

Appendix B

Hydraulic Modelling Results

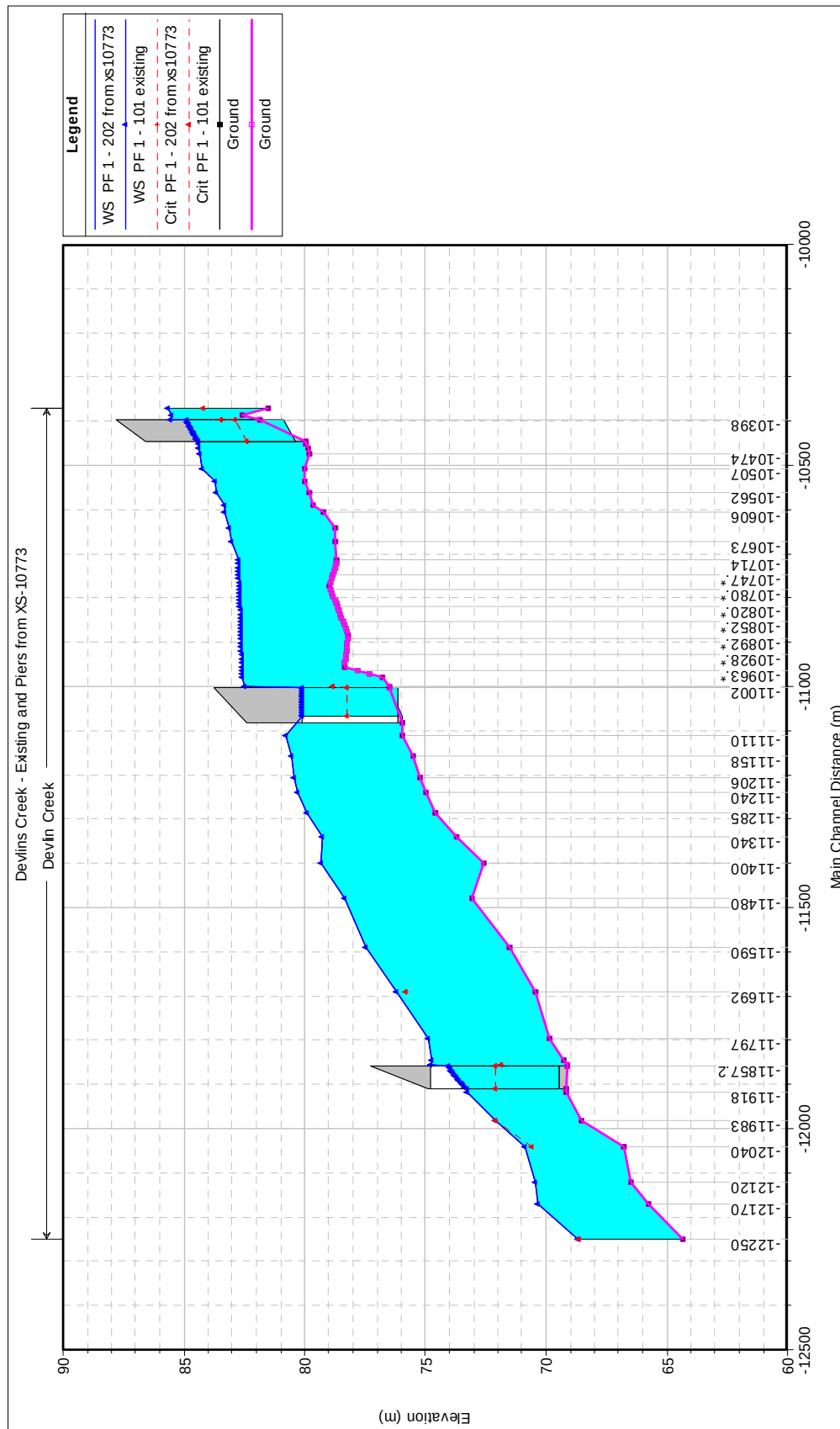
Appendix B Hydraulic Modelling Results

Devilins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
10372	109.6	Piers	81.52	85.67	85.75	1.2			1.2	46.76	0.27
10372	109.6	Exist	81.52	85.67	85.75	1.2			1.2	46.76	0.27
10387	109.6	Piers	82.56	85.53	85.7	1.82			1.82	36.41	0.45
-0387	109.6	Exist	82.56	85.53	85.7	1.82			1.82	36.41	0.45
10396	109.6	Piers	81.88	85.56	85.65	1.34			1.34	28.38	0.25
10396	109.6	Exist	81.88	85.56	85.65	1.34			1.34	28.38	0.25
10398	Culvert 23										
10452	109.6	Piers	79.97	84.41	84.49	1.28		0.36	1.25	26.68	0.2
10452	109.6	Exist	79.97	84.41	84.49	1.28		0.36	1.25	26.68	0.2
10462	109.6	Piers	79.86	84.37	84.47	1.44			1.44	26.36	0.27
10462	109.6	Exist	79.86	84.37	84.47	1.44			1.44	26.36	0.27
10474	109.6	Piers	79.79	84.34	84.45	1.48			1.48	27.53	0.29
10474	109.6	Exist	79.79	84.34	84.45	1.48			1.48	27.53	0.29
10507	109.6	Piers	80.01	84.25	84.38	1.58			1.58	27.84	0.32
10507	109.6	Exist	80.01	84.25	84.38	1.58			1.58	27.83	0.32
10535	109.6	Piers	80	83.69	84.22	3.22			3.22	10.34	0.57
10535	109.6	Exist	80	83.69	84.22	3.22			3.22	10.34	0.57
10562	109.6	Piers	79.78	83.66	83.97	2.49			2.49	14.73	0.46
10562	109.6	Exist	79.78	83.66	83.97	2.5			2.5	14.73	0.46
10589	109.6	Piers	79.64	83.3	83.77	3.02			3.02	16.4	0.65
10589	109.6	Exist	79.64	83.3	83.76	3.02			3.02	16.4	0.65
10606	109.6	Piers	79.23	83.33	83.58	2.25			2.25	17.45	0.43
10606	109.6	Exist	79.23	83.32	83.58	2.25			2.25	17.44	0.43
10641	109.6	Piers	78.73	83.11	83.4	2.38			2.38	15.14	0.44
10641	109.6	Exist	78.73	83.11	83.4	2.38			2.38	15.14	0.44
10673	109.6	Piers	78.73	83	83.25	2.18			2.18	15.43	0.39
10673	109.6	Exist	78.73	83	83.24	2.19			2.19	15.43	0.39
10714	109.6	Piers	78.66	82.73	83.05	2.51			2.51	14.87	0.47
10714	109.6	Exist	78.66	82.72	83.05	2.51			2.51	14.86	0.47

