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15th March 2019

D-11-267021

Wheeler Height Developments
40 Anzac Avenue
COLLAROY NSW 2097

Dear Neville,

Re: Flood Report – Proposed New Residential Development at 44 Rose Avenue, Wheeler Heights

INTRODUCTION

I, Edward A. Bennett, practicing Civil, Structural, Geotechnical & Environmental Engineer hereby confirm that one of our engineers have inspected the above property and reviewed existing survey levels for the purpose of providing a flood report for this property in respect to flood flow paths created during an ARI 1:100 rainfall events (1%AEP).

REPORT-

The purpose for this flood report for No. 44 Rose Avenue, Wheeler Heights, is to provide a flood level (AHD) RL that can be relied upon for the new residential development and is required as part of documentation for submission for development application.

This new development site, whilst not adjacent to an existing Stormwater Piped Easement, is located on the opposite (Southern) side of Rose Avenue. Along this southern side is an existing major Council Stormwater Easement, defined in Fig. 2.

Council predicted that the flood flow path for the 1%AEP flood, will partially enter the Development Property at existing southern boundary (driveway) which is not the case.

We have relied upon the existing contour maps, provided by Northern Beaches Council dated 15th March 2019 ***"Fig 4"***

The survey details and site plan provided by "Barry Rush Architects", information from SIX Maps & near maps, refer ***Appendix "A".***

Also, HEC-RAS 5.0.1, computations, to determine the flood level (AHD) RL, in this location for the 1%AEP storm event, refer ***Appendix "B".***

Parameters used in determining Discharge and over land flows using HEC RAS:

The discharge through the pipe line was calculated using the Rational Method. The assumed catchment area (A), the rainfall intensity (I) and the average coefficient (C) are used for the

calculation and all factors have been resourced from SIX maps and Bureau of Meteorology (BOM) statistics for this location, refer Figures 1 & 2, below:

Where, C = 0.66, I = 266 mm/hr & A = 3.9 ha

Where discharge is **Q**= CIA/360 = 0.6*266*5.4/360 = 1.7 m^3/s for 1% AEP event

Fig 1: Catchment Area

Home | IFD Table | IFD Chart | Coefficients | ARI | Print IFD table | Help IFD table

Intensity-Frequency-Duration Table

Location: 33.725S 151.275E NEAR.. Wheeler Heights Issued: 15/3/2019

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

	Average Recurrence Interval						
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	98.9	127	161	180	206	240	266
6Mins	92.6	119	151	169	194	226	250
10Mins	75.9	97.5	125	141	161	189	209
20Mins	55.4	71.6	93.0	105	122	143	160
30Mins	45.1	58.4	76.4	87.0	101	119	133
1Hr	30.7	39.9	52.7	60.2	70.1	83.1	93.1
2Hrs	20.5	26.6	35.1	40.1	46.7	55.3	61.9
3Hrs	16.1	20.9	27.4	31.3	36.3	43.0	48.1
6Hrs	10.7	13.8	17.9	20.4	23.5	27.7	30.9
12Hrs	7.00	9.04	11.7	13.3	15.3	18.0	20.1
24Hrs	4.50	5.83	7.63	8.69	10.1	11.9	13.3
48Hrs	2.78	3.63	4.84	5.57	6.50	7.75	8.71
72Hrs	2.05	2.68	3.60	4.16	4.86	5.82	6.56

(Raw data: 40.03, 9.08, 2.68, 84.06, 18.02, 5.83, skew=0.00, F2=4.3, F50=15.87)

© Australian Government, Bureau of Meteorology

Copy Table

Fig 2: Rainfall Intesity (I)

CALCULATION OF MAXIMUM DISCHARGE CAPACITY OF THE PIPE (USING MANNING'S EQUATION), from our Pipe Flow Advisor Program

The parameters used for the calculations are: Internal Pipe Diameter: 675 mm, Slope: 1:10 And Manning's Coefficient: 0.013, refer Figure 3 below:

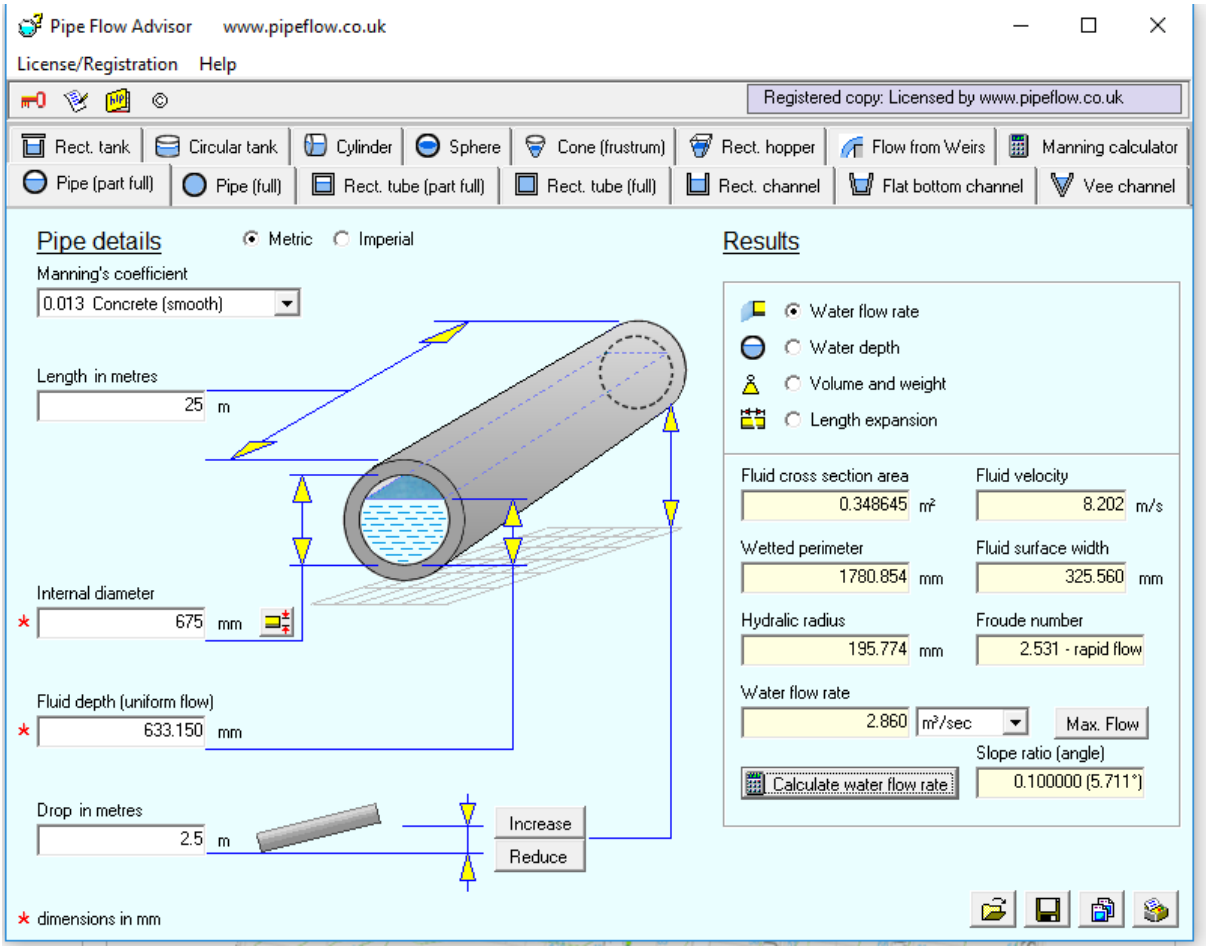


Fig 3: Screenshot from Pipe Flow Advisor

Based on Calculations above, the Maximum Capacity of the 675 mm Stormwater Pipe is 2.86 m^3/s.

Assuming a 50% blockage on this pipe = 50% of 2.86 m^3/s = 1.43 m^3/s.

Probable Overland Discharge due to the 50% blockage is 1.7 m^3/s – 1.43 m^3/s = 0.27 m^3/s

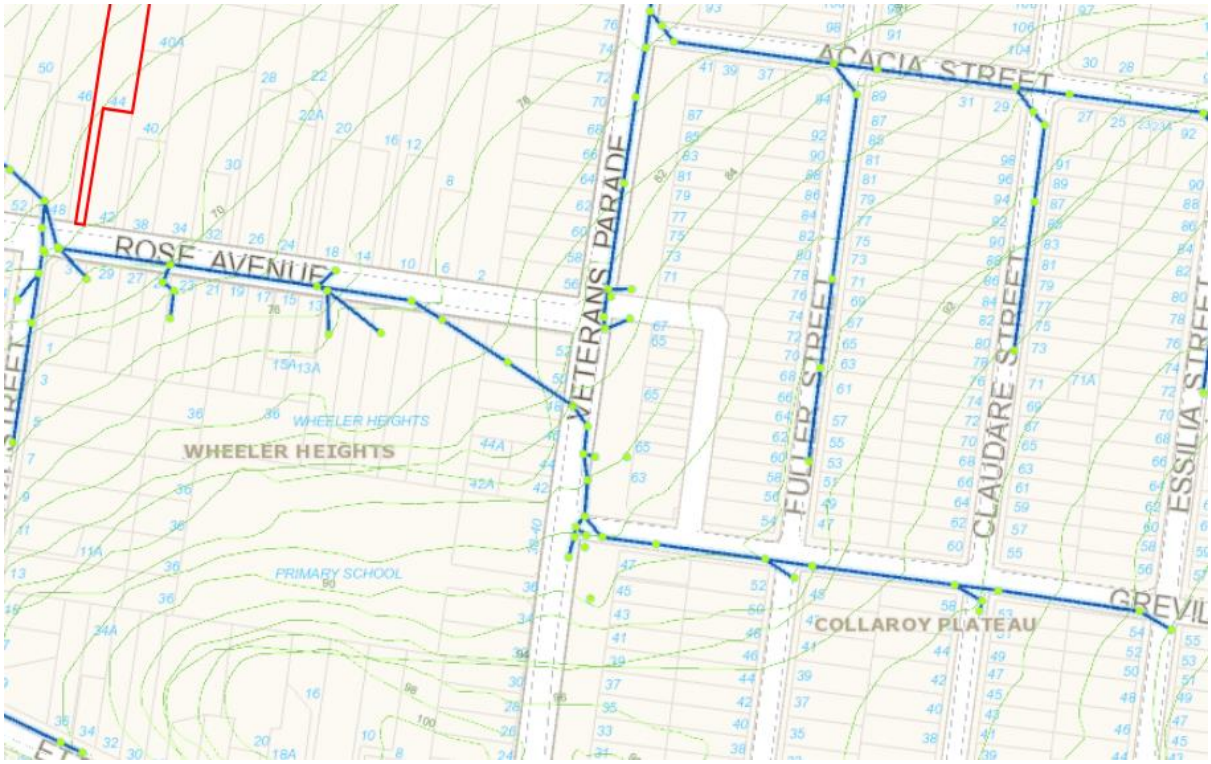


Fig 4: Council stormwater pipe layout

CONCLUSIONS:

It is our opinion that the flood water from 1%AEP will arrive at the front of our client's property and will not be a problem for the neighbor's property. Since the level of the new driveway at station 7 is 70.45m and the maximum overland flow level for 1:100 ARI at this station is 70.42 m. So, all the flood water would be continued along the Rose Avenue and collected by the pits located downstream.

