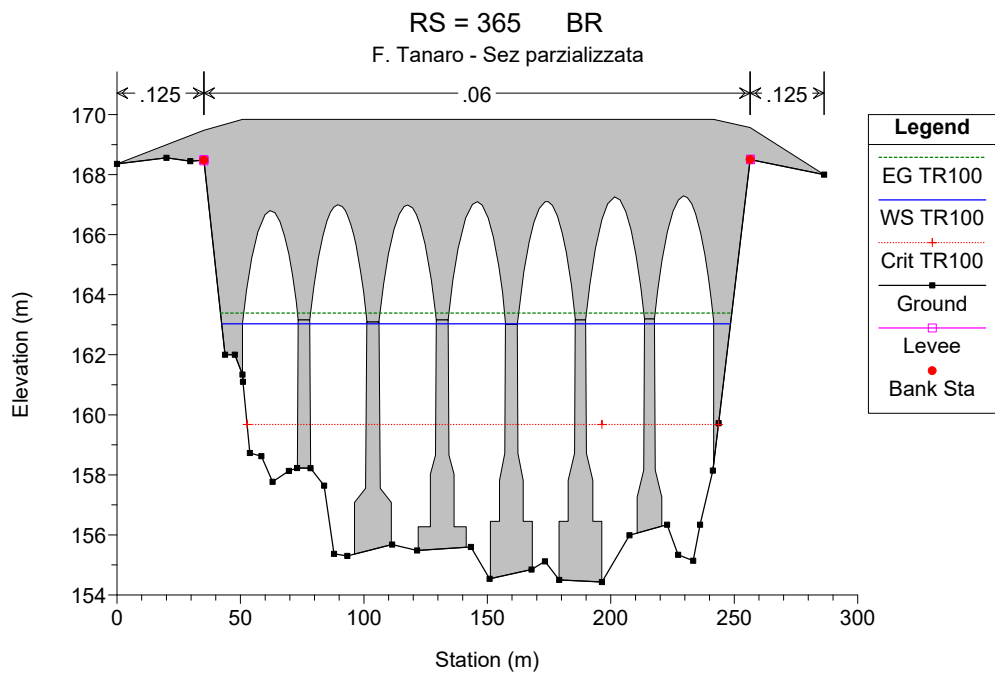
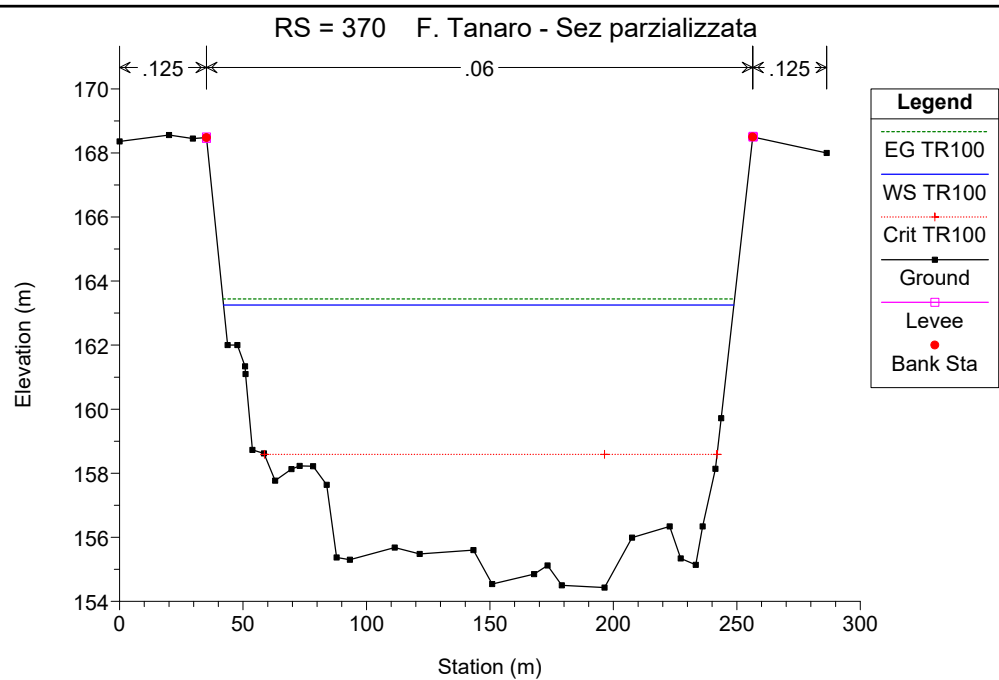
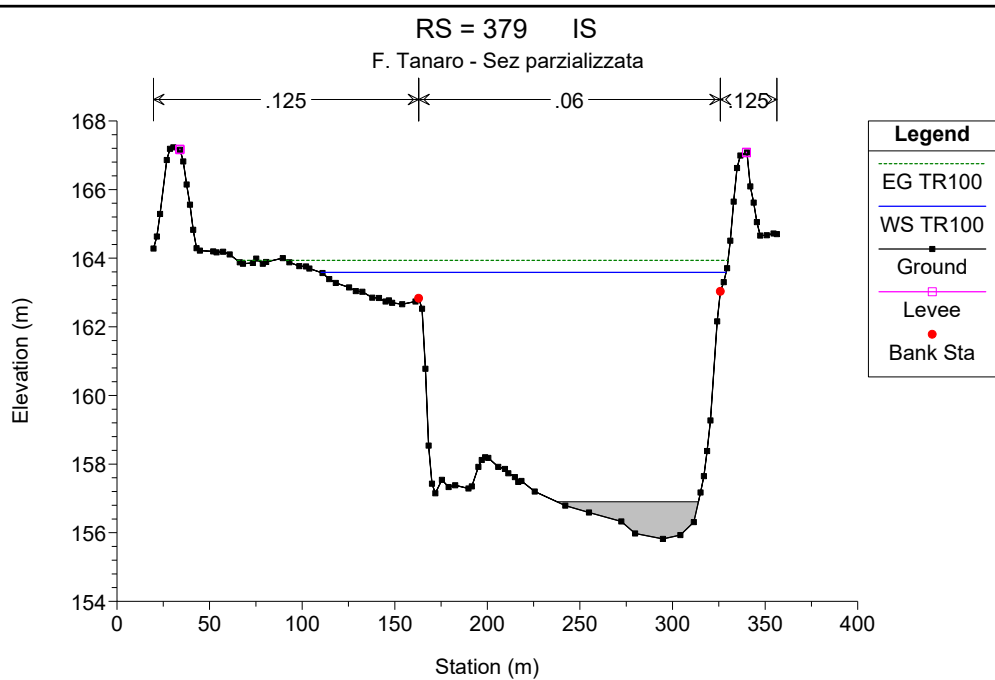


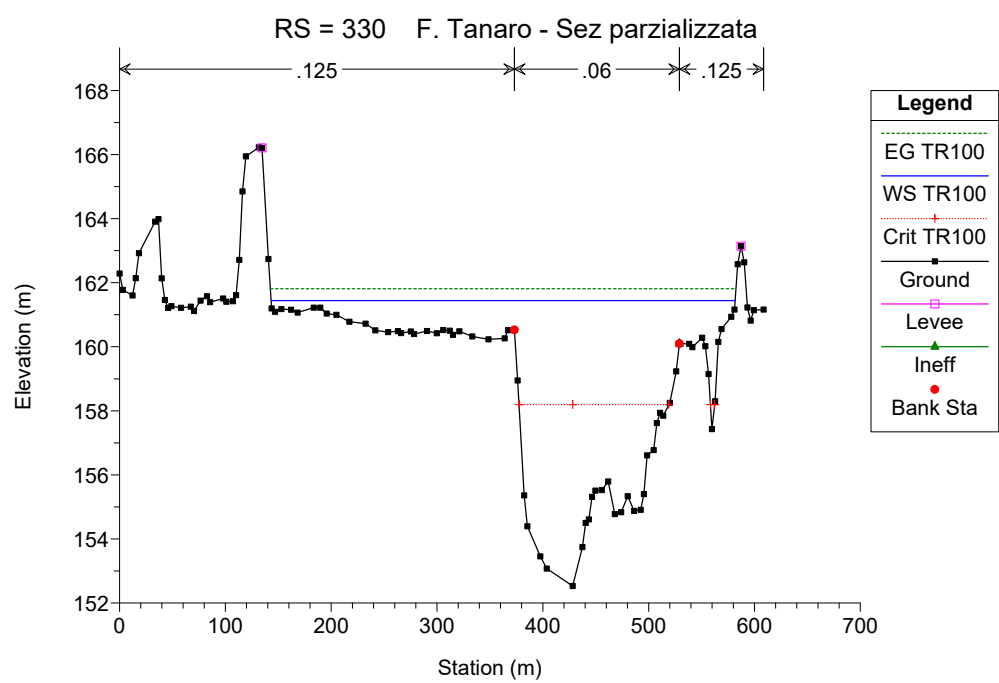
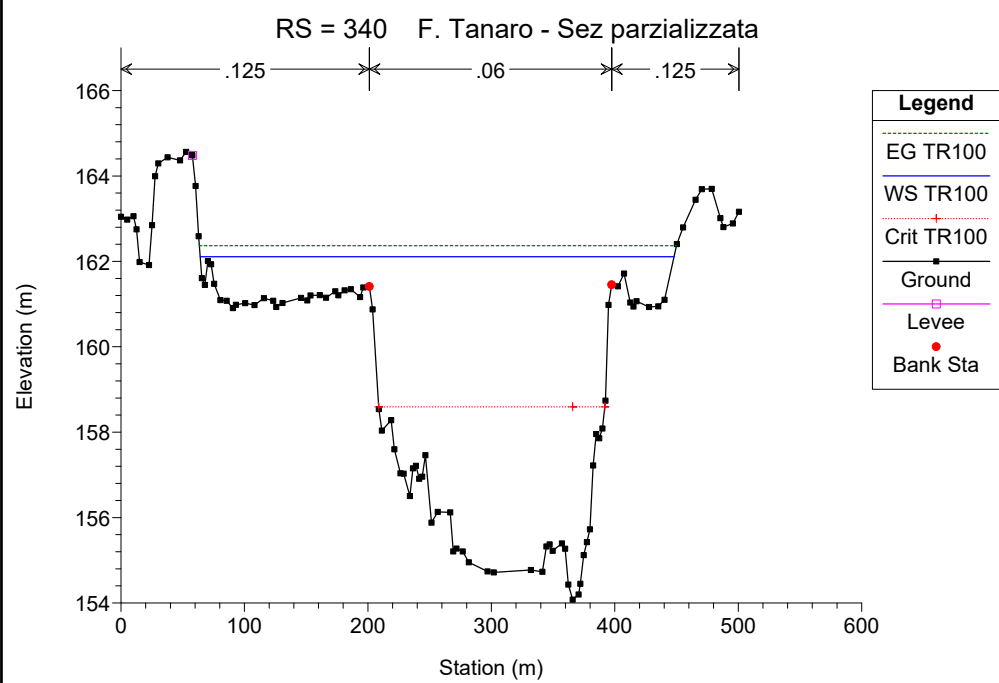
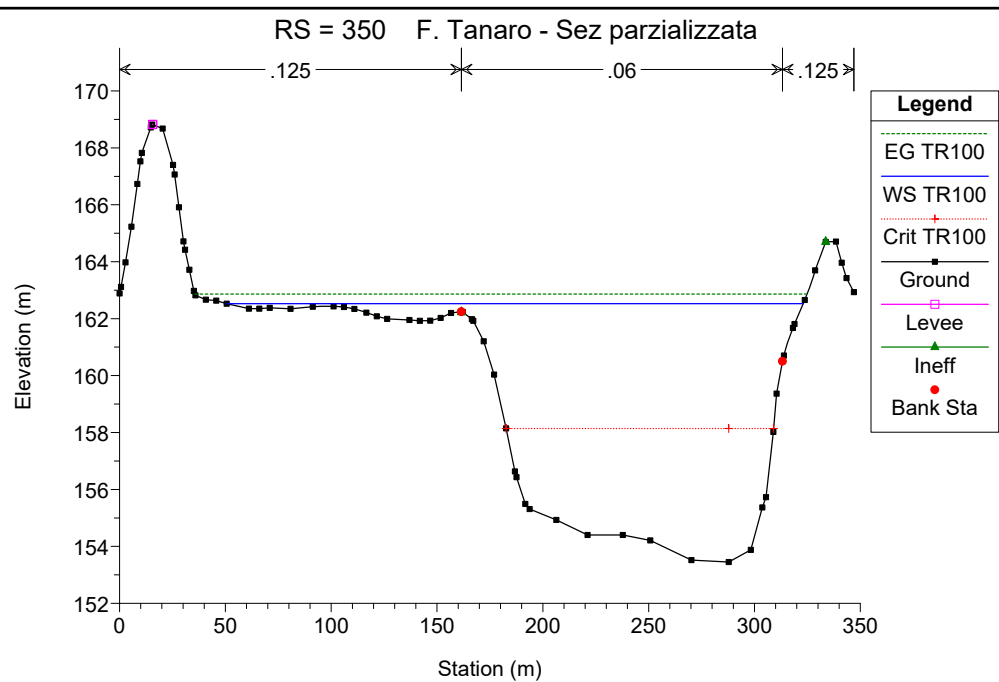
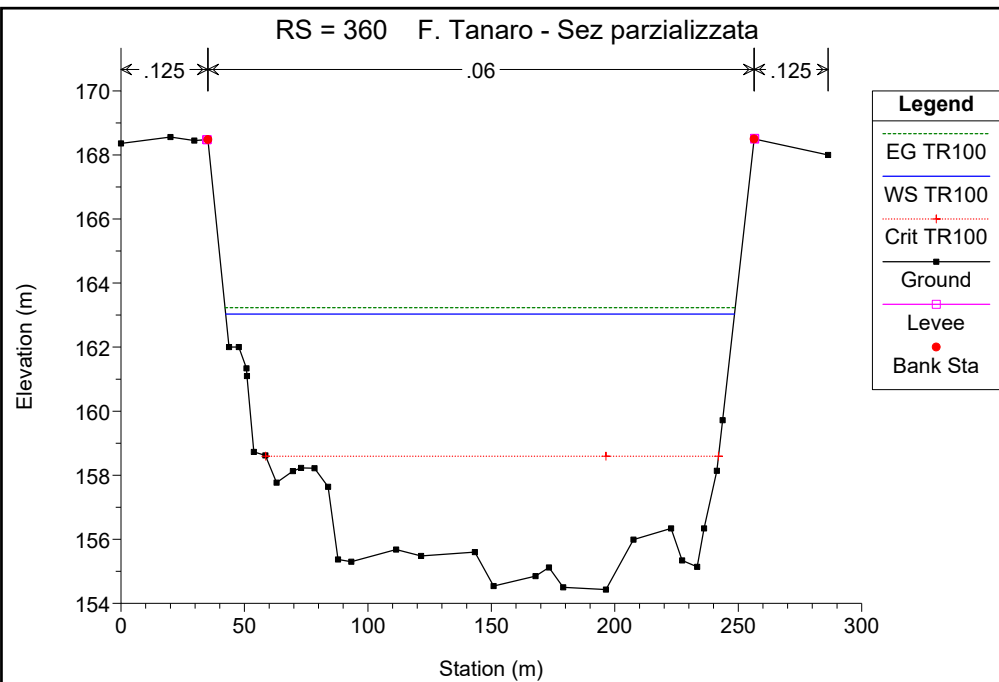


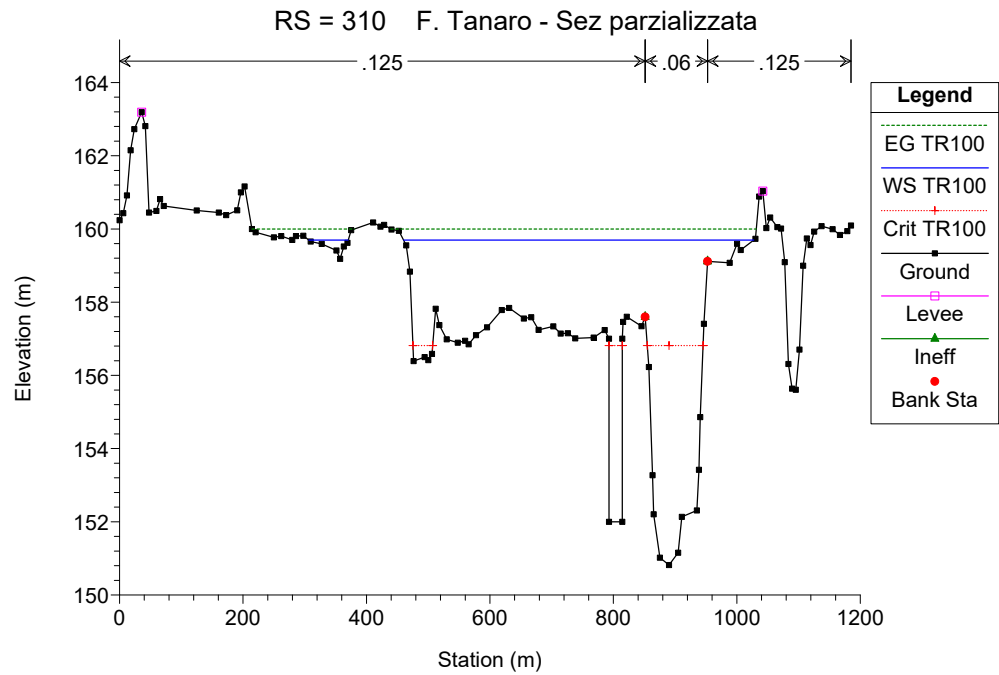
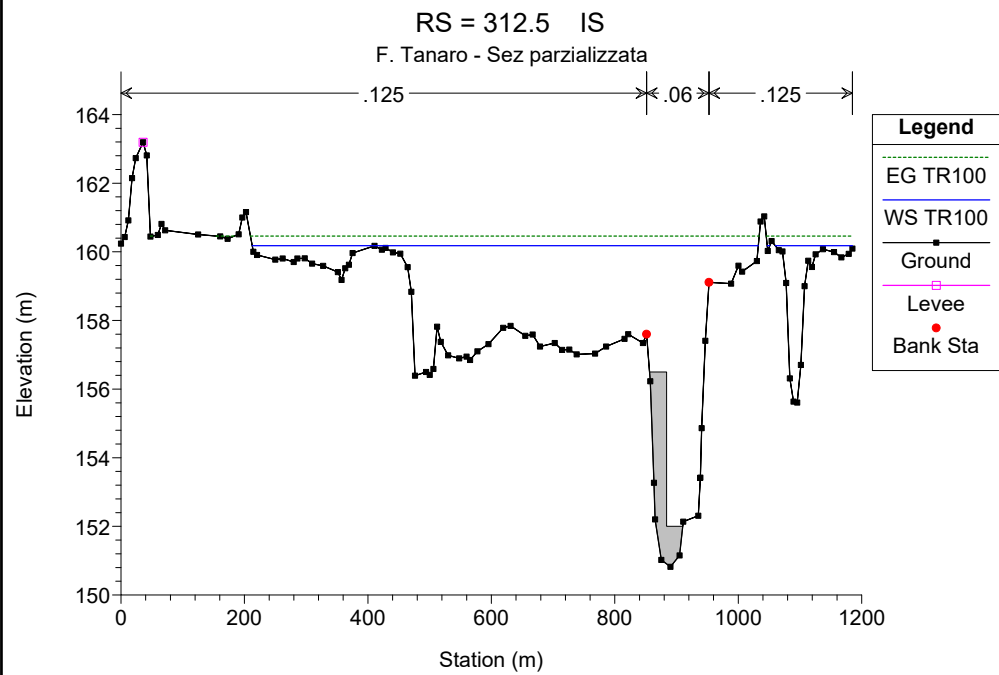
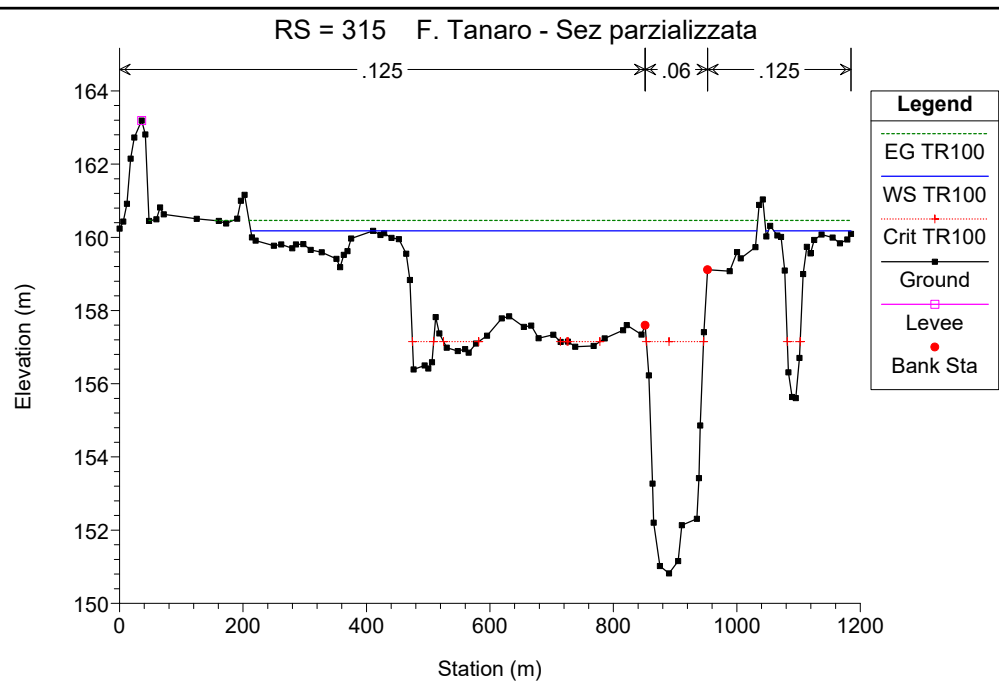
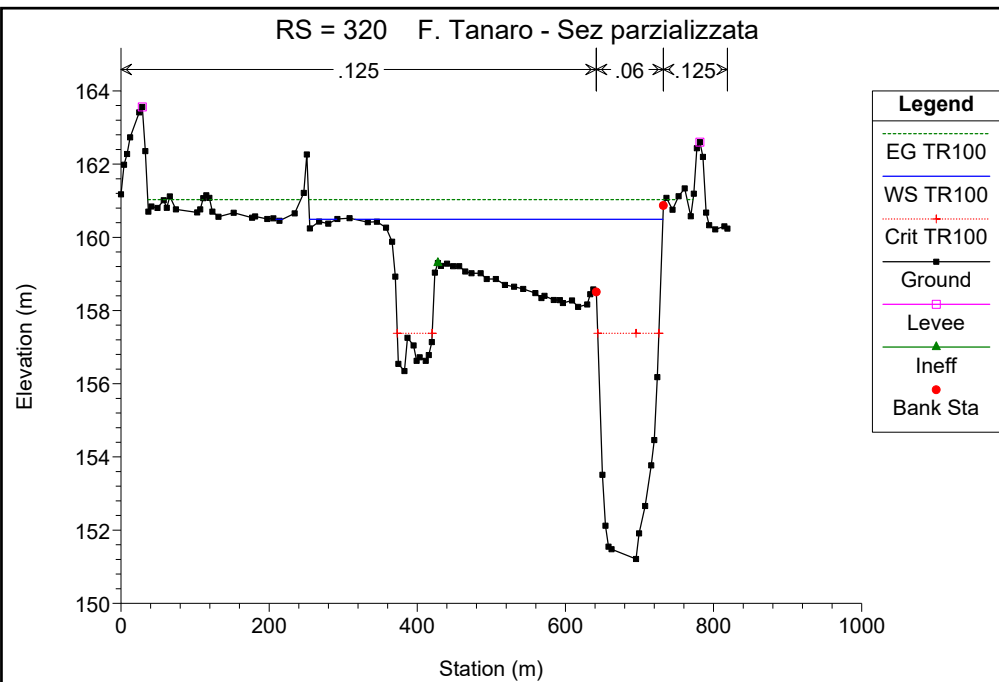


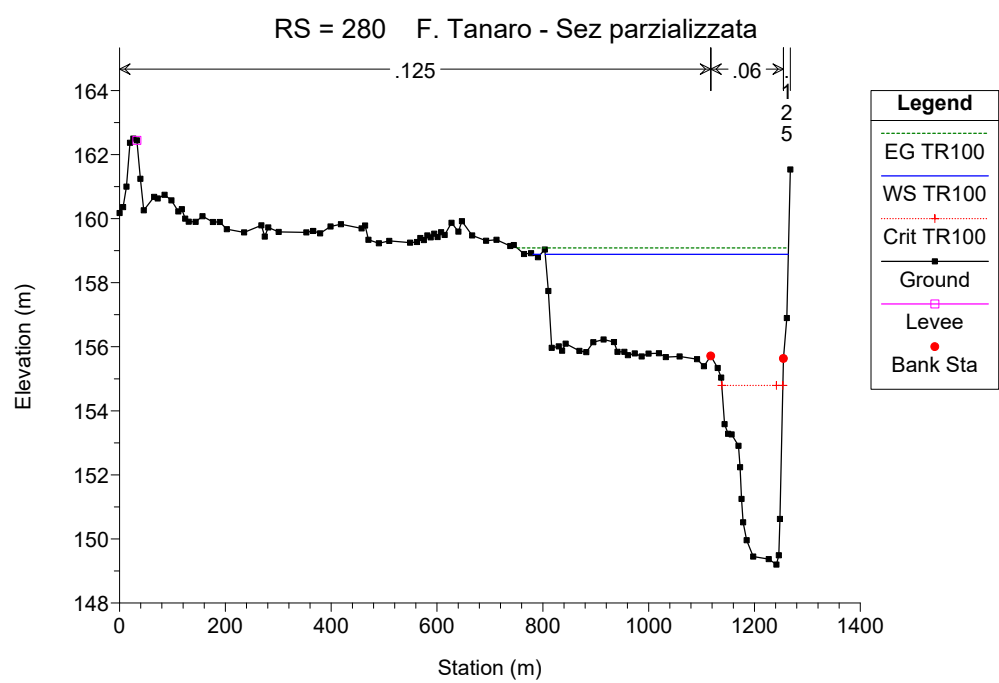
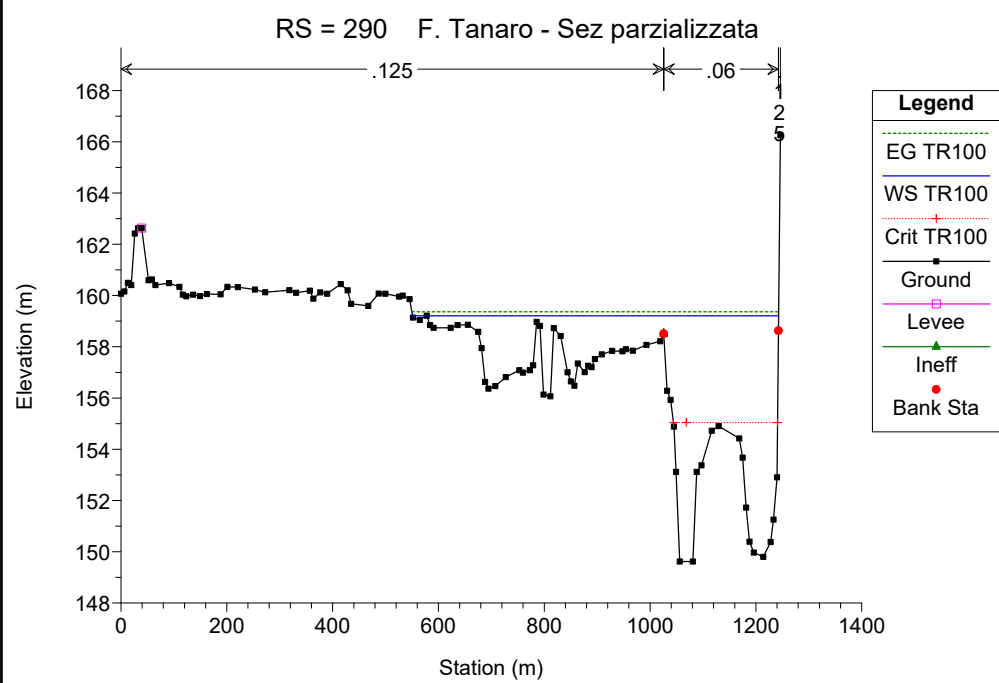
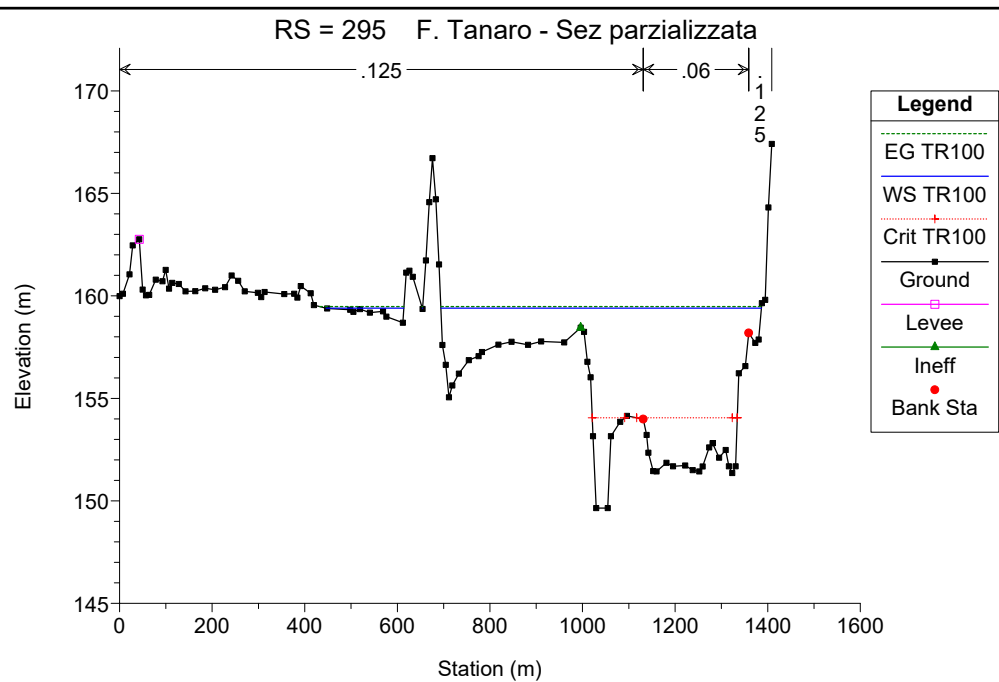
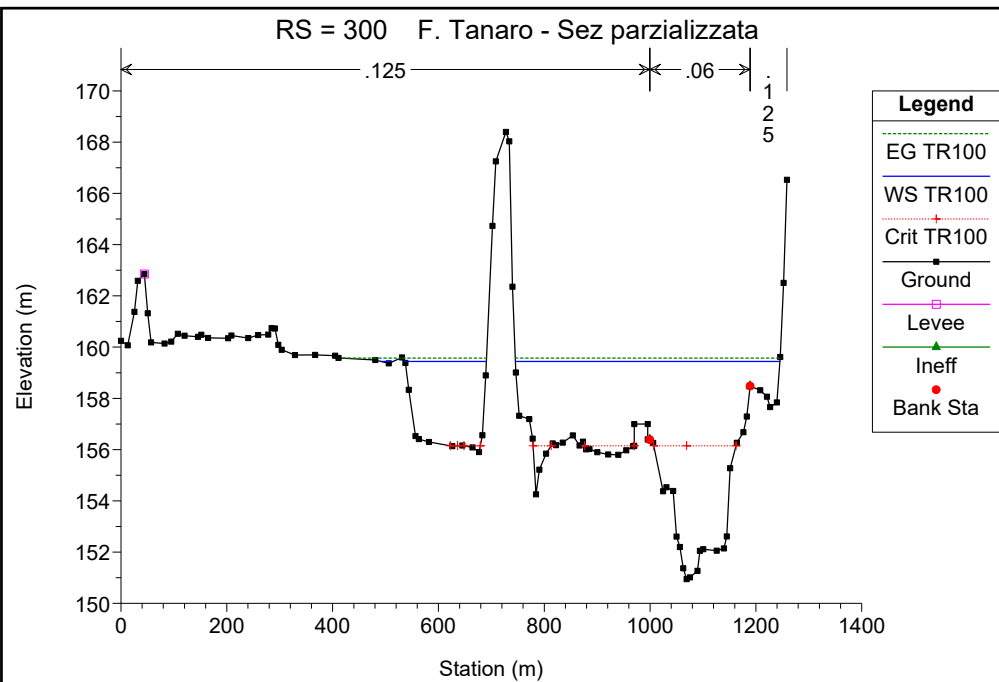


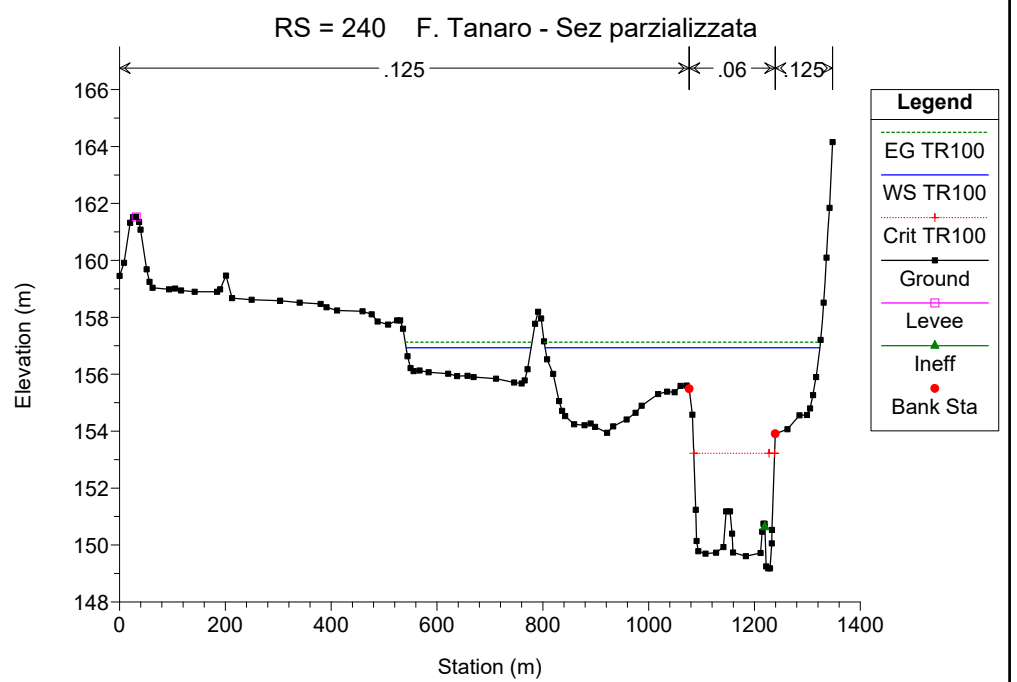
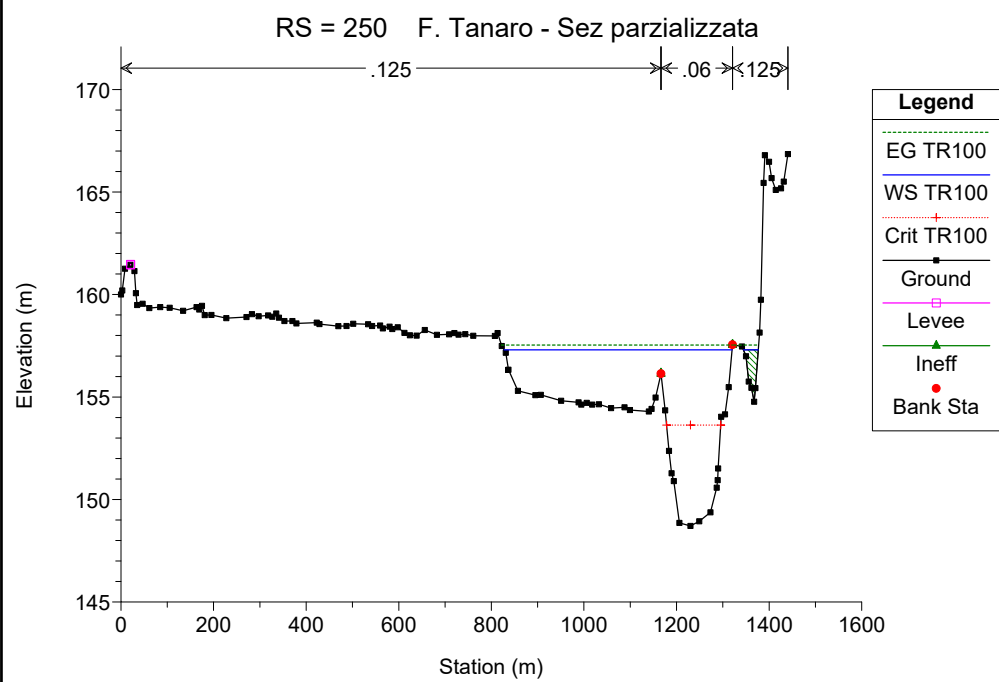
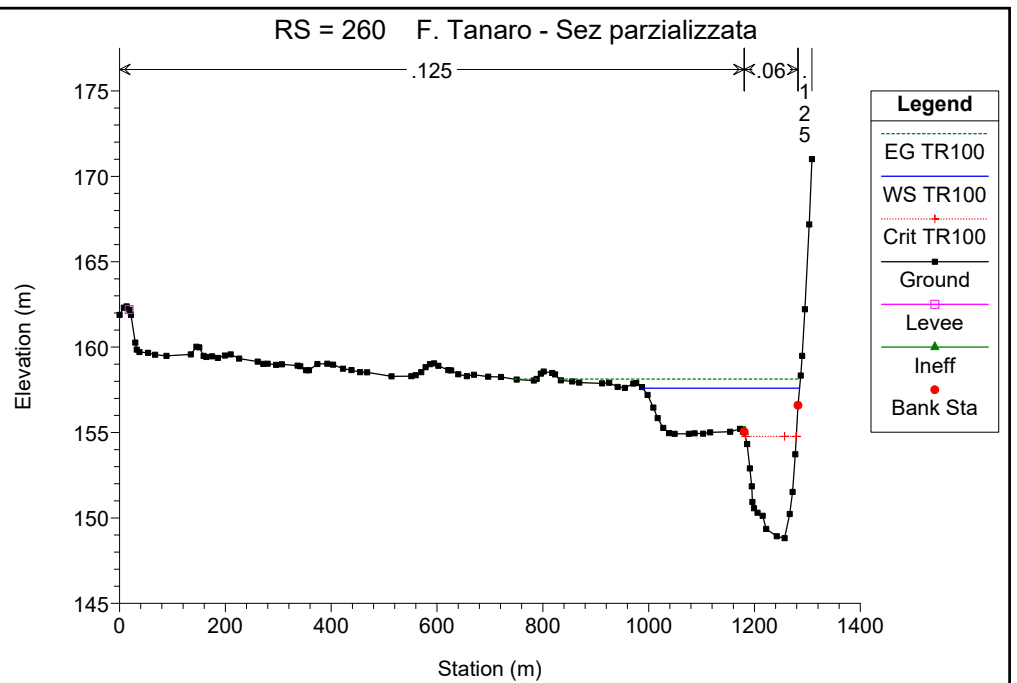
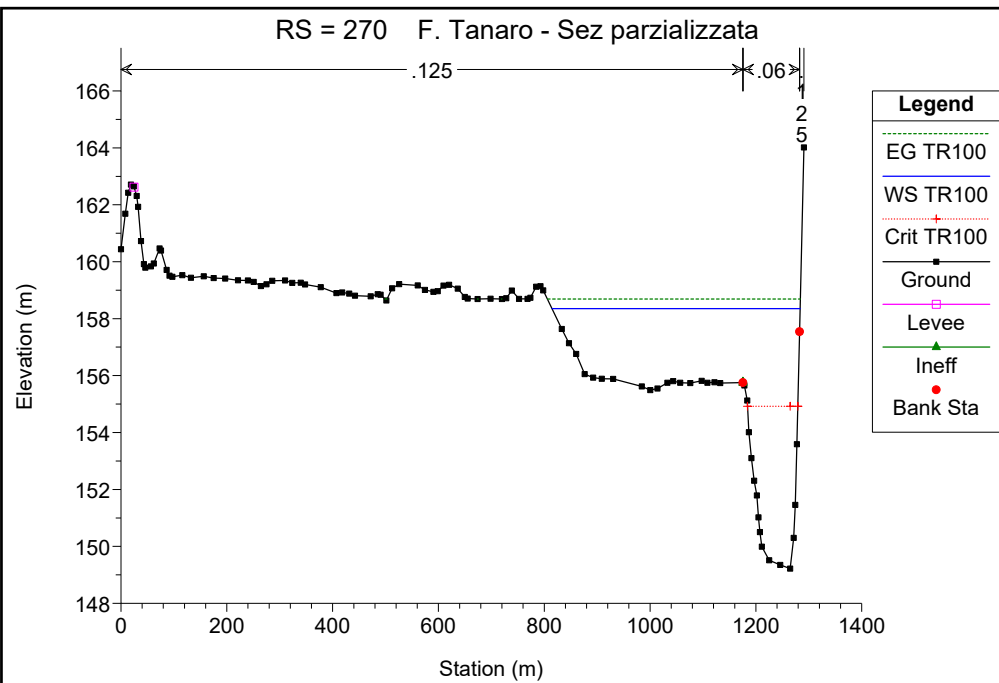


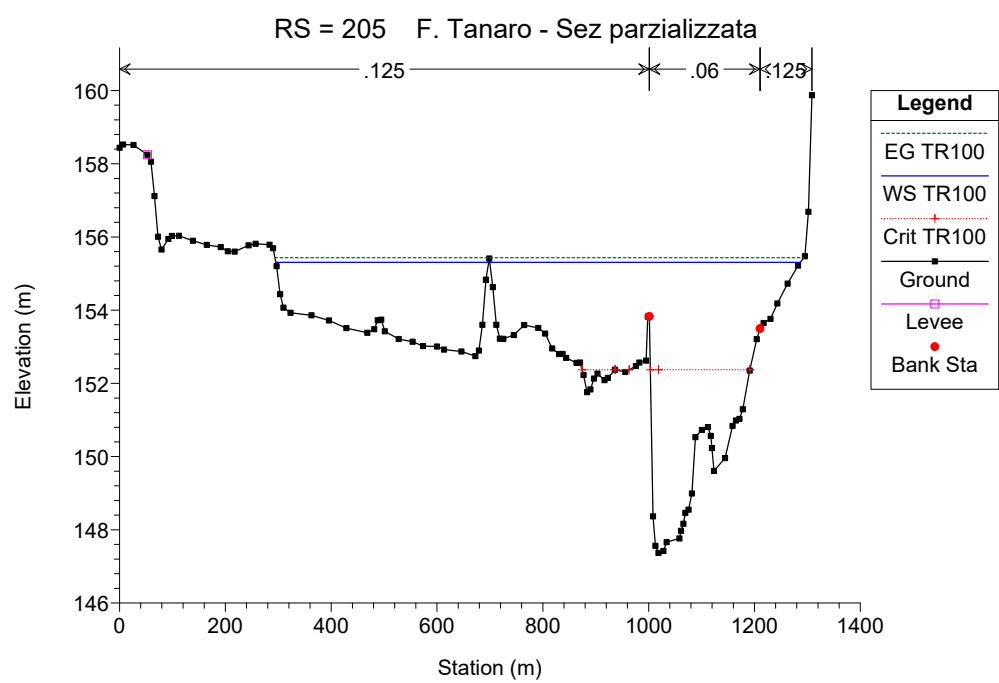
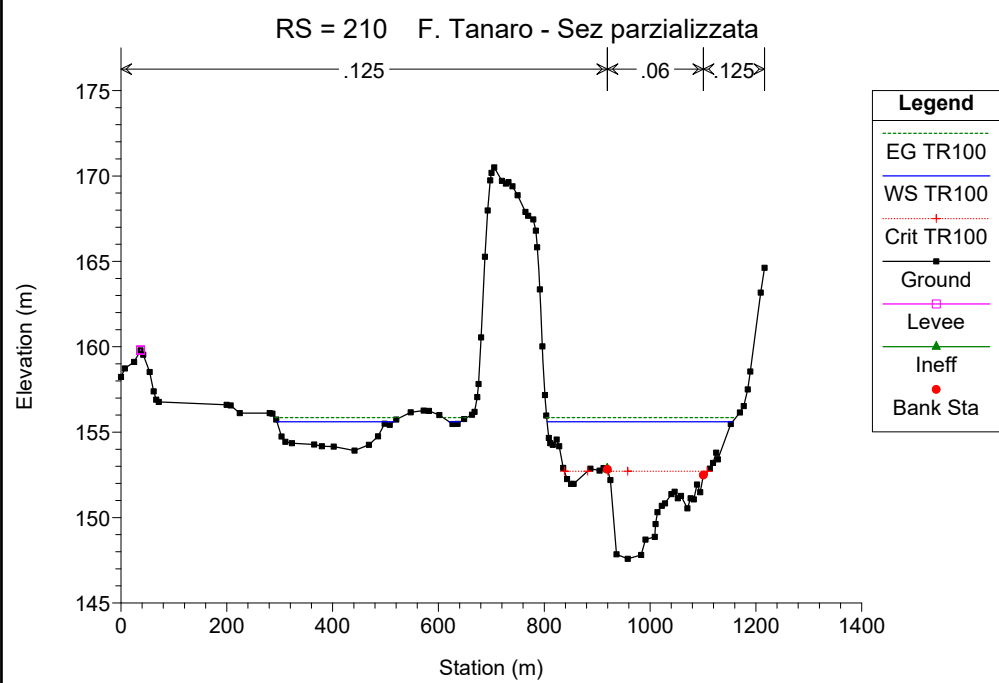
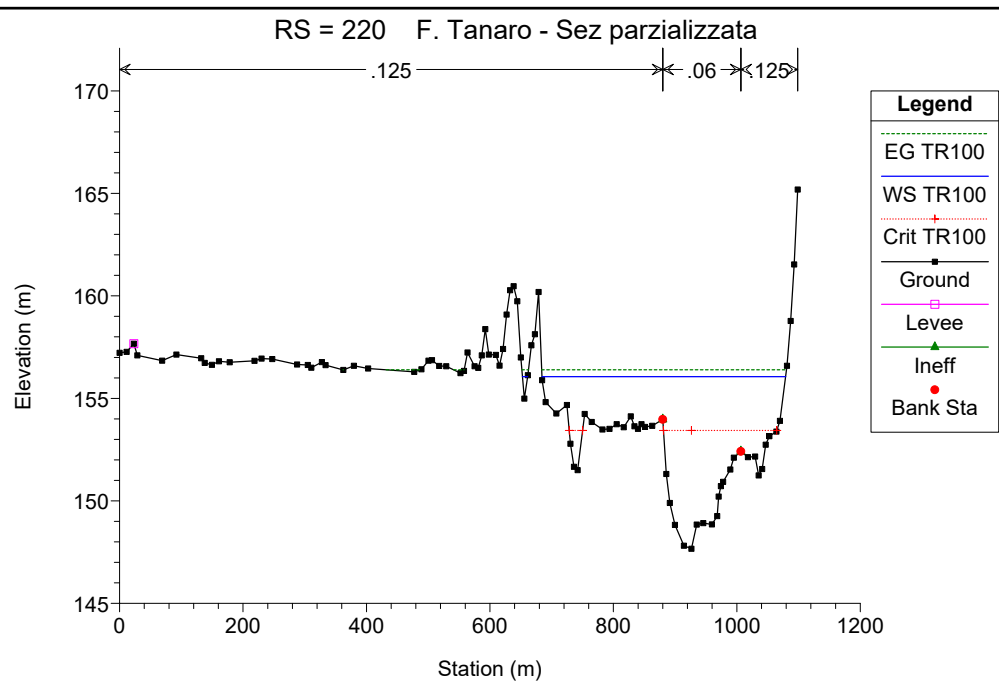
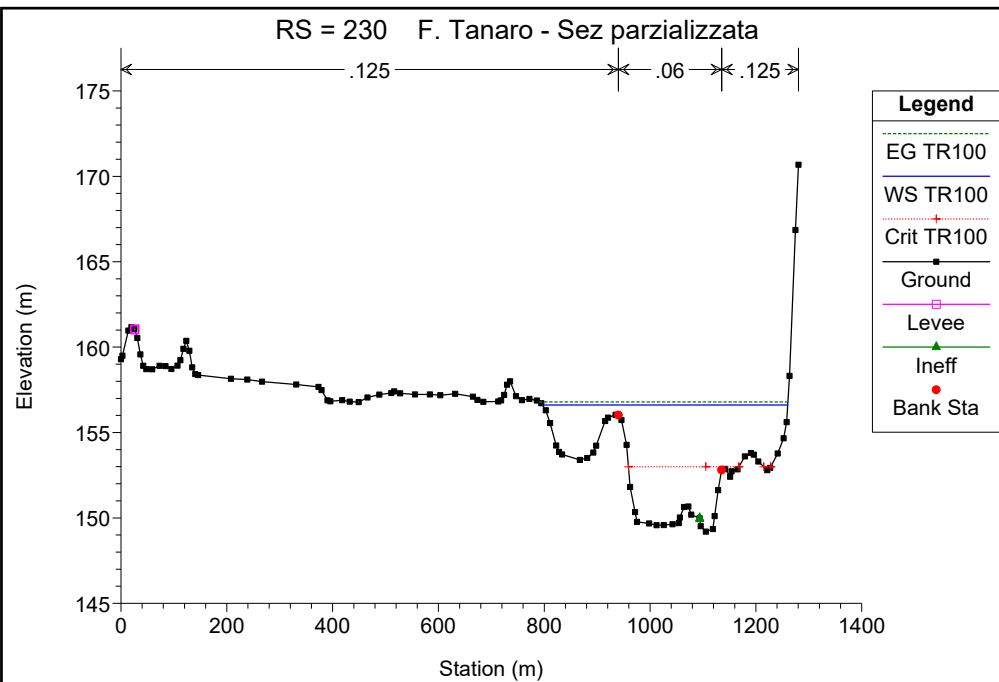


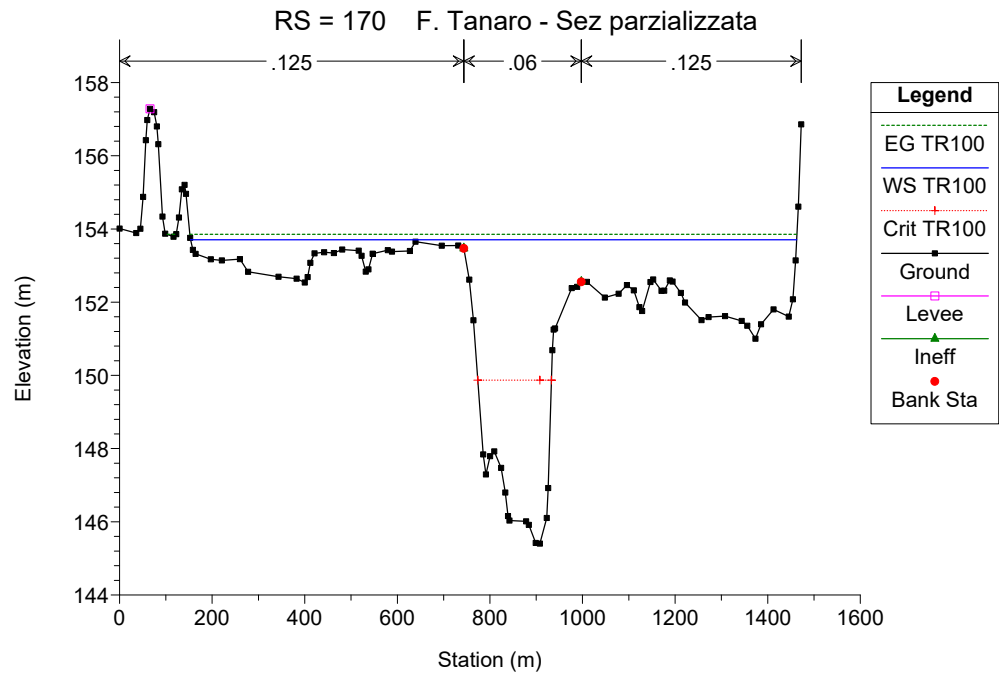
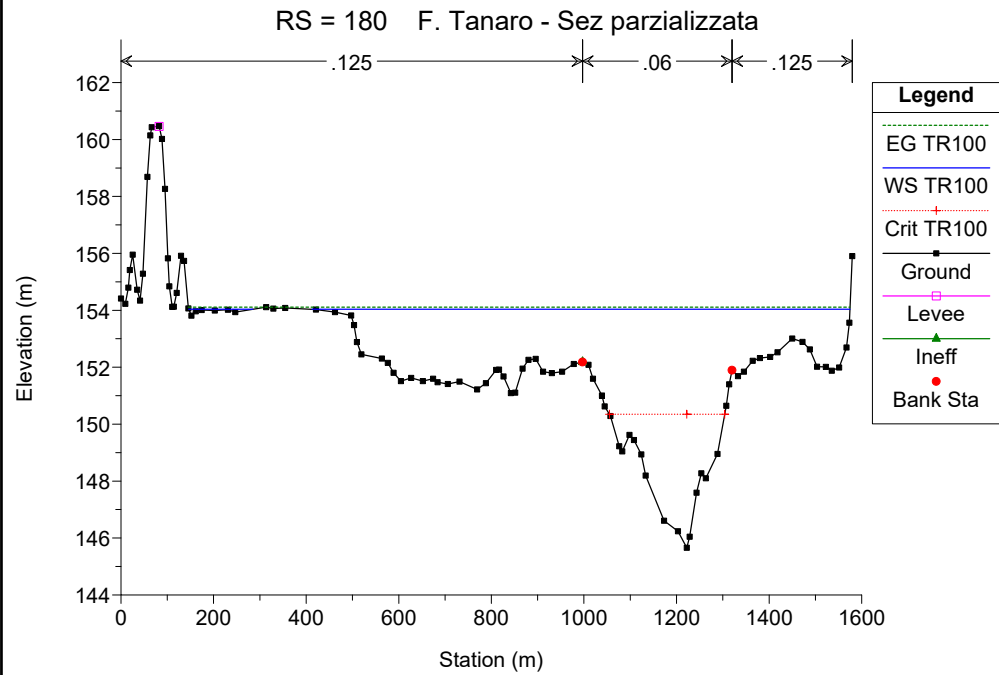
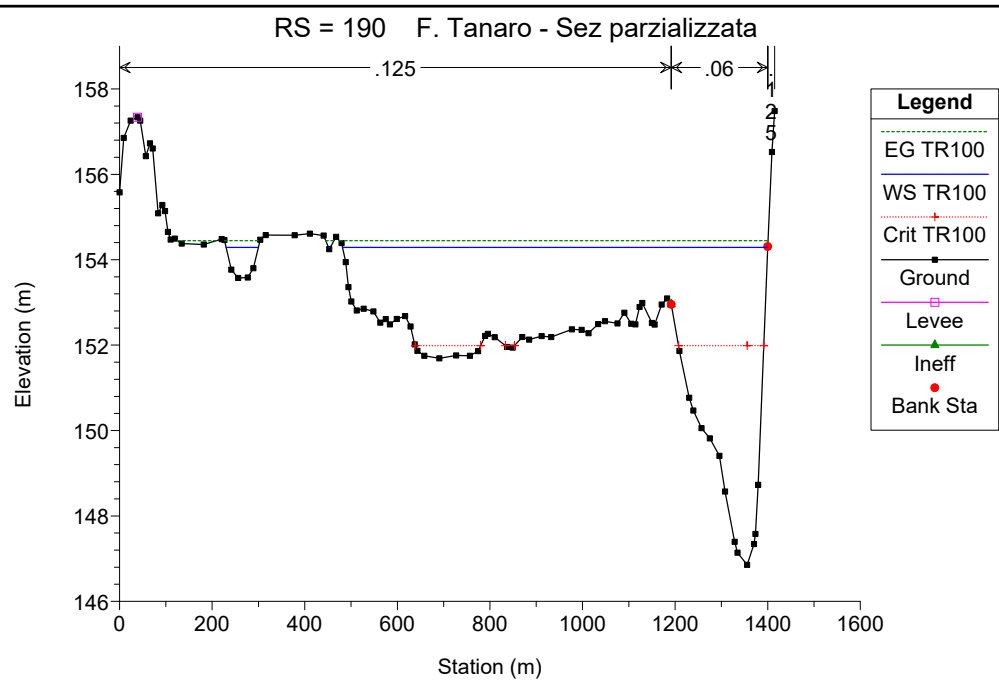
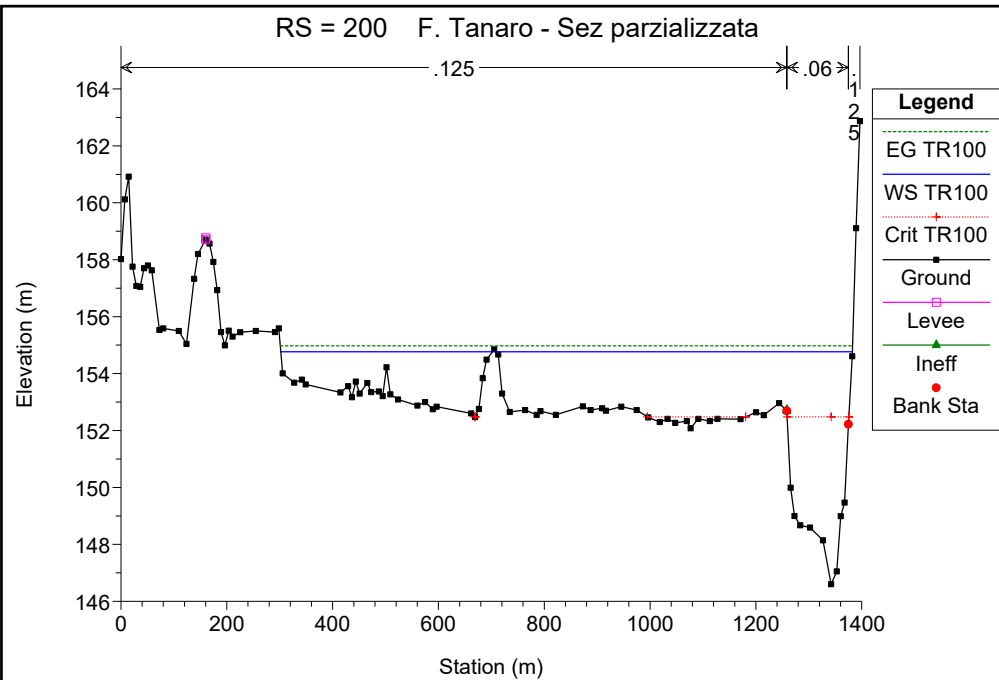


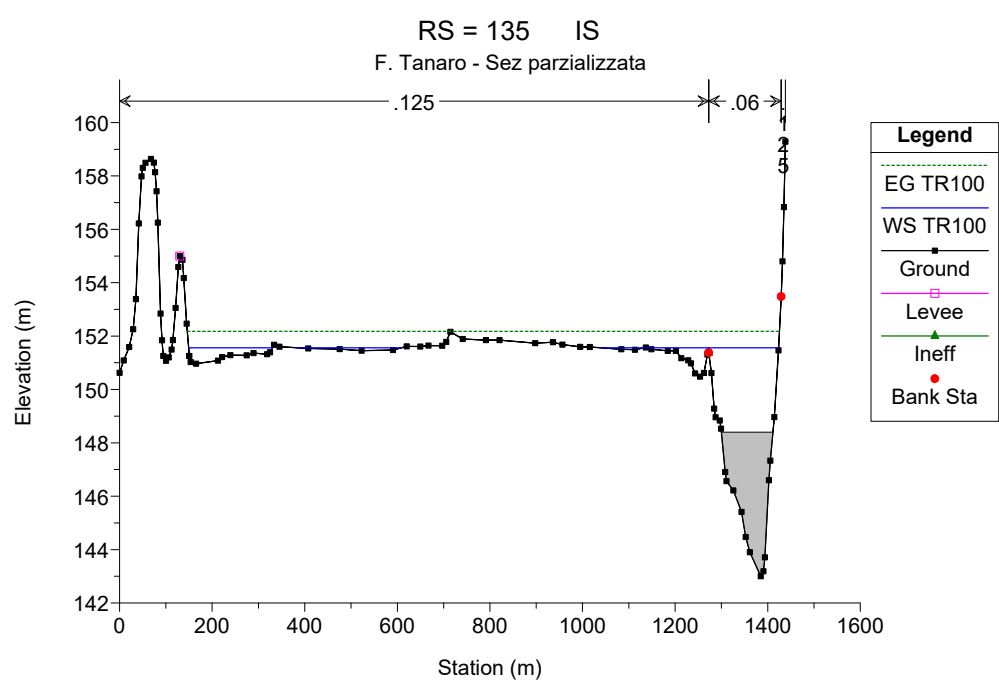
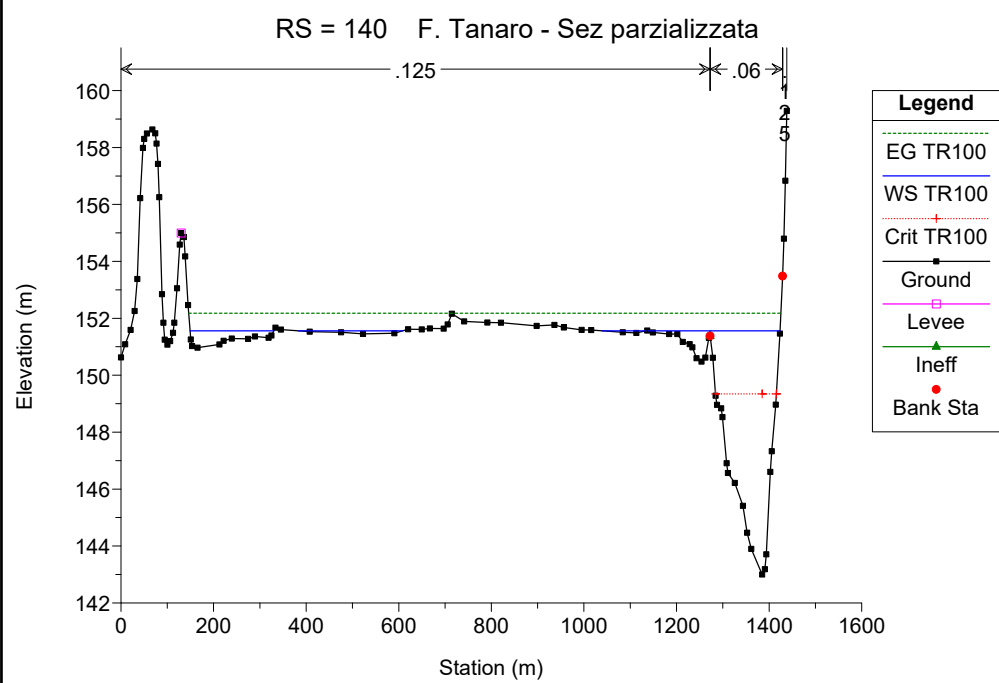
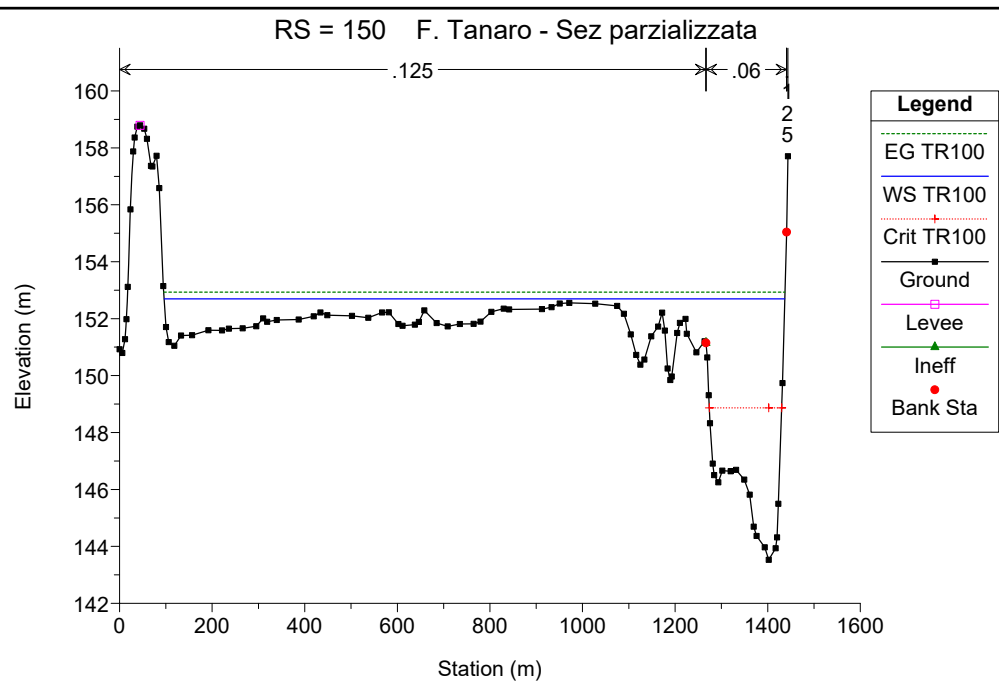
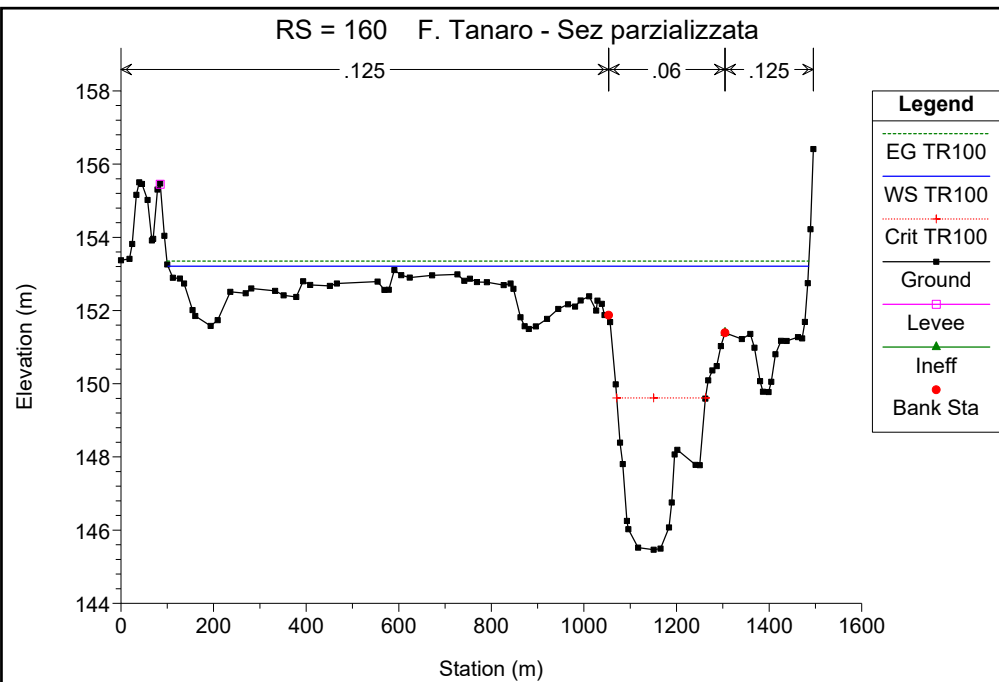


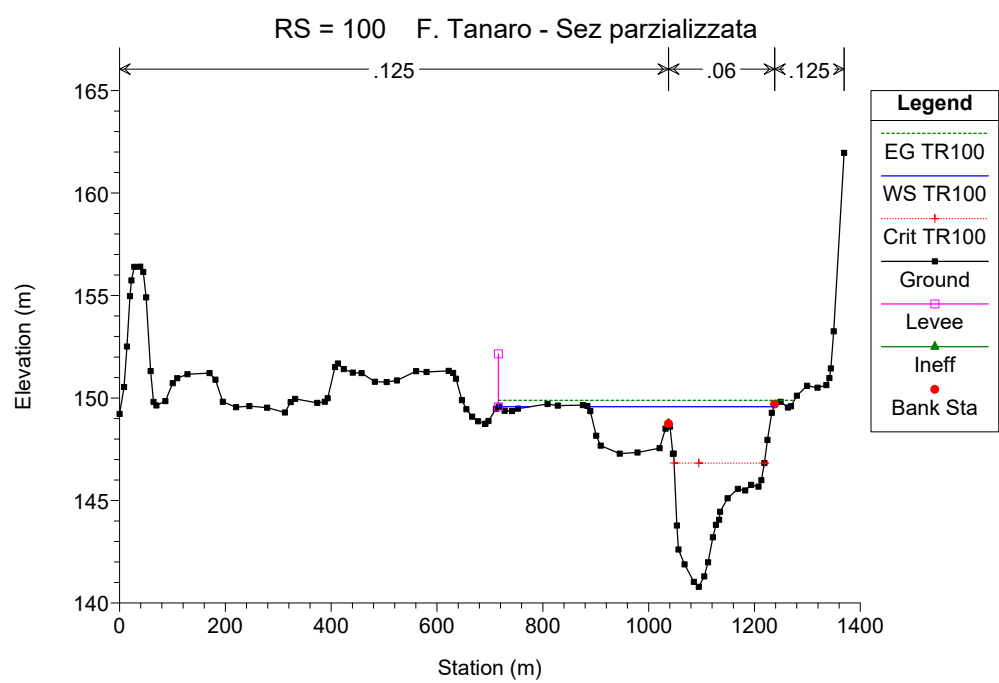
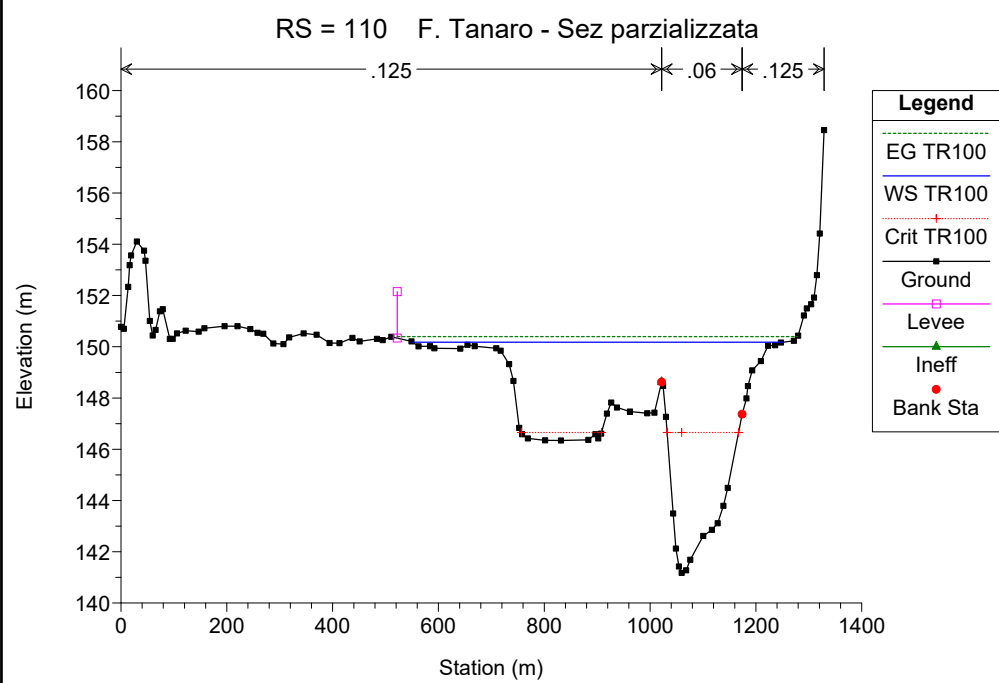
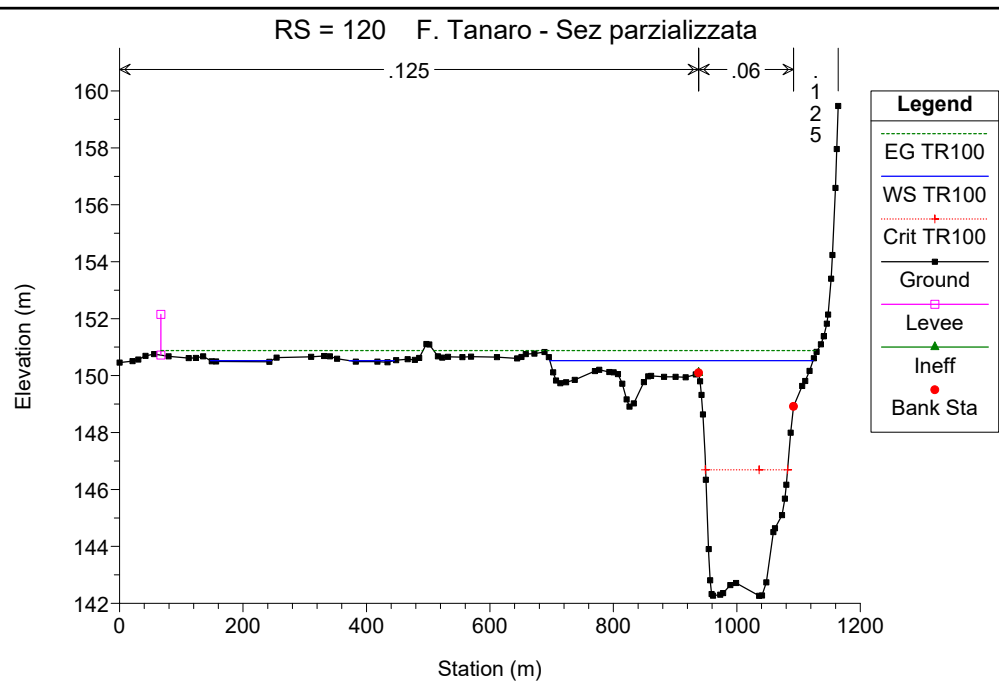
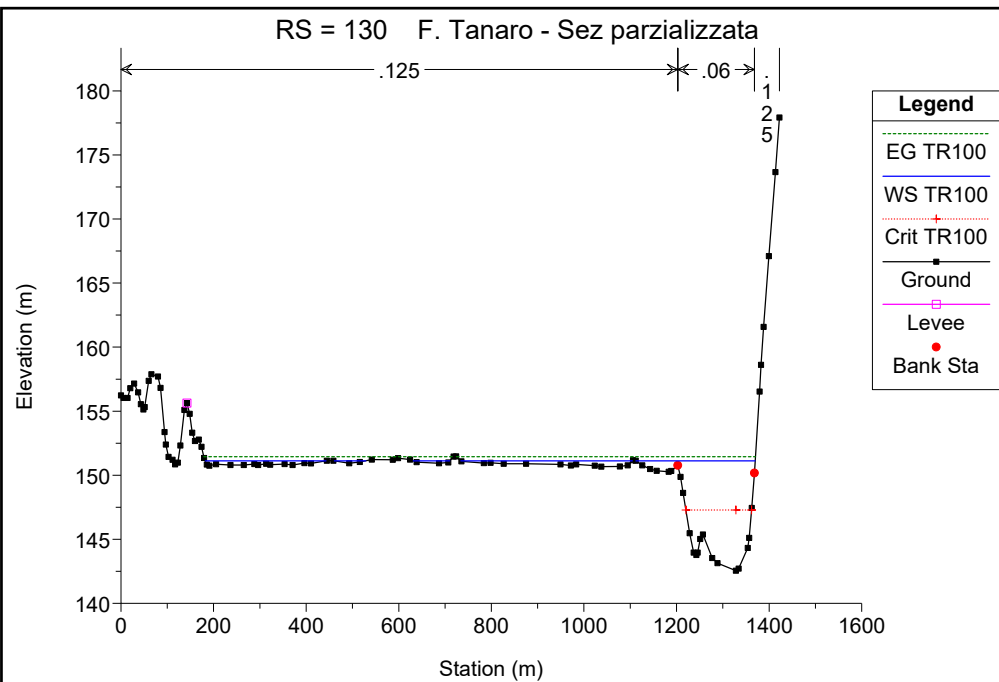


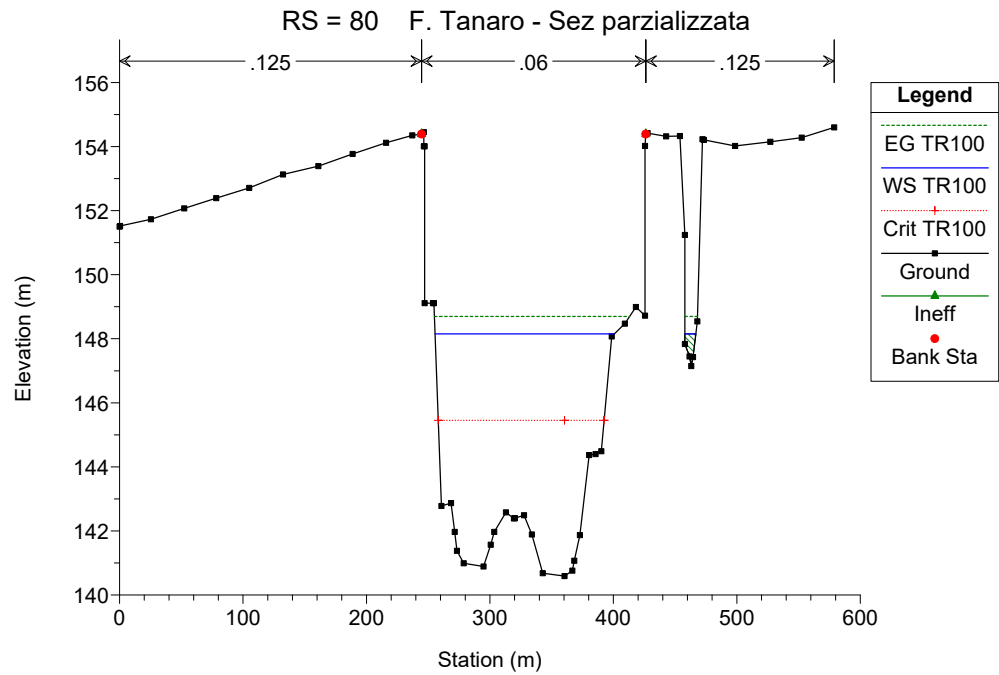
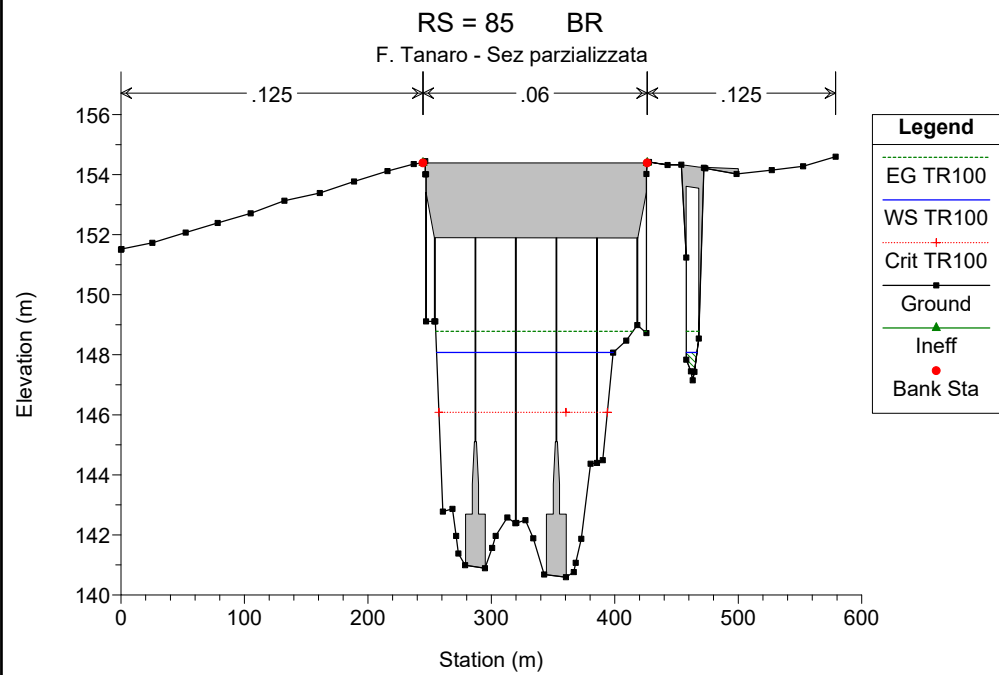
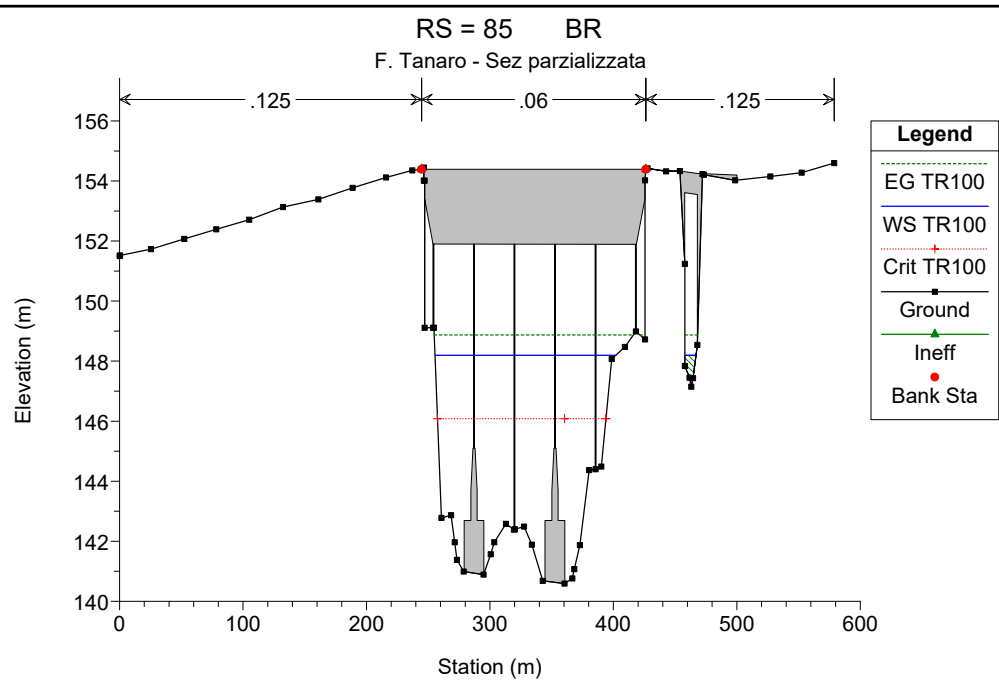
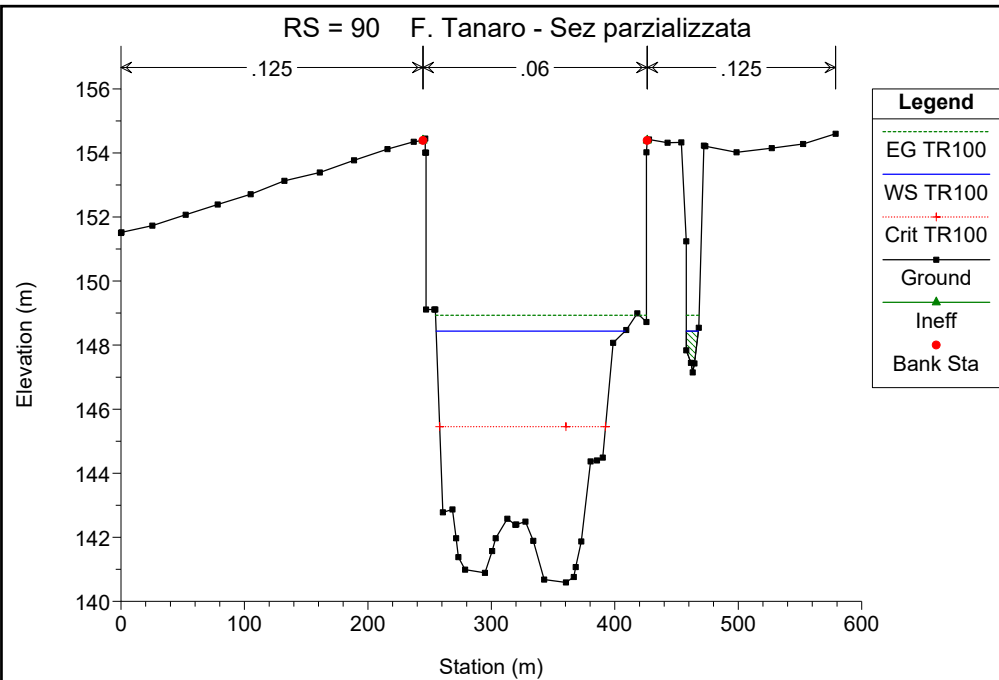


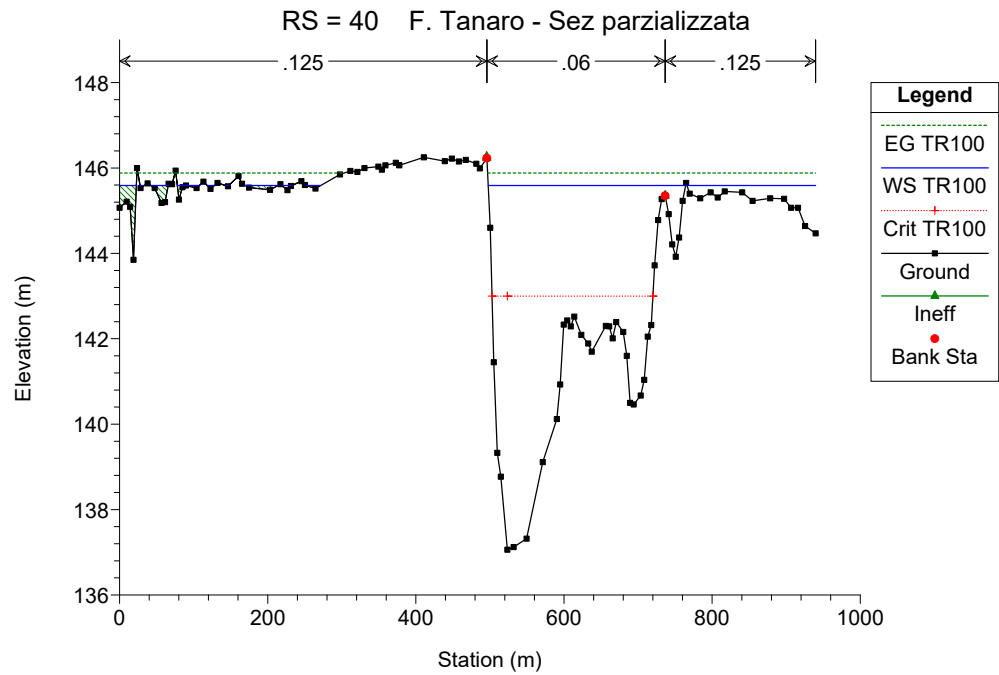
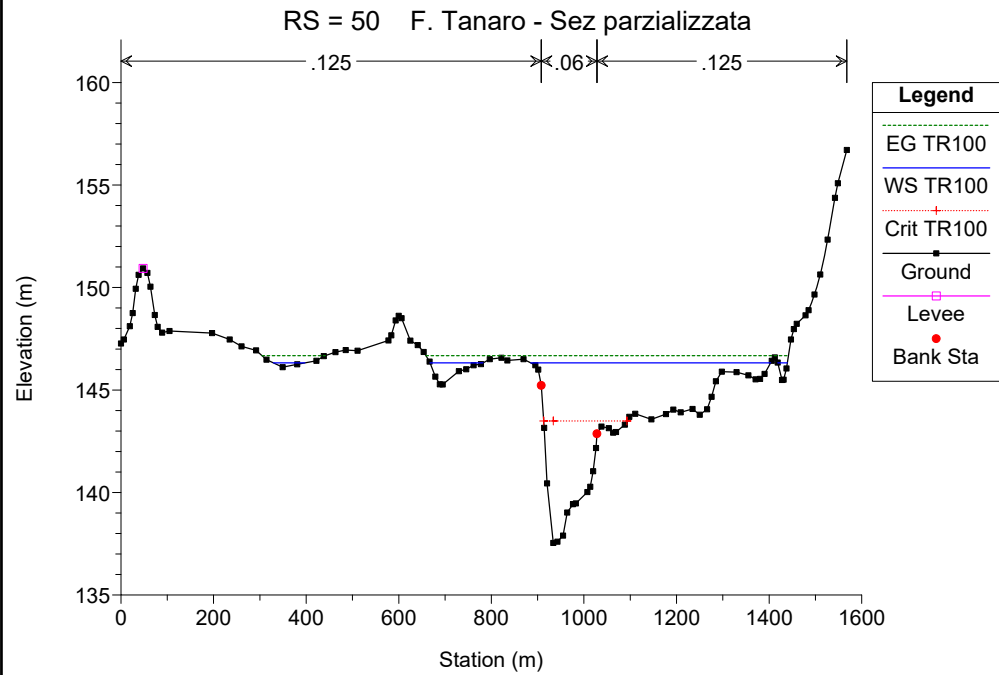
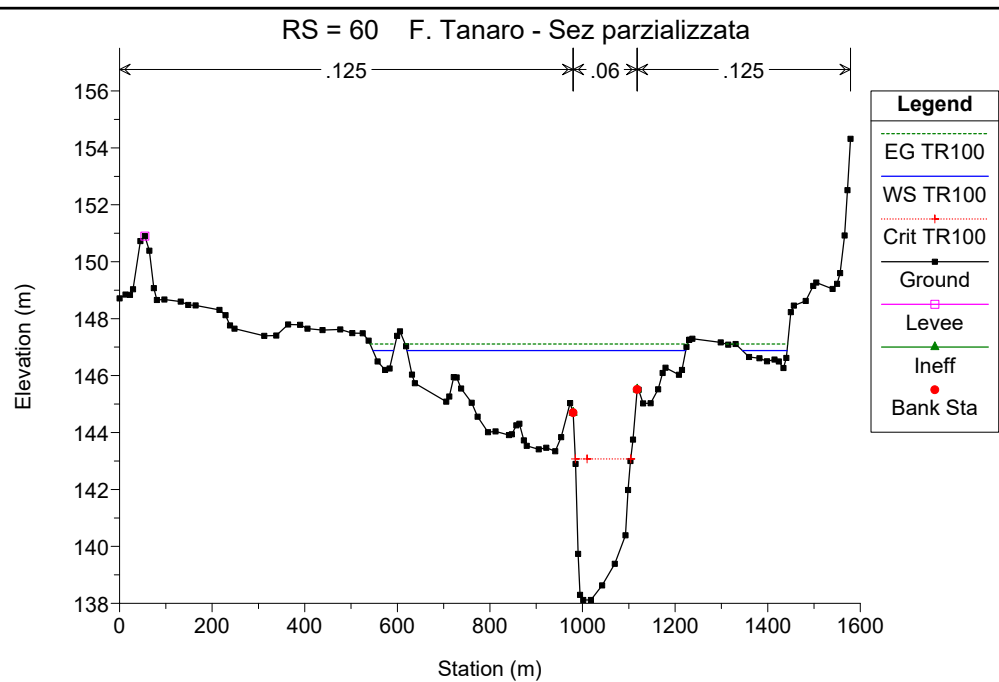
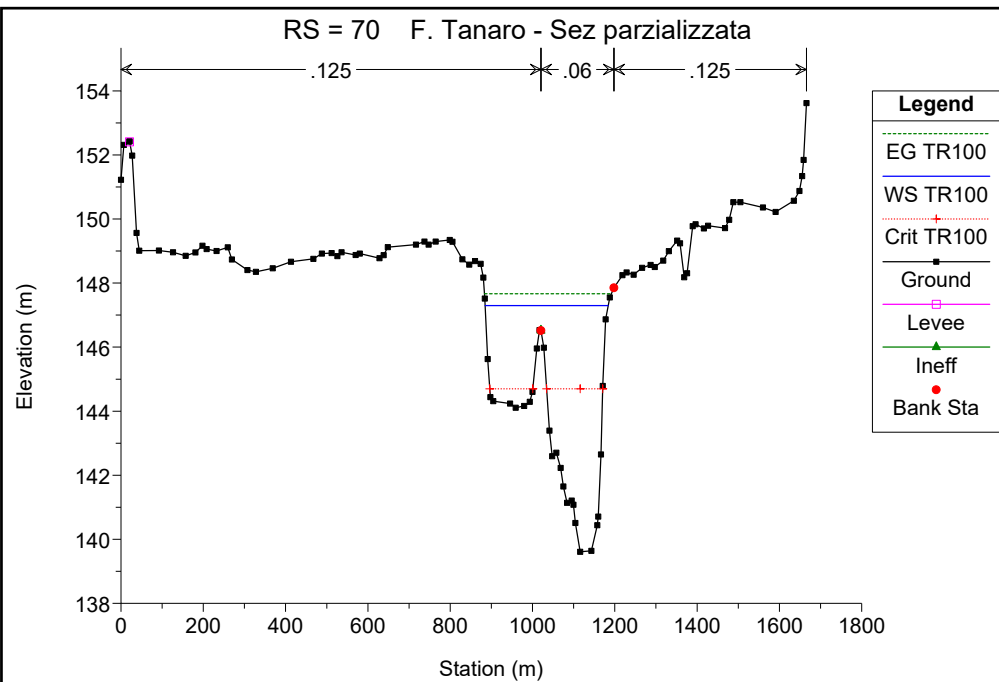


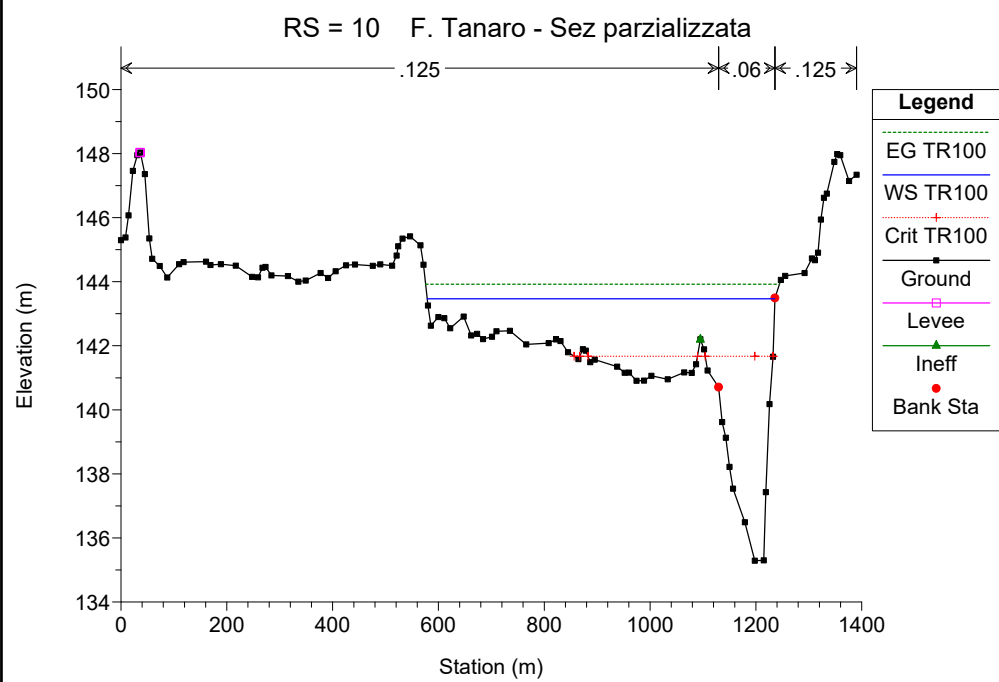
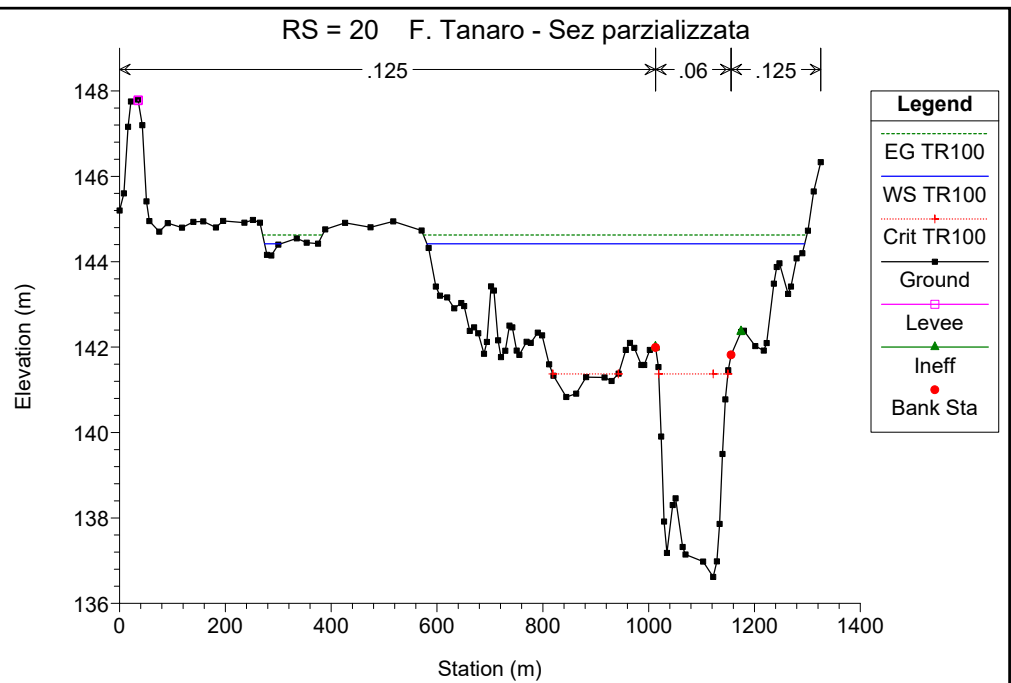
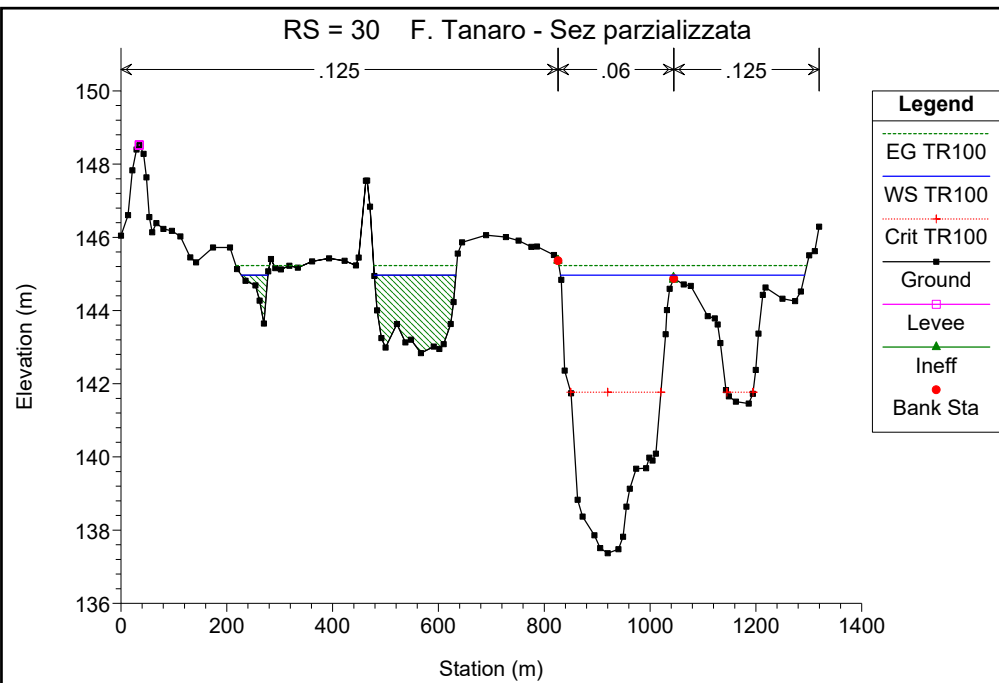












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 13

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3050	200
F. Tanaro valle Riddone	3058	
F. Tanaro valle Cherasca	3070	

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

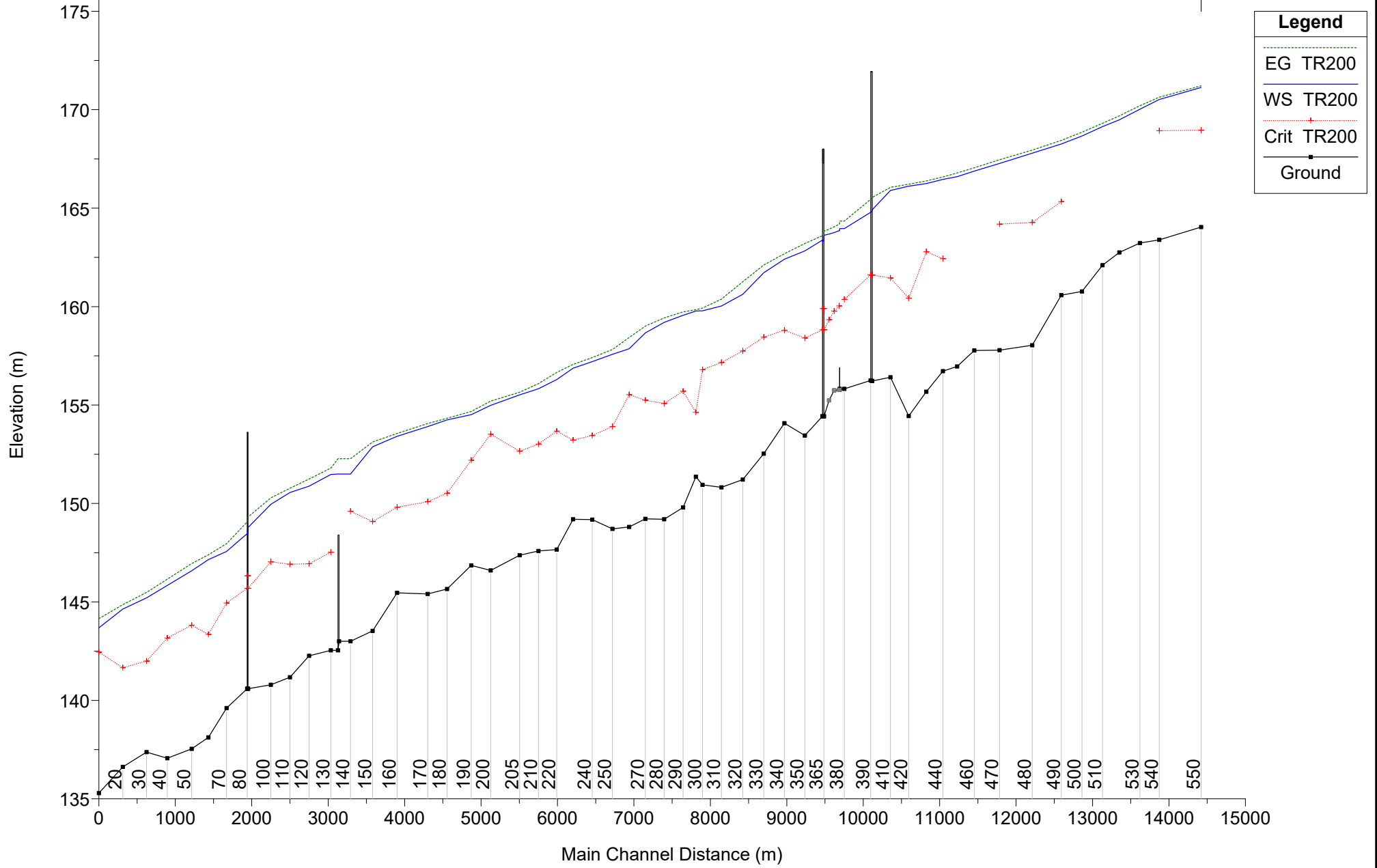
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001114	1.47	3245.02	1183.04	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.63	0.001628	2.09	3287.41	1121.44	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001814	2.16	2285.24	674.39	0.30
1	520	TR200	3050.00	162.75	169.49		169.69	0.002098	2.37	2500.25	1043.05	0.32
1	510	TR200	3050.00	162.10	169.14		169.31	0.001870	2.12	2425.07	736.79	0.30
1	500	TR200	3050.00	160.77	168.67		168.86	0.001597	2.19	2161.01	553.58	0.28
1	490	TR200	3050.00	160.58	168.26	165.33	168.44	0.001546	2.04	2004.19	517.20	0.28
1	480	TR200	3050.00	158.04	167.80	164.27	167.95	0.001188	1.96	2526.50	817.63	0.25
1	470	TR200	3050.00	157.79	167.27	164.19	167.46	0.001391	2.21	2236.98	561.15	0.27
1	460	TR200	3050.00	157.77	166.88		167.05	0.001092	1.98	2587.21	857.12	0.24
1	450	TR200	3050.00	156.96	166.60		166.79	0.001187	2.10	2454.65	1035.57	0.25
1	440	TR200	3050.00	156.72	166.46	162.43	166.58	0.000840	1.83	3045.97	798.17	0.21
1	430	TR200	3050.00	155.68	166.25	162.79	166.38	0.001015	2.02	2925.91	665.86	0.23
1	420	TR200	3050.00	154.44	166.12	160.43	166.22	0.000564	1.67	3253.43	689.26	0.18
1	410	TR200	3050.00	156.41	165.90	161.45	166.06	0.000975	2.01	2488.47	545.65	0.23
1	400	TR200	3050.00	156.22	164.92	161.61	165.55	0.003377	3.60	976.22	176.84	0.42
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.79	161.61	165.45	0.003586	3.67	954.69	175.46	0.43
1	380	TR200	3050.00	155.82	163.97	160.36	164.35	0.002198	2.75	1162.90	261.35	0.34
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.63	158.82	163.84	0.001072	2.02	1511.67	207.75	0.24
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.39	158.82	163.61	0.001195	2.09	1461.18	207.08	0.25
1	350	TR200	3050.00	153.45	162.84	158.40	163.22	0.001926	2.73	1192.34	288.94	0.32
1	340	TR200	3058.00	154.08	162.42	158.80	162.70	0.001759	2.38	1479.22	387.11	0.30
1	330	TR200	3058.00	152.53	161.73	158.45	162.12	0.002459	2.85	1355.01	439.66	0.36
1	320	TR200	3058.00	151.21	160.64	157.75	161.28	0.003683	3.81	1349.52	573.85	0.44
1	310	TR200	3058.00	150.82	160.05	157.18	160.40	0.002469	3.04	1927.28	772.62	0.36
1	300	TR200	3070.00	150.95	159.81	156.81	159.95	0.001182	1.92	2739.56	878.48	0.25
1	295	TR200	3070.00	151.36	159.80	154.64	159.86	0.000391	1.17	3326.07	906.42	0.14
1	290	TR200	3070.00	149.80	159.58	155.72	159.75	0.001181	1.95	2238.74	695.32	0.25
1	280	TR200	3070.00	149.20	159.22	155.10	159.45	0.001365	2.35	2119.29	535.37	0.27
1	270	TR200	3070.00	149.22	158.69	155.28	159.03	0.002141	2.93	1784.19	481.90	0.34
1	260	TR200	3070.00	148.81	157.88	155.55	158.46	0.003449	3.61	1238.07	355.34	0.43
1	250	TR200	3070.00	148.71	157.60	153.93	157.84	0.001764	2.43	1987.31	556.75	0.30
1	240	TR200	3070.00	149.18	157.22	153.47	157.43	0.001373	2.22	2299.93	764.34	0.27
1	230	TR200	3070.00	149.20	156.89	153.23	157.08	0.001350	2.10	2023.69	581.55	0.27
1	220	TR200	3070.00	147.66	156.31	153.69	156.67	0.002561	2.94	1597.51	428.04	0.37
1	210	TR200	3070.00	147.59	155.84	153.03	156.10	0.001967	2.43	1850.52	636.44	0.32
1	205	TR200	3070.00	147.37	155.53	152.67	155.66	0.001271	1.87	2922.19	1003.43	0.25

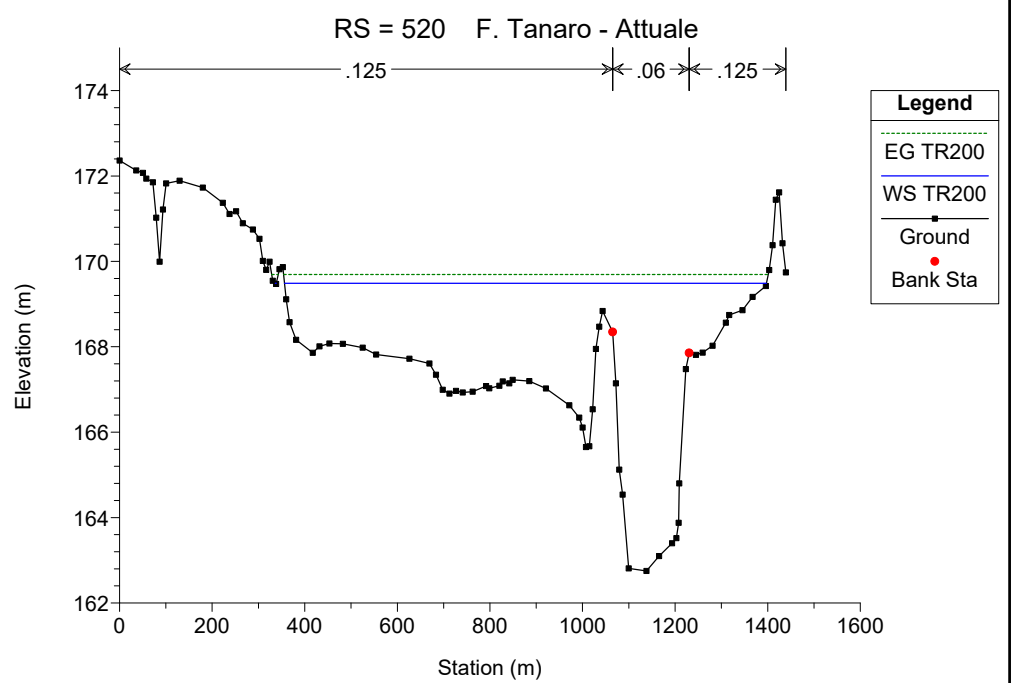
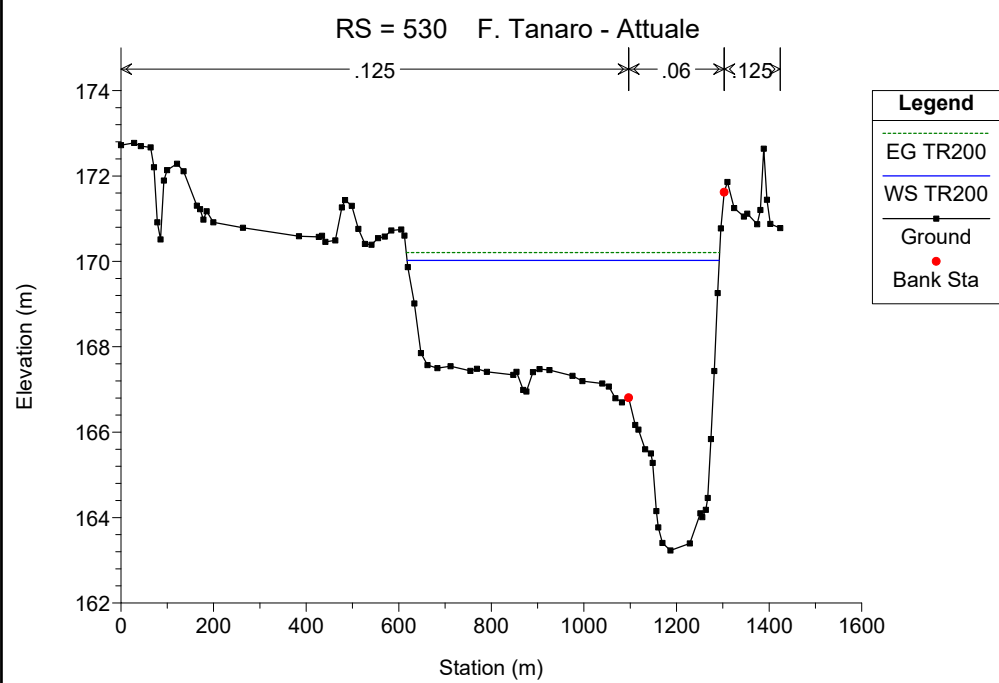
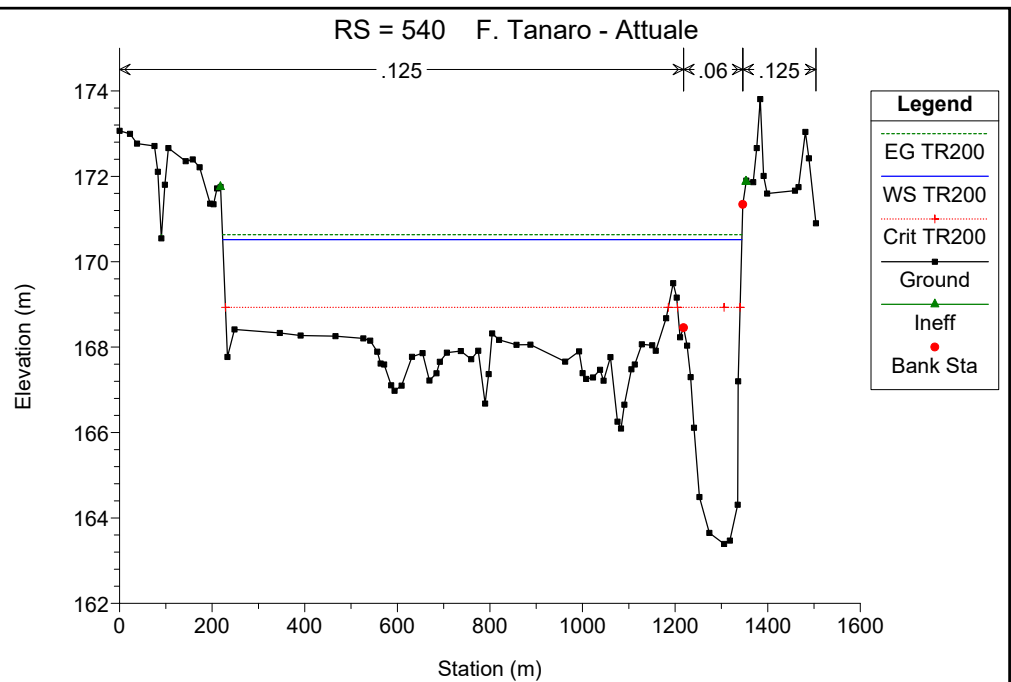
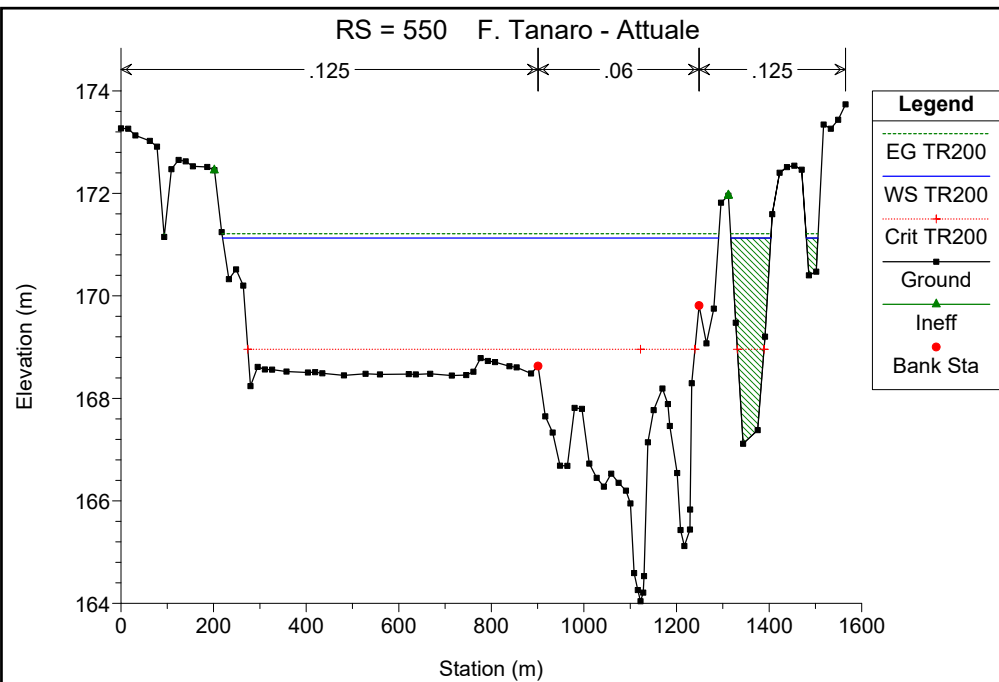
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

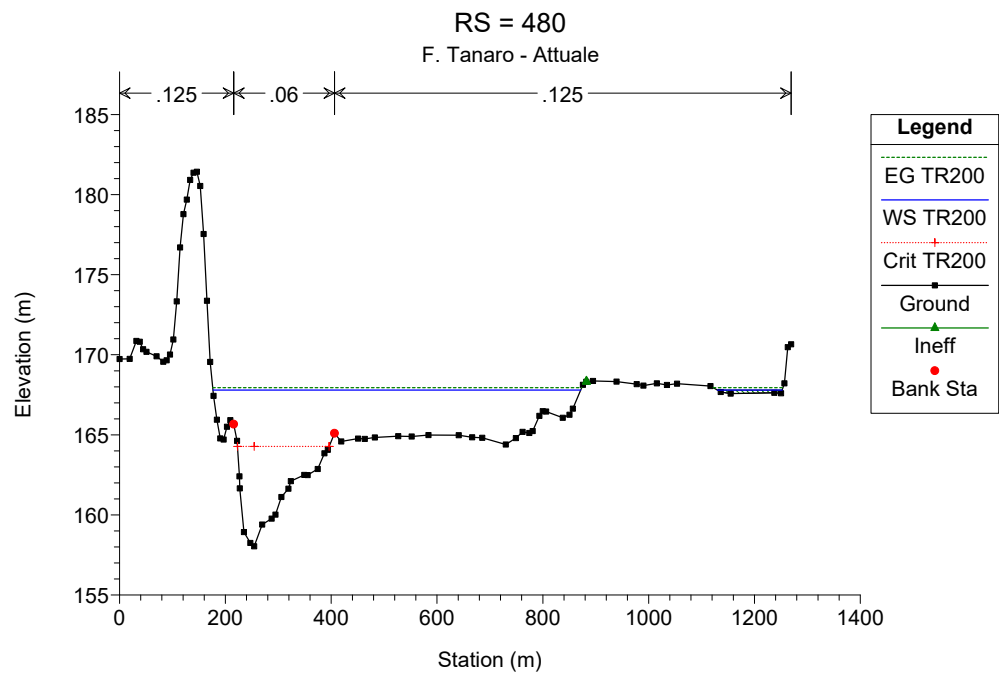
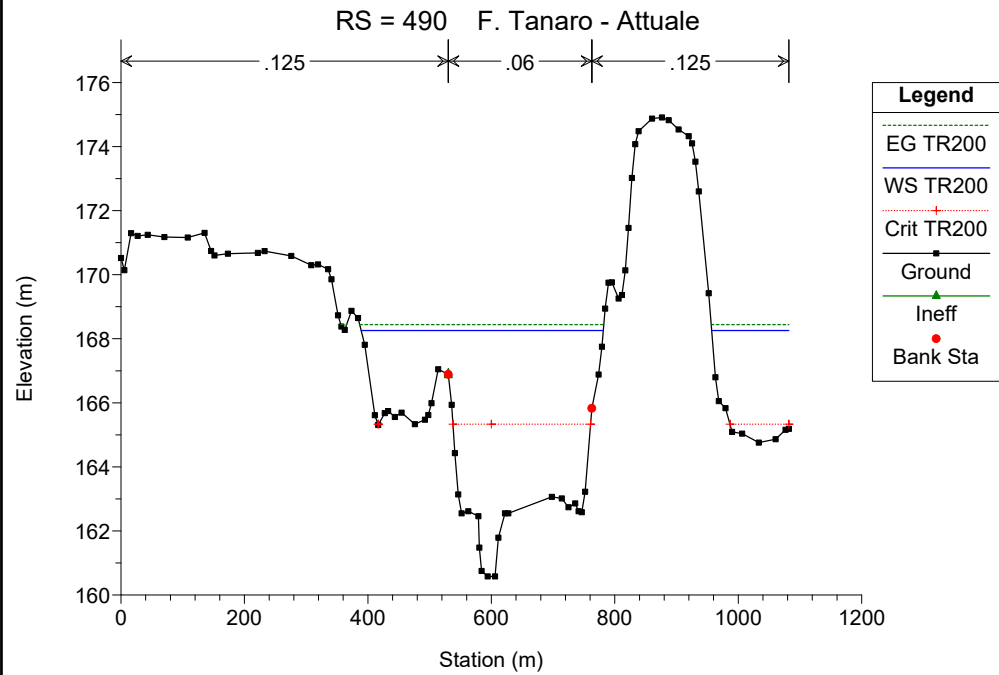
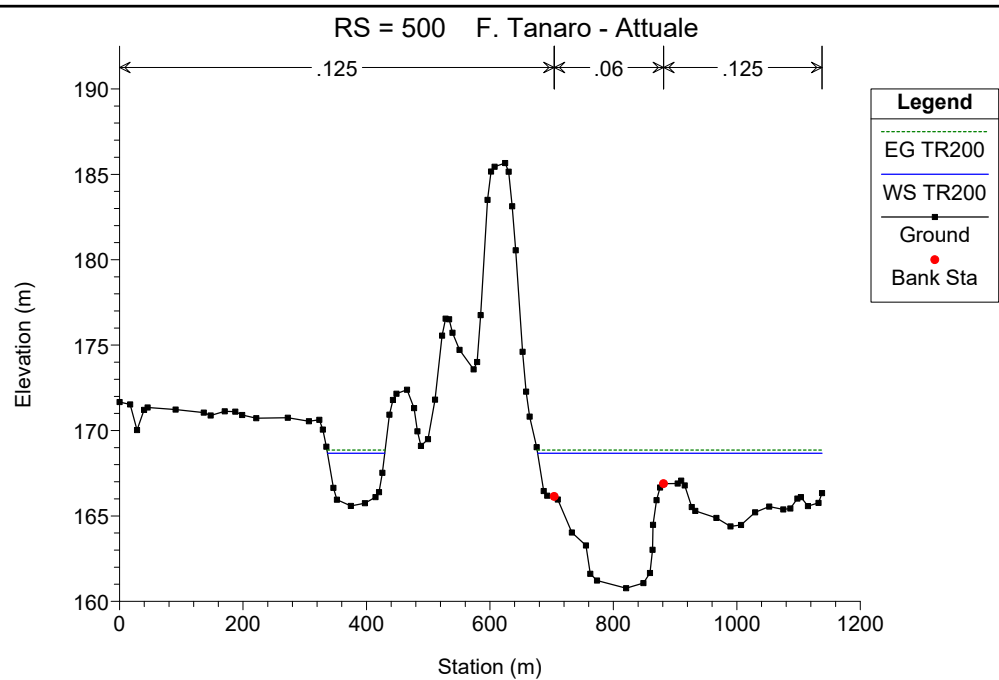
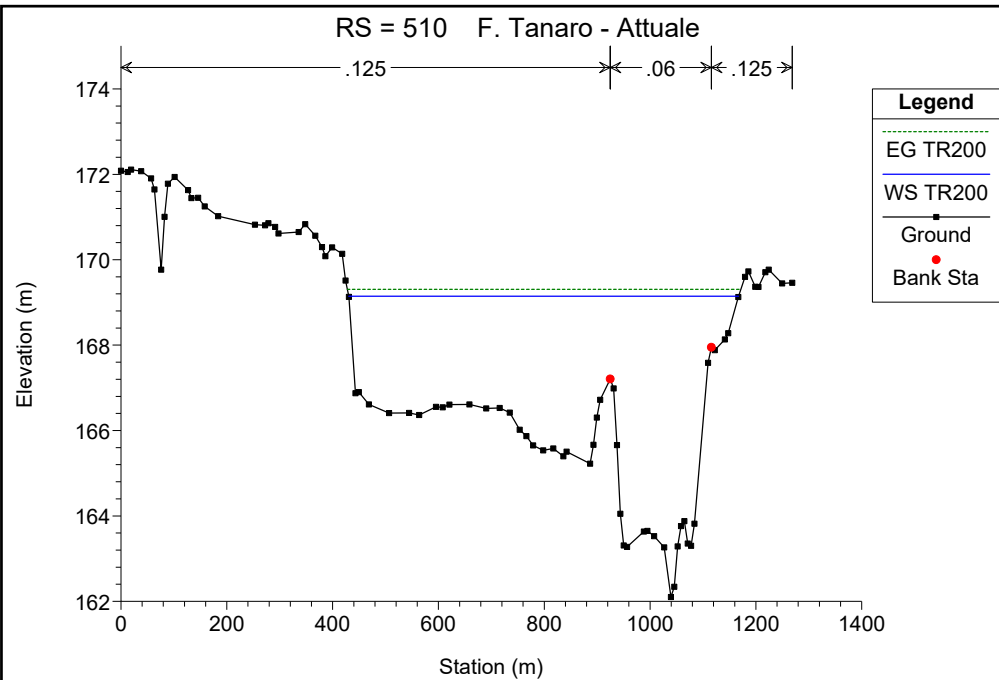
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	TR200	3070.00	146.60	155.00	153.53	155.21	0.002021	2.56	2746.11	1082.06	0.32
1	190	TR200	3070.00	146.85	154.52	152.21	154.69	0.001878	2.10	2652.06	1158.72	0.30
1	180	TR200	3070.00	145.66	154.26	150.54	154.34	0.000758	1.42	3567.74	1436.83	0.19
1	170	TR200	3070.00	145.40	153.92	150.11	154.08	0.001444	1.90	2670.61	1337.82	0.27
1	160	TR200	3070.00	145.46	153.42	149.83	153.57	0.001201	1.84	2747.73	1387.58	0.25
1	150	TR200	3070.00	143.53	152.89	149.10	153.14	0.001549	2.33	2329.68	1341.68	0.29
1	140	TR200	3070.00	143.00	151.50	149.62	152.28	0.006444	3.94	868.40	578.08	0.56
1	135		Inl Struct									
1	130	TR200	3070.00	142.54	151.50	147.54	151.82	0.001863	2.58	1740.01	1191.99	0.31
1	120	TR200	3070.00	142.27	150.90	146.96	151.27	0.002018	2.72	1551.38	1047.96	0.33
1	110	TR200	3070.00	141.17	150.58	146.94	150.80	0.001443	2.29	2322.27	759.96	0.28
1	100	TR200	3070.00	140.79	149.99	147.05	150.31	0.002557	2.60	1530.40	561.47	0.35
1	90	TR200	3070.00	140.59	148.81	145.71	149.34	0.003742	3.24	946.70	172.92	0.43
1	85		Bridge									
1	80	TR200	3070.00	140.59	148.50	145.71	149.09	0.004172	3.42	897.97	164.60	0.45
1	70	TR200	3070.00	139.61	147.59	144.97	147.99	0.003359	2.95	1313.38	305.57	0.41
1	60	TR200	3070.00	138.12	147.17	143.37	147.42	0.001556	2.44	2182.01	818.21	0.29
1	50	TR200	3070.00	137.54	146.60	143.99	146.97	0.002468	2.98	1840.17	907.16	0.36
1	40	TR200	3070.00	137.06	145.86	143.18	146.17	0.002702	2.52	1343.30	737.82	0.36
1	30	TR200	3070.00	137.37	145.22	142.02	145.50	0.002228	2.42	1581.88	738.76	0.33
1	20	TR200	3070.00	136.62	144.66	141.68	144.87	0.001721	2.40	2341.28	840.96	0.30
1	10	TR200	3070.00	135.29	143.70	142.45	144.17	0.004002	3.49	1689.40	662.87	0.45

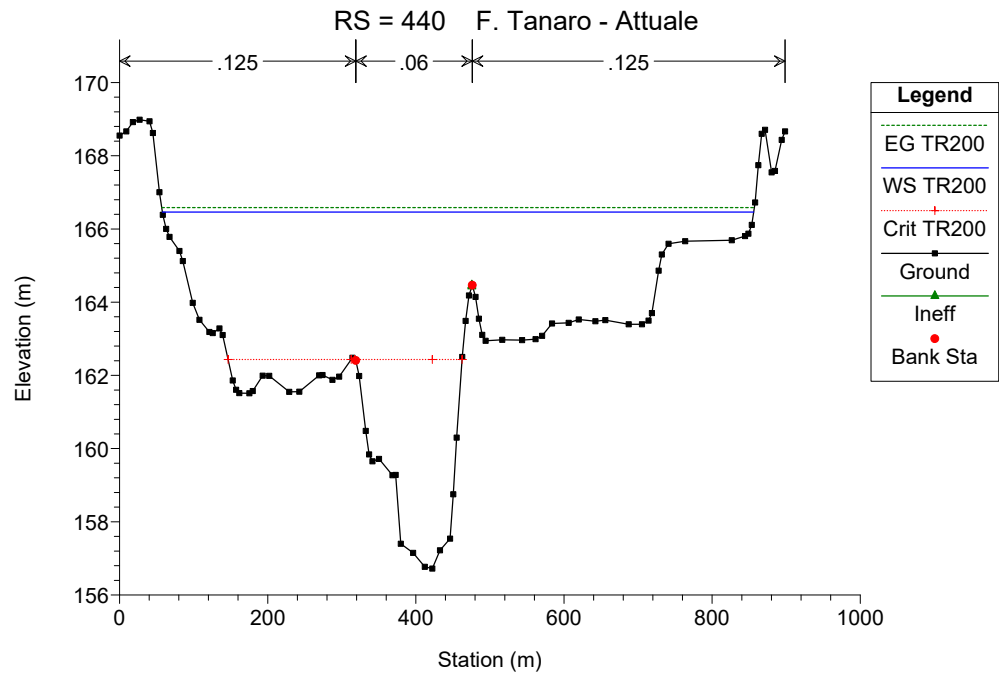
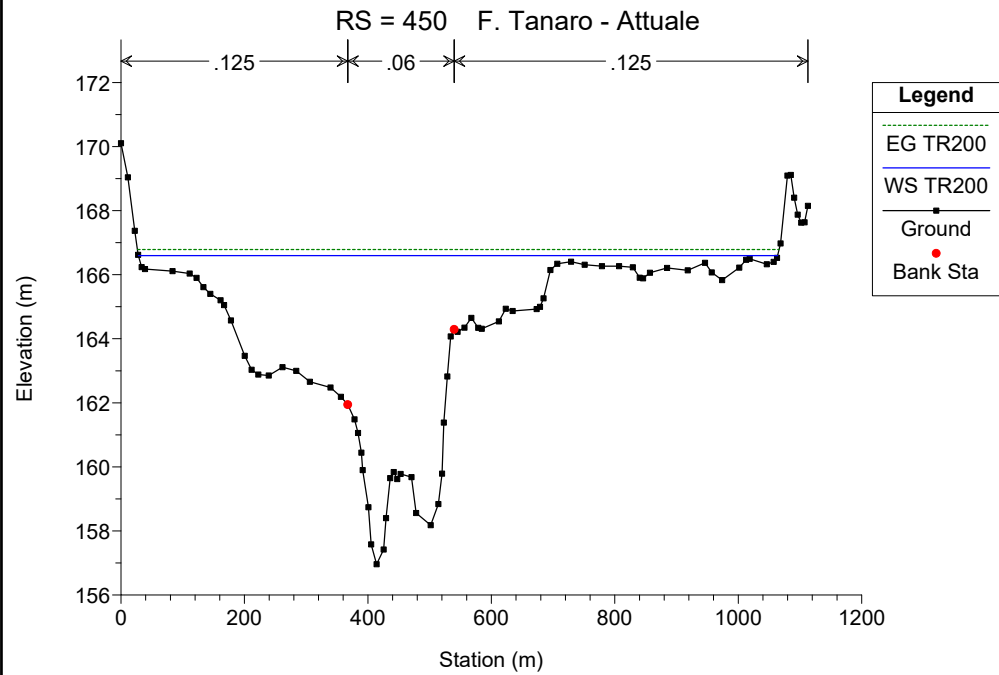
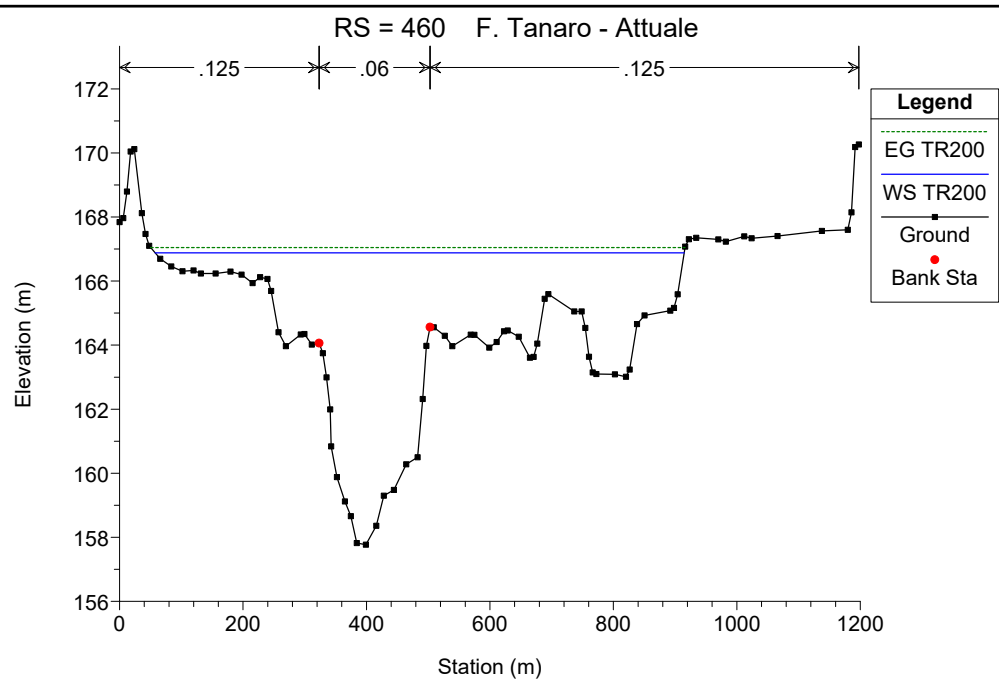
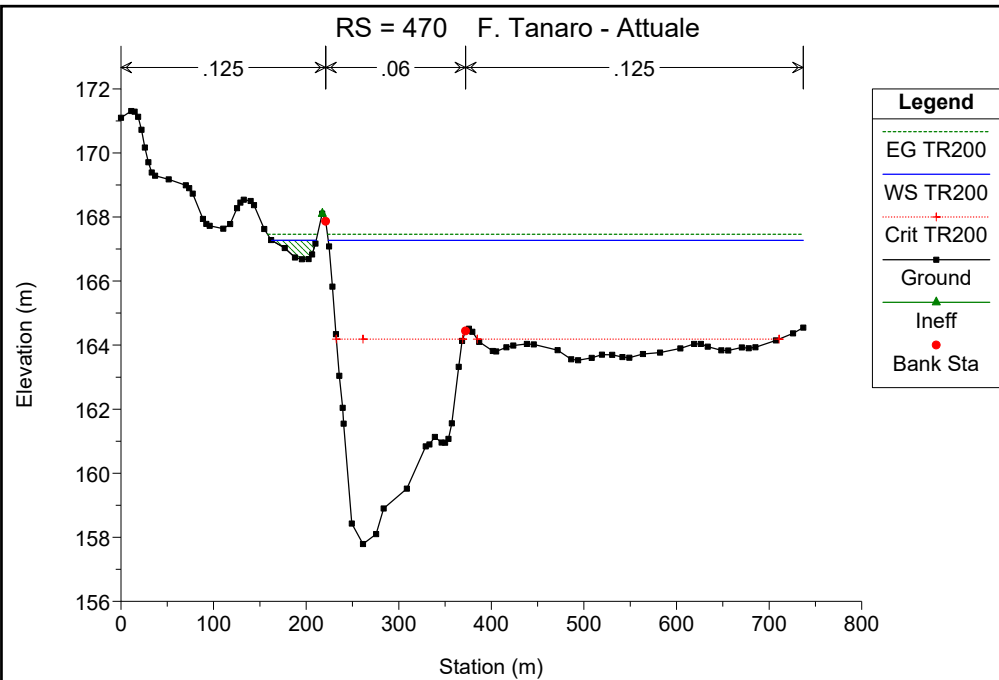
F. Tanaro - Attuale

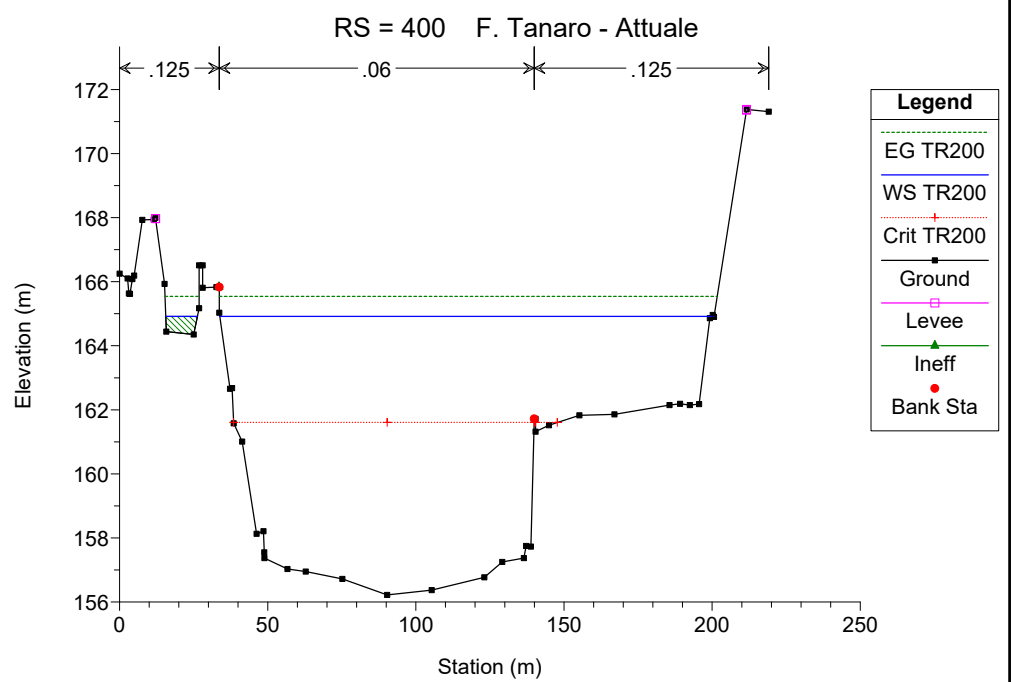
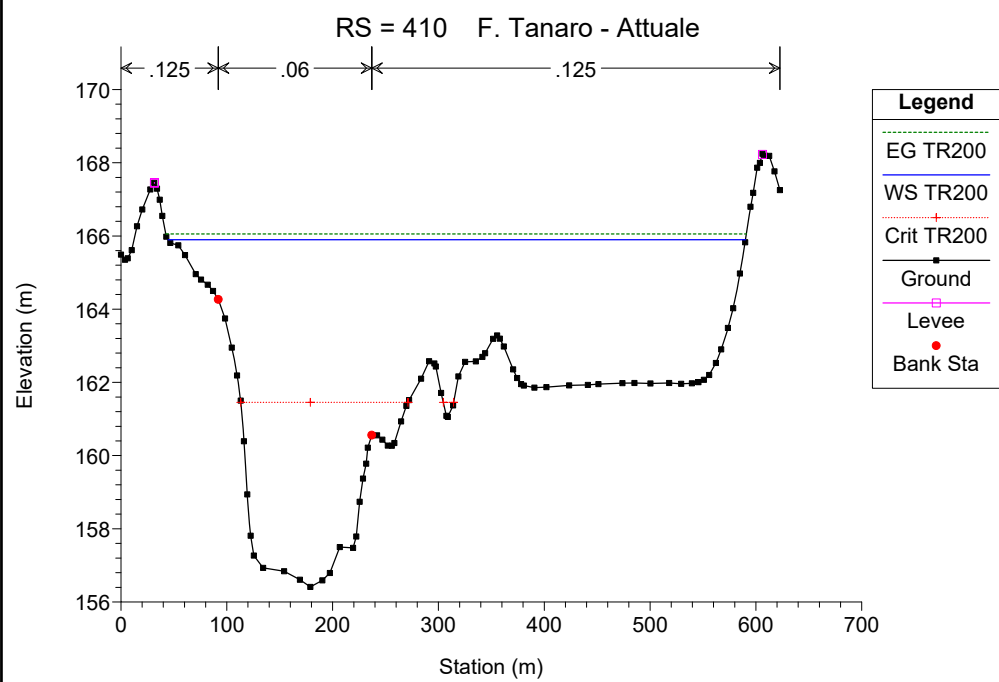
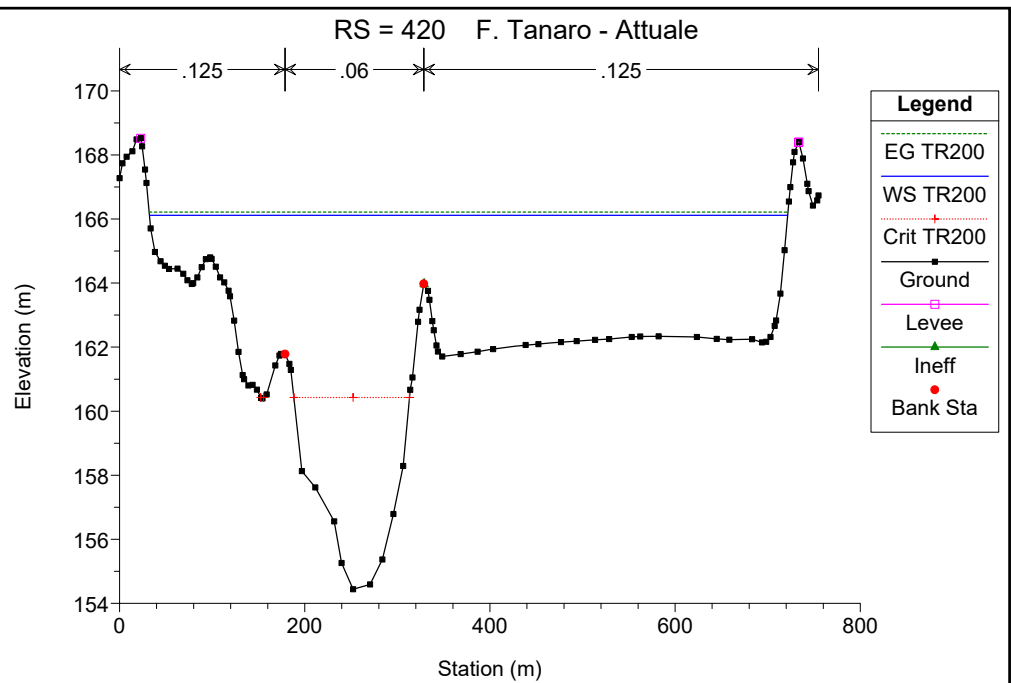
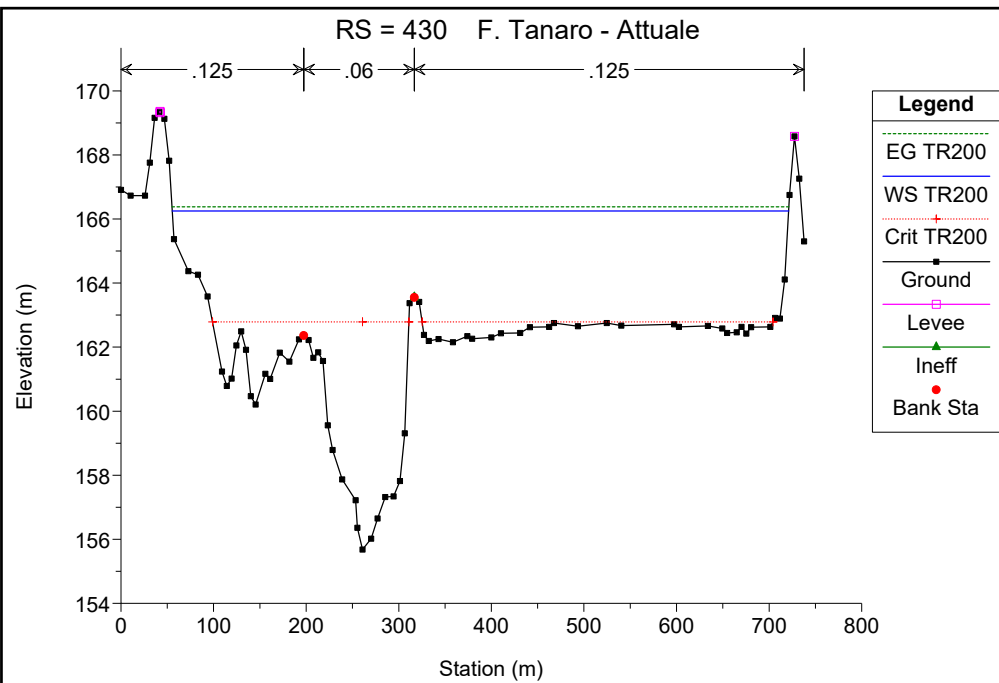
Tanaro 1

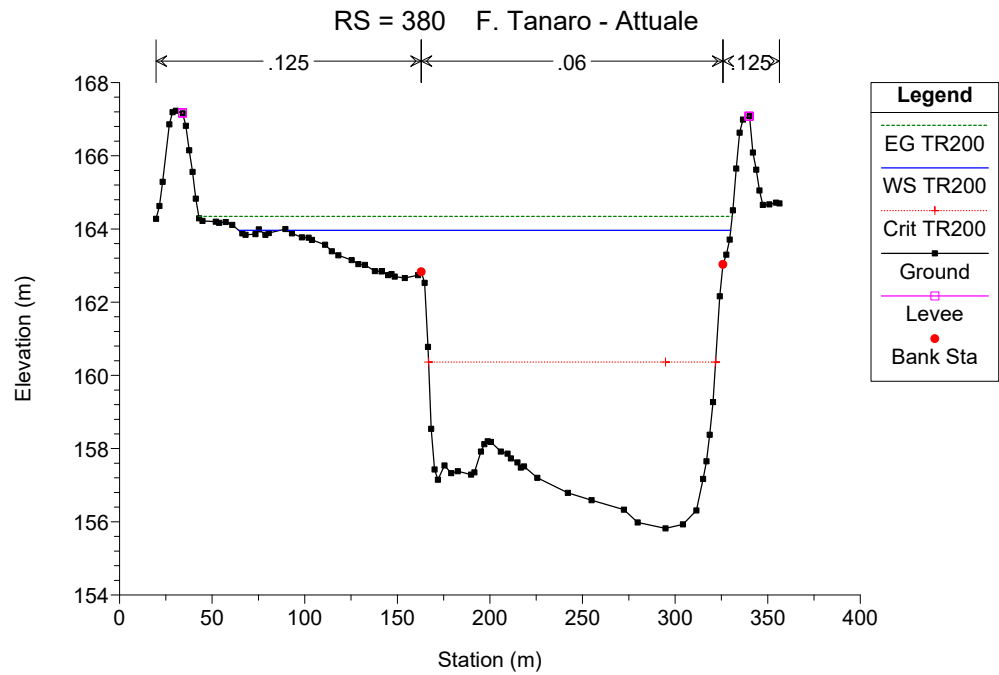
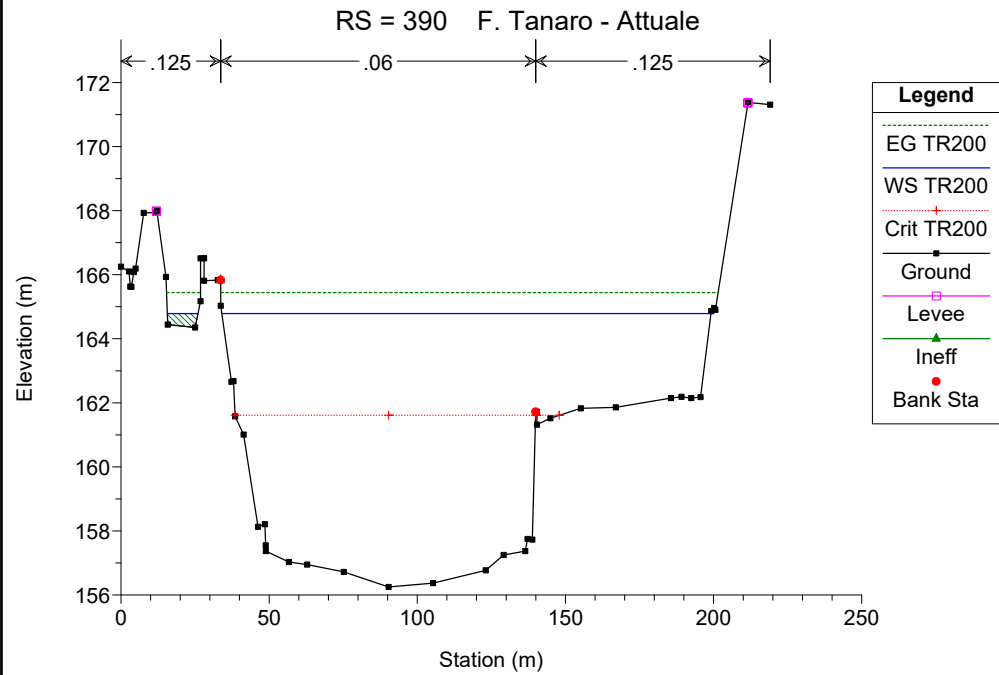
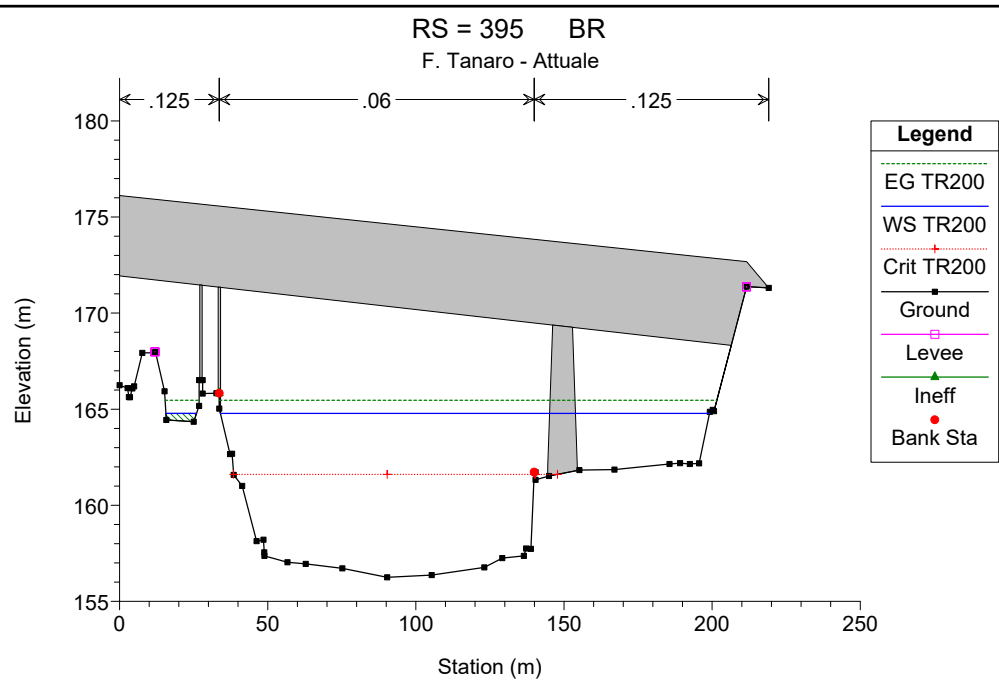
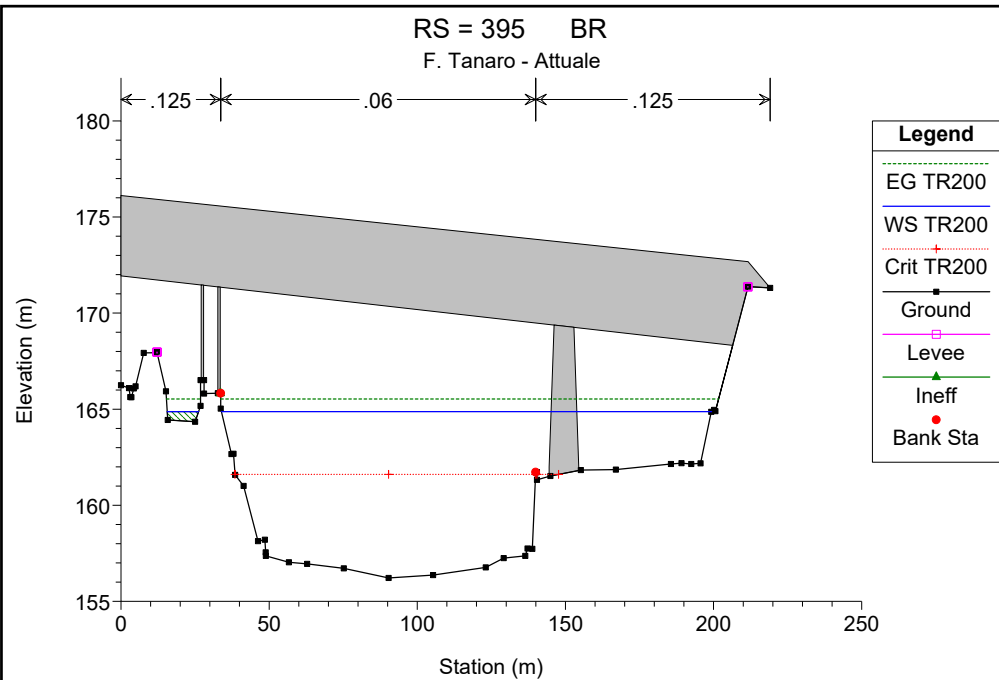


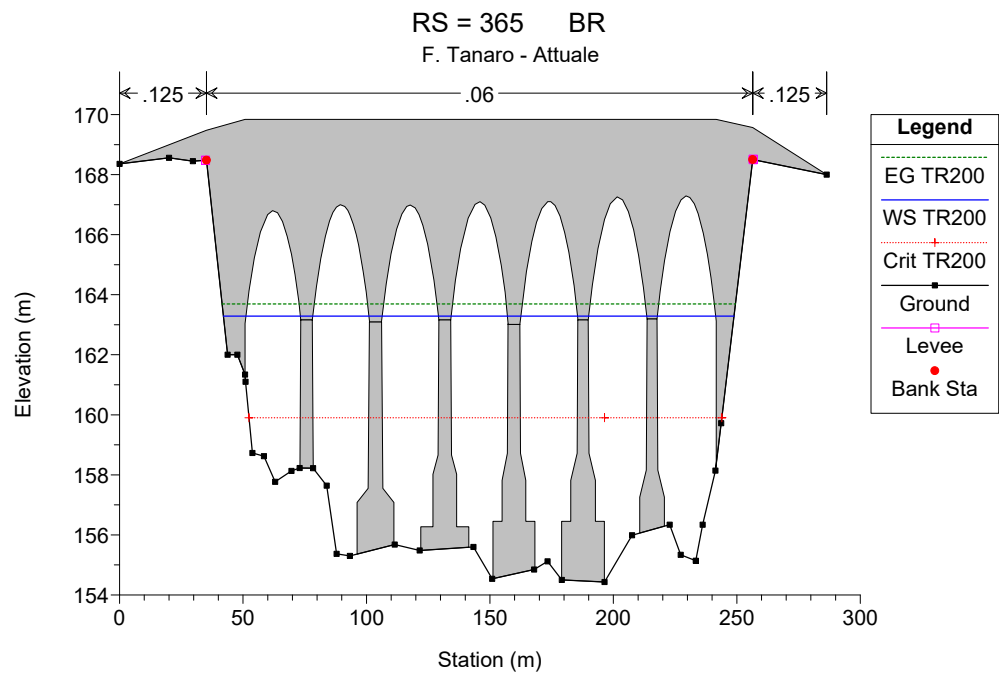
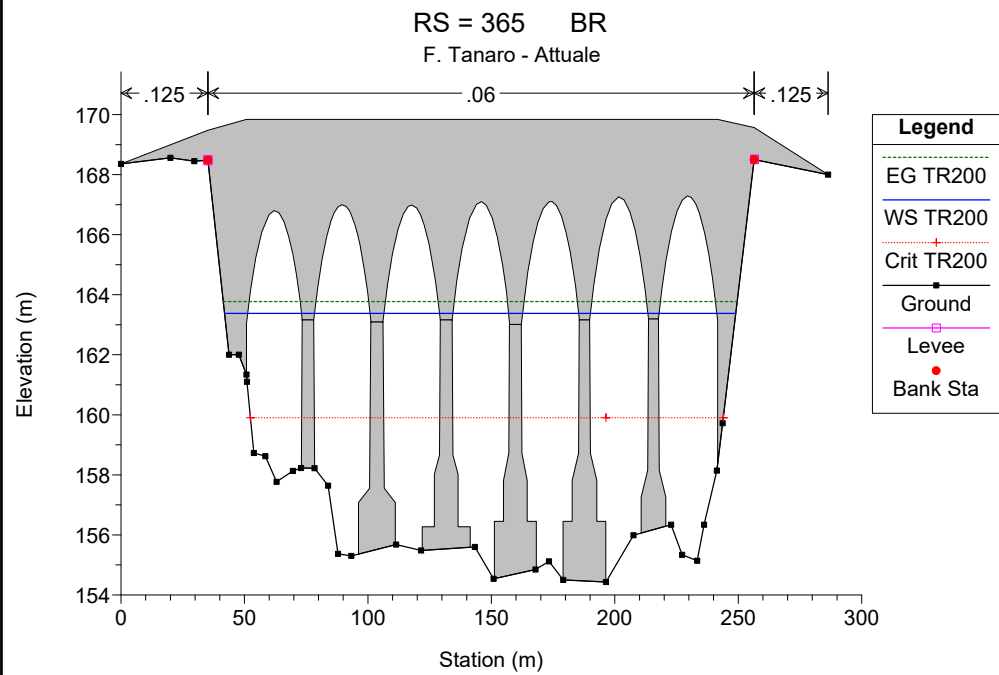
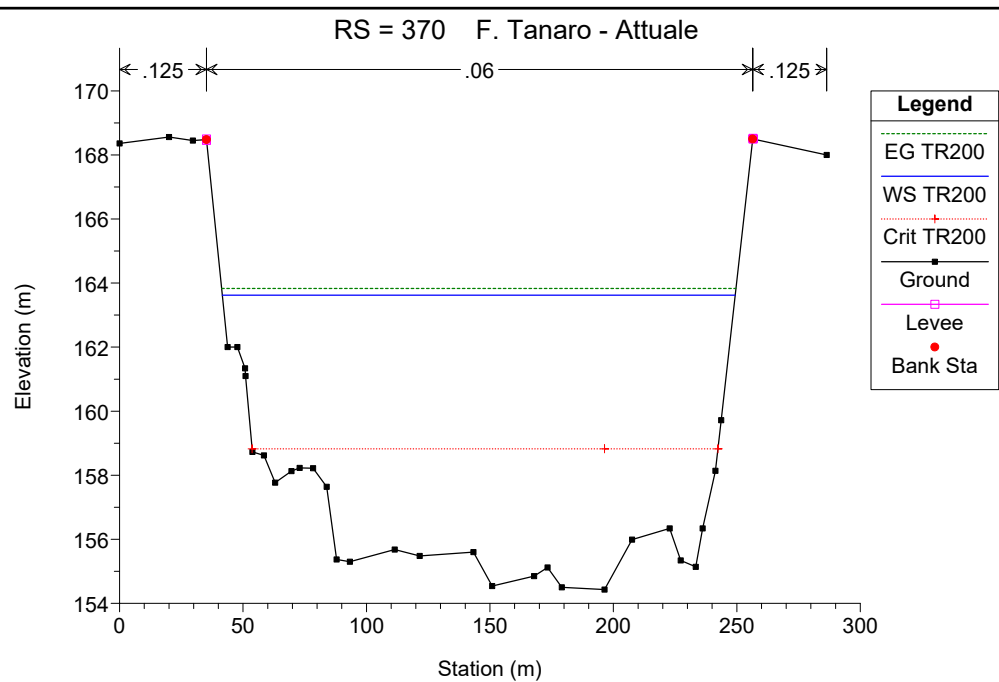
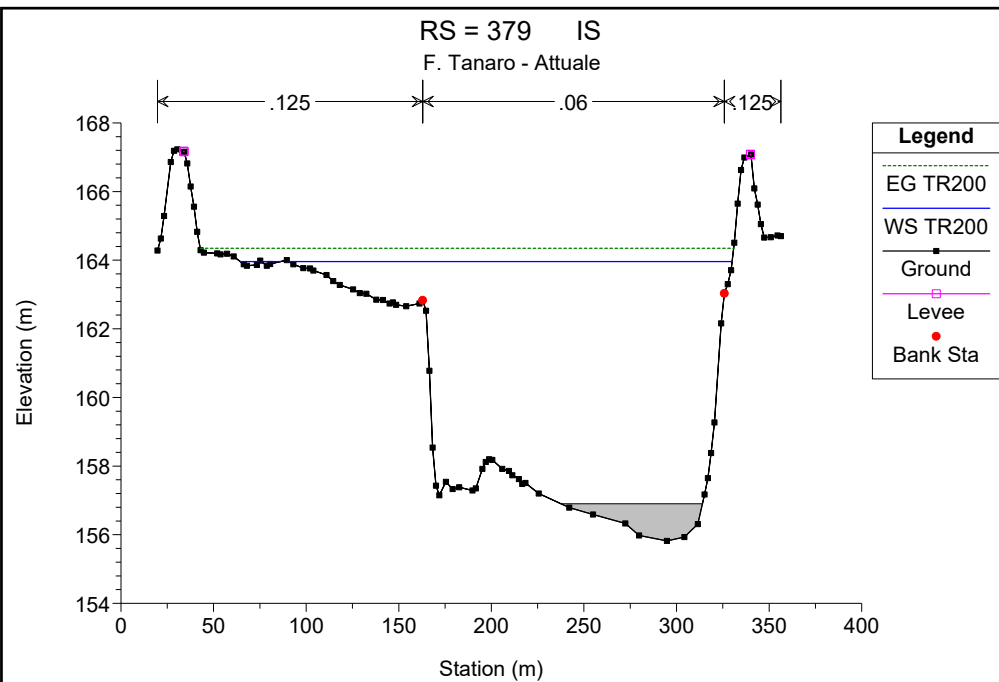


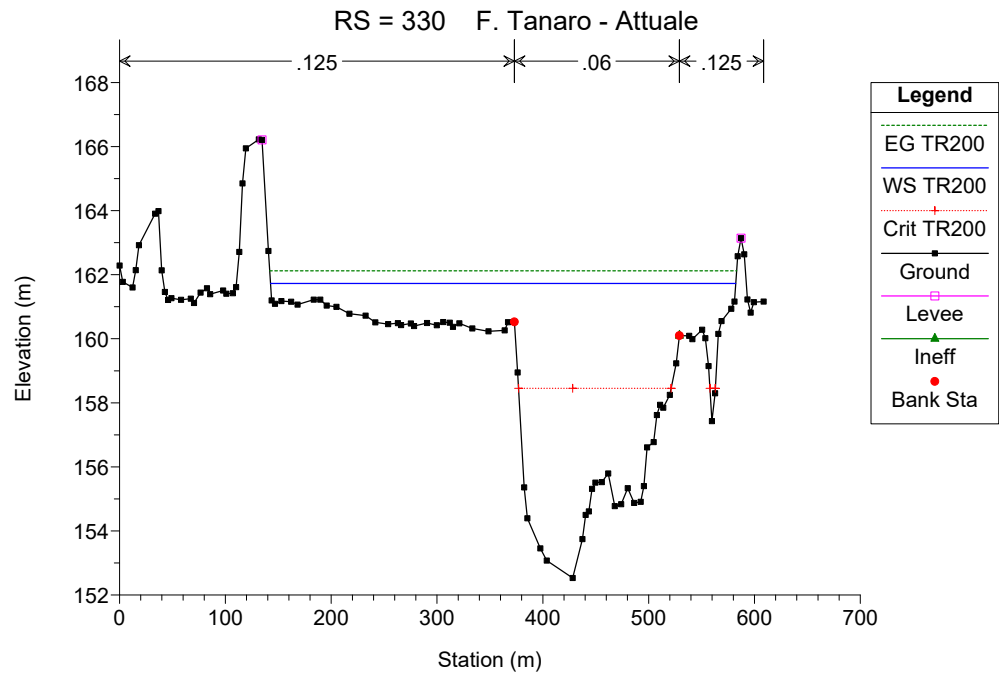
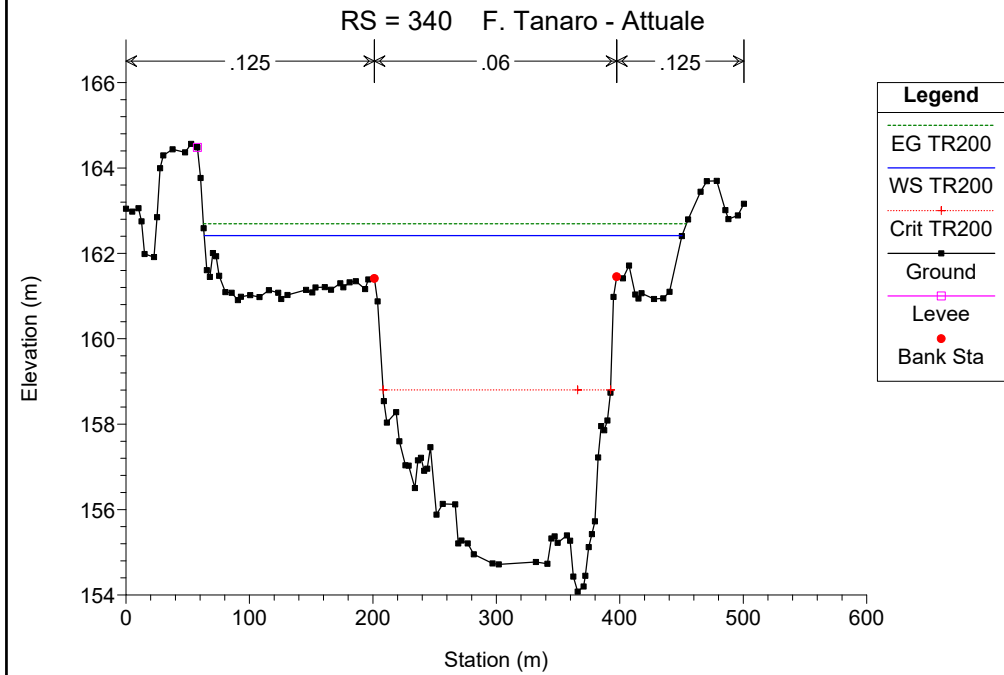
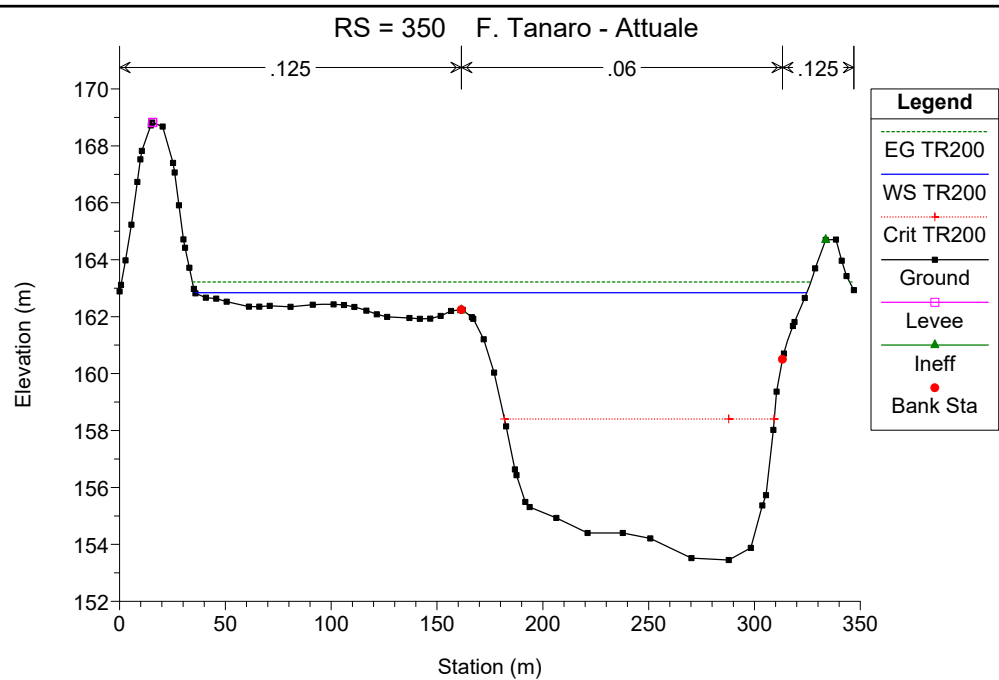
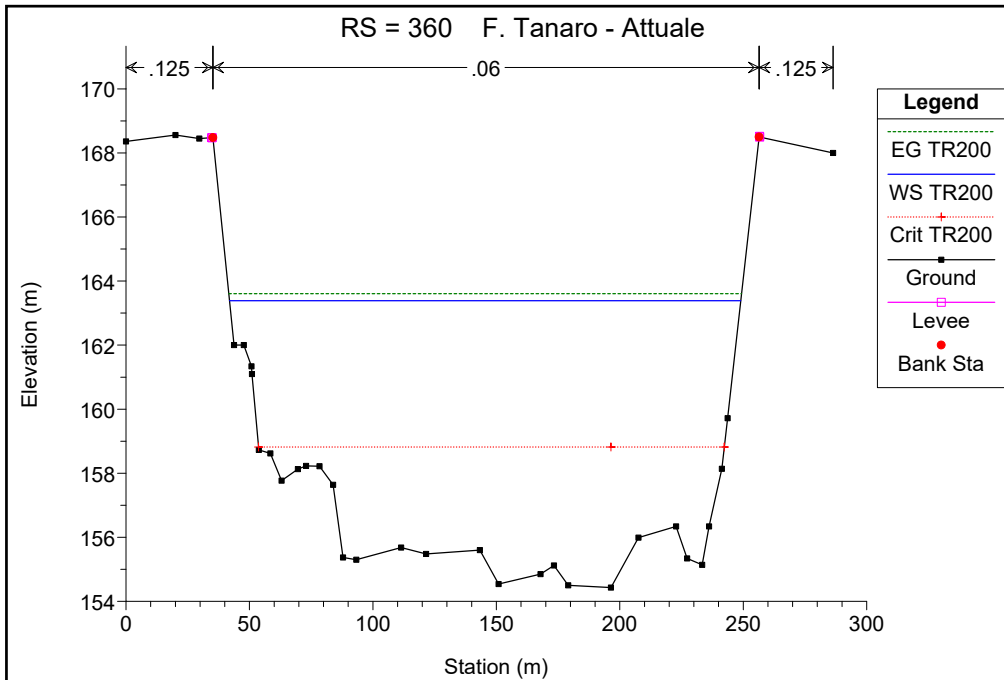


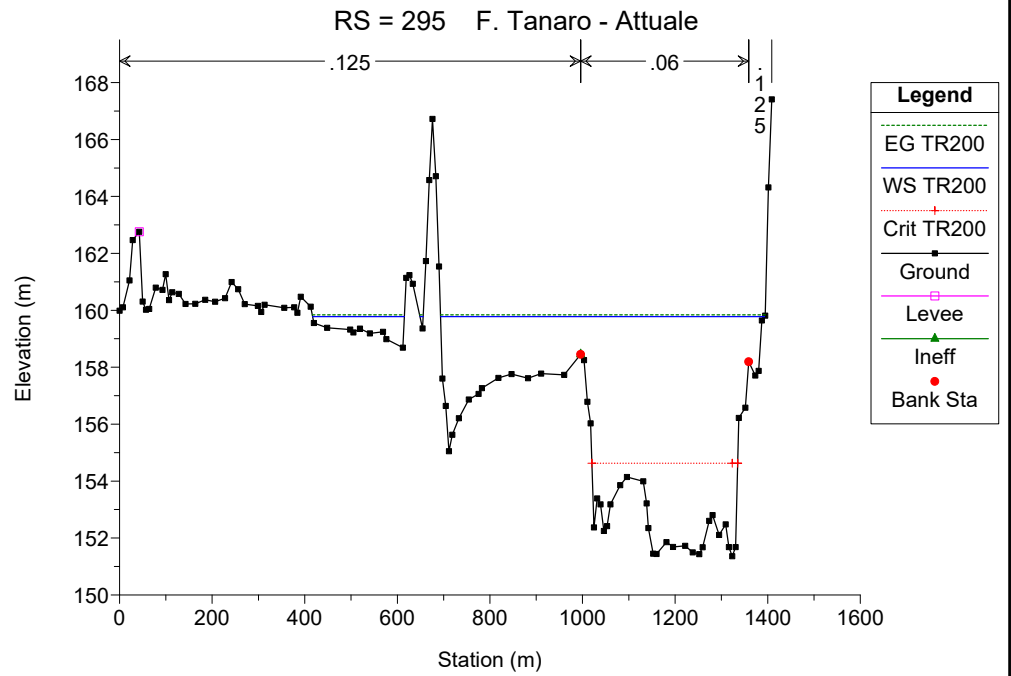
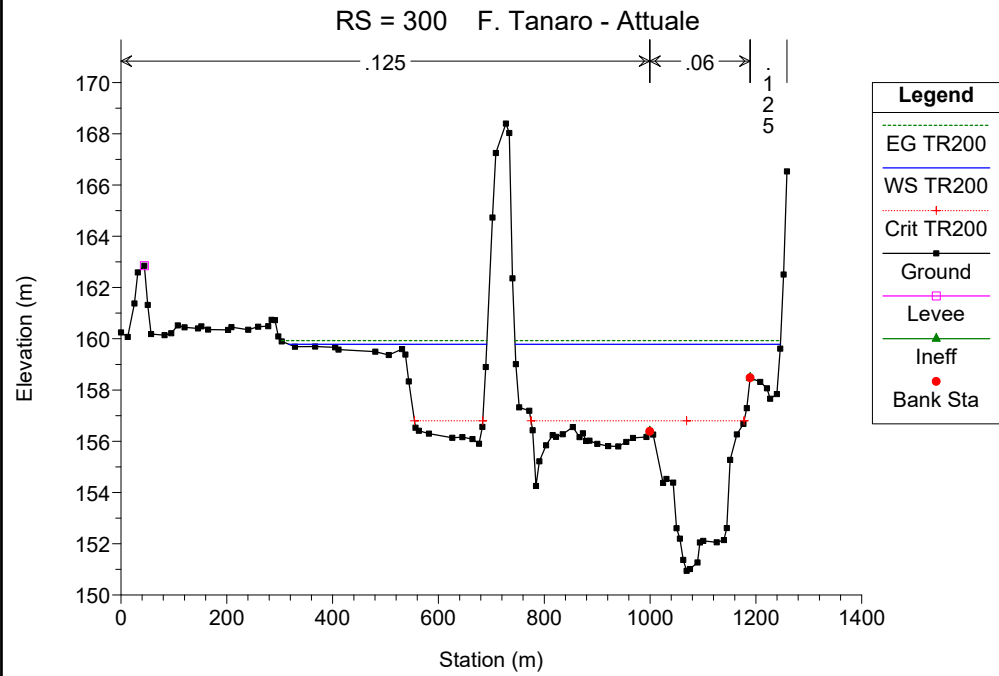
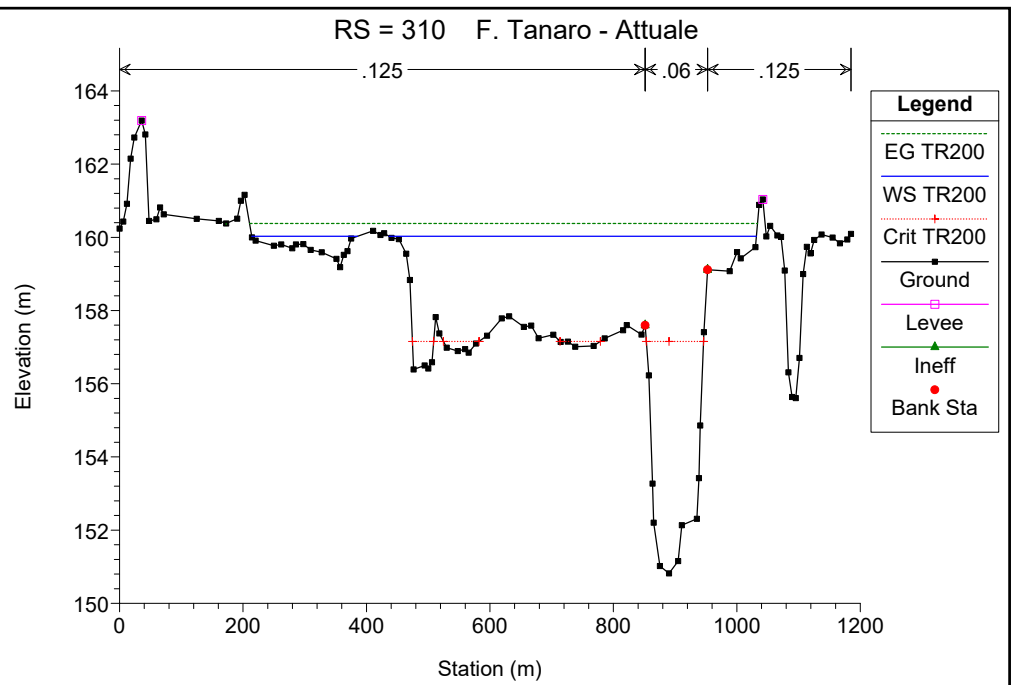
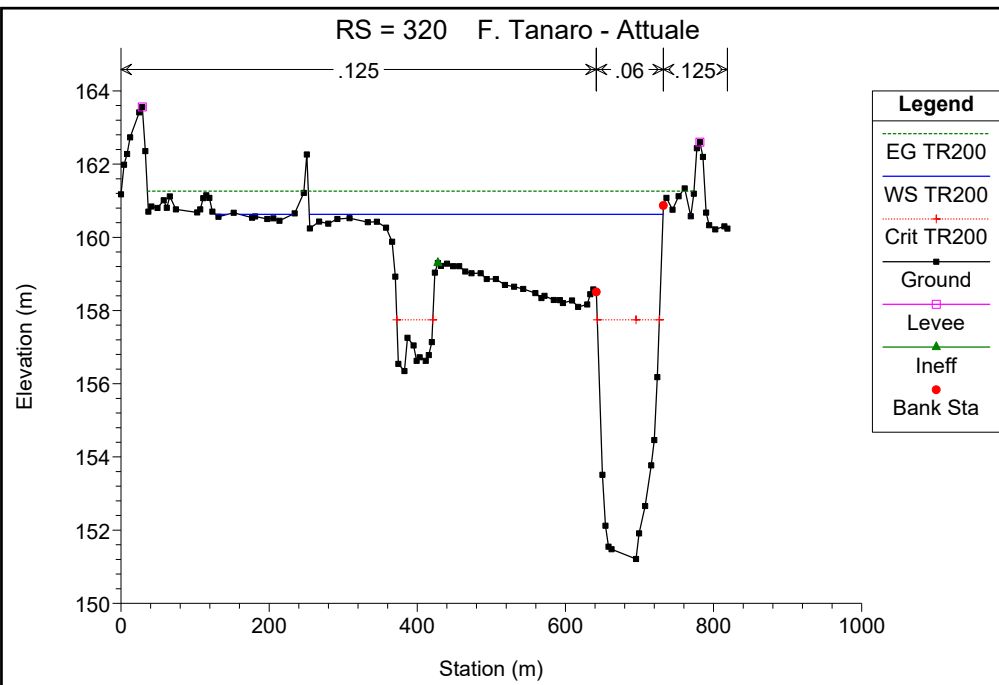


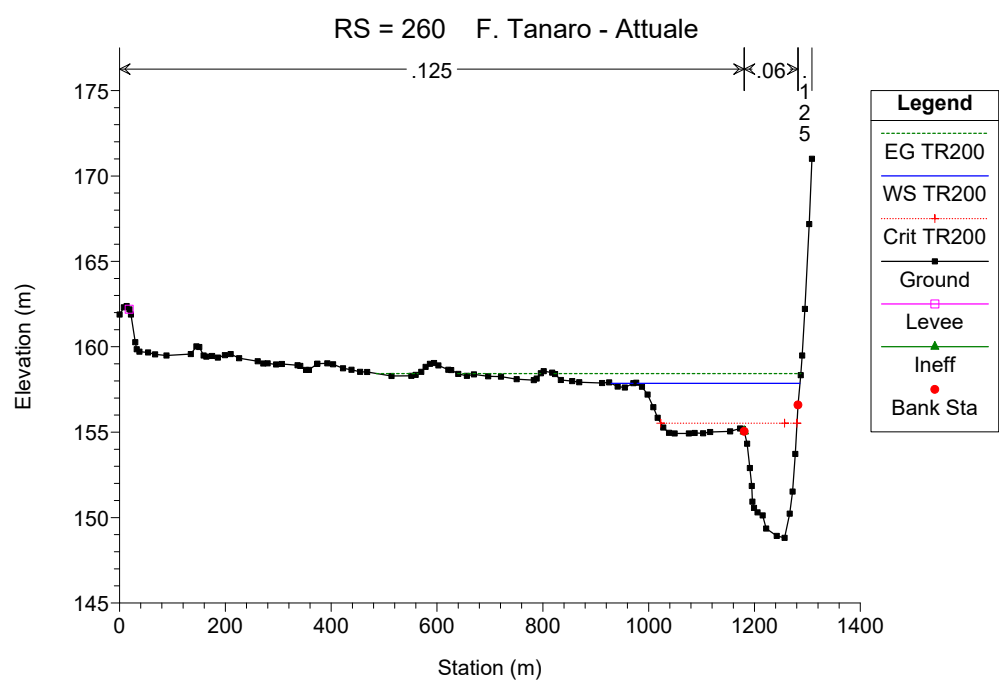
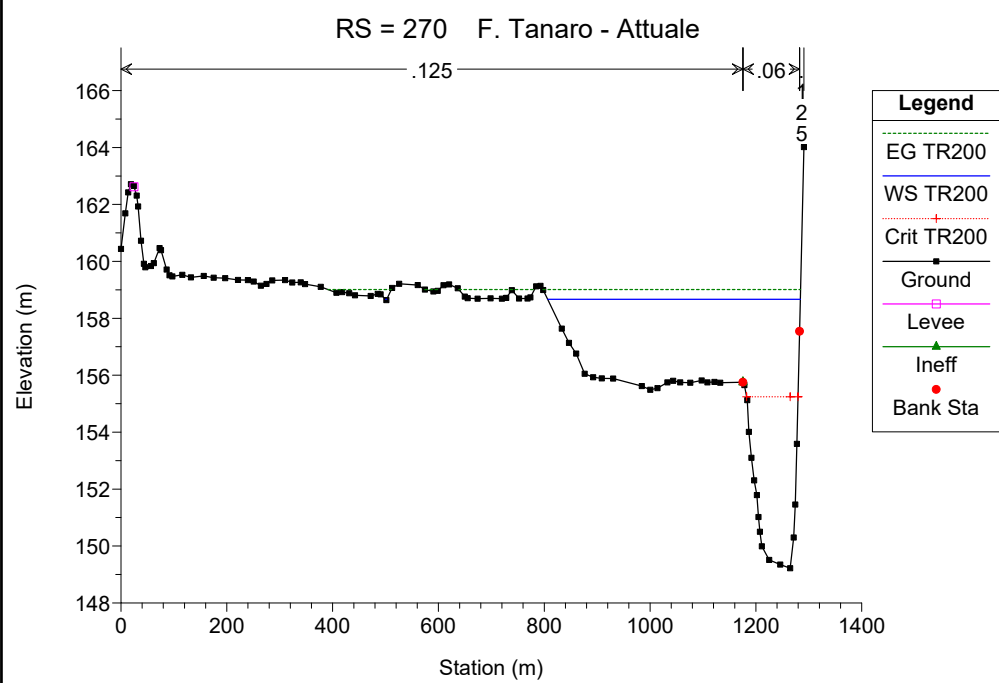
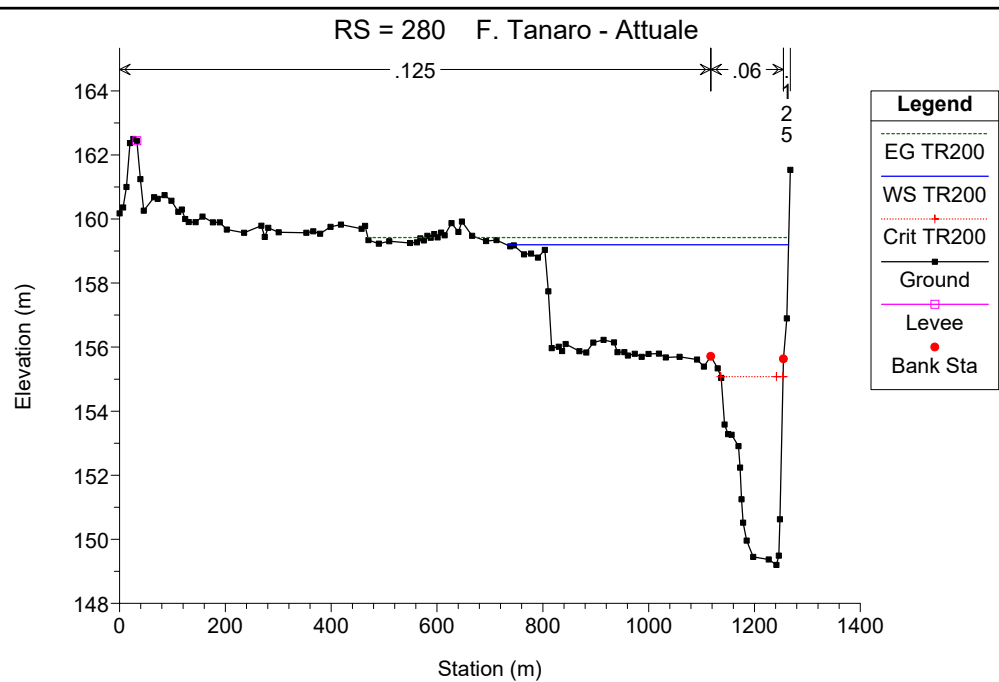
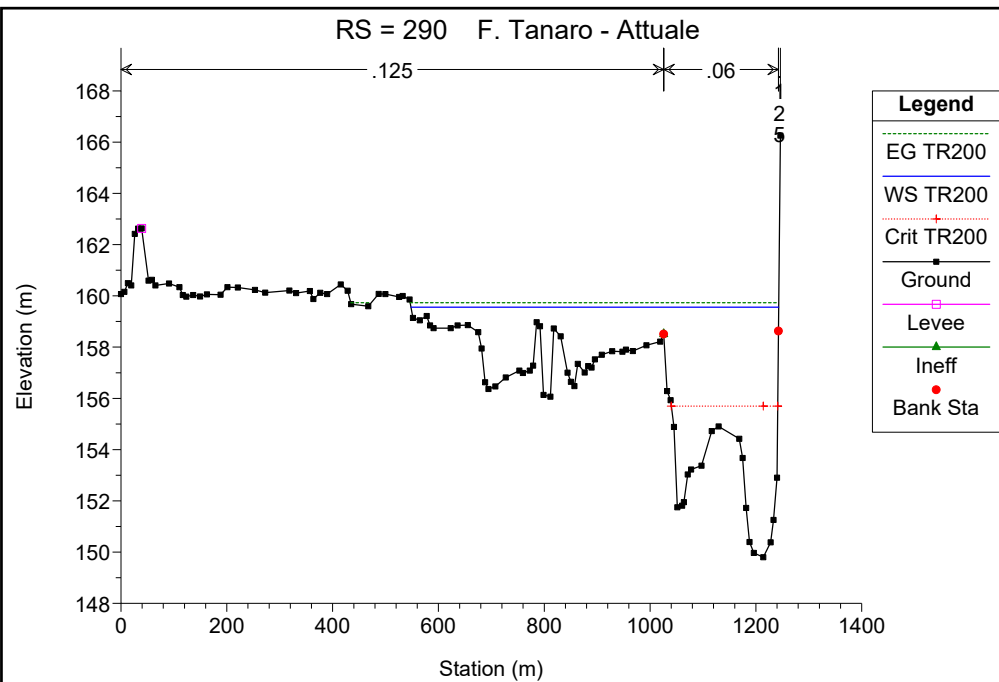


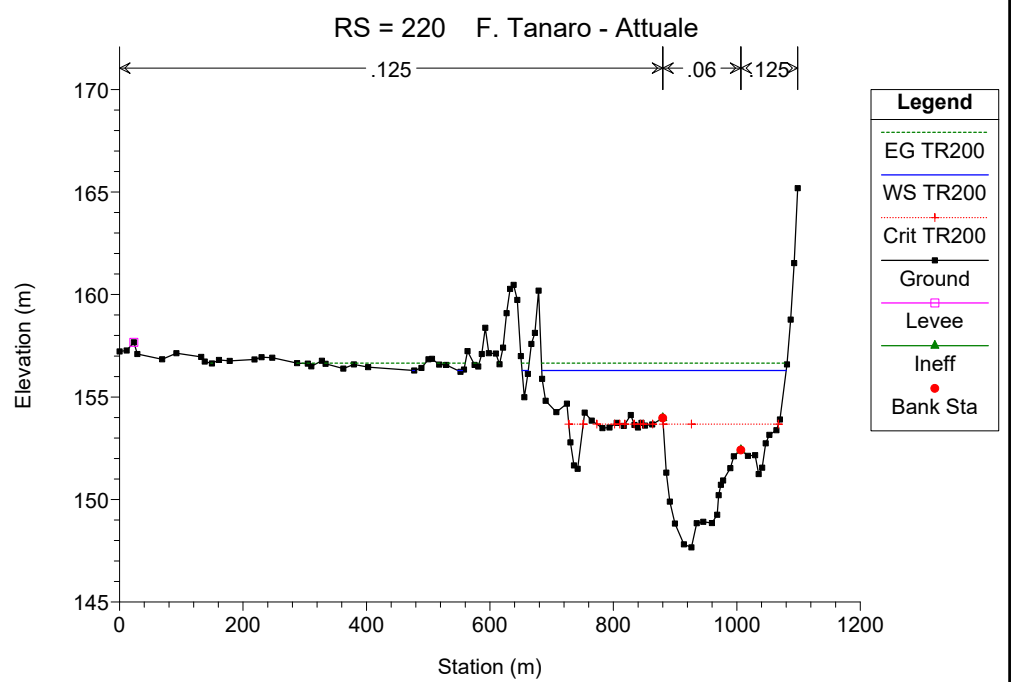
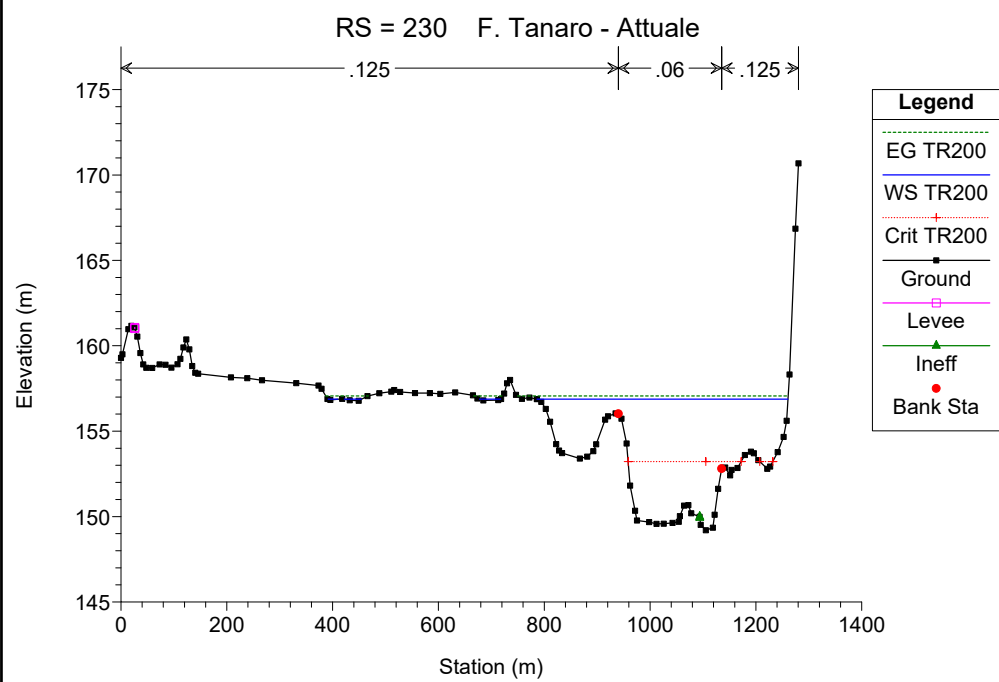
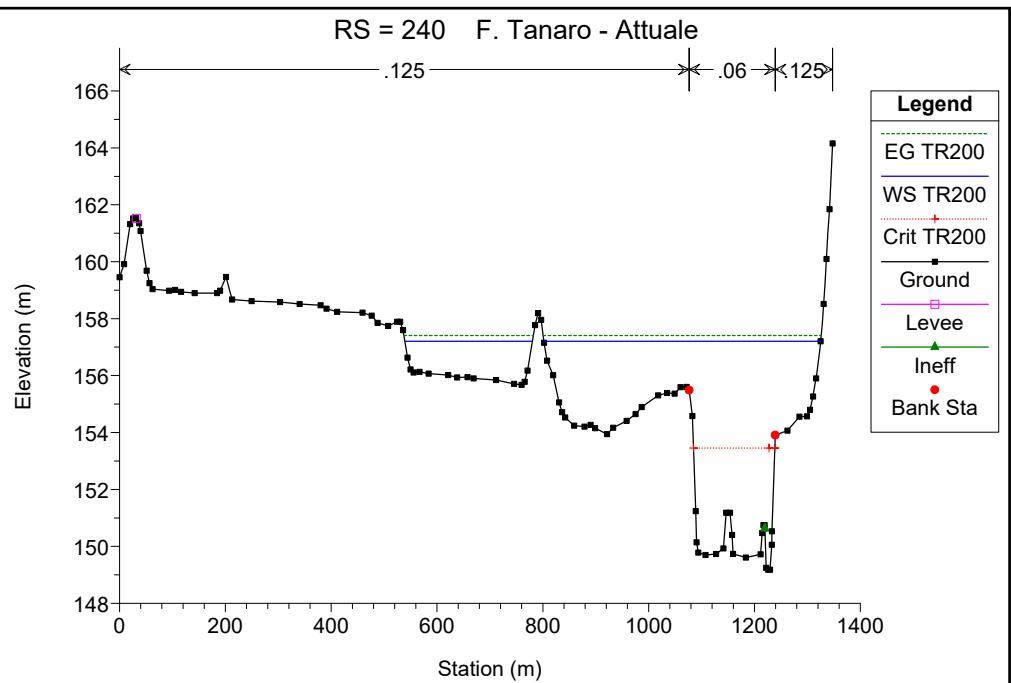
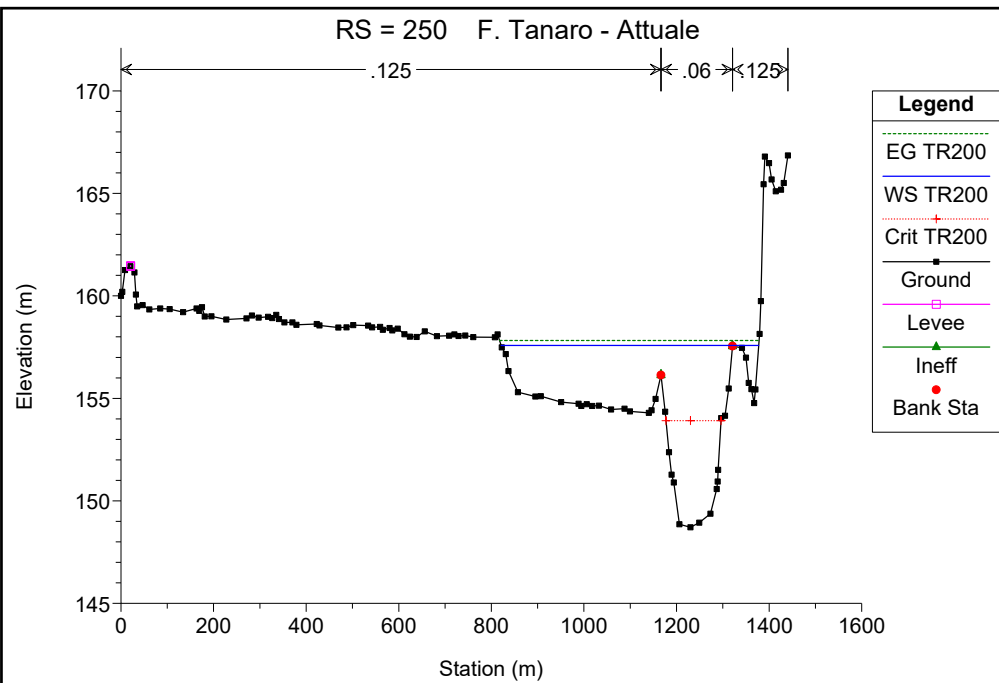


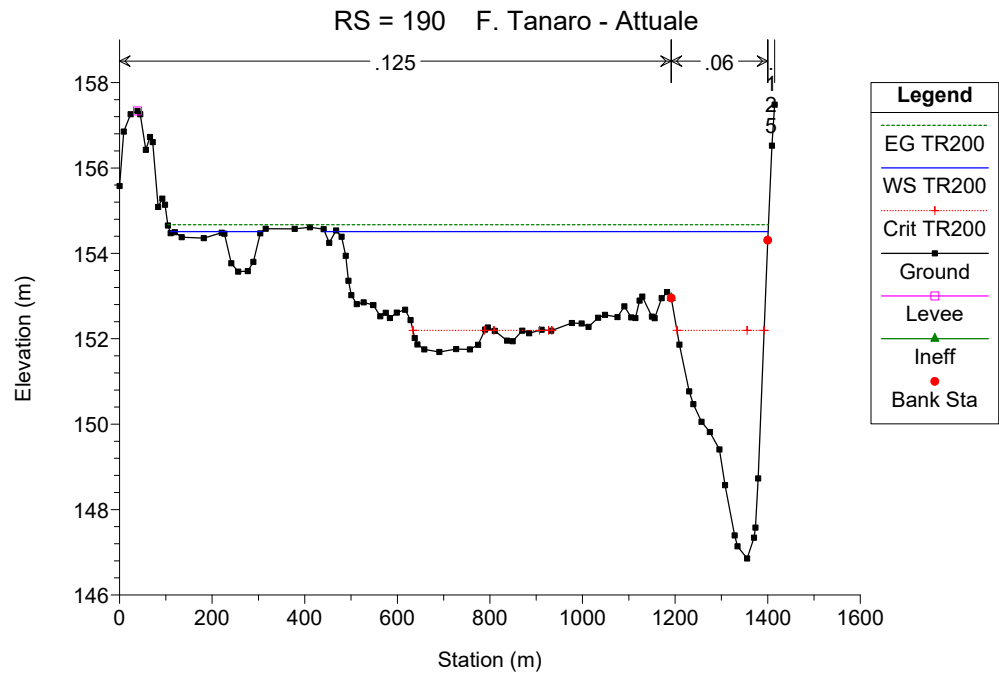
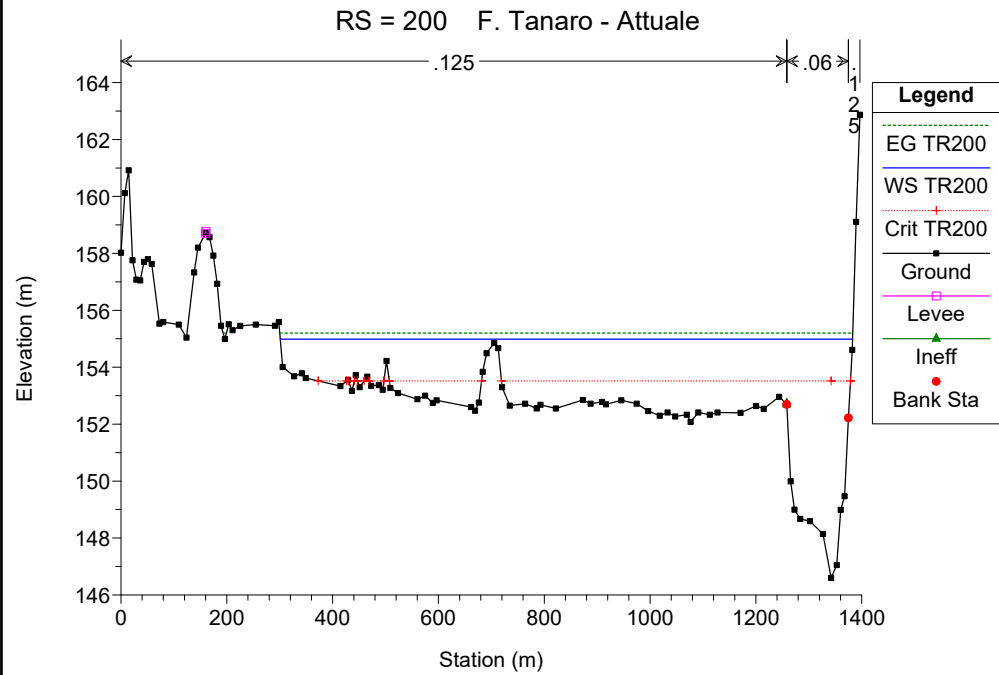
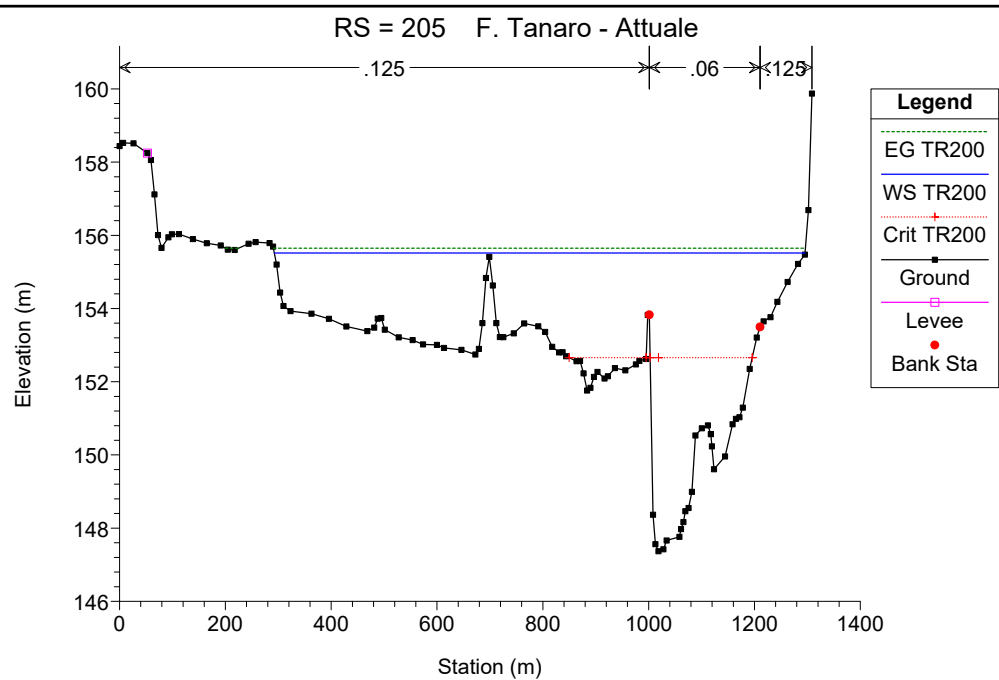
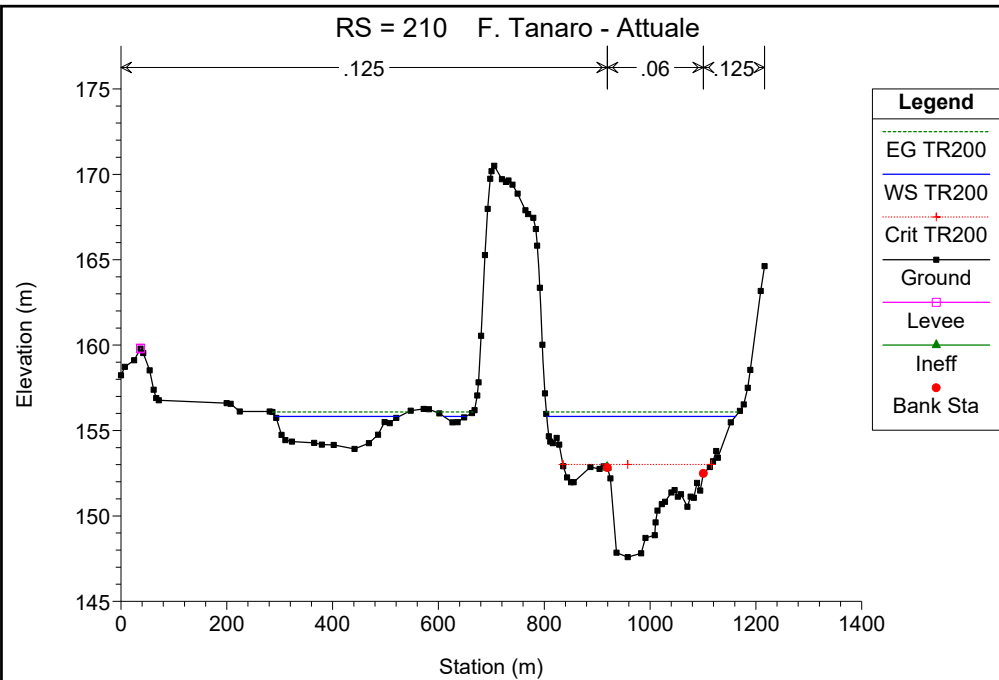


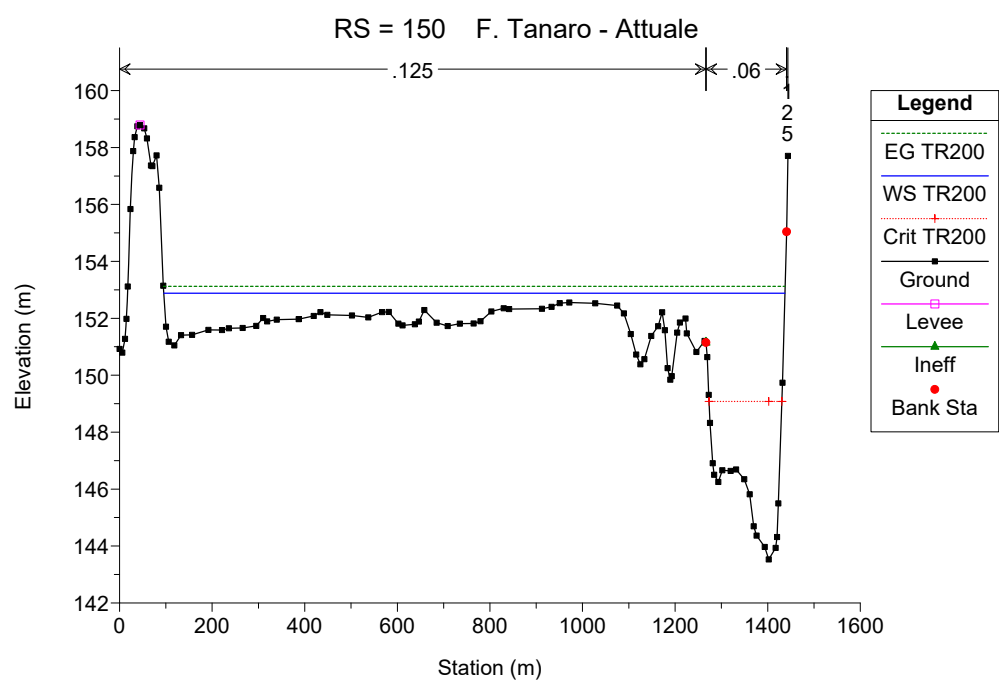
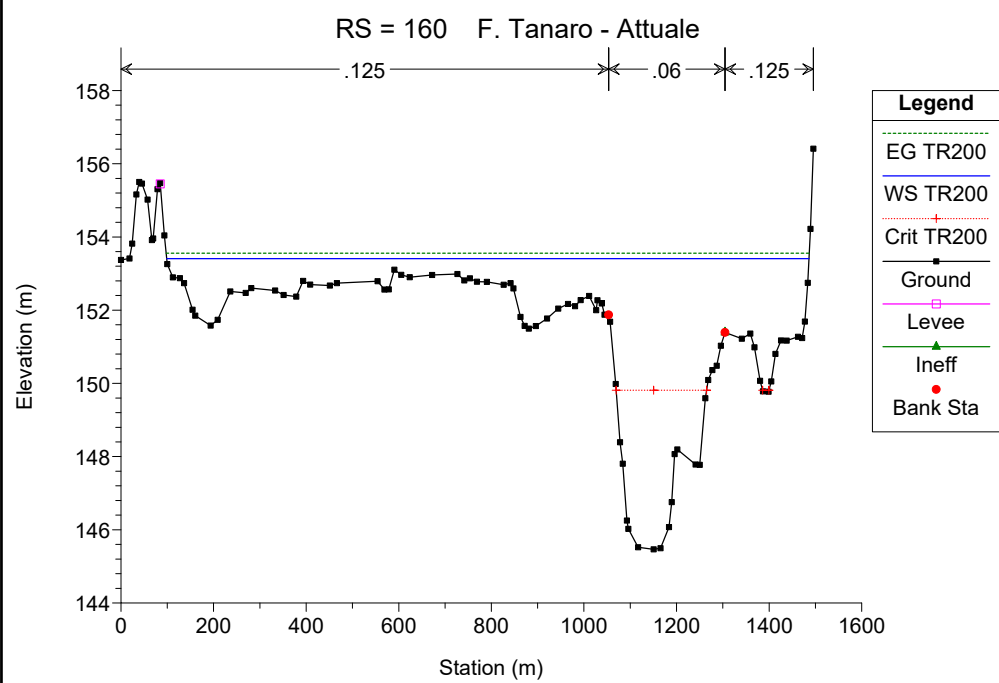
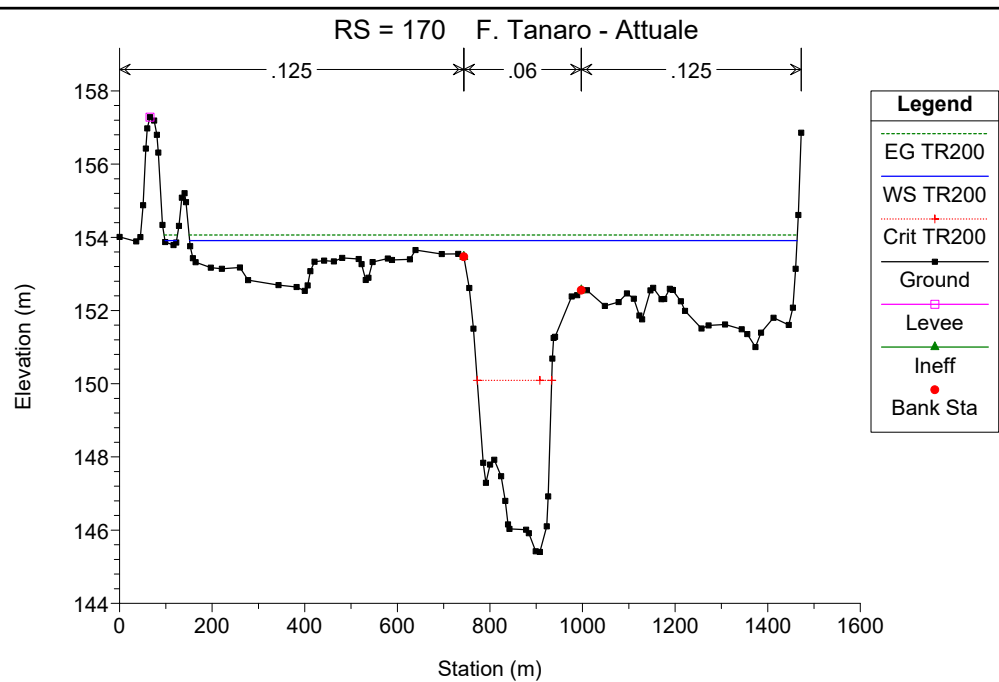
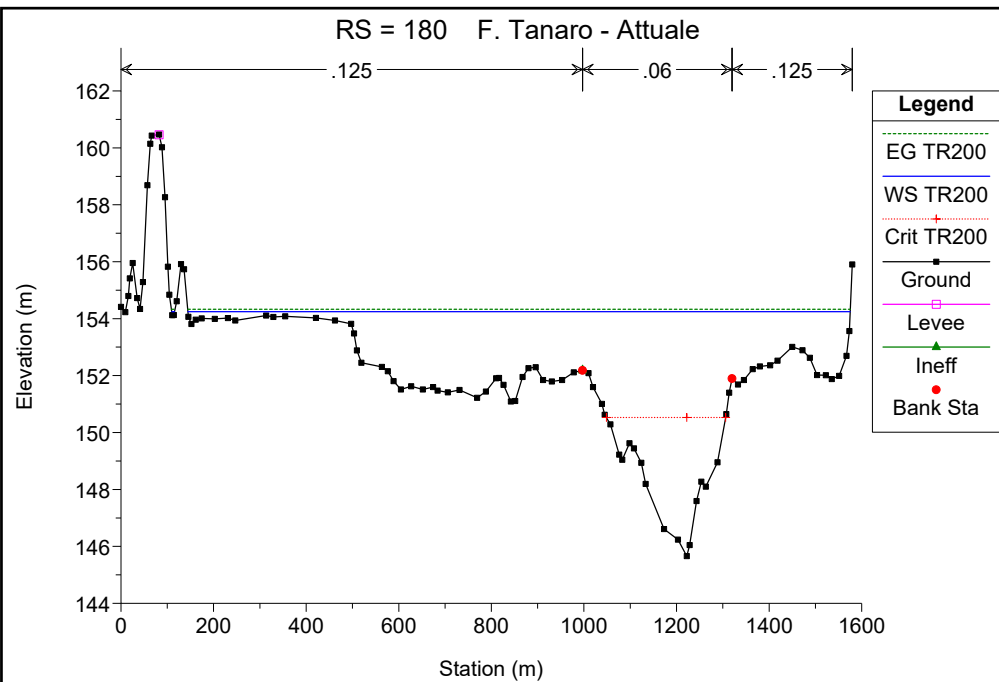


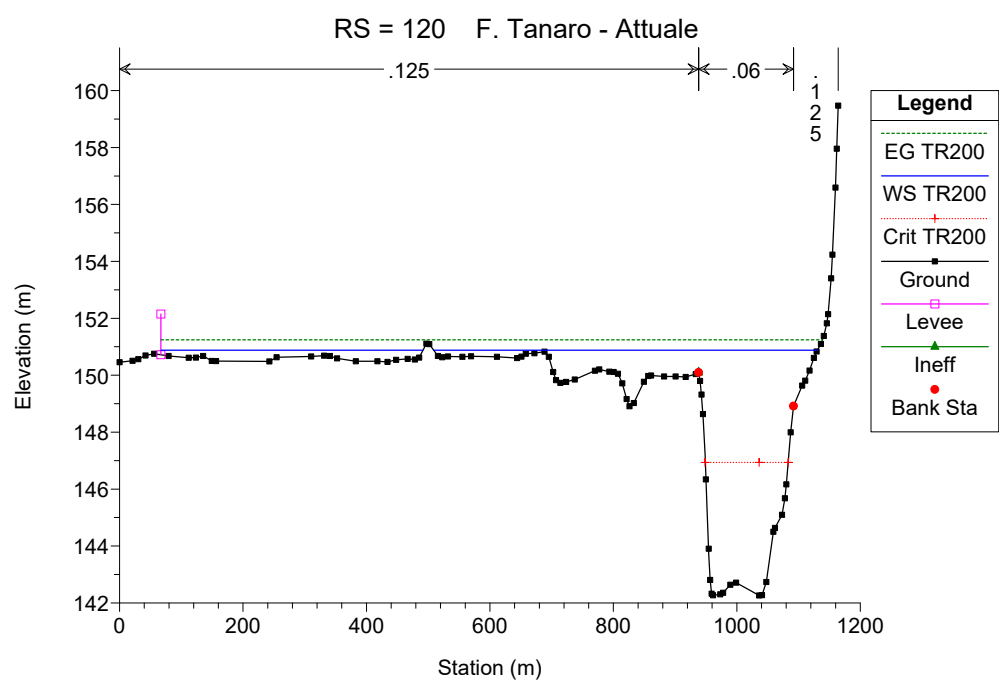
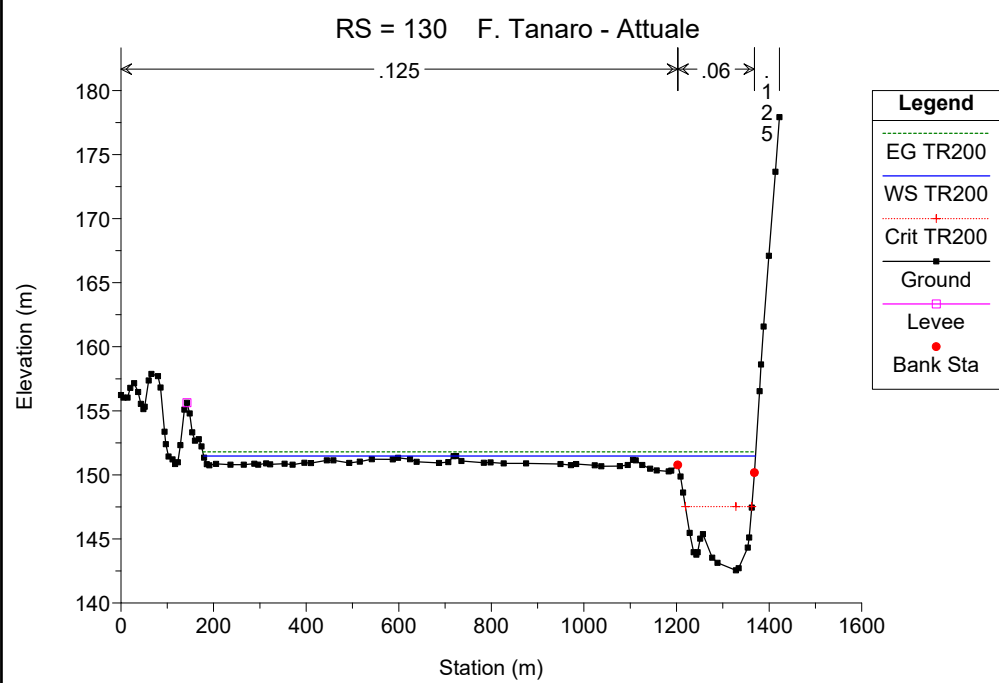
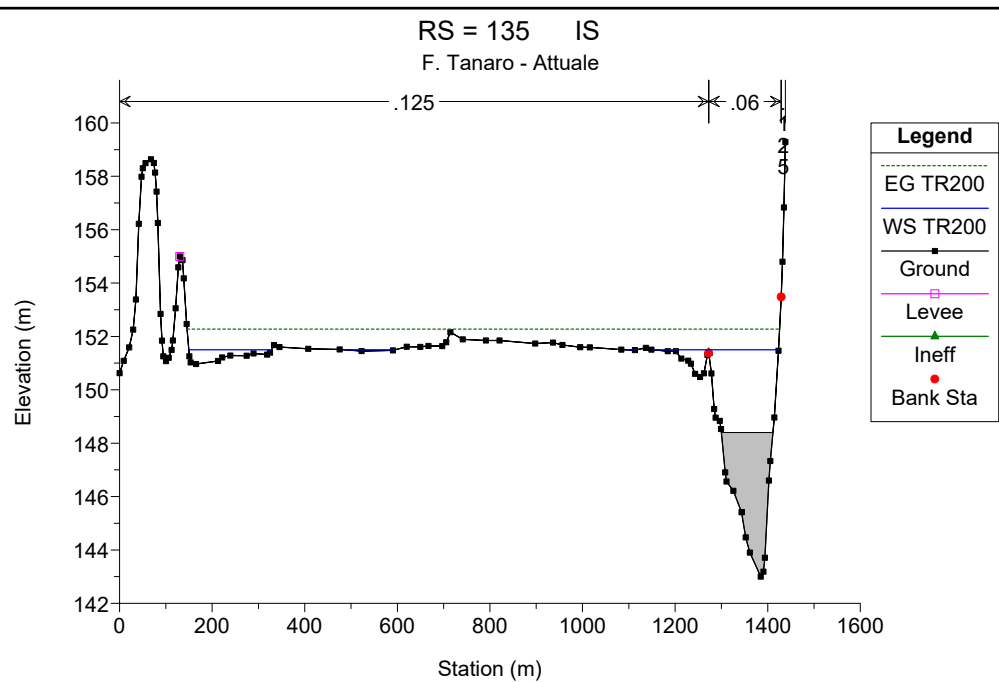
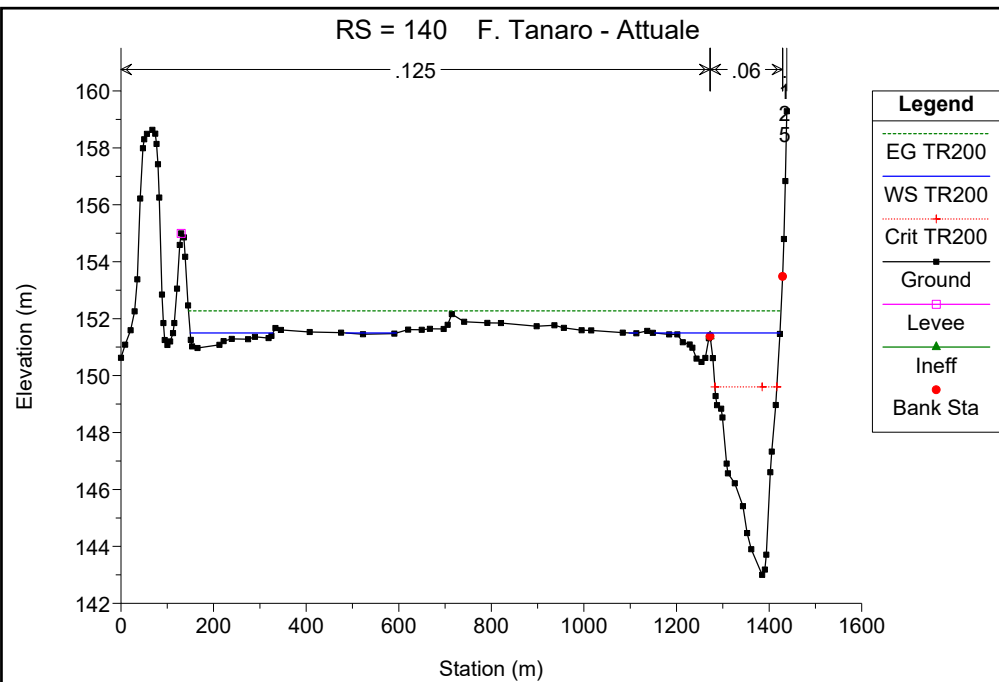


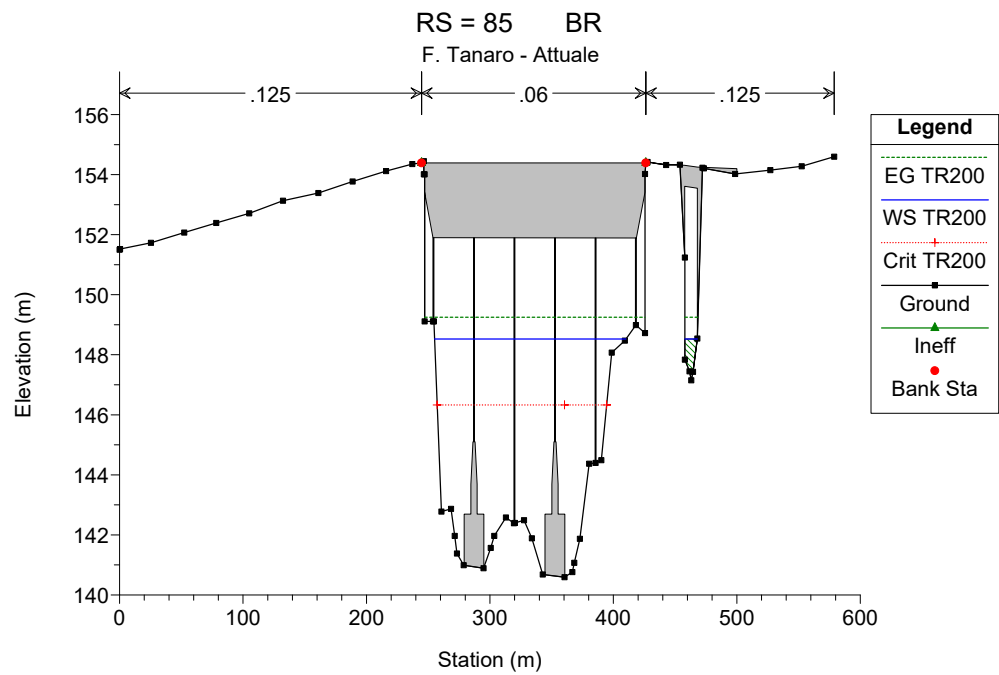
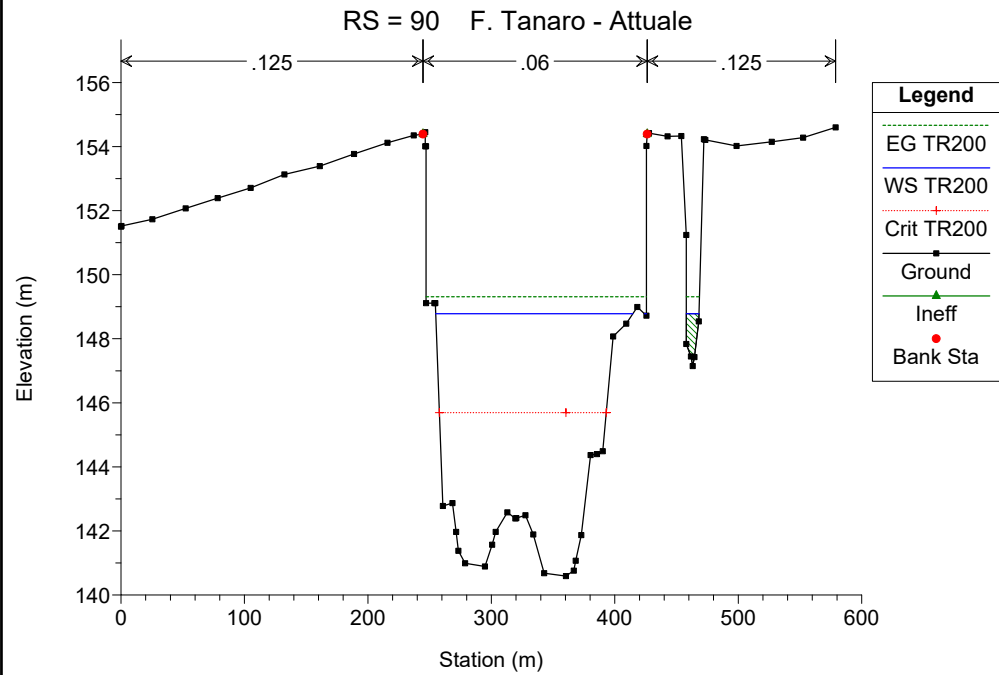
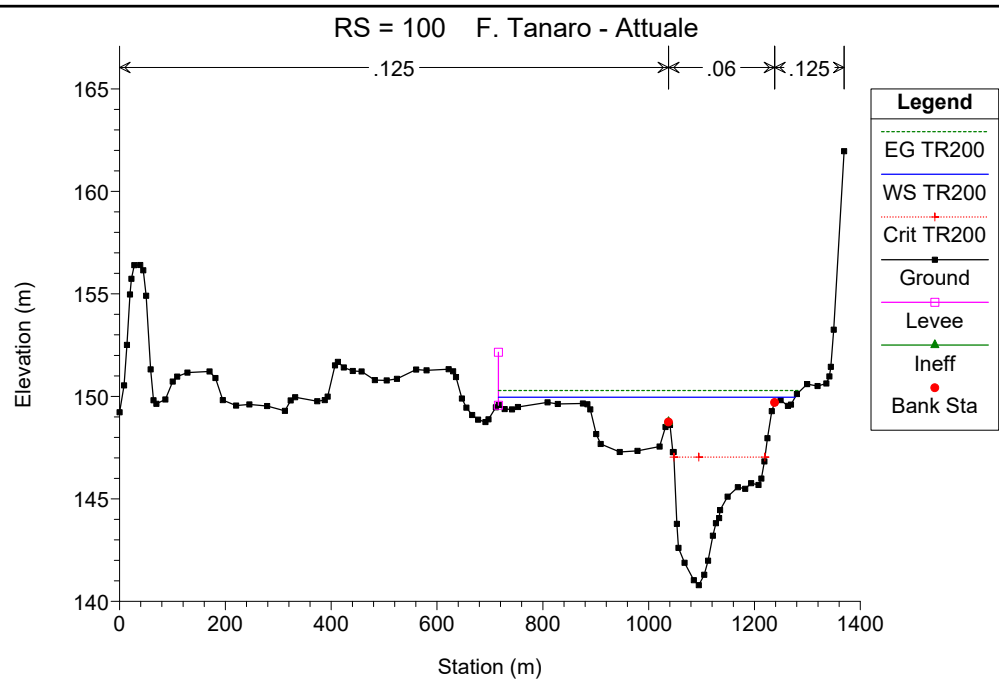
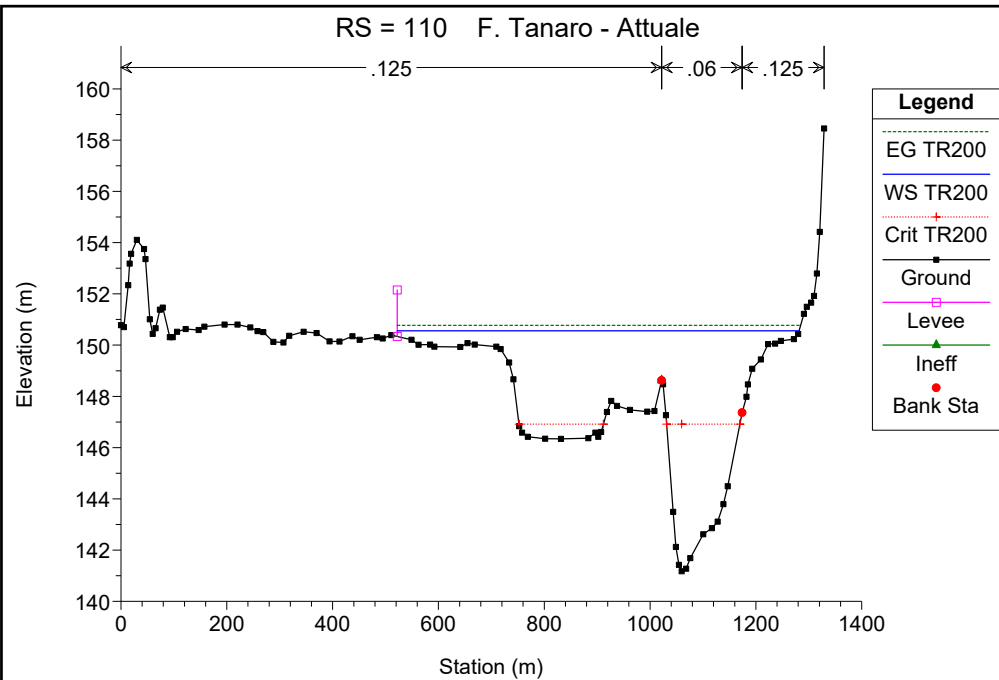


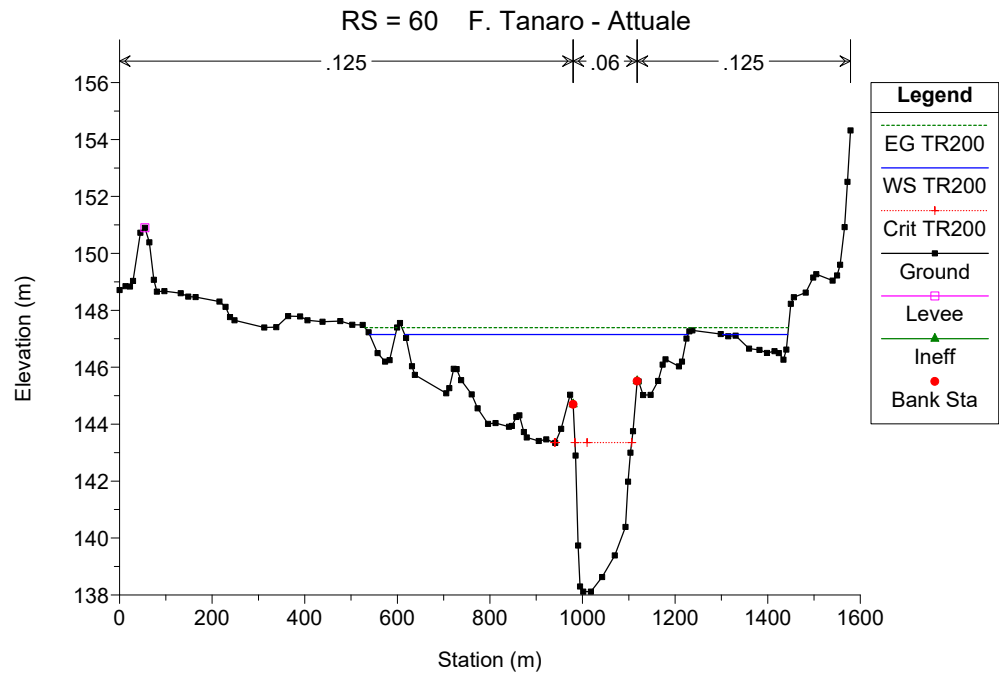
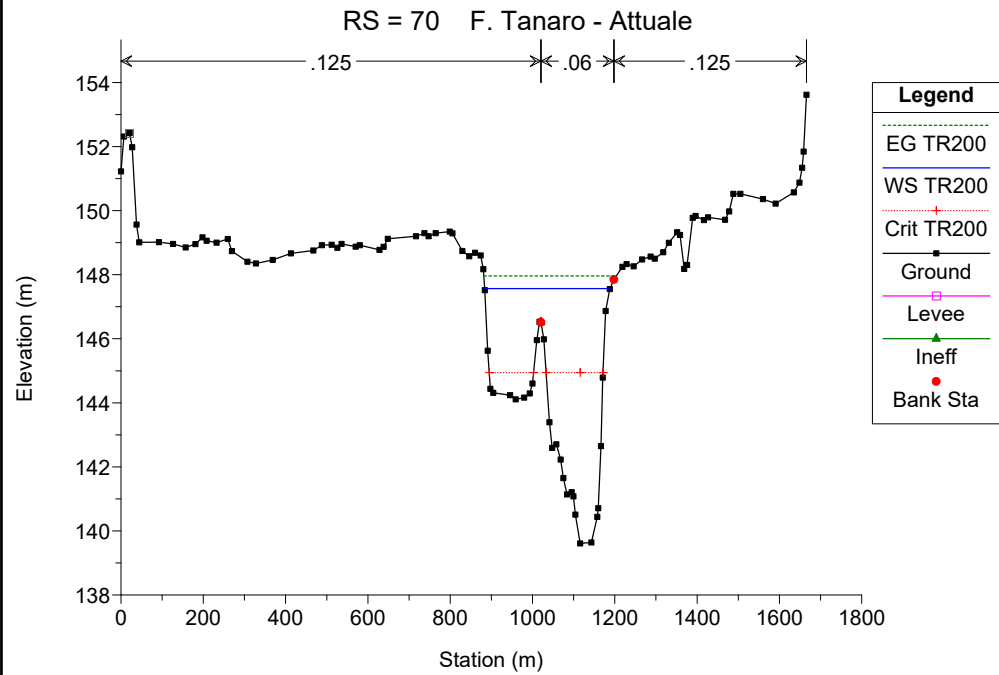
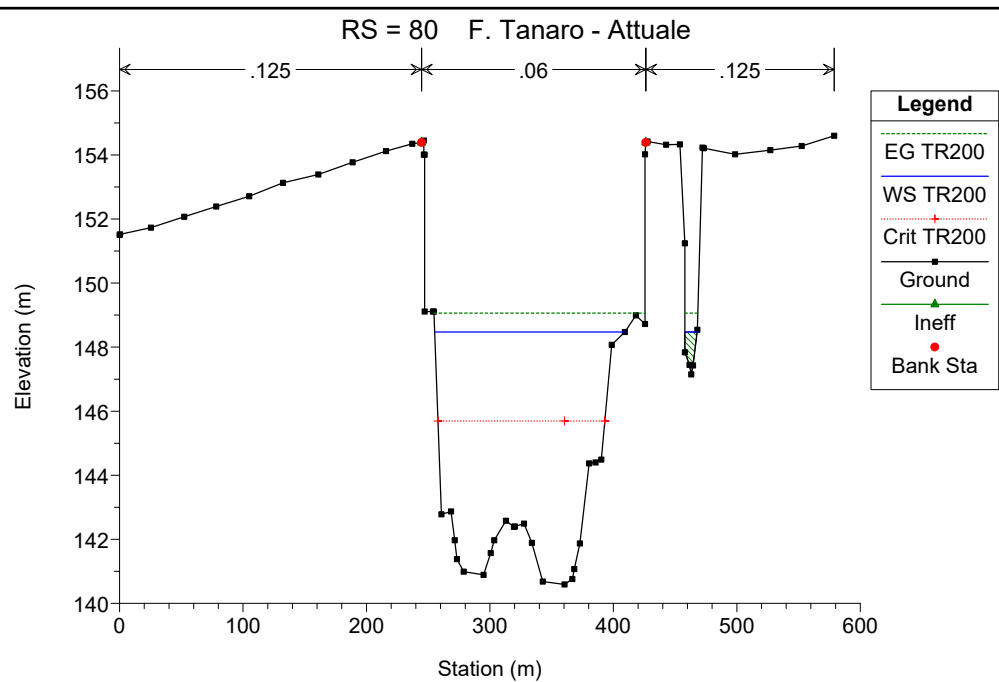
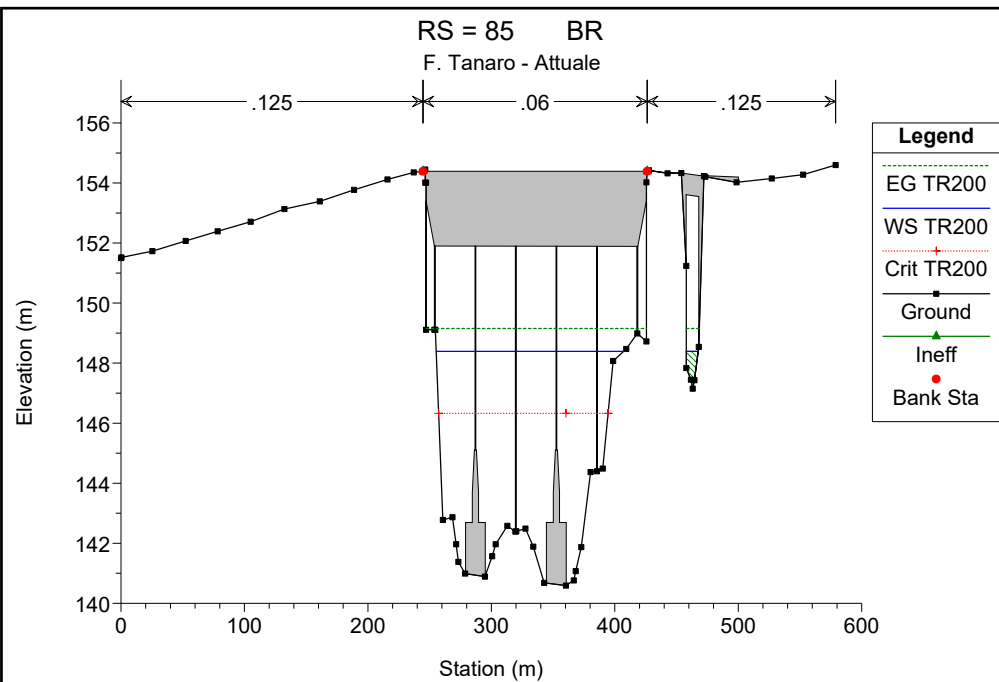


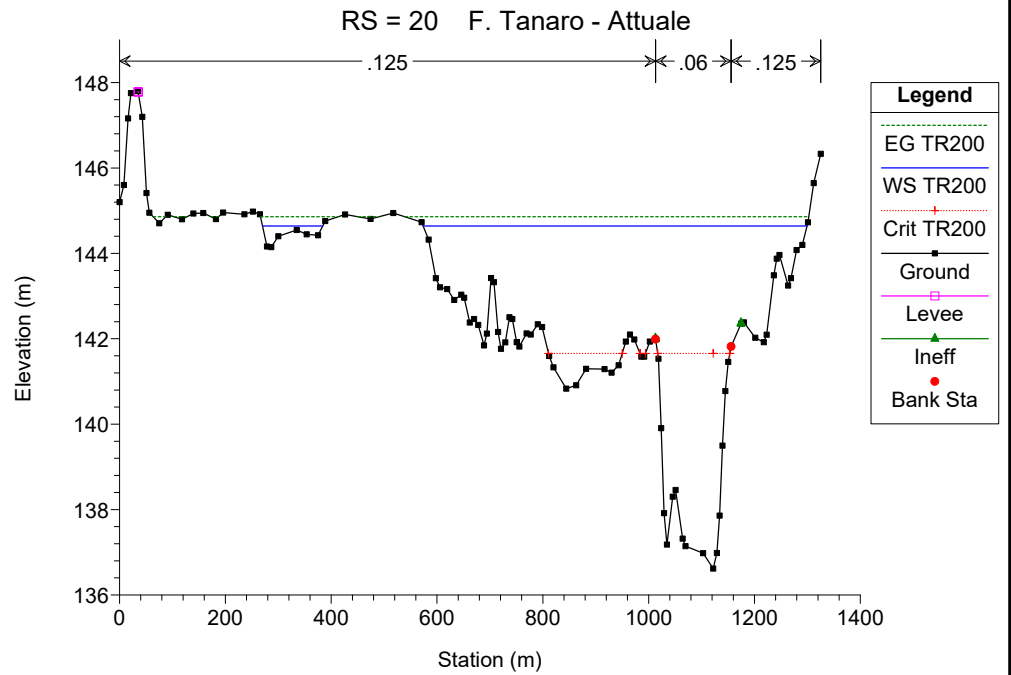
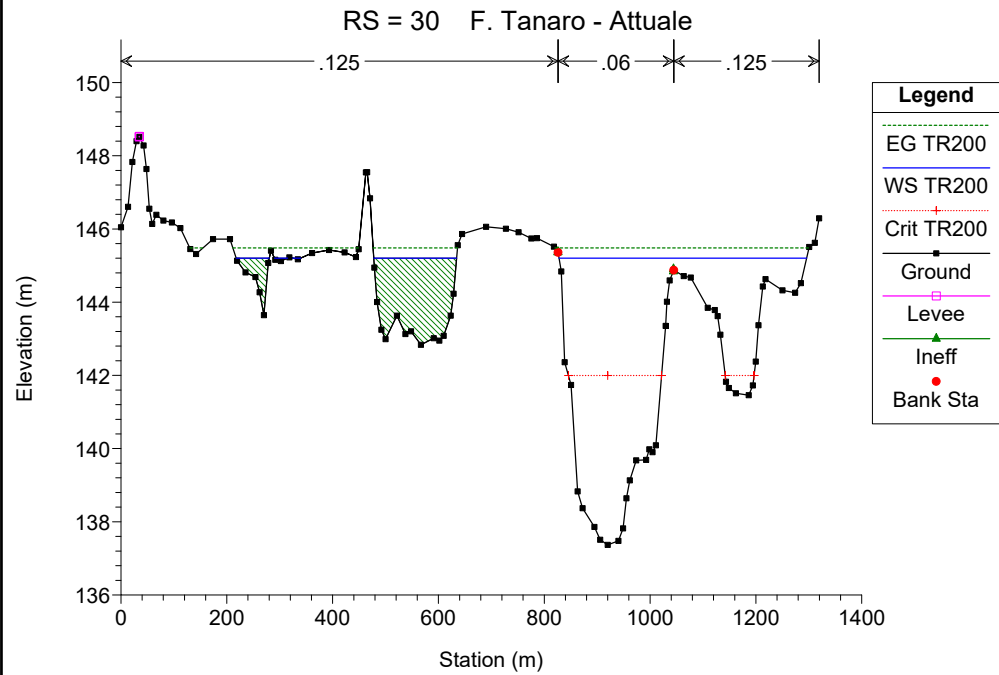
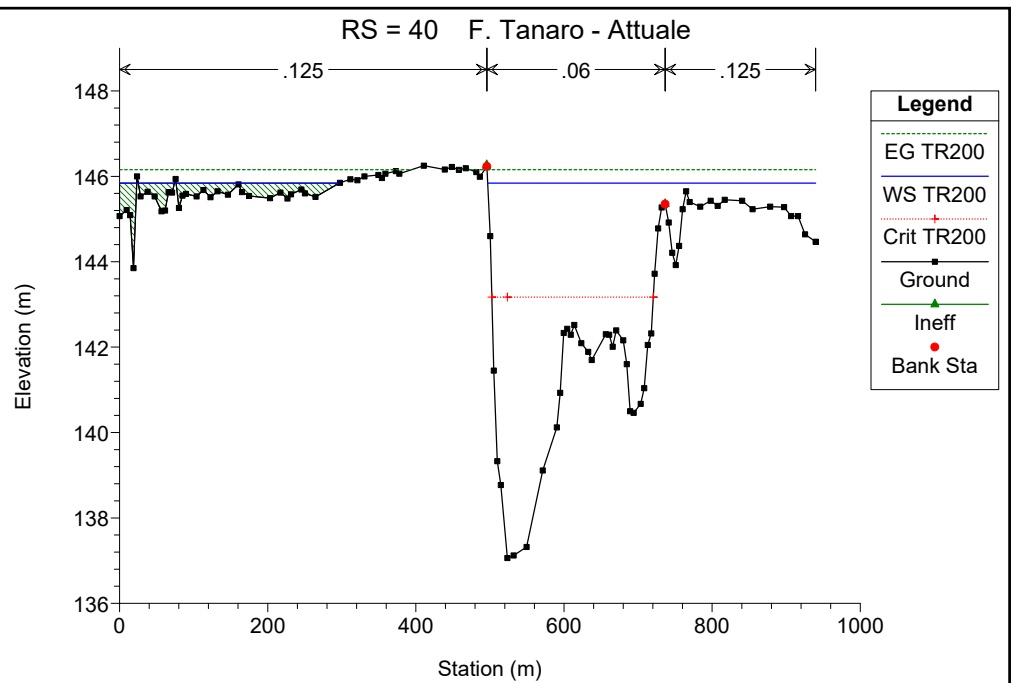
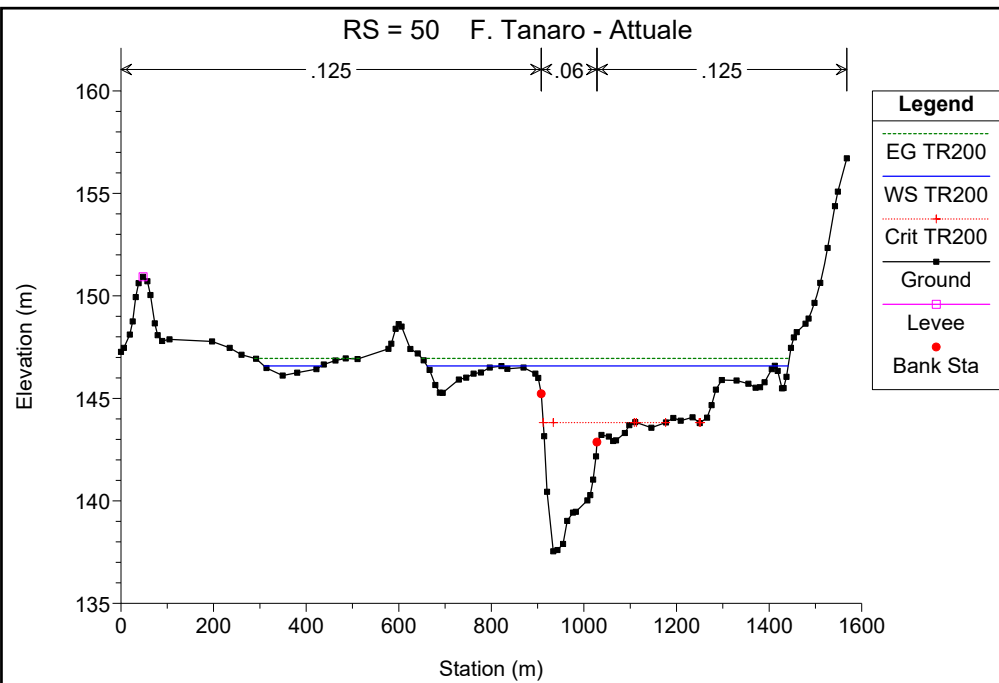




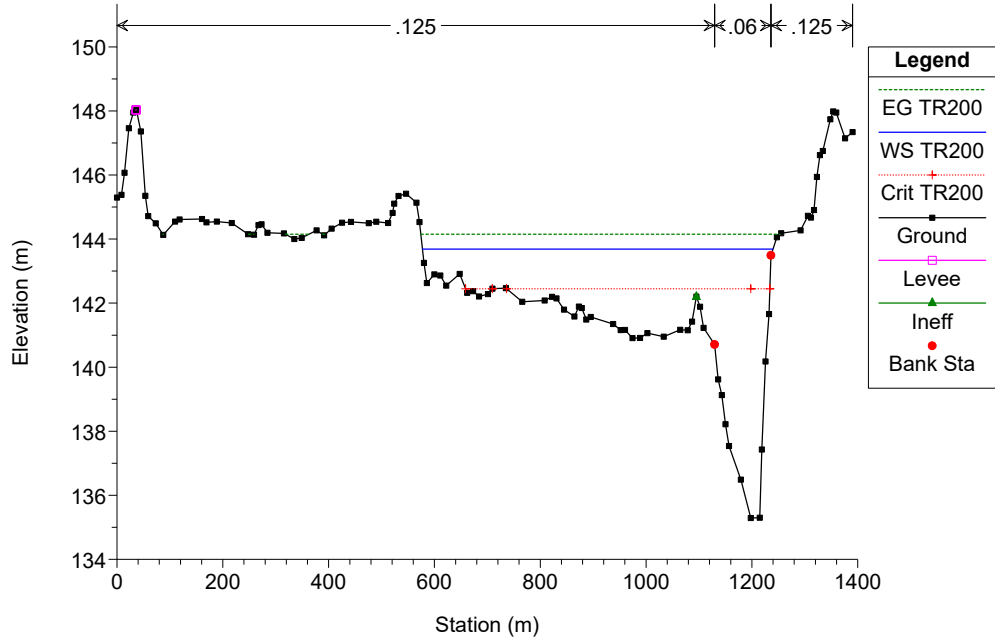








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO**

SIMULAZIONE 14

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3050	200
F. Tanaro valle Riddone	3058	
F. Tanaro valle Cherasca	3070	

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

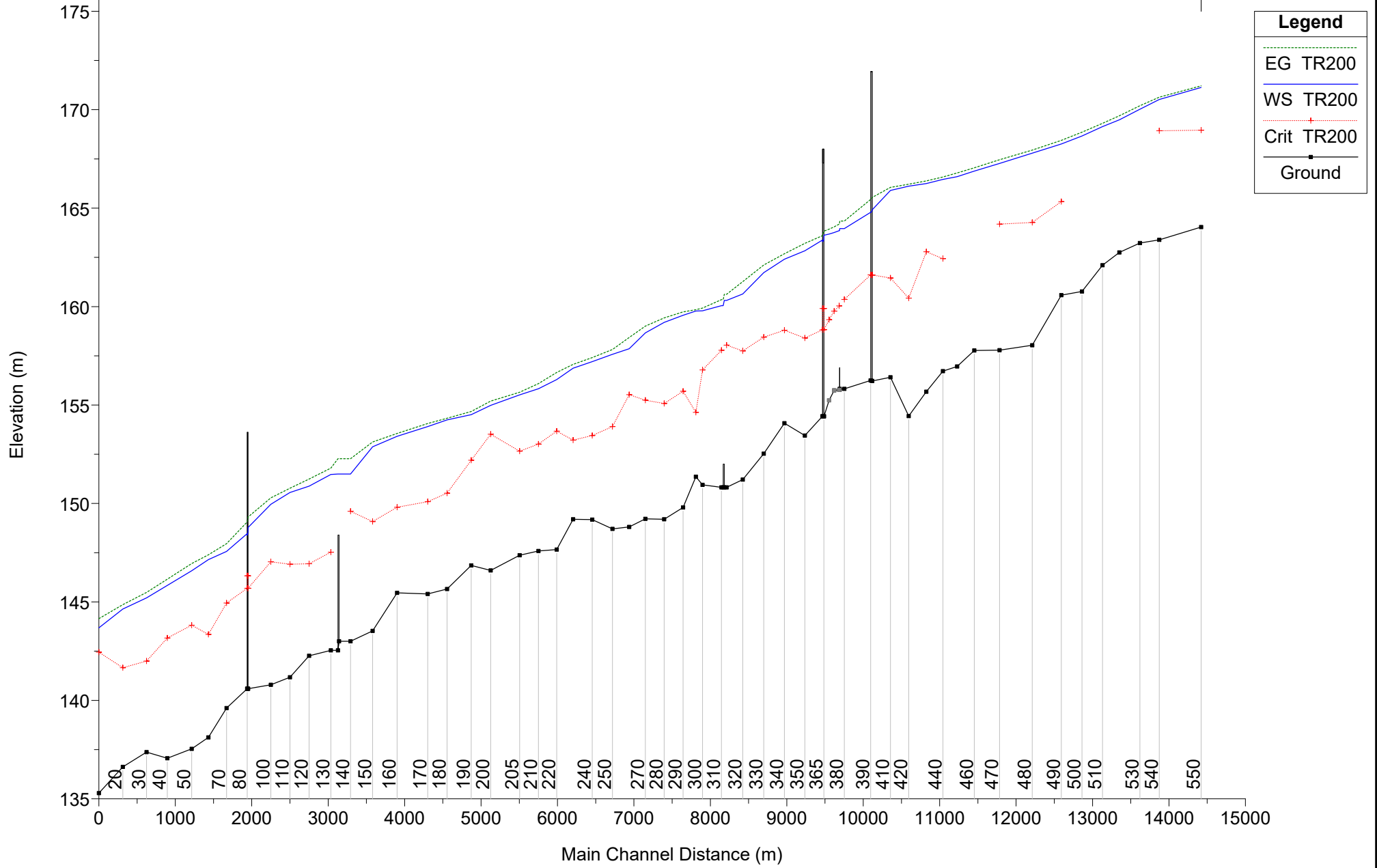
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001114	1.47	3245.02	1183.04	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.63	0.001628	2.09	3287.41	1121.44	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001814	2.16	2285.24	674.39	0.30
1	520	TR200	3050.00	162.75	169.49		169.69	0.002098	2.37	2500.27	1043.05	0.32
1	510	TR200	3050.00	162.10	169.14		169.31	0.001870	2.12	2425.08	736.79	0.30
1	500	TR200	3050.00	160.77	168.67		168.86	0.001597	2.19	2161.02	553.58	0.28
1	490	TR200	3050.00	160.58	168.26	165.33	168.44	0.001546	2.04	2004.22	517.21	0.28
1	480	TR200	3050.00	158.04	167.80	164.27	167.95	0.001188	1.96	2526.53	817.63	0.25
1	470	TR200	3050.00	157.79	167.27	164.19	167.46	0.001391	2.21	2237.03	561.15	0.27
1	460	TR200	3050.00	157.77	166.88		167.05	0.001092	1.98	2587.29	857.13	0.24
1	450	TR200	3050.00	156.96	166.60		166.79	0.001187	2.10	2454.76	1035.57	0.25
1	440	TR200	3050.00	156.72	166.46	162.43	166.58	0.000840	1.83	3046.07	798.18	0.21
1	430	TR200	3050.00	155.68	166.25	162.79	166.38	0.001015	2.02	2925.99	665.86	0.23
1	420	TR200	3050.00	154.44	166.12	160.43	166.22	0.000564	1.66	3253.54	689.26	0.18
1	410	TR200	3050.00	156.41	165.90	161.45	166.06	0.000975	2.01	2488.56	545.65	0.23
1	400	TR200	3050.00	156.22	164.92	161.61	165.55	0.003377	3.60	976.27	176.85	0.42
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.79	161.61	165.45	0.003585	3.67	954.73	175.46	0.43
1	380	TR200	3050.00	155.82	163.97	160.36	164.35	0.002197	2.75	1163.01	261.42	0.34
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.63	158.82	163.84	0.001072	2.02	1511.77	207.75	0.24
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.39	158.82	163.61	0.001194	2.09	1461.30	207.08	0.25
1	350	TR200	3050.00	153.45	162.84	158.40	163.22	0.001925	2.73	1192.55	288.95	0.32
1	340	TR200	3058.00	154.08	162.42	158.80	162.70	0.001758	2.38	1479.59	387.12	0.30
1	330	TR200	3058.00	152.53	161.73	158.45	162.12	0.002456	2.85	1355.70	439.67	0.36
1	320	TR200	3058.00	151.21	160.65	157.75	161.28	0.003671	3.80	1352.40	576.62	0.44
1	315	TR200	3058.00	150.82	160.32	158.04	160.63	0.002127	2.89	2300.99	960.83	0.34
1	312.5		Inl Struct									
1	310	TR200	3058.00	150.82	160.06	157.79	160.36	0.002253	2.90	2049.14	774.60	0.35
1	300	TR200	3070.00	150.95	159.79	156.80	159.94	0.001216	1.94	2703.65	876.43	0.25
1	295	TR200	3070.00	151.36	159.76	154.52	159.84	0.000522	1.43	3388.63	903.19	0.17
1	290	TR200	3070.00	149.62	159.57	155.24	159.73	0.000990	1.86	2323.26	695.23	0.23
1	280	TR200	3070.00	149.20	159.22	155.10	159.45	0.001365	2.35	2119.29	535.37	0.27
1	270	TR200	3070.00	149.22	158.69	155.28	159.03	0.002141	2.93	1784.19	481.90	0.34
1	260	TR200	3070.00	148.81	157.88	155.55	158.46	0.003449	3.61	1238.07	355.34	0.43
1	250	TR200	3070.00	148.71	157.60	153.93	157.84	0.001764	2.43	1987.31	556.75	0.30
1	240	TR200	3070.00	149.18	157.22	153.47	157.43	0.001373	2.22	2299.93	764.34	0.27
1	230	TR200	3070.00	149.20	156.89	153.23	157.08	0.001350	2.10	2023.69	581.55	0.27
1	220	TR200	3070.00	147.66	156.31	153.69	156.67	0.002561	2.94	1597.51	428.04	0.37

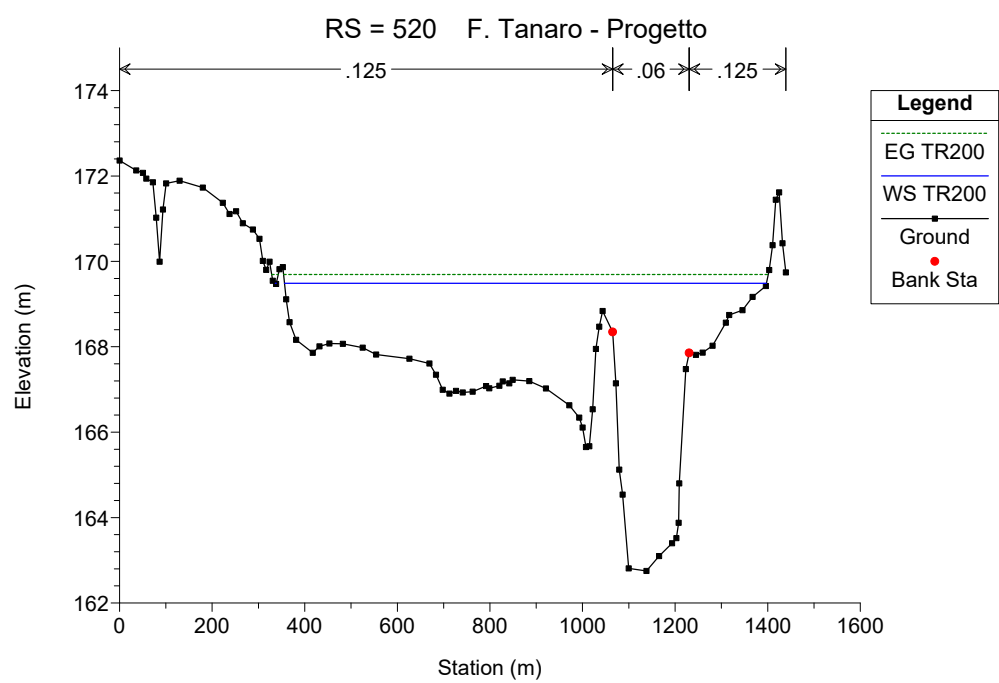
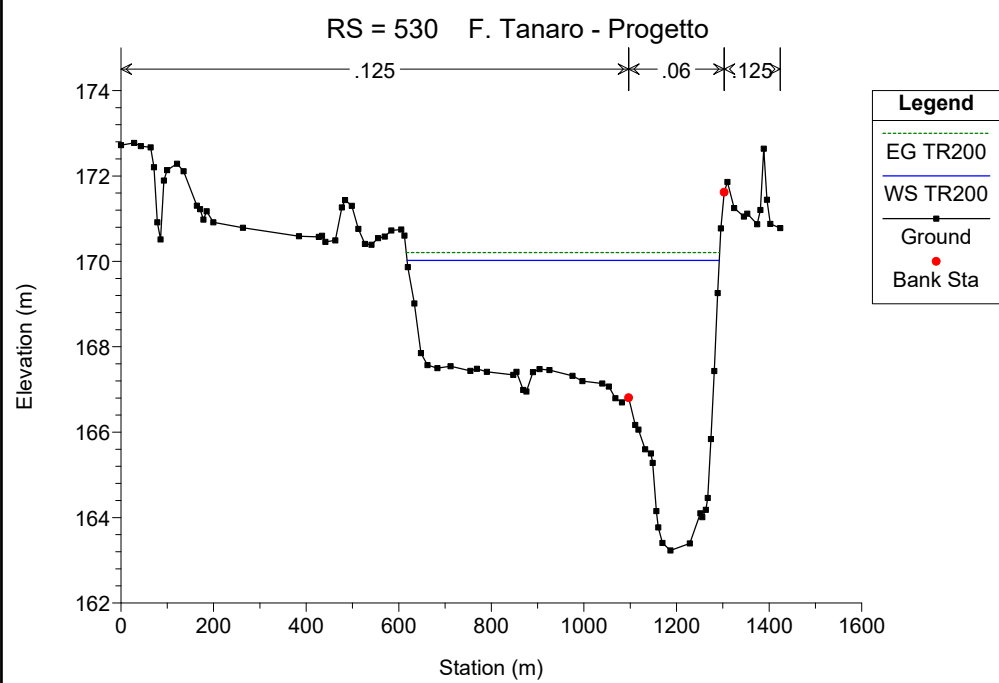
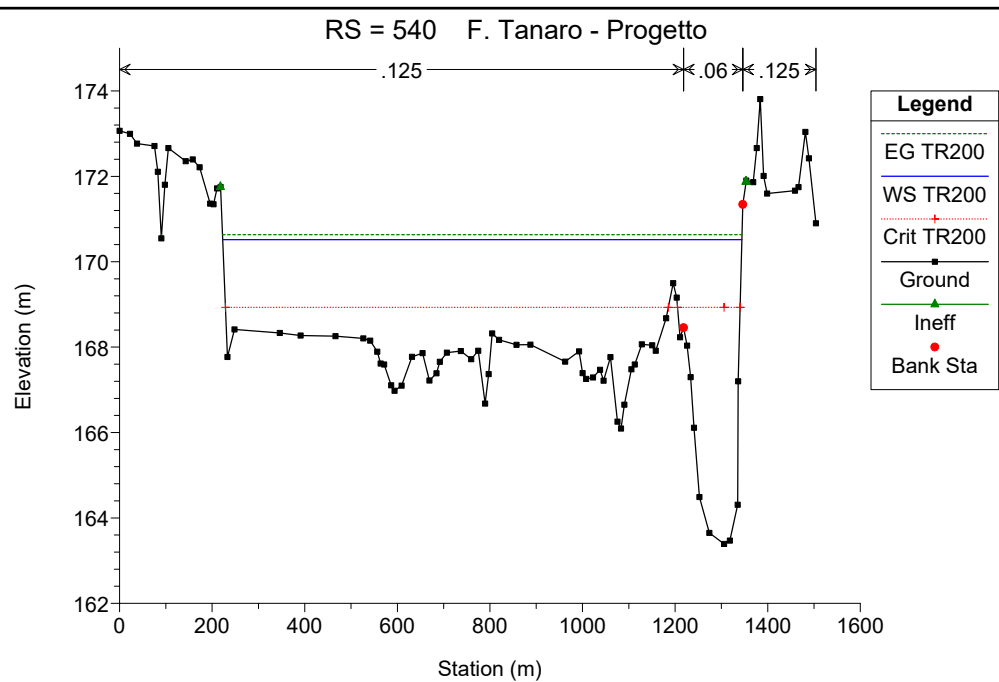
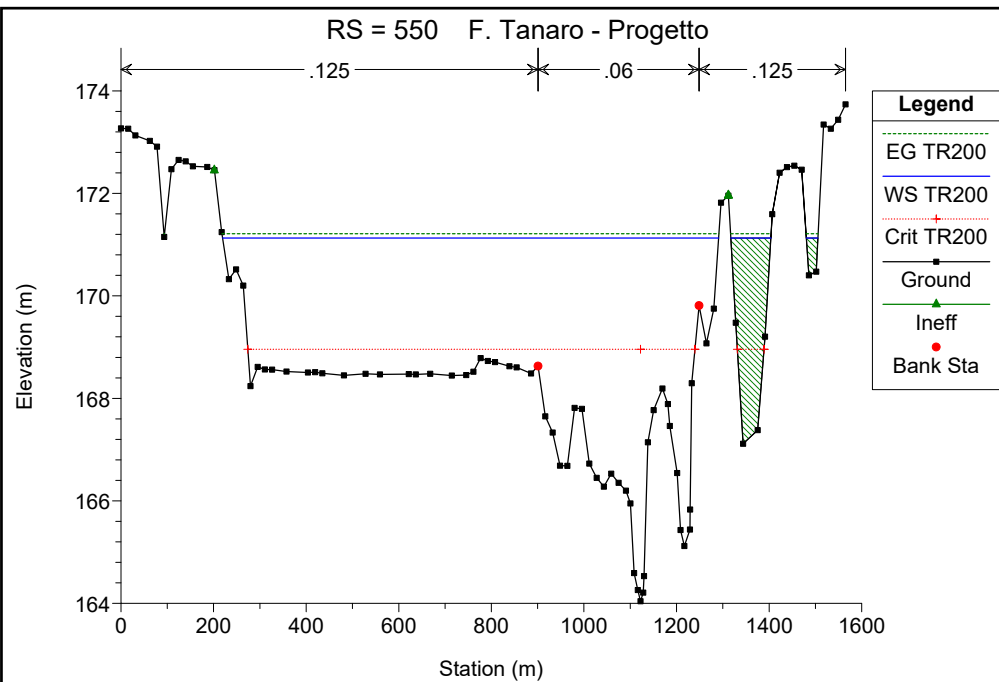
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

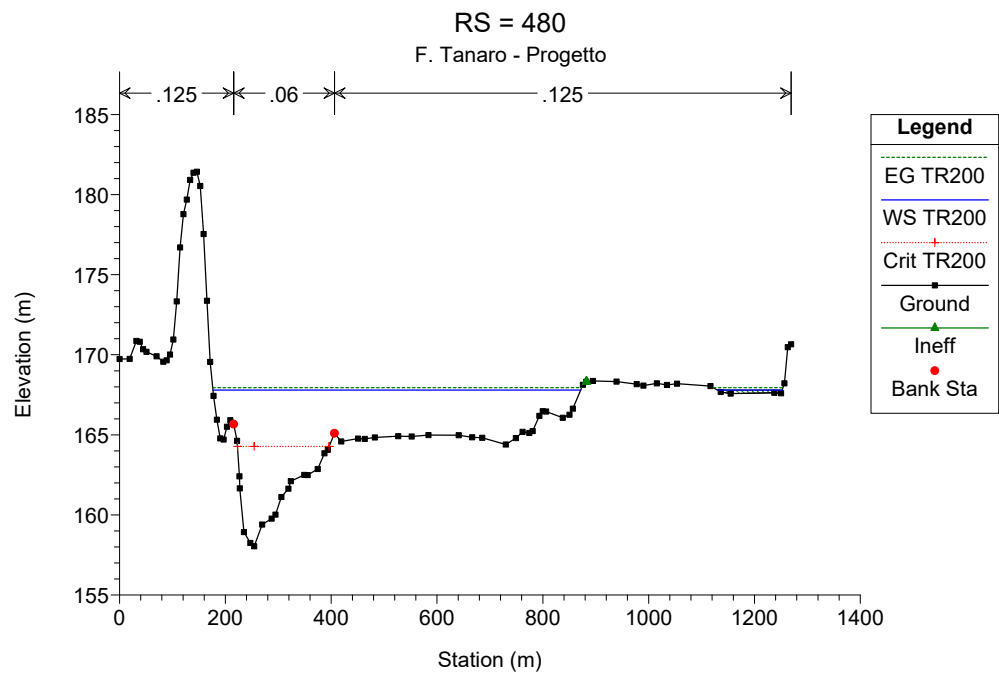
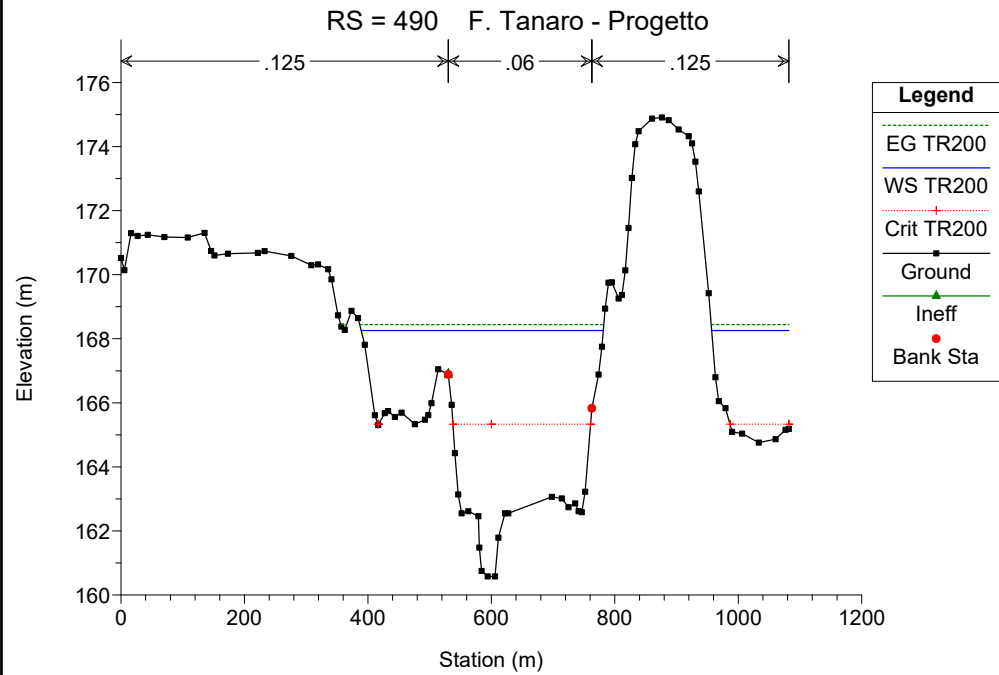
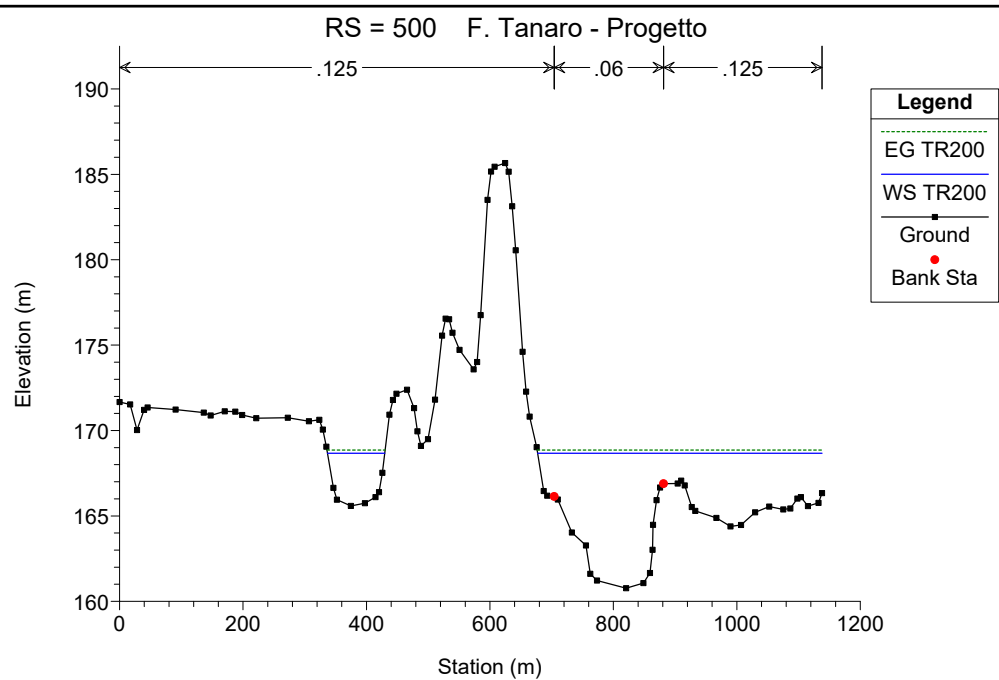
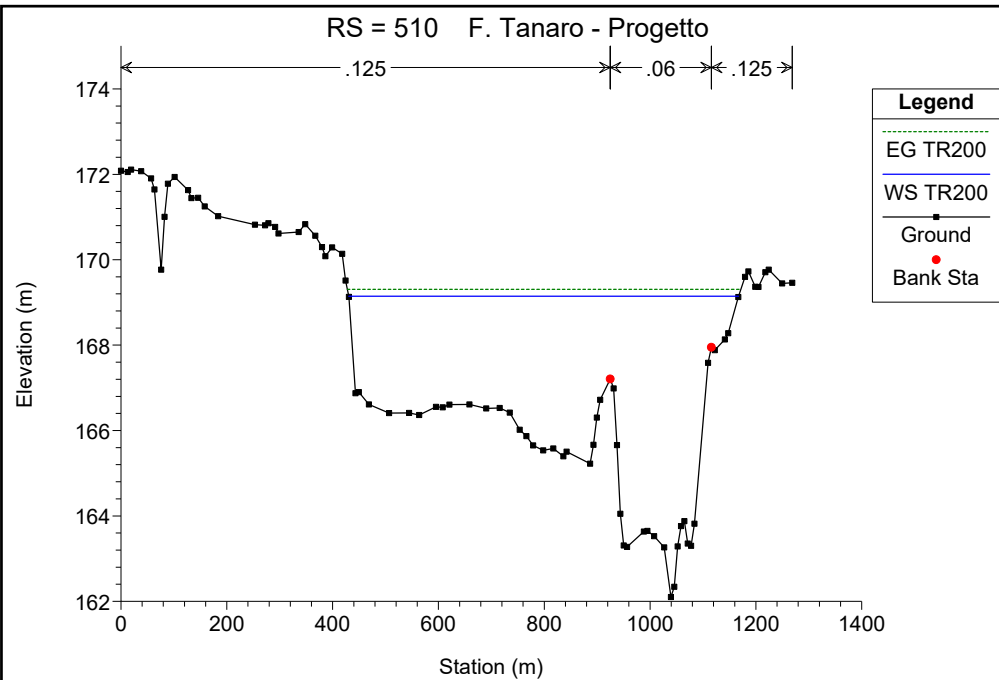
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR200	3070.00	147.59	155.84	153.03	156.10	0.001967	2.43	1850.52	636.44	0.32
1	205	TR200	3070.00	147.37	155.53	152.67	155.66	0.001271	1.87	2922.19	1003.43	0.25
1	200	TR200	3070.00	146.60	155.00	153.53	155.21	0.002021	2.56	2746.11	1082.06	0.32
1	190	TR200	3070.00	146.85	154.52	152.21	154.69	0.001878	2.10	2652.06	1158.72	0.30
1	180	TR200	3070.00	145.66	154.26	150.54	154.34	0.000758	1.42	3567.74	1436.83	0.19
1	170	TR200	3070.00	145.40	153.92	150.11	154.08	0.001444	1.90	2670.61	1337.82	0.27
1	160	TR200	3070.00	145.46	153.42	149.83	153.57	0.001201	1.84	2747.73	1387.58	0.25
1	150	TR200	3070.00	143.53	152.89	149.10	153.14	0.001549	2.33	2329.68	1341.68	0.29
1	140	TR200	3070.00	143.00	151.50	149.62	152.28	0.006444	3.94	868.40	578.08	0.56
1	135		Inl Struct									
1	130	TR200	3070.00	142.54	151.50	147.54	151.82	0.001863	2.58	1740.01	1191.99	0.31
1	120	TR200	3070.00	142.27	150.90	146.96	151.27	0.002018	2.72	1551.38	1047.96	0.33
1	110	TR200	3070.00	141.17	150.58	146.94	150.80	0.001443	2.29	2322.27	759.96	0.28
1	100	TR200	3070.00	140.79	149.99	147.05	150.31	0.002557	2.60	1530.40	561.47	0.35
1	90	TR200	3070.00	140.59	148.81	145.71	149.34	0.003742	3.24	946.70	172.92	0.43
1	85		Bridge									
1	80	TR200	3070.00	140.59	148.50	145.71	149.09	0.004172	3.42	897.97	164.60	0.45
1	70	TR200	3070.00	139.61	147.59	144.97	147.99	0.003359	2.95	1313.38	305.57	0.41
1	60	TR200	3070.00	138.12	147.17	143.37	147.42	0.001556	2.44	2182.01	818.21	0.29
1	50	TR200	3070.00	137.54	146.60	143.99	146.97	0.002468	2.98	1840.17	907.16	0.36
1	40	TR200	3070.00	137.06	145.86	143.18	146.17	0.002702	2.52	1343.30	737.82	0.36
1	30	TR200	3070.00	137.37	145.22	142.02	145.50	0.002228	2.42	1581.88	738.76	0.33
1	20	TR200	3070.00	136.62	144.66	141.68	144.87	0.001721	2.40	2341.28	840.96	0.30
1	10	TR200	3070.00	135.29	143.70	142.45	144.17	0.004002	3.49	1689.40	662.87	0.45

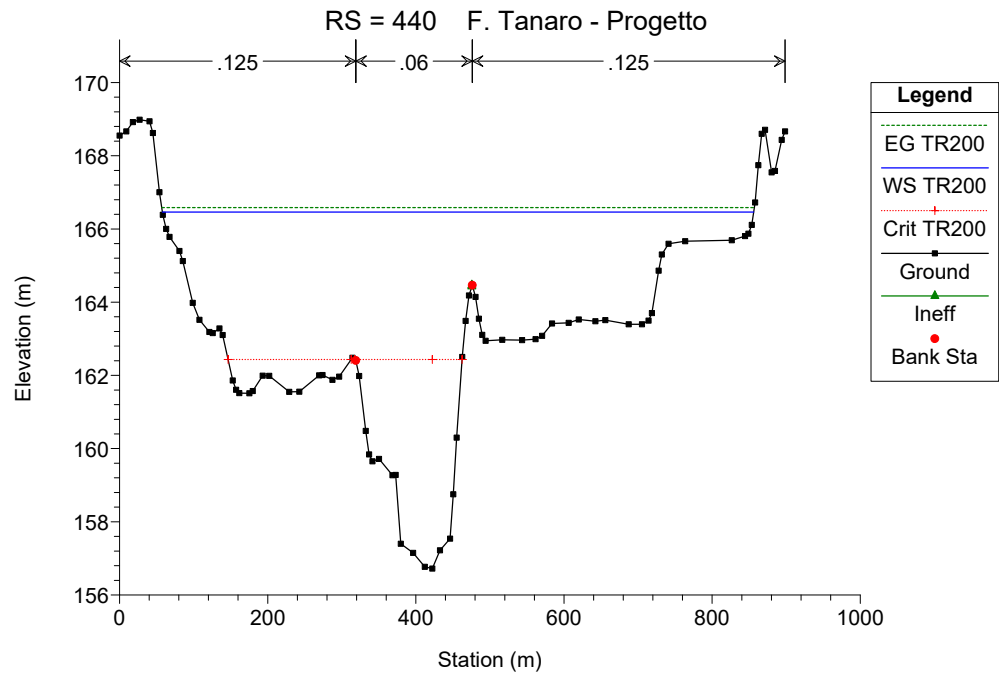
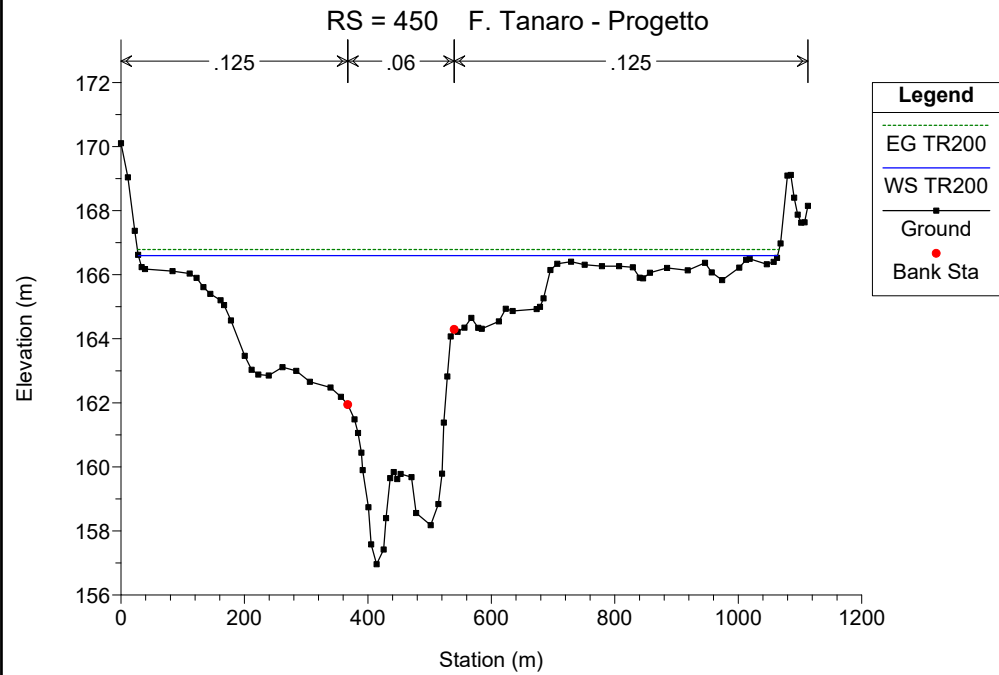
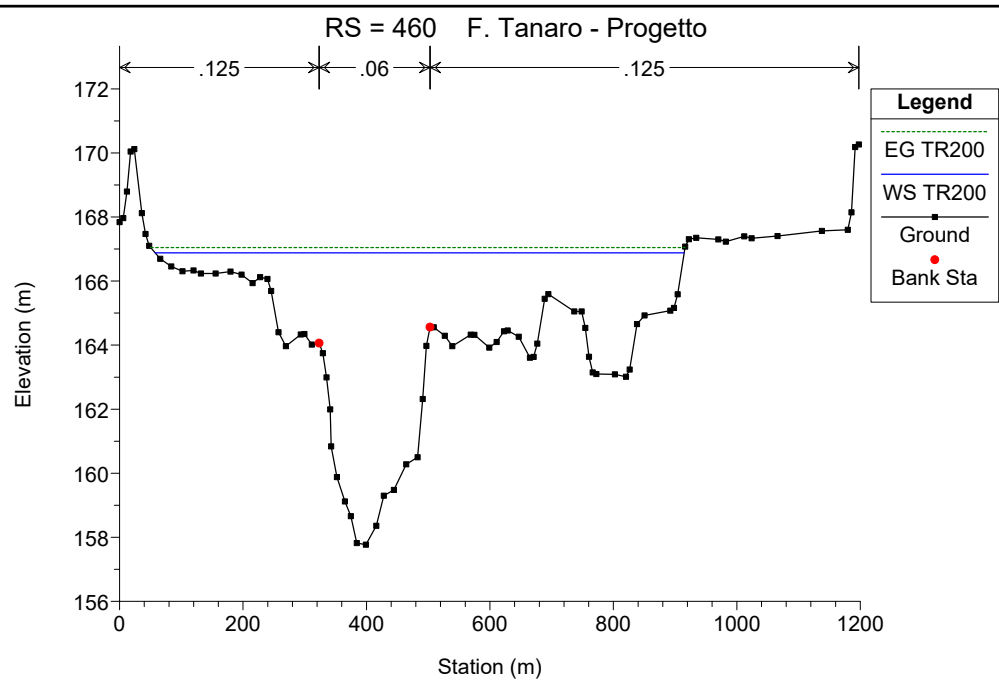
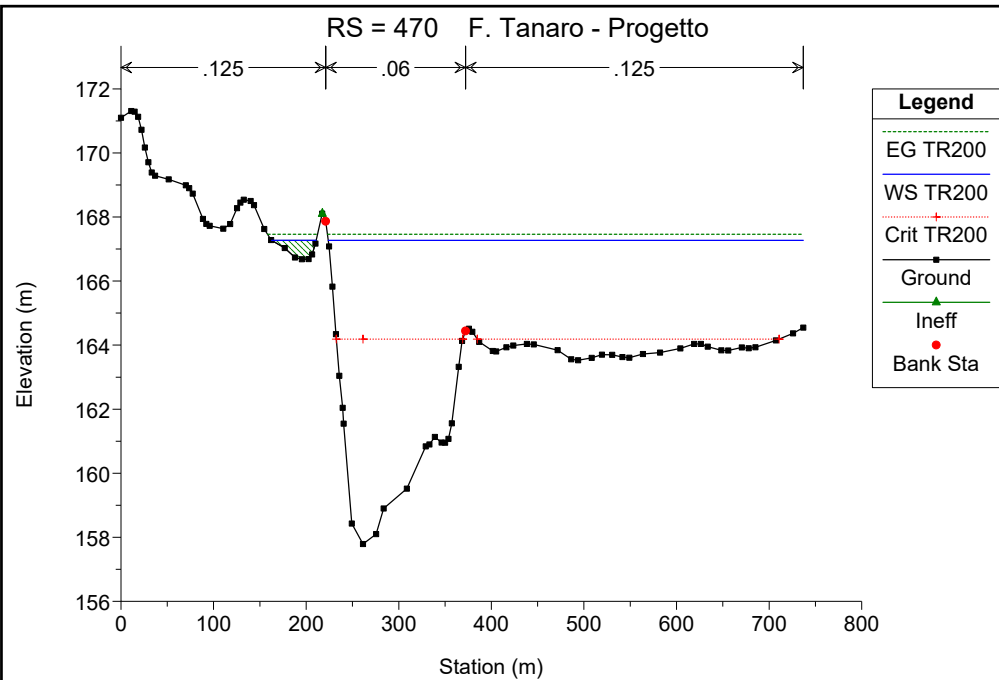
F. Tanaro - Progetto

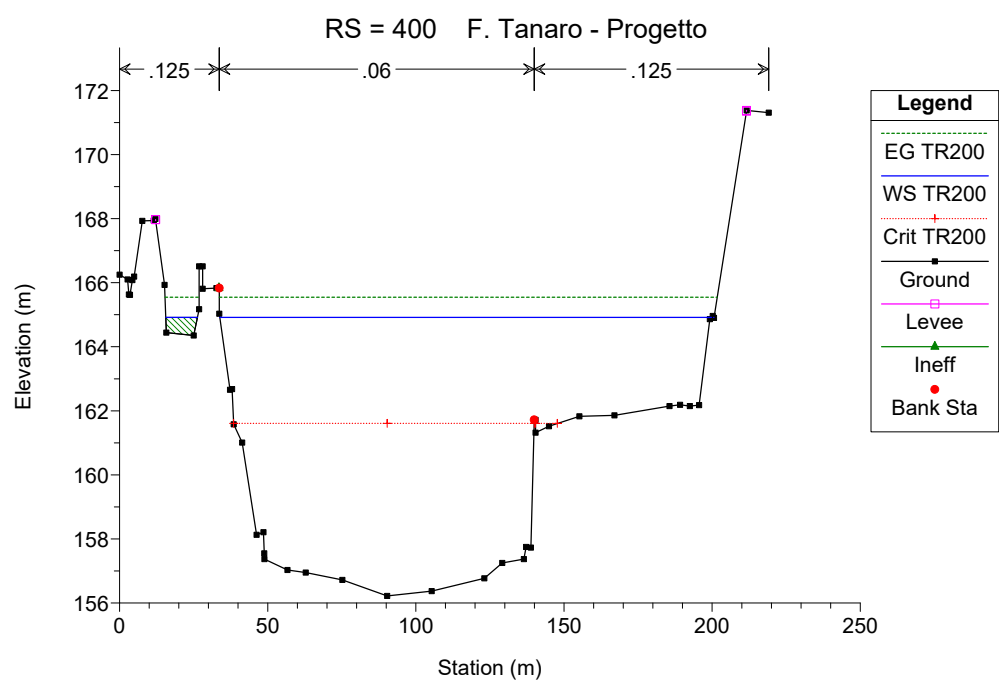
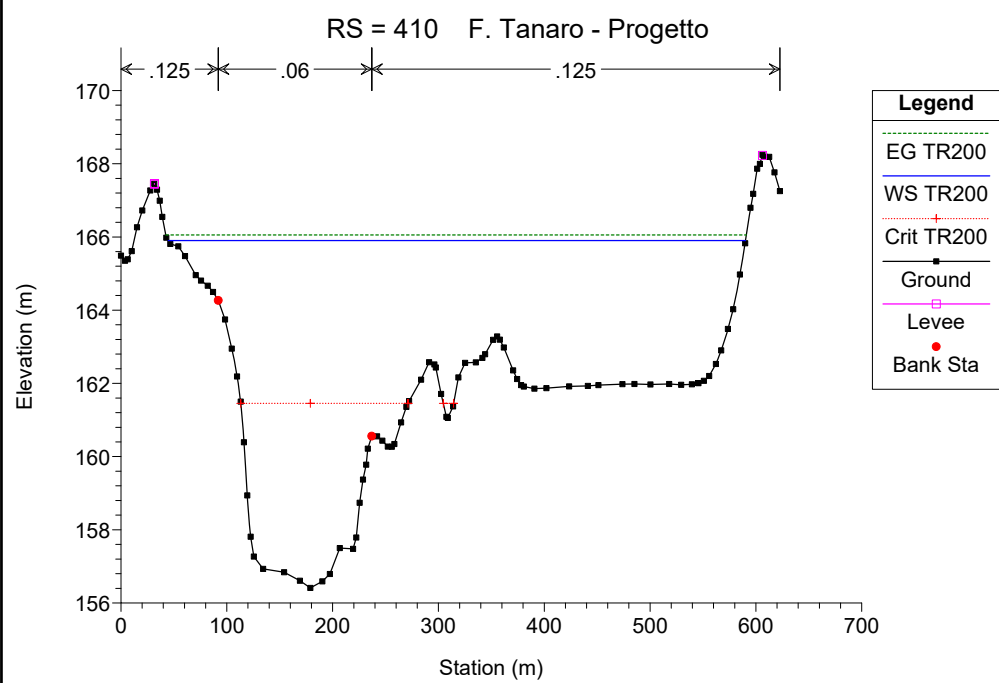
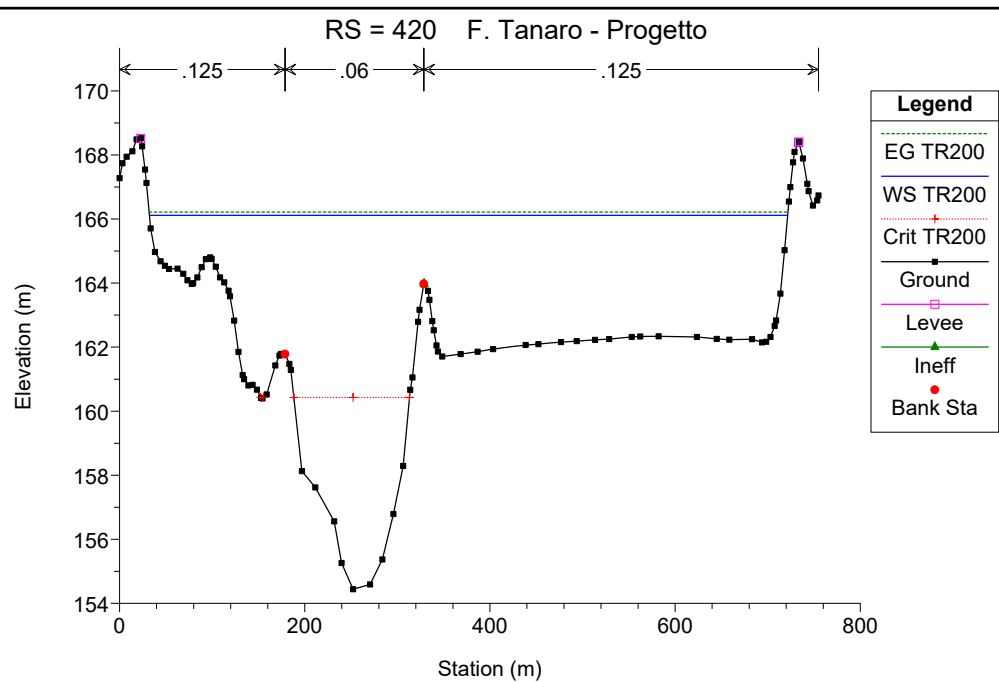
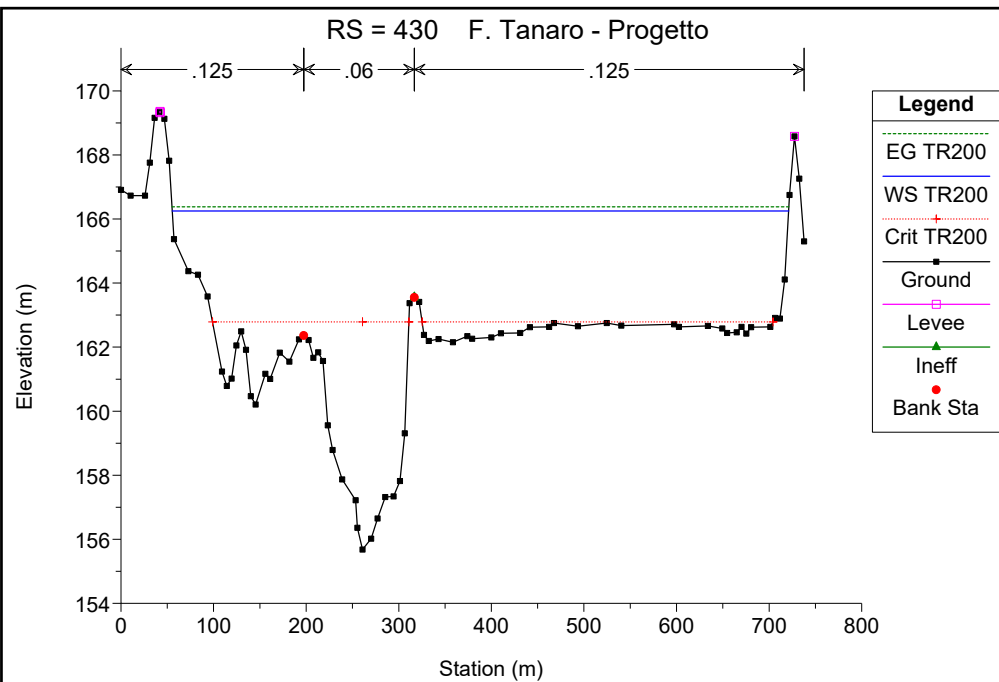
Tanaro 1

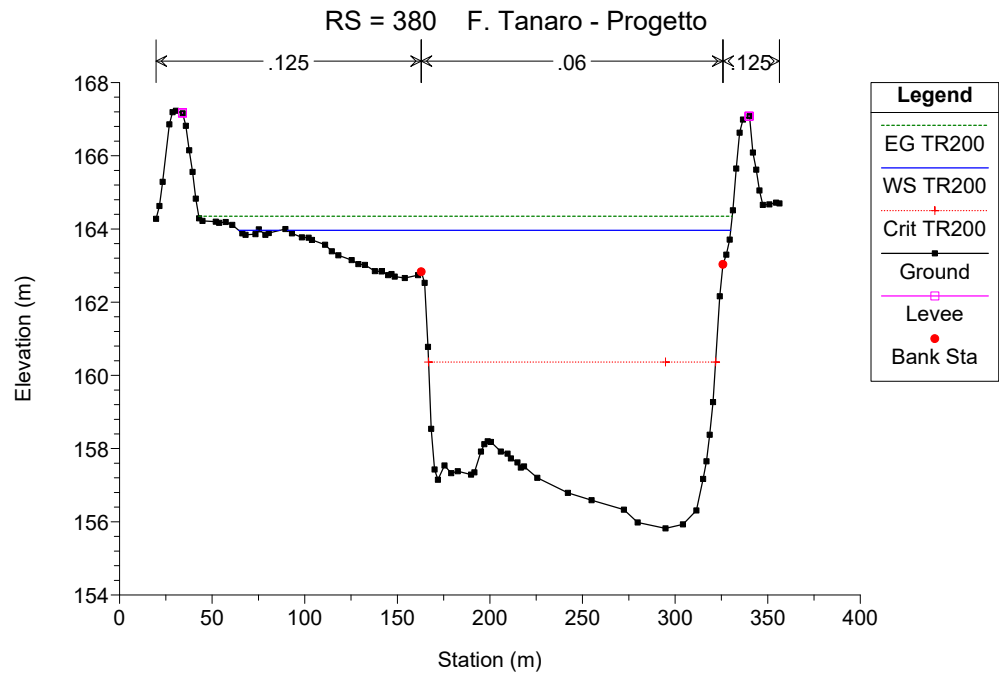
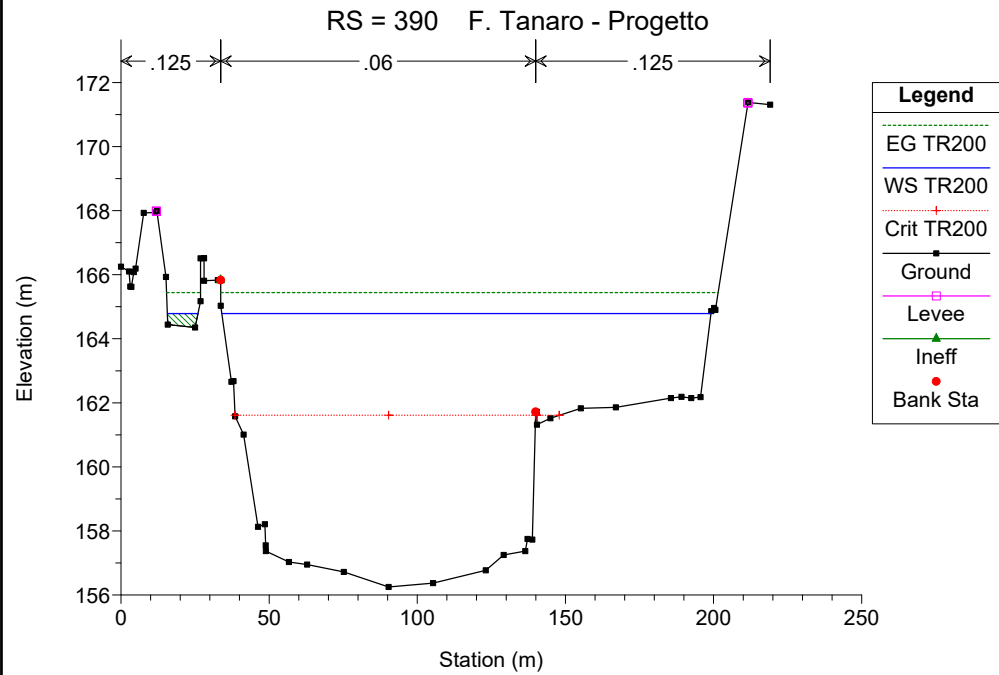
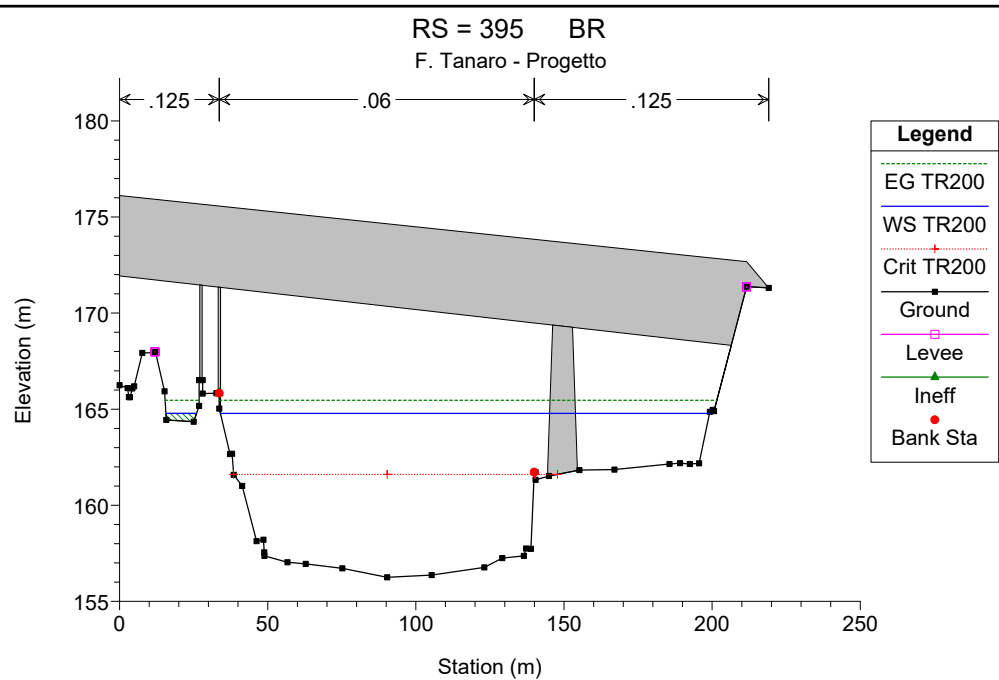
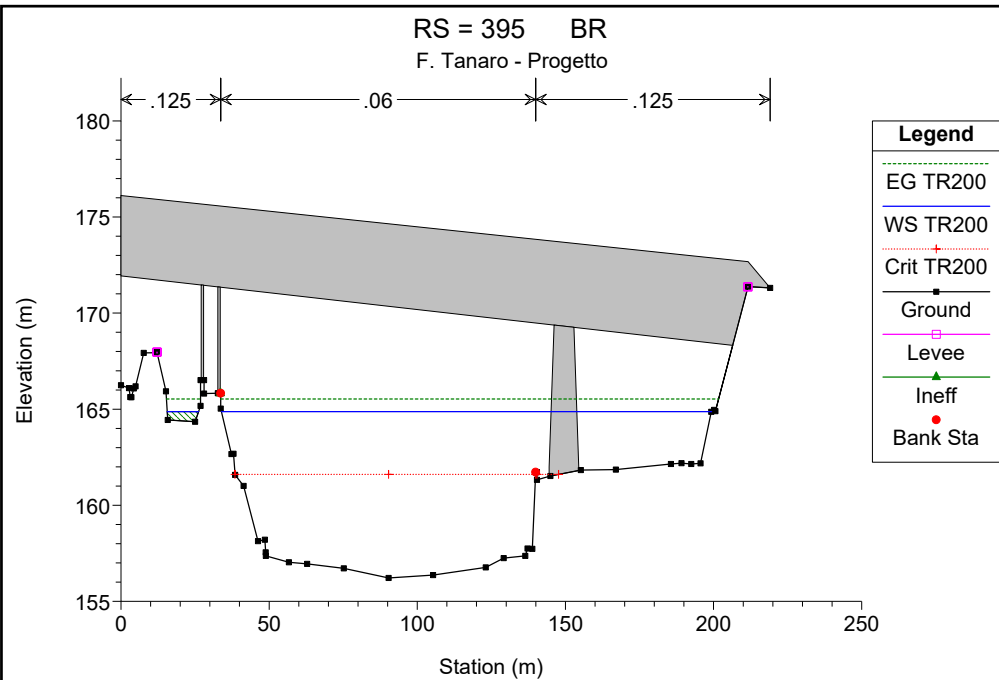


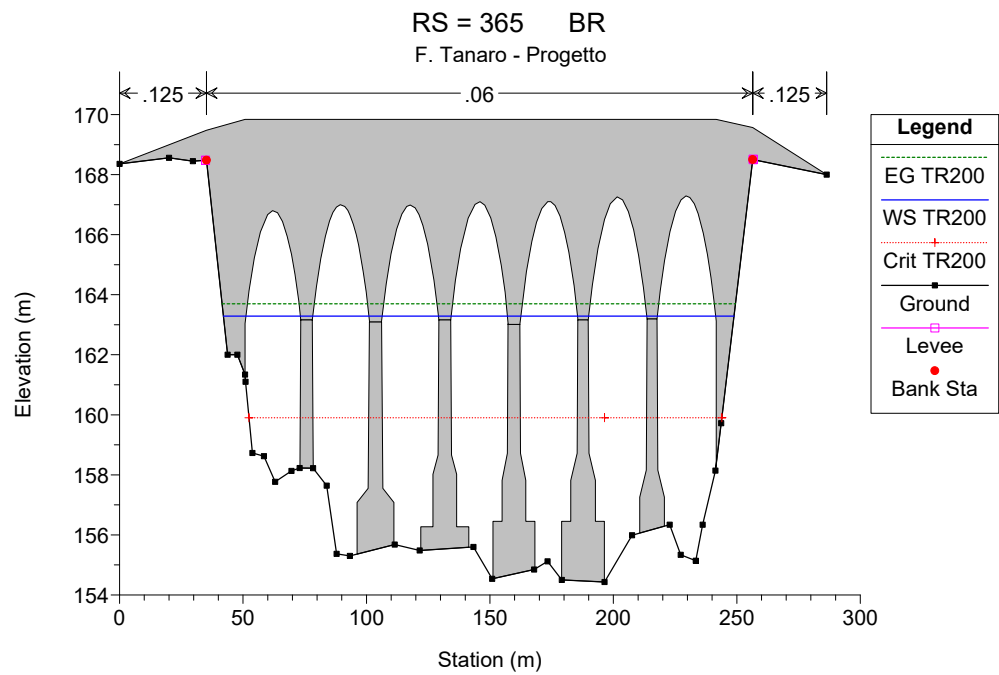
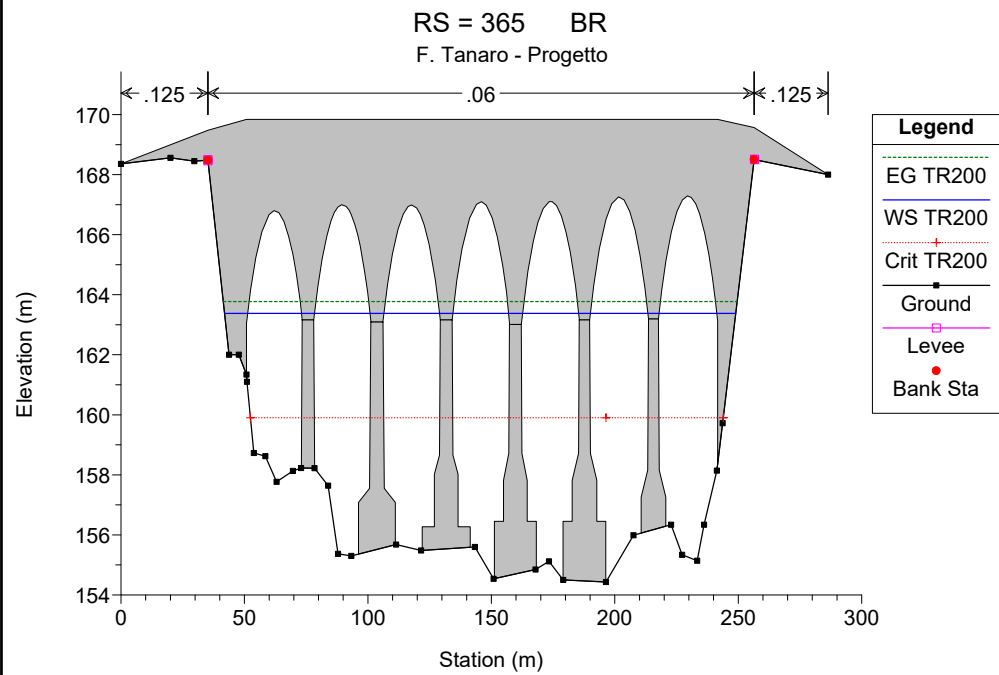
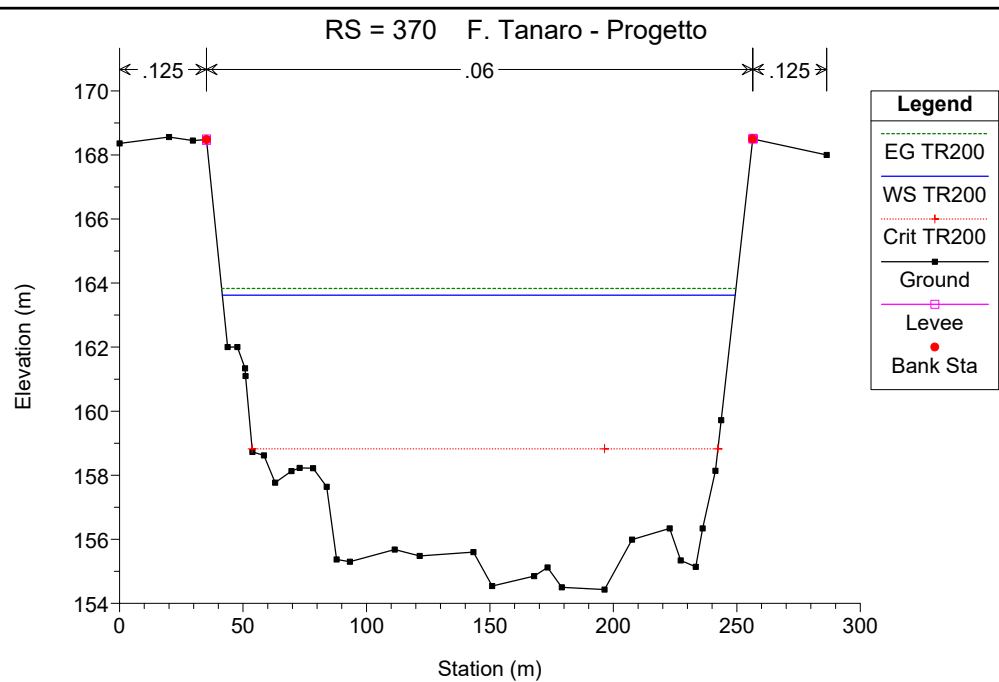
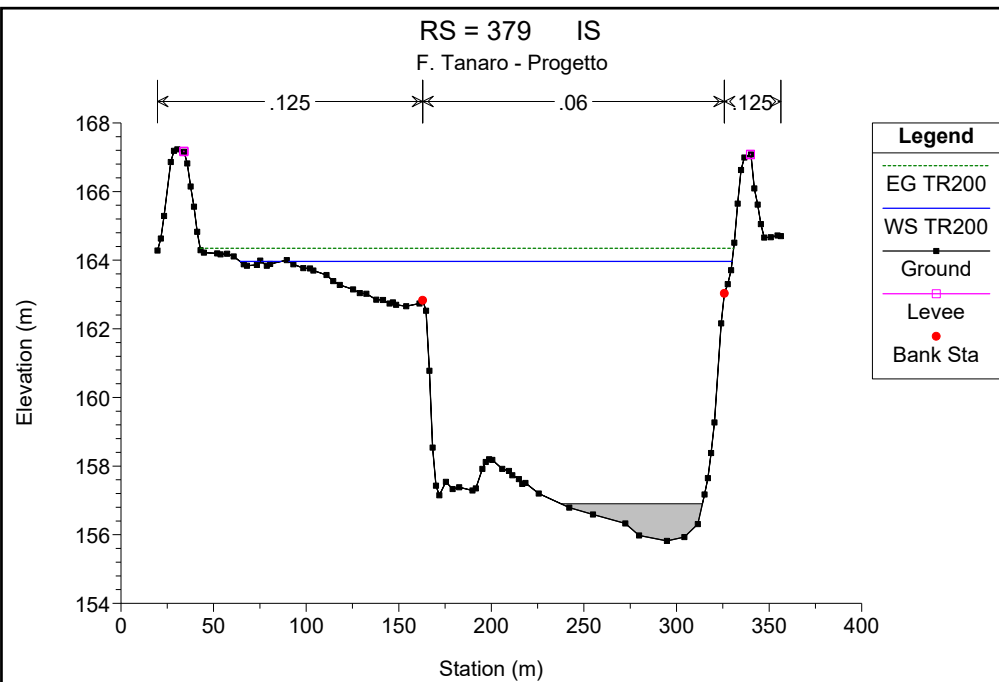


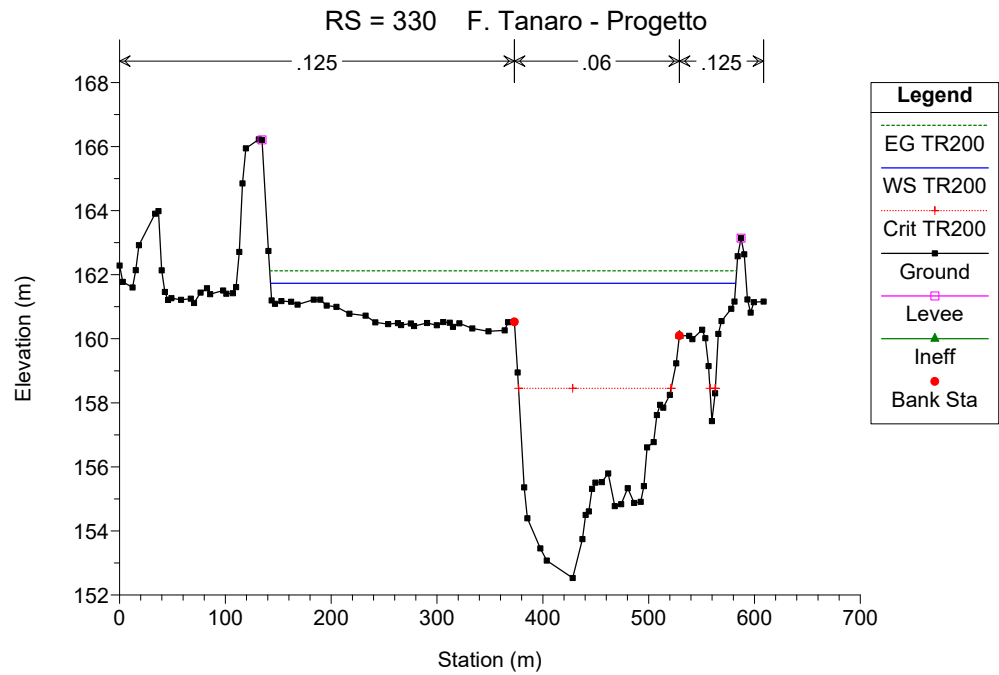
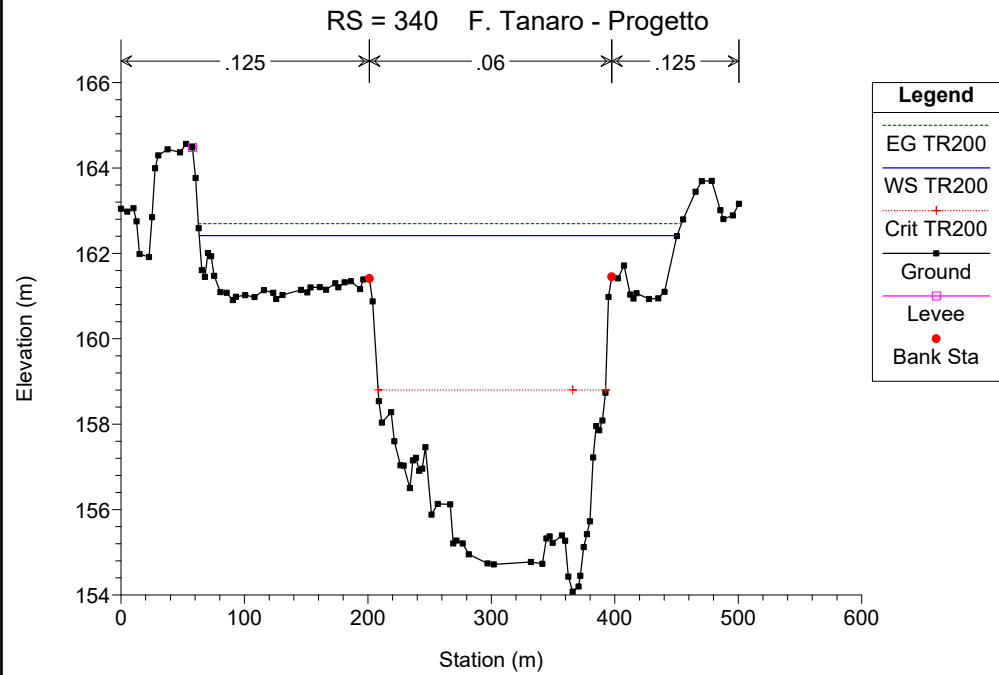
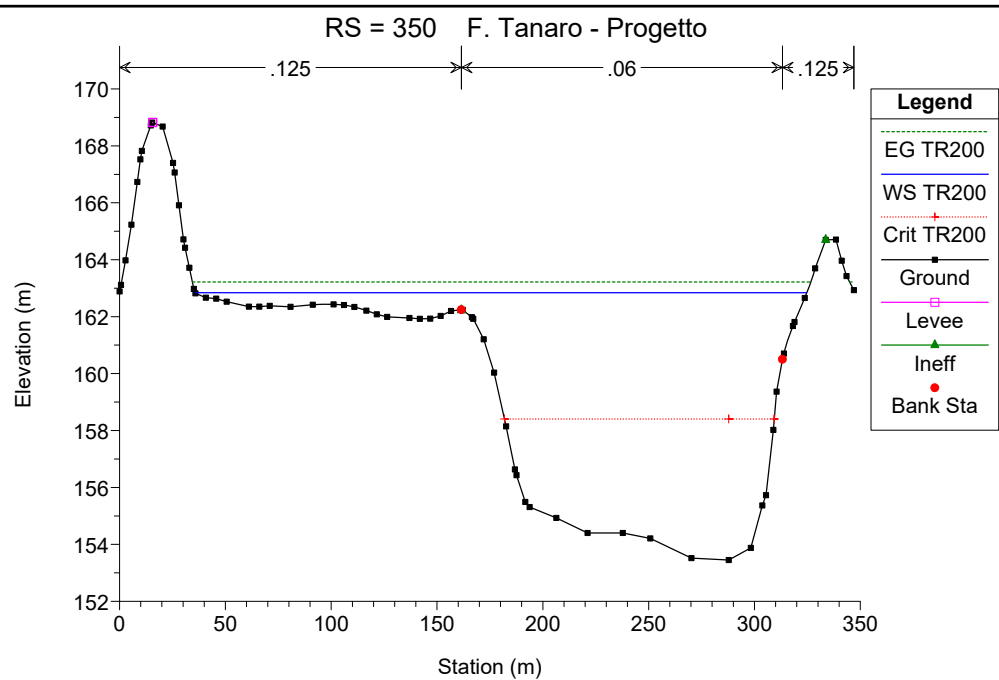
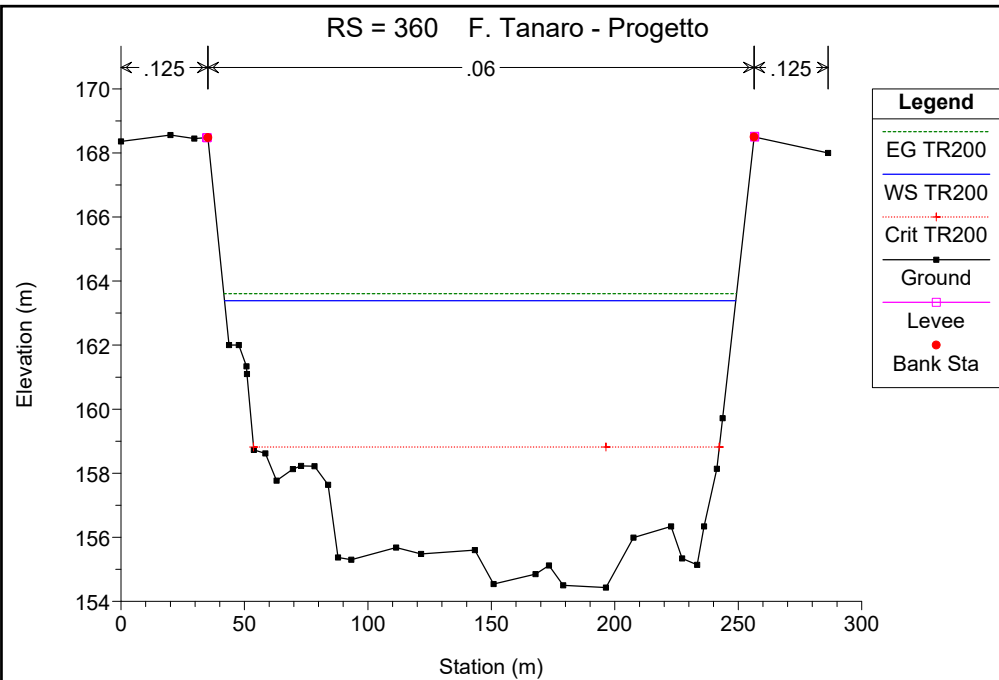


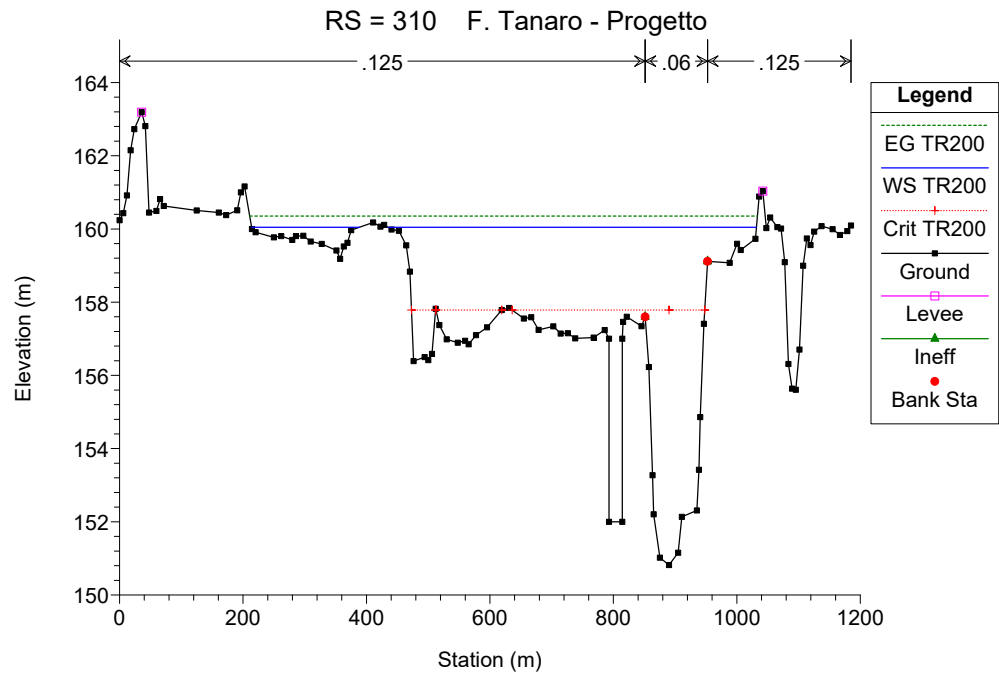
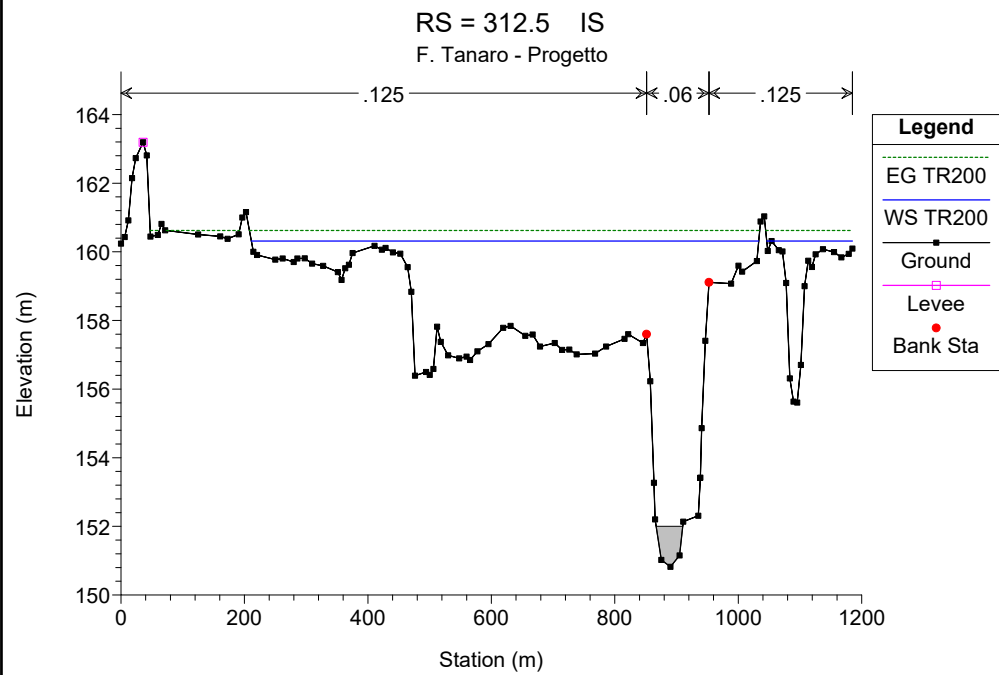
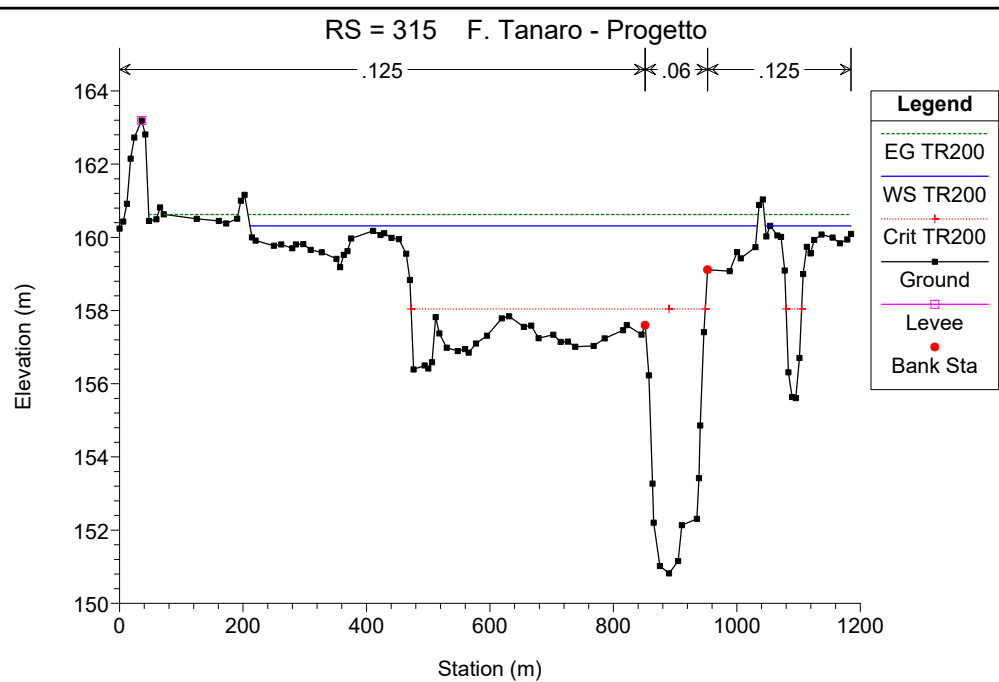
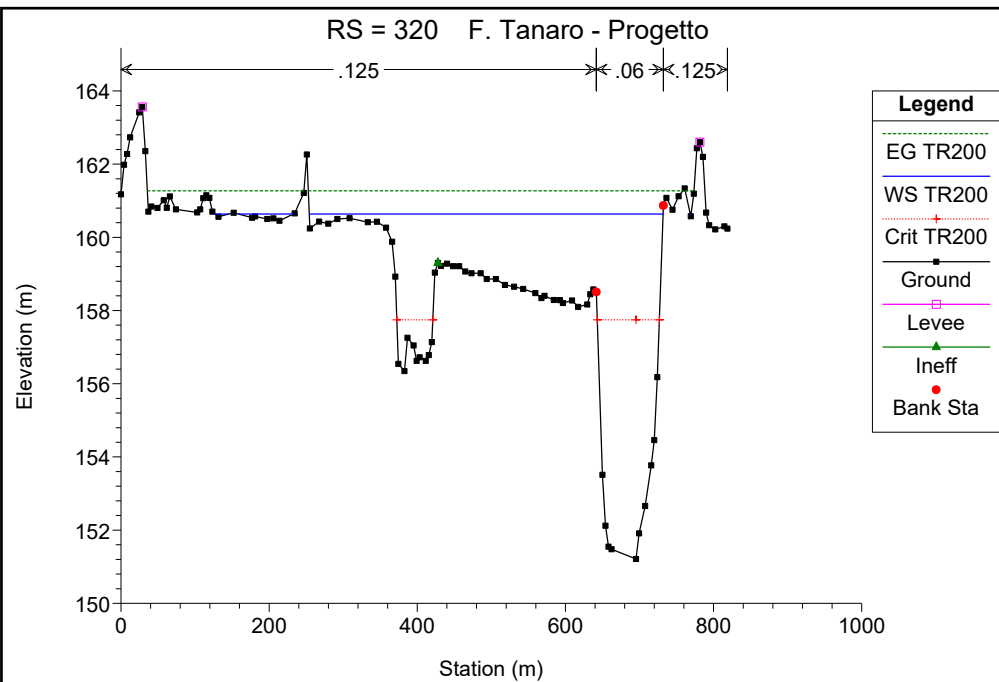


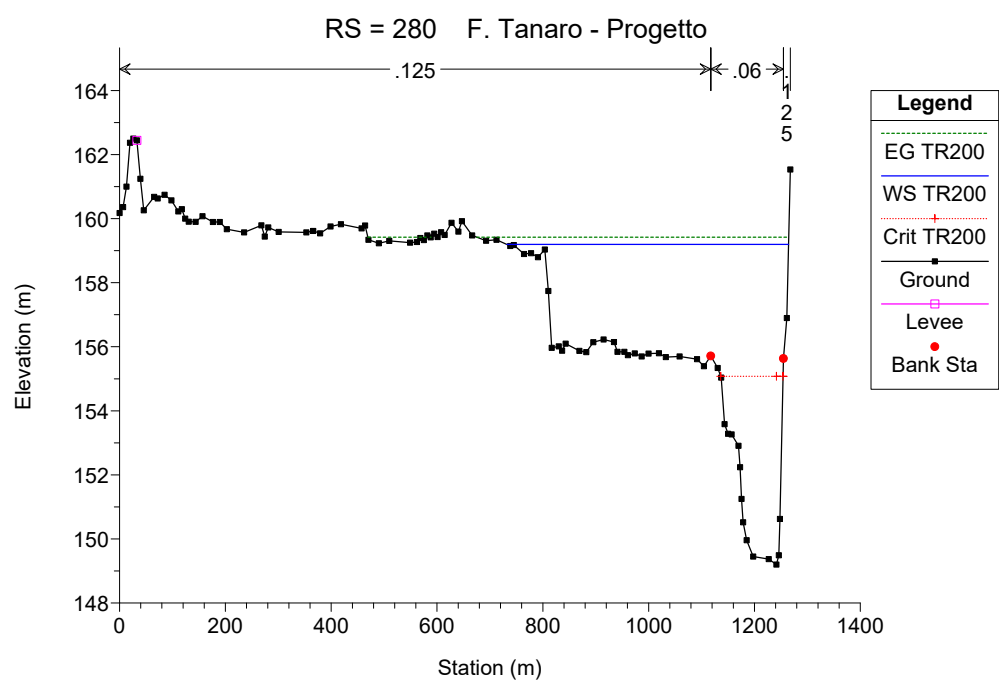
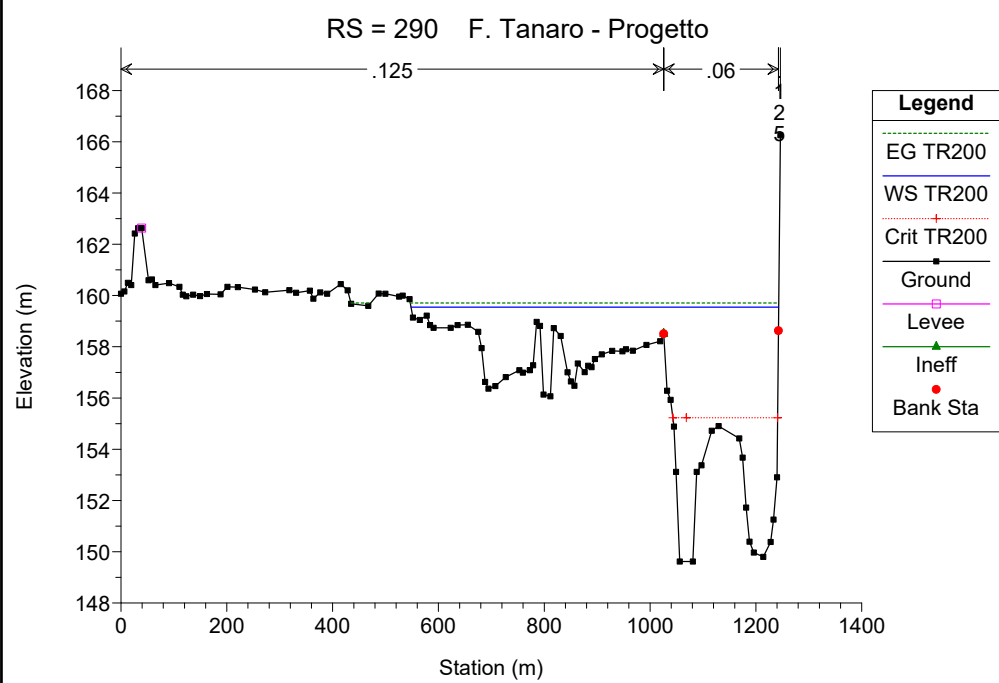
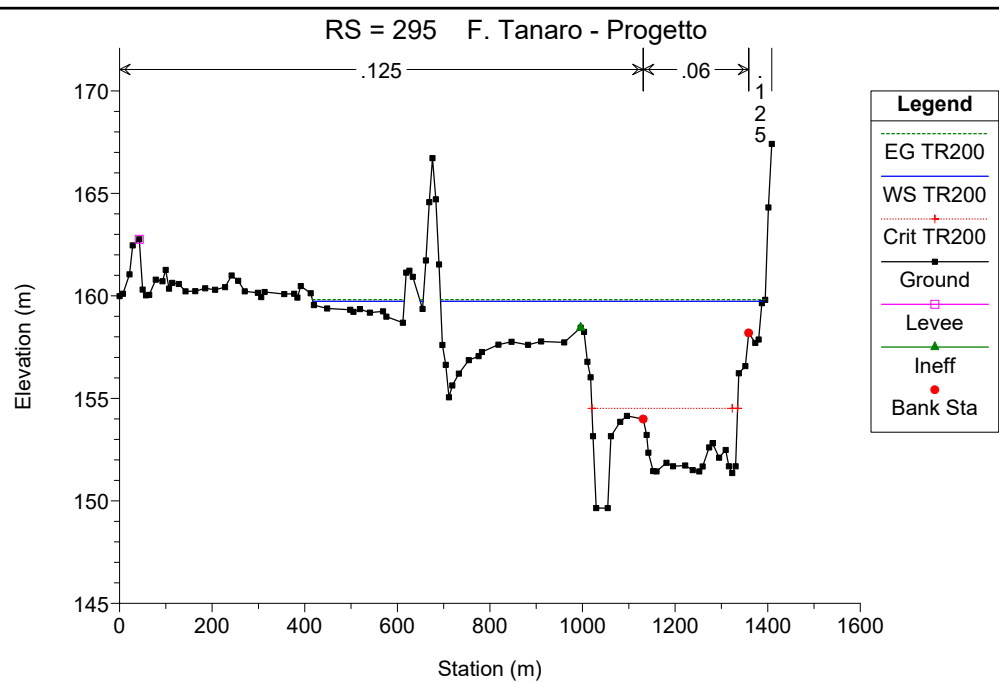
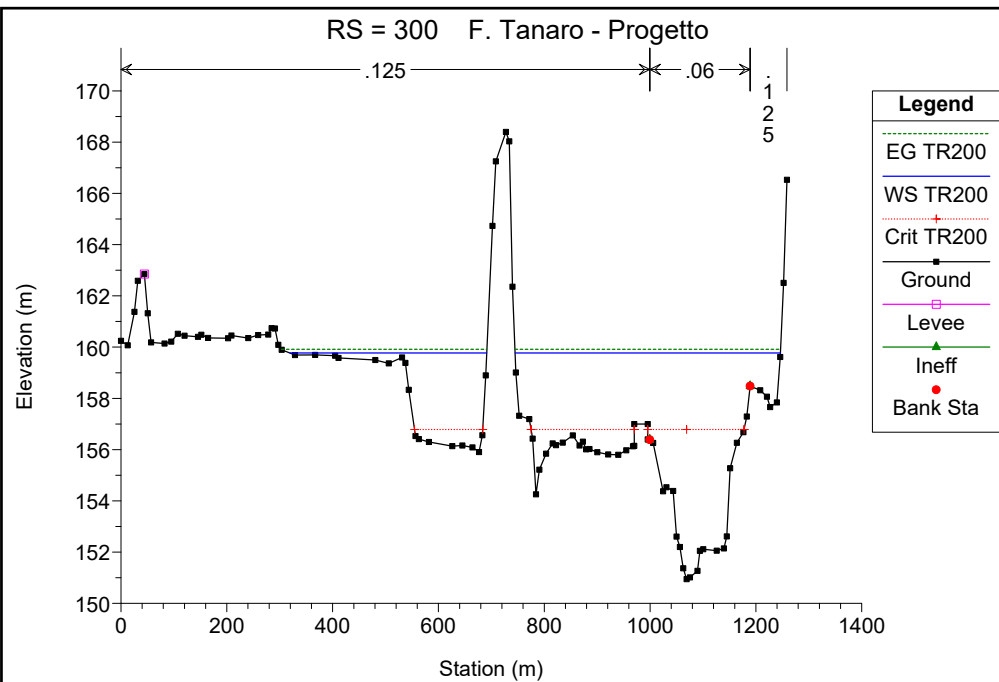


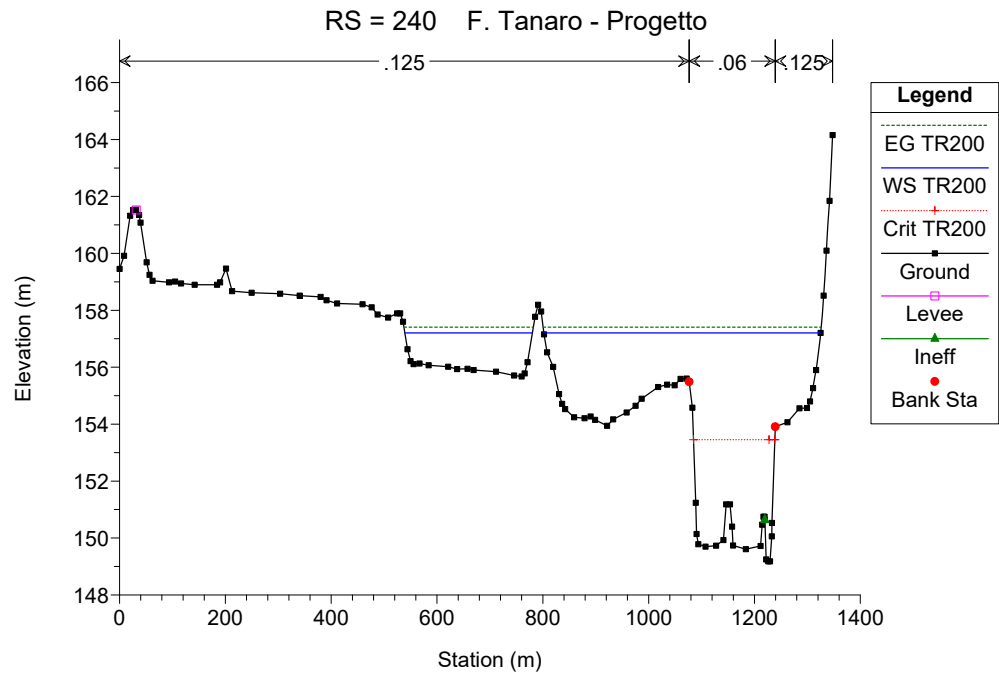
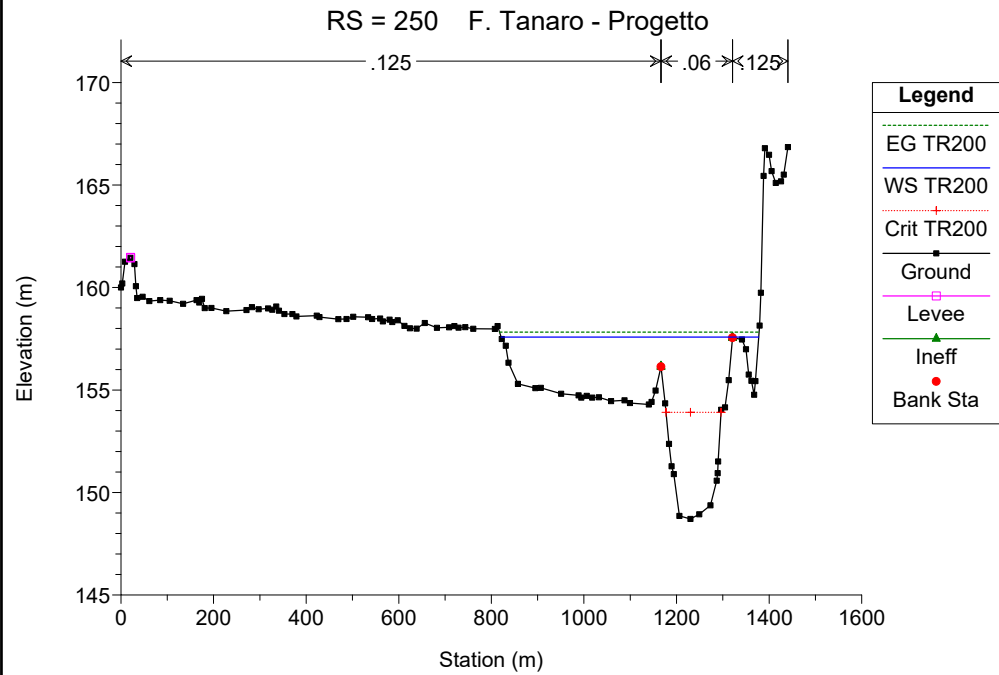
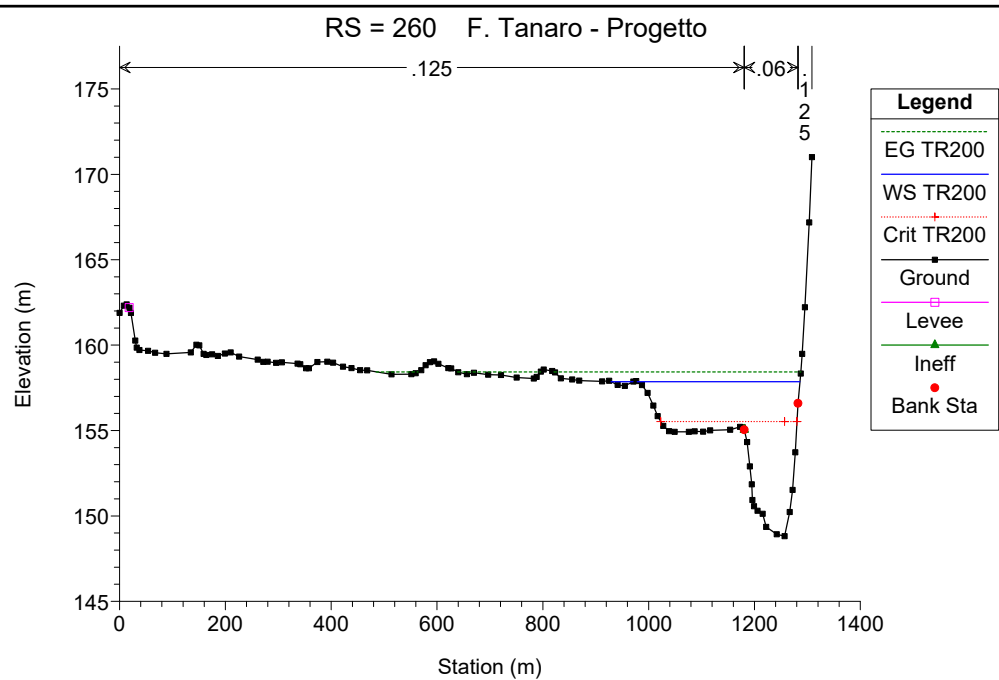
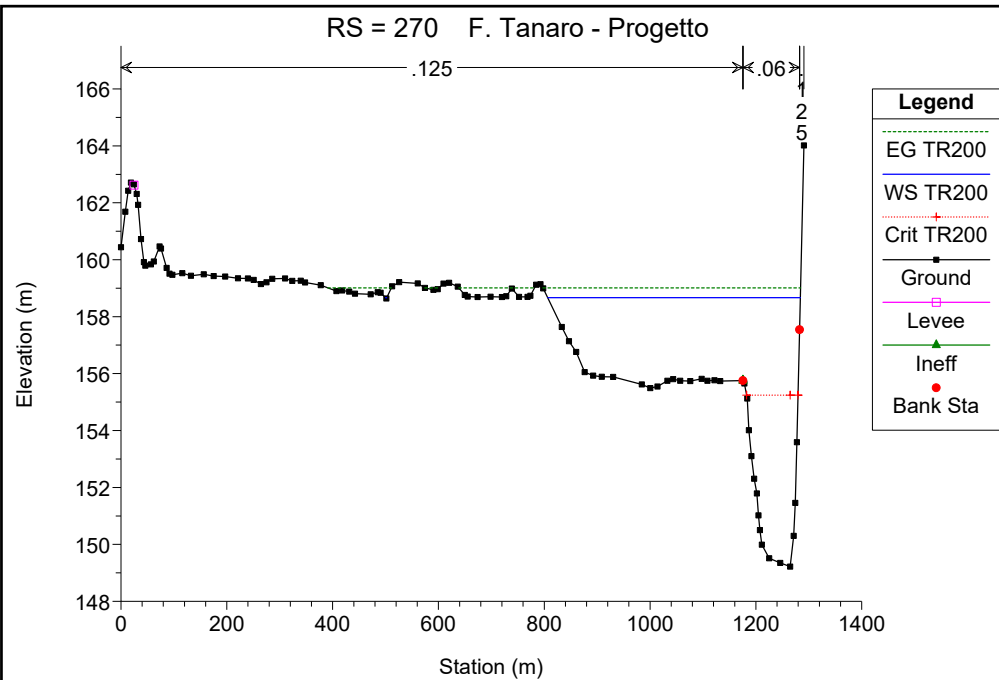


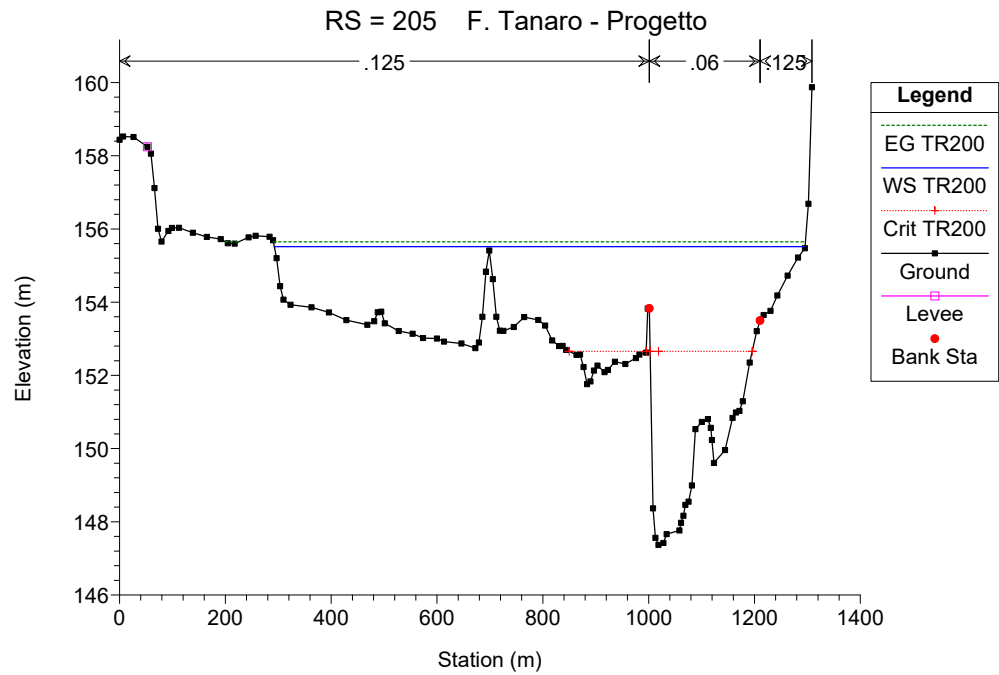
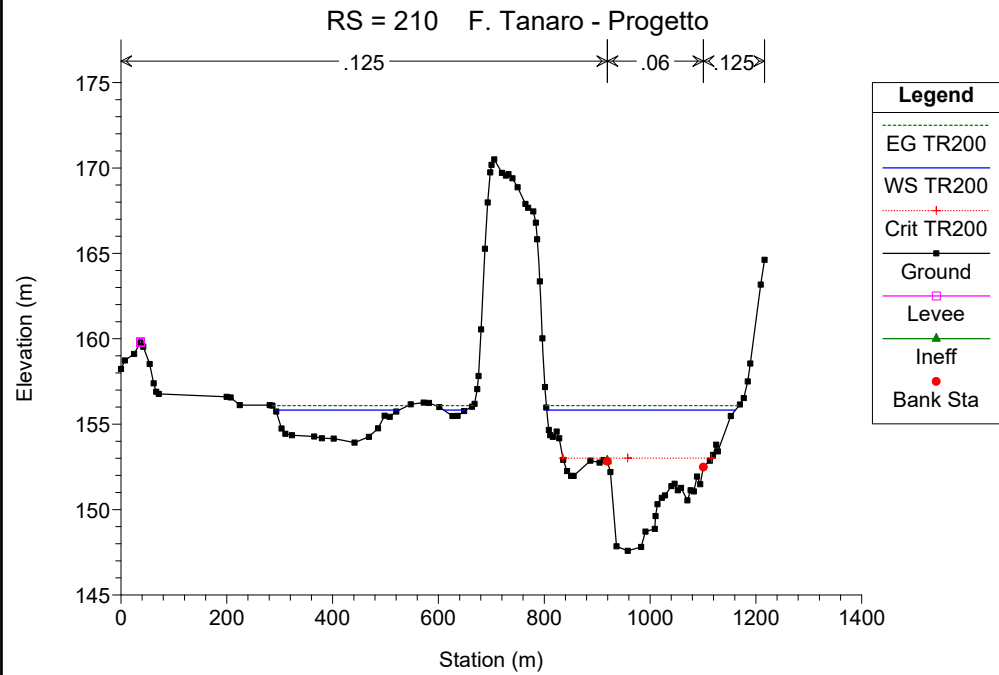
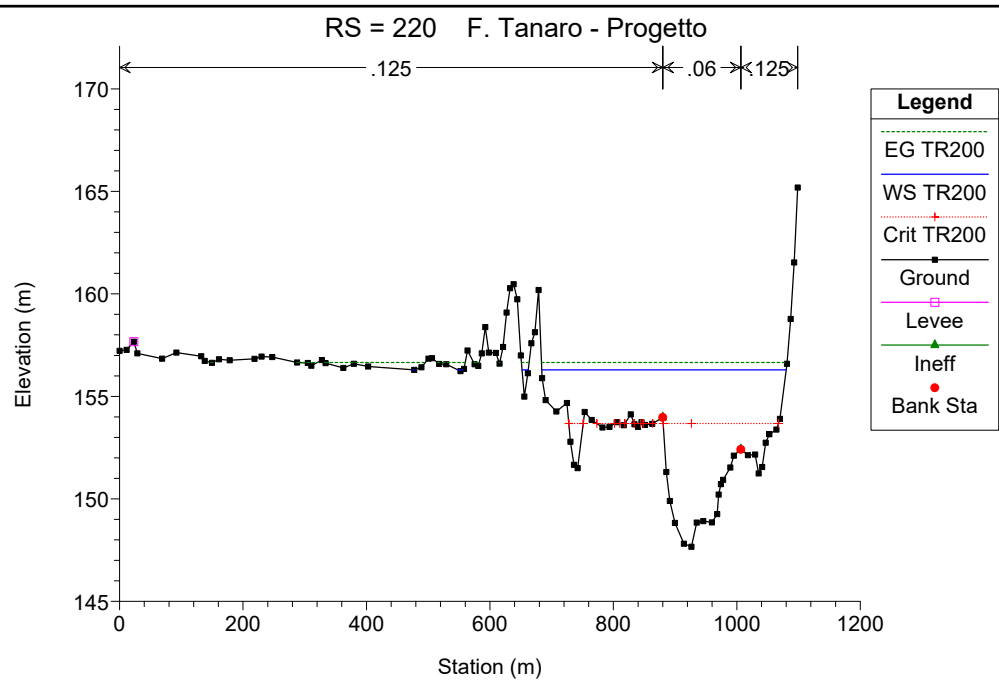
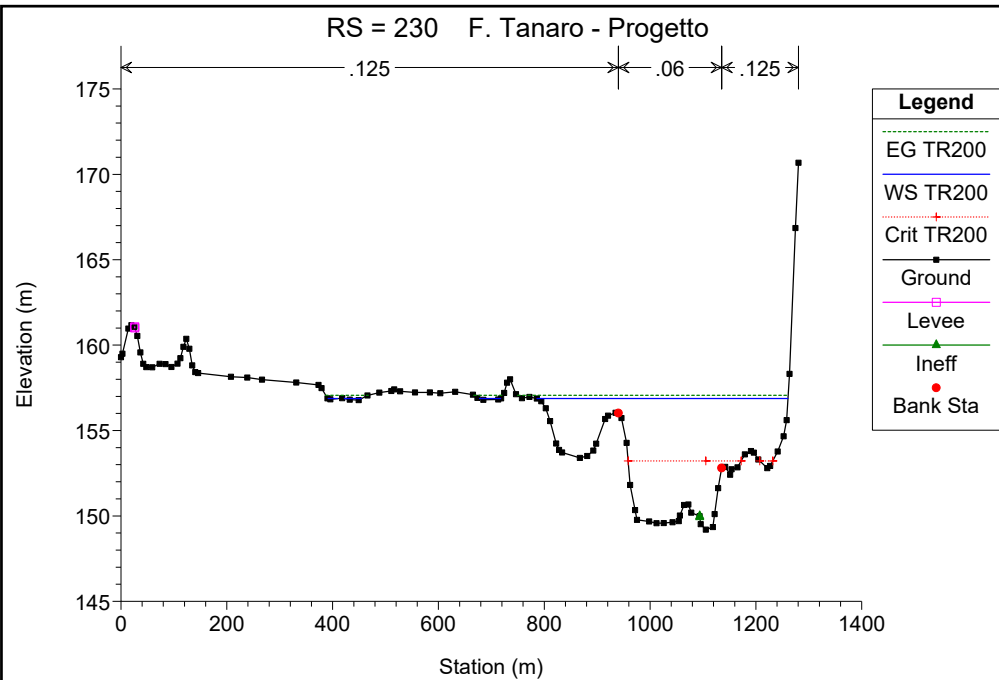


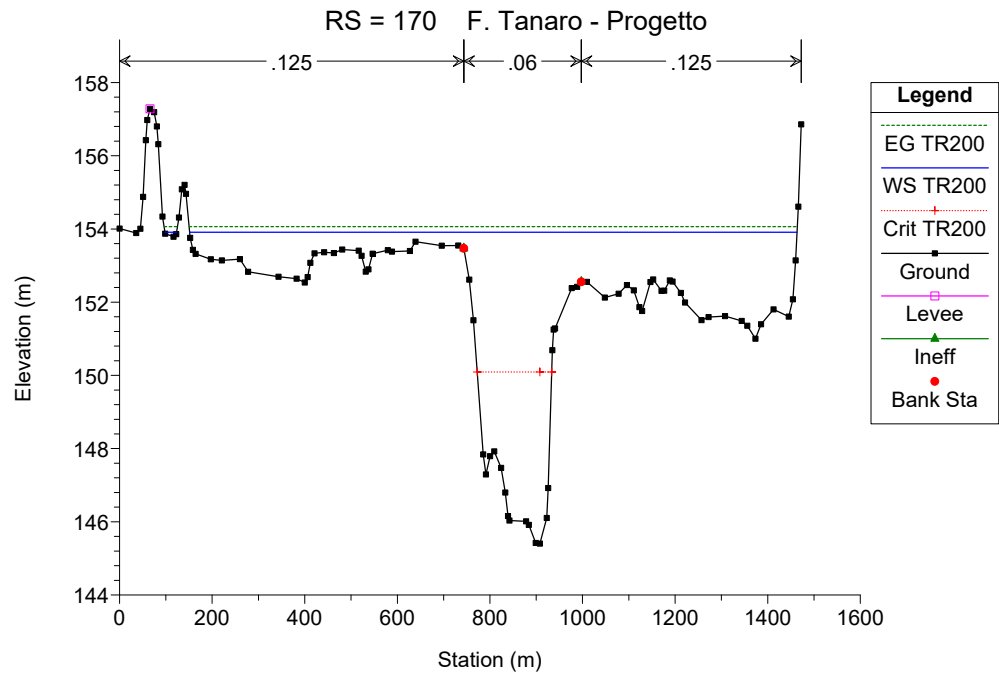
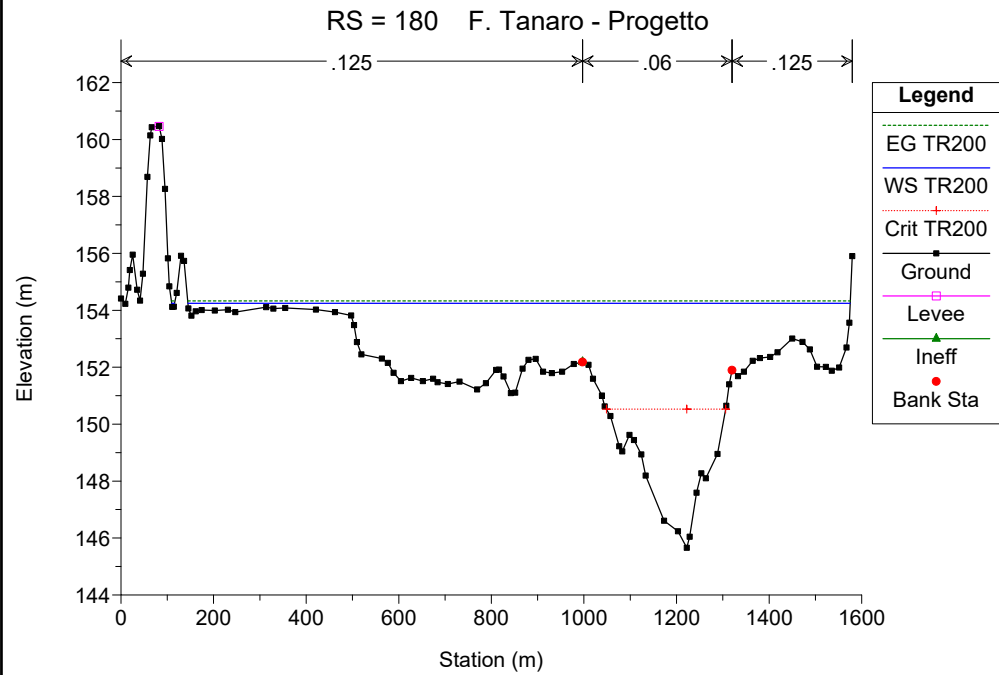
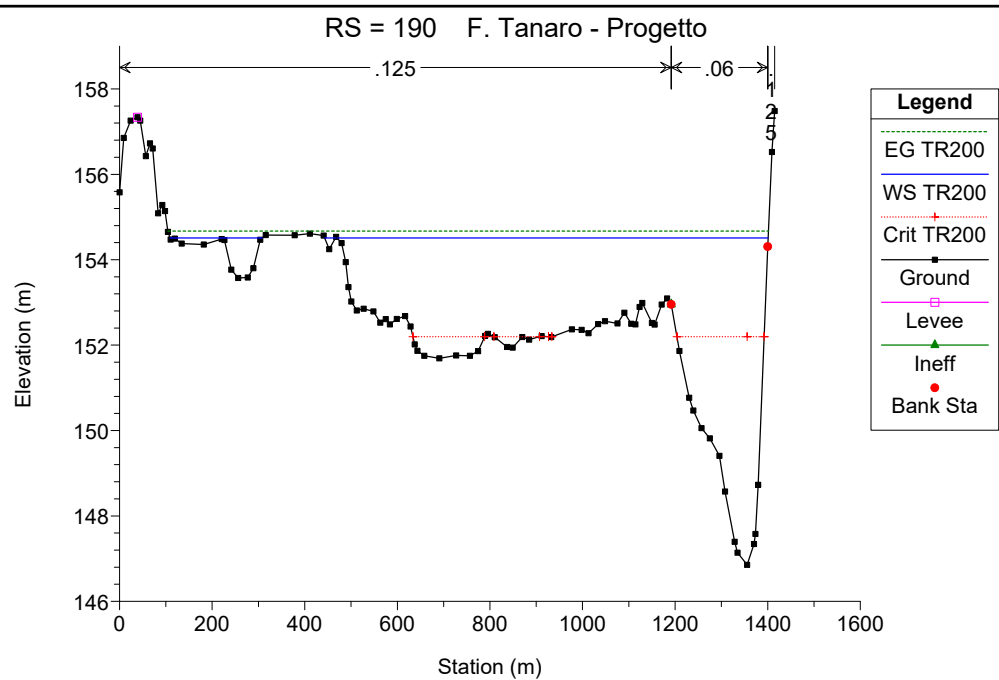
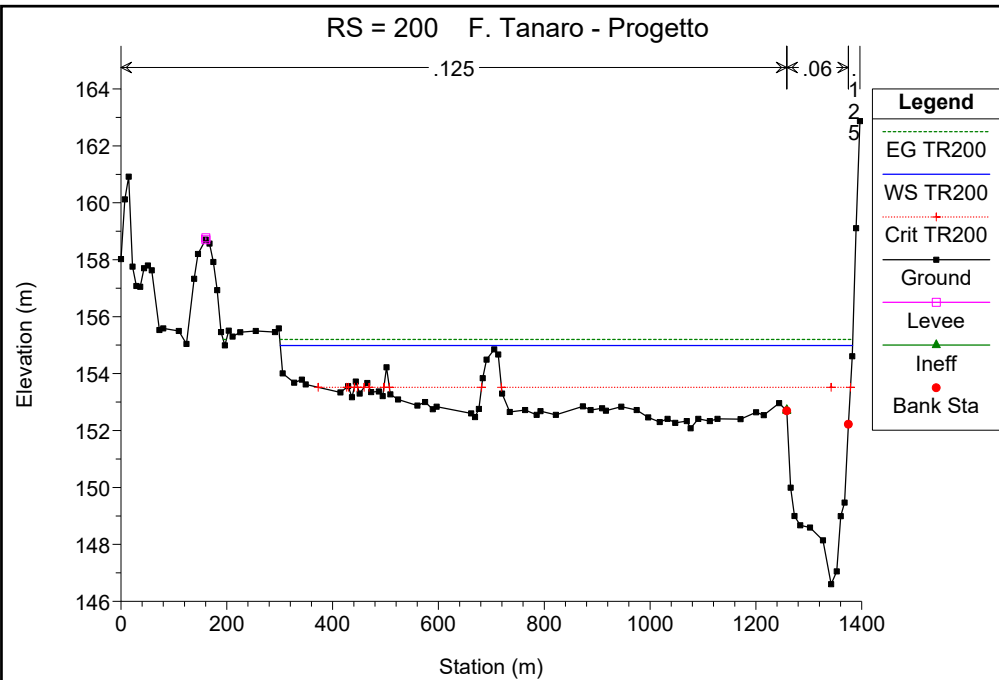


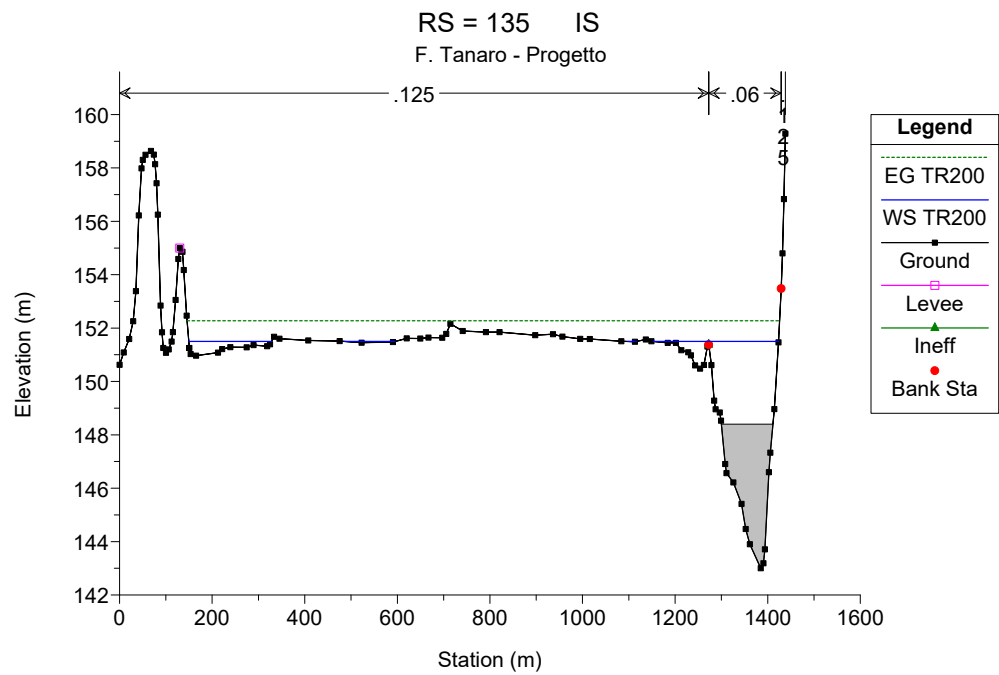
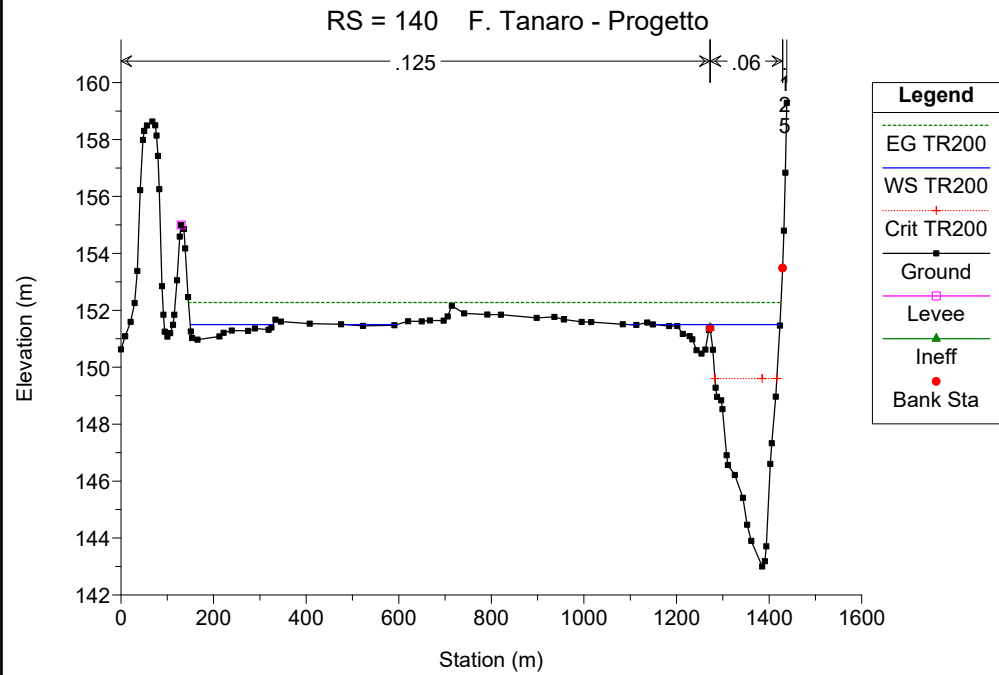
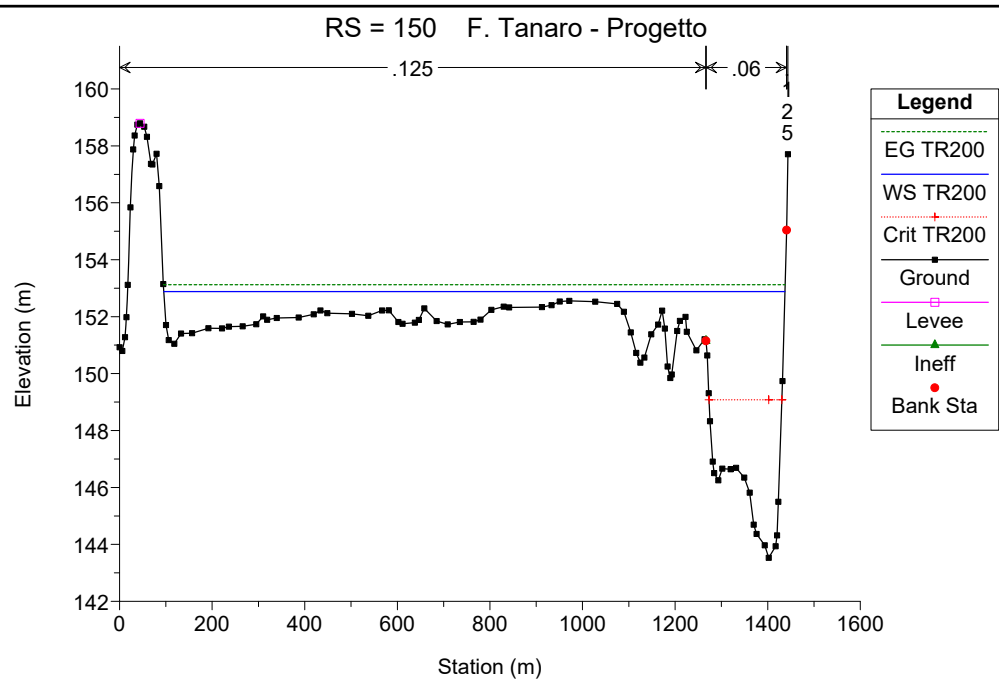
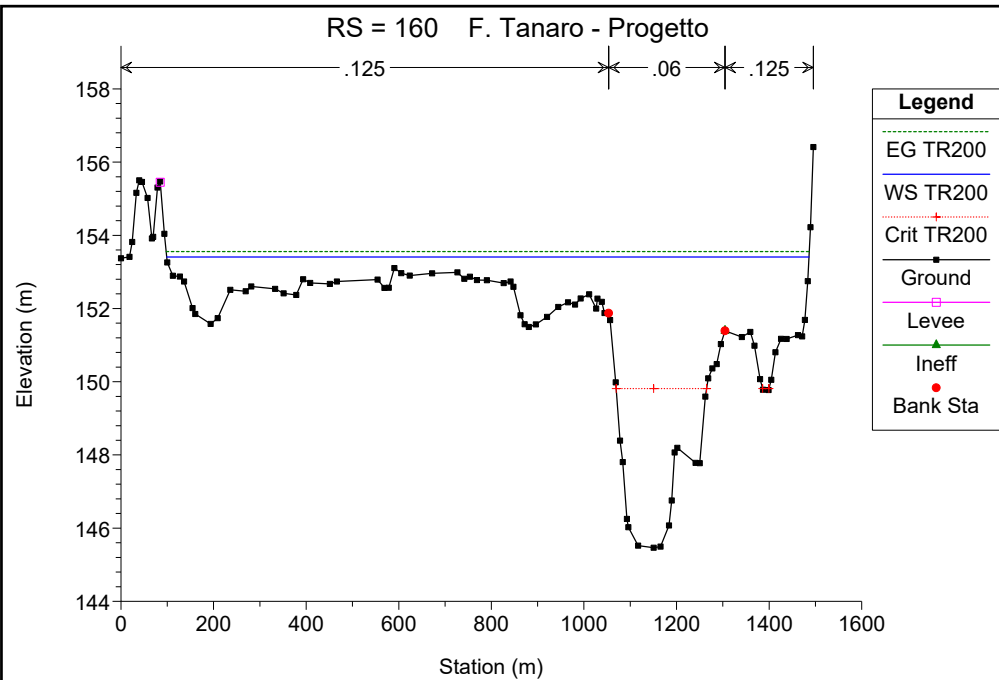


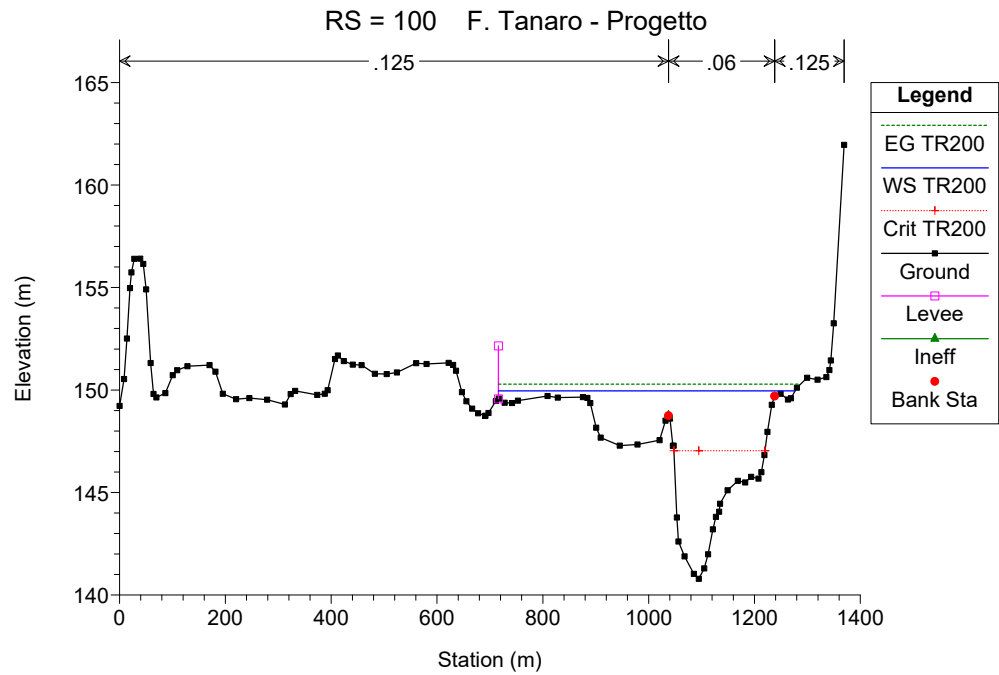
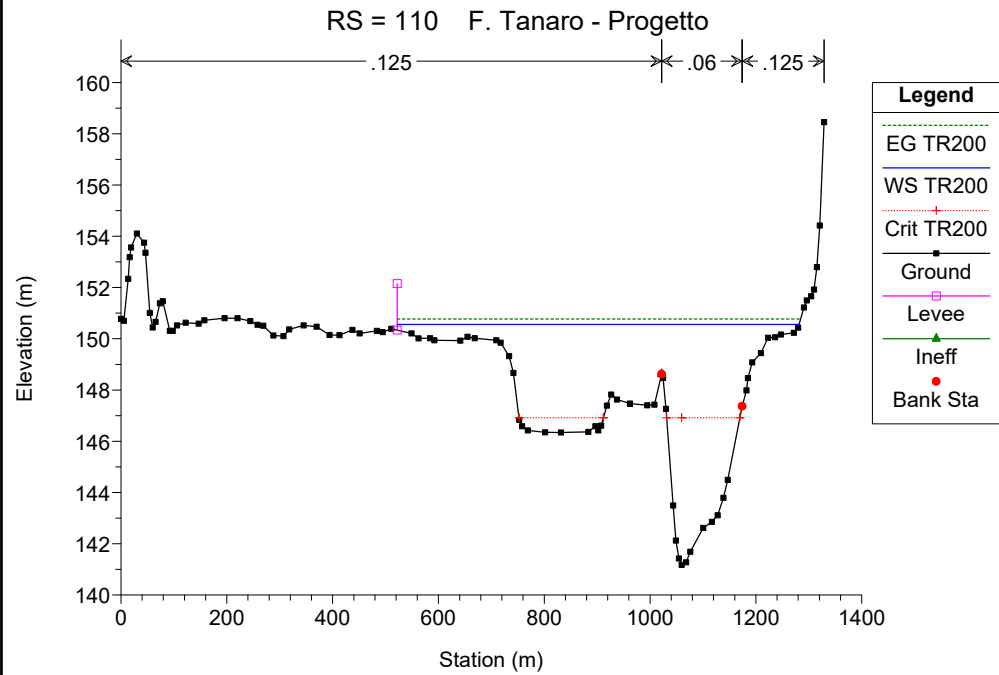
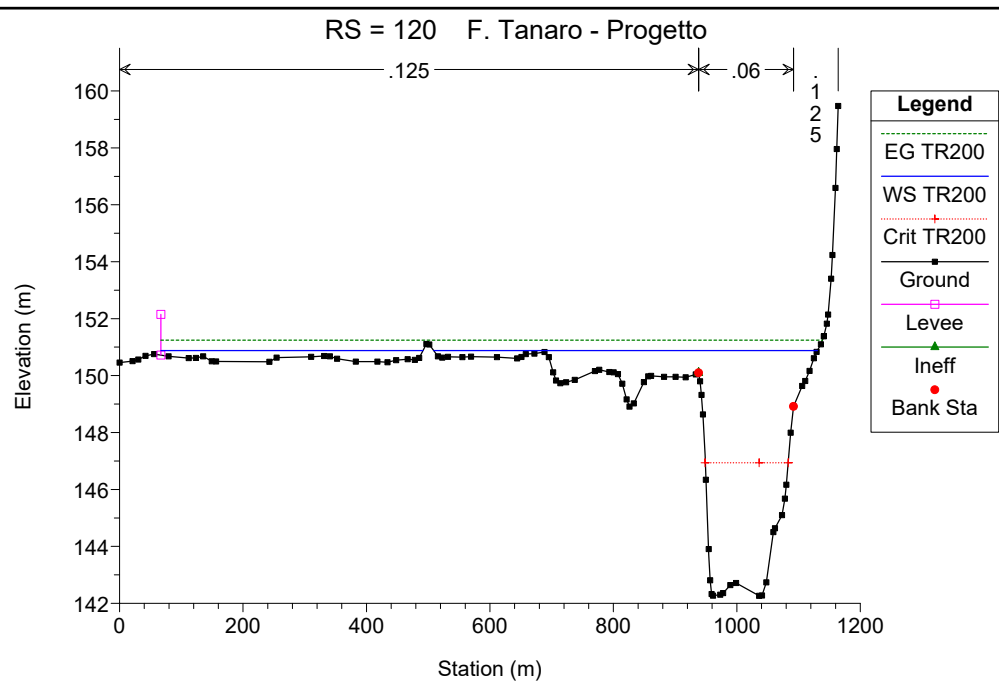
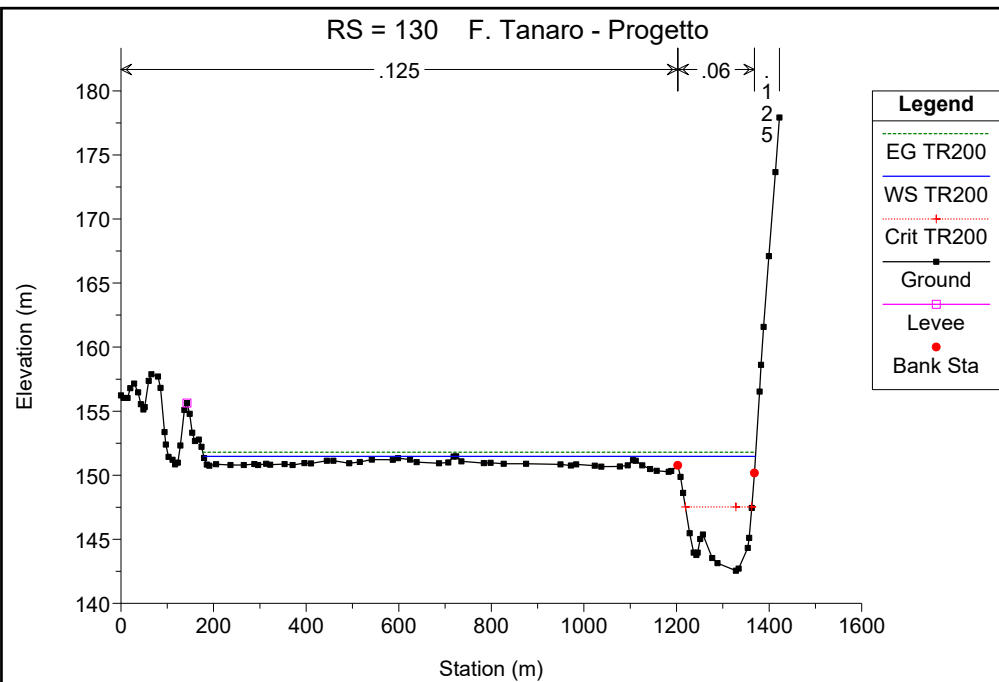


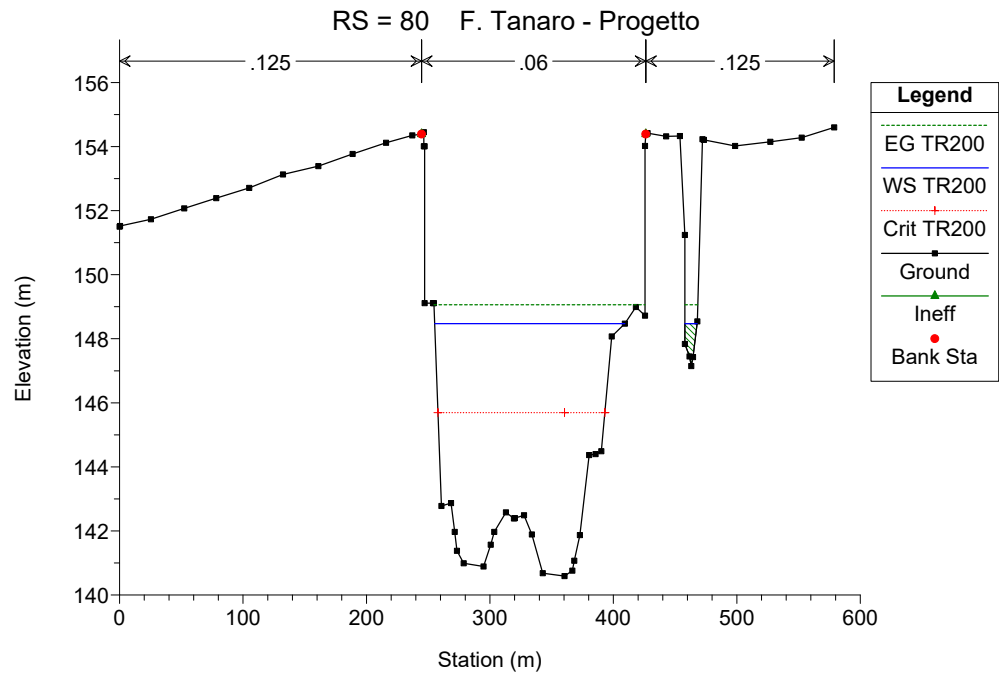
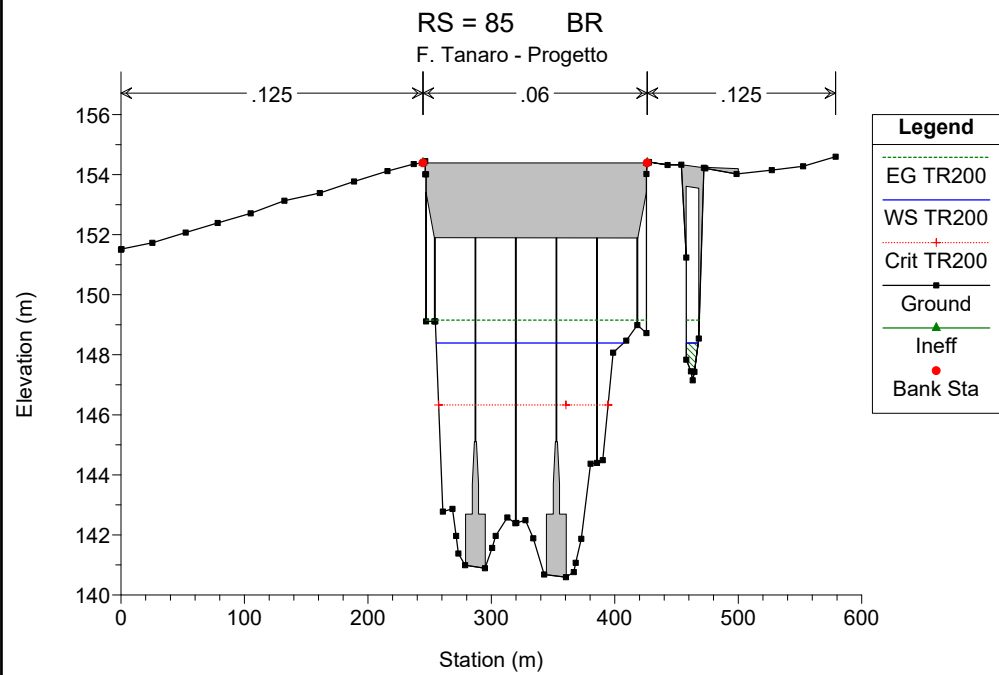
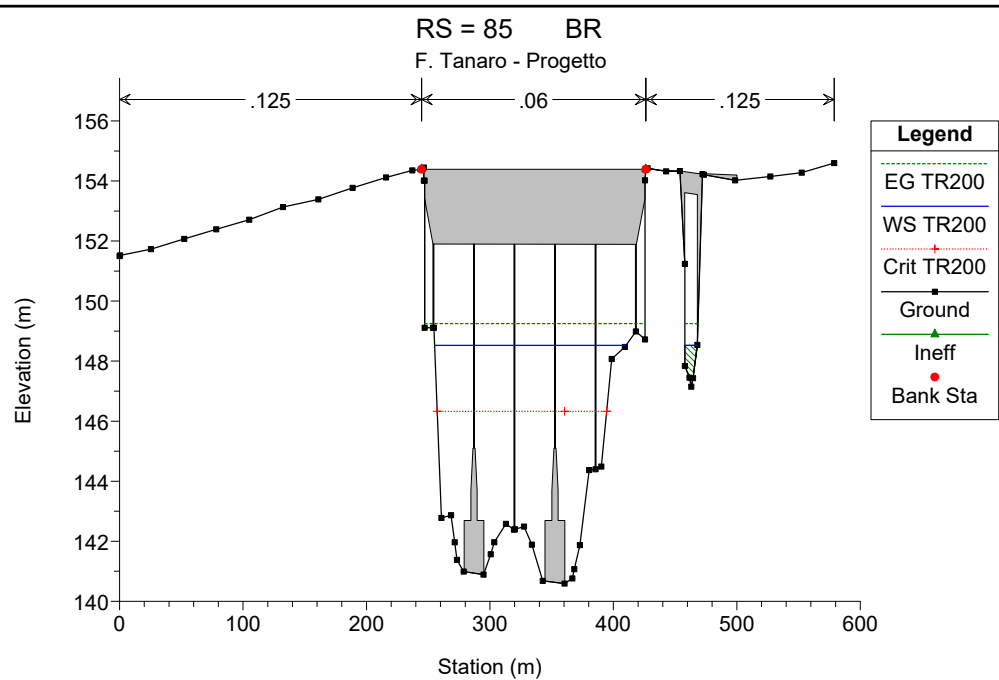
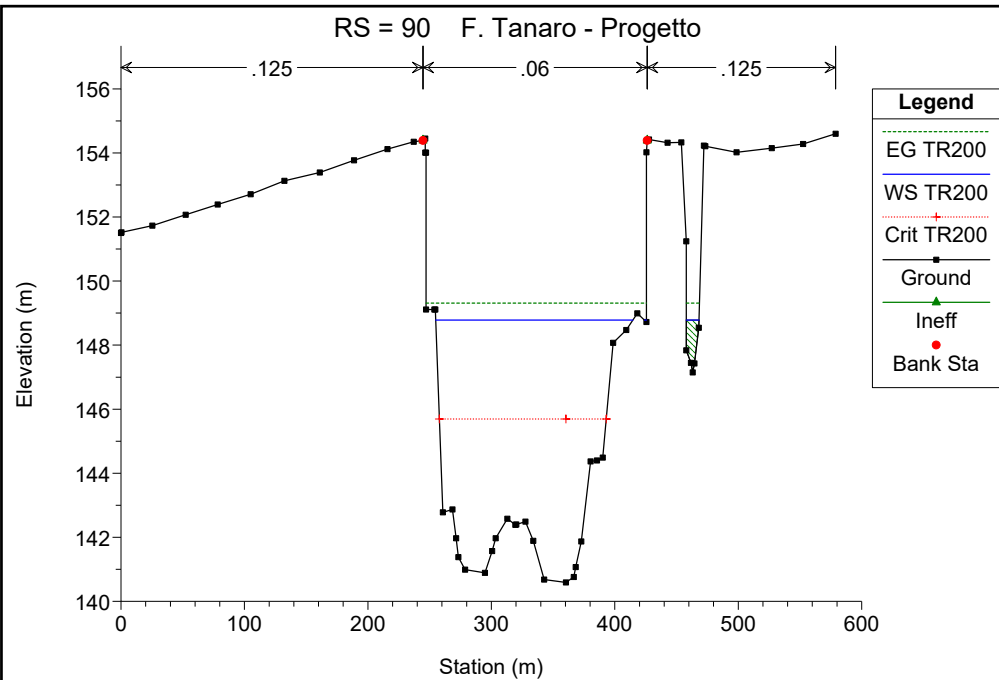


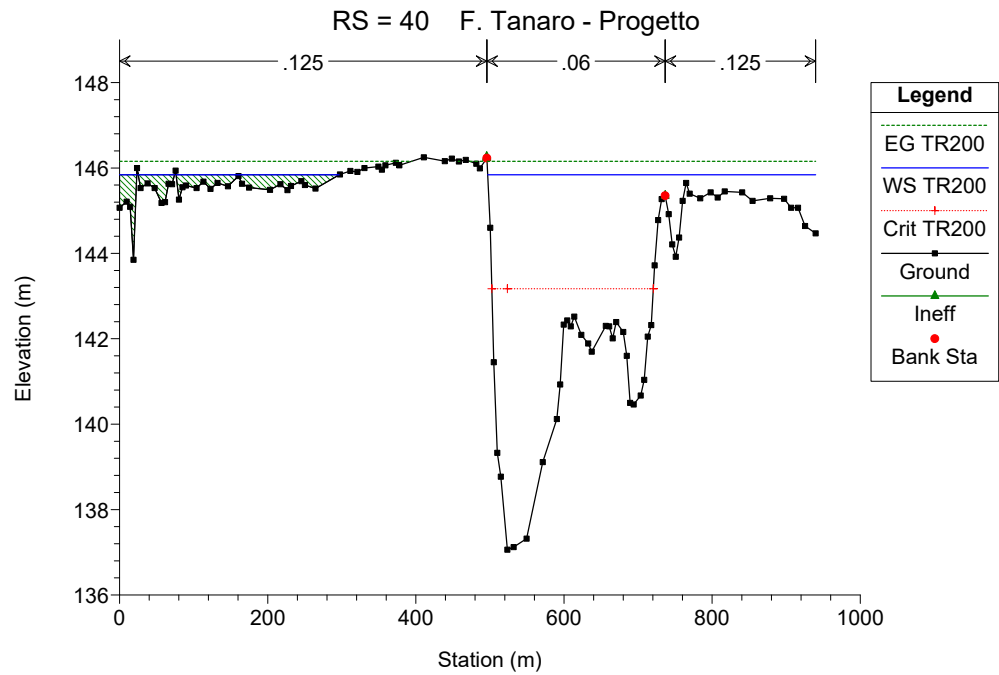
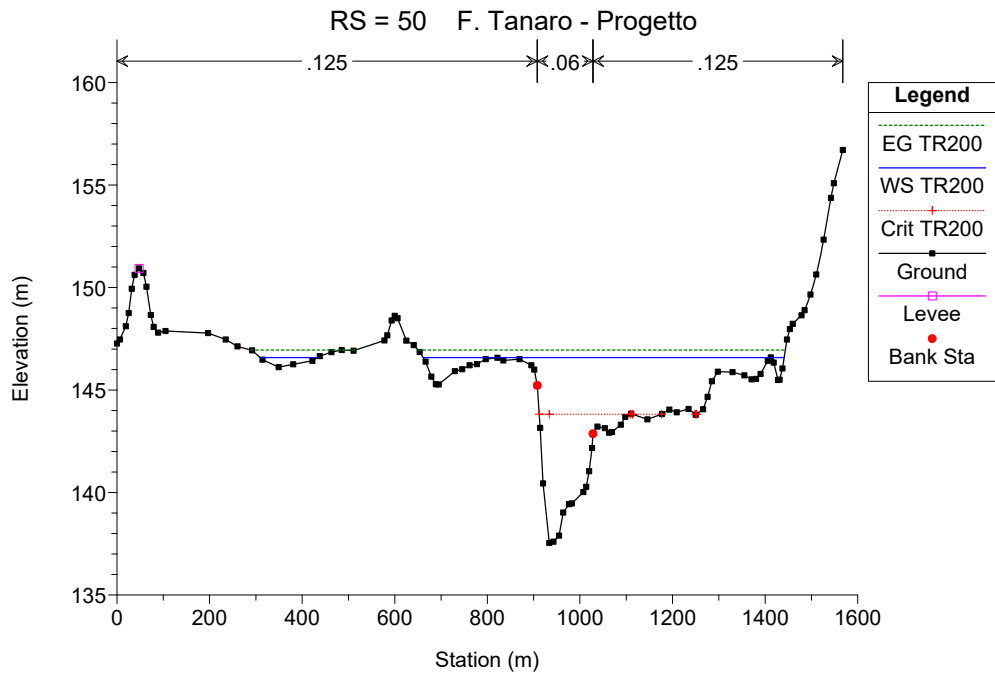
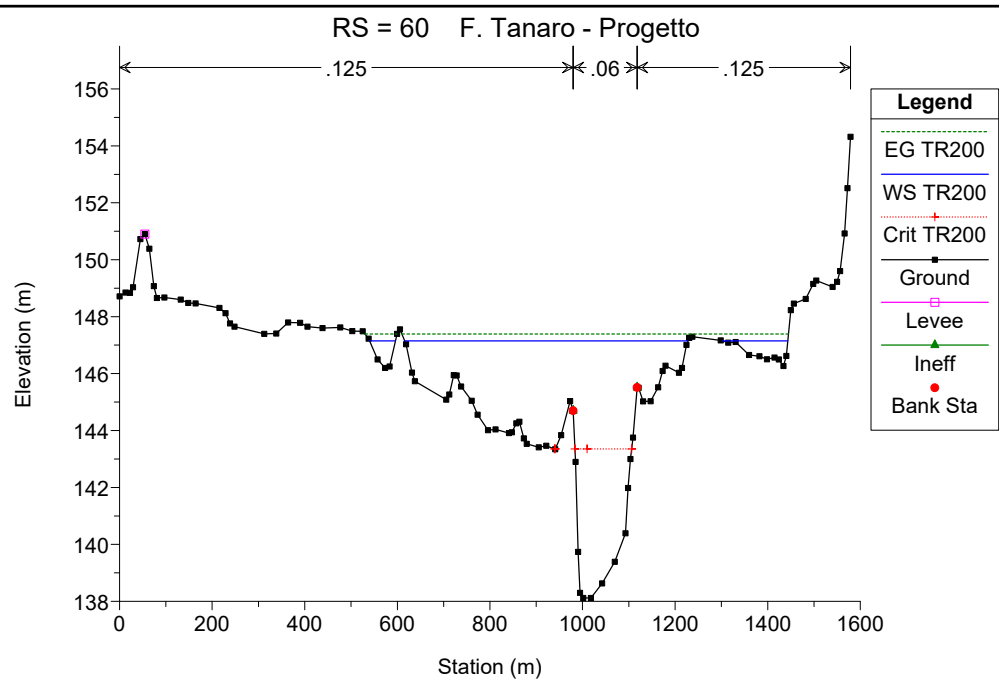
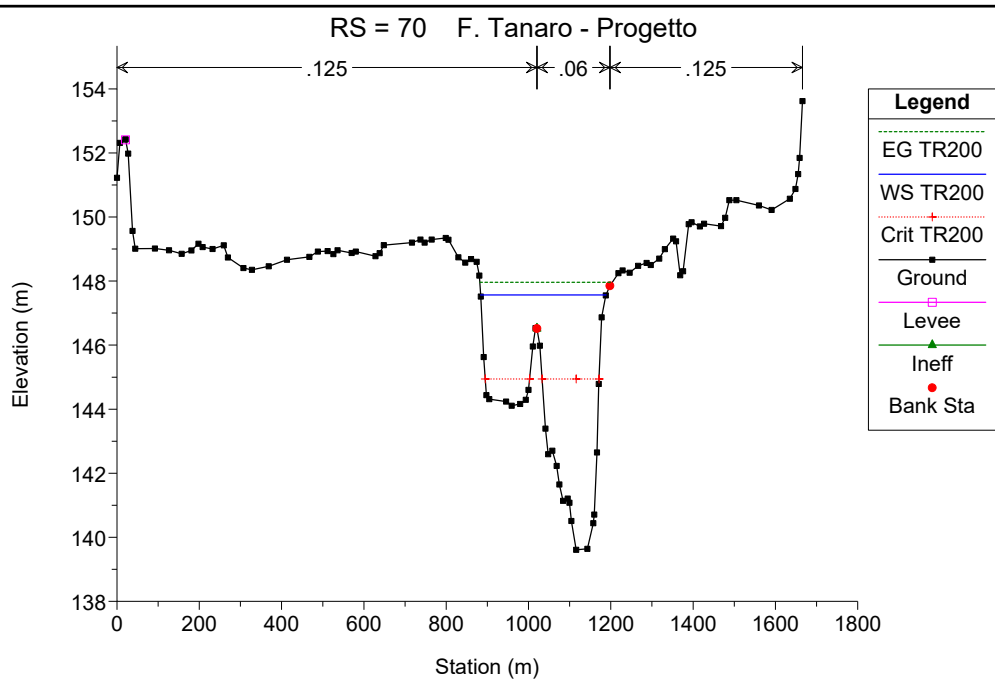


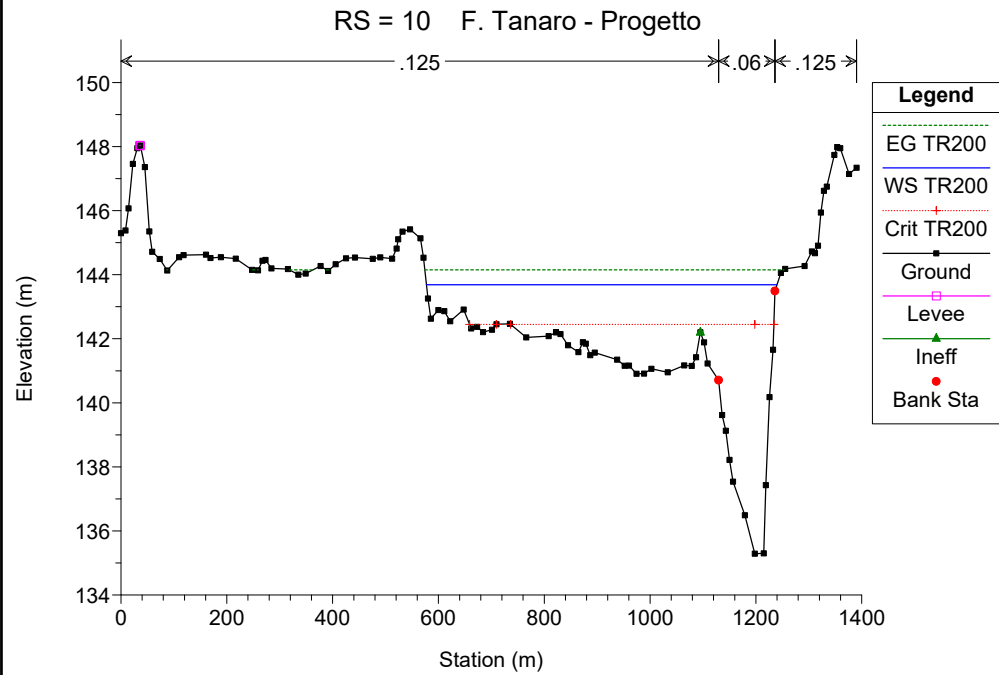
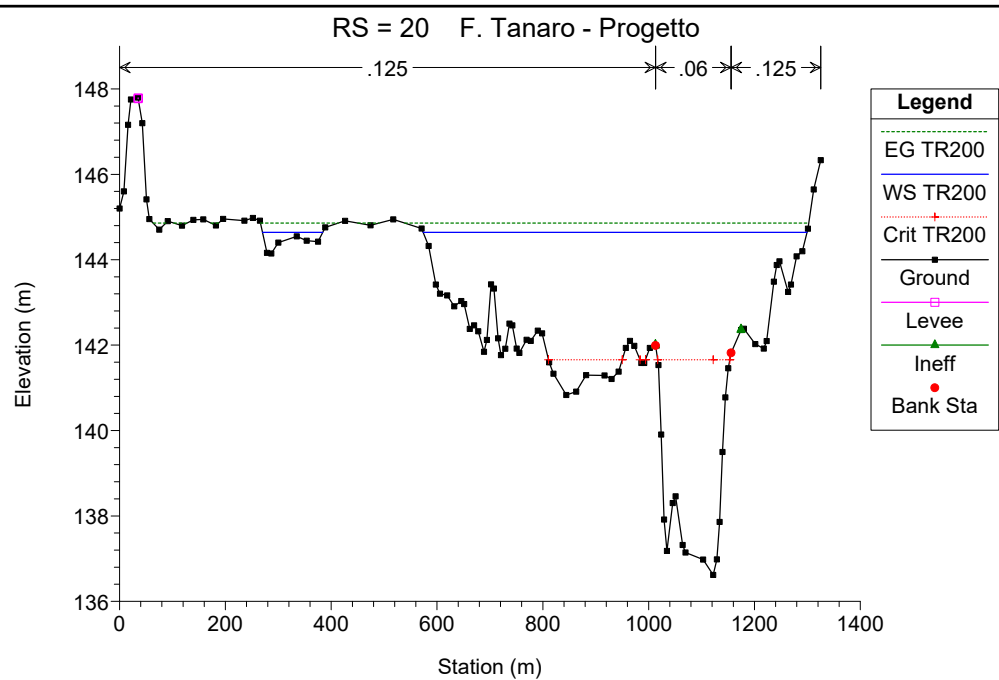
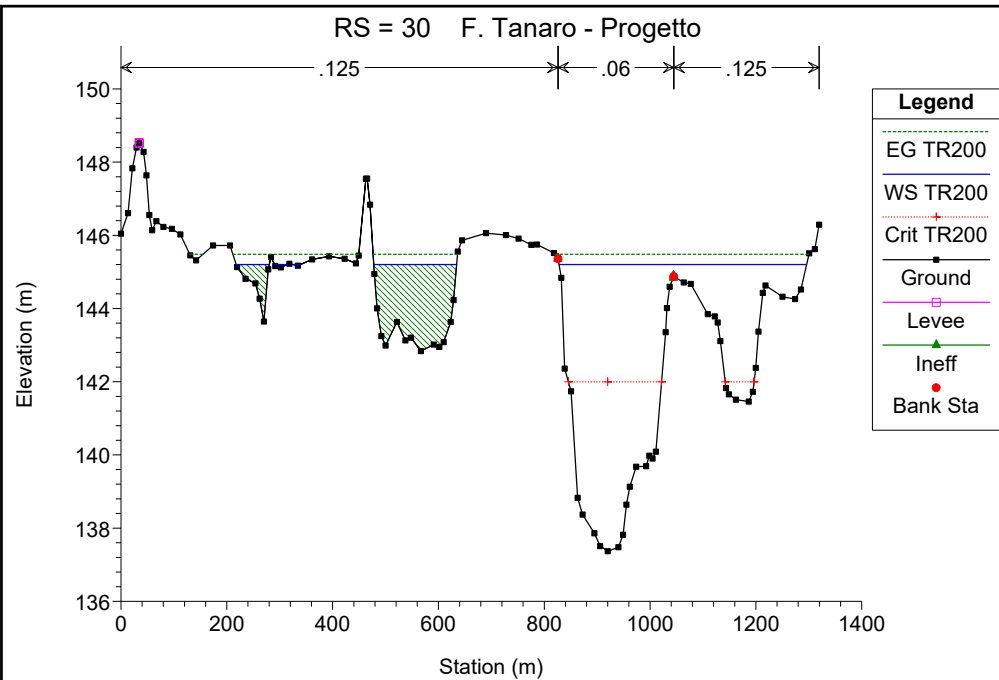












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 15

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3050	200
F. Tanaro valle Riddone	3058	
F. Tanaro valle Cherasca	3070	