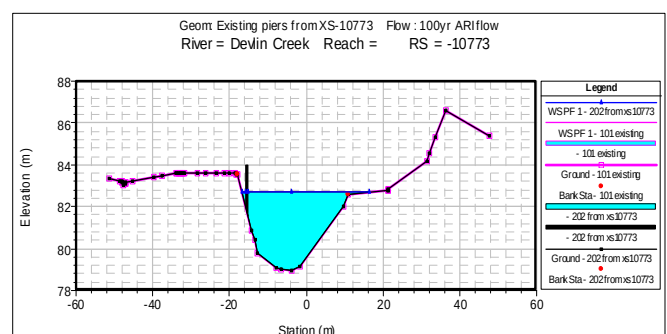
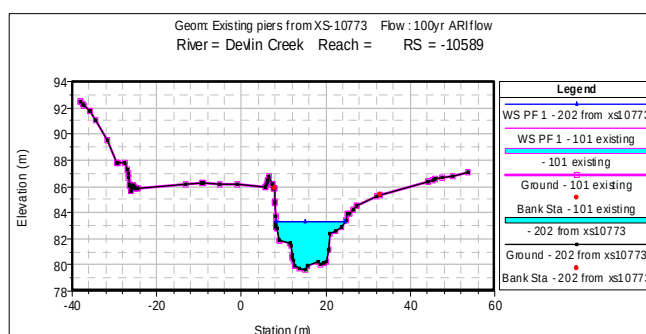
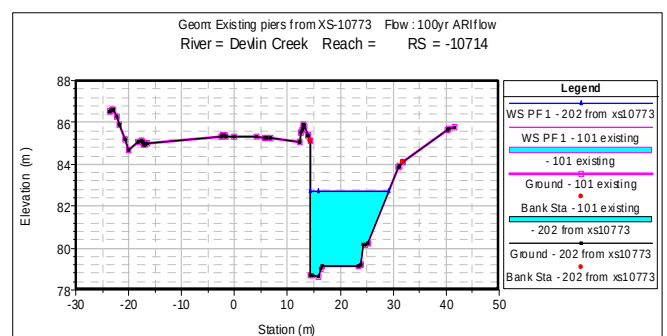
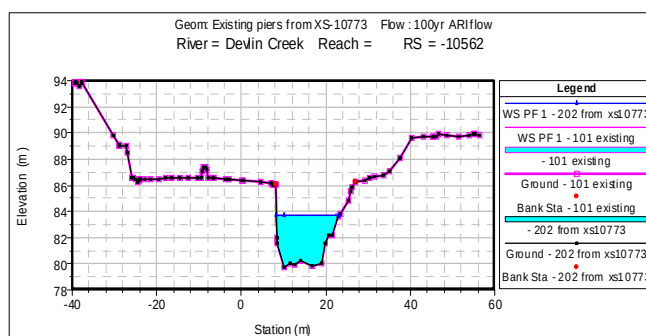
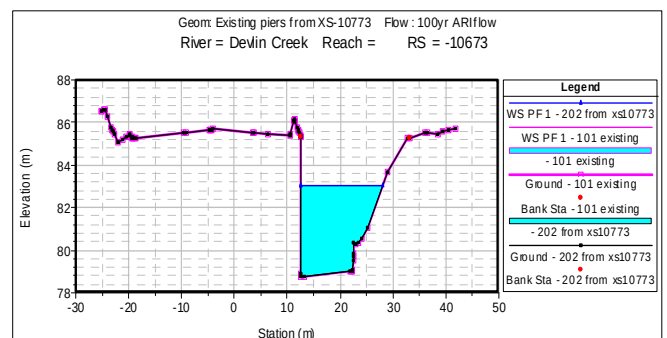
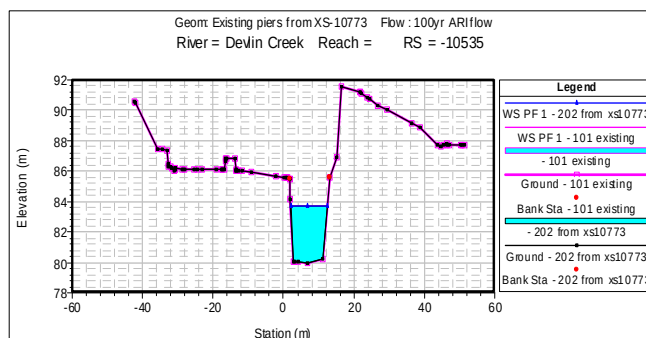
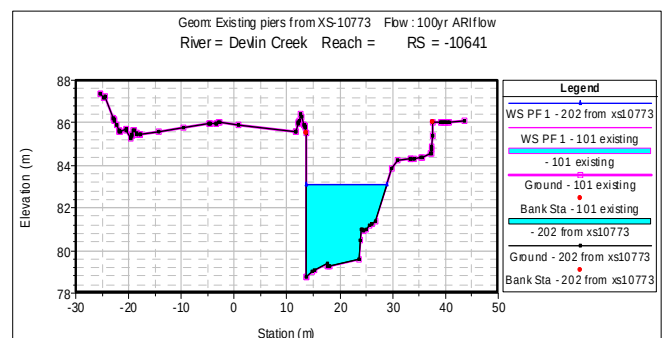
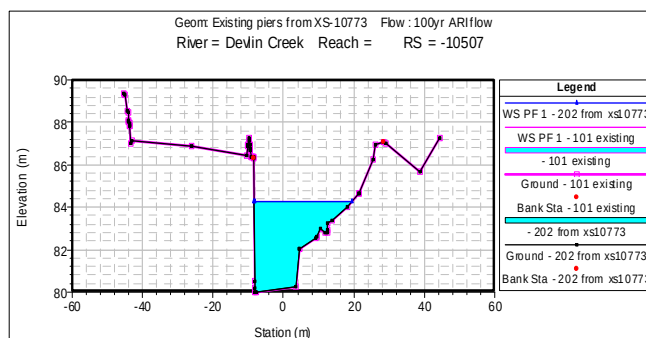
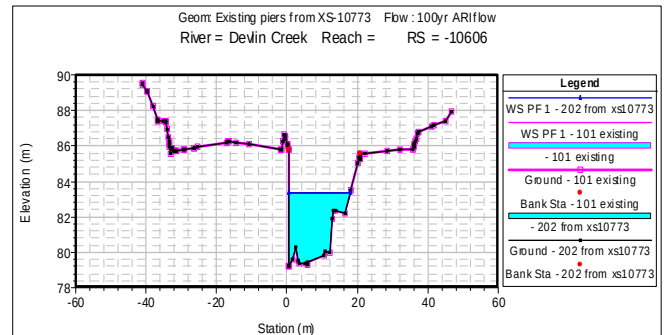
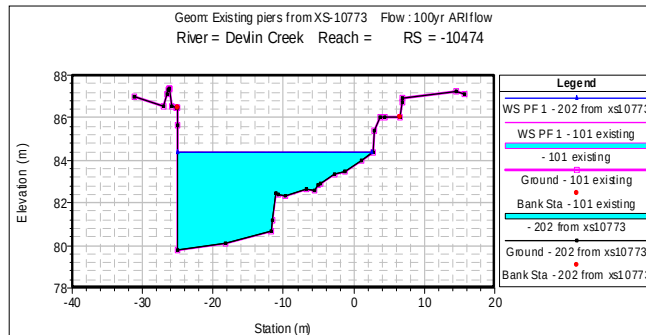
Devilins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
10773	109.6	Piers	78.97	82.69	82.82	1.6		0.14	1.59	32.73	0.32
10773	109.6	Exist	78.97	82.69	82.81	1.59		0.14	1.58	33.22	0.32
10884	109.6	Piers	78.19	82.63	82.67	0.84			0.84	49.44	0.17
10884	109.6	Exist	78.19	82.64	82.67	0.84			0.84	49.44	0.17
10955	109.6	Piers	78.34	82.58	82.63	0.96			0.96	39.36	0.18
10955	109.6	Exist	78.34	82.58	82.63	0.96			0.96	39.43	0.18
10980	109.6	Piers	76.79	82.58	82.62	0.84			0.84	33.33	0.13
10980	109.6	Exist	76.79	82.58	82.62	0.83			0.83	33.85	0.14
10999	235.3	Piers	76.49	82.49	82.6	1.46			1.46	30.35	0.2
10999	235.3	Exist	76.49	82.49	82.6	1.46			1.46	30.35	0.2
11002	Culvert 24										
11110	235.3	Piers	75.95	80.8	80.94	1.63			1.63	54.49	0.32
11110	235.3	Exist	75.95	80.8	80.94	1.63			1.63	54.49	0.32
11158	235.3	Piers	75.53	80.55	80.79	2.17	0.13		2.17	53.25	0.48
11158	235.3	Exist	75.53	80.55	80.79	2.17	0.13		2.17	53.25	0.48
11206	235.3	Piers	75.24	80.43	80.6	1.82			1.82	50.29	0.36
11206	235.3	Exist	75.24	80.43	80.6	1.82			1.82	50.29	0.36
11240	235.3	Piers	74.98	80.27	80.5	2.1			2.1	40.17	0.4
11240	235.3	Exist	74.98	80.27	80.5	2.1			2.1	40.17	0.4
11285	235.3	Piers	74.59	79.89	80.28	2.77			2.77	27.36	0.5
11285	235.3	Exist	74.59	79.89	80.28	2.77			2.77	27.36	0.5
11340	235.3	Piers	73.69	79.29	79.89	3.44			3.44	18.56	0.57
11340	235.3	Exist	73.69	79.29	79.89	3.44			3.44	18.56	0.57
11400	235.3	Piers	72.6	79.29	79.53	2.14			2.14	28.22	0.35
11400	235.3	Exist	72.6	79.29	79.53	2.14			2.14	28.22	0.35
11480	235.3	Piers	73.09	78.36	79.11	3.82			3.82	15.86	0.62
11480	235.3	Exist	73.09	78.36	79.11	3.82			3.82	15.86	0.62
11590	235.3	Piers	71.54	77.48	78.1	3.48			3.48	13.59	0.5
11590	235.3	Exist	71.54	77.48	78.1	3.48			3.48	13.59	0.5
11692	235.3	Piers	70.46	76.18	76.98	3.95			3.95	25.93	0.83
11692	235.3	Exist	70.46	76.18	76.98	3.95			3.95	25.93	0.83