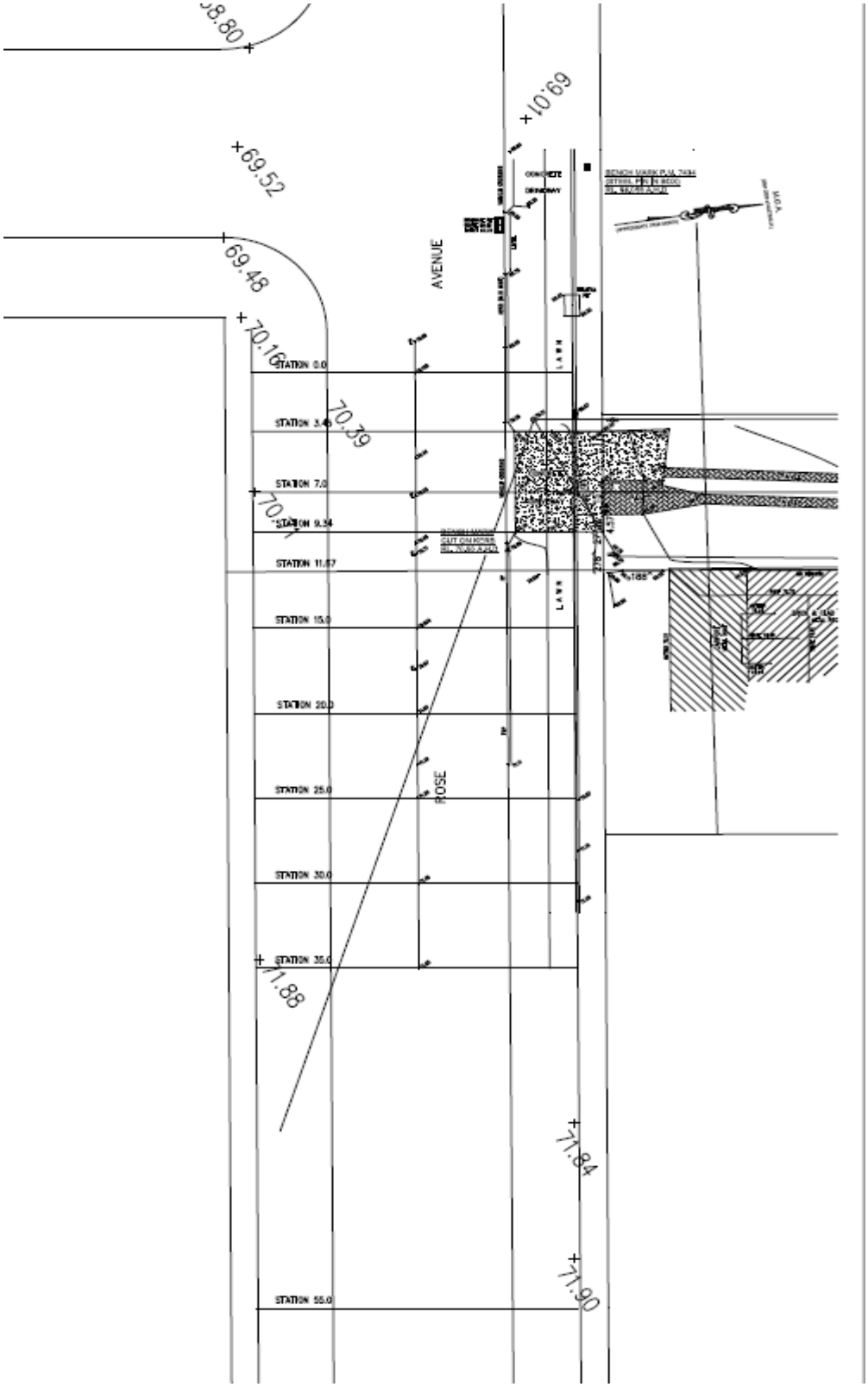
We believe that we covered every aspect of flooding in this area and we would request a decision by council for the development approval process to continue.

The results from the HEC-RAS for post-dev condition has been attached with this report in Appendix B

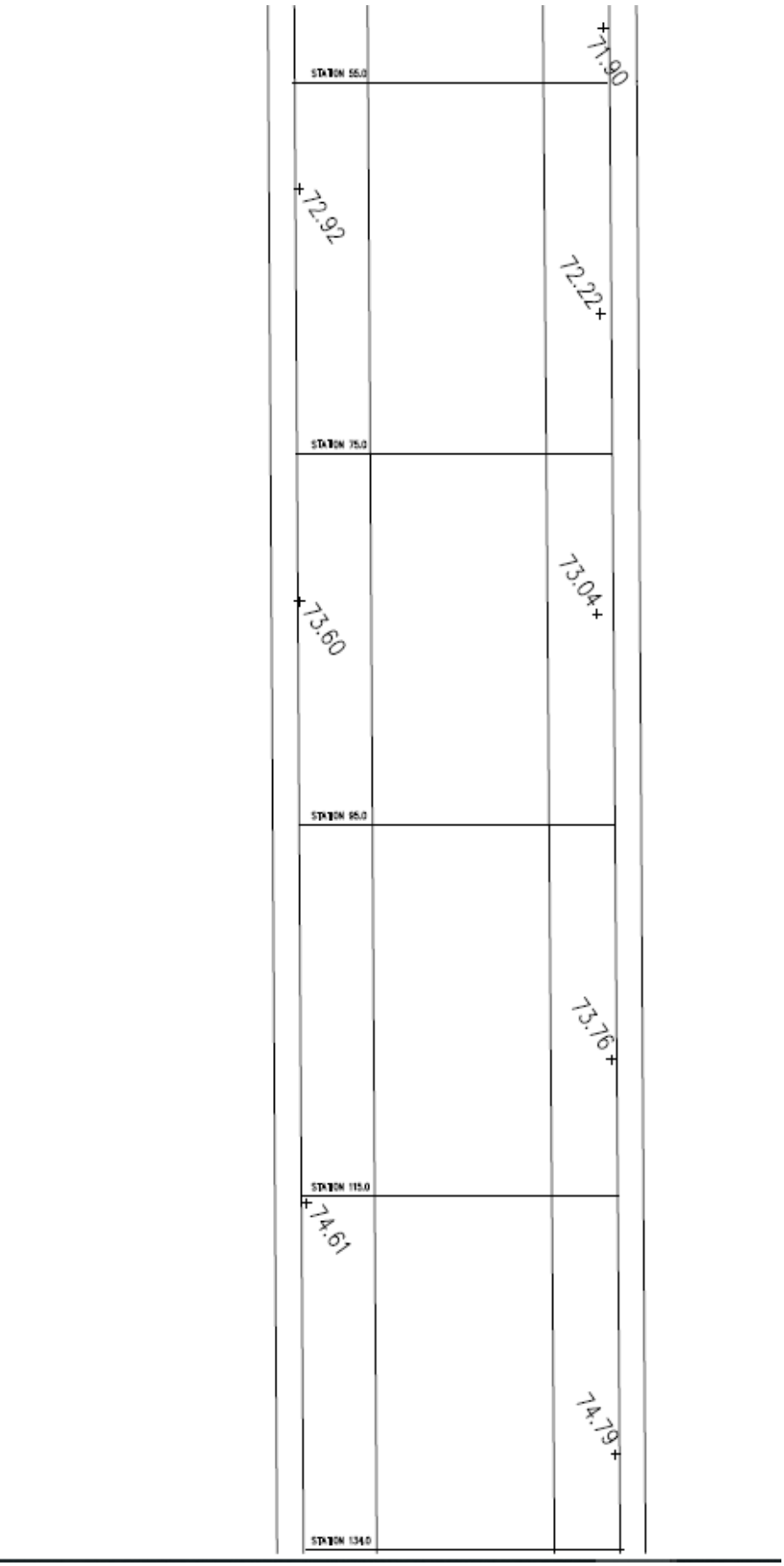
Yours faithfully,

E.A. Bennett M.I.E. Aust. Cp Eng. NPER 198230, Member AGS, BPB 0820

Appendix"A"



AVENUE
ROSE
LAWN
STATION 0.0
STATION 3.45
STATION 7.0
STATION 9.34
STATION 11.67
STATION 15.0
STATION 20.0
STATION 25.0
STATION 30.0
STATION 35.0
STATION 55.0
69.52
69.48
70.39
71.88
71.84
71.90



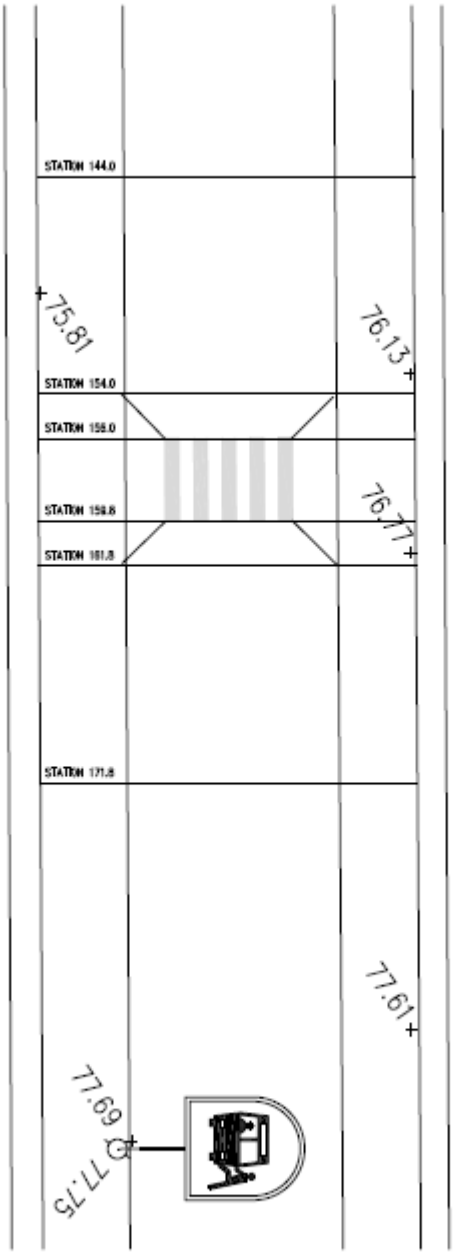


Fig 5: Station Map

Appendix "B"

HEC-RAS 5.0.1:

HEC-RAS 5.0.1 was used to predict the flood levels for ARI 1:100 (1%AEP) rainfall events. Cross sections in the rose avenue are shown in Appendix "A" and are interpolations of survey levels at certain intervals, starting at Station 0 (downstream) and working backwards to Station 35 (upstream) which is approx. 35m apart from Station 0. These survey level interpolations were used in the HEC-RAS model. The reach profile summaries are shown in the table below.