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

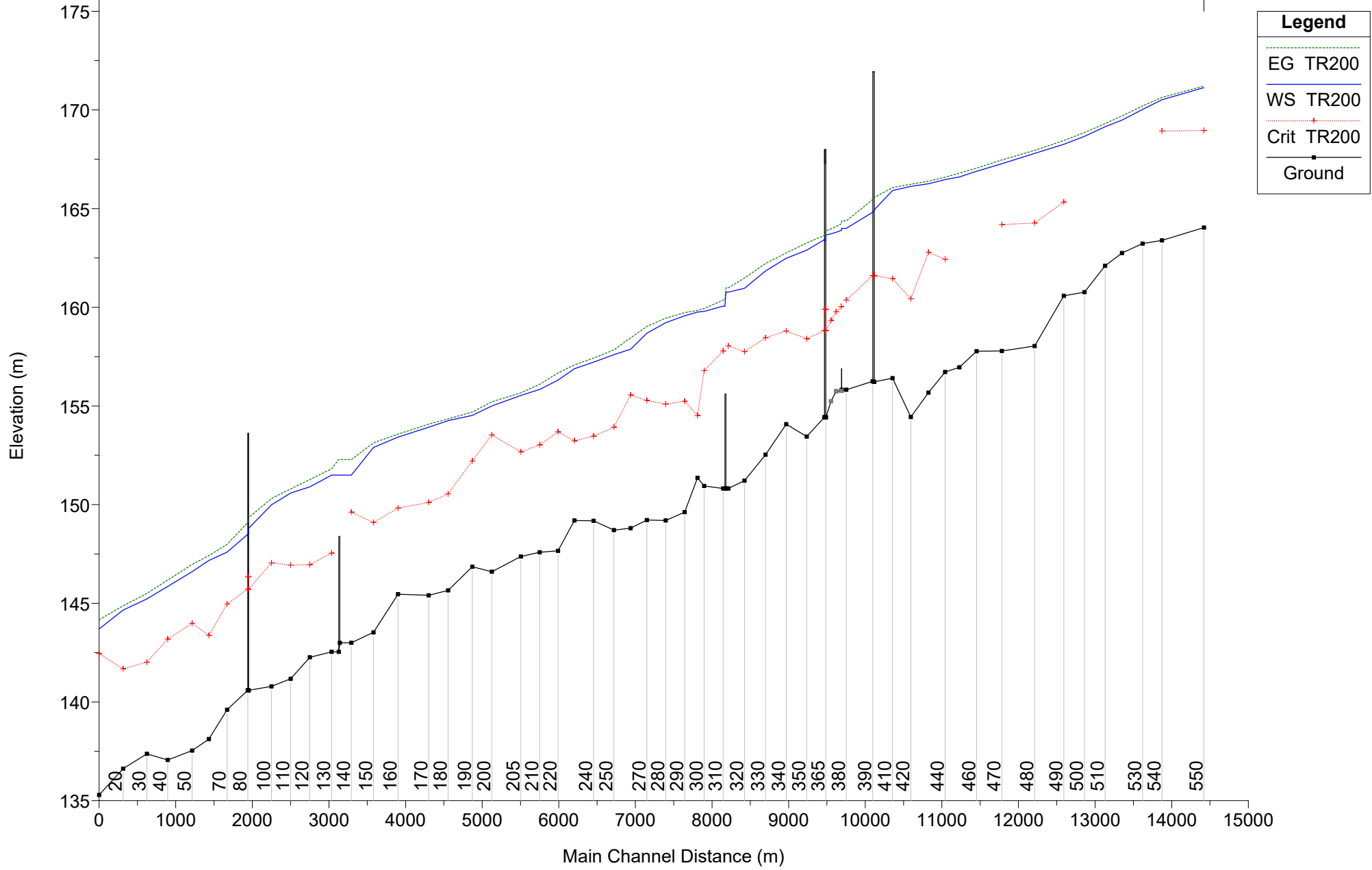
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001113	1.47	3245.24	1183.05	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.64	0.001627	2.09	3287.83	1121.44	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001813	2.16	2285.60	674.40	0.30
1	520	TR200	3050.00	162.75	169.49		169.69	0.002096	2.37	2501.30	1043.19	0.32
1	510	TR200	3050.00	162.10	169.15		169.31	0.001867	2.12	2426.08	736.85	0.30
1	500	TR200	3050.00	160.77	168.67		168.86	0.001595	2.19	2162.11	553.61	0.28
1	490	TR200	3050.00	160.58	168.26	165.33	168.45	0.001543	2.04	2005.59	517.26	0.28
1	480	TR200	3050.00	158.04	167.80	164.27	167.95	0.001185	1.95	2529.18	817.92	0.25
1	470	TR200	3050.00	157.79	167.28	164.19	167.47	0.001387	2.21	2239.82	561.54	0.27
1	460	TR200	3050.00	157.77	166.89		167.05	0.001086	1.98	2593.51	857.51	0.24
1	450	TR200	3050.00	156.96	166.61		166.79	0.001180	2.09	2464.24	1035.82	0.25
1	440	TR200	3050.00	156.72	166.47	162.43	166.59	0.000835	1.82	3054.06	798.32	0.21
1	430	TR200	3050.00	155.68	166.26	162.79	166.39	0.001007	2.01	2933.64	665.91	0.23
1	420	TR200	3050.00	154.44	166.13	160.43	166.23	0.000560	1.66	3262.09	689.34	0.18
1	410	TR200	3050.00	156.41	165.92	161.45	166.07	0.000968	2.00	2496.17	546.03	0.23
1	400	TR200	3050.00	156.22	164.94	161.61	165.56	0.003345	3.59	979.77	177.33	0.42
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.82	161.61	165.46	0.003548	3.66	958.50	175.59	0.43
1	380	TR200	3050.00	155.82	164.00	160.36	164.38	0.002162	2.74	1172.30	266.73	0.33
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.67	158.82	163.87	0.001054	2.01	1519.99	207.86	0.24
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.43	158.82	163.65	0.001171	2.07	1470.29	207.20	0.25
1	350	TR200	3050.00	153.45	162.90	158.40	163.27	0.001873	2.70	1208.91	289.47	0.32
1	340	TR200	3058.00	154.08	162.49	158.80	162.76	0.001683	2.34	1508.62	388.28	0.29
1	330	TR200	3058.00	152.53	161.85	158.45	162.22	0.002280	2.78	1408.79	440.17	0.34
1	320	TR200	3058.00	151.21	160.98	157.75	161.50	0.002940	3.49	1567.71	687.56	0.40
1	315	TR200	3058.00	150.82	160.79	158.04	161.01	0.001463	2.50	2795.09	1116.99	0.28
1	312.5		Inl Struct									
1	310	TR200	3058.00	150.82	160.06	157.79	160.36	0.002253	2.90	2049.14	774.60	0.35
1	300	TR200	3070.00	150.95	159.79	156.80	159.94	0.001216	1.94	2703.65	876.43	0.25
1	295	TR200	3070.00	151.36	159.76	154.52	159.84	0.000522	1.43	3388.63	903.19	0.17
1	290	TR200	3070.00	149.62	159.57	155.24	159.73	0.000990	1.86	2323.26	695.23	0.23
1	280	TR200	3070.00	149.20	159.22	155.10	159.45	0.001365	2.35	2119.29	535.37	0.27
1	270	TR200	3070.00	149.22	158.69	155.28	159.03	0.002141	2.93	1784.19	481.90	0.34
1	260	TR200	3070.00	148.81	157.88	155.55	158.46	0.003449	3.61	1238.07	355.34	0.43
1	250	TR200	3070.00	148.71	157.60	153.93	157.84	0.001764	2.43	1987.31	556.75	0.30
1	240	TR200	3070.00	149.18	157.22	153.47	157.43	0.001373	2.22	2299.93	764.34	0.27
1	230	TR200	3070.00	149.20	156.89	153.23	157.08	0.001350	2.10	2023.69	581.55	0.27
1	220	TR200	3070.00	147.66	156.31	153.69	156.67	0.002561	2.94	1597.51	428.04	0.37

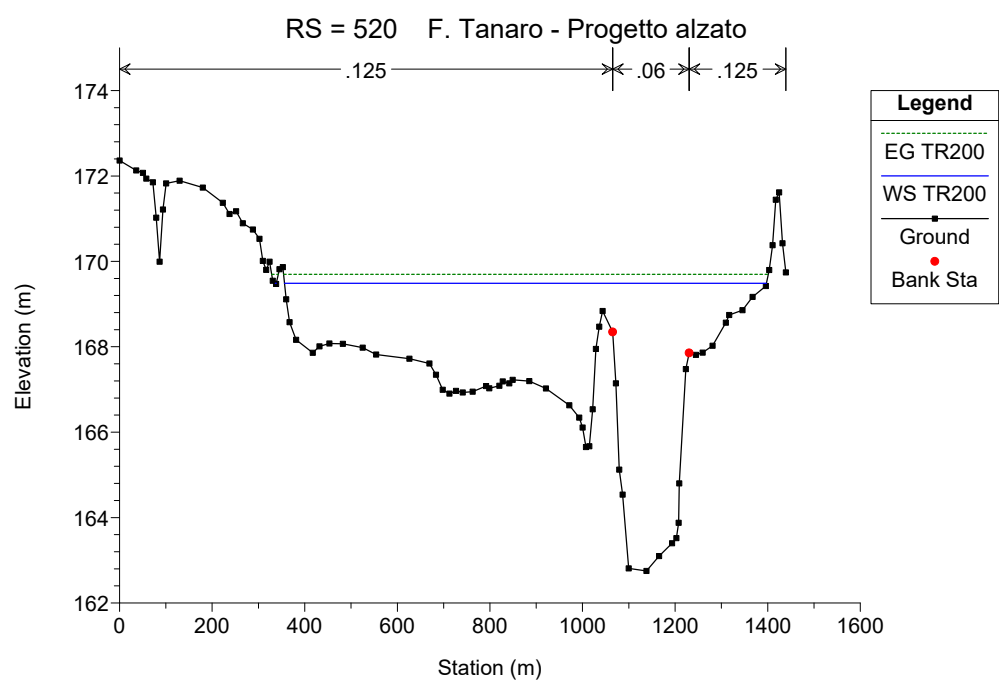
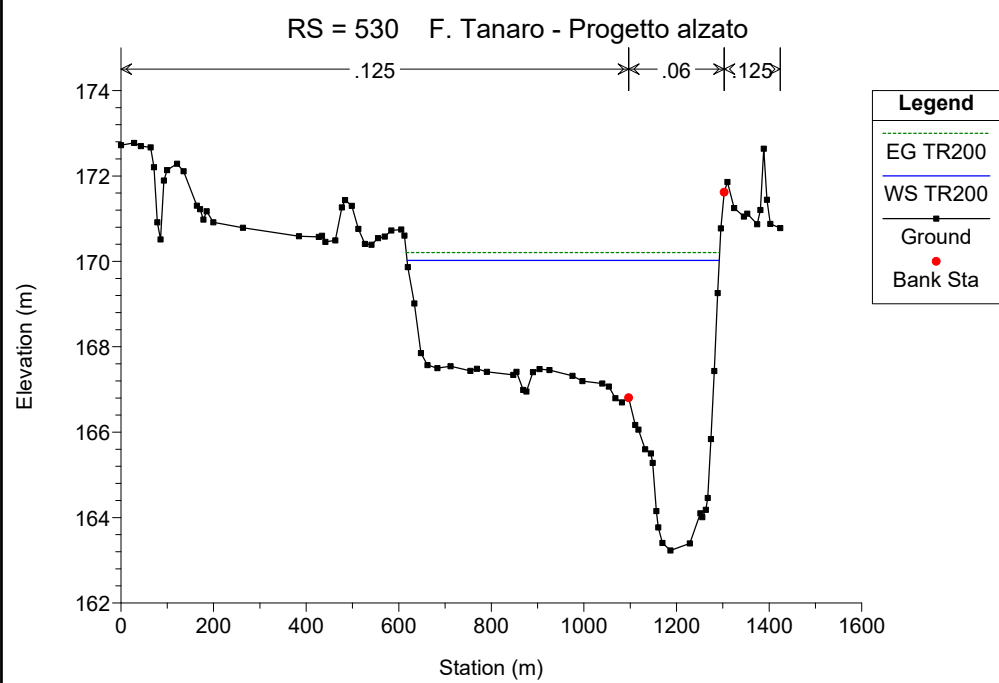
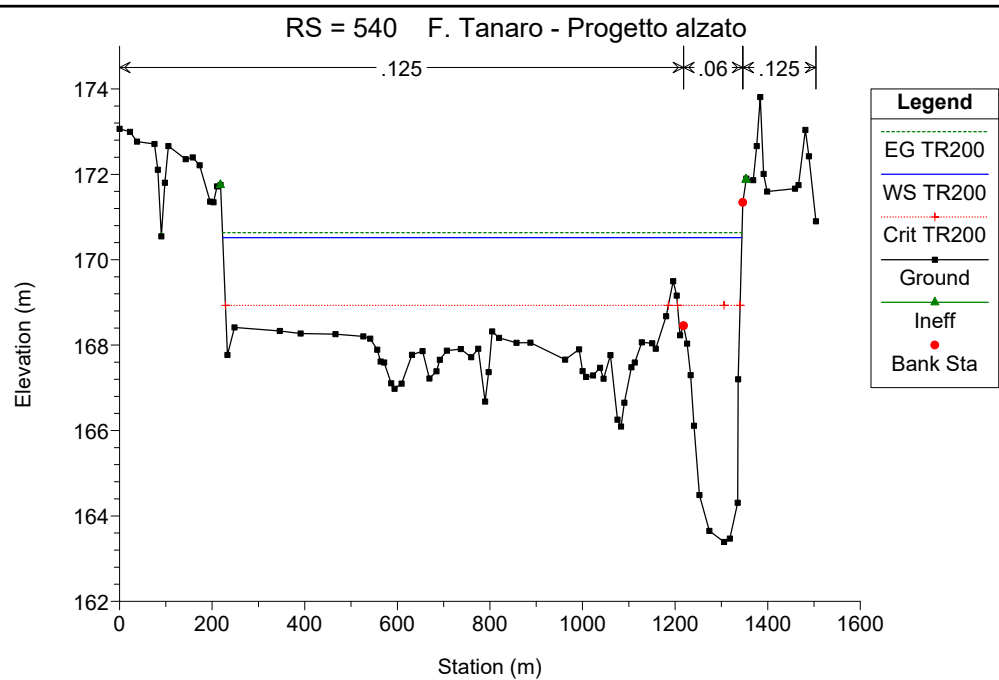
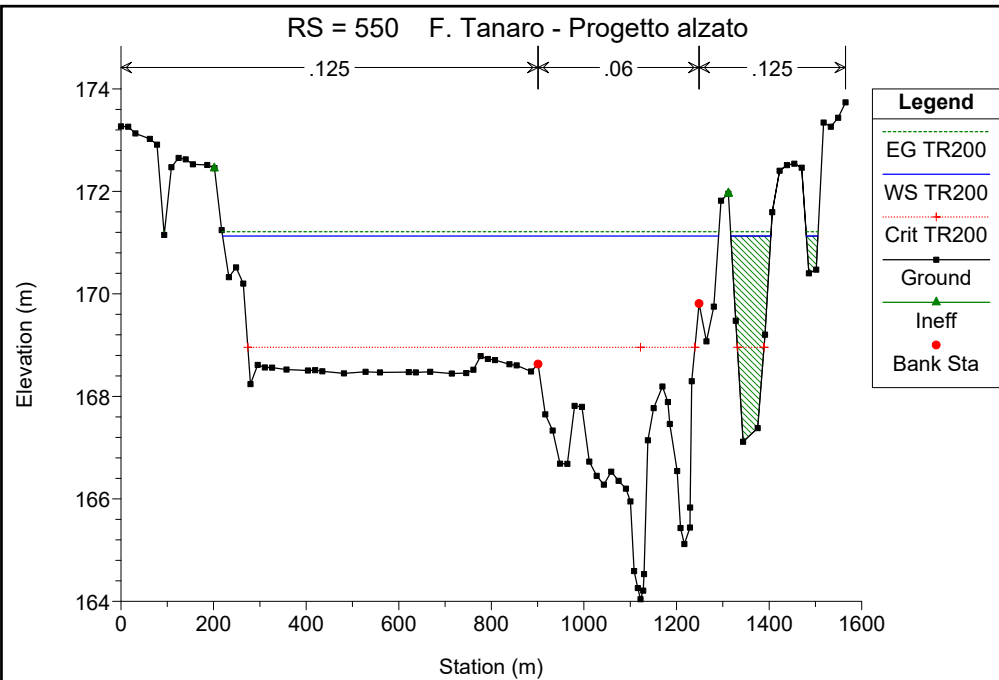
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

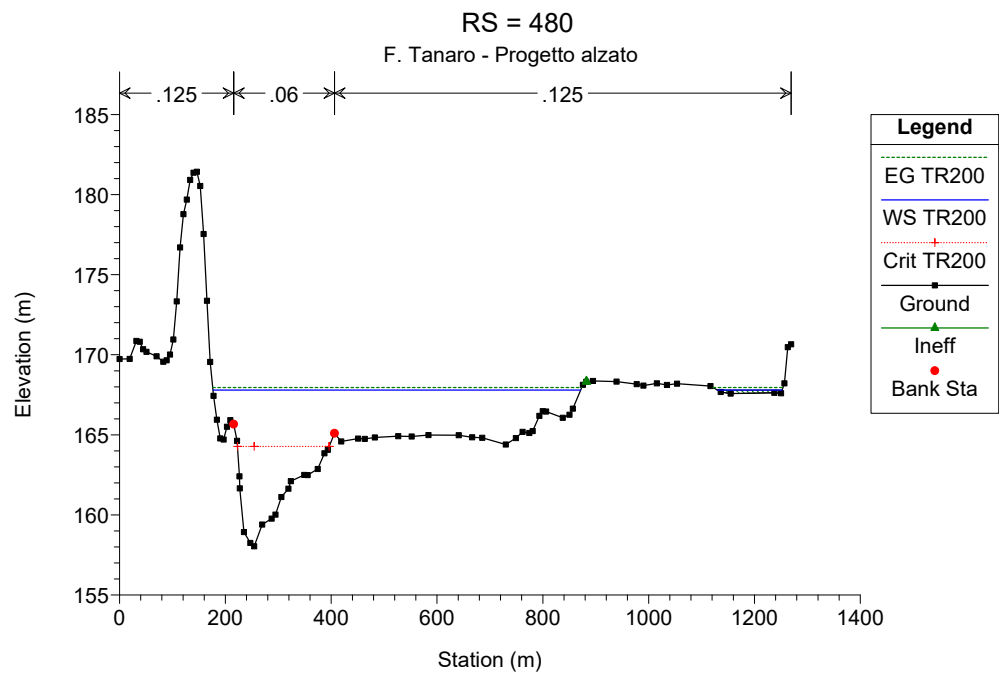
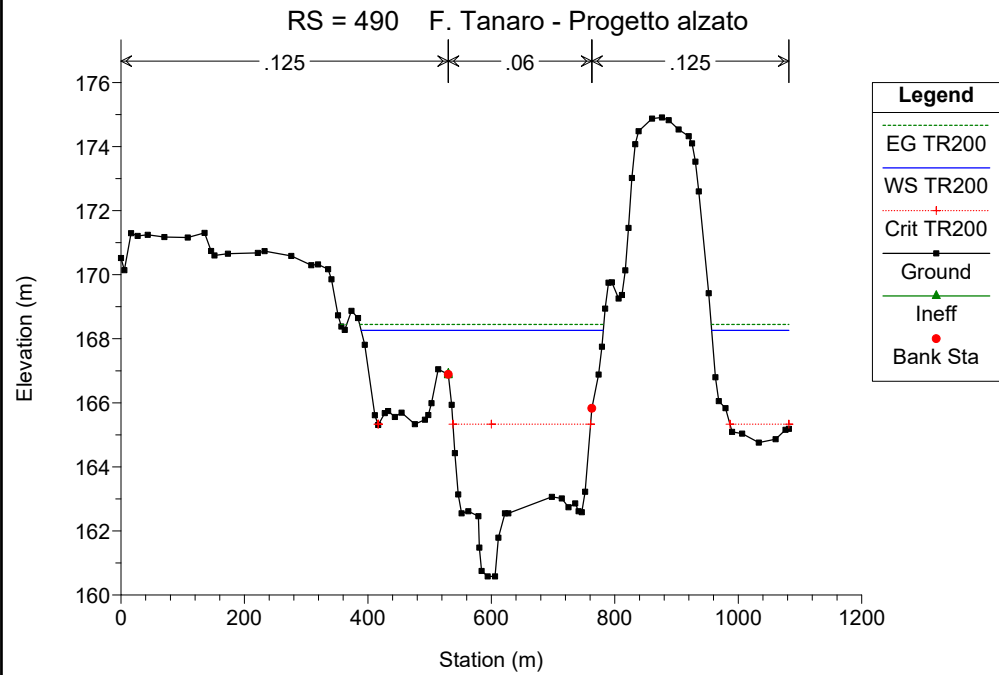
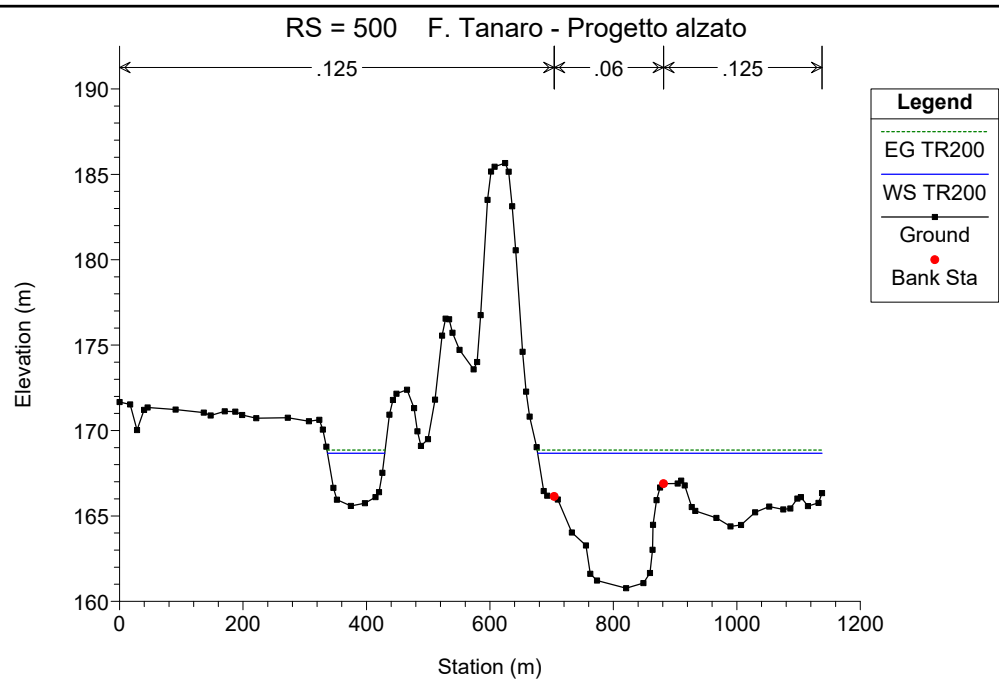
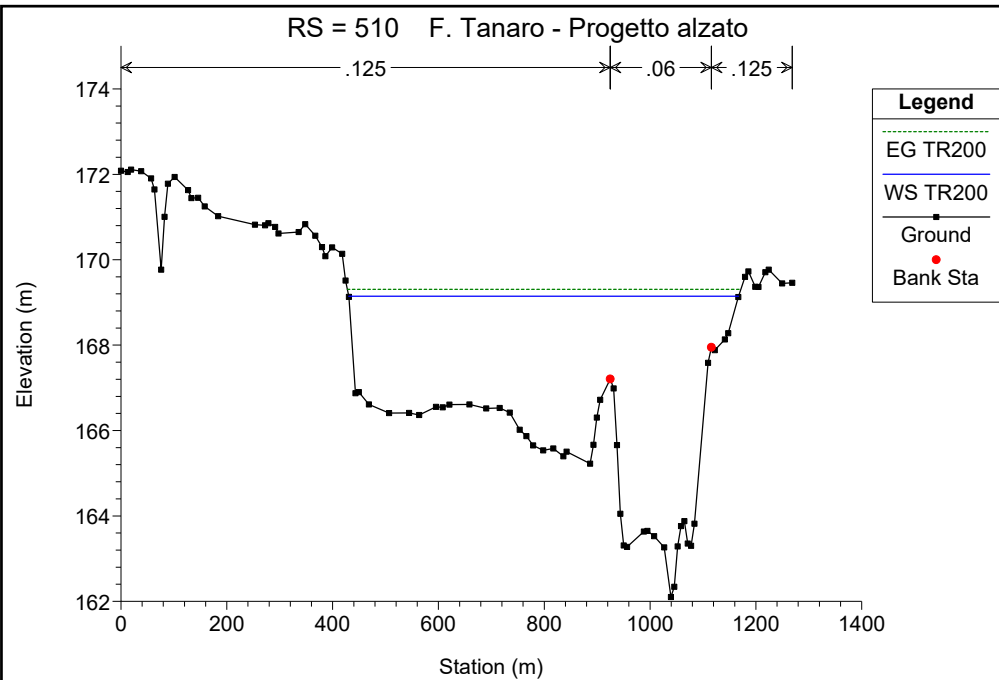
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR200	3070.00	147.59	155.84	153.03	156.10	0.001967	2.43	1850.52	636.44	0.32
1	205	TR200	3070.00	147.37	155.53	152.67	155.66	0.001271	1.87	2922.19	1003.43	0.25
1	200	TR200	3070.00	146.60	155.00	153.53	155.21	0.002021	2.56	2746.11	1082.06	0.32
1	190	TR200	3070.00	146.85	154.52	152.21	154.69	0.001878	2.10	2652.06	1158.72	0.30
1	180	TR200	3070.00	145.66	154.26	150.54	154.34	0.000758	1.42	3567.74	1436.83	0.19
1	170	TR200	3070.00	145.40	153.92	150.11	154.08	0.001444	1.90	2670.61	1337.82	0.27
1	160	TR200	3070.00	145.46	153.42	149.83	153.57	0.001201	1.84	2747.73	1387.58	0.25
1	150	TR200	3070.00	143.53	152.89	149.10	153.14	0.001549	2.33	2329.68	1341.68	0.29
1	140	TR200	3070.00	143.00	151.50	149.62	152.28	0.006444	3.94	868.40	578.08	0.56
1	135		Inl Struct									
1	130	TR200	3070.00	142.54	151.50	147.54	151.82	0.001863	2.58	1740.01	1191.99	0.31
1	120	TR200	3070.00	142.27	150.90	146.96	151.27	0.002018	2.72	1551.38	1047.96	0.33
1	110	TR200	3070.00	141.17	150.58	146.94	150.80	0.001443	2.29	2322.27	759.96	0.28
1	100	TR200	3070.00	140.79	149.99	147.05	150.31	0.002557	2.60	1530.40	561.47	0.35
1	90	TR200	3070.00	140.59	148.81	145.71	149.34	0.003742	3.24	946.70	172.92	0.43
1	85		Bridge									
1	80	TR200	3070.00	140.59	148.50	145.71	149.09	0.004172	3.42	897.97	164.60	0.45
1	70	TR200	3070.00	139.61	147.59	144.97	147.99	0.003359	2.95	1313.38	305.57	0.41
1	60	TR200	3070.00	138.12	147.17	143.37	147.42	0.001556	2.44	2182.01	818.21	0.29
1	50	TR200	3070.00	137.54	146.60	143.99	146.97	0.002468	2.98	1840.17	907.16	0.36
1	40	TR200	3070.00	137.06	145.86	143.18	146.17	0.002702	2.52	1343.30	737.82	0.36
1	30	TR200	3070.00	137.37	145.22	142.02	145.50	0.002228	2.42	1581.88	738.76	0.33
1	20	TR200	3070.00	136.62	144.66	141.68	144.87	0.001721	2.40	2341.28	840.96	0.30
1	10	TR200	3070.00	135.29	143.70	142.45	144.17	0.004002	3.49	1689.40	662.87	0.45

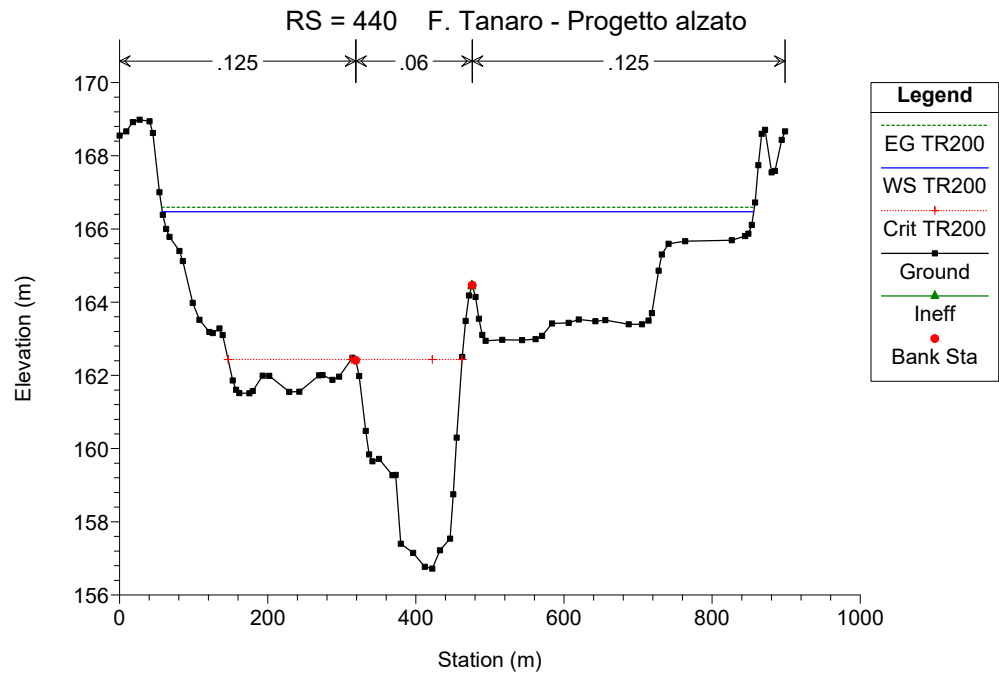
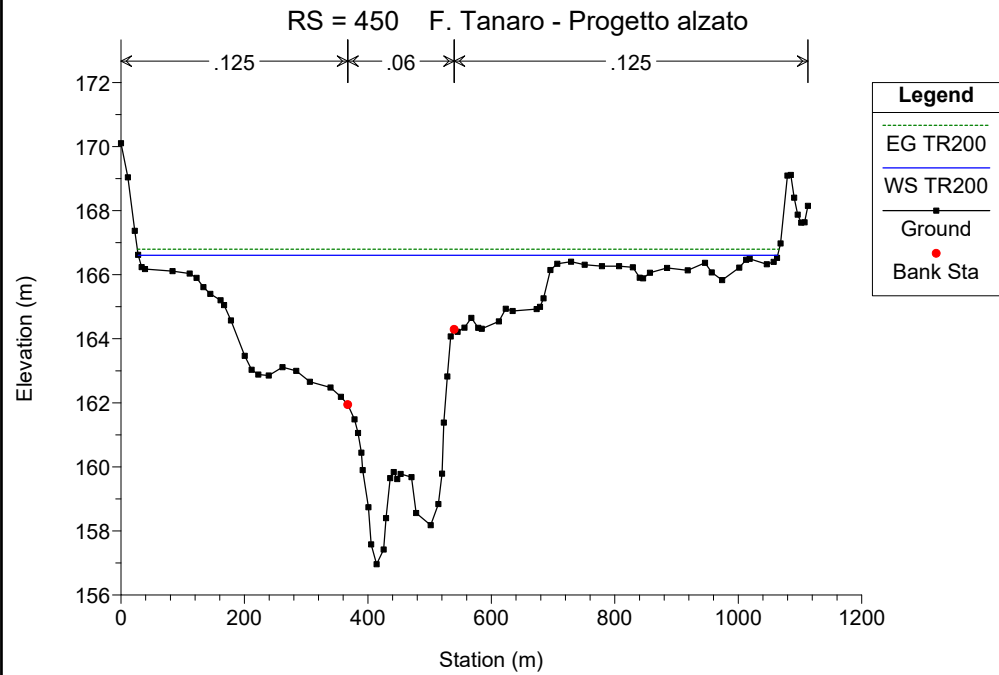
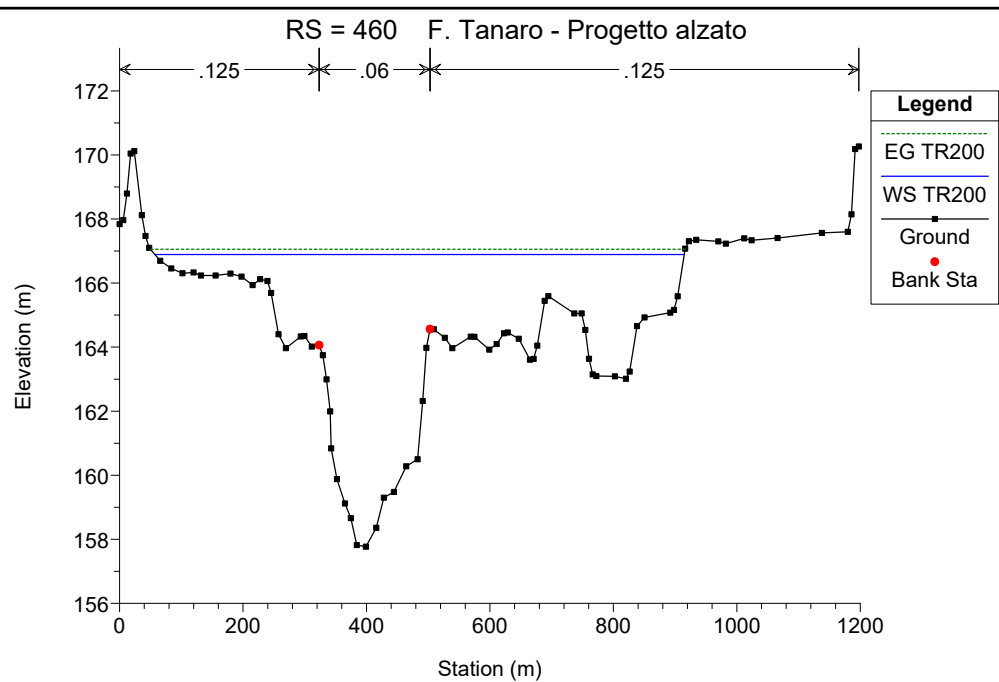
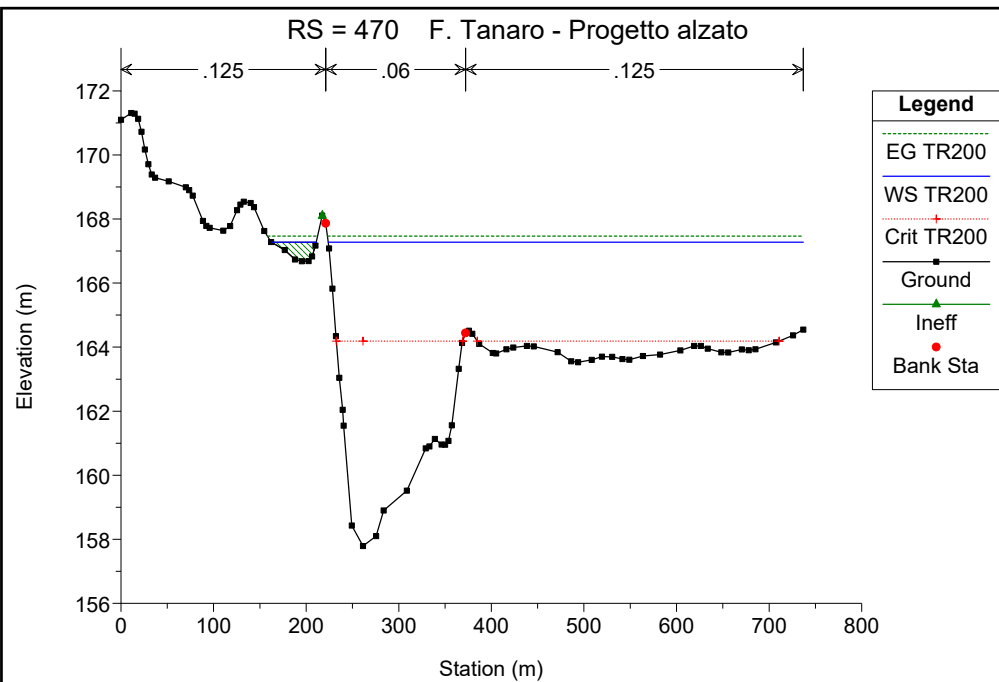
F. Tanaro - Progetto alzato

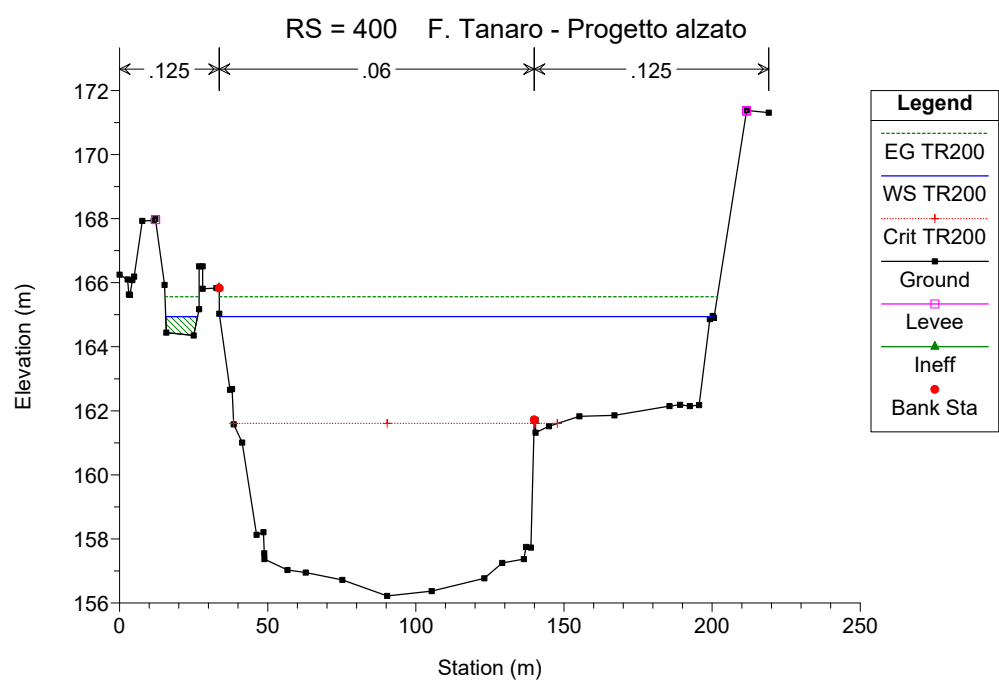
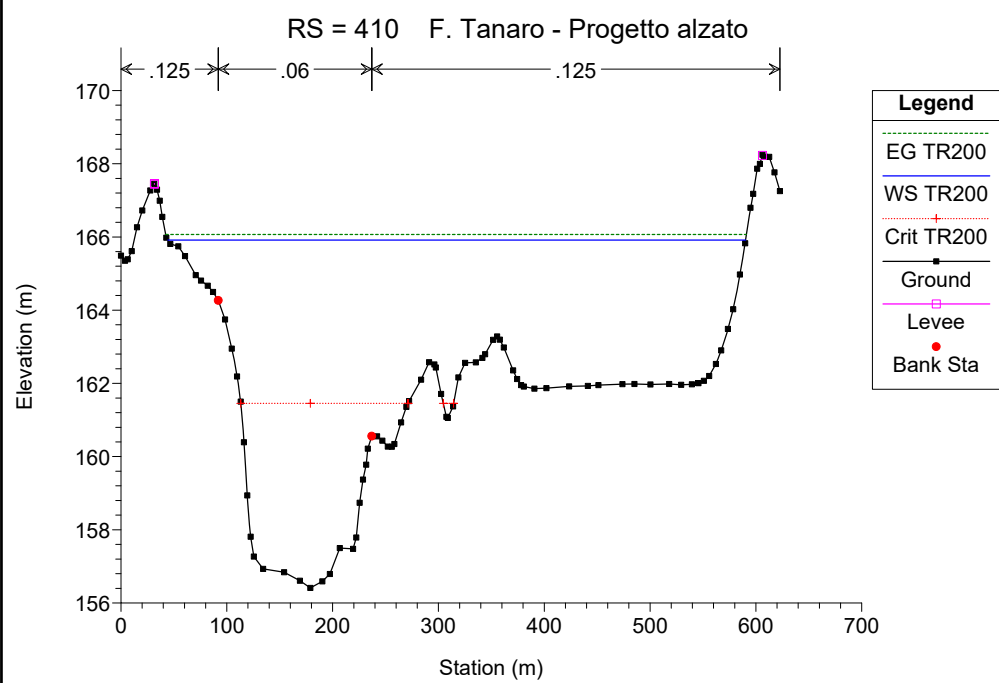
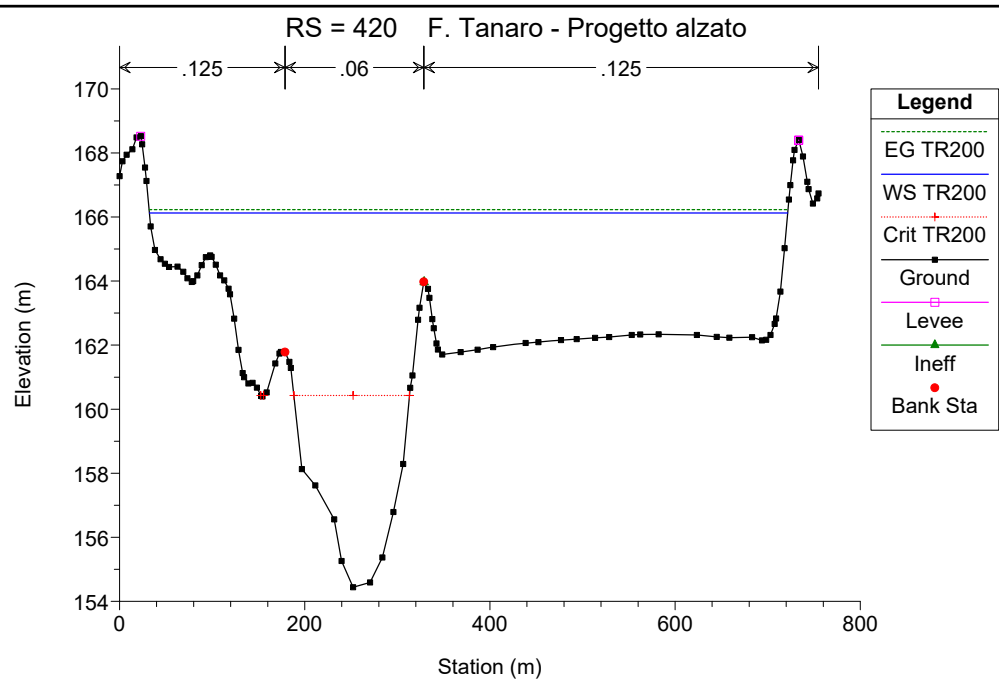
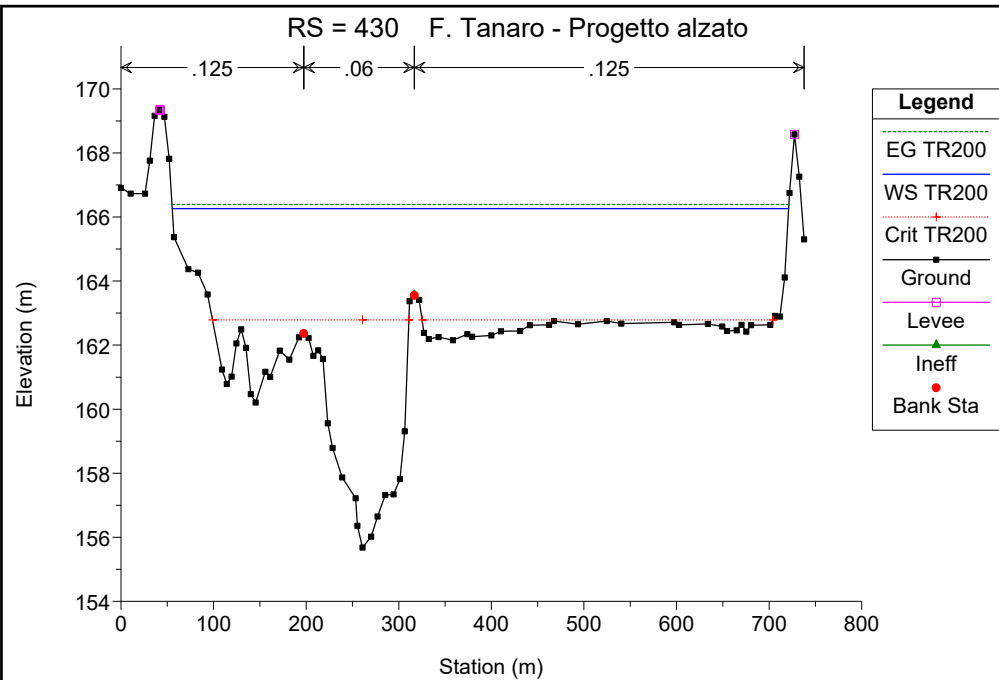
Tanaro 1

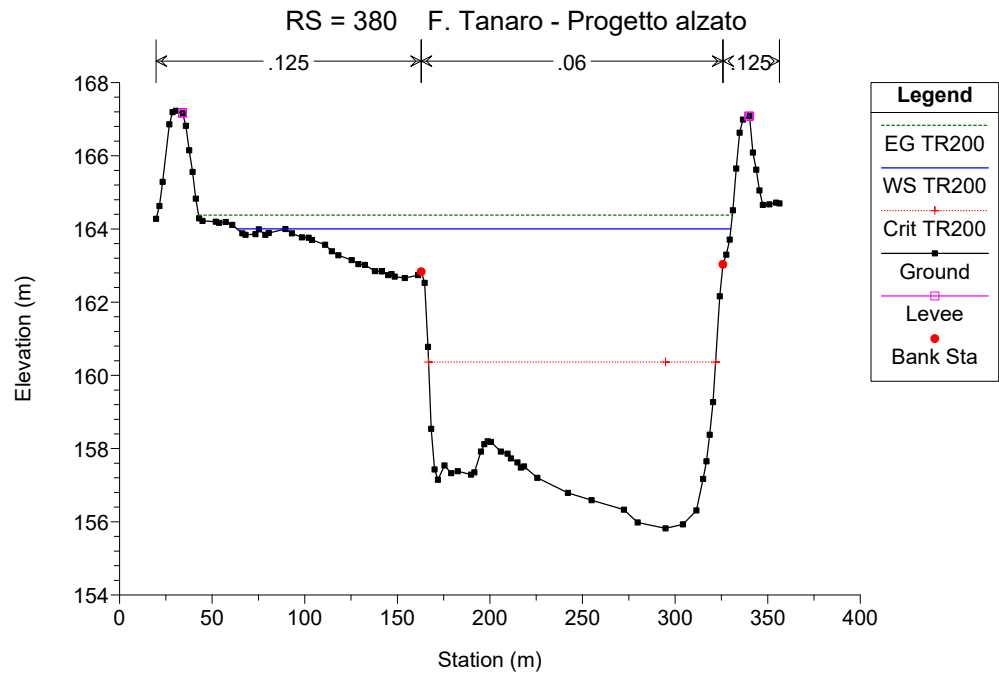
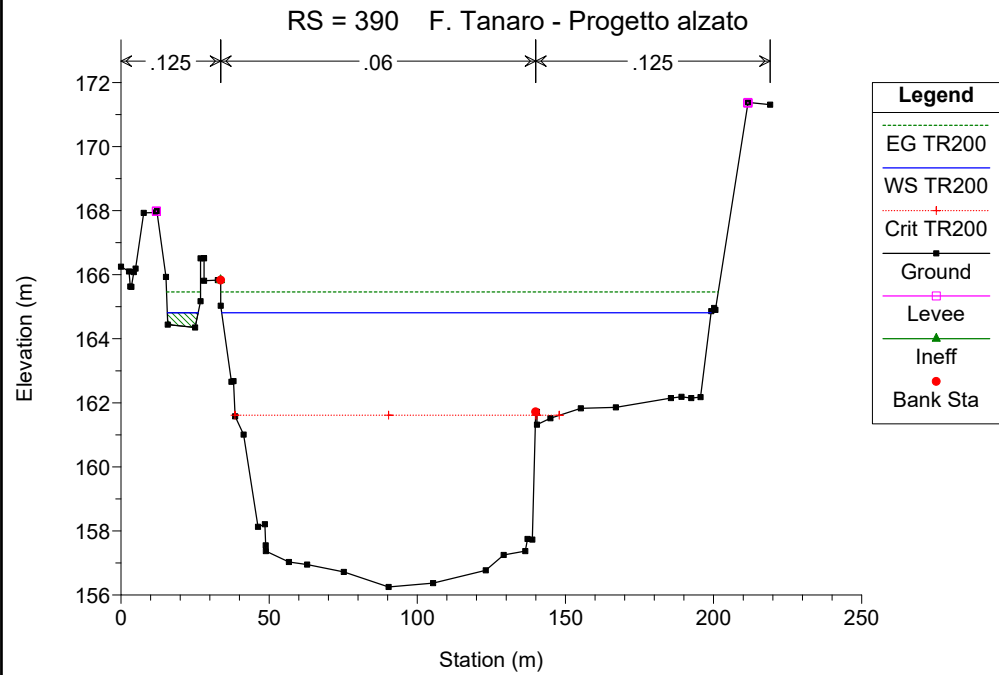
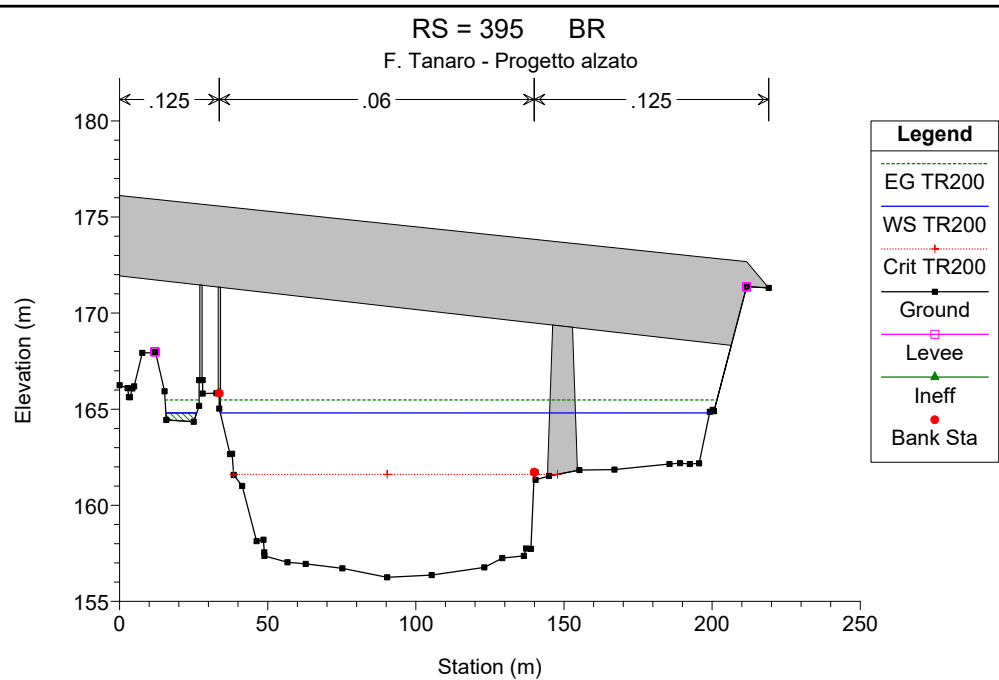
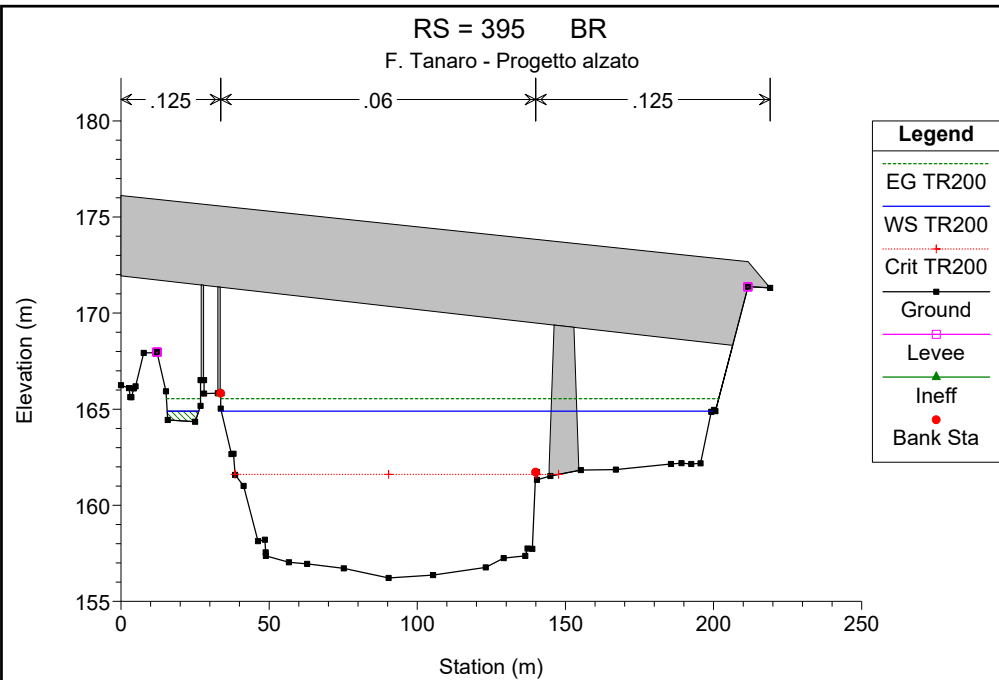


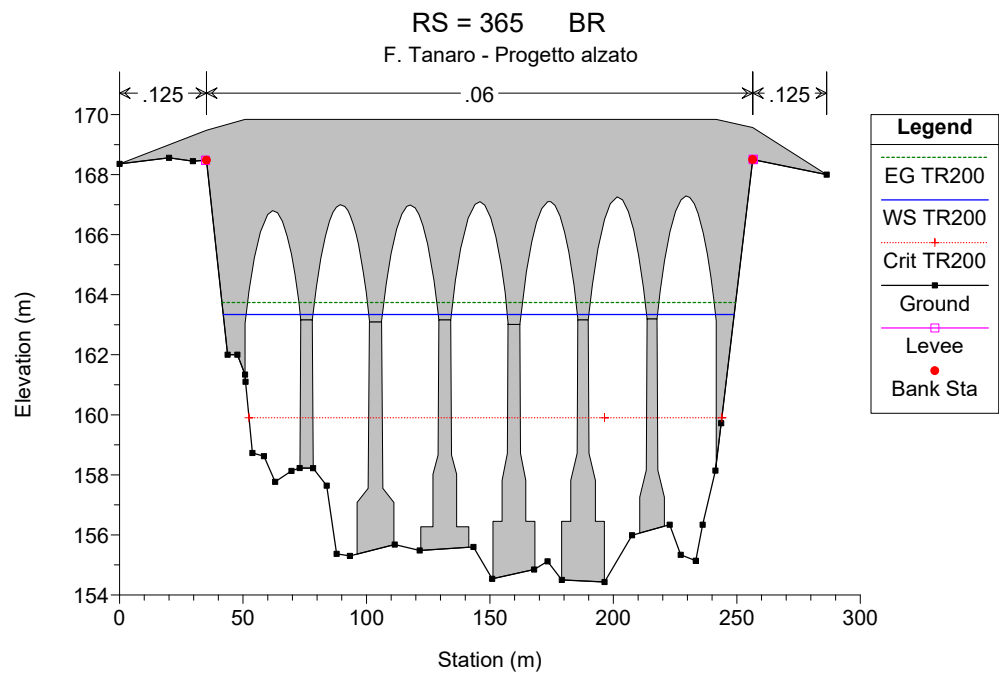
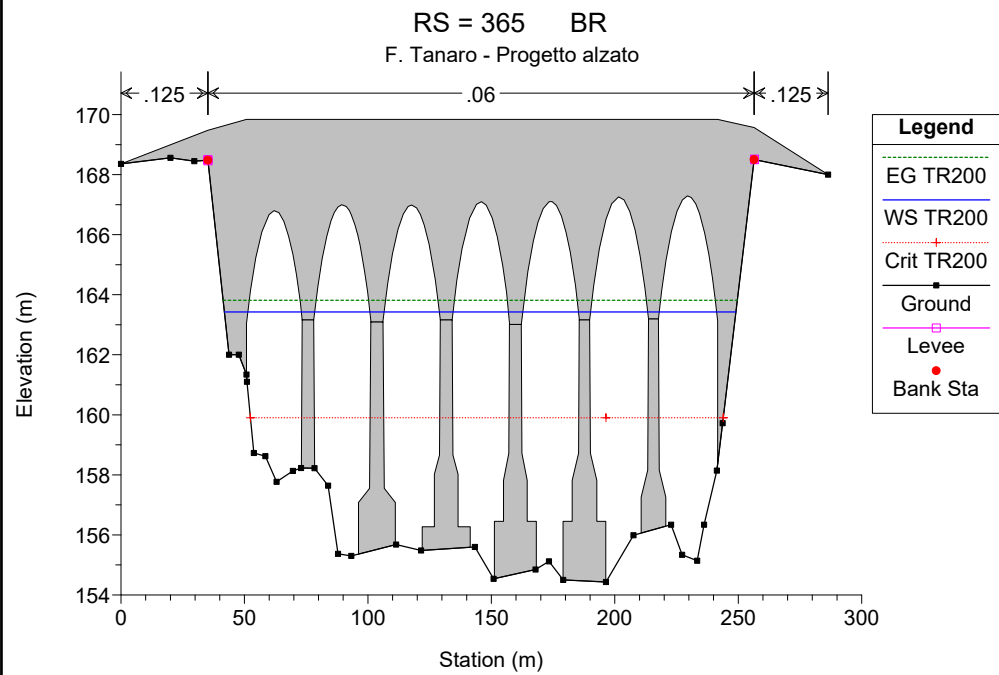
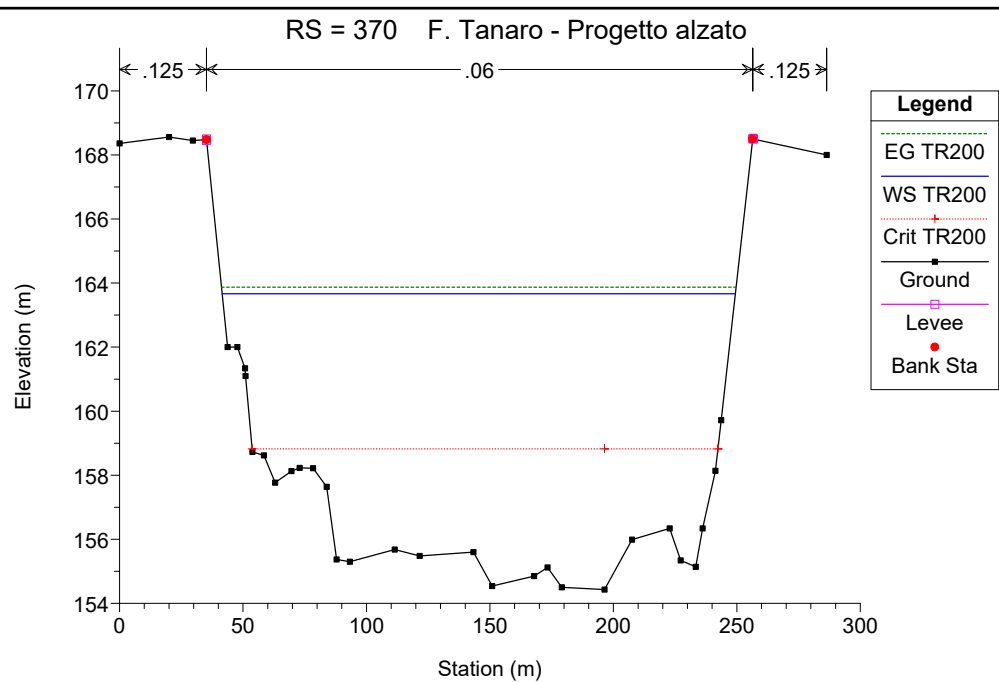
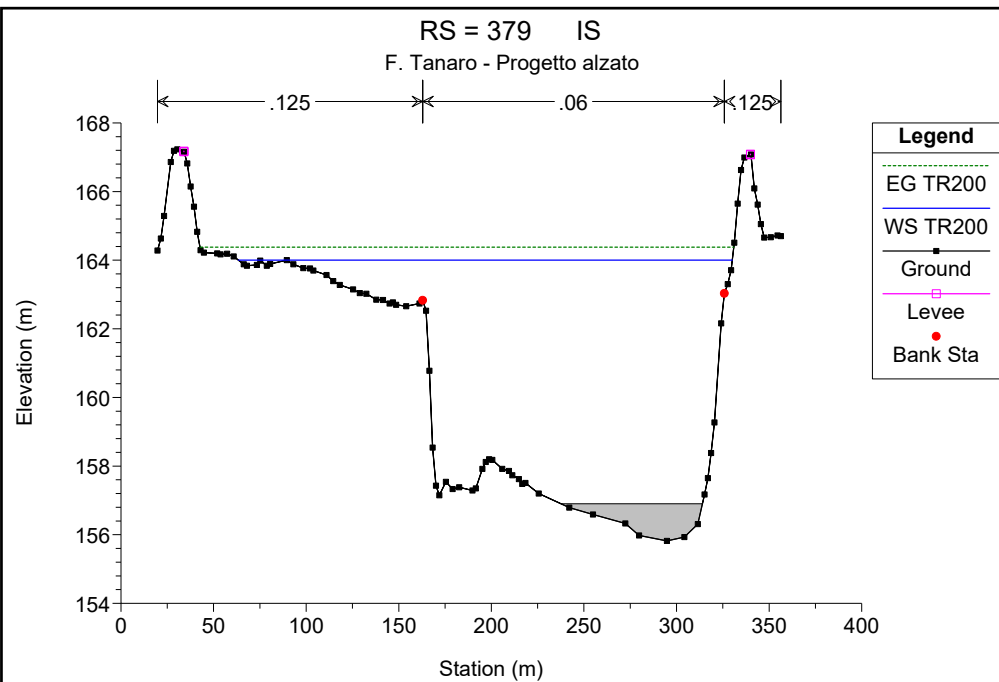


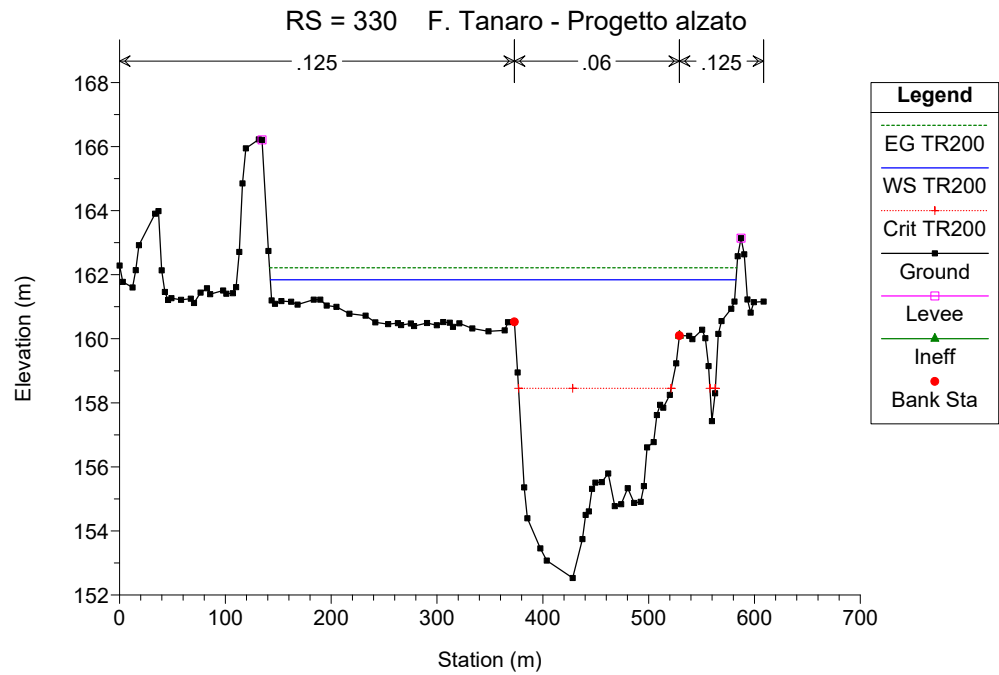
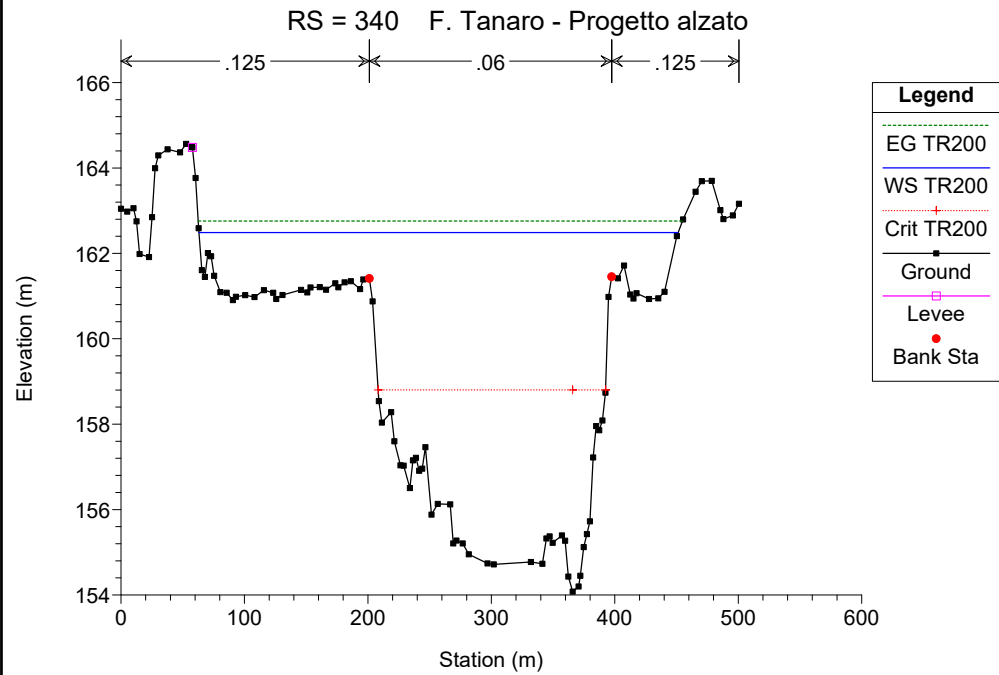
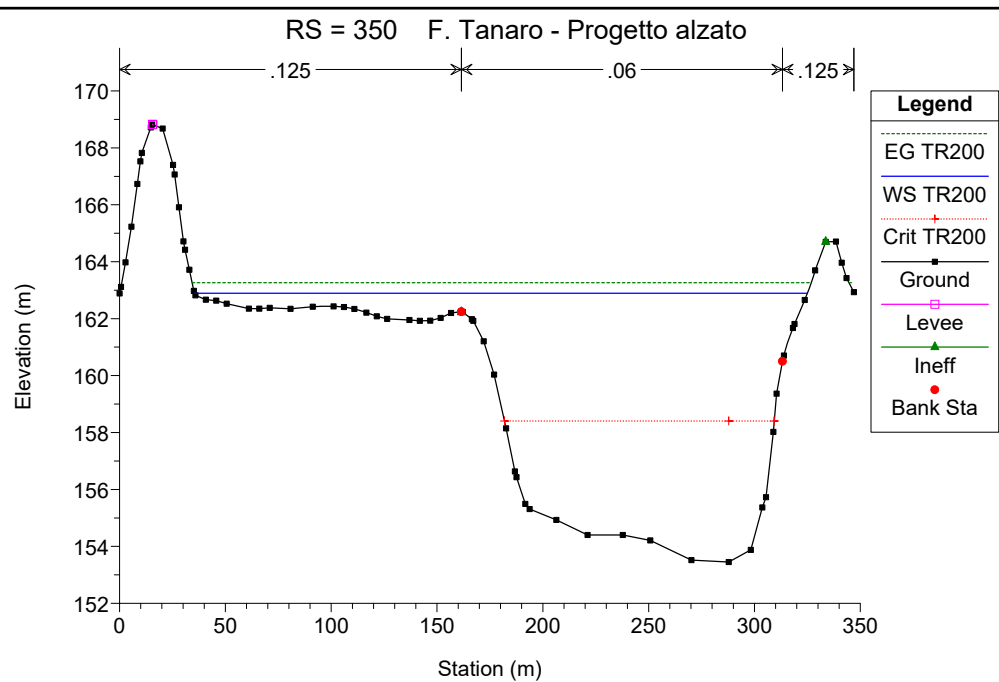
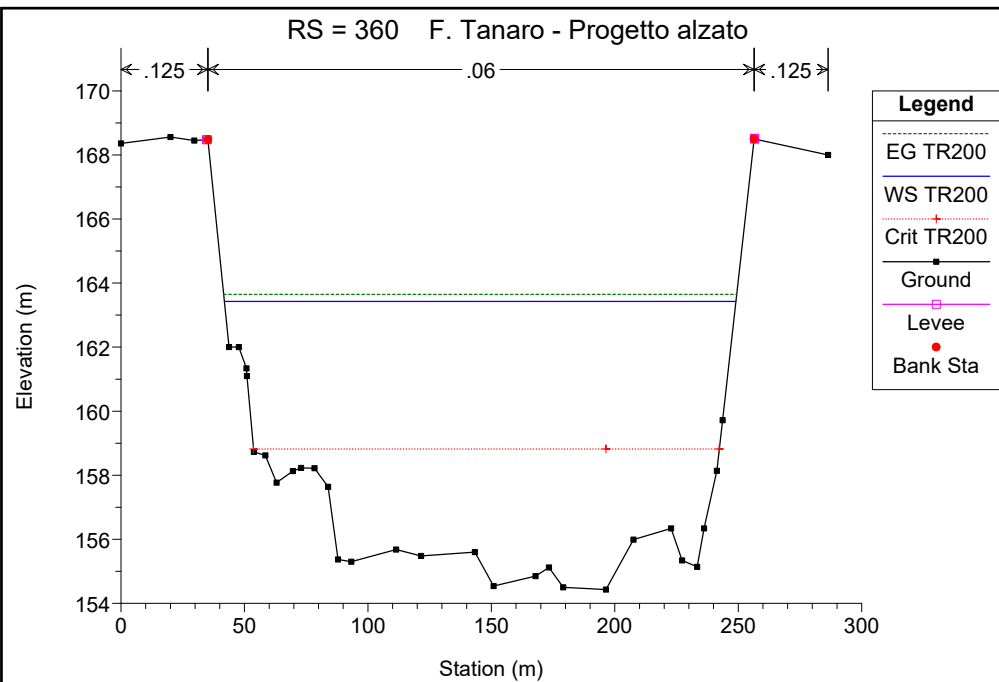


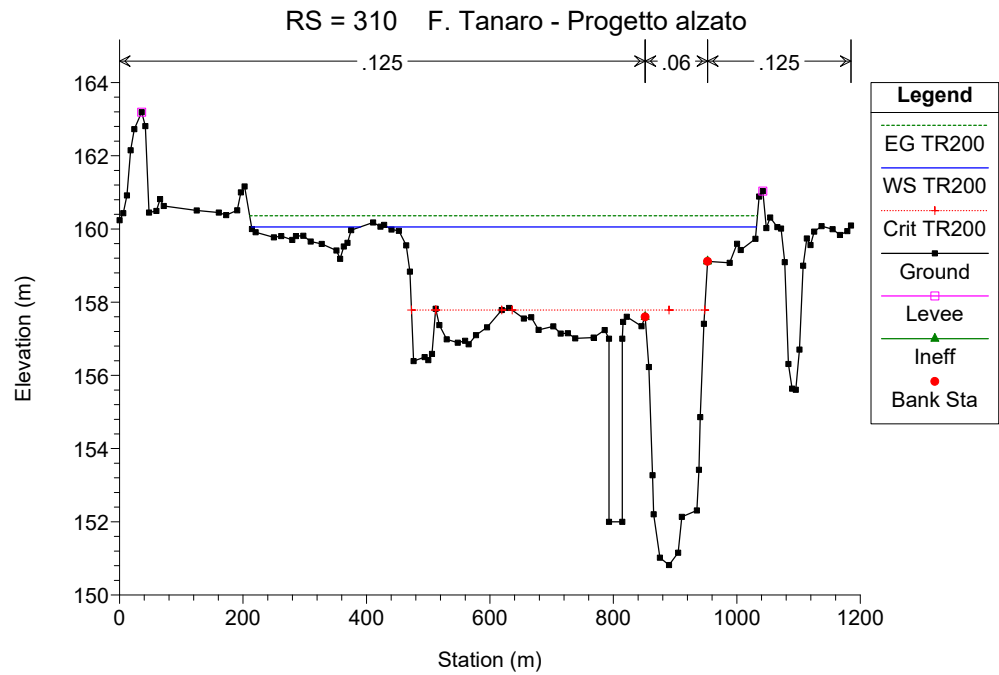
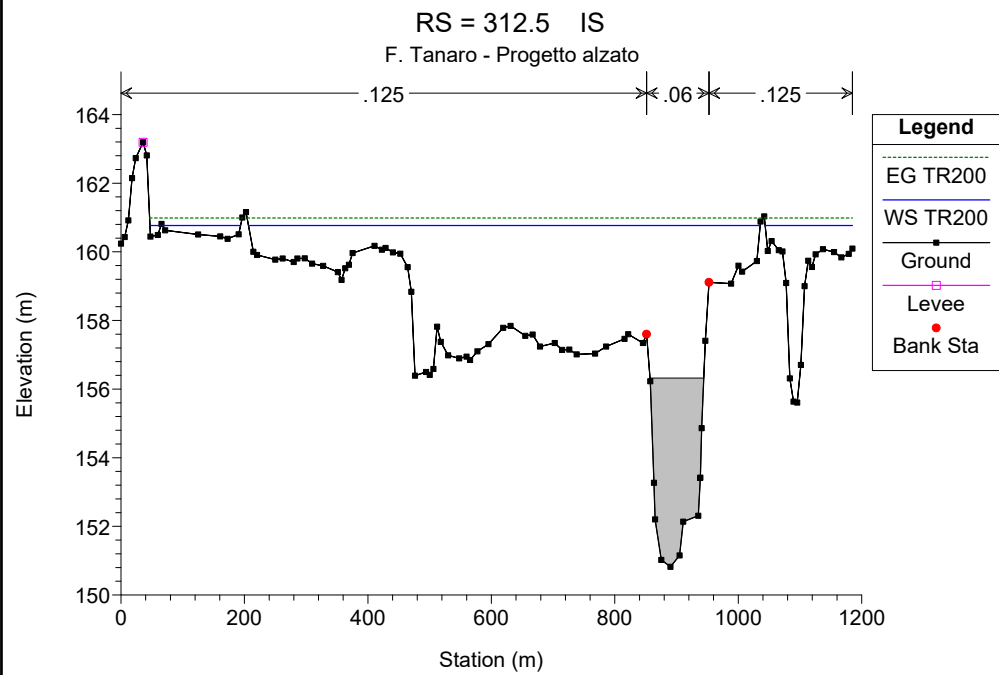
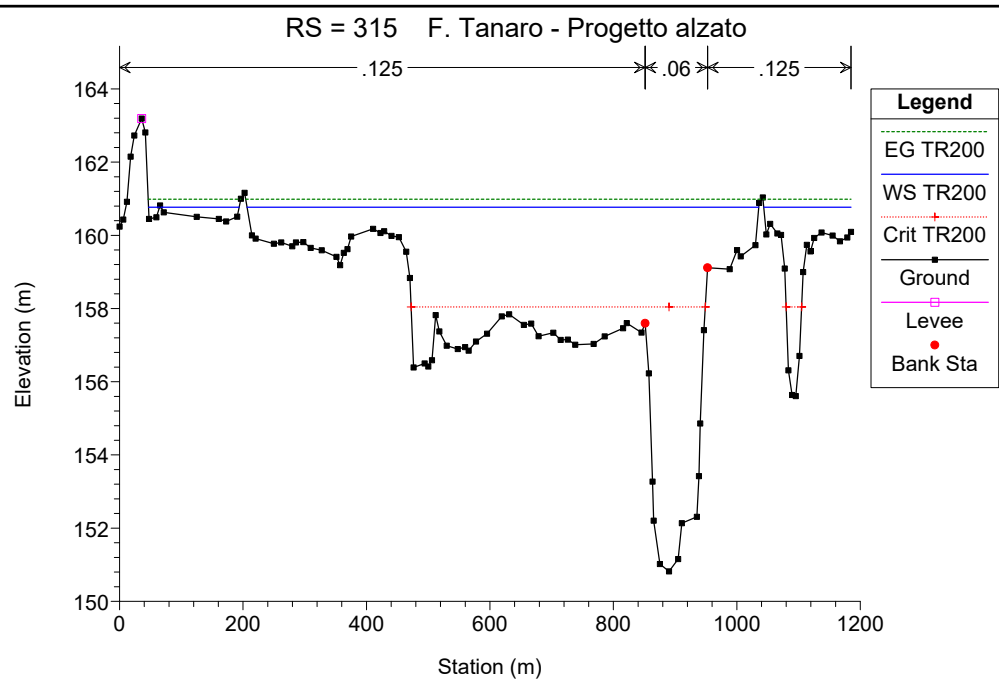
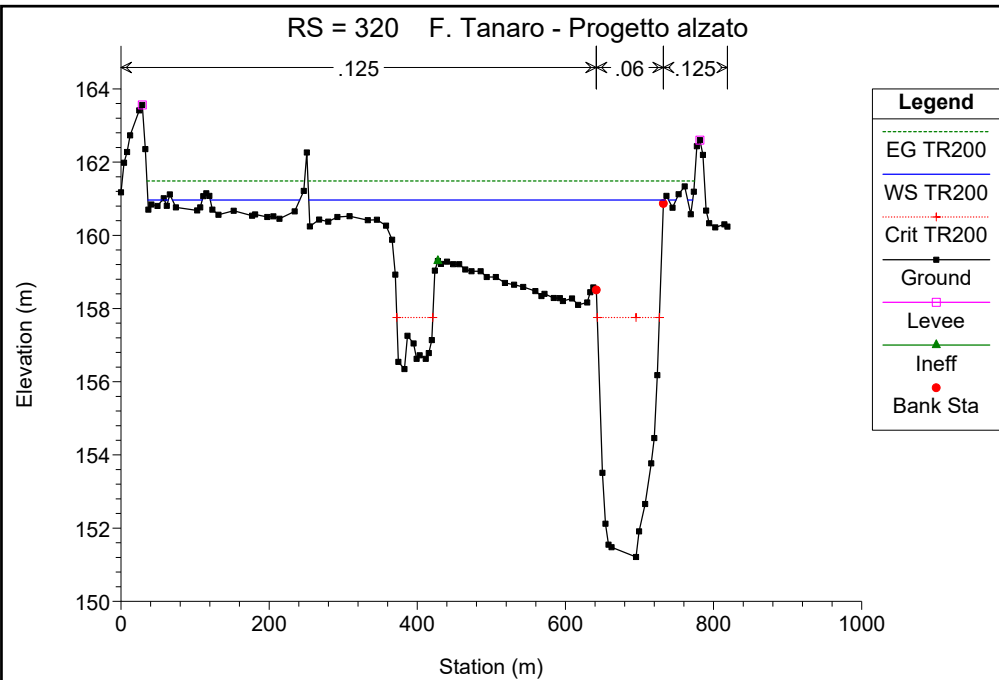


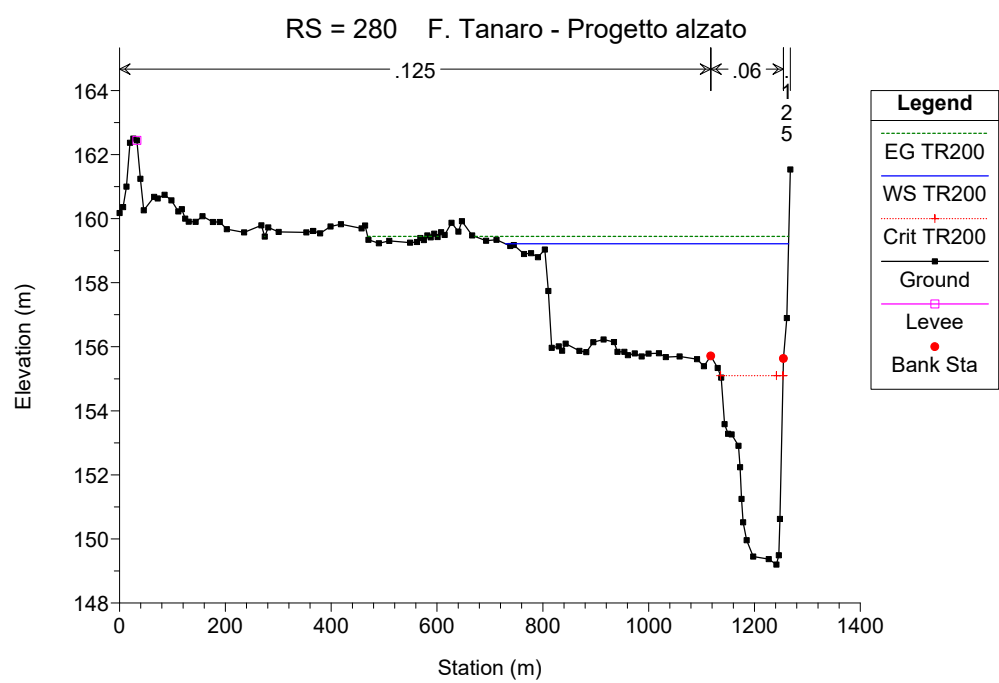
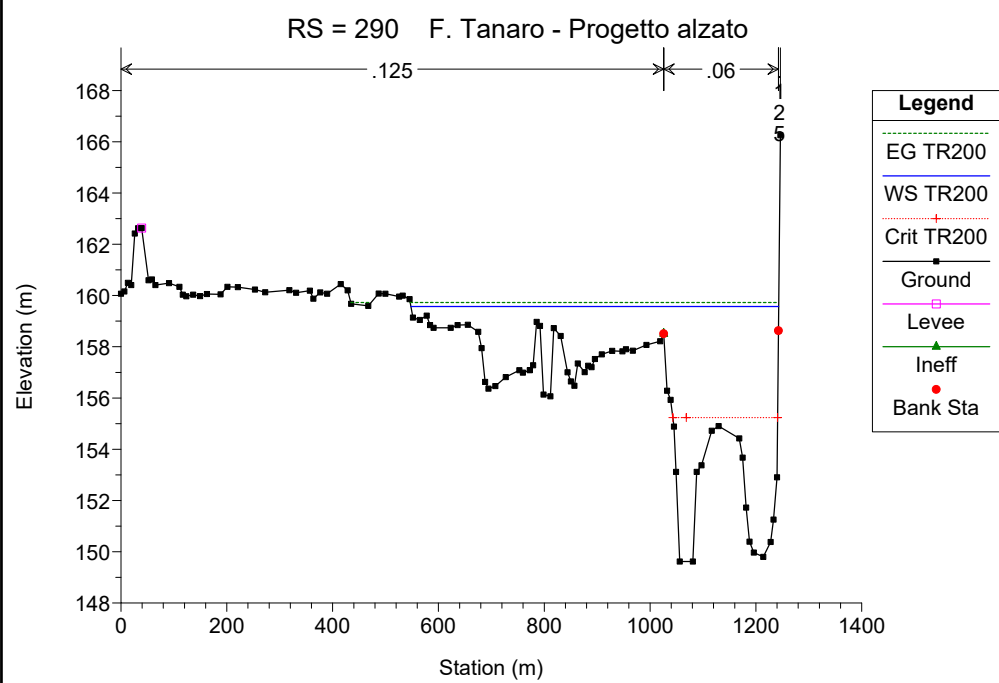
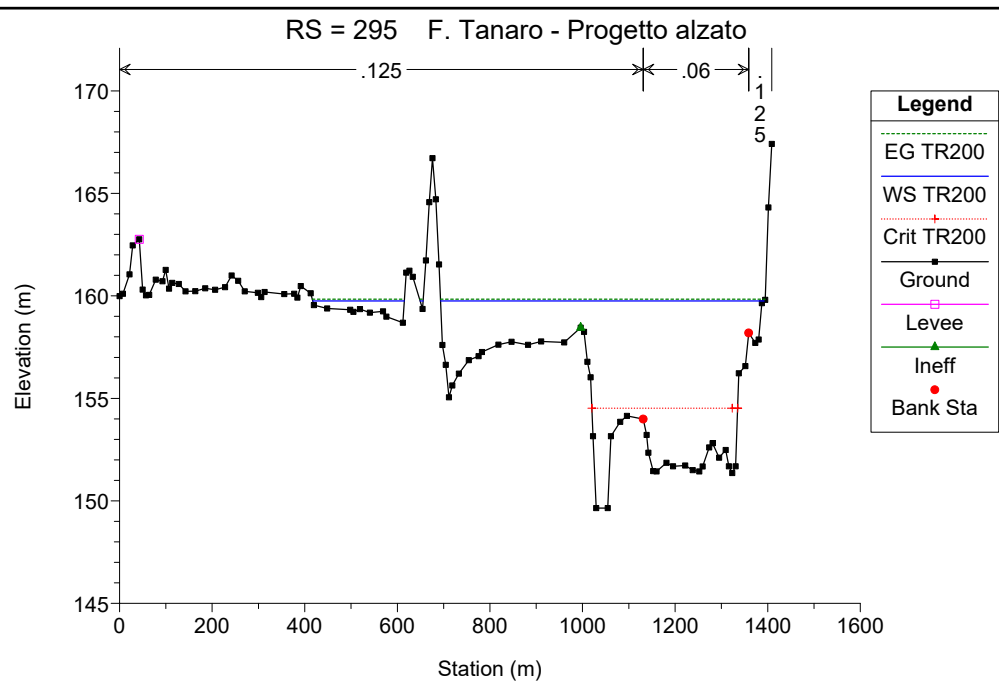
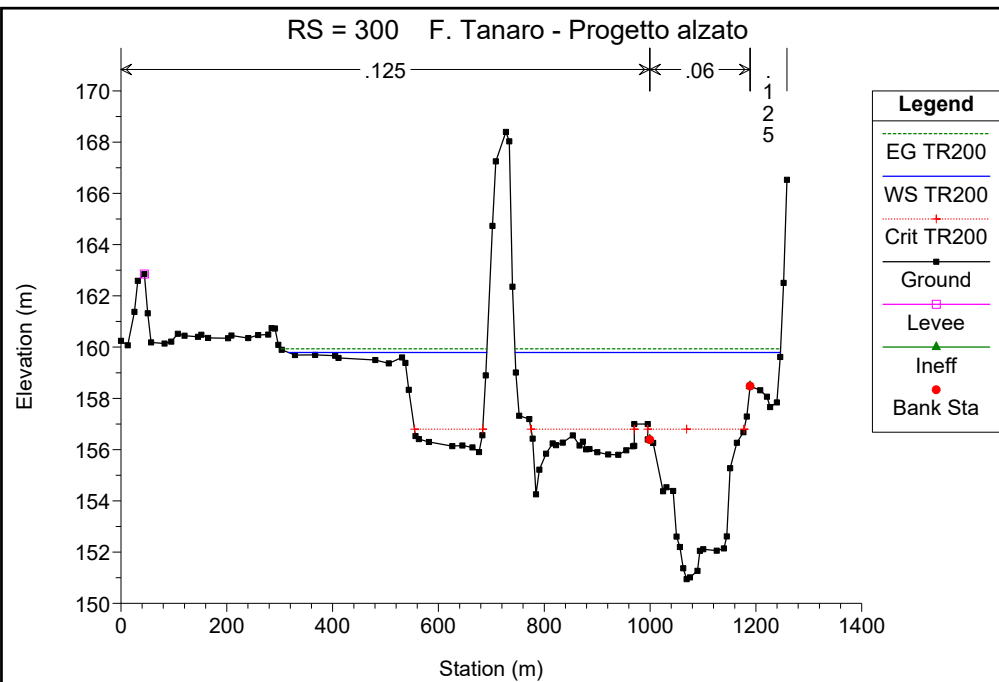


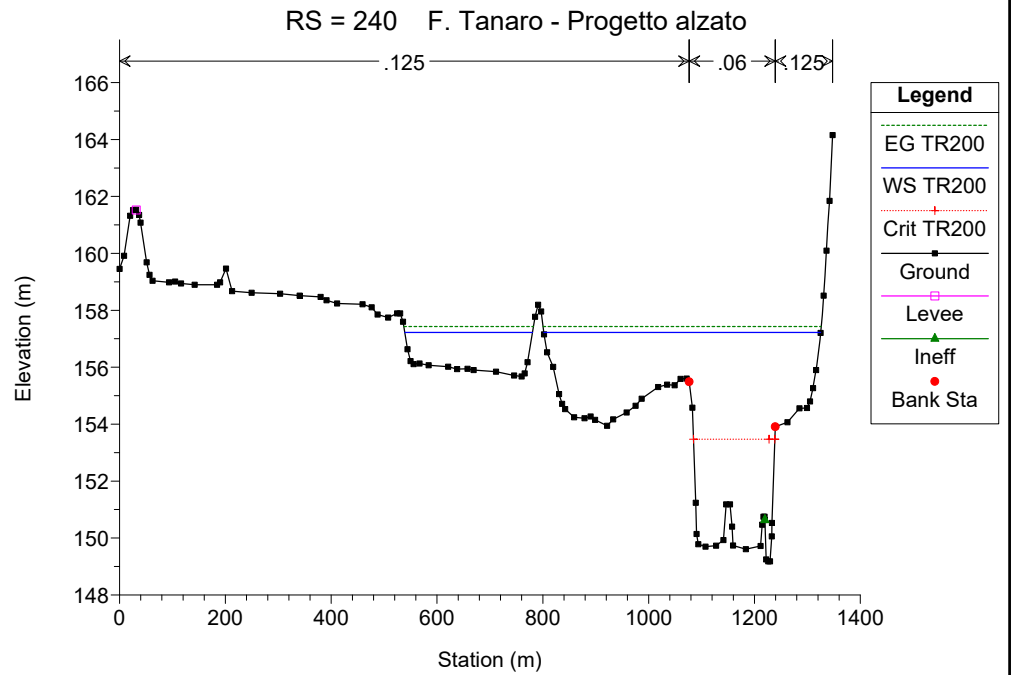
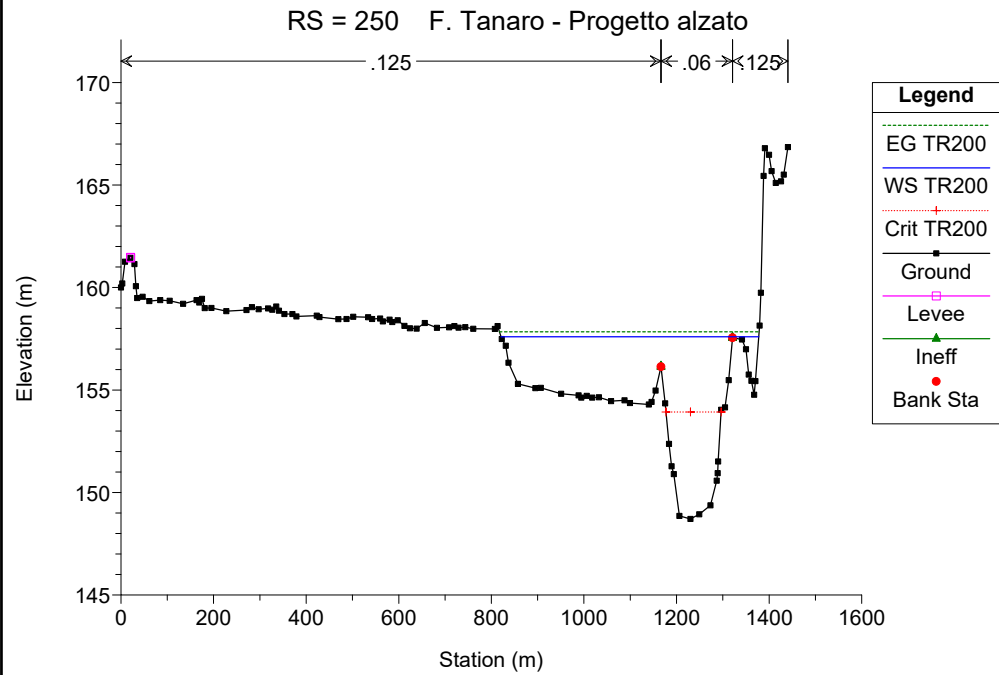
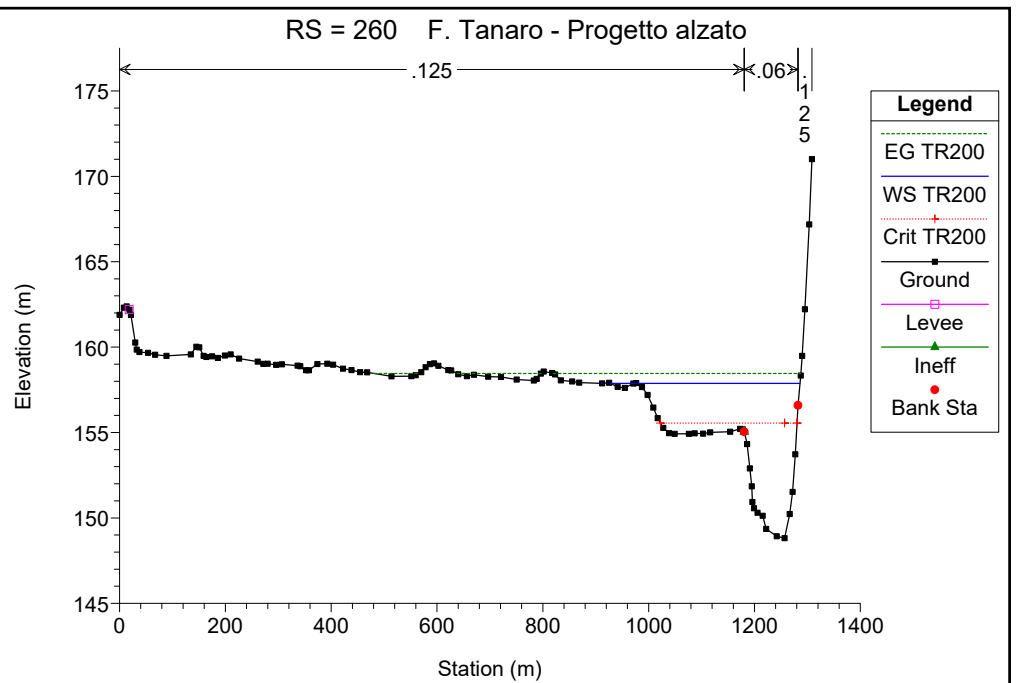
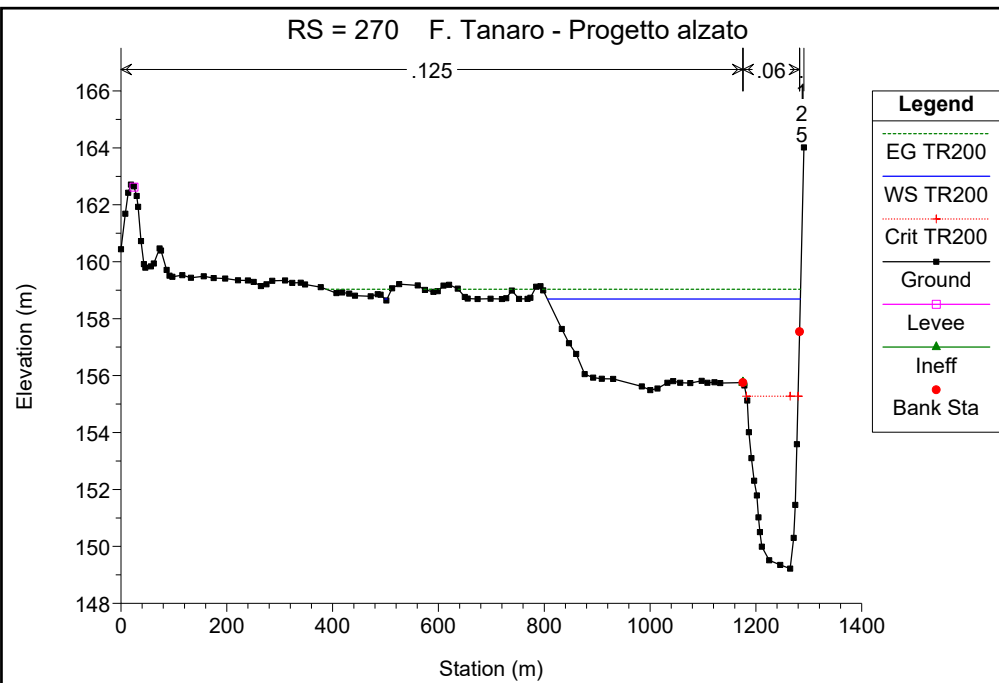


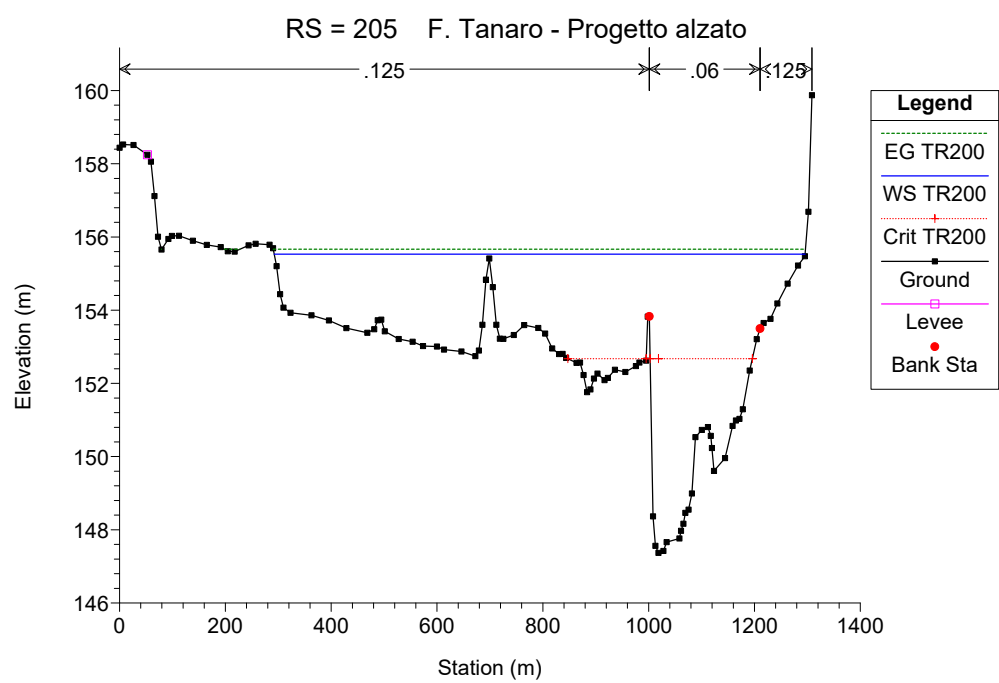
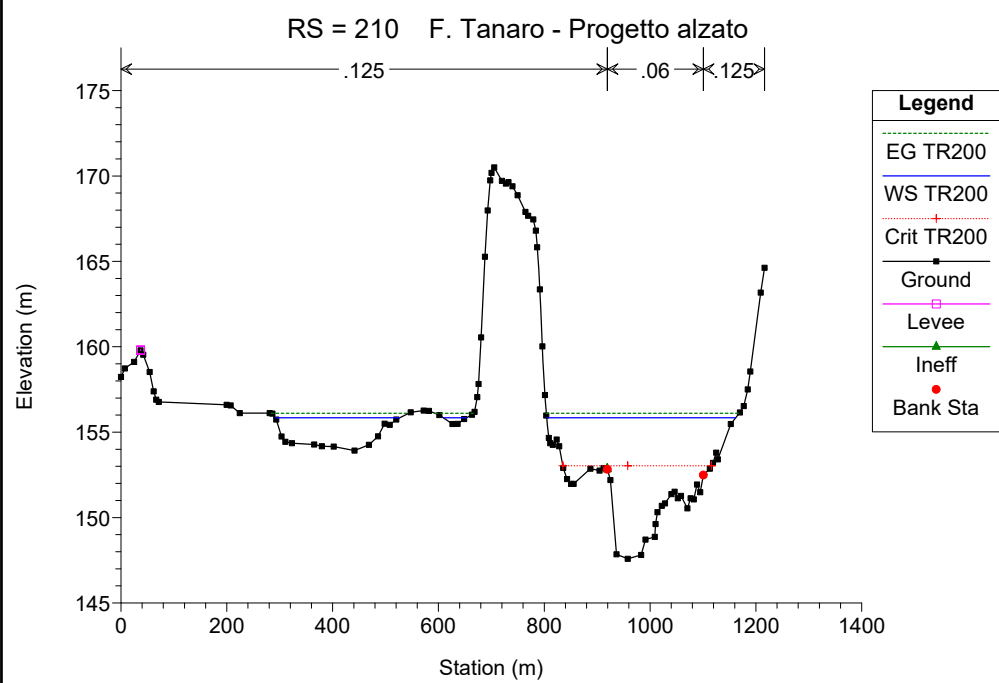
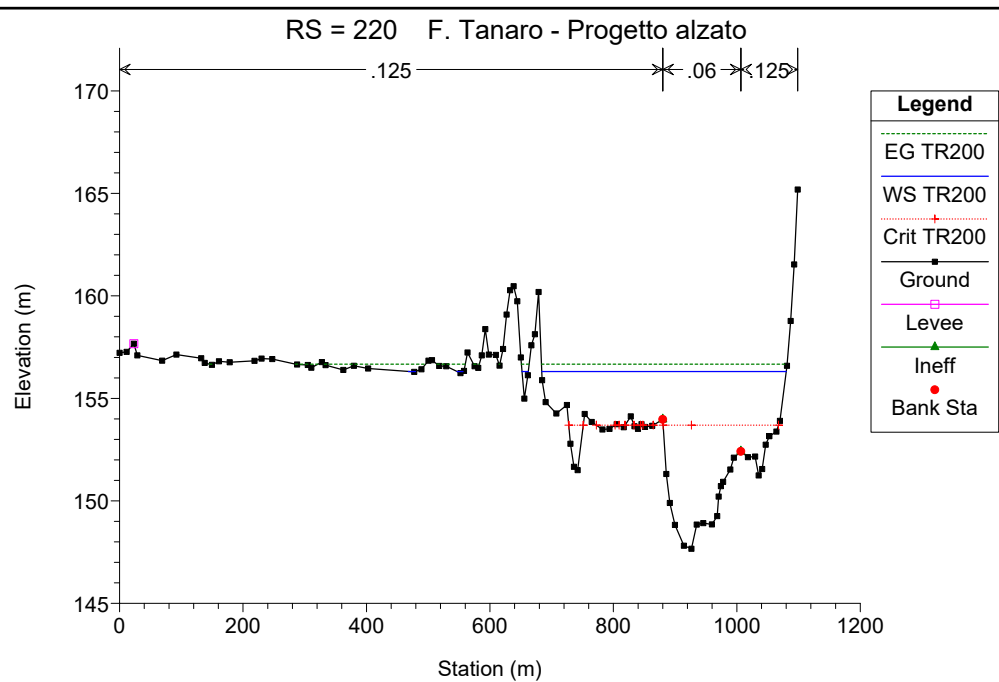
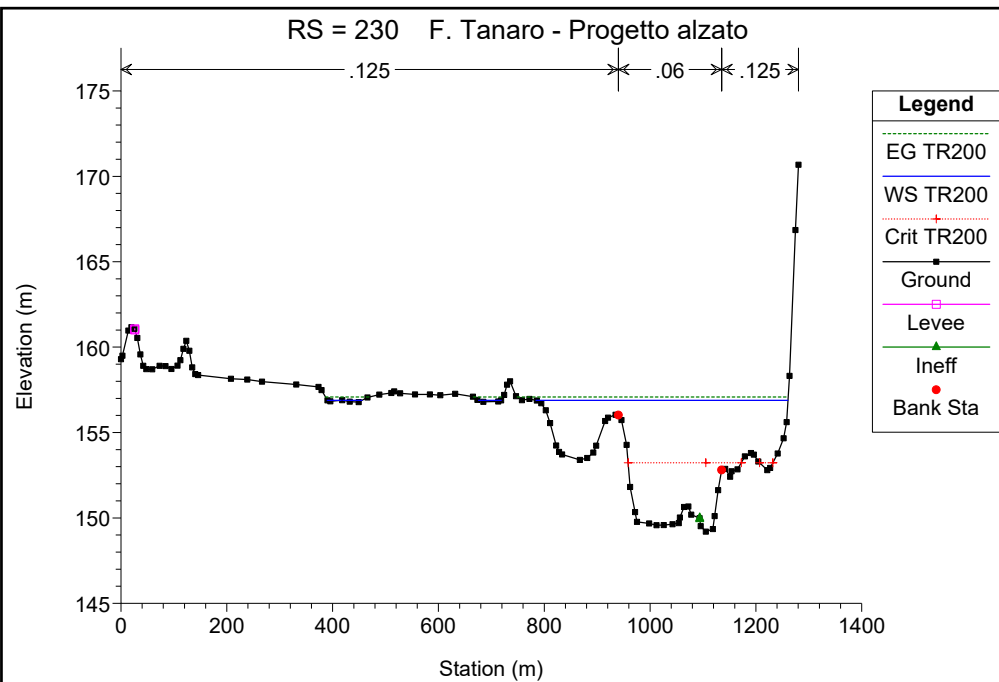


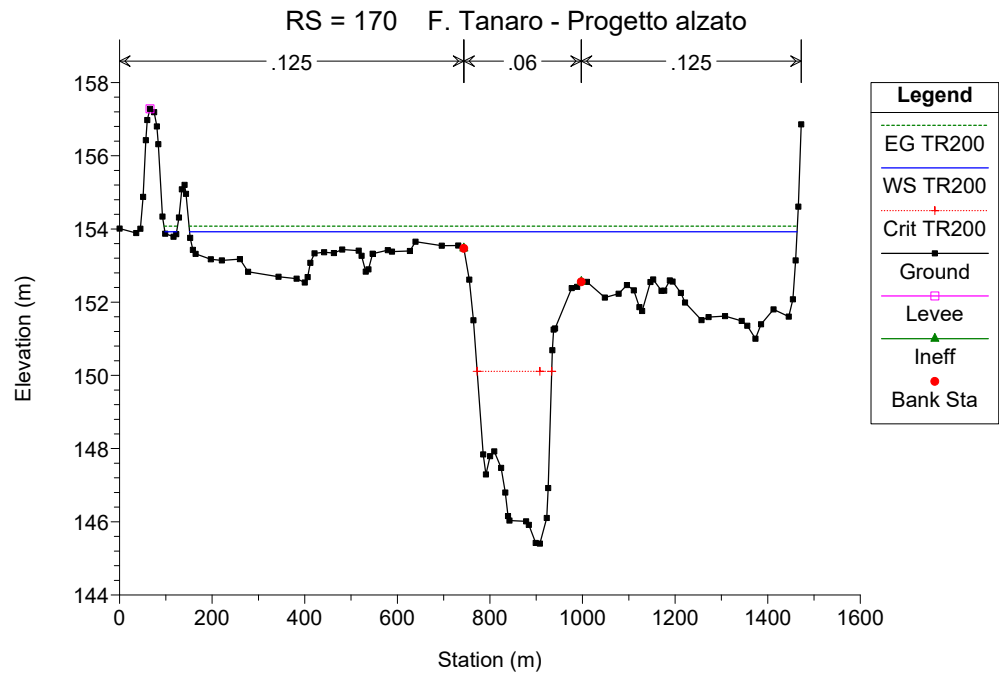
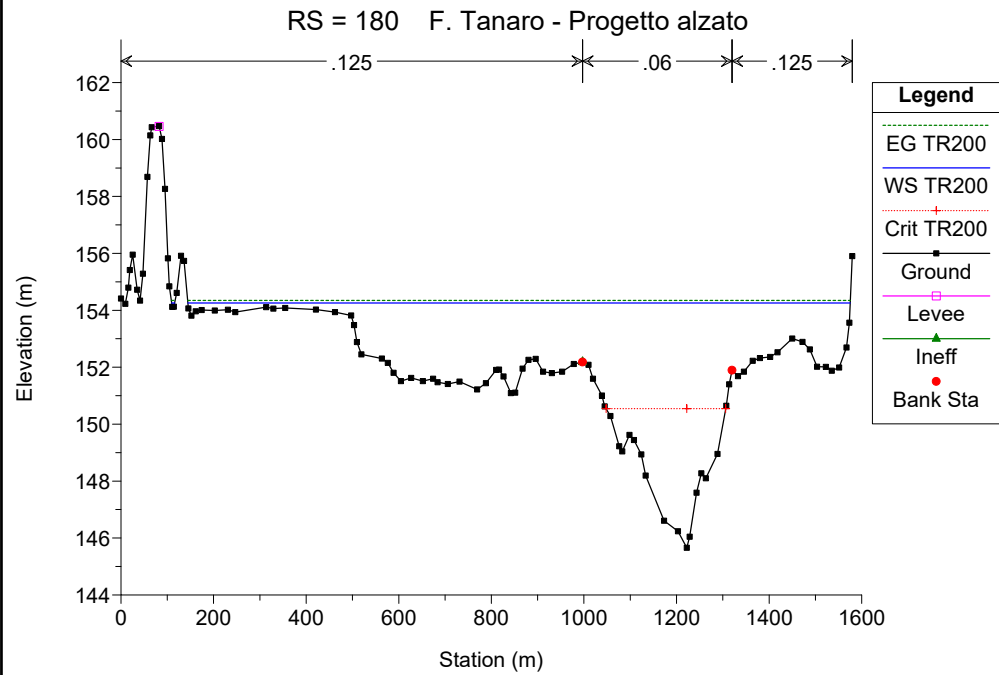
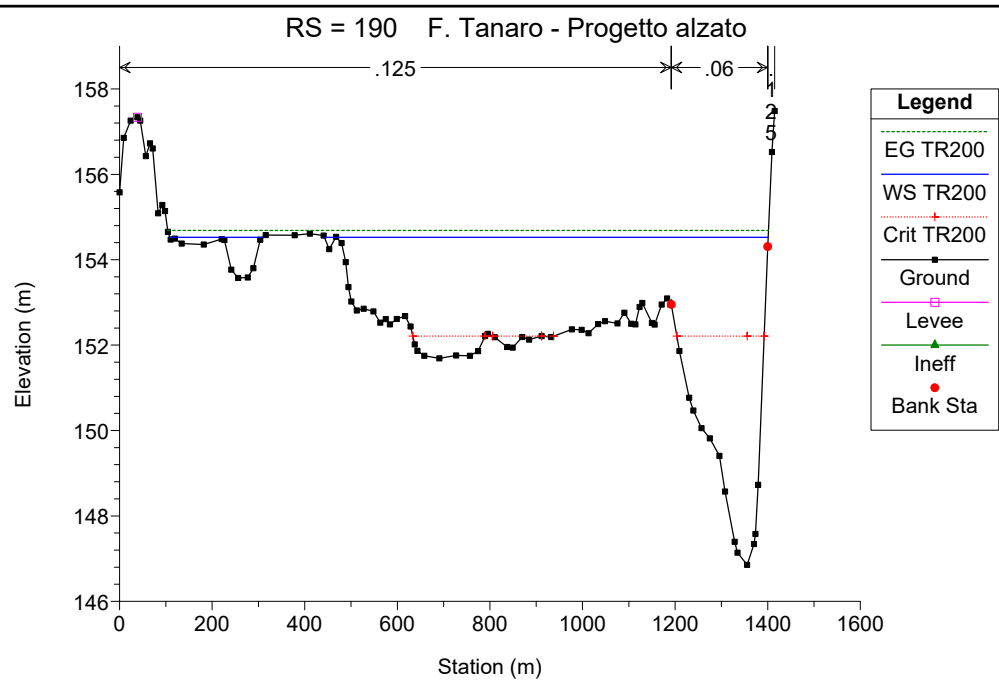
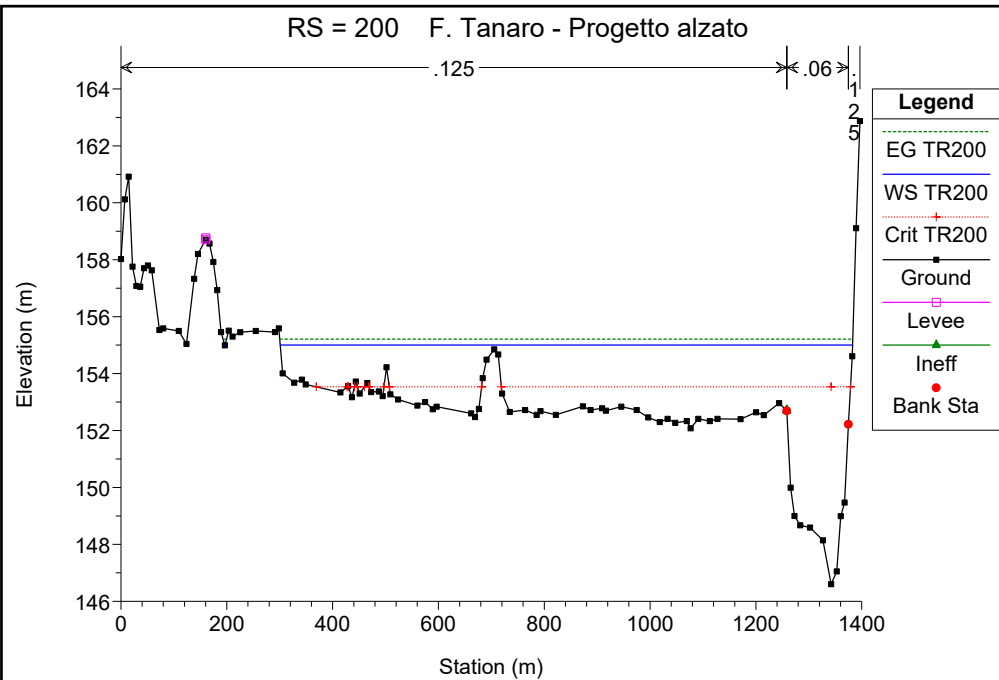


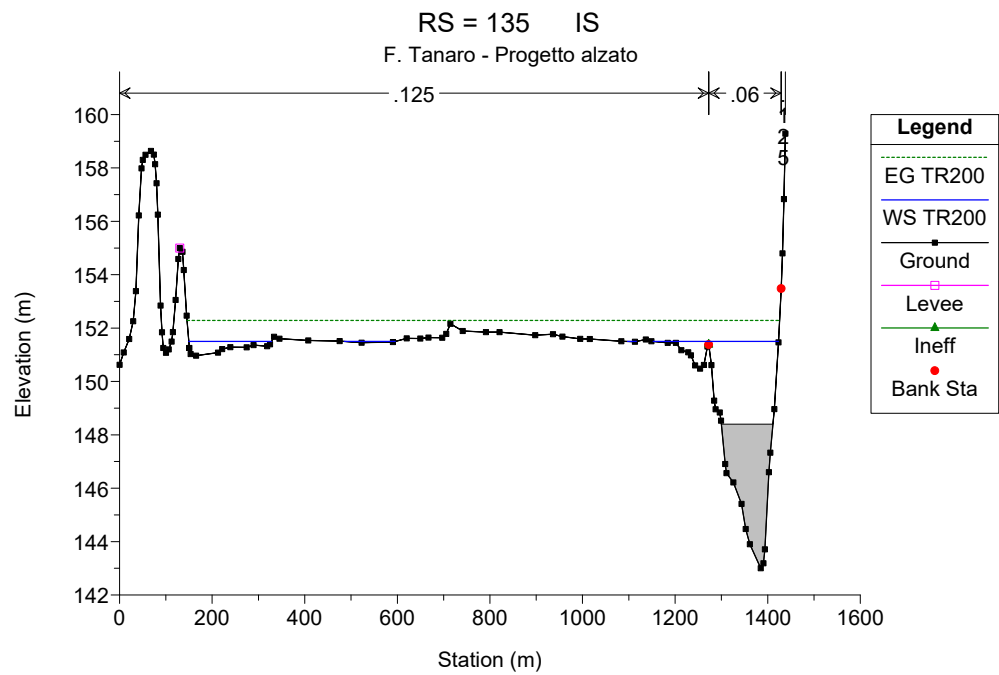
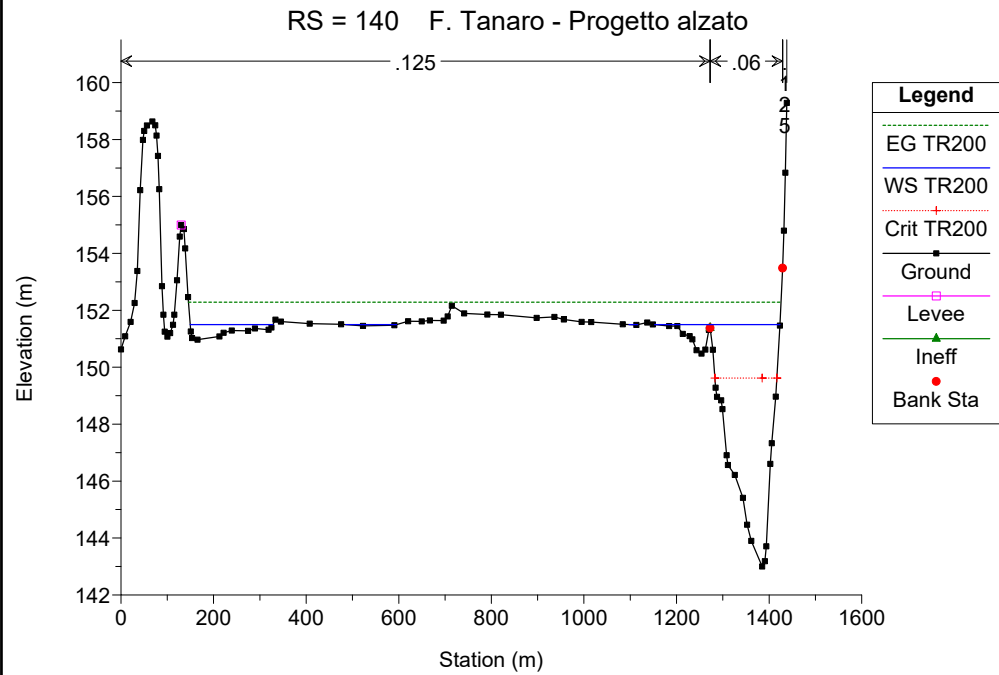
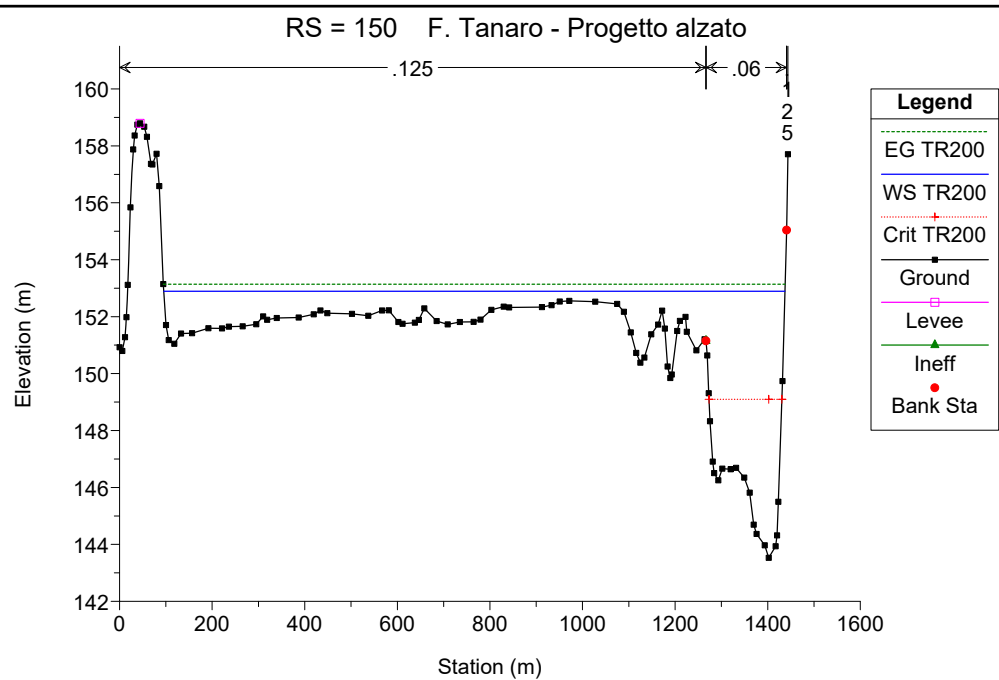
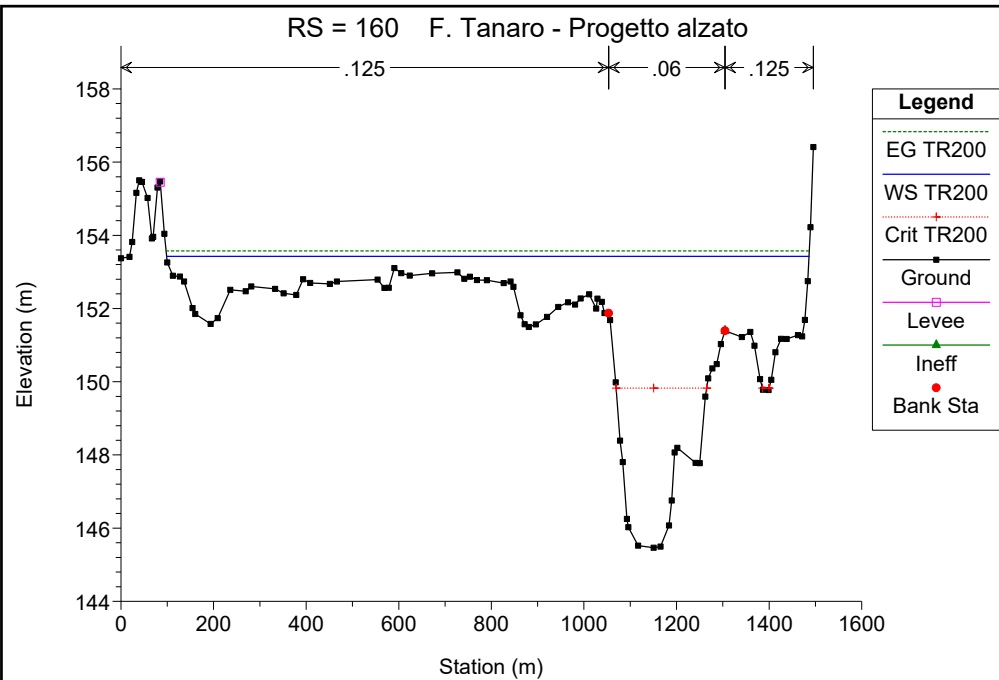


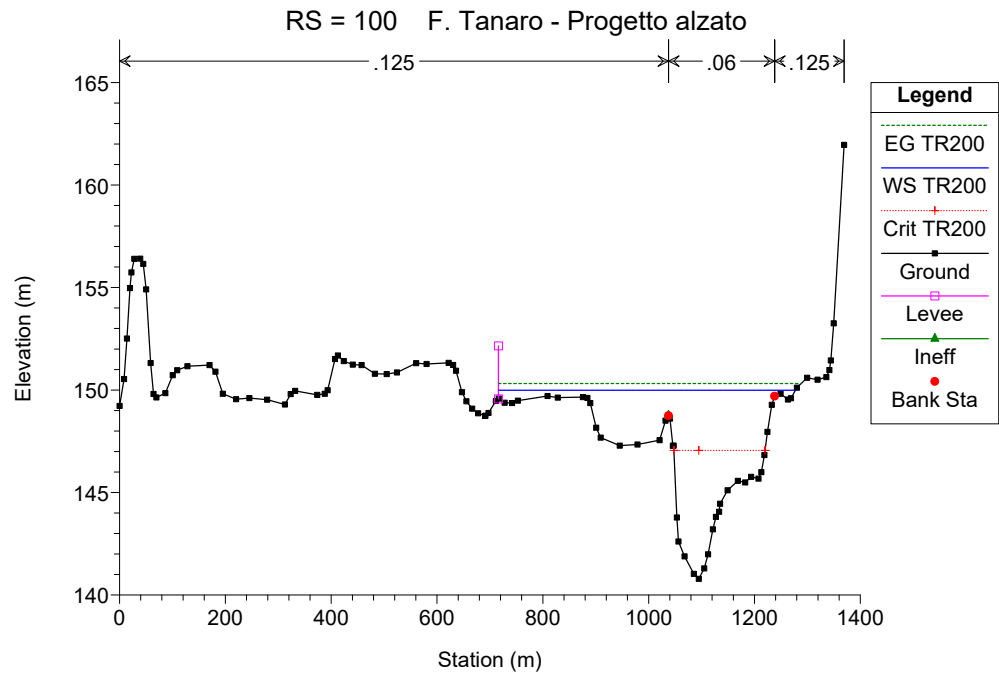
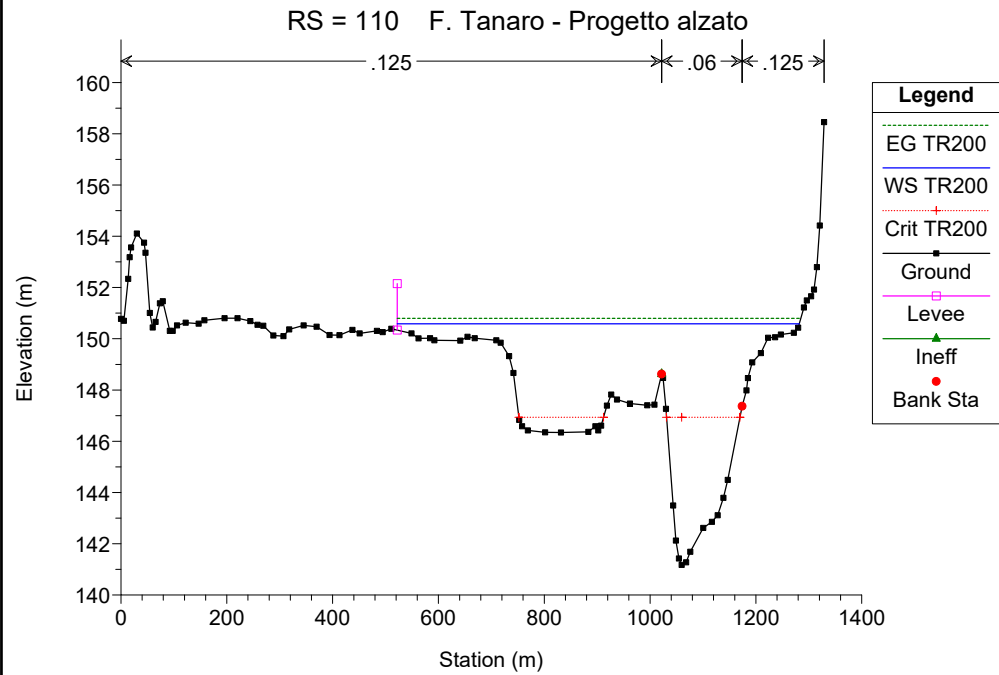
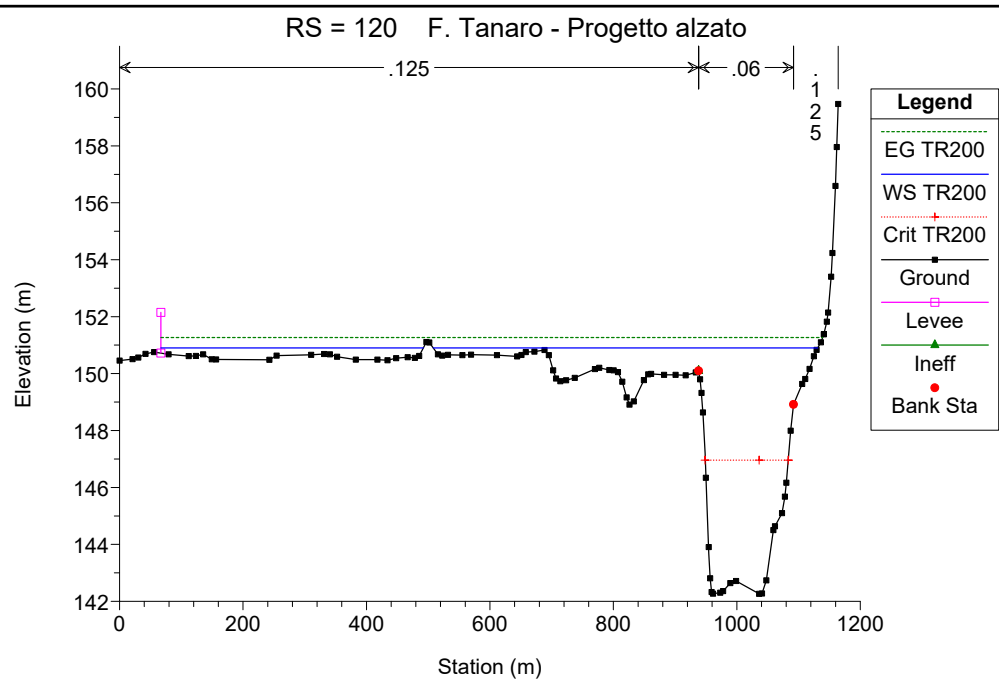
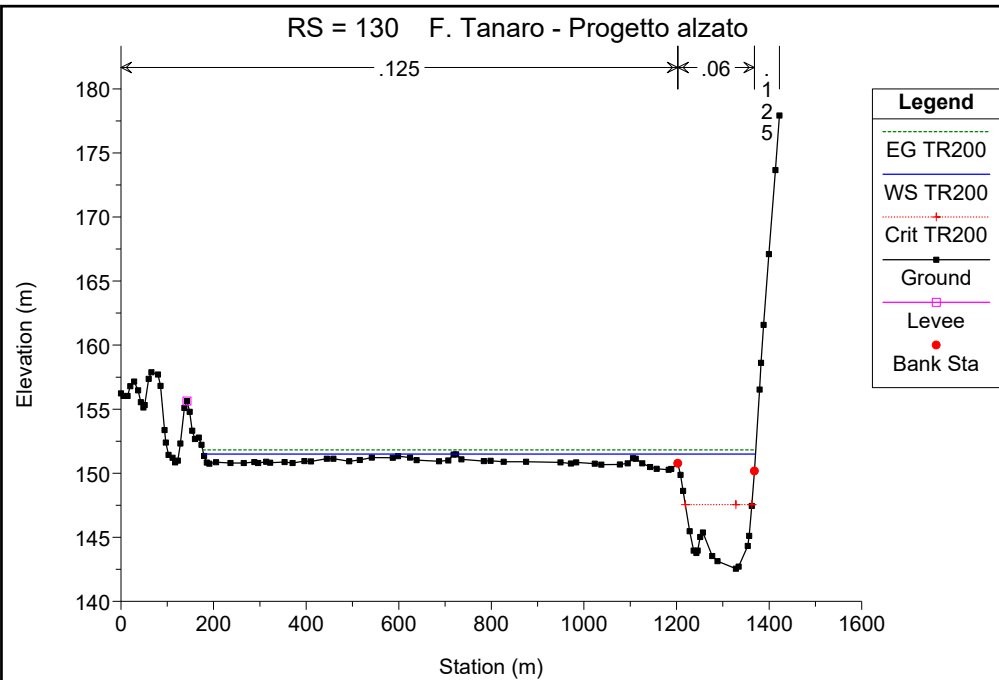


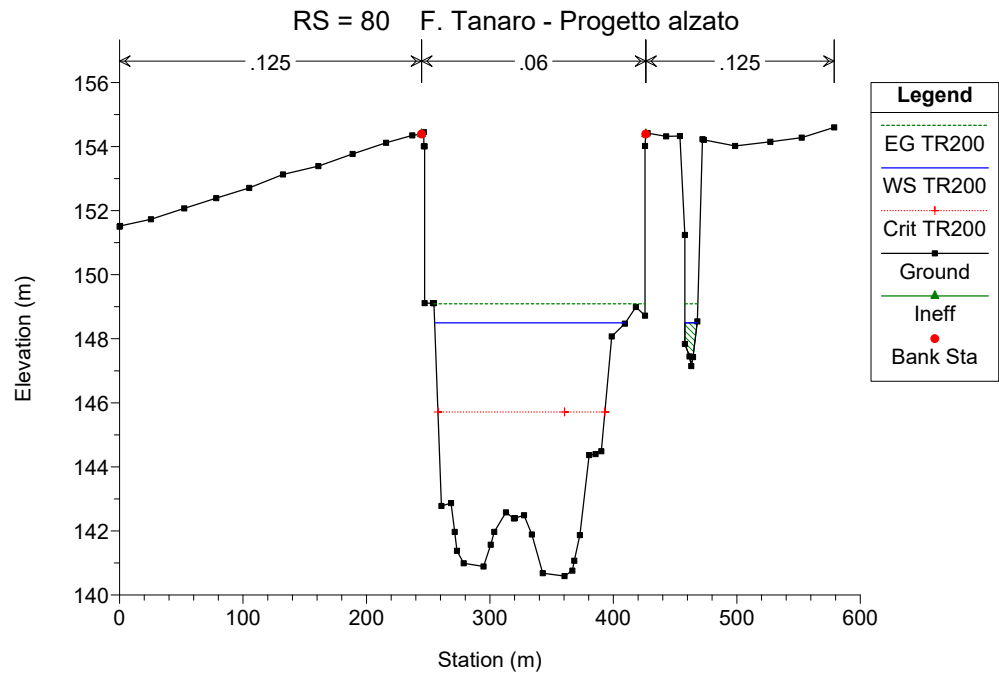
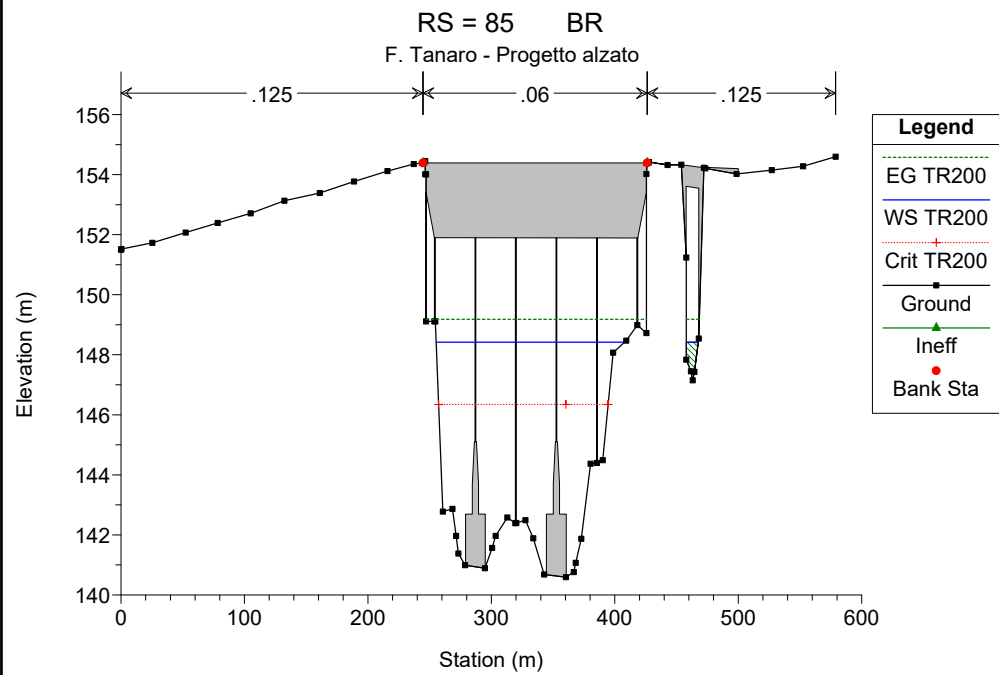
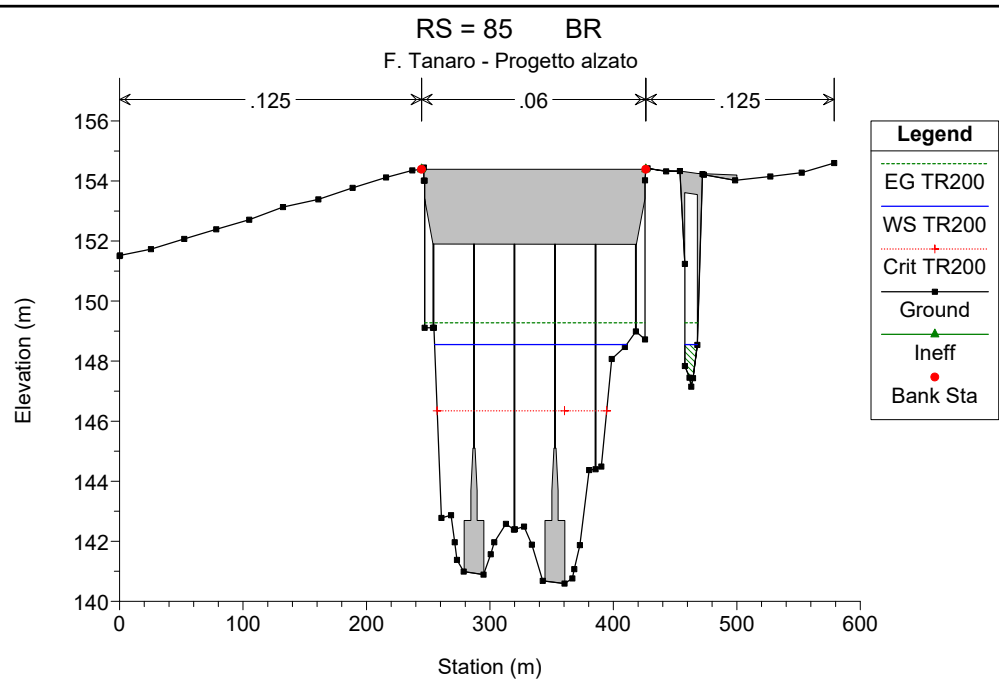
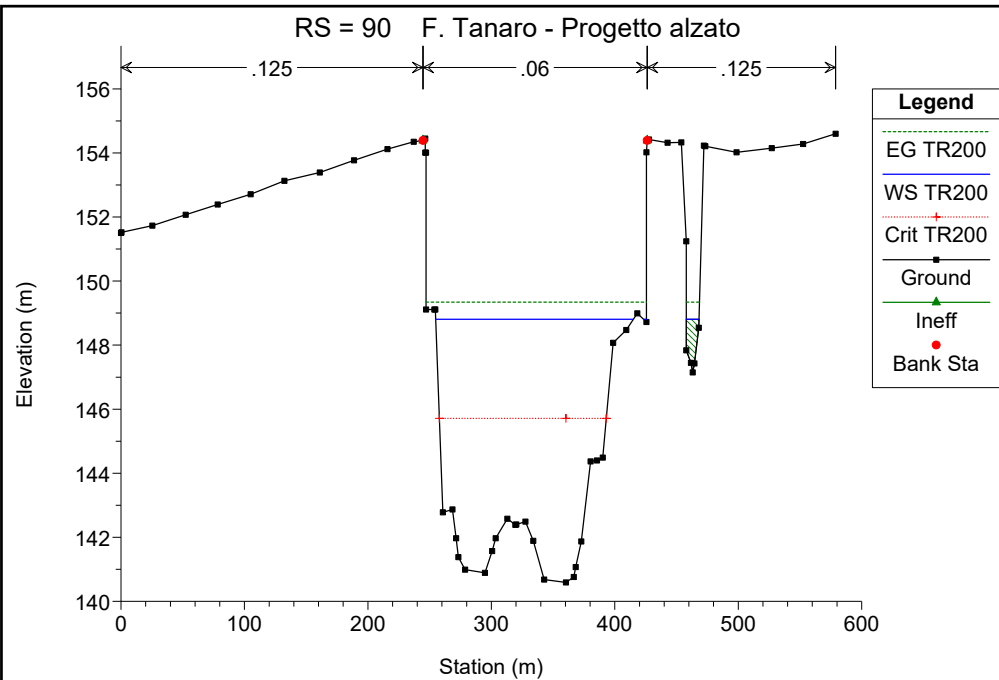


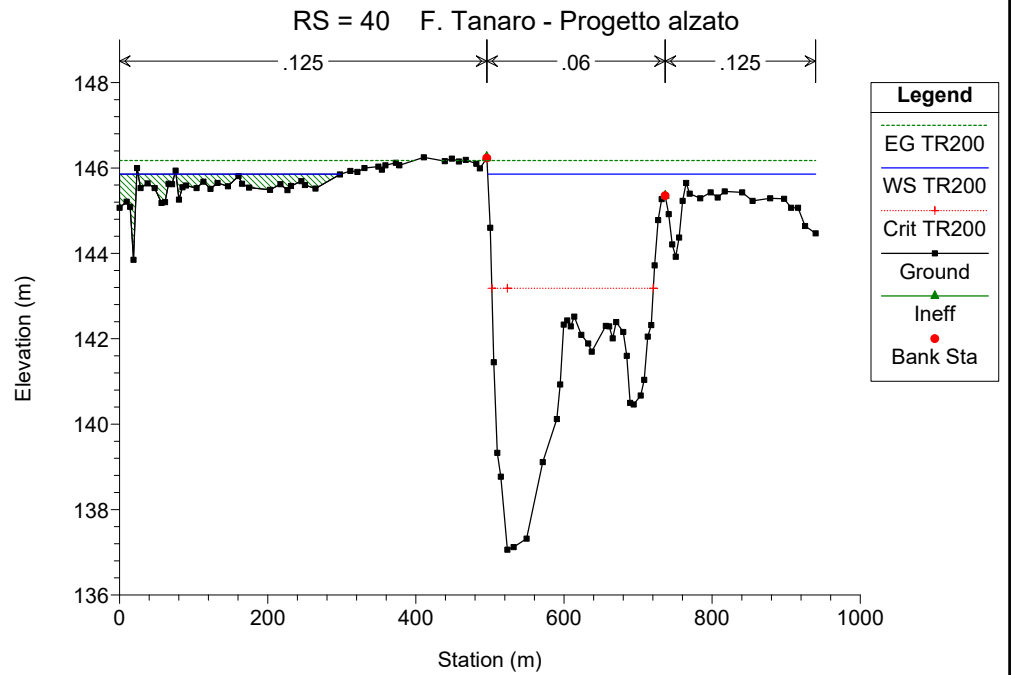
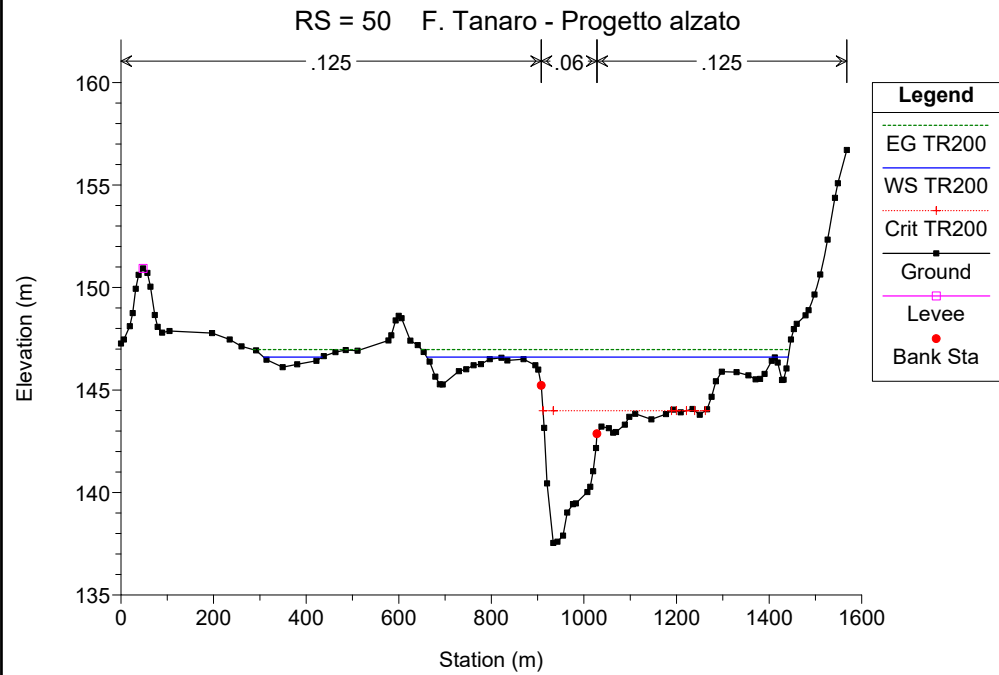
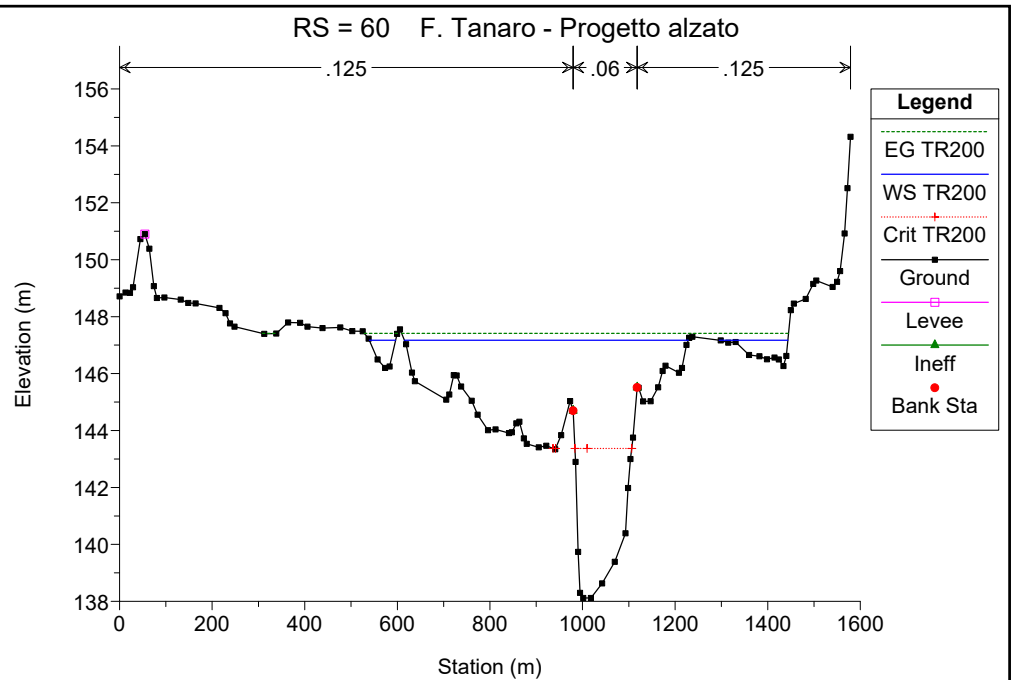
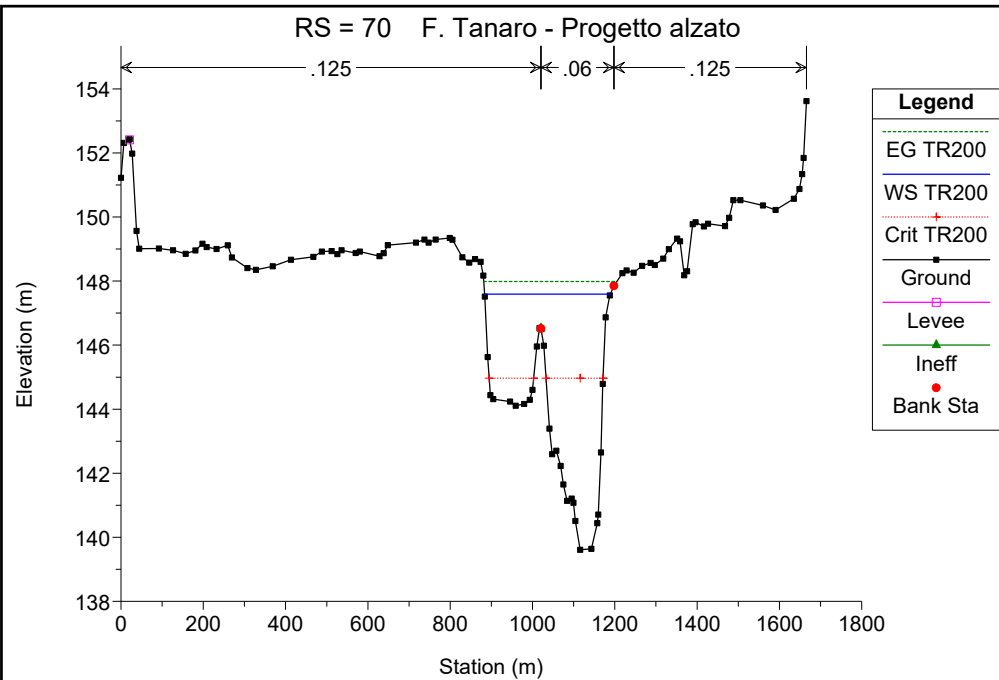


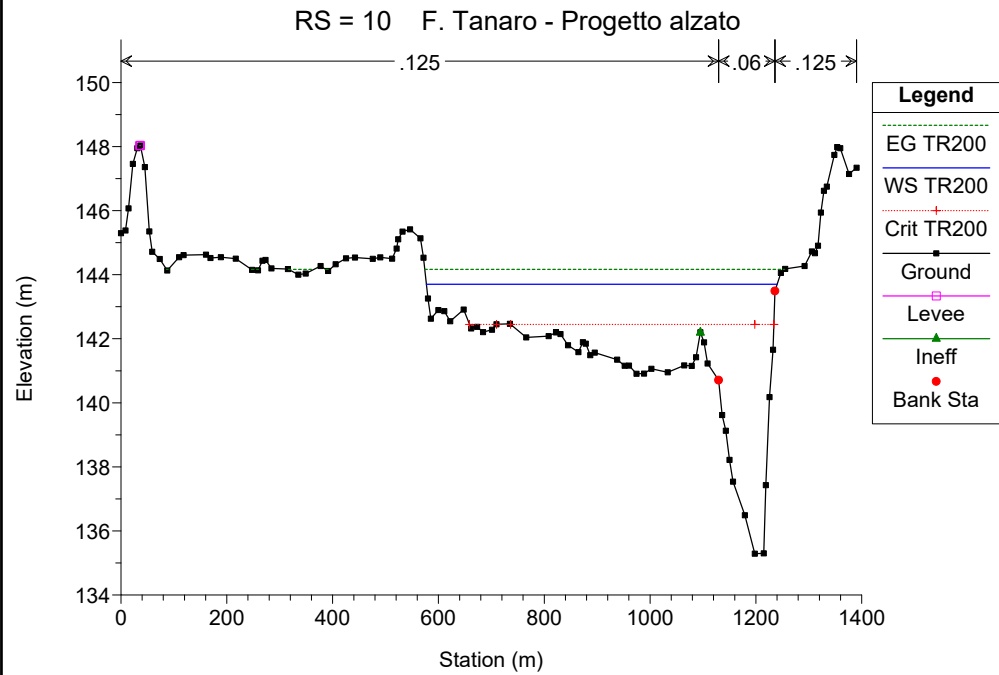
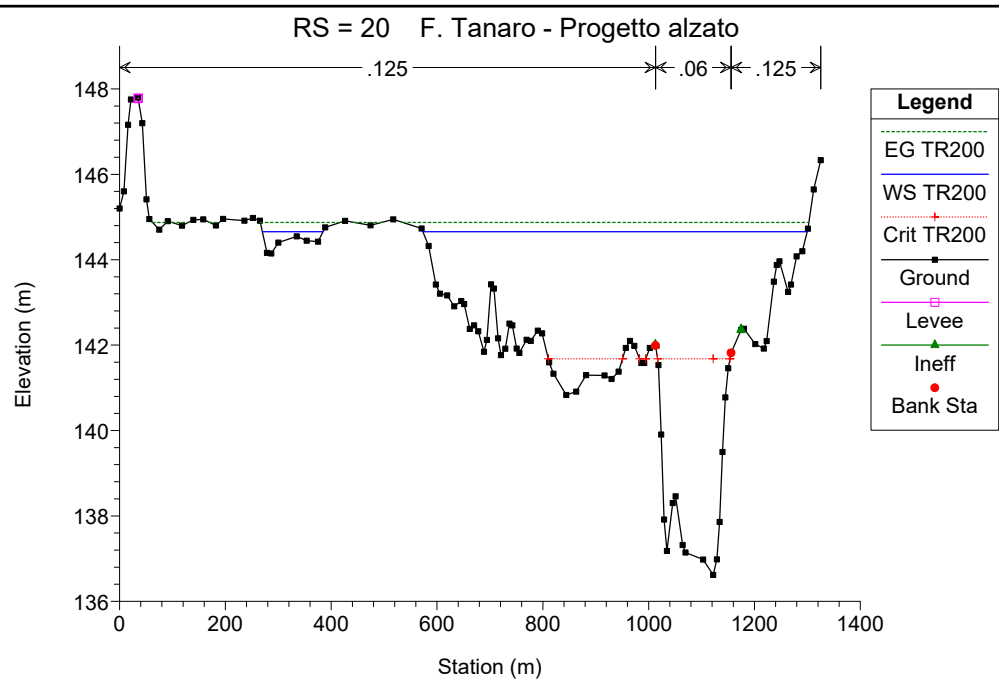
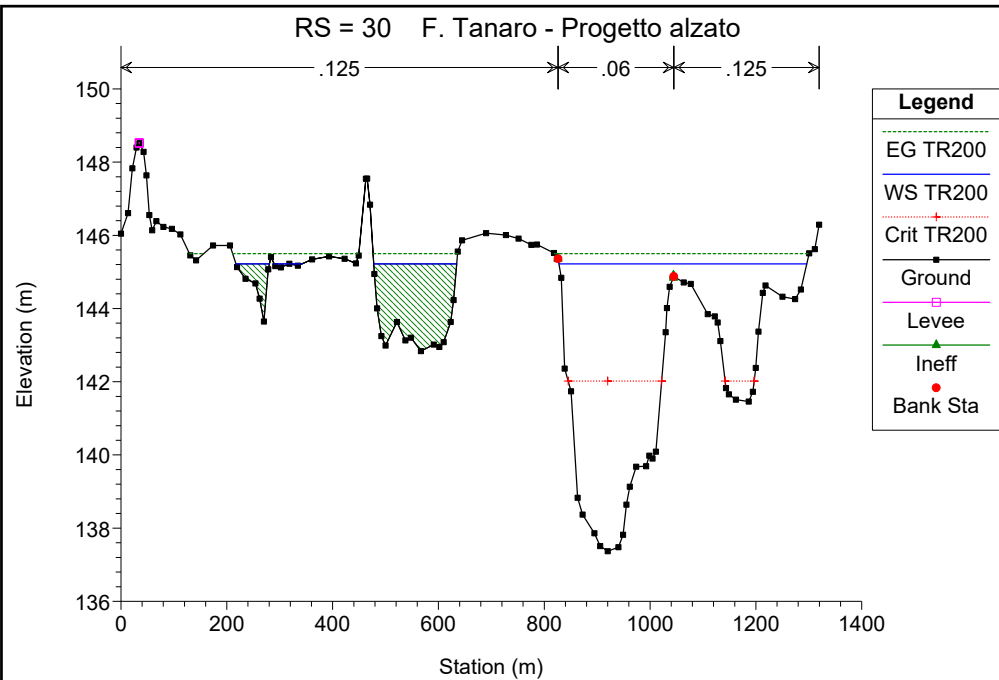












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 16

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3050	200
F. Tanaro valle Riddone	3058	
F. Tanaro valle Cherasca	3070	

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

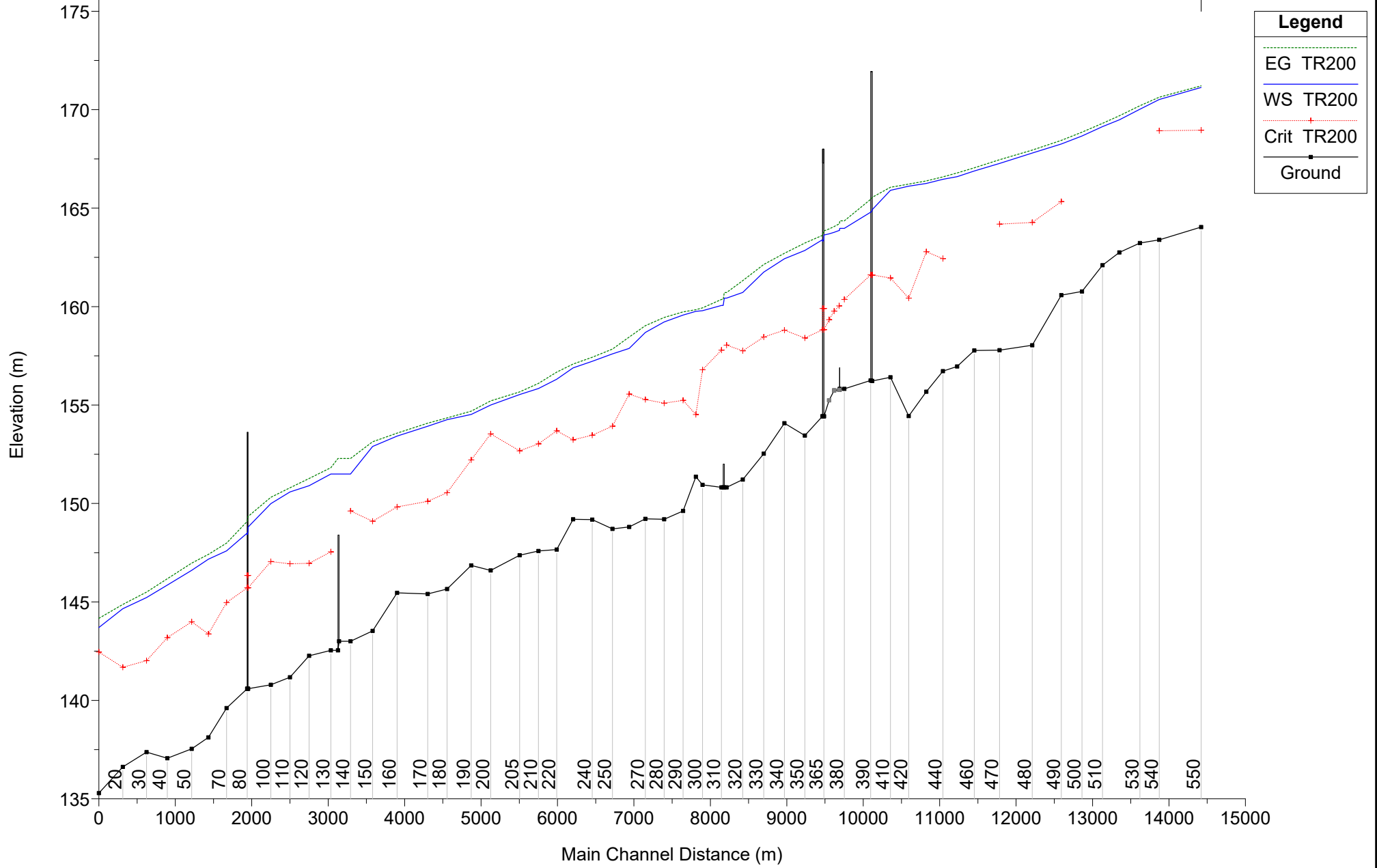
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR200	3050.00	164.04	171.13	168.96	171.21	0.001114	1.47	3245.08	1183.05	0.23
1	540	TR200	3050.00	163.39	170.52	168.93	170.64	0.001628	2.09	3287.51	1121.44	0.28
1	530	TR200	3050.00	163.23	170.02		170.20	0.001814	2.16	2285.32	674.40	0.30
1	520	TR200	3050.00	162.75	169.49		169.69	0.002097	2.37	2500.45	1043.07	0.32
1	510	TR200	3050.00	162.10	169.14		169.31	0.001869	2.12	2425.24	736.80	0.30
1	500	TR200	3050.00	160.77	168.67		168.86	0.001597	2.19	2161.21	553.59	0.28
1	490	TR200	3050.00	160.58	168.26	165.33	168.44	0.001545	2.04	2004.45	517.21	0.28
1	480	TR200	3050.00	158.04	167.80	164.27	167.95	0.001187	1.95	2526.99	817.68	0.25
1	470	TR200	3050.00	157.79	167.27	164.19	167.46	0.001391	2.21	2237.49	561.22	0.27
1	460	TR200	3050.00	157.77	166.89		167.05	0.001091	1.98	2588.32	857.19	0.24
1	450	TR200	3050.00	156.96	166.60		166.79	0.001186	2.10	2456.34	1035.61	0.25
1	440	TR200	3050.00	156.72	166.46	162.43	166.59	0.000839	1.82	3047.41	798.20	0.21
1	430	TR200	3050.00	155.68	166.25	162.79	166.39	0.001013	2.01	2927.27	665.87	0.23
1	420	TR200	3050.00	154.44	166.12	160.43	166.22	0.000563	1.66	3254.96	689.28	0.18
1	410	TR200	3050.00	156.41	165.90	161.45	166.06	0.000974	2.01	2489.83	545.72	0.23
1	400	TR200	3050.00	156.22	164.92	161.61	165.55	0.003372	3.60	976.85	176.93	0.42
1	395		Bridge									
1	390	TR200	3050.00	156.25	164.80	161.61	165.45	0.003579	3.67	955.36	175.49	0.43
1	380	TR200	3050.00	155.82	163.97	160.36	164.36	0.002190	2.75	1164.67	262.52	0.34
1	379		Inl Struct									
1	370	TR200	3050.00	154.43	163.64	158.82	163.84	0.001069	2.02	1513.25	207.77	0.24
1	365		Bridge									
1	360	TR200	3050.00	154.43	163.39	158.82	163.62	0.001190	2.08	1462.91	207.10	0.25
1	350	TR200	3050.00	153.45	162.85	158.40	163.23	0.001915	2.72	1195.50	289.04	0.32
1	340	TR200	3058.00	154.08	162.43	158.80	162.71	0.001744	2.37	1484.85	387.33	0.30
1	330	TR200	3058.00	152.53	161.75	158.45	162.14	0.002423	2.84	1365.50	439.76	0.35
1	320	TR200	3058.00	151.21	160.72	157.75	161.32	0.003511	3.74	1393.16	607.43	0.43
1	315	TR200	3058.00	150.82	160.43	158.04	160.71	0.001953	2.80	2402.57	978.07	0.32
1	312.5		Inl Struct									
1	310	TR200	3058.00	150.82	160.06	157.79	160.36	0.002253	2.90	2049.14	774.60	0.35
1	300	TR200	3070.00	150.95	159.79	156.80	159.94	0.001216	1.94	2703.65	876.43	0.25
1	295	TR200	3070.00	151.36	159.76	154.52	159.84	0.000522	1.43	3388.63	903.19	0.17
1	290	TR200	3070.00	149.62	159.57	155.24	159.73	0.000990	1.86	2323.26	695.23	0.23
1	280	TR200	3070.00	149.20	159.22	155.10	159.45	0.001365	2.35	2119.29	535.37	0.27
1	270	TR200	3070.00	149.22	158.69	155.28	159.03	0.002141	2.93	1784.19	481.90	0.34
1	260	TR200	3070.00	148.81	157.88	155.55	158.46	0.003449	3.61	1238.07	355.34	0.43
1	250	TR200	3070.00	148.71	157.60	153.93	157.84	0.001764	2.43	1987.31	556.75	0.30
1	240	TR200	3070.00	149.18	157.22	153.47	157.43	0.001373	2.22	2299.93	764.34	0.27
1	230	TR200	3070.00	149.20	156.89	153.23	157.08	0.001350	2.10	2023.69	581.55	0.27
1	220	TR200	3070.00	147.66	156.31	153.69	156.67	0.002561	2.94	1597.51	428.04	0.37

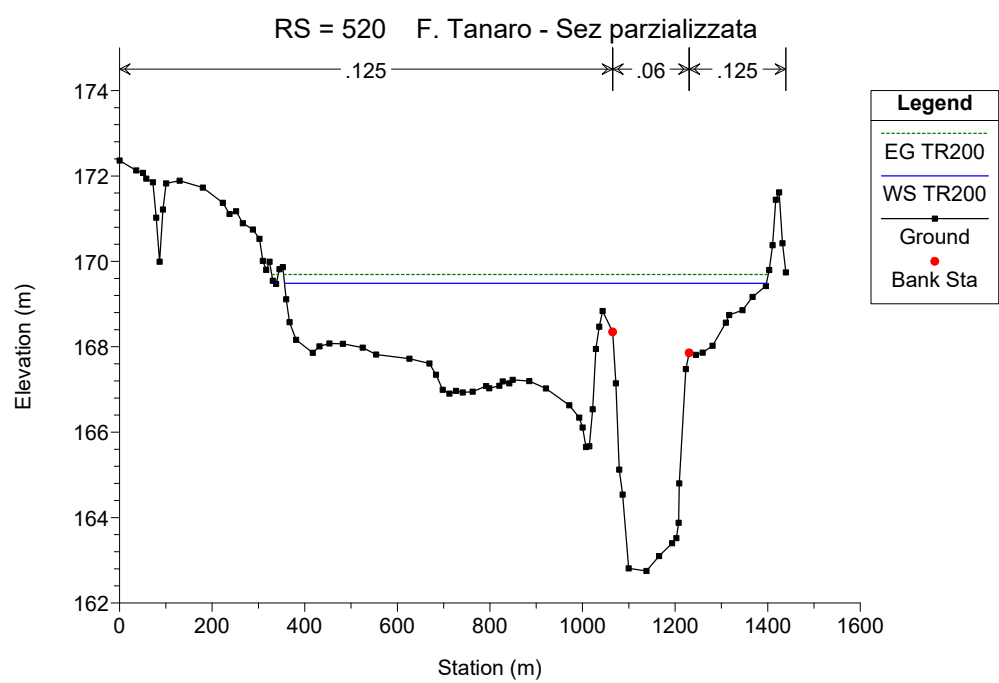
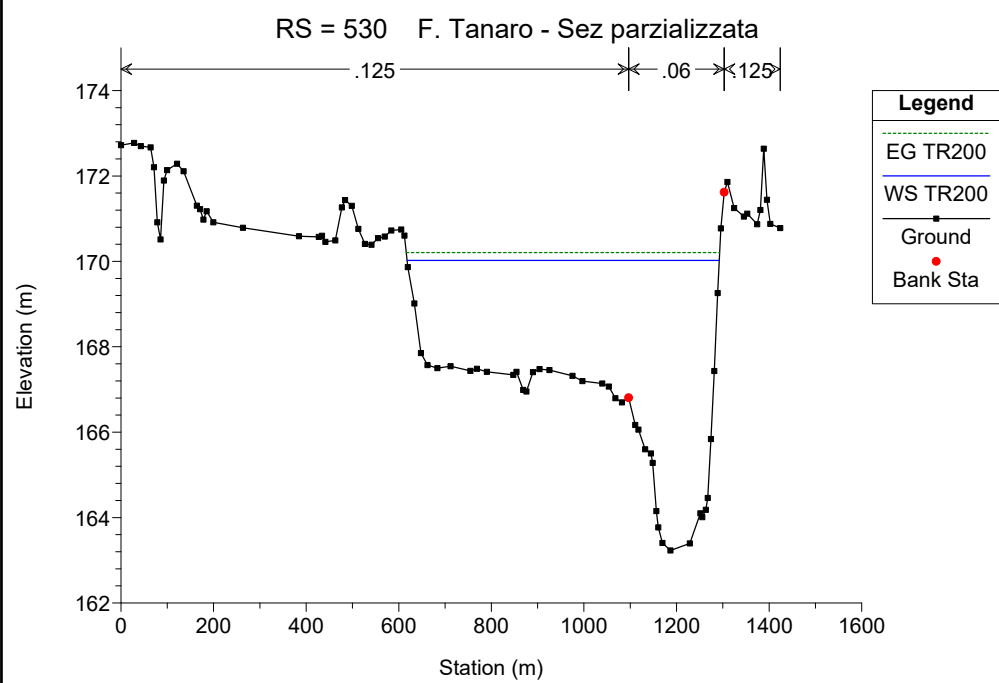
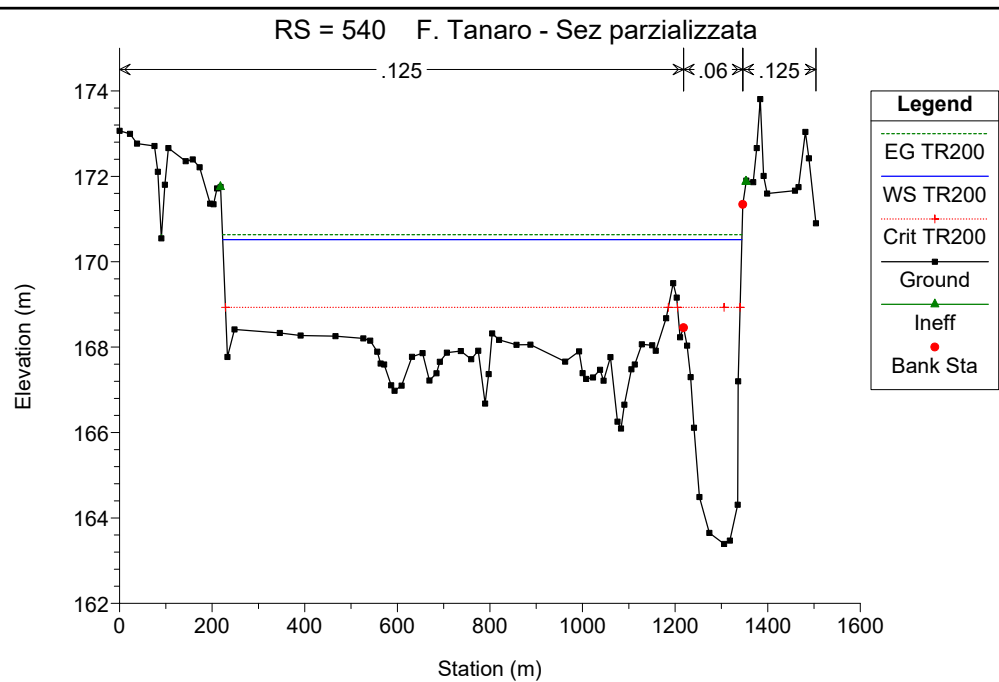
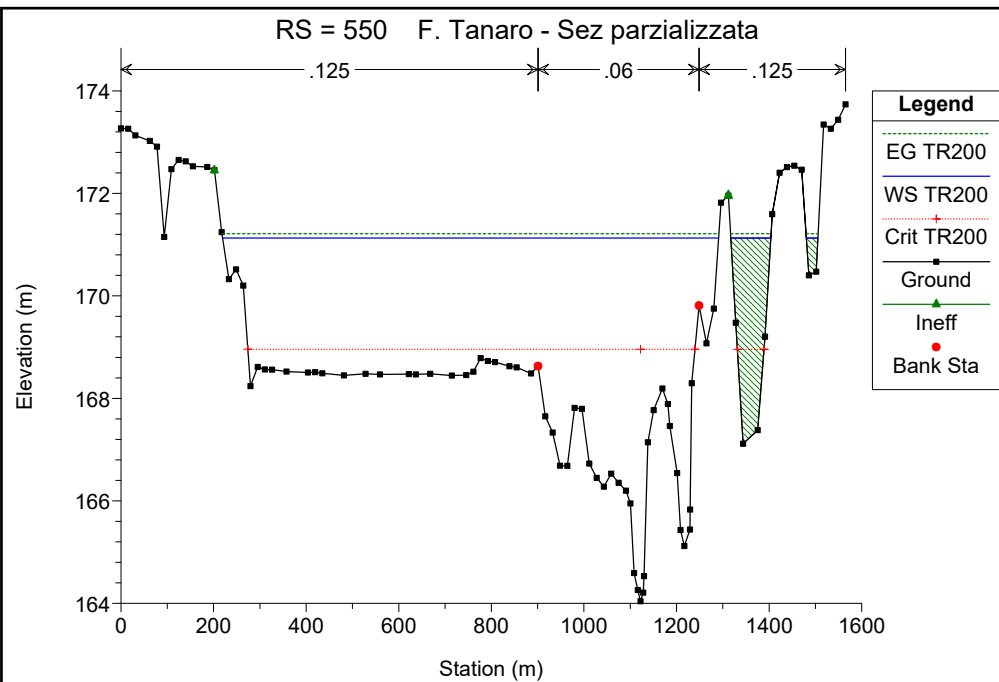
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR200 (Continued)

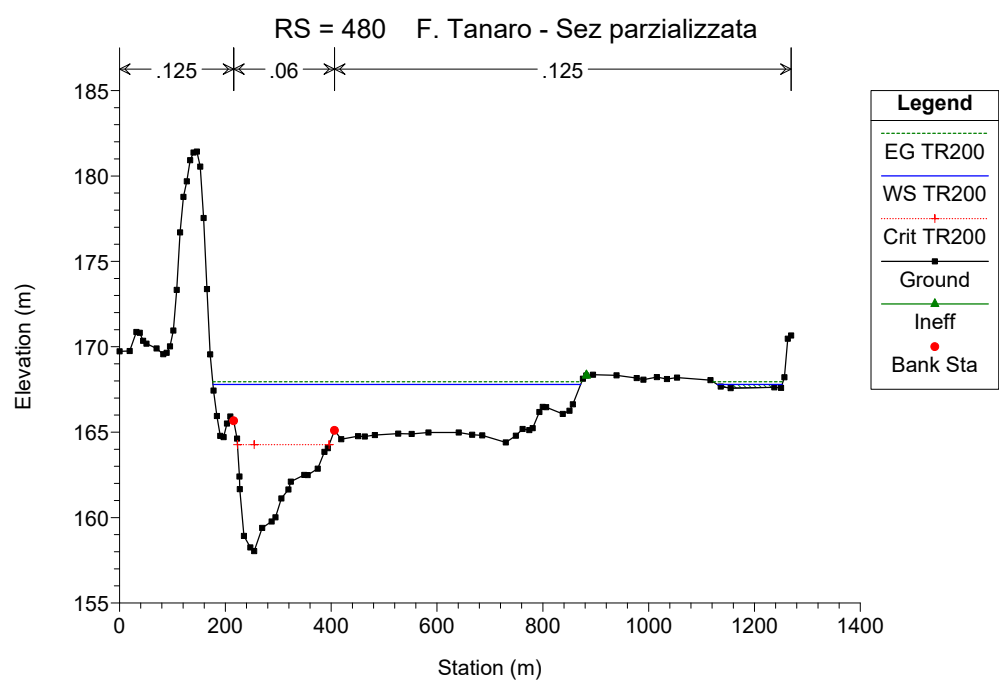
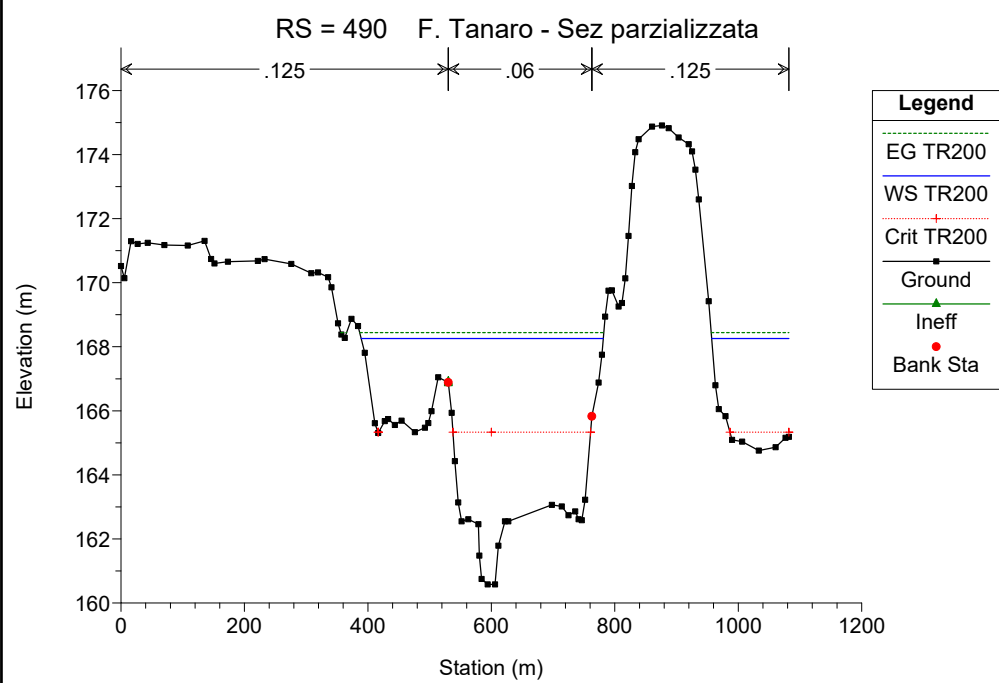
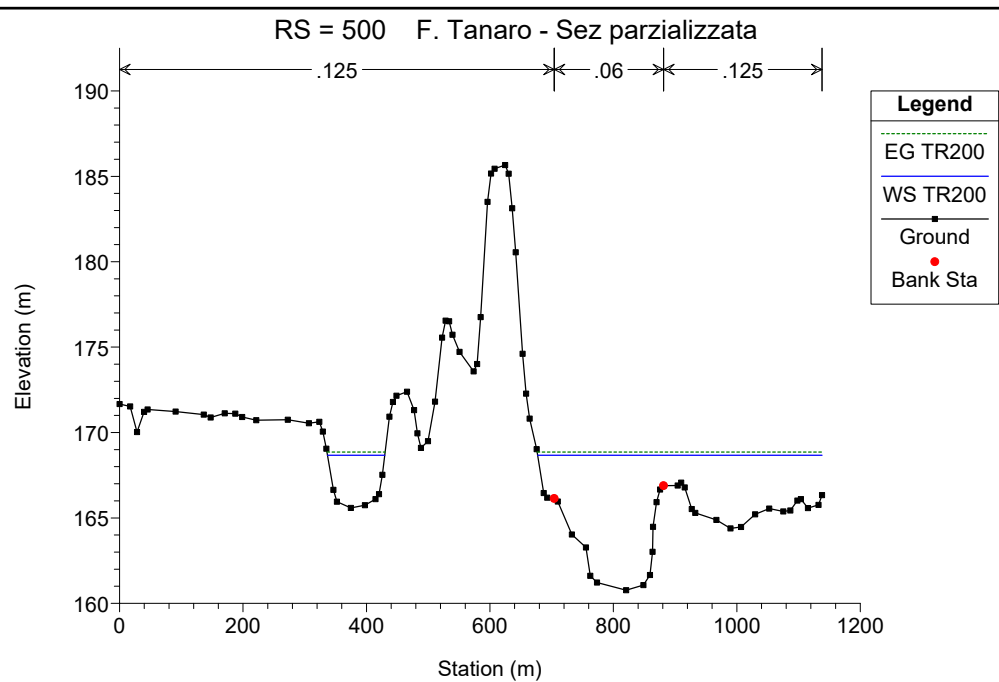
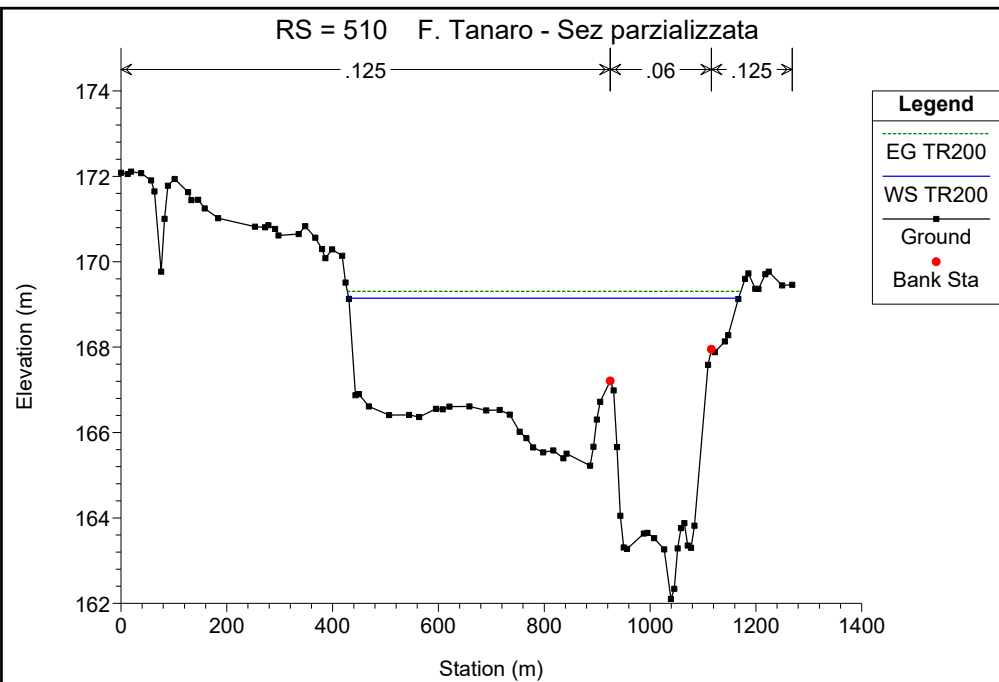
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR200	3070.00	147.59	155.84	153.03	156.10	0.001967	2.43	1850.52	636.44	0.32
1	205	TR200	3070.00	147.37	155.53	152.67	155.66	0.001271	1.87	2922.19	1003.43	0.25
1	200	TR200	3070.00	146.60	155.00	153.53	155.21	0.002021	2.56	2746.11	1082.06	0.32
1	190	TR200	3070.00	146.85	154.52	152.21	154.69	0.001878	2.10	2652.06	1158.72	0.30
1	180	TR200	3070.00	145.66	154.26	150.54	154.34	0.000758	1.42	3567.74	1436.83	0.19
1	170	TR200	3070.00	145.40	153.92	150.11	154.08	0.001444	1.90	2670.61	1337.82	0.27
1	160	TR200	3070.00	145.46	153.42	149.83	153.57	0.001201	1.84	2747.73	1387.58	0.25
1	150	TR200	3070.00	143.53	152.89	149.10	153.14	0.001549	2.33	2329.68	1341.68	0.29
1	140	TR200	3070.00	143.00	151.50	149.62	152.28	0.006444	3.94	868.40	578.08	0.56
1	135		Inl Struct									
1	130	TR200	3070.00	142.54	151.50	147.54	151.82	0.001863	2.58	1740.01	1191.99	0.31
1	120	TR200	3070.00	142.27	150.90	146.96	151.27	0.002018	2.72	1551.38	1047.96	0.33
1	110	TR200	3070.00	141.17	150.58	146.94	150.80	0.001443	2.29	2322.27	759.96	0.28
1	100	TR200	3070.00	140.79	149.99	147.05	150.31	0.002557	2.60	1530.40	561.47	0.35
1	90	TR200	3070.00	140.59	148.81	145.71	149.34	0.003742	3.24	946.70	172.92	0.43
1	85		Bridge									
1	80	TR200	3070.00	140.59	148.50	145.71	149.09	0.004172	3.42	897.97	164.60	0.45
1	70	TR200	3070.00	139.61	147.59	144.97	147.99	0.003359	2.95	1313.38	305.57	0.41
1	60	TR200	3070.00	138.12	147.17	143.37	147.42	0.001556	2.44	2182.01	818.21	0.29
1	50	TR200	3070.00	137.54	146.60	143.99	146.97	0.002468	2.98	1840.17	907.16	0.36
1	40	TR200	3070.00	137.06	145.86	143.18	146.17	0.002702	2.52	1343.30	737.82	0.36
1	30	TR200	3070.00	137.37	145.22	142.02	145.50	0.002228	2.42	1581.88	738.76	0.33
1	20	TR200	3070.00	136.62	144.66	141.68	144.87	0.001721	2.40	2341.28	840.96	0.30
1	10	TR200	3070.00	135.29	143.70	142.45	144.17	0.004002	3.49	1689.40	662.87	0.45

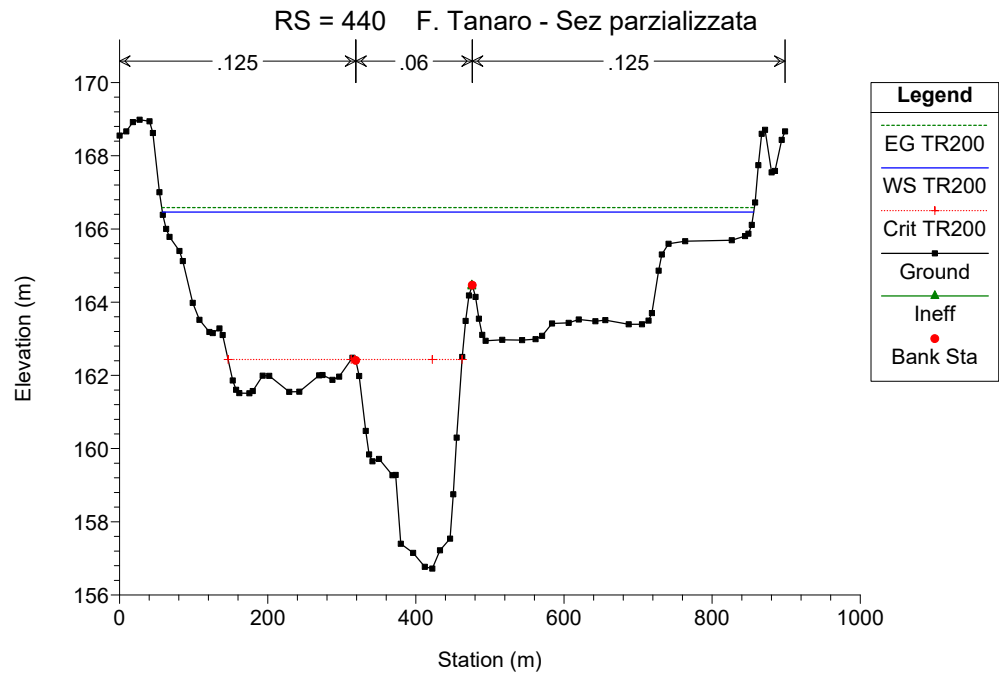
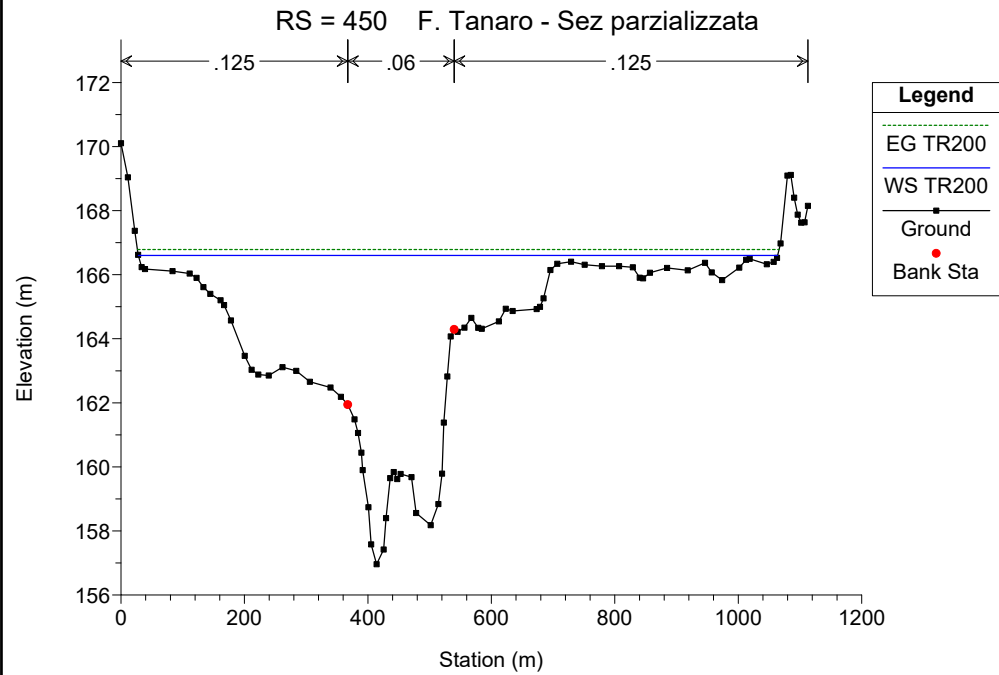
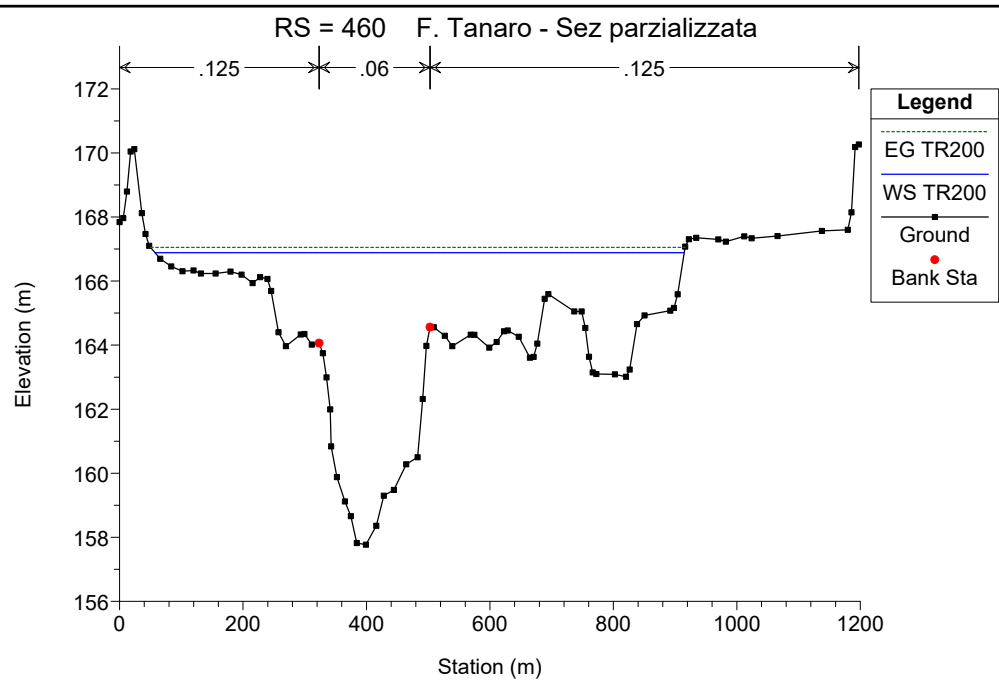
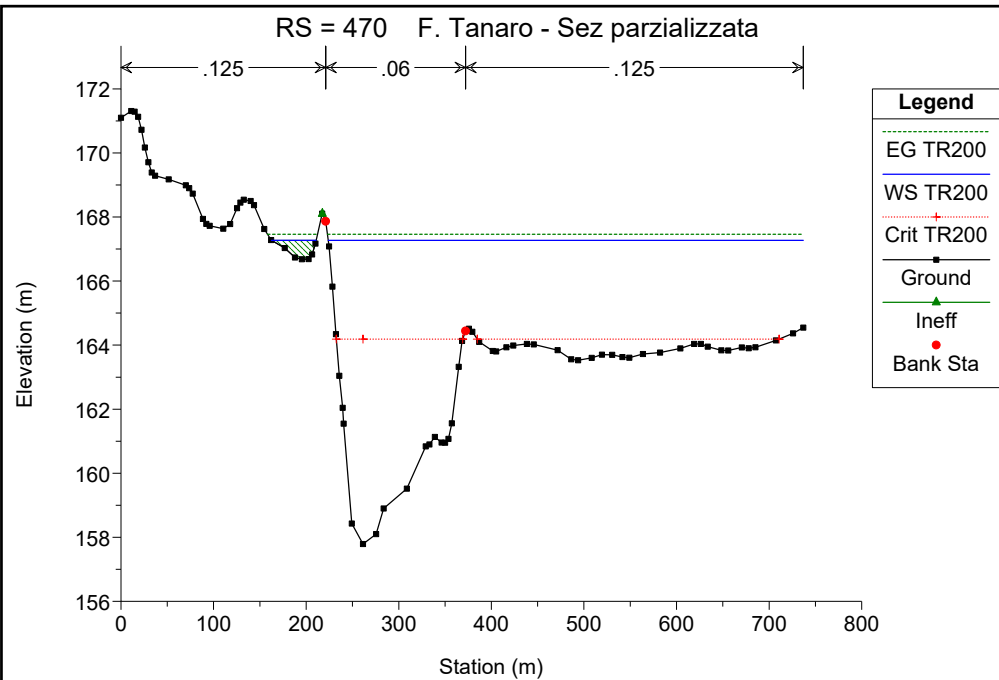
F. Tanaro - Sez parzializzata

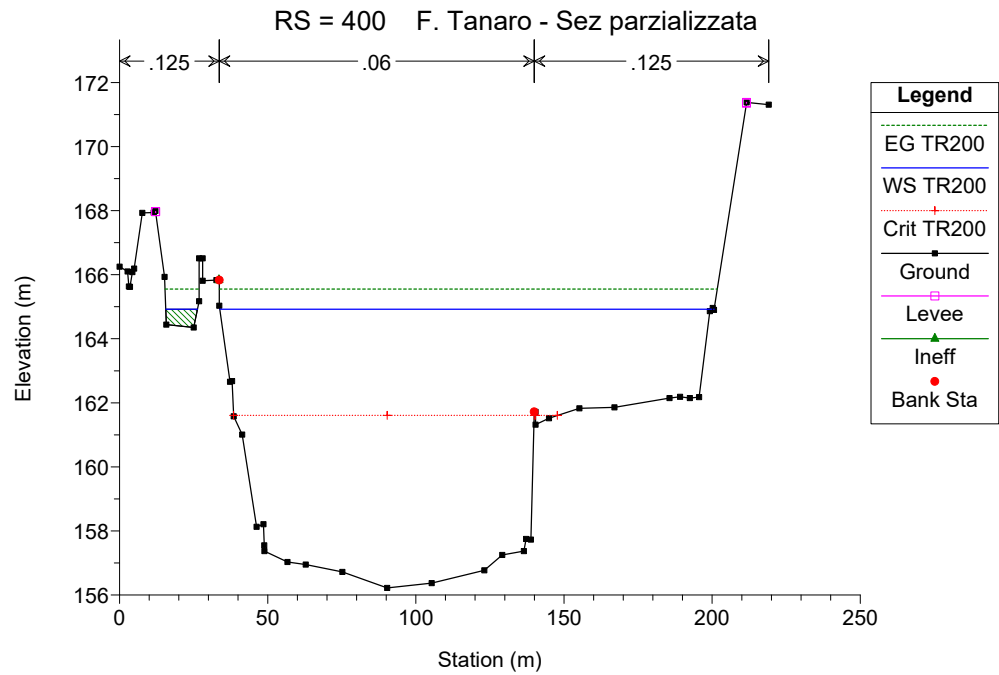
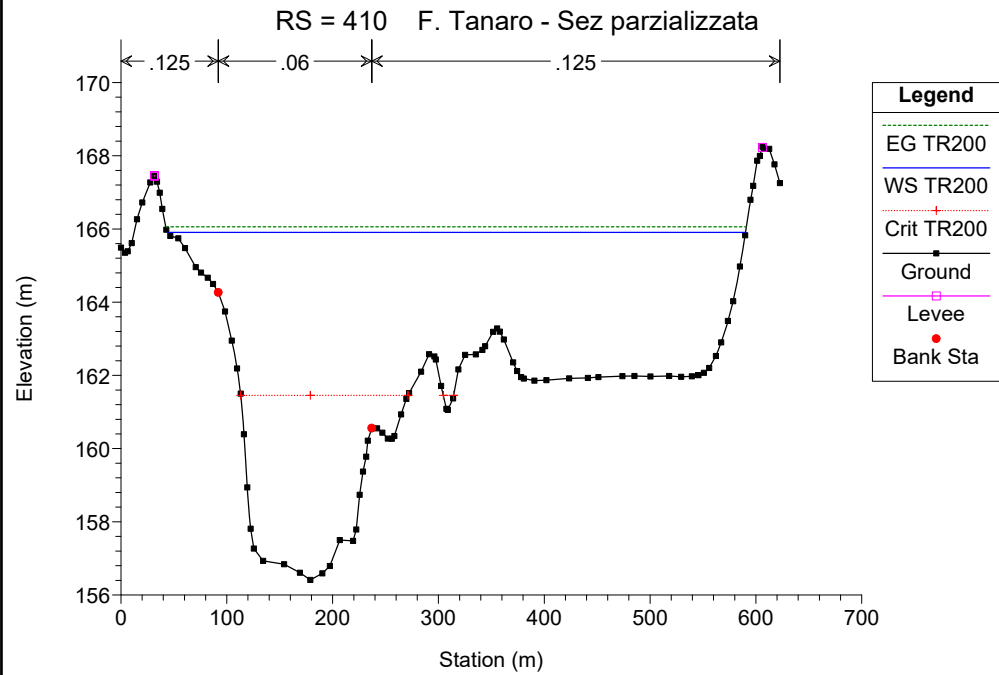
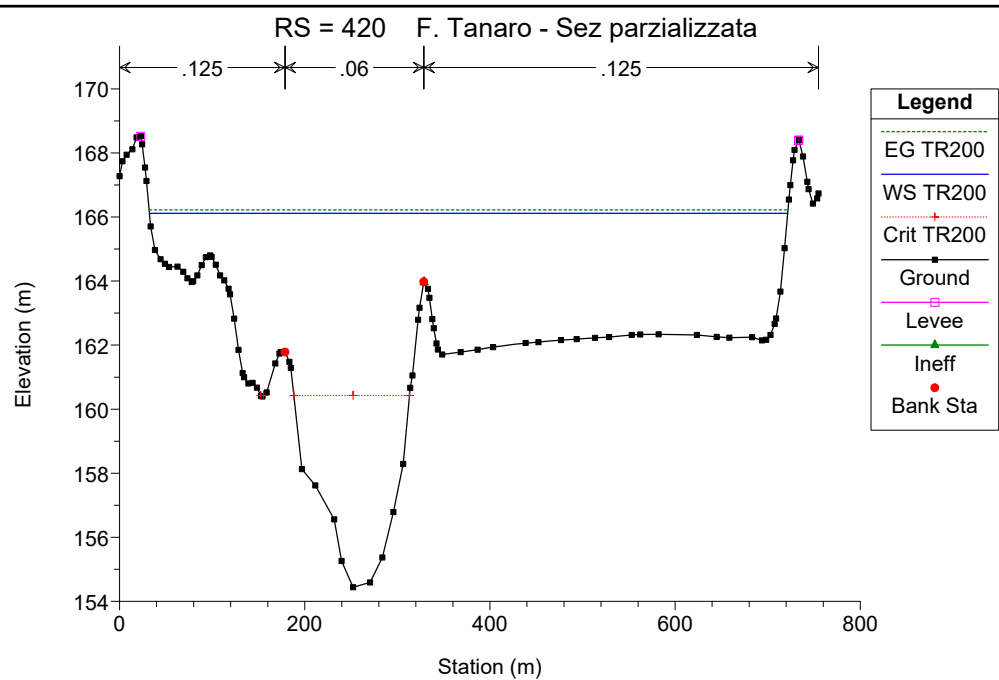
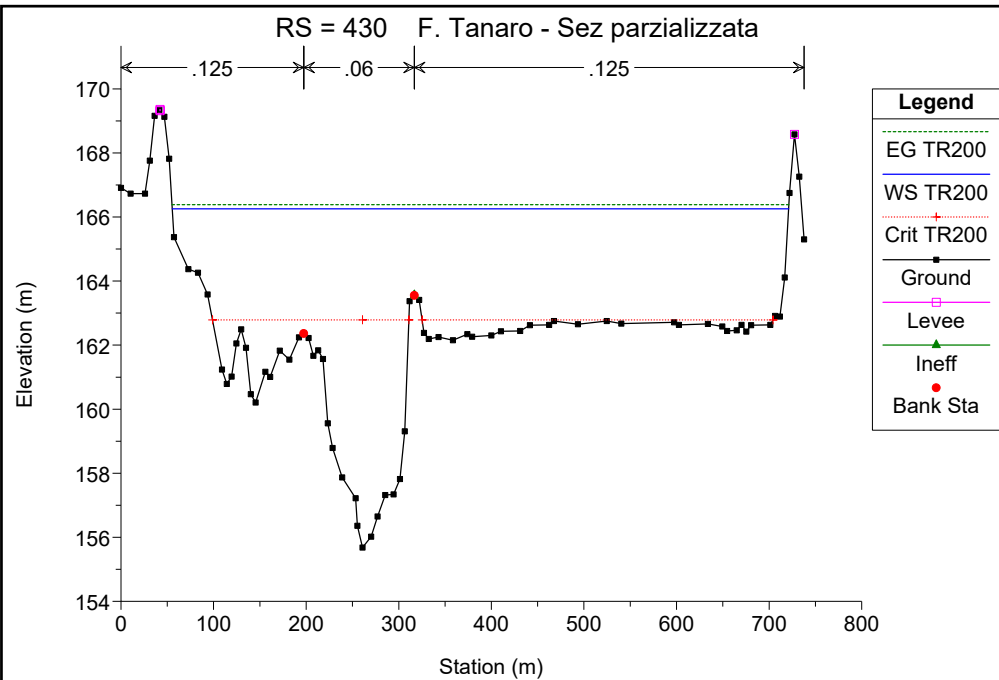
Tanaro 1

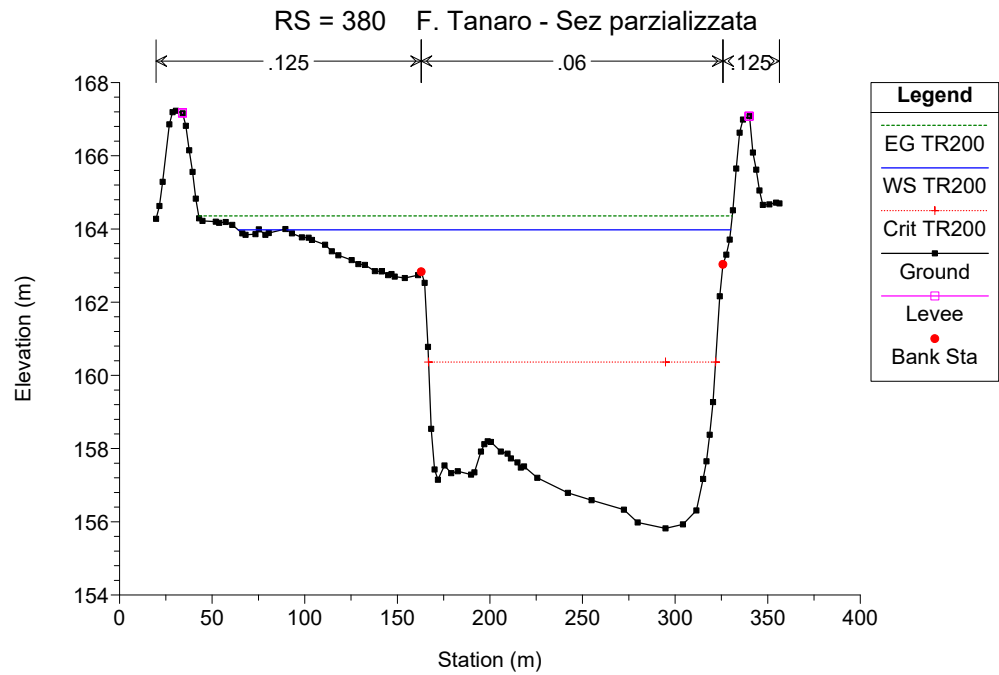
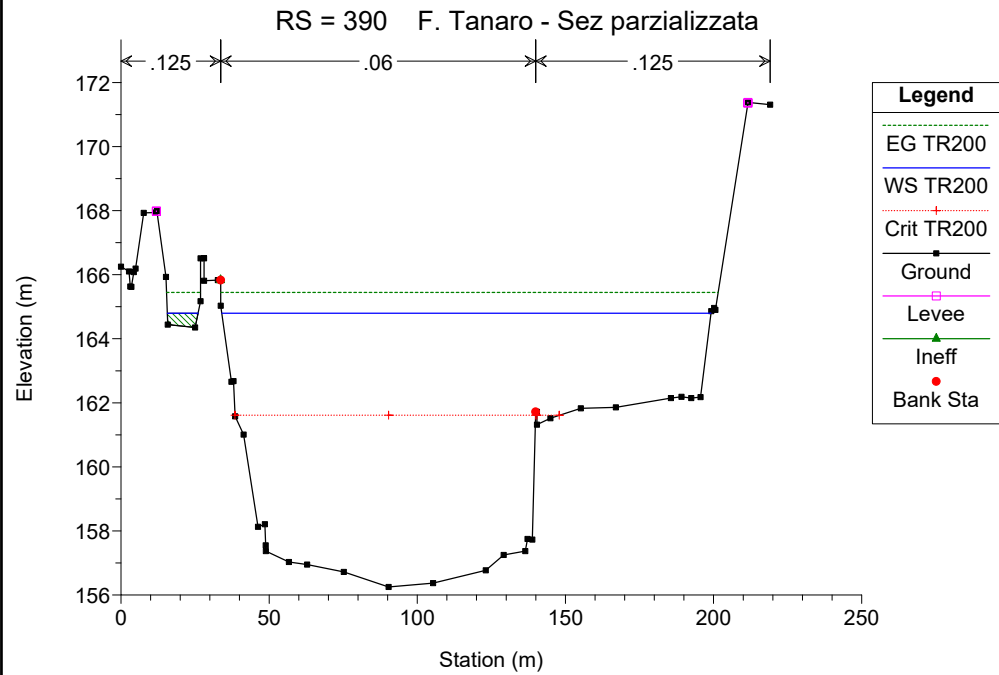
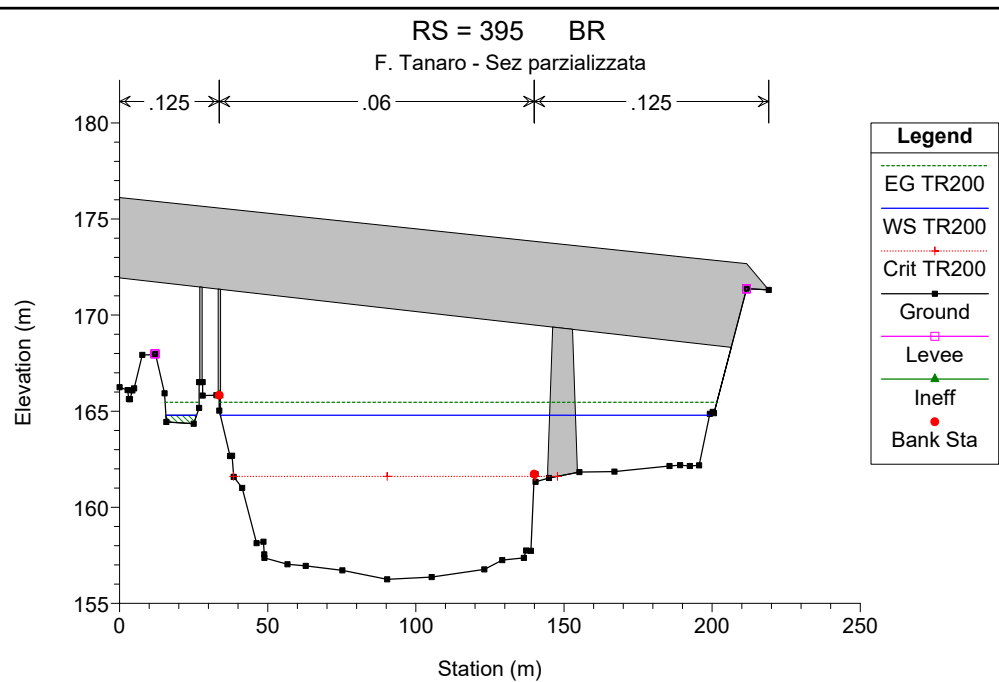
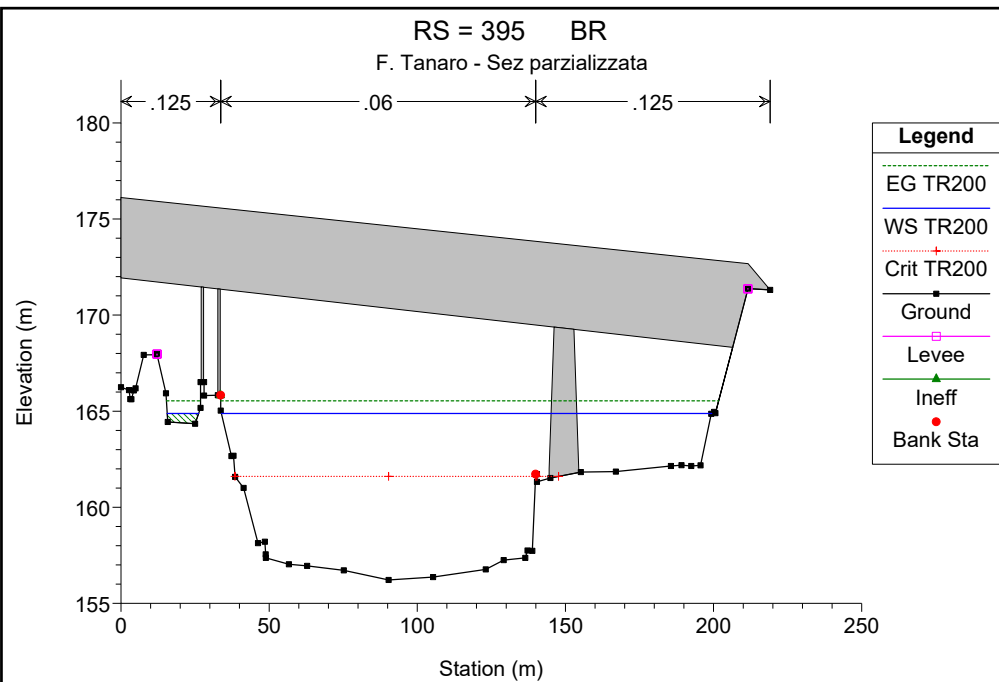


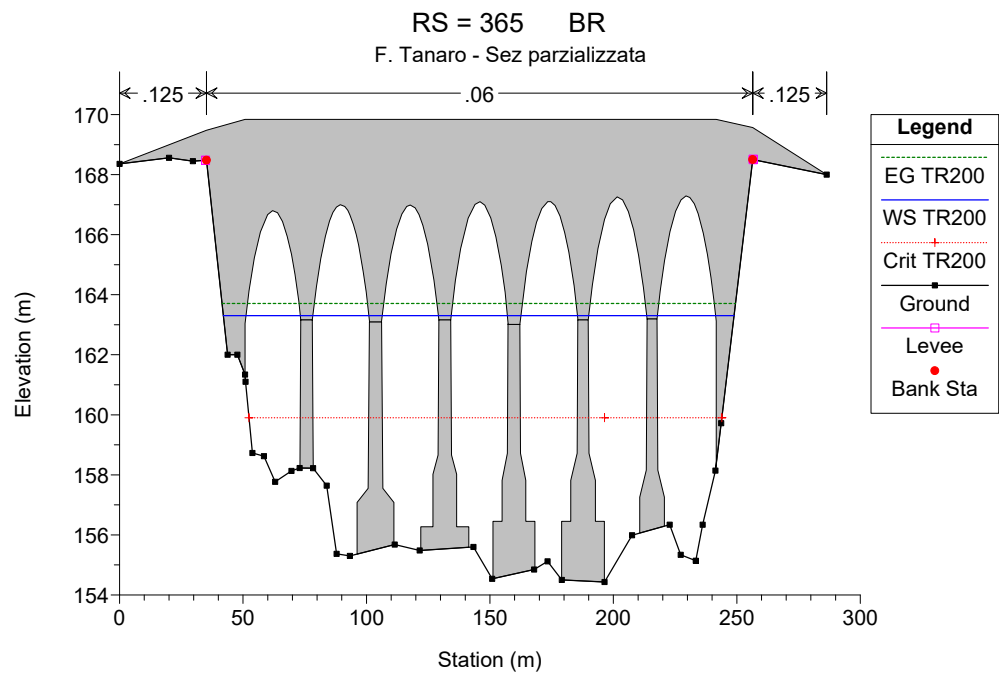
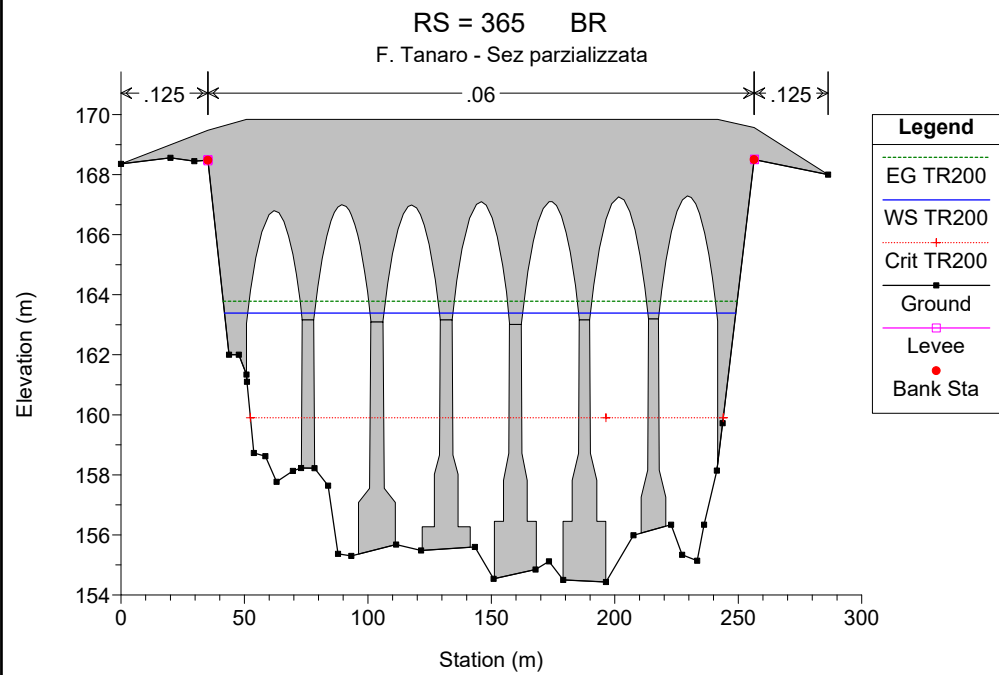
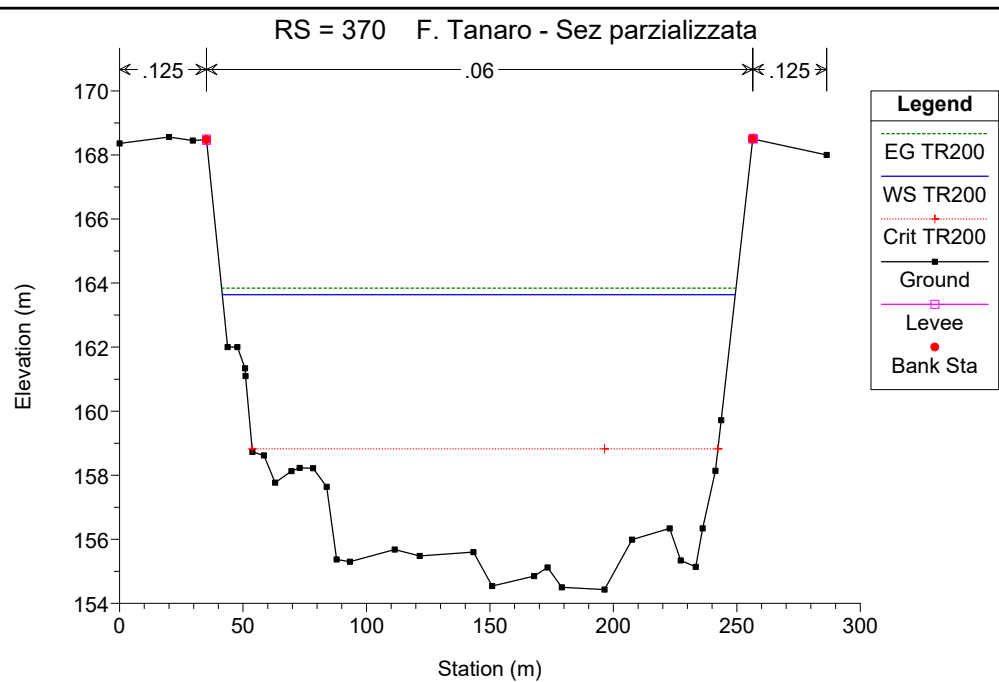
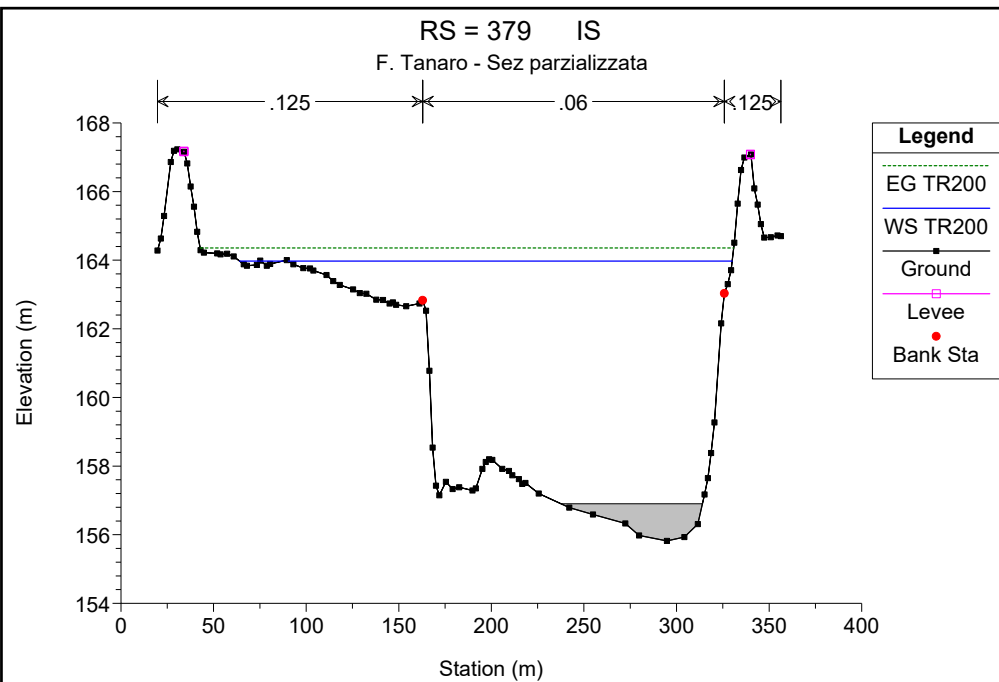


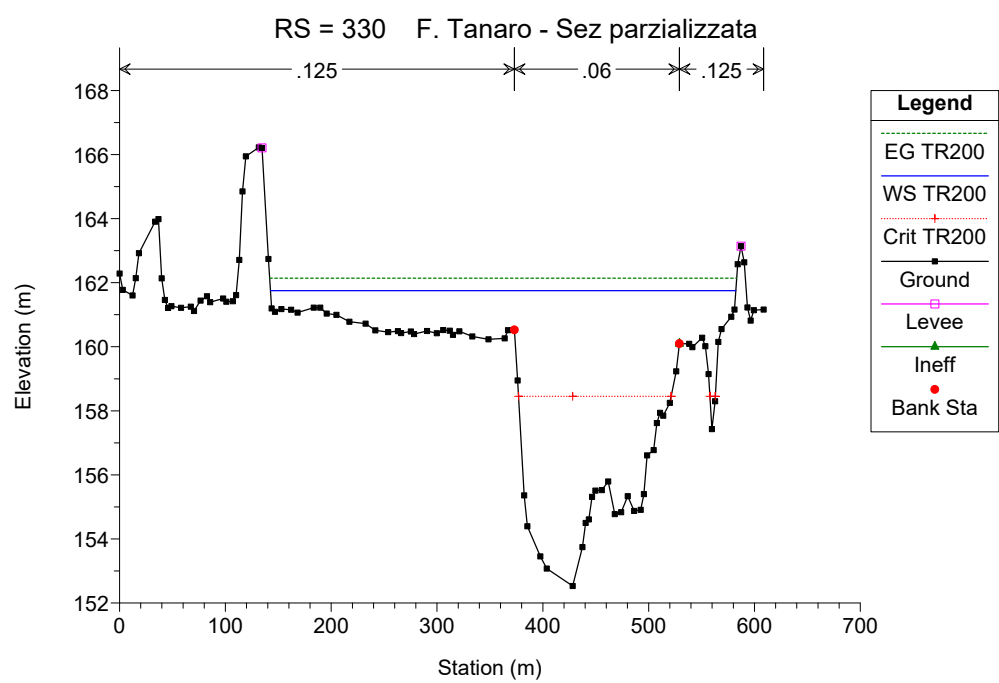
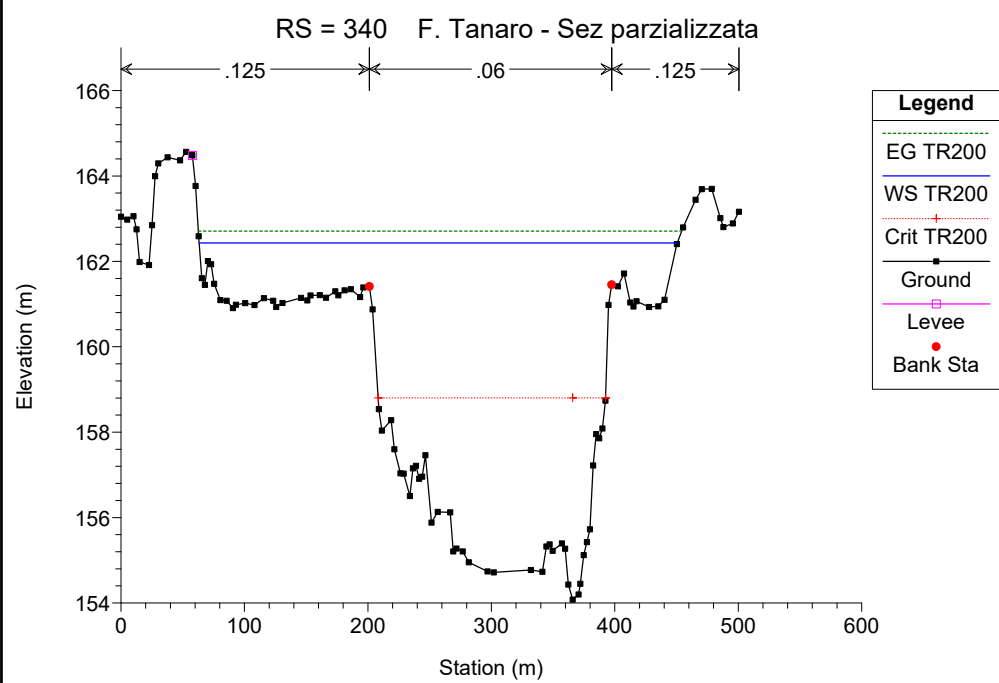
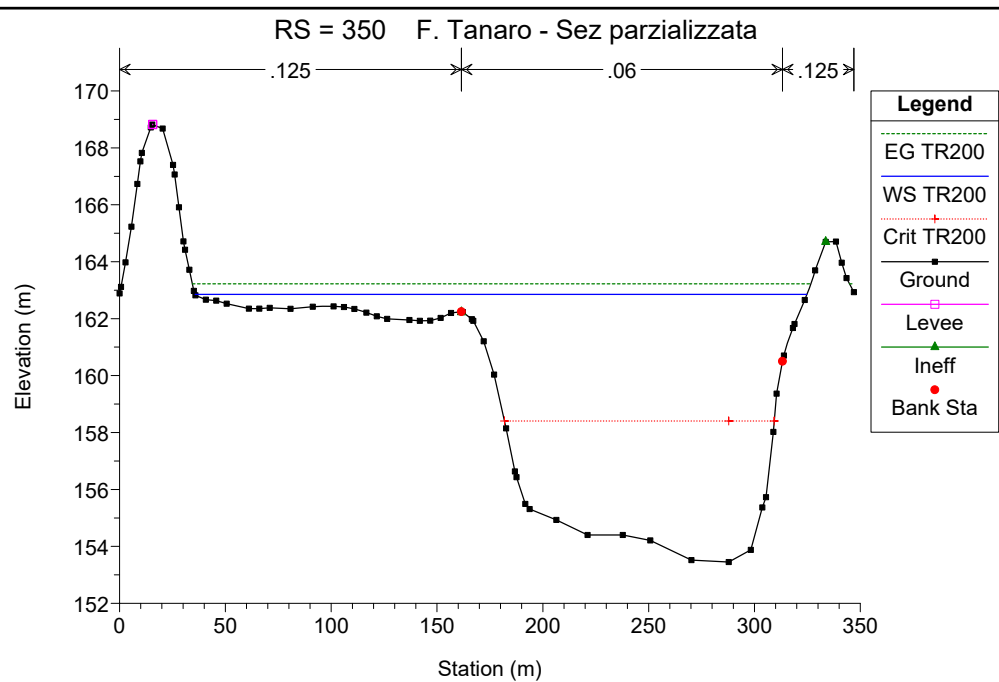
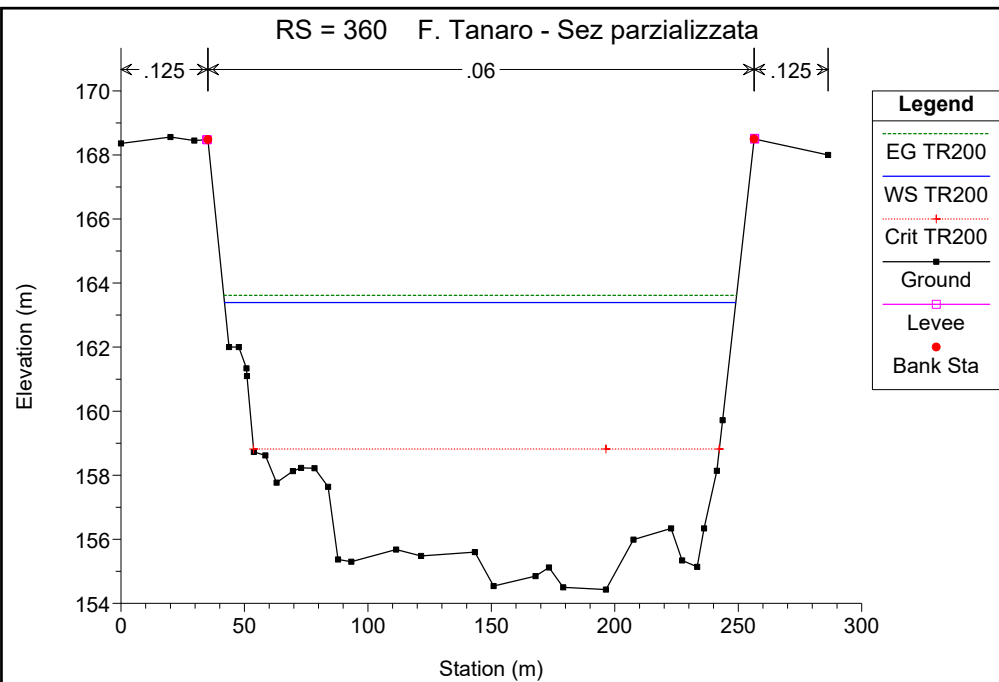


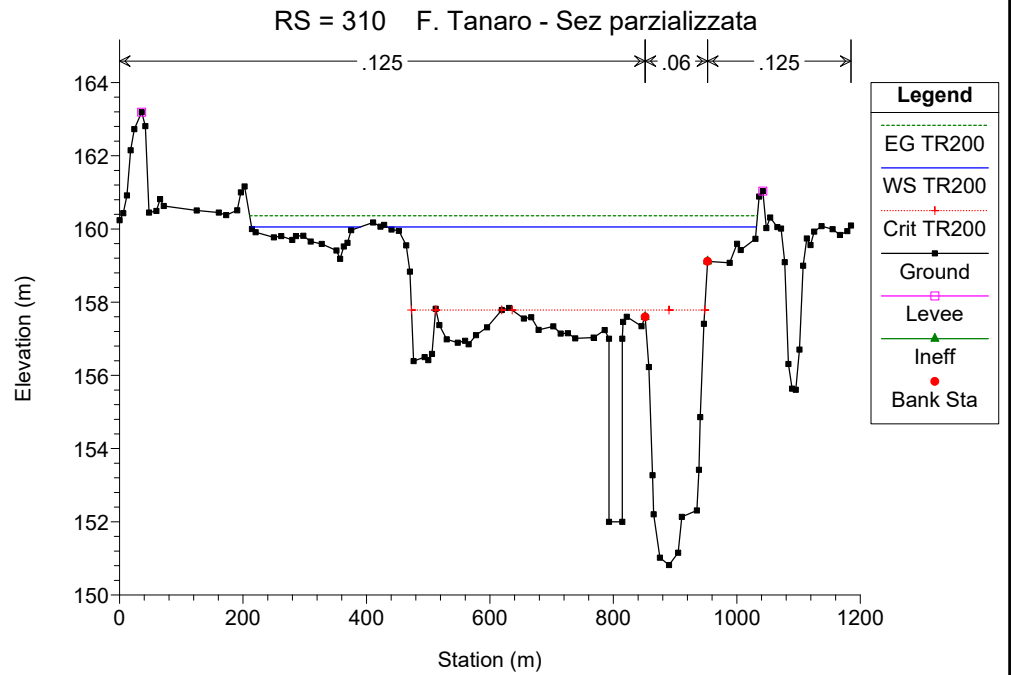
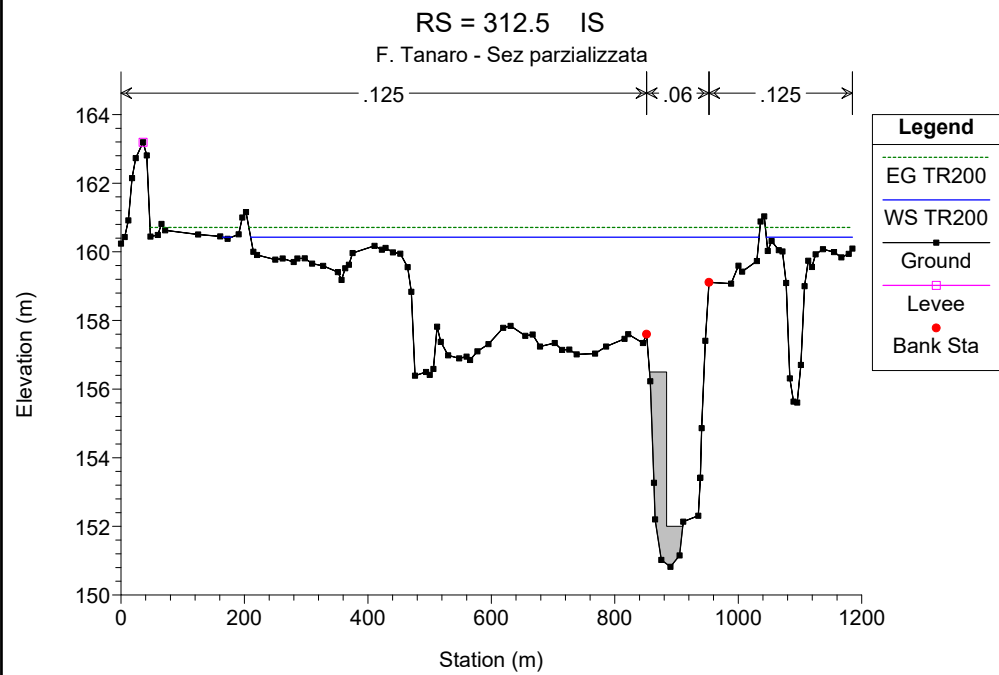
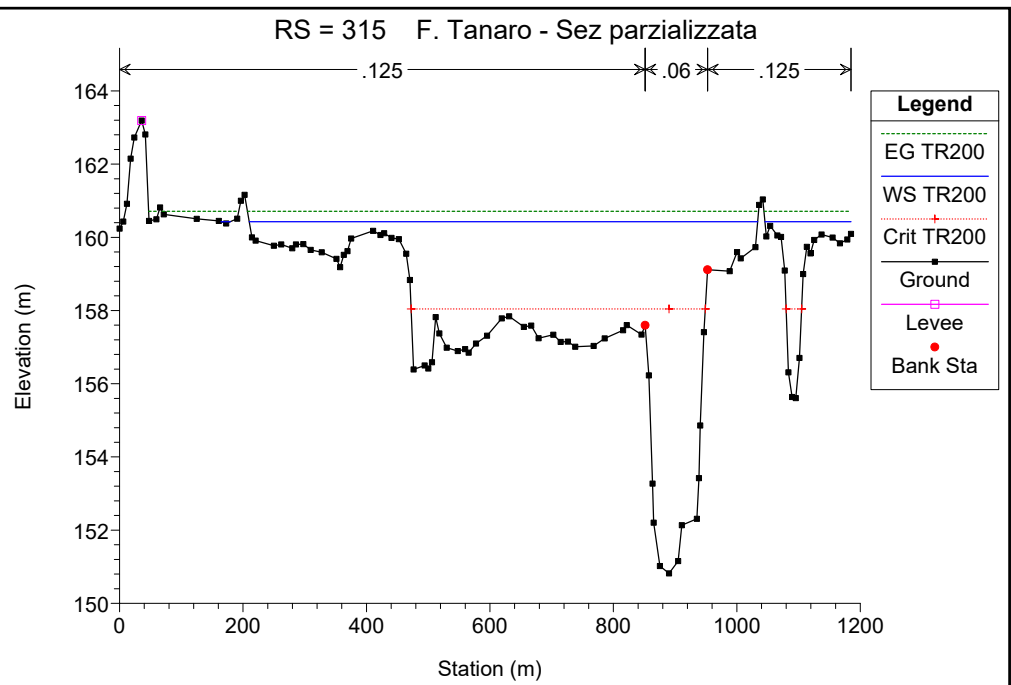
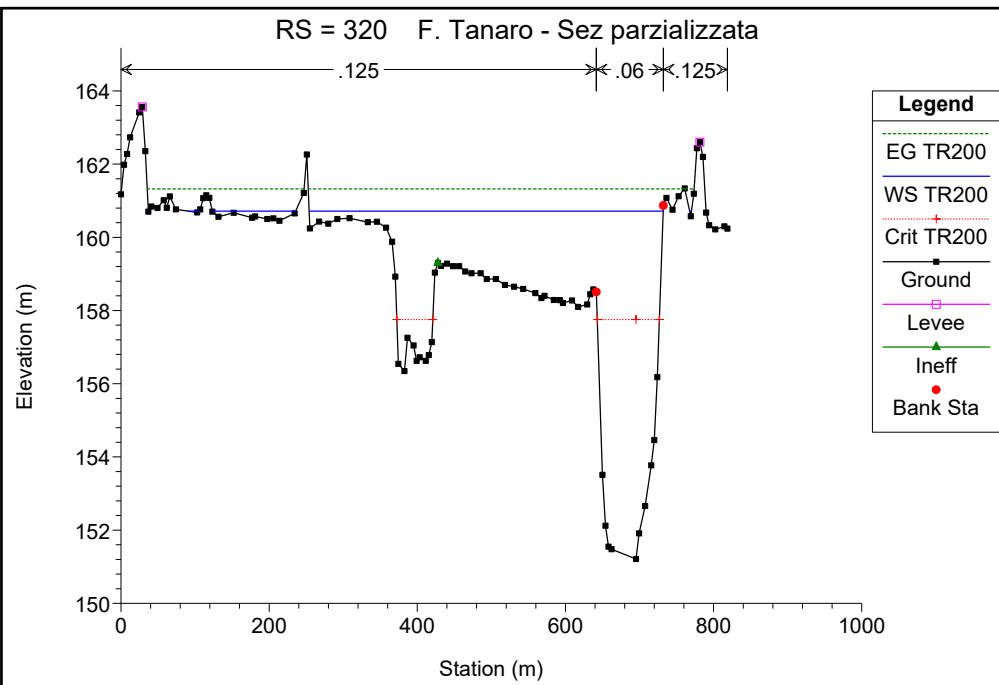


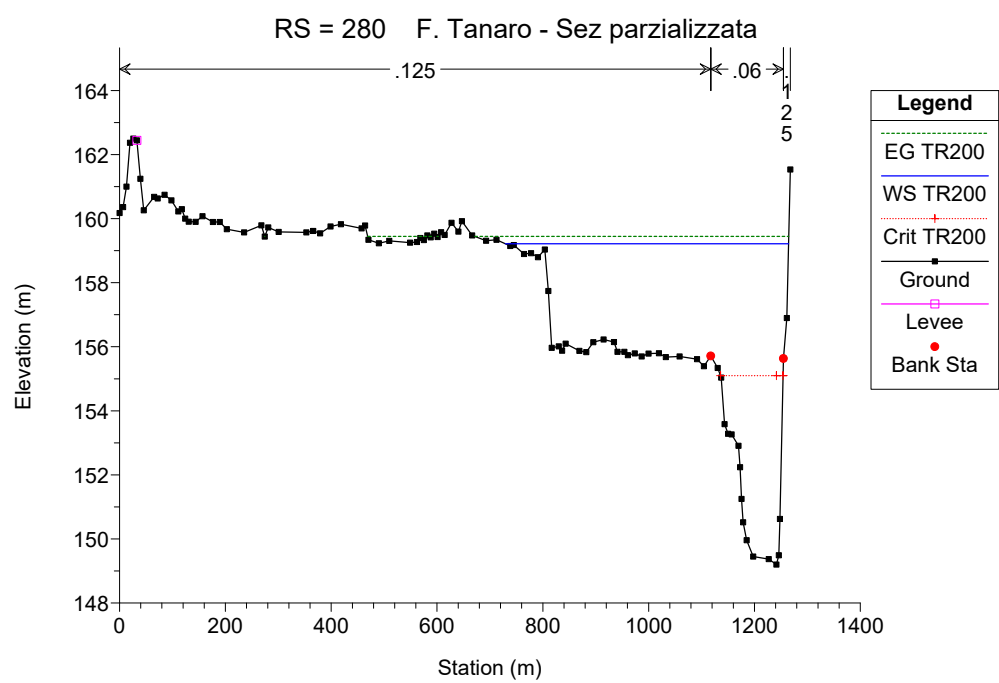
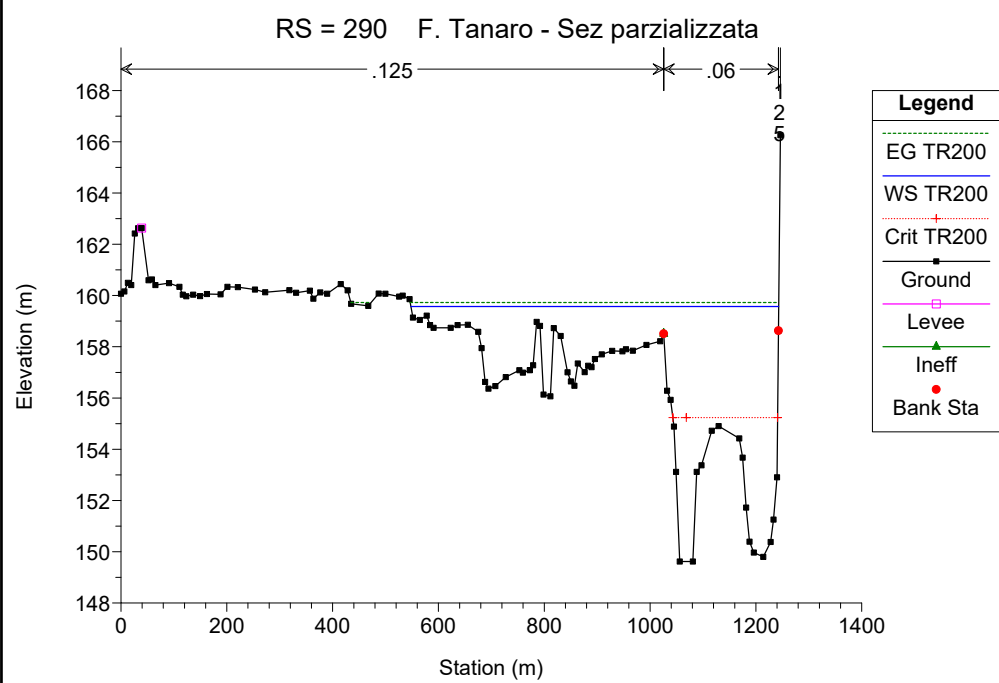
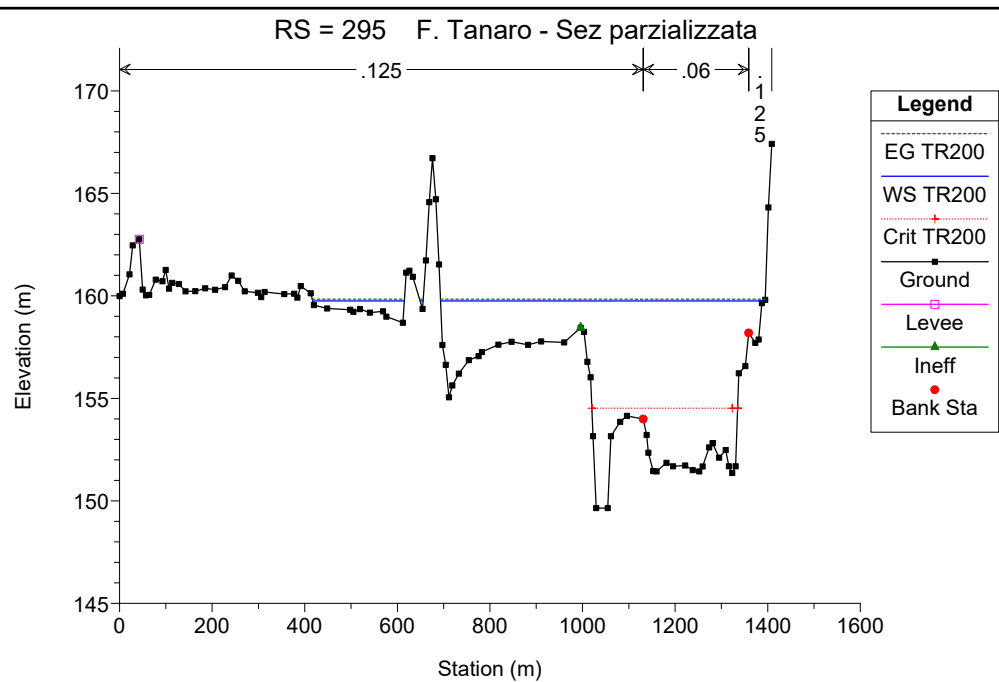
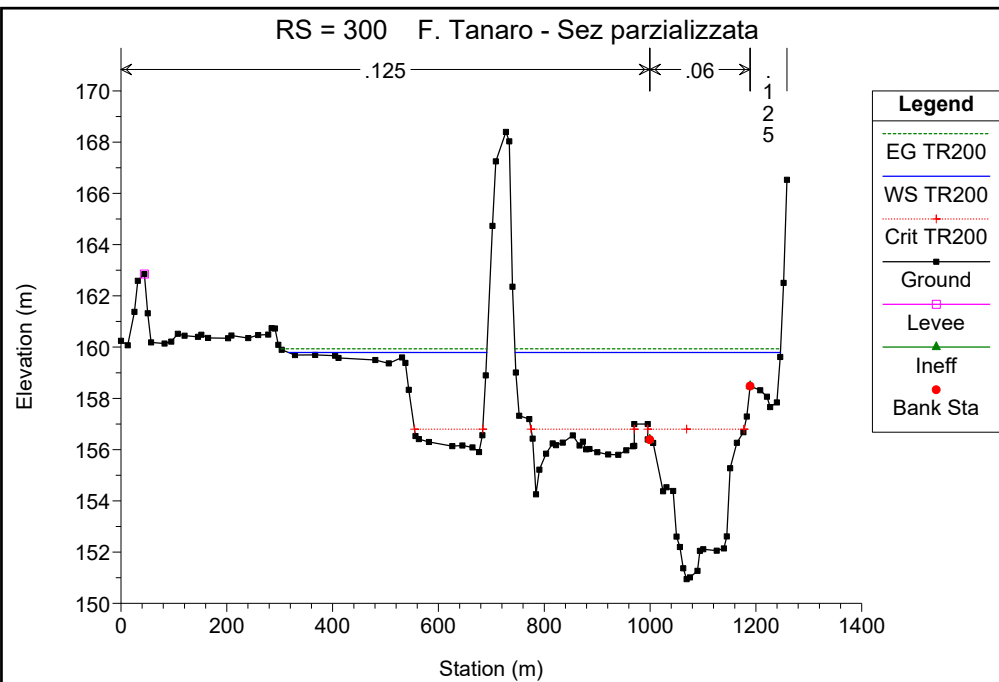


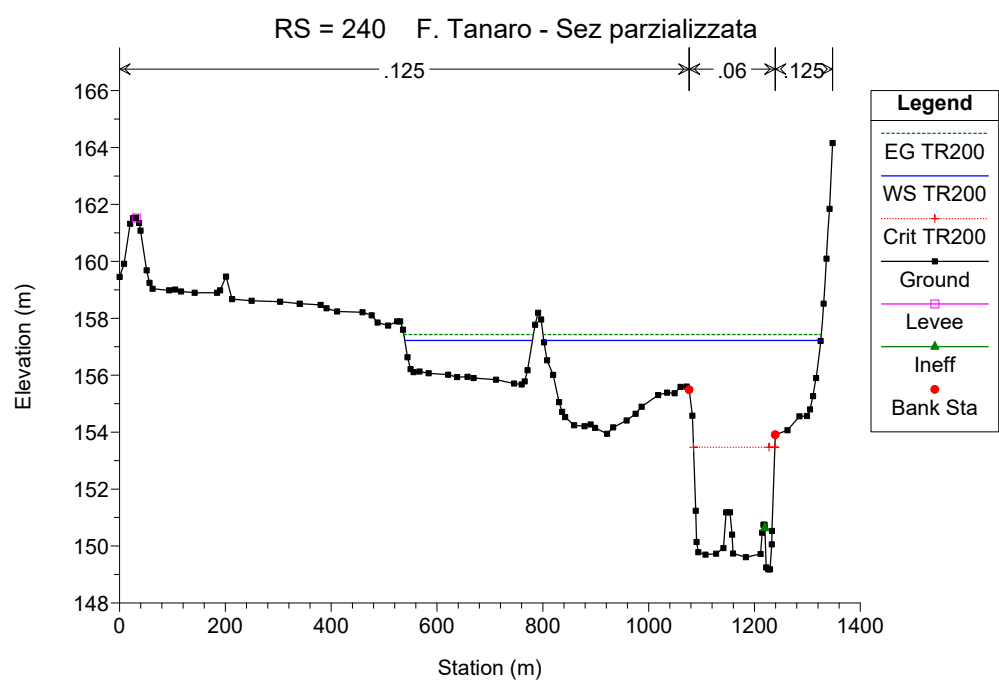
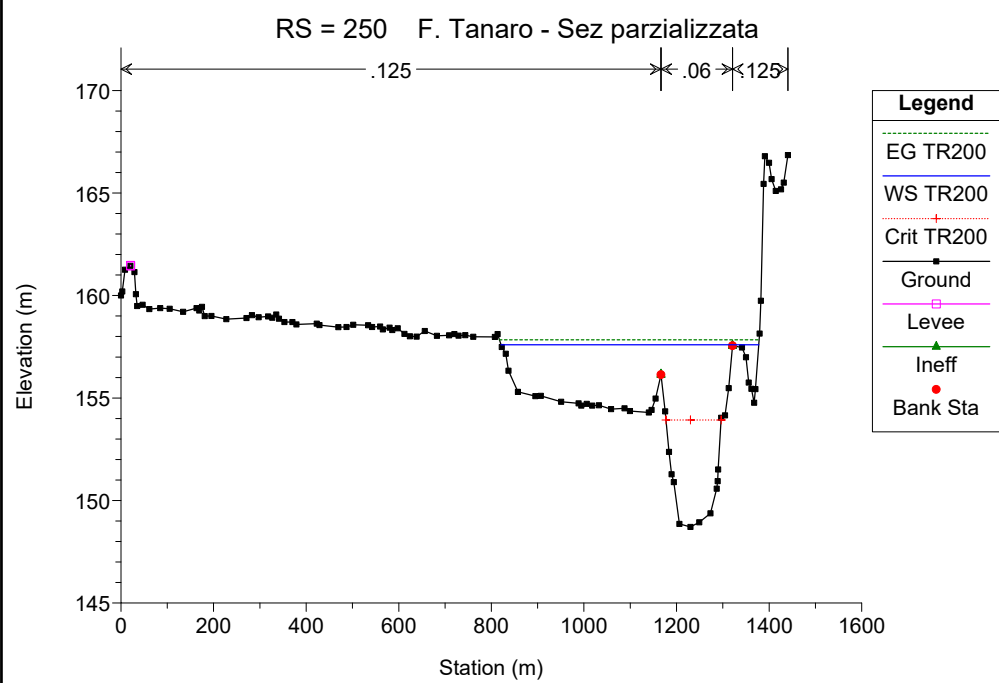
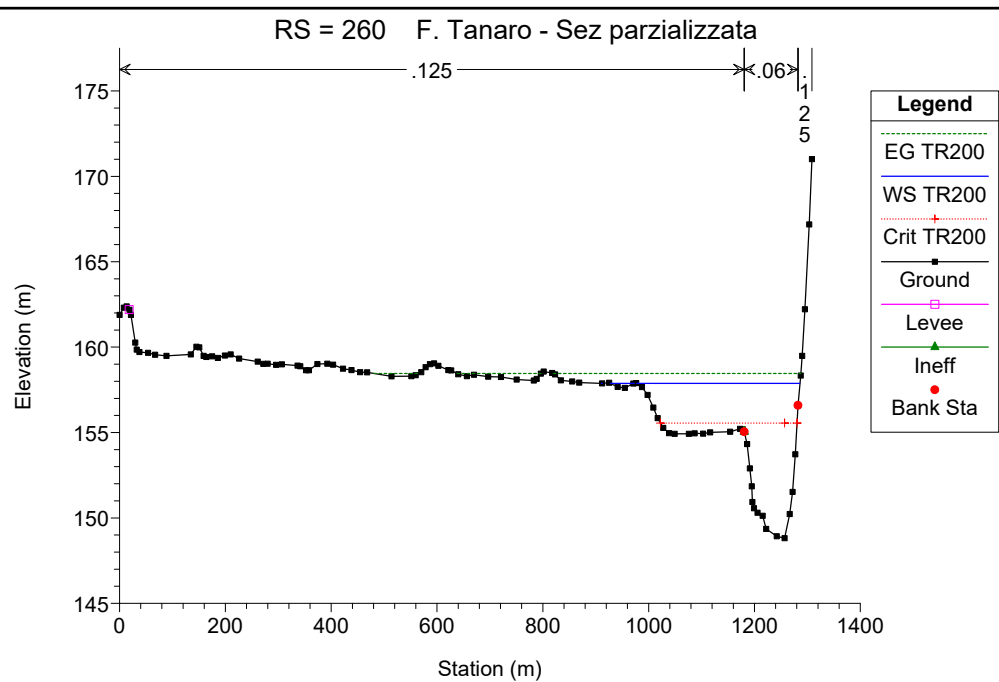
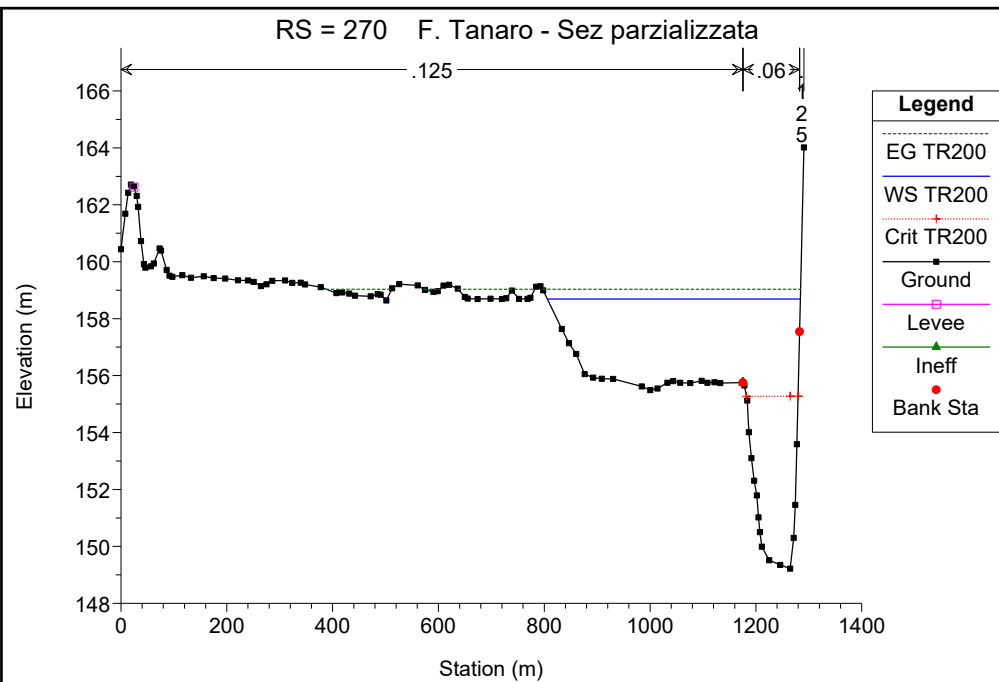


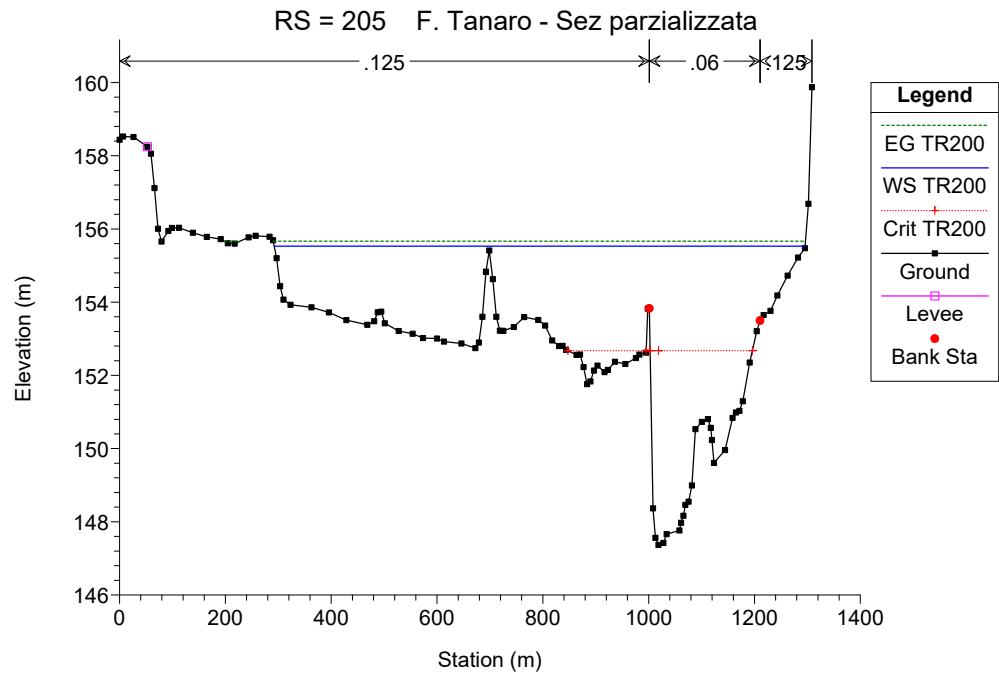
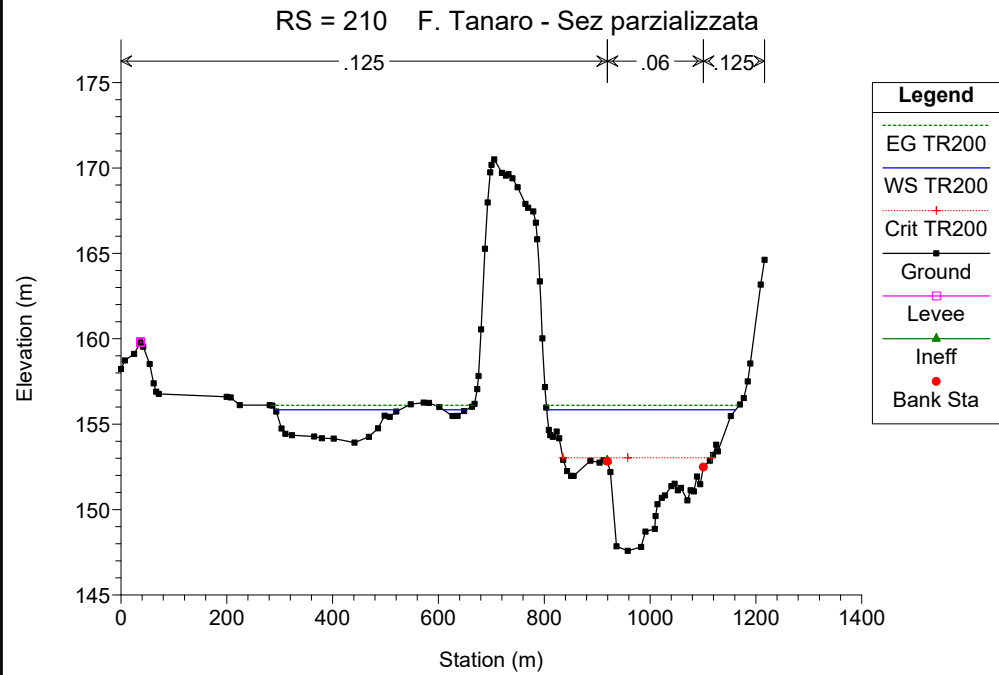
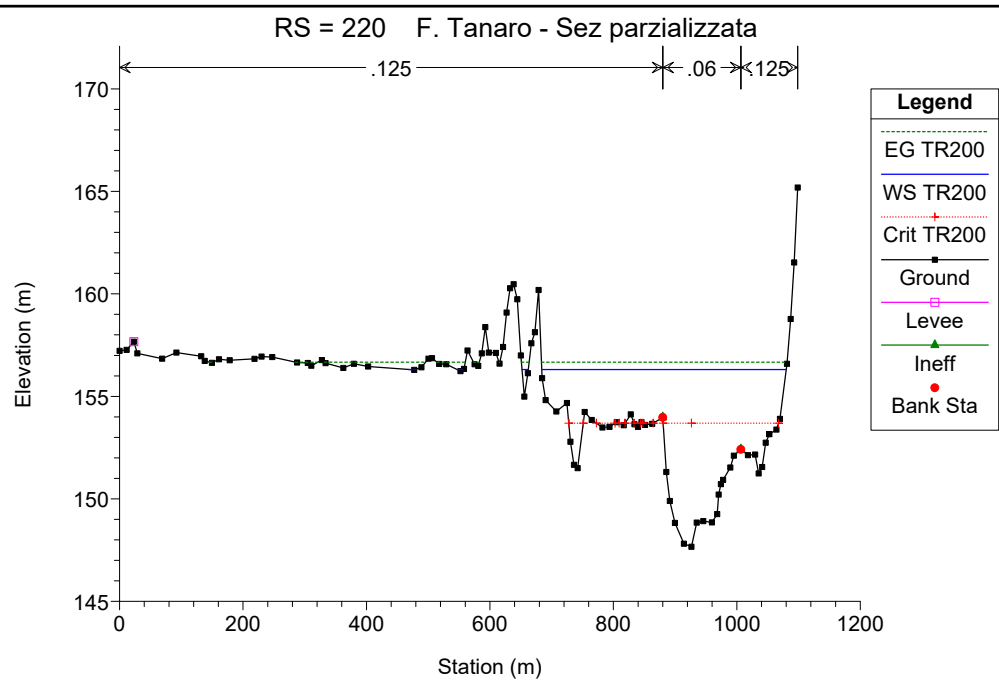
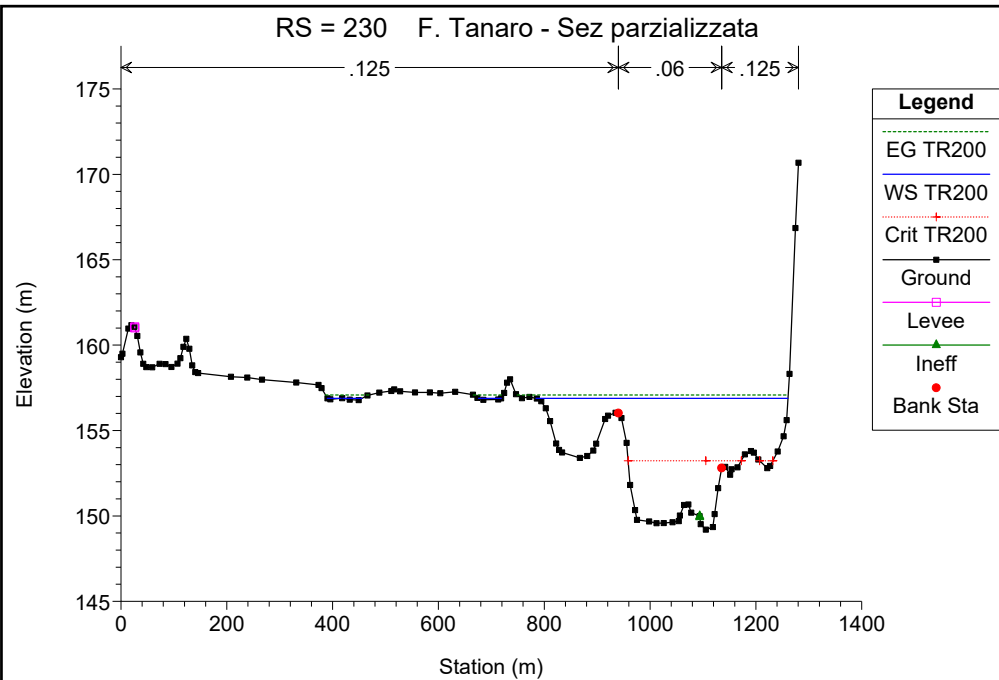


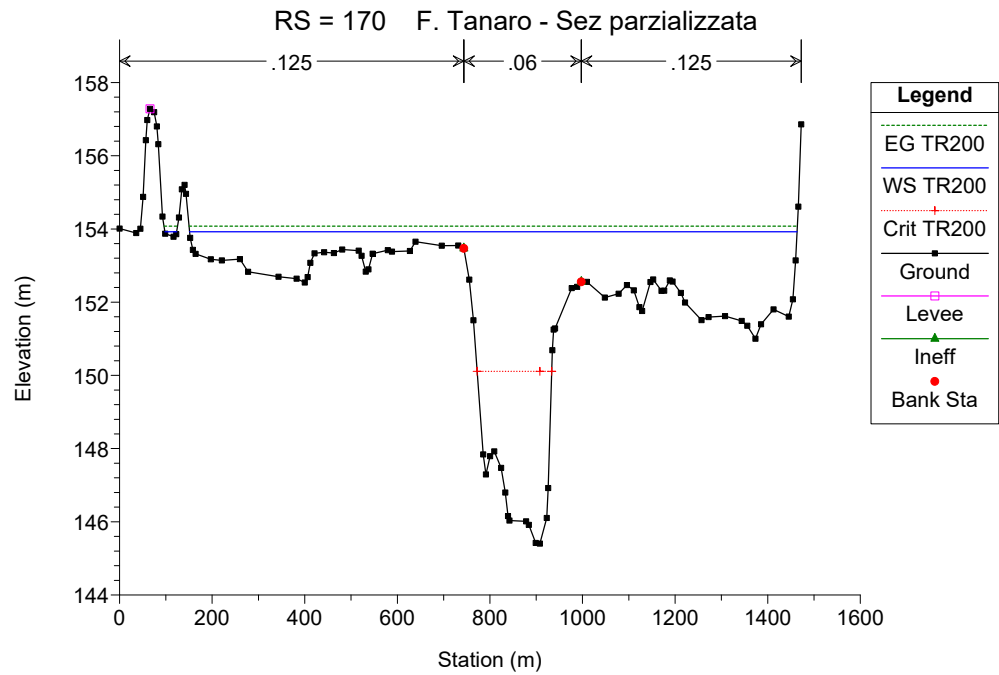
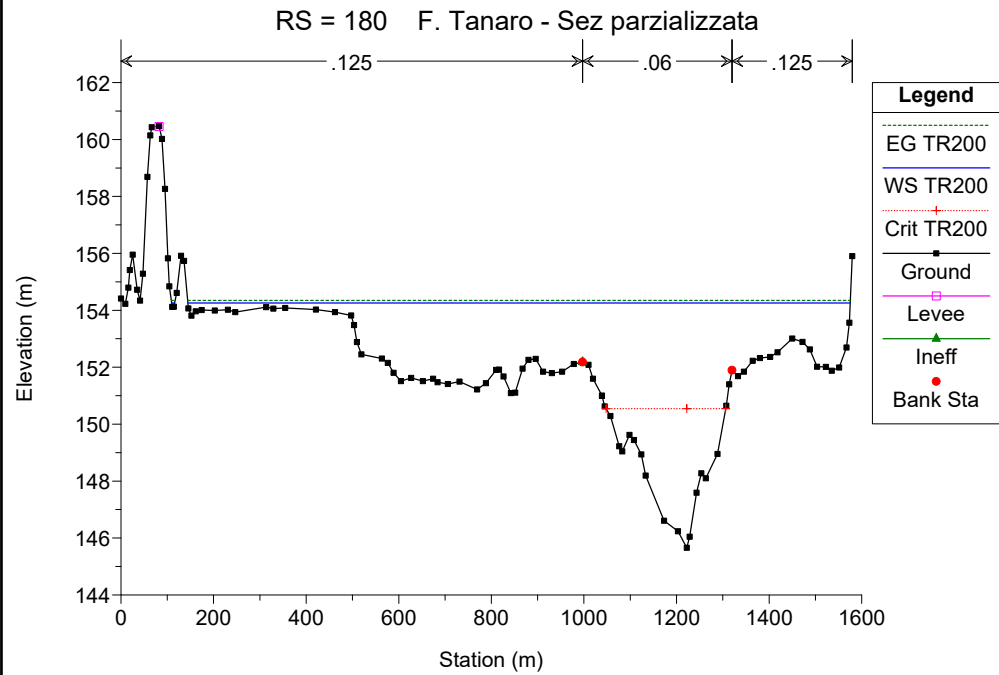
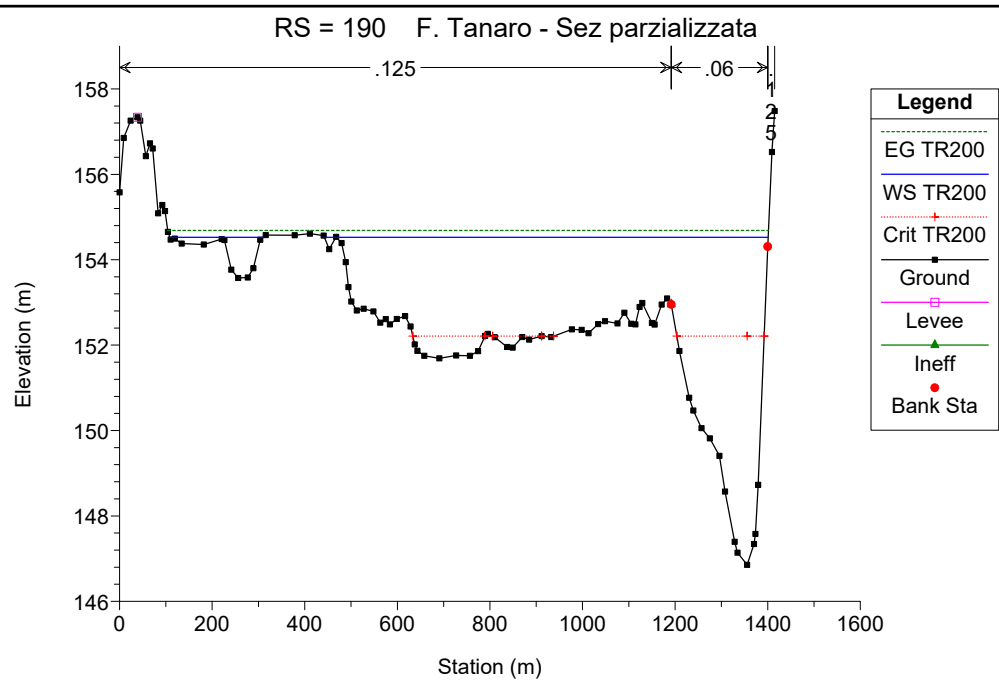
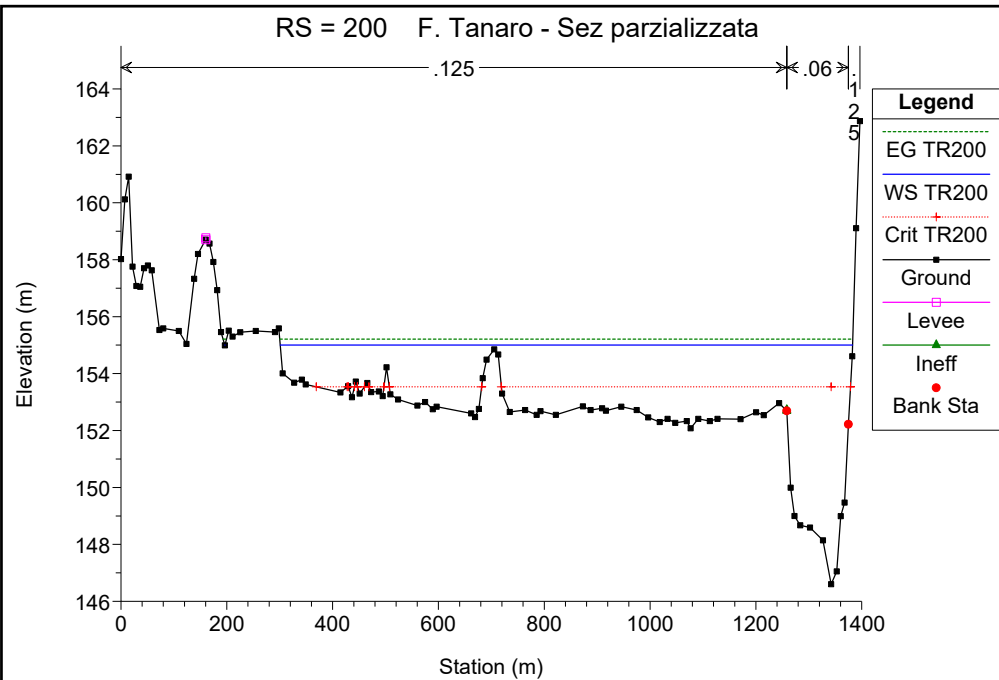


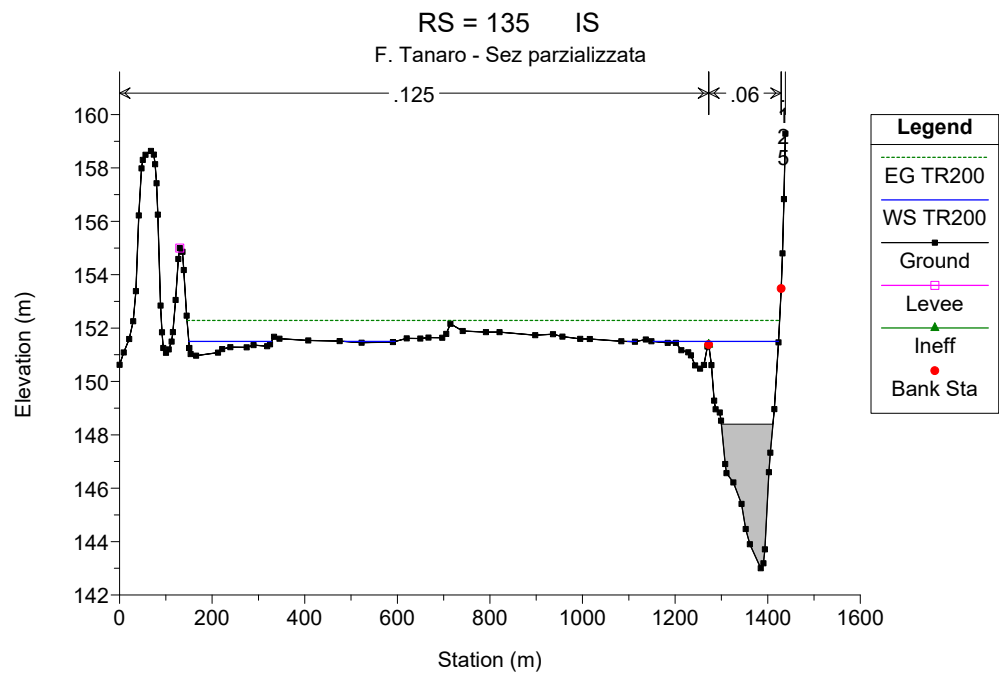
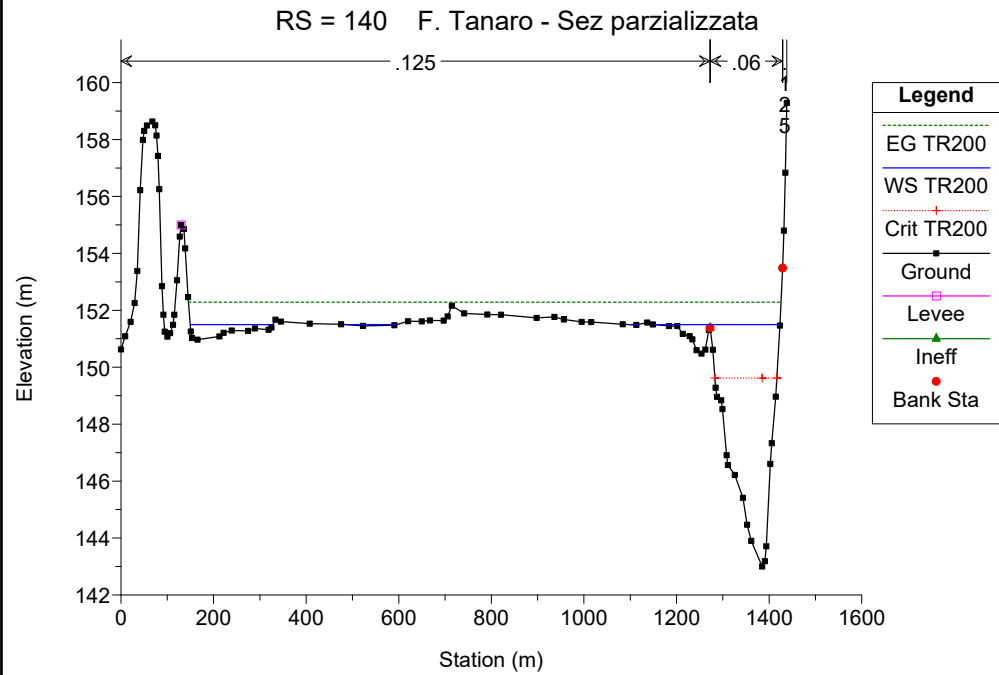
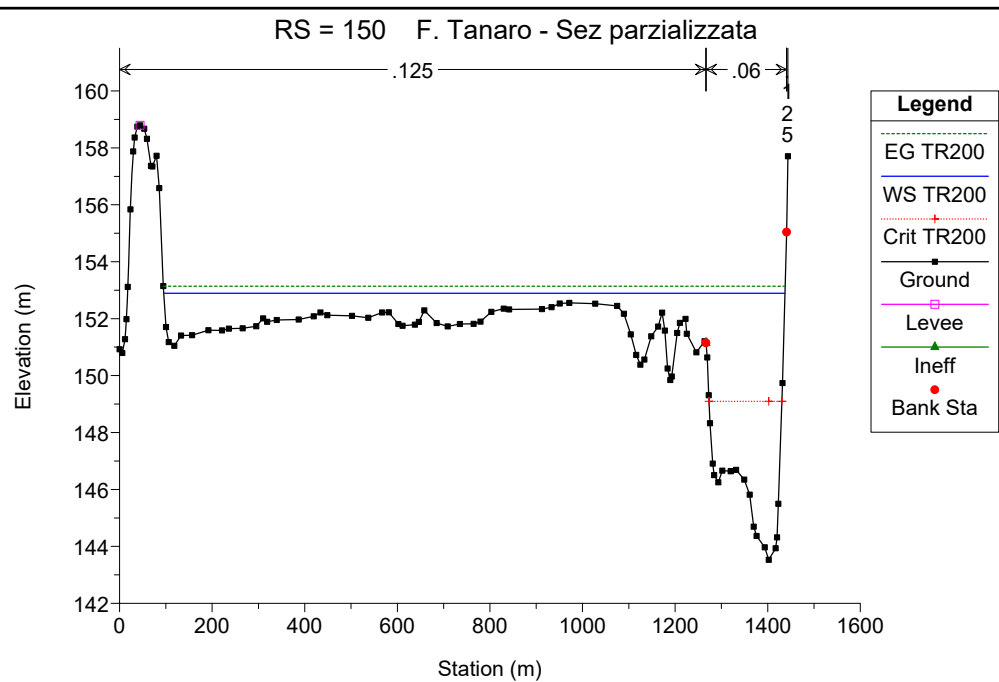
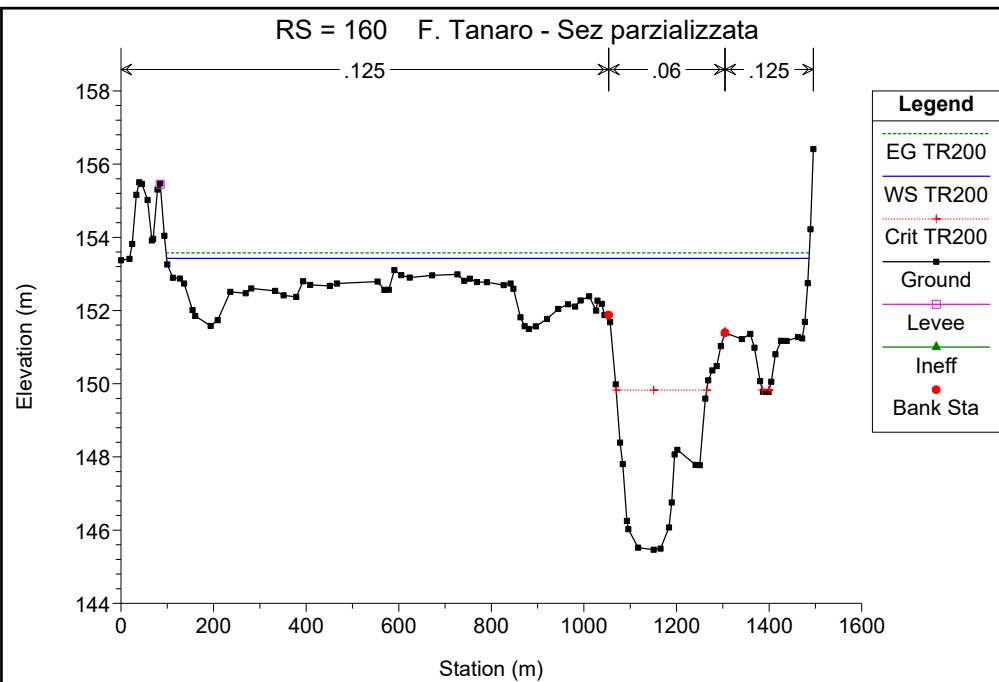


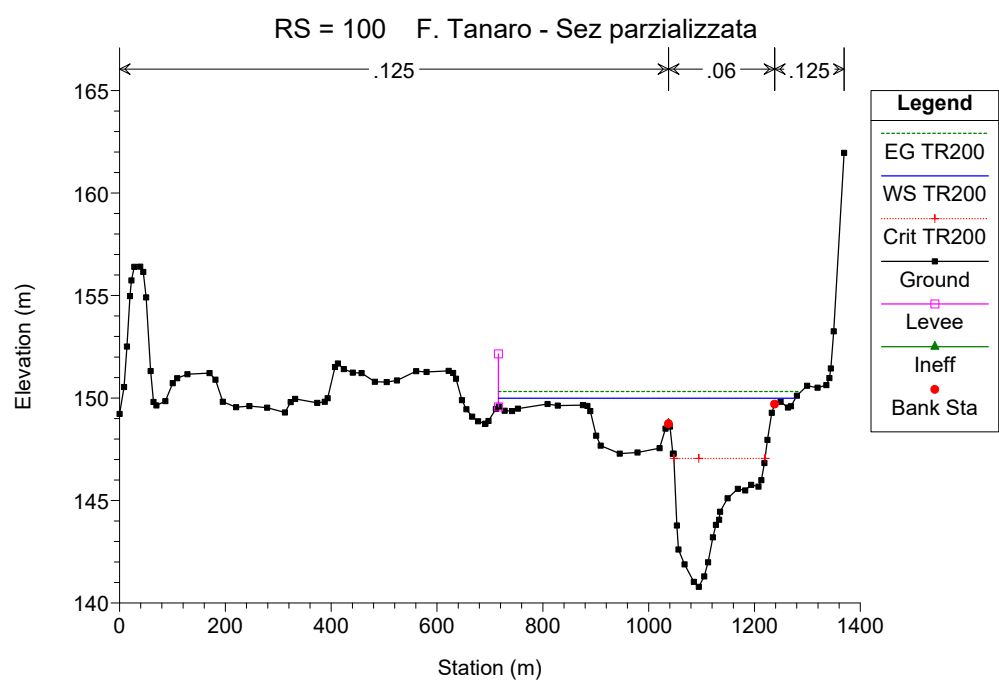
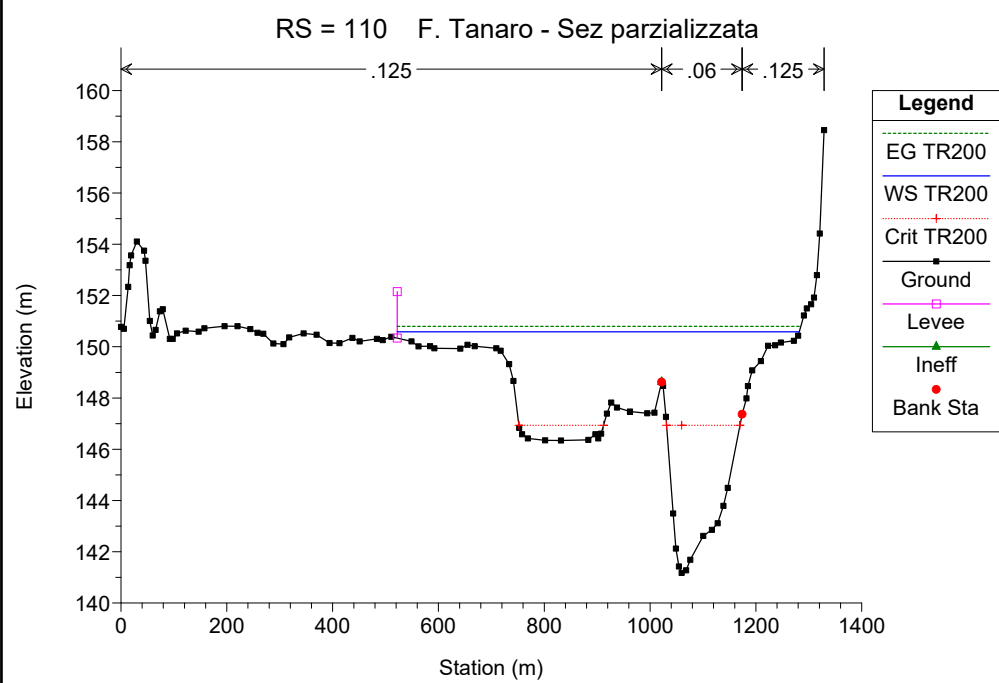
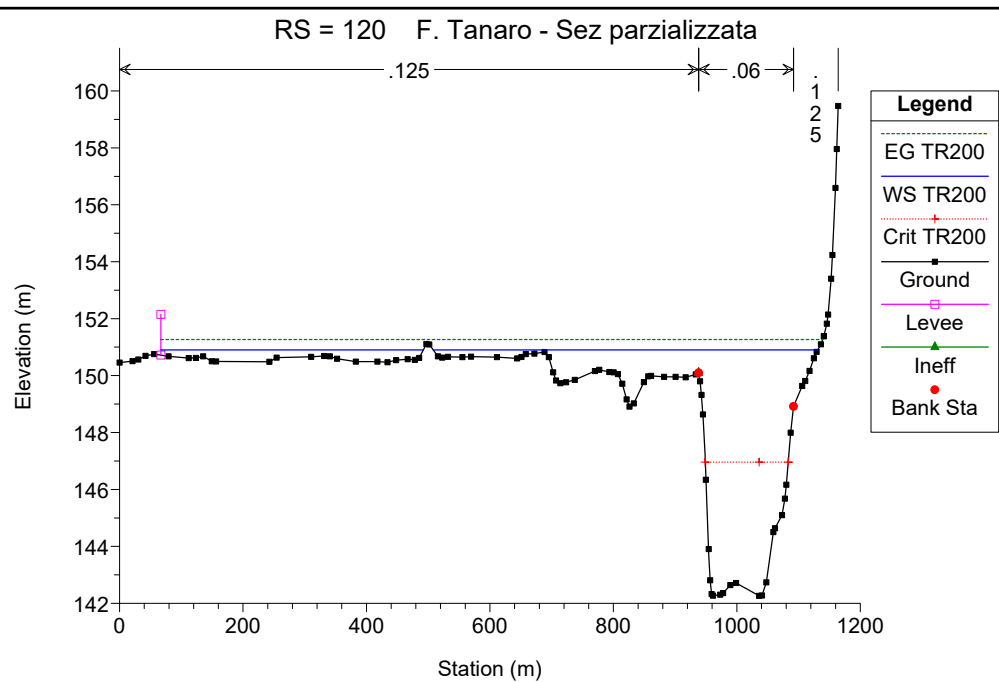
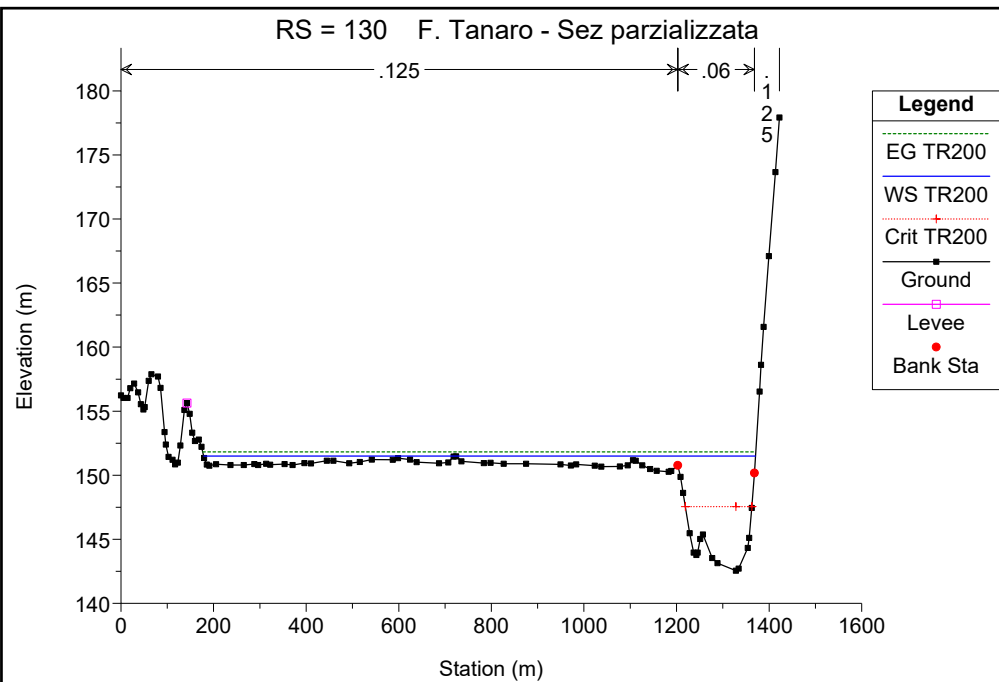


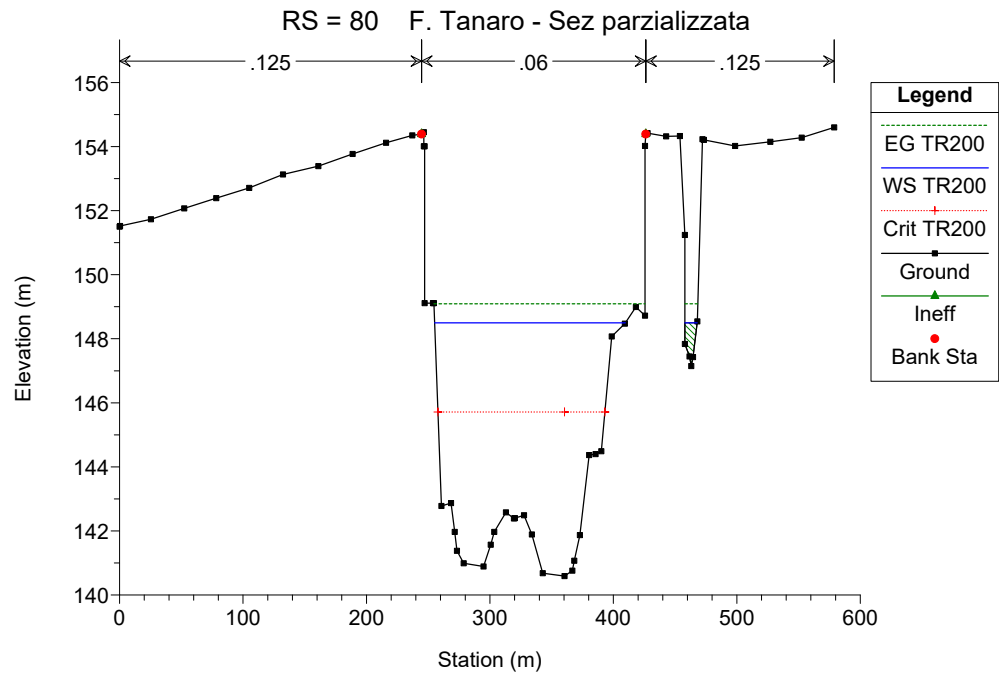
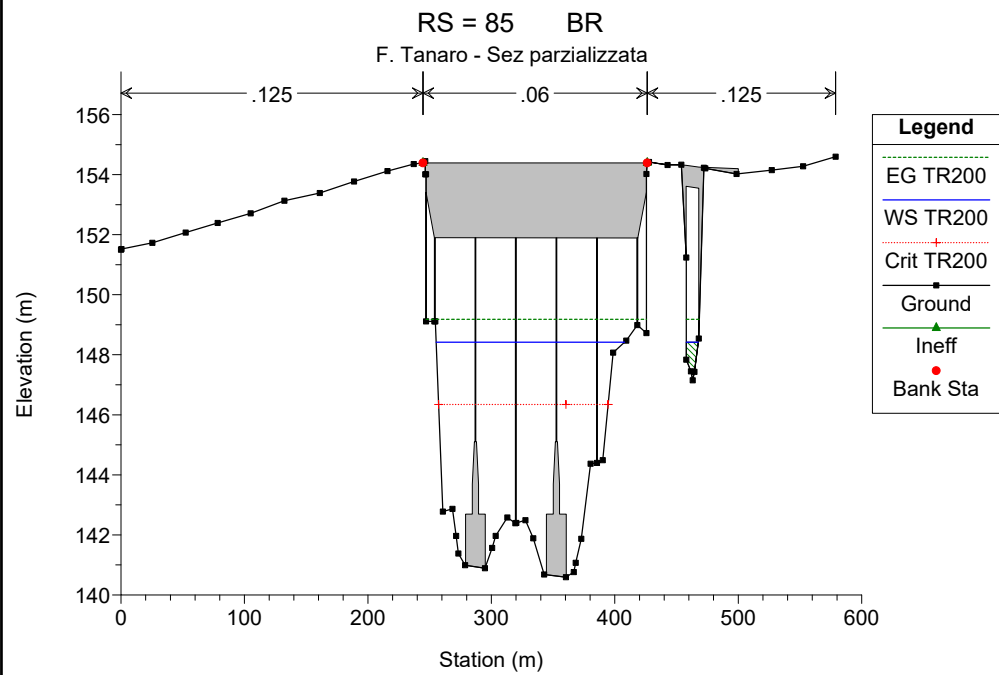
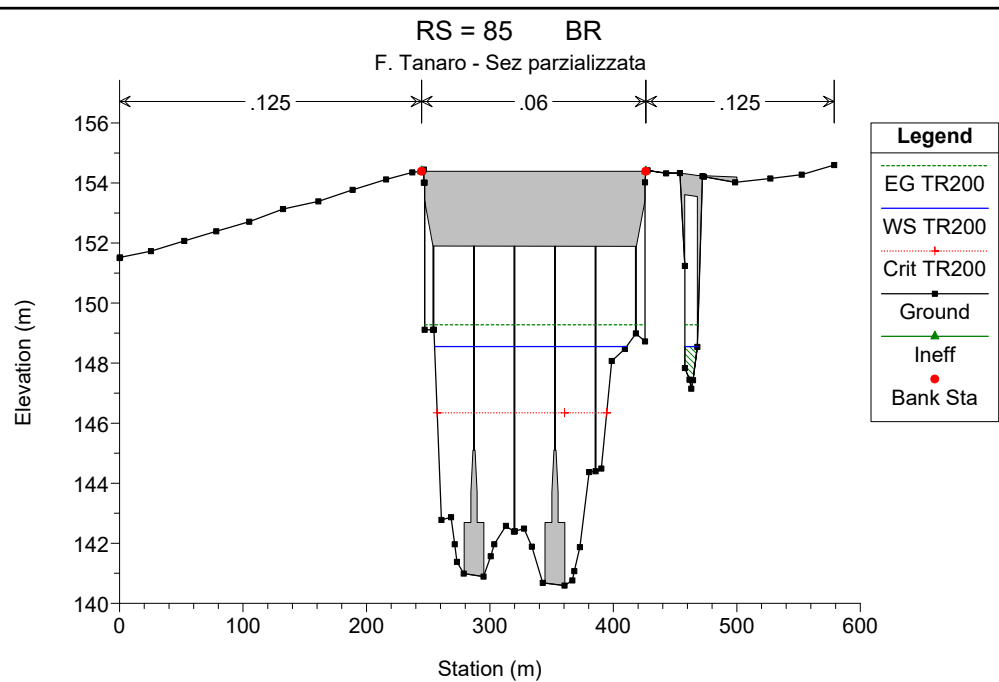
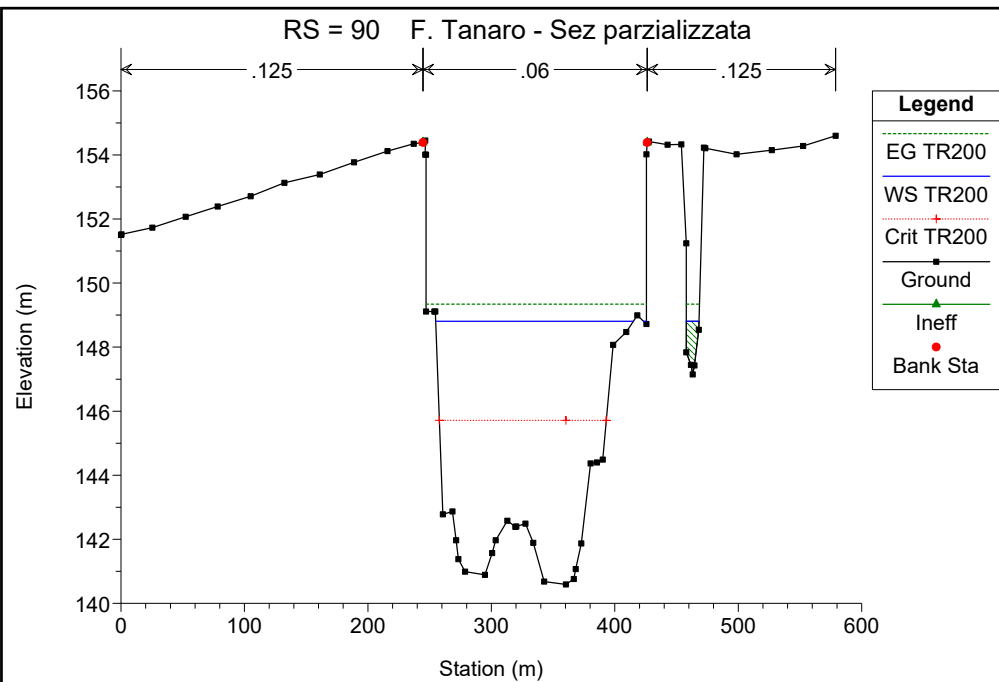


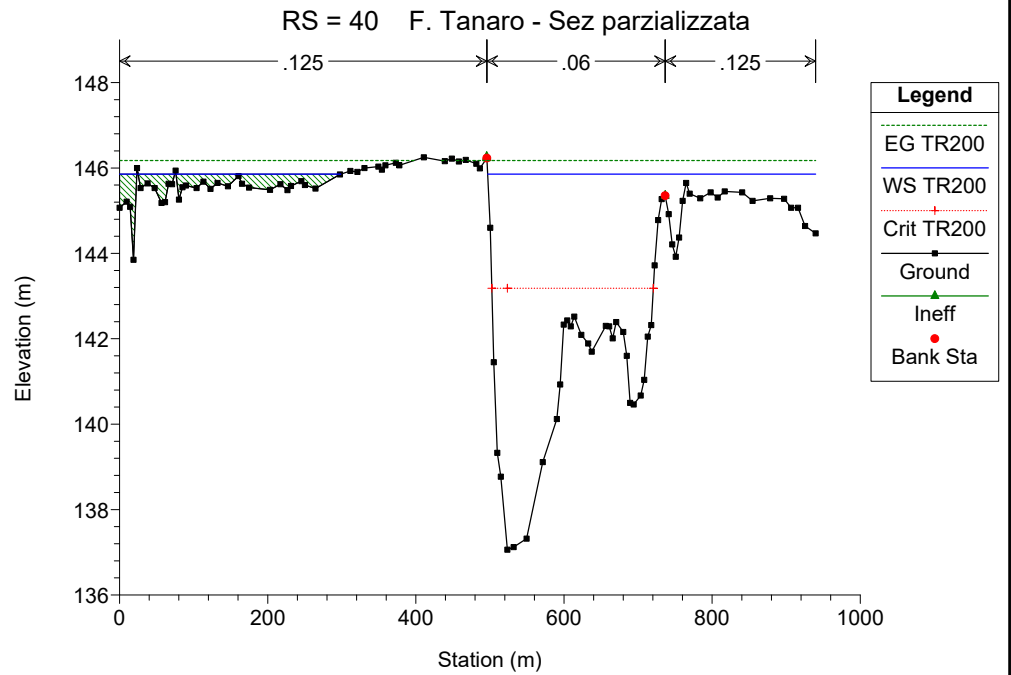
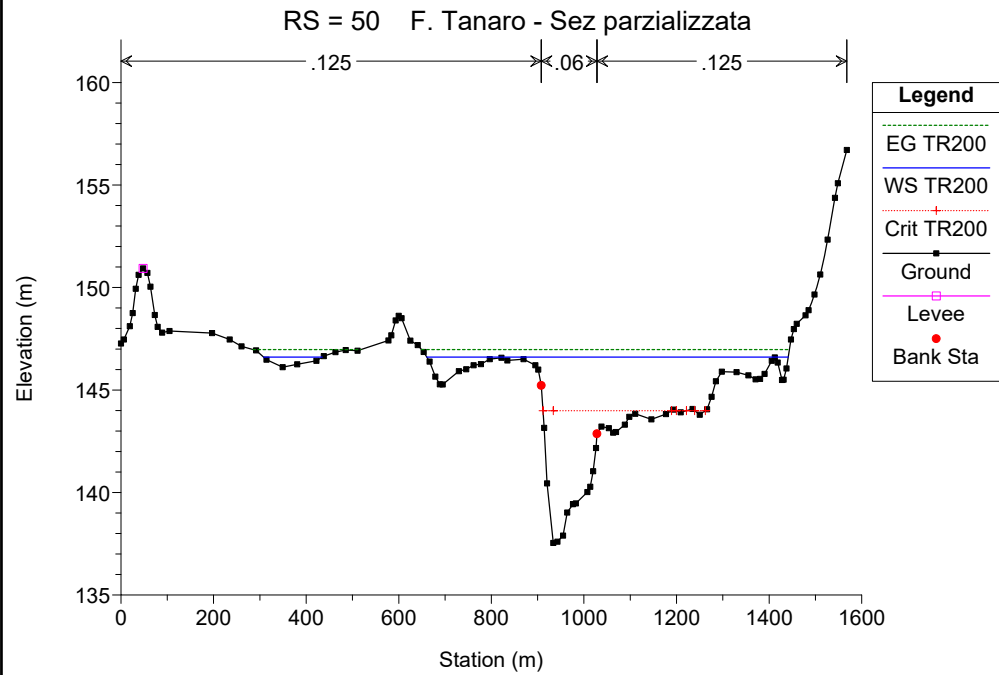
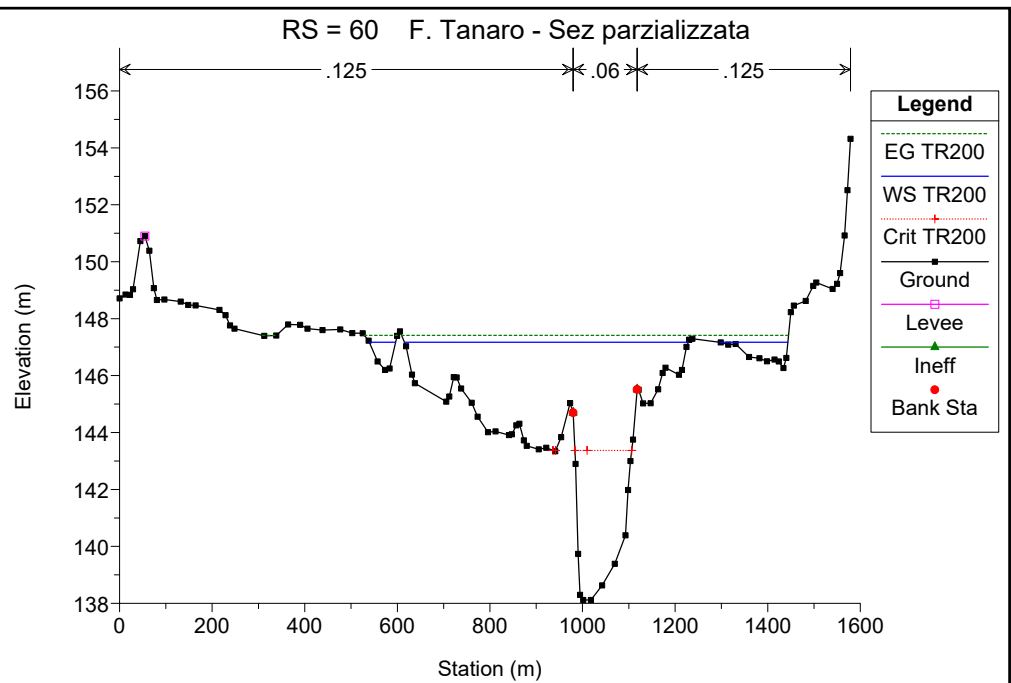
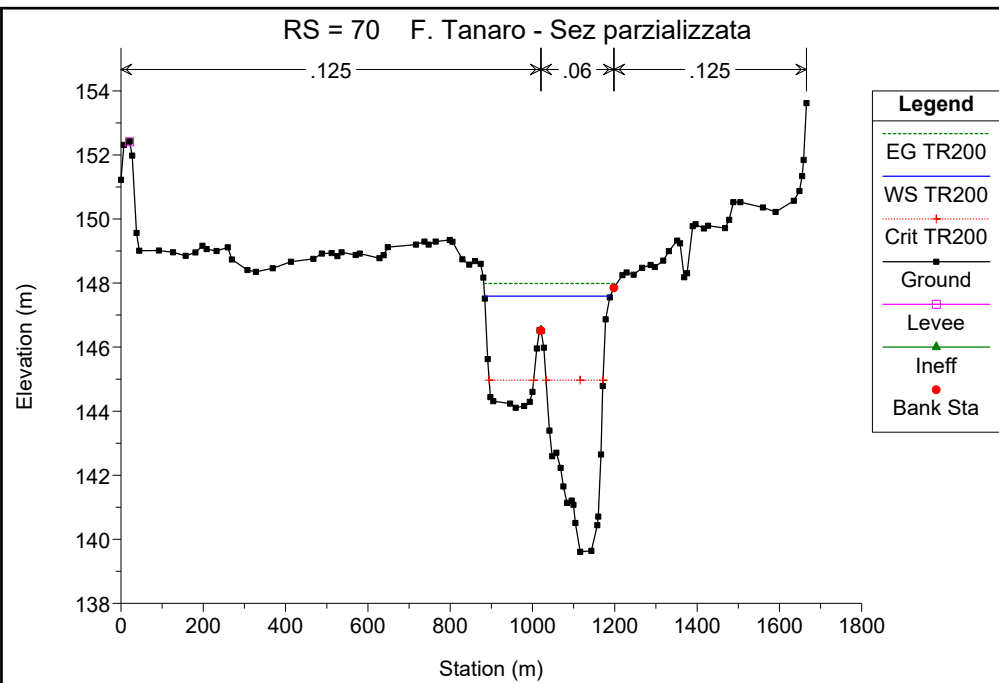


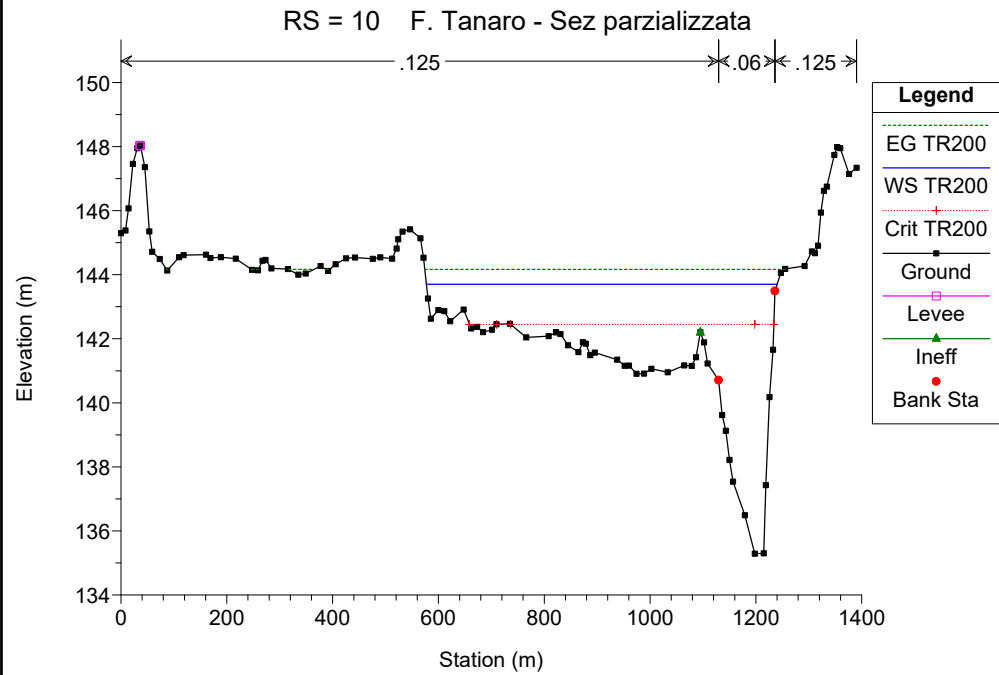
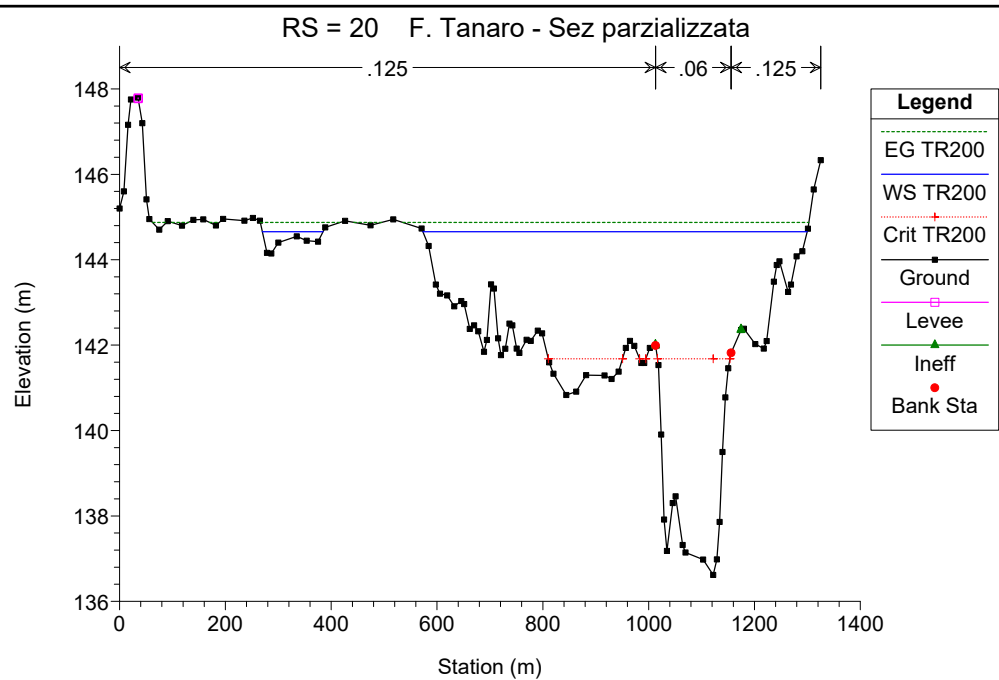
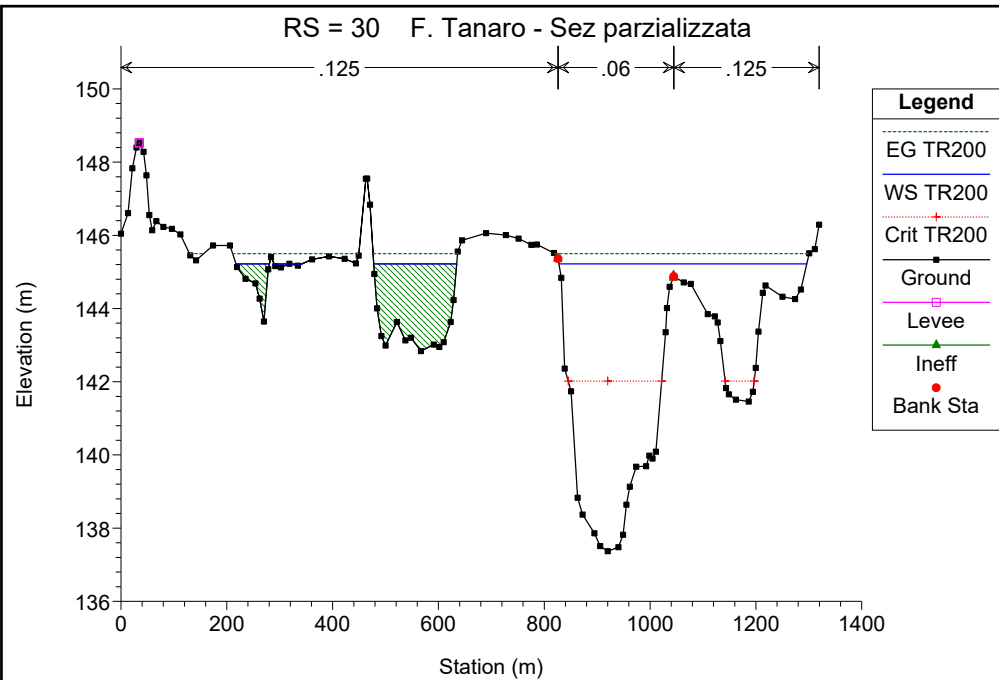












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 17

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3400	500
F. Tanaro valle Riddone	3409	
F. Tanaro valle Cherasca	3422	

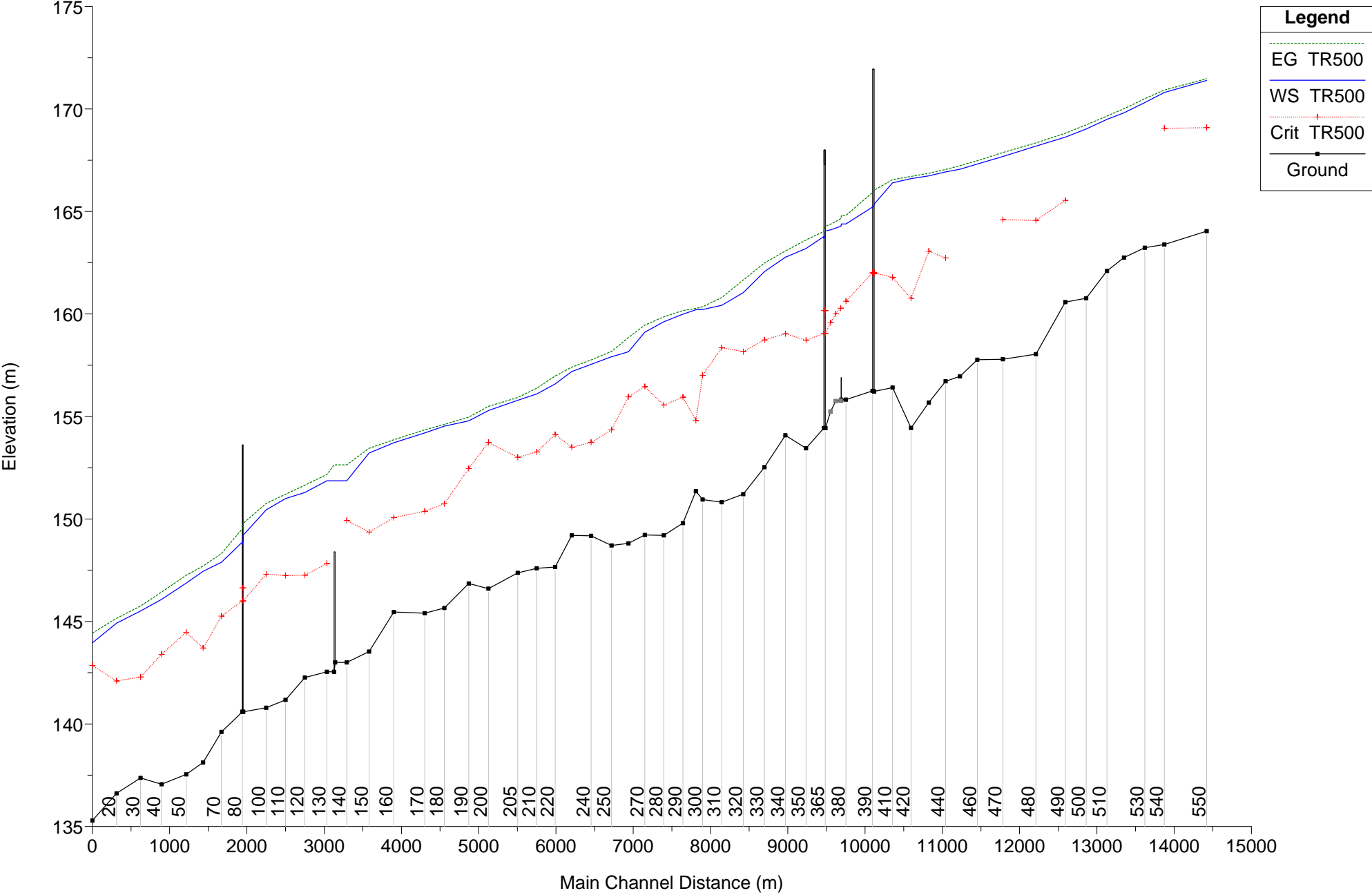
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500

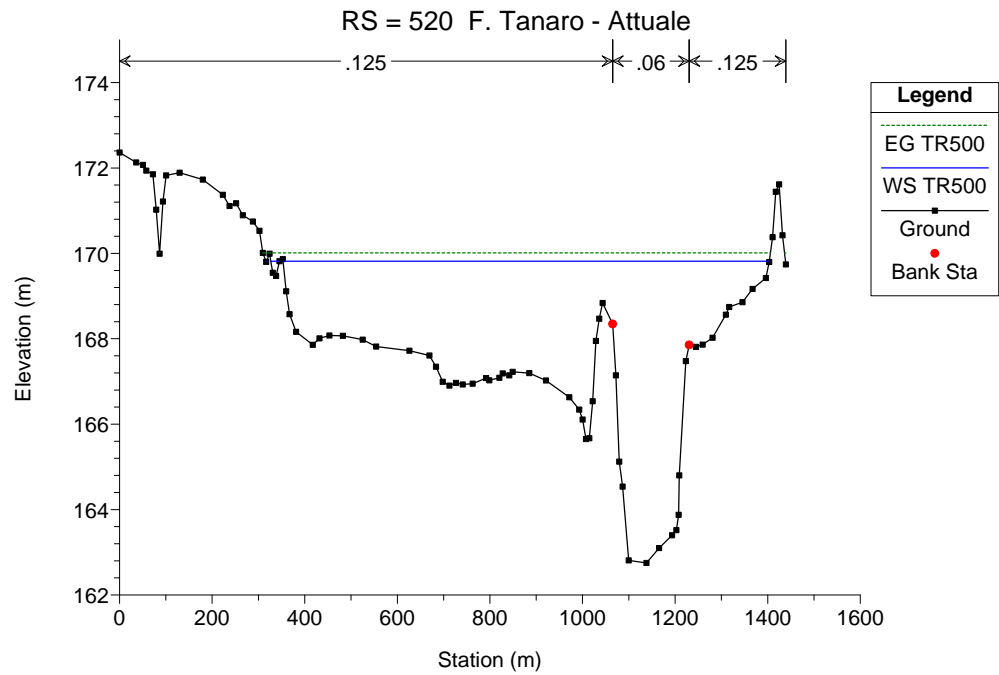
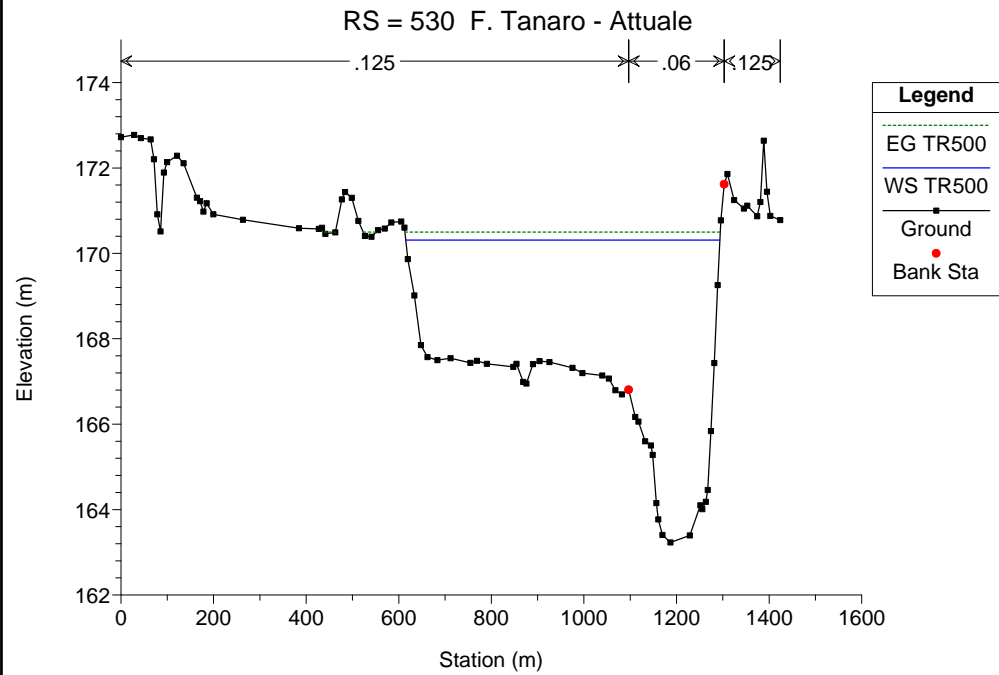
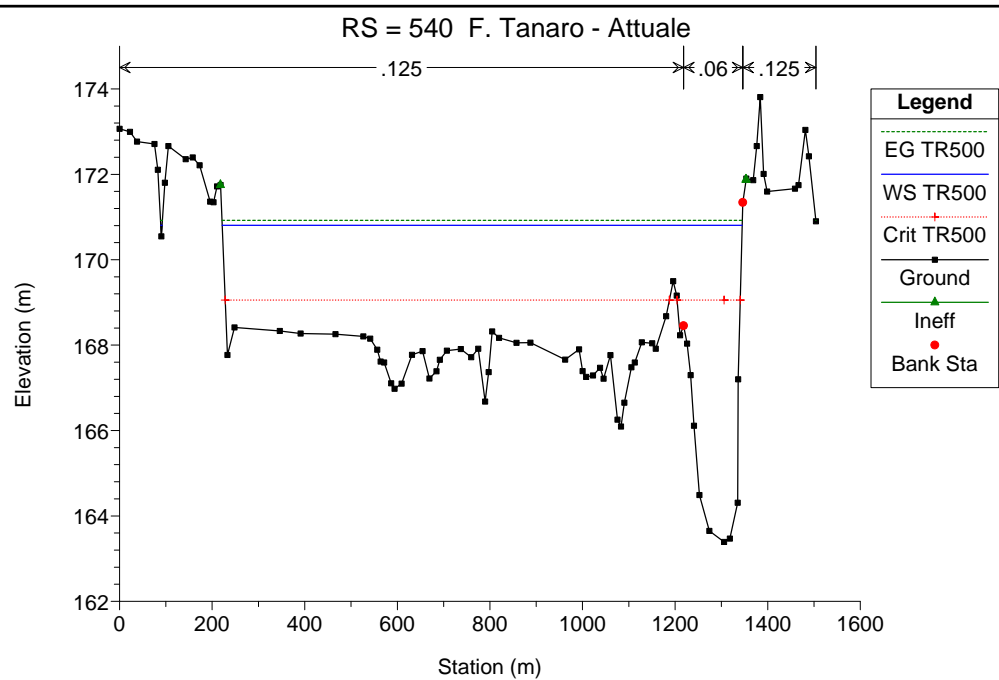
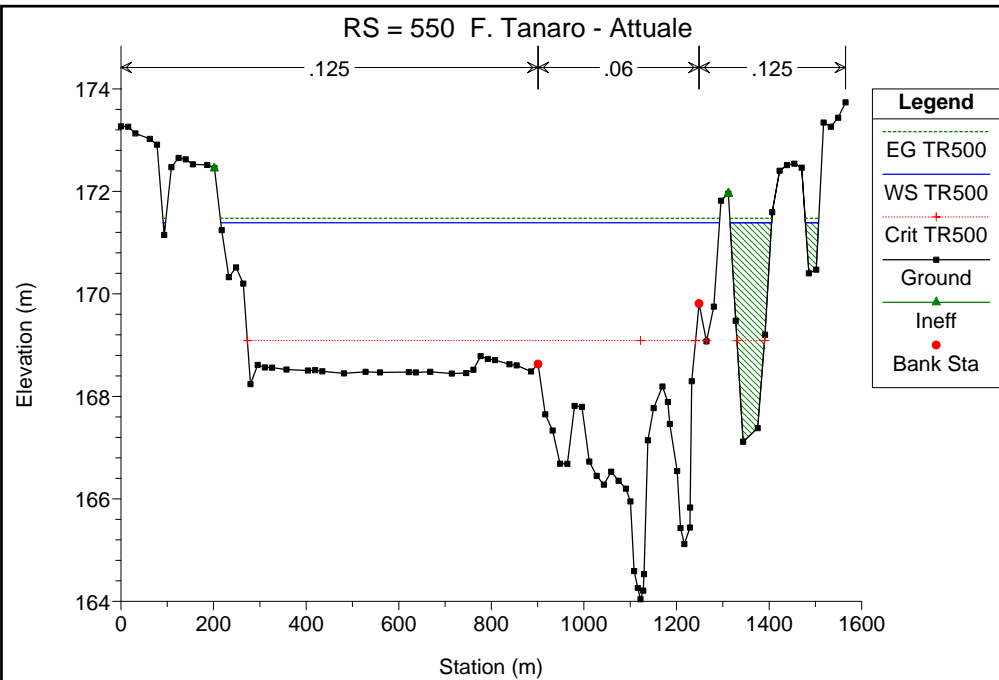
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR500	3400.00	164.04	171.39	169.09	171.48	0.001096	1.52	3523.91	1200.51	0.23
1	540	TR500	3400.00	163.39	170.81	169.06	170.92	0.001558	2.11	3612.56	1126.04	0.28
1	530	TR500	3400.00	163.23	170.31		170.50	0.001819	2.23	2479.72	678.51	0.30
1	520	TR500	3400.00	162.75	169.81		170.01	0.001937	2.36	2846.49	1070.74	0.31
1	510	TR500	3400.00	162.10	169.49		169.66	0.001765	2.15	2686.23	790.27	0.30
1	500	TR500	3400.00	160.77	169.02		169.22	0.001567	2.25	2360.18	558.06	0.28
1	490	TR500	3400.00	160.58	168.63	165.54	168.82	0.001505	2.10	2199.08	540.65	0.28
1	480	TR500	3400.00	158.04	168.19	164.56	168.34	0.001140	1.99	2799.82	971.36	0.25
1	470	TR500	3400.00	157.79	167.68	164.60	167.87	0.001368	2.26	2446.92	584.34	0.27
1	460	TR500	3400.00	157.77	167.32		167.48	0.001021	2.00	2963.03	919.17	0.24
1	450	TR500	3400.00	156.96	167.06		167.24	0.001069	2.08	2935.48	1044.38	0.24
1	440	TR500	3400.00	156.72	166.93	162.73	167.05	0.000783	1.84	3422.50	804.44	0.21
1	430	TR500	3400.00	155.68	166.74	163.06	166.86	0.000945	2.03	3247.98	667.84	0.23
1	420	TR500	3400.00	154.44	166.61	160.77	166.71	0.000545	1.70	3591.28	692.34	0.18
1	410	TR500	3400.00	156.41	166.40	161.78	166.55	0.000928	2.04	2760.93	552.74	0.23
1	400	TR500	3400.00	156.22	165.36	162.01	166.04	0.003449	3.76	1049.50	179.17	0.43
1	395		Bridge									
1	390	TR500	3400.00	156.25	165.22	162.02	165.93	0.003677	3.84	1025.56	178.87	0.44
1	380	TR500	3400.00	155.82	164.39	160.62	164.81	0.002207	2.87	1280.92	288.35	0.34
1	379		Inl Struct									
1	370	TR500	3400.00	154.43	164.05	159.05	164.28	0.001116	2.13	1598.71	208.91	0.25
1	365		Bridge									
1	360	TR500	3400.00	154.43	163.78	159.05	164.02	0.001251	2.20	1542.18	208.16	0.26
1	350	TR500	3400.00	153.45	163.19	158.72	163.61	0.002018	2.88	1295.10	293.70	0.33
1	340	TR500	3409.00	154.08	162.77	159.04	163.07	0.001789	2.48	1615.85	392.44	0.31
1	330	TR500	3409.00	152.53	162.07	158.73	162.49	0.002485	2.97	1504.61	441.07	0.36
1	320	TR500	3409.00	151.21	161.04	158.17	161.66	0.003507	3.84	1609.55	699.69	0.43
1	310	TR500	3409.00	150.82	160.42	158.35	160.80	0.002546	3.19	2231.10	837.00	0.37
1	300	TR500	3422.00	150.95	160.22	157.00	160.36	0.001100	1.93	3106.77	937.80	0.24
1	295	TR500	3422.00	151.36	160.21	154.80	160.27	0.000386	1.20	3709.19	1051.46	0.14
1	290	TR500	3422.00	149.80	159.99	155.94	160.17	0.001128	1.99	2543.08	797.69	0.24
1	280	TR500	3422.00	149.20	159.62	155.56	159.86	0.001388	2.46	2398.43	879.22	0.28
1	270	TR500	3422.00	149.22	159.11	156.45	159.46	0.002060	2.98	2079.80	828.20	0.34
1	260	TR500	3422.00	148.81	158.16	155.95	158.85	0.003905	3.94	1361.48	505.08	0.46
1	250	TR500	3422.00	148.71	157.92	154.35	158.18	0.001784	2.52	2166.38	562.22	0.31
1	240	TR500	3422.00	149.18	157.54	153.73	157.76	0.001376	2.29	2547.94	773.70	0.27
1	230	TR500	3422.00	149.20	157.19	153.50	157.41	0.001408	2.21	2220.42	700.30	0.27
1	220	TR500	3422.00	147.66	156.59	154.12	156.98	0.002674	3.09	1741.77	624.31	0.38
1	210	TR500	3422.00	147.59	156.10	153.27	156.38	0.002057	2.55	2020.70	695.11	0.33
1	205	TR500	3422.00	147.37	155.79	153.01	155.93	0.001287	1.94	3187.76	1106.77	0.25

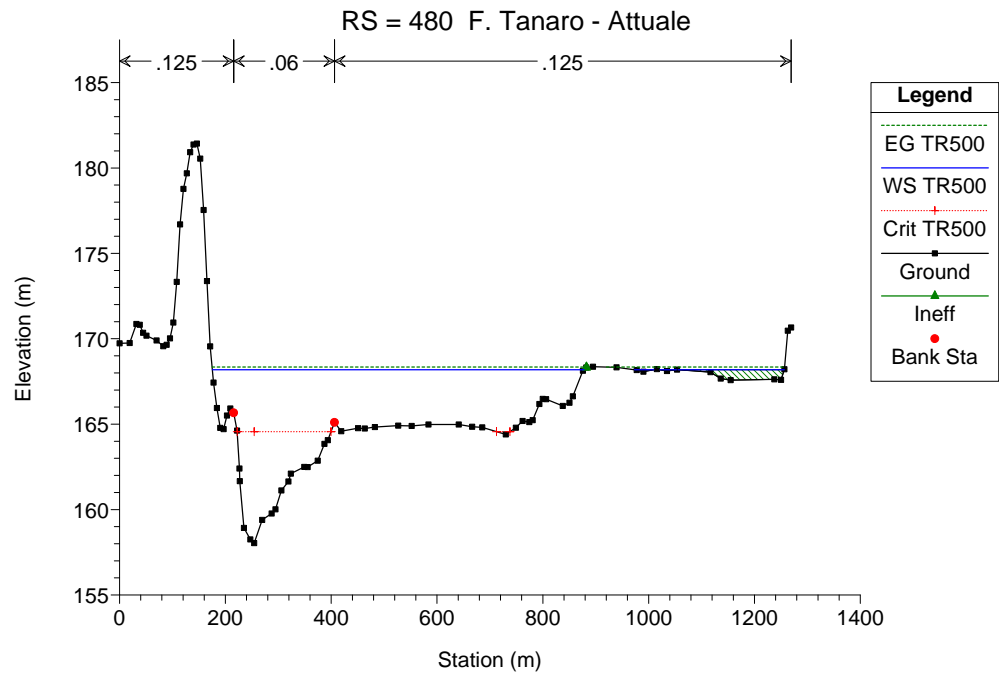
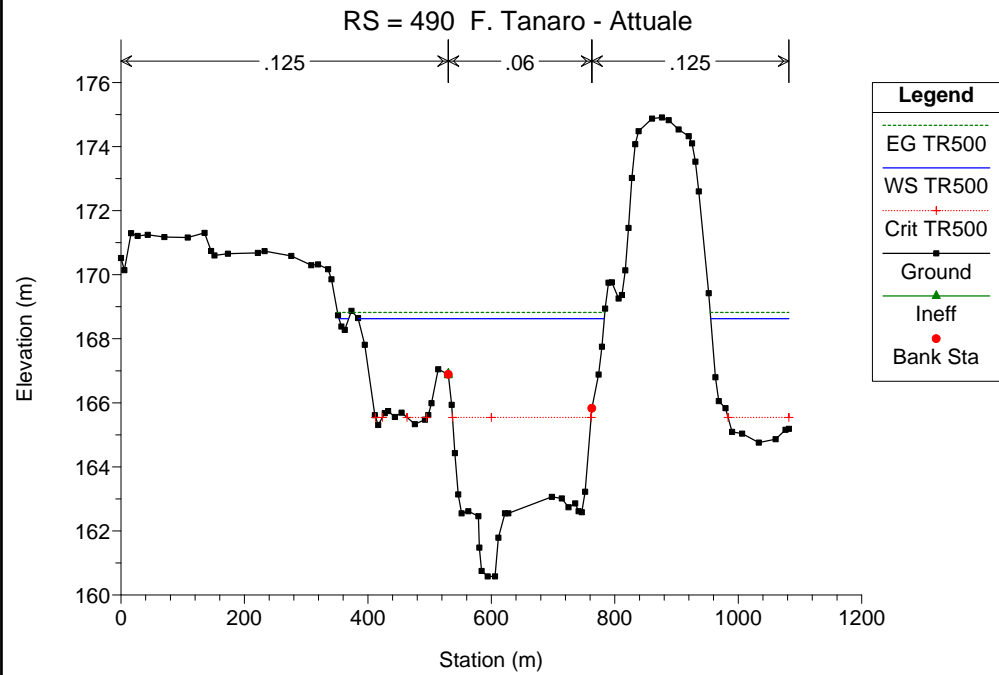
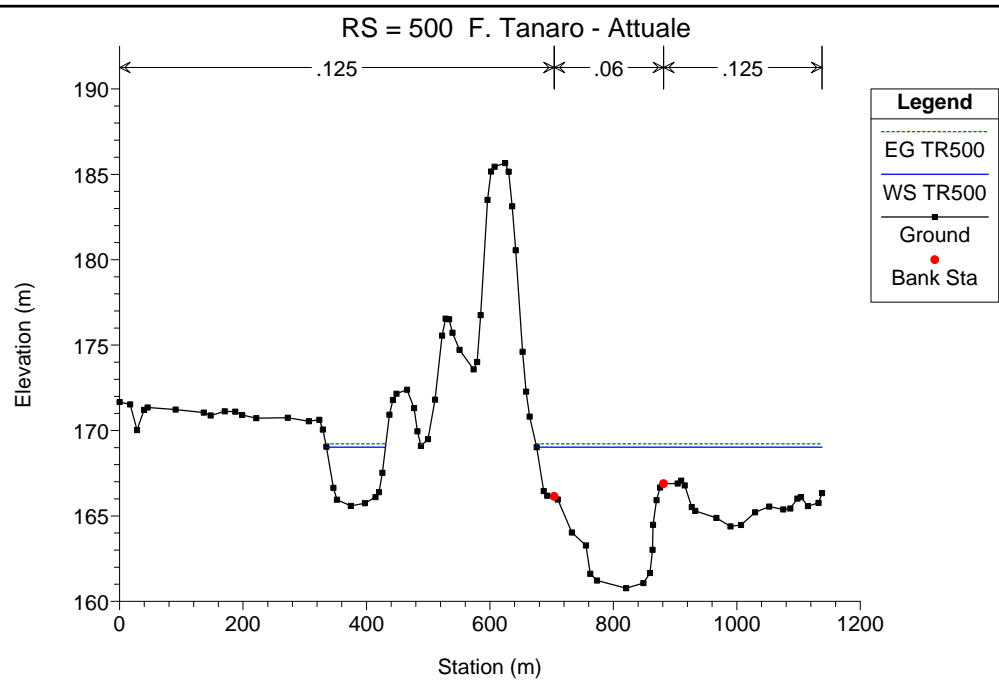
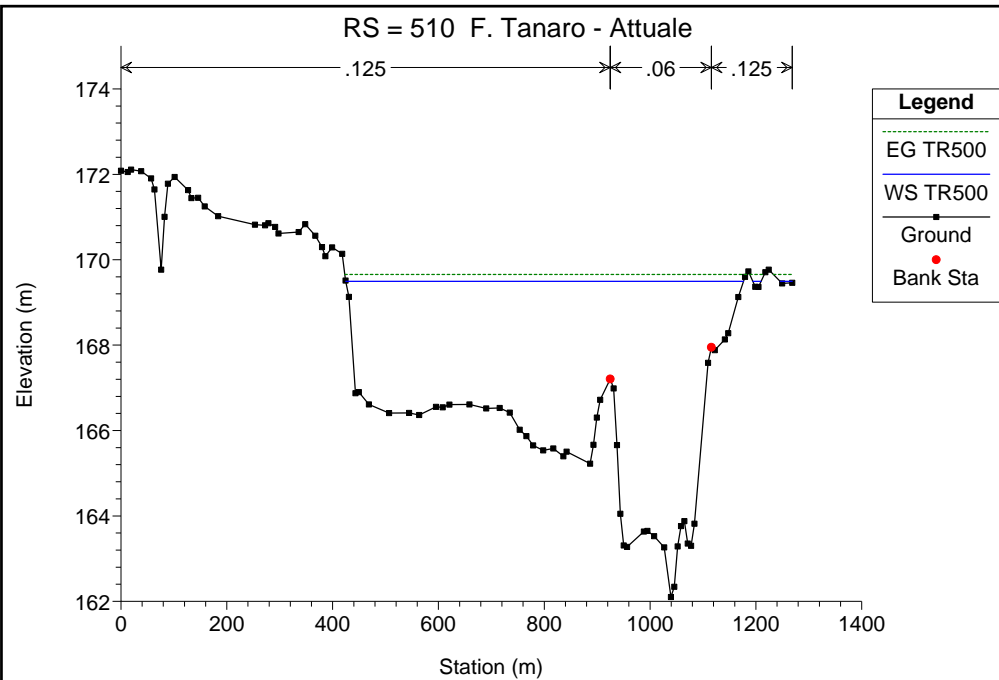
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500 (Continued)

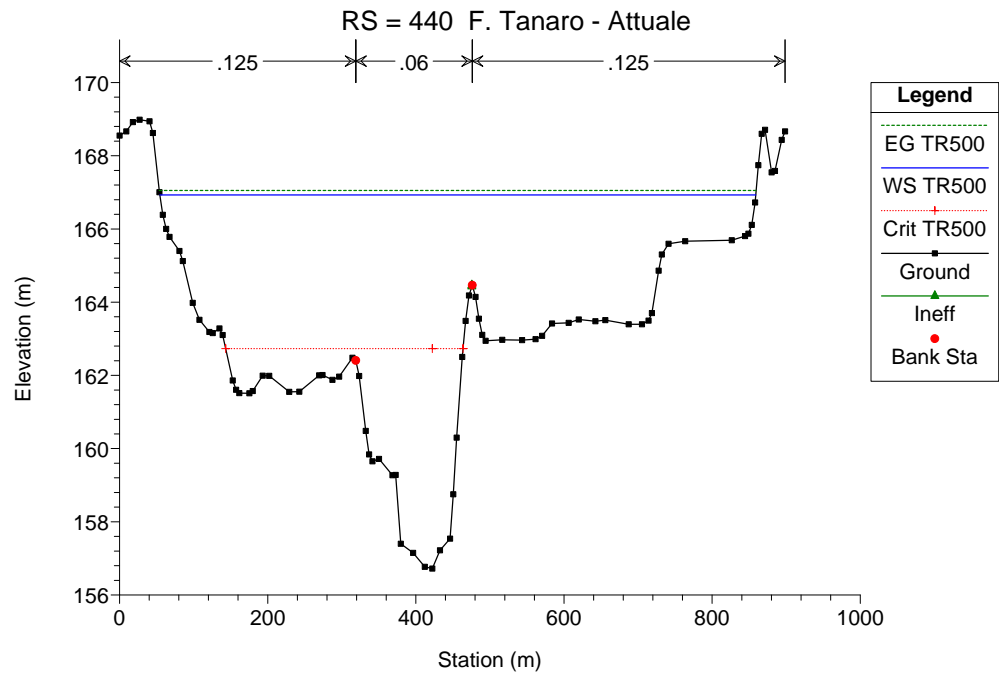
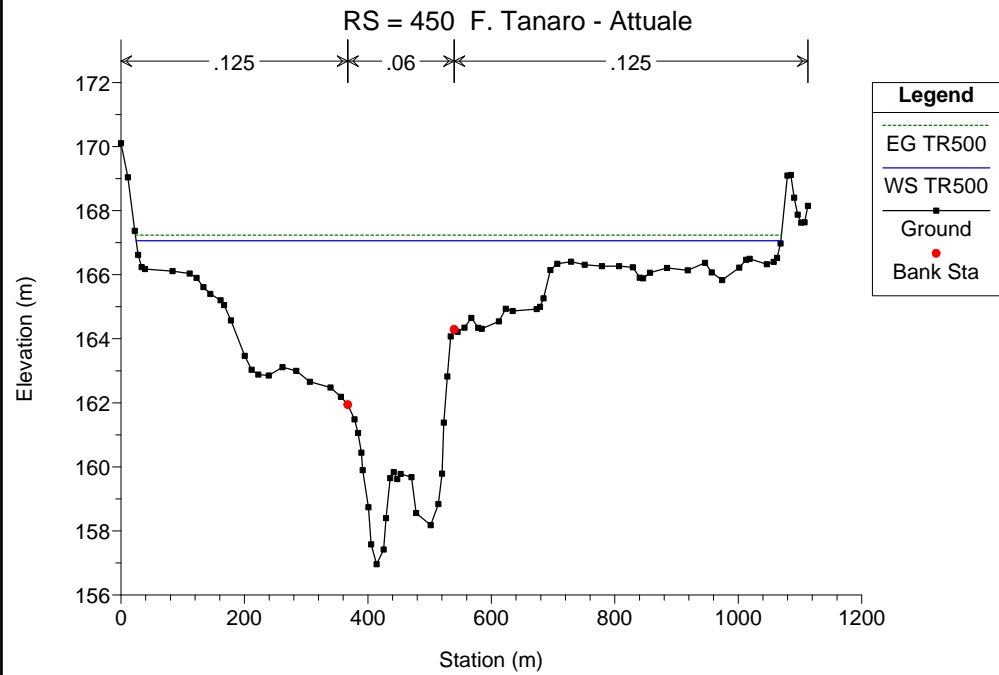
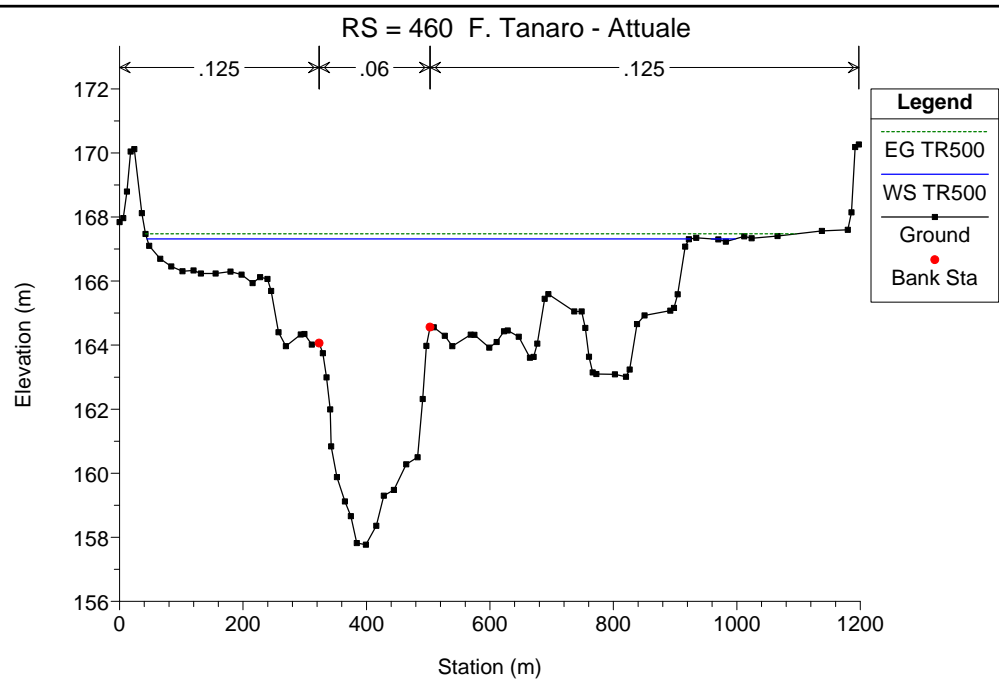
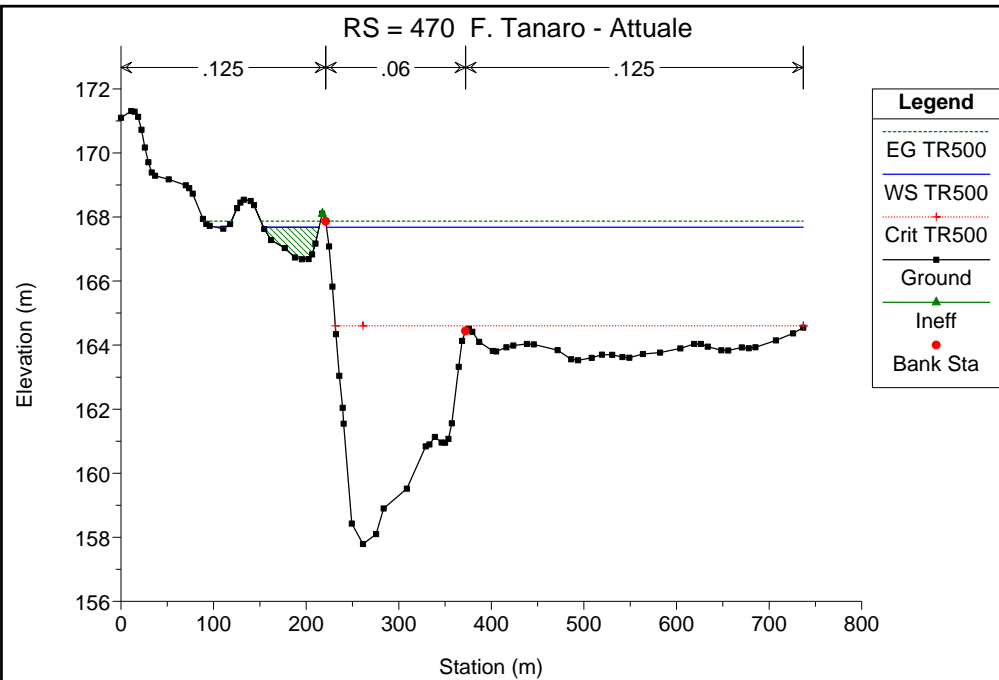
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	TR500	3422.00	146.60	155.29	153.74	155.49	0.001936	2.58	3059.00	1092.32	0.32
1	190	TR500	3422.00	146.85	154.78	152.46	154.97	0.002008	2.24	2981.23	1299.47	0.31
1	180	TR500	3422.00	145.66	154.53	150.74	154.62	0.000750	1.46	3956.46	1444.97	0.19
1	170	TR500	3422.00	145.40	154.20	150.37	154.35	0.001400	1.94	3039.46	1348.10	0.26
1	160	TR500	3422.00	145.46	153.72	150.07	153.87	0.001160	1.87	3157.55	1391.08	0.24
1	150	TR500	3422.00	143.53	153.22	149.36	153.45	0.001481	2.34	2764.20	1343.44	0.28
1	140	TR500	3422.00	143.00	151.86	149.93	152.64	0.006055	3.98	1222.29	1207.93	0.55
1	135		Inl Struct									
1	130	TR500	3422.00	142.54	151.86	147.83	152.17	0.001766	2.60	2175.76	1195.01	0.31
1	120	TR500	3422.00	142.27	151.29	147.26	151.65	0.001921	2.76	1967.75	1072.58	0.32
1	110	TR500	3422.00	141.17	151.00	147.24	151.21	0.001353	2.31	2638.24	765.70	0.27
1	100	TR500	3422.00	140.79	150.45	147.31	150.76	0.002287	2.60	1790.89	577.54	0.34
1	90	TR500	3422.00	140.59	149.21	146.00	149.79	0.004177	3.37	1015.62	189.29	0.45
1	85		Bridge									
1	80	TR500	3422.00	140.59	148.87	146.00	149.52	0.004590	3.57	957.31	175.93	0.47
1	70	TR500	3422.00	139.61	147.89	145.27	148.31	0.003625	3.08	1405.92	317.89	0.42
1	60	TR500	3422.00	138.12	147.45	143.71	147.71	0.001630	2.56	2424.15	951.28	0.30
1	50	TR500	3422.00	137.54	146.87	144.48	147.25	0.002511	3.08	2087.31	961.97	0.37
1	40	TR500	3422.00	137.06	146.08	143.40	146.43	0.002875	2.67	1441.41	818.36	0.37
1	30	TR500	3422.00	137.37	145.51	142.29	145.76	0.002000	2.36	2157.78	909.01	0.32
1	20	TR500	3422.00	136.62	144.92	142.10	145.16	0.001818	2.53	2584.10	1133.53	0.31
1	10	TR500	3422.00	135.29	143.96	142.85	144.43	0.004002	3.58	1861.45	669.69	0.45

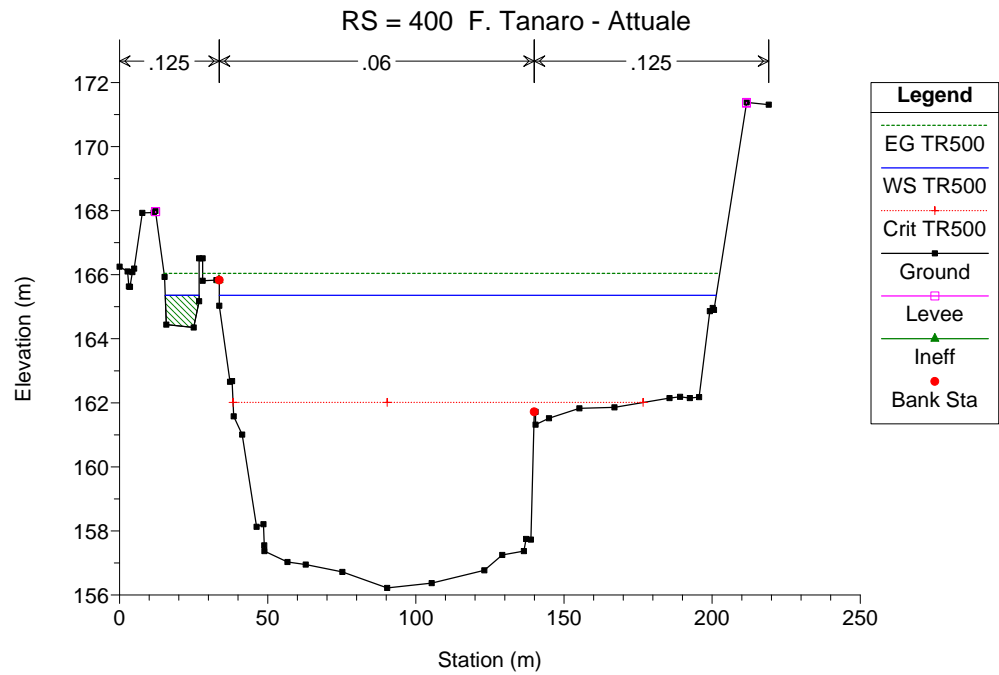
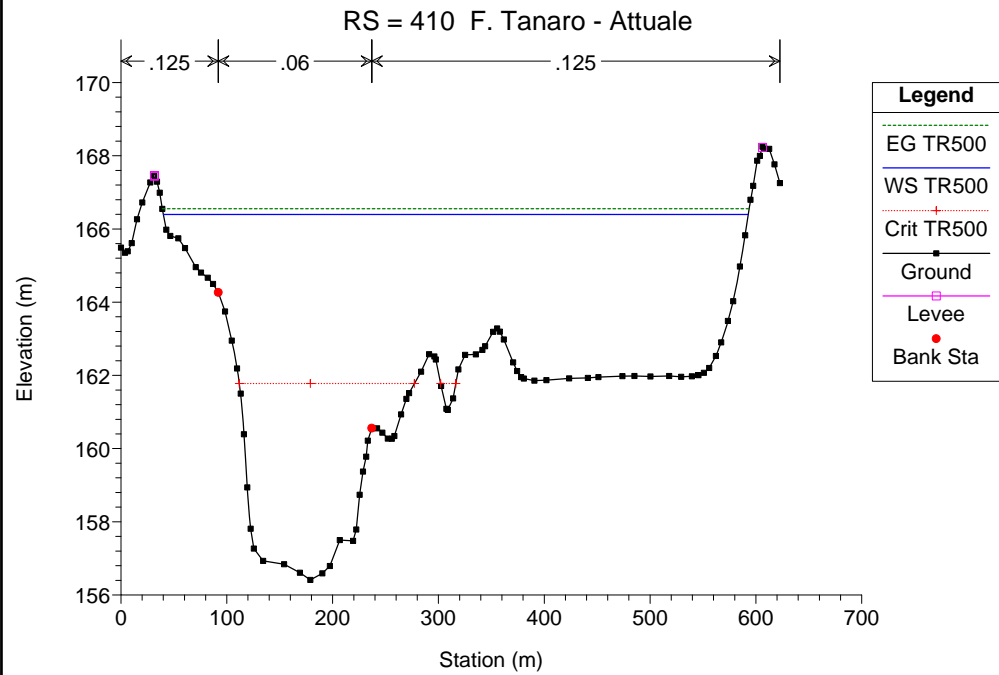
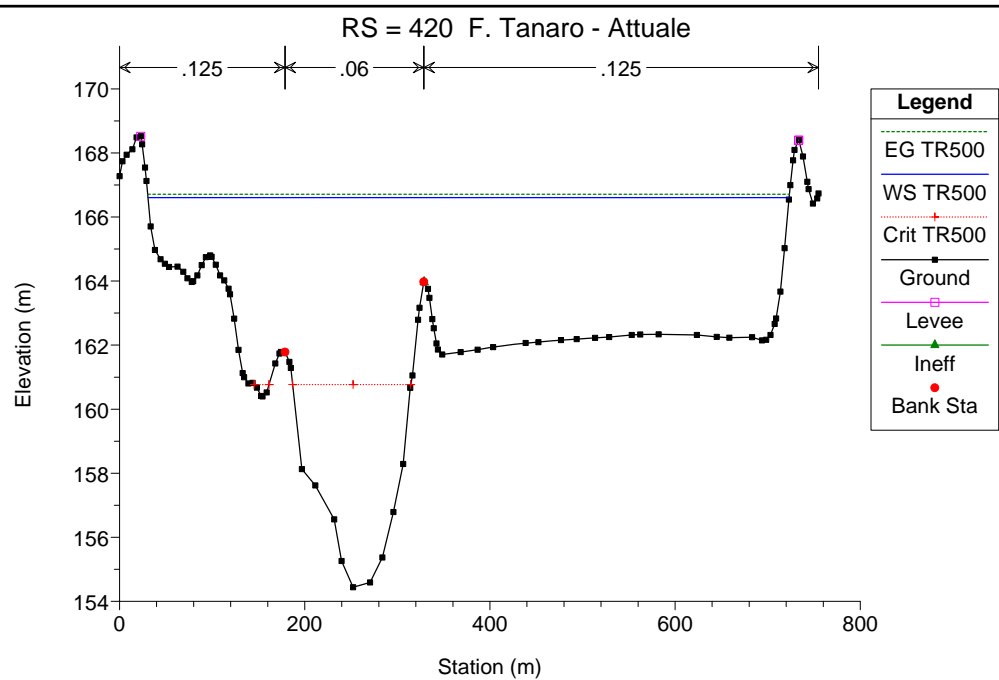
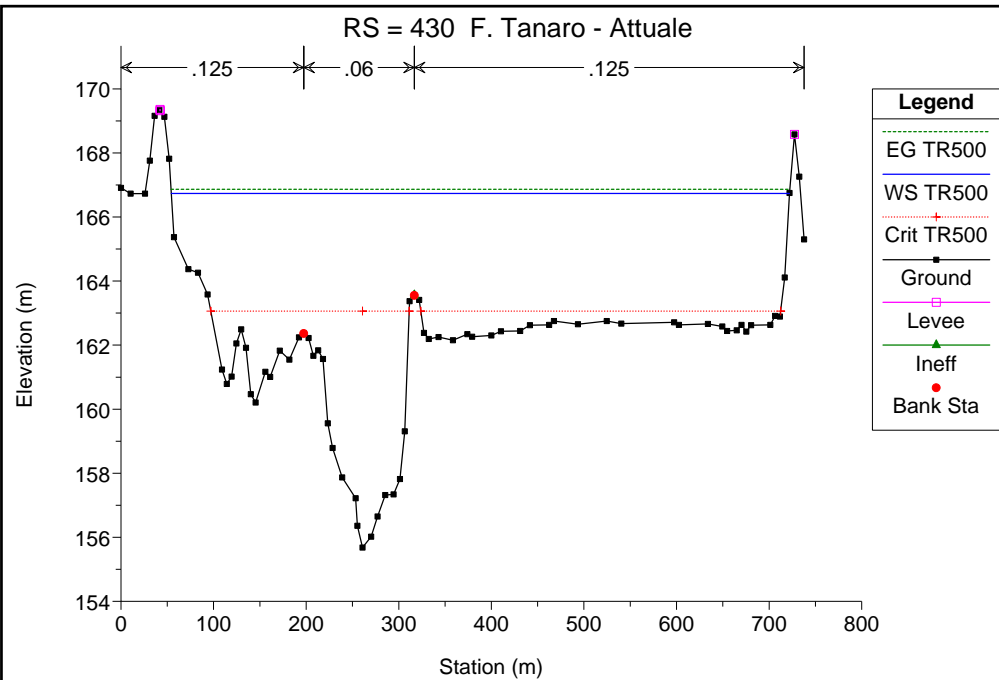
F. Tanaro - Attuale

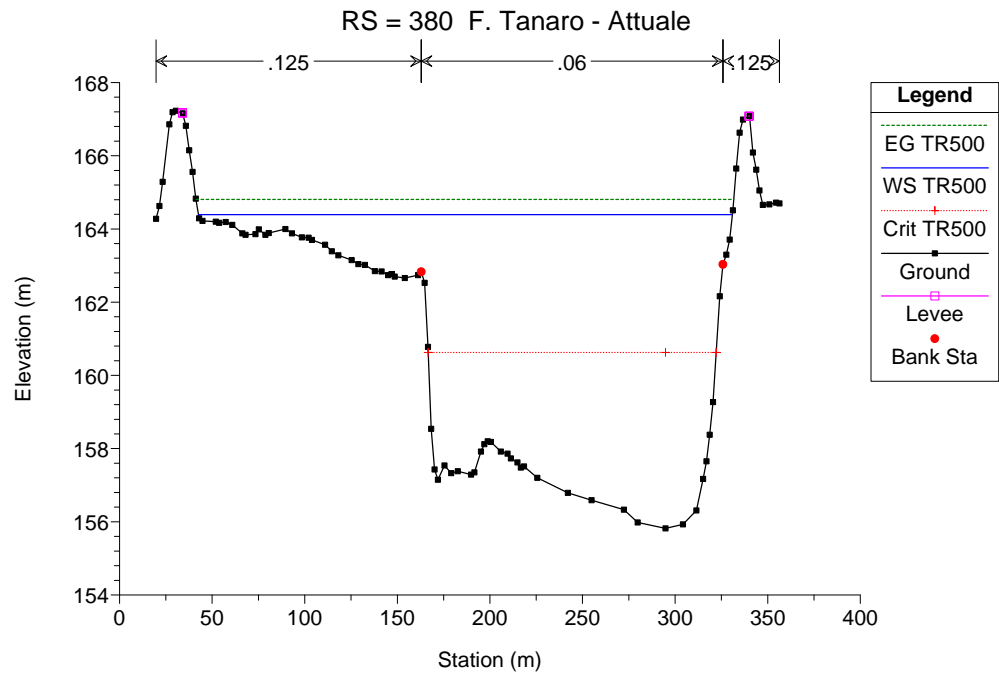
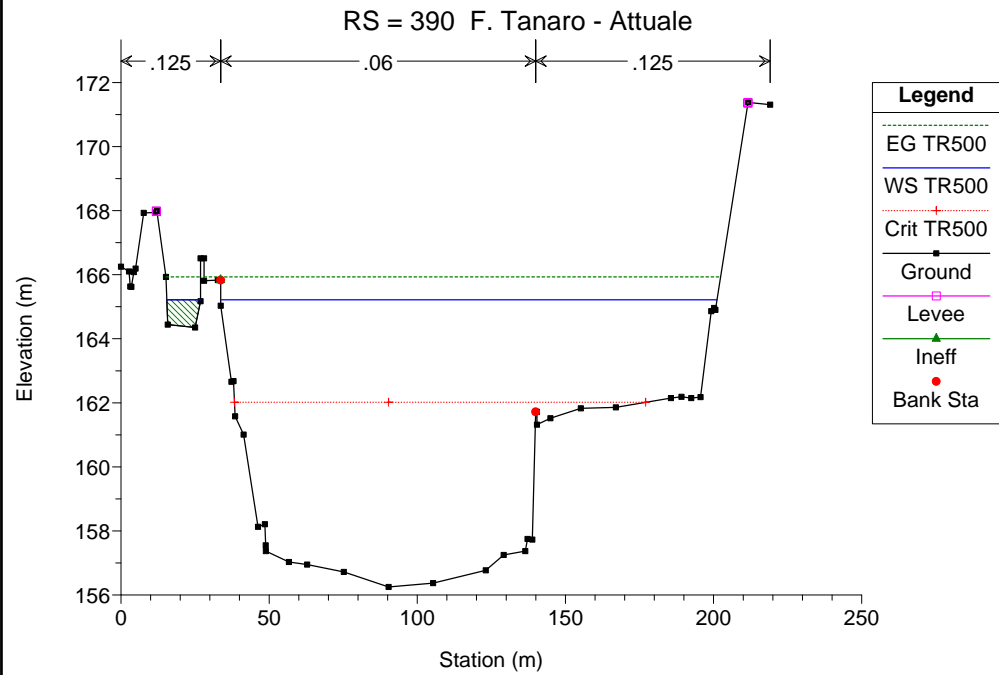
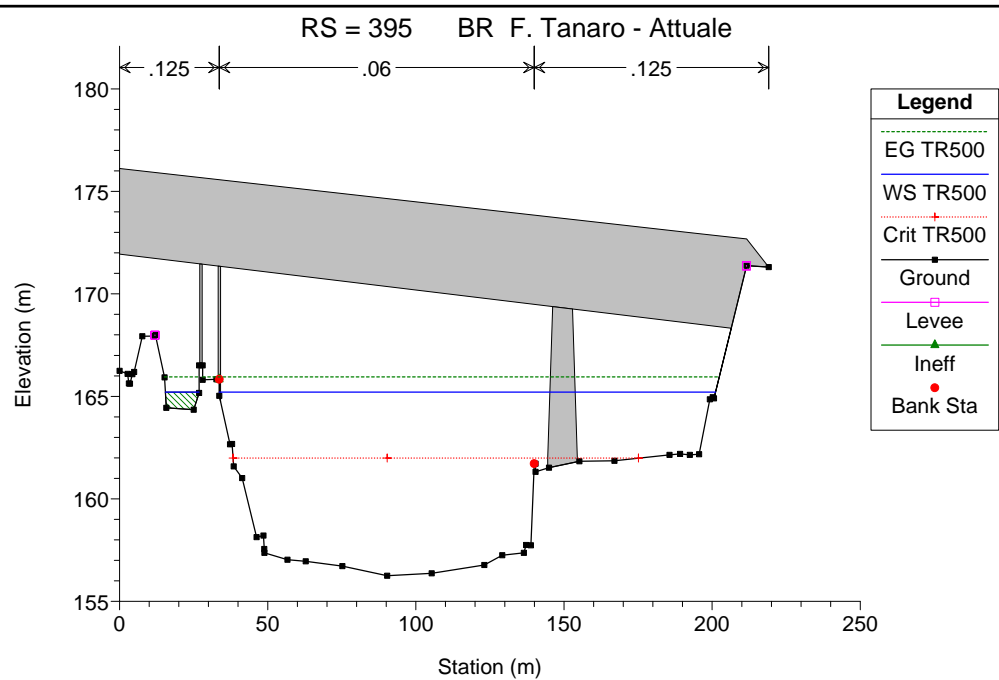
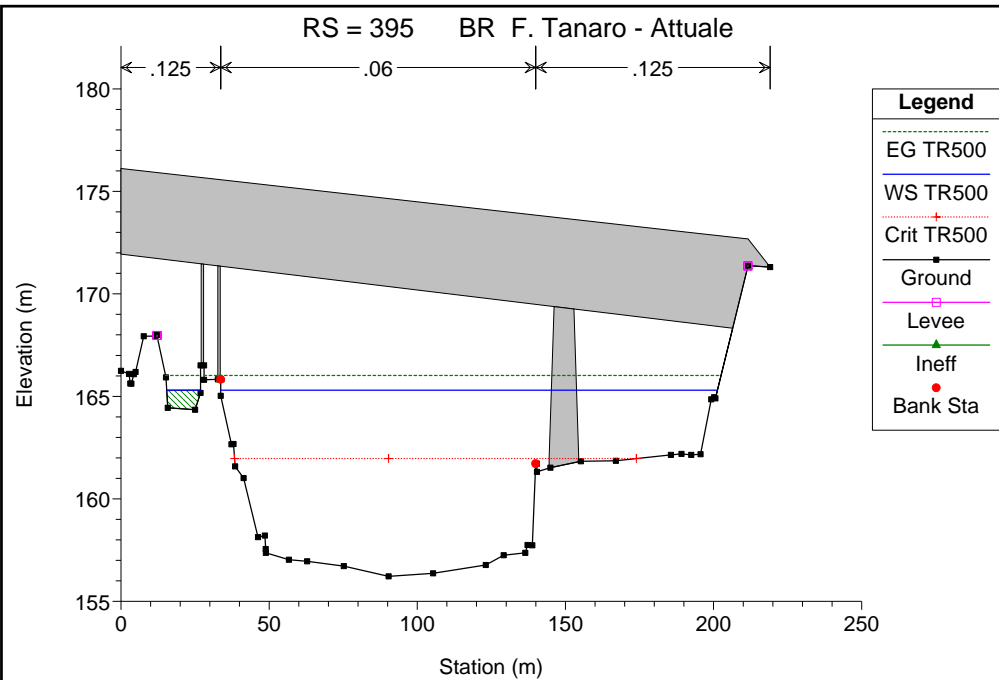


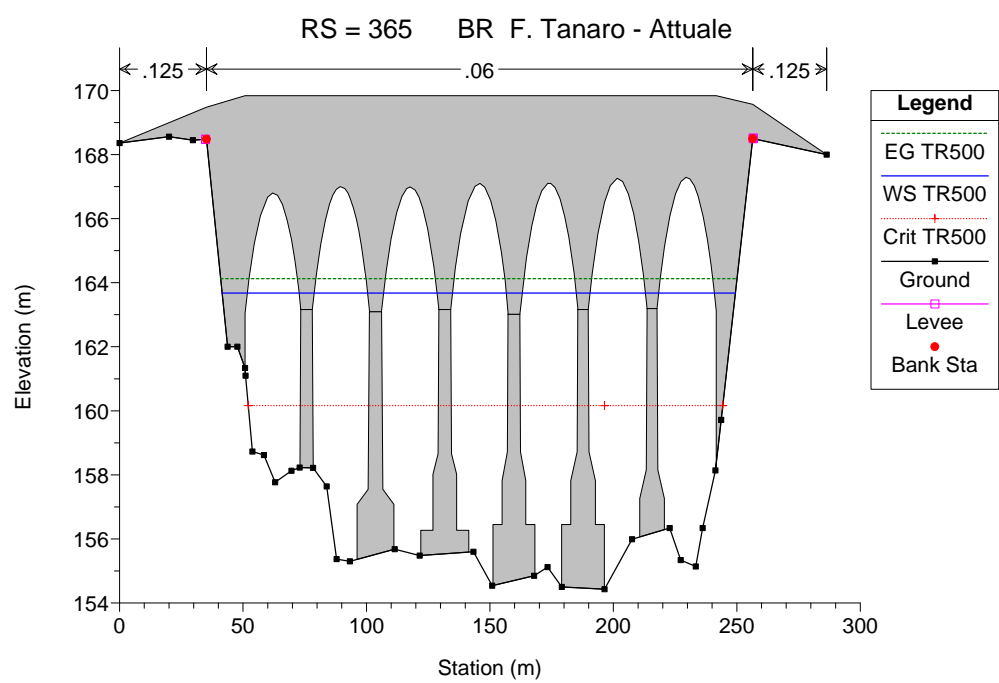
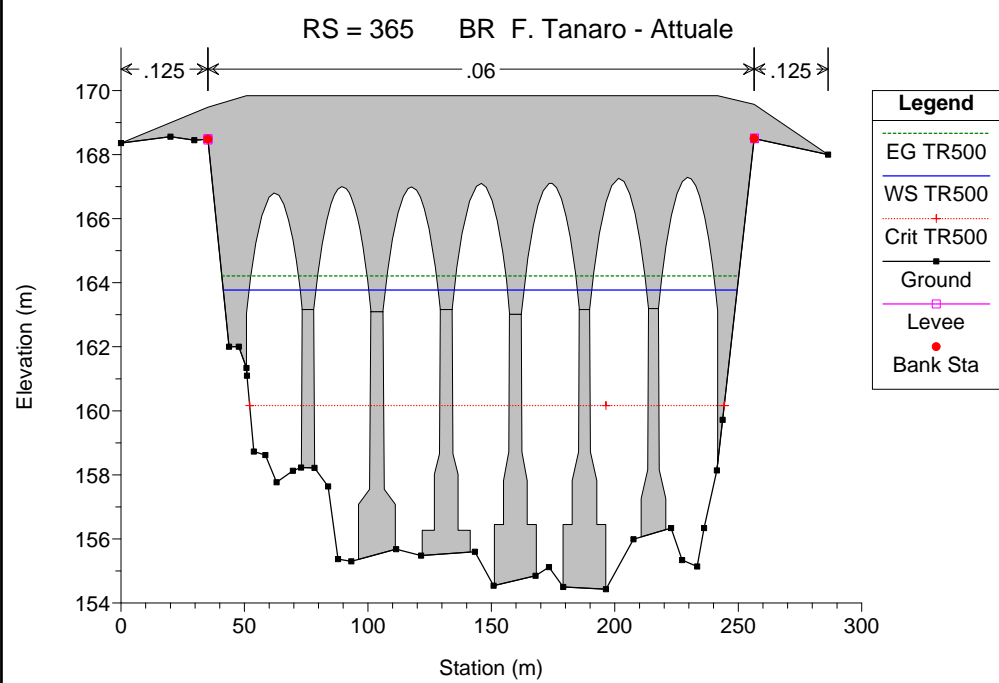
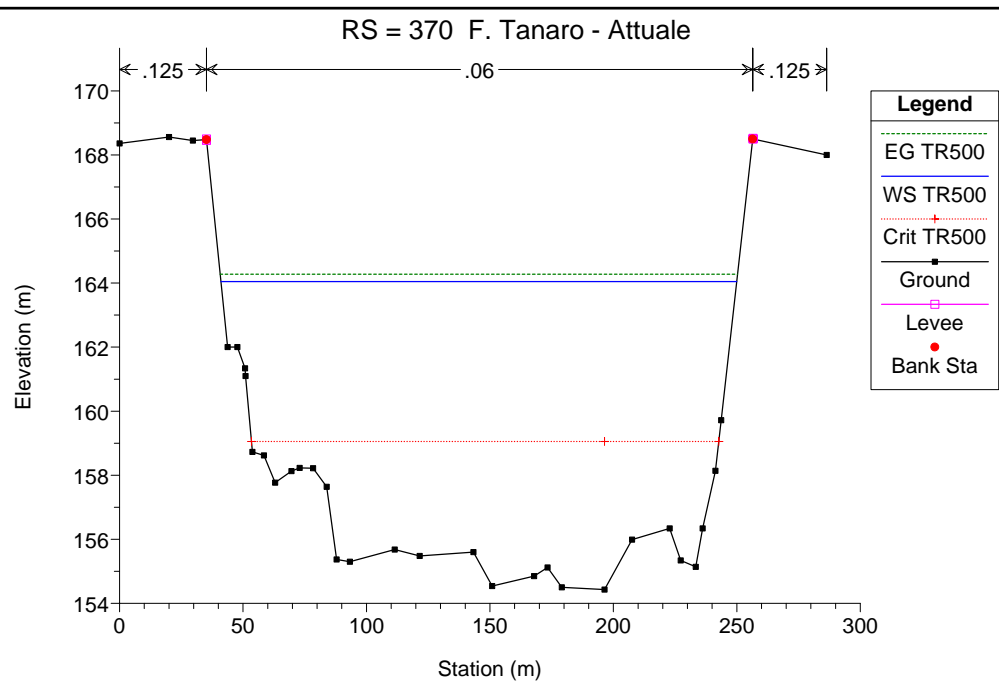
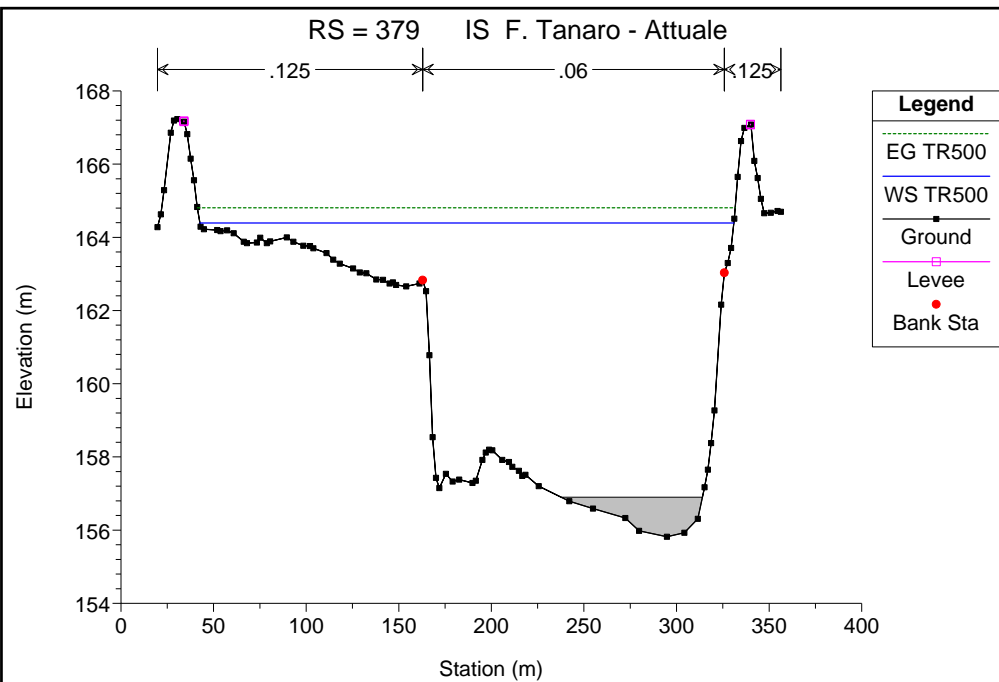


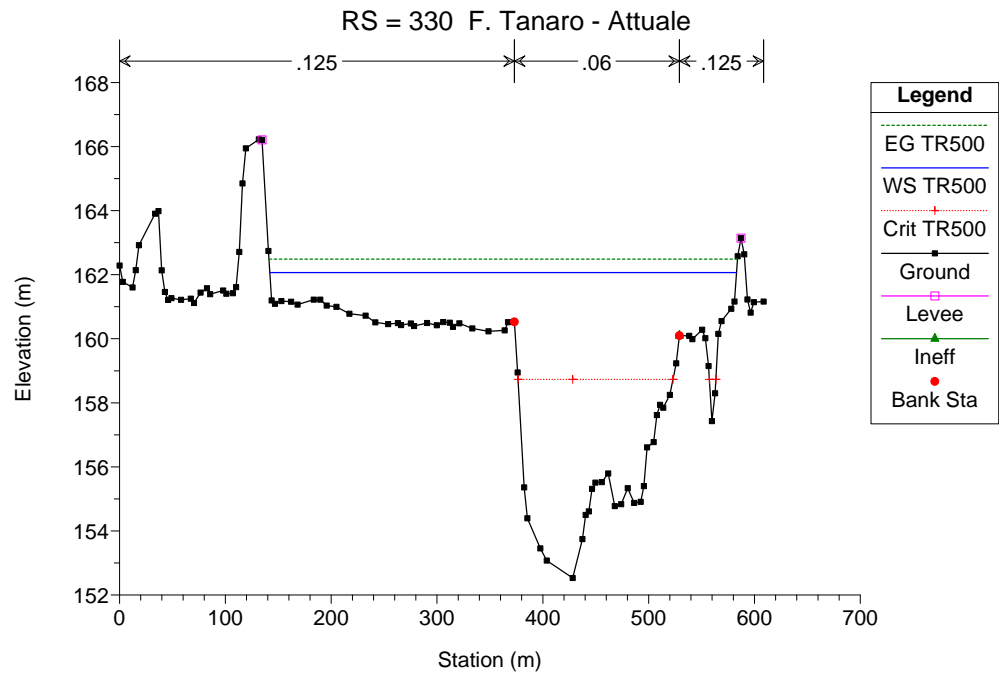
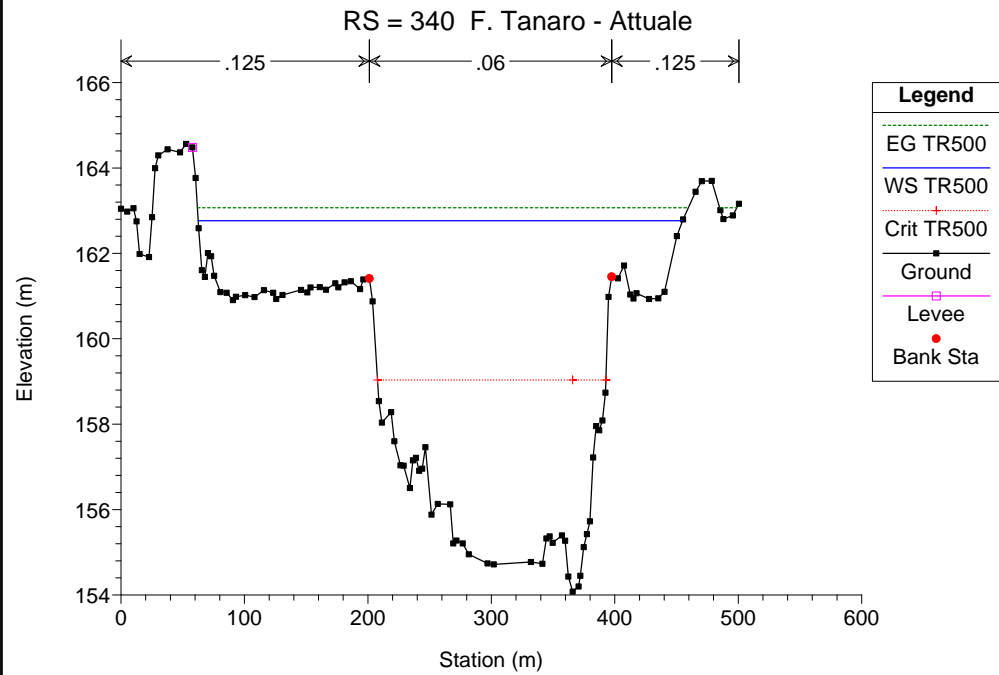
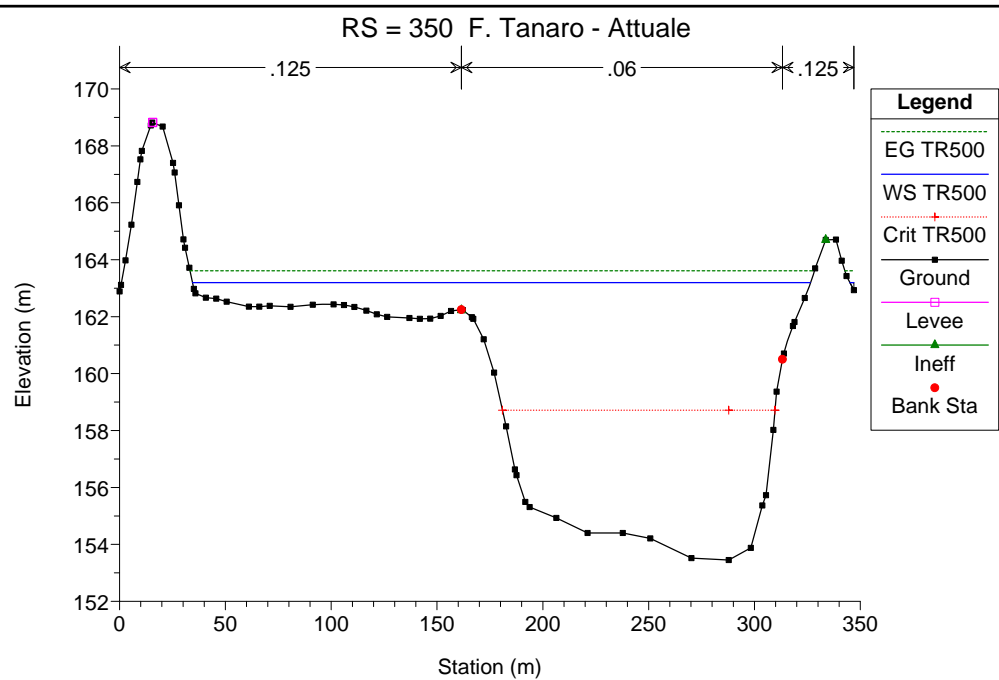
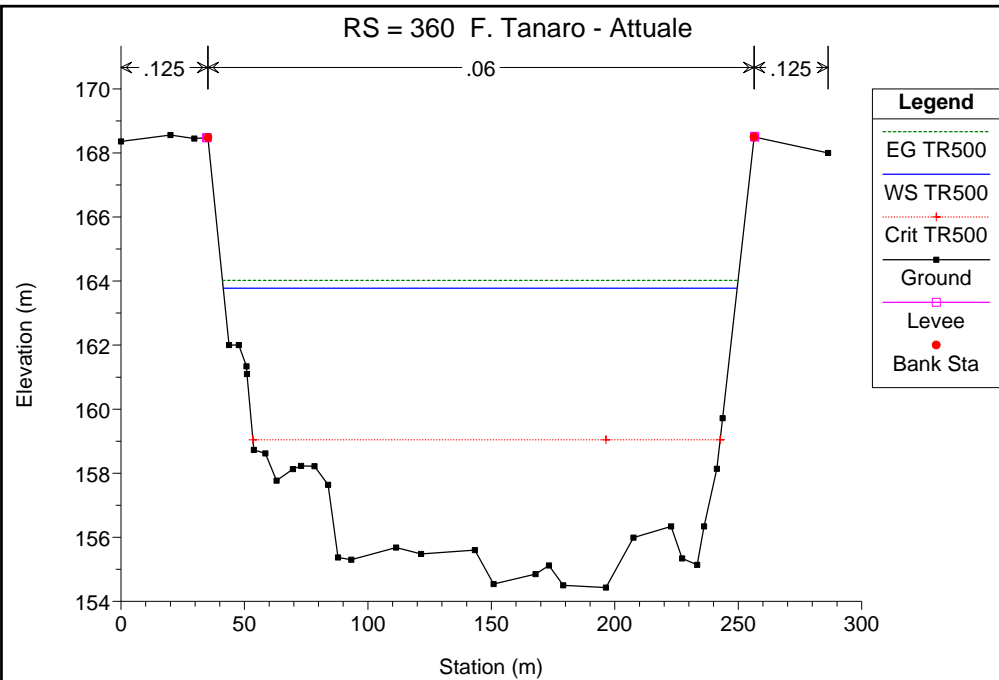


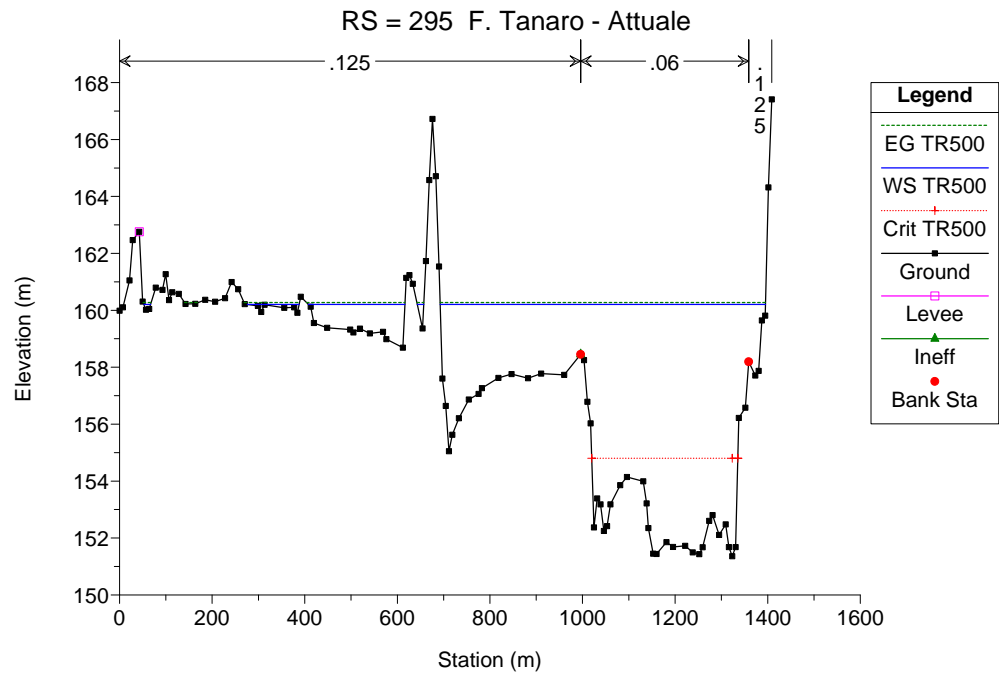
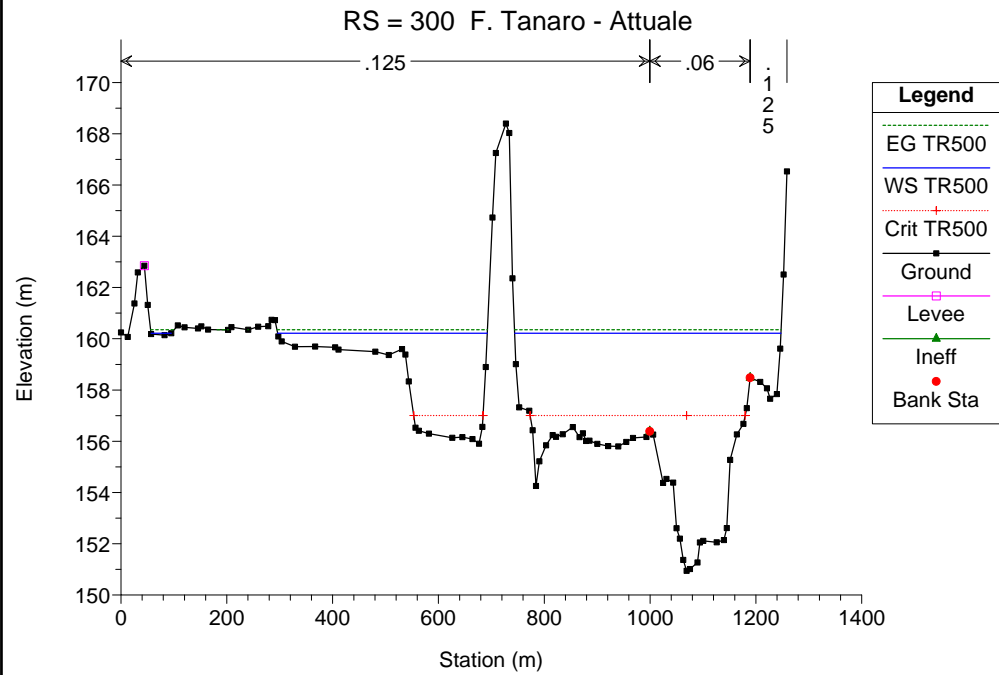
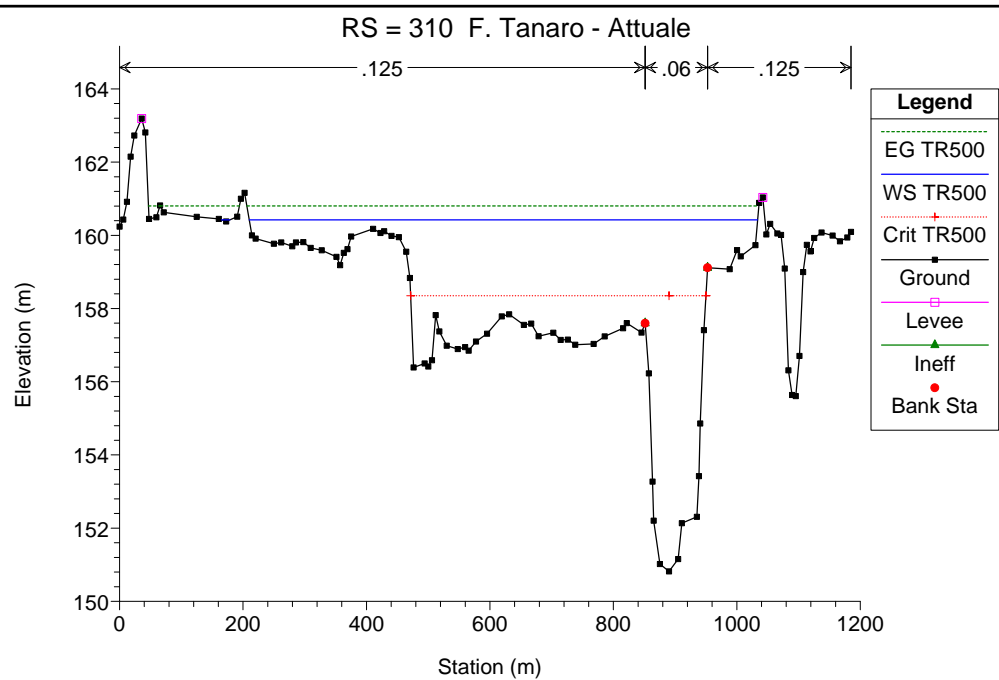
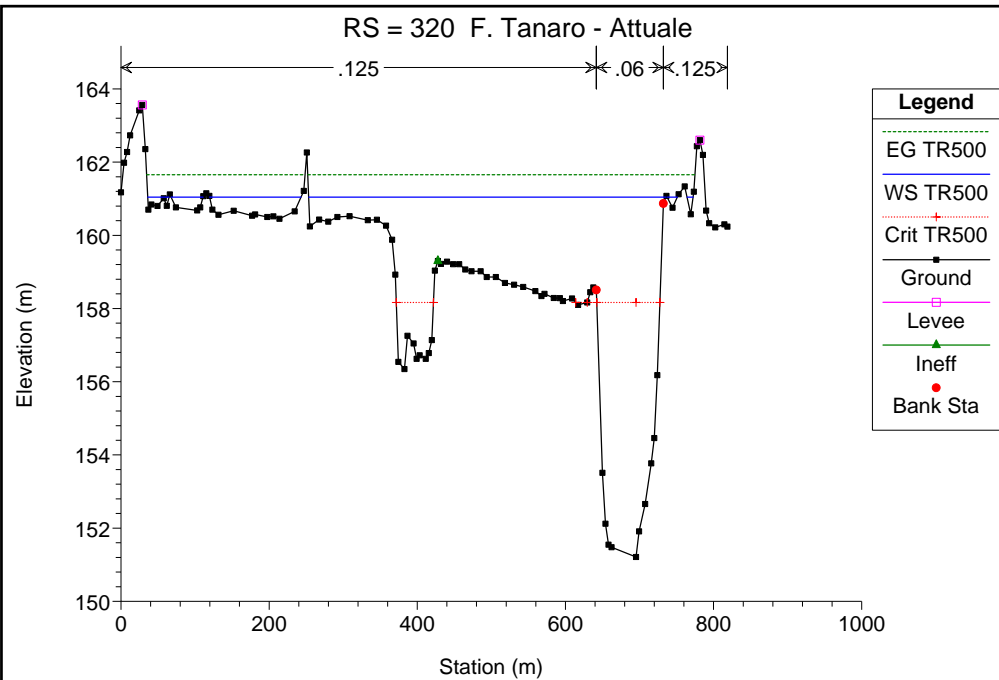


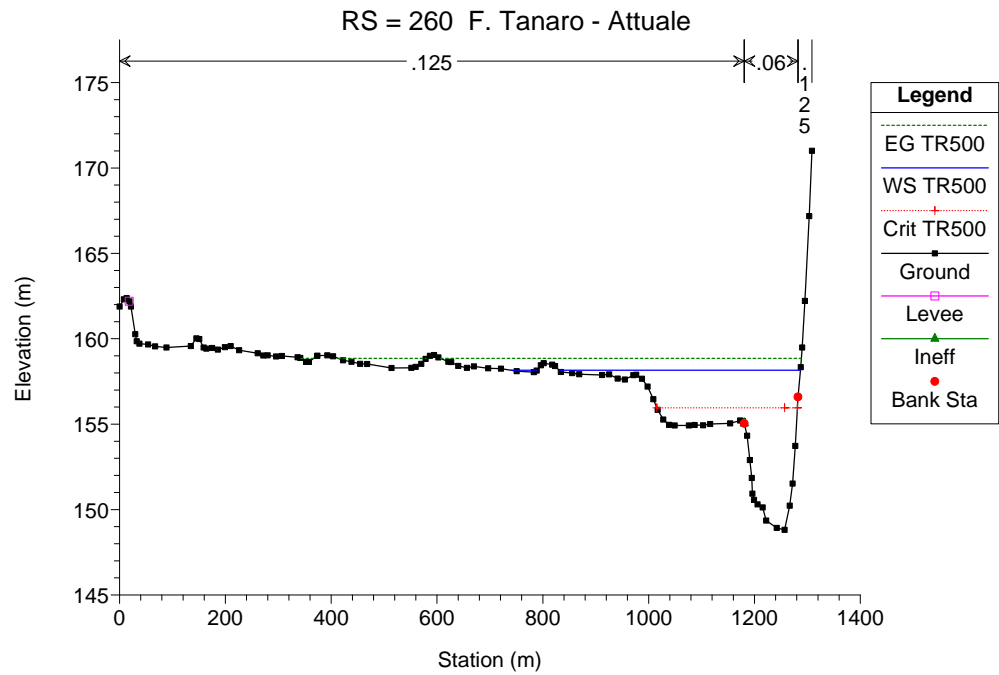
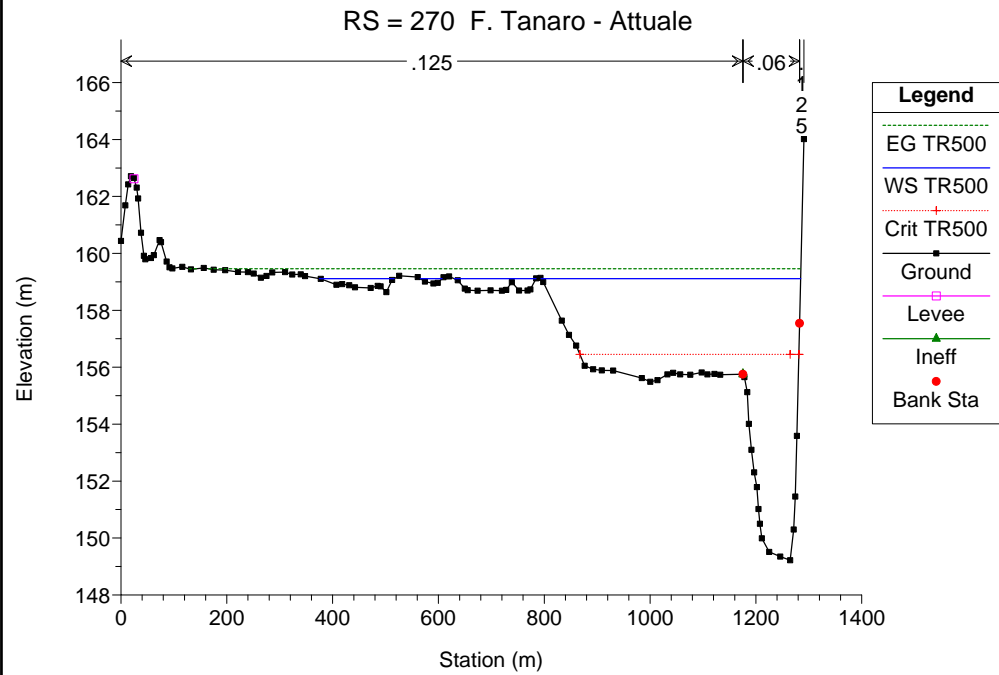
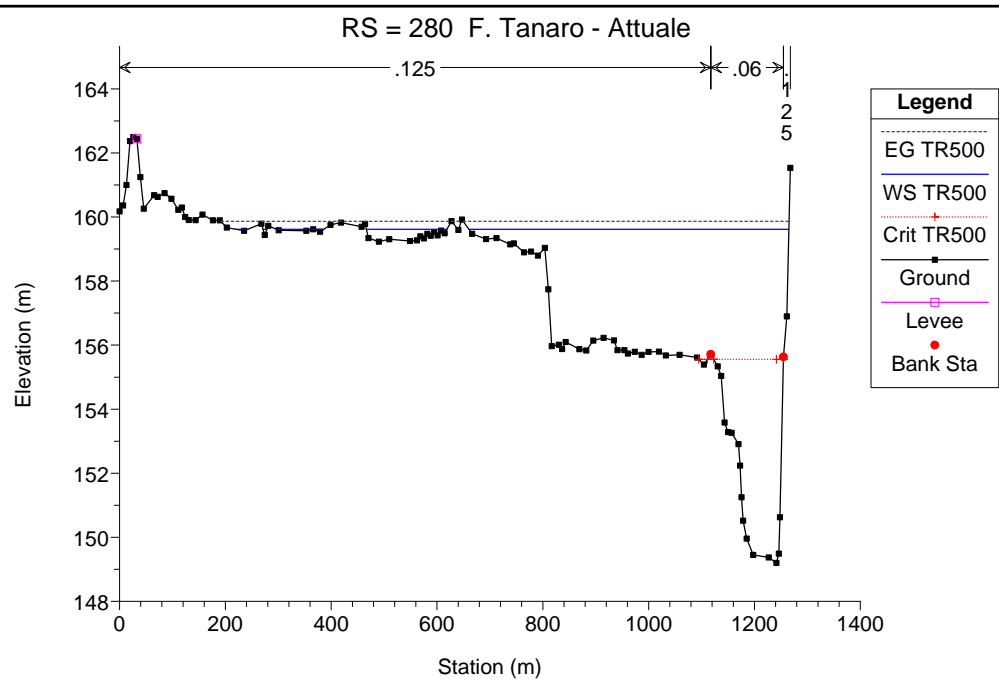
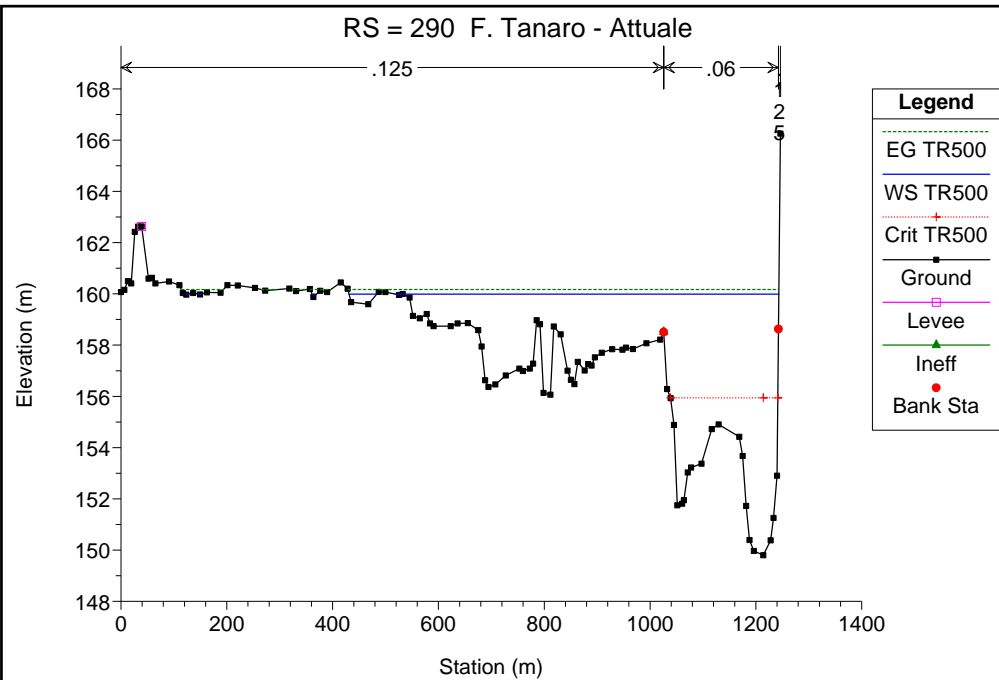


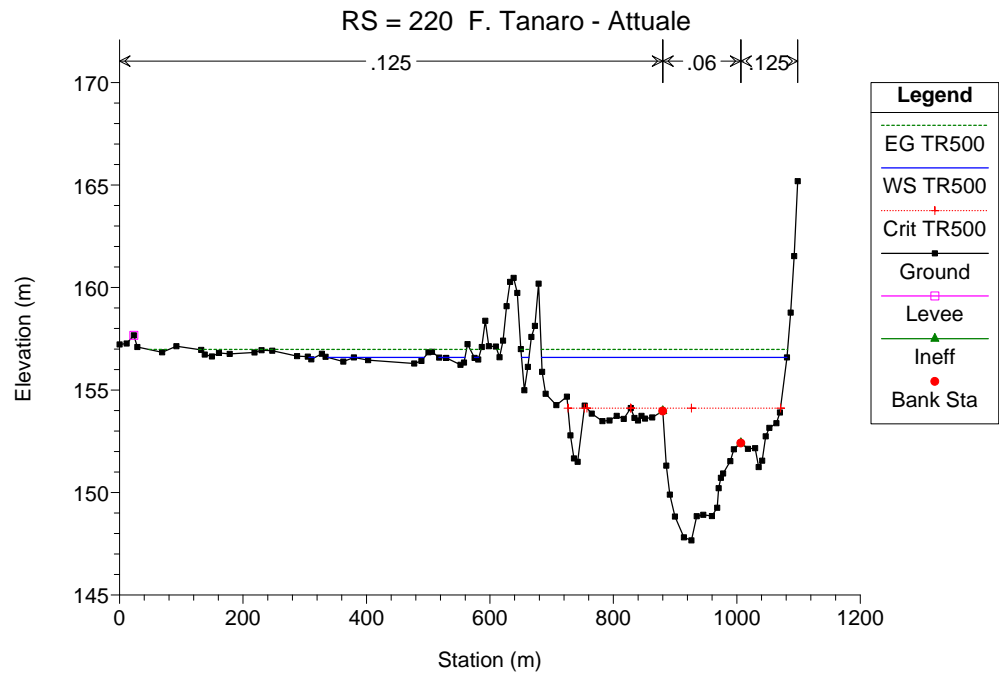
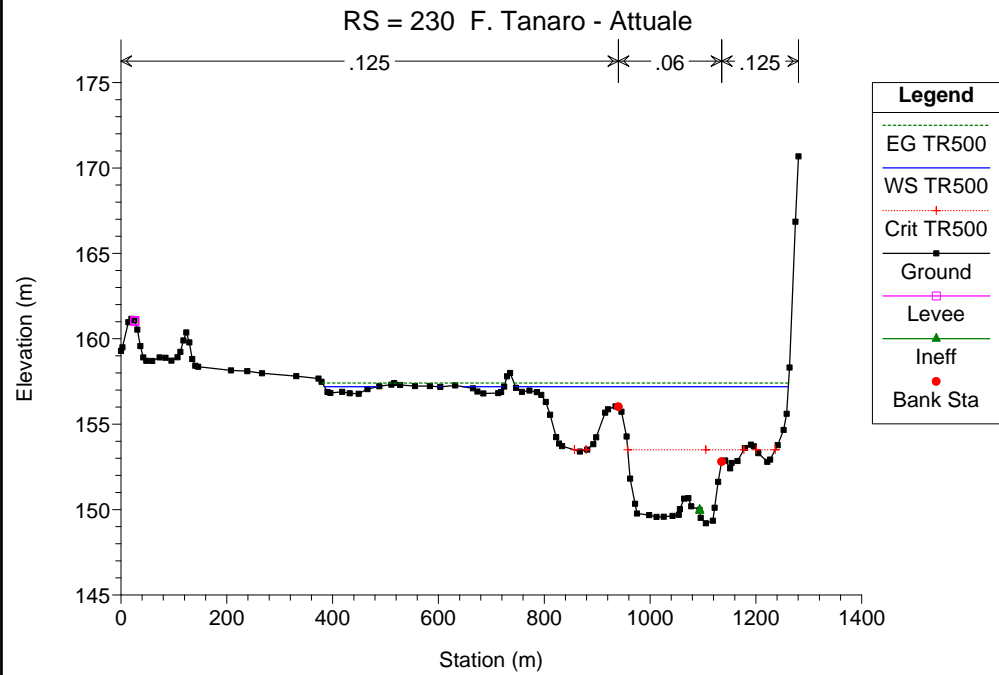
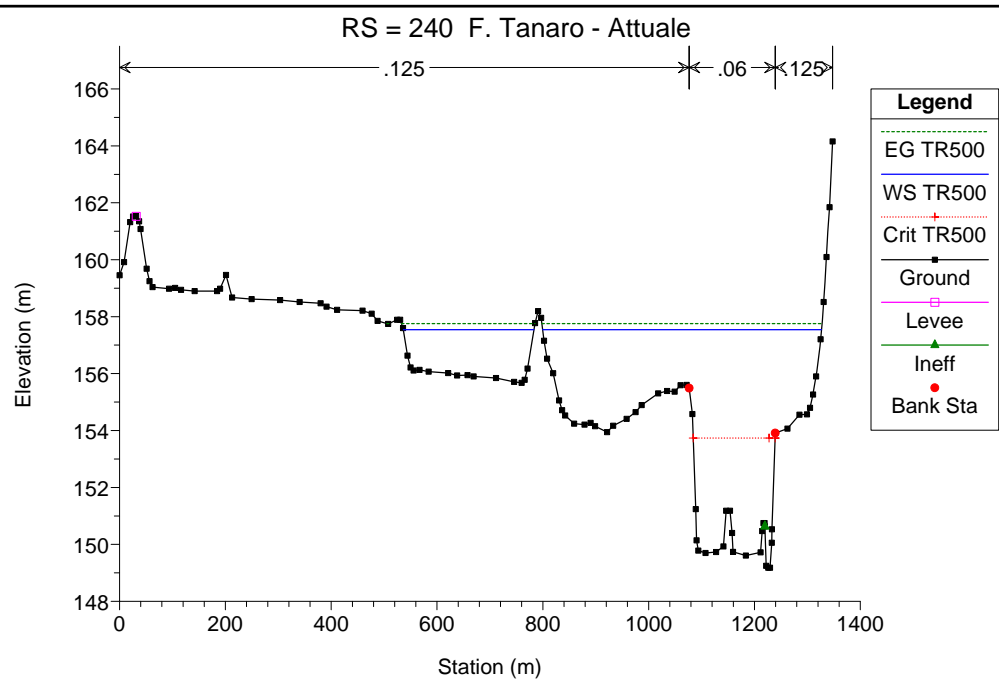
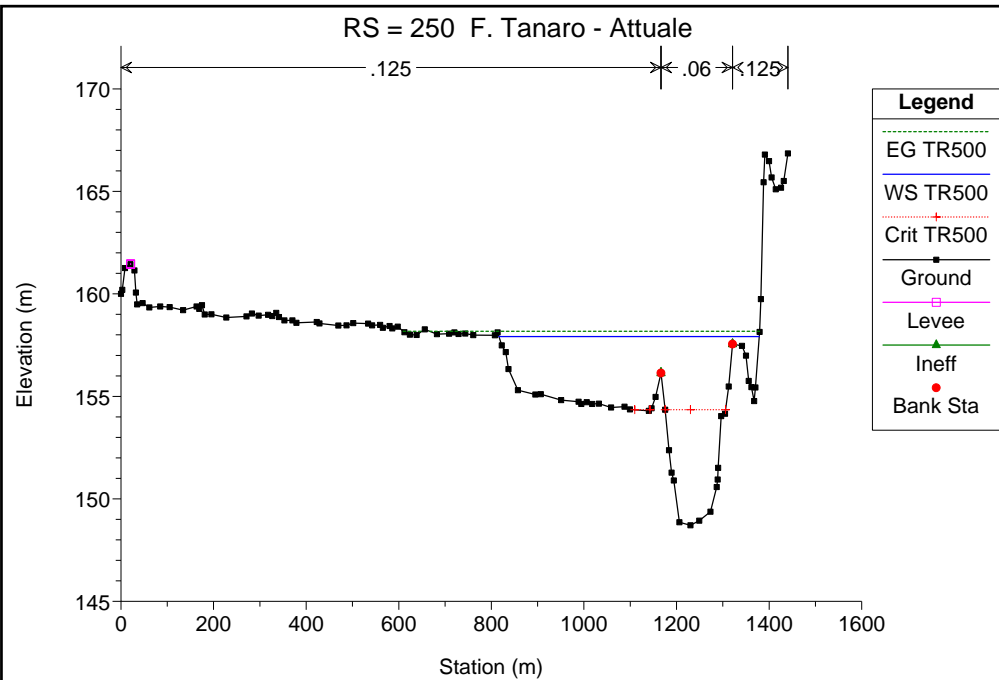