Devilins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
11797	235.3	Piers	69.84	74.9	75.39	3.13			3.13	37.35	0.7
11797	235.3	Exist	69.84	74.9	75.39	3.13			3.13	37.35	0.7
11845	246.1	Piers	69.29	74.72	75.03	2.47			2.47	32.42	0.45
11845	246.1	Exist	69.29	74.72	75.03	2.47			2.47	32.42	0.45
11856	246.1	Piers	69.12	74.76	74.98	2.06			2.06	24.76	0.3
11856	246.1	Exist	69.12	74.76	74.98	2.06			2.06	24.76	0.3
11857	Culvert 27										
11918	246.1	Piers	69.16	73.29	73.66	2.71			2.71	37.81	0.56
11918	246.1	Exist	69.16	73.29	73.66	2.71			2.71	37.81	0.56
11983	246.1	Piers	68.56	72.08	72.9	4.01			4.01	38.25	1.01
11983	246.1	Exist	68.56	72.08	72.9	4.01			4.01	38.25	1.01
12040	246.1	Piers	66.79	70.9	71.66	3.85			3.85	29.36	0.83
12040	246.1	Exist	66.79	70.9	71.66	3.85			3.85	29.36	0.83
12120	246.1	Piers	66.49	70.44	70.83	2.75			2.75	34.67	0.55
12120	246.1	Exist	66.49	70.44	70.83	2.75			2.75	34.67	0.55
12170	246.1	Piers	65.77	70.34	70.55	2.04			2.04	48.07	0.41
12170	246.1	Exist	65.77	70.34	70.55	2.04			2.04	48.07	0.41
12250	246.1	Piers	64.34	68.7	69.91	4.88			4.88	19.2	0.96
12250	246.1	Exist	64.34	68.7	69.91	4.88			4.88	19.2	0.96

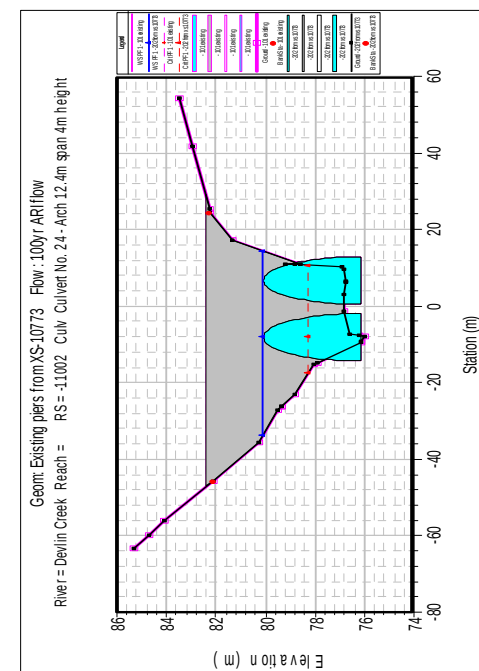
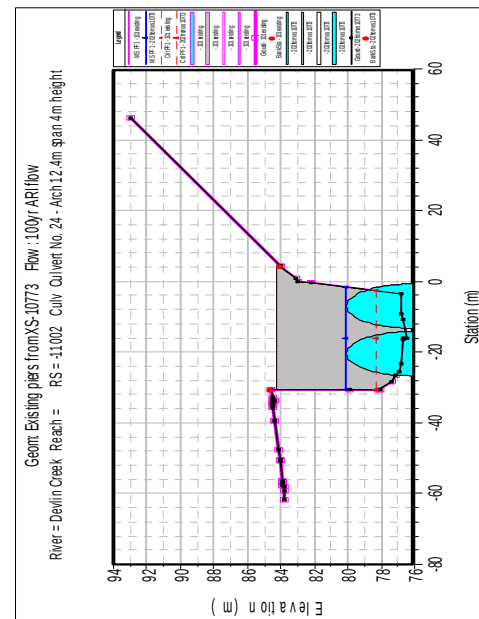
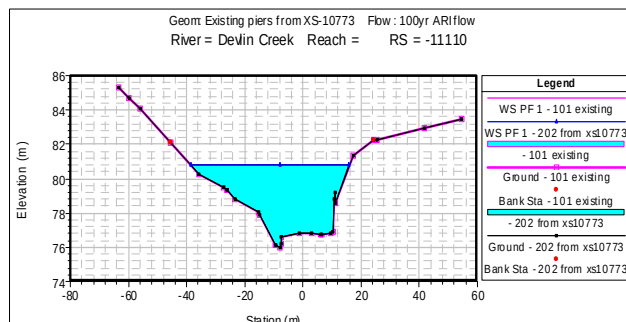
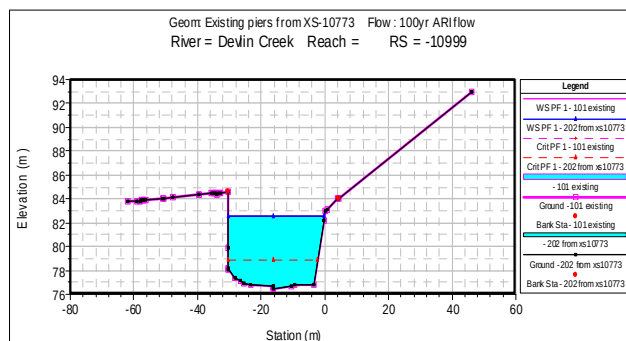
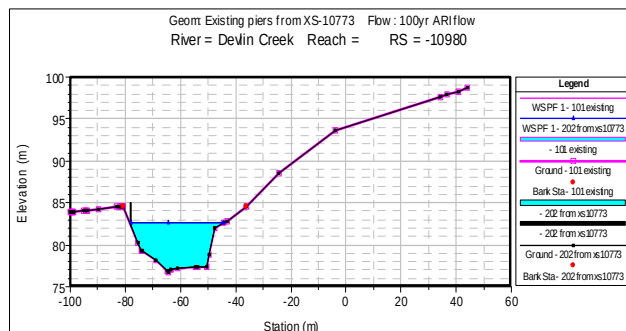
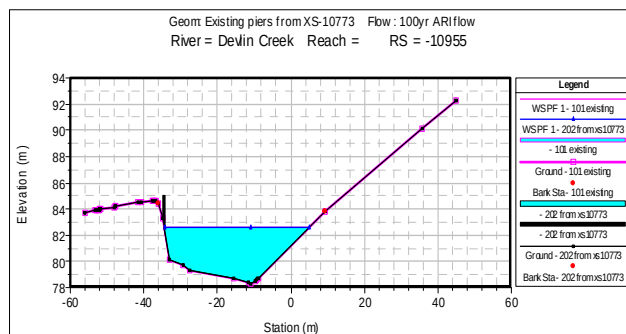
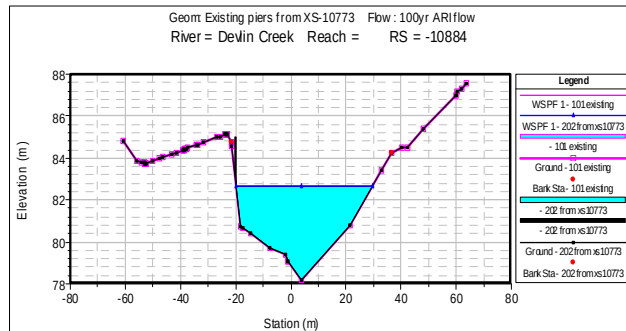
Devilins Creek hydraulic profile