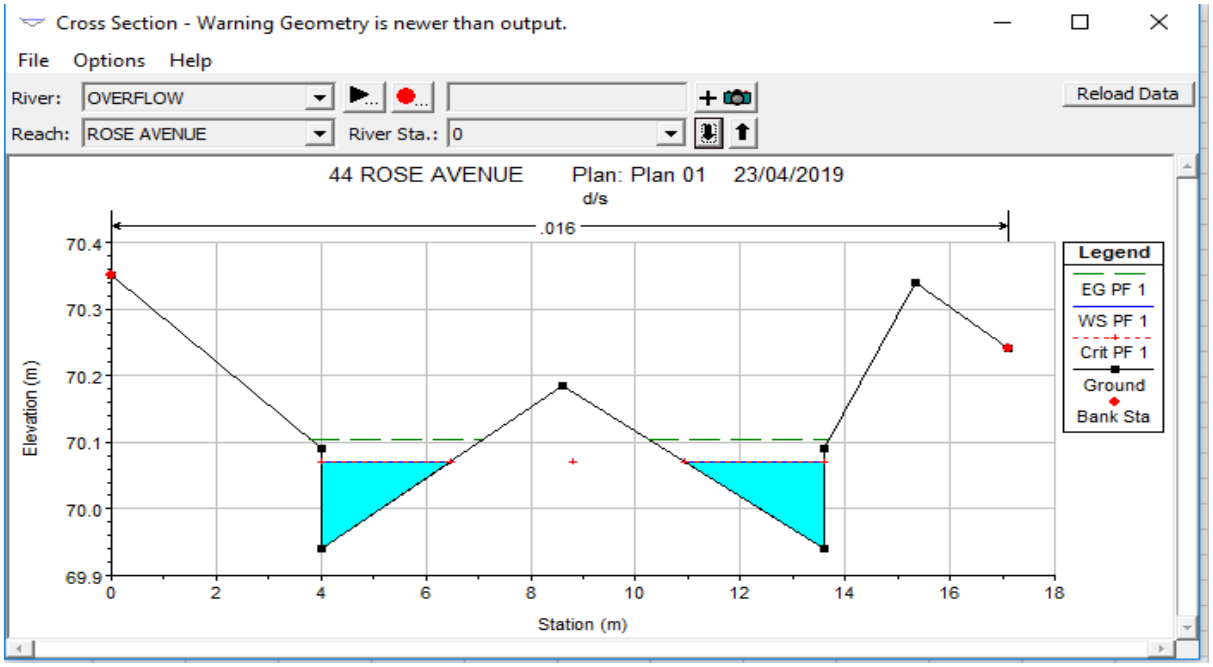


Fig 6: River Station 0

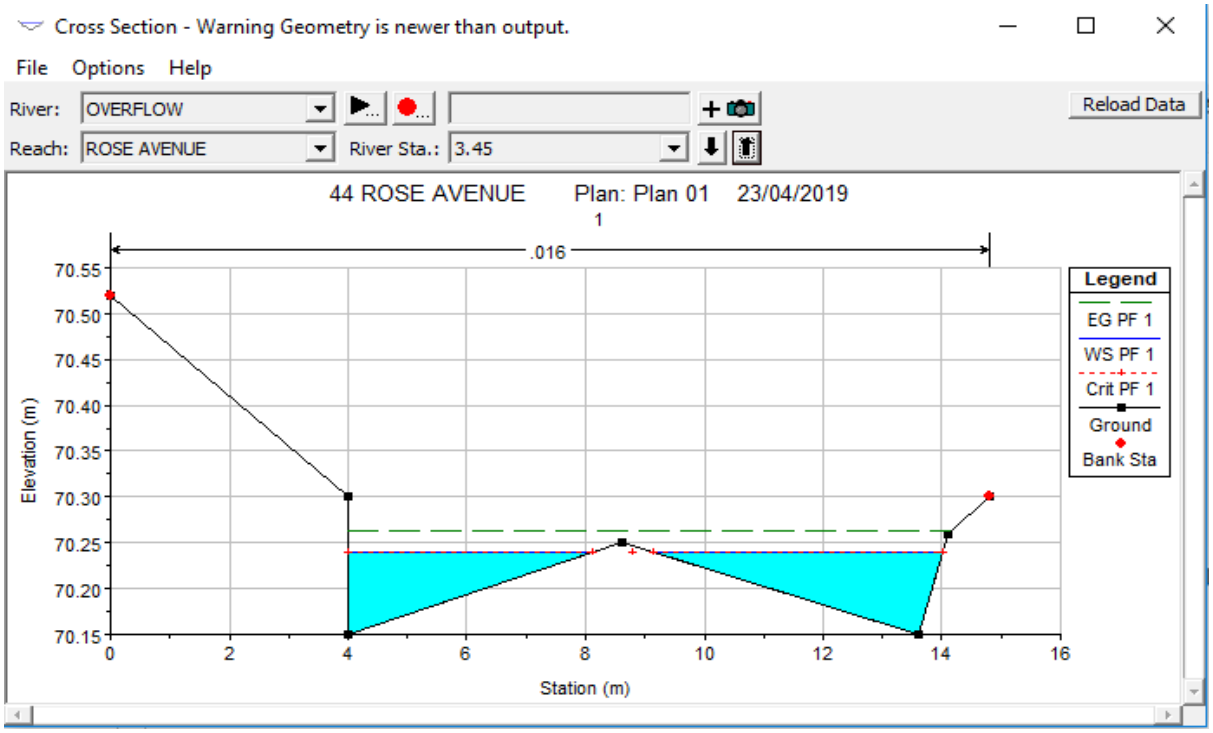


Fig 7: River Station 3.45

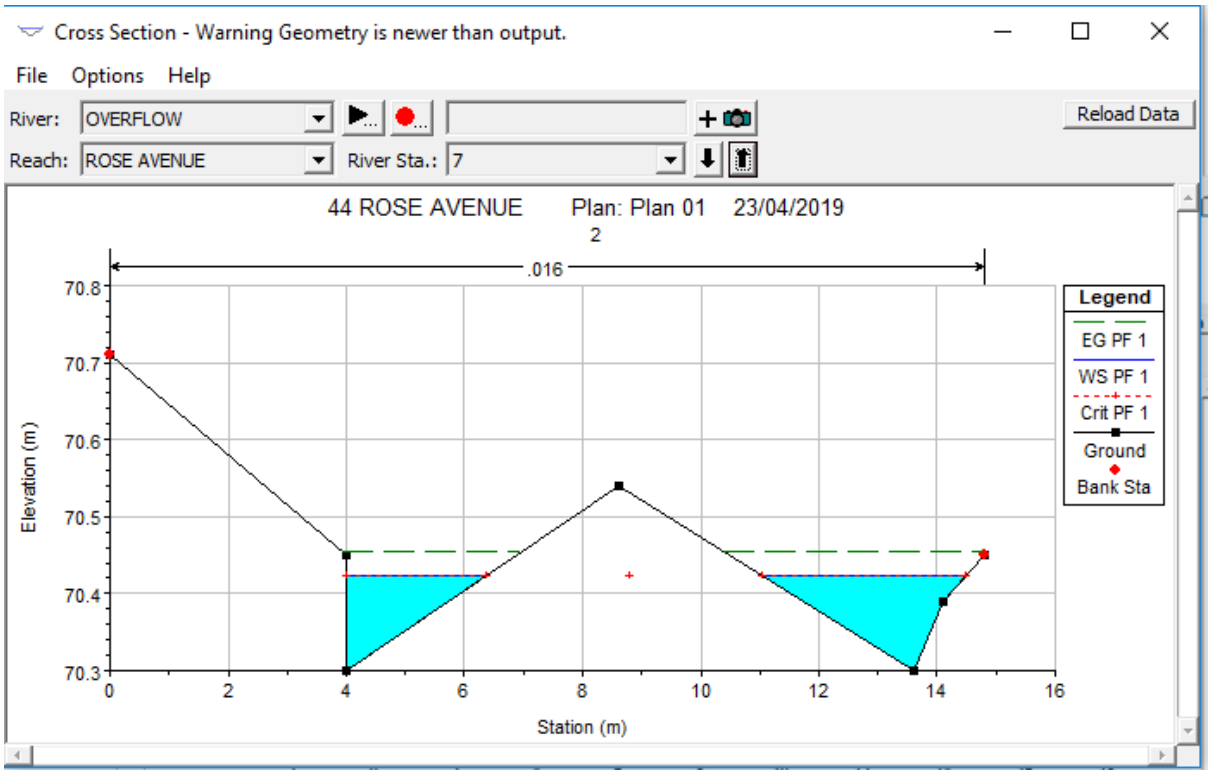


Fig 8: River Station 7

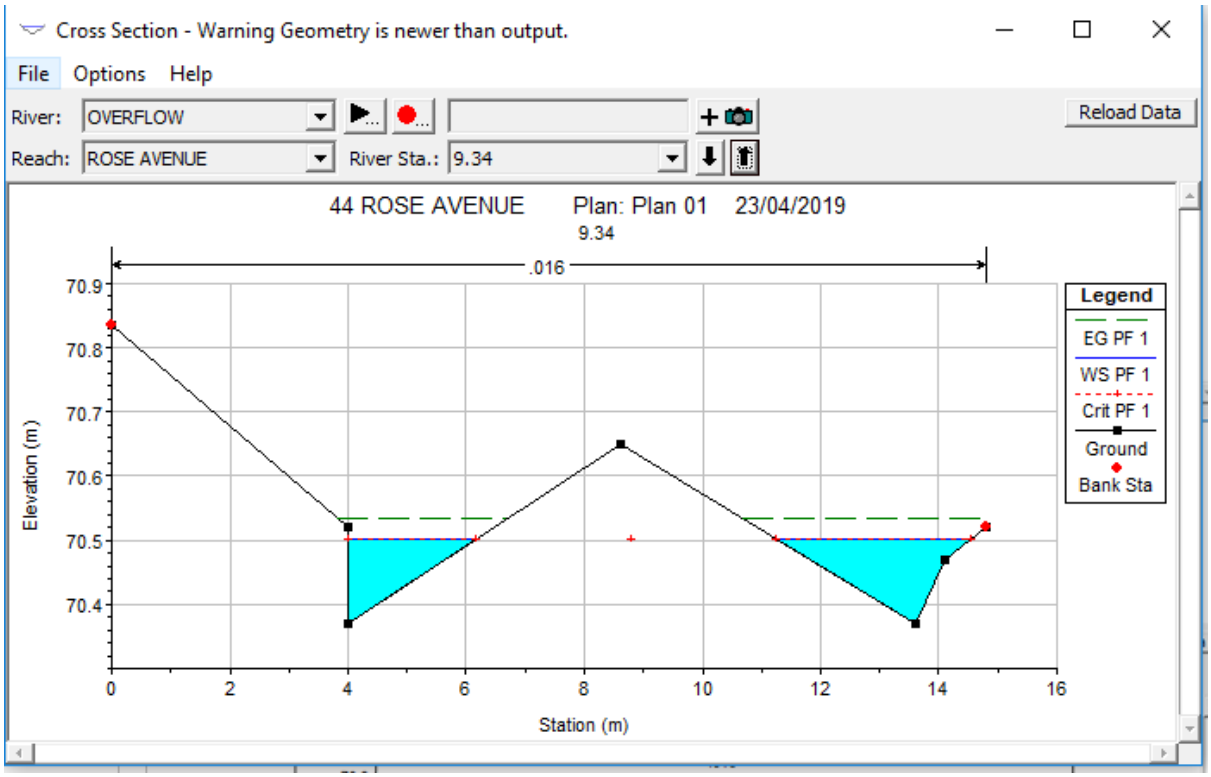


Fig 9: River Station 9.34

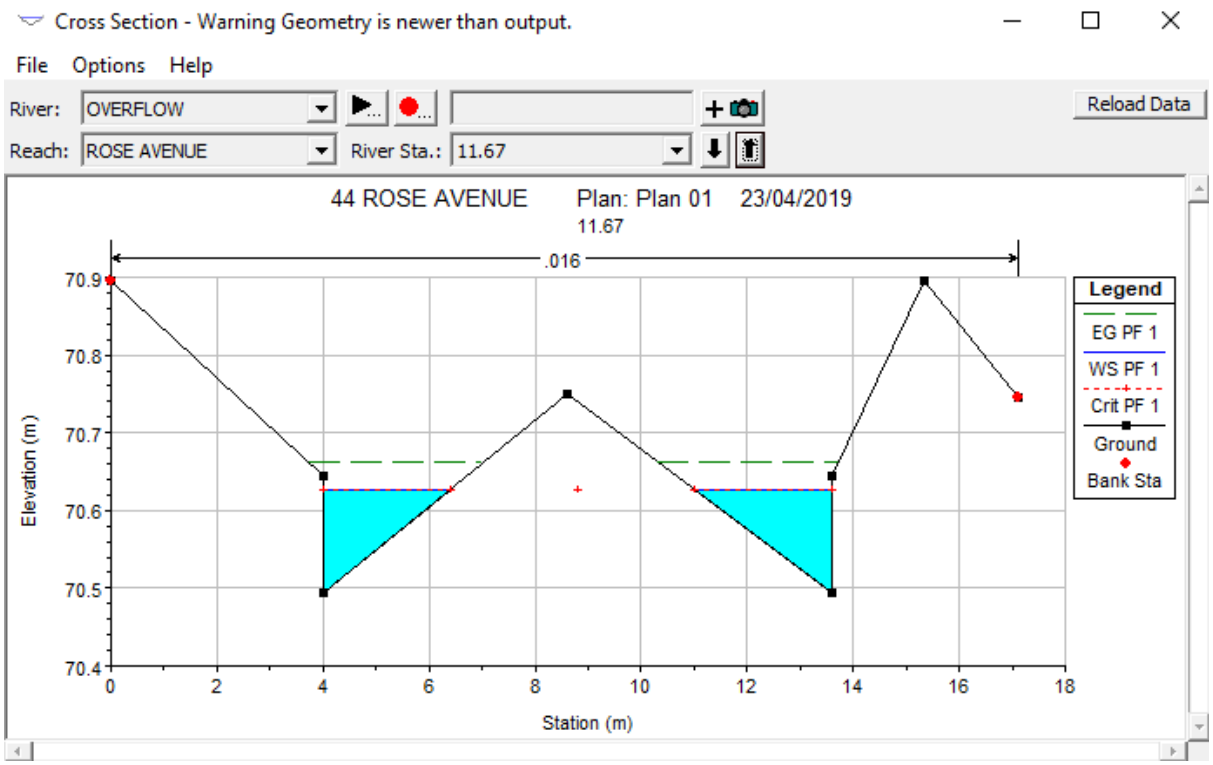


Fig 10: River Station 11.67

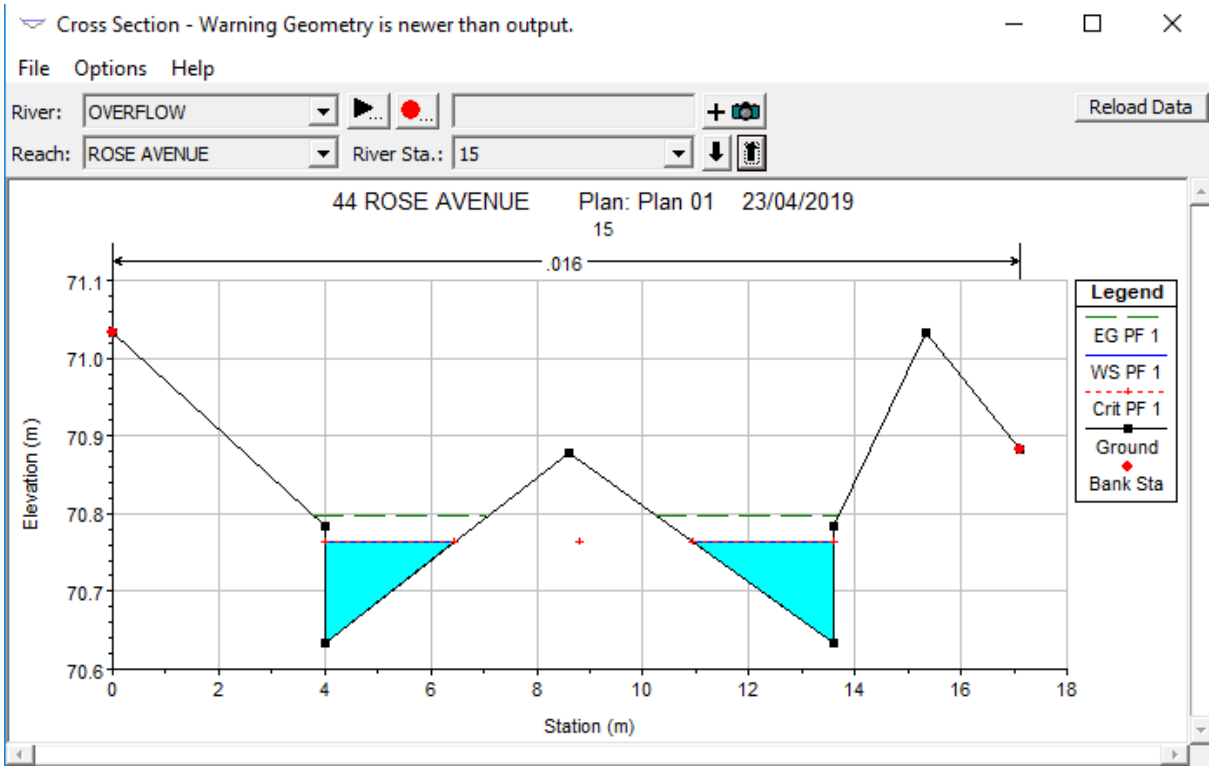


Fig 11: River Station 15

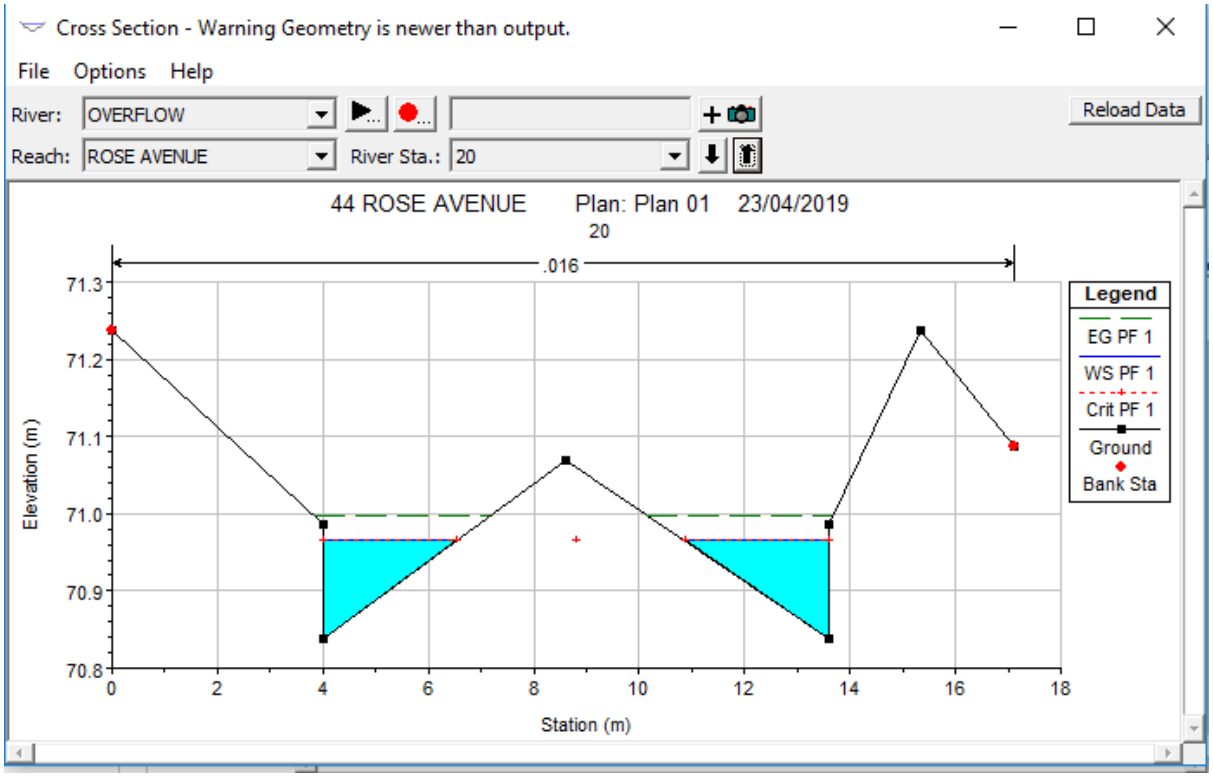


Fig 12: River Station 20

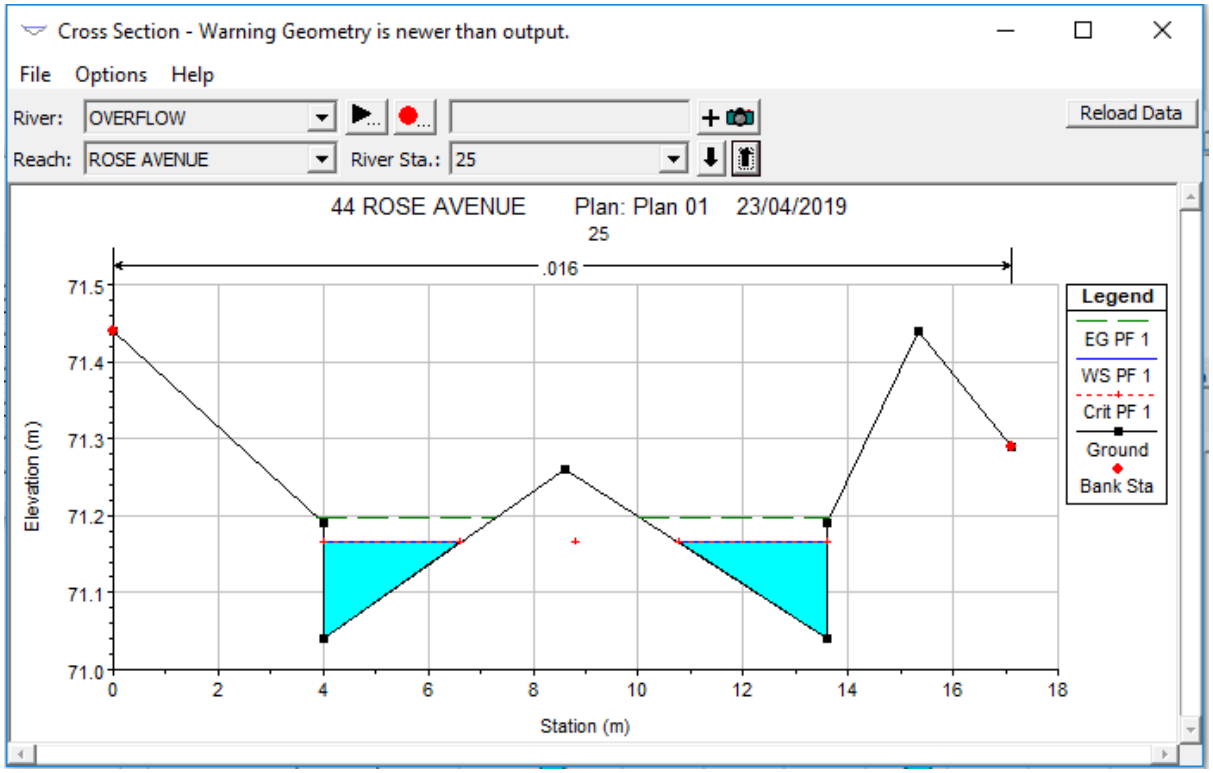


Fig 13: River Station 25