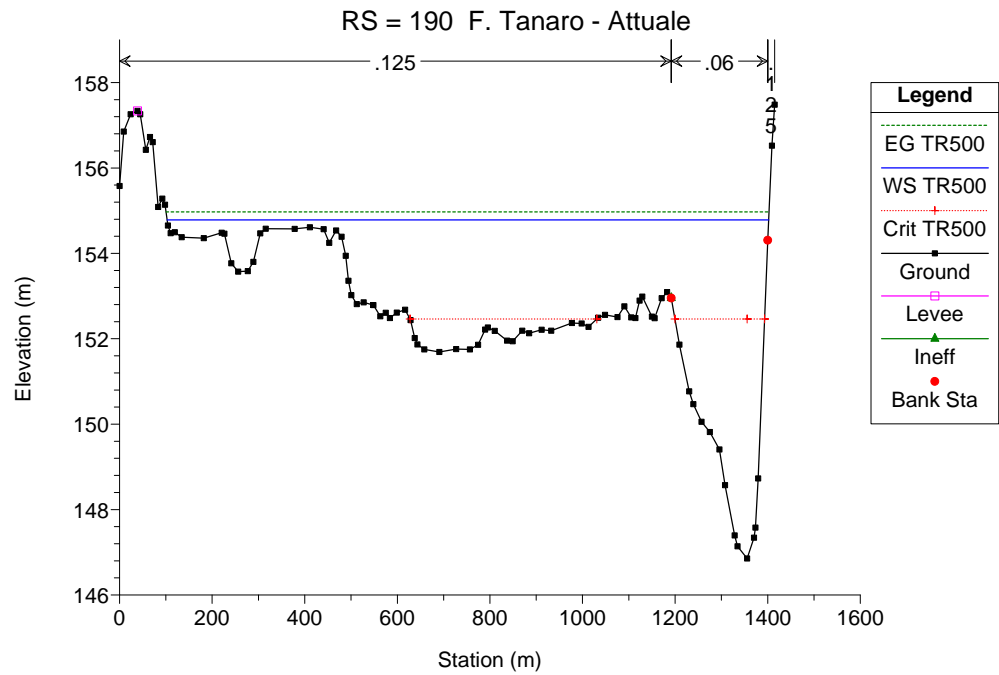
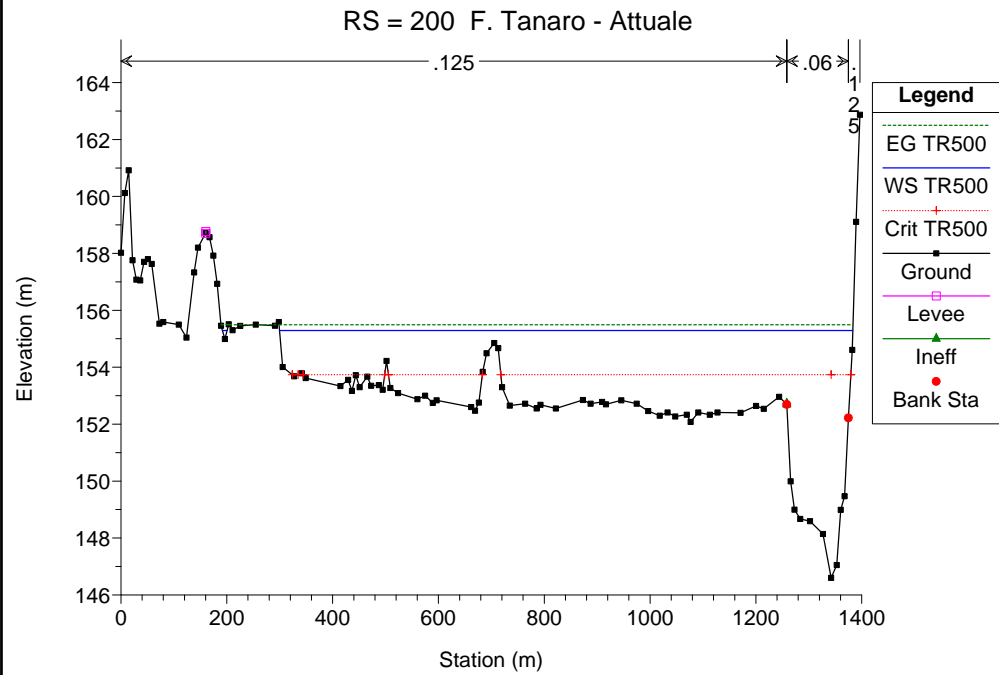
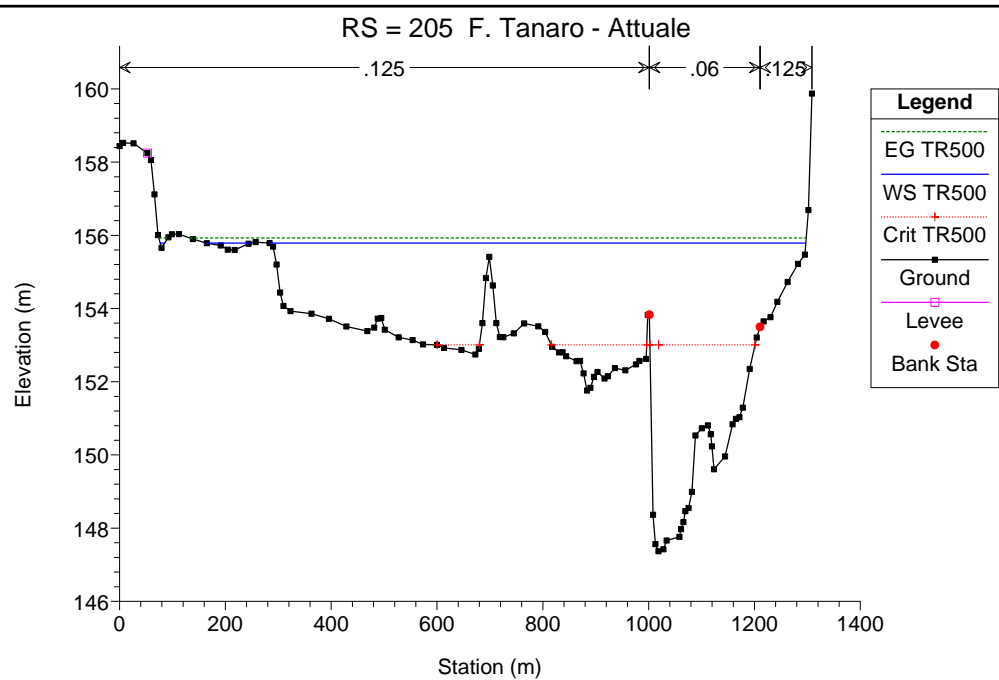
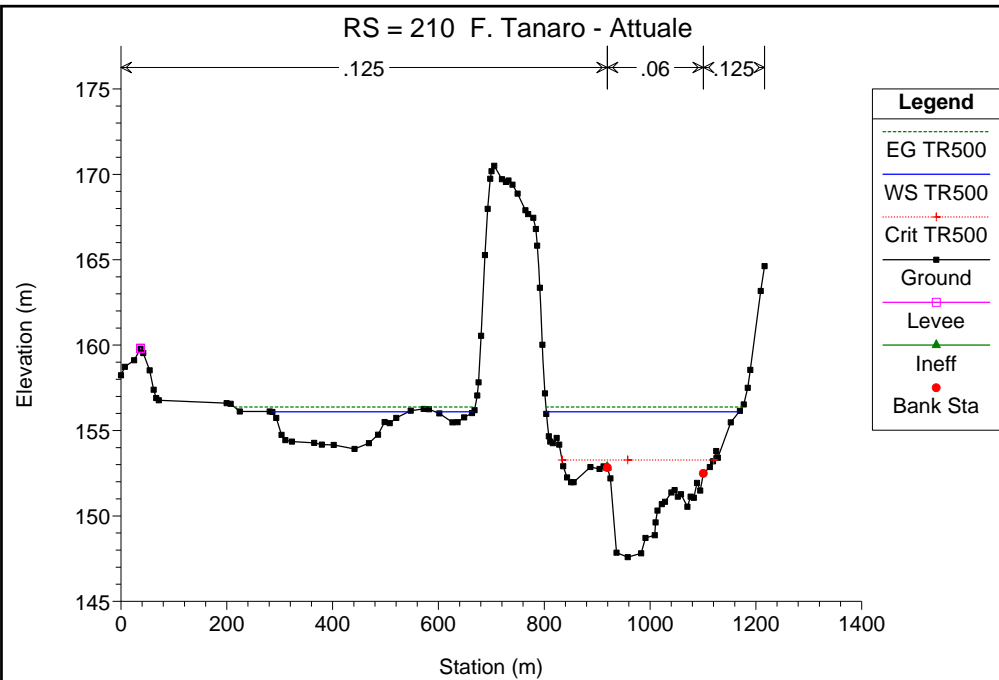


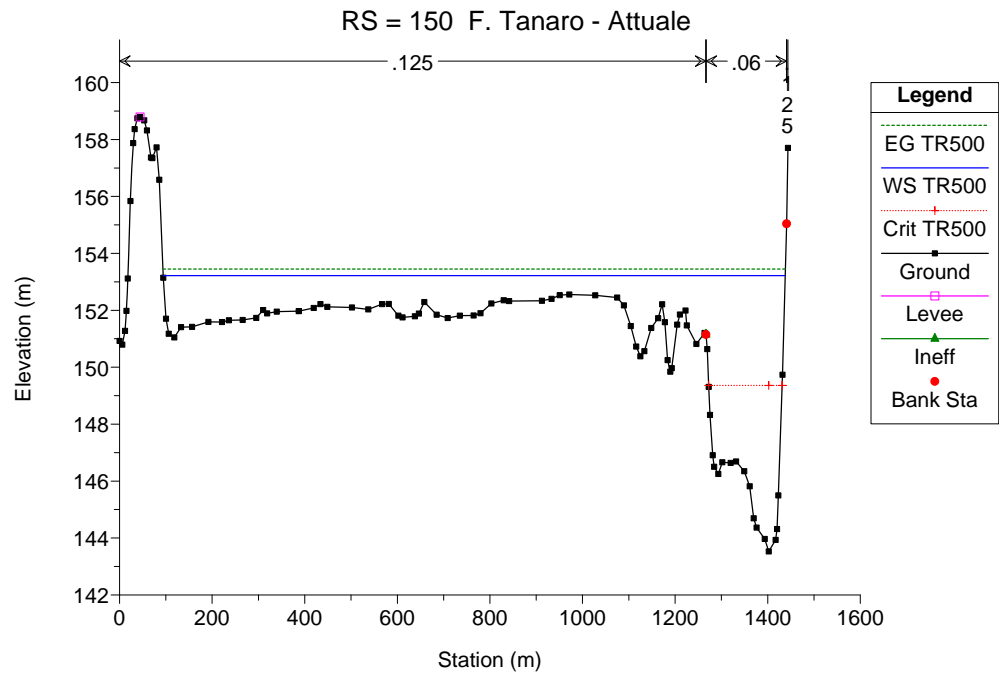
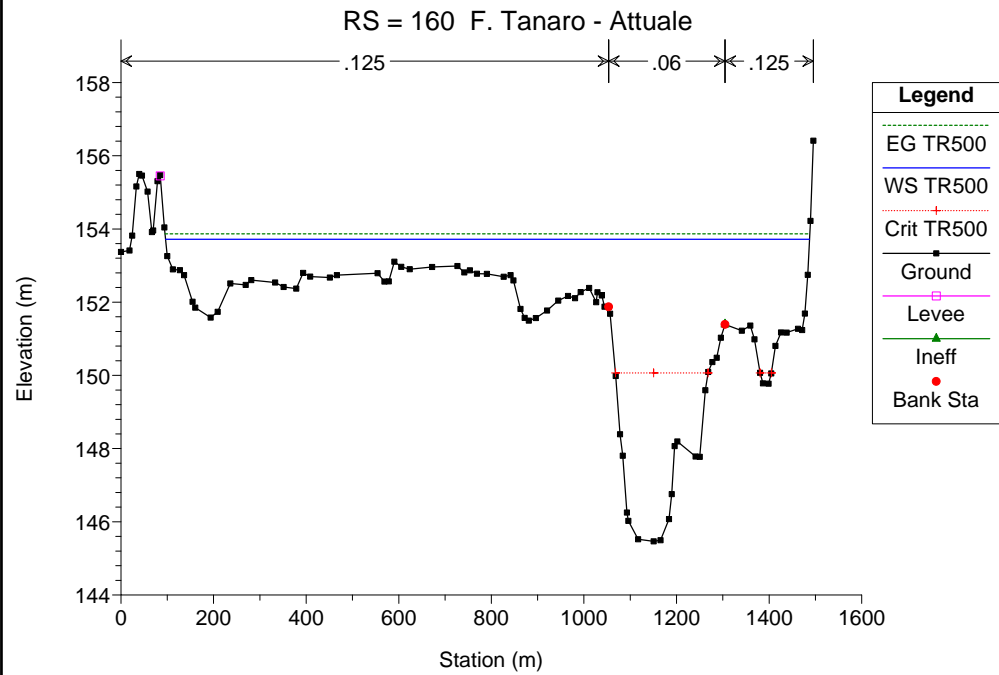
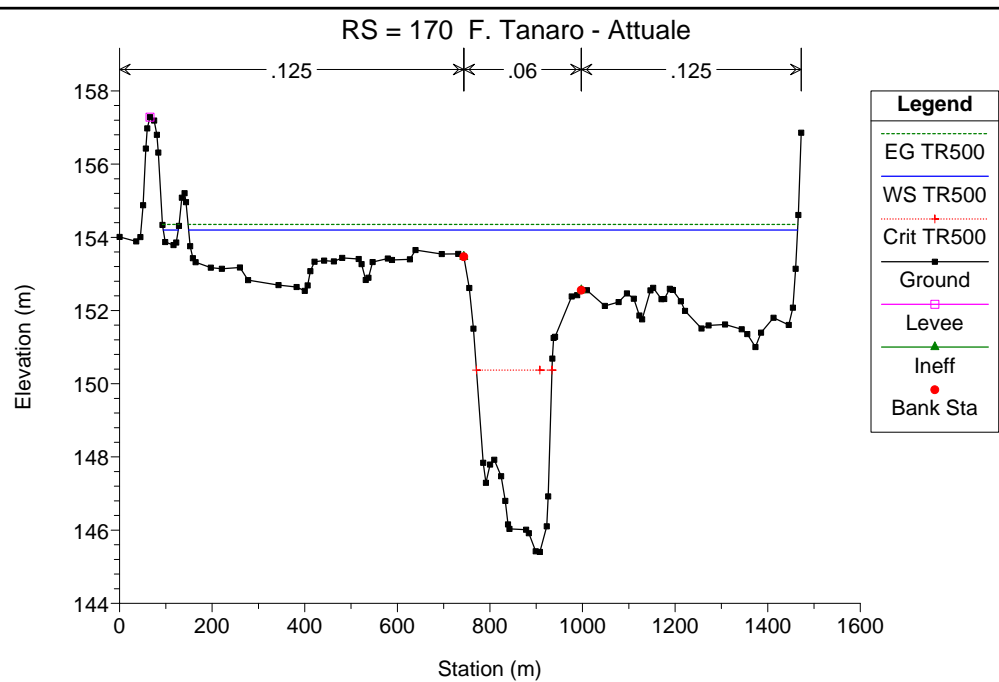
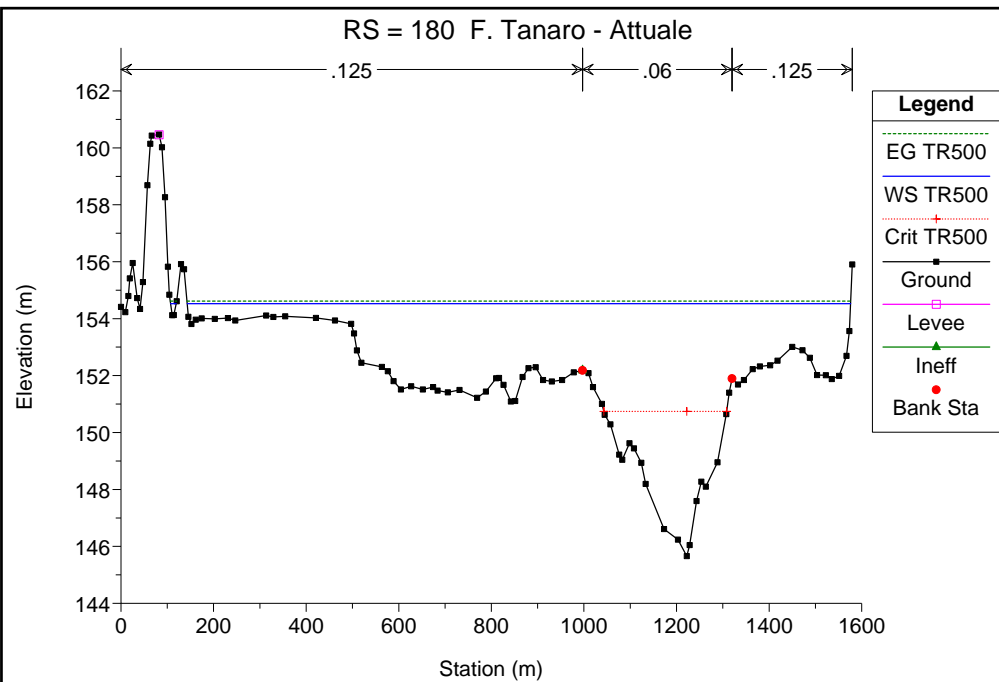


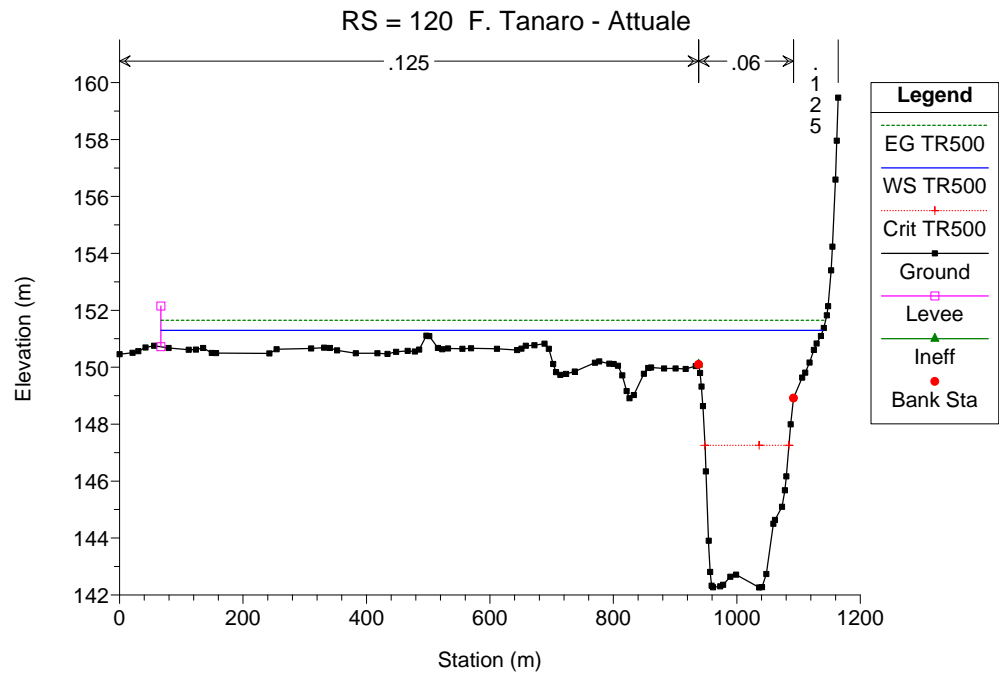
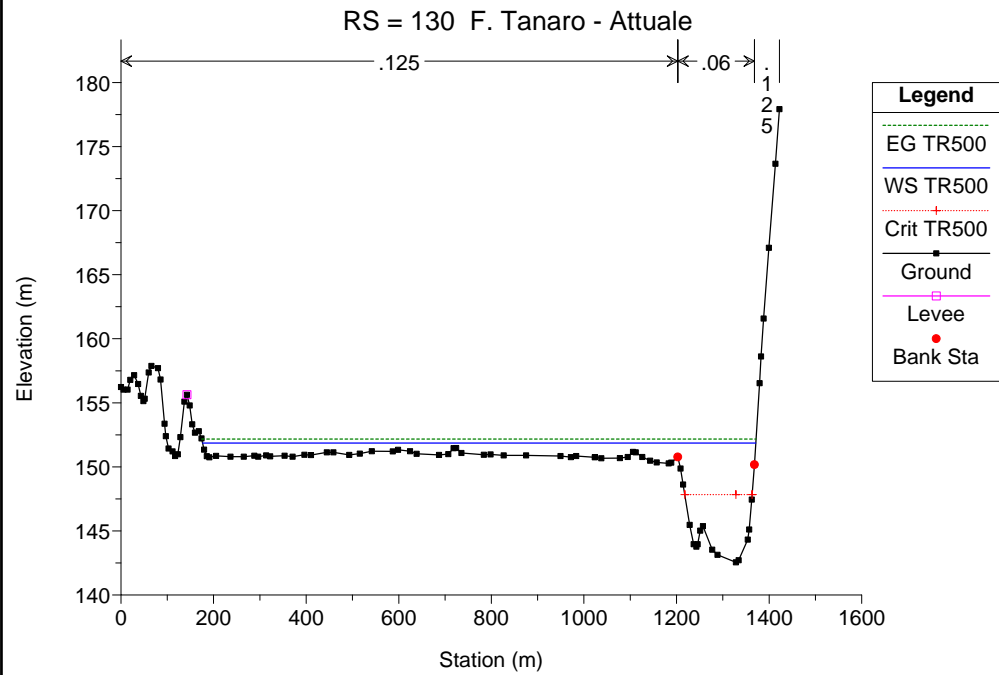
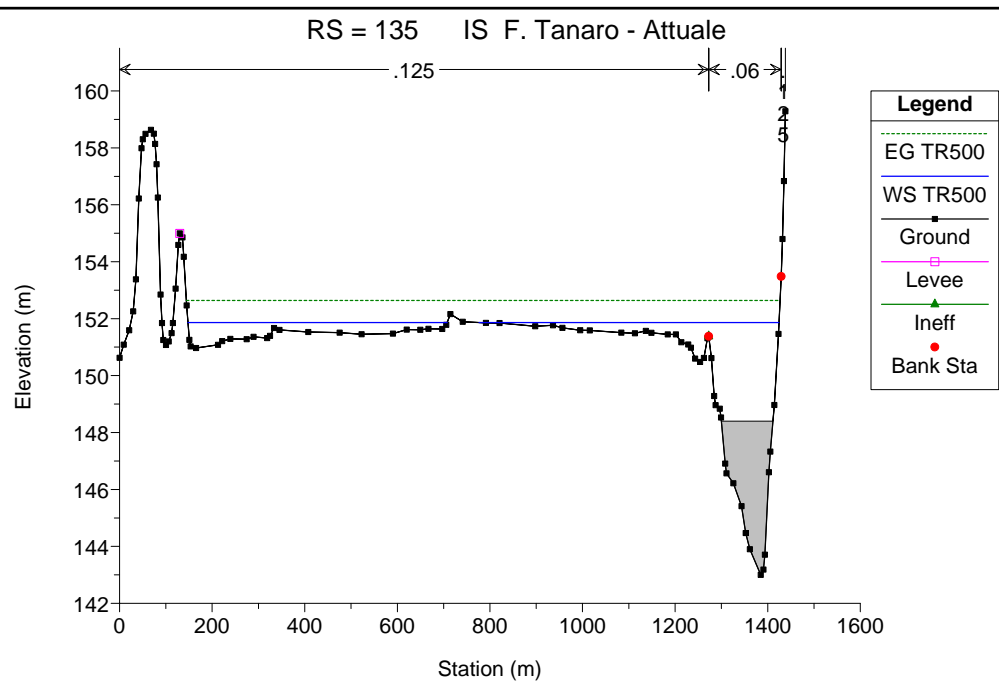
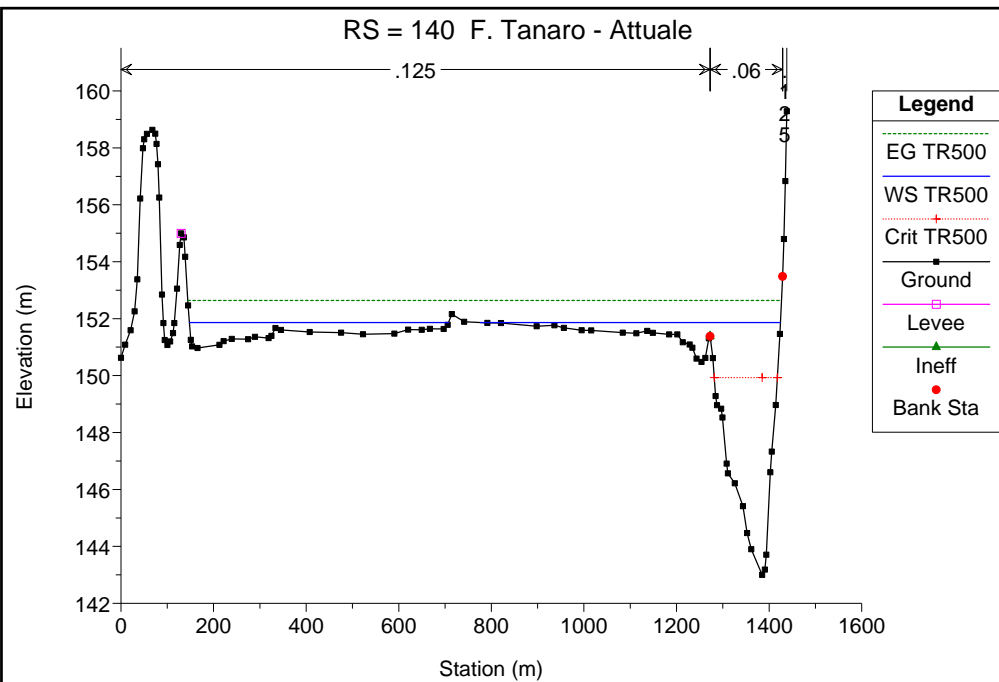


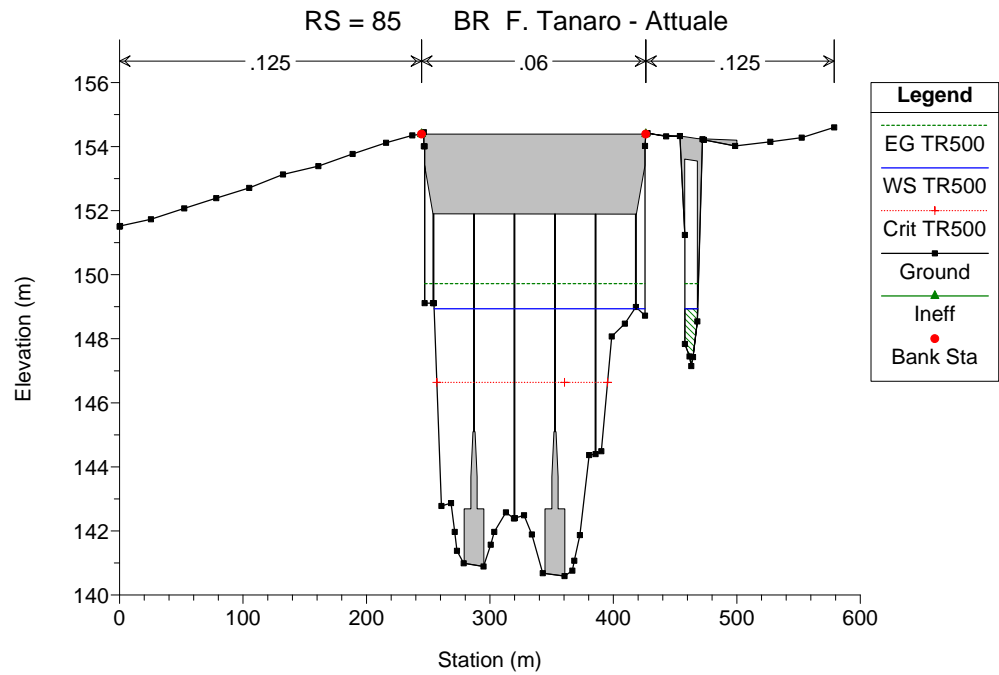
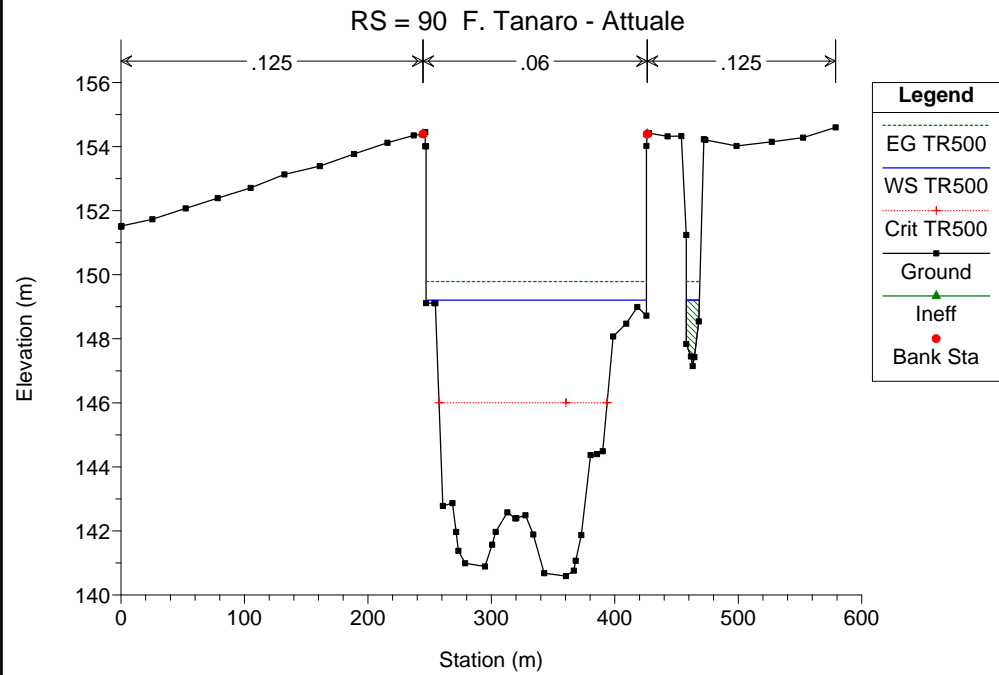
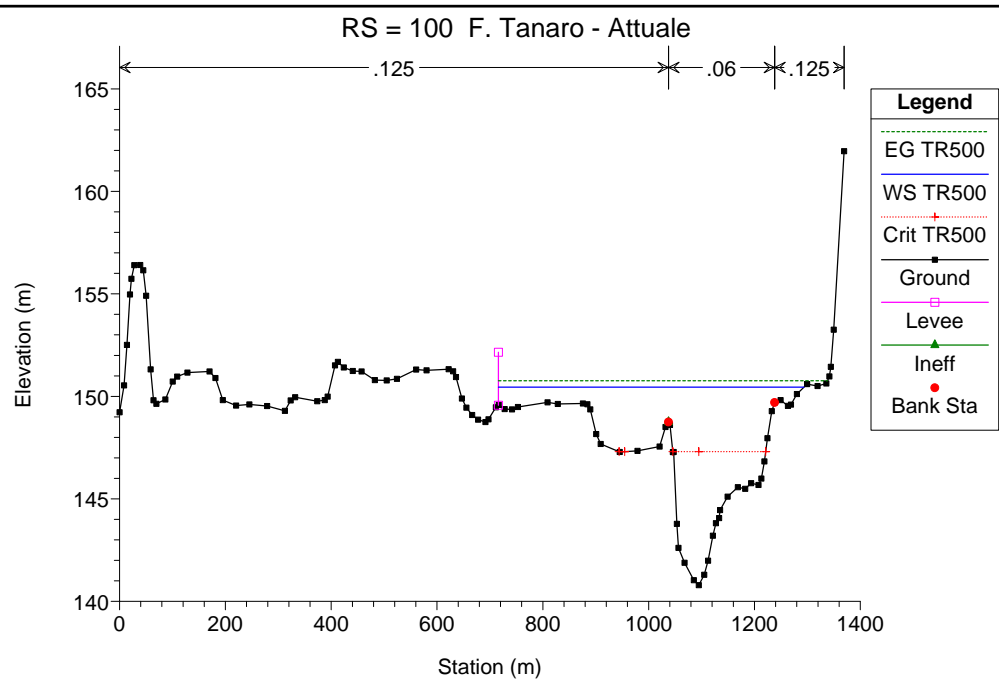
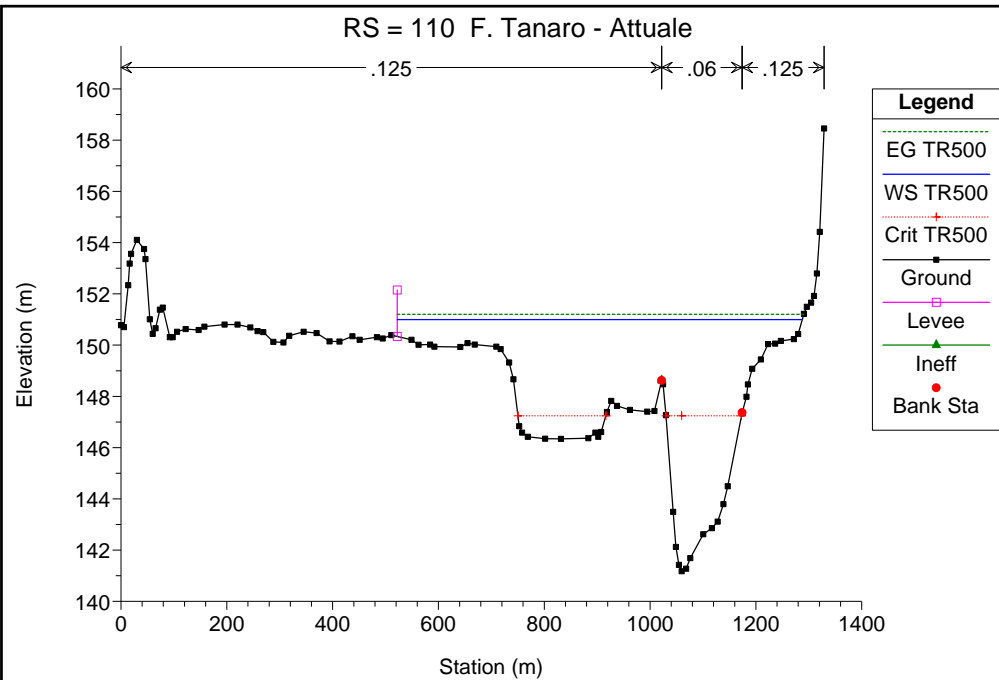


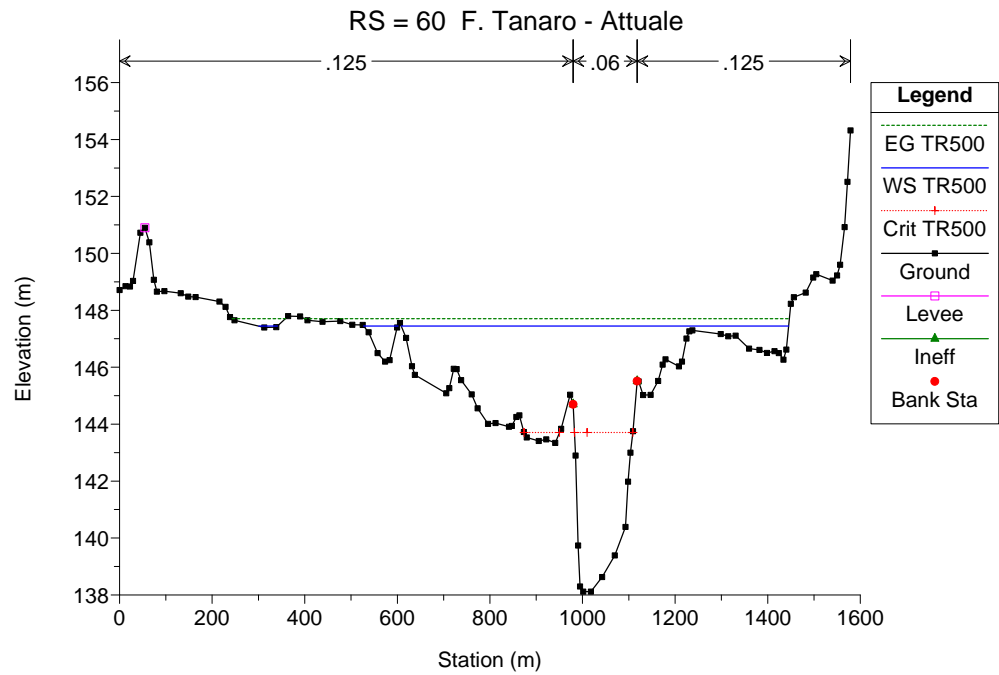
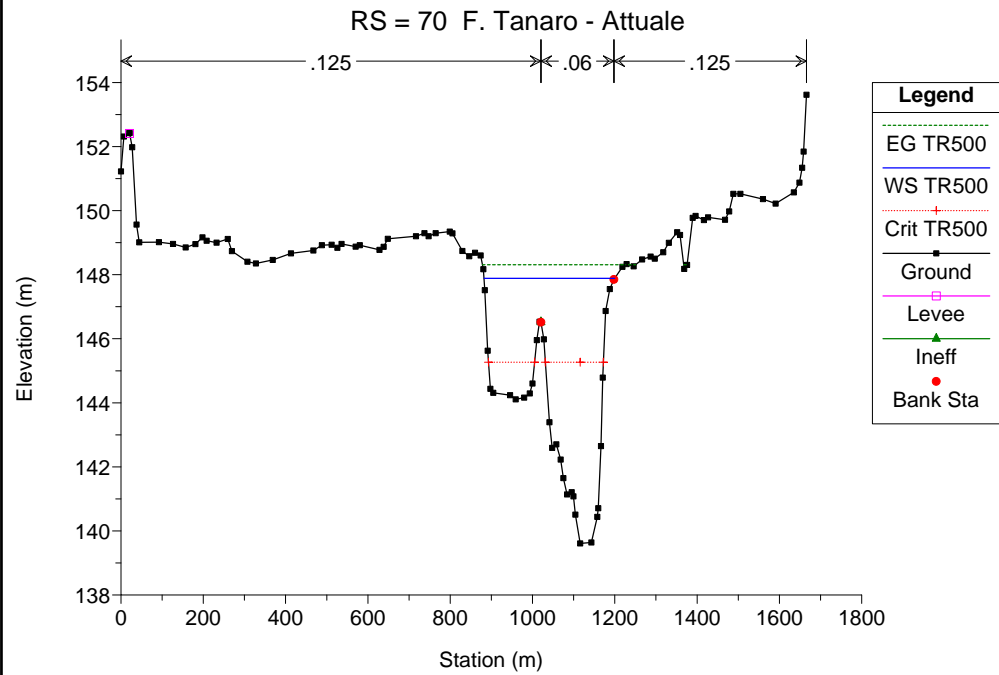
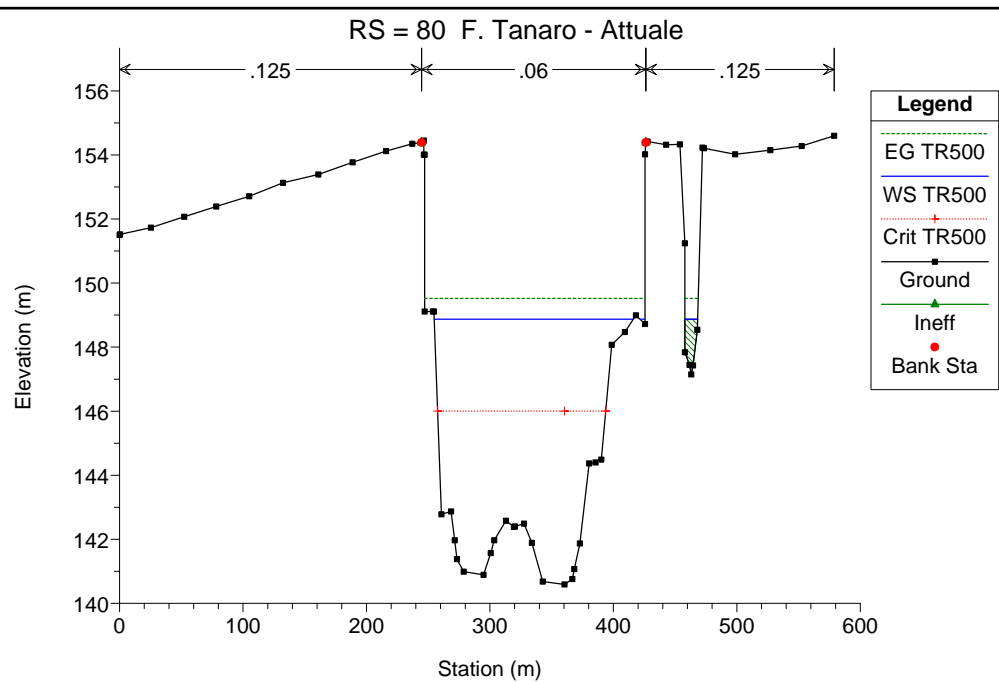
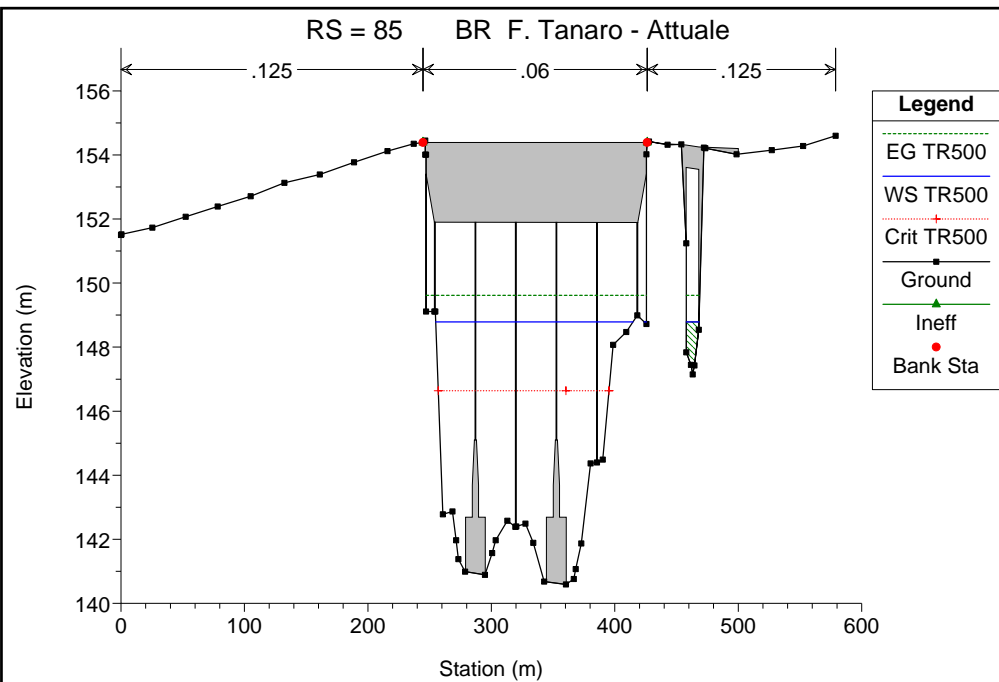


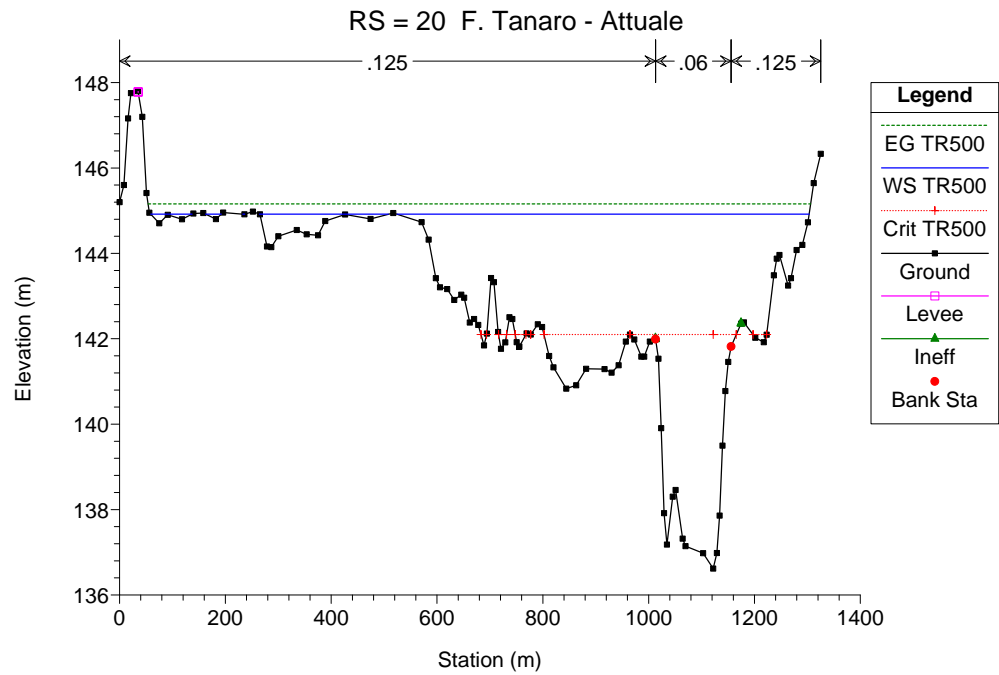
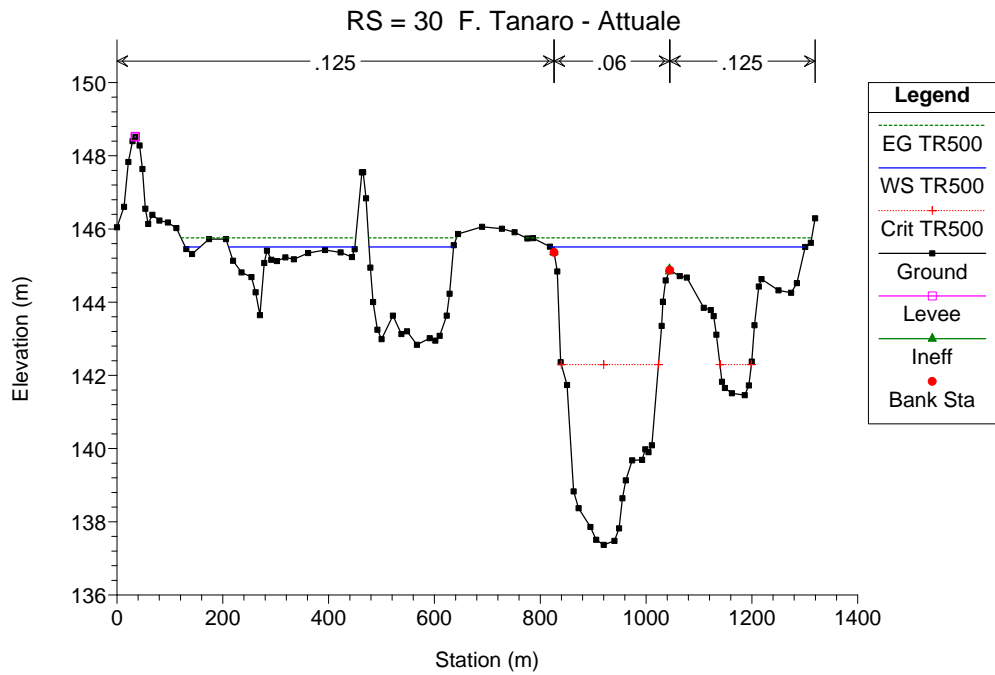
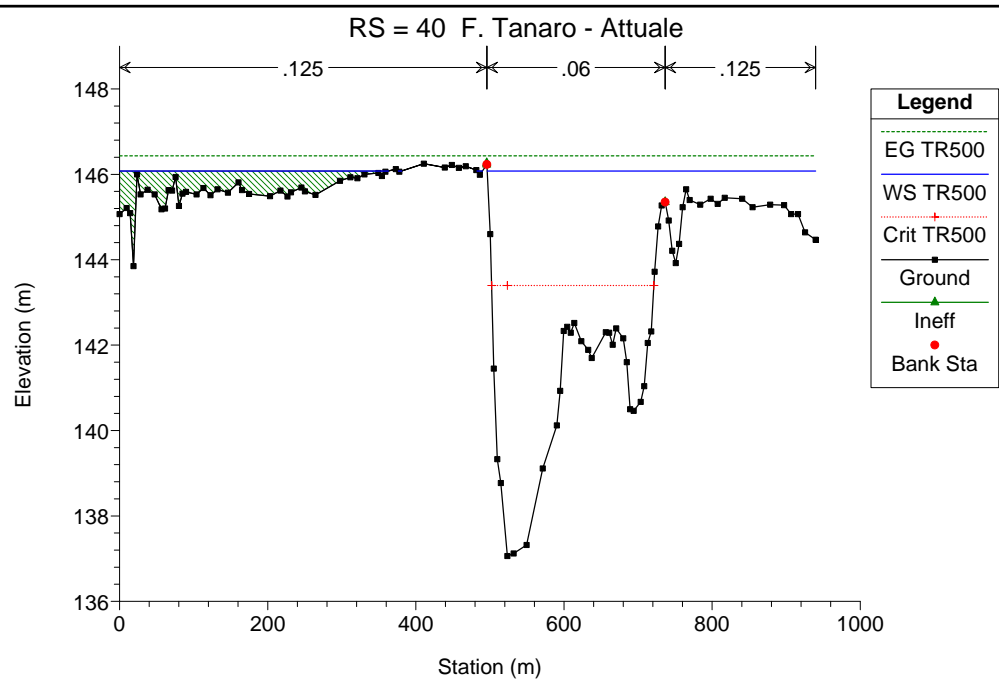
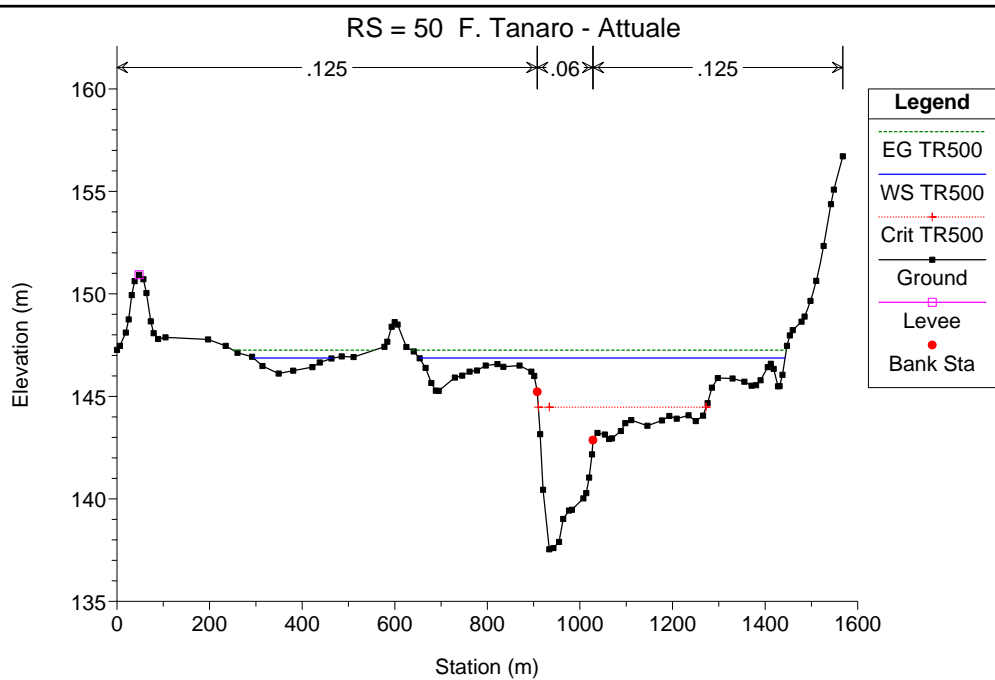




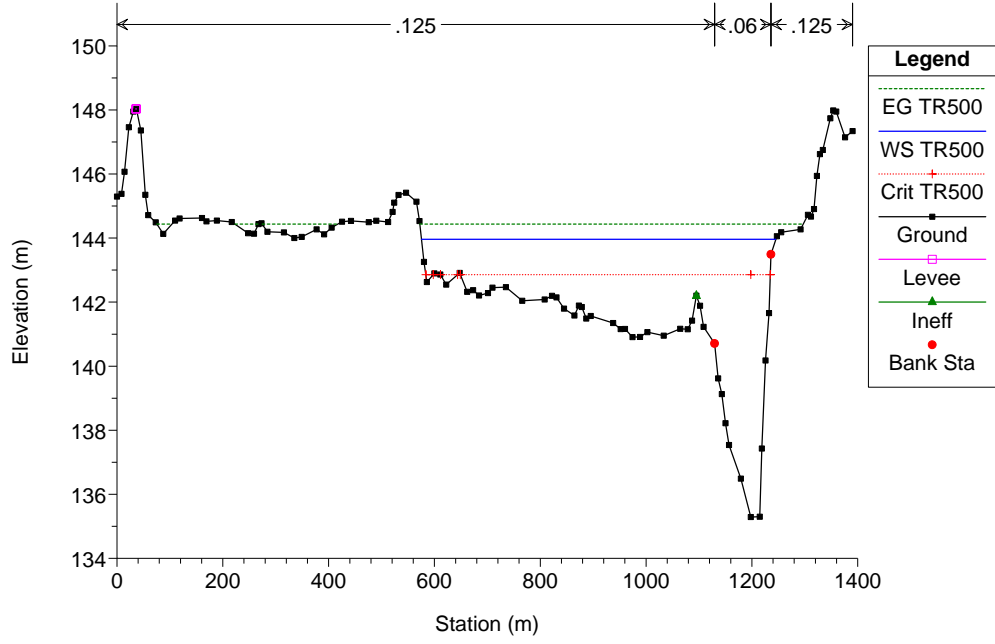








RS = 10 F. Tanaro - Attuale



MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO

SIMULAZIONE 18

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3400	500
F. Tanaro valle Riddone	3409	
F. Tanaro valle Cherasca	3422	

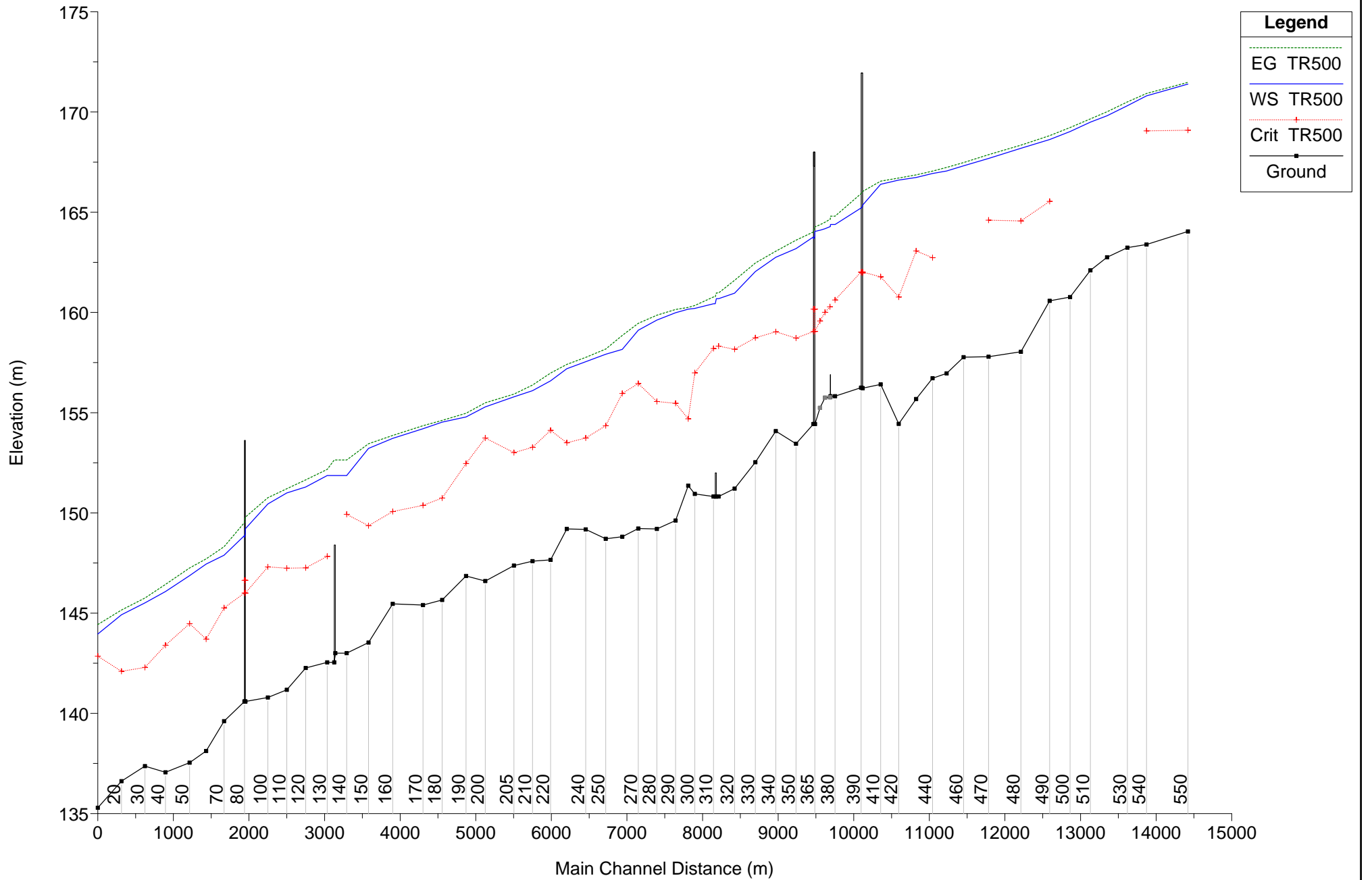
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500

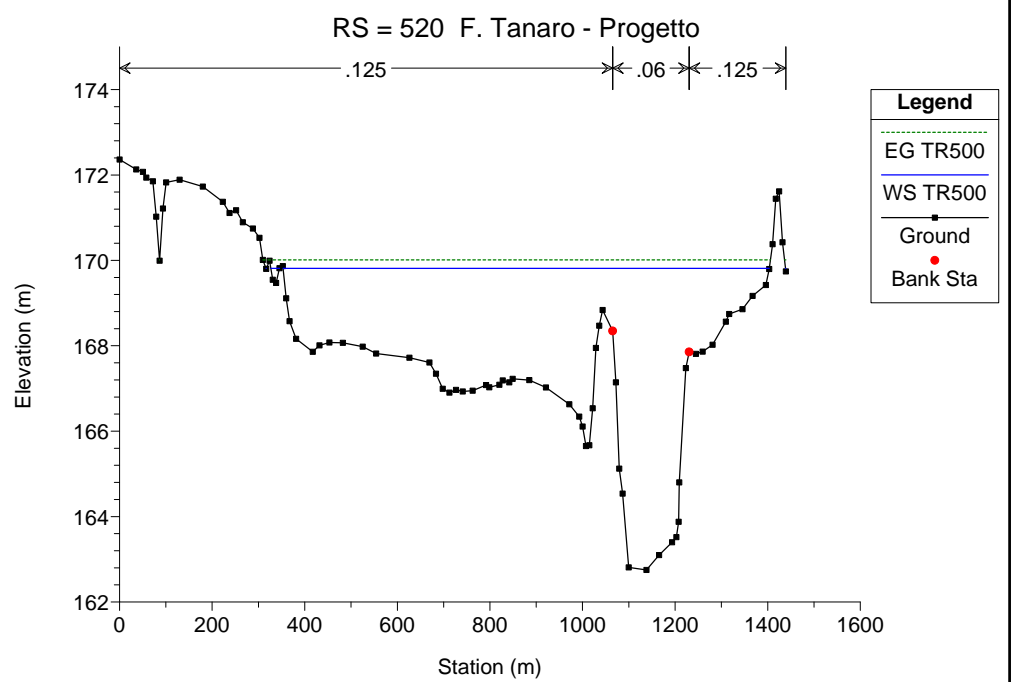
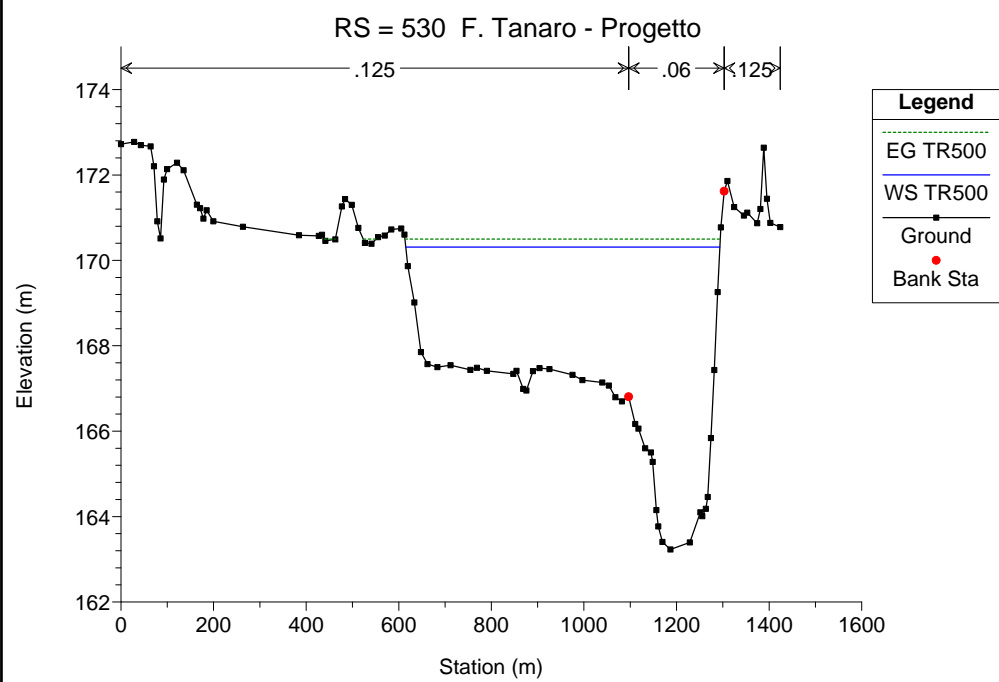
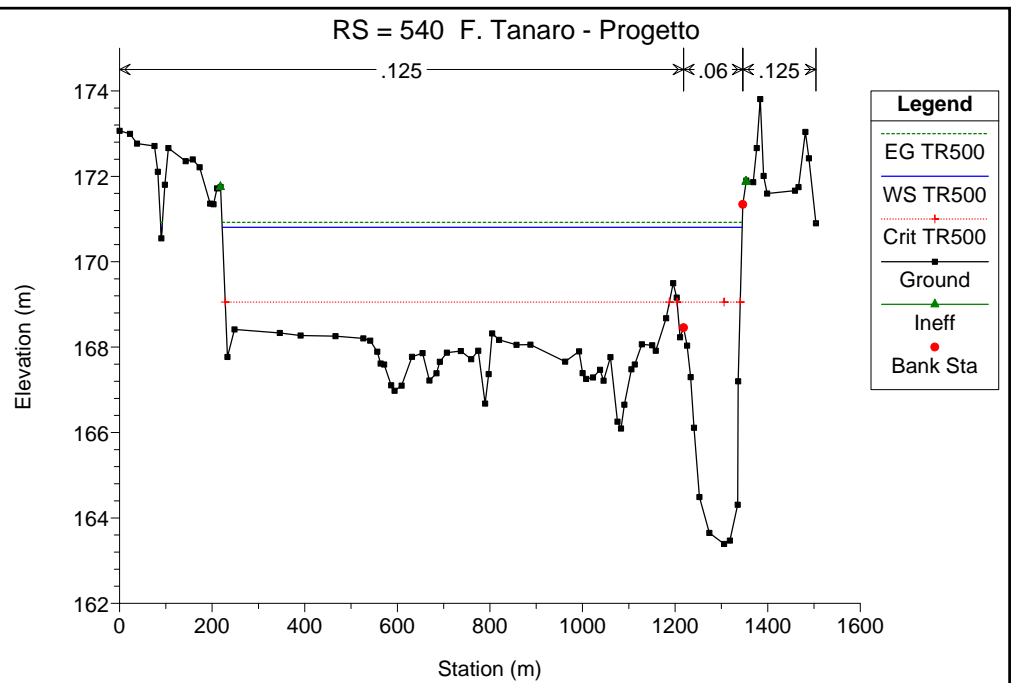
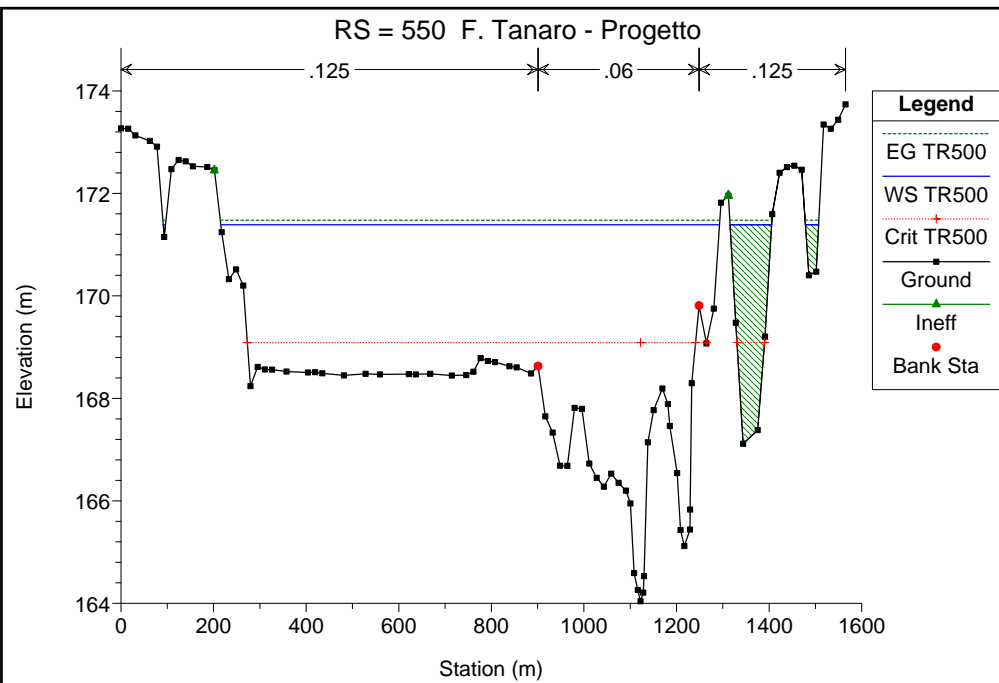
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR500	3400.00	164.04	171.39	169.09	171.48	0.001096	1.52	3523.91	1200.51	0.23
1	540	TR500	3400.00	163.39	170.81	169.06	170.92	0.001558	2.11	3612.56	1126.04	0.28
1	530	TR500	3400.00	163.23	170.31		170.50	0.001819	2.23	2479.72	678.51	0.30
1	520	TR500	3400.00	162.75	169.81		170.01	0.001937	2.36	2846.45	1070.73	0.31
1	510	TR500	3400.00	162.10	169.49		169.66	0.001765	2.15	2686.21	790.27	0.30
1	500	TR500	3400.00	160.77	169.02		169.22	0.001567	2.25	2360.17	558.06	0.28
1	490	TR500	3400.00	160.58	168.63	165.54	168.82	0.001505	2.10	2199.06	540.65	0.28
1	480	TR500	3400.00	158.04	168.19	164.56	168.34	0.001140	1.99	2799.78	971.28	0.25
1	470	TR500	3400.00	157.79	167.68	164.60	167.87	0.001368	2.26	2446.88	584.32	0.27
1	460	TR500	3400.00	157.77	167.32		167.48	0.001022	2.00	2962.95	919.07	0.24
1	450	TR500	3400.00	156.96	167.06		167.24	0.001069	2.08	2935.37	1044.38	0.24
1	440	TR500	3400.00	156.72	166.93	162.73	167.05	0.000783	1.84	3422.40	804.44	0.21
1	430	TR500	3400.00	155.68	166.74	163.06	166.86	0.000945	2.03	3247.89	667.84	0.23
1	420	TR500	3400.00	154.44	166.61	160.77	166.71	0.000545	1.70	3591.19	692.34	0.18
1	410	TR500	3400.00	156.41	166.40	161.78	166.55	0.000928	2.04	2760.84	552.74	0.23
1	400	TR500	3400.00	156.22	165.36	162.01	166.04	0.003450	3.76	1049.45	179.17	0.43
1	395		Bridge									
1	390	TR500	3400.00	156.25	165.22	162.02	165.93	0.003677	3.84	1025.51	178.87	0.44
1	380	TR500	3400.00	155.82	164.39	160.62	164.81	0.002207	2.87	1280.78	288.35	0.34
1	379		Inl Struct									
1	370	TR500	3400.00	154.43	164.05	159.05	164.28	0.001116	2.13	1598.59	208.91	0.25
1	365		Bridge									
1	360	TR500	3400.00	154.43	163.78	159.05	164.02	0.001251	2.20	1542.05	208.16	0.26
1	350	TR500	3400.00	153.45	163.19	158.72	163.61	0.002019	2.88	1294.85	293.69	0.33
1	340	TR500	3409.00	154.08	162.76	159.04	163.07	0.001790	2.48	1615.40	392.42	0.31
1	330	TR500	3409.00	152.53	162.07	158.73	162.49	0.002488	2.97	1503.77	441.06	0.36
1	320	TR500	3409.00	151.21	161.04	158.17	161.65	0.003521	3.84	1605.26	698.63	0.43
1	315	TR500	3409.00	150.82	160.79	158.29	161.06	0.001815	2.78	2800.45	1127.53	0.31
1	312.5		Inl Struct									
1	310	TR500	3409.00	150.82	160.43	158.20	160.77	0.002355	3.07	2355.46	840.01	0.36
1	300	TR500	3422.00	150.95	160.20	156.99	160.35	0.001128	1.95	3071.89	935.41	0.24
1	295	TR500	3422.00	151.36	160.17	154.70	160.25	0.000513	1.47	3769.13	1016.17	0.17
1	290	TR500	3422.00	149.62	159.98	155.47	160.15	0.000960	1.90	2627.08	785.03	0.22
1	280	TR500	3422.00	149.20	159.62	155.56	159.86	0.001388	2.46	2398.43	879.22	0.28
1	270	TR500	3422.00	149.22	159.11	156.45	159.46	0.002060	2.98	2079.80	828.20	0.34
1	260	TR500	3422.00	148.81	158.16	155.95	158.85	0.003905	3.94	1361.48	505.08	0.46
1	250	TR500	3422.00	148.71	157.92	154.35	158.18	0.001784	2.52	2166.38	562.22	0.31
1	240	TR500	3422.00	149.18	157.54	153.73	157.76	0.001376	2.29	2547.94	773.70	0.27
1	230	TR500	3422.00	149.20	157.19	153.50	157.41	0.001408	2.21	2220.42	700.30	0.27
1	220	TR500	3422.00	147.66	156.59	154.12	156.98	0.002674	3.09	1741.77	624.31	0.38

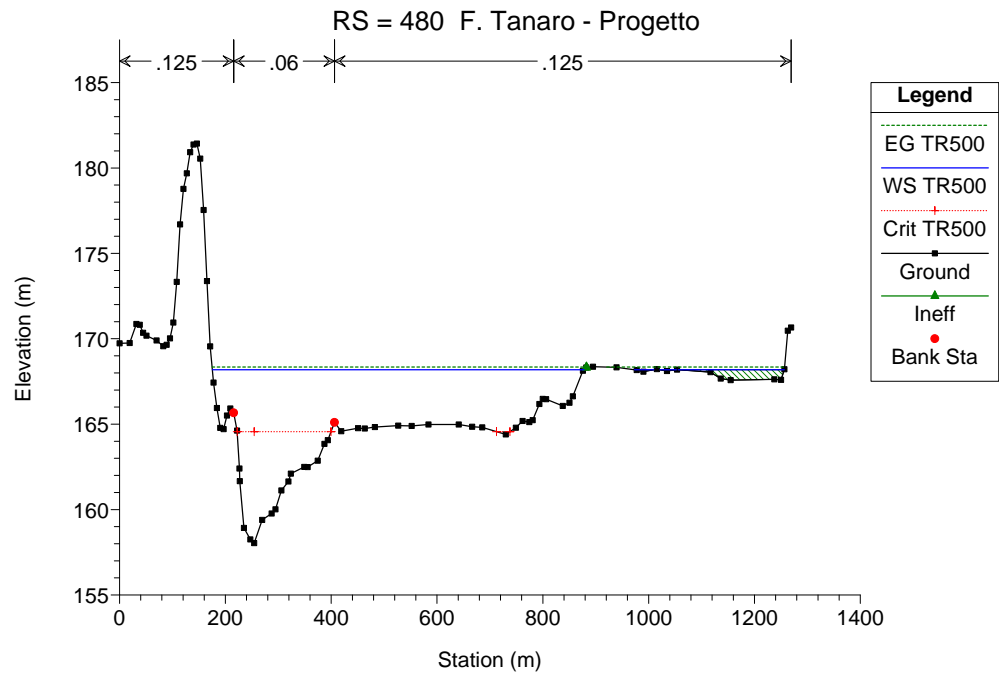
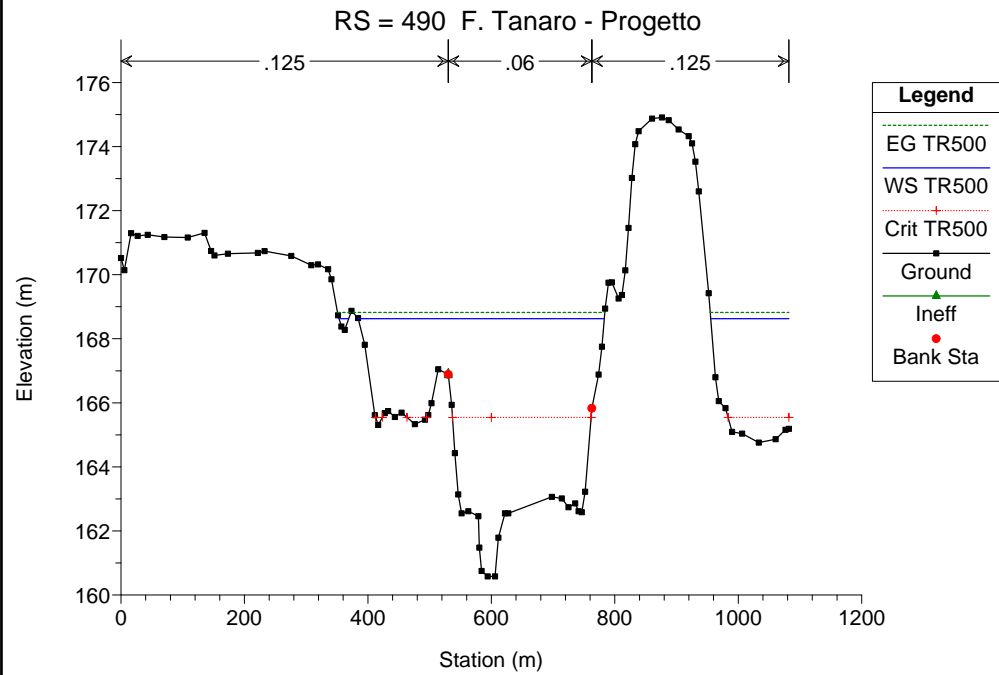
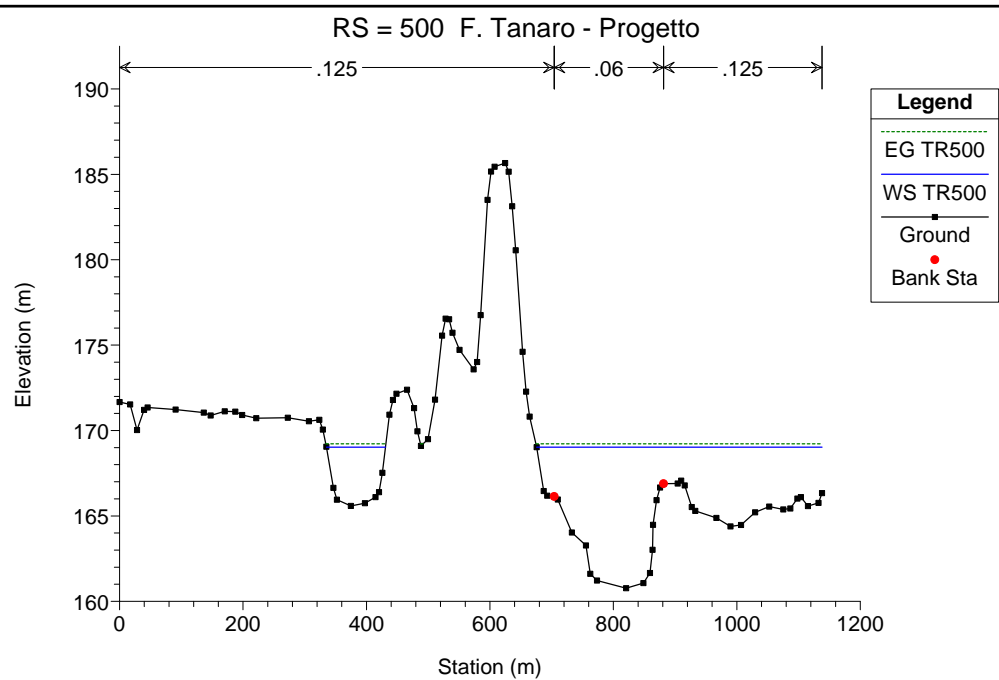
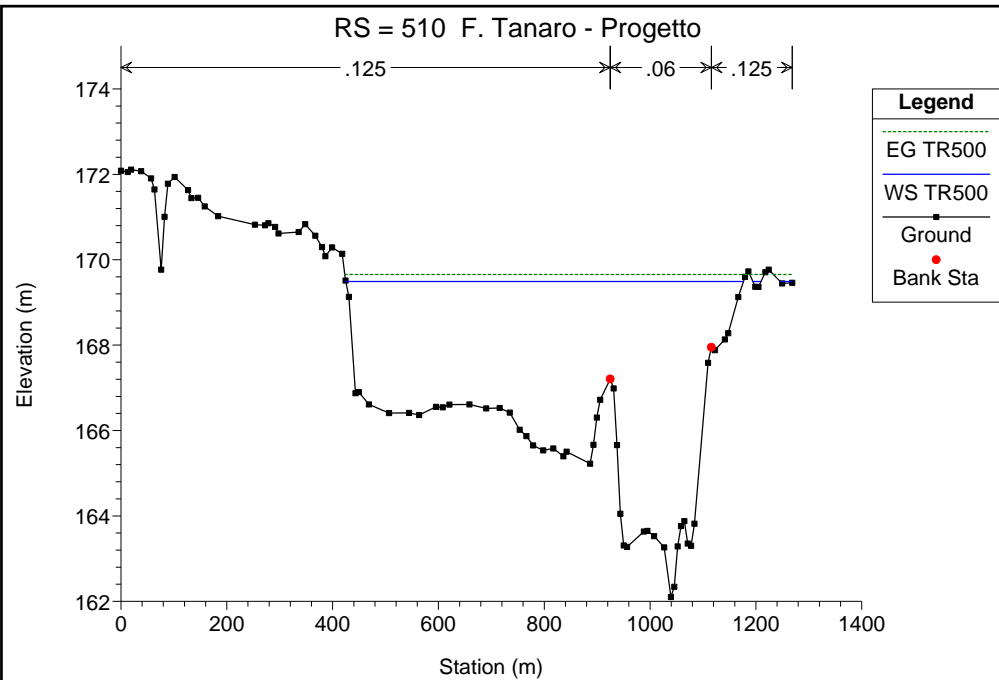
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500 (Continued)

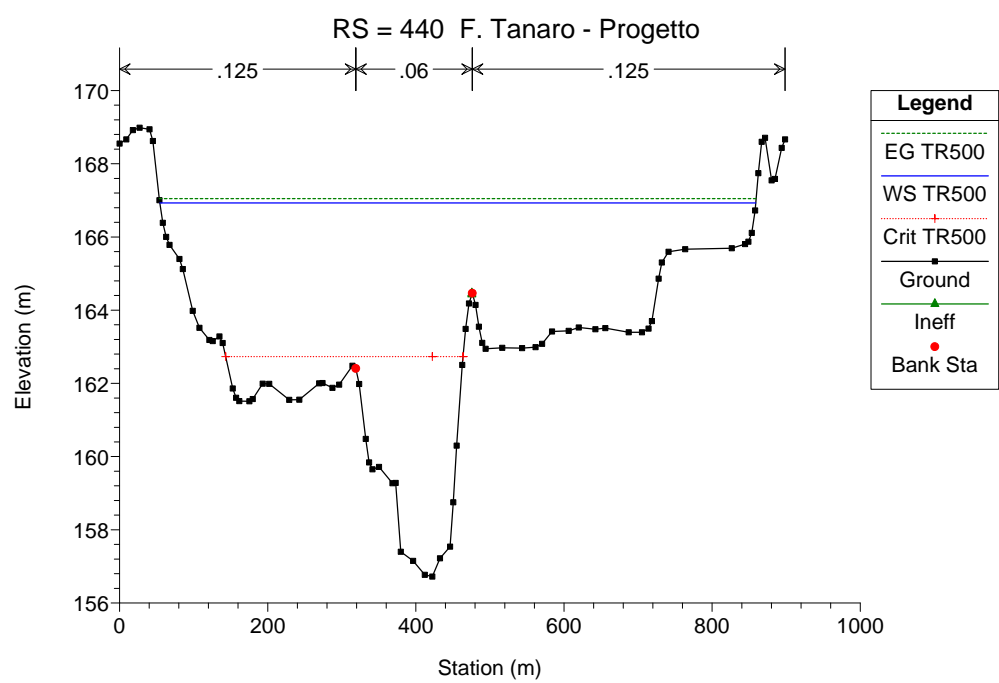
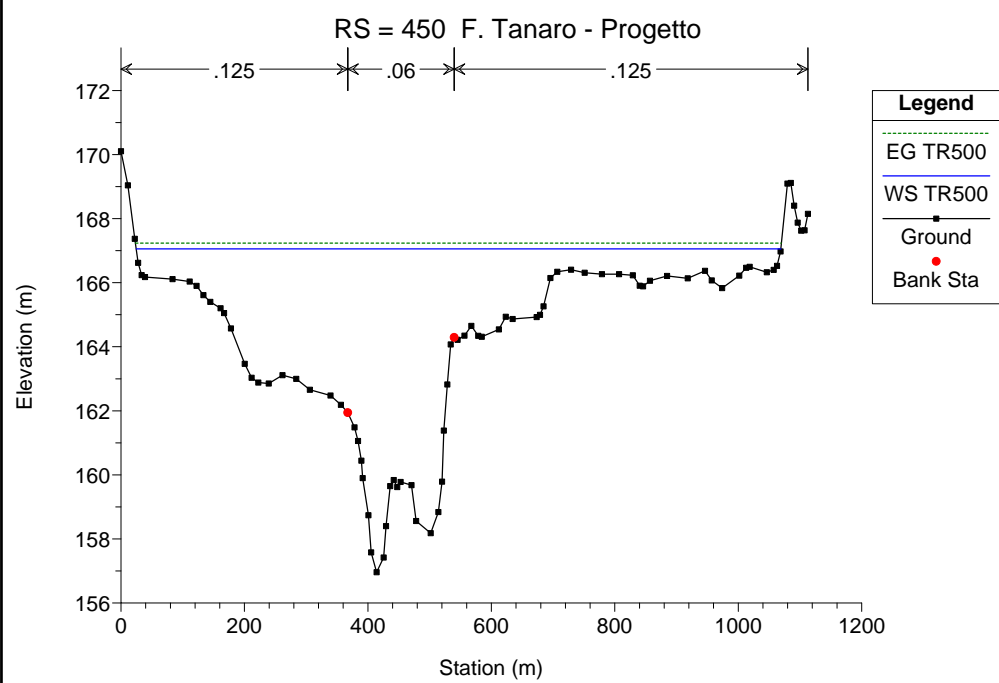
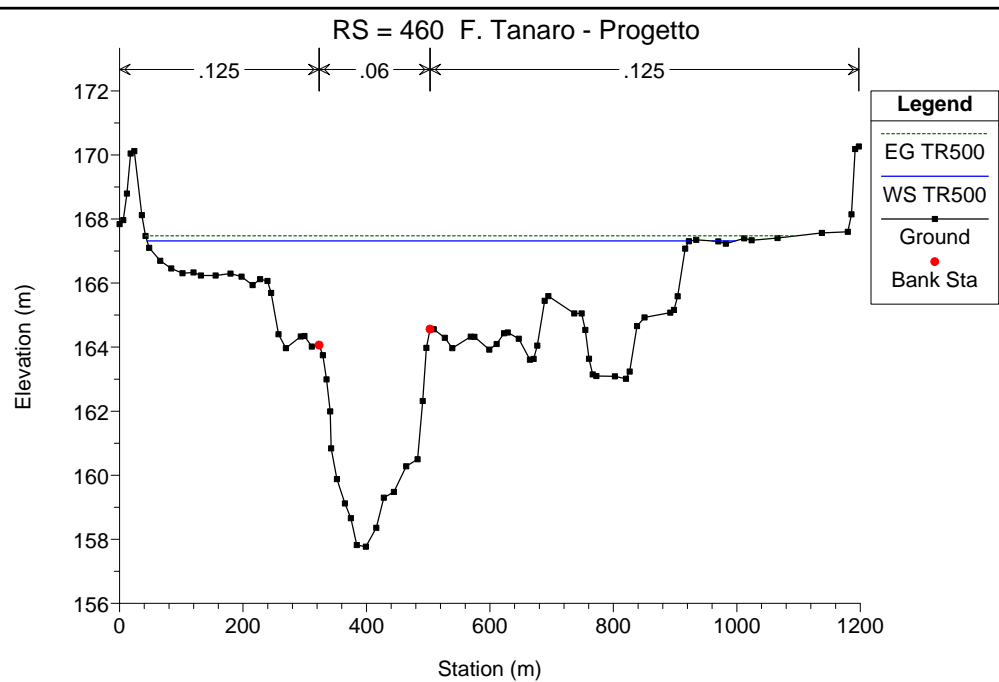
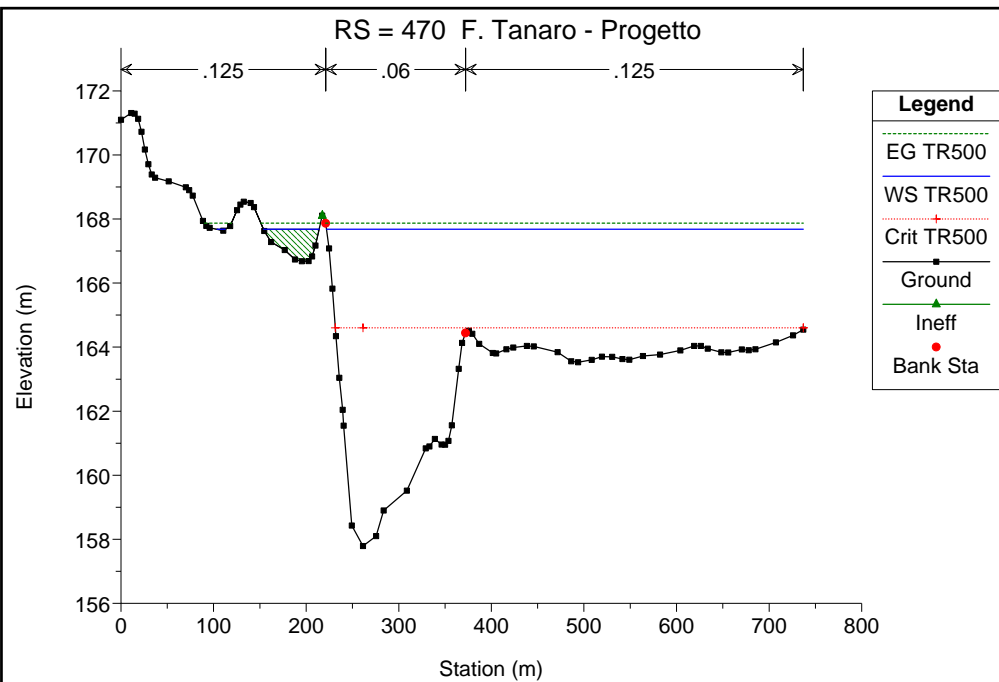
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR500	3422.00	147.59	156.10	153.27	156.38	0.002057	2.55	2020.70	695.11	0.33
1	205	TR500	3422.00	147.37	155.79	153.01	155.93	0.001287	1.94	3187.76	1106.77	0.25
1	200	TR500	3422.00	146.60	155.29	153.74	155.49	0.001936	2.58	3059.00	1092.32	0.32
1	190	TR500	3422.00	146.85	154.78	152.46	154.97	0.002008	2.24	2981.23	1299.47	0.31
1	180	TR500	3422.00	145.66	154.53	150.74	154.62	0.000750	1.46	3956.46	1444.97	0.19
1	170	TR500	3422.00	145.40	154.20	150.37	154.35	0.001400	1.94	3039.46	1348.10	0.26
1	160	TR500	3422.00	145.46	153.72	150.07	153.87	0.001160	1.87	3157.55	1391.08	0.24
1	150	TR500	3422.00	143.53	153.22	149.36	153.45	0.001481	2.34	2764.20	1343.44	0.28
1	140	TR500	3422.00	143.00	151.86	149.93	152.64	0.006055	3.98	1222.29	1207.93	0.55
1	135		Inl Struct									
1	130	TR500	3422.00	142.54	151.86	147.83	152.17	0.001766	2.60	2175.76	1195.01	0.31
1	120	TR500	3422.00	142.27	151.29	147.26	151.65	0.001921	2.76	1967.75	1072.58	0.32
1	110	TR500	3422.00	141.17	151.00	147.24	151.21	0.001353	2.31	2638.24	765.70	0.27
1	100	TR500	3422.00	140.79	150.45	147.31	150.76	0.002287	2.60	1790.89	577.54	0.34
1	90	TR500	3422.00	140.59	149.21	146.00	149.79	0.004177	3.37	1015.62	189.29	0.45
1	85		Bridge									
1	80	TR500	3422.00	140.59	148.87	146.00	149.52	0.004590	3.57	957.31	175.93	0.47
1	70	TR500	3422.00	139.61	147.89	145.27	148.31	0.003625	3.08	1405.92	317.89	0.42
1	60	TR500	3422.00	138.12	147.45	143.71	147.71	0.001630	2.56	2424.15	951.28	0.30
1	50	TR500	3422.00	137.54	146.87	144.48	147.25	0.002511	3.08	2087.31	961.97	0.37
1	40	TR500	3422.00	137.06	146.08	143.40	146.43	0.002875	2.67	1441.41	818.36	0.37
1	30	TR500	3422.00	137.37	145.51	142.29	145.76	0.002000	2.36	2157.78	909.01	0.32
1	20	TR500	3422.00	136.62	144.92	142.10	145.16	0.001818	2.53	2584.10	1133.53	0.31
1	10	TR500	3422.00	135.29	143.96	142.85	144.43	0.004002	3.58	1861.45	669.69	0.45

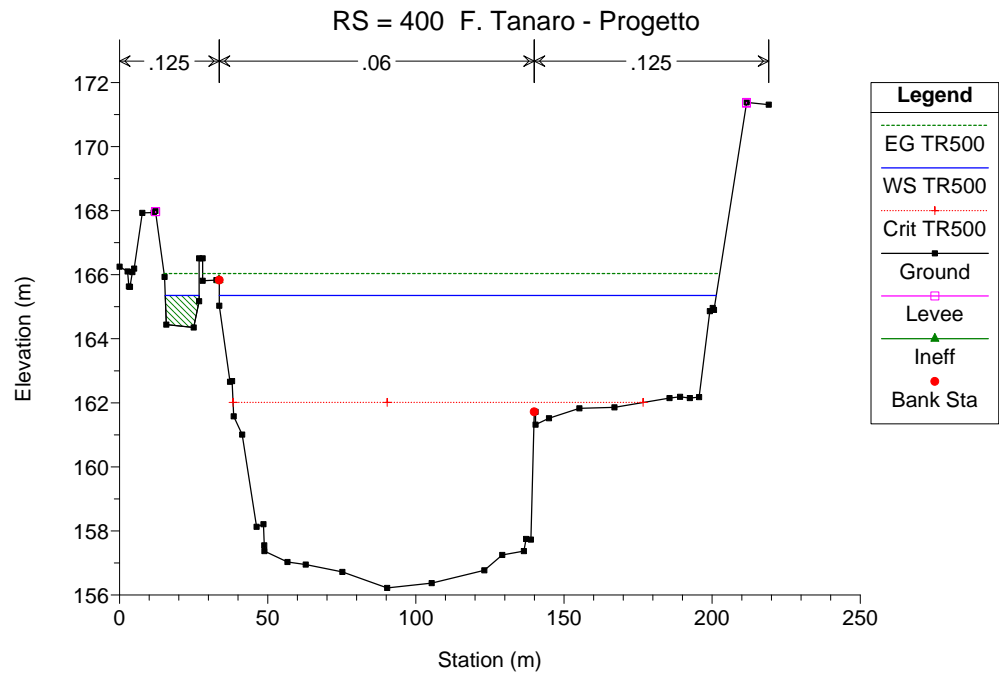
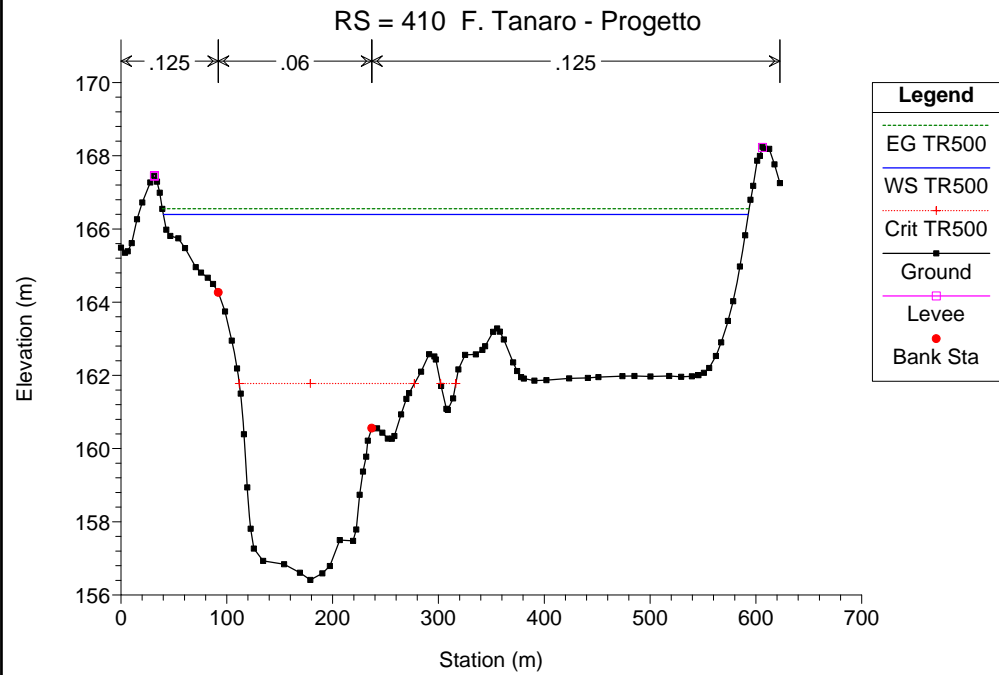
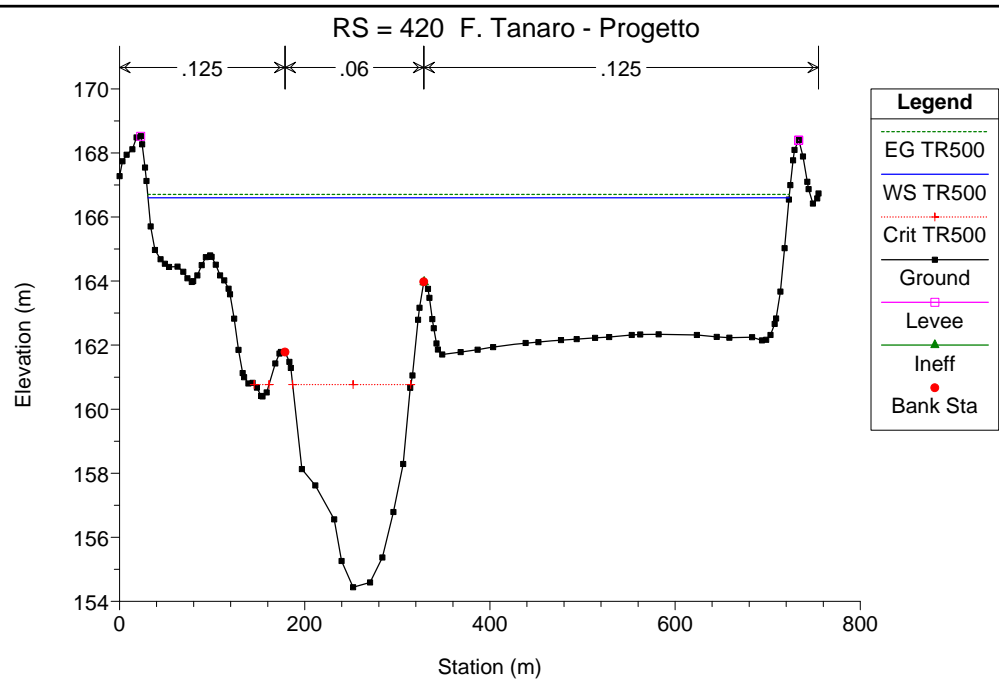
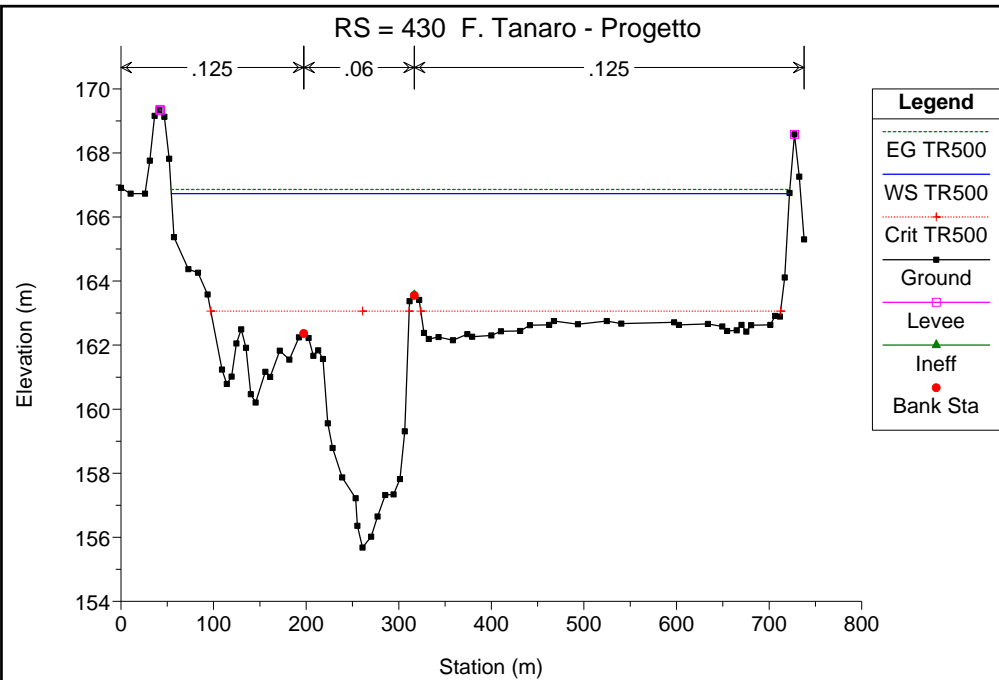
F. Tanaro - Progetto

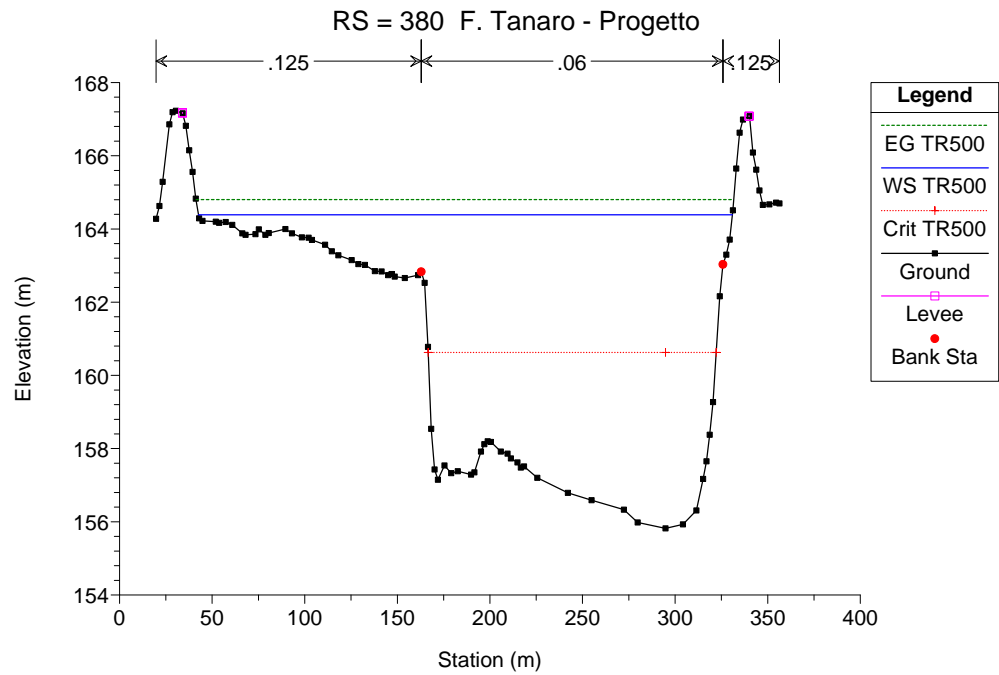
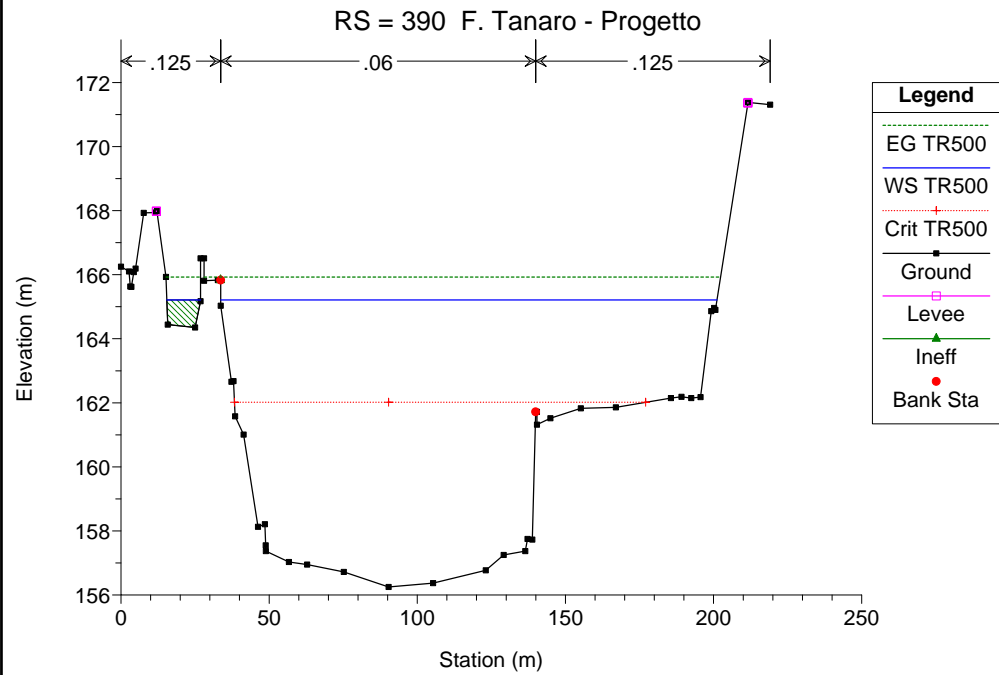
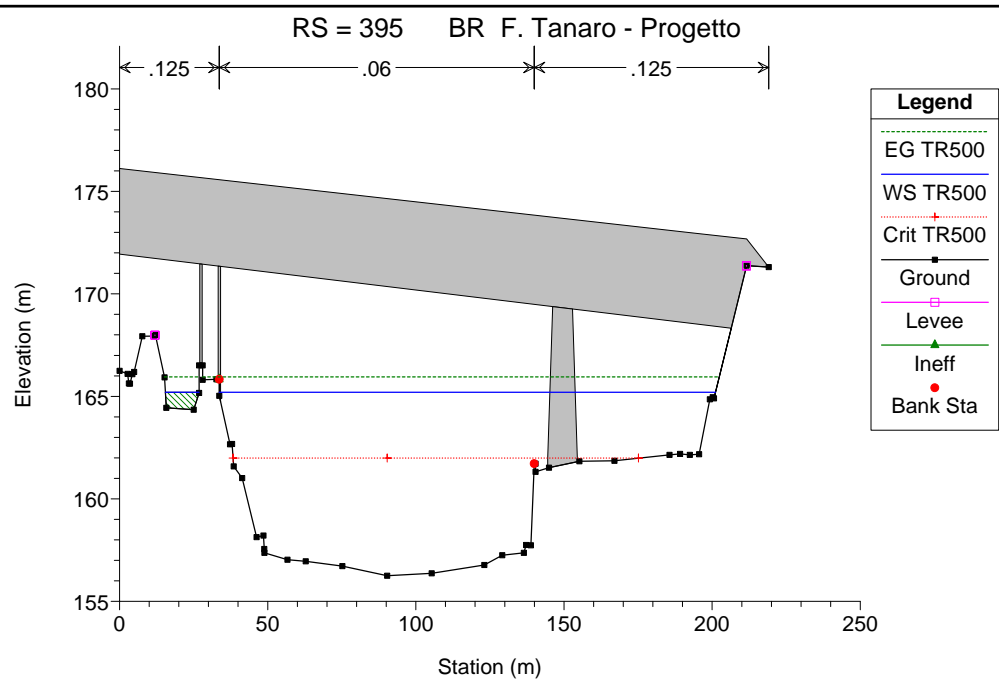
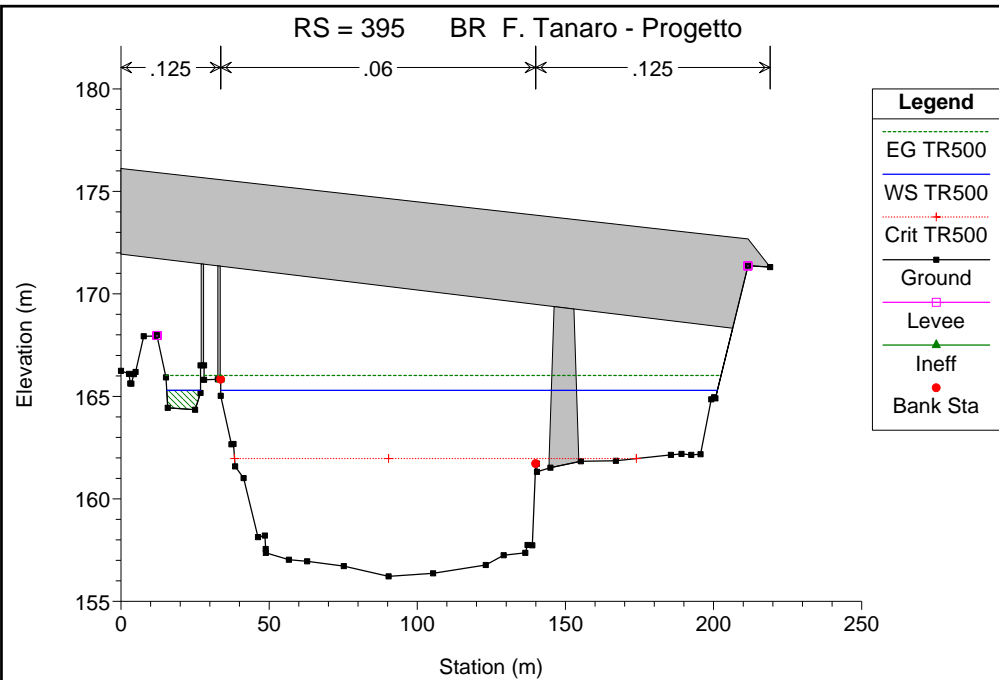


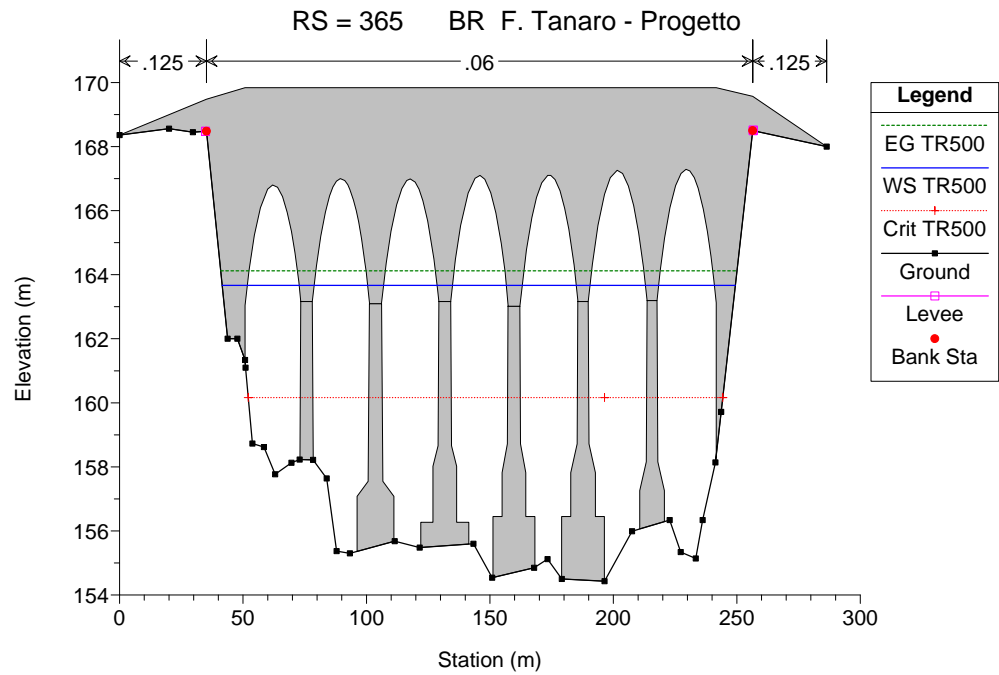
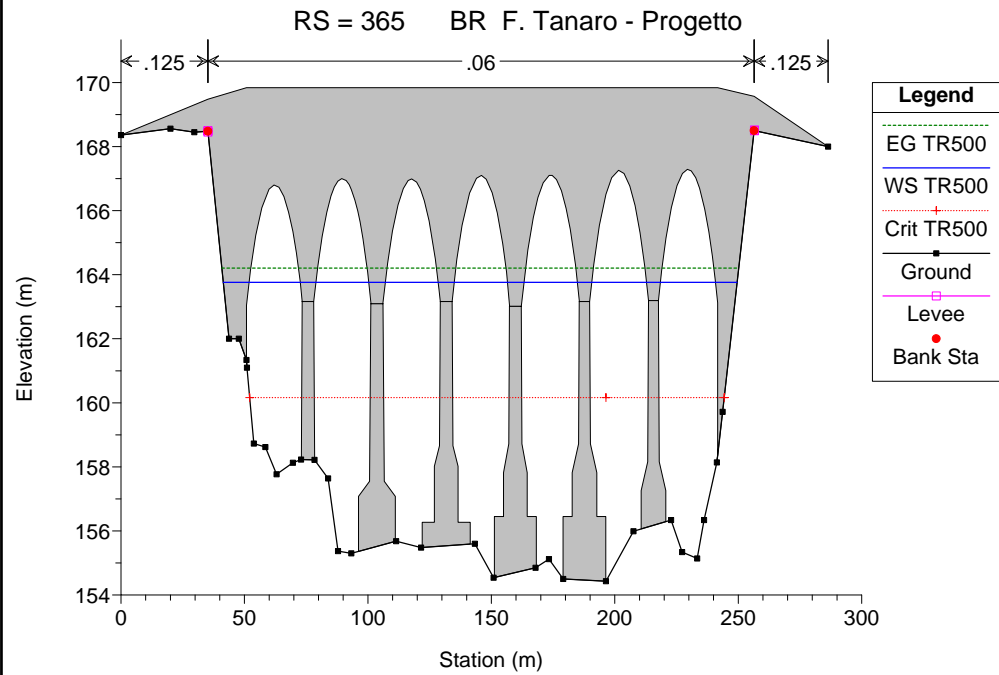
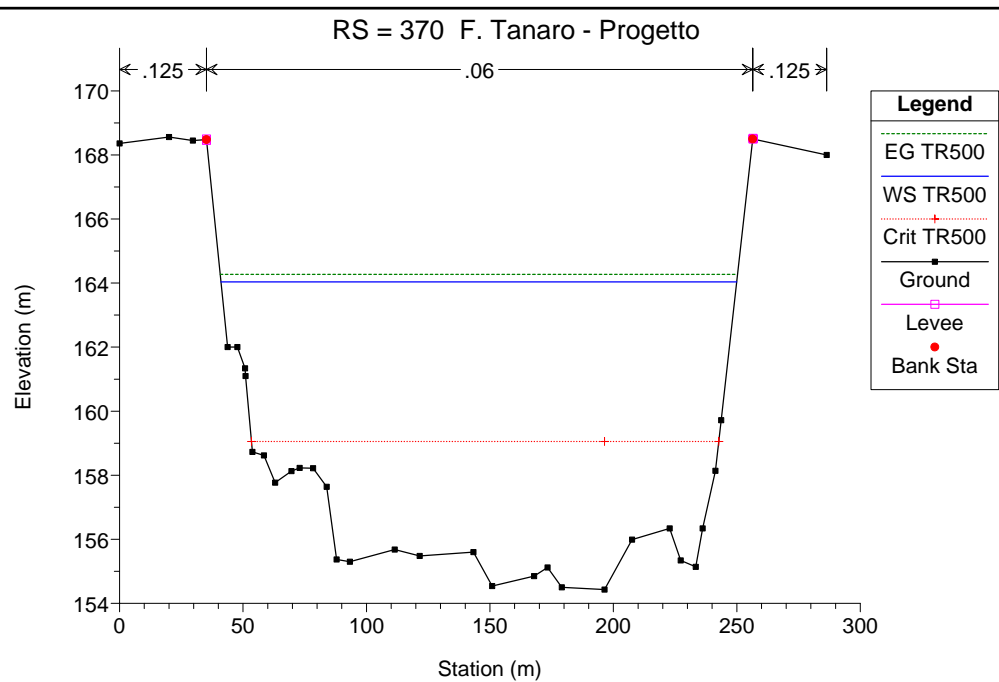
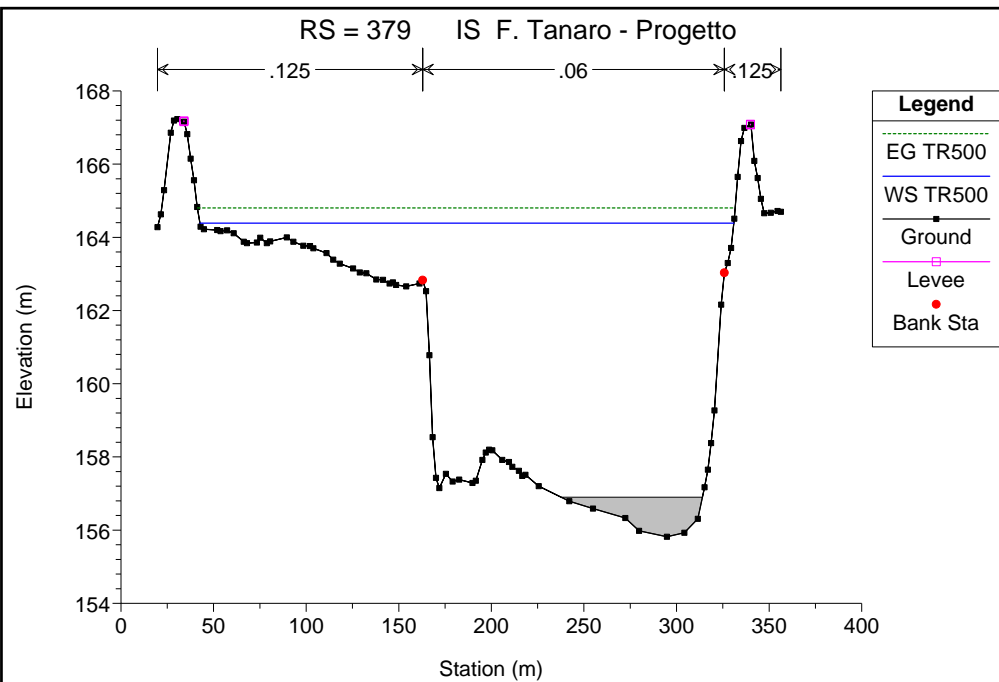




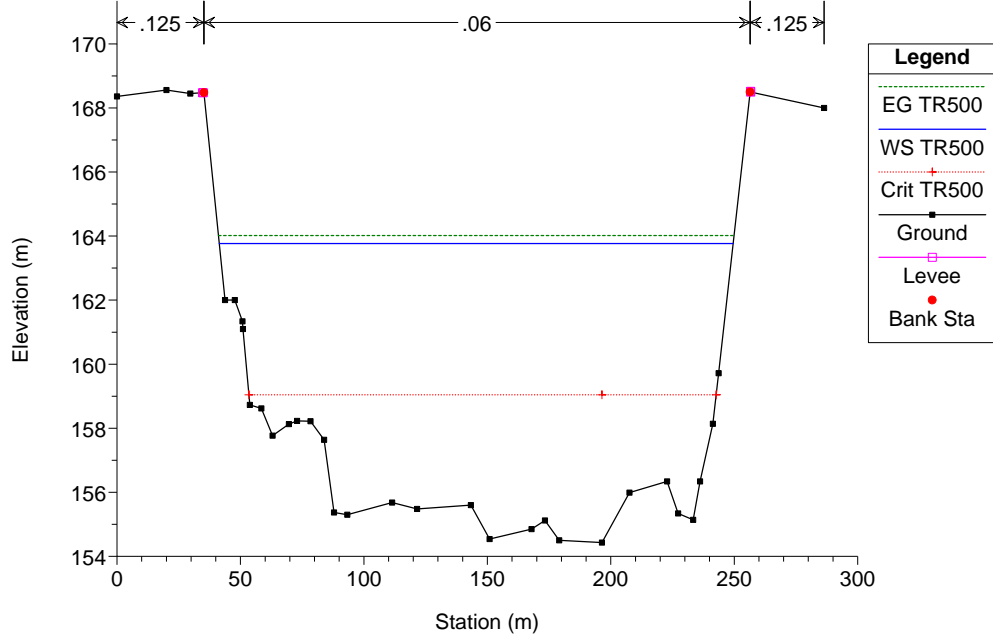




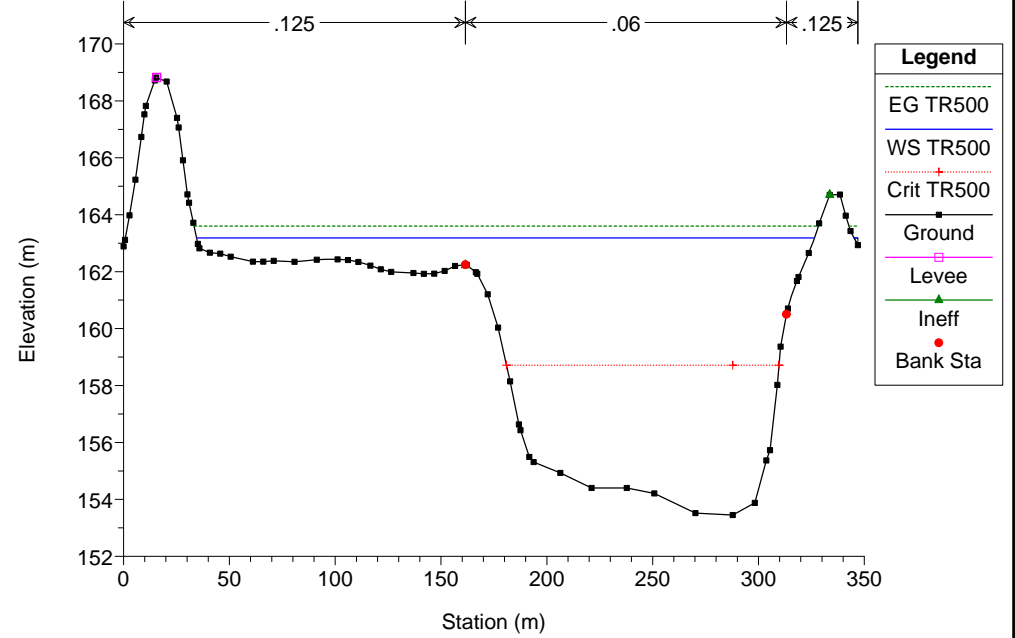




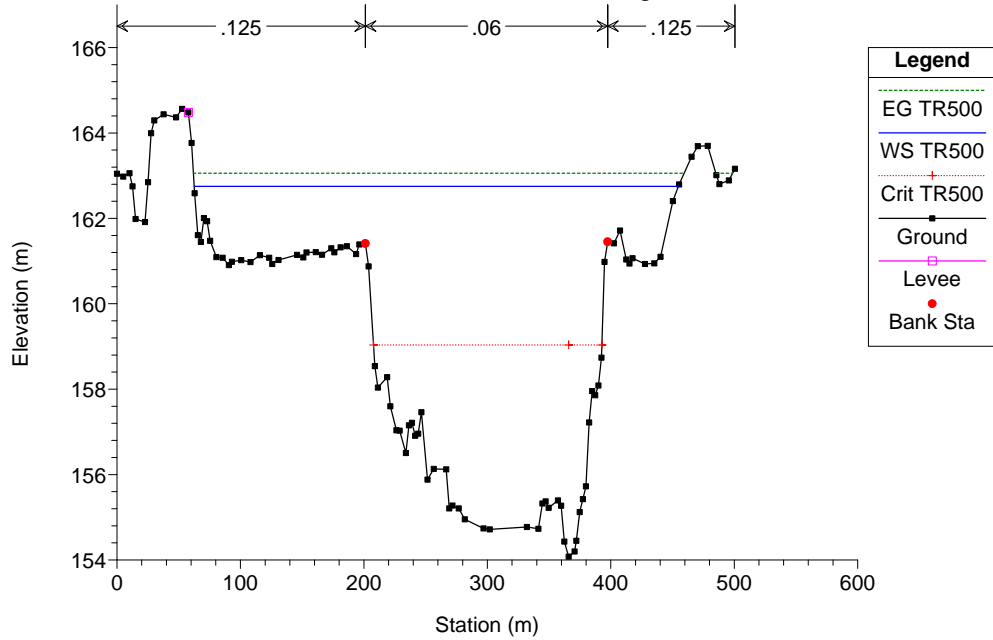
RS = 360 F. Tanaro - Progetto



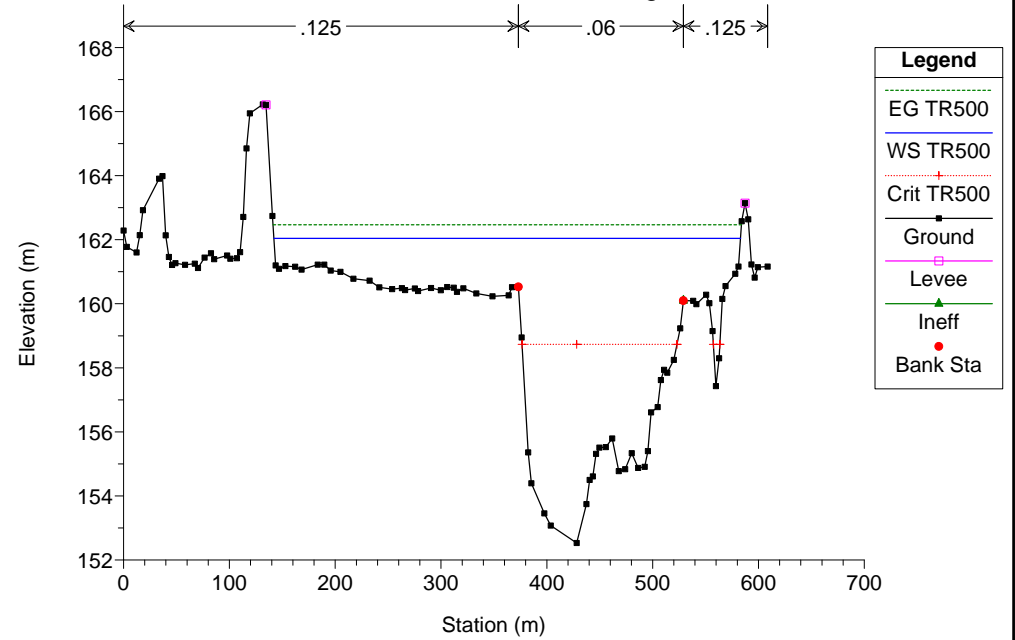
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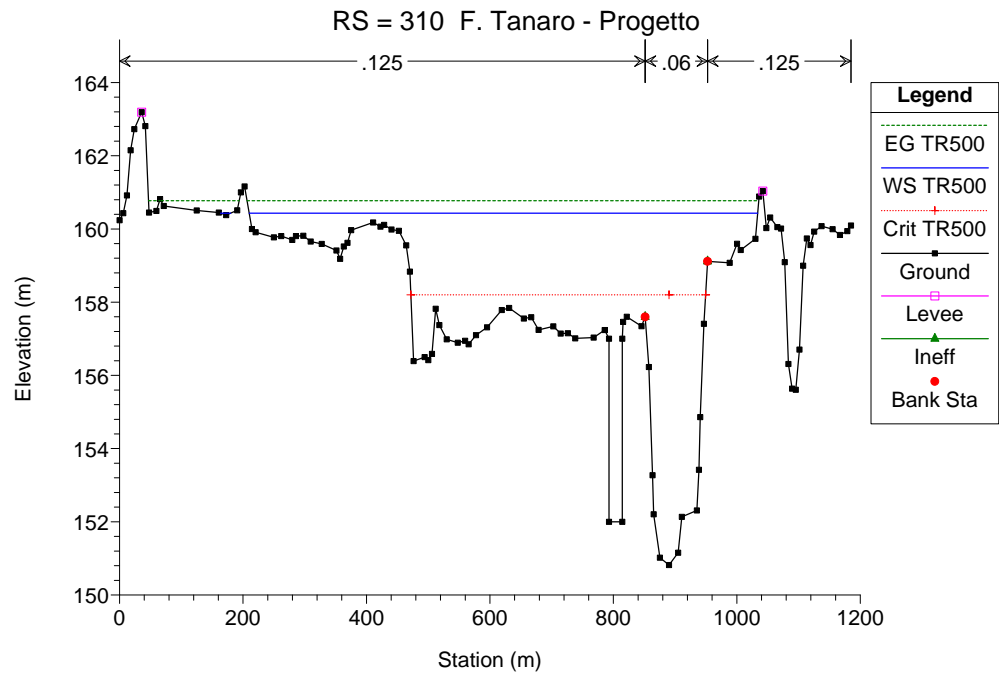
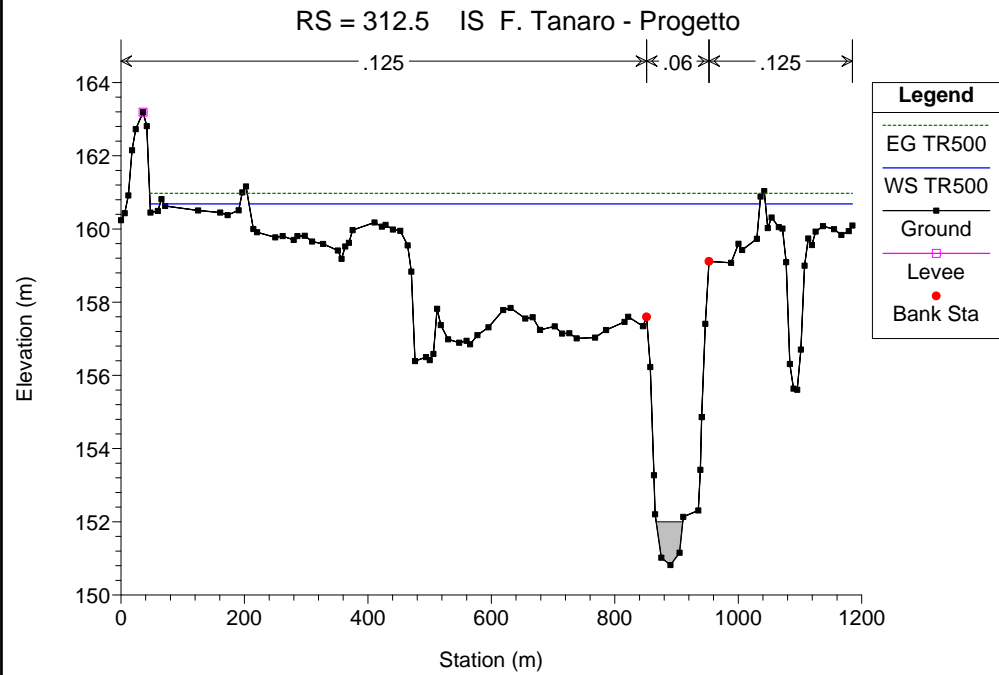
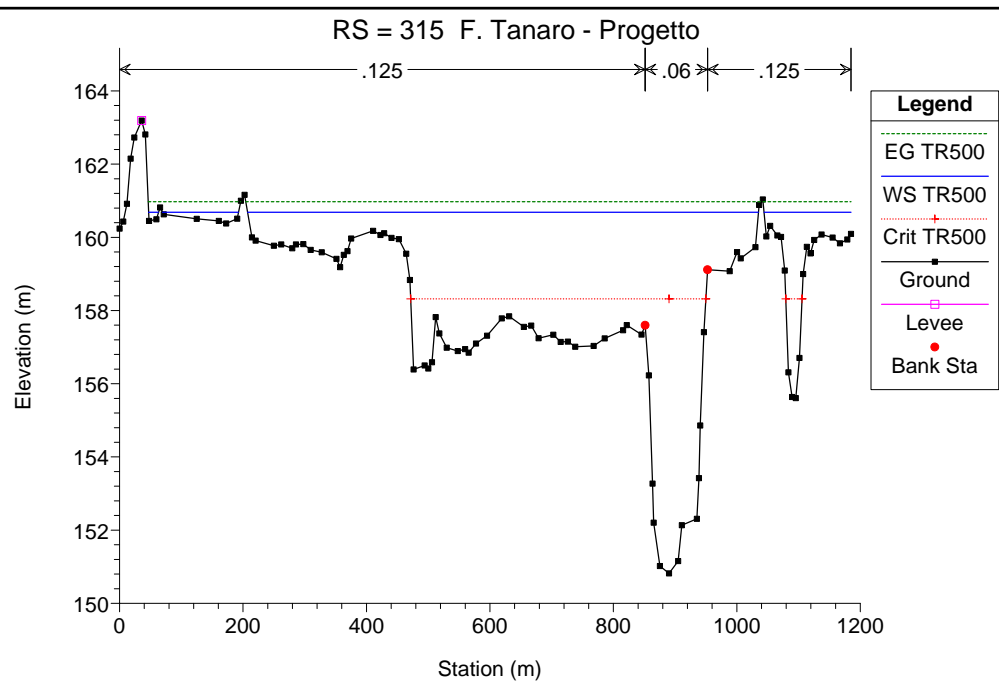
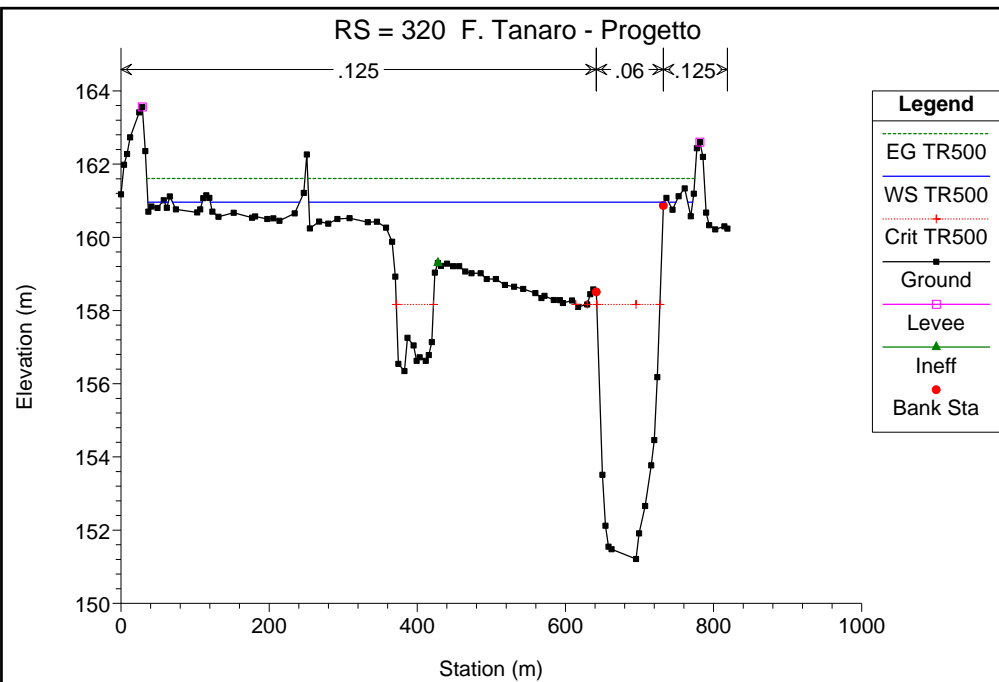


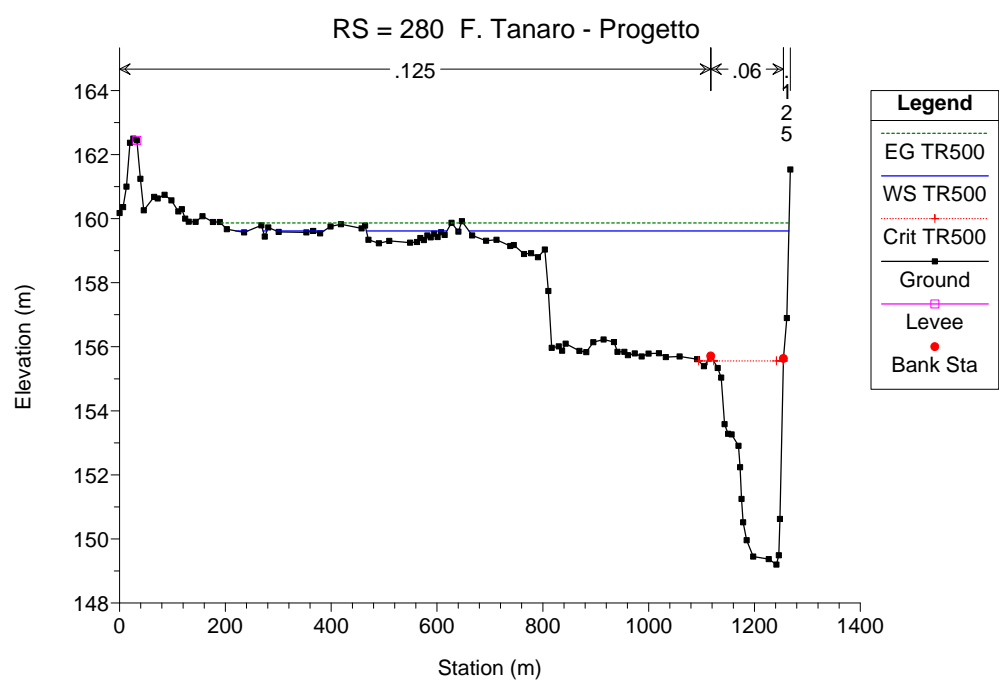
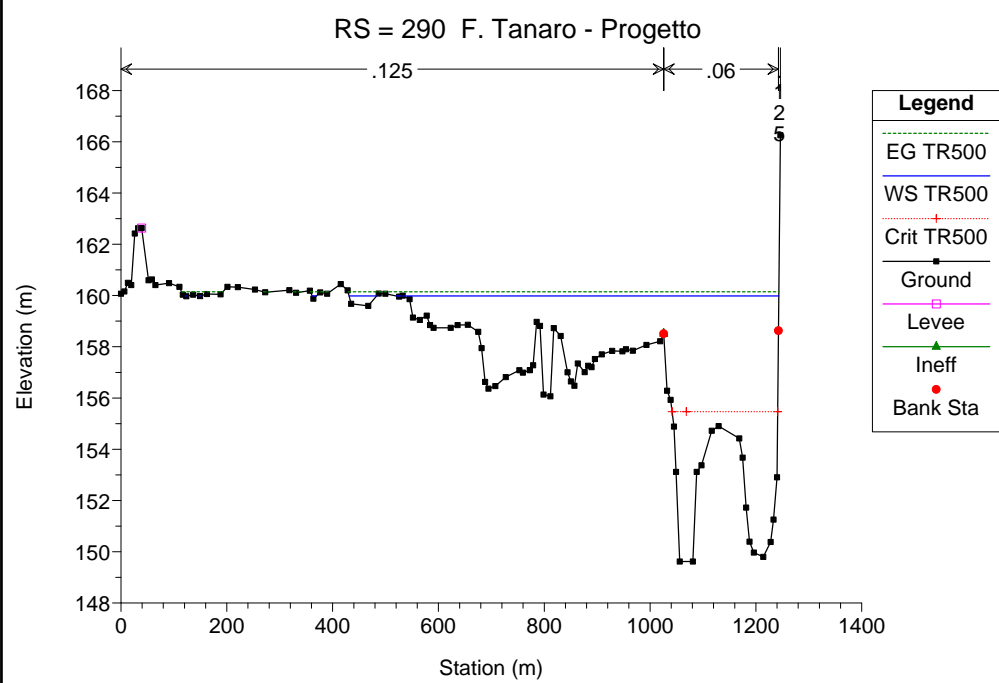
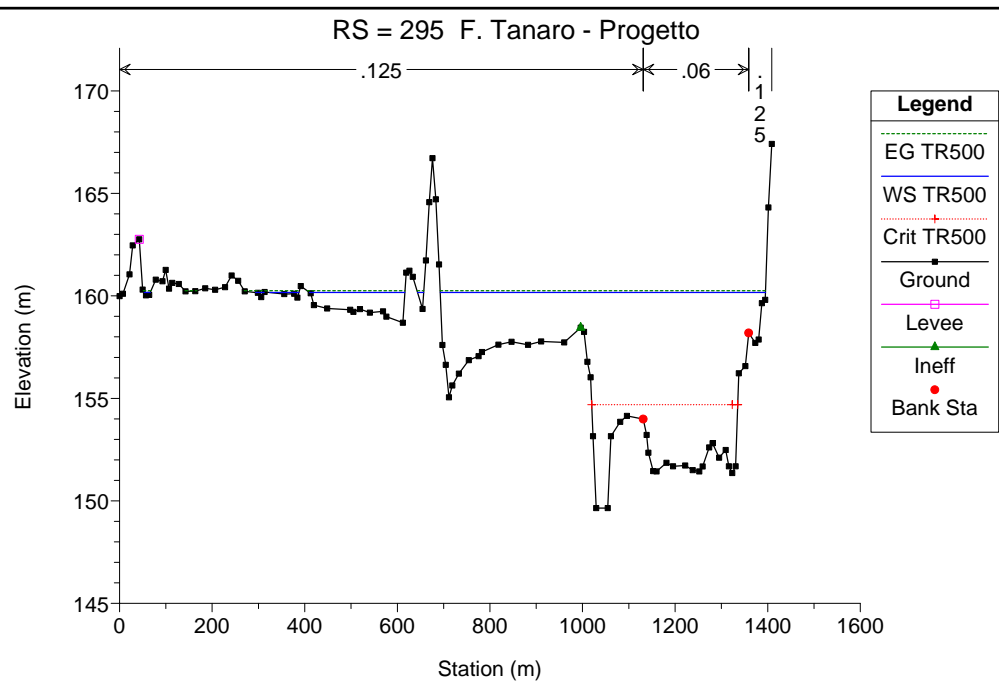
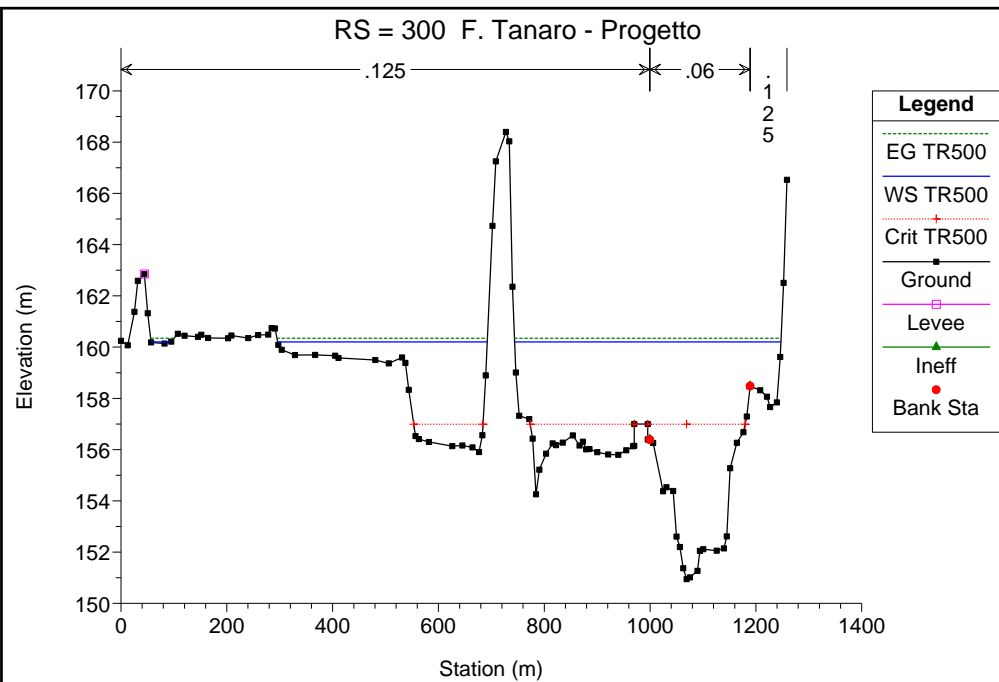
RS = 340 F. Tanaro - Progetto



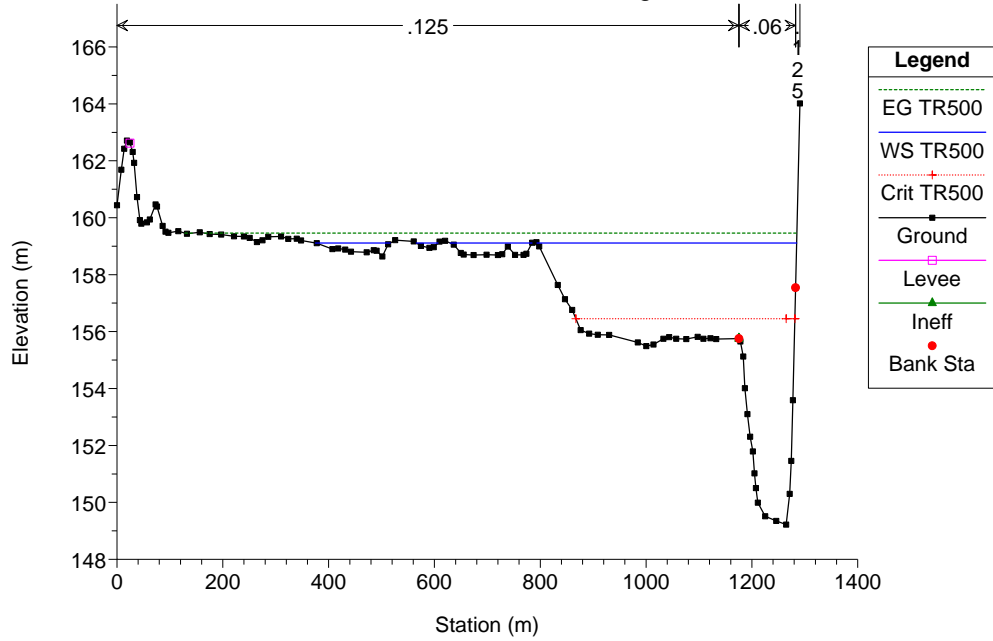
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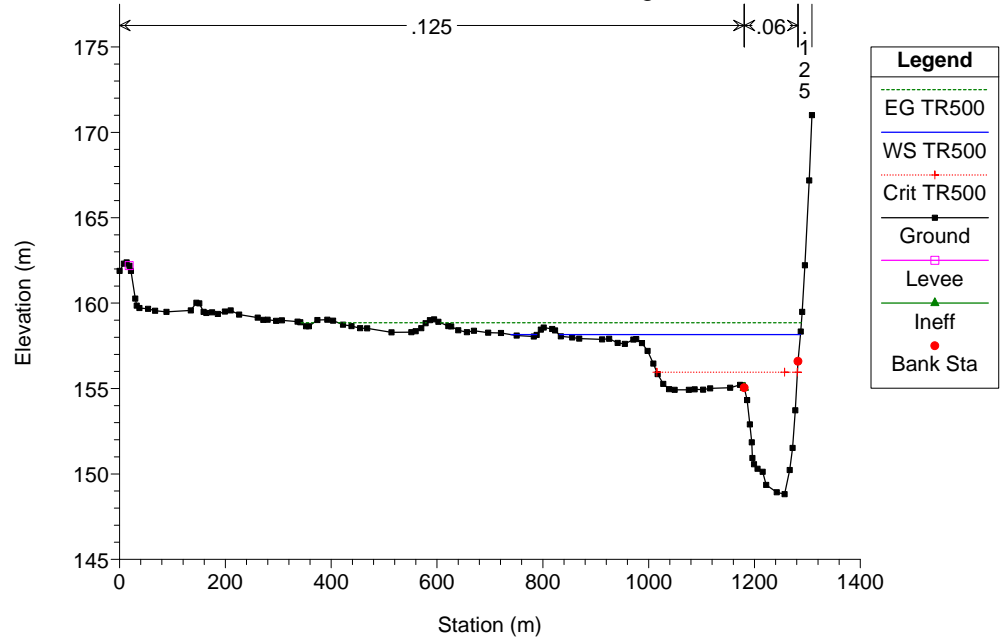




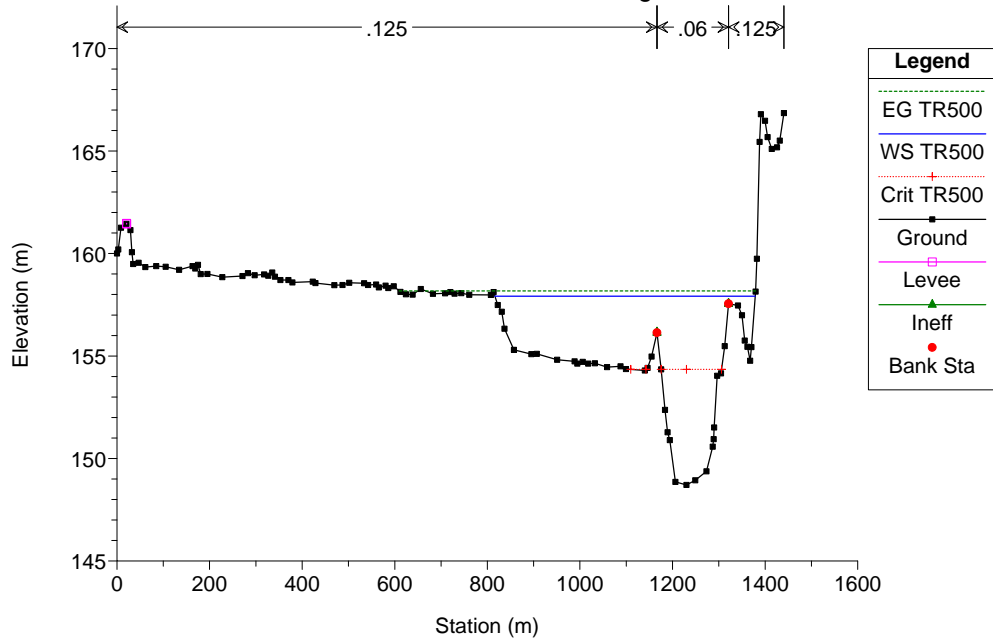
RS = 270 F. Tanaro - Progetto



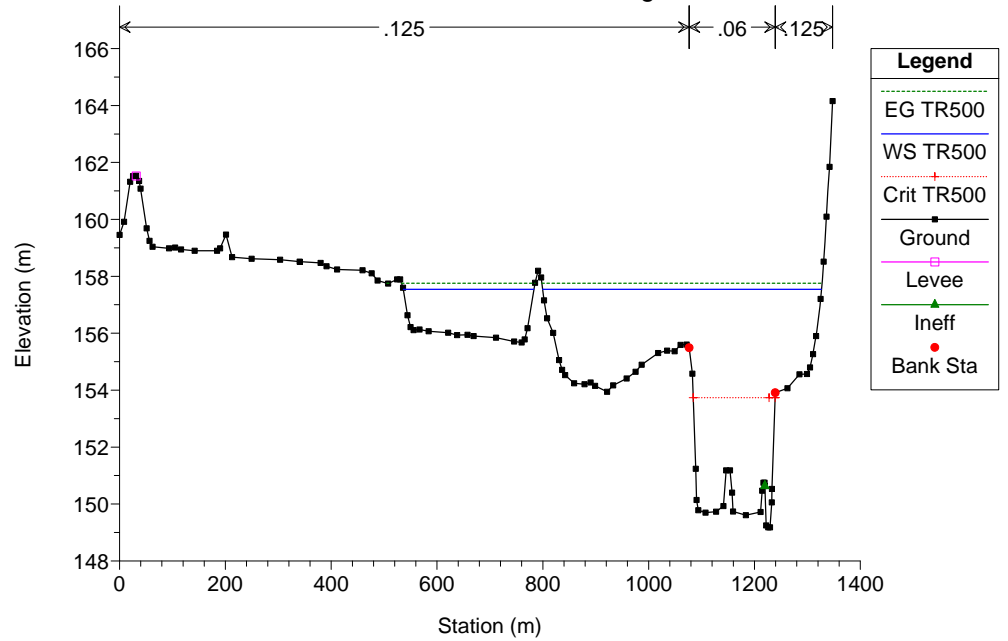
RS = 260 F. Tanaro - Progetto

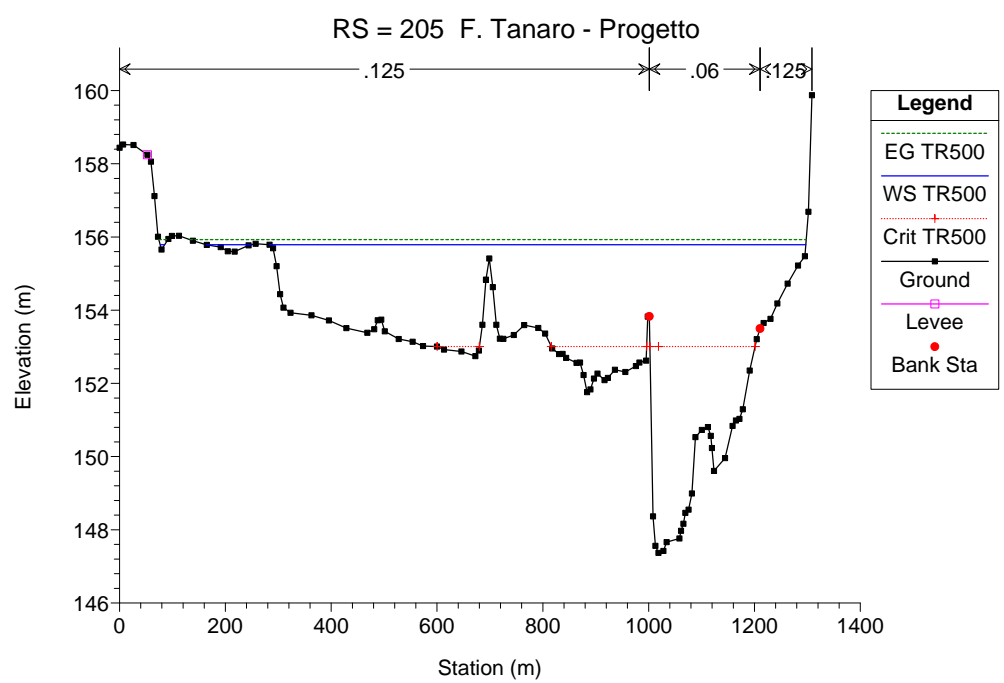
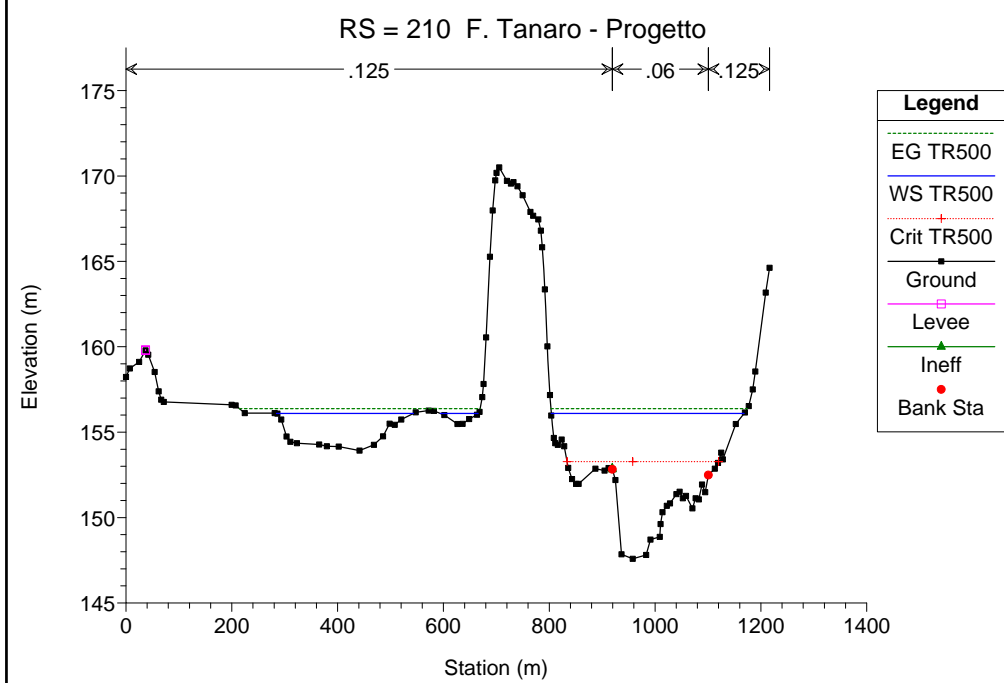
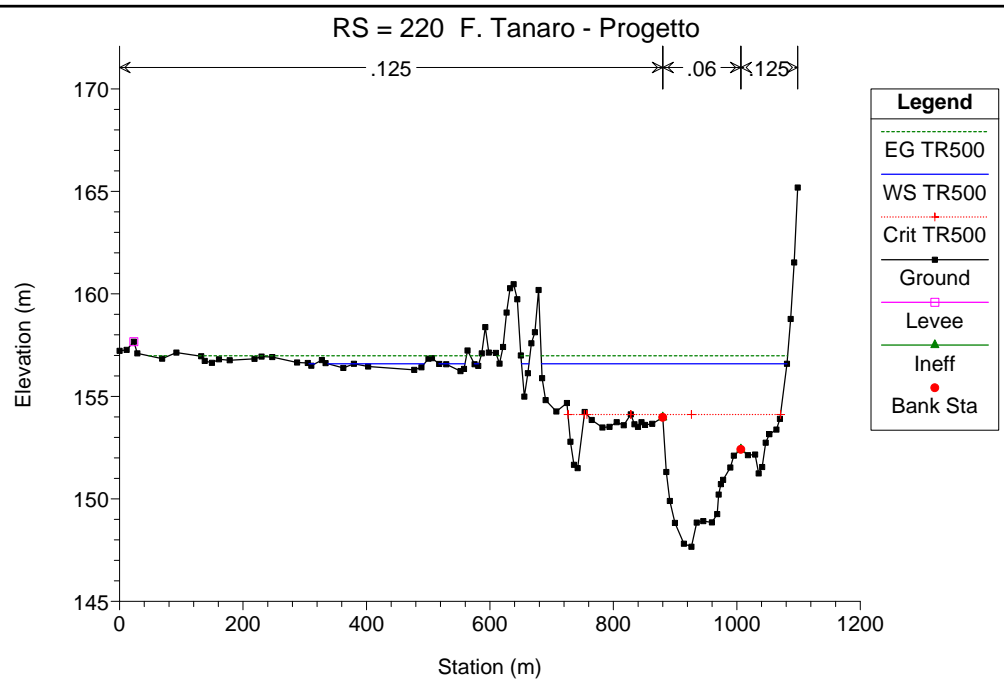
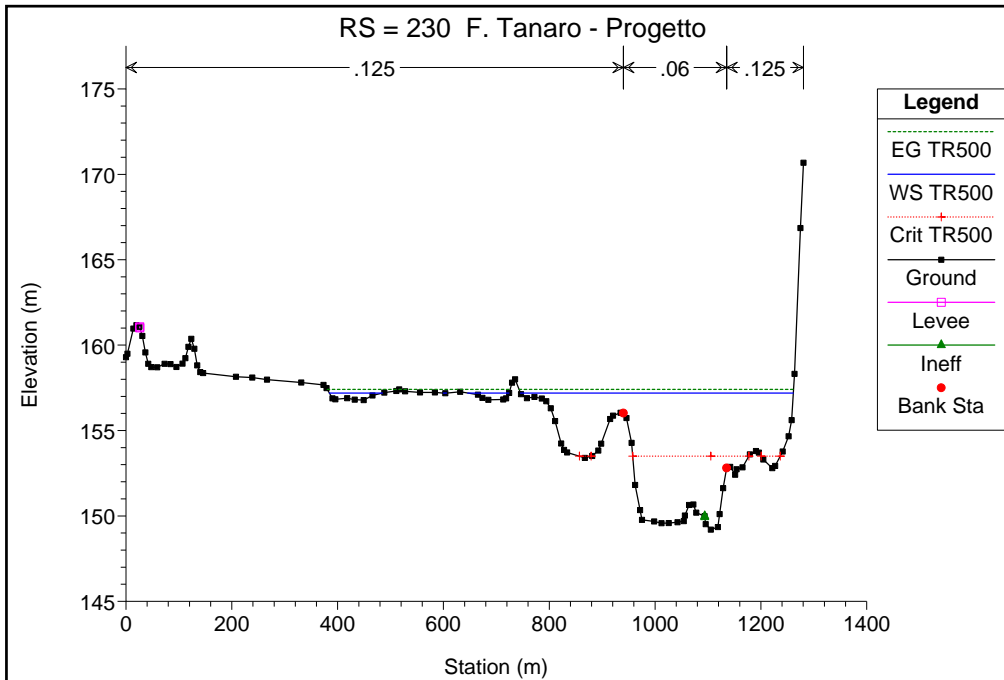


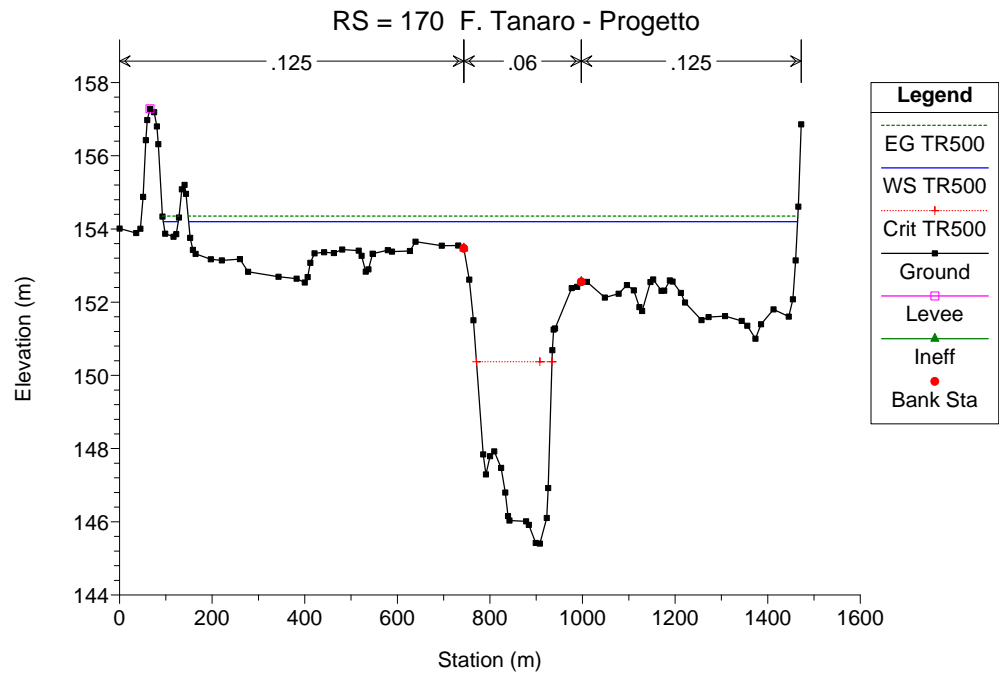
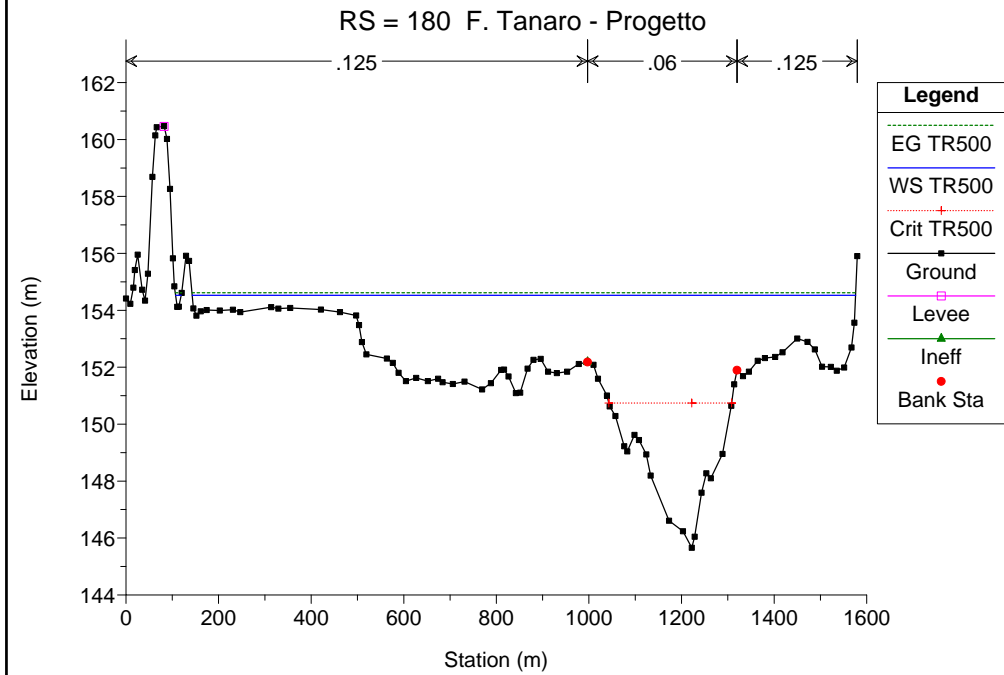
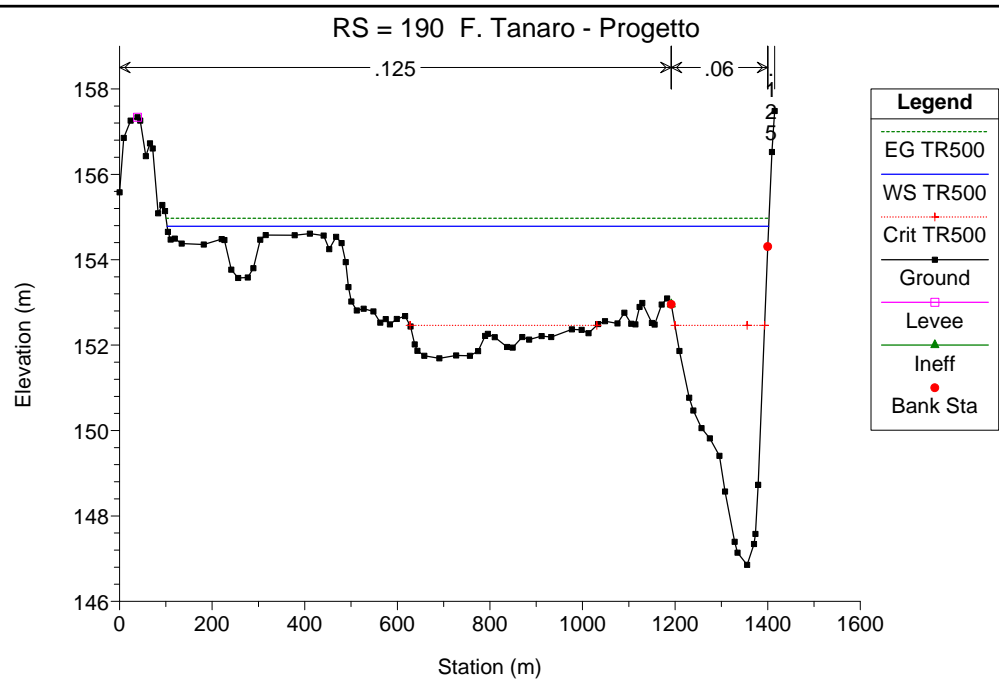
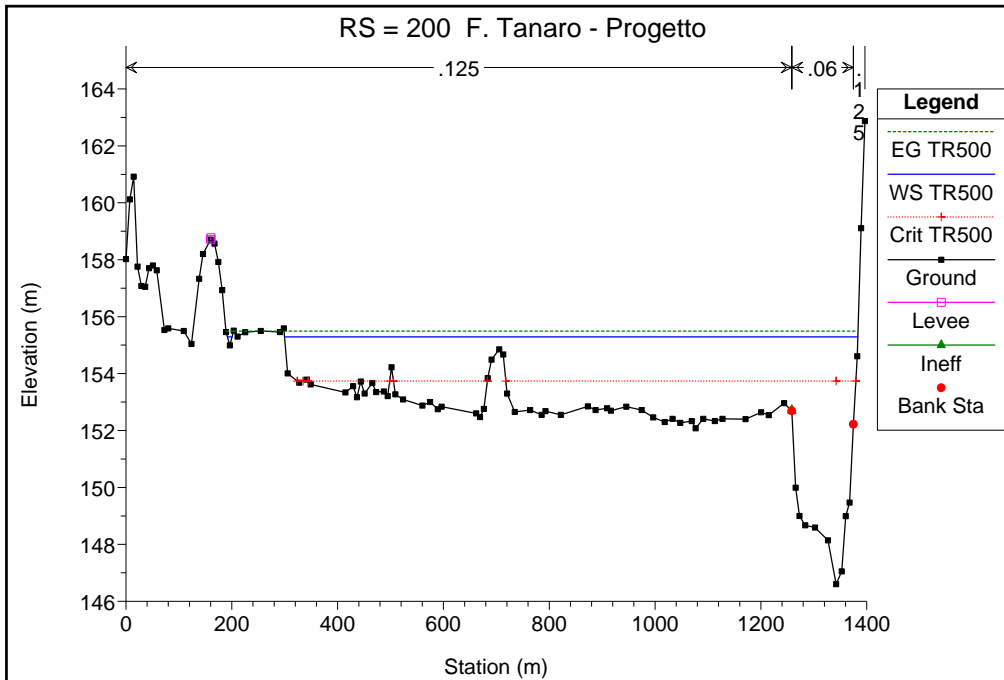
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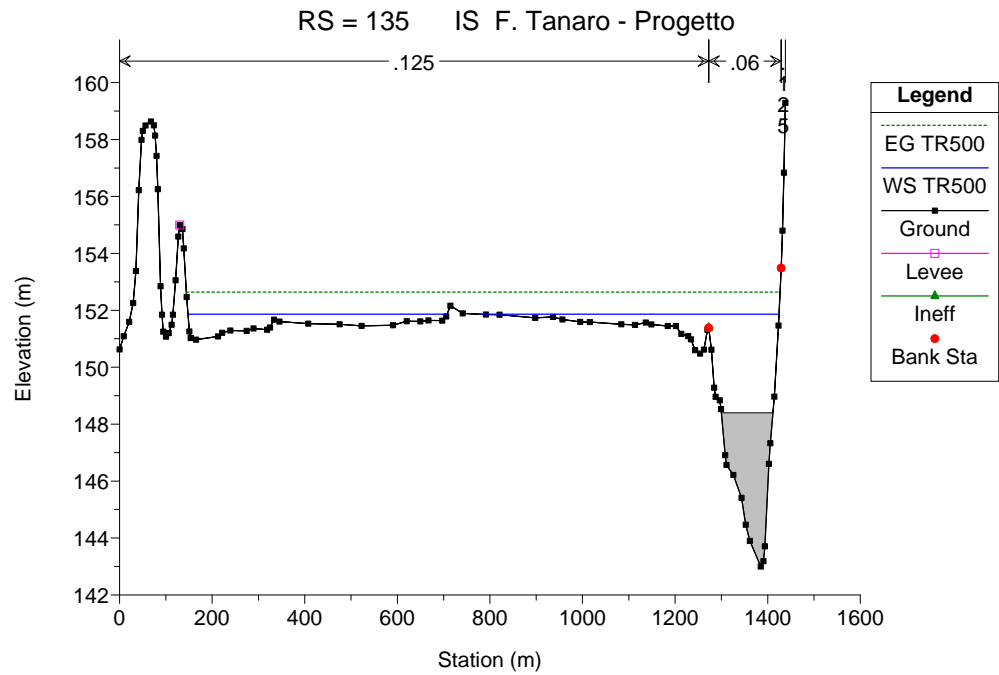
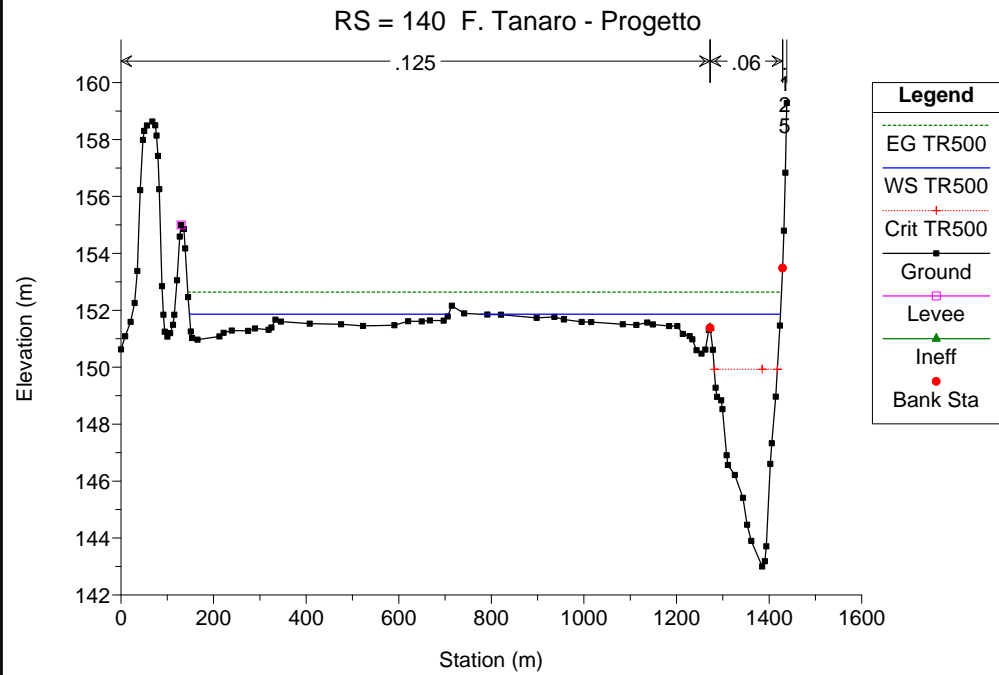
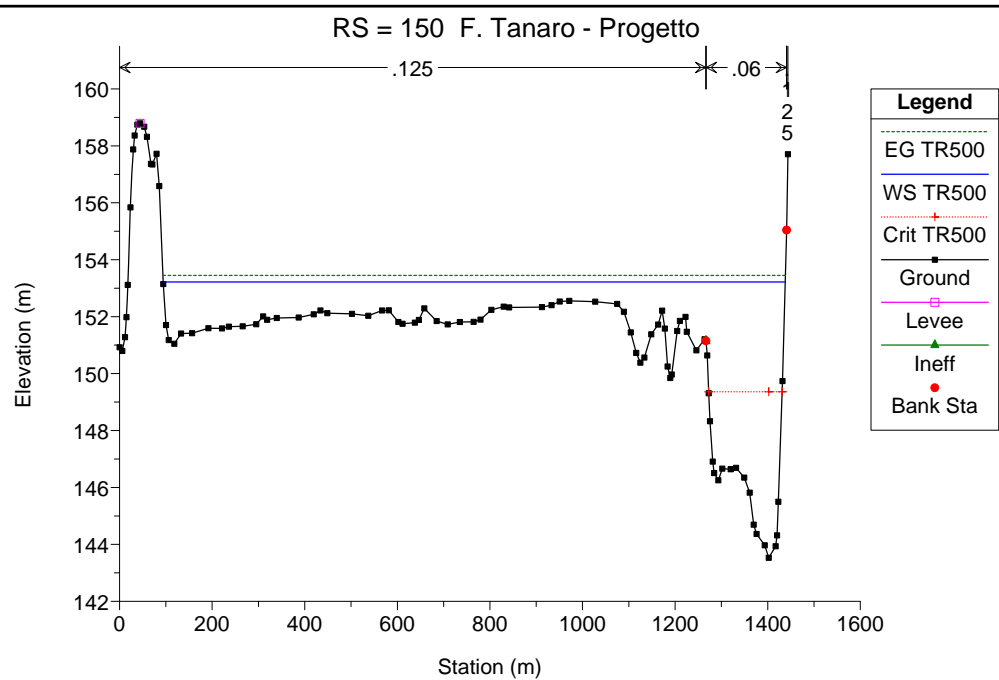
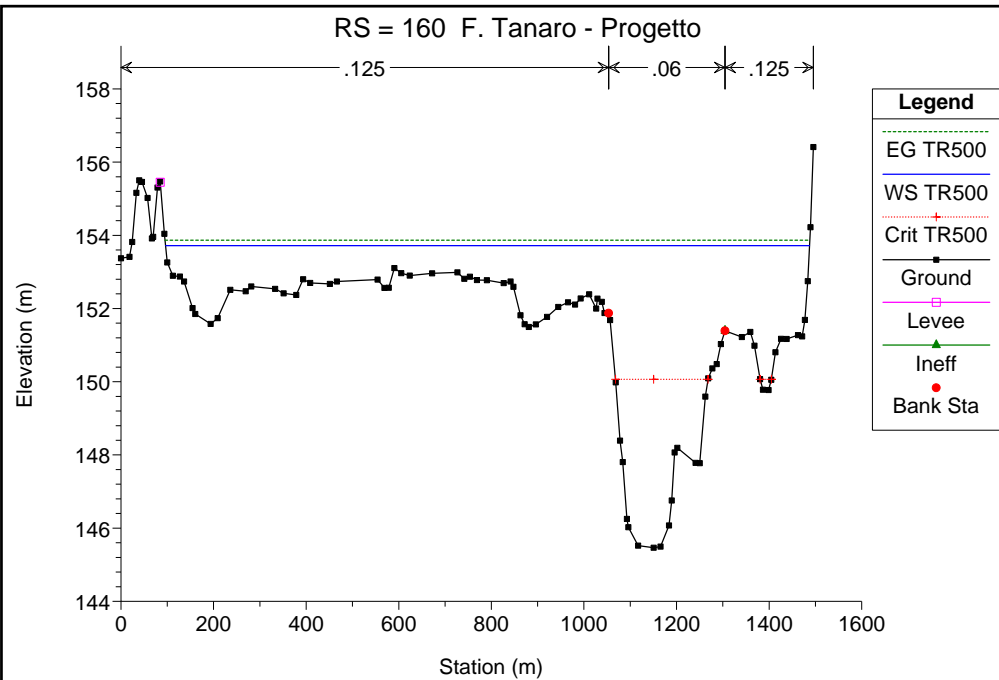


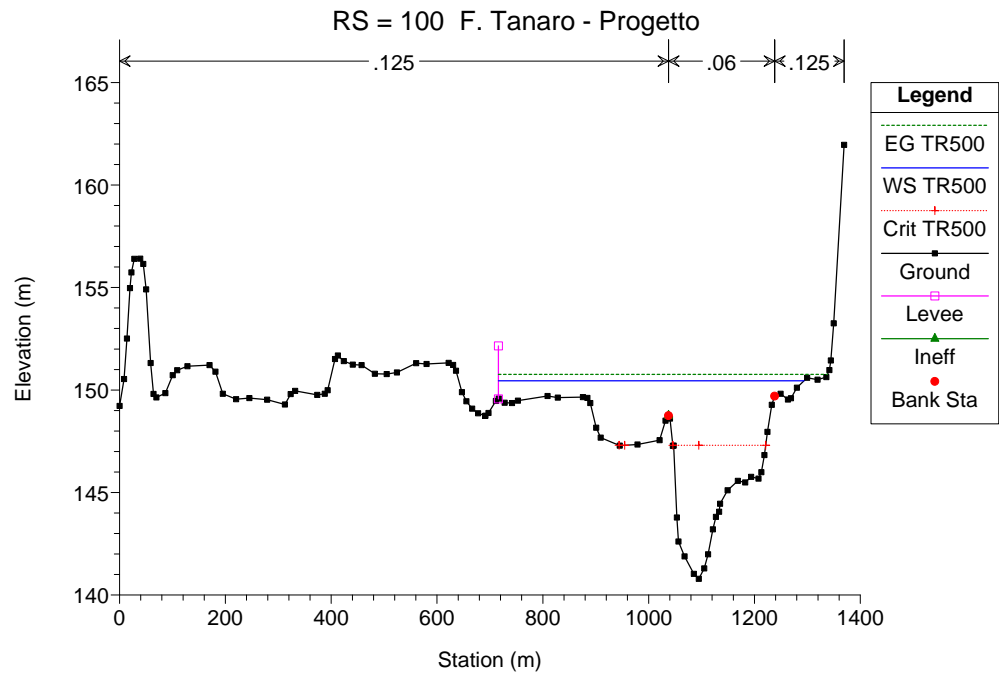
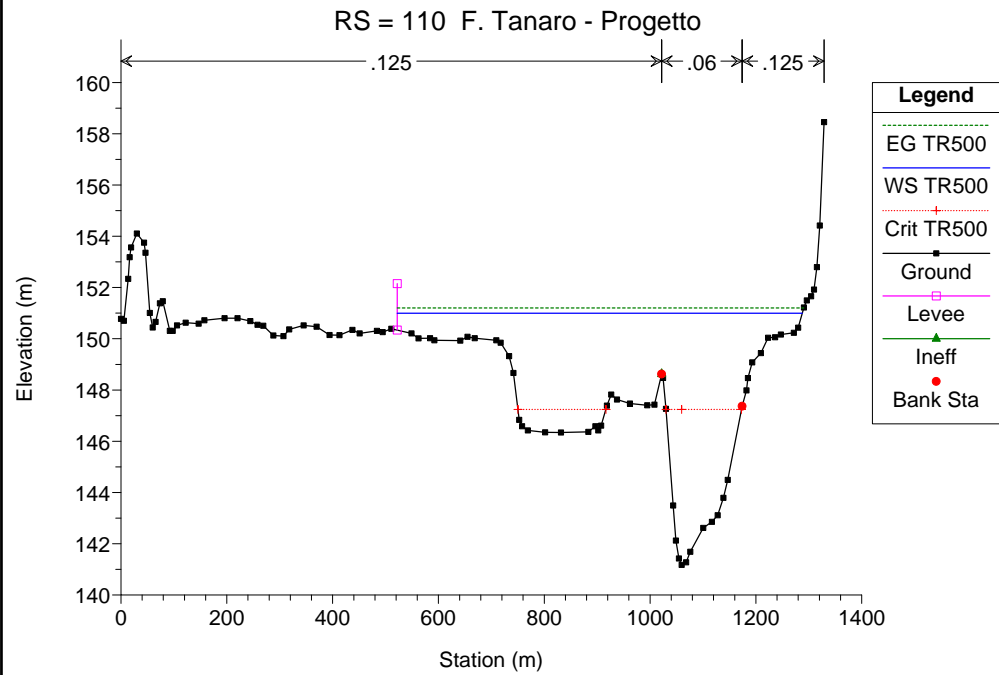
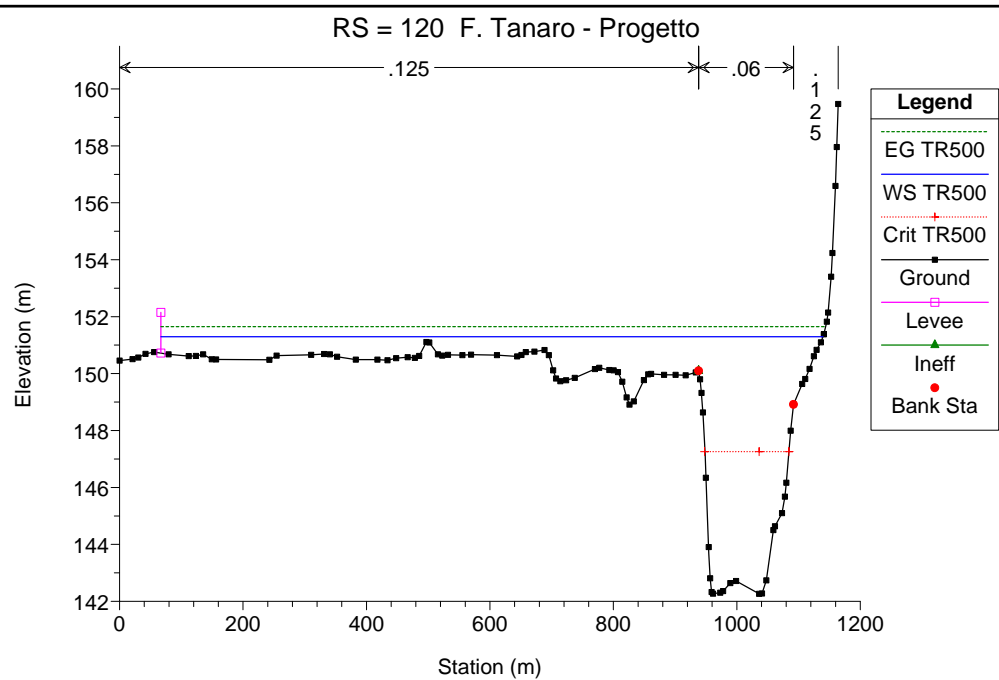
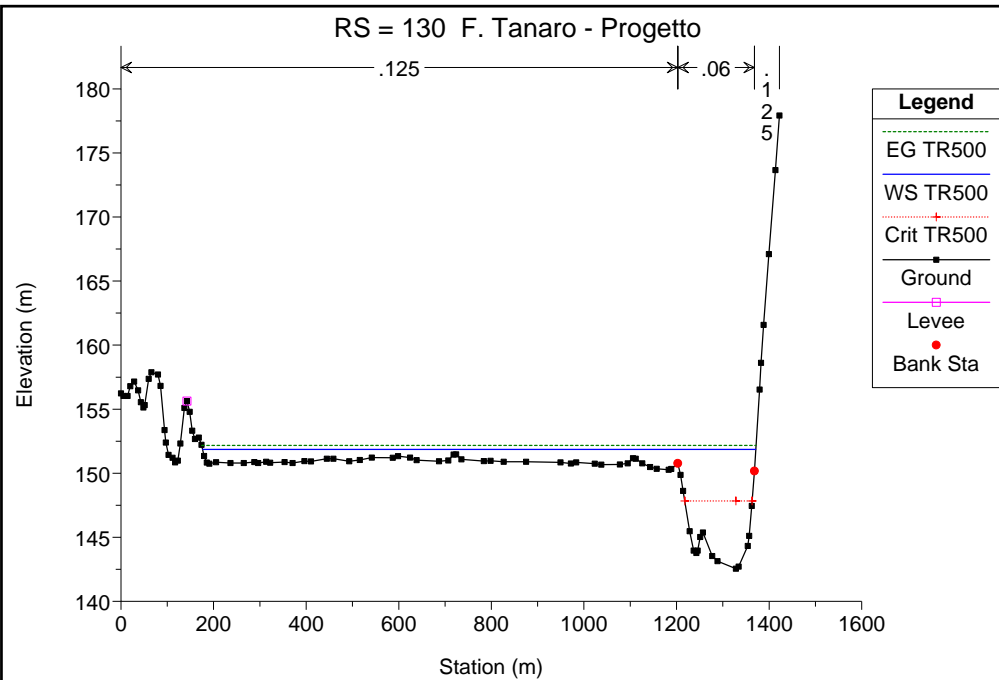
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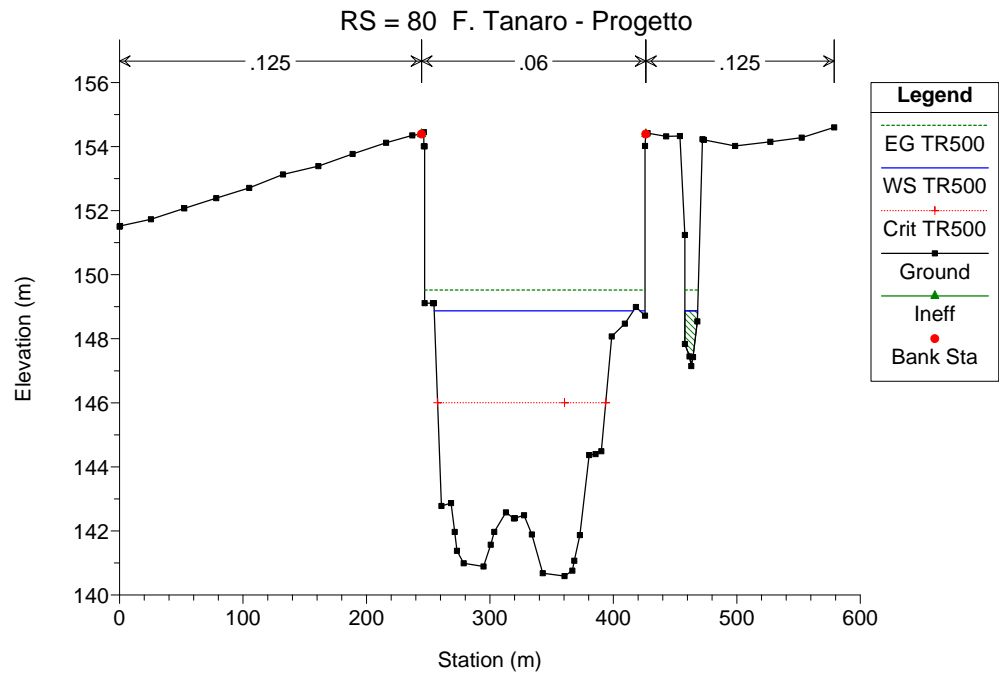
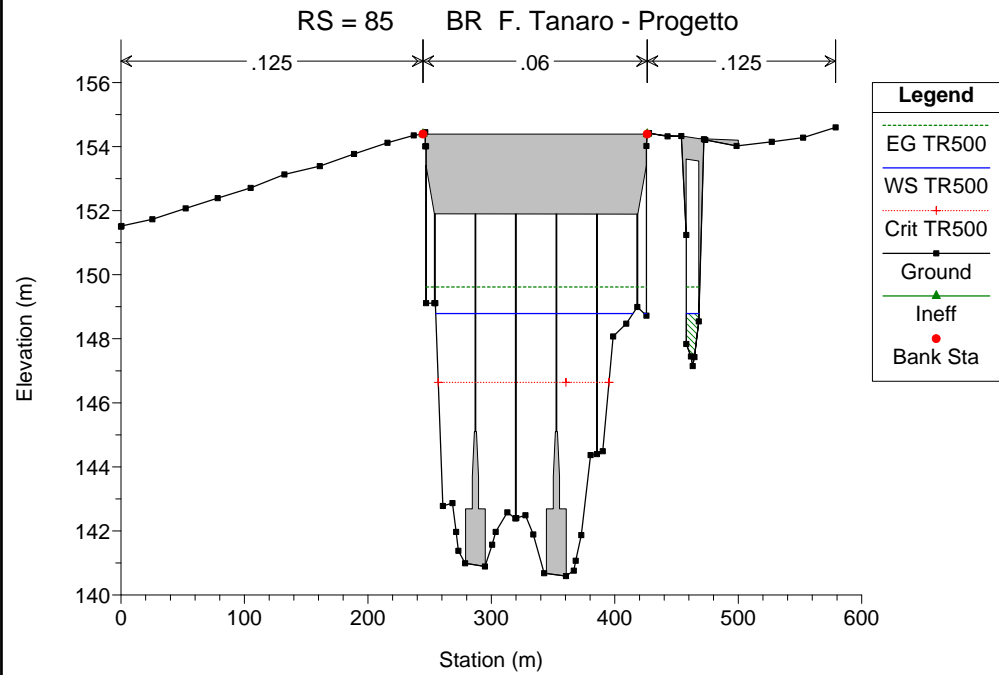
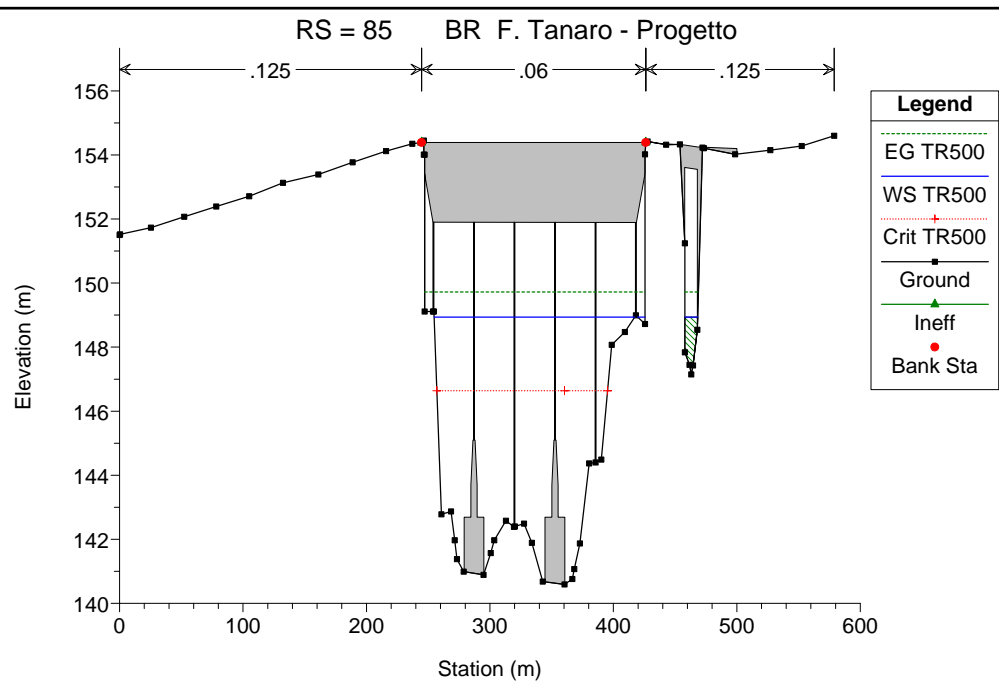
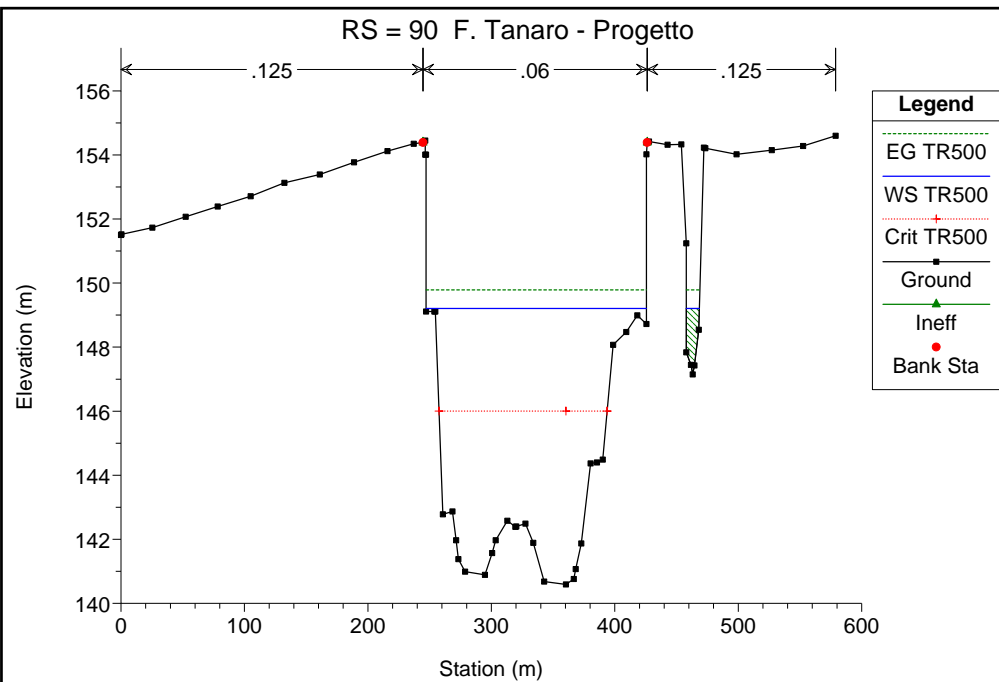


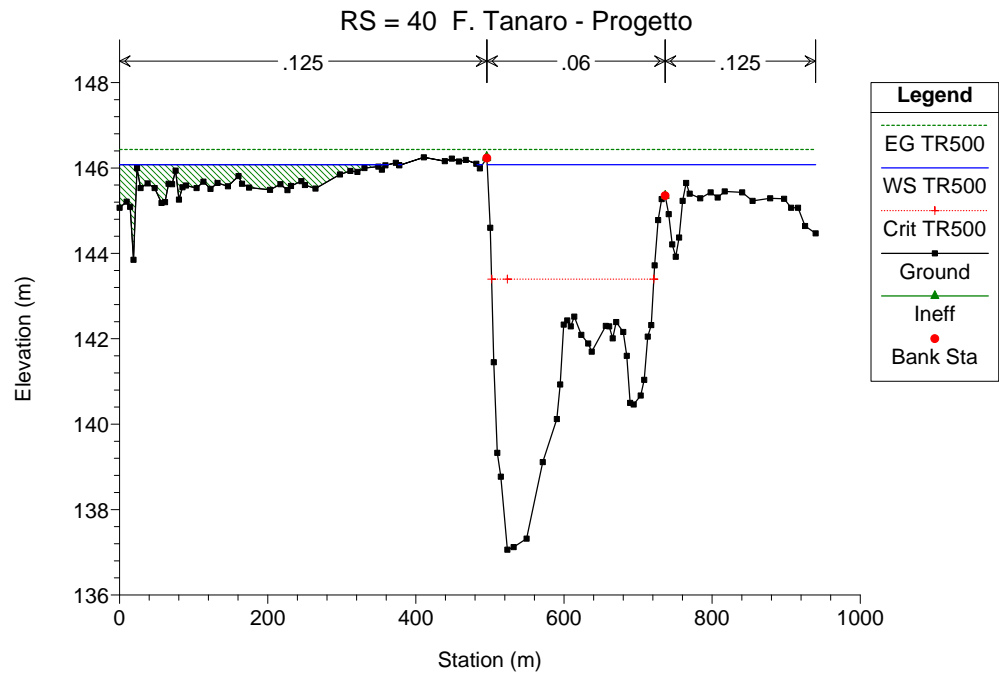
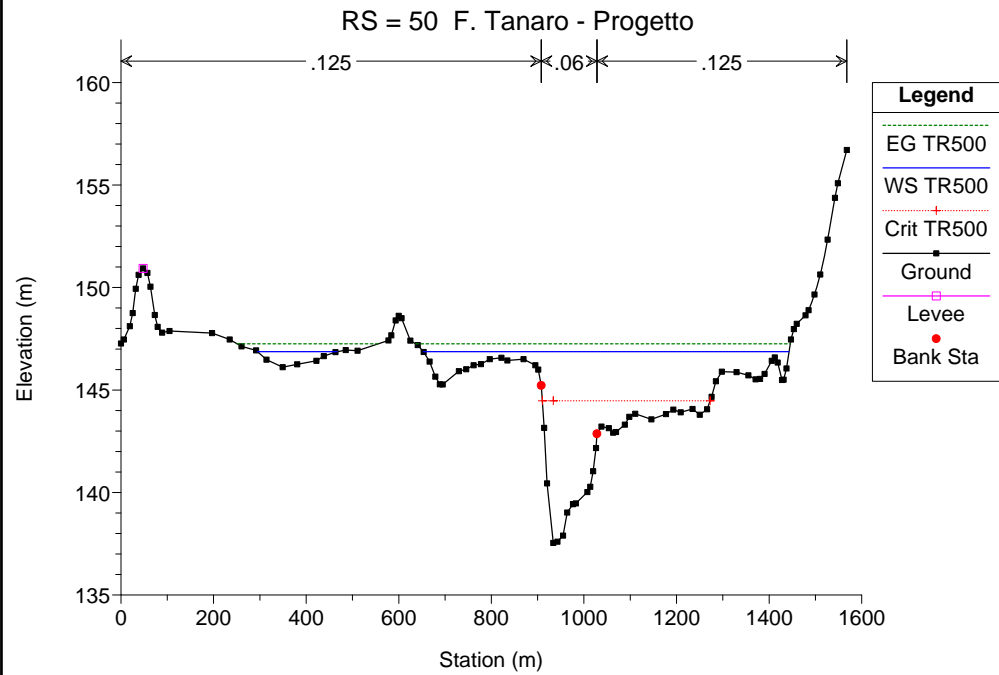
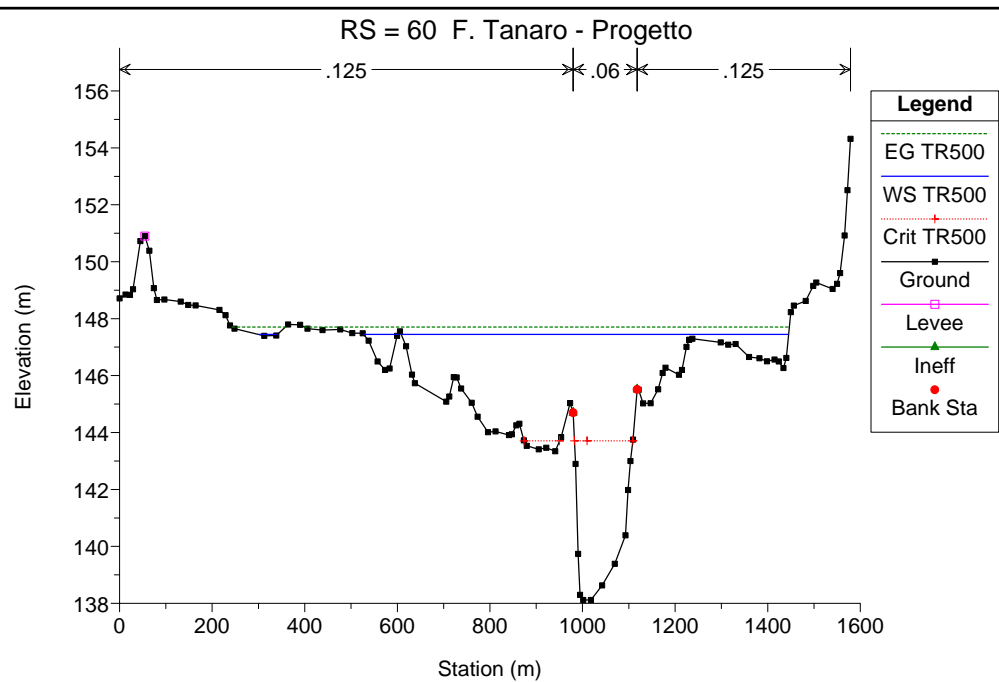
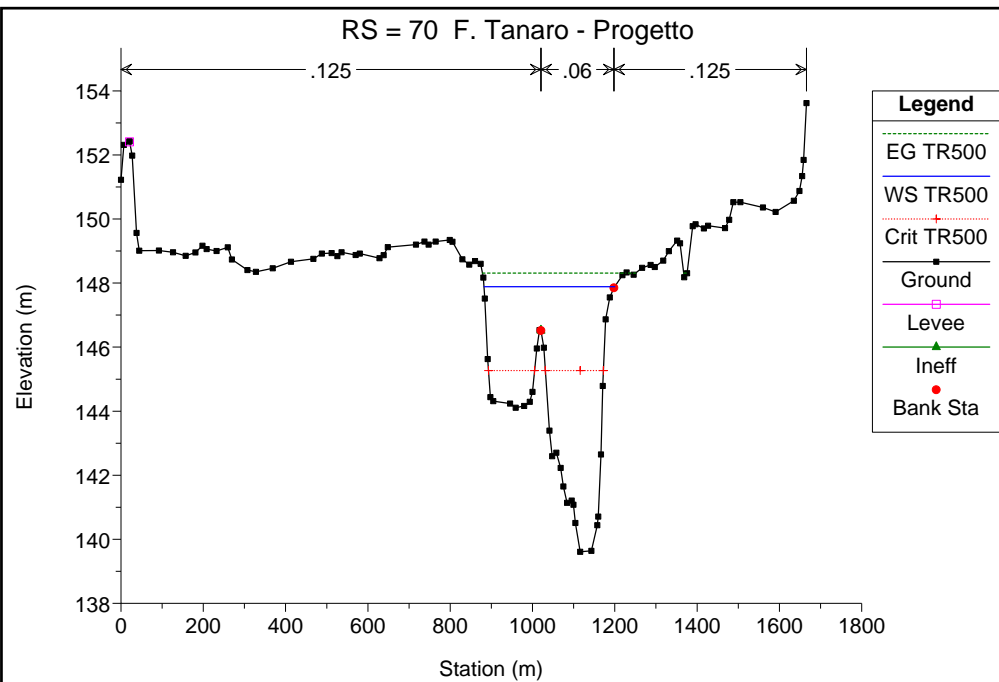


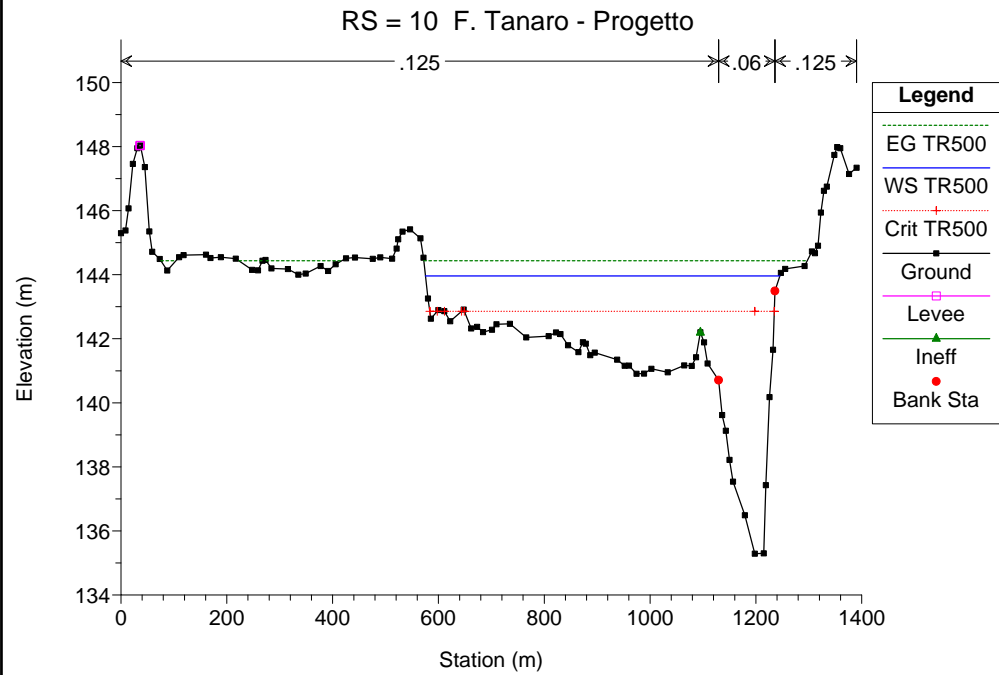
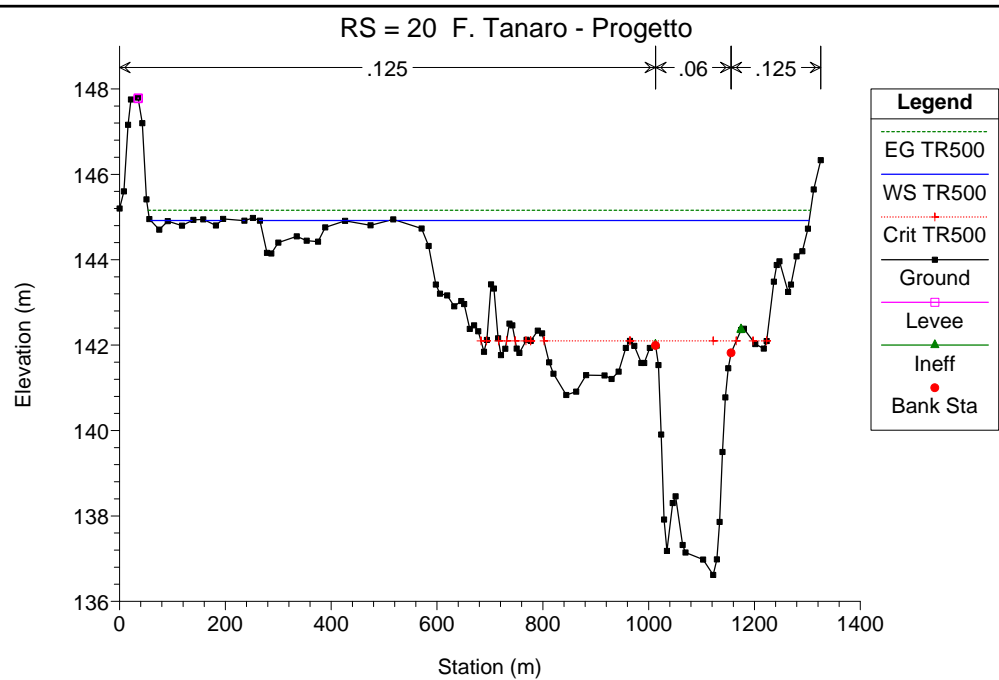
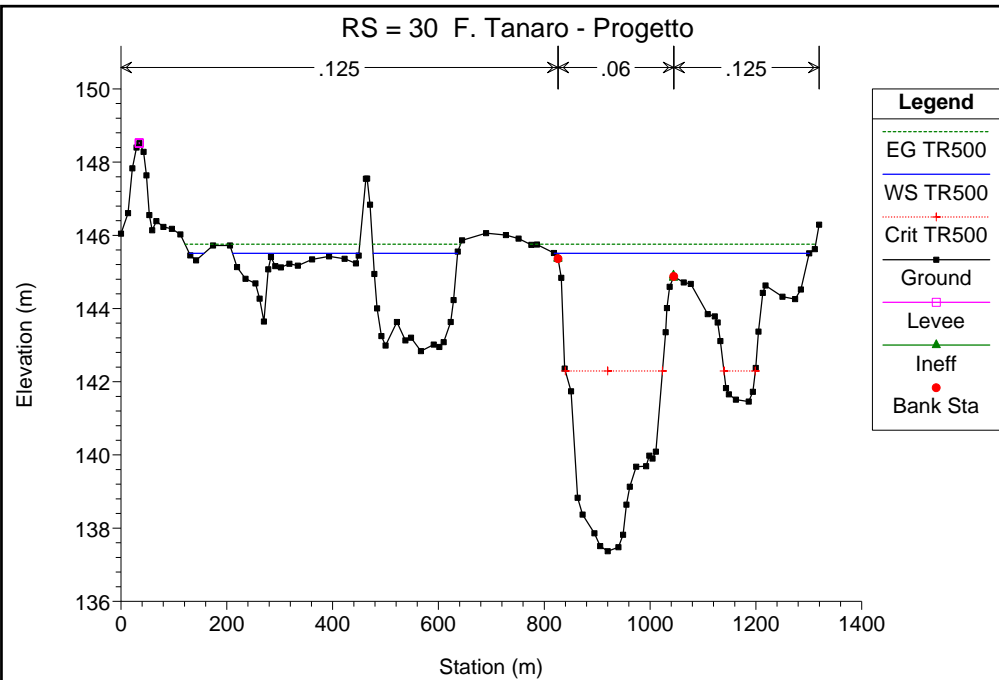












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 19

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3400	500
F. Tanaro valle Riddone	3409	
F. Tanaro valle Cherasca	3422	

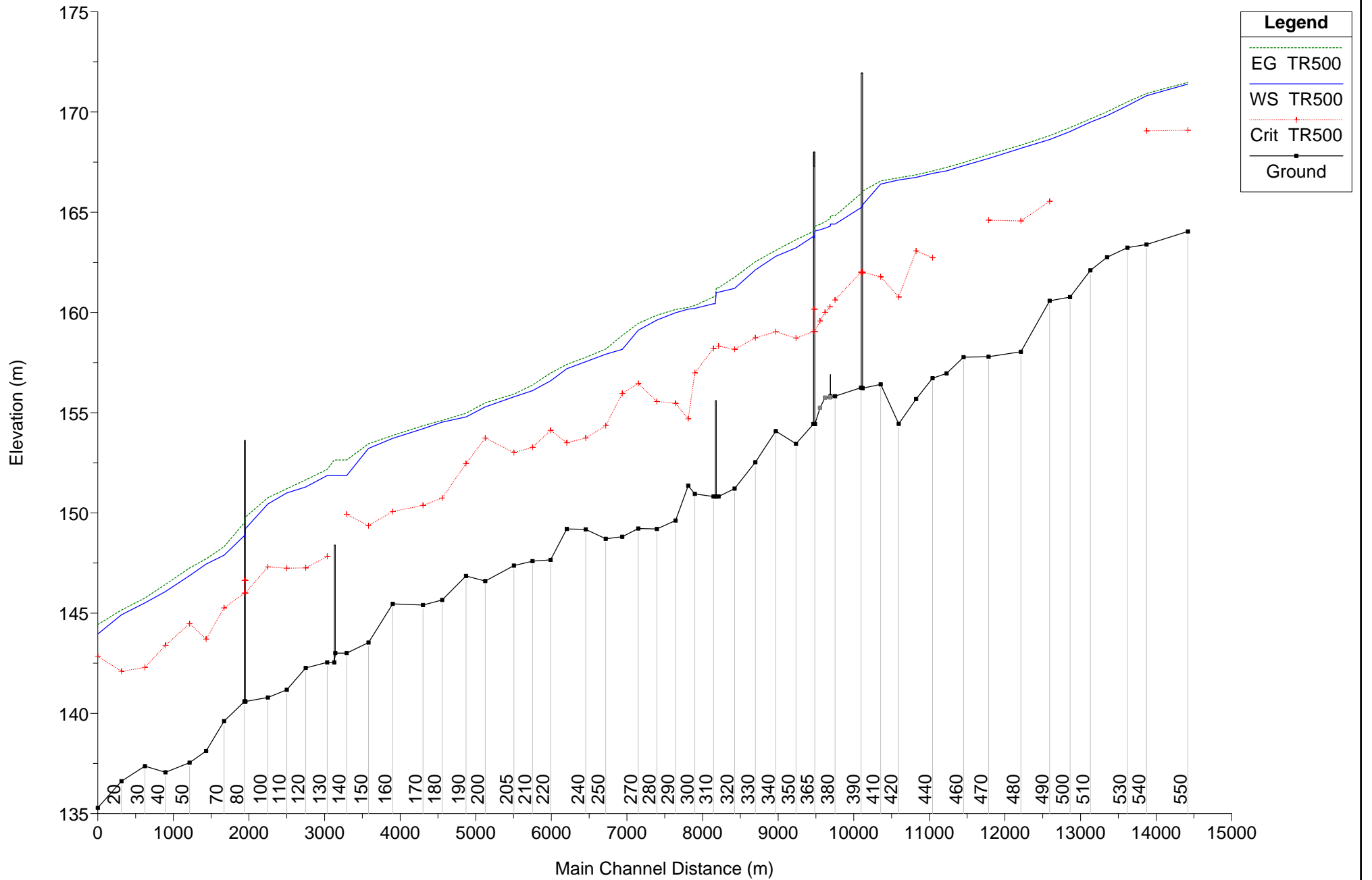
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500

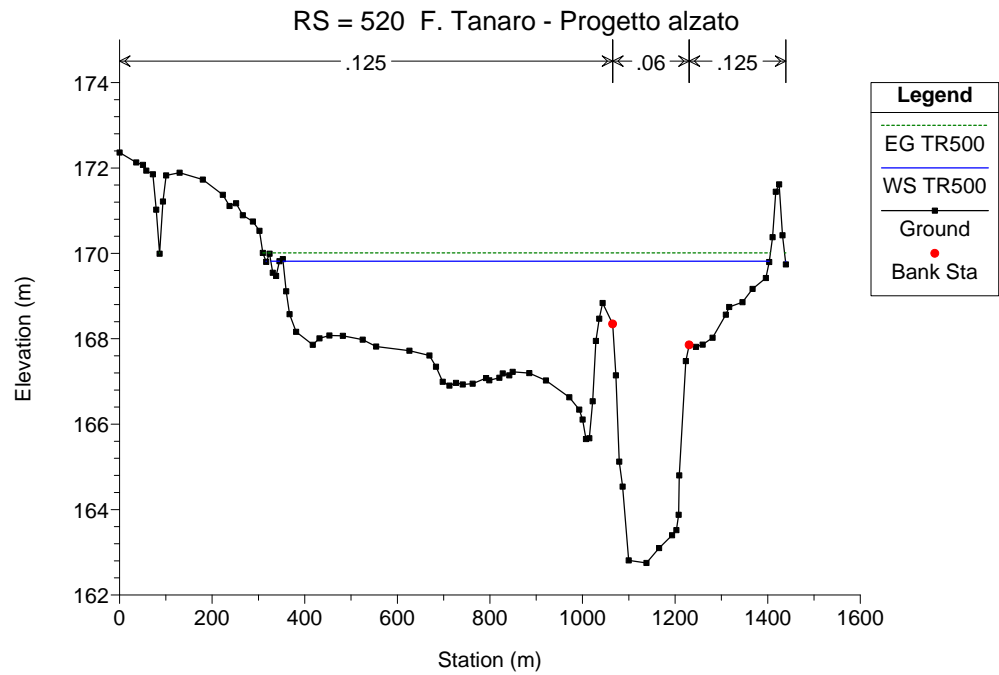
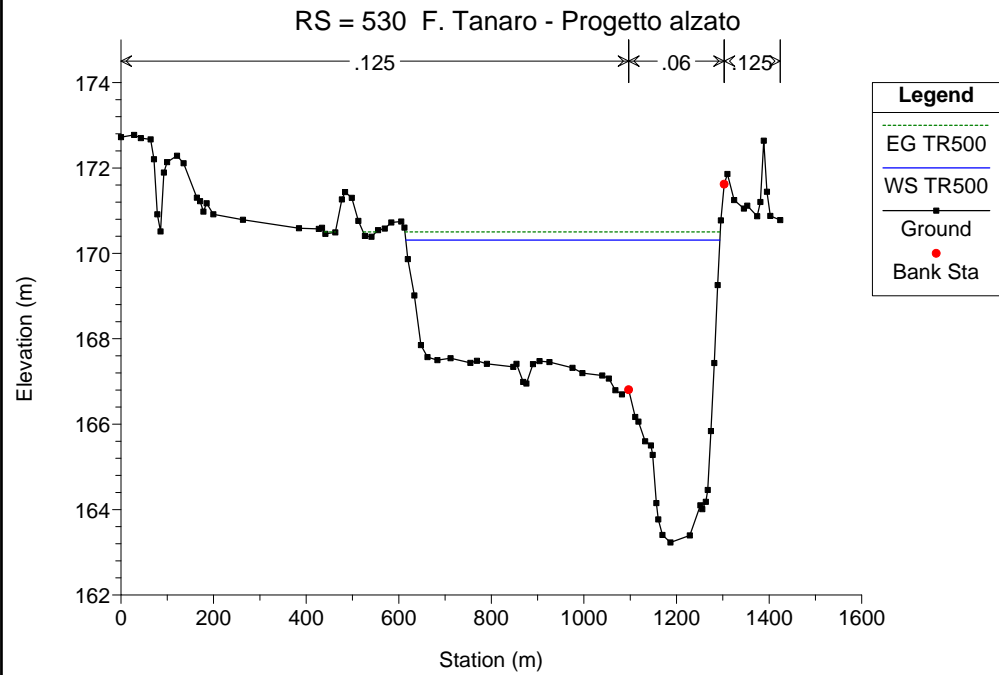
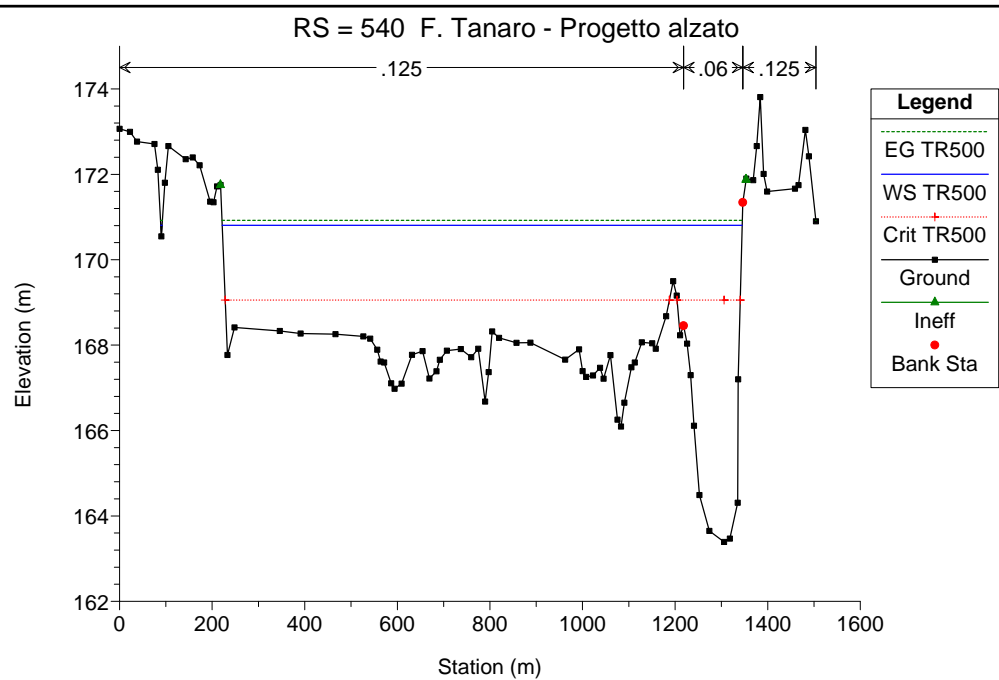
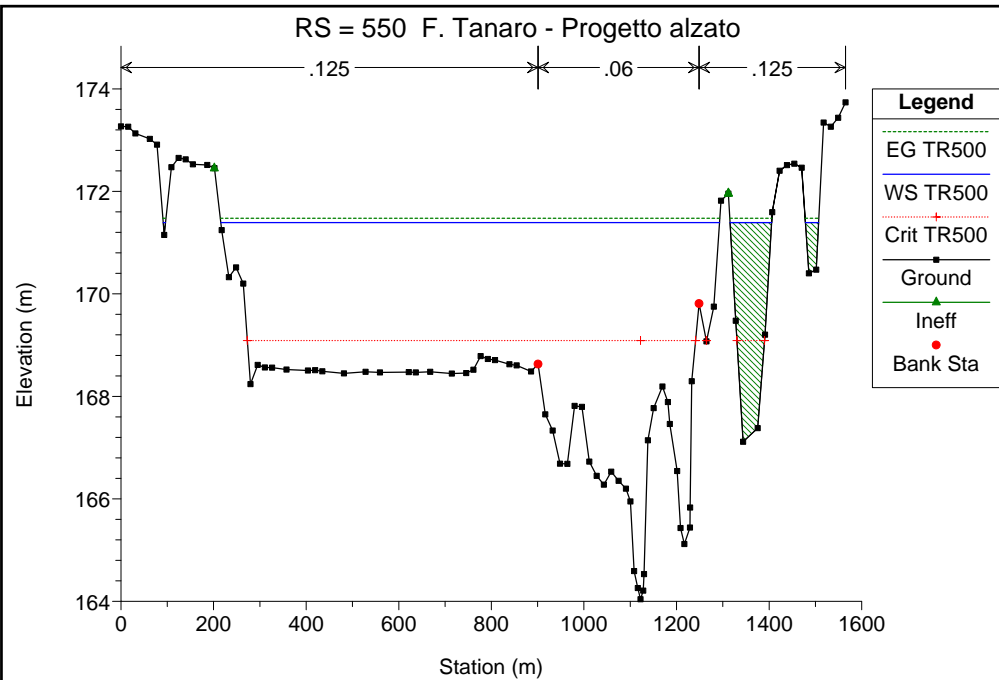
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	TR500	3400.00	164.04	171.39	169.09	171.48	0.001096	1.52	3524.05	1200.52	0.23
1	540	TR500	3400.00	163.39	170.81	169.06	170.92	0.001557	2.11	3612.84	1126.05	0.28
1	530	TR500	3400.00	163.23	170.31		170.50	0.001819	2.23	2479.95	678.52	0.30
1	520	TR500	3400.00	162.75	169.82		170.01	0.001936	2.36	2847.06	1070.81	0.31
1	510	TR500	3400.00	162.10	169.49		169.66	0.001764	2.15	2686.82	790.42	0.30
1	500	TR500	3400.00	160.77	169.02		169.22	0.001566	2.25	2360.77	558.08	0.28
1	490	TR500	3400.00	160.58	168.63	165.54	168.82	0.001503	2.10	2199.81	540.72	0.28
1	480	TR500	3400.00	158.04	168.19	164.56	168.35	0.001138	1.99	2801.13	973.79	0.25
1	470	TR500	3400.00	157.79	167.68	164.60	167.88	0.001366	2.26	2448.24	584.96	0.27
1	460	TR500	3400.00	157.77	167.32		167.48	0.001020	2.00	2965.89	922.73	0.24
1	450	TR500	3400.00	156.96	167.06		167.24	0.001067	2.07	2939.52	1044.43	0.24
1	440	TR500	3400.00	156.72	166.94	162.73	167.06	0.000781	1.83	3425.85	804.49	0.21
1	430	TR500	3400.00	155.68	166.74	163.06	166.87	0.000942	2.02	3251.11	667.86	0.23
1	420	TR500	3400.00	154.44	166.61	160.77	166.71	0.000544	1.70	3594.77	692.37	0.18
1	410	TR500	3400.00	156.41	166.40	161.78	166.56	0.000925	2.04	2764.03	552.81	0.23
1	400	TR500	3400.00	156.22	165.37	162.01	166.05	0.003436	3.76	1050.93	179.19	0.42
1	395		Bridge									
1	390	TR500	3400.00	156.25	165.23	162.02	165.94	0.003662	3.84	1027.10	178.89	0.44
1	380	TR500	3400.00	155.82	164.41	160.62	164.82	0.002190	2.86	1285.27	288.43	0.34
1	379		Inl Struct									
1	370	TR500	3400.00	154.43	164.06	159.05	164.29	0.001108	2.12	1602.25	208.96	0.24
1	365		Bridge									
1	360	TR500	3400.00	154.43	163.79	159.05	164.04	0.001241	2.20	1546.06	208.21	0.26
1	350	TR500	3400.00	153.45	163.22	158.72	163.63	0.001995	2.87	1302.32	294.06	0.33
1	340	TR500	3409.00	154.08	162.80	159.04	163.10	0.001757	2.47	1628.68	392.94	0.30
1	330	TR500	3409.00	152.53	162.12	158.73	162.53	0.002408	2.94	1527.99	441.28	0.36
1	320	TR500	3409.00	151.21	161.20	158.17	161.75	0.003158	3.69	1720.63	724.37	0.41
1	315	TR500	3409.00	150.82	161.01	158.32	161.23	0.001542	2.61	3036.87	1130.36	0.29
1	312.5		Inl Struct									
1	310	TR500	3409.00	150.82	160.43	158.20	160.77	0.002355	3.07	2355.46	840.01	0.36
1	300	TR500	3422.00	150.95	160.20	156.99	160.35	0.001128	1.95	3071.89	935.41	0.24
1	295	TR500	3422.00	151.36	160.17	154.70	160.25	0.000513	1.47	3769.13	1016.17	0.17
1	290	TR500	3422.00	149.62	159.98	155.47	160.15	0.000960	1.90	2627.08	785.03	0.22
1	280	TR500	3422.00	149.20	159.62	155.56	159.86	0.001388	2.46	2398.43	879.22	0.28
1	270	TR500	3422.00	149.22	159.11	156.45	159.46	0.002060	2.98	2079.80	828.20	0.34
1	260	TR500	3422.00	148.81	158.16	155.95	158.85	0.003905	3.94	1361.48	505.08	0.46
1	250	TR500	3422.00	148.71	157.92	154.35	158.18	0.001784	2.52	2166.38	562.22	0.31
1	240	TR500	3422.00	149.18	157.54	153.73	157.76	0.001376	2.29	2547.94	773.70	0.27
1	230	TR500	3422.00	149.20	157.19	153.50	157.41	0.001408	2.21	2220.42	700.30	0.27
1	220	TR500	3422.00	147.66	156.59	154.12	156.98	0.002674	3.09	1741.77	624.31	0.38

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500 (Continued)

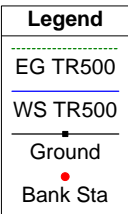
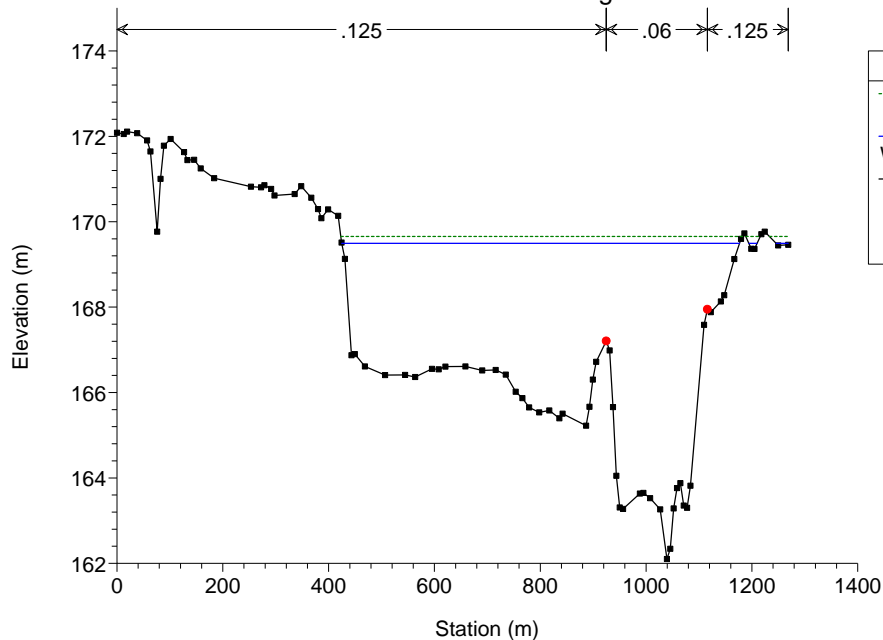
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR500	3422.00	147.59	156.10	153.27	156.38	0.002057	2.55	2020.70	695.11	0.33
1	205	TR500	3422.00	147.37	155.79	153.01	155.93	0.001287	1.94	3187.76	1106.77	0.25
1	200	TR500	3422.00	146.60	155.29	153.74	155.49	0.001936	2.58	3059.00	1092.32	0.32
1	190	TR500	3422.00	146.85	154.78	152.46	154.97	0.002008	2.24	2981.23	1299.47	0.31
1	180	TR500	3422.00	145.66	154.53	150.74	154.62	0.000750	1.46	3956.46	1444.97	0.19
1	170	TR500	3422.00	145.40	154.20	150.37	154.35	0.001400	1.94	3039.46	1348.10	0.26
1	160	TR500	3422.00	145.46	153.72	150.07	153.87	0.001160	1.87	3157.55	1391.08	0.24
1	150	TR500	3422.00	143.53	153.22	149.36	153.45	0.001481	2.34	2764.20	1343.44	0.28
1	140	TR500	3422.00	143.00	151.86	149.93	152.64	0.006055	3.98	1222.29	1207.93	0.55
1	135		Inl Struct									
1	130	TR500	3422.00	142.54	151.86	147.83	152.17	0.001766	2.60	2175.76	1195.01	0.31
1	120	TR500	3422.00	142.27	151.29	147.26	151.65	0.001921	2.76	1967.75	1072.58	0.32
1	110	TR500	3422.00	141.17	151.00	147.24	151.21	0.001353	2.31	2638.24	765.70	0.27
1	100	TR500	3422.00	140.79	150.45	147.31	150.76	0.002287	2.60	1790.89	577.54	0.34
1	90	TR500	3422.00	140.59	149.21	146.00	149.79	0.004177	3.37	1015.62	189.29	0.45
1	85		Bridge									
1	80	TR500	3422.00	140.59	148.87	146.00	149.52	0.004590	3.57	957.31	175.93	0.47
1	70	TR500	3422.00	139.61	147.89	145.27	148.31	0.003625	3.08	1405.92	317.89	0.42
1	60	TR500	3422.00	138.12	147.45	143.71	147.71	0.001630	2.56	2424.15	951.28	0.30
1	50	TR500	3422.00	137.54	146.87	144.48	147.25	0.002511	3.08	2087.31	961.97	0.37
1	40	TR500	3422.00	137.06	146.08	143.40	146.43	0.002875	2.67	1441.41	818.36	0.37
1	30	TR500	3422.00	137.37	145.51	142.29	145.76	0.002000	2.36	2157.78	909.01	0.32
1	20	TR500	3422.00	136.62	144.92	142.10	145.16	0.001818	2.53	2584.10	1133.53	0.31
1	10	TR500	3422.00	135.29	143.96	142.85	144.43	0.004002	3.58	1861.45	669.69	0.45

F. Tanaro - Progetto alzato

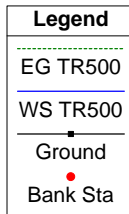
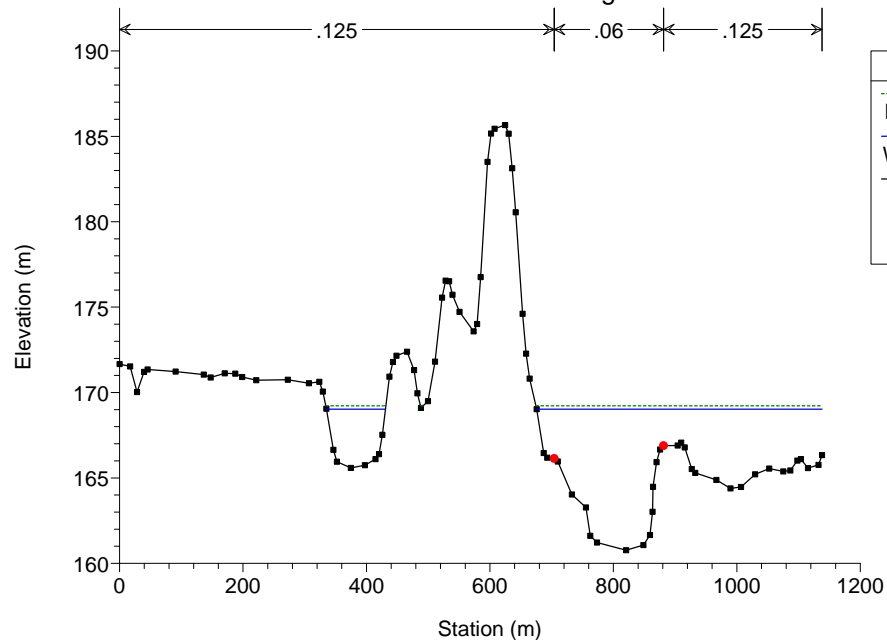




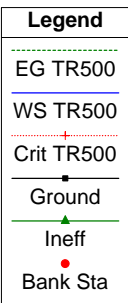
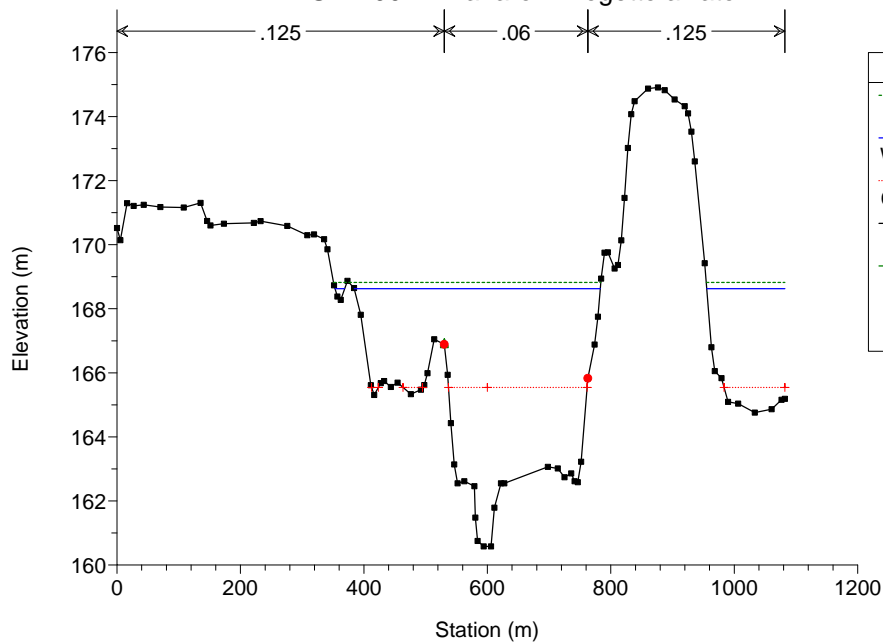
RS = 510 F. Tanaro - Progetto alzato



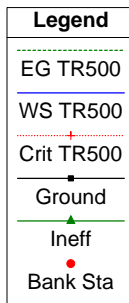
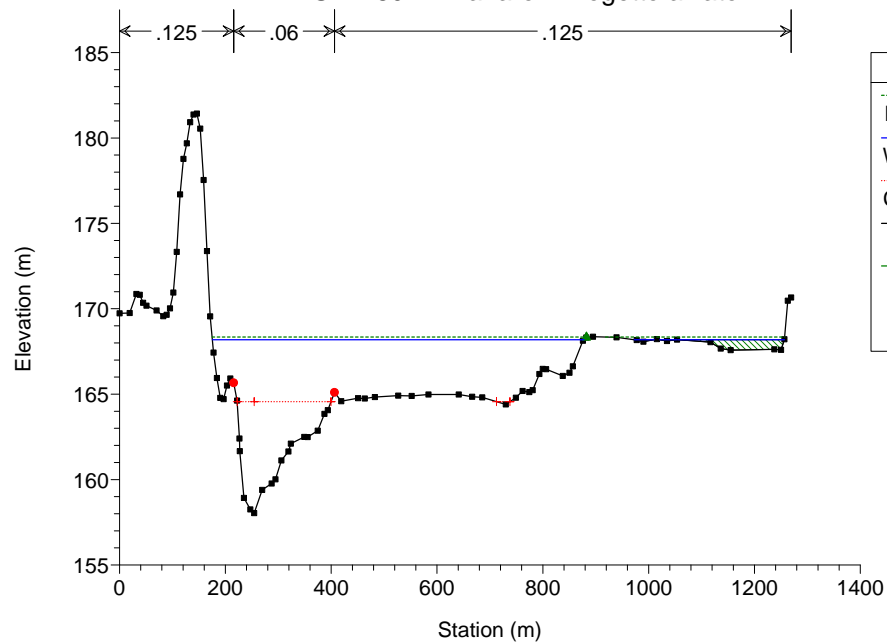
RS = 500 F. Tanaro - Progetto alzato

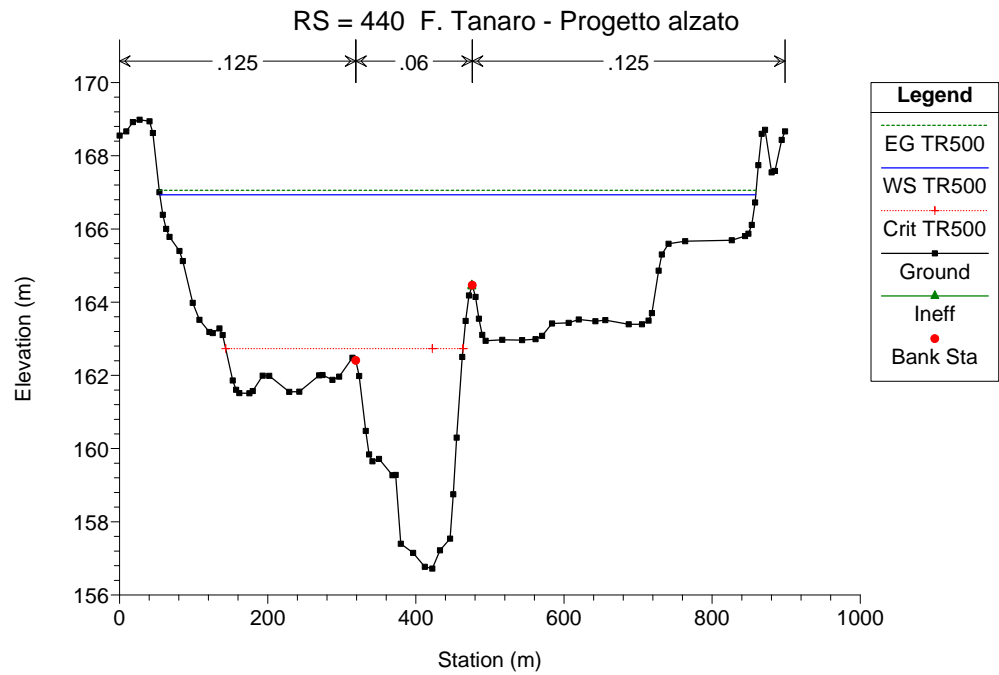
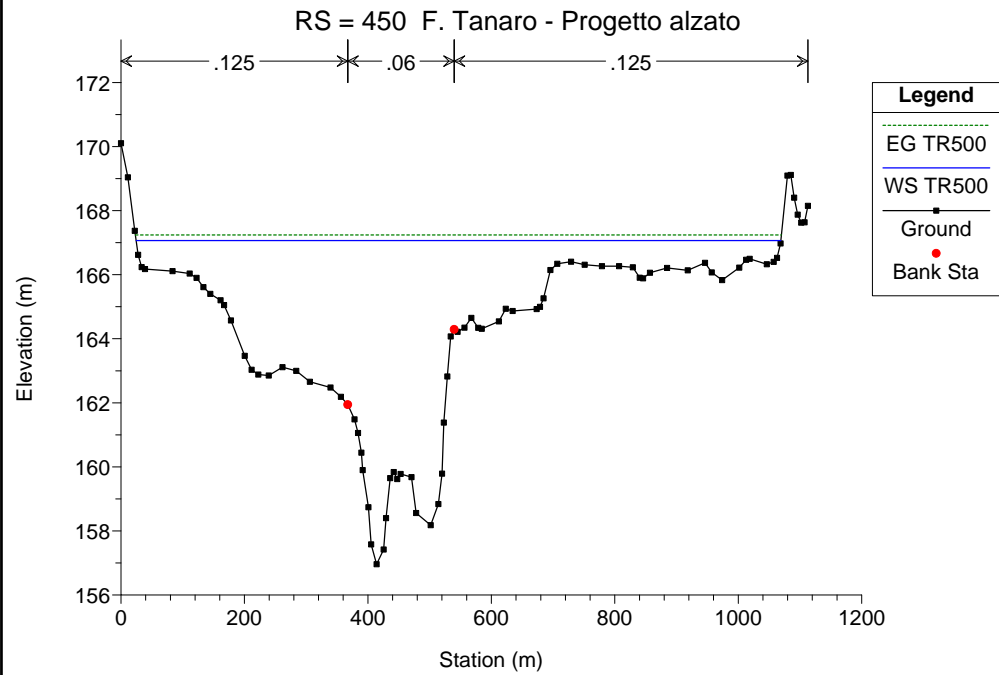
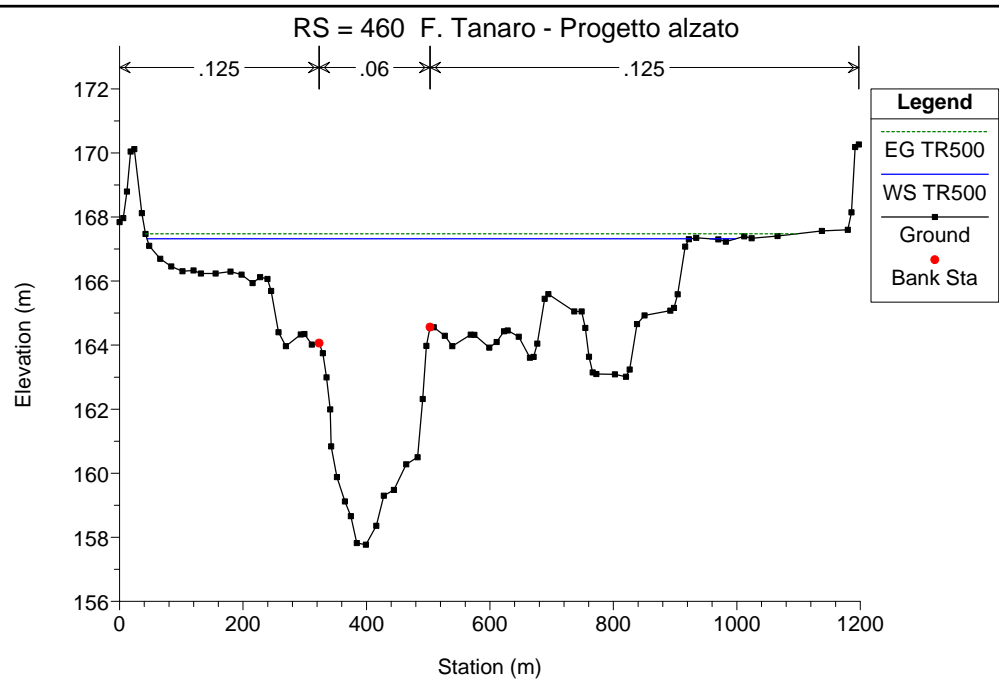
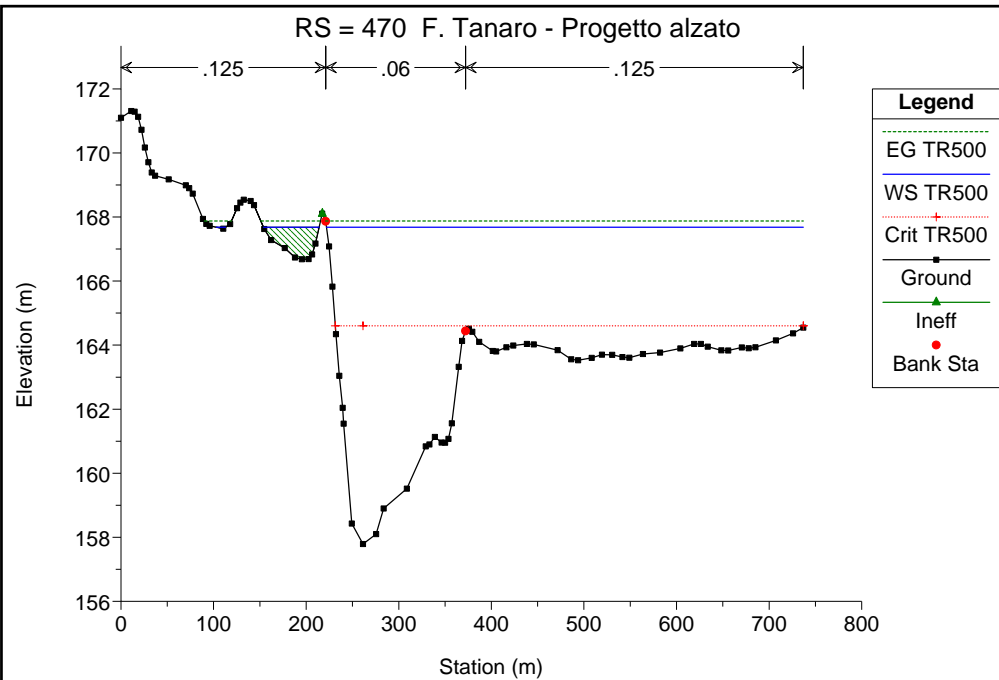


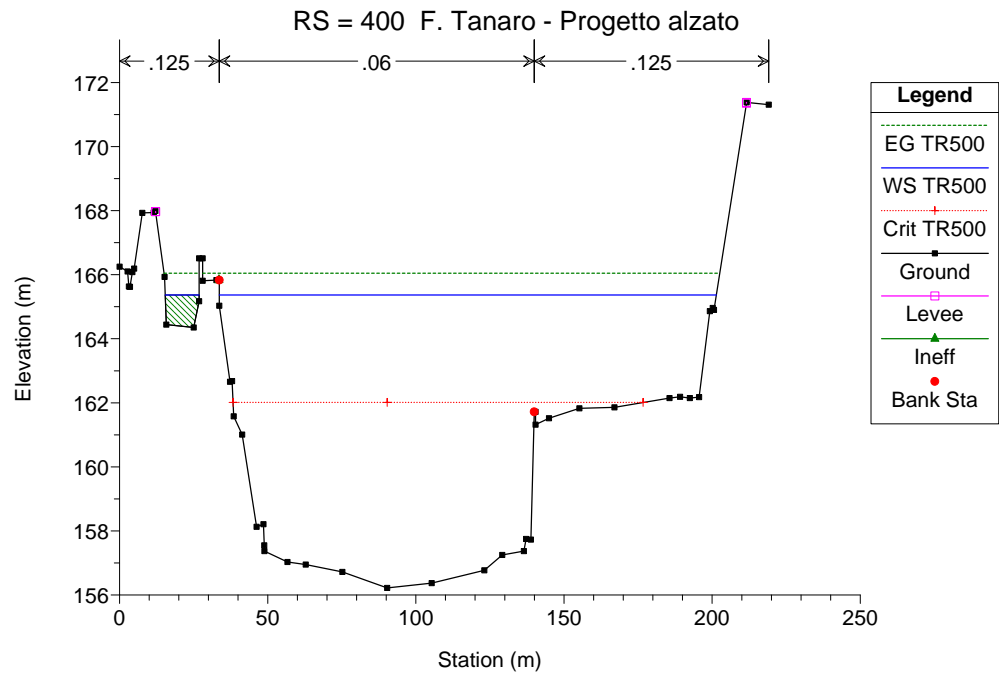
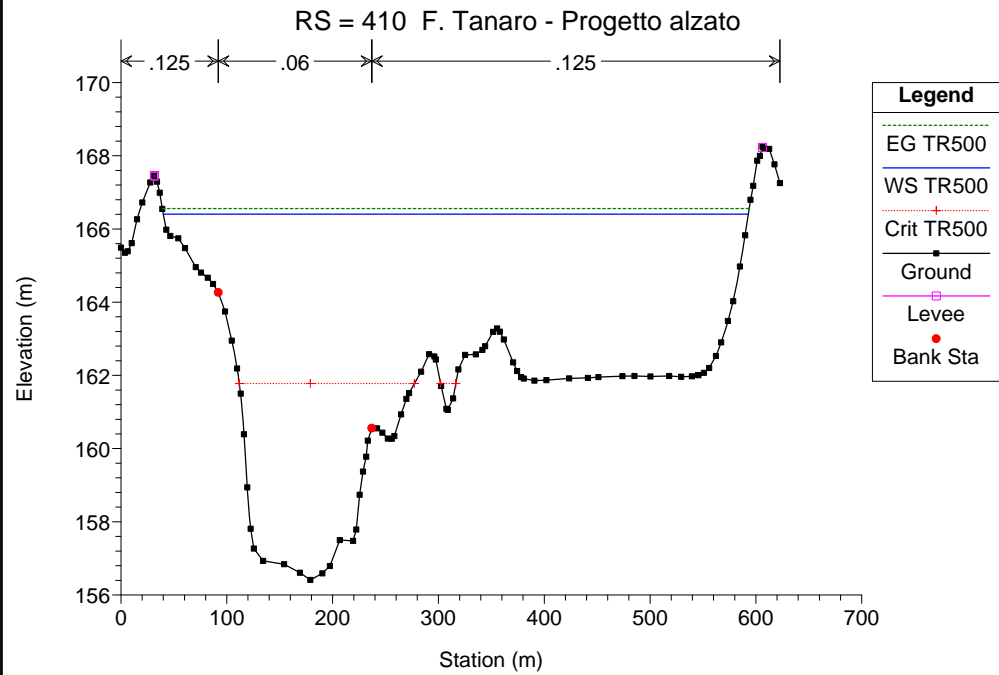
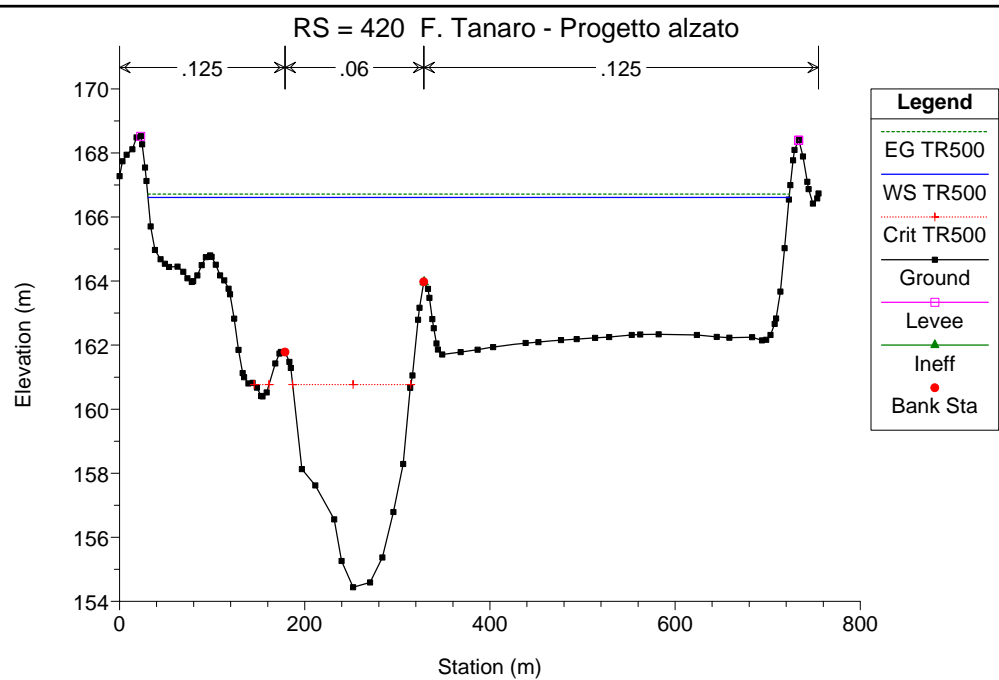
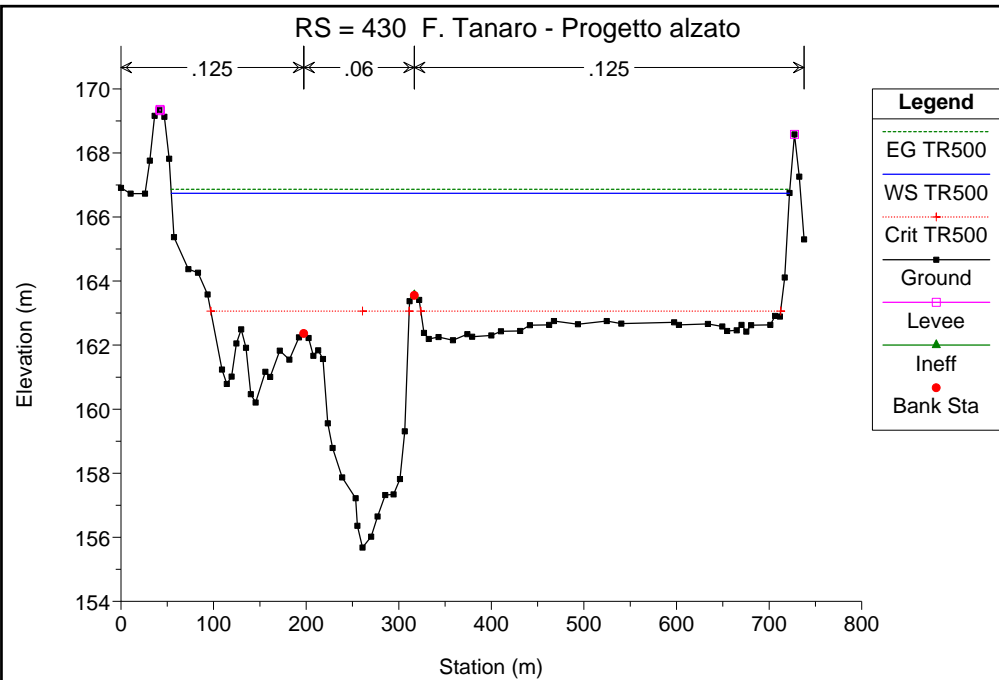
RS = 490 F. Tanaro - Progetto alzato

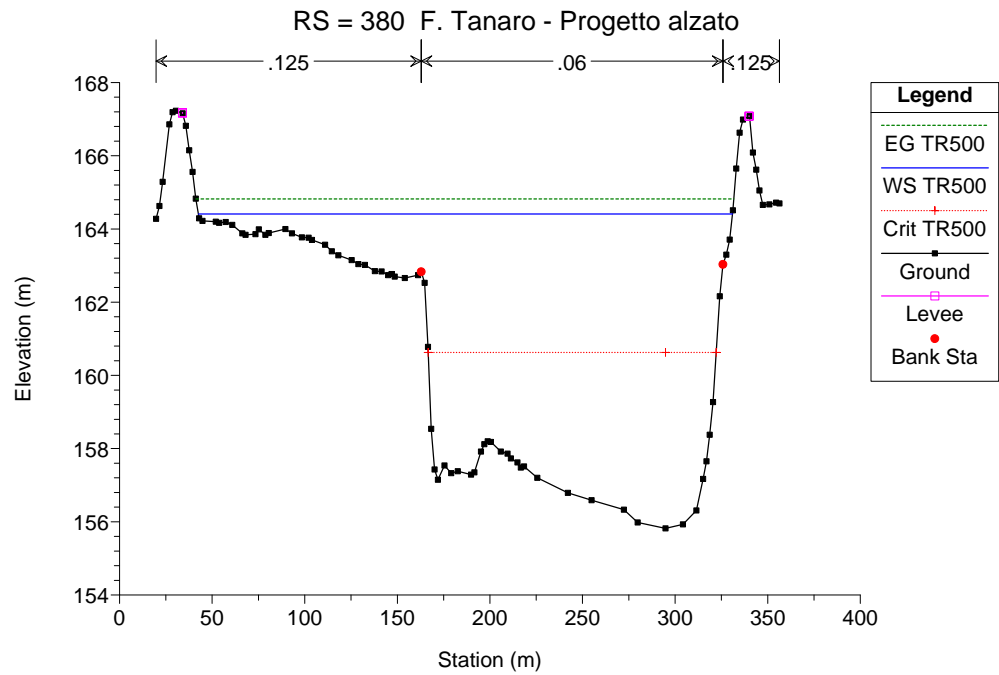
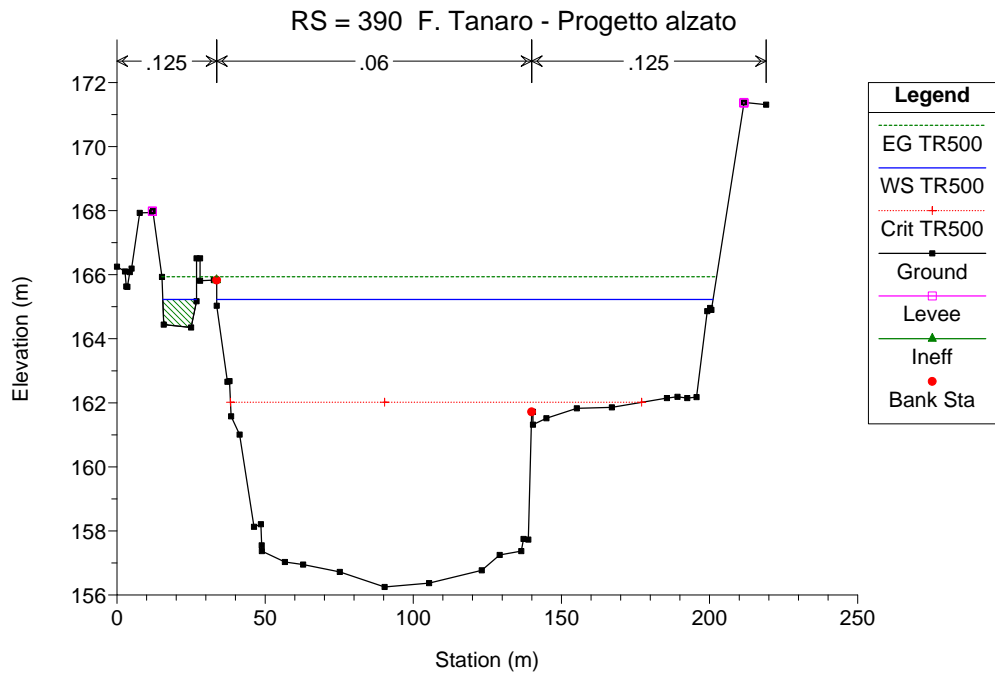
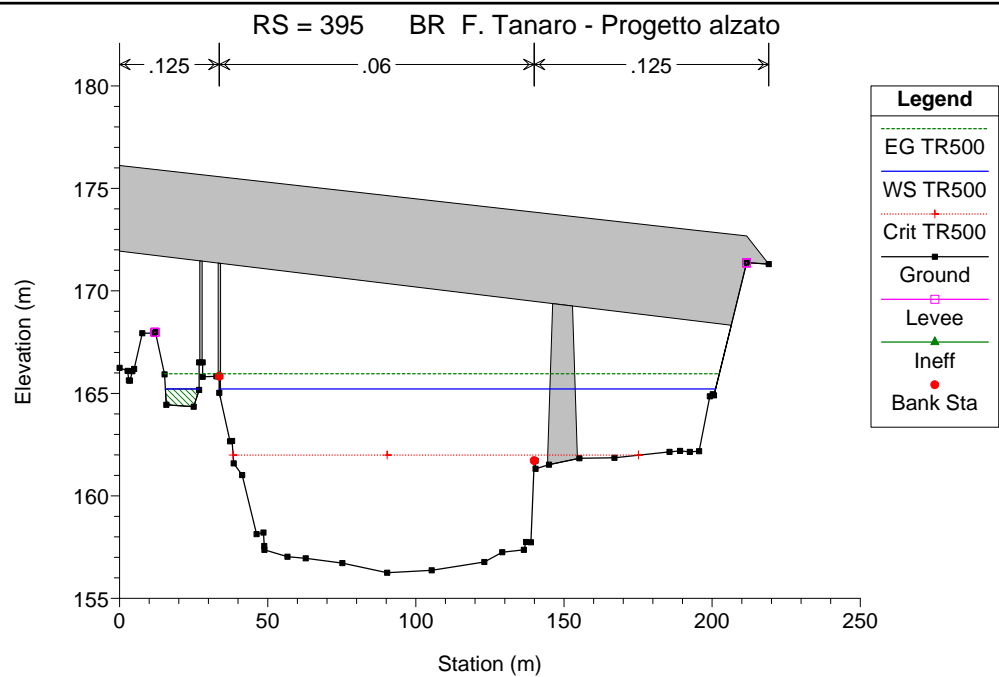
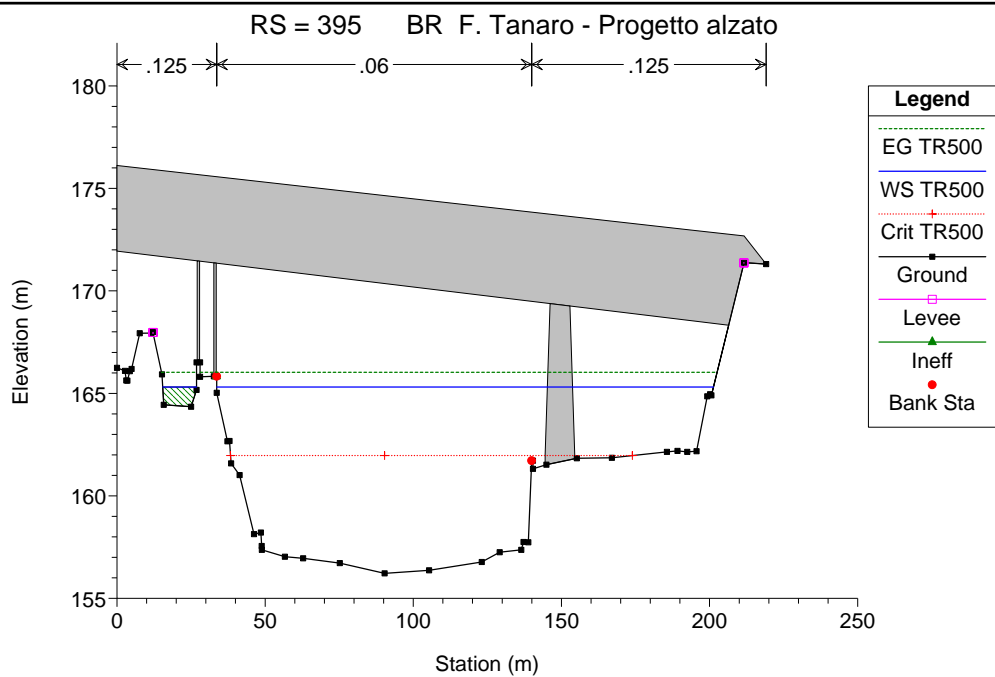


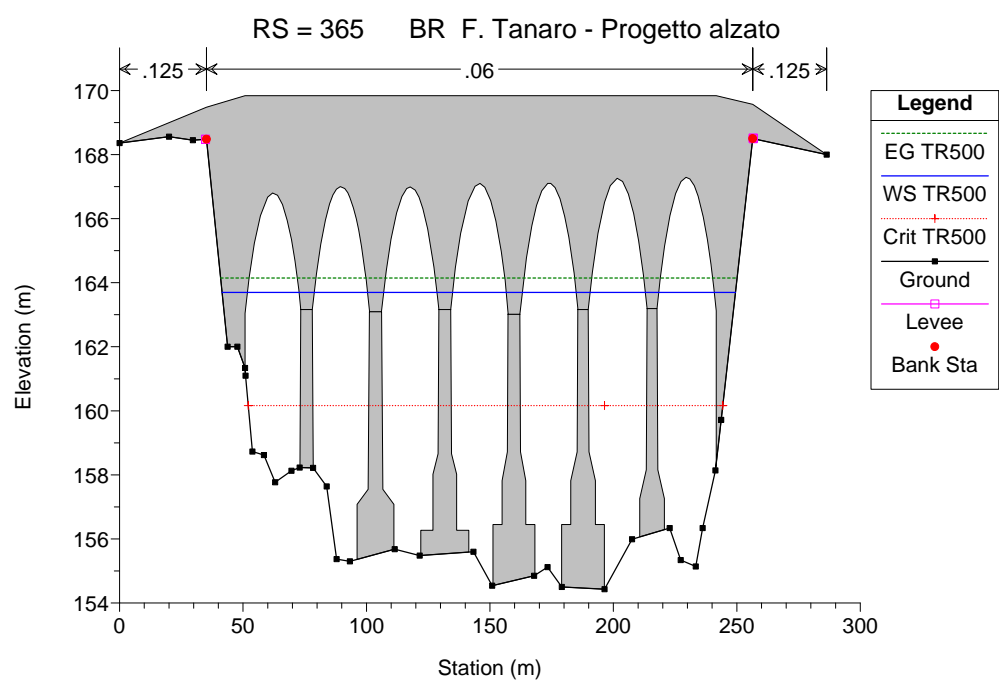
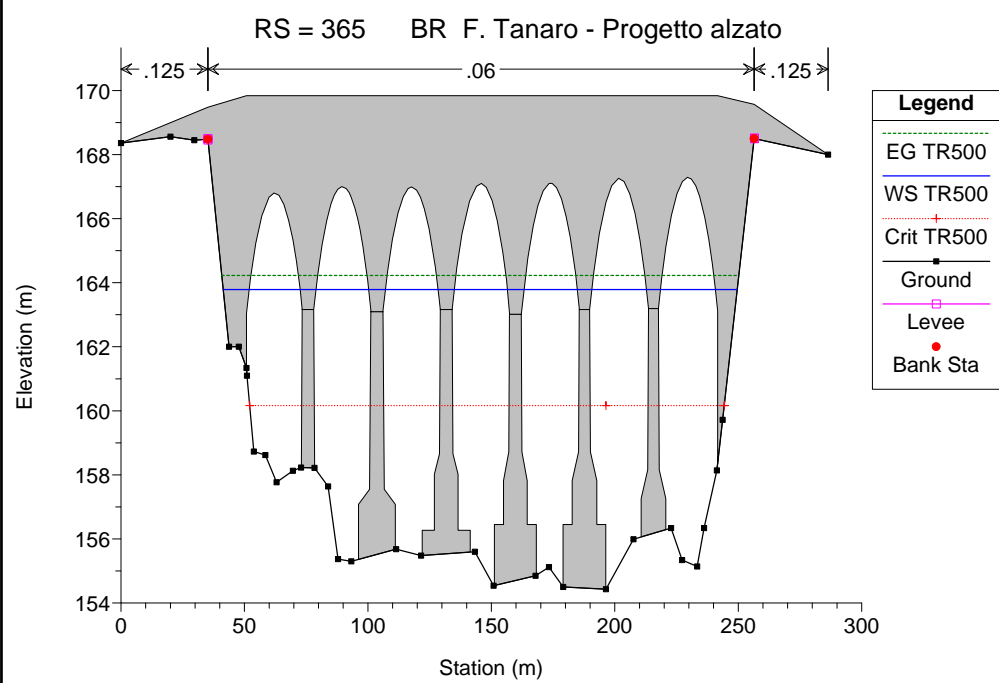
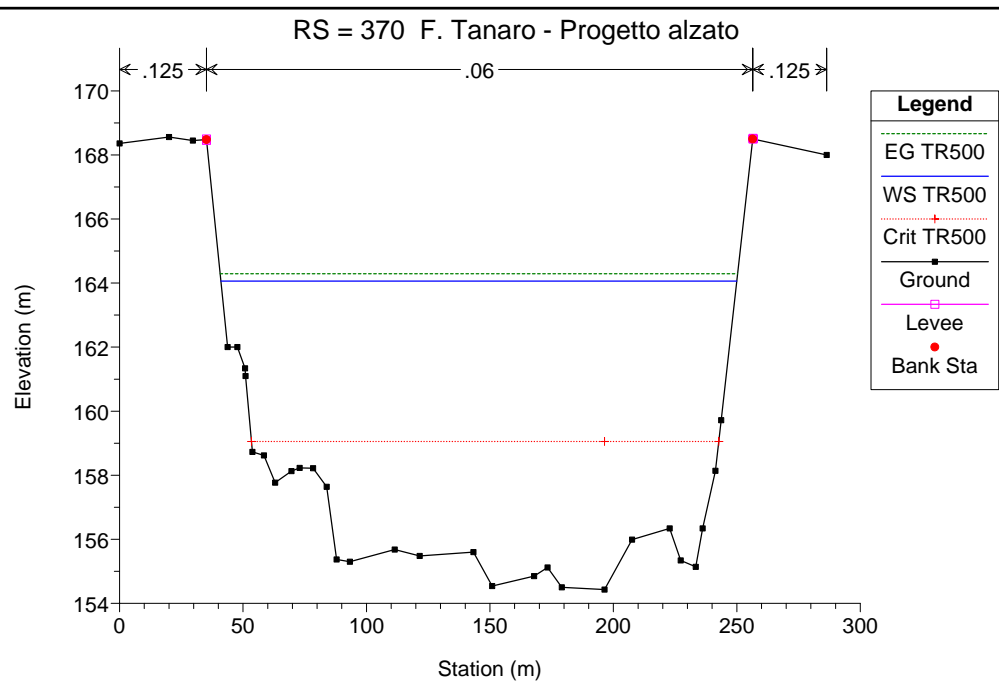
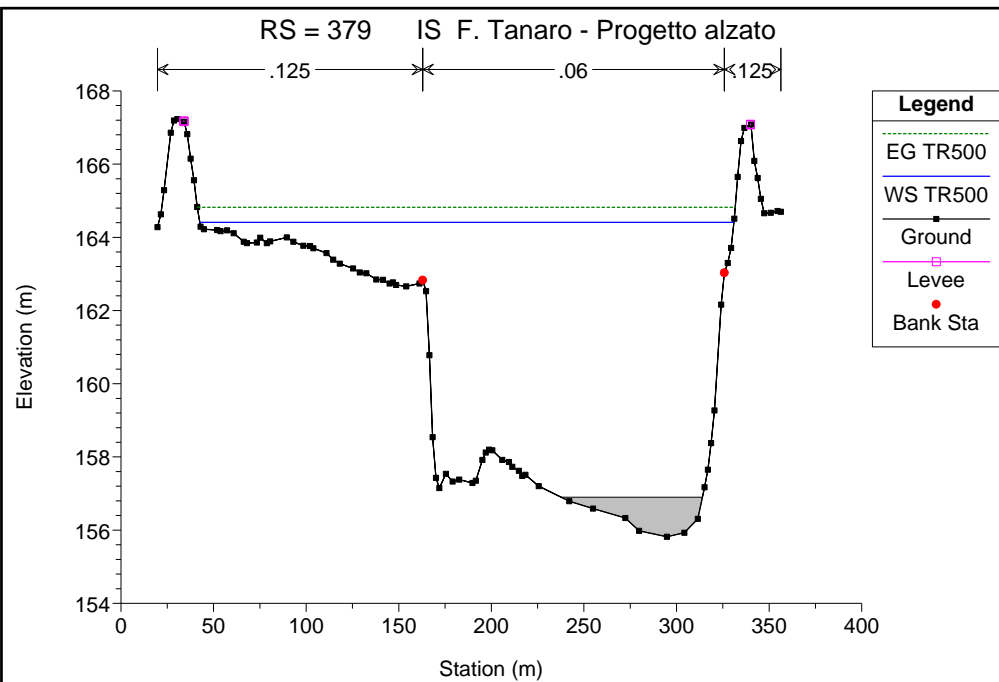
RS = 480 F. Tanaro - Progetto alzato



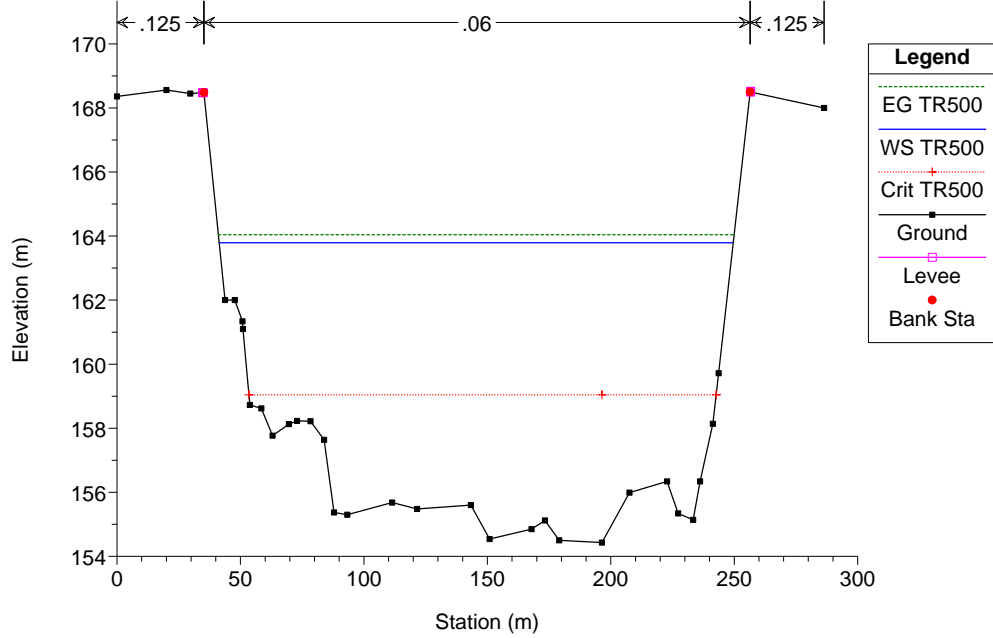




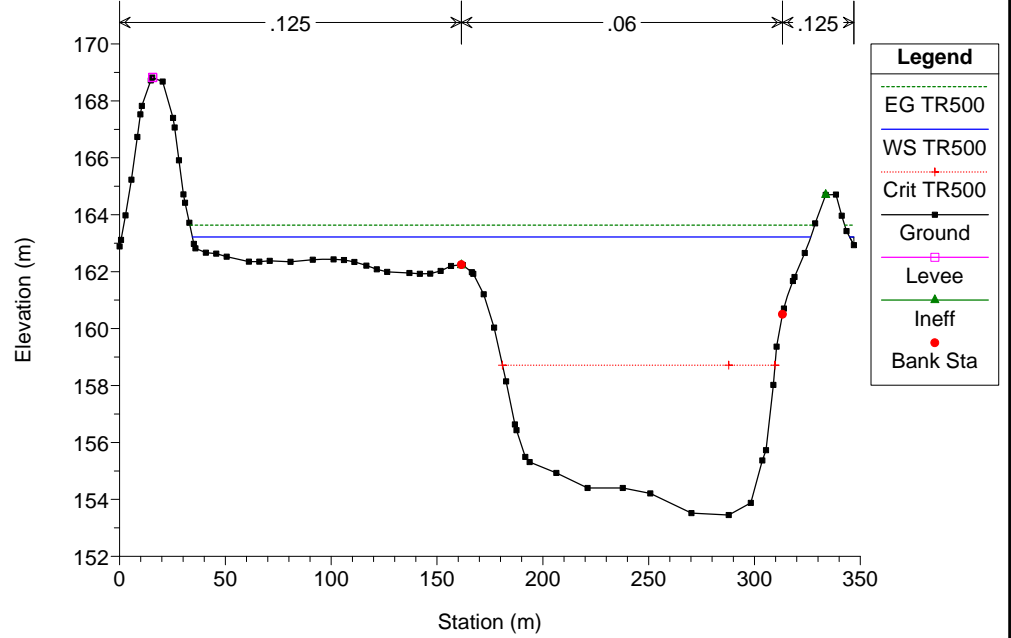




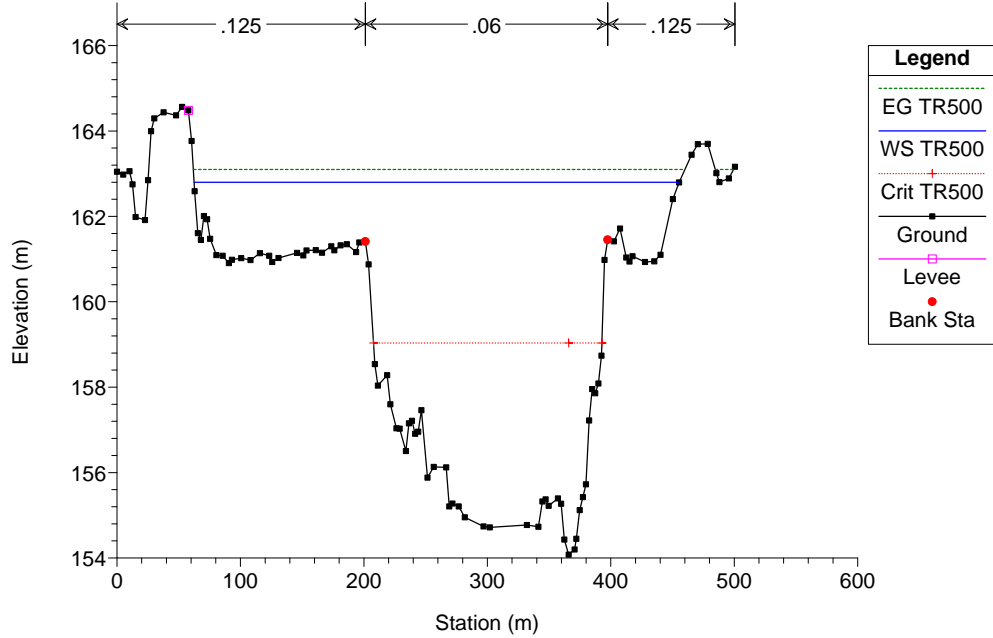
RS = 360 F. Tanaro - Progetto alzato



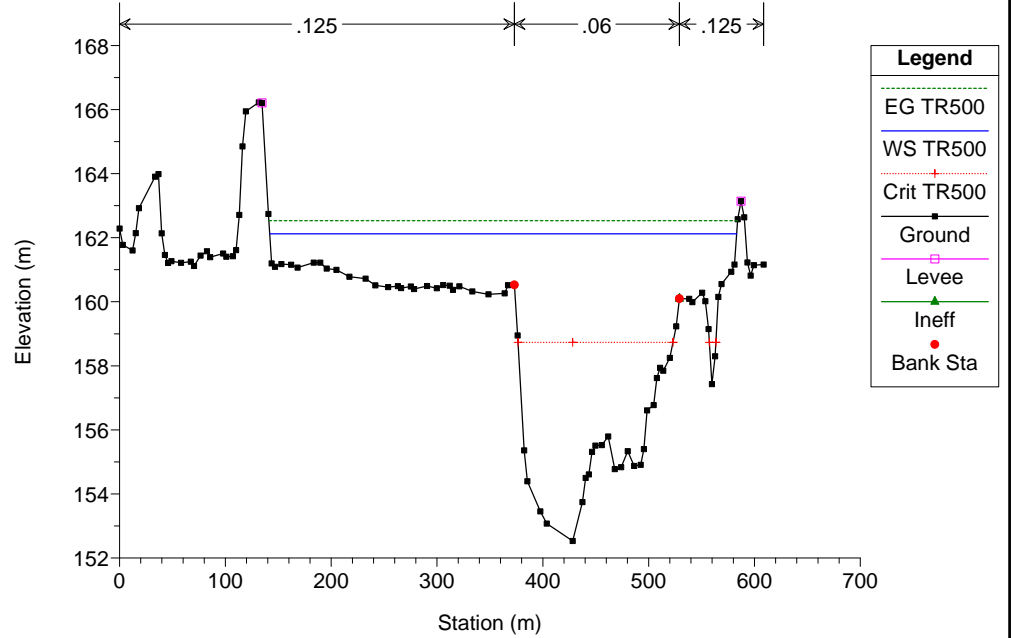
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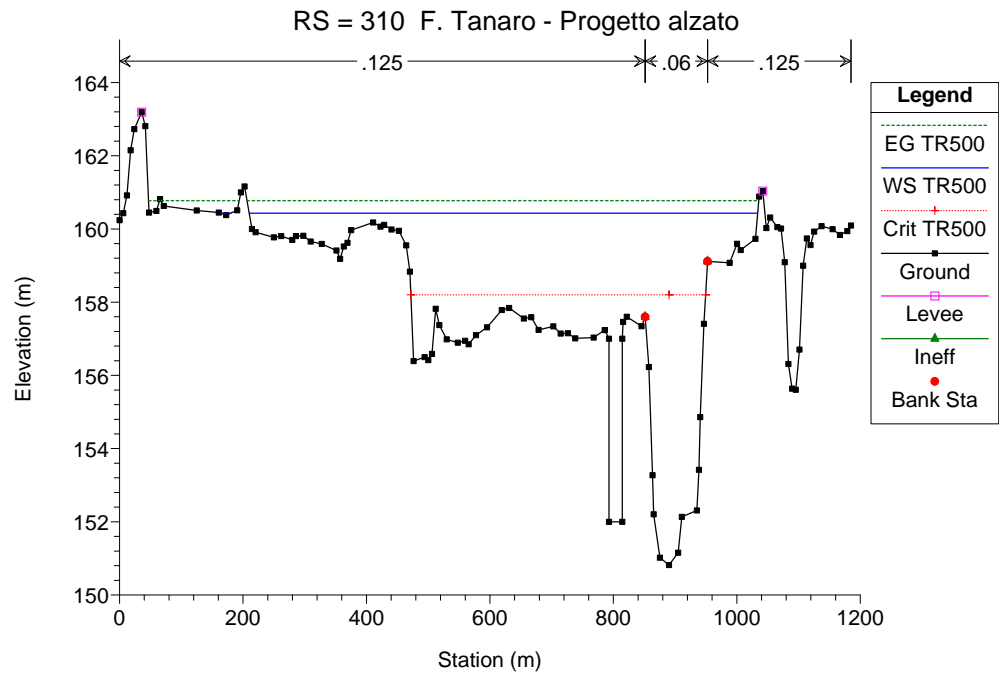
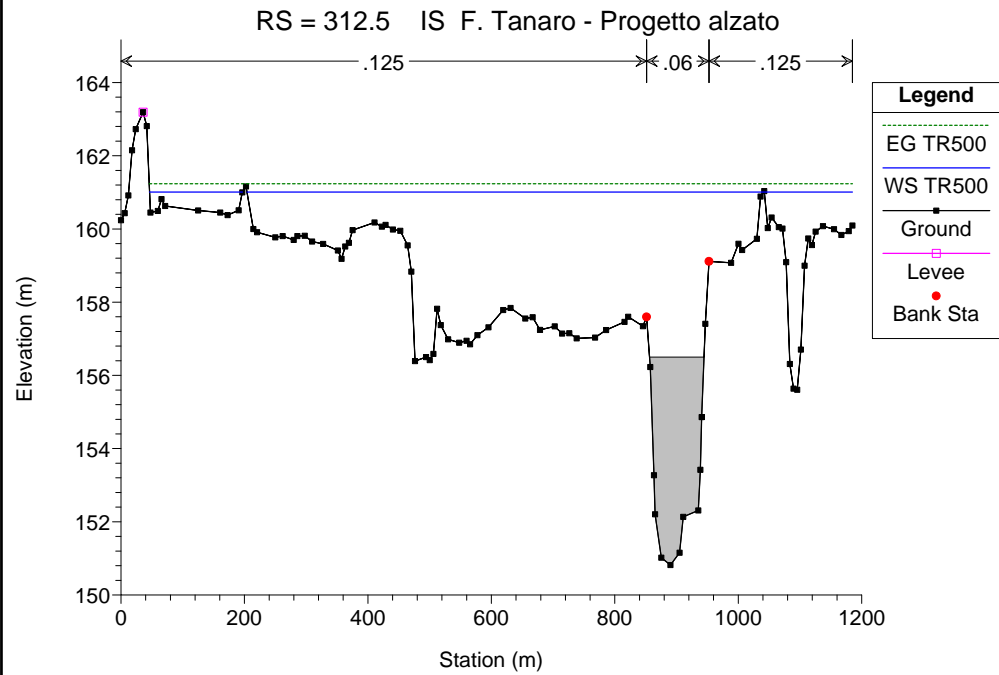
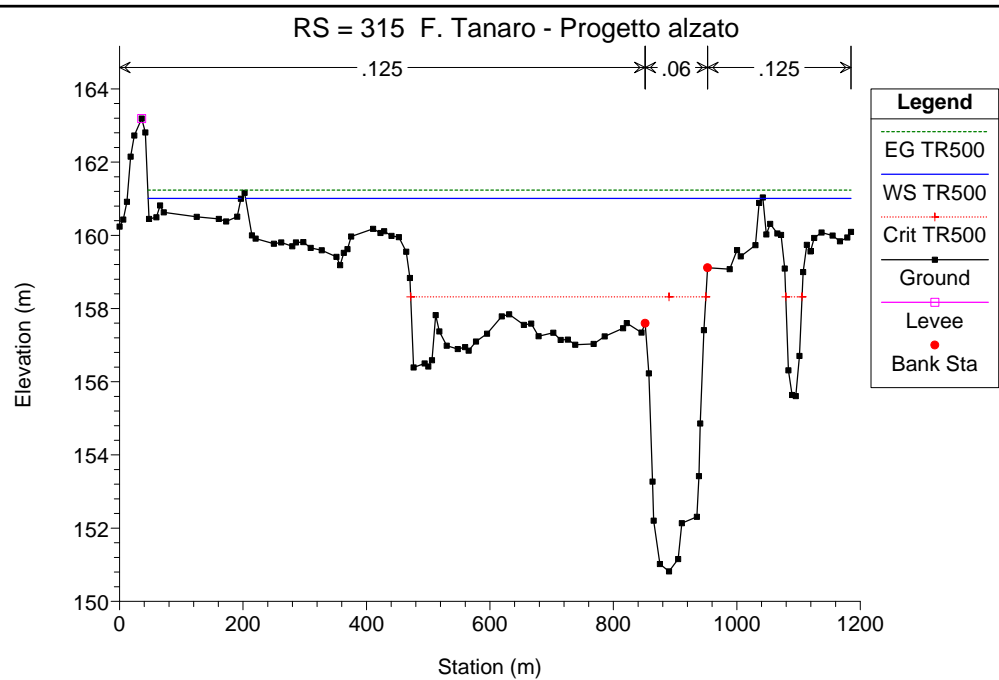
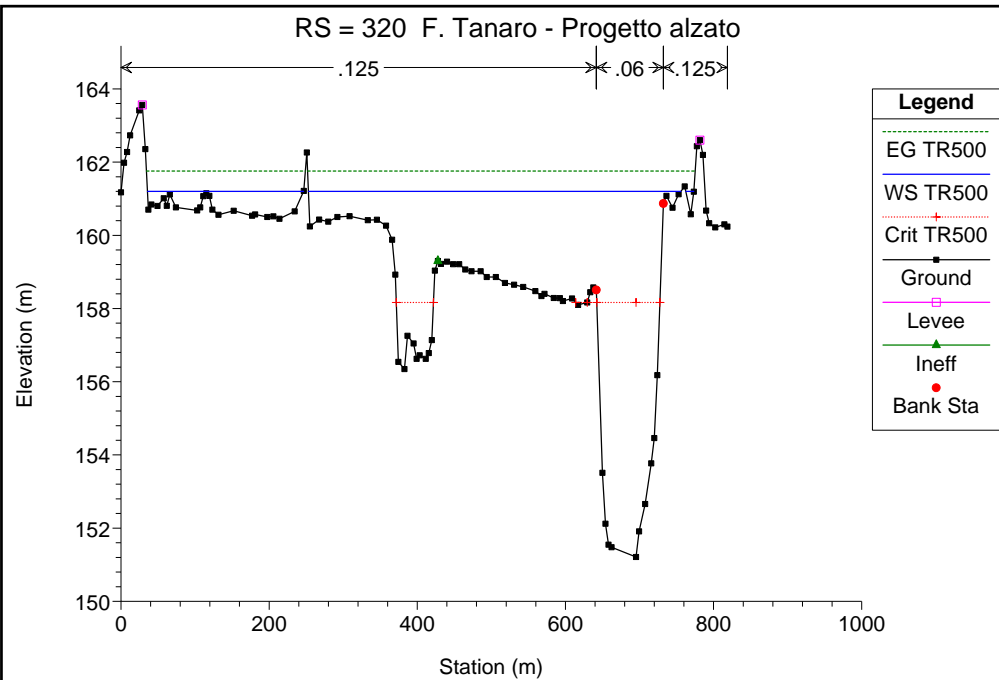


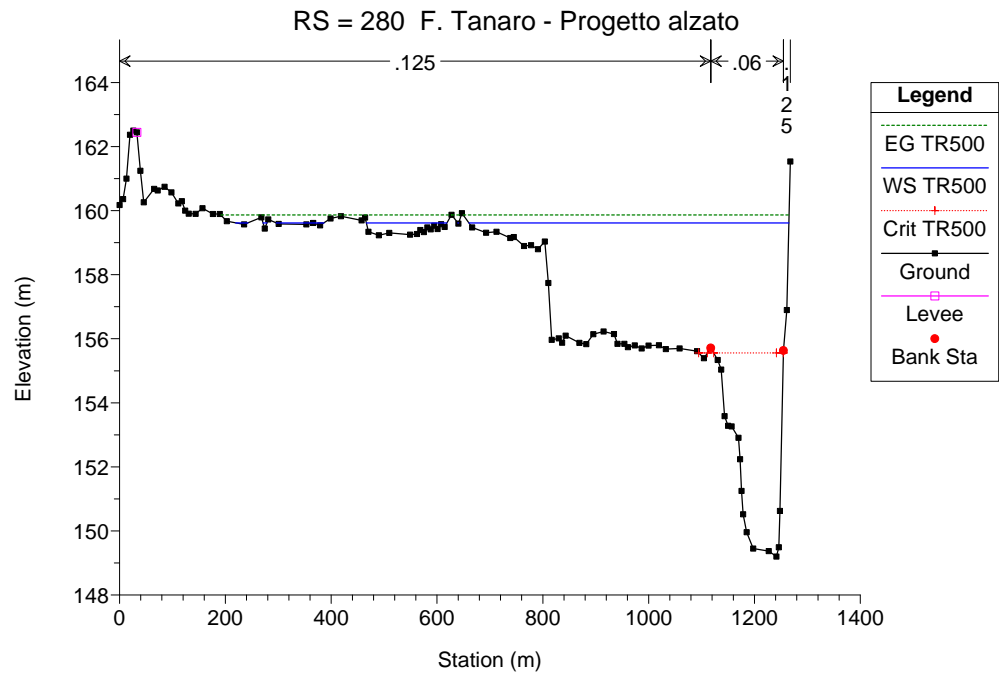
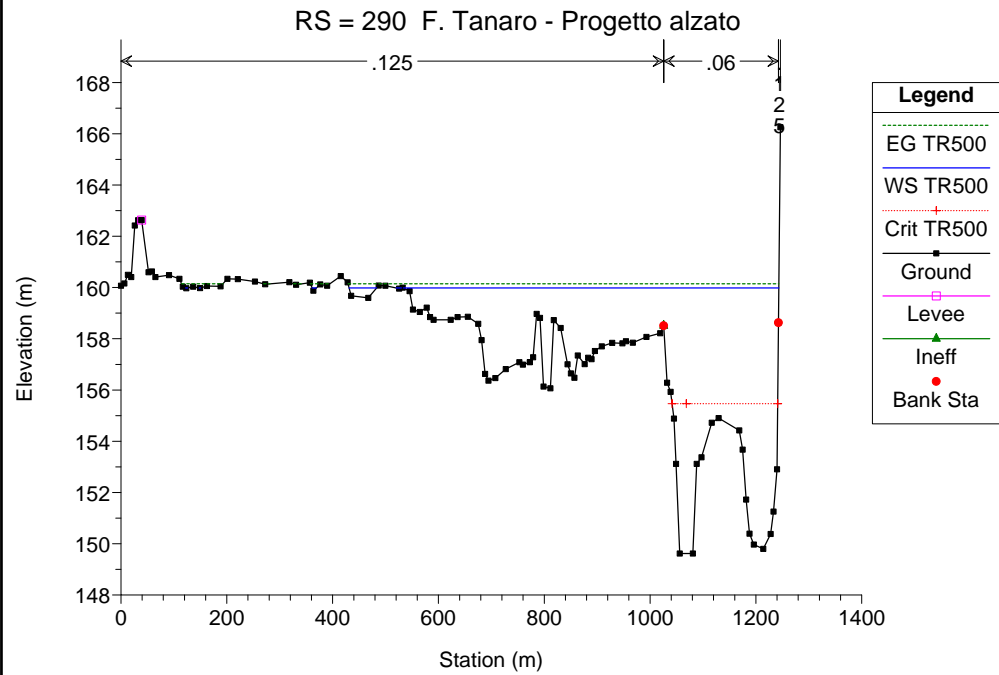
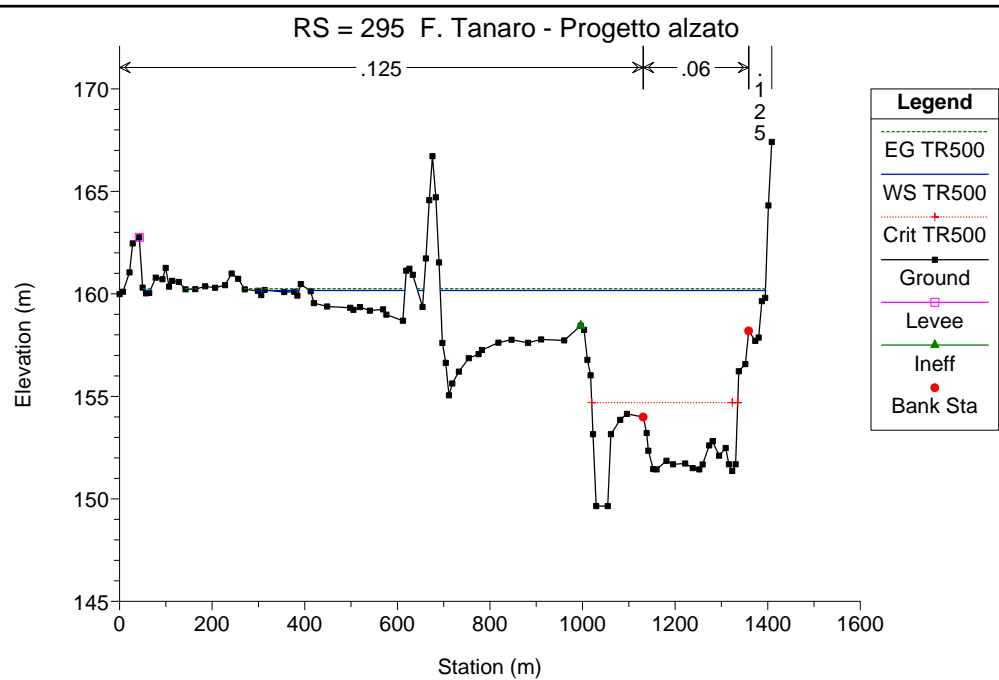
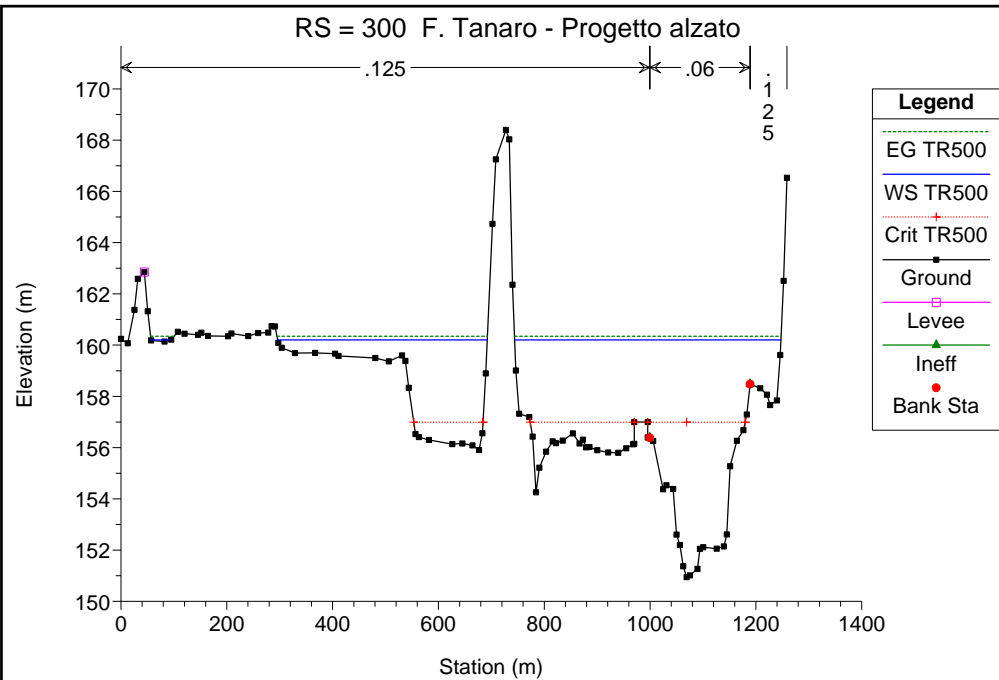
RS = 340 F. Tanaro - Progetto alzato



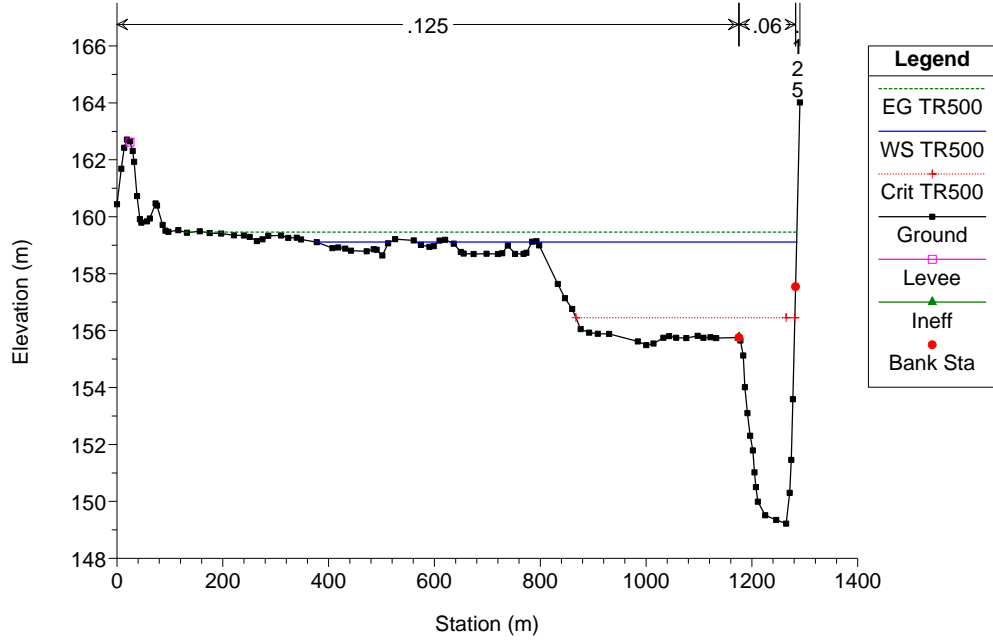
RS = 330 F. Tanaro - Progetto alzato



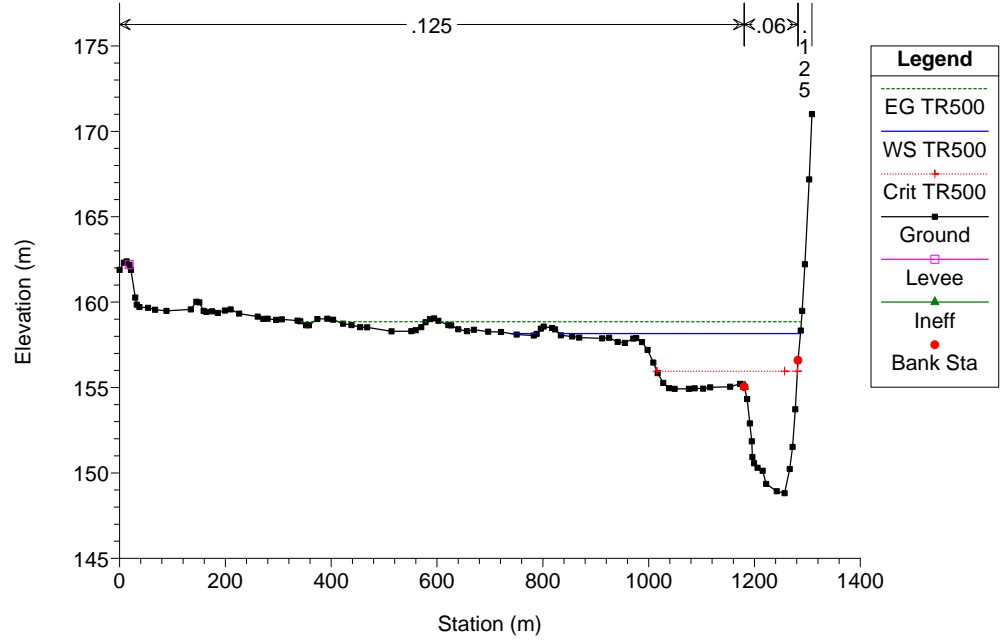




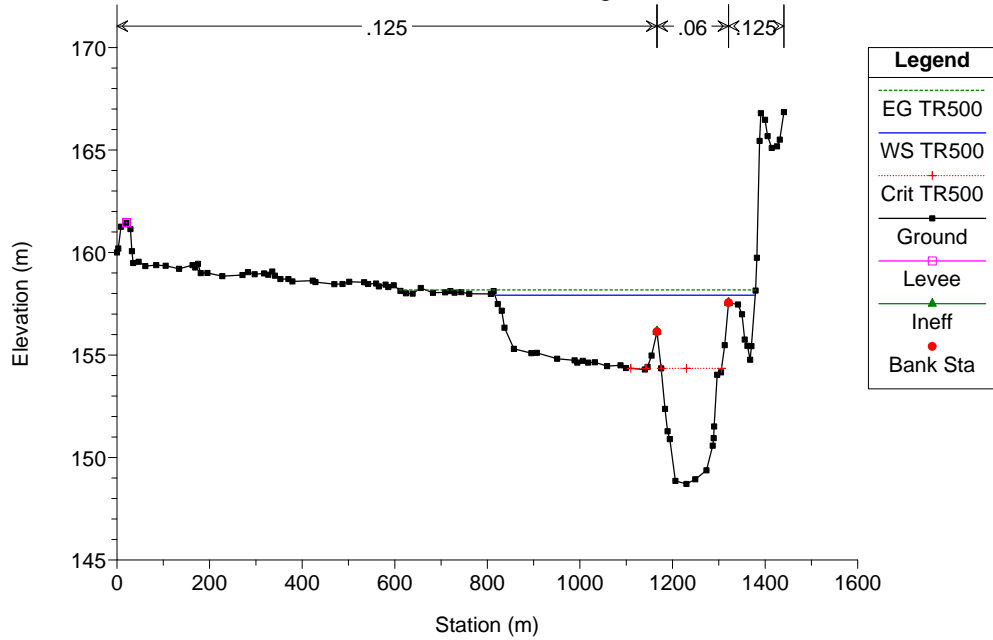
RS = 270 F. Tanaro - Progetto alzato



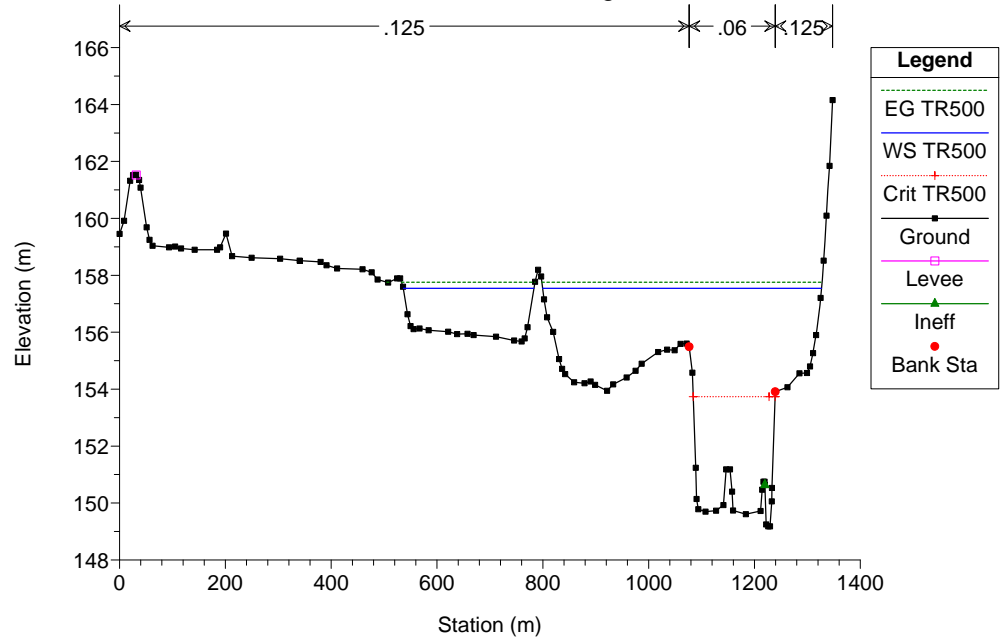
RS = 260 F. Tanaro - Progetto alzato



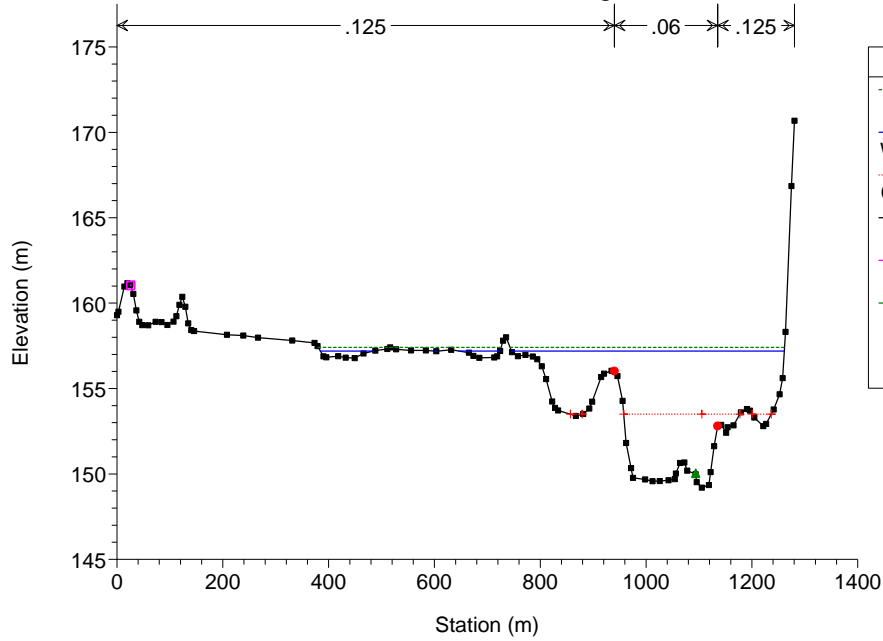
RS = 250 F. Tanaro - Progetto alzato



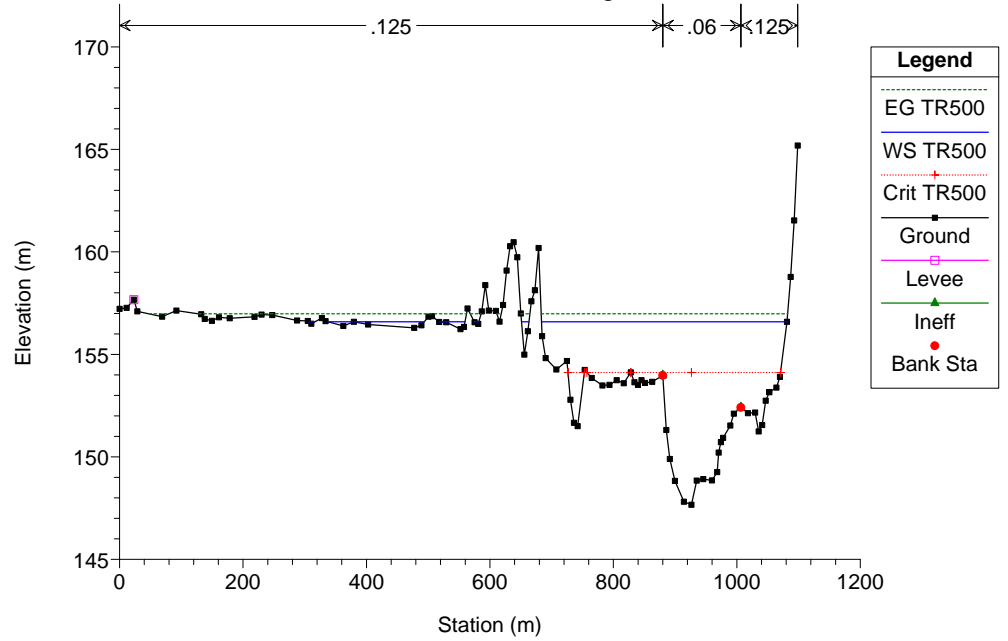
RS = 240 F. Tanaro - Progetto alzato



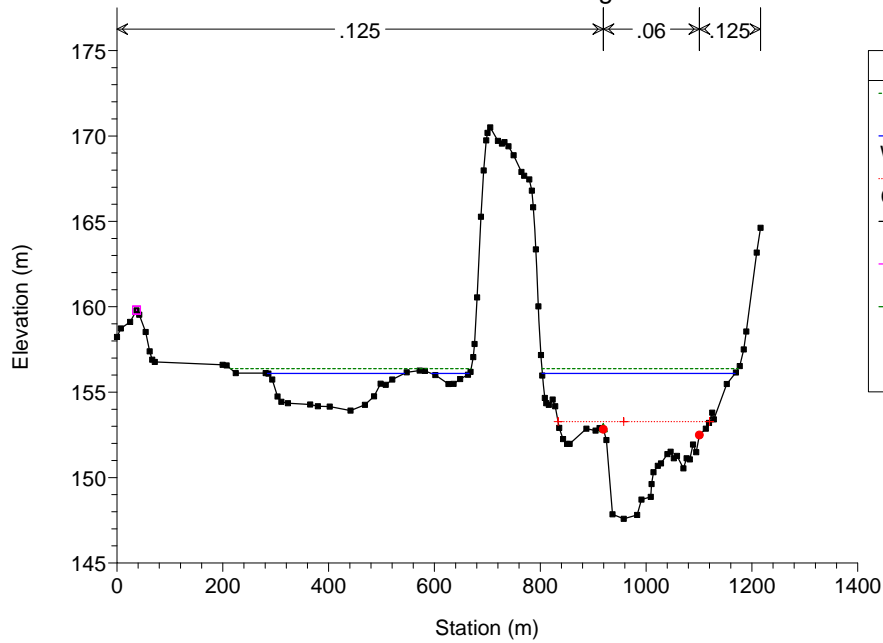
RS = 230 F. Tanaro - Progetto alzato



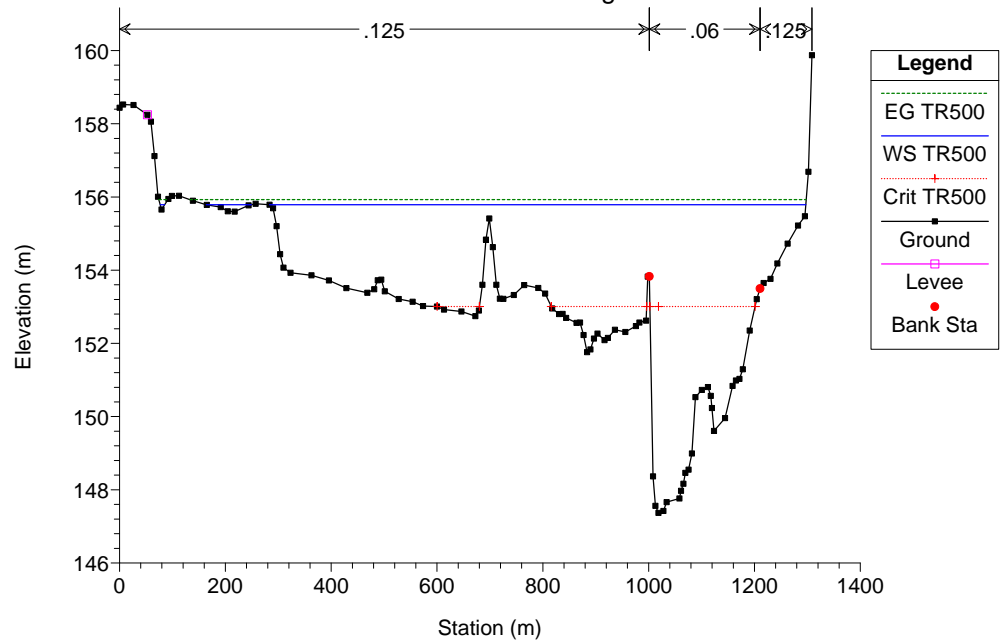
RS = 220 F. Tanaro - Progetto alzato



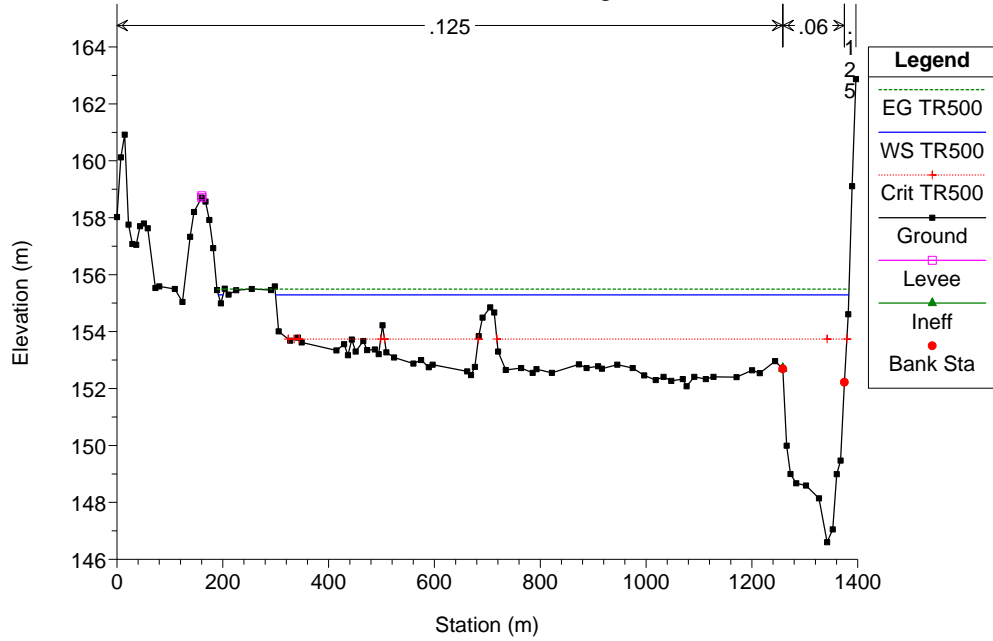
RS = 210 F. Tanaro - Progetto alzato



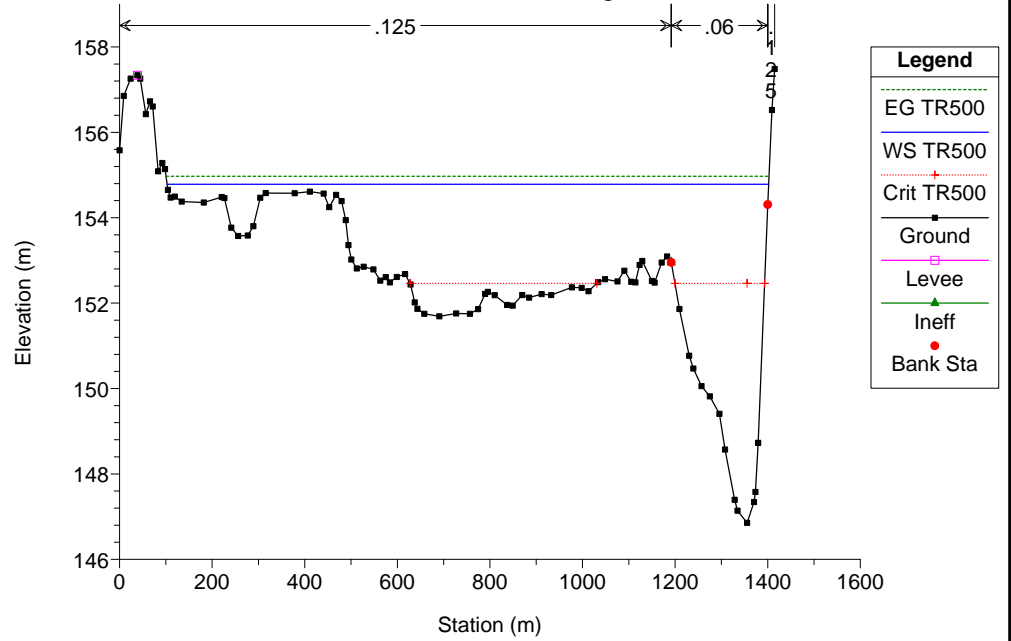
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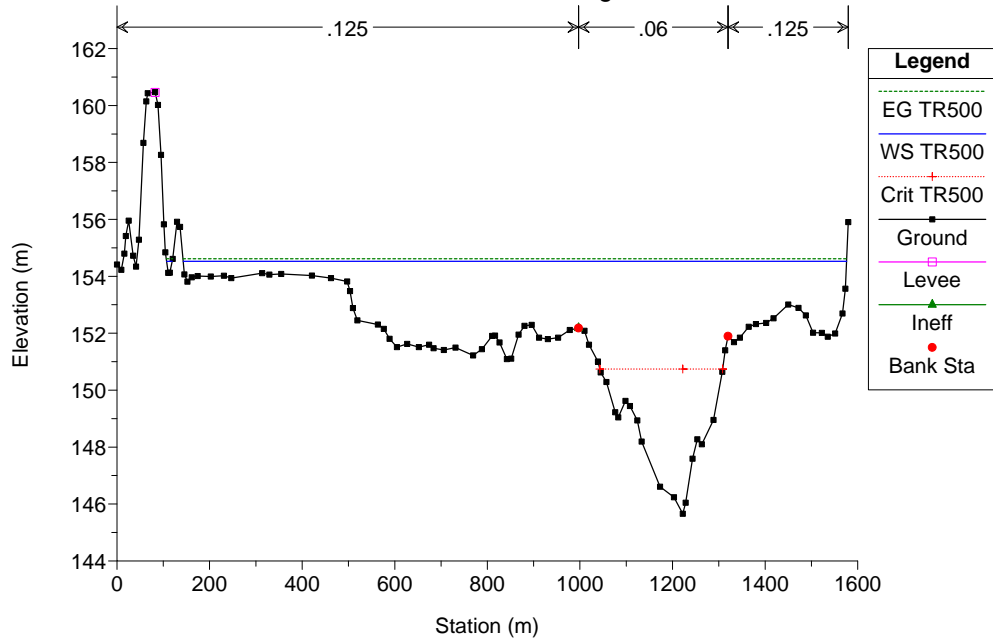
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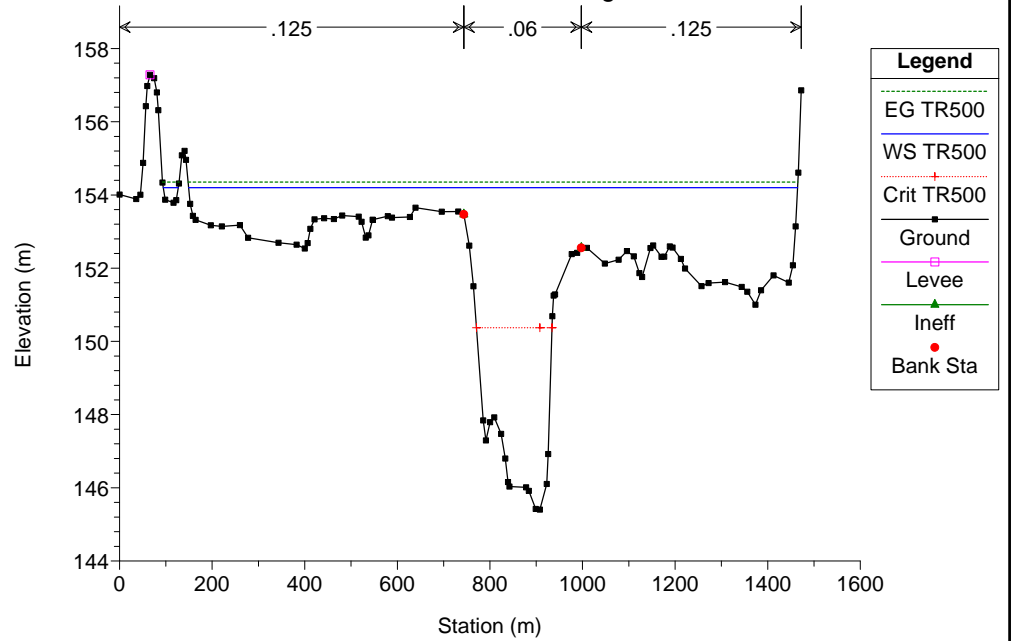
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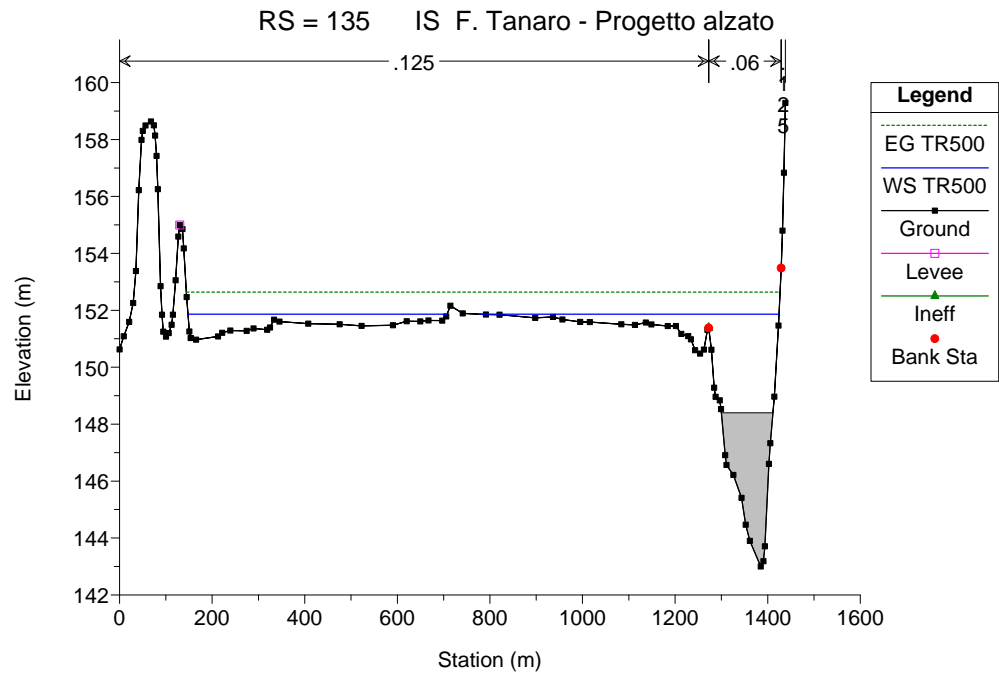
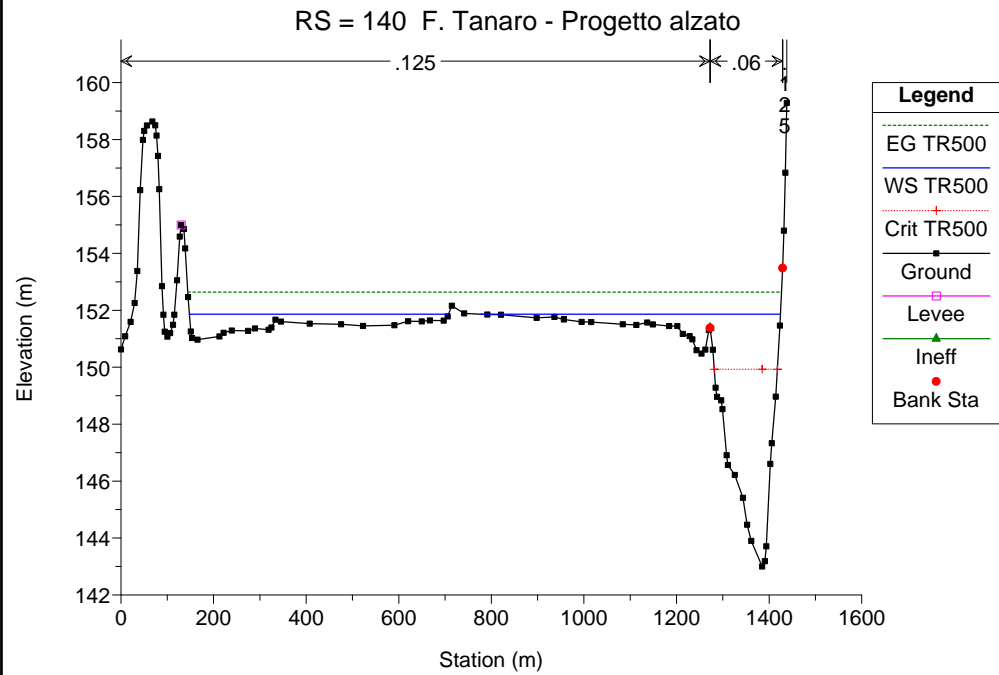
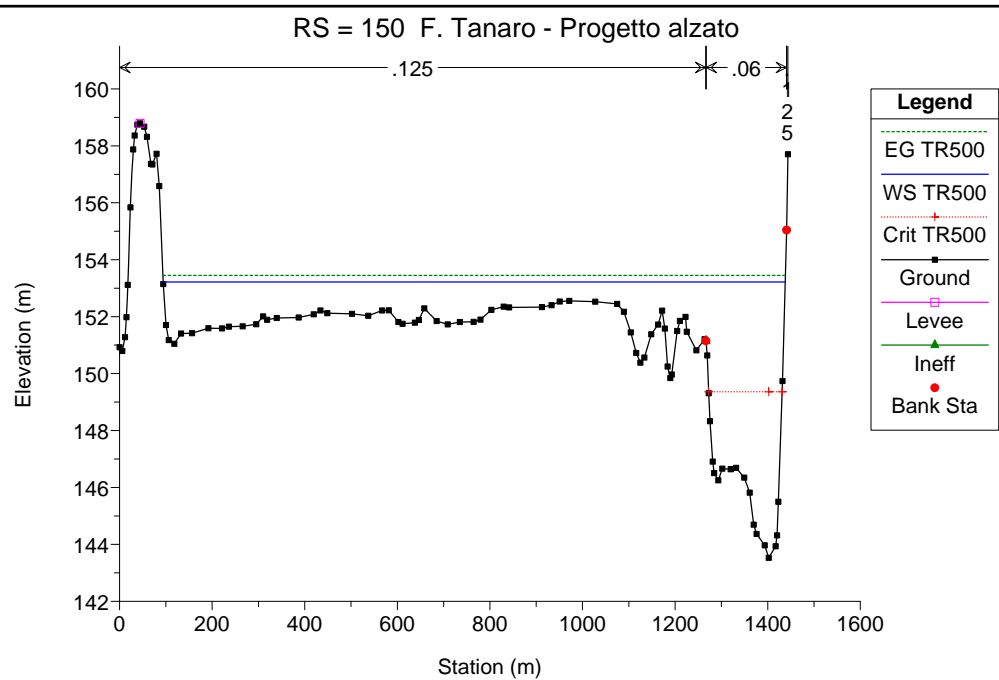
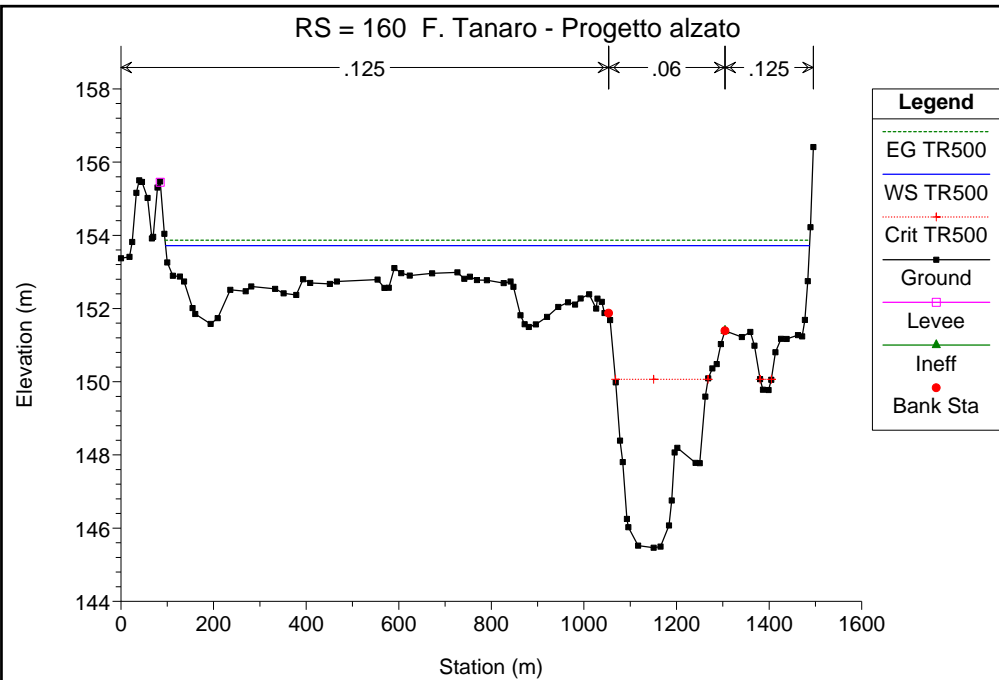


RS = 180 F. Tanaro - Progetto alzato

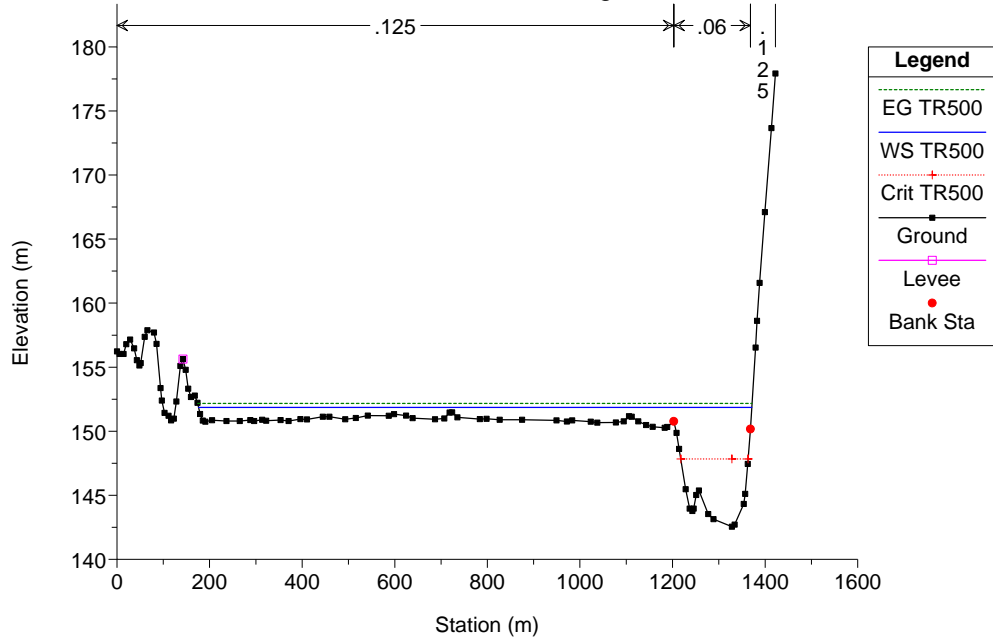


RS = 170 F. Tanaro - Progetto alzato

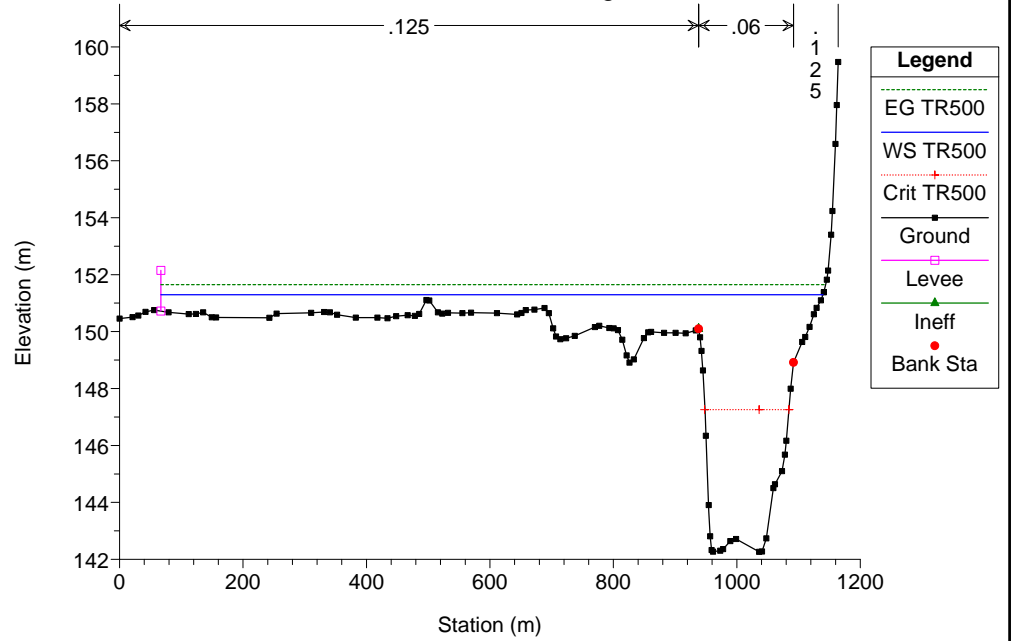




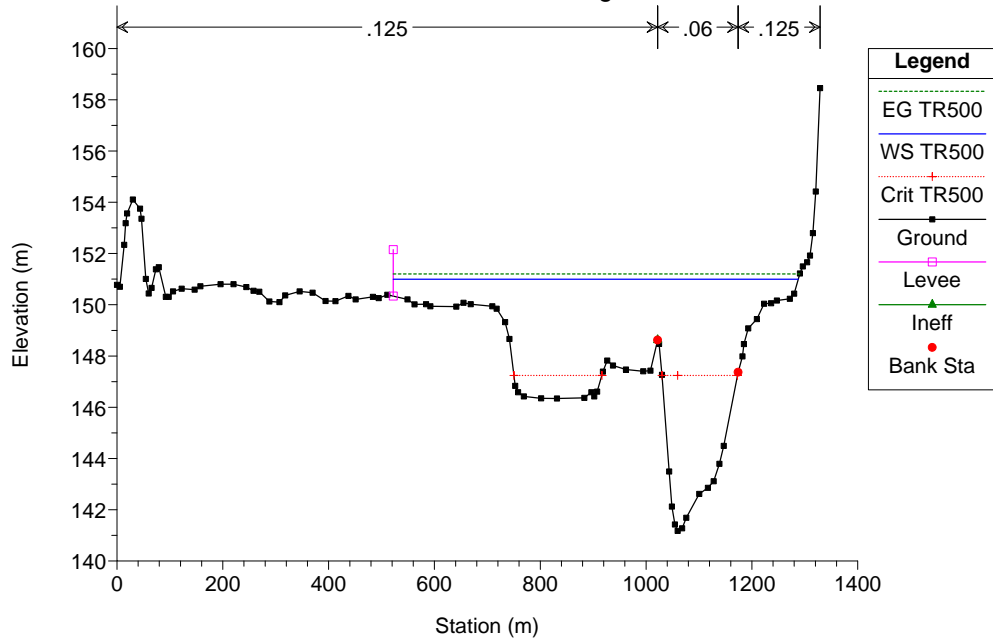
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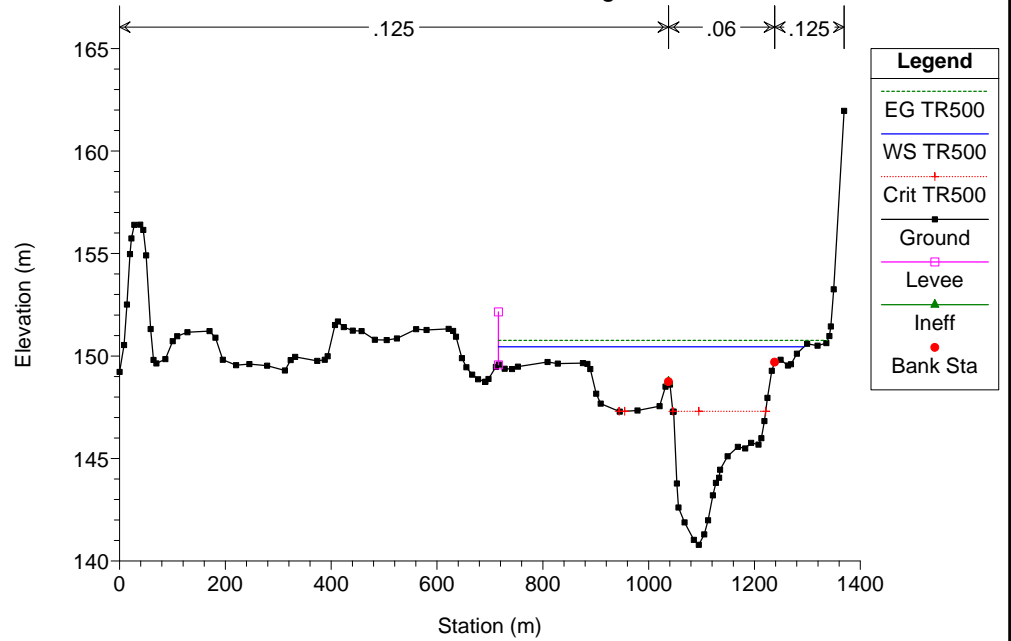
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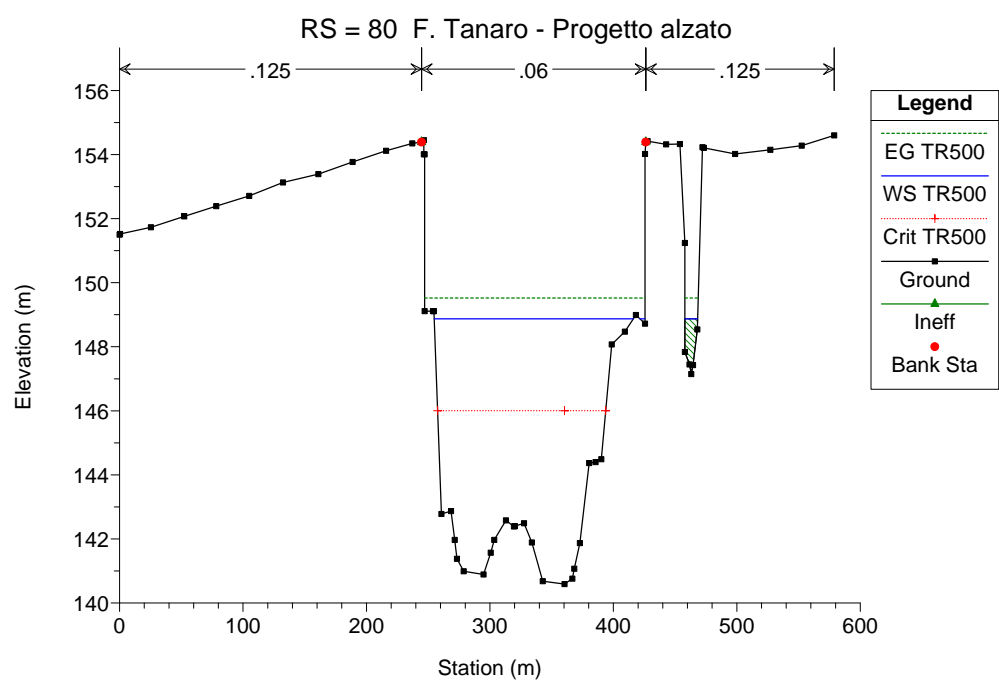
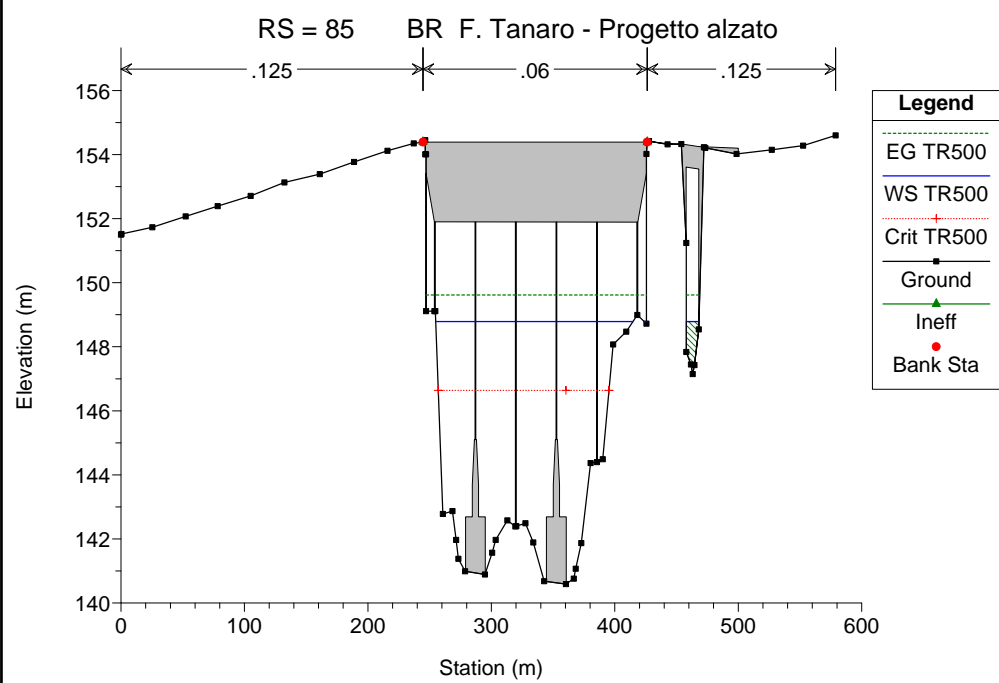
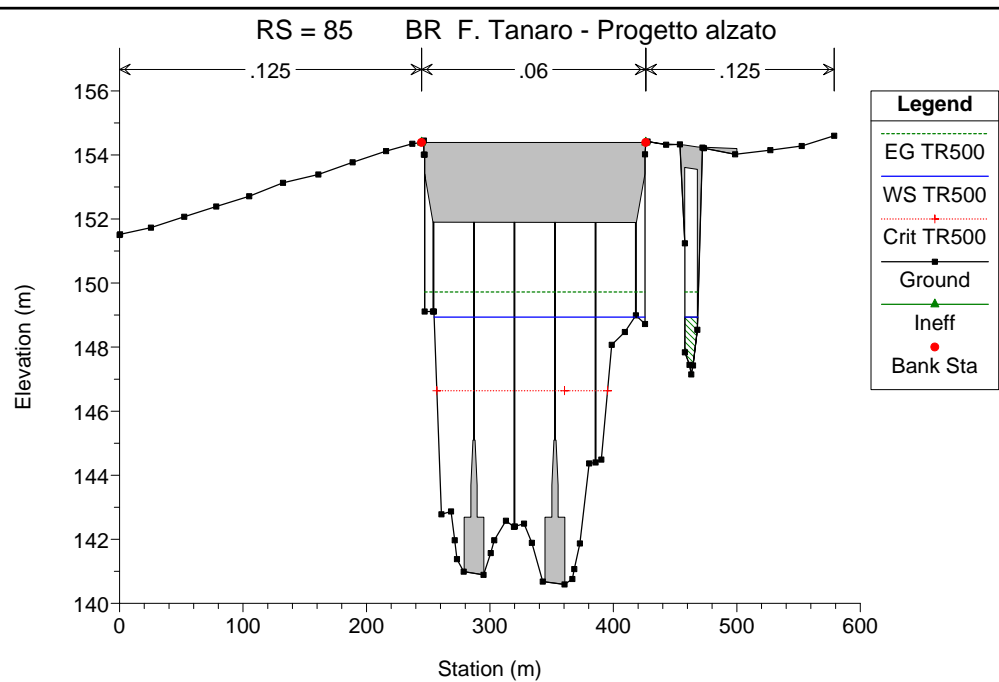
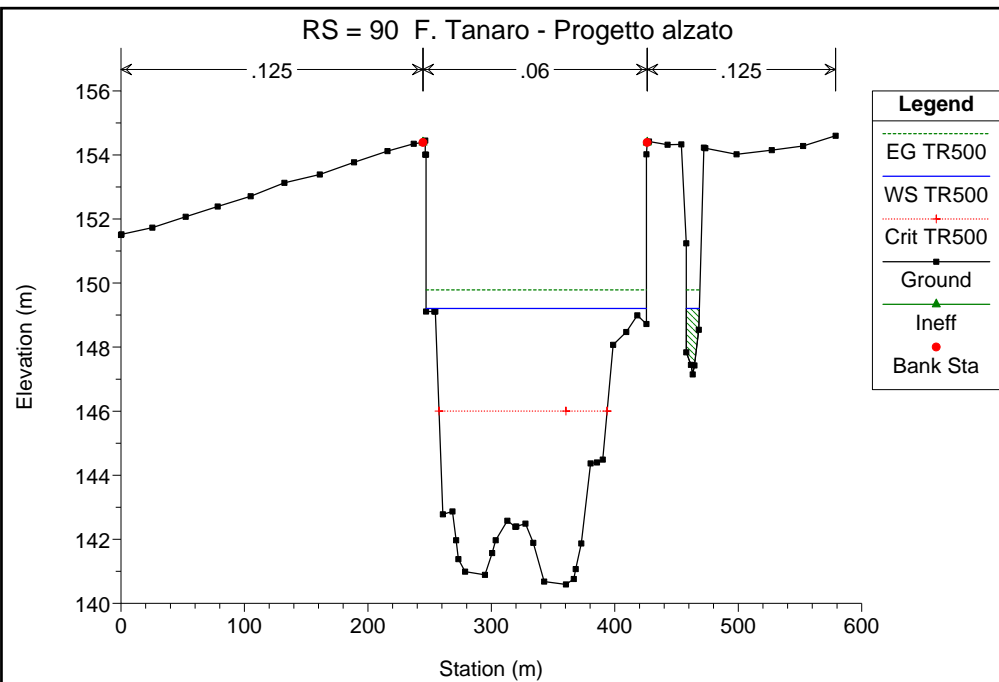


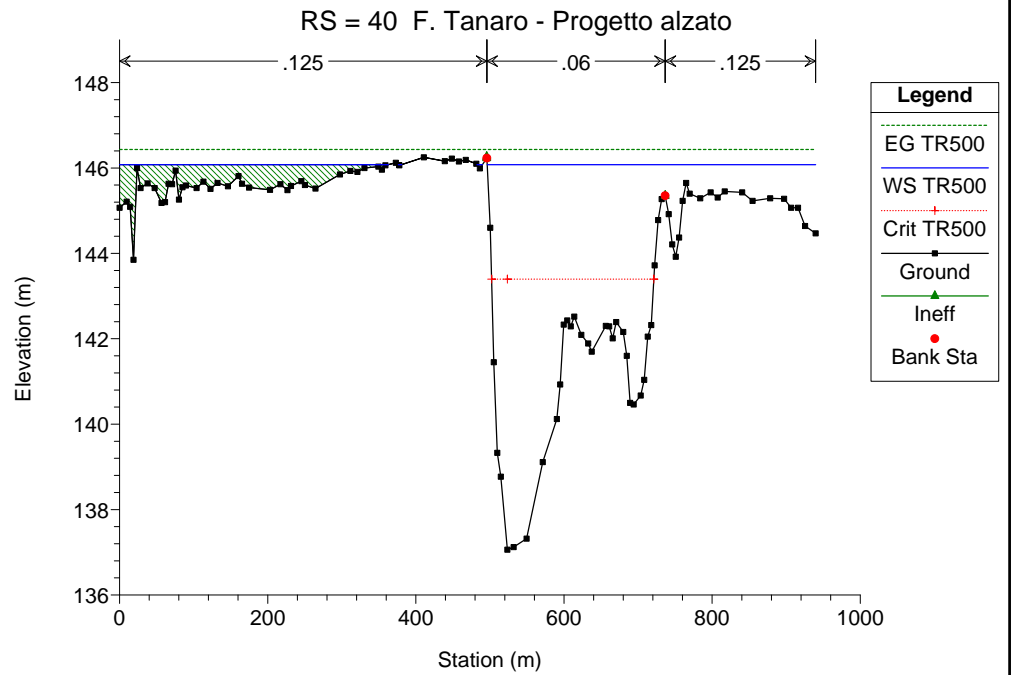
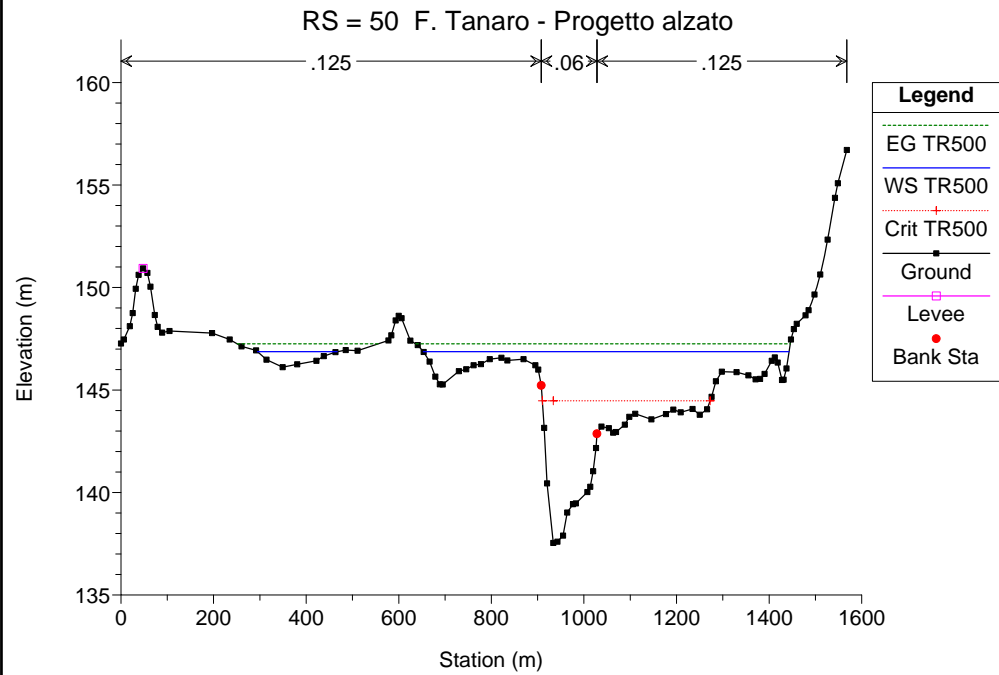
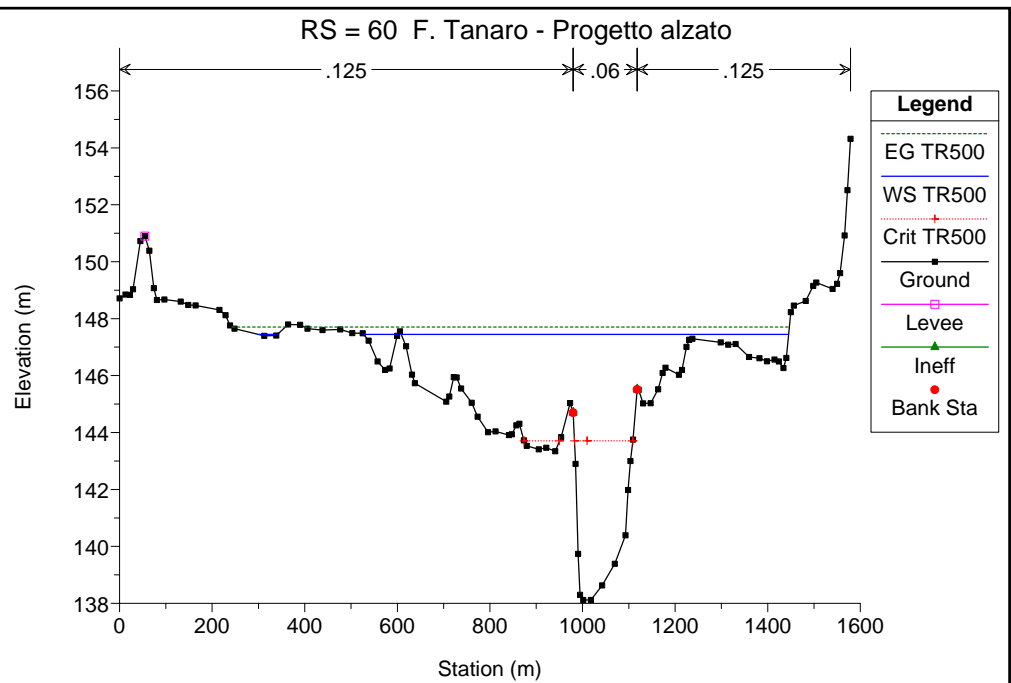
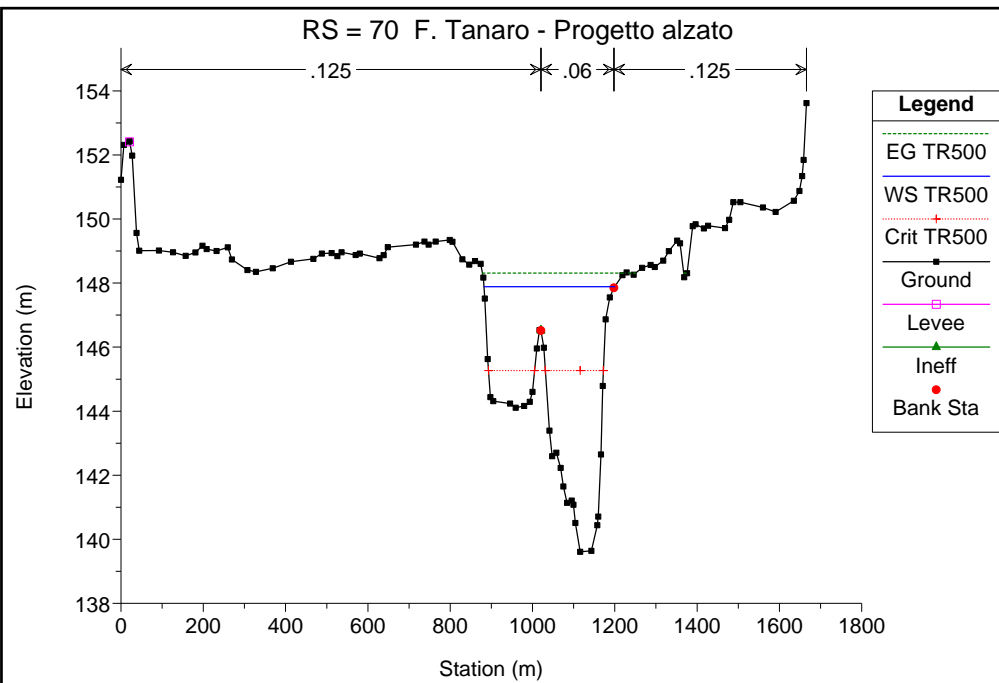
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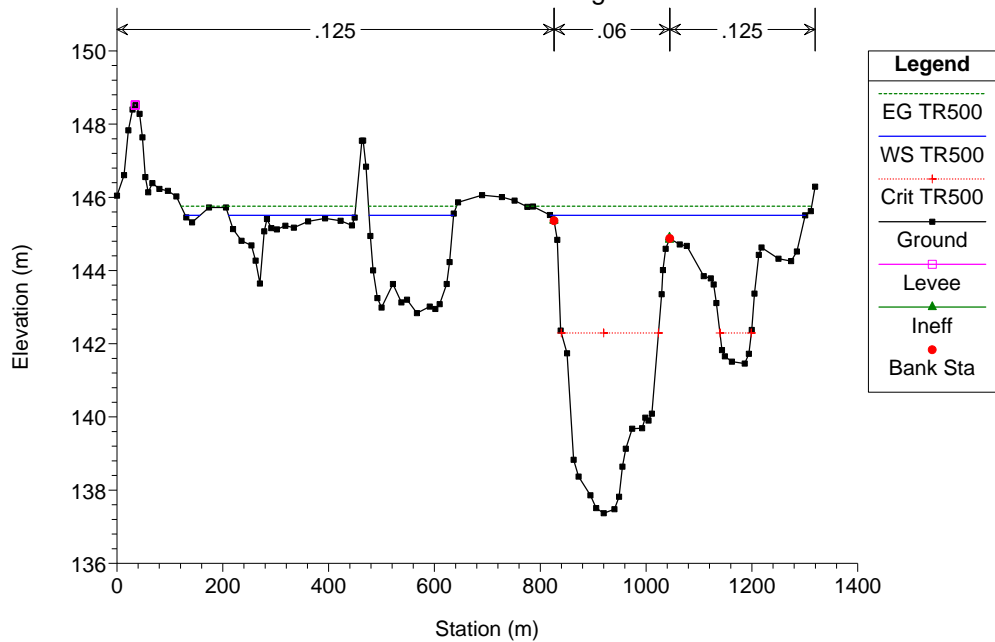
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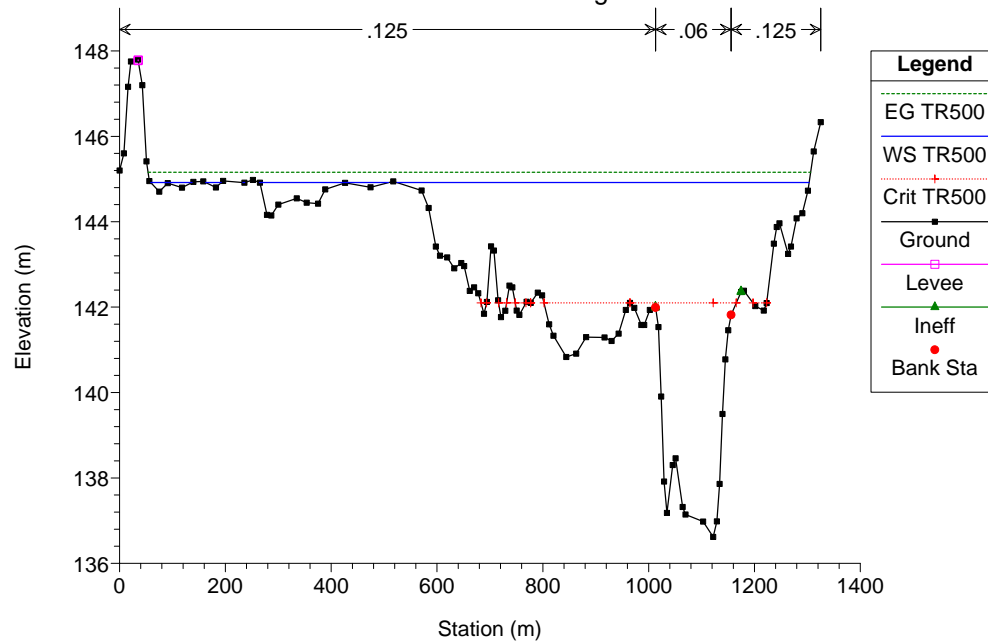




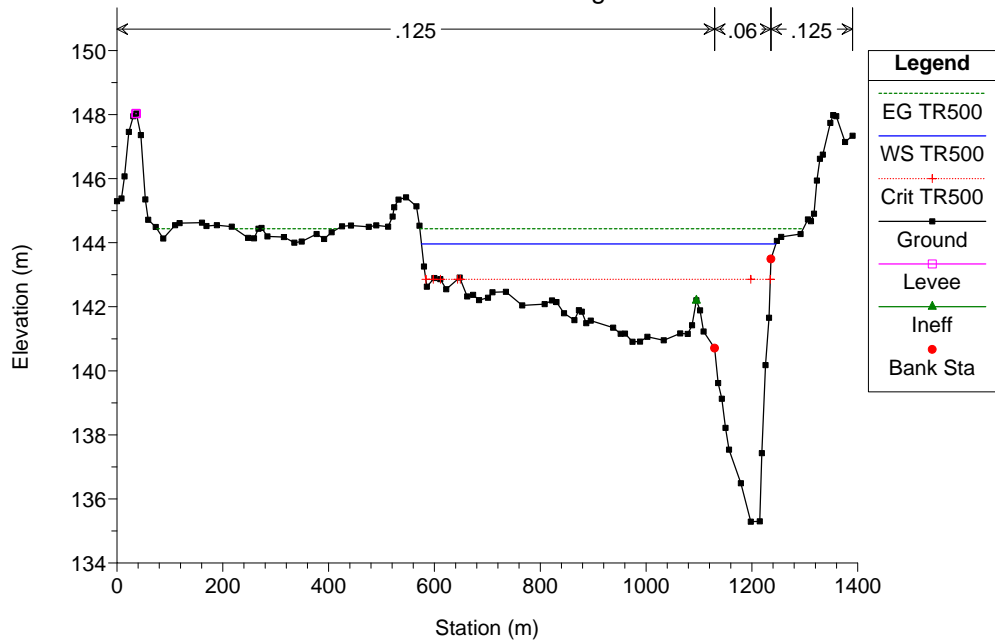
RS = 30 F. Tanaro - Progetto alzato



RS = 20 F. Tanaro - Progetto alzato



RS = 10 F. Tanaro - Progetto alzato



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 20

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3400	500
F. Tanaro valle Riddone	3409	
F. Tanaro valle Cherasca	3422	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500

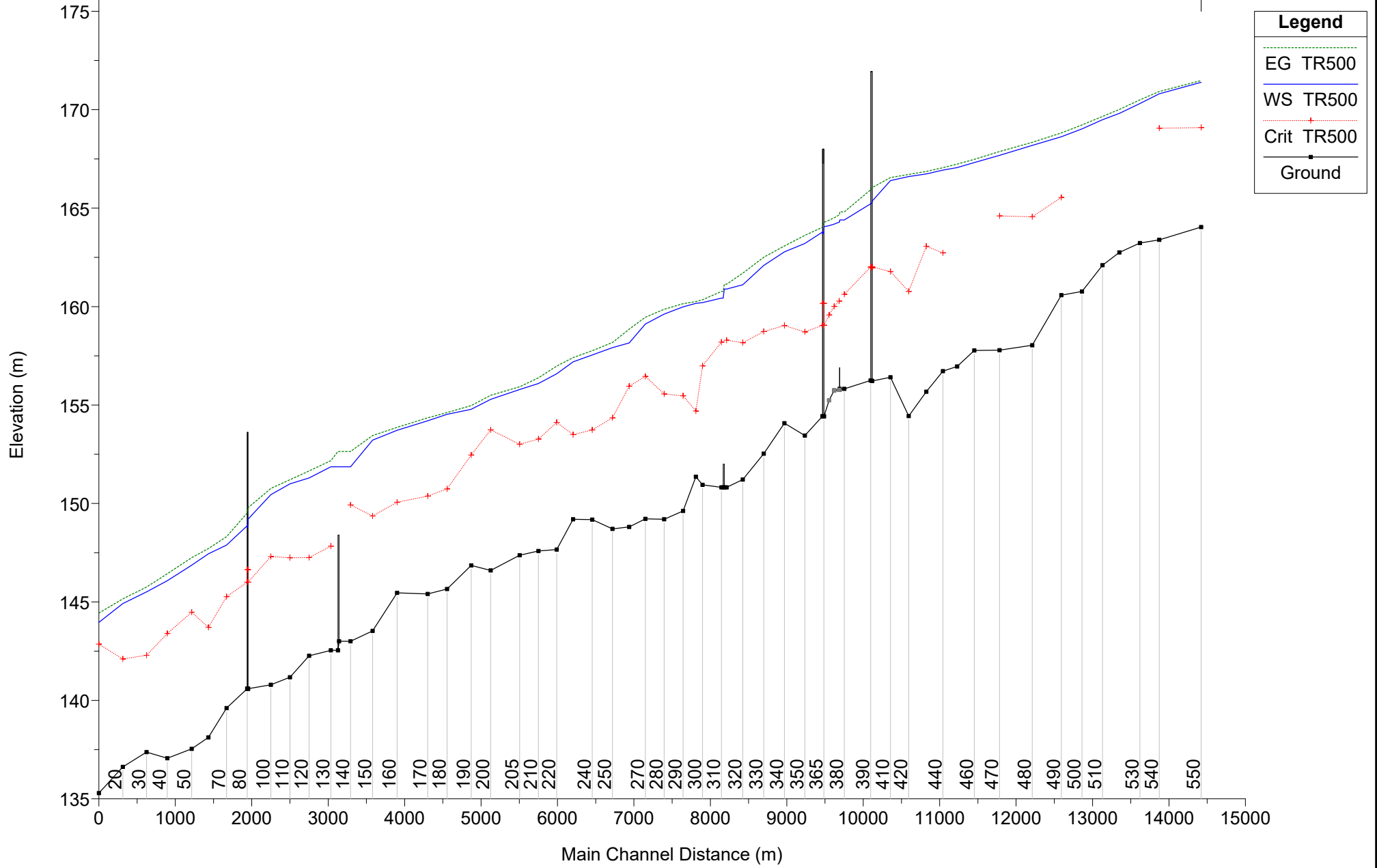
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	550	TR500	3400.00	164.04	171.39	169.09	171.48	0.001096	1.52	3523.99	1200.51	0.23
1	540	TR500	3400.00	163.39	170.81	169.06	170.92	0.001558	2.11	3612.67	1126.05	0.28
1	530	TR500	3400.00	163.23	170.31		170.50	0.001819	2.23	2479.81	678.52	0.30
1	520	TR500	3400.00	162.75	169.81		170.01	0.001936	2.36	2846.73	1070.77	0.31
1	510	TR500	3400.00	162.10	169.49		169.66	0.001765	2.15	2686.48	790.34	0.30
1	500	TR500	3400.00	160.77	169.02		169.22	0.001566	2.25	2360.42	558.07	0.28
1	490	TR500	3400.00	160.58	168.63	165.54	168.82	0.001504	2.10	2199.38	540.68	0.28
1	480	TR500	3400.00	158.04	168.19	164.56	168.34	0.001139	1.99	2800.37	972.38	0.25
1	470	TR500	3400.00	157.79	167.68	164.60	167.87	0.001367	2.26	2447.46	584.59	0.27
1	460	TR500	3400.00	157.77	167.32		167.48	0.001021	2.00	2964.20	920.62	0.24
1	450	TR500	3400.00	156.96	167.06		167.24	0.001068	2.08	2937.11	1044.40	0.24
1	440	TR500	3400.00	156.72	166.93	162.73	167.05	0.000782	1.84	3423.85	804.46	0.21
1	430	TR500	3400.00	155.68	166.74	163.06	166.87	0.000944	2.03	3249.24	667.85	0.23
1	420	TR500	3400.00	154.44	166.61	160.77	166.71	0.000544	1.70	3592.68	692.35	0.18
1	410	TR500	3400.00	156.41	166.40	161.78	166.56	0.000927	2.04	2762.17	552.77	0.23
1	400	TR500	3400.00	156.22	165.36	162.01	166.04	0.003444	3.76	1050.07	179.18	0.42
1	395		Bridge									
1	390	TR500	3400.00	156.25	165.22	162.02	165.93	0.003671	3.84	1026.17	178.88	0.44
1	380	TR500	3400.00	155.82	164.40	160.62	164.81	0.002200	2.87	1282.65	288.38	0.34
1	379		Inl Struct									
1	370	TR500	3400.00	154.43	164.05	159.05	164.28	0.001113	2.12	1600.11	208.93	0.25
1	365		Bridge									
1	360	TR500	3400.00	154.43	163.78	159.05	164.03	0.001247	2.20	1543.71	208.18	0.26
1	350	TR500	3400.00	153.45	163.20	158.72	163.62	0.002009	2.88	1297.95	293.85	0.33
1	340	TR500	3409.00	154.08	162.78	159.04	163.08	0.001776	2.48	1620.92	392.63	0.30
1	330	TR500	3409.00	152.53	162.09	158.73	162.50	0.002454	2.96	1513.90	441.15	0.36
1	320	TR500	3409.00	151.21	161.11	158.17	161.70	0.003356	3.77	1655.45	712.41	0.43
1	315	TR500	3409.00	150.82	160.89	158.29	161.14	0.001683	2.70	2909.86	1133.42	0.30
1	312.5		Inl Struct									
1	310	TR500	3409.00	150.82	160.43	158.20	160.77	0.002355	3.07	2355.46	840.01	0.36
1	300	TR500	3422.00	150.95	160.20	156.99	160.35	0.001128	1.95	3071.89	935.41	0.24
1	295	TR500	3422.00	151.36	160.17	154.70	160.25	0.000513	1.47	3769.13	1016.17	0.17
1	290	TR500	3422.00	149.62	159.98	155.47	160.15	0.000960	1.90	2627.08	785.03	0.22
1	280	TR500	3422.00	149.20	159.62	155.56	159.86	0.001388	2.46	2398.43	879.22	0.28
1	270	TR500	3422.00	149.22	159.11	156.45	159.46	0.002060	2.98	2079.80	828.20	0.34
1	260	TR500	3422.00	148.81	158.16	155.95	158.85	0.003905	3.94	1361.48	505.08	0.46
1	250	TR500	3422.00	148.71	157.92	154.35	158.18	0.001784	2.52	2166.38	562.22	0.31
1	240	TR500	3422.00	149.18	157.54	153.73	157.76	0.001376	2.29	2547.94	773.70	0.27
1	230	TR500	3422.00	149.20	157.19	153.50	157.41	0.001408	2.21	2220.42	700.30	0.27
1	220	TR500	3422.00	147.66	156.59	154.12	156.98	0.002674	3.09	1741.77	624.31	0.38

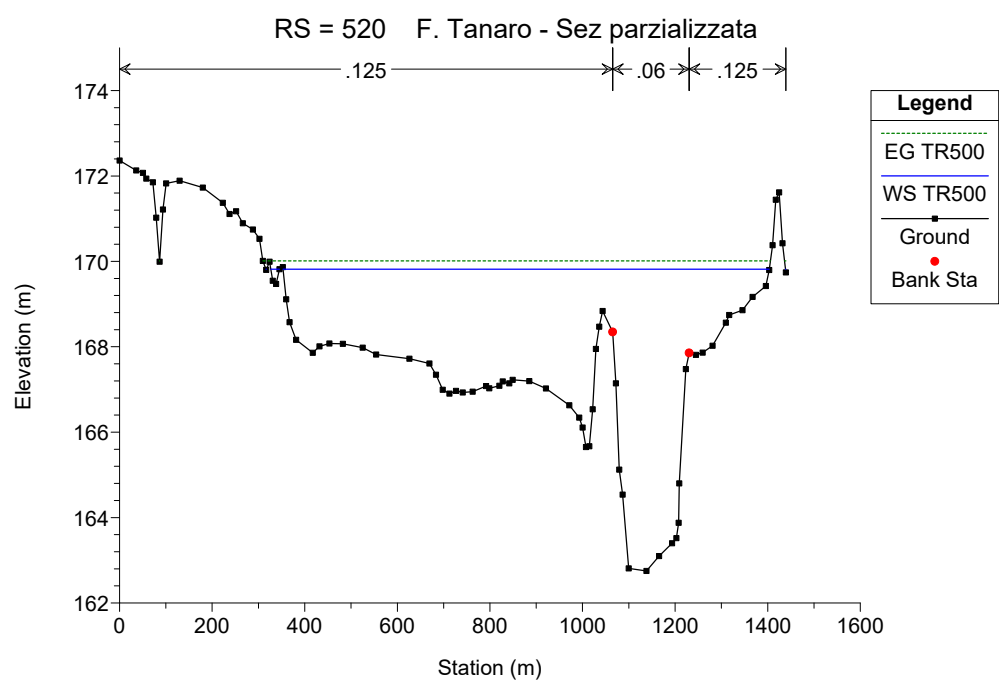
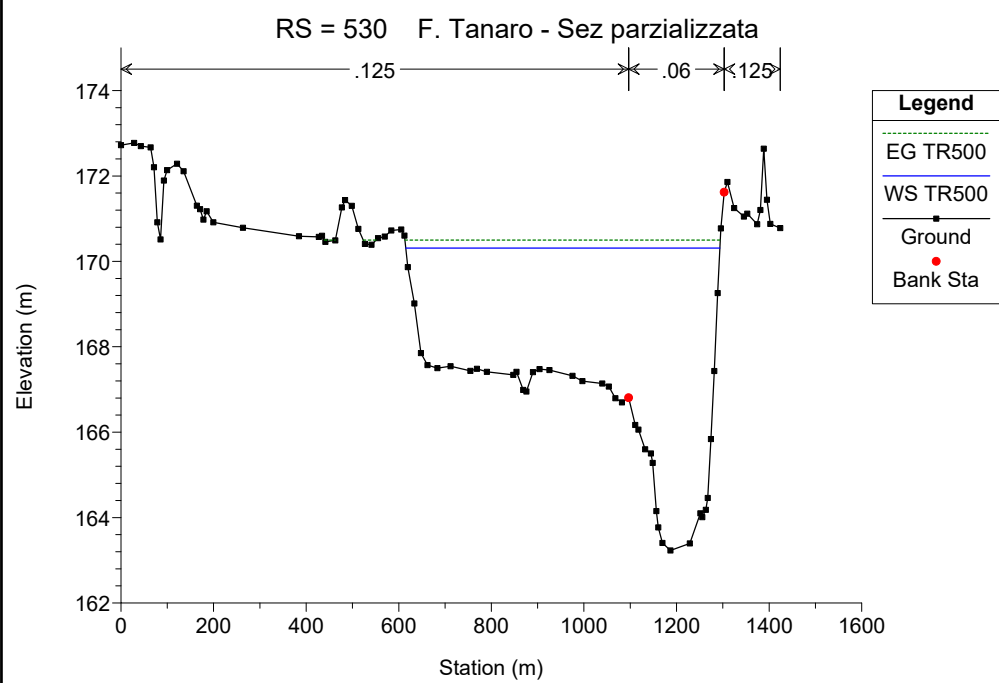
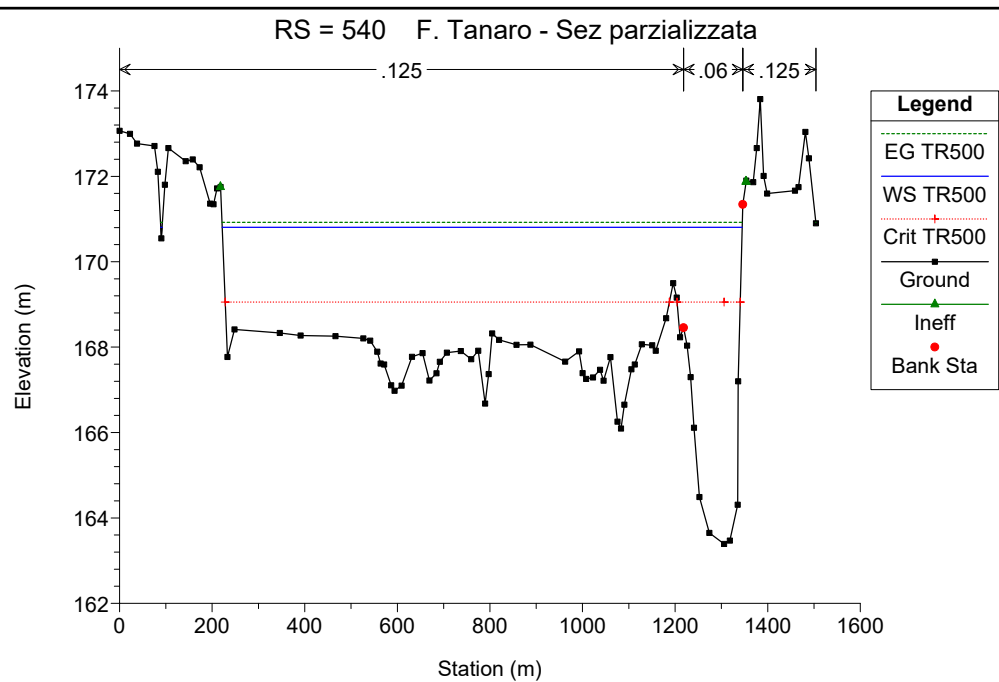
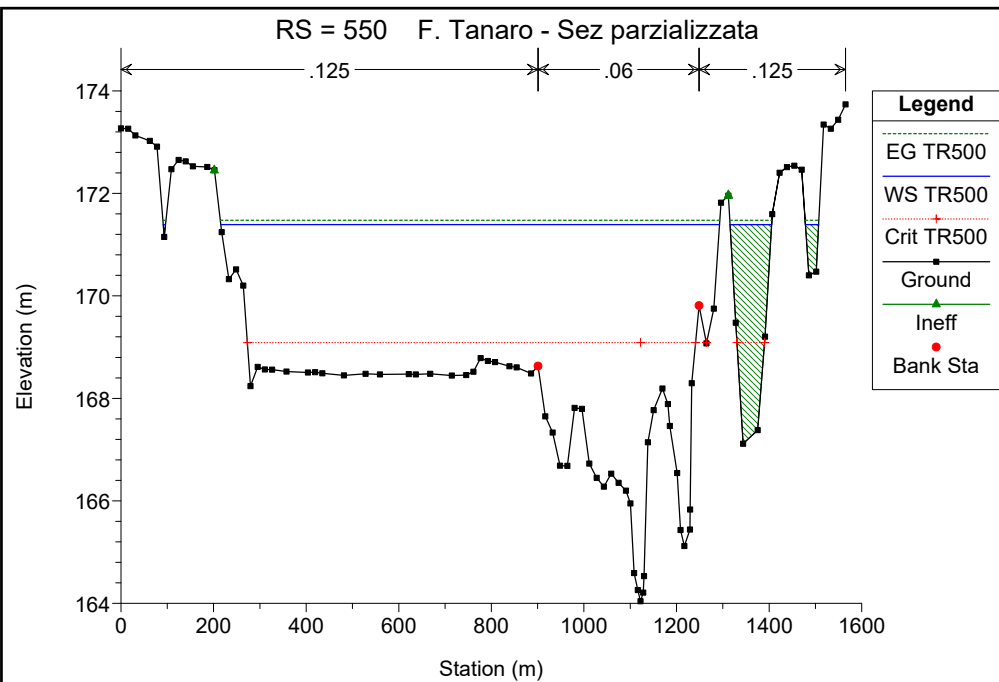
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: TR500 (Continued)

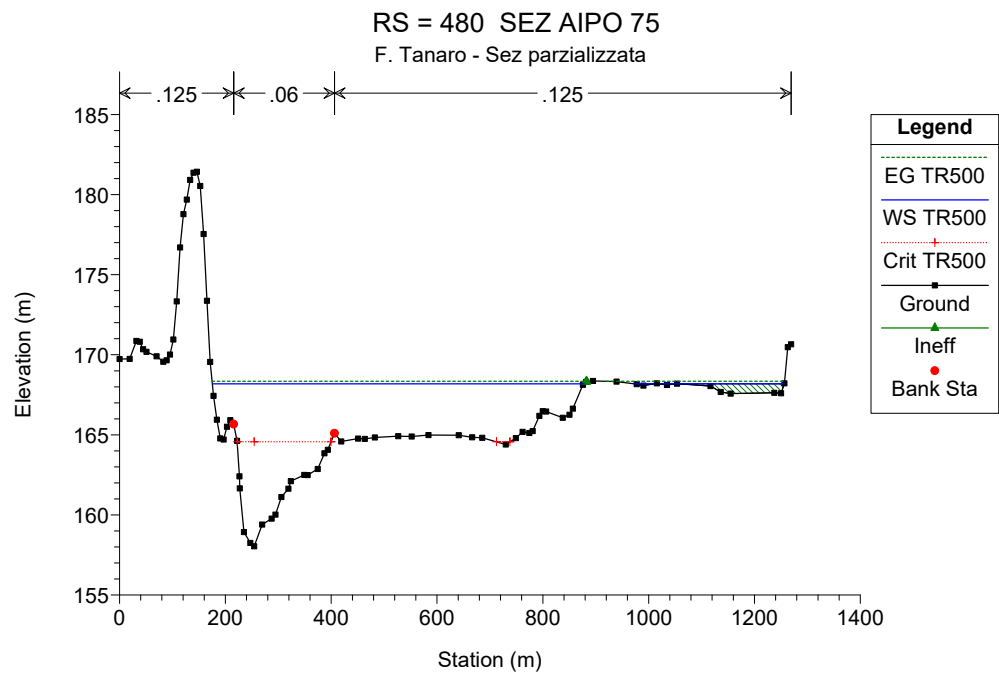
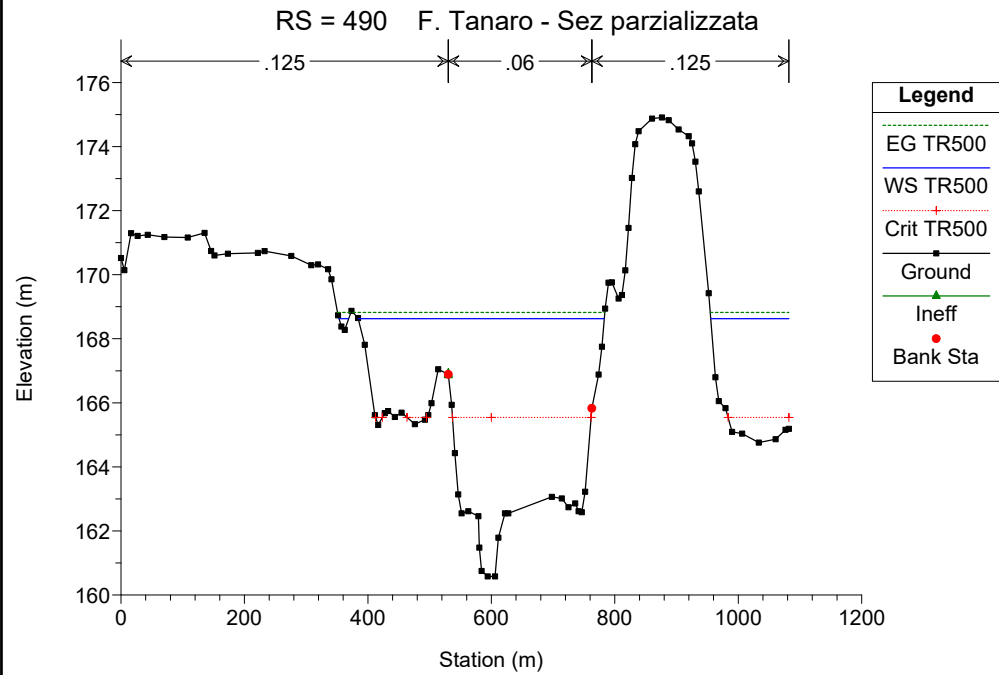
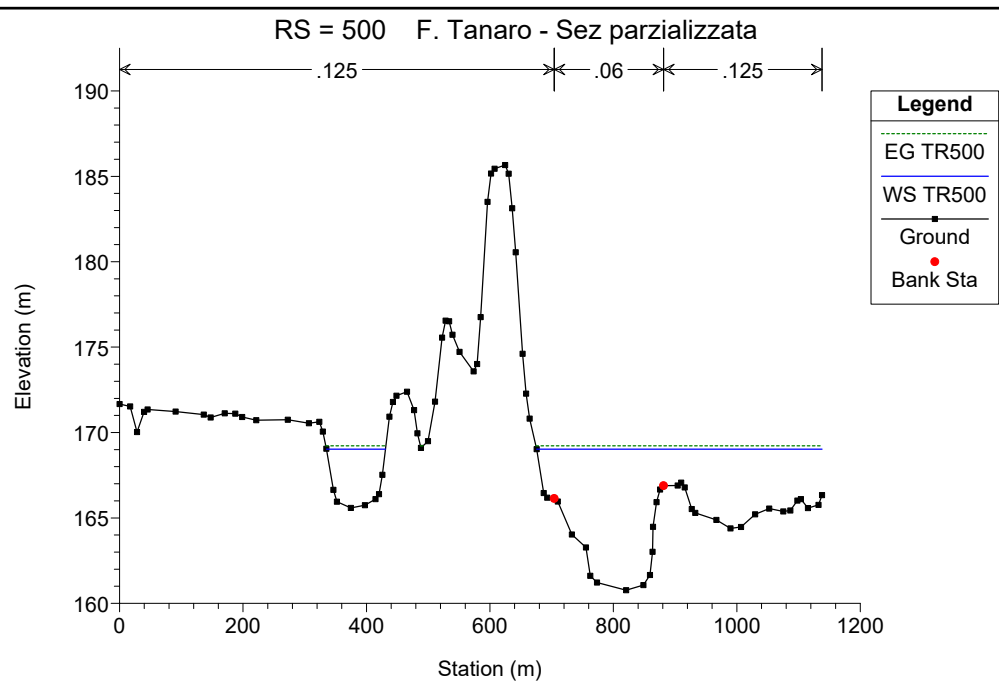
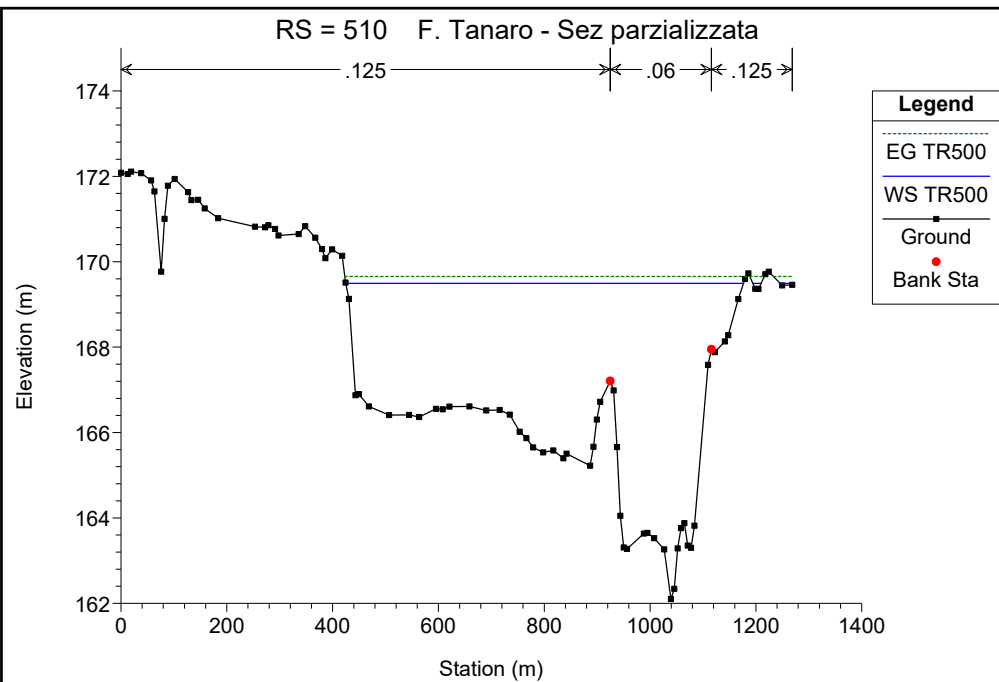
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	TR500	3422.00	147.59	156.10	153.27	156.38	0.002057	2.55	2020.70	695.11	0.33
1	205	TR500	3422.00	147.37	155.79	153.01	155.93	0.001287	1.94	3187.76	1106.77	0.25
1	200	TR500	3422.00	146.60	155.29	153.74	155.49	0.001936	2.58	3059.00	1092.32	0.32
1	190	TR500	3422.00	146.85	154.78	152.46	154.97	0.002008	2.24	2981.23	1299.47	0.31
1	180	TR500	3422.00	145.66	154.53	150.74	154.62	0.000750	1.46	3956.46	1444.97	0.19
1	170	TR500	3422.00	145.40	154.20	150.37	154.35	0.001400	1.94	3039.46	1348.10	0.26
1	160	TR500	3422.00	145.46	153.72	150.07	153.87	0.001160	1.87	3157.55	1391.08	0.24
1	150	TR500	3422.00	143.53	153.22	149.36	153.45	0.001481	2.34	2764.20	1343.44	0.28
1	140	TR500	3422.00	143.00	151.86	149.93	152.64	0.006055	3.98	1222.29	1207.93	0.55
1	135		Inl Struct									
1	130	TR500	3422.00	142.54	151.86	147.83	152.17	0.001766	2.60	2175.76	1195.01	0.31
1	120	TR500	3422.00	142.27	151.29	147.26	151.65	0.001921	2.76	1967.75	1072.58	0.32
1	110	TR500	3422.00	141.17	151.00	147.24	151.21	0.001353	2.31	2638.24	765.70	0.27
1	100	TR500	3422.00	140.79	150.45	147.31	150.76	0.002287	2.60	1790.89	577.54	0.34
1	90	TR500	3422.00	140.59	149.21	146.00	149.79	0.004177	3.37	1015.62	189.29	0.45
1	85		Bridge									
1	80	TR500	3422.00	140.59	148.87	146.00	149.52	0.004590	3.57	957.31	175.93	0.47
1	70	TR500	3422.00	139.61	147.89	145.27	148.31	0.003625	3.08	1405.92	317.89	0.42
1	60	TR500	3422.00	138.12	147.45	143.71	147.71	0.001630	2.56	2424.15	951.28	0.30
1	50	TR500	3422.00	137.54	146.87	144.48	147.25	0.002511	3.08	2087.31	961.97	0.37
1	40	TR500	3422.00	137.06	146.08	143.40	146.43	0.002875	2.67	1441.41	818.36	0.37
1	30	TR500	3422.00	137.37	145.51	142.29	145.76	0.002000	2.36	2157.78	909.01	0.32
1	20	TR500	3422.00	136.62	144.92	142.10	145.16	0.001818	2.53	2584.10	1133.53	0.31
1	10	TR500	3422.00	135.29	143.96	142.85	144.43	0.004002	3.58	1861.45	669.69	0.45

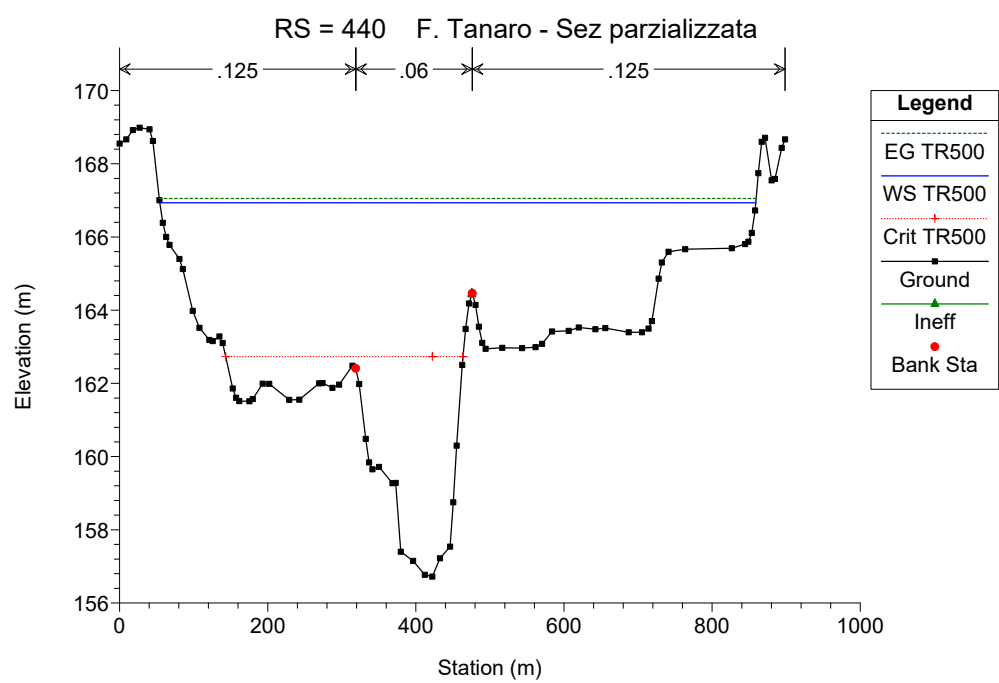
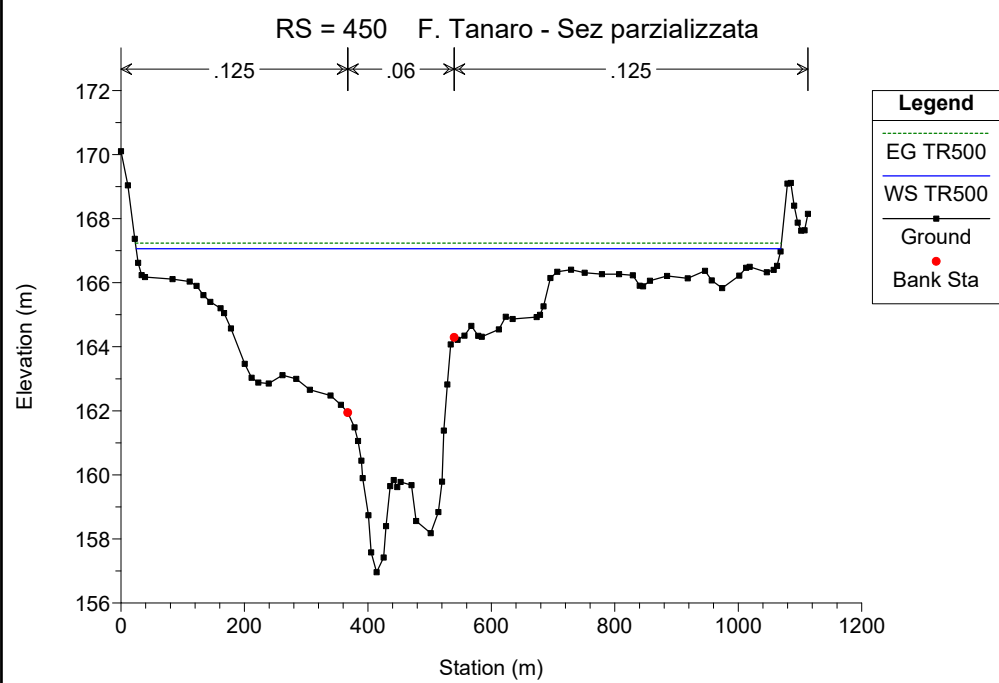
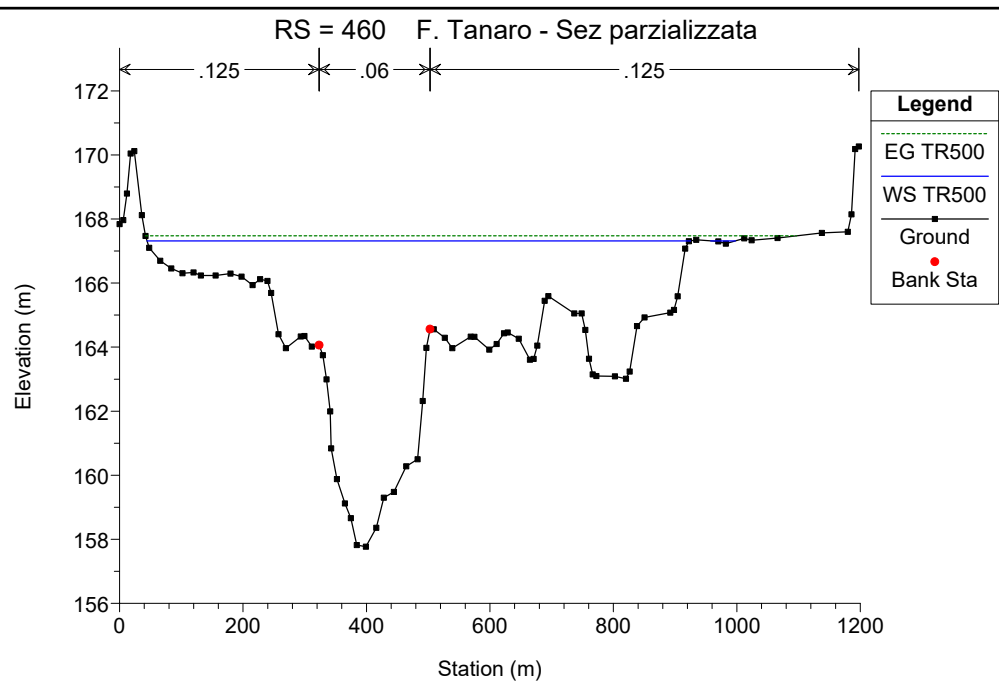
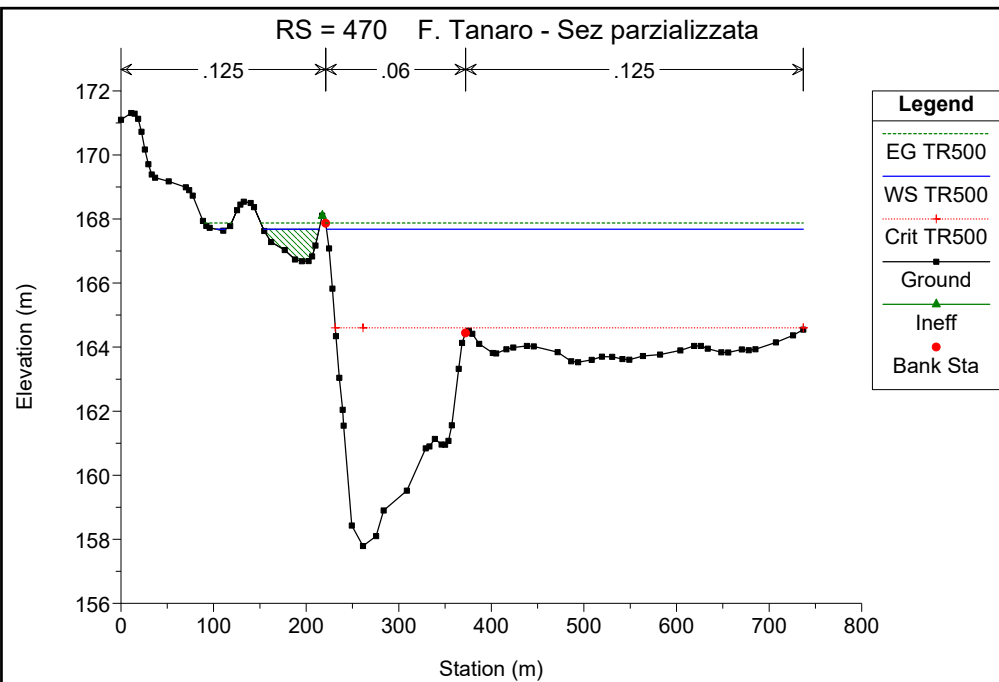
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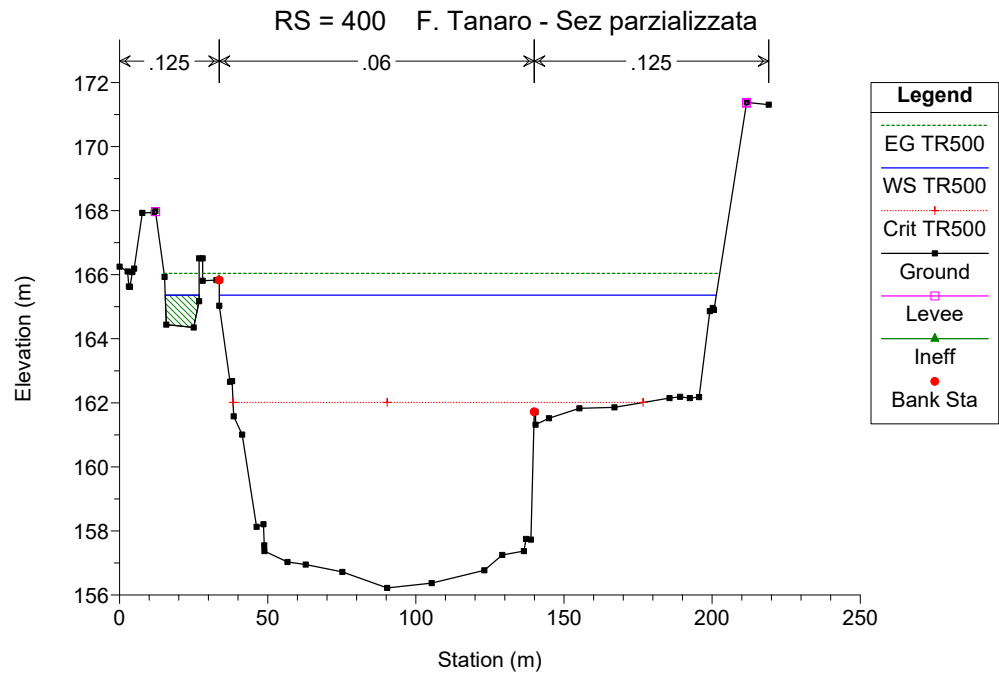
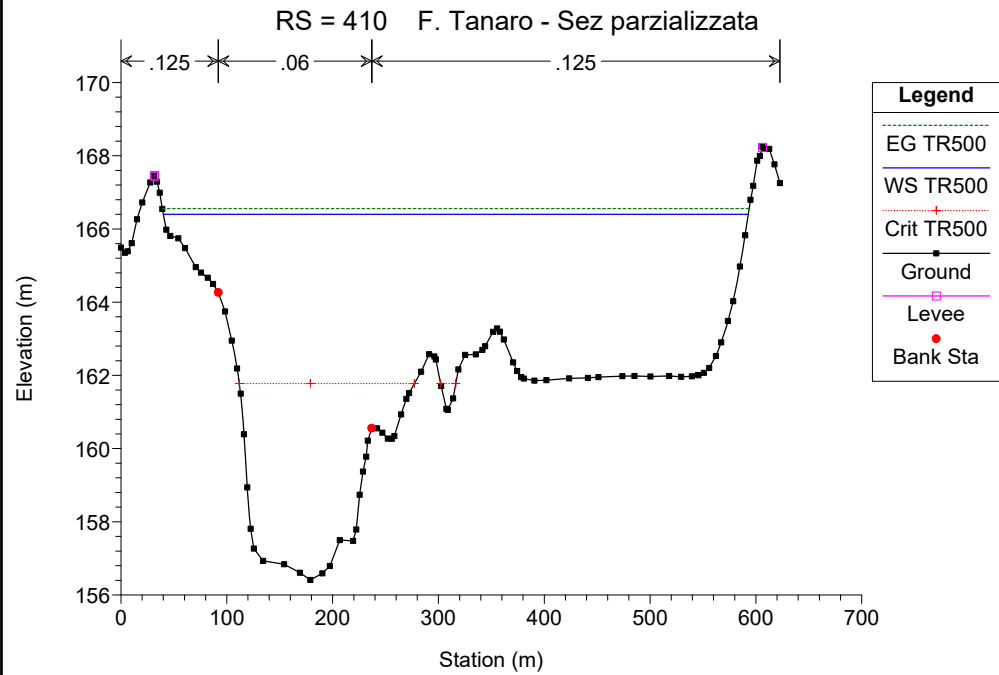
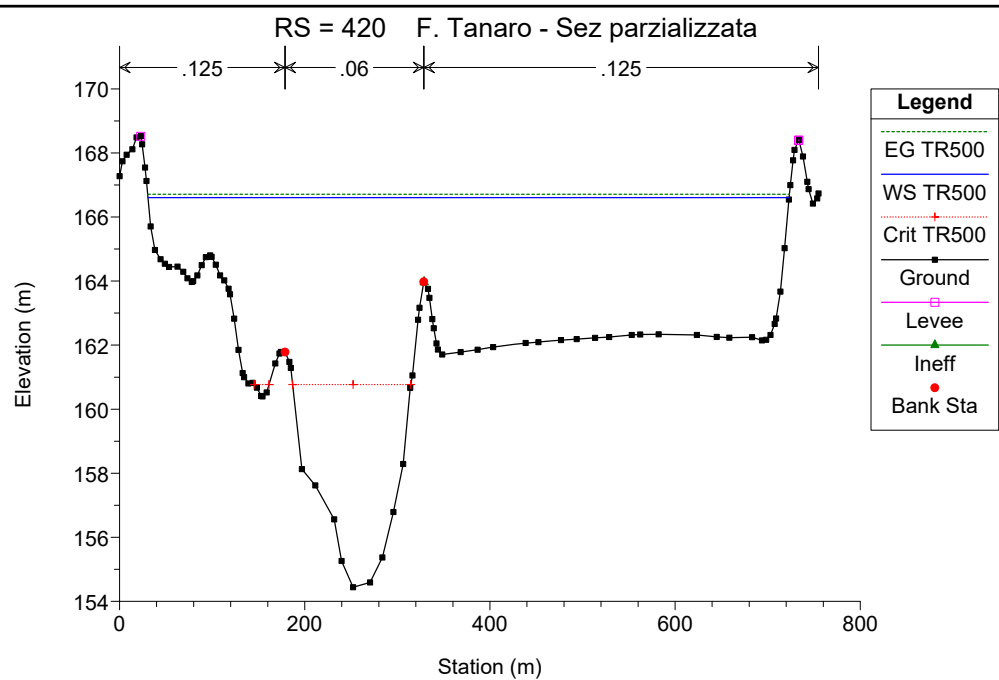
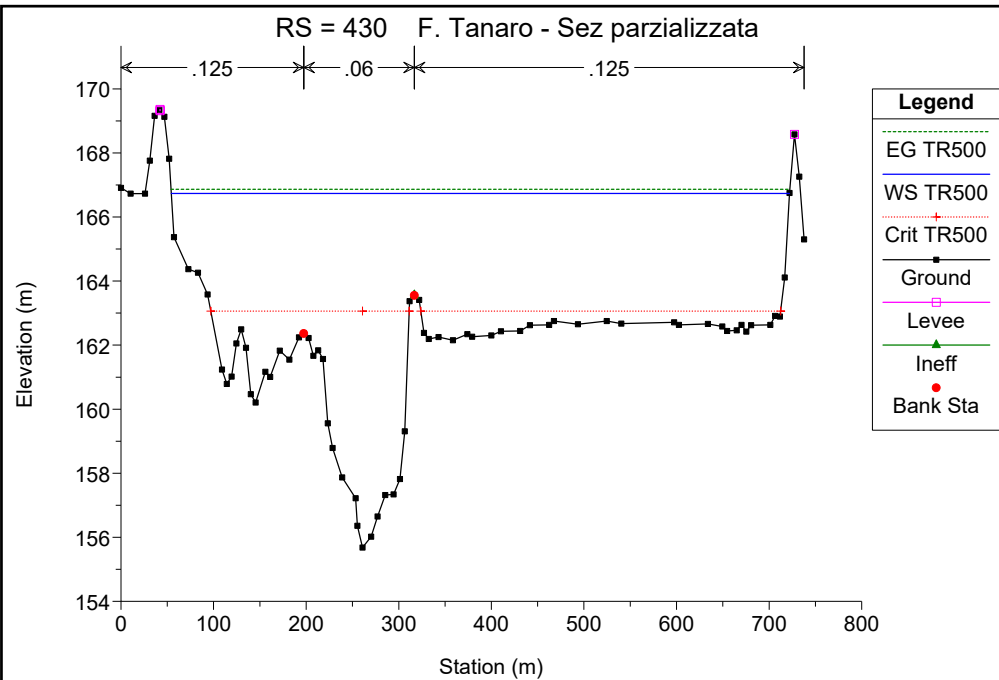
Tanaro 1