Devlins Creek cross sections

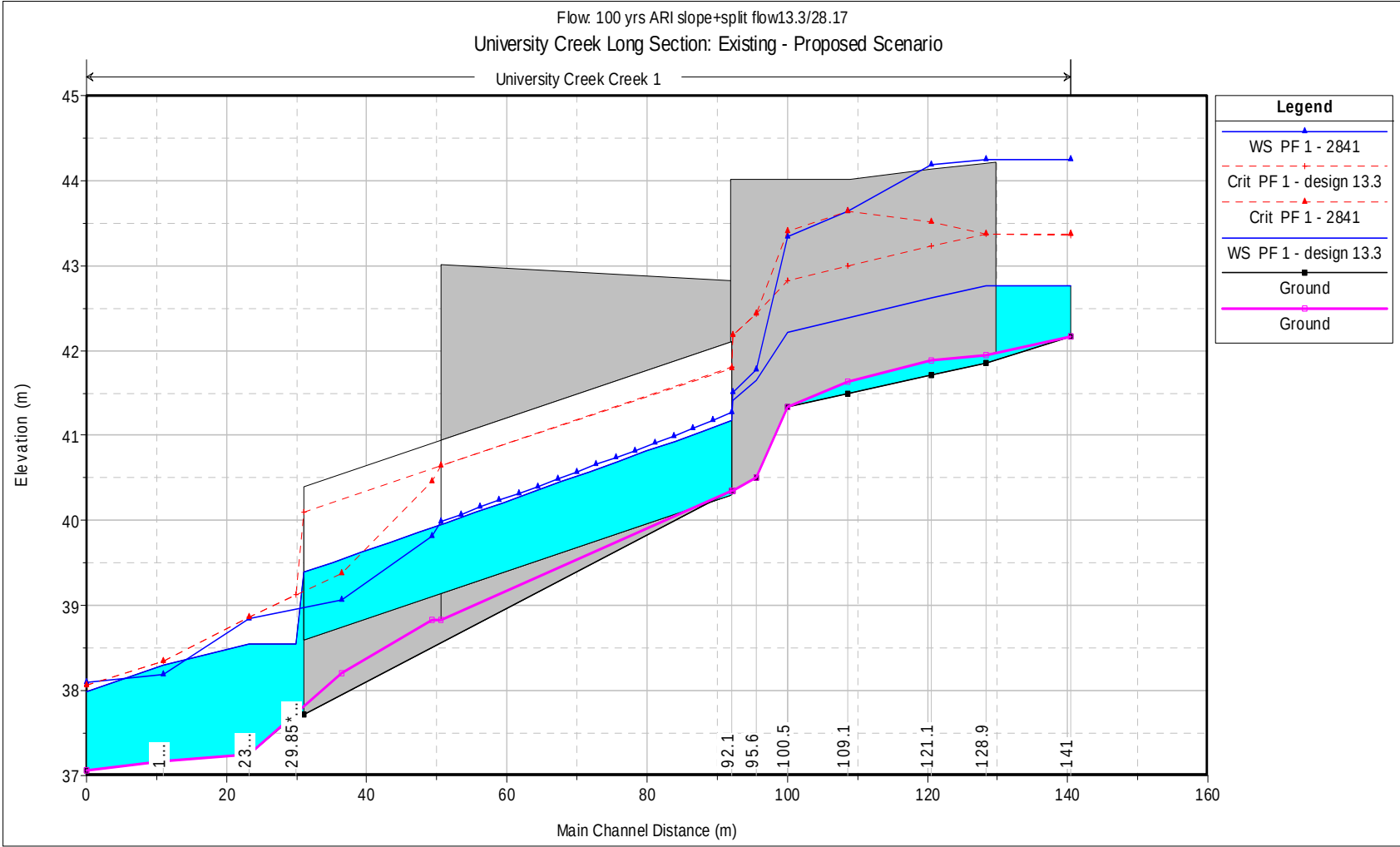


Devlins Creek cross sections . continued

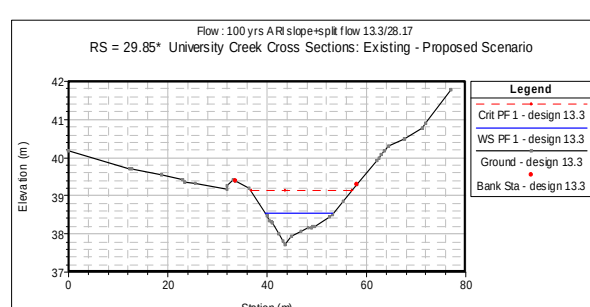
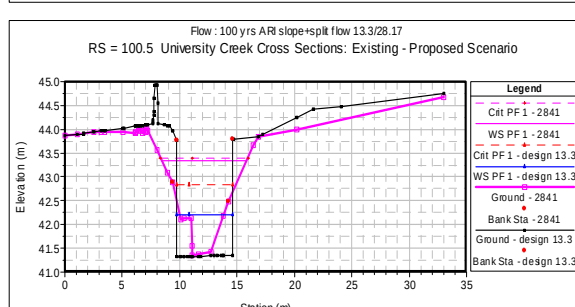
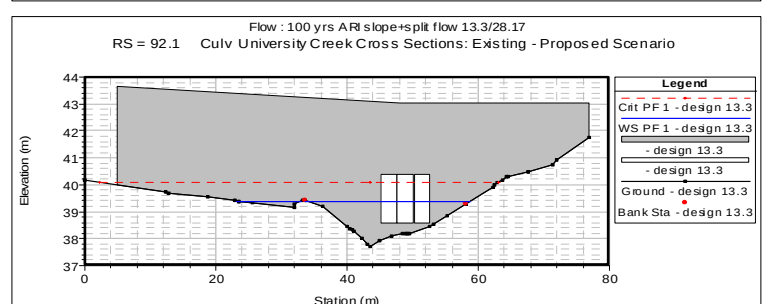
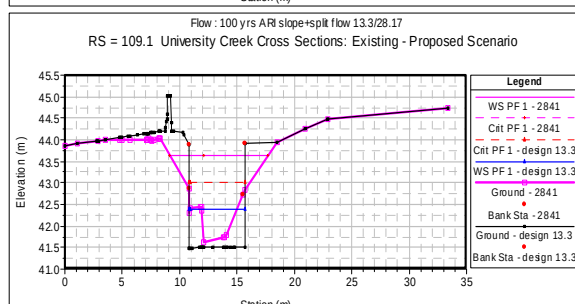
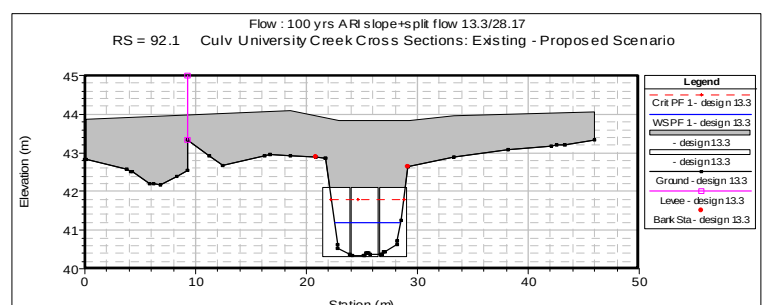
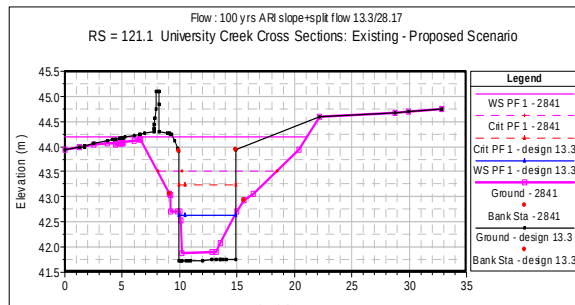
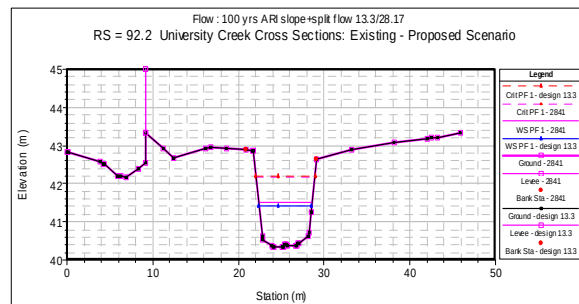
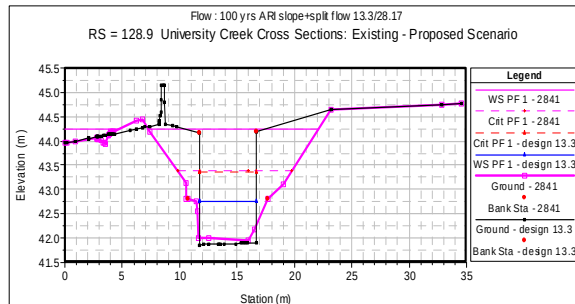
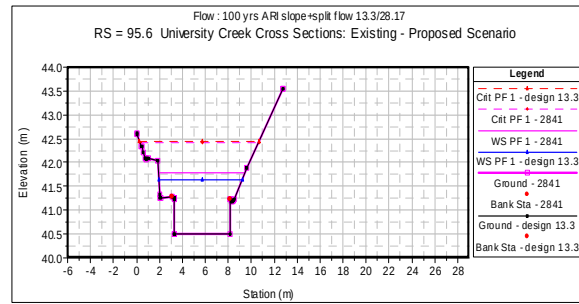
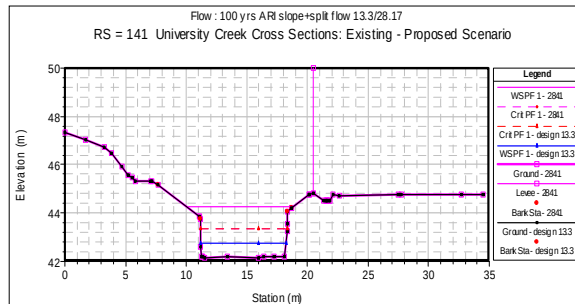