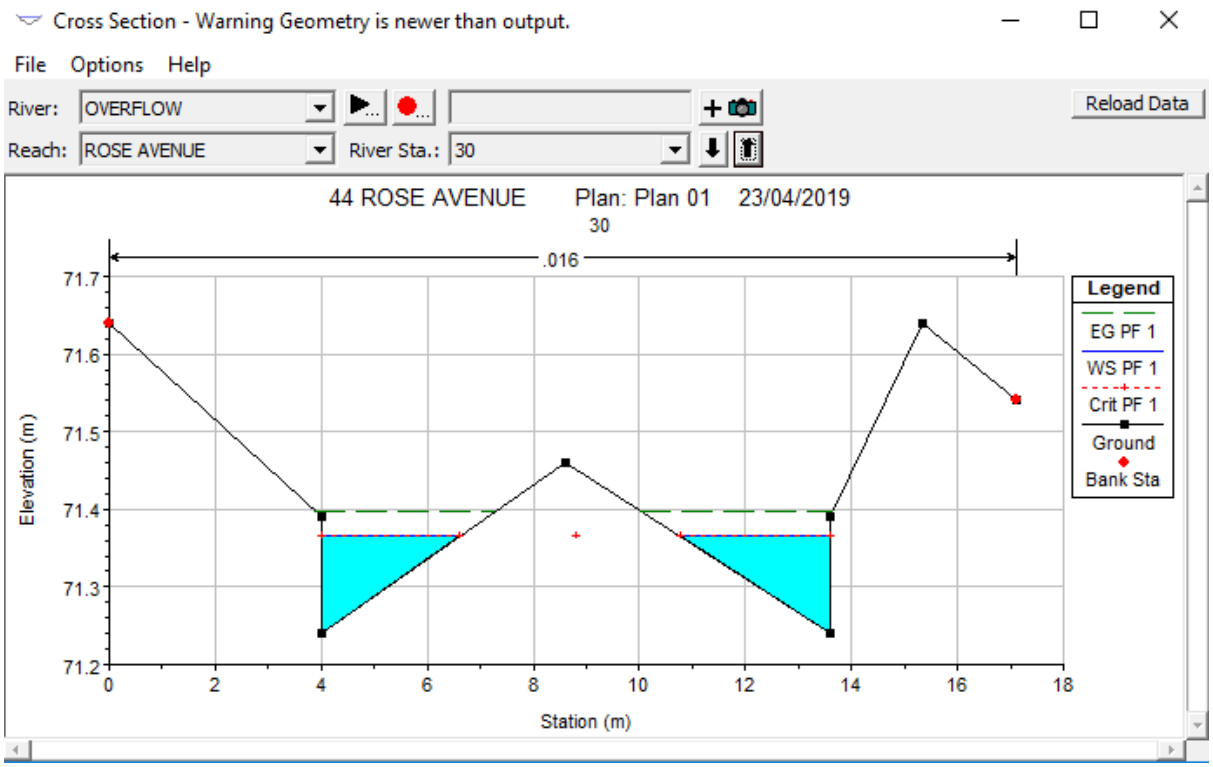


Fig 14: River Station 30

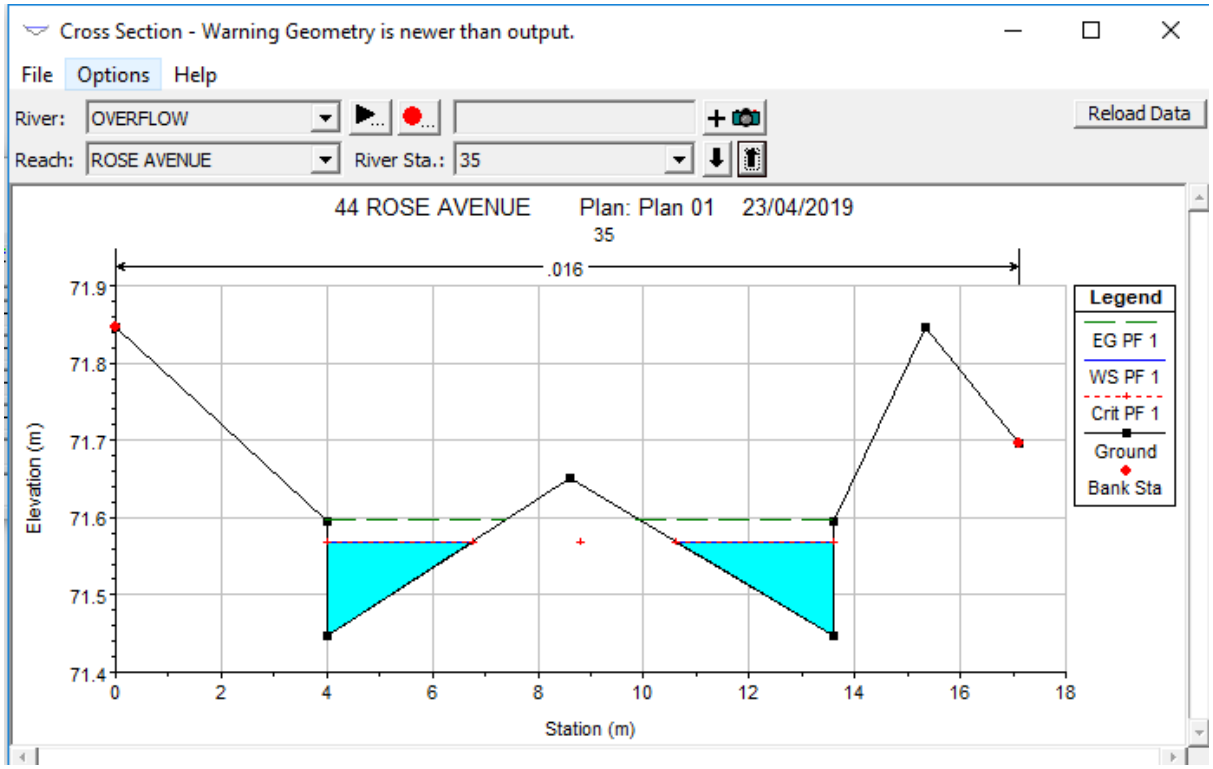


Fig 15: River Station 35

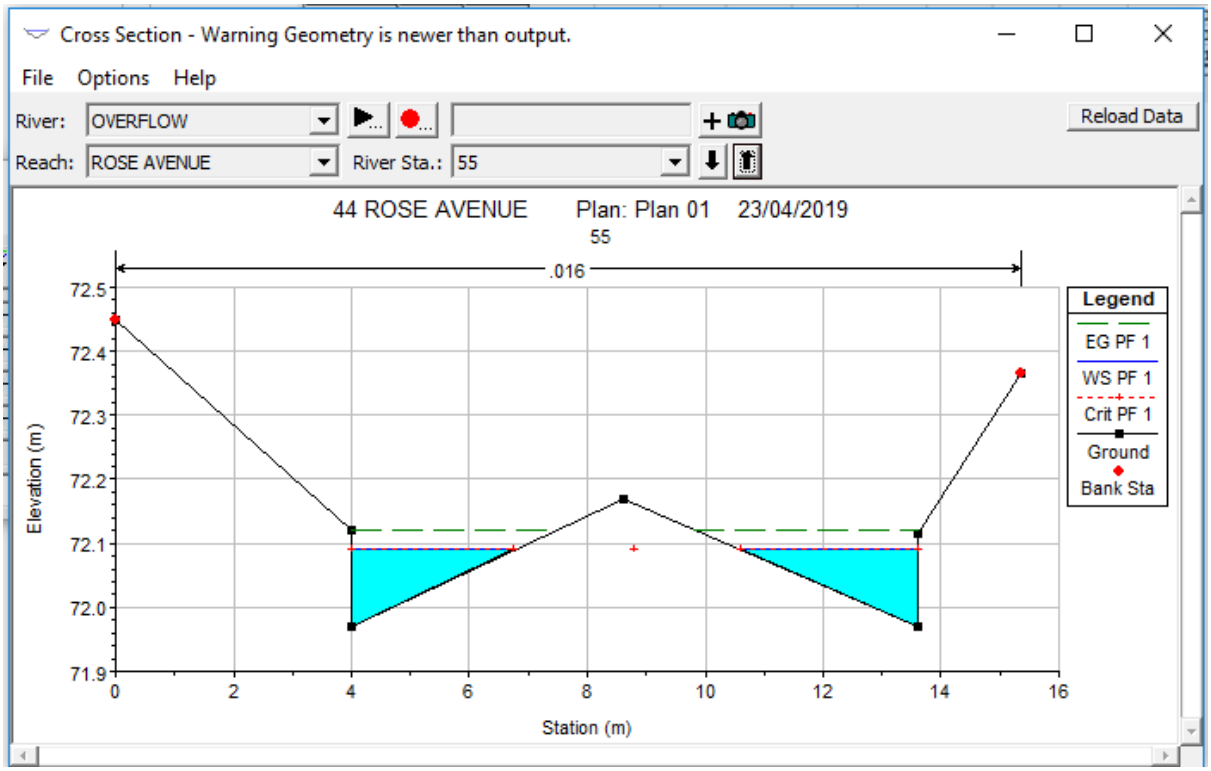


Fig 16: River Station 55

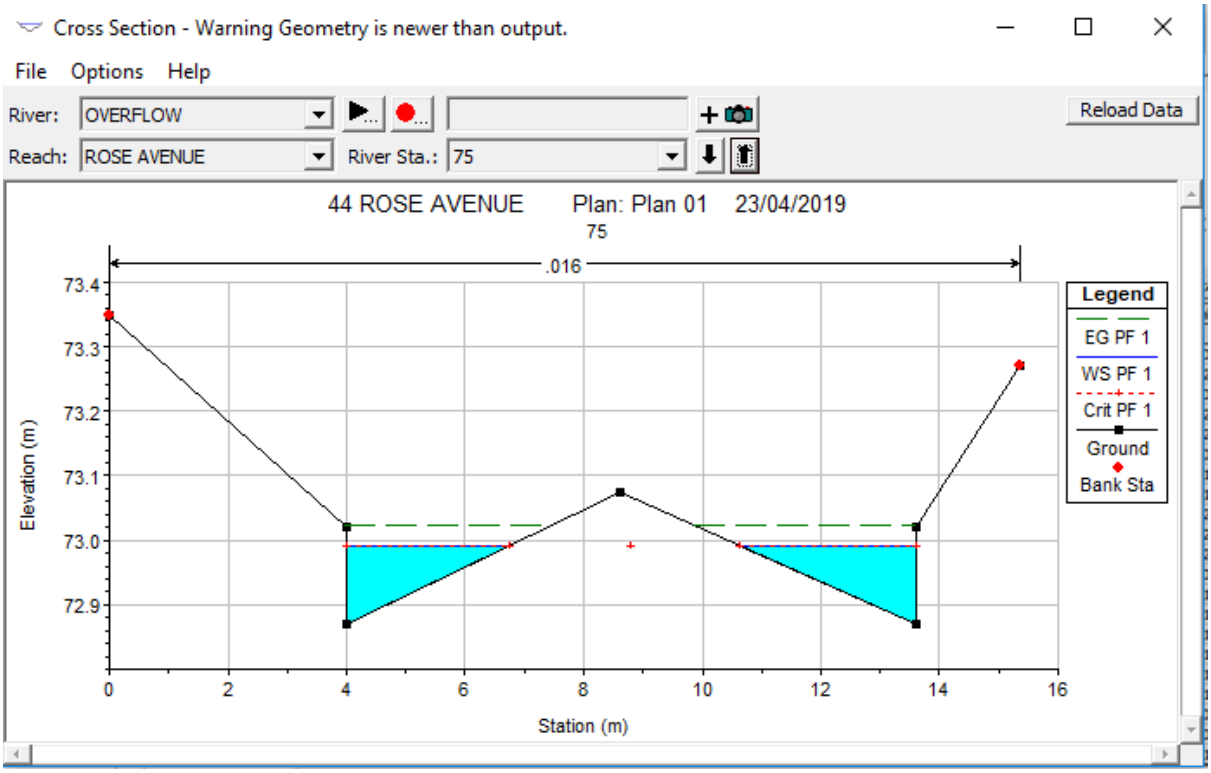


Fig 17: River Station 75

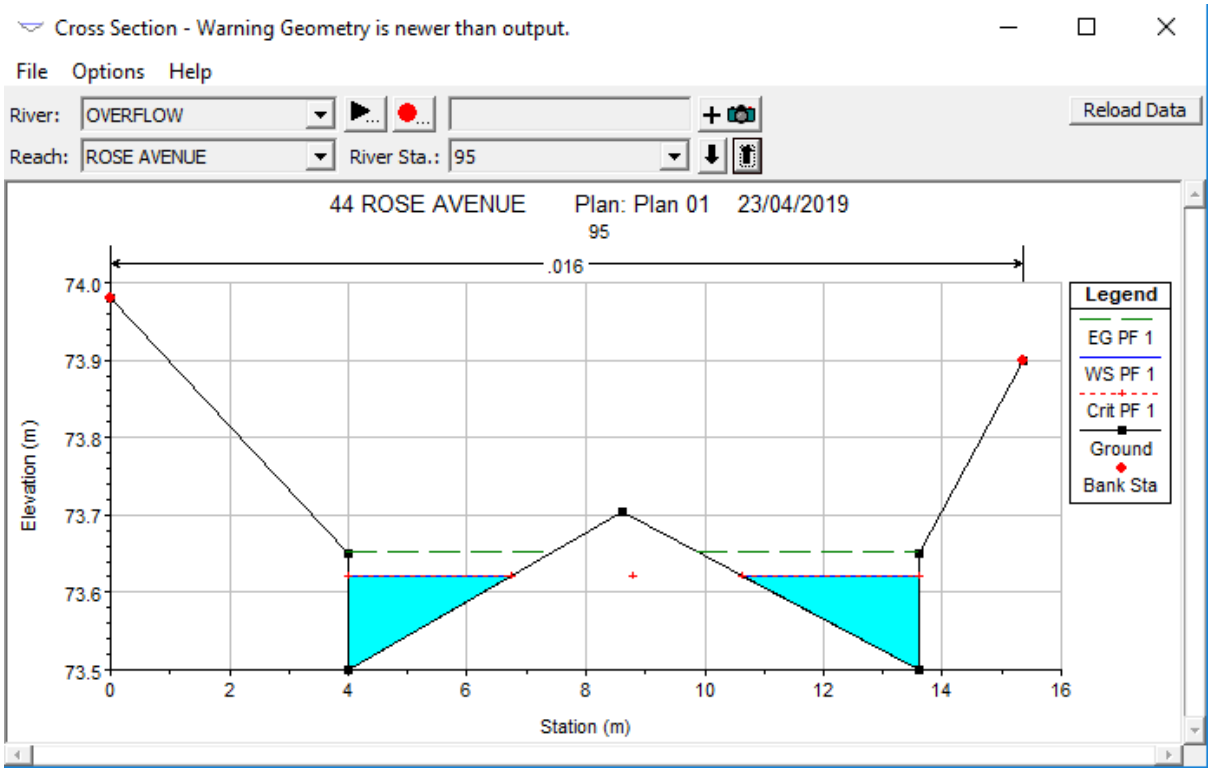


Fig 18: River Station 95

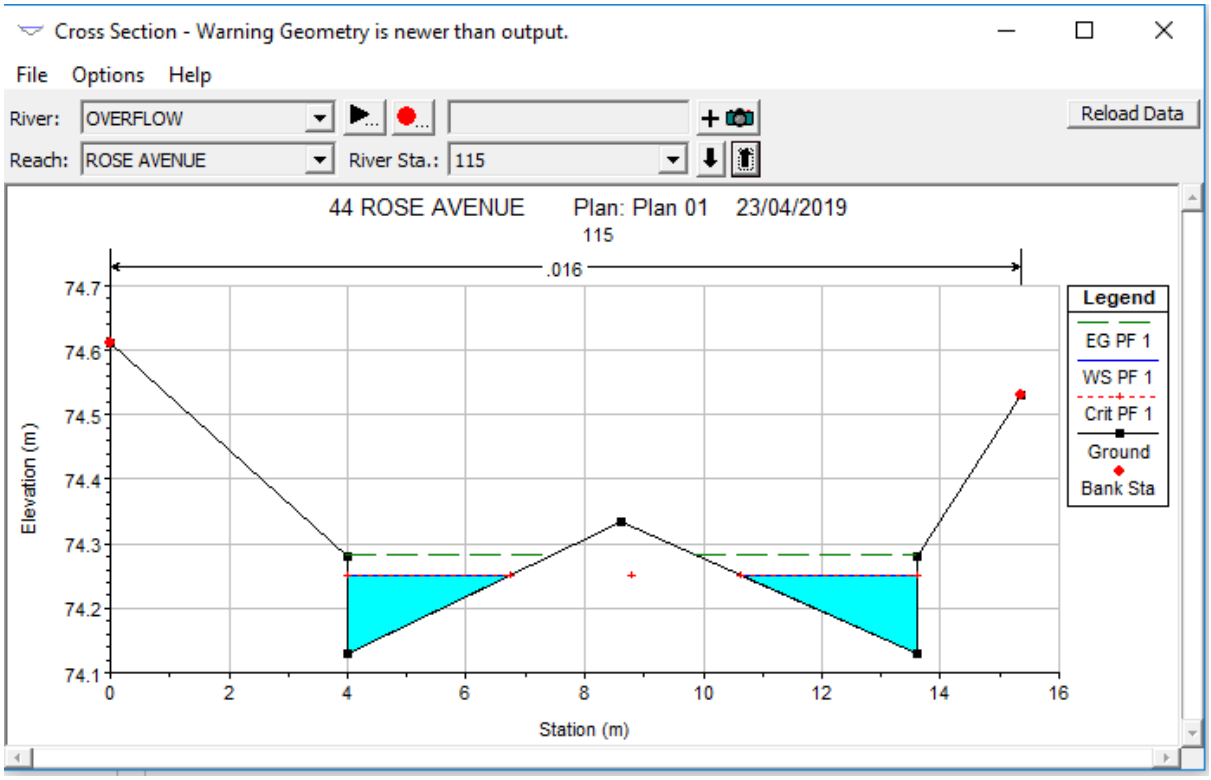


Fig 19: River Station 115

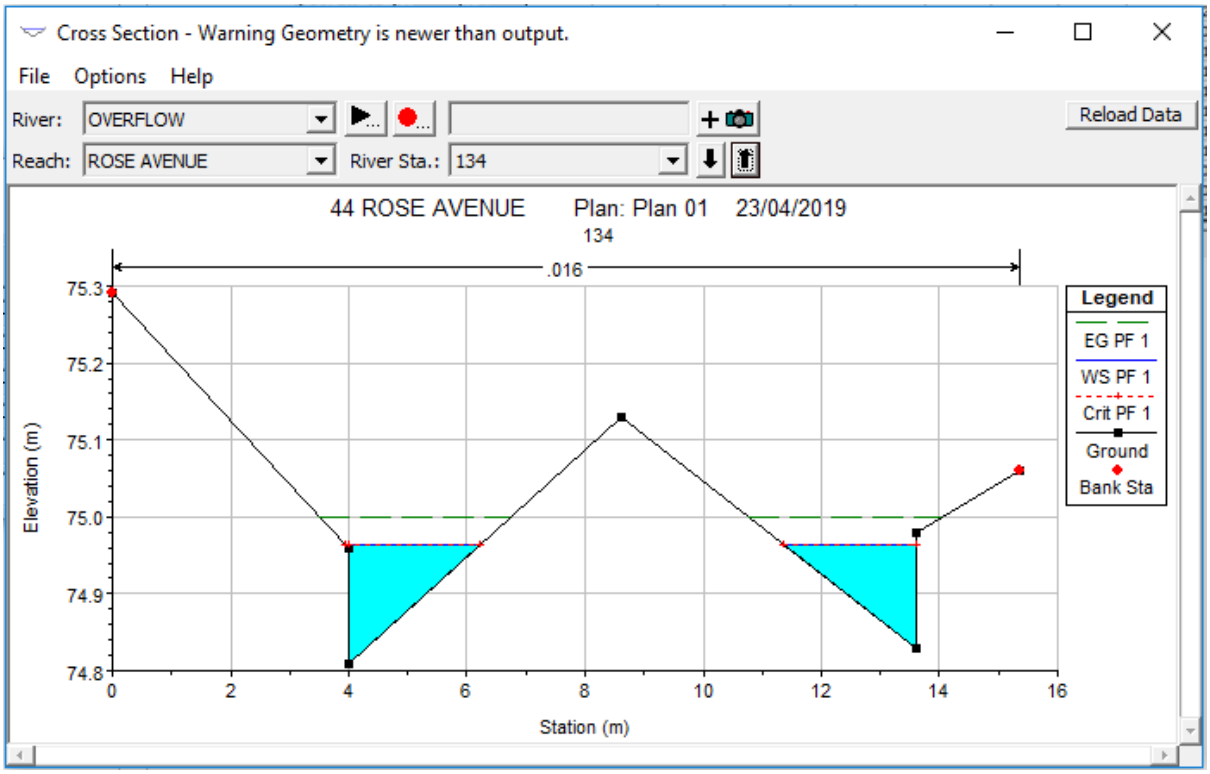


Fig 20: River Station 134

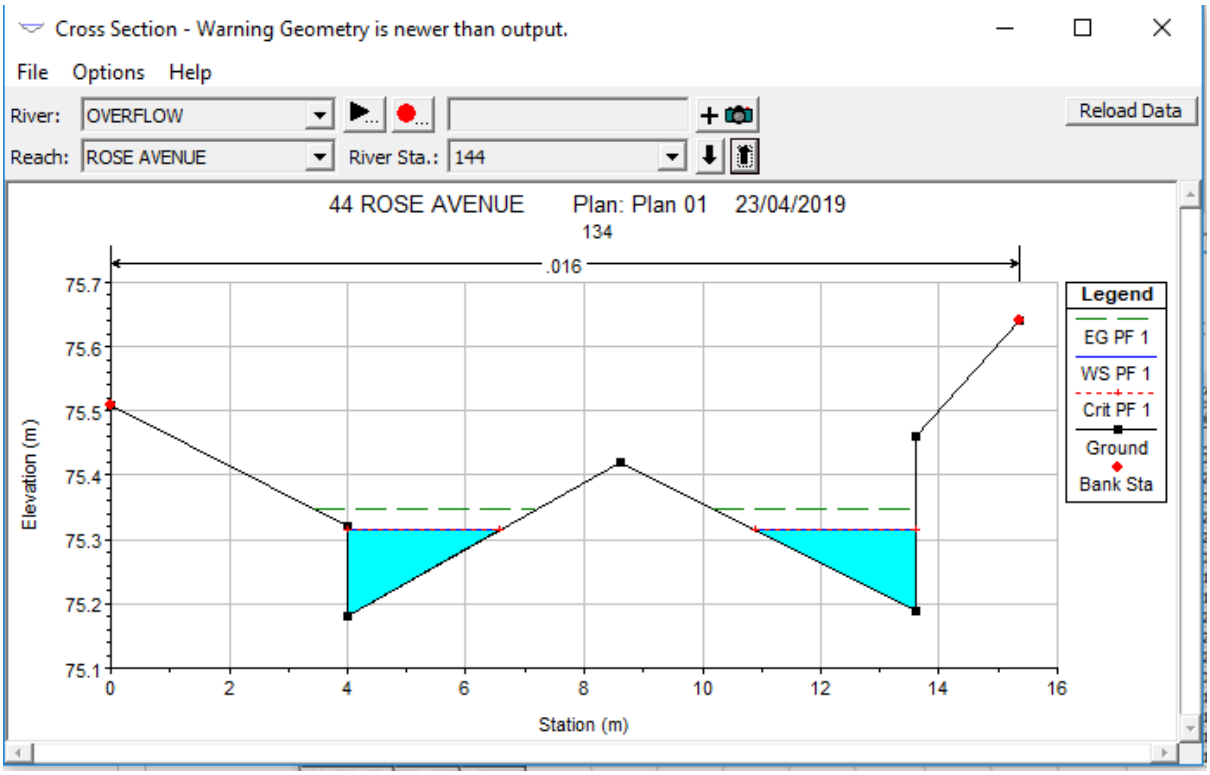


Fig 21: River Station 144

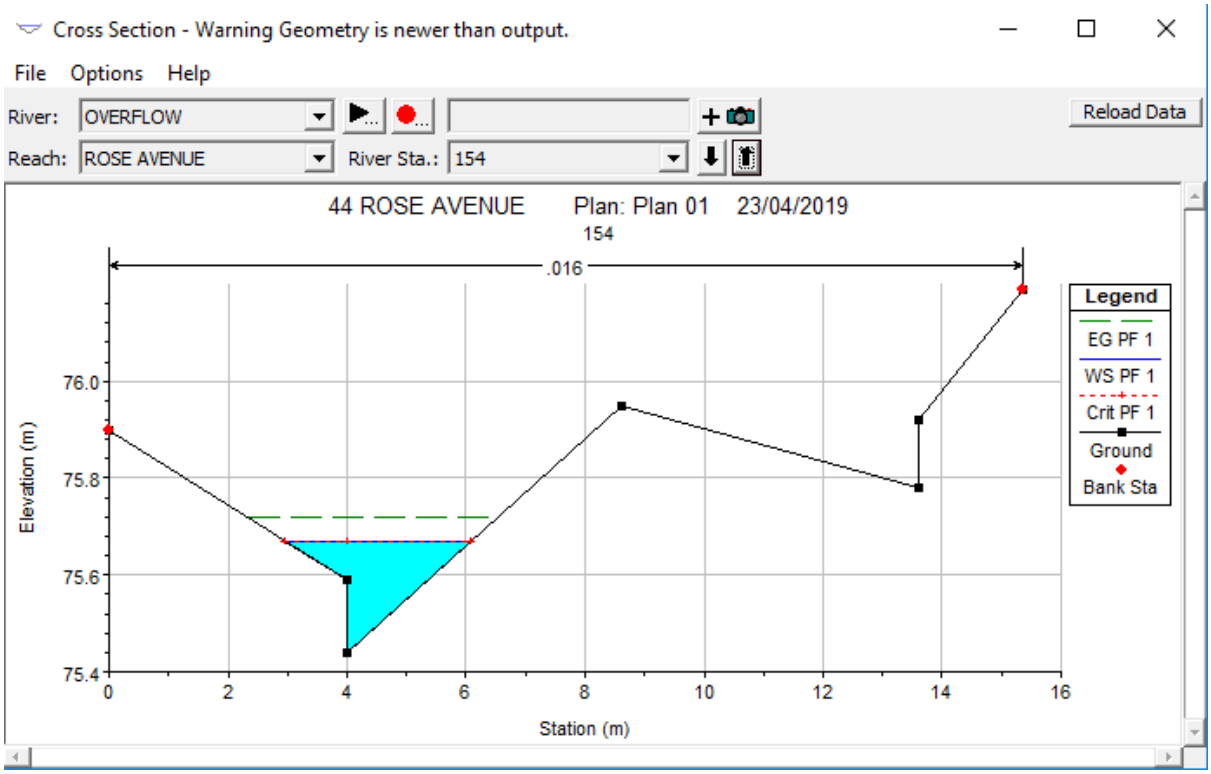