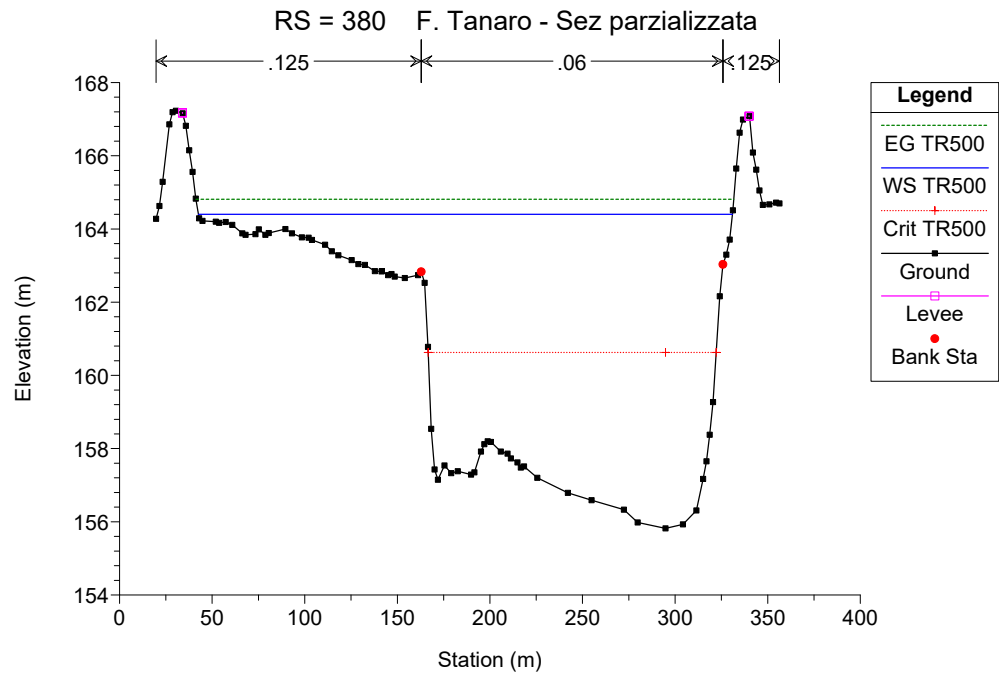
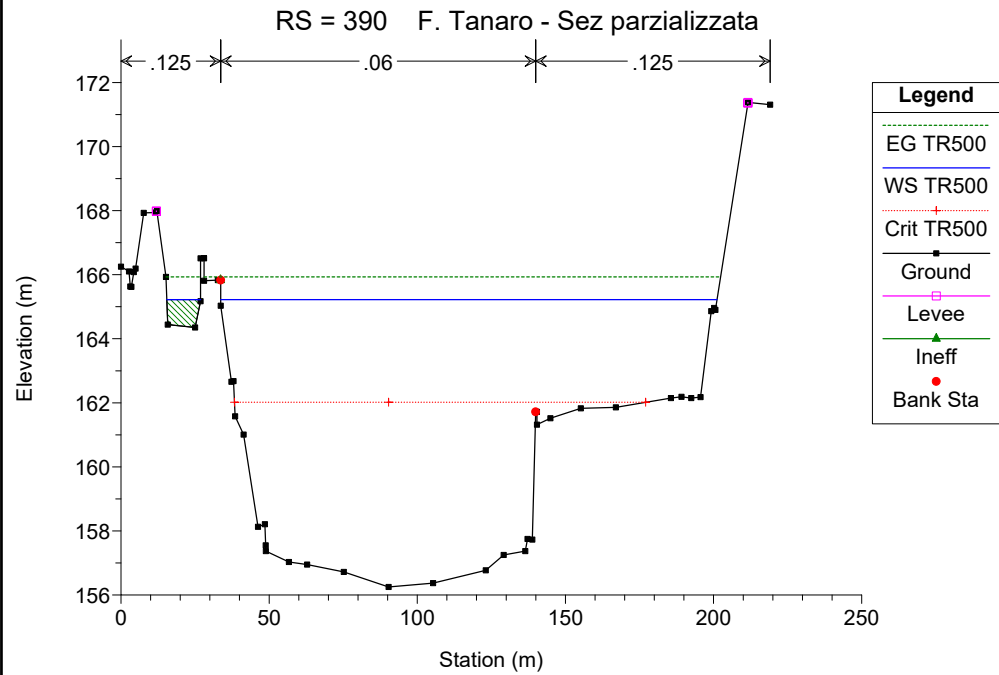
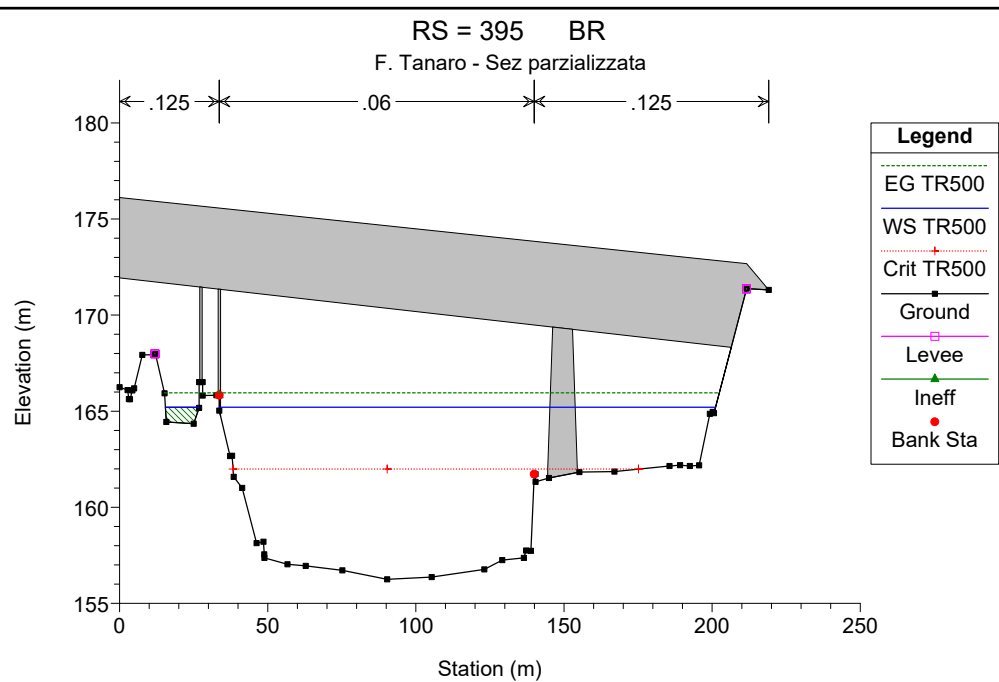
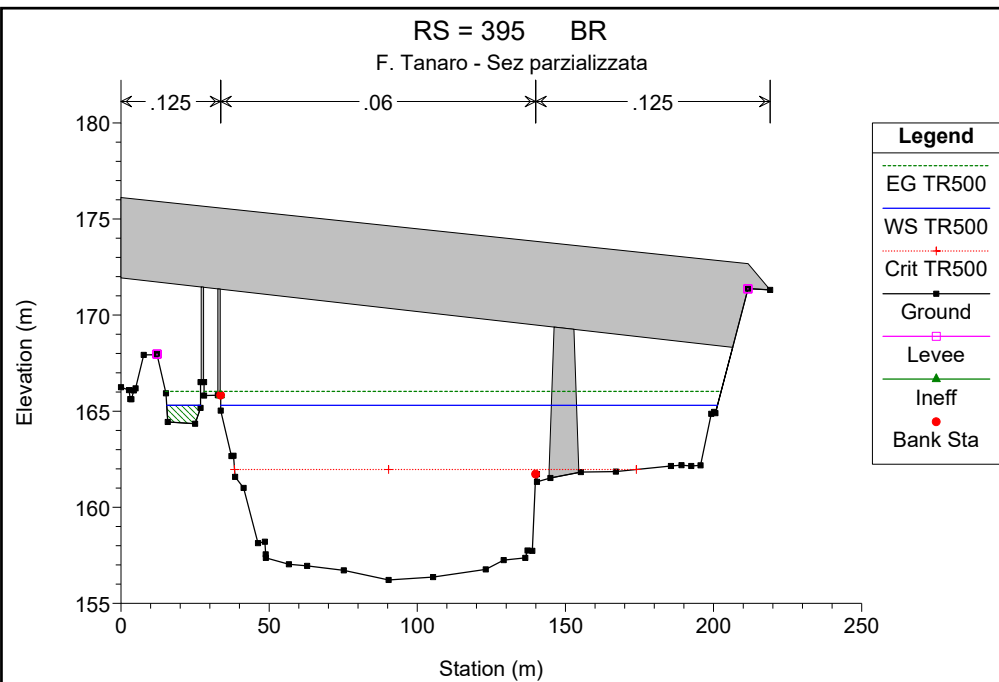


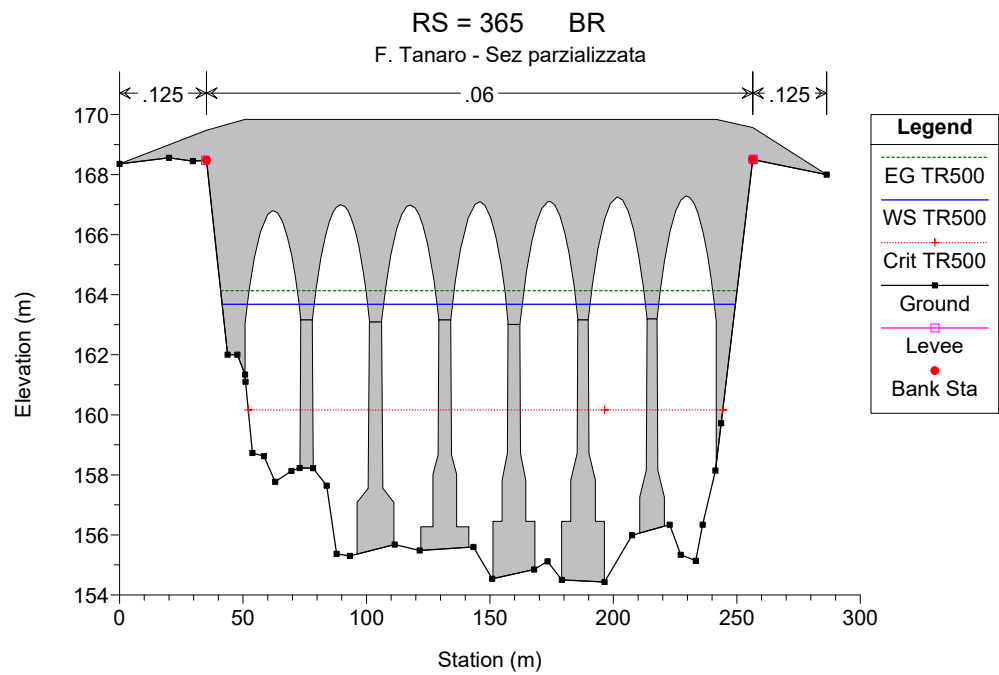
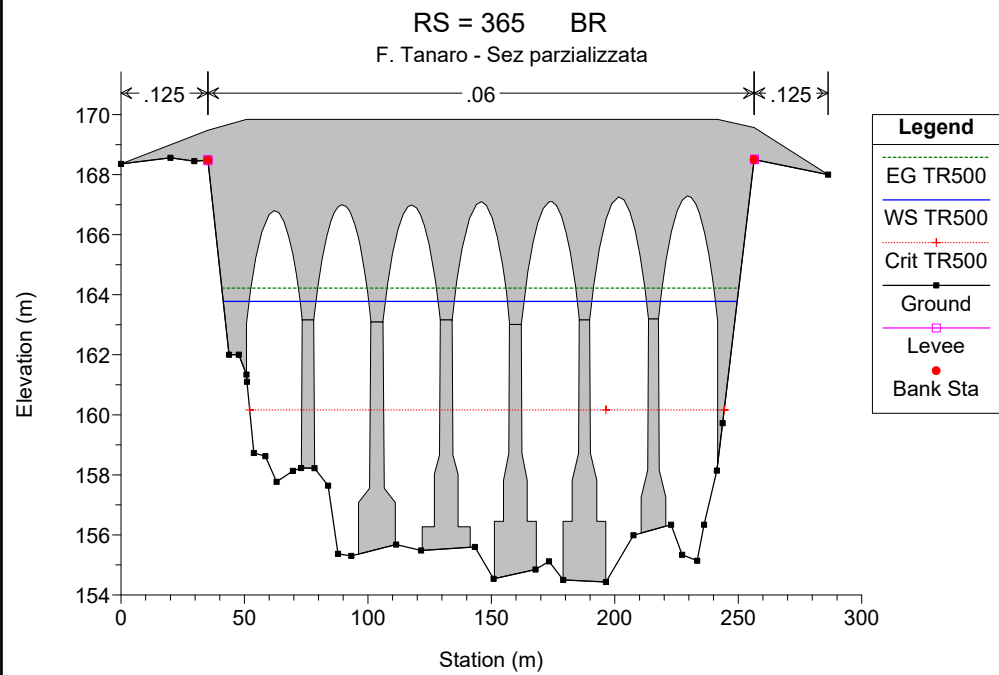
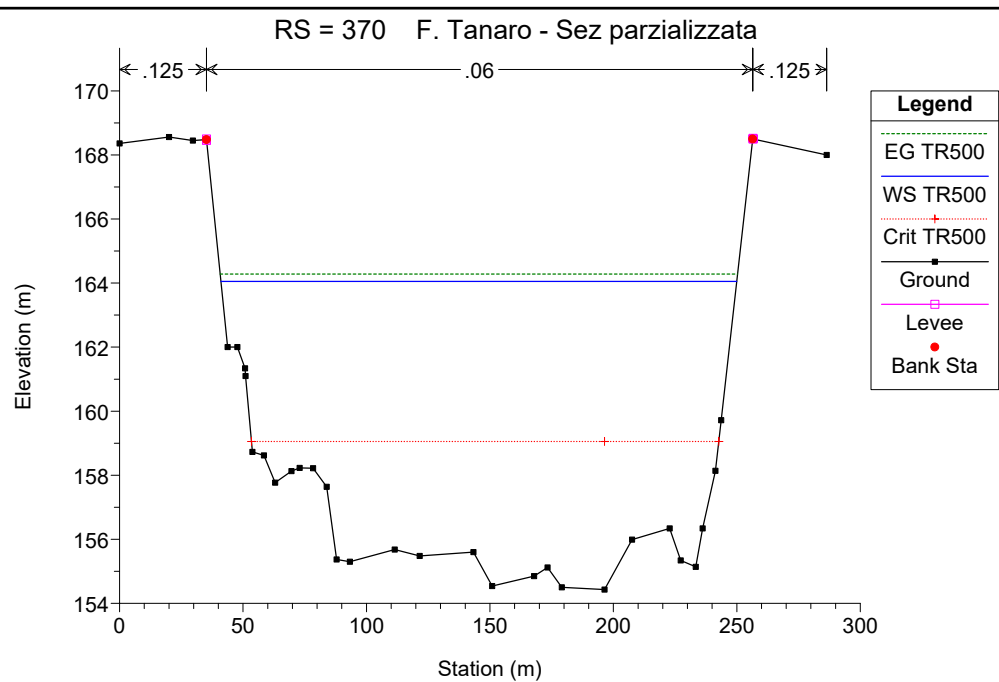
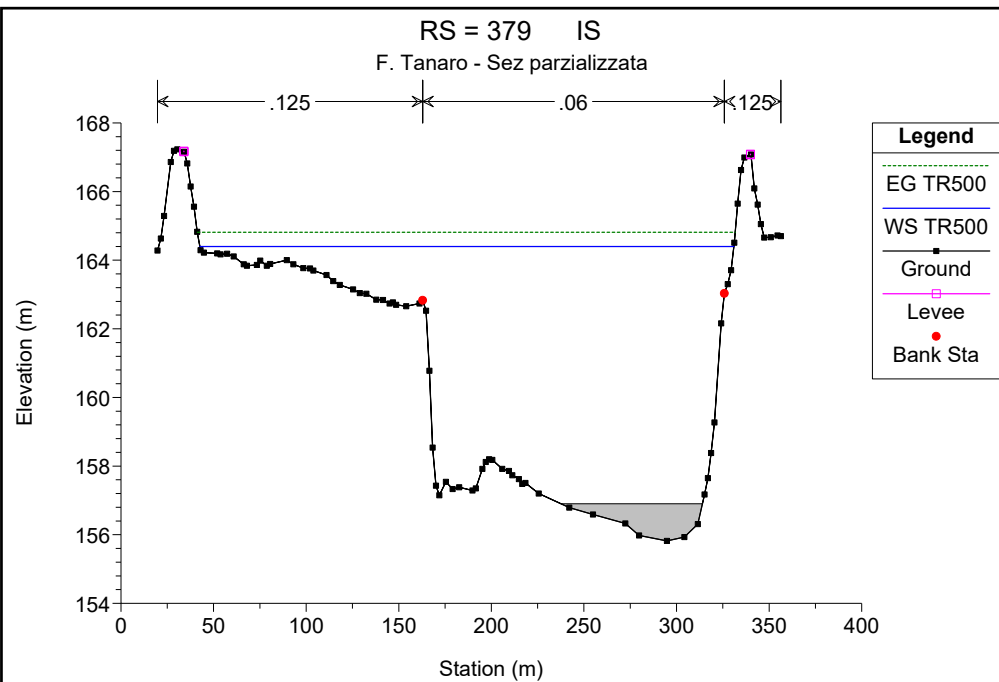


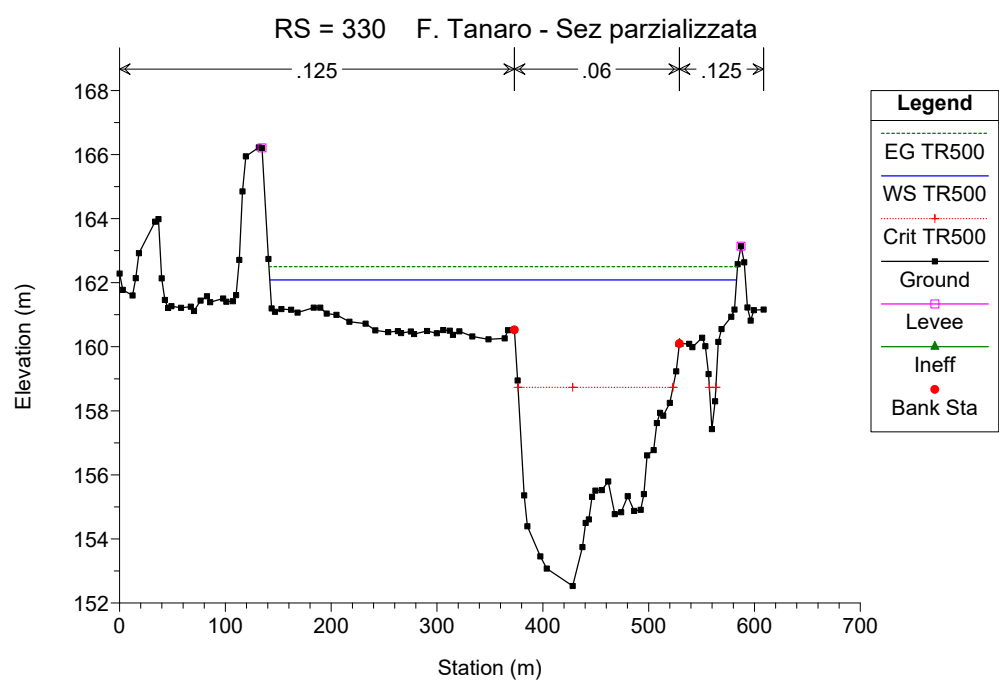
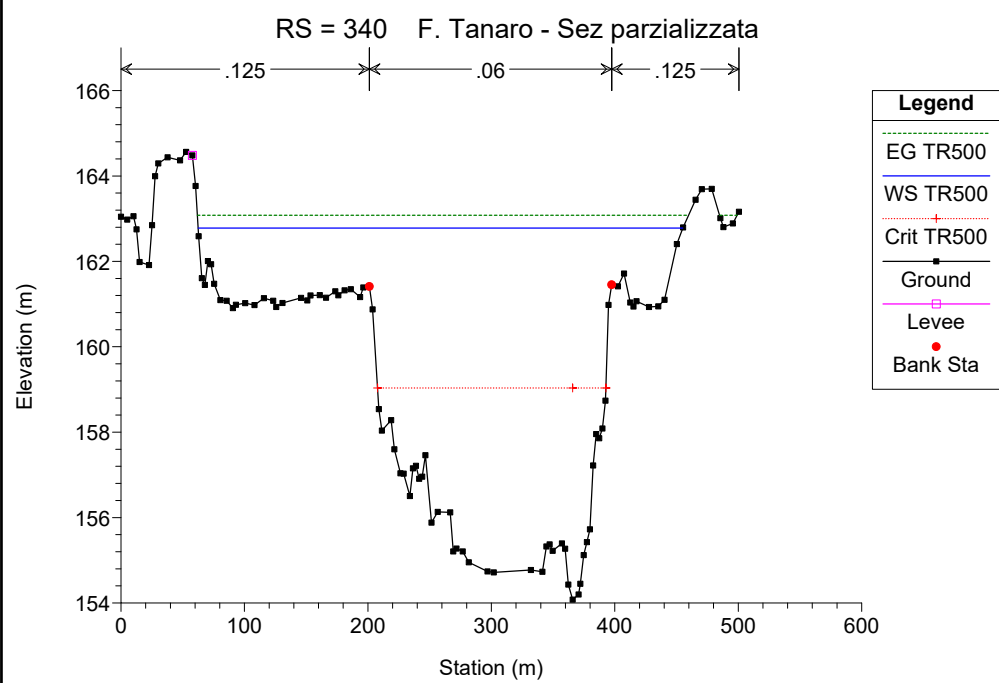
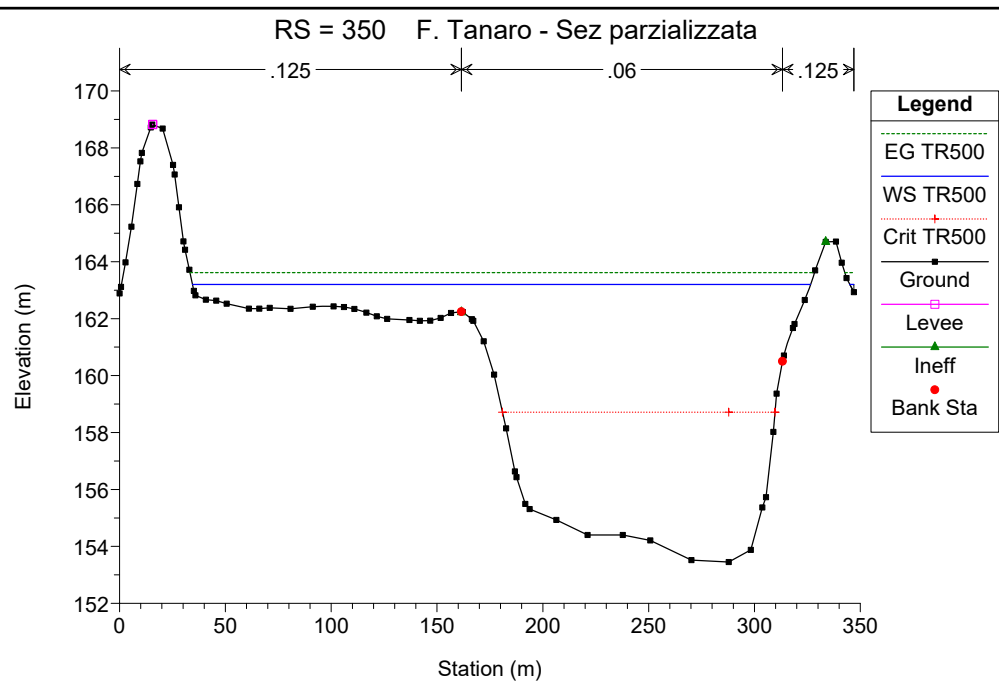
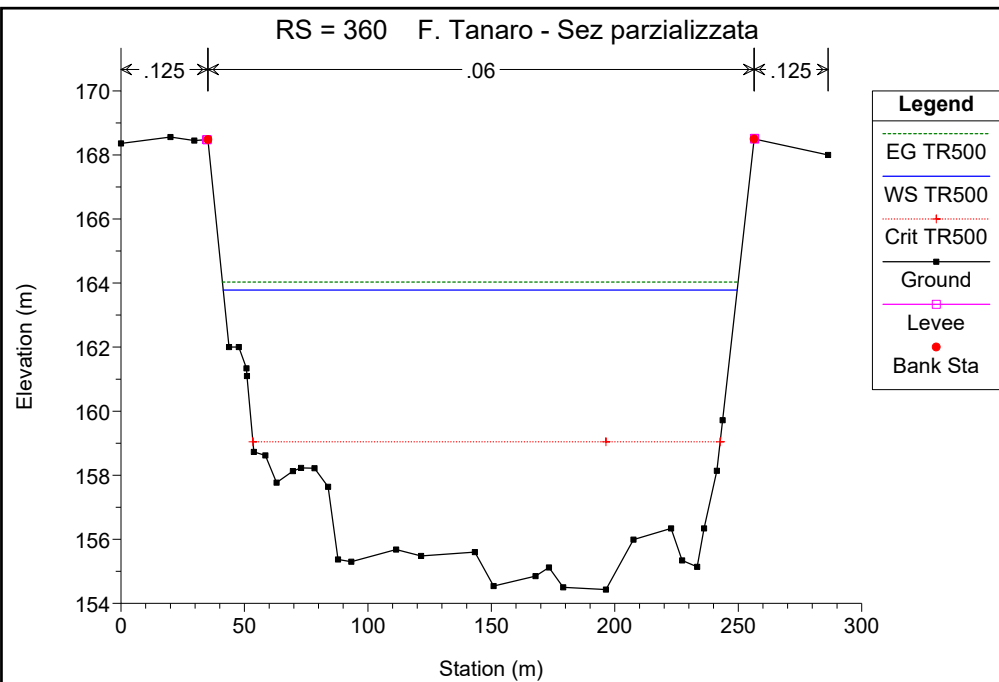


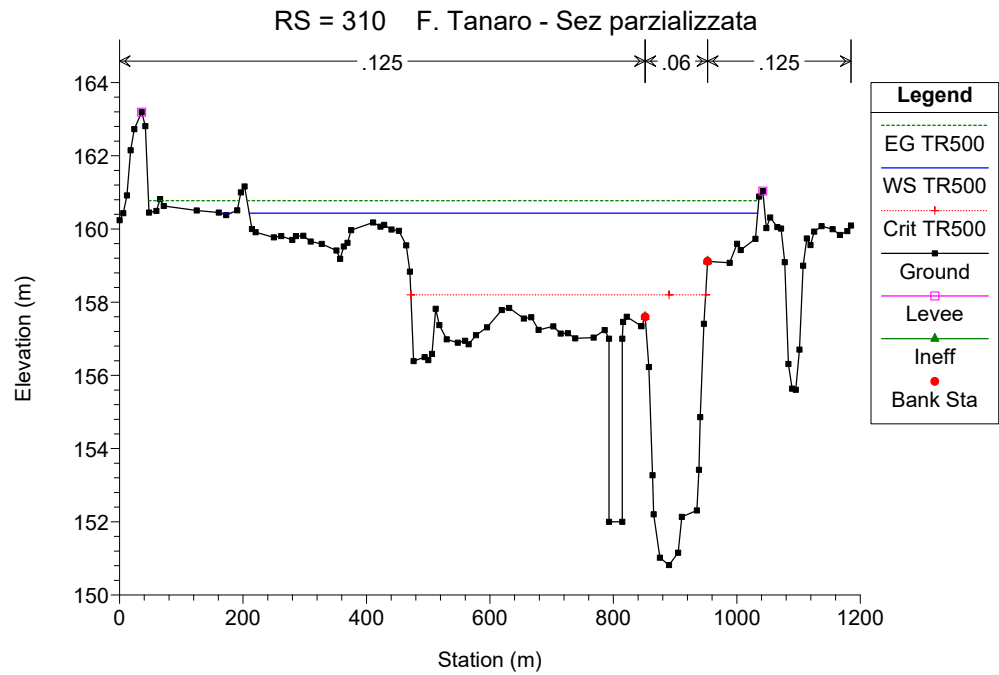
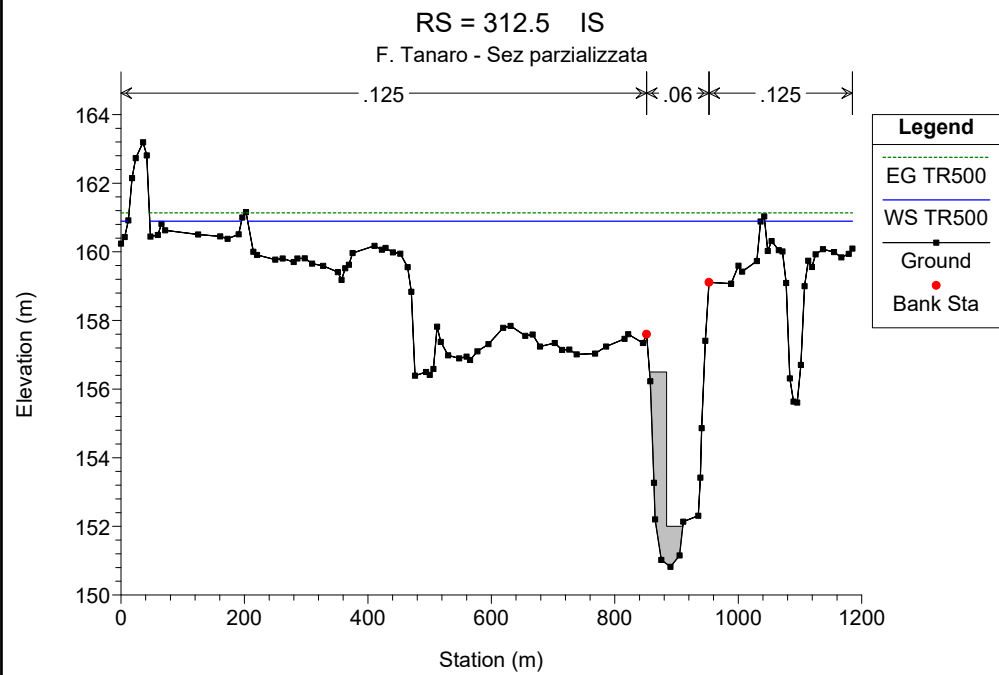
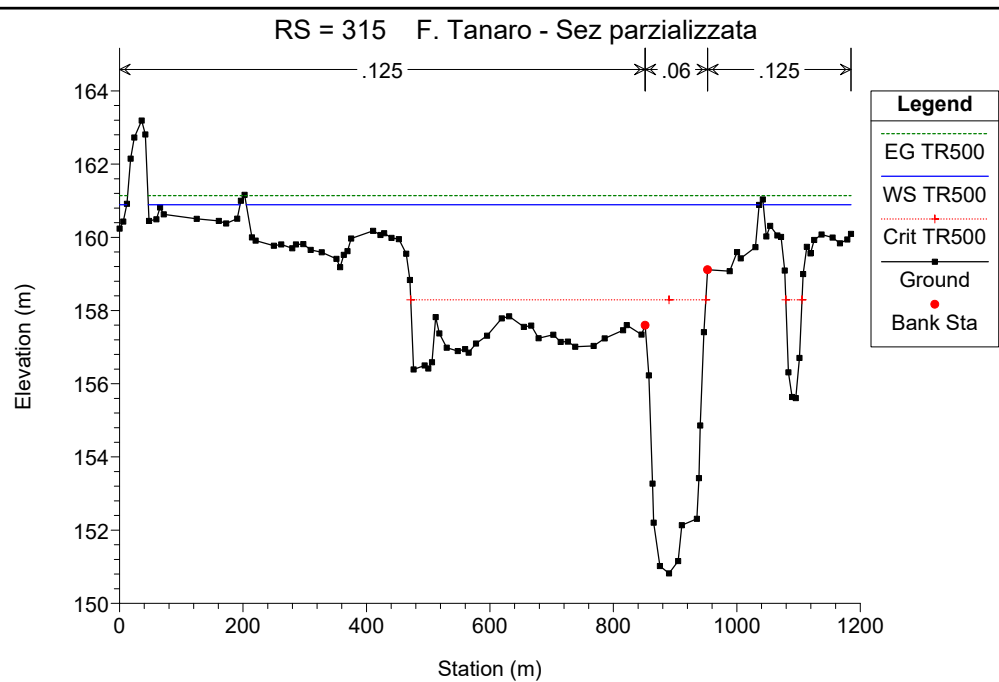
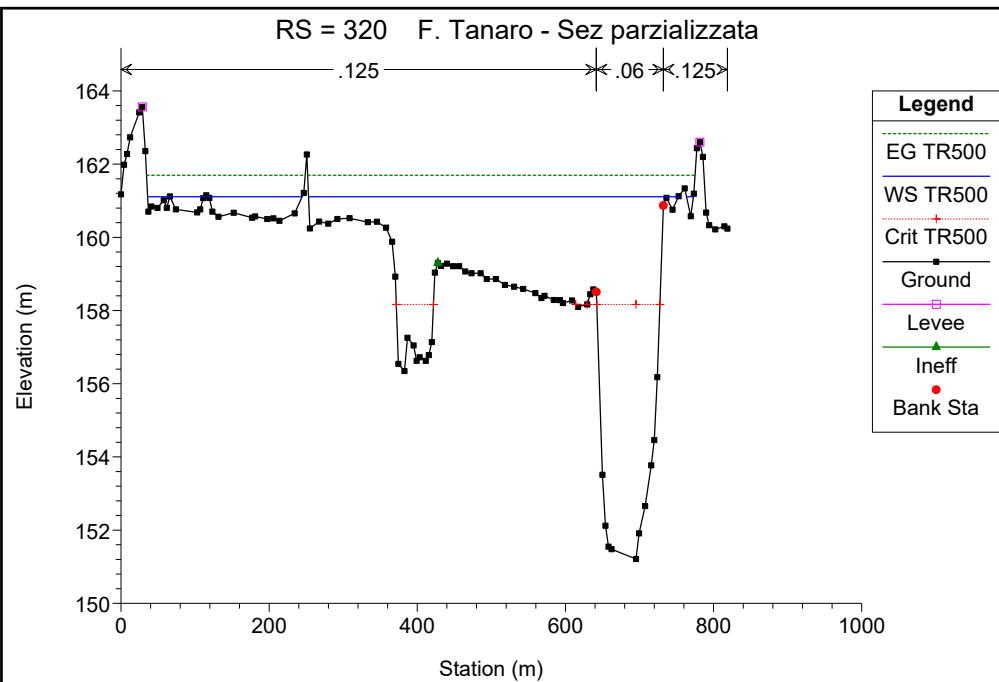


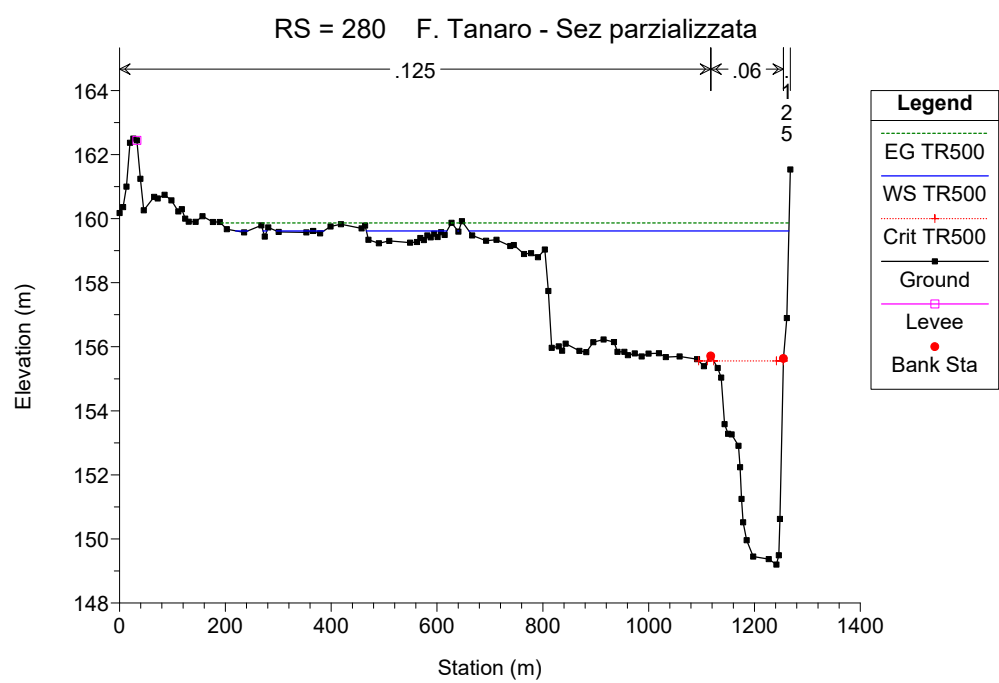
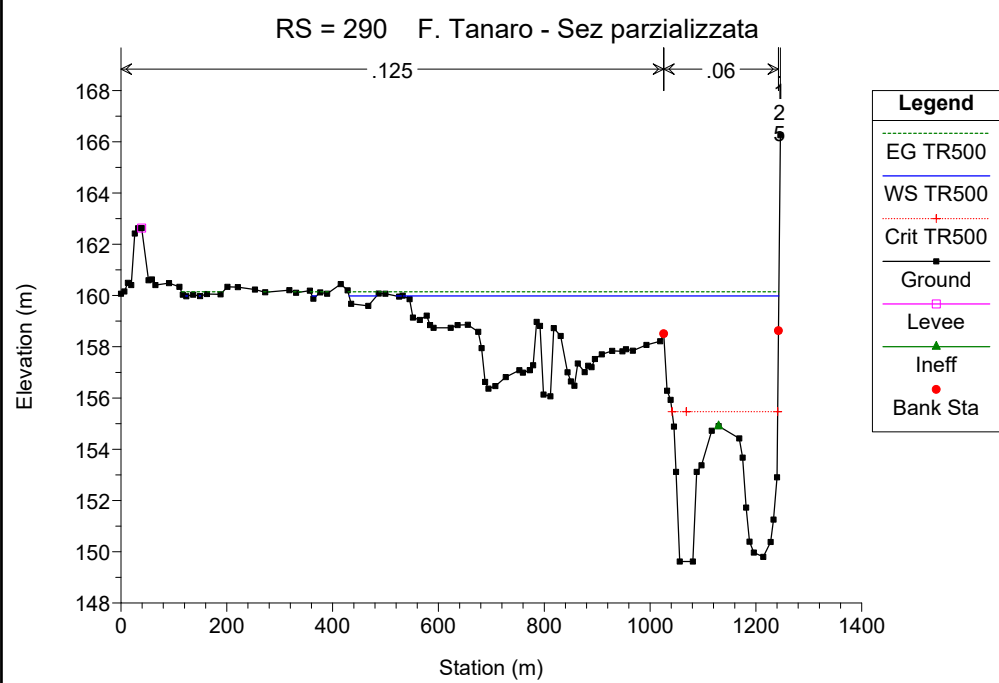
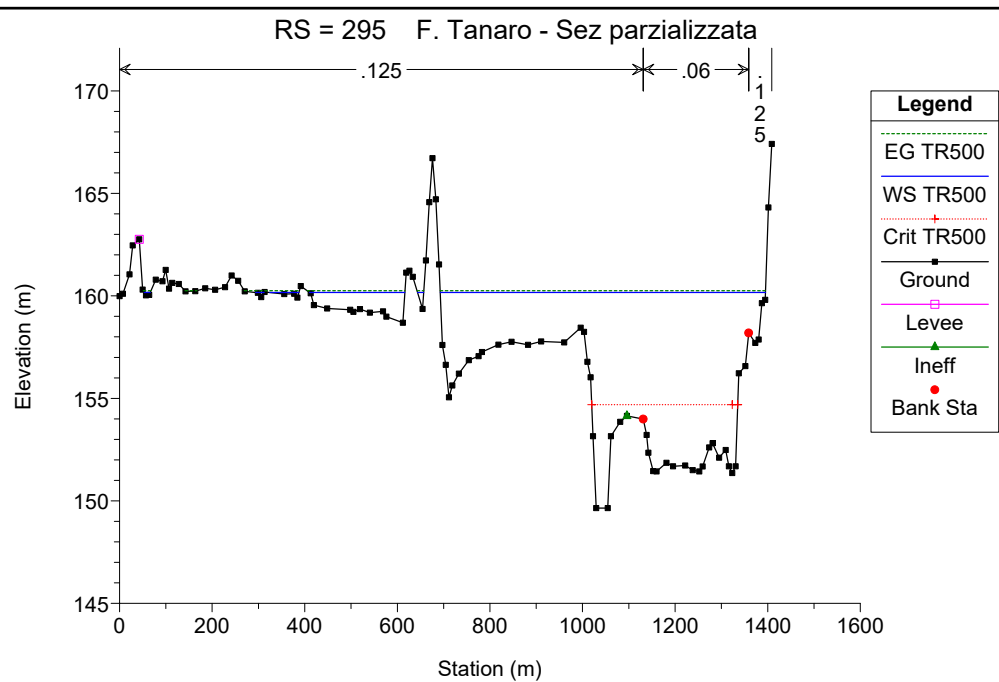
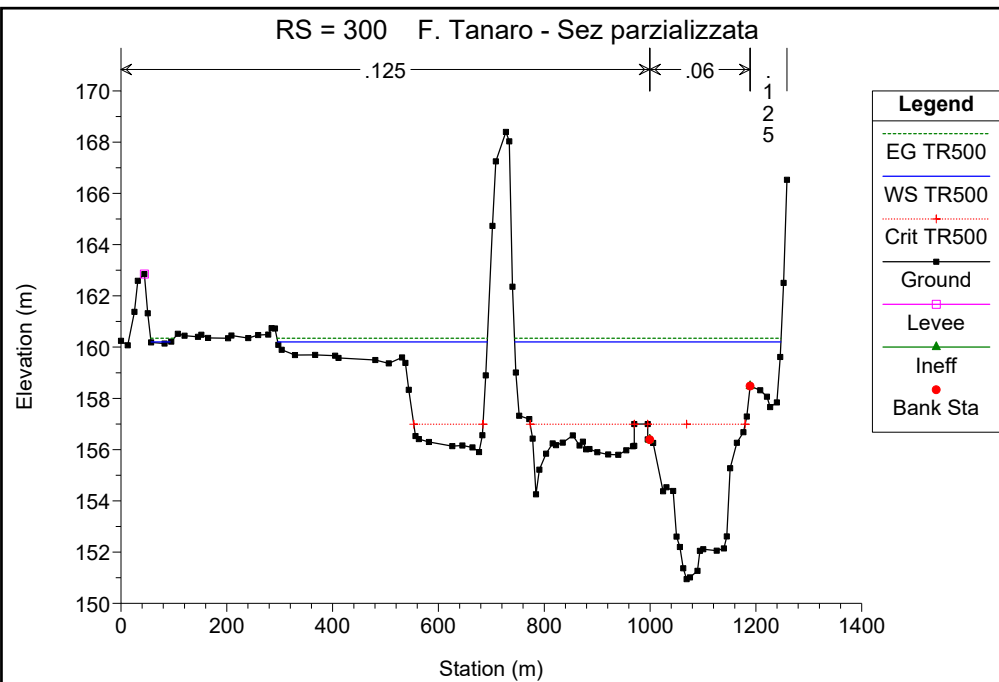


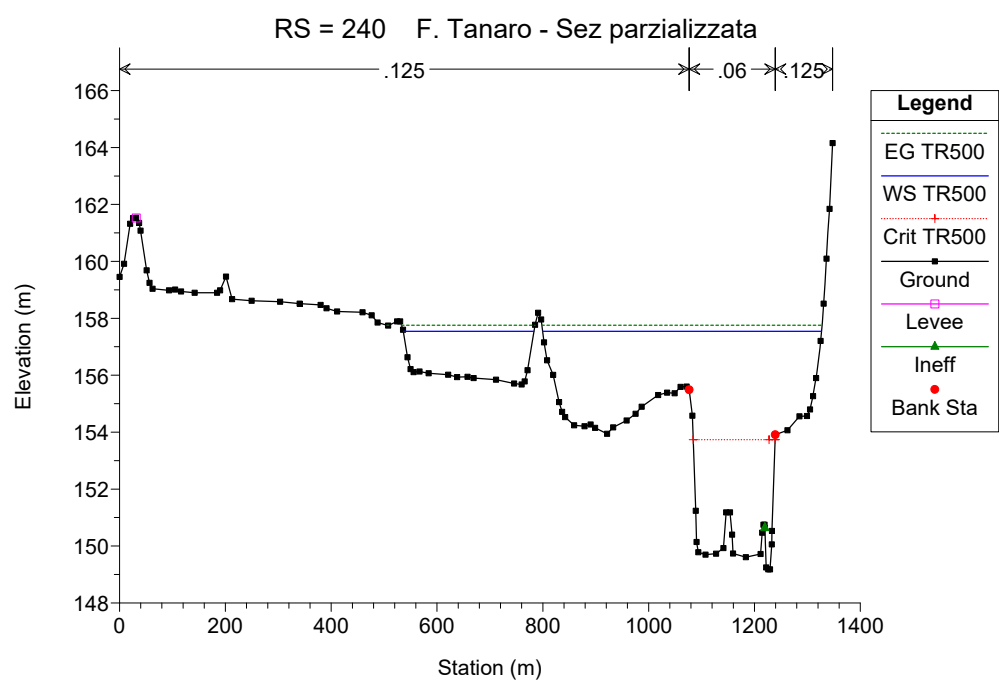
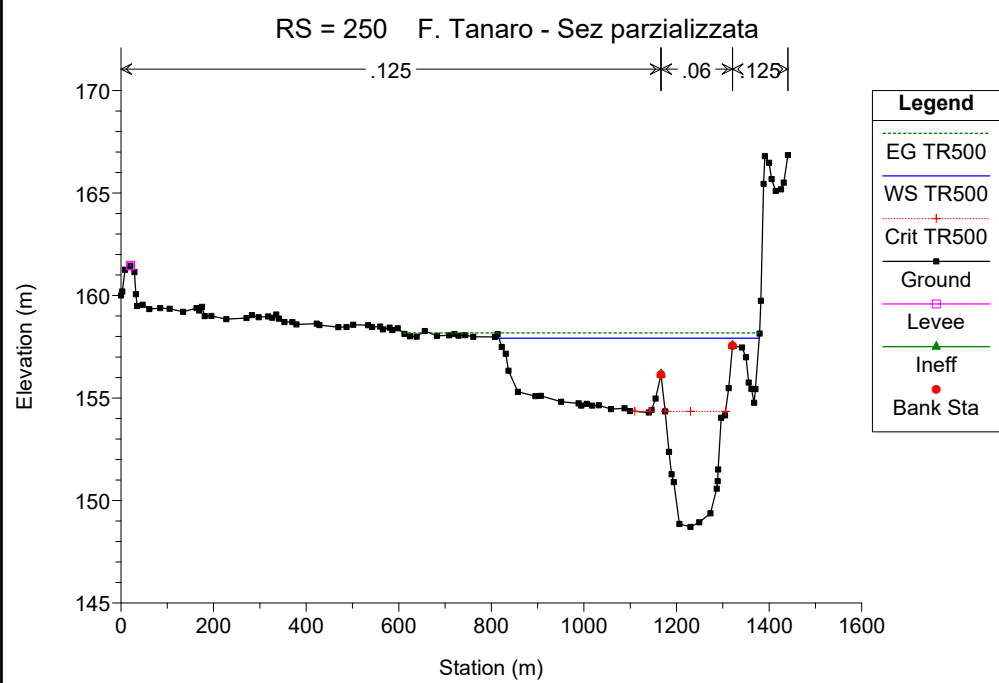
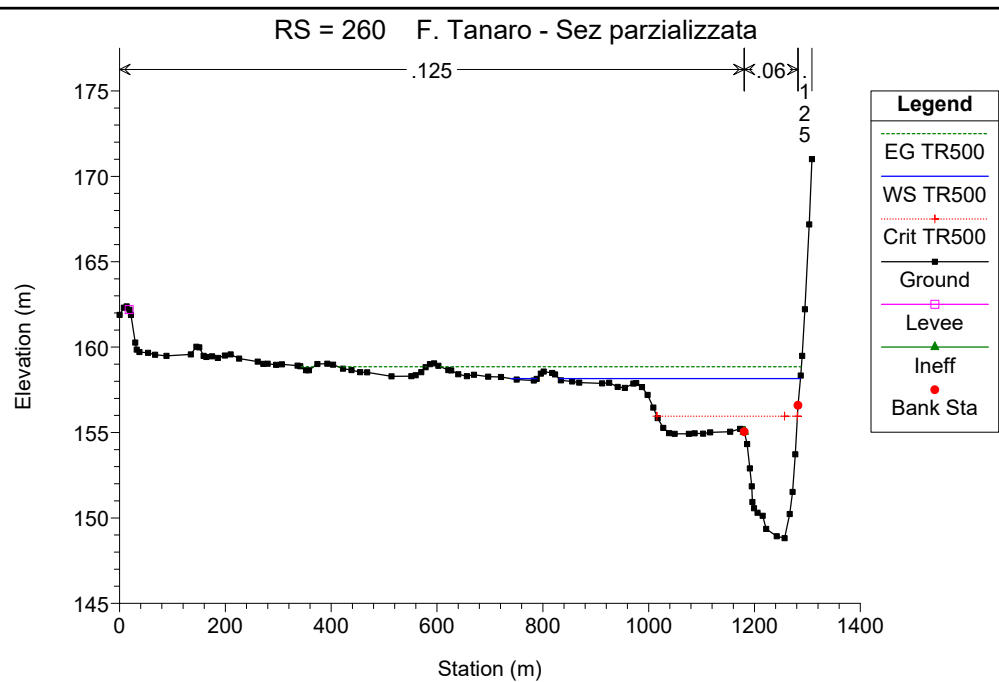
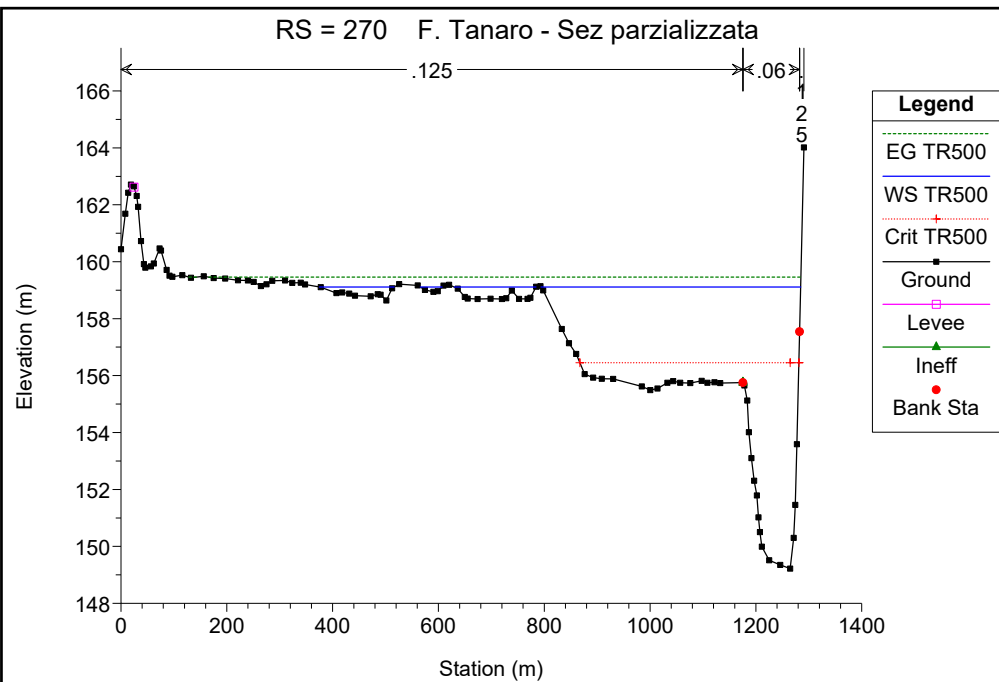


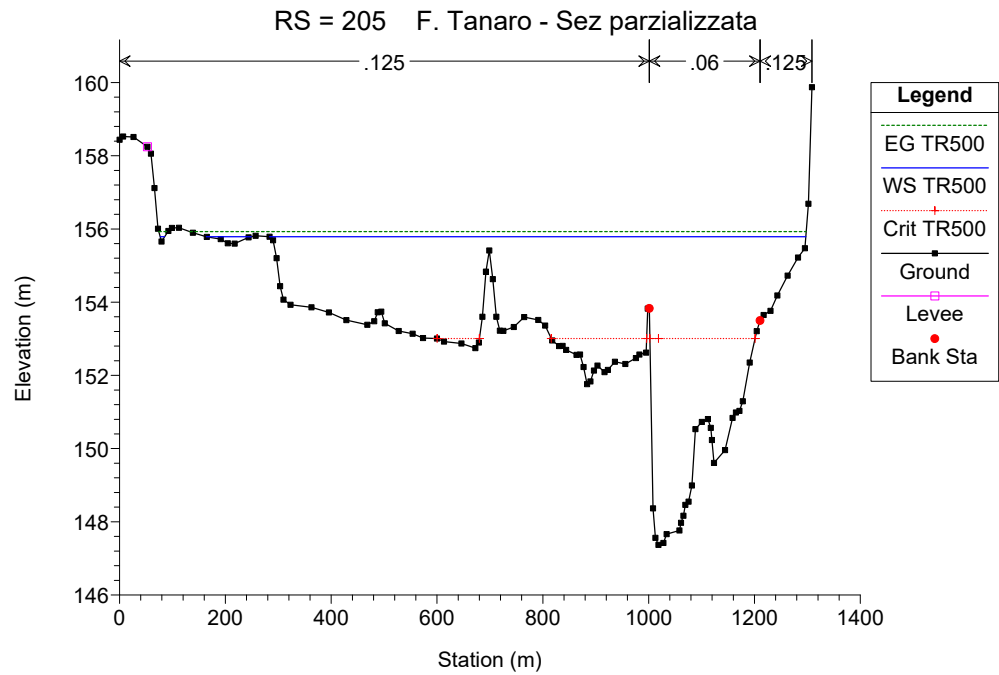
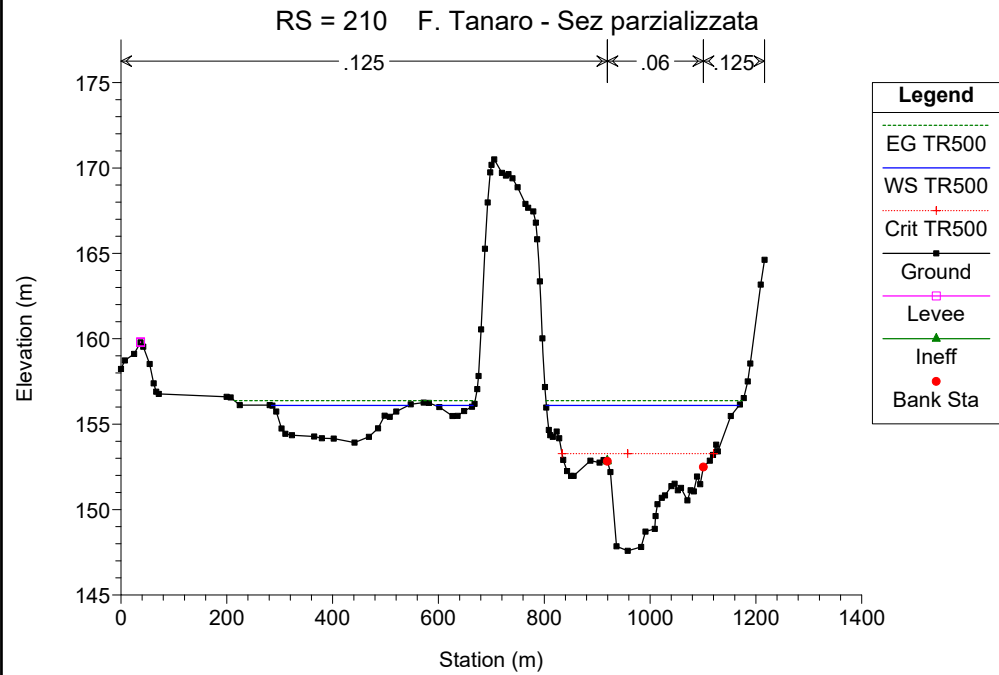
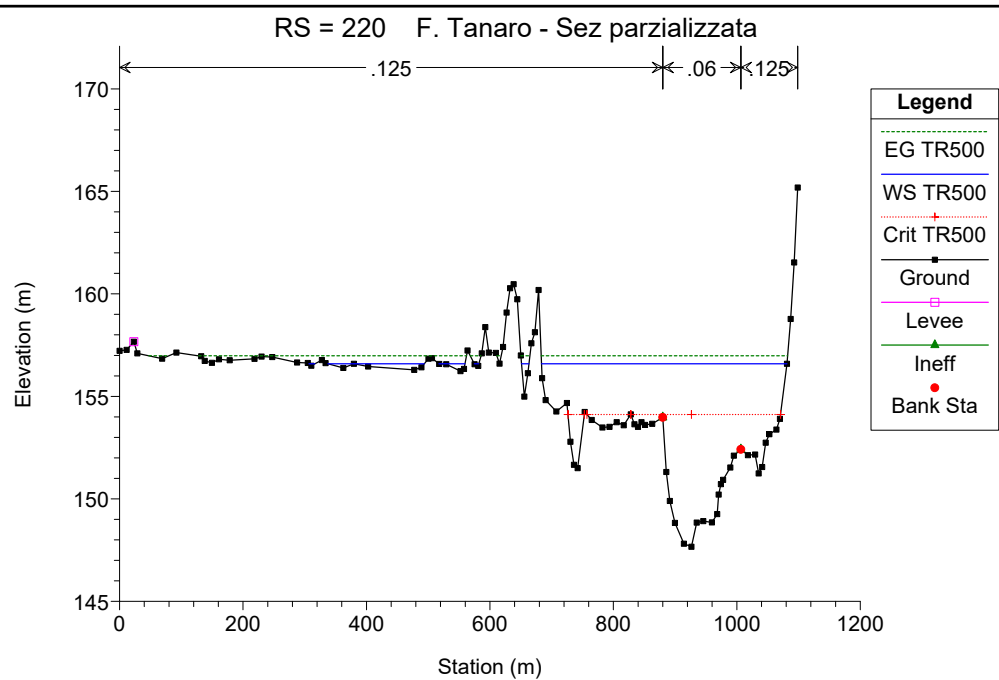
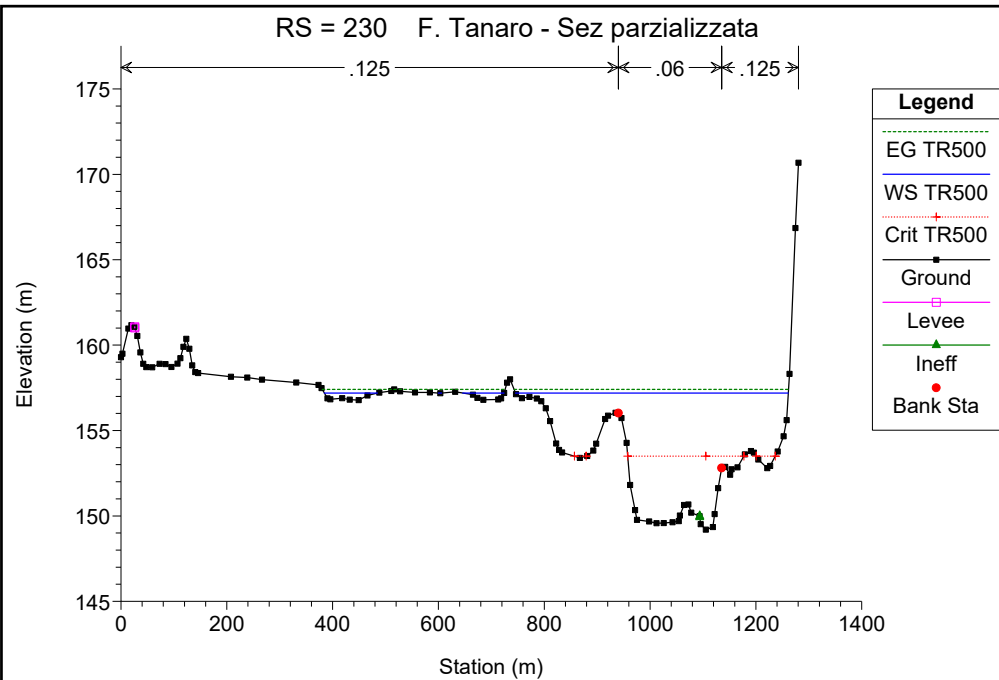


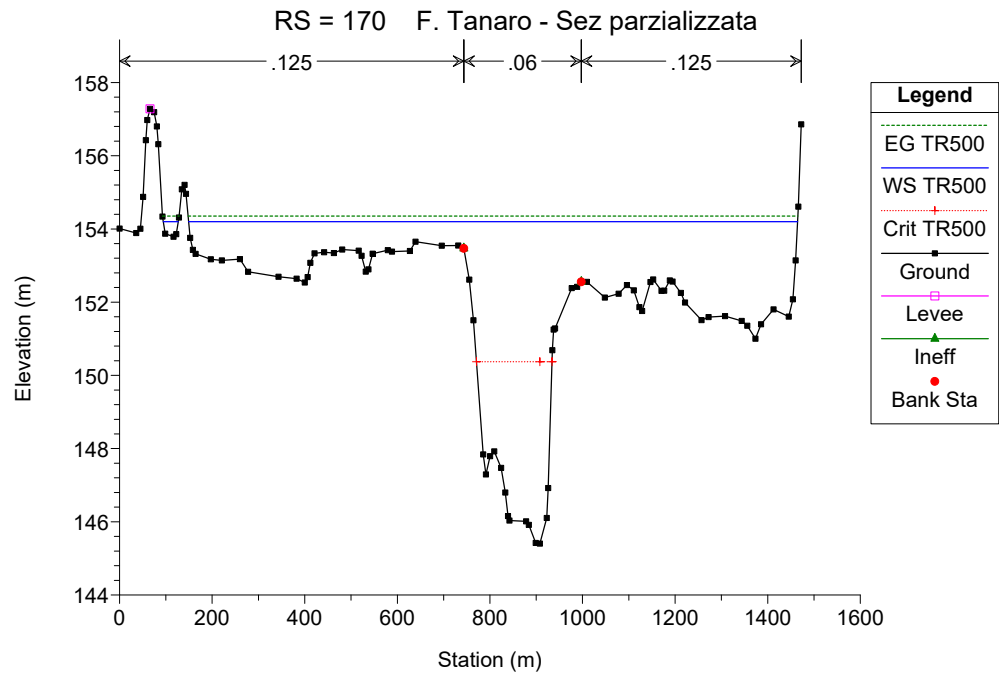
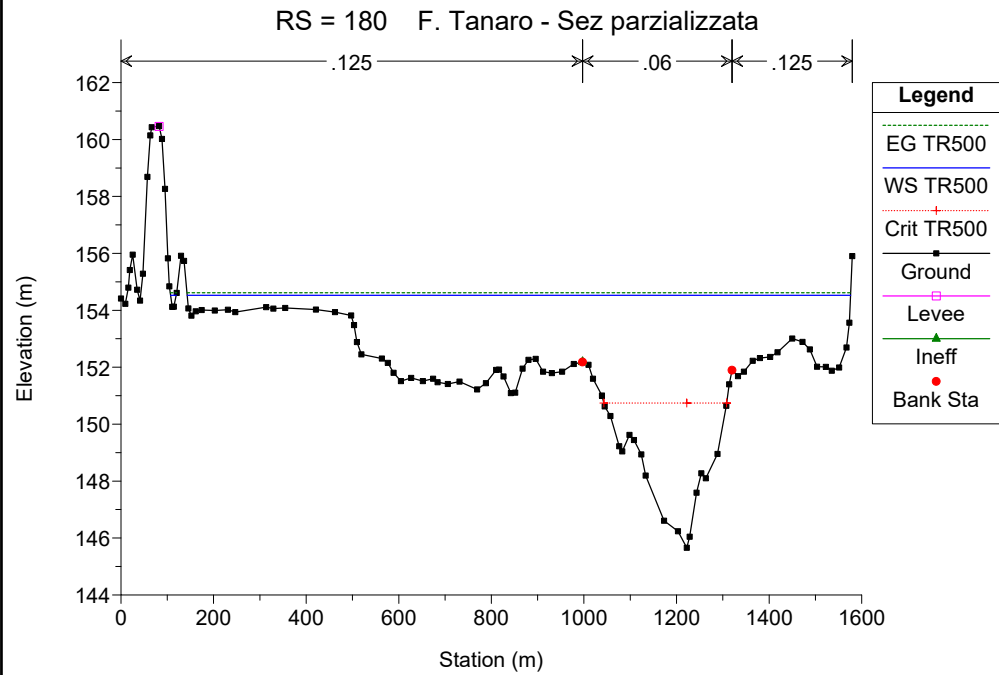
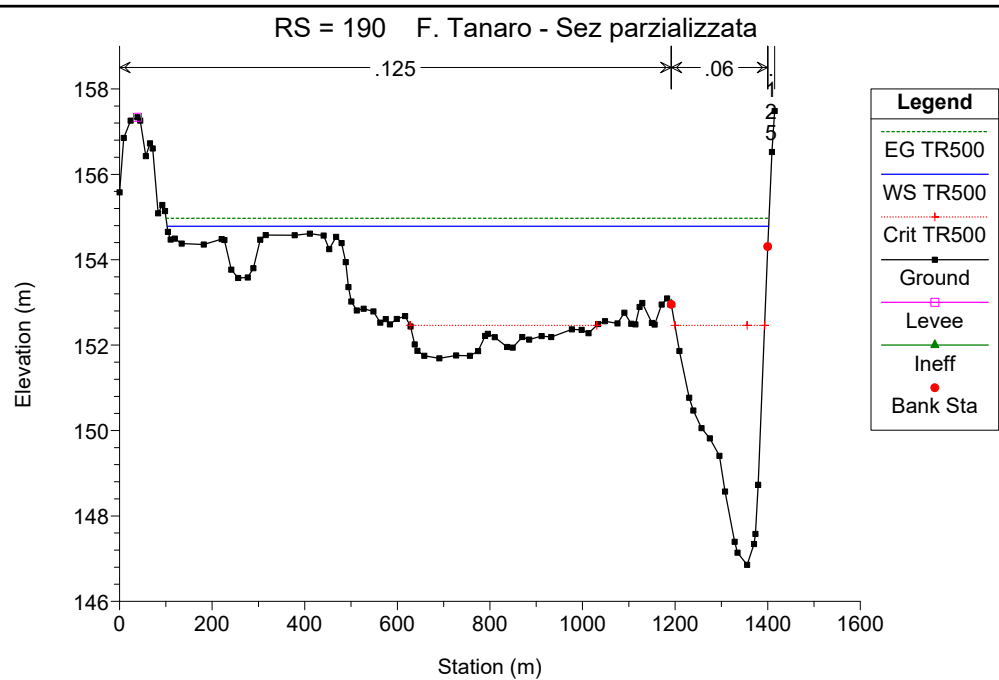
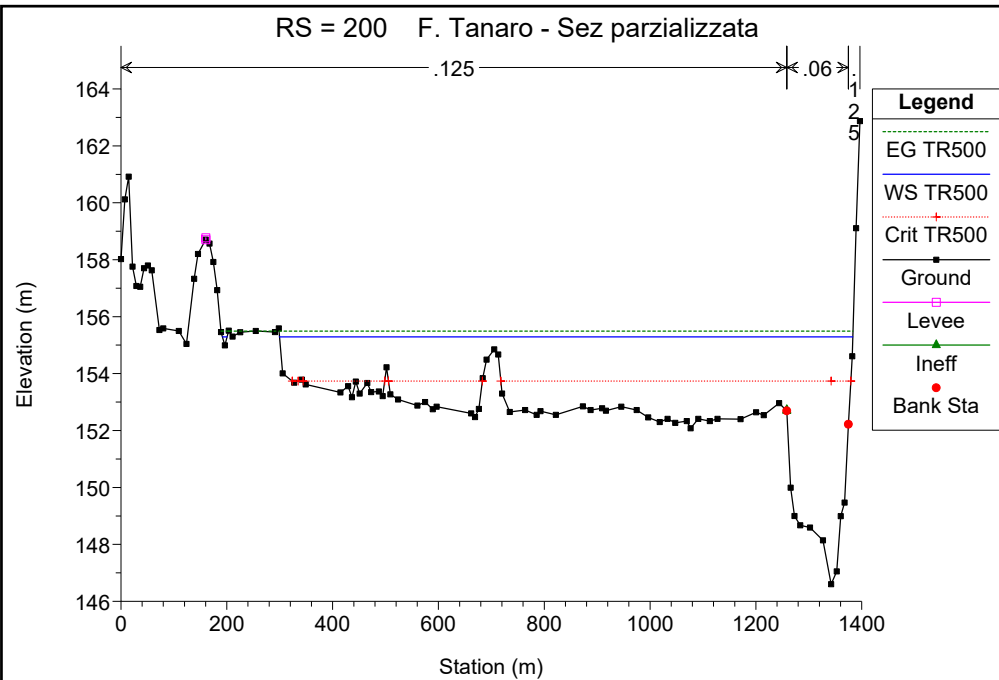


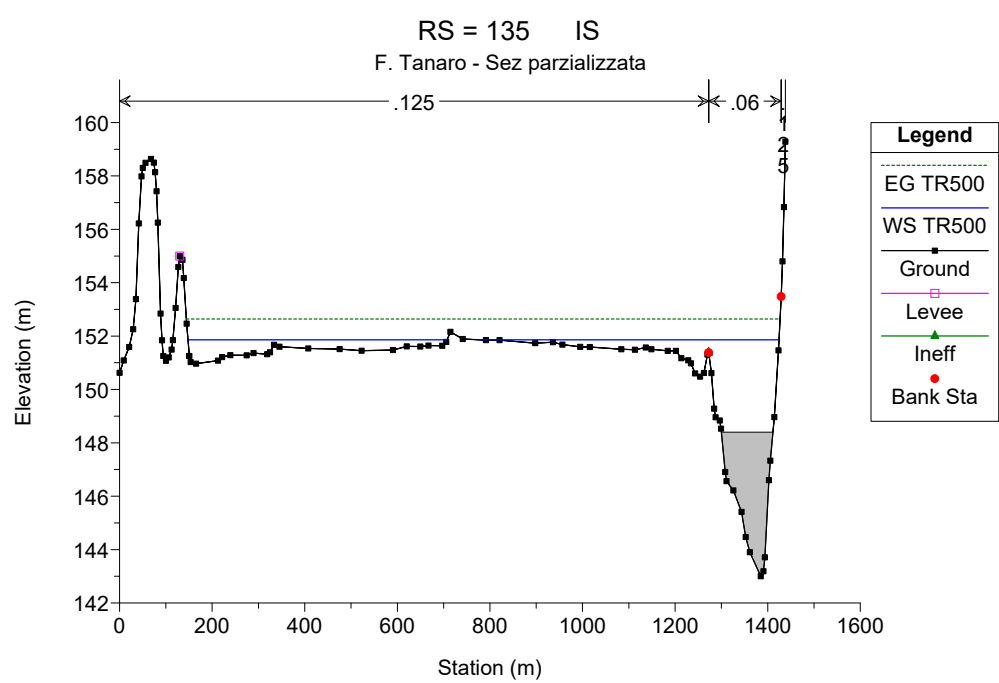
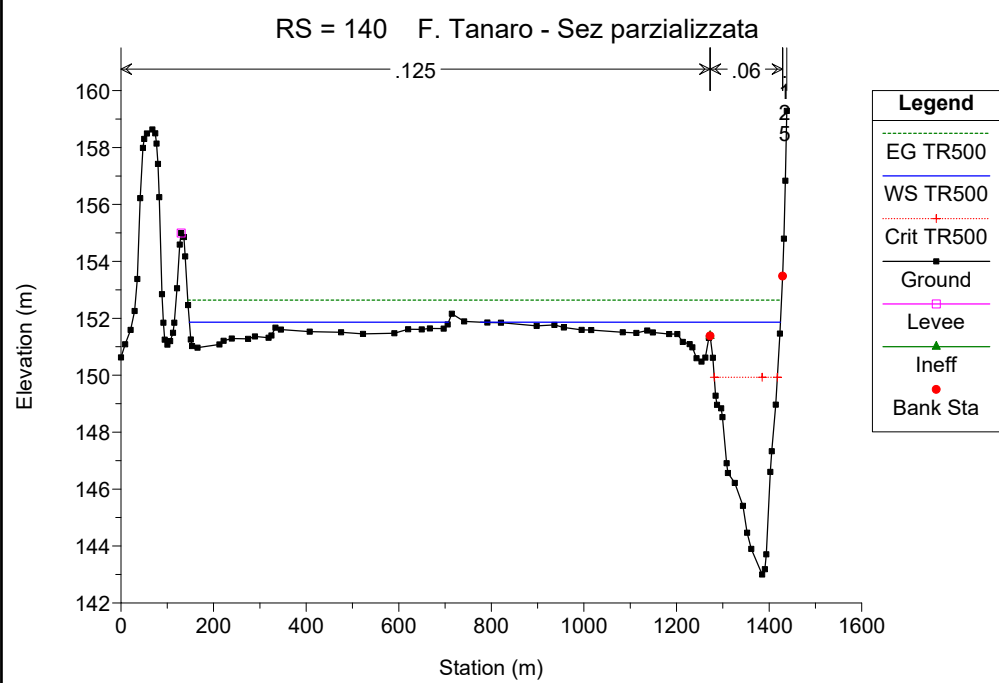
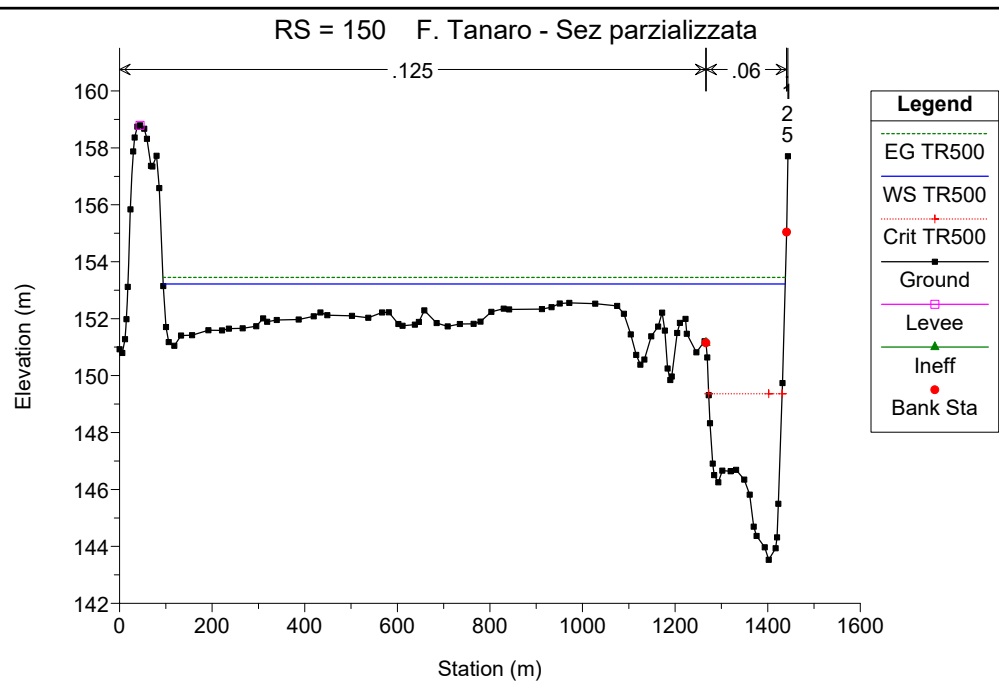
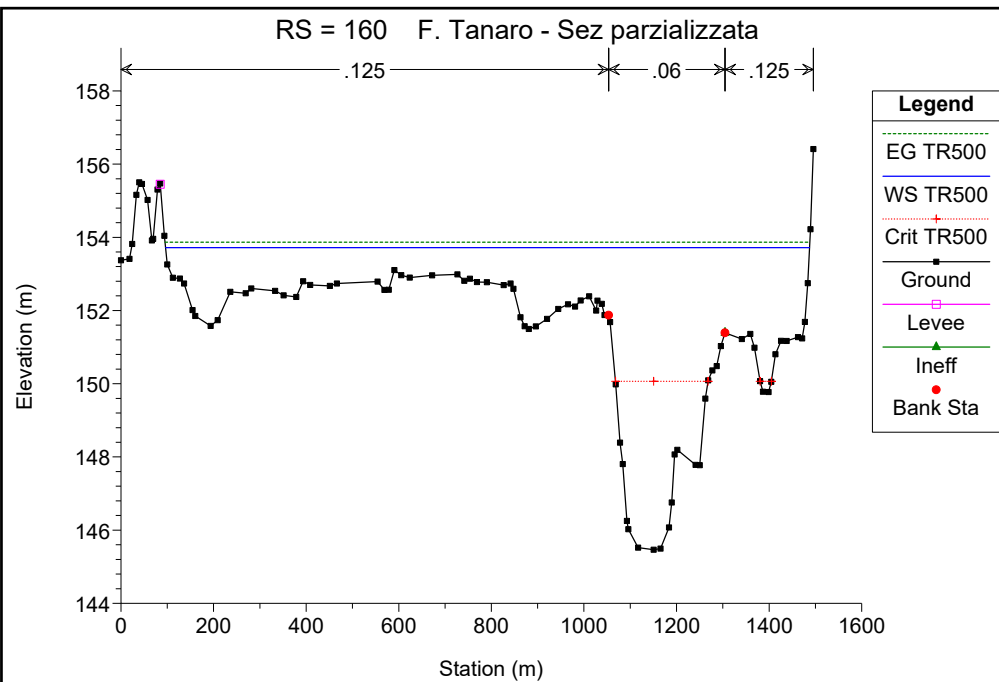


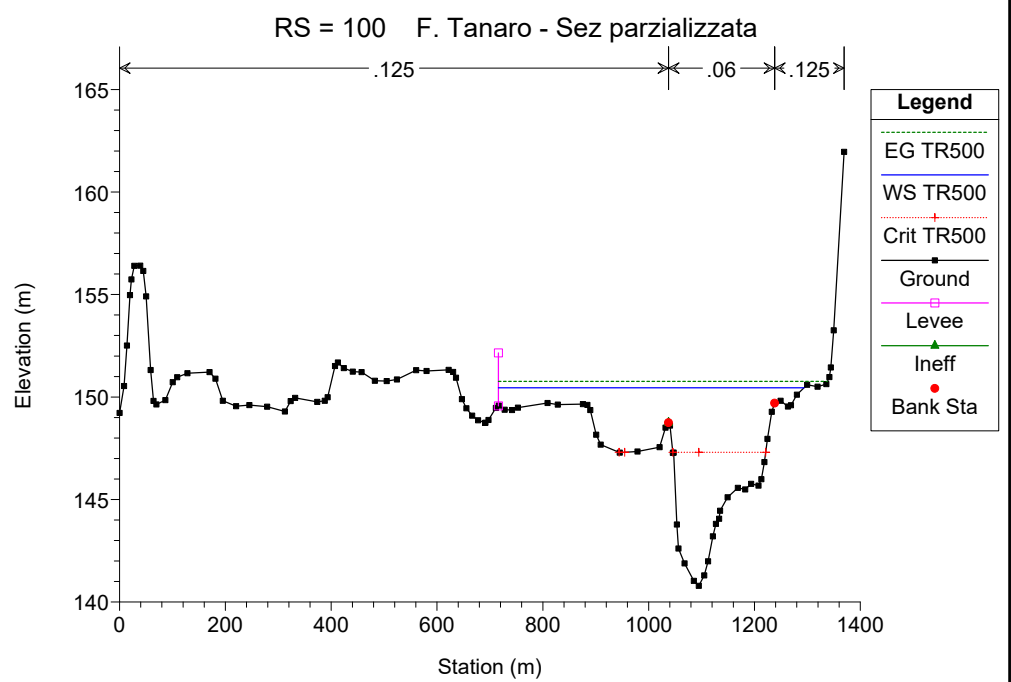
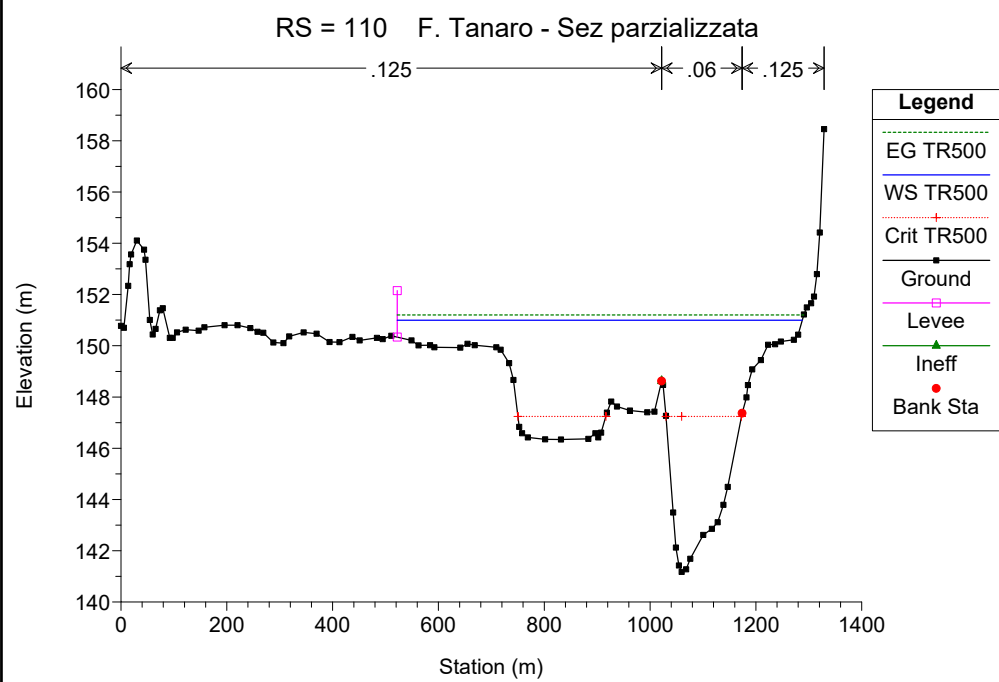
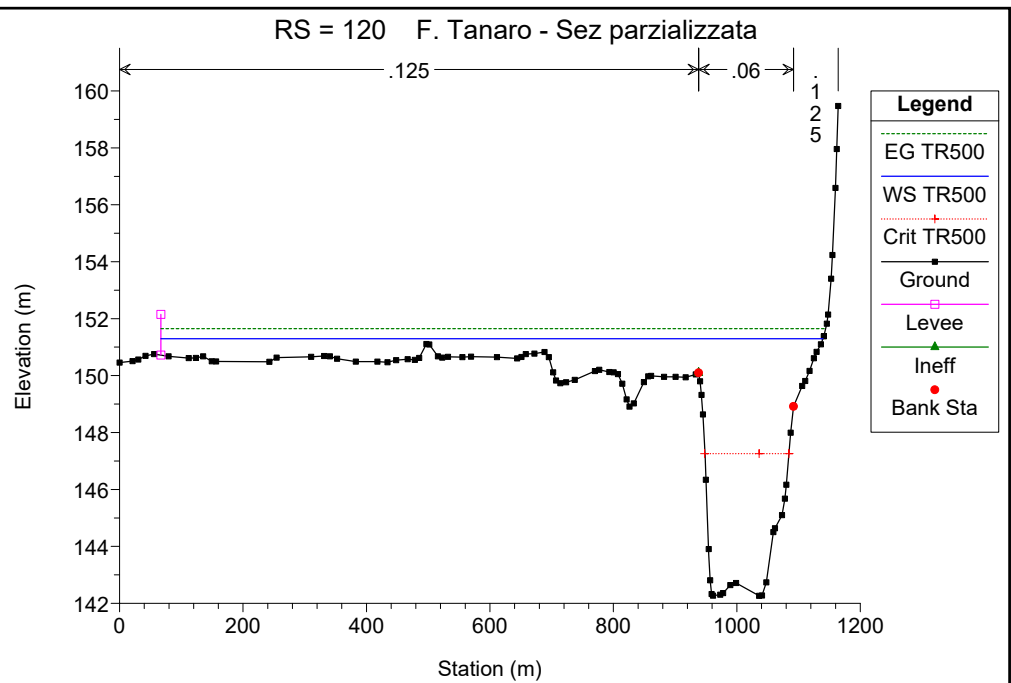
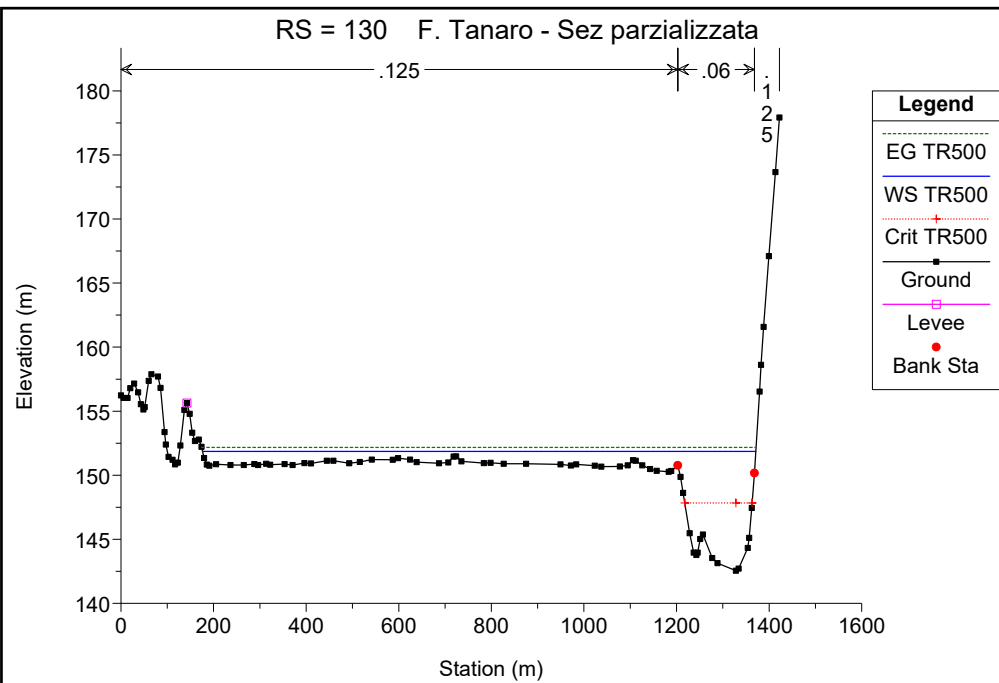


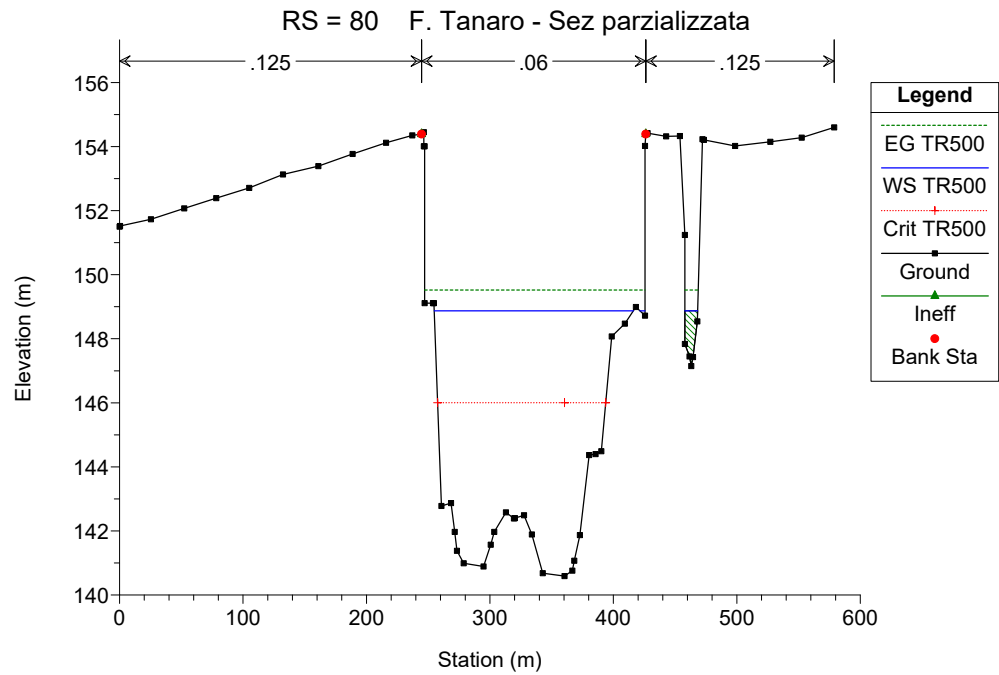
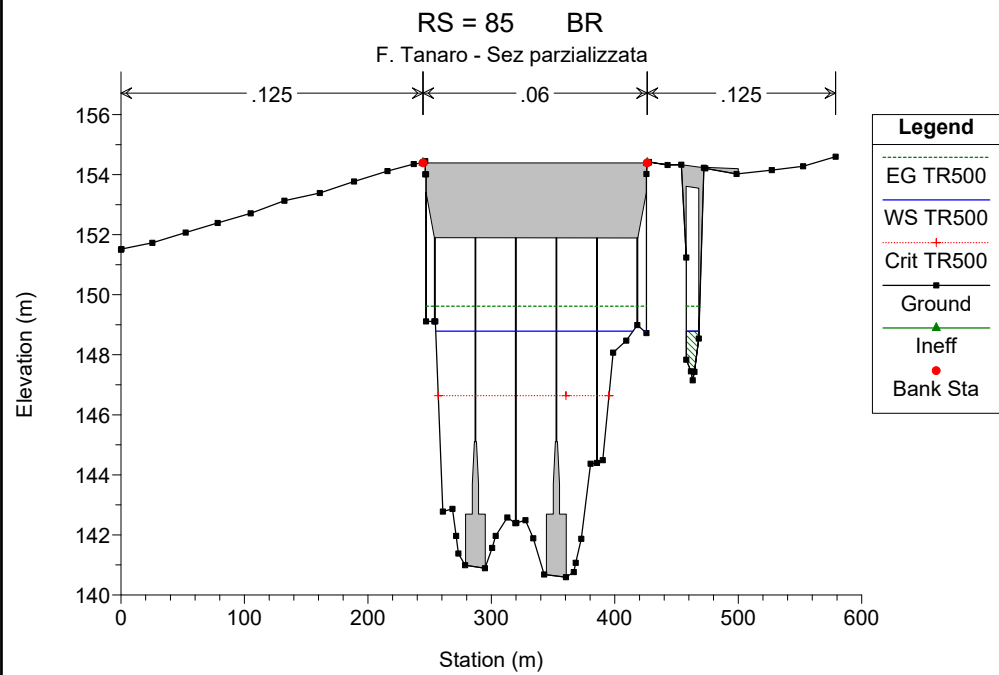
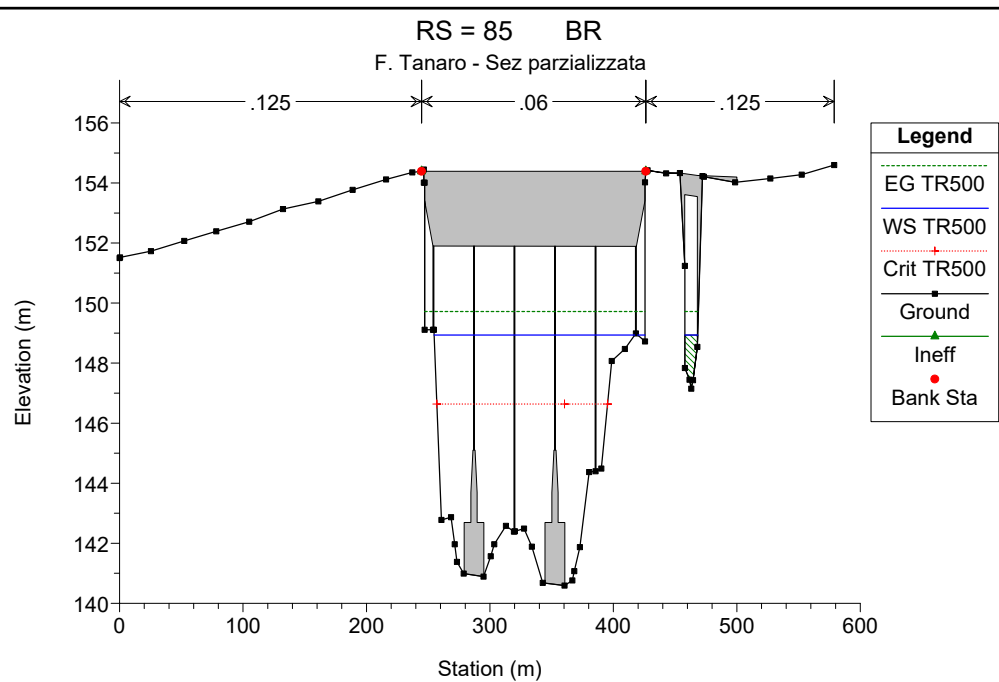
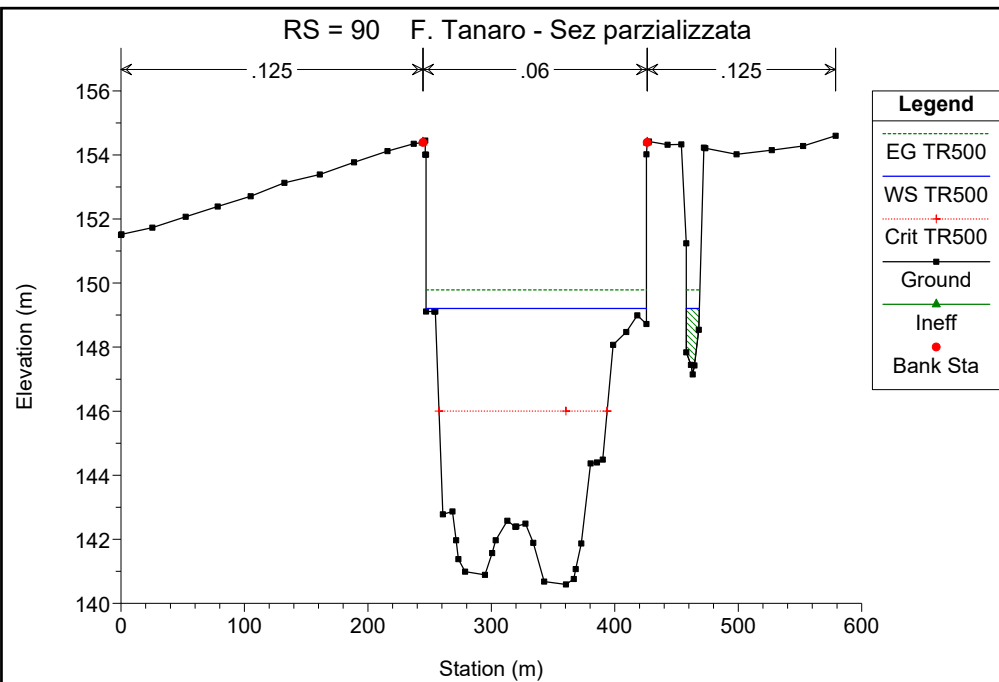


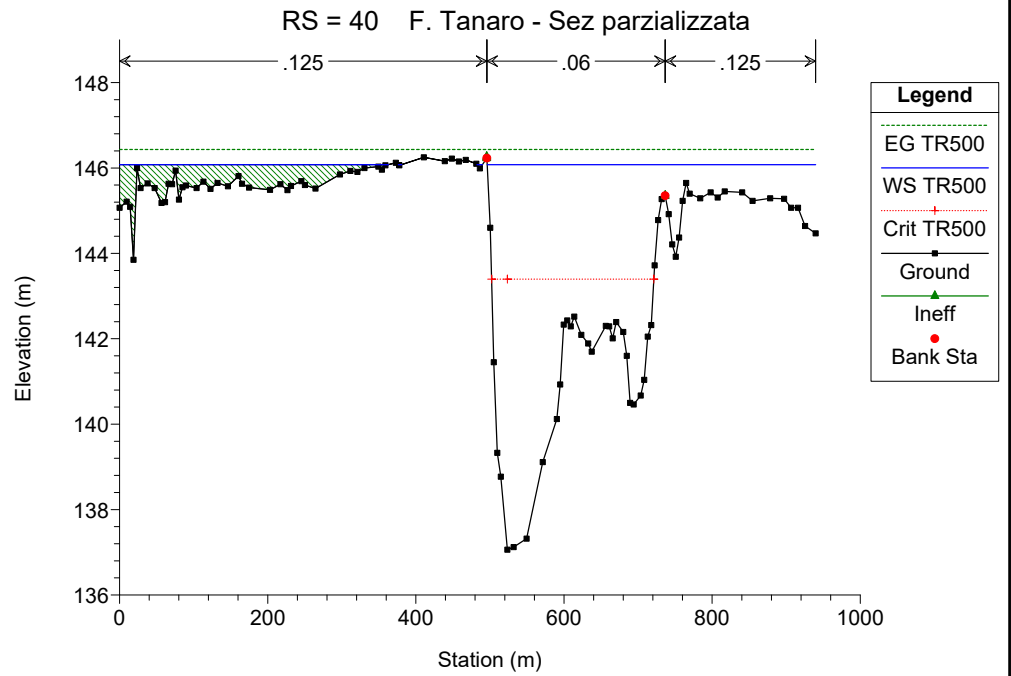
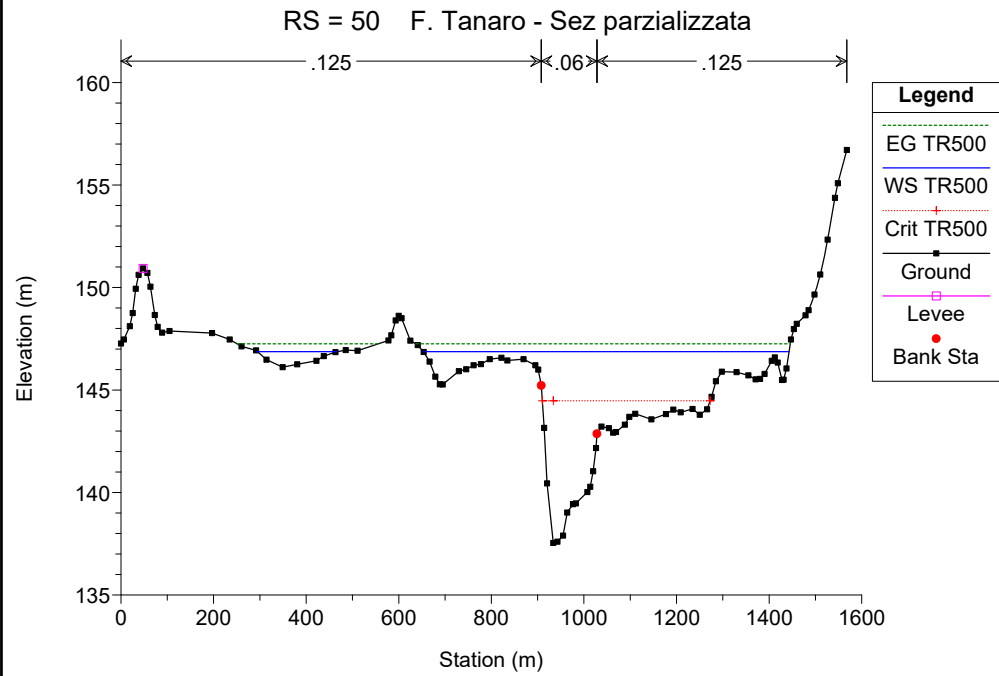
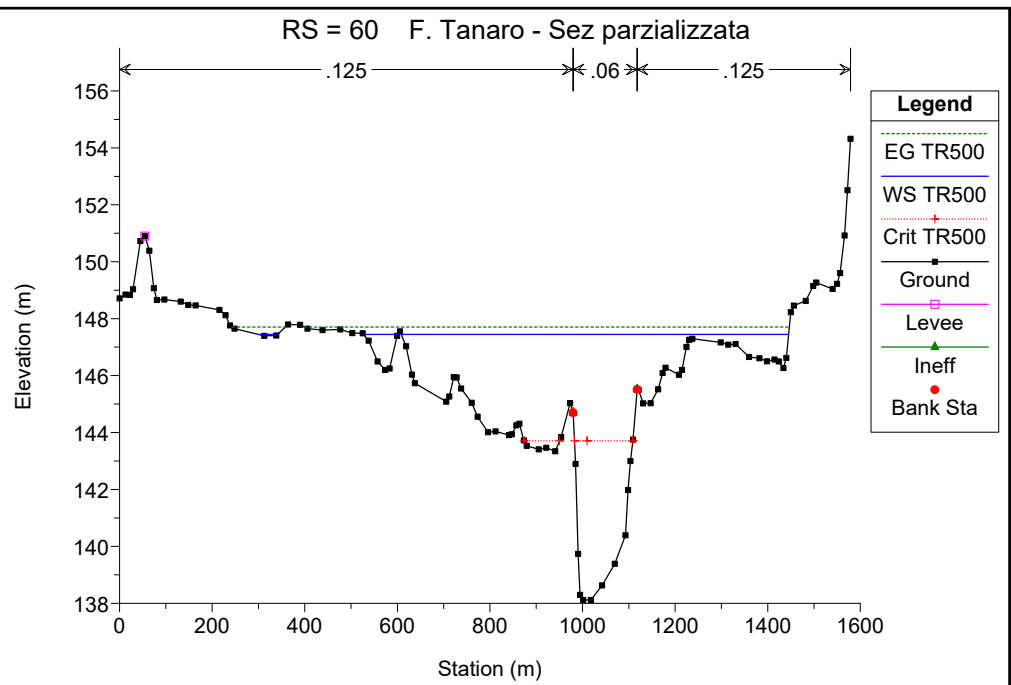
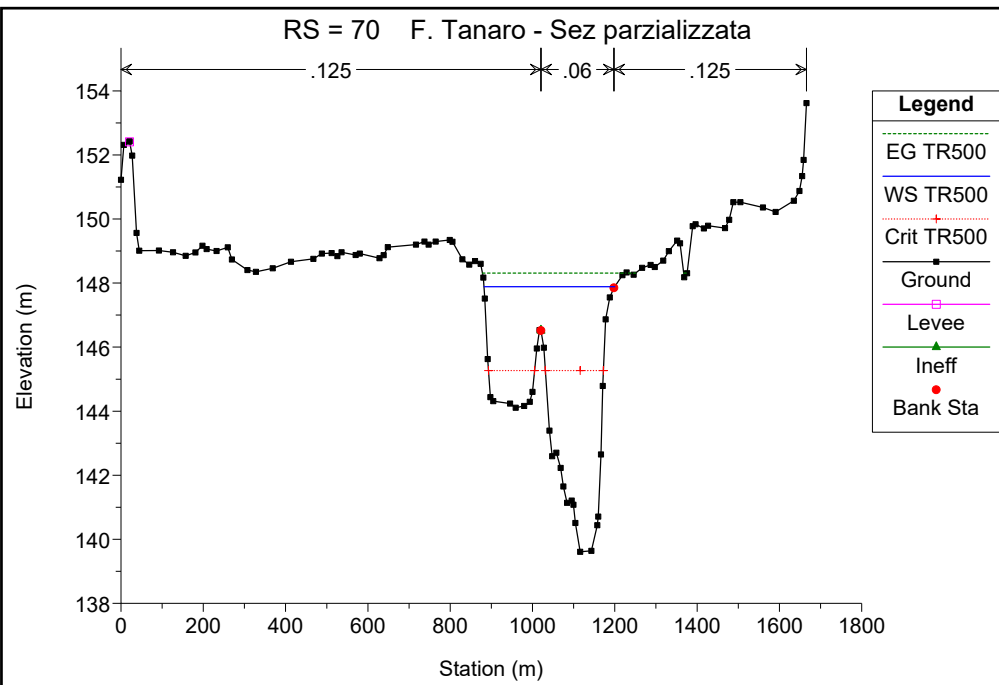


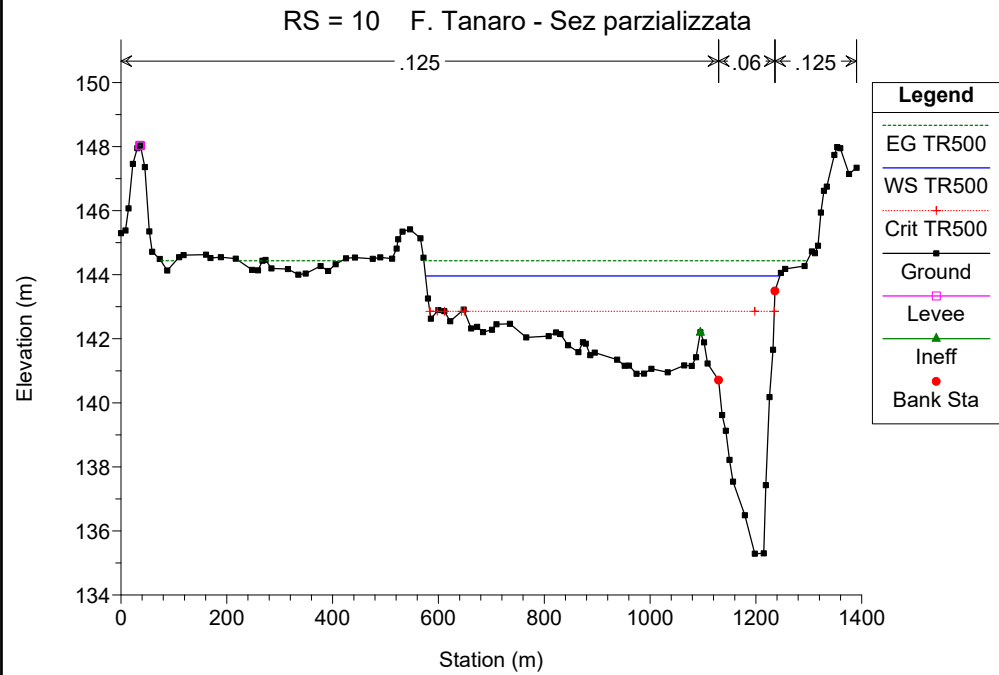
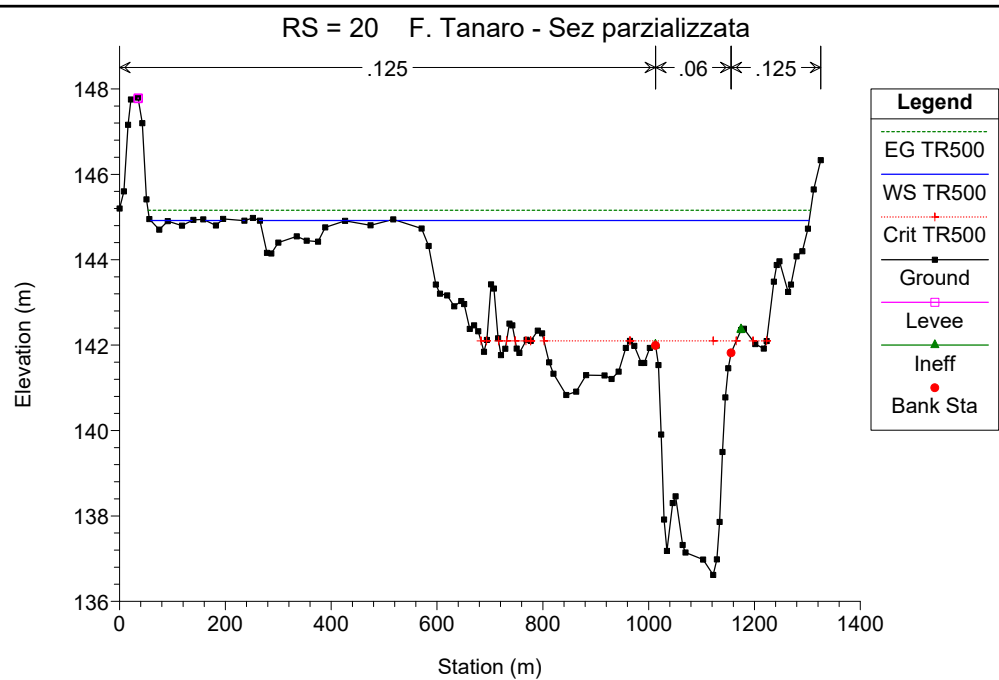
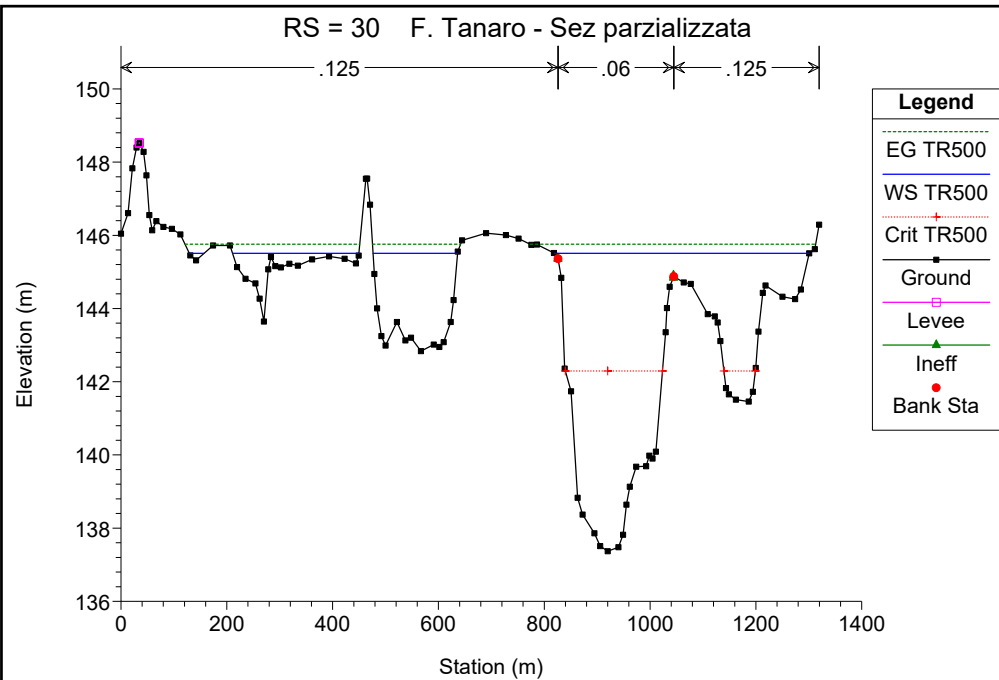












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 0: SITUAZIONE ATTUALE**

SIMULAZIONE 21

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3700	Portata utilizzata per il dimensionamento delle opere di difesa di Alba
F. Tanaro valle Riddone	3710	
F. Tanaro valle Cherasca	3724	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s

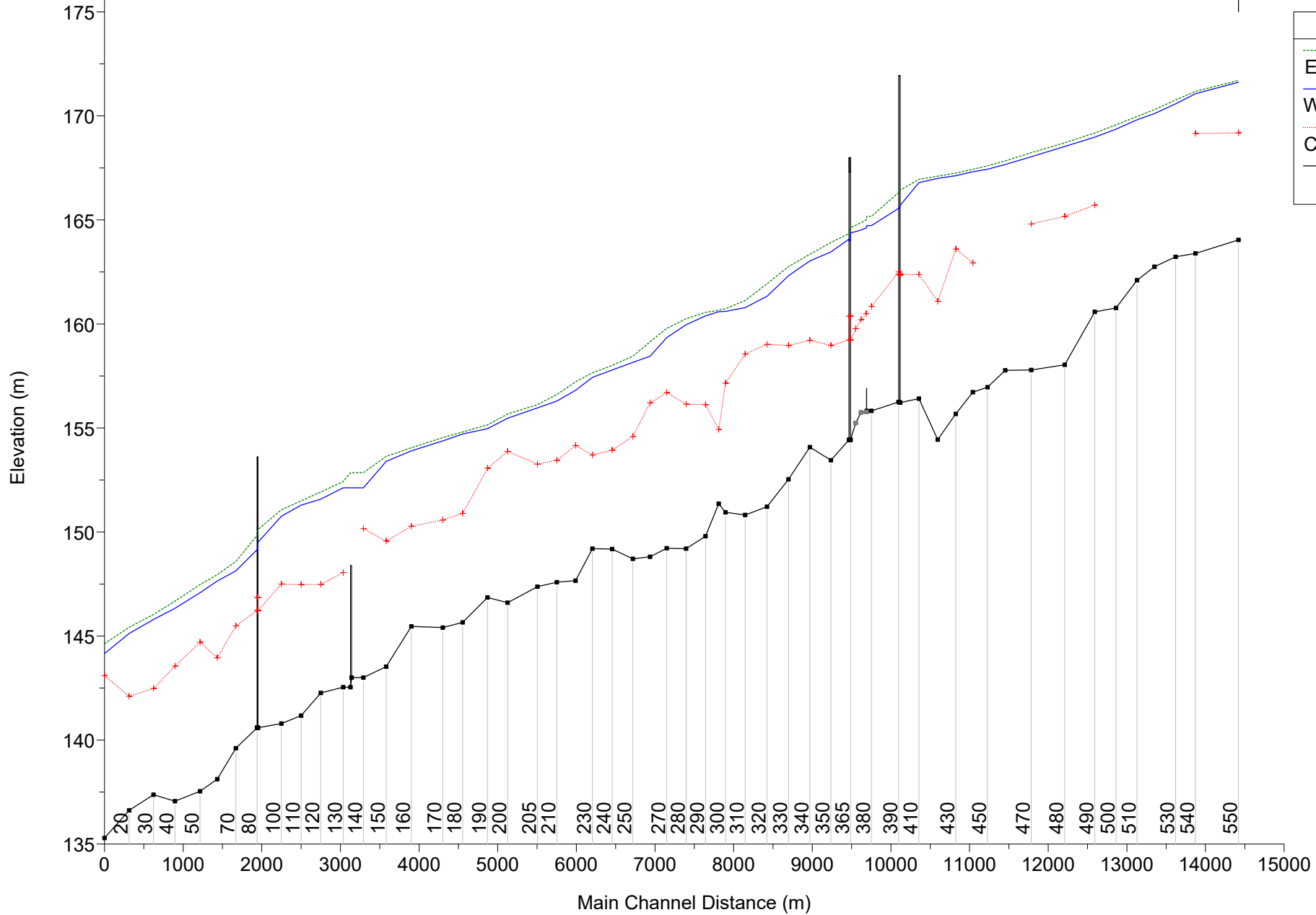
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	3700 m3/s	3700.00	164.04	171.62	169.19	171.71	0.001070	1.55	3770.83	1216.18	0.23
1	540	3700 m3/s	3700.00	163.39	171.07	169.15	171.18	0.001481	2.11	3904.53	1132.10	0.27
1	530	3700 m3/s	3700.00	163.23	170.58		170.77	0.001782	2.27	2669.76	779.63	0.30
1	520	3700 m3/s	3700.00	162.75	170.12		170.31	0.001806	2.36	3174.92	1104.68	0.30
1	510	3700 m3/s	3700.00	162.10	169.81		169.98	0.001650	2.16	2950.92	847.96	0.29
1	500	3700 m3/s	3700.00	160.77	169.37		169.57	0.001502	2.29	2552.91	572.68	0.28
1	490	3700 m3/s	3700.00	160.58	168.98	165.71	169.18	0.001442	2.14	2396.90	563.50	0.27
1	480	3700 m3/s	3700.00	158.04	168.53	165.17	168.71	0.001190	2.11	3242.50	1083.17	0.25
1	470	3700 m3/s	3700.00	157.79	168.04	164.81	168.24	0.001326	2.29	2632.65	621.46	0.27
1	460	3700 m3/s	3700.00	157.77	167.66		167.84	0.001056	2.10	3331.83	1140.27	0.24
1	450	3700 m3/s	3700.00	156.96	167.44		167.61	0.000983	2.06	3333.12	1049.15	0.23
1	440	3700 m3/s	3700.00	156.72	167.32	162.94	167.43	0.000743	1.85	3732.72	808.39	0.20
1	430	3700 m3/s	3700.00	155.68	167.13	163.60	167.26	0.000899	2.04	3510.80	669.78	0.22
1	420	3700 m3/s	3700.00	154.44	167.00	161.08	167.11	0.000532	1.73	3866.72	694.97	0.18
1	410	3700 m3/s	3700.00	156.41	166.80	162.37	166.96	0.000896	2.07	2983.57	557.26	0.23
1	400	3700 m3/s	3700.00	156.22	165.71	162.40	166.44	0.003514	3.90	1108.30	179.92	0.43
1	395		Bridge									
1	390	3700 m3/s	3700.00	156.25	165.56	162.50	166.32	0.003752	3.98	1082.49	179.60	0.44
1	380	3700 m3/s	3700.00	155.82	164.74	160.84	165.18	0.002207	2.96	1380.37	290.11	0.34
1	379		Inl Struct									
1	370	3700 m3/s	3700.00	154.43	164.38	159.23	164.63	0.001153	2.22	1669.04	209.84	0.25
1	365		Bridge									
1	360	3700 m3/s	3700.00	154.43	164.08	159.24	164.35	0.001301	2.30	1606.58	209.01	0.27
1	350	3700 m3/s	3700.00	153.45	163.47	158.96	163.92	0.002098	3.01	1376.55	297.80	0.34
1	340	3700 m3/s	3710.00	154.08	163.04	159.22	163.36	0.001824	2.58	1725.84	410.14	0.31
1	330	3700 m3/s	3710.00	152.53	162.33	158.98	162.77	0.002526	3.07	1619.27	442.14	0.37
1	320	3700 m3/s	3710.00	151.21	161.35	159.02	161.95	0.003374	3.86	1831.36	733.10	0.43
1	310	3700 m3/s	3710.00	150.82	160.82	158.56	161.16	0.002237	3.09	2603.73	977.37	0.35
1	300	3700 m3/s	3724.00	150.95	160.64	157.16	160.77	0.000981	1.90	3543.35	1133.99	0.23
1	295	3700 m3/s	3724.00	151.36	160.62	154.93	160.69	0.000364	1.22	4194.50	1234.40	0.14
1	290	3700 m3/s	3724.00	149.80	160.42	156.14	160.59	0.001044	1.99	2972.73	1146.85	0.24
1	280	3700 m3/s	3724.00	149.20	160.01	156.15	160.29	0.001470	2.61	2798.71	1128.73	0.29
1	270	3700 m3/s	3724.00	149.22	159.36	156.73	159.82	0.002511	3.36	2314.96	1067.62	0.37
1	260	3700 m3/s	3724.00	148.81	158.47	156.22	159.16	0.003819	4.00	1548.91	715.34	0.46
1	250	3700 m3/s	3724.00	148.71	158.17	154.62	158.48	0.001962	2.71	2334.17	752.17	0.32
1	240	3700 m3/s	3724.00	149.18	157.81	153.95	158.03	0.001379	2.34	2752.84	802.43	0.27
1	230	3700 m3/s	3724.00	149.20	157.45	153.71	157.67	0.001428	2.28	2430.37	866.25	0.28
1	220	3700 m3/s	3724.00	147.66	156.83	154.16	157.24	0.002726	3.19	1908.29	803.19	0.38
1	210	3700 m3/s	3724.00	147.59	156.31	153.46	156.62	0.002155	2.67	2188.08	821.70	0.34
1	205	3700 m3/s	3724.00	147.37	155.98	153.28	156.14	0.001395	2.06	3410.29	1196.92	0.27

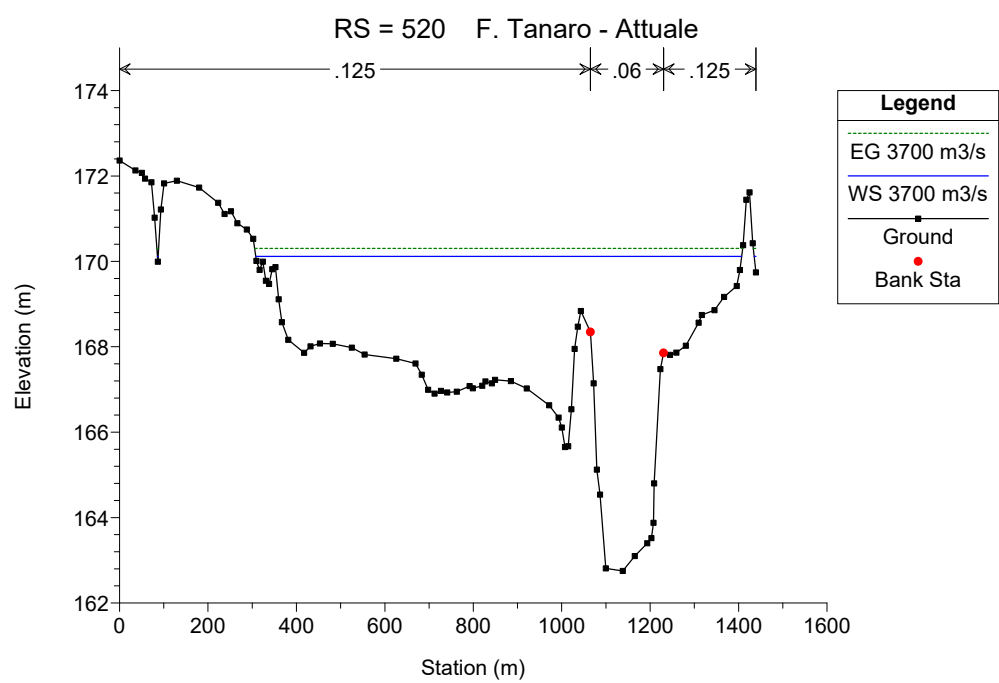
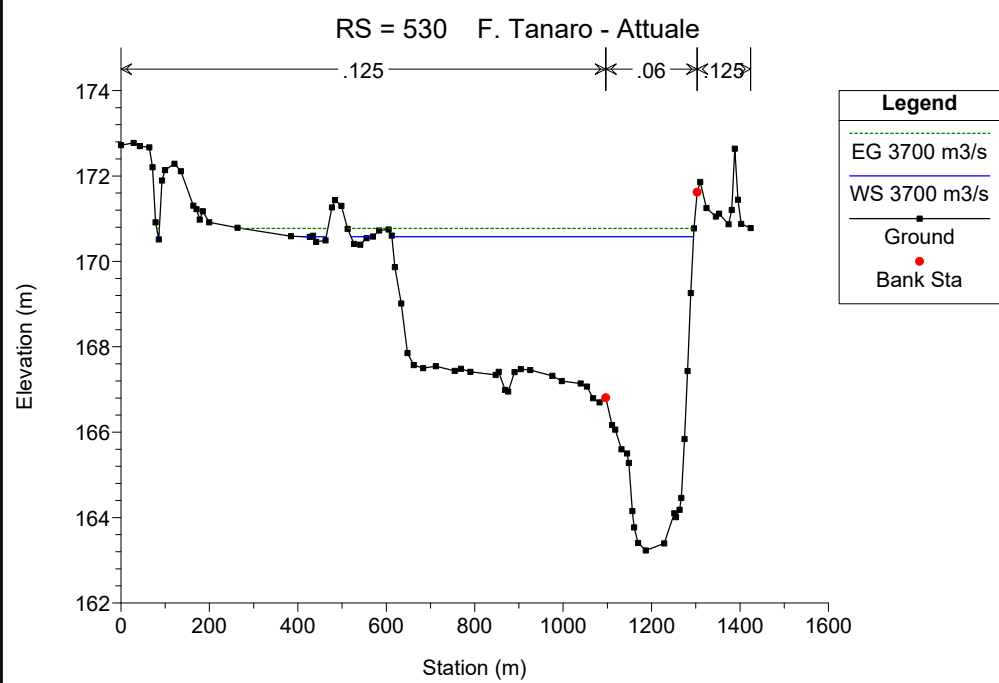
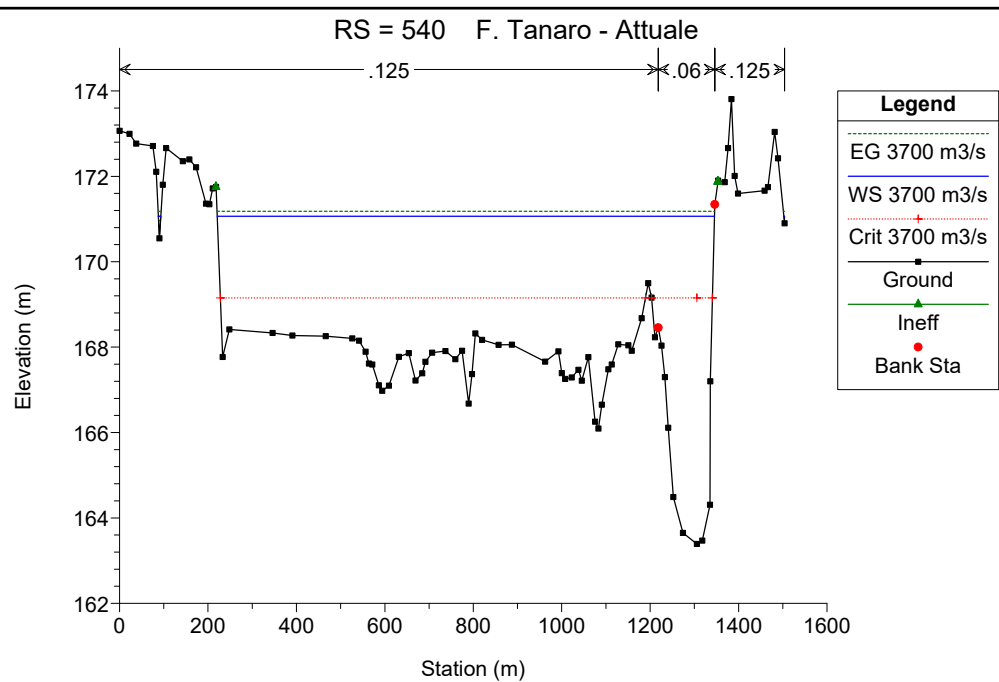
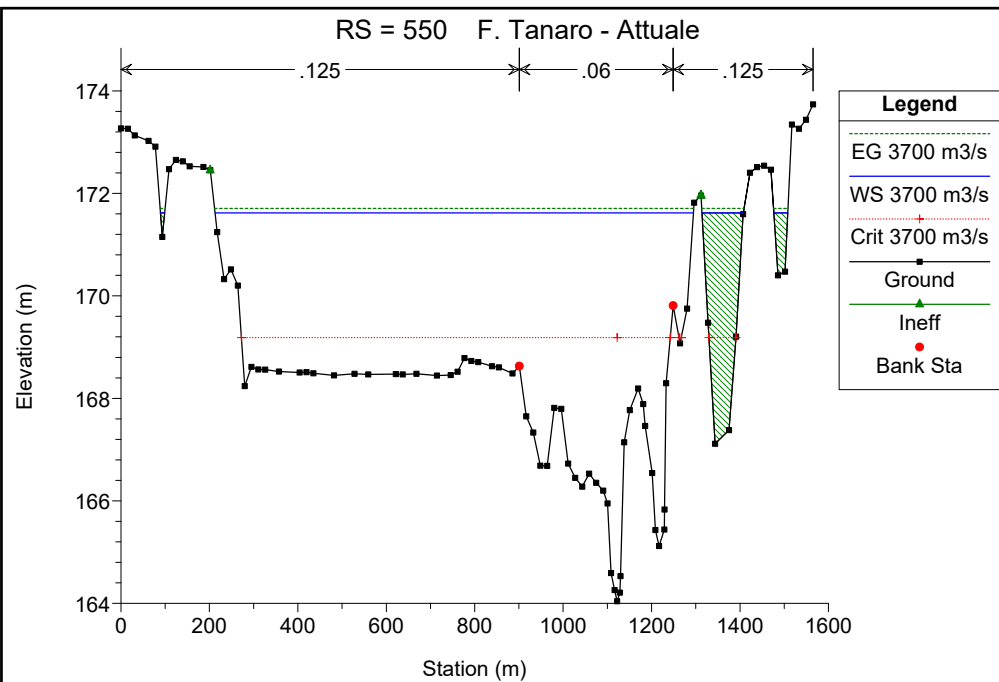
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s (Continued)

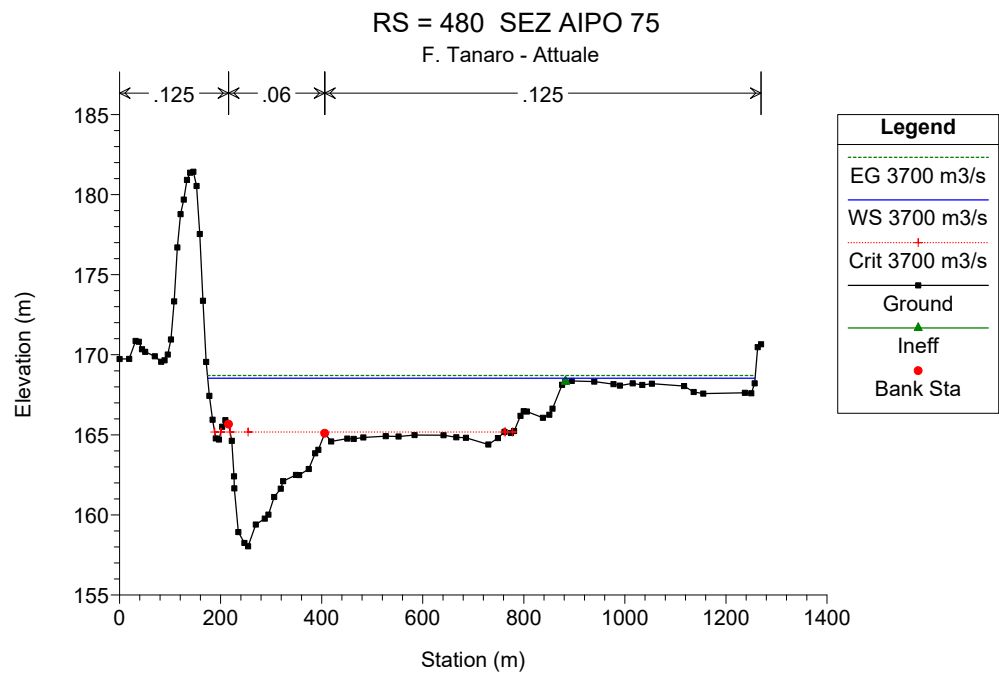
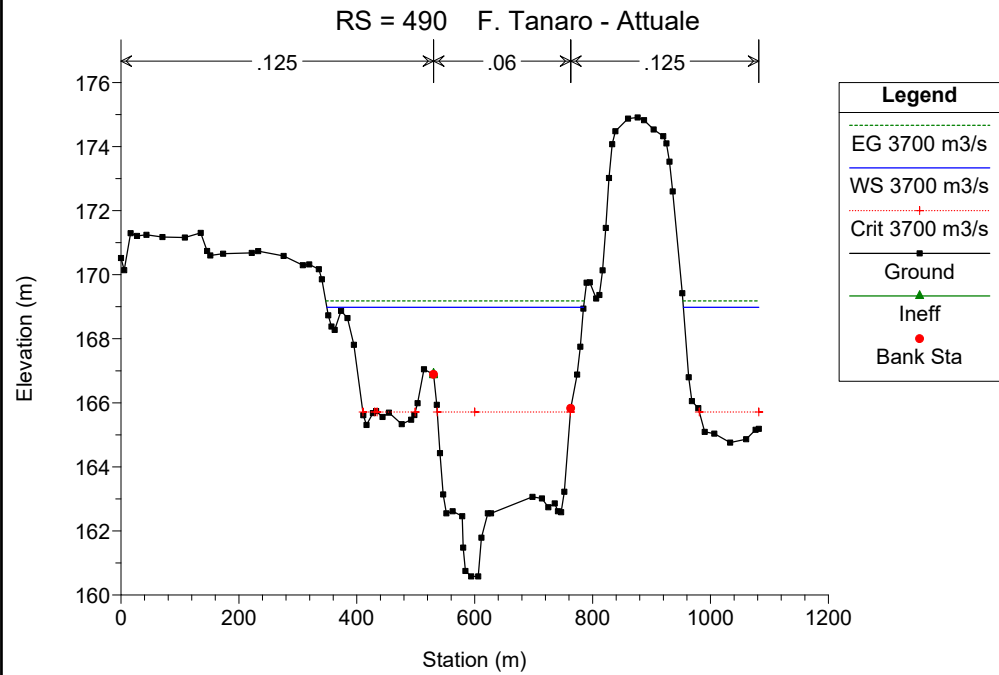
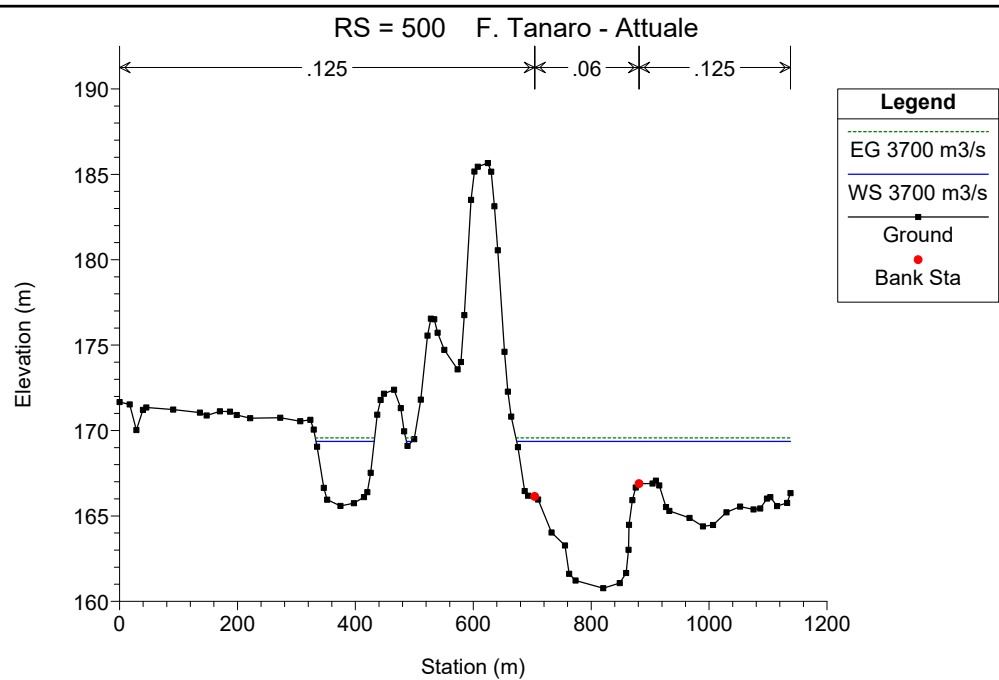
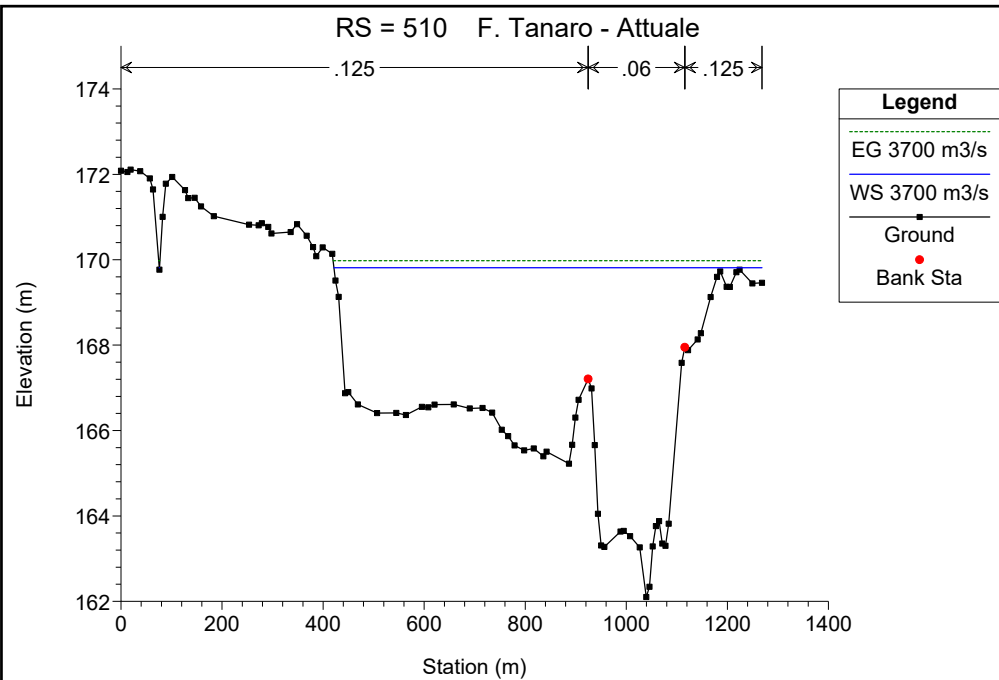
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	3700 m3/s	3724.00	146.60	155.48	153.88	155.69	0.001945	2.63	3270.55	1154.87	0.32
1	190	3700 m3/s	3724.00	146.85	154.98	153.07	155.17	0.001961	2.27	3237.92	1302.67	0.31
1	180	3700 m3/s	3724.00	145.66	154.73	150.91	154.82	0.000757	1.50	4245.28	1450.33	0.20
1	170	3700 m3/s	3724.00	145.40	154.40	150.59	154.55	0.001396	1.98	3305.47	1354.59	0.26
1	160	3700 m3/s	3724.00	145.46	153.92	150.28	154.07	0.001167	1.91	3432.45	1393.43	0.25
1	150	3700 m3/s	3724.00	143.53	153.41	149.58	153.65	0.001504	2.40	3025.21	1344.27	0.28
1	140	3700 m3/s	3724.00	143.00	152.14	150.17	152.87	0.005542	3.93	1575.38	1277.24	0.53
1	135		Inl Struct									
1	130	3700 m3/s	3724.00	142.54	152.14	148.05	152.45	0.001699	2.61	2511.75	1197.33	0.30
1	120	3700 m3/s	3724.00	142.27	151.60	147.50	151.95	0.001834	2.77	2298.28	1076.36	0.32
1	110	3700 m3/s	3724.00	141.17	151.31	147.49	151.52	0.001308	2.33	2881.10	770.63	0.27
1	100	3700 m3/s	3724.00	140.79	150.78	147.52	151.09	0.002159	2.62	1994.29	622.37	0.33
1	90	3700 m3/s	3724.00	140.59	149.53	146.24	150.14	0.004138	3.47	1072.97	189.52	0.45
1	85		Bridge									
1	80	3700 m3/s	3724.00	140.59	149.17	146.24	149.87	0.005052	3.69	1009.07	189.26	0.50
1	70	3700 m3/s	3724.00	139.61	148.15	145.51	148.60	0.003622	3.17	1490.96	332.90	0.43
1	60	3700 m3/s	3724.00	138.12	147.66	143.97	147.97	0.001799	2.74	2649.75	1150.88	0.31
1	50	3700 m3/s	3724.00	137.54	147.10	144.72	147.49	0.002503	3.14	2325.45	1070.99	0.37
1	40	3700 m3/s	3724.00	137.06	146.35	143.56	146.69	0.002706	2.67	1853.06	939.65	0.36
1	30	3700 m3/s	3724.00	137.37	145.81	142.50	146.05	0.001903	2.39	2447.67	1047.58	0.31
1	20	3700 m3/s	3724.00	136.62	145.14	142.10	145.43	0.002070	2.76	2857.01	1251.88	0.33
1	10	3700 m3/s	3724.00	135.29	144.17	143.10	144.65	0.004002	3.66	2008.35	755.11	0.46

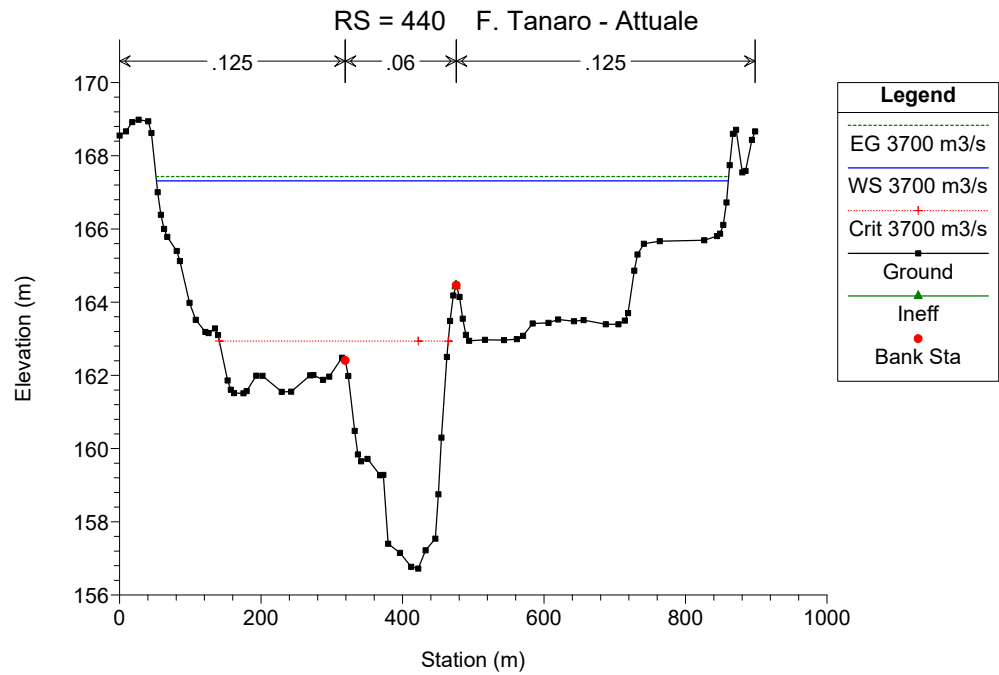
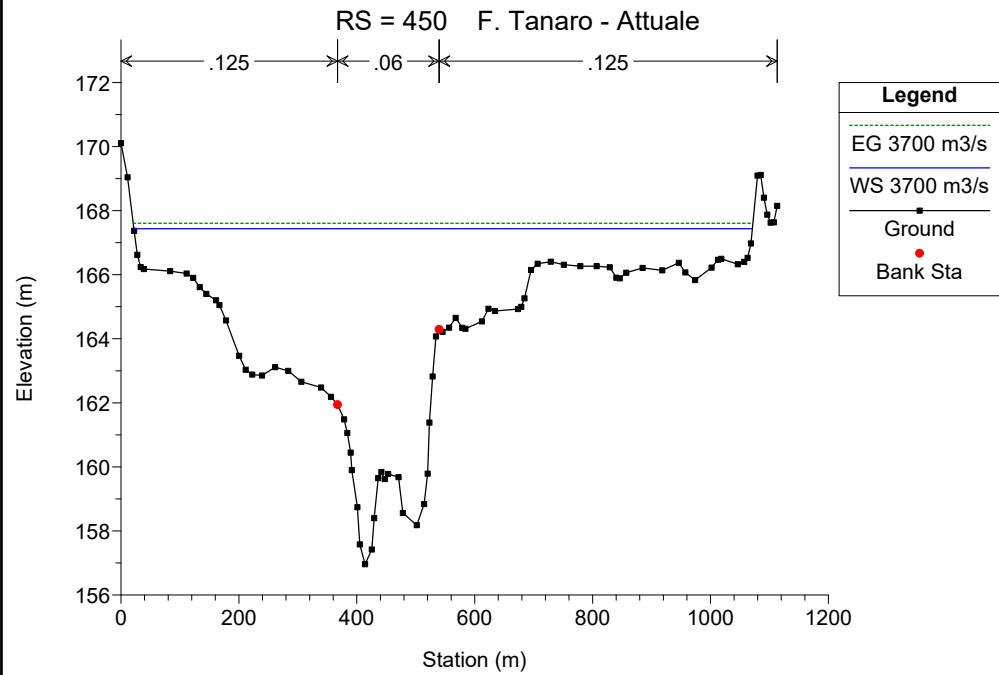
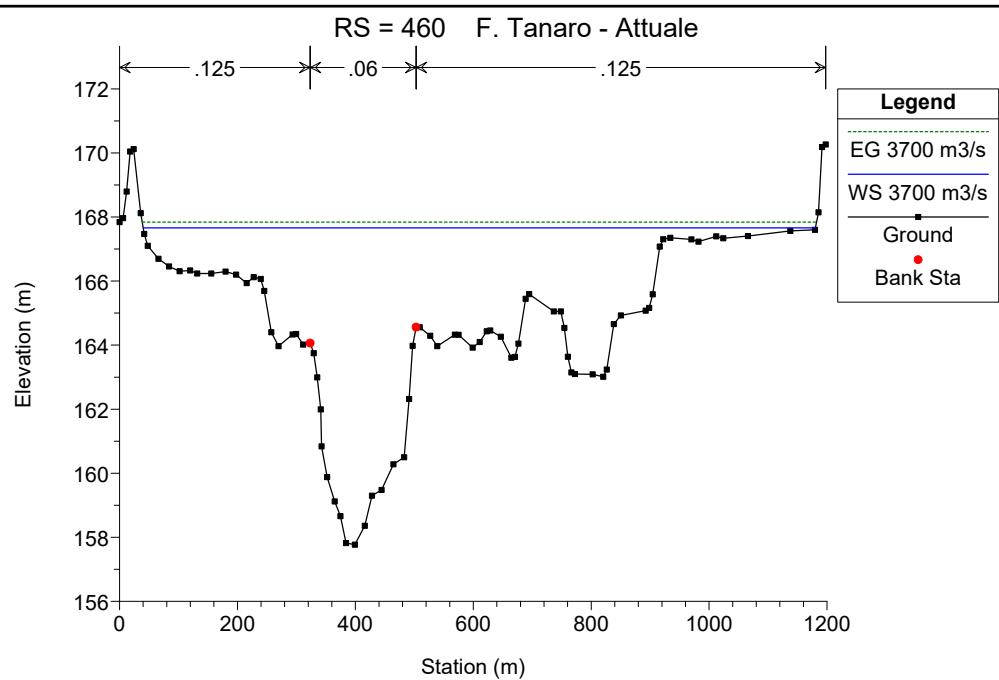
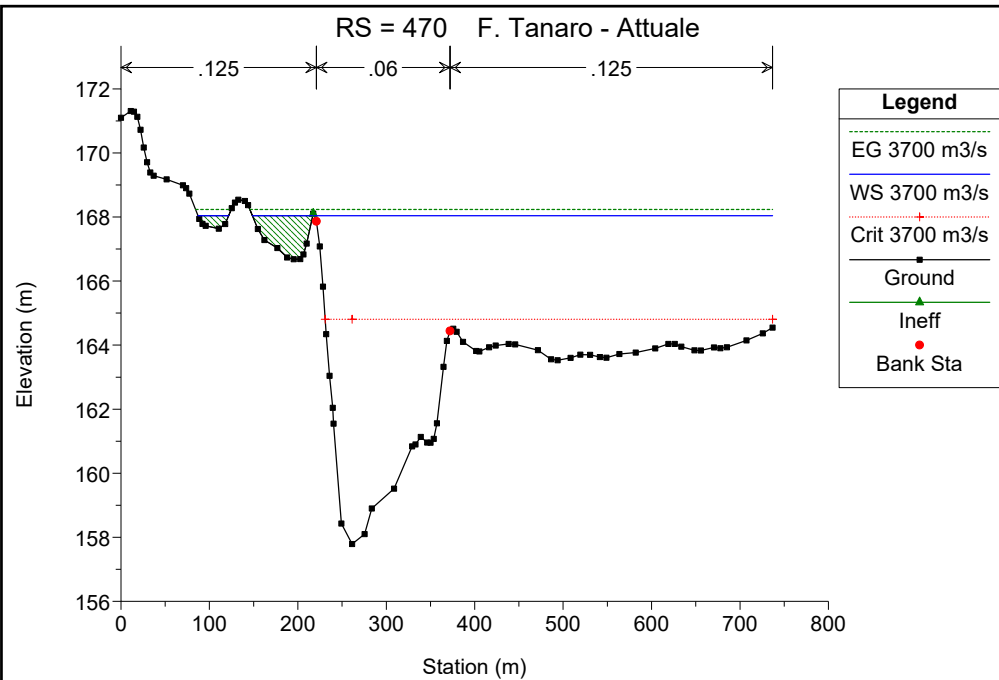
F. Tanaro - Attuale

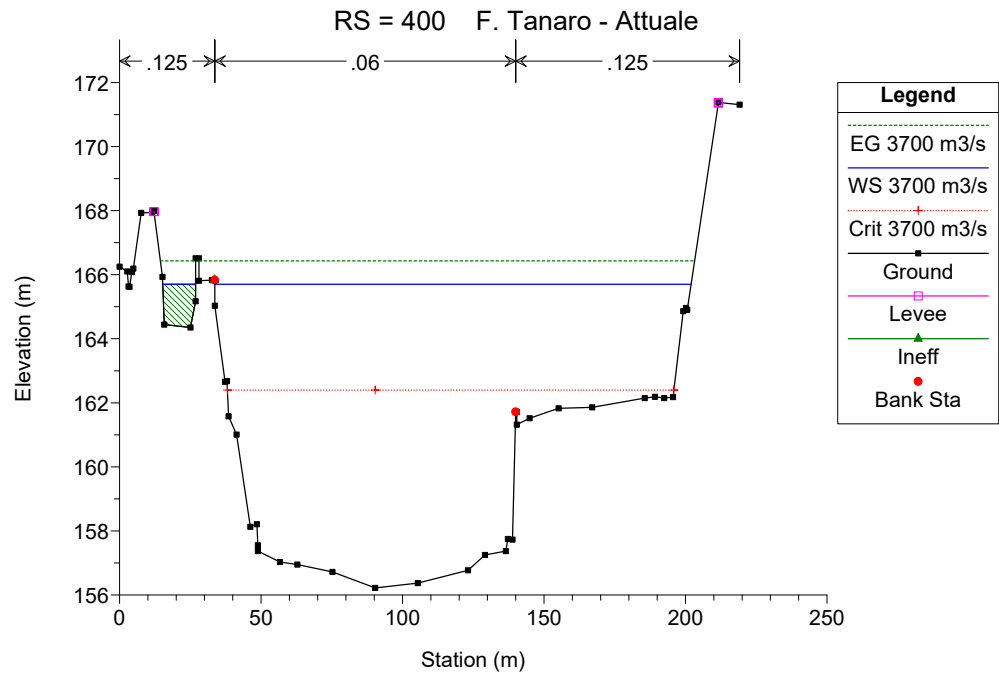
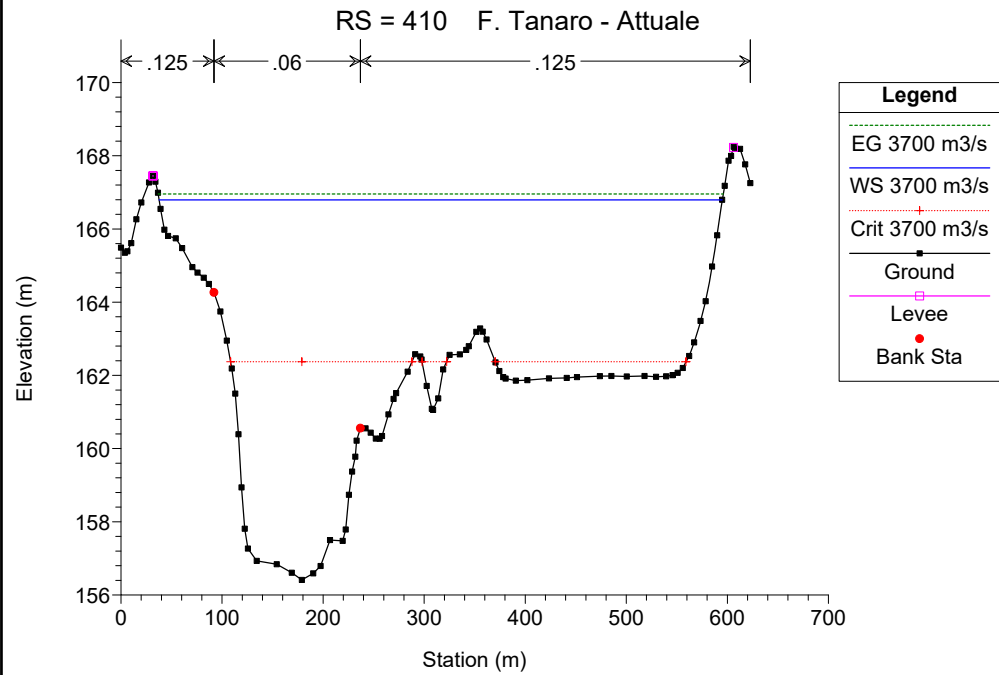
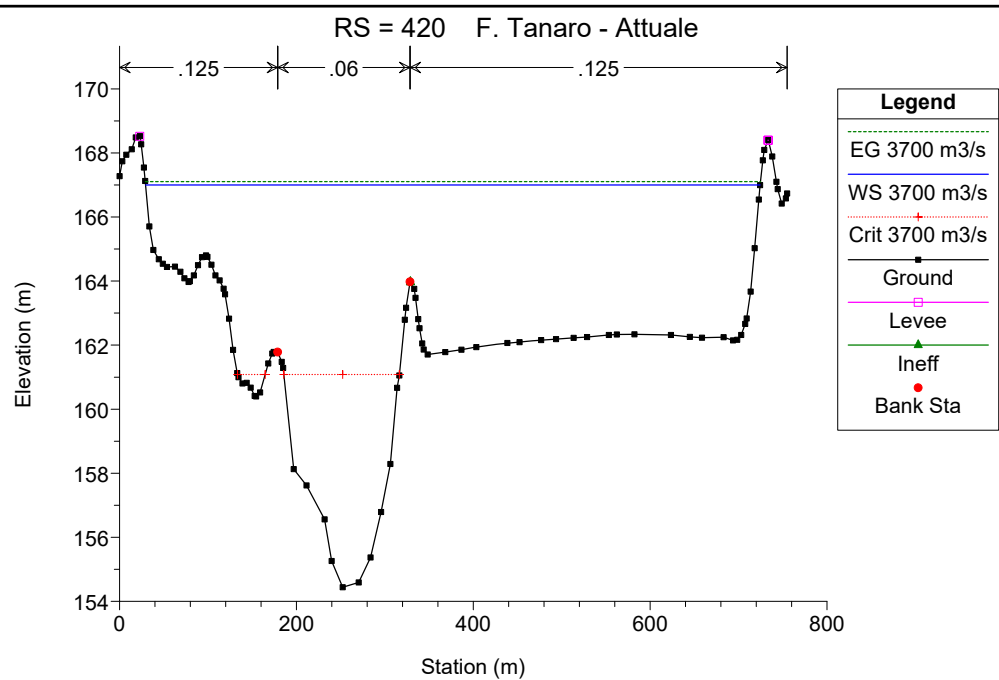
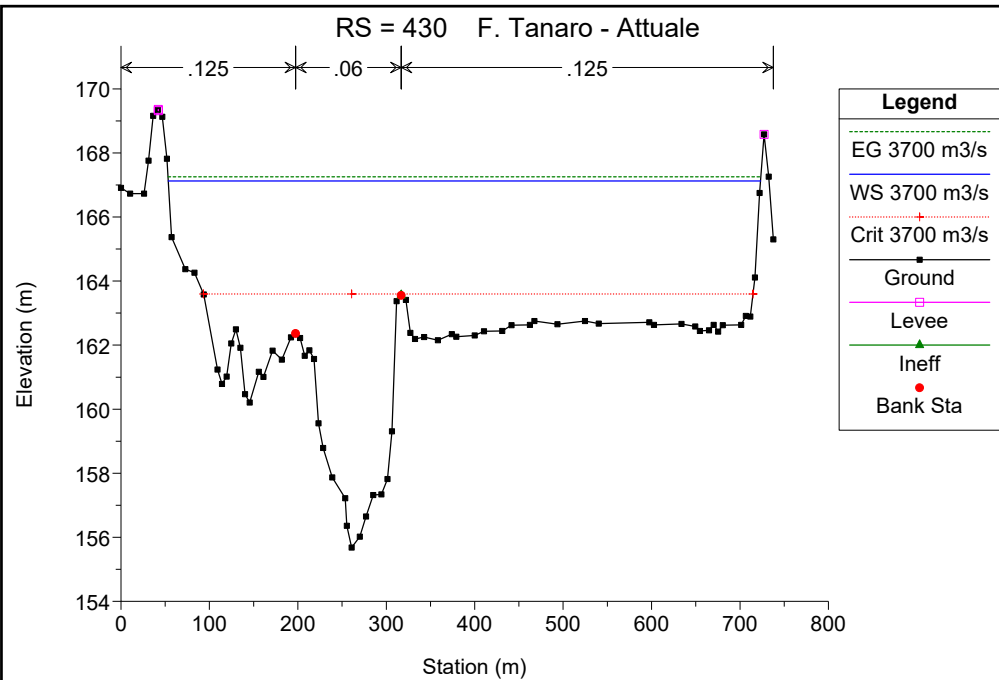
Tanaro 1

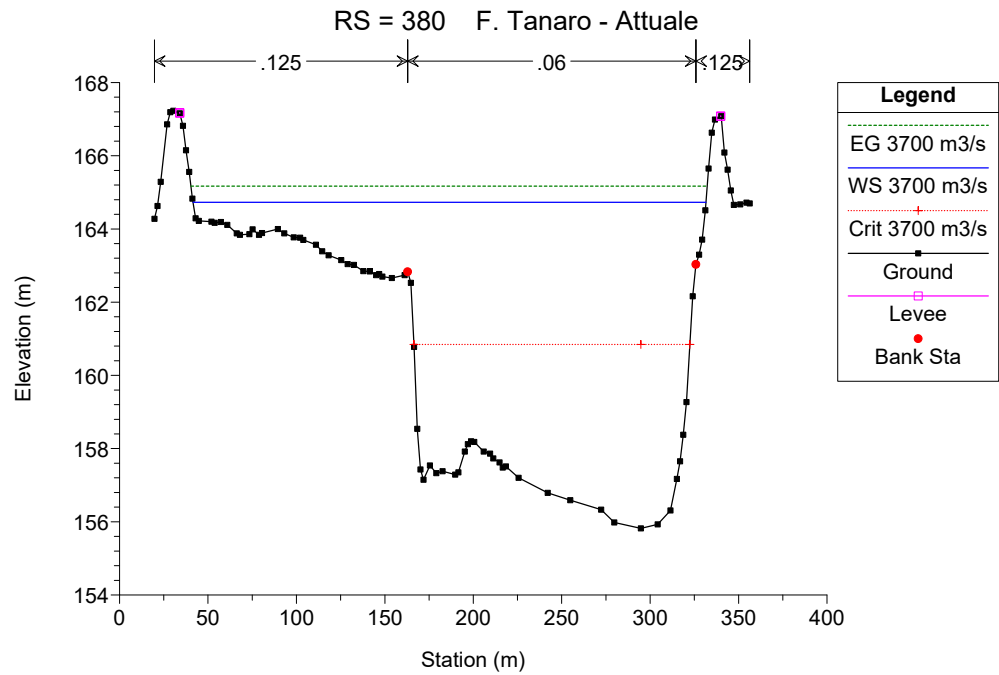
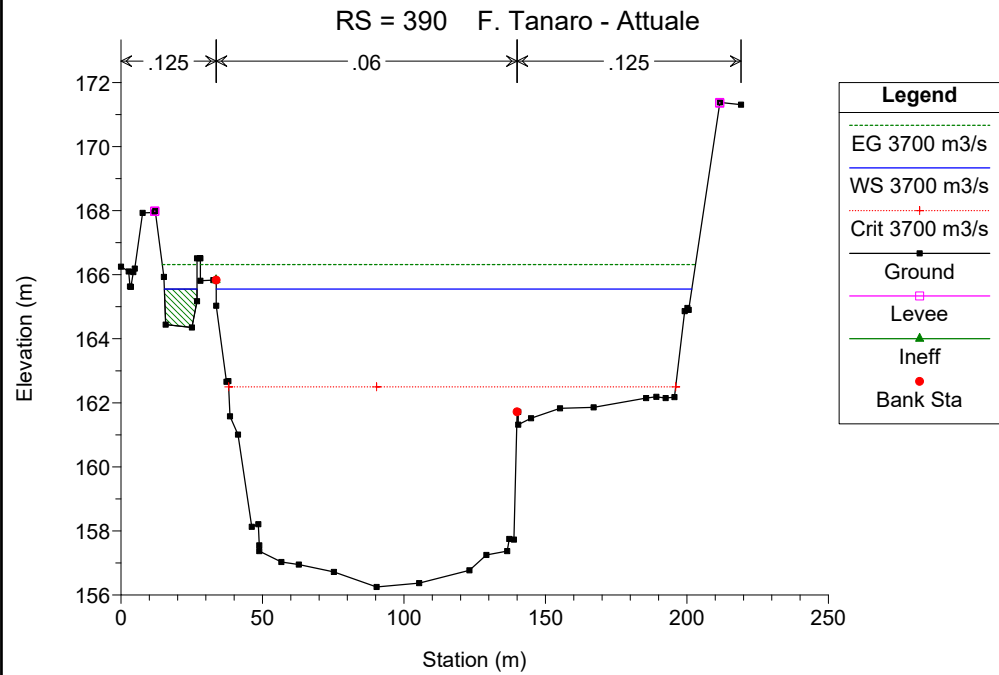
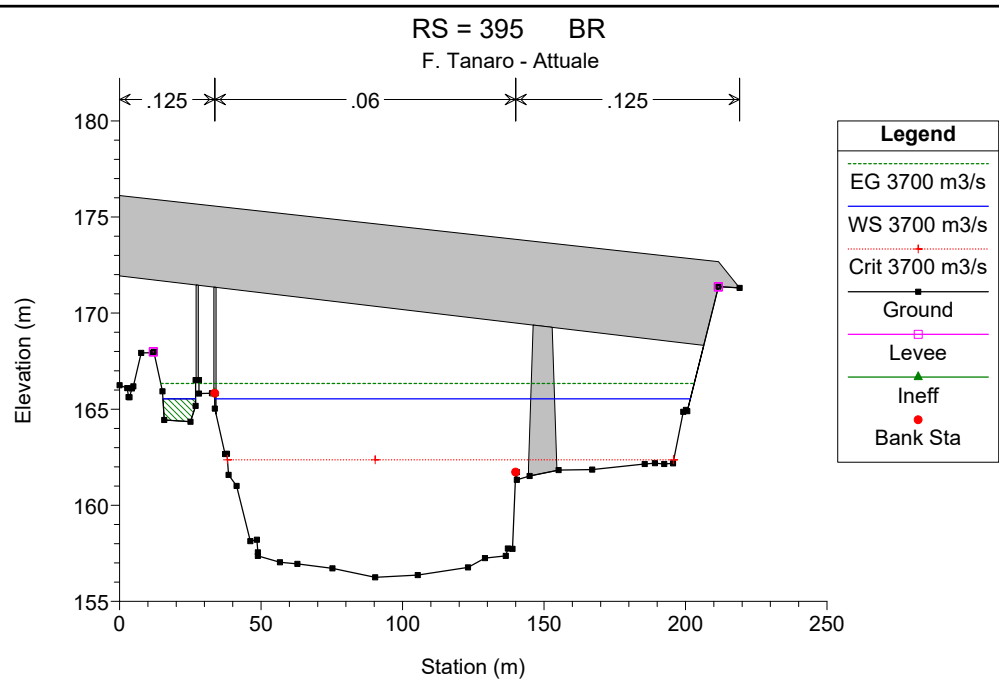
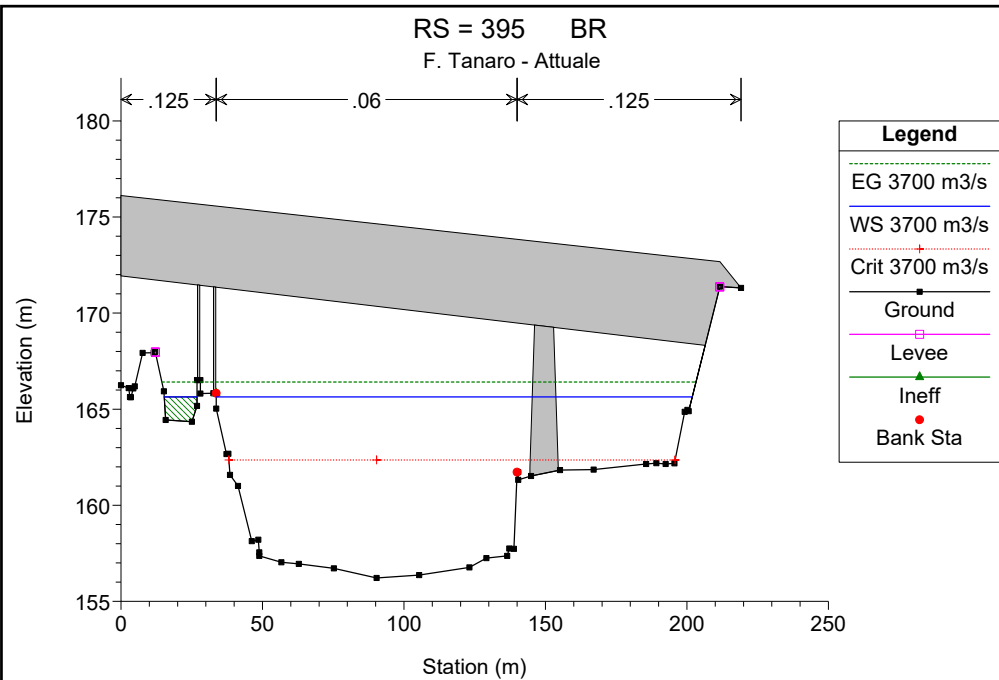


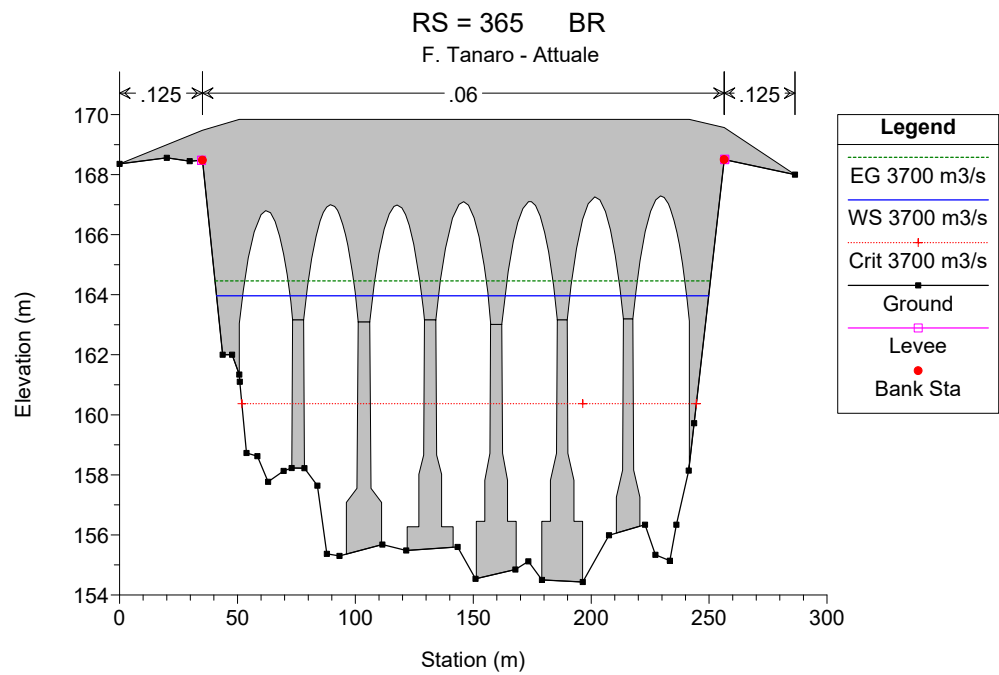
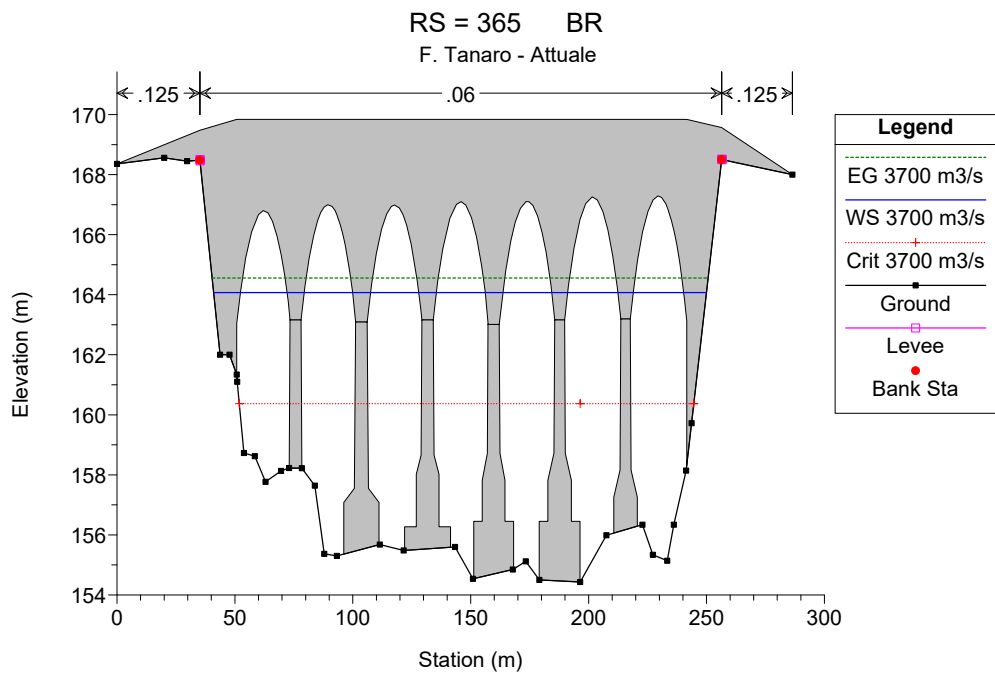
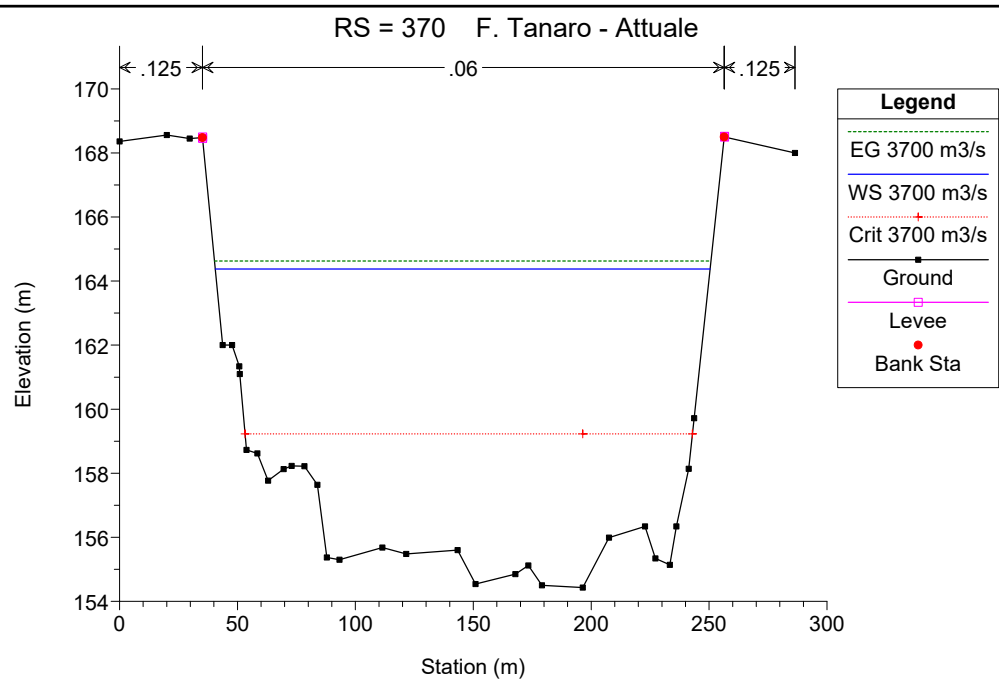
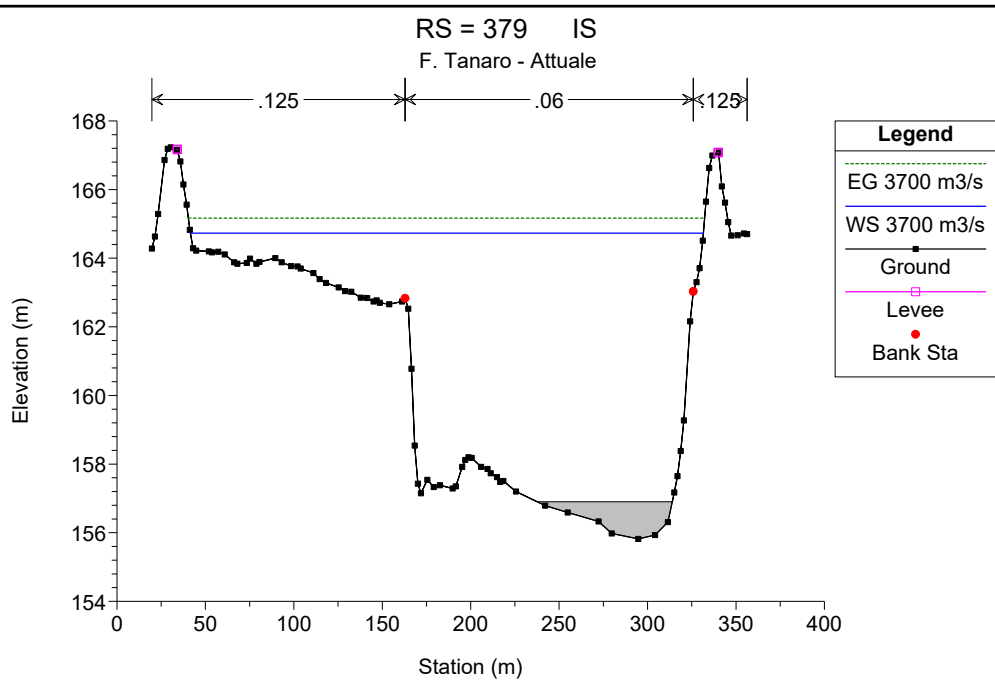


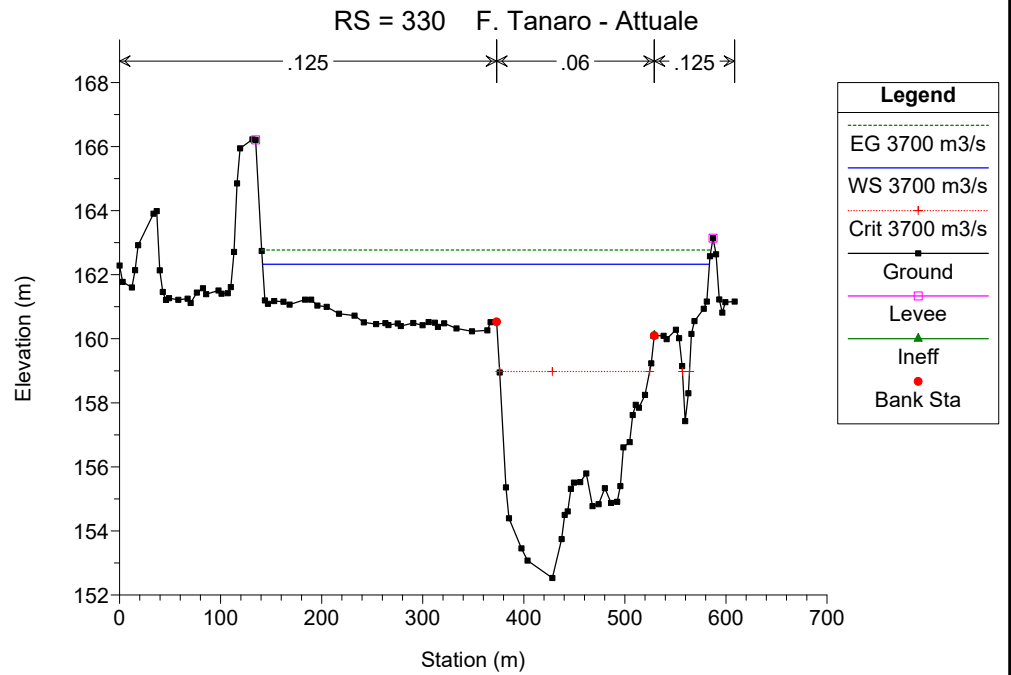
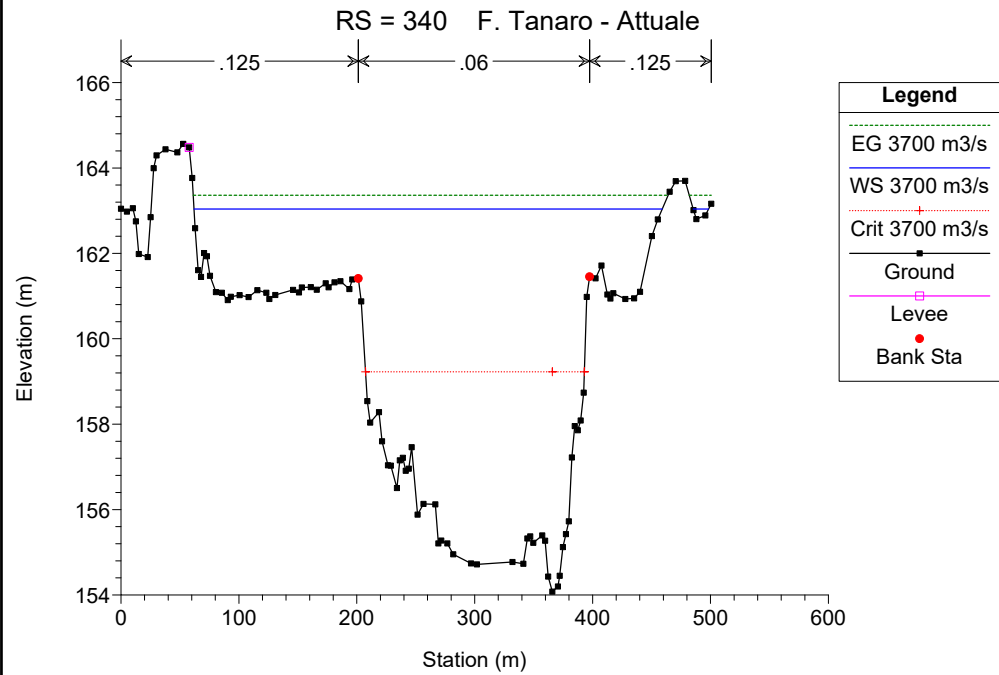
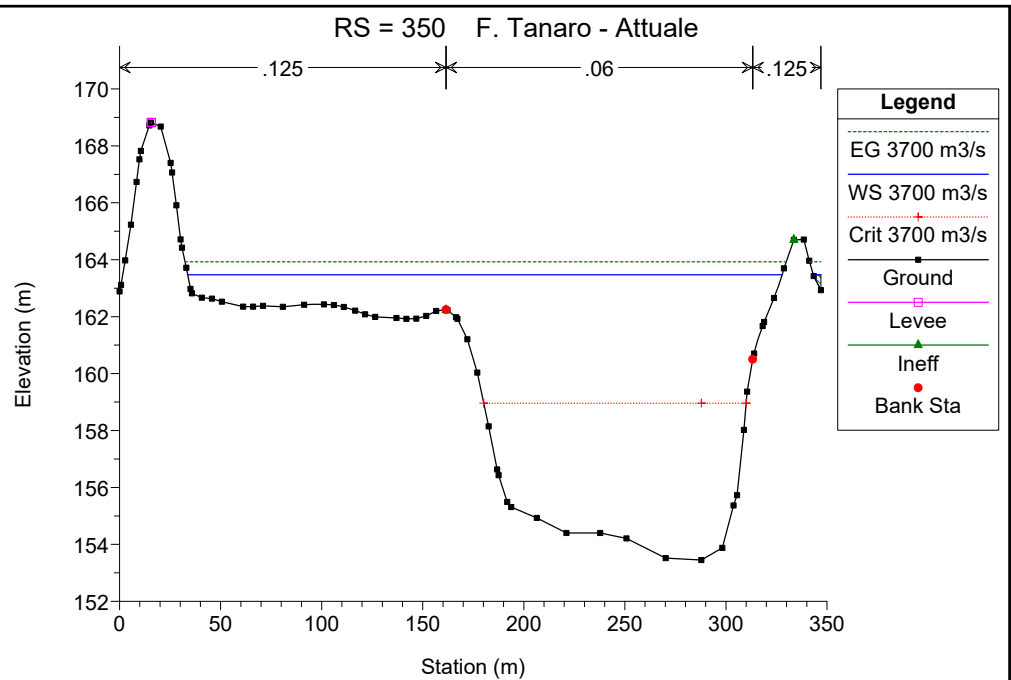
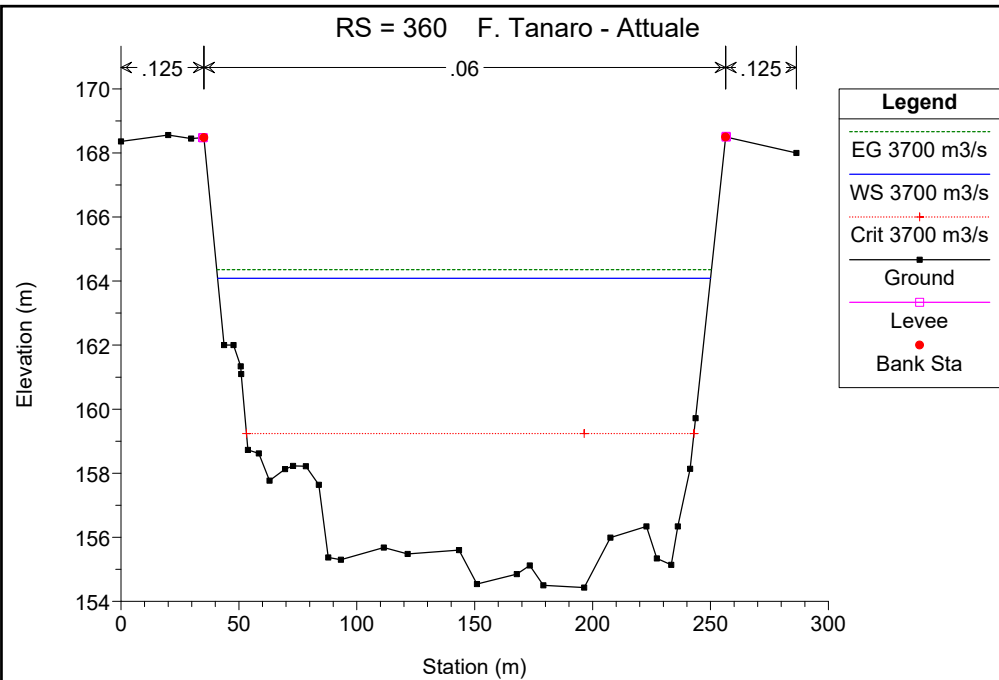


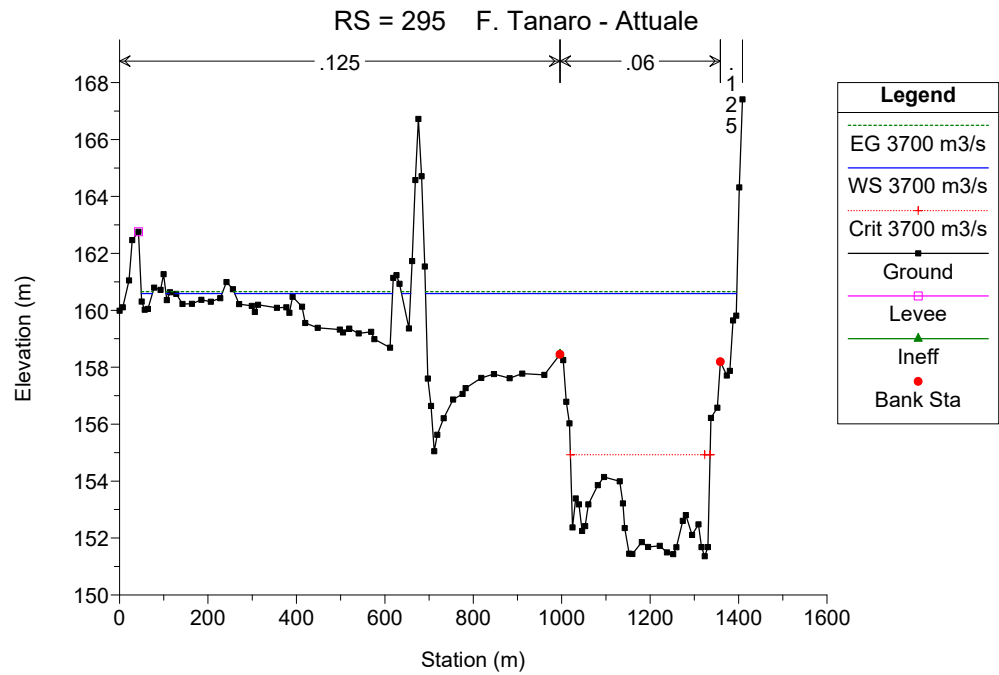
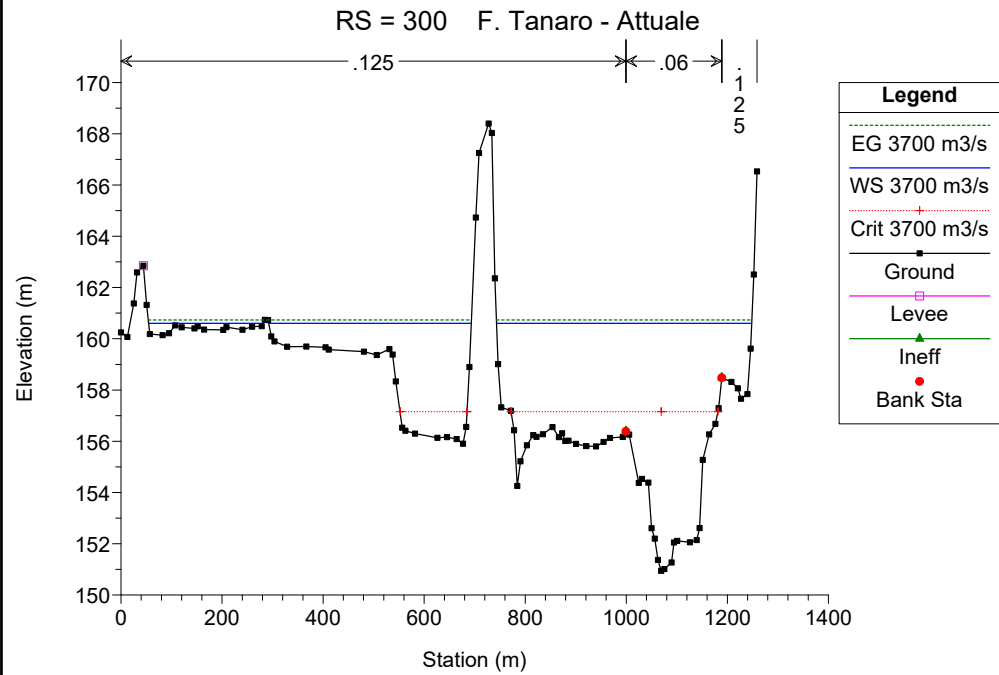
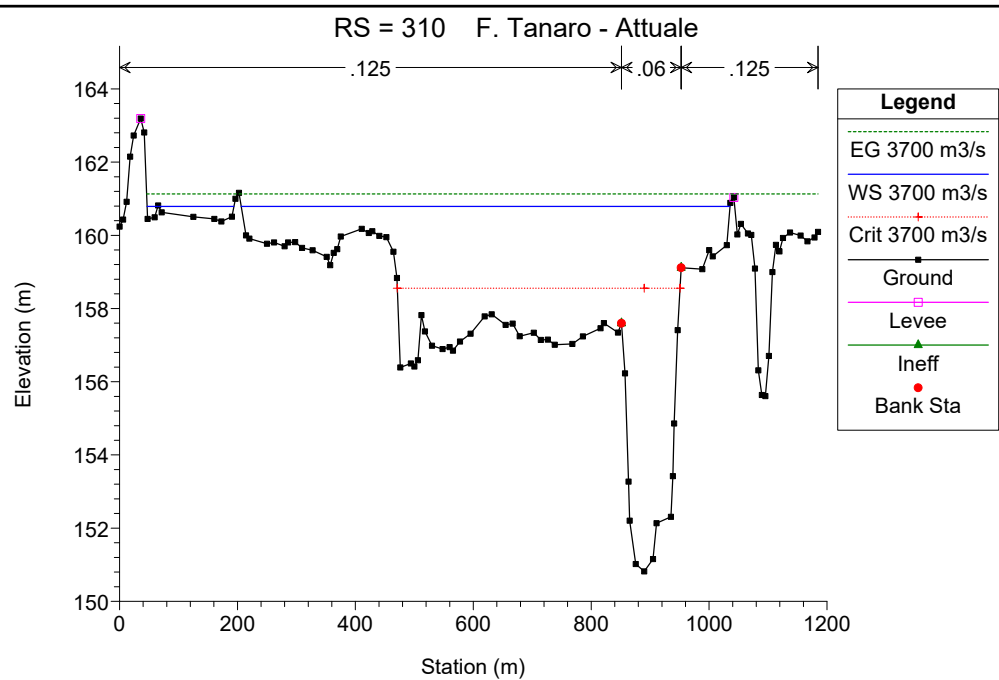
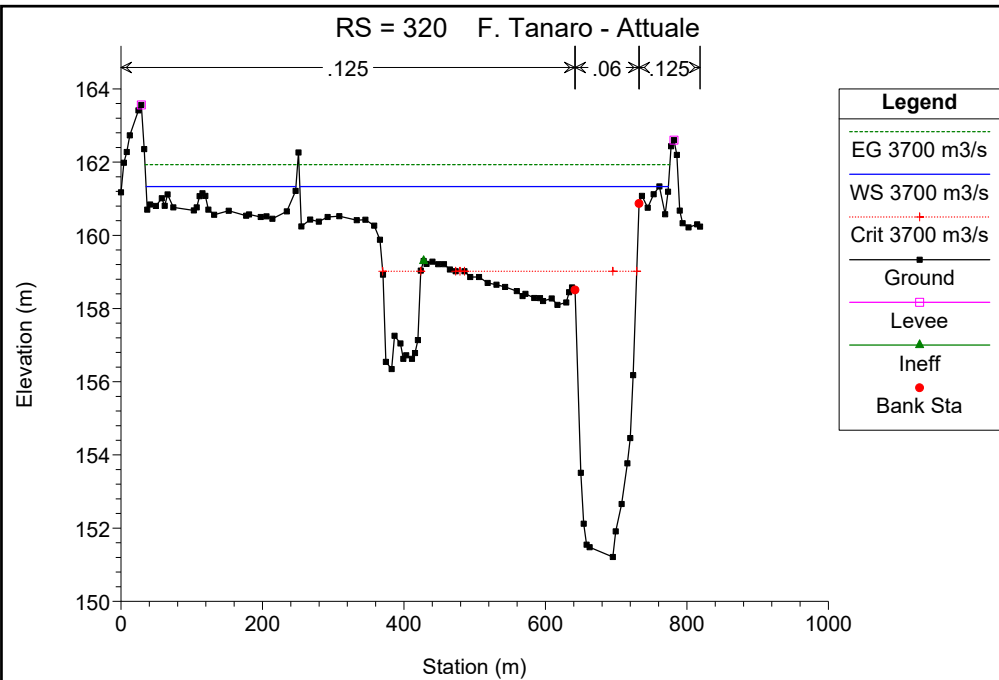


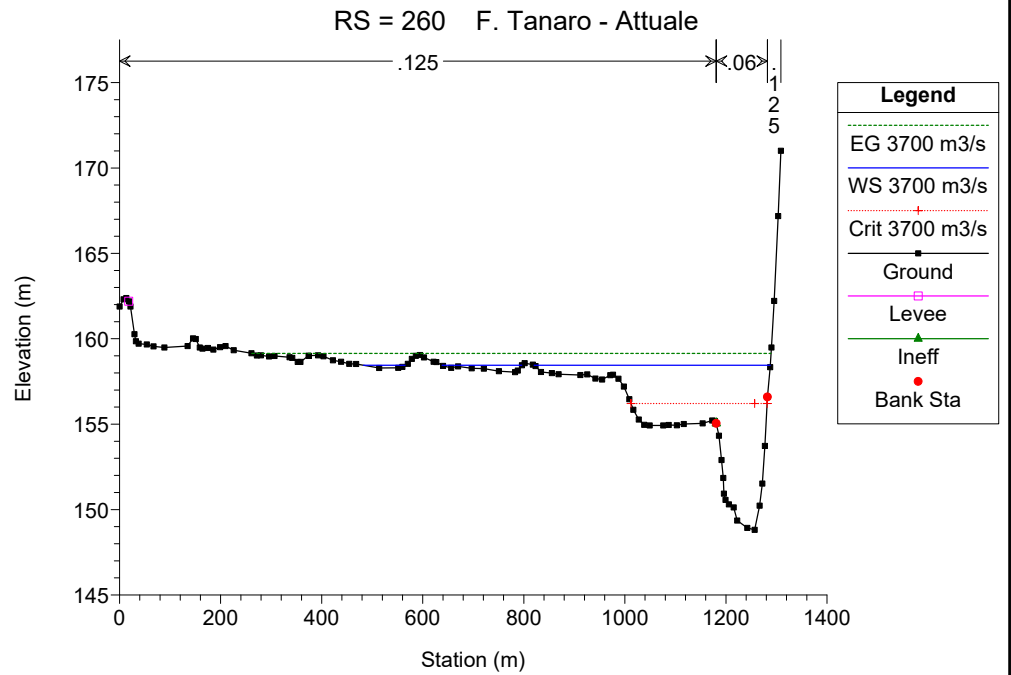
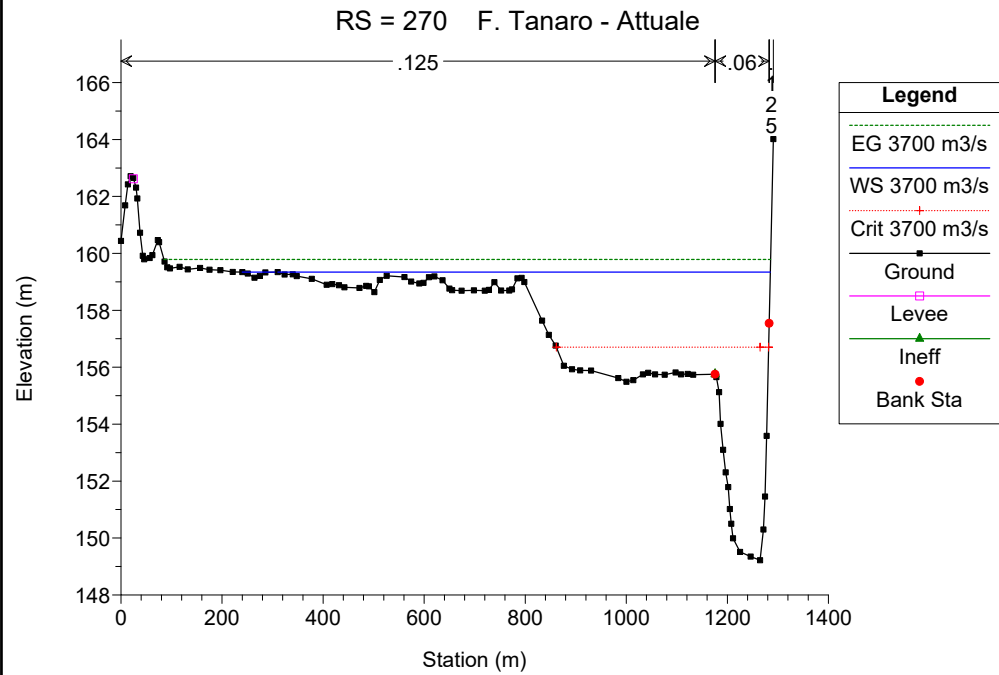
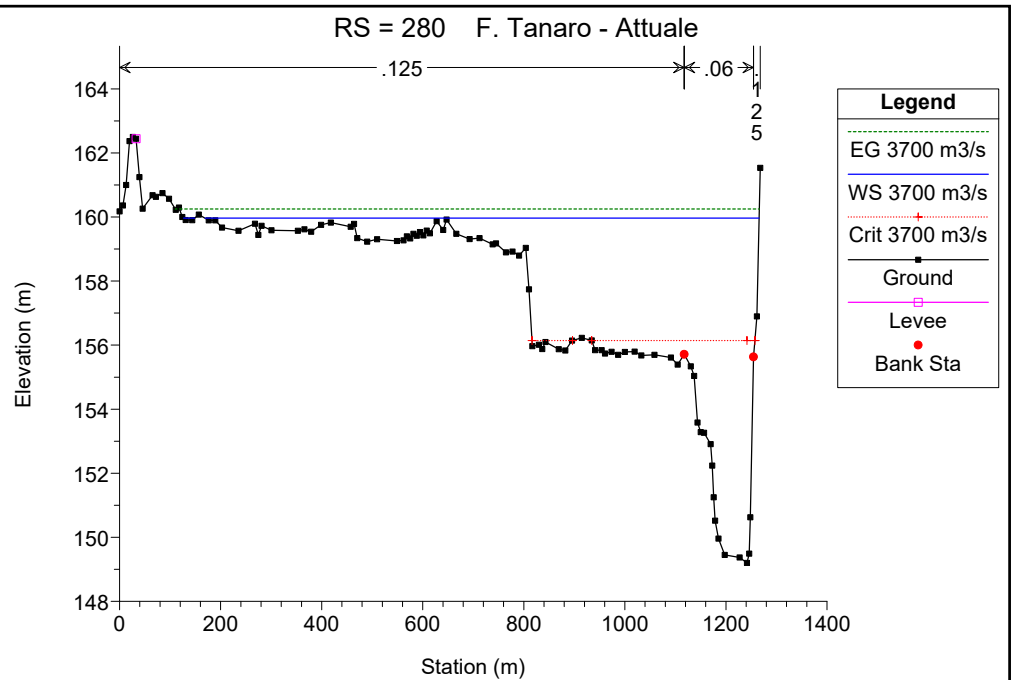
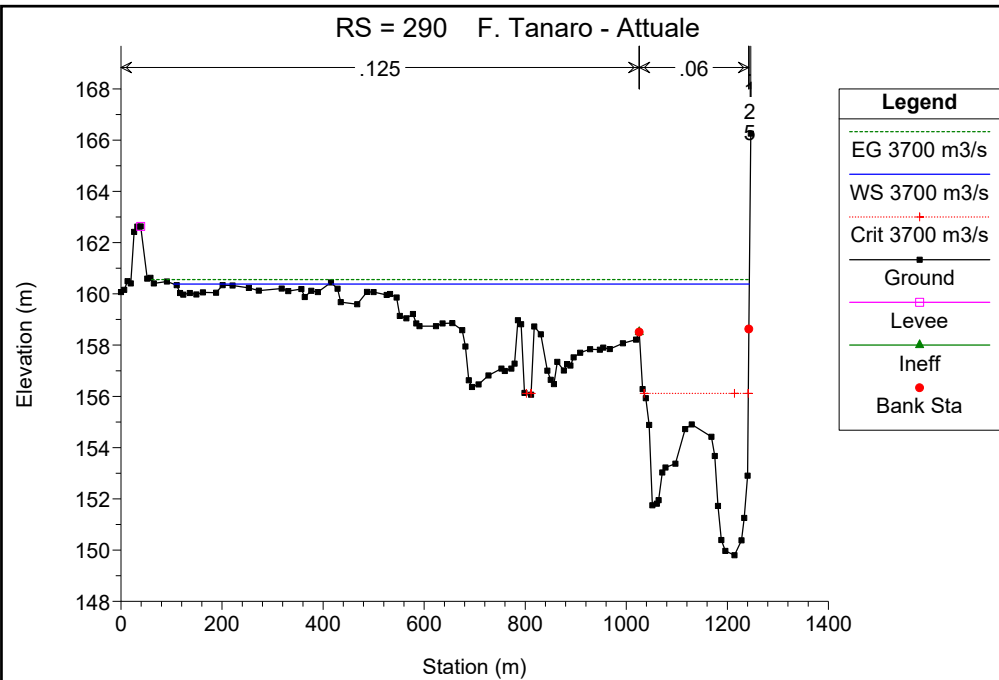


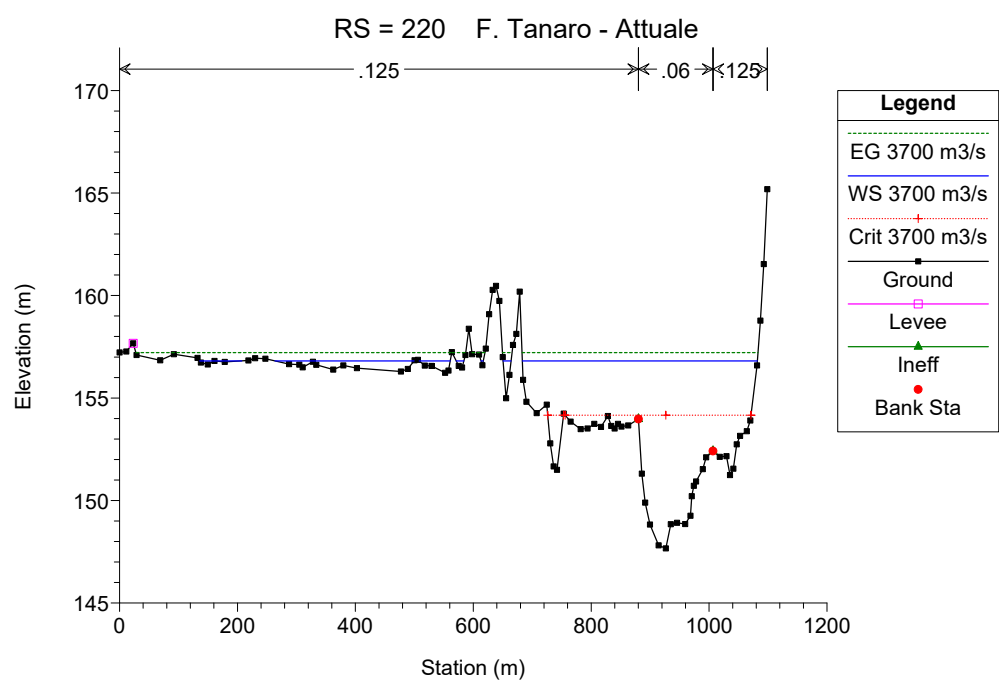
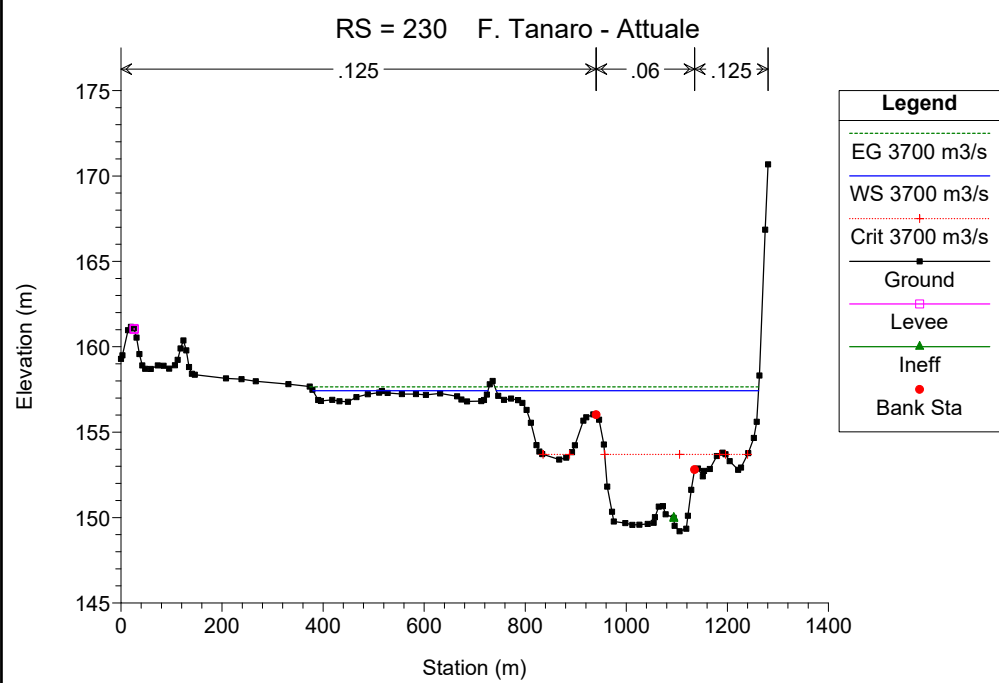
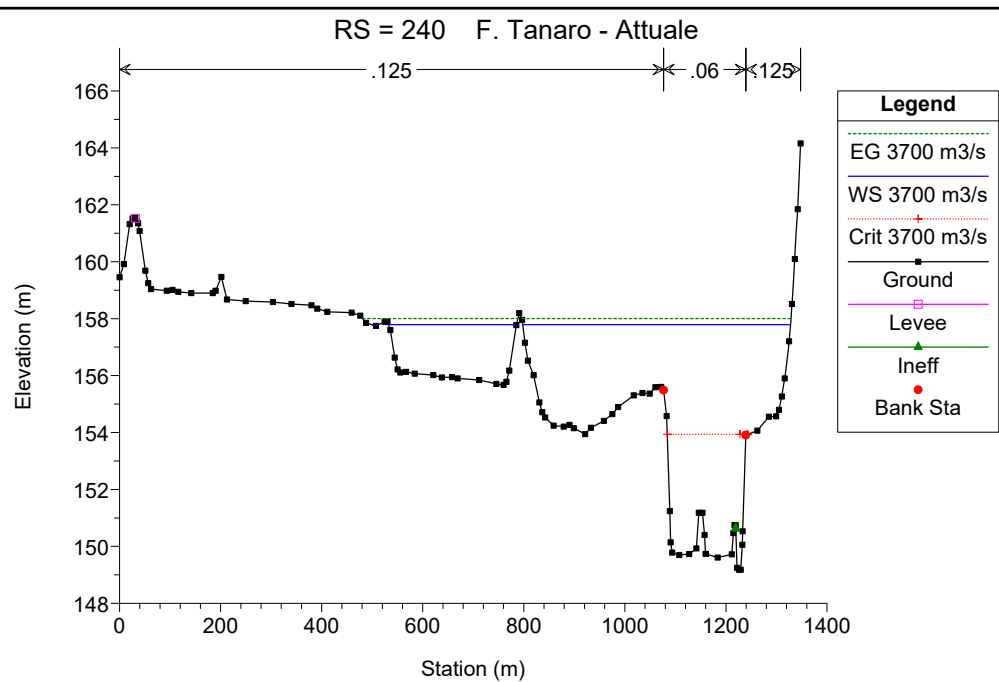
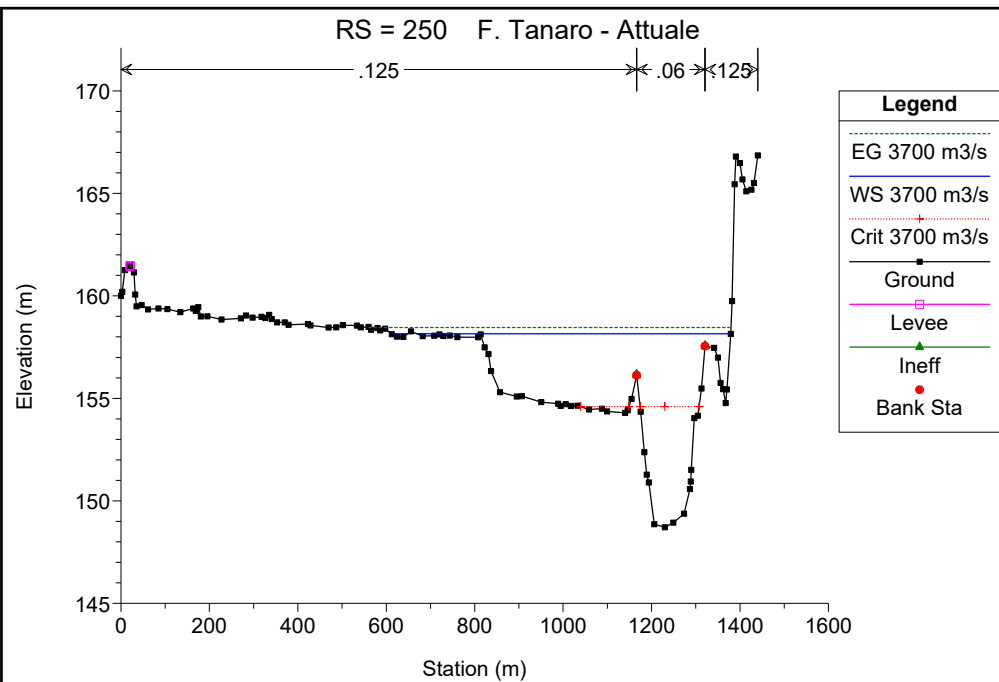


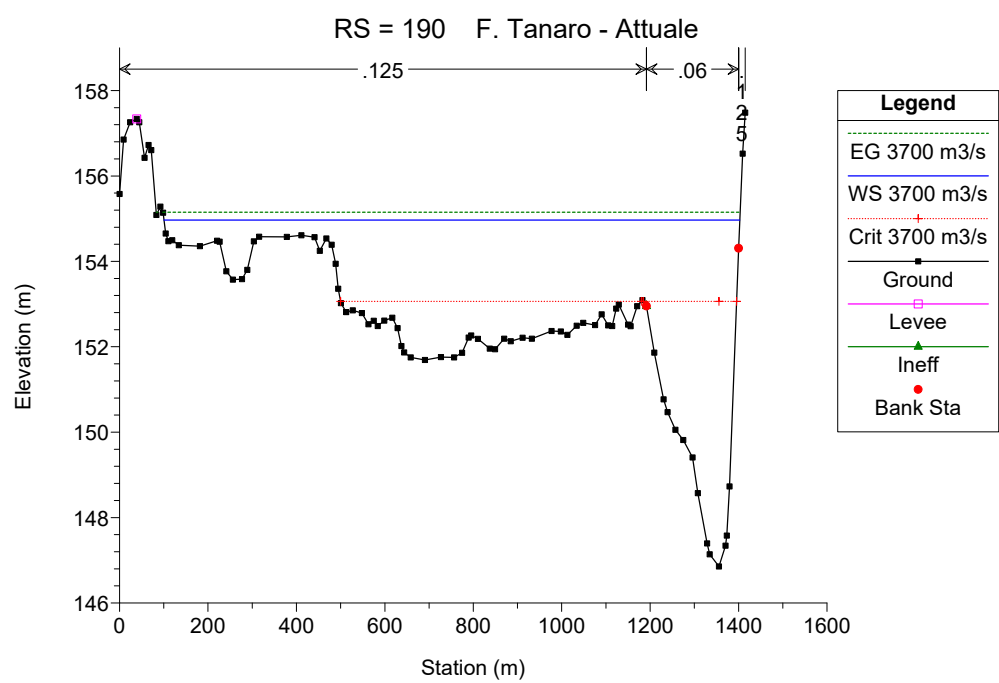
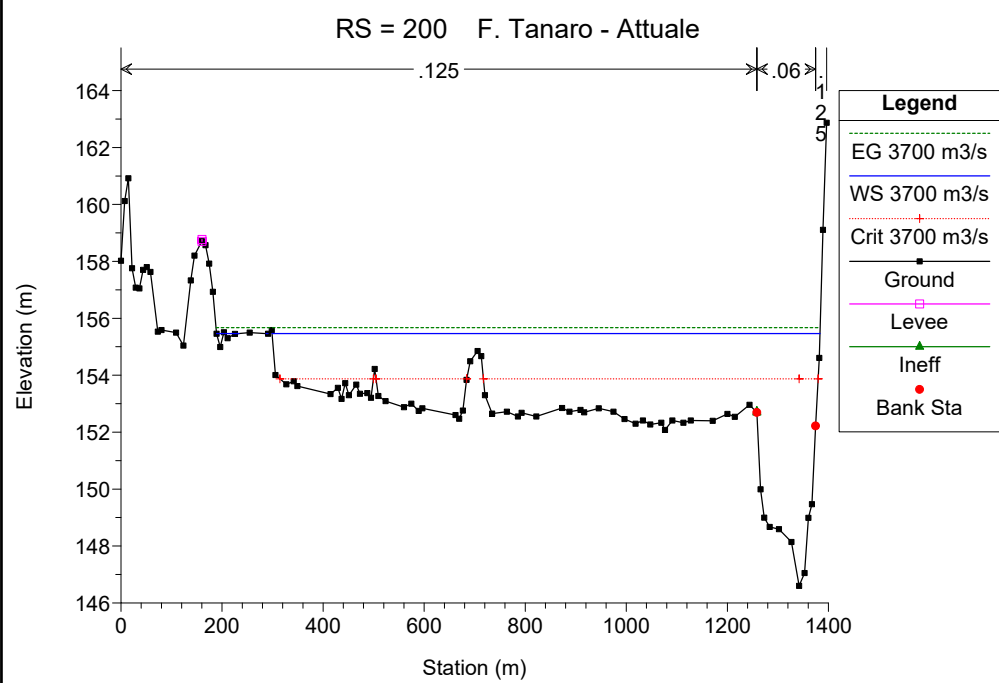
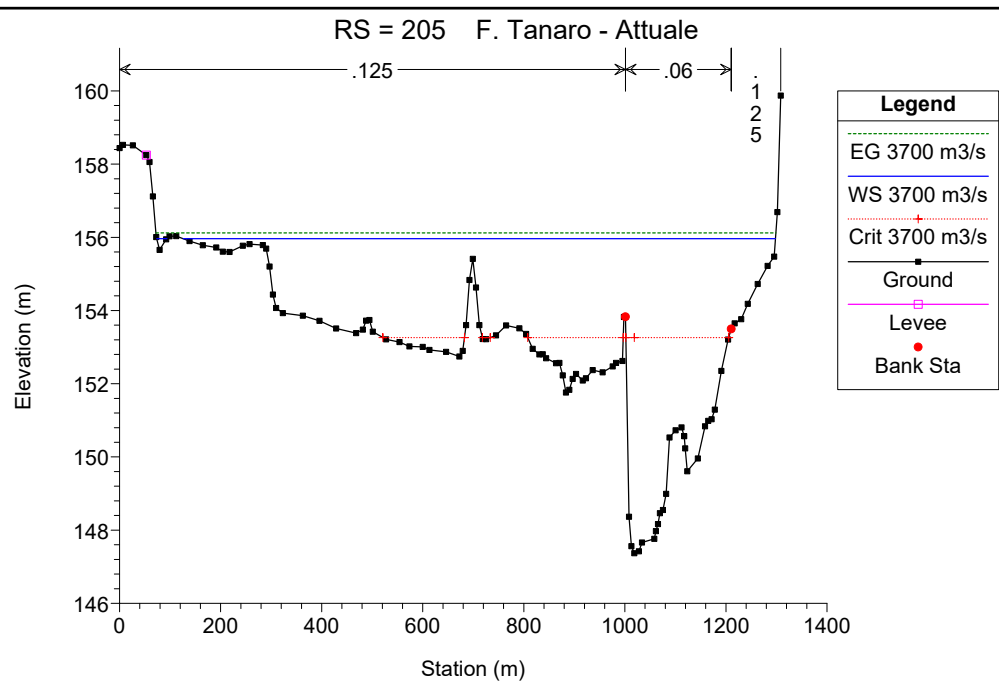
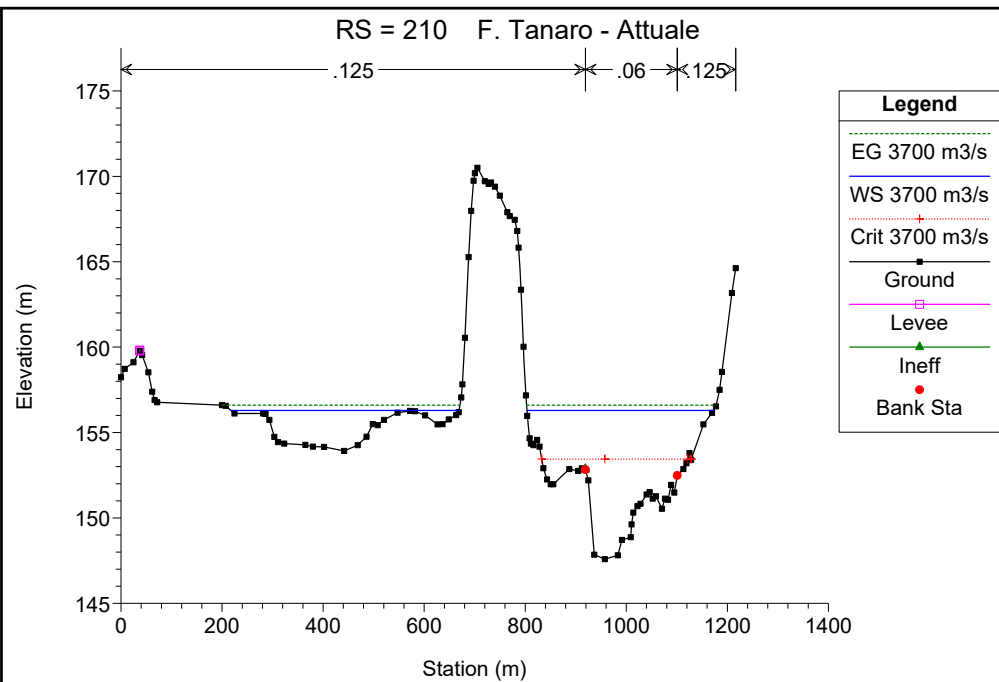


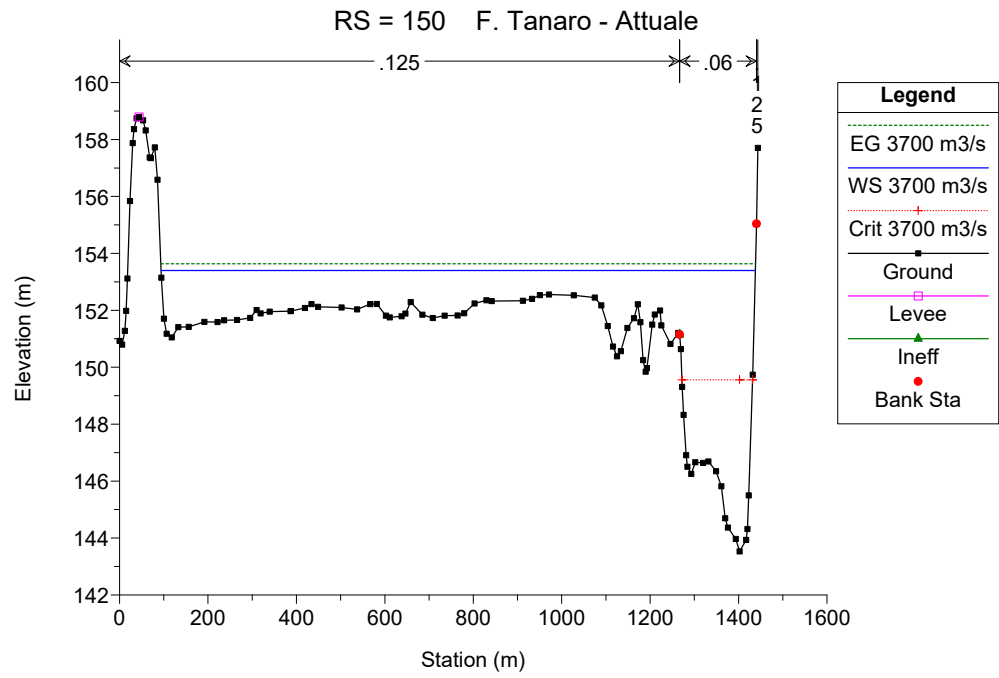
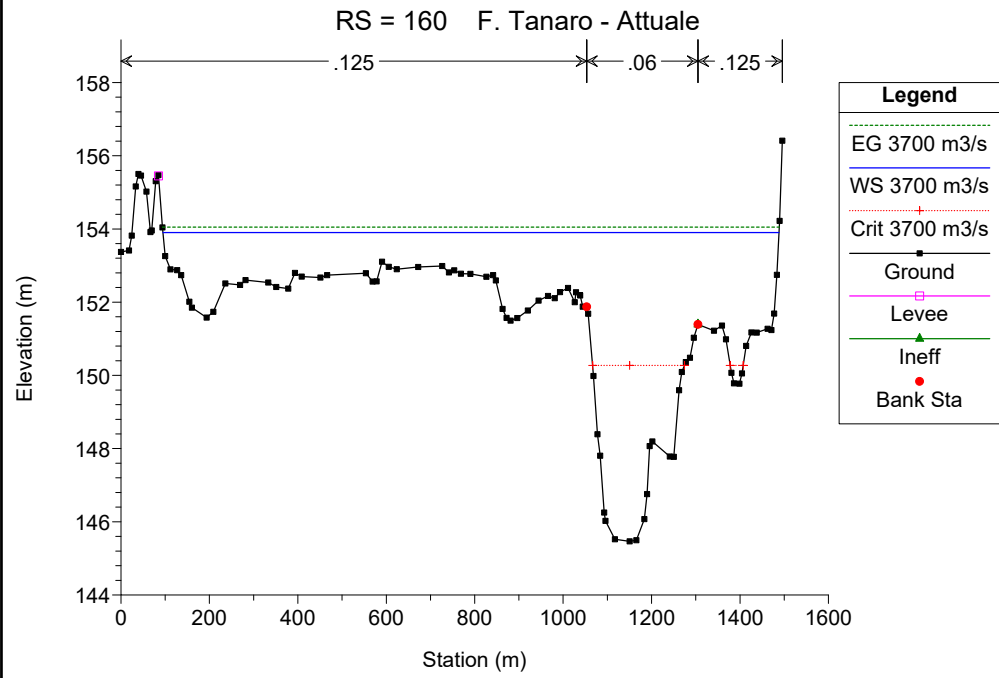
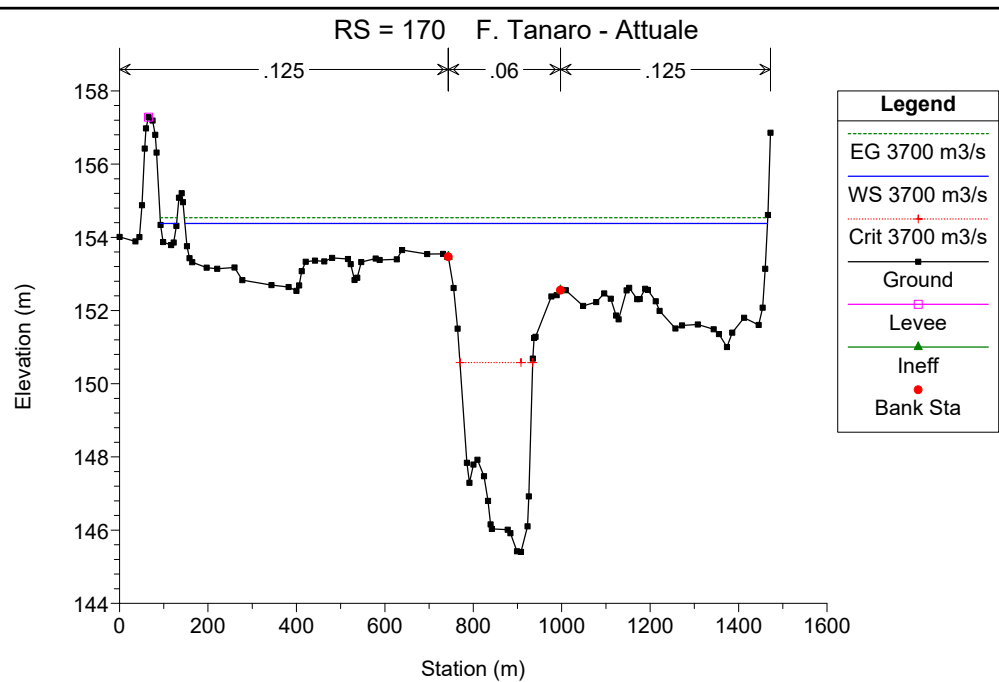
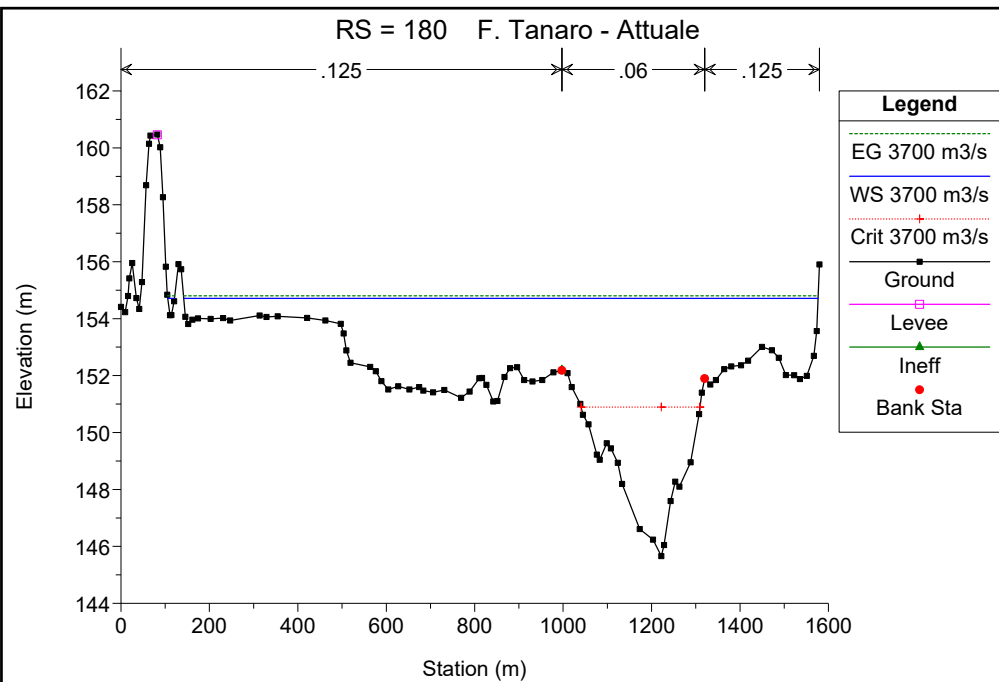


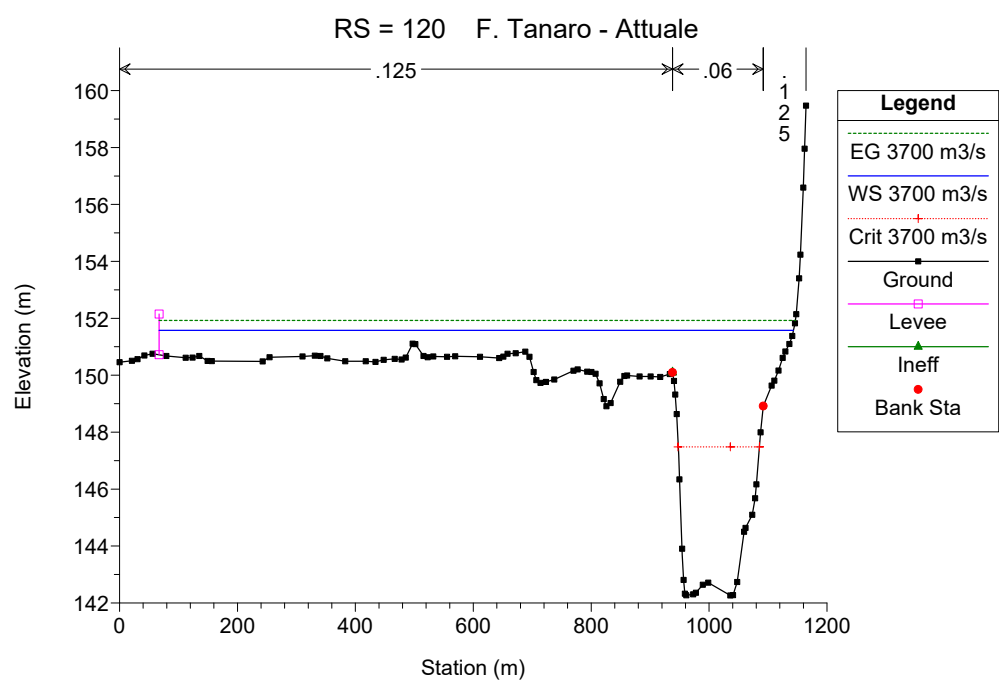
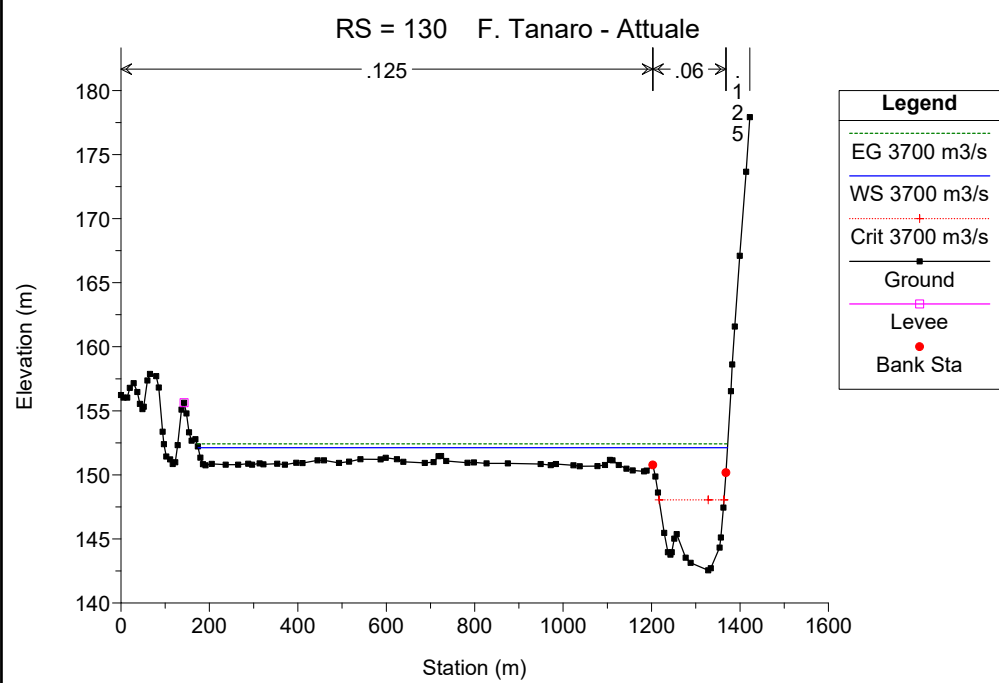
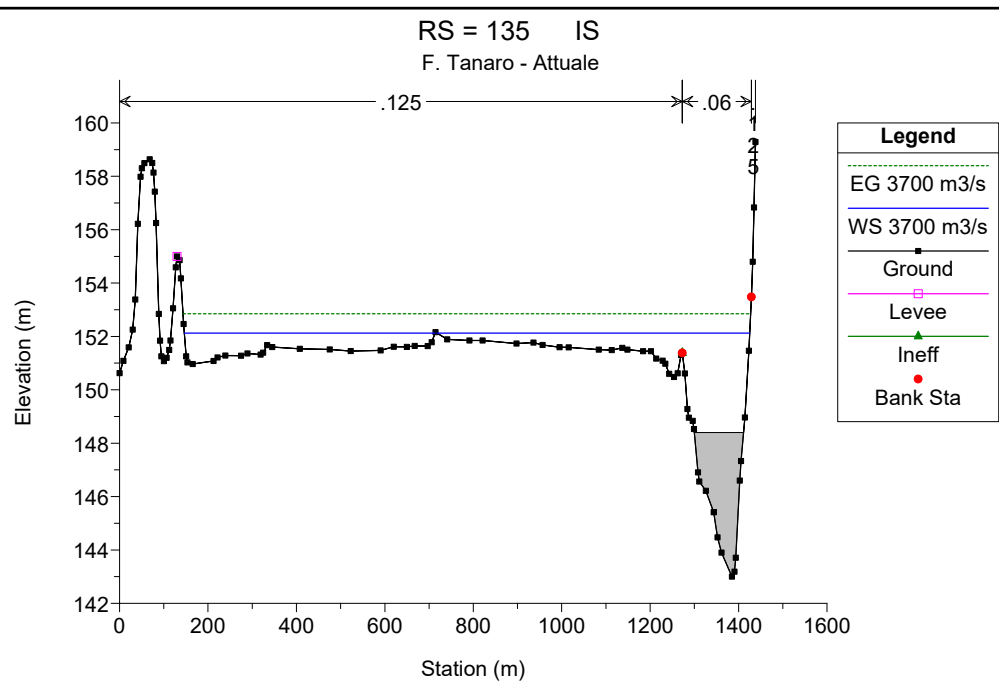
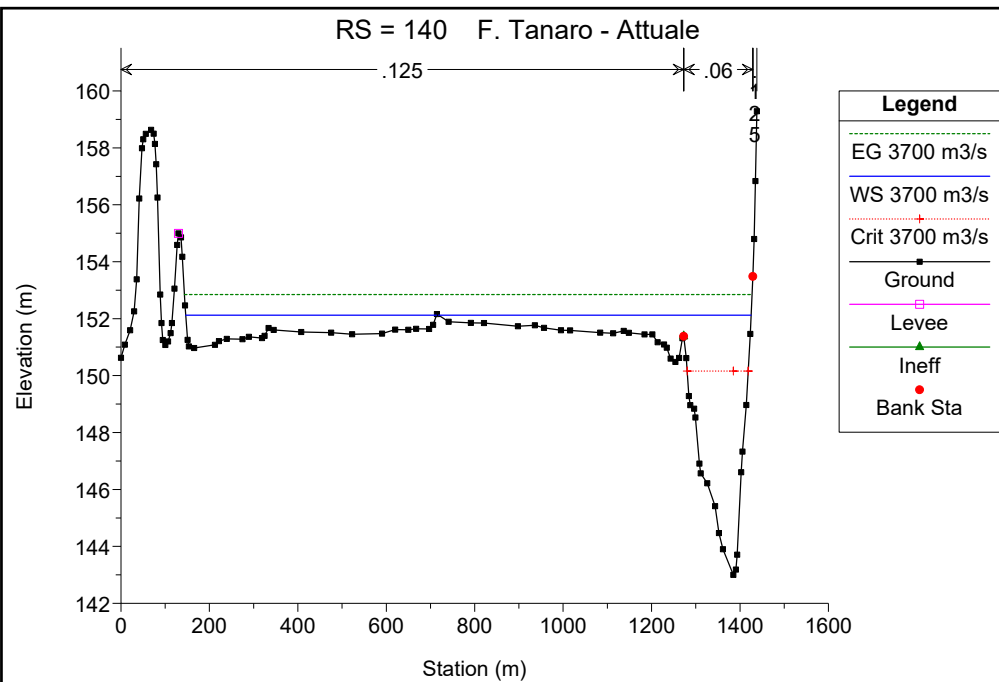


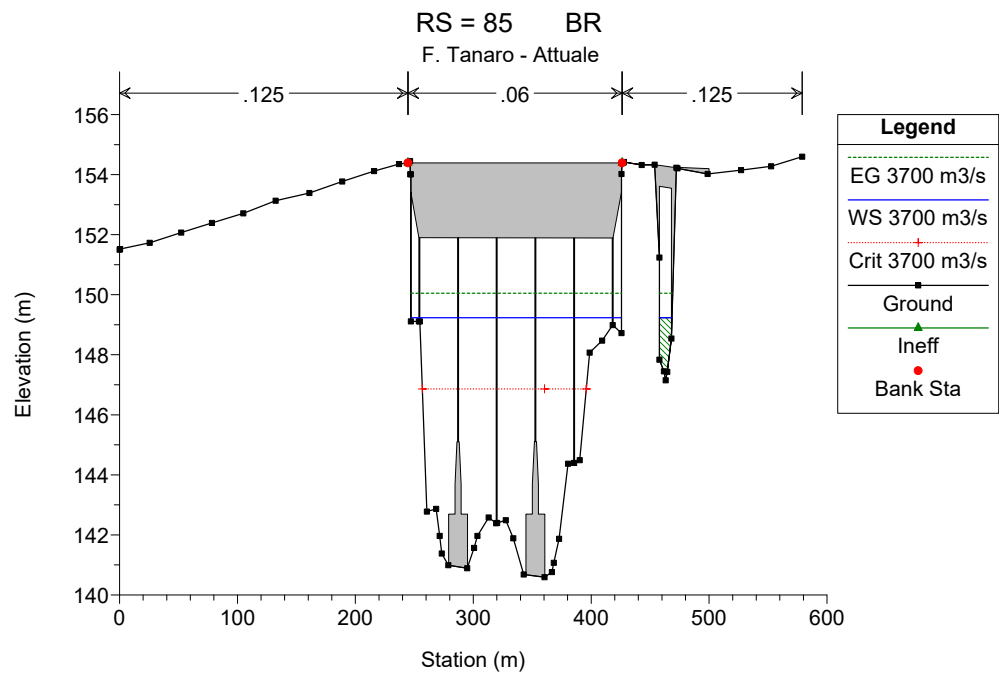
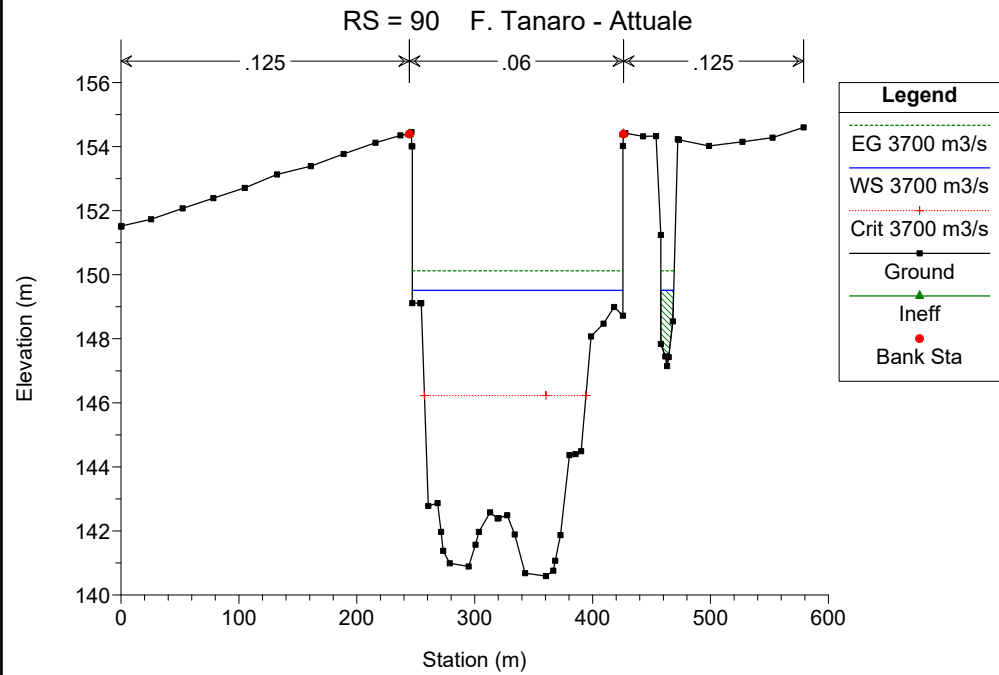
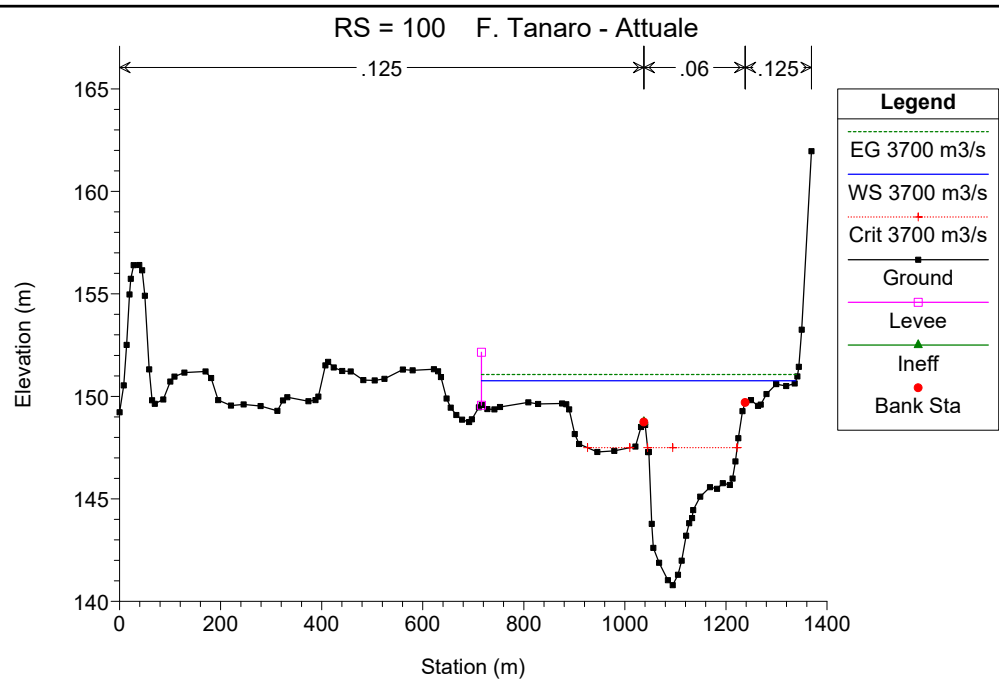
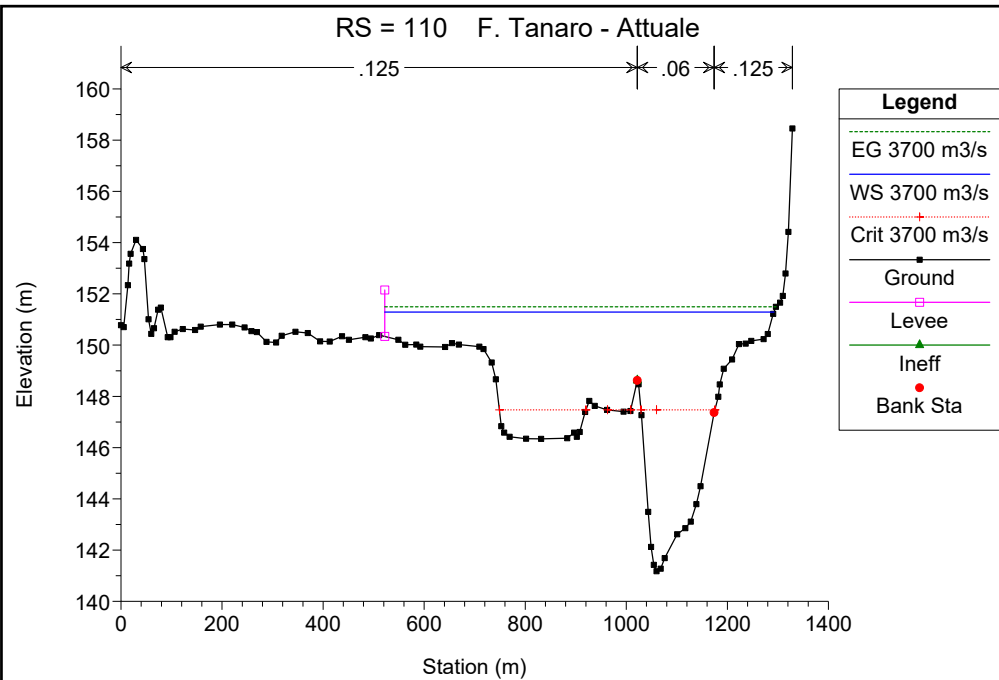


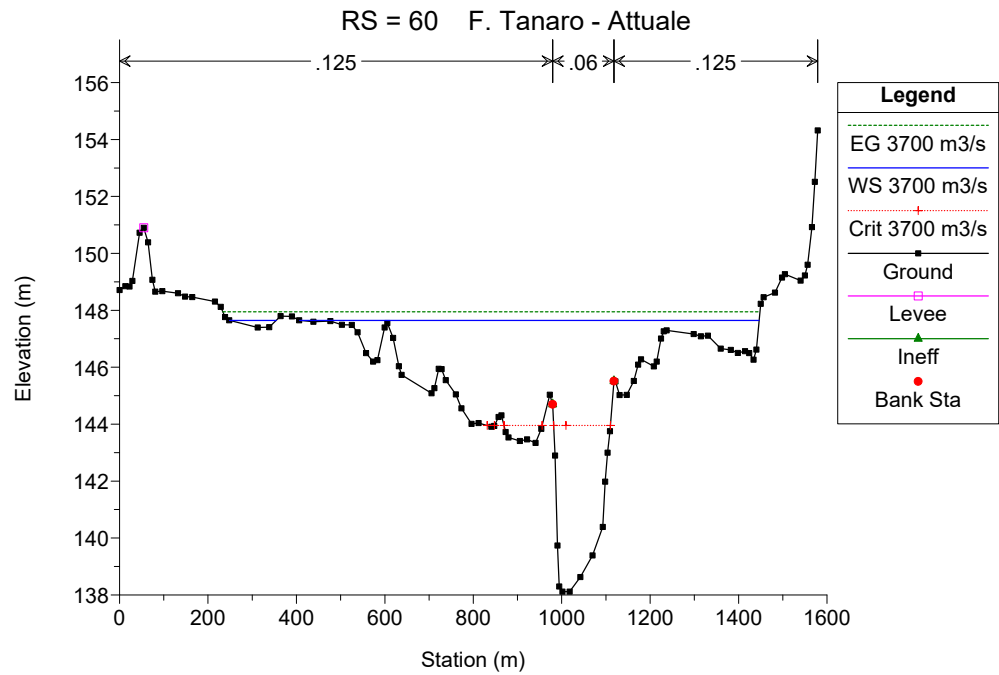
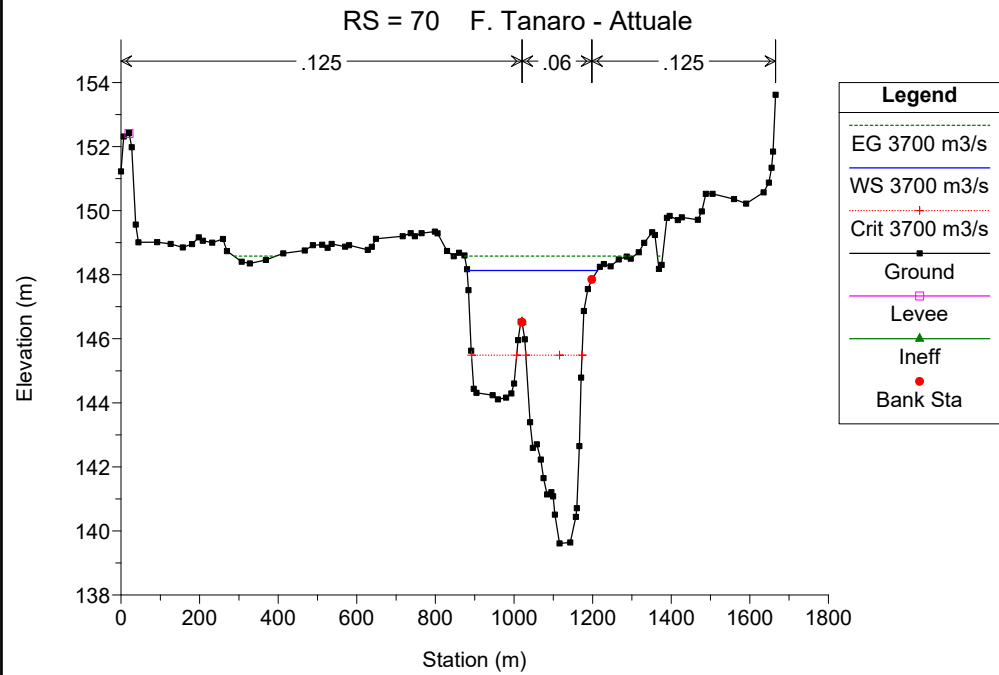
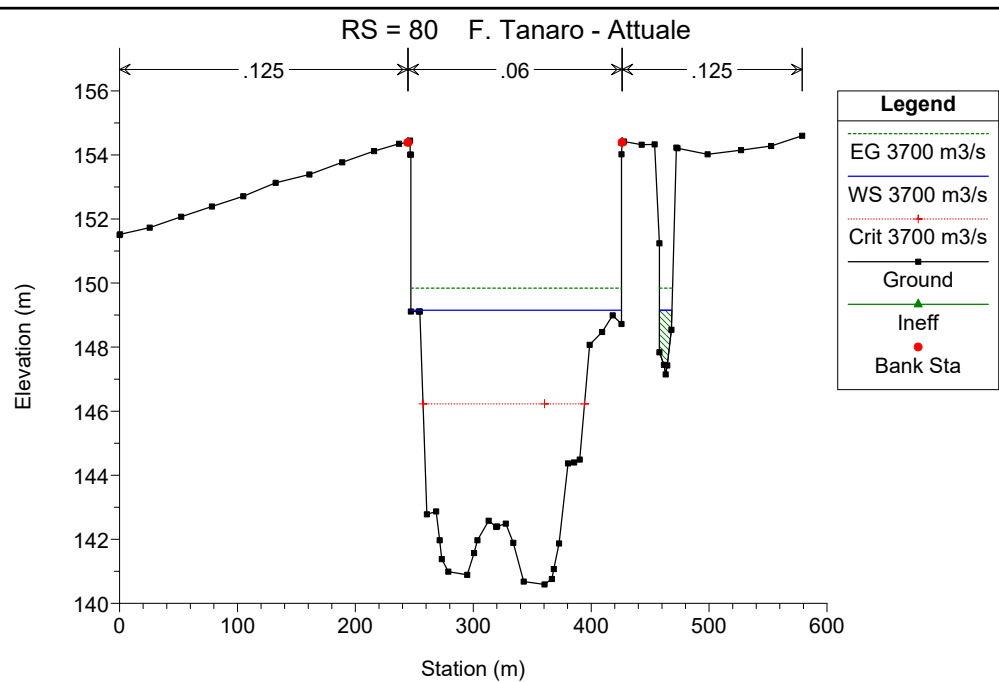
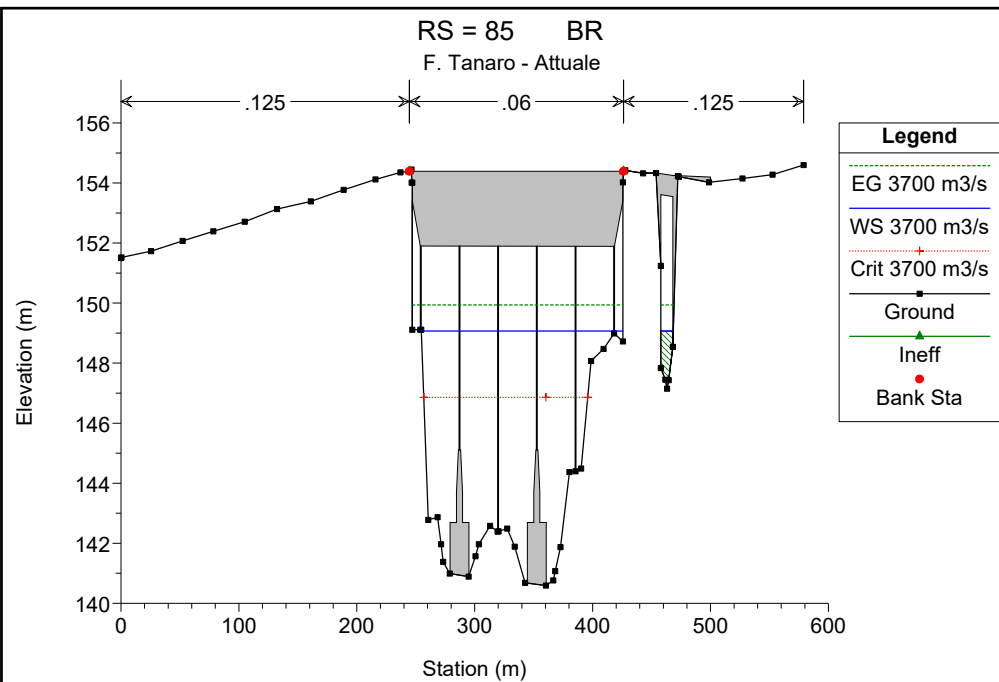


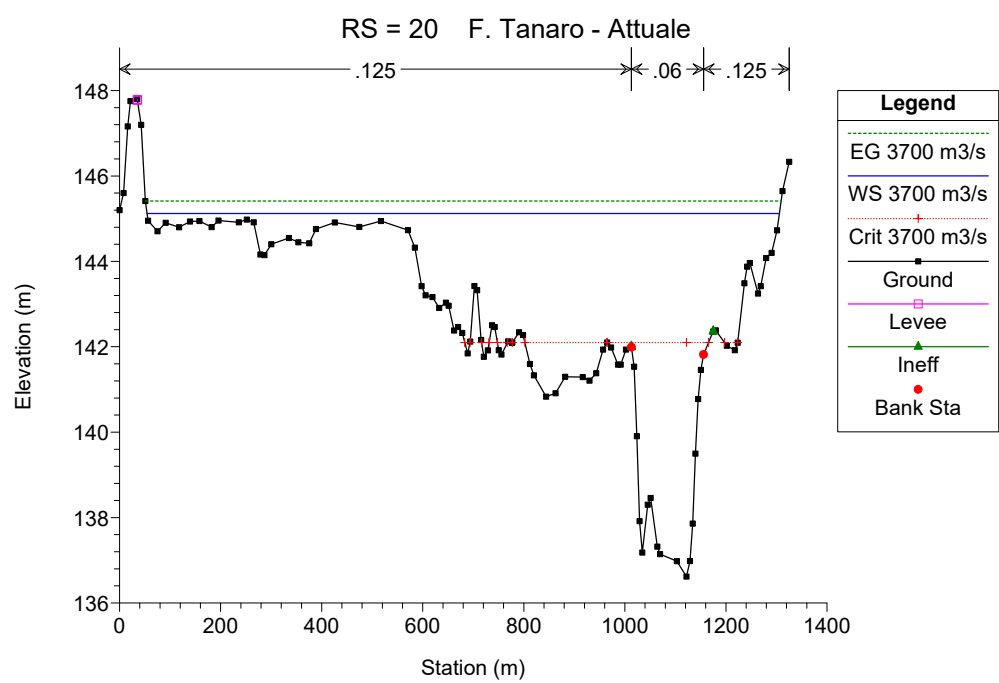
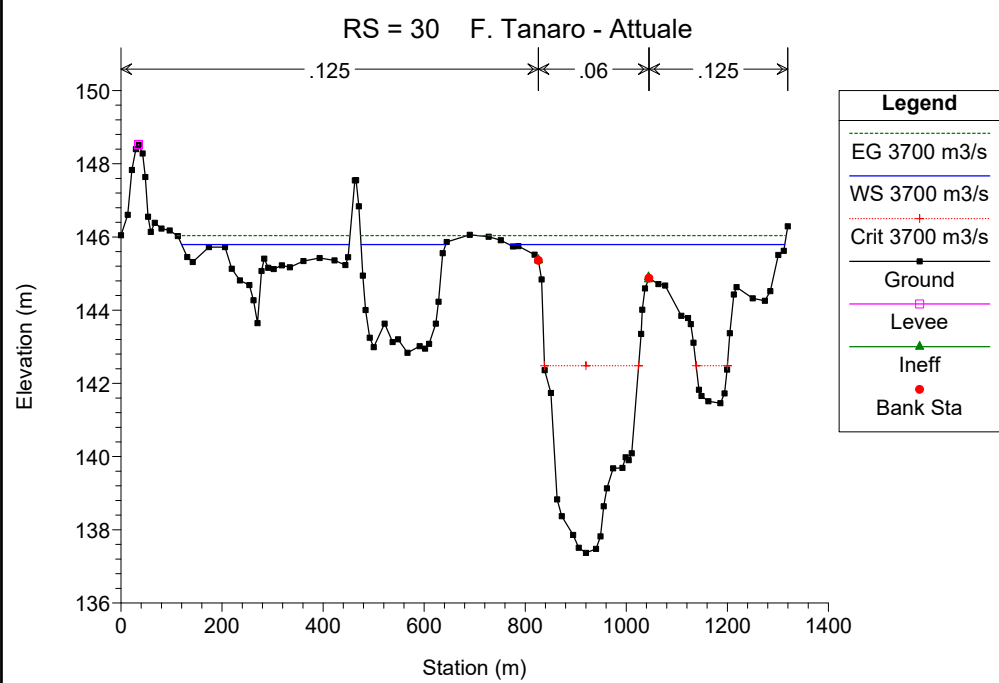
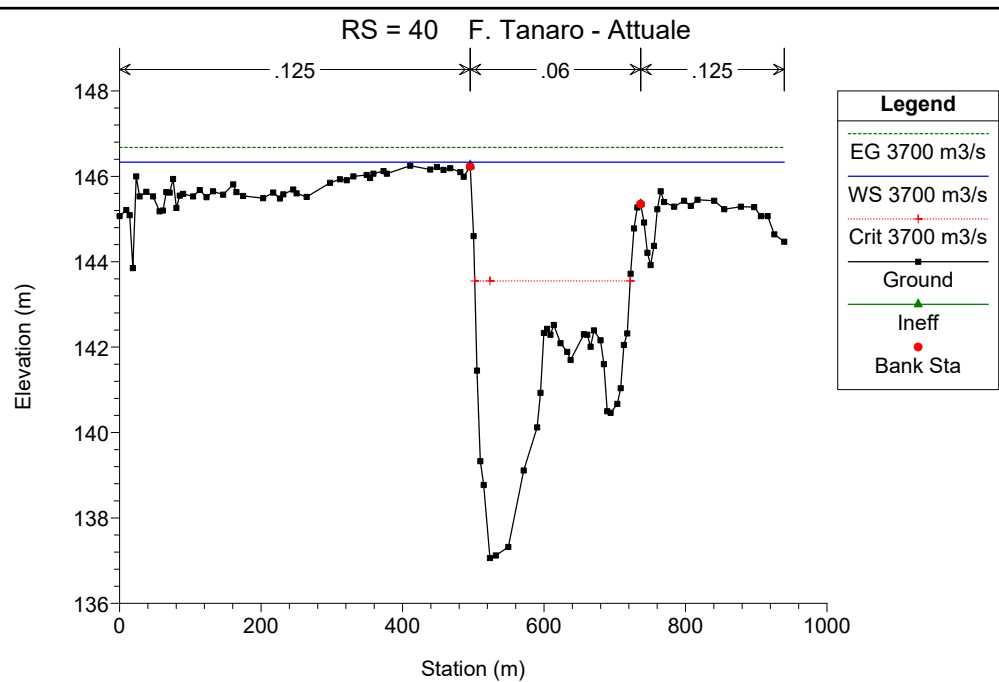
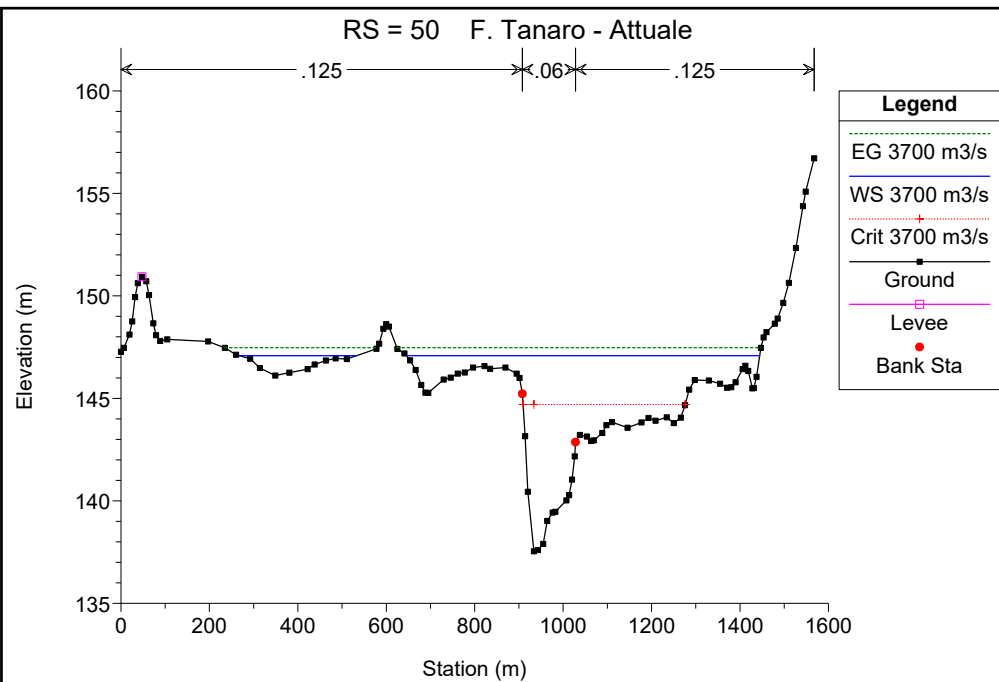




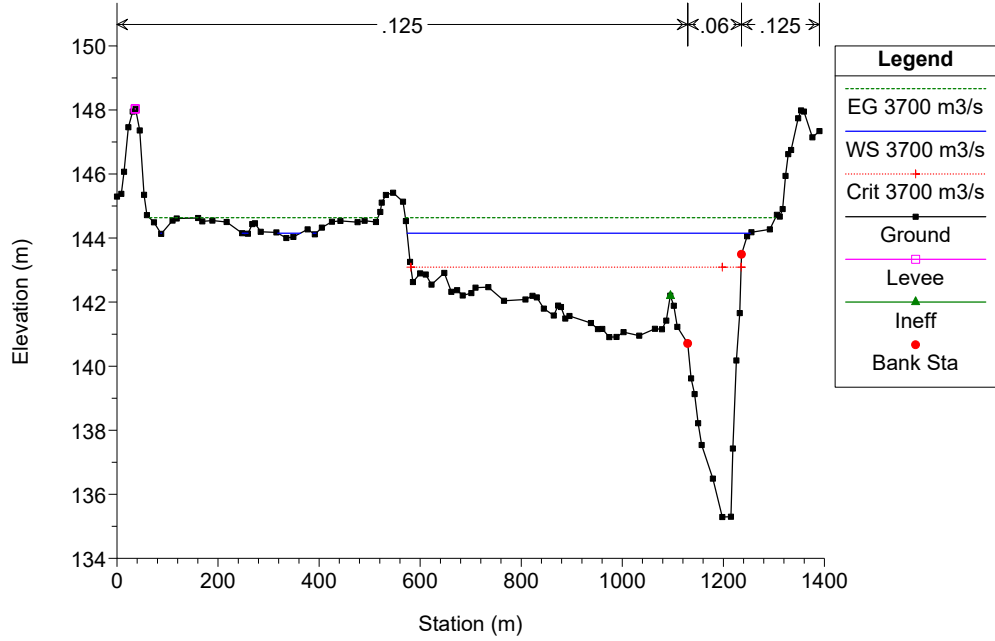








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 1: PROGETTO CON SBARRAMENTO MOBILE ABBASSATO**

SIMULAZIONE 22

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3700	Portata utilizzata per il dimensionamento delle opere di difesa di Alba
F. Tanaro valle Riddone	3710	
F. Tanaro valle Cherasca	3724	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s

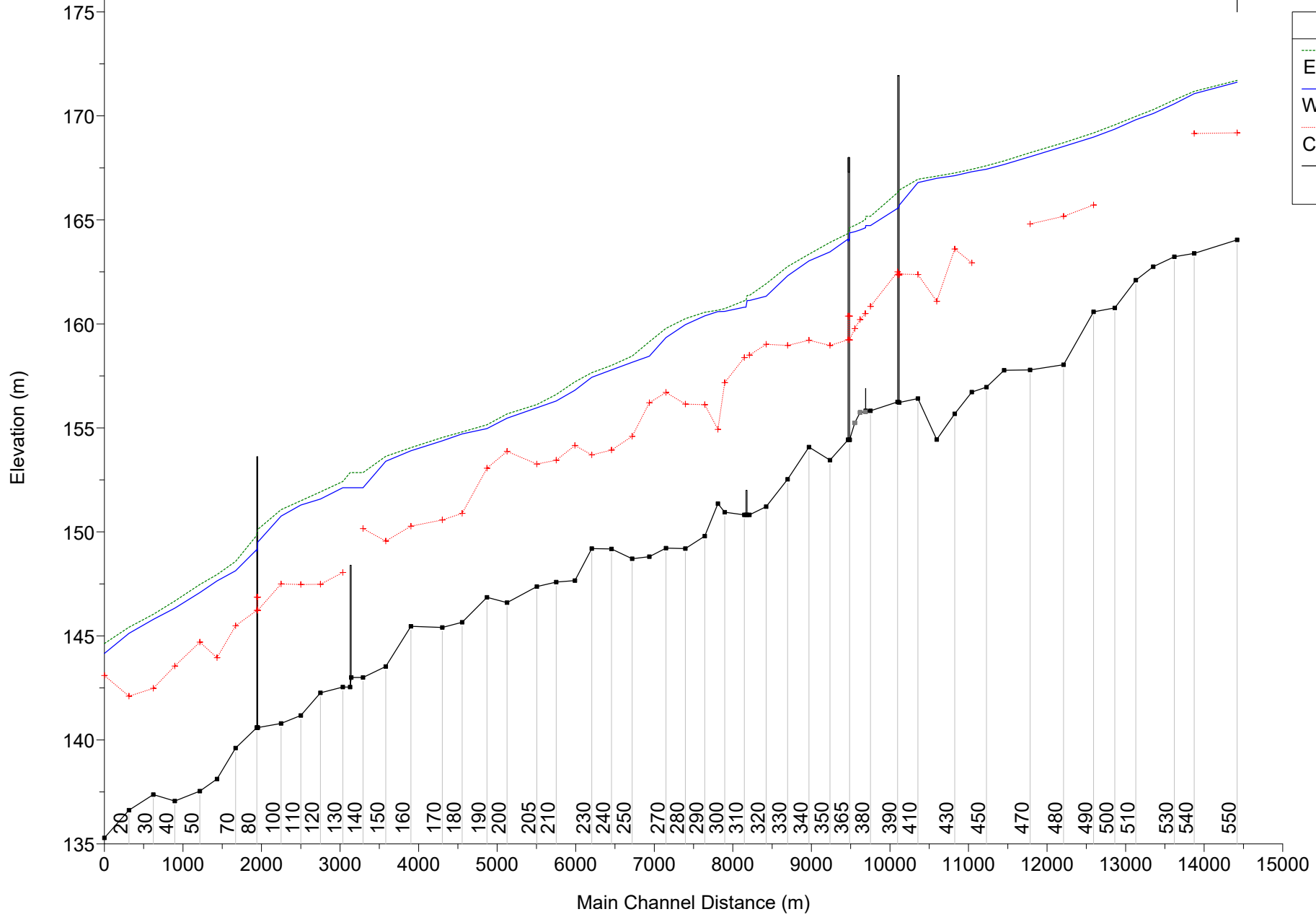
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	3700 m3/s	3700.00	164.04	171.62	169.19	171.71	0.001070	1.55	3770.83	1216.18	0.23
1	540	3700 m3/s	3700.00	163.39	171.07	169.15	171.18	0.001481	2.11	3904.53	1132.10	0.27
1	530	3700 m3/s	3700.00	163.23	170.58		170.77	0.001782	2.27	2669.76	779.63	0.30
1	520	3700 m3/s	3700.00	162.75	170.11		170.31	0.001806	2.36	3174.88	1104.68	0.30
1	510	3700 m3/s	3700.00	162.10	169.81		169.98	0.001650	2.16	2950.89	847.96	0.29
1	500	3700 m3/s	3700.00	160.77	169.37		169.57	0.001502	2.29	2552.88	572.68	0.28
1	490	3700 m3/s	3700.00	160.58	168.98	165.71	169.18	0.001442	2.14	2396.86	563.49	0.27
1	480	3700 m3/s	3700.00	158.04	168.53	165.17	168.71	0.001190	2.11	3242.38	1083.17	0.25
1	470	3700 m3/s	3700.00	157.79	168.04	164.81	168.24	0.001326	2.29	2632.57	621.45	0.27
1	460	3700 m3/s	3700.00	157.77	167.66		167.84	0.001056	2.10	3331.58	1140.26	0.24
1	450	3700 m3/s	3700.00	156.96	167.44		167.61	0.000984	2.06	3332.85	1049.15	0.23
1	440	3700 m3/s	3700.00	156.72	167.32	162.94	167.43	0.000743	1.85	3732.51	808.39	0.20
1	430	3700 m3/s	3700.00	155.68	167.13	163.60	167.26	0.000899	2.04	3510.61	669.78	0.22
1	420	3700 m3/s	3700.00	154.44	167.00	161.08	167.11	0.000532	1.73	3866.53	694.97	0.18
1	410	3700 m3/s	3700.00	156.41	166.80	162.37	166.96	0.000897	2.07	2983.38	557.25	0.23
1	400	3700 m3/s	3700.00	156.22	165.71	162.40	166.44	0.003514	3.90	1108.21	179.92	0.43
1	395		Bridge									
1	390	3700 m3/s	3700.00	156.25	165.56	162.50	166.32	0.003753	3.99	1082.40	179.60	0.44
1	380	3700 m3/s	3700.00	155.82	164.74	160.84	165.18	0.002208	2.96	1380.12	290.10	0.34
1	379		Inl Struct									
1	370	3700 m3/s	3700.00	154.43	164.38	159.23	164.63	0.001153	2.22	1668.83	209.84	0.25
1	365		Bridge									
1	360	3700 m3/s	3700.00	154.43	164.08	159.24	164.35	0.001301	2.30	1606.35	209.01	0.27
1	350	3700 m3/s	3700.00	153.45	163.47	158.96	163.92	0.002100	3.01	1376.12	297.78	0.34
1	340	3700 m3/s	3710.00	154.08	163.04	159.22	163.36	0.001826	2.58	1725.04	410.06	0.31
1	330	3700 m3/s	3710.00	152.53	162.32	158.98	162.77	0.002531	3.07	1617.86	442.12	0.37
1	320	3700 m3/s	3710.00	151.21	161.34	159.02	161.94	0.003397	3.87	1823.99	732.98	0.43
1	315	3700 m3/s	3710.00	150.82	161.14	158.51	161.38	0.001650	2.73	3195.67	1151.10	0.30
1	312.5		Inl Struct									
1	310	3700 m3/s	3710.00	150.82	160.83	158.39	161.13	0.002082	2.99	2726.51	977.57	0.34
1	300	3700 m3/s	3724.00	150.95	160.62	157.19	160.76	0.001004	1.92	3506.95	1133.39	0.23
1	295	3700 m3/s	3724.00	151.36	160.59	154.84	160.67	0.000482	1.47	4250.50	1220.01	0.16
1	290	3700 m3/s	3724.00	149.62	160.41	155.65	160.57	0.000901	1.91	3052.89	1140.56	0.22
1	280	3700 m3/s	3724.00	149.20	160.01	156.15	160.29	0.001470	2.61	2798.71	1128.73	0.29
1	270	3700 m3/s	3724.00	149.22	159.36	156.73	159.82	0.002511	3.36	2314.96	1067.62	0.37
1	260	3700 m3/s	3724.00	148.81	158.47	156.22	159.16	0.003819	4.00	1548.91	715.34	0.46
1	250	3700 m3/s	3724.00	148.71	158.17	154.62	158.48	0.001962	2.71	2334.17	752.17	0.32
1	240	3700 m3/s	3724.00	149.18	157.81	153.95	158.03	0.001379	2.34	2752.84	802.43	0.27
1	230	3700 m3/s	3724.00	149.20	157.45	153.71	157.67	0.001428	2.28	2430.37	866.25	0.28
1	220	3700 m3/s	3724.00	147.66	156.83	154.16	157.24	0.002726	3.19	1908.29	803.19	0.38

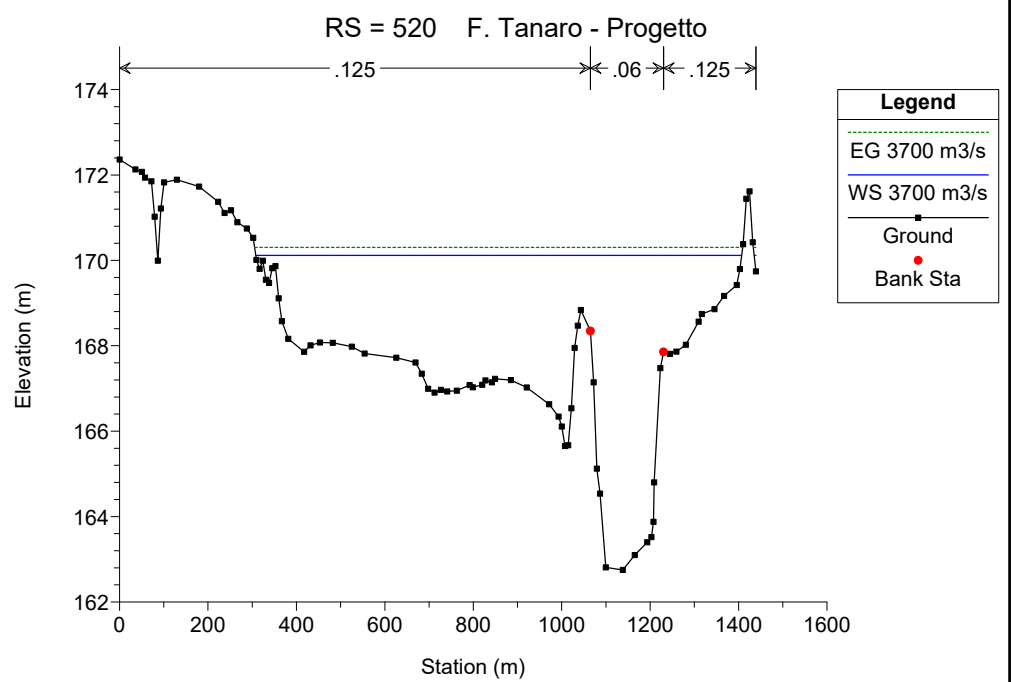
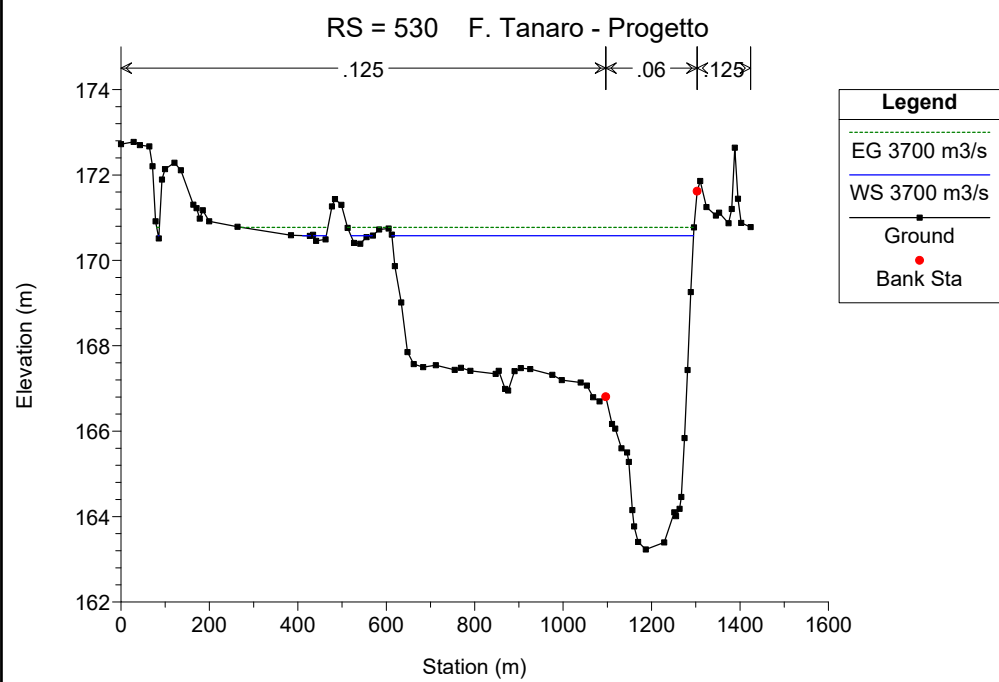
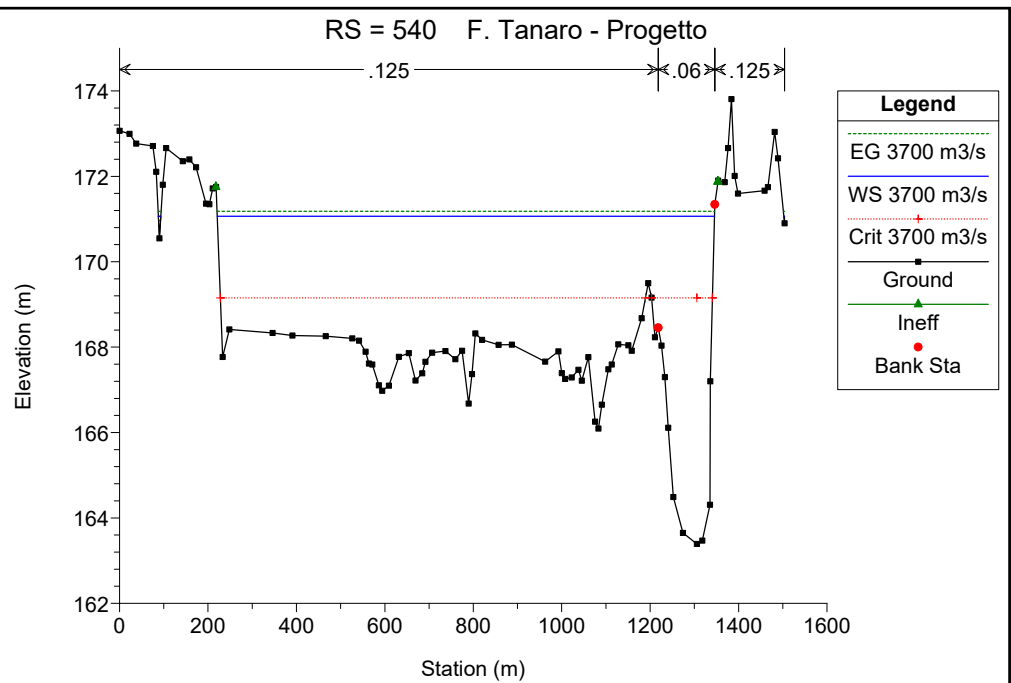
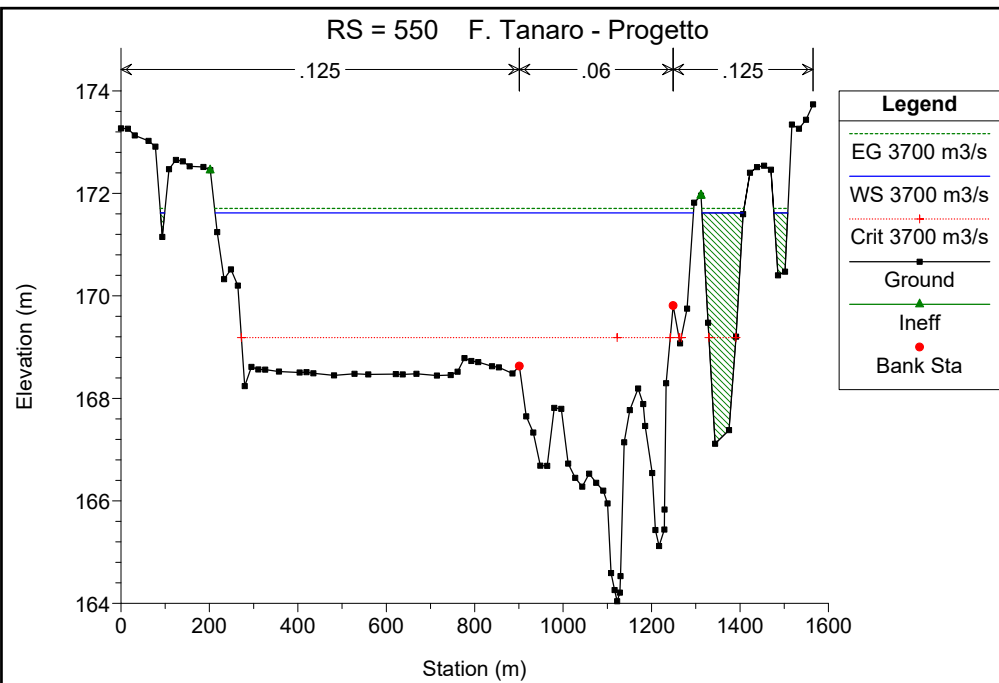
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s (Continued)

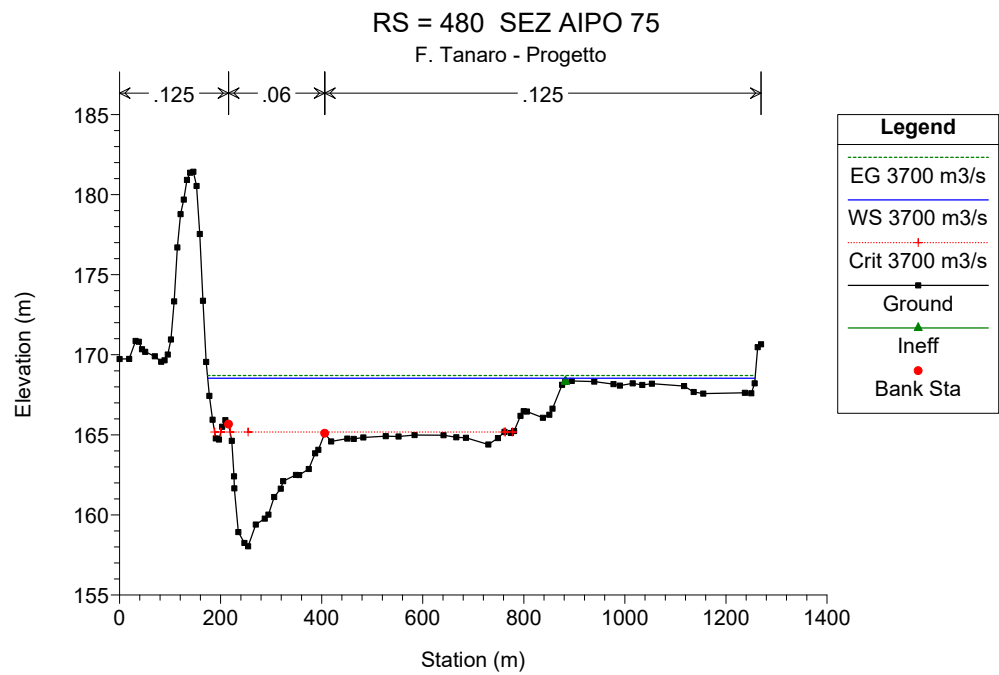
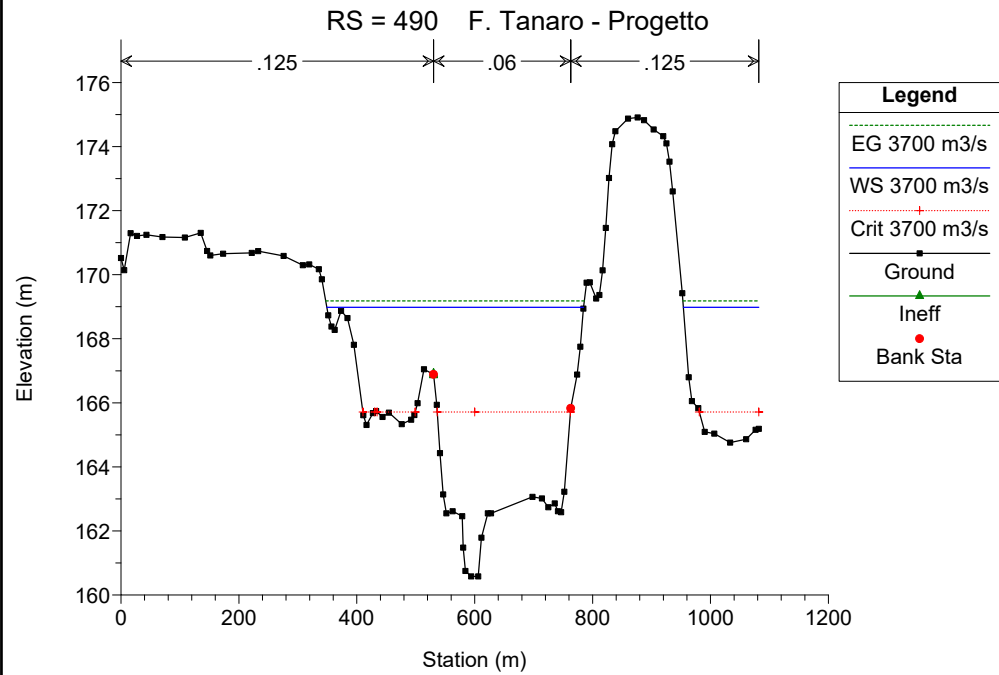
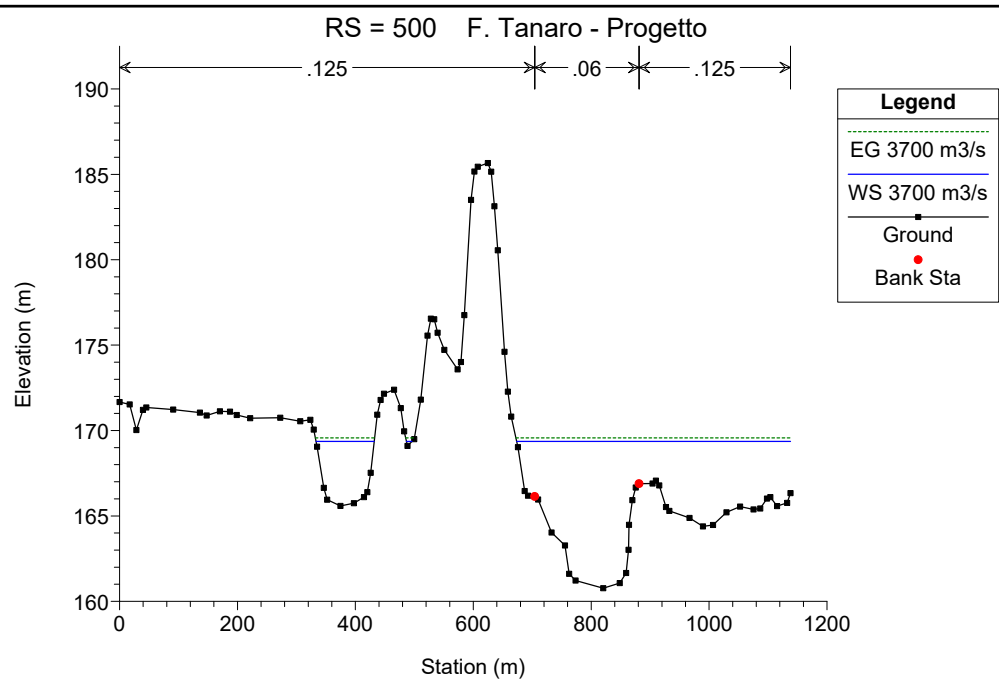
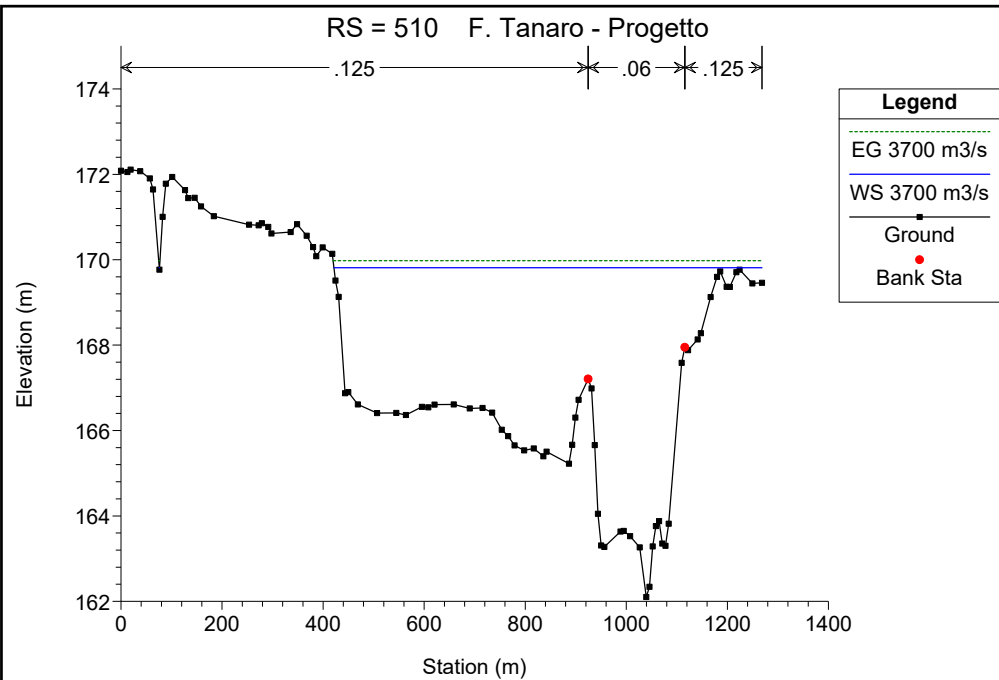
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	3700 m3/s	3724.00	147.59	156.31	153.46	156.62	0.002155	2.67	2188.08	821.70	0.34
1	205	3700 m3/s	3724.00	147.37	155.98	153.28	156.14	0.001395	2.06	3410.29	1196.92	0.27
1	200	3700 m3/s	3724.00	146.60	155.48	153.88	155.69	0.001945	2.63	3270.55	1154.87	0.32
1	190	3700 m3/s	3724.00	146.85	154.98	153.07	155.17	0.001961	2.27	3237.92	1302.67	0.31
1	180	3700 m3/s	3724.00	145.66	154.73	150.91	154.82	0.000757	1.50	4245.28	1450.33	0.20
1	170	3700 m3/s	3724.00	145.40	154.40	150.59	154.55	0.001396	1.98	3305.47	1354.59	0.26
1	160	3700 m3/s	3724.00	145.46	153.92	150.28	154.07	0.001167	1.91	3432.45	1393.43	0.25
1	150	3700 m3/s	3724.00	143.53	153.41	149.58	153.65	0.001504	2.40	3025.21	1344.27	0.28
1	140	3700 m3/s	3724.00	143.00	152.14	150.17	152.87	0.005542	3.93	1575.38	1277.24	0.53
1	135		Inl Struct									
1	130	3700 m3/s	3724.00	142.54	152.14	148.05	152.45	0.001699	2.61	2511.75	1197.33	0.30
1	120	3700 m3/s	3724.00	142.27	151.60	147.50	151.95	0.001834	2.77	2298.28	1076.36	0.32
1	110	3700 m3/s	3724.00	141.17	151.31	147.49	151.52	0.001308	2.33	2881.10	770.63	0.27
1	100	3700 m3/s	3724.00	140.79	150.78	147.52	151.09	0.002159	2.62	1994.29	622.37	0.33
1	90	3700 m3/s	3724.00	140.59	149.53	146.24	150.14	0.004138	3.47	1072.97	189.52	0.45
1	85		Bridge									
1	80	3700 m3/s	3724.00	140.59	149.17	146.24	149.87	0.005052	3.69	1009.07	189.26	0.50
1	70	3700 m3/s	3724.00	139.61	148.15	145.51	148.60	0.003622	3.17	1490.96	332.90	0.43
1	60	3700 m3/s	3724.00	138.12	147.66	143.97	147.97	0.001799	2.74	2649.75	1150.88	0.31
1	50	3700 m3/s	3724.00	137.54	147.10	144.72	147.49	0.002503	3.14	2325.45	1070.99	0.37
1	40	3700 m3/s	3724.00	137.06	146.35	143.56	146.69	0.002706	2.67	1853.06	939.65	0.36
1	30	3700 m3/s	3724.00	137.37	145.81	142.50	146.05	0.001903	2.39	2447.67	1047.58	0.31
1	20	3700 m3/s	3724.00	136.62	145.14	142.10	145.43	0.002070	2.76	2857.01	1251.88	0.33
1	10	3700 m3/s	3724.00	135.29	144.17	143.10	144.65	0.004002	3.66	2008.35	755.11	0.46

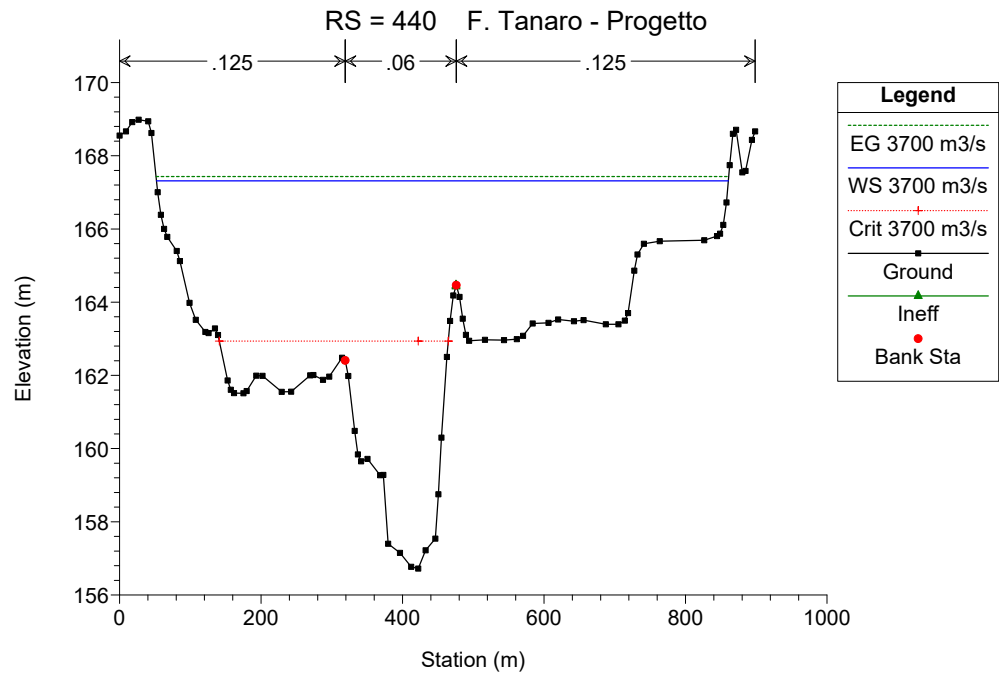
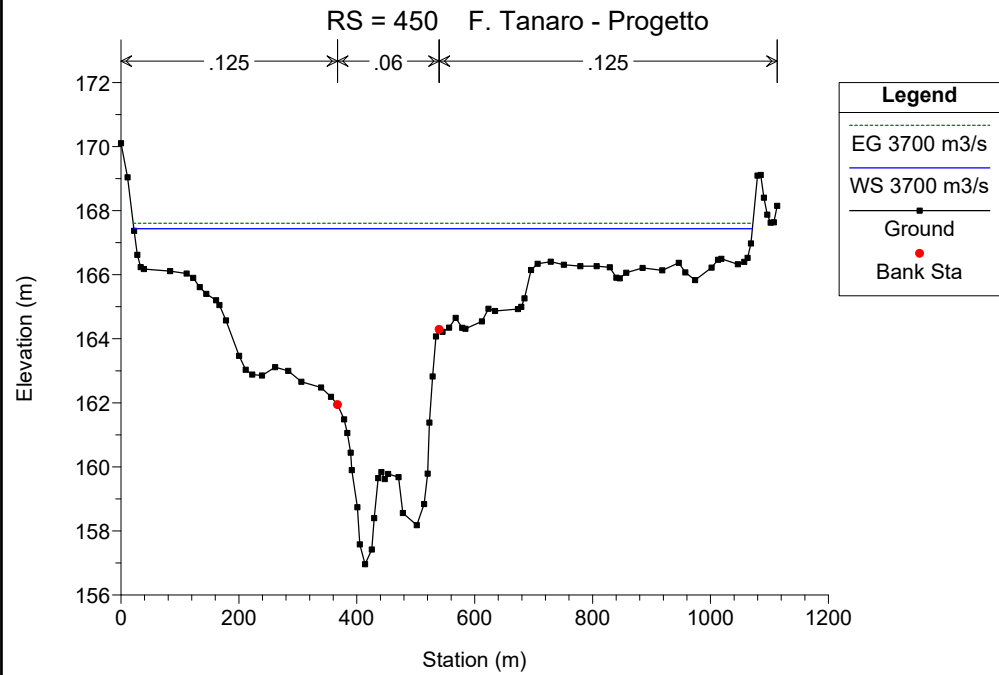
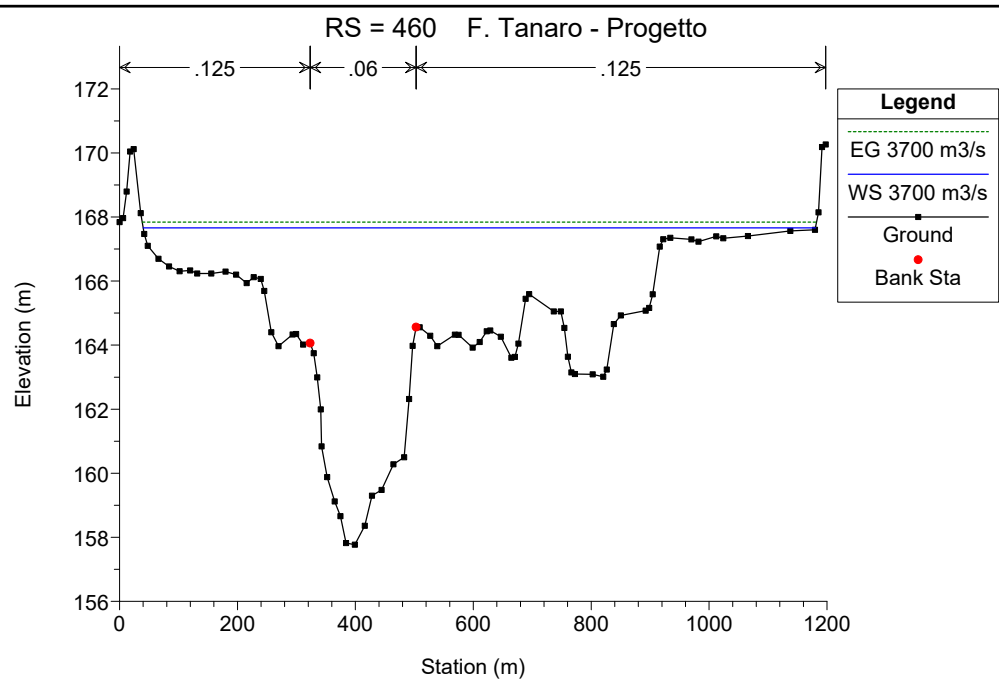
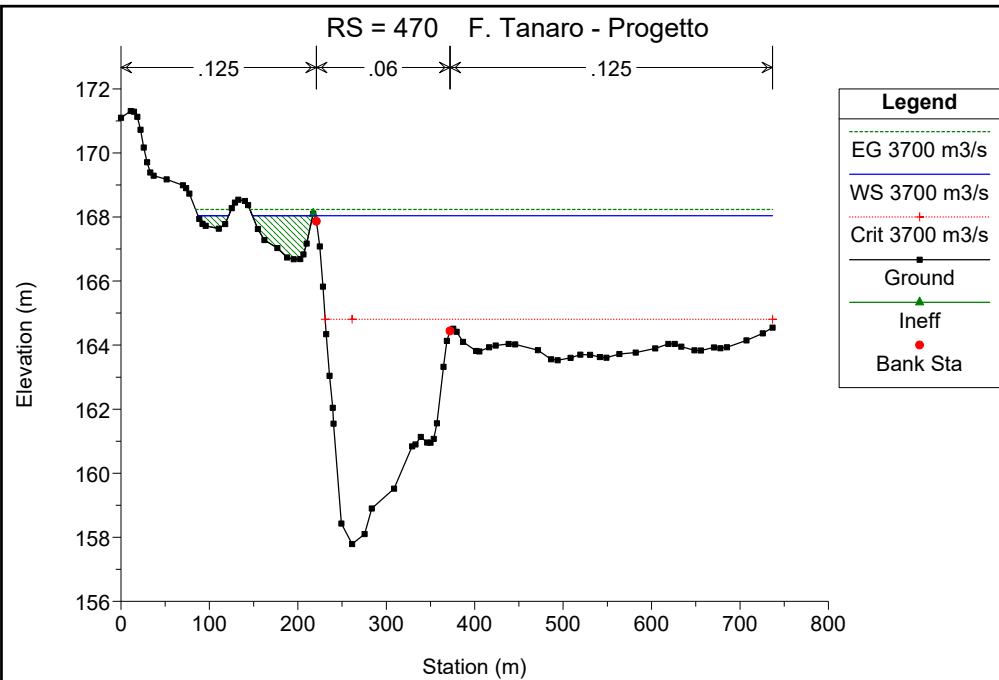
F. Tanaro - Progetto

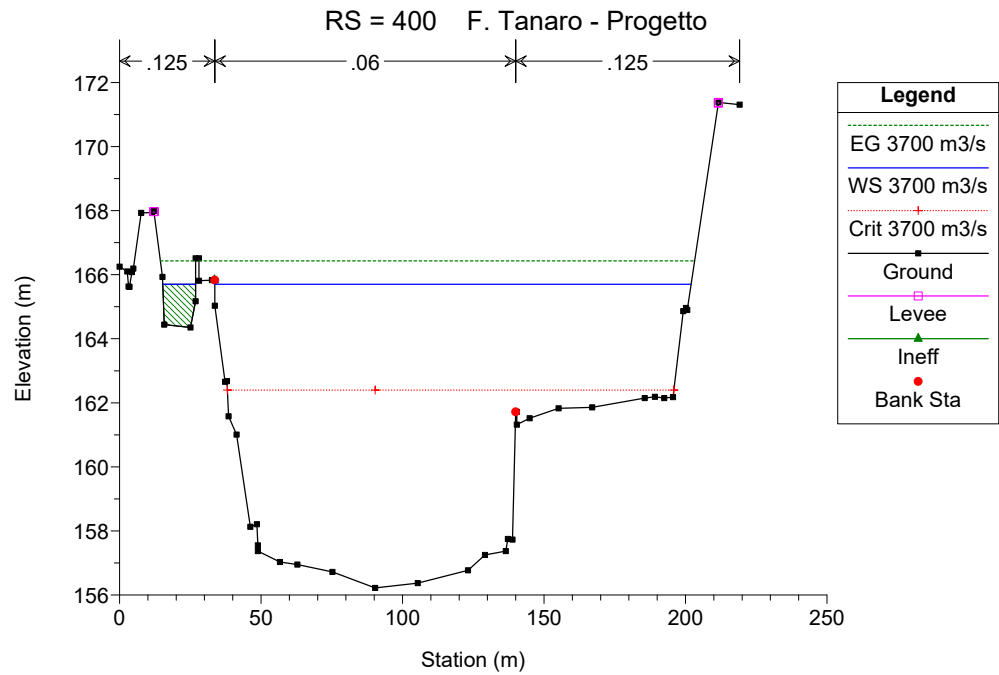
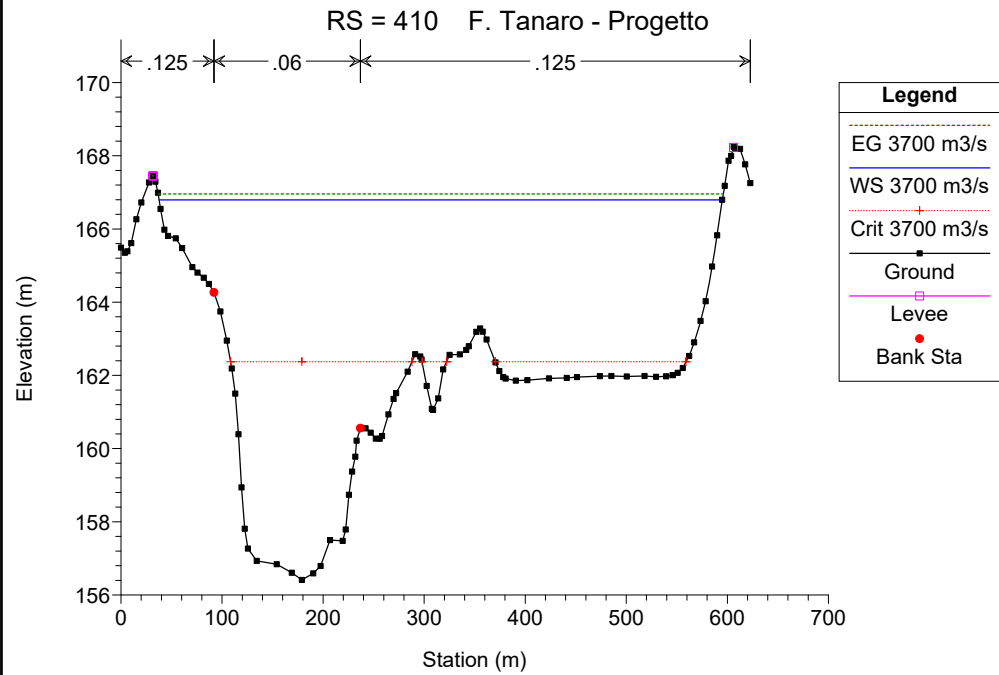
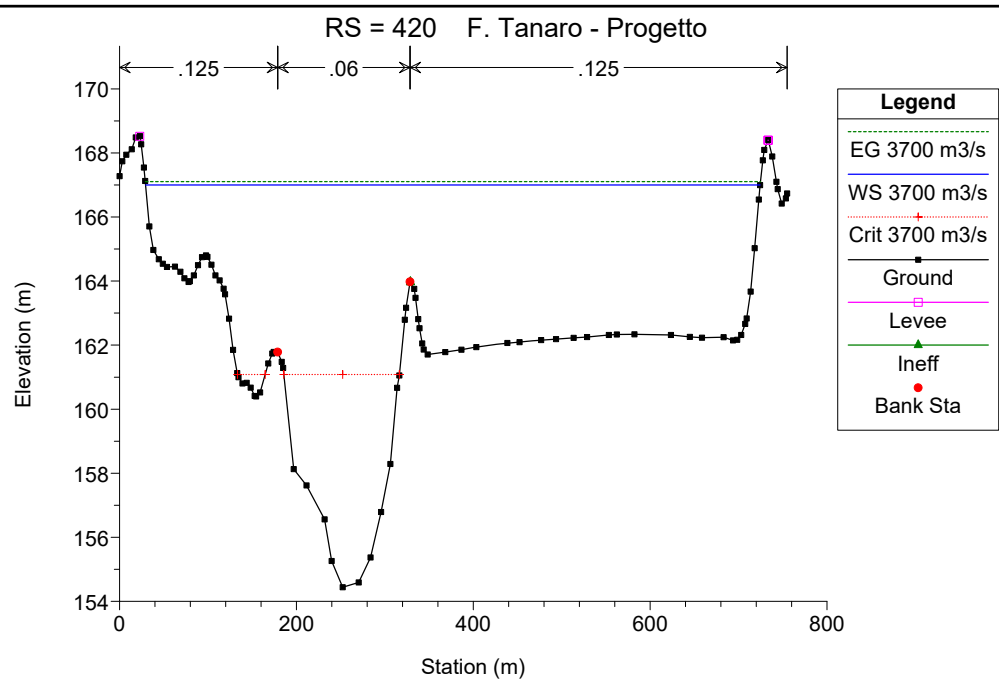
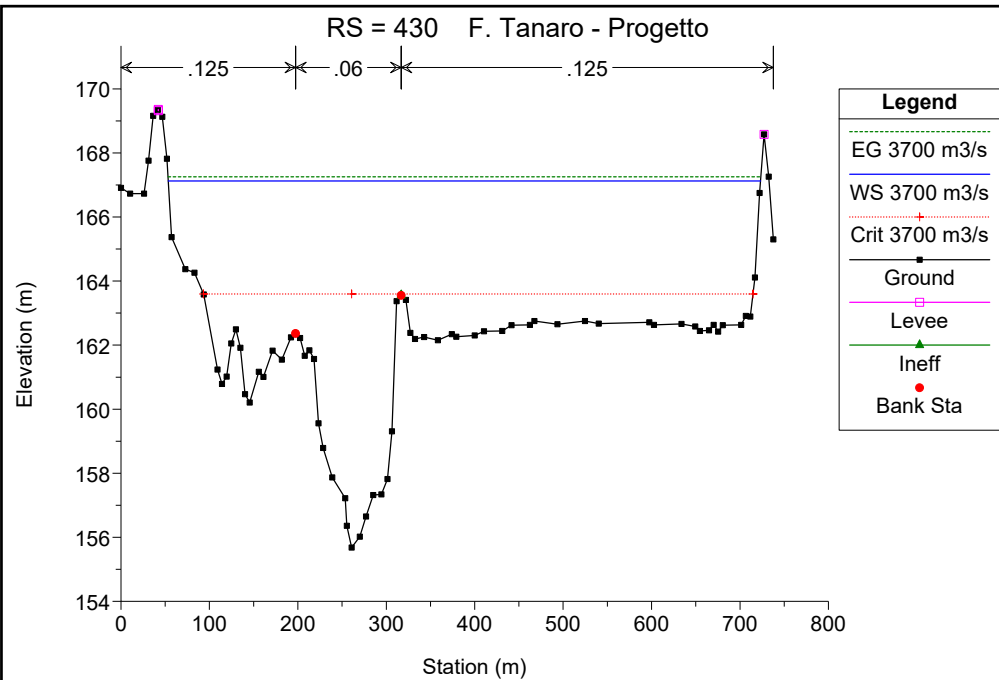
Tanaro 1

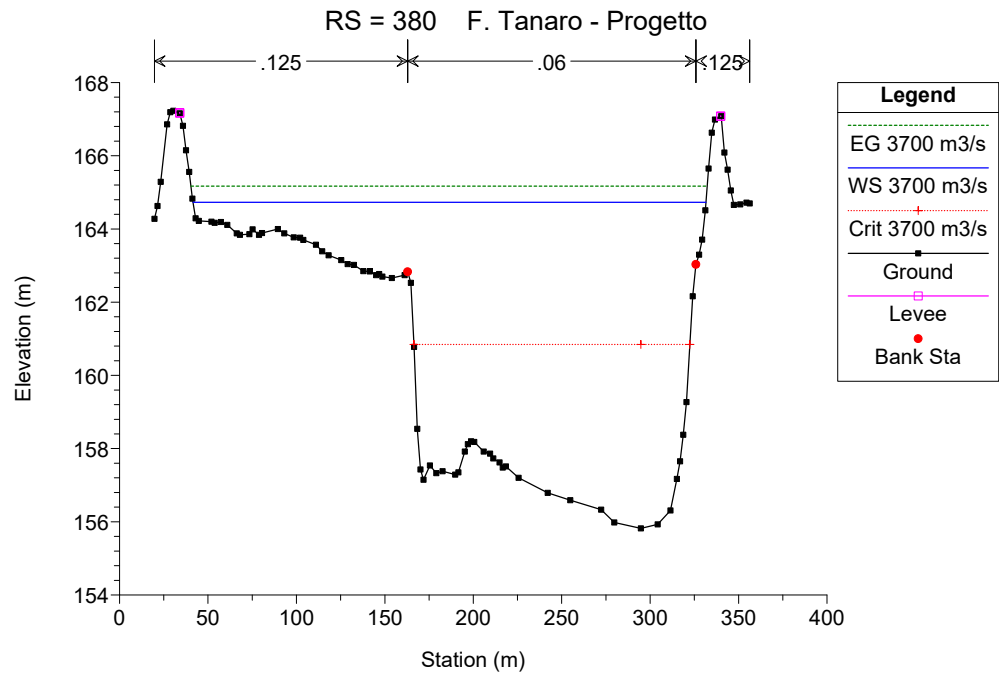
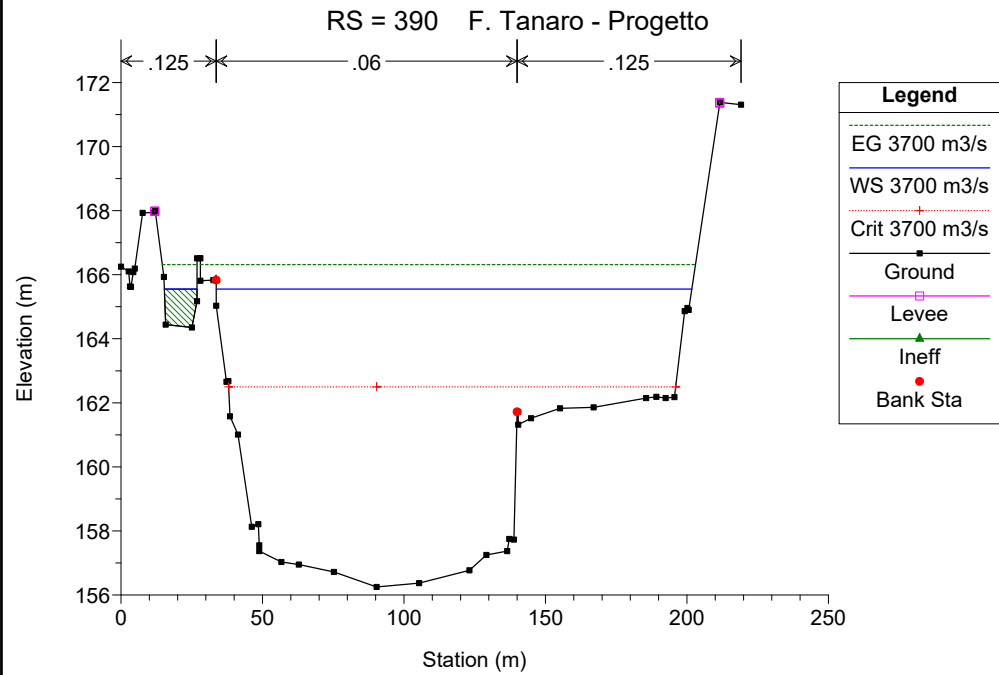
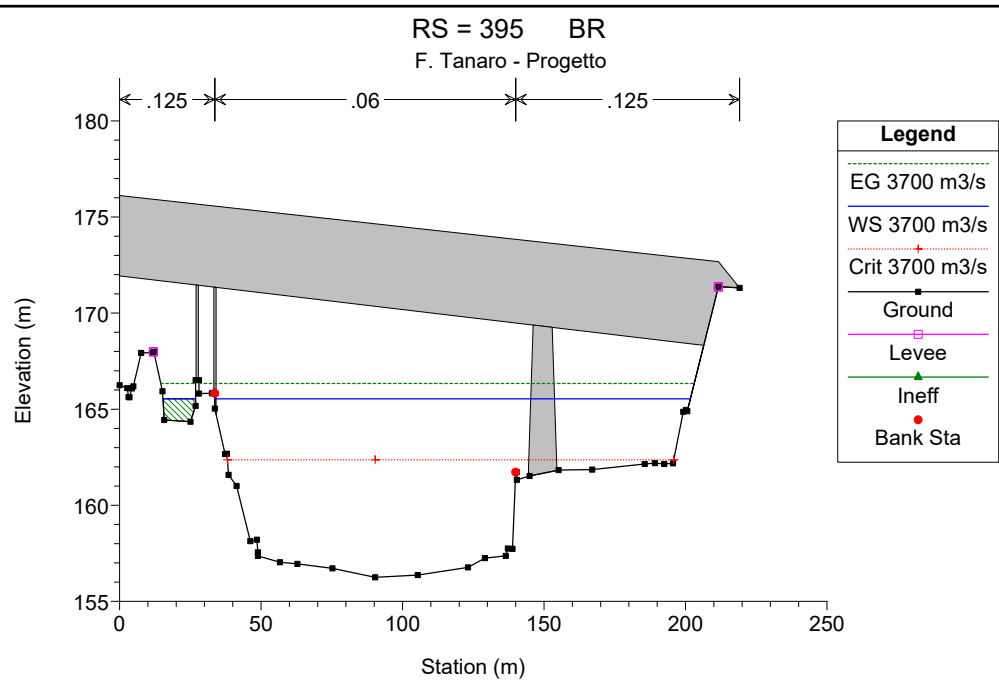
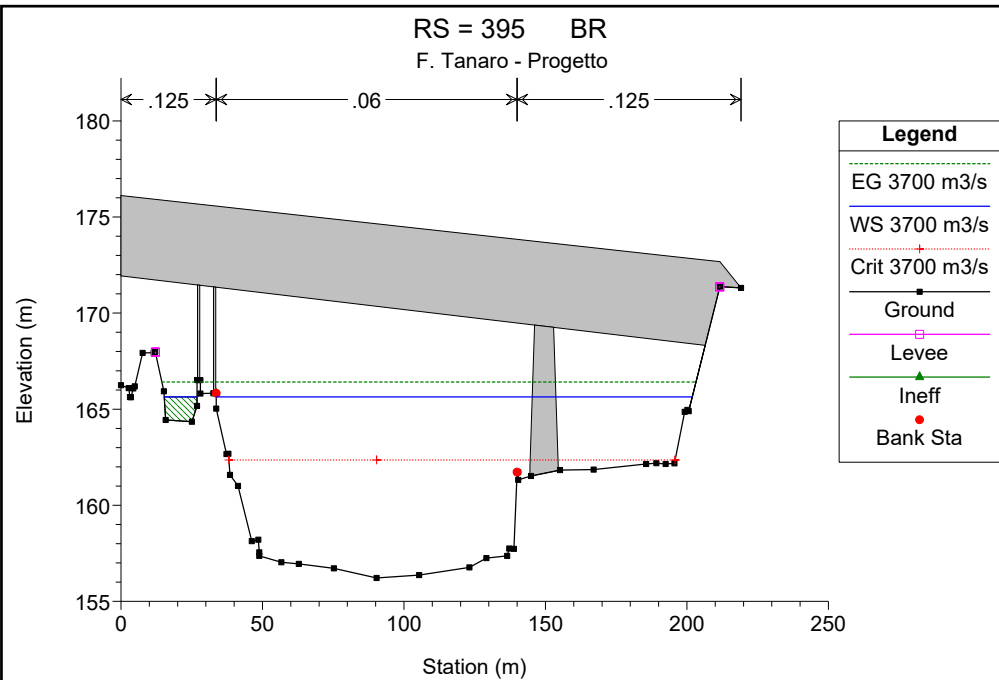


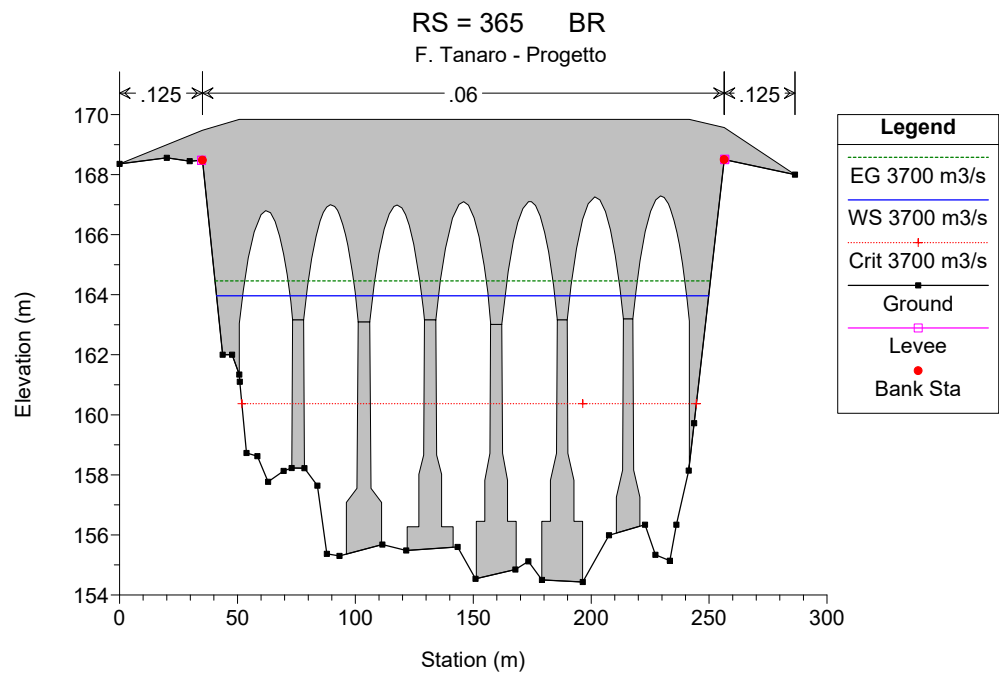
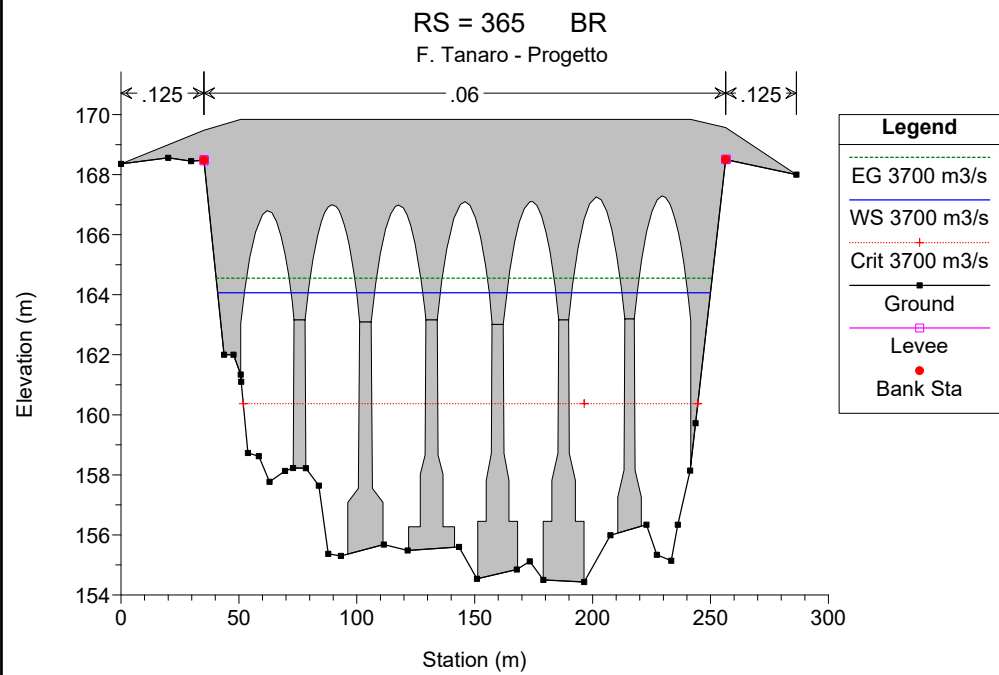
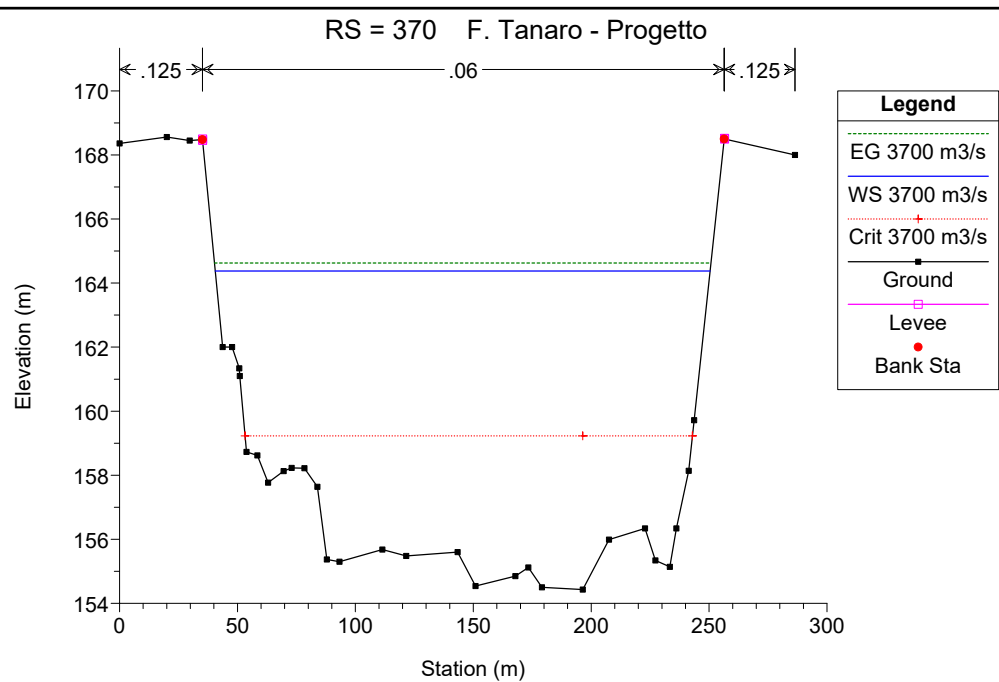
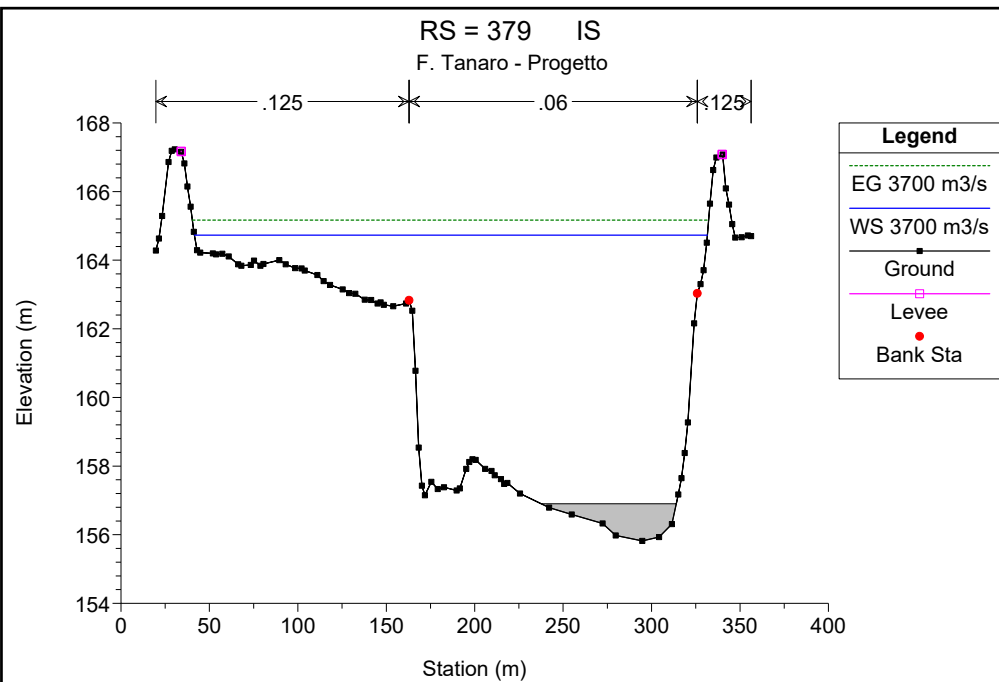


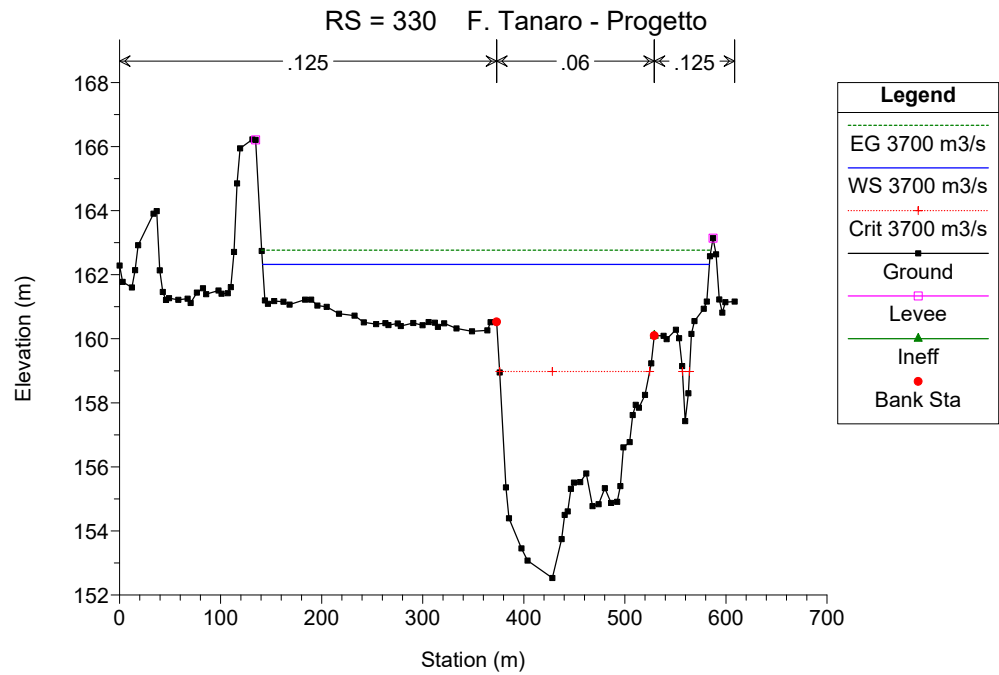
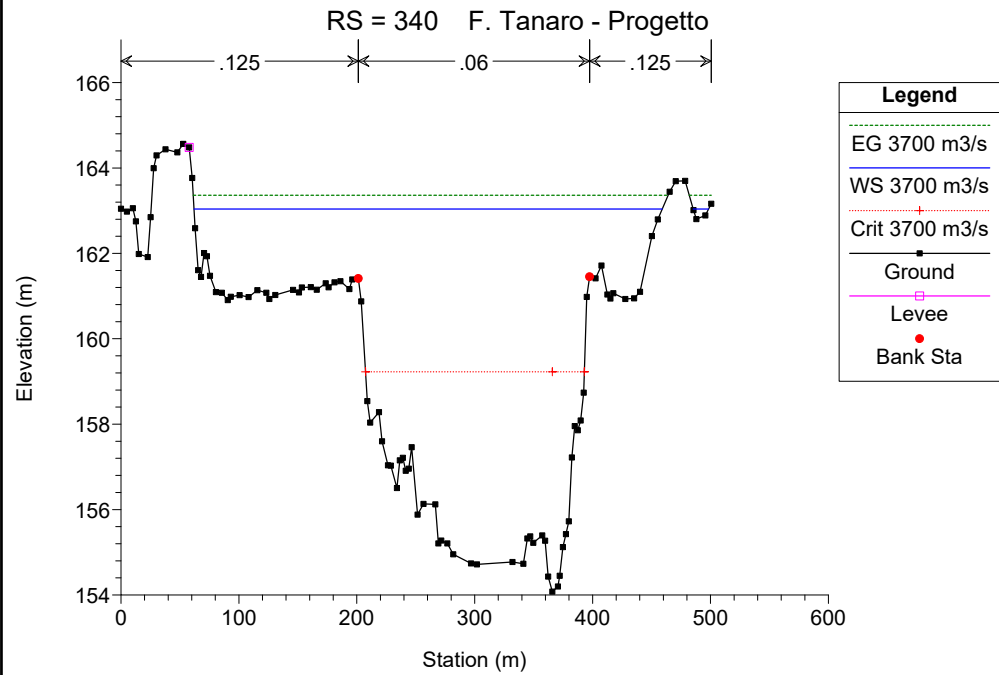
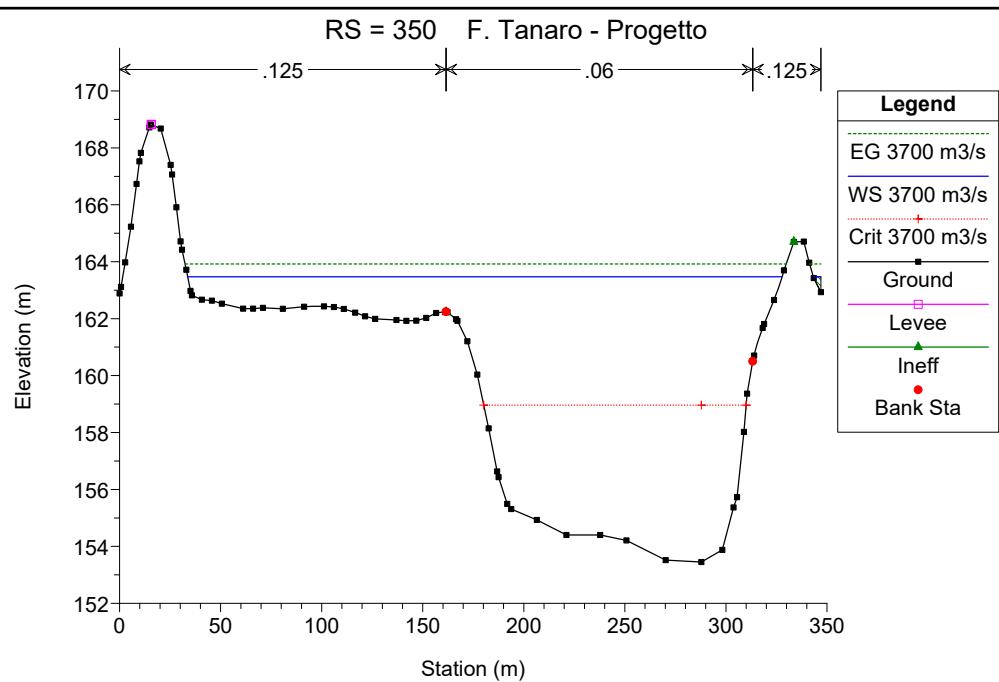
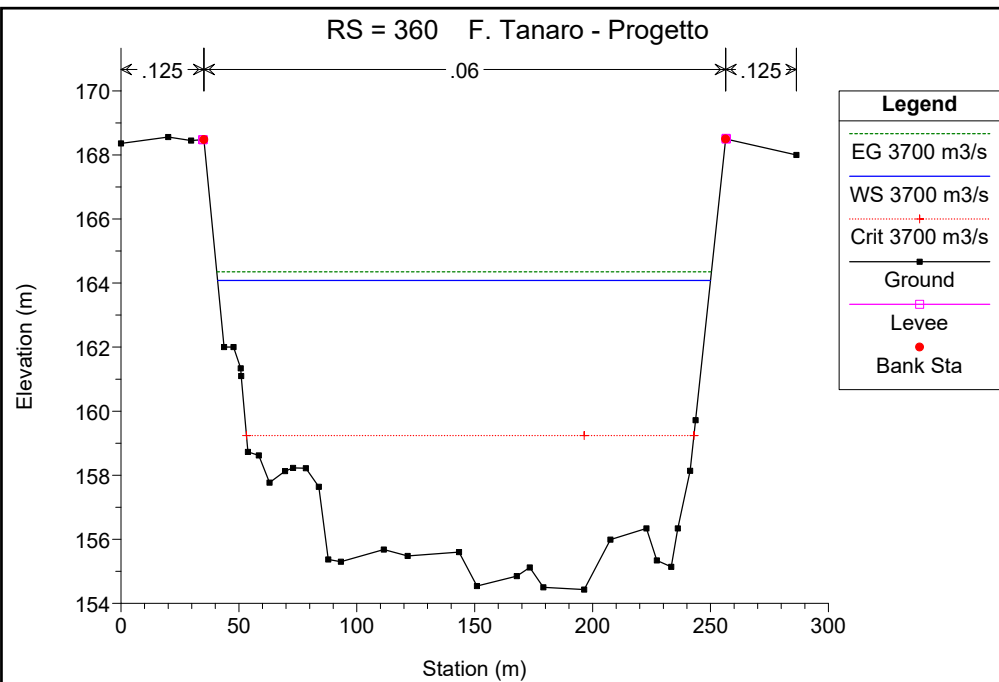


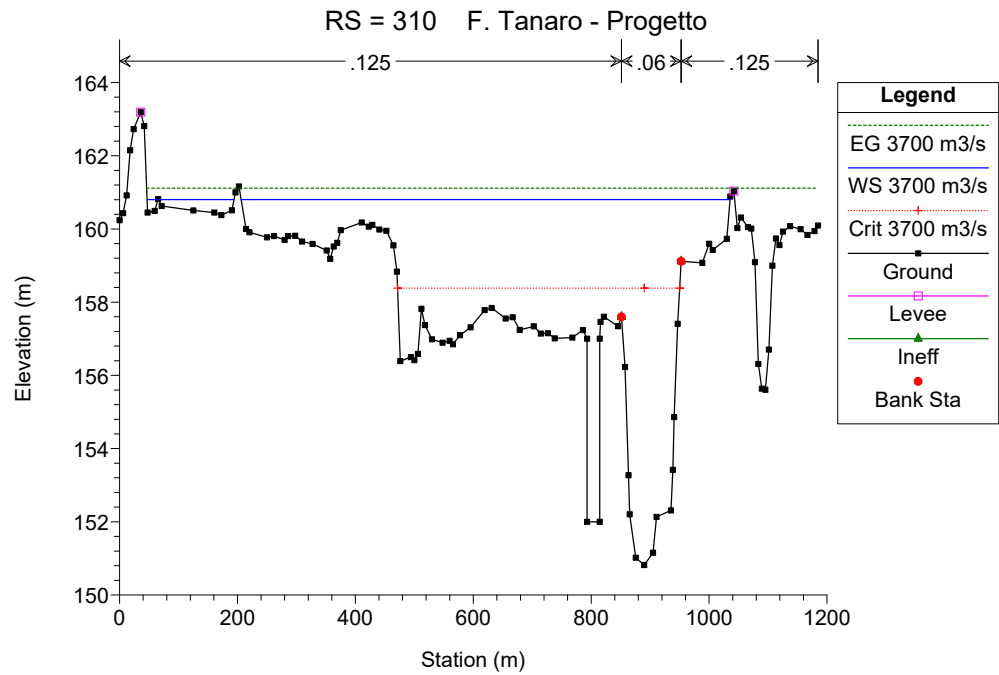
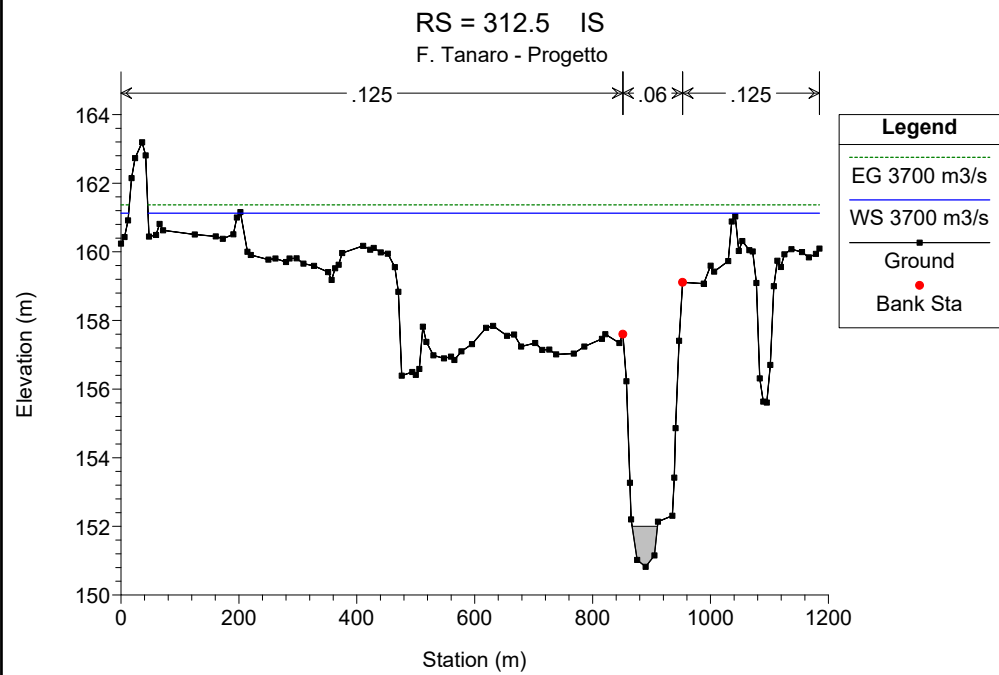
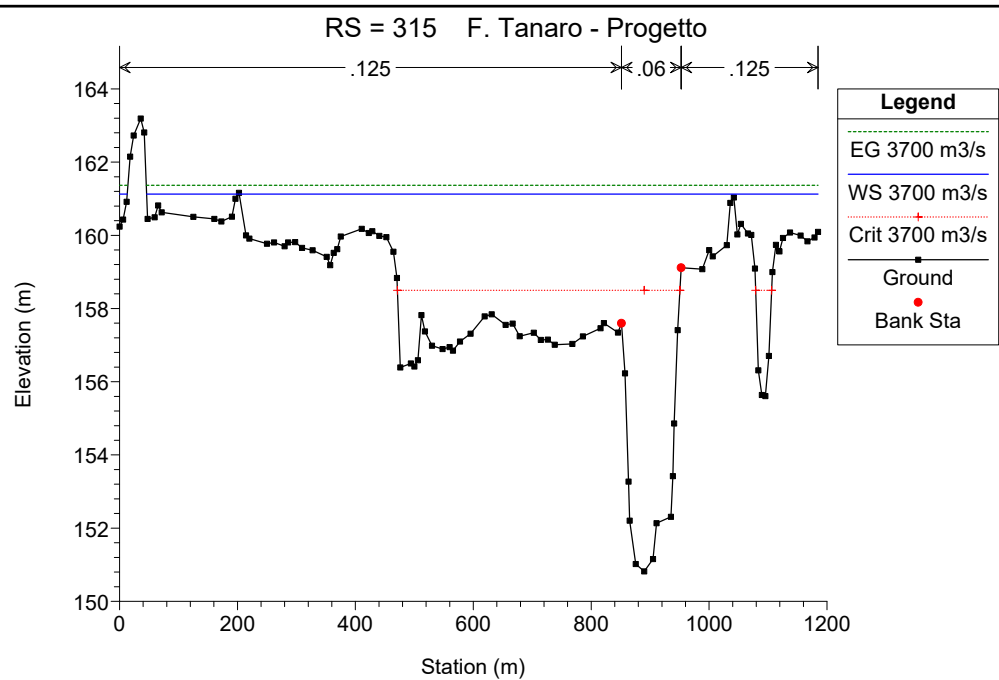
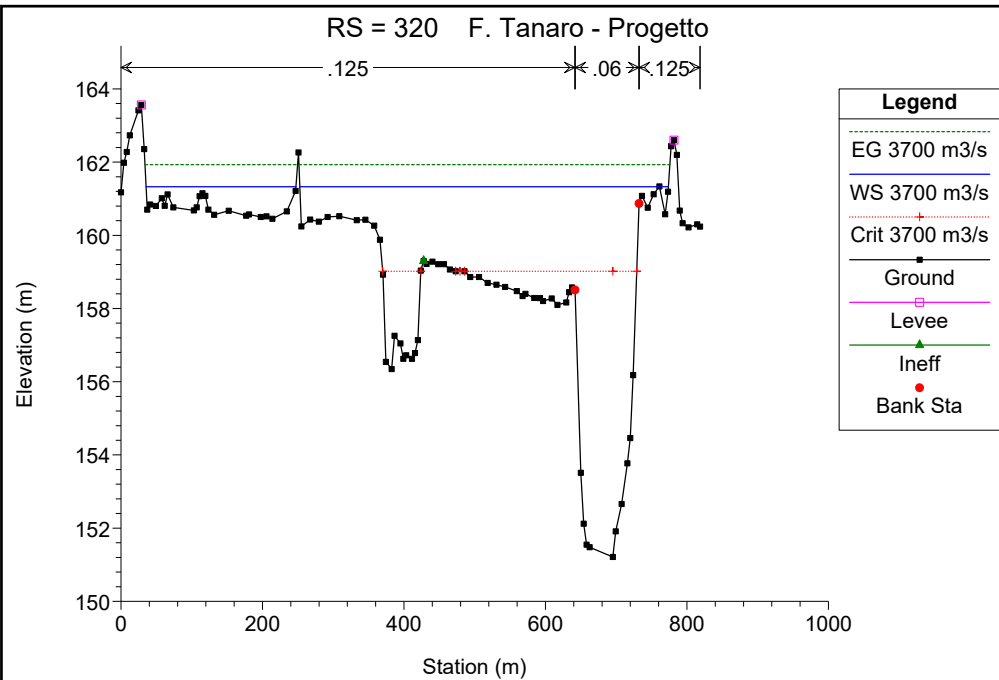


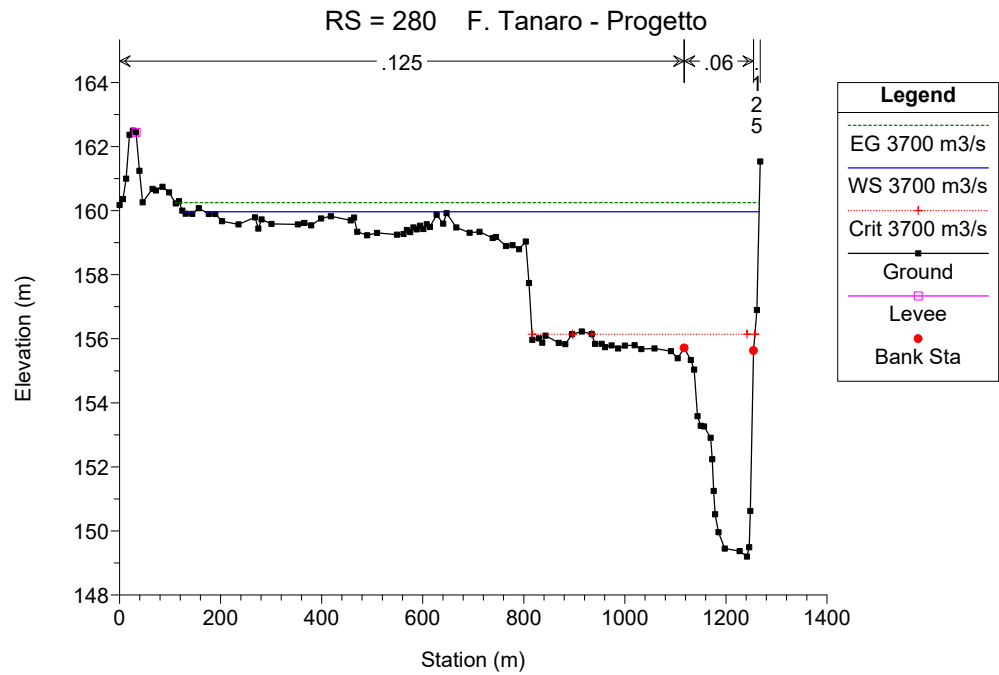
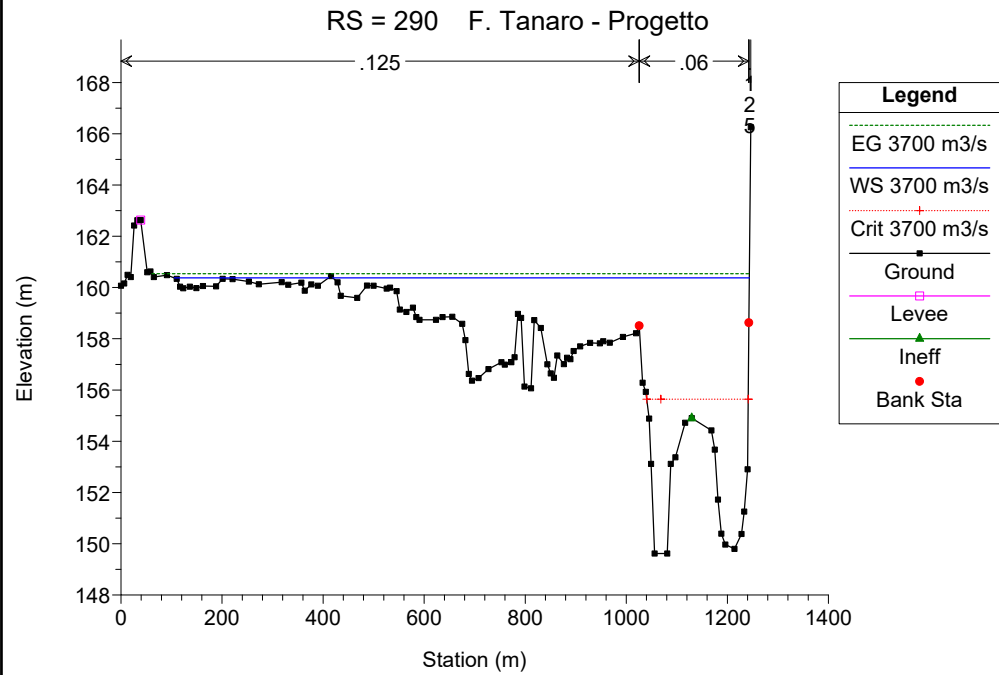
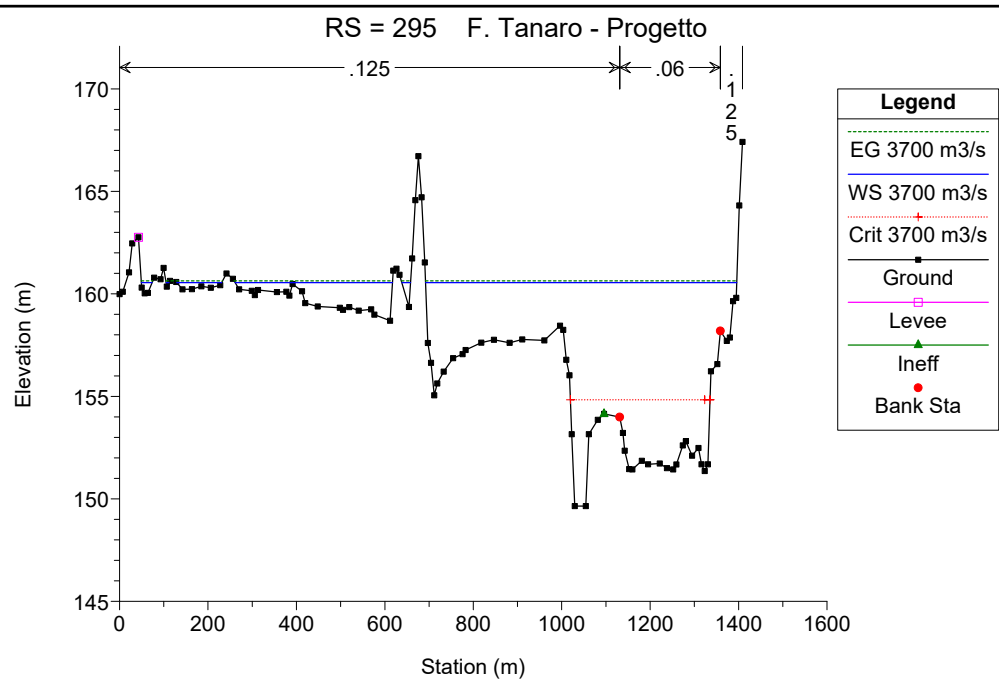
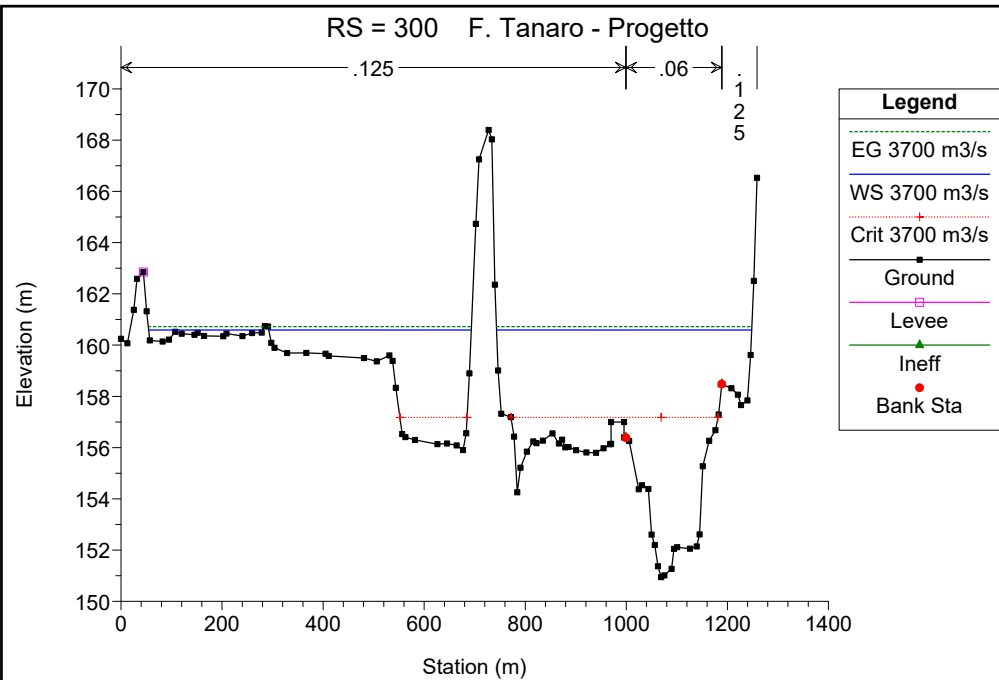


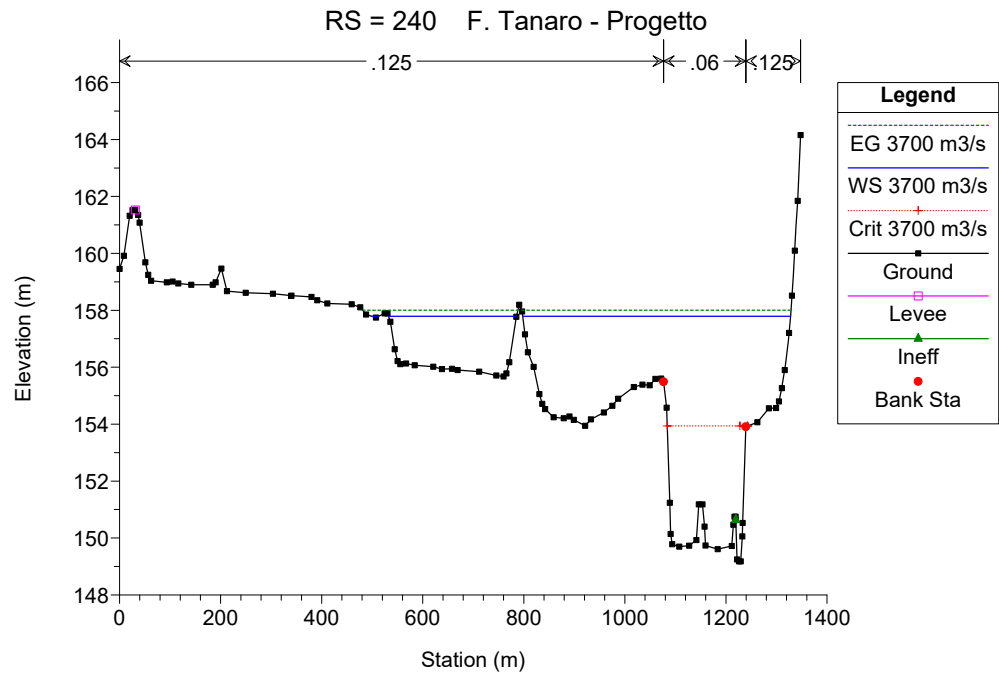
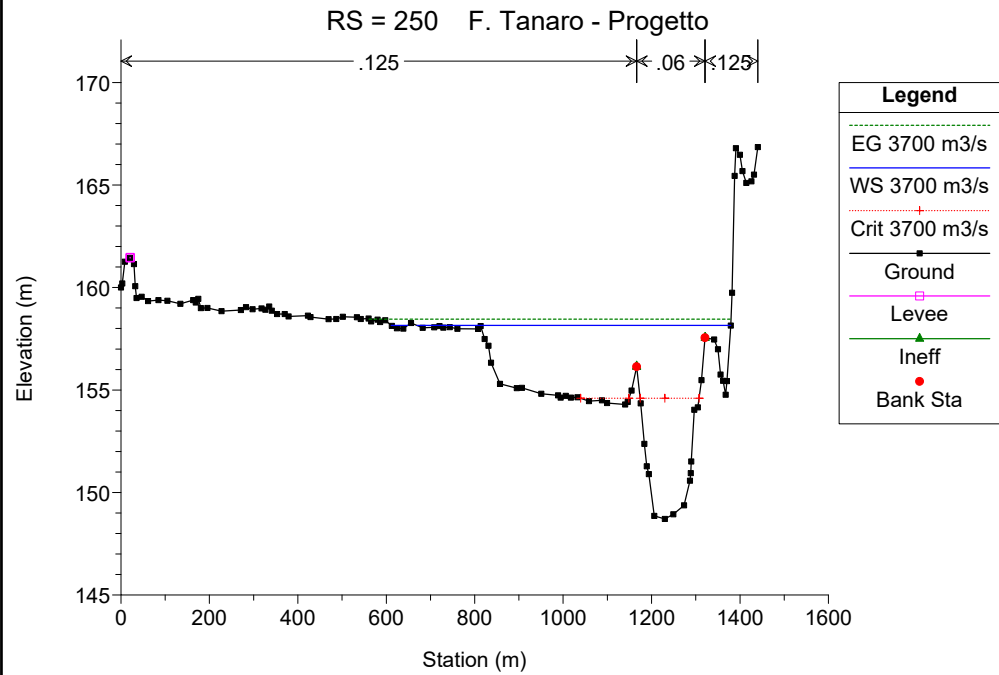
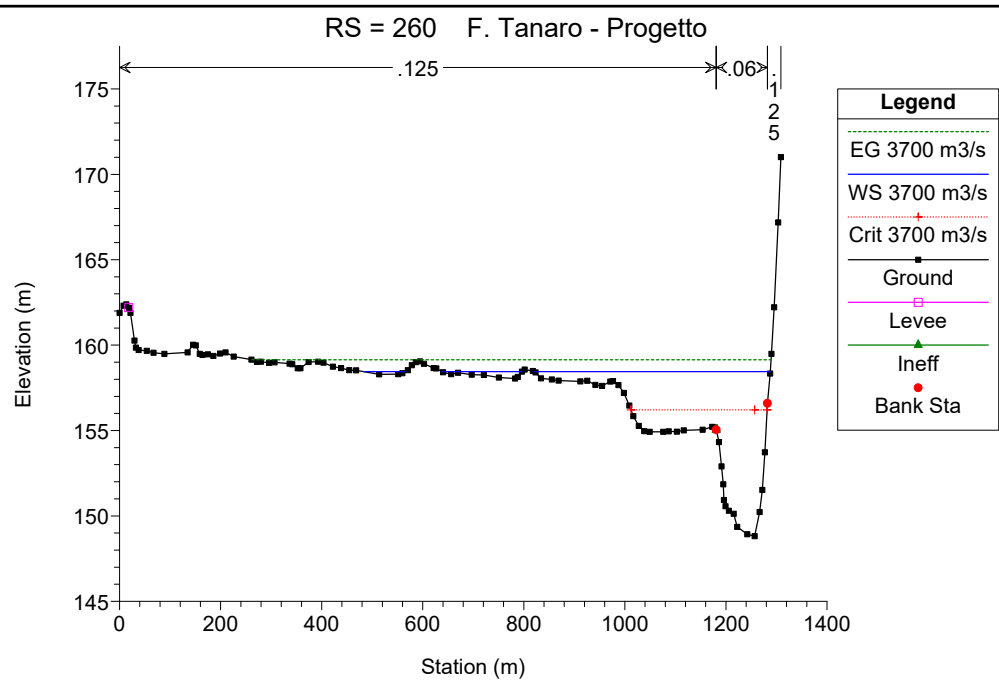
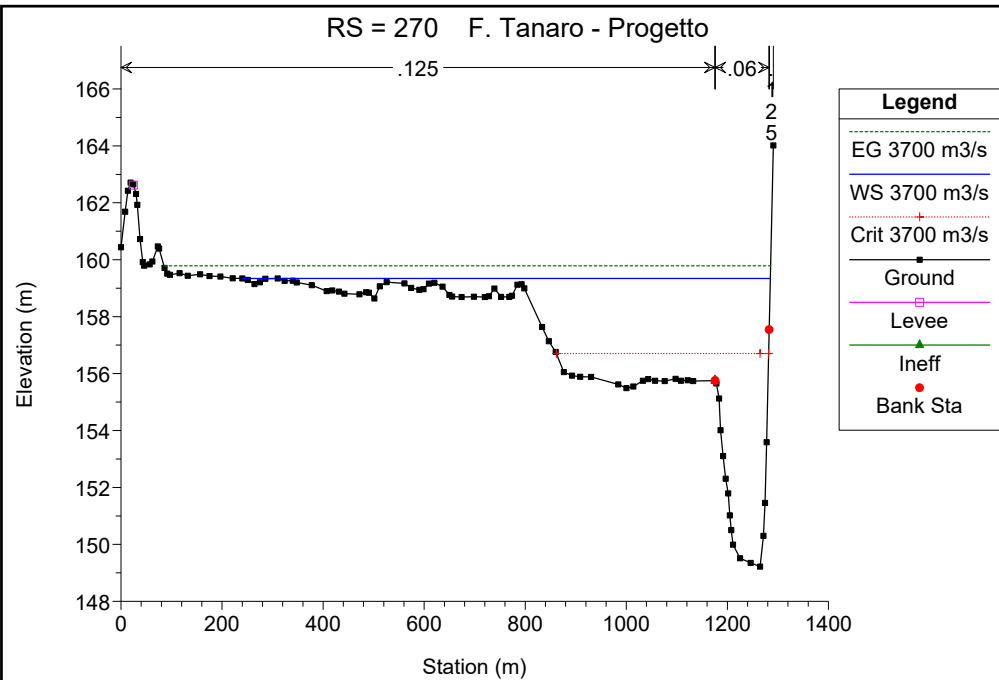


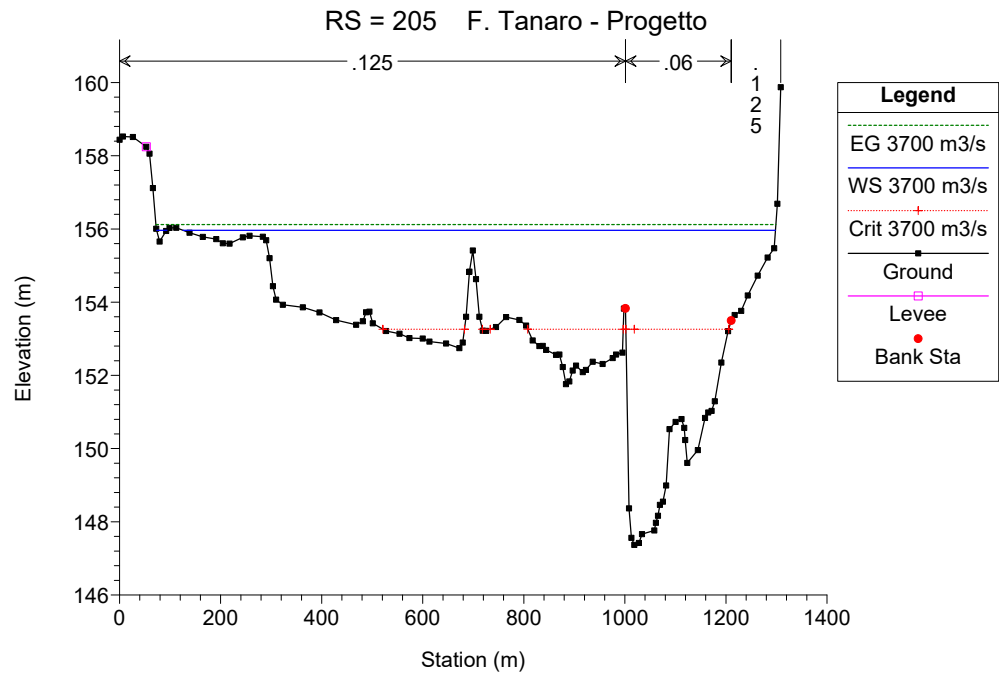
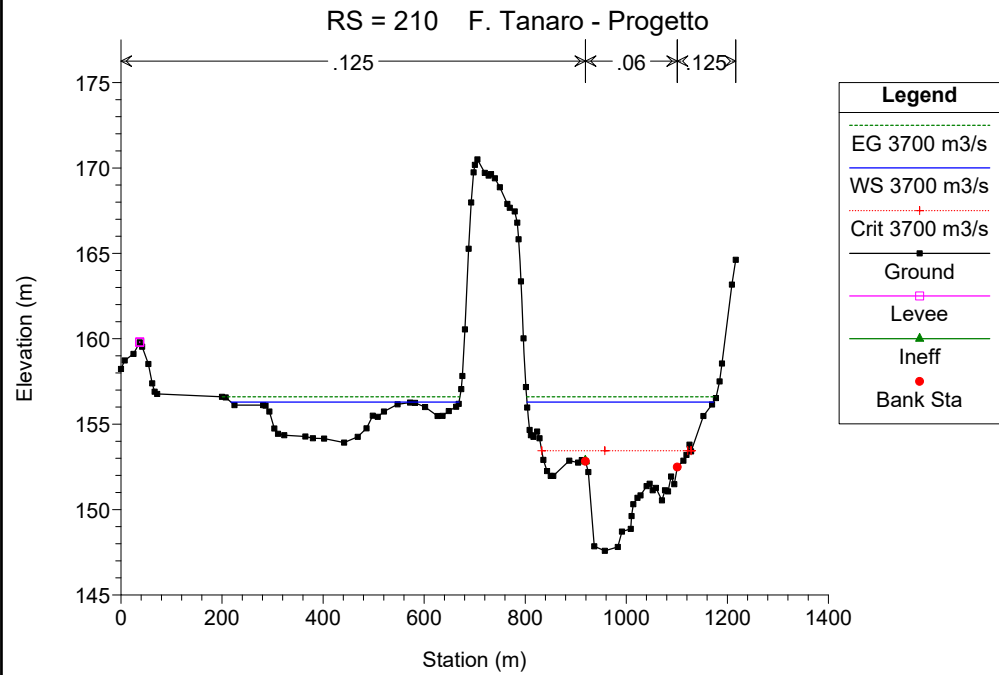
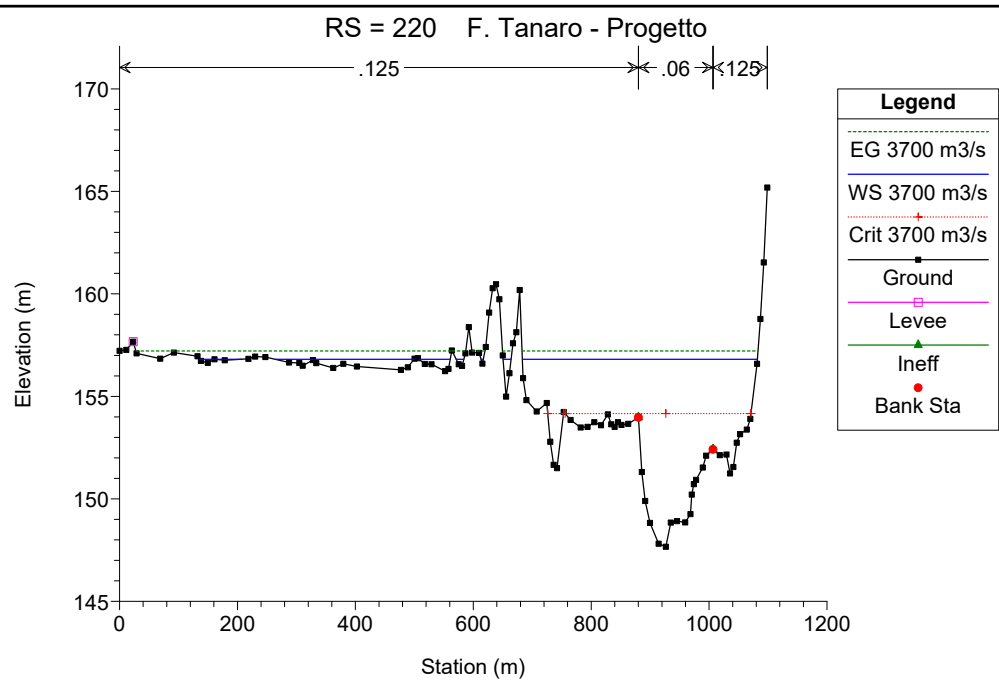
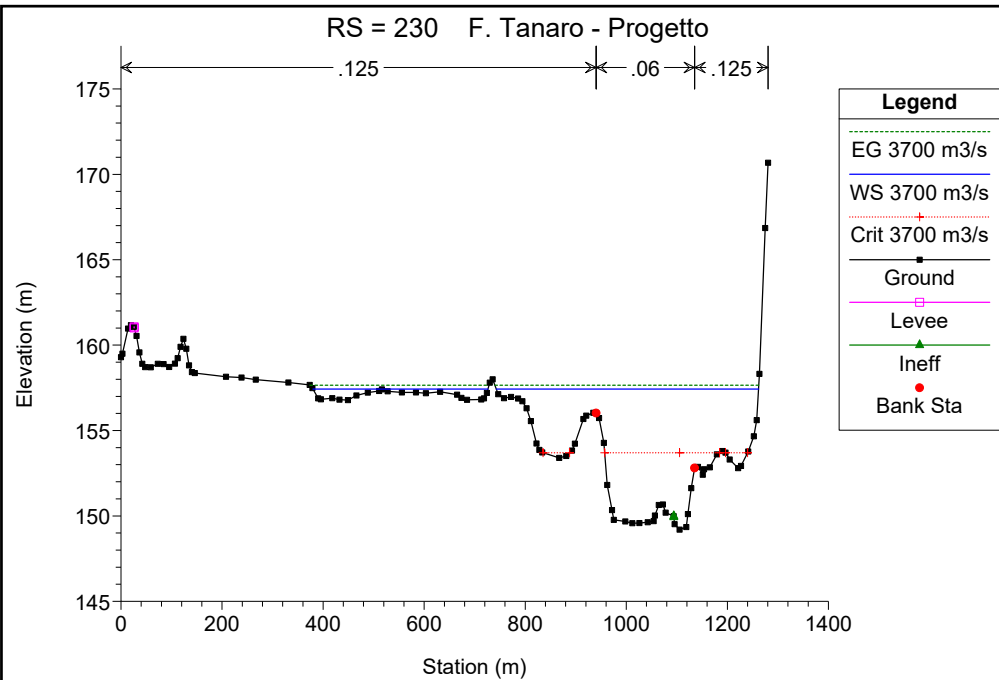


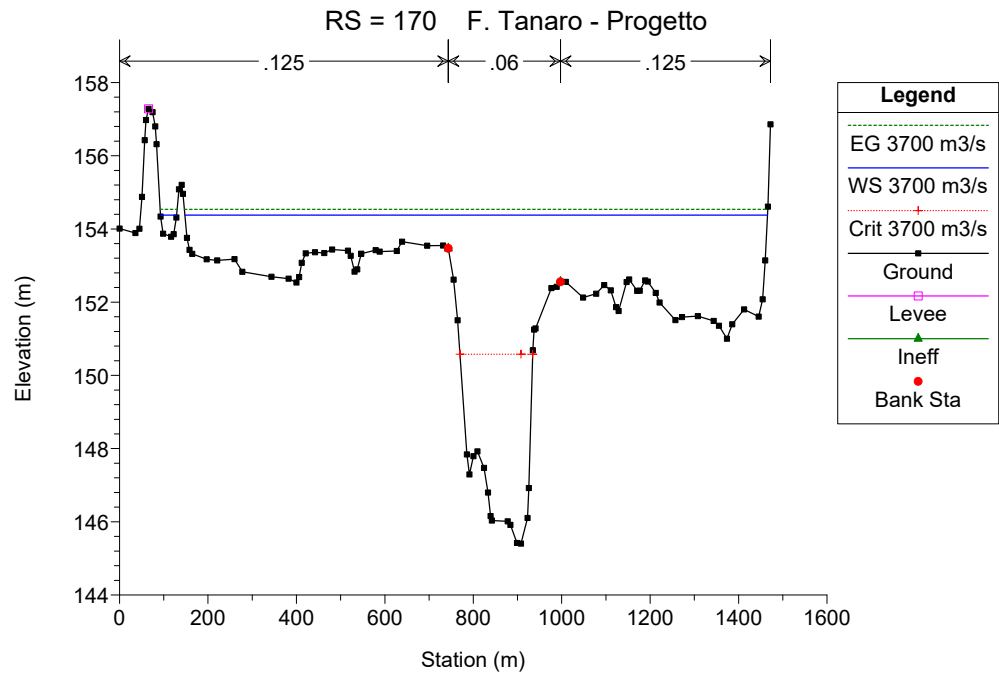
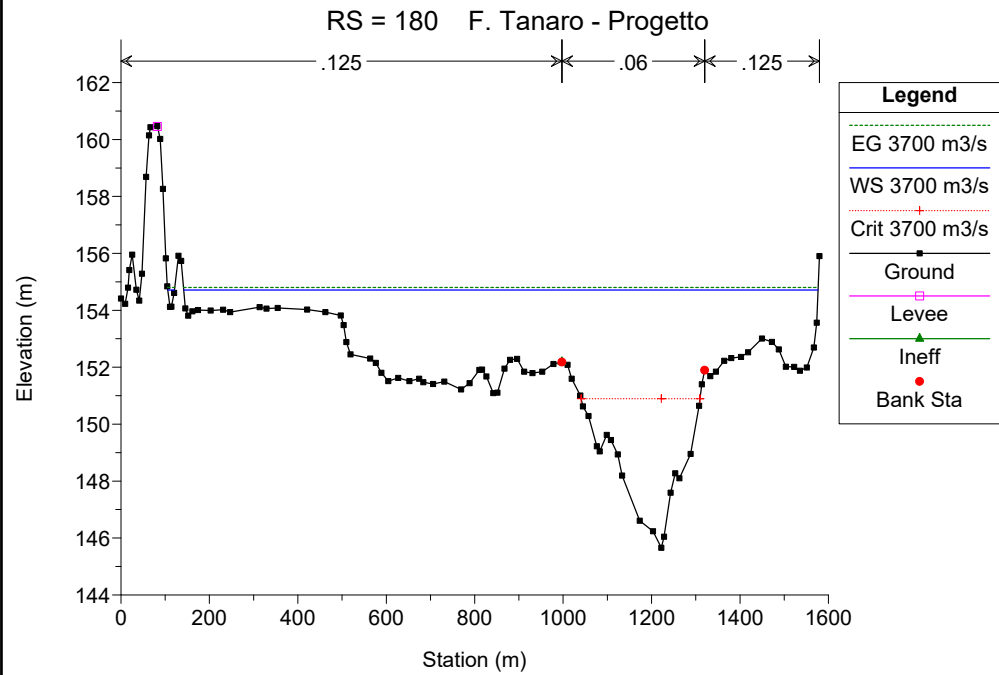
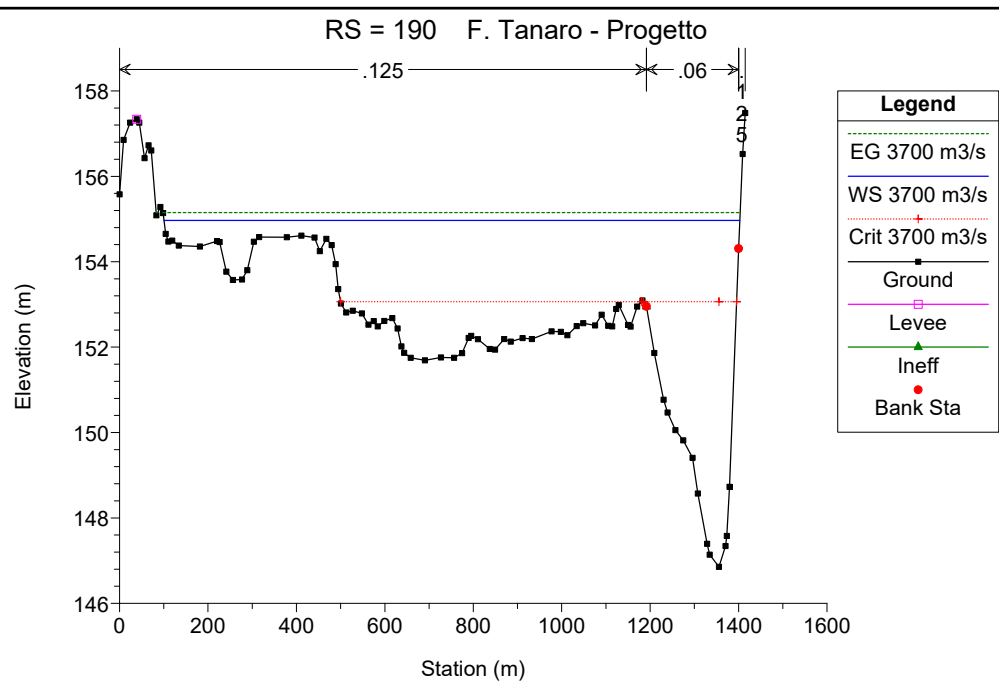
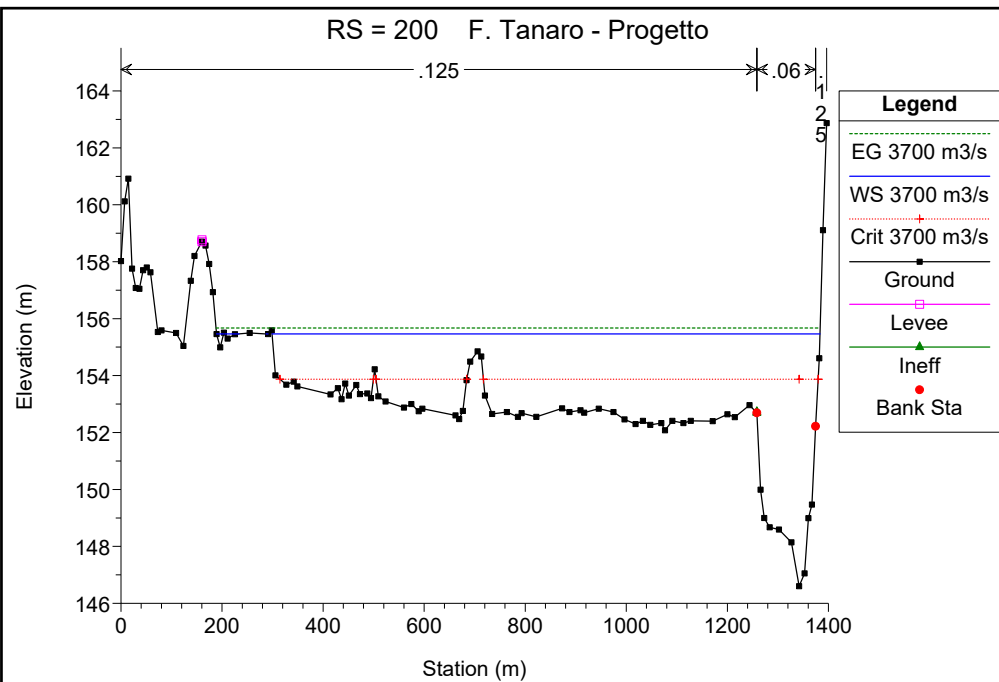


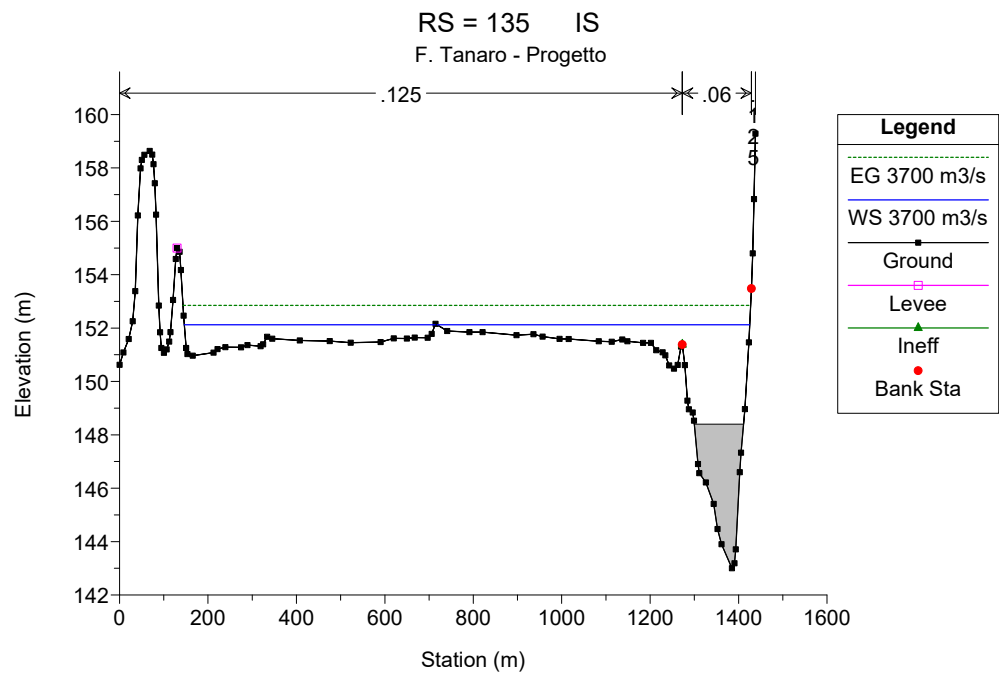
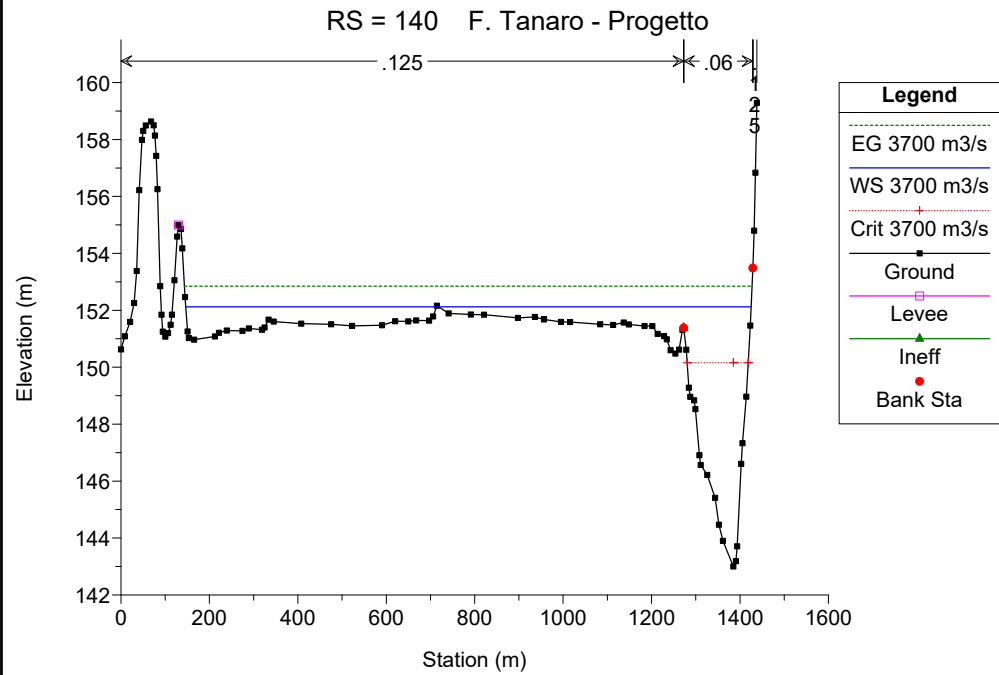
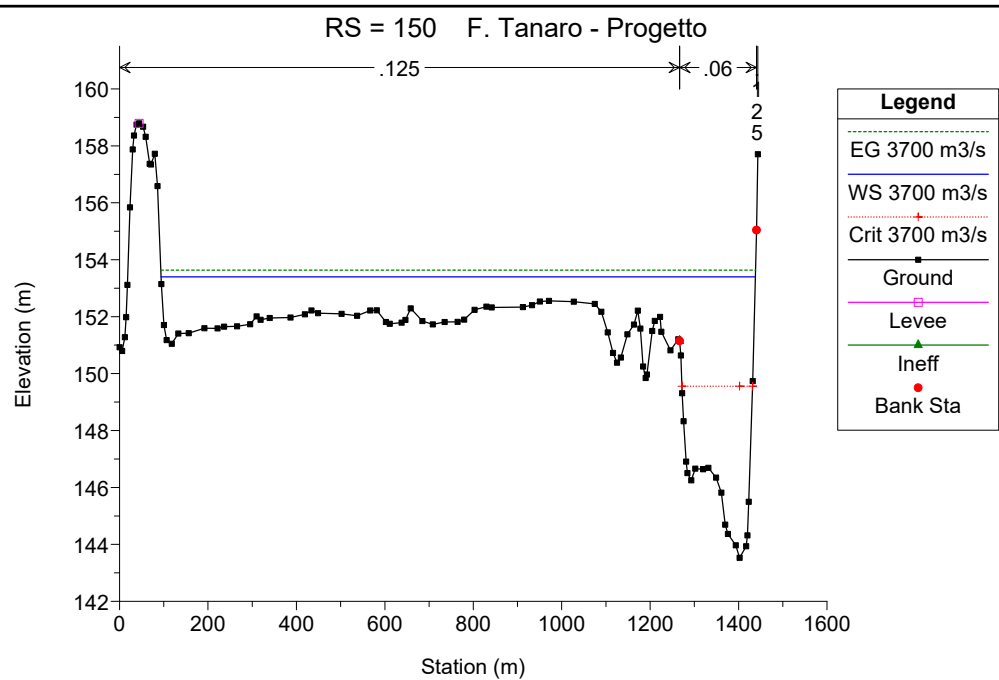
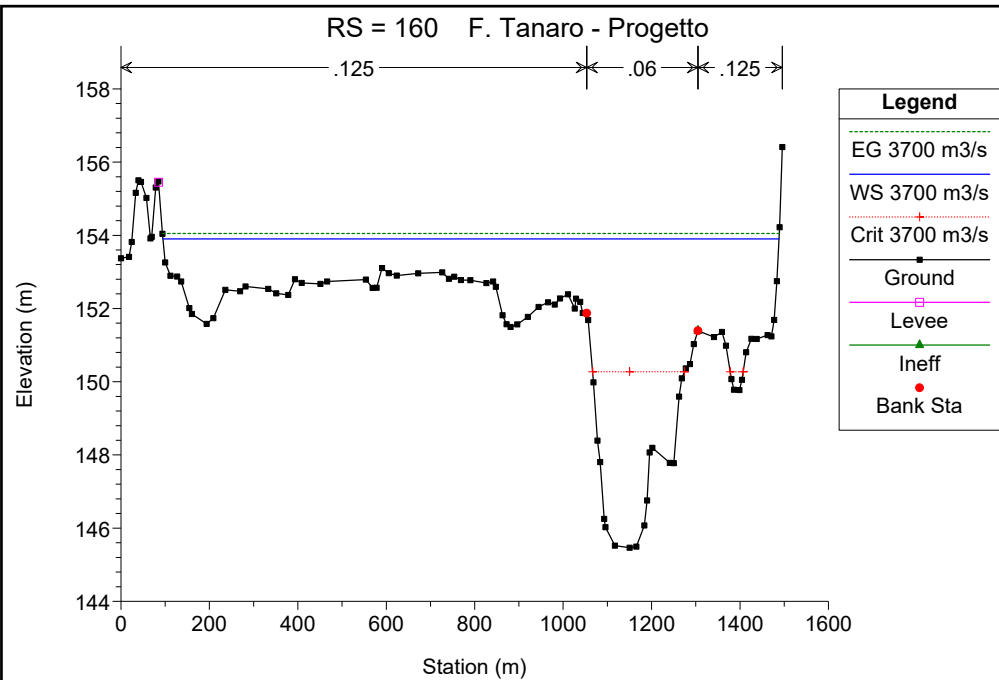


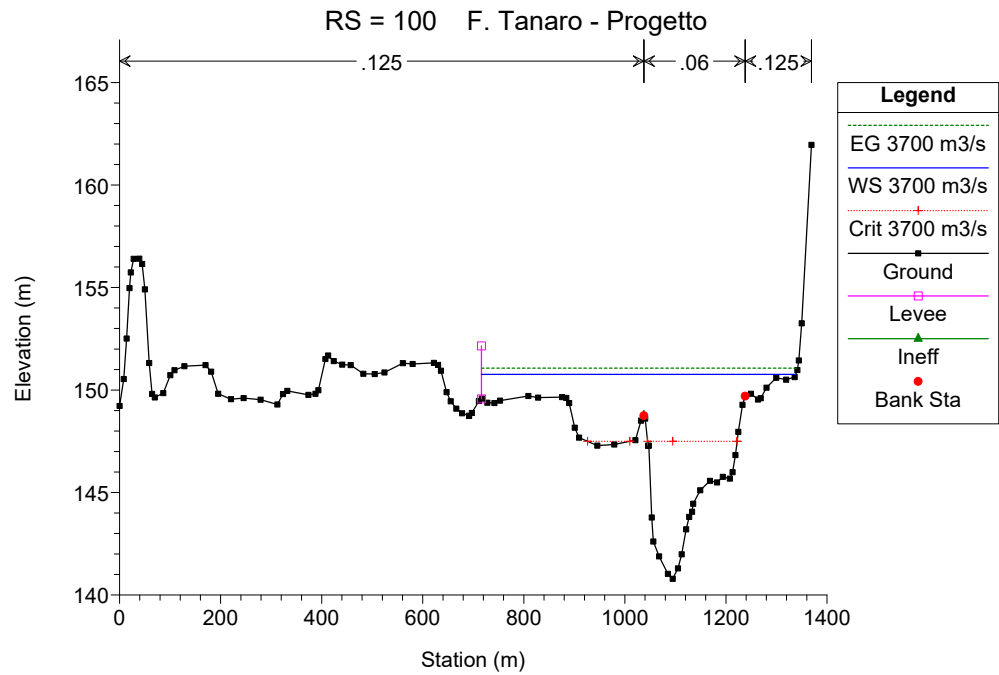
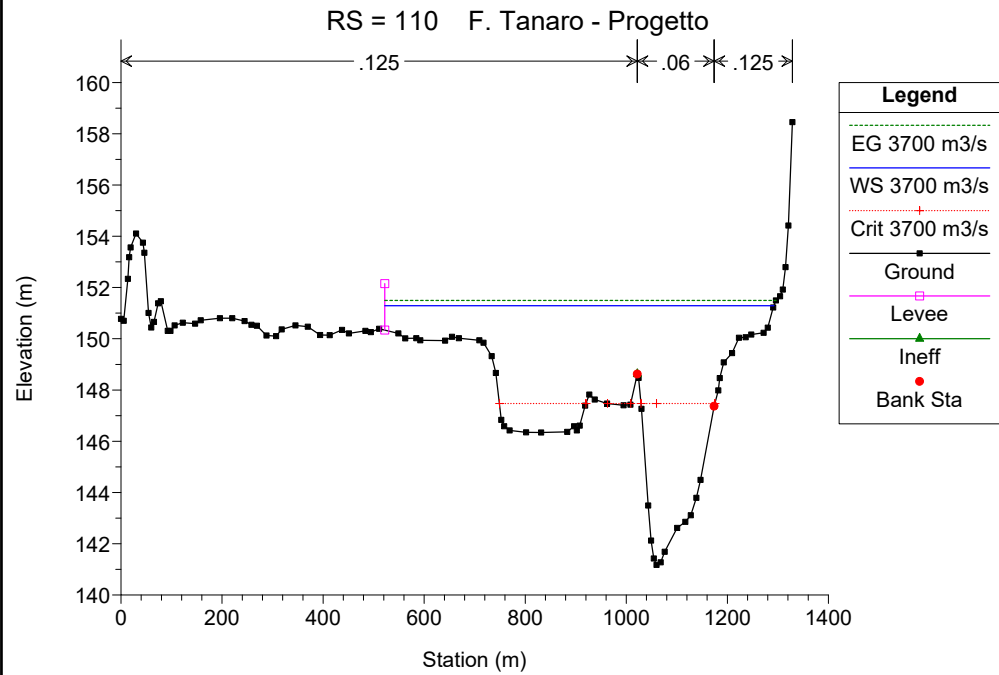
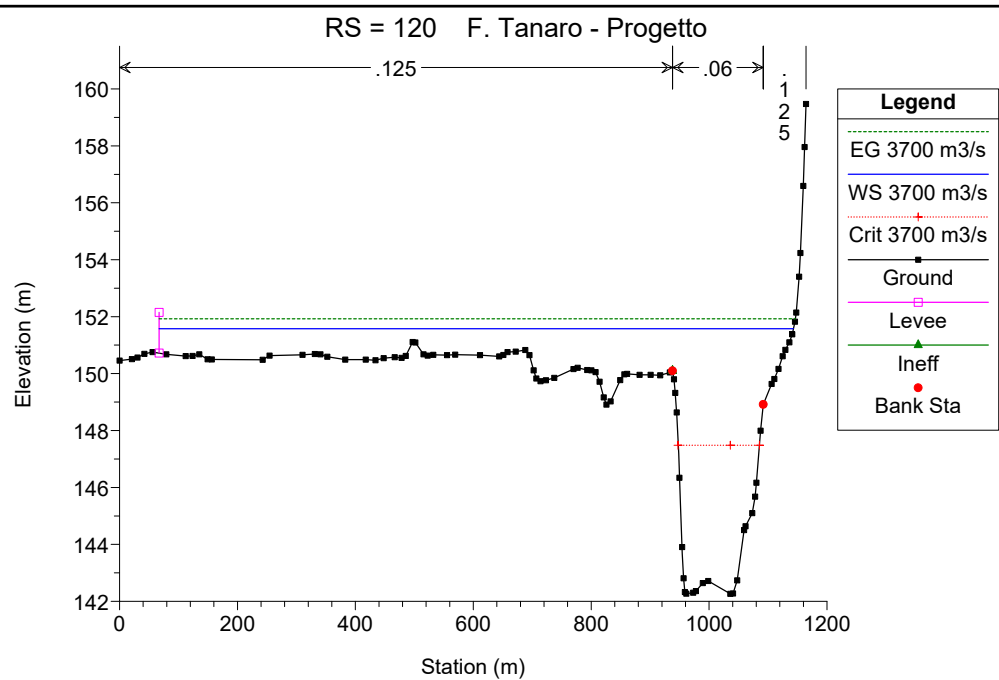
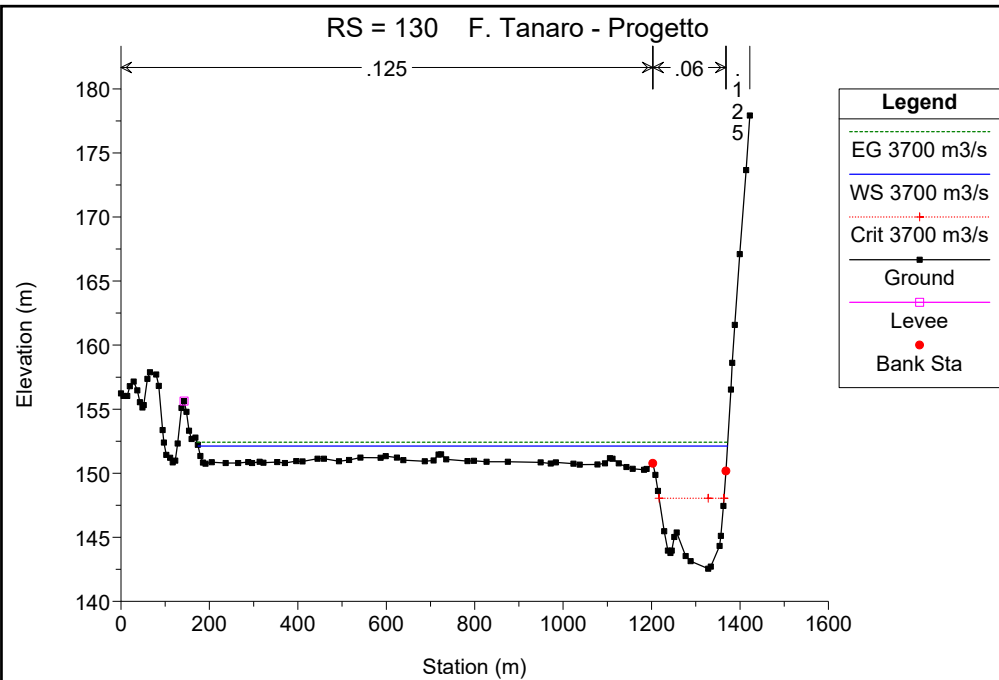


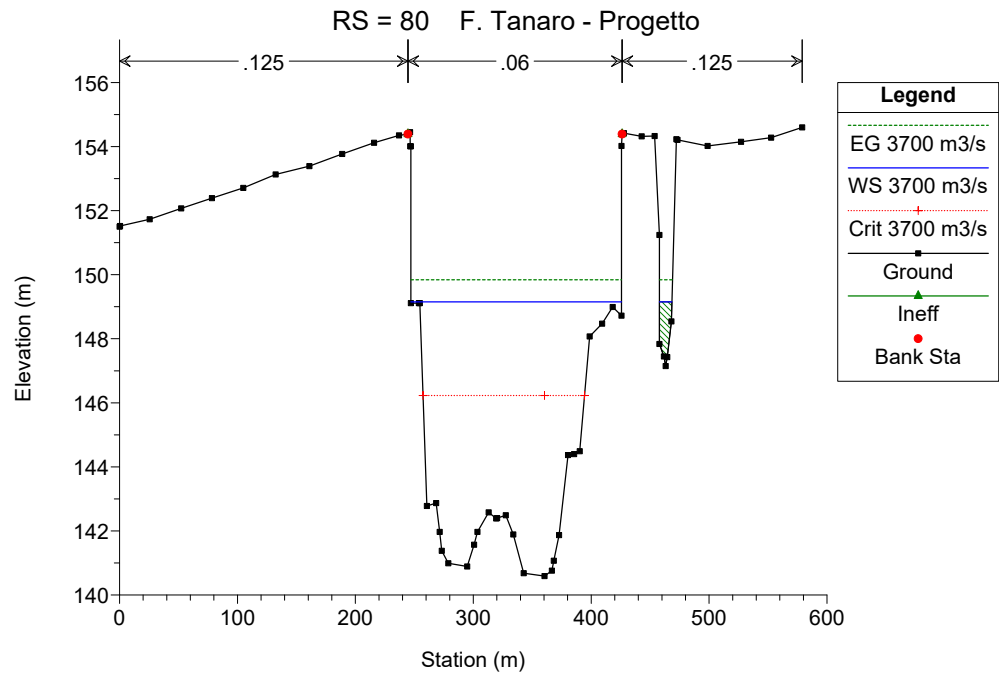
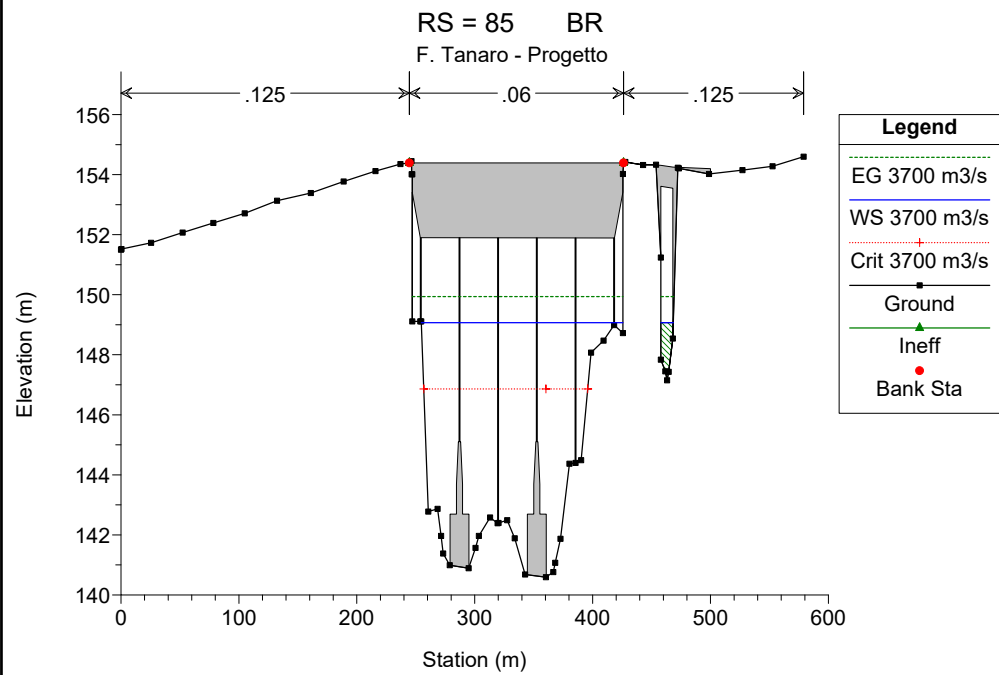
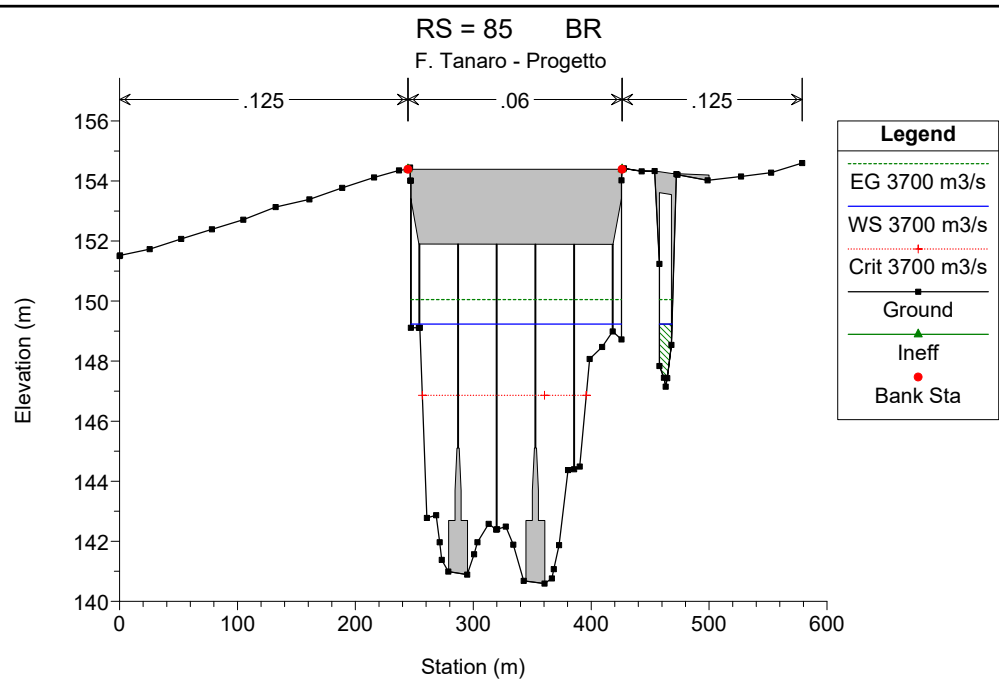
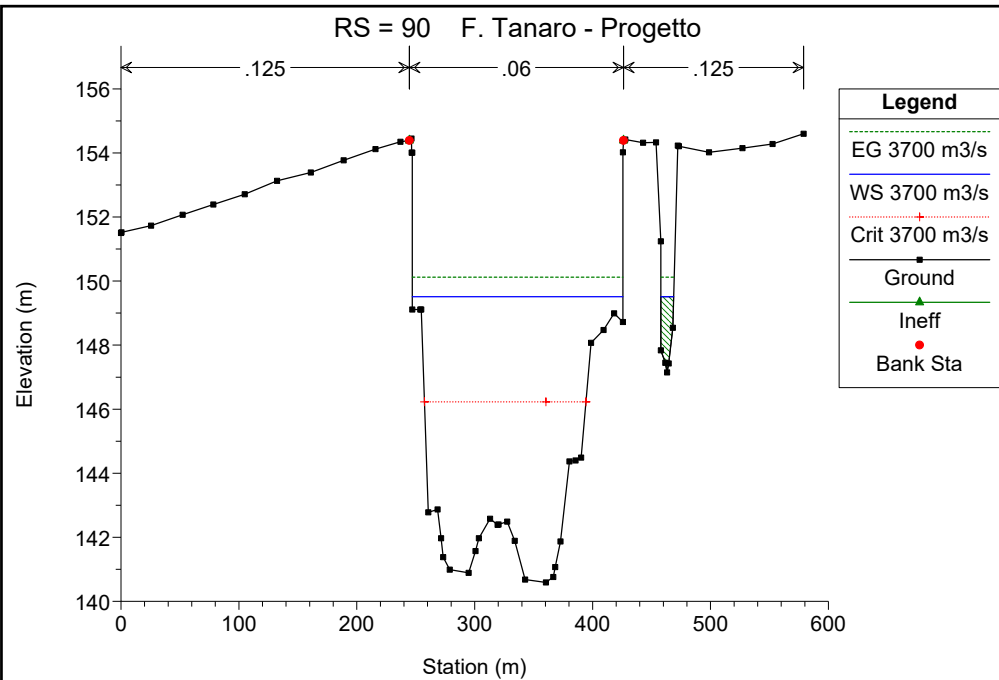


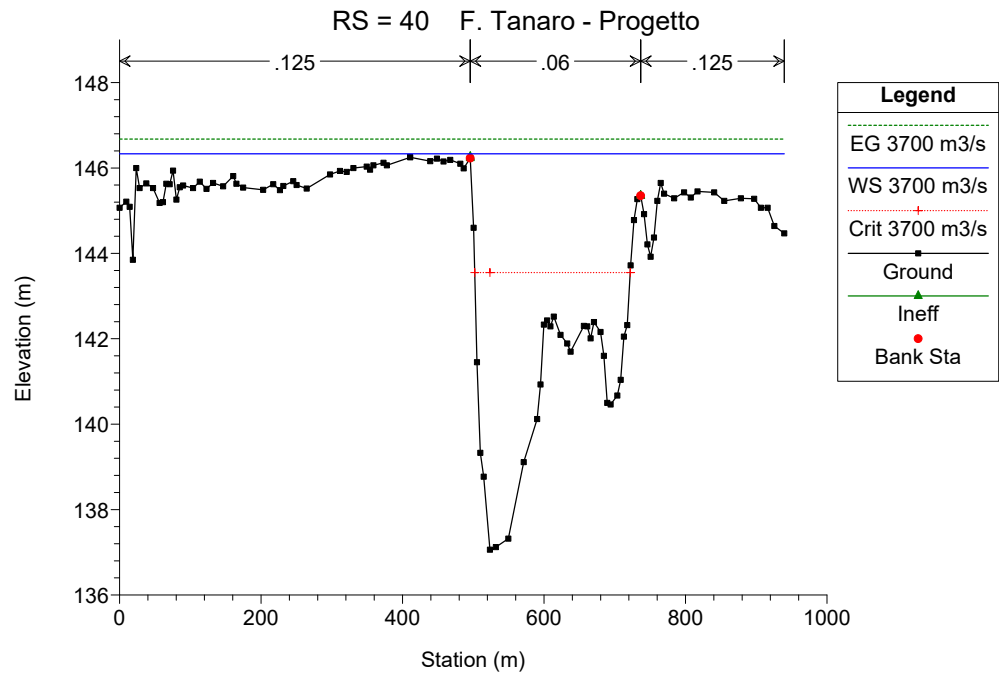
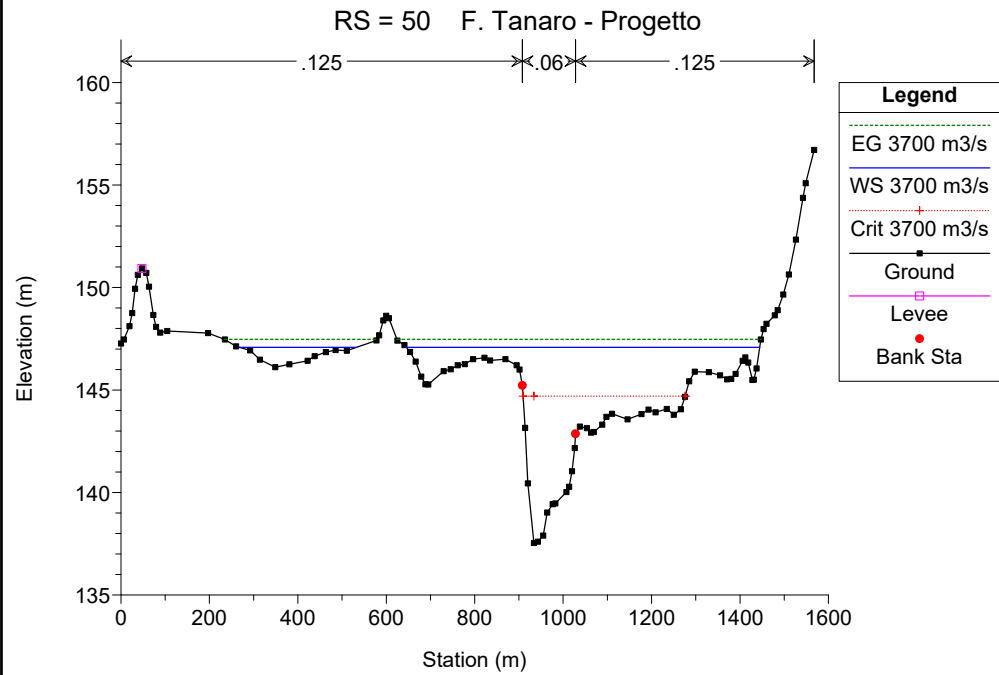
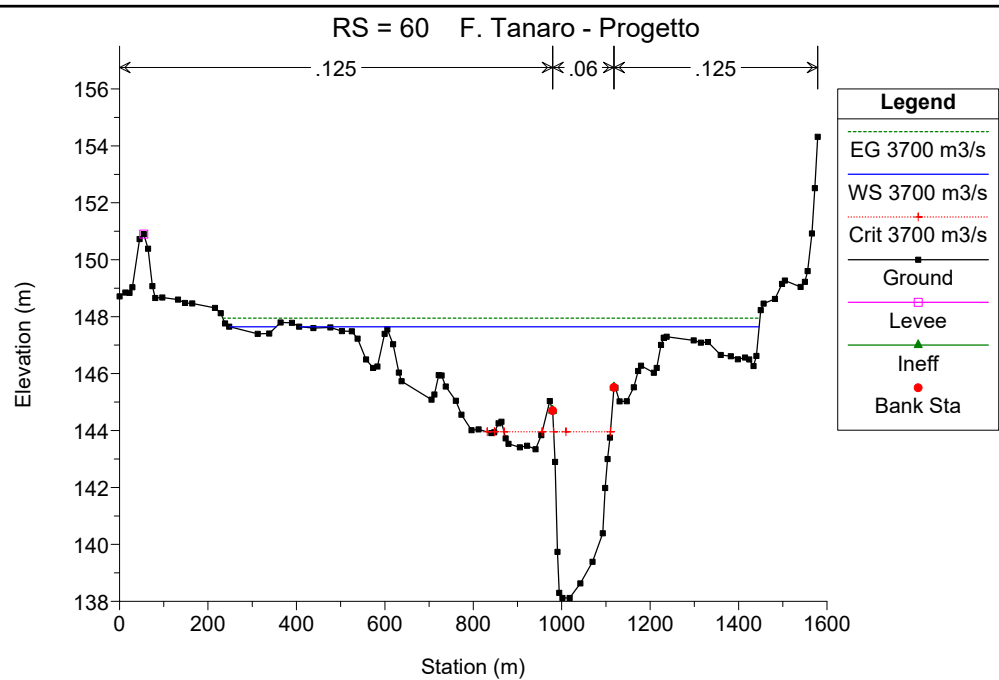
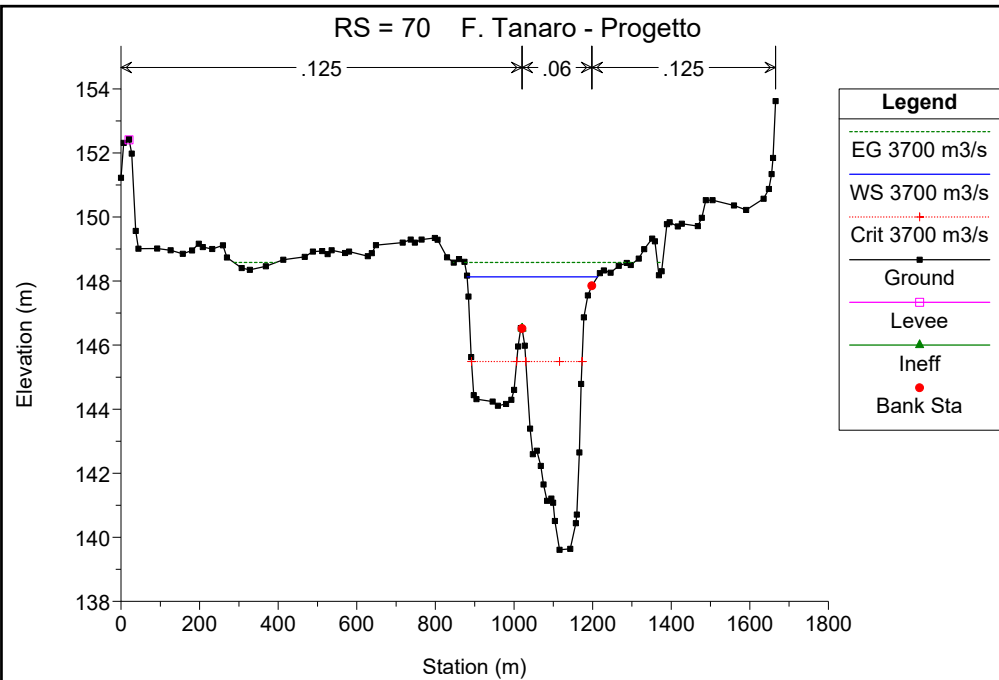