University Creek - 100y ARI – Existing and Proposed conditions											
River Sta	Q Total (m3/s)	Condition	Min Ch El (m)	W.S. Elev (m)	E.G. Elev (m)	Vel Chnl (m/s)	Vel Left (m/s)	Vel Right (m/s)	Vel Total (m/s)	Top Width (m)	Froude
141	28.17	extended	42.16	42.76	45.27	7.02			7.02	7.04	2.97
141	28.17	existing	42.16	44.25	44.43	1.88		0.13	1.88	8.81	0.46
128.9	28.17	extended	41.86	42.77	44.9	6.47			6.47	4.91	2.2
128.9	28.15	existing	41.95	44.25	44.37	1.67	0.5	0.74	1.34	19.58	0.37
121.1	28.17	extended	41.72	42.62	44.76	6.48			6.48	4.9	2.2
121.1	28.03	existing	41.88	44.19	44.34	1.87	0.44	0.85	1.48	21.08	0.43
109.1	28.17	extended	41.49	42.38	44.56	6.54			6.54	4.9	2.23
109.1	28.02	existing	41.63	43.64	44.22	3.52	1.28	1.4	3.12	8.57	0.89
100.5	28.17	extended	41.33	42.21	44.41	6.57			6.57	4.9	2.24
100.5	28.02	existing	41.34	43.34	44.03	3.74	0.99	1.46	3.47	7.4	0.99
95.6	41.47	extended	40.5	41.65	44.28	7.25	0.94	0.88	6.52	7.28	2.19
95.6	41.32	existing	40.5	41.78	43.83	6.42	0.9	0.83	5.63	7.53	1.83
92.2	41.47	extended	40.35	41.41	44.22	7.43			7.43	6.16	2.49
92.2	41.32	existing	40.35	41.51	43.78	6.67			6.67	6.26	2.14
92.1	Culvert 35										
49.3	41.32		38.83	39.82	42.26	6.93			6.93	8.12	2.58
36.5	41.32		38.2	39.07	39.93	4.11			4.11	18.37	1.77
29.85*	41.47		37.73	38.54	41.64	7.8			7.8	13.62	3.98
23.2	41.47	extended	37.25	38.54	39.57	4.49			4.49	13.77	1.75
23.2	41.32	existing	37.25	38.85	39.3	2.97		0.49	2.96	17.07	1.02
11	41.47	extended	37.17	38.29	38.66	2.69			2.69	26.5	1.13
11	41.32	existing	37.17	38.19	38.73	3.26			3.26	24.57	1.45
0	41.47	extended	37.06	37.99	38.35	2.69			2.69	34.53	1.28
0	41.32	existing	37.06	38.09	38.33	2.14			2.14	37.5	0.96

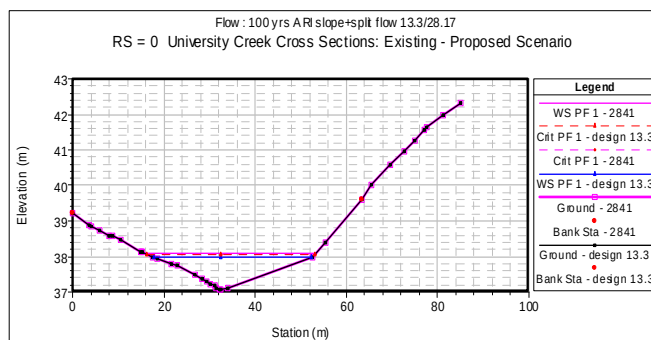
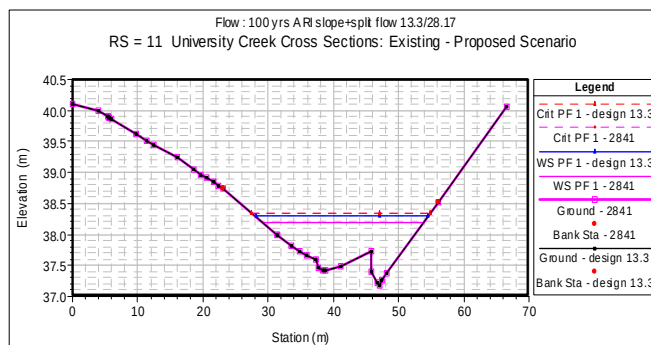
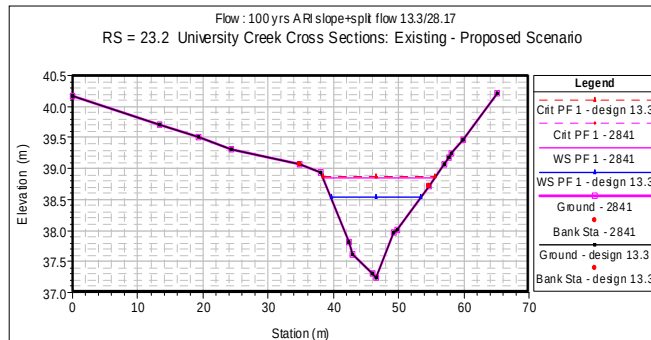
University Creek hydraulic profile