Fig 22: River Station 154

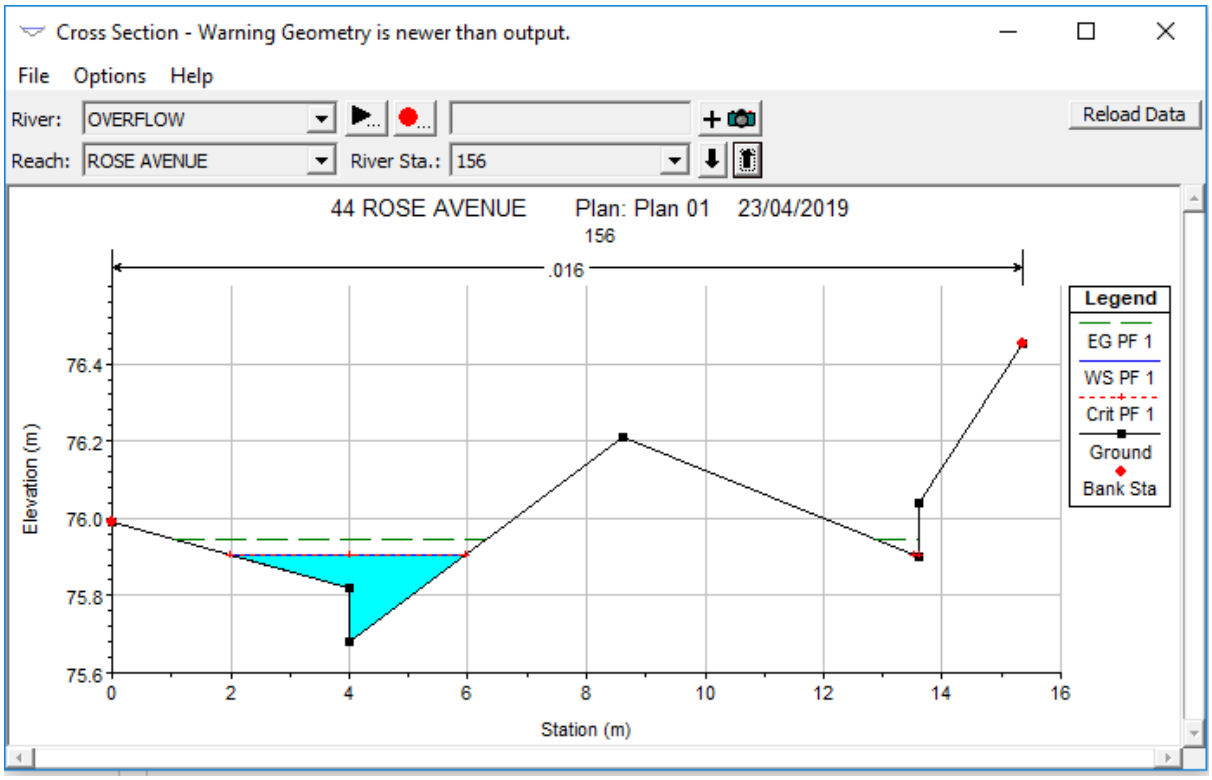


Fig 23: River Station 156

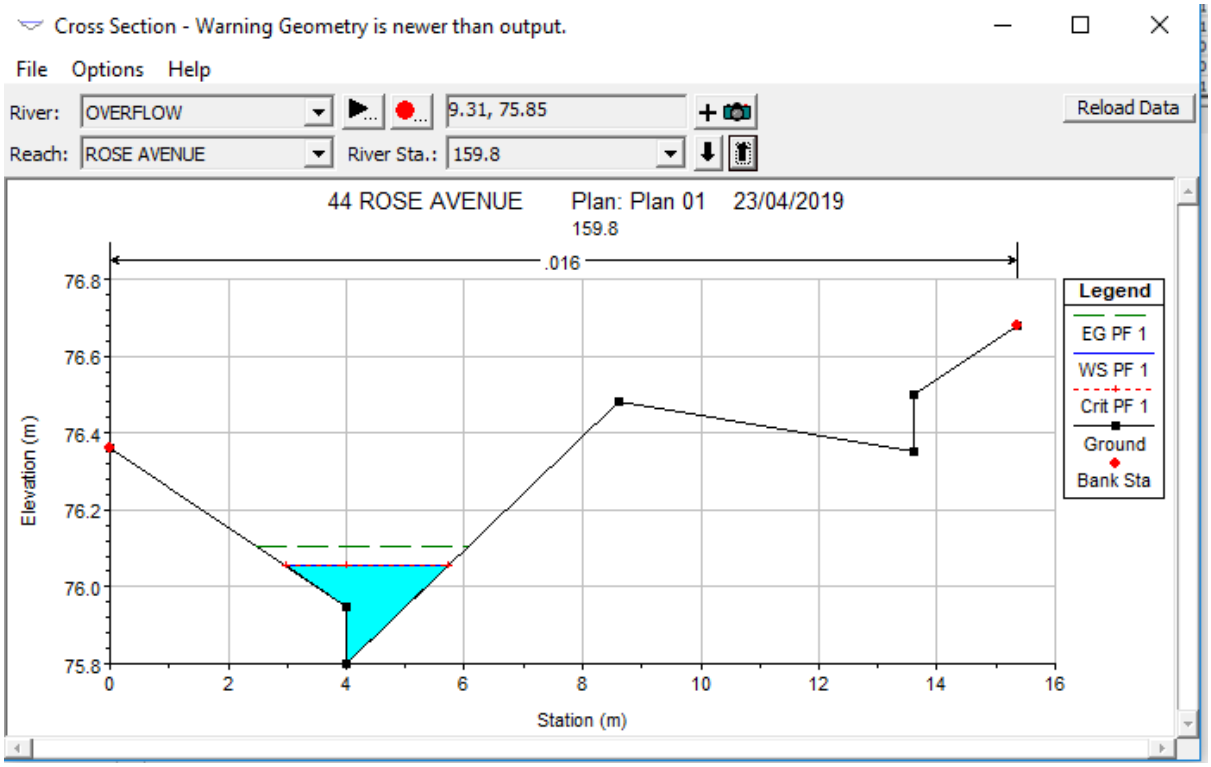


Fig 24: River Station 159.8

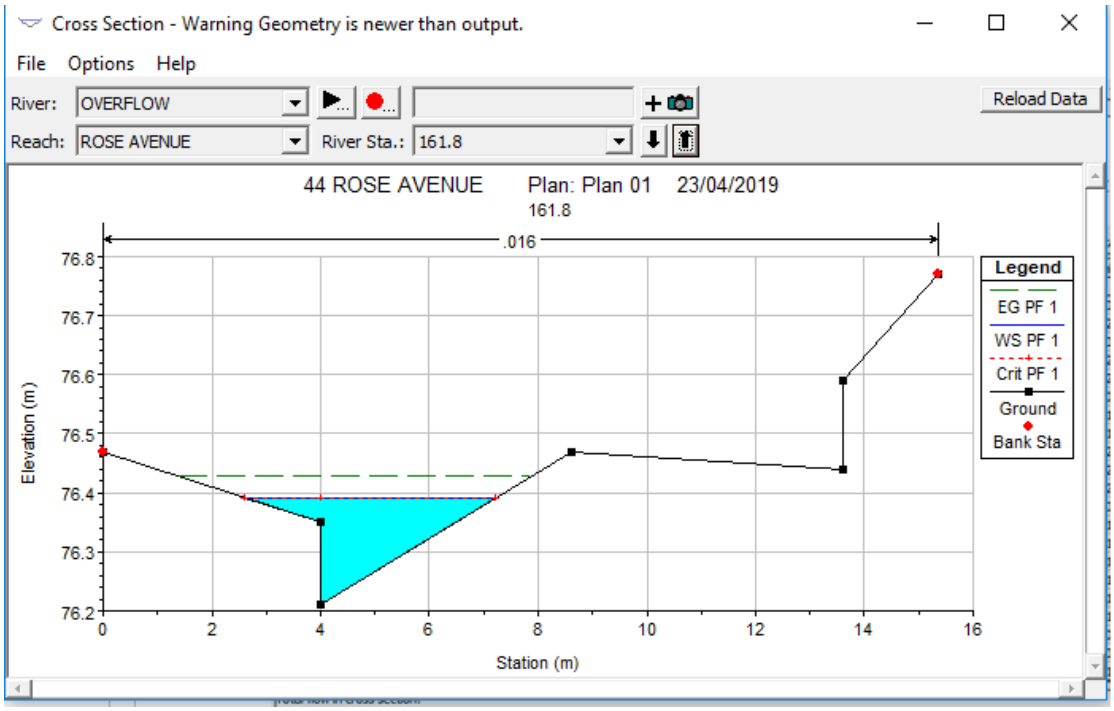


Fig 25: River Station 161.8

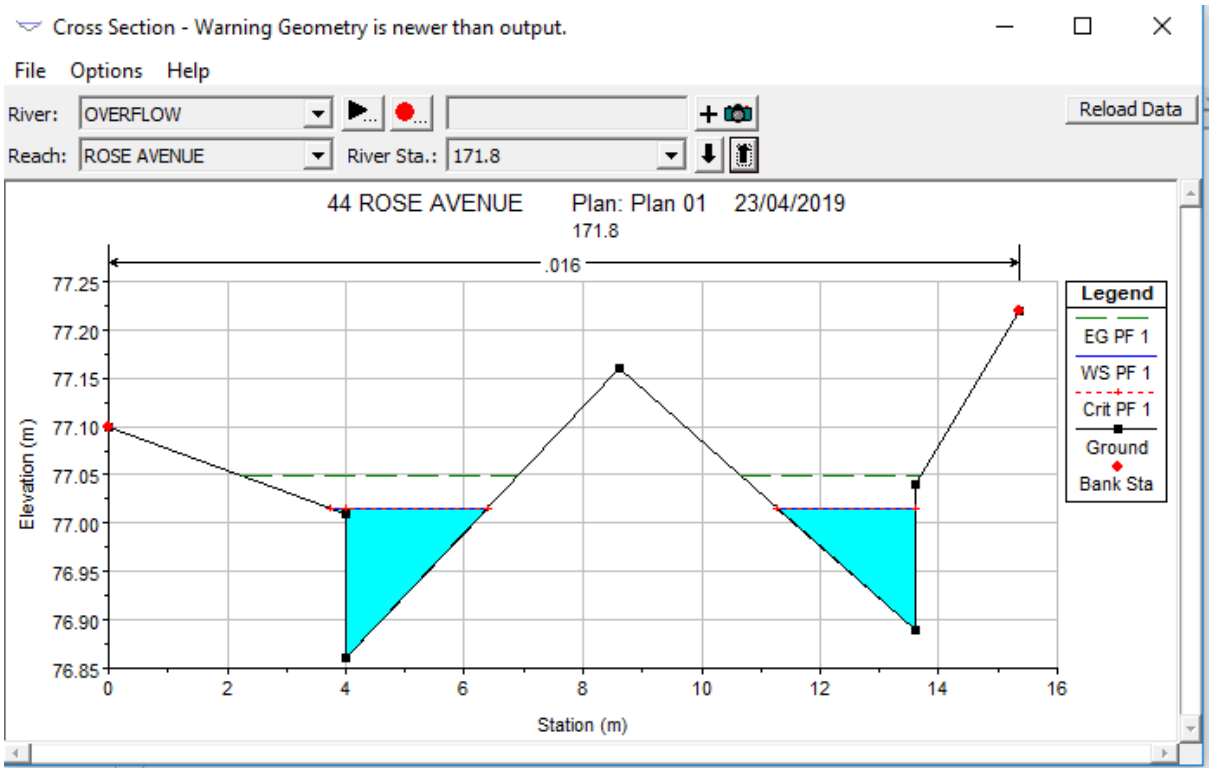


Fig 26: River Station 171.8

Profile Output Table - Standard Table 1

File Options Std. Tables Locations Help

HEC-RAS Plan: Plan 01 River: OVERFLOW Reach: ROSE AVENUE Profile: PF 1

Reload Data

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)	