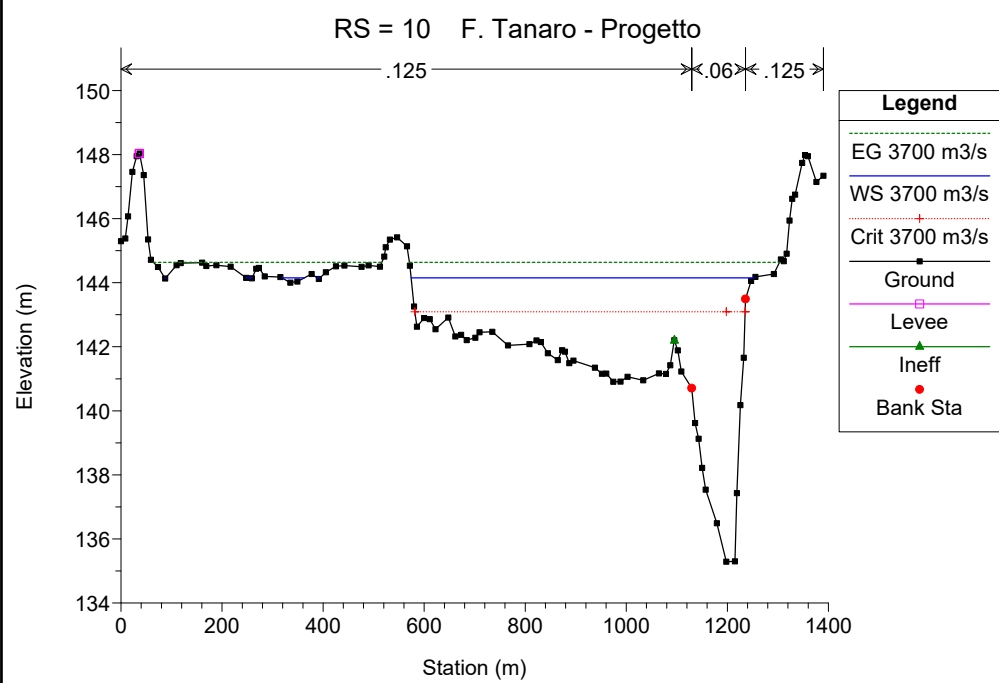
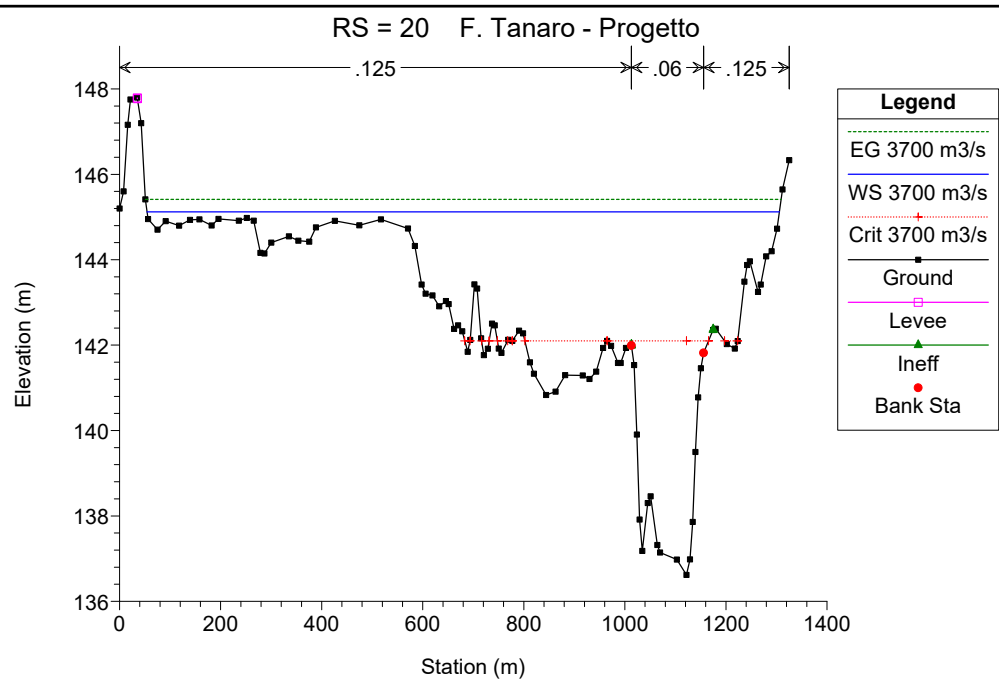
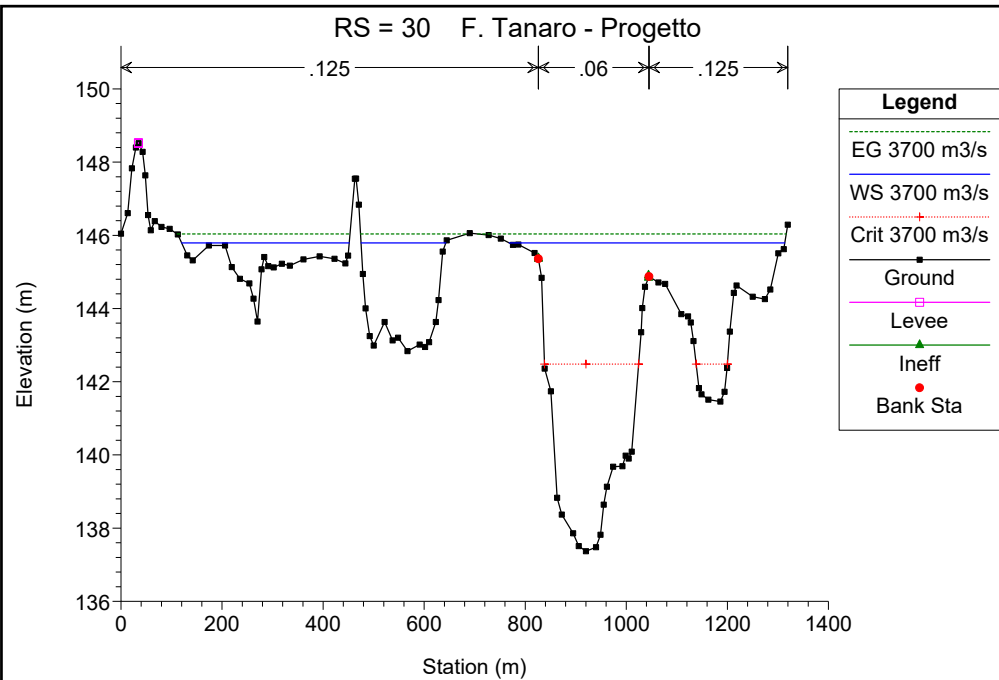












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 2: PROGETTO CON SBARRAMENTO MOBILE ALZATO**

SIMULAZIONE 23

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3700	Portata utilizzata per il dimensionamento delle opere di difesa di Alba
F. Tanaro valle Riddone	3710	
F. Tanaro valle Cherasca	3724	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s

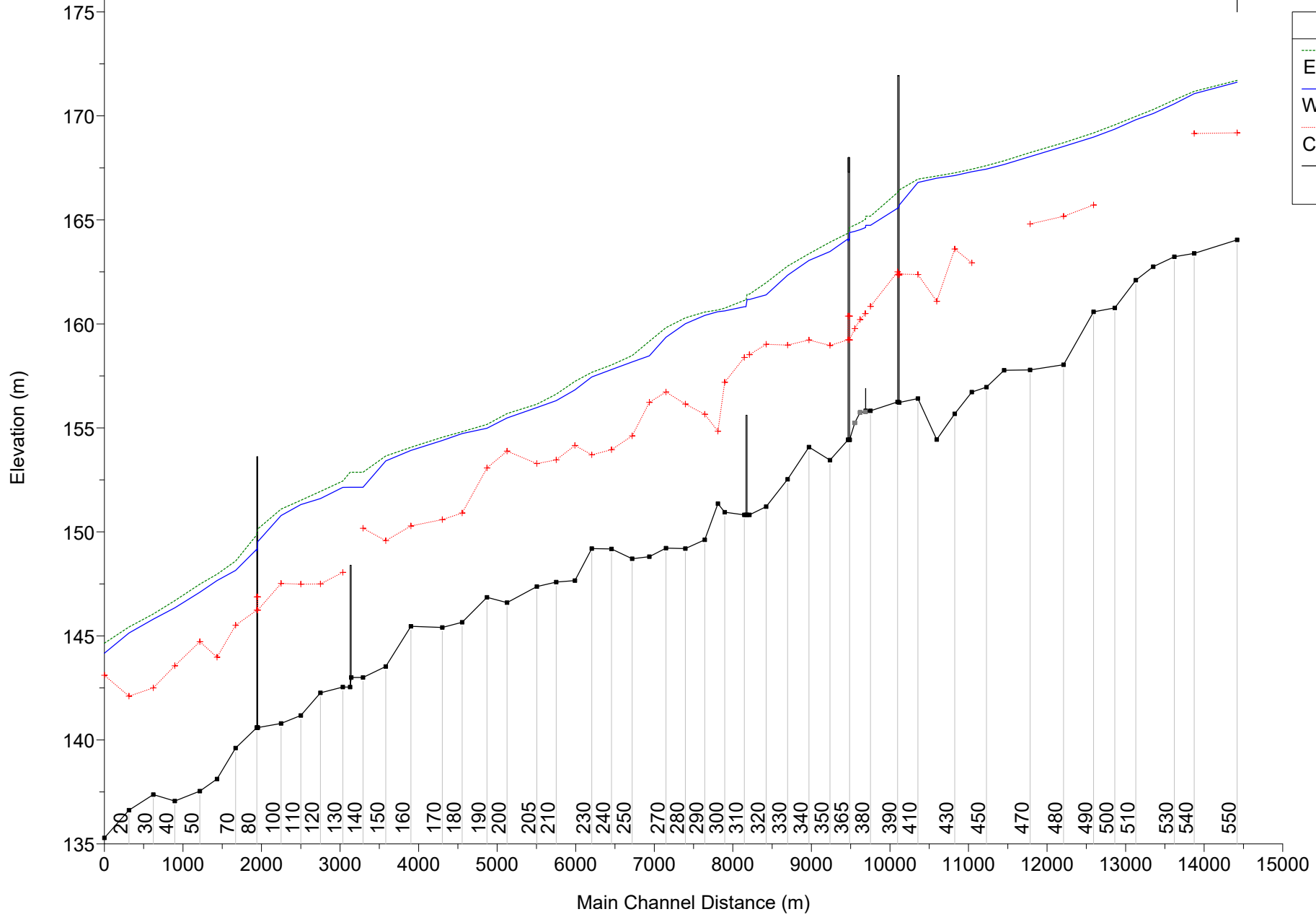
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	3700 m3/s	3700.00	164.04	171.62	169.19	171.71	0.001070	1.55	3770.89	1216.19	0.23
1	540	3700 m3/s	3700.00	163.39	171.07	169.15	171.18	0.001481	2.11	3904.63	1132.10	0.27
1	530	3700 m3/s	3700.00	163.23	170.58		170.77	0.001782	2.27	2669.87	780.23	0.30
1	520	3700 m3/s	3700.00	162.75	170.12		170.31	0.001806	2.36	3175.15	1104.69	0.30
1	510	3700 m3/s	3700.00	162.10	169.81		169.98	0.001650	2.16	2951.14	847.97	0.29
1	500	3700 m3/s	3700.00	160.77	169.37		169.57	0.001501	2.29	2553.13	572.70	0.28
1	490	3700 m3/s	3700.00	160.58	168.98	165.71	169.18	0.001441	2.14	2397.17	563.51	0.27
1	480	3700 m3/s	3700.00	158.04	168.53	165.17	168.71	0.001189	2.10	3243.24	1083.17	0.25
1	470	3700 m3/s	3700.00	157.79	168.04	164.81	168.24	0.001325	2.29	2633.14	621.52	0.27
1	460	3700 m3/s	3700.00	157.77	167.67		167.84	0.001055	2.09	3333.25	1140.29	0.24
1	450	3700 m3/s	3700.00	156.96	167.44		167.61	0.000983	2.06	3334.64	1049.17	0.23
1	440	3700 m3/s	3700.00	156.72	167.32	162.94	167.44	0.000742	1.85	3734.00	808.41	0.20
1	430	3700 m3/s	3700.00	155.68	167.13	163.60	167.26	0.000898	2.04	3511.97	669.79	0.22
1	420	3700 m3/s	3700.00	154.44	167.00	161.08	167.11	0.000532	1.73	3868.01	694.98	0.18
1	410	3700 m3/s	3700.00	156.41	166.80	162.37	166.96	0.000896	2.07	2984.71	557.28	0.23
1	400	3700 m3/s	3700.00	156.22	165.71	162.40	166.44	0.003509	3.90	1108.82	179.92	0.43
1	395		Bridge									
1	390	3700 m3/s	3700.00	156.25	165.56	162.50	166.32	0.003747	3.98	1083.05	179.60	0.44
1	380	3700 m3/s	3700.00	155.82	164.74	160.84	165.18	0.002202	2.96	1381.93	290.13	0.34
1	379		Inl Struct									
1	370	3700 m3/s	3700.00	154.43	164.39	159.23	164.64	0.001150	2.22	1670.34	209.86	0.25
1	365		Bridge									
1	360	3700 m3/s	3700.00	154.43	164.09	159.24	164.36	0.001297	2.30	1608.01	209.03	0.26
1	350	3700 m3/s	3700.00	153.45	163.48	158.96	163.93	0.002090	3.00	1379.25	297.74	0.34
1	340	3700 m3/s	3710.00	154.08	163.05	159.22	163.37	0.001812	2.57	1730.84	410.88	0.31
1	330	3700 m3/s	3710.00	152.53	162.35	158.98	162.79	0.002498	3.06	1628.05	442.22	0.36
1	320	3700 m3/s	3710.00	151.21	161.41	159.02	161.99	0.003240	3.80	1875.39	733.81	0.42
1	315	3700 m3/s	3710.00	150.82	161.19	158.52	161.44	0.001670	2.76	3246.37	1139.15	0.30
1	312.5		Inl Struct									
1	310	3700 m3/s	3710.00	150.82	160.83	158.39	161.13	0.002082	2.99	2726.51	977.57	0.34
1	300	3700 m3/s	3724.00	150.95	160.62	157.19	160.76	0.001004	1.92	3506.95	1133.39	0.23
1	295	3700 m3/s	3724.00	151.36	160.59	154.84	160.67	0.000482	1.47	4250.50	1220.01	0.16
1	290	3700 m3/s	3724.00	149.62	160.41	155.66	160.57	0.000901	1.91	3052.89	1140.56	0.22
1	280	3700 m3/s	3724.00	149.20	160.01	156.15	160.29	0.001470	2.61	2798.71	1128.73	0.29
1	270	3700 m3/s	3724.00	149.22	159.36	156.73	159.82	0.002511	3.36	2314.96	1067.62	0.37
1	260	3700 m3/s	3724.00	148.81	158.47	156.22	159.16	0.003819	4.00	1548.91	715.34	0.46
1	250	3700 m3/s	3724.00	148.71	158.17	154.62	158.48	0.001962	2.71	2334.17	752.17	0.32
1	240	3700 m3/s	3724.00	149.18	157.81	153.95	158.03	0.001379	2.34	2752.84	802.43	0.27
1	230	3700 m3/s	3724.00	149.20	157.45	153.71	157.67	0.001428	2.28	2430.37	866.25	0.28
1	220	3700 m3/s	3724.00	147.66	156.83	154.16	157.24	0.002726	3.19	1908.29	803.19	0.38

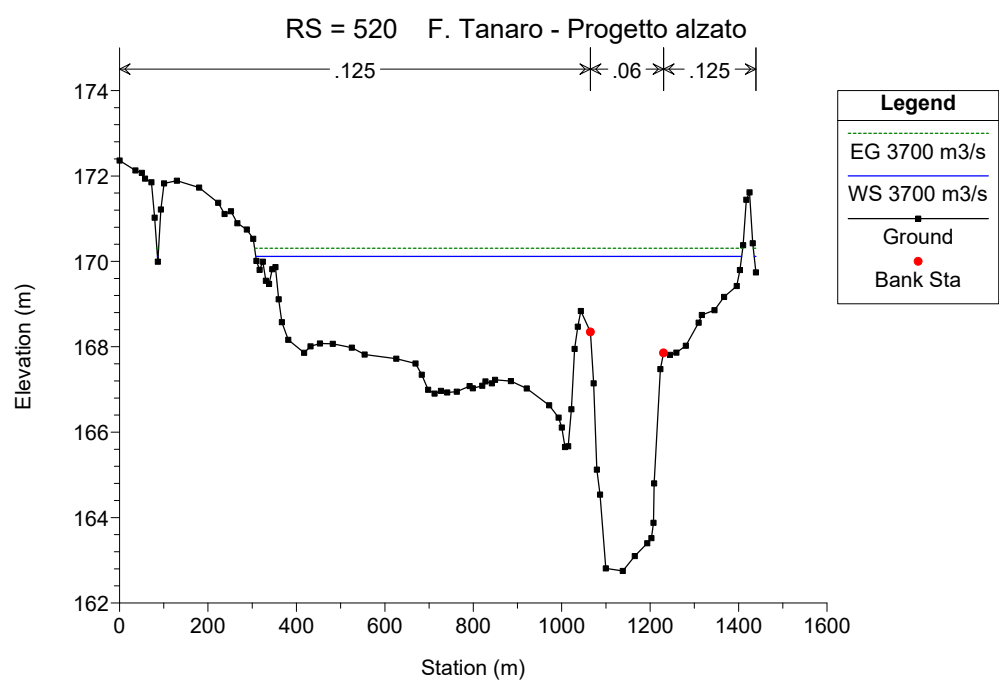
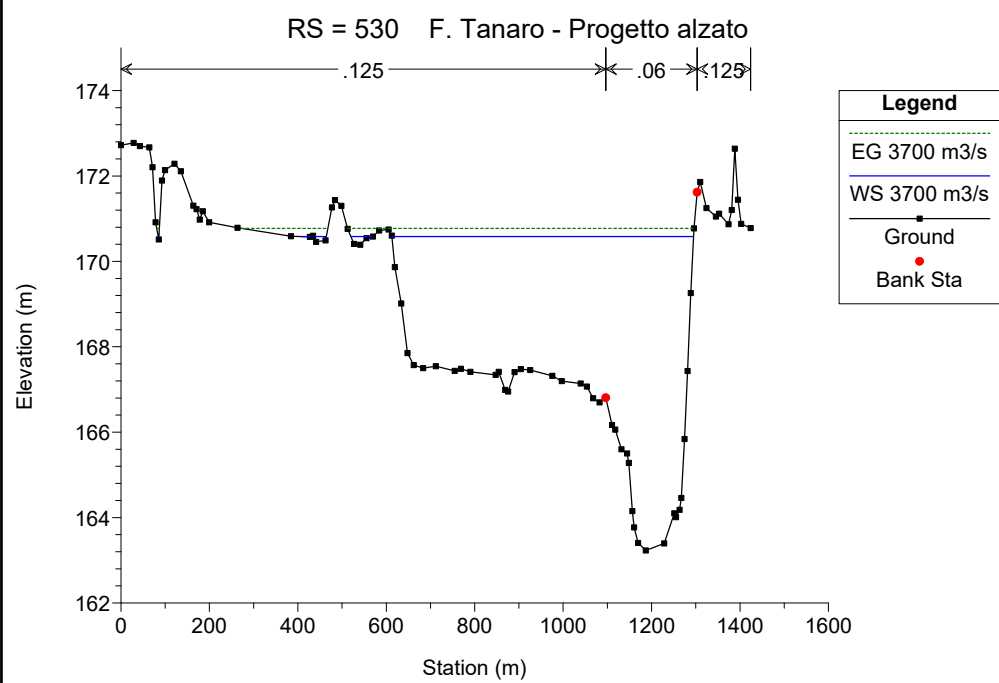
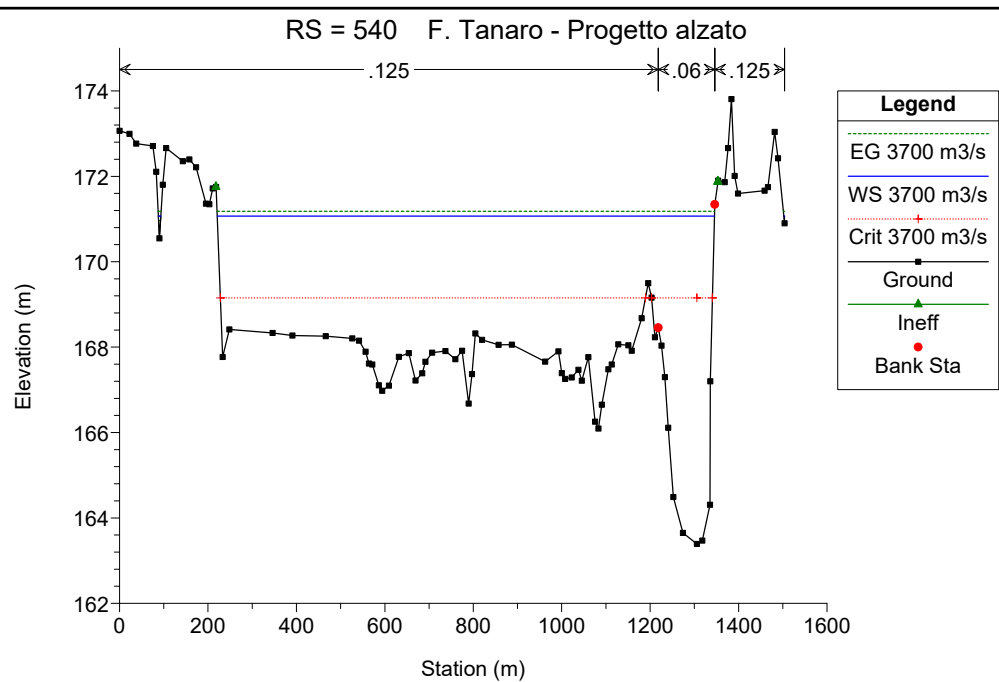
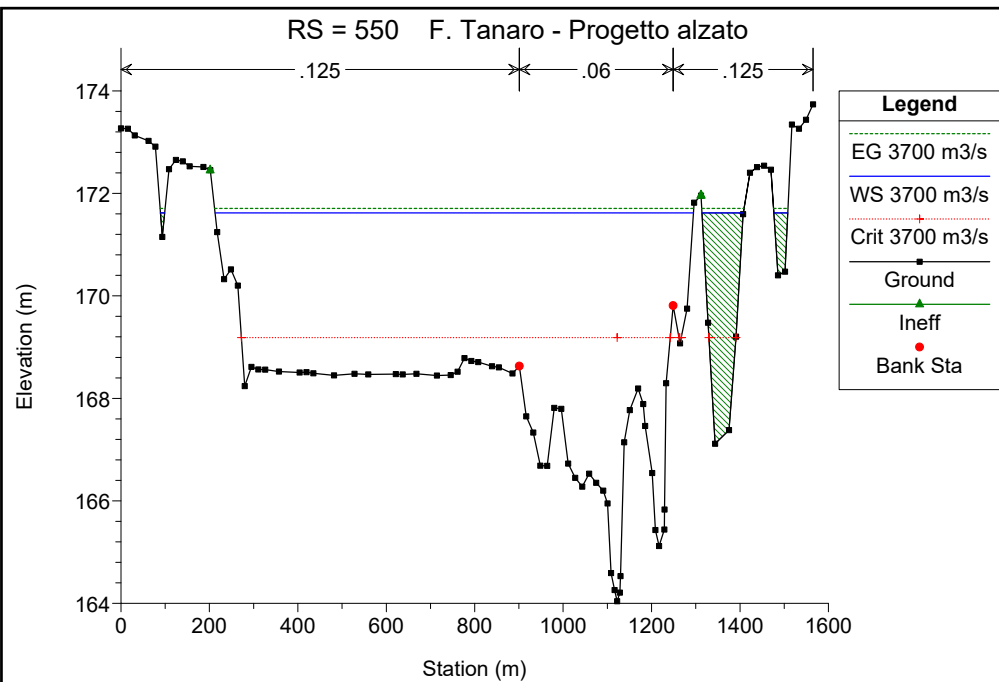
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s (Continued)

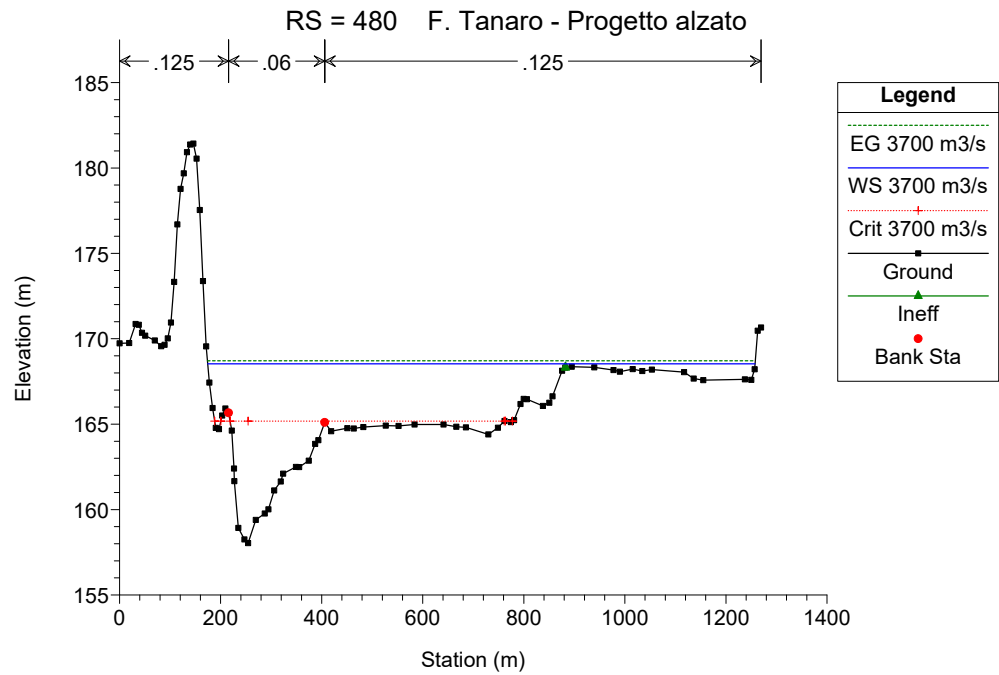
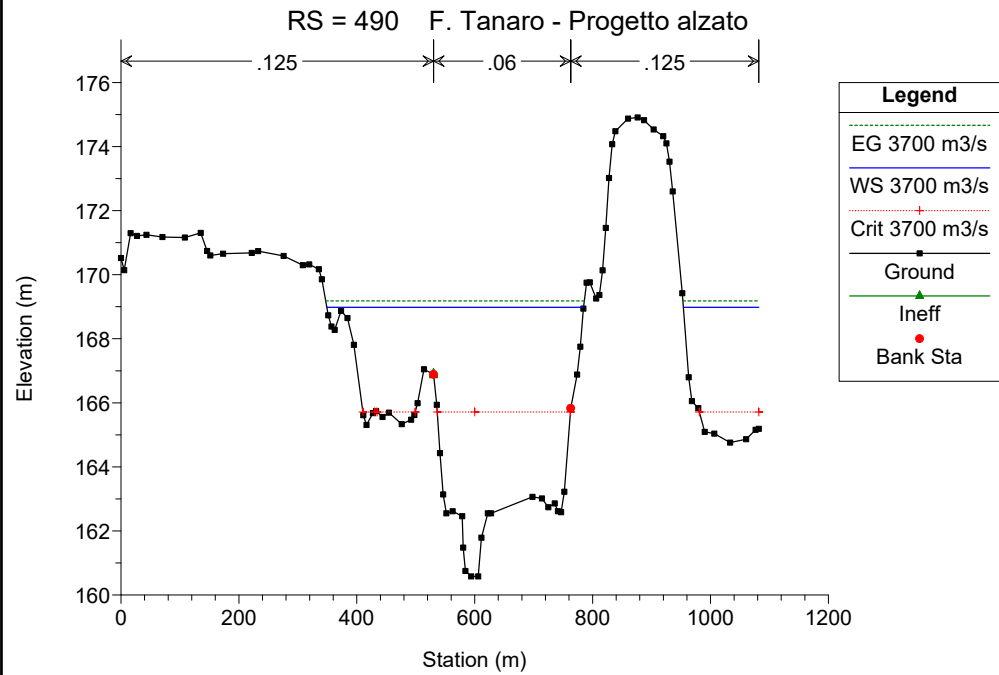
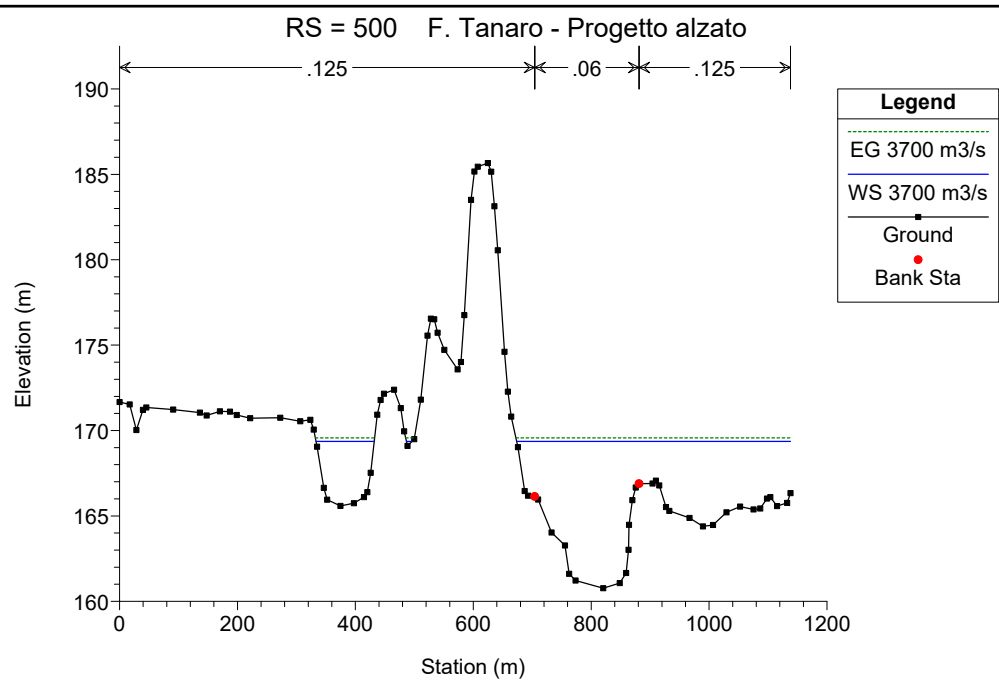
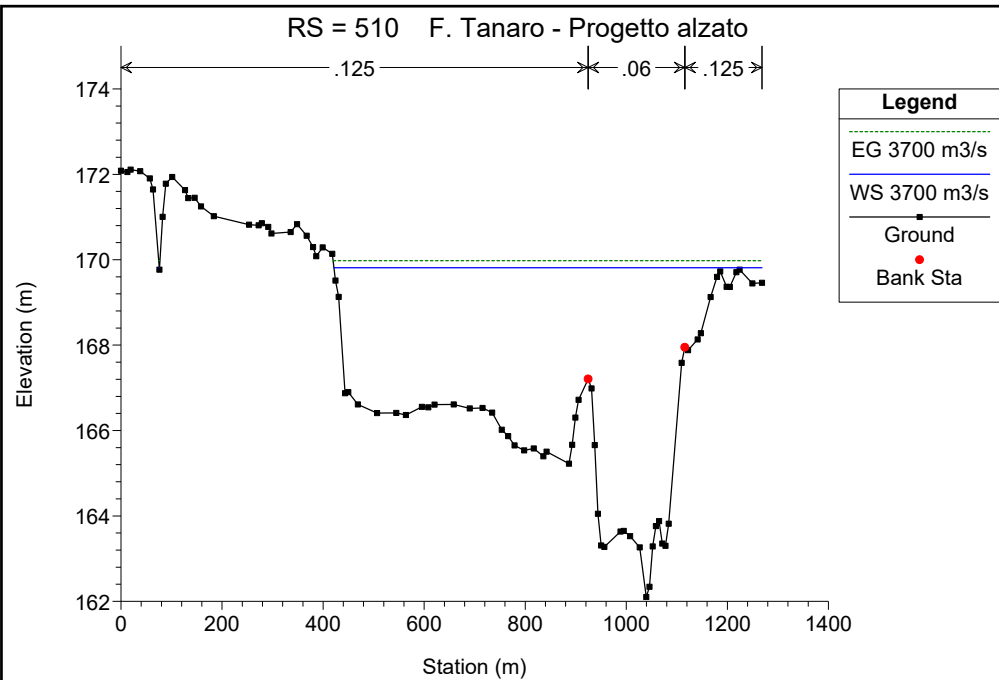
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	3700 m3/s	3724.00	147.59	156.31	153.46	156.62	0.002155	2.67	2188.08	821.70	0.34
1	205	3700 m3/s	3724.00	147.37	155.98	153.28	156.14	0.001395	2.06	3410.29	1196.92	0.27
1	200	3700 m3/s	3724.00	146.60	155.48	153.88	155.69	0.001945	2.63	3270.55	1154.87	0.32
1	190	3700 m3/s	3724.00	146.85	154.98	153.07	155.17	0.001961	2.27	3237.92	1302.67	0.31
1	180	3700 m3/s	3724.00	145.66	154.73	150.91	154.82	0.000757	1.50	4245.28	1450.33	0.20
1	170	3700 m3/s	3724.00	145.40	154.40	150.59	154.55	0.001396	1.98	3305.47	1354.59	0.26
1	160	3700 m3/s	3724.00	145.46	153.92	150.28	154.07	0.001167	1.91	3432.45	1393.43	0.25
1	150	3700 m3/s	3724.00	143.53	153.41	149.58	153.65	0.001504	2.40	3025.21	1344.27	0.28
1	140	3700 m3/s	3724.00	143.00	152.14	150.17	152.87	0.005542	3.93	1575.38	1277.24	0.53
1	135		Inl Struct									
1	130	3700 m3/s	3724.00	142.54	152.14	148.05	152.45	0.001699	2.61	2511.75	1197.33	0.30
1	120	3700 m3/s	3724.00	142.27	151.60	147.50	151.95	0.001834	2.77	2298.28	1076.36	0.32
1	110	3700 m3/s	3724.00	141.17	151.31	147.49	151.52	0.001308	2.33	2881.10	770.63	0.27
1	100	3700 m3/s	3724.00	140.79	150.78	147.52	151.09	0.002159	2.62	1994.29	622.37	0.33
1	90	3700 m3/s	3724.00	140.59	149.53	146.24	150.14	0.004138	3.47	1072.97	189.52	0.45
1	85		Bridge									
1	80	3700 m3/s	3724.00	140.59	149.17	146.24	149.87	0.005052	3.69	1009.07	189.26	0.50
1	70	3700 m3/s	3724.00	139.61	148.15	145.51	148.60	0.003622	3.17	1490.96	332.90	0.43
1	60	3700 m3/s	3724.00	138.12	147.66	143.97	147.97	0.001799	2.74	2649.75	1150.88	0.31
1	50	3700 m3/s	3724.00	137.54	147.10	144.72	147.49	0.002503	3.14	2325.45	1070.99	0.37
1	40	3700 m3/s	3724.00	137.06	146.35	143.56	146.69	0.002706	2.67	1853.06	939.65	0.36
1	30	3700 m3/s	3724.00	137.37	145.81	142.50	146.05	0.001903	2.39	2447.67	1047.58	0.31
1	20	3700 m3/s	3724.00	136.62	145.14	142.10	145.43	0.002070	2.76	2857.01	1251.88	0.33
1	10	3700 m3/s	3724.00	135.29	144.17	143.10	144.65	0.004002	3.66	2008.35	755.11	0.46

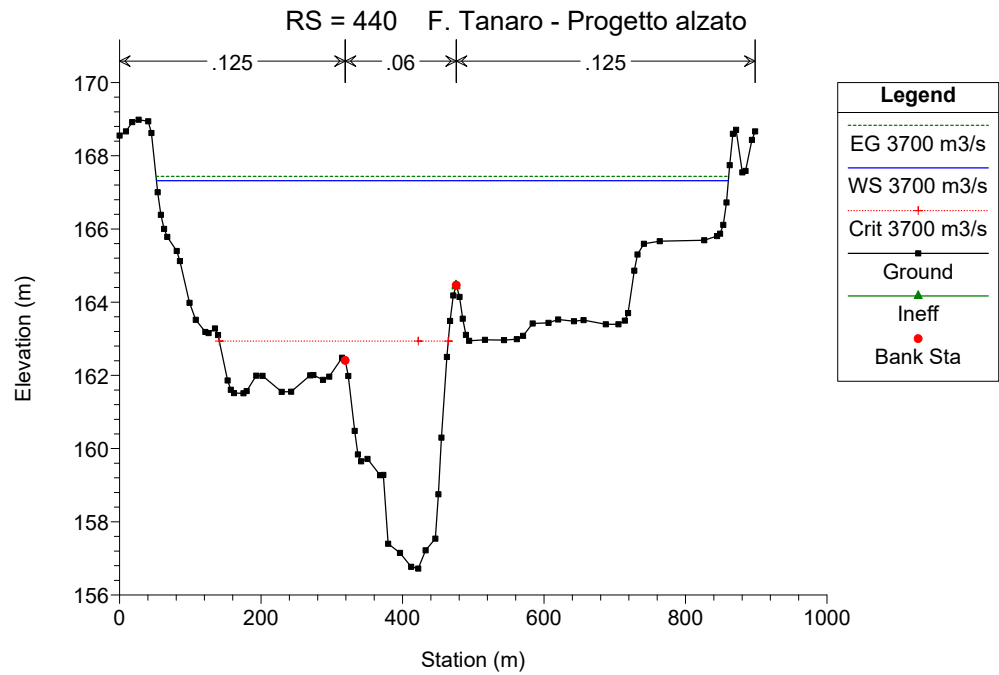
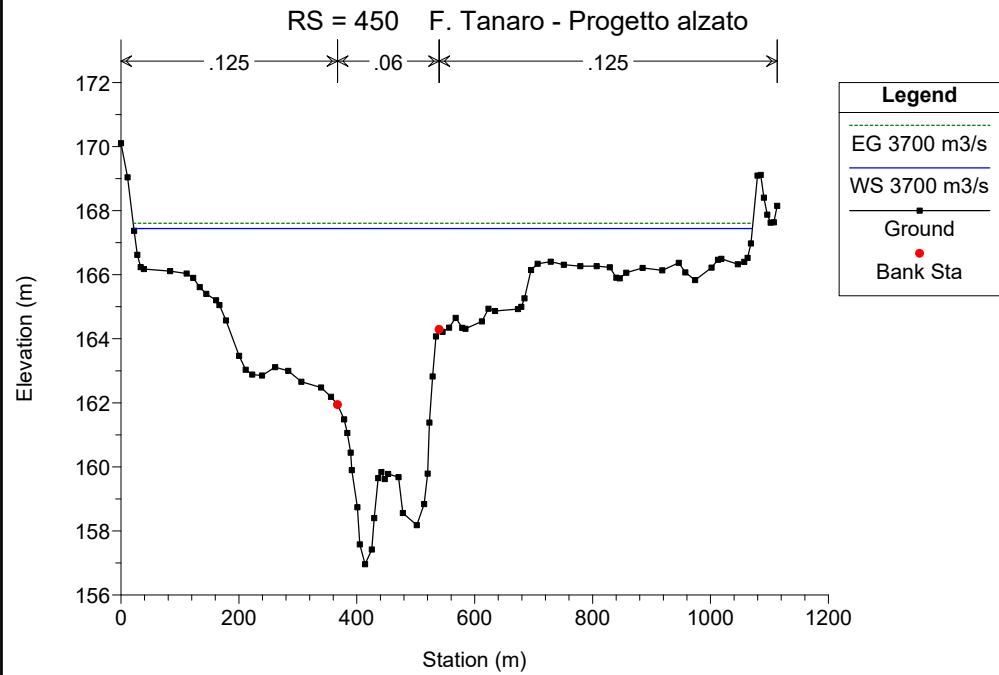
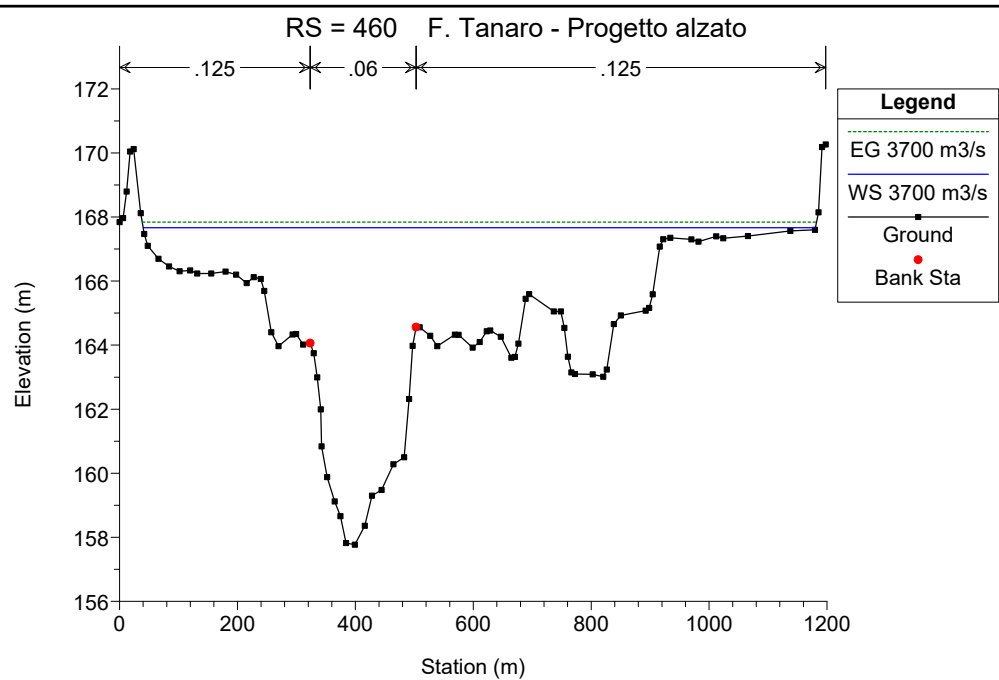
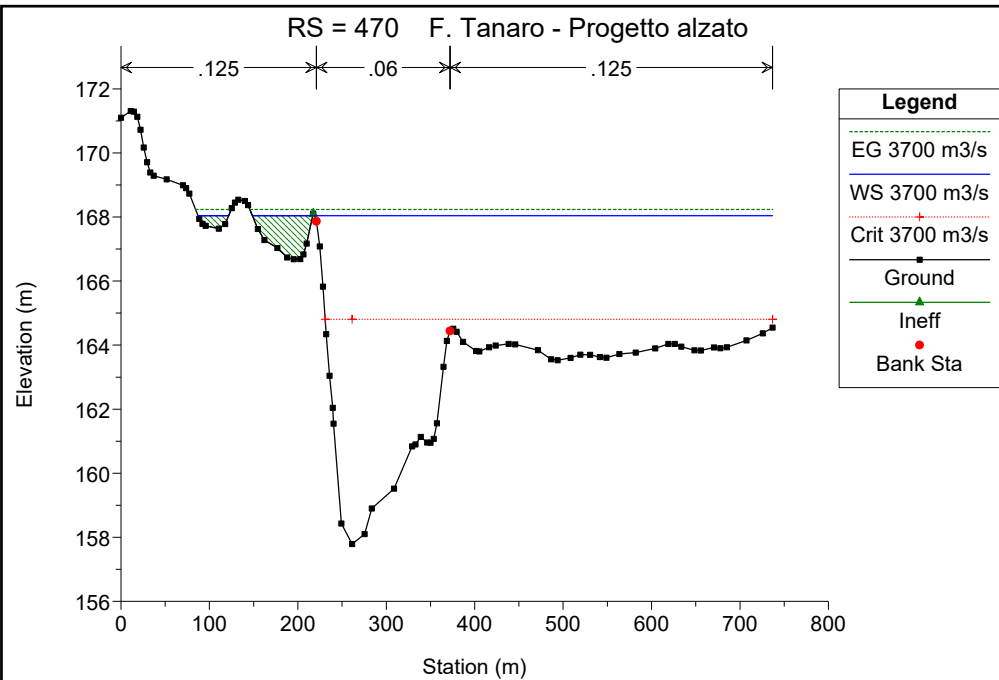
F. Tanaro - Progetto alzato

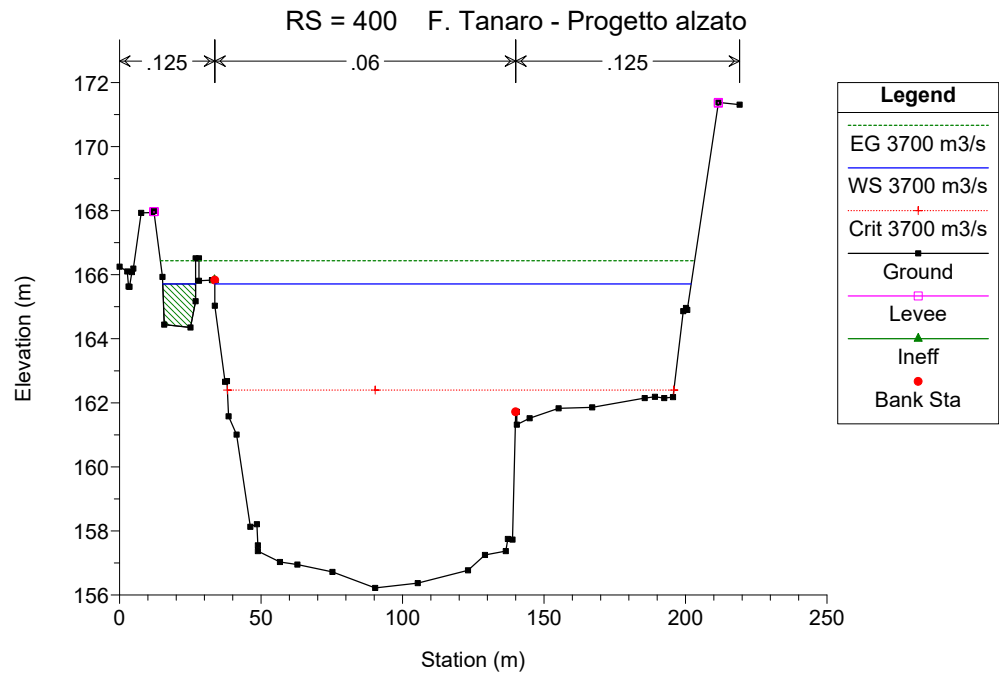
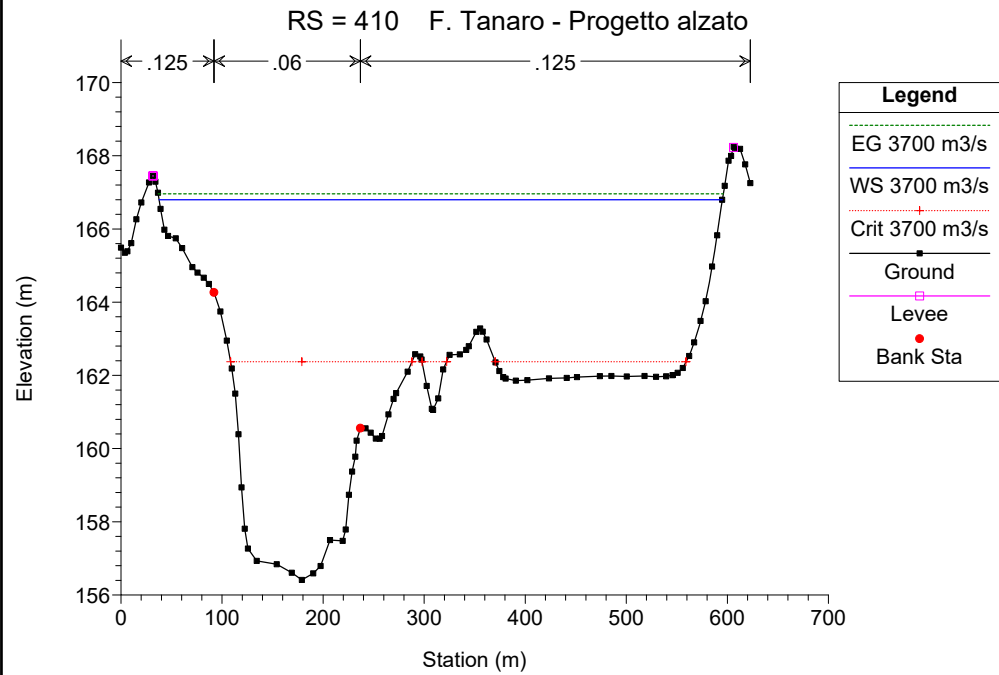
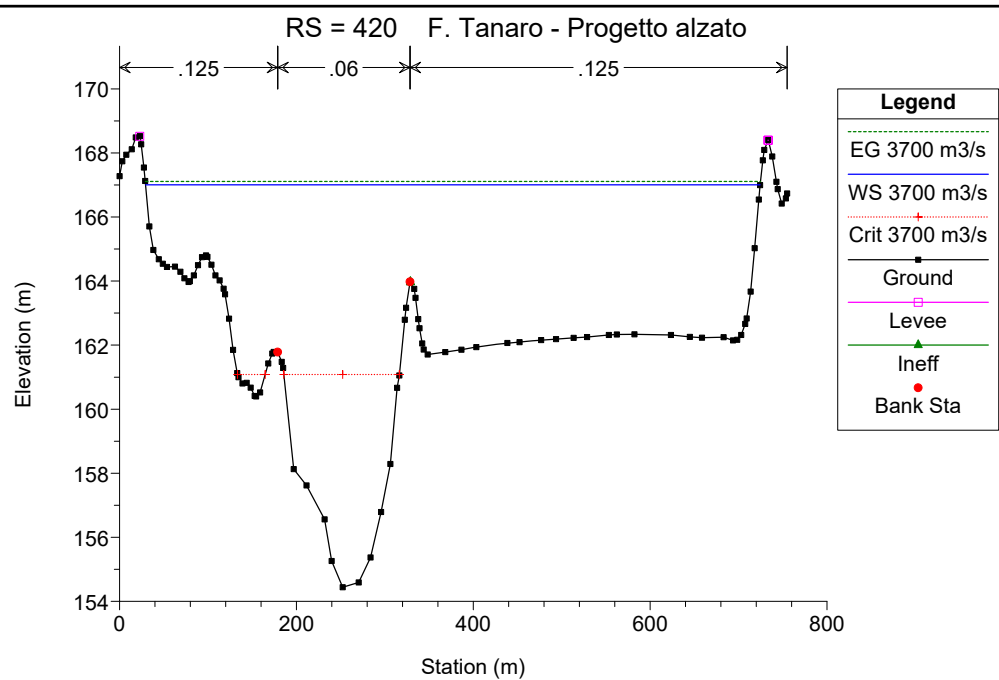
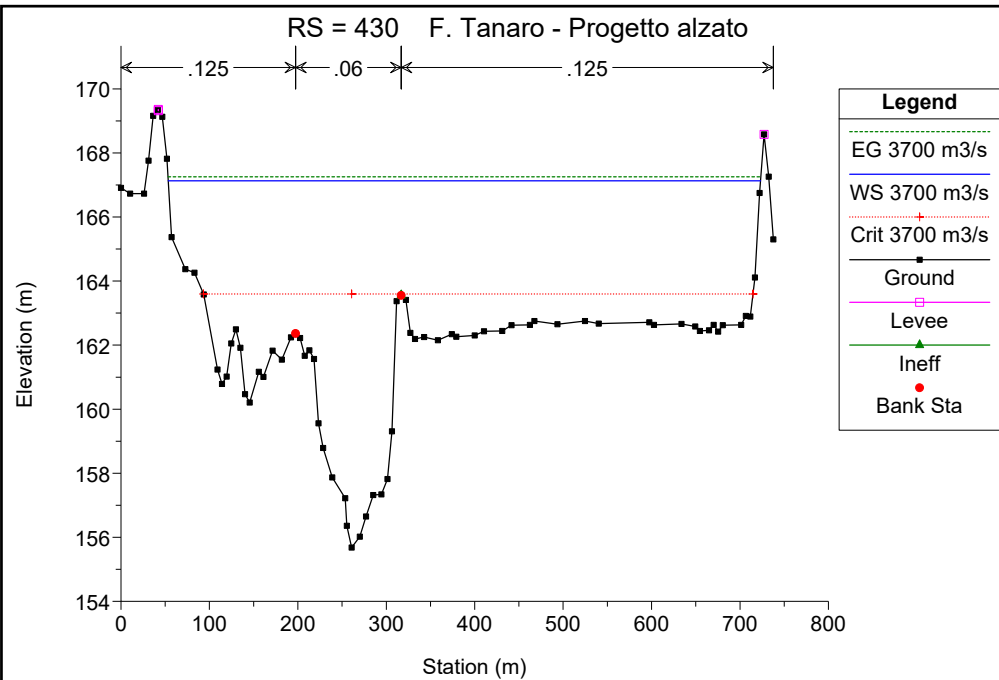
Tanaro 1

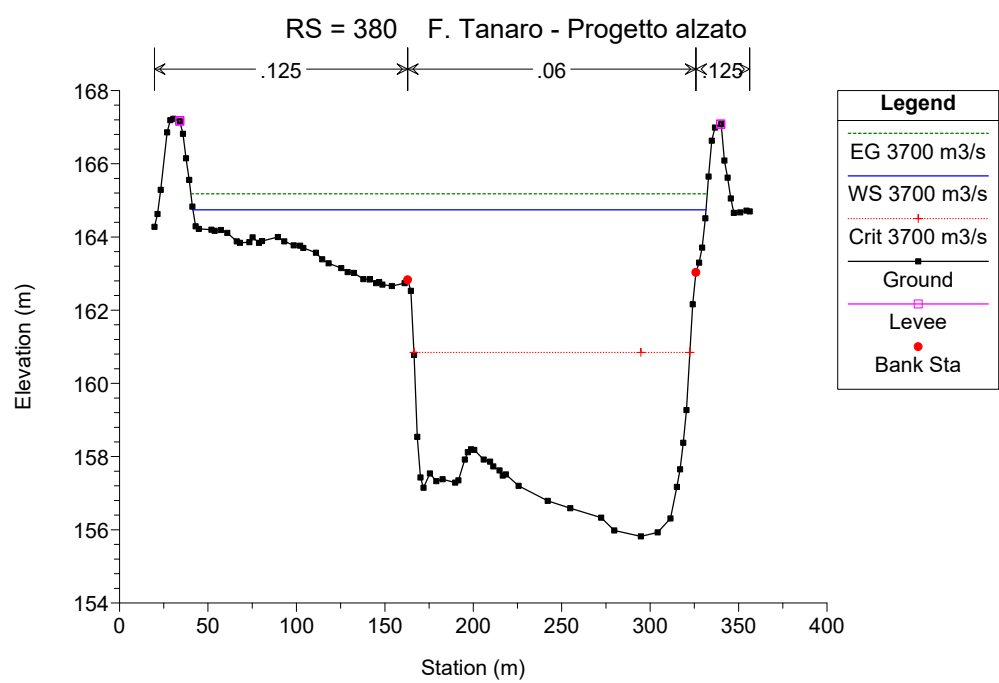
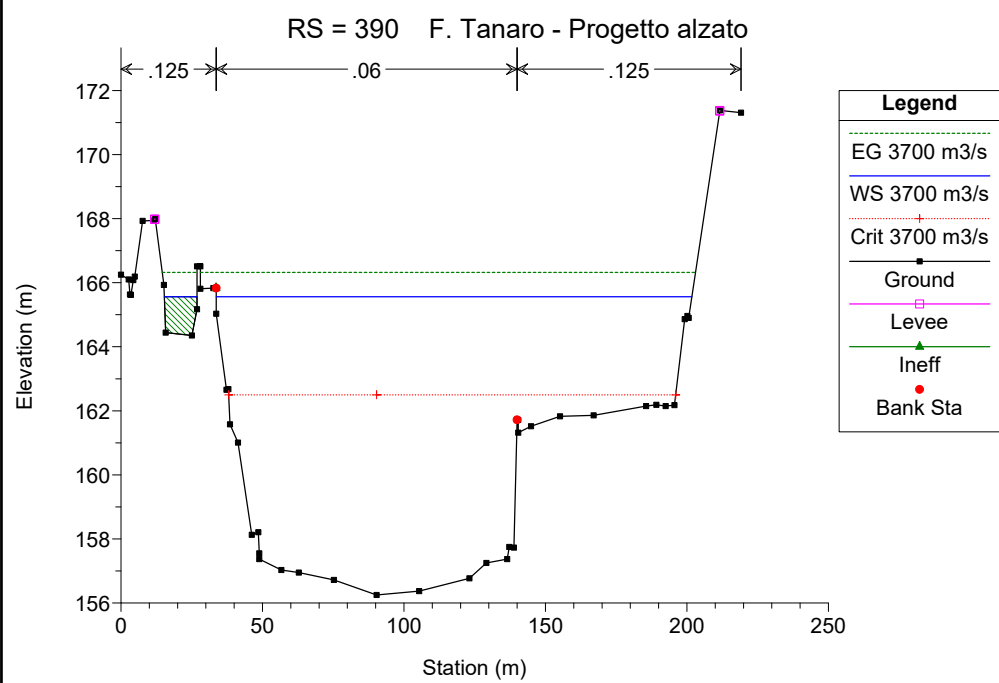
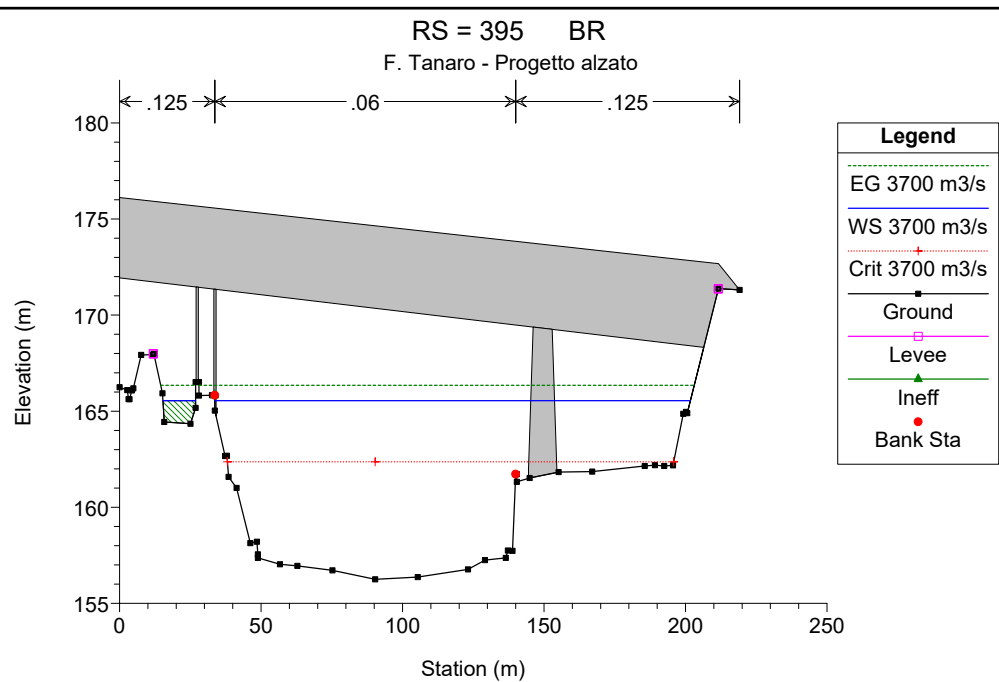
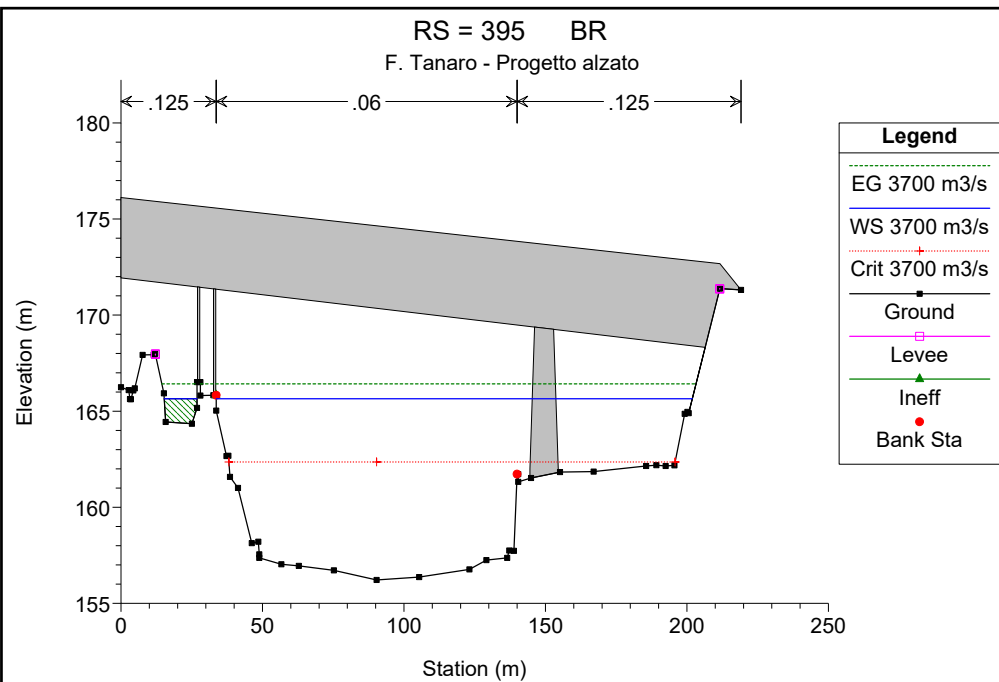


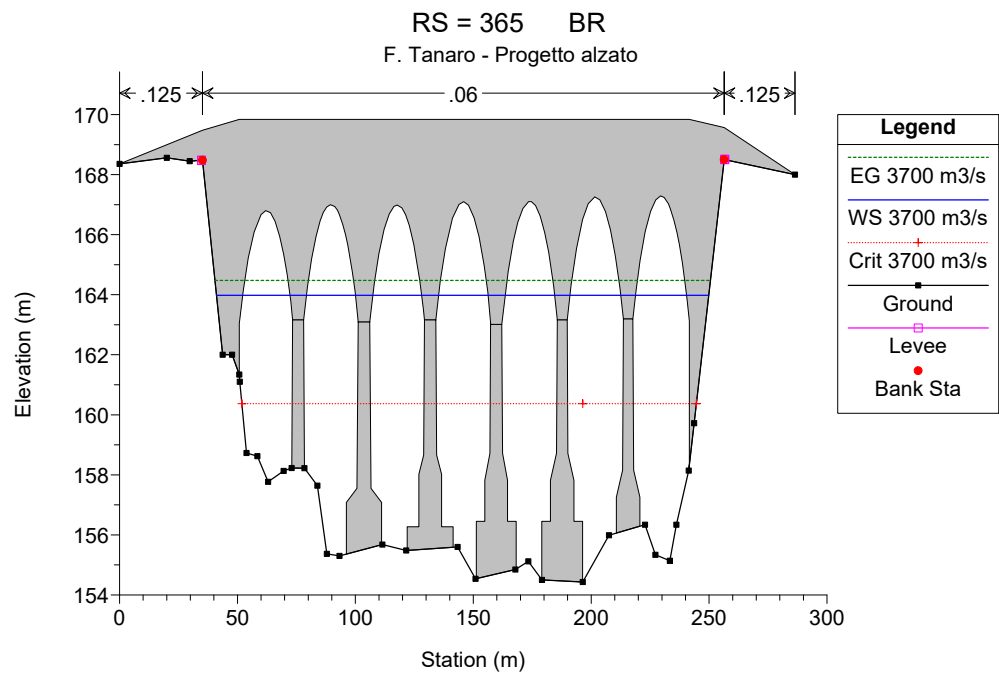
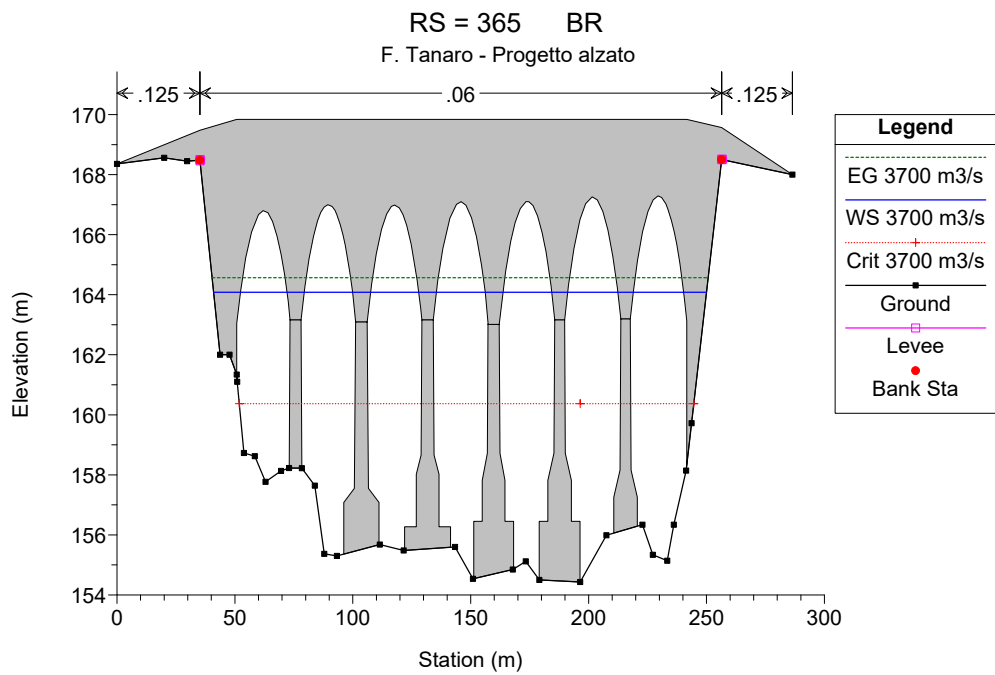
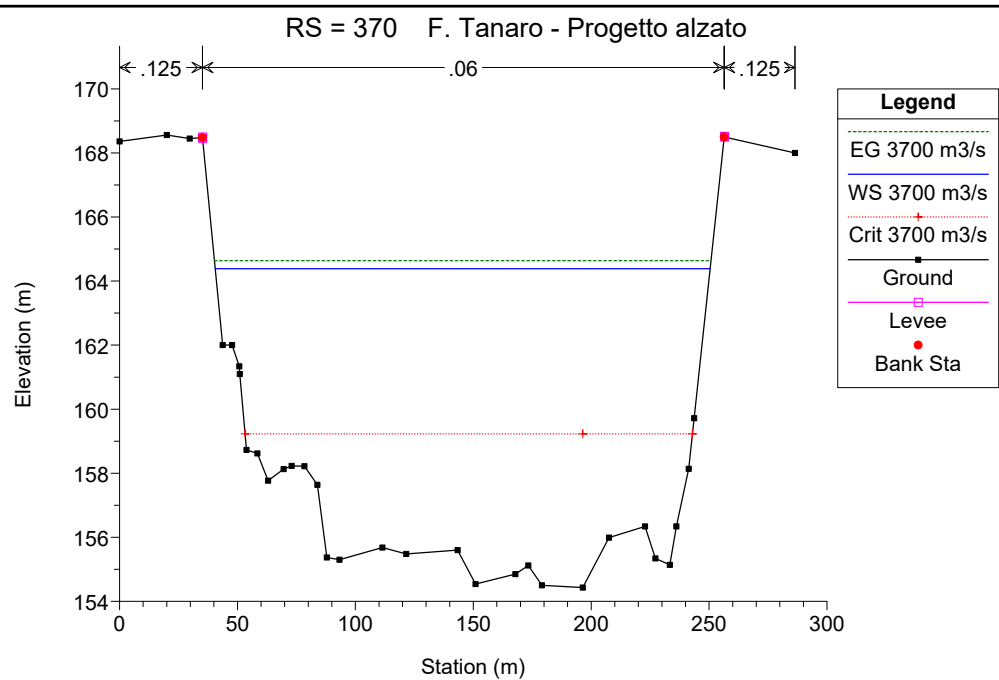
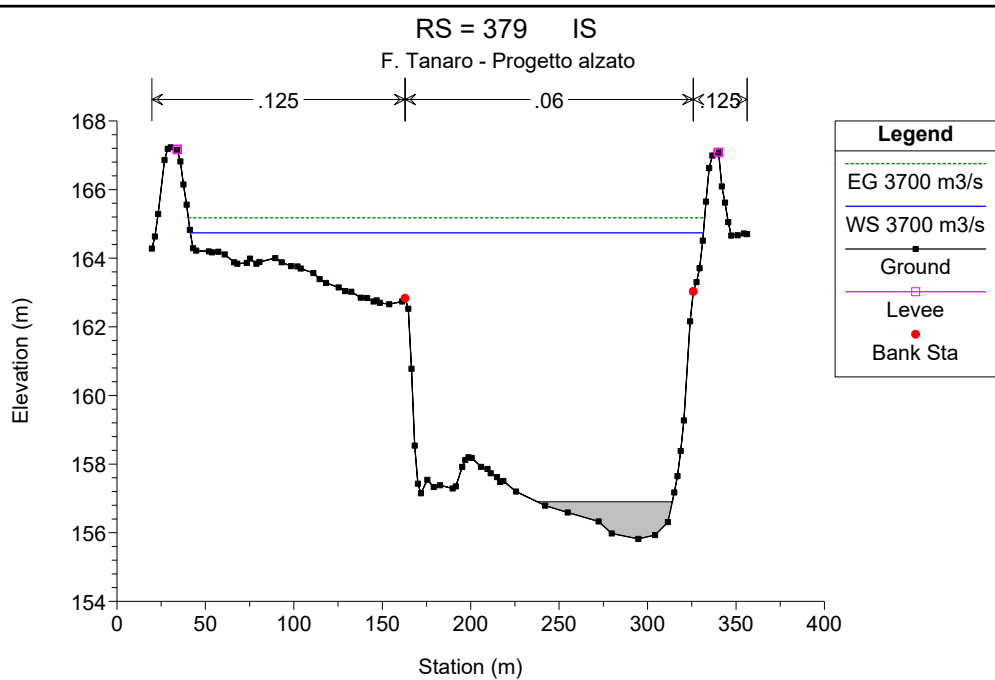


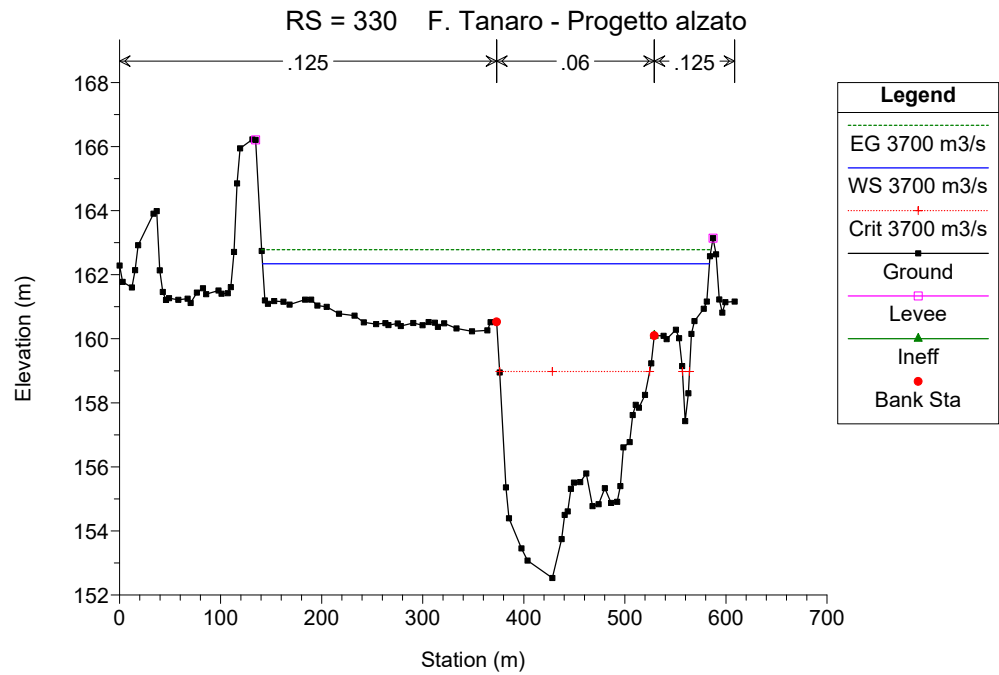
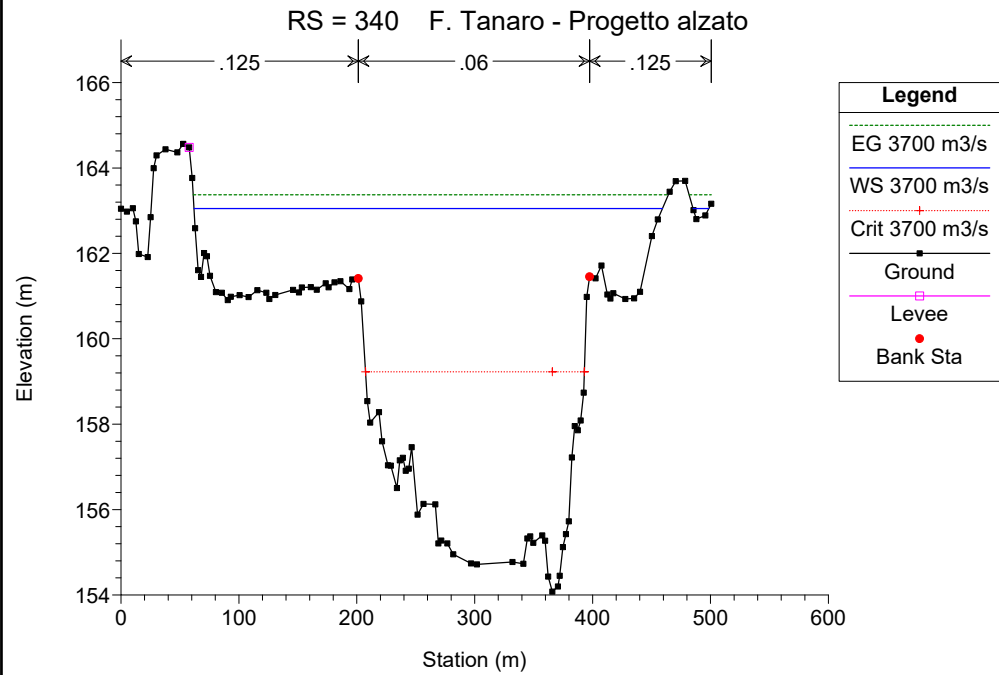
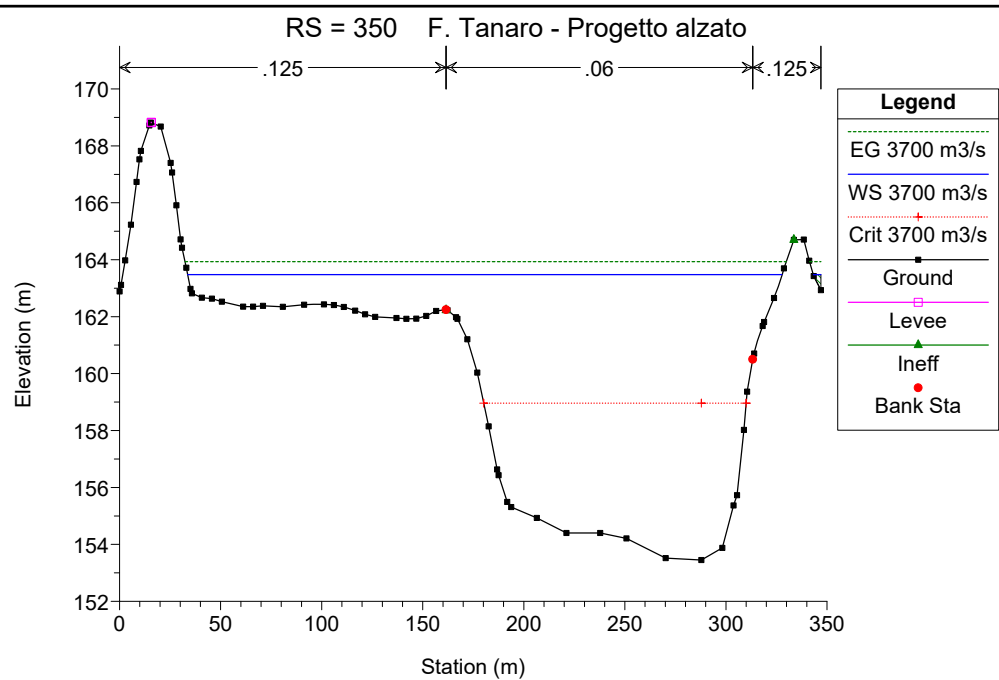
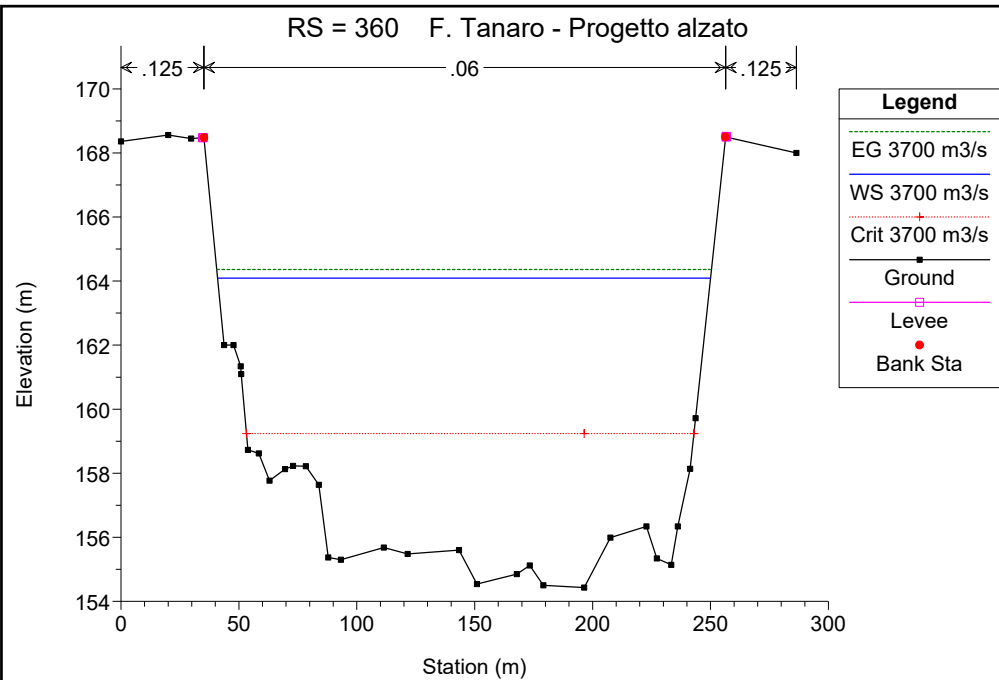


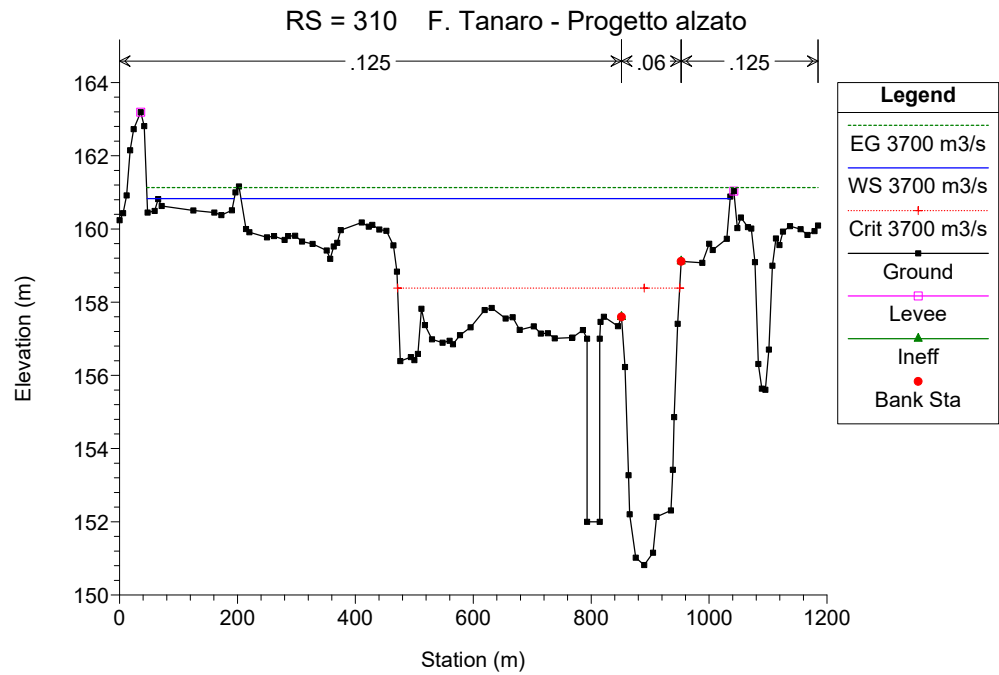
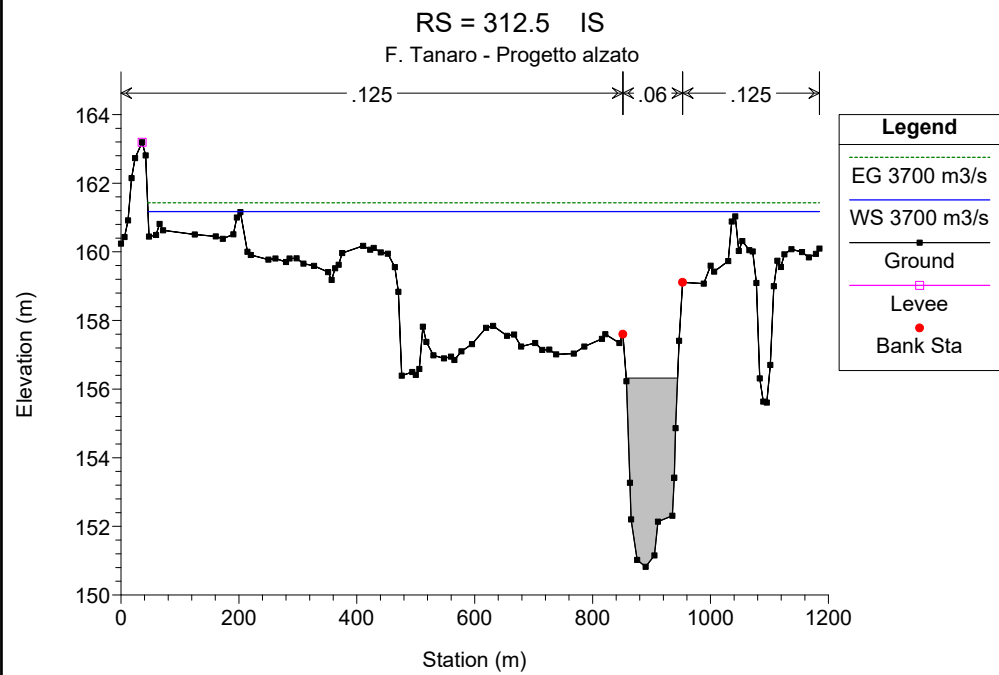
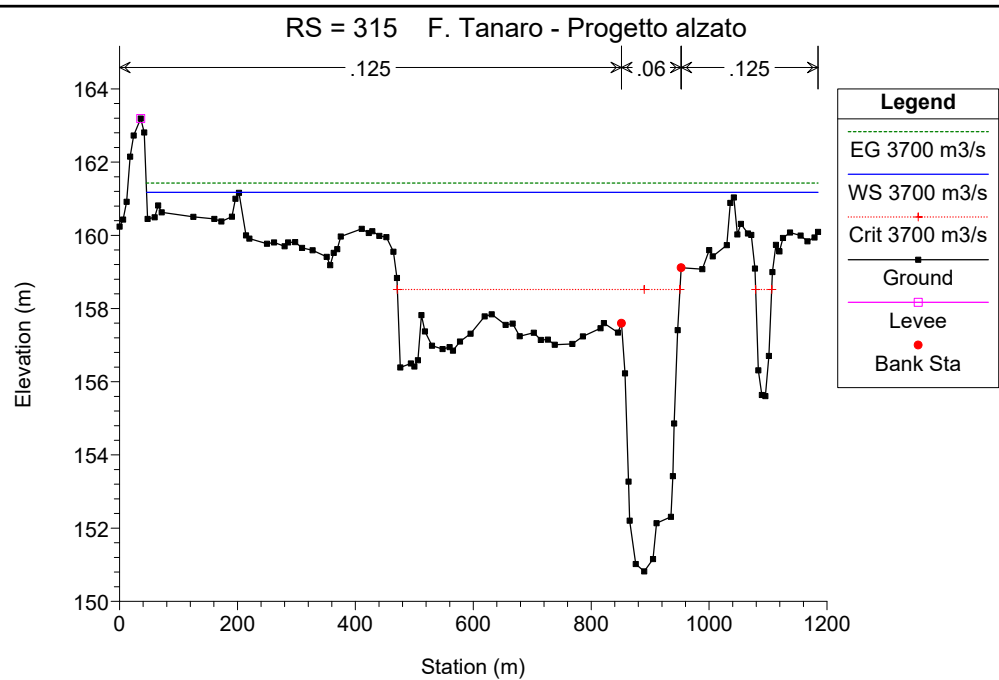
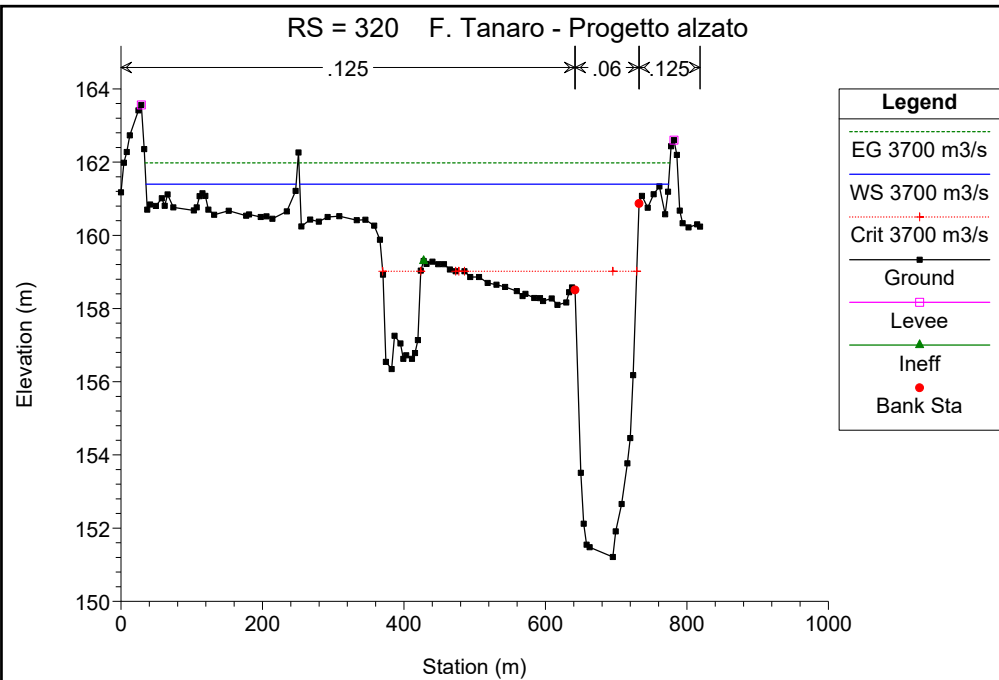


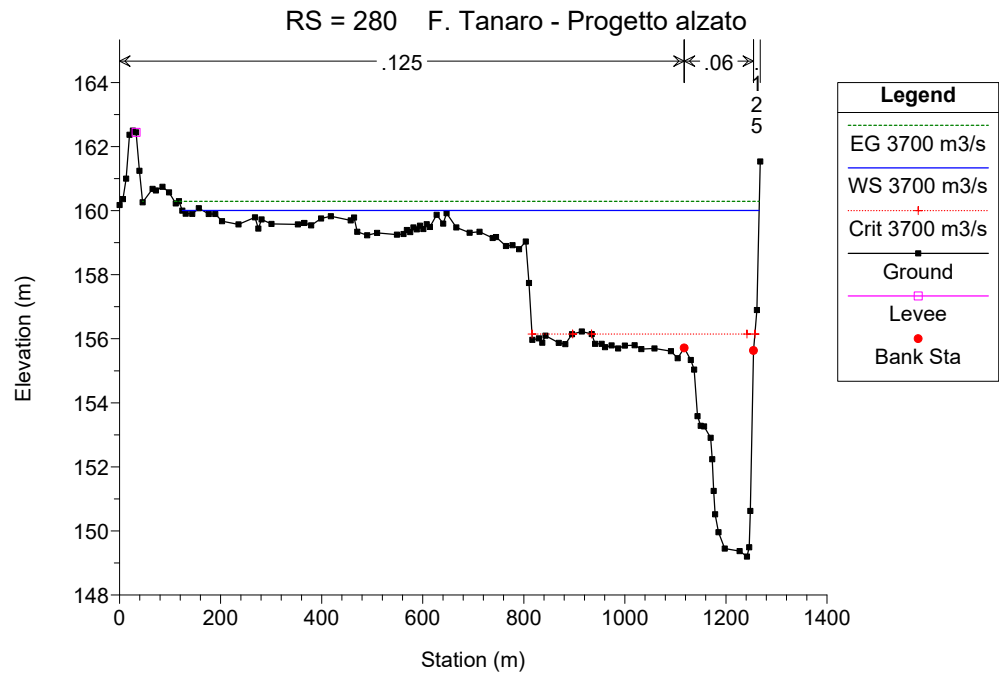
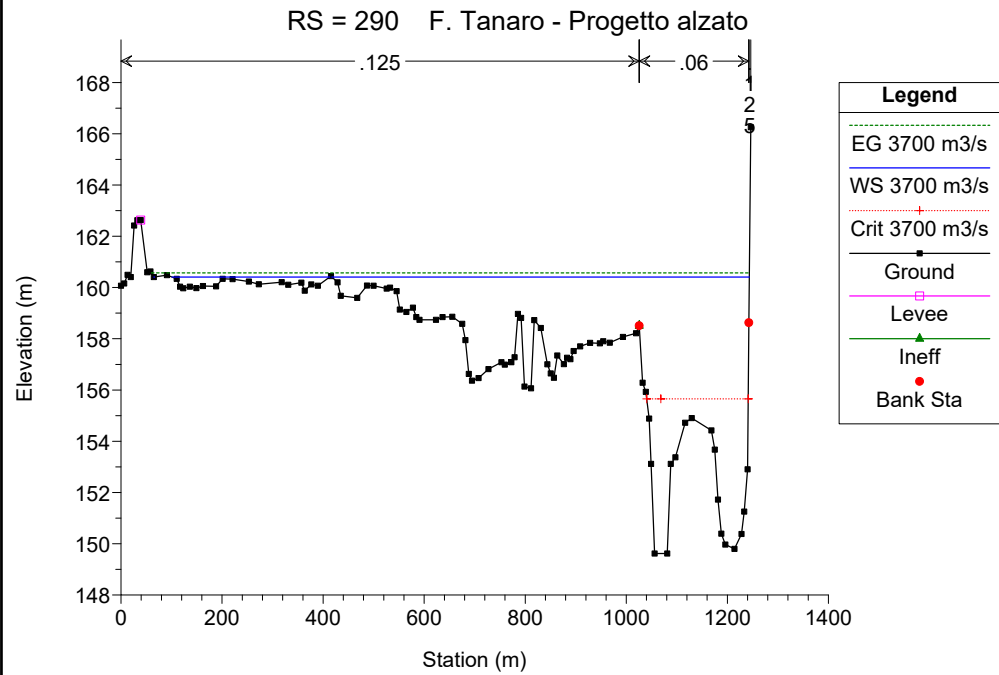
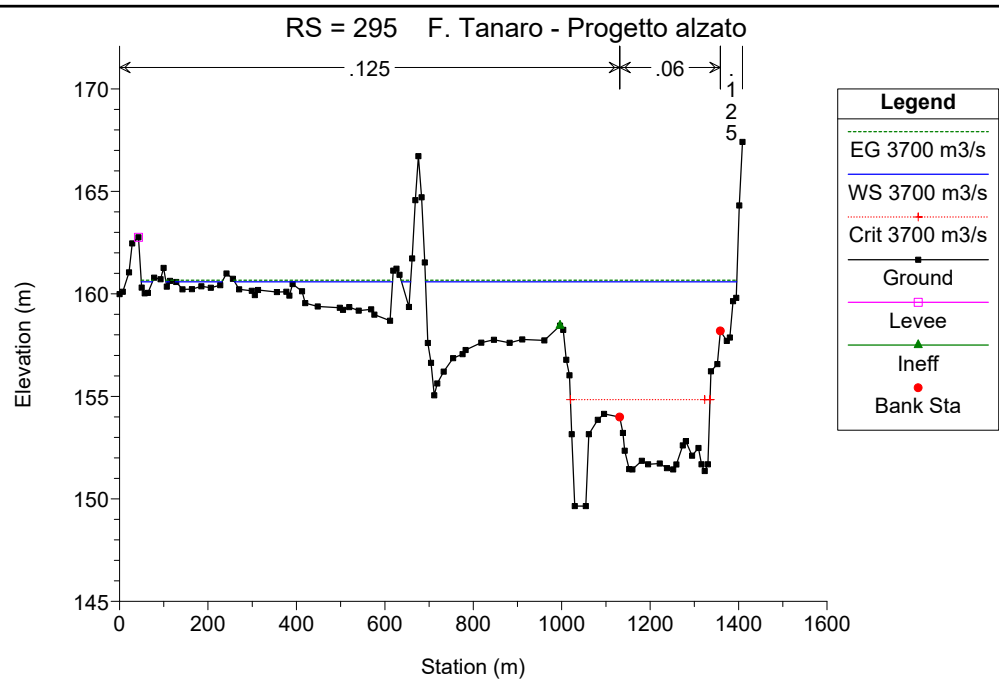
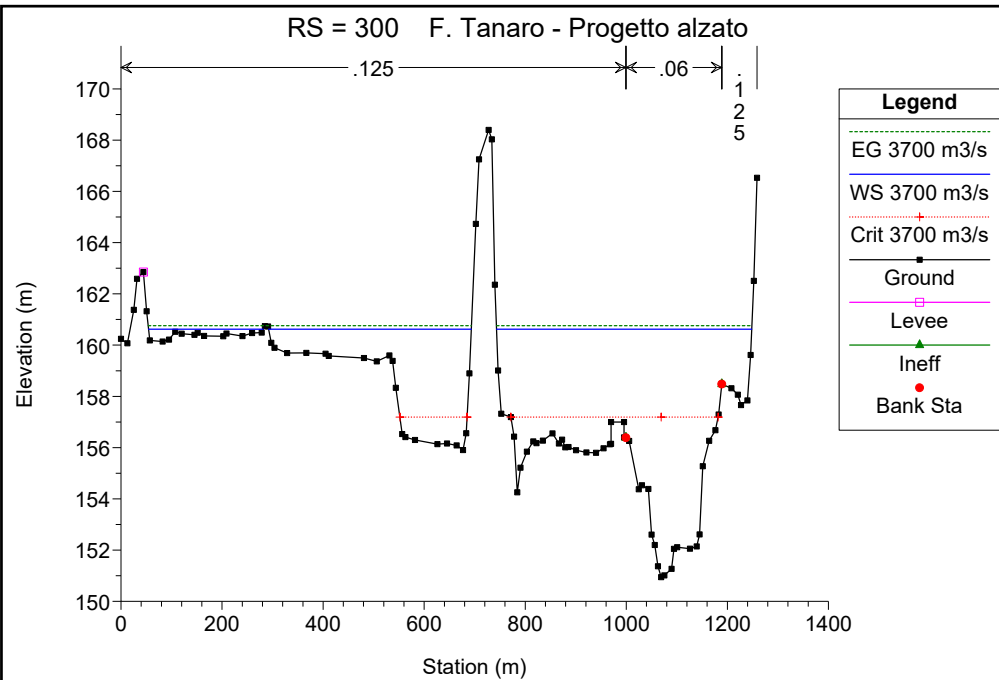


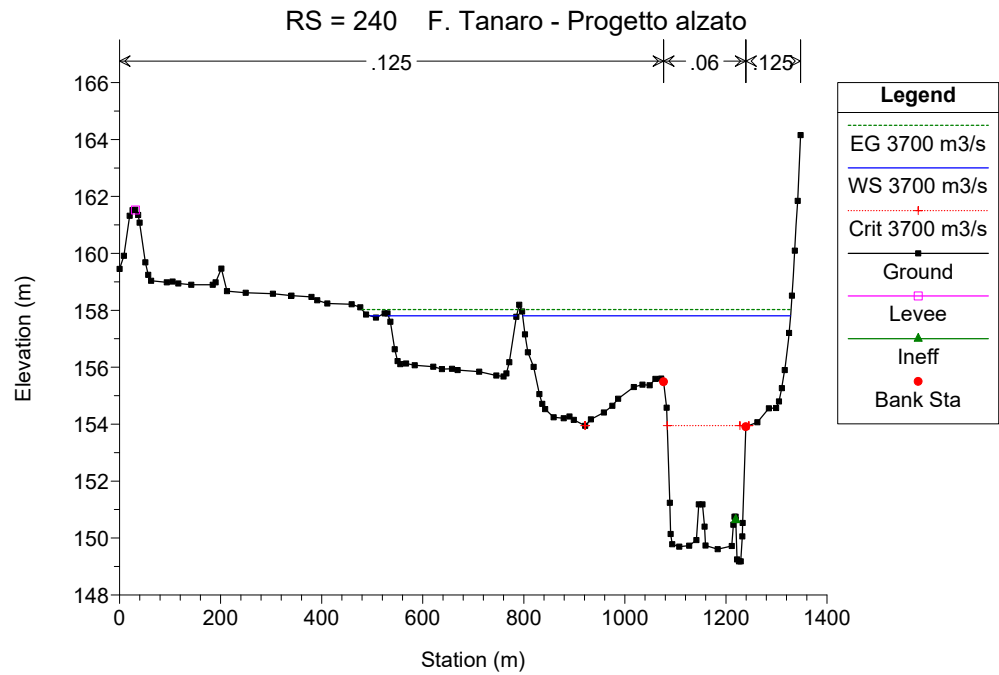
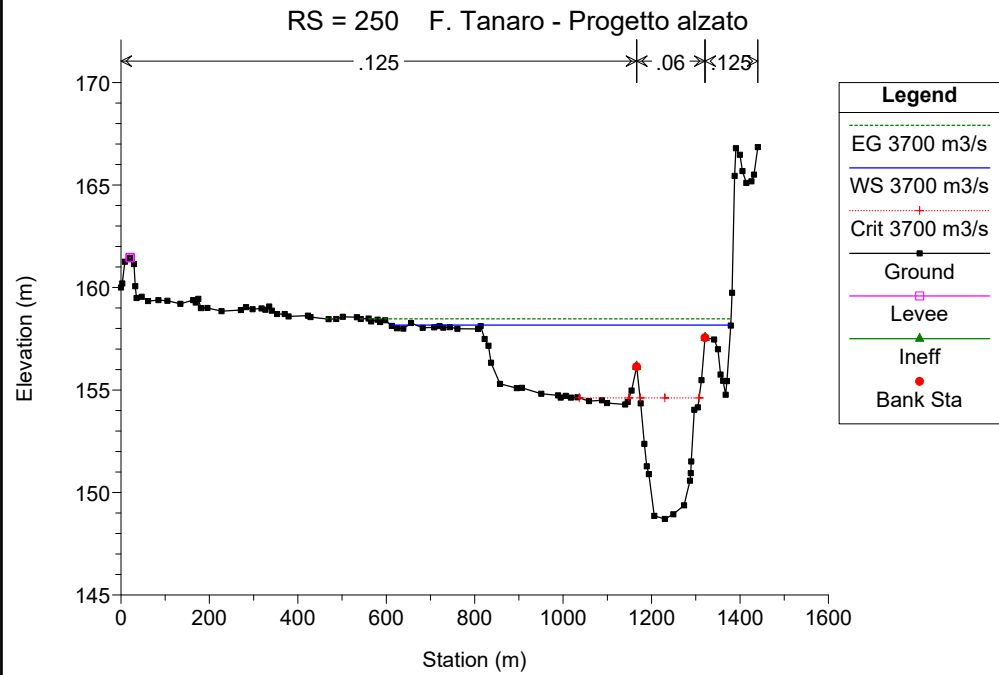
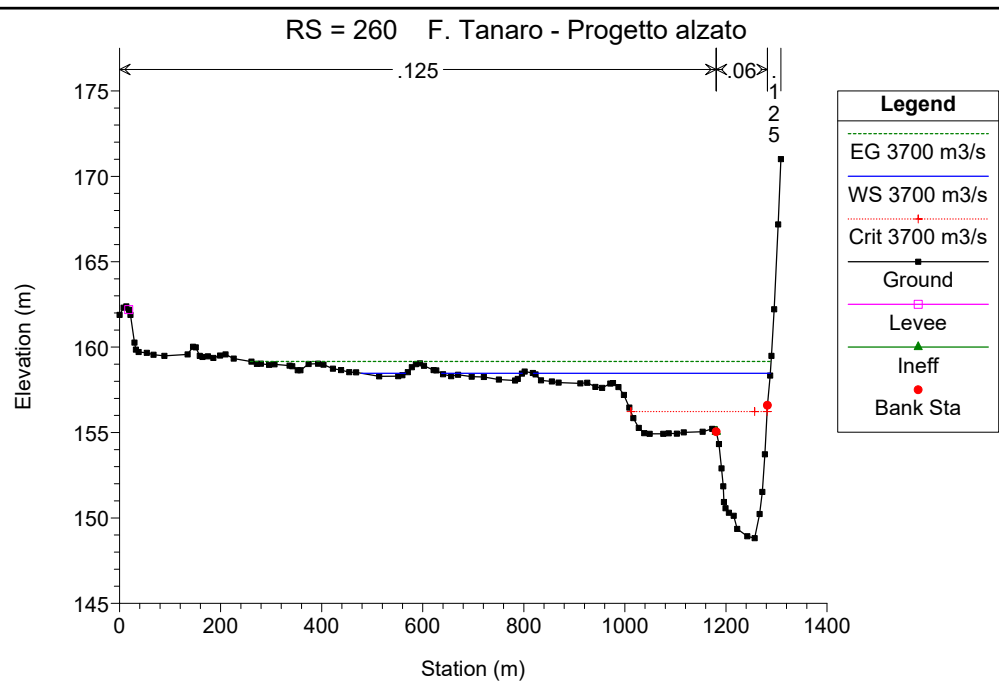
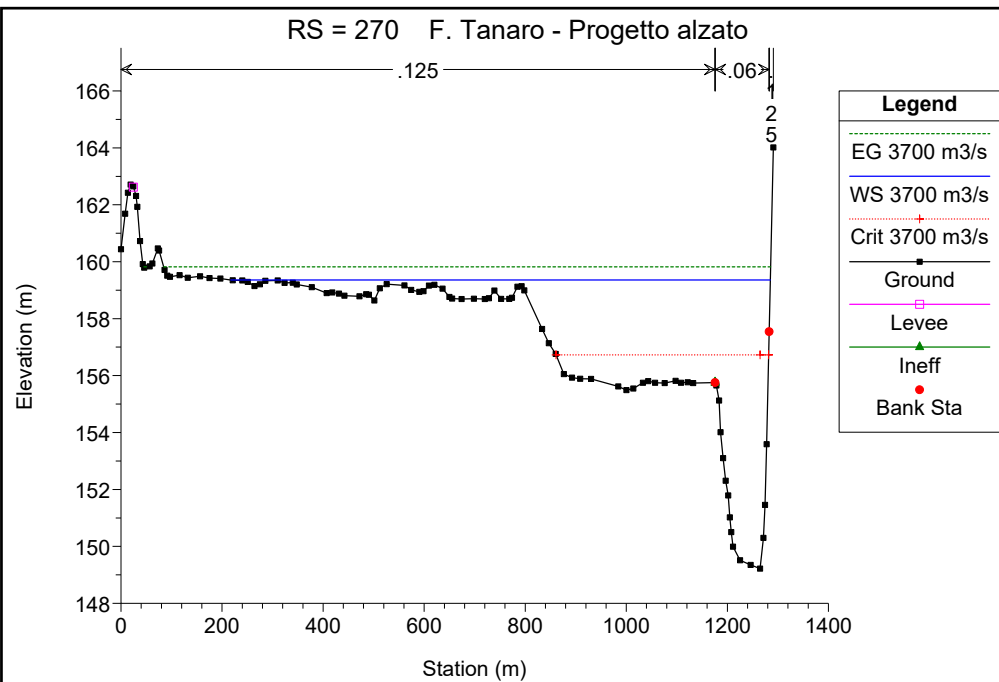


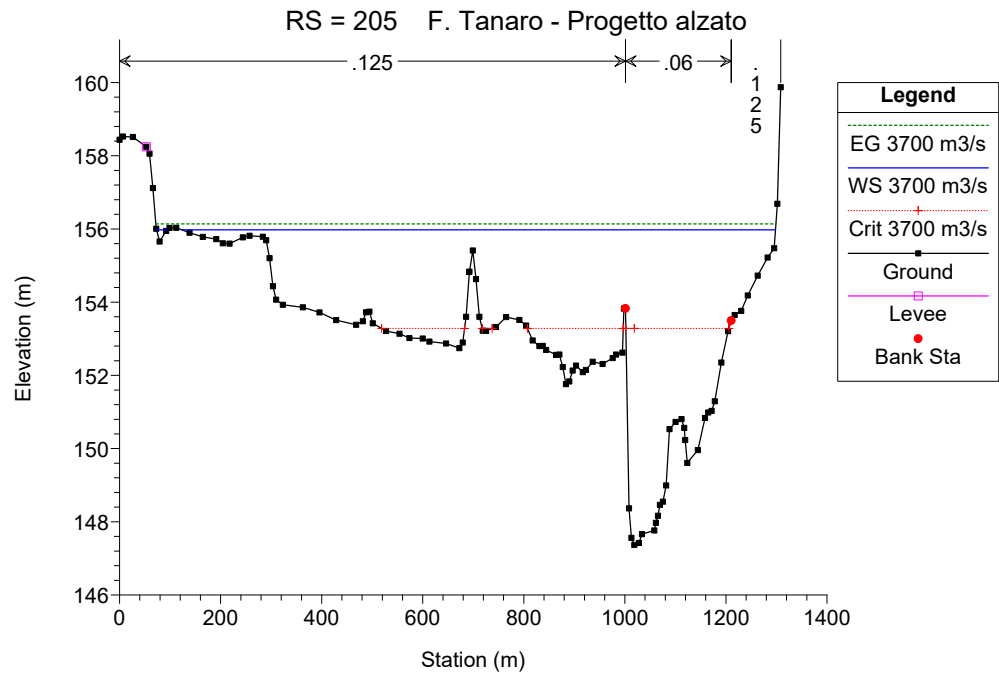
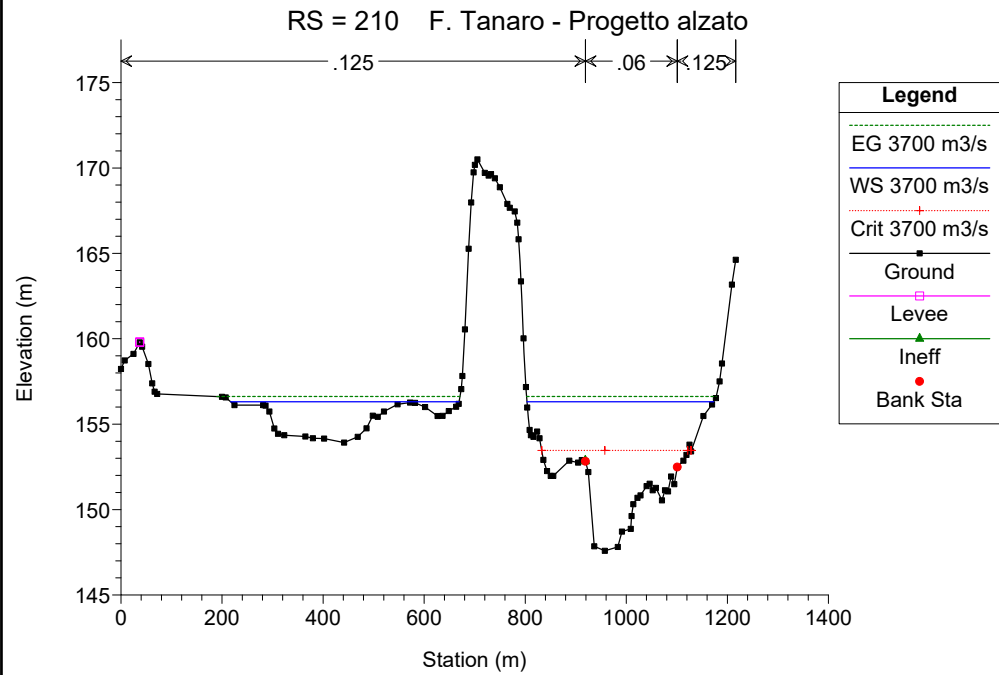
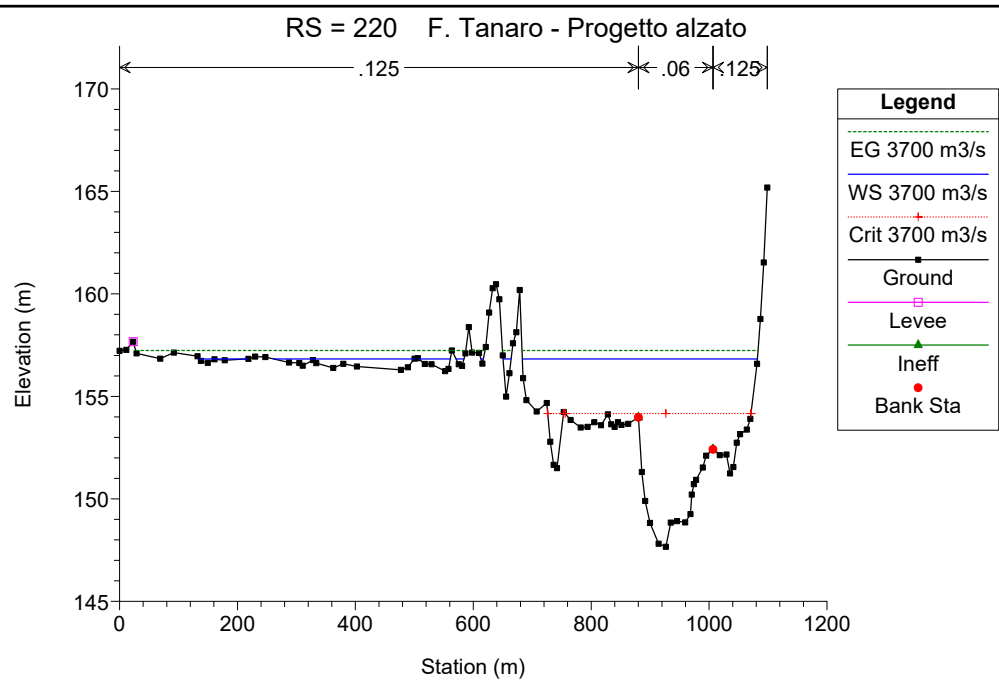
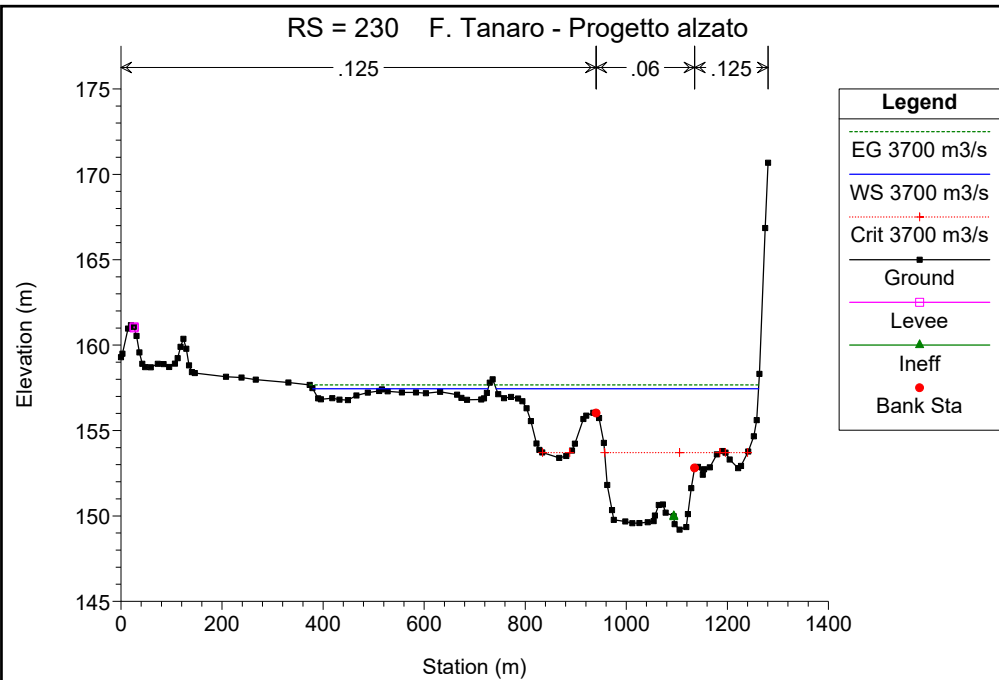


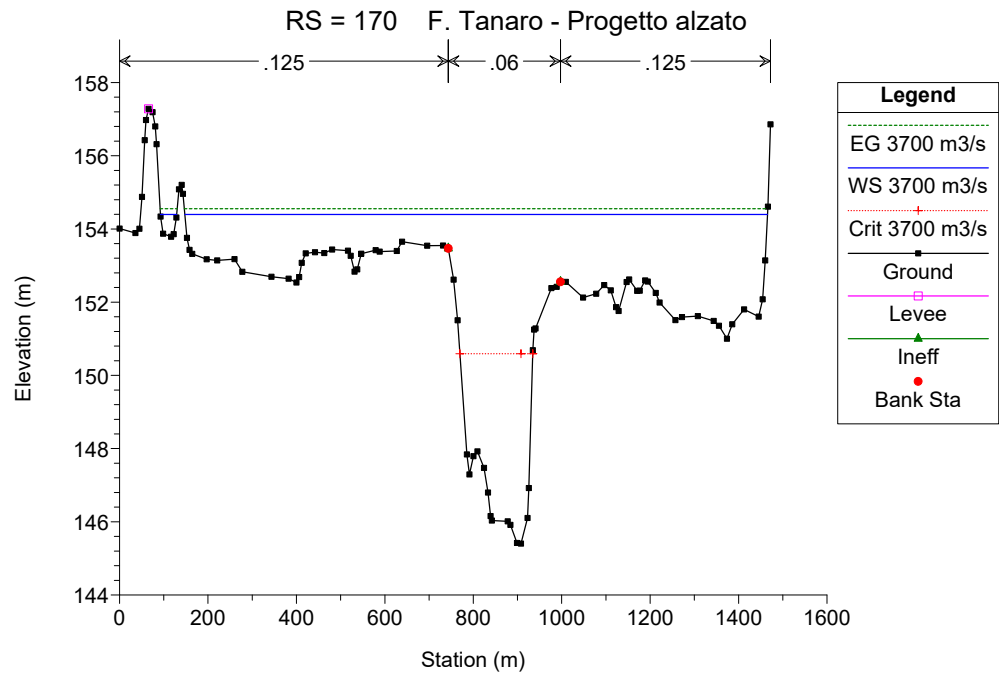
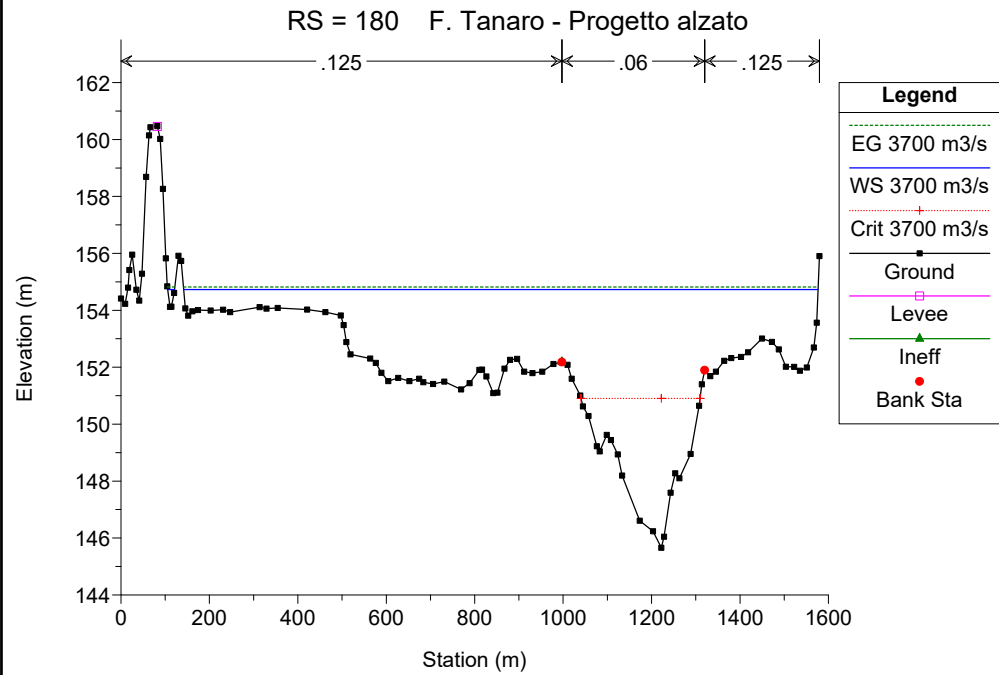
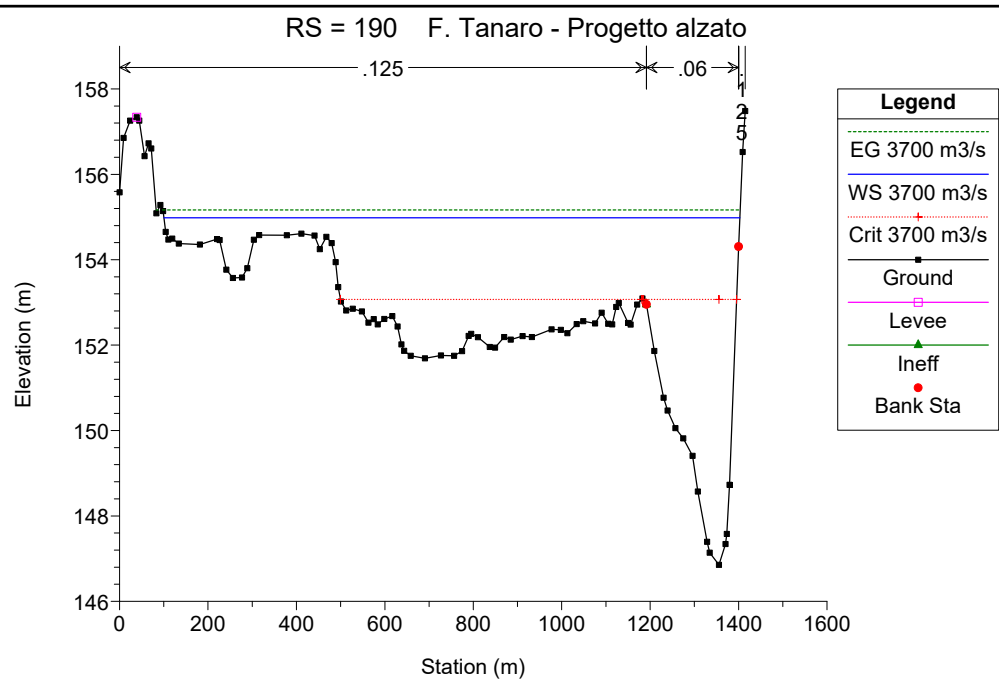
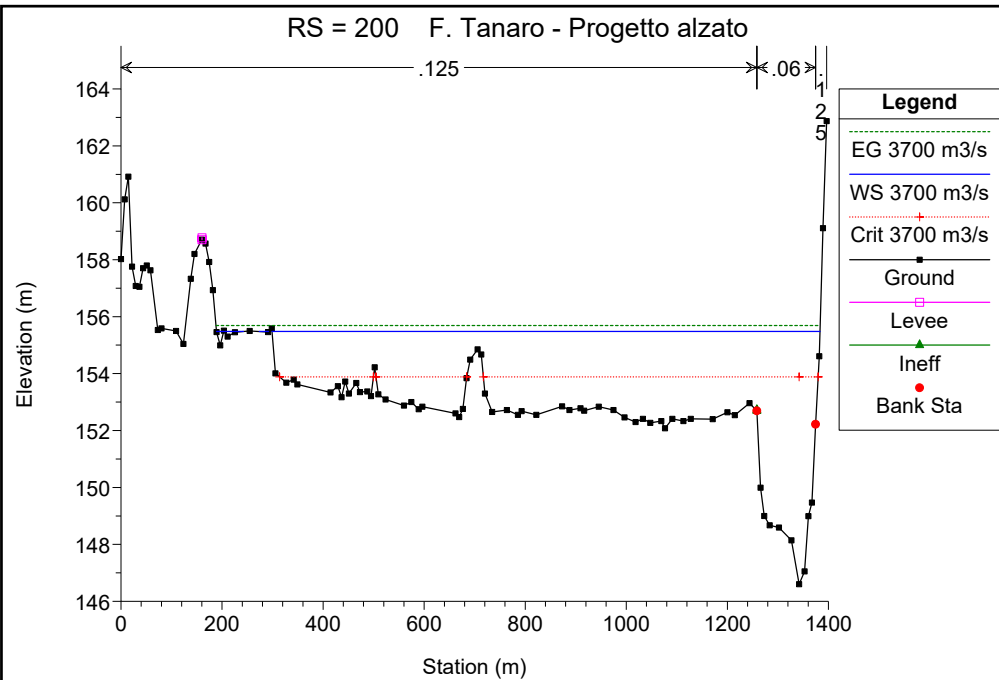


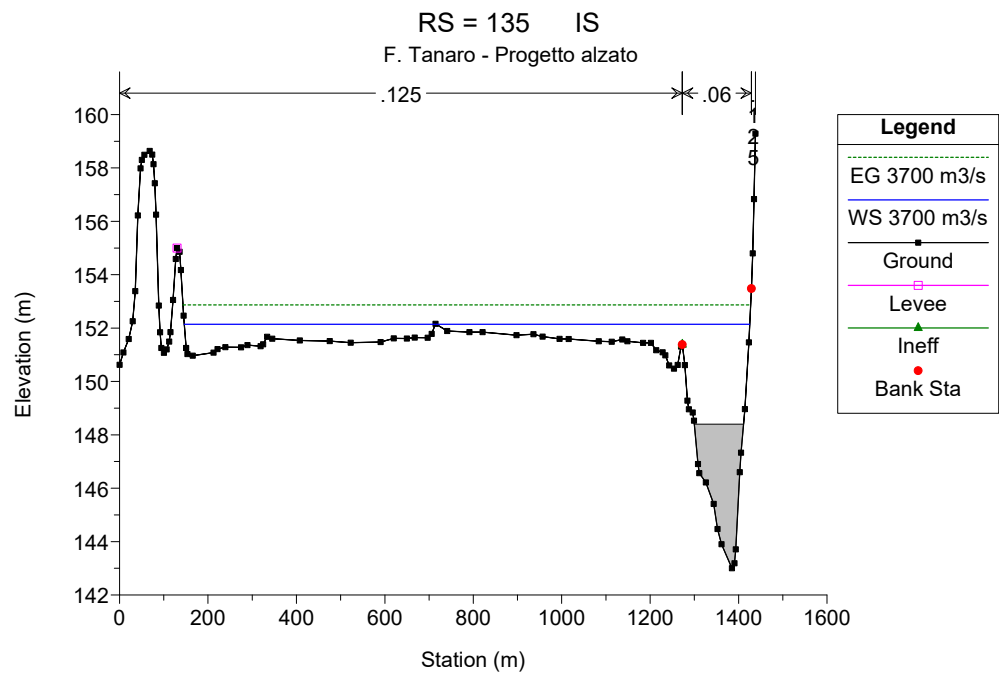
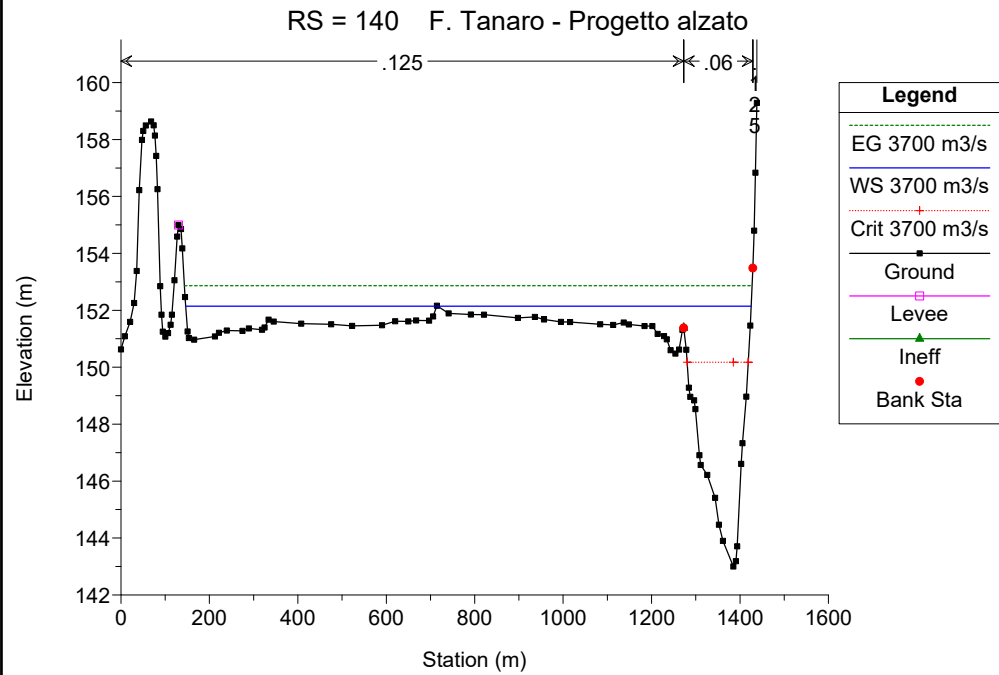
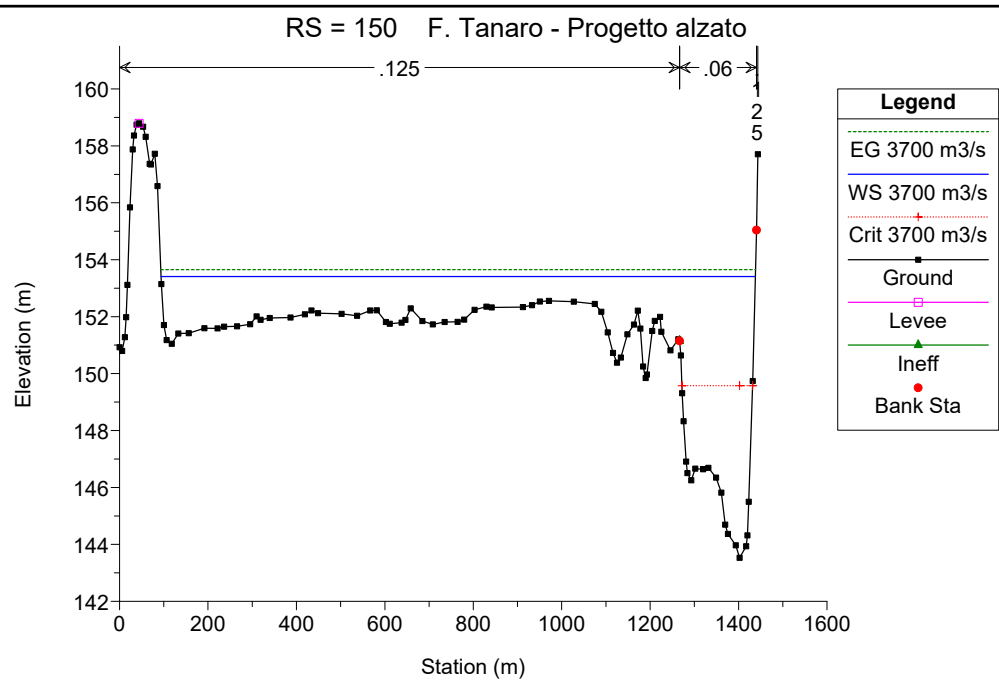
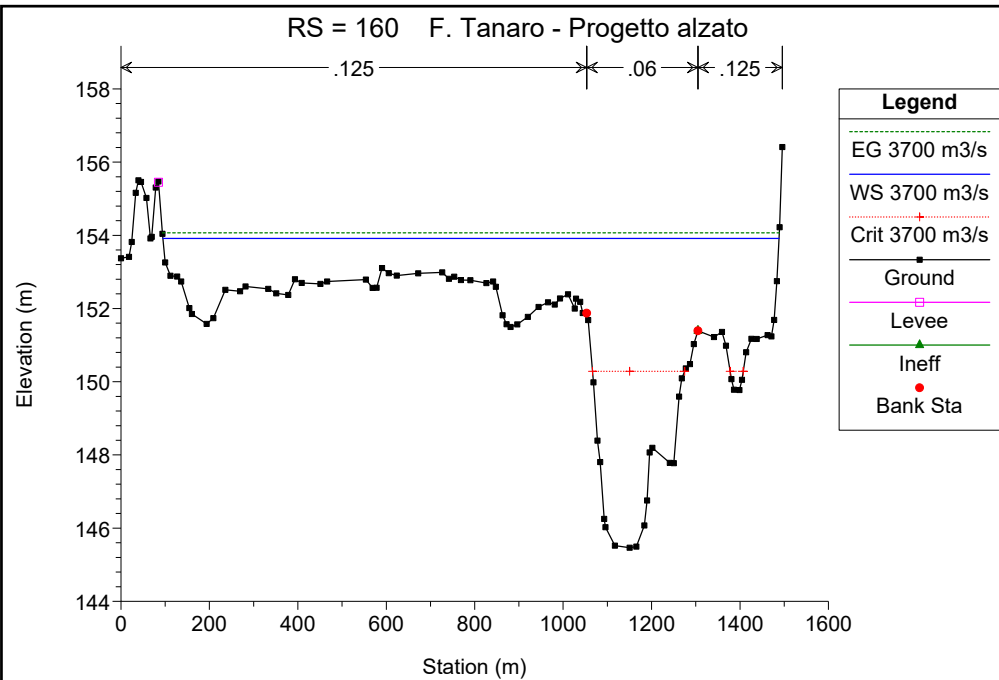


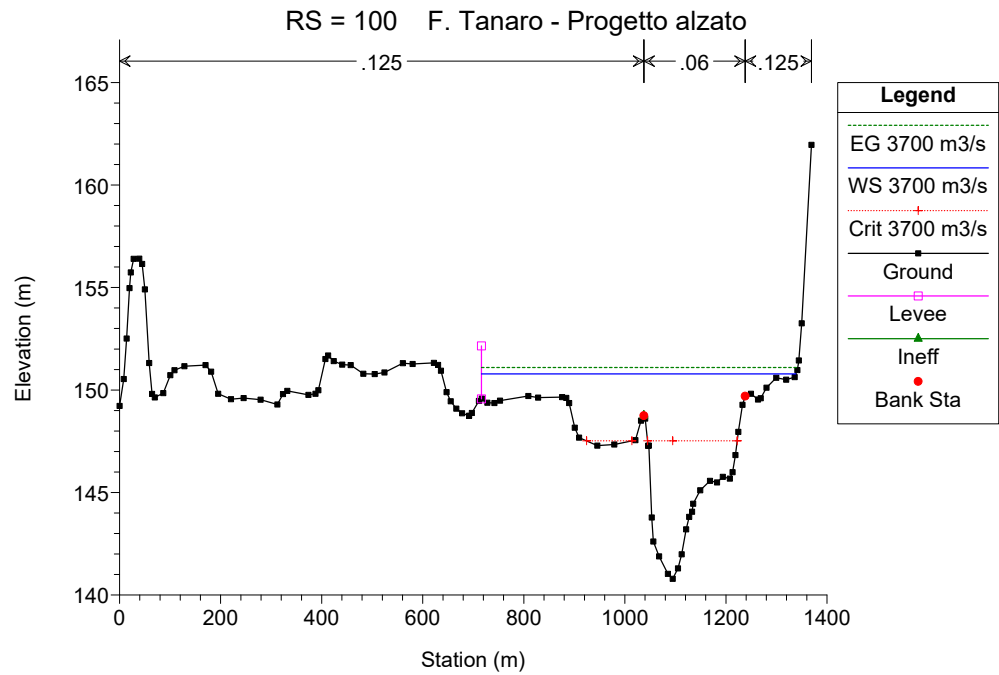
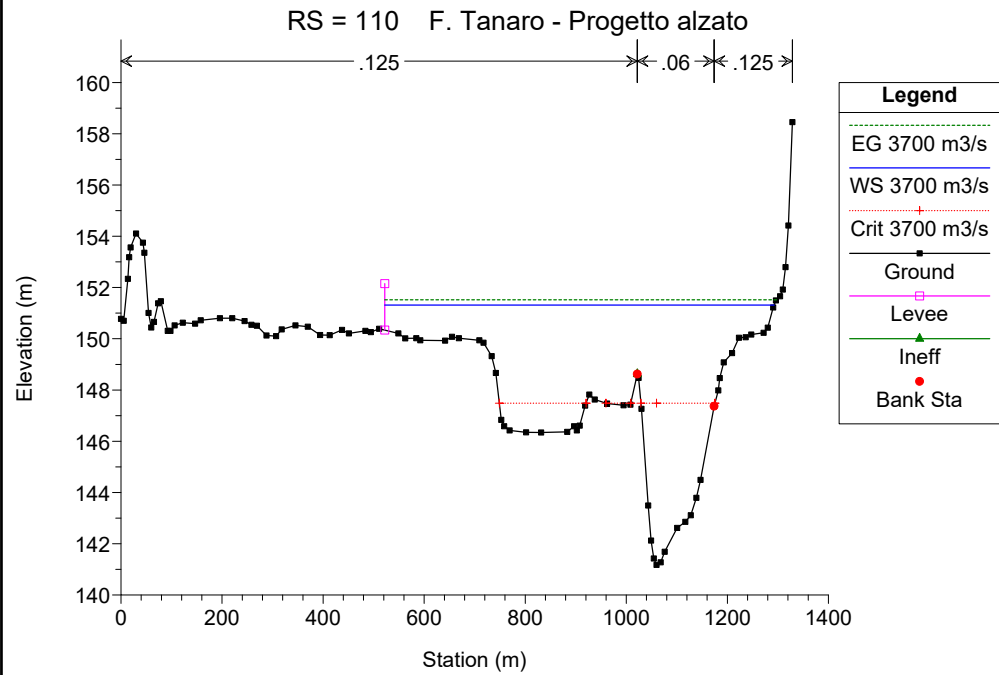
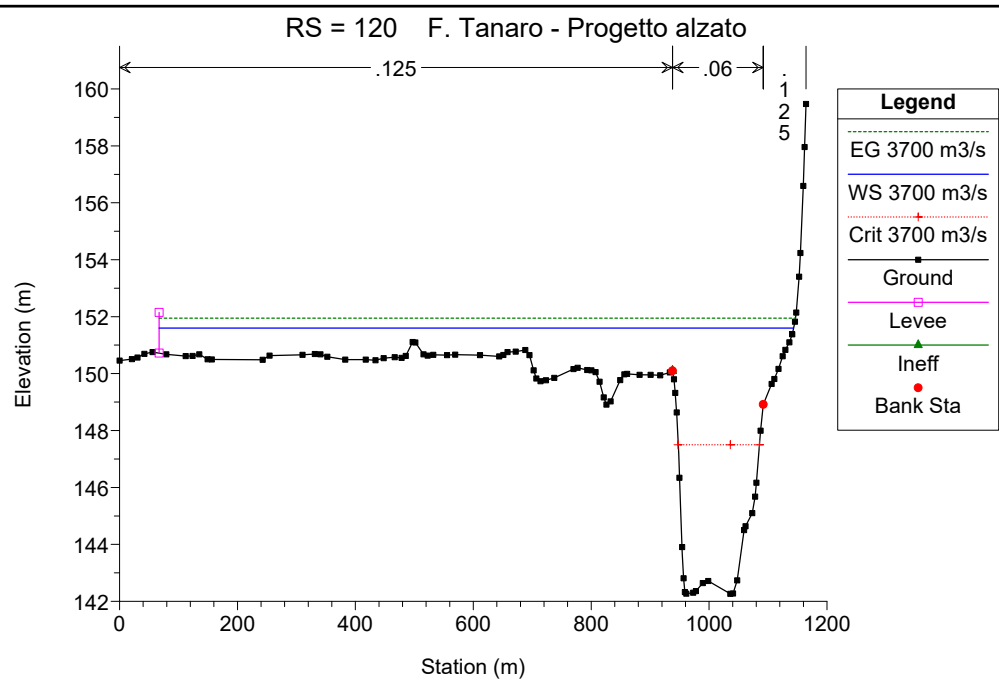
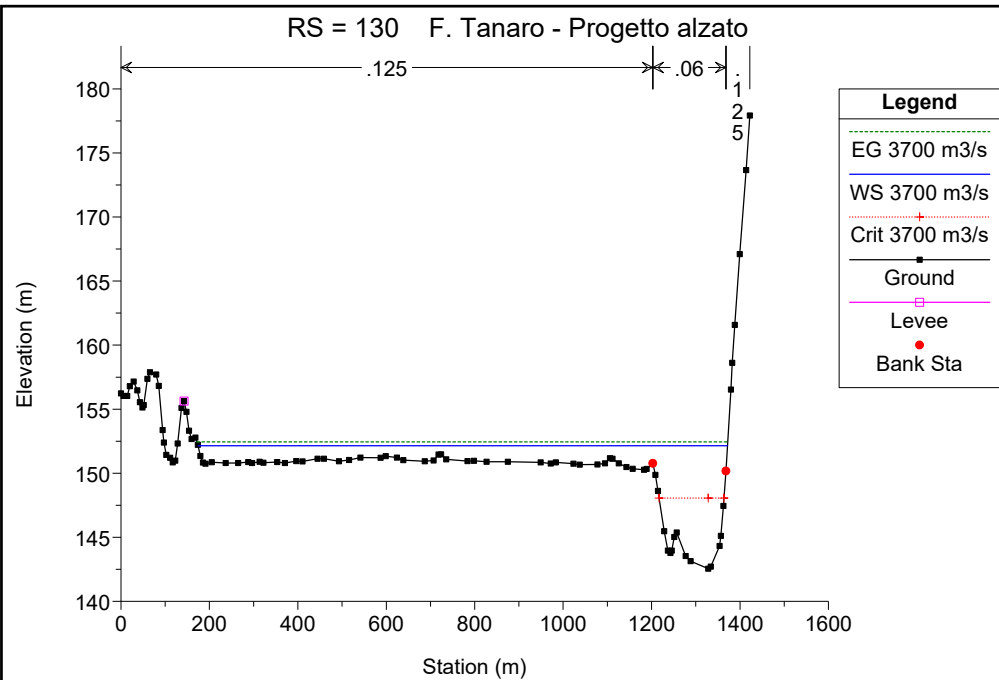


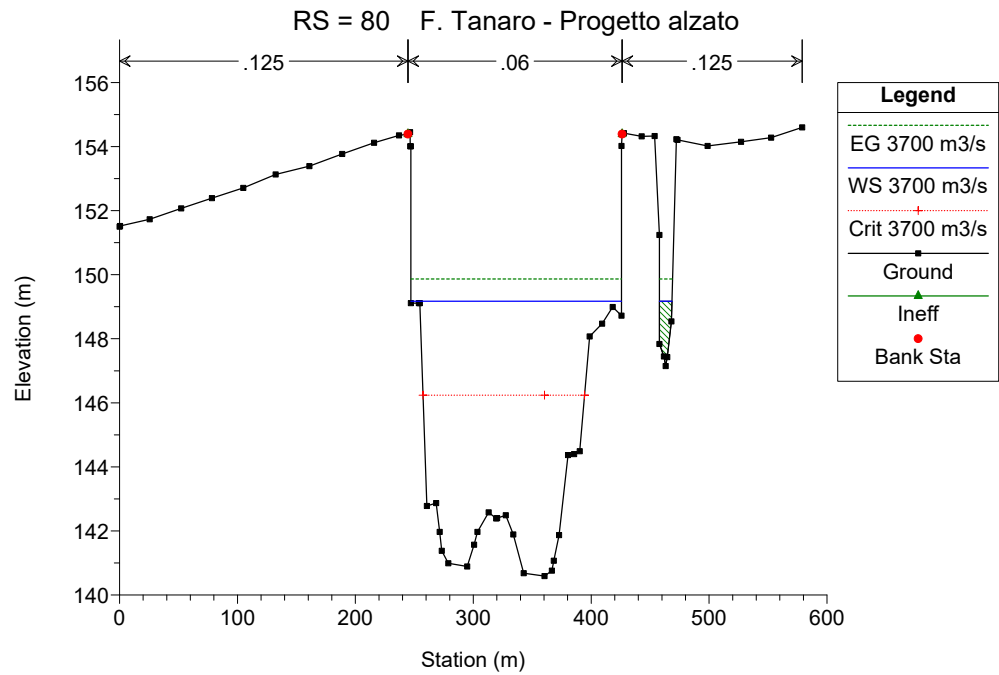
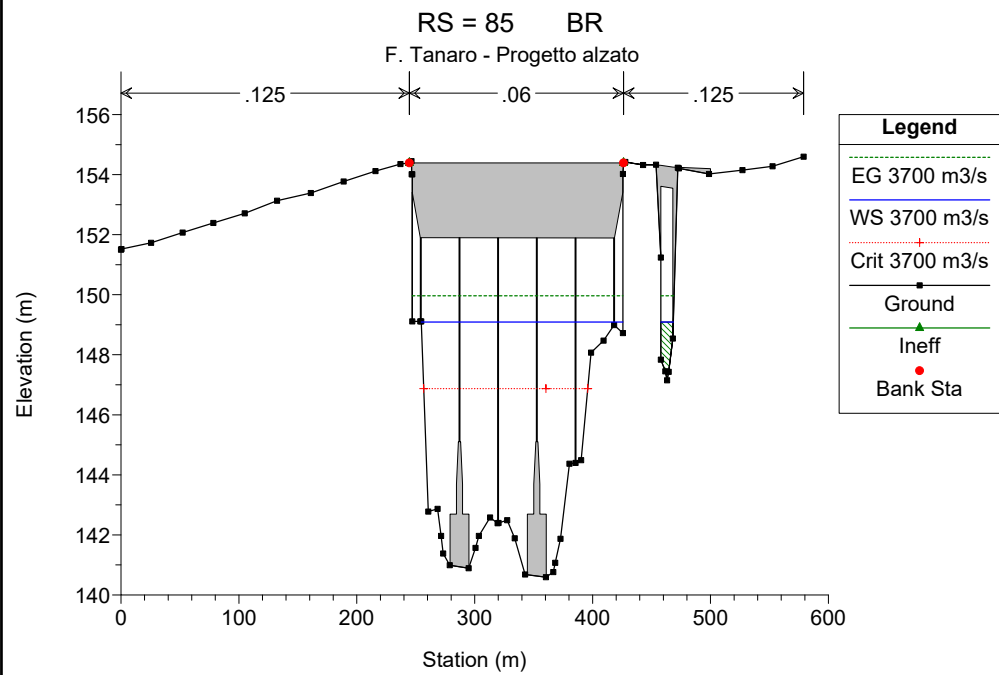
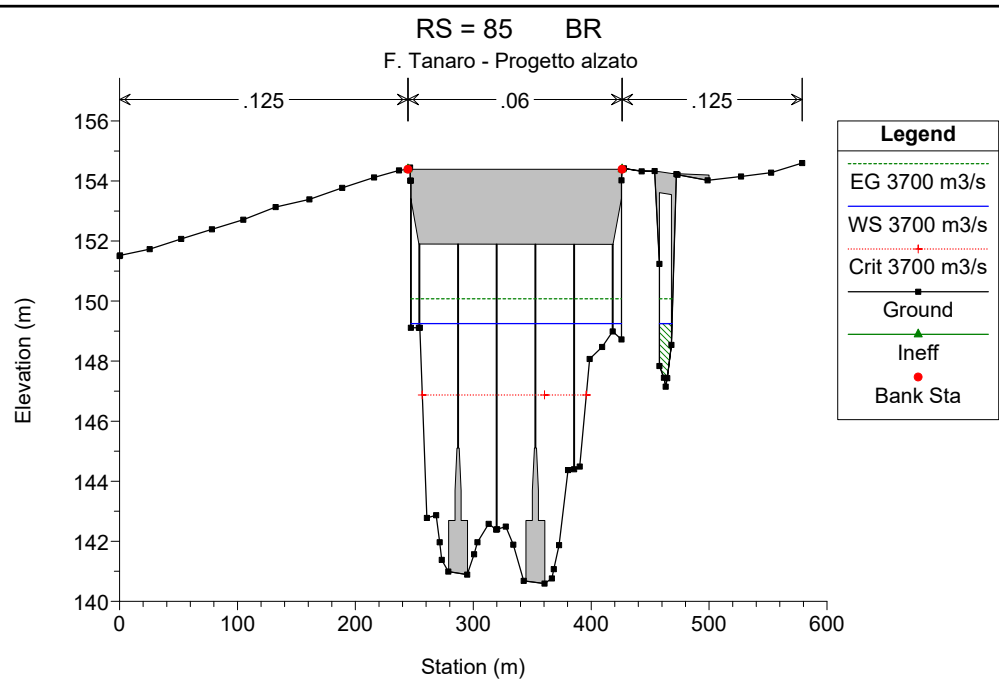
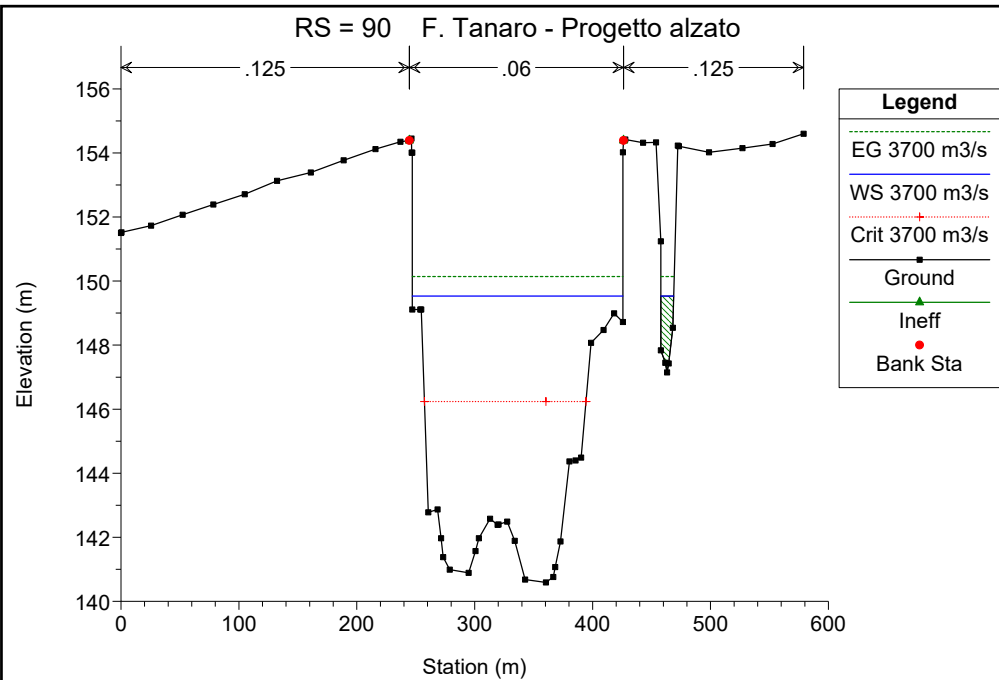


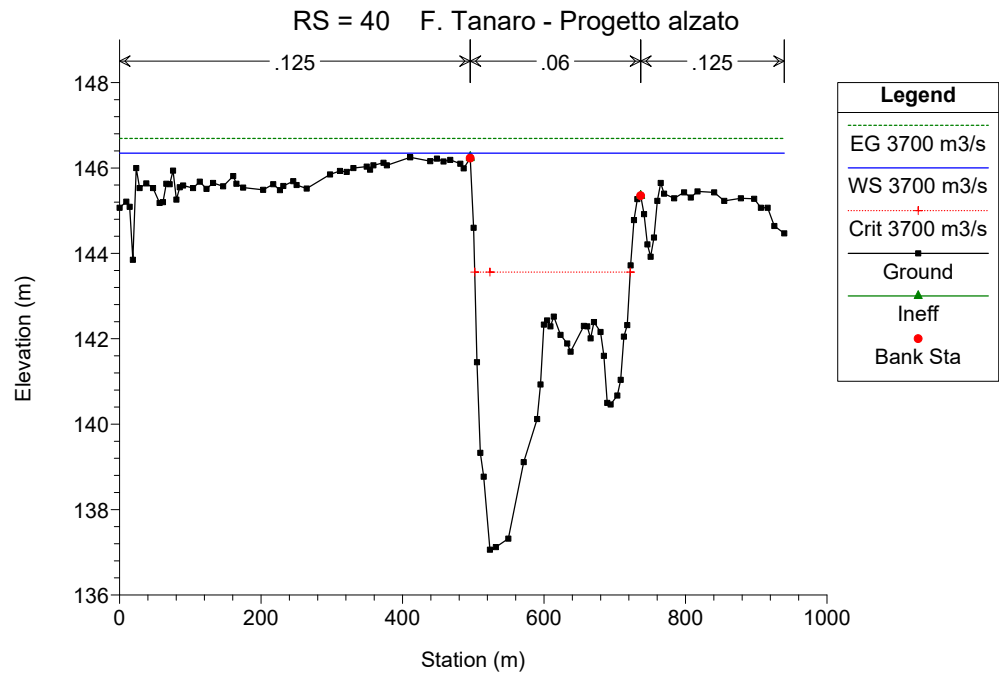
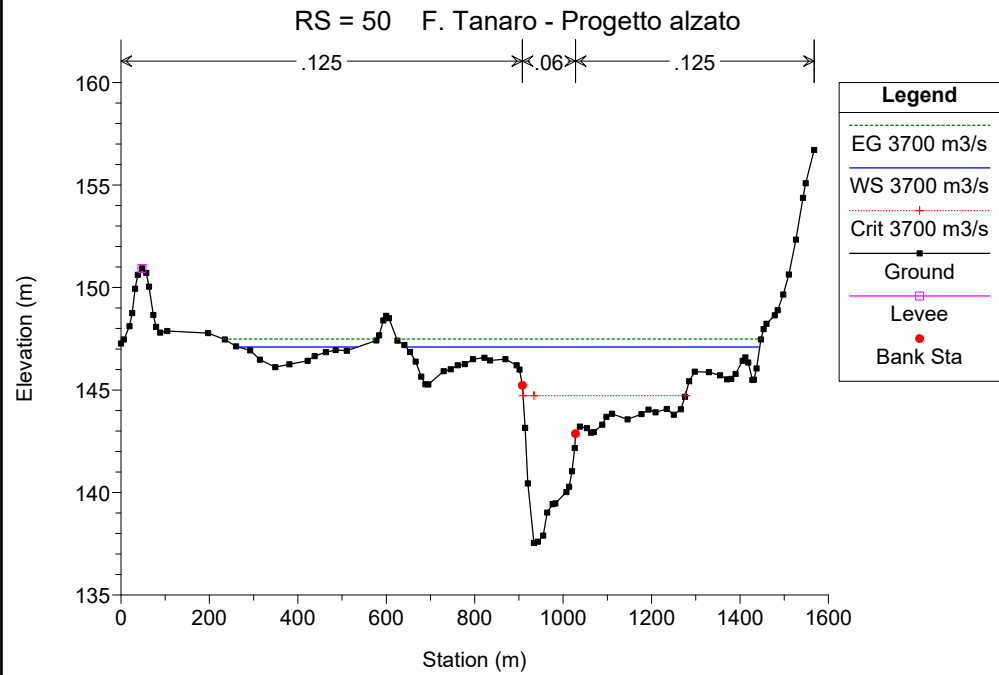
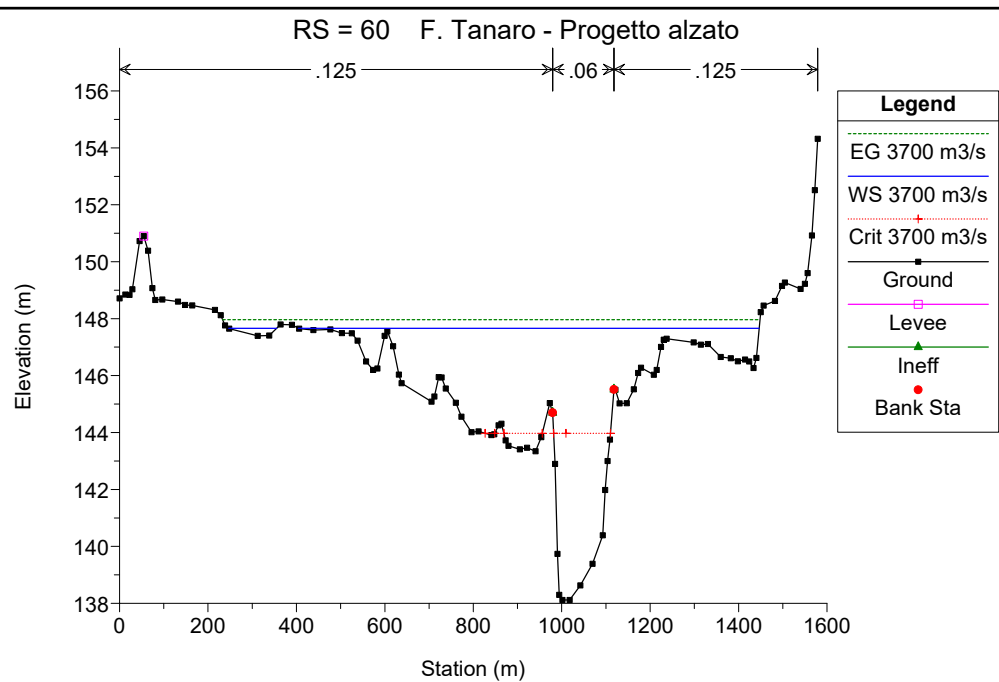
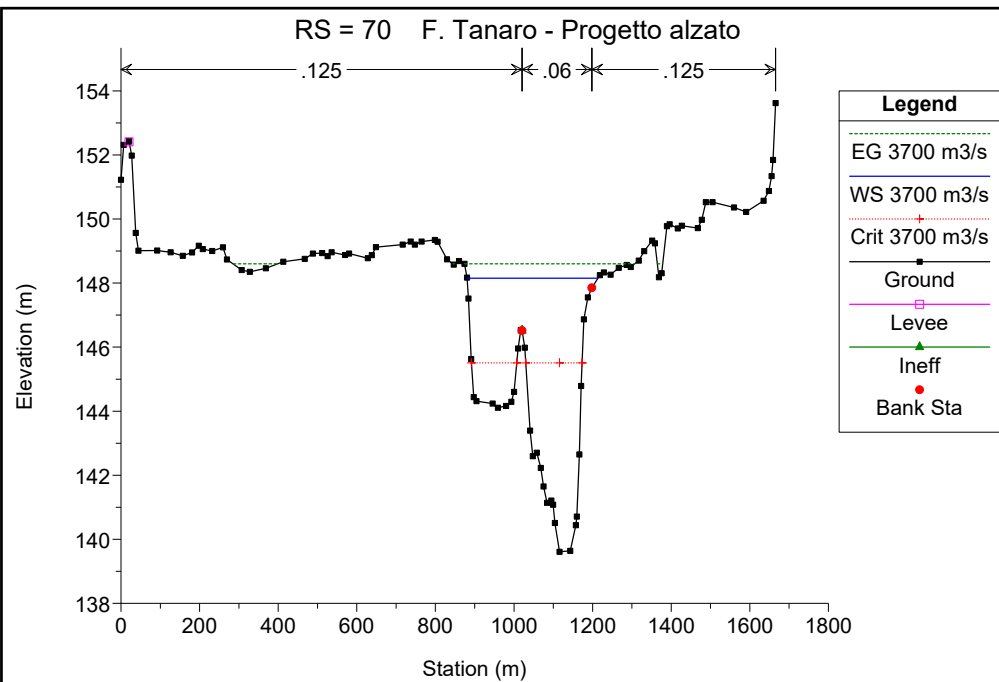


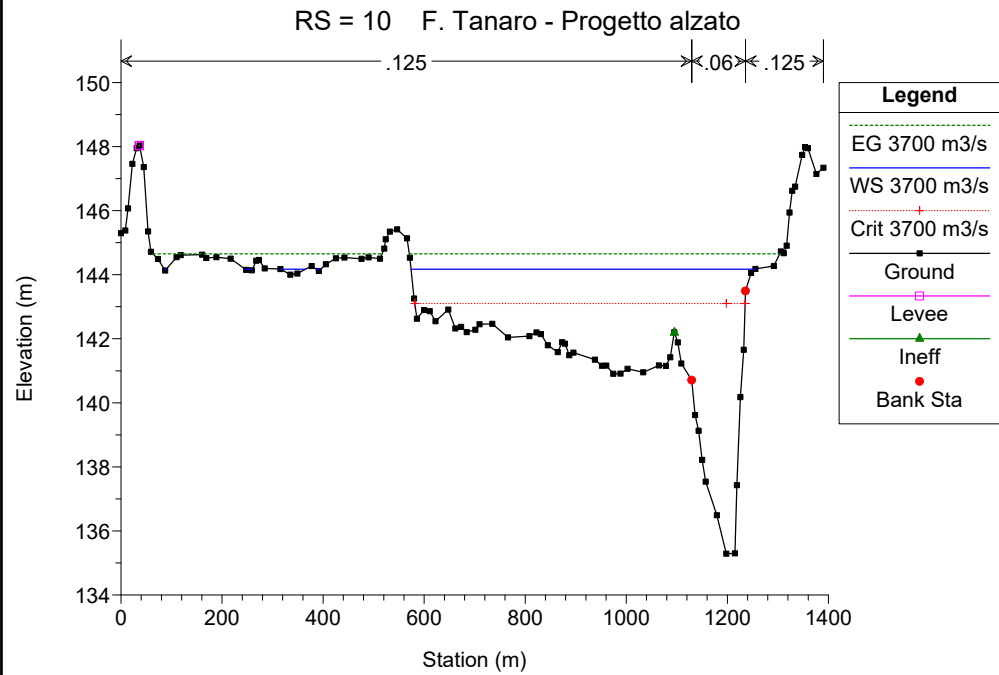
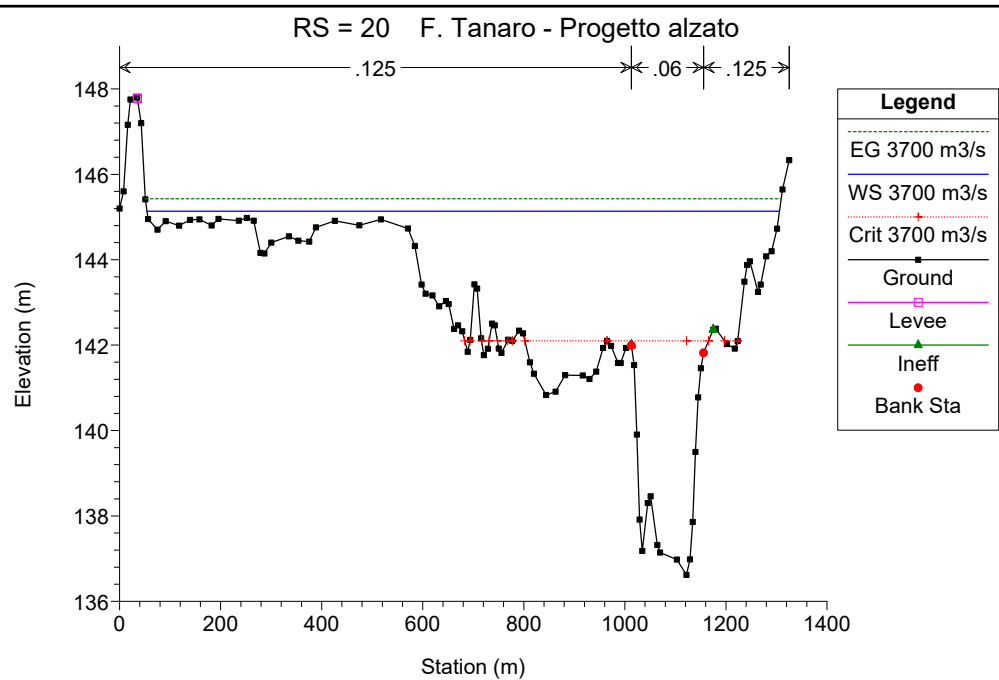
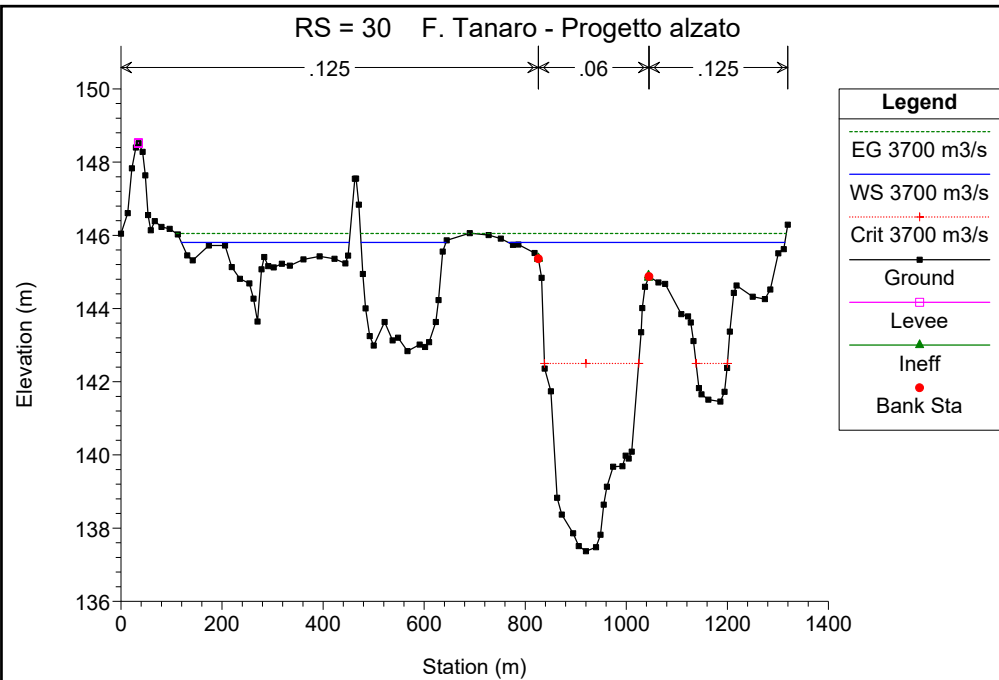












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SCENARIO 3: PROGETTO CON SEZIONE PARZIALIZZATA**

SIMULAZIONE 24

corso d'acqua	portata al colmo Q_c [m³/s]	tempo di ritorno [anni]
F. Tanaro sezione PAI	3700	Portata utilizzata per il dimensionamento delle opere di difesa di Alba
F. Tanaro valle Riddone	3710	
F. Tanaro valle Cherasca	3724	

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s

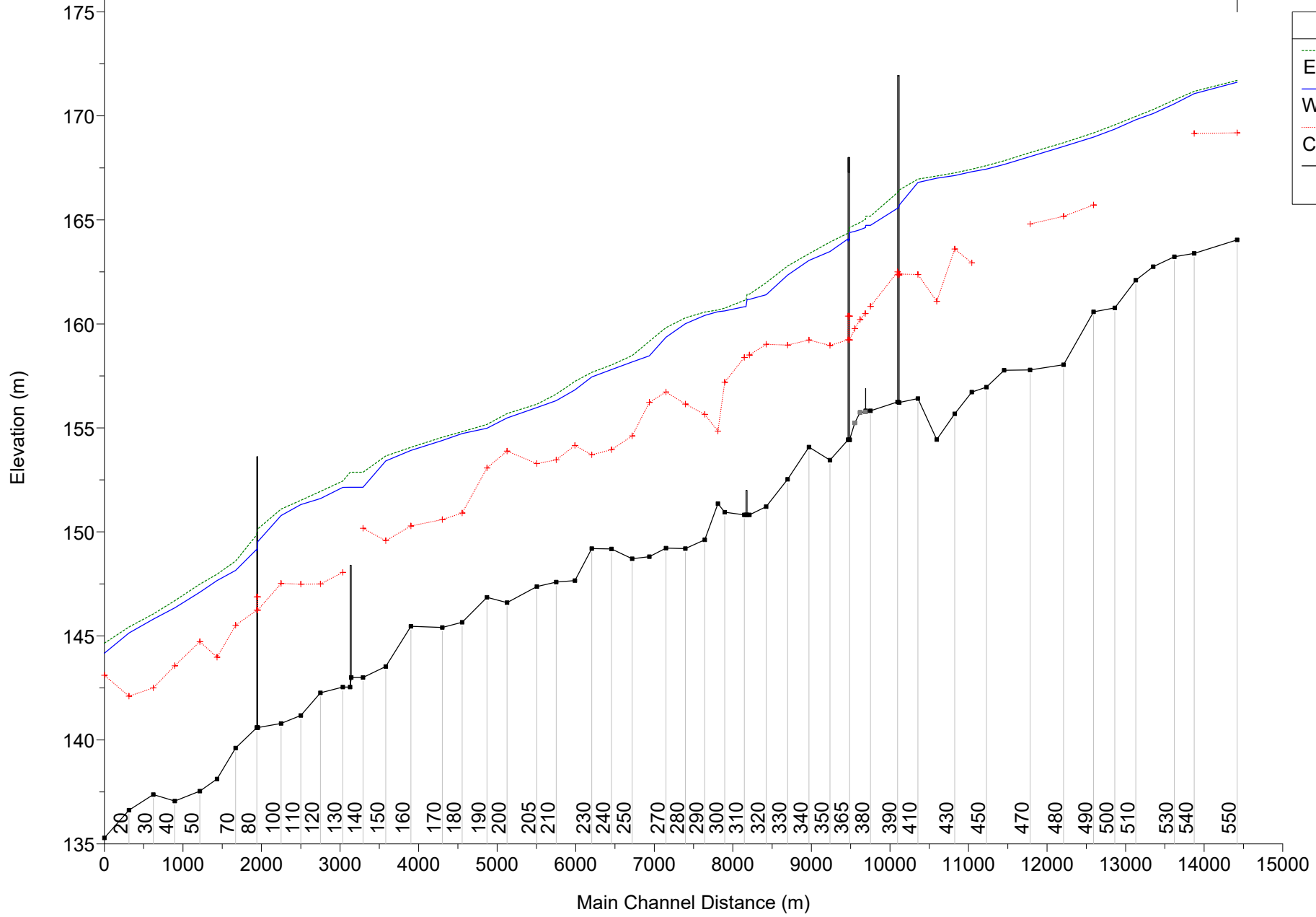
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	3700 m3/s	3700.00	164.04	171.62	169.19	171.71	0.001070	1.55	3770.87	1216.19	0.23
1	540	3700 m3/s	3700.00	163.39	171.07	169.15	171.18	0.001481	2.11	3904.59	1132.10	0.27
1	530	3700 m3/s	3700.00	163.23	170.58		170.77	0.001782	2.27	2669.84	780.08	0.30
1	520	3700 m3/s	3700.00	162.75	170.12		170.31	0.001806	2.36	3175.11	1104.69	0.30
1	510	3700 m3/s	3700.00	162.10	169.81		169.98	0.001650	2.16	2951.11	847.97	0.29
1	500	3700 m3/s	3700.00	160.77	169.37		169.57	0.001501	2.29	2553.09	572.70	0.28
1	490	3700 m3/s	3700.00	160.58	168.98	165.71	169.18	0.001441	2.14	2397.13	563.50	0.27
1	480	3700 m3/s	3700.00	158.04	168.53	165.17	168.71	0.001189	2.10	3243.10	1083.17	0.25
1	470	3700 m3/s	3700.00	157.79	168.04	164.81	168.24	0.001325	2.29	2633.05	621.51	0.27
1	460	3700 m3/s	3700.00	157.77	167.67		167.84	0.001055	2.09	3333.00	1140.29	0.24
1	450	3700 m3/s	3700.00	156.96	167.44		167.61	0.000983	2.06	3334.37	1049.16	0.23
1	440	3700 m3/s	3700.00	156.72	167.32	162.94	167.44	0.000742	1.85	3733.76	808.40	0.20
1	430	3700 m3/s	3700.00	155.68	167.13	163.60	167.26	0.000898	2.04	3511.77	669.78	0.22
1	420	3700 m3/s	3700.00	154.44	167.00	161.08	167.11	0.000532	1.73	3867.81	694.98	0.18
1	410	3700 m3/s	3700.00	156.41	166.80	162.37	166.96	0.000896	2.07	2984.51	557.28	0.23
1	400	3700 m3/s	3700.00	156.22	165.71	162.40	166.44	0.003510	3.90	1108.74	179.92	0.43
1	395		Bridge									
1	390	3700 m3/s	3700.00	156.25	165.56	162.50	166.32	0.003748	3.98	1082.96	179.60	0.44
1	380	3700 m3/s	3700.00	155.82	164.74	160.84	165.18	0.002203	2.96	1381.67	290.13	0.34
1	379		Inl Struct									
1	370	3700 m3/s	3700.00	154.43	164.39	159.23	164.64	0.001150	2.22	1670.14	209.85	0.25
1	365		Bridge									
1	360	3700 m3/s	3700.00	154.43	164.09	159.24	164.36	0.001298	2.30	1607.79	209.03	0.26
1	350	3700 m3/s	3700.00	153.45	163.48	158.96	163.93	0.002091	3.00	1378.83	297.73	0.34
1	340	3700 m3/s	3710.00	154.08	163.05	159.22	163.37	0.001814	2.57	1730.05	410.79	0.31
1	330	3700 m3/s	3710.00	152.53	162.34	158.98	162.78	0.002502	3.06	1626.66	442.21	0.37
1	320	3700 m3/s	3710.00	151.21	161.40	159.02	161.98	0.003261	3.81	1868.55	733.70	0.42
1	315	3700 m3/s	3710.00	150.82	161.18	158.51	161.43	0.001684	2.76	3241.36	1152.30	0.31
1	312.5		Inl Struct									
1	310	3700 m3/s	3710.00	150.82	160.83	158.39	161.13	0.002082	2.99	2726.51	977.57	0.34
1	300	3700 m3/s	3724.00	150.95	160.62	157.19	160.76	0.001004	1.92	3506.95	1133.39	0.23
1	295	3700 m3/s	3724.00	151.36	160.59	154.84	160.67	0.000482	1.47	4250.50	1220.01	0.16
1	290	3700 m3/s	3724.00	149.62	160.41	155.65	160.57	0.000901	1.91	3052.89	1140.56	0.22
1	280	3700 m3/s	3724.00	149.20	160.01	156.15	160.29	0.001470	2.61	2798.71	1128.73	0.29
1	270	3700 m3/s	3724.00	149.22	159.36	156.73	159.82	0.002511	3.36	2314.96	1067.62	0.37
1	260	3700 m3/s	3724.00	148.81	158.47	156.22	159.16	0.003819	4.00	1548.91	715.34	0.46
1	250	3700 m3/s	3724.00	148.71	158.17	154.62	158.48	0.001962	2.71	2334.17	752.17	0.32
1	240	3700 m3/s	3724.00	149.18	157.81	153.95	158.03	0.001379	2.34	2752.84	802.43	0.27
1	230	3700 m3/s	3724.00	149.20	157.45	153.71	157.67	0.001428	2.28	2430.37	866.25	0.28
1	220	3700 m3/s	3724.00	147.66	156.83	154.16	157.24	0.002726	3.19	1908.29	803.19	0.38

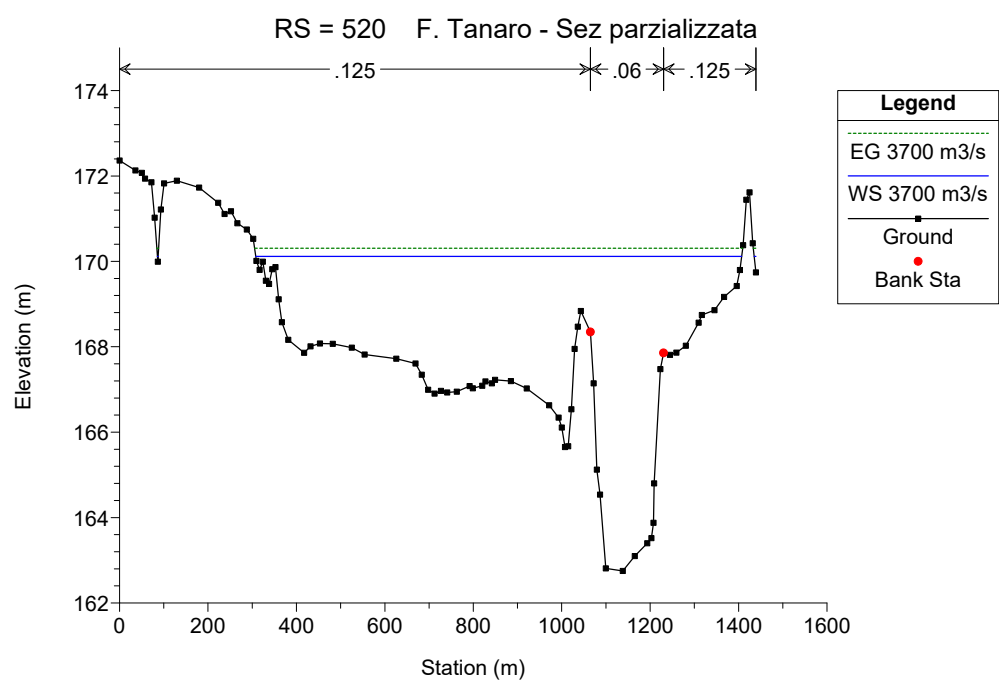
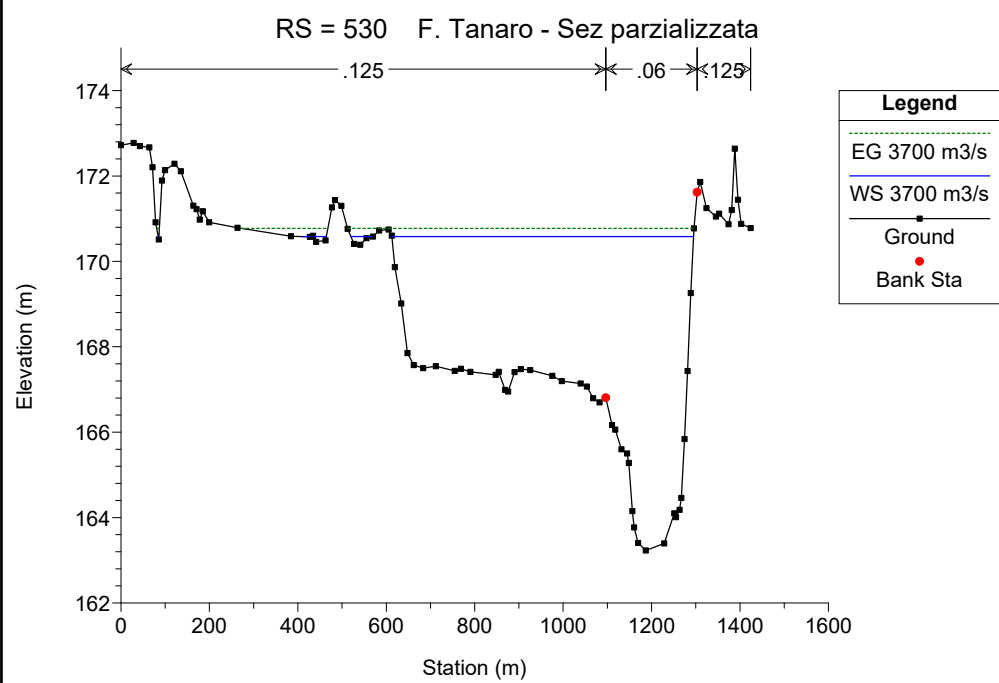
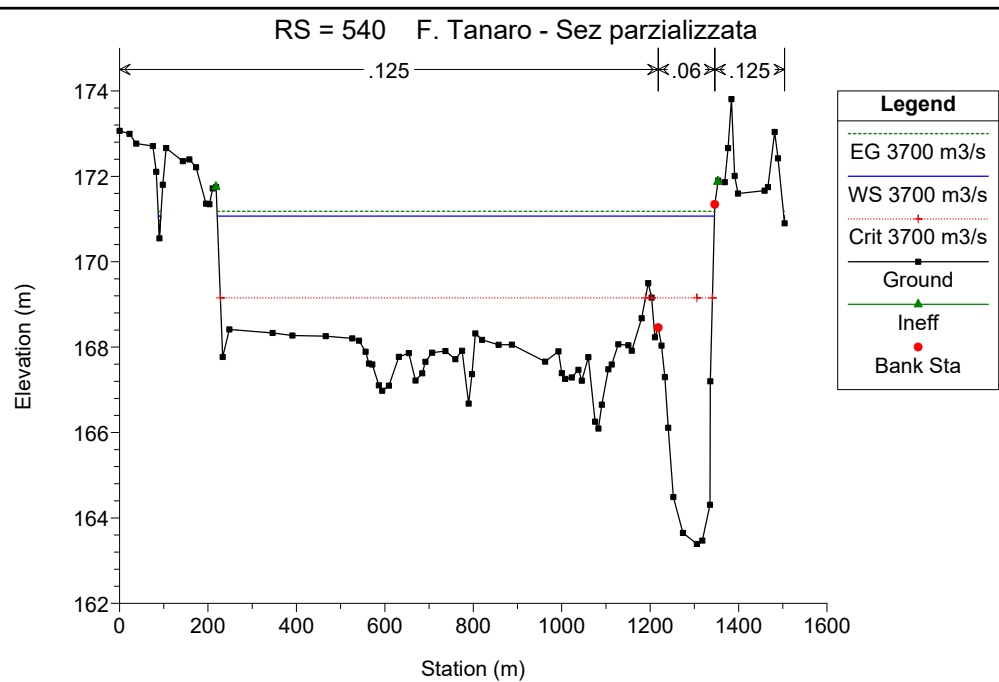
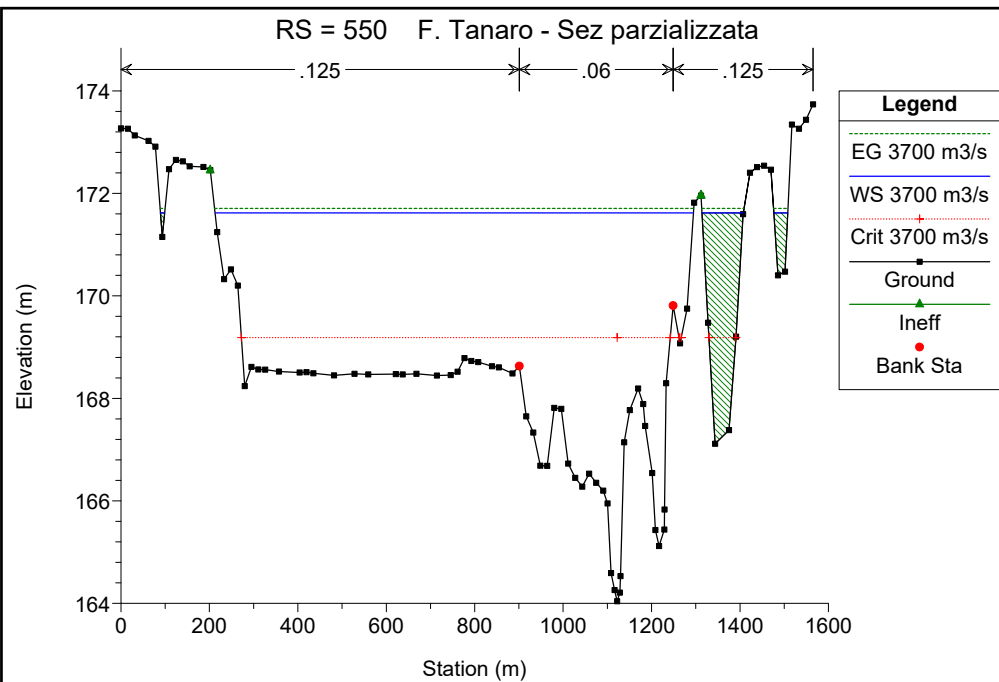
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 3700 m3/s (Continued)

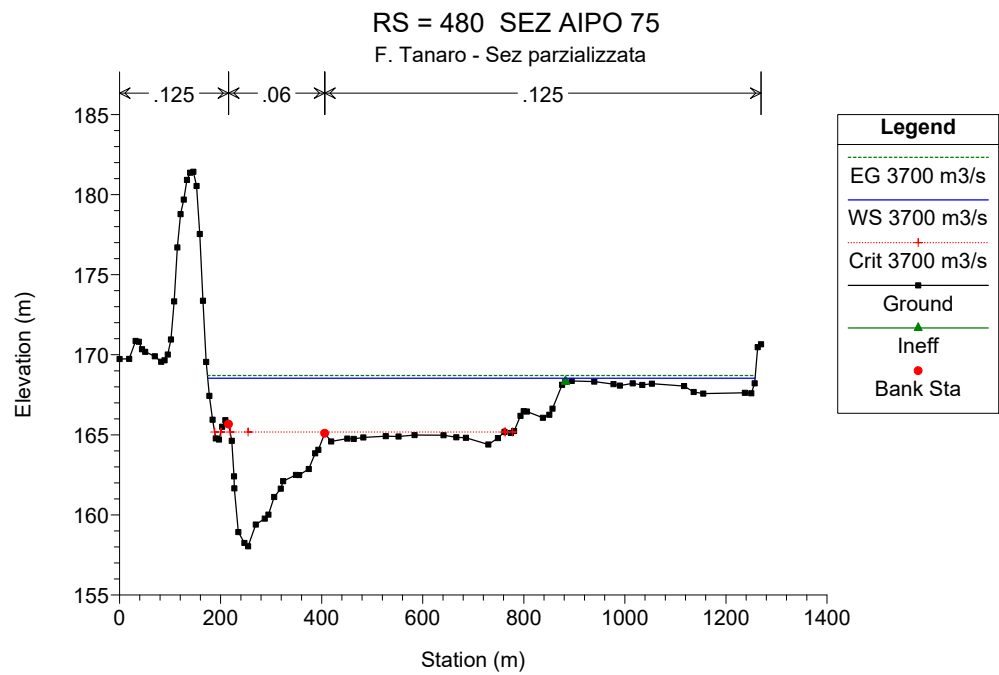
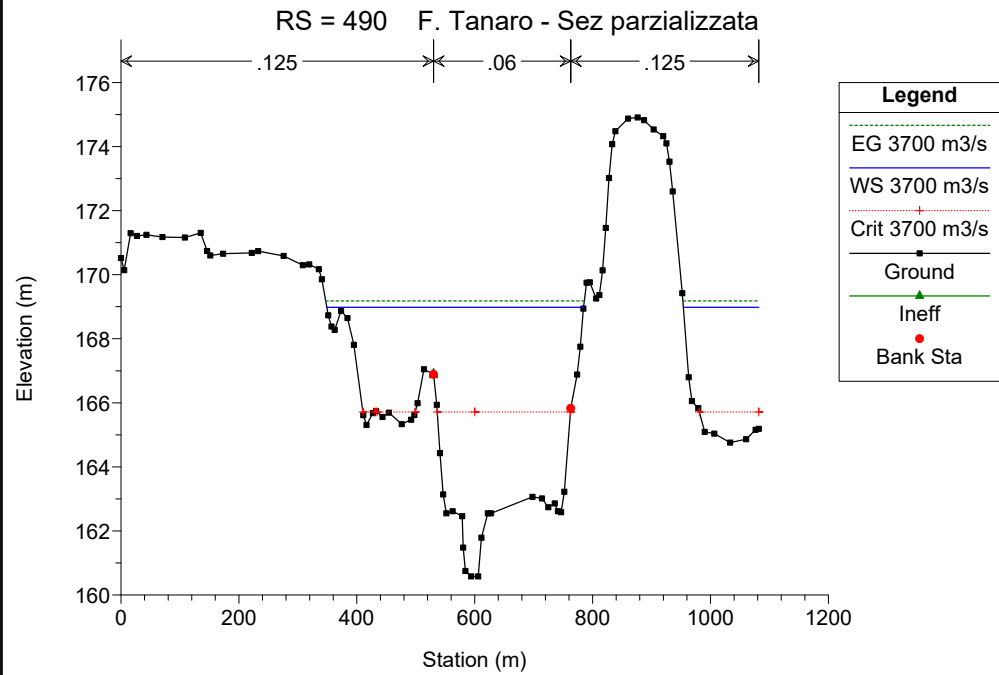
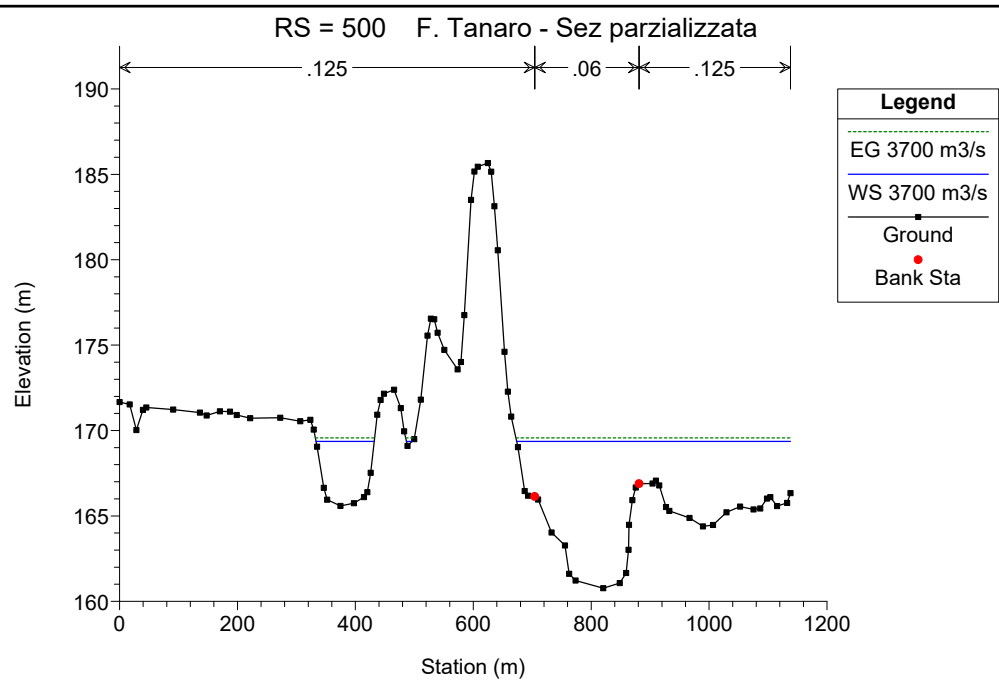
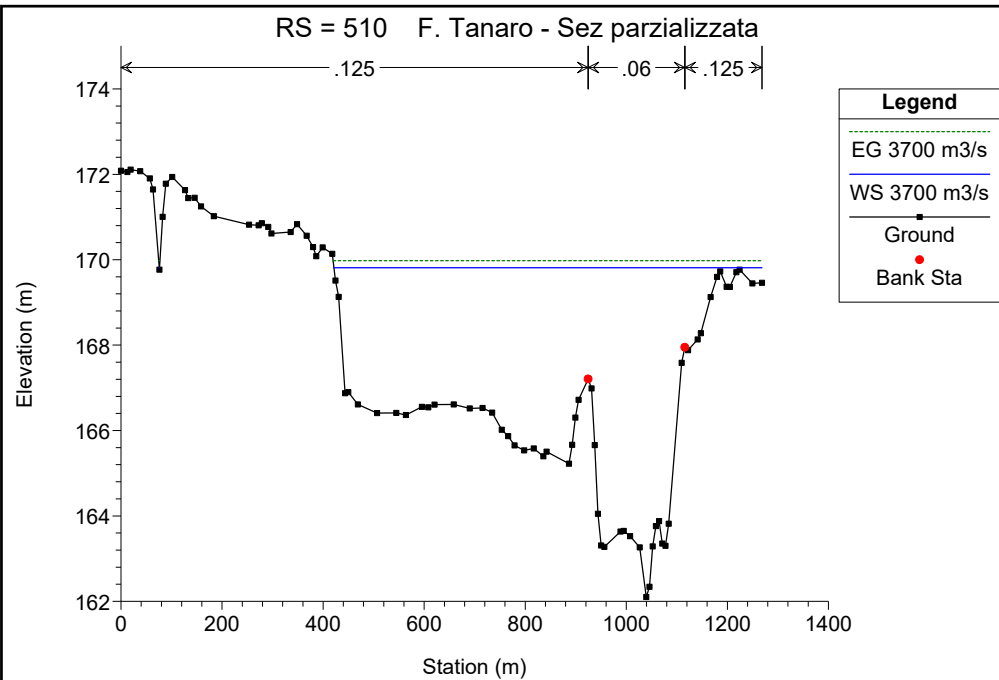
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	3700 m3/s	3724.00	147.59	156.31	153.46	156.62	0.002155	2.67	2188.08	821.70	0.34
1	205	3700 m3/s	3724.00	147.37	155.98	153.28	156.14	0.001395	2.06	3410.29	1196.92	0.27
1	200	3700 m3/s	3724.00	146.60	155.48	153.88	155.69	0.001945	2.63	3270.55	1154.87	0.32
1	190	3700 m3/s	3724.00	146.85	154.98	153.07	155.17	0.001961	2.27	3237.92	1302.67	0.31
1	180	3700 m3/s	3724.00	145.66	154.73	150.91	154.82	0.000757	1.50	4245.28	1450.33	0.20
1	170	3700 m3/s	3724.00	145.40	154.40	150.59	154.55	0.001396	1.98	3305.47	1354.59	0.26
1	160	3700 m3/s	3724.00	145.46	153.92	150.28	154.07	0.001167	1.91	3432.45	1393.43	0.25
1	150	3700 m3/s	3724.00	143.53	153.41	149.58	153.65	0.001504	2.40	3025.21	1344.27	0.28
1	140	3700 m3/s	3724.00	143.00	152.14	150.17	152.87	0.005542	3.93	1575.38	1277.24	0.53
1	135		Inl Struct									
1	130	3700 m3/s	3724.00	142.54	152.14	148.05	152.45	0.001699	2.61	2511.75	1197.33	0.30
1	120	3700 m3/s	3724.00	142.27	151.60	147.50	151.95	0.001834	2.77	2298.28	1076.36	0.32
1	110	3700 m3/s	3724.00	141.17	151.31	147.49	151.52	0.001308	2.33	2881.10	770.63	0.27
1	100	3700 m3/s	3724.00	140.79	150.78	147.52	151.09	0.002159	2.62	1994.29	622.37	0.33
1	90	3700 m3/s	3724.00	140.59	149.53	146.24	150.14	0.004138	3.47	1072.97	189.52	0.45
1	85		Bridge									
1	80	3700 m3/s	3724.00	140.59	149.17	146.24	149.87	0.005052	3.69	1009.07	189.26	0.50
1	70	3700 m3/s	3724.00	139.61	148.15	145.51	148.60	0.003622	3.17	1490.96	332.90	0.43
1	60	3700 m3/s	3724.00	138.12	147.66	143.97	147.97	0.001799	2.74	2649.75	1150.88	0.31
1	50	3700 m3/s	3724.00	137.54	147.10	144.72	147.49	0.002503	3.14	2325.45	1070.99	0.37
1	40	3700 m3/s	3724.00	137.06	146.35	143.56	146.69	0.002706	2.67	1853.06	939.65	0.36
1	30	3700 m3/s	3724.00	137.37	145.81	142.50	146.05	0.001903	2.39	2447.67	1047.58	0.31
1	20	3700 m3/s	3724.00	136.62	145.14	142.10	145.43	0.002070	2.76	2857.01	1251.88	0.33
1	10	3700 m3/s	3724.00	135.29	144.17	143.10	144.65	0.004002	3.66	2008.35	755.11	0.46

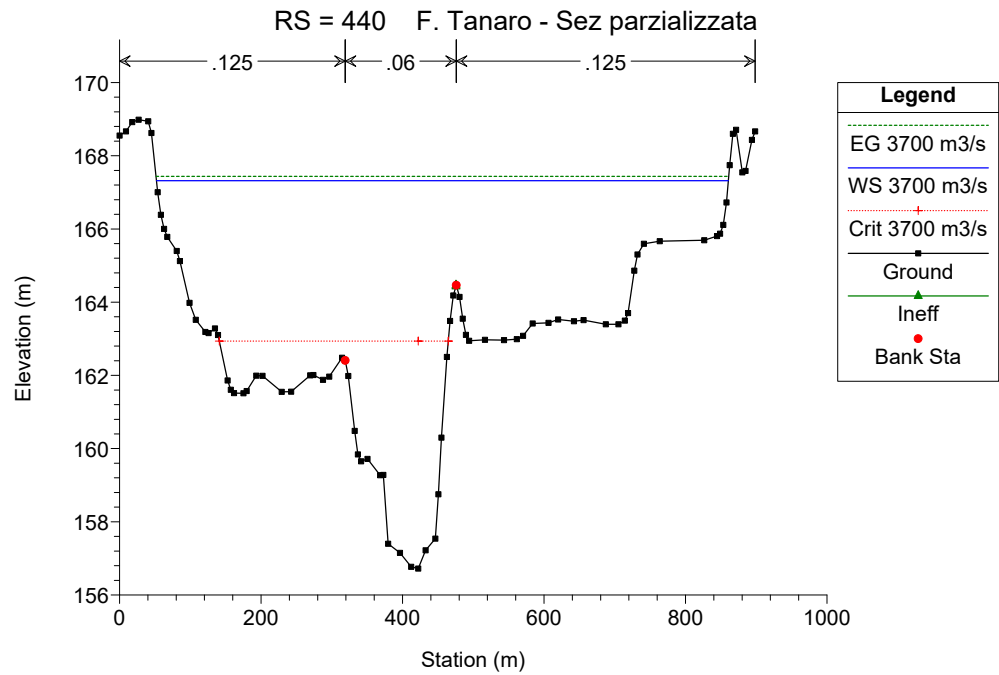
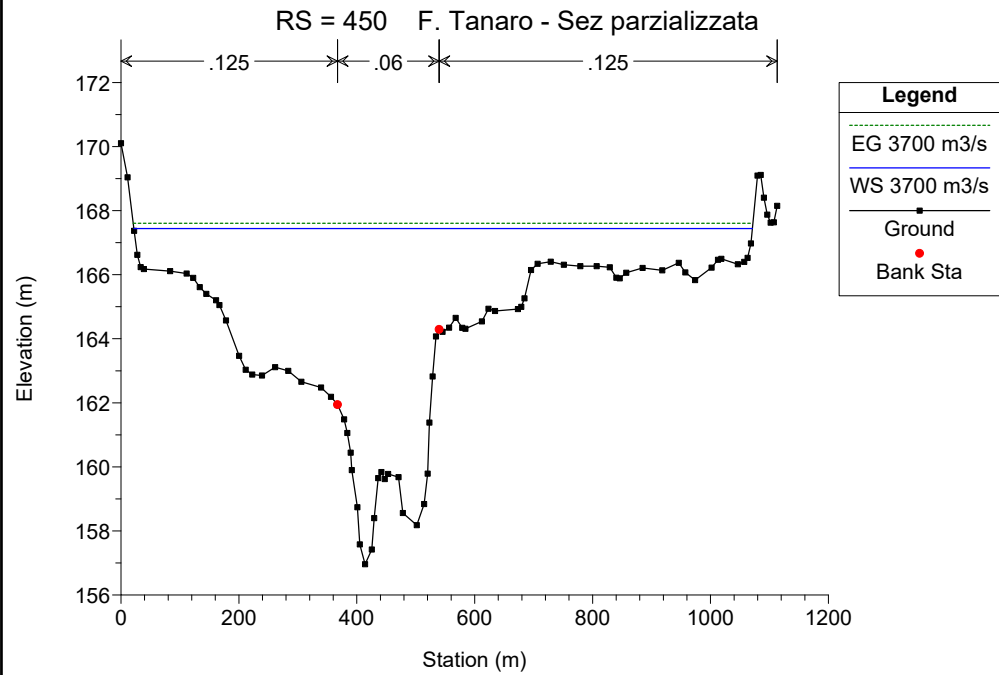
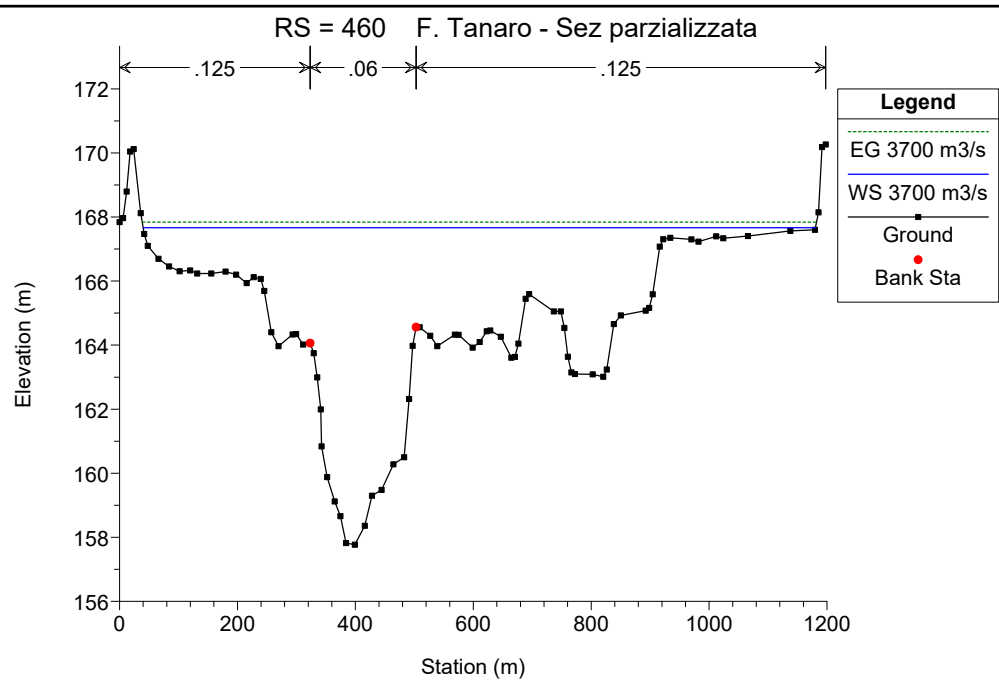
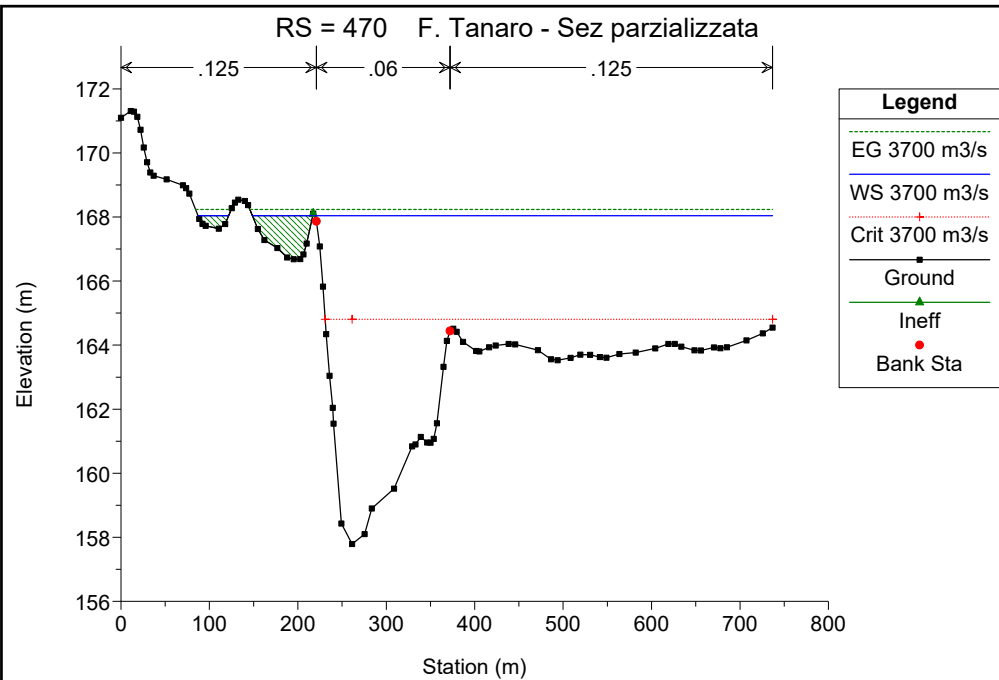
F. Tanaro - Sez parzializzata

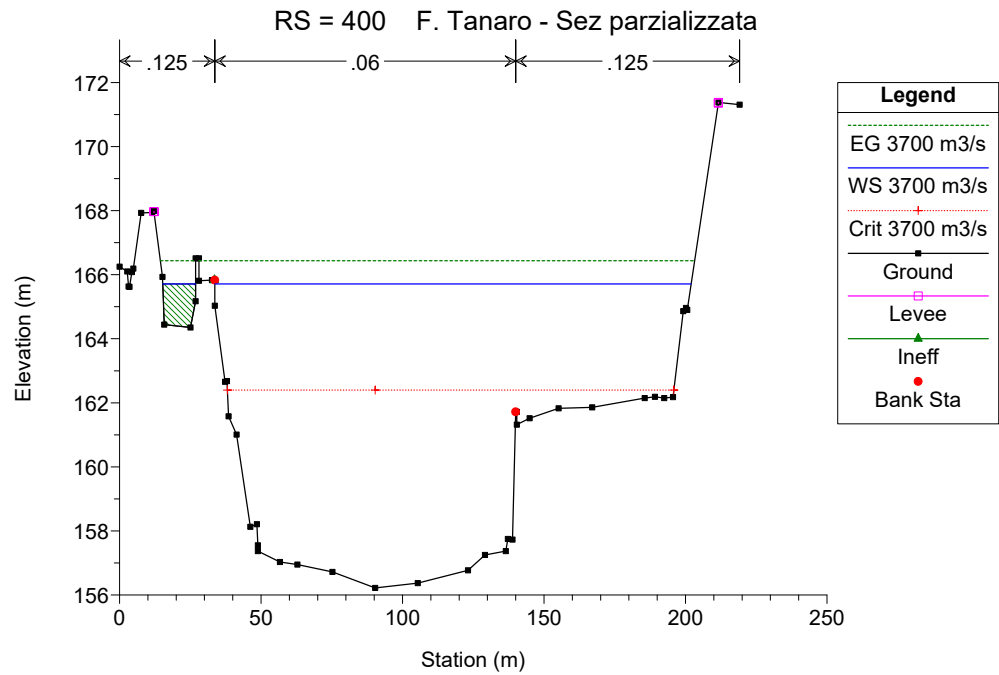
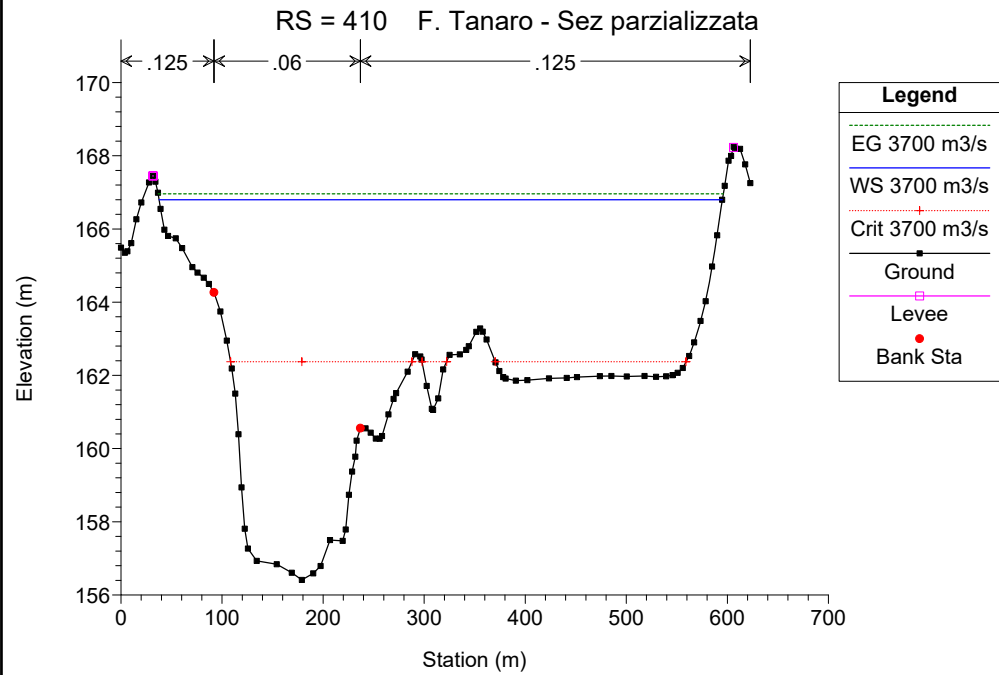
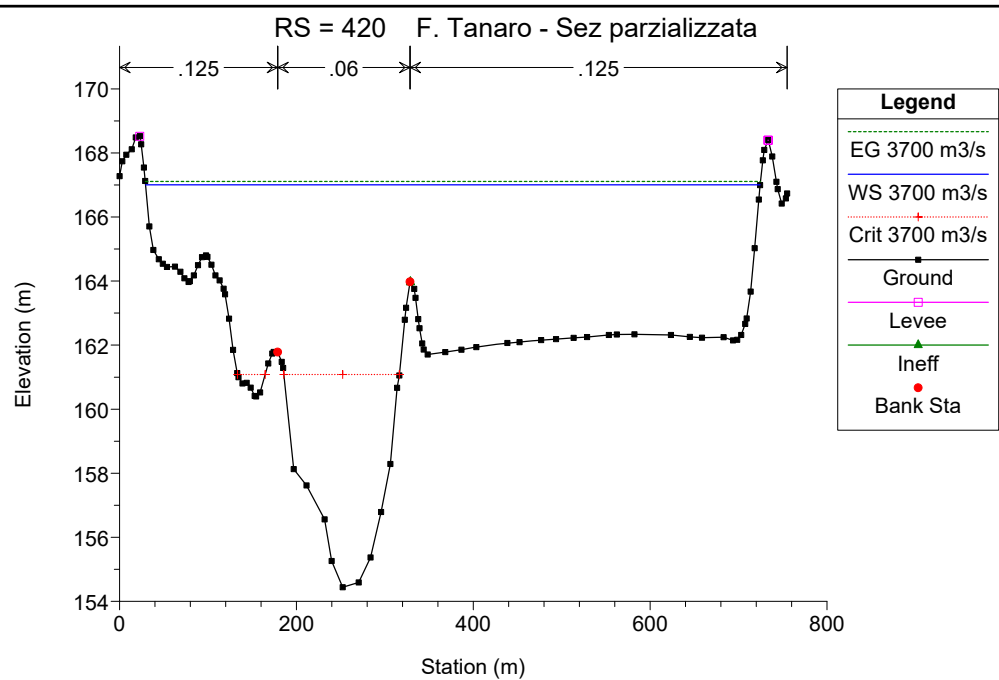
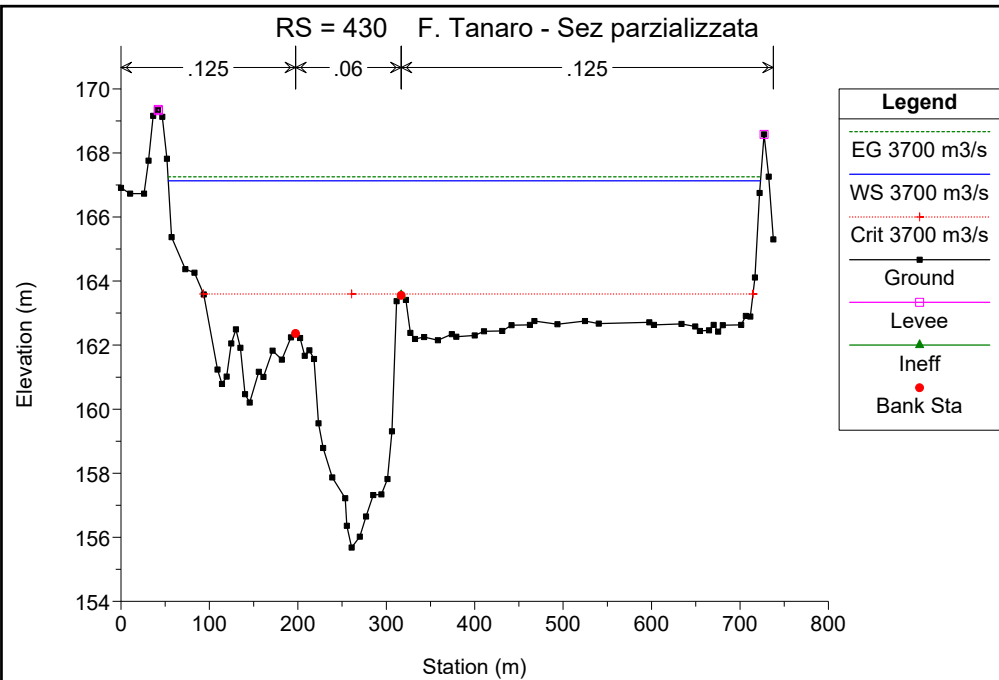
Tanaro 1

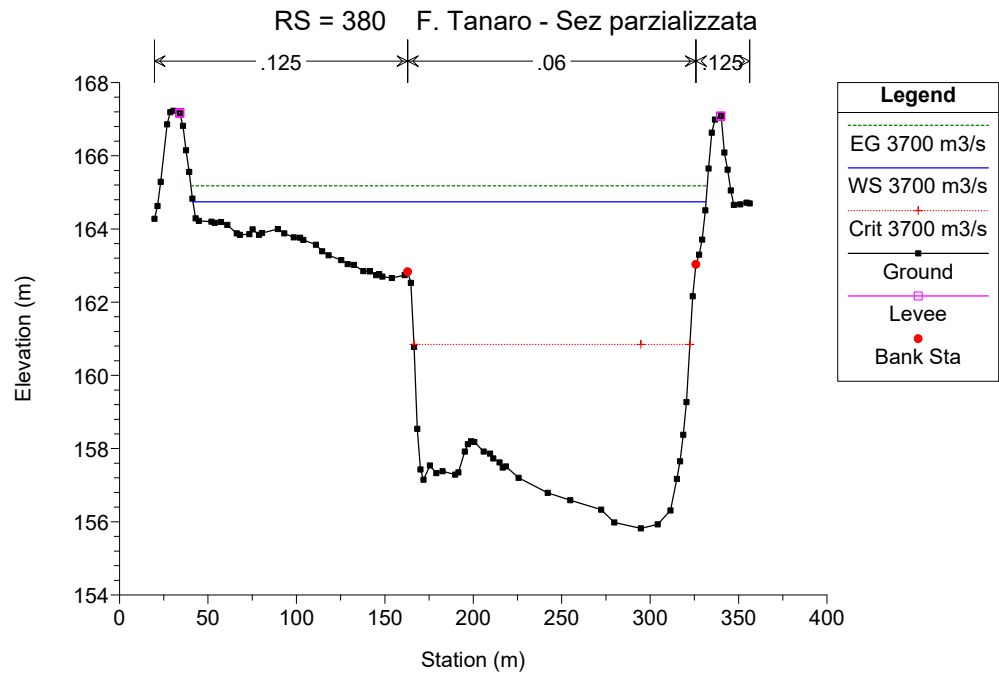
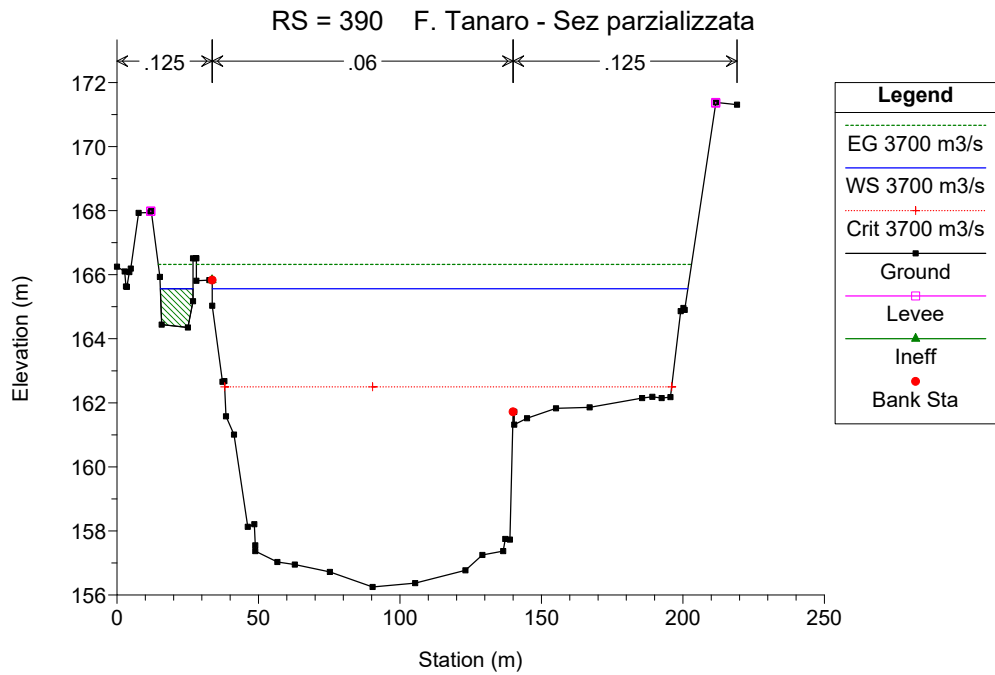
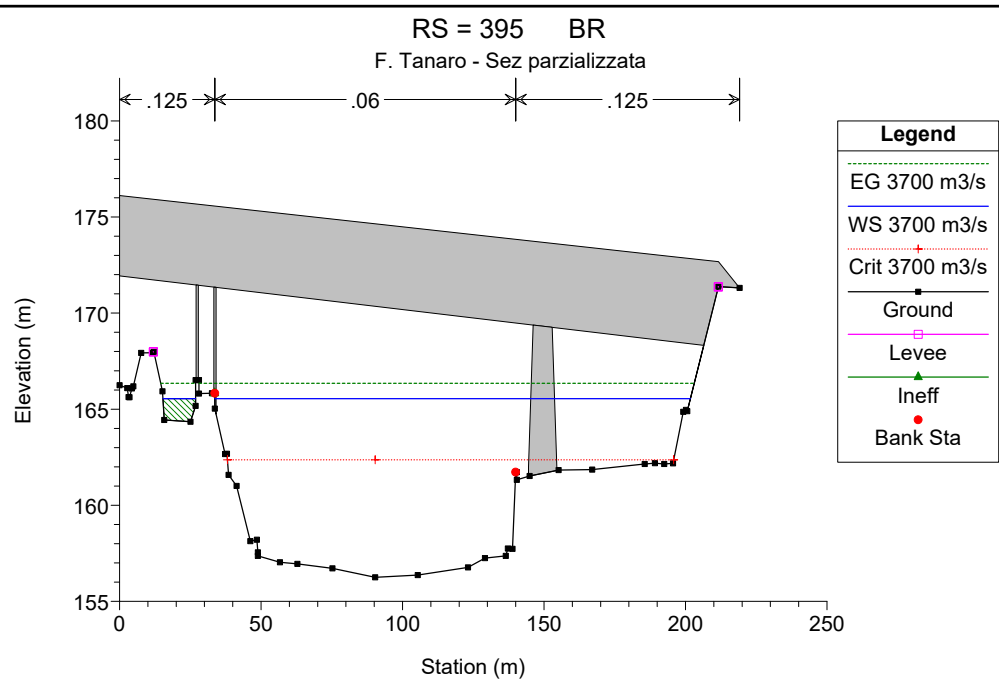
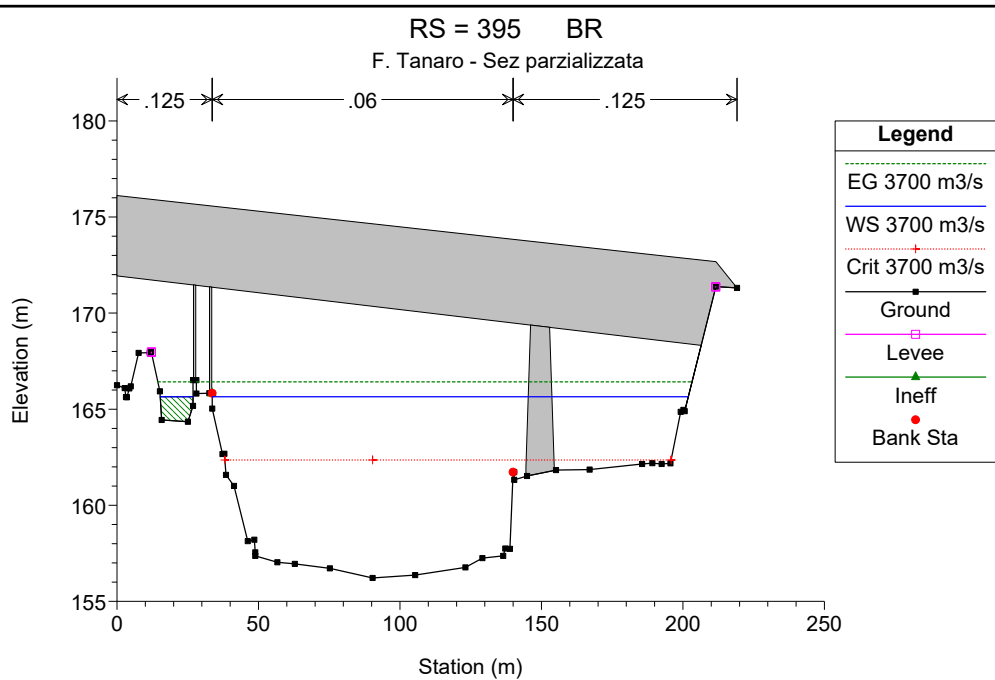


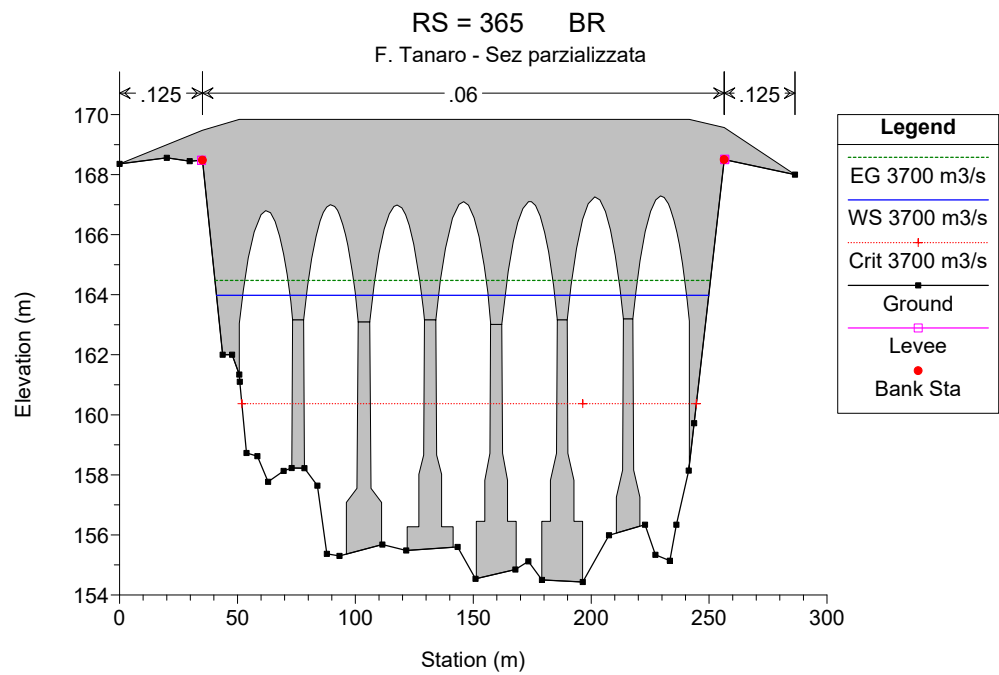
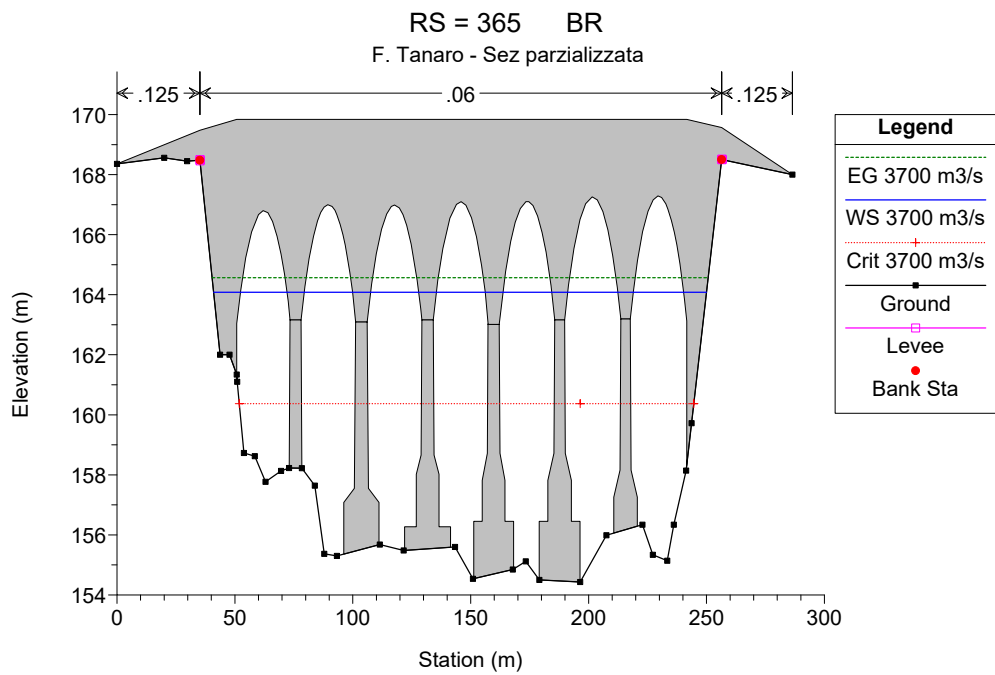
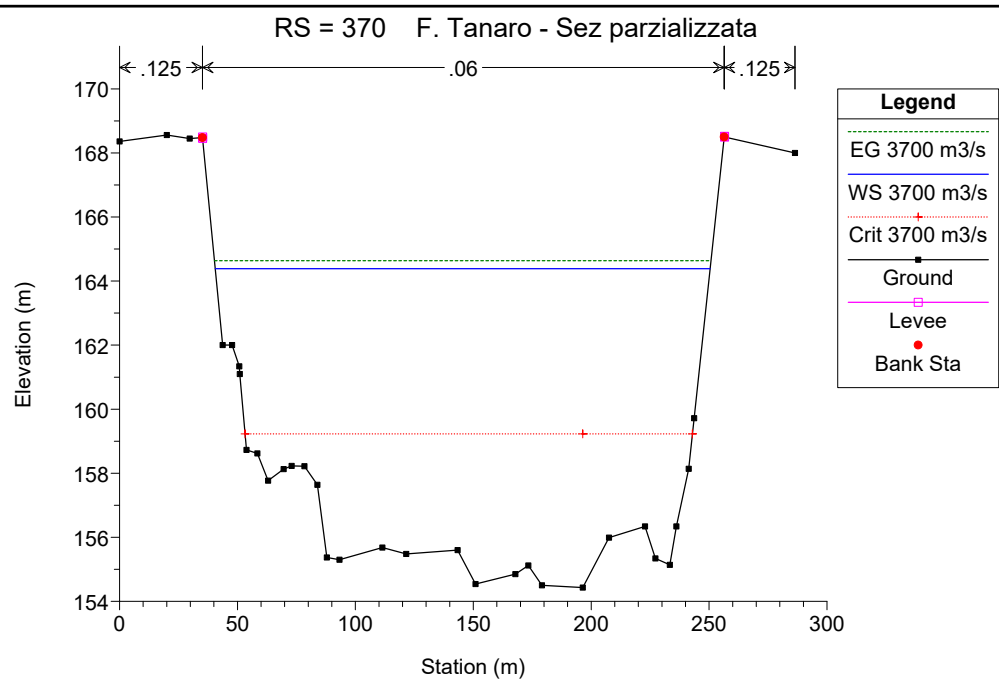
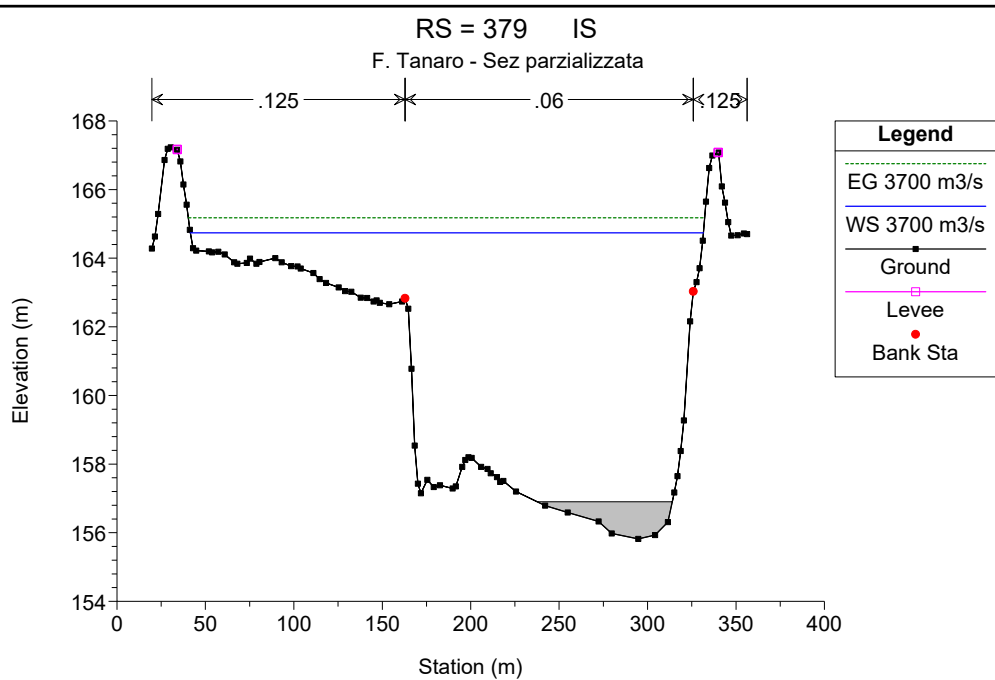


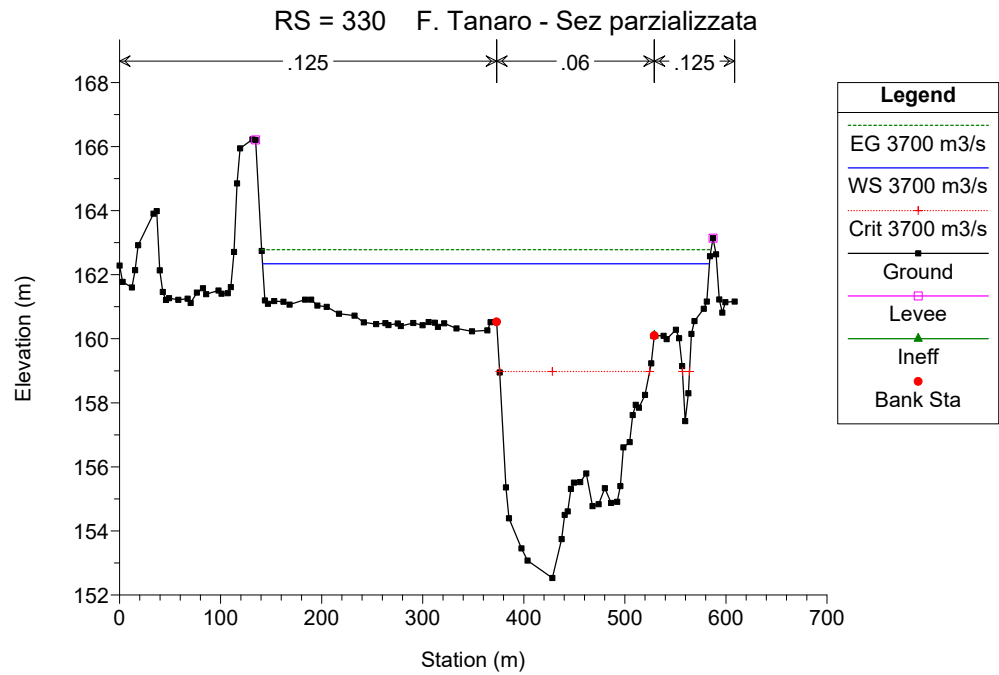
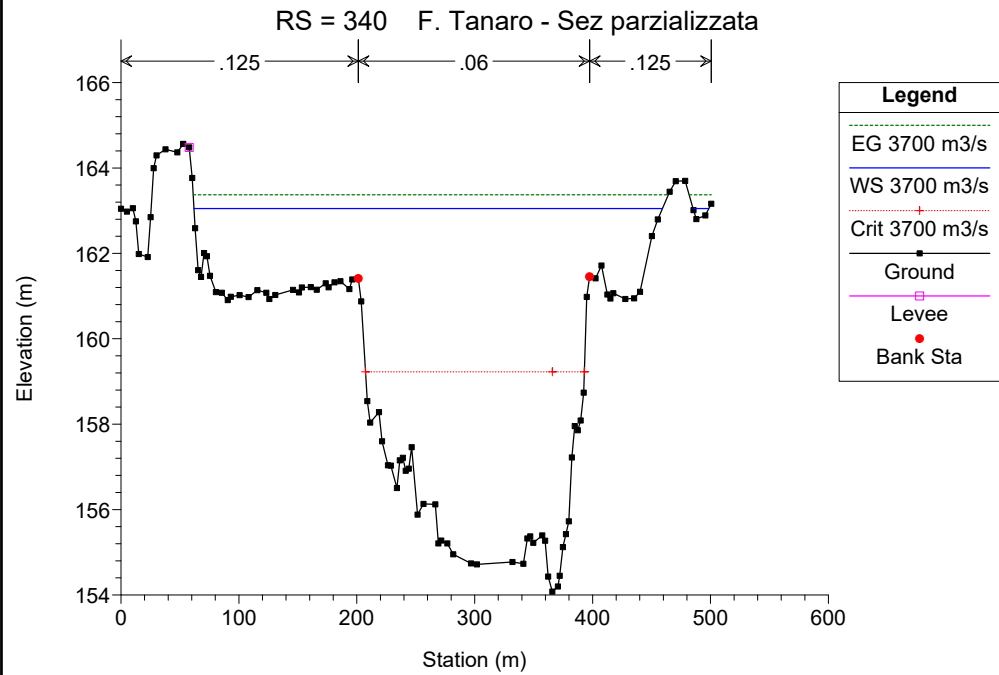
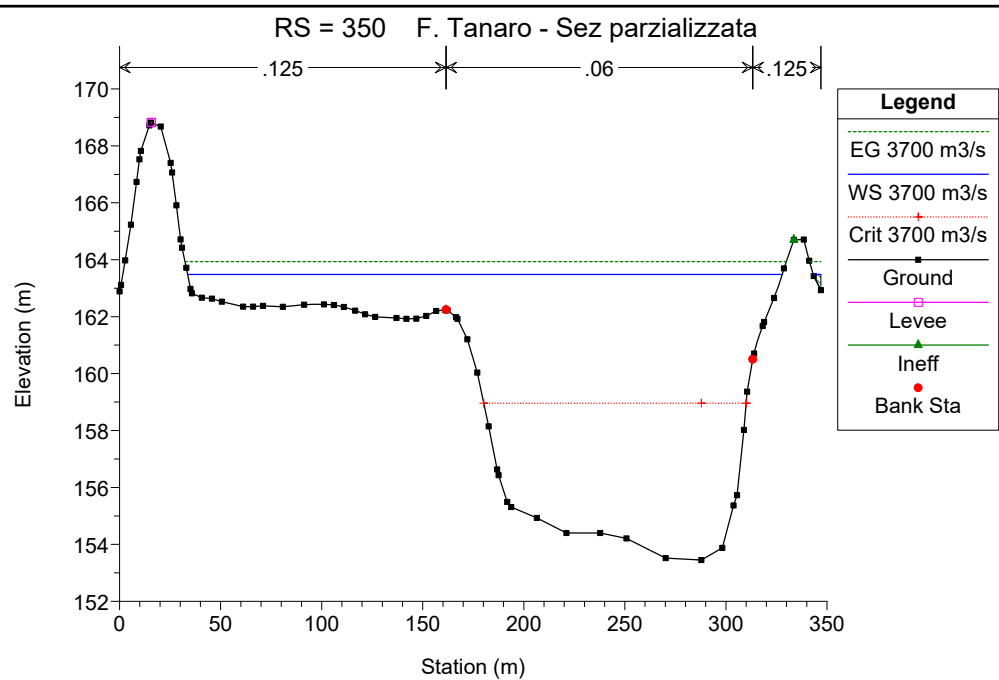
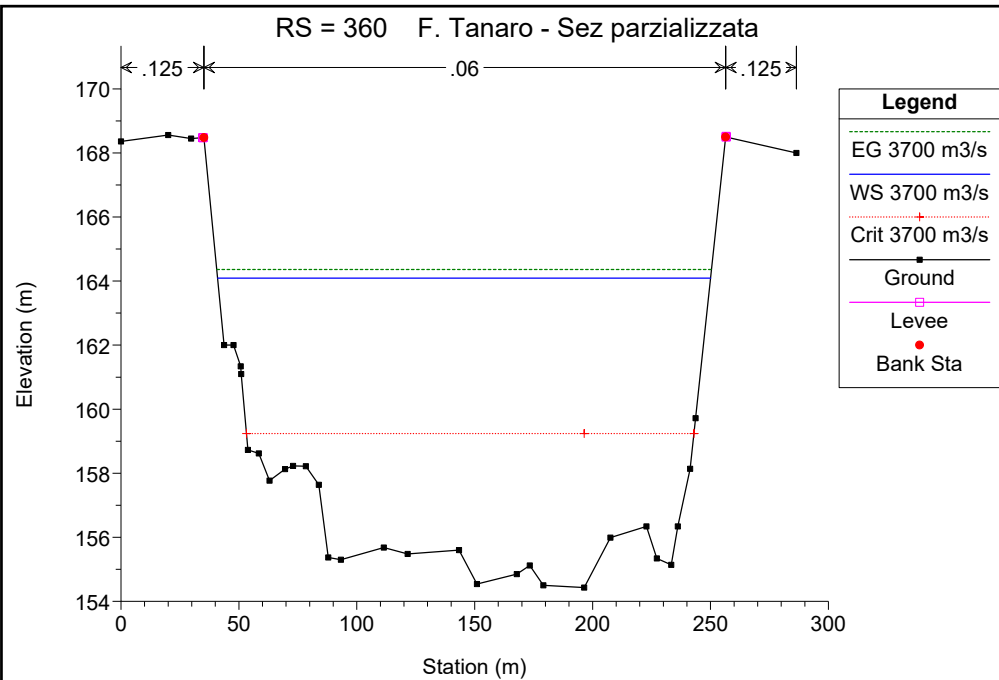


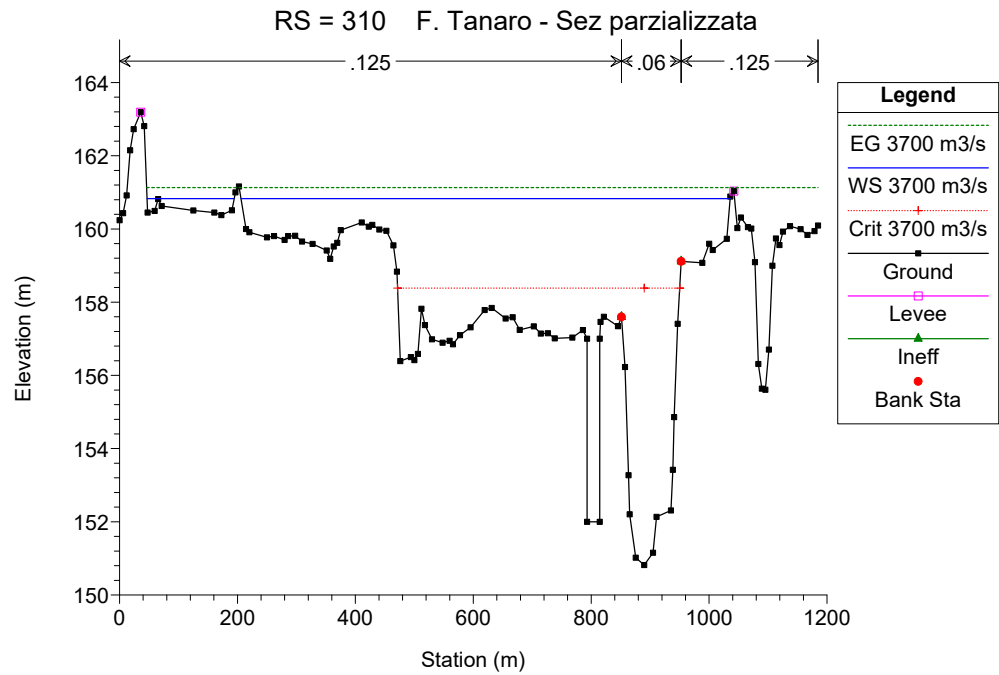
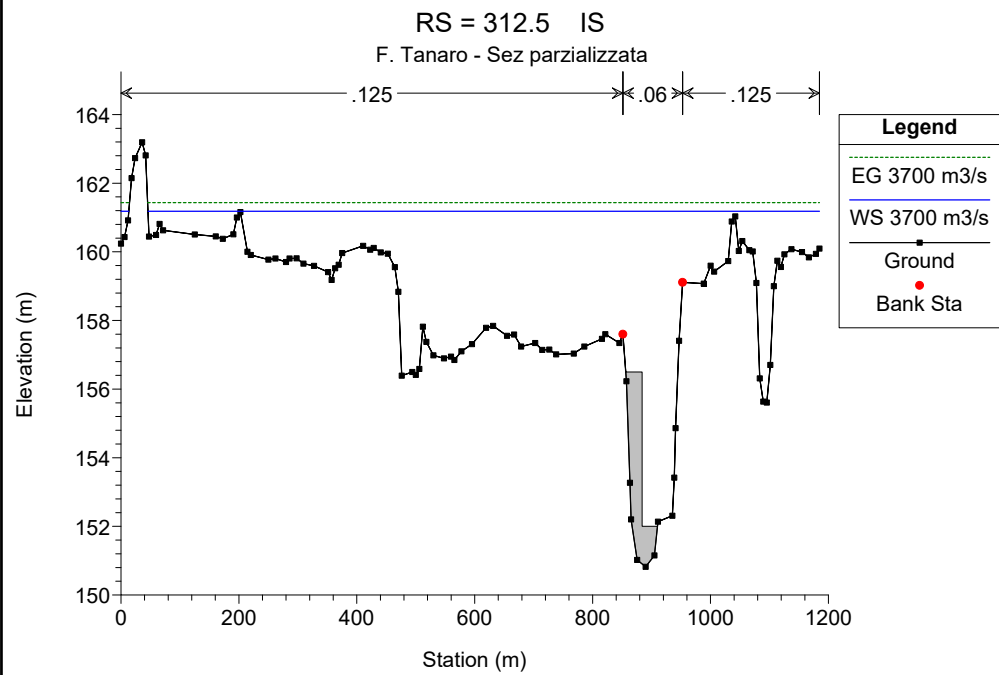
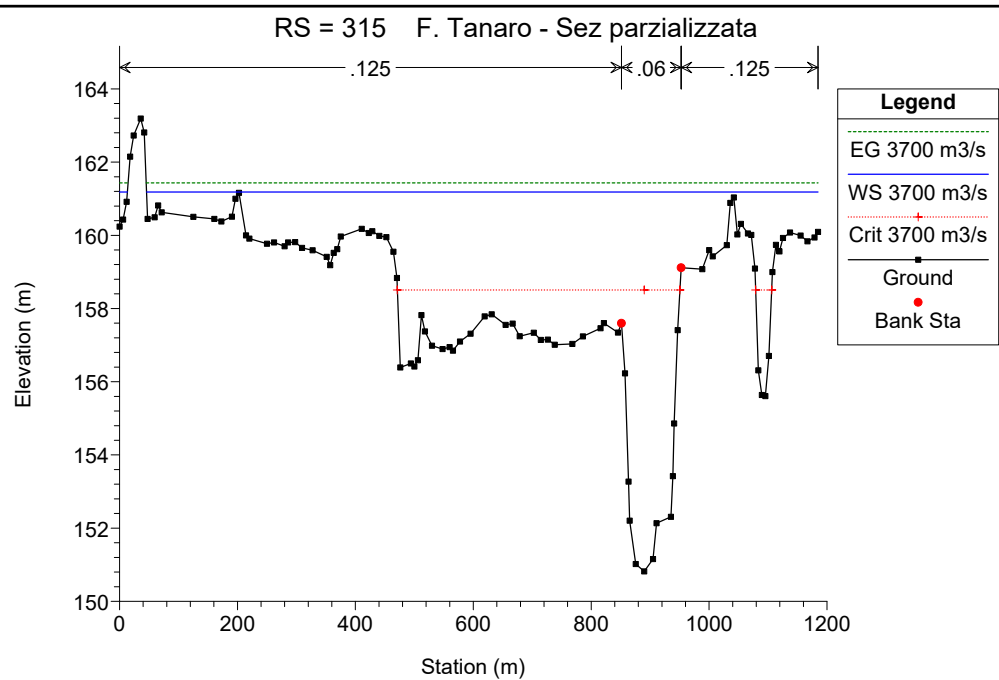
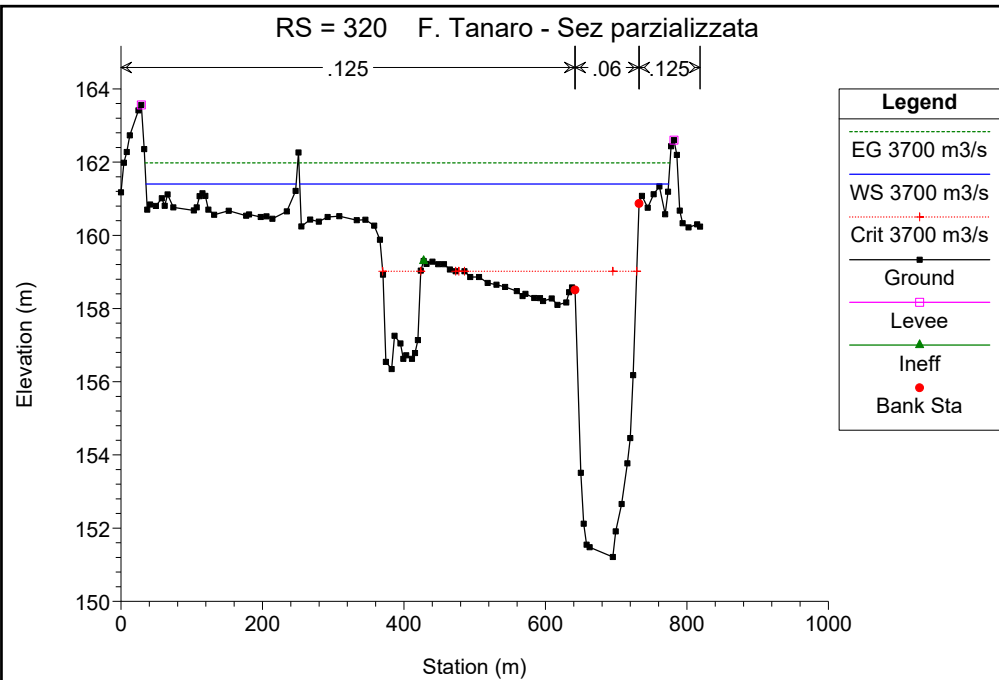


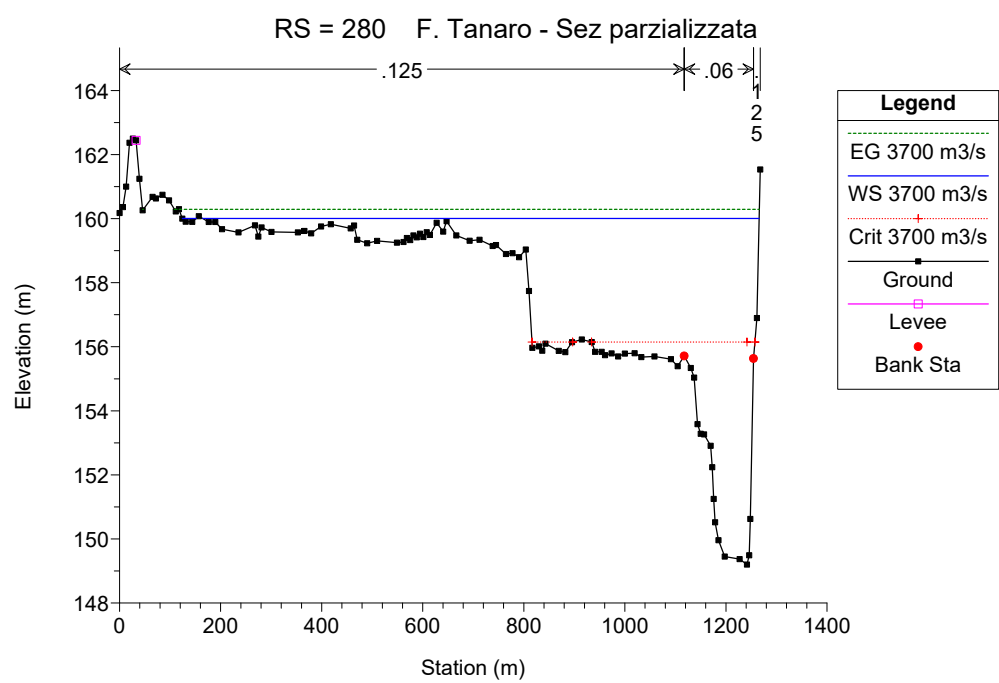
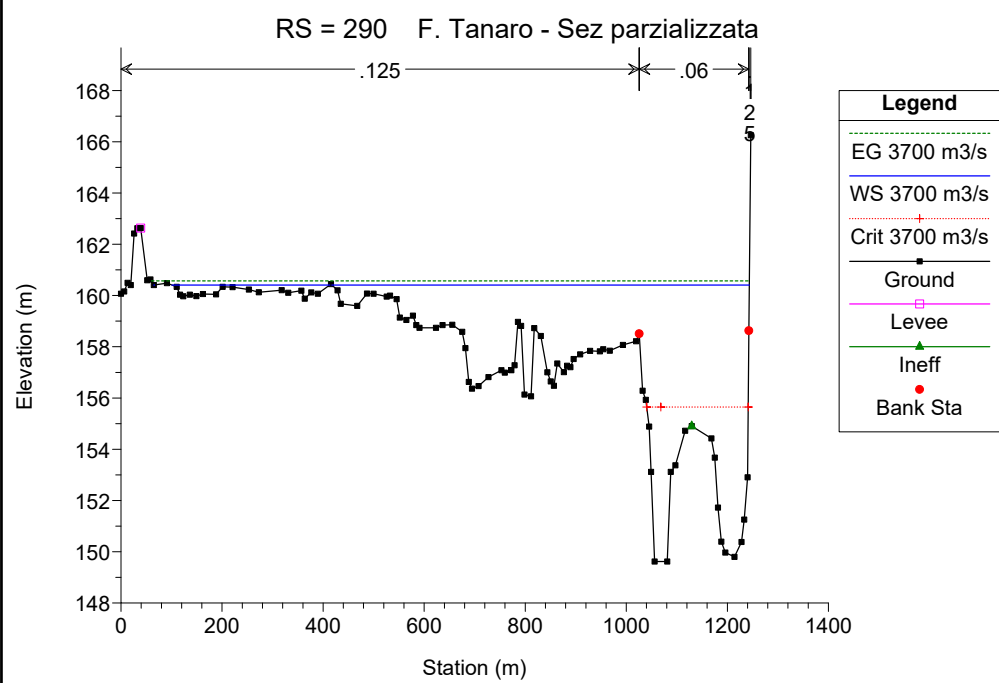
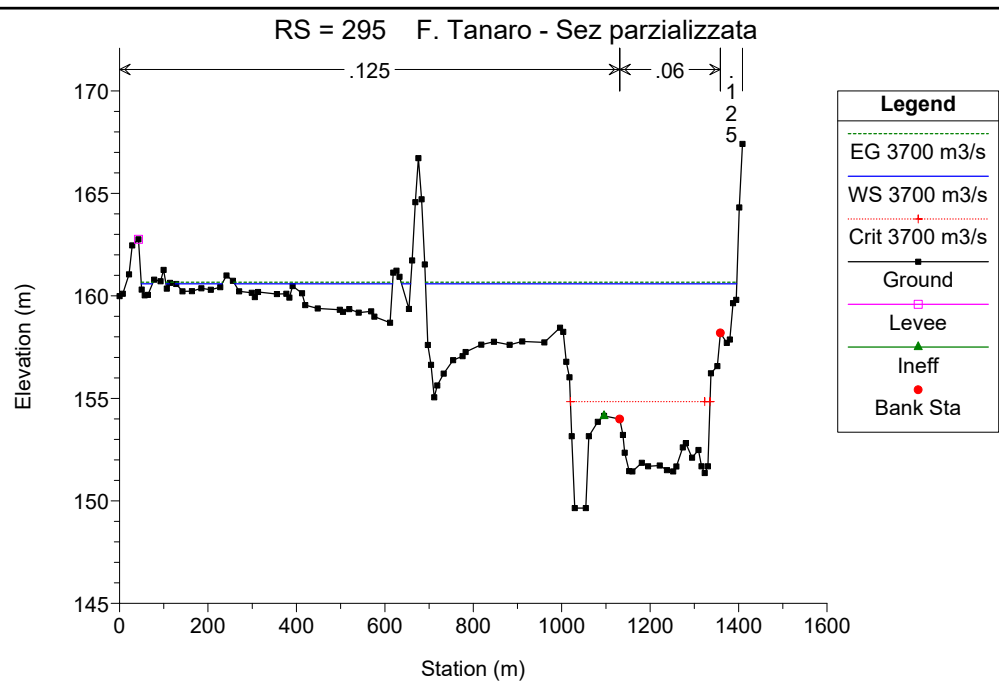
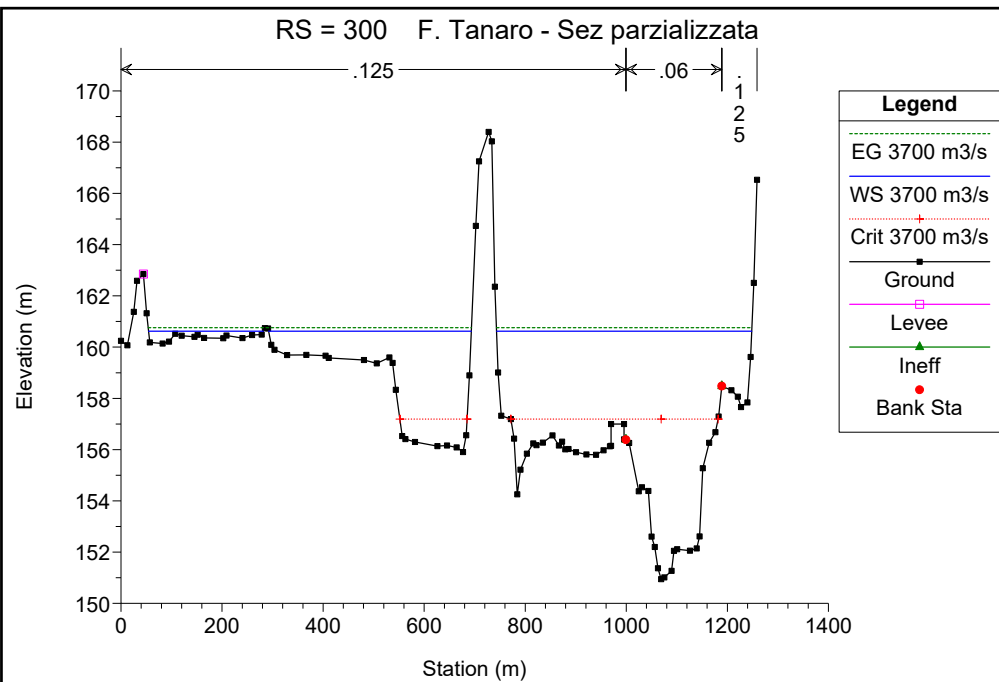


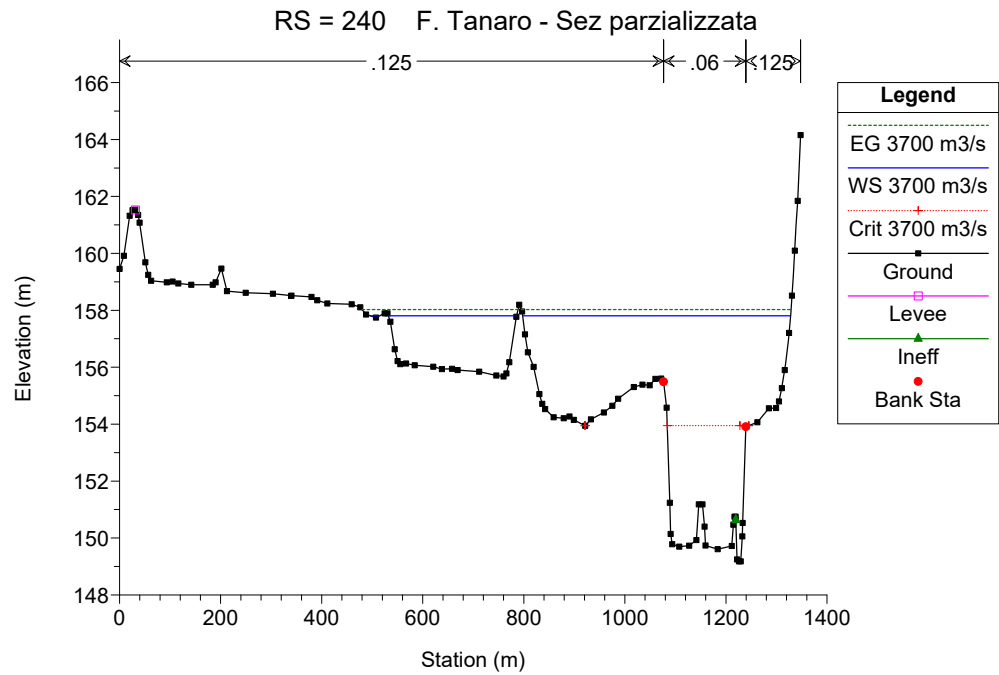
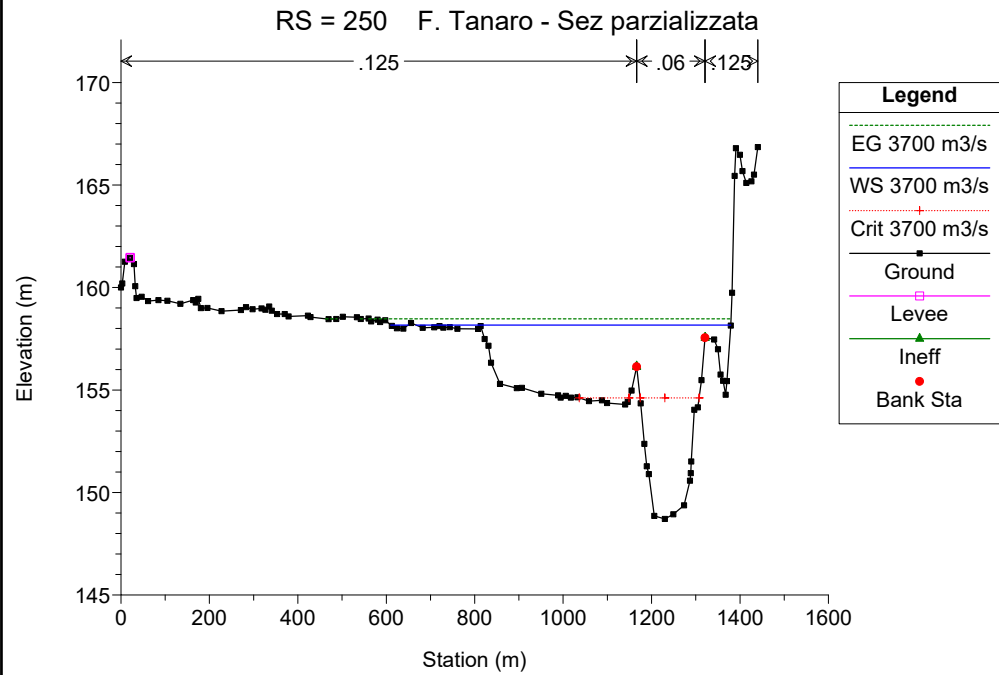
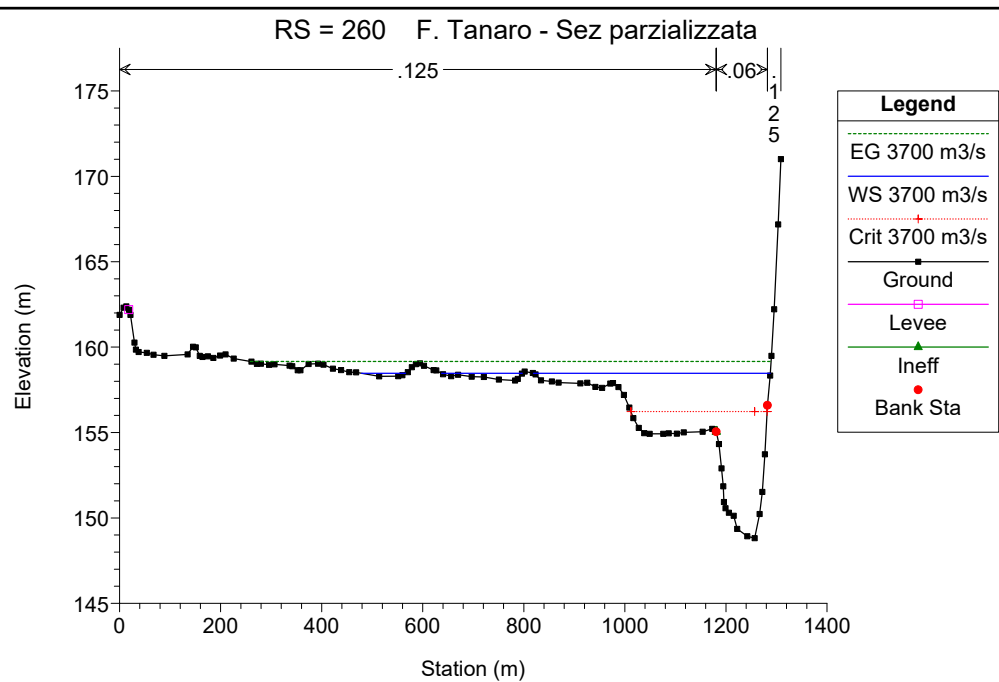
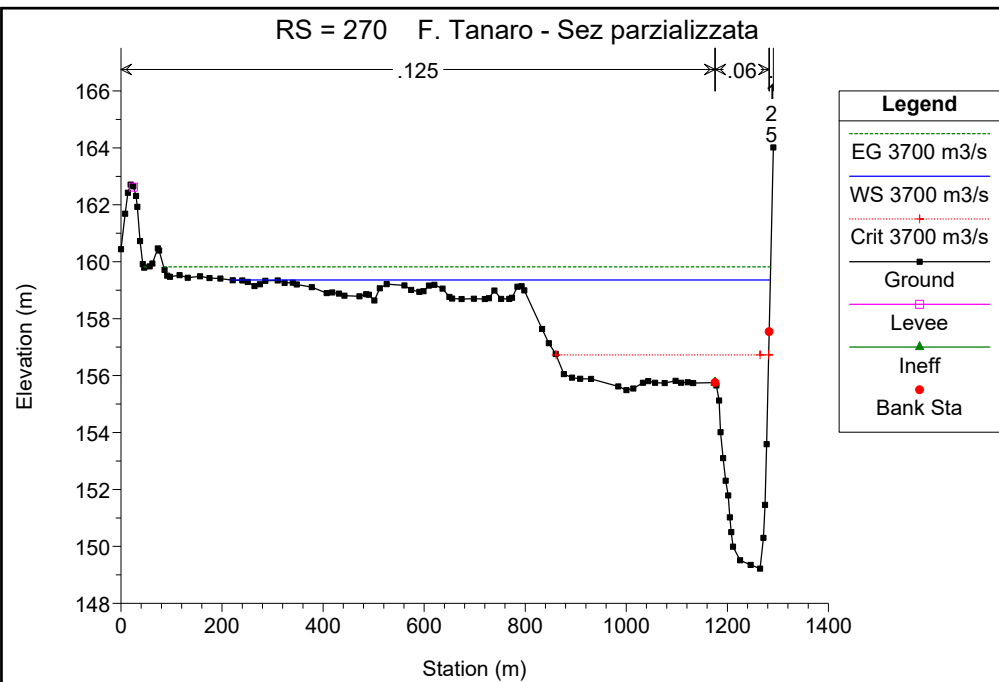


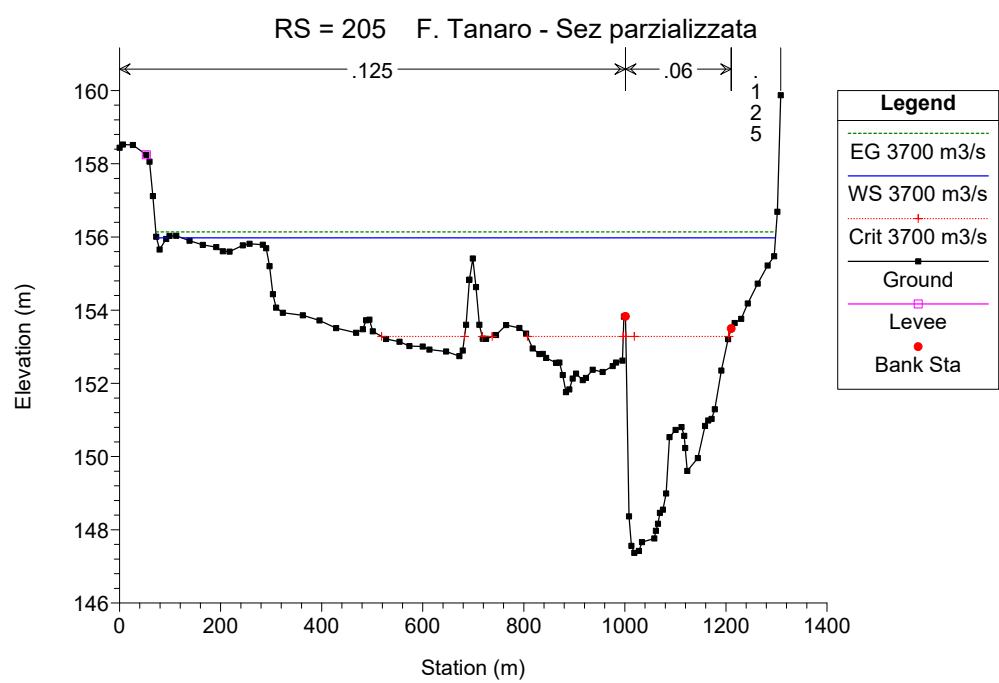
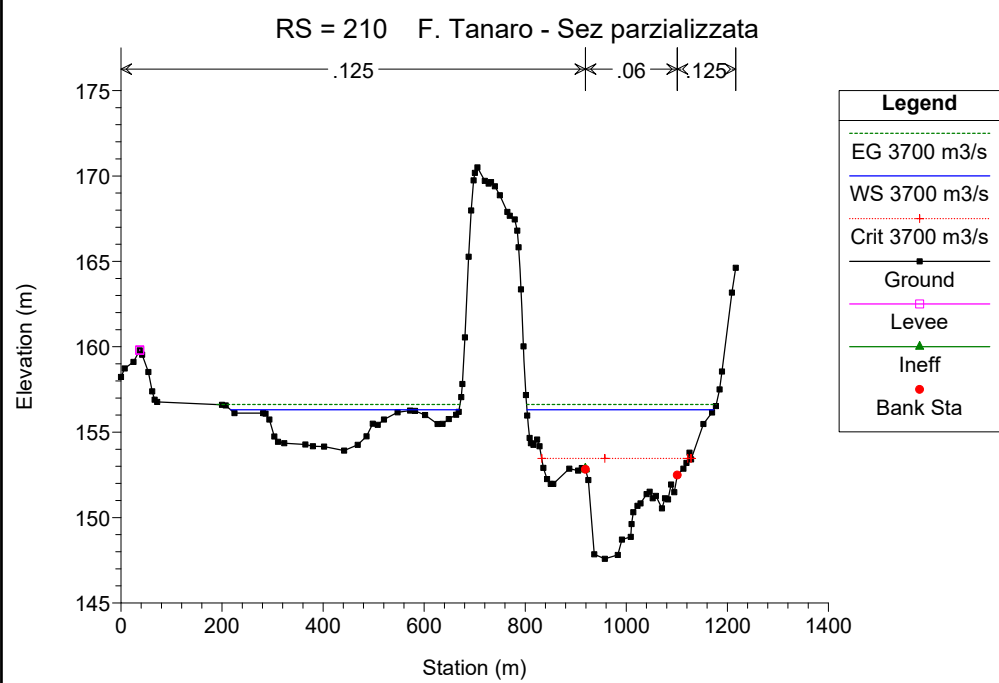
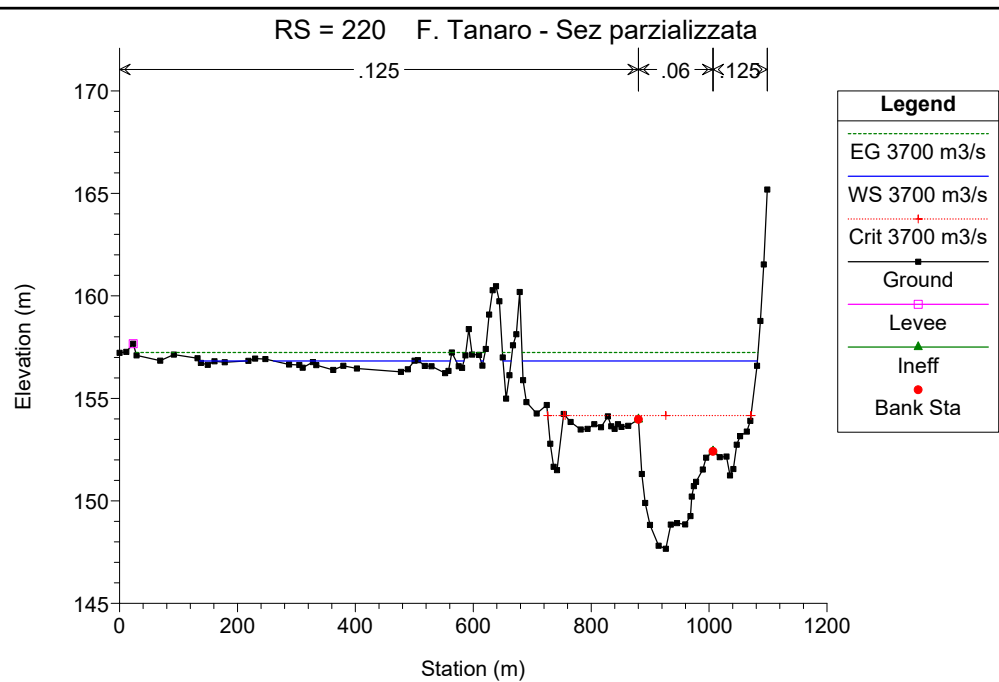
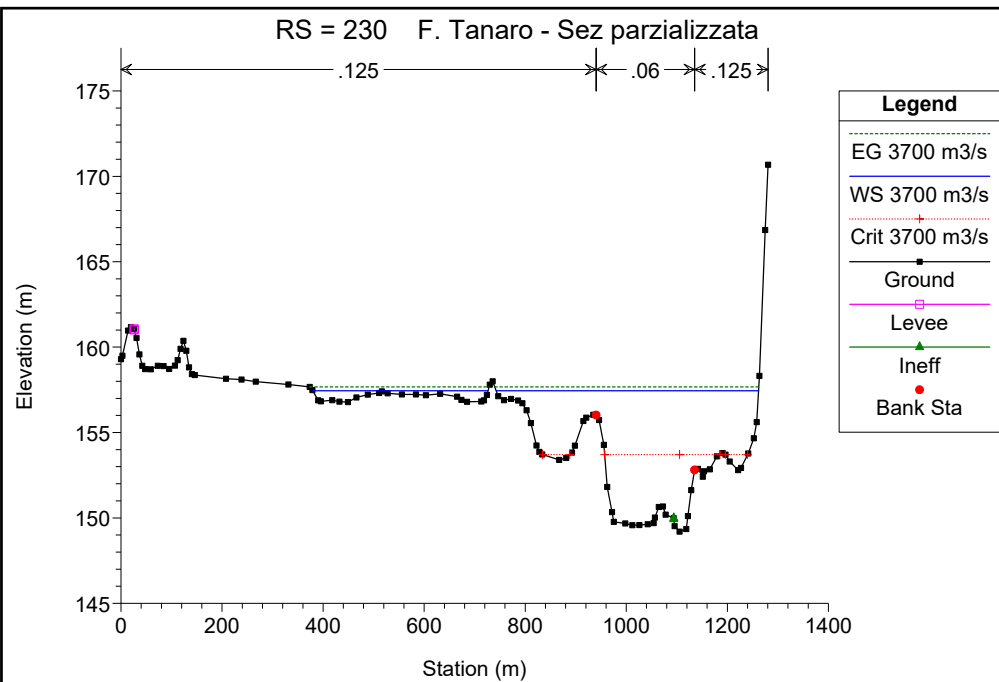


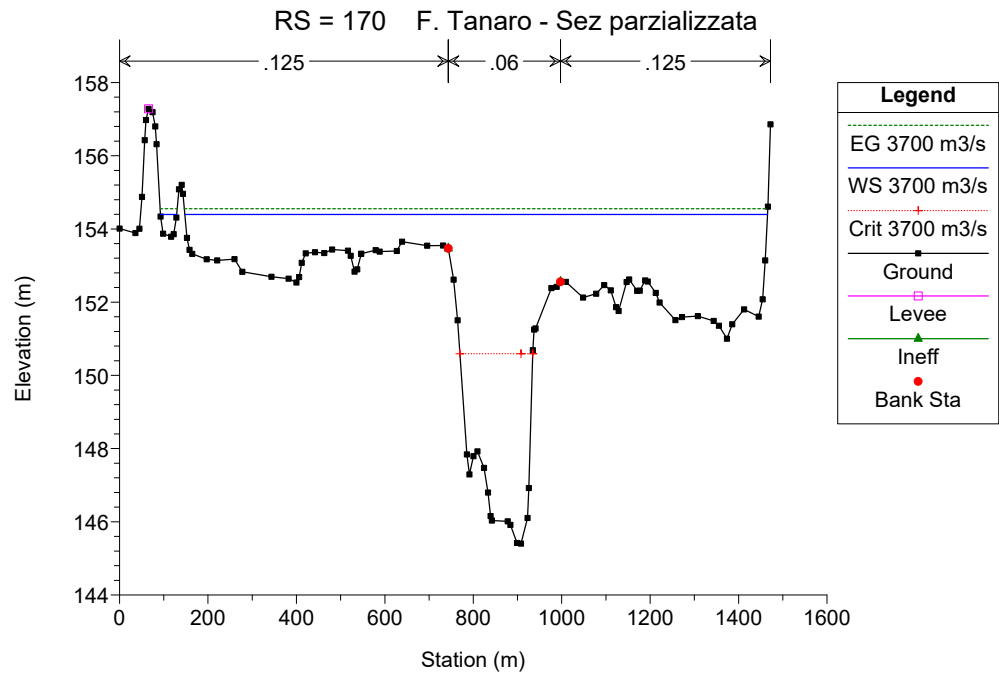
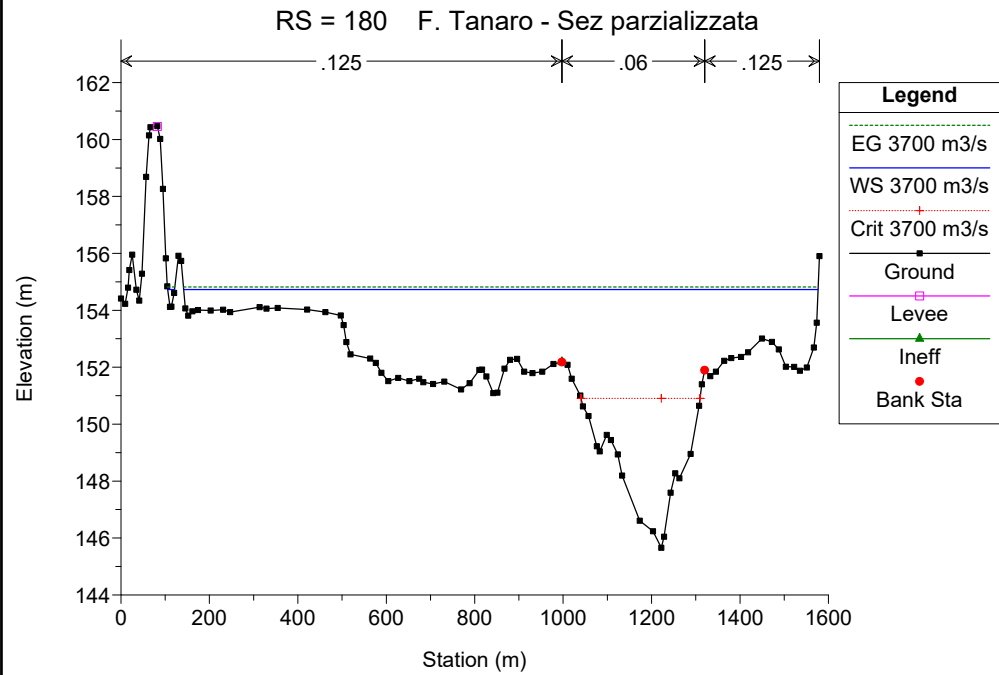
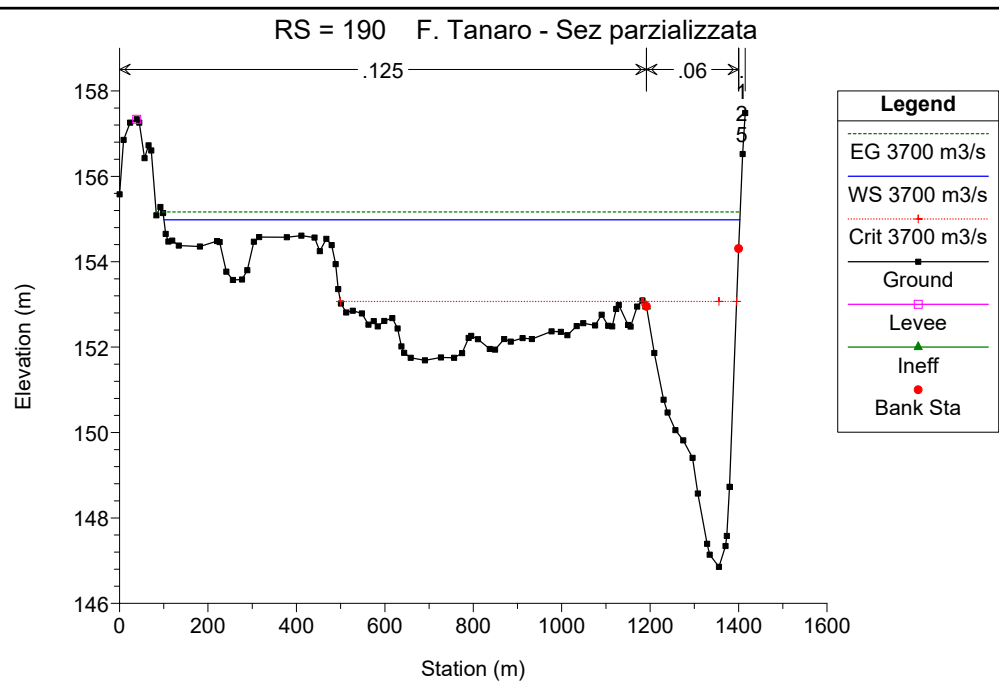
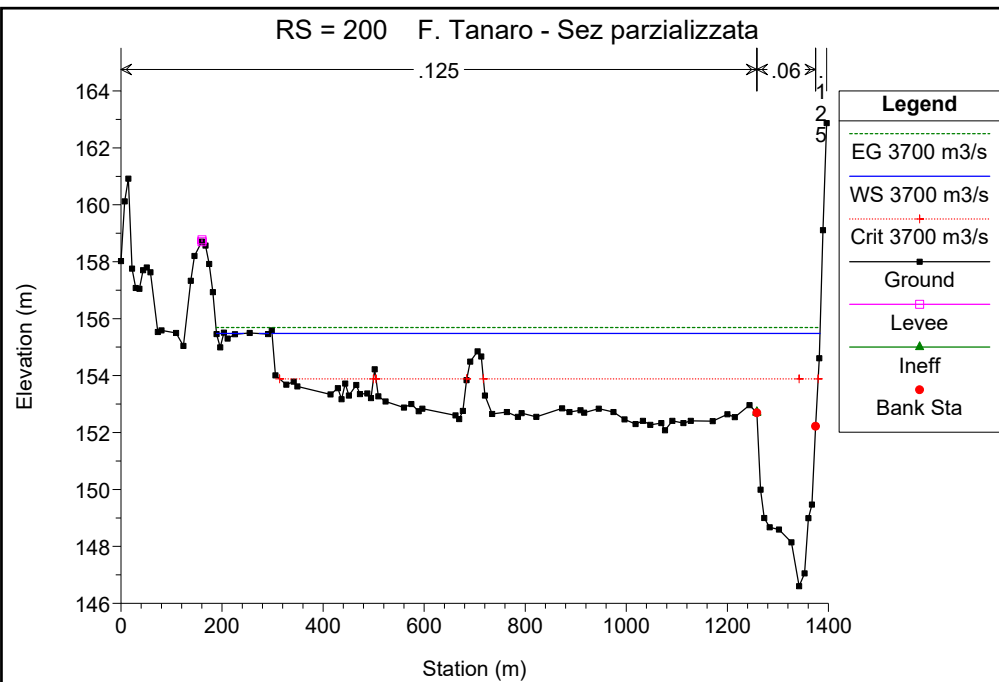


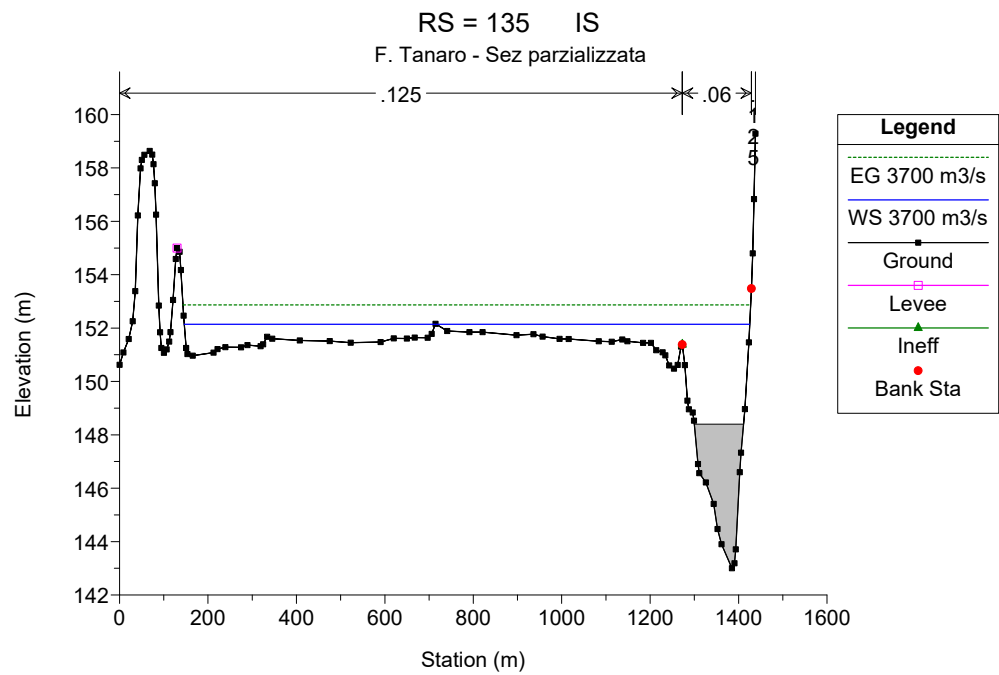
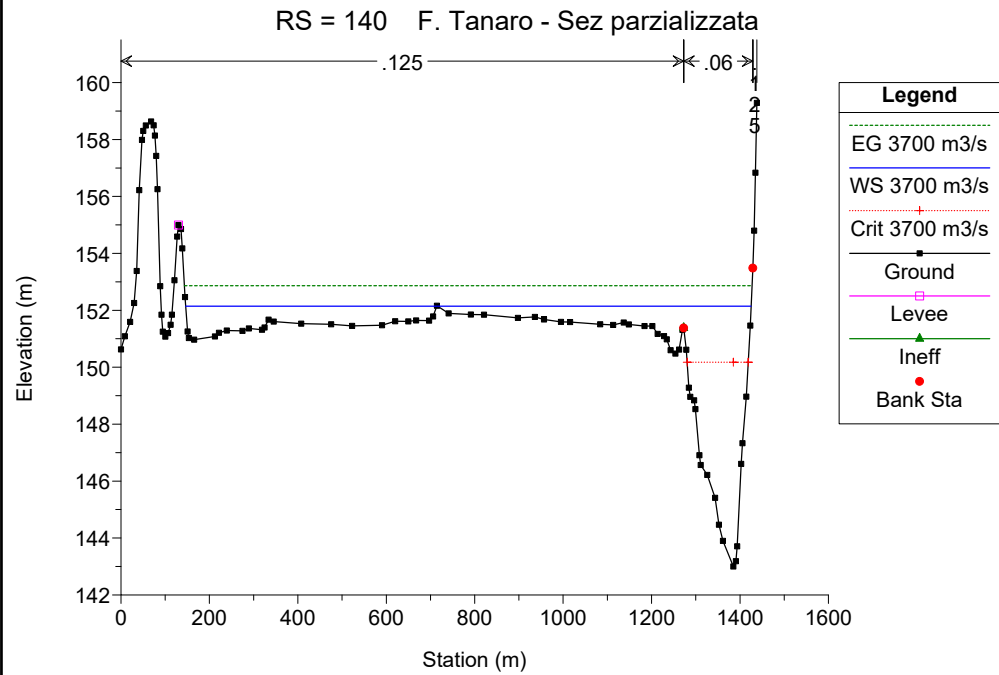
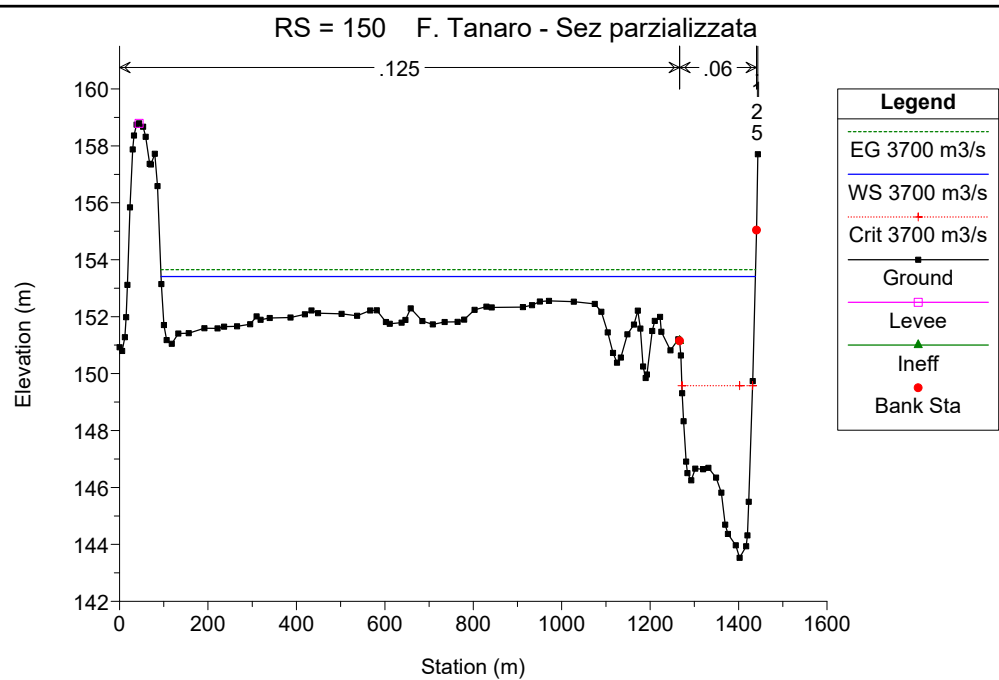
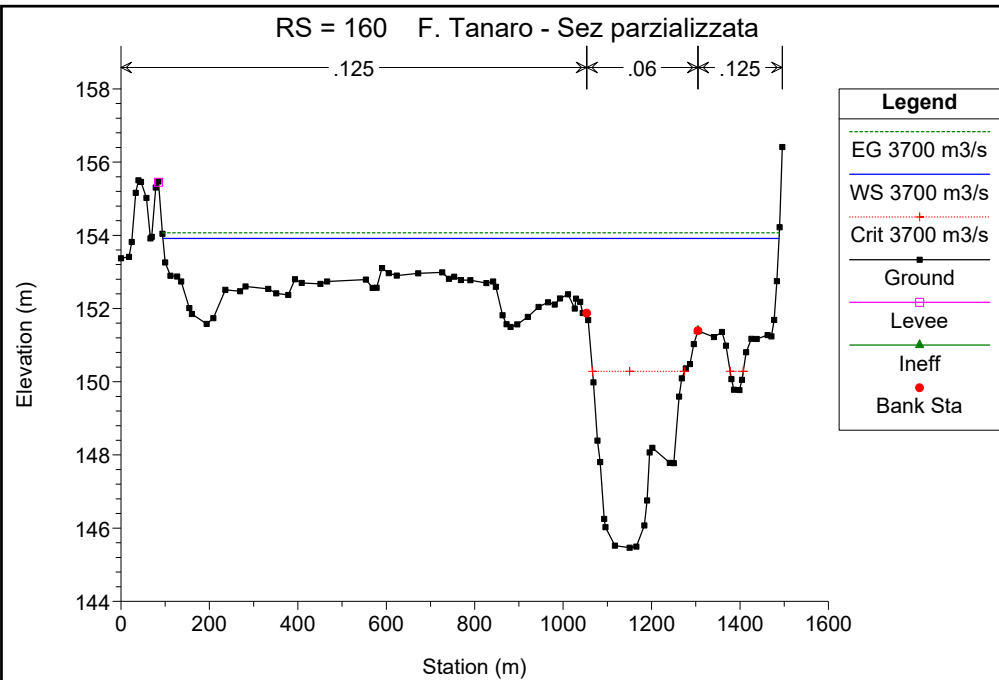


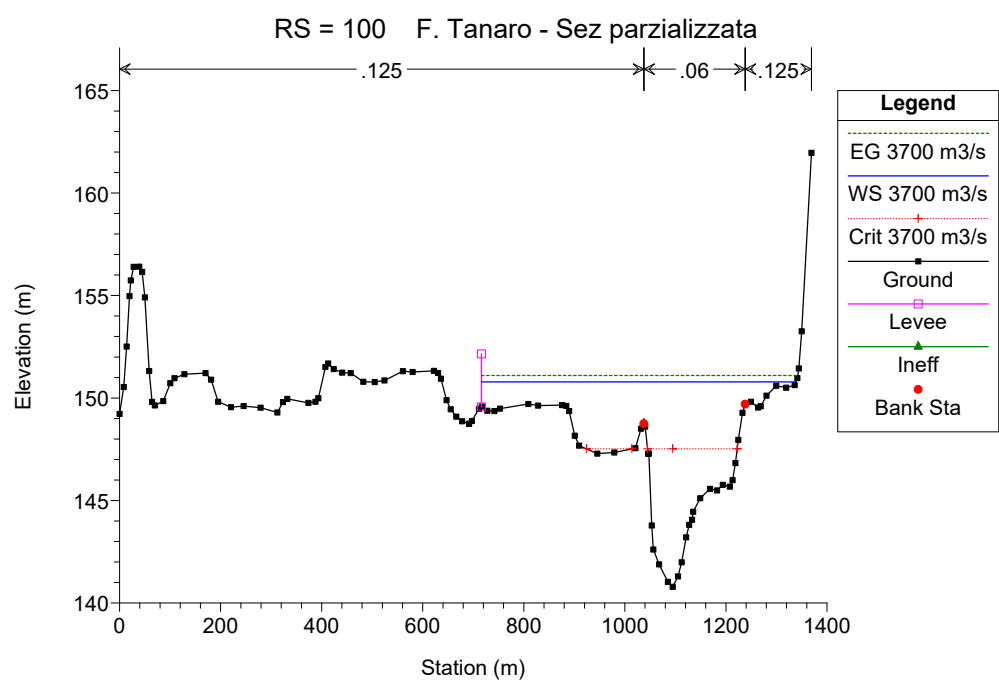
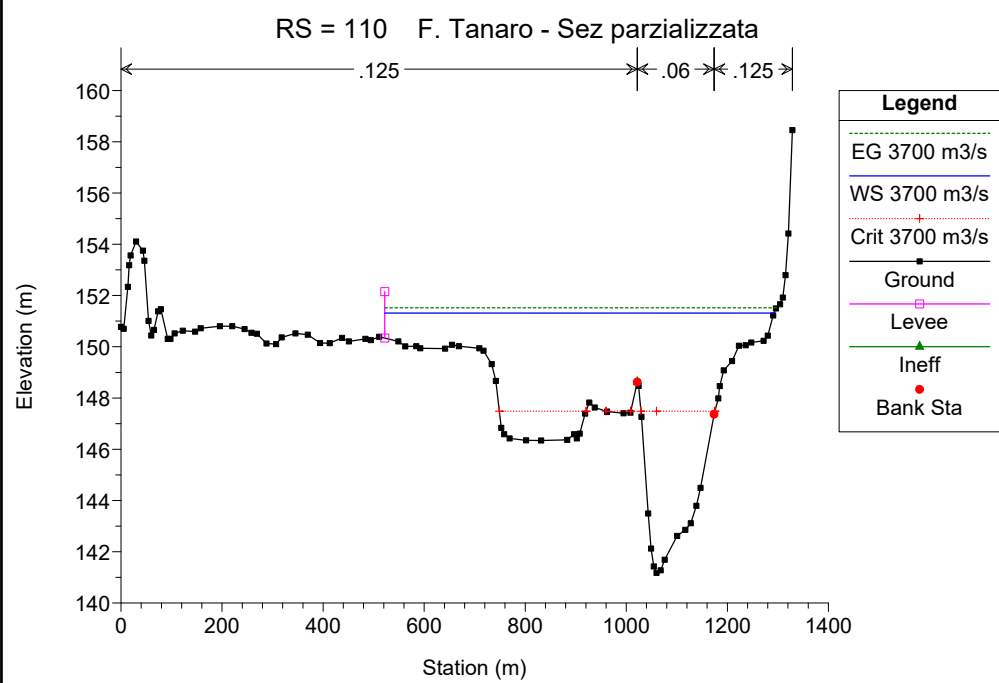
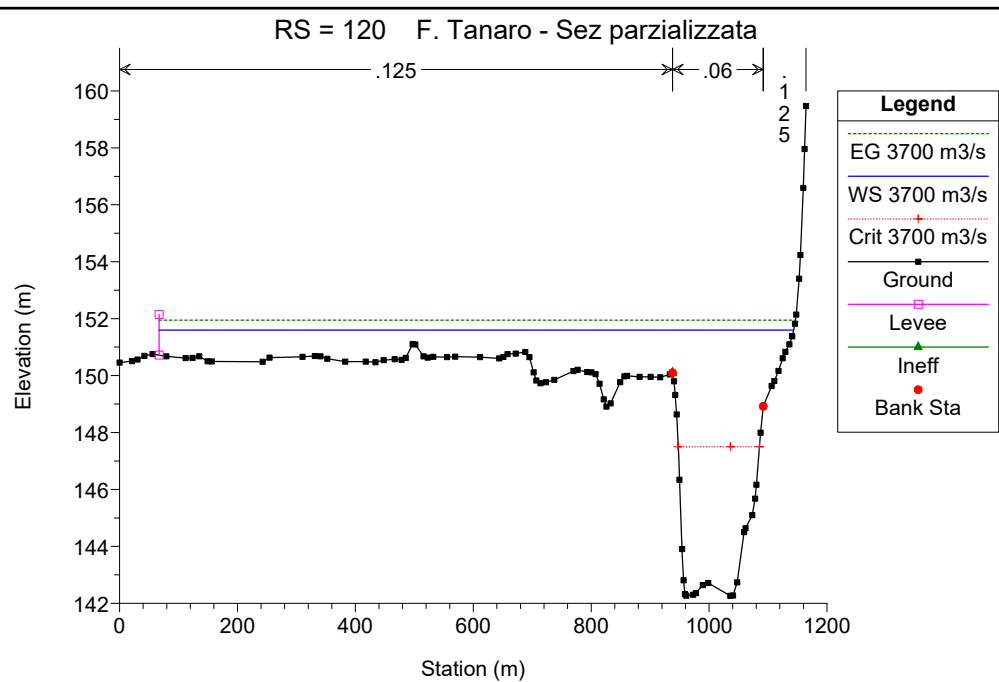
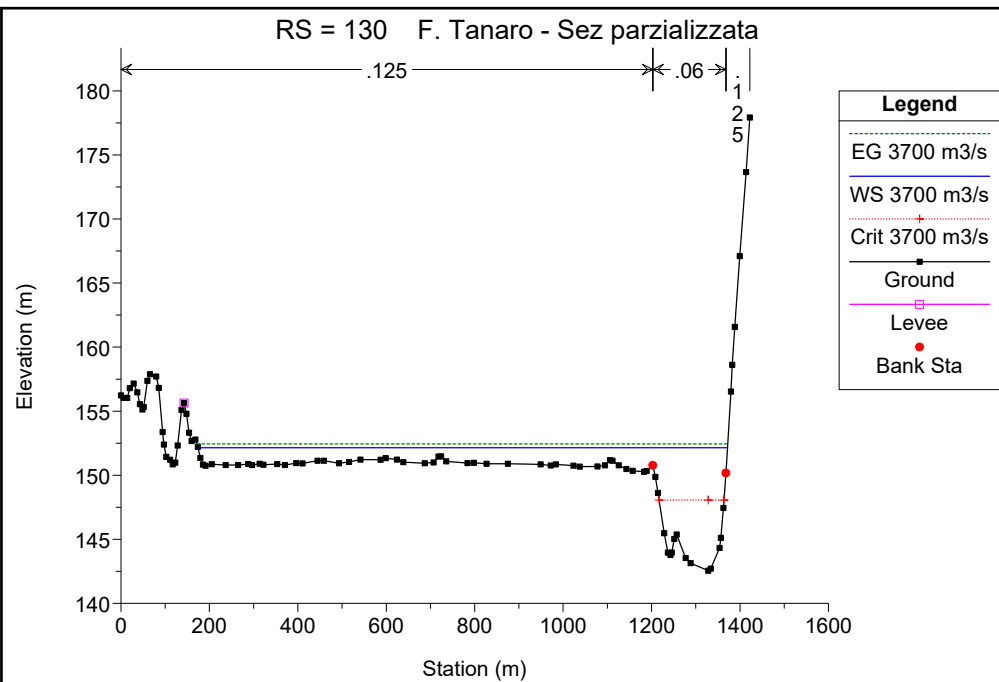


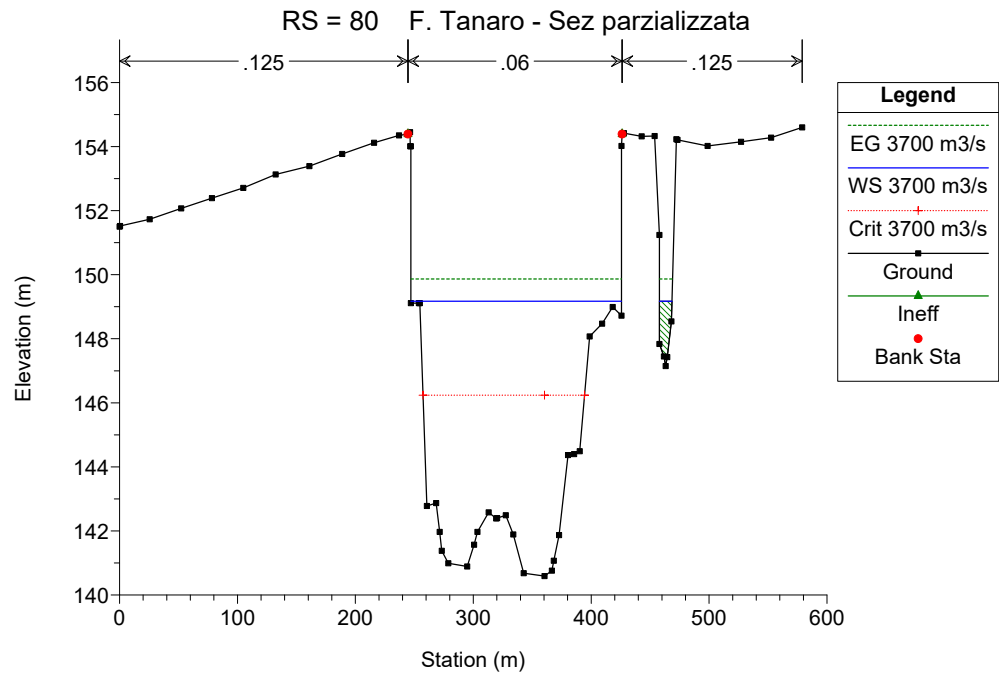
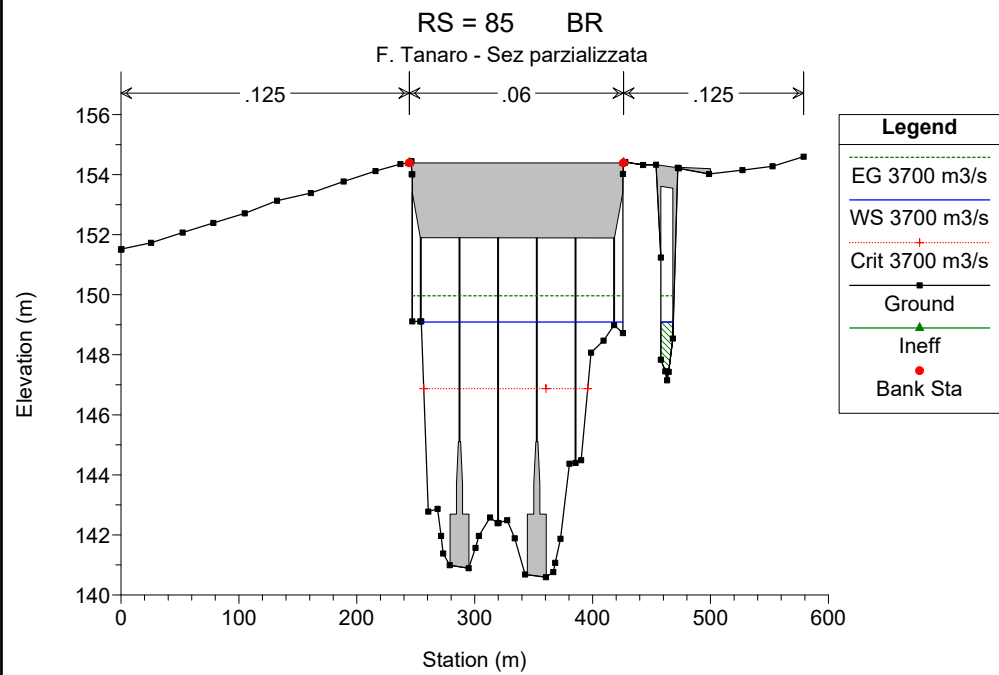
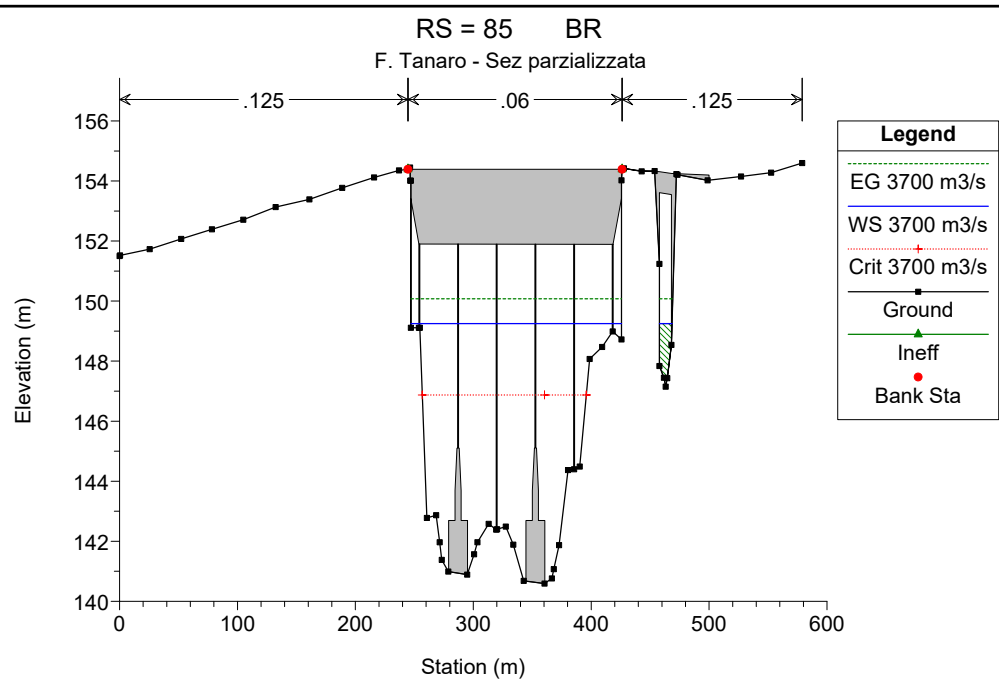
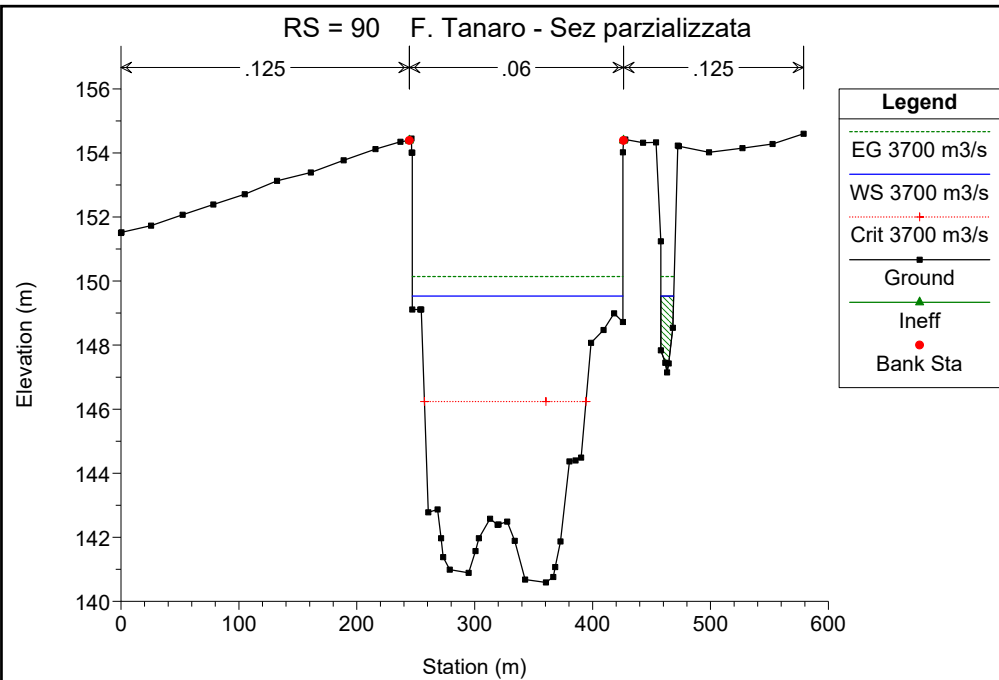


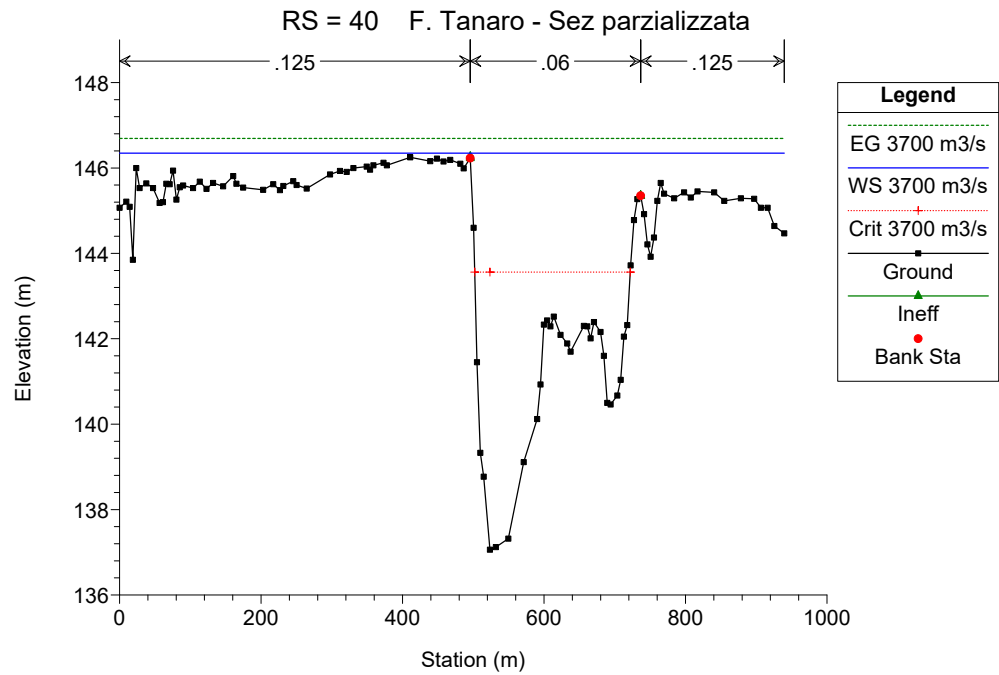
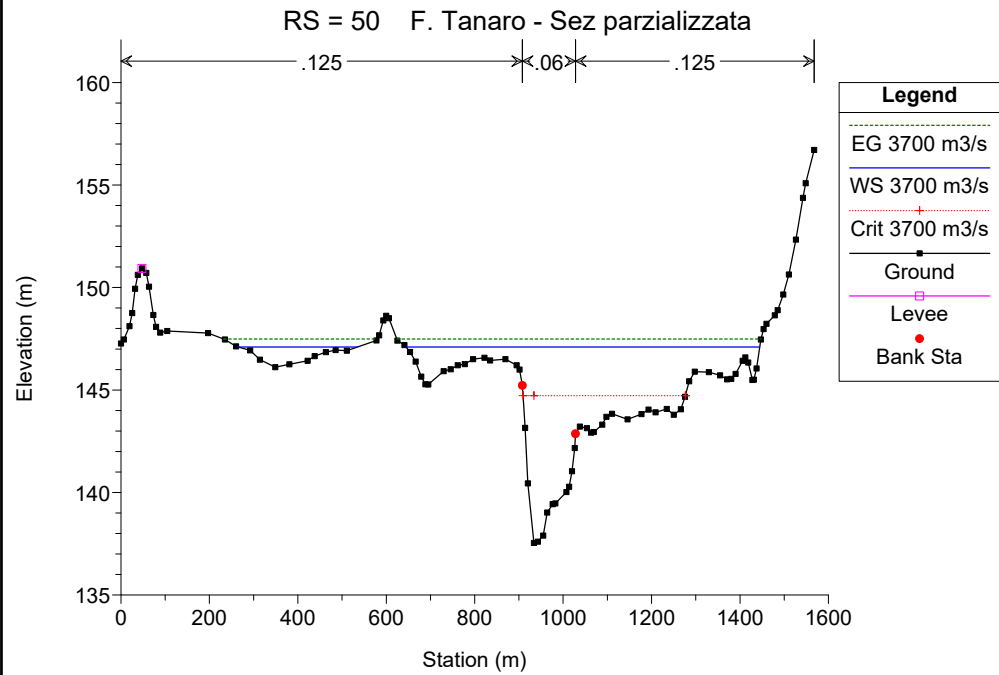
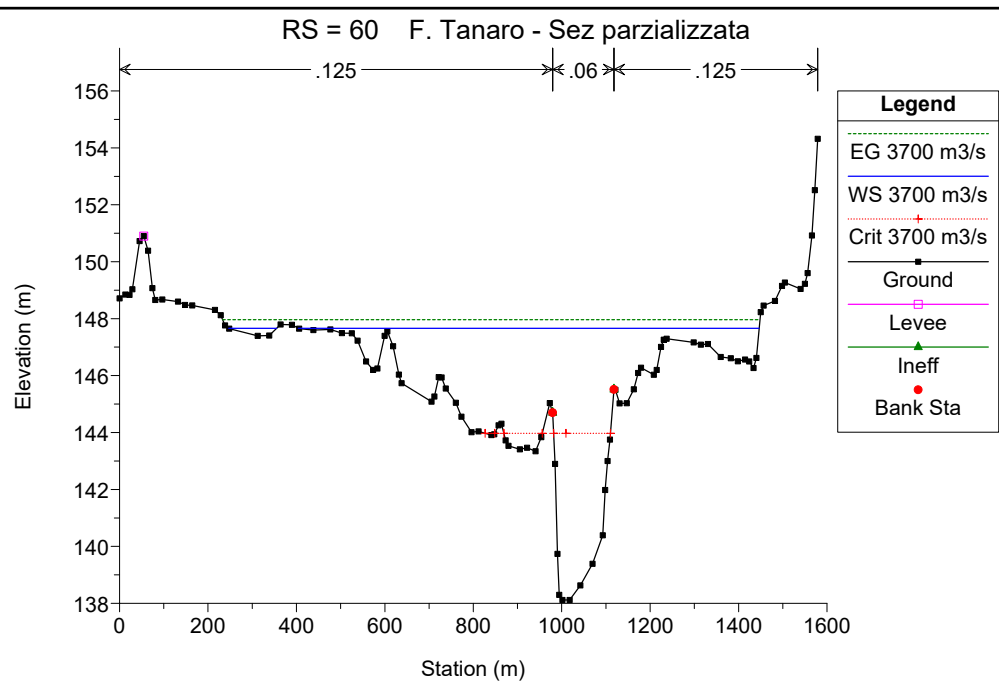
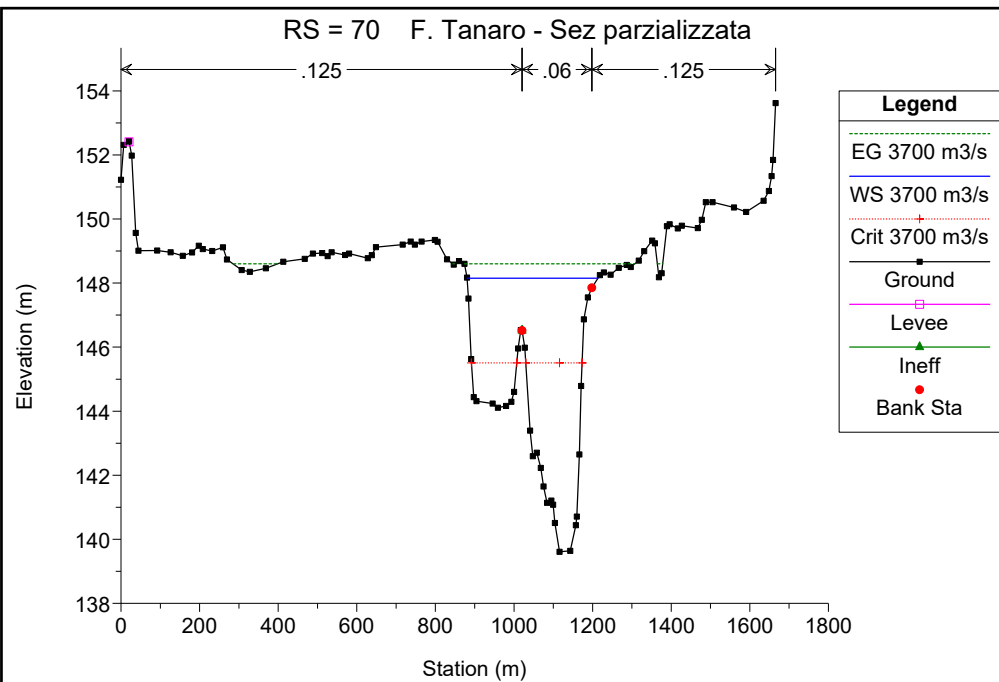


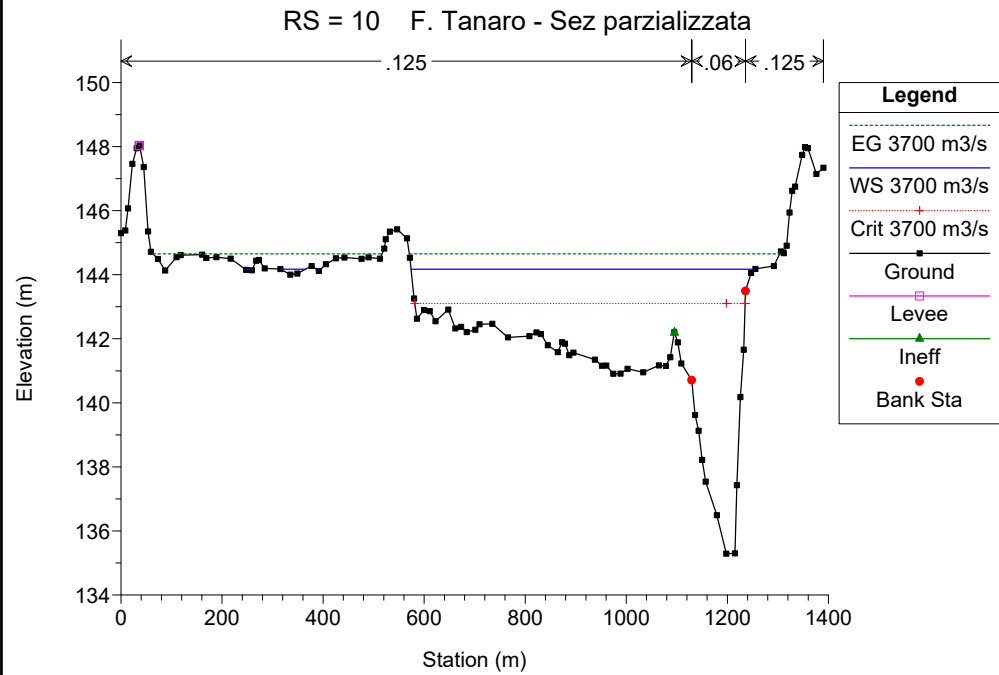
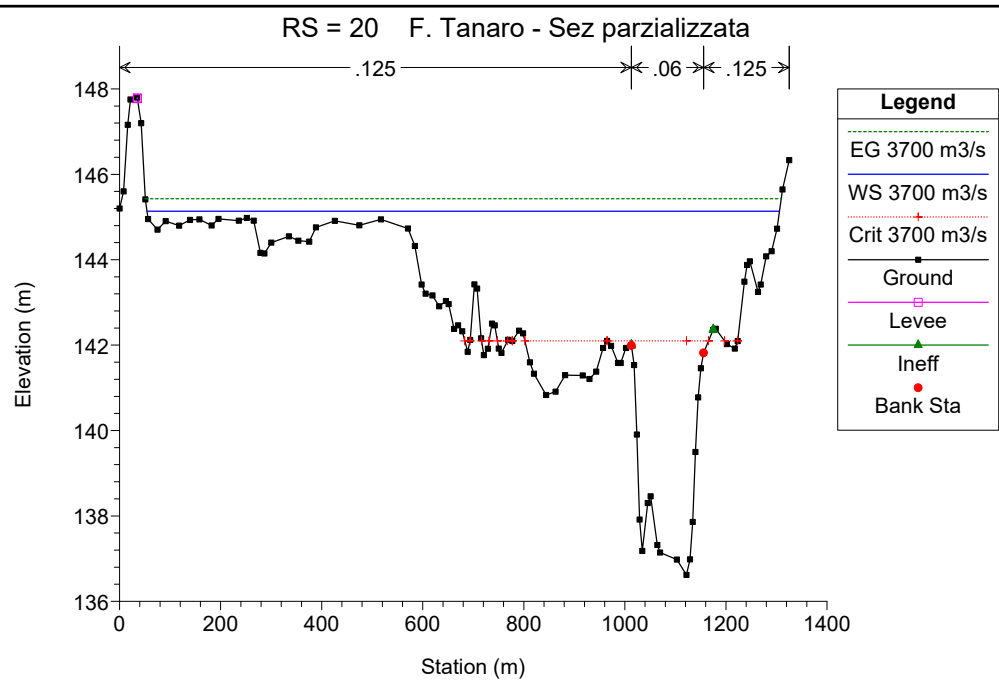
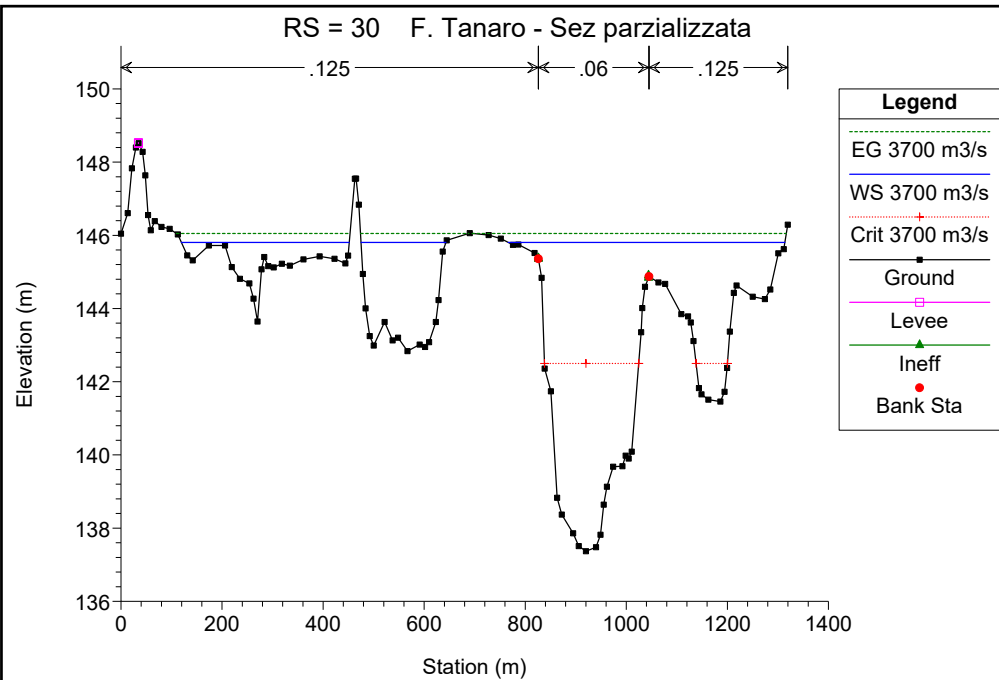












5.1 CONFRONTO LIVELLI IDRICI ATTUALE-PROGETTO

L'esame dei risultati del calcolo dei livelli idrici associati alle portate di piena evidenzia che, nella zona immediatamente a monte della traversa, i livelli di piena in presenza dell'opera in progetto, con sbarramento mobile abbattuto, sono:

- superiori a quelli attuali di circa 15 cm con riferimento alla portata avente tempo di ritorno di 20 anni;
- superiori a quelli attuali di circa 10 cm con riferimento alla portata avente tempo di ritorno di 50 anni;
- superiori a quelli attuali di circa 5 cm con riferimento alla portata avente tempo di ritorno di 100 anni;
- sostanzialmente invariati con riferimento alle portate aventi tempo di ritorno di 200 e 500 anni e alla portata di 3700 m³/s.

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 0.10 m/s con riferimento alla portata avente tempo di ritorno di 20 anni e di circa 0.05 m/s con riferimento alle portate aventi tempo di ritorno di 50 e 100 anni; analizzando invece i risultati delle simulazioni relative alla portata 3050 m³/s (T_R=200 anni), alla portata 3400 m³/s (T_R=500 anni) e a 3700 m³/s si osserva come la variazione di velocità in alveo tra la situazione attuale e quella di progetto sia sostanzialmente trascurabile.

Per quanto concerne le simulazioni relative alla situazione di progetto con sbarramento mobile completamente alzato (scenario teorico in quanto lo sbarramento mobile si abbassa per portate in alveo superiori a 300 m³/s) si evidenzia che, nella zona immediatamente a monte della traversa, i livelli di piena sono:

- superiori a quelli attuali di circa 80 cm con riferimento alla portata avente tempo di ritorno di 20 anni;
- superiori a quelli attuali di circa 60 cm con riferimento alla portata avente tempo di ritorno di 50 anni;
- superiori a quelli attuali di circa 50 cm con riferimento alla portata avente tempo di ritorno di 100 anni;
- superiori a quelli attuali di circa 35 cm con riferimento alla portata avente tempo di ritorno di 200 anni;

- superiori a quelli attuali di circa 15 cm con riferimento alla portata avente tempo di ritorno di 500 anni;
- superiori a quelli attuali di circa 10 cm con riferimento alla portata di 3700 m³/s.

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 0.55 m/s con riferimento alla portata avente tempo di ritorno di 20 anni, di circa 0.40 m/s con riferimento alla portata avente tempo di ritorno di 50 anni, di circa 0.30 m/s con riferimento alle portate aventi tempo di ritorno di 100 anni e 200 anni, di circa 0.15 m/s con riferimento alla portata avente tempo di ritorno di 500 anni e di circa 0.05 m/s con riferimento alla portata di 3700 m³/s.

Per quanto concerne le simulazioni relative alla situazione di progetto con una parzializzazione della sezione pari al 30% si evidenzia che, nella zona immediatamente a monte della traversa, i livelli di piena 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 20 cm con riferimento alle portate aventi tempo di ritorno di 50 e 100 anni;
- superiori a quelli attuali di circa 10 cm con riferimento alla portata avente tempo di ritorno di 200 anni;
- superiori a quelli attuali di circa 5 cm con riferimento alla portata avente tempo di ritorno di 500 anni e alla portata di 3700 m³/s.

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 0.25 m/s con riferimento alla portata avente tempo di ritorno di 20 anni, di circa 0.15 m/s con riferimento alla portata avente tempo di ritorno di 50 anni, di circa 0.10 m/s con riferimento alla portata avente tempo di ritorno di 100 anni e di circa 0.05 m/s con riferimento alle portate aventi tempo di ritorno di 200 e 500 anni e alla portata di 3700 m³/s.

Le aree di esondazione relative ai 3 scenari considerati e perimetrate per le portate con tempo di ritorno di 20, 50, 100, 200 e 500 anni, sono contenute negli elaborati A18-1, A18-2, A18-3, A18-4 e A18-5.

5.2 VALUTAZIONE DEI FRANCHI DI SICUREZZA



Fig. 5.2.1 Localizzazione delle arginature a protezione dell'abitato di Alba.

Nella seguente tabella si riportano i franchi idraulici minimi sulle arginature a protezione dell'abitato di Alba relativi alla situazione attuale, alla situazione di progetto con sbarramento mobile abbattuto e alla situazione di progetto con sbarramento alzato con riferimento alla portata al colmo di piena avente tempo di ritorno di 200 anni.

Il numero identificativo delle arginature è riportato in Fig. 5.2.1.

Argine n.	Sponda	Franco minimo attuale [m]	Franco minimo prog abbattuto [m]	Franco minimo prog alzato [m]	Franco minimo sez. parz. [m]
1	Sx	2.25	2.25	2.24	2.25
2	Dx	2.25	2.25	2.24	2.25
3	Dx	3.14	3.14	3.10	3.13
4	Dx	1.29	1.29	1.21	1.27
5	Dx	1.28	1.28	1.15	1.25

Tab. 5.2.1 Valori dei franchi idraulici minimi sulle arginature a protezione dell'abitato di Alba con riferimento alla portata con tempo di ritorno di 200 anni.

Per quanto concerne gli attraversamenti esistenti (ponte della tangenziale e ponte della S.R. 29) si evidenzia che, con riferimento alla portata con tempo di ritorno di 200 anni, i franchi sono superiori a 3 m per entrambi i ponti sia nella condizione

attuale che in quelle di progetto (con sbarramento mobile abbattuto, con sbarramento mobile completamente sollevato e con sezione parzializzata).

I sopraccitati attraversamenti sono quindi idraulicamente verificati anche nelle condizioni di progetto.

Il presente impianto idroelettrico risulta pertanto compatibile sia con le opere di difesa idraulica dell'abitato di Alba, sia con i ponti su Fiume Tanaro esistenti.

Per quanto concerne l'interferenza con il terzo ponte Sul F. Tanaro in progetto, ubicato circa 200 m a valle dello sbarramento in progetto, si segnala che la traversa prevista, in condizioni di piena, non determina variazioni apprezzabili per quanto concerne i livelli idrici e le velocità della corrente rispetto alla situazione attuale nella zona a valle; inoltre l'attraversamento in progetto non presenterà pile in alveo in quanto sarà realizzato mediante l'affiancamento di tre impalcati distinti e strutturalmente indipendenti: un impalcato principale a tre luci a trave continua con sezione trasversale a cassone ed altezza variabile (con luci previste di 140 m per quella a scavalco del Fiume Tanaro e di 85 m per laterali) e due impalcati con campate da 50 m continue ma strutturalmente indipendenti dall'impalcato principale (in numero di quattro in sponda sinistra e tre in sponda destra).

Il presente impianto idroelettrico risulta pertanto pienamente compatibile con il terzo ponte in progetto.

Per quanto concerne il potenziale insorgere di fenomeni erosivi nella zona a valle della traversa in progetto si segnala la presenza, circa 400 m a valle della traversa in progetto, di un affioramento diffuso del substrato marnoso che si comporta come una sorta di soglia naturale che vincola la quota di fondo alveo a circa 151.50 m e consente di mantenere sostanzialmente inalterate le quote di fondo alveo rispetto alla situazione attuale.

In conclusione si ritiene che l'opera sia compatibile con l'assetto difensivo esistente e che essa non comporti un aumento delle condizioni di rischio idraulico per il territorio circostante. Le analisi idrauliche eseguite non hanno infatti evidenziato variazioni apprezzabili per quanto concerne delimitazione delle aree di esondazione con tempo di ritorno di 200 anni a seguito della realizzazione dell'impianto in progetto; inoltre i franchi idraulici sulle arginature (con riferimento alla portata con tempo di ritorno di 200 anni) sono superiori a quelli previsti dalla normativa.

6. VALUTAZIONE DEI LIVELLI IN ALVEO IN CONDIZIONI DI ESERCIZIO CON LE PORTATE MASSIME E MINIME DI FUNZIONAMENTO DELL'IMPIANTO E CON LA PORTATA MEDIA DERIVATA

Si effettuano le simulazioni idraulico numeriche nella condizione attuale e di progetto con riferimento alle principali portate di funzionamento dell'impianto utilizzando un modello di calcolo monodimensionale di moto permanente della stessa tipologia di quello implementato per le simulazioni in condizioni di piena precedentemente riportate.

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

Alla portata di minimo funzionamento dell'impianto ($6.66 \text{ m}^3/\text{s}$) corrisponde la portata naturale in alveo di $15.90 \text{ m}^3/\text{s}$ ($6.66 \text{ m}^3/\text{s} + 9.24 \text{ m}^3/\text{s}$ di DMV modulato), alla portata media derivata ($39.20 \text{ m}^3/\text{s}$) corrisponde la portata naturale in alveo di $52.00 \text{ m}^3/\text{s}$ ($39.20 \text{ m}^3/\text{s} + 12.80 \text{ m}^3/\text{s}$ di DMV modulato), mentre a quella massima di funzionamento dell'impianto ($100.00 \text{ m}^3/\text{s}$) corrispondono portate naturali in alveo variabili tra $120.0 \text{ m}^3/\text{s}$ e $300.00 \text{ m}^3/\text{s}$.

Per portate superiori a $300 \text{ m}^3/\text{s}$ lo sbarramento mobile viene completamente abbattuto e viene interrotta la derivazione.

Le portate in alveo utilizzate nelle simulazioni sono le seguenti:

$15.9 \text{ m}^3/\text{s}$, $20 \text{ m}^3/\text{s}$, $25.5 \text{ m}^3/\text{s}$ (Q_{274}), $30 \text{ m}^3/\text{s}$, $43.1 \text{ m}^3/\text{s}$ (Q_{182}), $52 \text{ m}^3/\text{s}$, $60 \text{ m}^3/\text{s}$, $80.8 \text{ m}^3/\text{s}$ (Q_{91}), $100 \text{ m}^3/\text{s}$, $109 \text{ m}^3/\text{s}$ (Q_{60}), $120 \text{ m}^3/\text{s}$, $140 \text{ m}^3/\text{s}$, $159 \text{ m}^3/\text{s}$ (Q_{30}), $180 \text{ m}^3/\text{s}$, $200 \text{ m}^3/\text{s}$, $220 \text{ m}^3/\text{s}$, $240 \text{ m}^3/\text{s}$, $260 \text{ m}^3/\text{s}$, $272.0 \text{ m}^3/\text{s}$ (Q_{10}), $280 \text{ m}^3/\text{s}$, $300 \text{ m}^3/\text{s}$.

Nel seguito si riportano i risultati completi delle simulazioni idraulico-numeriche per la portata minima di funzionamento ($15.90 \text{ m}^3/\text{s}$ in alveo di cui $6.66 \text{ m}^3/\text{s}$ derivati), per la portata massima di funzionamento ($300.0 \text{ m}^3/\text{s}$ in alveo di cui $100.0 \text{ m}^3/\text{s}$ derivati) e per la portata media derivata ($52.0 \text{ m}^3/\text{s}$ in alveo di cui $39.20 \text{ m}^3/\text{s}$ derivati).

Per i valori intermedi di portata si riportano i livelli idrici immediatamente a monte e immediatamente a valle della traversa.

Nelle sopraccitate simulazione è stata considerata la presenza dello sbarramento di Barbaresco secondo il progetto della Tanaro Power S.p.A., avente una quota in sommità che in condizioni ordinarie è pari a 149.20 m s.l.m. (sbarramento mobile

abbattuto). Non è necessario eseguire ulteriori simulazioni relative allo stato attuale (con traversa in parte dissestata) e considerando uno sbarramento avente una quota di regolazione di 148.50 m s.l.m. (come da progetto Edison) in quanto il rigurgito provocato dalle sopraccitate traverse di Barbaresco in progetto si estende verso monte per un tratto limitato e pertanto non è in grado di influenzare il comportamento idraulico del F. Tanaro nella zona a ridosso della centrale di Alba in progetto.

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 indicati nelle sezioni schematiche e nel profilo longitudinale allegati nelle pagine seguenti.

LEGENDA

River sta.	=	sezione di calcolo
Q total	=	portata in m ³ /s
Min Ch El	=	quota del fondo alveo in m
W.S. Elev.	=	livello del pelo libero dell'acqua in m
Crit W.S.	=	livello di moto critico dell'acqua in m
E.G. Elev	=	livello energetico globale in m
E.G. Slope	=	pendenza motrice
Vel Chnl	=	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

**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE ATTUALE
PORTATA MINIMA DI FUNZIONAMENTO DELL'IMPIANTO**

SIMULAZIONE 25

corso d'acqua	portata Q [m³/s]	
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

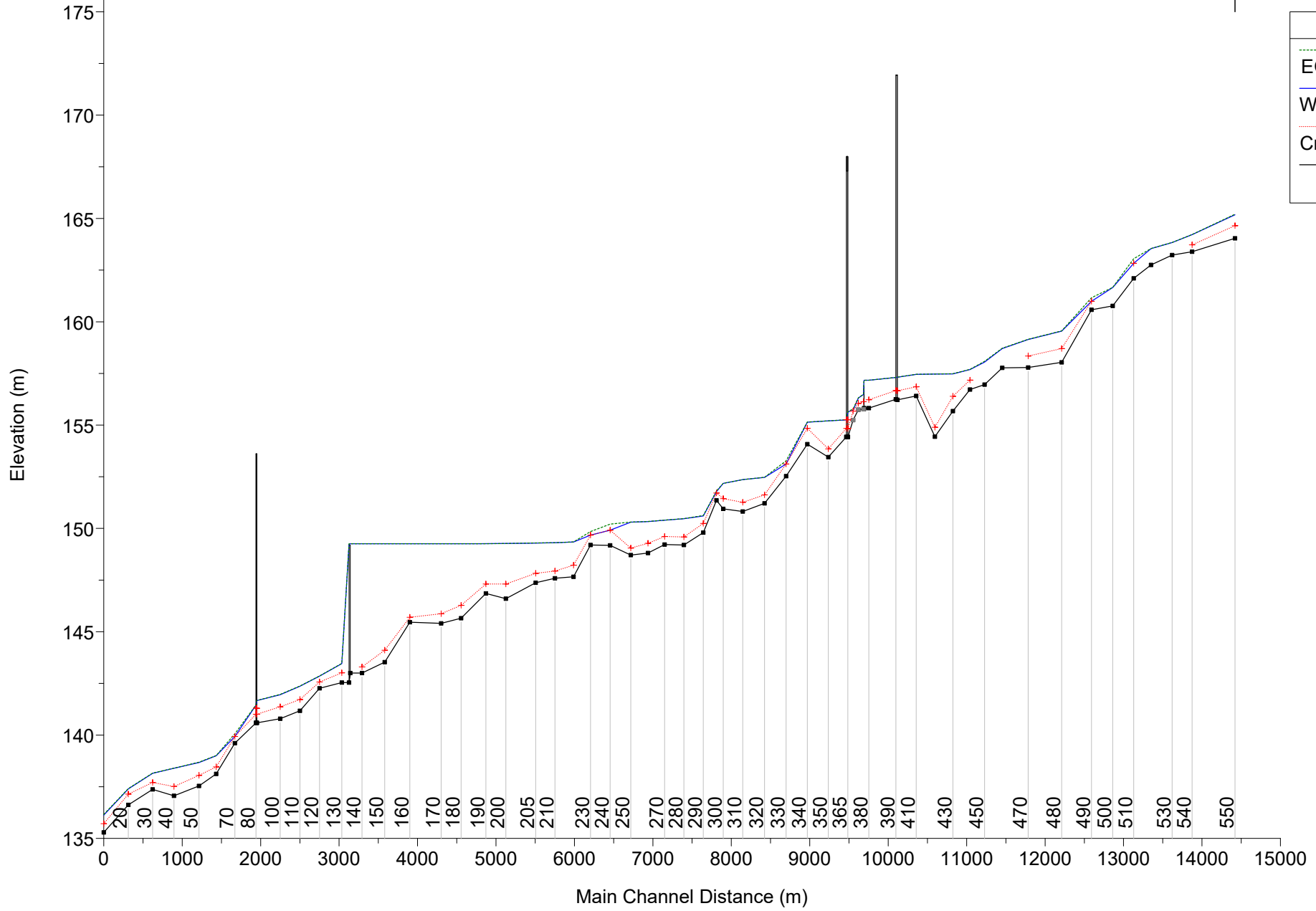
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	15.9 m3/s	15.90	164.04	165.18	164.65	165.21	0.003252	0.74	21.41	30.80	0.28
1	540	15.9 m3/s	15.90	163.39	164.22	163.73	164.22	0.001122	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	64.63	122.39	0.11
1	365		Bridge									
1	360	15.9 m3/s	15.90	154.43	155.25	154.84	155.26	0.002222	0.51	31.28	59.92	0.22
1	350	15.9 m3/s	15.90	153.45	155.21	153.85	155.21	0.000071	0.14	110.15	105.97	0.05
1	340	15.9 m3/s	15.90	154.08	155.14	154.85	155.15	0.002561	0.47	33.72	80.41	0.23
1	330	15.9 m3/s	15.90	152.53	153.12	153.12	153.27	0.052481	1.74	9.14	29.66	1.00
1	320	15.9 m3/s	15.90	151.21	152.47	151.62	152.48	0.000411	0.32	49.19	52.41	0.11
1	310	15.9 m3/s	15.90	150.82	152.36	151.26	152.37	0.000376	0.28	56.84	70.33	0.10
1	300	15.9 m3/s	15.90	150.95	152.18	151.44	152.19	0.001814	0.42	37.92	83.40	0.20
1	295	15.9 m3/s	15.90	151.36	151.78	151.71	151.81	0.020166	0.75	21.10	117.42	0.57
1	290	15.9 m3/s	15.90	149.80	150.60	150.24	150.62	0.003574	0.67	23.60	42.37	0.29
1	280	15.9 m3/s	15.90	149.20	150.47	149.59	150.47	0.000229	0.24	65.34	68.75	0.08
1	270	15.9 m3/s	15.90	149.22	150.40	149.61	150.40	0.000366	0.29	54.94	63.38	0.10
1	260	15.9 m3/s	15.90	148.81	150.33	149.28	150.33	0.000296	0.27	58.06	62.06	0.09
1	250	15.9 m3/s	15.90	148.71	150.30	149.05	150.31	0.000067	0.15	103.39	86.19	0.04
1	240	15.9 m3/s	15.90	149.18	149.92	149.92	150.21	0.043501	2.41	6.61	112.44	1.00
1	230	15.9 m3/s	15.90	149.20	149.67	149.67	149.85	0.050632	1.84	8.66	75.78	1.00
1	220	15.9 m3/s	15.90	147.66	149.34	148.22	149.35	0.000350	0.27	58.84	72.72	0.10
1	210	15.9 m3/s	15.90	147.59	149.31	147.94	149.31	0.000076	0.17	95.19	76.97	0.05
1	205	15.9 m3/s	15.90	147.37	149.29	147.82	149.30	0.000053	0.15	105.57	76.12	0.04

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

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	15.9 m3/s	15.90	146.60	149.27	147.31	149.27	0.000073	0.15	104.24	93.54	0.05
1	190	15.9 m3/s	15.90	146.85	149.26	147.31	149.26	0.000027	0.12	133.76	83.38	0.03
1	180	15.9 m3/s	15.90	145.66	149.26	146.28	149.26	0.000004	0.05	331.50	190.88	0.01
1	170	15.9 m3/s	15.90	145.40	149.26	145.87	149.26	0.000002	0.04	402.70	153.99	0.01
1	160	15.9 m3/s	15.90	145.46	149.26	145.70	149.26	0.000001	0.03	464.13	187.30	0.01
1	150	15.9 m3/s	15.90	143.53	149.26	144.11	149.26	0.000001	0.03	558.18	158.23	0.00
1	140	15.9 m3/s	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	15.9 m3/s	15.90	142.54	143.46	143.01	143.47	0.001789	0.46	34.20	63.79	0.20
1	120	15.9 m3/s	15.90	142.27	142.85	142.57	142.86	0.002578	0.45	35.46	91.88	0.23
1	110	15.9 m3/s	15.90	141.17	142.36	141.72	142.37	0.001528	0.51	31.43	45.84	0.19
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

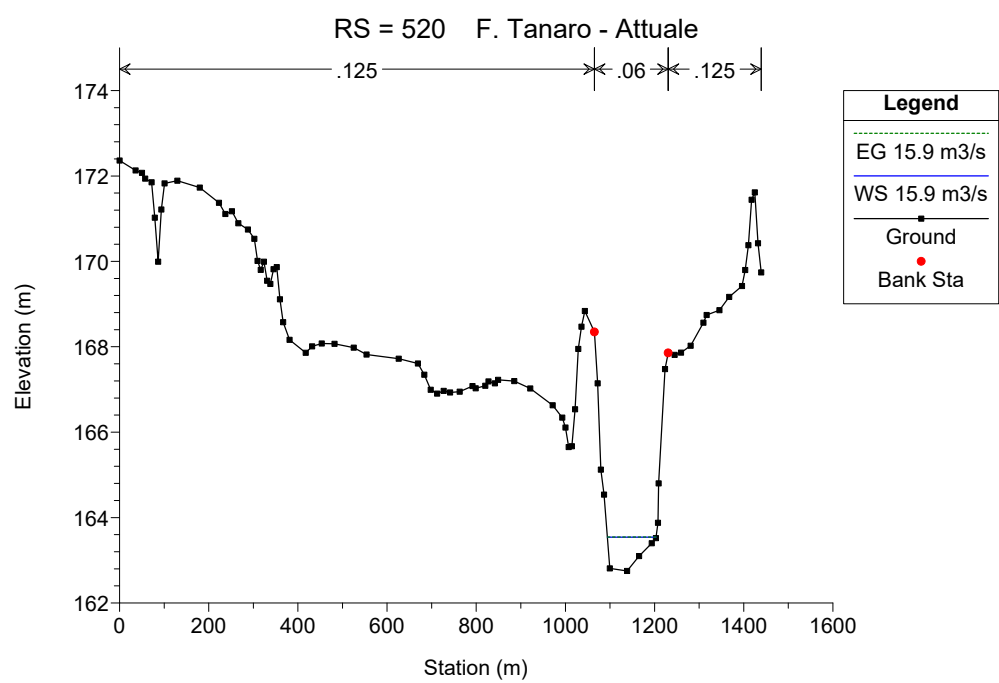
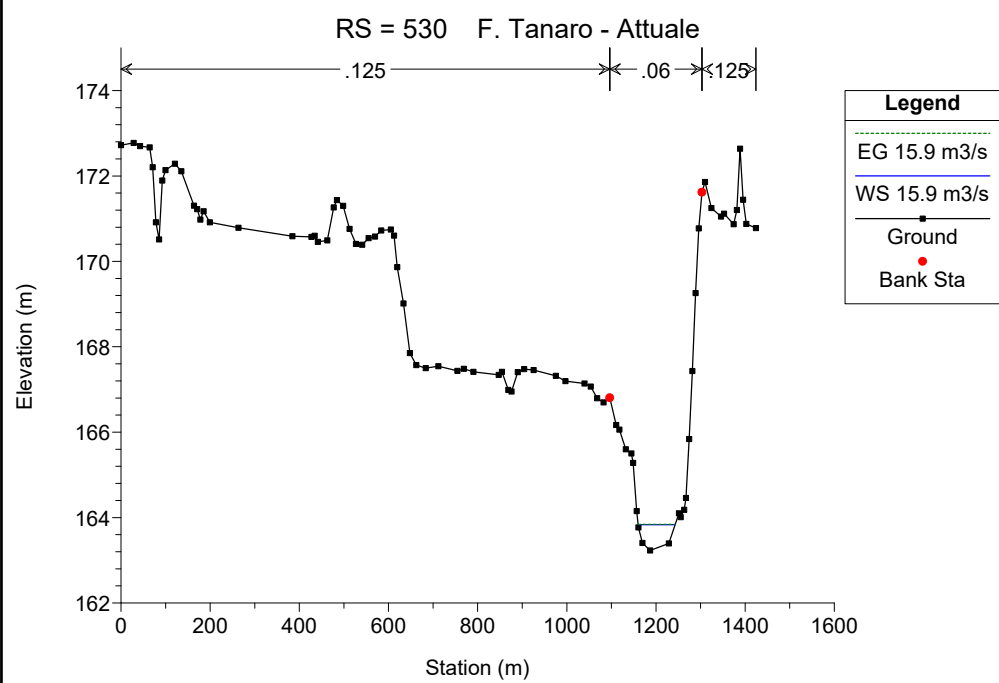
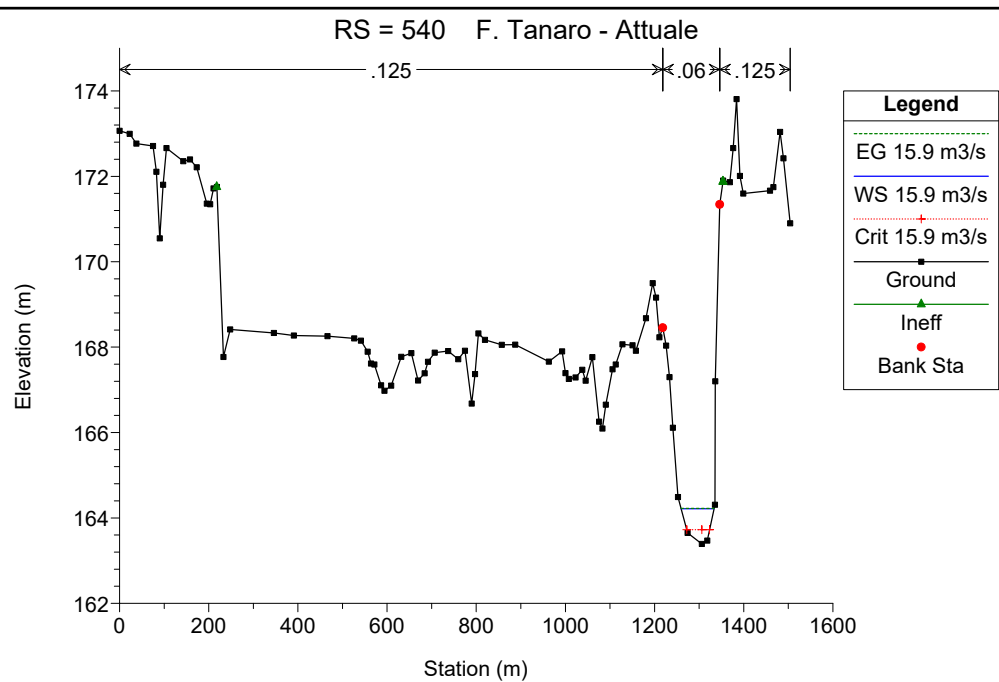
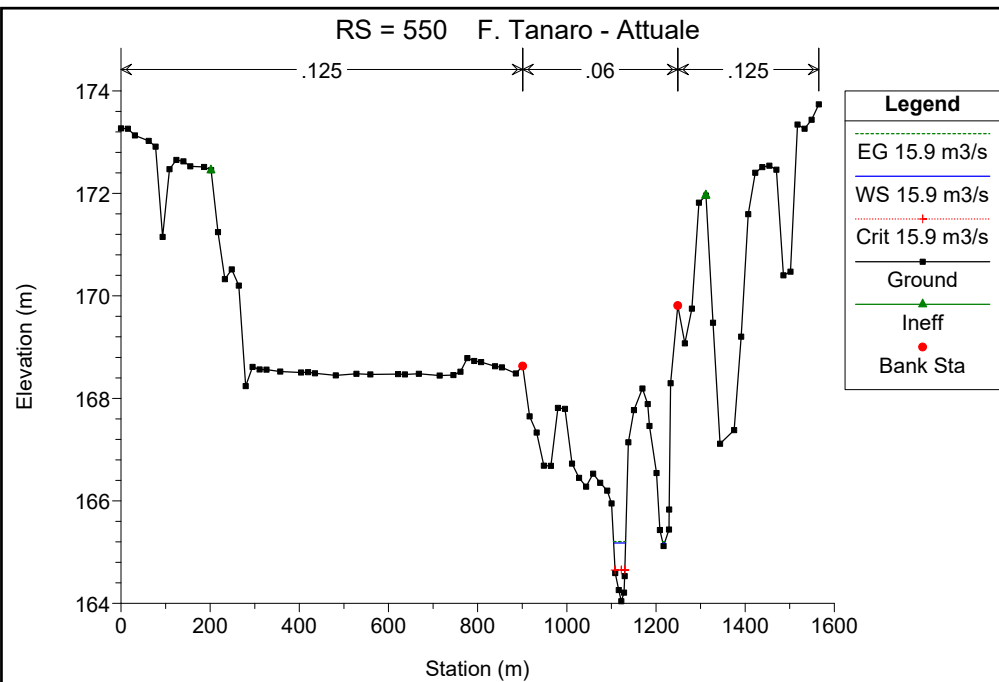
F. Tanaro - Attuale

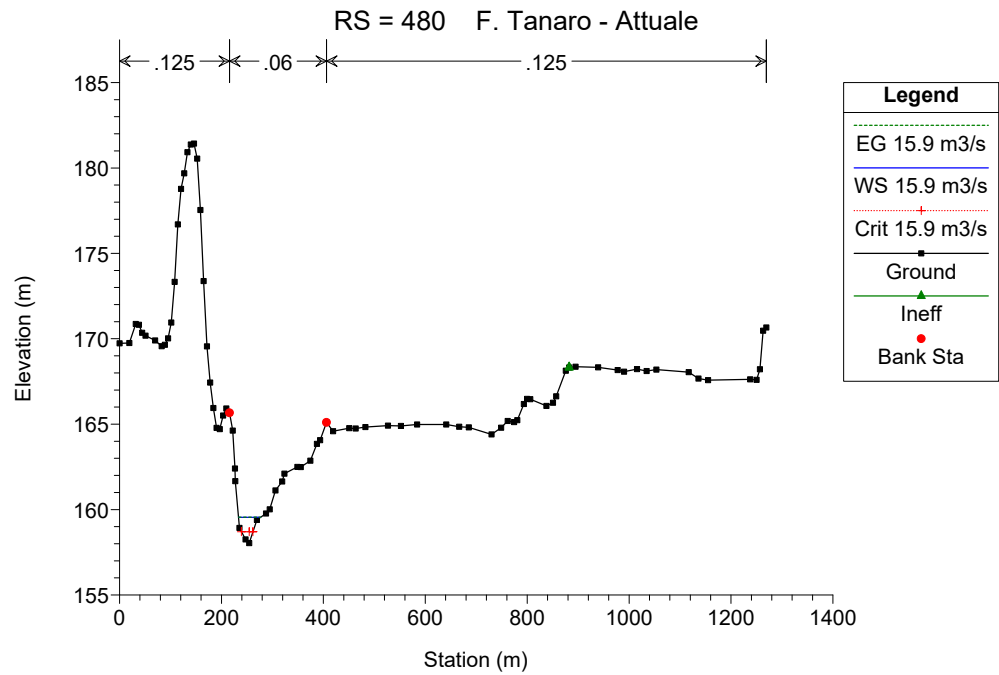
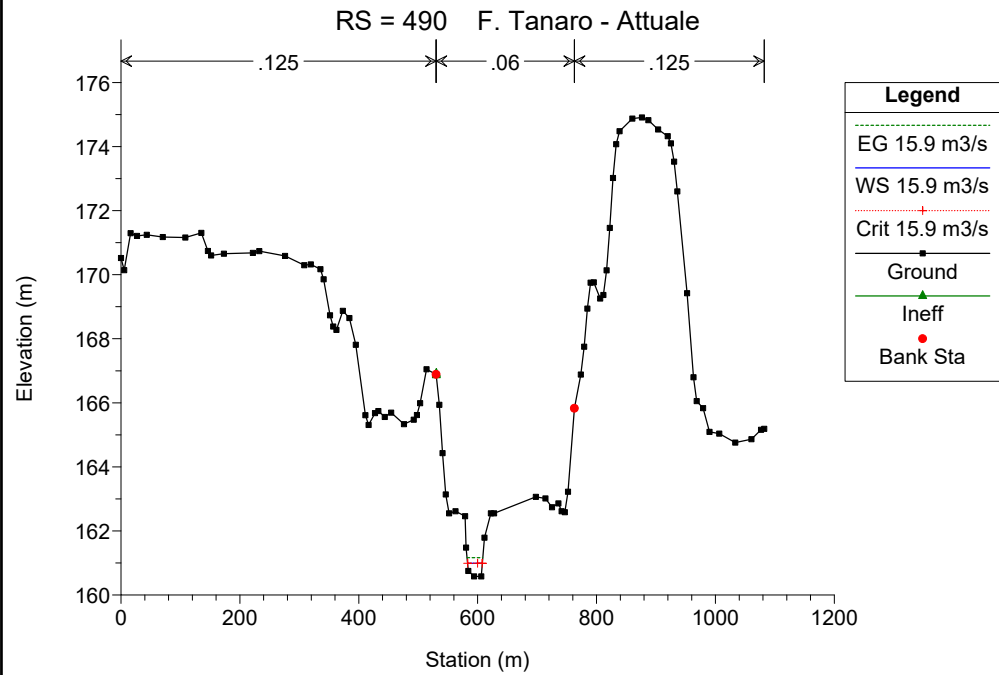
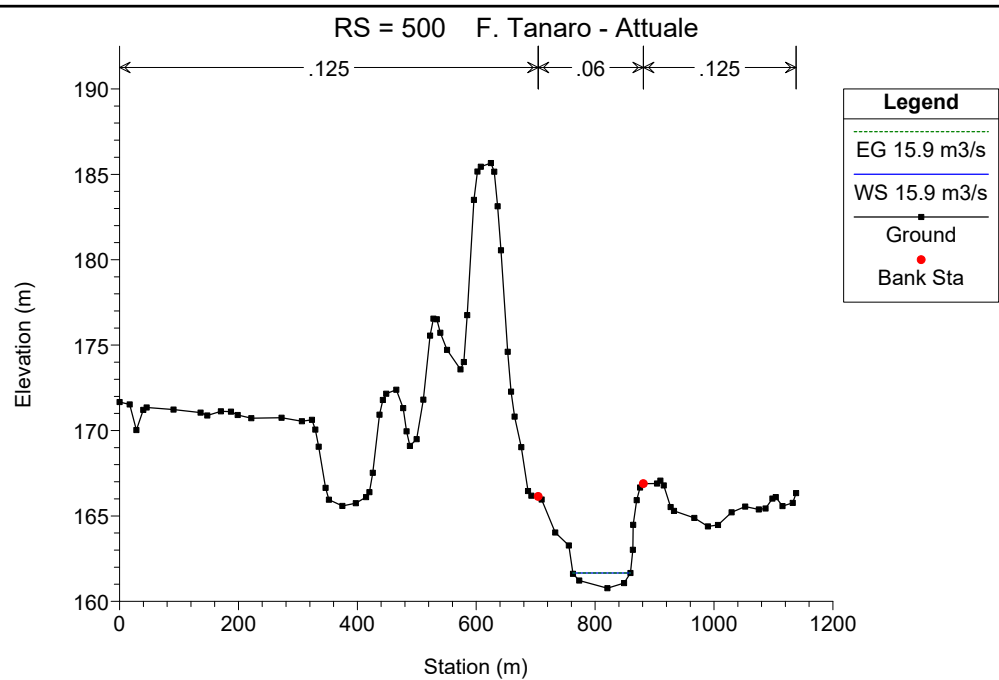
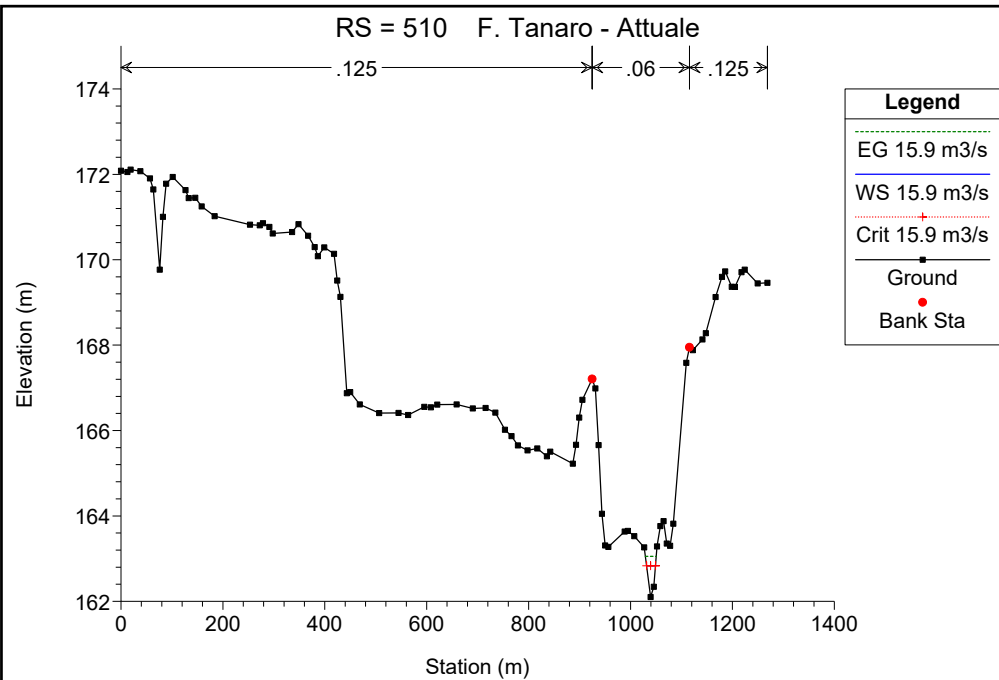
Tanaro 1

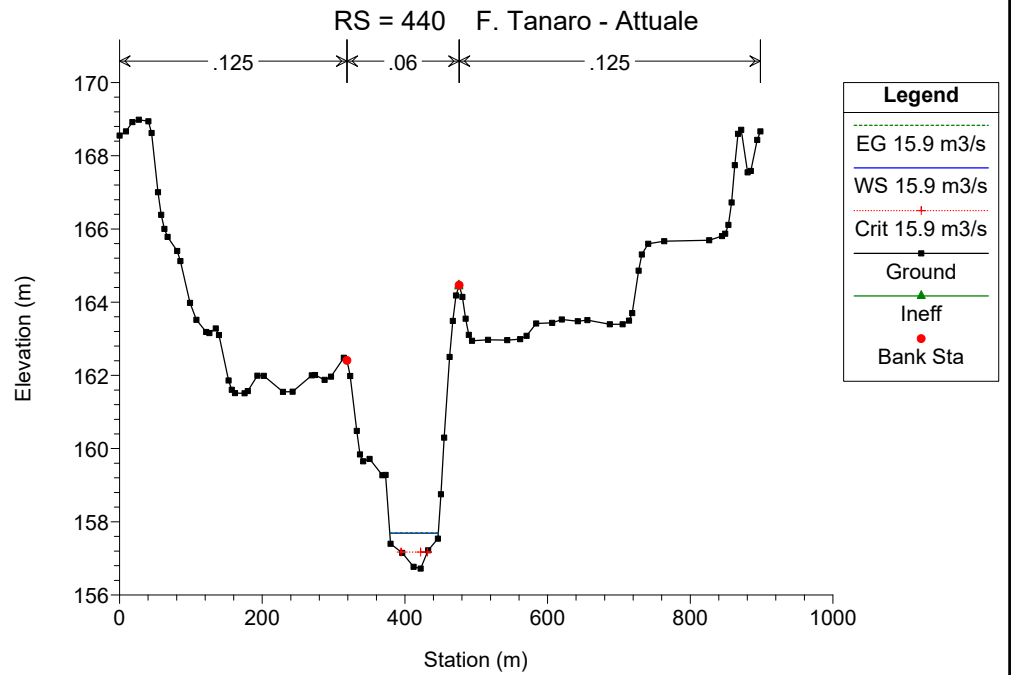
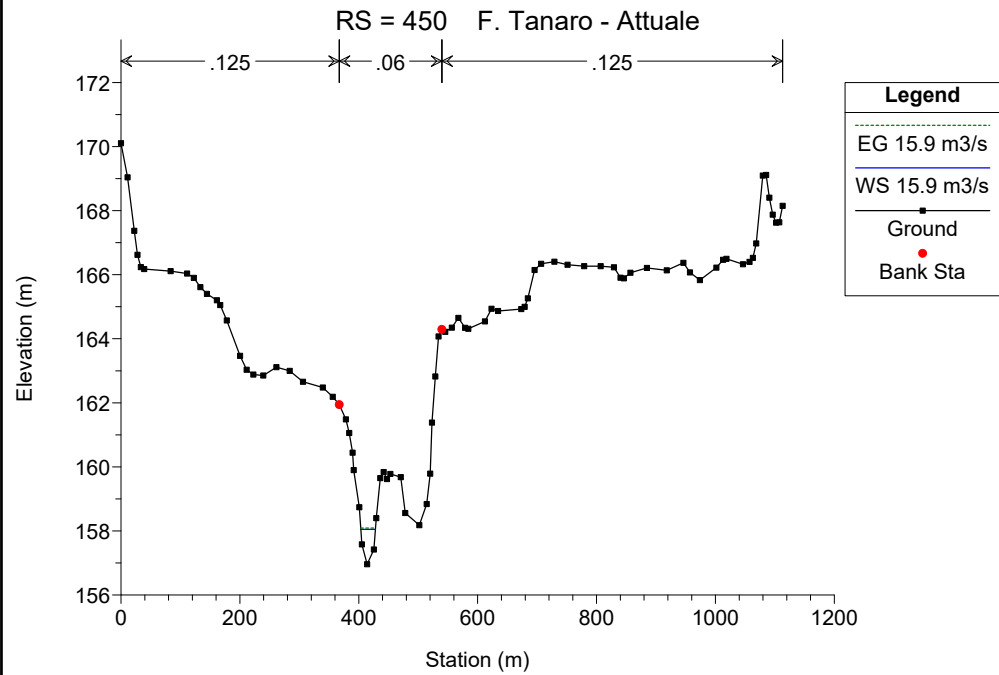
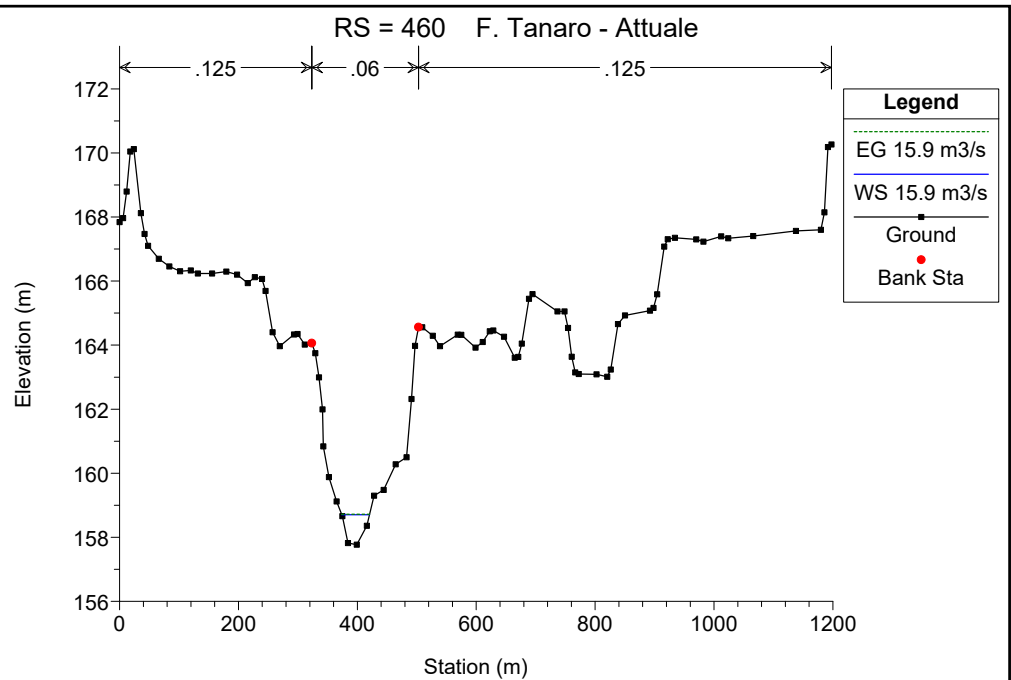
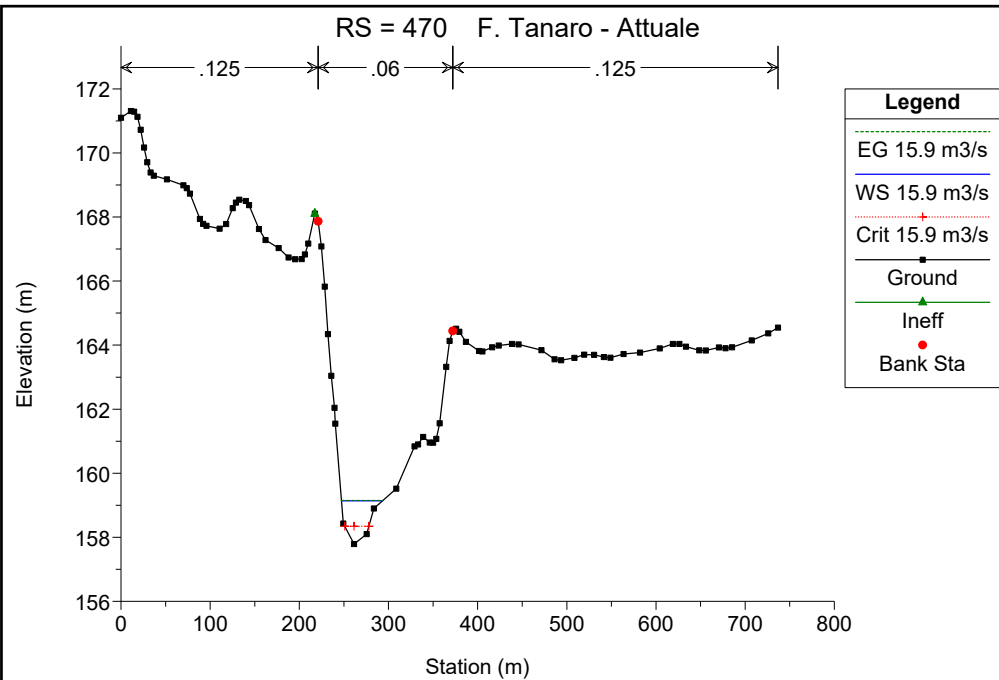


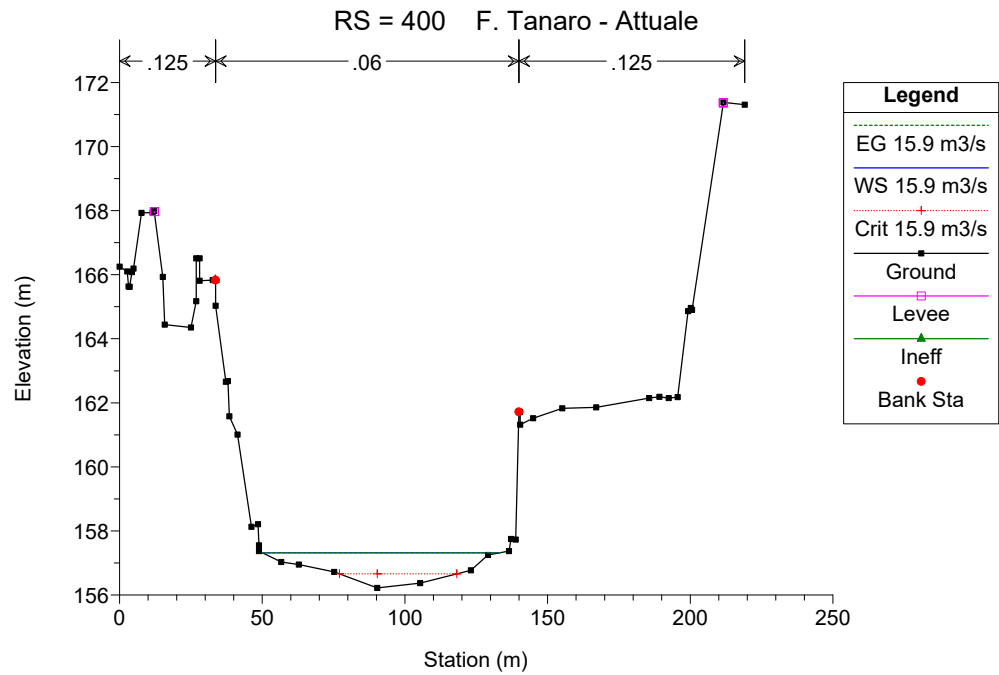
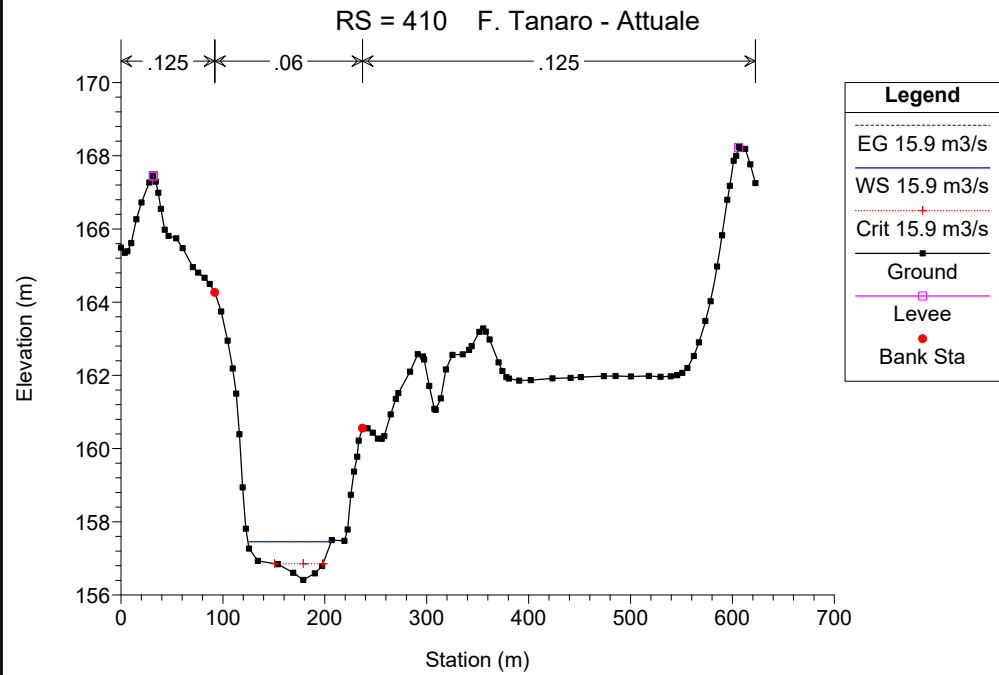
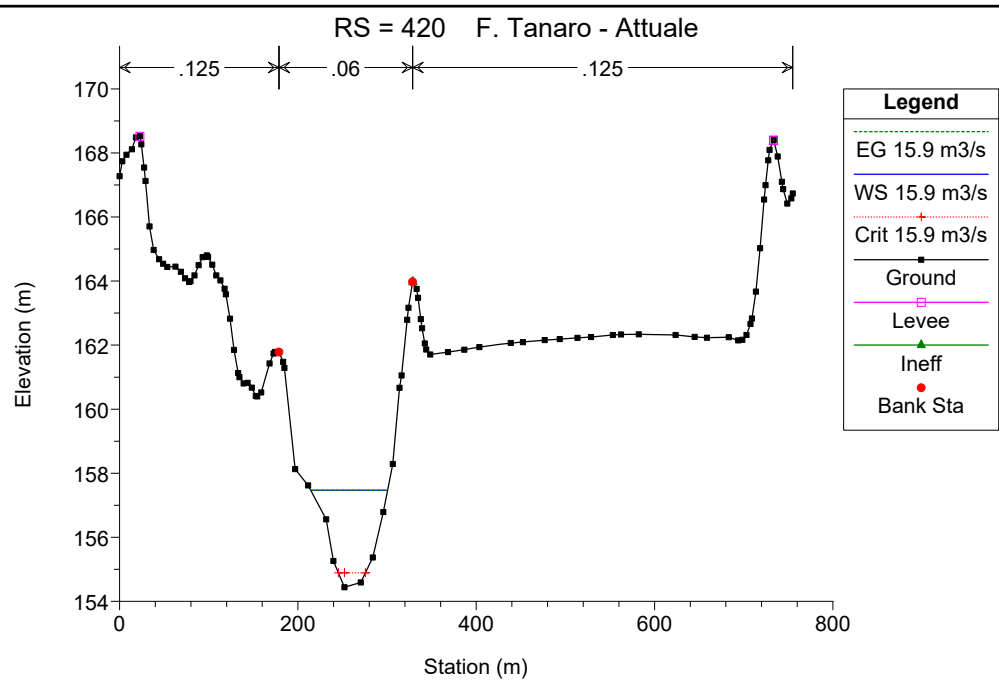
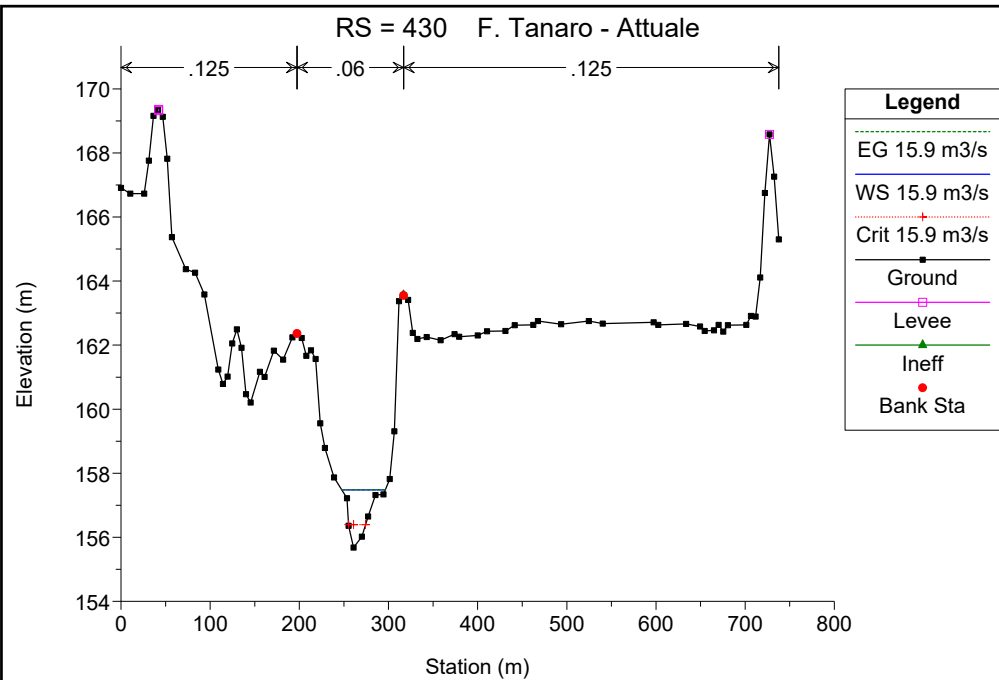
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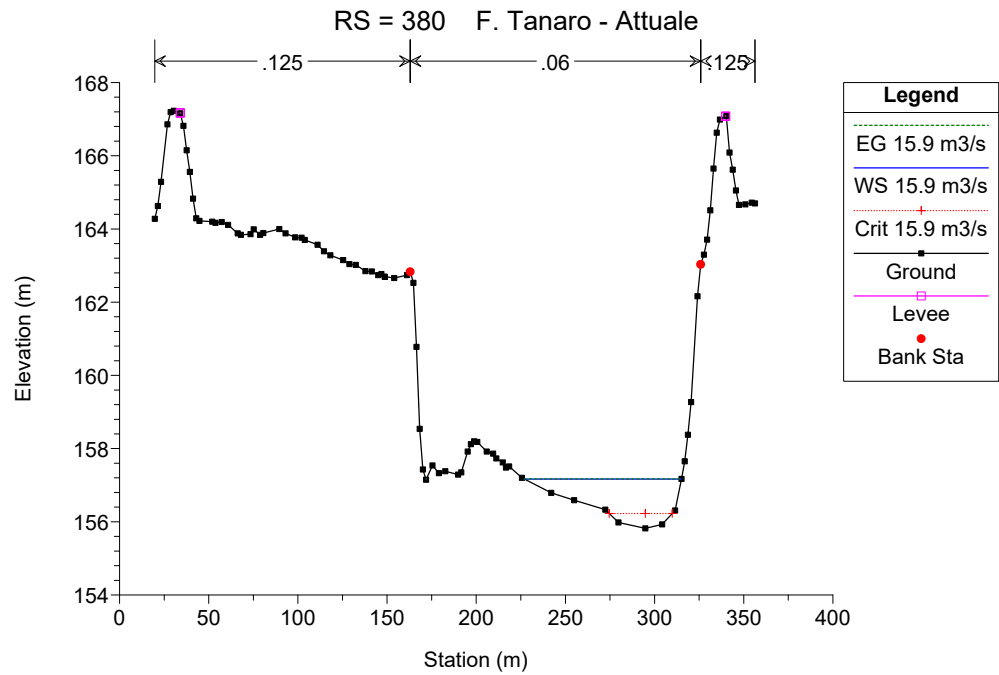
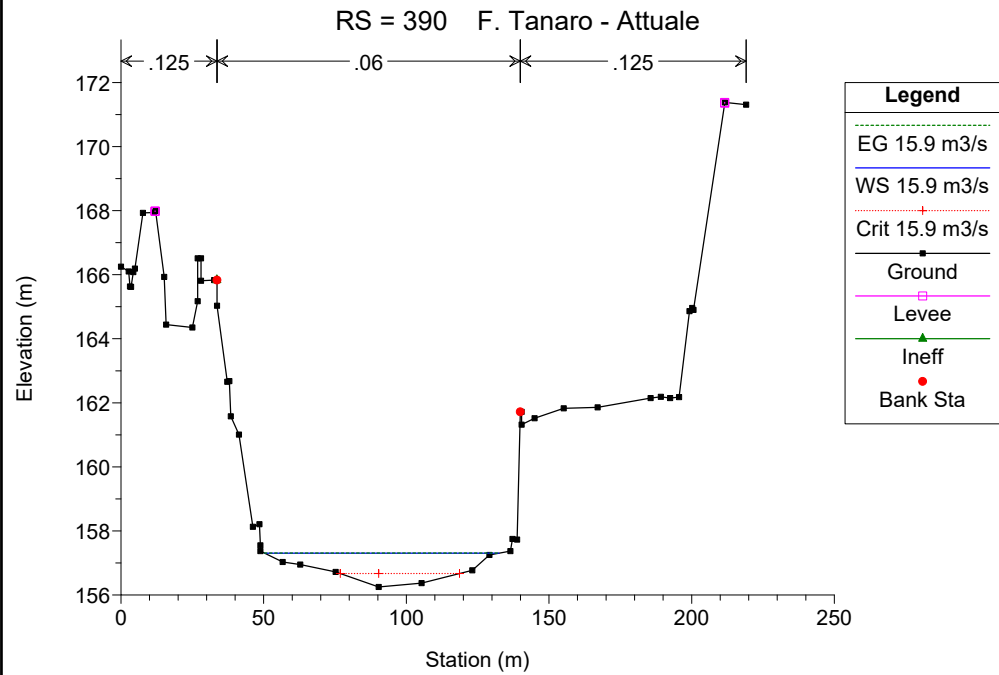
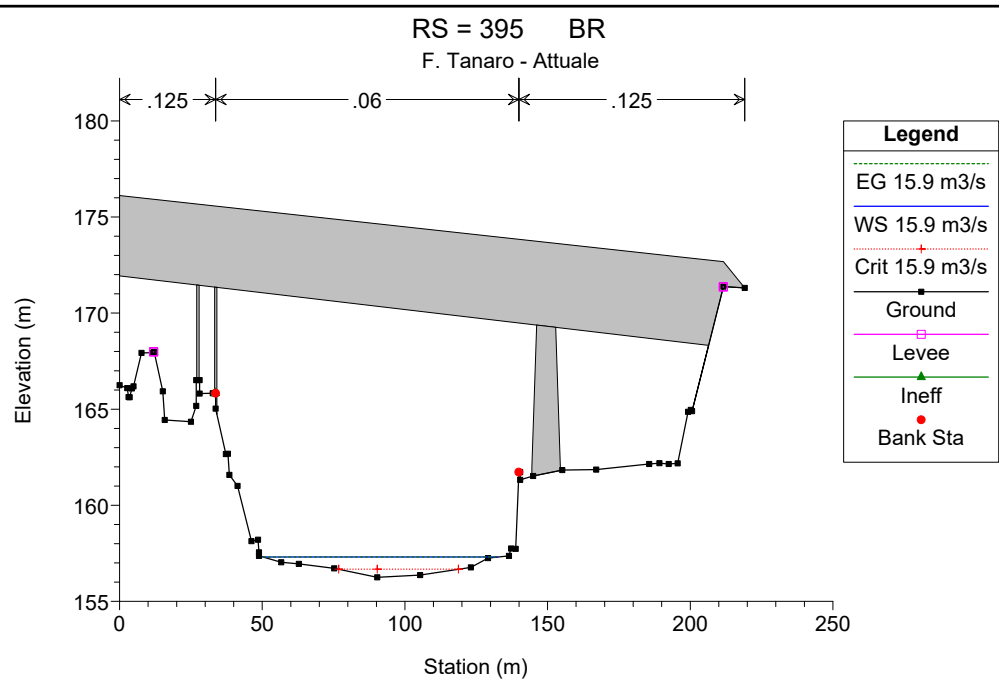
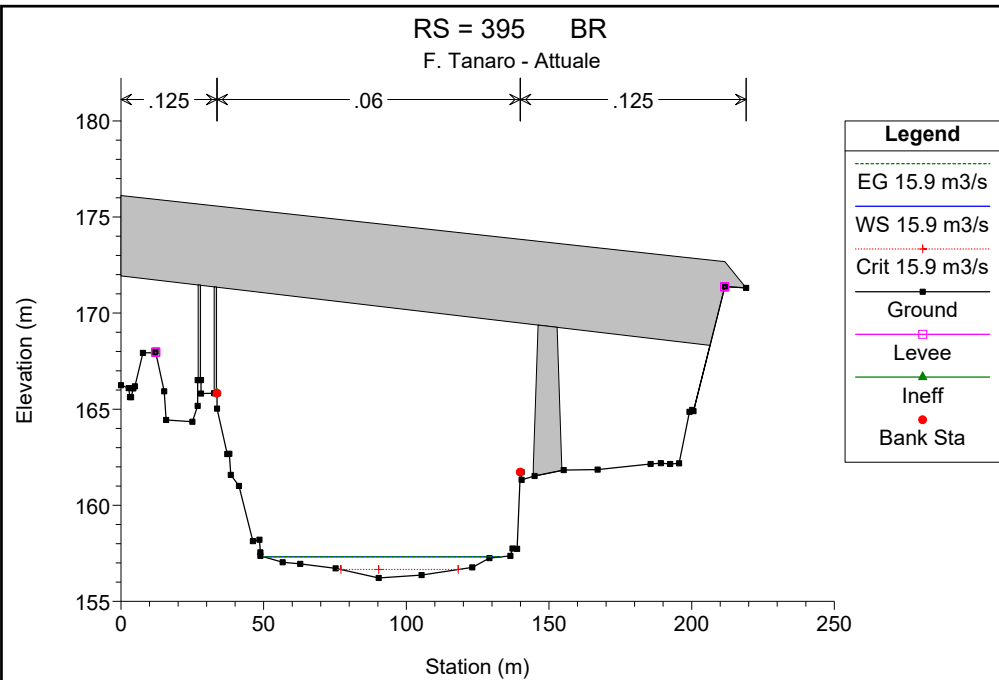
- EG 15.9 m³/s
- WS 15.9 m³/s
- Crit 15.9 m³/s
- Ground

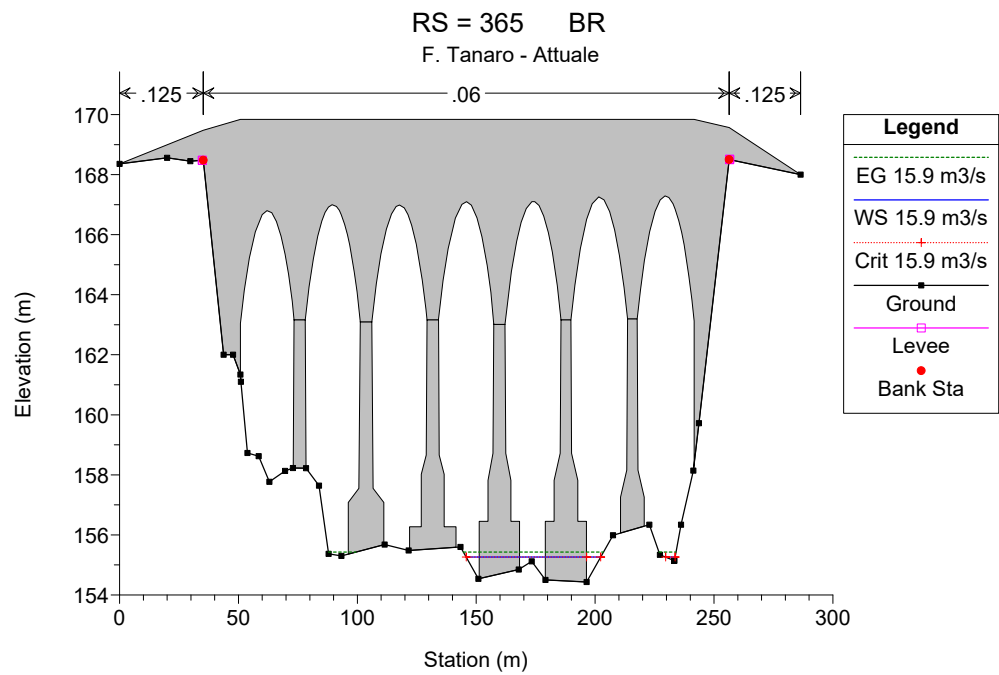
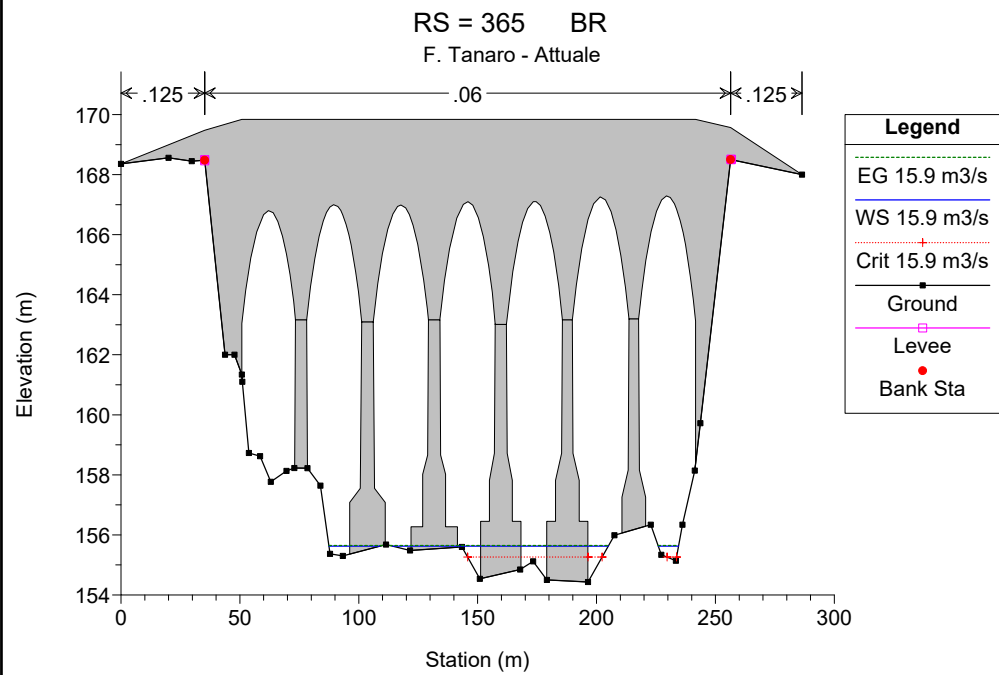
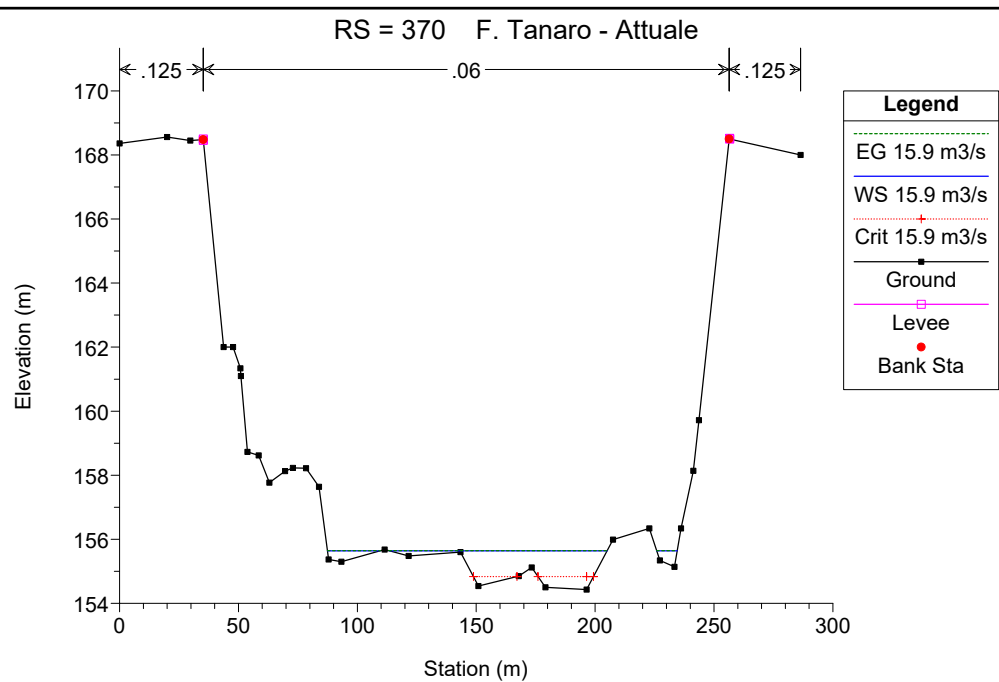
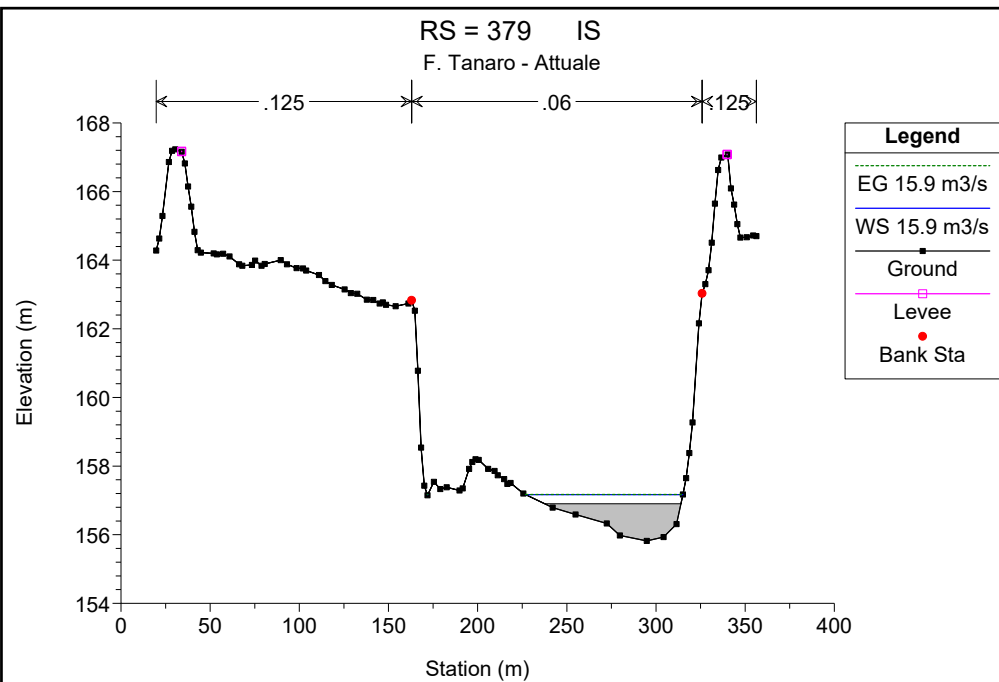


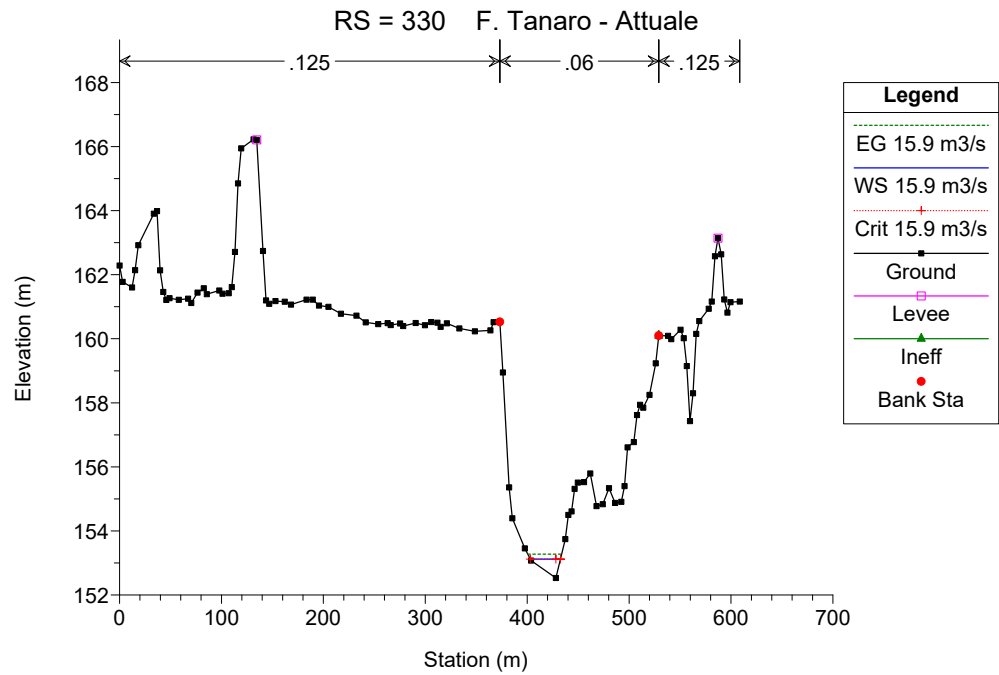
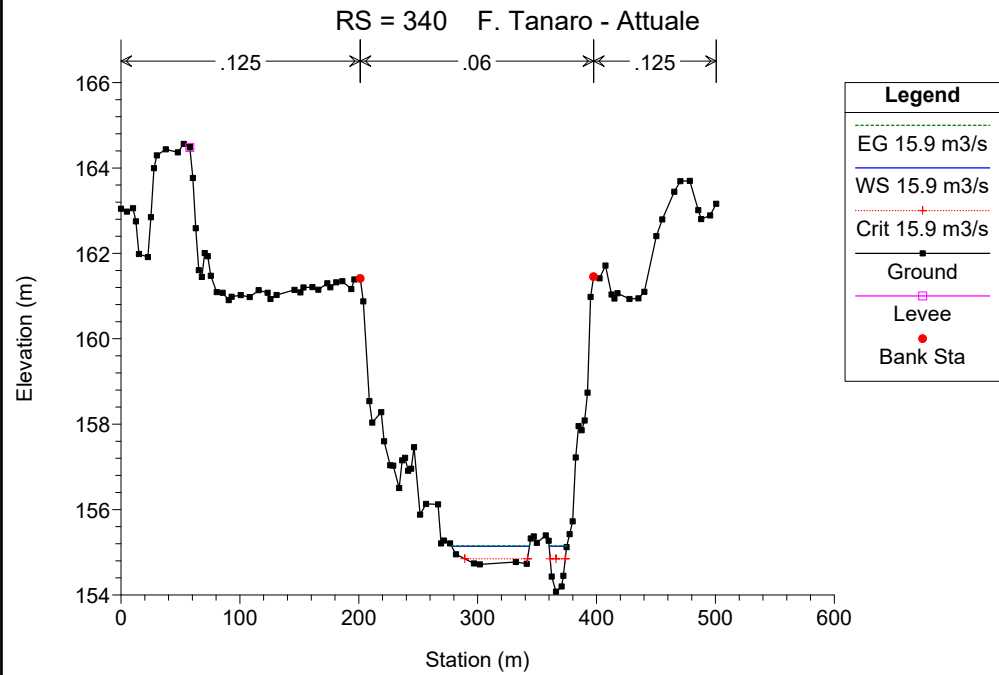
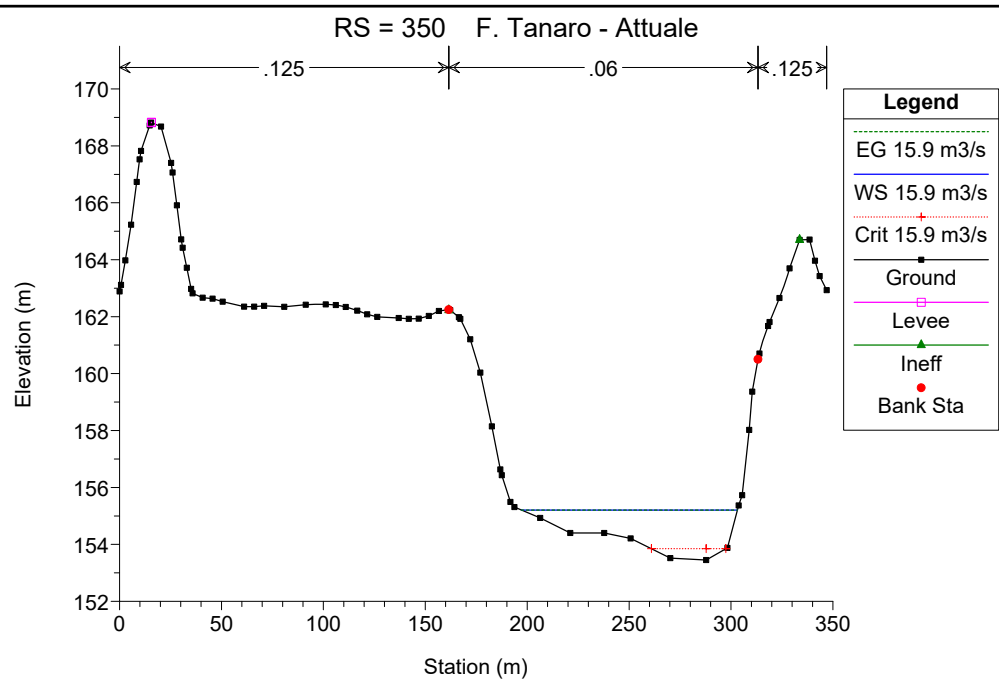
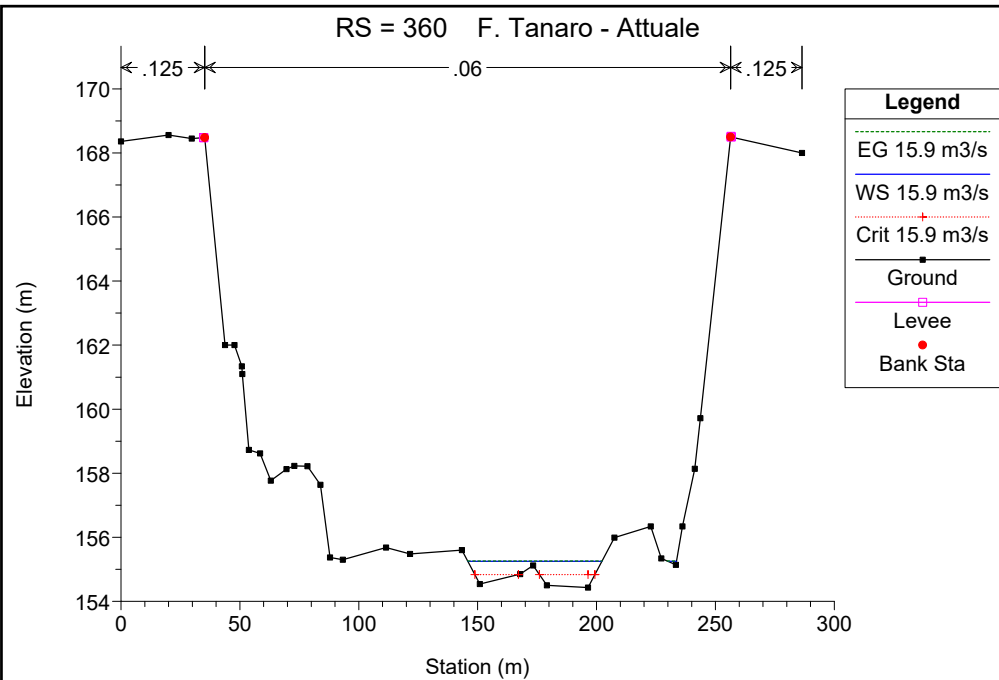