University Creek cross sections

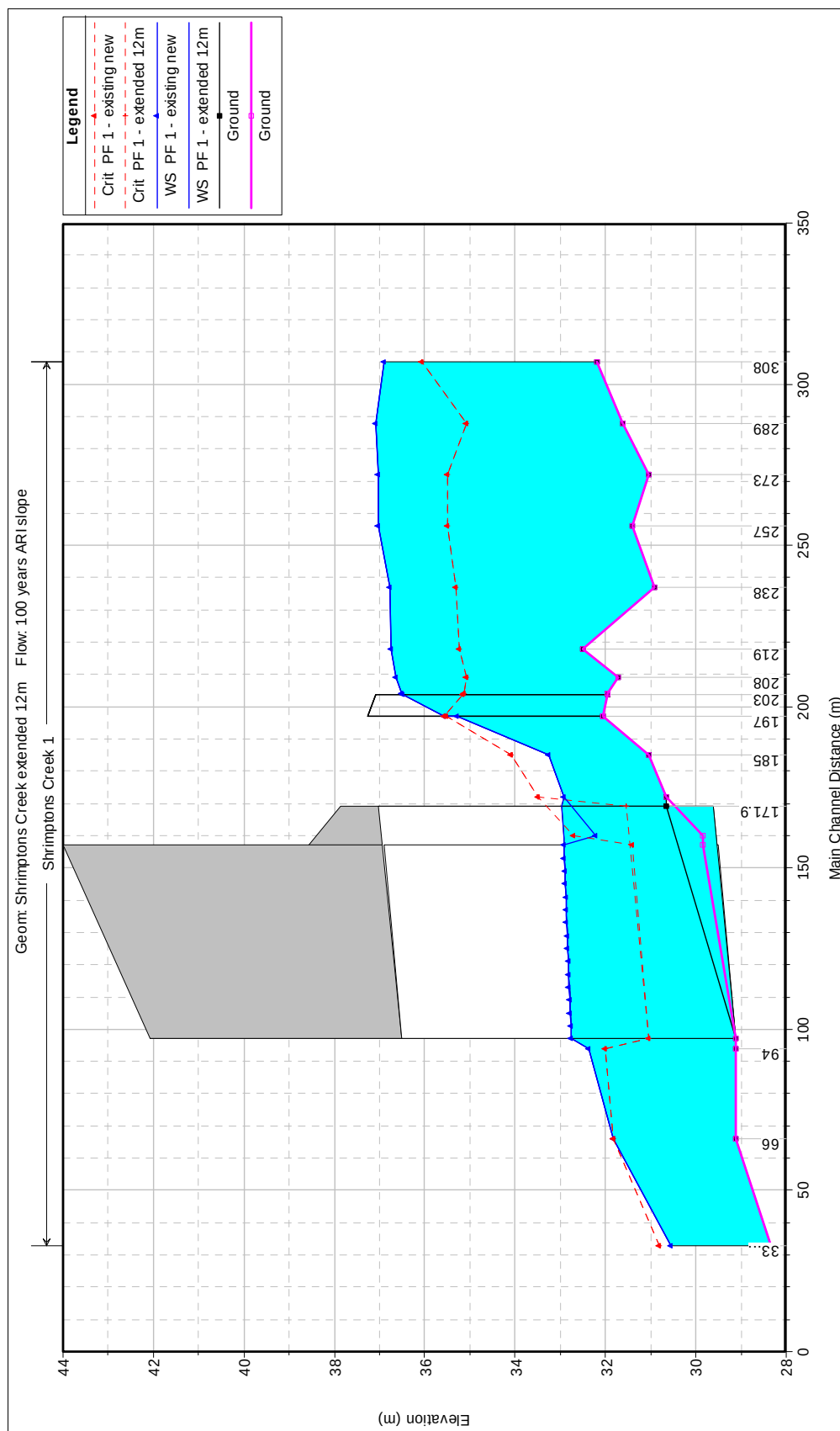


University Creek cross sections ... continued

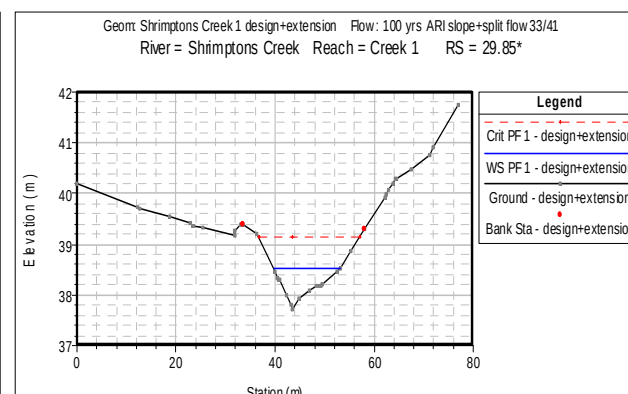
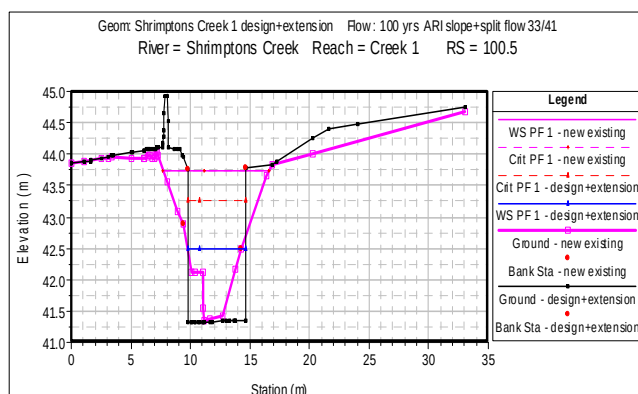
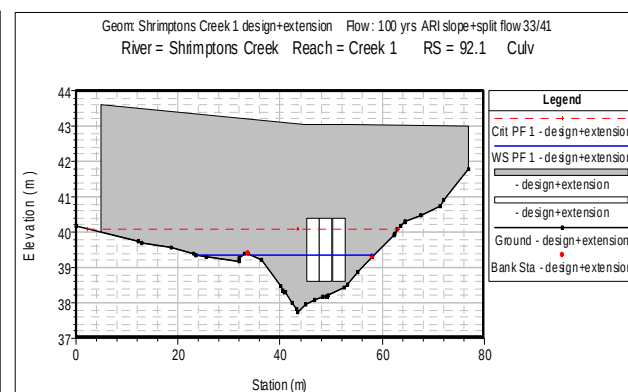
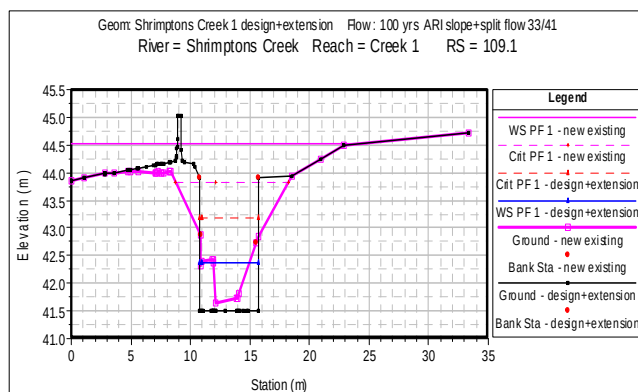
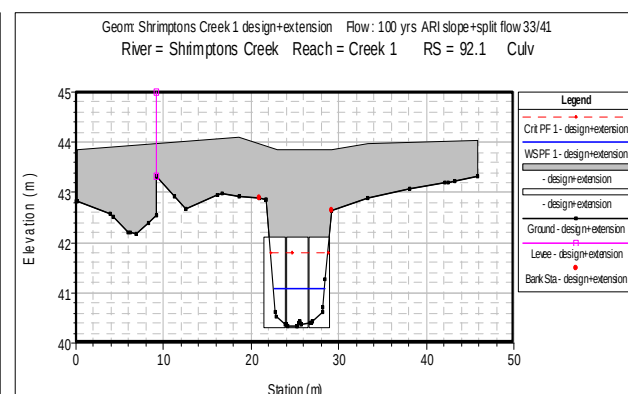
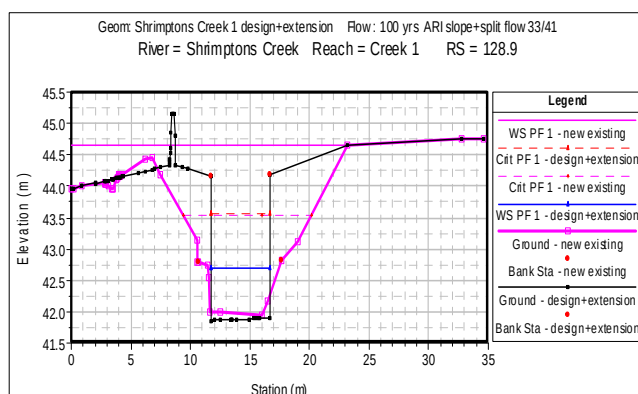
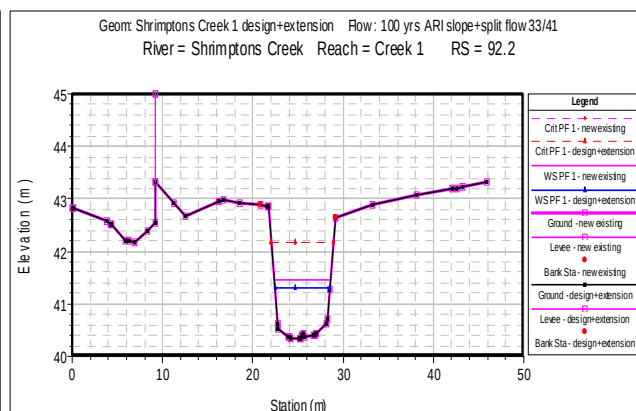
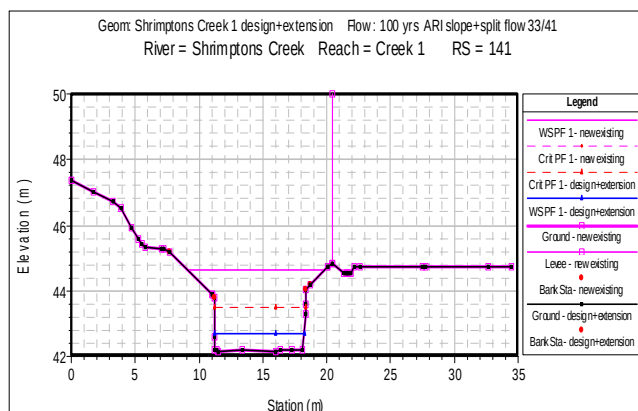