ROSE AVENUE	171.8	PF 1	0.27	76.86	77.02	77.02	77.05	0.006634	0.81	0.33	4.99	1.00
ROSE AVENUE	161.8	PF 1	0.27	76.21	76.39	76.39	76.43	0.006586	0.84	0.32	4.60	1.02
ROSE AVENUE	159.8	PF 1	0.27	75.80	76.05	76.05	76.10	0.005883	0.99	0.27	2.75	1.00
ROSE AVENUE	156	PF 1	0.27	75.68	75.91	75.91	75.94	0.006487	0.88	0.31	4.06	1.02
ROSE AVENUE	154	PF 1	0.27	75.44	75.67	75.67	75.72	0.006244	0.96	0.28	3.12	1.02
ROSE AVENUE	144	PF 1	0.27	75.18	75.31	75.31	75.35	0.006707	0.80	0.34	5.26	1.00
ROSE AVENUE	134	PF 1	0.27	74.81	74.96	74.96	75.00	0.006753	0.85	0.32	4.49	1.01
ROSE AVENUE	115	PF 1	0.27	74.13	74.25	74.25	74.28	0.006960	0.78	0.35	5.70	1.01
ROSE AVENUE	95	PF 1	0.27	73.50	73.62	73.62	73.65	0.006975	0.78	0.35	5.70	1.02
ROSE AVENUE	75	PF 1	0.27	72.87	72.99	72.99	73.02	0.006975	0.78	0.35	5.70	1.02
ROSE AVENUE	55	PF 1	0.27	71.97	72.09	72.09	72.12	0.007108	0.78	0.34	5.75	1.02
ROSE AVENUE	35	PF 1	0.27	71.45	71.57	71.57	71.60	0.006689	0.77	0.35	5.75	1.00
ROSE AVENUE	30	PF 1	0.27	71.24	71.36	71.36	71.40	0.006923	0.79	0.34	5.45	1.01
ROSE AVENUE	25	PF 1	0.27	71.04	71.16	71.16	71.20	0.006923	0.79	0.34	5.45	1.01
ROSE AVENUE	20	PF 1	0.27	70.84	70.96	70.96	71.00	0.006885	0.80	0.34	5.27	1.01
ROSE AVENUE	15	PF 1	0.27	70.63	70.76	70.76	70.80	0.006820	0.81	0.33	5.12	1.01
ROSE AVENUE	11.67	PF 1	0.27	70.50	70.63	70.63	70.66	0.006785	0.81	0.33	5.01	1.01
ROSE AVENUE	9.34	PF 1	0.27	70.37	70.50	70.50	70.53	0.006654	0.79	0.34	5.43	1.01
ROSE AVENUE	7	PF 1	0.27	70.30	70.42	70.42	70.45	0.006556	0.77	0.35	5.85	1.00
ROSE AVENUE	3.45	PF 1	0.27	70.15	70.24	70.24	70.26	0.007111	0.66	0.41	9.01	1.00
ROSE AVENUE	0	PF 1	0.27	69.94	70.07	70.07	70.10	0.006850	0.81	0.33	5.13	1.01

Total flow in cross section.

Table: Profile summary (Post Dev)