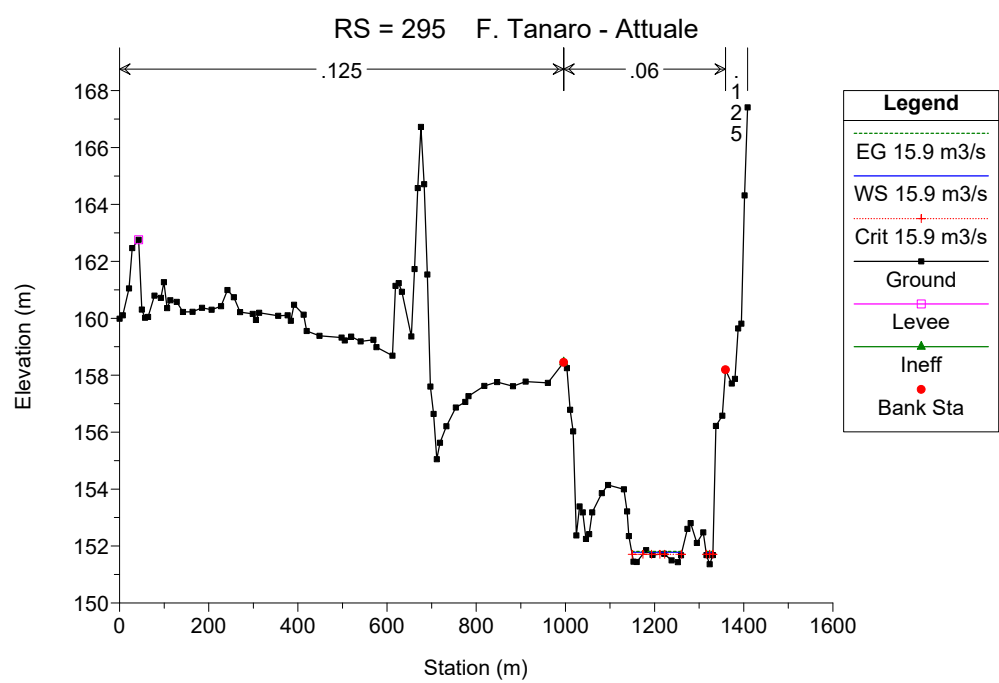
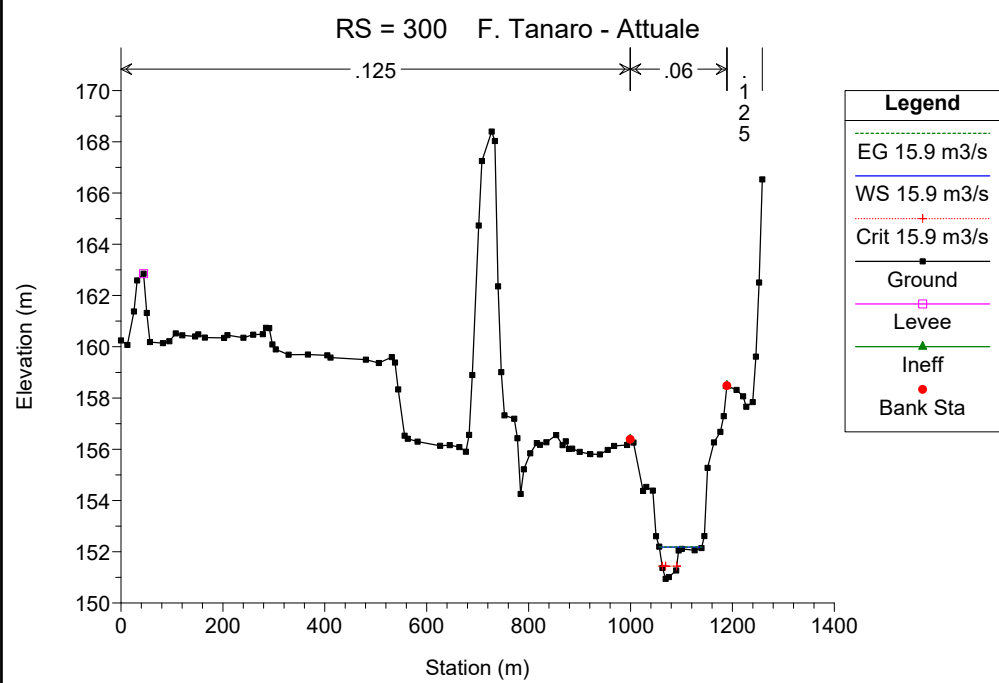
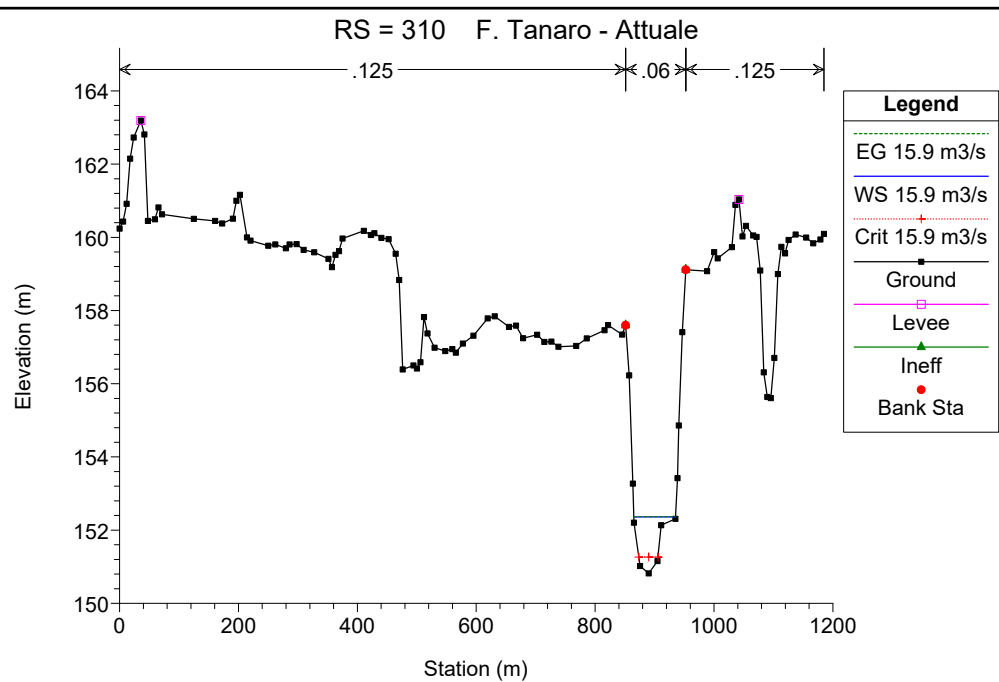
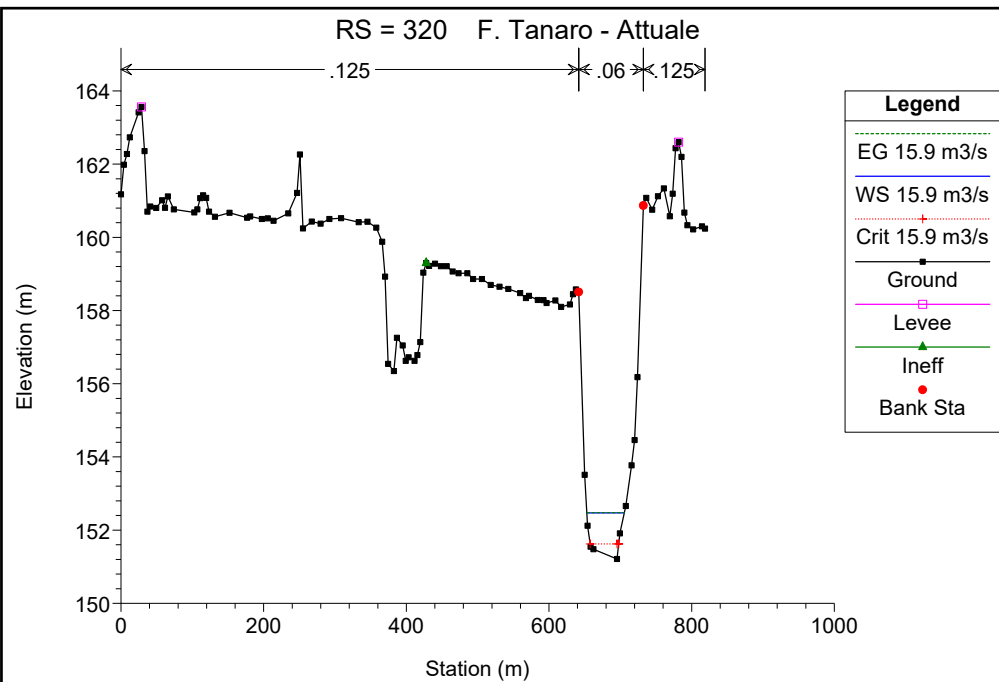


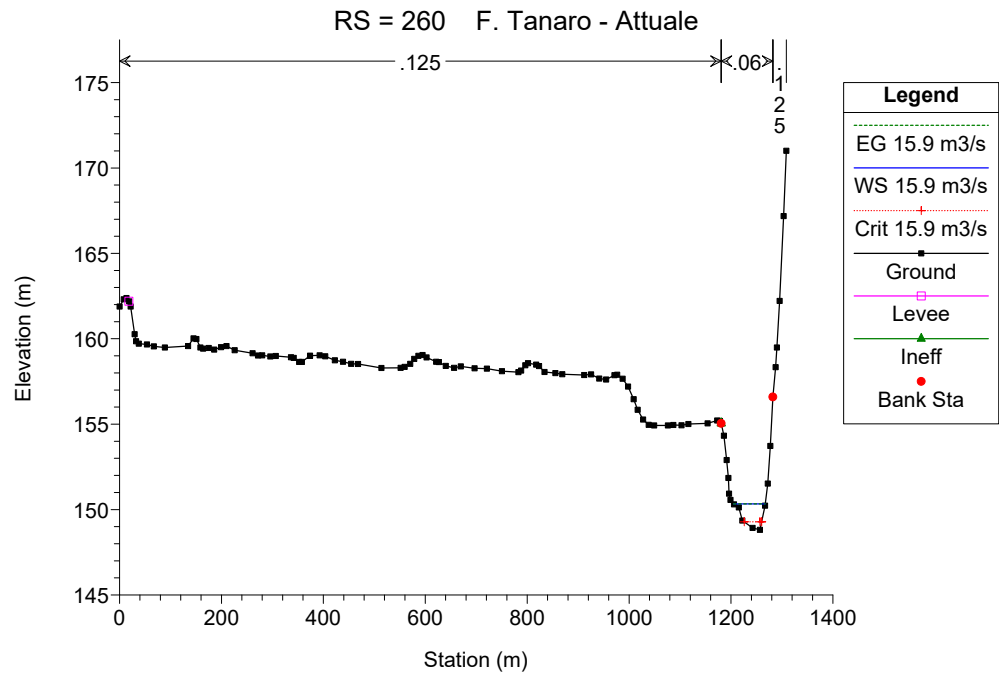
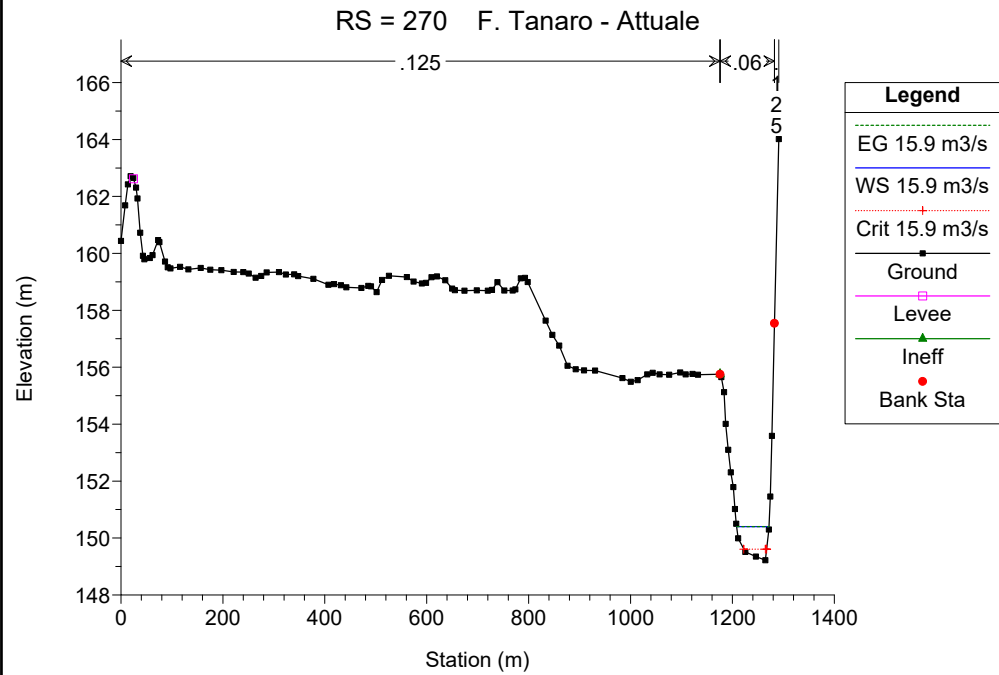
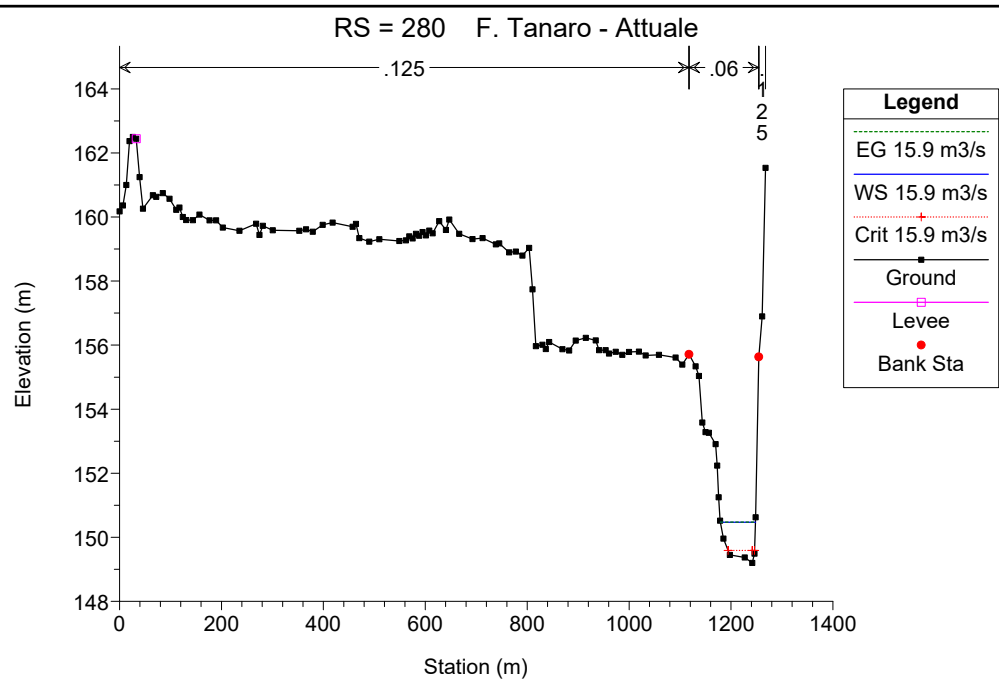
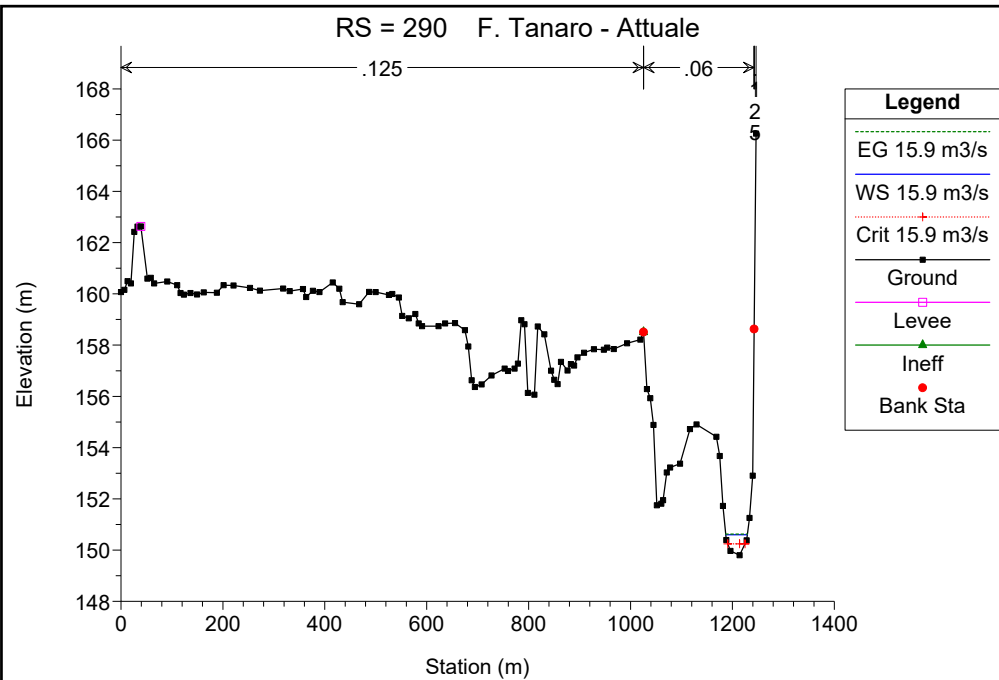


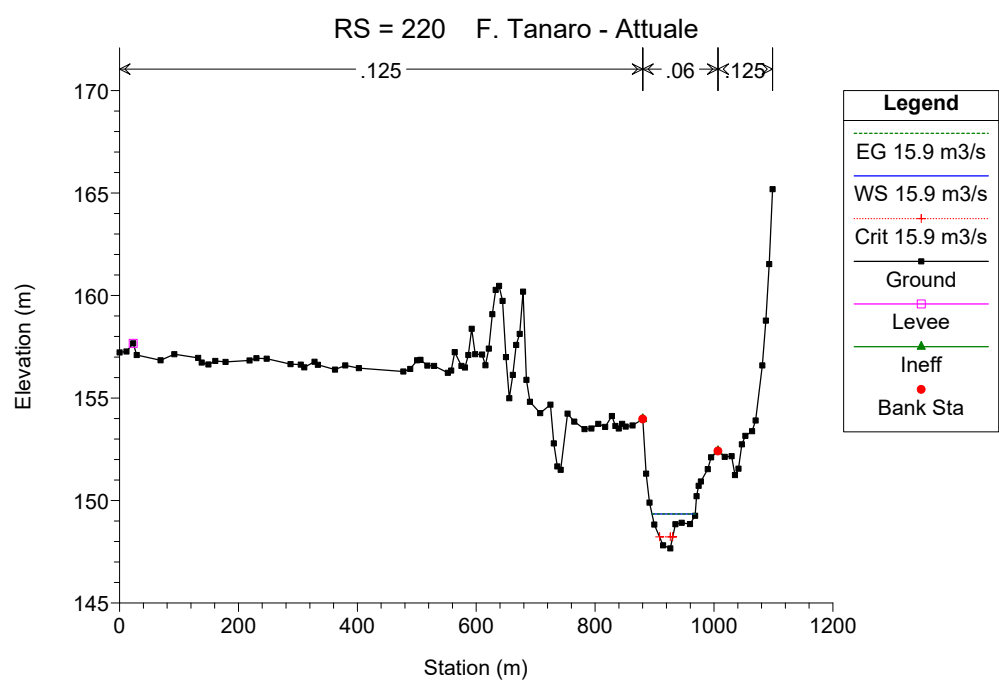
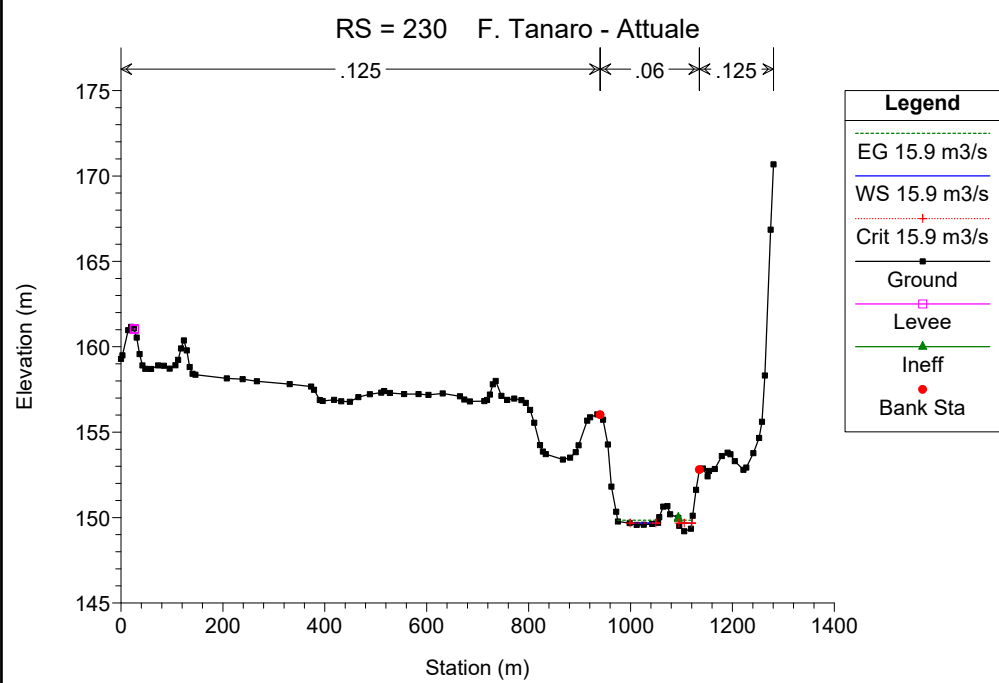
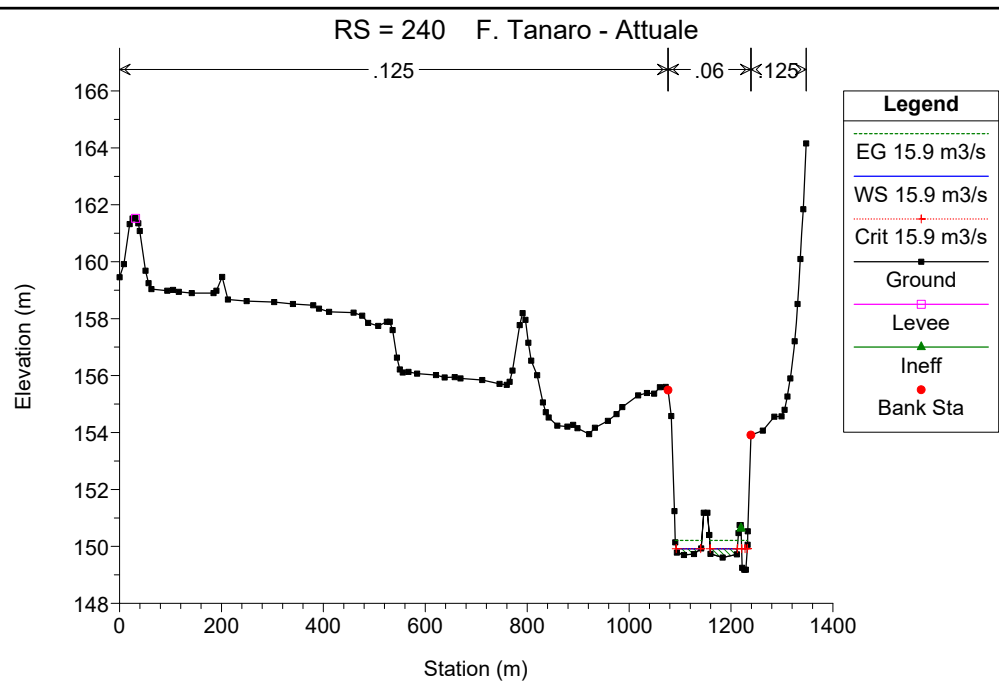
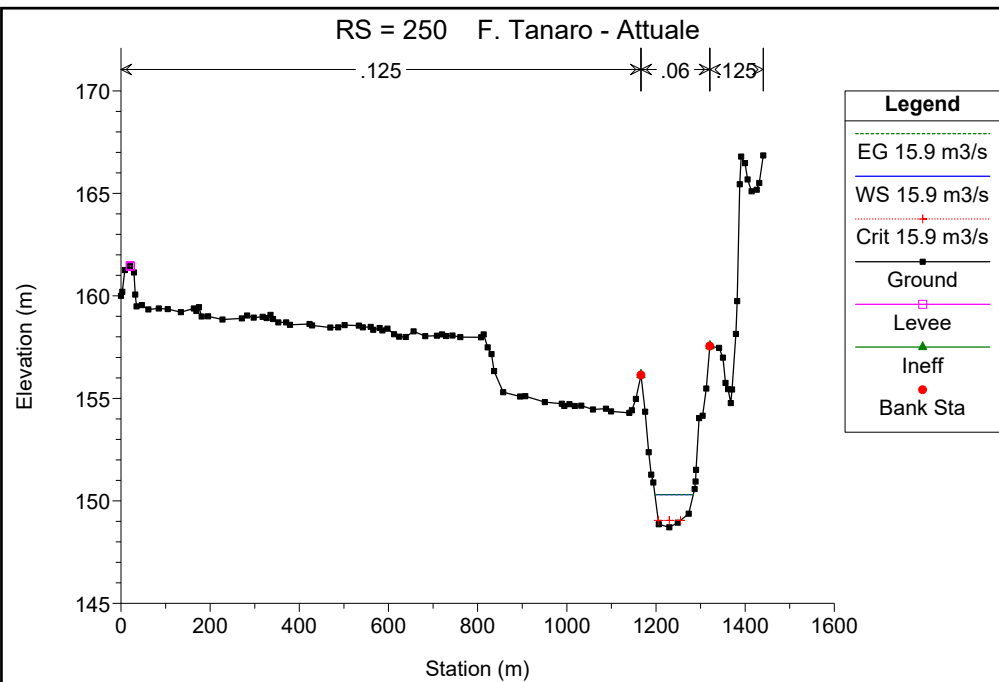


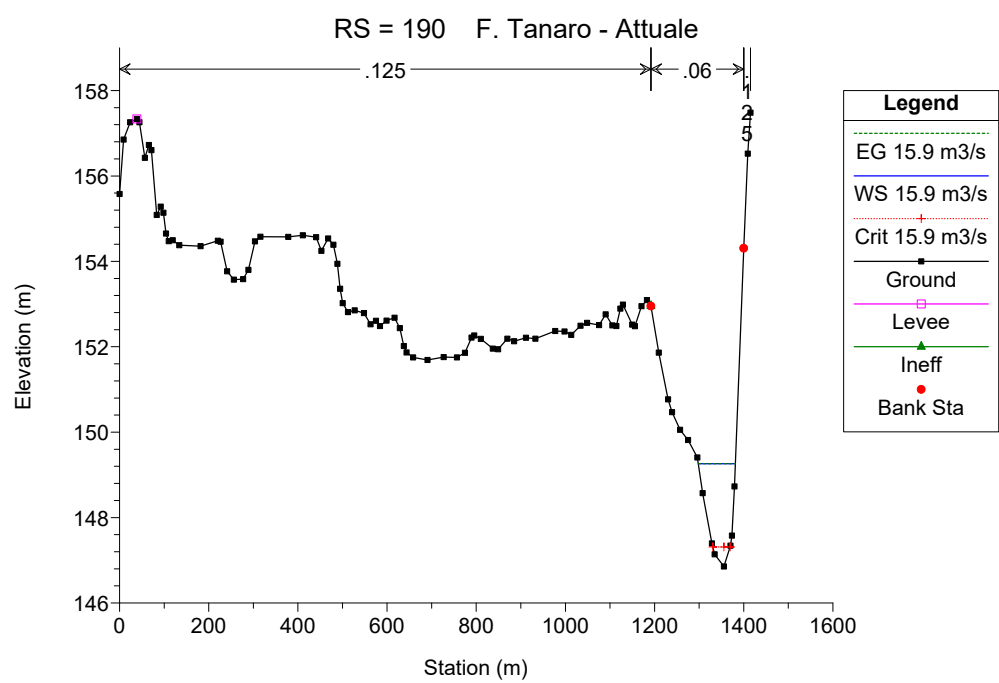
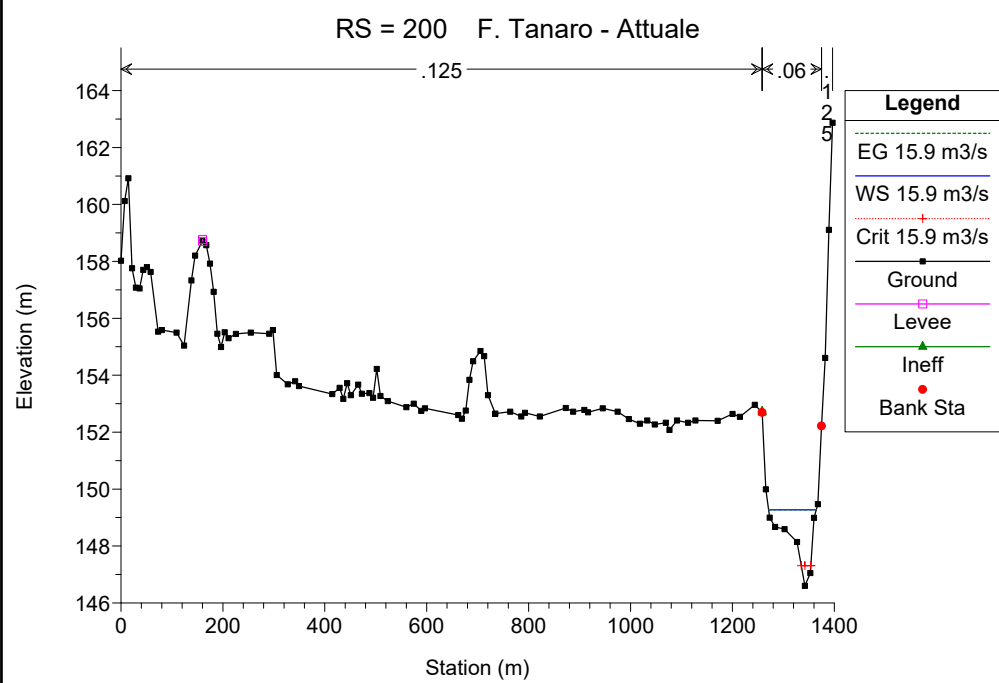
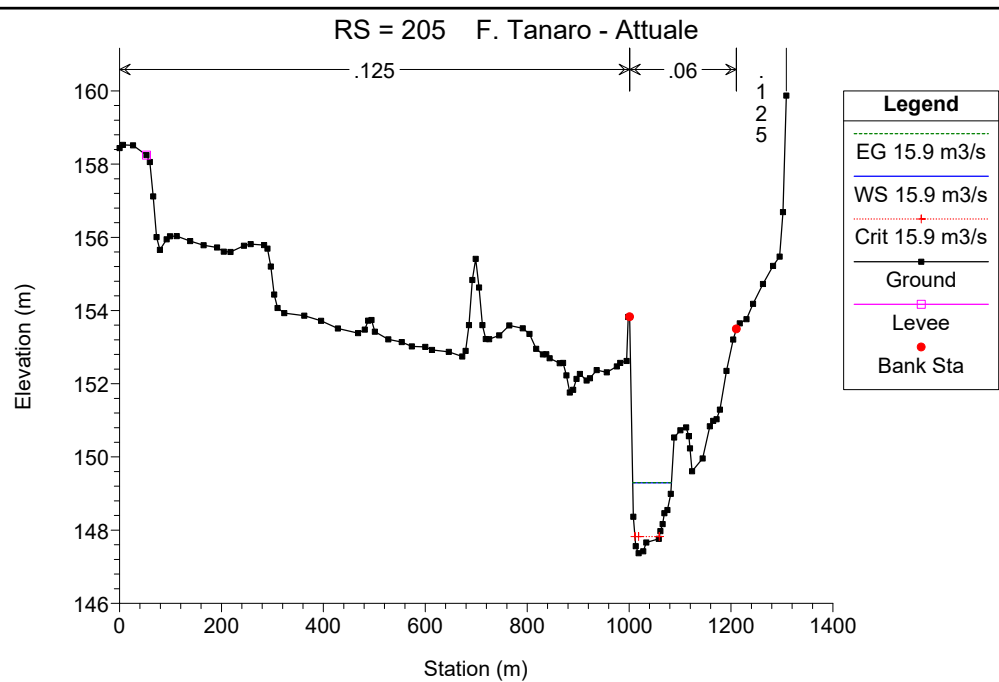
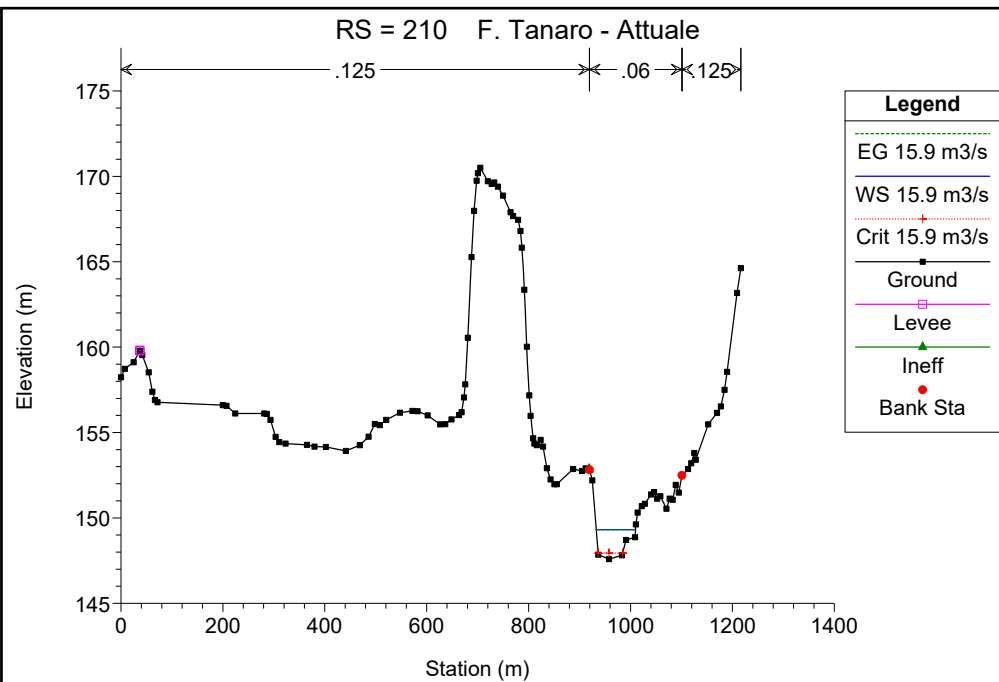


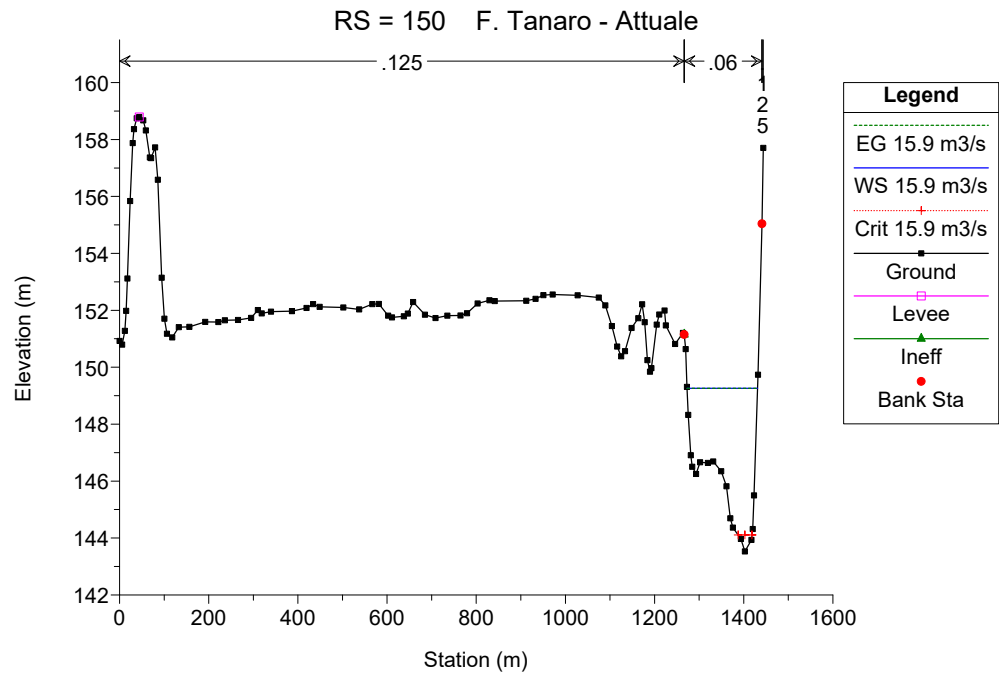
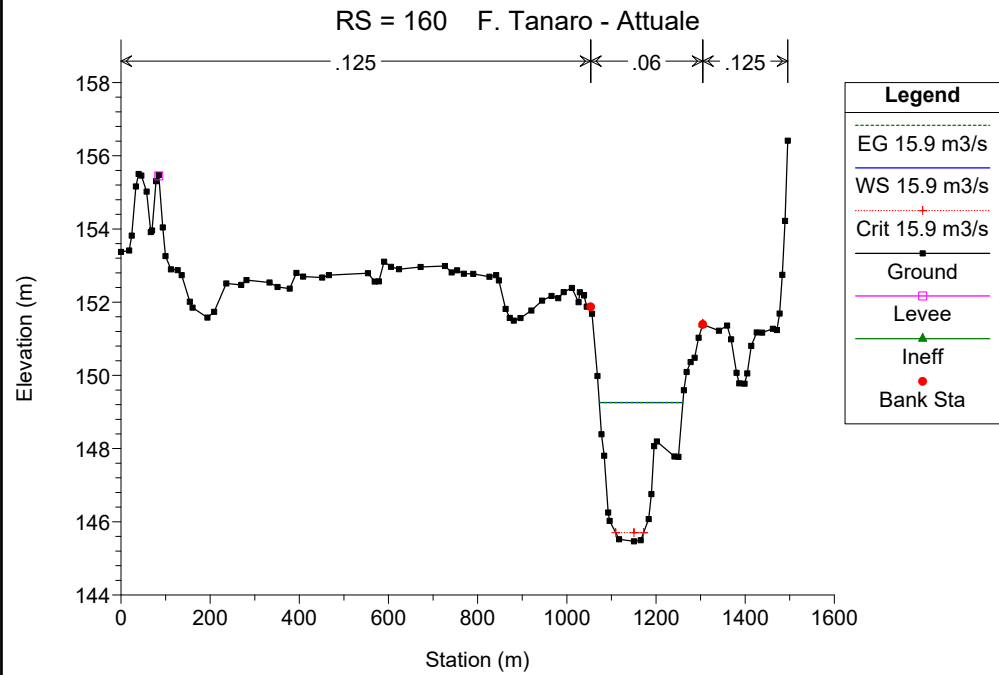
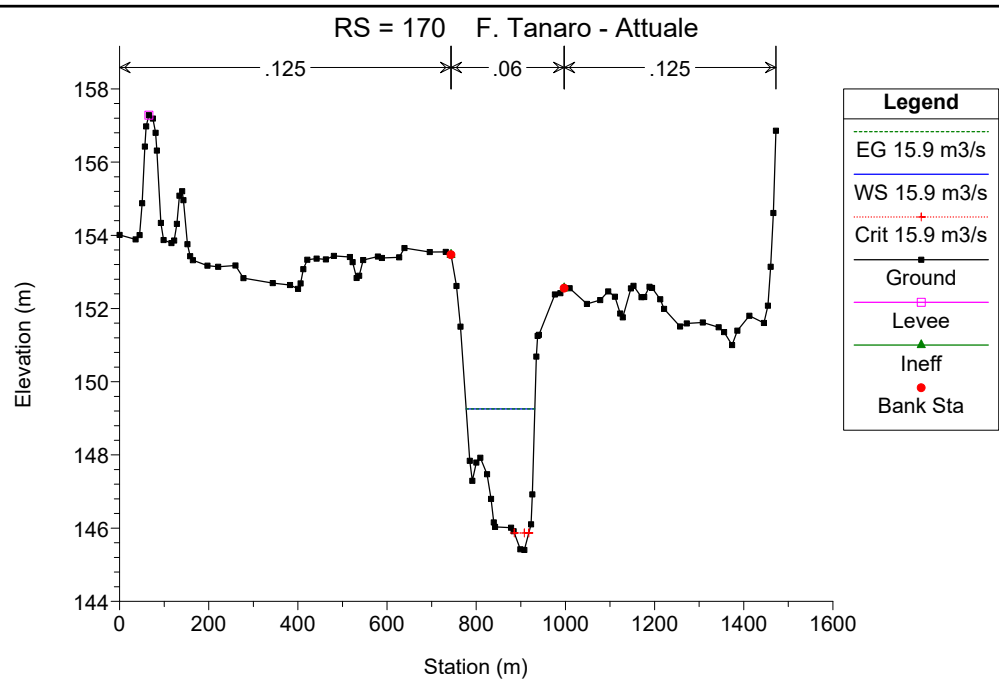
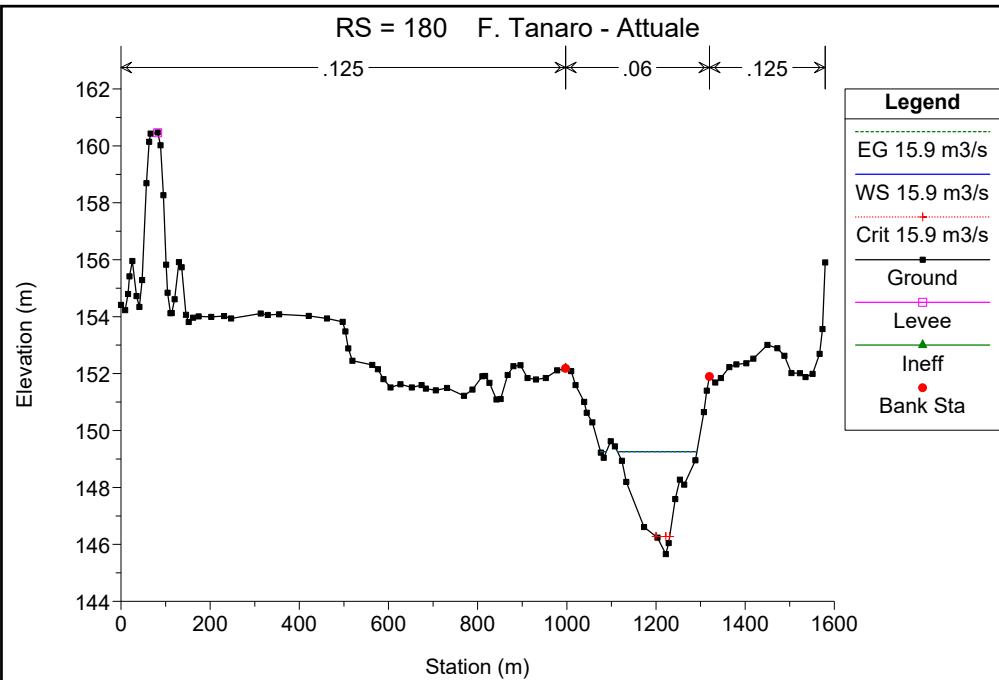


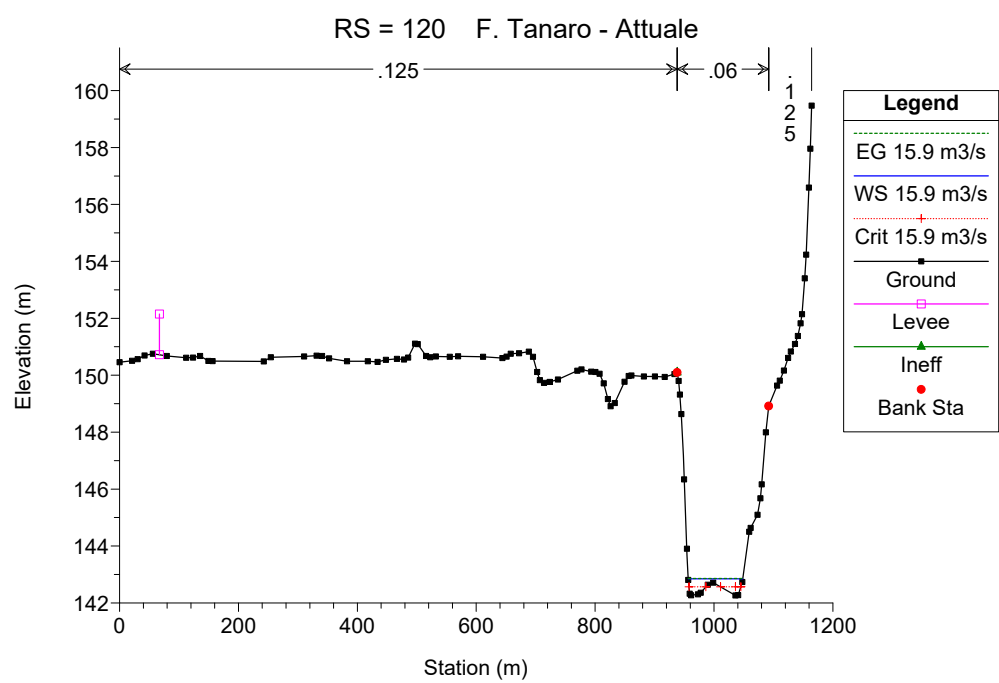
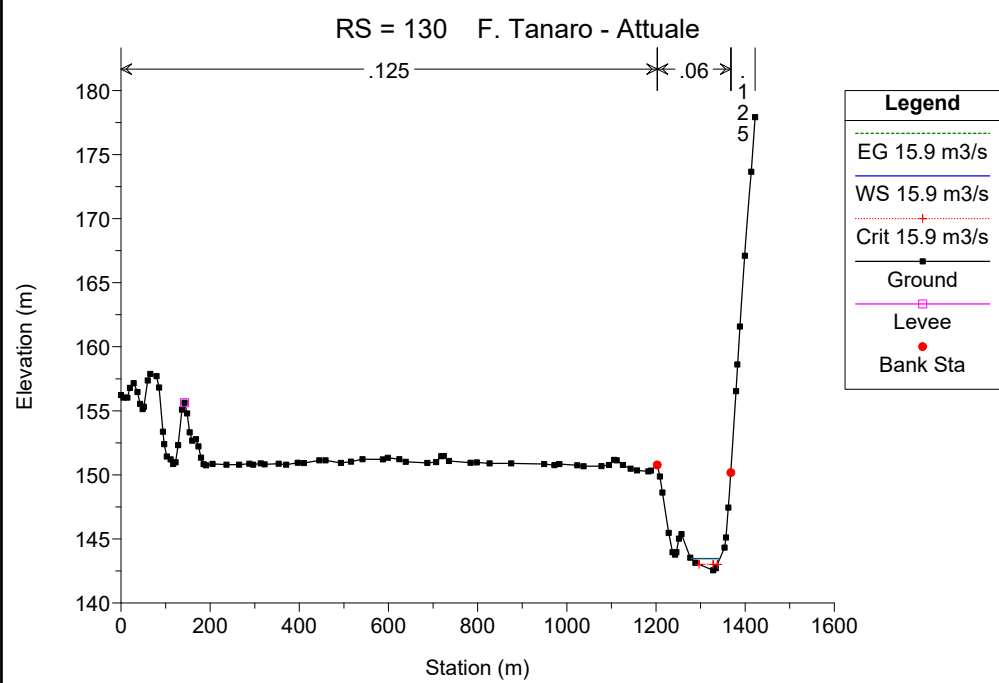
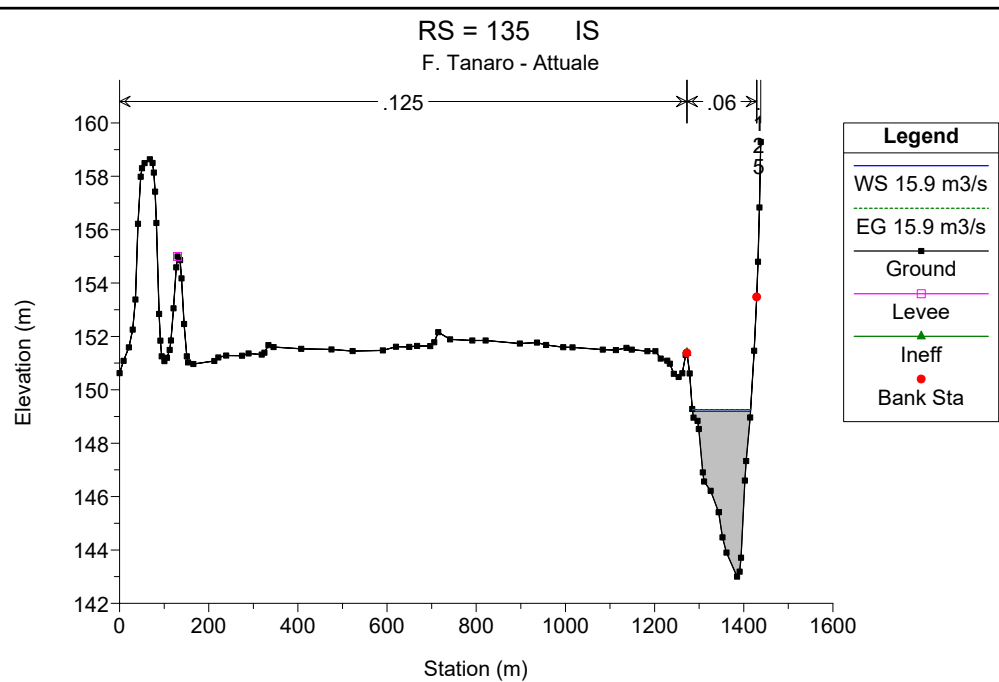
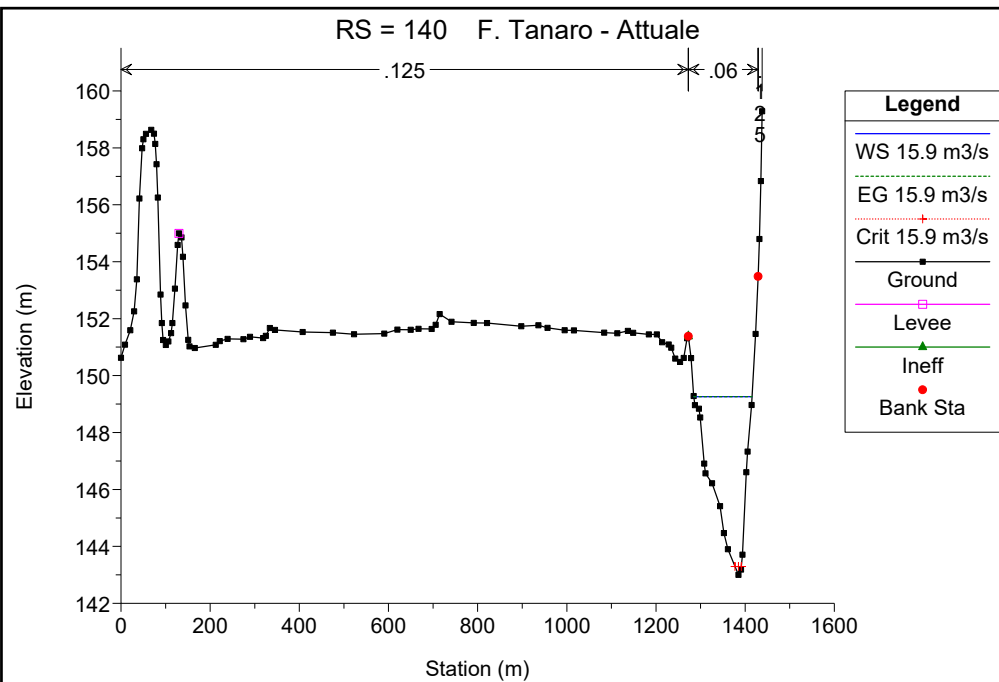


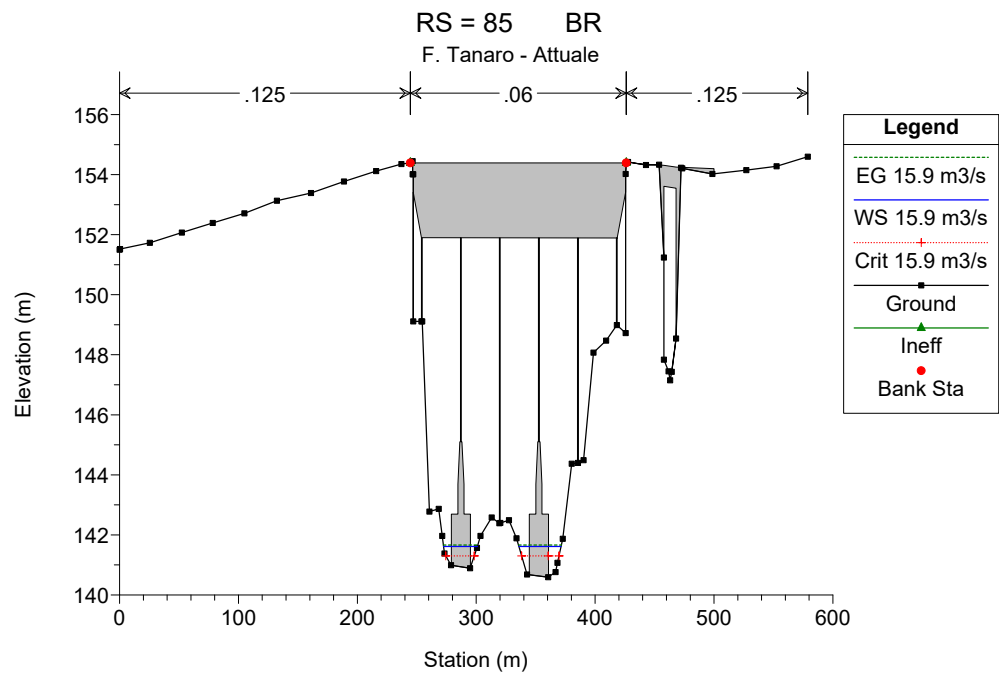
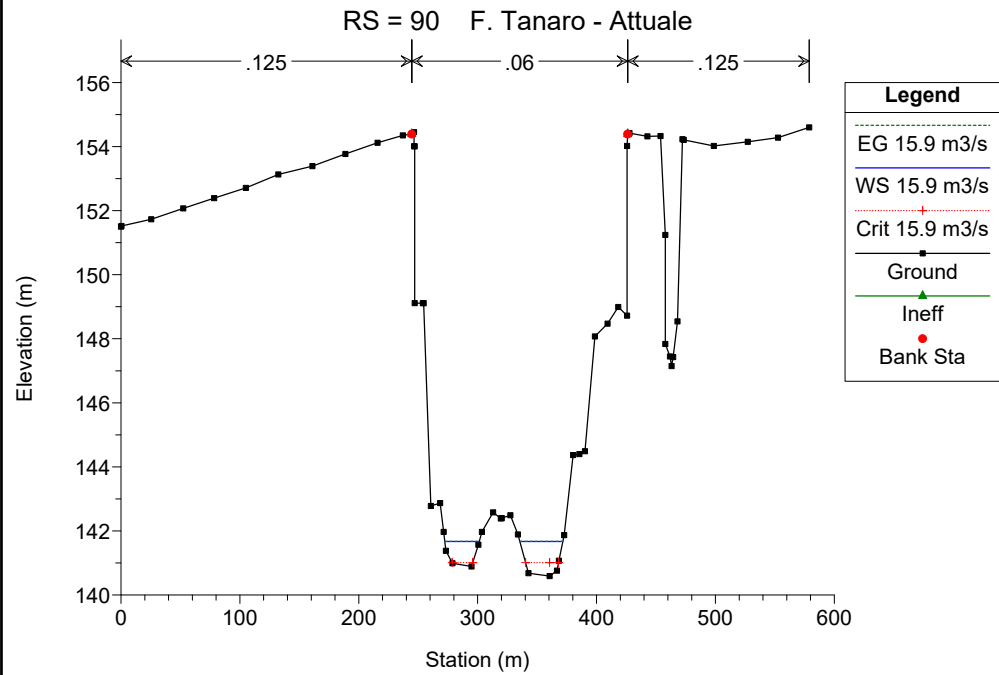
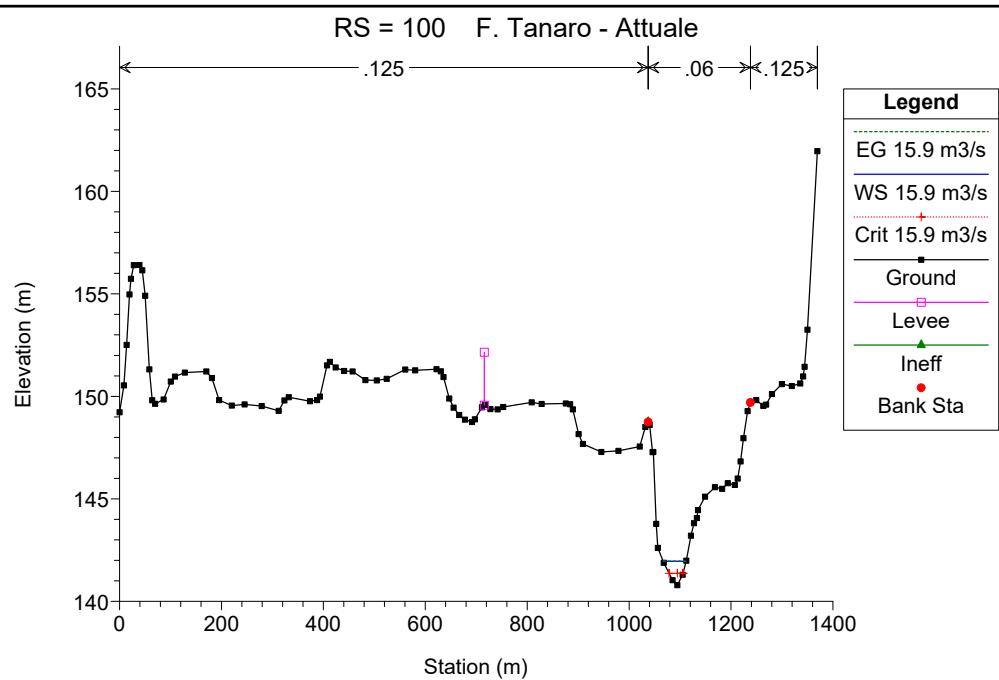
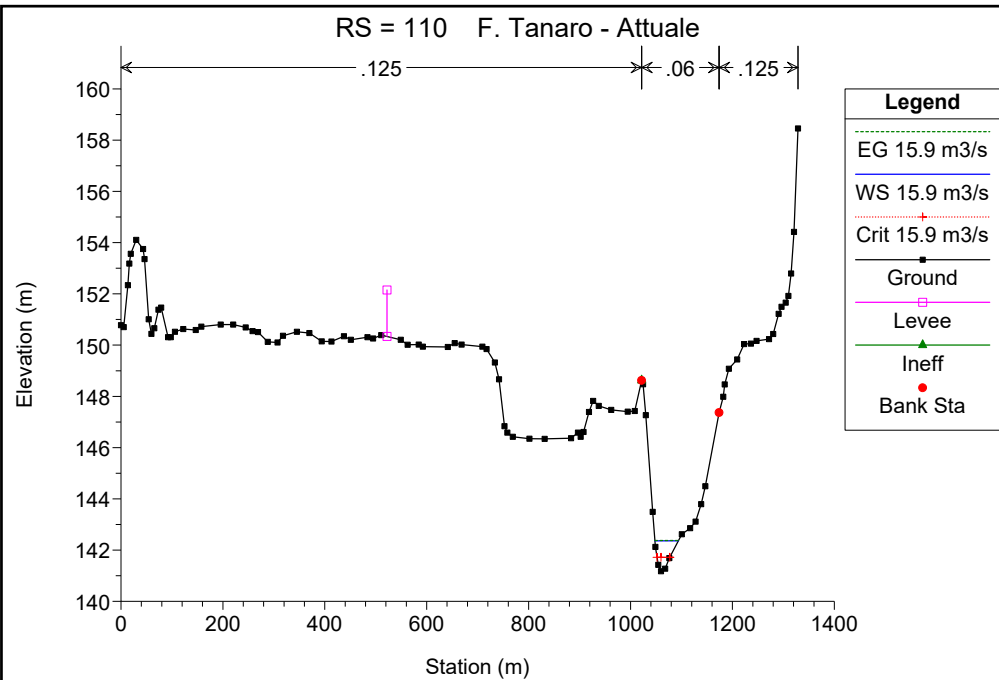


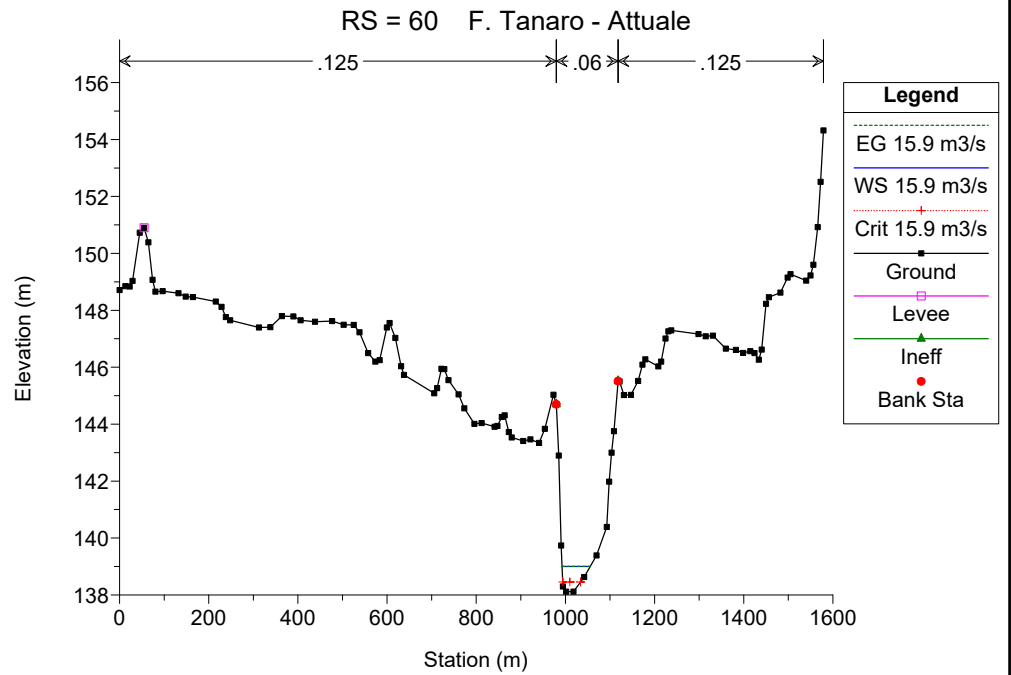
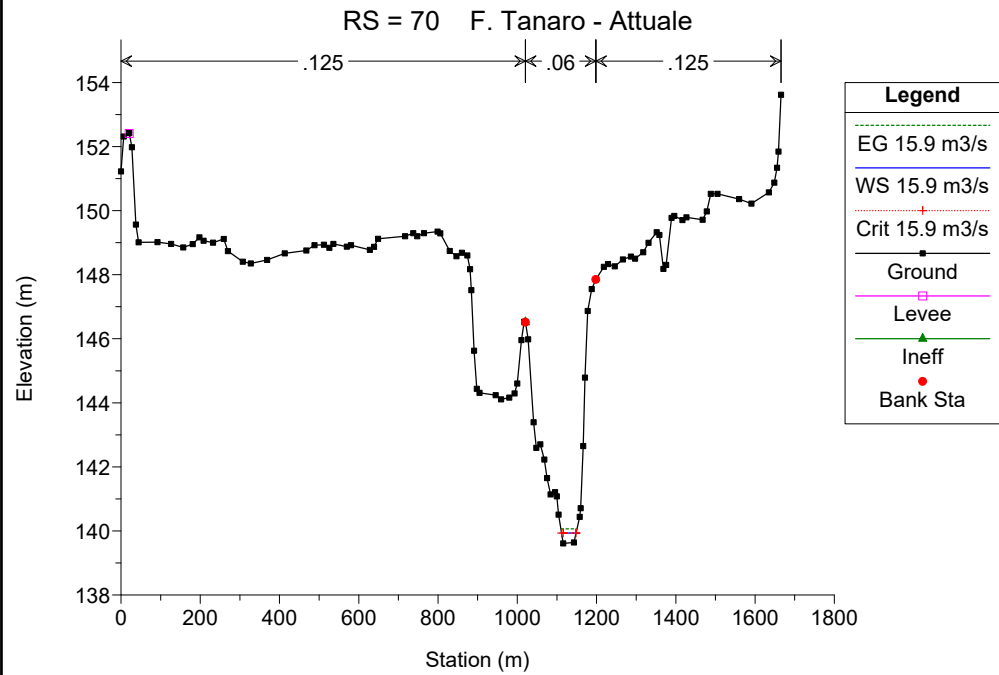
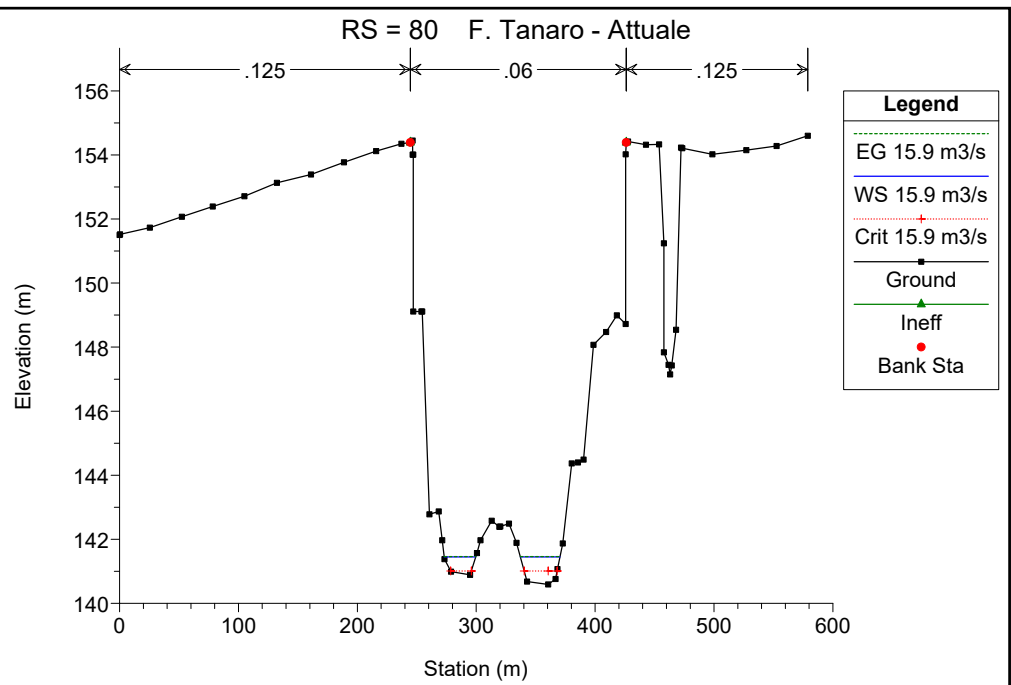
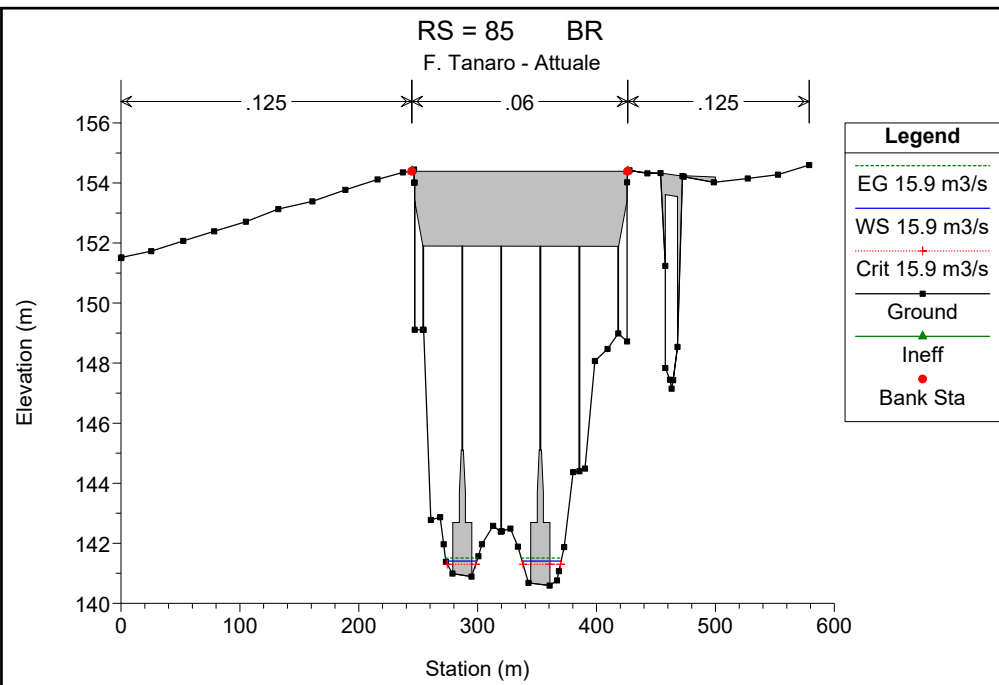


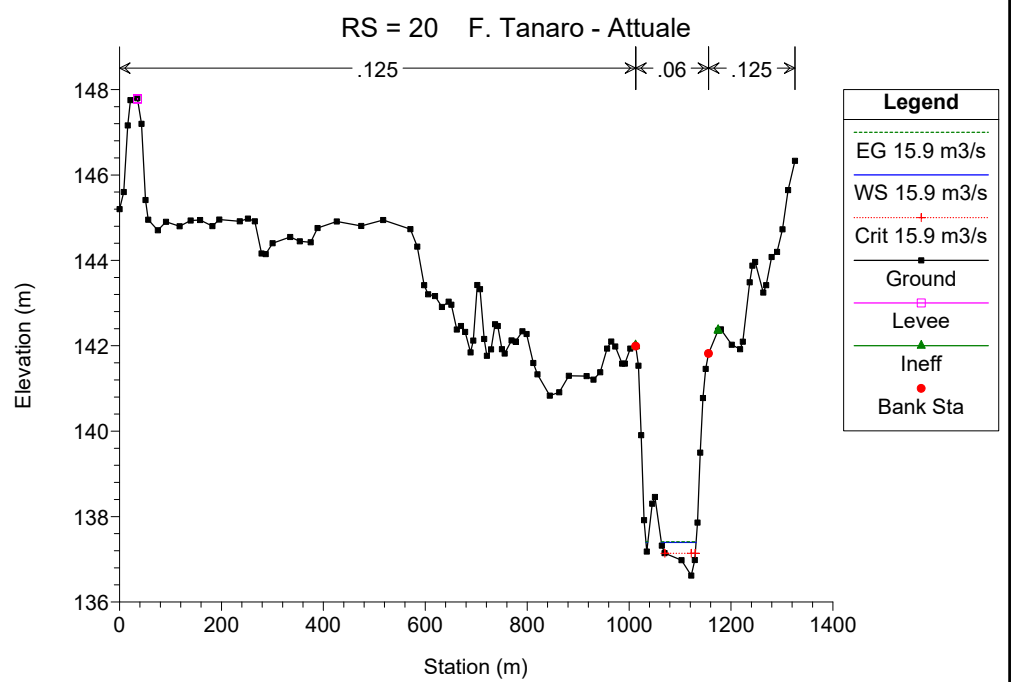
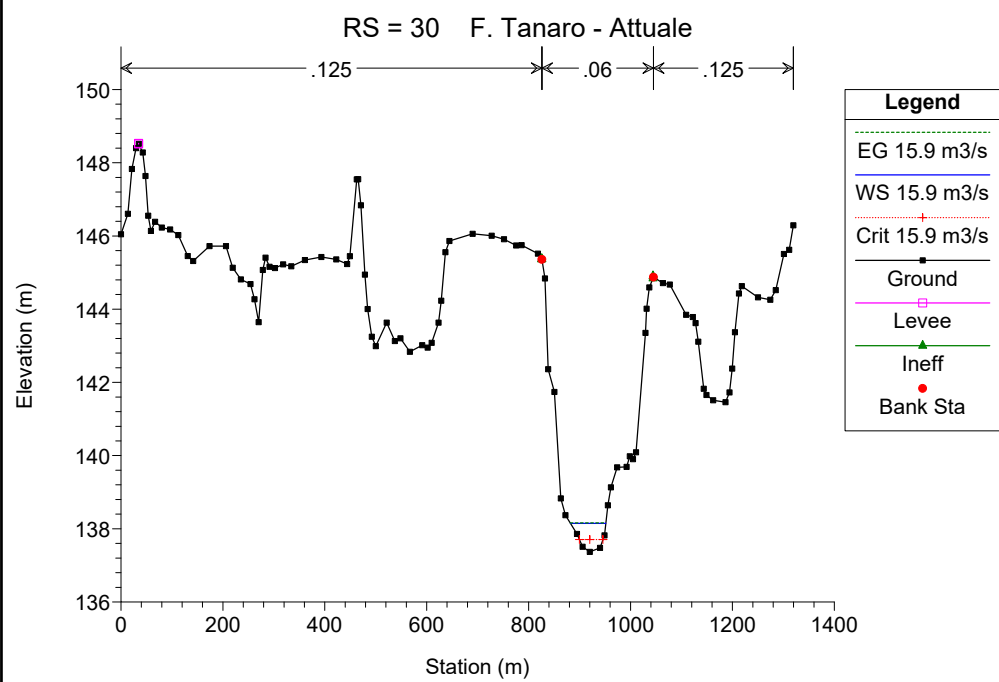
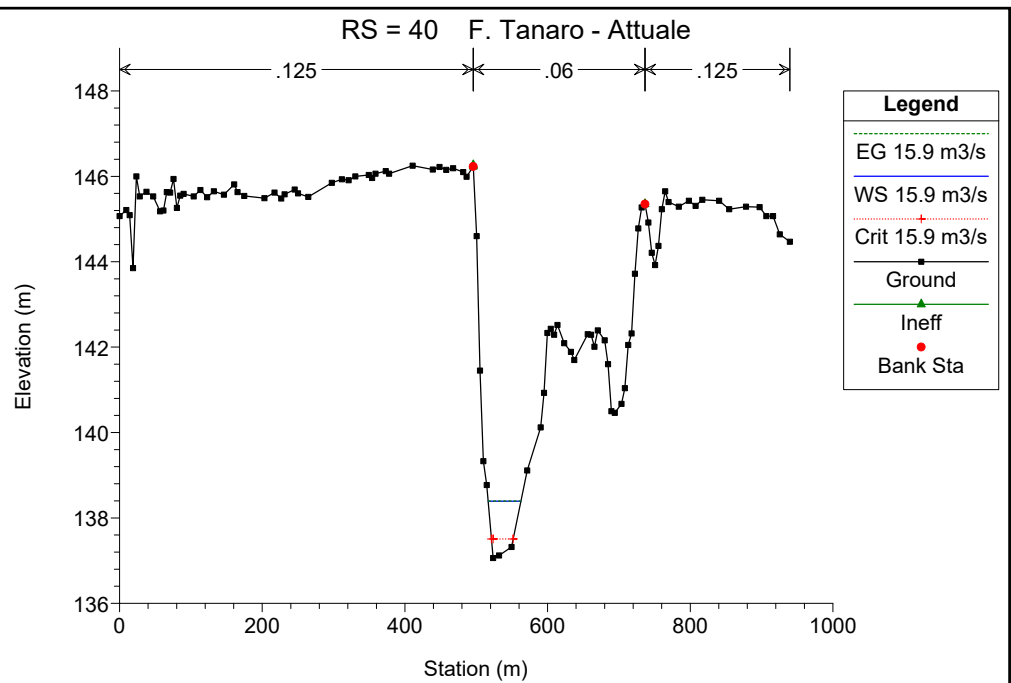
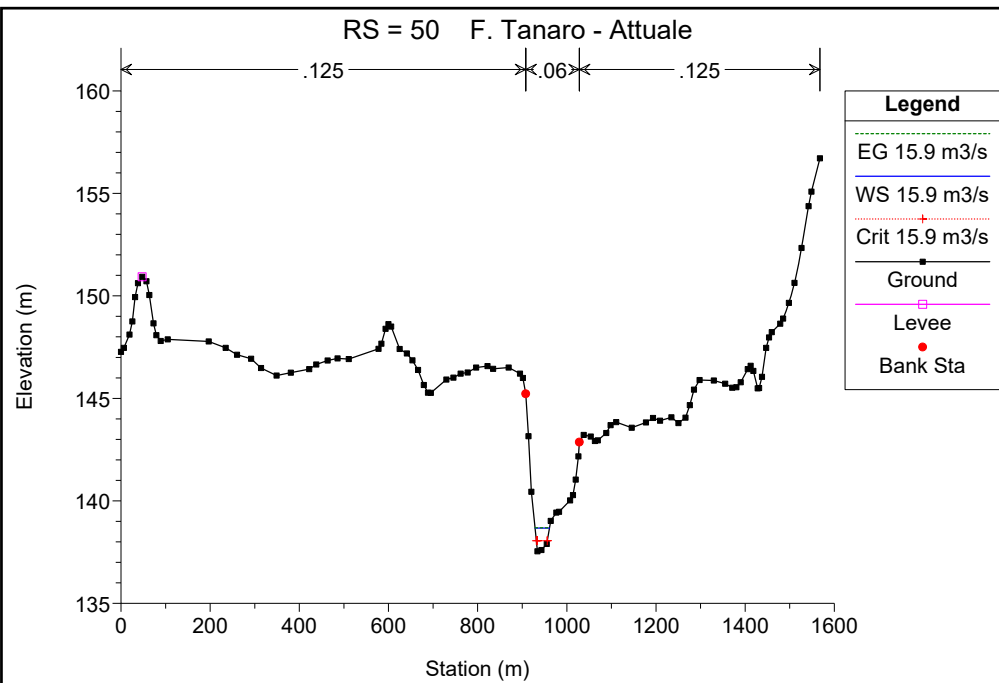




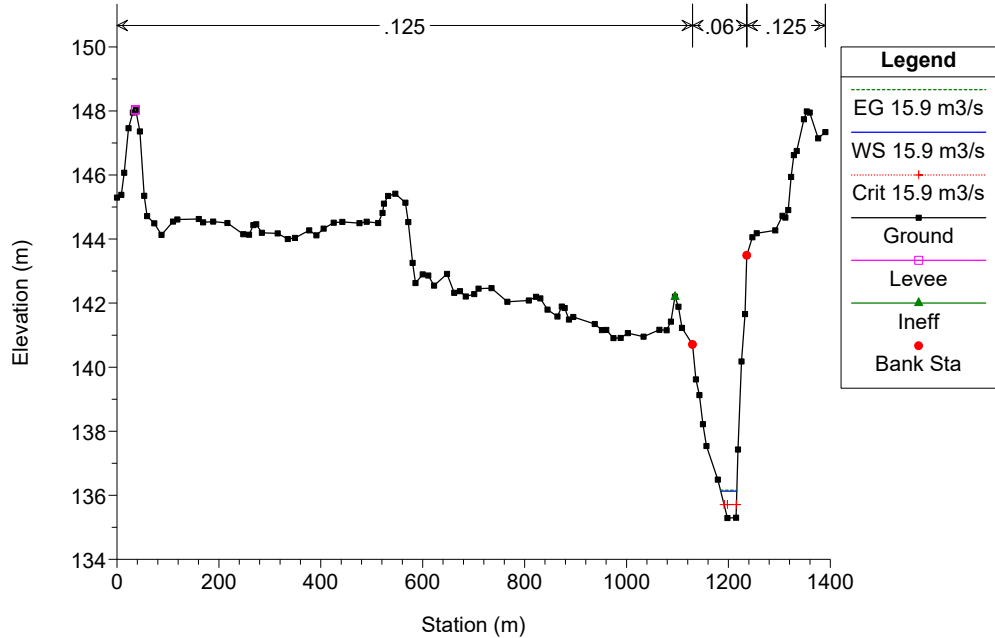








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE DI PROGETTO
PORTATA MINIMA DI FUNZIONAMENTO DELL'IMPIANTO**

SIMULAZIONE 26

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	15.90 in alveo (6.66 turbinati)	minima di funzionamento dell'impianto

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

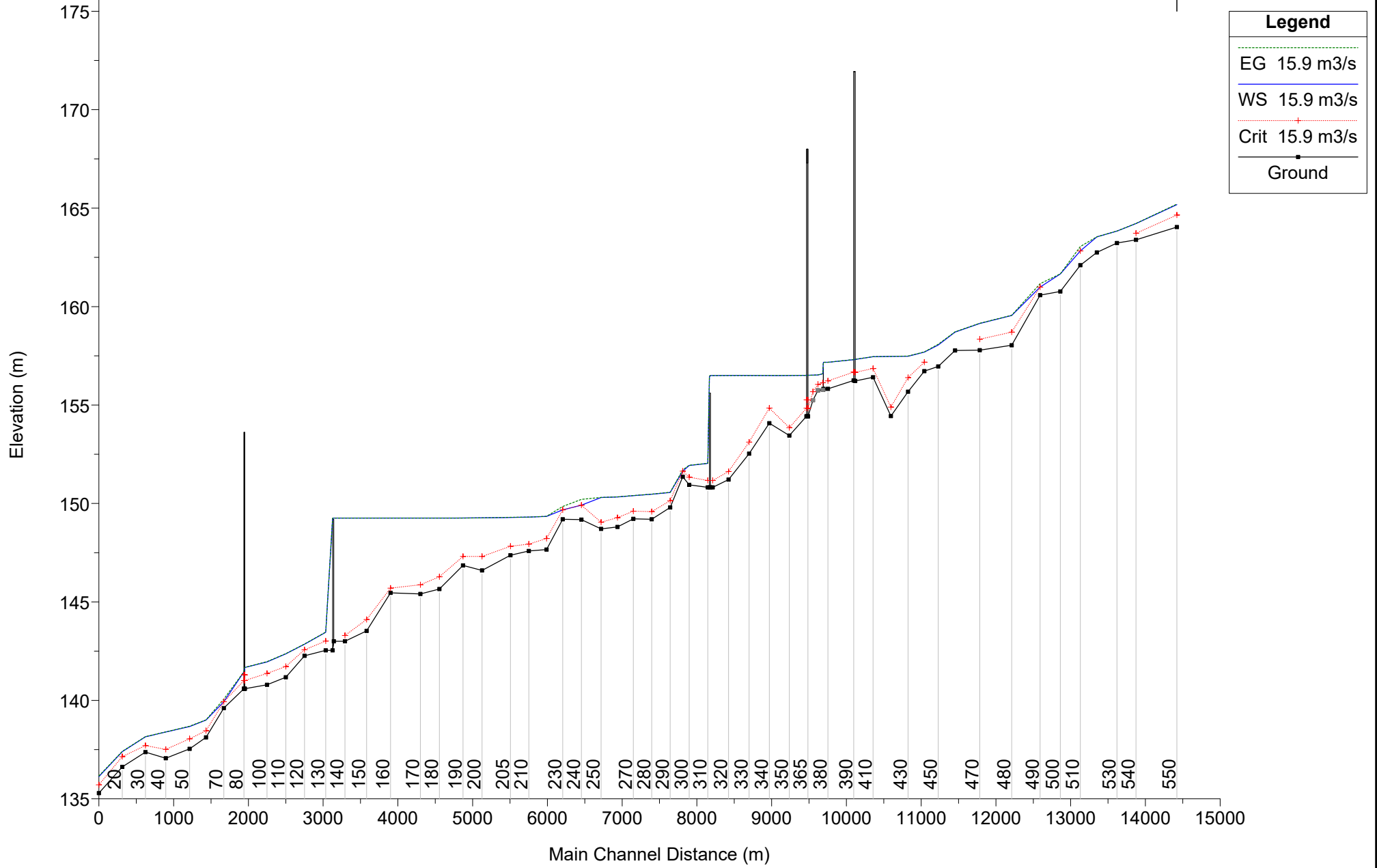
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	15.9 m3/s	15.90	164.04	165.18	164.65	165.21	0.003252	0.74	21.41	30.80	0.28
1	540	15.9 m3/s	15.90	163.39	164.22	163.73	164.22	0.001122	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	158.71		158.72	0.001931	0.54	29.49	46.61	0.22
1	450	15.9 m3/s	15.90	156.96	158.05		158.09	0.004389	0.89	17.87	24.55	0.33
1	440	15.9 m3/s	15.90	156.72	157.69	157.17	157.70	0.001174	0.40	39.86	68.16	0.17
1	430	15.9 m3/s	15.90	155.68	157.48	156.40	157.49	0.000836	0.41	38.63	48.62	0.15
1	420	15.9 m3/s	15.90	154.44	157.47	154.89	157.47	0.000016	0.10	158.66	86.25	0.02
1	410	15.9 m3/s	15.90	156.41	157.46	156.85	157.46	0.000542	0.29	54.01	81.70	0.12
1	400	15.9 m3/s	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	15.9 m3/s	15.90	156.25	157.30	156.67	157.31	0.000666	0.31	50.87	82.11	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	156.51	154.84	156.51	0.000021	0.09	184.49	150.72	0.02
1	365		Bridge									
1	360	15.9 m3/s	15.90	154.43	156.51	154.84	156.51	0.000021	0.09	183.81	150.70	0.03
1	350	15.9 m3/s	15.90	153.45	156.50	153.85	156.50	0.000005	0.06	259.24	119.35	0.01
1	340	15.9 m3/s	15.90	154.08	156.50	154.85	156.50	0.000016	0.08	189.01	131.58	0.02
1	330	15.9 m3/s	15.90	152.53	156.50	153.12	156.50	0.000005	0.06	261.62	117.88	0.01
1	320	15.9 m3/s	15.90	151.21	156.50	151.62	156.50	0.000001	0.05	328.61	86.56	0.01
1	315	15.9 m3/s	9.24	150.82	156.50	151.17	156.50	0.000000	0.02	384.52	115.34	0.00
1	312.5		Inl Struct									
1	310	15.9 m3/s	9.24	150.82	152.04	151.17	152.04	0.000240	0.24	38.81	65.04	0.08
1	300	15.9 m3/s	9.24	150.95	151.93	151.34	151.94	0.000811	0.37	24.72	35.25	0.14
1	295	15.9 m3/s	9.24	151.36	151.64	151.64	151.70	0.069108	1.13	8.17	62.30	1.00
1	290	15.9 m3/s	9.24	149.80	150.56	150.14	150.57	0.001526	0.42	21.90	41.93	0.19
1	280	15.9 m3/s	15.90	149.20	150.47	149.59	150.47	0.000229	0.24	65.34	68.75	0.08
1	270	15.9 m3/s	15.90	149.22	150.40	149.61	150.40	0.000366	0.29	54.94	63.38	0.10
1	260	15.9 m3/s	15.90	148.81	150.33	149.28	150.33	0.000296	0.27	58.06	62.06	0.09
1	250	15.9 m3/s	15.90	148.71	150.30	149.05	150.31	0.000067	0.15	103.39	86.19	0.04
1	240	15.9 m3/s	15.90	149.18	149.92	149.92	150.21	0.043501	2.41	6.61	112.44	1.00
1	230	15.9 m3/s	15.90	149.20	149.67	149.67	149.85	0.050632	1.84	8.66	75.78	1.00
1	220	15.9 m3/s	15.90	147.66	149.34	148.22	149.35	0.000350	0.27	58.84	72.72	0.10

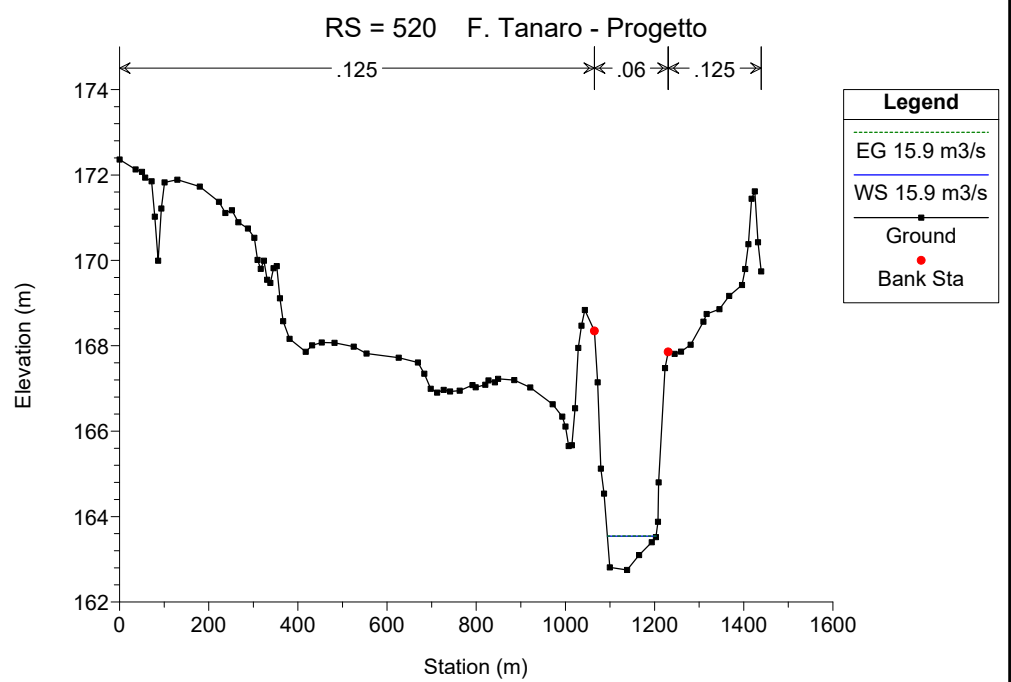
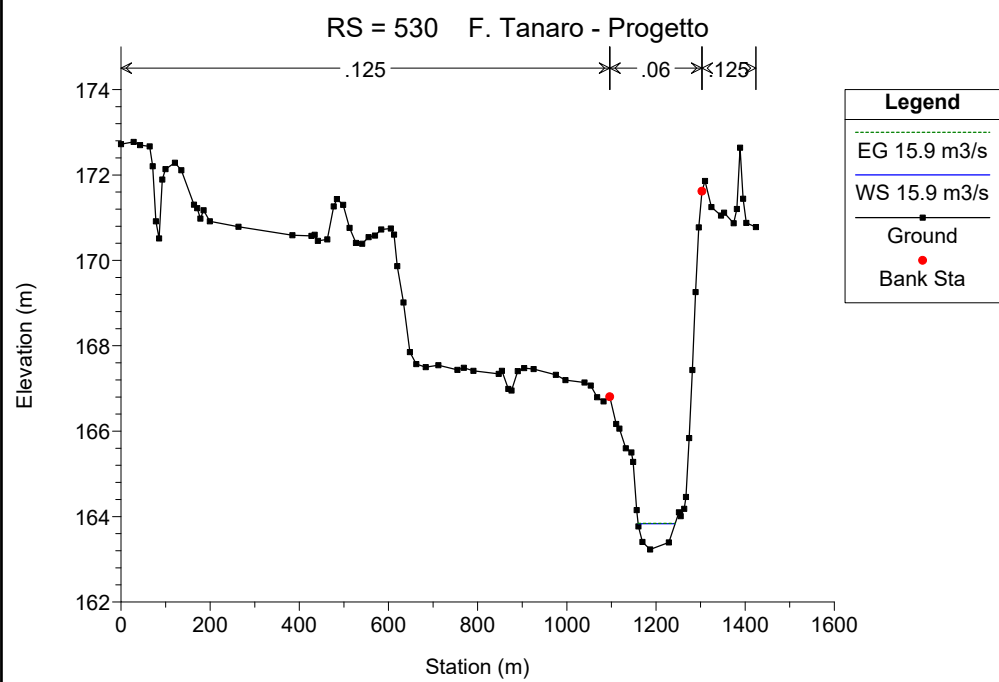
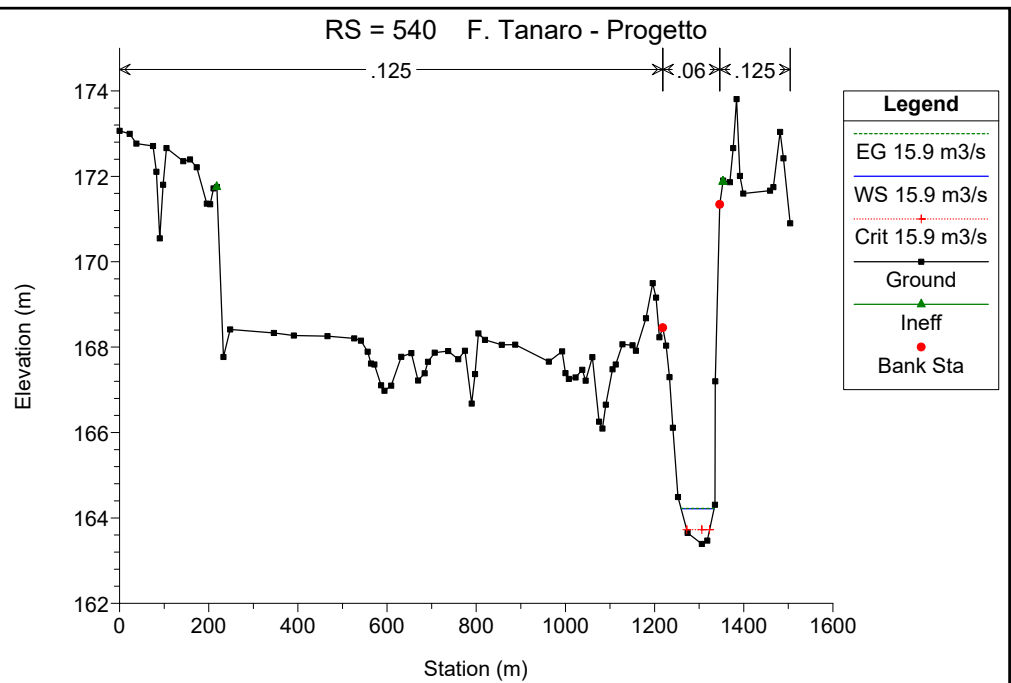
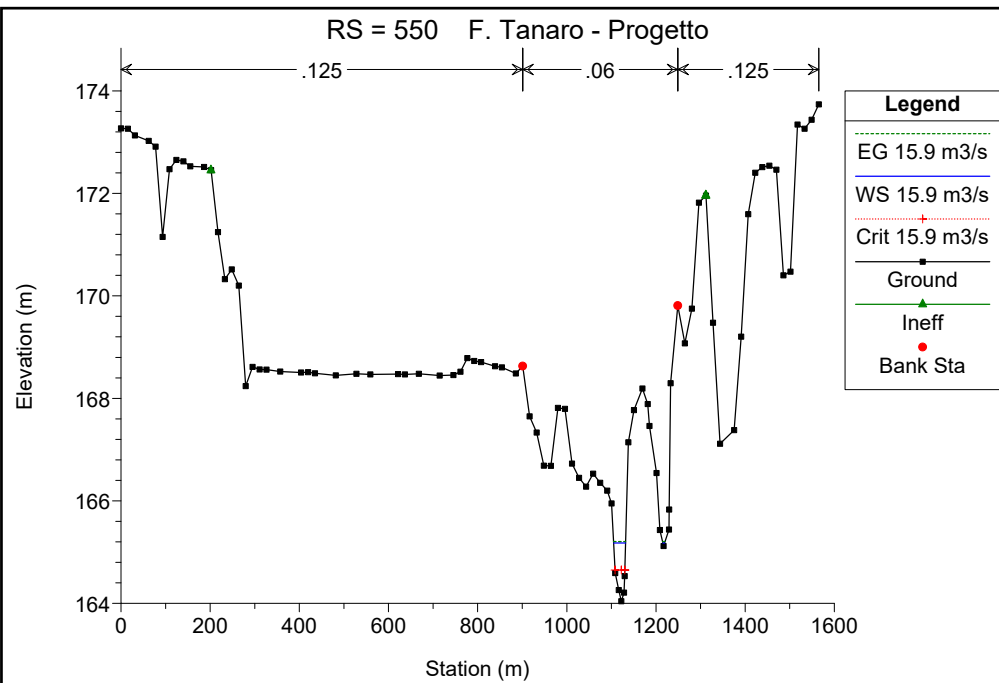
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 15.9 m3/s (Continued)

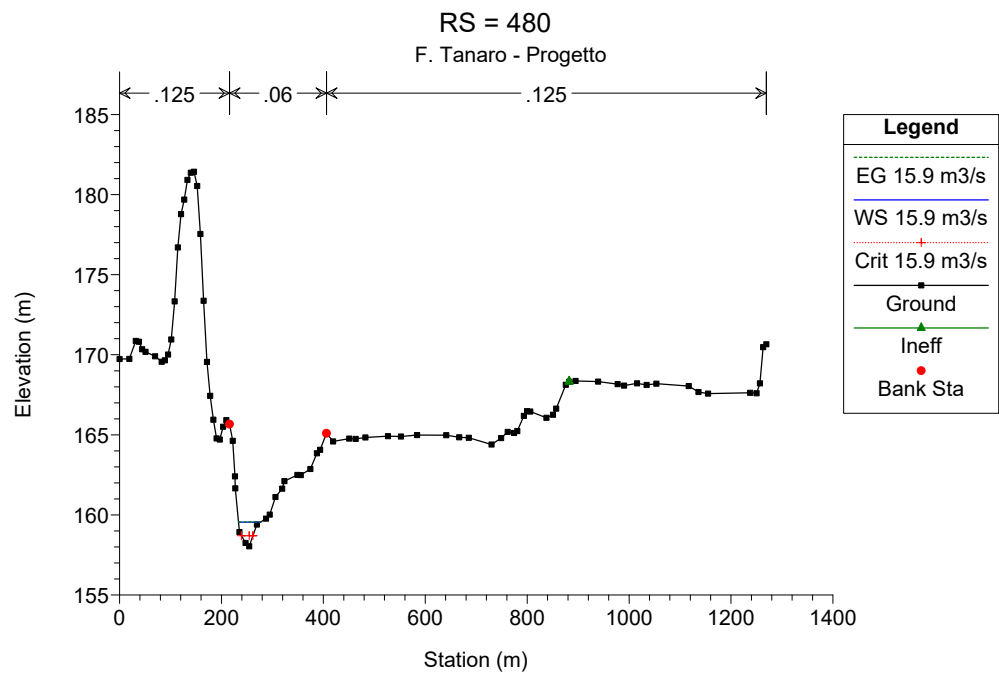
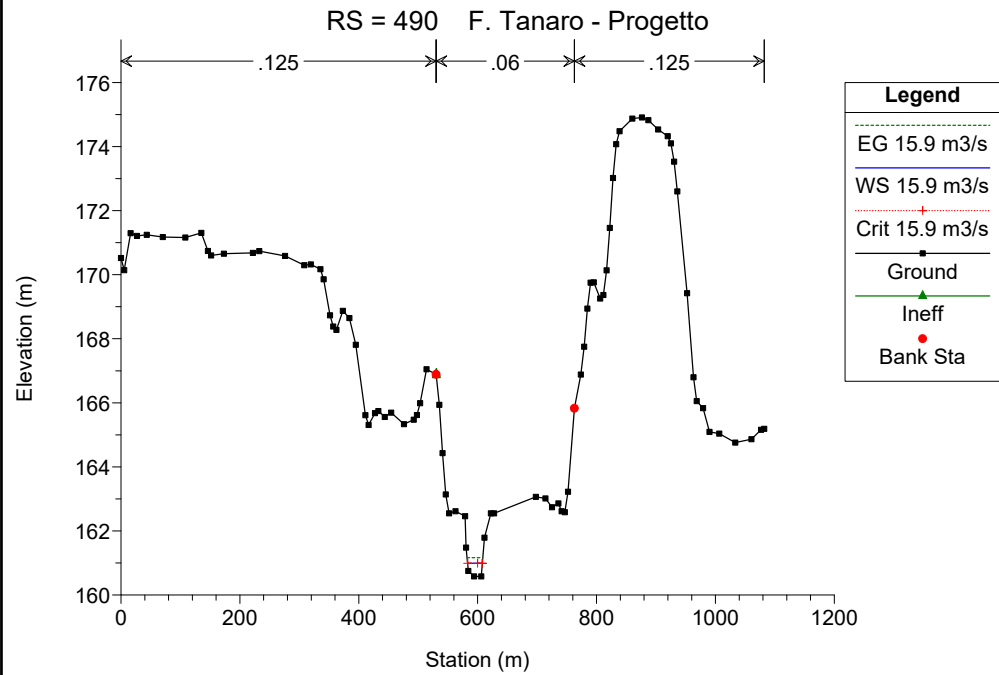
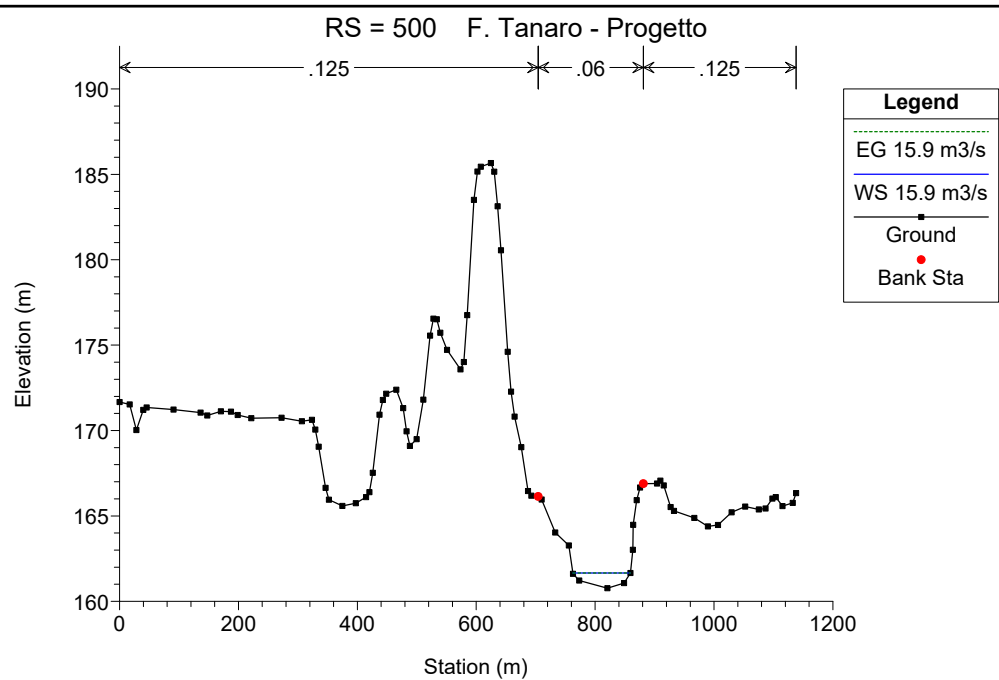
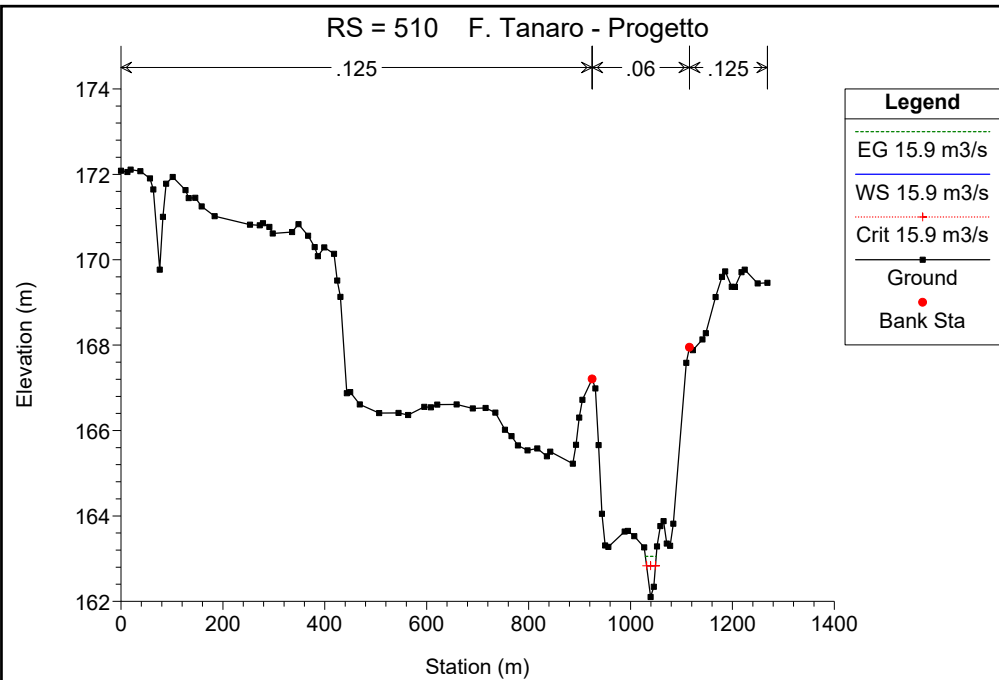
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	15.9 m3/s	15.90	147.59	149.31	147.94	149.31	0.000076	0.17	95.19	76.97	0.05
1	205	15.9 m3/s	15.90	147.37	149.29	147.82	149.30	0.000053	0.15	105.57	76.12	0.04
1	200	15.9 m3/s	15.90	146.60	149.27	147.31	149.27	0.000073	0.15	104.24	93.54	0.05
1	190	15.9 m3/s	15.90	146.85	149.26	147.31	149.26	0.000027	0.12	133.76	83.38	0.03
1	180	15.9 m3/s	15.90	145.66	149.26	146.28	149.26	0.000004	0.05	331.50	190.88	0.01
1	170	15.9 m3/s	15.90	145.40	149.26	145.87	149.26	0.000002	0.04	402.70	153.99	0.01
1	160	15.9 m3/s	15.90	145.46	149.26	145.70	149.26	0.000001	0.03	464.13	187.30	0.01
1	150	15.9 m3/s	15.90	143.53	149.26	144.11	149.26	0.000001	0.03	558.18	158.23	0.00
1	140	15.9 m3/s	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	15.9 m3/s	15.90	142.54	143.46	143.01	143.47	0.001789	0.46	34.20	63.79	0.20
1	120	15.9 m3/s	15.90	142.27	142.85	142.57	142.86	0.002578	0.45	35.46	91.88	0.23
1	110	15.9 m3/s	15.90	141.17	142.36	141.72	142.37	0.001528	0.51	31.43	45.84	0.19
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

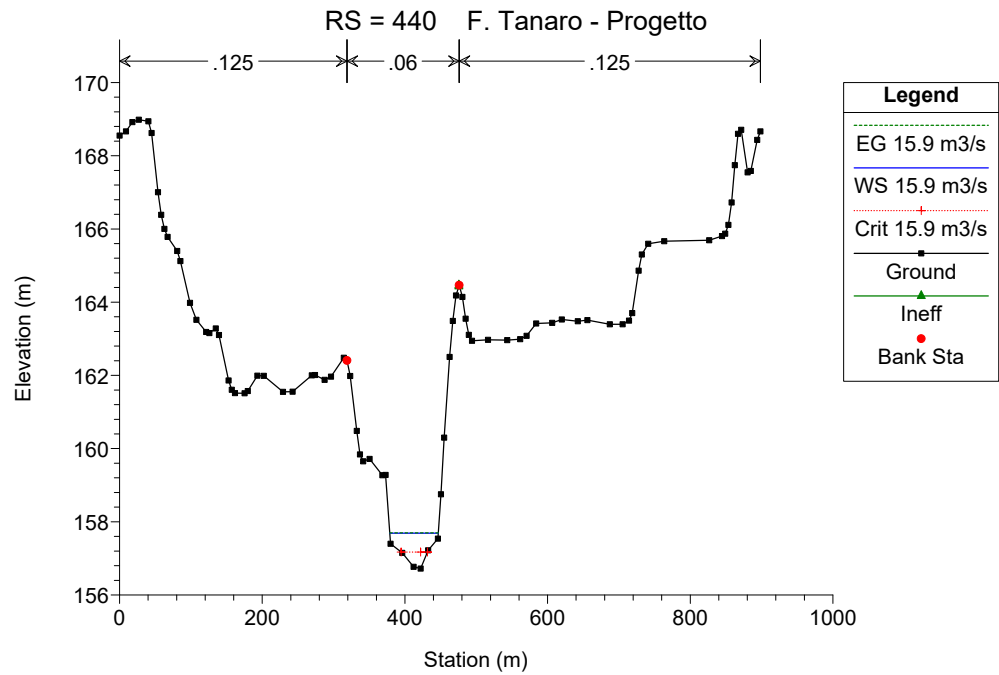
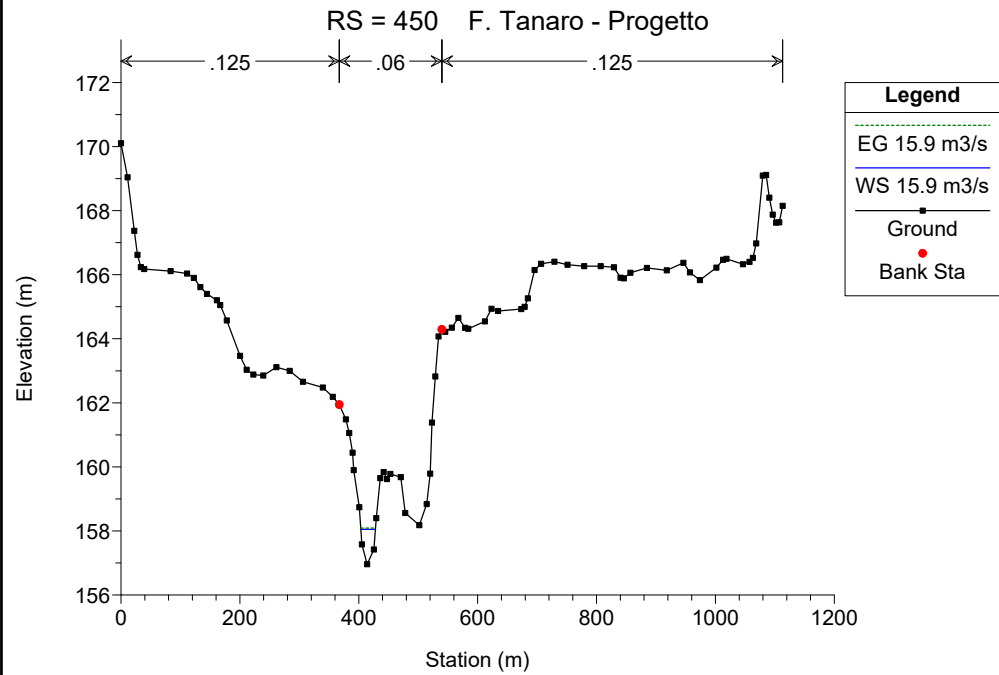
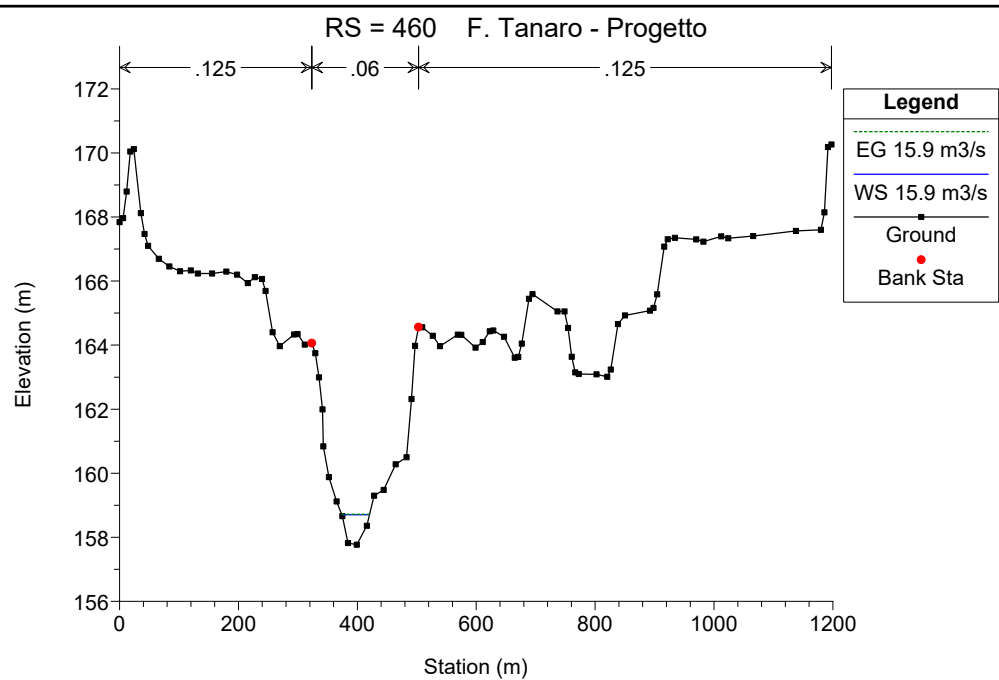
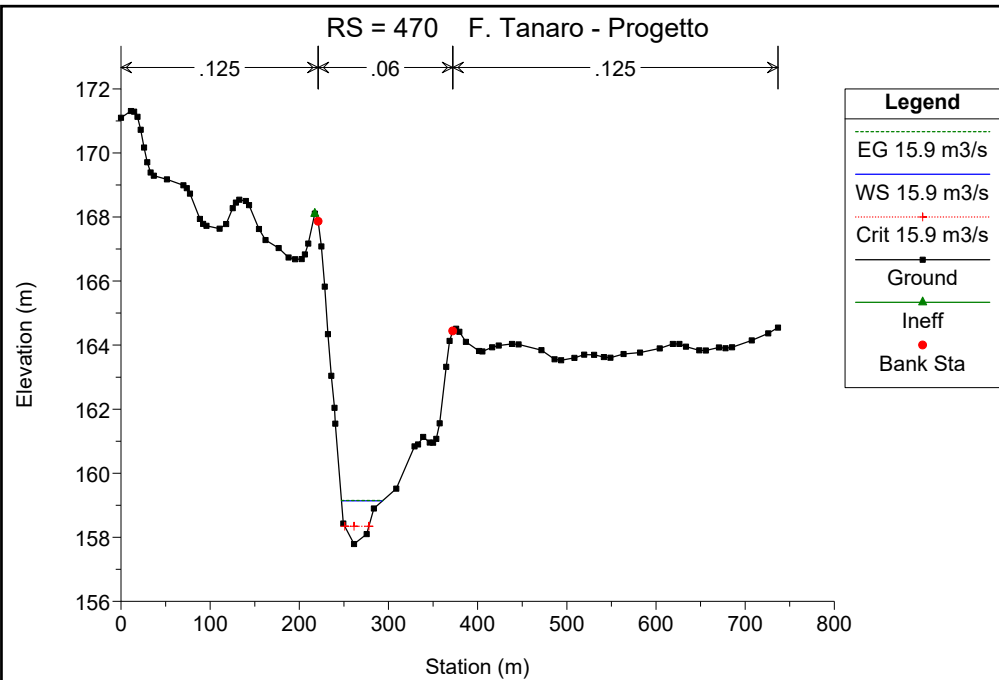
F. Tanaro - Progetto

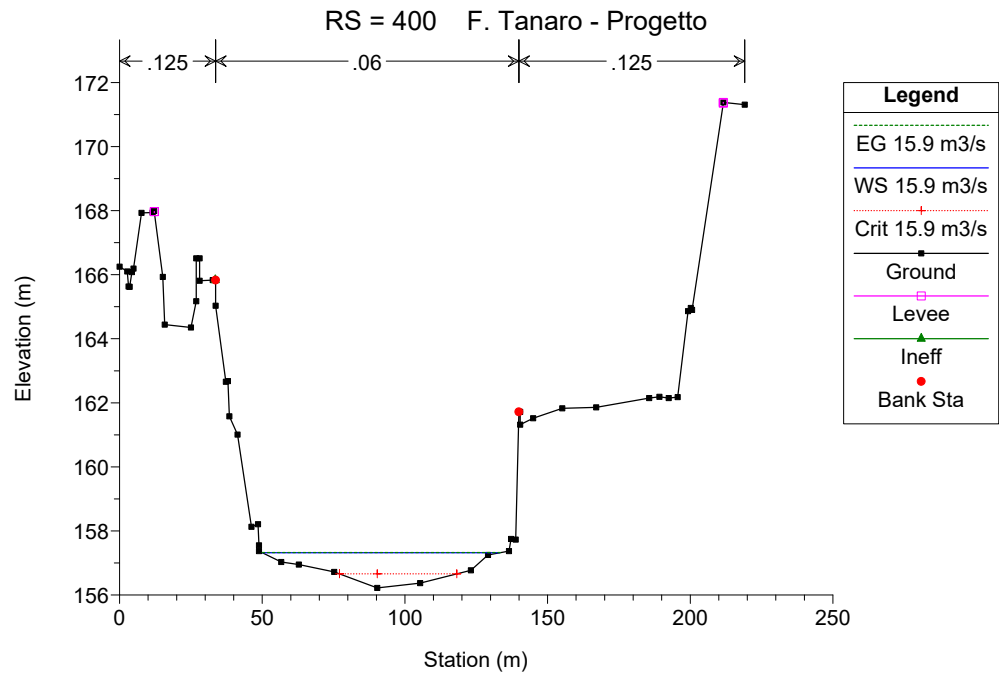
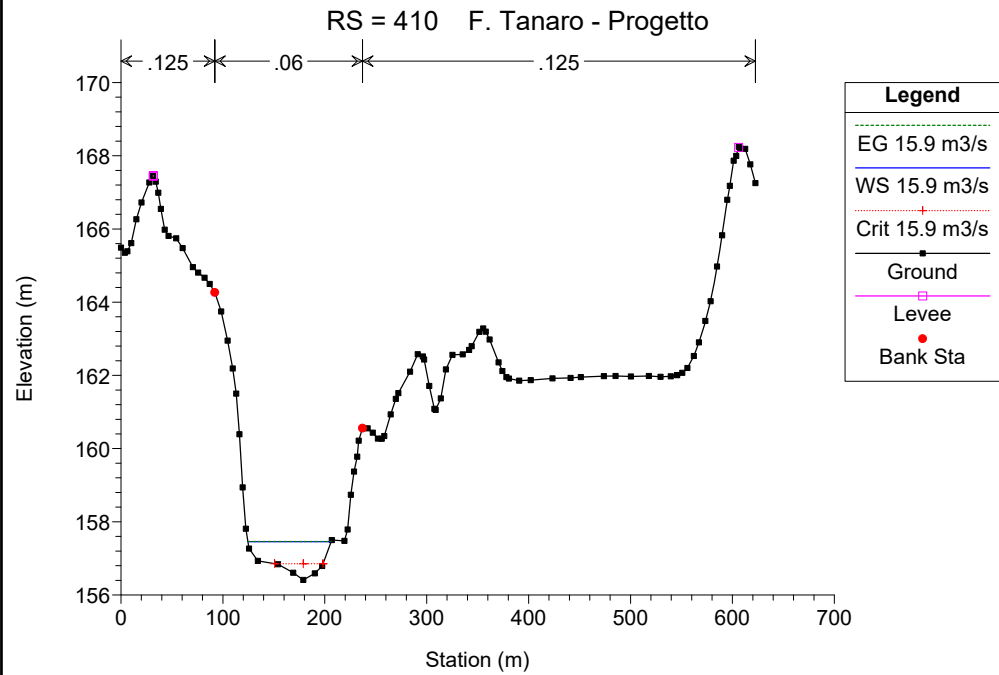
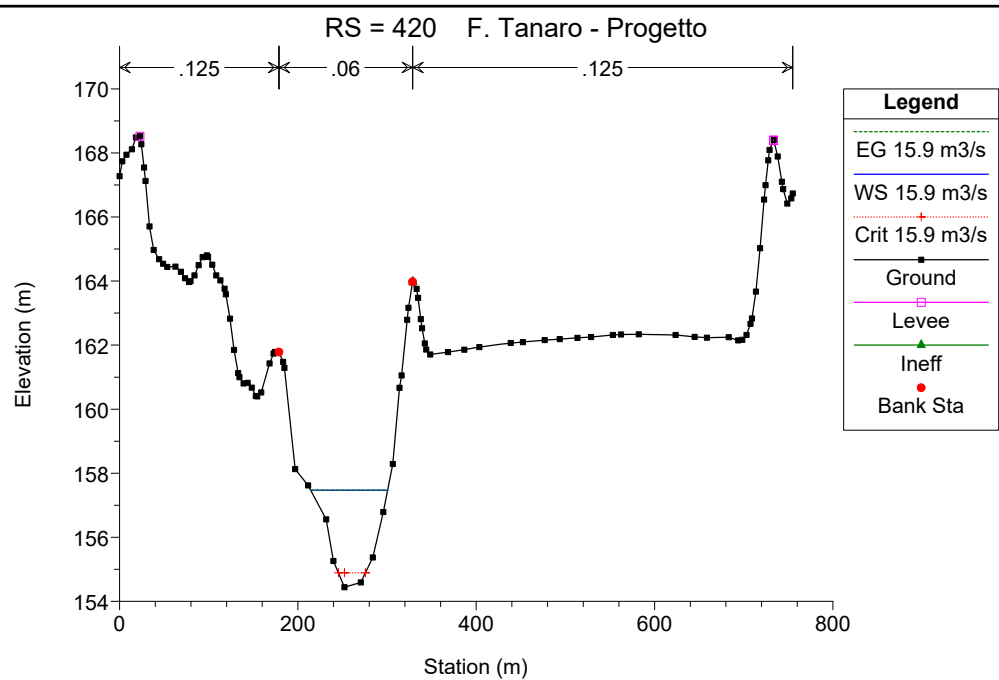
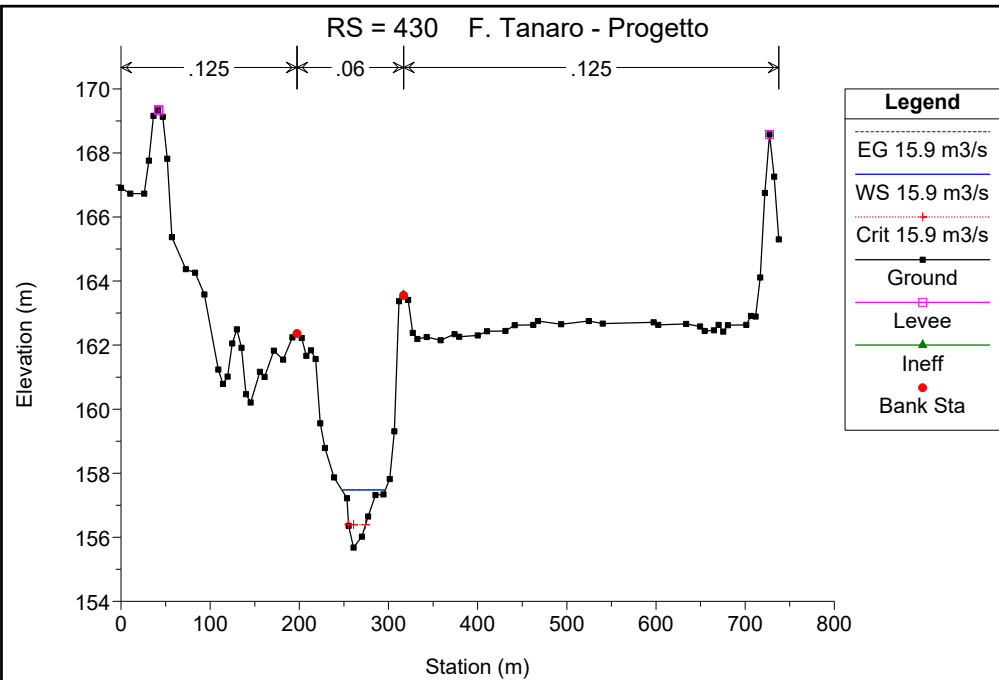
Tanaro 1

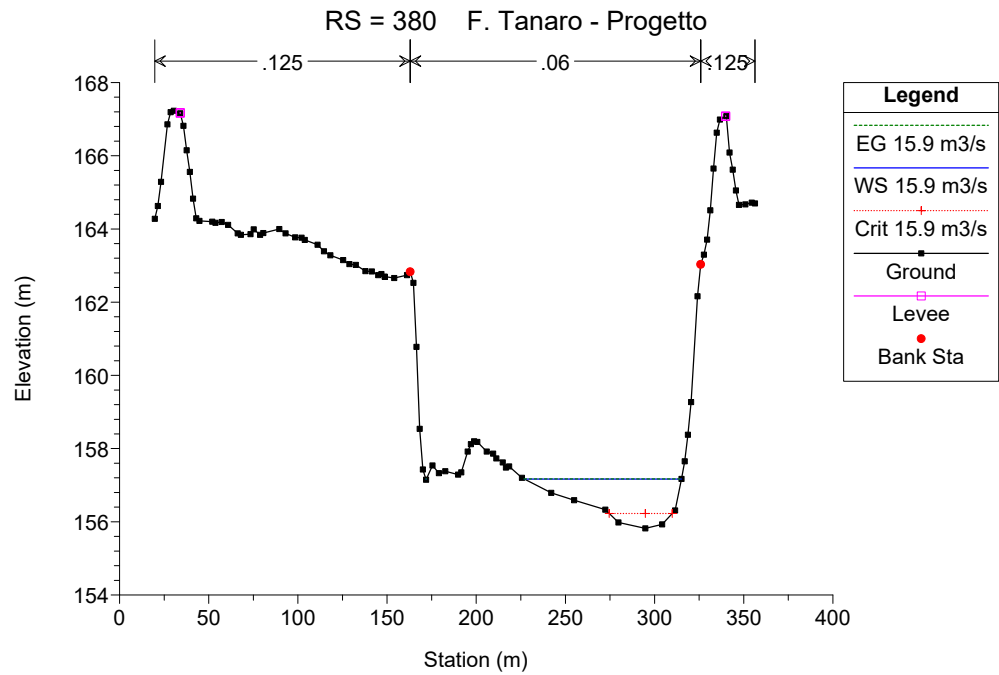
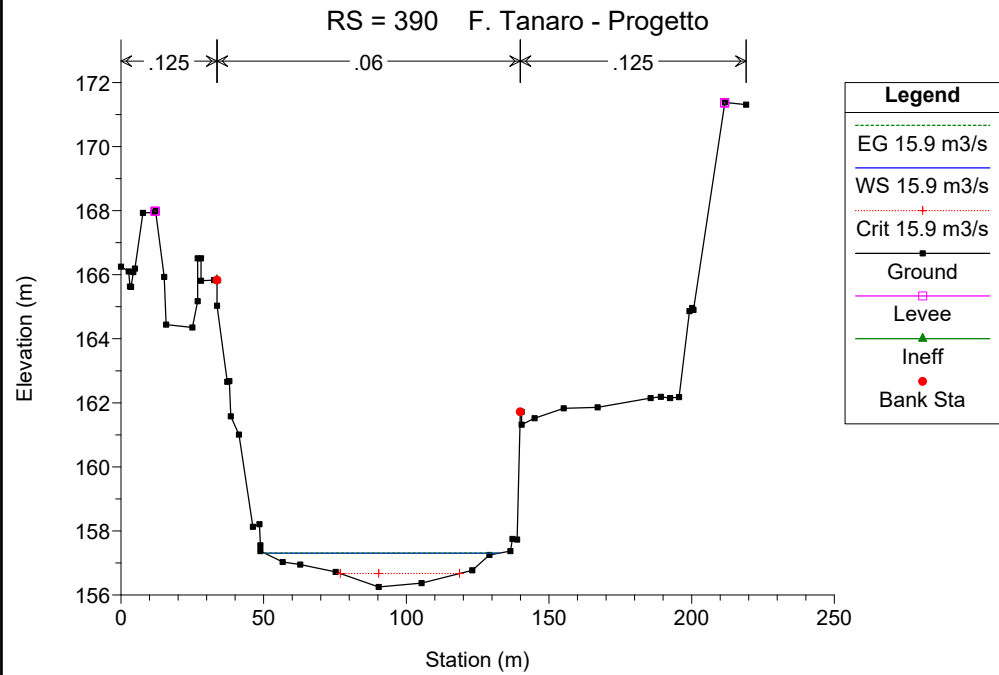
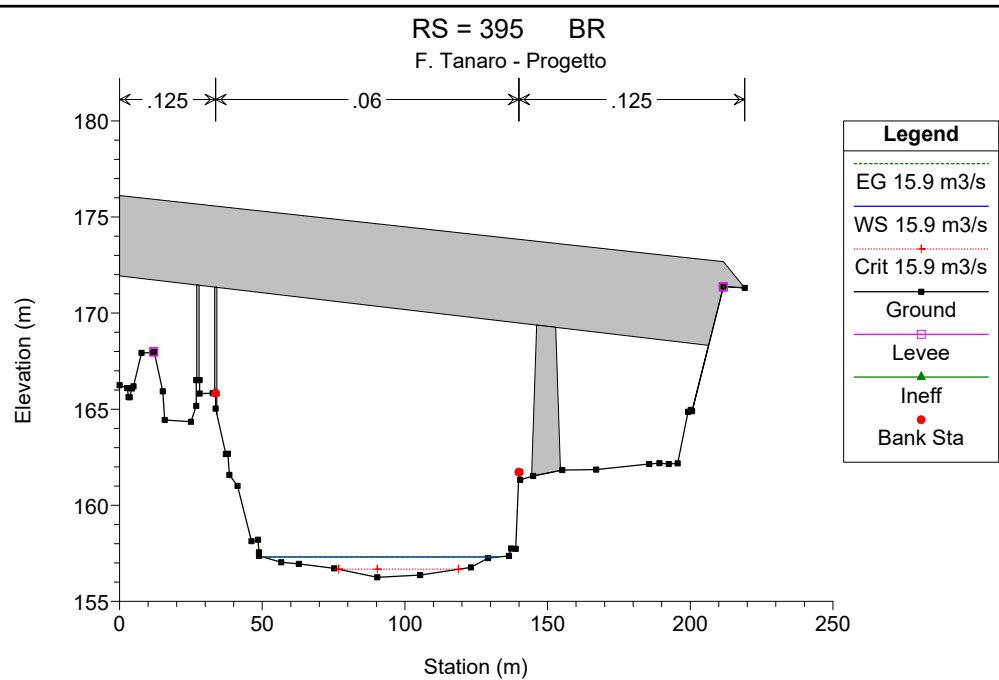
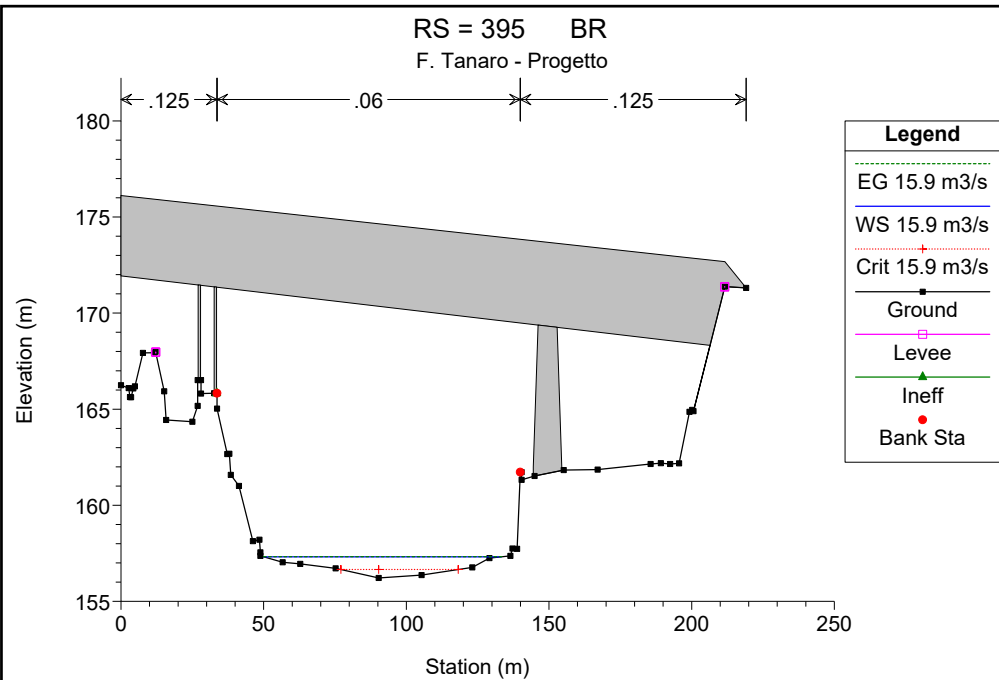


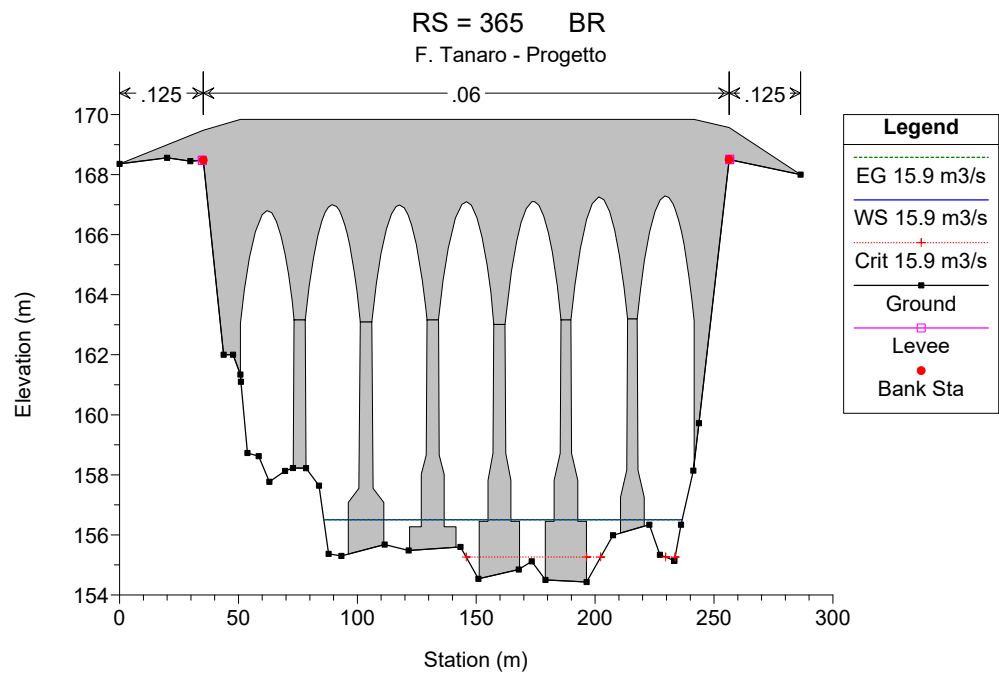
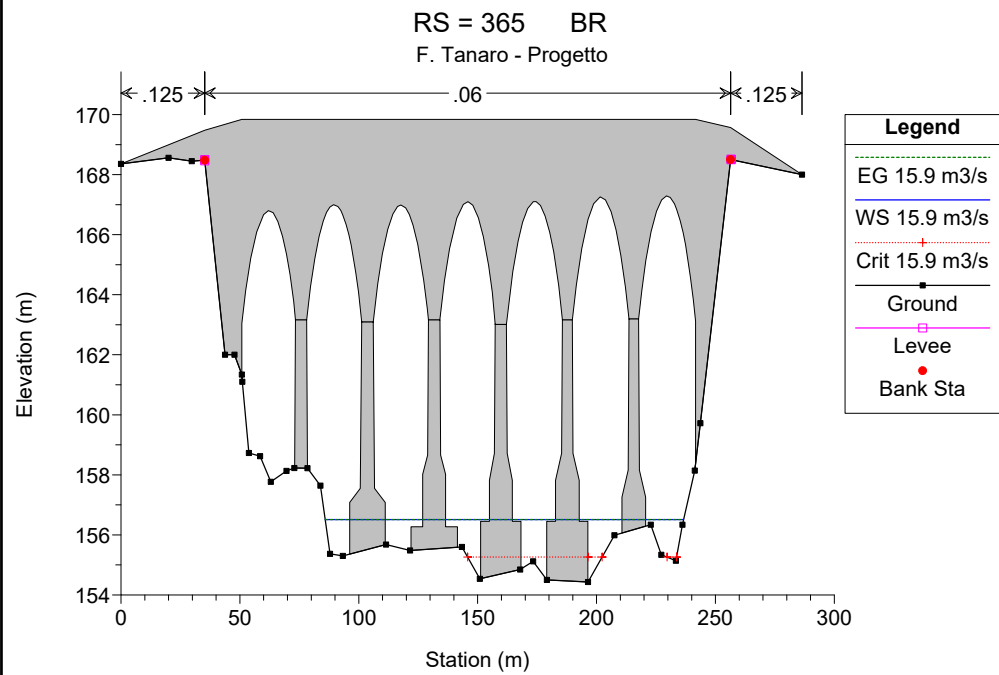
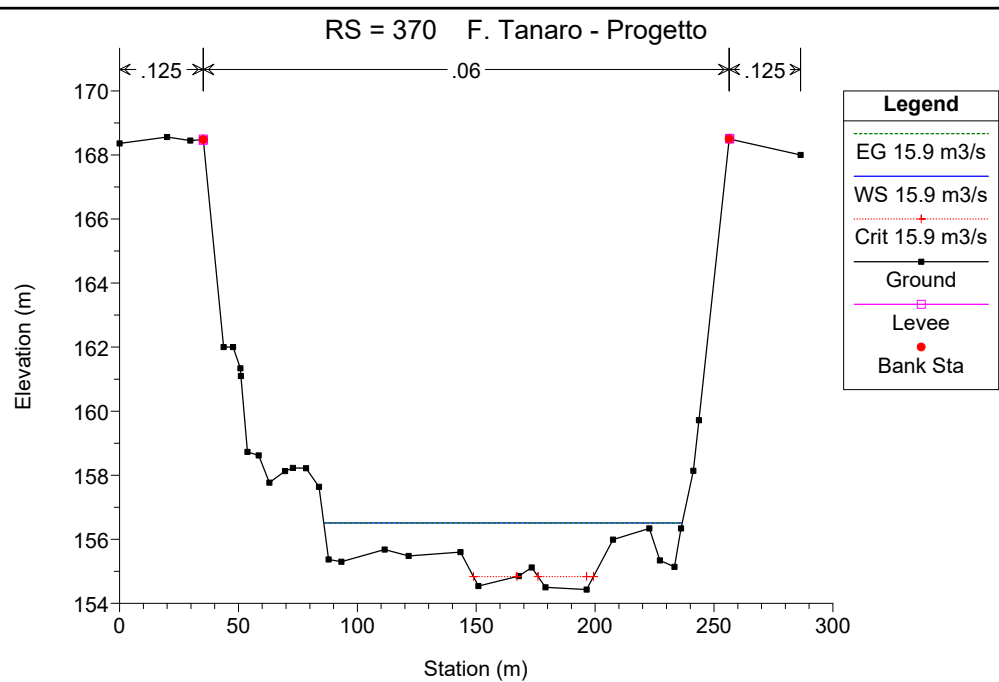
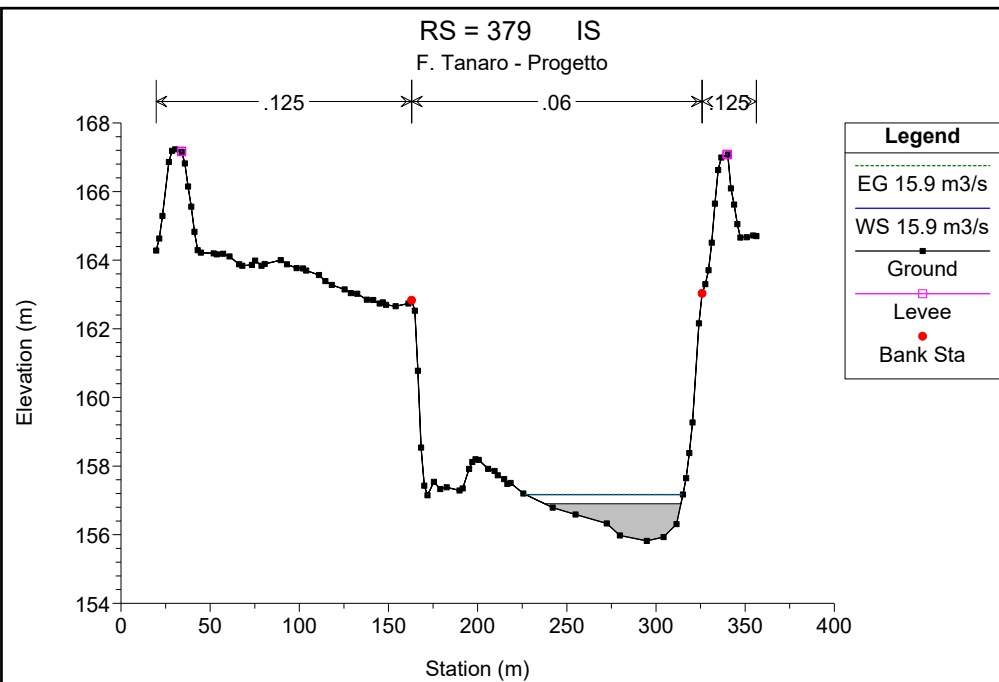


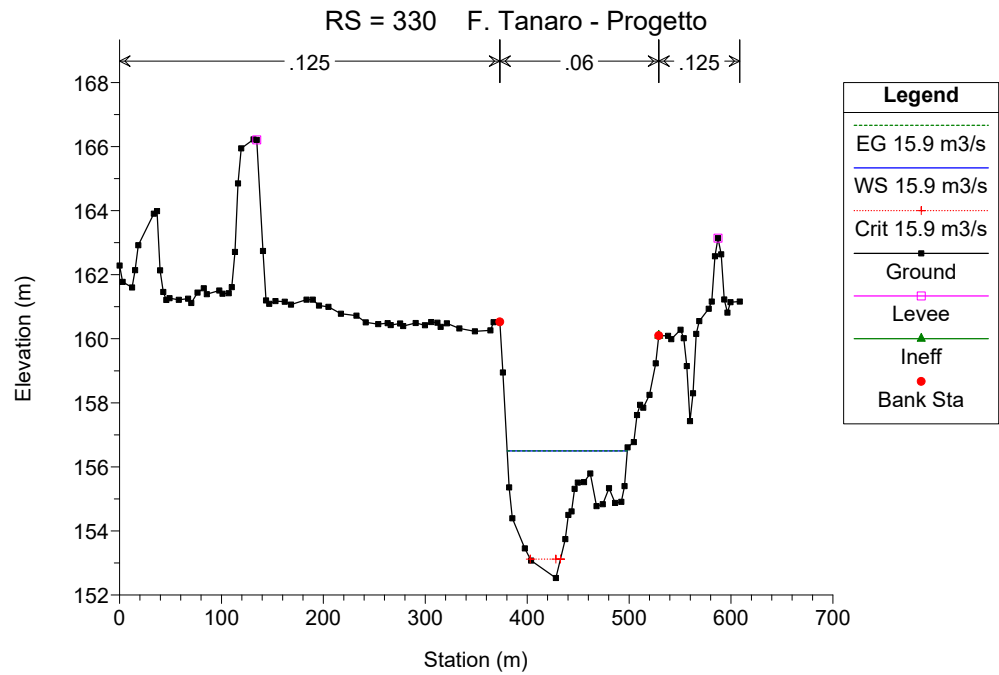
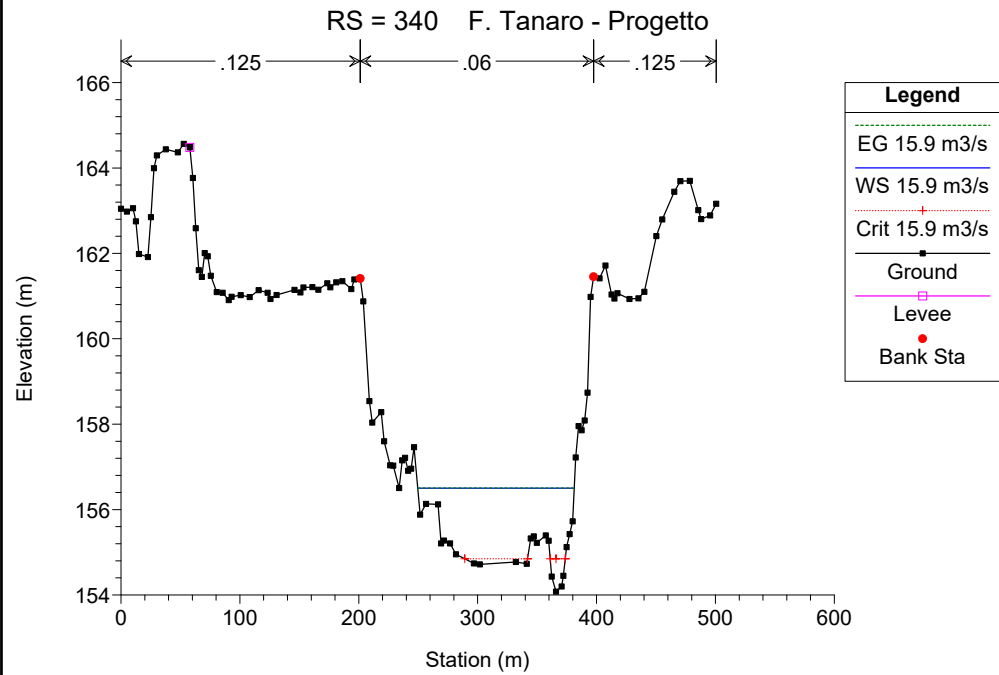
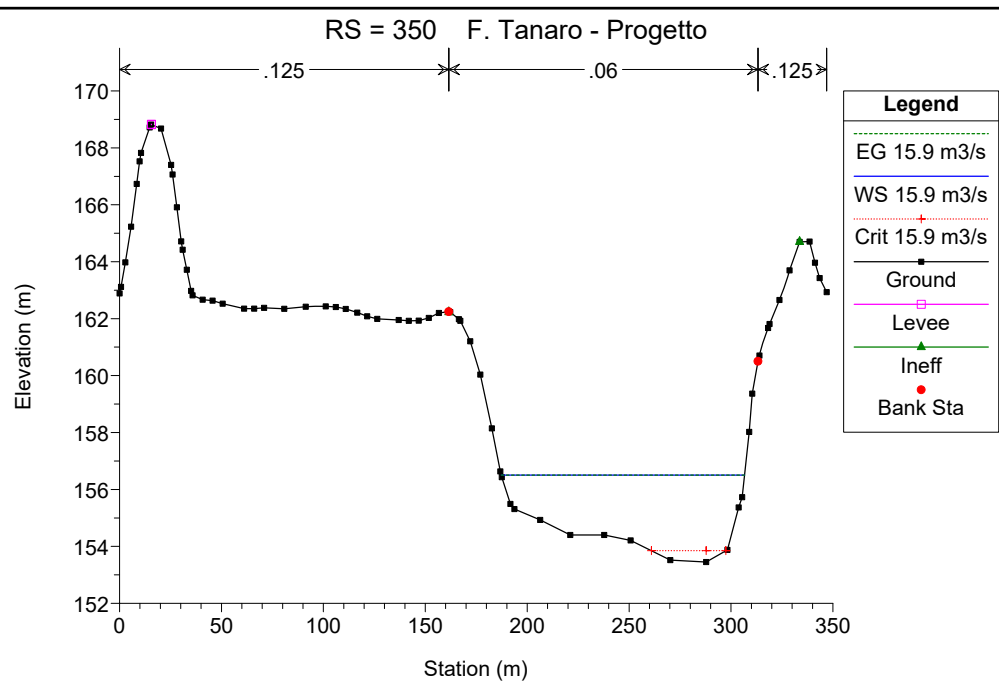
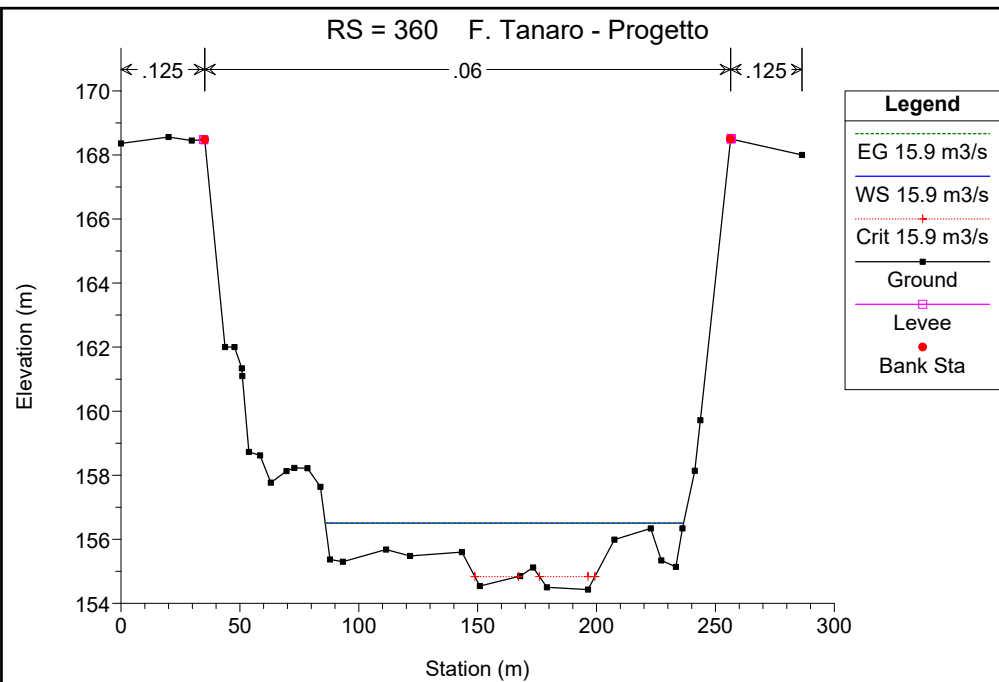


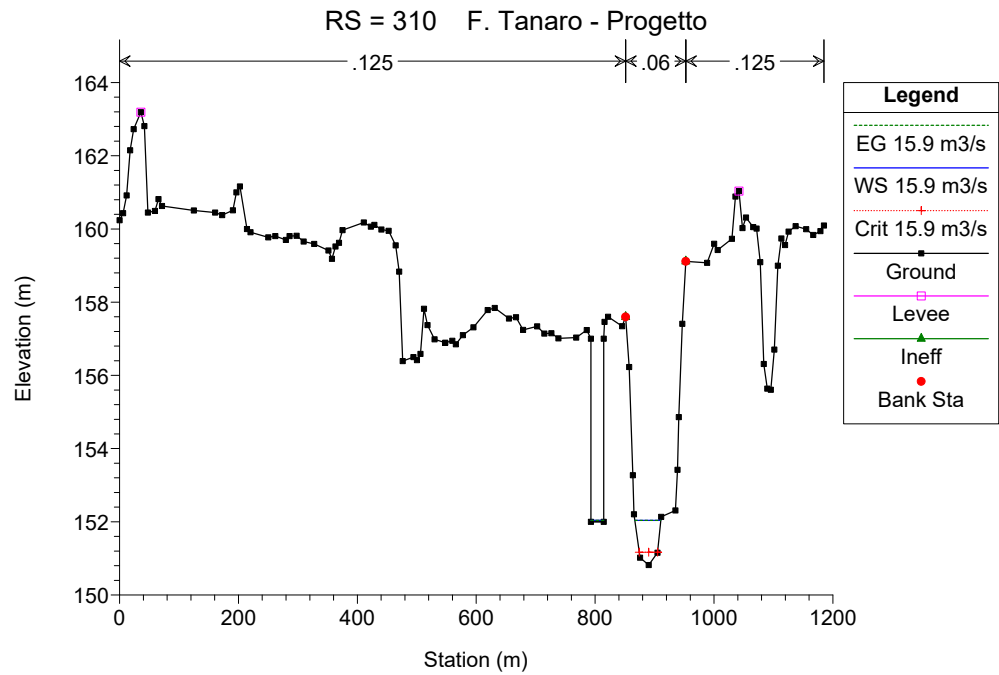
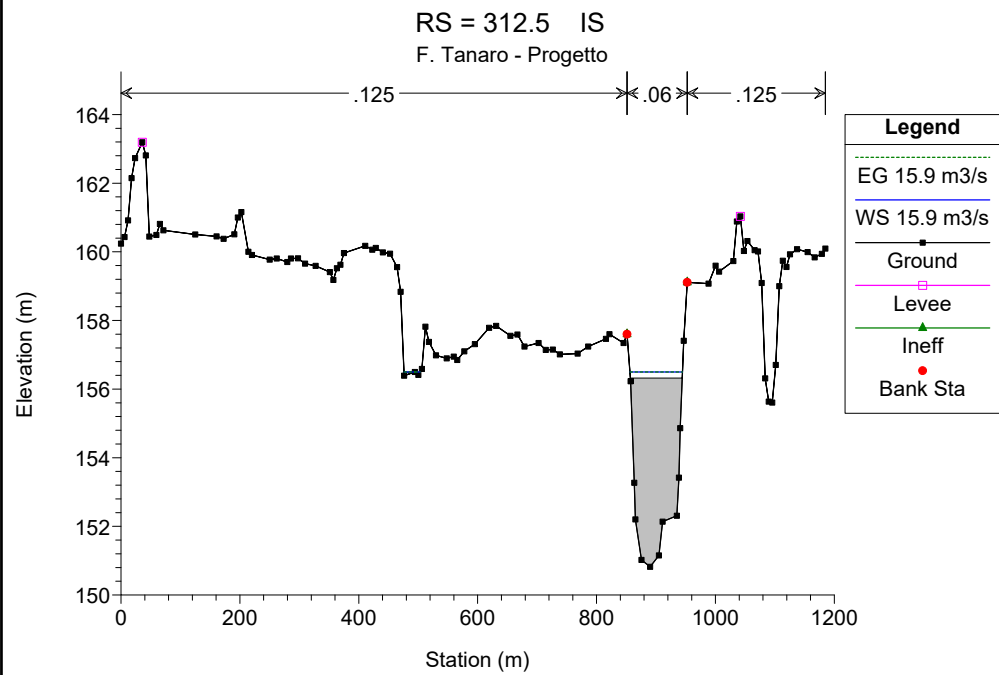
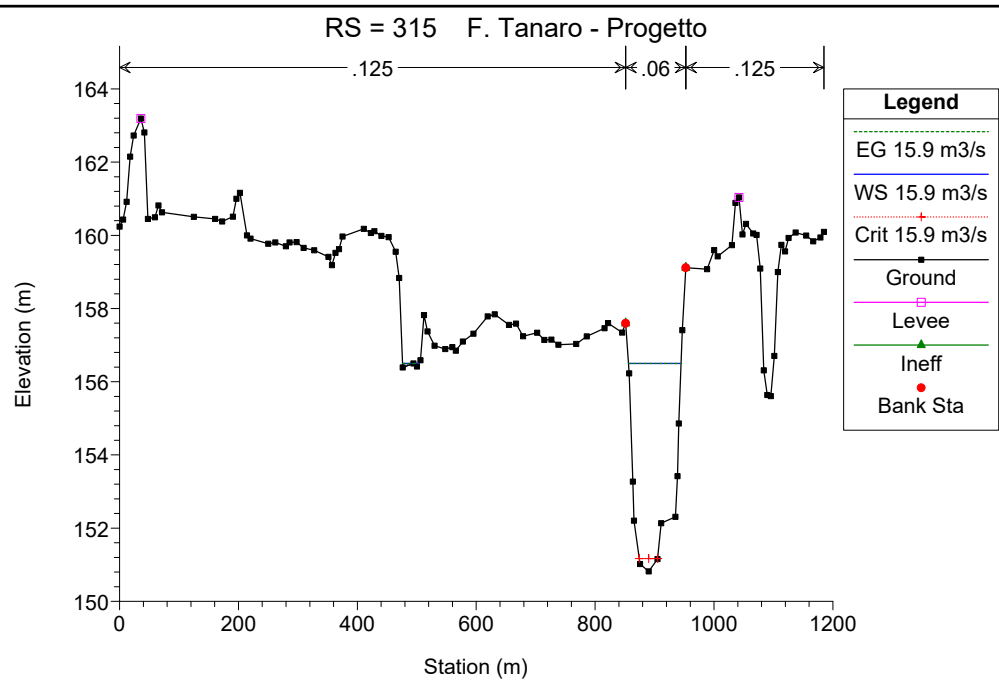
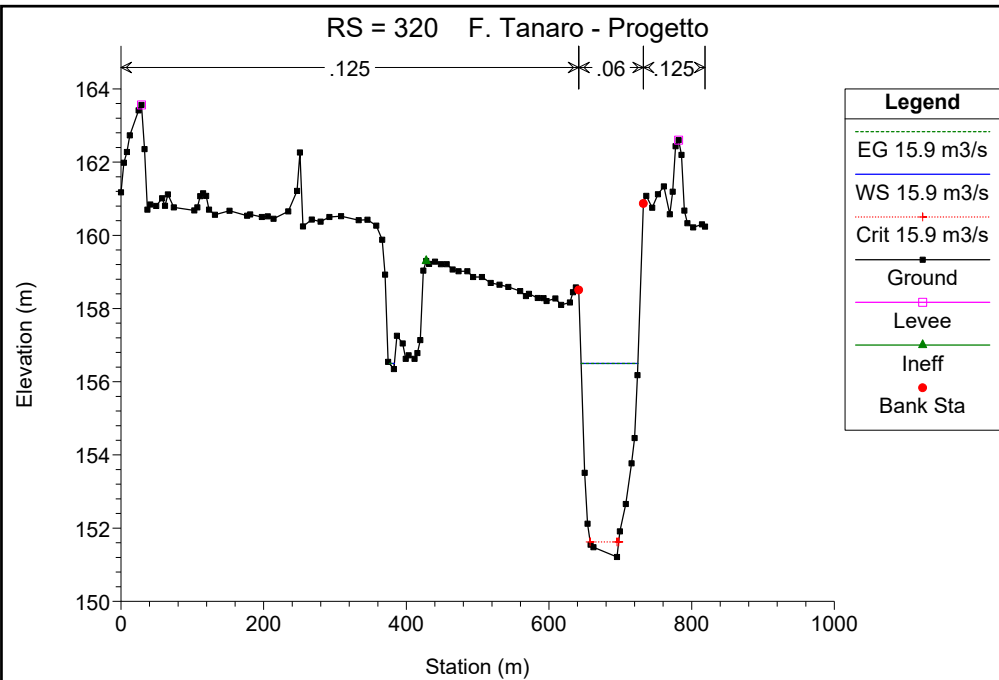


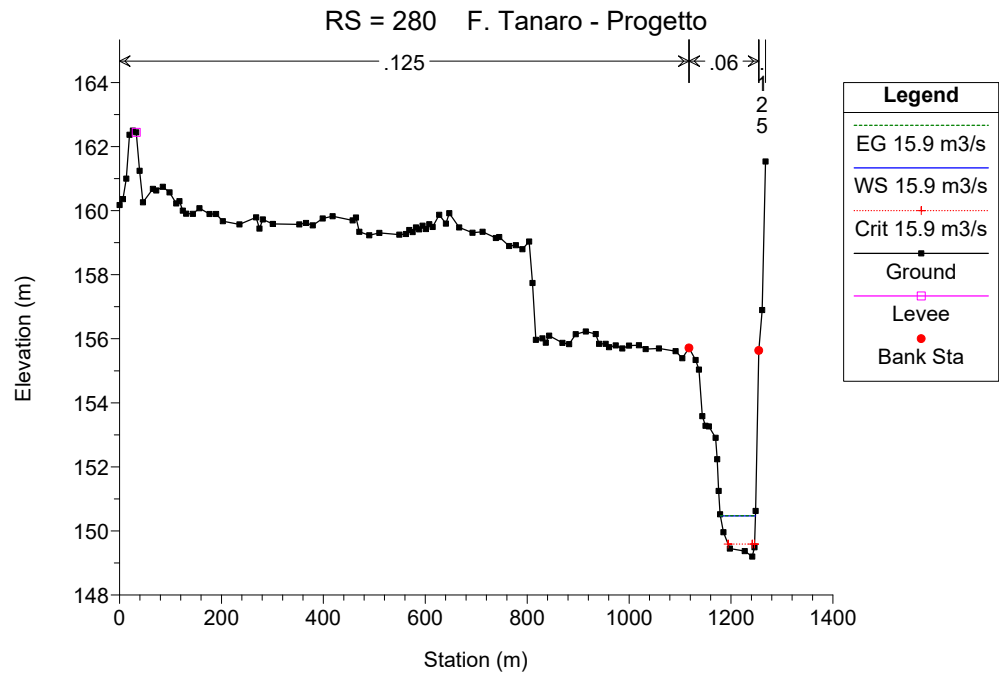
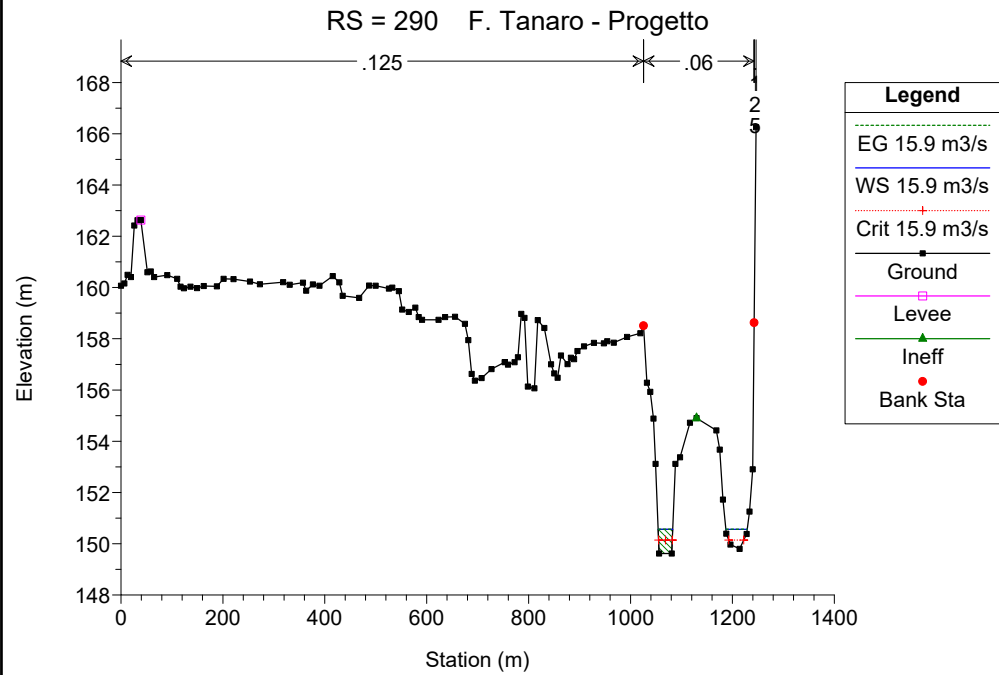
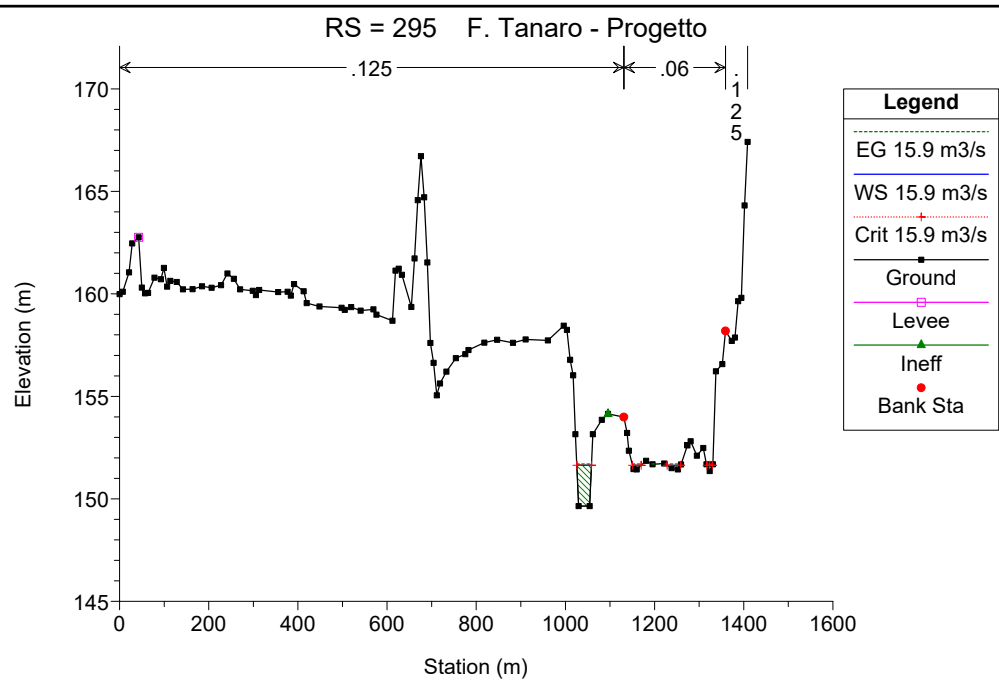
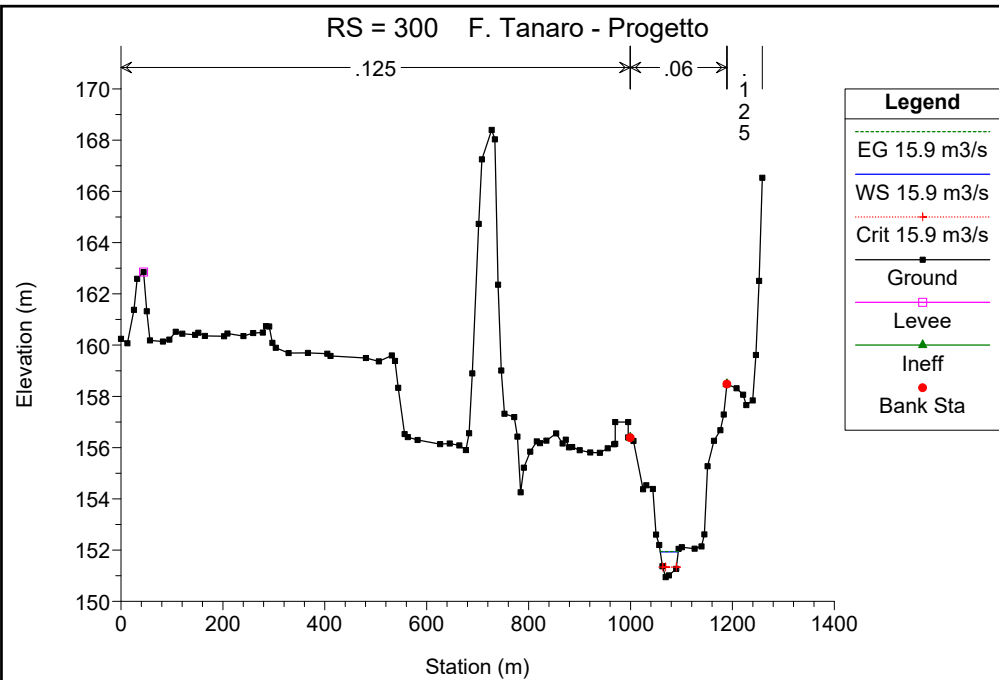


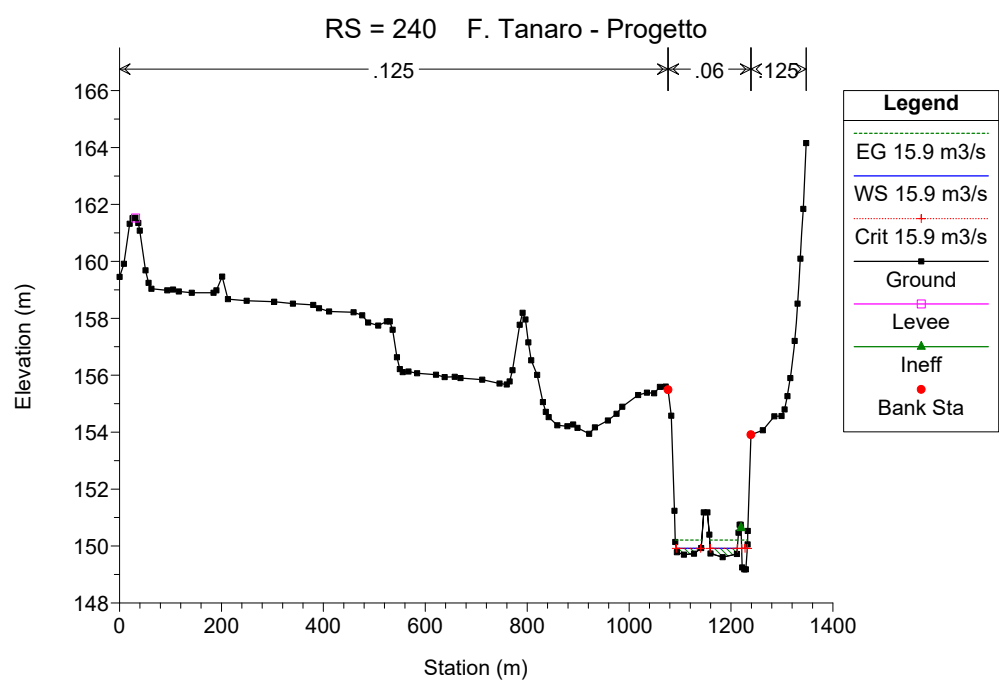
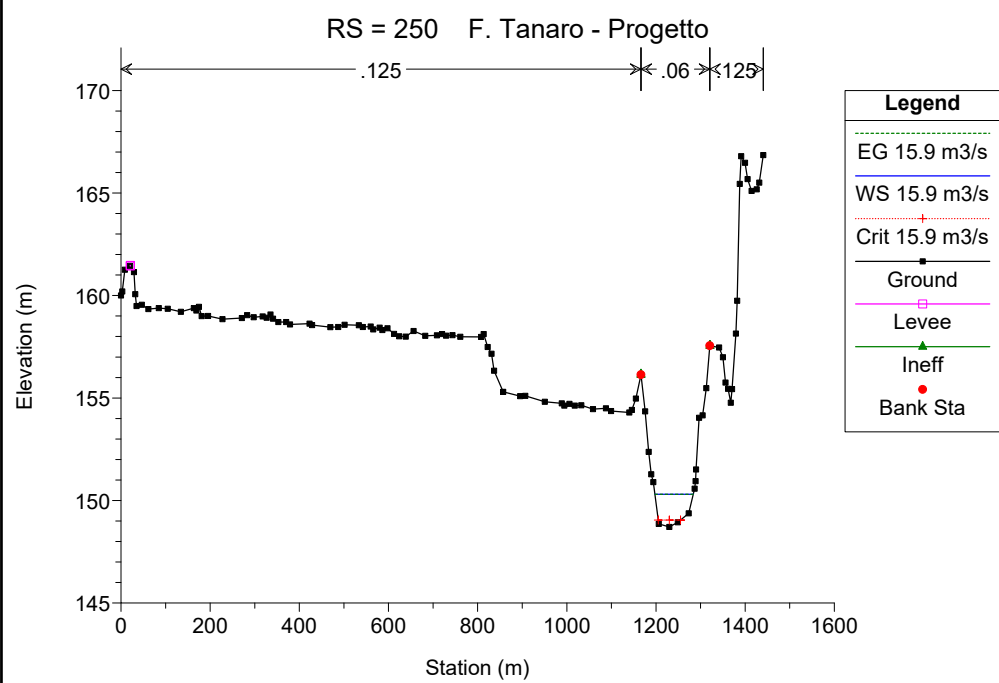
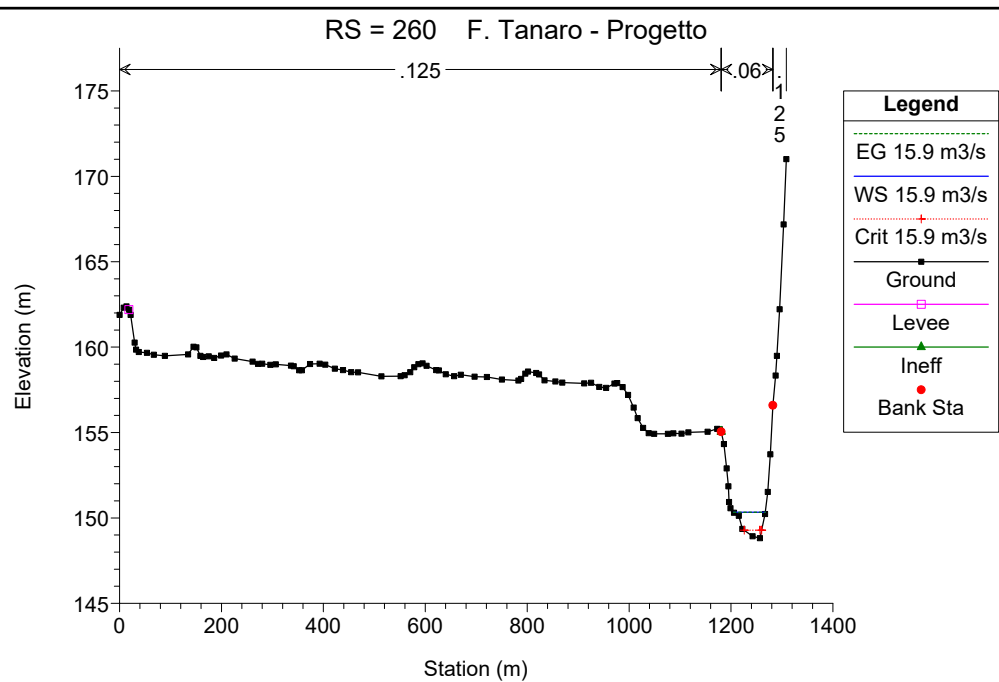
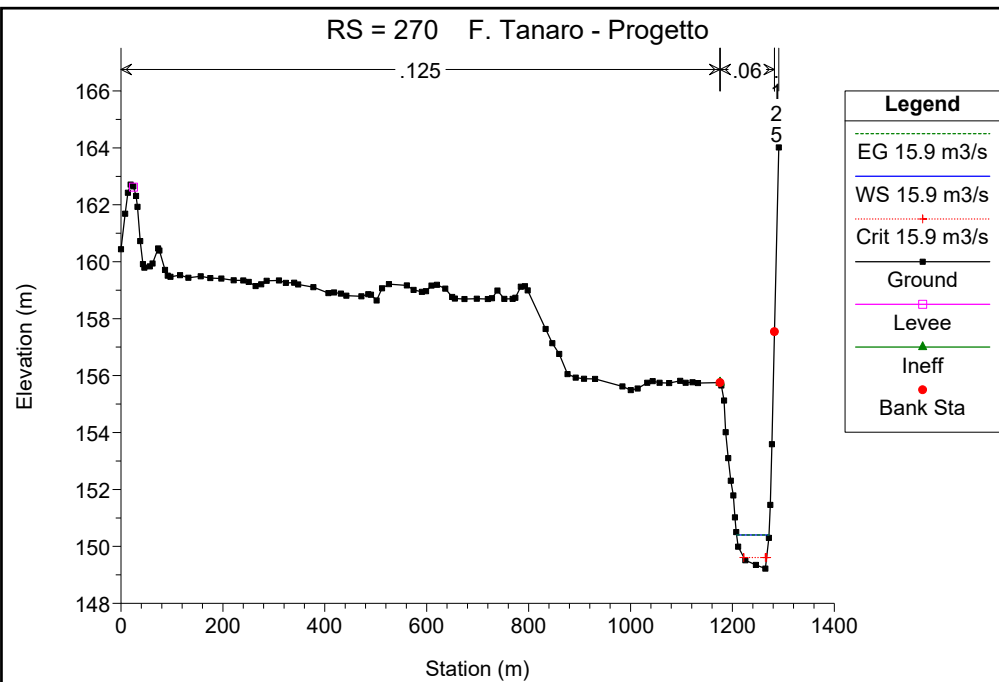




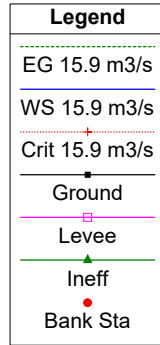
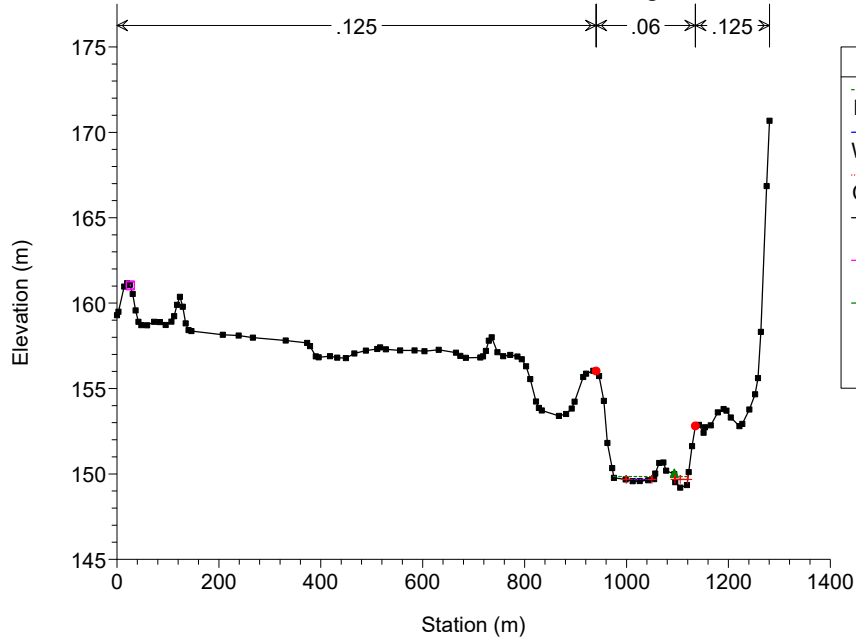




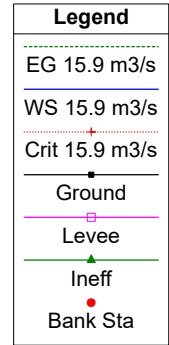
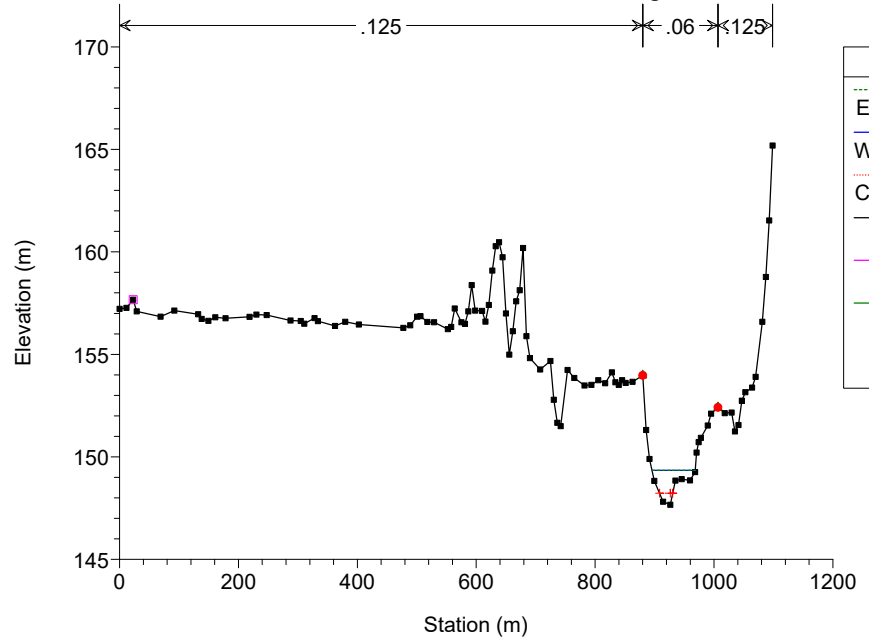




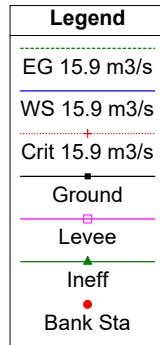
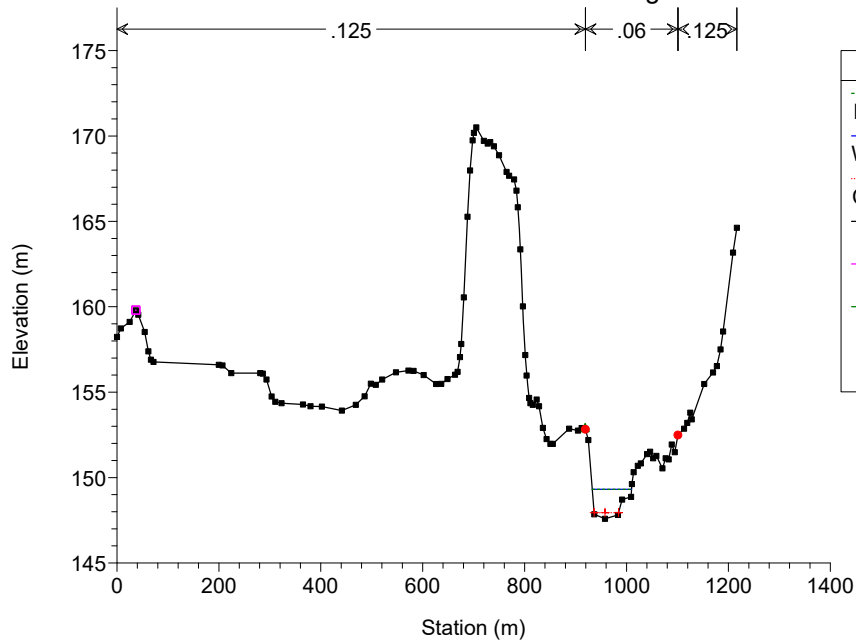
RS = 230 F. Tanaro - Progetto



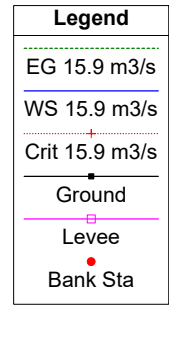
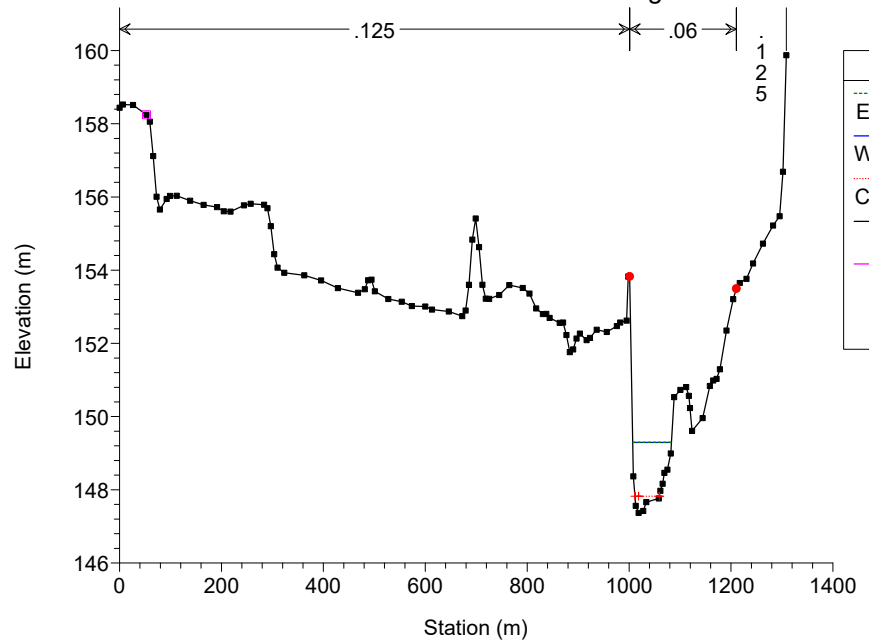
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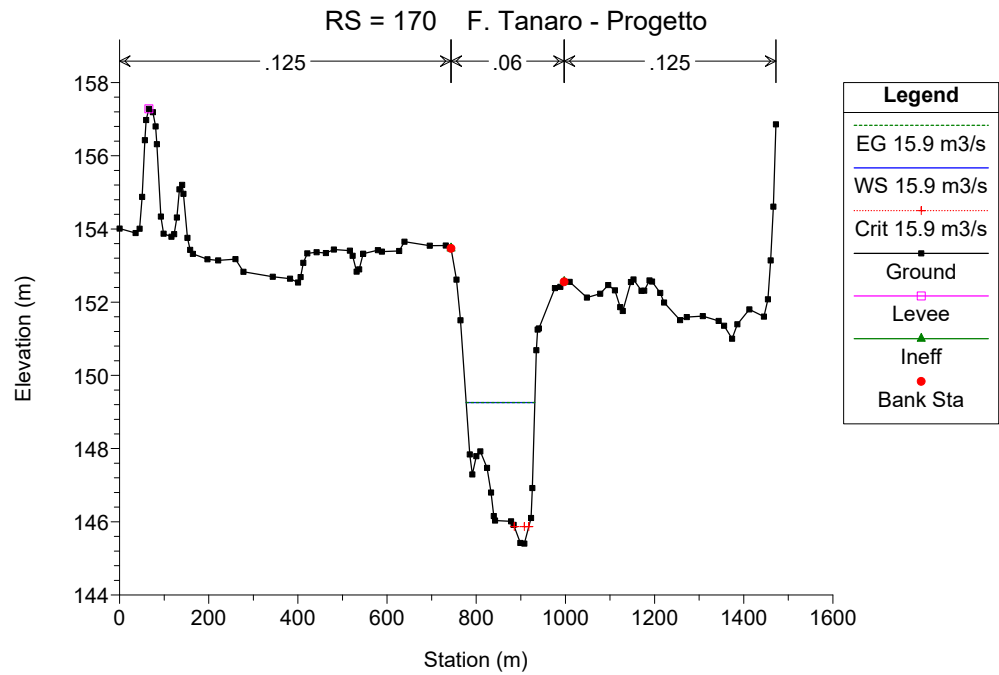
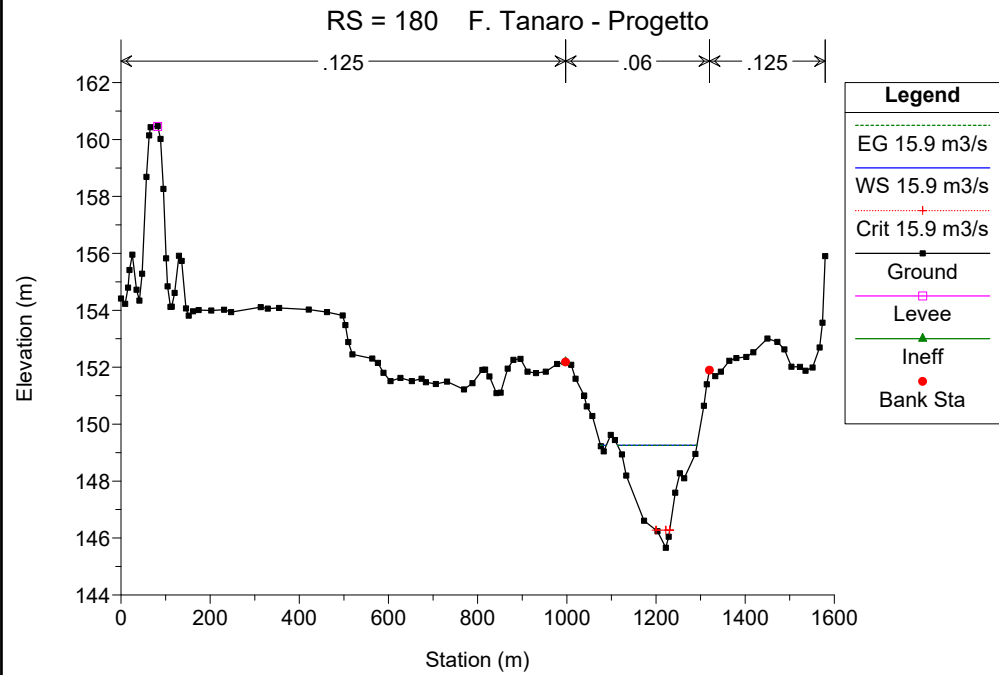
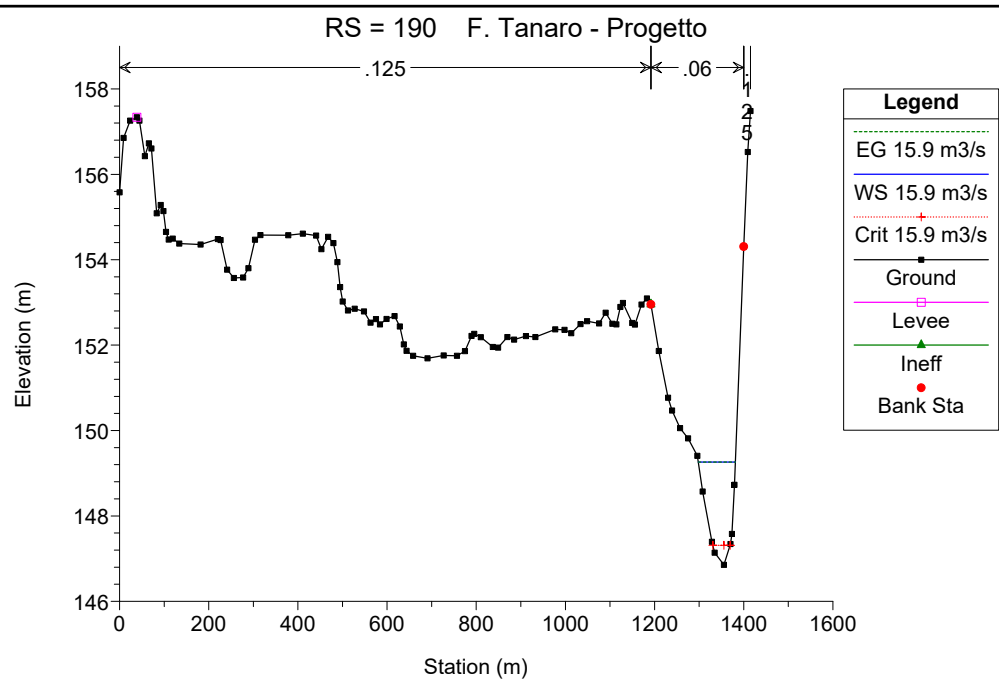
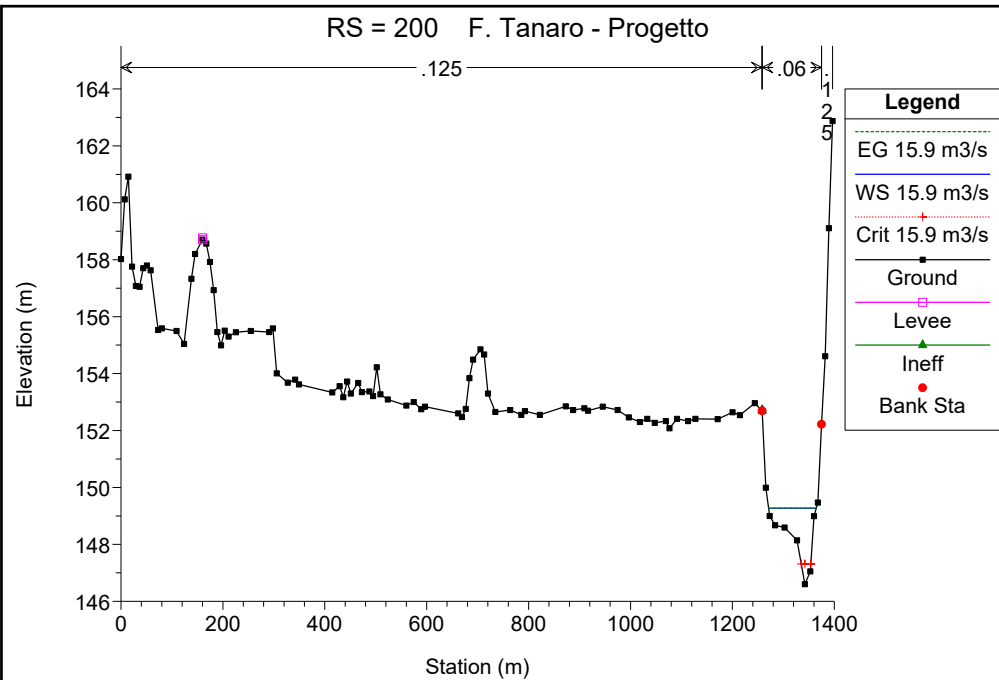


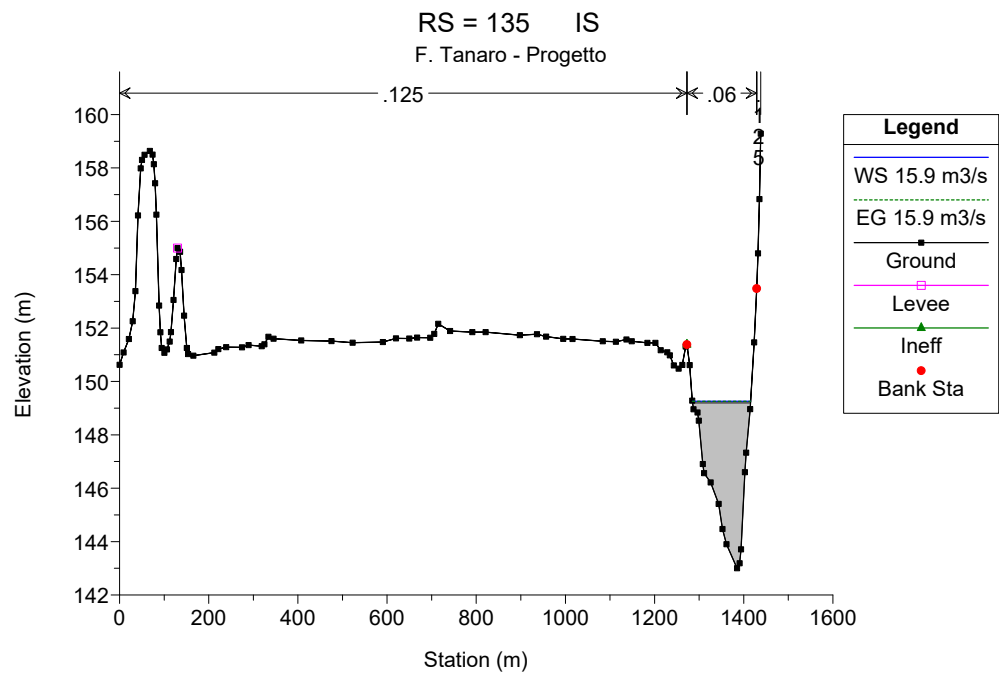
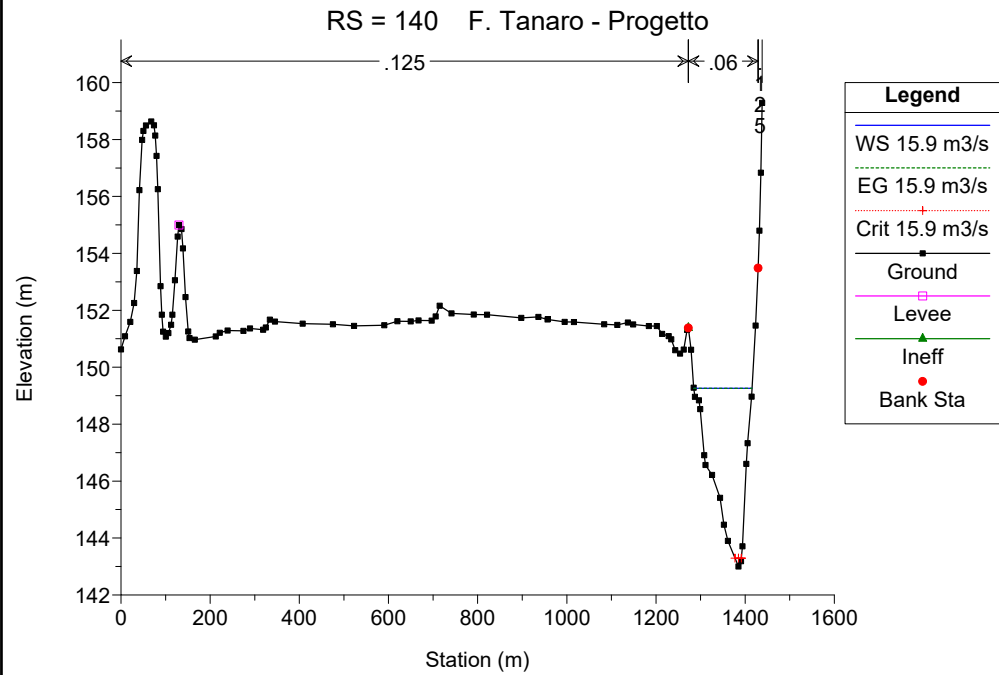
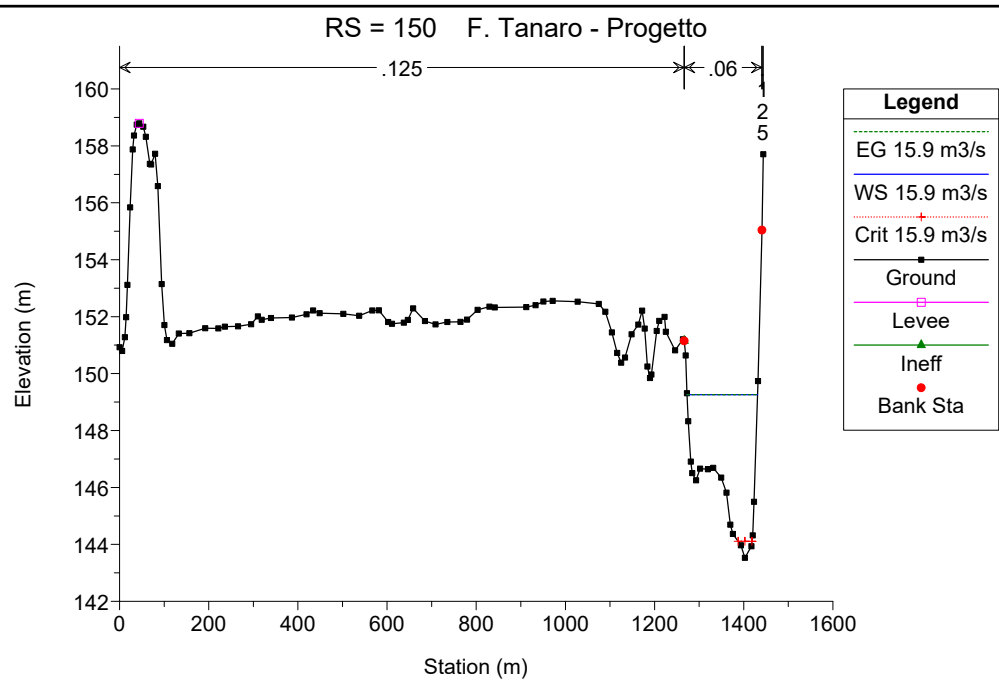
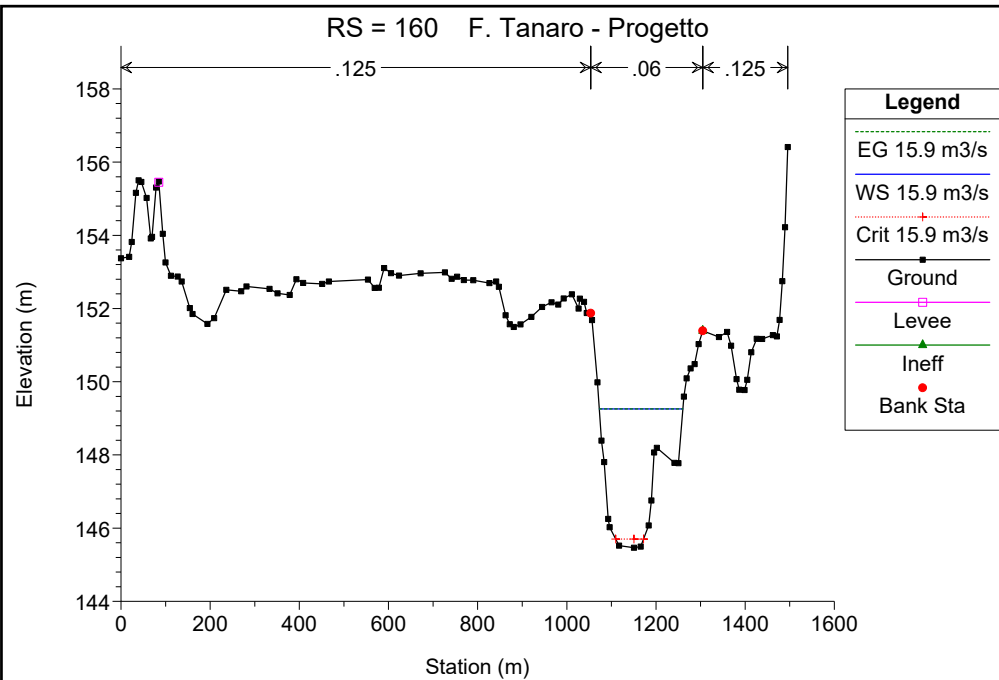
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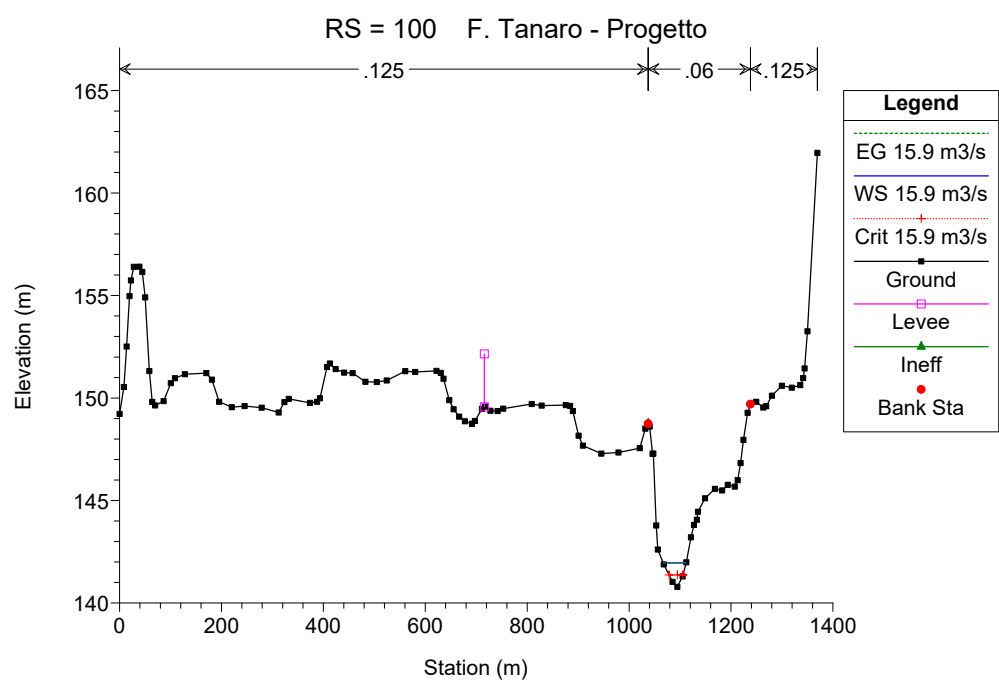
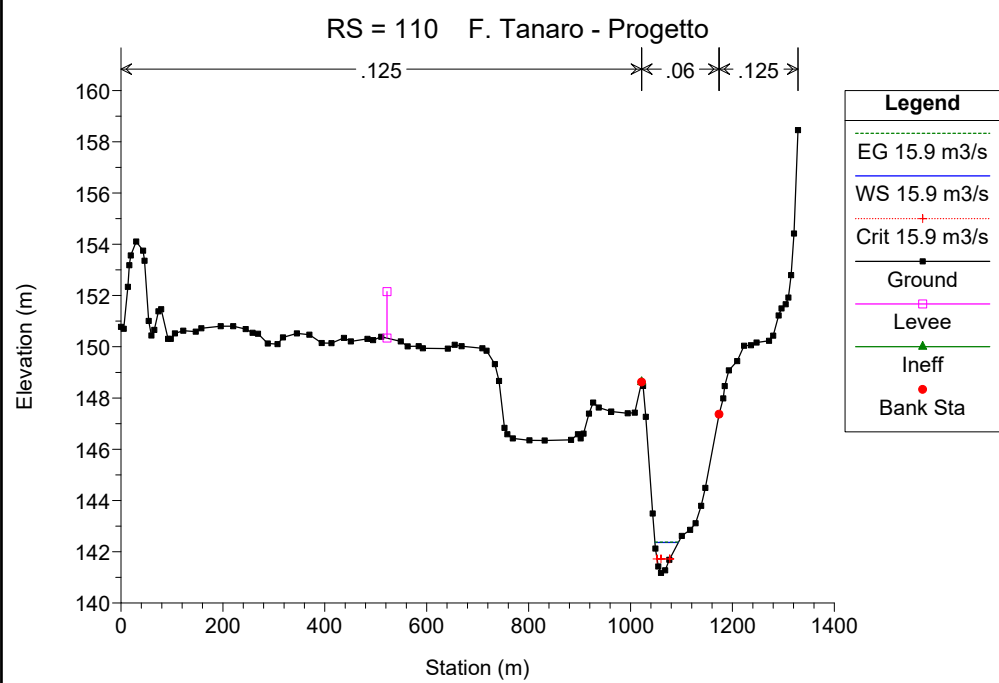
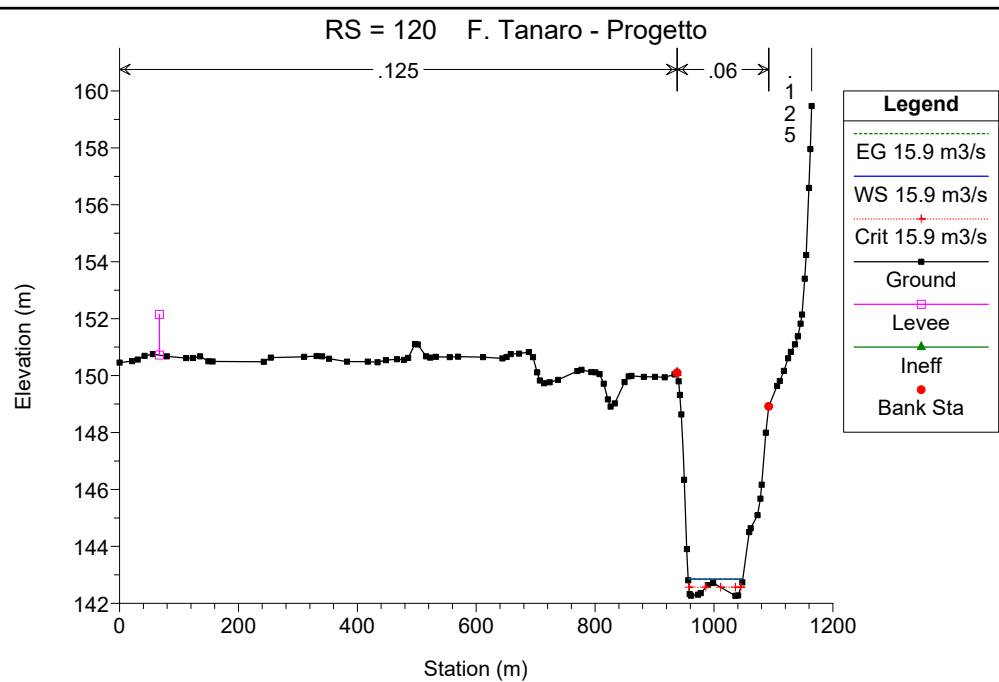
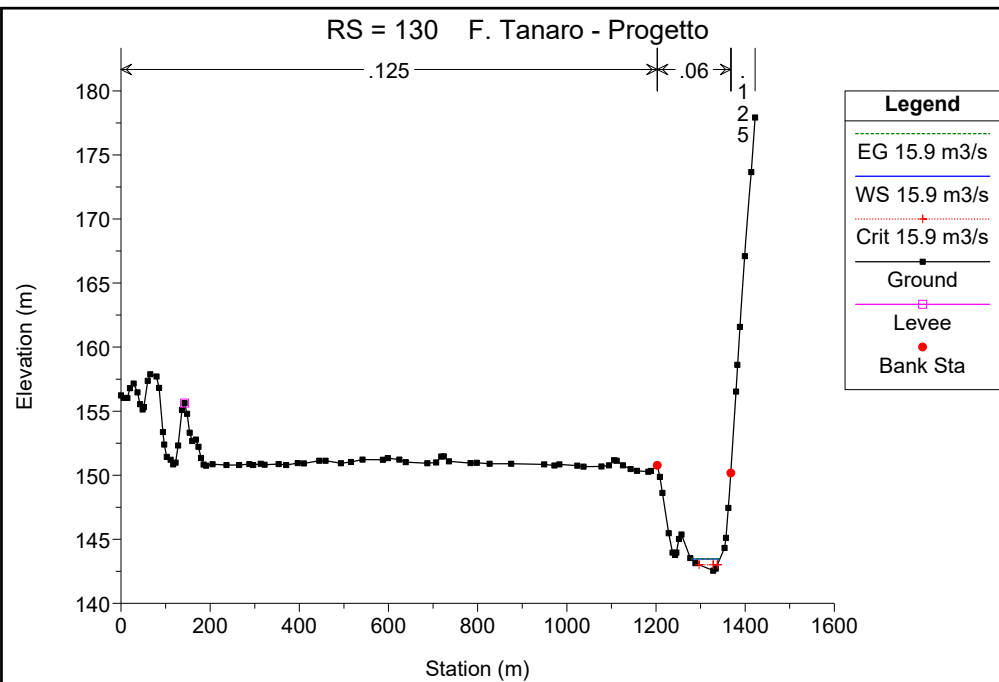


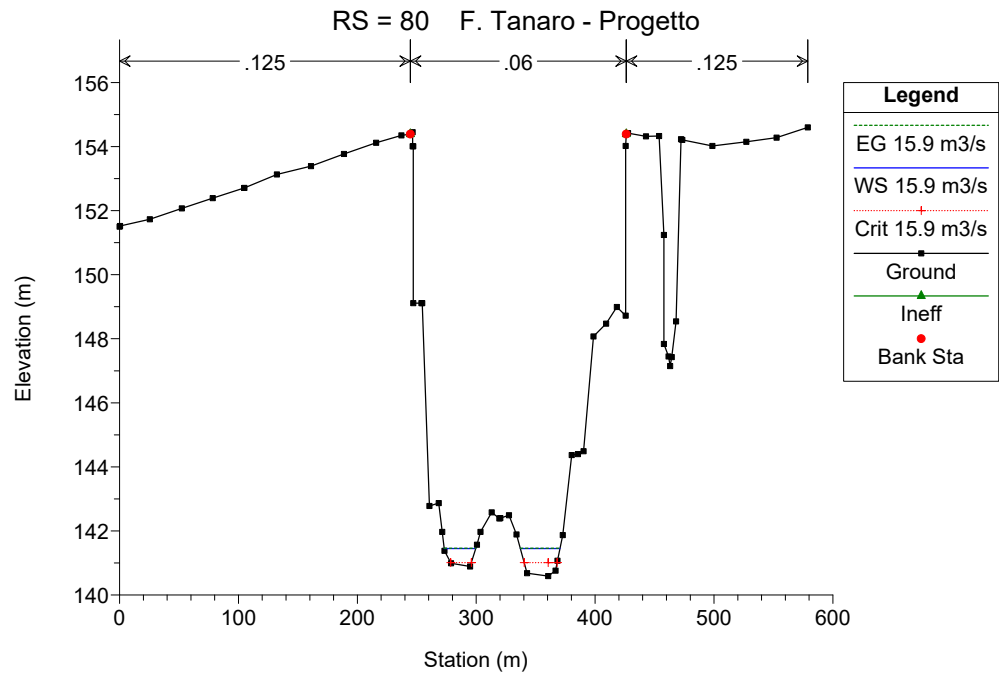
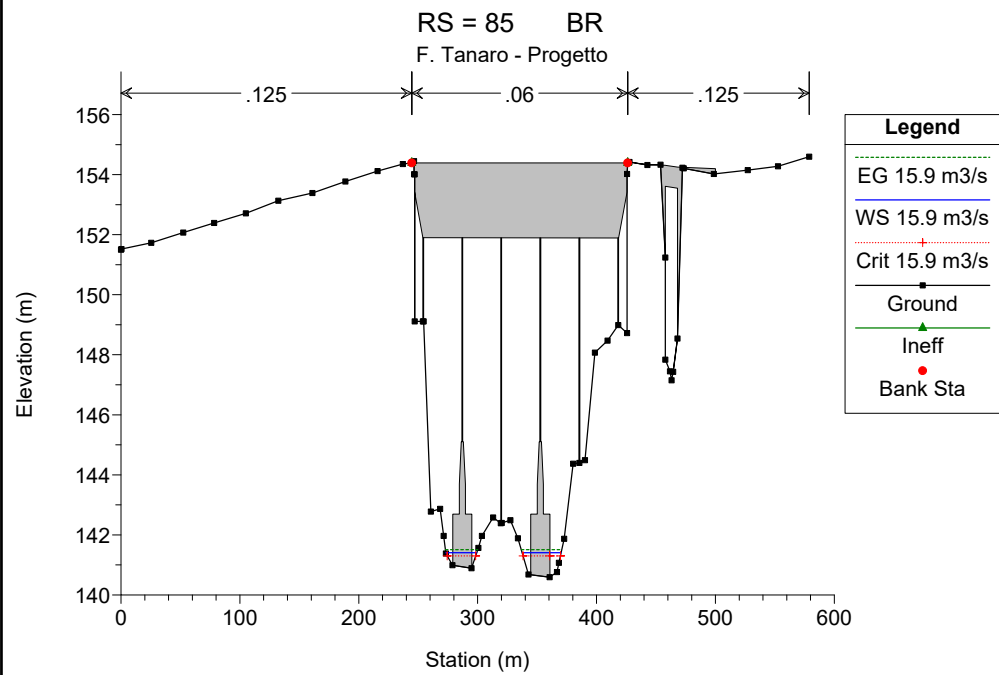
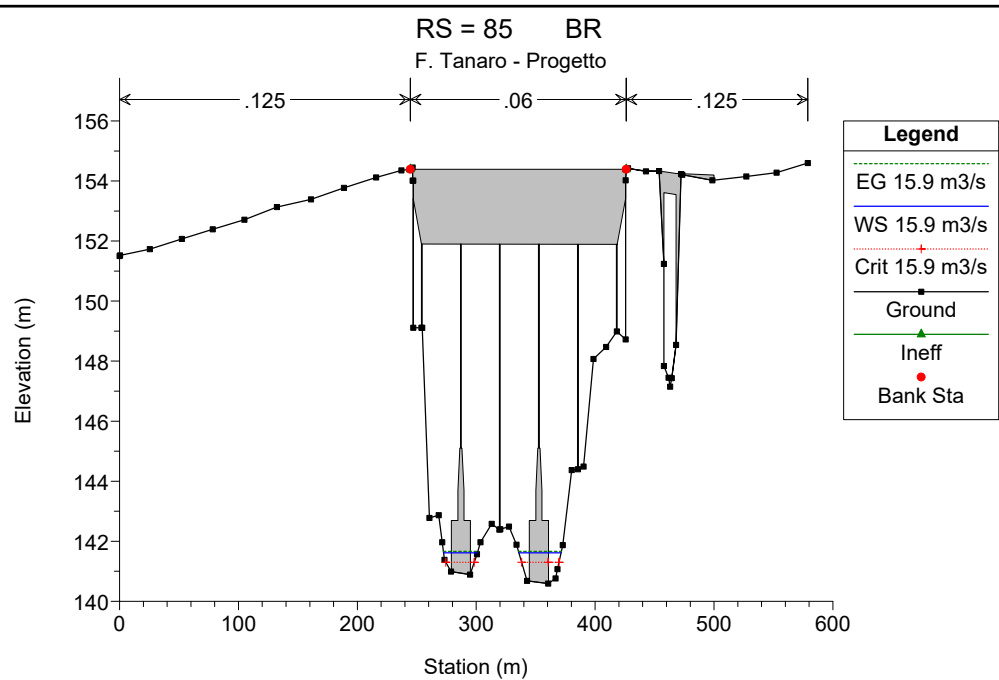
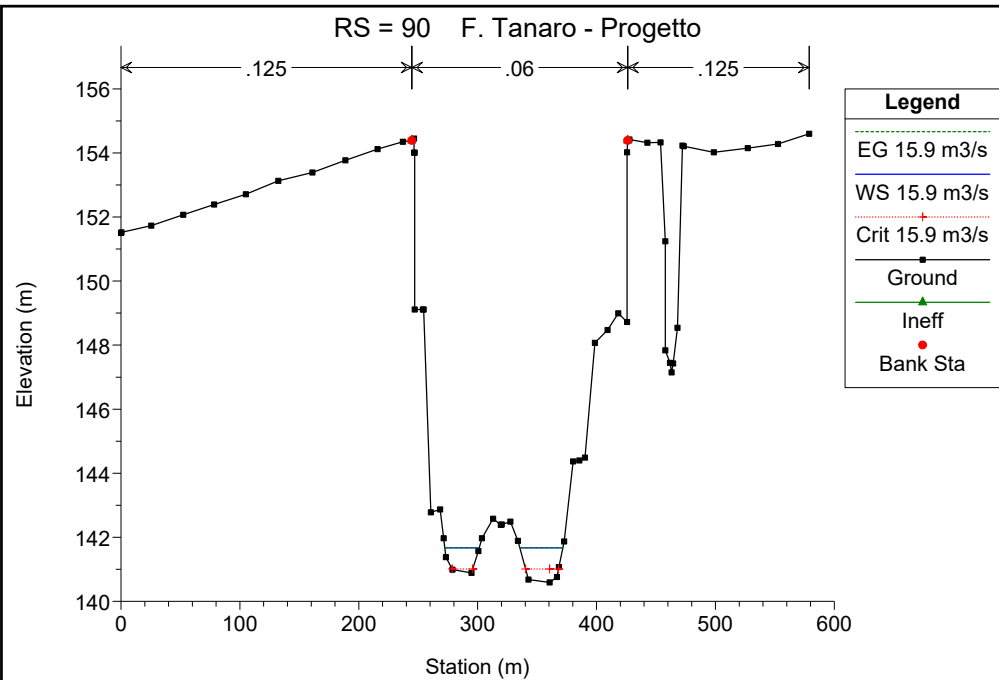
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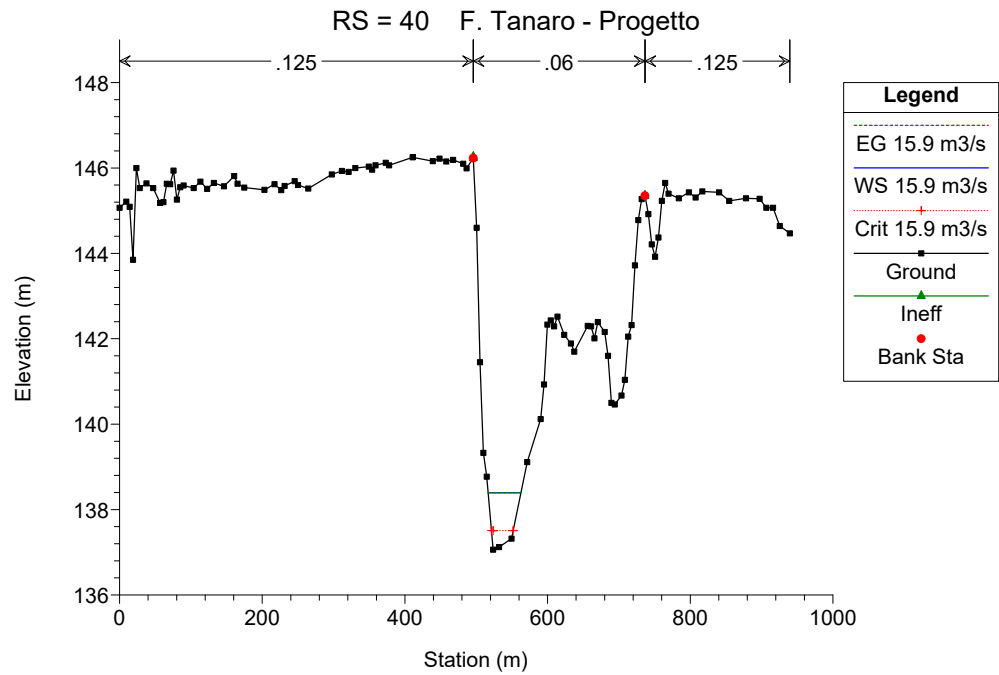
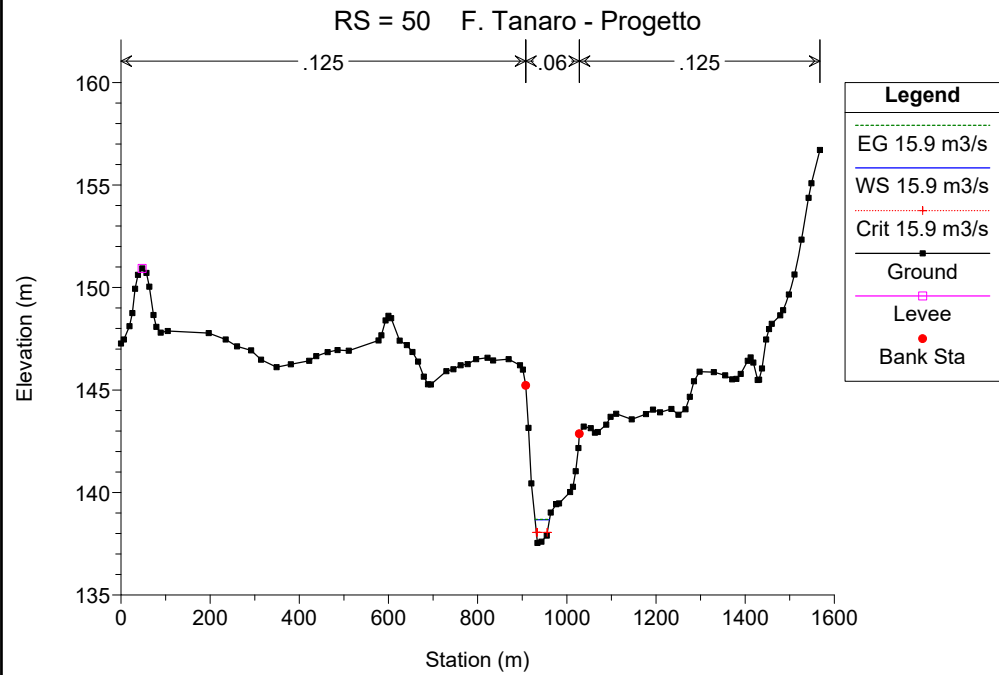
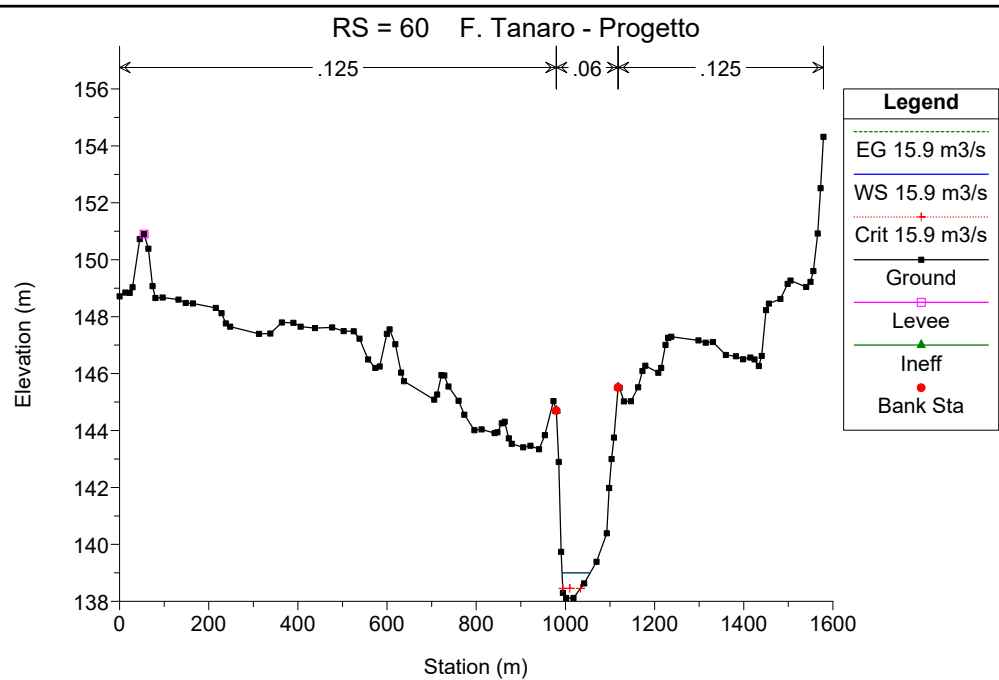
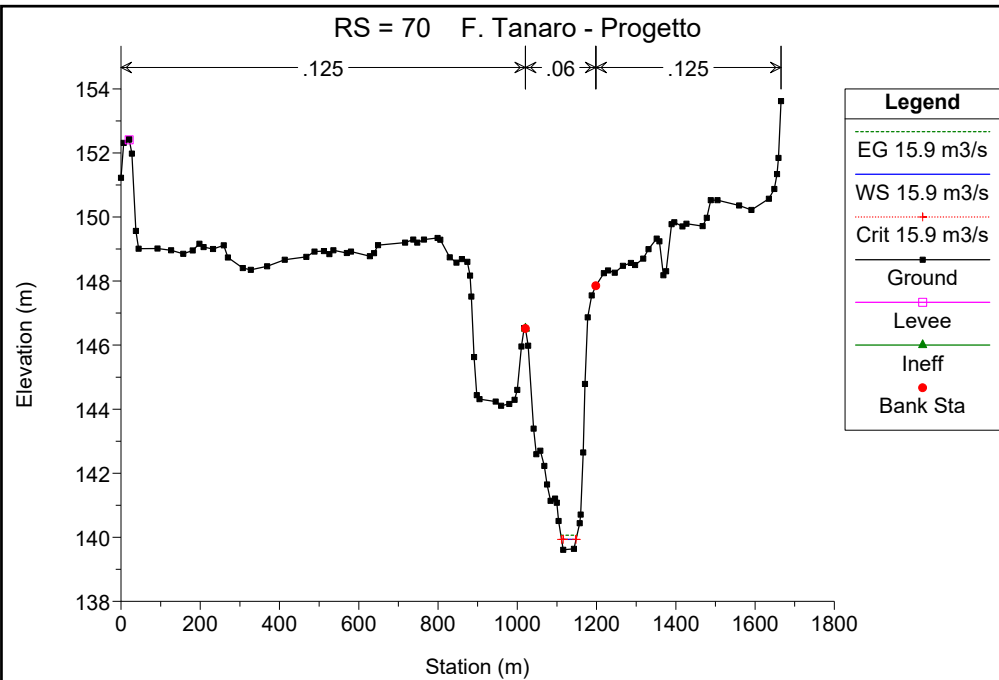


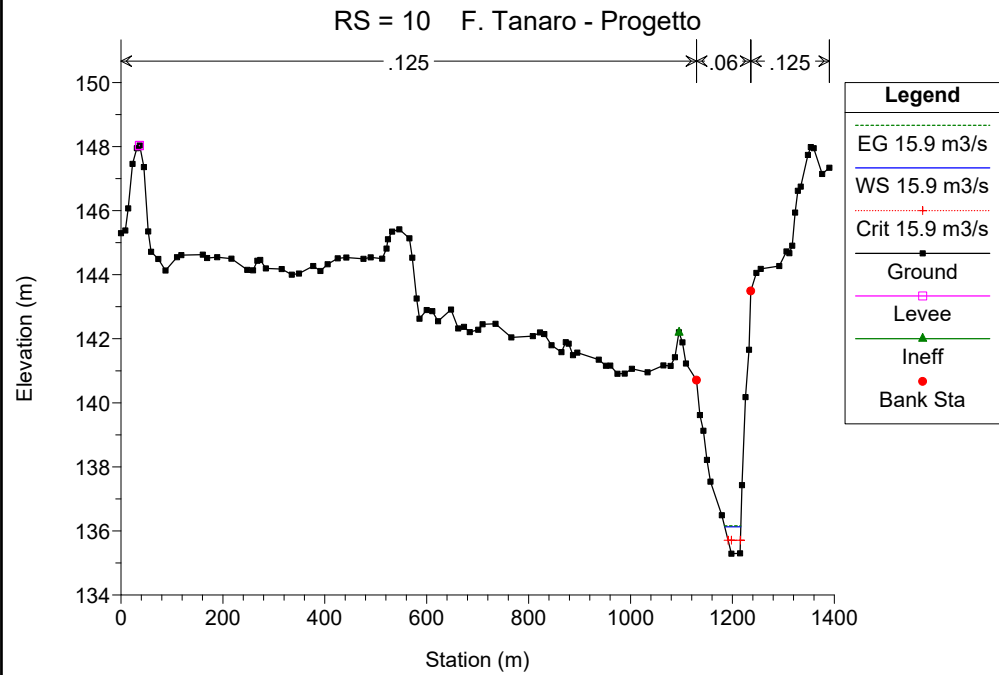
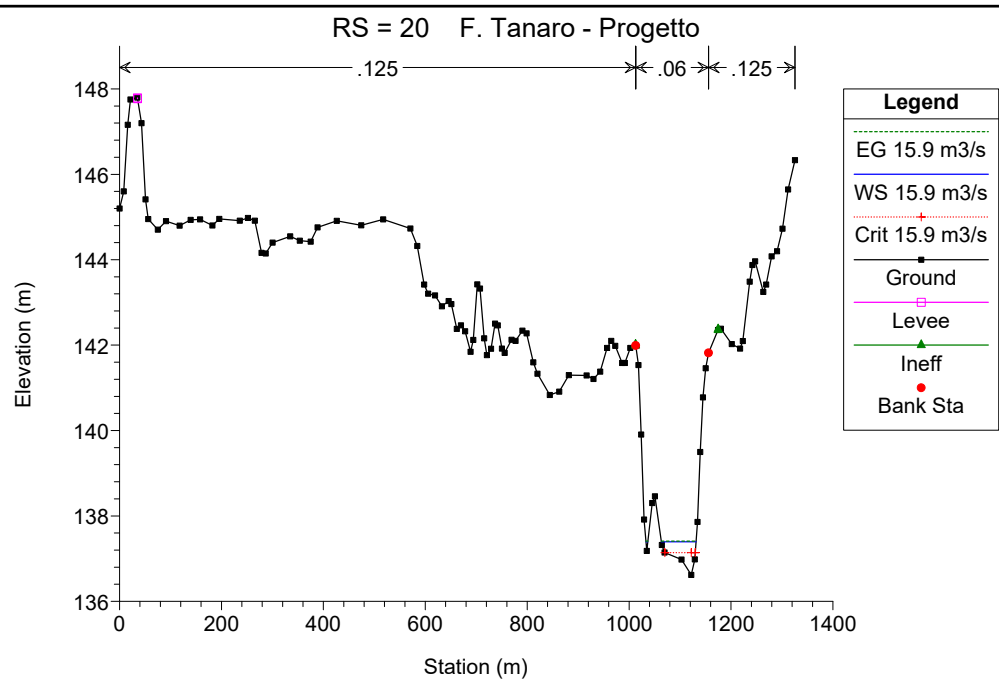
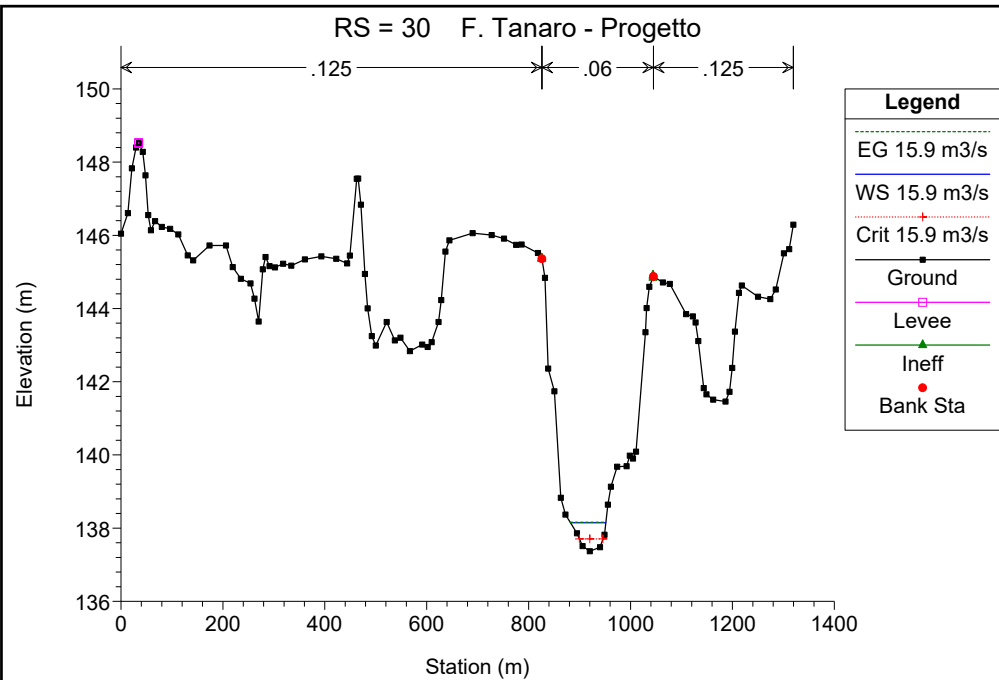












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE ATTUALE
PORTATA MEDIA DERIVATA**

SIMULAZIONE 27

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	52 in alveo	media derivata

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 52 m3/s

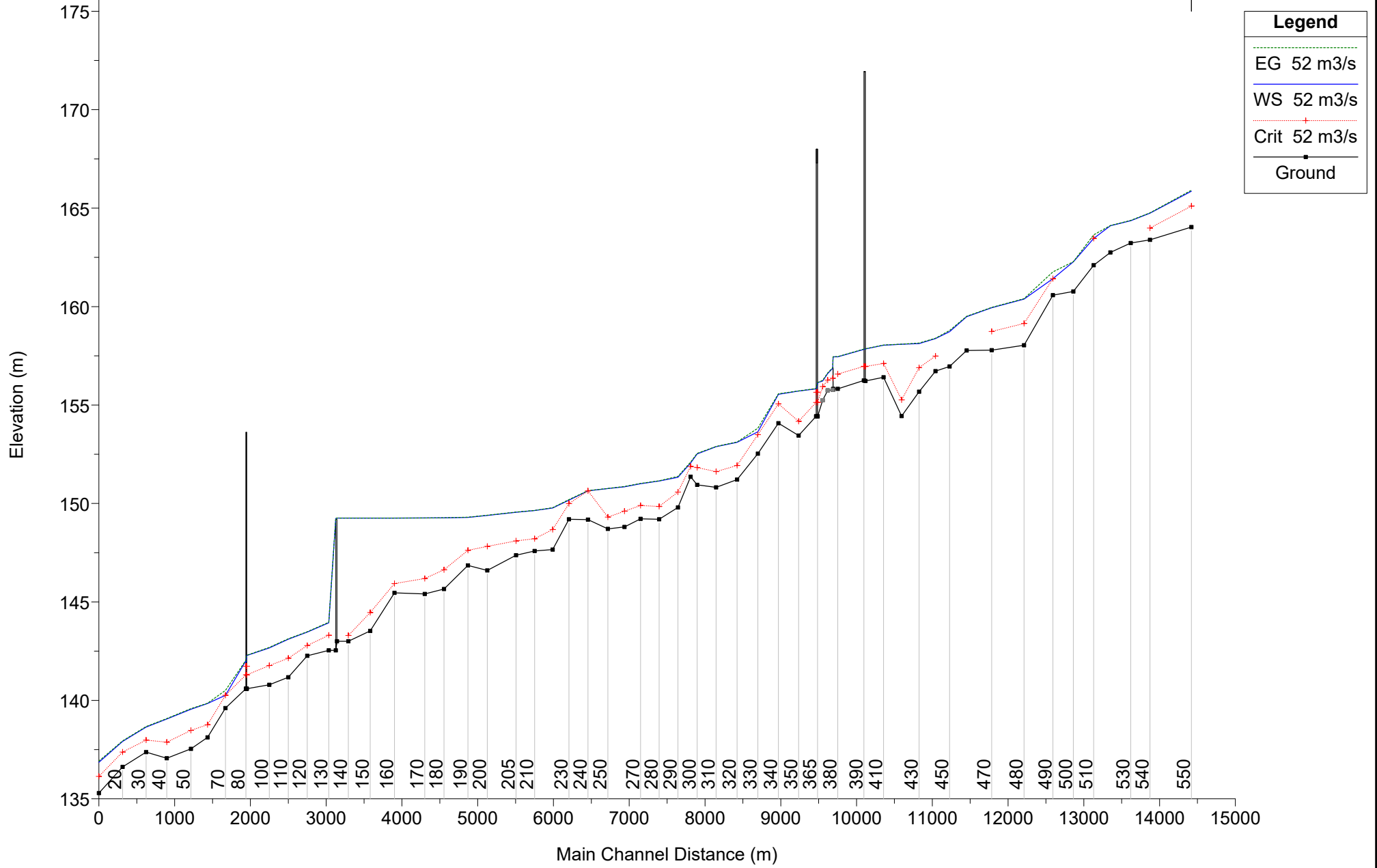
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	52 m3/s	52.00	164.04	165.86	165.11	165.91	0.003508	0.95	54.51	56.80	0.31
1	540	52 m3/s	52.00	163.39	164.74	163.99	164.76	0.001373	0.61	84.59	84.78	0.20
1	530	52 m3/s	52.00	163.23	164.36		164.38	0.001685	0.59	88.44	110.95	0.21
1	520	52 m3/s	52.00	162.75	164.11		164.12	0.000635	0.43	121.55	118.00	0.13
1	510	52 m3/s	52.00	162.10	163.46	163.46	163.65	0.050275	1.89	27.52	76.40	1.00
1	500	52 m3/s	52.00	160.77	162.27		162.28	0.000564	0.44	118.49	101.30	0.13
1	490	52 m3/s	52.00	160.58	161.42	161.42	161.76	0.040044	2.60	19.97	28.78	1.00
1	480	52 m3/s	52.00	158.04	160.38	159.14	160.40	0.001017	0.62	84.46	67.40	0.18
1	470	52 m3/s	52.00	157.79	159.94	158.74	159.96	0.001049	0.61	85.08	70.27	0.18
1	460	52 m3/s	52.00	157.77	159.48		159.51	0.001879	0.67	77.18	85.60	0.23
1	450	52 m3/s	52.00	156.96	158.72		158.79	0.006579	1.09	47.61	65.20	0.41
1	440	52 m3/s	52.00	156.72	158.38	157.49	158.39	0.000974	0.59	88.33	73.11	0.17
1	430	52 m3/s	52.00	155.68	158.12	156.90	158.15	0.001366	0.68	76.79	66.24	0.20
1	420	52 m3/s	52.00	154.44	158.09	155.26	158.09	0.000080	0.24	217.96	106.81	0.05
1	410	52 m3/s	52.00	156.41	158.04	157.11	158.05	0.000703	0.47	110.95	101.40	0.14
1	400	52 m3/s	52.00	156.22	157.85	156.96	157.86	0.000882	0.52	99.07	90.16	0.16
1	395		Bridge									
1	390	52 m3/s	52.00	156.25	157.83	156.97	157.84	0.000949	0.54	96.90	90.15	0.17
1	380	52 m3/s	52.00	155.82	157.45	156.57	157.46	0.001298	0.53	97.42	116.00	0.19
1	379		Inl Struct									
1	370	52 m3/s	52.00	154.43	156.14	155.13	156.15	0.000644	0.40	129.51	139.36	0.13
1	365		Bridge									
1	360	52 m3/s	52.00	154.43	155.82	155.13	155.84	0.002161	0.60	87.31	128.99	0.23
1	350	52 m3/s	52.00	153.45	155.71	154.17	155.72	0.000214	0.31	166.48	114.62	0.08
1	340	52 m3/s	52.00	154.08	155.55	155.06	155.57	0.003027	0.70	74.07	110.13	0.27
1	330	52 m3/s	52.00	152.53	153.64	153.50	153.82	0.021601	1.87	27.76	41.43	0.73
1	320	52 m3/s	52.00	151.21	153.11	151.93	153.13	0.000846	0.61	85.06	59.71	0.16
1	310	52 m3/s	52.00	150.82	152.88	151.62	152.90	0.000785	0.55	94.19	72.86	0.15
1	300	52 m3/s	52.00	150.95	152.52	151.83	152.55	0.003226	0.77	67.68	92.40	0.29
1	295	52 m3/s	52.00	151.36	152.06	151.88	152.10	0.009563	0.91	57.30	137.74	0.45
1	290	52 m3/s	52.00	149.80	151.33	150.58	151.37	0.002468	0.90	57.56	50.30	0.27
1	280	52 m3/s	52.00	149.20	151.14	149.85	151.15	0.000428	0.46	113.08	72.83	0.12
1	270	52 m3/s	52.00	149.22	151.00	149.90	151.02	0.000702	0.55	94.93	68.42	0.15
1	260	52 m3/s	52.00	148.81	150.85	149.61	150.86	0.000801	0.56	93.31	72.46	0.16
1	250	52 m3/s	52.00	148.71	150.76	149.31	150.77	0.000261	0.36	144.26	92.97	0.09
1	240	52 m3/s	52.00	149.18	150.64	150.64	150.65	0.000863	0.45	114.74	127.69	0.15
1	230	52 m3/s	52.00	149.20	150.17	149.99	150.20	0.005490	0.79	65.78	128.23	0.35
1	220	52 m3/s	52.00	147.66	149.77	148.68	149.79	0.000949	0.57	90.89	76.96	0.17
1	210	52 m3/s	52.00	147.59	149.64	148.21	149.65	0.000379	0.43	120.84	78.62	0.11
1	205	52 m3/s	52.00	147.37	149.55	148.10	149.56	0.000329	0.41	125.47	77.57	0.10

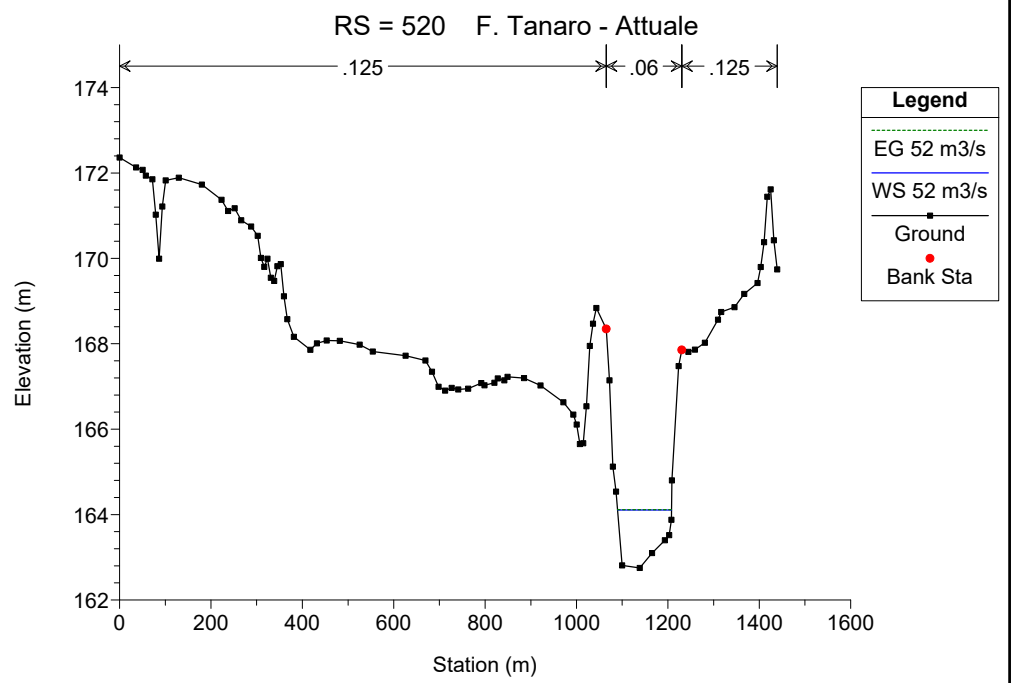
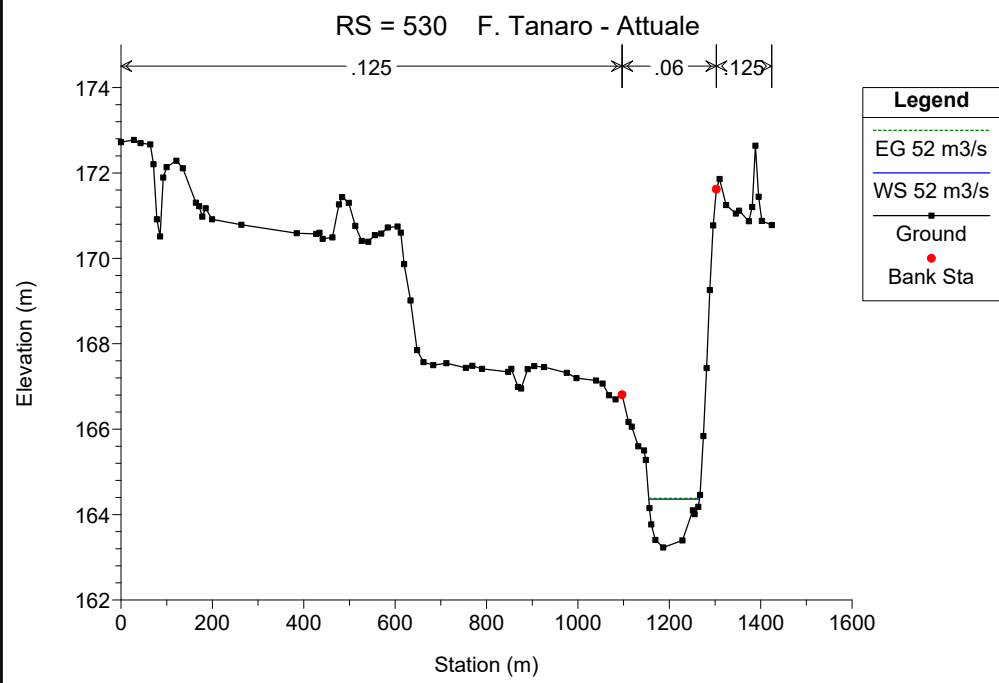
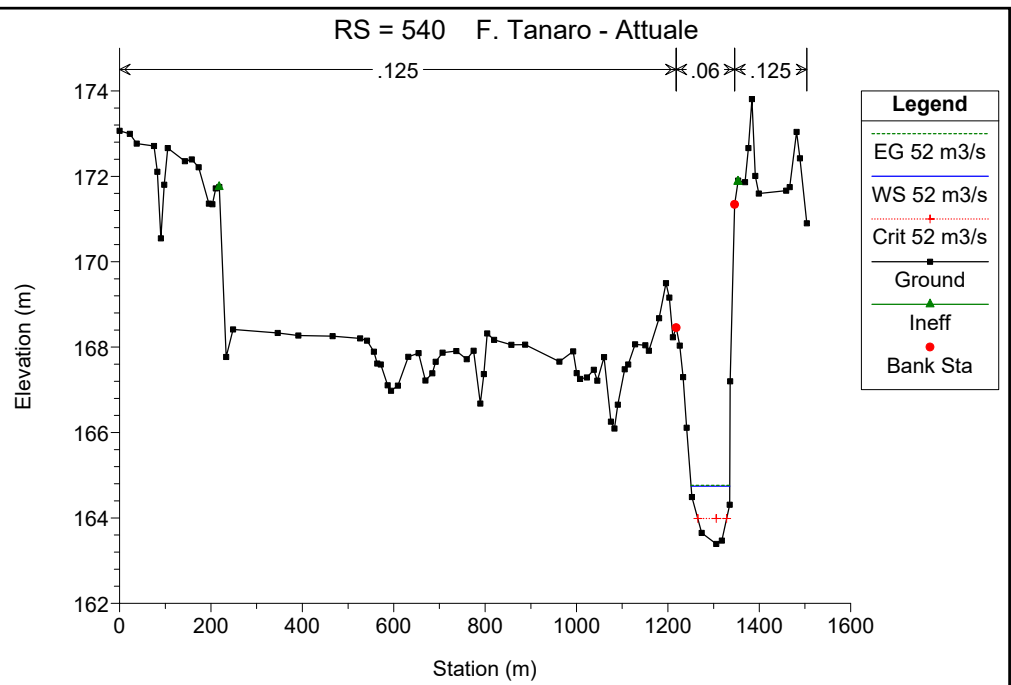
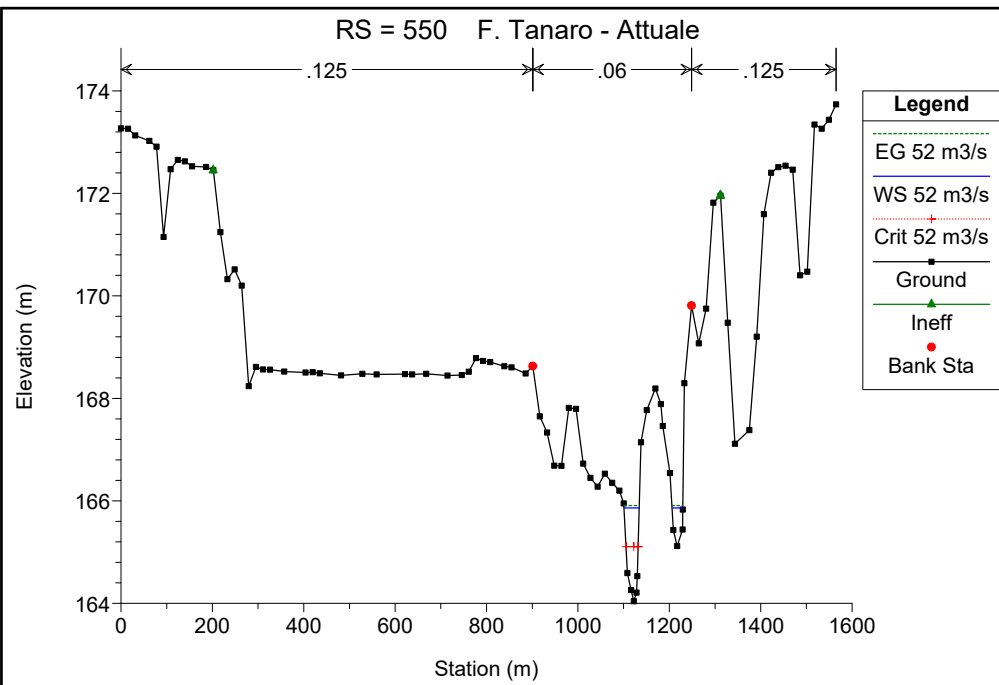
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 52 m3/s (Continued)

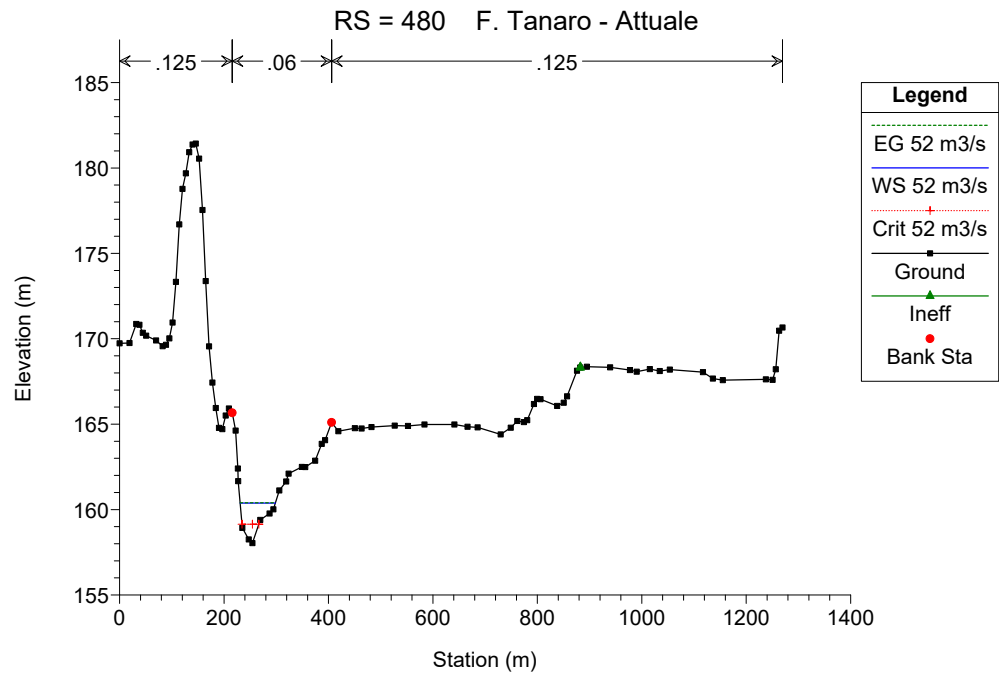
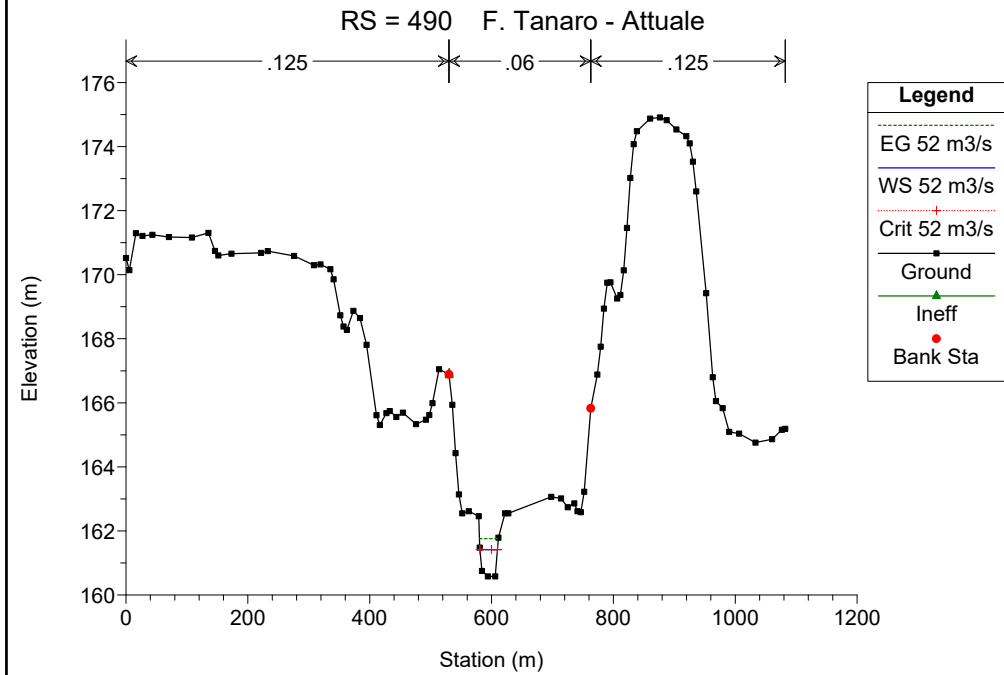
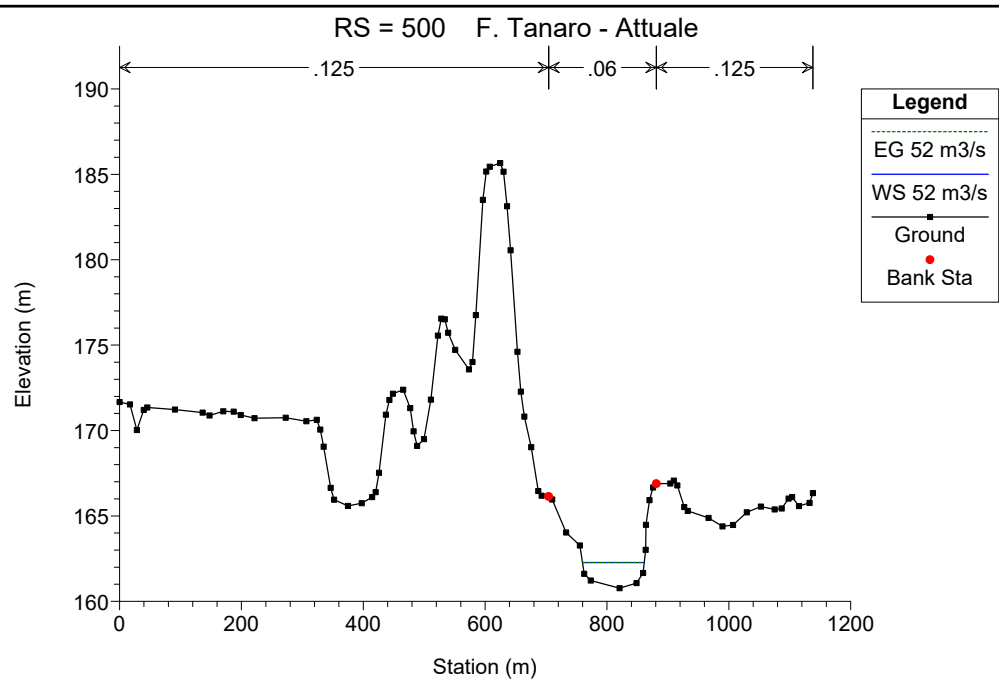
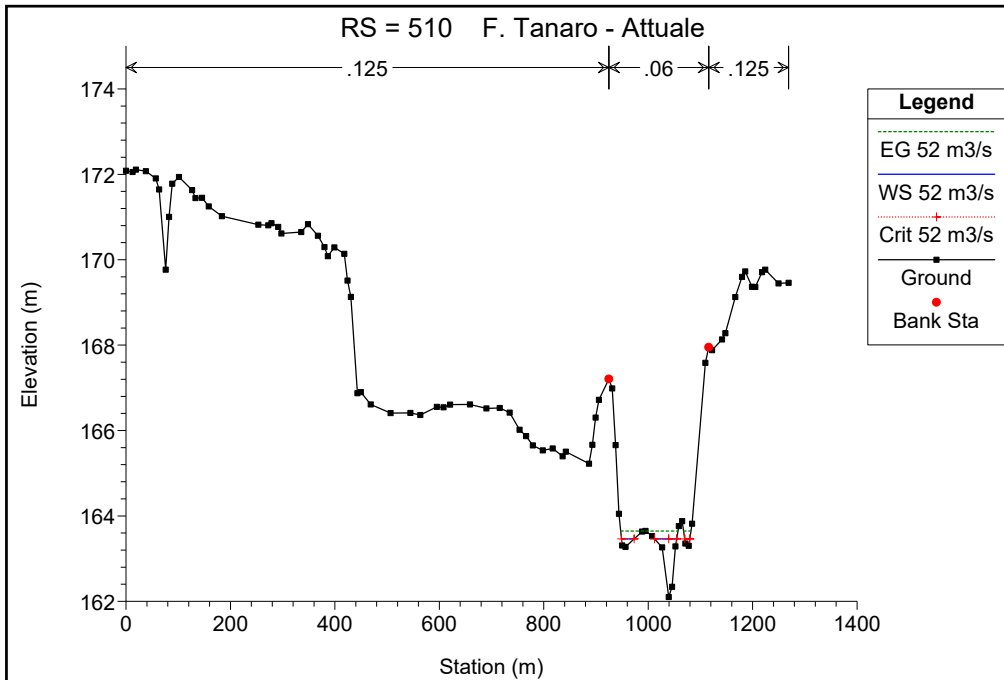
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	52 m3/s	52.00	146.60	149.39	147.82	149.40	0.000574	0.45	115.58	96.22	0.13
1	190	52 m3/s	52.00	146.85	149.29	147.62	149.30	0.000274	0.38	136.62	84.00	0.10
1	180	52 m3/s	52.00	145.66	149.27	146.63	149.27	0.000042	0.16	334.06	192.05	0.04
1	170	52 m3/s	52.00	145.40	149.27	146.19	149.27	0.000017	0.13	403.91	154.06	0.03
1	160	52 m3/s	52.00	145.46	149.26	145.93	149.26	0.000013	0.11	464.61	187.34	0.02
1	150	52 m3/s	52.00	143.53	149.26	144.46	149.26	0.000006	0.09	558.21	158.23	0.02
1	140	52 m3/s	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	52 m3/s	52.00	142.54	143.94	143.31	143.97	0.002664	0.75	68.96	83.95	0.27
1	120	52 m3/s	52.00	142.27	143.47	142.78	143.48	0.001174	0.56	93.57	97.21	0.18
1	110	52 m3/s	52.00	141.17	143.11	142.14	143.13	0.001695	0.66	78.47	82.48	0.22
1	100	52 m3/s	52.00	140.79	142.66	141.77	142.69	0.001808	0.76	68.33	61.25	0.23
1	90	52 m3/s	52.00	140.59	142.28	141.29	142.29	0.001006	0.57	91.70	82.03	0.17
1	85		Bridge									
1	80	52 m3/s	52.00	140.59	142.02	141.29	142.04	0.002005	0.73	71.36	73.56	0.24
1	70	52 m3/s	52.00	139.61	140.26	140.26	140.51	0.044346	2.21	23.50	46.92	1.00
1	60	52 m3/s	52.00	138.12	139.84	138.76	139.85	0.000747	0.50	103.89	89.91	0.15
1	50	52 m3/s	52.00	137.54	139.55	138.48	139.58	0.002368	0.82	63.20	61.57	0.26
1	40	52 m3/s	52.00	137.06	139.05	137.88	139.07	0.001130	0.67	77.19	58.32	0.19
1	30	52 m3/s	52.00	137.37	138.64	137.98	138.67	0.002051	0.68	76.26	88.72	0.23
1	20	52 m3/s	52.00	136.62	137.91	137.38	137.94	0.002727	0.74	70.33	89.62	0.27
1	10	52 m3/s	52.00	135.29	136.86	136.14	136.91	0.004001	1.08	48.29	46.34	0.34

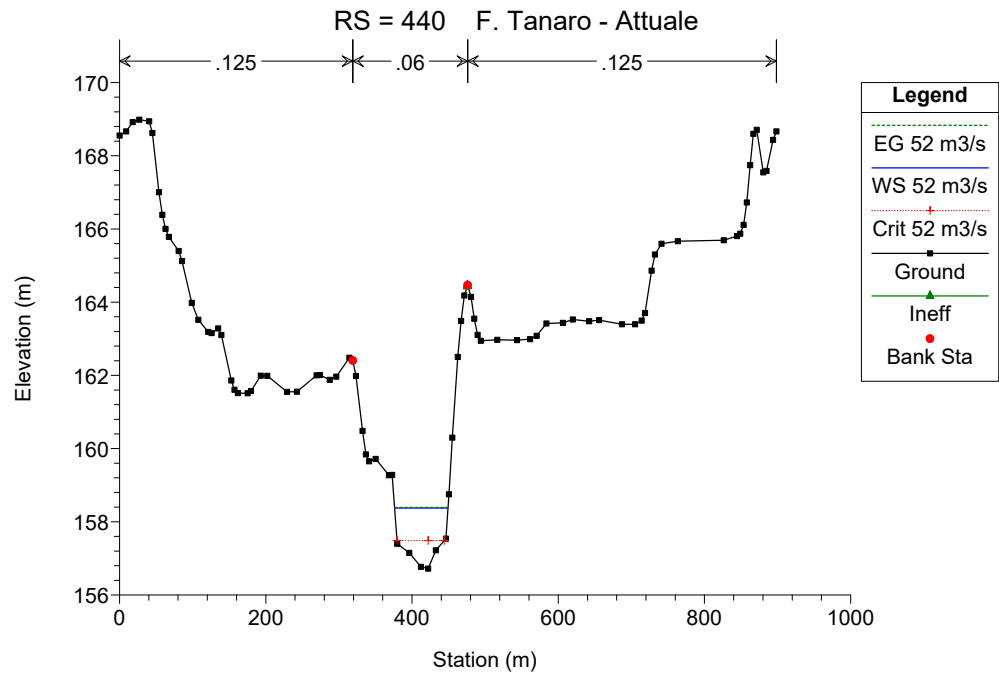
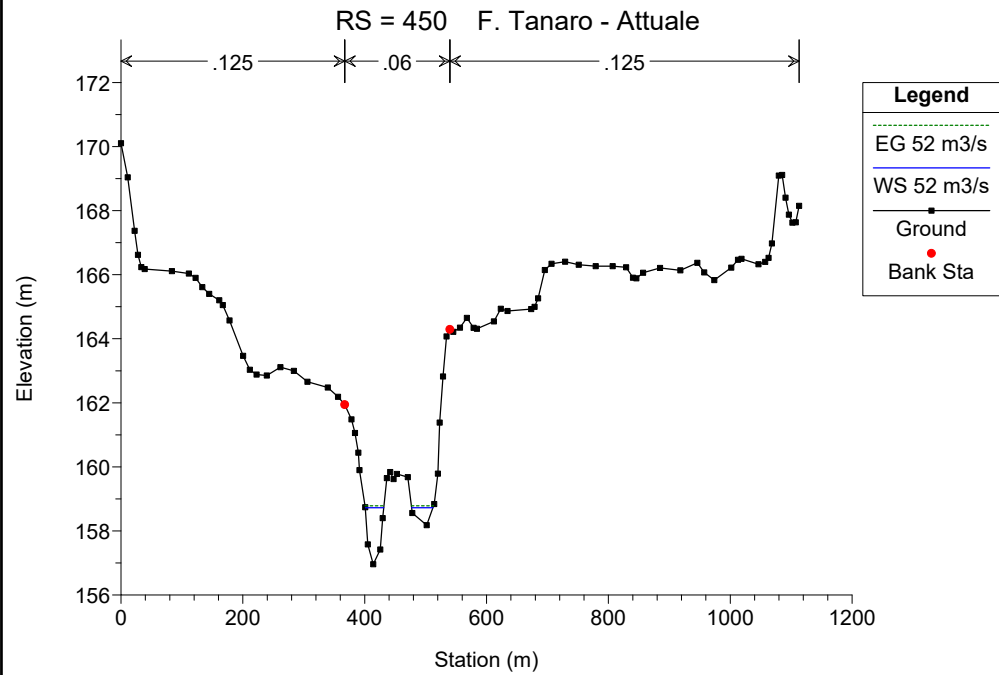
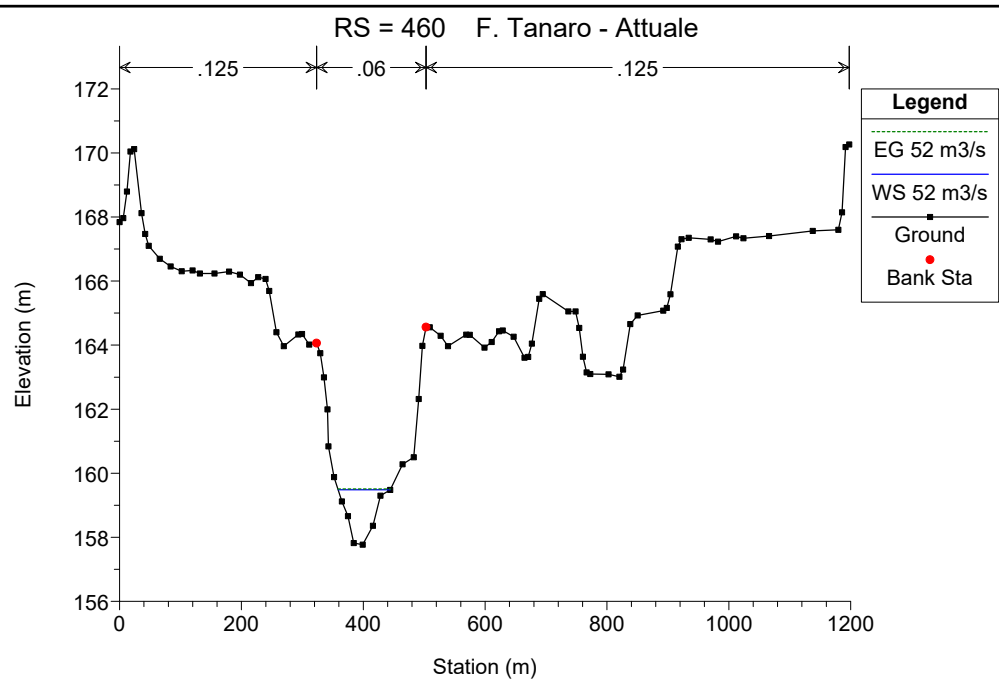
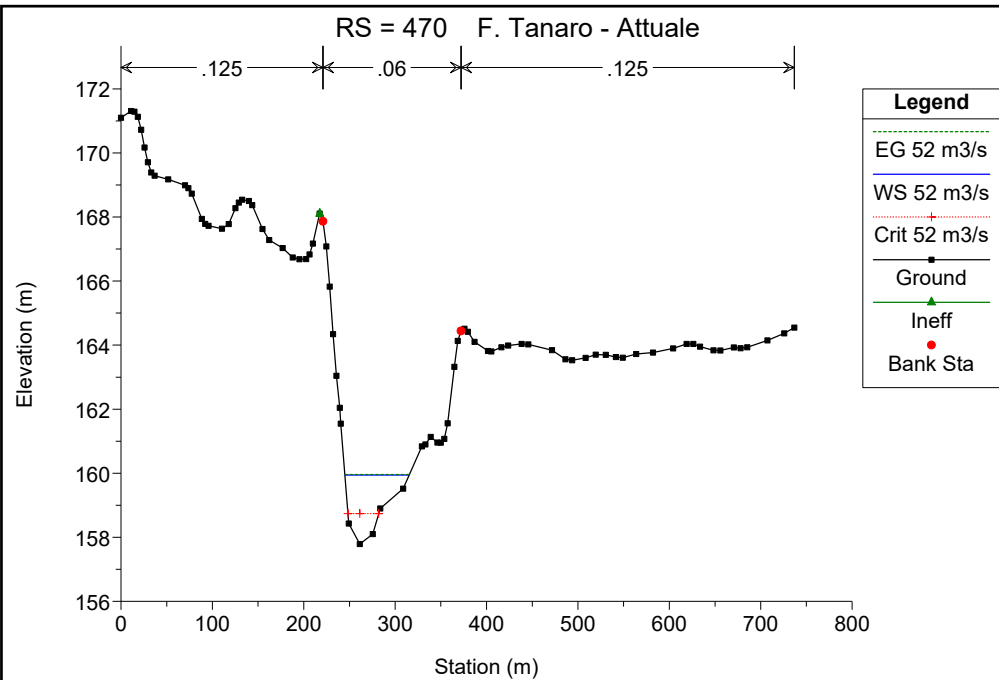
F. Tanaro - Attuale

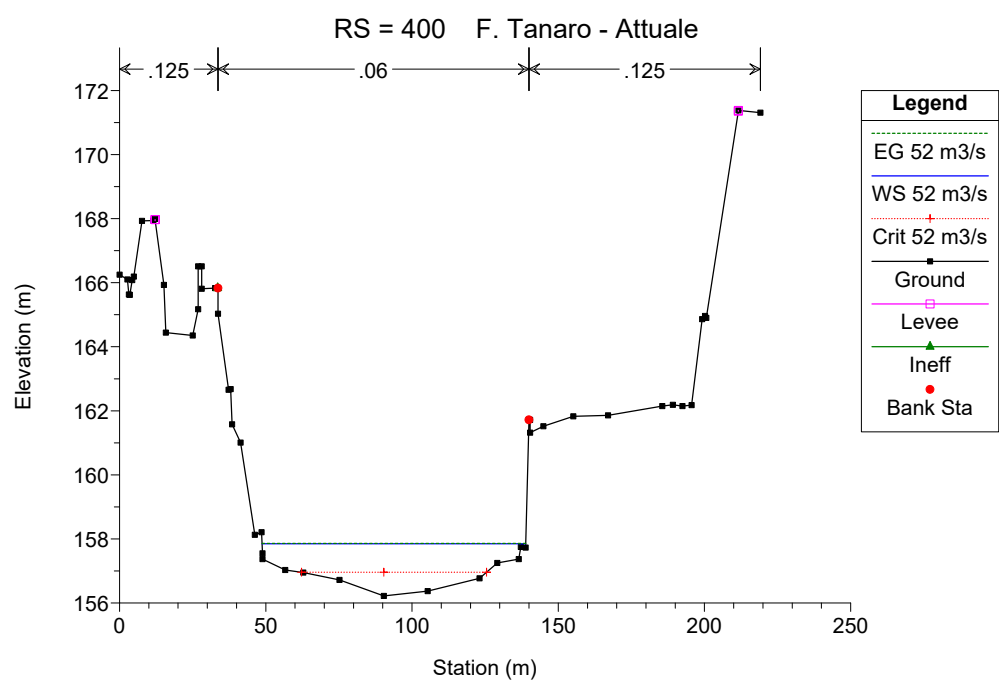
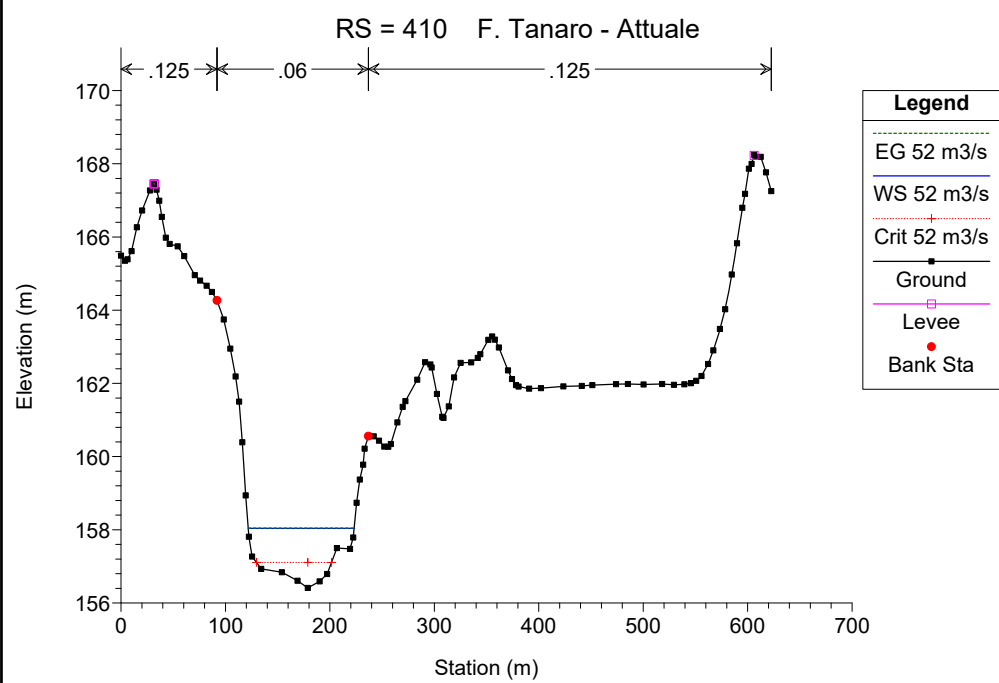
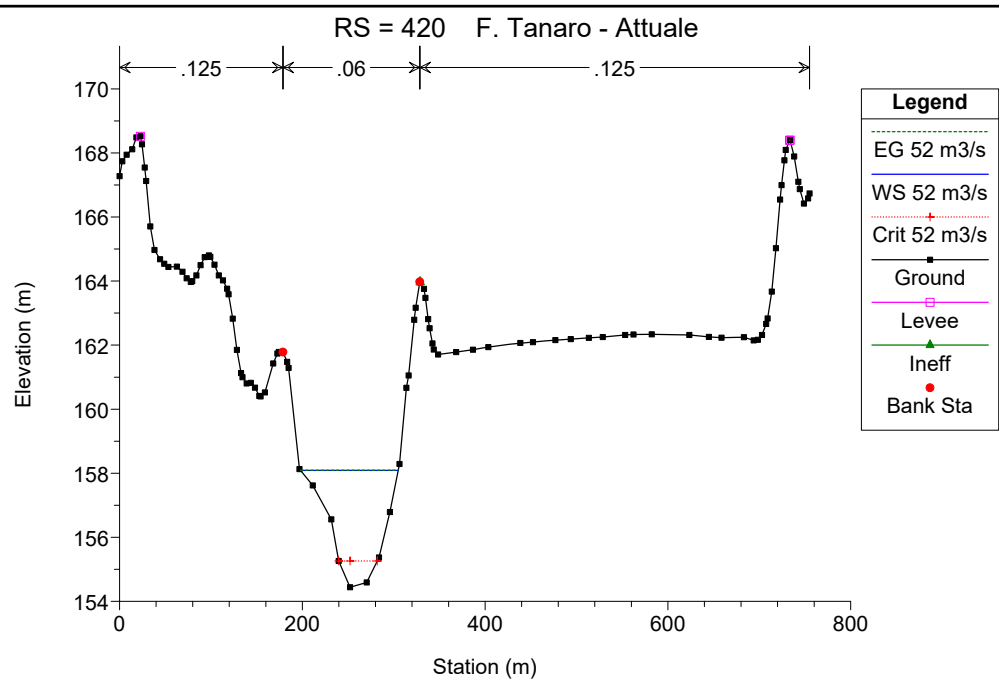
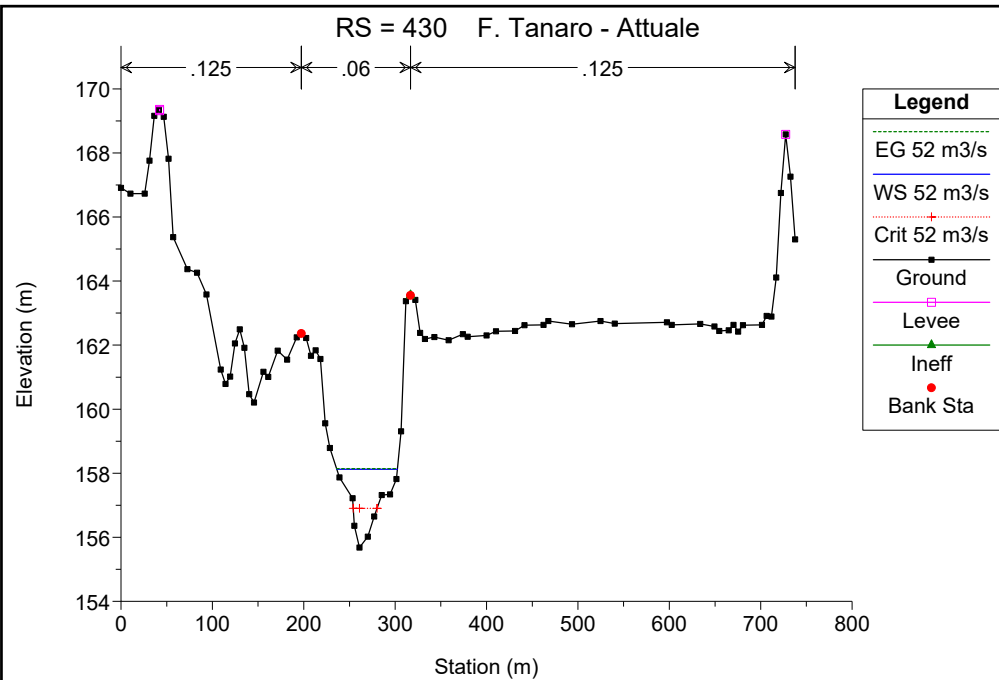
Tanaro 1

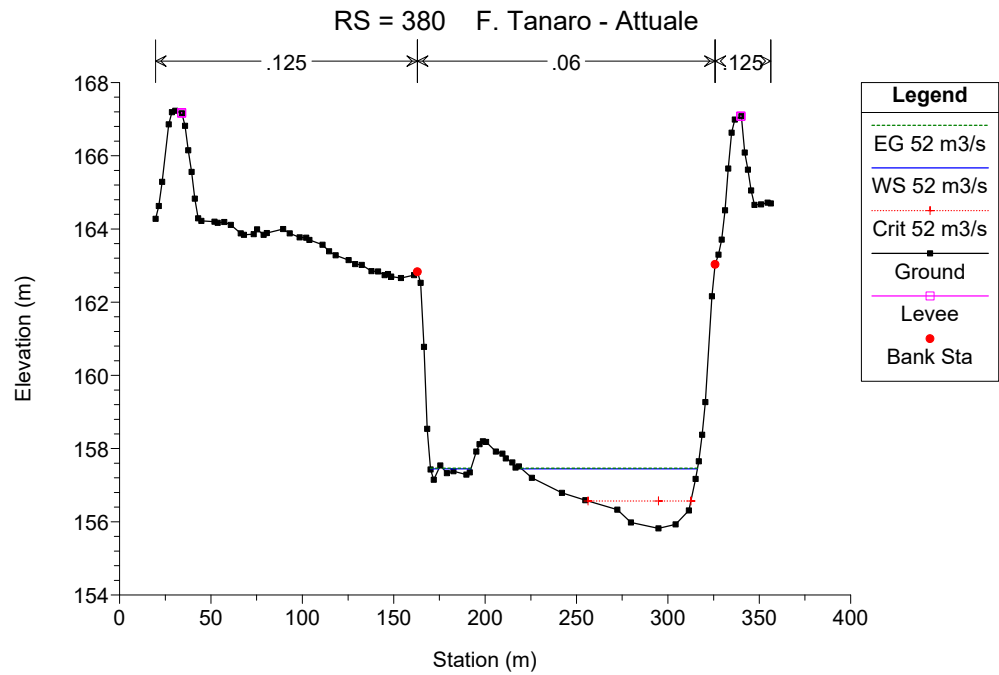
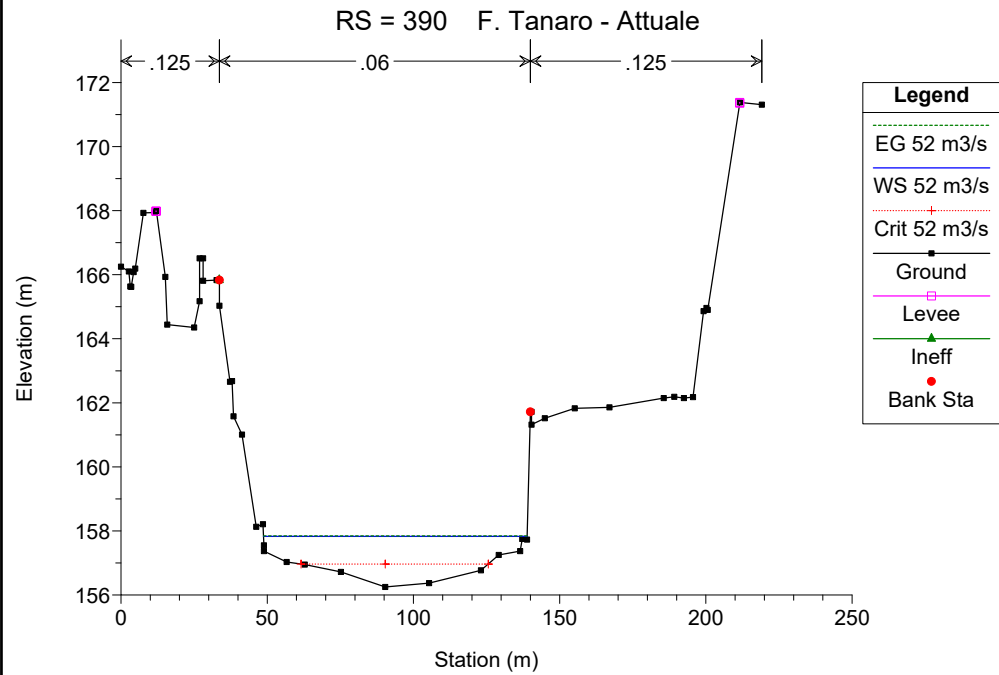
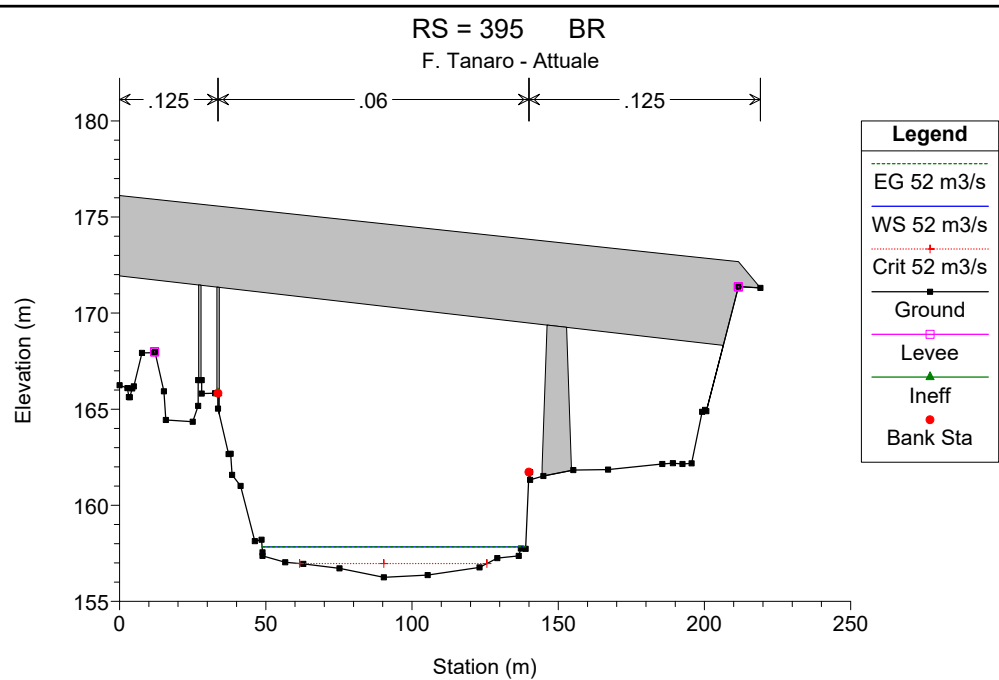
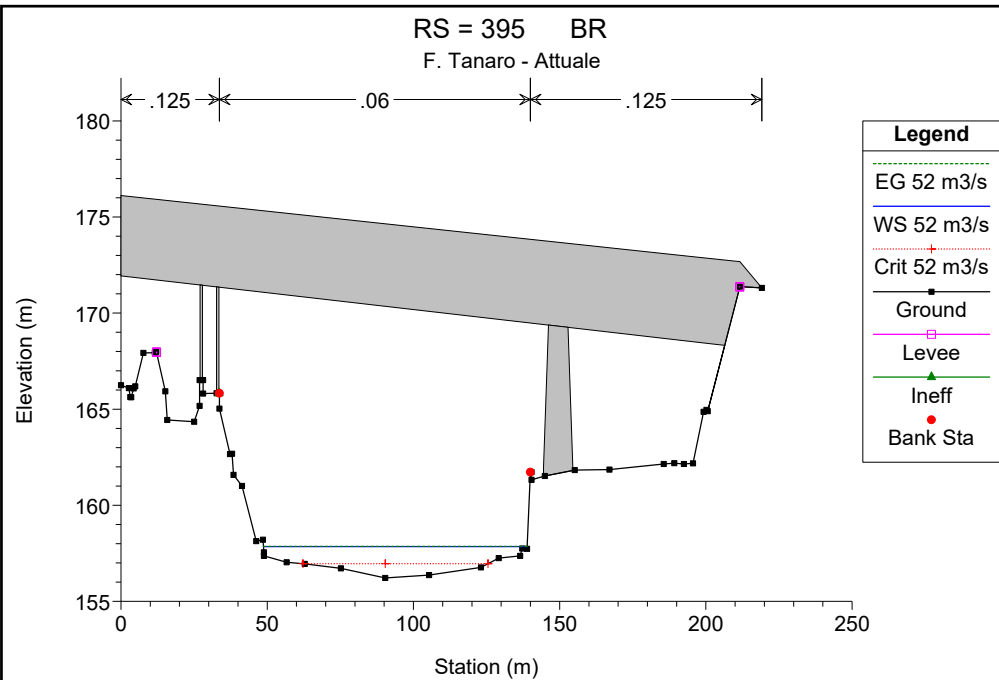


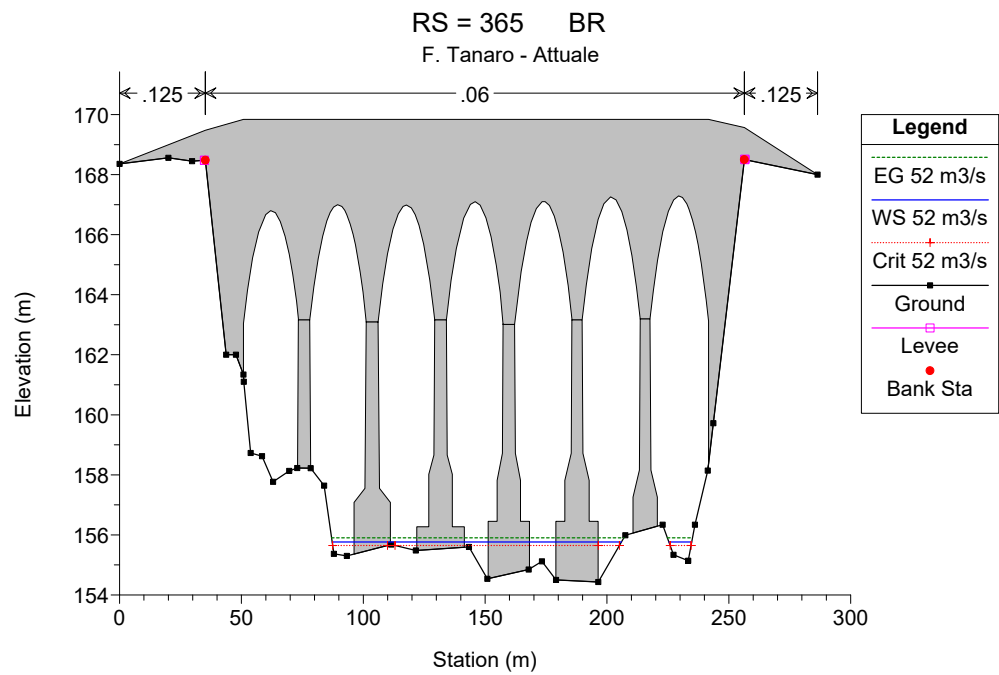
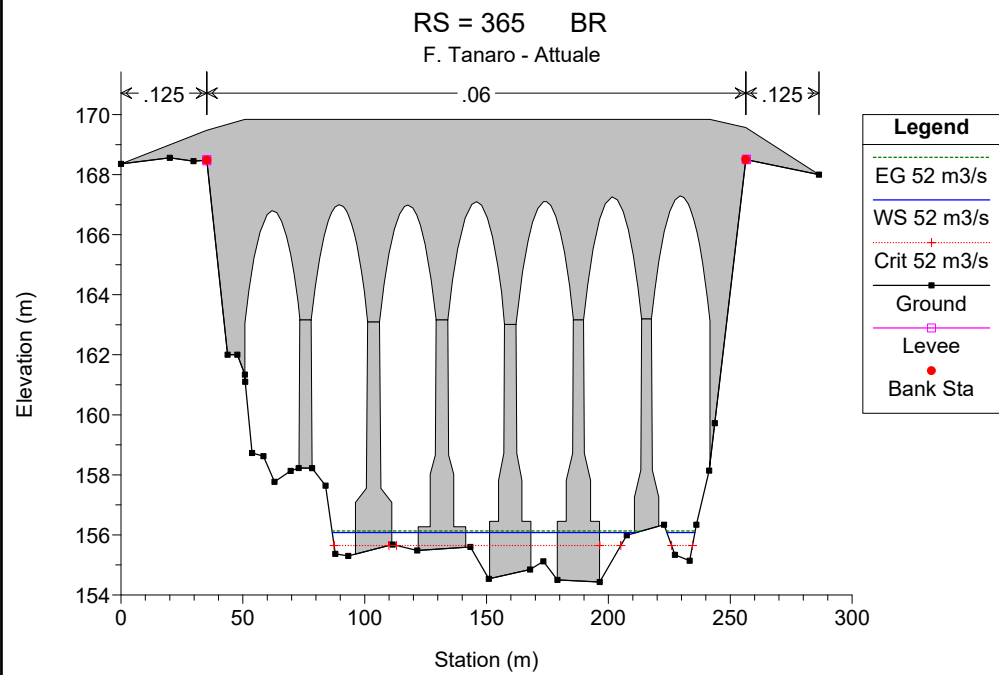
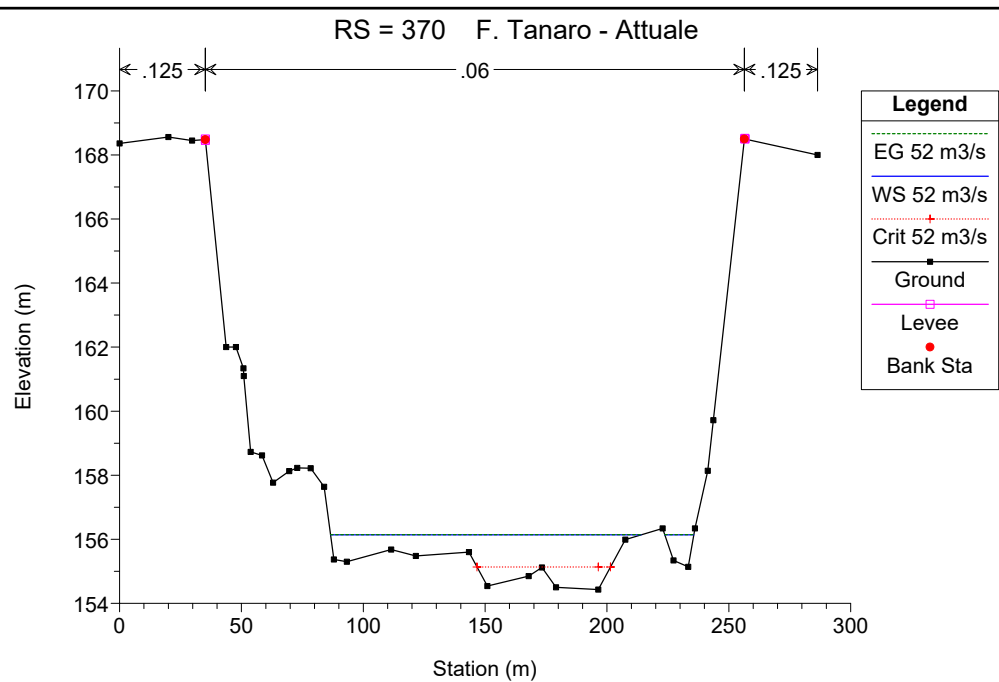
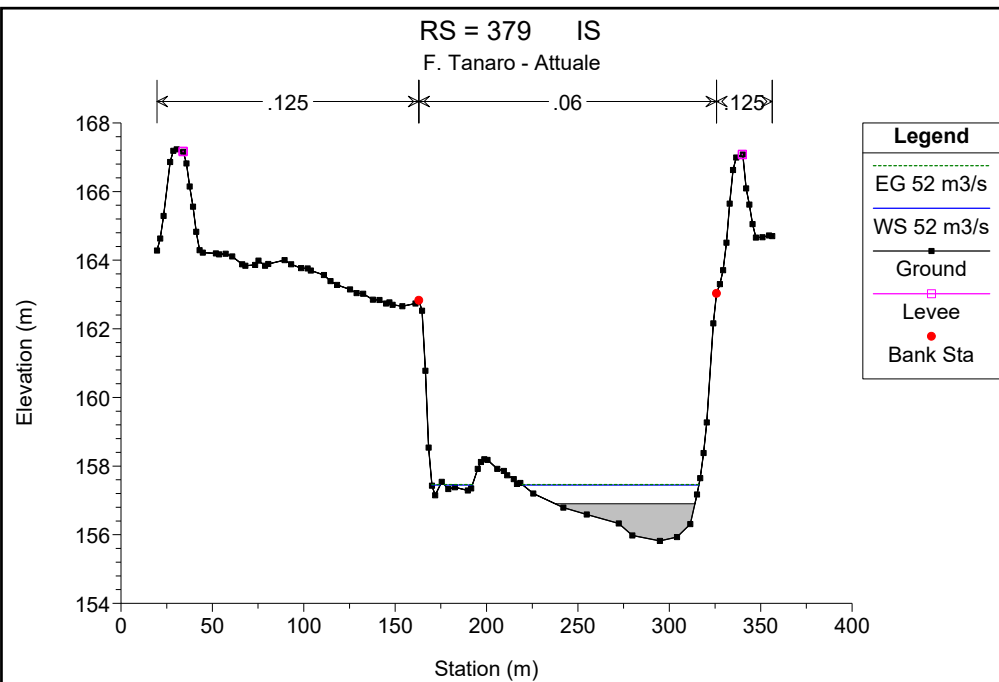


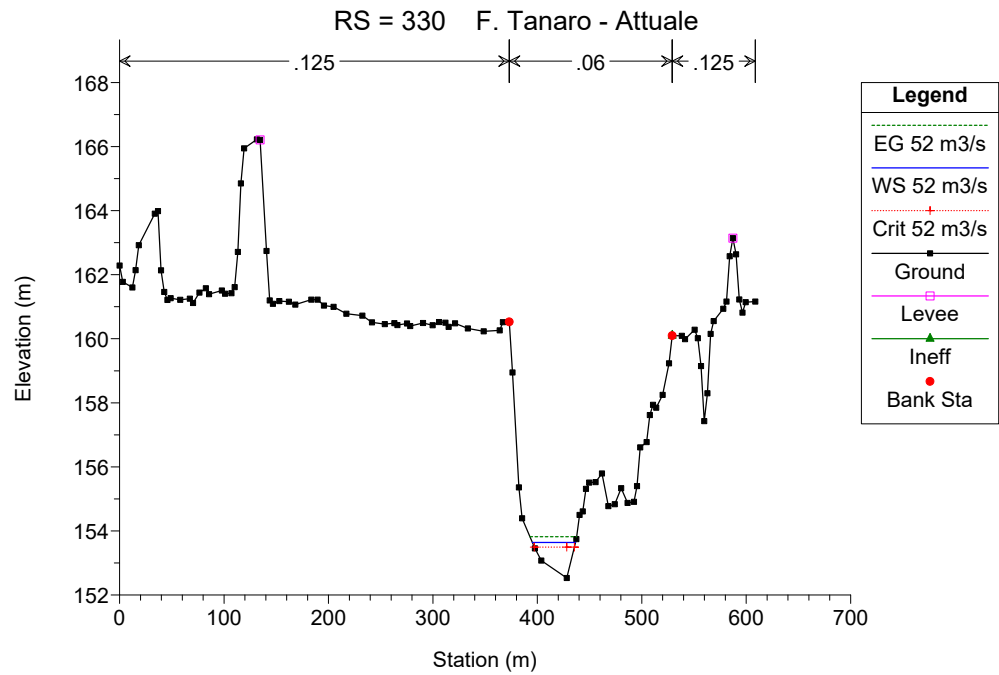
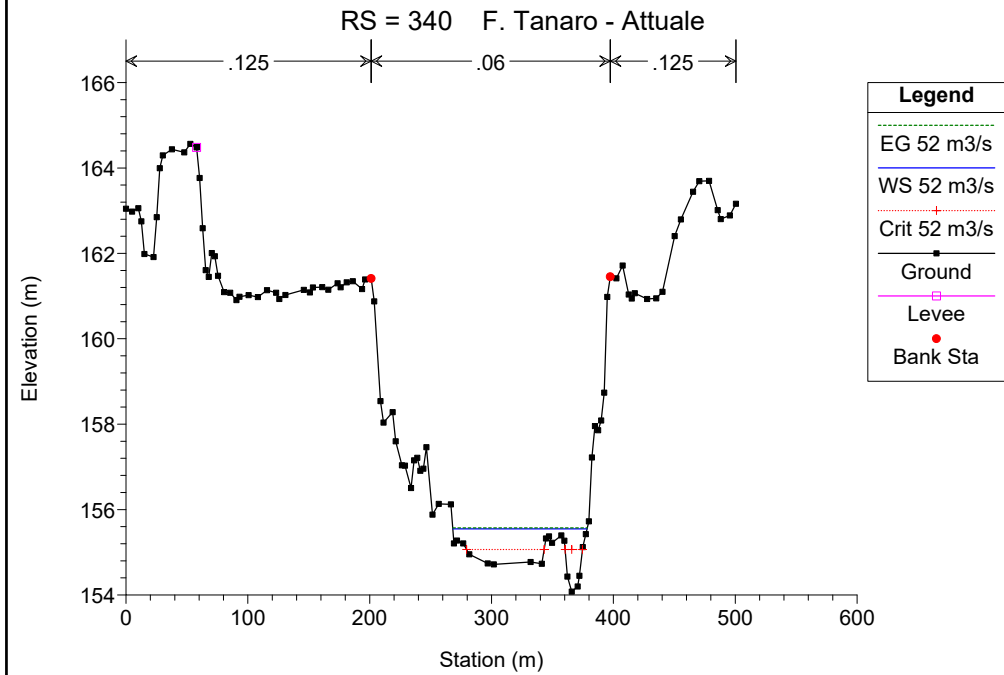
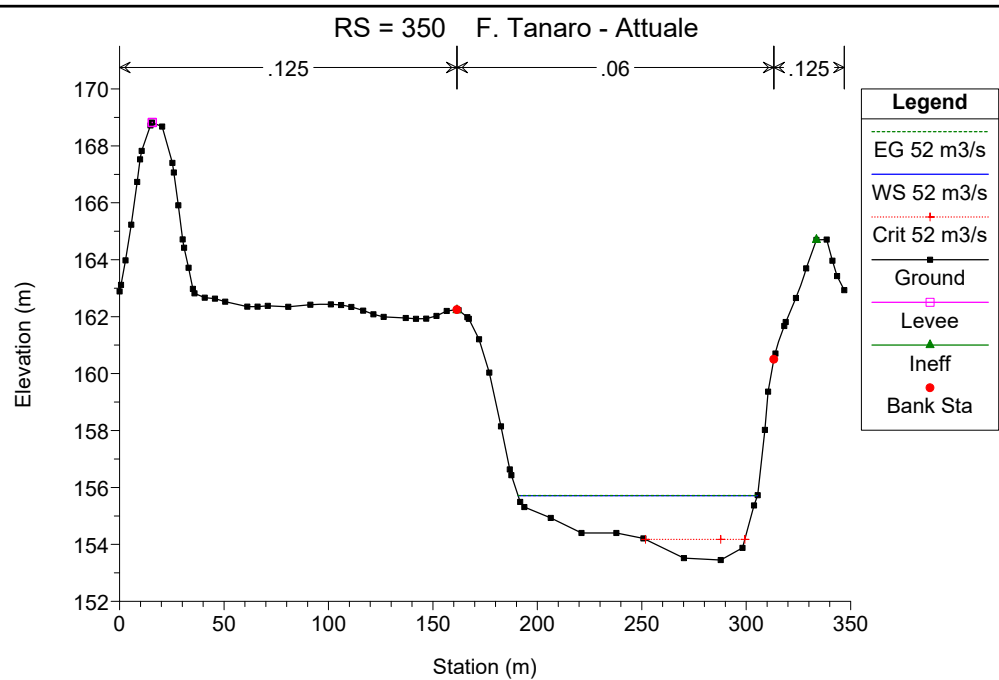
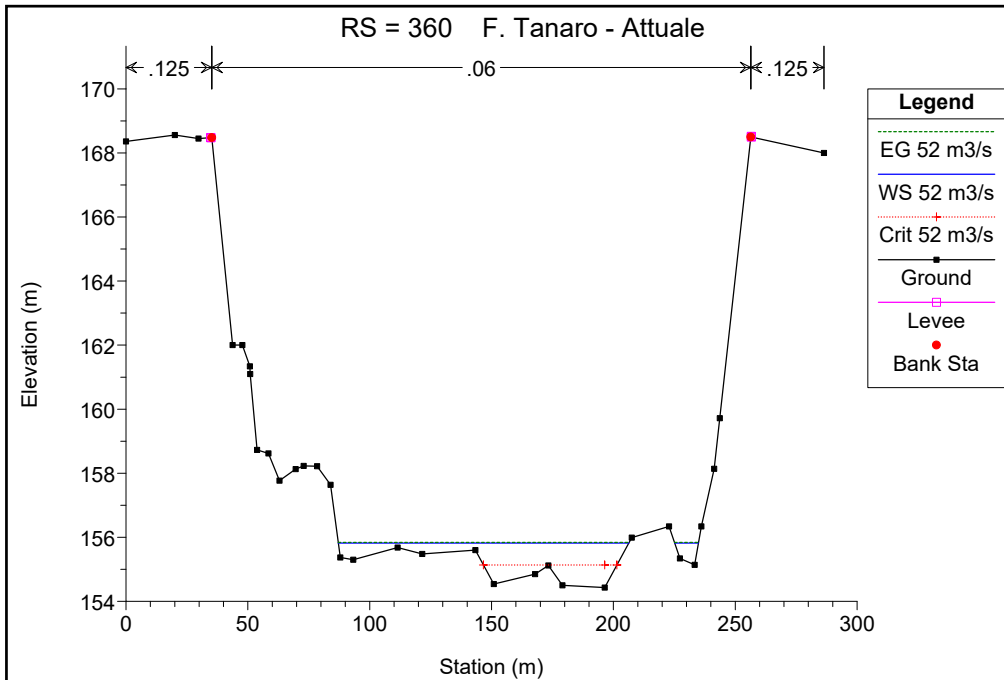


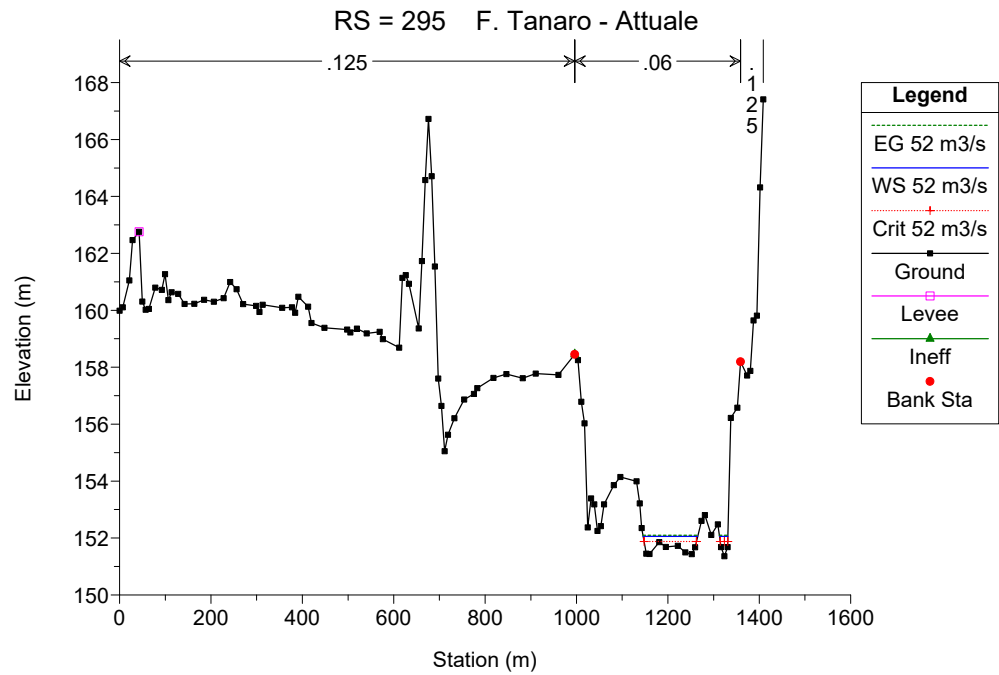
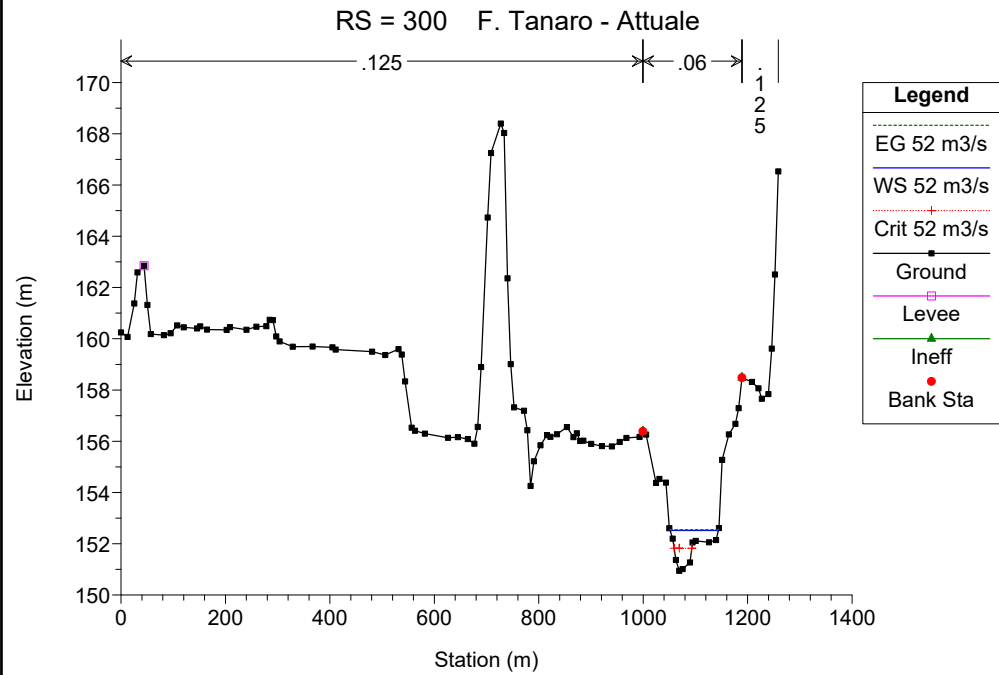
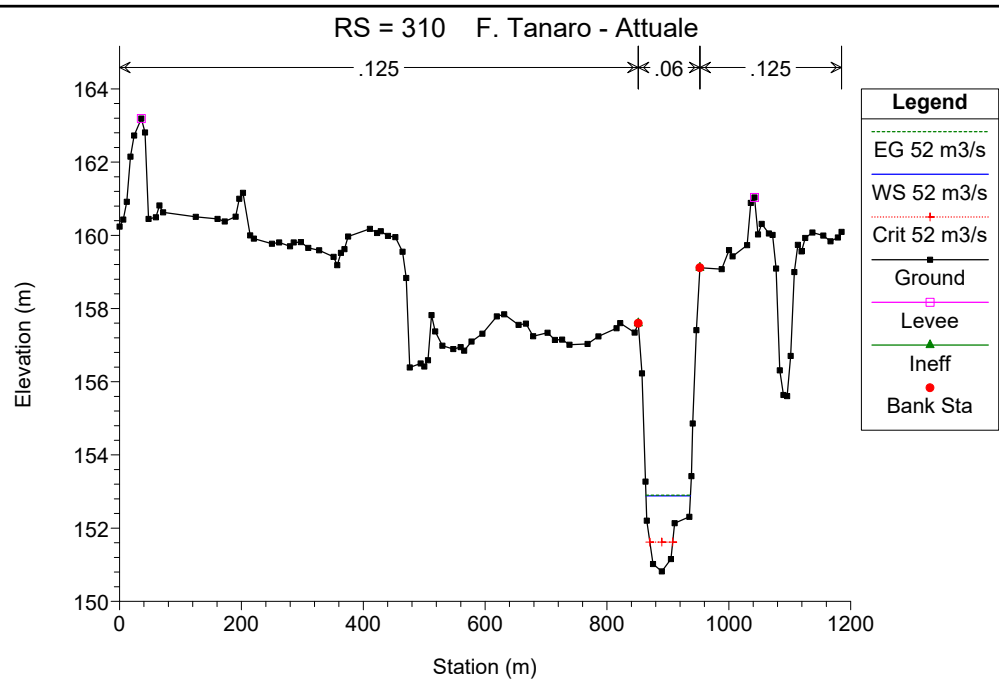
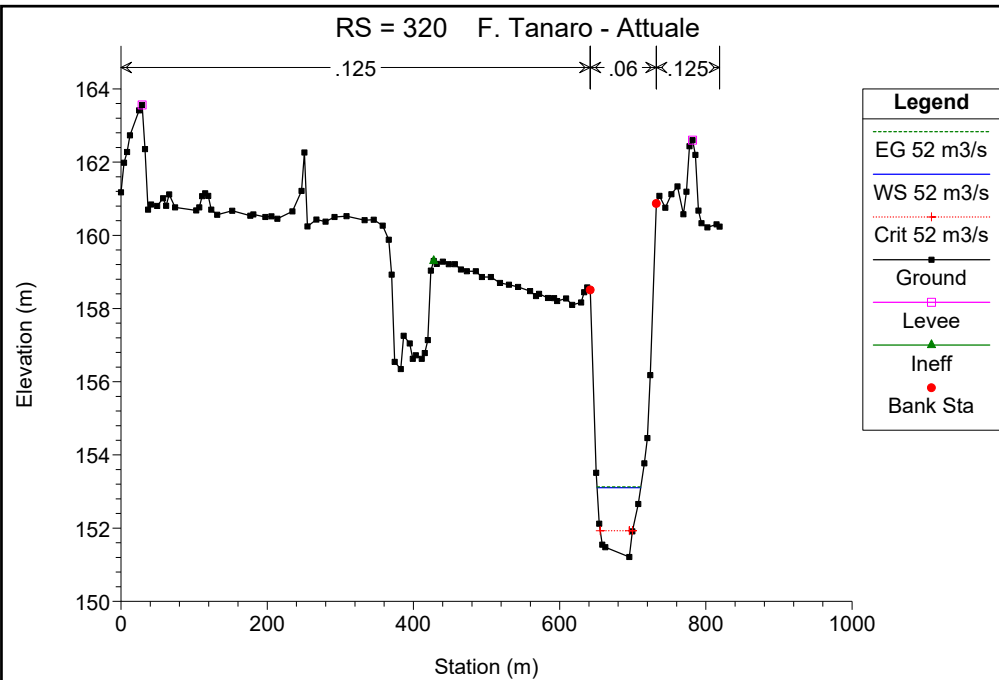


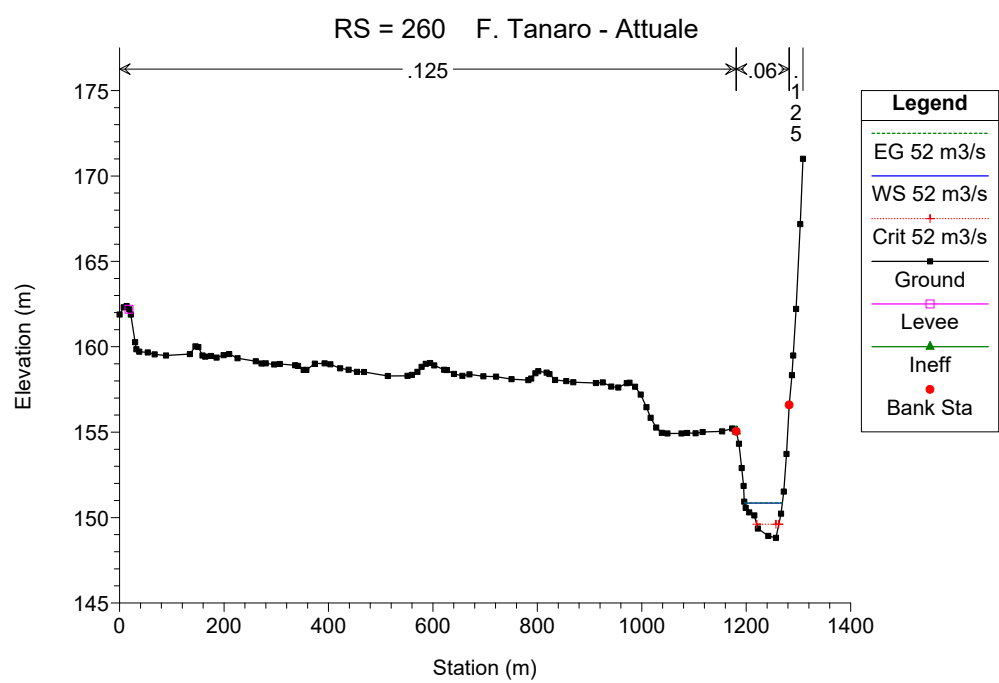
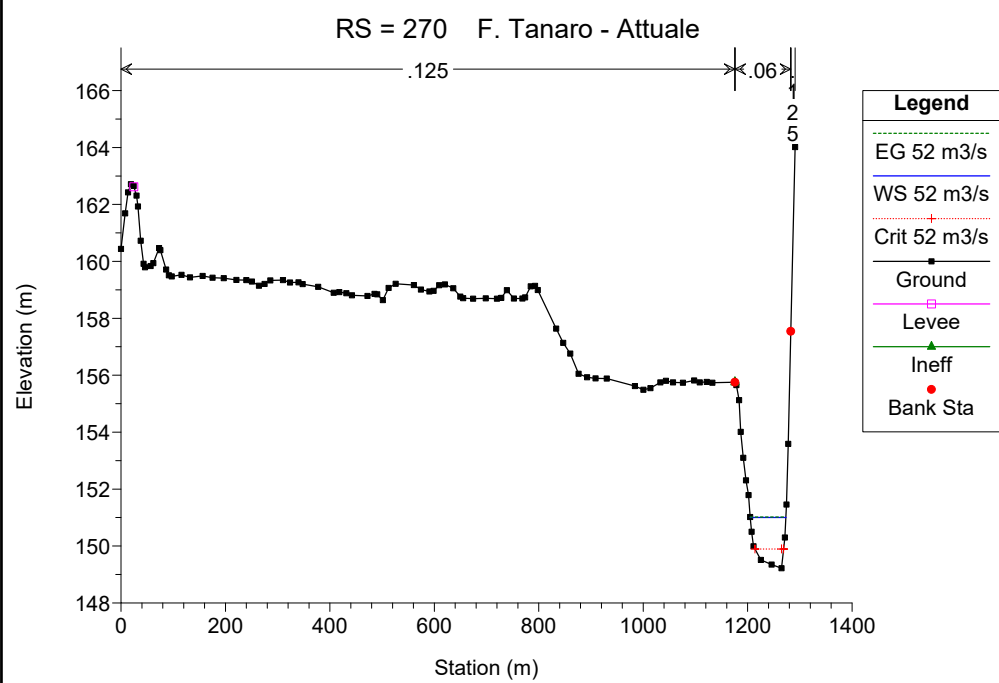
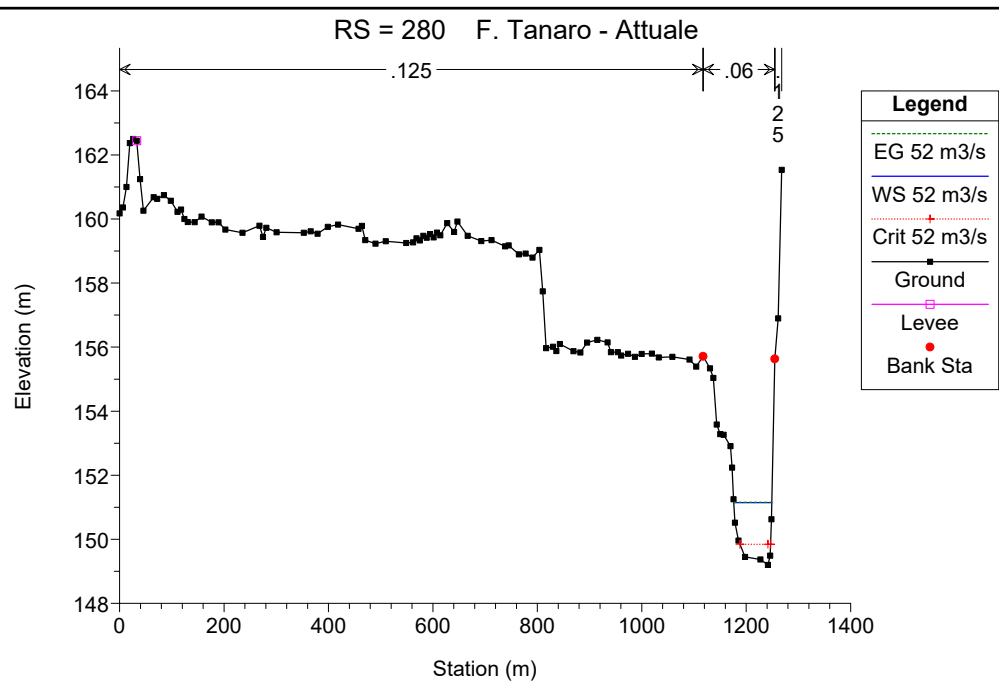
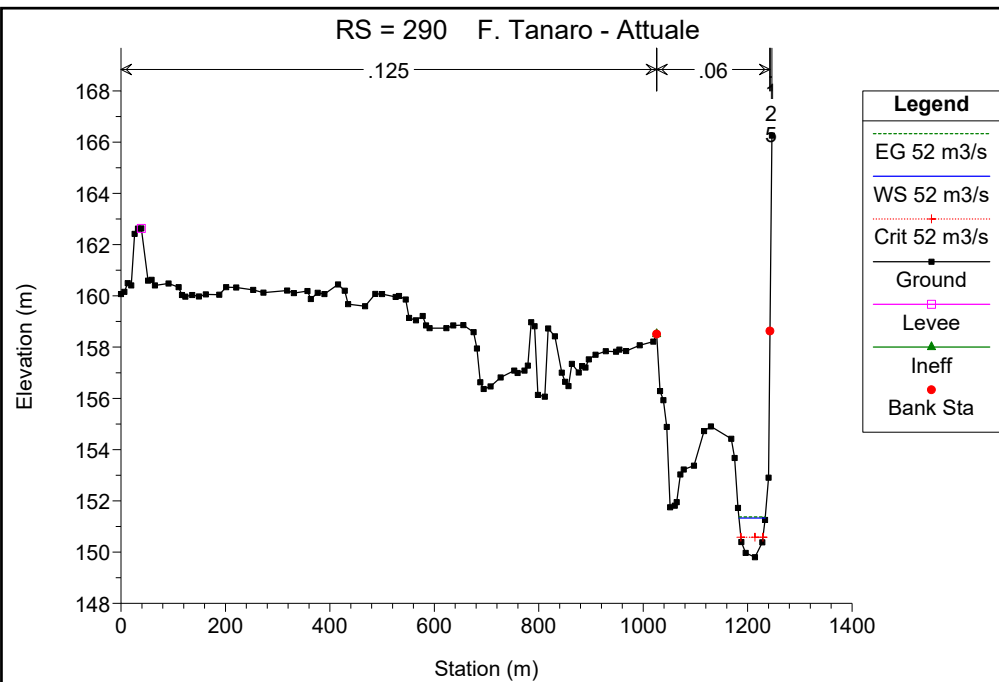


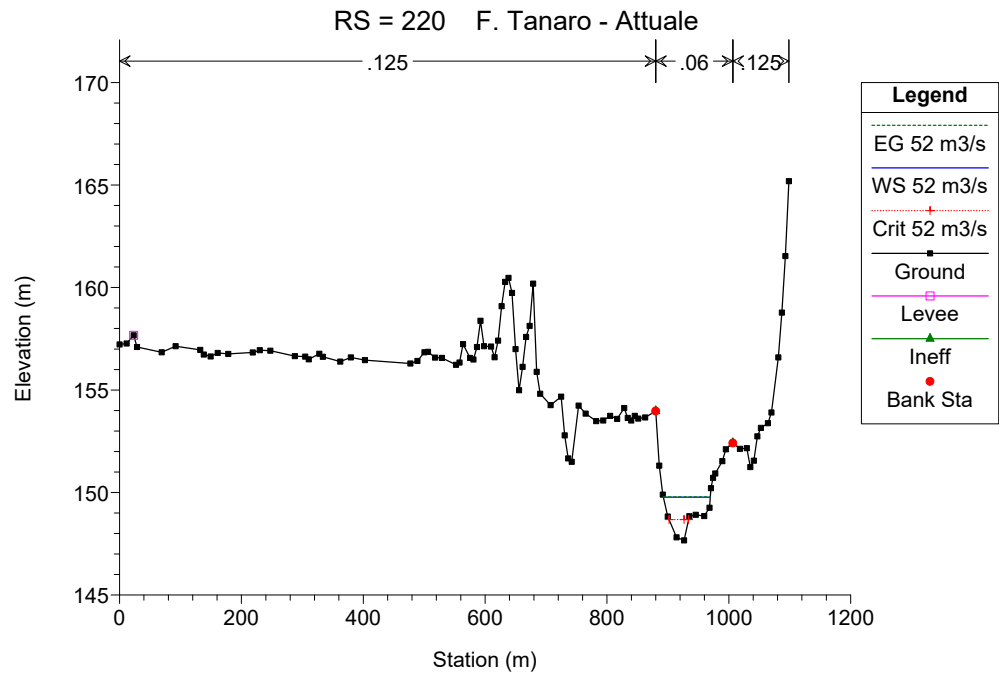
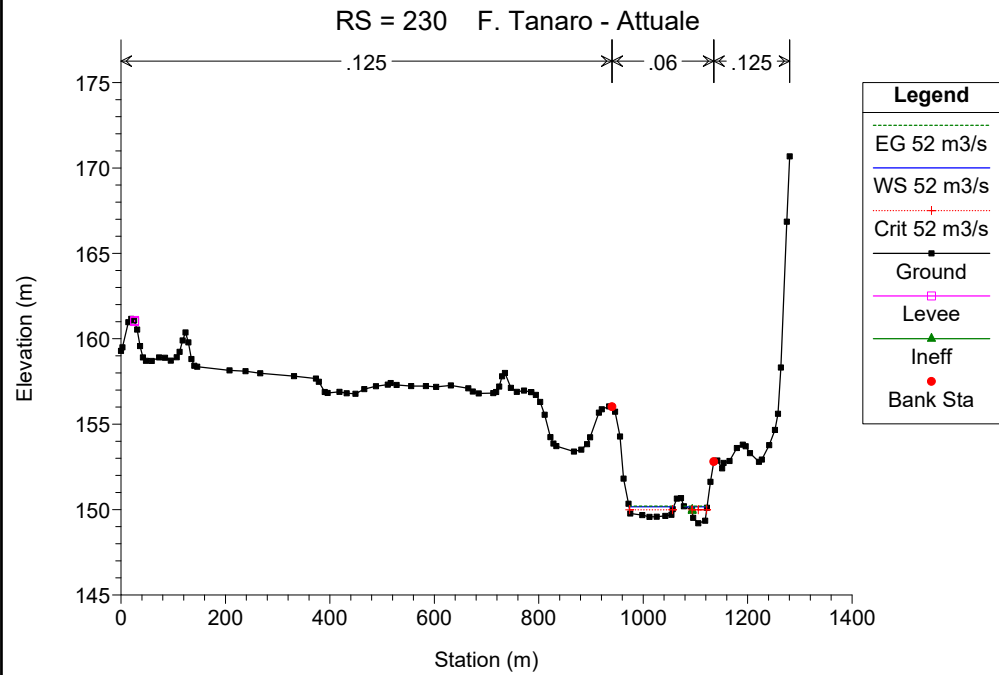
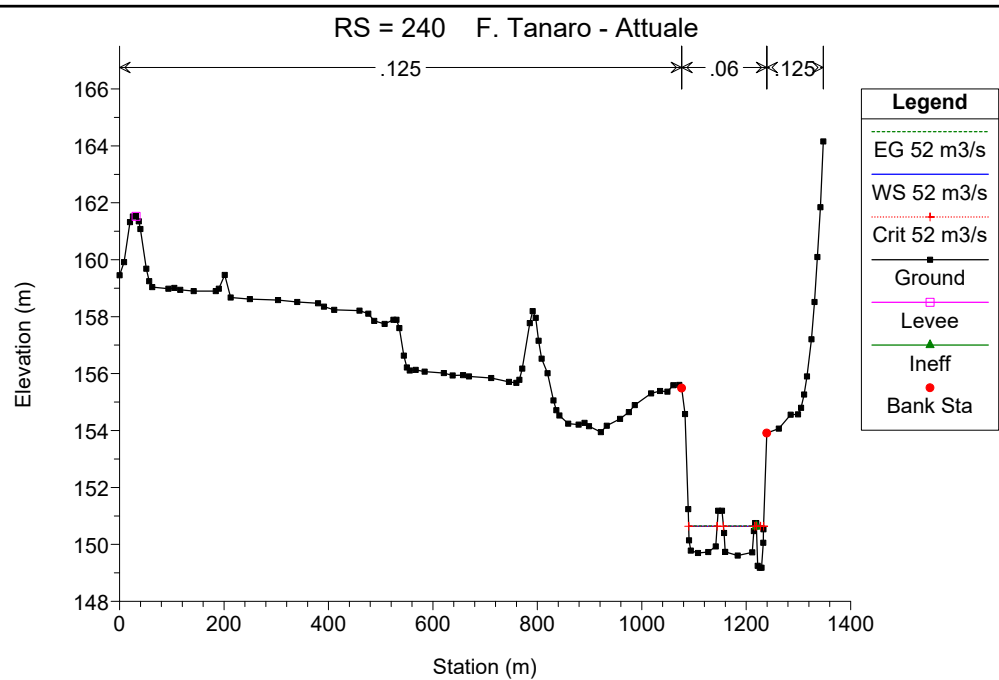
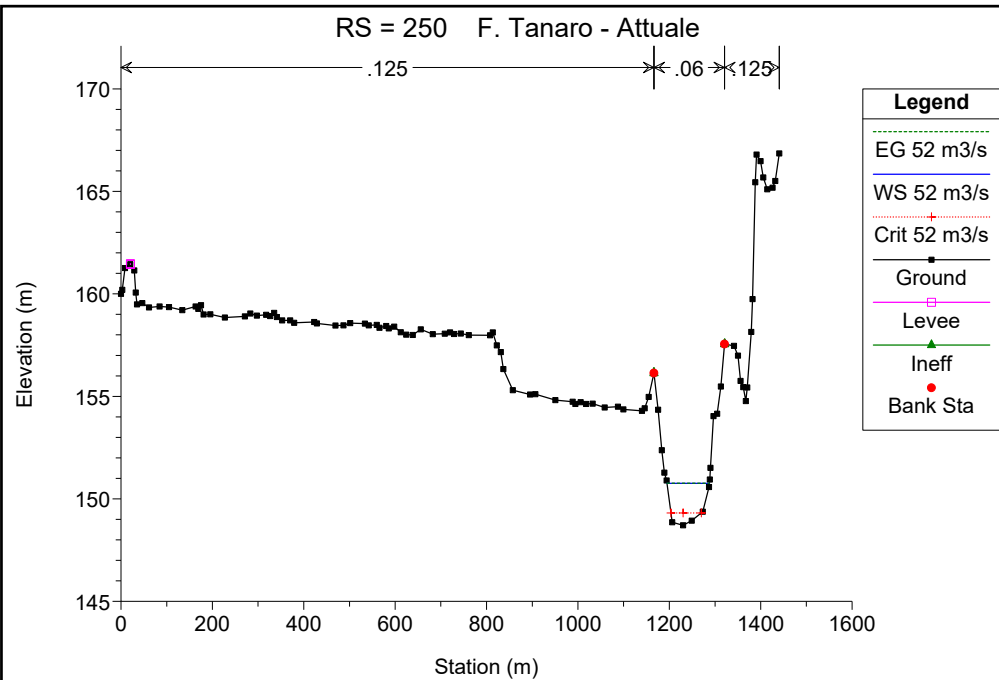


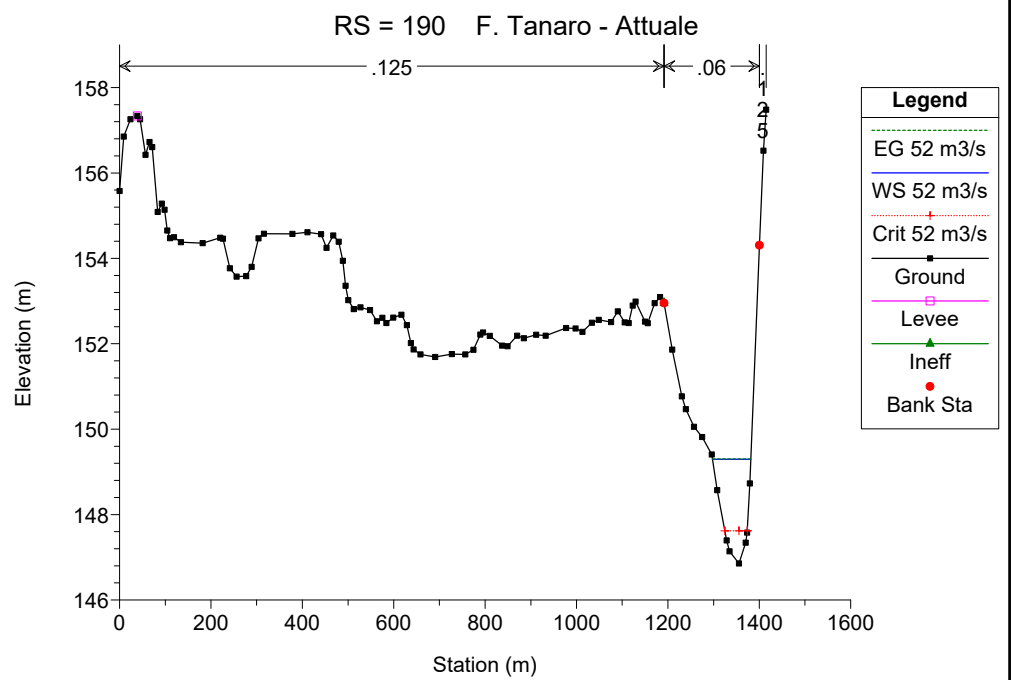
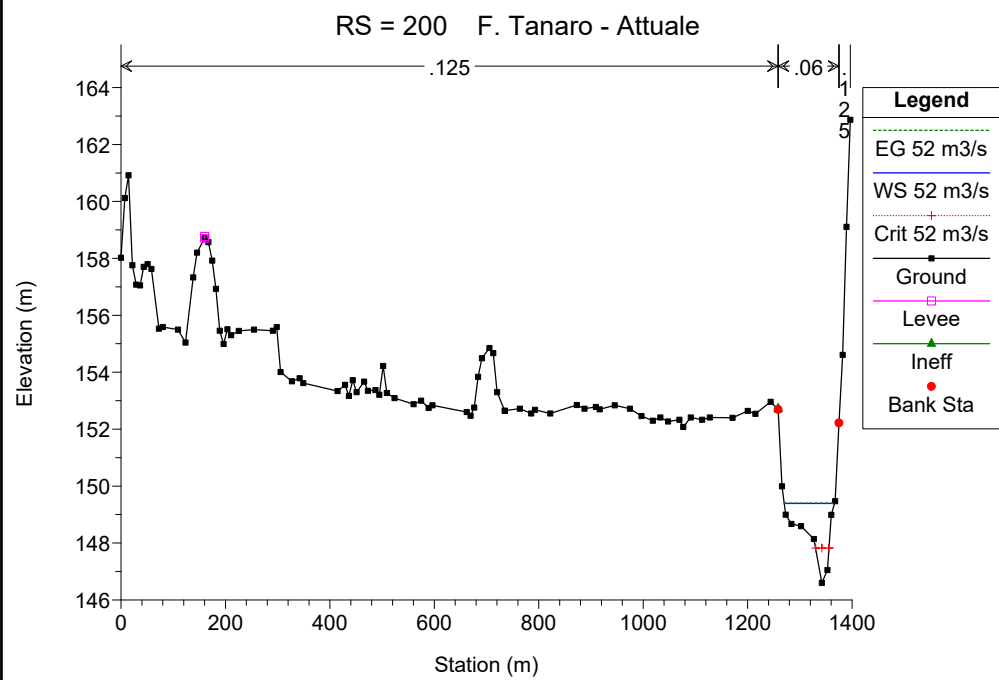
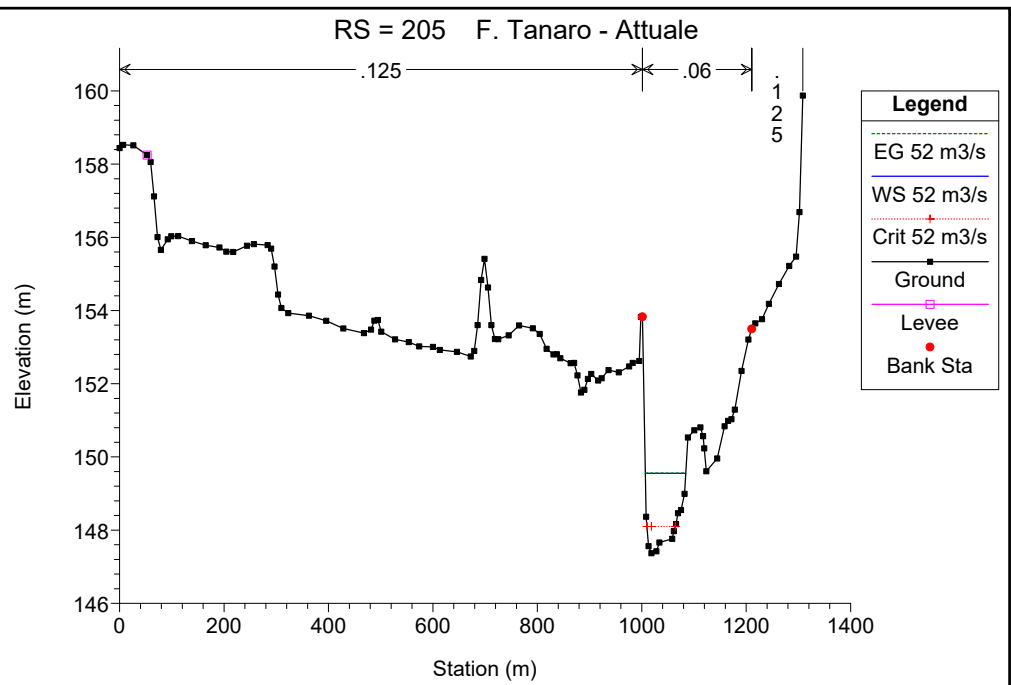
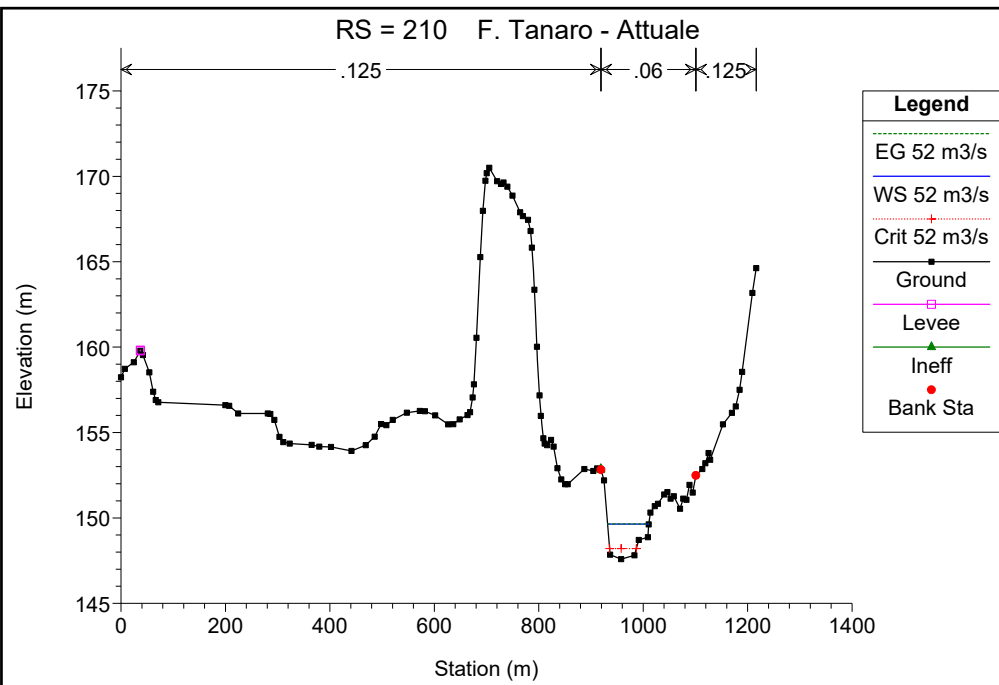


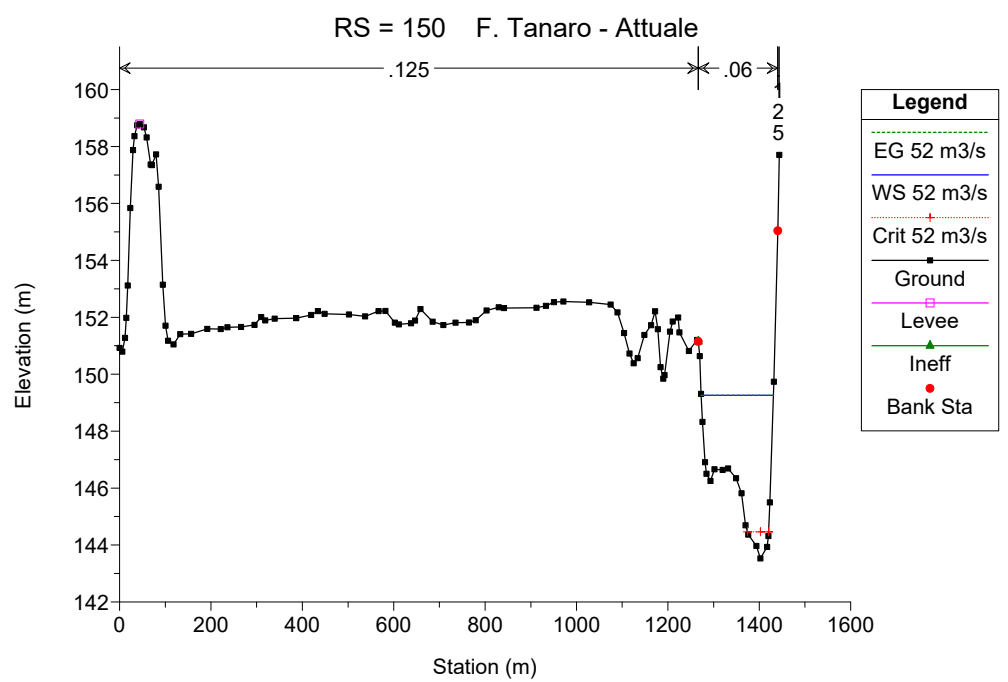
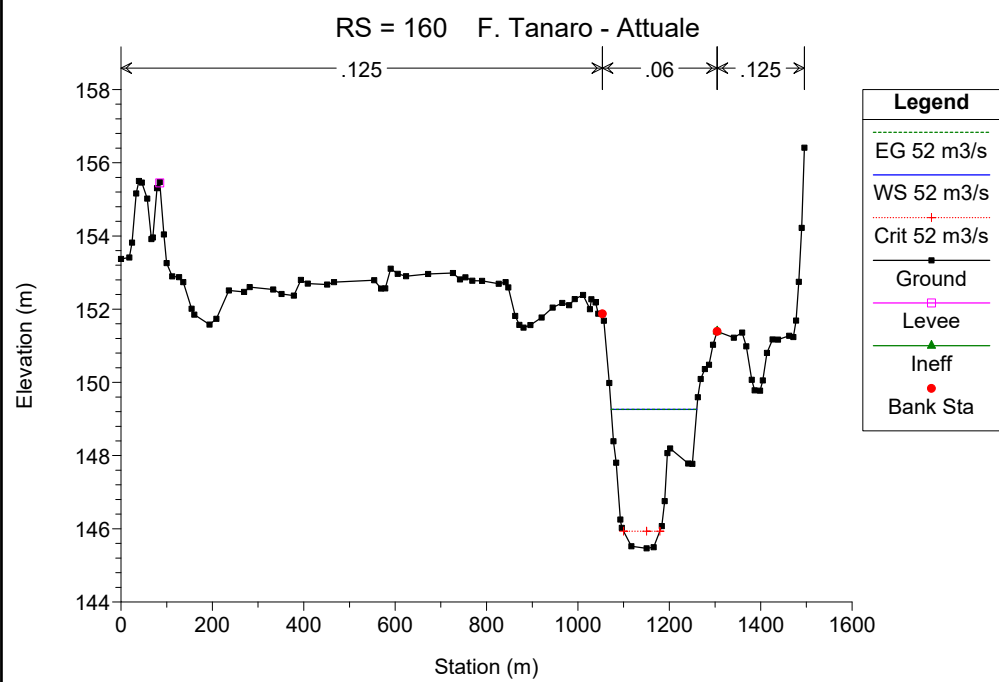
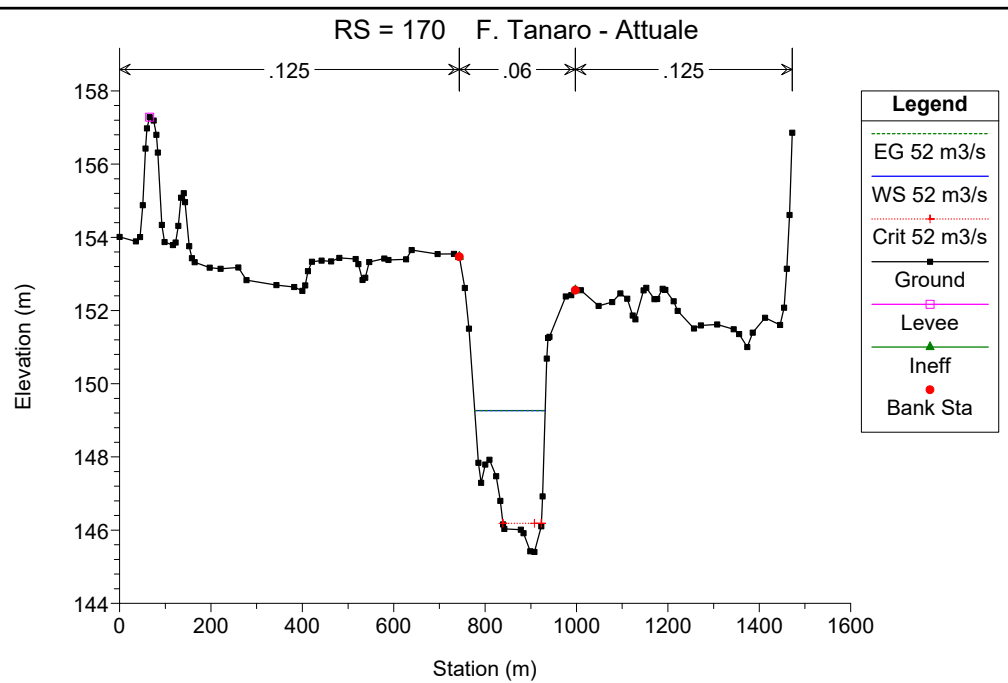
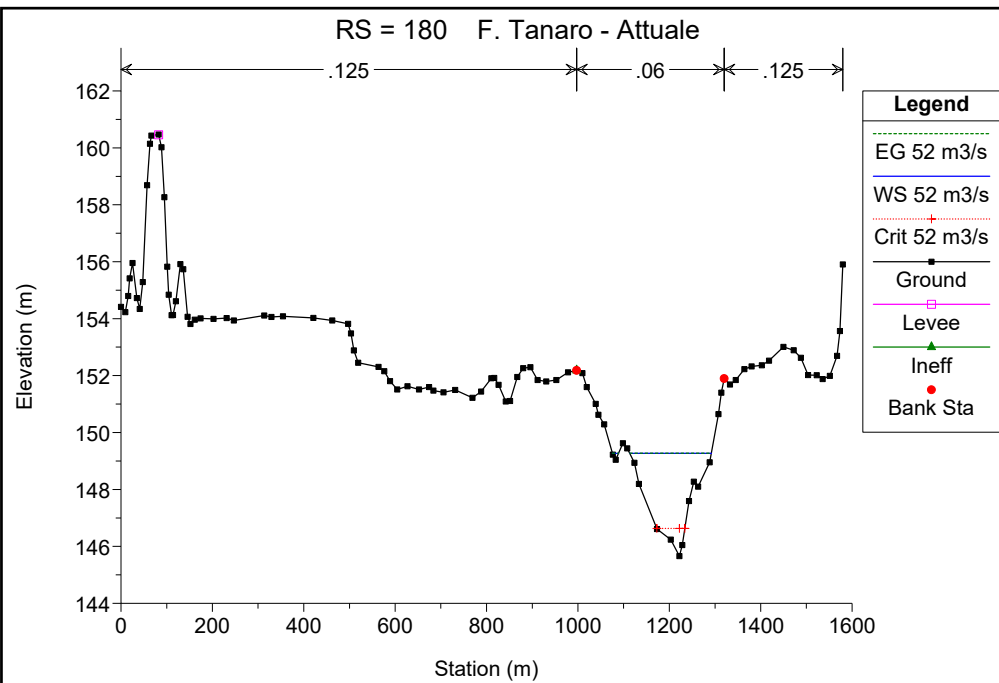


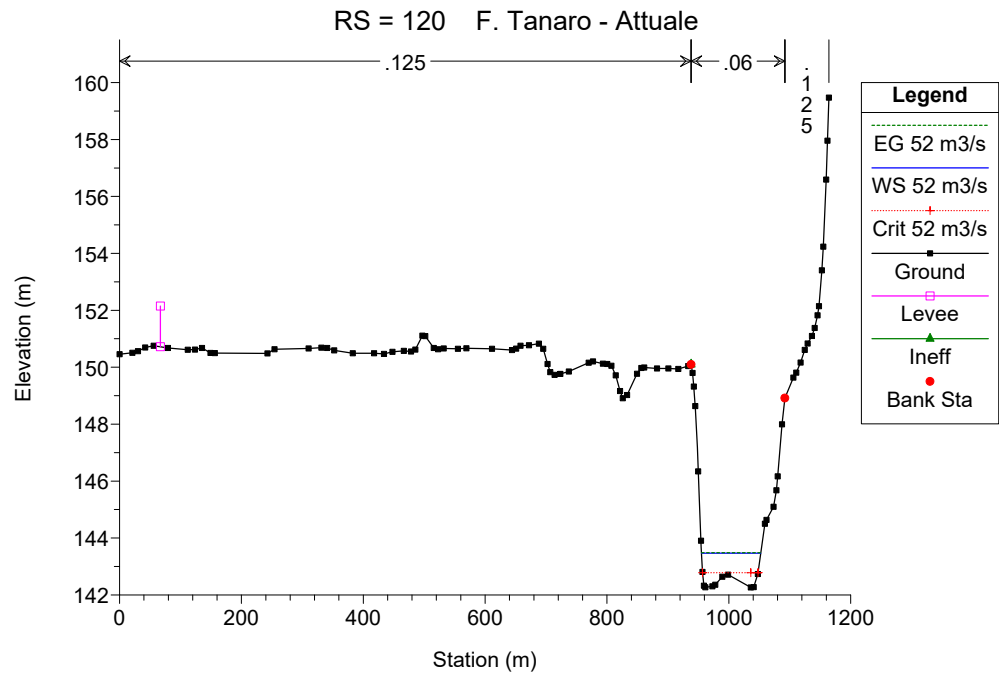
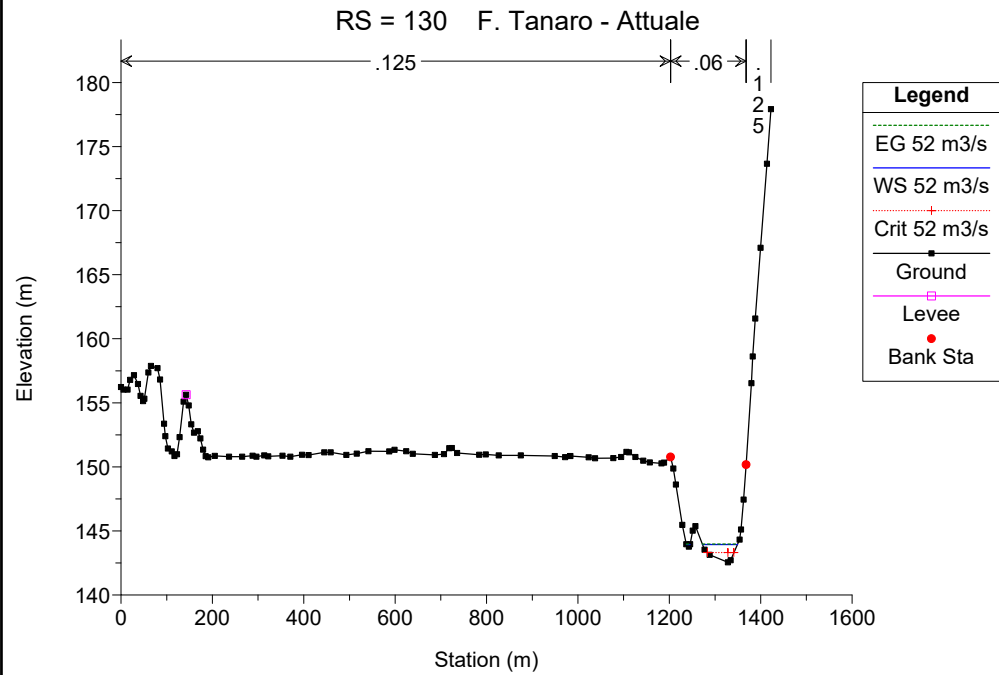
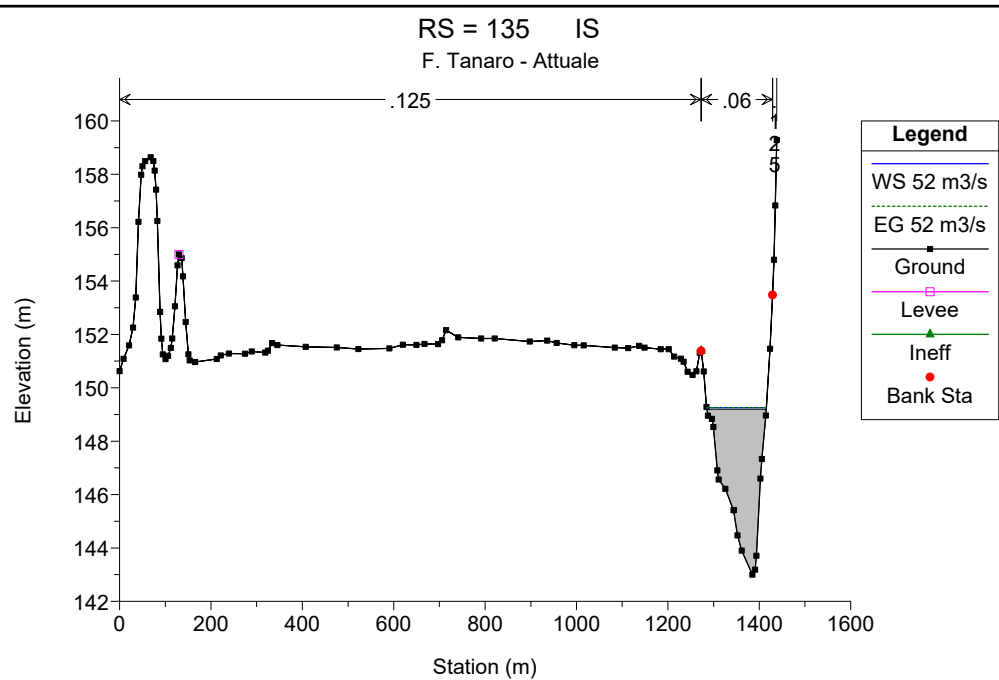
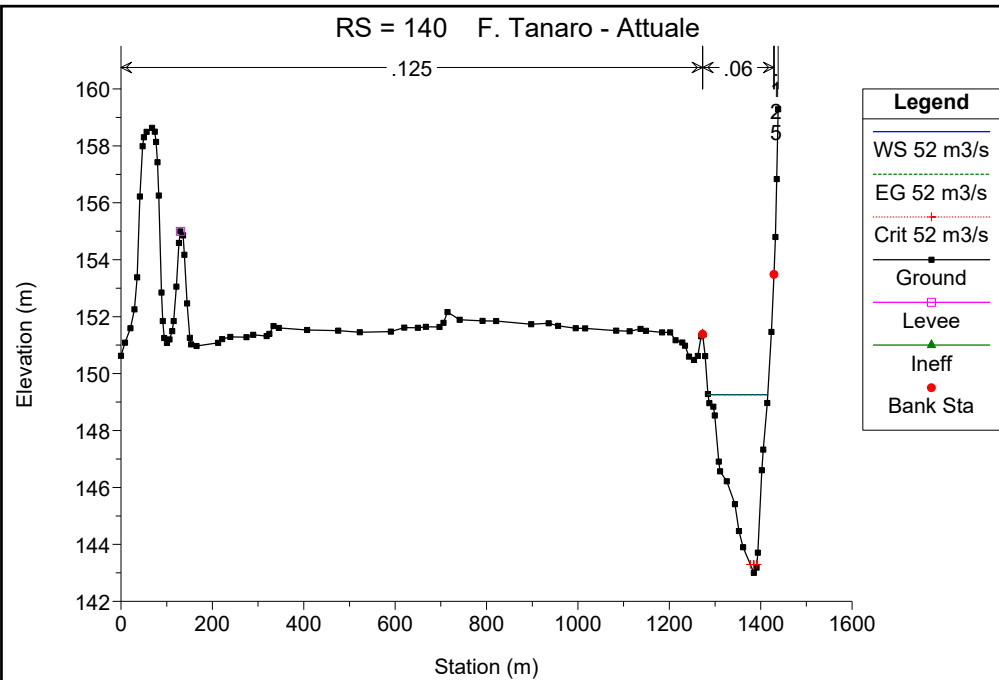


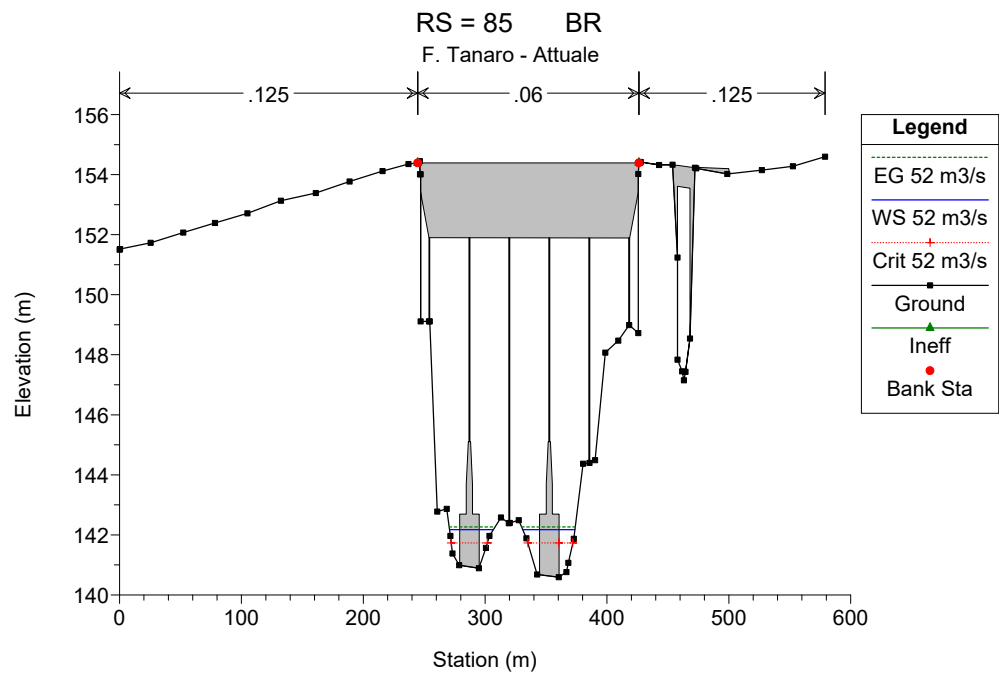
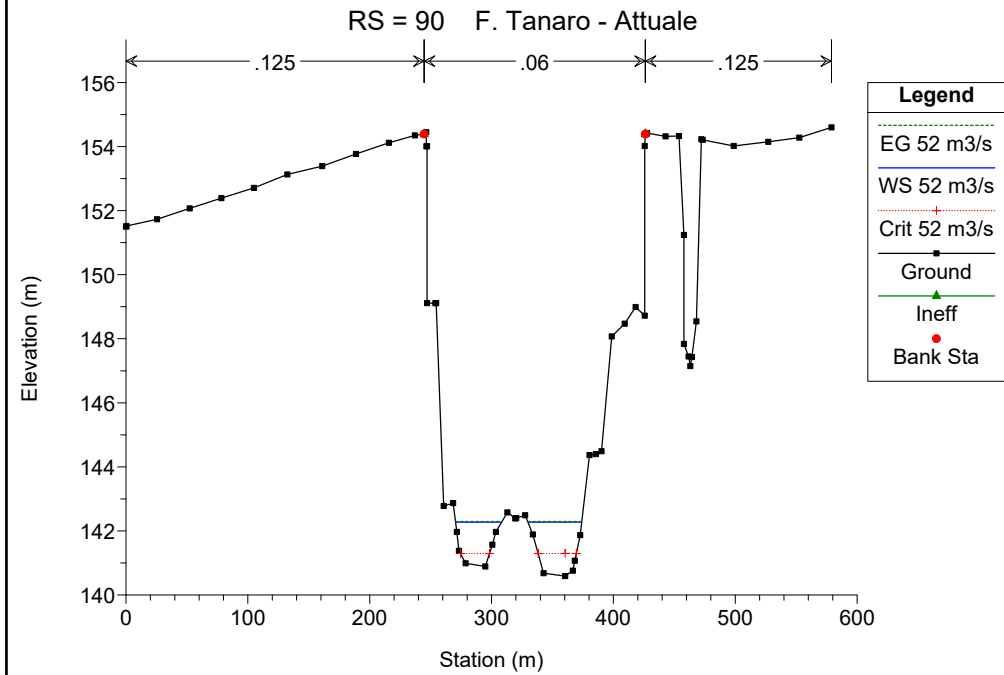
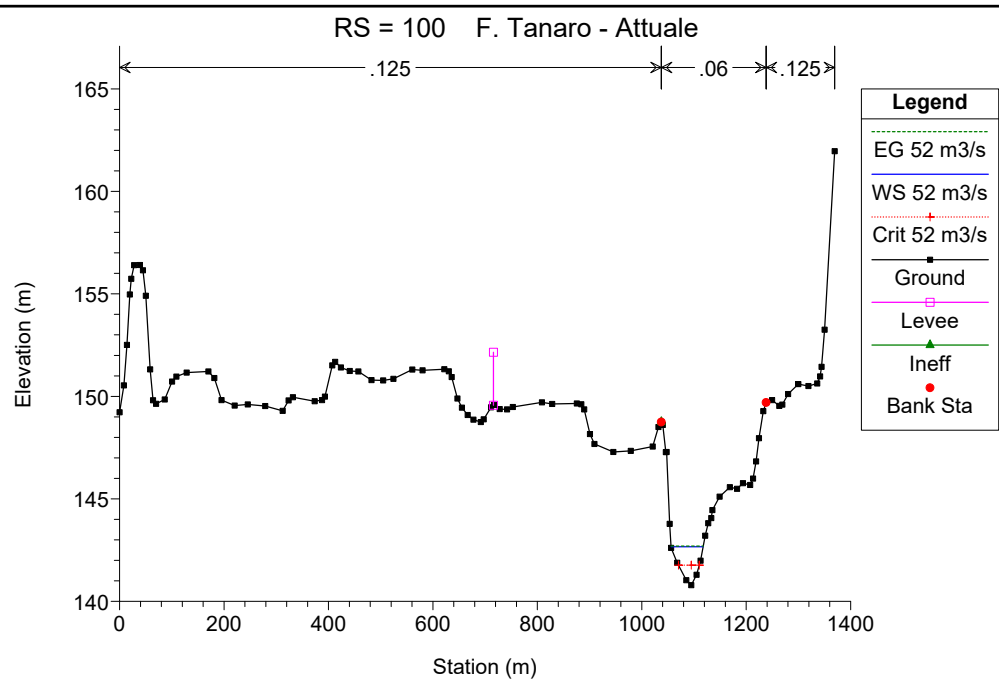
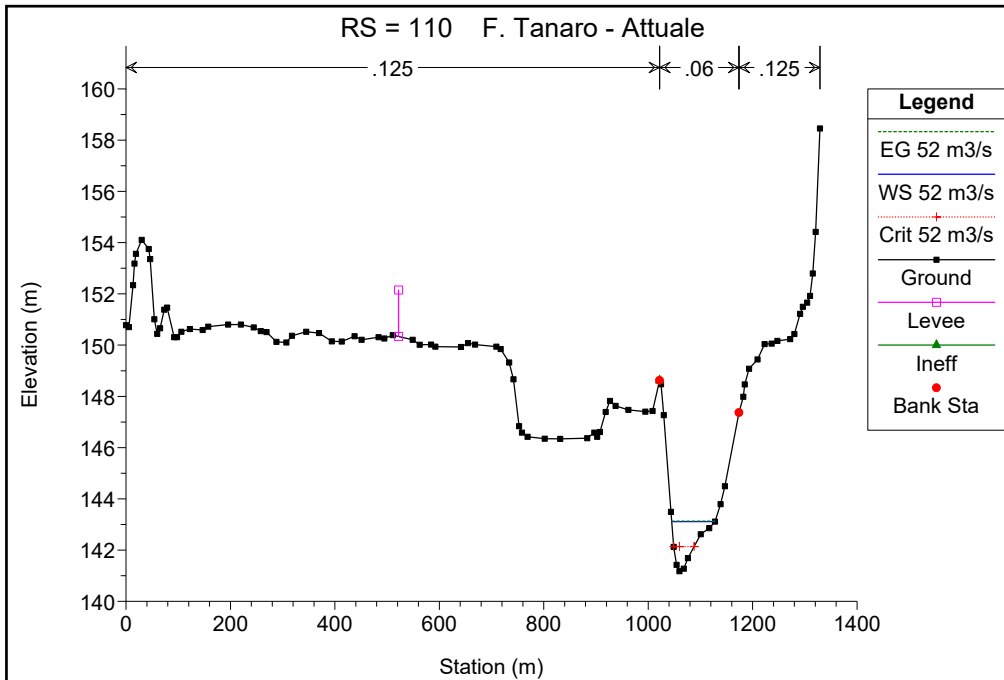


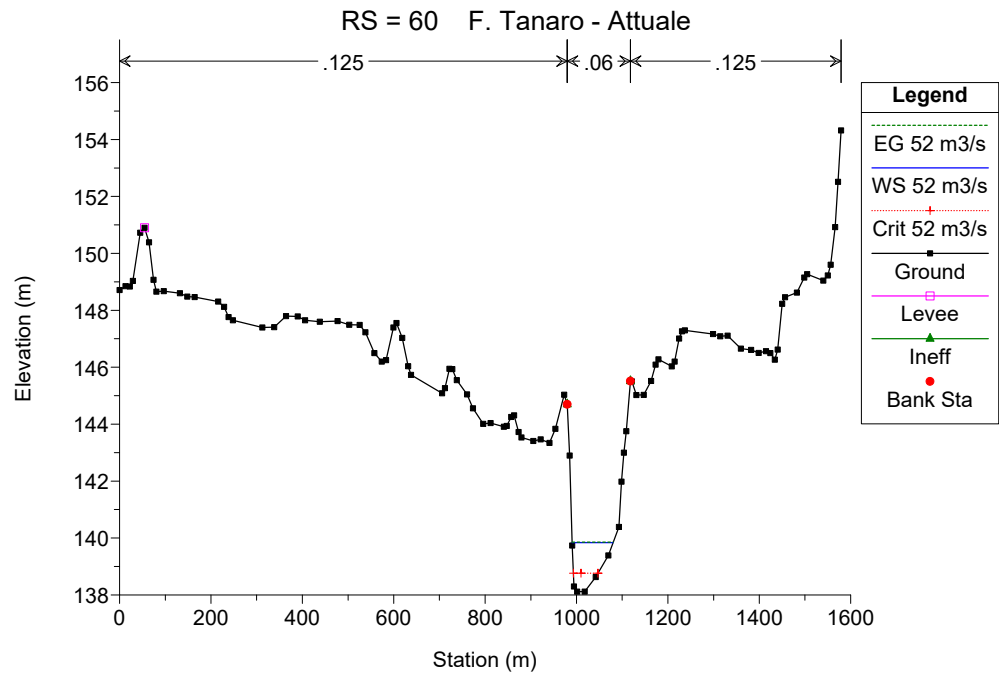
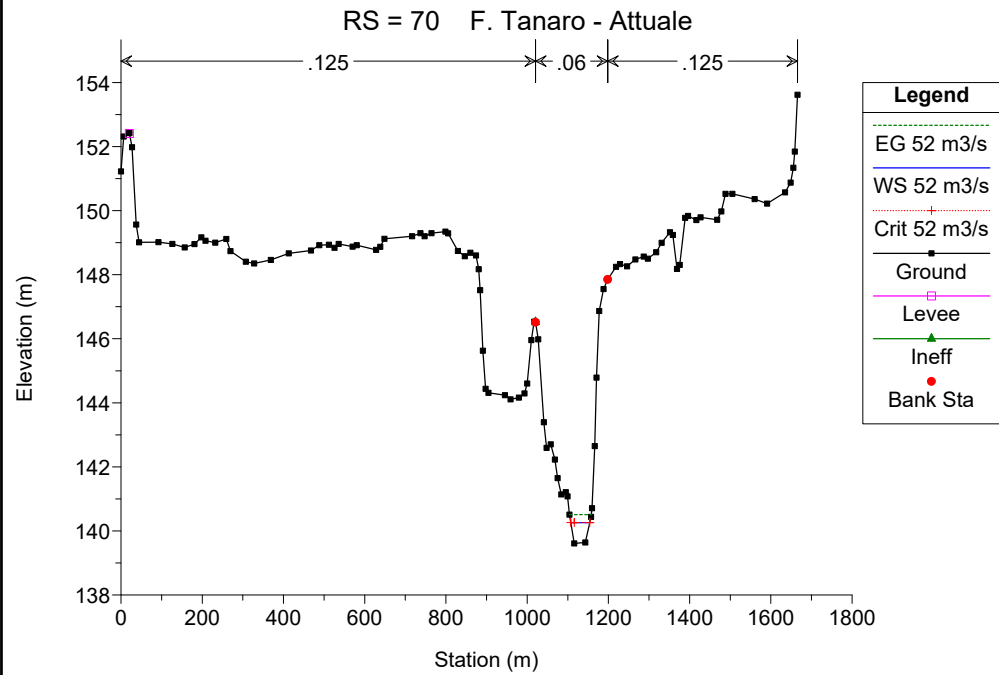
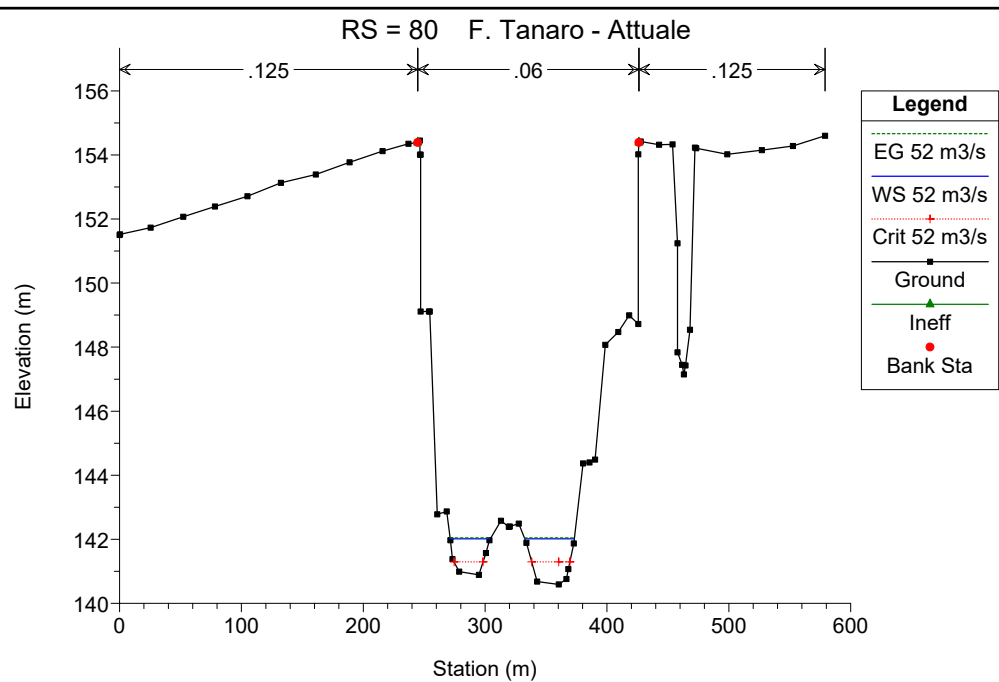
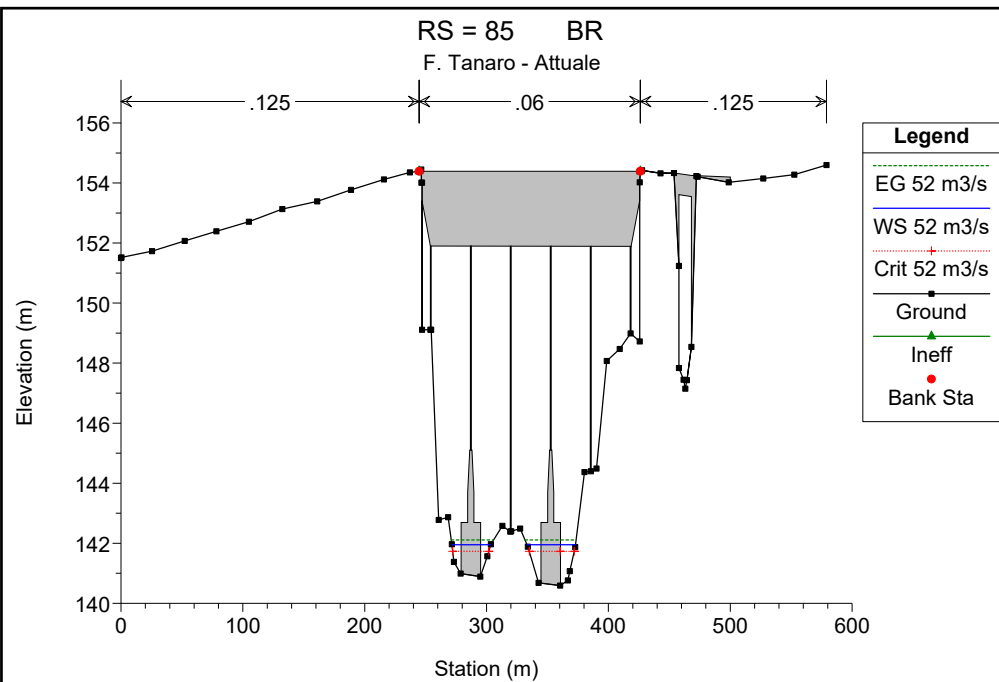


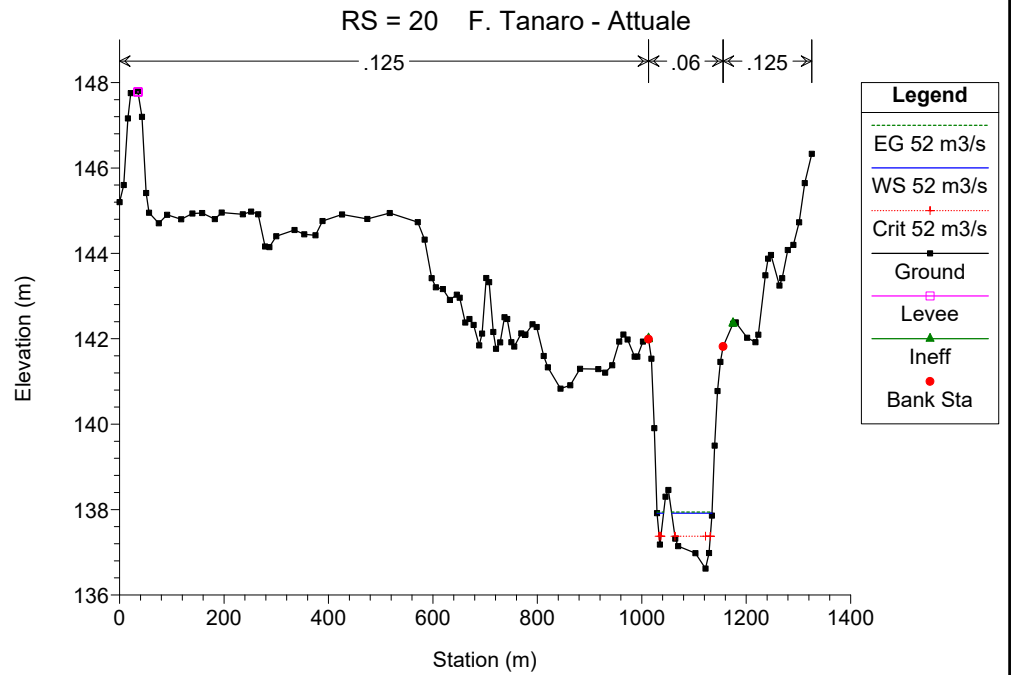
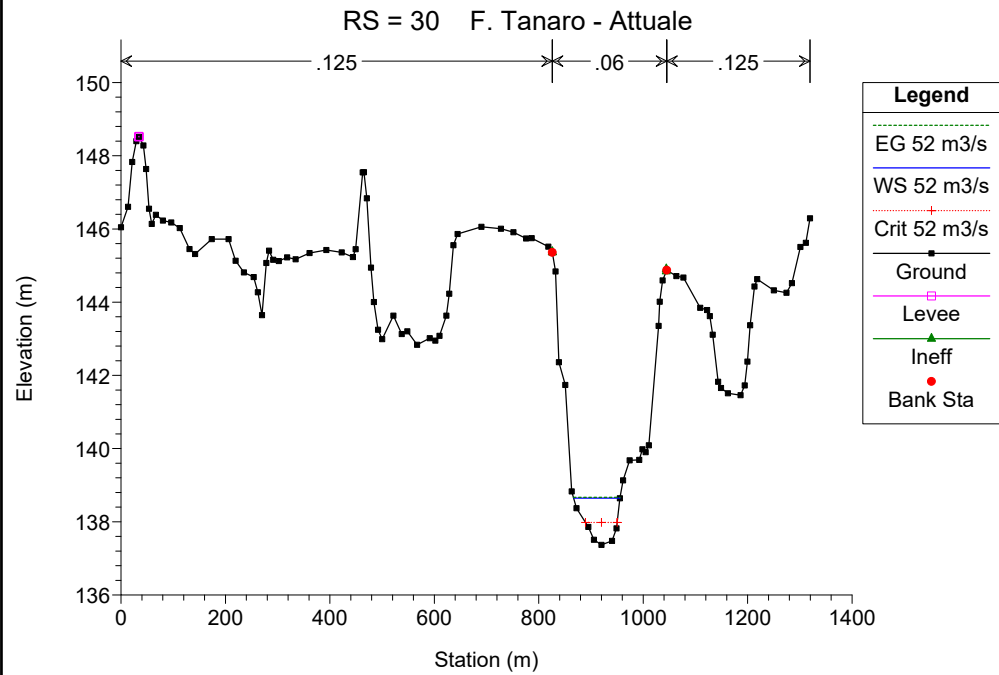
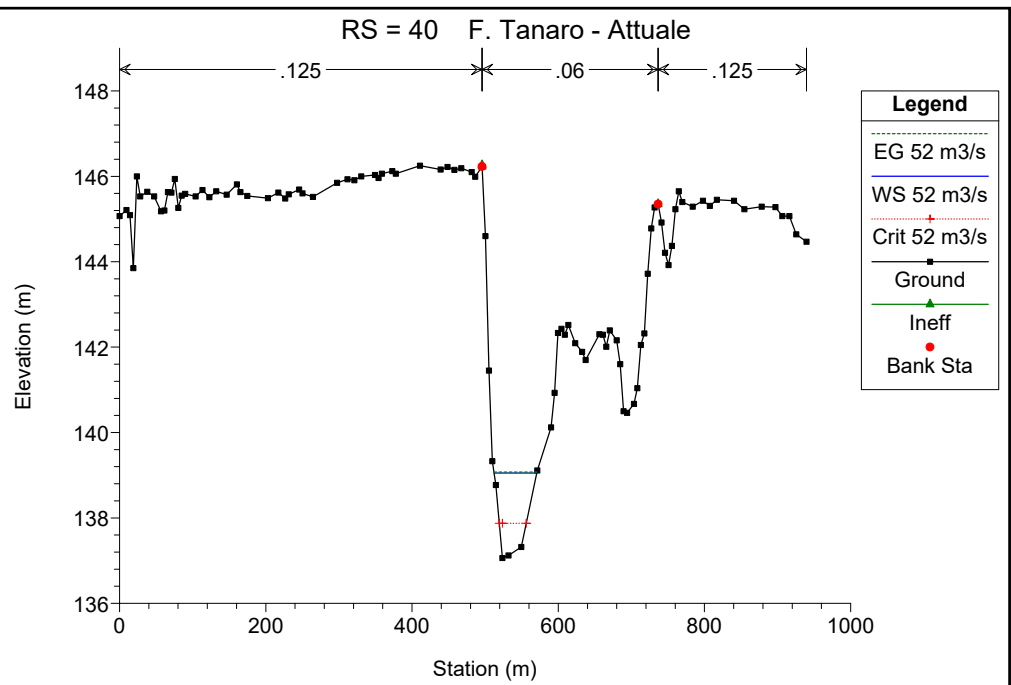
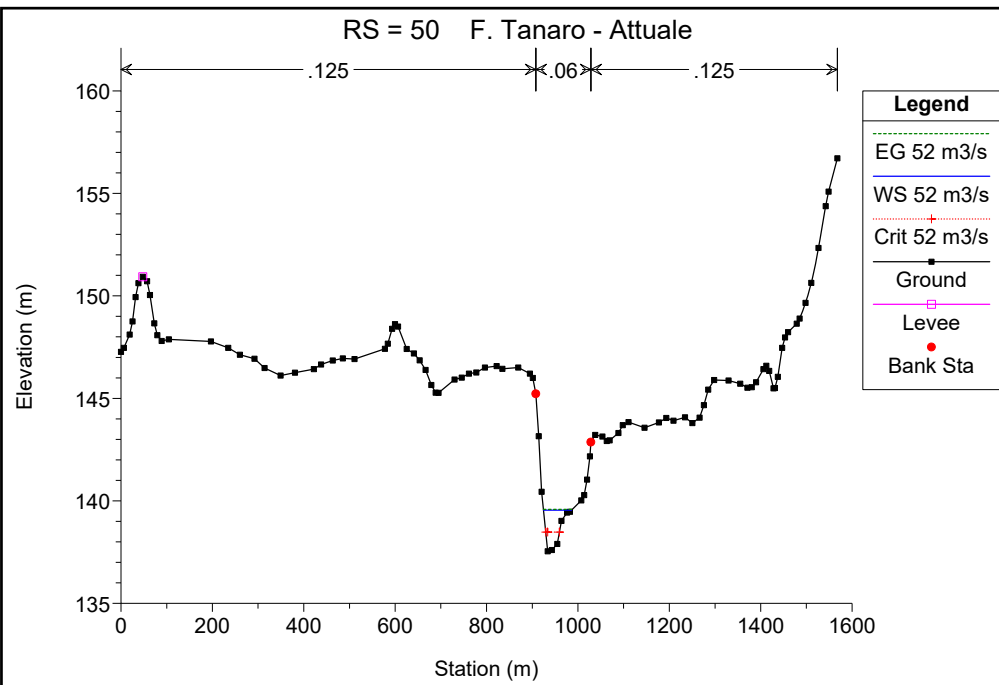




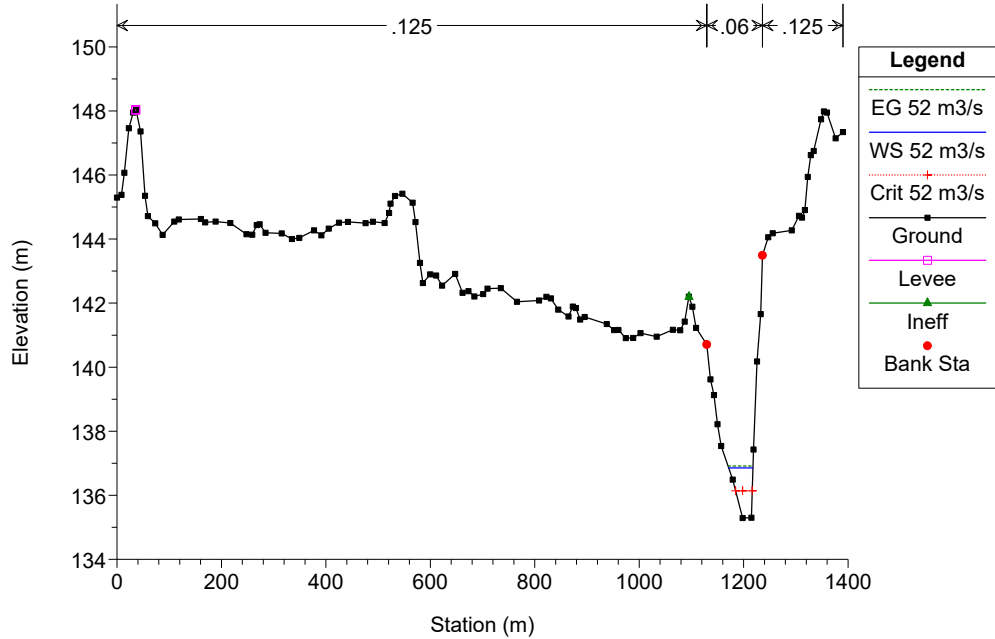








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE DI PROGETTO
PORTATA MEDIA DERIVATA**

SIMULAZIONE 28

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	52 in alveo (39.20 turbinati)	media derivata

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 52 m3/s

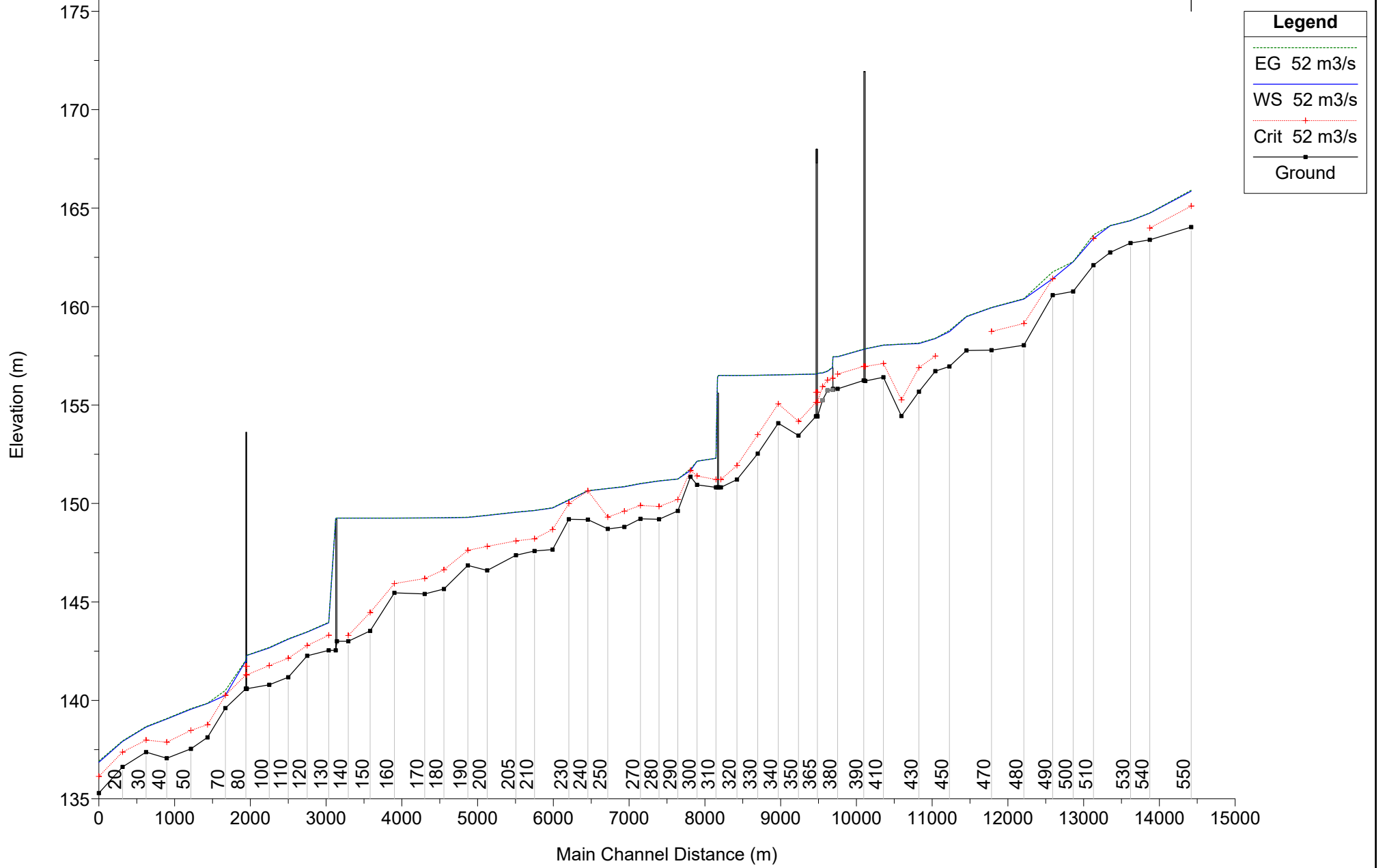
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	52 m3/s	52.00	164.04	165.86	165.11	165.91	0.003508	0.95	54.51	56.80	0.31
1	540	52 m3/s	52.00	163.39	164.74	163.99	164.76	0.001373	0.61	84.59	84.78	0.20
1	530	52 m3/s	52.00	163.23	164.36		164.38	0.001685	0.59	88.44	110.95	0.21
1	520	52 m3/s	52.00	162.75	164.11		164.12	0.000635	0.43	121.55	118.00	0.13
1	510	52 m3/s	52.00	162.10	163.46	163.46	163.65	0.050275	1.89	27.52	76.40	1.00
1	500	52 m3/s	52.00	160.77	162.27		162.28	0.000564	0.44	118.49	101.30	0.13
1	490	52 m3/s	52.00	160.58	161.42	161.42	161.76	0.040044	2.60	19.97	28.78	1.00
1	480	52 m3/s	52.00	158.04	160.38	159.14	160.40	0.001017	0.62	84.46	67.40	0.18
1	470	52 m3/s	52.00	157.79	159.94	158.74	159.96	0.001049	0.61	85.08	70.27	0.18
1	460	52 m3/s	52.00	157.77	159.48		159.51	0.001879	0.67	77.18	85.60	0.23
1	450	52 m3/s	52.00	156.96	158.72		158.79	0.006578	1.09	47.61	65.20	0.41
1	440	52 m3/s	52.00	156.72	158.38	157.49	158.39	0.000974	0.59	88.34	73.11	0.17
1	430	52 m3/s	52.00	155.68	158.12	156.90	158.15	0.001365	0.68	76.81	66.24	0.20
1	420	52 m3/s	52.00	154.44	158.09	155.26	158.09	0.000080	0.24	217.99	106.82	0.05
1	410	52 m3/s	52.00	156.41	158.04	157.11	158.05	0.000703	0.47	110.97	101.40	0.14
1	400	52 m3/s	52.00	156.22	157.85	156.96	157.86	0.000881	0.52	99.11	90.16	0.16
1	395		Bridge									
1	390	52 m3/s	52.00	156.25	157.83	156.97	157.84	0.000948	0.54	96.93	90.15	0.17
1	380	52 m3/s	52.00	155.82	157.45	156.57	157.46	0.001298	0.53	97.42	116.00	0.19
1	379		Inl Struct									
1	370	52 m3/s	52.00	154.43	156.61	155.13	156.61	0.000170	0.26	199.53	151.18	0.07
1	365		Bridge									
1	360	52 m3/s	52.00	154.43	156.57	155.13	156.58	0.000188	0.27	193.61	151.00	0.08
1	350	52 m3/s	52.00	153.45	156.55	154.17	156.55	0.000048	0.20	264.99	119.59	0.04
1	340	52 m3/s	52.00	154.08	156.53	155.06	156.53	0.000160	0.27	192.56	132.05	0.07
1	330	52 m3/s	52.00	152.53	156.51	153.50	156.51	0.000049	0.20	262.57	117.92	0.04
1	320	52 m3/s	52.00	151.21	156.50	151.93	156.50	0.000014	0.16	328.82	86.70	0.02
1	315	52 m3/s	12.80	150.82	156.50	151.22	156.50	0.000001	0.03	384.75	115.55	0.01
1	312.5		Inl Struct									
1	310	52 m3/s	12.80	150.82	152.29	151.22	152.30	0.000309	0.25	52.19	89.31	0.09
1	300	52 m3/s	12.80	150.95	152.15	151.40	152.15	0.001495	0.36	35.17	82.76	0.18
1	295	52 m3/s	12.80	151.36	151.68	151.68	151.75	0.065903	1.21	10.55	102.87	1.00
1	290	52 m3/s	12.80	149.62	151.24	150.20	151.24	0.000193	0.24	52.91	80.92	0.07
1	280	52 m3/s	52.00	149.20	151.14	149.85	151.15	0.000428	0.46	113.08	72.83	0.12
1	270	52 m3/s	52.00	149.22	151.00	149.90	151.02	0.000702	0.55	94.93	68.42	0.15
1	260	52 m3/s	52.00	148.81	150.85	149.61	150.86	0.000801	0.56	93.31	72.46	0.16
1	250	52 m3/s	52.00	148.71	150.76	149.31	150.77	0.000261	0.36	144.26	92.97	0.09
1	240	52 m3/s	52.00	149.18	150.64	150.64	150.65	0.000863	0.45	114.74	127.69	0.15
1	230	52 m3/s	52.00	149.20	150.17	149.99	150.20	0.005490	0.79	65.78	128.23	0.35
1	220	52 m3/s	52.00	147.66	149.77	148.68	149.79	0.000949	0.57	90.89	76.96	0.17

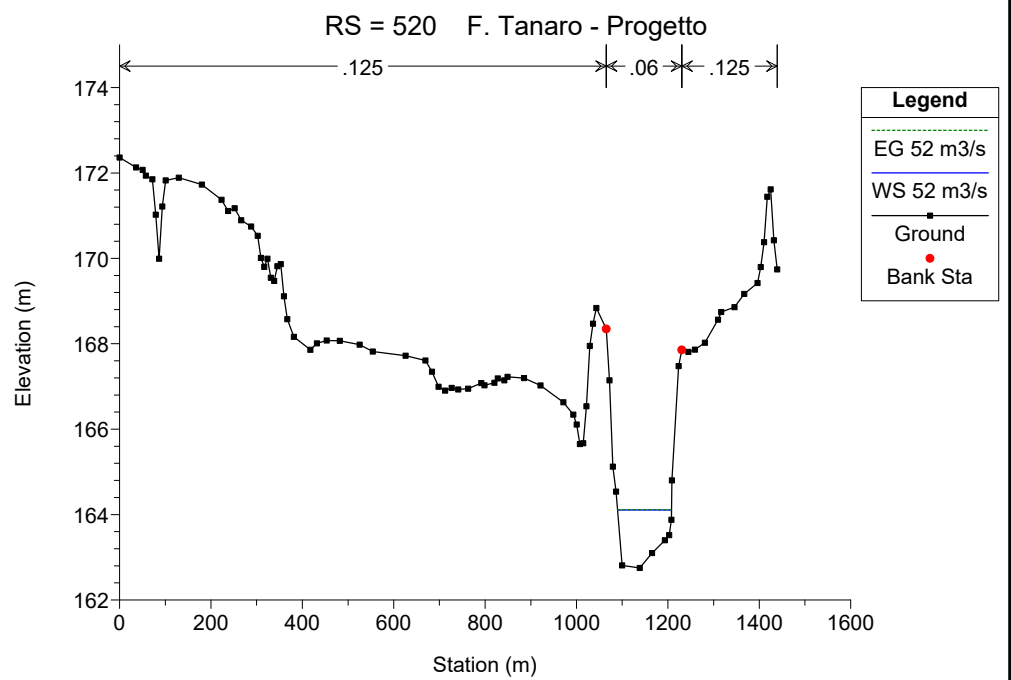
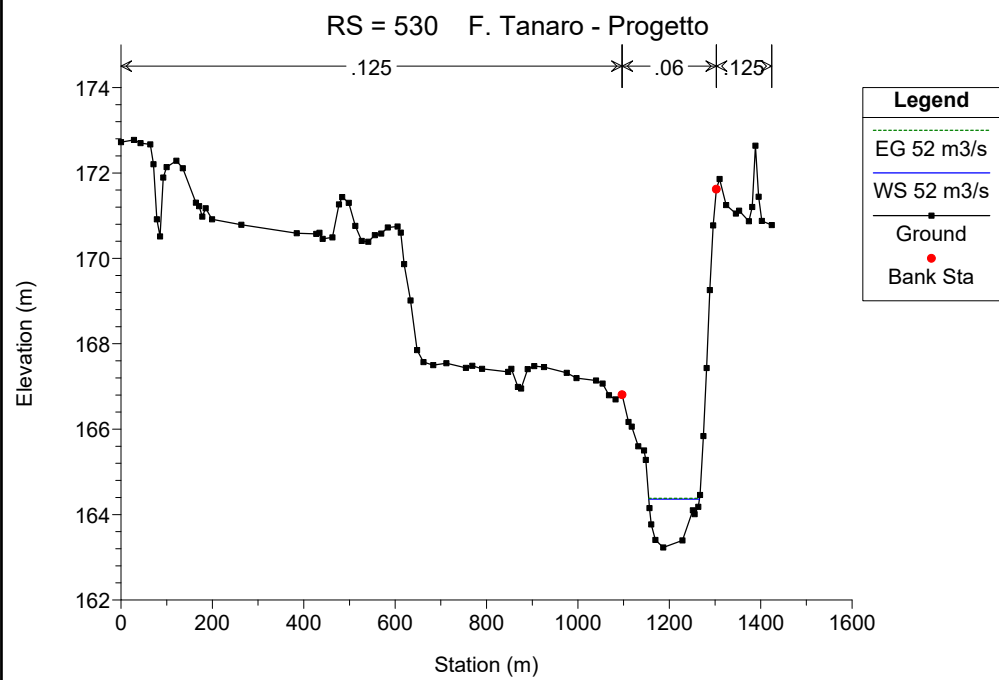
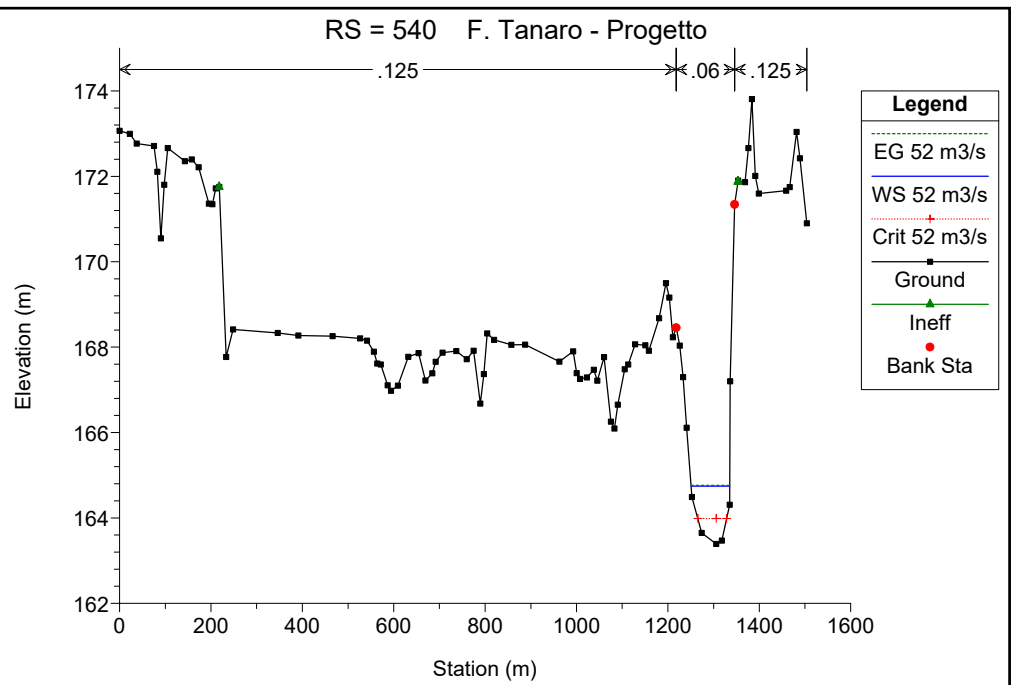
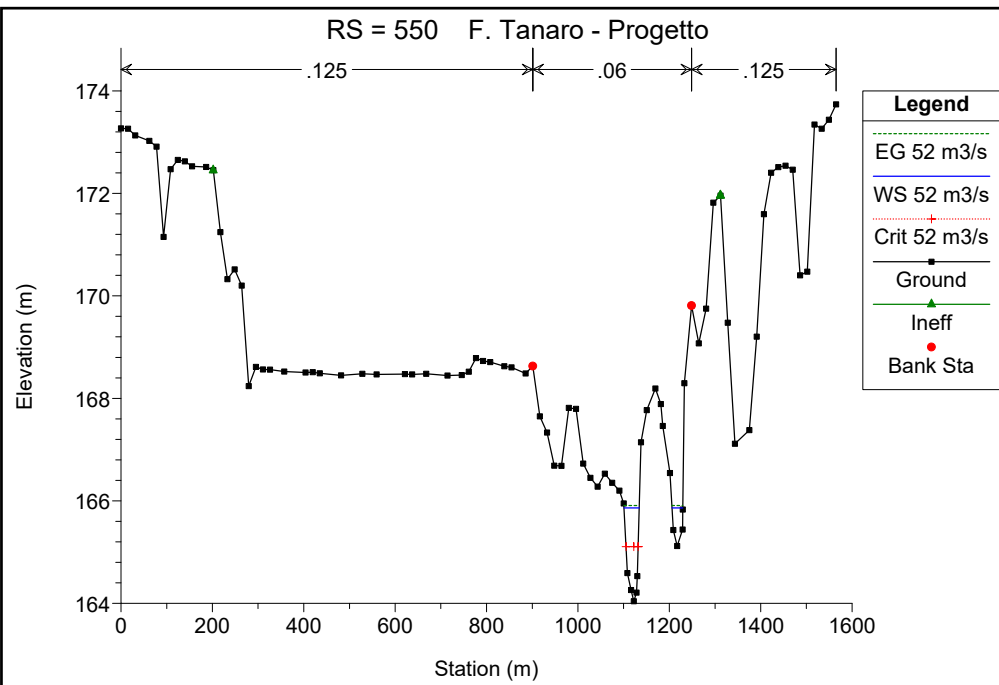
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 52 m3/s (Continued)

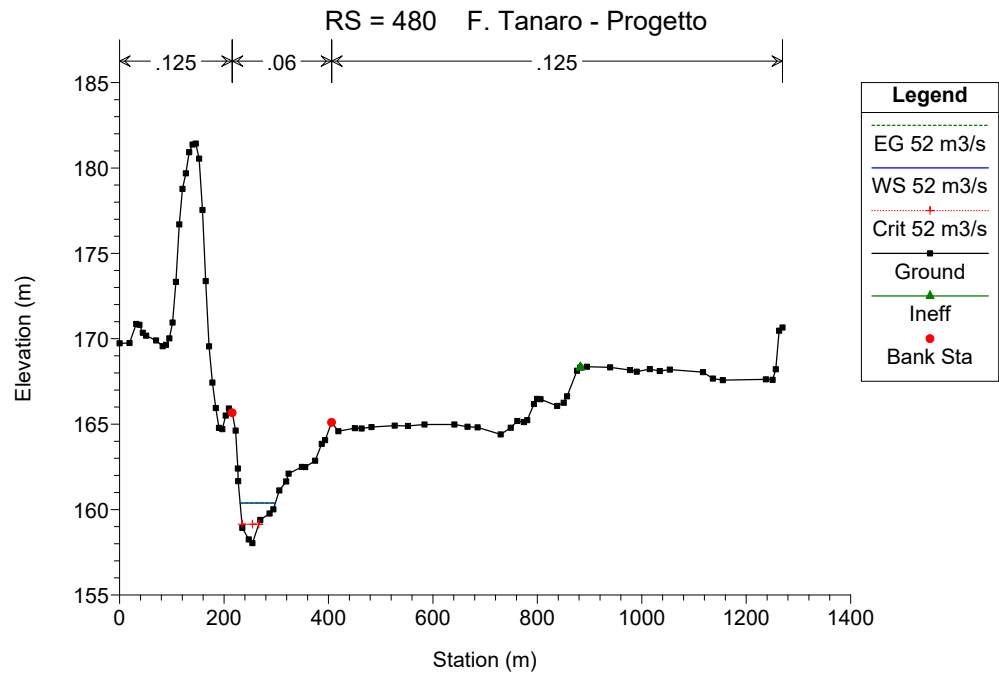
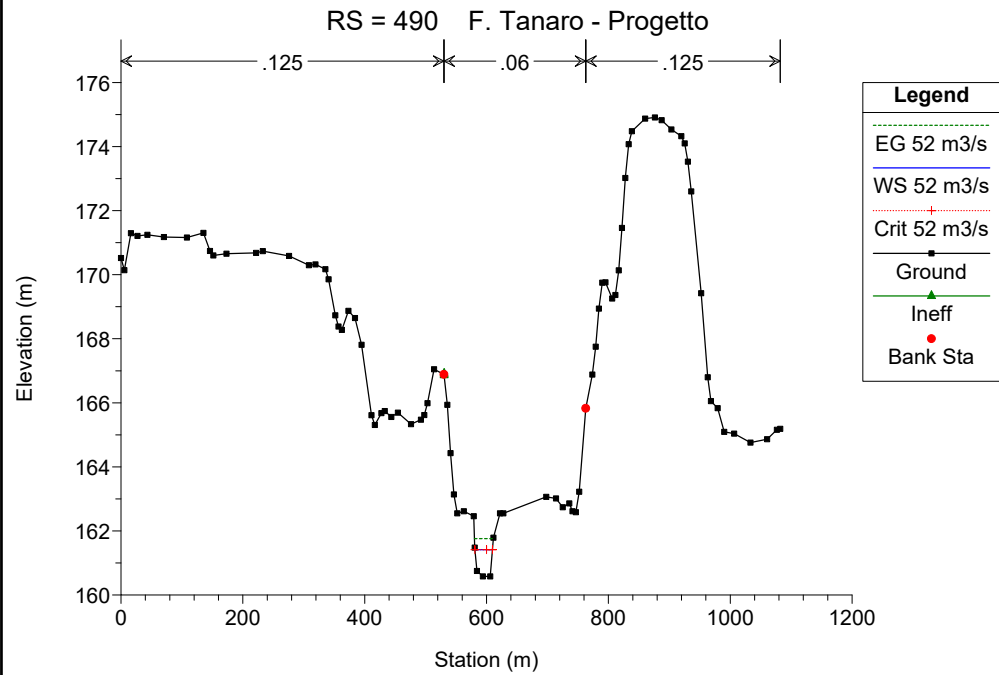
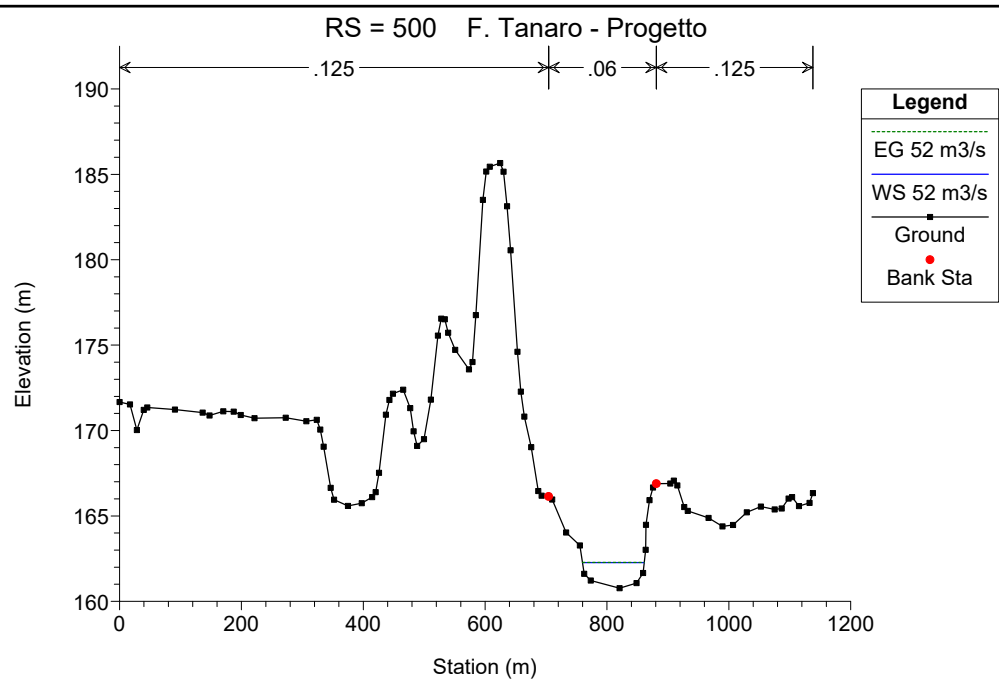
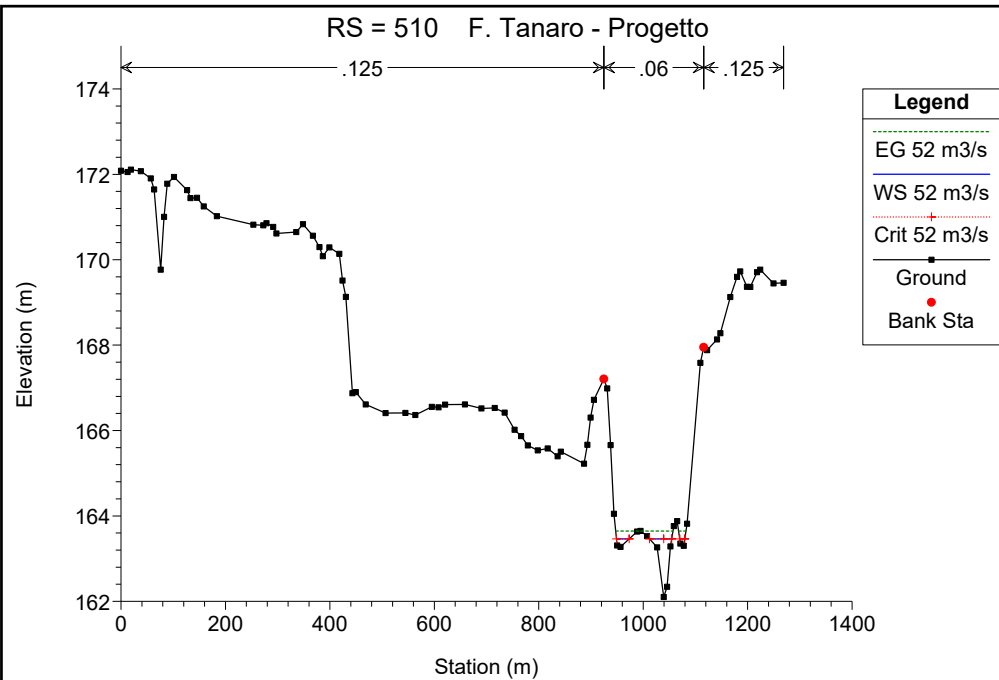
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	52 m3/s	52.00	147.59	149.64	148.21	149.65	0.000379	0.43	120.84	78.62	0.11
1	205	52 m3/s	52.00	147.37	149.55	148.10	149.56	0.000329	0.41	125.47	77.57	0.10
1	200	52 m3/s	52.00	146.60	149.39	147.82	149.40	0.000574	0.45	115.58	96.22	0.13
1	190	52 m3/s	52.00	146.85	149.29	147.62	149.30	0.000274	0.38	136.62	84.00	0.10
1	180	52 m3/s	52.00	145.66	149.27	146.63	149.27	0.000042	0.16	334.06	192.05	0.04
1	170	52 m3/s	52.00	145.40	149.27	146.19	149.27	0.000017	0.13	403.91	154.06	0.03
1	160	52 m3/s	52.00	145.46	149.26	145.93	149.26	0.000013	0.11	464.61	187.34	0.02
1	150	52 m3/s	52.00	143.53	149.26	144.46	149.26	0.000006	0.09	558.21	158.23	0.02
1	140	52 m3/s	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	52 m3/s	52.00	142.54	143.94	143.31	143.97	0.002664	0.75	68.96	83.95	0.27
1	120	52 m3/s	52.00	142.27	143.47	142.78	143.48	0.001174	0.56	93.57	97.21	0.18
1	110	52 m3/s	52.00	141.17	143.11	142.14	143.13	0.001695	0.66	78.47	82.48	0.22
1	100	52 m3/s	52.00	140.79	142.66	141.77	142.69	0.001808	0.76	68.33	61.25	0.23
1	90	52 m3/s	52.00	140.59	142.28	141.29	142.29	0.001006	0.57	91.70	82.03	0.17
1	85		Bridge									
1	80	52 m3/s	52.00	140.59	142.02	141.29	142.04	0.002005	0.73	71.36	73.56	0.24
1	70	52 m3/s	52.00	139.61	140.26	140.26	140.51	0.044346	2.21	23.50	46.92	1.00
1	60	52 m3/s	52.00	138.12	139.84	138.76	139.85	0.000747	0.50	103.89	89.91	0.15
1	50	52 m3/s	52.00	137.54	139.55	138.48	139.58	0.002368	0.82	63.20	61.57	0.26
1	40	52 m3/s	52.00	137.06	139.05	137.88	139.07	0.001130	0.67	77.19	58.32	0.19
1	30	52 m3/s	52.00	137.37	138.64	137.98	138.67	0.002051	0.68	76.26	88.72	0.23
1	20	52 m3/s	52.00	136.62	137.91	137.38	137.94	0.002727	0.74	70.33	89.62	0.27
1	10	52 m3/s	52.00	135.29	136.86	136.14	136.91	0.004001	1.08	48.29	46.34	0.34