Shrimptons Creek - 100y ARI - Existing & Proposed 12m Extension											
River Sta	Q Total	Condition	Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
308	190.11	extend	32.19	36.9	37.6	3.87	0.97	1.78	3.42	28.54	0.6
308	190.11	exist	32.19	36.9	37.6	3.87	0.97	1.78	3.42	28.54	0.6
289	190.11	extend	31.61	37.08	37.38	2.53	0.81	1.05	2.19	40.65	0.38
289	190.11	exist	31.61	37.08	37.38	2.53	0.81	1.05	2.19	40.65	0.38
273	190.11	extend	31.05	37.03	37.31	2.51	0.72	1.29	2.08	49.18	0.4
273	190.11	exist	31.05	37.03	37.31	2.51	0.72	1.29	2.08	49.18	0.4
257	190.11	extend	31.4	37.03	37.23	2.16	0.3	1.33	1.82	47.97	0.34
257	190.11	exist	31.4	37.03	37.23	2.16	0.3	1.33	1.82	47.97	0.34
238	190.11	extend	30.91	36.76	37.14	2.89	0.73	1.08	2.43	44.26	0.45
238	190.11	exist	30.91	36.76	37.14	2.89	0.73	1.08	2.43	44.26	0.45
219	190.11	extend	32.49	36.75	37.03	2.38	0.13	0.61	2.14	54.21	0.42
219	190.11	exist	32.49	36.75	37.03	2.38	0.13	0.61	2.14	54.21	0.42
208	190.11	extend	31.73	36.64	36.99	2.62		0.48	2.58	38.12	0.45
208	190.11	exist	31.73	36.64	36.99	2.62		0.48	2.58	38.12	0.45
204	190.11	extend	31.95	36.52	36.95	2.91		0.34	2.91	19.82	0.49
204	190.11	exist	31.95	36.52	36.95	2.91		0.34	2.91	19.82	0.49
203	Property Access Bridge										
197	190.11	extend	32.06	35.29	36.74	5.33			5.33	16.41	1.15
197	190.11	exist	32.06	35.29	36.74	5.33			5.33	16.41	1.15
185	190.11	extend	31.04	33.25	35.94	7.26			7.26	20.9	2.07
185	190.11	exist	31.04	33.25	35.94	7.26			7.26	20.9	2.07
172	190.11	extend	30.65	32.91	34.69	5.91			5.91	22.7	1.58
172	190.11	exist	30.65	32.91	34.69	5.91			5.91	22.7	1.58
171.9	Culvert 36 Extended										
160	190.11	Existing culvert	29.85	32.2	33.98	5.91			5.91	24.82	1.59
94	190.11	extend	29.12	32.36	33.05	3.68			3.68	34.61	0.78
94	190.11	exist	29.12	32.36	33.05	3.68			3.68	34.61	0.78
66	190.11	extend	29.12	31.81	32.6	3.92			3.92	31.15	1
66	190.11	exist	29.12	31.81	32.6	3.92			3.92	31.14	1
33	190.11	extend	28.33	30.54	31.57	4.5			4.5	37.05	1.35
33	190.11	exist	28.33	30.54	31.57	4.5			4.5	37.05	1.34

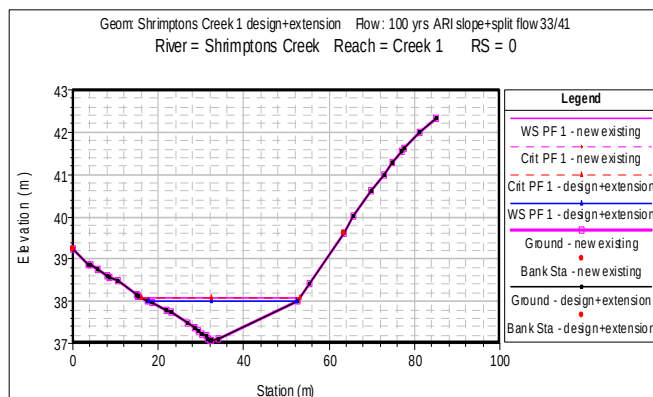
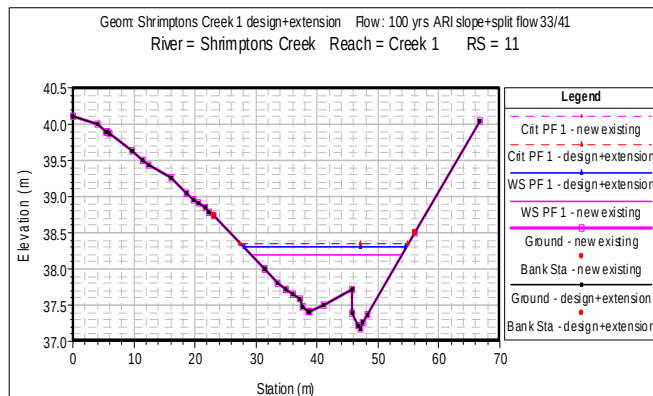
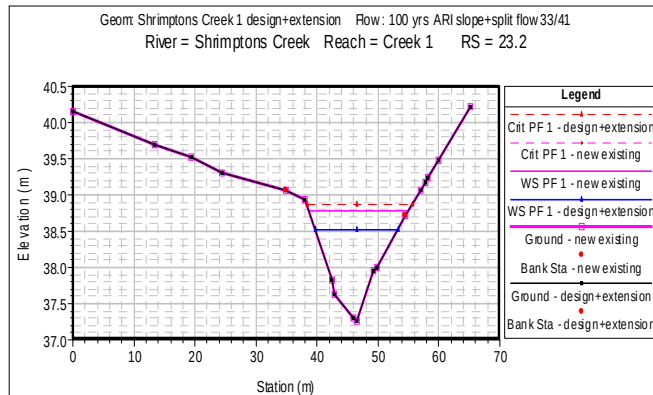
Shrimptons Creek hydraulic profile



Shrimptons Creek cross sections

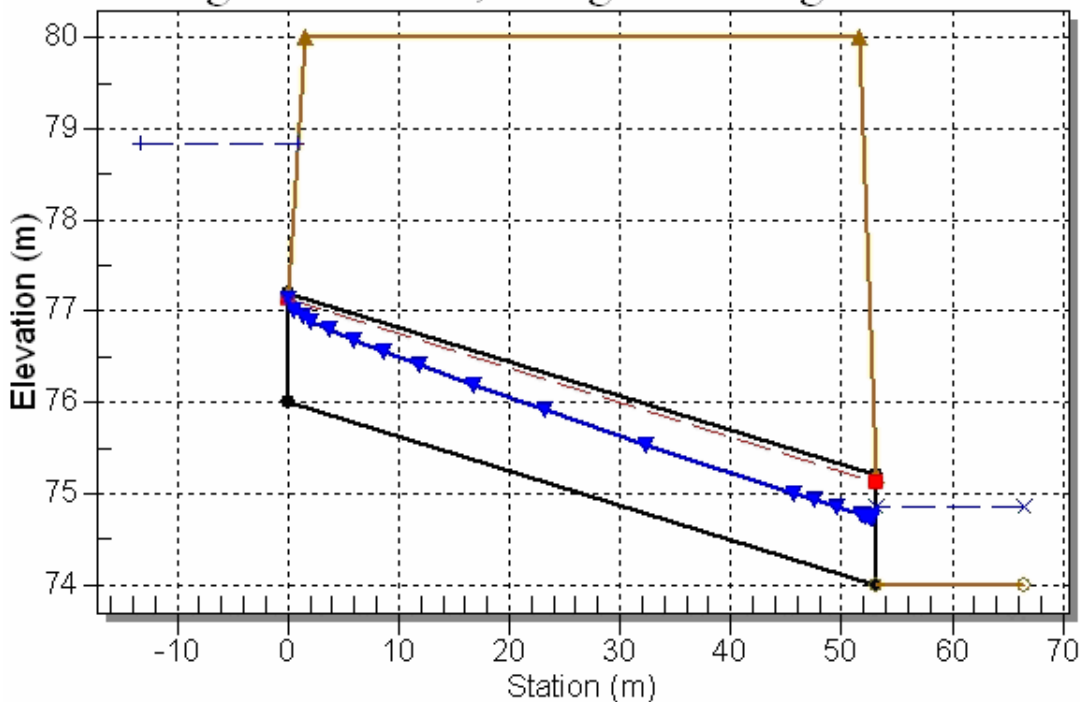


Shrimptons Creek cross sections ... continued



HY-8 Culvert 13 Analysis Report			
Culvert Data Summary - Culvert 13		Tailwater Channel Data - Culvert 13	
Barrel Shape:	Circular	Tailwater Channel Option:	Trapezoidal Channel
Barrel Diameter:	1200.00 mm	Bottom Width:	1.00 m
Barrel Material:	Concrete	Side Slope (H:V):	2.00 (┐:1)
Barrel Manning's n:	0.0130	Channel Slope:	0.0040
Inlet Type:	Conventional	Channel Manning's n:	0.0200
Inlet Edge Condition:	Square Edge with Headwall	Channel Invert Elevation:	74.00 m
Inlet Depression:	None		