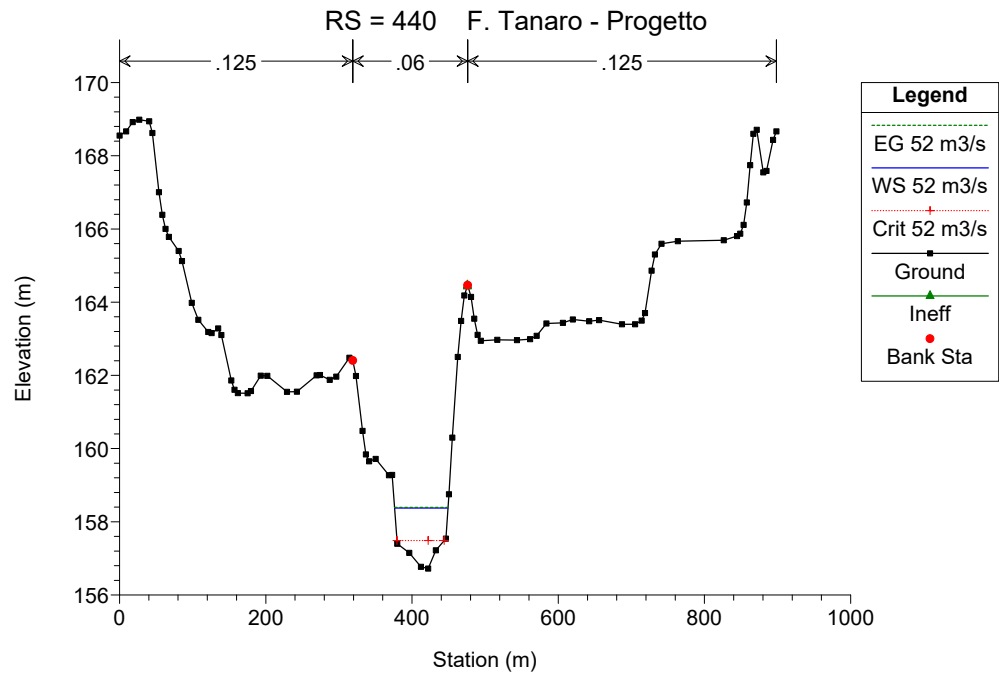
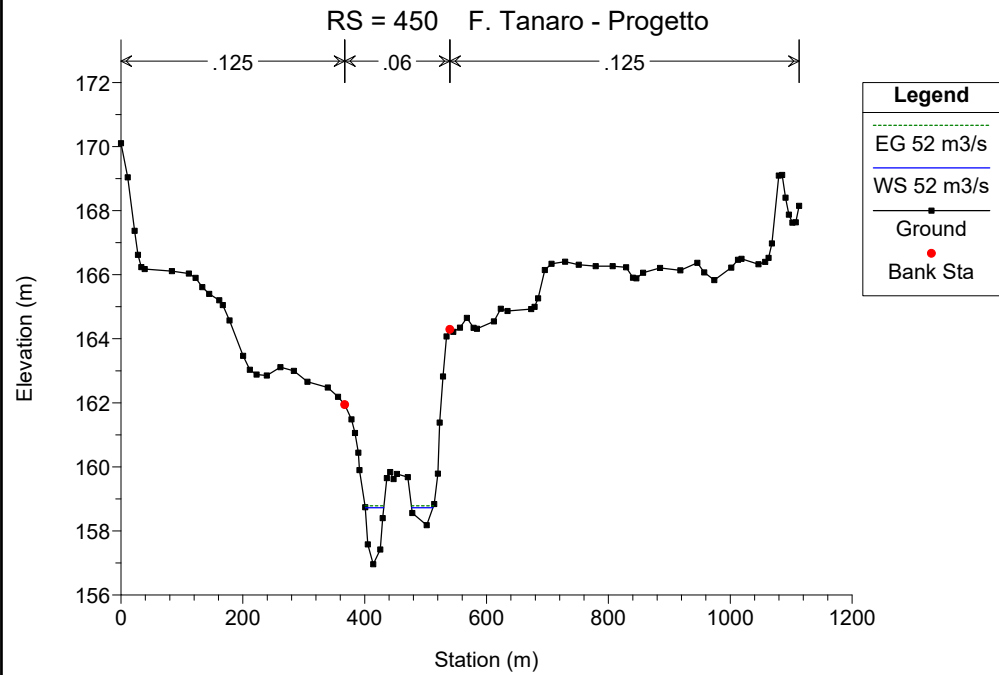
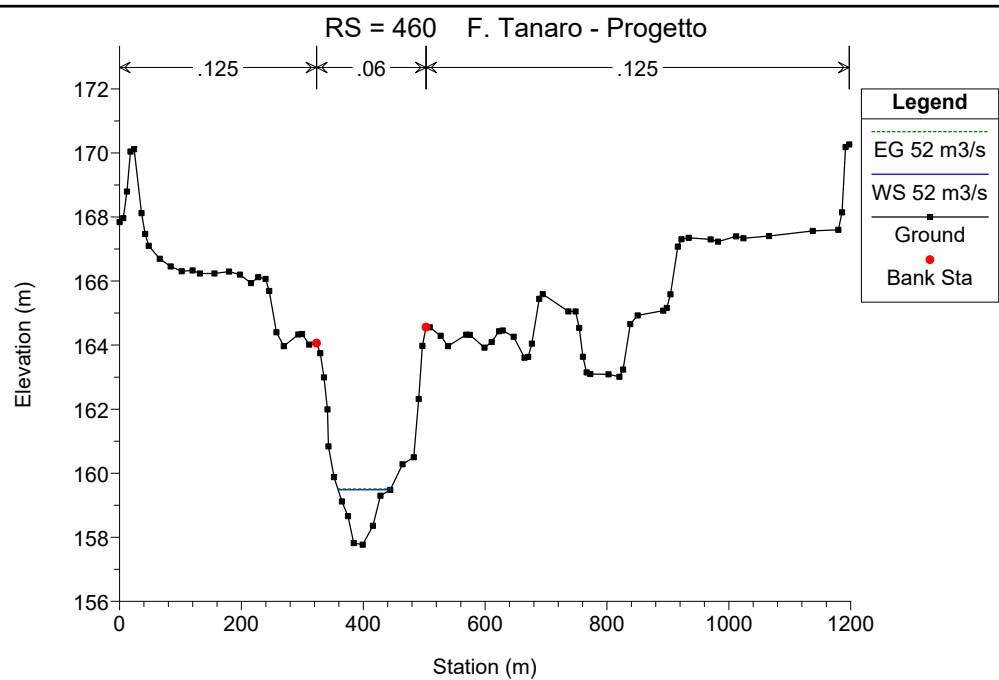
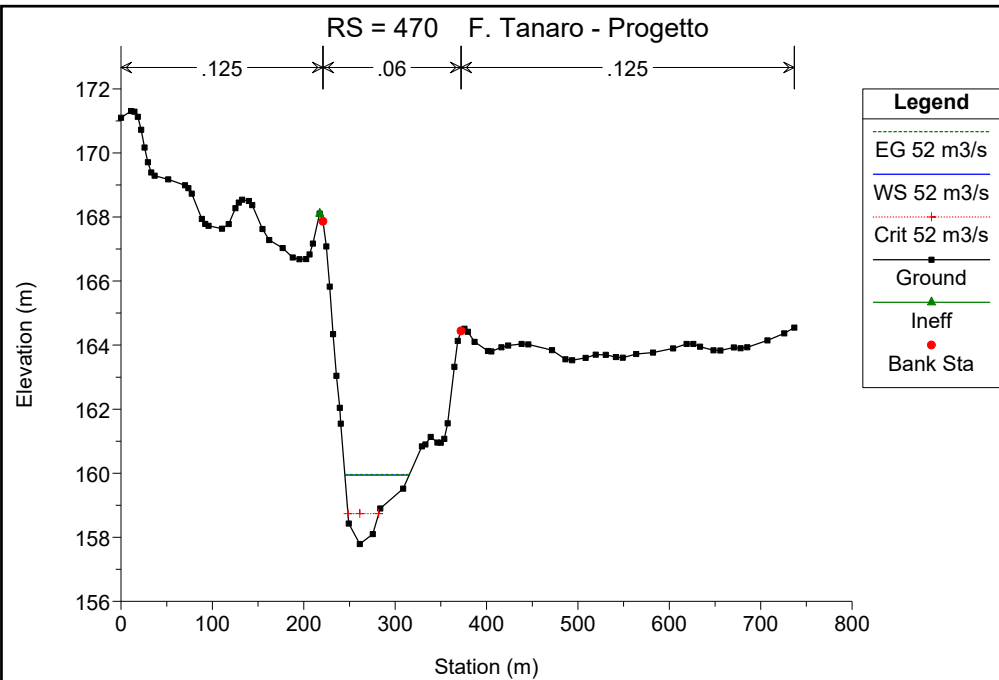
F. Tanaro - Progetto

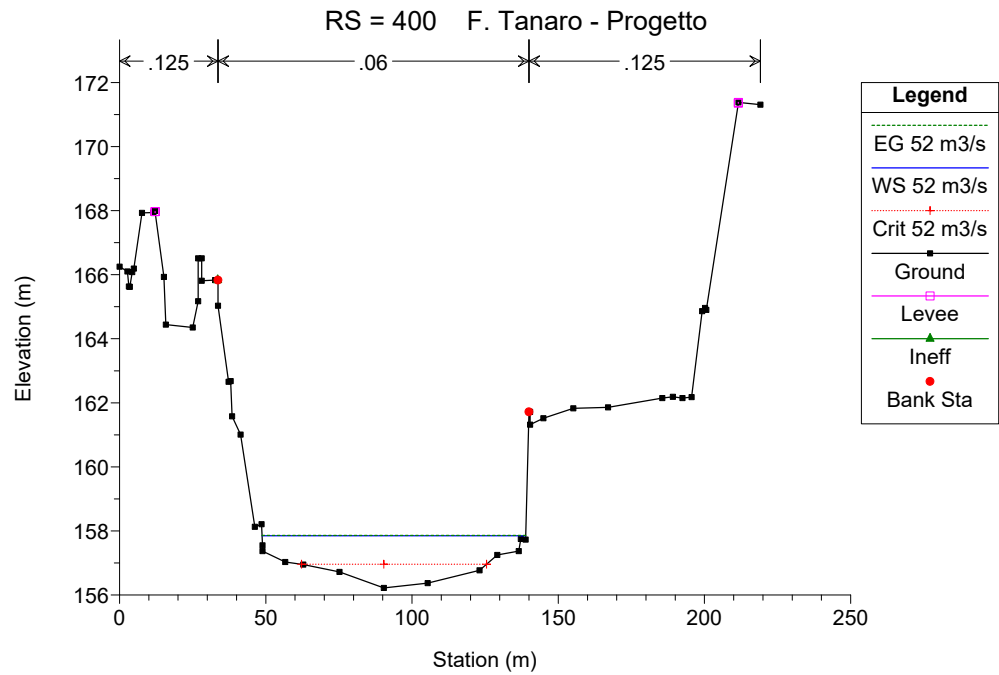
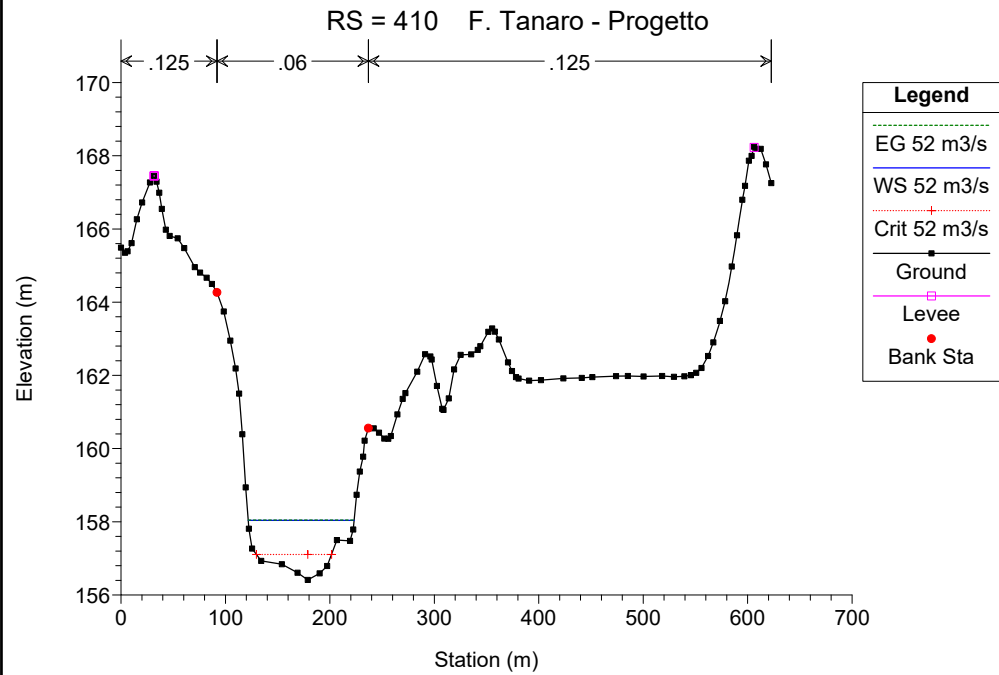
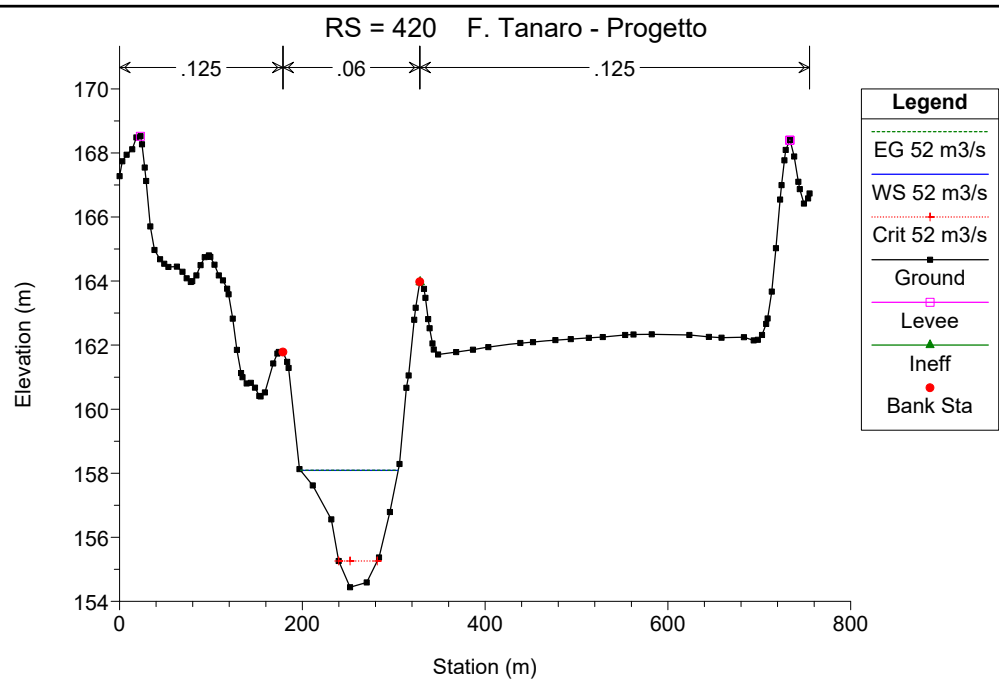
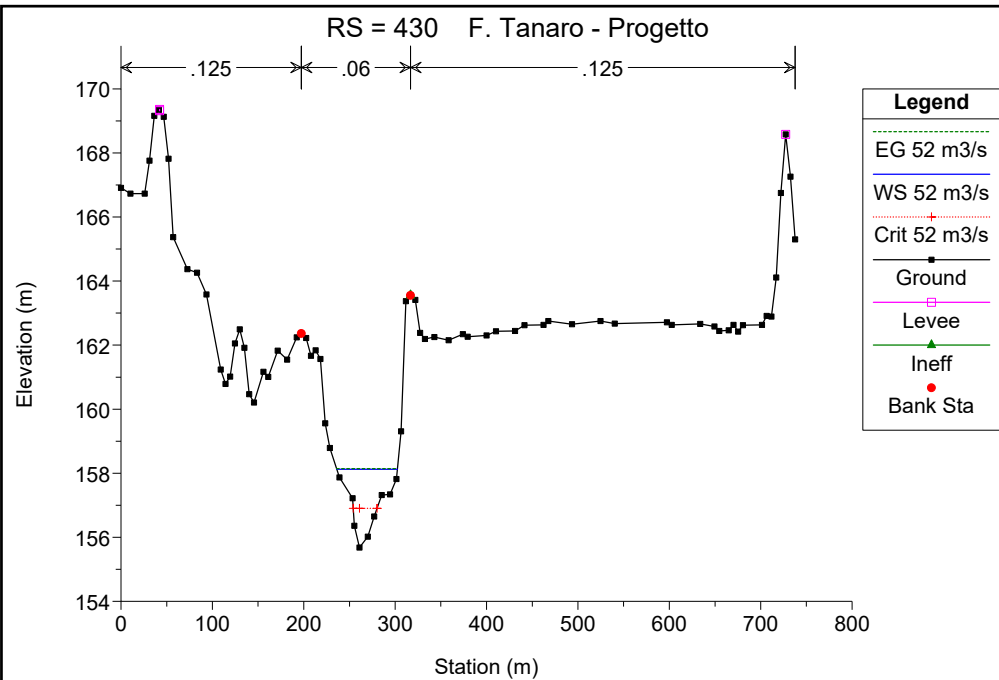
Tanaro 1

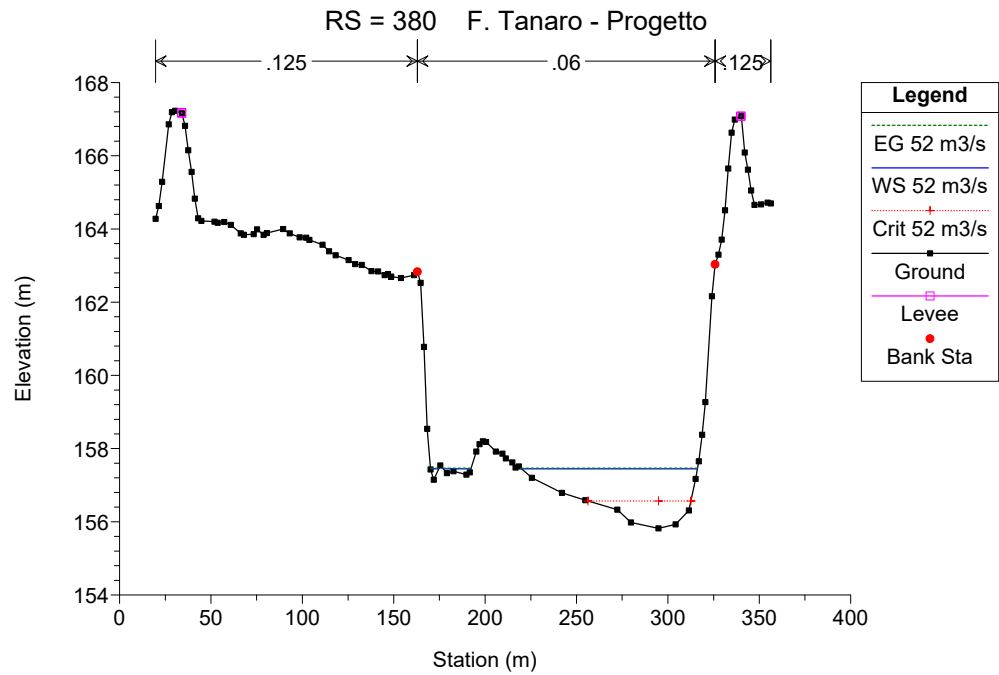
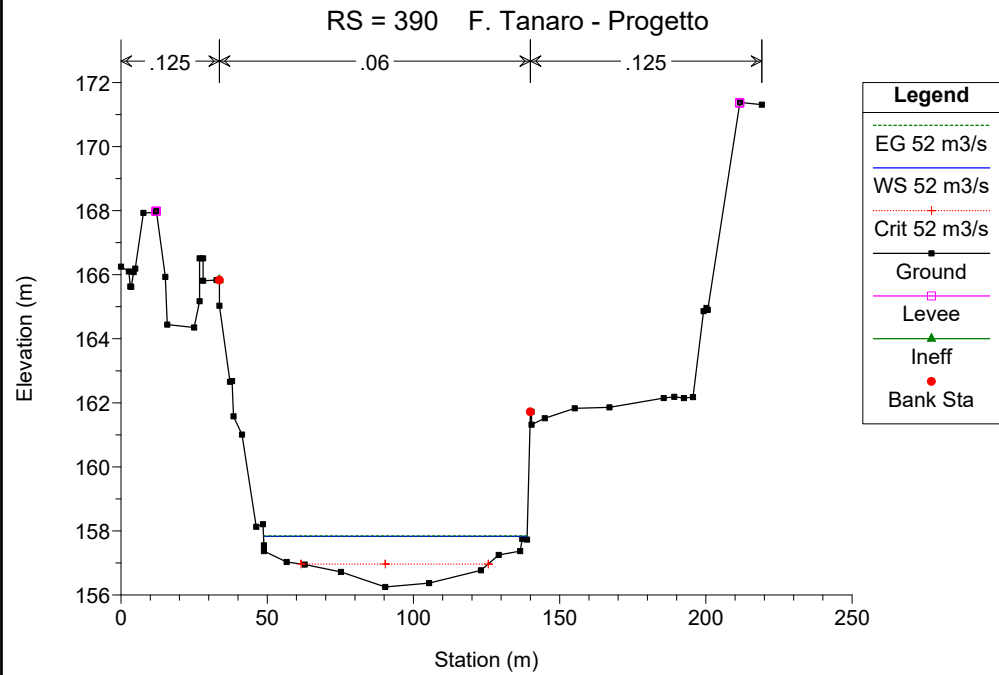
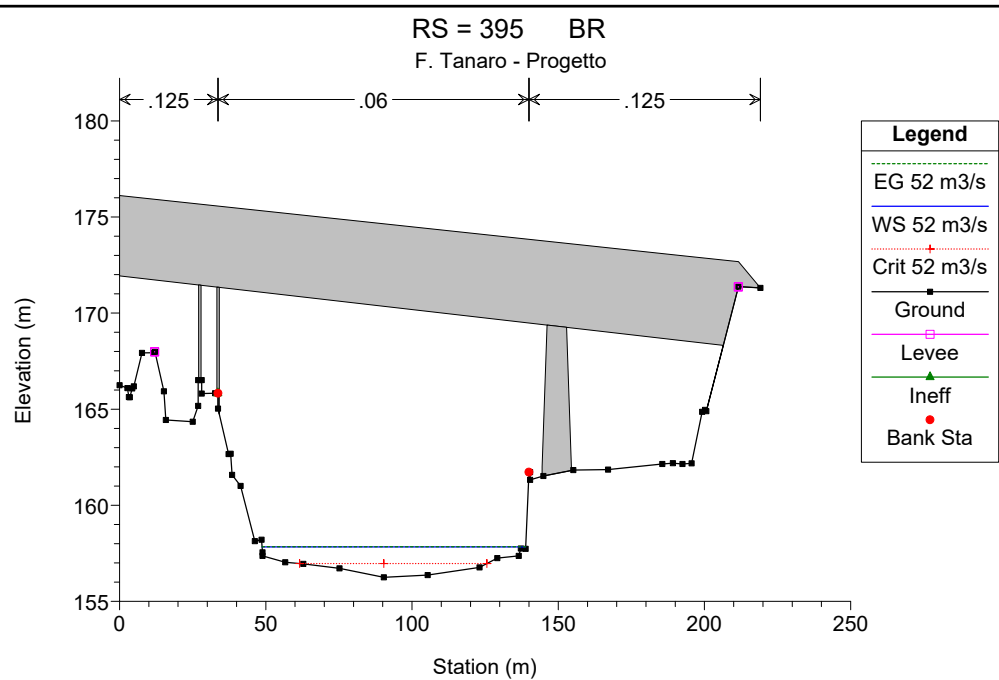
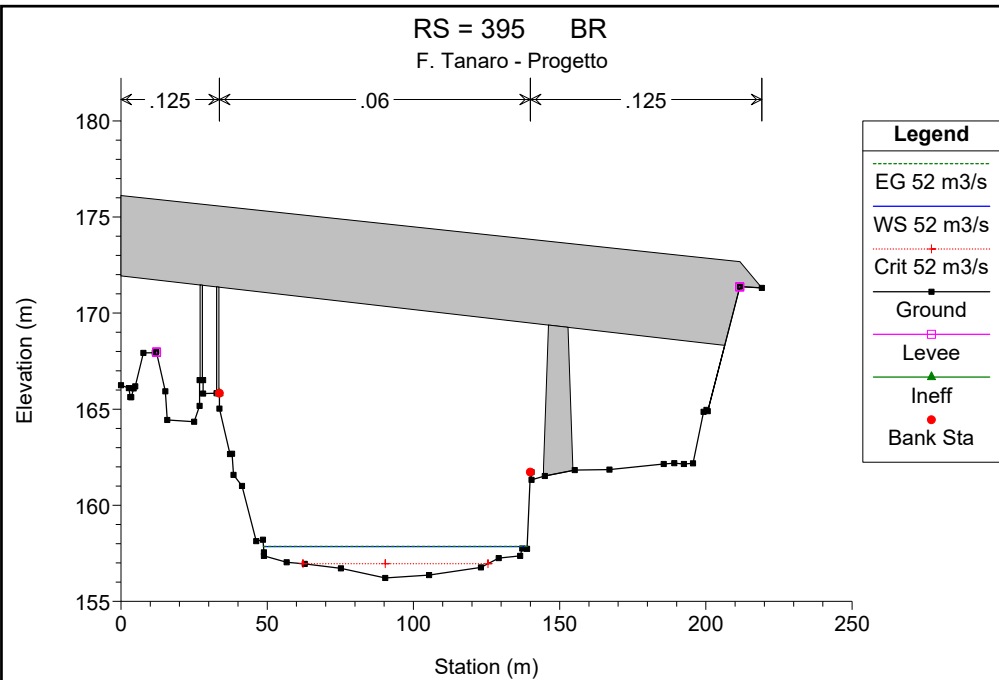


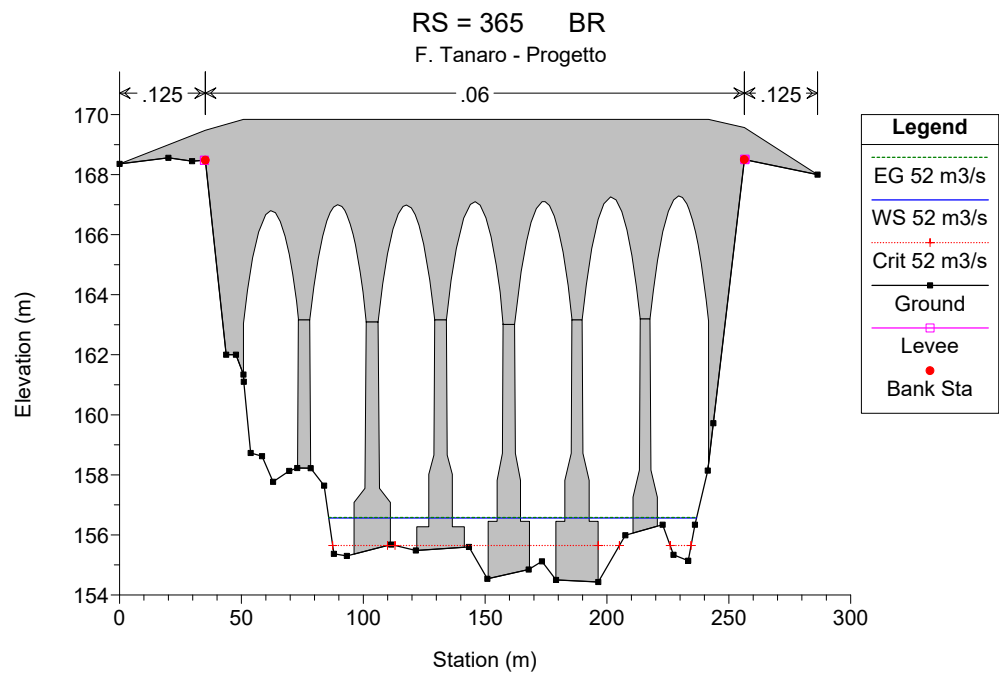
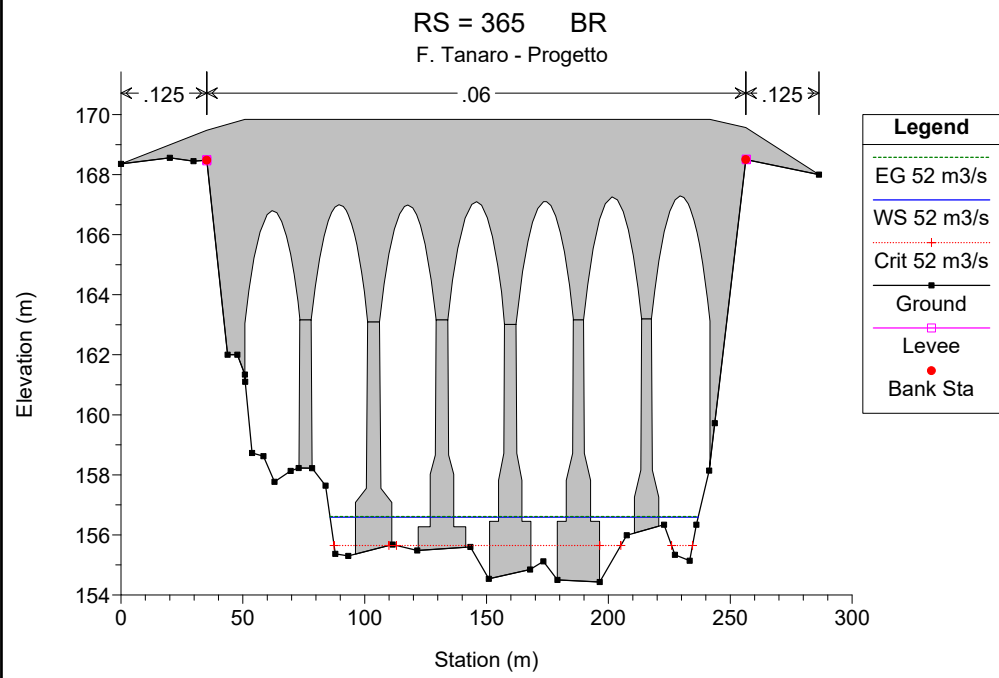
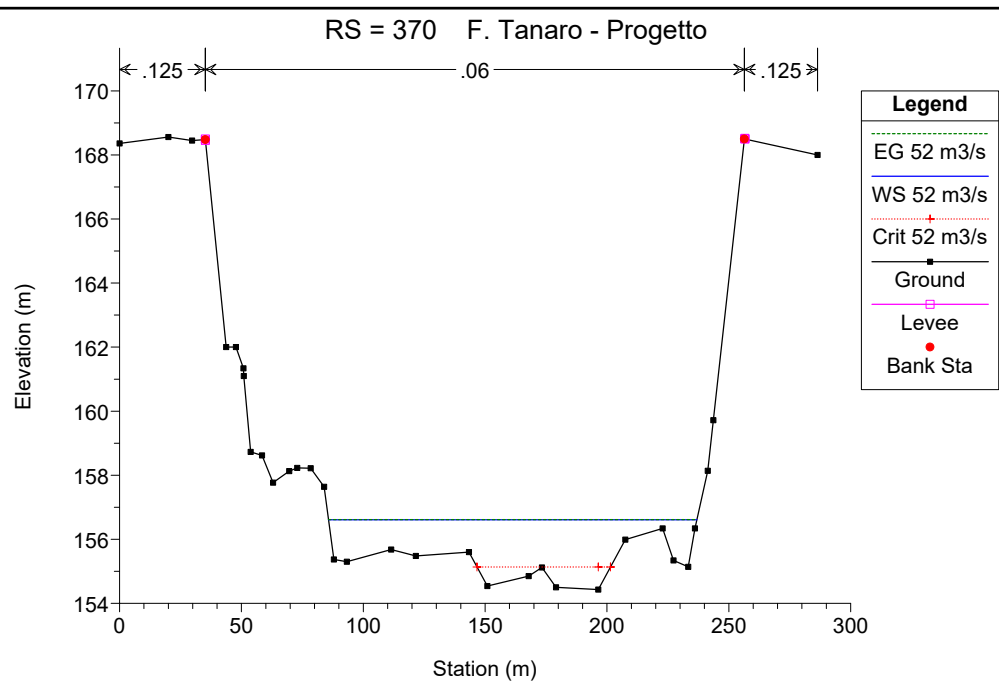
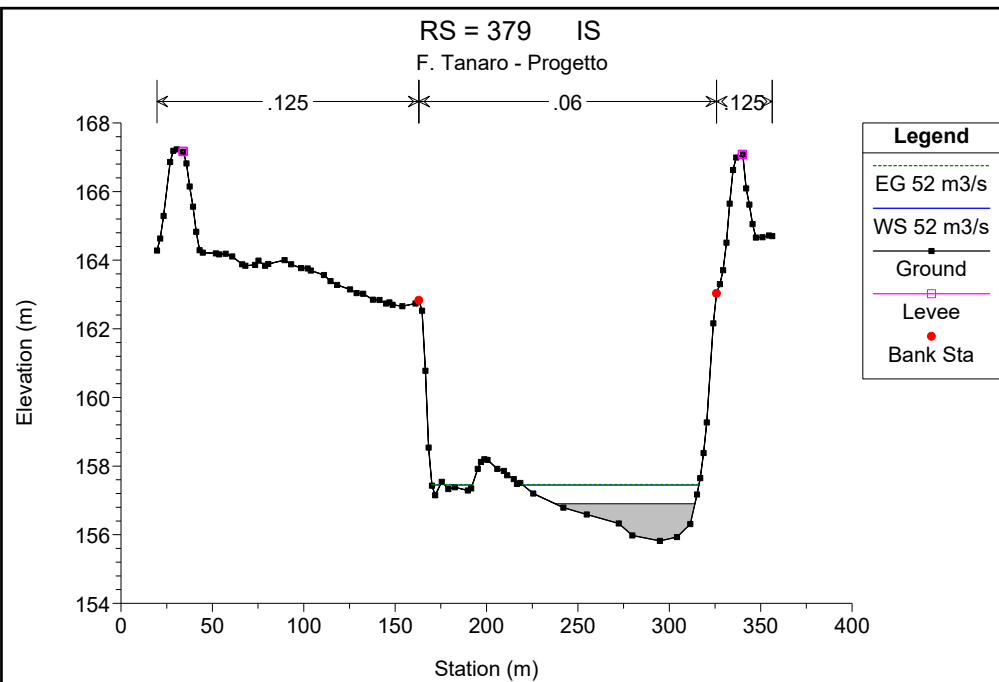


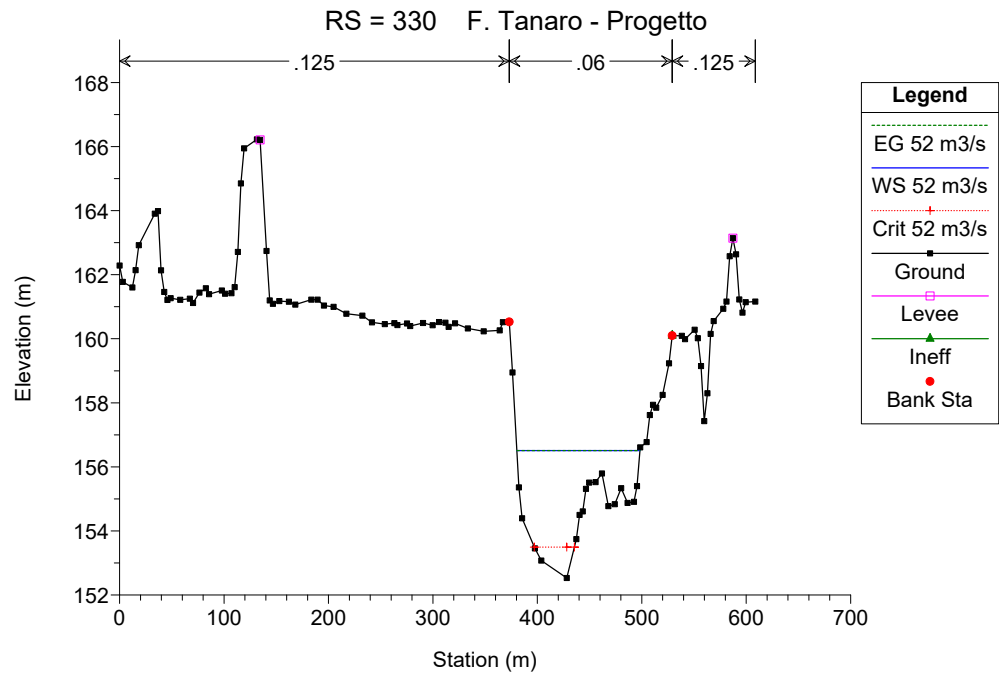
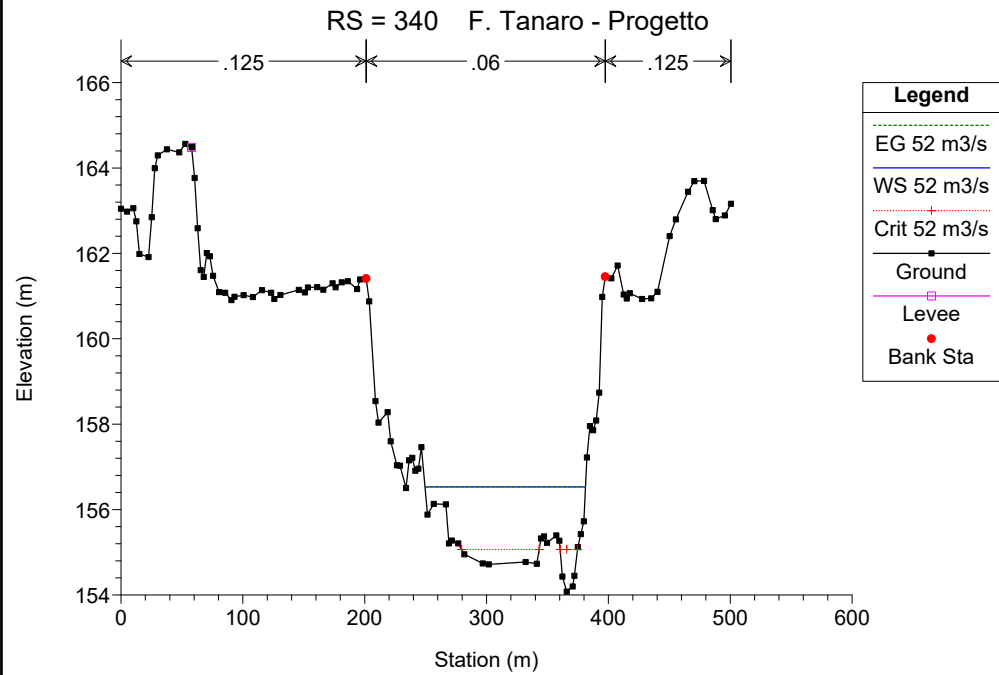
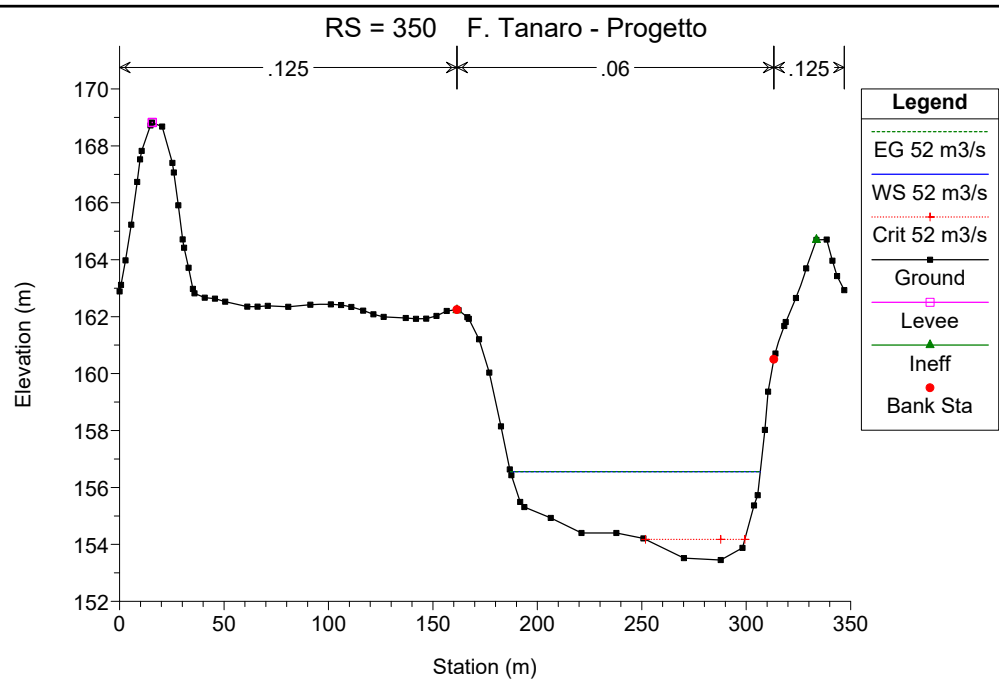
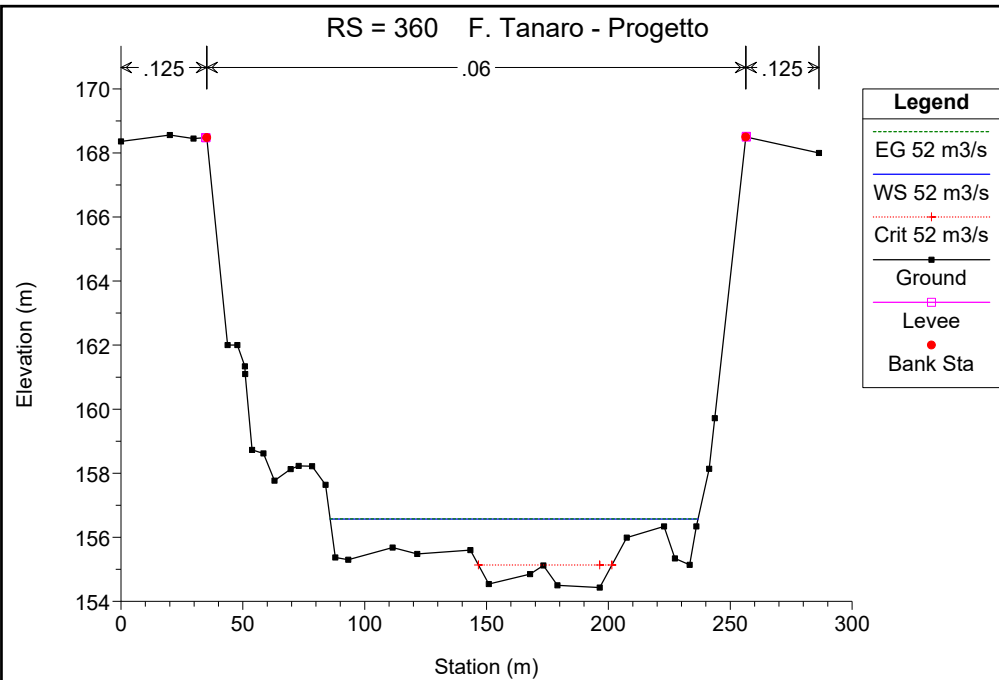


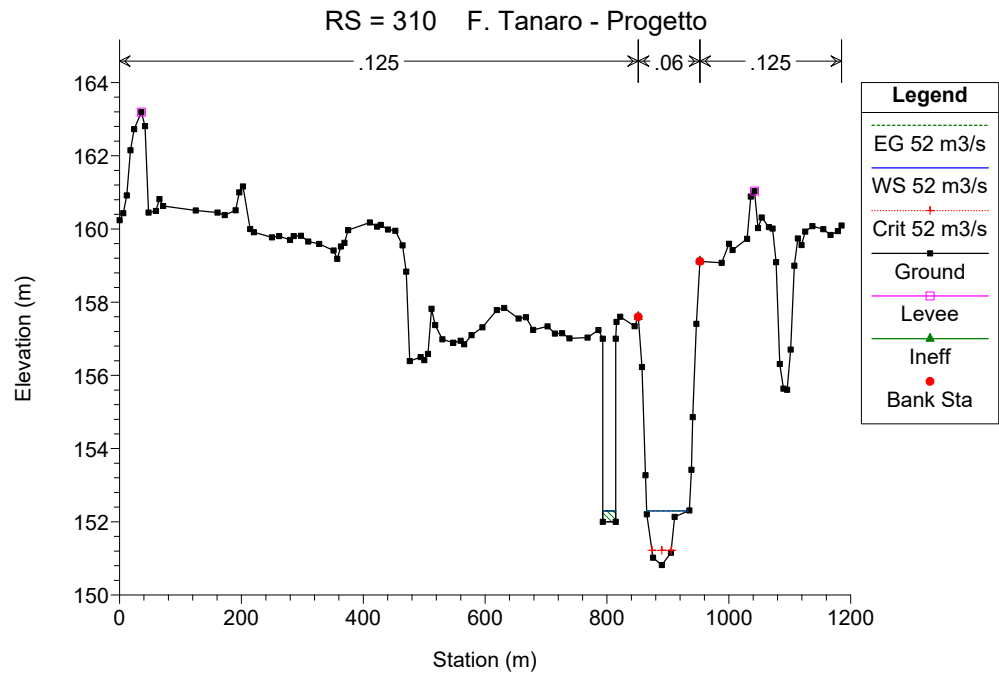
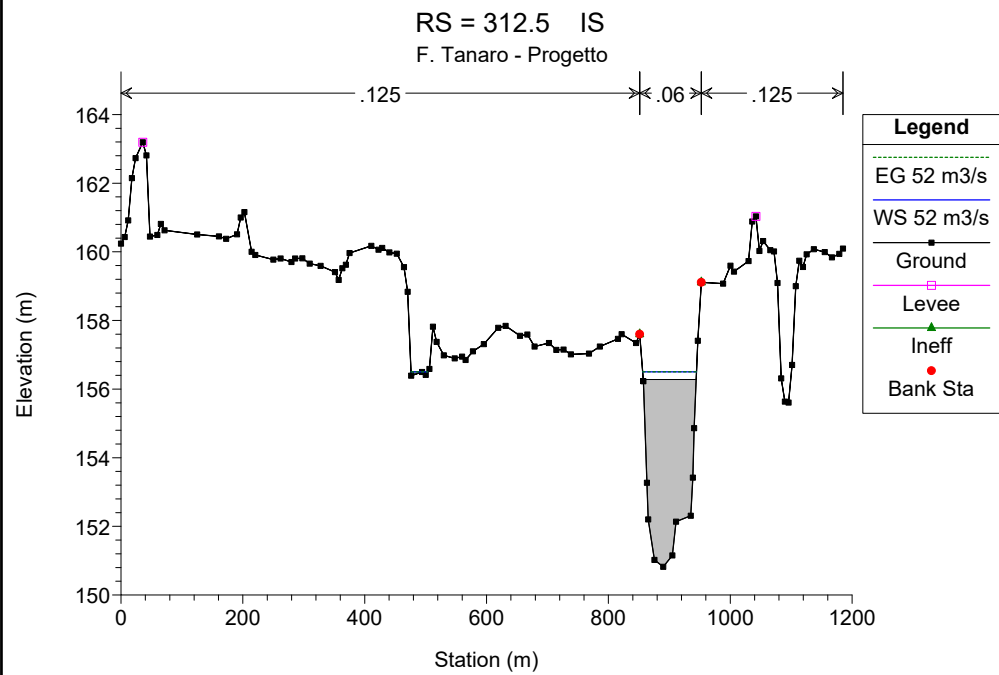
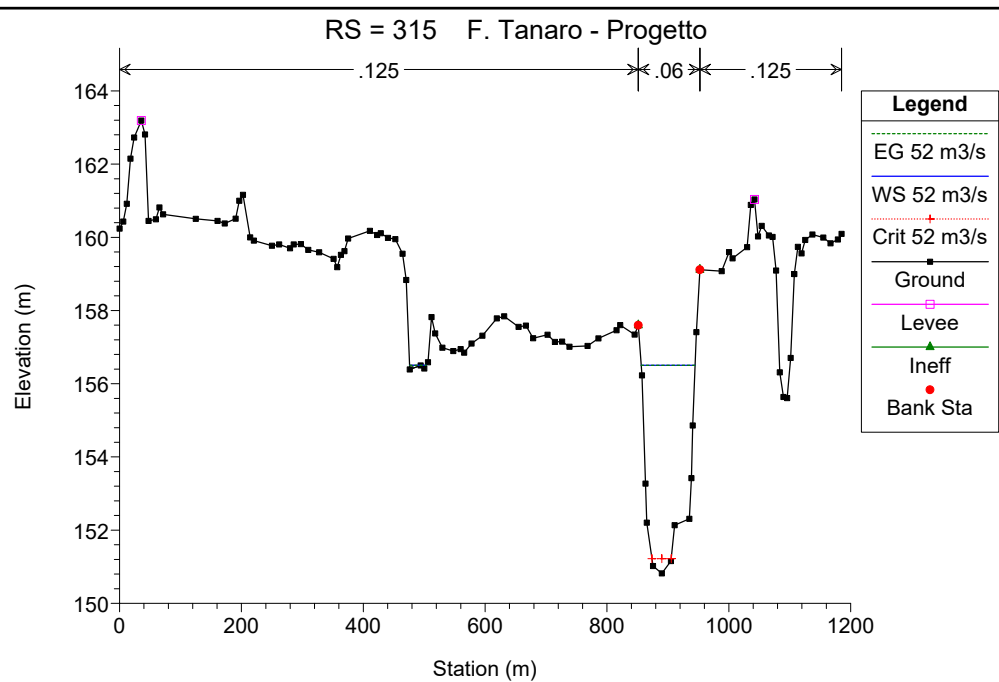
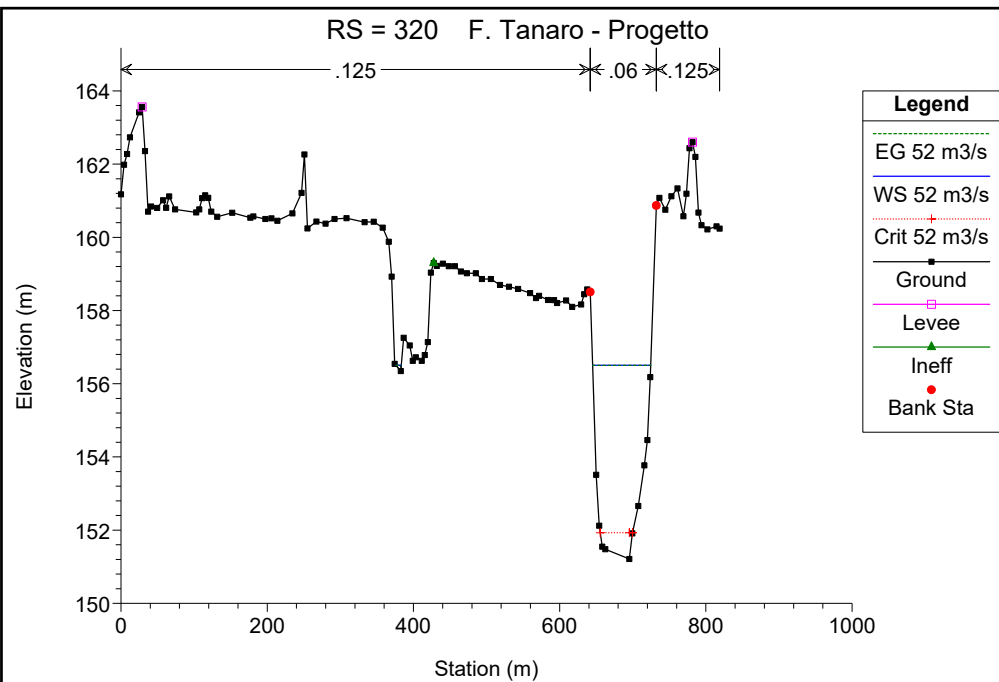


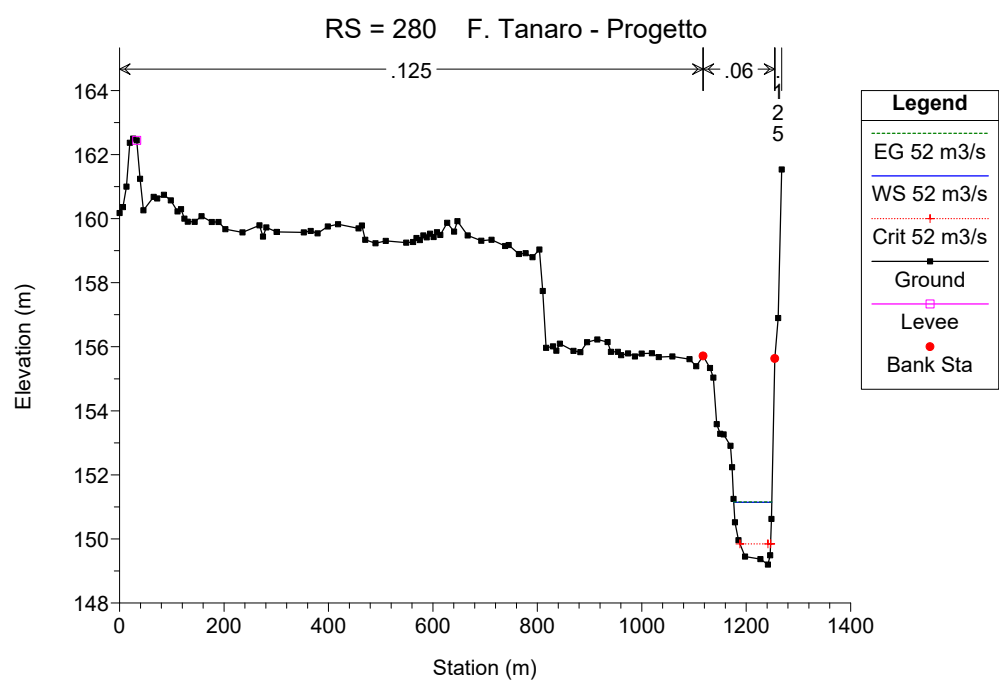
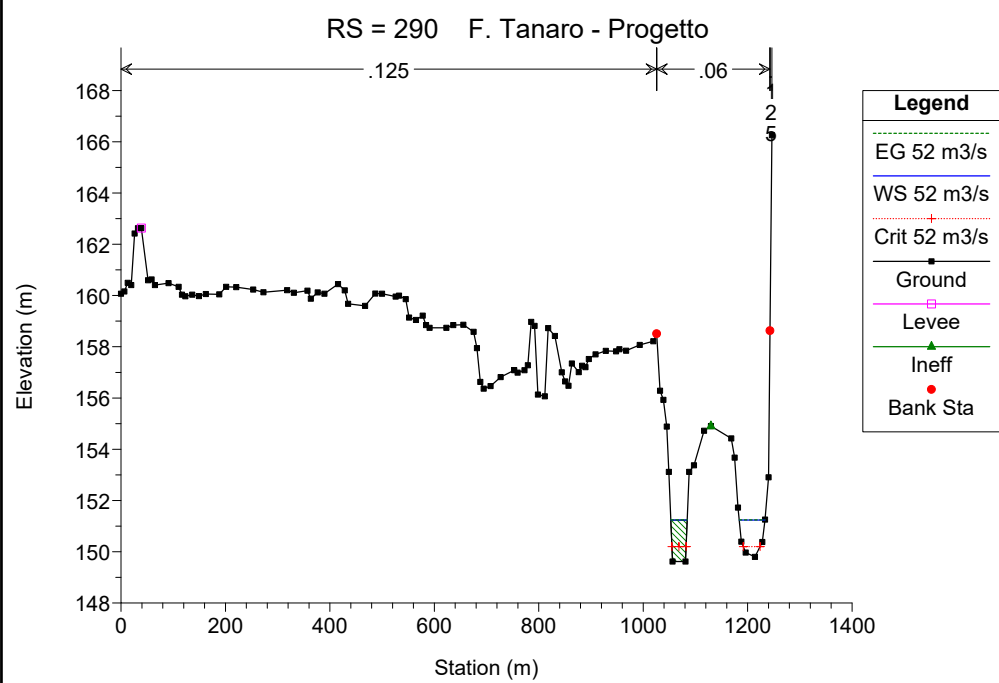
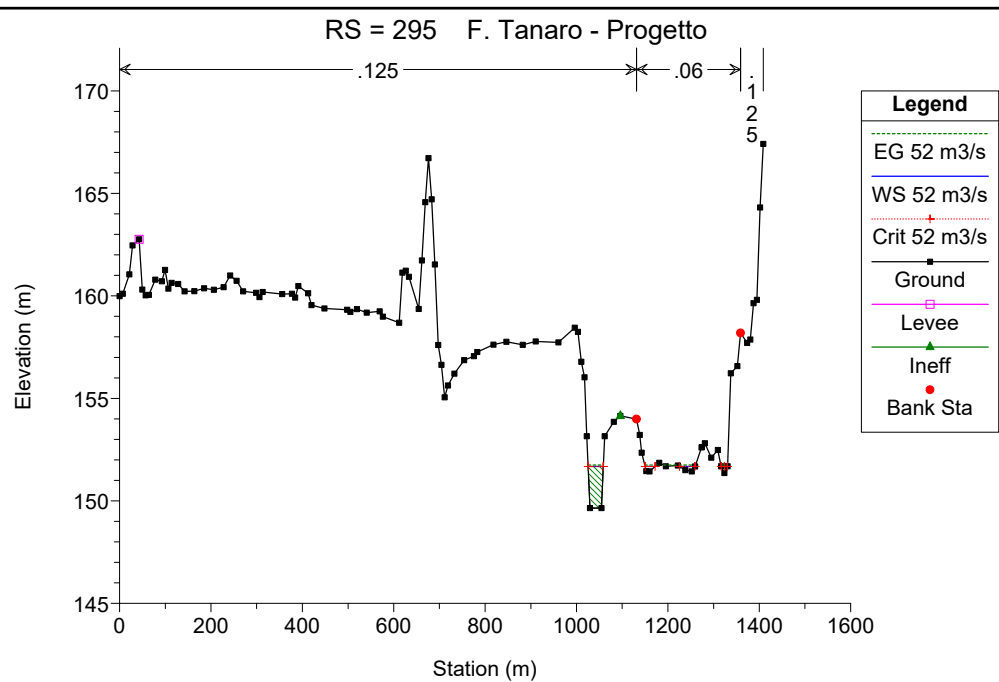
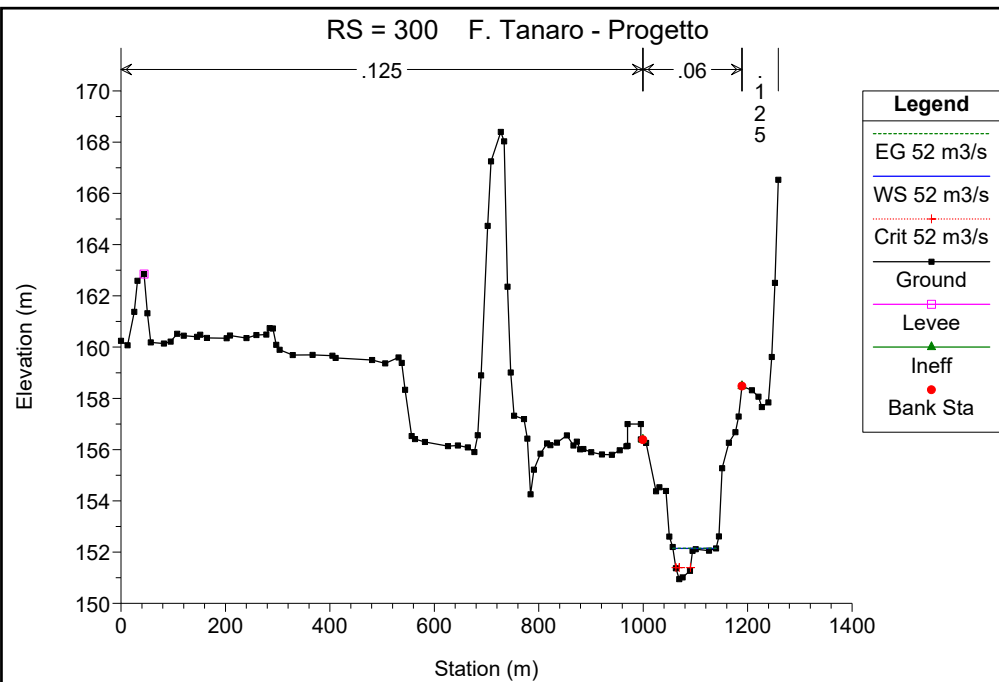


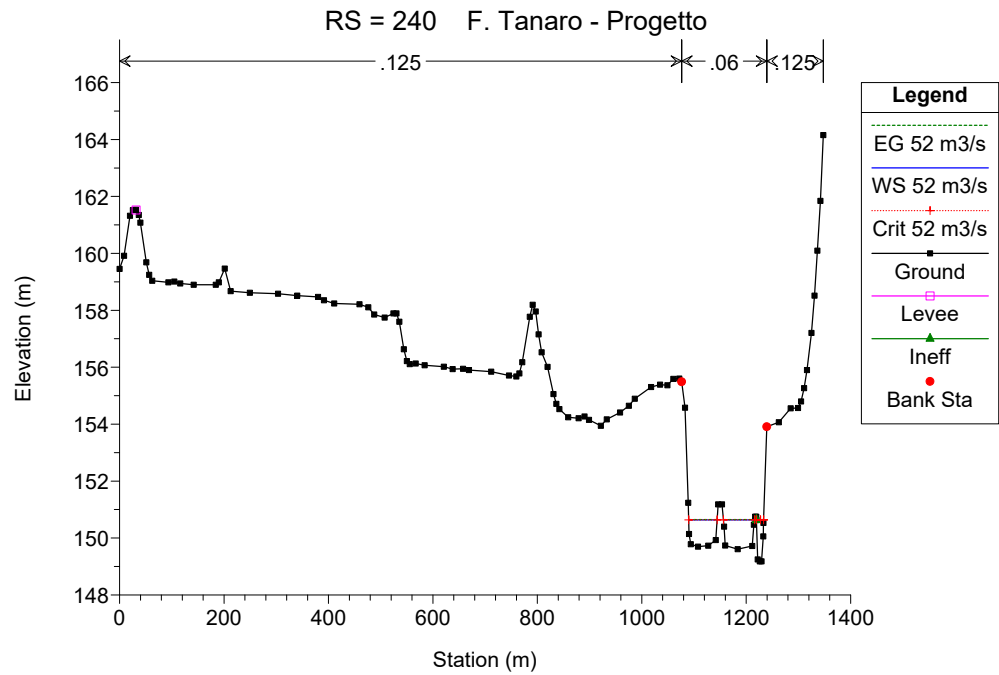
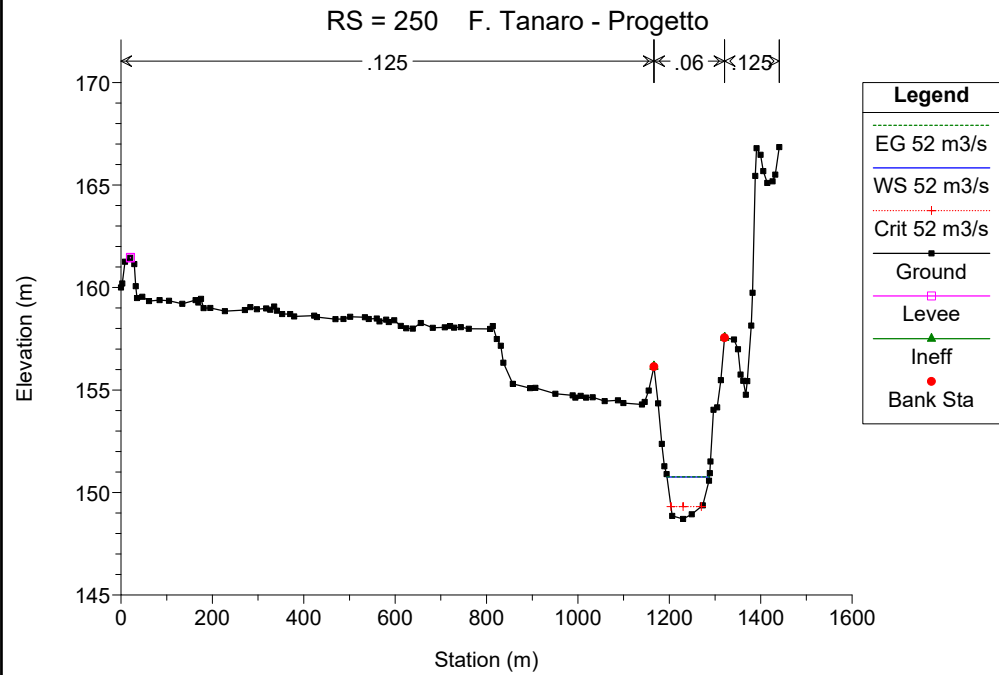
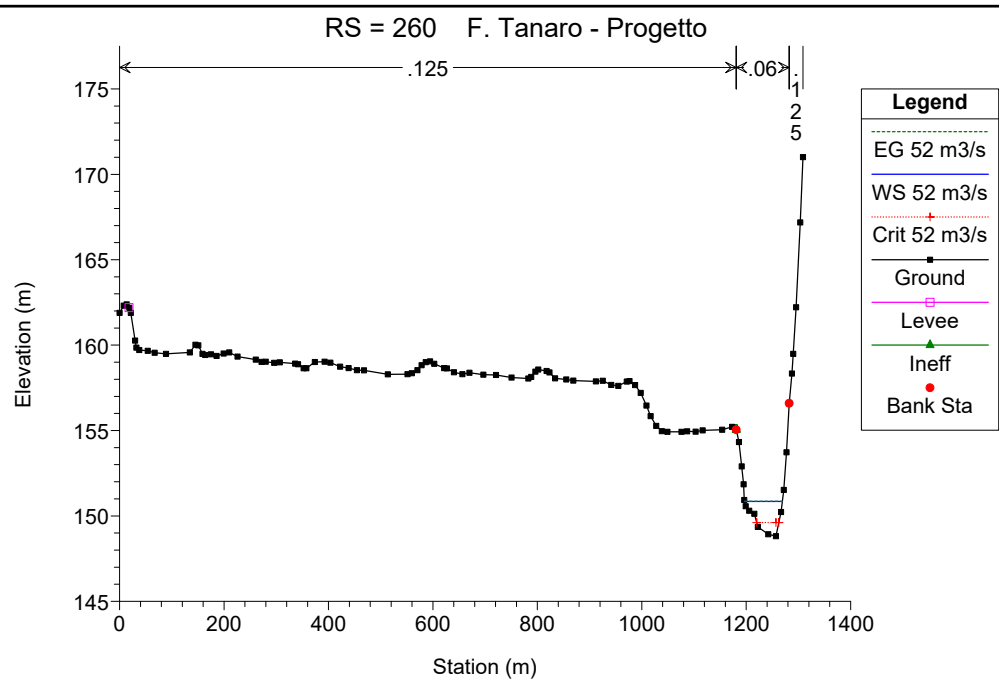
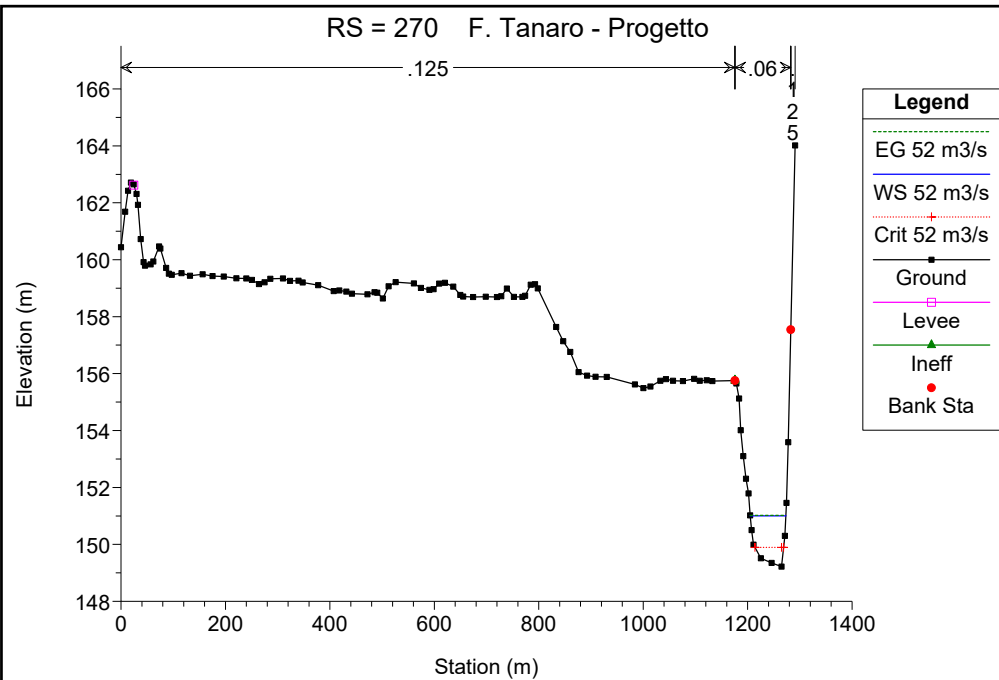


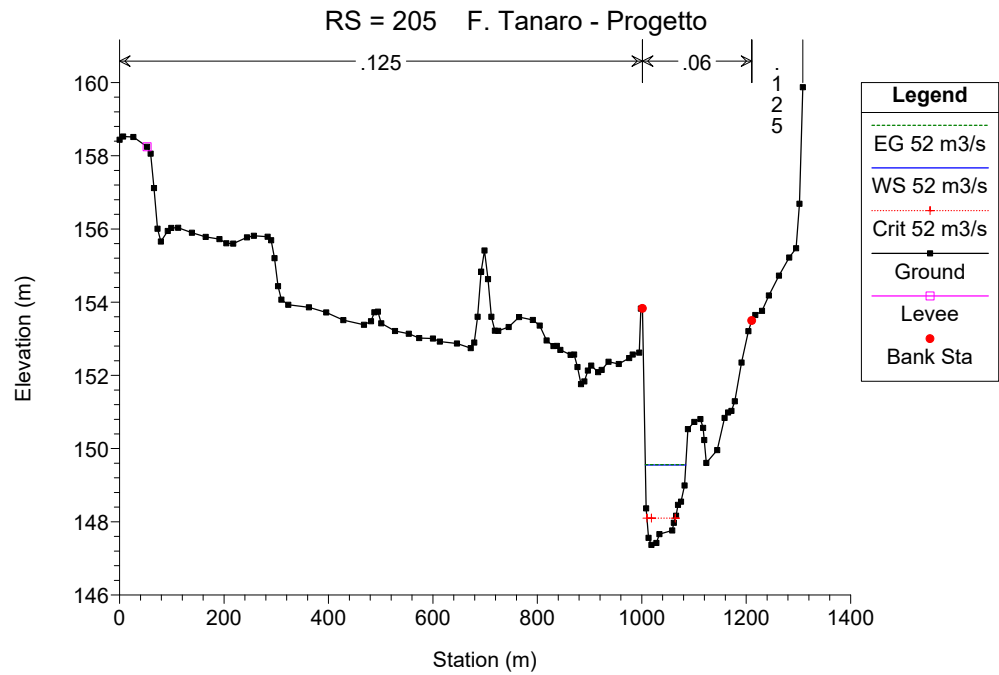
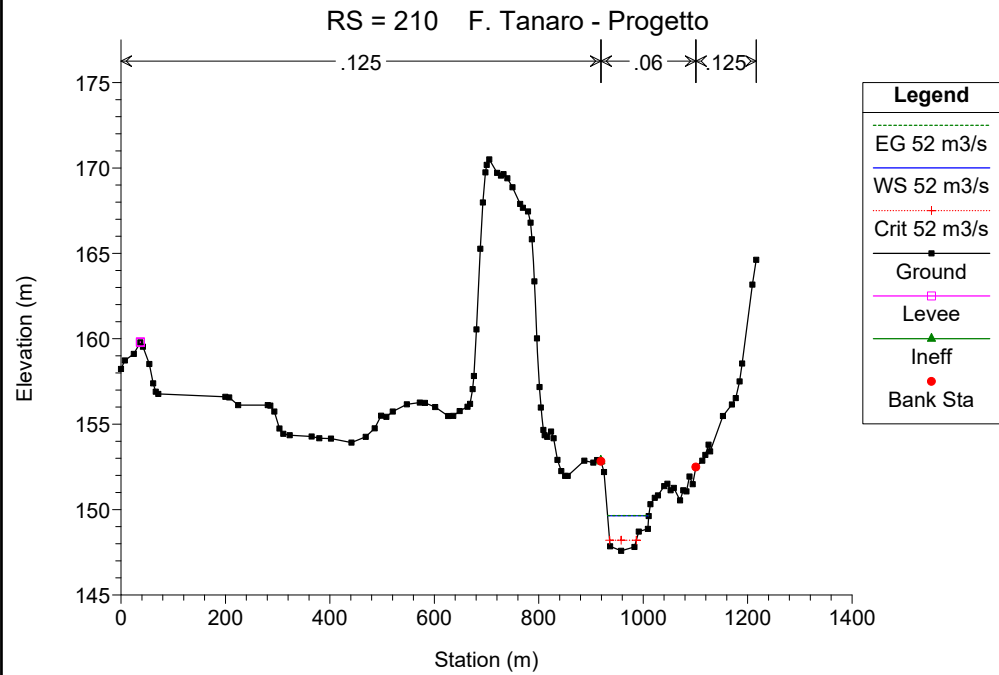
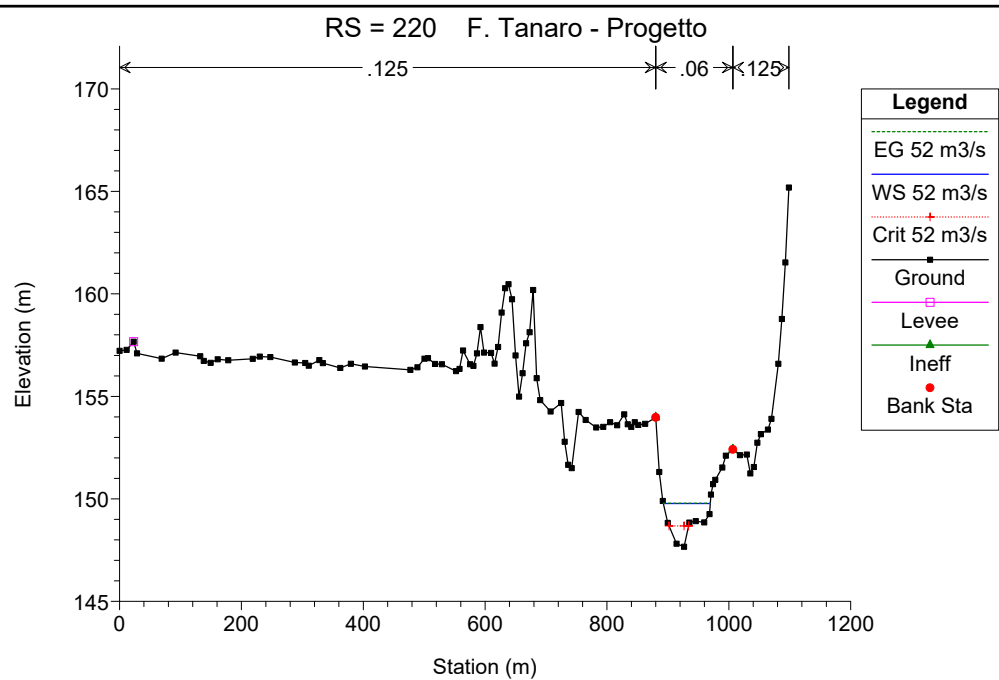
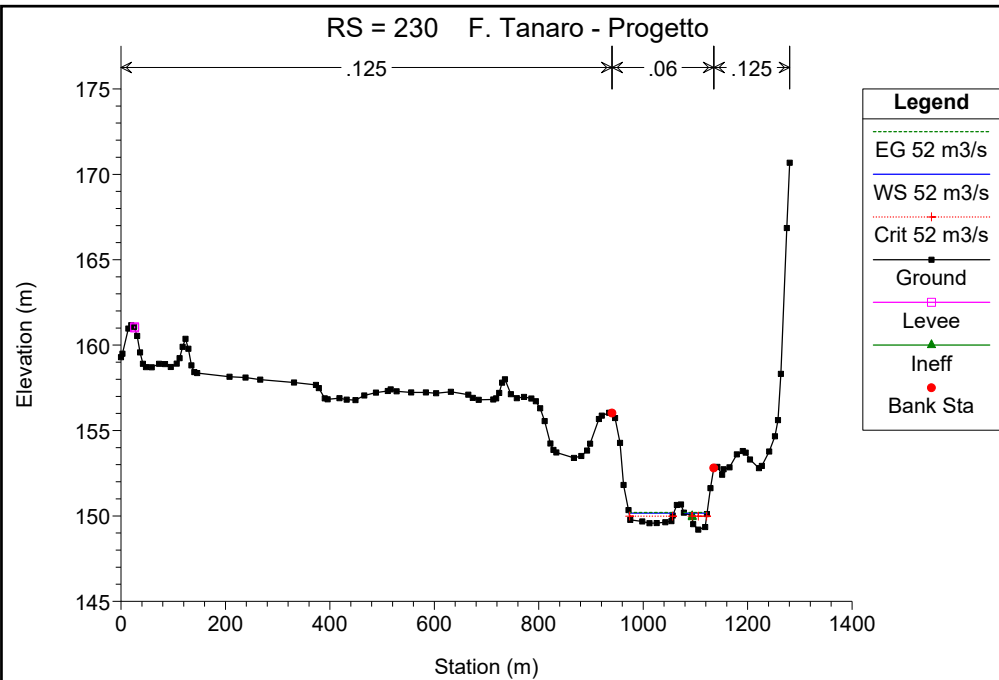


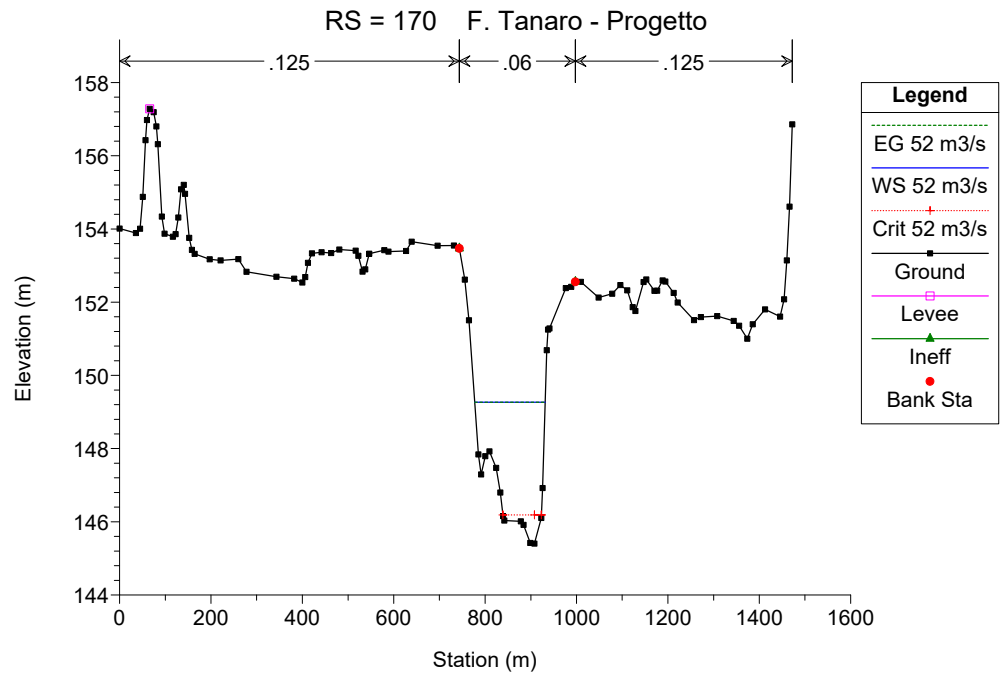
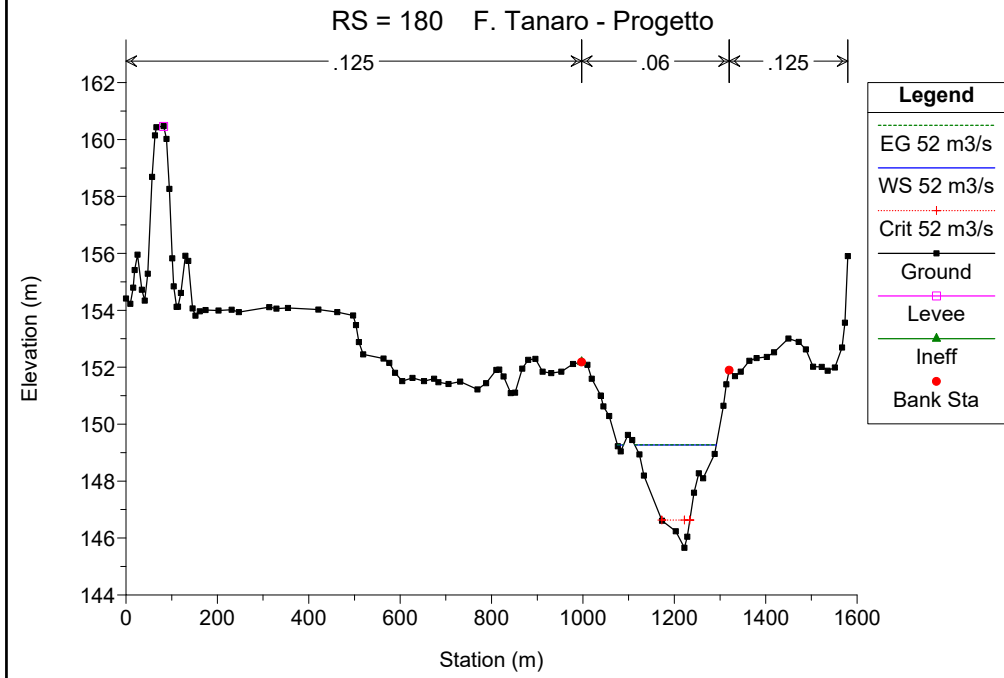
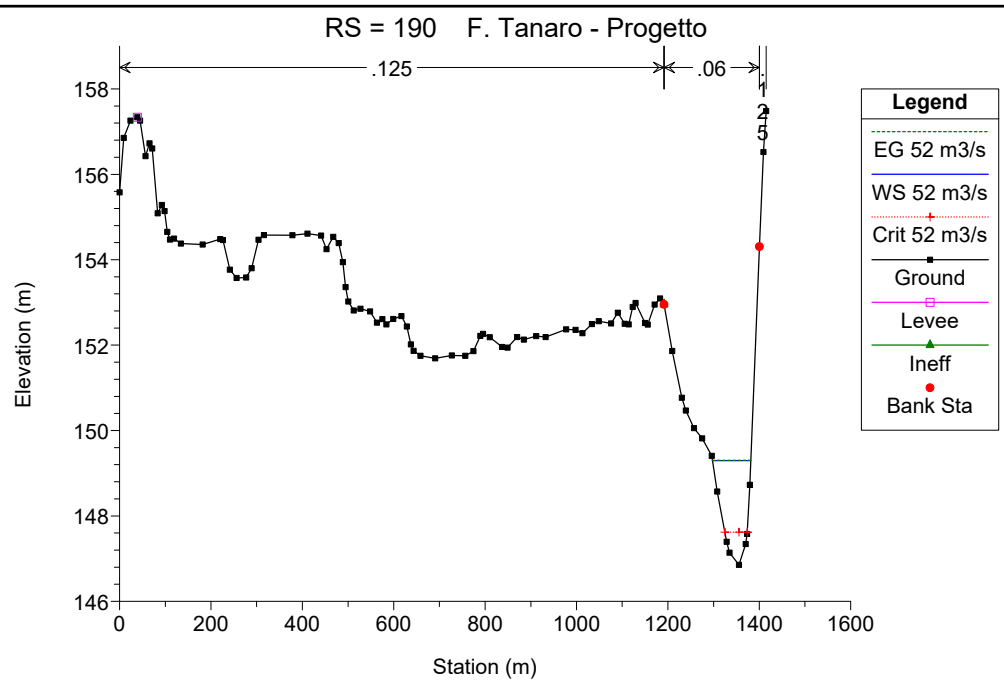
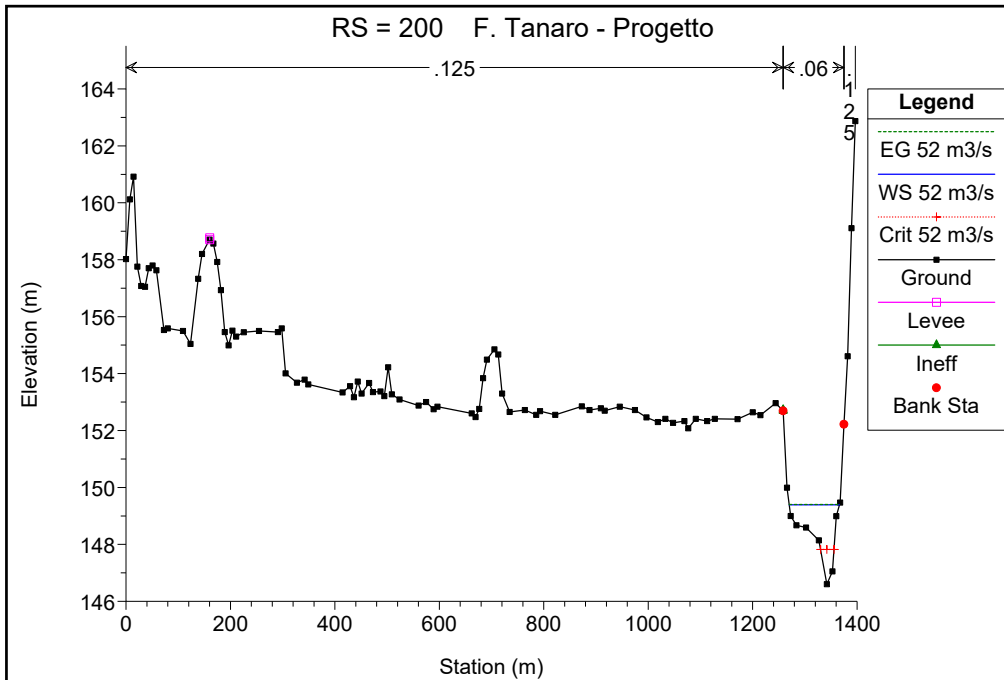


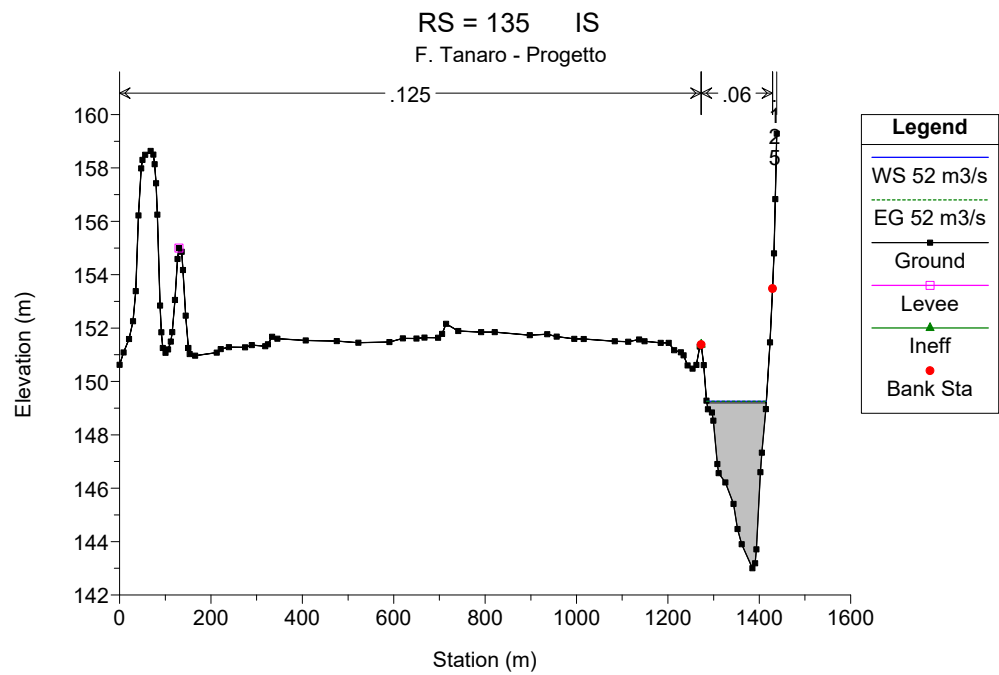
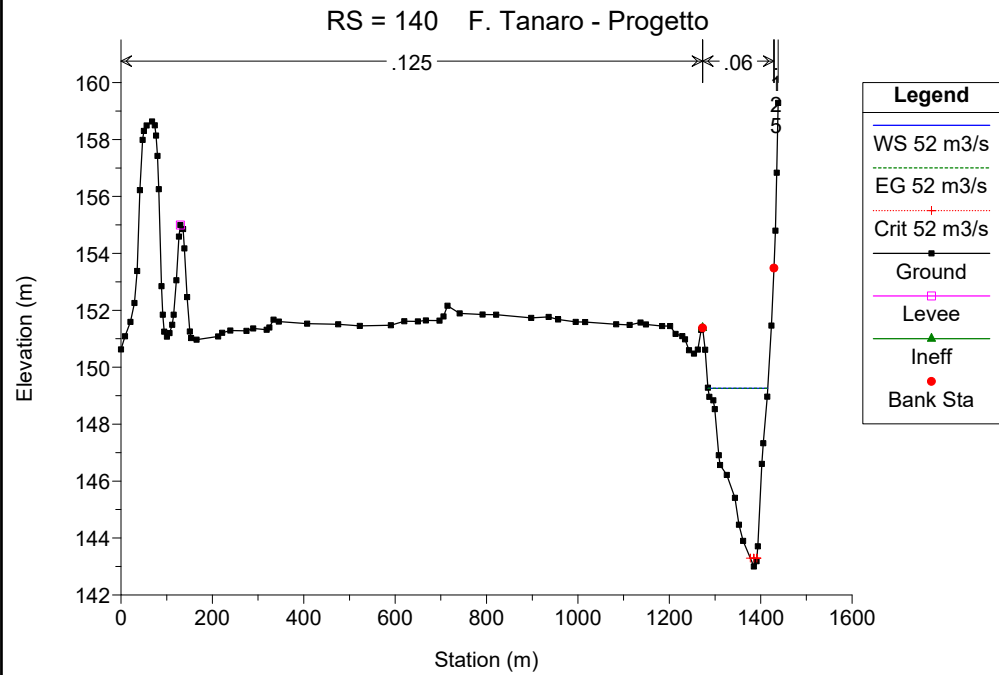
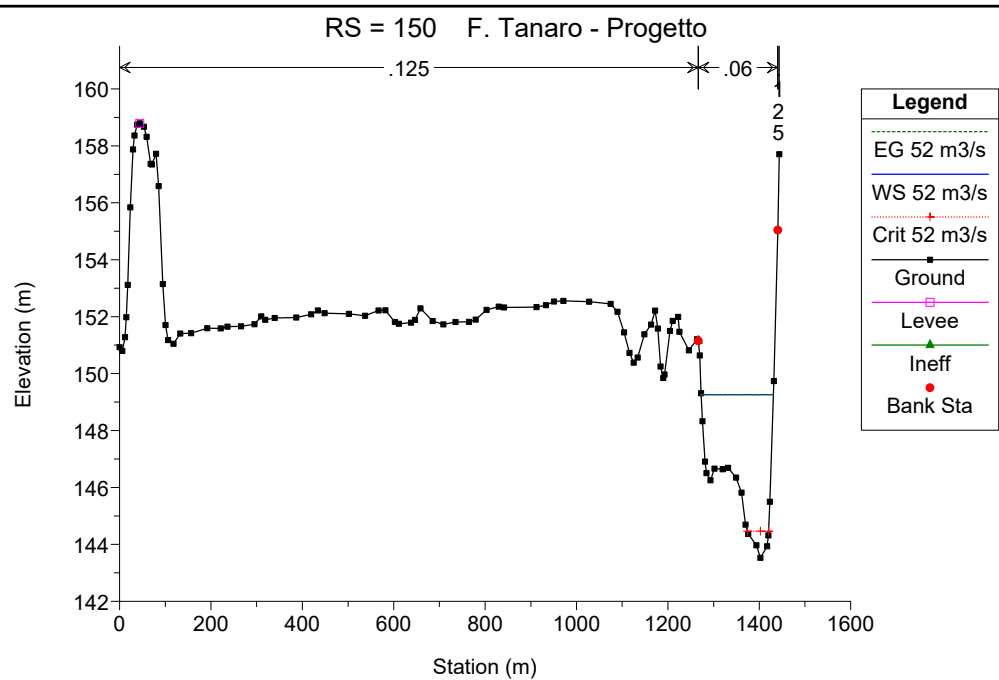
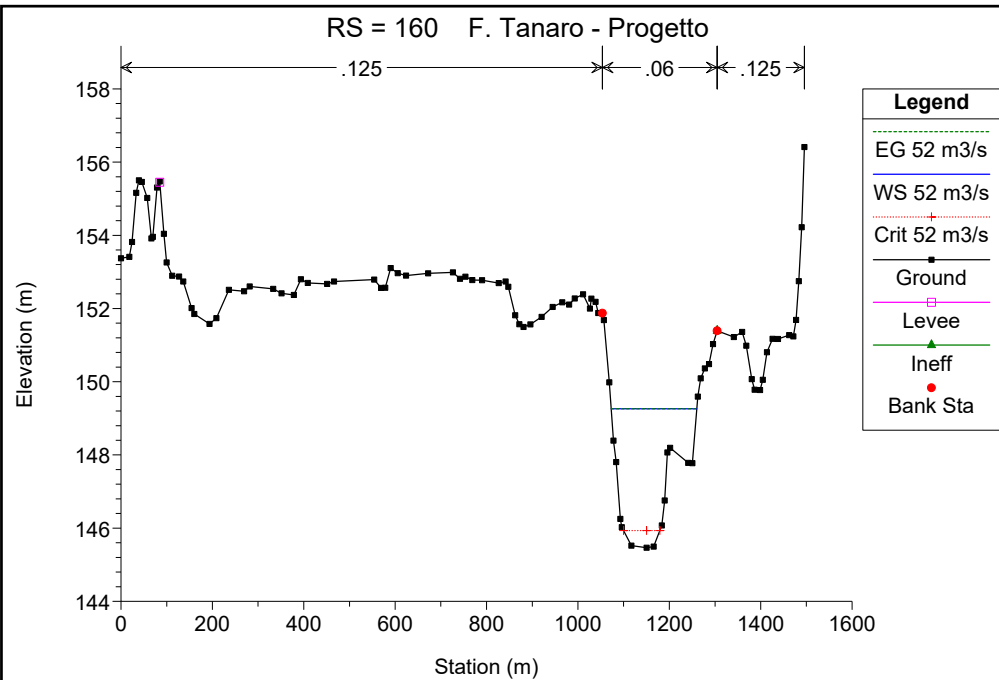


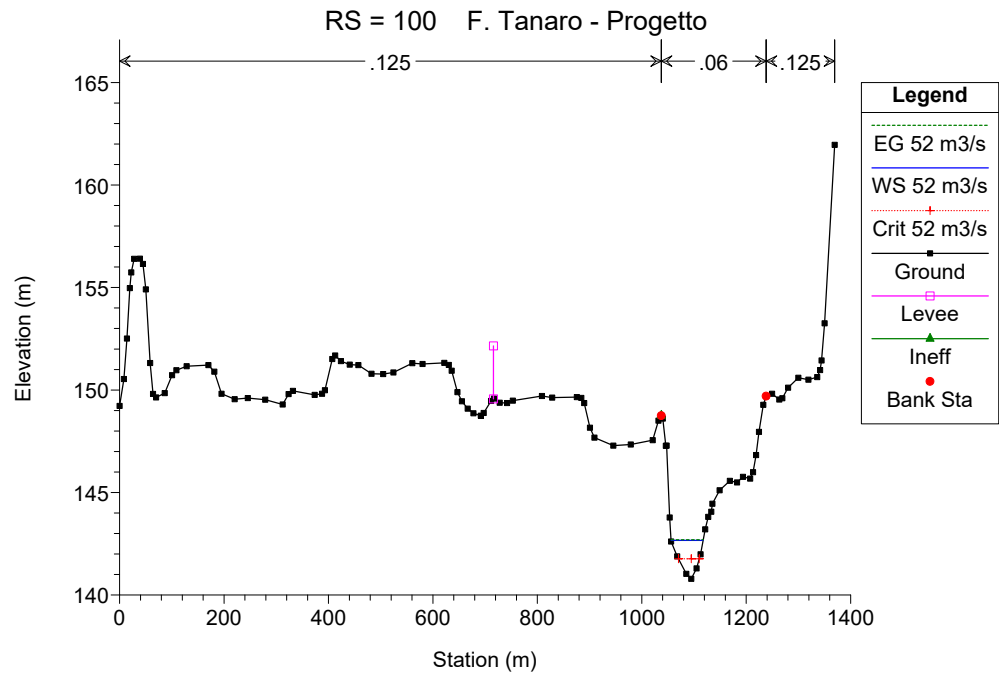
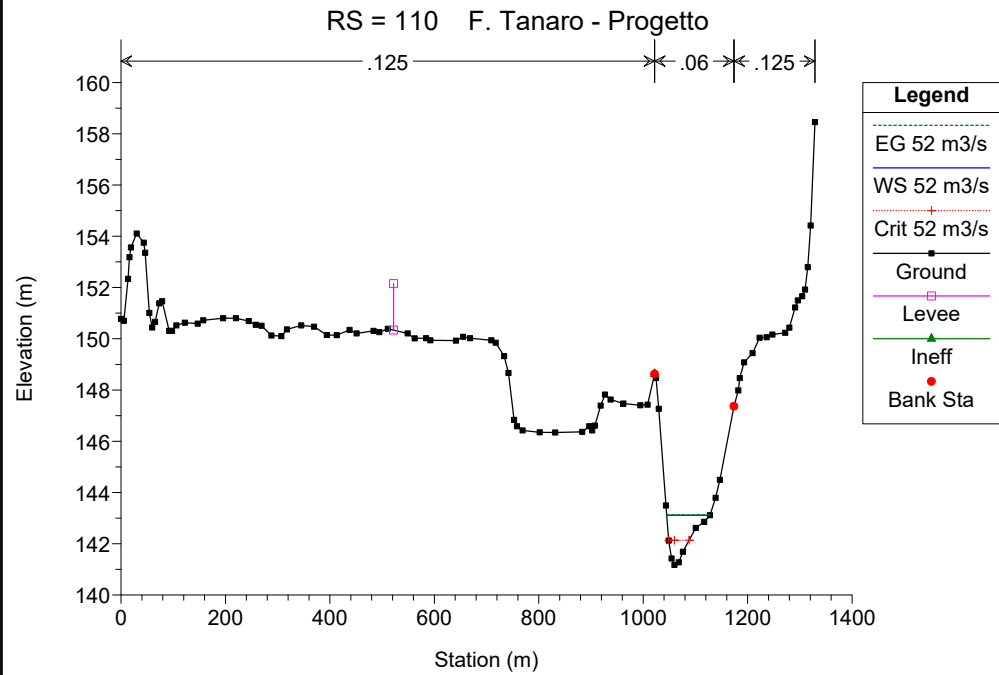
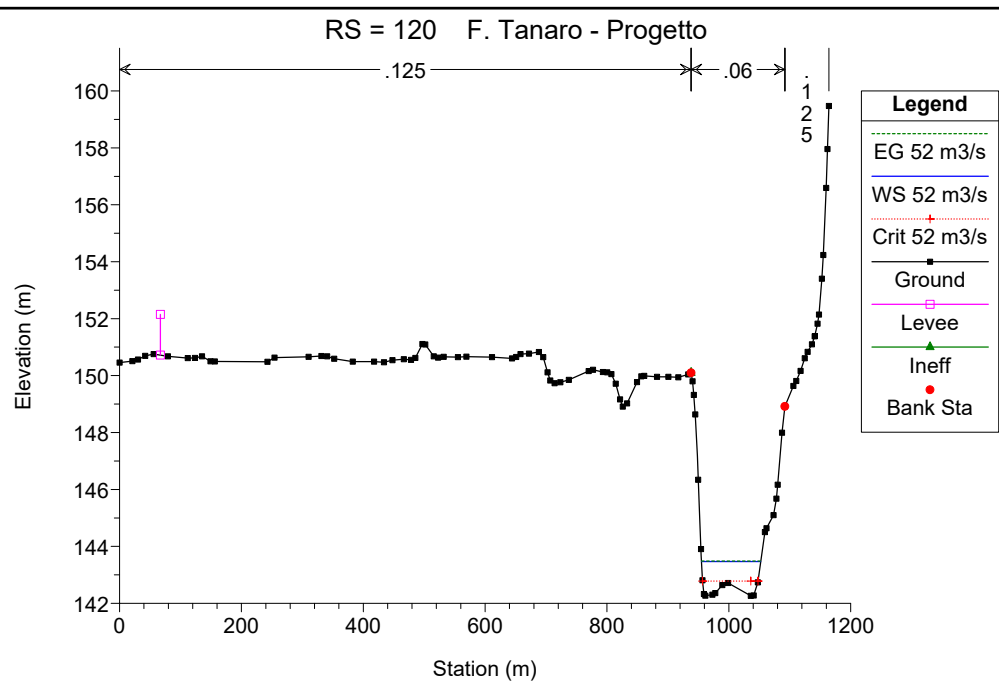
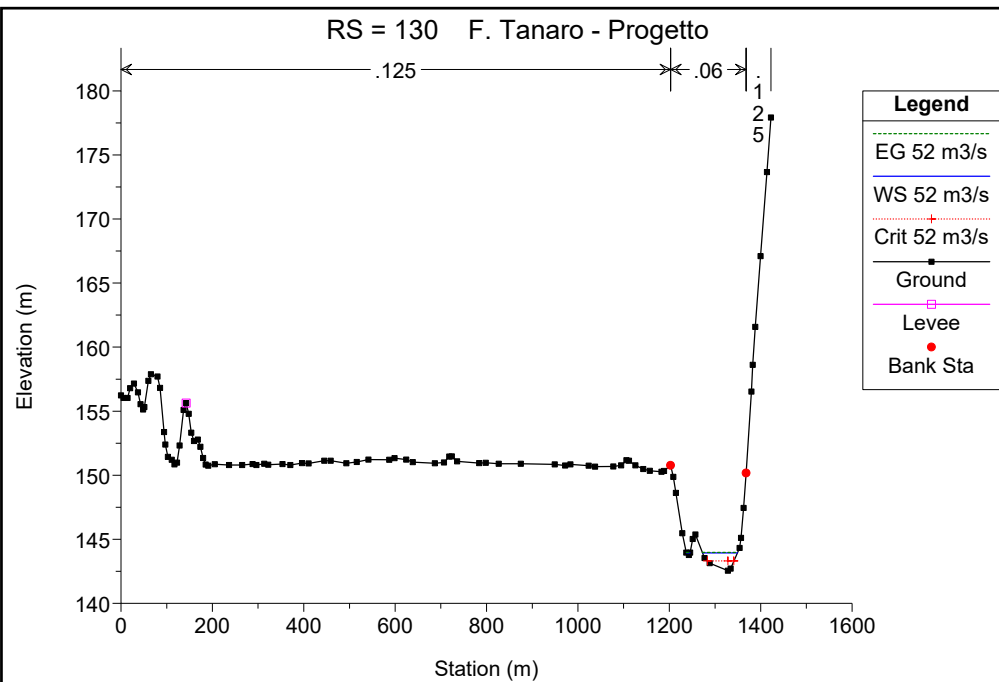


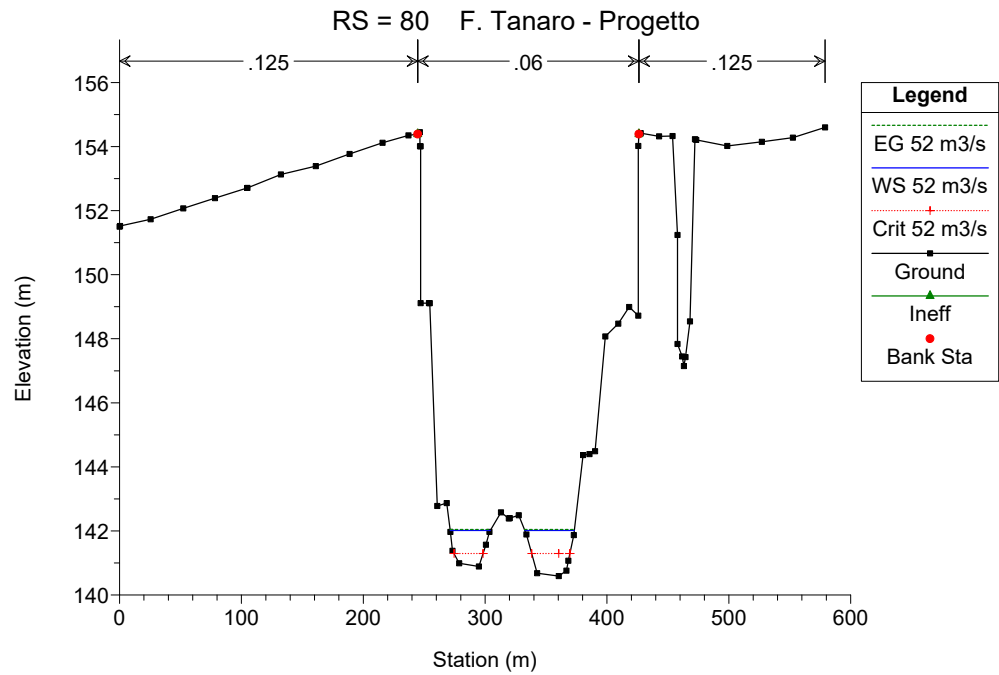
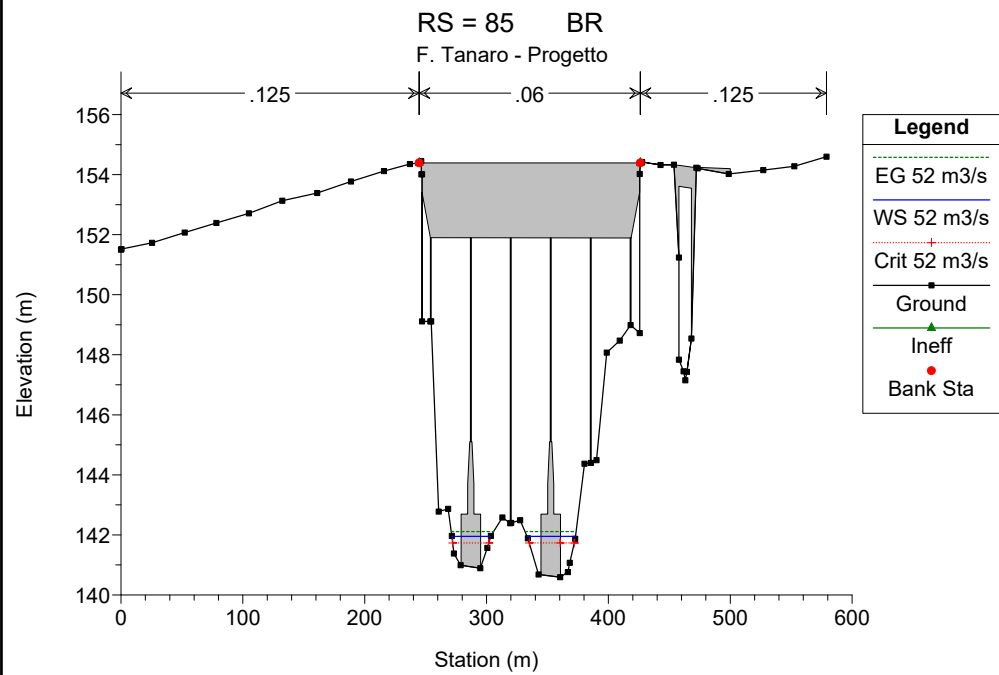
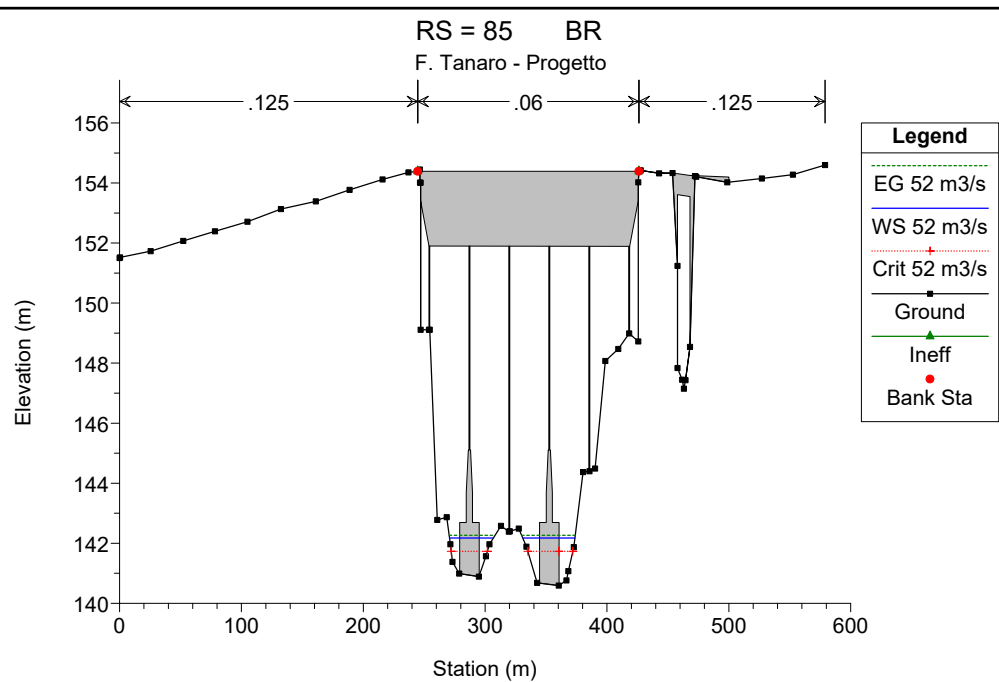
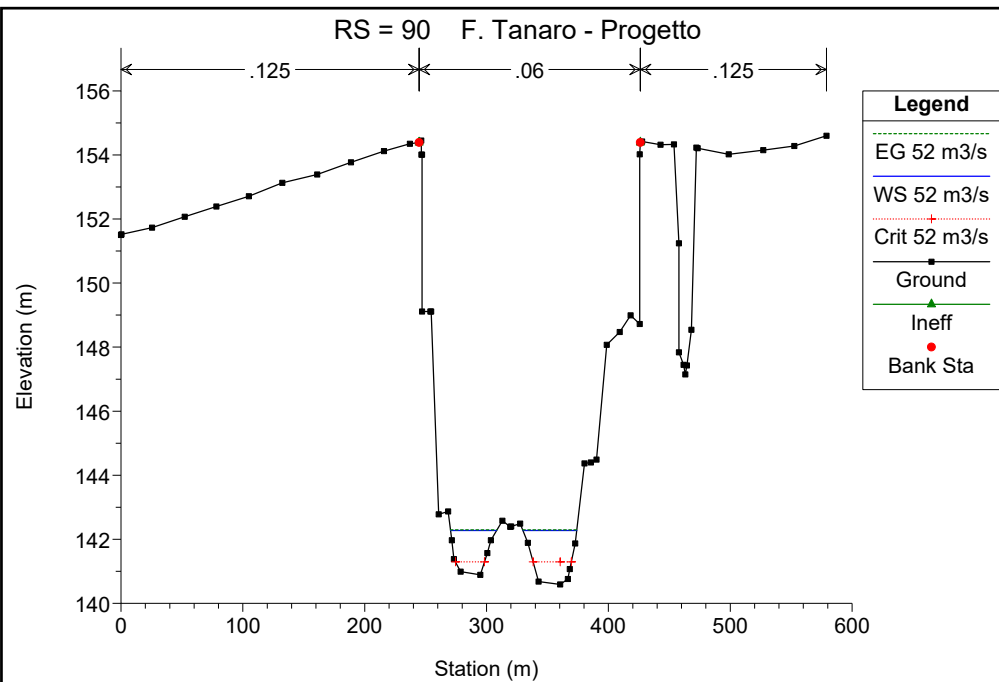


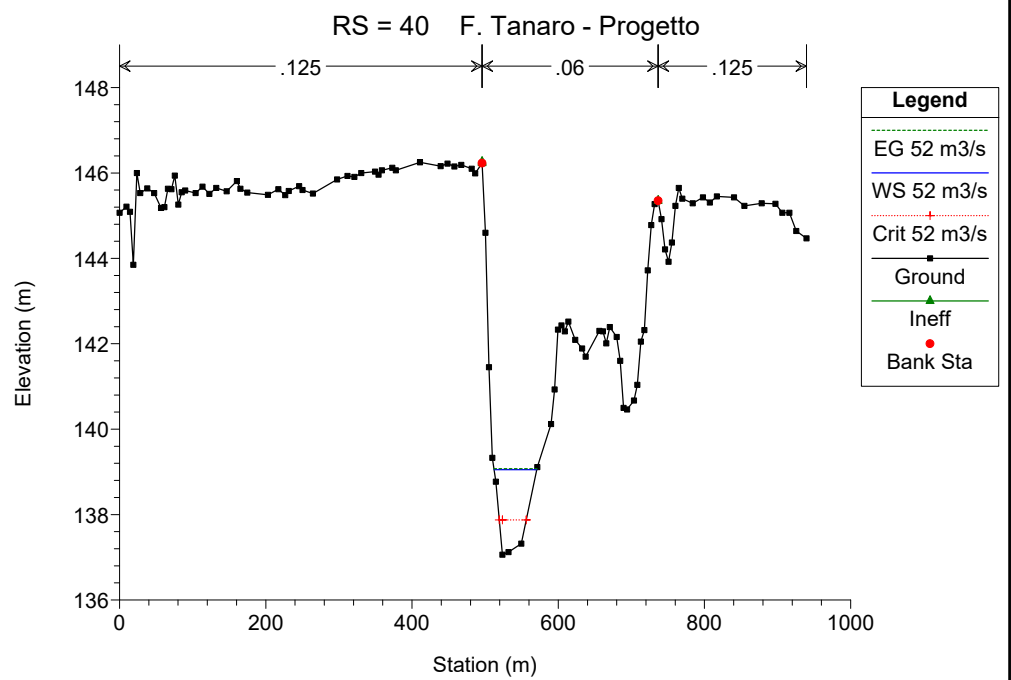
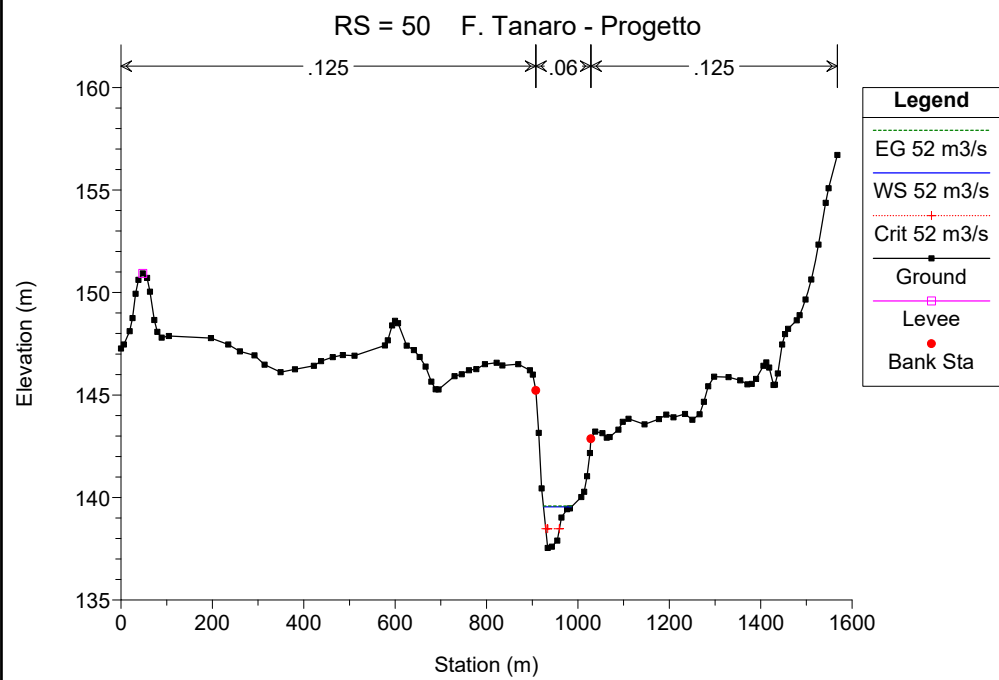
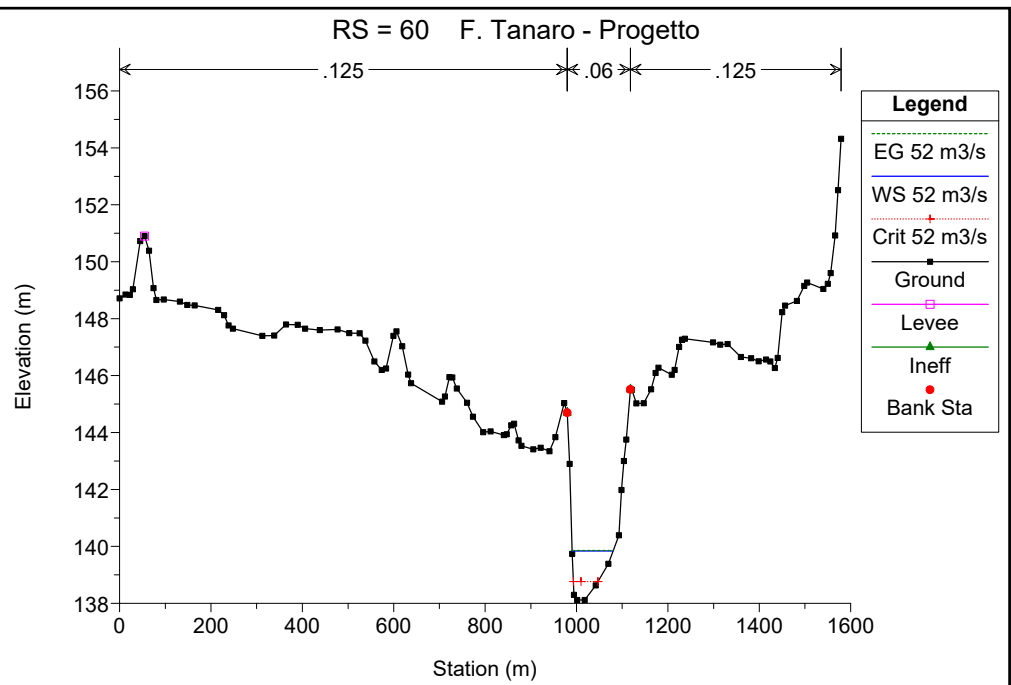
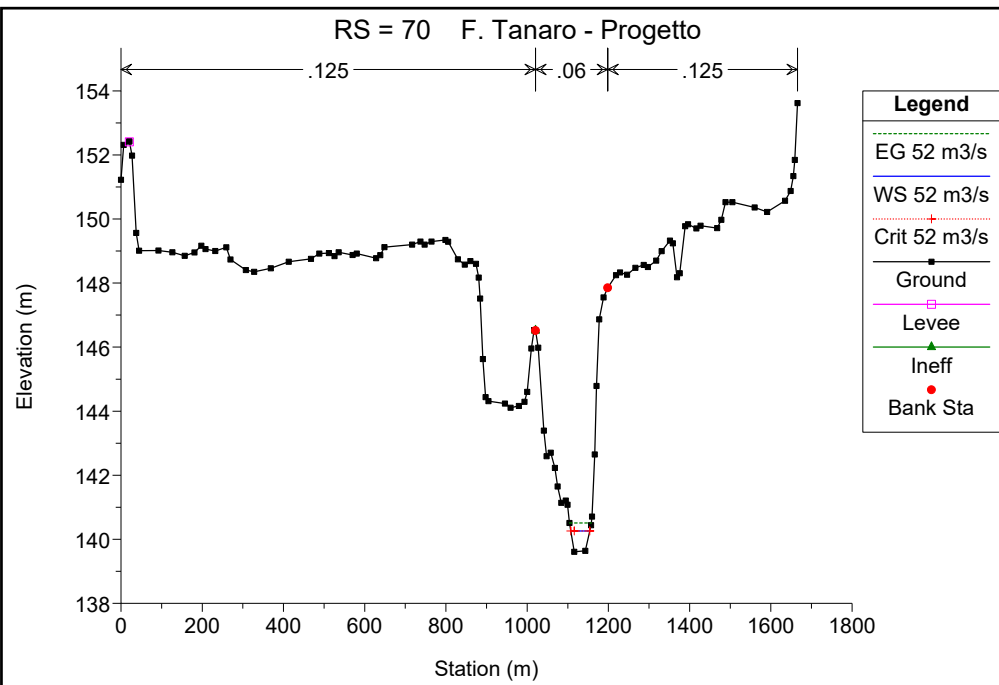


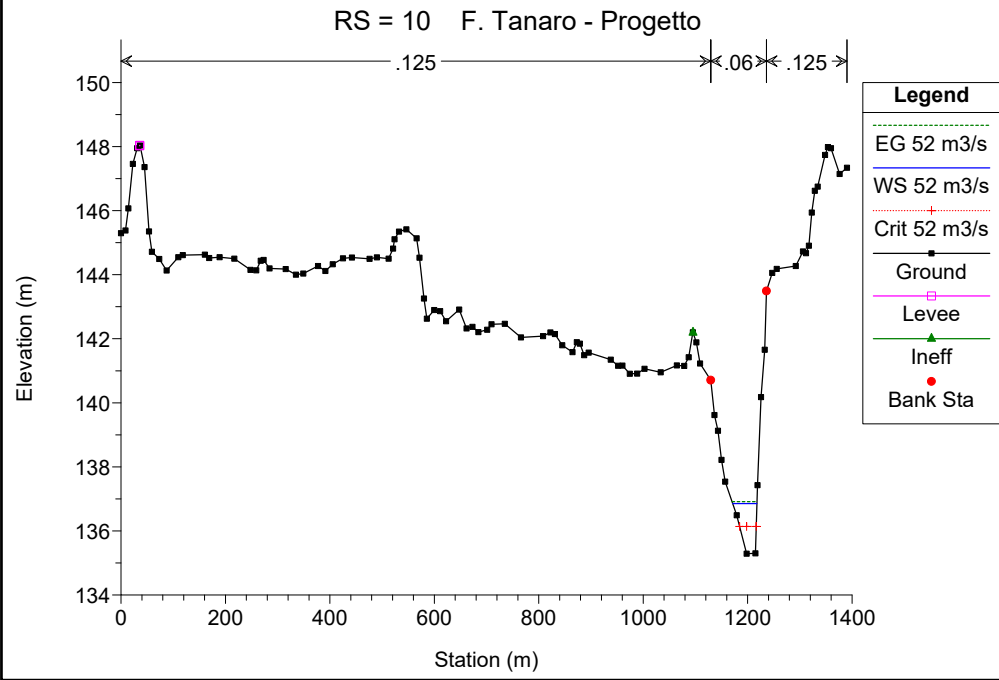
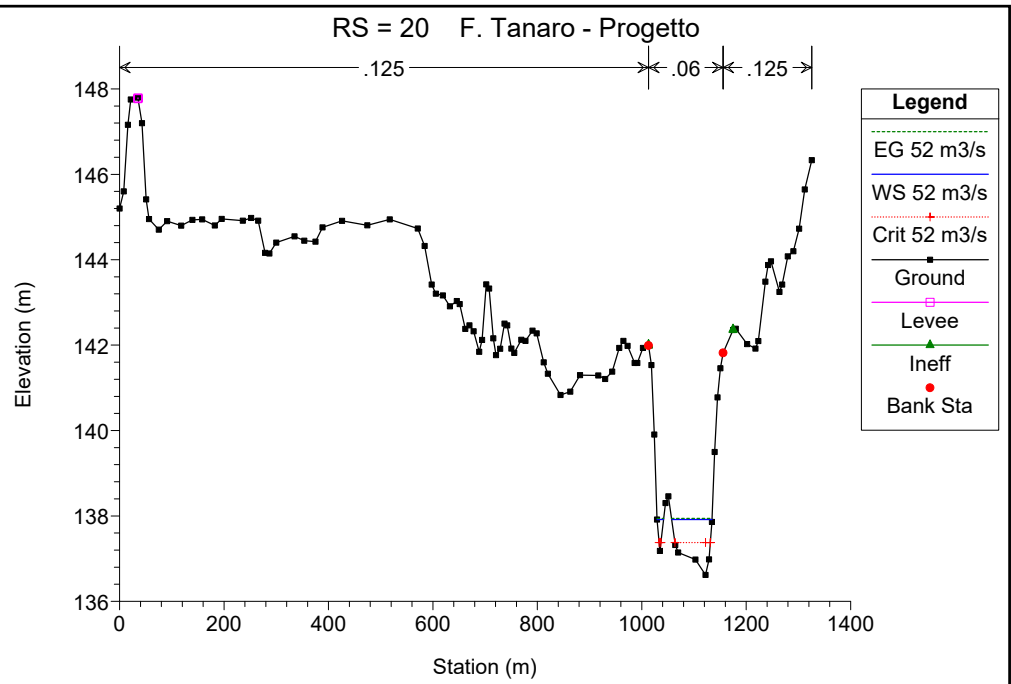
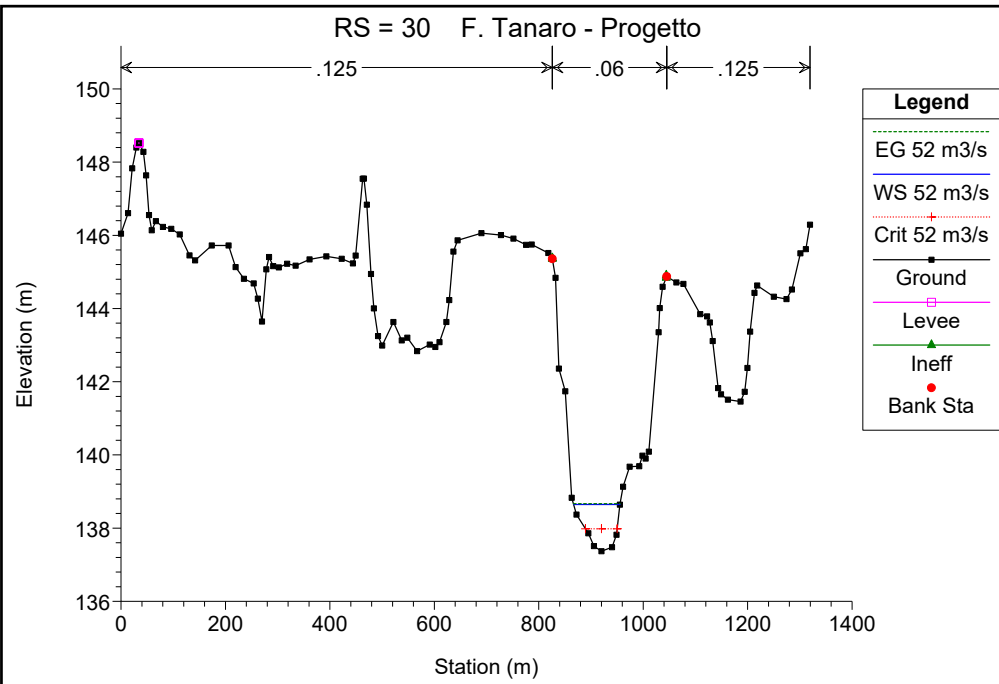












**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE ATTUALE
PORTATA MASSIMA DI FUNZIONAMENTO DELL'IMPIANTO**

SIMULAZIONE 29

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	300.00 in alveo	massima di funzionamento dell'impianto

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

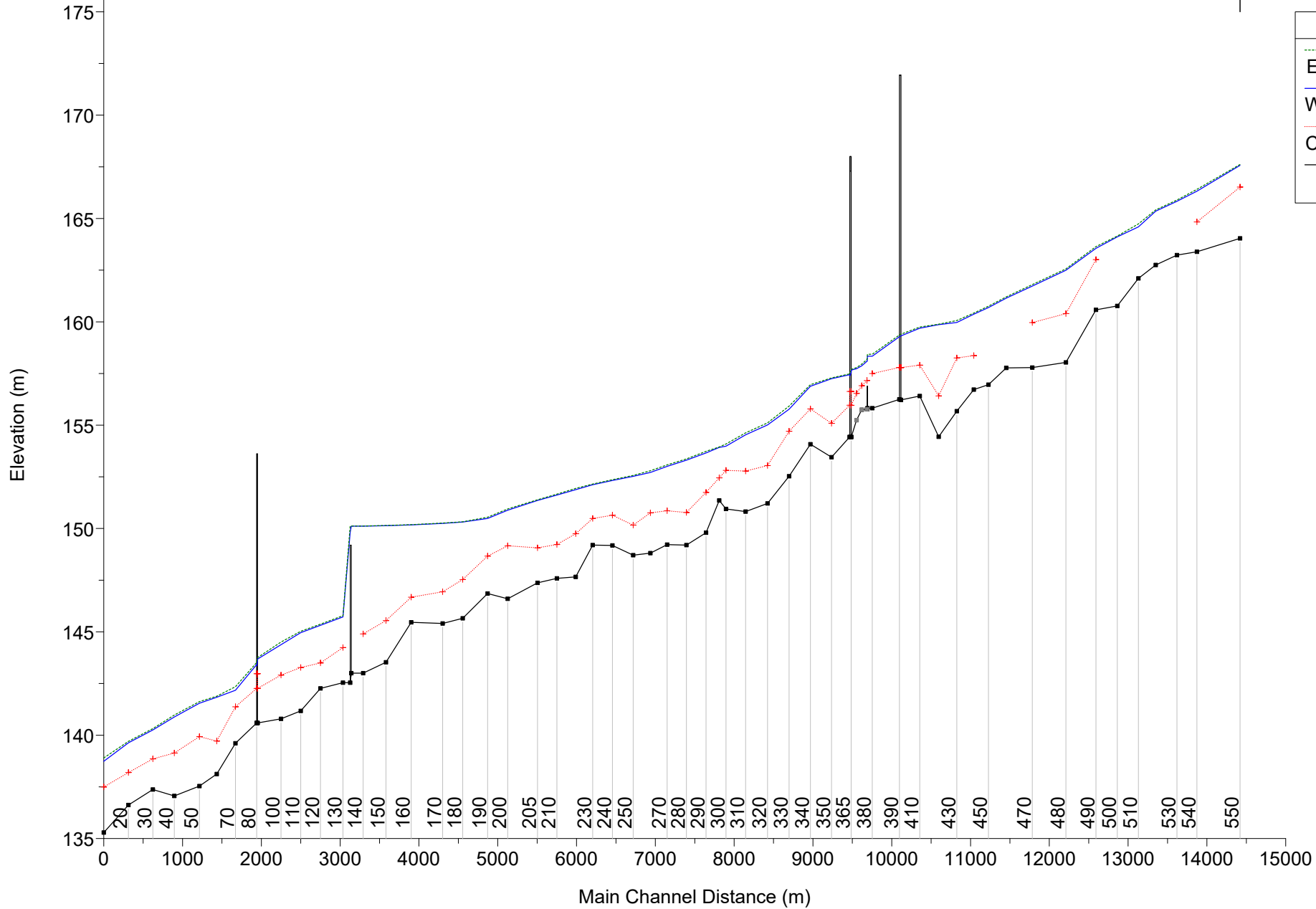
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	300 m3/s	300.00	164.04	167.57	166.52	167.62	0.002382	0.95	316.96	287.32	0.27
1	540	300 m3/s	300.00	163.39	166.32	164.83	166.41	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	0.007898	1.68	178.63	147.59	0.49
1	500	300 m3/s	300.00	160.77	164.11		164.15	0.000940	0.92	324.33	132.02	0.19
1	490	300 m3/s	300.00	160.58	163.55	163.01	163.64	0.005448	1.31	229.43	208.70	0.40
1	480	300 m3/s	300.00	158.04	162.50	160.40	162.56	0.001718	1.12	268.47	129.50	0.25
1	470	300 m3/s	300.00	157.79	161.73	159.96	161.80	0.001831	1.18	253.64	118.01	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	253.09	134.48	0.28
1	440	300 m3/s	300.00	156.72	160.37	158.37	160.43	0.001453	1.09	275.56	122.07	0.23
1	430	300 m3/s	300.00	155.68	159.97	158.25	160.07	0.001896	1.36	220.56	85.03	0.27
1	420	300 m3/s	300.00	154.44	159.86	156.41	159.89	0.000349	0.71	421.39	120.95	0.12
1	410	300 m3/s	300.00	156.41	159.69	157.90	159.75	0.001141	1.04	287.67	113.40	0.21
1	400	300 m3/s	300.00	156.22	159.32	157.79	159.40	0.001777	1.27	236.35	95.07	0.26
1	395		Bridge									
1	390	300 m3/s	300.00	156.25	159.28	157.79	159.37	0.001886	1.29	232.06	94.99	0.26
1	380	300 m3/s	300.00	155.82	158.34	157.50	158.43	0.004159	1.38	218.12	149.97	0.36
1	379		Inl Struct									
1	370	300 m3/s	300.00	154.43	157.66	155.96	157.70	0.000822	0.83	361.31	156.27	0.17
1	365		Bridge									
1	360	300 m3/s	300.00	154.43	157.44	155.97	157.48	0.001135	0.92	326.81	155.06	0.20
1	350	300 m3/s	300.00	153.45	157.25	155.09	157.29	0.000665	0.86	349.20	122.62	0.16
1	340	300 m3/s	300.00	154.08	156.88	155.79	156.96	0.002712	1.25	240.52	138.54	0.30
1	330	300 m3/s	300.00	152.53	155.77	154.70	155.92	0.005812	1.69	177.05	114.16	0.43
1	320	300 m3/s	300.00	151.21	155.01	153.05	155.11	0.001726	1.40	214.52	73.73	0.26
1	310	300 m3/s	300.00	150.82	154.53	152.78	154.63	0.001752	1.36	220.20	79.44	0.26
1	300	300 m3/s	300.00	150.95	153.99	152.81	154.09	0.002758	1.41	212.44	103.03	0.31
1	295	300 m3/s	300.00	151.36	153.93	152.45	153.95	0.000779	0.66	453.25	265.58	0.16
1	290	300 m3/s	300.00	149.80	153.66	151.75	153.74	0.002230	1.25	240.38	118.67	0.28
1	280	300 m3/s	300.00	149.20	153.31	150.77	153.36	0.001041	1.05	284.54	102.09	0.20
1	270	300 m3/s	300.00	149.22	153.00	150.86	153.08	0.001292	1.21	246.95	84.48	0.23
1	260	300 m3/s	300.00	148.81	152.71	150.76	152.79	0.001409	1.26	238.68	82.78	0.24
1	250	300 m3/s	300.00	148.71	152.52	150.17	152.57	0.000727	0.92	324.94	109.61	0.17
1	240	300 m3/s	300.00	149.18	152.32	150.64	152.36	0.000823	0.84	355.49	149.37	0.17
1	230	300 m3/s	300.00	149.20	152.12	150.49	152.15	0.000836	0.81	370.88	169.95	0.17
1	220	300 m3/s	300.00	147.66	151.88	149.75	151.94	0.001145	1.06	282.22	128.13	0.21
1	210	300 m3/s	300.00	147.59	151.62	149.23	151.66	0.001151	0.91	331.42	162.57	0.20
1	205	300 m3/s	300.00	147.37	151.36	149.07	151.39	0.001032	0.85	352.62	174.55	0.19

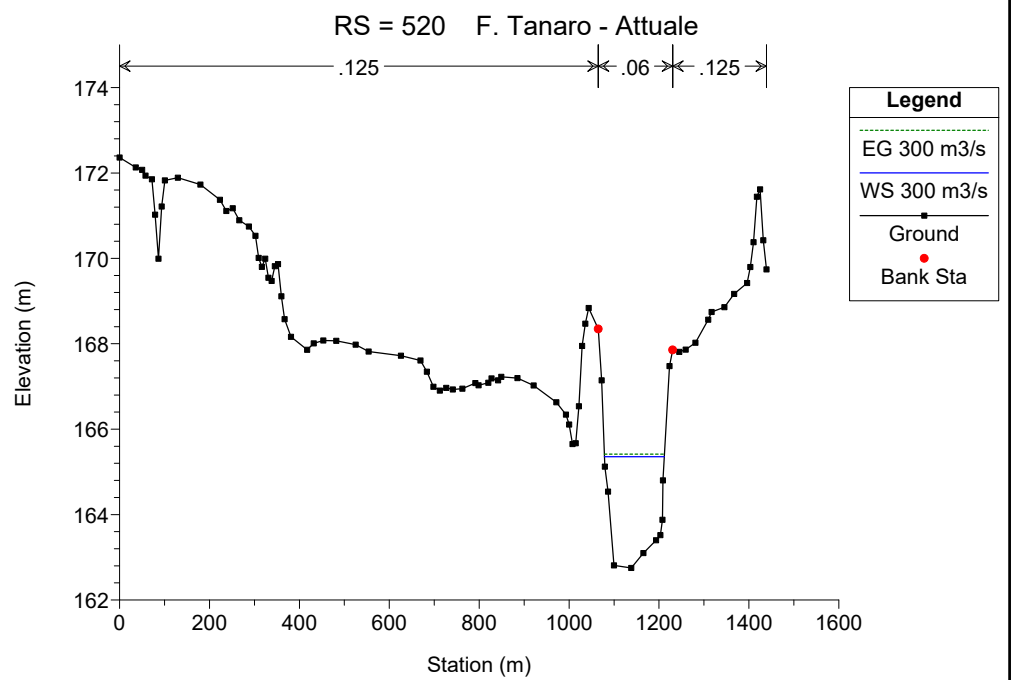
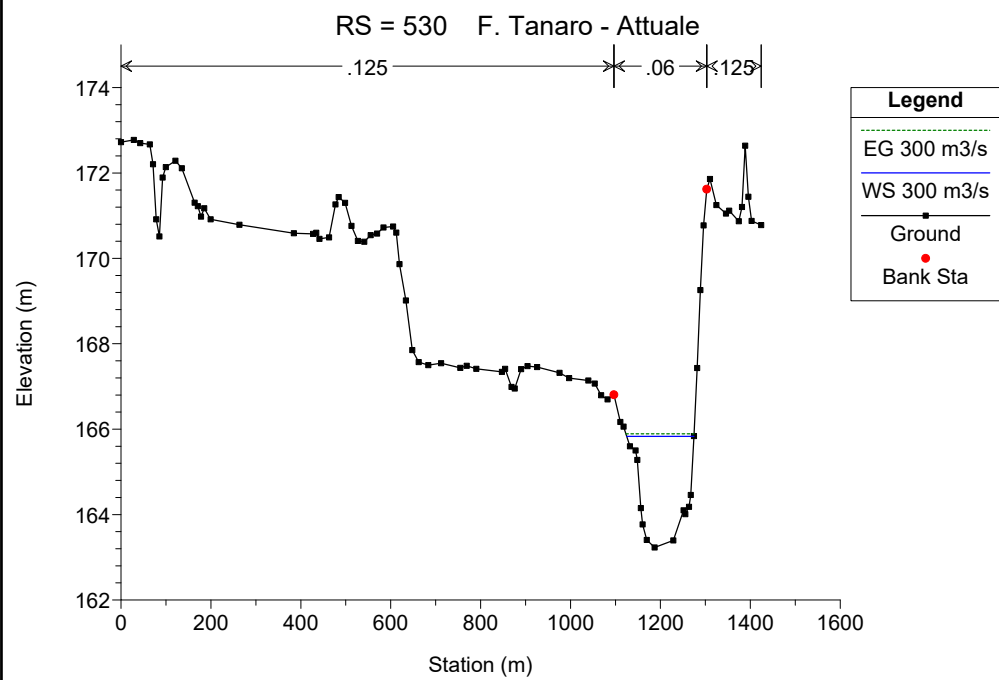
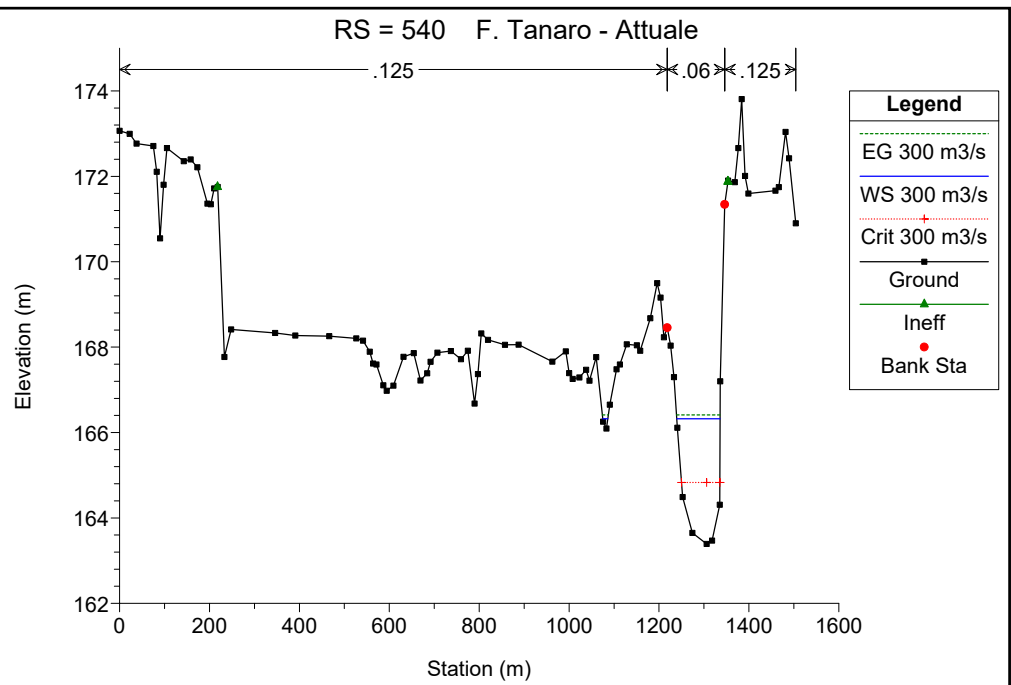
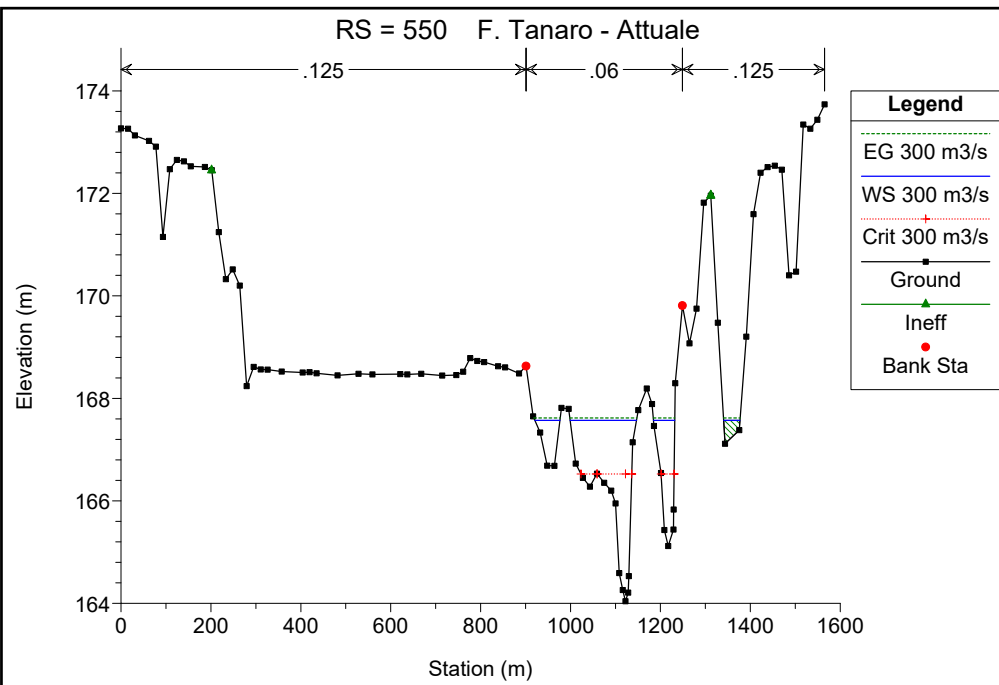
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 300 m3/s (Continued)

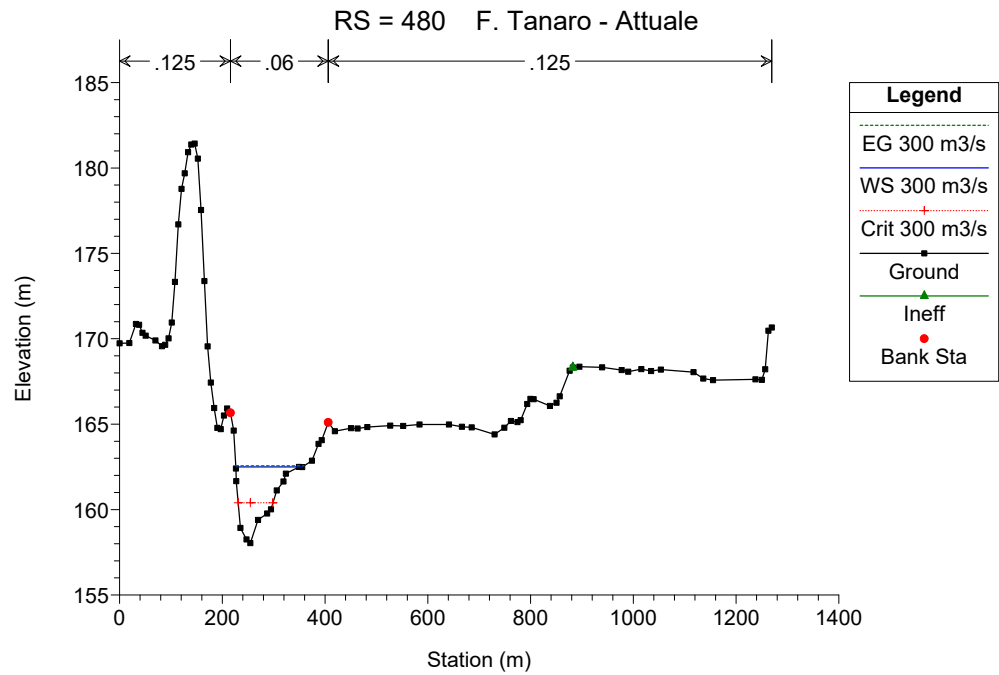
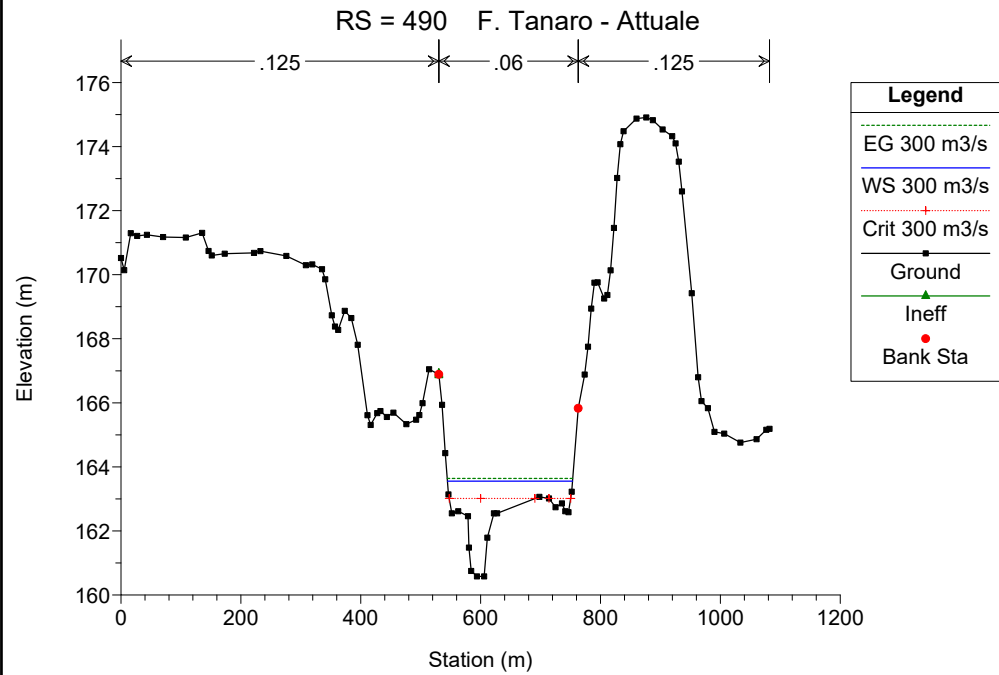
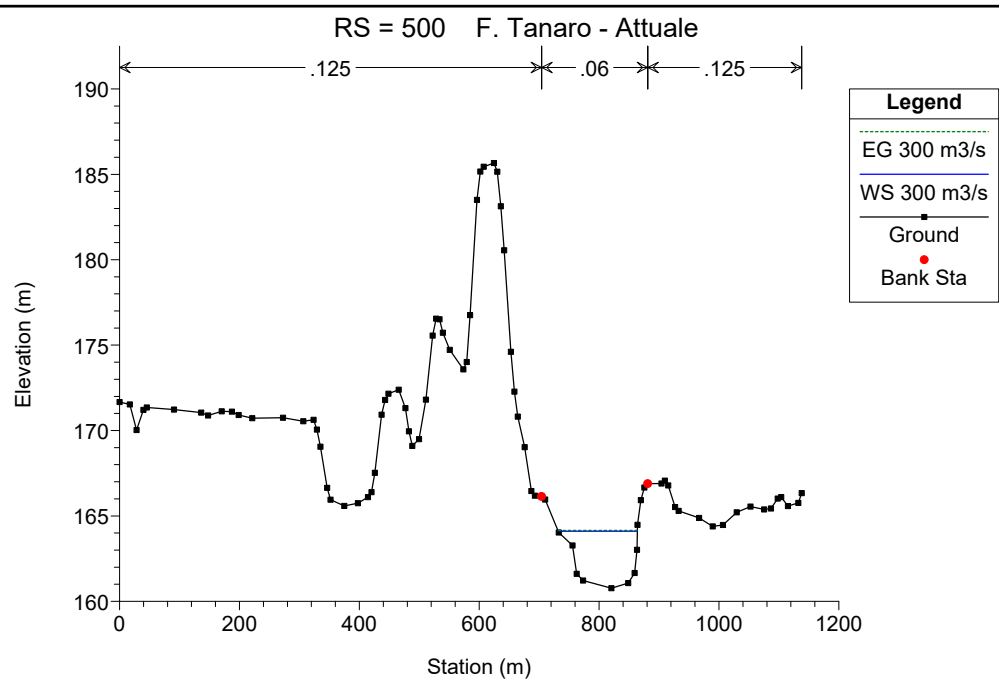
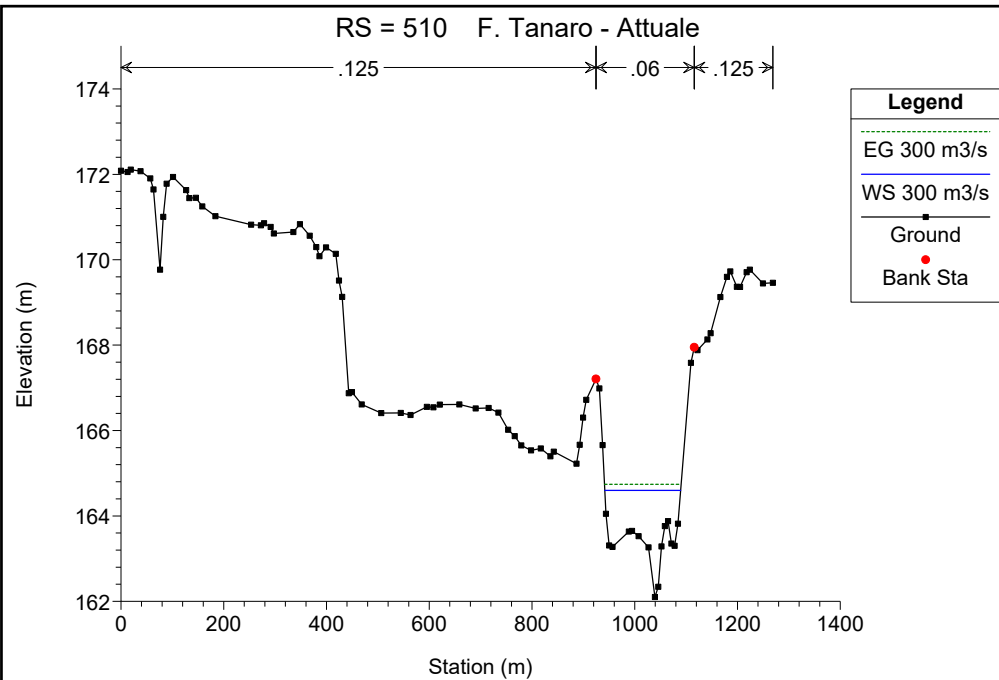
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	300 m3/s	300.00	146.60	150.89	149.16	150.95	0.001319	1.11	270.31	108.00	0.22
1	190	300 m3/s	300.00	146.85	150.49	148.66	150.55	0.001912	1.10	273.07	147.09	0.26
1	180	300 m3/s	300.00	145.66	150.31	147.53	150.33	0.000327	0.53	570.28	247.19	0.11
1	170	300 m3/s	300.00	145.40	150.25	146.94	150.26	0.000201	0.54	558.96	161.98	0.09
1	160	300 m3/s	300.00	145.46	150.18	146.68	150.19	0.000171	0.47	642.37	231.01	0.08
1	150	300 m3/s	300.00	143.53	150.14	145.54	150.15	0.000096	0.43	699.01	170.41	0.07
1	140	300 m3/s	200.00	143.00	150.11	144.90	150.12	0.000067	0.35	571.74	137.68	0.05
1	135		Inl Struct									
1	130	300 m3/s	300.00	142.54	145.72	144.24	145.79	0.001776	1.12	266.68	130.90	0.25
1	120	300 m3/s	300.00	142.27	145.32	143.50	145.37	0.001200	1.02	293.21	123.43	0.21
1	110	300 m3/s	300.00	141.17	144.96	143.27	145.03	0.001538	1.14	262.52	113.06	0.24
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

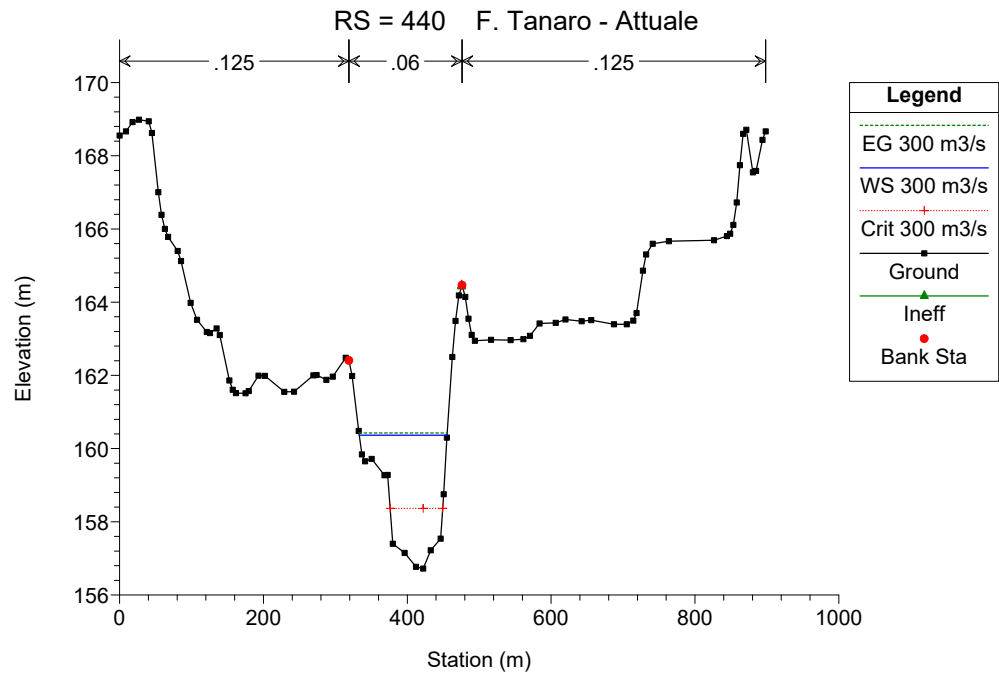
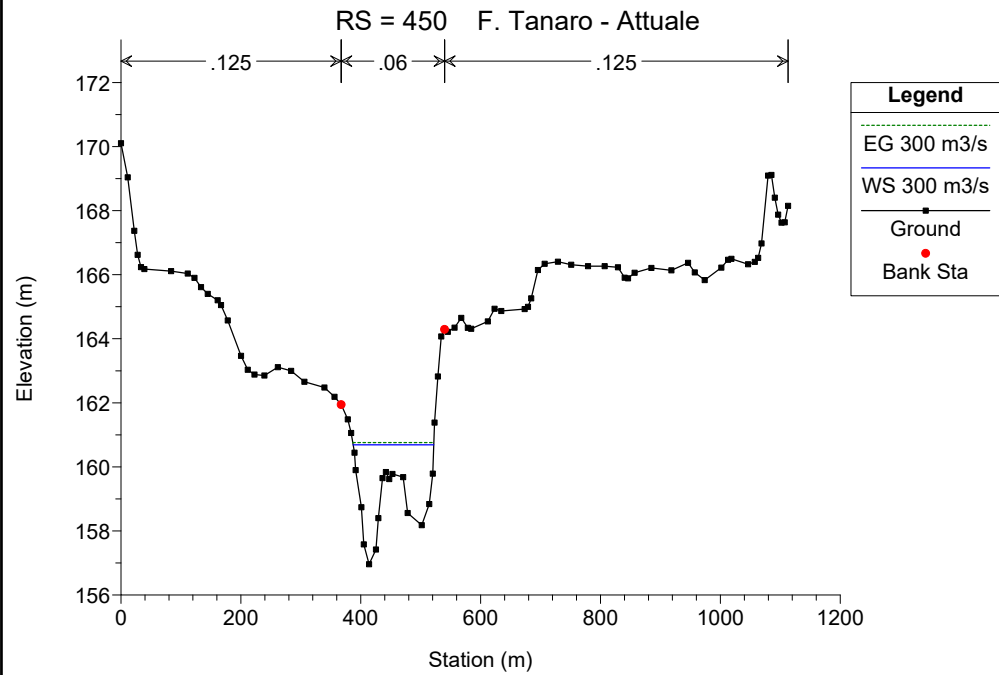
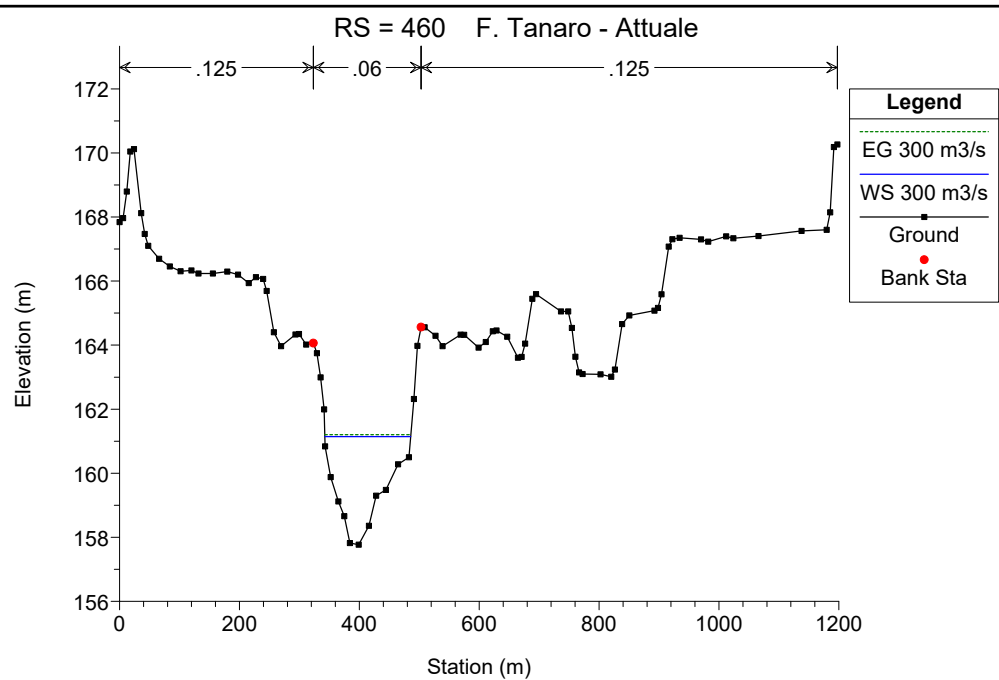
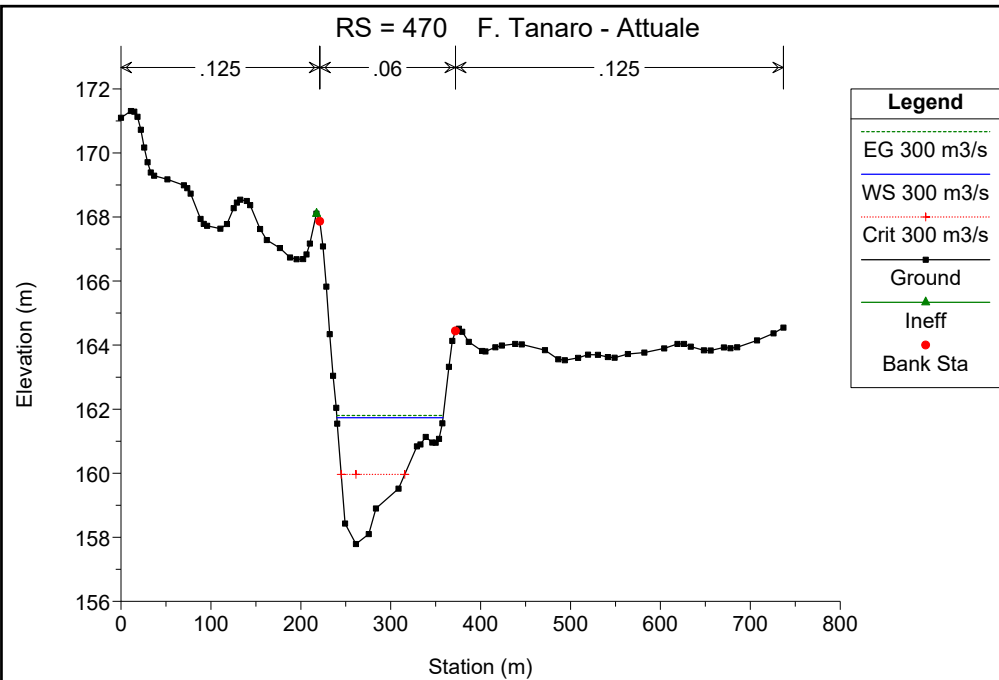
F. Tanaro - Attuale

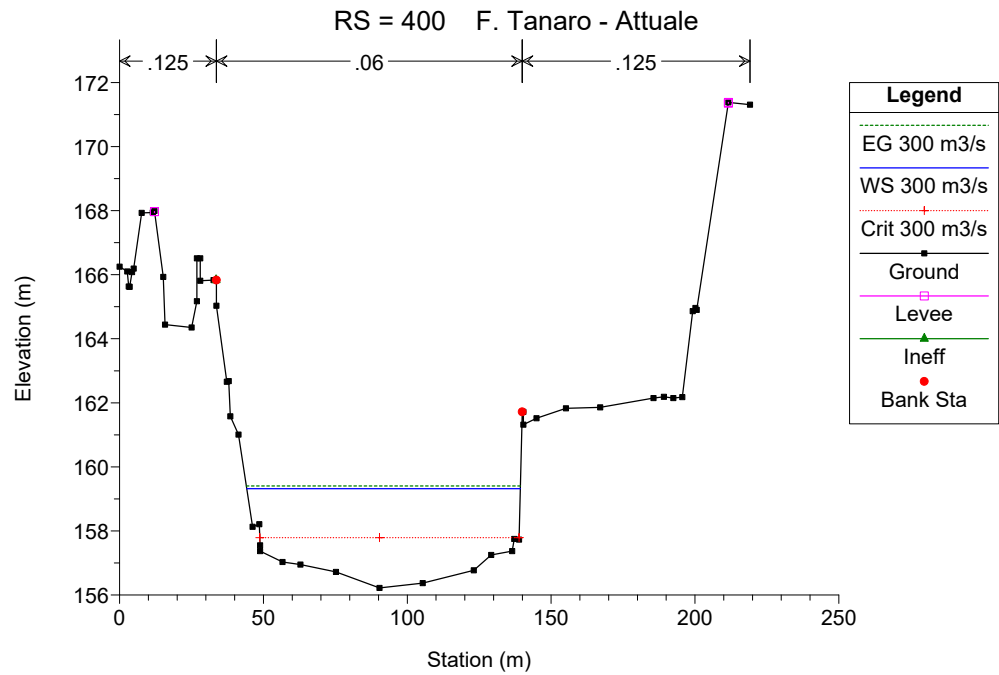
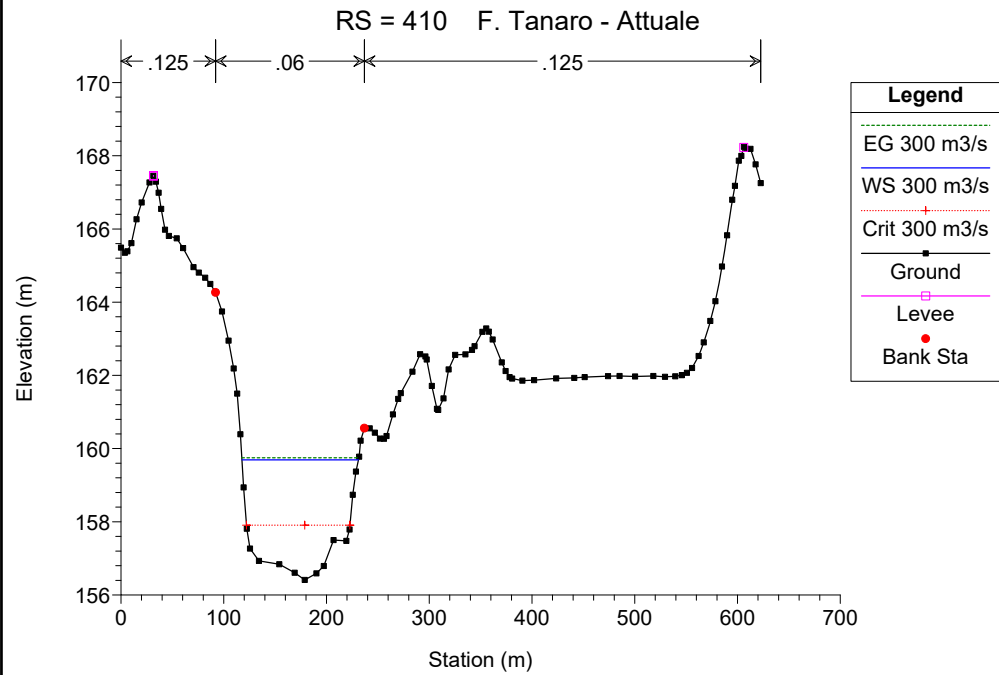
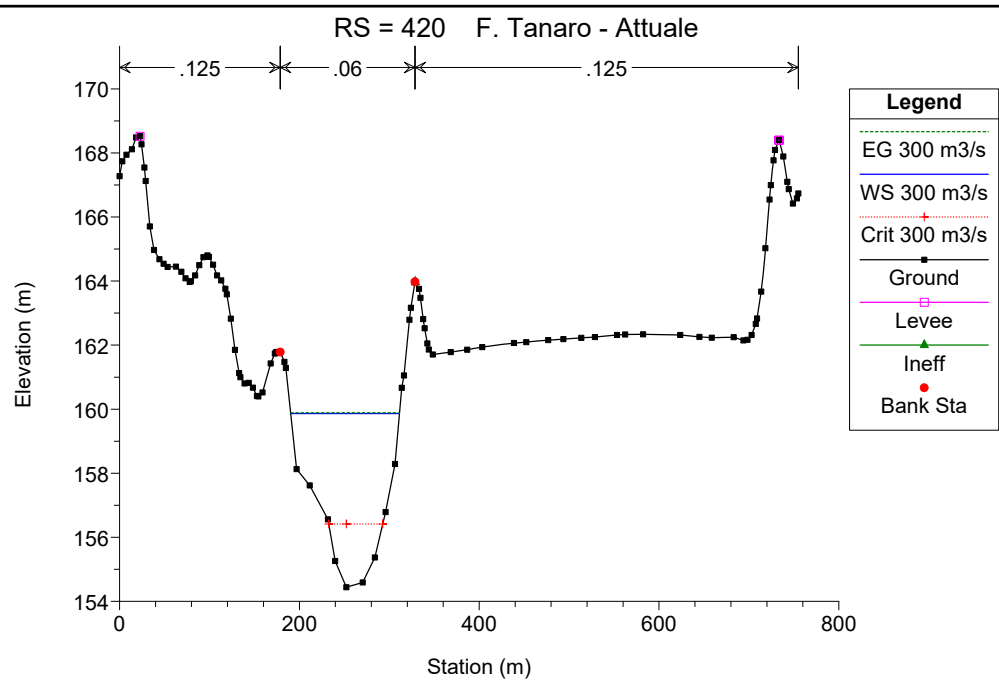
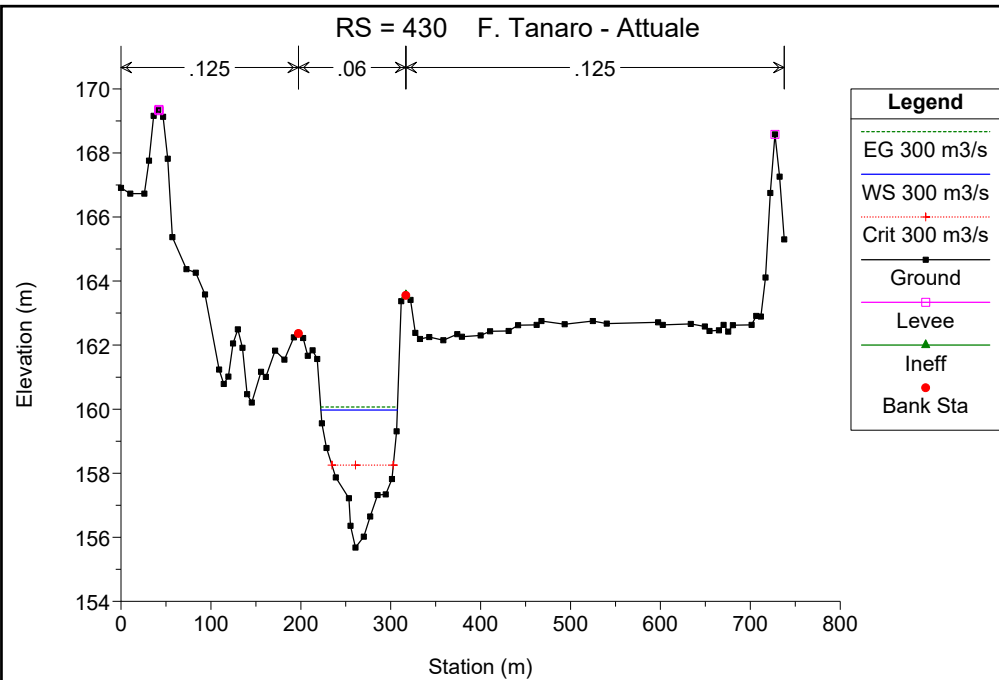
Tanaro 1

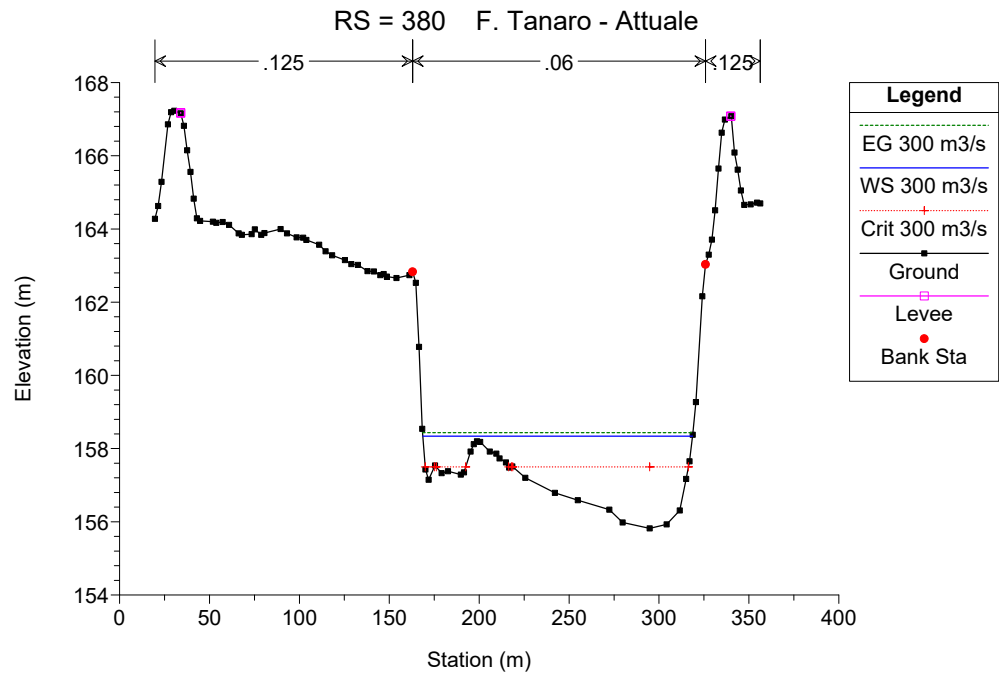
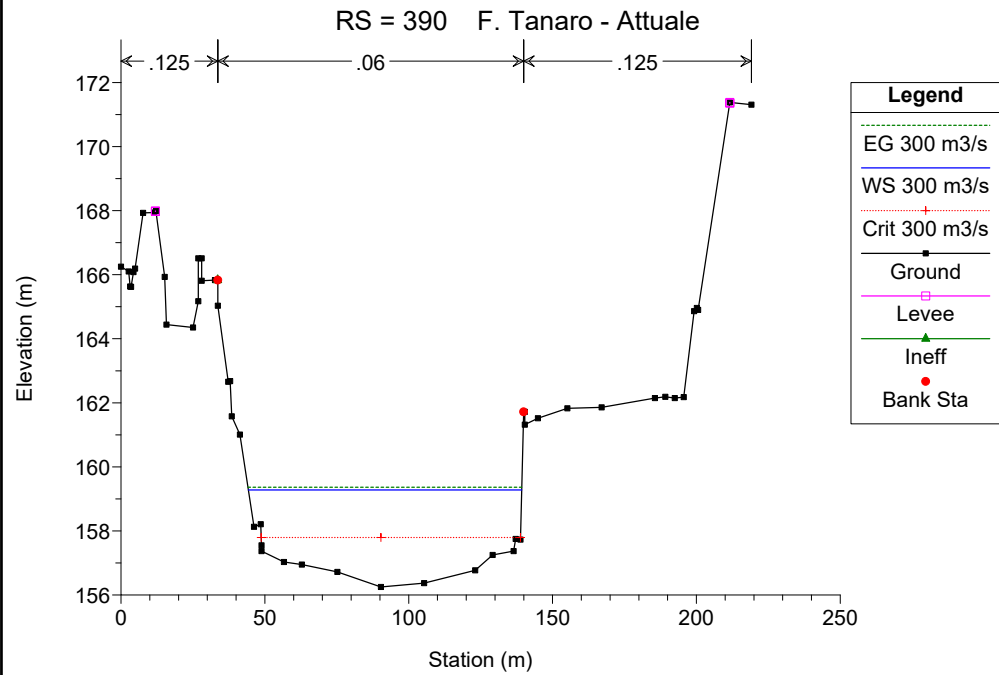
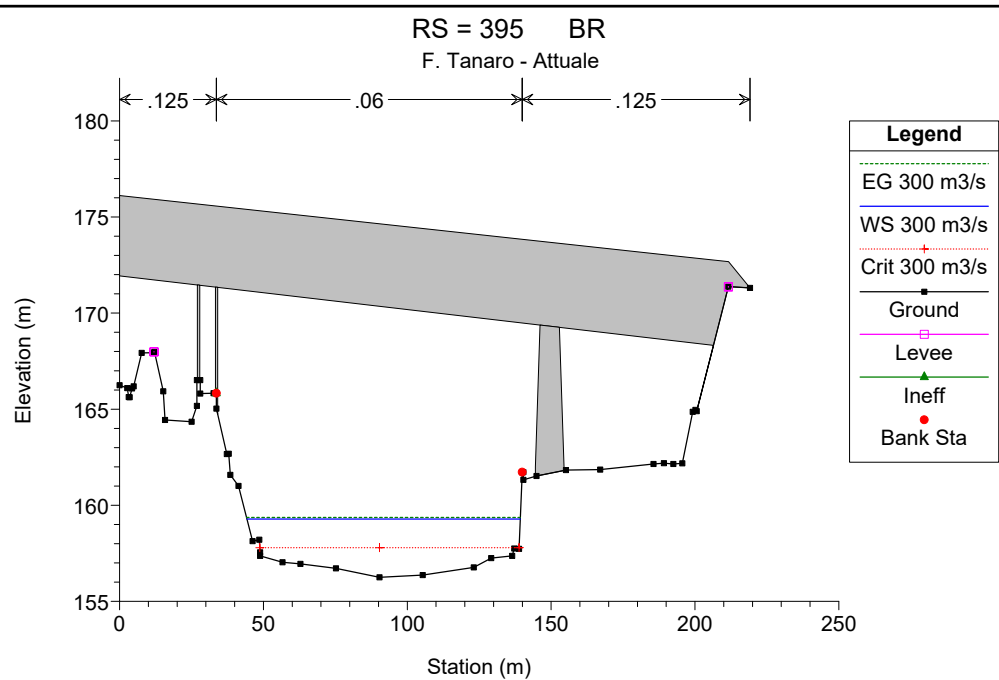
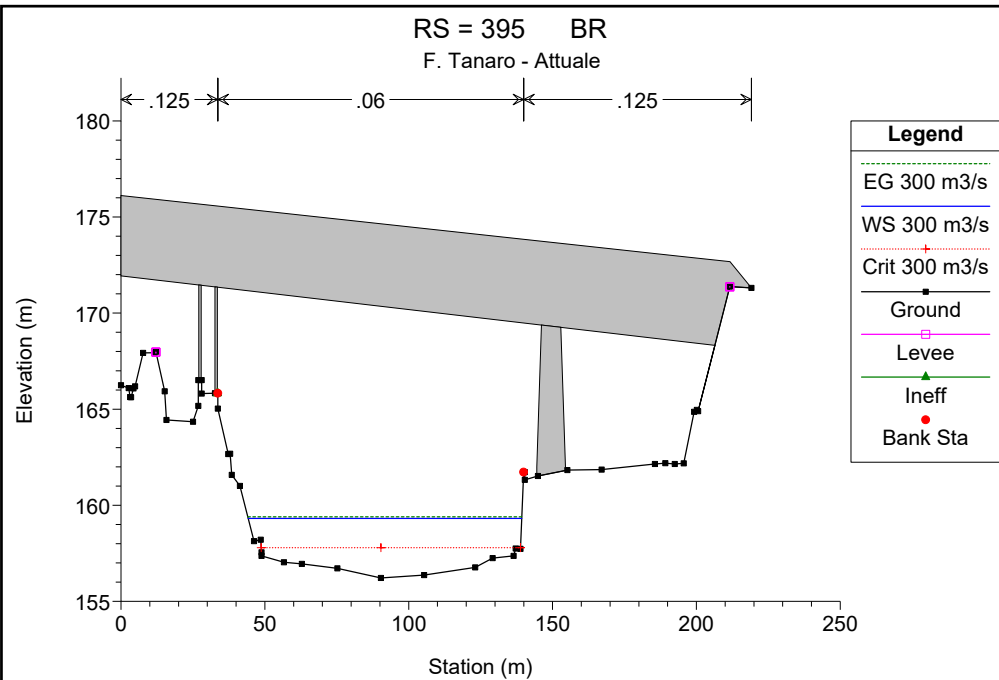


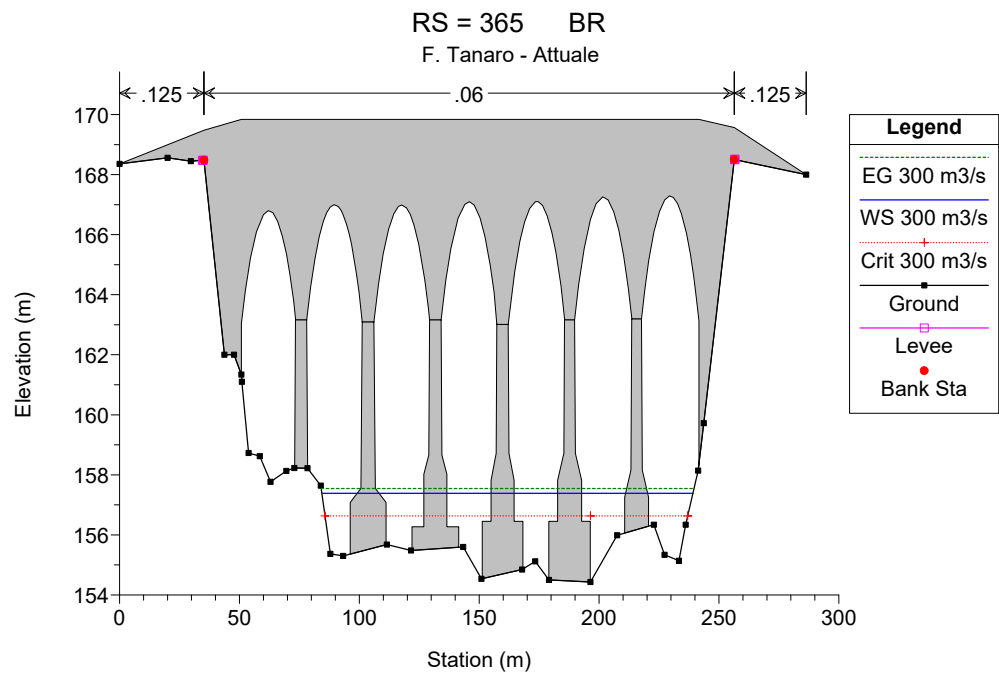
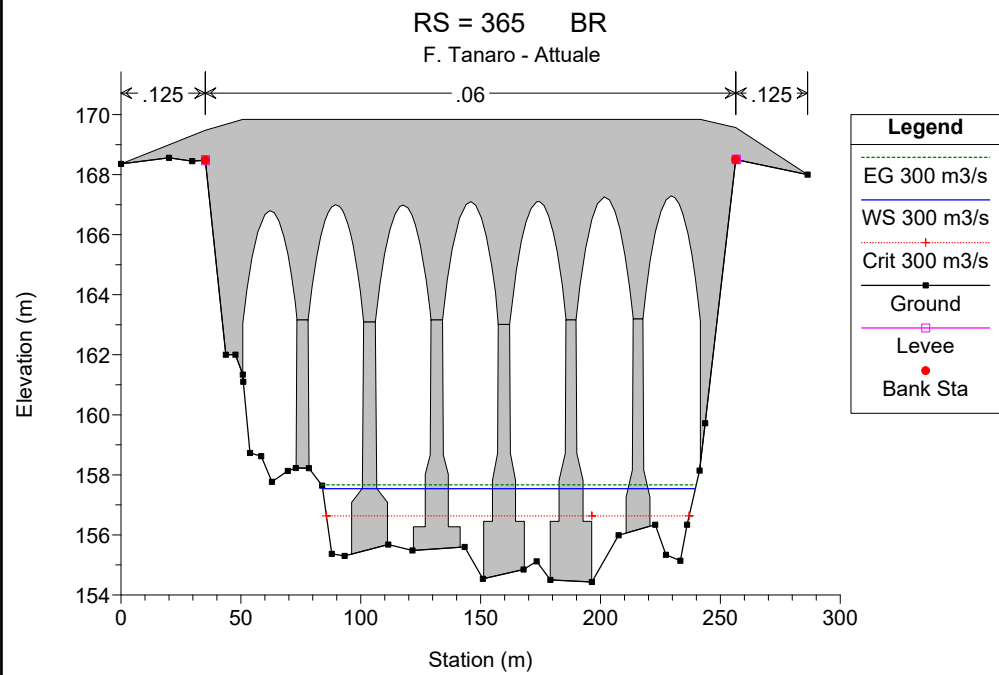
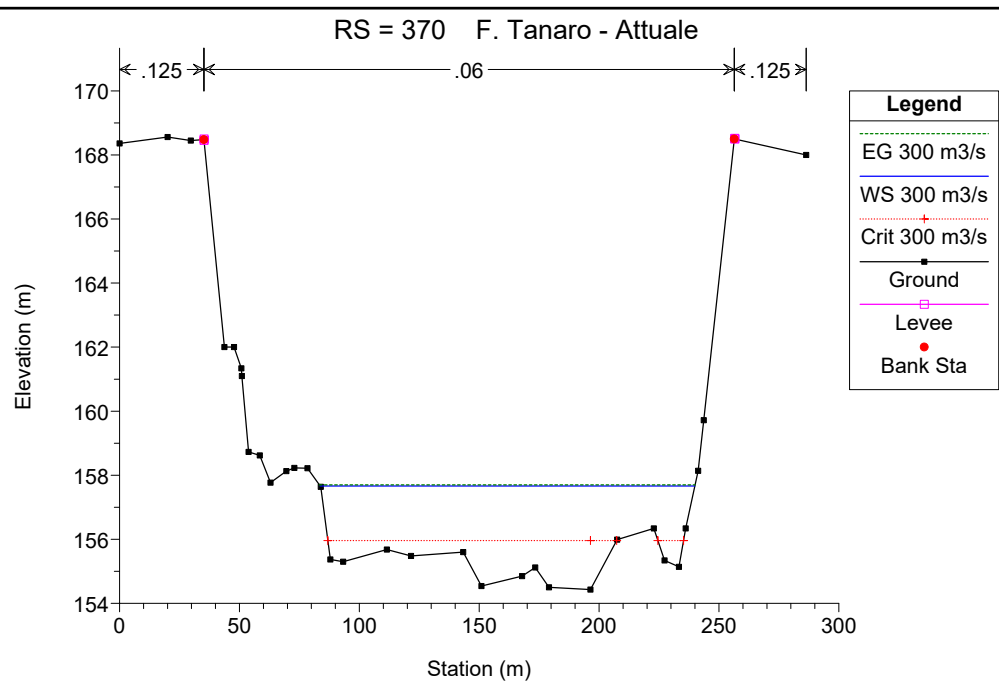
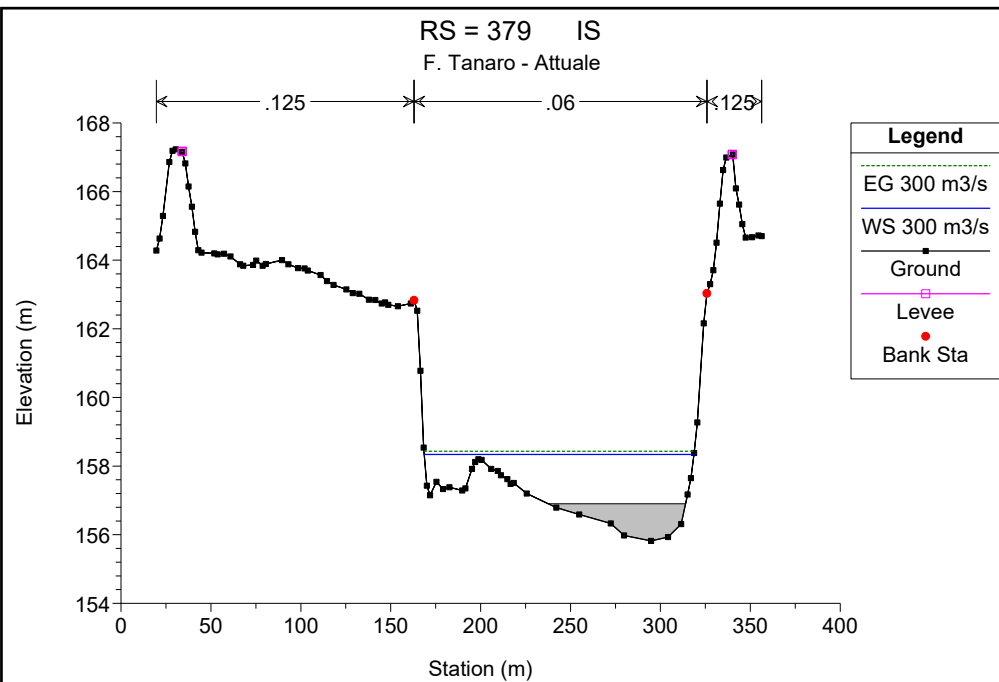


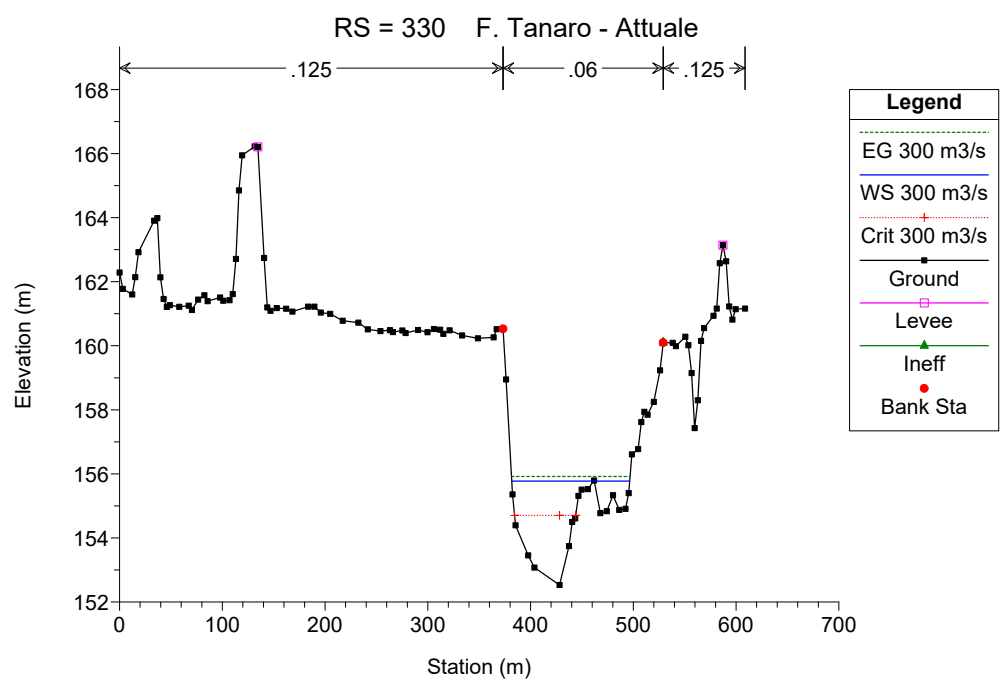
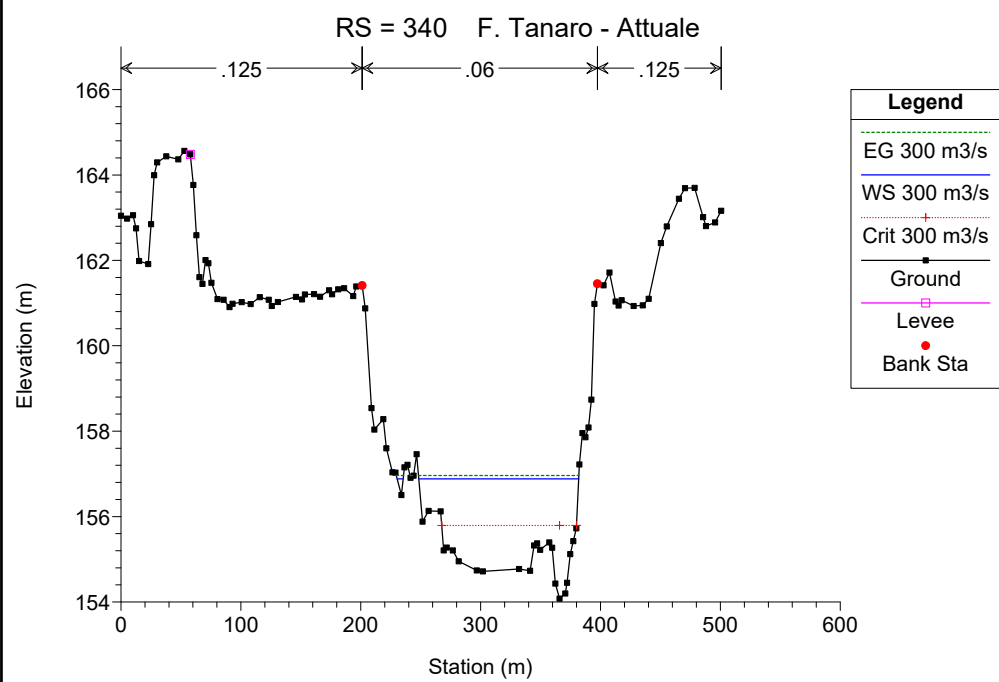
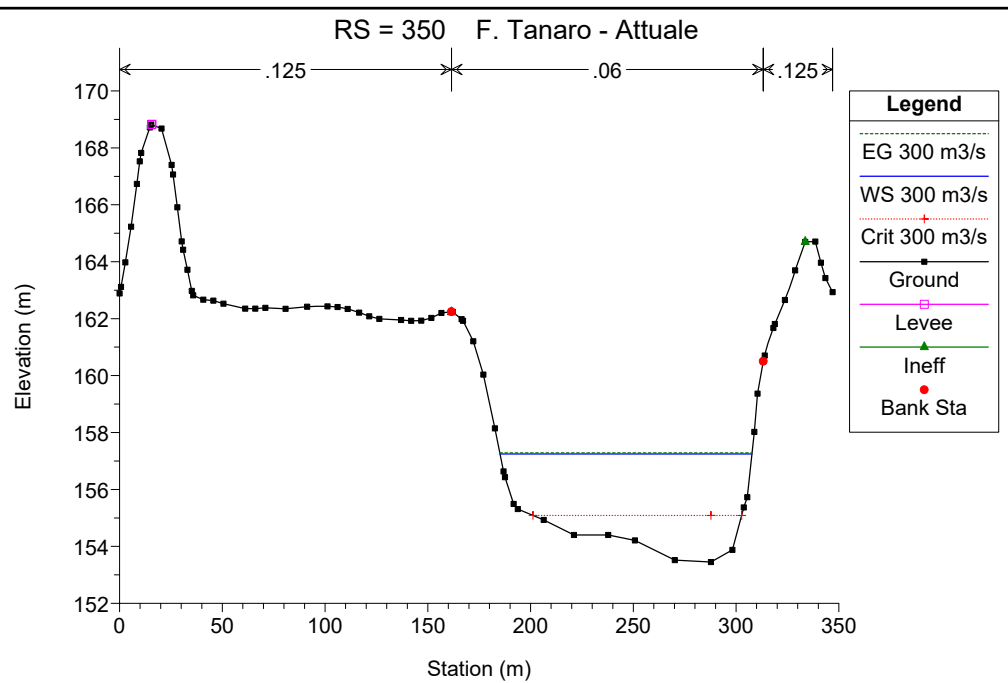
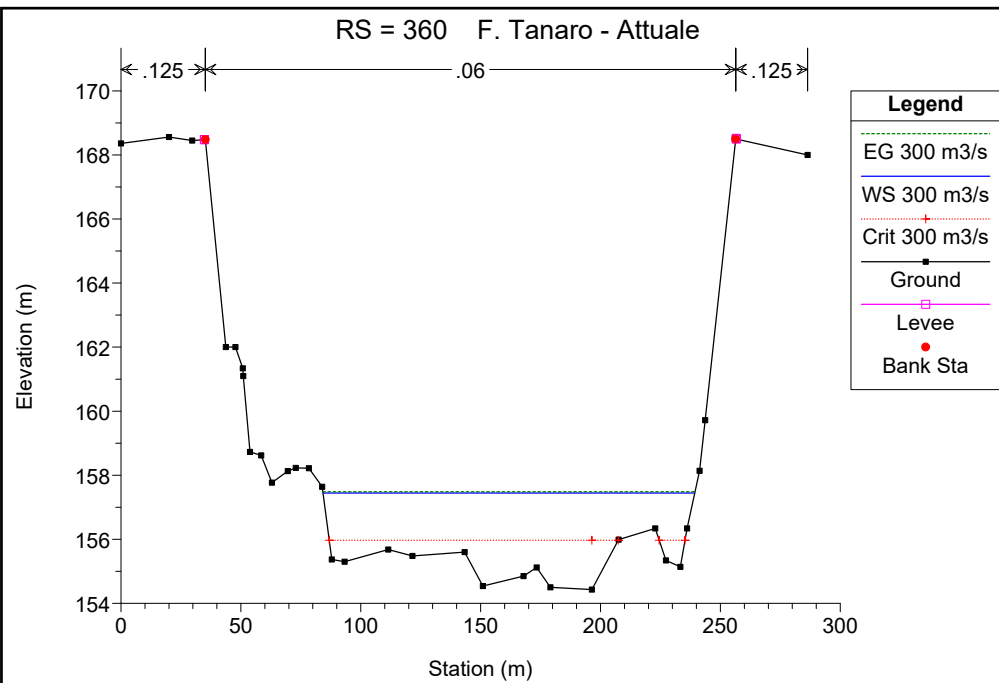


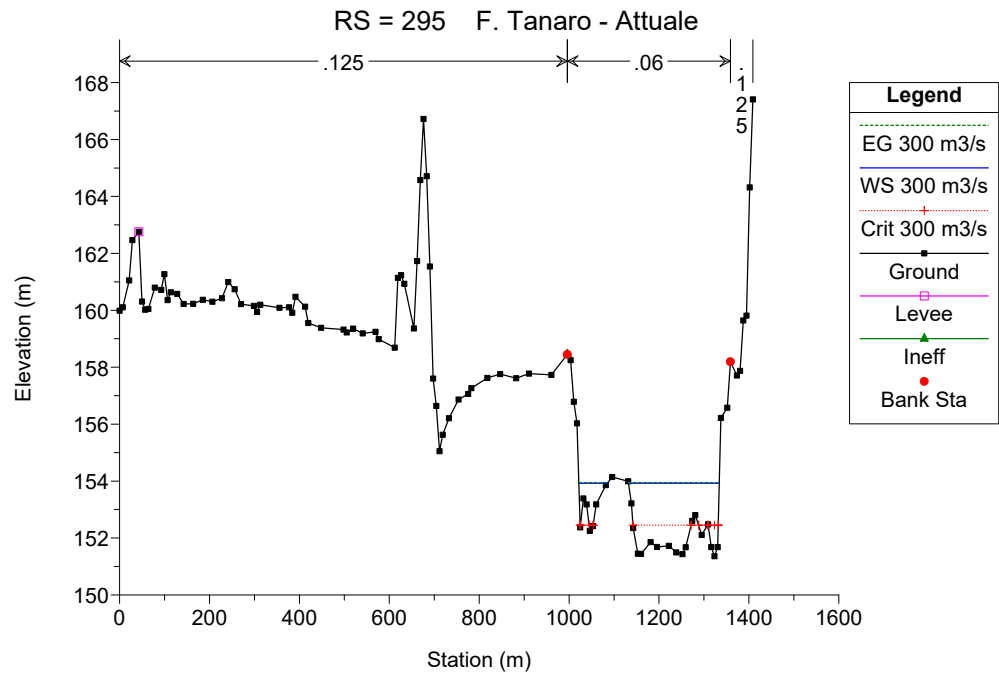
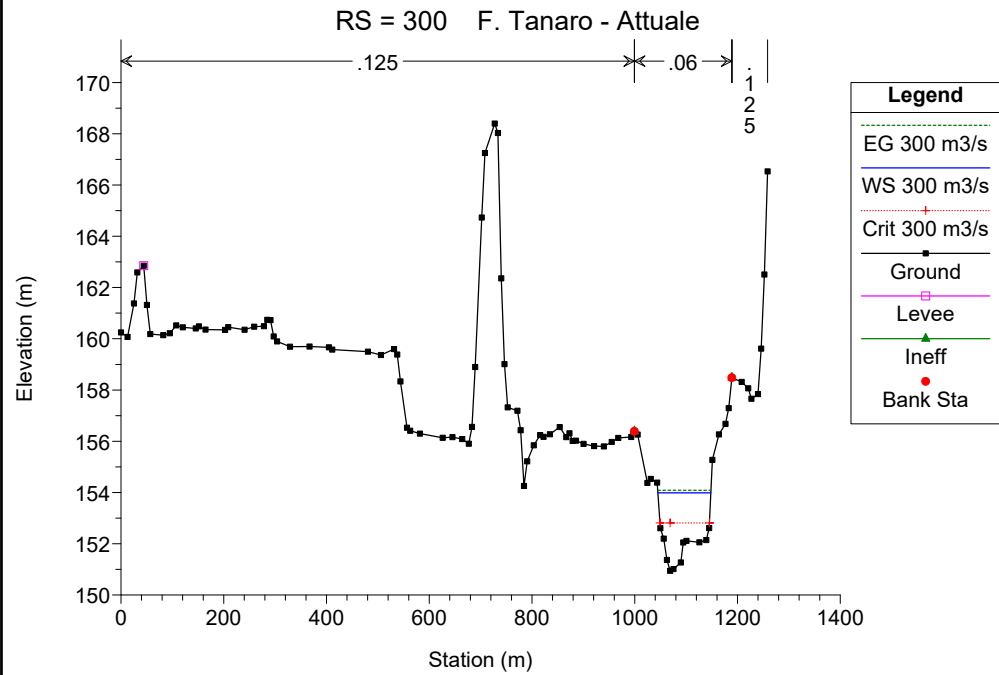
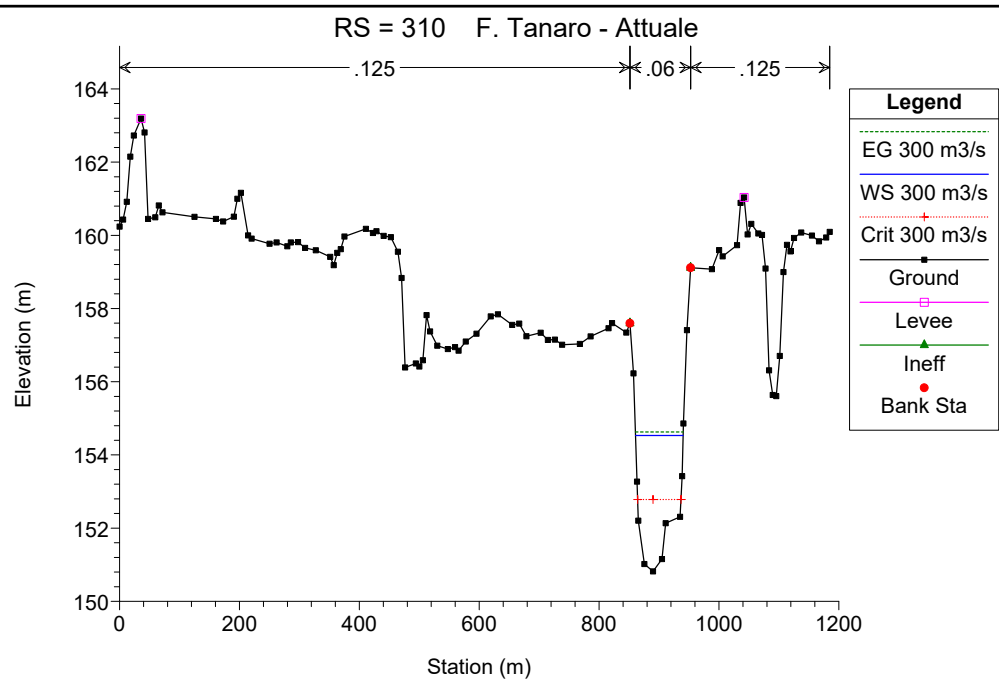
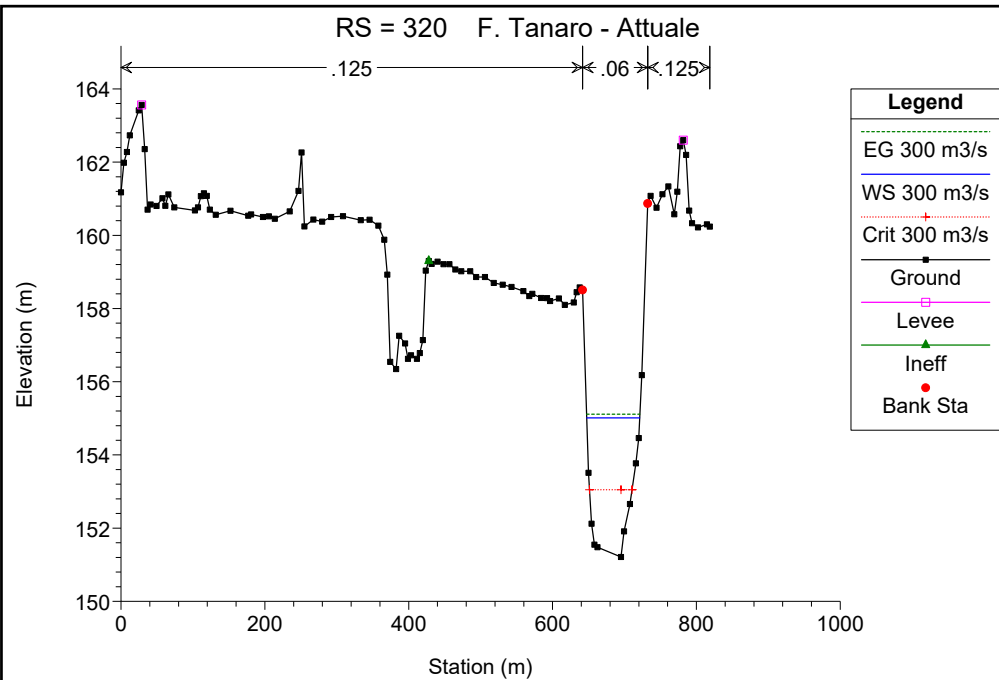


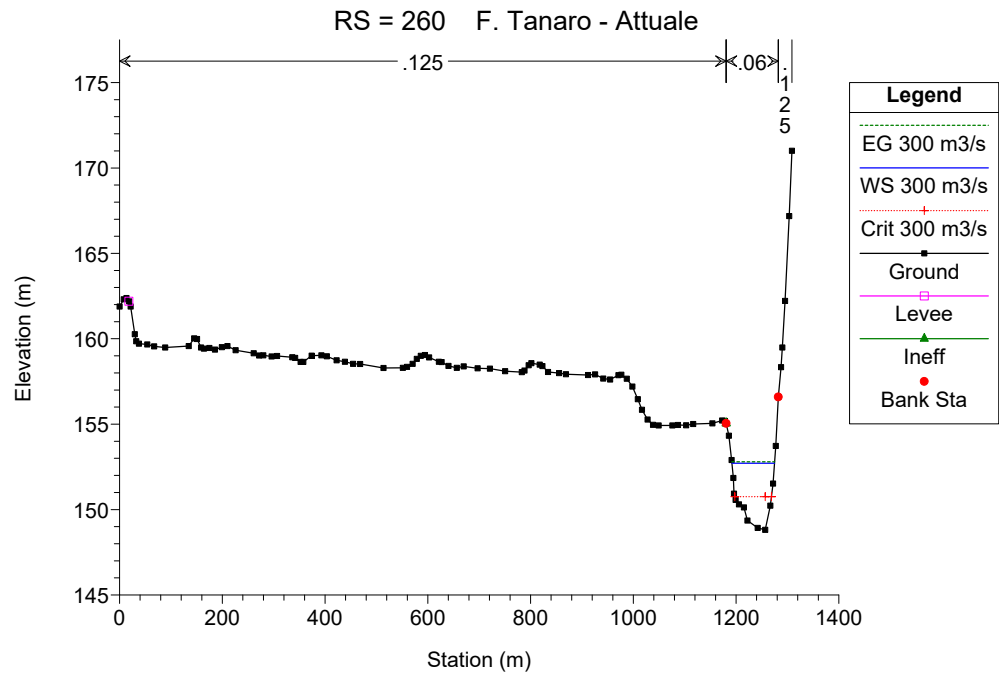
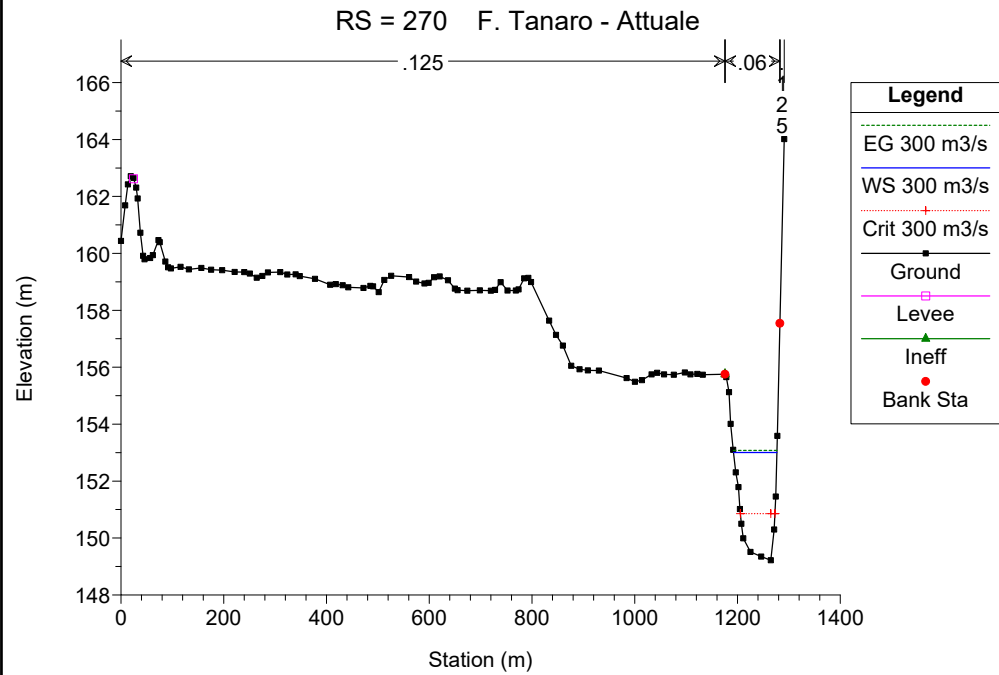
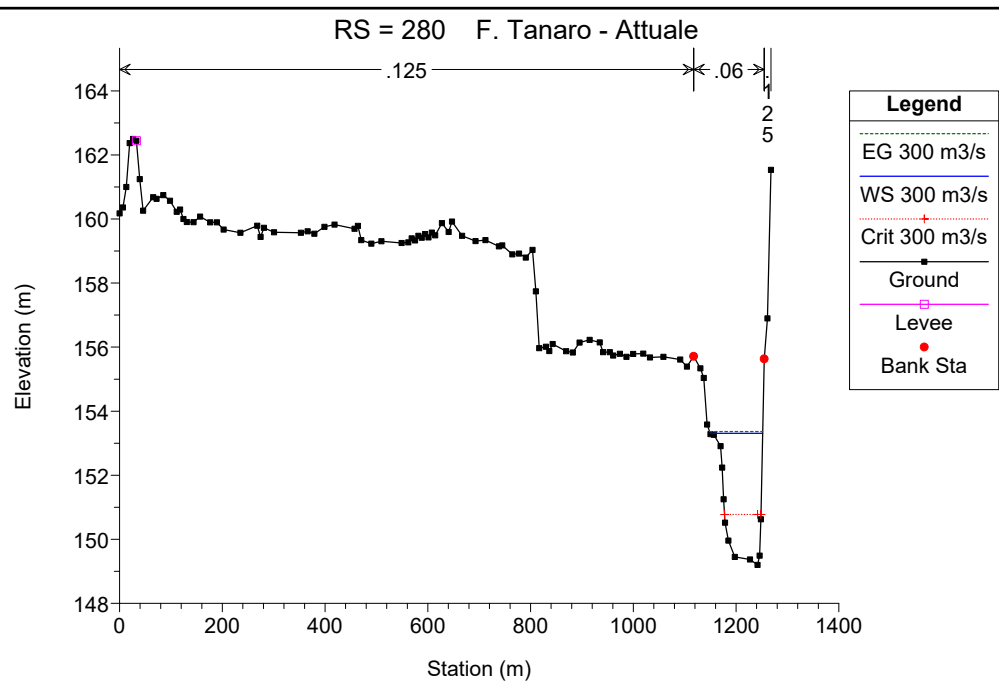
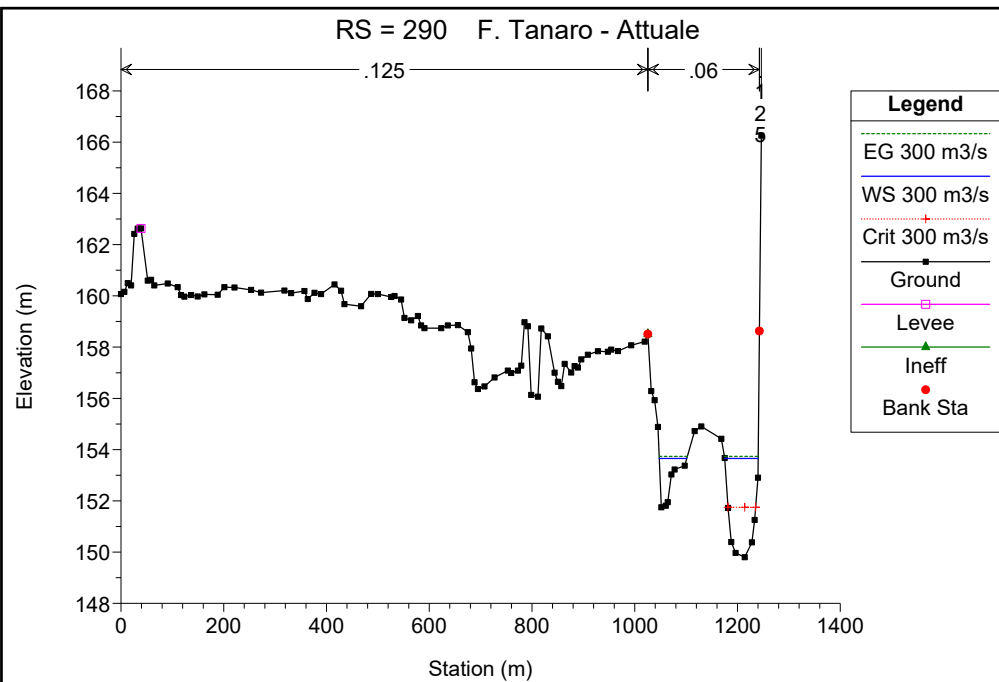


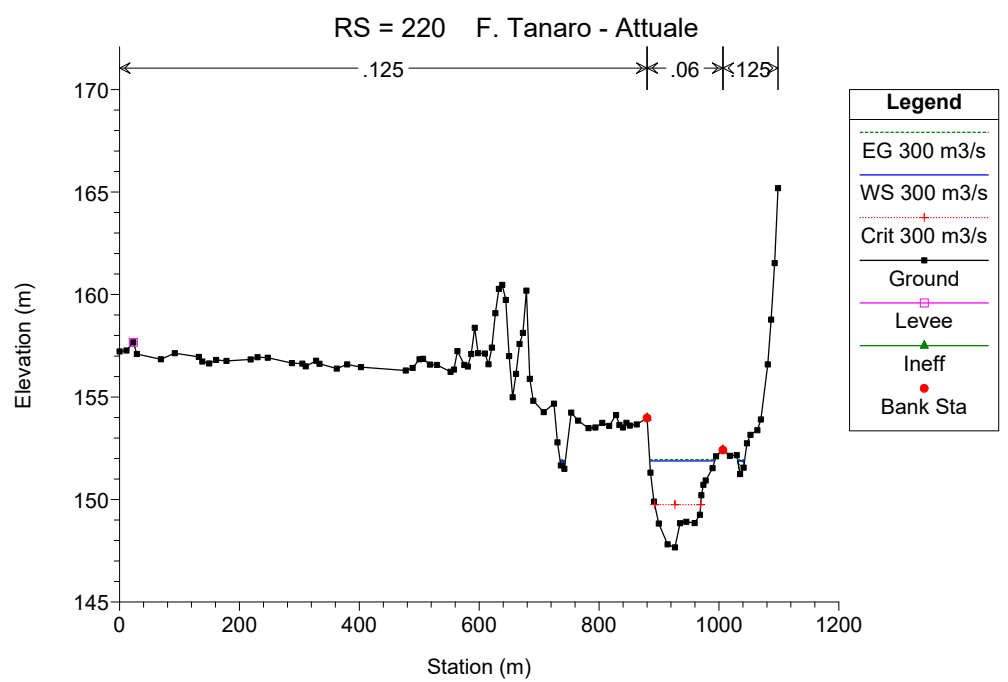
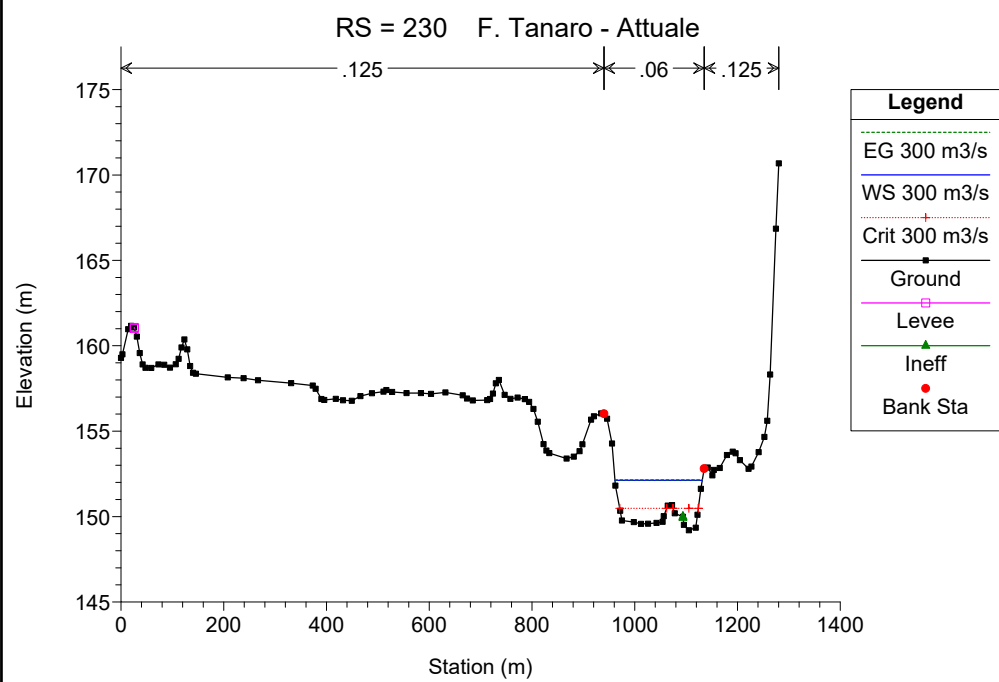
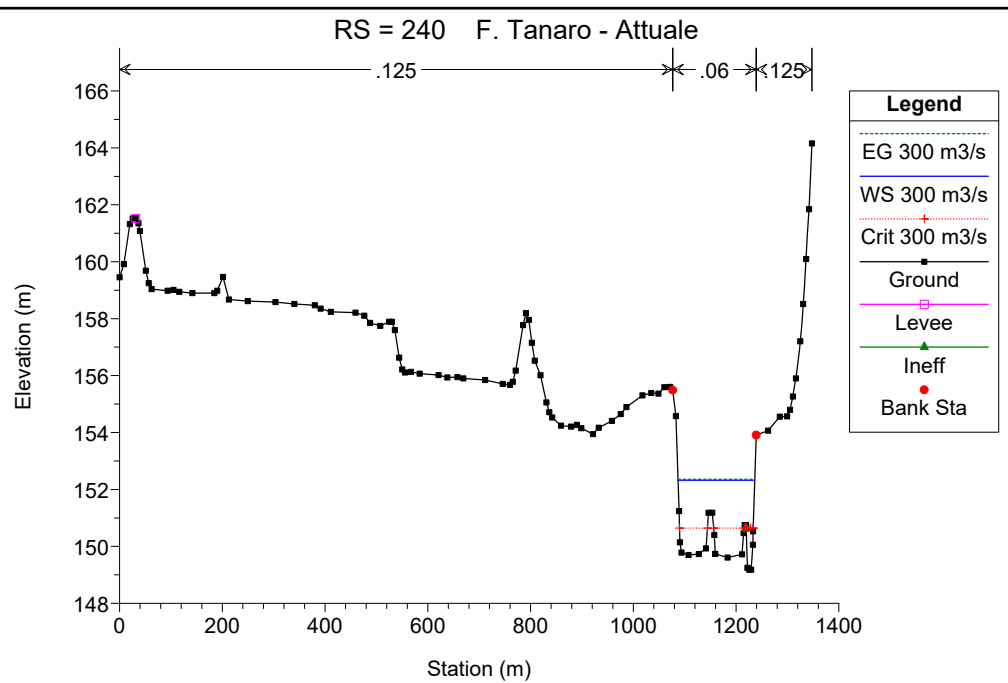
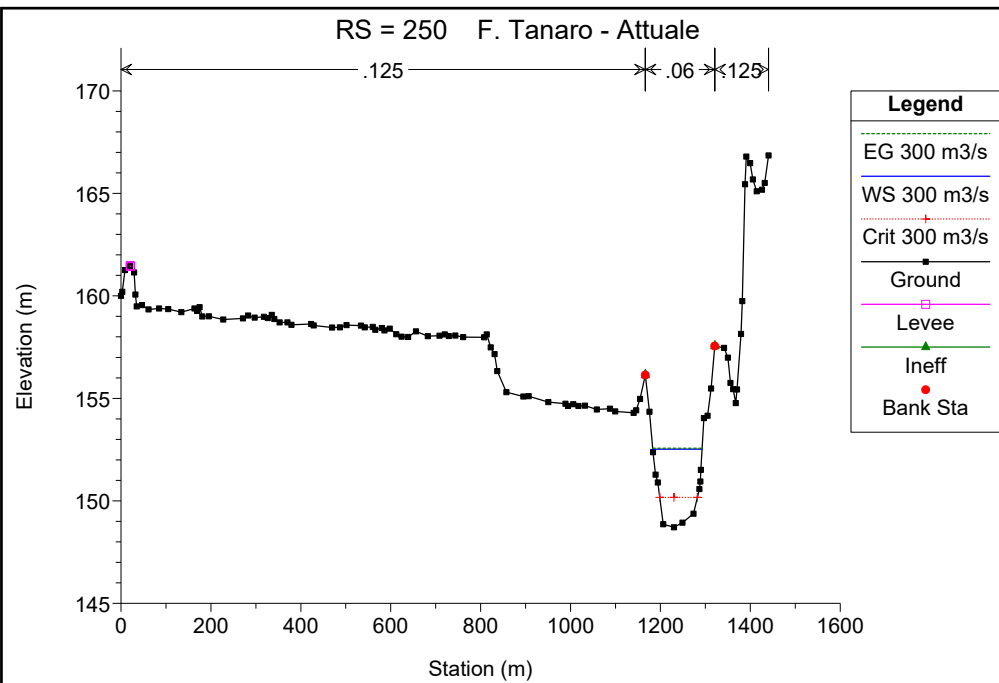


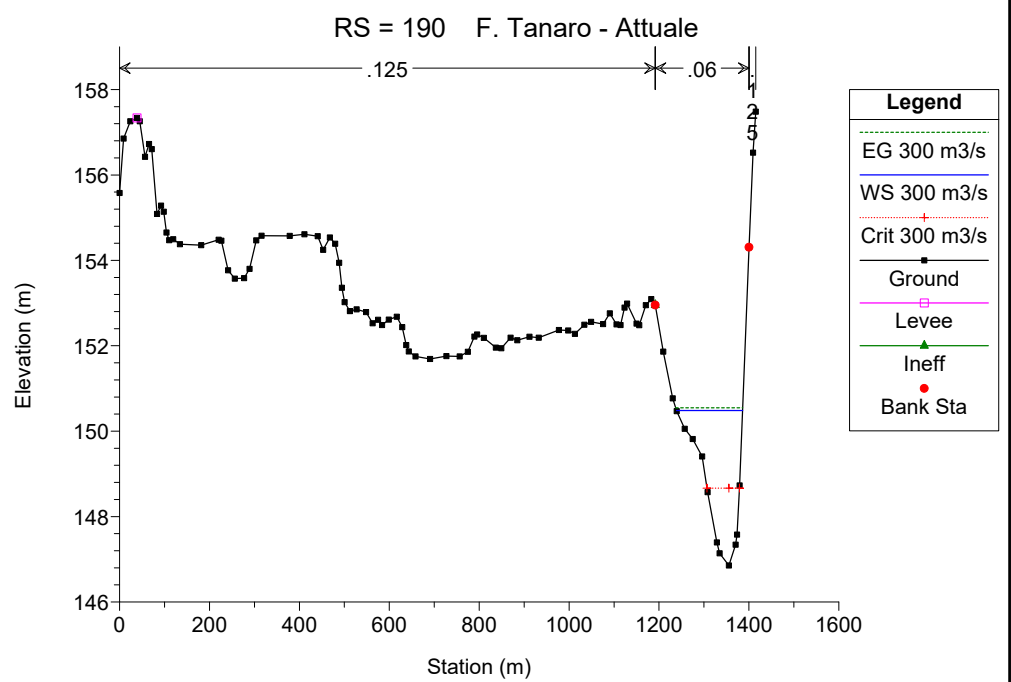
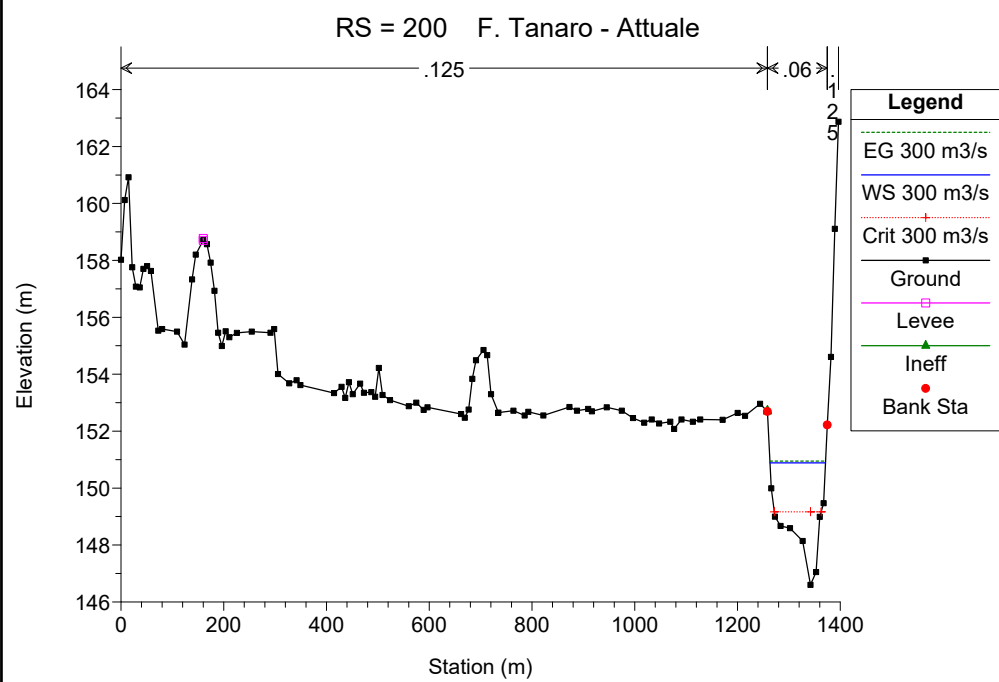
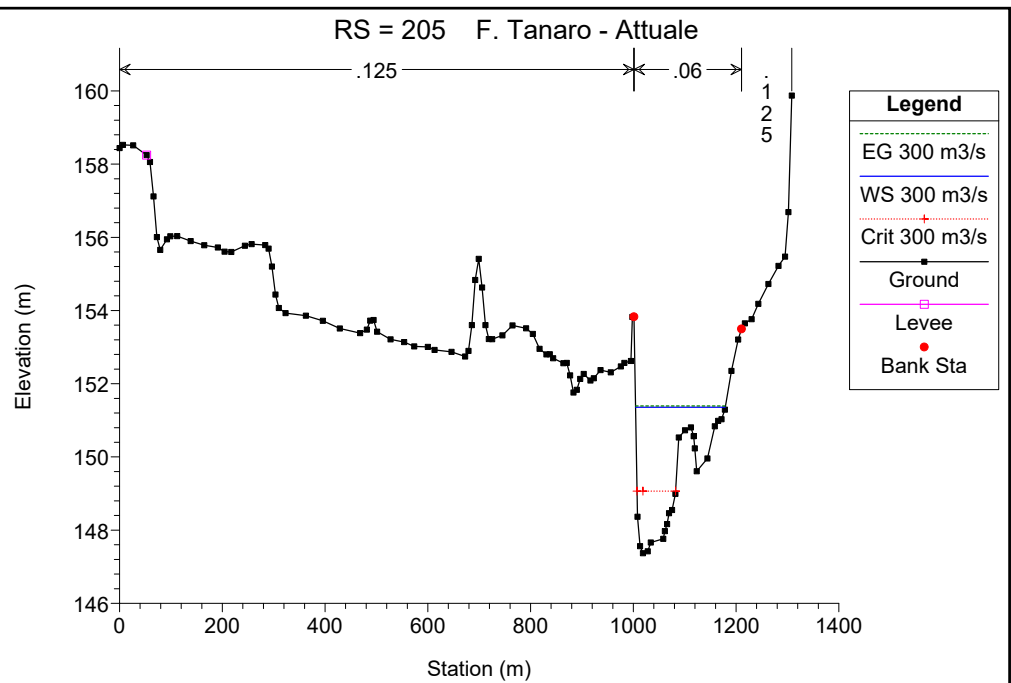
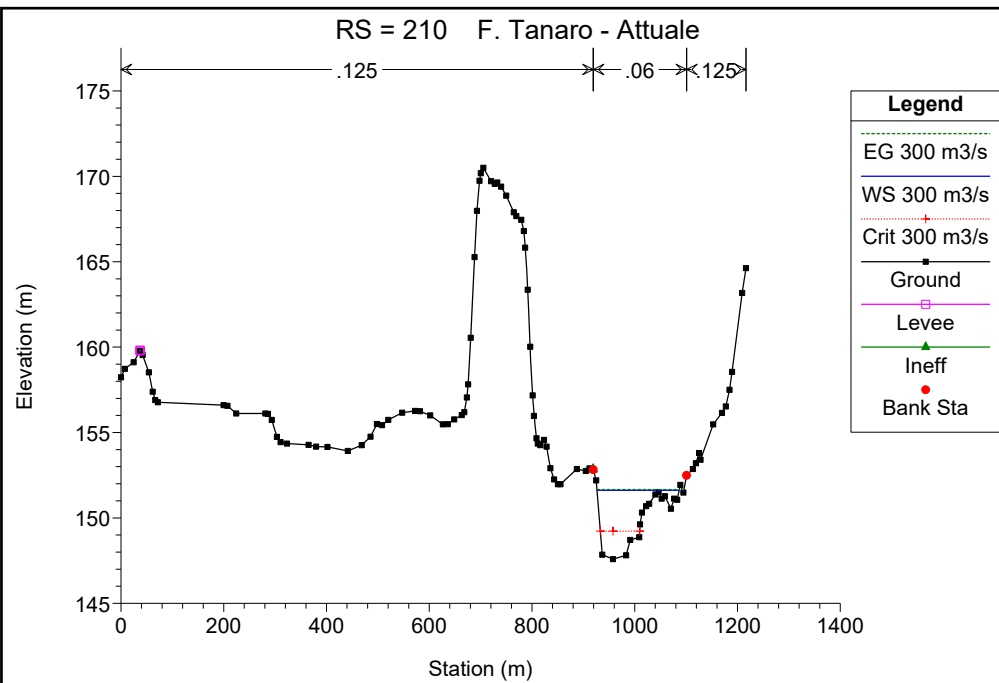


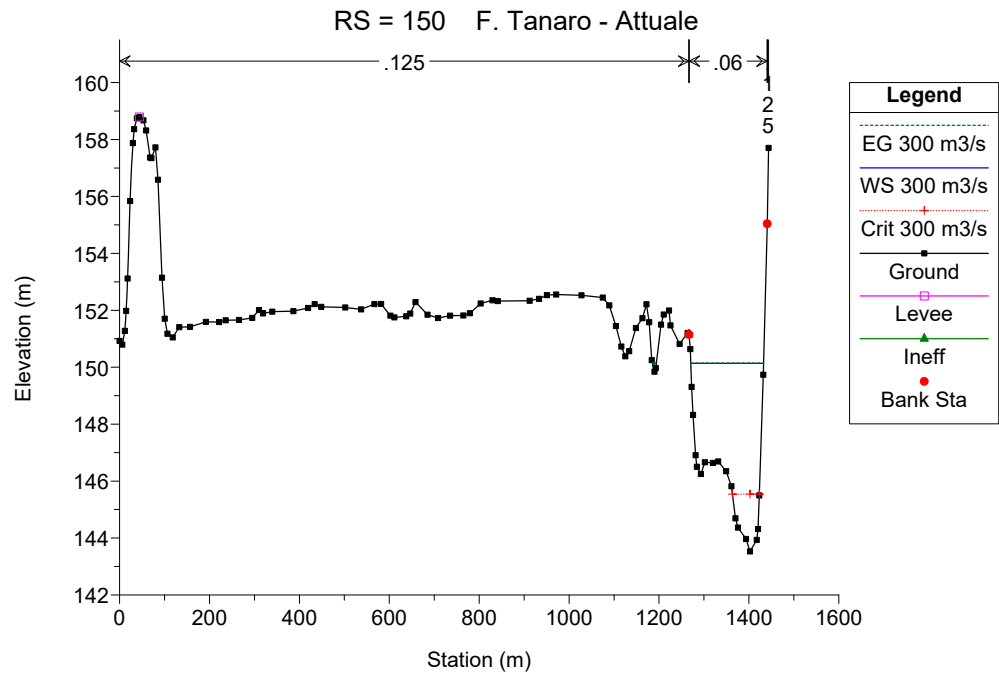
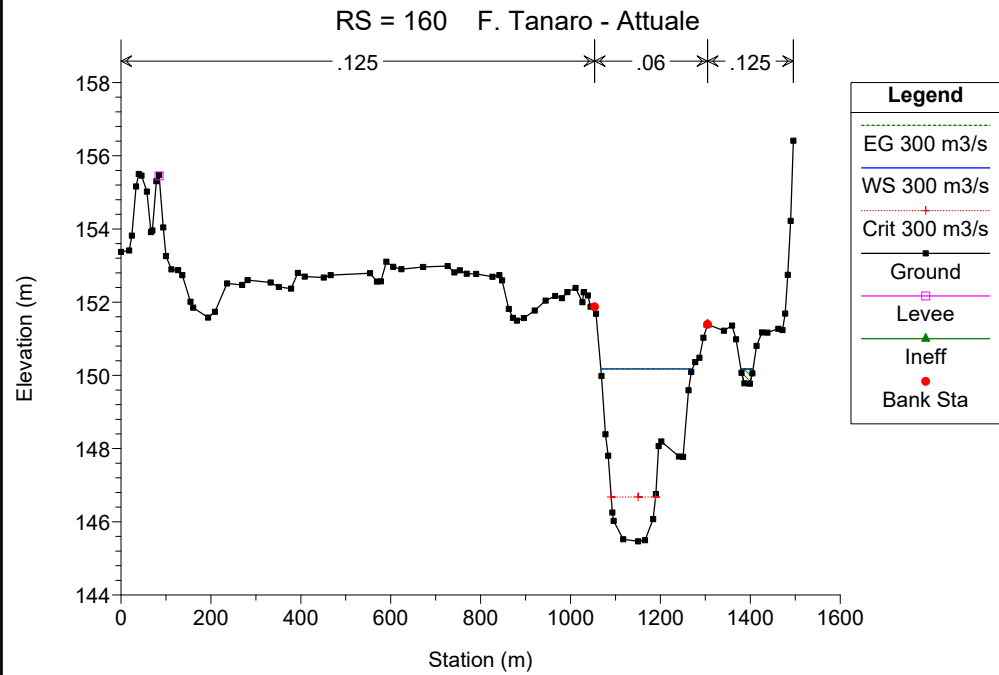
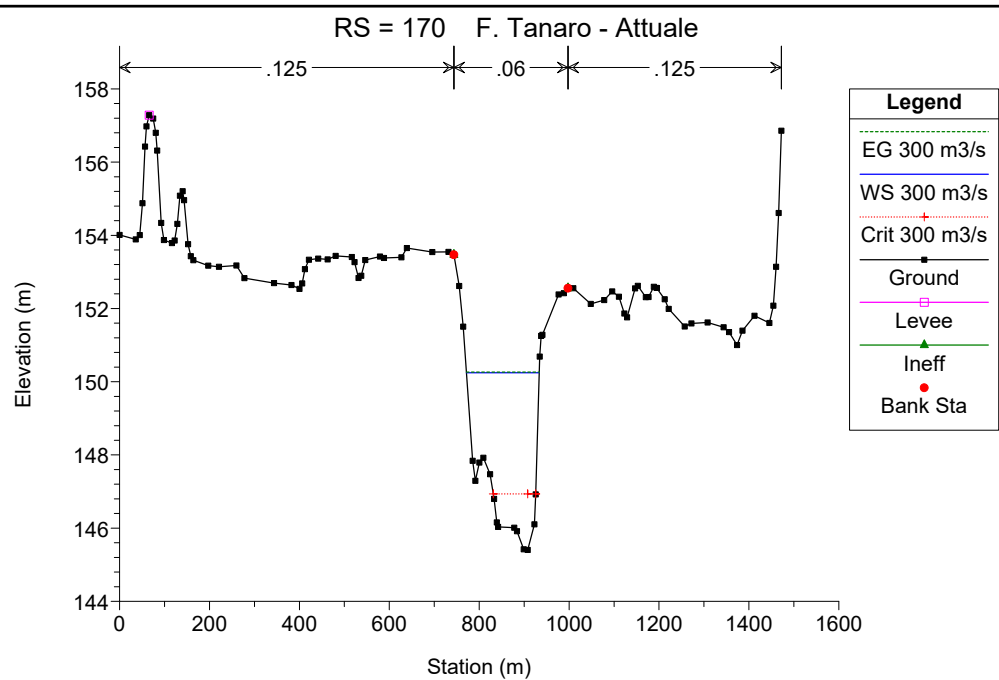
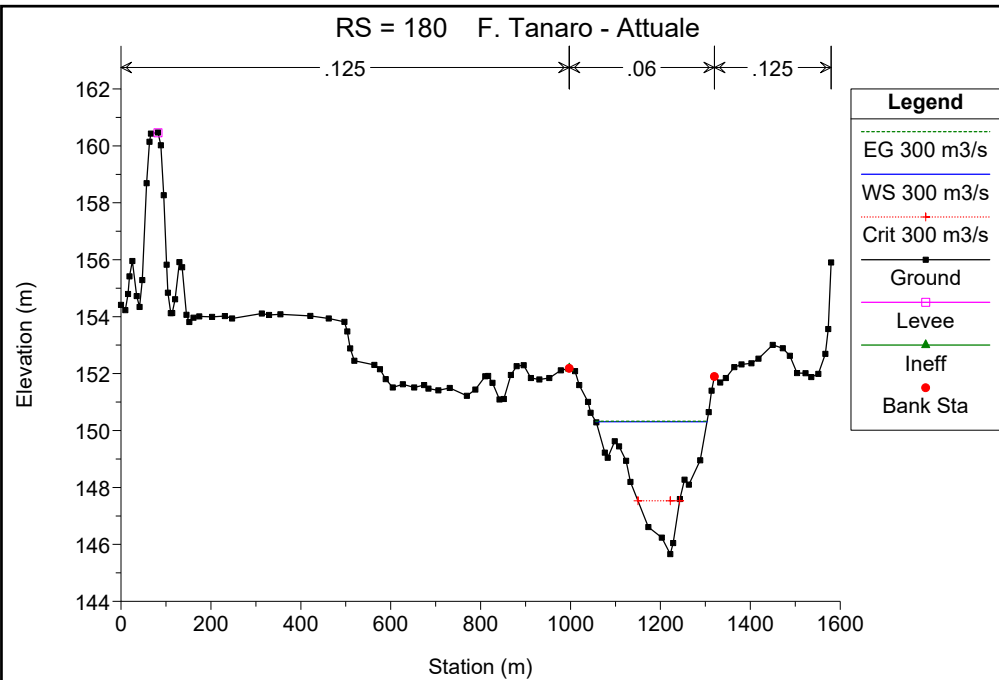


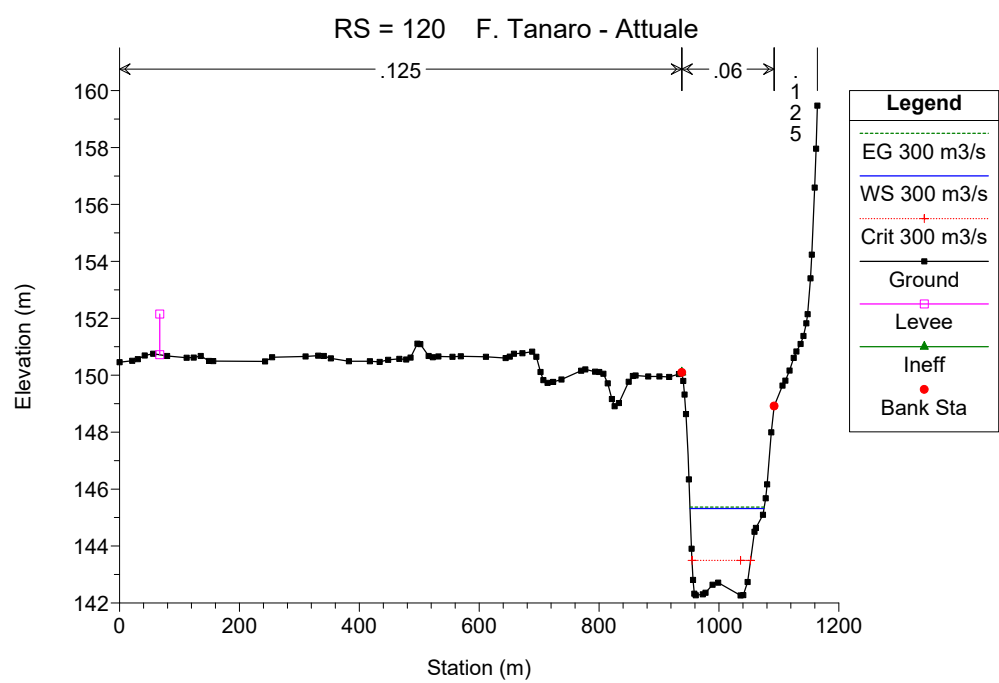
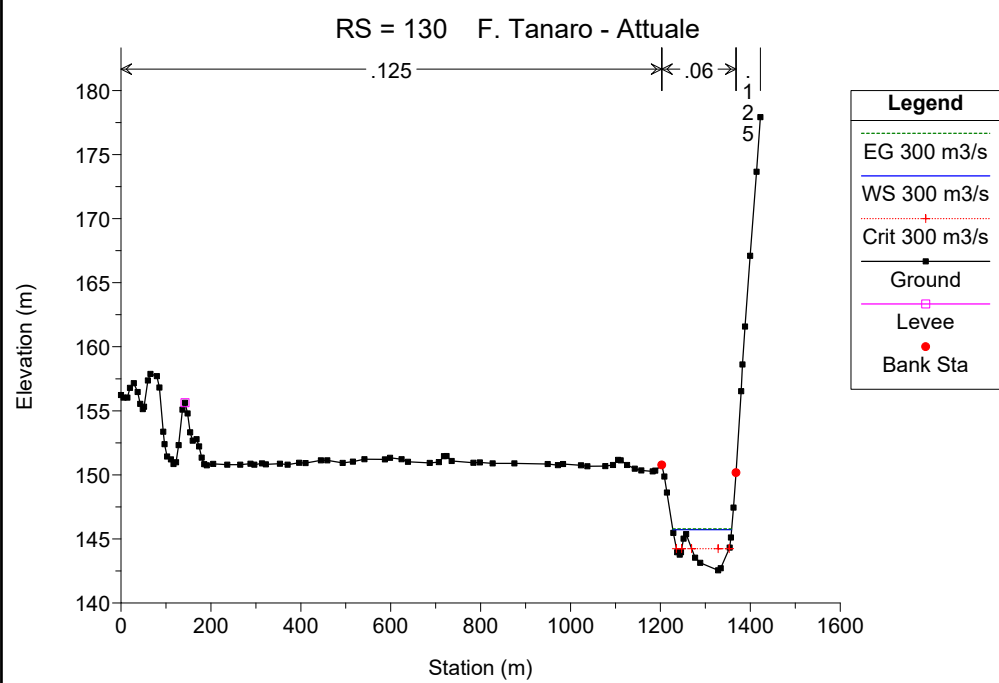
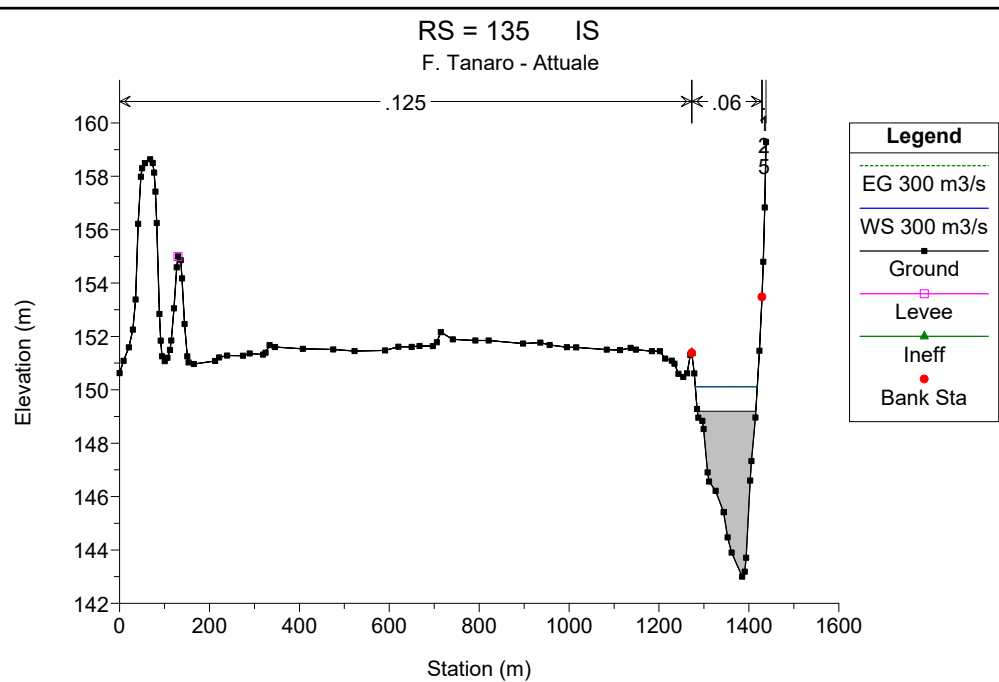
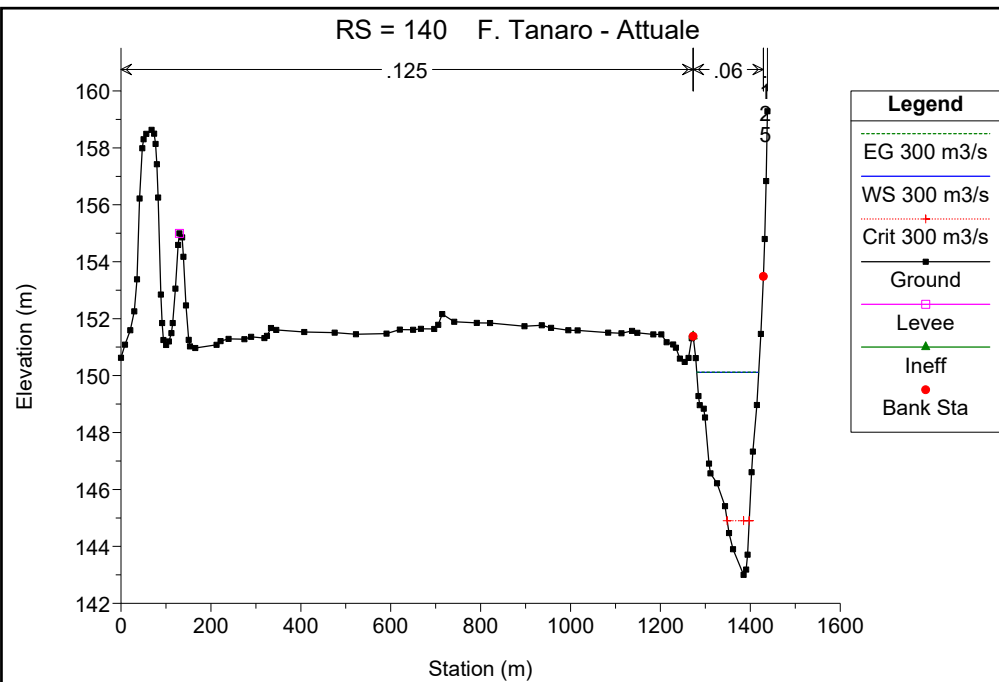


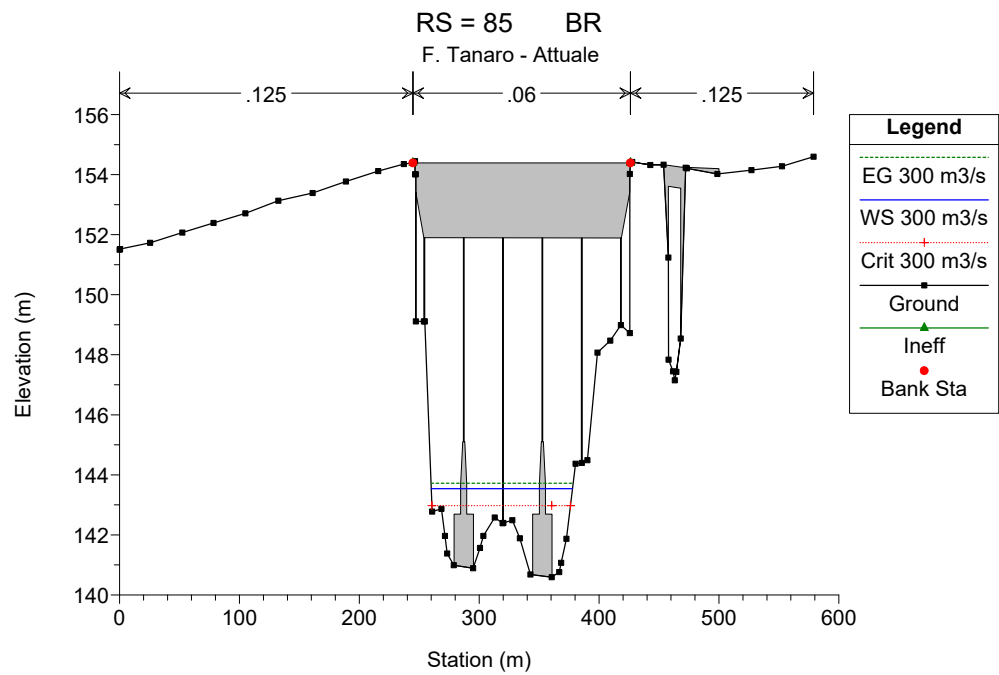
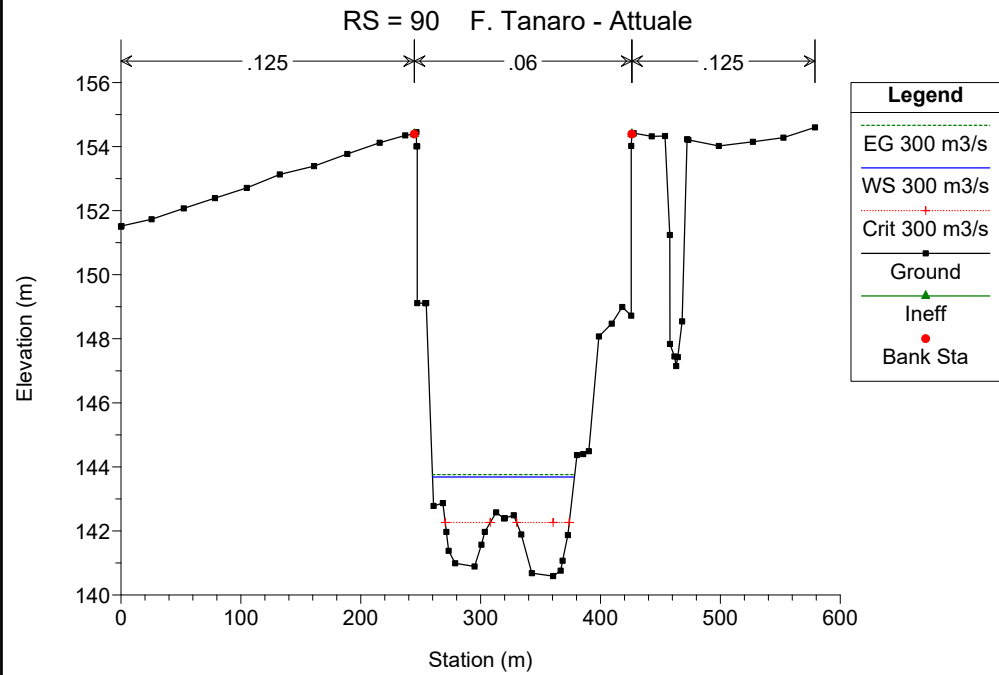
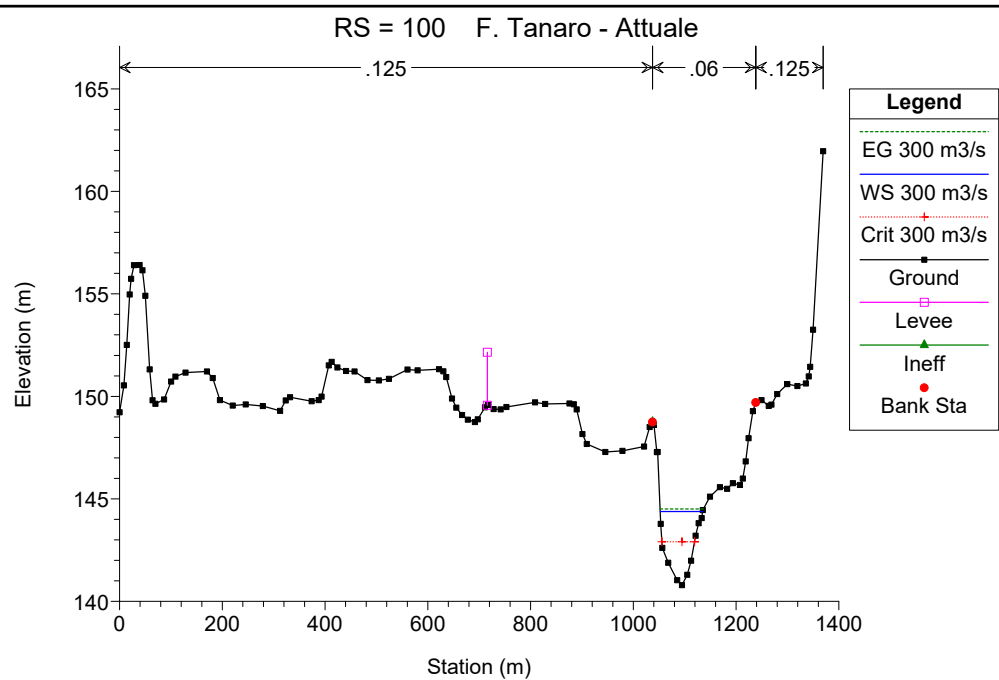
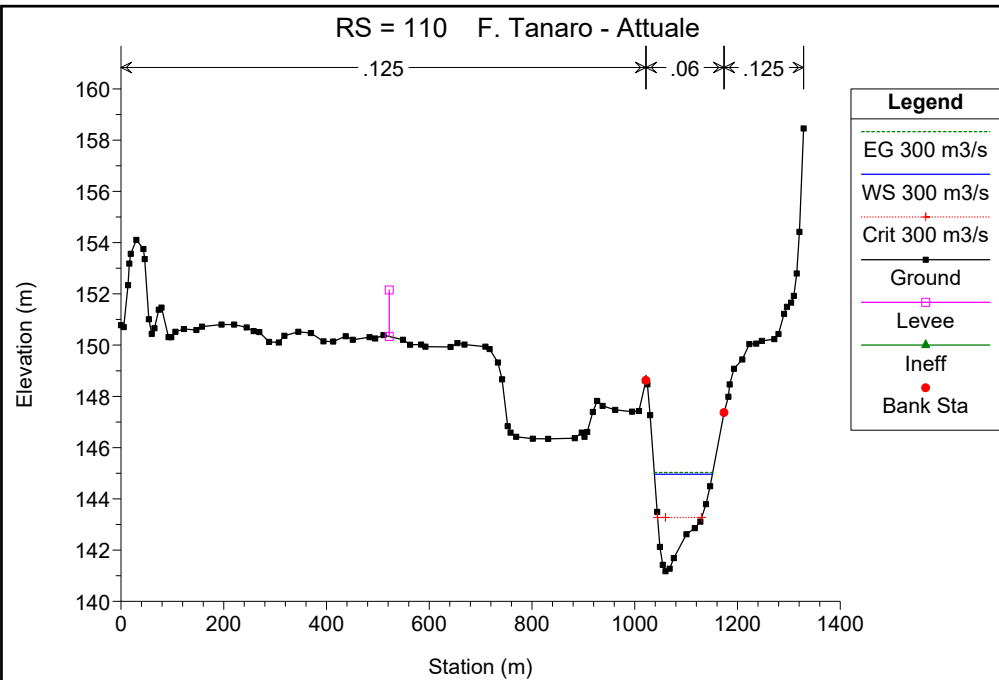


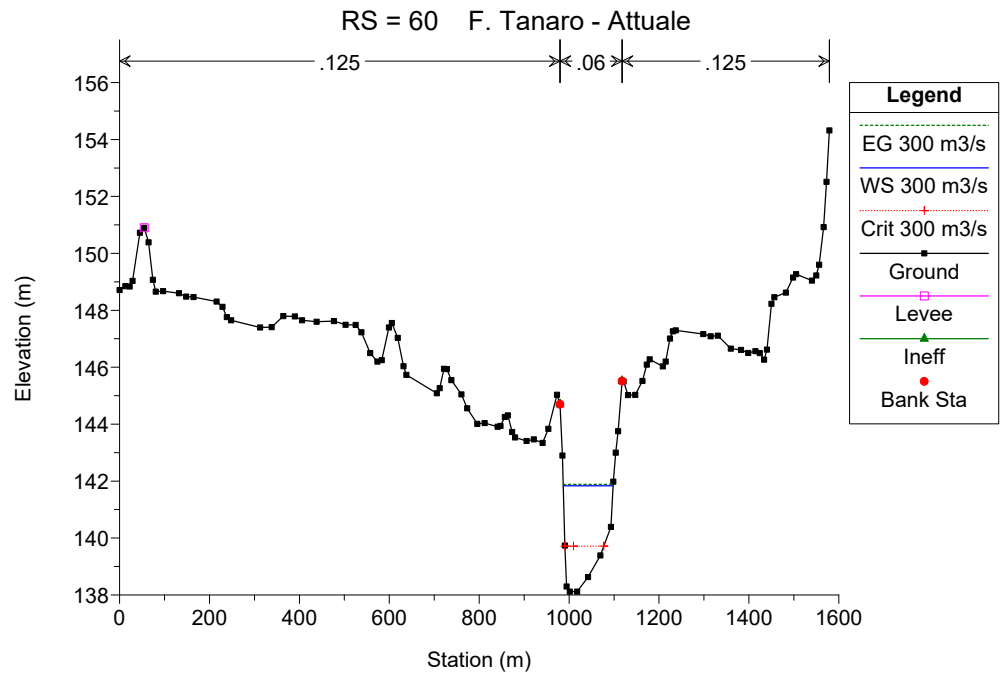
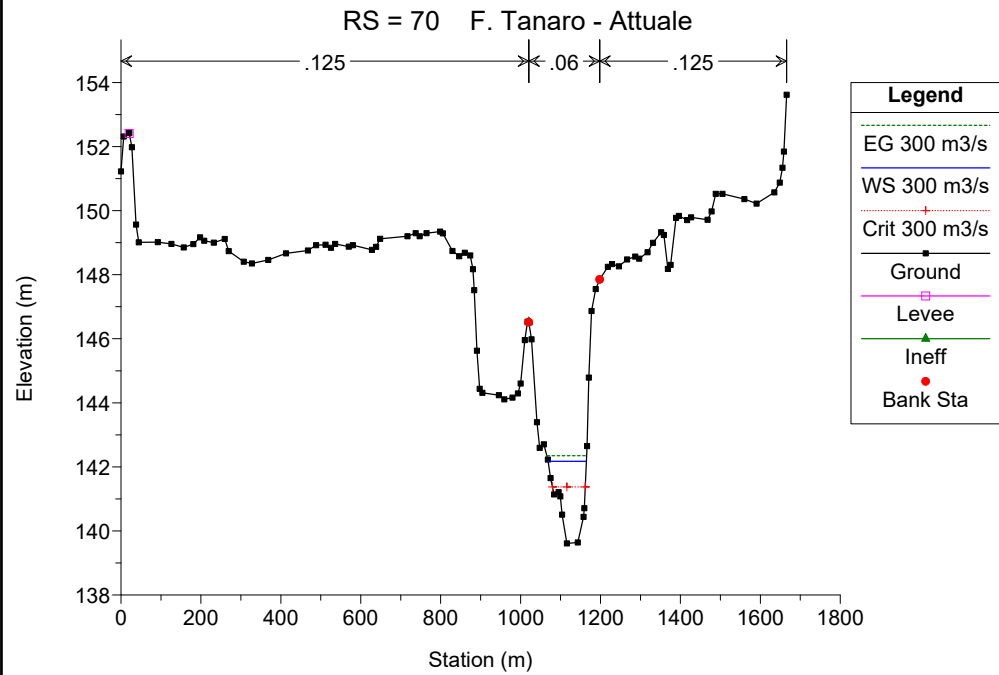
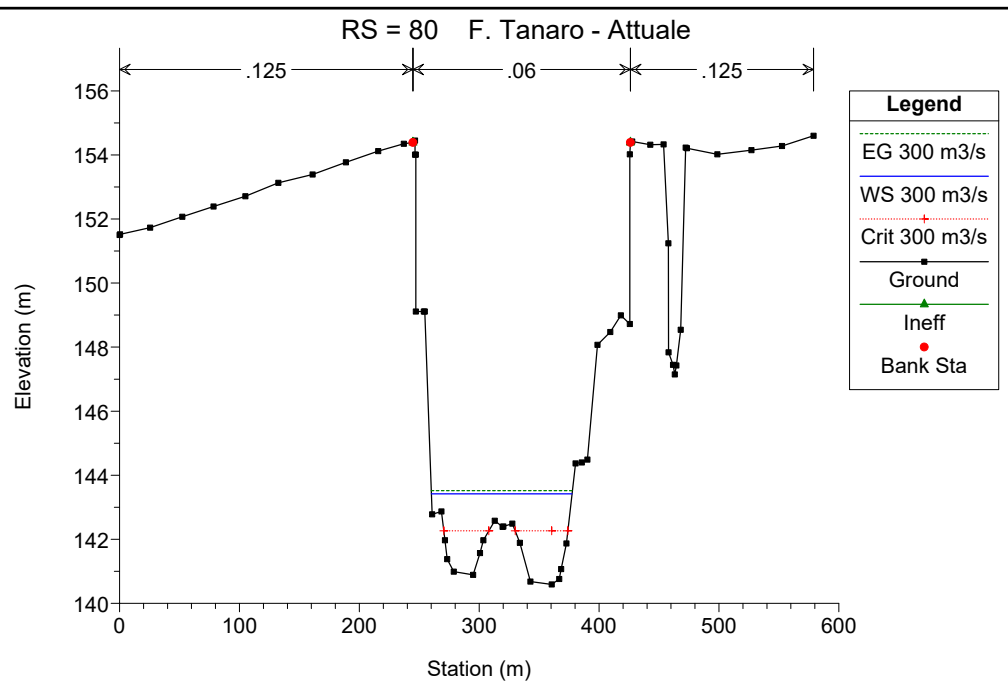
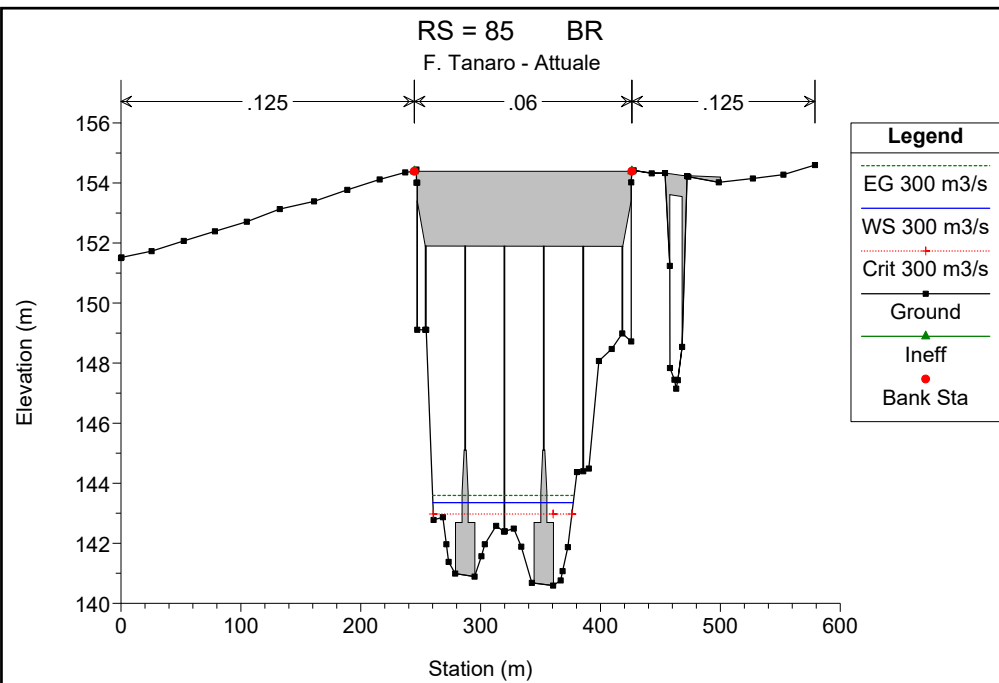


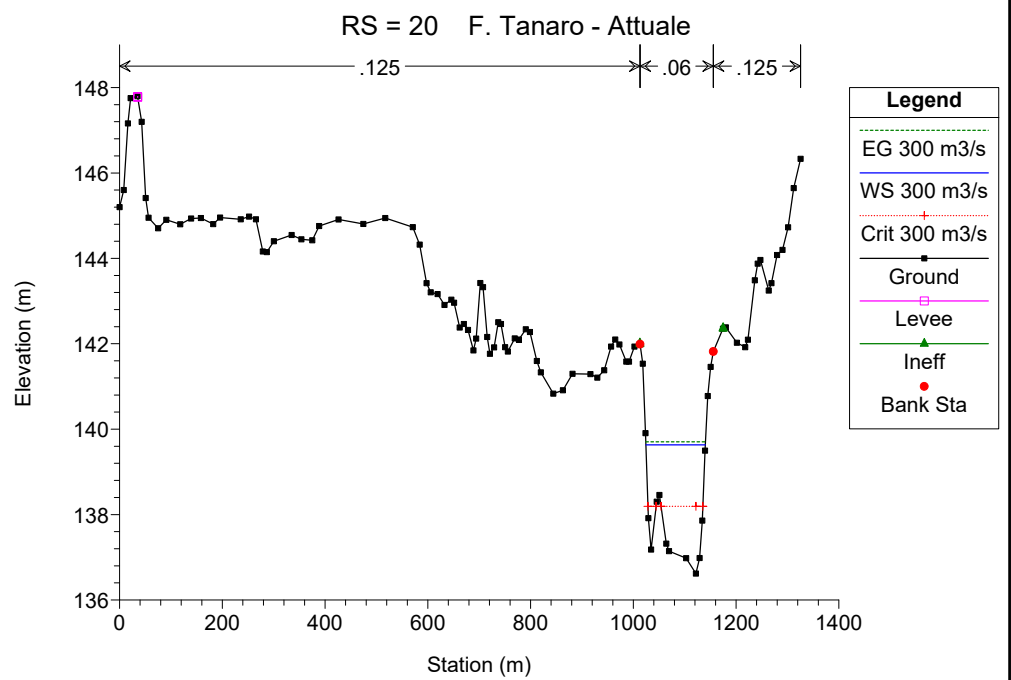
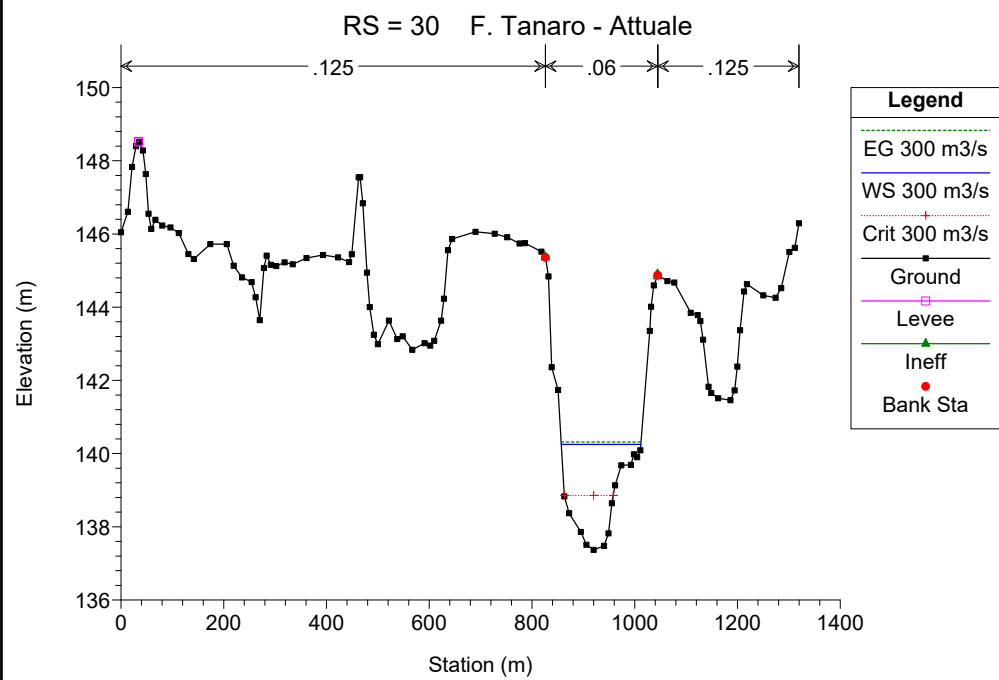
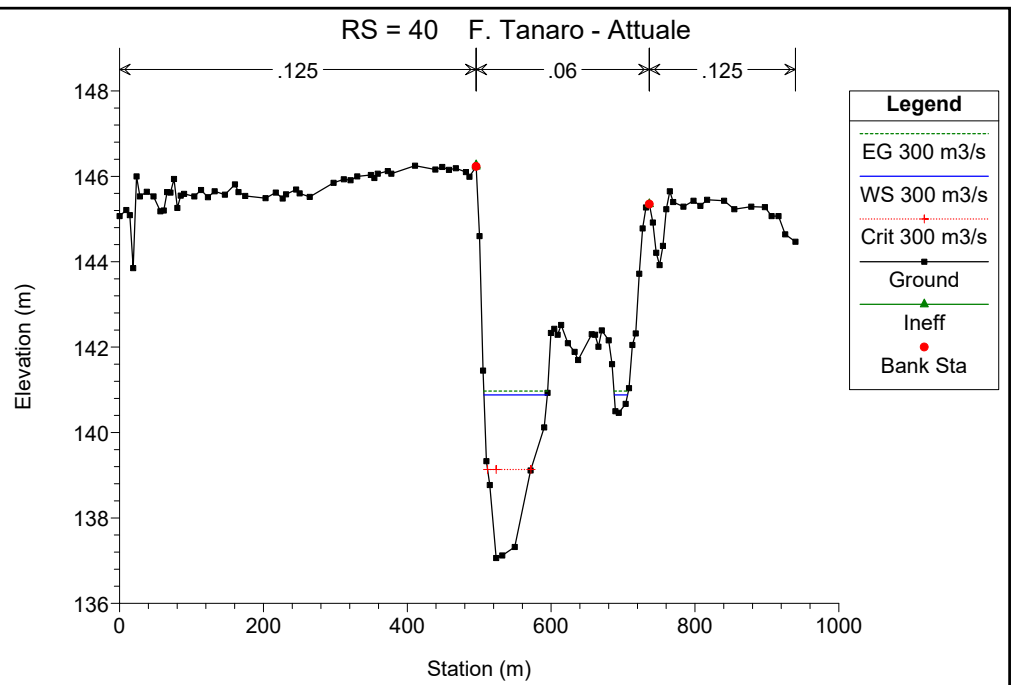
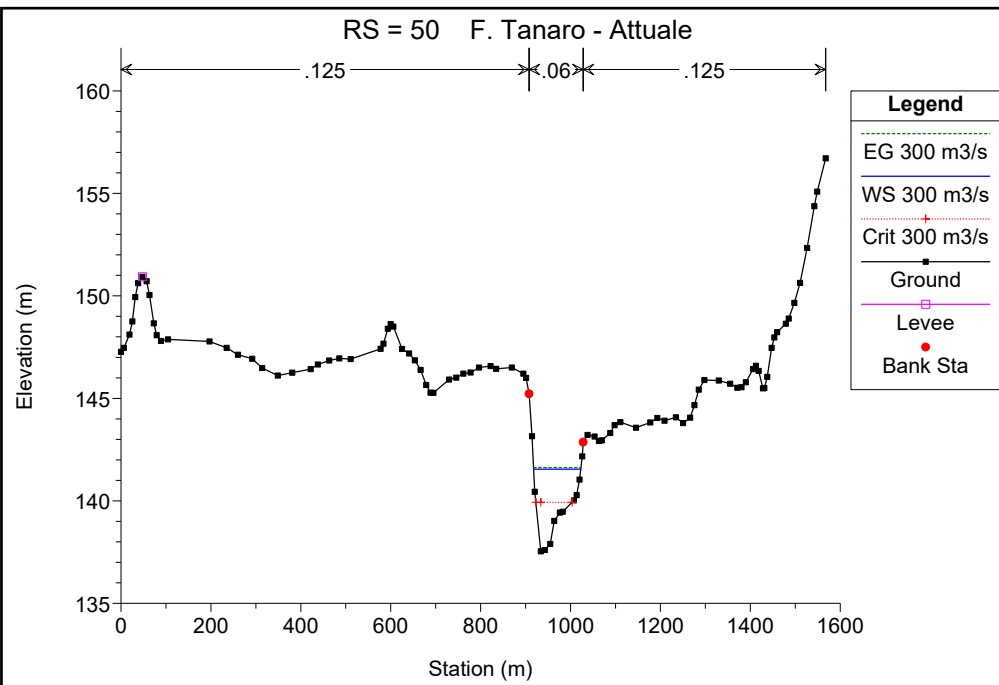




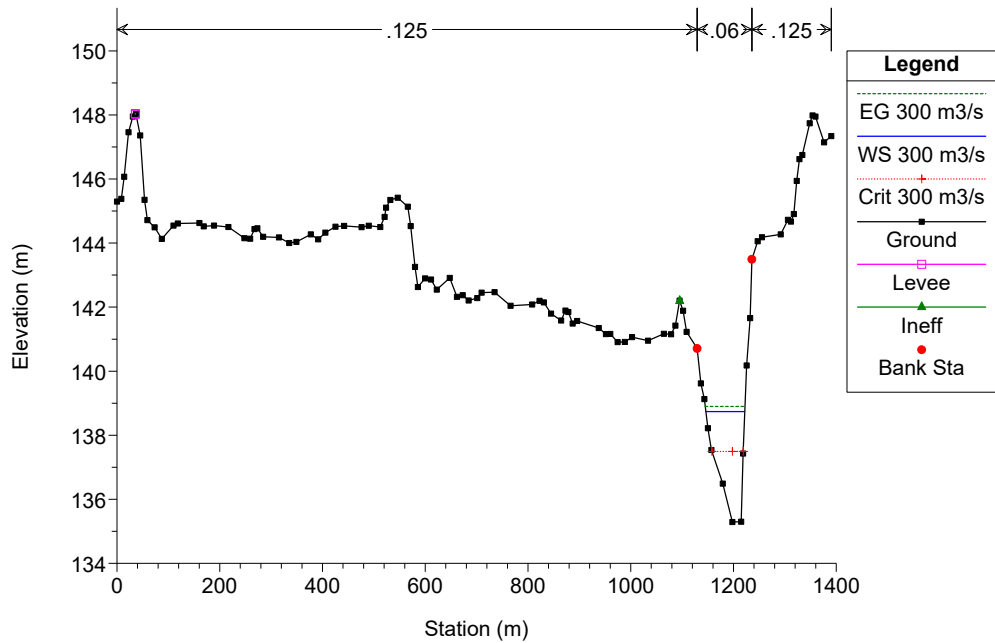








RS = 10 F. Tanaro - Attuale



**MODELLO MODIMENSIONALE DI MOTO PERMANENTE
SITUAZIONE DI PROGETTO
PORTATA MASSIMA DI FUNZIONAMENTO DELL'IMPIANTO**

SIMULAZIONE 30

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	300.00 in alveo (100.00 turbinati)	massima di funzionamento dell'impianto

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

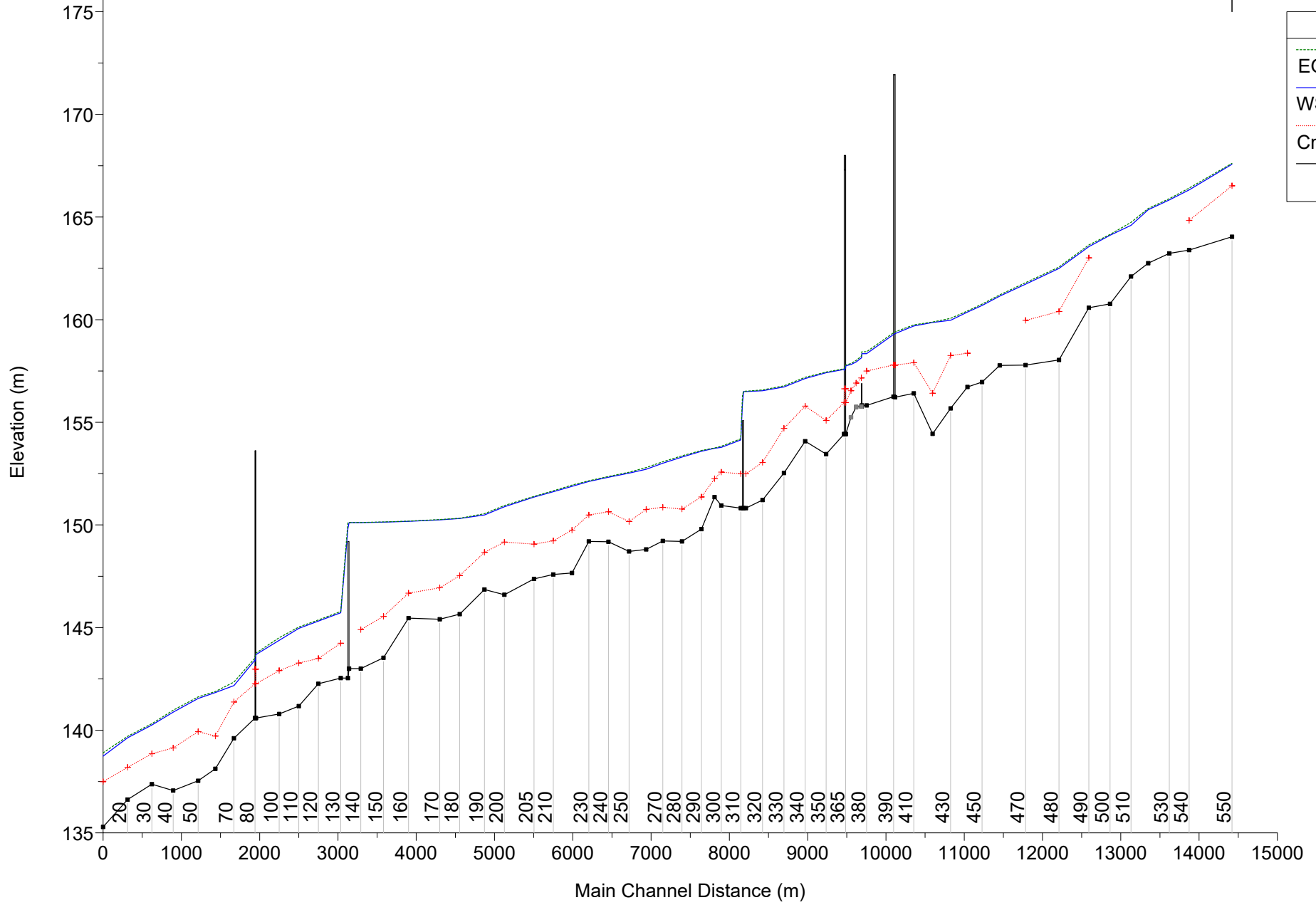
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	300 m3/s	300.00	164.04	167.57	166.52	167.62	0.002382	0.95	316.96	287.32	0.27
1	540	300 m3/s	300.00	163.39	166.32	164.83	166.41	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	0.007898	1.68	178.63	147.59	0.49
1	500	300 m3/s	300.00	160.77	164.11		164.15	0.000940	0.92	324.33	132.02	0.19
1	490	300 m3/s	300.00	160.58	163.55	163.01	163.64	0.005448	1.31	229.43	208.70	0.40
1	480	300 m3/s	300.00	158.04	162.50	160.40	162.56	0.001718	1.12	268.47	129.50	0.25
1	470	300 m3/s	300.00	157.79	161.73	159.96	161.80	0.001831	1.18	253.64	118.01	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	253.10	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	0.001141	1.04	287.69	113.40	0.21
1	400	300 m3/s	300.00	156.22	159.32	157.79	159.40	0.001776	1.27	236.39	95.08	0.26
1	395		Bridge									
1	390	300 m3/s	300.00	156.25	159.28	157.79	159.37	0.001885	1.29	232.09	95.00	0.26
1	380	300 m3/s	300.00	155.82	158.34	157.50	158.44	0.004115	1.37	218.84	149.99	0.36
1	379		Inl Struct									
1	370	300 m3/s	300.00	154.43	157.75	155.96	157.79	0.000729	0.80	375.57	157.40	0.17
1	365		Bridge									
1	360	300 m3/s	300.00	154.43	157.57	155.97	157.61	0.000931	0.86	347.42	155.68	0.18
1	350	300 m3/s	300.00	153.45	157.41	155.09	157.45	0.000555	0.81	369.60	123.33	0.15
1	340	300 m3/s	300.00	154.08	157.13	155.79	157.19	0.001900	1.08	276.89	150.78	0.26
1	330	300 m3/s	300.00	152.53	156.72	154.70	156.78	0.001267	1.04	288.12	122.67	0.22
1	320	300 m3/s	300.00	151.21	156.54	153.05	156.58	0.000453	0.90	331.59	88.41	0.14
1	315	300 m3/s	200.00	150.82	156.50	152.49	156.51	0.000141	0.52	384.66	115.50	0.08
1	312.5		Inl Struct									
1	310	300 m3/s	200.00	150.82	154.13	152.49	154.19	0.001264	1.06	188.86	99.44	0.22
1	300	300 m3/s	200.00	150.95	153.77	152.57	153.83	0.001739	1.05	190.28	101.75	0.25
1	295	300 m3/s	200.00	151.36	153.72	152.25	153.74	0.000503	0.55	361.65	256.26	0.13
1	290	300 m3/s	200.00	149.62	153.56	151.36	153.62	0.001003	1.06	188.27	116.61	0.20
1	280	300 m3/s	300.00	149.20	153.31	150.77	153.36	0.001041	1.05	284.54	102.09	0.20
1	270	300 m3/s	300.00	149.22	153.00	150.86	153.08	0.001292	1.21	246.95	84.48	0.23
1	260	300 m3/s	300.00	148.81	152.71	150.76	152.79	0.001409	1.26	238.68	82.78	0.24
1	250	300 m3/s	300.00	148.71	152.52	150.17	152.57	0.000727	0.92	324.94	109.61	0.17
1	240	300 m3/s	300.00	149.18	152.32	150.64	152.36	0.000823	0.84	355.49	149.37	0.17
1	230	300 m3/s	300.00	149.20	152.12	150.49	152.15	0.000836	0.81	370.88	169.95	0.17
1	220	300 m3/s	300.00	147.66	151.88	149.75	151.94	0.001145	1.06	282.22	128.13	0.21

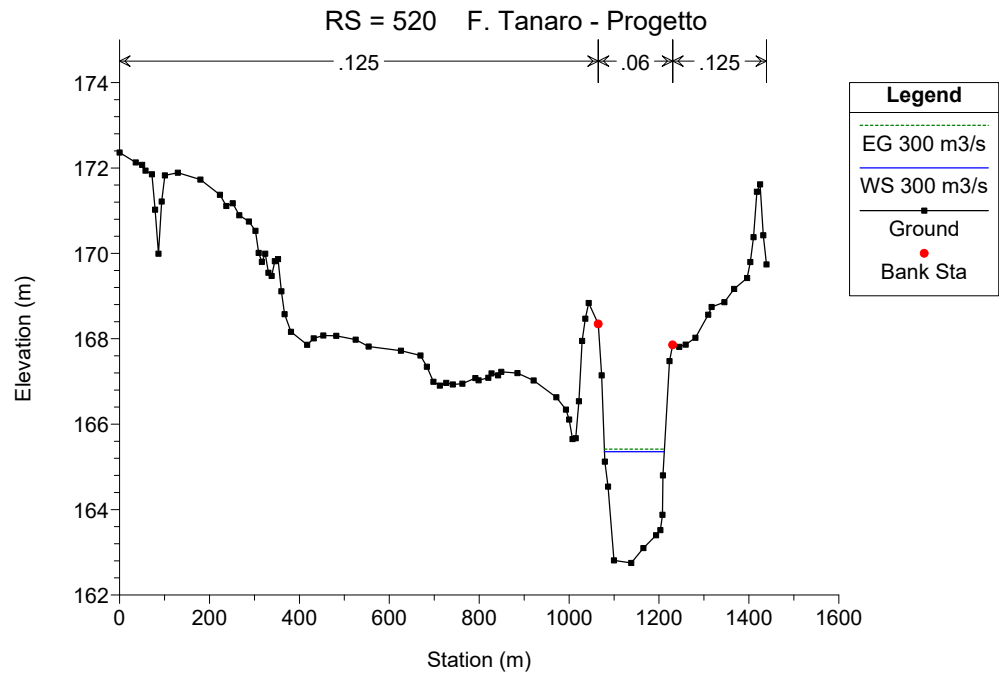
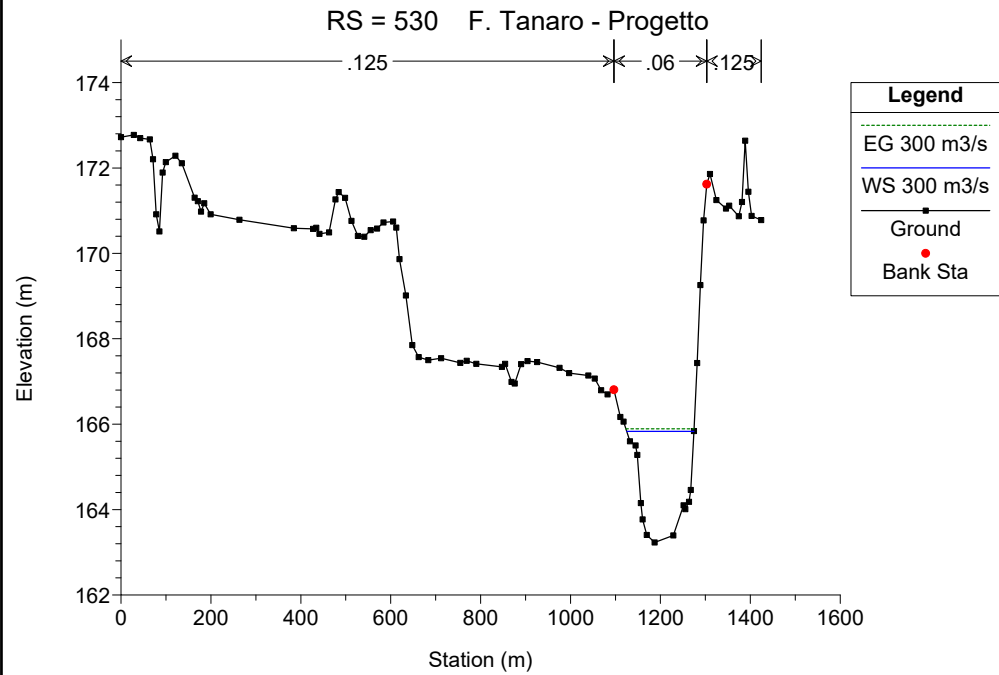
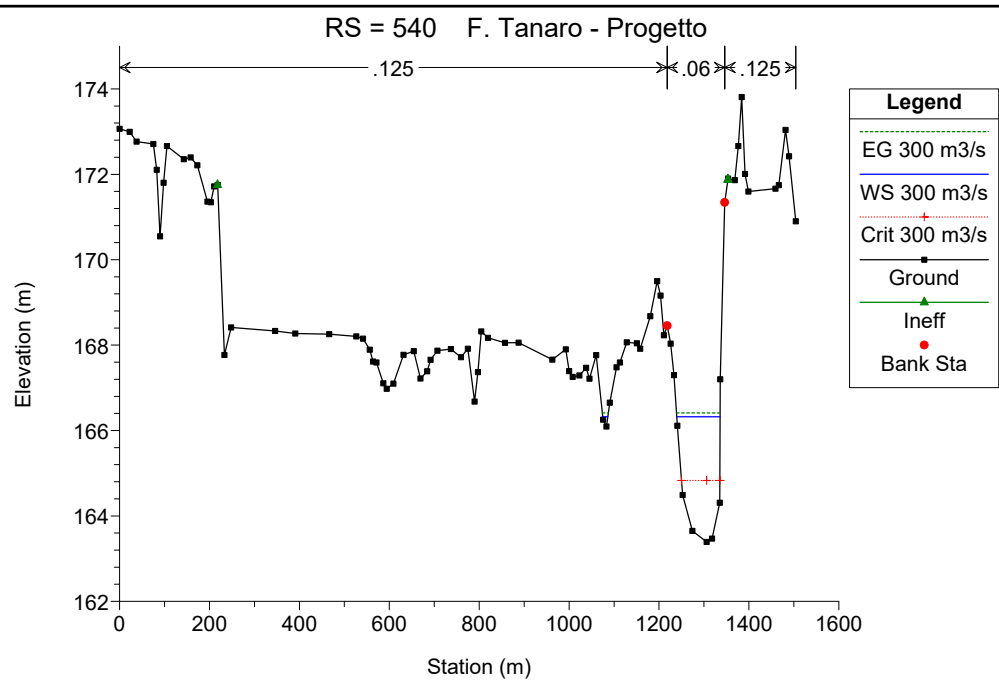
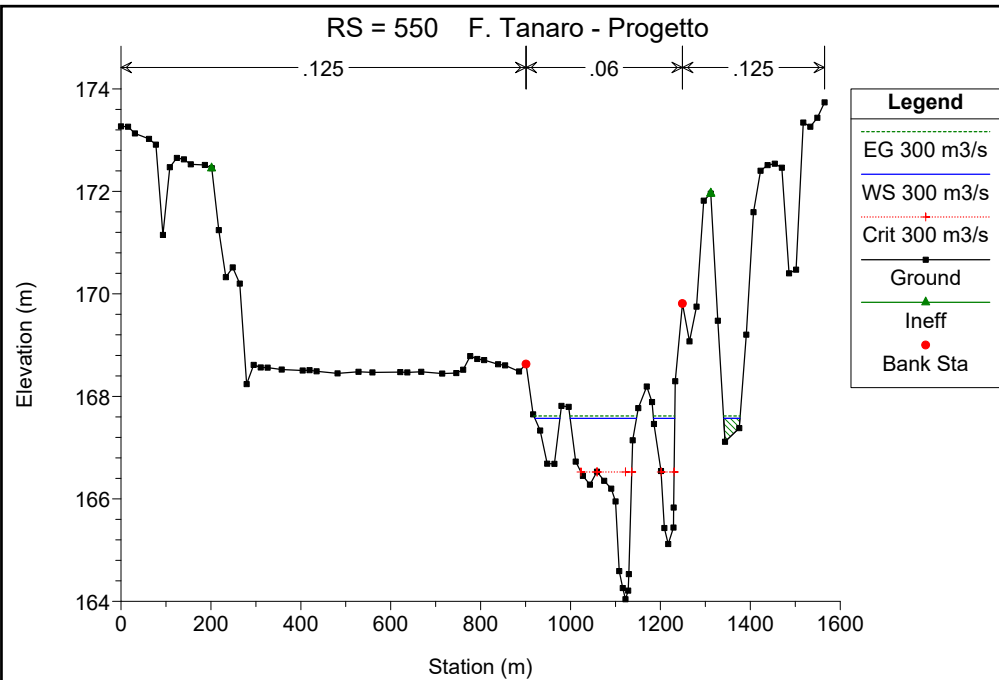
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: 300 m3/s (Continued)

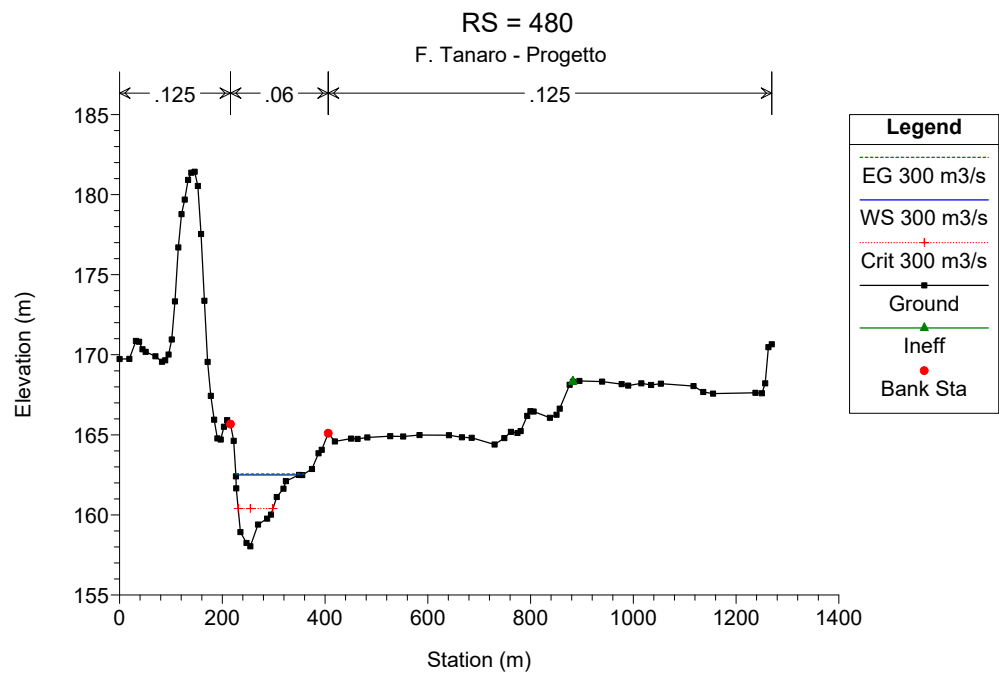
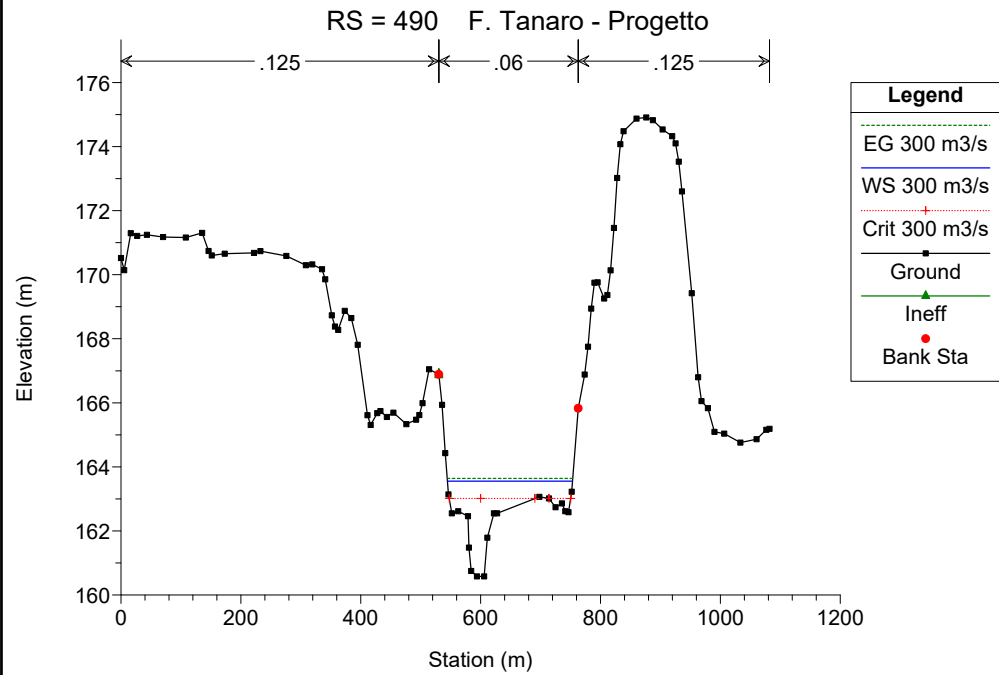
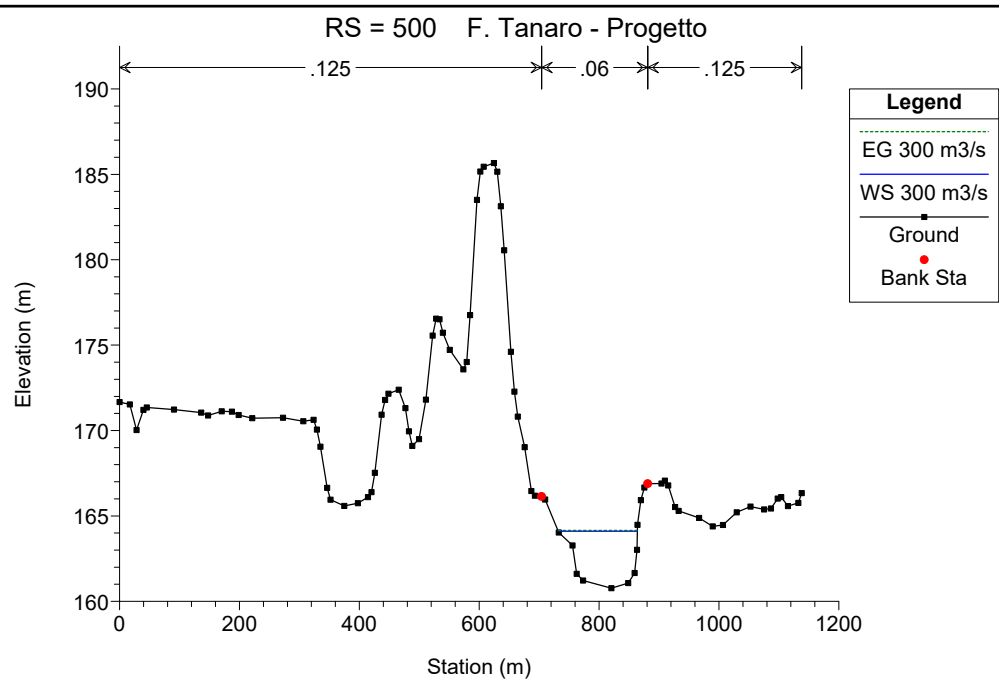
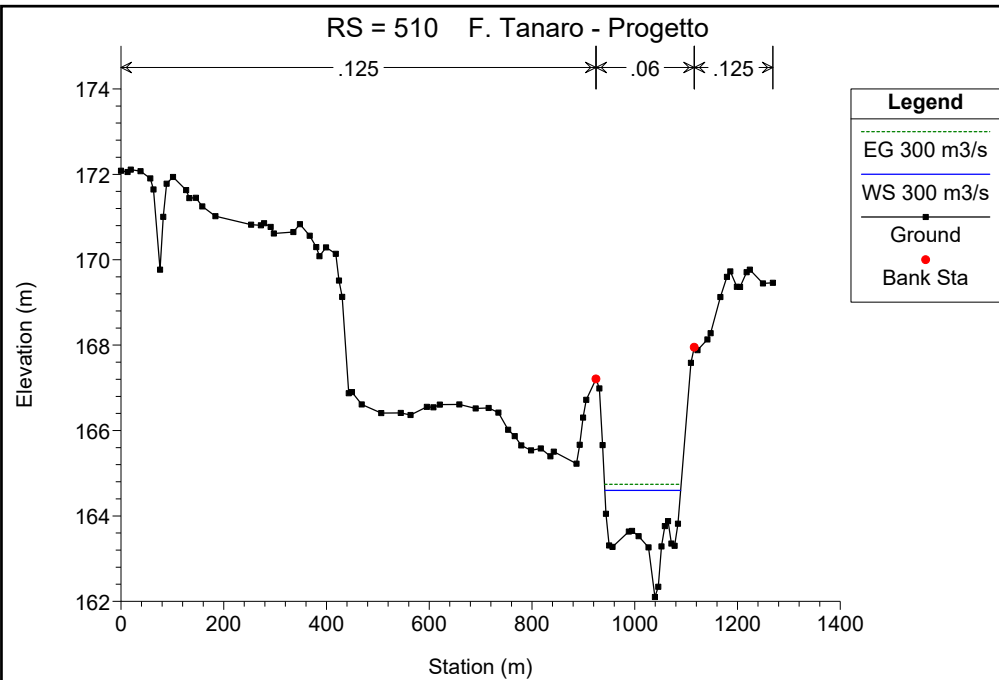
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	300 m3/s	300.00	147.59	151.62	149.23	151.66	0.001151	0.91	331.42	162.57	0.20
1	205	300 m3/s	300.00	147.37	151.36	149.07	151.39	0.001032	0.85	352.62	174.55	0.19
1	200	300 m3/s	300.00	146.60	150.89	149.16	150.95	0.001319	1.11	270.31	108.00	0.22
1	190	300 m3/s	300.00	146.85	150.49	148.66	150.55	0.001912	1.10	273.07	147.09	0.26
1	180	300 m3/s	300.00	145.66	150.31	147.53	150.33	0.000327	0.53	570.28	247.19	0.11
1	170	300 m3/s	300.00	145.40	150.25	146.94	150.26	0.000201	0.54	558.96	161.98	0.09
1	160	300 m3/s	300.00	145.46	150.18	146.68	150.19	0.000171	0.47	642.37	231.01	0.08
1	150	300 m3/s	300.00	143.53	150.14	145.54	150.15	0.000096	0.43	699.01	170.41	0.07
1	140	300 m3/s	200.00	143.00	150.11	144.90	150.12	0.000067	0.35	571.74	137.68	0.05
1	135		Inl Struct									
1	130	300 m3/s	300.00	142.54	145.72	144.24	145.79	0.001776	1.12	266.68	130.90	0.25
1	120	300 m3/s	300.00	142.27	145.32	143.50	145.37	0.001200	1.02	293.21	123.43	0.21
1	110	300 m3/s	300.00	141.17	144.96	143.27	145.03	0.001538	1.14	262.52	113.06	0.24
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

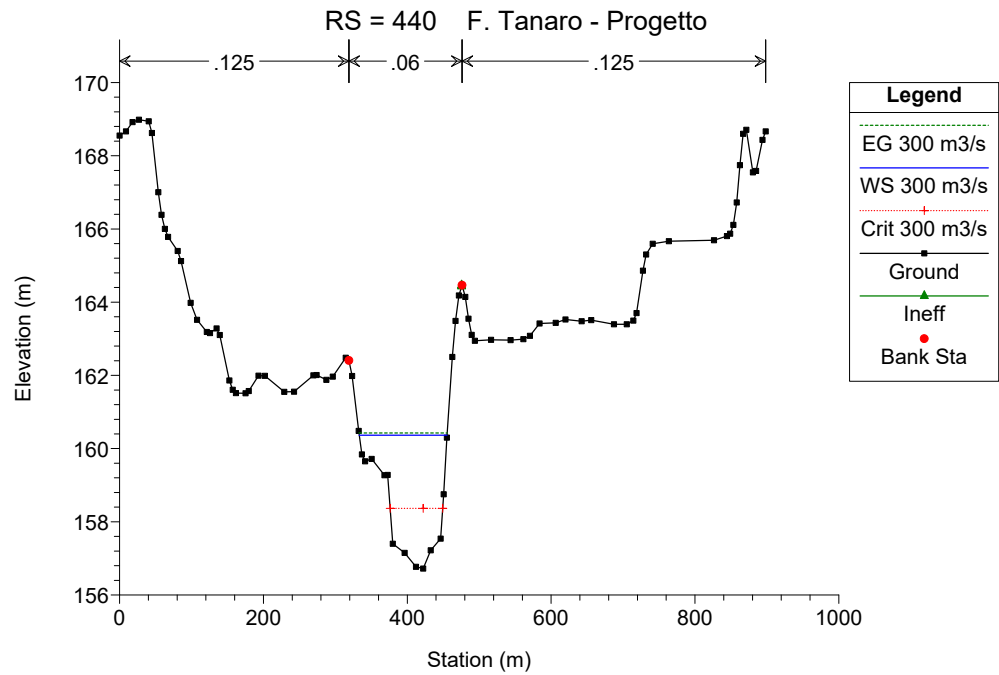
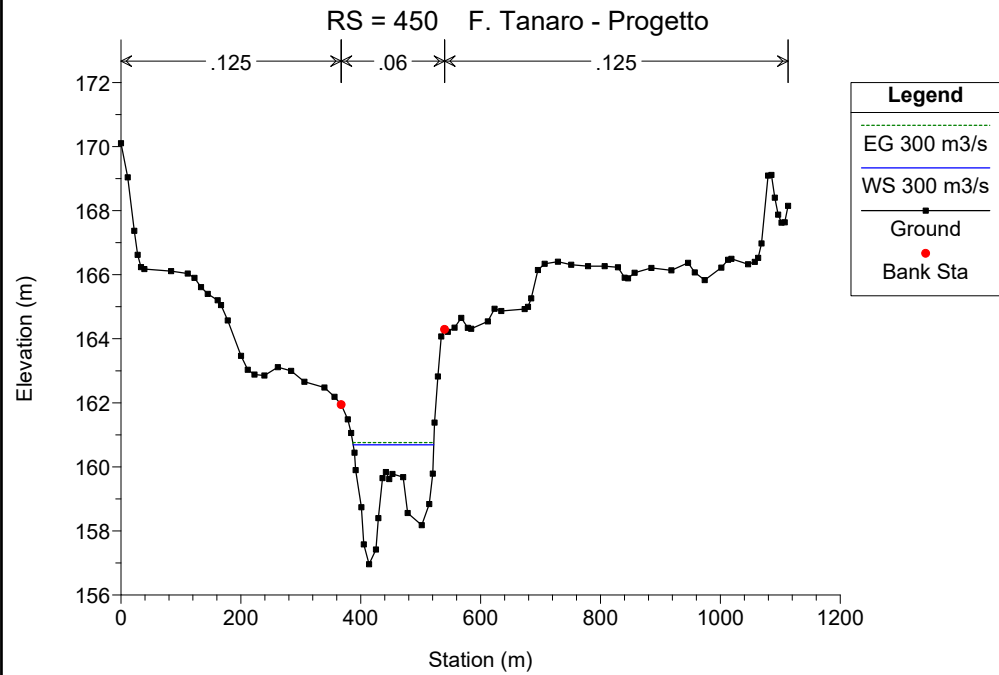
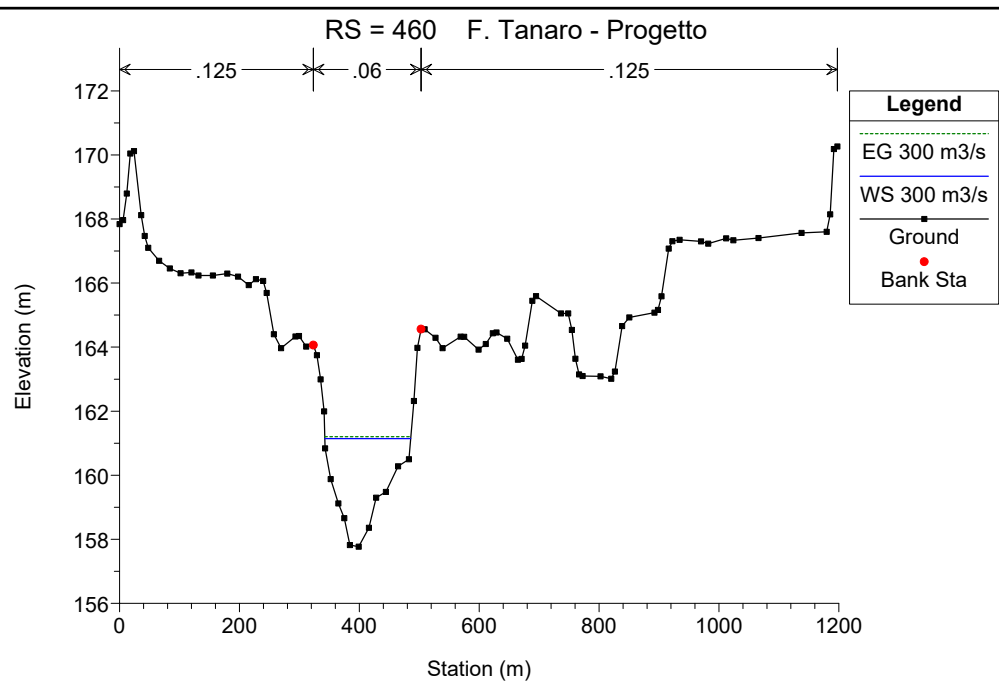
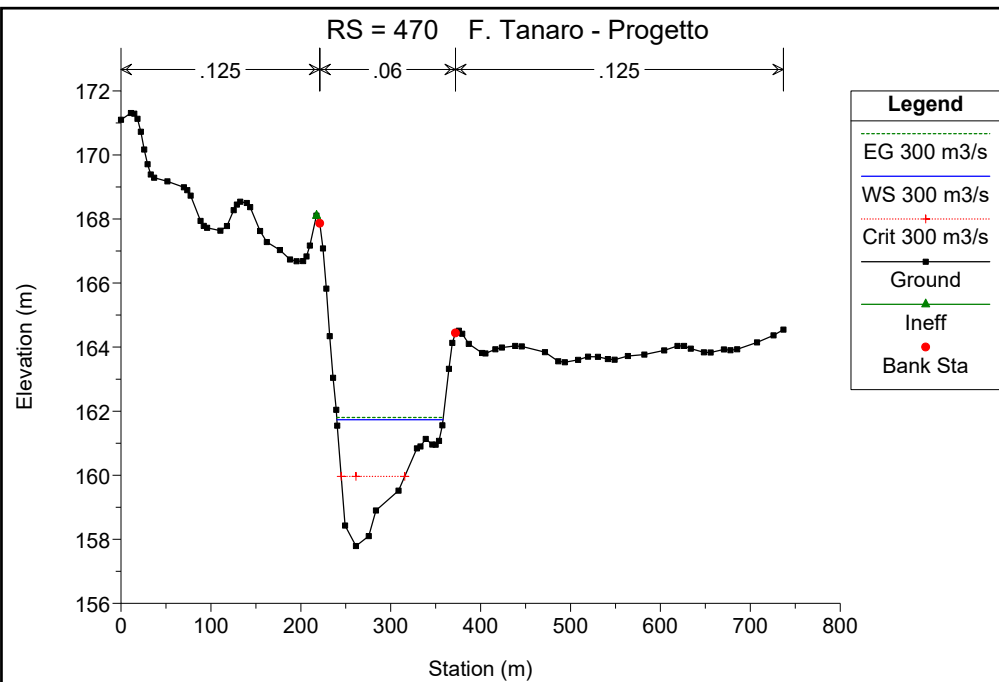
F. Tanaro - Progetto

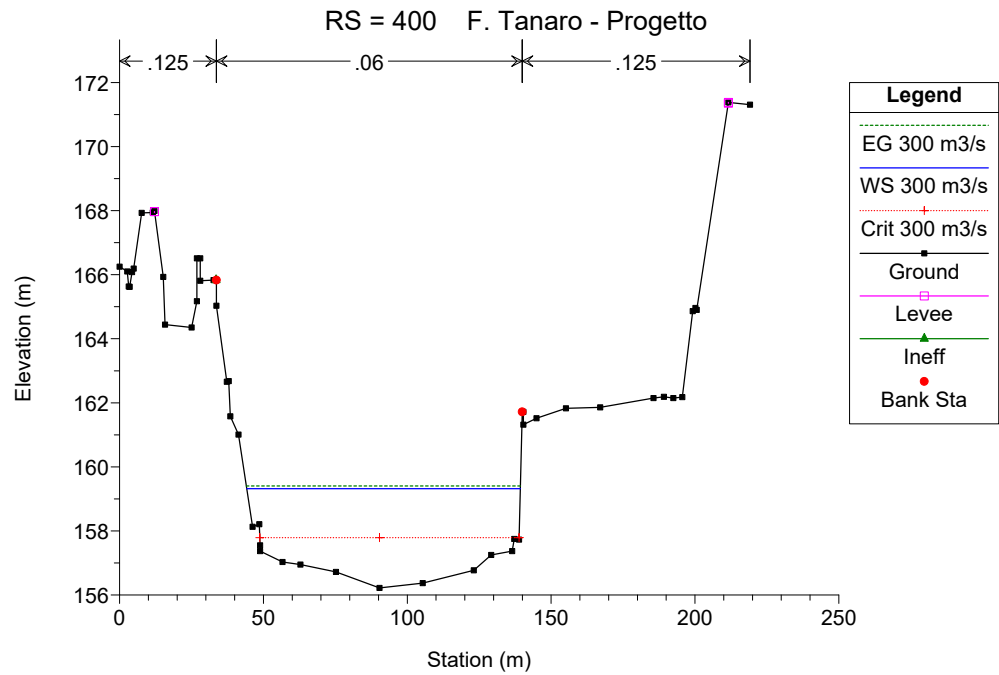
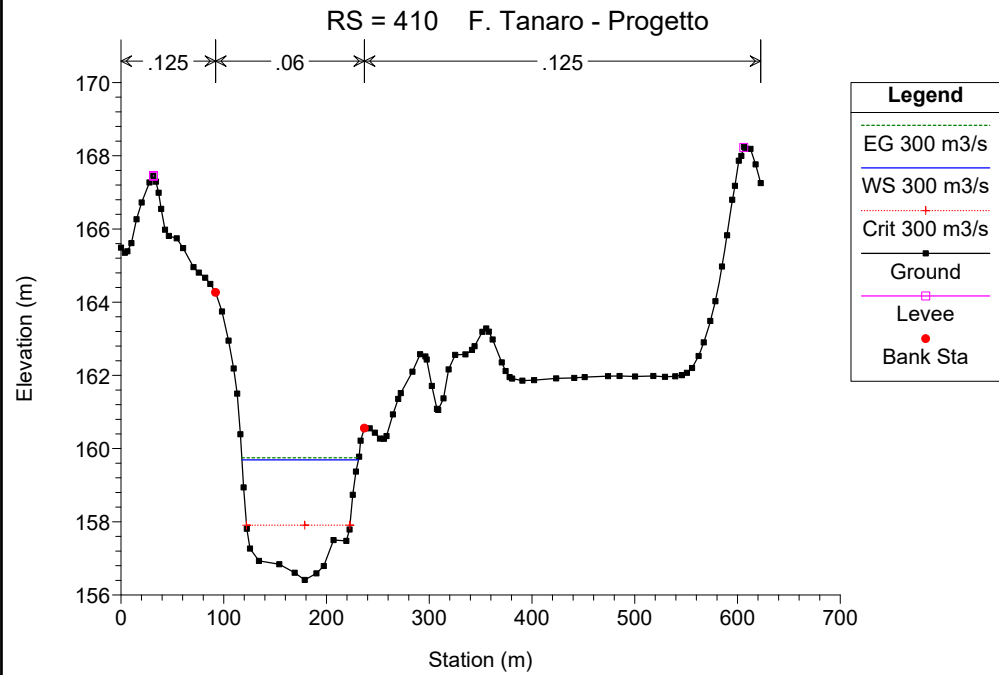
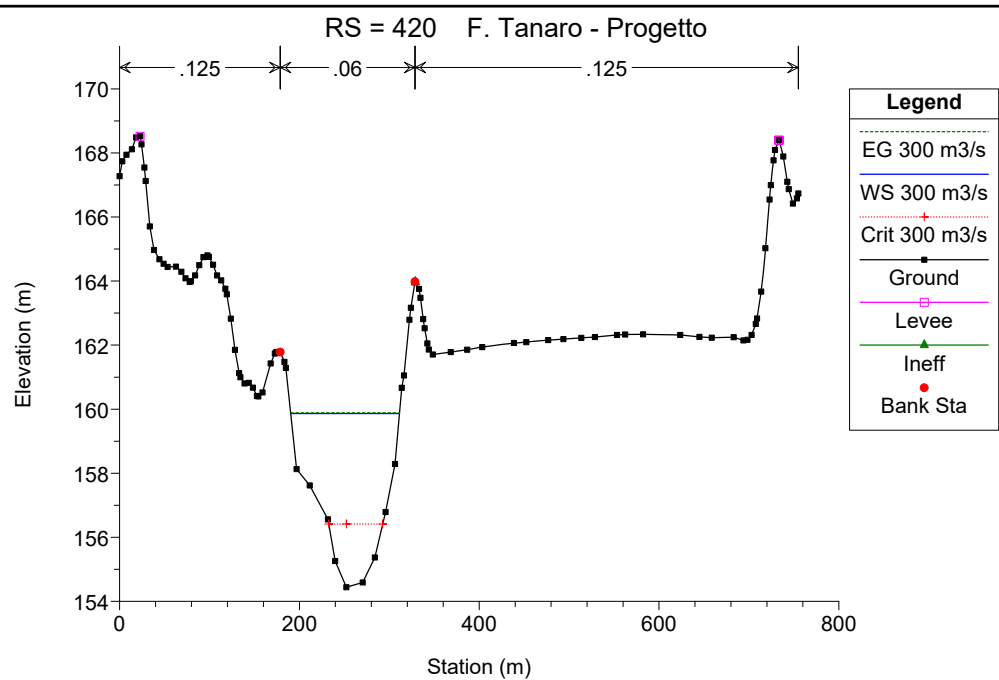
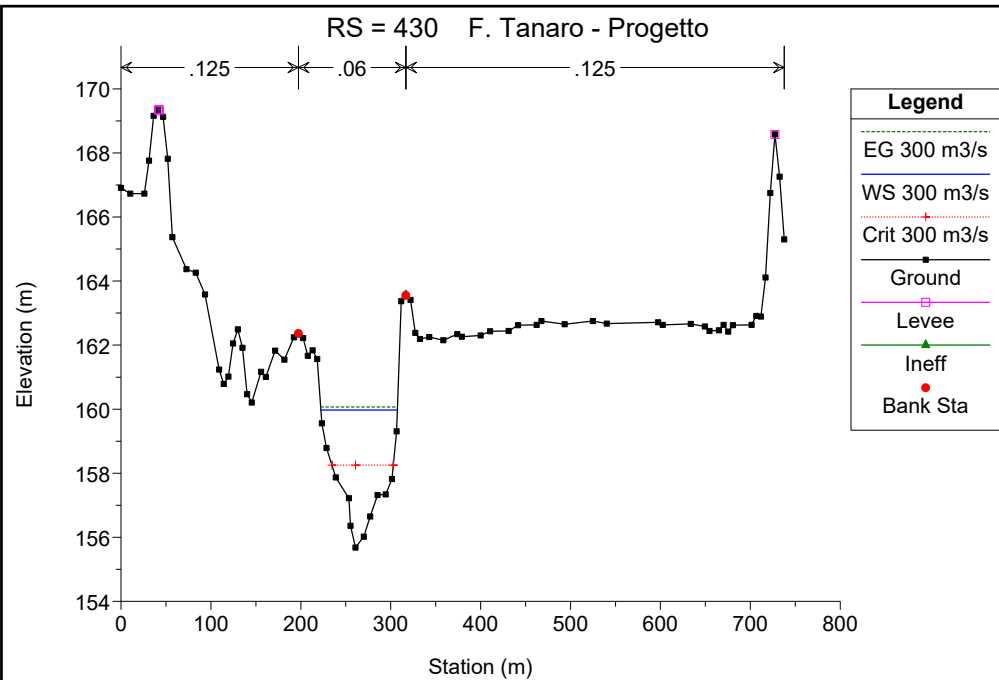
Tanaro 1

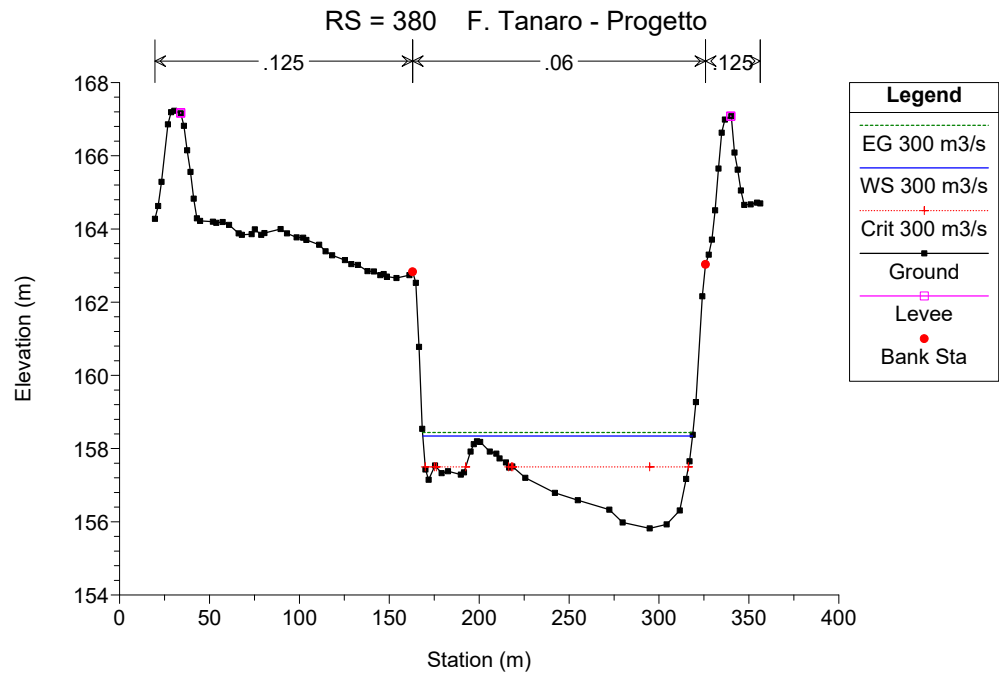
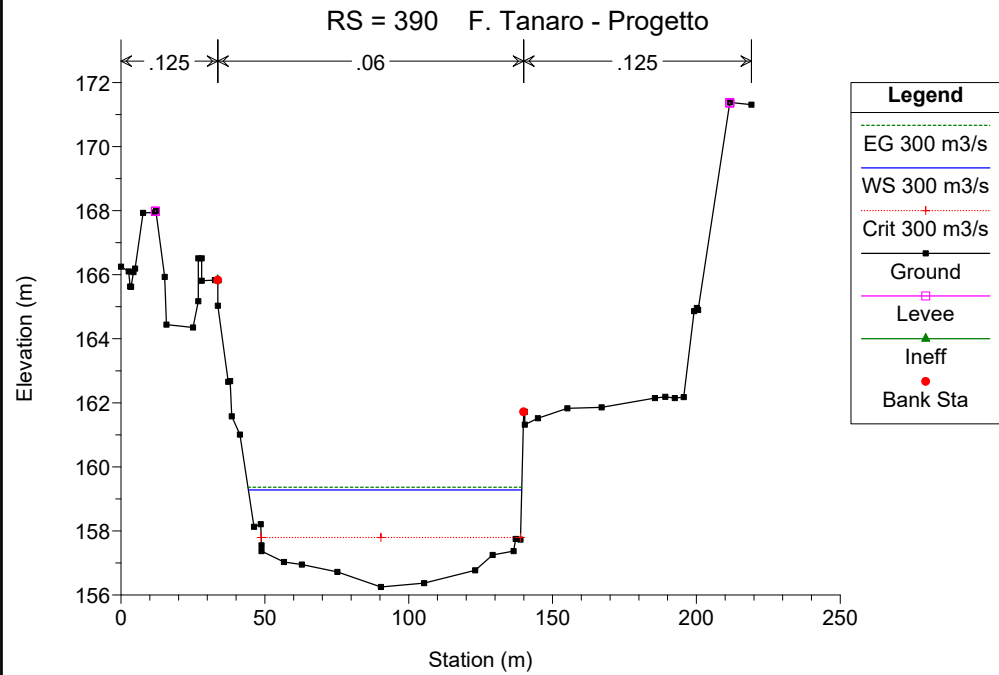
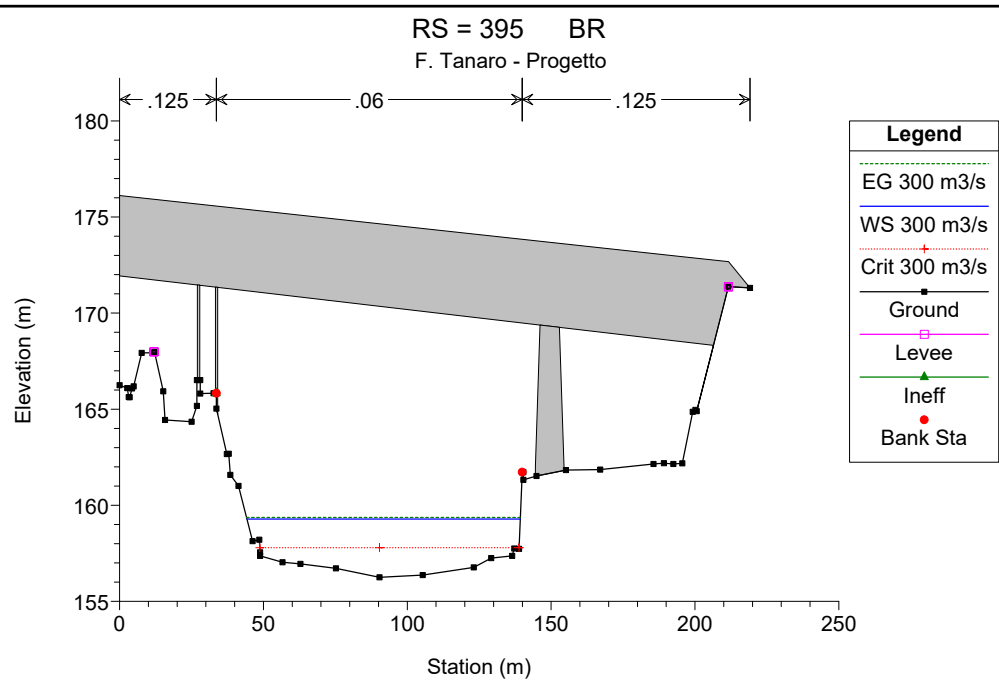
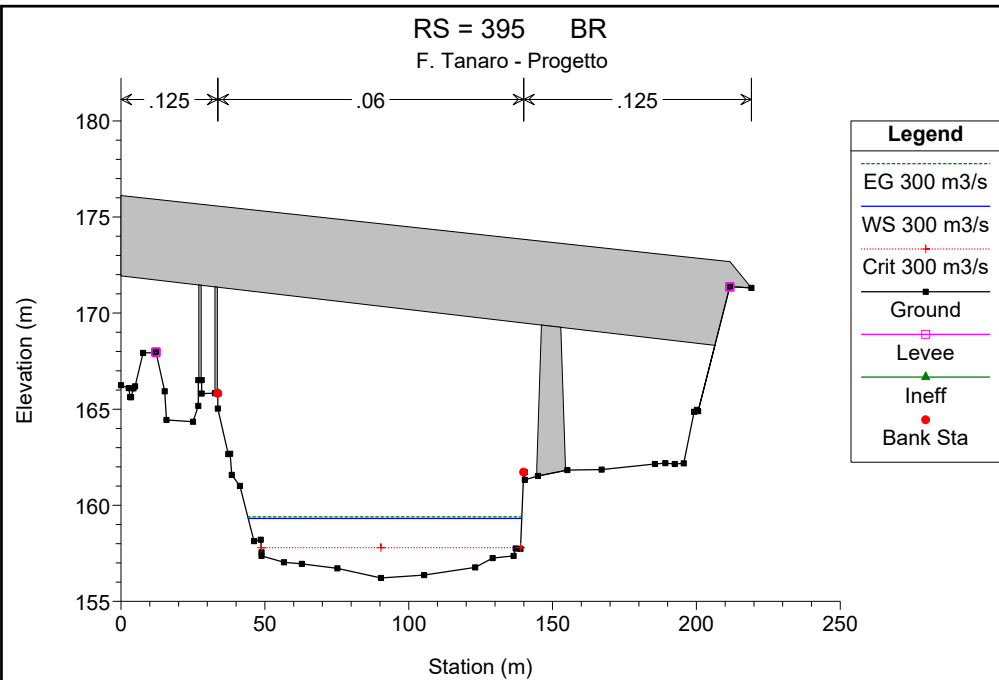


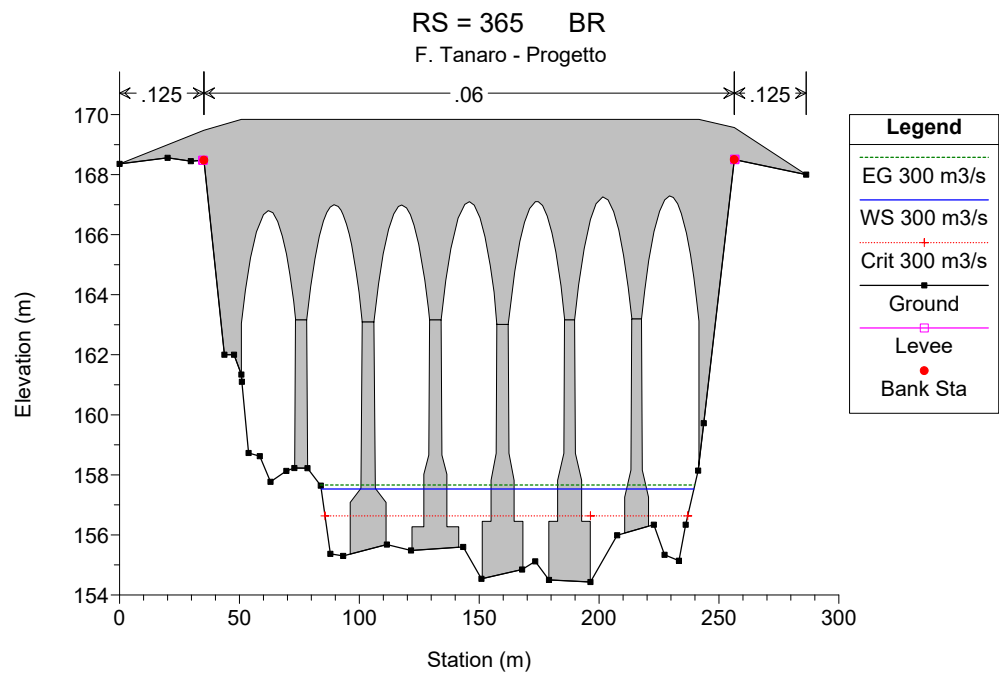
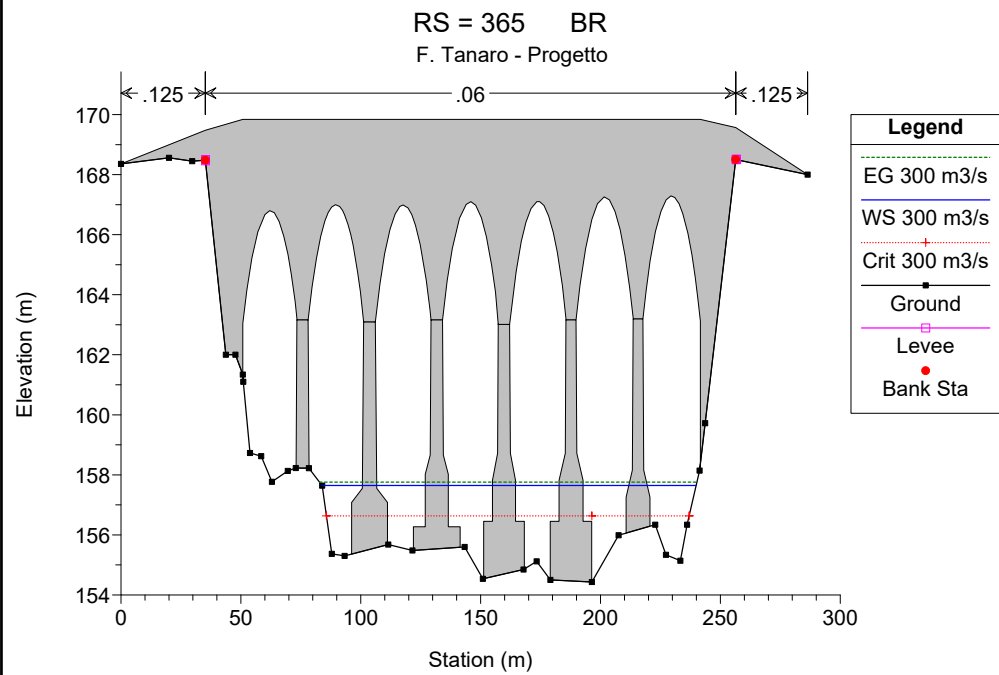
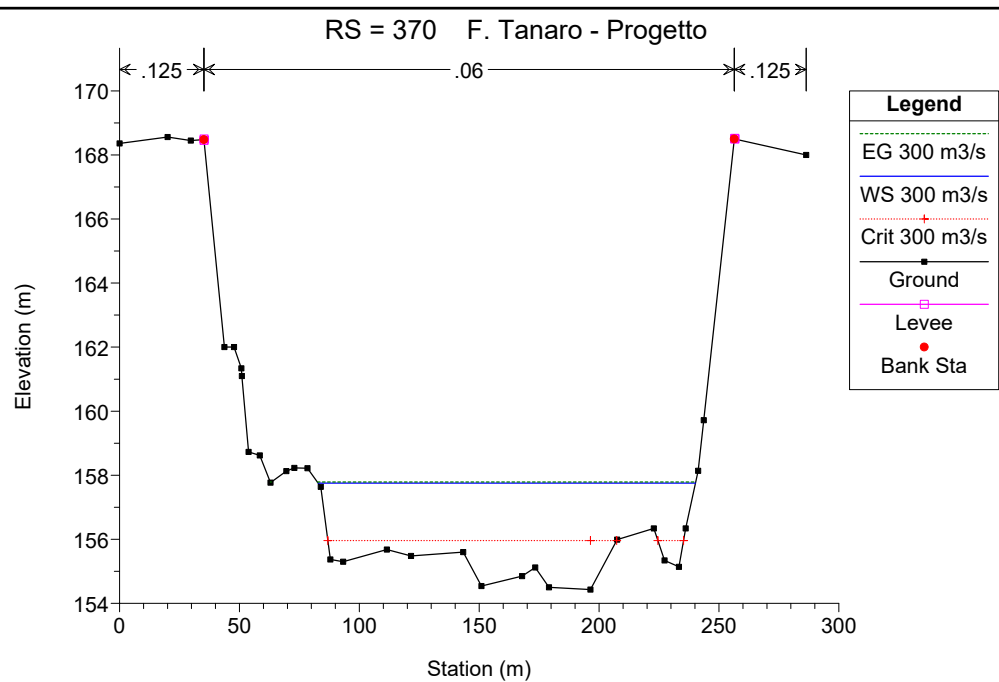
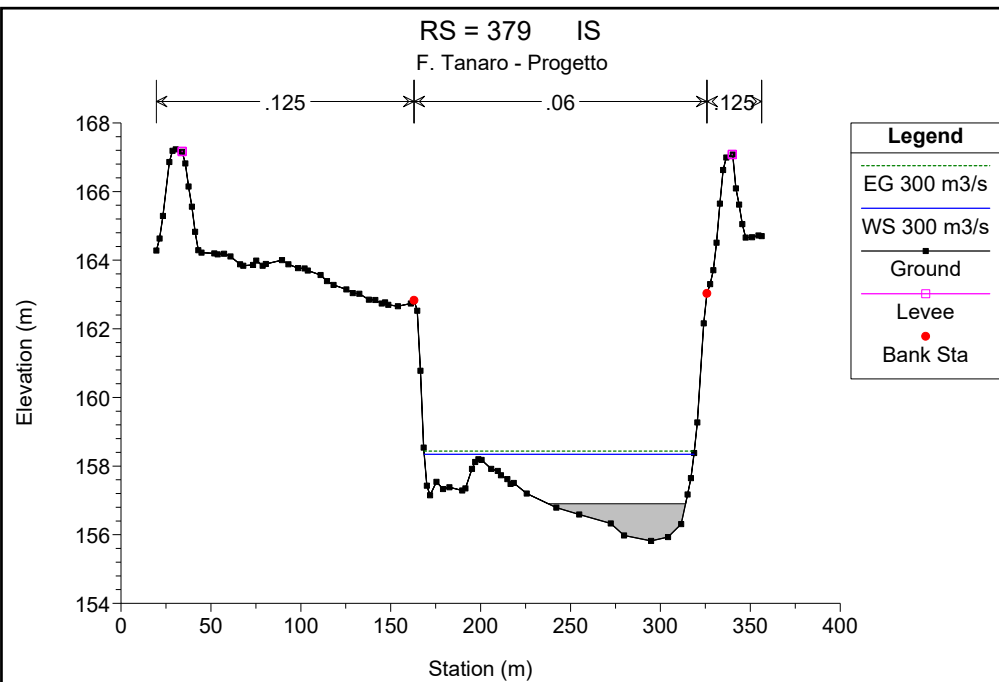


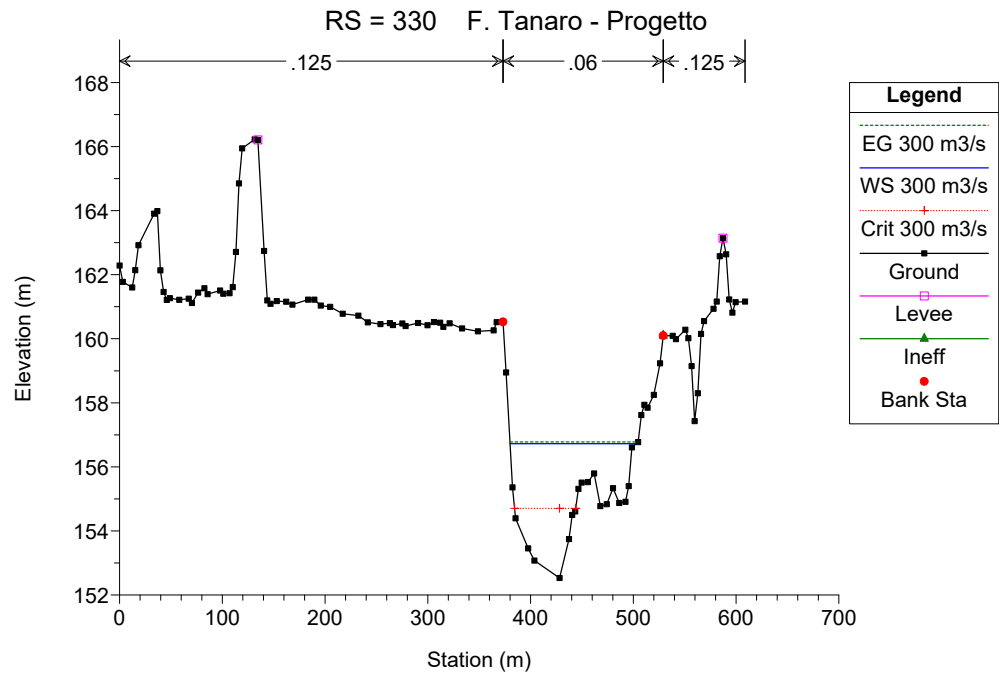
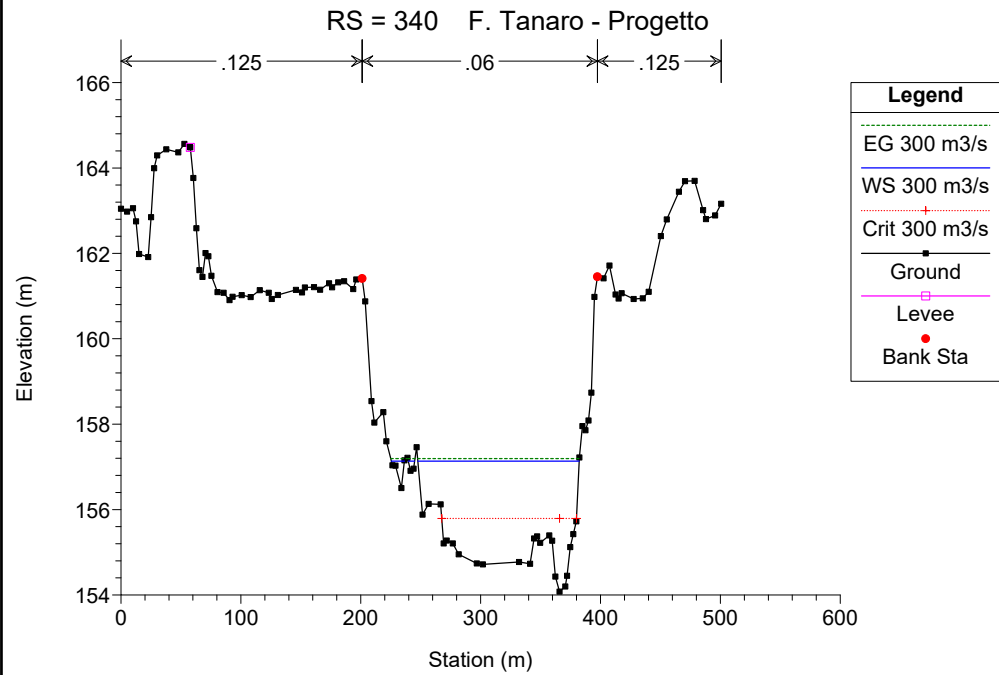
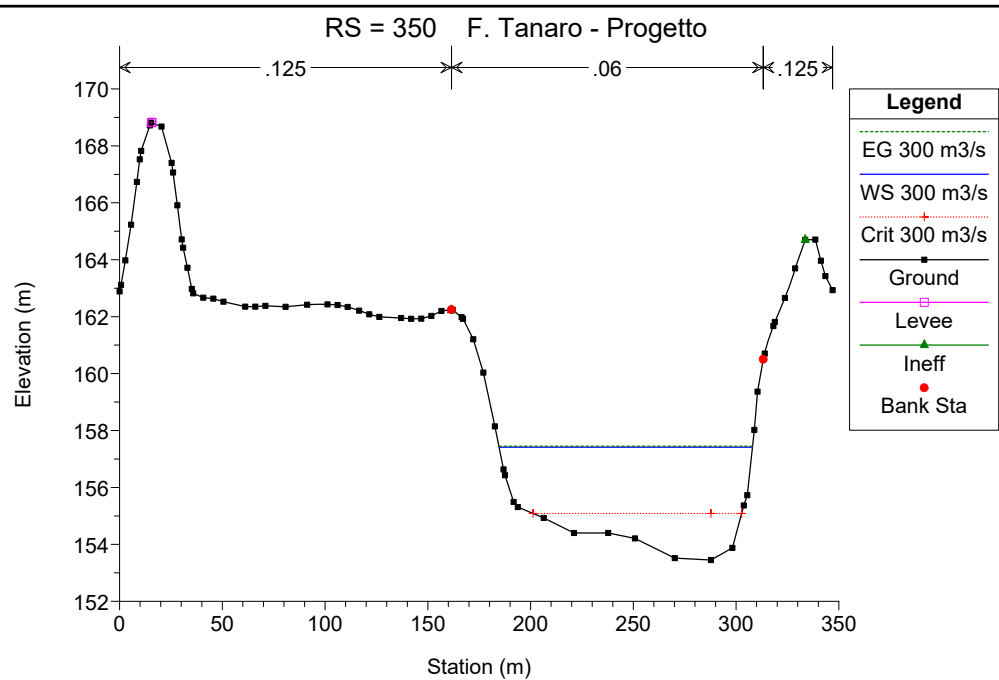
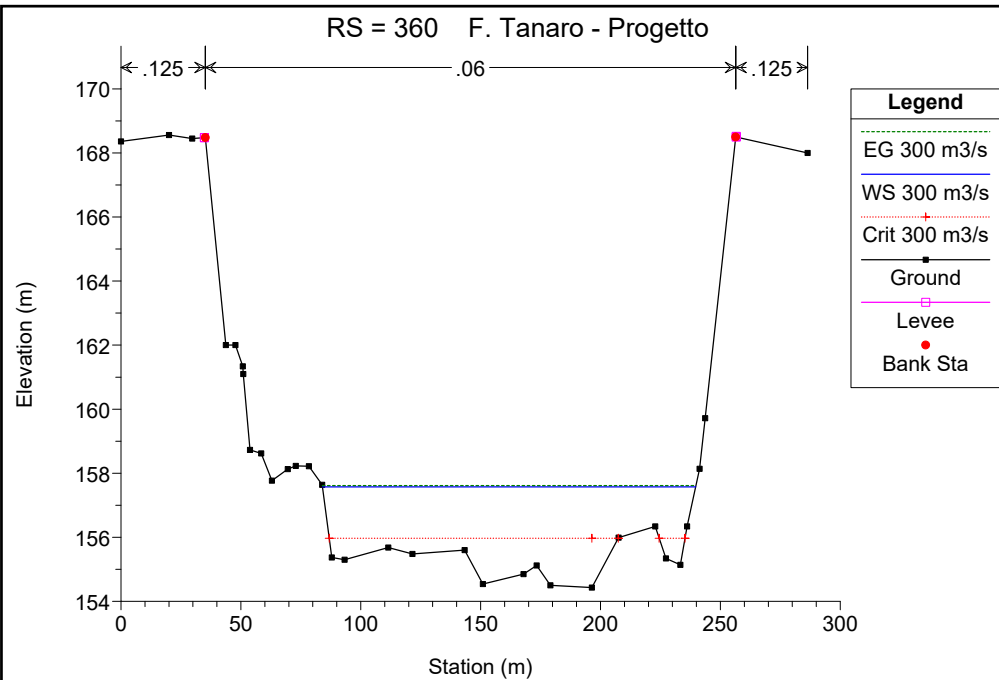


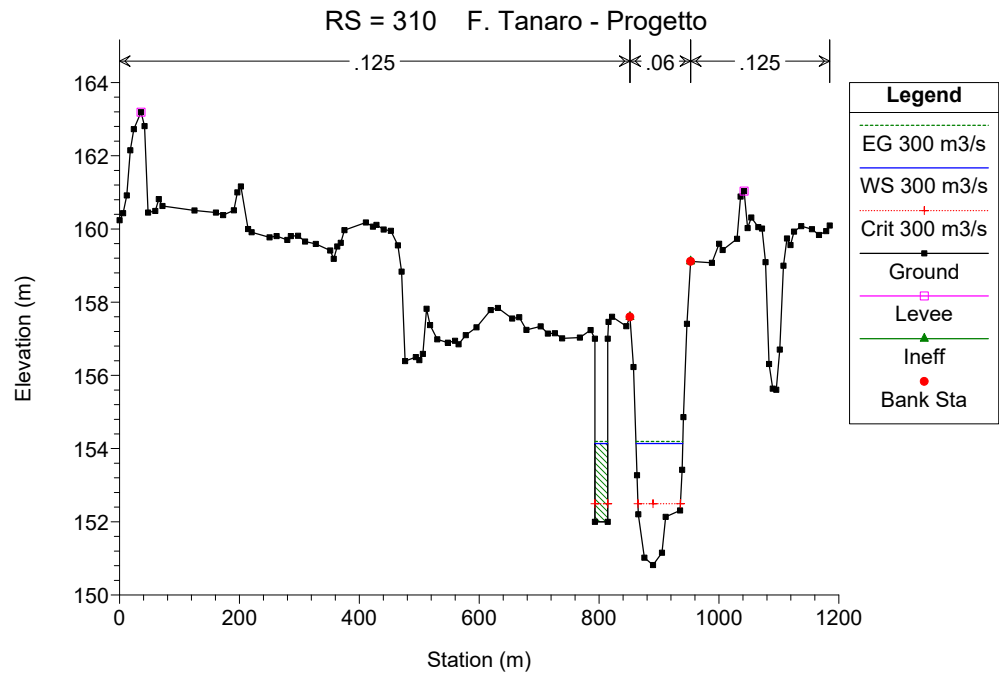
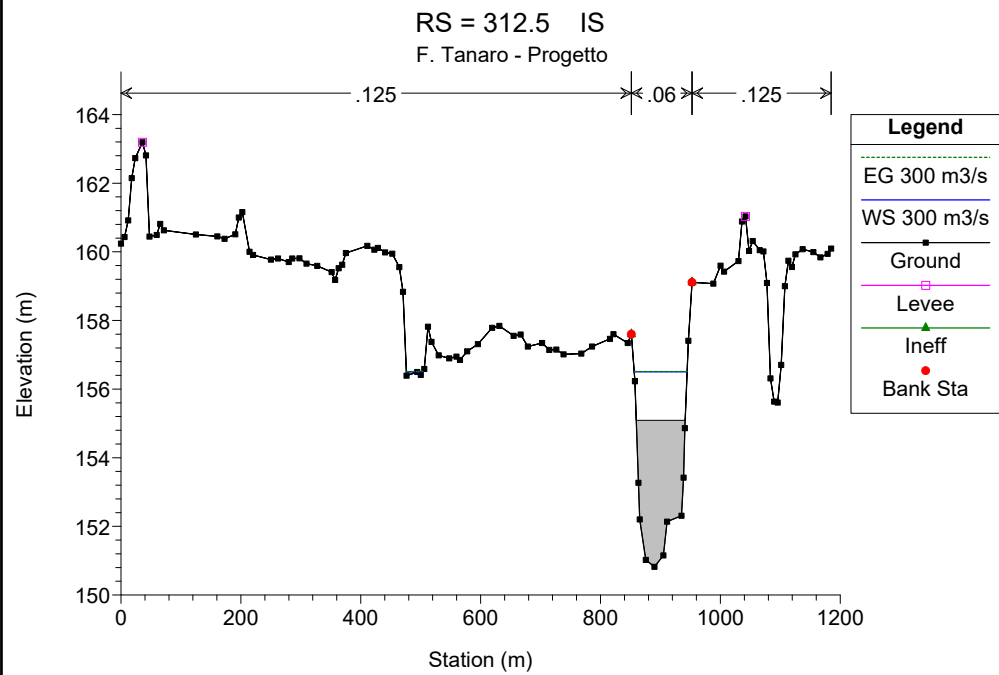
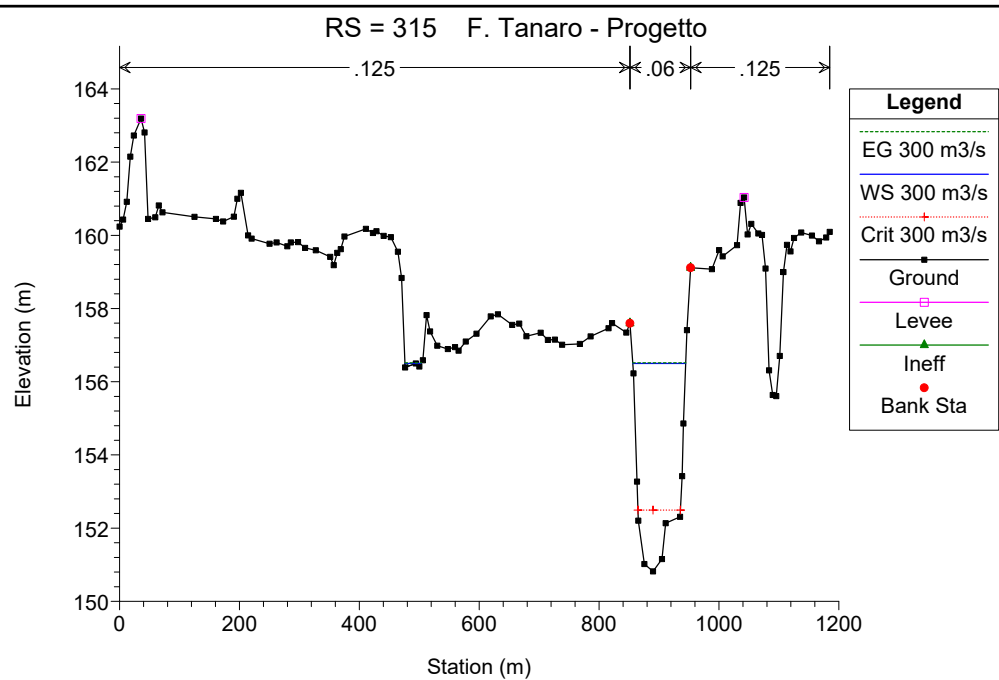
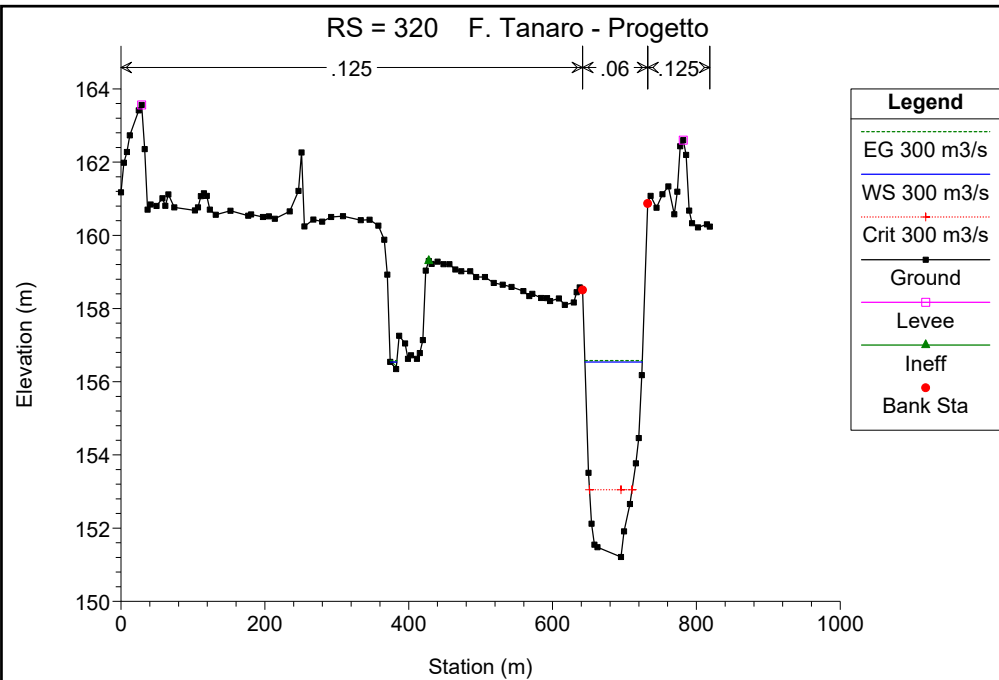


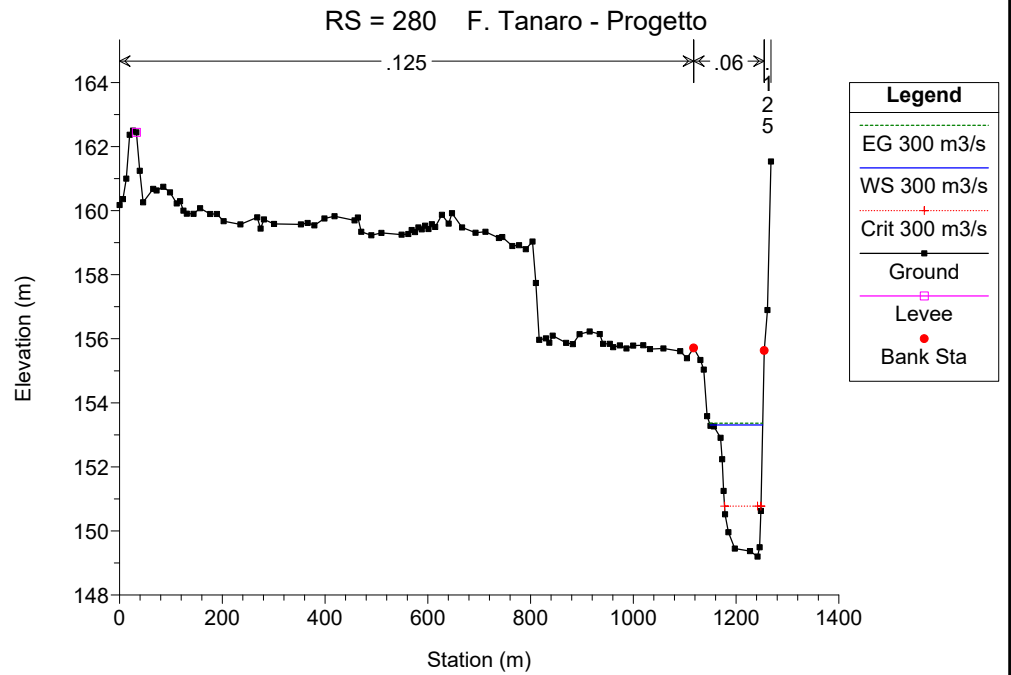
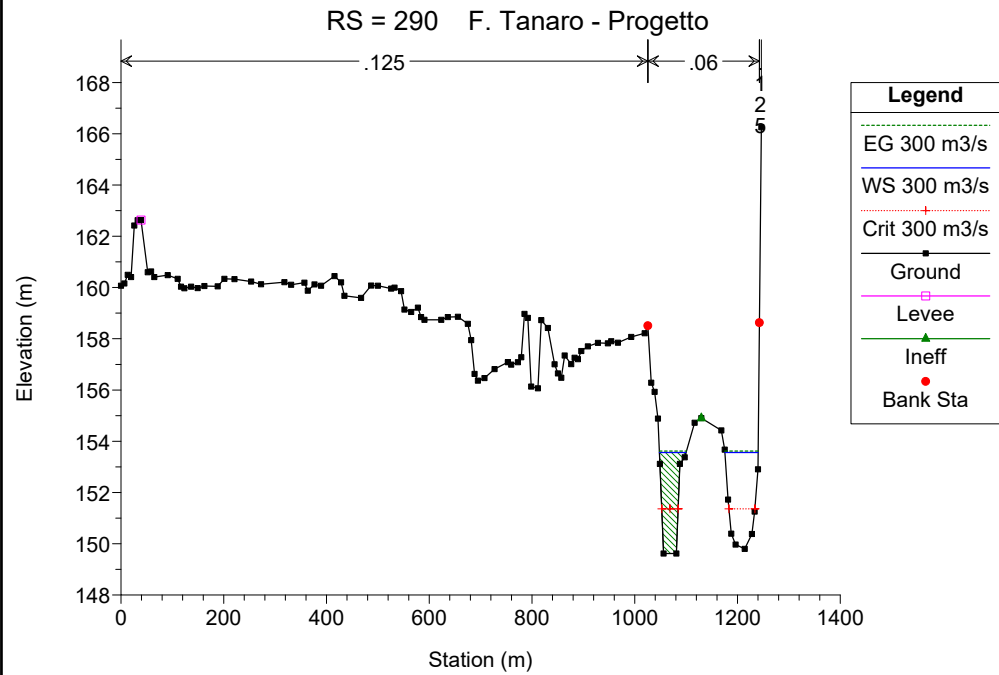
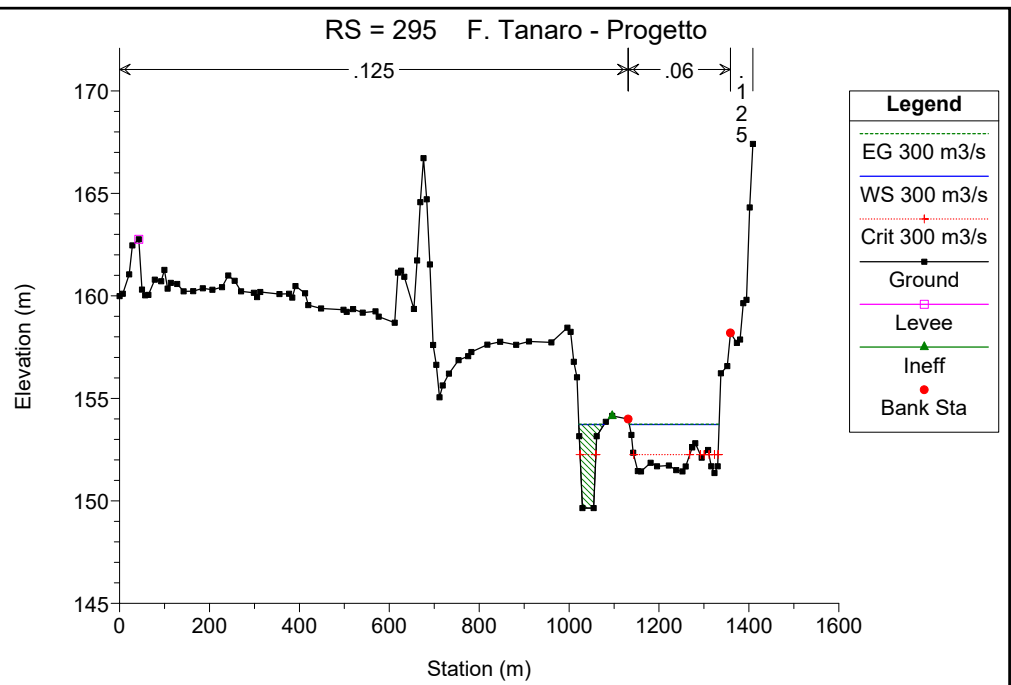
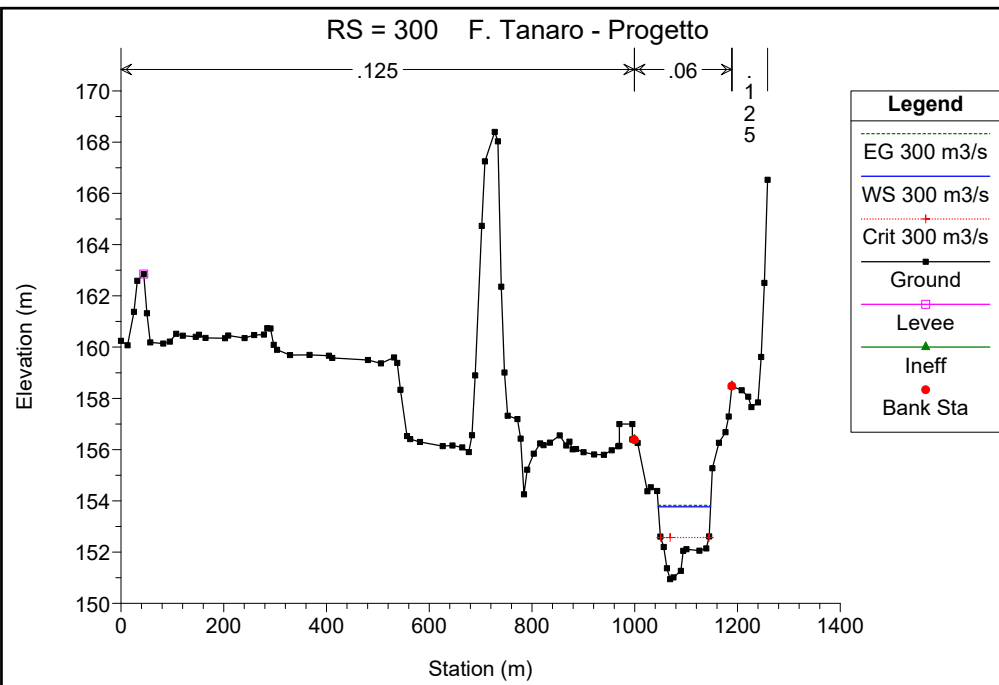


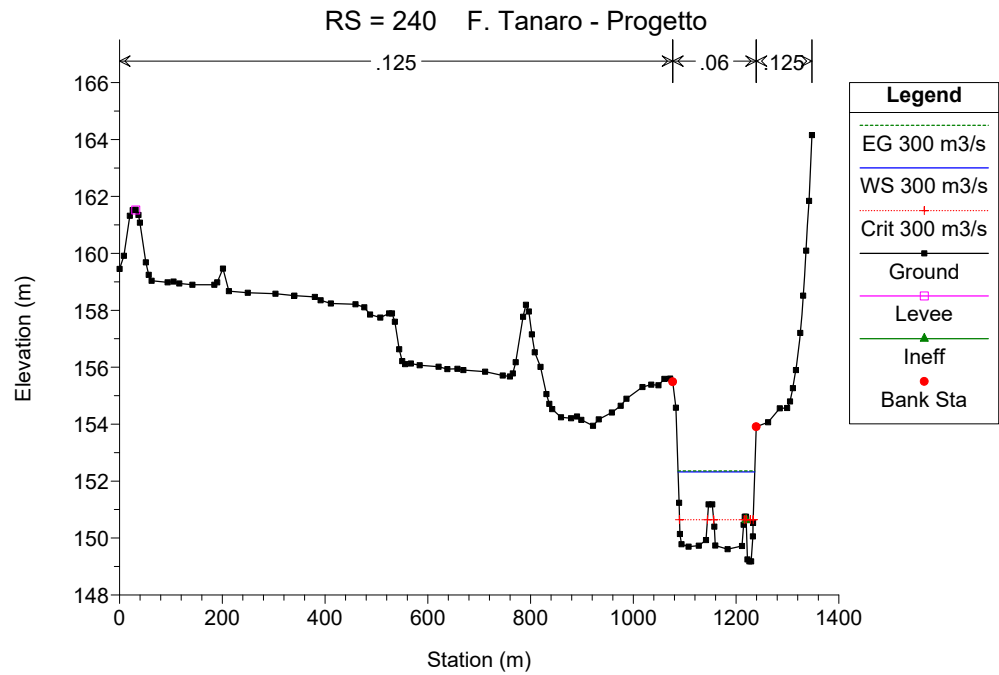
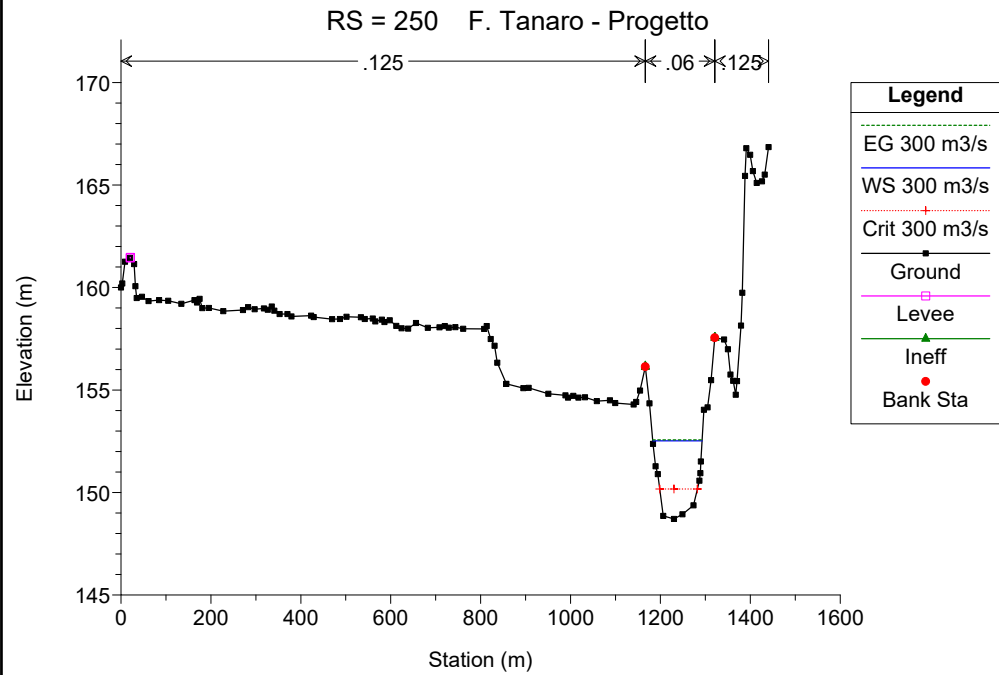
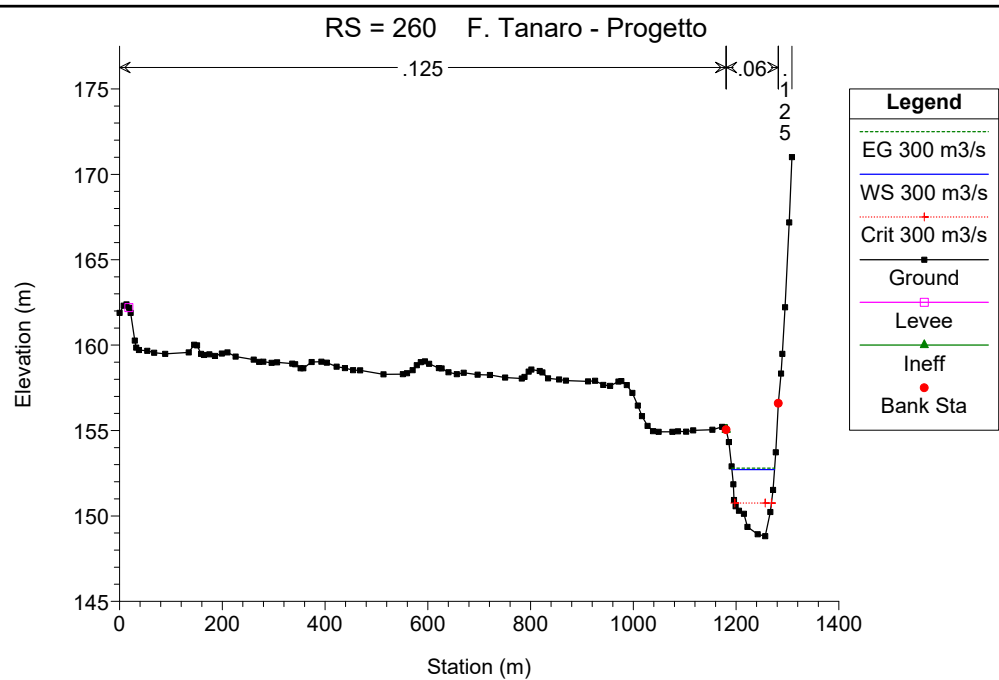
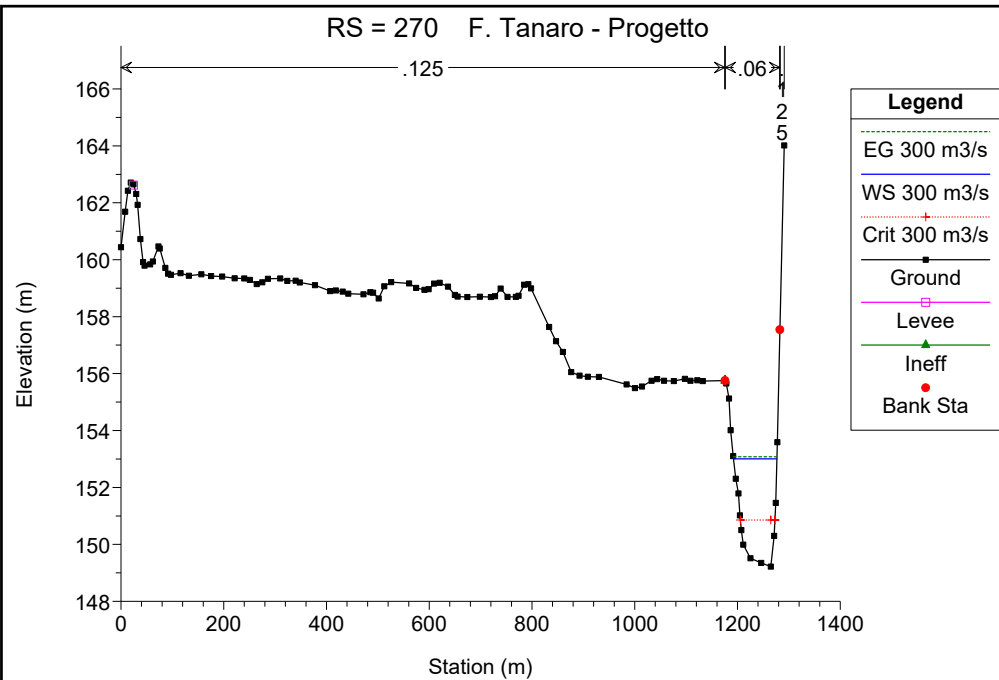


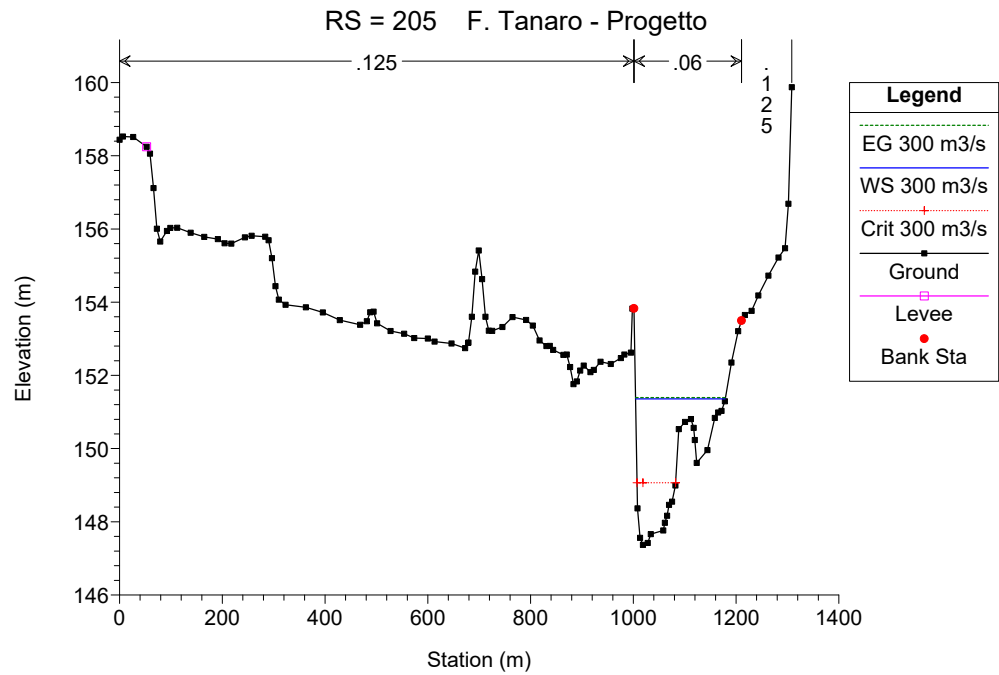
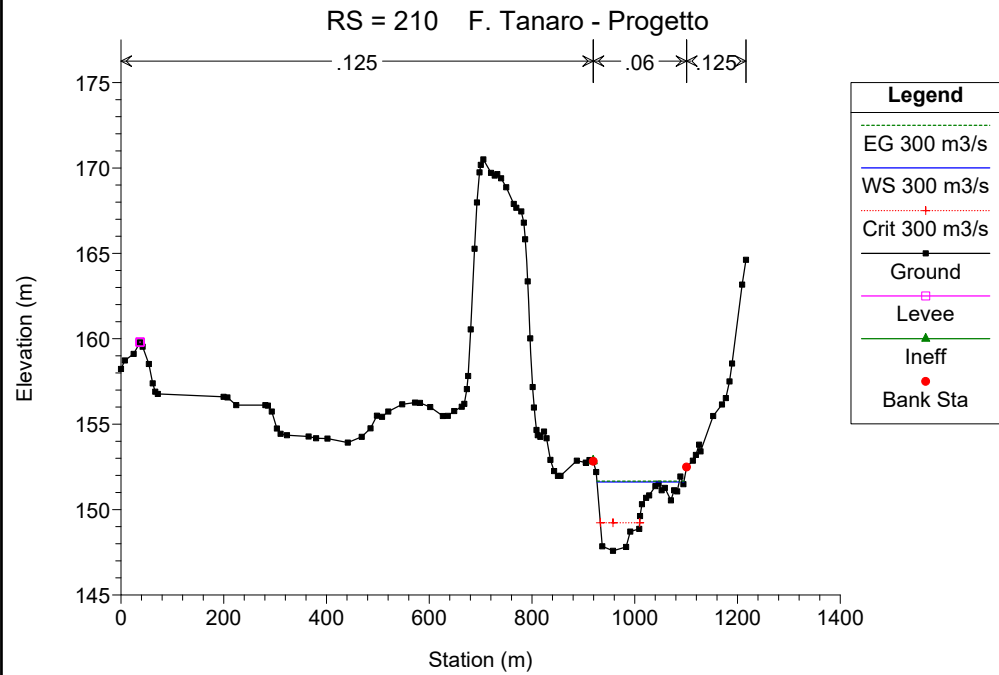
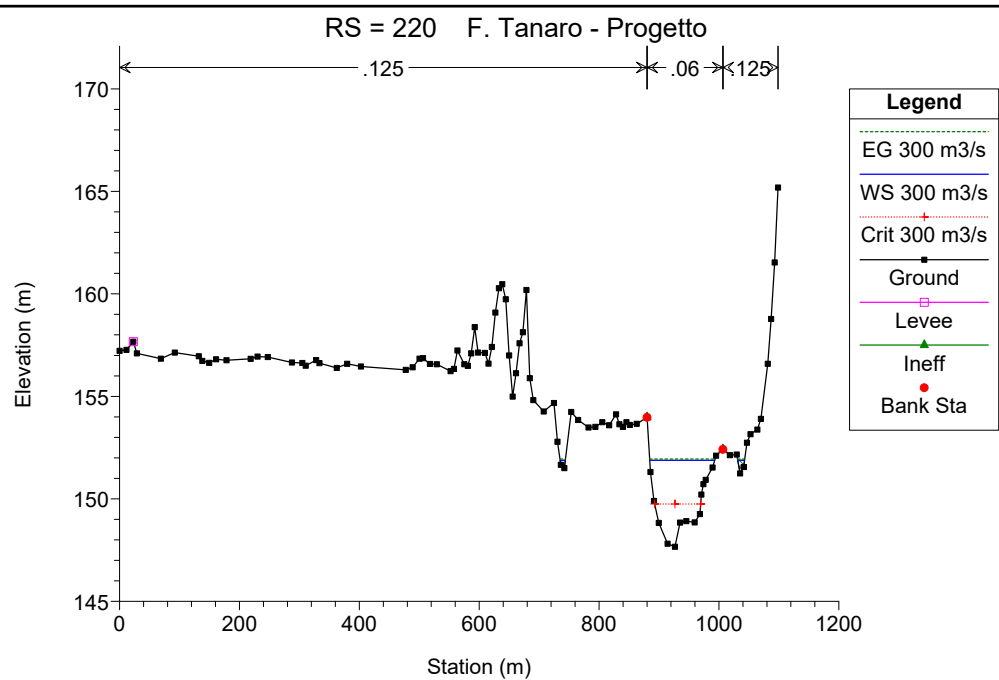
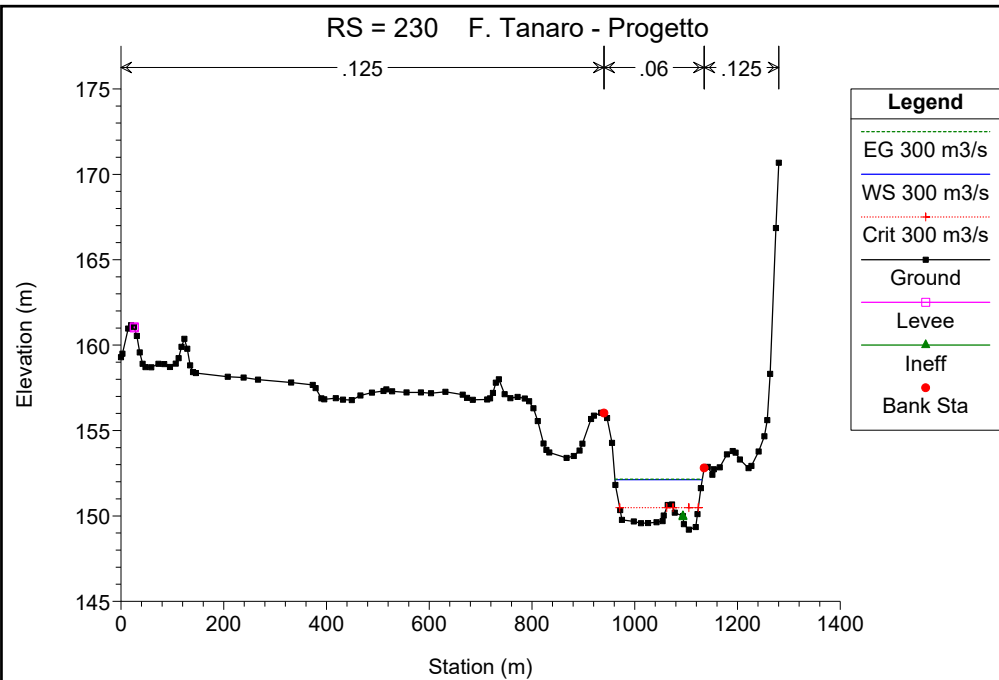


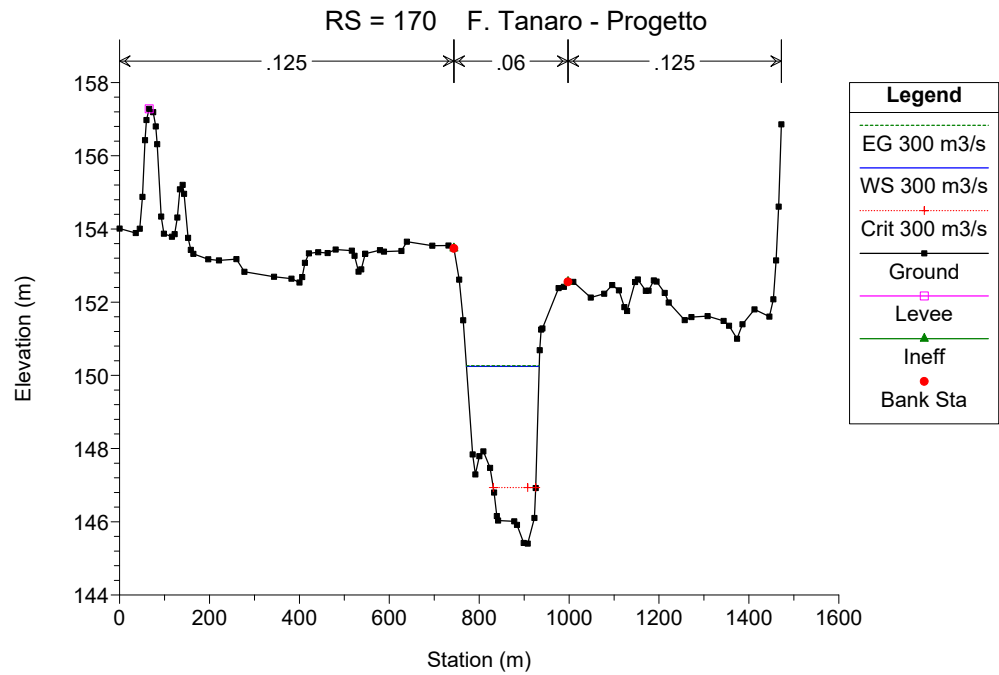
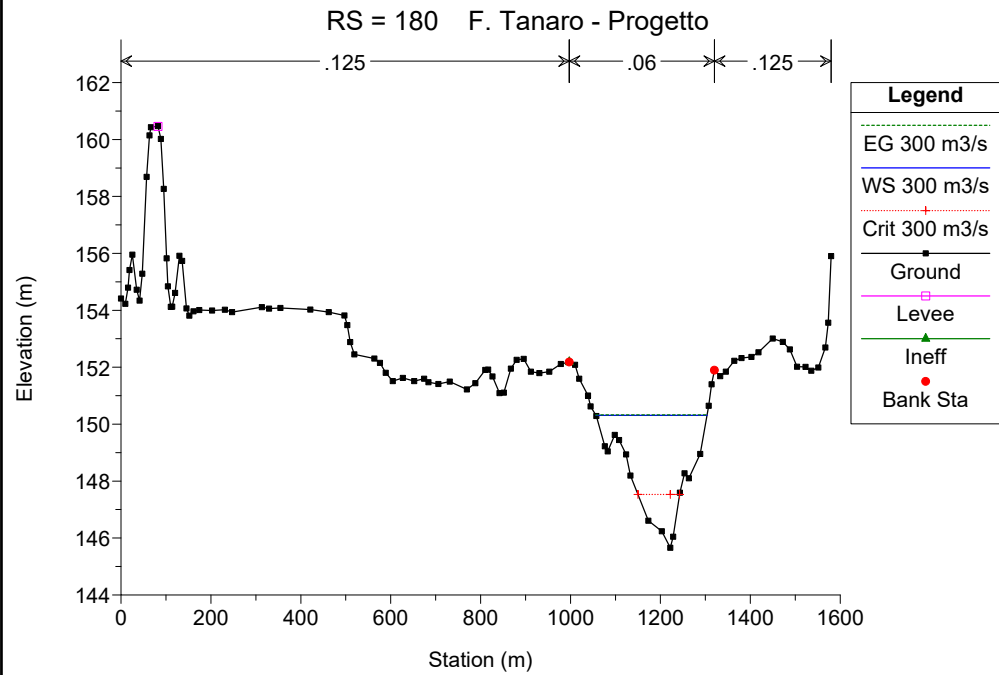
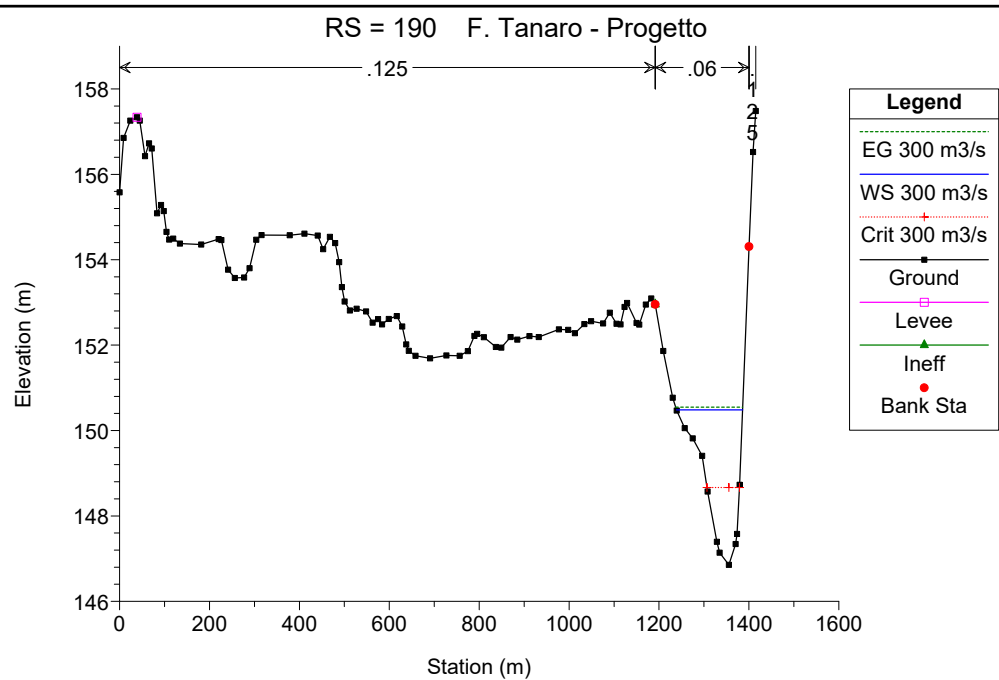
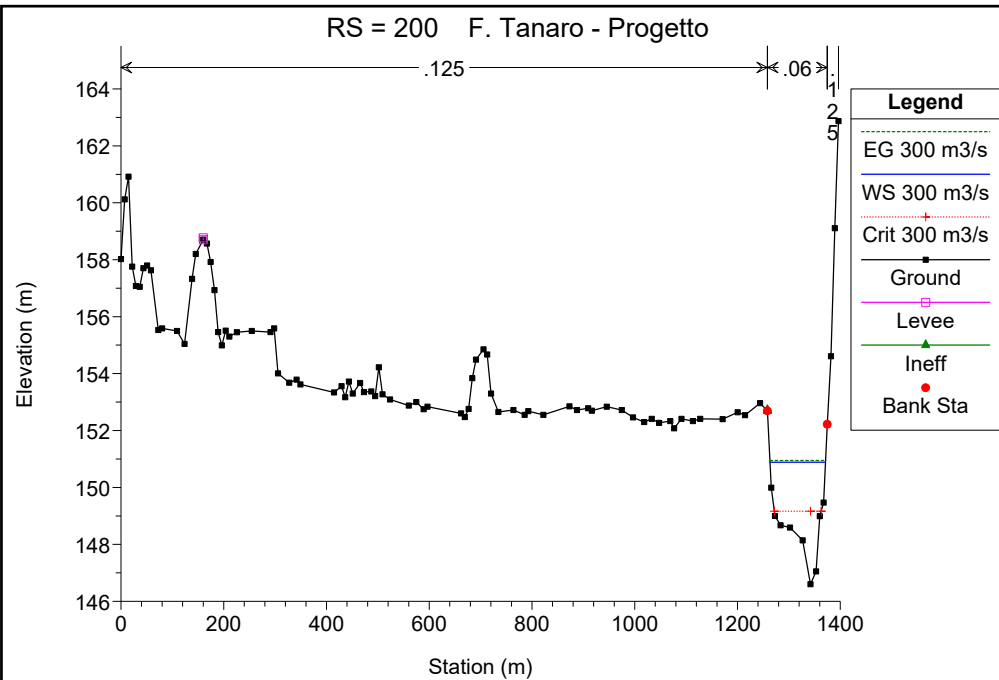


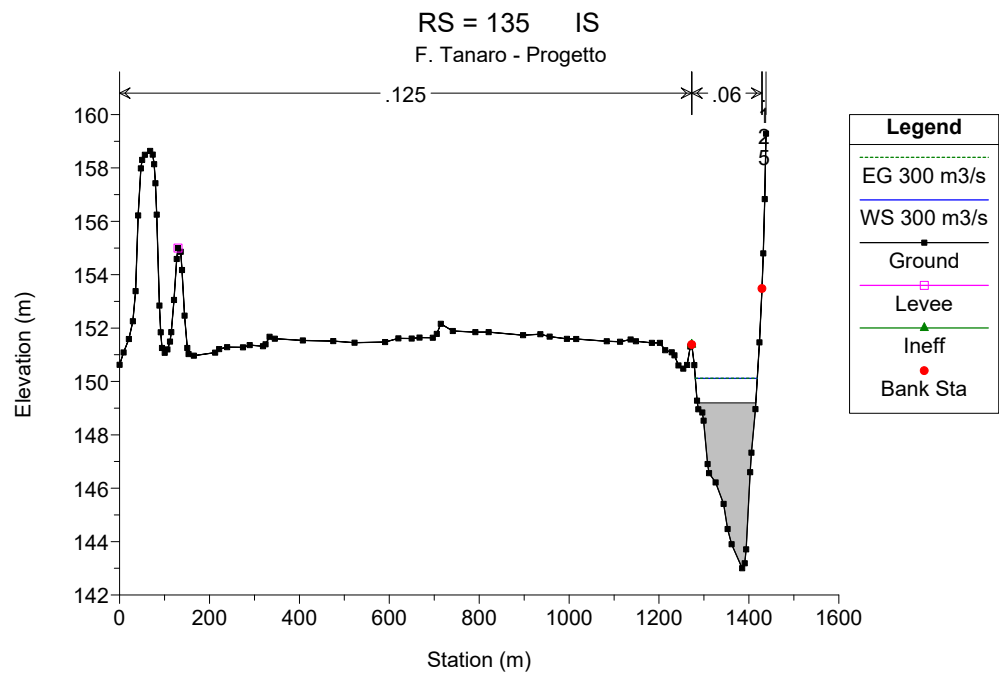
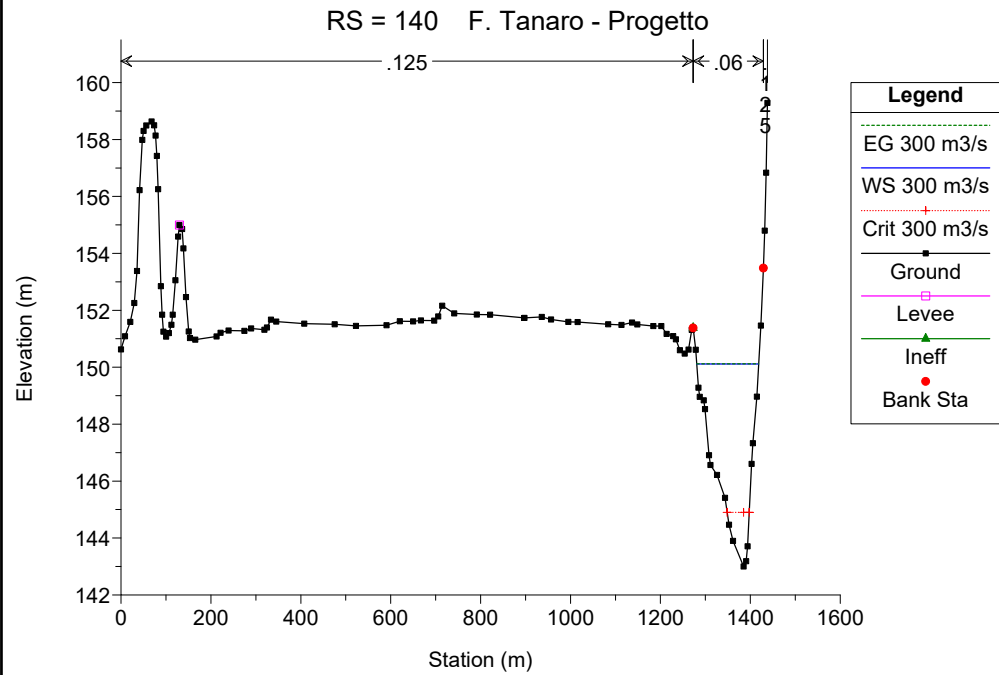
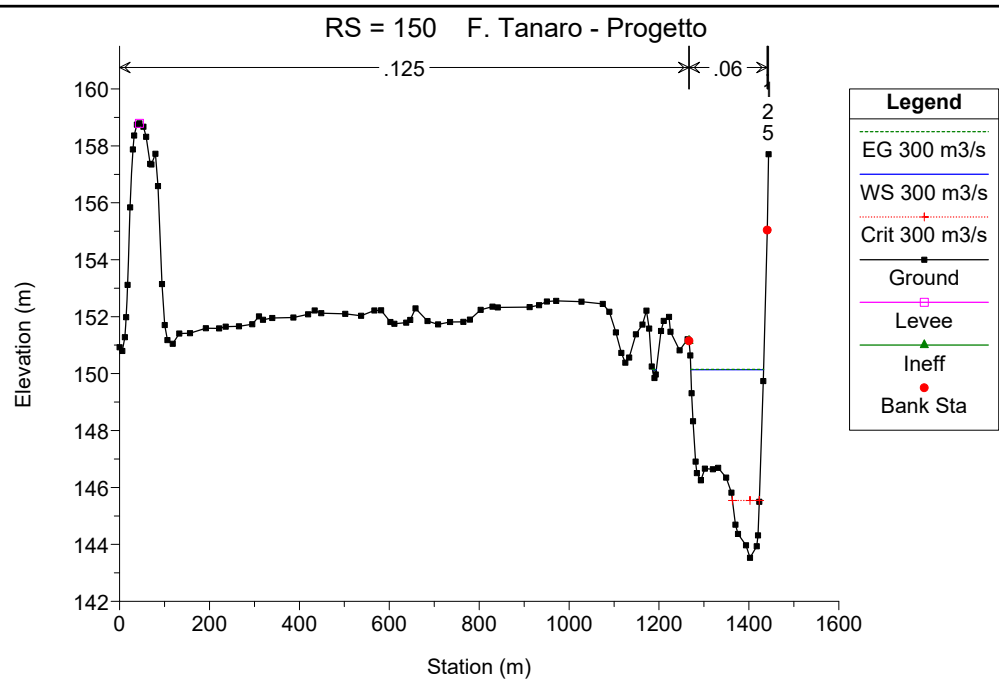
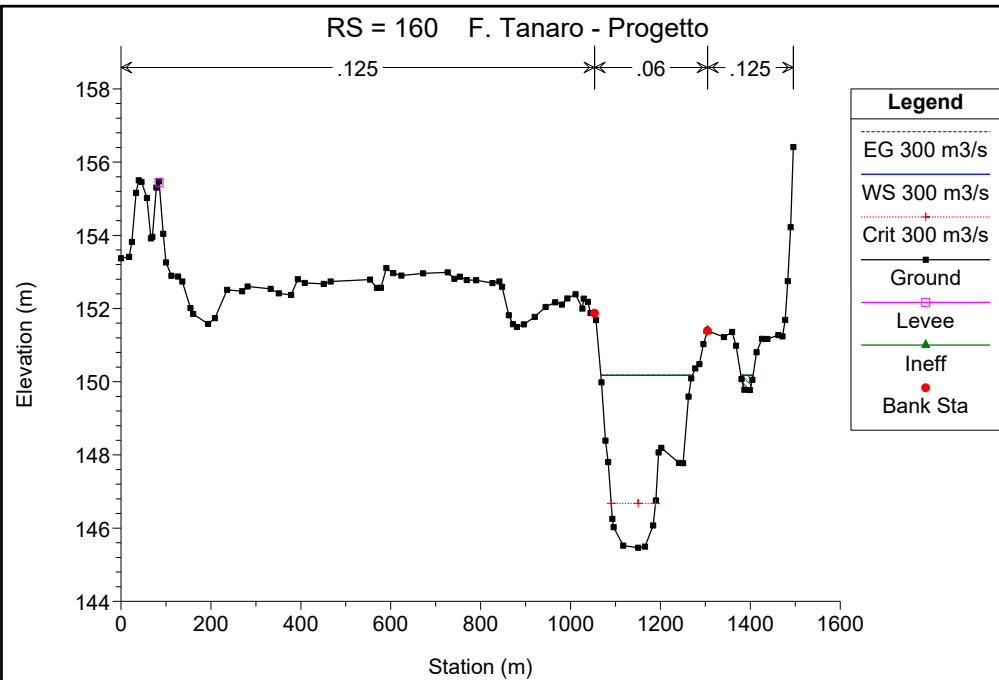


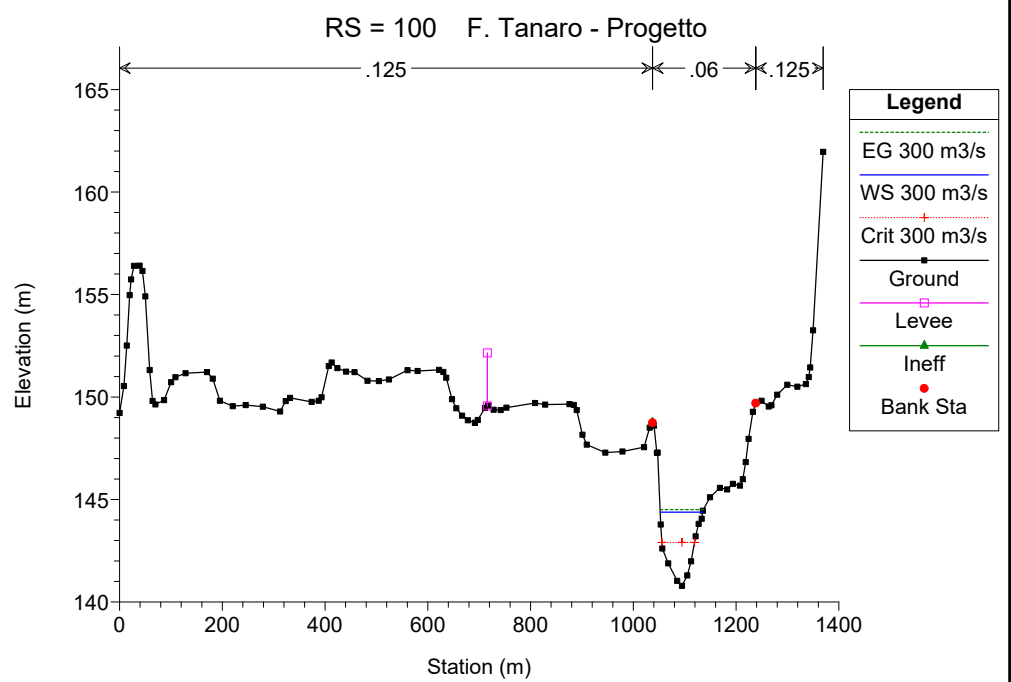
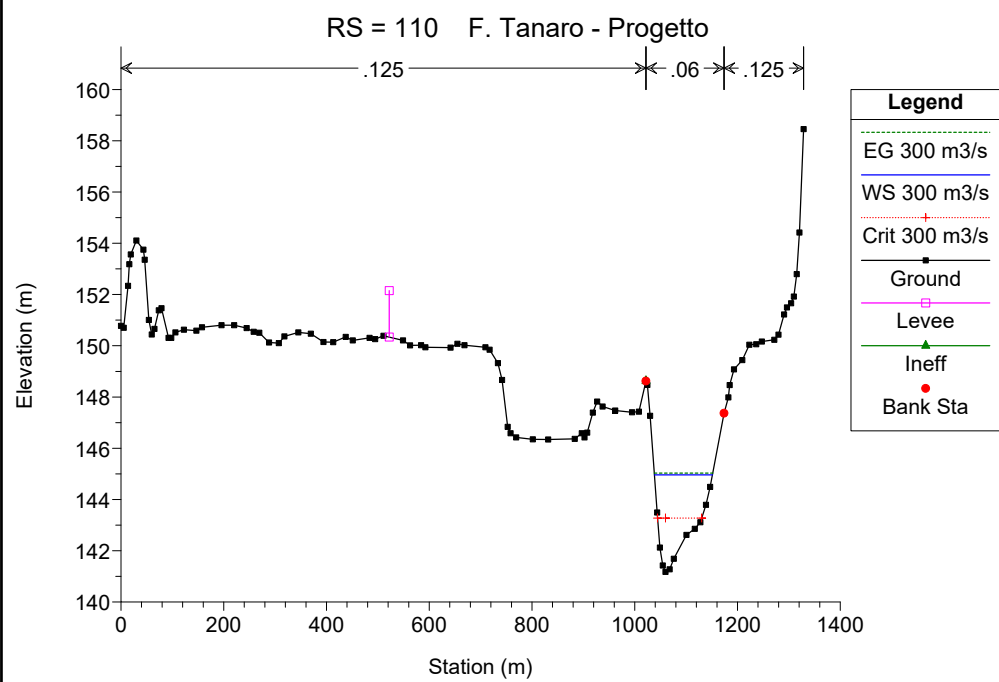
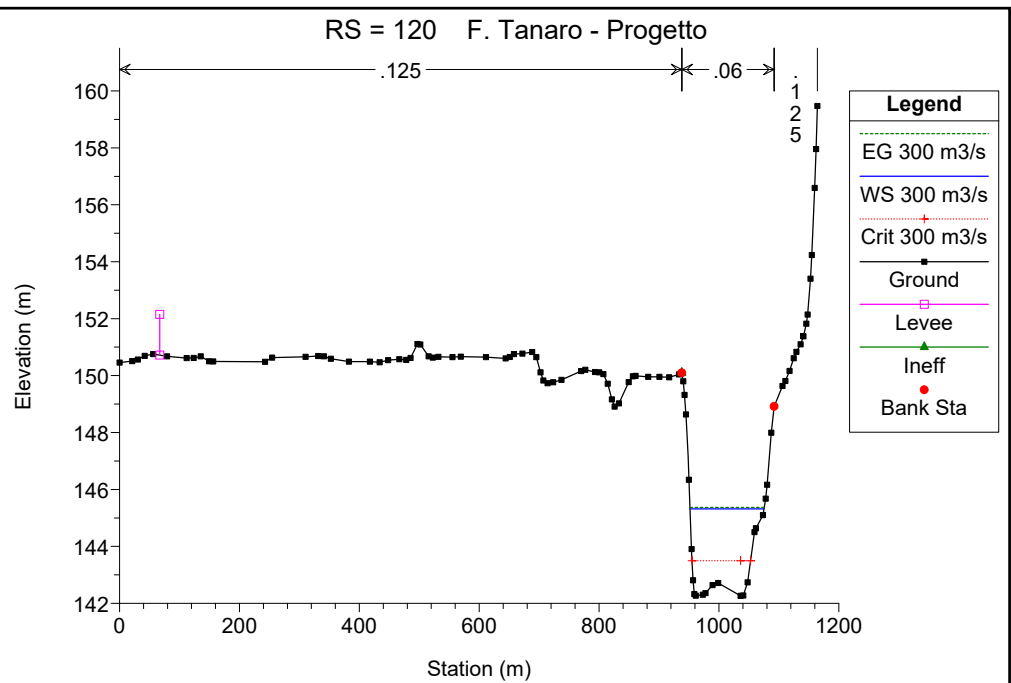
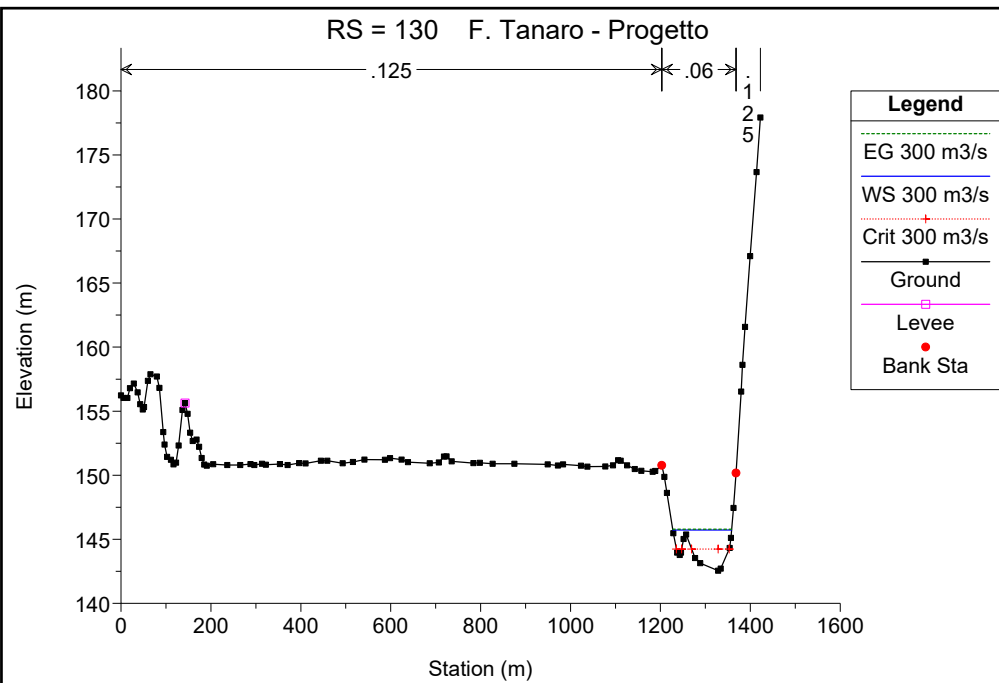


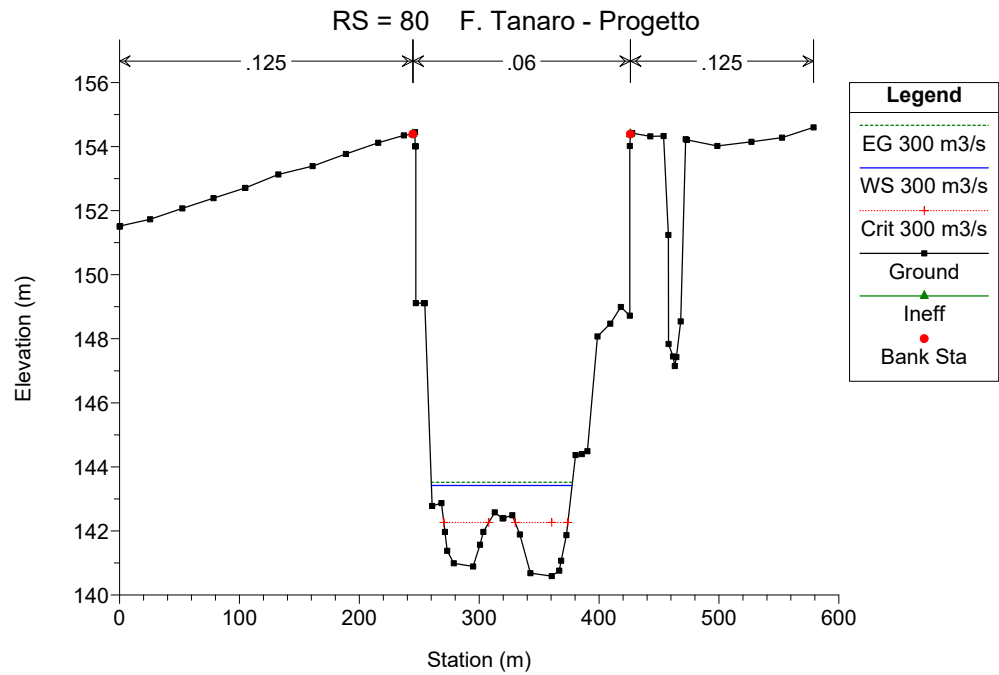
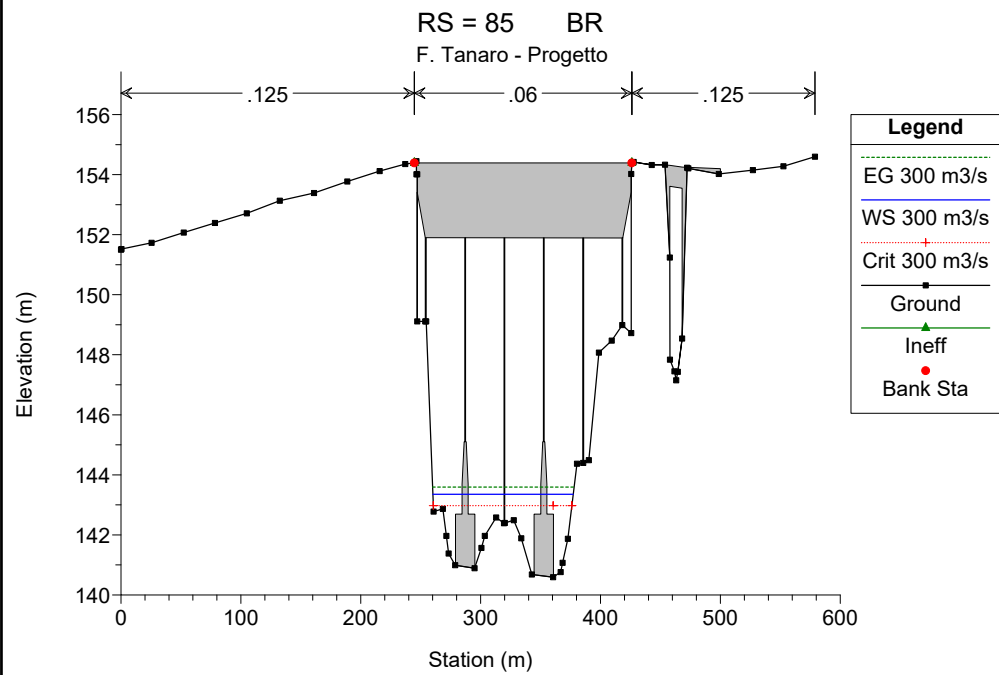
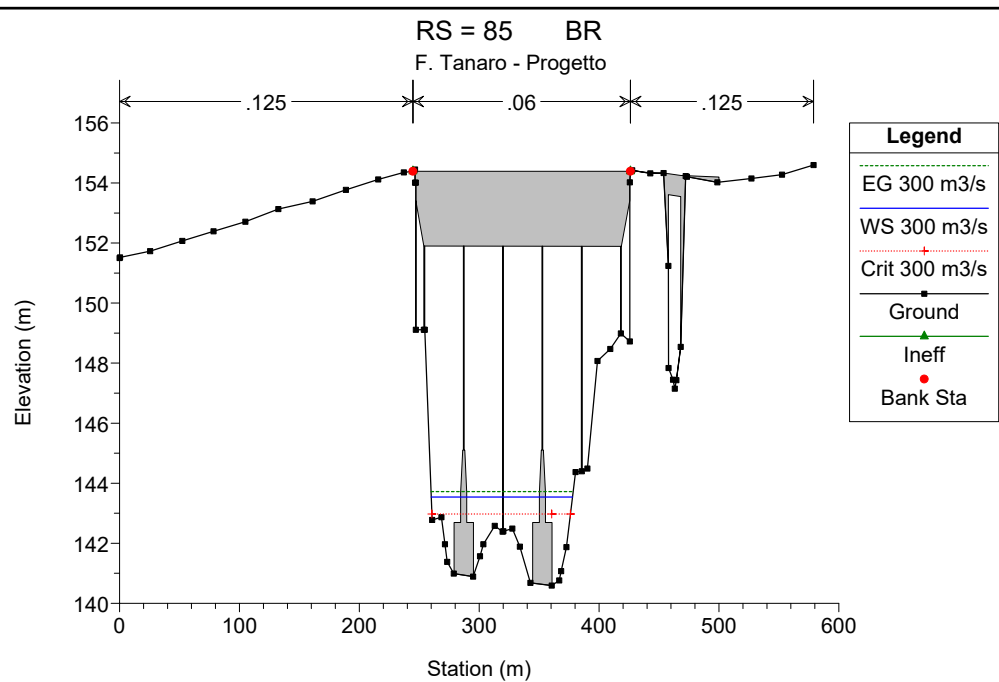
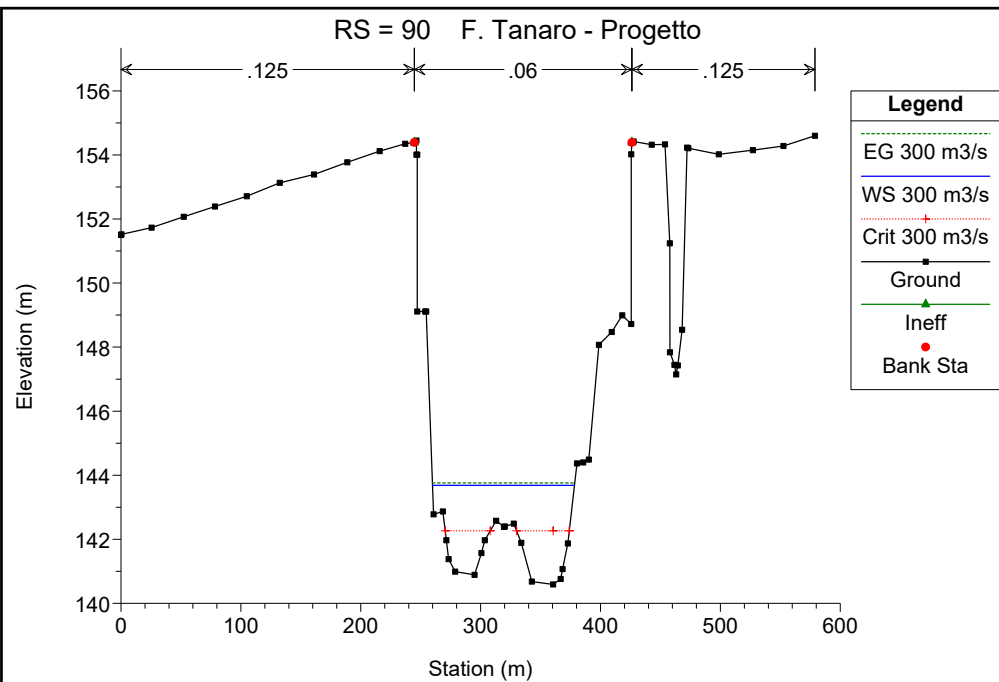


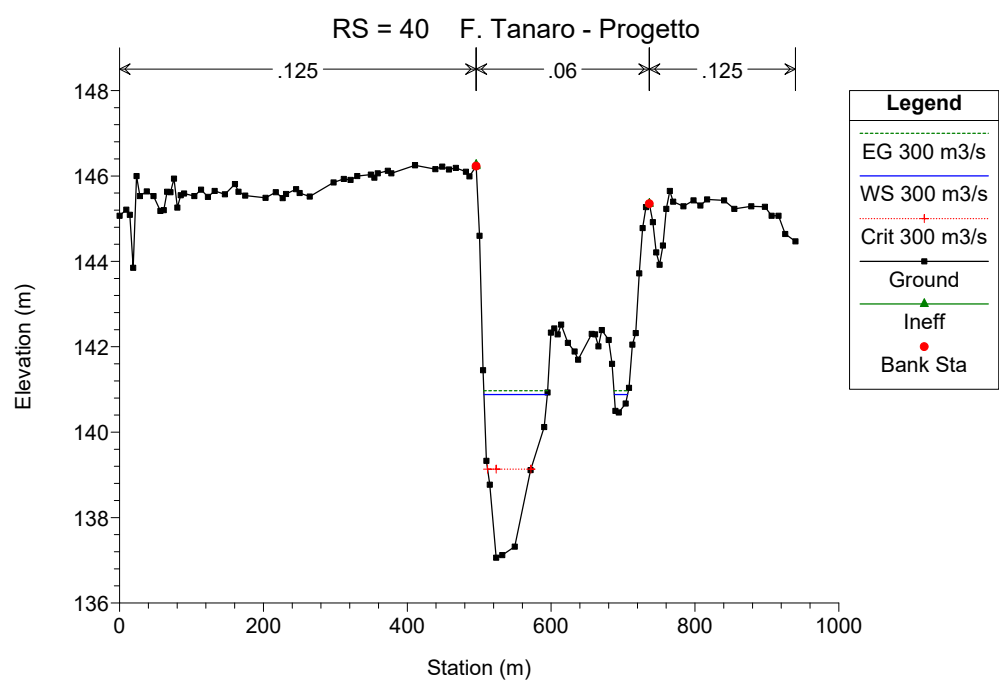
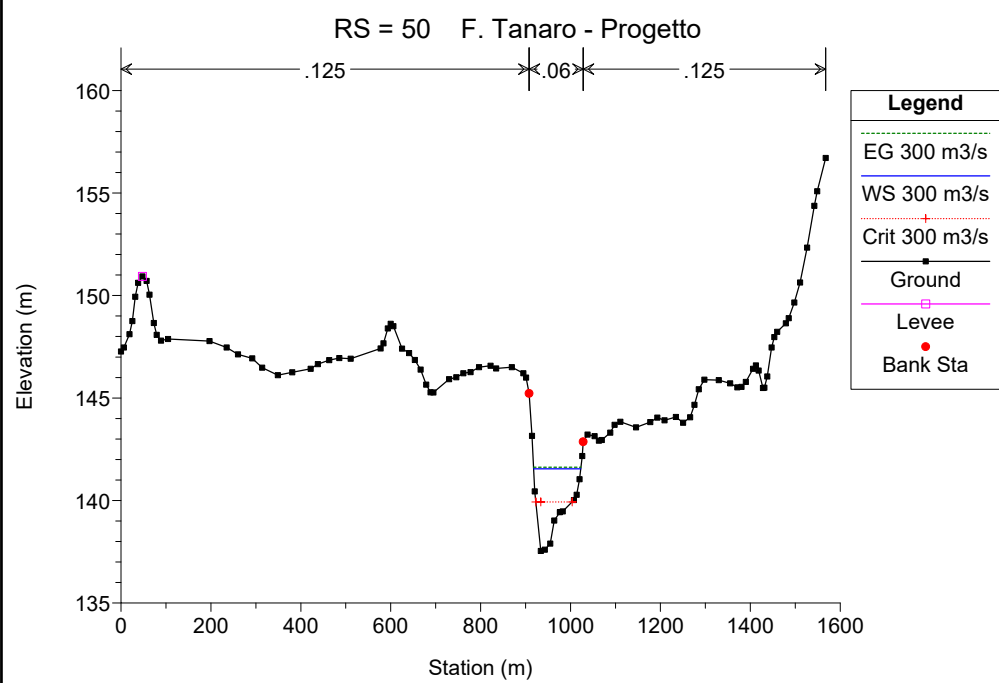
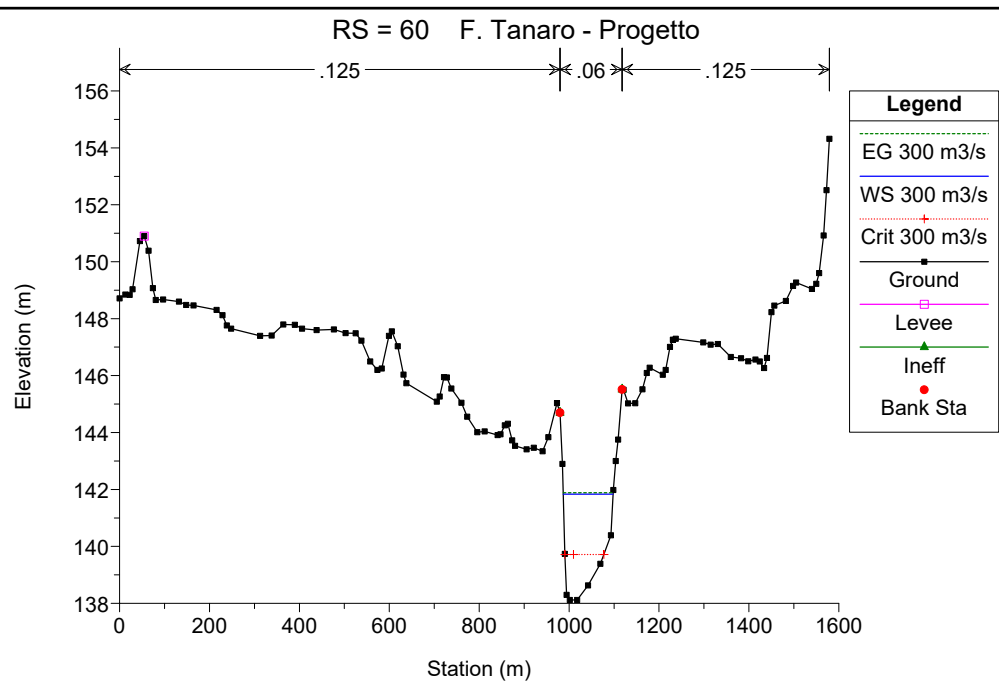
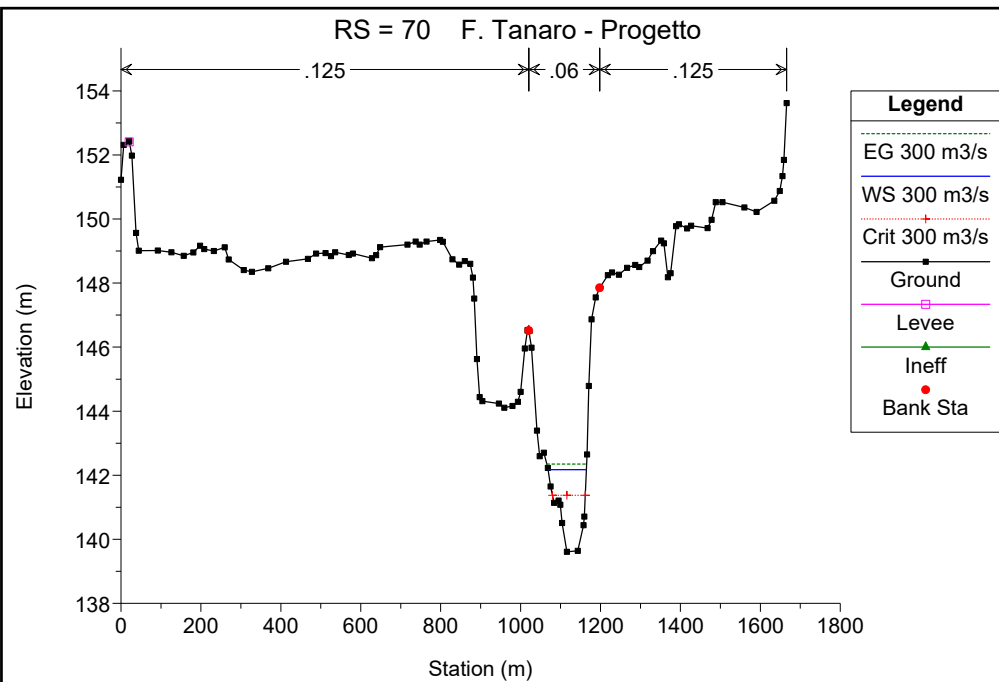


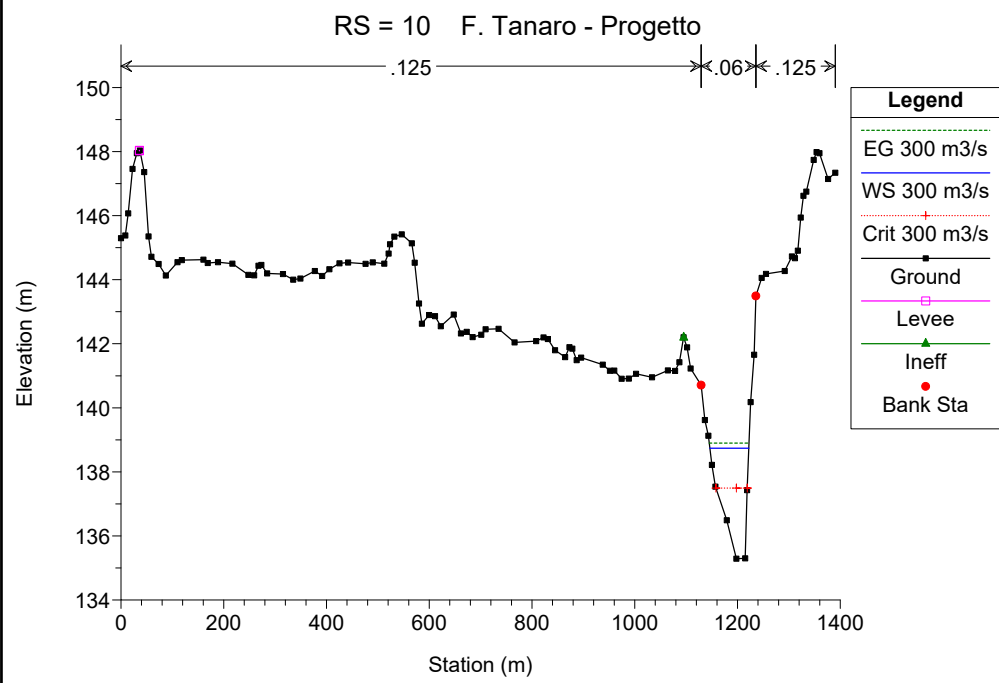
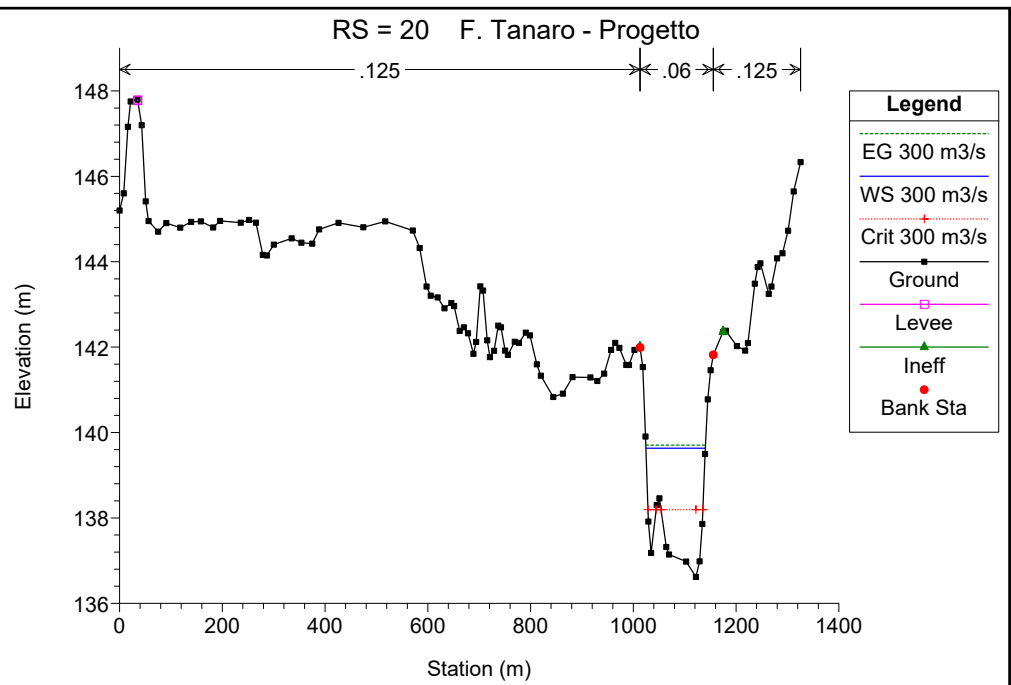
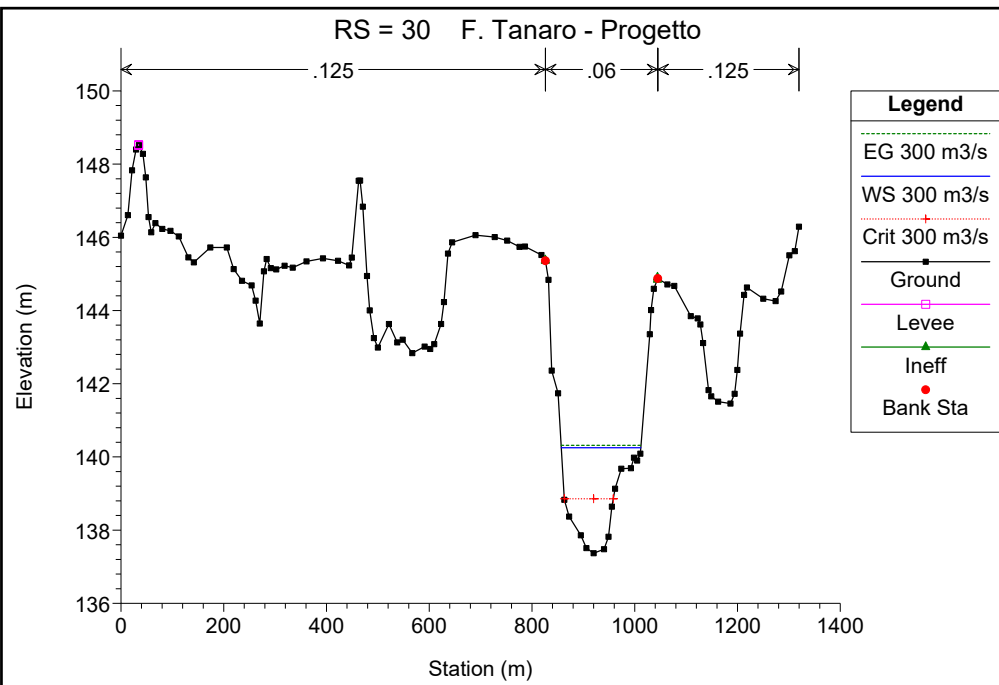












Nella tabella seguente si riportano i livelli a monte della traversa in progetto (in corrispondenza dell'ingresso nel canale di presa) ed a valle, in corrispondenza della sezione di restituzione, per le portate di esercizio considerate.

Portata [m ³ /s]	Livello monte traversa [m s.l.m.]	Livello sezione di scarico [m s.l.m.]
15.90	156.50	150.47
20	156.50	150.62
25.5 (Q ₂₇₄)	156.50	150.80
30	156.50	150.94
43.1 (Q ₁₈₂)	156.50	151.09
52	156.50	151.14
60	156.50	151.25
80.8 (Q ₉₁)	156.50	151.51
100	156.50	151.73
109 (Q ₆₀)	156.50	151.82
120	156.50	151.93
140	156.50	152.11
159 (Q ₃₀)	156.50	152.28
180	156.50	152.45
200	156.50	152.61
220	156.50	152.76
240	156.50	152.91
260	156.50	153.04
272 (Q ₁₀)	156.50	153.12
280	156.50	153.17
300	156.50	153.31

Tab. 6.1. Livelli idrici in corrispondenza della sezione di presa e della sezione di restituzione durante il funzionamento dell'impianto con lo sbarramento mobile alzato.

Come precedentemente illustrato, per portate comprese tra 15.90 e 300.00 m³/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 150.47 e 153.31 m s.l.m..

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.

Le planimetrie illustranti gli effetti della presenza dello sbarramento in condizioni di esercizio sui livelli idrici del corso d'acqua sono riportate negli elaborati A3-7-R1, A3-7-b e A3-7c e negli elaborati A3-8-R1, A3-8-b e A3-8c. In particolare in tali planimetrie si riporta l'area di esondazione in condizioni attuali ed in condizioni di progetto e l'incremento dei livelli idrici dovuto alla realizzazione dello sbarramento fisso e mobile in progetto. Nell'elaborato A3-8d sono invece contenuti i profili di rigurgito con l'indicazione delle quote del pelo libero nelle varie sezioni nello scenario attuale in quello di progetto.

I livelli di rigurgito corrispondenti al range di operatività dell'impianto idroelettrico (portate in alveo comprese tra 15.90 e 300.00 m³/s), sono sempre ampiamente contenuti all'interno dell'alveo inciso del Fiume Tanaro.

Nella seguente tabella si riportano i livelli idrici del F. Tanaro, rappresentativi dello stato di progetto, corrispondenti alla portata massima turbinabile (Q in alveo pari a 300 m³/s e portata derivata pari a 100 m³/s) e le rispettive quote delle sponde. L'esame dei dati contenuti nella tabella evidenzia che le quote delle sponde sono sempre superiori ai relativi livelli idrici; la portata massima turbinabile risulta quindi sempre contenuta all'interno dell'alveo inciso.

Sezione	Quota sponda sinistra [m s.l.m.]	Quota sponda destra [m s.l.m.]	Livello idrico [m s.l.m.]
550	168.63	169.81	167.57
540	168.46	171.34	166.32
530	167.07	171.62	165.83
520	168.35	167.86	165.36
510	167.21	167.95	164.60
500	166.14	166.89	164.11
490	166.89	165.83	163.55
480	165.67	165.10	162.50
470	167.87	164.44	161.73
460	164.06	164.56	161.15
450	161.94	164.29	160.69
440	162.41	164.46	160.37
430	162.36	163.55	159.97
420	161.78	163.98	159.86
410	164.27	162.58	159.69
400	165.83	161.72	159.32
395	Ponte tangenziale		
390	165.83	161.72	159.28
380	162.83	163.03	158.34
379	Traversa Ferrero S.p.A.		
370	168.48	168.50	157.75
365	Ponte S.R. 29		
360	168.48	168.50	157.57
350	162.25	160.50	157.41
340	161.41	161.45	157.13
330	160.53	160.10	156.72
320	158.51	160.87	156.54
315	157.60	159.11	156.50
312.5	Traversa in progetto		

Tab. 6.2. Livelli idrici nella zona a monte della centrale in progetto con riferimento alla portata massima di esercizio. Si evidenzia che i relativi livelli di rigurgito sono sempre ampiamente contenuti all'interno dell'alveo inciso del Fiume Tanaro.

7. VALUTAZIONE DEL VOLUME INVASATO

In tale capitolo viene calcolato il volume d'acqua invasato a monte dello sbarramento in progetto in conformità a quanto indicato nel D.M. del 26 giugno 2014.

Il volume di invaso, definito nel sopraccitato decreto come il volume del serbatoio compreso tra la quota massima di regolazione (156.50 m s.l.m.) e la quota del punto più depresso del paramento di monte (150.82 m s.l.m.), è pari a circa 355'000 m³. Tale valore rappresenta sostanzialmente il volume statico invasato a monte della traversa in progetto.

Si procede inoltre con la valutazione del volume invasato calcolato con riferimento alla Q_{270} , nella condizione di funzionamento con sbarramento mobile alzato e quota di regolazione di 156.50 m s.l.m.

La Q_{270} , ovvero la portata mediamente defluente per almeno 270 giorni all'anno, viene ricavata a partire dai dati contenuti negli annali idrologici dell'Arpa utilizzati per la costruzione della curva di durata delle portate ed è pari a 26 m³/s.

Per valutare le grandezze idrauliche utili alla definizione del volume invasato con la Q_{270} e la sezione di incrocio tra il profilo di rigurgito generato dalla traversa alla massima quota di regolazione ed il profilo che si realizza nelle condizioni attuali vengono effettuate due simulazioni idraulico numeriche con la Q_{270} , una nelle condizioni di progetto ed una nelle condizioni attuali senza traversa.

Si riportano di seguito tali simulazioni.

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 indicati nelle sezioni schematiche e nel profilo longitudinale allegati nelle pagine seguenti.

LEGENDA

River sta.	=	sezione di calcolo
Q total	=	portata in m ³ /s
Min Ch El	=	quota del fondo alveo in m
W.S. Elev.	=	livello del pelo libero dell'acqua in m
Crit W.S.	=	livello di moto critico dell'acqua in m
E.G. Elev	=	livello energetico globale in m
E.G. Slope	=	pendenza motrice
Vel Chnl	=	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

MODELLO MODIMENSIONALE DI MOTO PERMANENTE**SITUAZIONE ATTUALE****PORTATA Q_{270}** **SIMULAZIONE 31**

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	26.00 in alveo	Q_{270} (portata mediamente superata per 270 giorni all'anno)

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Q270

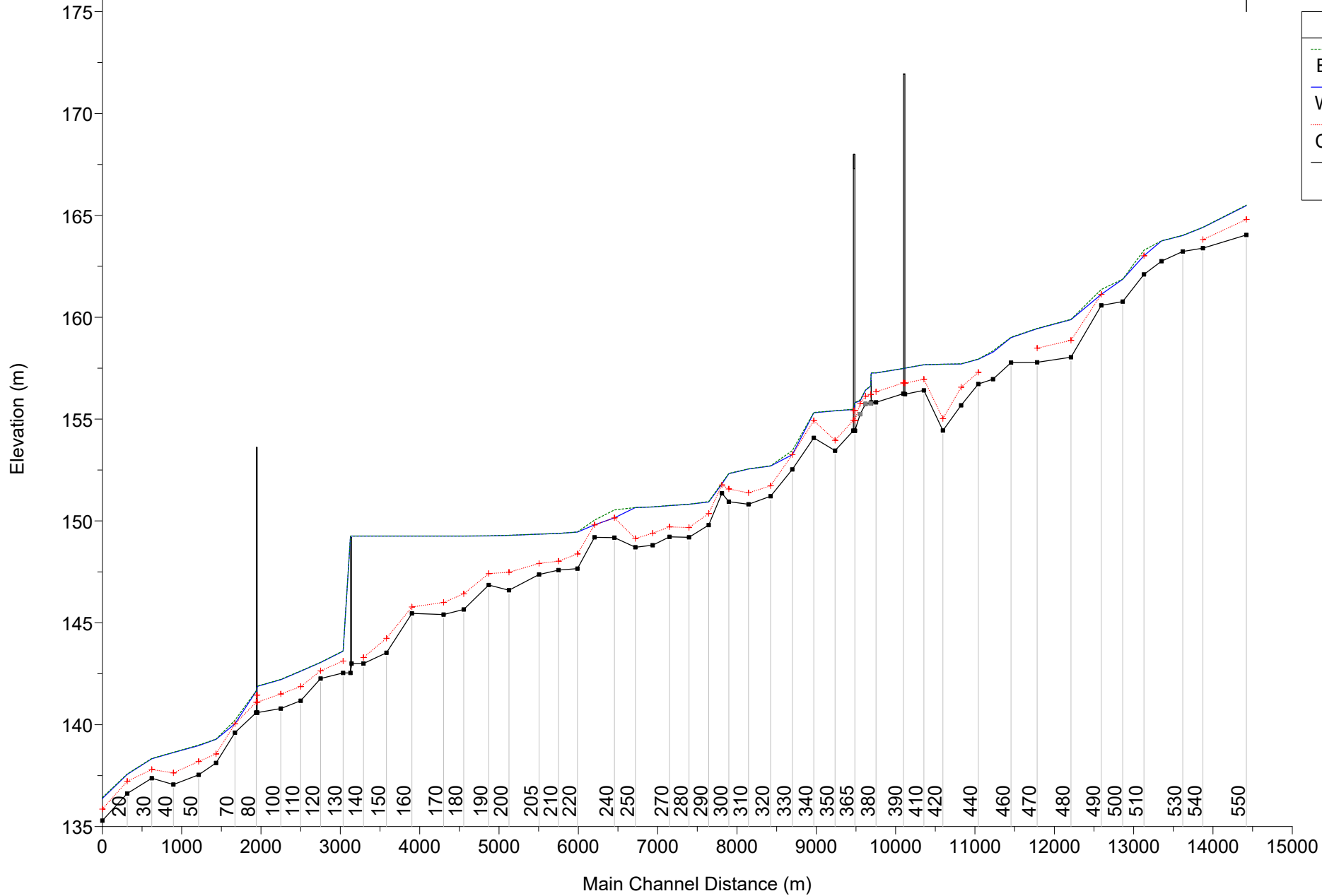
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	Q270	26.00	164.04	165.48	164.80	165.51	0.003633	0.77	33.85	50.33	0.30
1	540	Q270	26.00	163.39	164.40	163.81	164.41	0.001250	0.46	56.19	80.64	0.18
1	530	Q270	26.00	163.23	164.01		164.02	0.001953	0.51	51.48	90.64	0.21
1	520	Q270	26.00	162.75	163.75		163.75	0.000610	0.33	79.78	113.20	0.12
1	510	Q270	26.00	162.10	163.02	163.02	163.29	0.044509	2.31	11.23	20.94	1.01
1	500	Q270	26.00	160.77	161.87		161.87	0.000548	0.33	77.92	98.38	0.12
1	490	Q270	26.00	160.58	161.12	161.12	161.36	0.047767	2.17	11.99	25.99	1.02
1	480	Q270	26.00	158.04	159.88	158.86	159.89	0.001016	0.49	52.55	58.21	0.17
1	470	Q270	26.00	157.79	159.44	158.48	159.45	0.001061	0.50	52.15	59.03	0.17
1	460	Q270	26.00	157.77	159.00		159.02	0.001670	0.58	44.75	56.73	0.21
1	450	Q270	26.00	156.96	158.29		158.35	0.006634	1.06	24.51	35.24	0.41
1	440	Q270	26.00	156.72	157.94	157.30	157.95	0.000998	0.46	56.81	69.93	0.16
1	430	Q270	26.00	155.68	157.70	156.57	157.72	0.001120	0.51	50.61	56.96	0.17
1	420	Q270	26.00	154.44	157.69	155.02	157.69	0.000032	0.15	178.27	92.66	0.03
1	410	Q270	26.00	156.41	157.66	156.96	157.67	0.000656	0.35	73.66	97.85	0.13
1	400	Q270	26.00	156.22	157.50	156.77	157.51	0.000740	0.38	68.08	87.86	0.14
1	395		Bridge									
1	390	Q270	26.00	156.25	157.48	156.78	157.49	0.000811	0.39	66.22	87.83	0.14
1	380	Q270	26.00	155.82	157.27	156.34	157.27	0.000504	0.33	78.19	93.19	0.12
1	379		Inl Struct									
1	370	Q270	26.00	154.43	155.81	154.94	155.81	0.000573	0.30	85.71	128.80	0.12
1	365		Bridge									
1	360	Q270	26.00	154.43	155.47	154.94	155.49	0.002288	0.55	46.91	80.63	0.23
1	350	Q270	26.00	153.45	155.41	153.96	155.41	0.000111	0.20	132.06	111.25	0.06
1	340	Q270	26.00	154.08	155.31	154.92	155.33	0.002615	0.53	48.87	98.74	0.24
1	330	Q270	26.00	152.53	153.25	153.25	153.45	0.047738	1.98	13.13	32.70	1.00
1	320	Q270	26.00	151.21	152.70	151.72	152.71	0.000564	0.42	61.47	55.45	0.13
1	310	Q270	26.00	150.82	152.55	151.38	152.56	0.000506	0.37	70.20	71.25	0.12
1	300	Q270	26.00	150.95	152.32	151.57	152.33	0.002070	0.52	49.80	87.02	0.22
1	295	Q270	26.00	151.36	151.82	151.77	151.87	0.032075	1.03	25.15	123.24	0.73
1	290	Q270	26.00	149.80	150.93	150.36	150.95	0.002148	0.68	38.19	46.03	0.24
1	280	Q270	26.00	149.20	150.82	149.68	150.82	0.000224	0.29	89.70	71.10	0.08
1	270	Q270	26.00	149.22	150.75	149.71	150.76	0.000327	0.33	77.77	66.38	0.10
1	260	Q270	26.00	148.81	150.68	149.40	150.69	0.000299	0.32	81.80	70.45	0.09
1	250	Q270	26.00	148.71	150.66	149.14	150.66	0.000081	0.19	134.74	91.78	0.05
1	240	Q270	26.00	149.18	150.16	150.16	150.54	0.040433	2.75	9.44	119.12	1.00
1	230	Q270	26.00	149.20	149.81	149.81	150.04	0.045822	2.13	12.20	106.37	1.00
1	220	Q270	26.00	147.66	149.45	148.38	149.46	0.000622	0.39	66.90	73.81	0.13
1	210	Q270	26.00	147.59	149.39	148.03	149.39	0.000168	0.26	101.06	77.33	0.07
1	205	Q270	26.00	147.37	149.35	147.91	149.35	0.000125	0.24	109.86	76.43	0.06

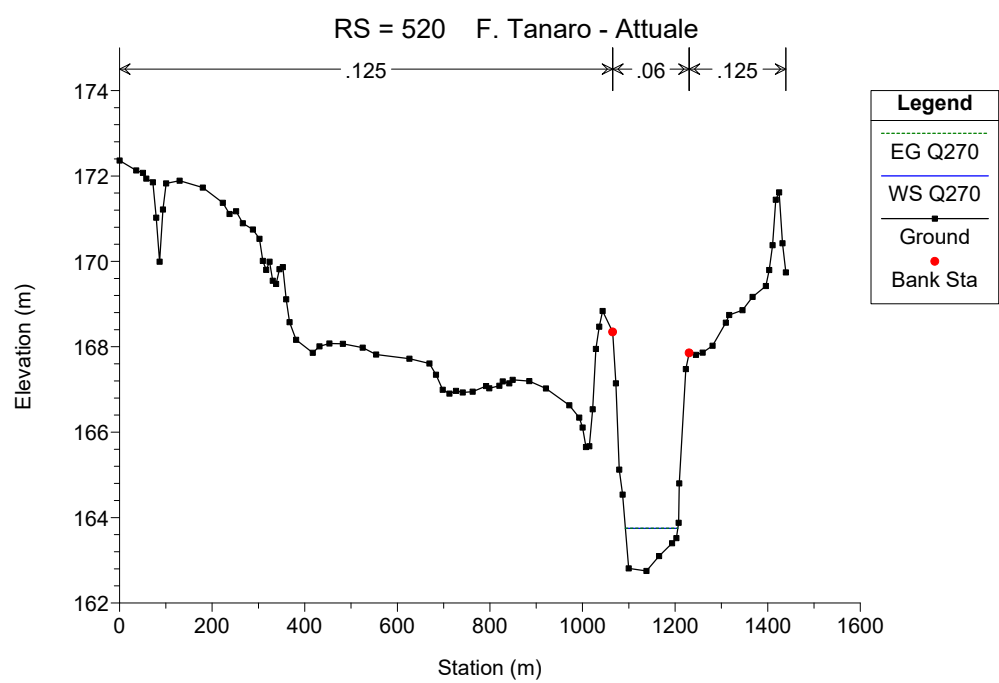
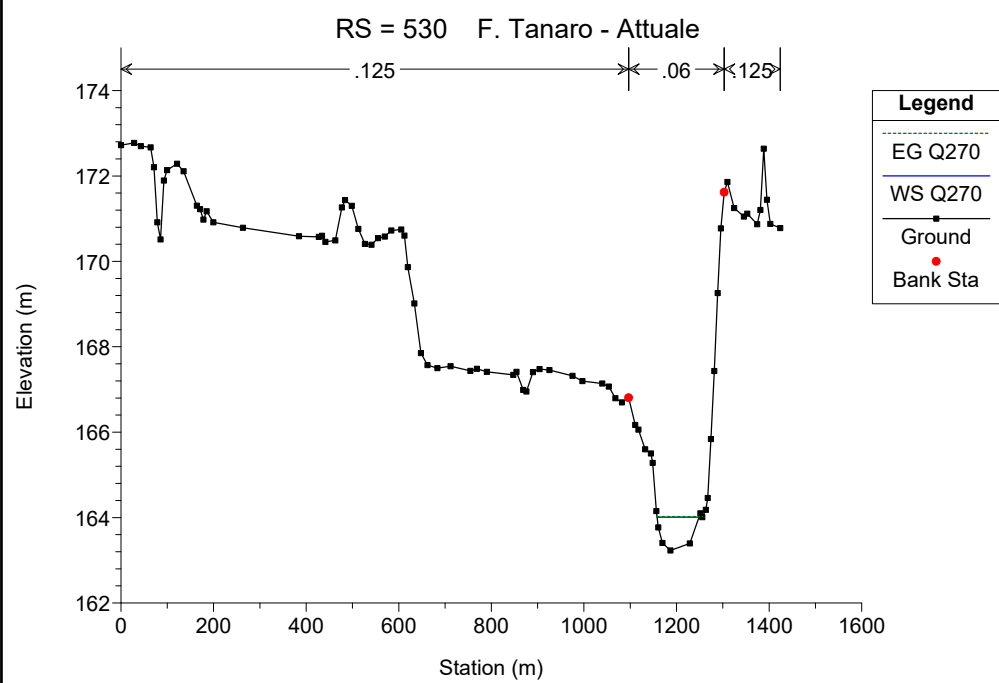
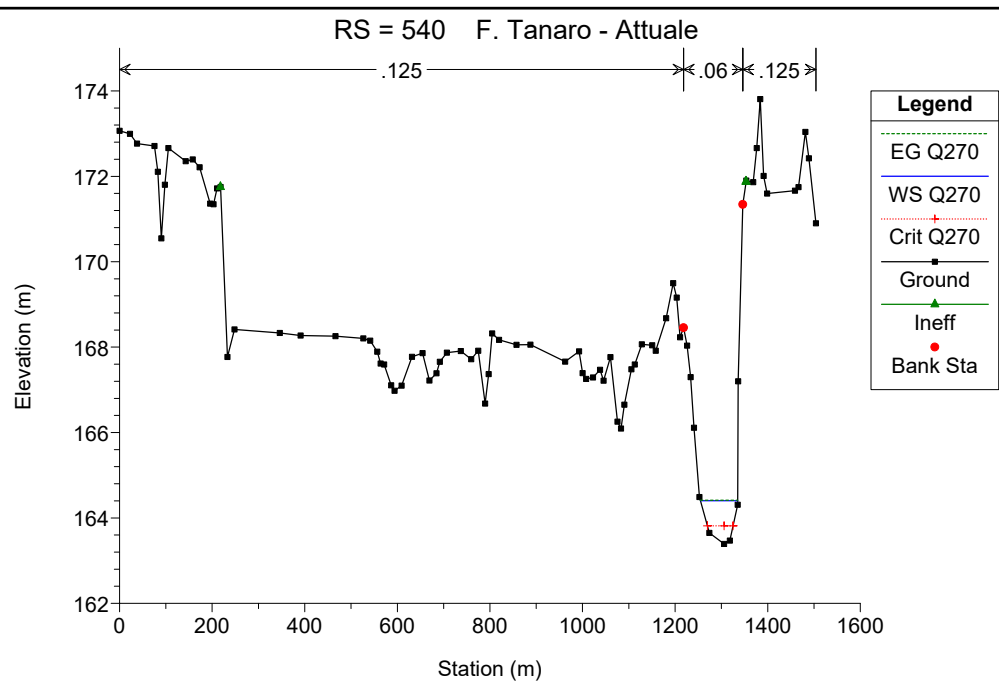
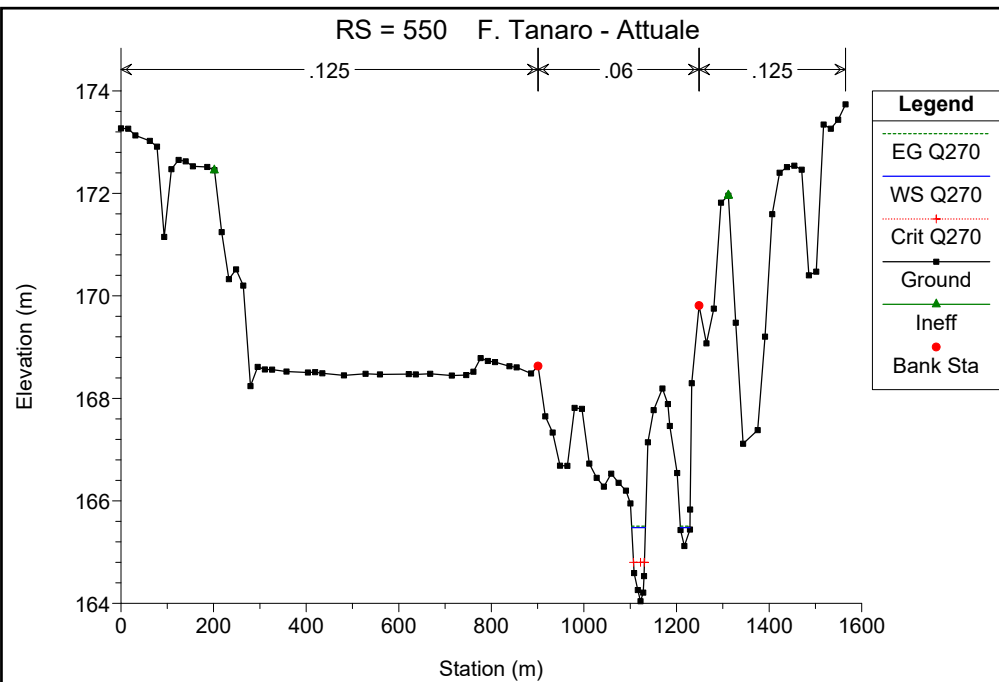
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Q270 (Continued)

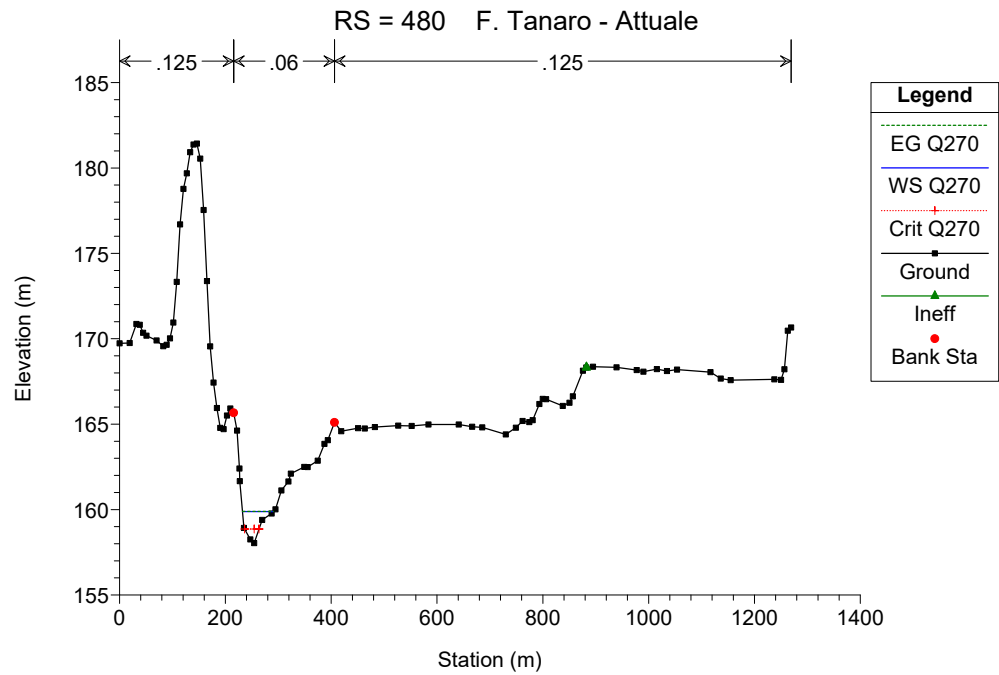
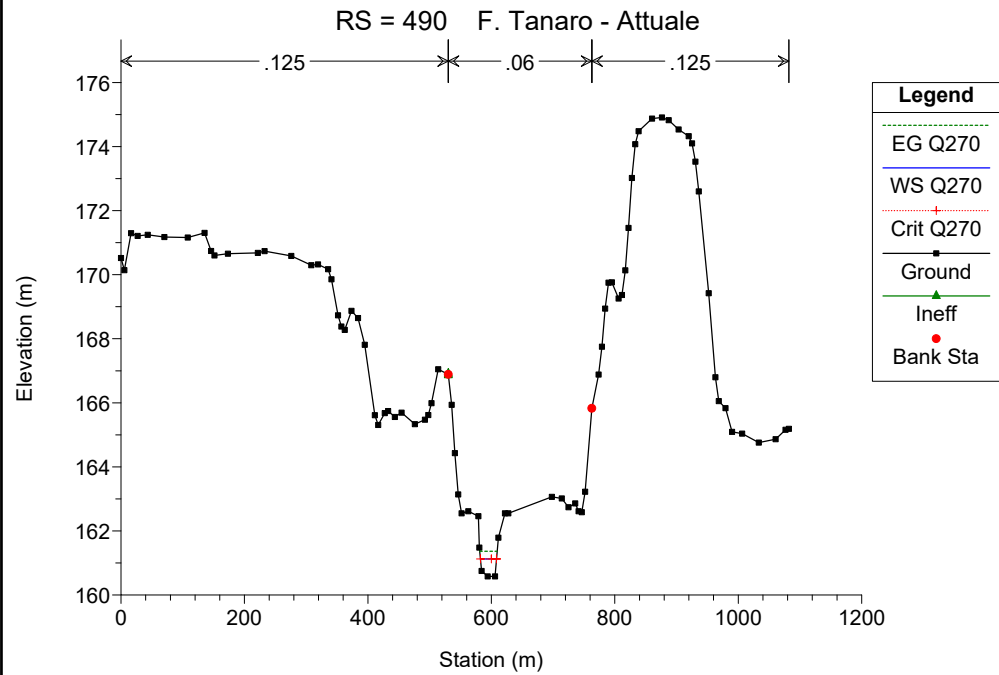
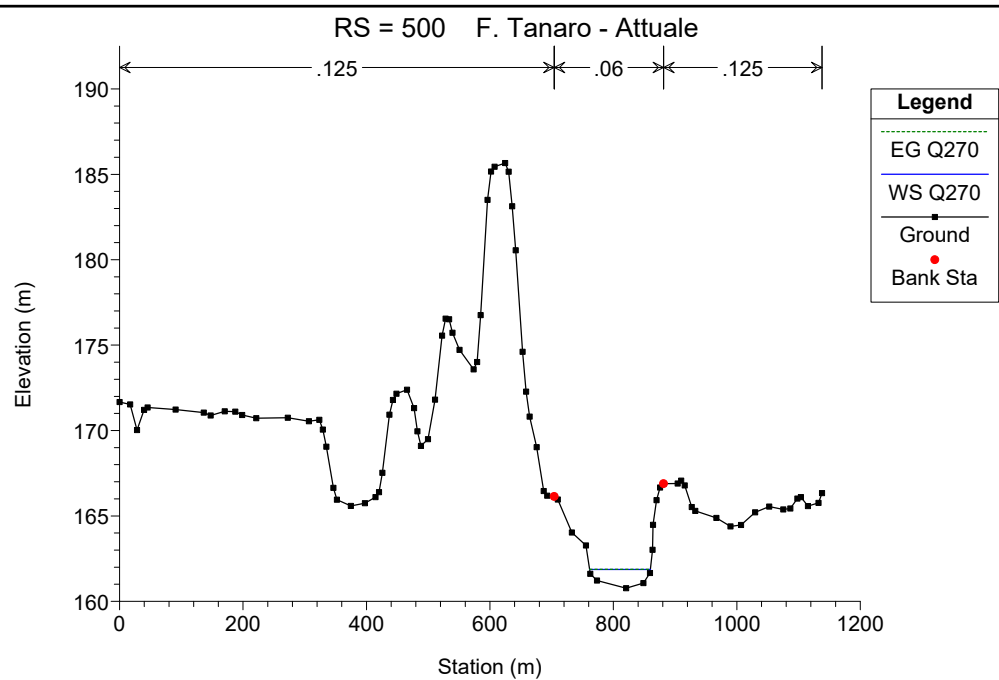
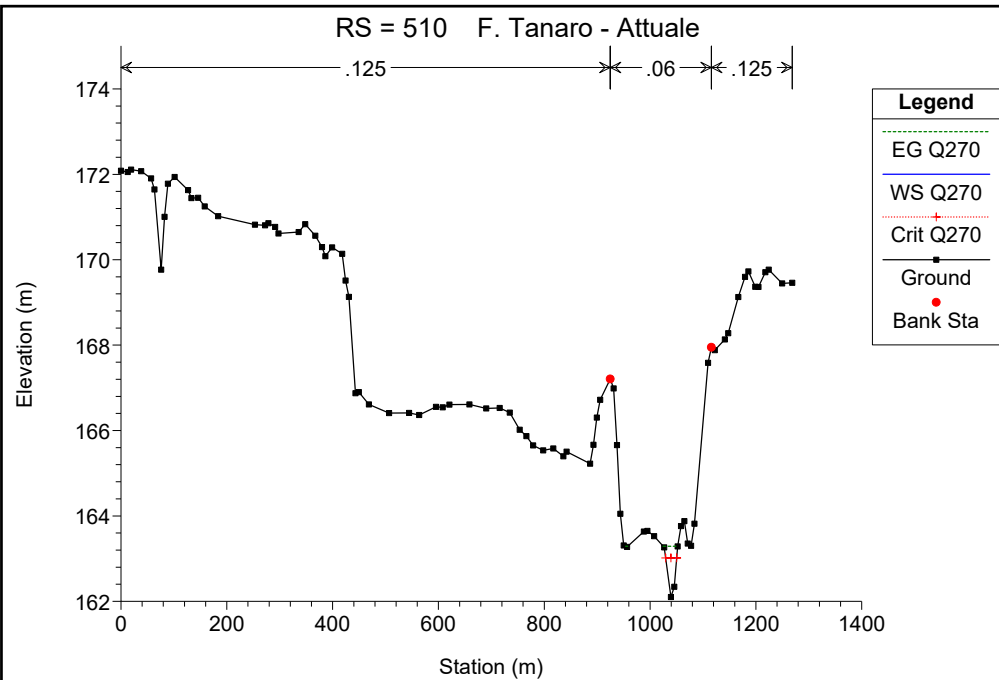
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	200	Q270	26.00	146.60	149.29	147.48	149.30	0.000184	0.24	106.36	94.04	0.07
1	190	Q270	26.00	146.85	149.27	147.42	149.27	0.000072	0.19	134.26	83.49	0.05
1	180	Q270	26.00	145.66	149.26	146.42	149.26	0.000011	0.08	331.94	191.09	0.02
1	170	Q270	26.00	145.40	149.26	146.00	149.26	0.000004	0.06	402.91	154.00	0.01
1	160	Q270	26.00	145.46	149.26	145.78	149.26	0.000003	0.06	464.21	187.31	0.01
1	150	Q270	26.00	143.53	149.26	144.24	149.26	0.000001	0.05	558.18	158.23	0.01
1	140	Q270	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	Q270	26.00	142.54	143.61	143.12	143.62	0.002246	0.59	44.20	68.72	0.23
1	120	Q270	26.00	142.27	143.05	142.64	143.06	0.001774	0.48	53.70	93.59	0.20
1	110	Q270	26.00	141.17	142.62	141.87	142.64	0.001588	0.58	44.59	54.09	0.20
1	100	Q270	26.00	140.79	142.21	141.51	142.22	0.001750	0.61	42.42	51.36	0.22
1	90	Q270	26.00	140.59	141.88	141.10	141.89	0.000760	0.42	61.74	70.00	0.14
1	85		Bridge									
1	80	Q270	26.00	140.59	141.64	141.10	141.66	0.001841	0.57	45.81	64.55	0.22
1	70	Q270	26.00	139.61	140.04	140.04	140.22	0.049886	1.85	14.07	40.17	1.00
1	60	Q270	26.00	138.12	139.28	138.56	139.29	0.001023	0.45	57.70	74.07	0.16
1	50	Q270	26.00	137.54	138.97	138.19	139.00	0.001817	0.71	36.56	36.28	0.23
1	40	Q270	26.00	137.06	138.63	137.63	138.64	0.000737	0.48	54.47	50.07	0.15
1	30	Q270	26.00	137.37	138.33	137.80	138.34	0.001839	0.52	49.56	78.74	0.21
1	20	Q270	26.00	136.62	137.56	137.22	137.58	0.003428	0.64	40.87	77.52	0.28
1	10	Q270	26.00	135.29	136.38	135.85	136.42	0.004005	0.90	28.78	36.01	0.32

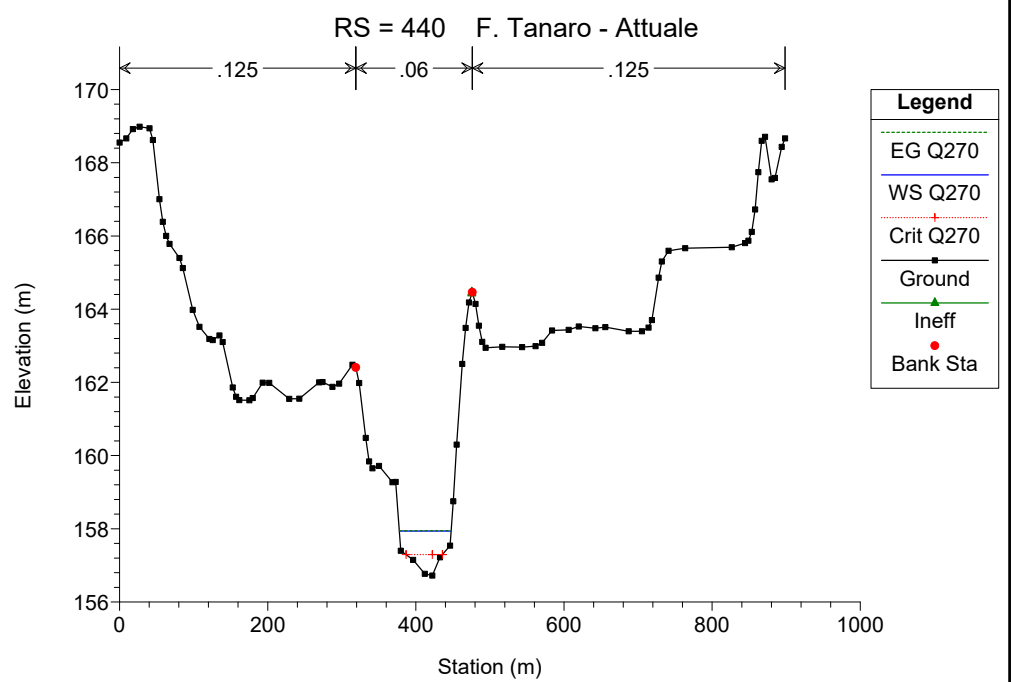
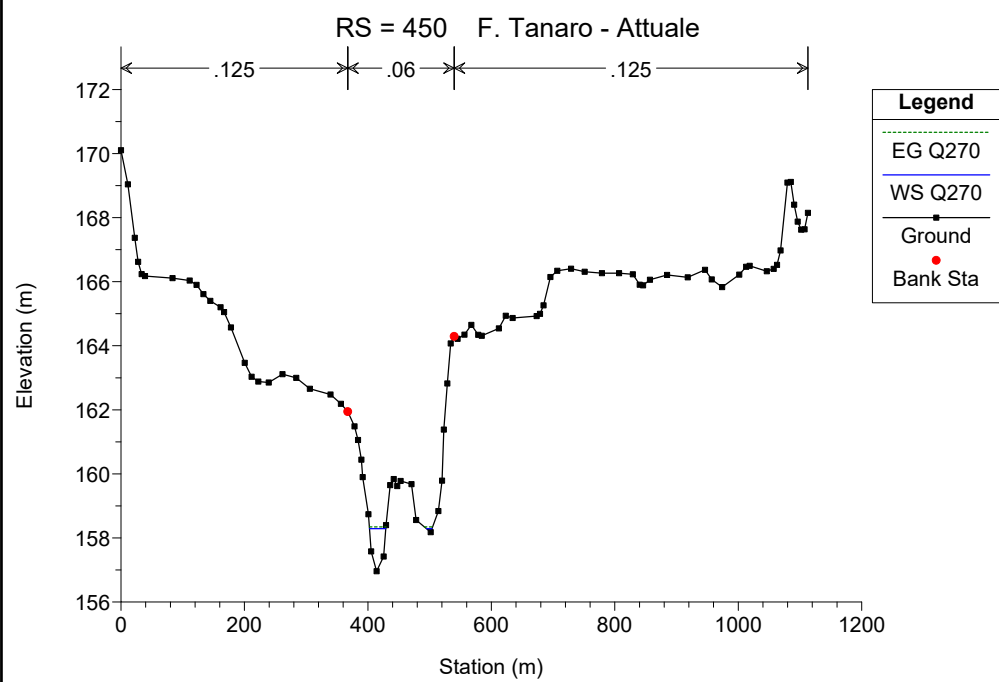
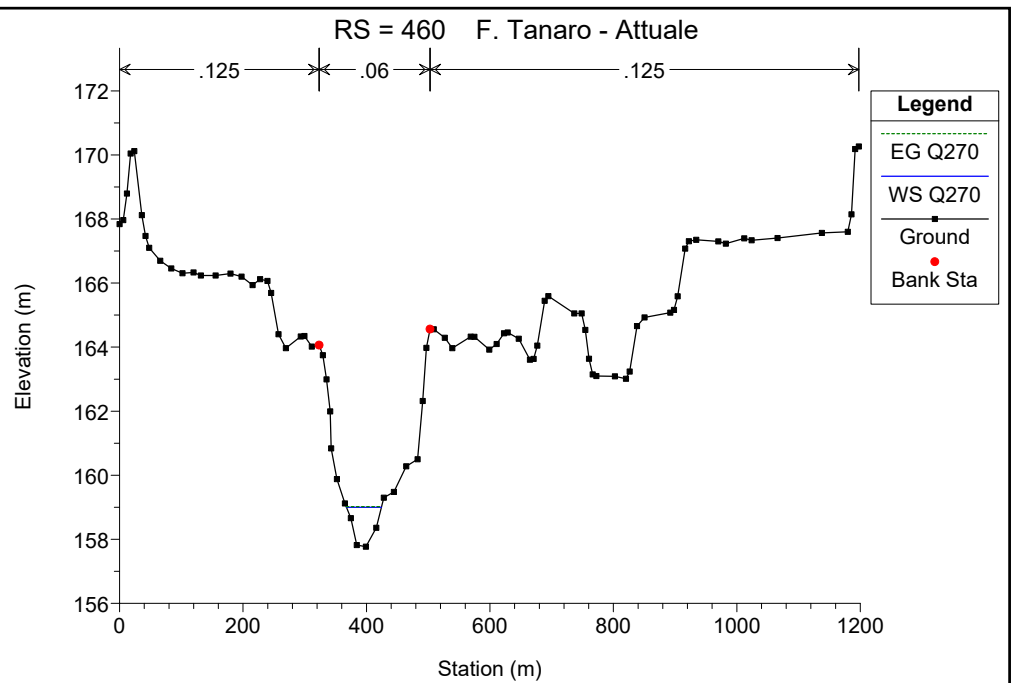
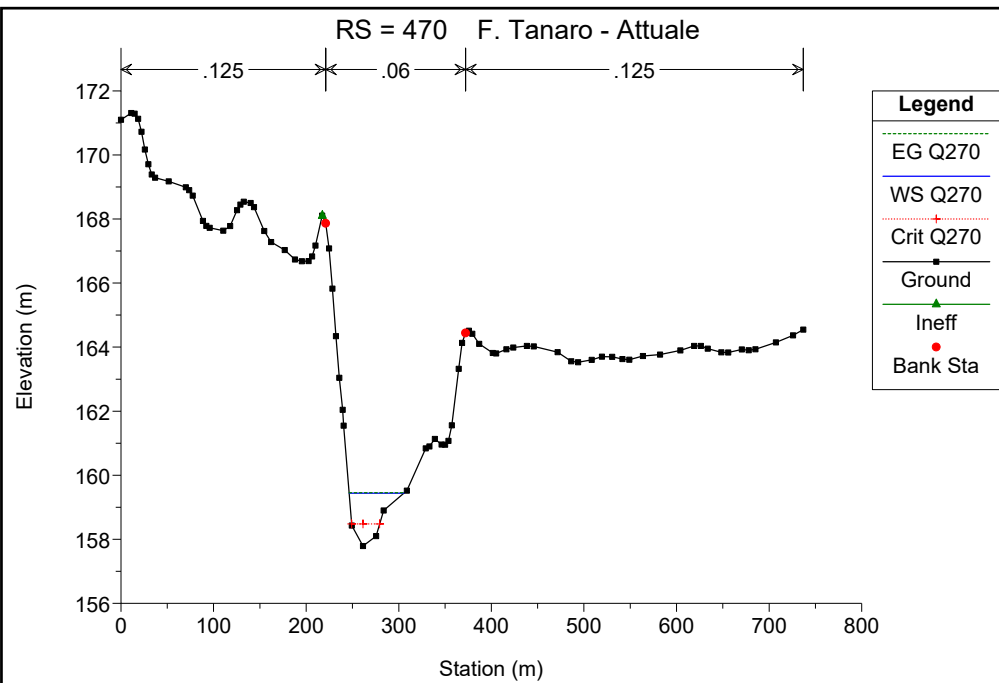
F. Tanaro - Attuale

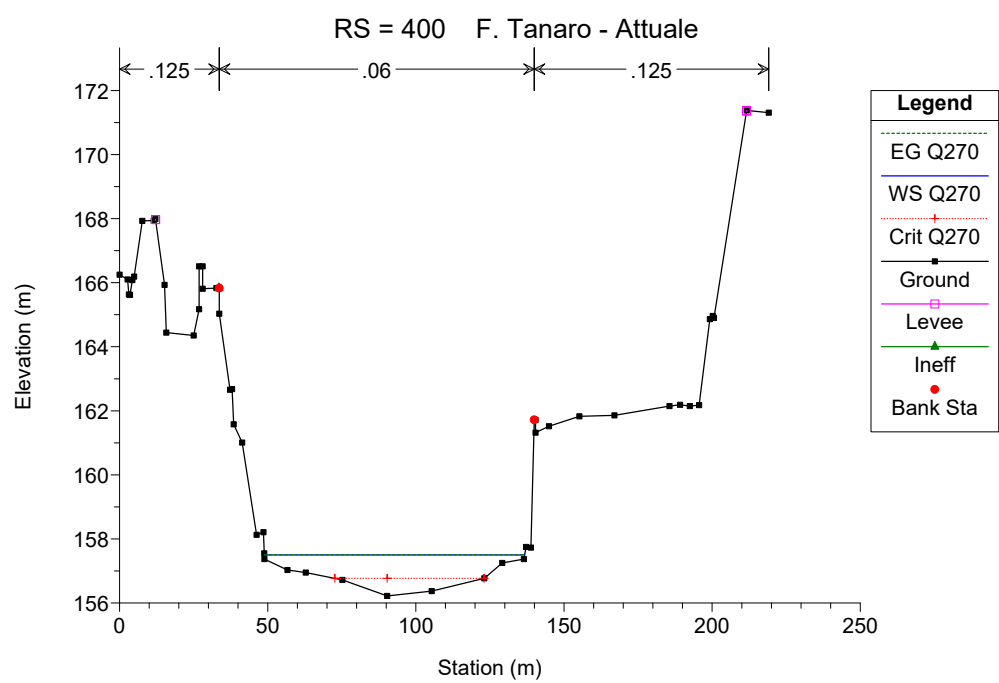
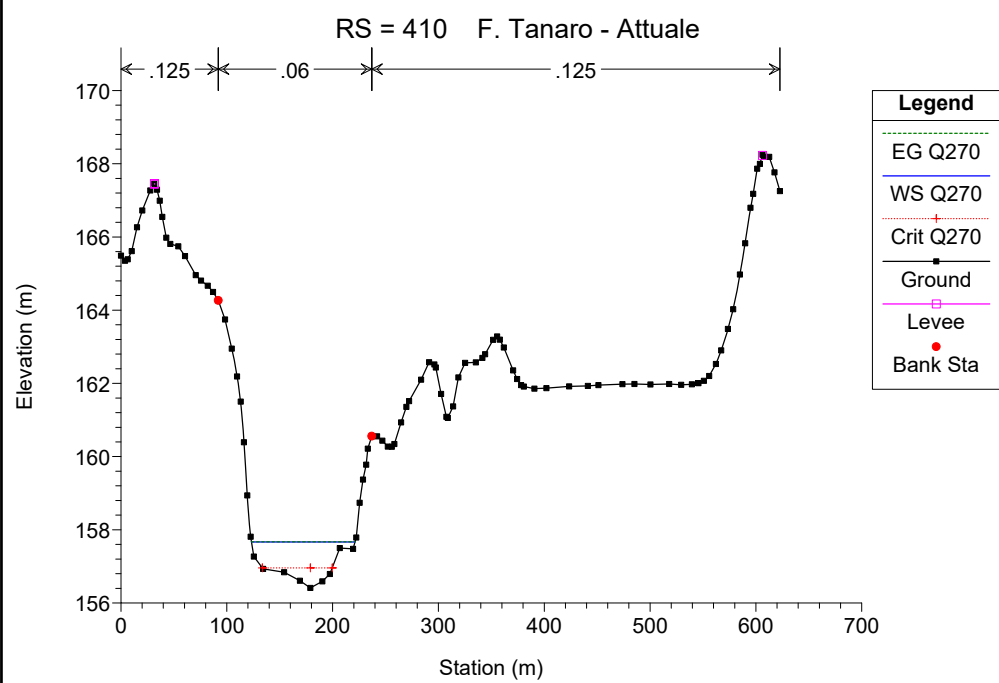
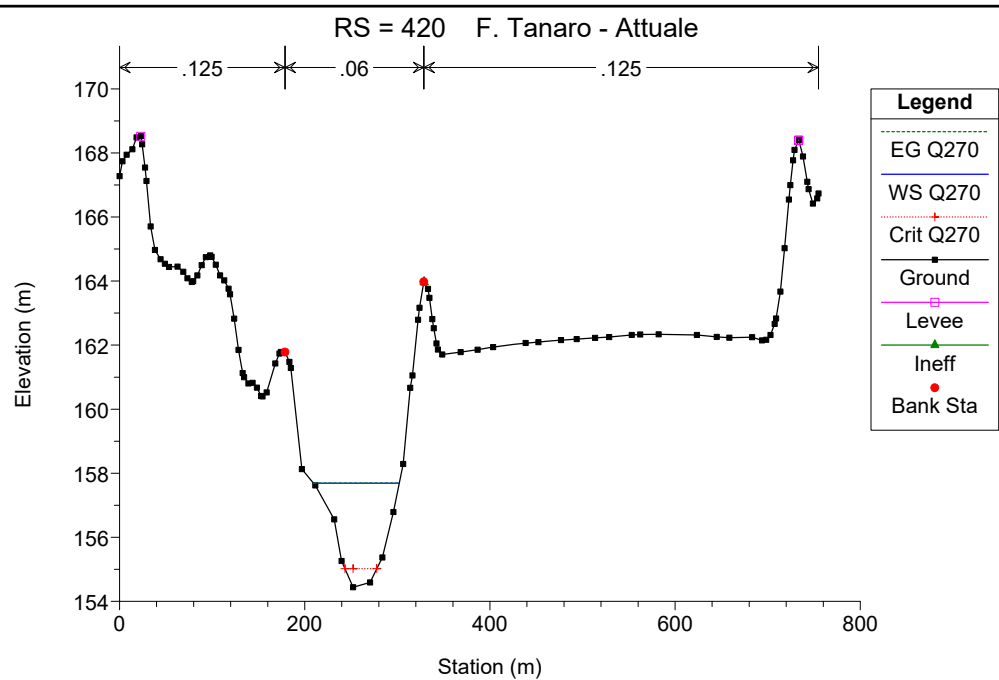
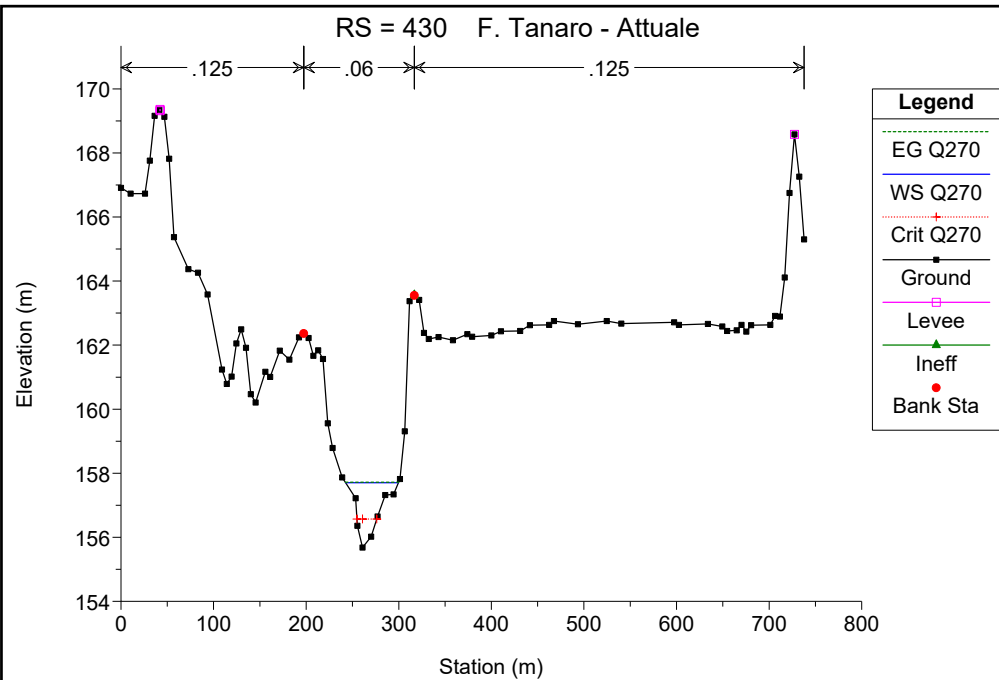
Tanaro 1

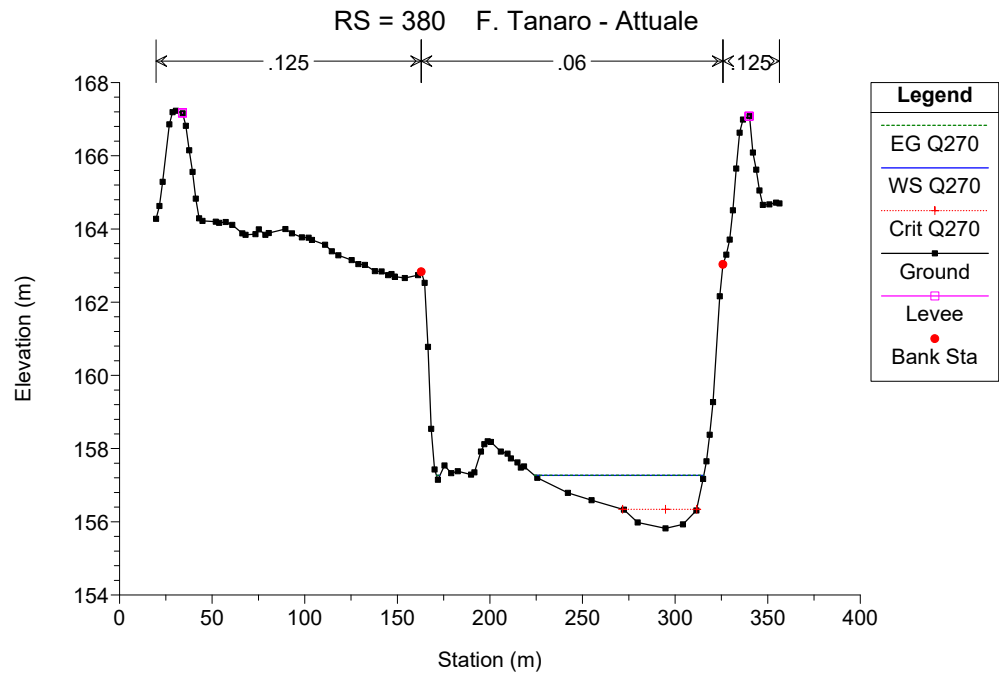
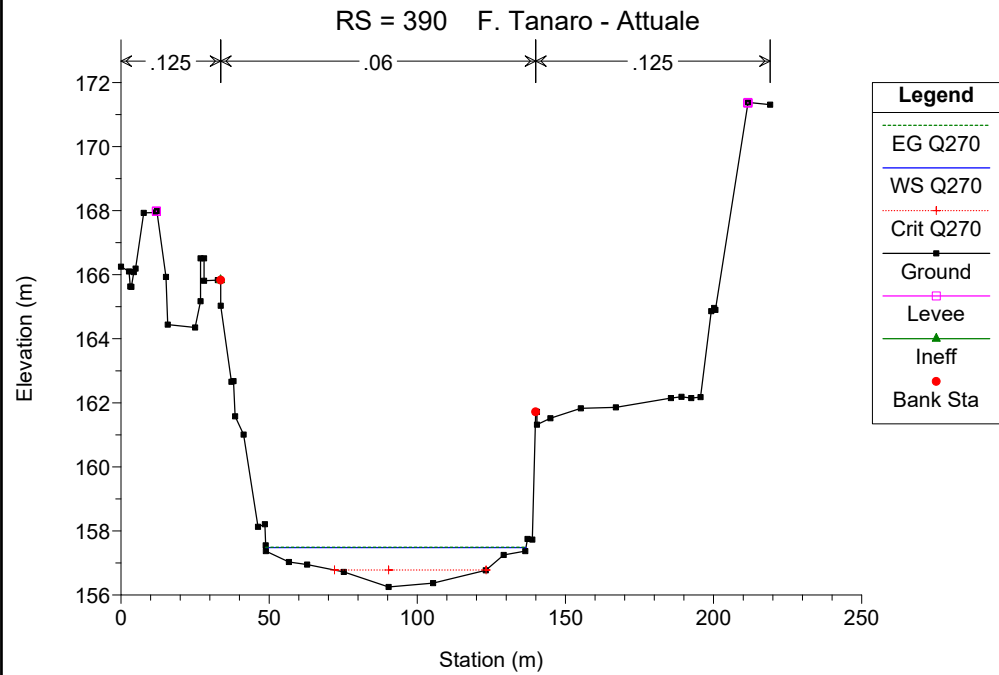
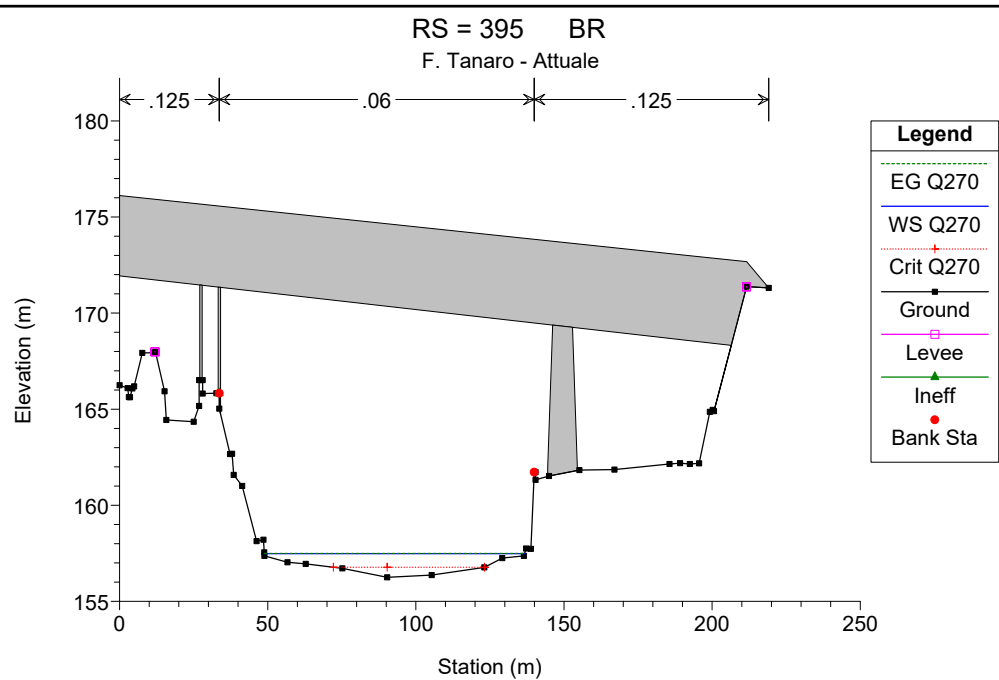
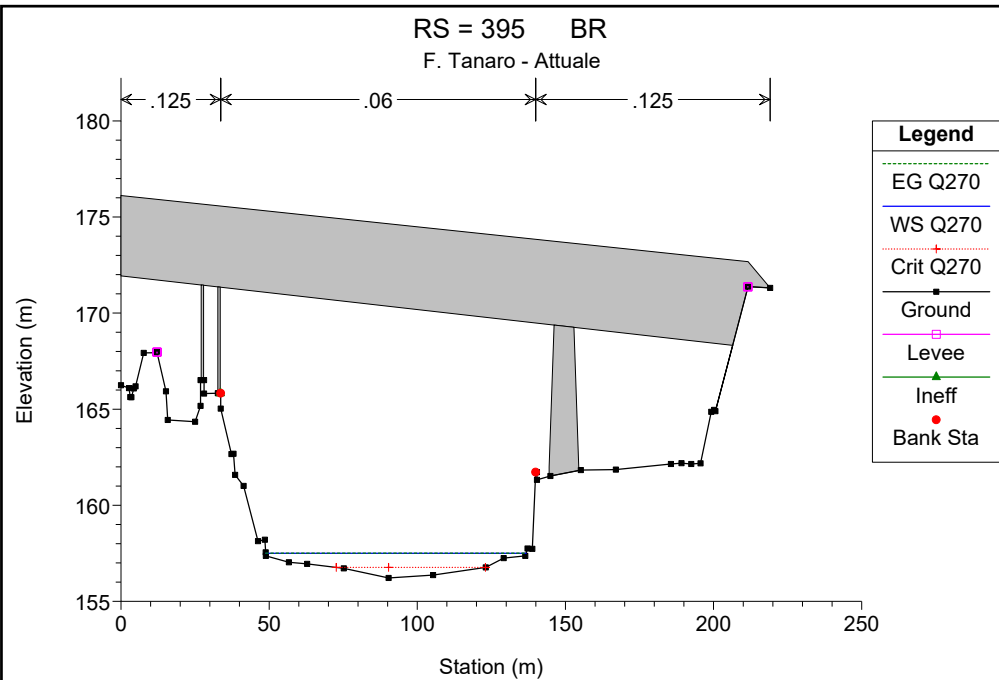


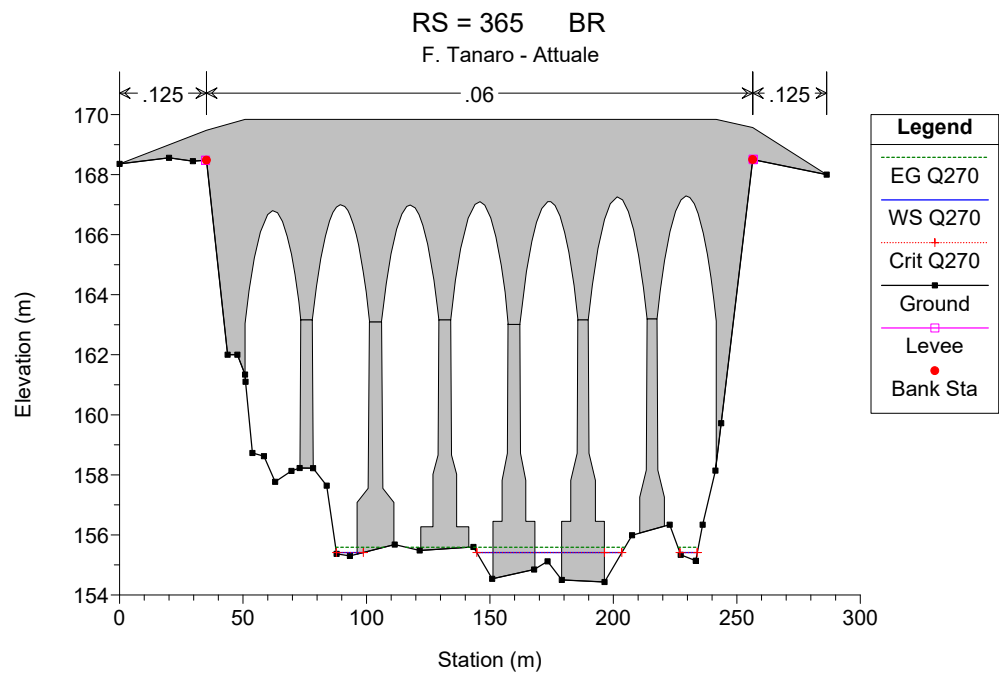
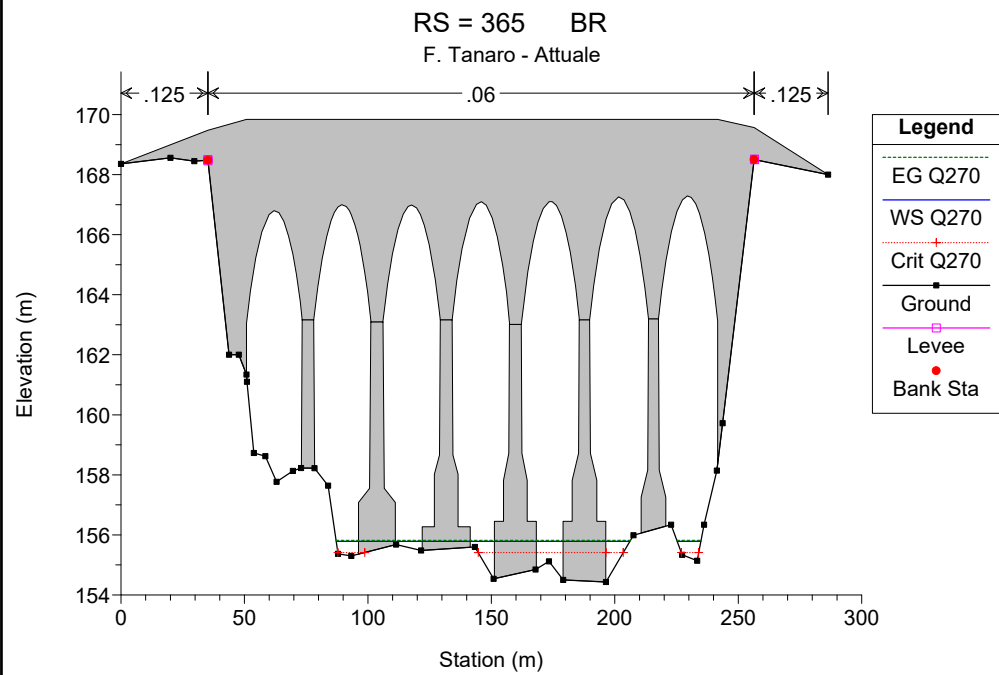
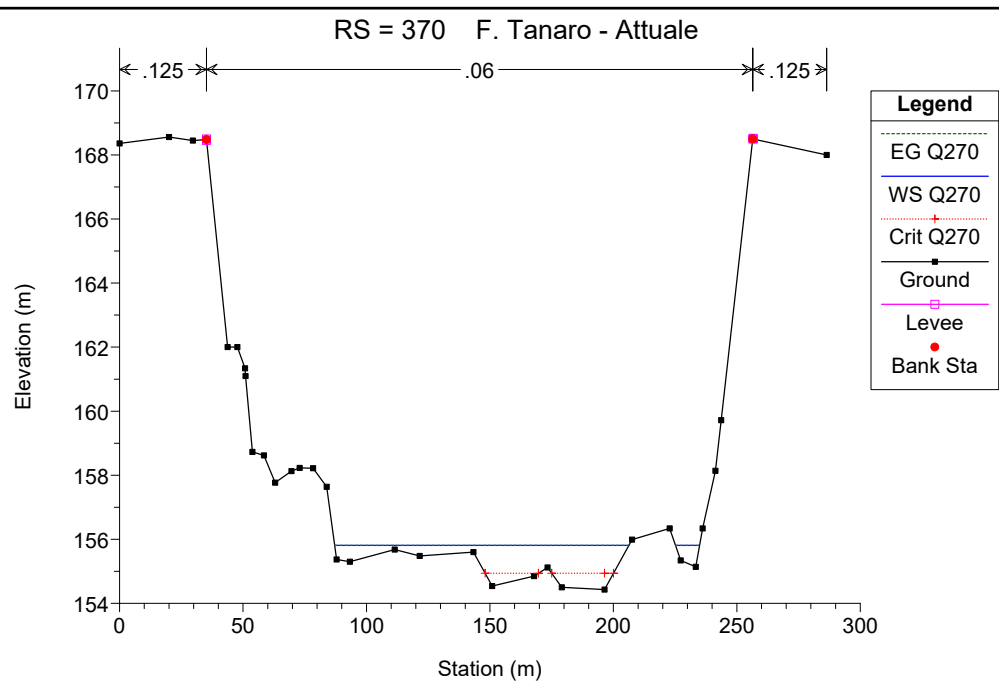
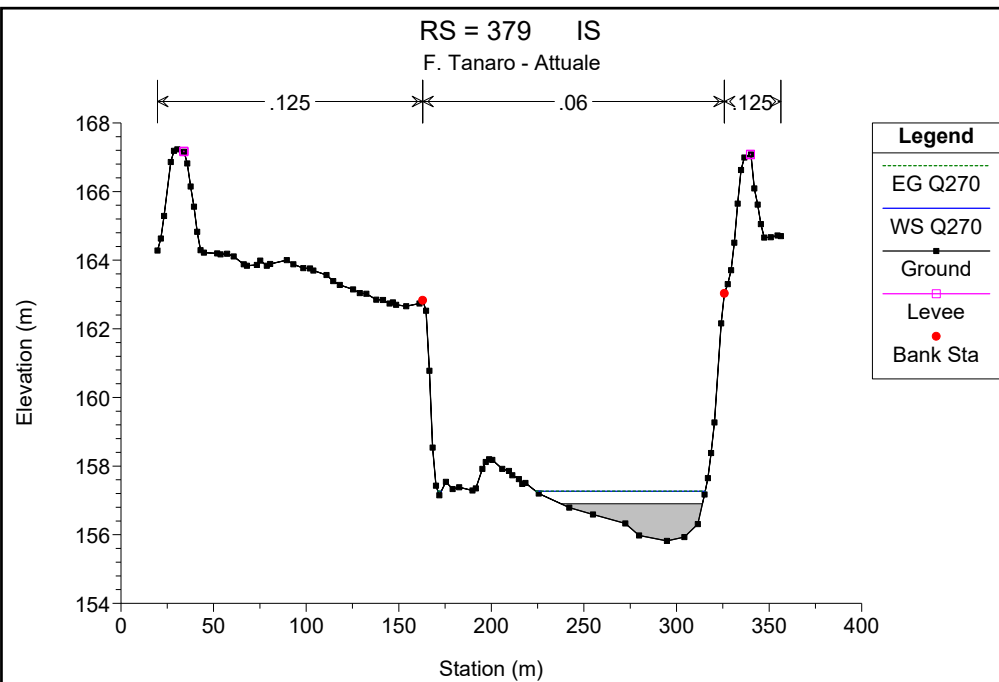


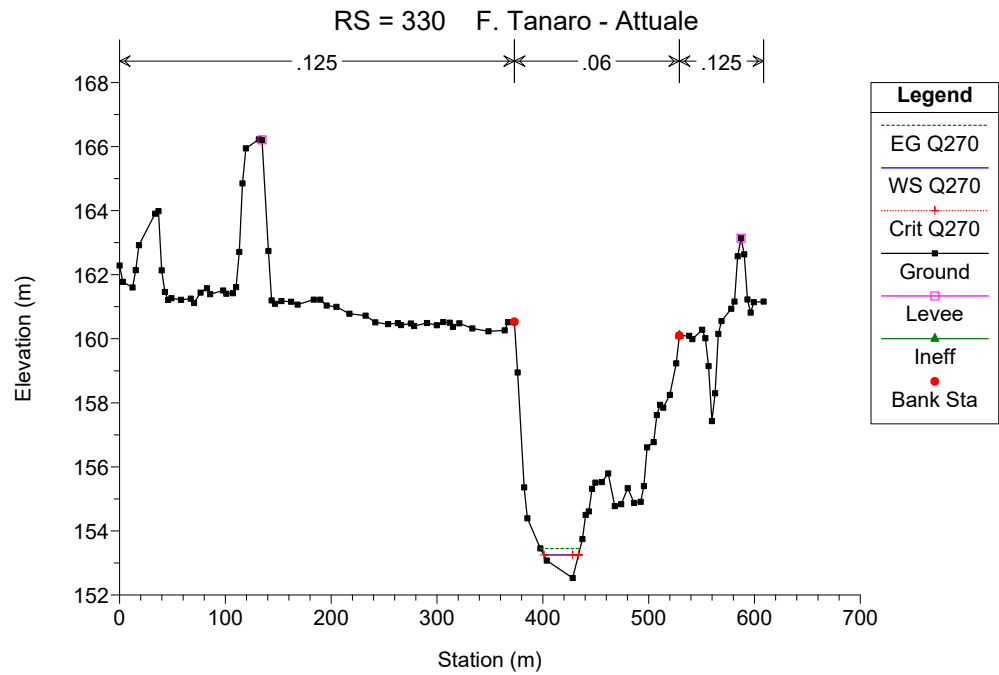
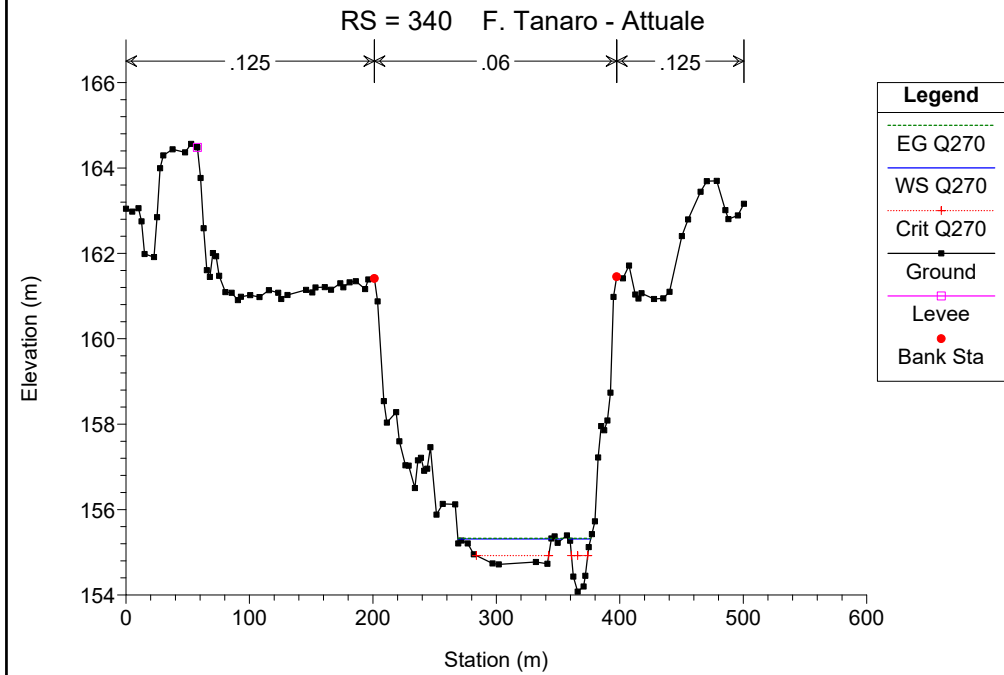
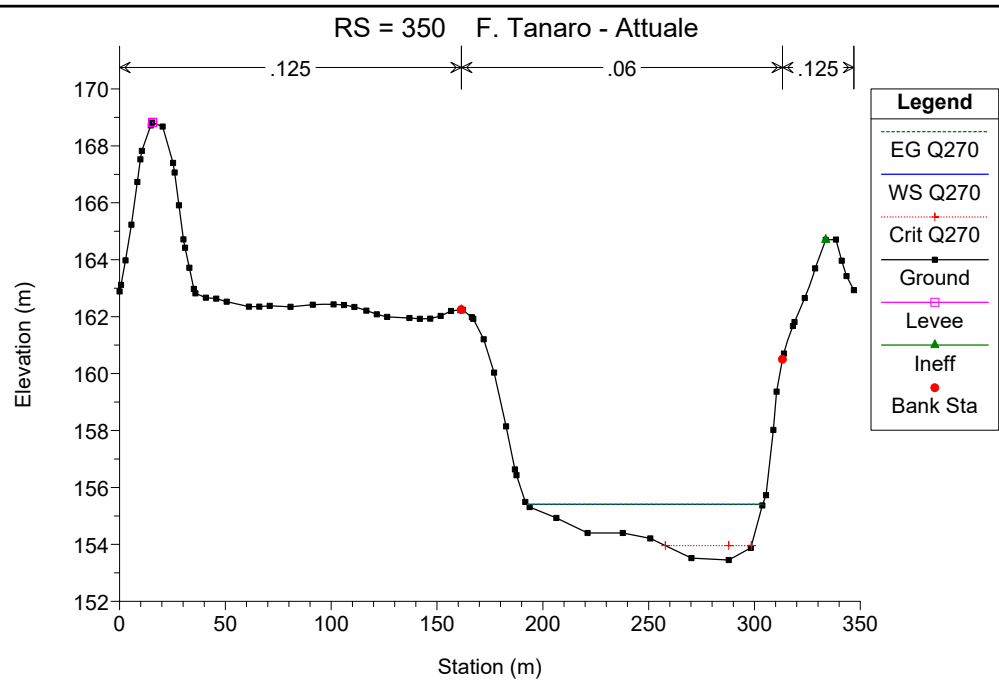
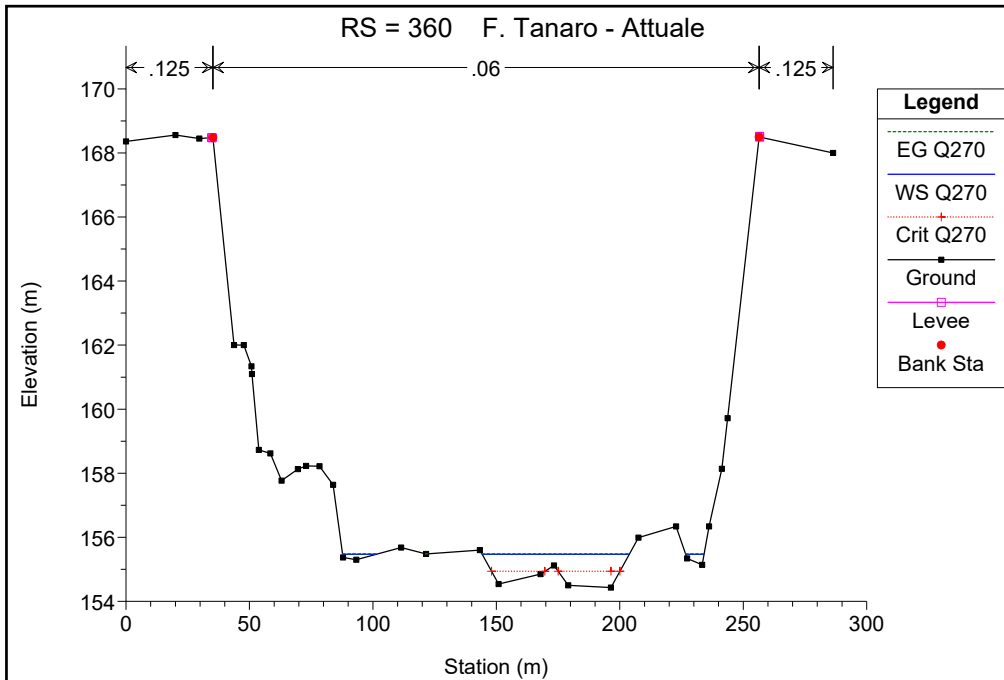


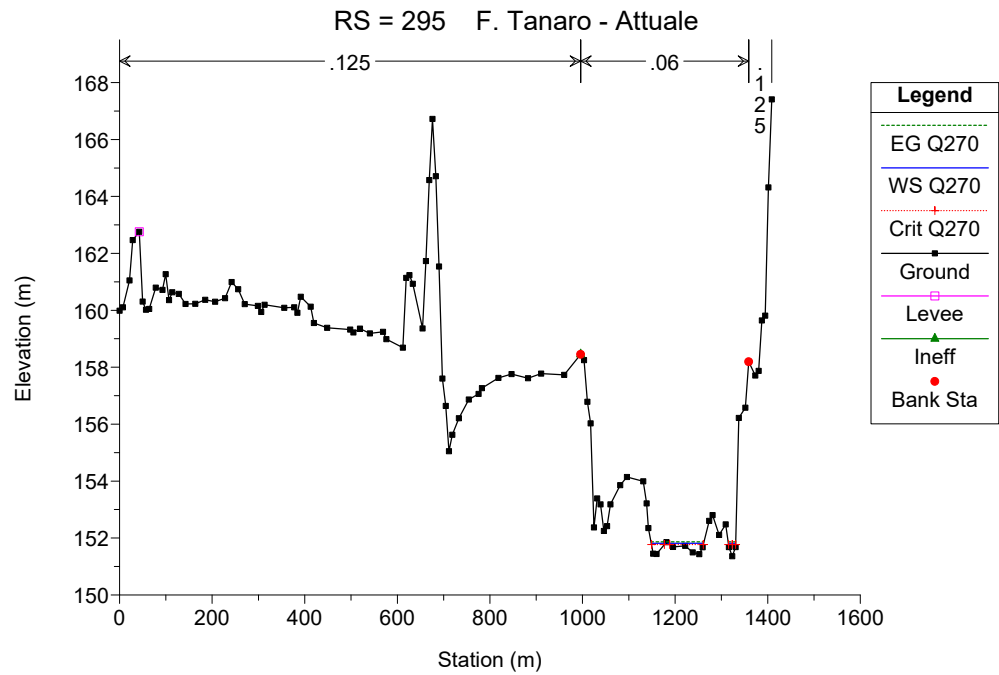
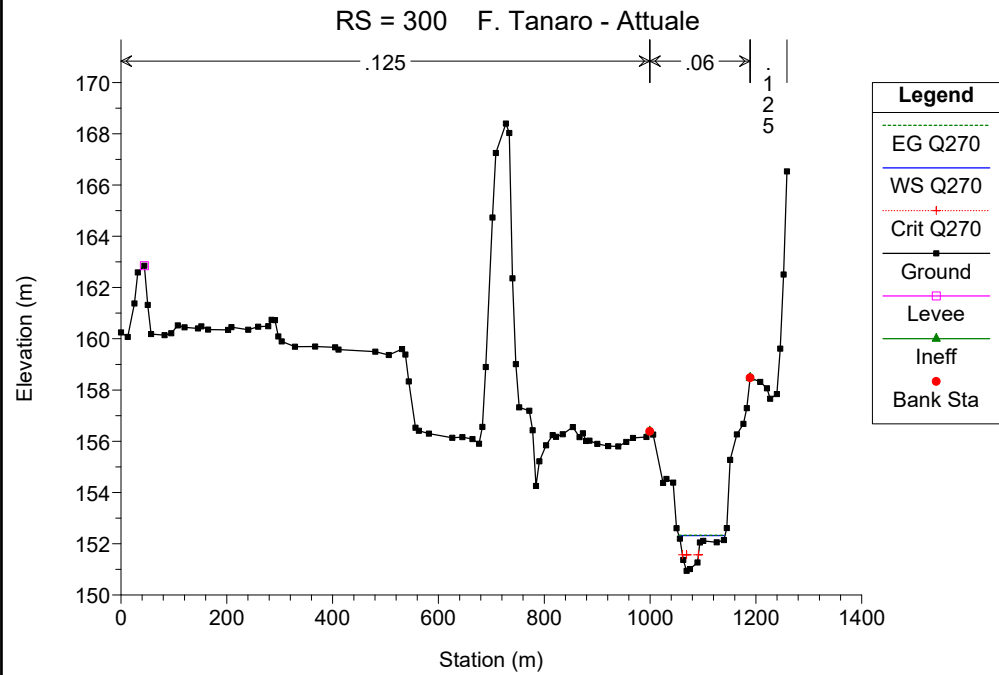
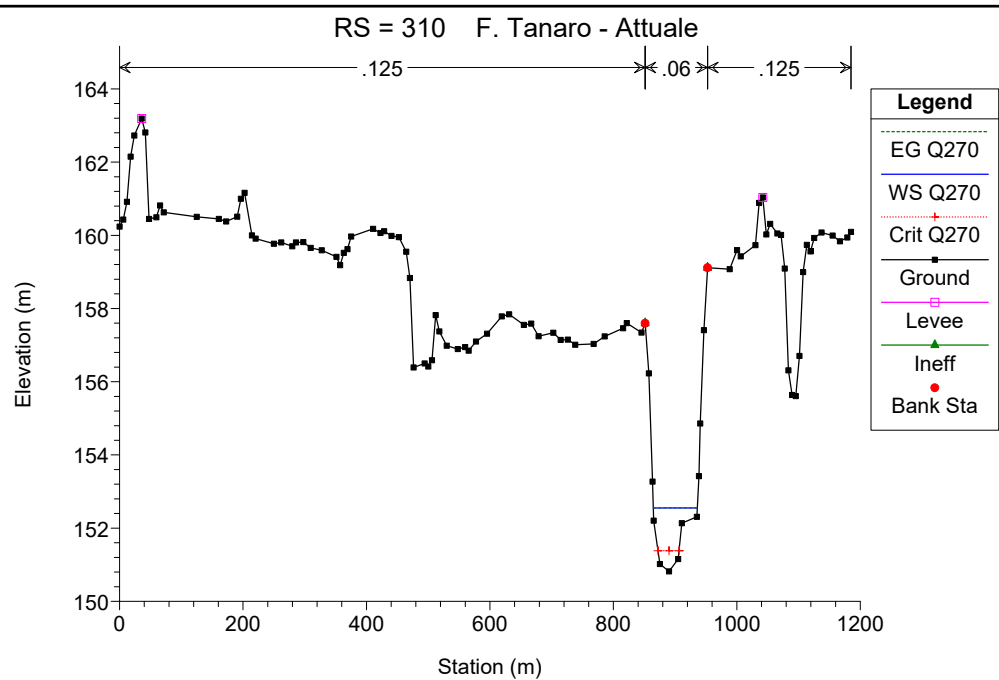
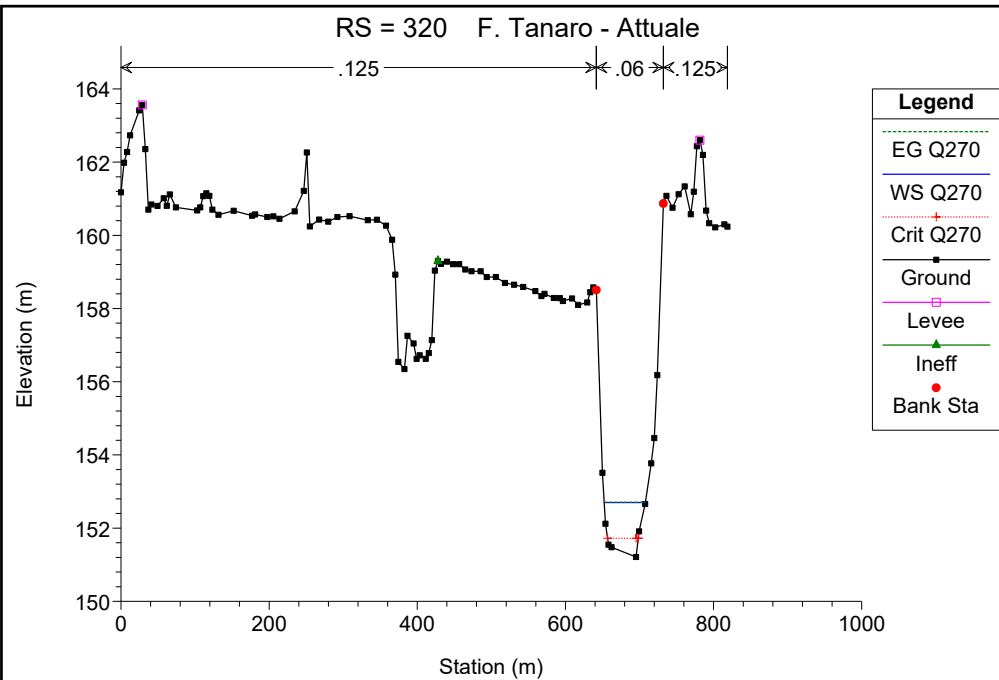


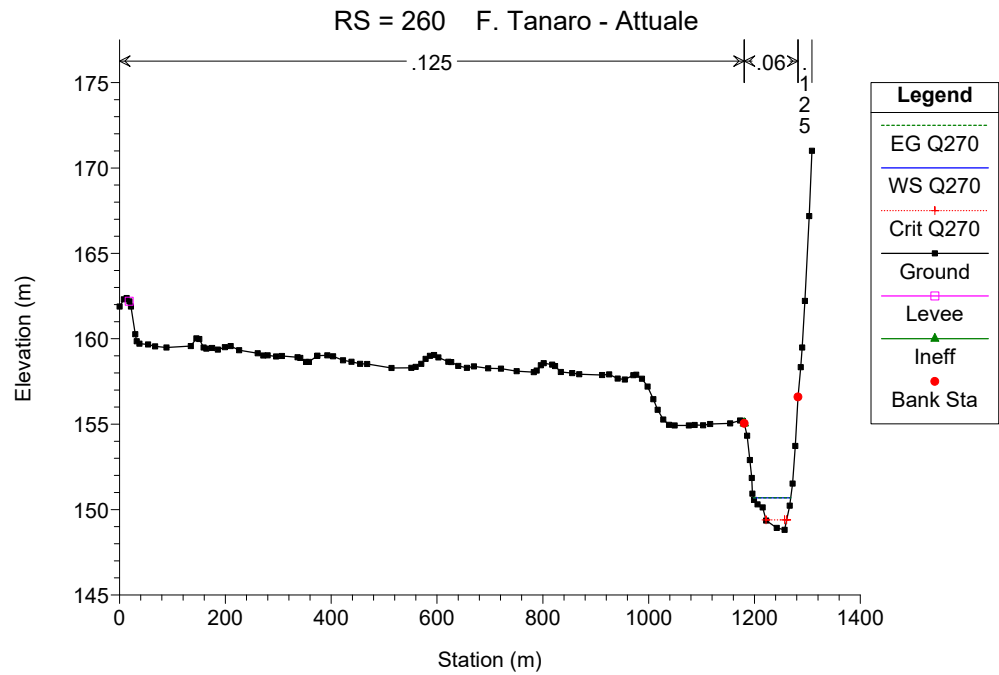
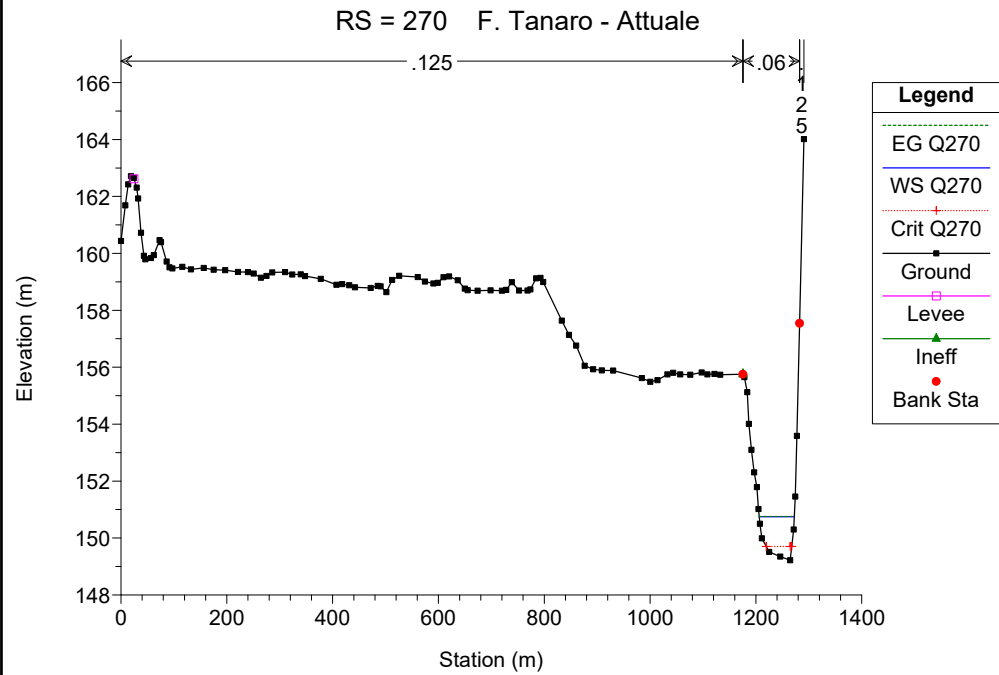
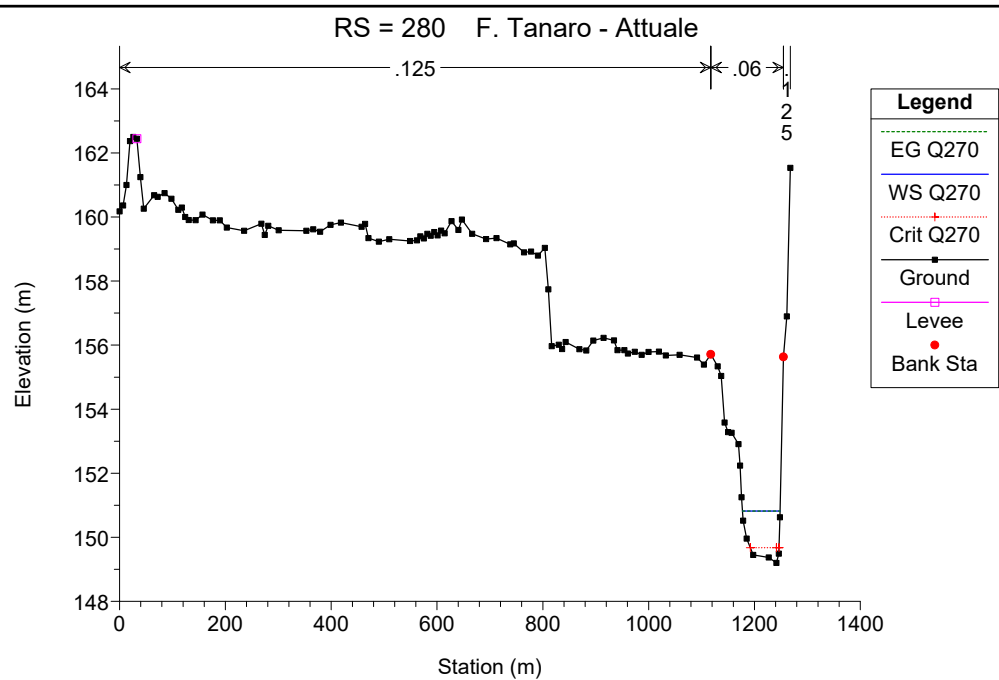
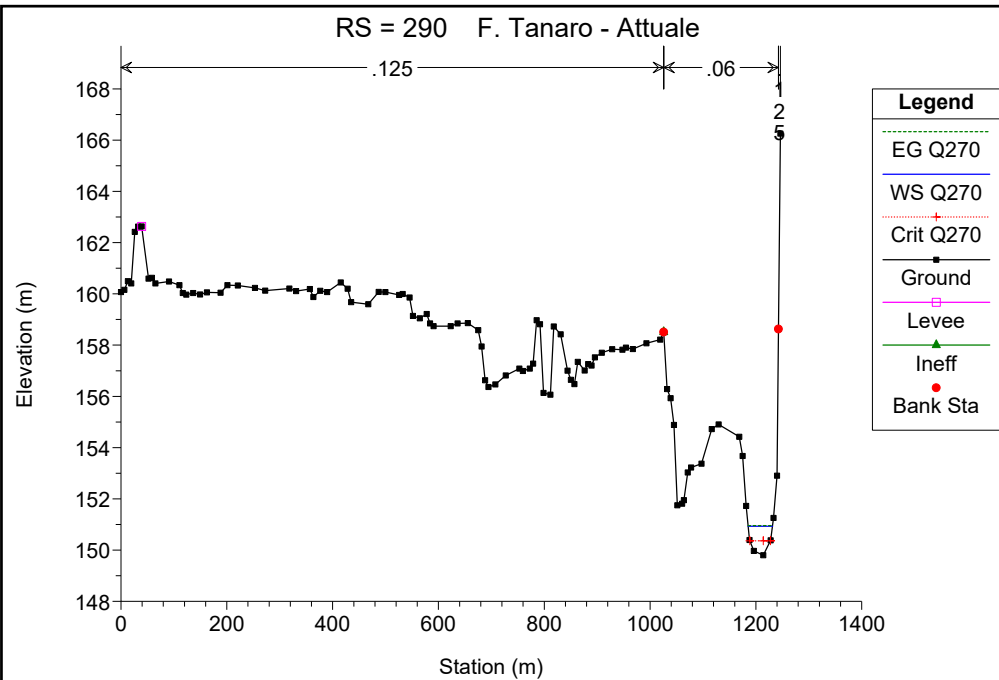


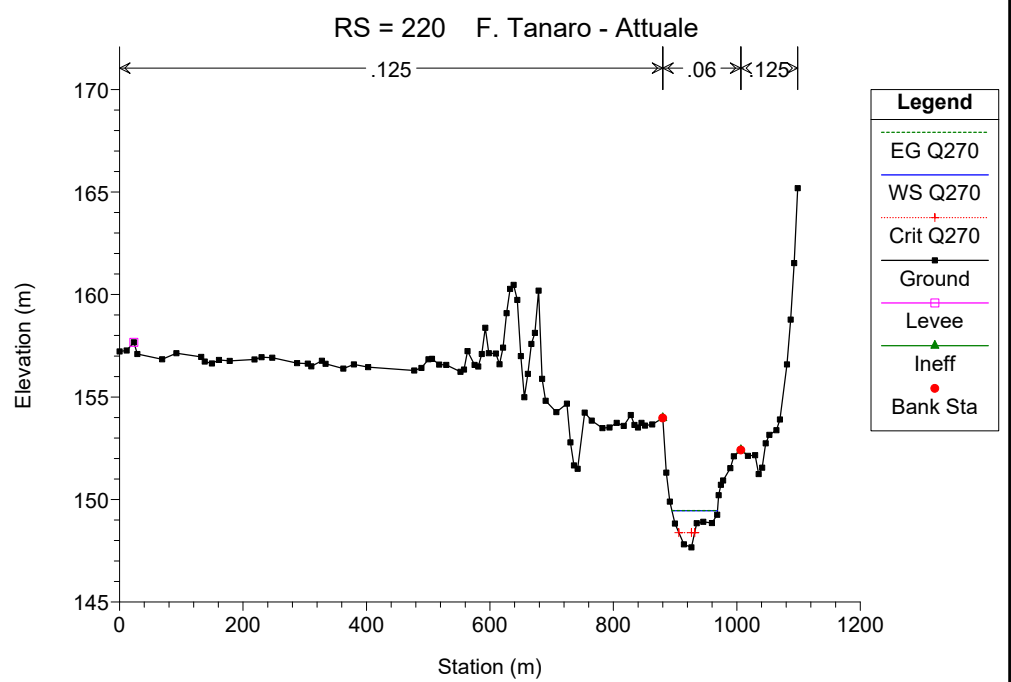
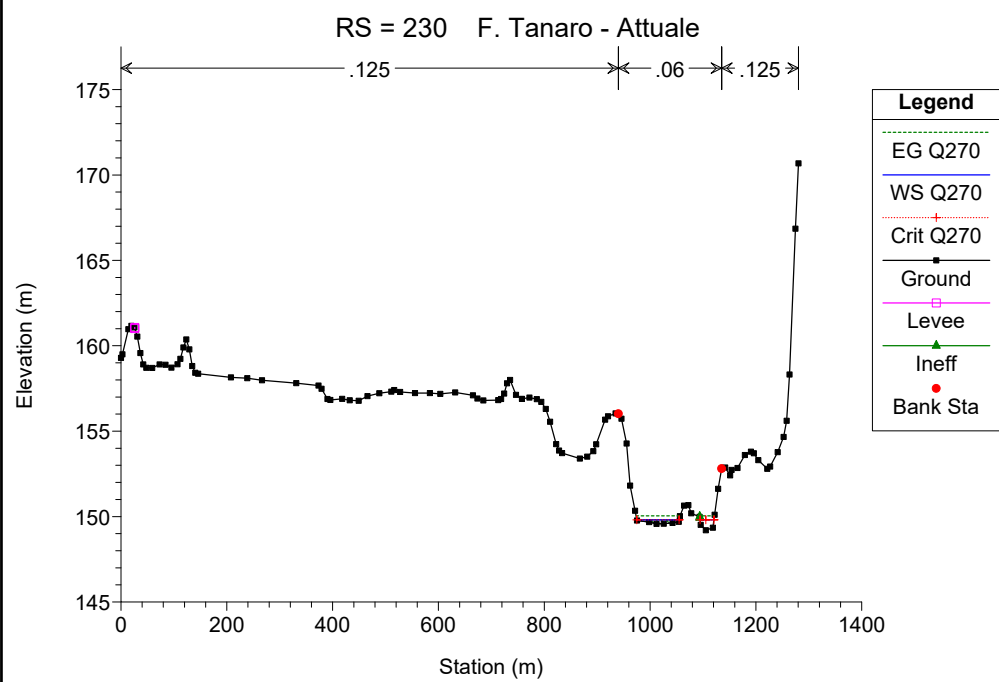
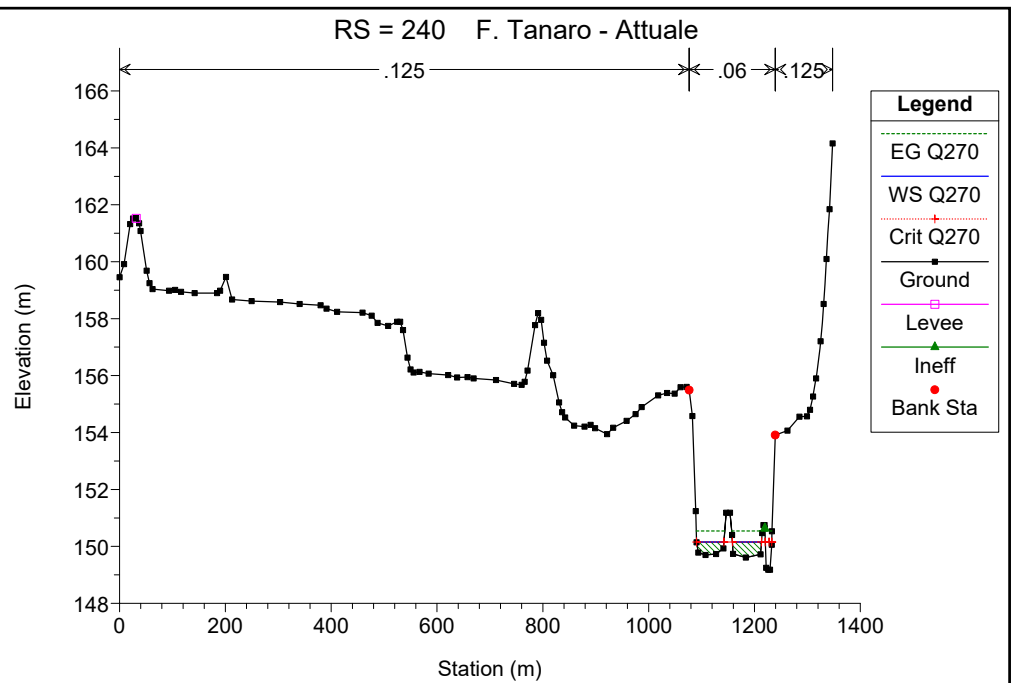
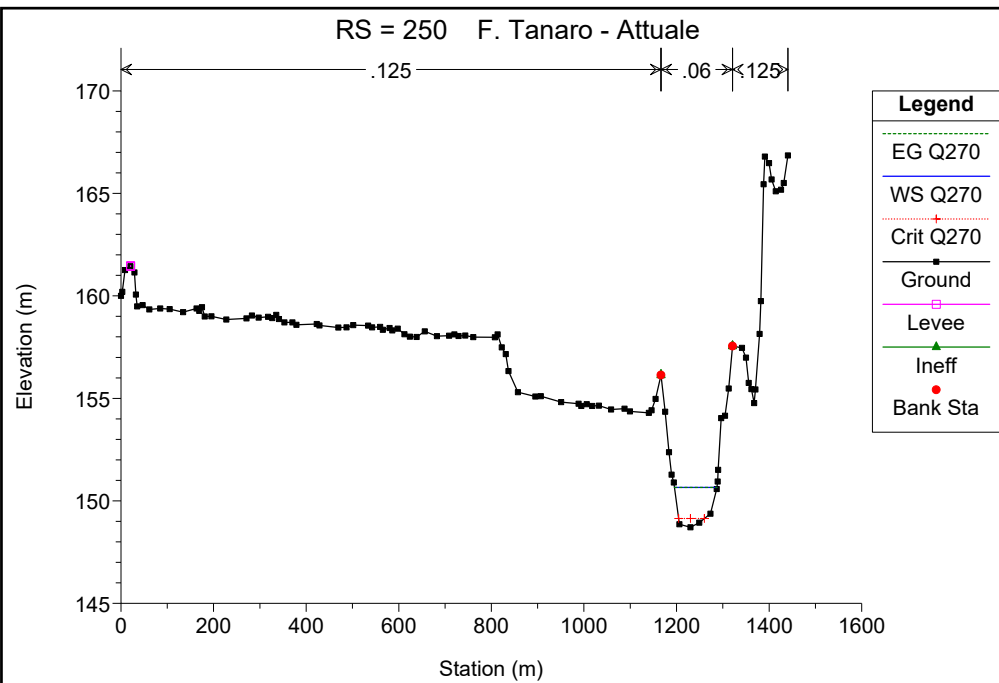


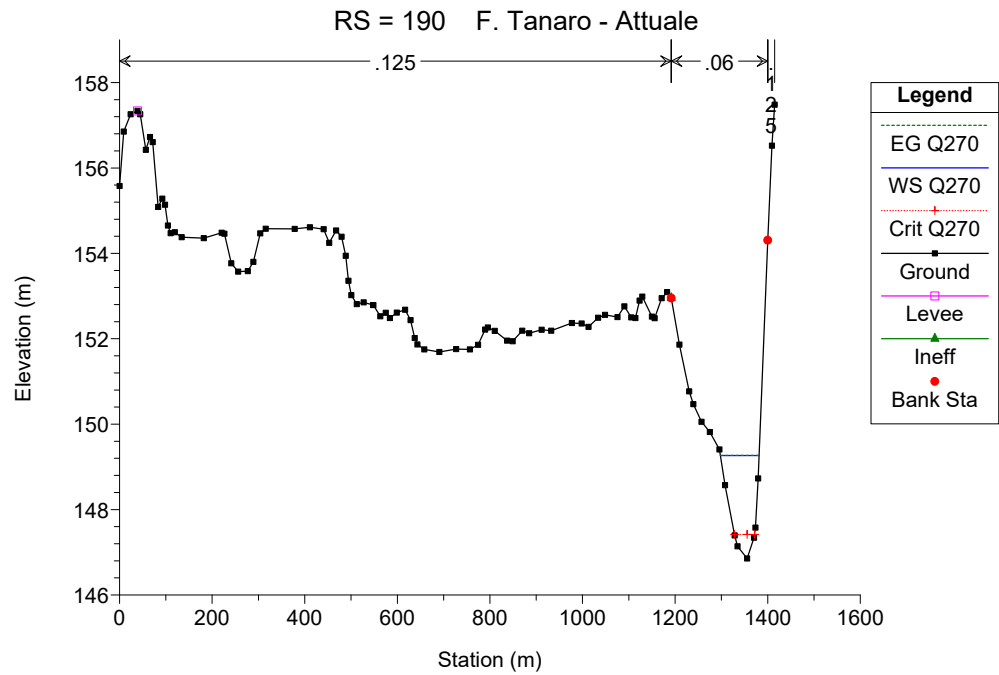
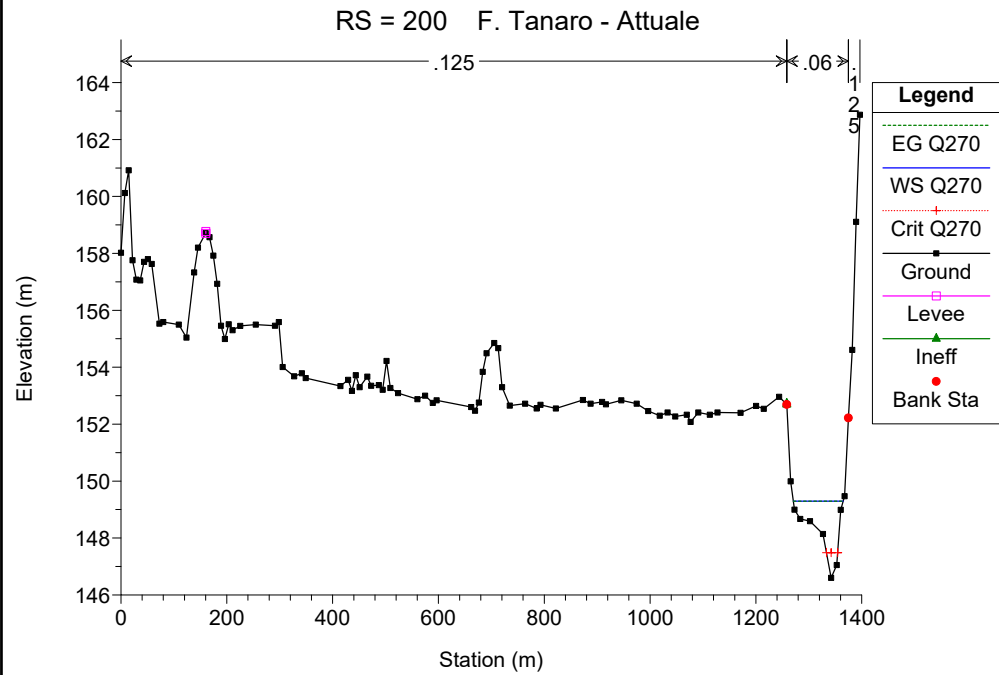
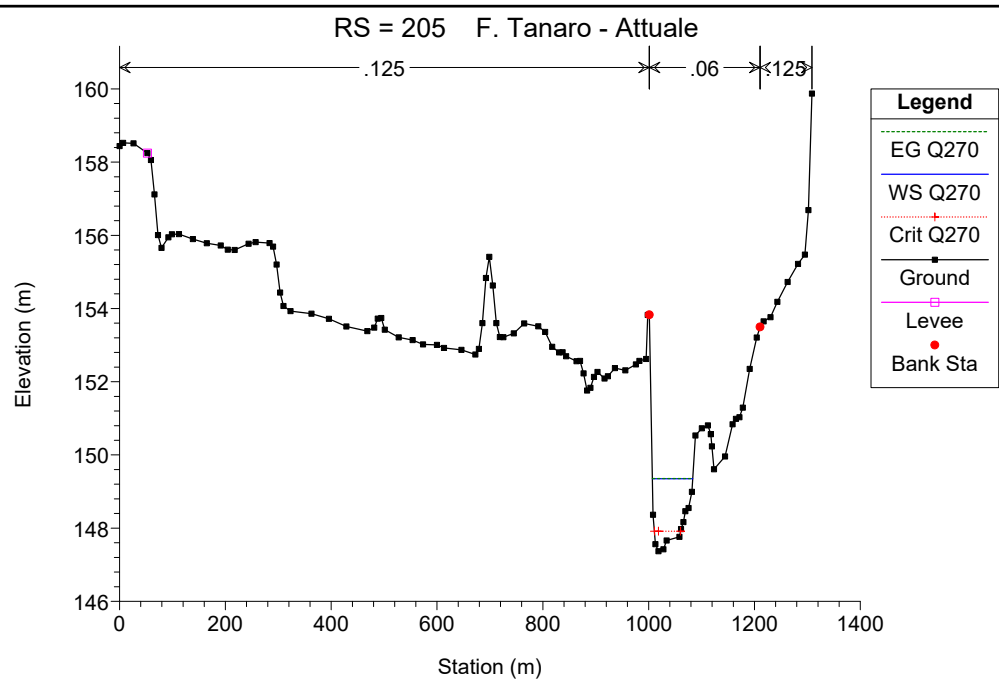
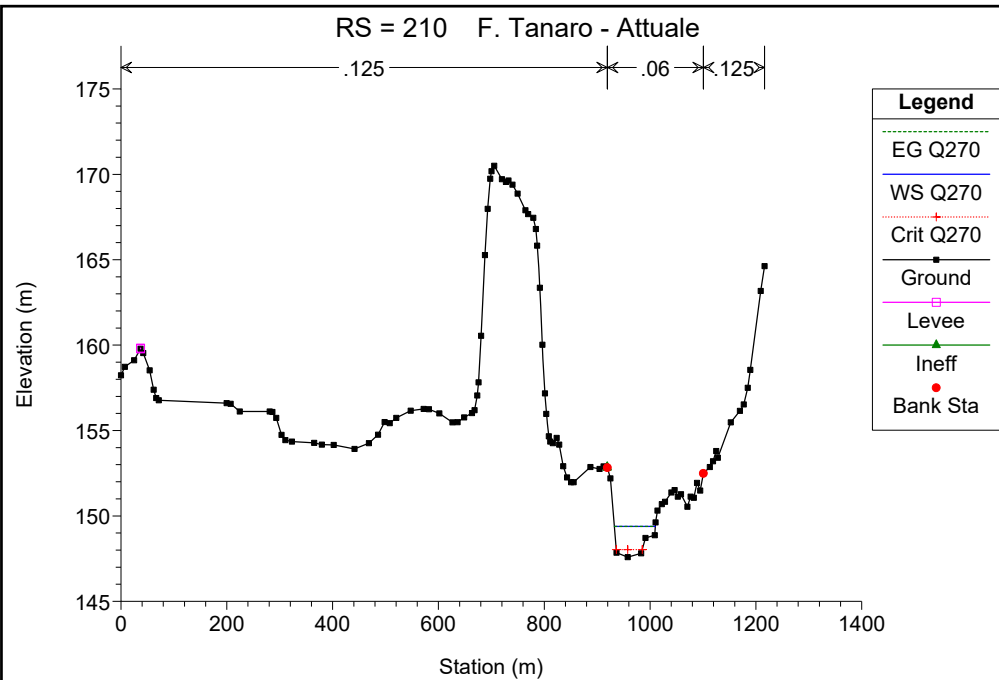


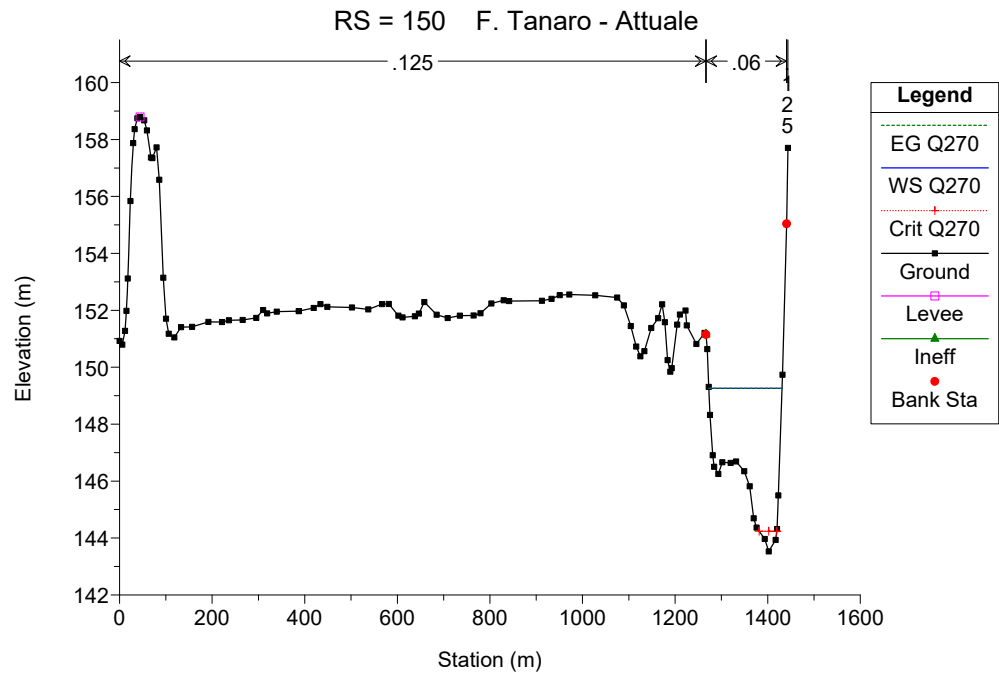
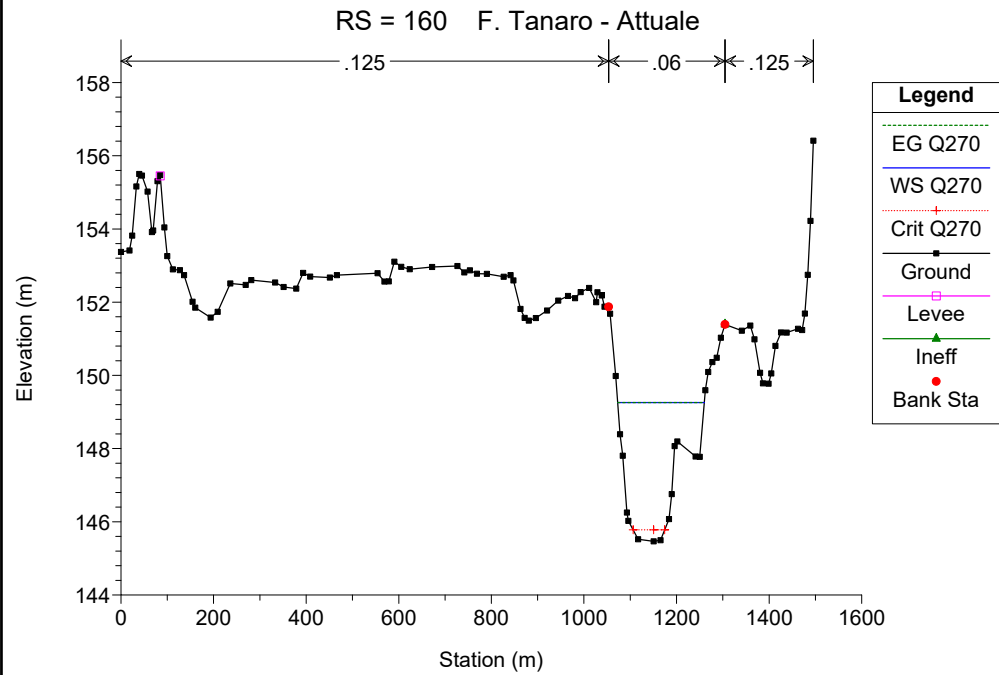
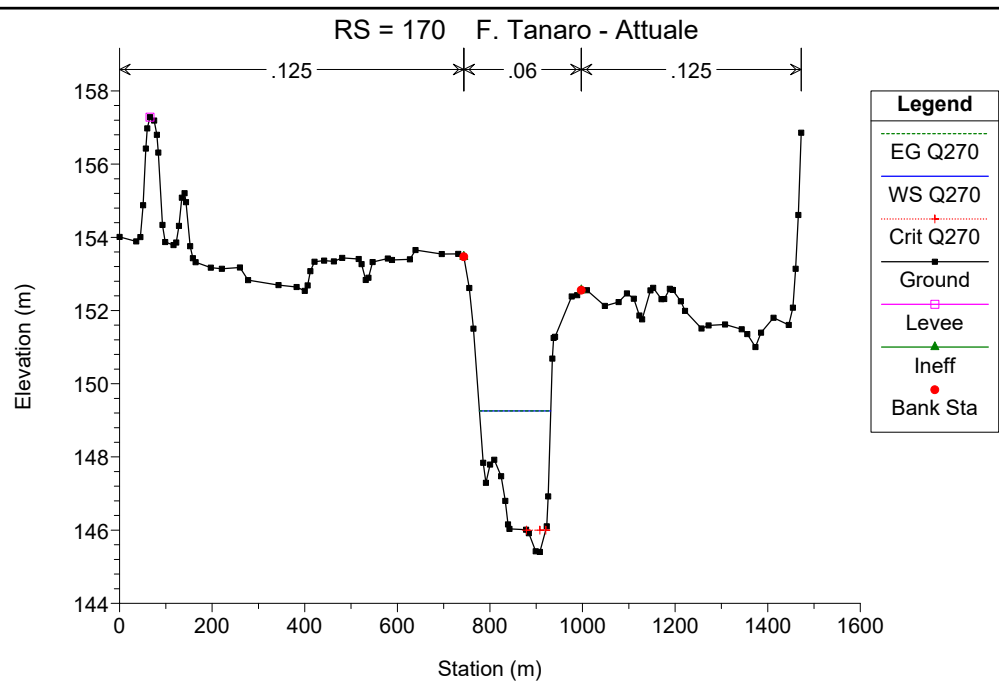
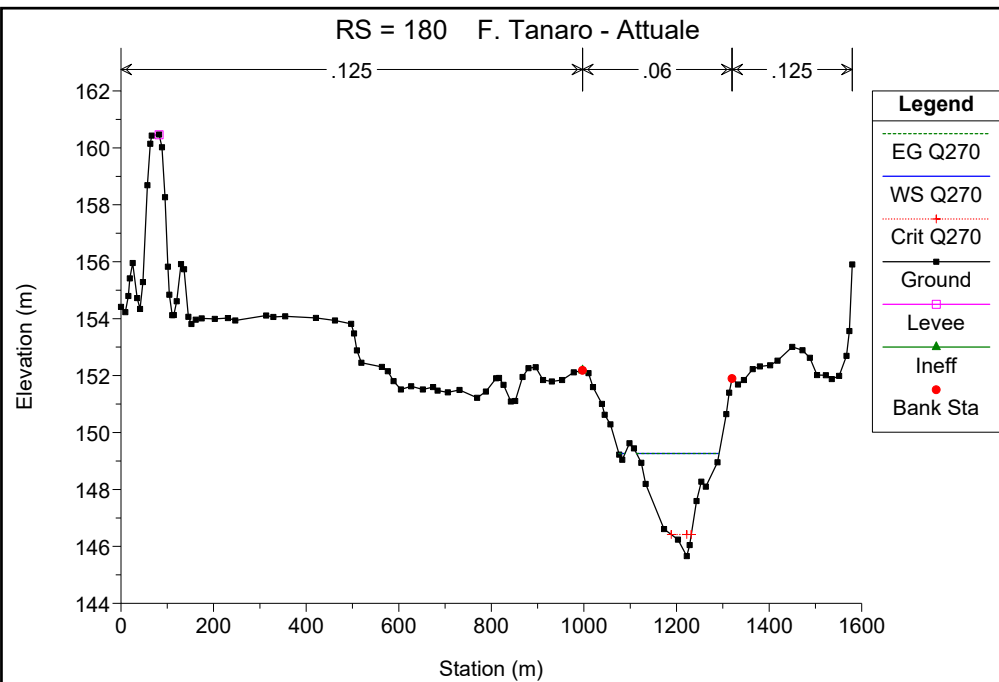


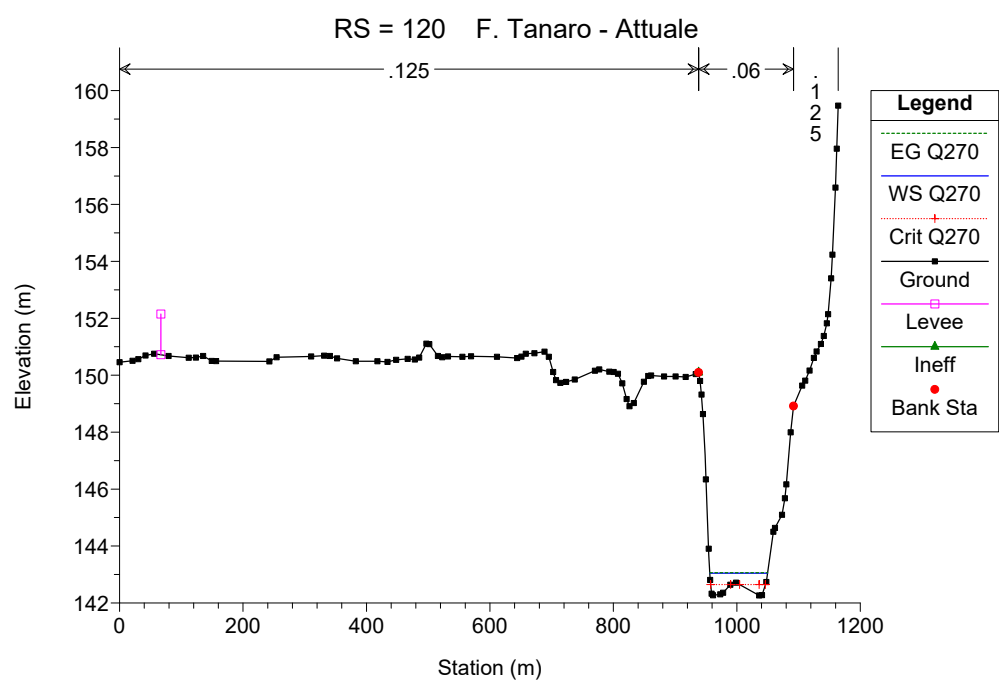
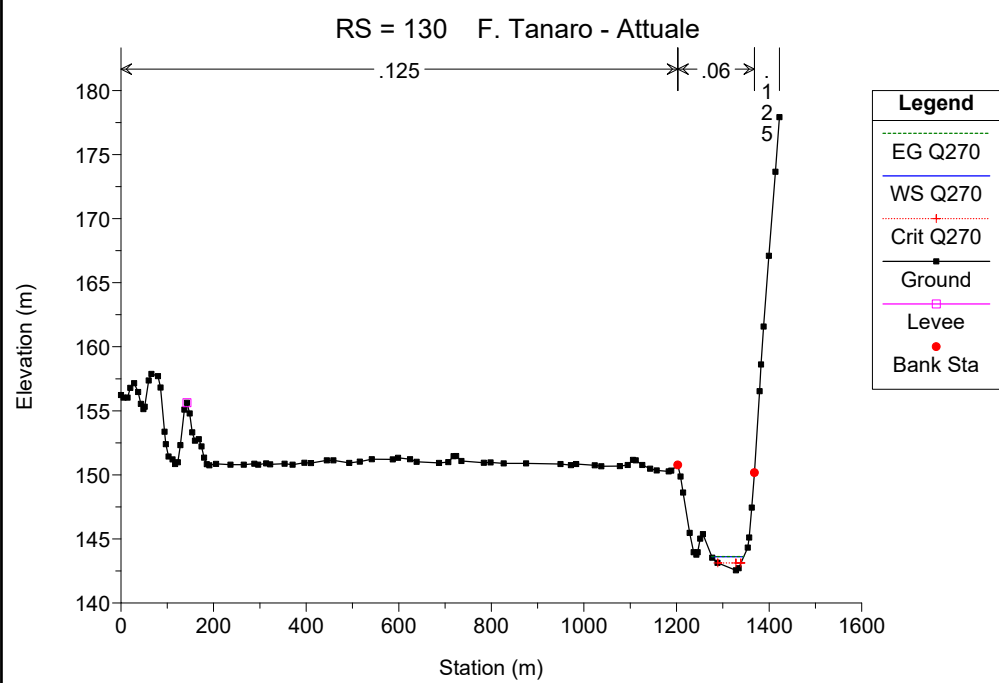
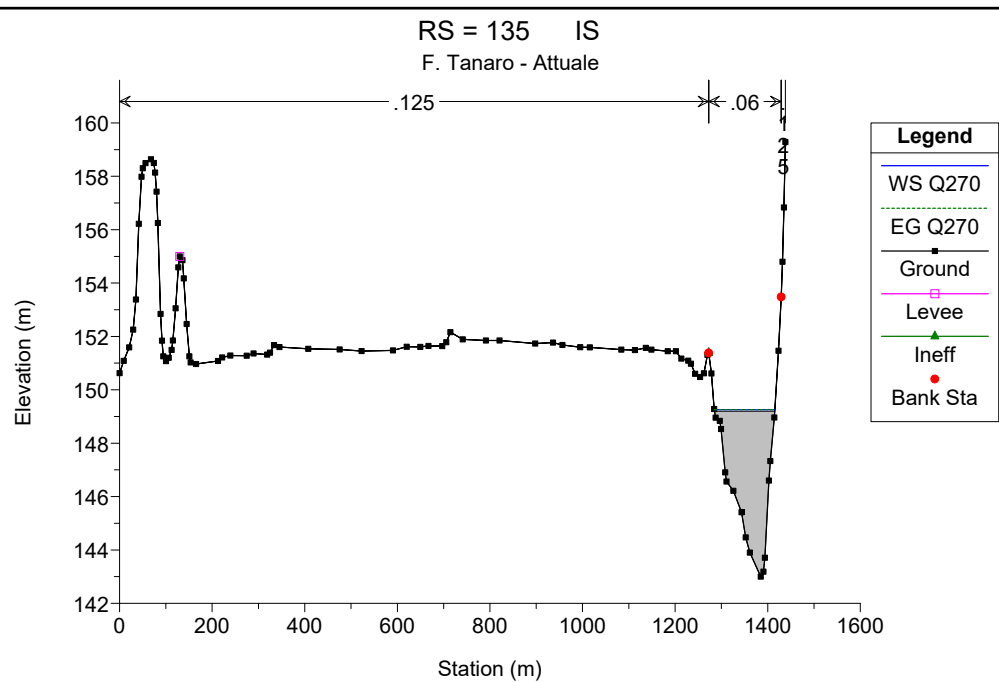
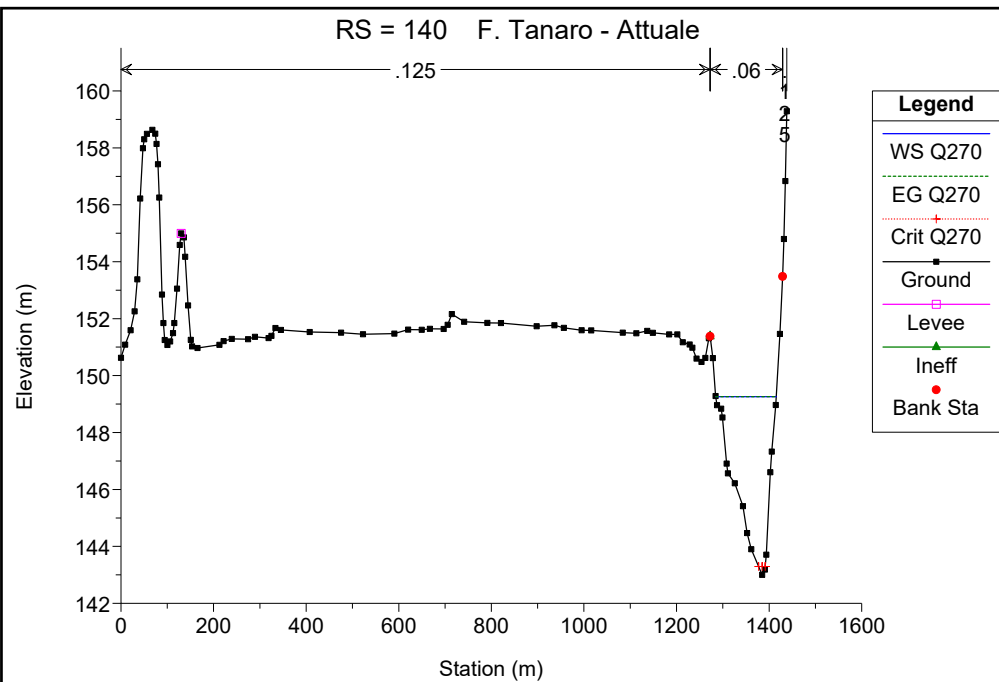


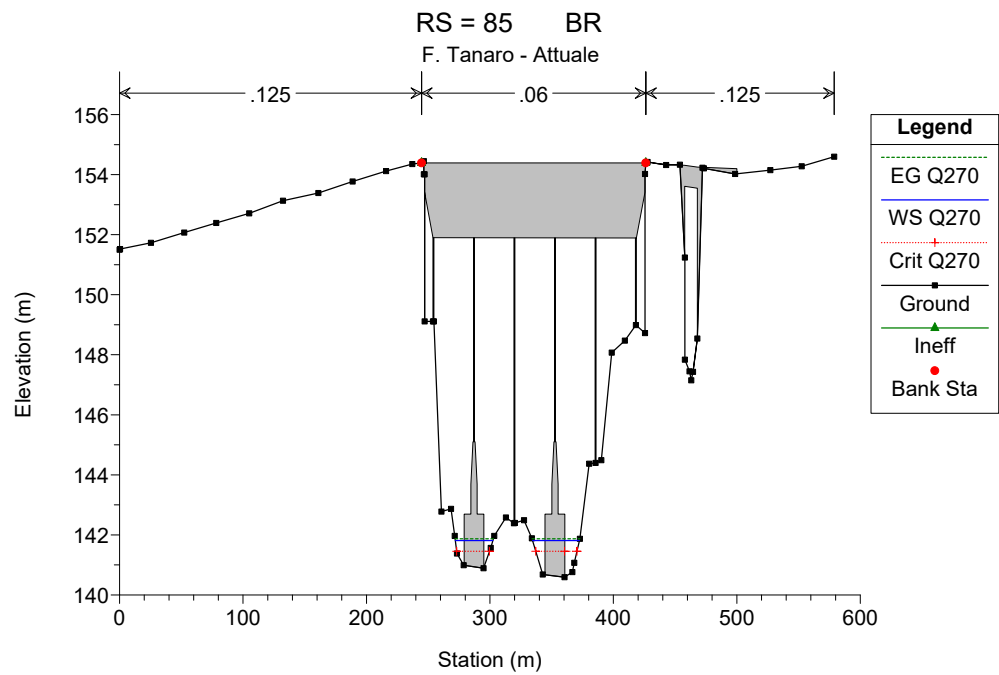
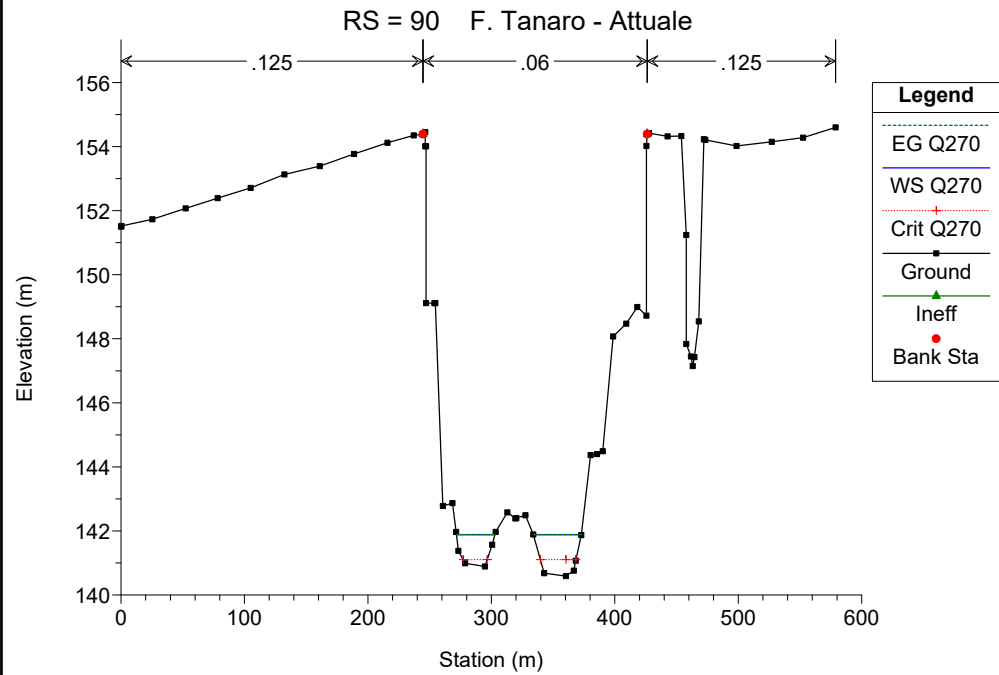
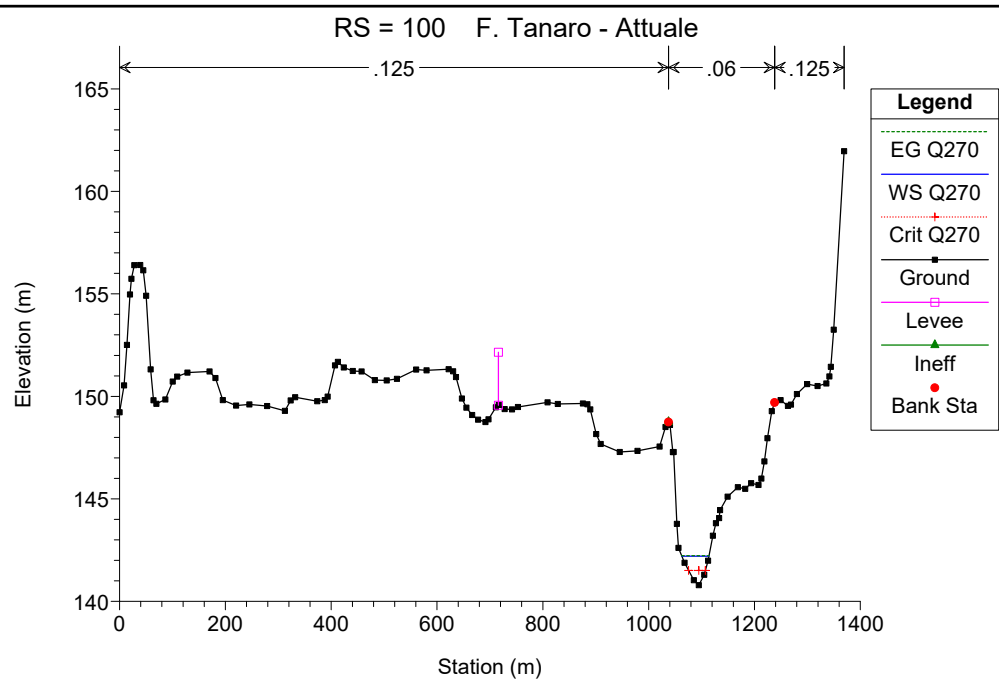
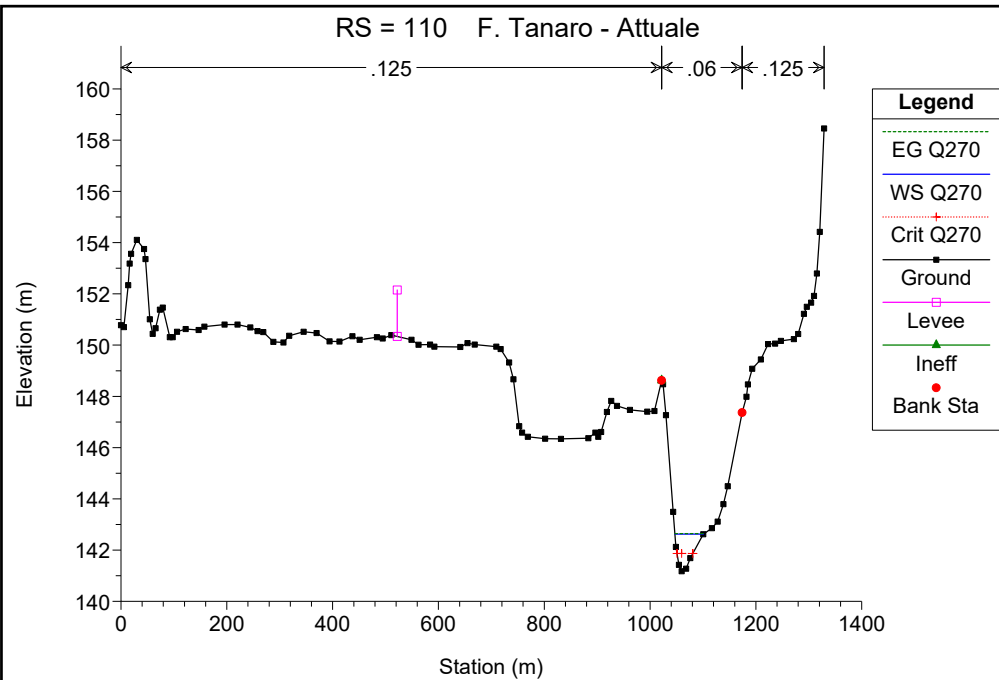


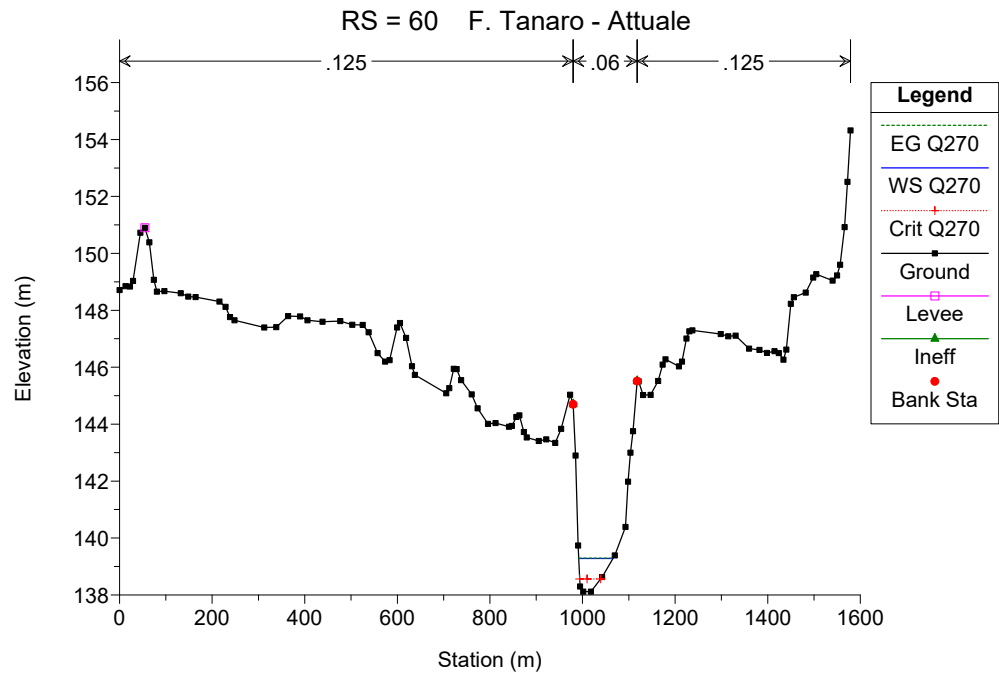
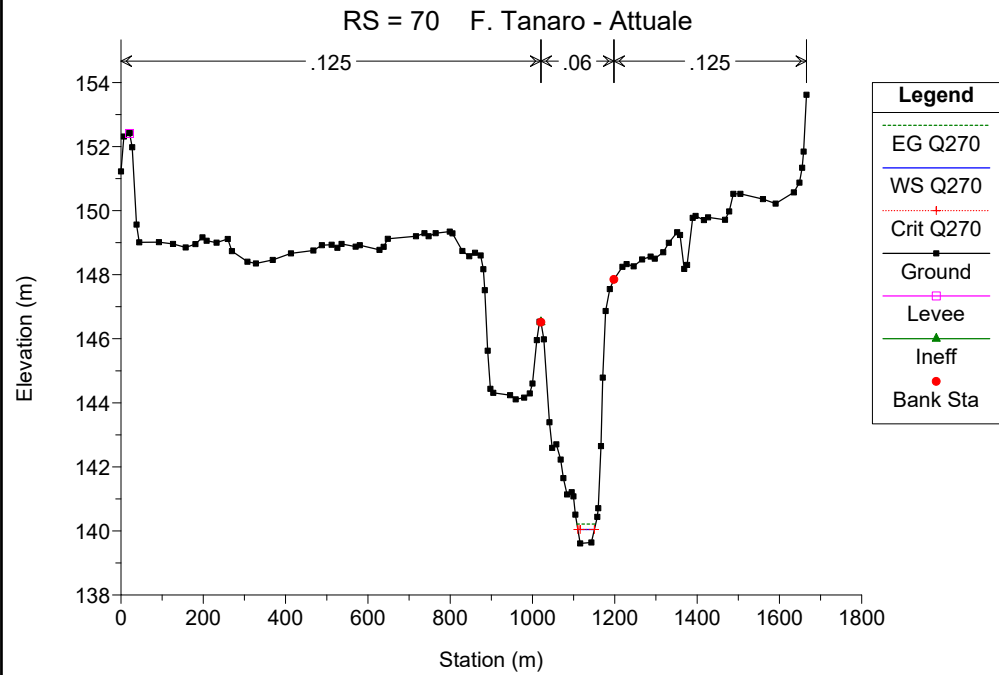
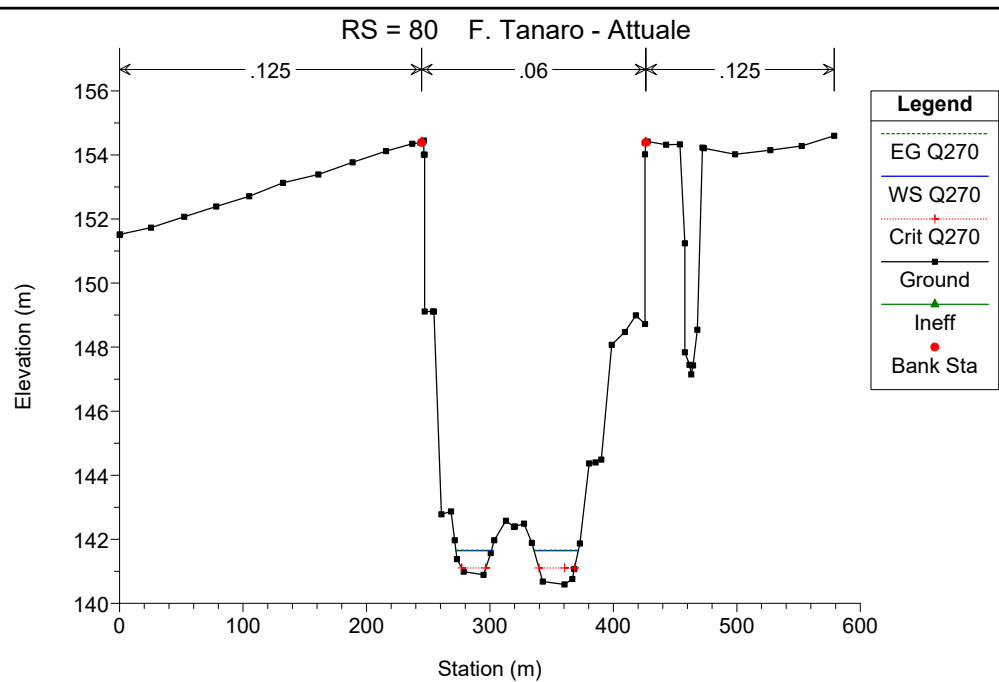
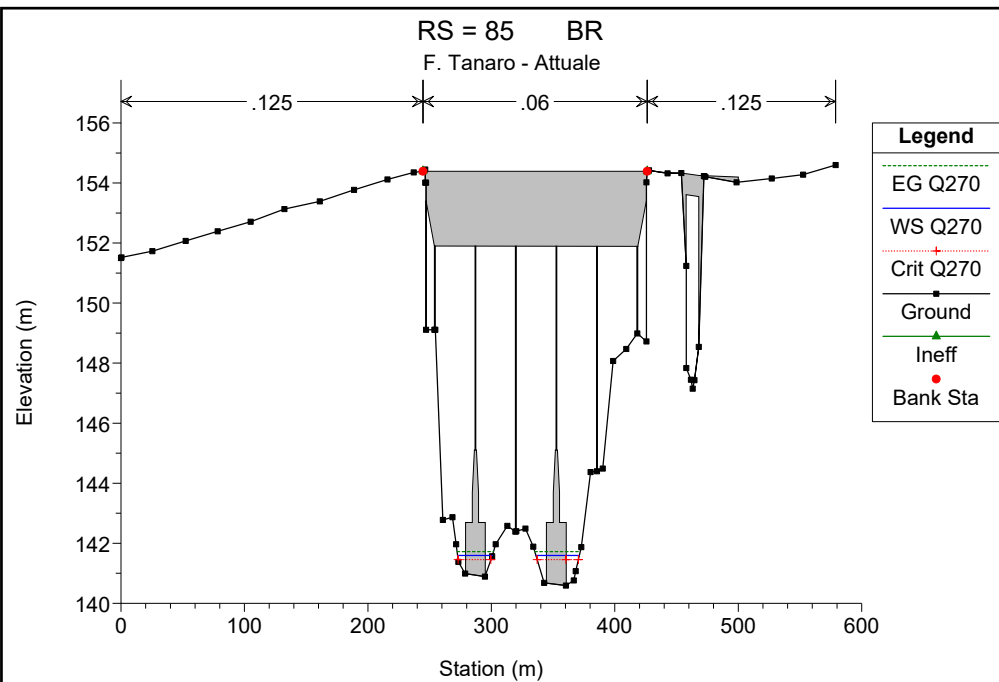


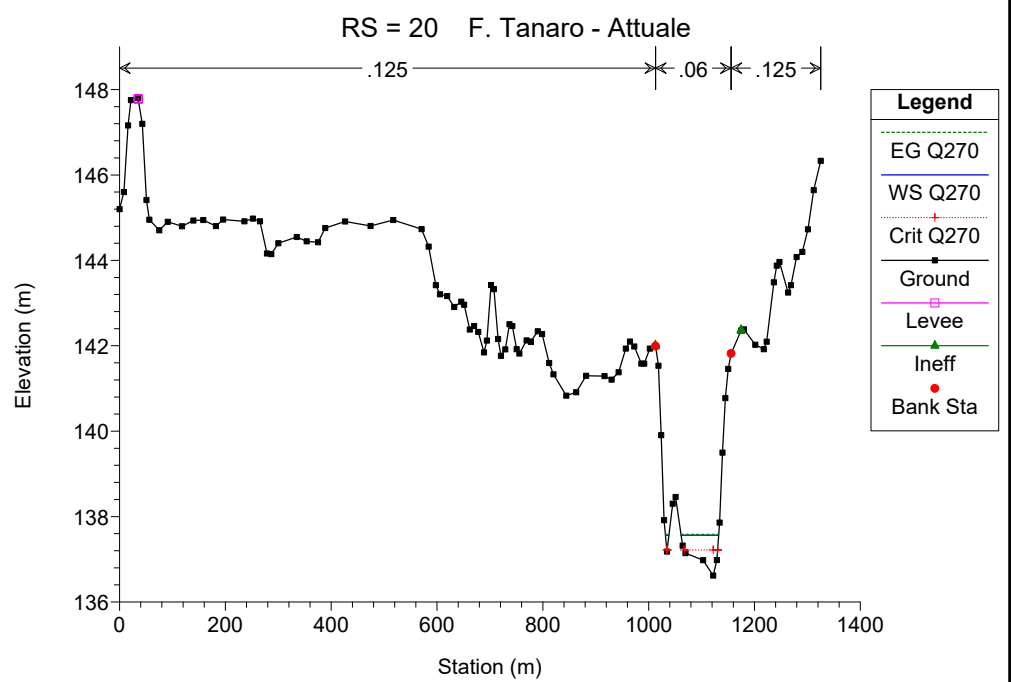
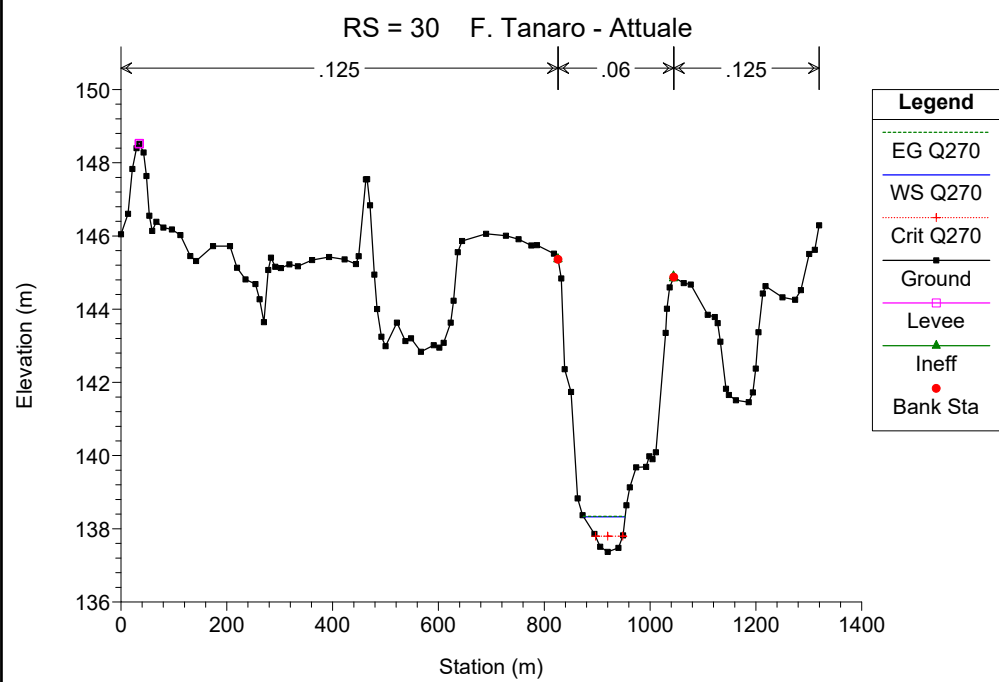
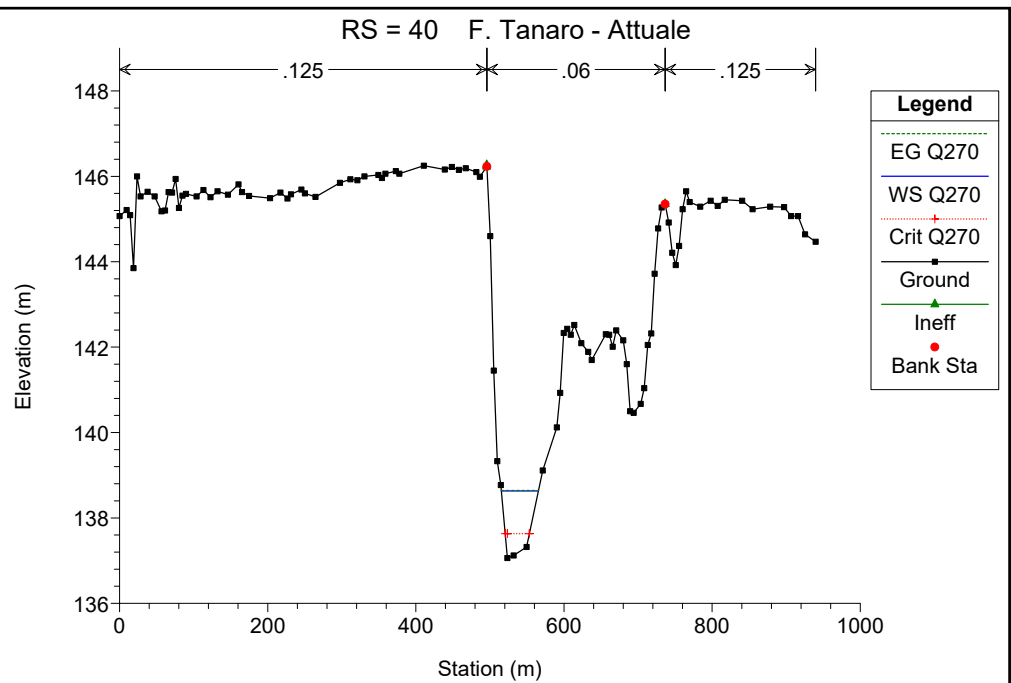
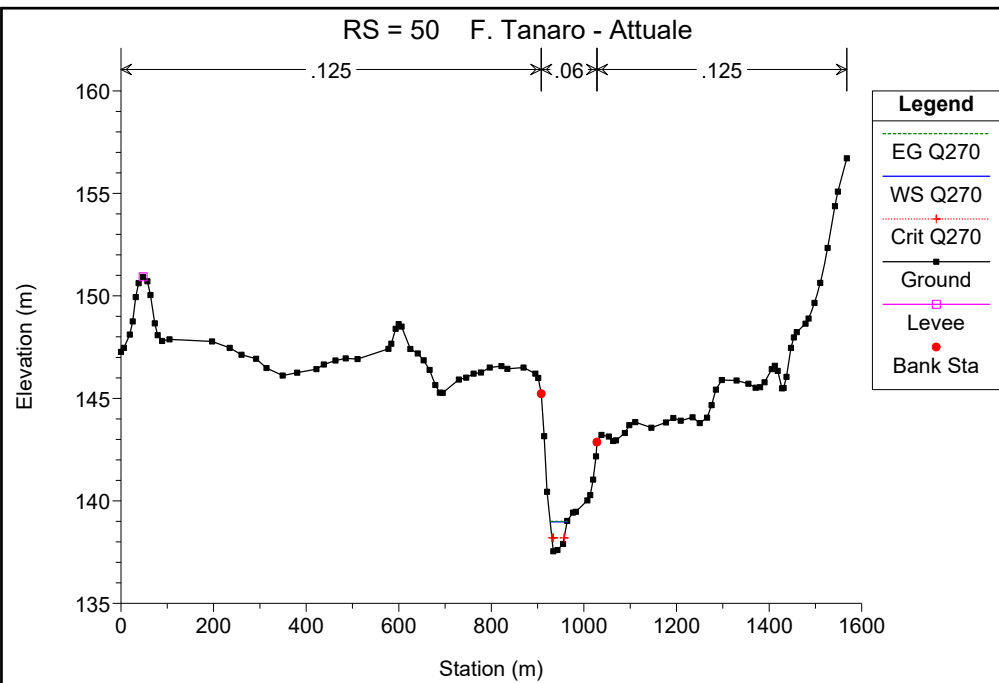




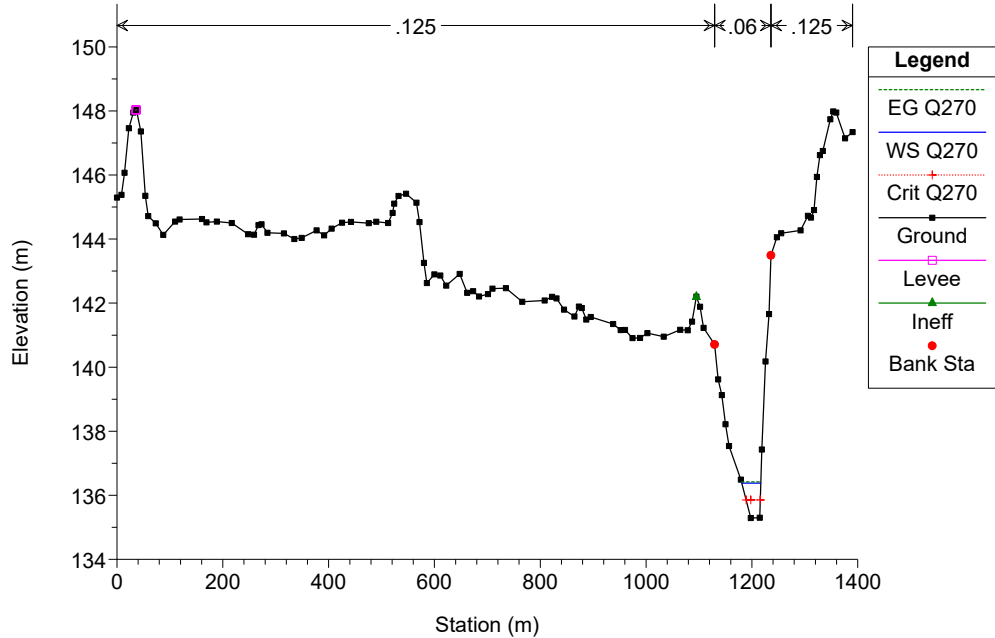








RS = 10 F. Tanaro - Attuale



MODELLO MODIMENSIONALE DI MOTO PERMANENTE**SITUAZIONE DI PROGETTO****PORTATA Q_{270}** **SIMULAZIONE 32**

corso d'acqua	portata Q [m³/s]	
Fiume Tanaro	26.00 in alveo	Q_{270} (portata mediamente superata per 270 giorni all'anno)

HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Q270

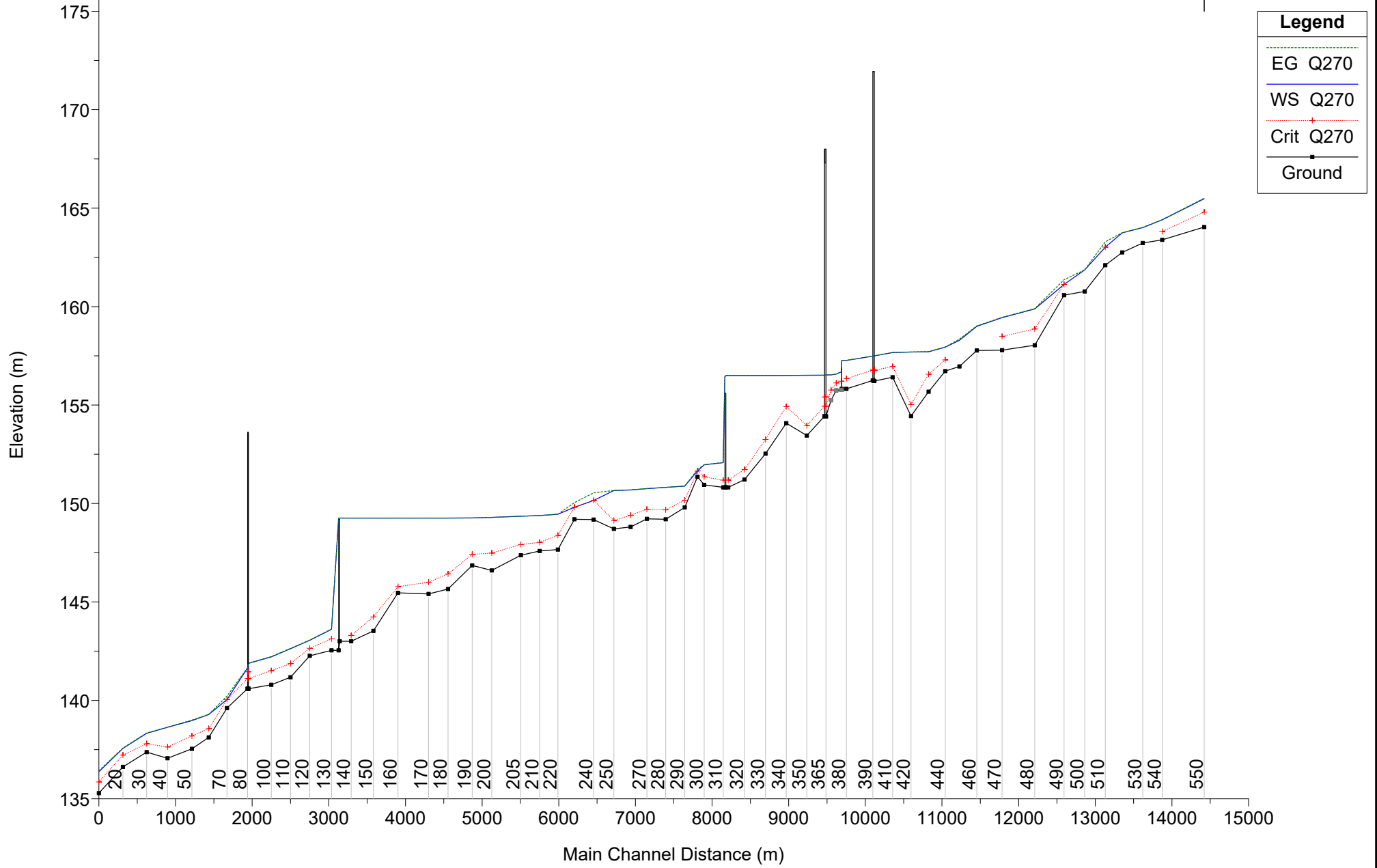
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	550	Q270	26.00	164.04	165.48	164.80	165.51	0.003633	0.77	33.85	50.33	0.30
1	540	Q270	26.00	163.39	164.40	163.81	164.41	0.001250	0.46	56.19	80.64	0.18
1	530	Q270	26.00	163.23	164.01		164.02	0.001953	0.51	51.48	90.64	0.21
1	520	Q270	26.00	162.75	163.75		163.75	0.000610	0.33	79.78	113.20	0.12
1	510	Q270	26.00	162.10	163.02	163.02	163.29	0.044509	2.31	11.23	20.94	1.01
1	500	Q270	26.00	160.77	161.87		161.87	0.000548	0.33	77.92	98.38	0.12
1	490	Q270	26.00	160.58	161.12	161.12	161.36	0.047767	2.17	11.99	25.99	1.02
1	480	Q270	26.00	158.04	159.88	158.86	159.89	0.001016	0.49	52.55	58.21	0.17
1	470	Q270	26.00	157.79	159.44	158.48	159.45	0.001061	0.50	52.15	59.03	0.17
1	460	Q270	26.00	157.77	159.00		159.02	0.001670	0.58	44.75	56.73	0.21
1	450	Q270	26.00	156.96	158.29		158.35	0.006634	1.06	24.51	35.24	0.41
1	440	Q270	26.00	156.72	157.94	157.30	157.95	0.000998	0.46	56.81	69.93	0.16
1	430	Q270	26.00	155.68	157.70	156.57	157.72	0.001121	0.51	50.61	56.96	0.17
1	420	Q270	26.00	154.44	157.69	155.02	157.69	0.000032	0.15	178.26	92.66	0.03
1	410	Q270	26.00	156.41	157.66	156.96	157.67	0.000656	0.35	73.66	97.85	0.13
1	400	Q270	26.00	156.22	157.50	156.77	157.51	0.000741	0.38	68.06	87.86	0.14
1	395		Bridge									
1	390	Q270	26.00	156.25	157.48	156.78	157.49	0.000811	0.39	66.20	87.83	0.14
1	380	Q270	26.00	155.82	157.27	156.34	157.27	0.000504	0.33	78.19	93.19	0.12
1	379		Inl Struct									
1	370	Q270	26.00	154.43	156.53	154.94	156.53	0.000052	0.14	187.26	150.81	0.04
1	365		Bridge									
1	360	Q270	26.00	154.43	156.52	154.94	156.52	0.000054	0.14	185.50	150.75	0.04
1	350	Q270	26.00	153.45	156.51	153.96	156.51	0.000013	0.10	260.20	119.39	0.02
1	340	Q270	26.00	154.08	156.51	154.92	156.51	0.000042	0.14	189.56	131.63	0.04
1	330	Q270	26.00	152.53	156.50	153.25	156.50	0.000012	0.10	261.72	117.89	0.02
1	320	Q270	26.00	151.21	156.50	151.72	156.50	0.000003	0.08	328.61	86.56	0.01
1	315	Q270	10.25	150.82	156.50	151.18	156.50	0.000000	0.03	384.51	115.31	0.00
1	312.5		Inl Struct									
1	310	Q270	10.25	150.82	152.08	151.18	152.08	0.000259	0.25	40.56	65.63	0.08
1	300	Q270	10.25	150.95	151.96	151.35	151.97	0.000876	0.40	25.82	35.68	0.15
1	295	Q270	10.25	151.36	151.65	151.65	151.72	0.069011	1.16	8.82	64.42	1.00
1	290	Q270	10.25	149.80	150.88	150.16	150.89	0.000402	0.29	35.95	45.49	0.10
1	280	Q270	26.00	149.20	150.82	149.68	150.82	0.000224	0.29	89.70	71.10	0.08
1	270	Q270	26.00	149.22	150.75	149.71	150.76	0.000327	0.33	77.77	66.38	0.10
1	260	Q270	26.00	148.81	150.68	149.40	150.69	0.000299	0.32	81.80	70.45	0.09
1	250	Q270	26.00	148.71	150.66	149.14	150.66	0.000081	0.19	134.74	91.78	0.05
1	240	Q270	26.00	149.18	150.16	150.16	150.54	0.040433	2.75	9.44	119.12	1.00
1	230	Q270	26.00	149.20	149.81	149.81	150.04	0.045822	2.13	12.20	106.37	1.00
1	220	Q270	26.00	147.66	149.45	148.38	149.46	0.000622	0.39	66.90	73.81	0.13

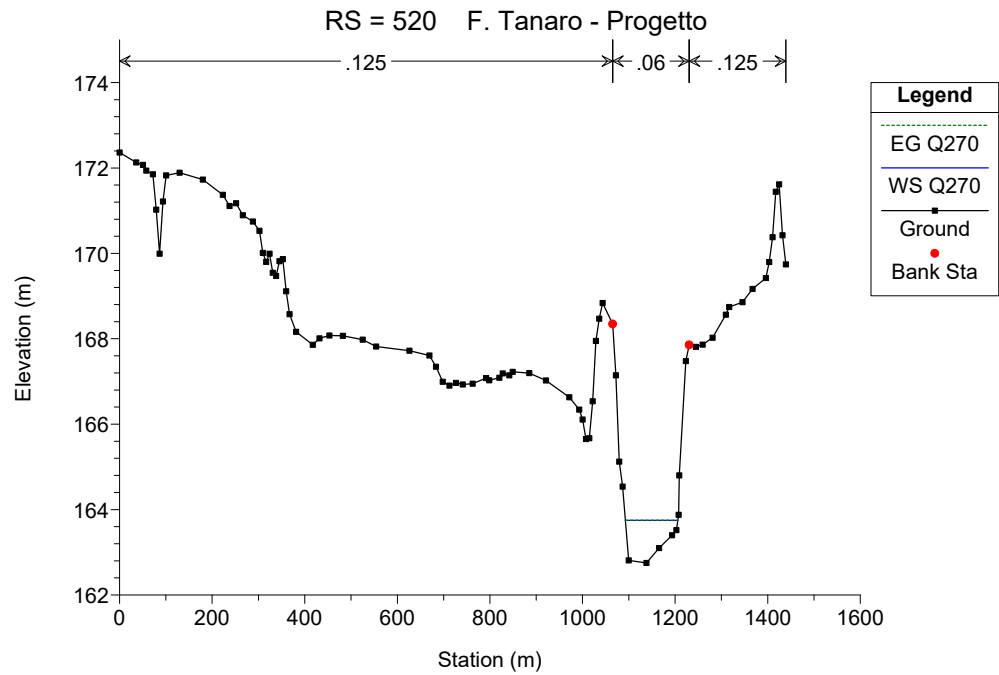
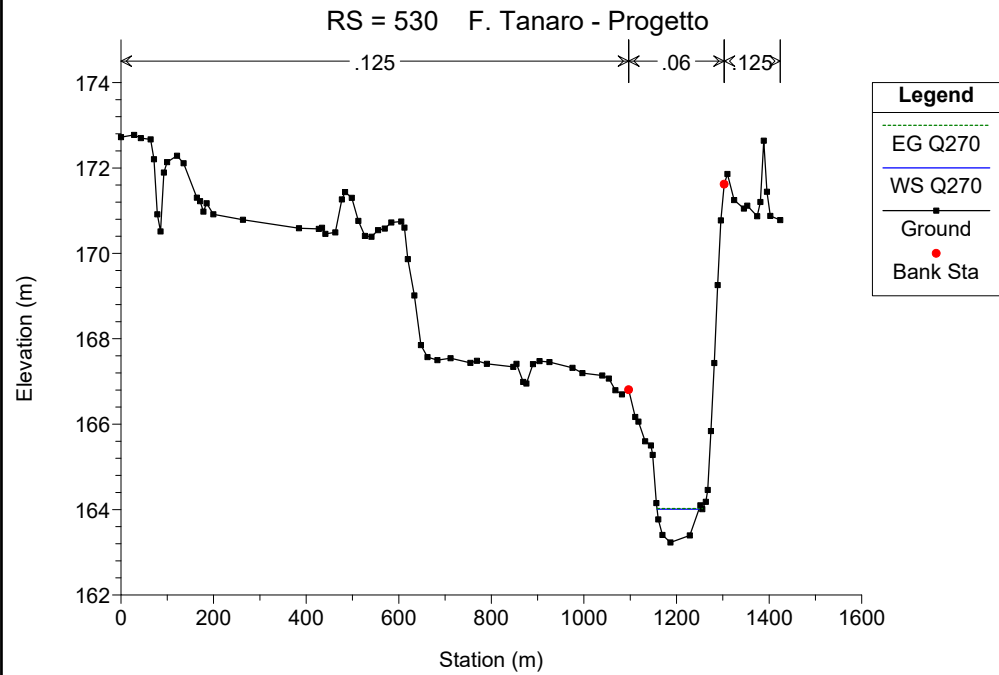
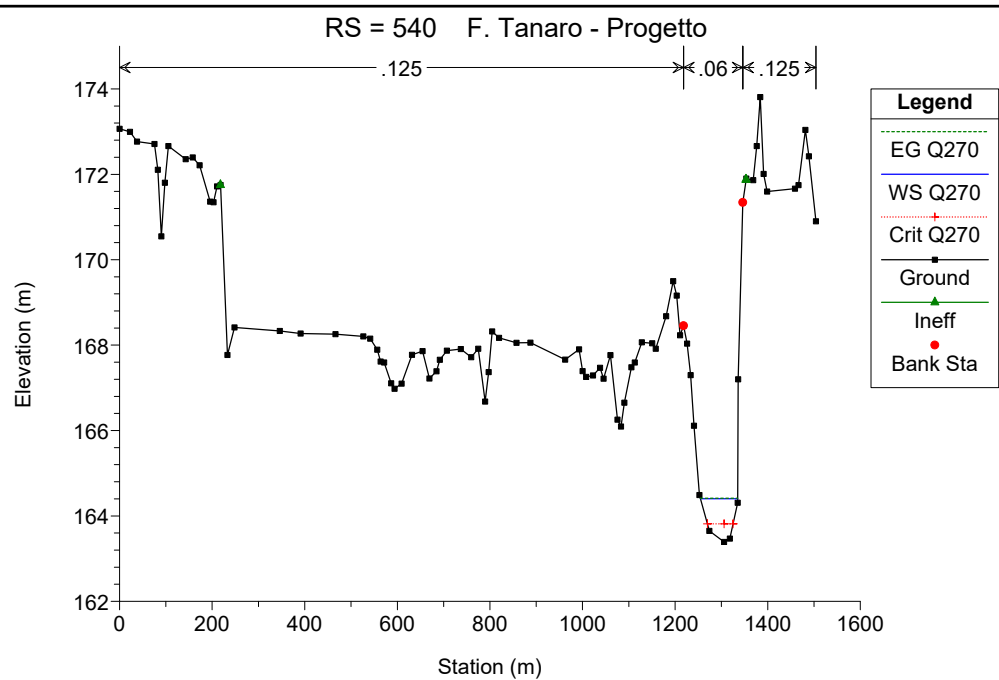
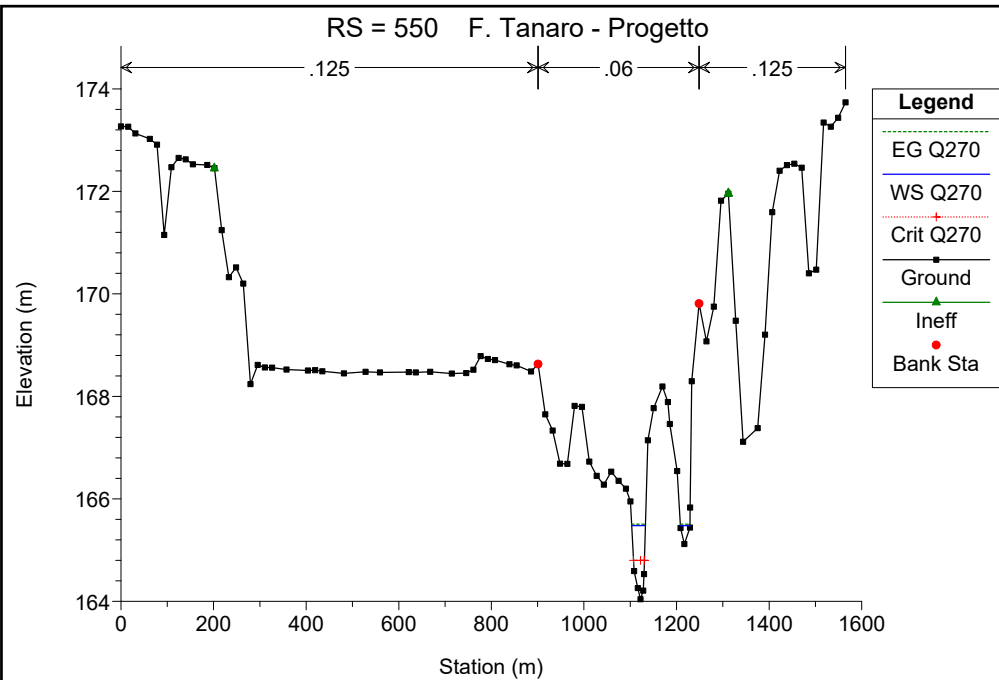
HEC-RAS Plan: Plan 06 River: Tanaro Reach: 1 Profile: Q270 (Continued)

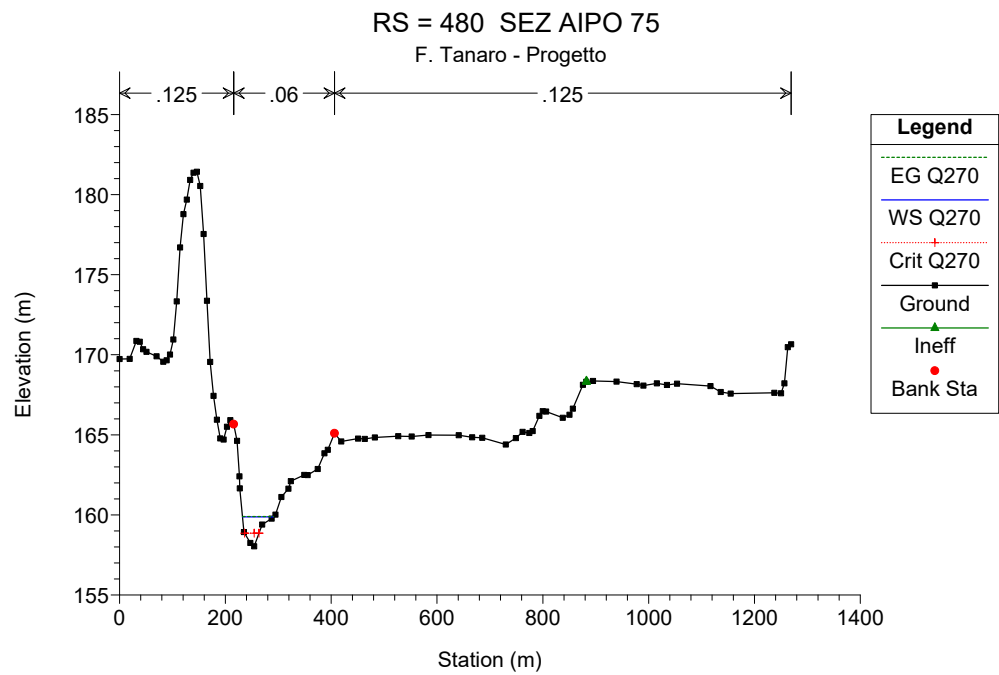
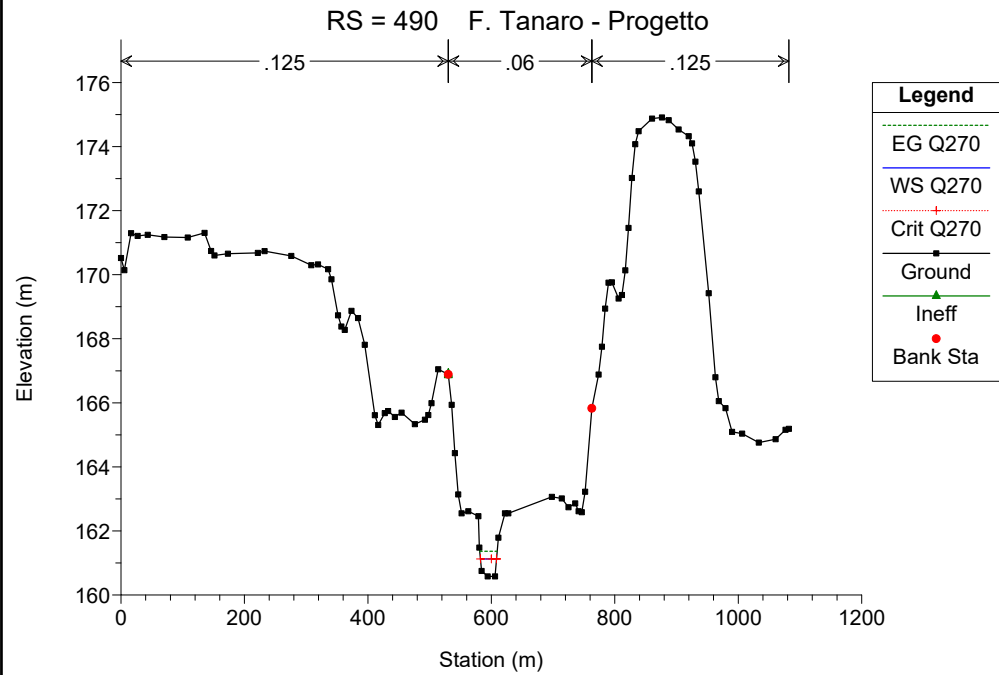
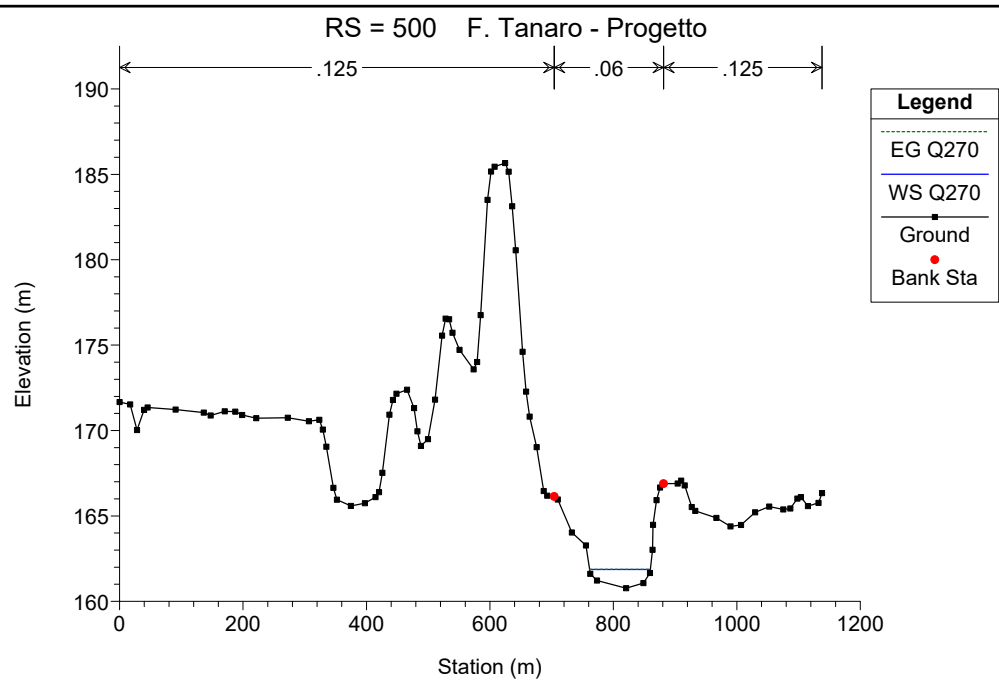
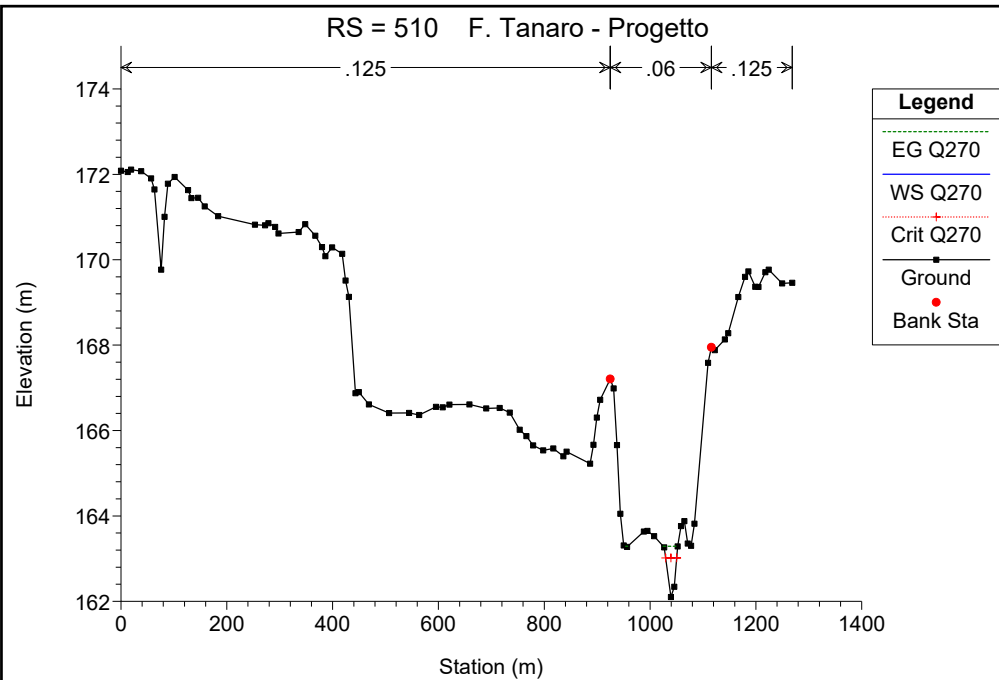
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	210	Q270	26.00	147.59	149.39	148.03	149.39	0.000168	0.26	101.06	77.33	0.07
1	205	Q270	26.00	147.37	149.35	147.91	149.35	0.000125	0.24	109.86	76.43	0.06
1	200	Q270	26.00	146.60	149.29	147.48	149.30	0.000184	0.24	106.36	94.04	0.07
1	190	Q270	26.00	146.85	149.27	147.42	149.27	0.000072	0.19	134.26	83.49	0.05
1	180	Q270	26.00	145.66	149.26	146.42	149.26	0.000011	0.08	331.94	191.09	0.02
1	170	Q270	26.00	145.40	149.26	146.00	149.26	0.000004	0.06	402.91	154.00	0.01
1	160	Q270	26.00	145.46	149.26	145.78	149.26	0.000003	0.06	464.21	187.31	0.01
1	150	Q270	26.00	143.53	149.26	144.24	149.26	0.000001	0.05	558.18	158.23	0.01
1	140	Q270	3.00	143.00	149.26	143.30	149.26	0.000000	0.01	456.56	130.69	0.00
1	135		Inl Struct									
1	130	Q270	26.00	142.54	143.61	143.12	143.62	0.002246	0.59	44.20	68.72	0.23
1	120	Q270	26.00	142.27	143.05	142.64	143.06	0.001774	0.48	53.70	93.59	0.20
1	110	Q270	26.00	141.17	142.62	141.87	142.64	0.001588	0.58	44.59	54.09	0.20
1	100	Q270	26.00	140.79	142.21	141.51	142.22	0.001750	0.61	42.42	51.36	0.22
1	90	Q270	26.00	140.59	141.88	141.10	141.89	0.000760	0.42	61.74	70.00	0.14
1	85		Bridge									
1	80	Q270	26.00	140.59	141.64	141.10	141.66	0.001841	0.57	45.81	64.55	0.22
1	70	Q270	26.00	139.61	140.04	140.04	140.22	0.049886	1.85	14.07	40.17	1.00
1	60	Q270	26.00	138.12	139.28	138.56	139.29	0.001023	0.45	57.70	74.07	0.16
1	50	Q270	26.00	137.54	138.97	138.19	139.00	0.001817	0.71	36.56	36.28	0.23
1	40	Q270	26.00	137.06	138.63	137.63	138.64	0.000737	0.48	54.47	50.07	0.15
1	30	Q270	26.00	137.37	138.33	137.80	138.34	0.001839	0.52	49.56	78.74	0.21
1	20	Q270	26.00	136.62	137.56	137.22	137.58	0.003428	0.64	40.87	77.52	0.28
1	10	Q270	26.00	135.29	136.38	135.85	136.42	0.004005	0.90	28.78	36.01	0.32

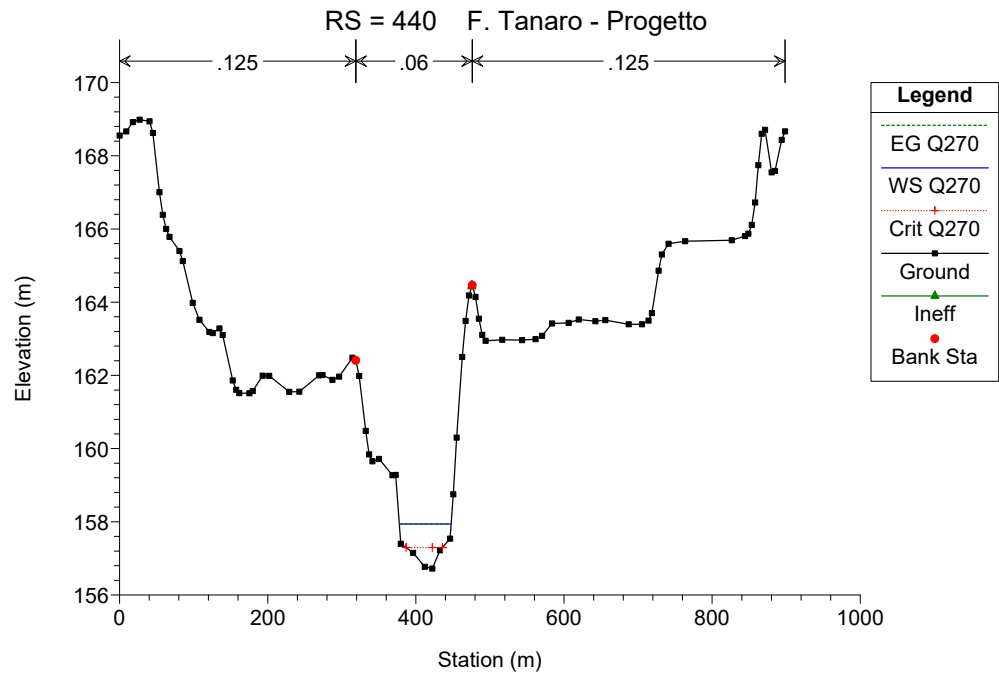
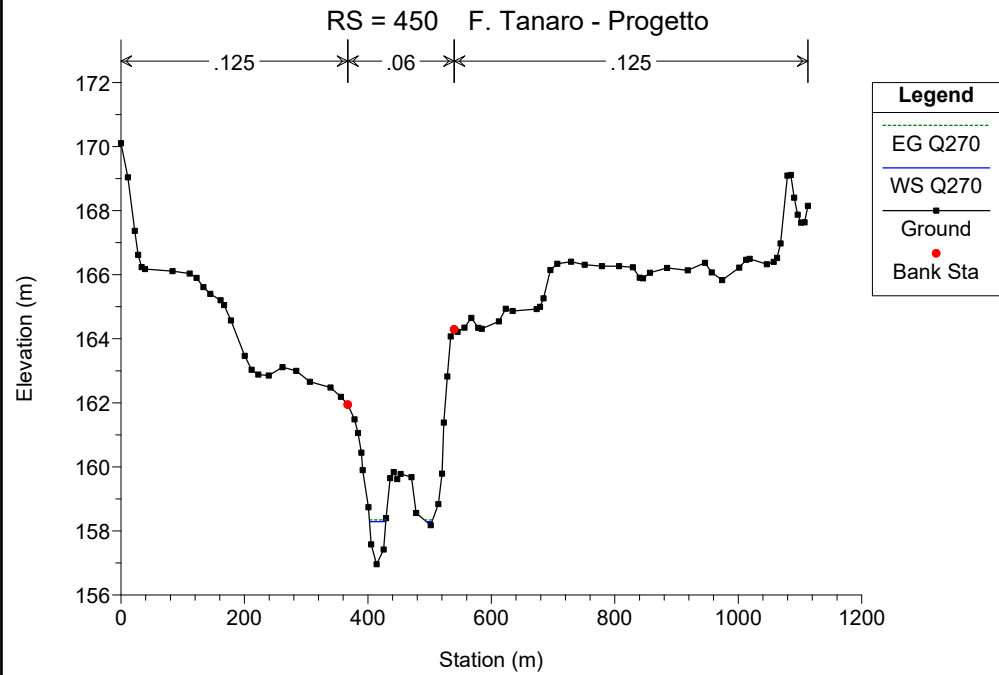
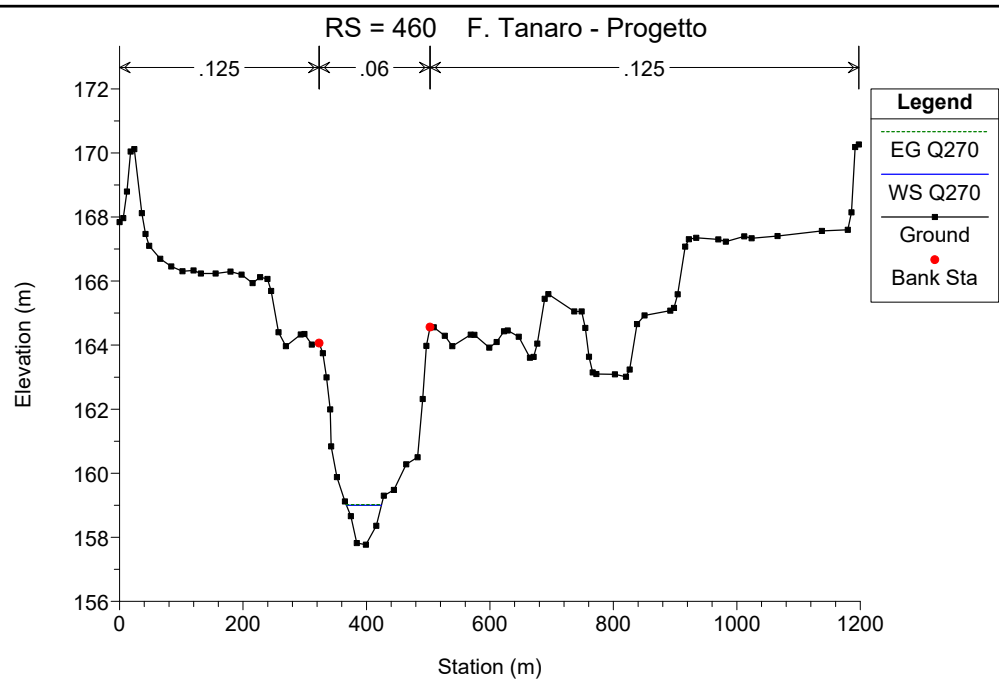
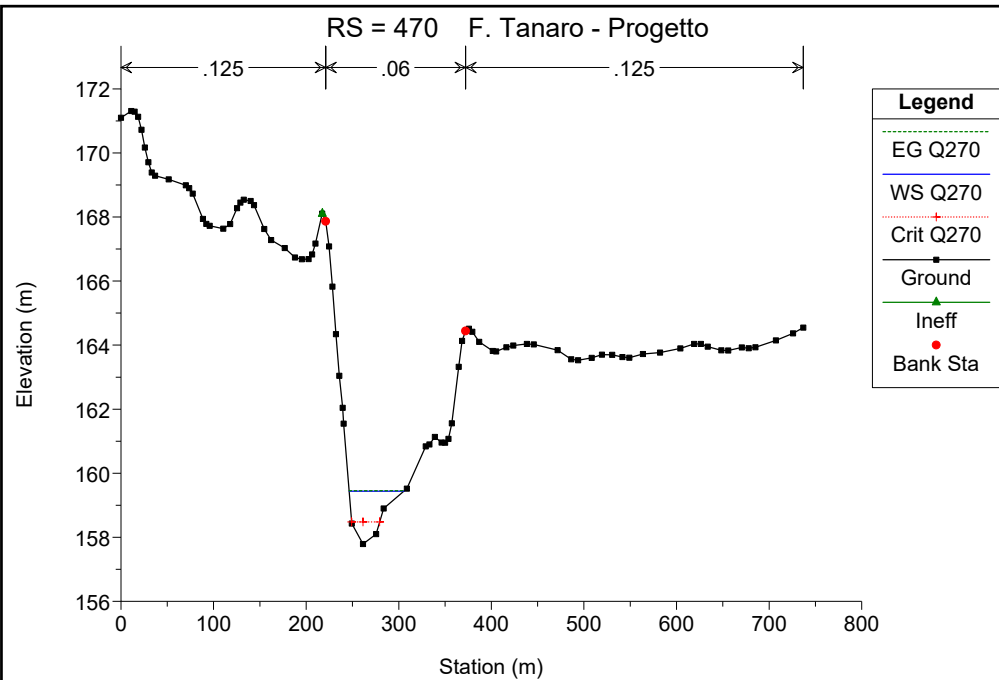
F. Tanaro - Progetto

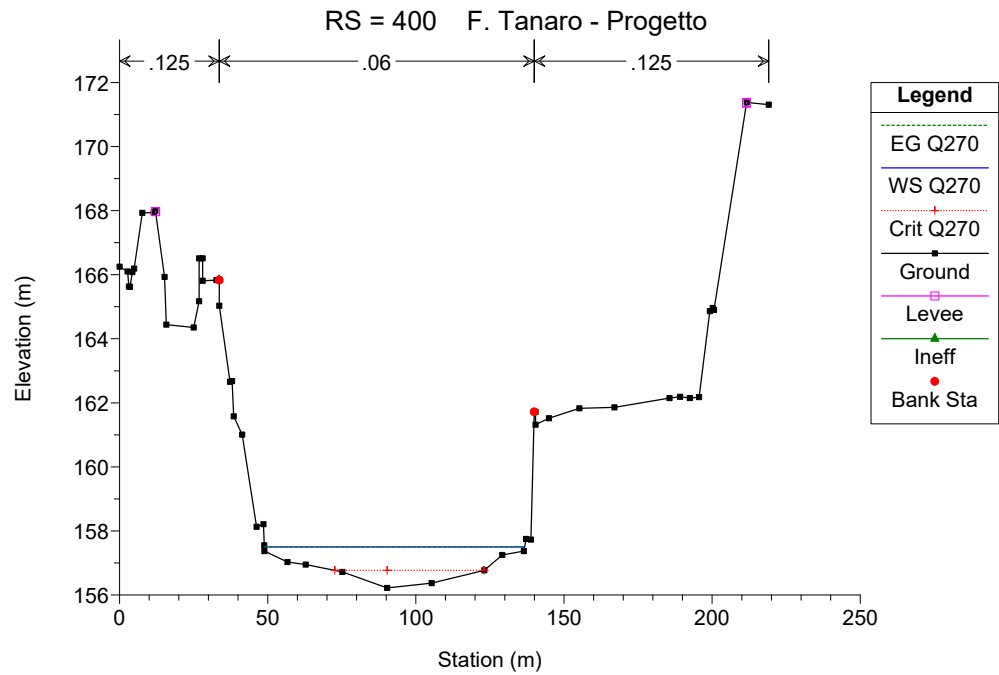
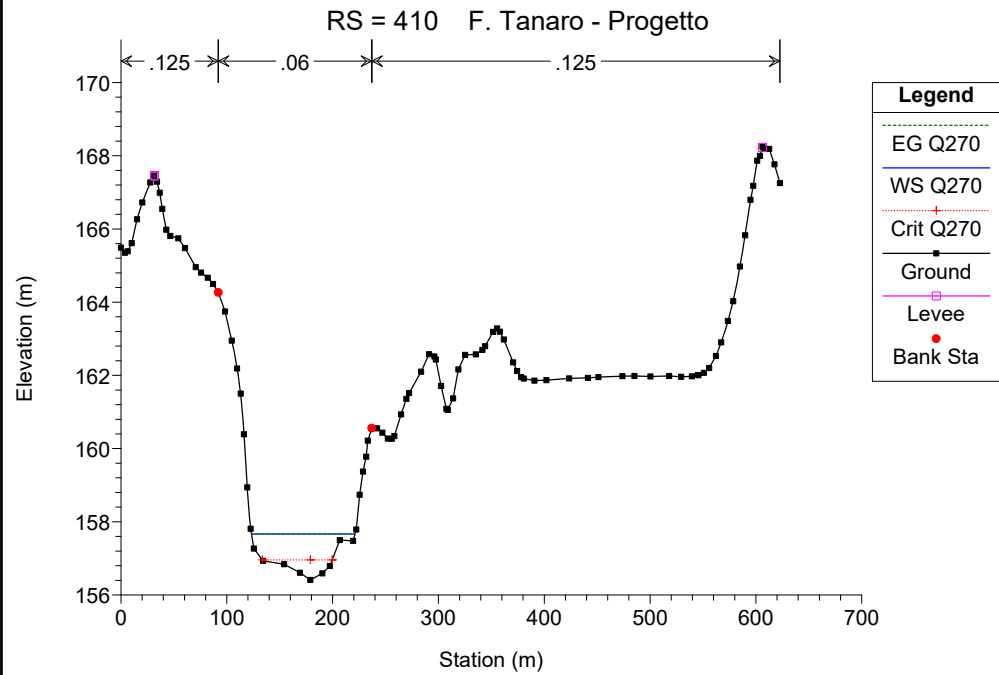
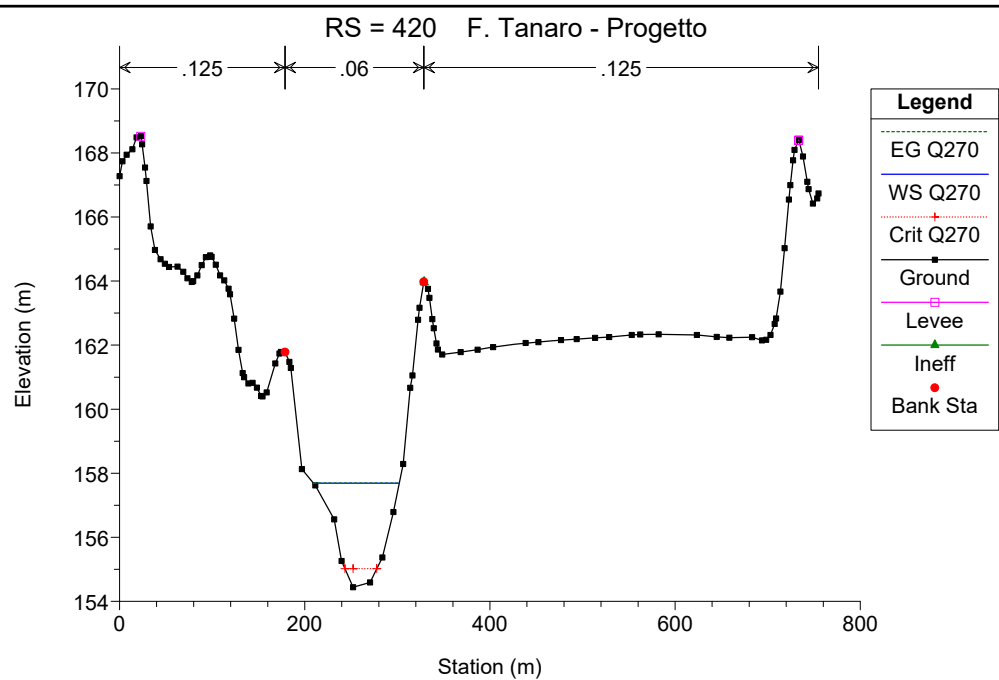
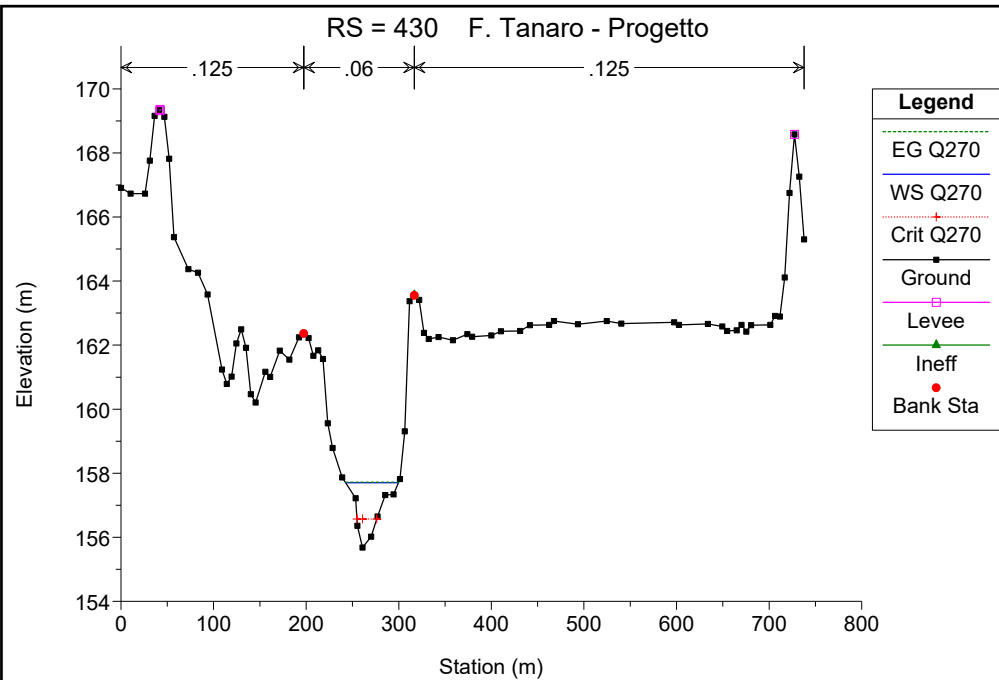
Tanaro 1

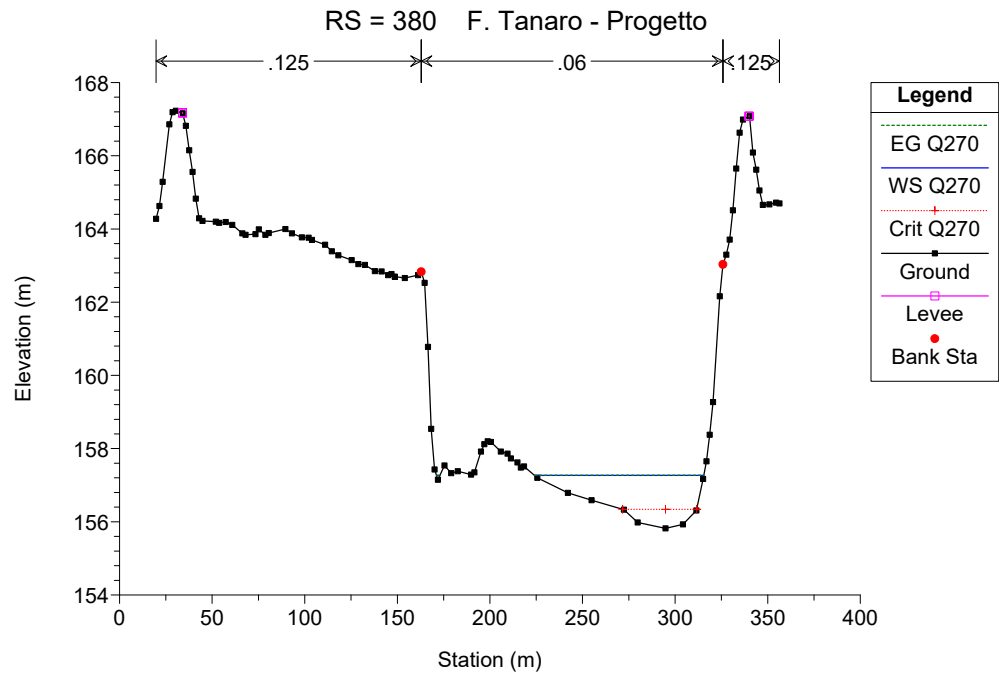
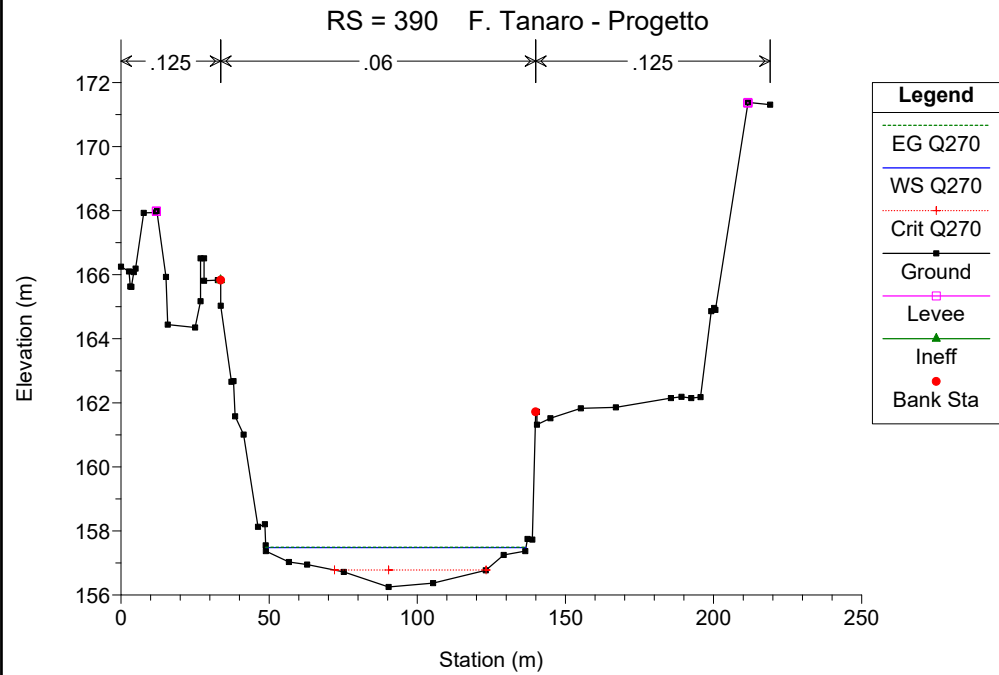
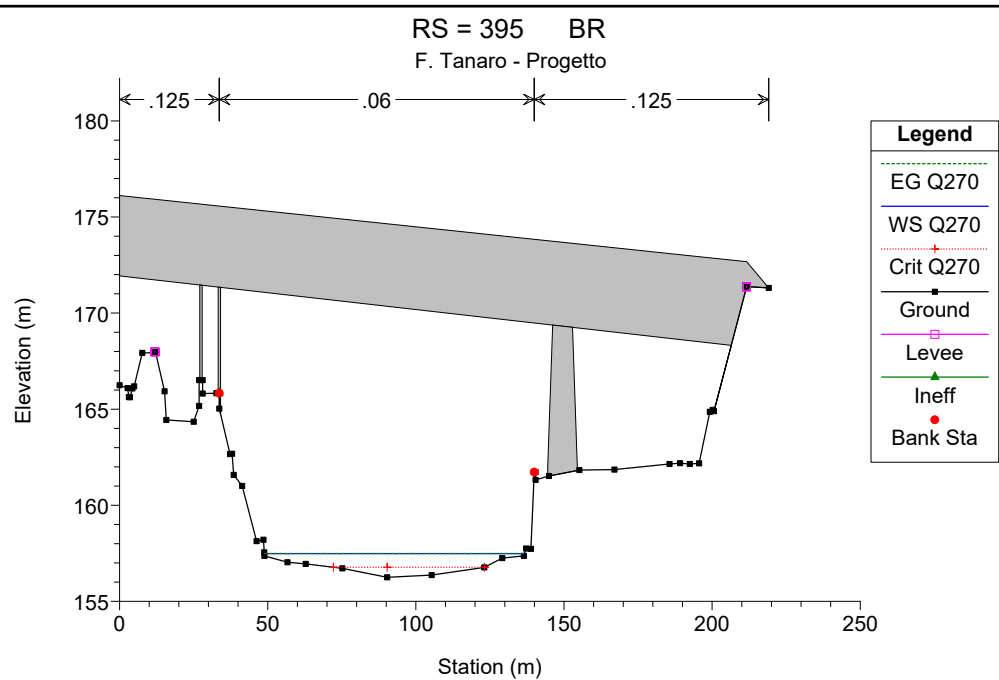
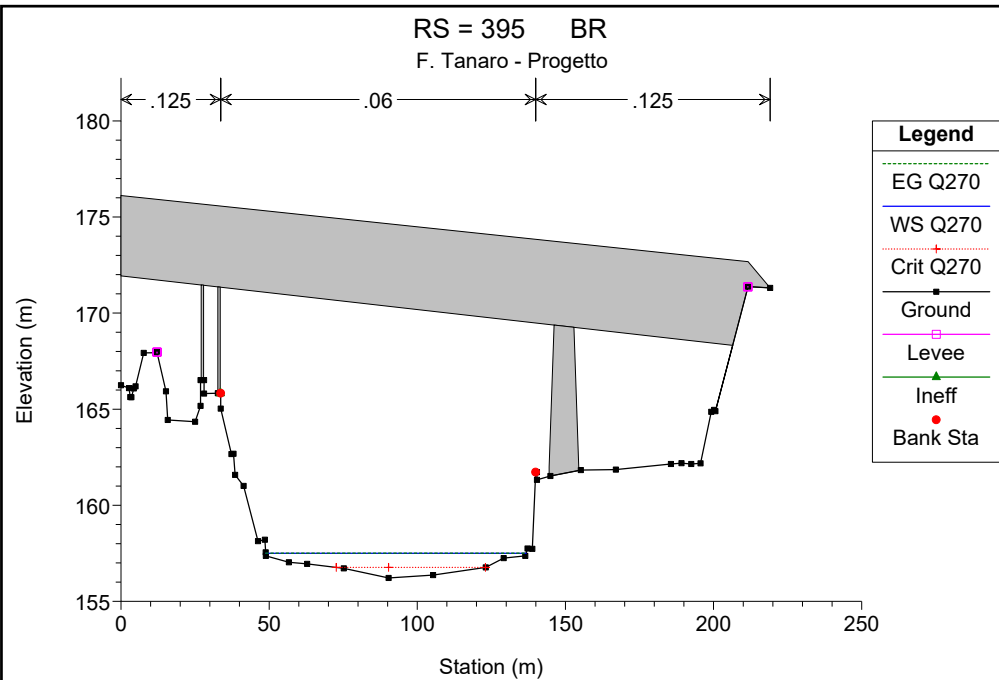


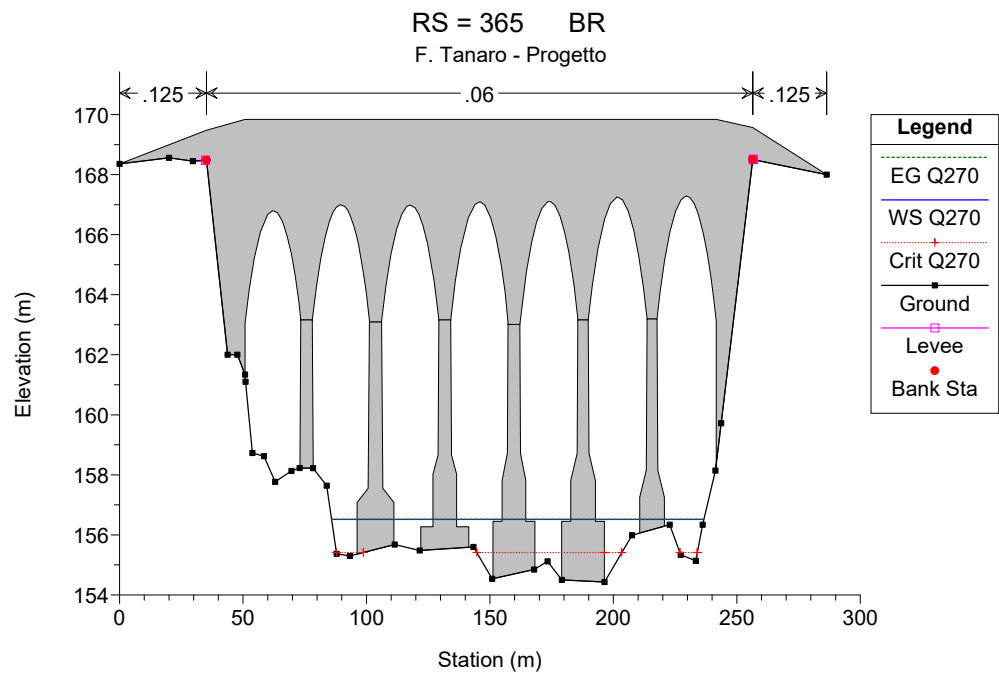
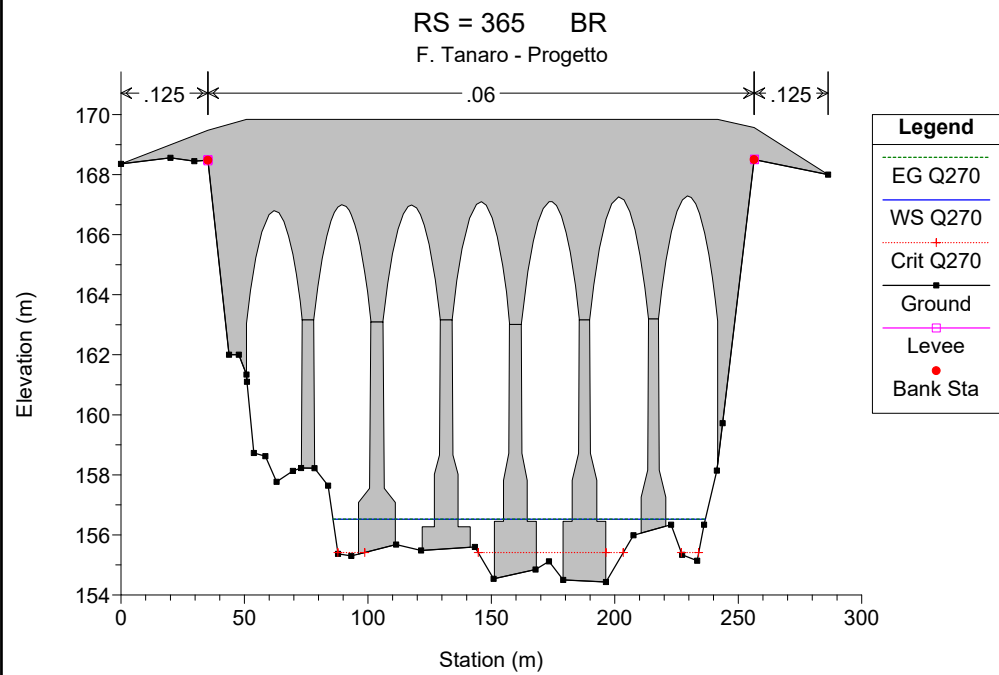
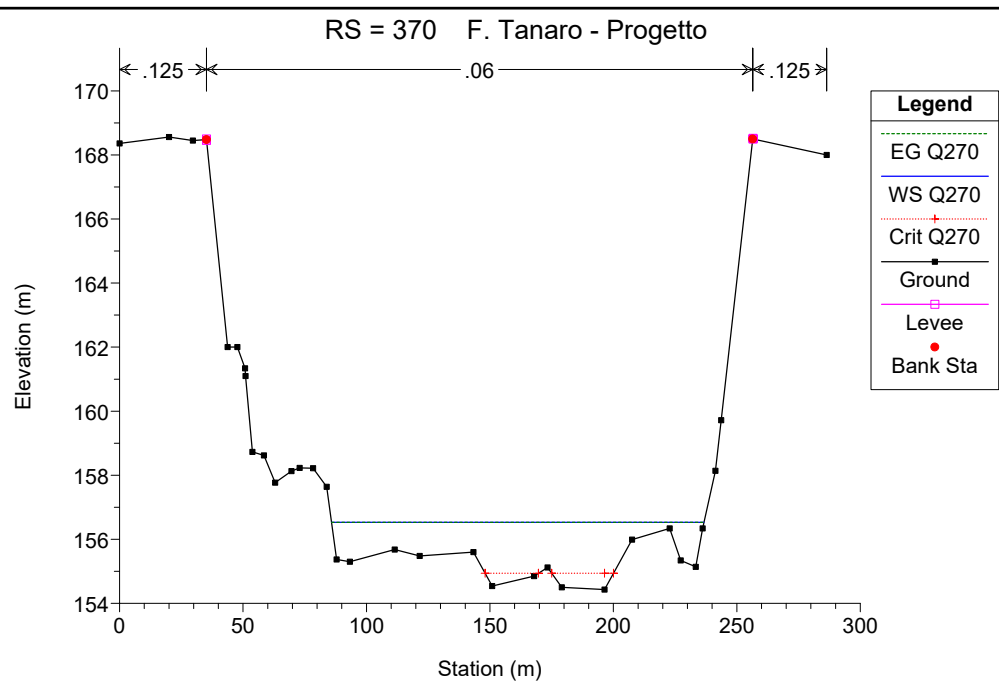
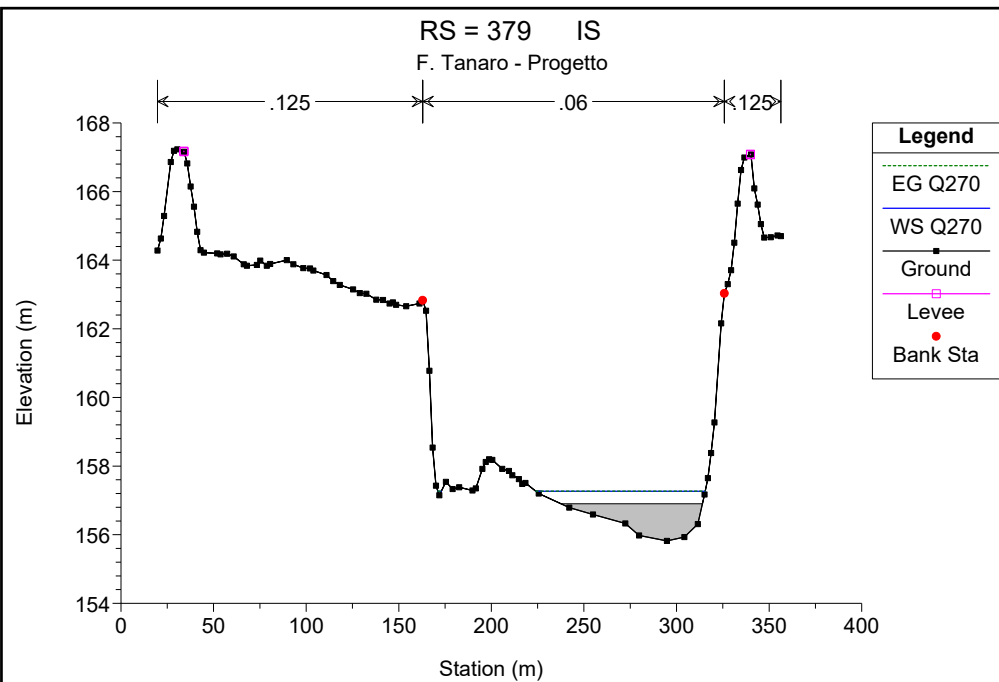


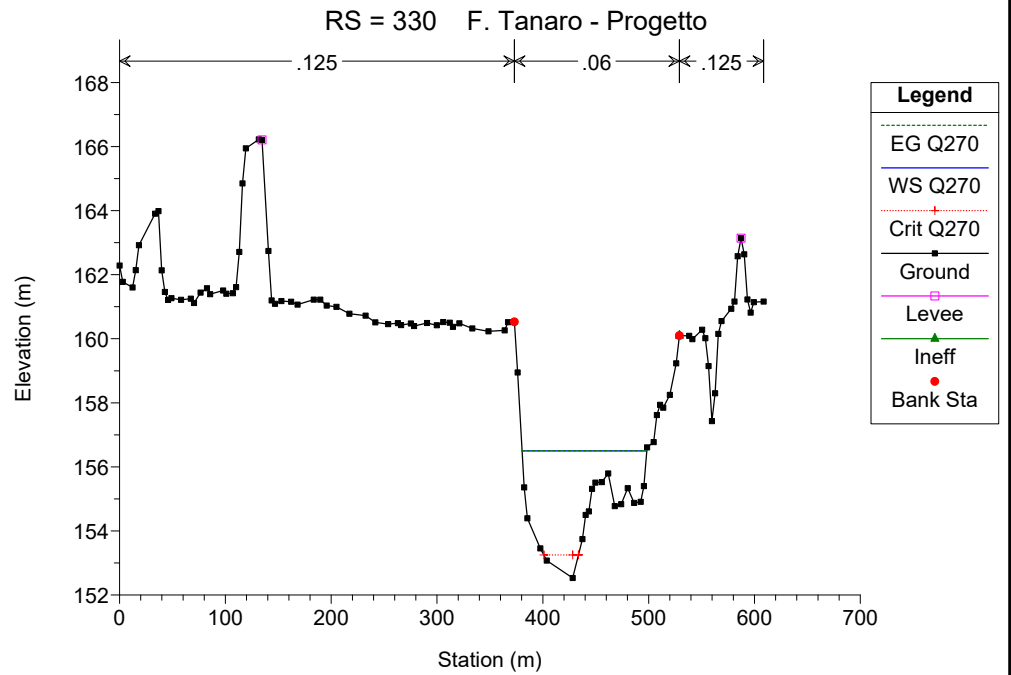
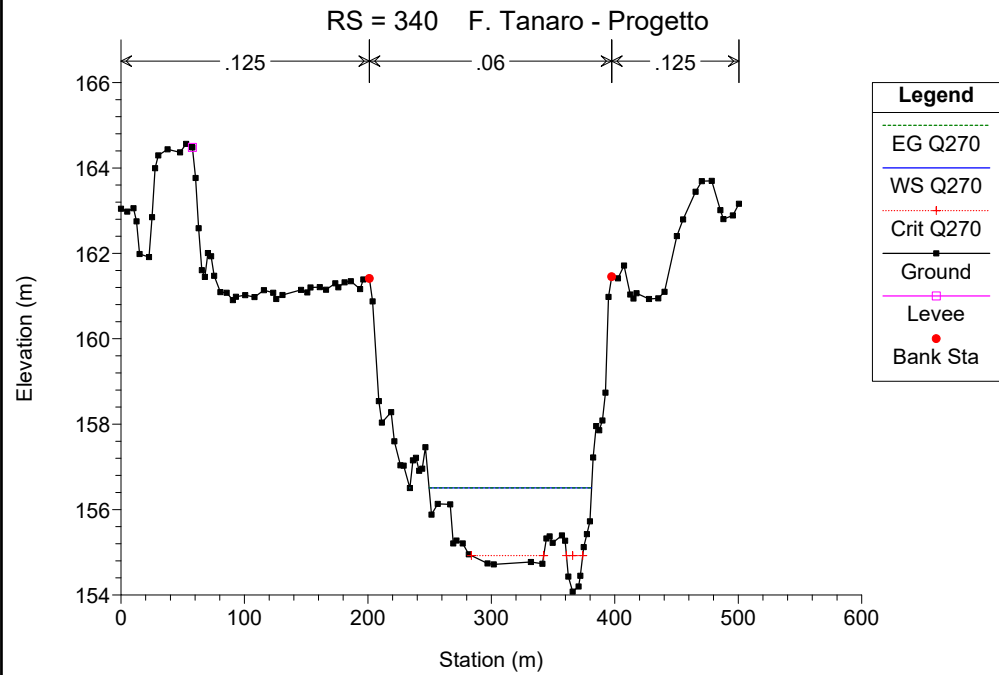
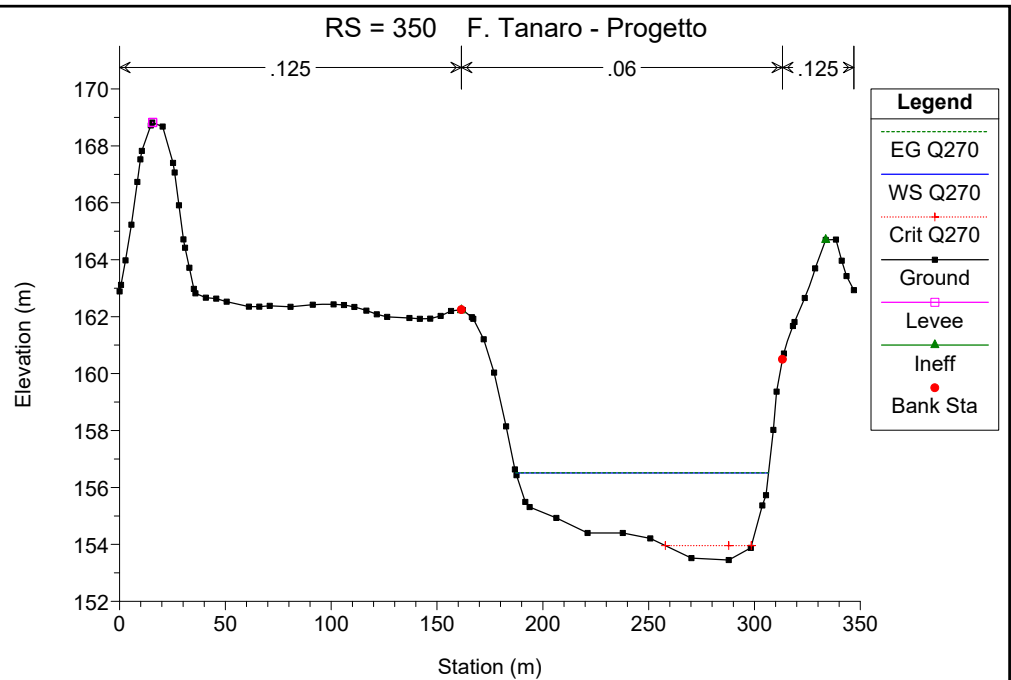
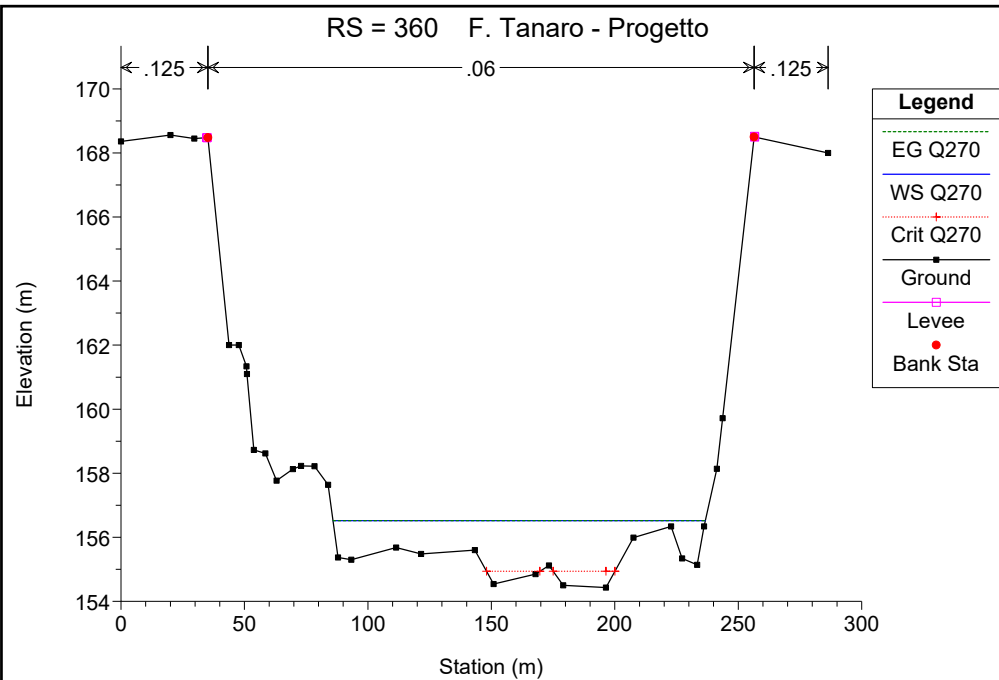


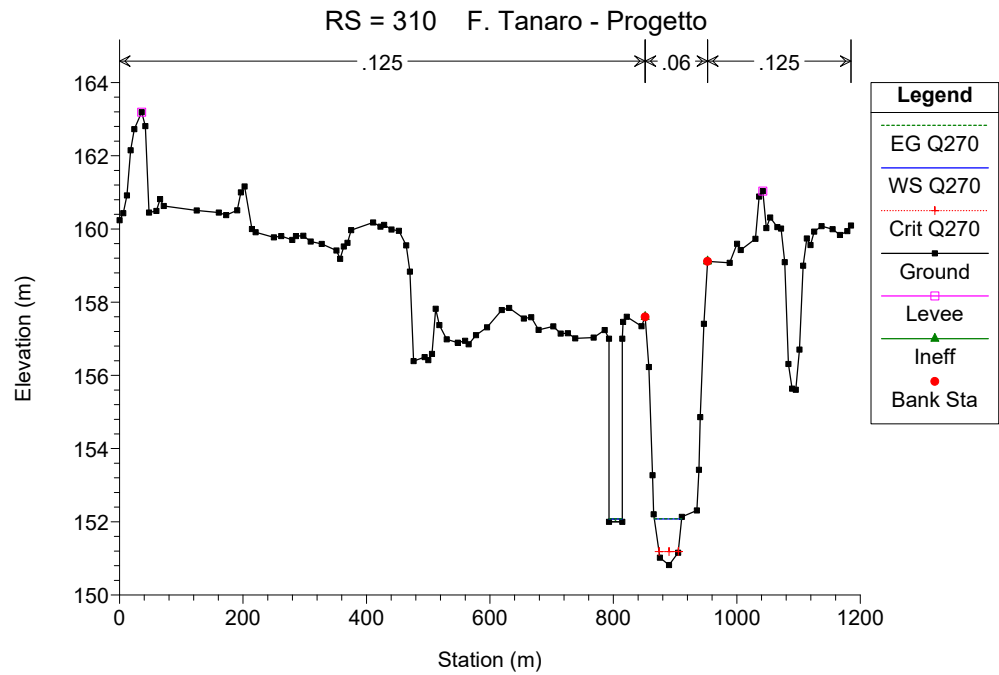
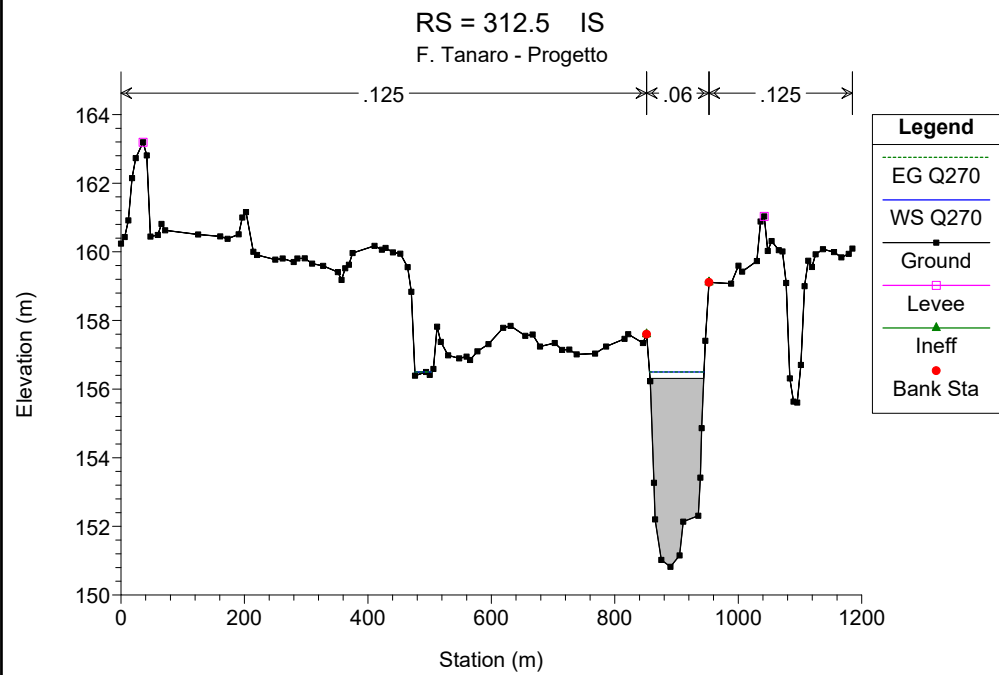
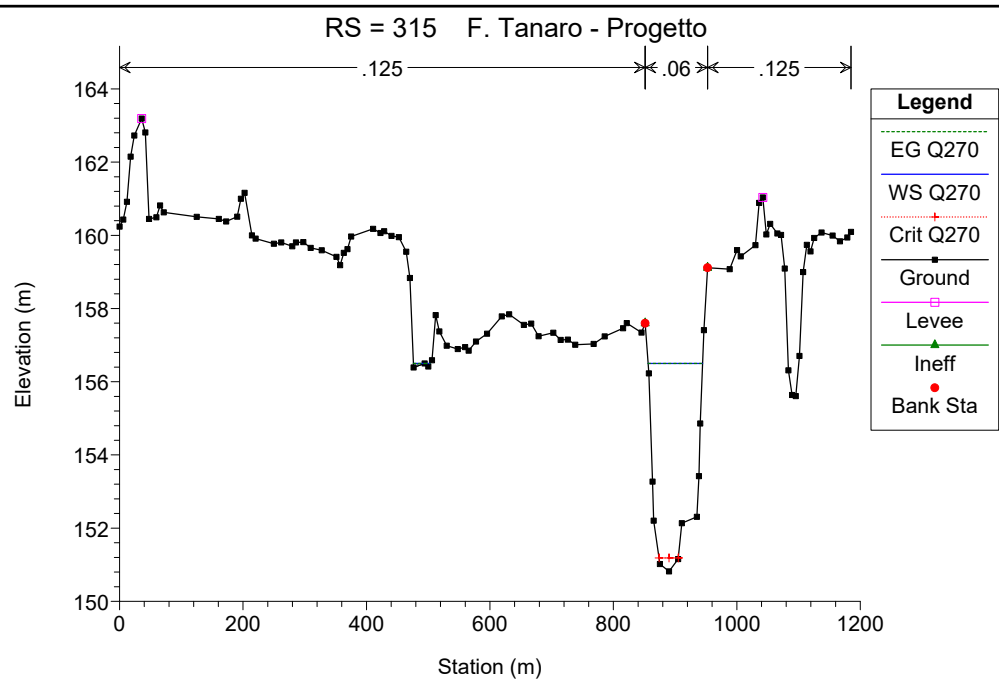
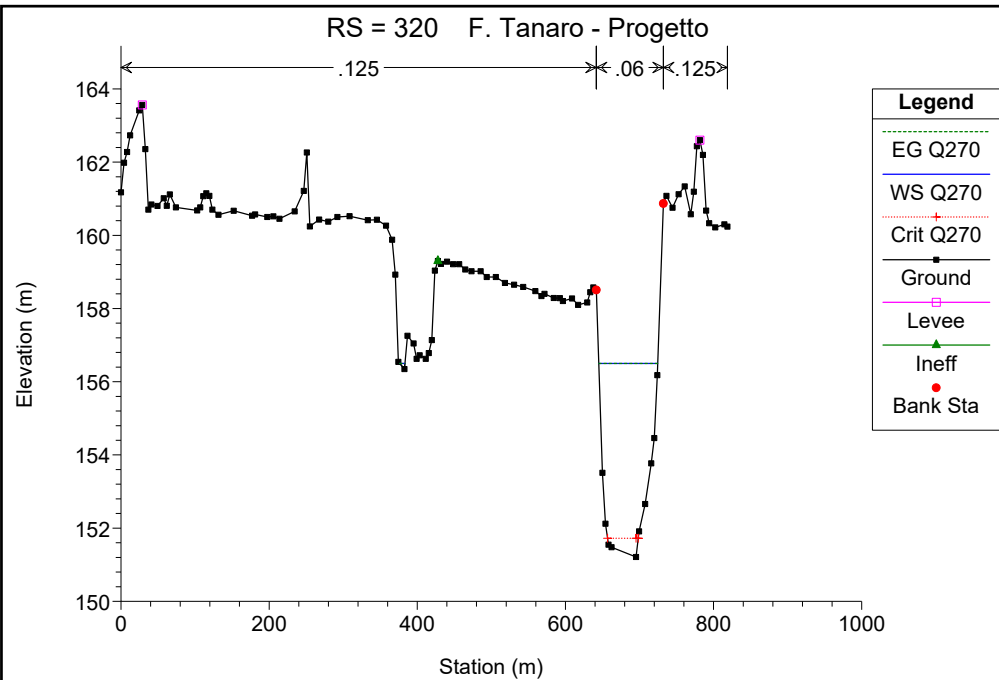


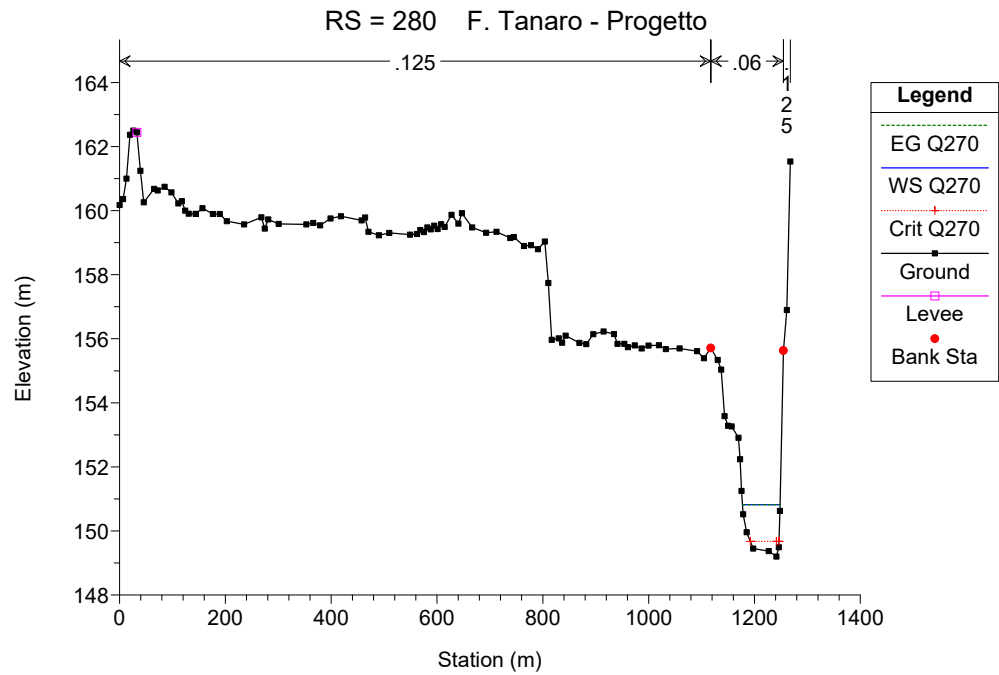
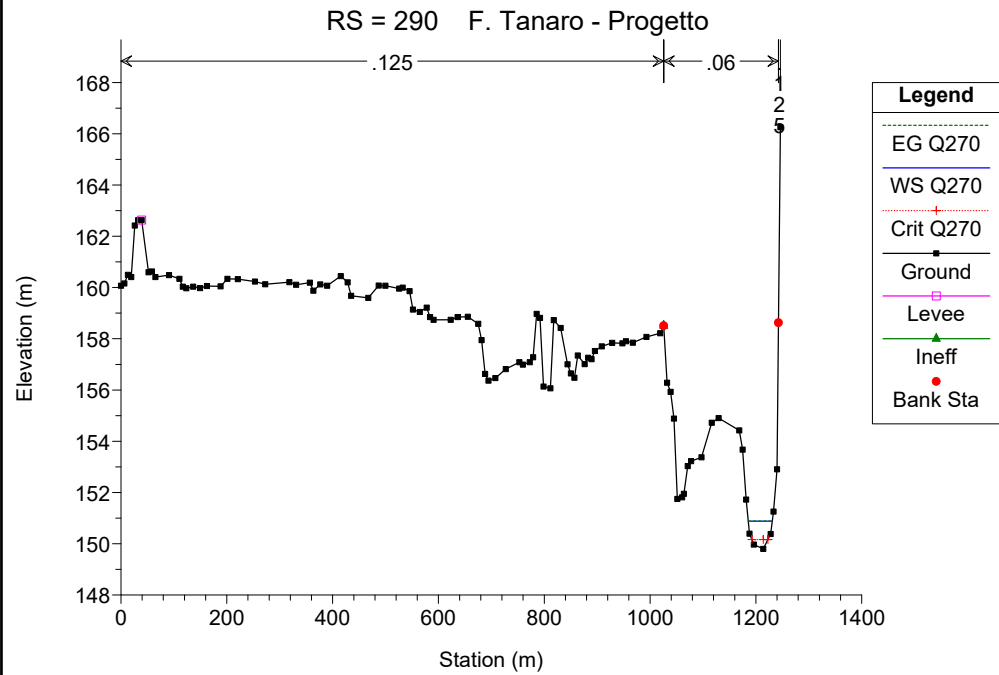
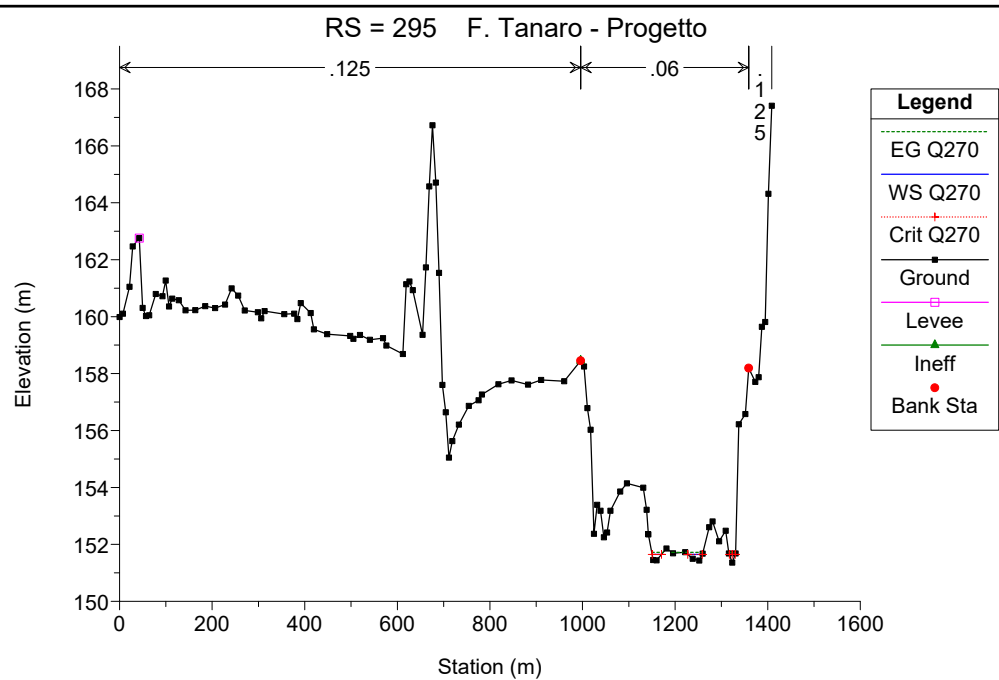
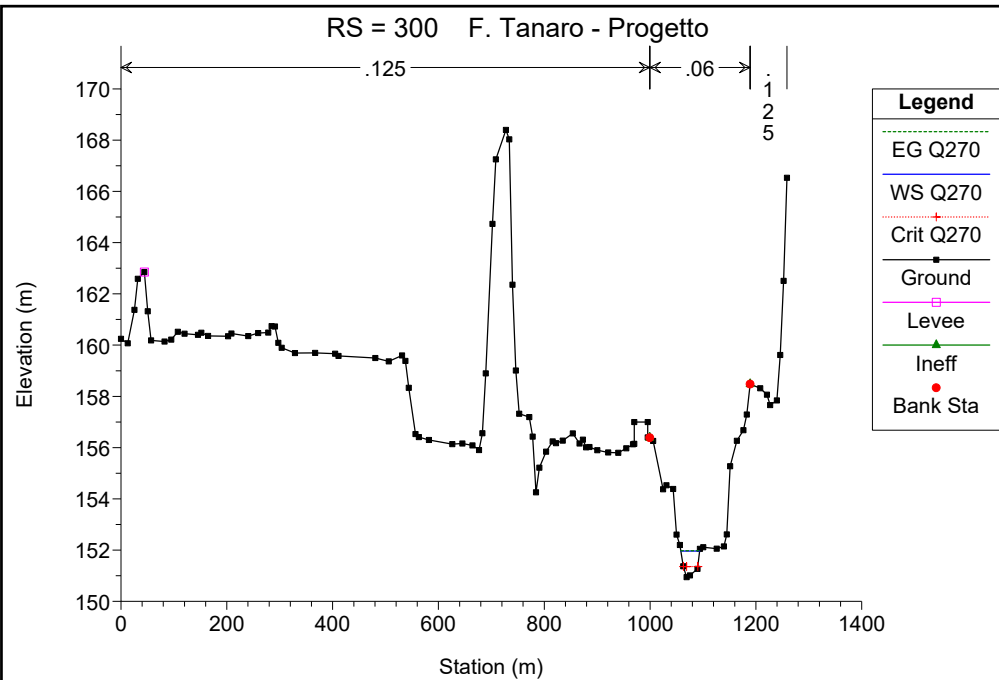


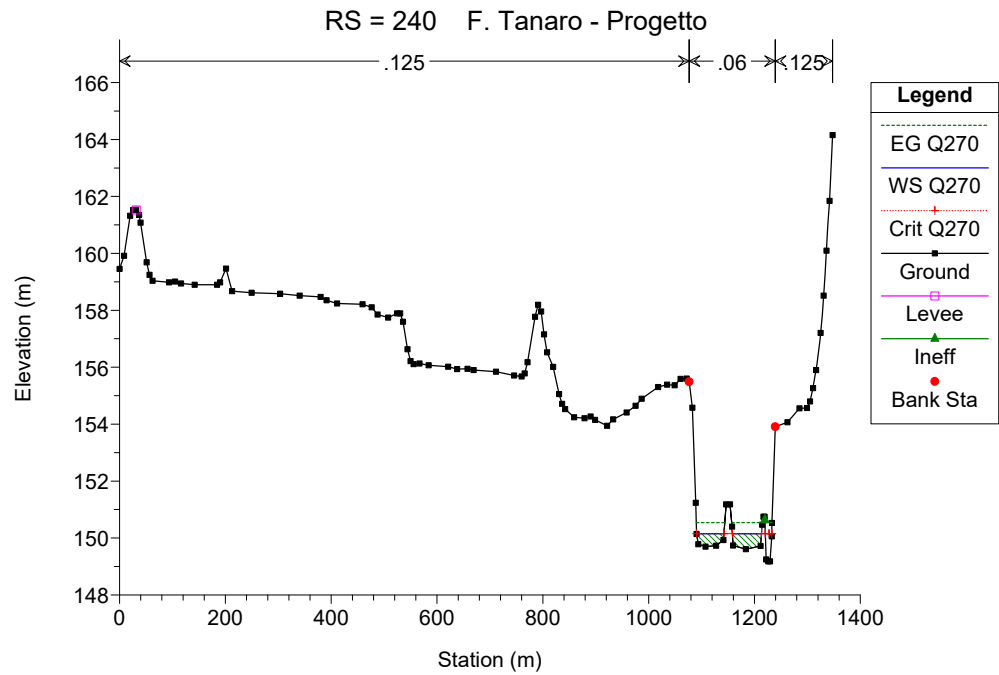
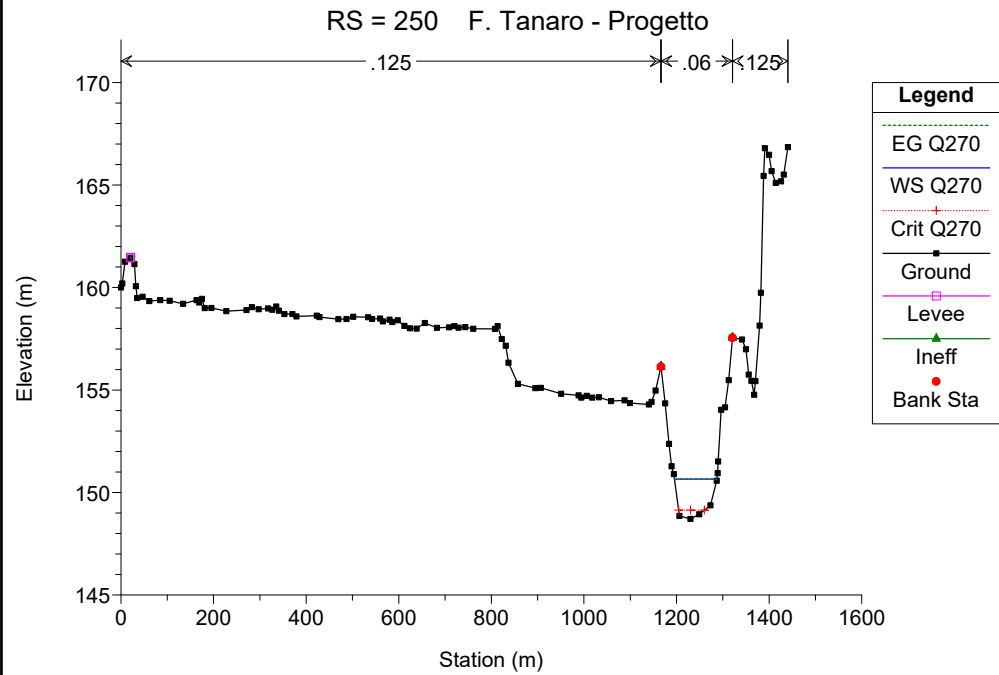
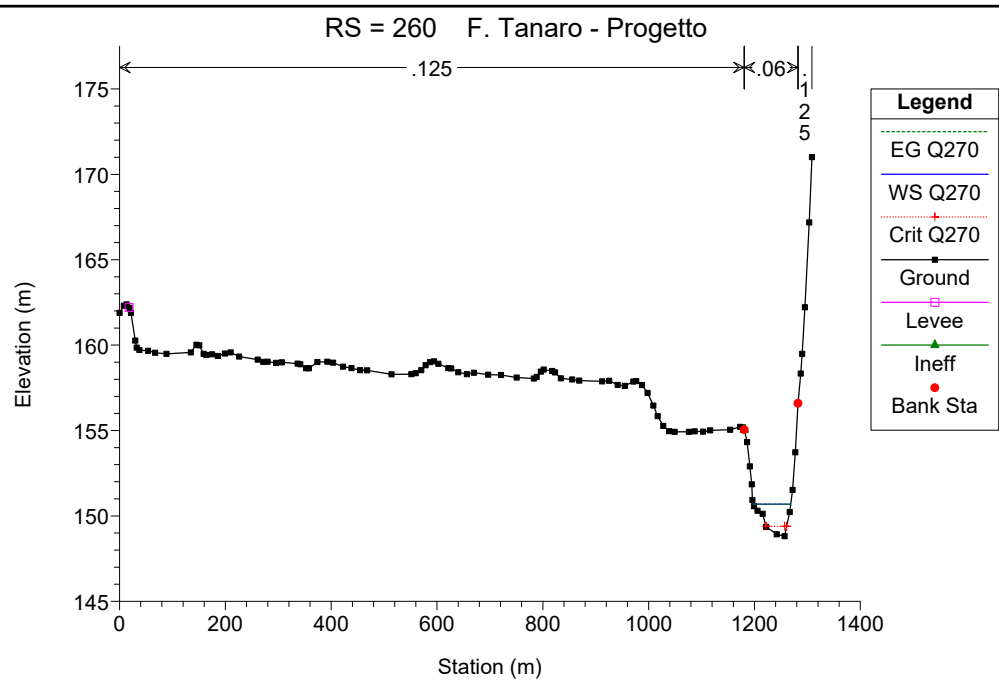
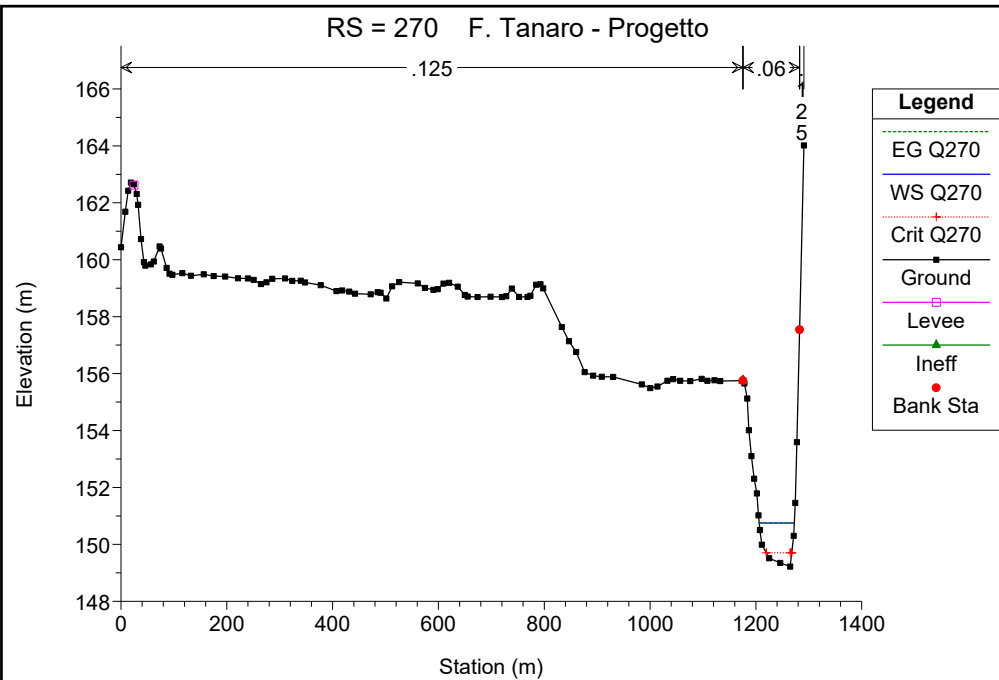




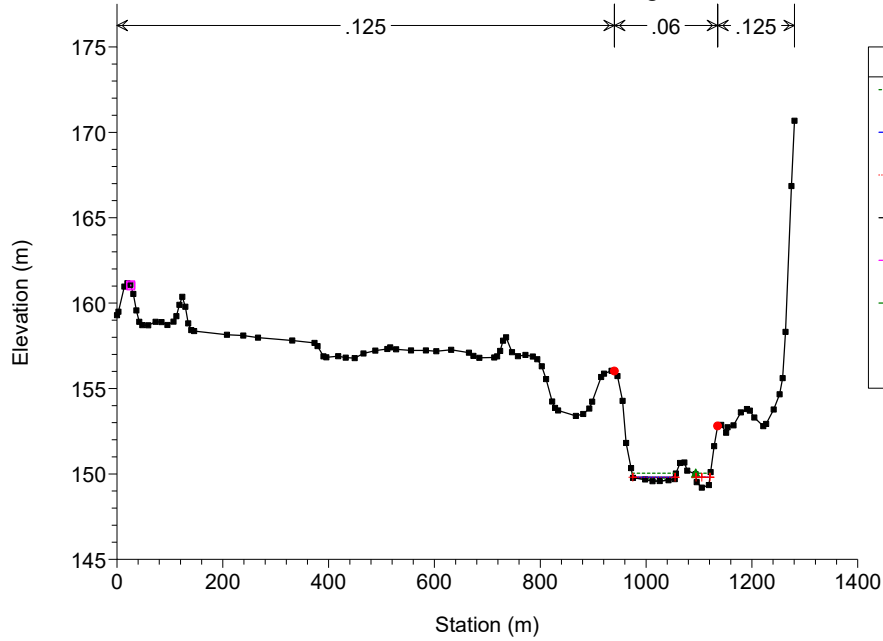




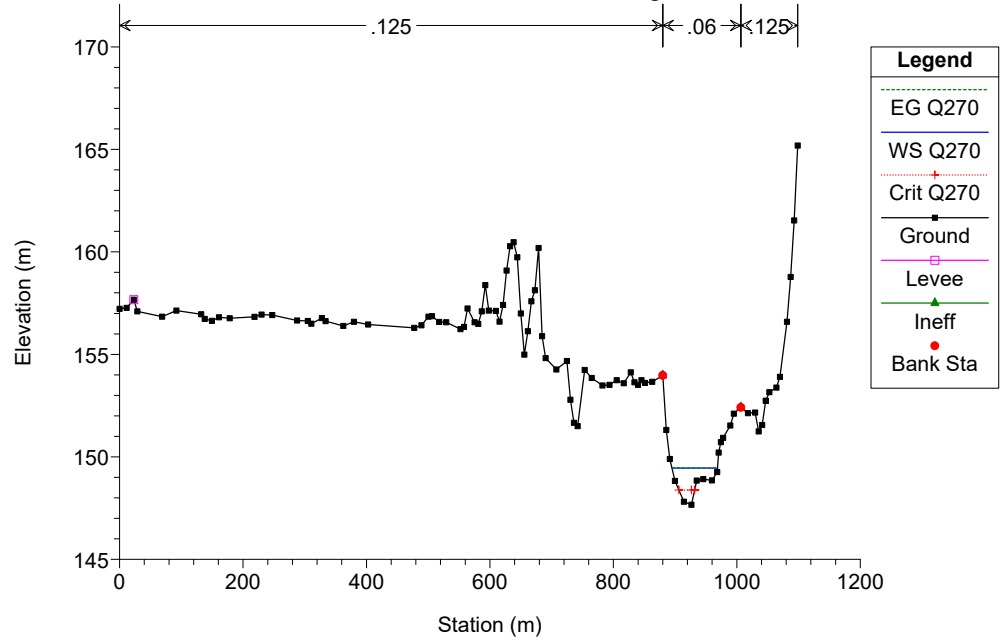




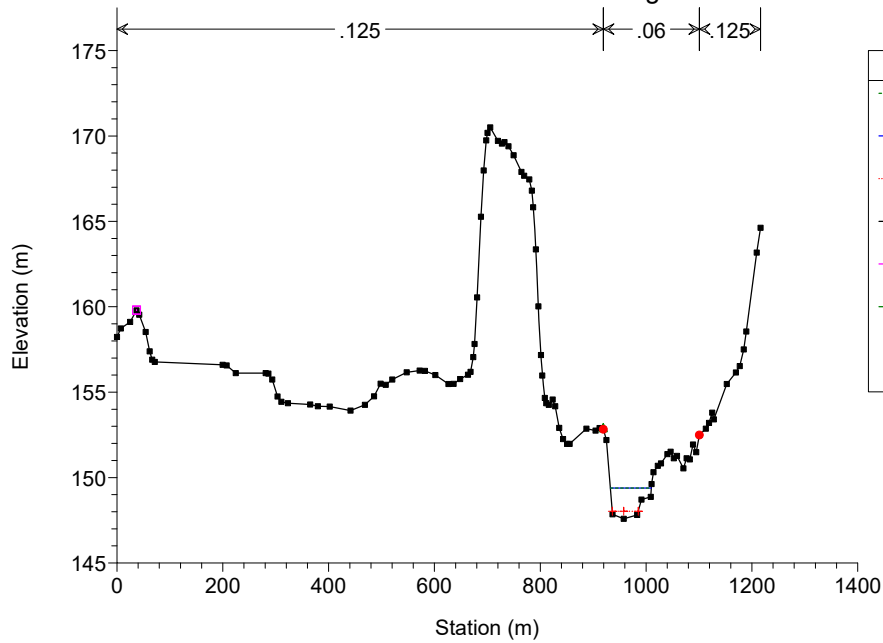
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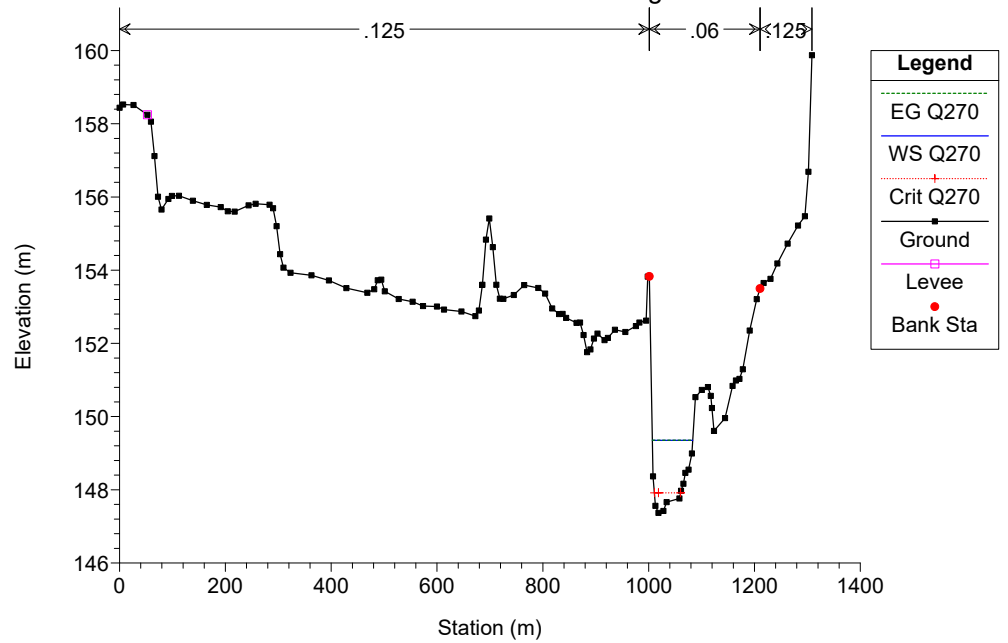
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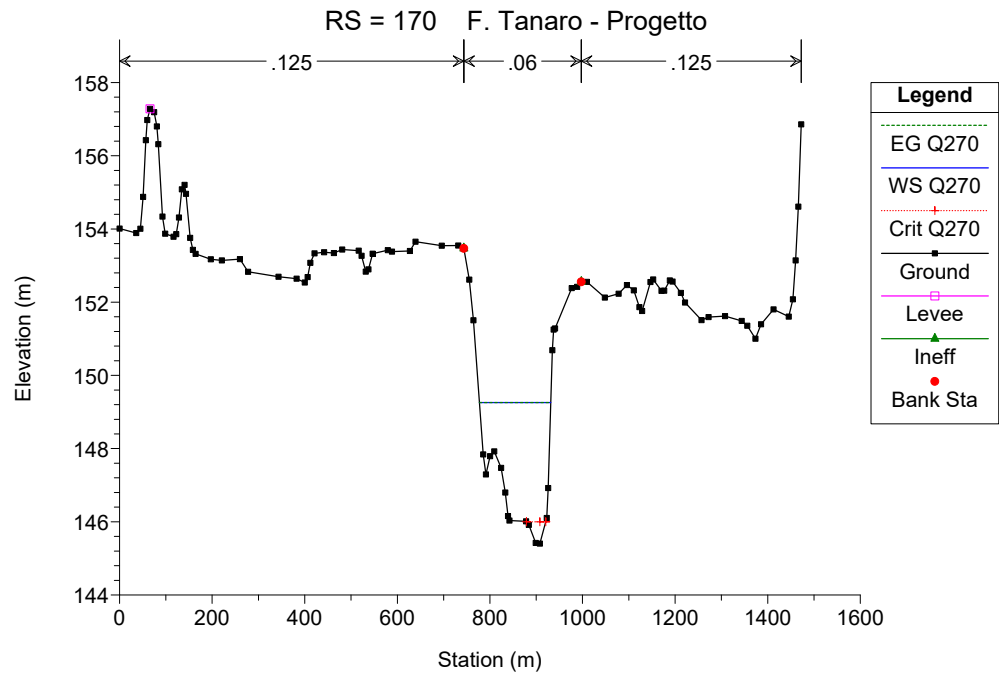
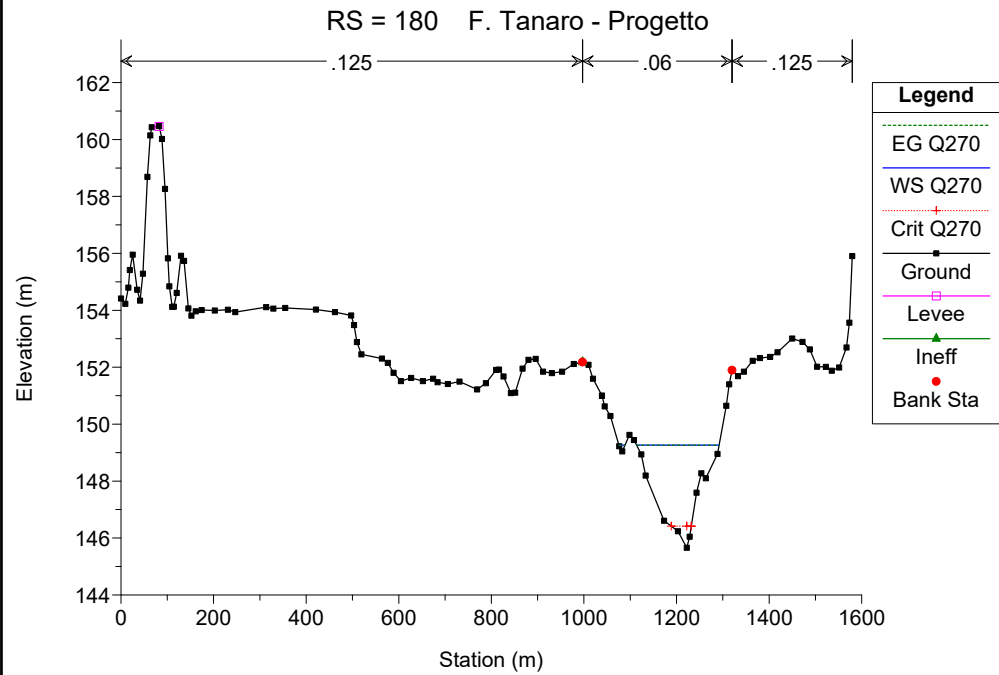
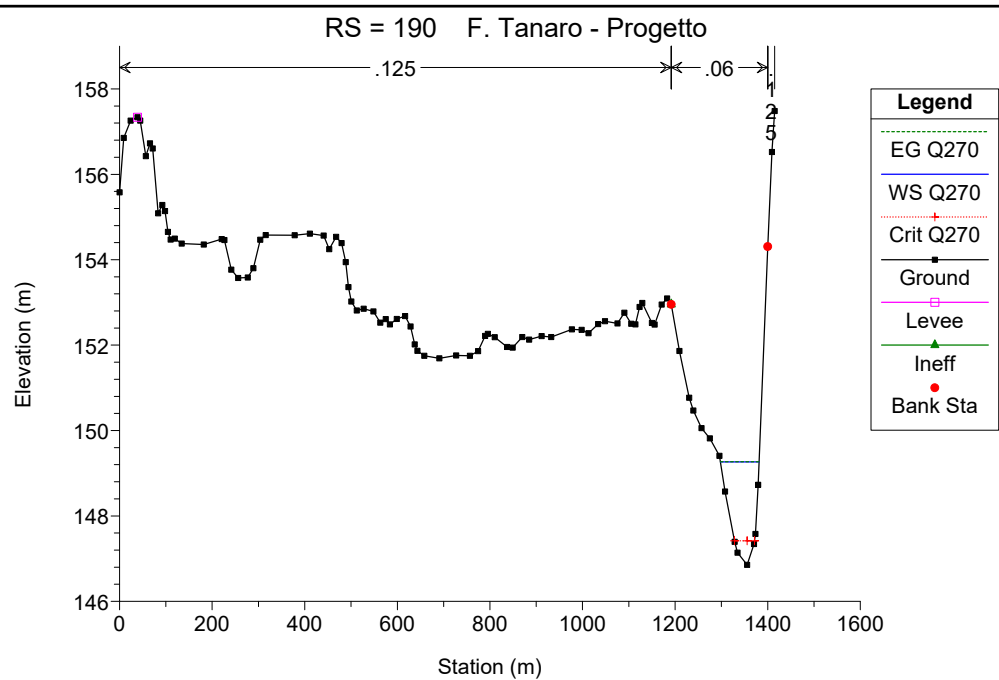
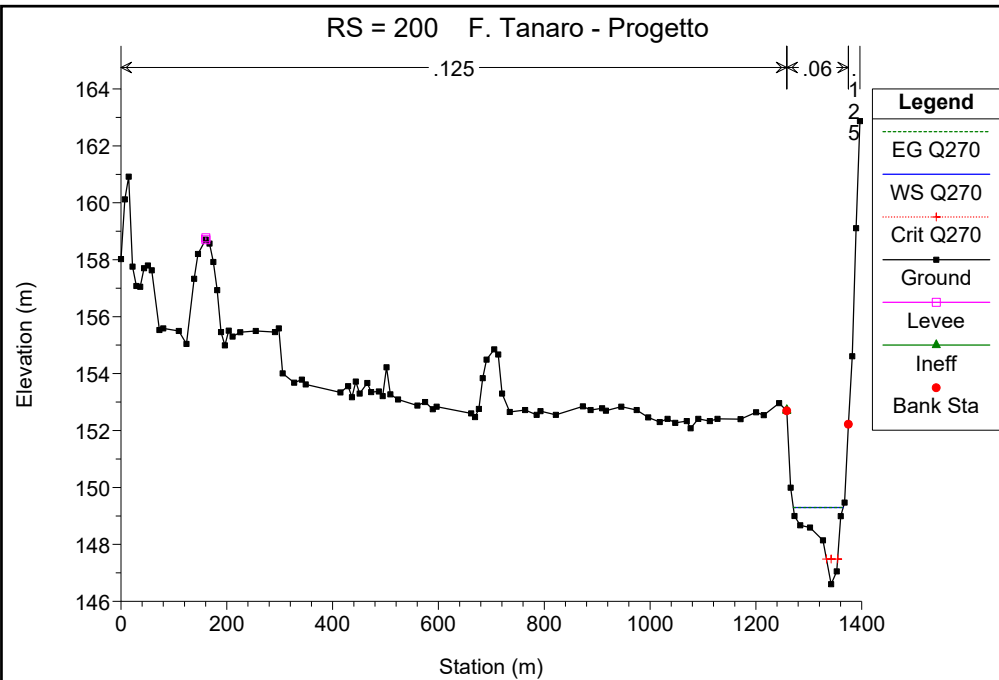


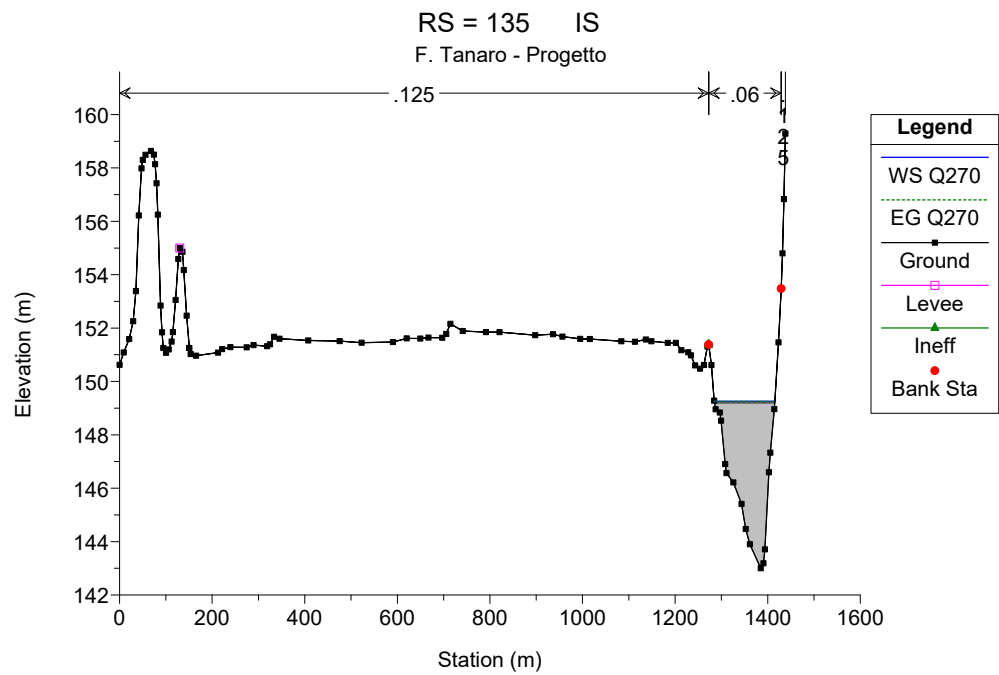
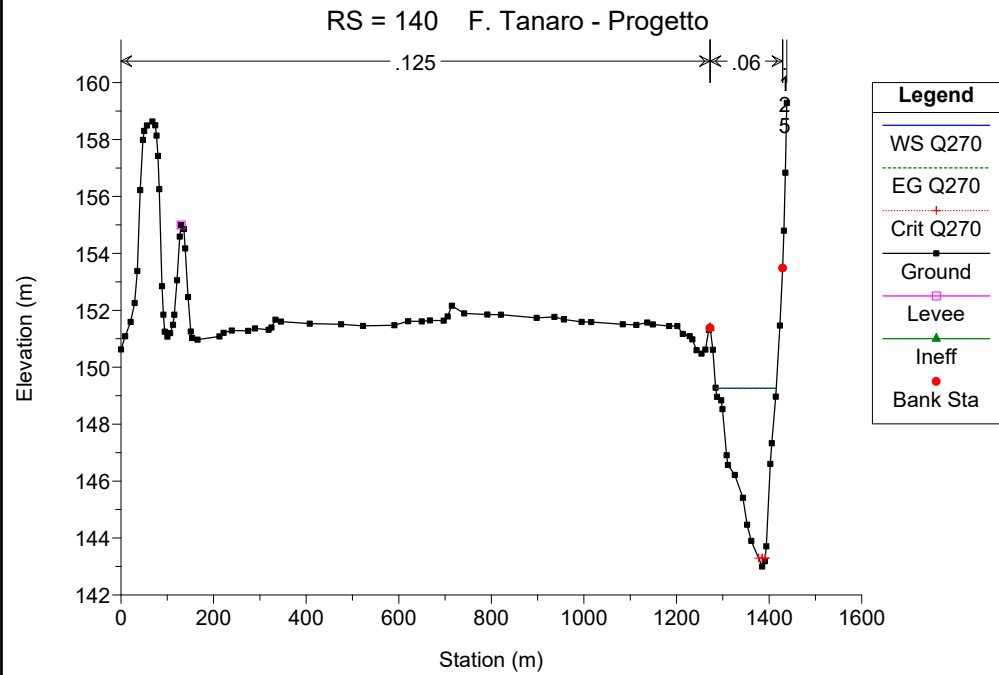
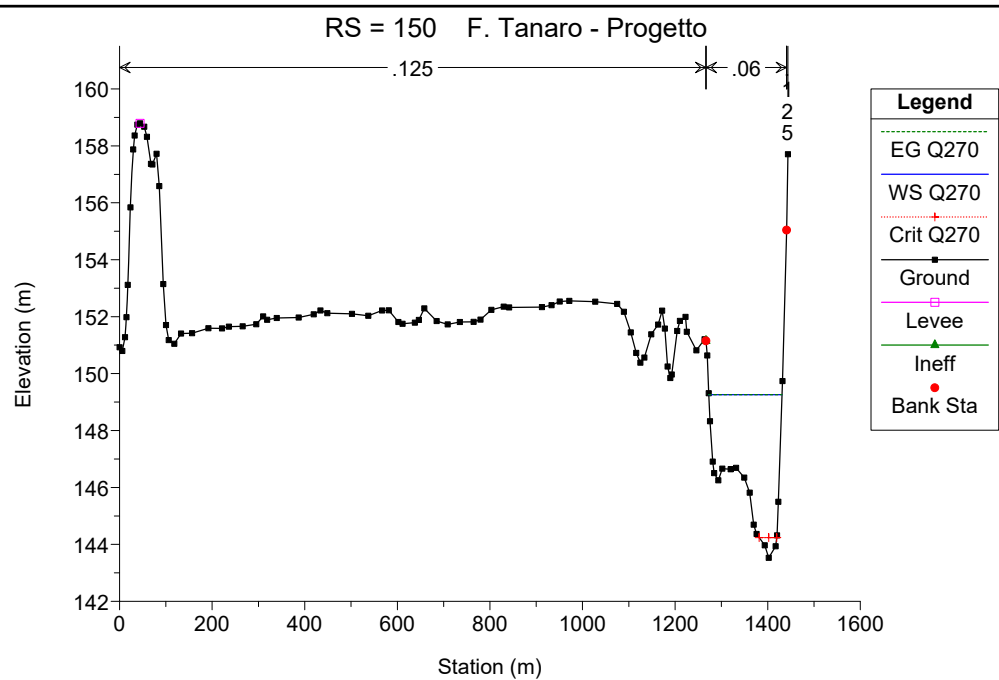
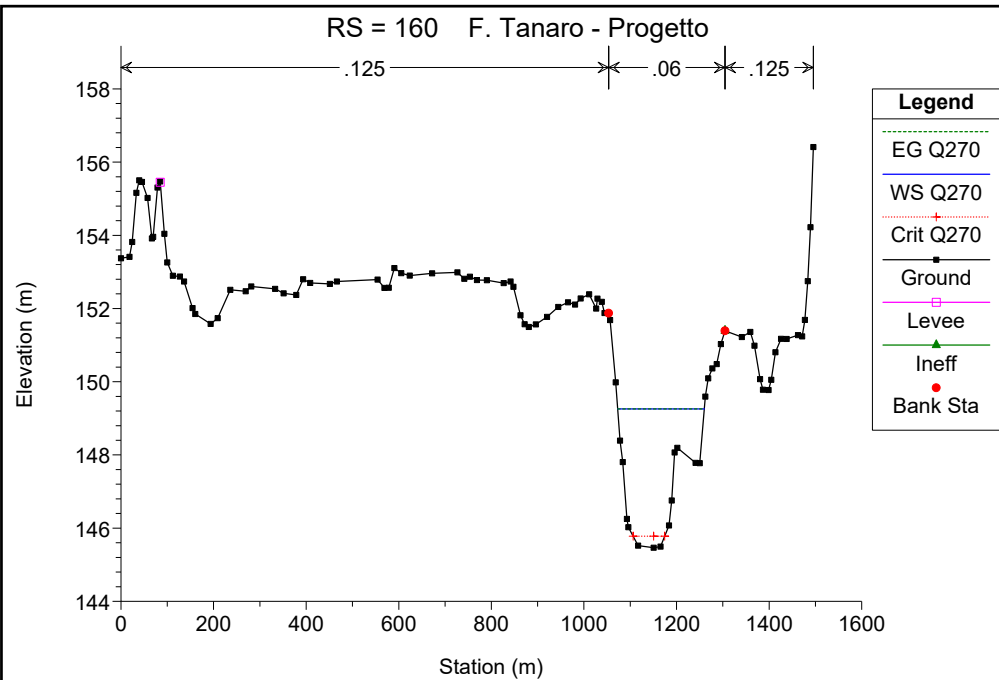
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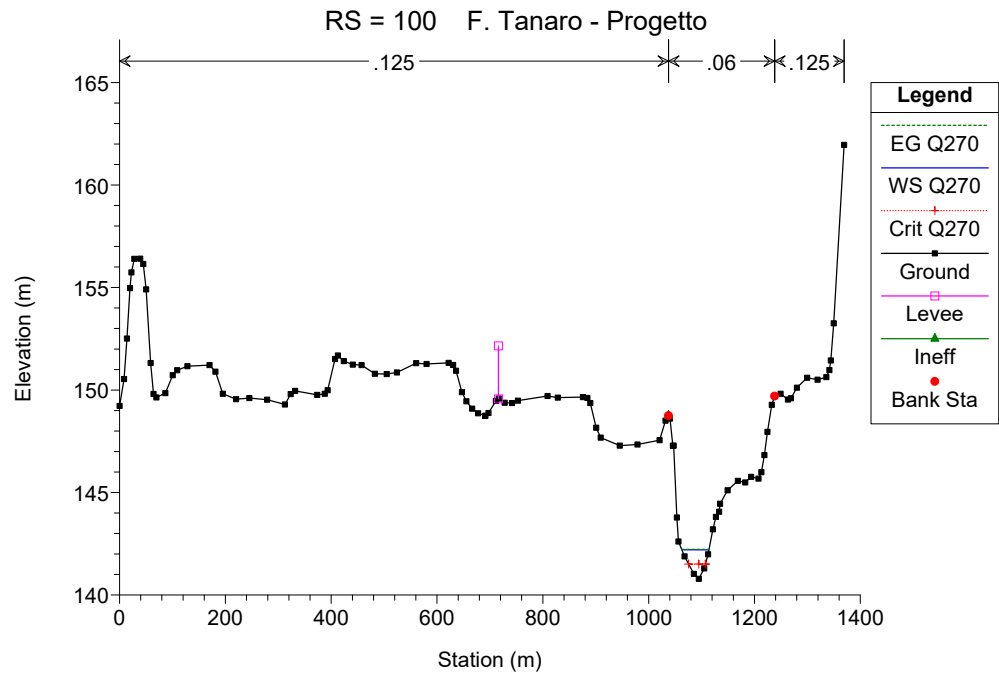
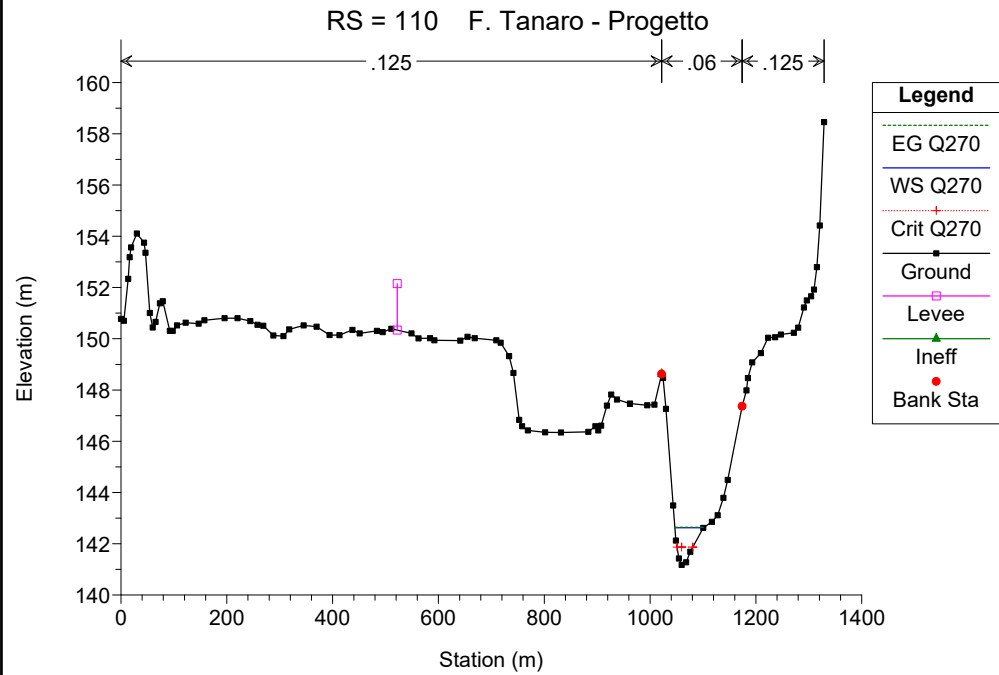
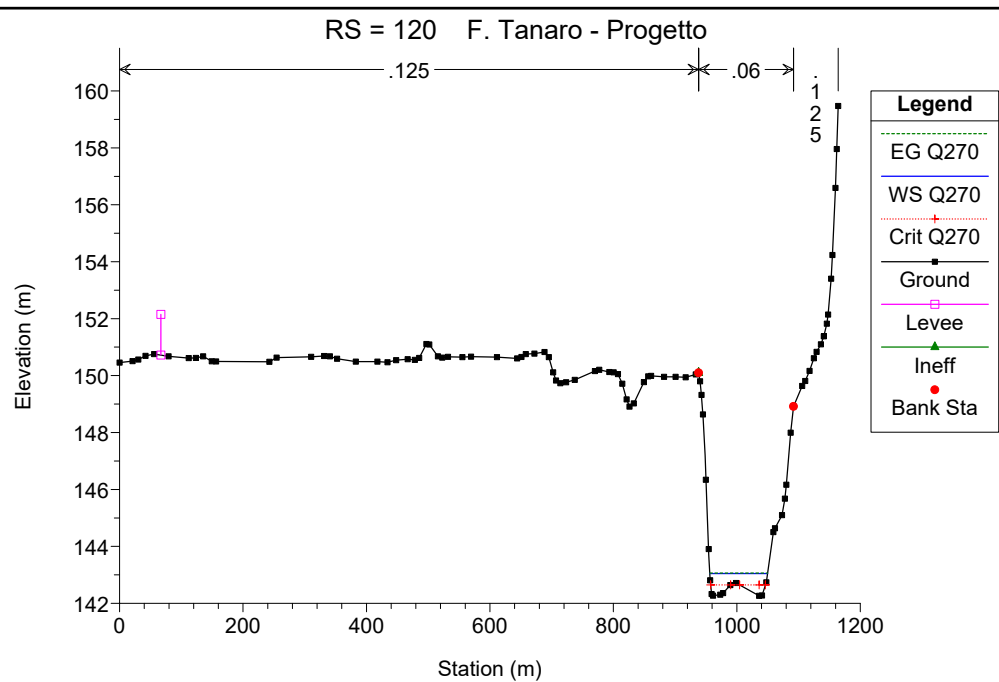
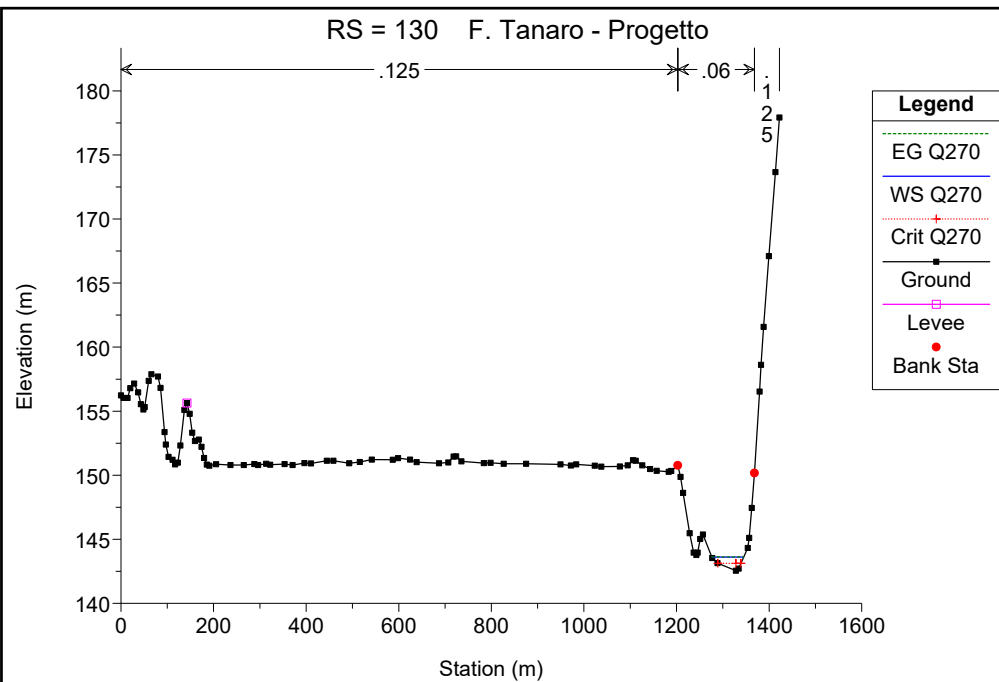


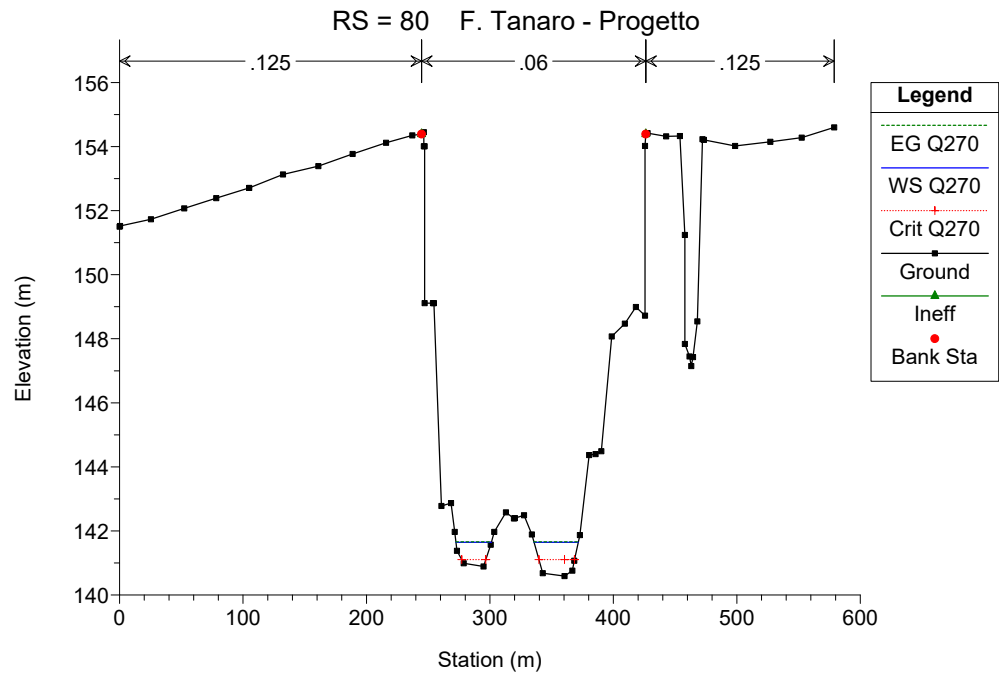
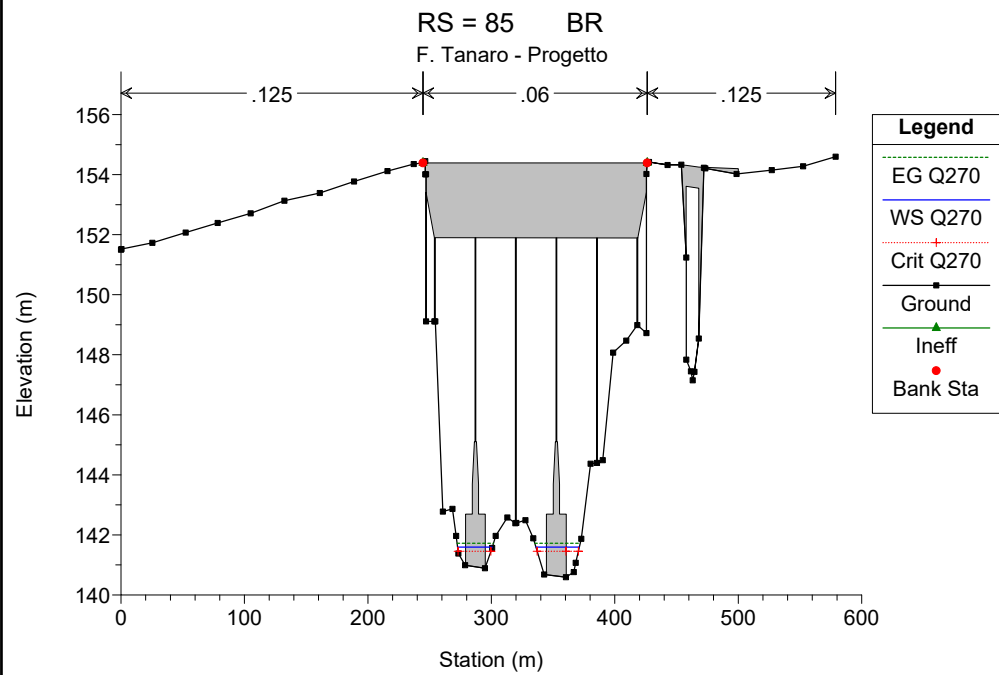
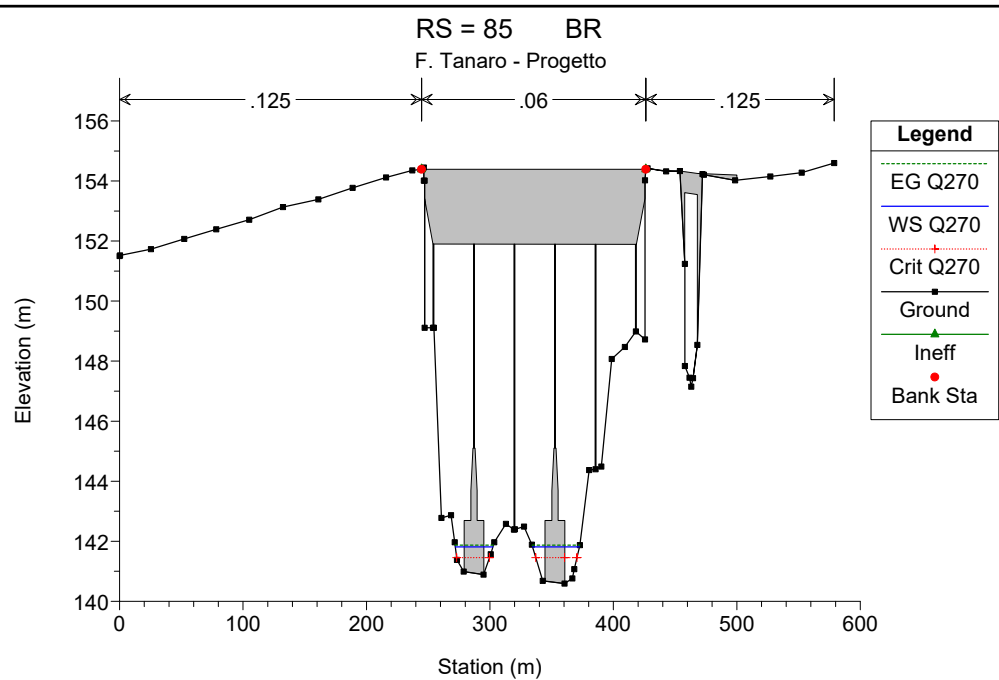
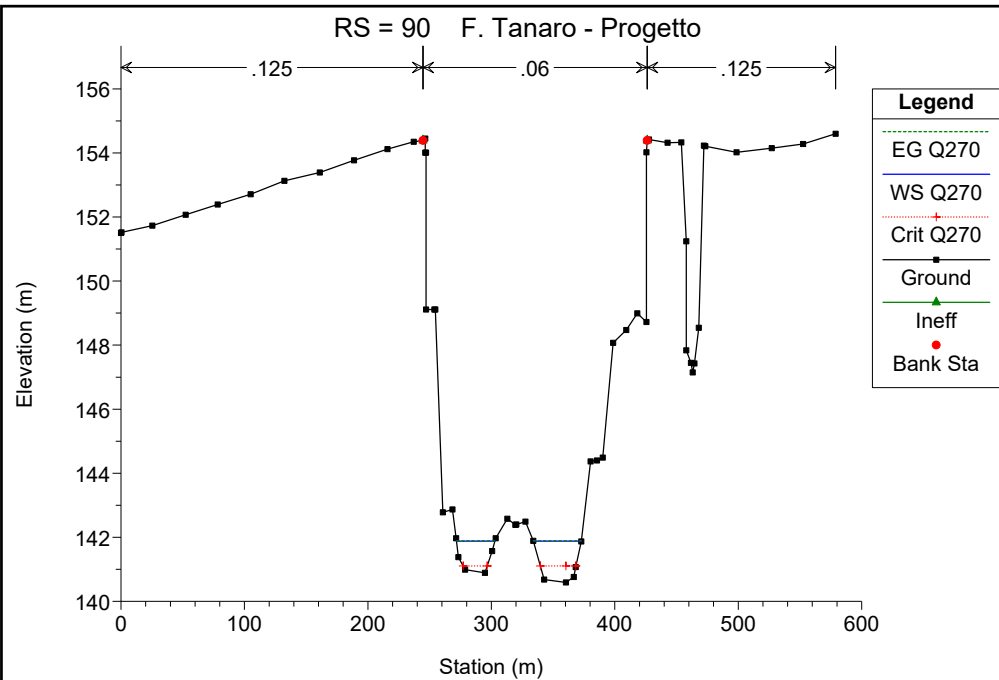
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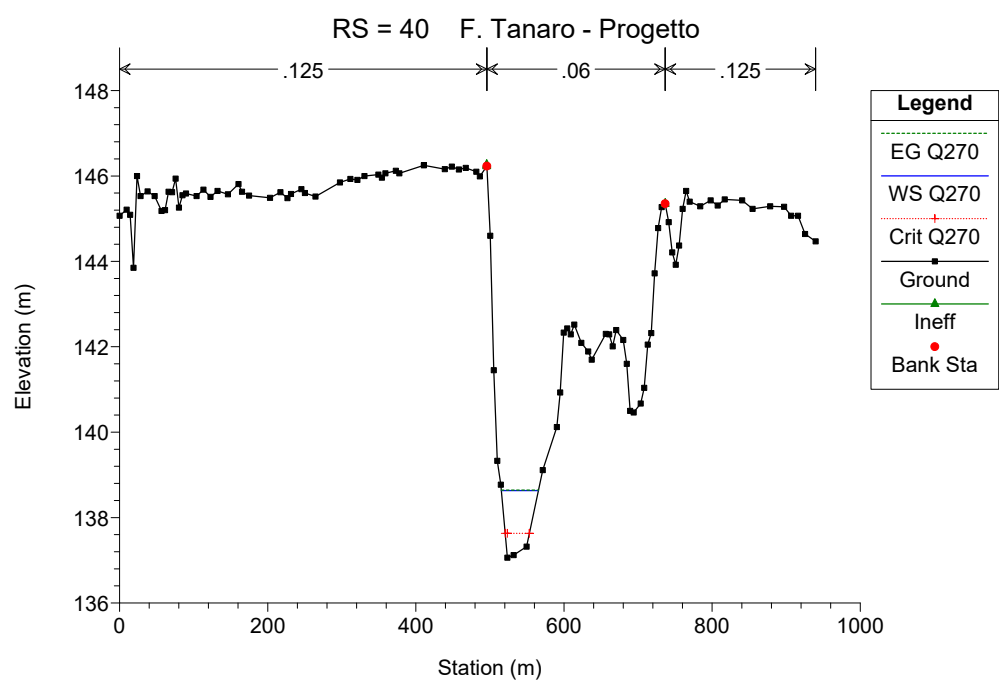
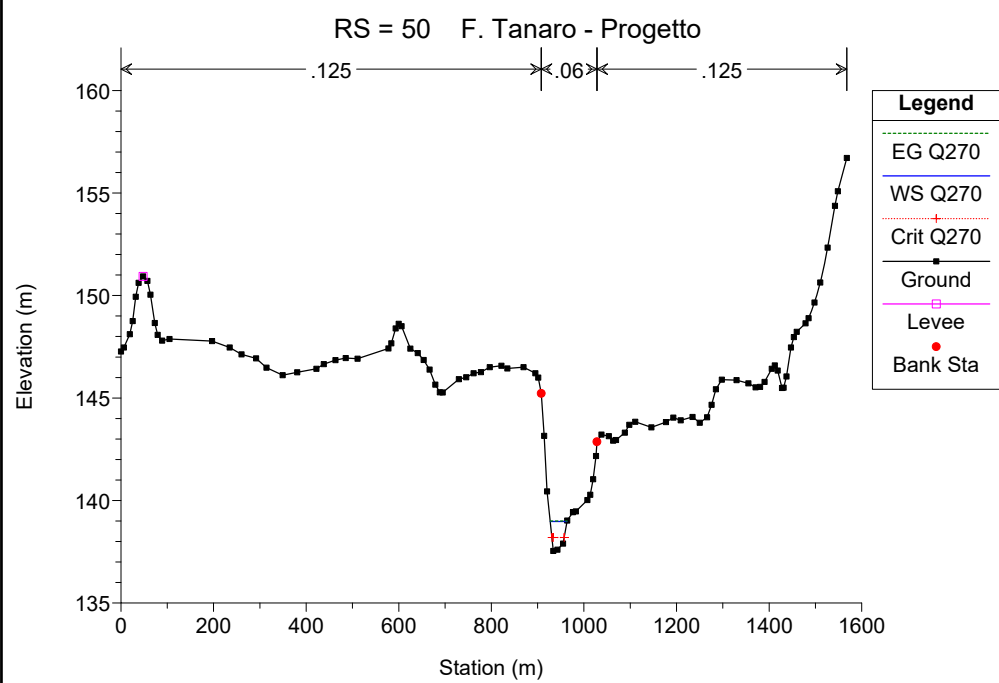
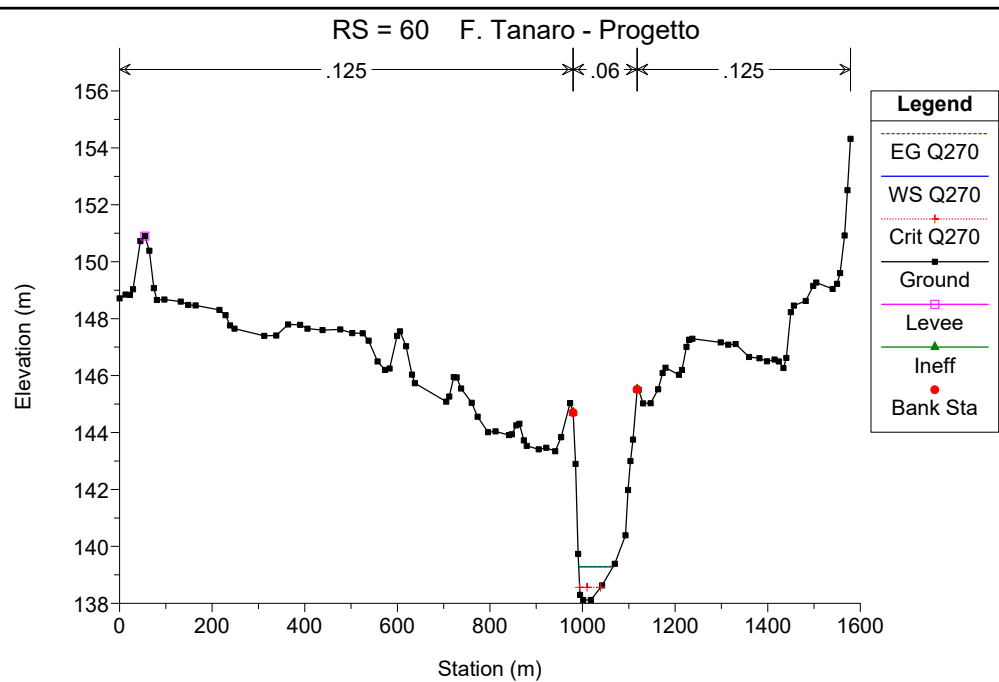
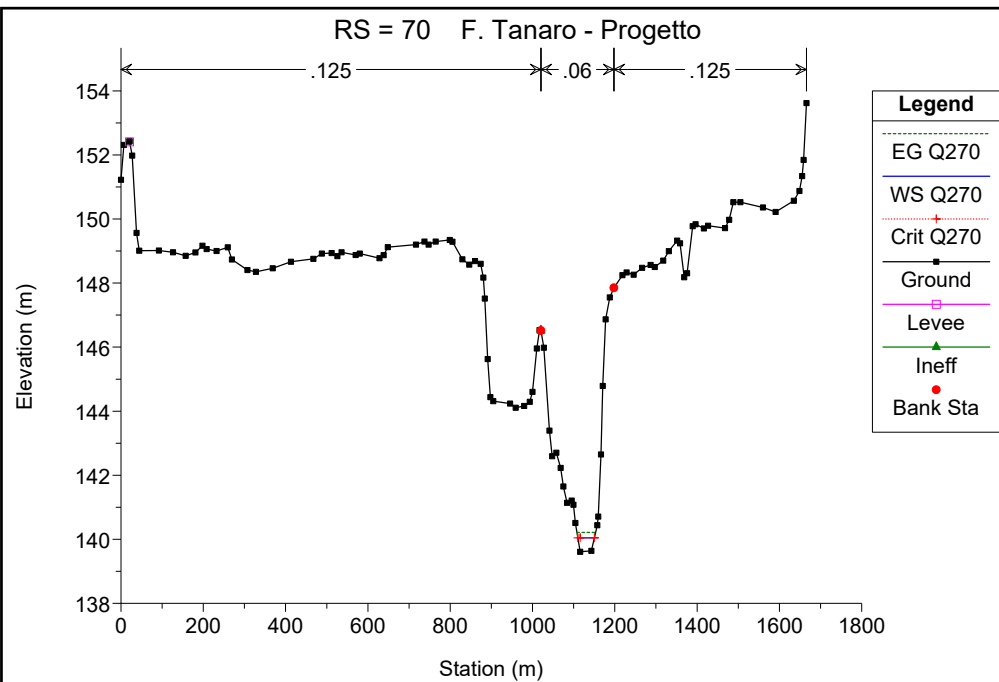


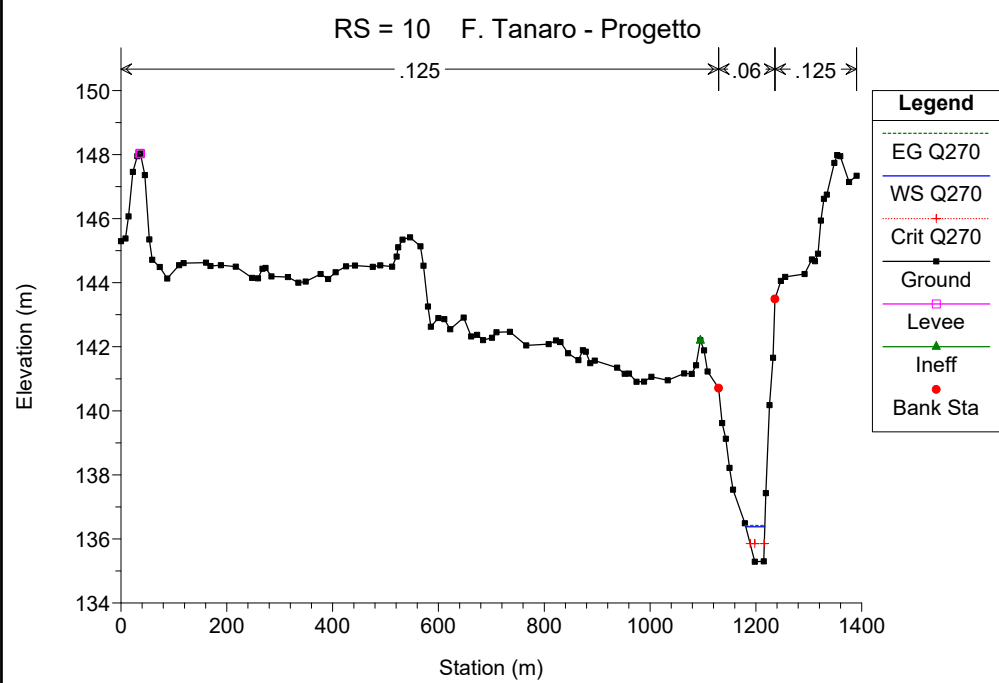
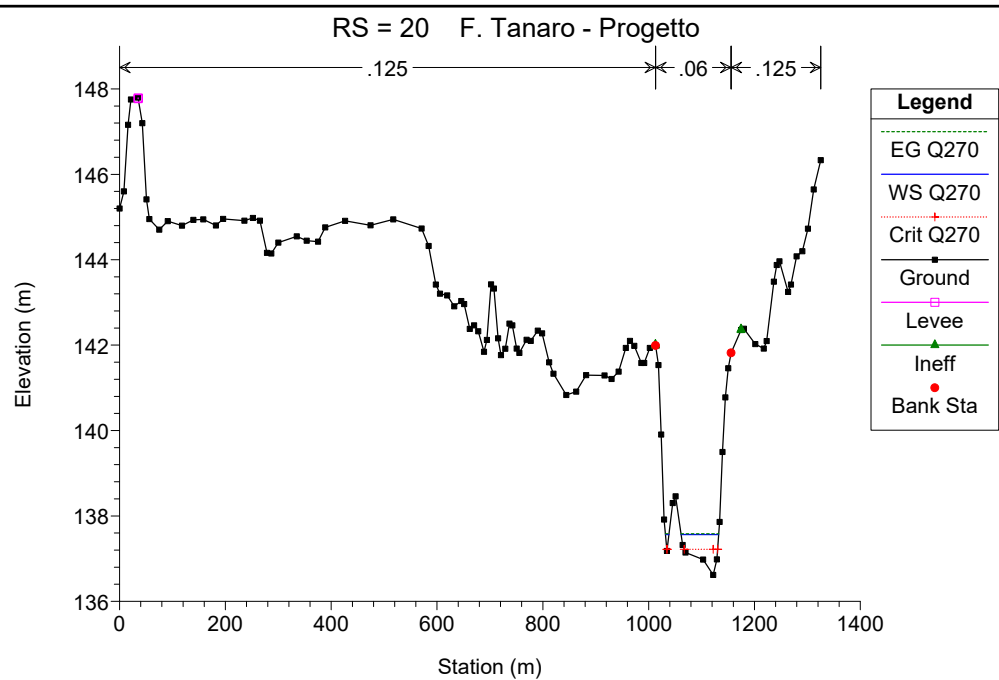
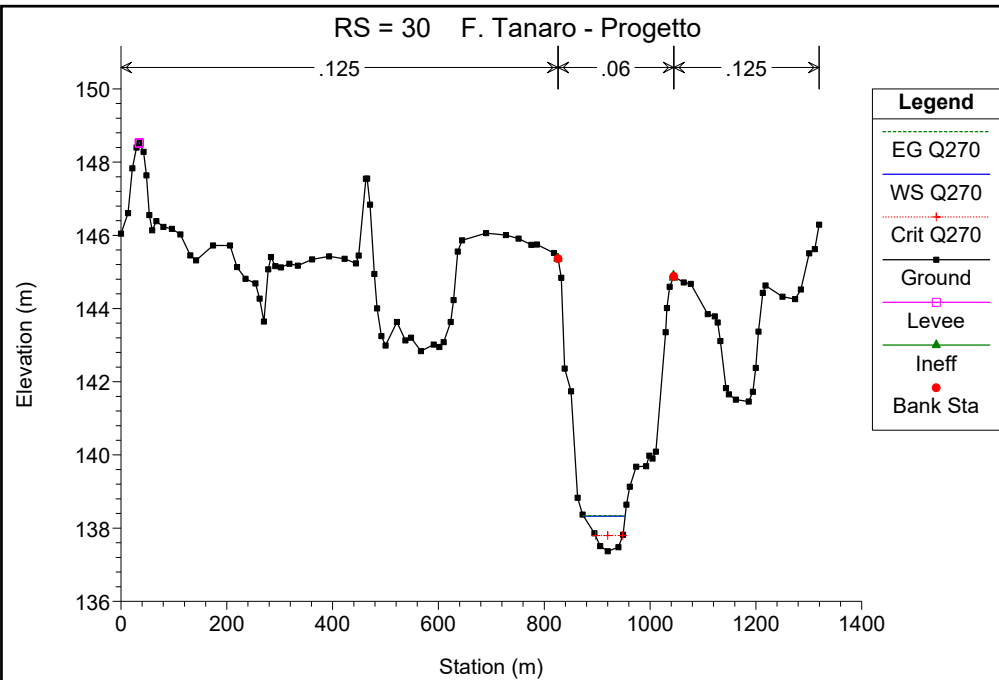












Nella tabella seguente si confrontano i profili di deflusso per valutare il punto di incrocio tra il profilo idrico di progetto e quello attuale, con riferimento alla Q_{270} .

Sezione	Liv. idrico attuale [m s.l.m.]	Liv. idrico progetto [m s.l.m.]	Differenza [m]
550	165.48	165.48	0.00
540	164.40	164.40	0.00
530	164.01	164.01	0.00
520	163.75	163.75	0.00
510	163.02	163.02	0.00
500	161.87	161.87	0.00
490	161.12	161.12	0.00
480	159.88	159.88	0.00
470	159.44	159.44	0.00
460	159.00	159.00	0.00
450	158.29	158.29	0.00
440	157.94	157.94	0.00
430	157.70	157.70	0.00
420	157.69	157.69	0.00
410	157.66	157.66	0.00
400	157.50	157.50	0.00
390	157.48	157.48	0.00
380	157.27	157.27	0.00
379	157.27	157.27	0.00
370	155.81	156.53	0.72
360	155.47	156.52	1.05
350	155.41	156.51	1.10
340	155.31	156.51	1.20
330	153.25	156.50	3.25
320	152.70	156.50	3.80

Tab. 7.1. Livelli idrici nella zona a monte della centrale in progetto per la portata Q_{270} con riferimento alla situazione attuale e alla situazione di progetto.

La lunghezza del profilo di rigurgito è pari a circa 1480 m. Il volume invasato, calcolato facendo riferimento alla Q_{270} , nel tratto compreso tra la traversa ed il punto di annullamento del rigurgito, è pari a circa 380'000 m³. Tale volume è pari all'intero volume invasato compreso tra il pelo libero ed il fondo alveo.

8. 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.

8.1. SCELTA DELLE PORTATE DI VERIFICA

Si assumono come portate di verifica le seguenti portate: 15.9 m³/s (portata minima di funzionamento dell'impianto), 300 m³/s (portata massima di funzionamento dell'impianto) e 3050 m³/s (che è la portata con tempo di ritorno 200 anni).

8.2. 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.

8.2.1 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. 8.2.1 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.

8.3 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.

8.4 CALCOLO 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 in progetto di Alba;
- sezione immediatamente a valle della traversa in progetto di Alba;
- sezione immediatamente a monte della traversa di Barbaresco;
- sezione immediatamente a valle della traversa di Barbaresco;
- ponte della SP3 Castagnito-Neive;

Il collasso dello sbarramento in progetto è stato analizzato nelle seguenti condizioni:

A) $Q = 15.9 \text{ m}^3/\text{s}$ – TRAVERSA CON SBARRAMENTO MOBILE ALZATO

B) $Q = 300 \text{ m}^3/\text{s}$ - TRAVERSA CON SBARRAMENTO MOBILE ALZATO

C) $Q = 3050 \text{ m}^3/\text{s}$ (TR200) - TRAVERSA CON SBARRAMENTO MOBILE ALZATO

Le simulazioni sono state condotte analizzando uno scenario particolarmente sfavorevole: si è infatti ipotizzato che, oltre al crollo dello sbarramento in progetto di Alba, si verifichi anche il crollo della traversa di Barbaresco nel momento in cui sopraggiunge l'onda di piena generata dal crollo dello sbarramento di Alba. In questo modo è possibile valutare gli effetti cumulativi generato dal duplice crollo delle traverse.

A) $Q = 15.90 \text{ m}^3/\text{s}$ - TRAVERSA CON SBARRAMENTO MOBILE ALZATO

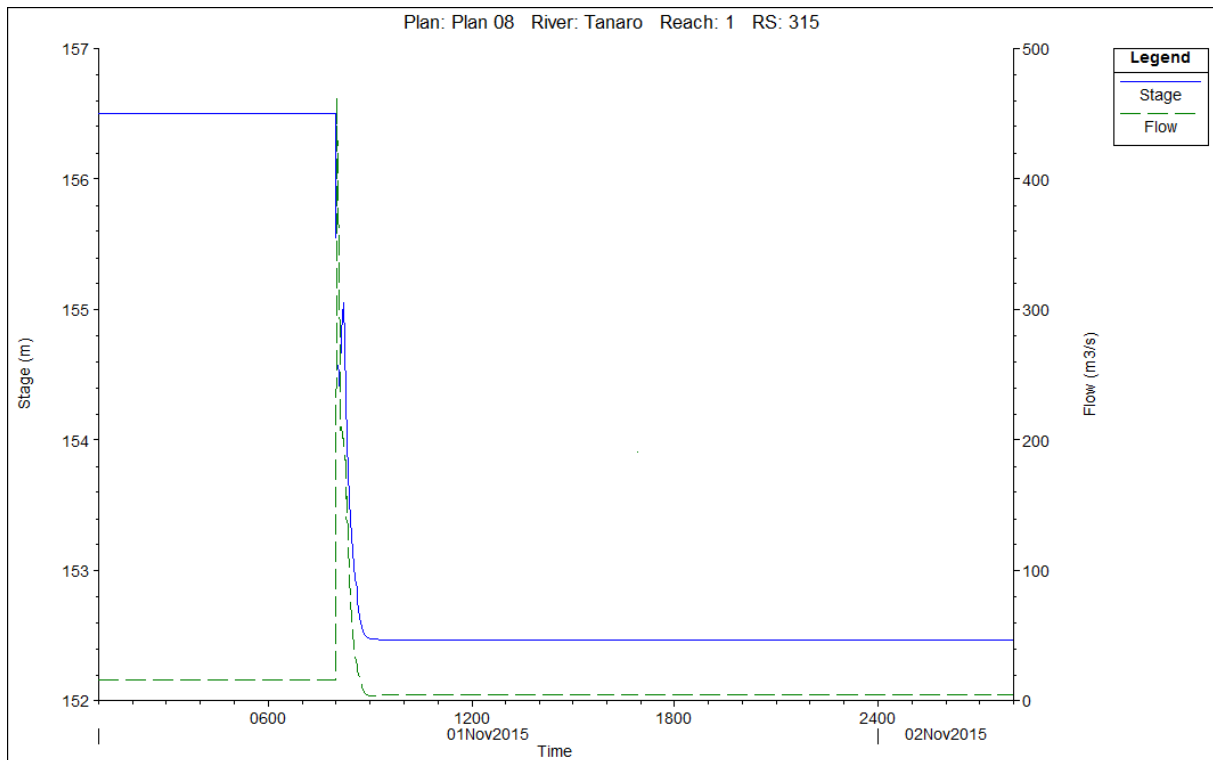


Fig. 8.4.1 sezione 320 - immediatamente a monte della traversa in progetto

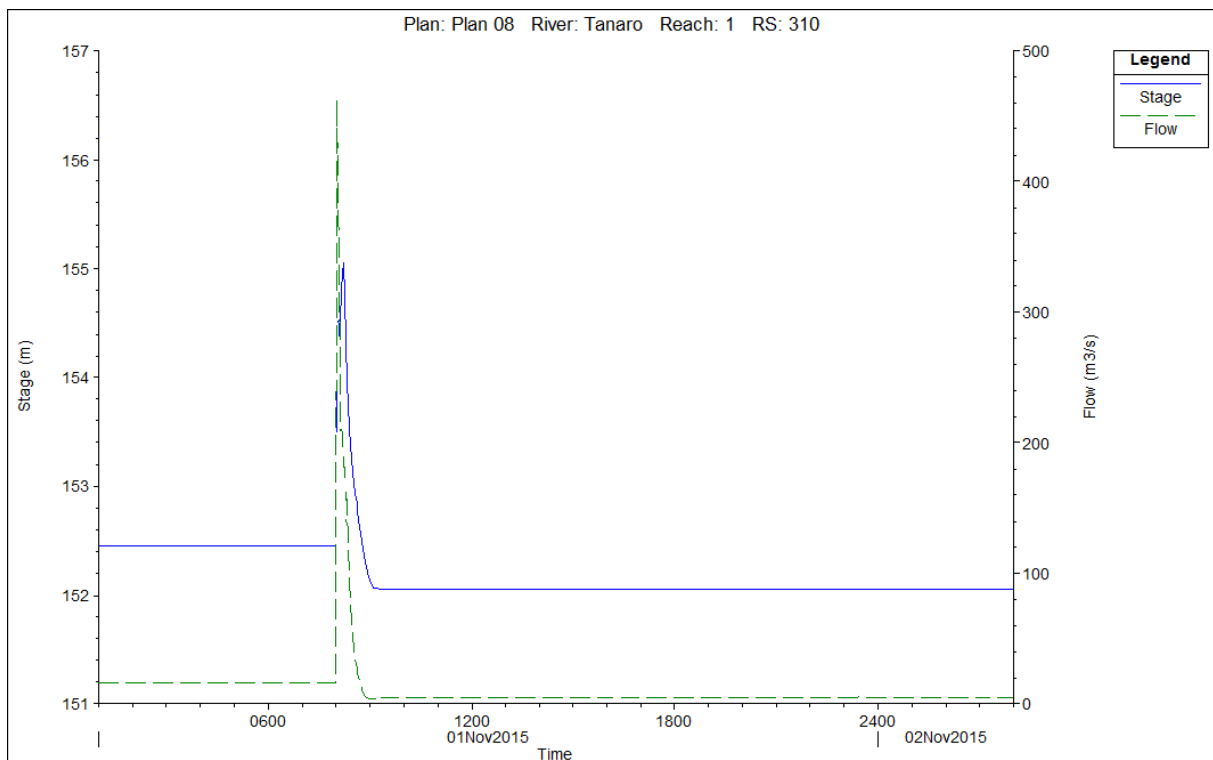


Fig. 8.4.2 sezione 310 - immediatamente a valle della traversa in progetto

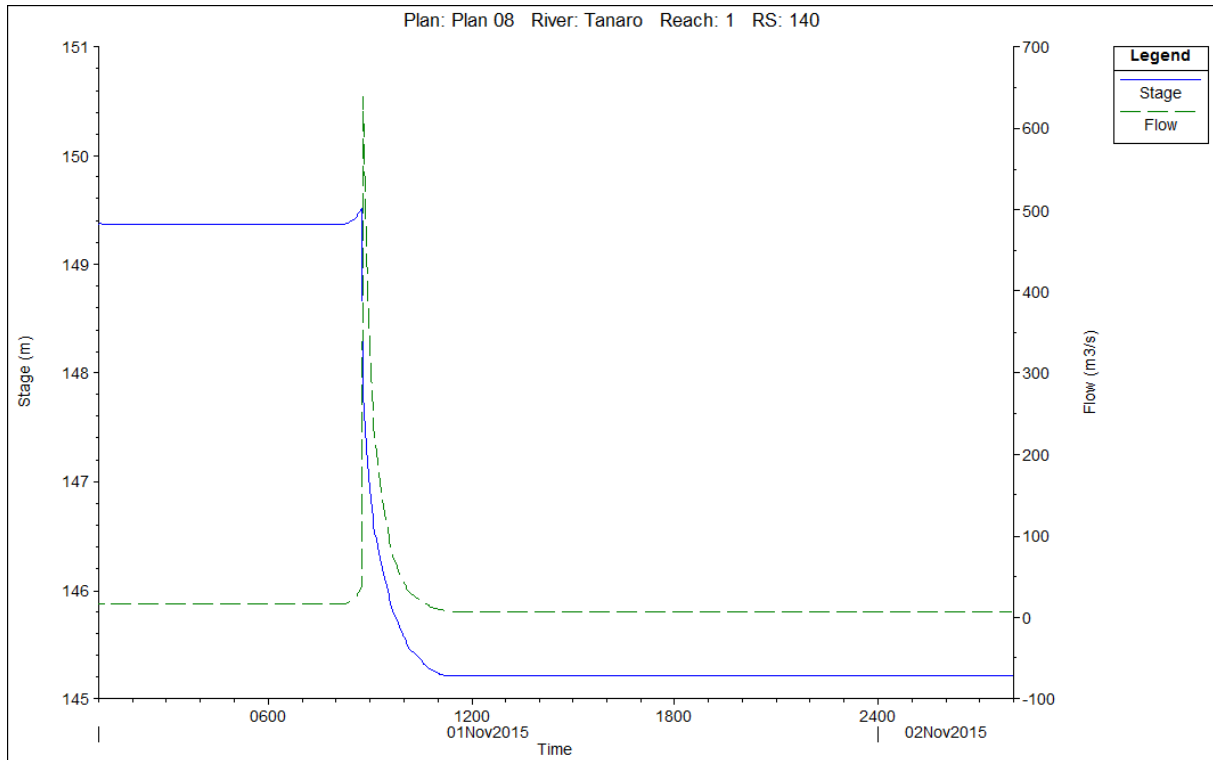


Fig. 8.4.3 sezione 140 - immediatamente a monte della traversa di Barbaresco

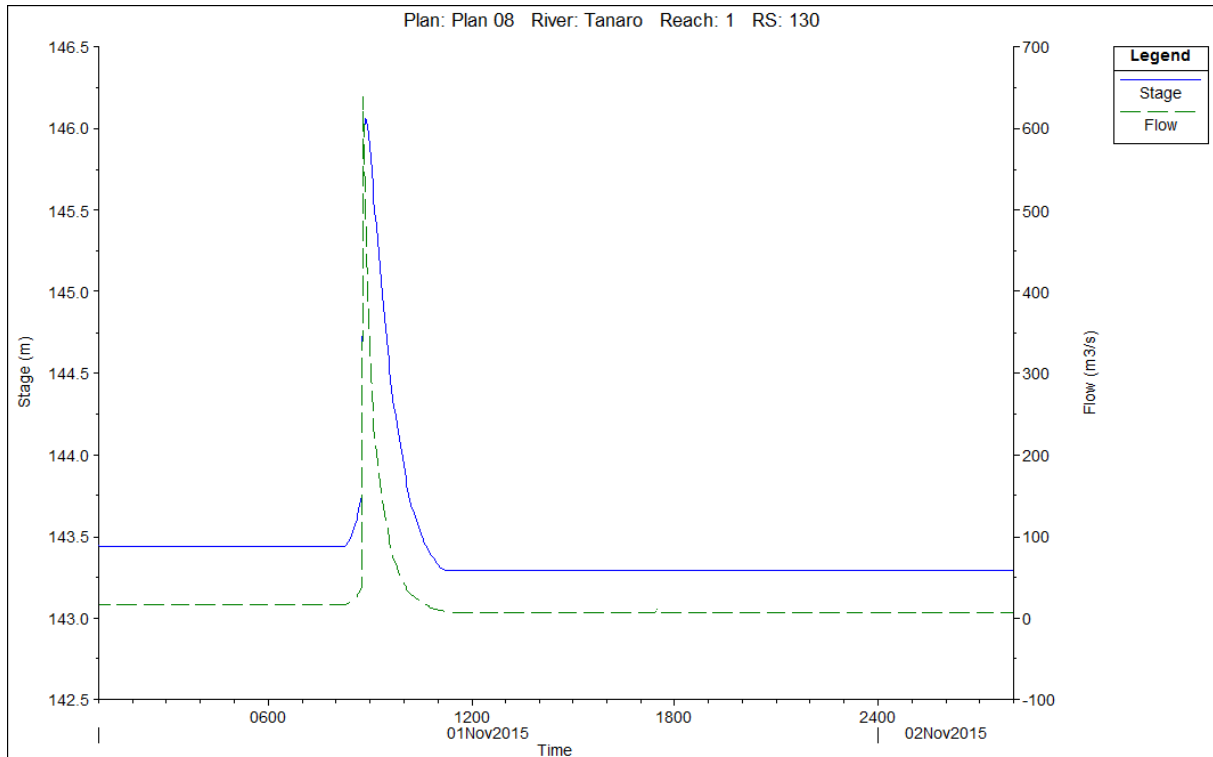


Fig. 8.4.4 sezione 130 - immediatamente a valle della traversa di Barbaresco

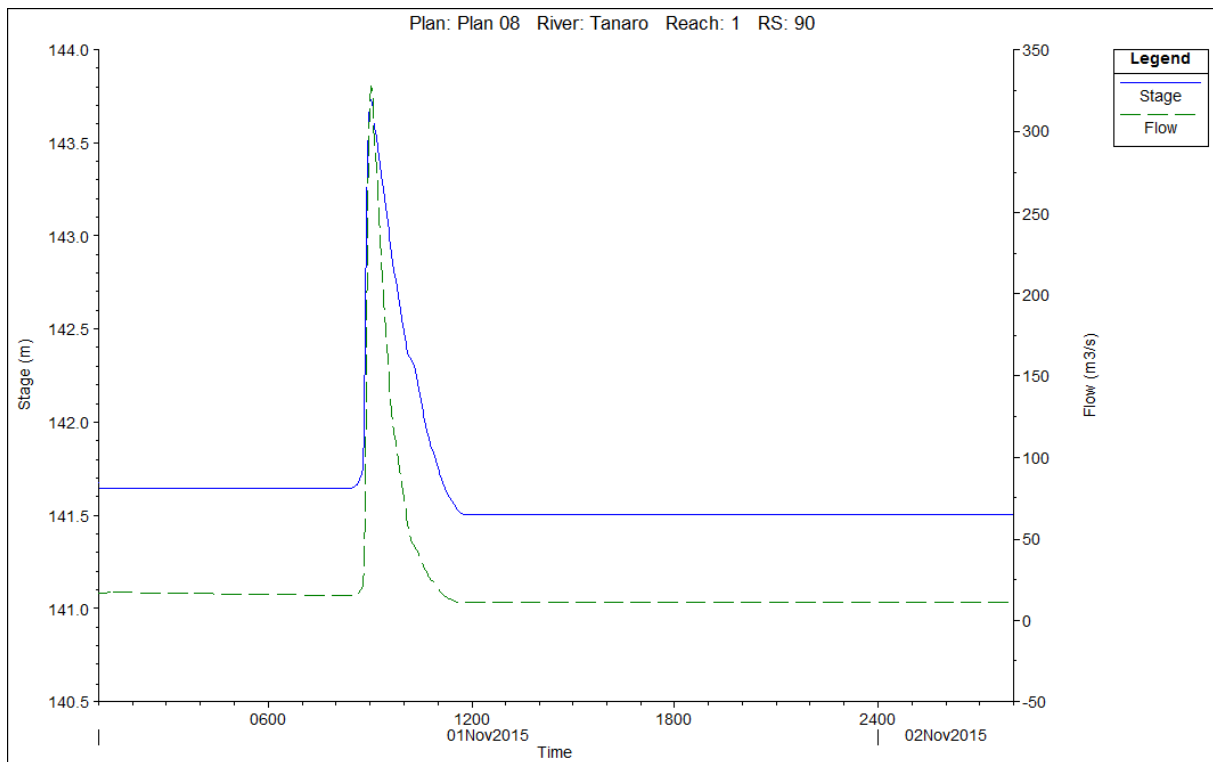


Fig. 8.4.5 sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".

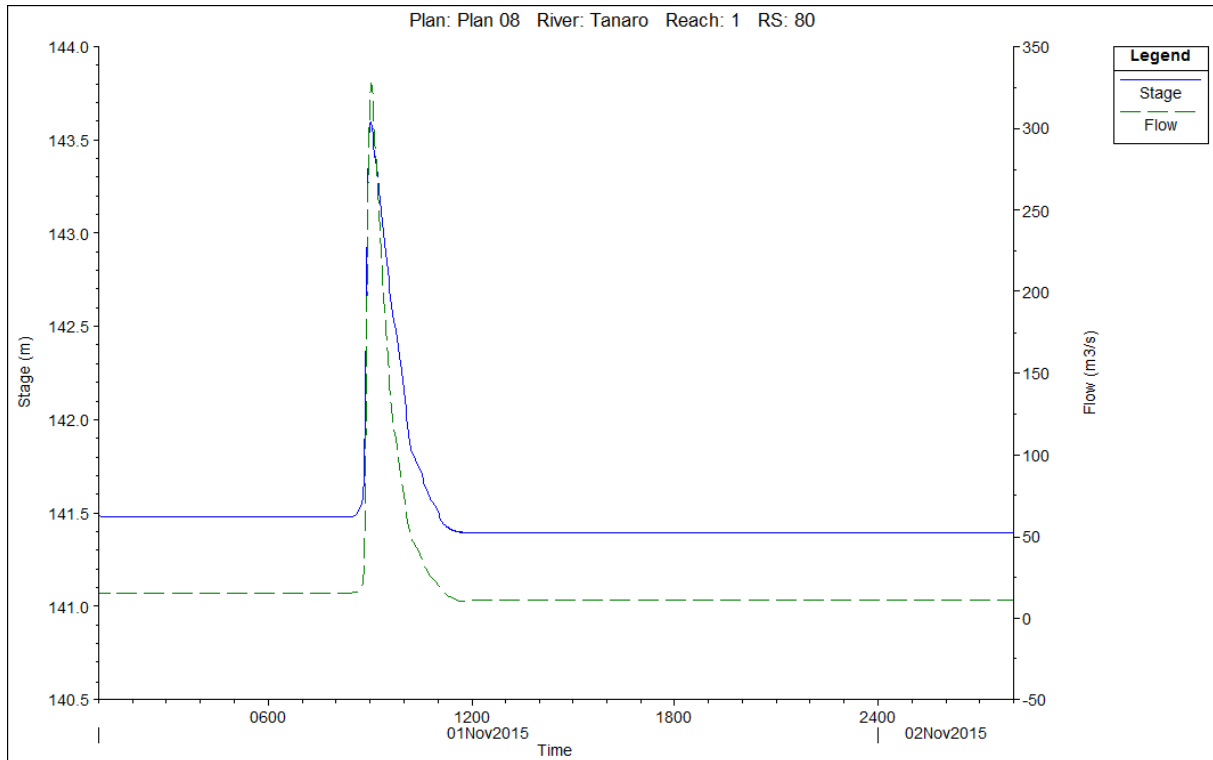


Fig. 8.4.6 sezione 80 - immediatamente a valle del ponte della S.P. 3.

B) $Q = 300 \text{ m}^3/\text{s}$ - TRAVERSA CON SBARRAMENTO MOBILE ALZATO

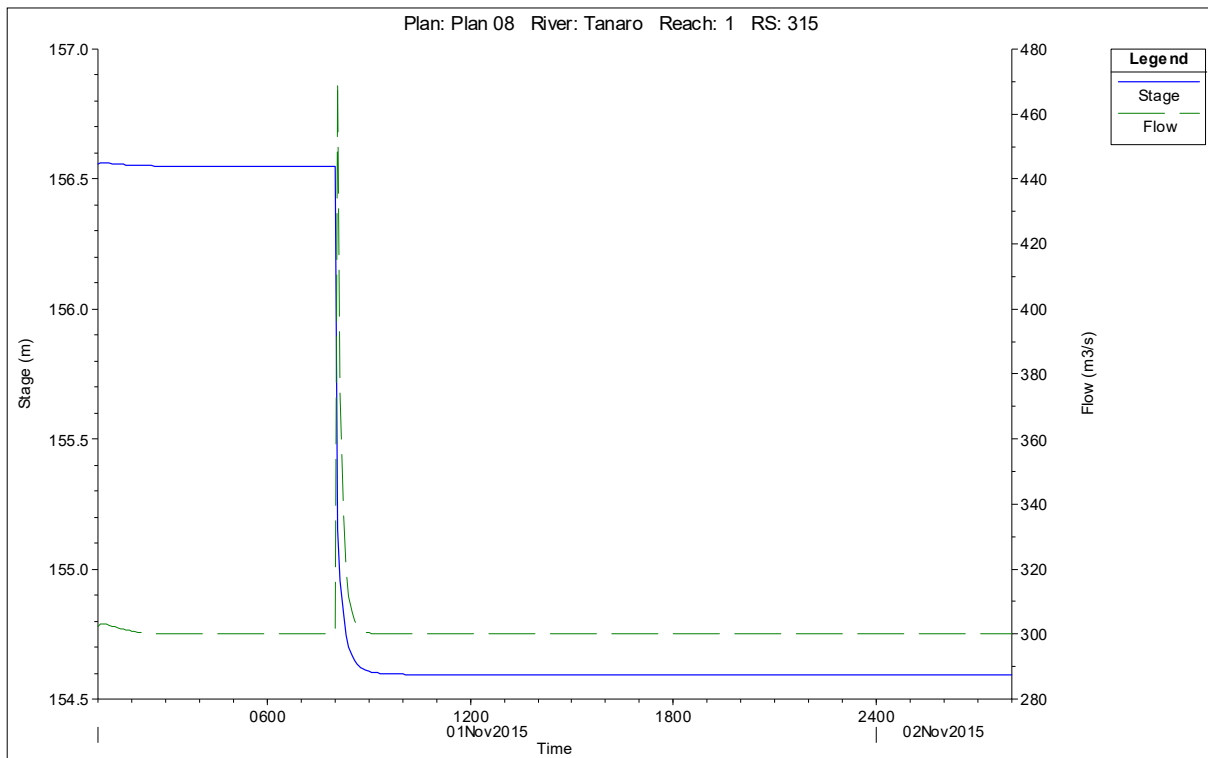


Fig. 8.4.7 sezione 315 - immediatamente a monte della traversa in progetto

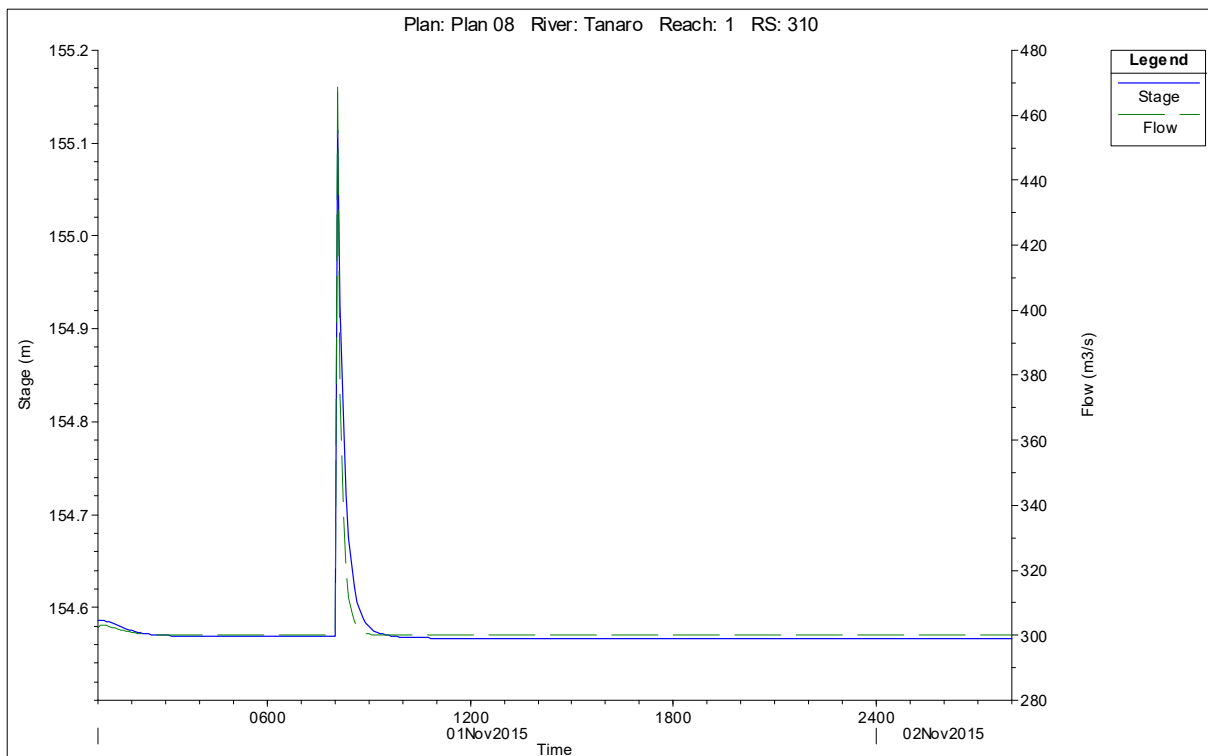


Fig. 8.4.8 sezione 310 - immediatamente a valle della traversa in progetto

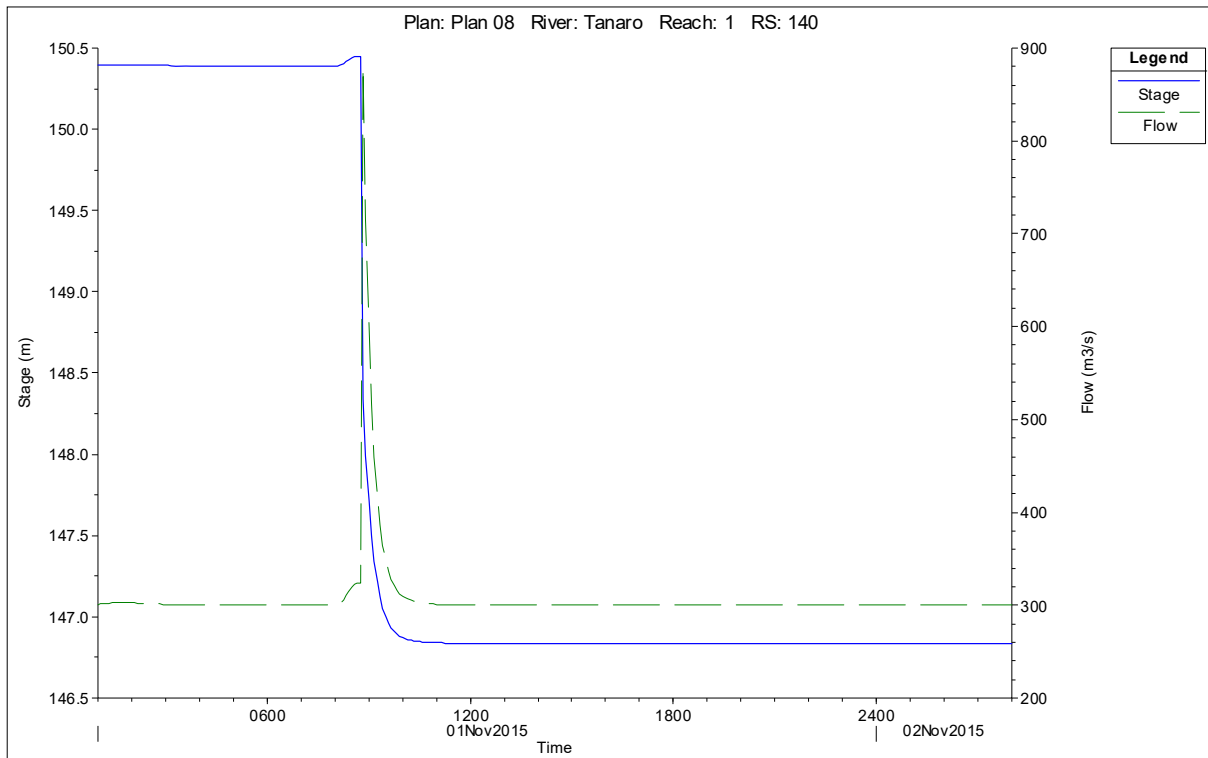


Fig. 8.4.9 sezione 140 - immediatamente a monte della traversa di Barbaresco

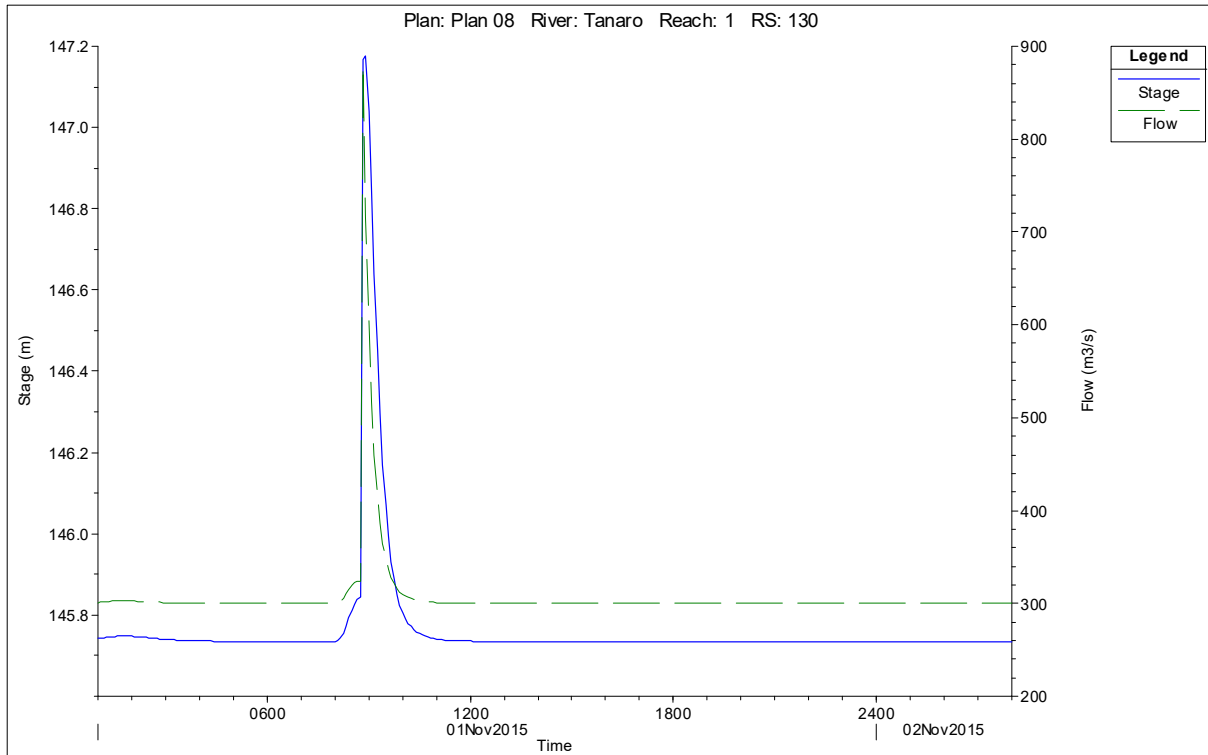


Fig. 8.4.10 sezione 130 - immediatamente a valle della traversa di Barbaresco

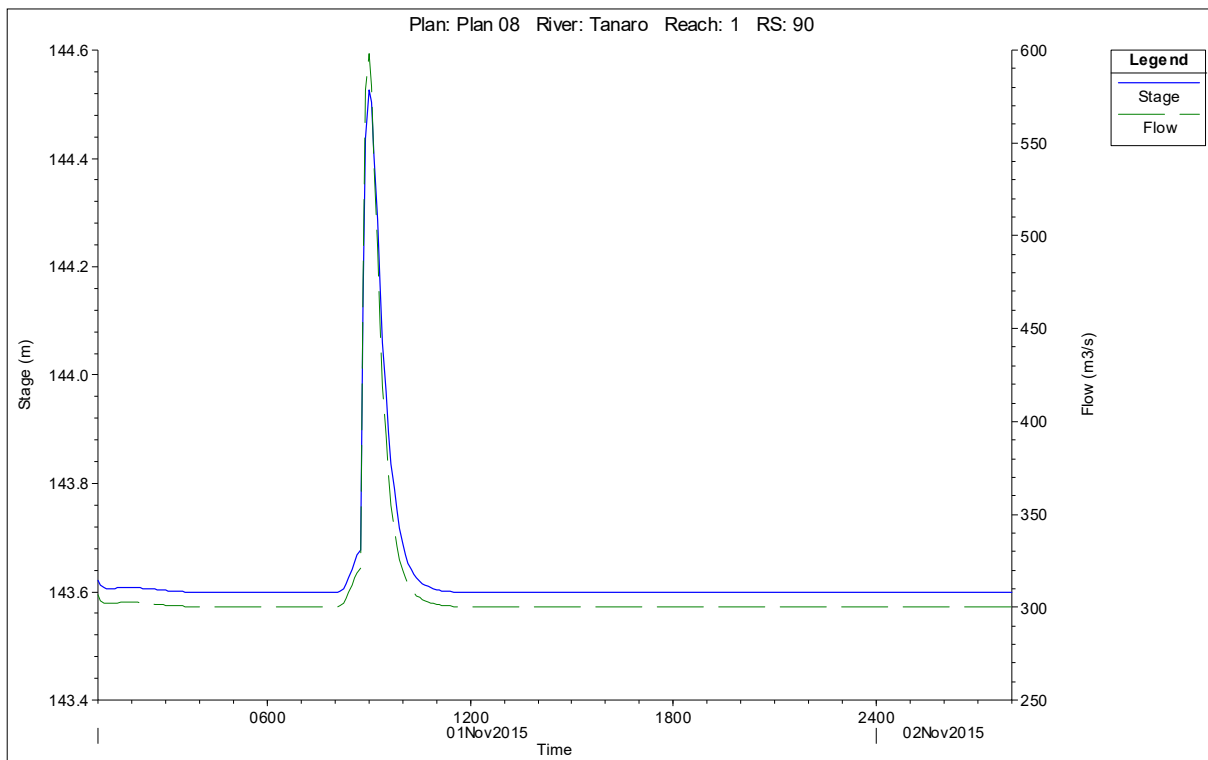


Fig. 8.4.11 sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".

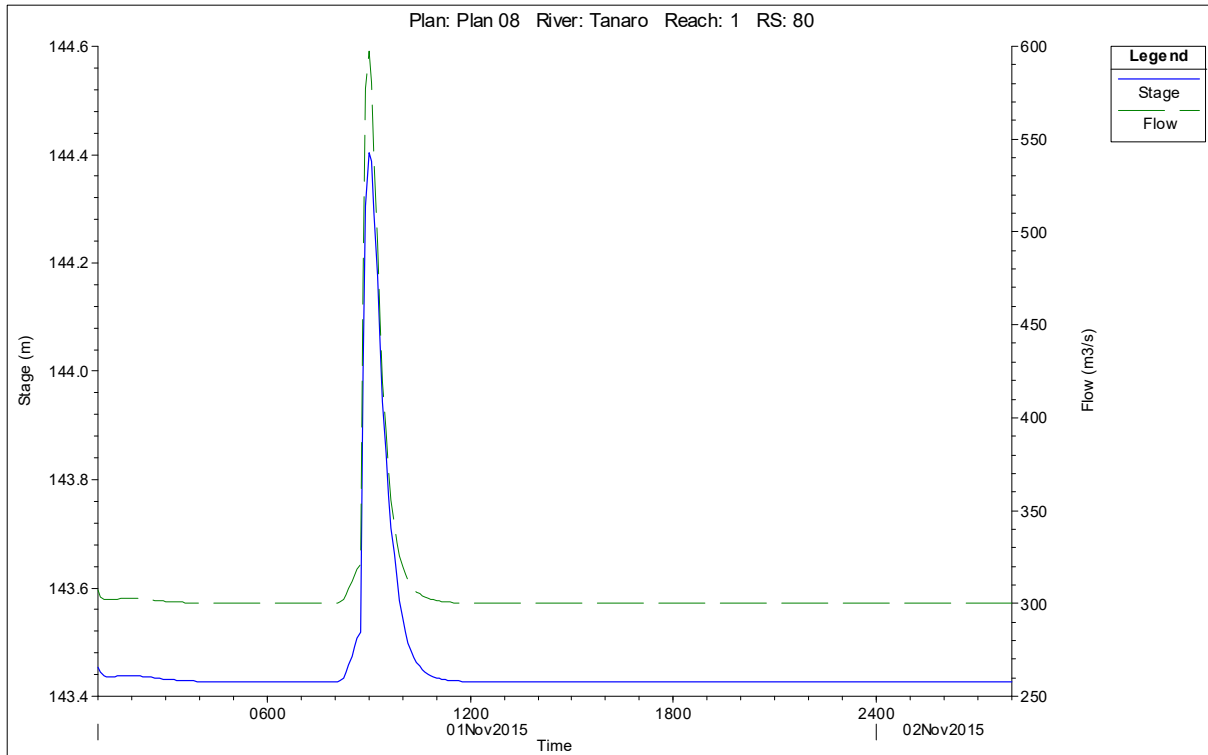


Fig. 8.4.12 sezione 80 - immediatamente a valle del ponte della S.P. 3.

C) $Q_{TR=200}$ ANNI - TRAVERSA CON SBARRAMENTO MOBILE ALZATO

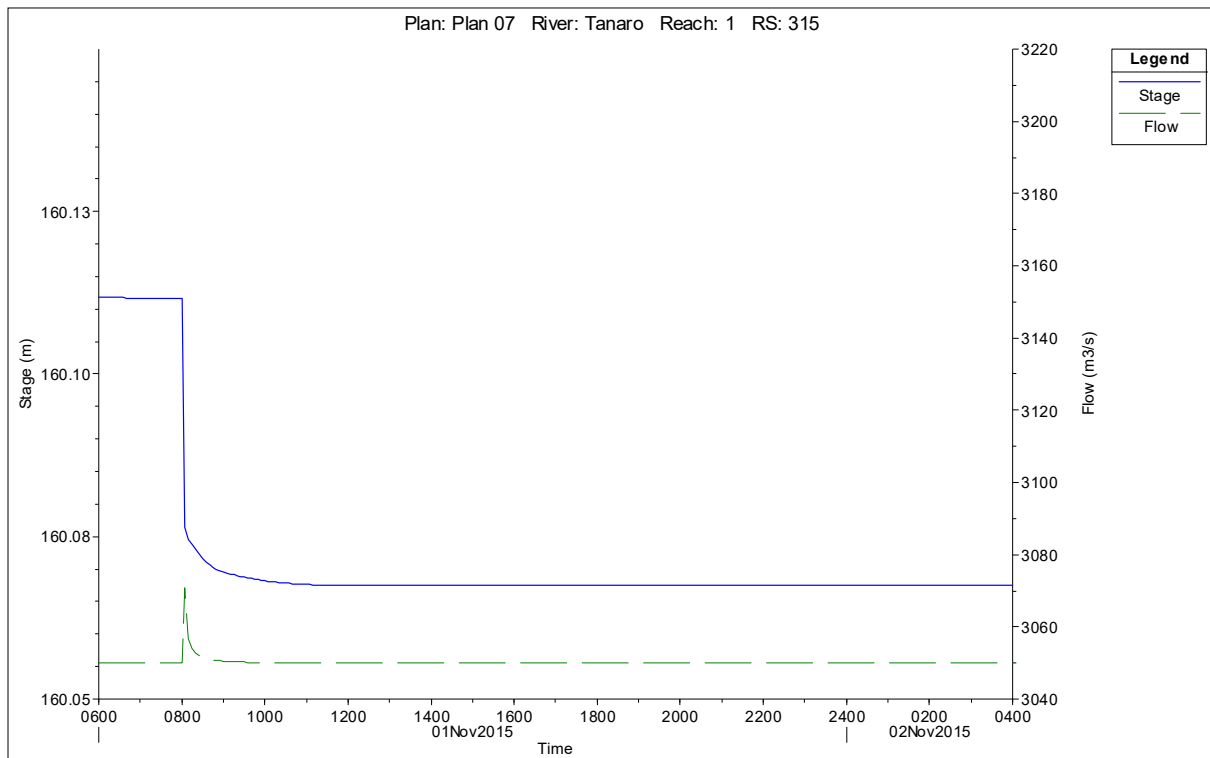


Fig. 8.4.13 sezione 315 - immediatamente a monte della traversa in progetto

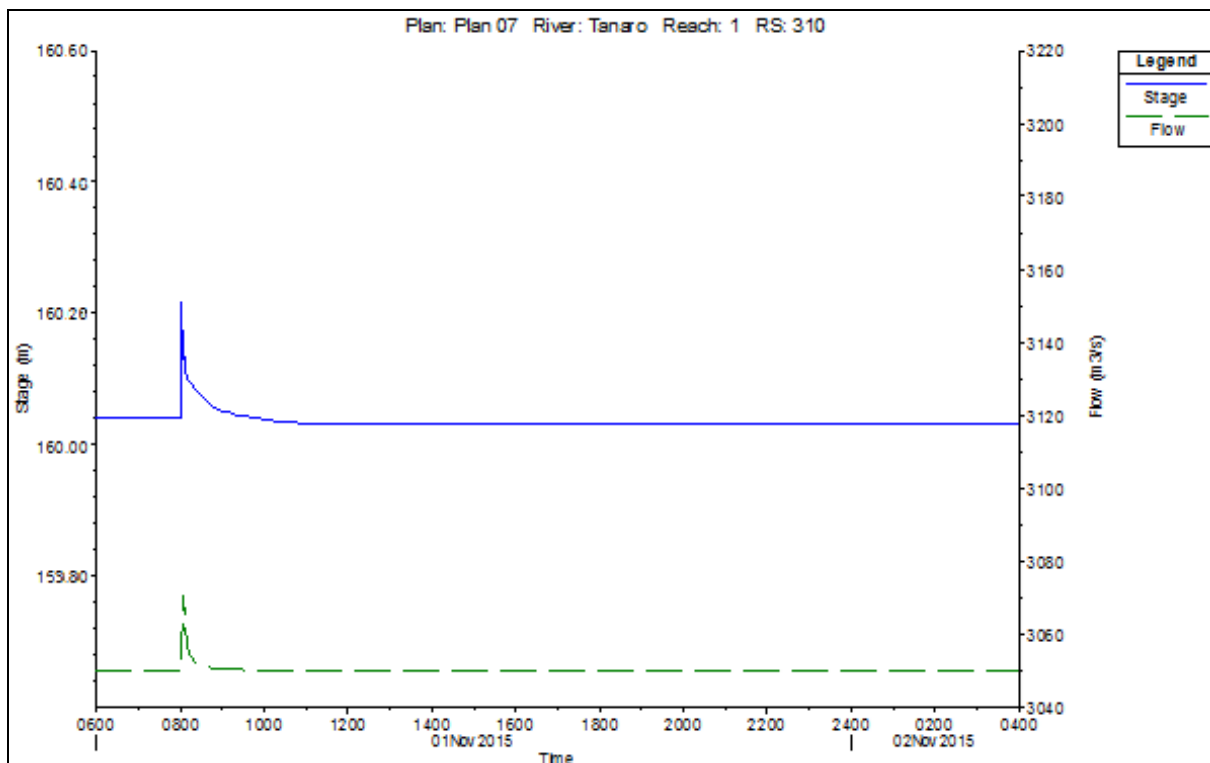


Fig. 8.4.14 sezione 310 - immediatamente a valle della traversa in progetto

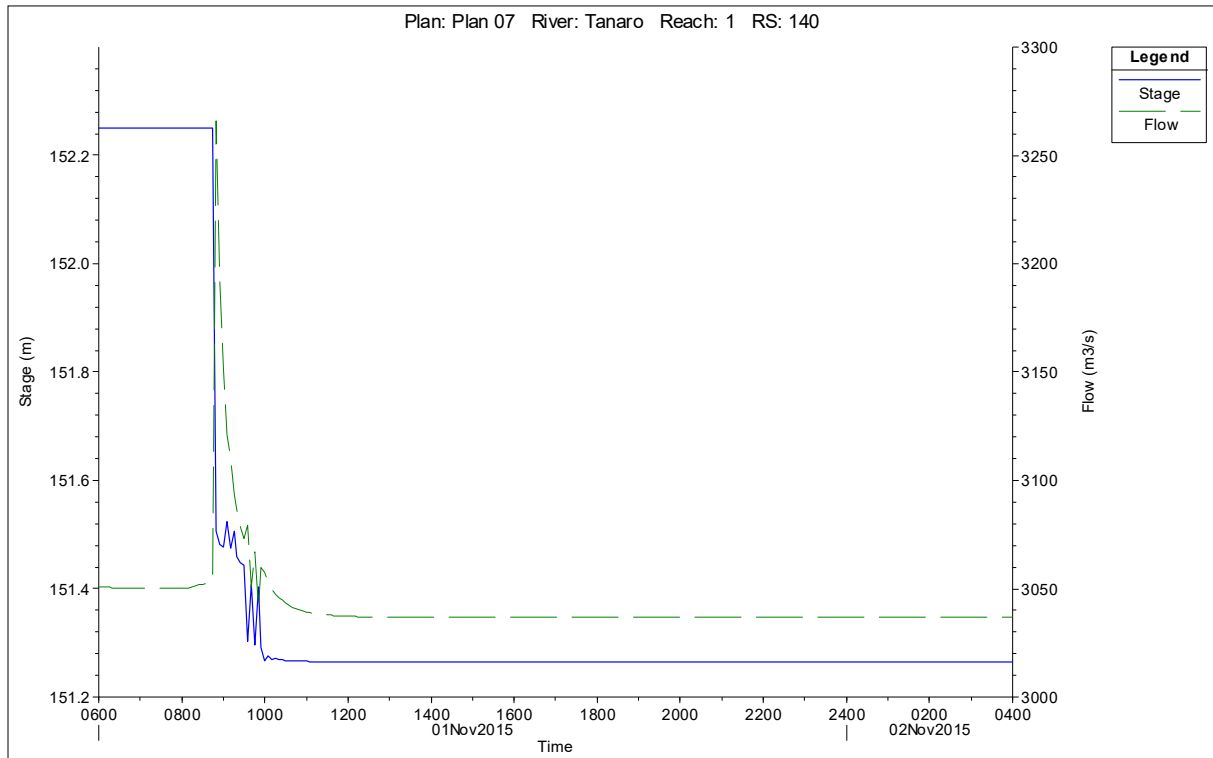


Fig. 8.4.15 sezione 140 - immediatamente a monte della traversa di Barbaresco

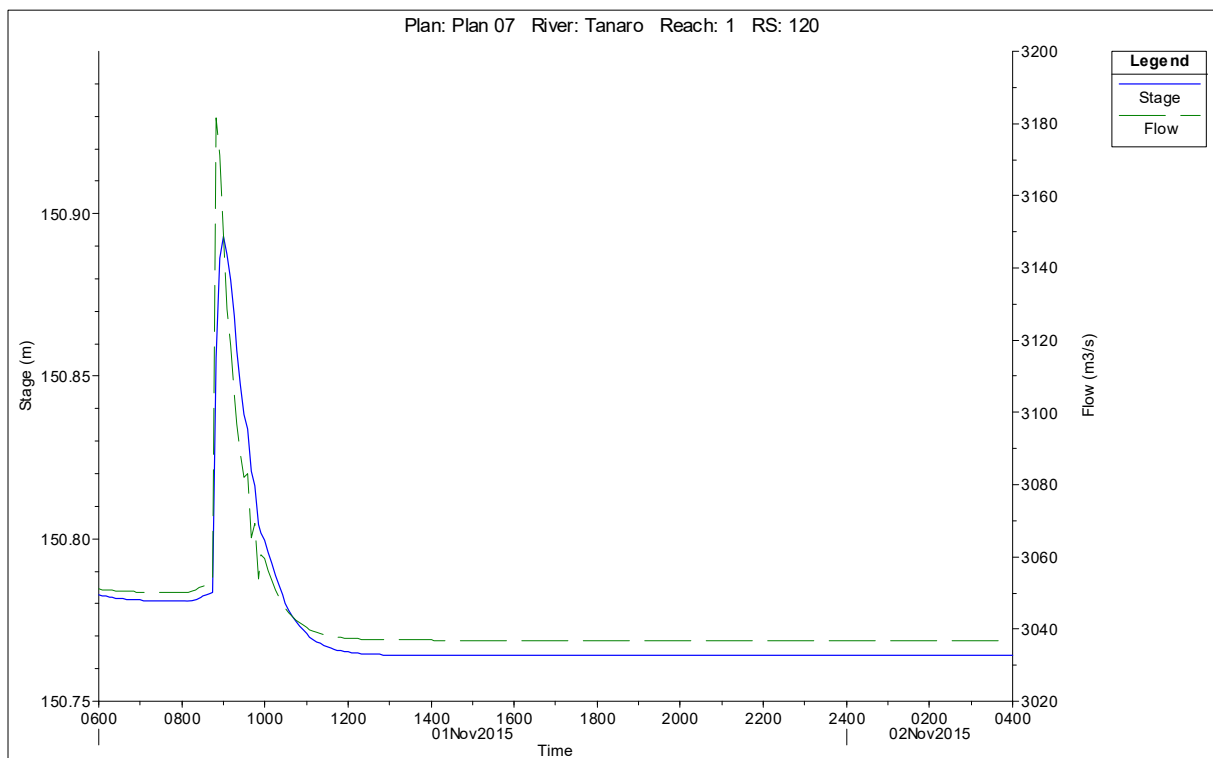


Fig. 8.4.16 sezione 130 - immediatamente a valle della traversa di Barbaresco

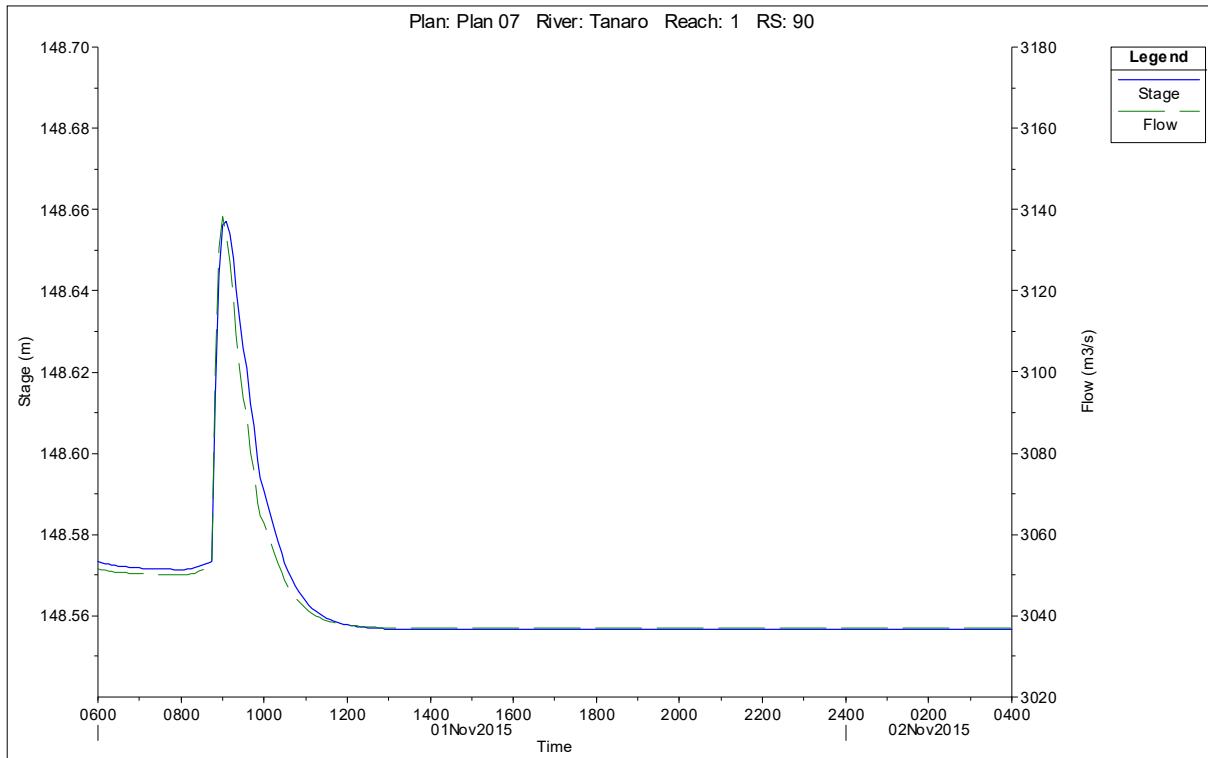


Fig. 8.4.17 sezione 90 - immediatamente a monte del ponte della S.P. 3 "Castagnito-Neive".

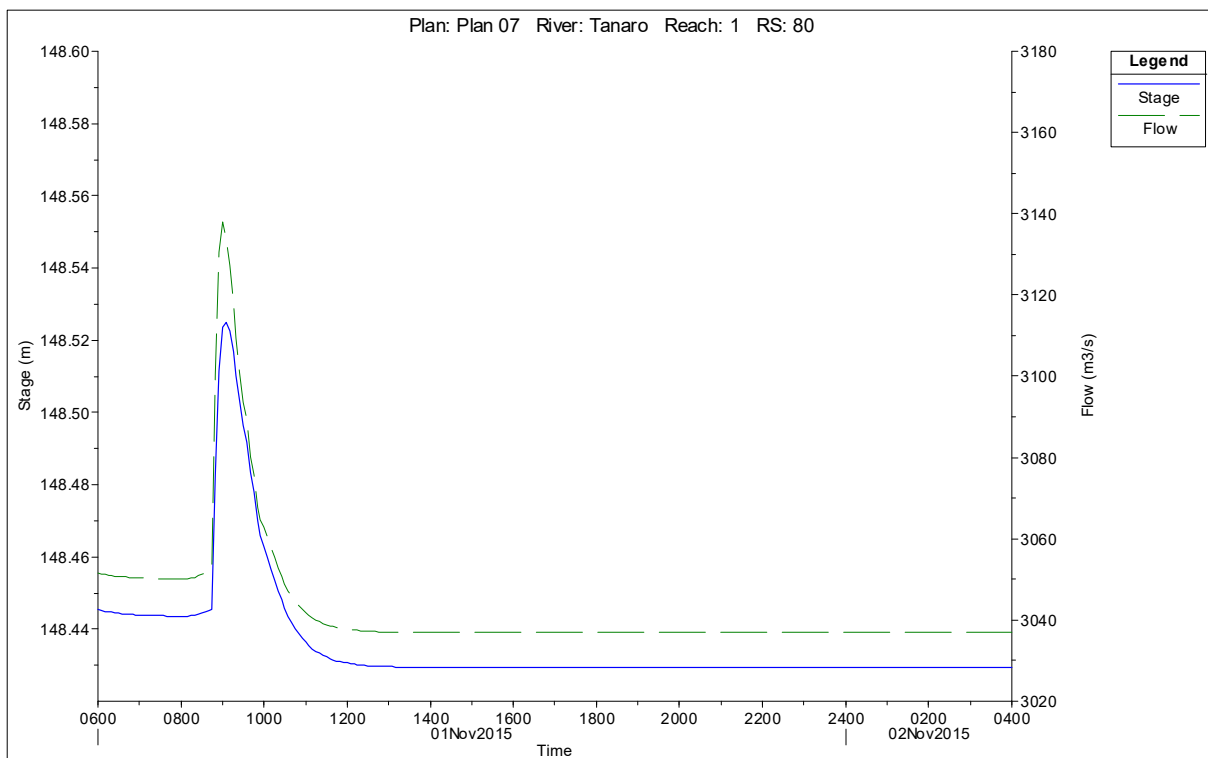


Fig. 8.4.18 sezione 80 - immediatamente a valle del ponte della S.P. 3.

8.5. COMMENTO AI RISULTATI IDRAULICI OTTENUTI

Le simulazioni sono state condotte analizzando uno scenario particolarmente sfavorevole: si è infatti ipotizzato che, oltre al crollo dello sbarramento in progetto di Alba, si verifichi anche il crollo della traversa di Barbaresco nel momento in cui sopraggiunge l'onda di piena generata dal crollo dello sbarramento di Alba. In questo modo è possibile valutare gli effetti cumulativi generato dal duplice crollo delle traverse.

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 sono dell'ordine dei 2.6 m per la portata pari a 15.9 m³/s, di 0.5 m per la portata pari a 300 m³/s e di circa 0.2 m per la portata duecentennale (pari a 3050 m³/s).

In corrispondenza della traversa di Barbaresco (sez. 140, localizzata circa 5 km a valle di quella in progetto di Alba) si osserva che il sovrizzo del pelo libero generato dall'onda di piena conseguente al dam break dello sbarramento di Alba è di circa 0.15 m per la portata pari a 15.9 m³/s, di 0.06 m per la portata pari a 300 m³/s e di 0.03 m per la portata con tempo di ritorno di 200 anni; in tale sezione pertanto l'onda di piena generata dal crollo dello sbarramento risulta quindi già quasi completamente laminata sia per la portata di 300 m³/s che per la portata duecentennale.

In corrispondenza del ponte della S.P. 3 "Castagnito Neive" (sez 90) si osserva che il sovrizzo del pelo libero generato dall'onda di piena conseguente al doppio dam break (effetto cumulativo crollo traversa di Alba + crollo traversa Barbaresco) è pari a circa 2 m per la portata pari a 15.9 m³/s, a circa 1 m per la portata pari a 300 m³/s e a circa 0.10 m per la portata pari a 3050 m³/s

8.6 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 nel tratto a valle dello sbarramento.

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 combinato delle

due traverse per le portate di verifica pari a 15.9 m³/s, 300 m³/s e 3050 m³/s (T_R=200 anni).

Sezione	Quota sponda sx [m s.l.m.]	Quota sponda dx [m s.l.m.]	Liv. max Q=15.9 m ³ /s [m s.l.m.]	Liv. max Q=300 m ³ /s [m s.l.m.]	Liv. max Q=3050 m ³ /s [m s.l.m.]
Traversa in progetto					
310	157.60	159.11	155.06	155.11	160.22
300	156.38	158.48	155.06	154.38	159.88
295	158.45	158.19	153.91	154.31	159.85
290	158.51	158.63	152.47	154.00	159.65
280	155.71	155.63	151.88	153.60	159.30
270	155.75	157.54	151.63	153.26	158.81
260	155.05	156.59	151.39	152.94	158.04
250	156.14	157.55	151.24	152.72	157.71
240	155.49	153.91	151.06	152.52	157.32
230	156.02	152.81	150.56	152.31	156.97
220	153.97	152.41	150.18	152.07	156.43
210	152.83	152.49	150.03	151.82	155.95
205	153.83	153.50	149.86	151.58	155.63
200	152.69	152.22	149.71	151.17	155.17
190	152.95	154.31	149.59	150.86	154.65
180	152.18	151.90	149.53	150.64	154.33
170	153.47	152.56	149.52	150.59	154.01
160	151.87	151.39	149.52	150.53	153.54
150	151.15	155.04	149.51	150.49	153.10
140	151.38	153.48	149.51	150.45	152.28
Traversa Barbaresco					
130	150.78	150.17	146.06	147.18	151.54
120	150.10	148.92	145.54	146.76	150.95
110	148.62	147.37	145.16	146.38	150.63
100	148.75	149.70	144.49	145.55	149.98
90	154.39	154.39	143.73	144.53	148.72
Ponte S.P.3 "Castagnito-Neive"					
80	154.39	154.39	143.60	144.40	148.58
70	146.52	147.85	142.25	143.43	147.79
60	144.70	145.51	141.64	142.93	147.32
50	145.22	142.87	141.31	142.60	146.85

Sezione	Quota sponda sx [m s.l.m.]	Quota sponda dx [m s.l.m.]	Liv. max Q=15.9 m ³ /s [m s.l.m.]	Liv. max Q=300 m ³ /s [m s.l.m.]	Liv. max Q=3050 m ³ /s [m s.l.m.]
Traversa in progetto					
40	146.23	145.35	140.60	141.89	146.18
30	145.36	144.87	139.98	141.45	145.78
20	141.99	141.82	139.48	141.11	145.40
10	140.71	143.49	139.04	140.69	145.01

Tab. 8.6.1 livelli idrici conseguenti al crollo delle traverse per le portate di verifica di 15.9 m³/s, 300 m³/s e 3050 m³/s.

Si osserva che i livelli idrici relativi alle portate di 15.9 m³/s e 300 m³/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 evidenzia che i livelli idrici in caso di crollo della traversa sono generalmente superiori alle quote delle sponde dell'alveo inciso. Occorre però osservare che anche nella situazione attuale le medesime portate non sono contenute in alveo; inoltre gli incrementi di livello nel tratto a valle della traversa, derivanti dal crollo della stessa, sono contenuti (inferiori ai 20 cm). Le aree esondabili non subiscono pertanto variazioni apprezzabili rispetto alla situazione attuale.

Per quanto concerne l'efficienza delle opere di difesa idraulica ed il possibile effetto di scalzamento dovuto al passaggio dell'onda di piena si evidenzia che l'incremento dei livelli idrici seguente al crollo della traversa è estremamente contenuto (inferiore ai 20 cm con riferimento alla portata con tempo di ritorno di 200 anni). Si ritiene pertanto che non sia necessario prevedere accorgimenti e/o adeguamenti delle opere di difesa esistenti.

Le aree di esondazione perimetrate nel presente studio comprendono, in sponda sinistra, ampie aree golenali; i beni potenzialmente esposti presenti (prevalentemente cascine) risultano esterni ad esse. I limiti dell'area di esondazione con tempo di ritorno di 200 anni perimetrata nel presente studio sono più stretti rispetto alla Fascia B del PAI. Tali differenze sono legate al fatto che la Fascia B del PAI è stata delimitata assumendo come riferimento le aree inondabili relative alla piena con tempo di ritorno di 200 anni, ma integrate con le aree sede di potenziale riattivazione di forme fluviali relitte non fossili, le aree di elevato pregio naturalistico e

ambientale e quelle di interesse storico, artistico, culturale strettamente collegate all'ambito fluviale.

Si riporta un estratto della carta della “Distribuzione della popolazione secondo gli scenari di pericolosità da alluvione” contenuta nella Direttiva Alluvioni su cui è stata sovrapposta l'area inondabile con tempo di ritorno di 200 anni perimetrata nel presente studio idraulico (tratteggiato in rosso); esaminando la stessa si evidenzia che nell'area a valle della traversa in progetto, la stima degli abitanti interessati dalle esondazioni del F. Tanaro è pari a zero. Le cascate presenti nella zona, per le quali è stato stimato un numero di abitanti interessato inferiore a 10, risultano, infatti, esterne all'area di esondazione perimetrata.

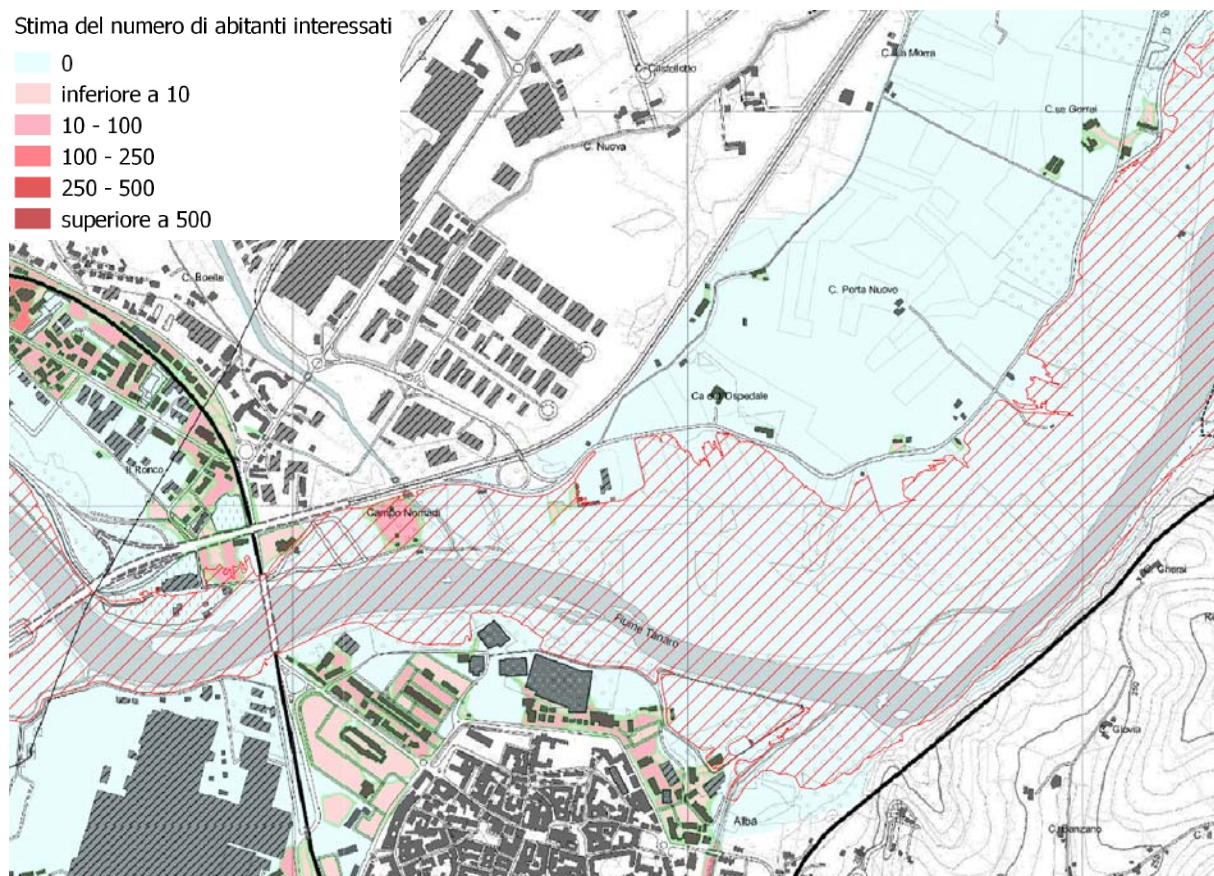


Fig. 8.6.1.: estratto della carta “Distribuzione della popolazione secondo gli scenari di pericolosità da alluvione” contenuta nella Direttiva Alluvioni su è stata sovrapposta l'area inondabile dal F. Tanaro per una portata con tempo di ritorno di 200 anni definita nel presente studio (area tratteggiata in rosso).

Si evidenzia che gli edifici presenti in sponda sinistra risultano esterni all'area di esondazione con tempo di ritorno di 200 anni perimetrata nel presente studio, ma ricadono in Fascia B e pertanto sono già oggi inclusi nel Piano di Protezione Civile della Città di Alba e conseguentemente vengono allertati e/o evacuati nel caso in cui si preveda il verificarsi un evento alluvionale caratterizzato da un elevato tempo di ritorno.

Sulla base di quanto precedentemente esposto non si ritiene necessario predisporre un piano delle misure di protezione civile specifico.