Crossing - Culvert 13, Design Discharge - 4.50 cms

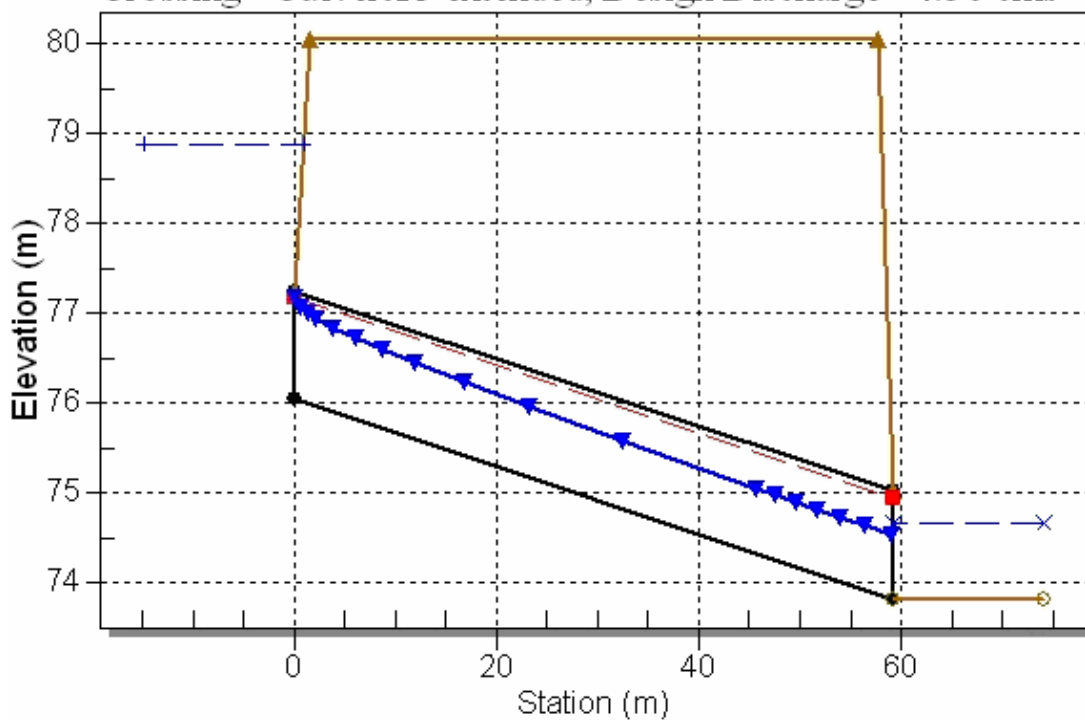


Inlet Elevation (invert): 76.00 m	Outlet Elevation (invert): 74.00m	Culvert Length: 53.23 m	Culvert Slope: 0.0376
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	78.40	2.401	0.0*	5-S2n	0.620	1.069	0.668	0.811	6.192	1.883
4.14	4.14	78.52	2.518	0.0*	5-S2n	0.632	1.085	0.682	0.823	6.237	1.900
4.28	4.28	78.64	2.639	0.0*	5-S2n	0.645	1.101	0.697	0.836	6.287	1.916
4.42	4.42	78.76	2.765	0.0*	5-S2n	0.658	1.117	0.711	0.849	6.332	1.931
4.50	4.50	78.84	2.838	0.0*	5-S2n	0.666	1.126	0.719	0.855	6.360	1.941
4.70	4.70	79.03	3.028	0.0*	5-S2n	0.684	1.149	0.740	0.872	6.422	1.963
4.84	4.84	79.17	3.166	0.0*	5-S2n	0.697	1.165	0.755	0.885	6.464	1.976
4.98	4.98	79.31	3.307	0.0*	5-S2n	0.710	1.181	0.770	0.896	6.509	1.990
5.12	5.12	79.45	3.453	0.0*	5-S2n	0.723	1.197	0.784	0.907	6.553	2.005
5.26	5.26	79.60	3.601	1.816	6-FFc	0.736	1.200	1.200	0.918	4.651	2.020
5.40	5.40	79.76	3.762	1.957	6-FFc	0.750	1.200	1.200	0.929	4.775	2.033

HY-8 Culvert 13 Extended Analysis Report			
Culvert Data Summary - Culvert 13		Tailwater Channel Data - Culvert 13	
Barrel Shape:	Circular	Tailwater Channel Option:	Trapezoidal Channel
Barrel Diameter:	1200.00 mm	Bottom Width:	1.00 m
Barrel Material:	Concrete	Side Slope (H:V):	2.00 (1:1)
Barrel Manning's n:	0.0130	Channel Slope:	0.0040
Inlet Type:	Conventional	Channel Manning's n:	0.0200
Inlet Edge Condition:	Square Edge with Headwall	Channel Invert Elevation:	73.77 m
Inlet Depression:	None		

Crossing - Culvert13 extended, Design Discharge - 4.50 cms

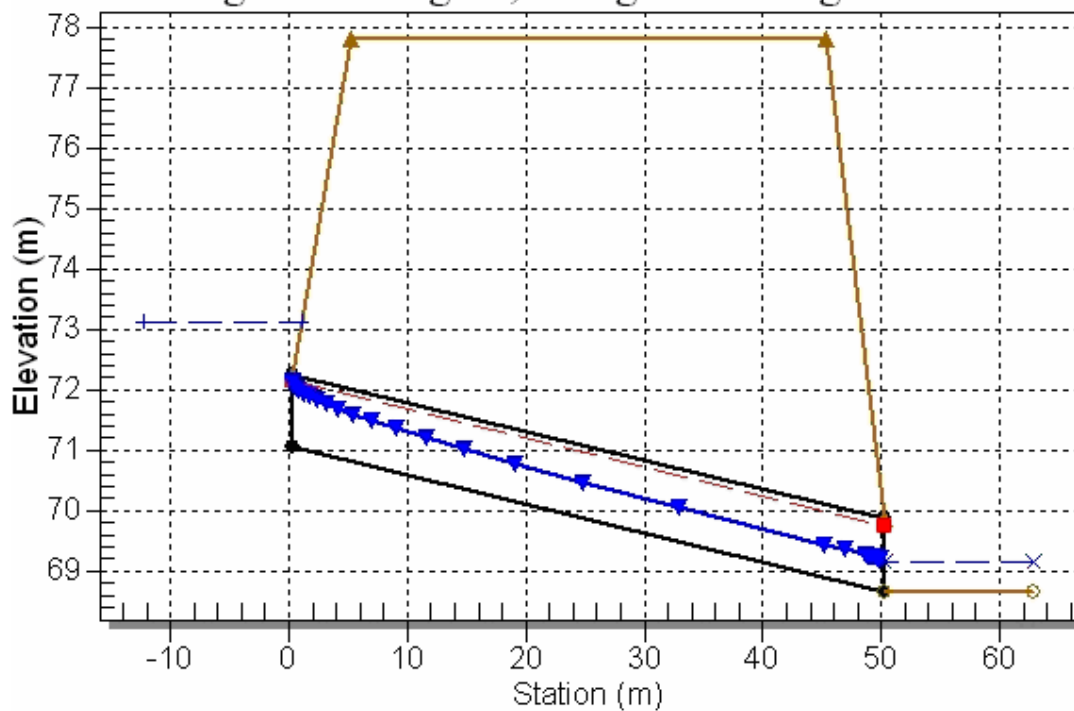


Inlet Elevation (invert): 76.00 m	Outlet Elevation (invert): 73.77m	Culvert Length: 59.33 m	Culvert Slope: 0.0376
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	78.40	2.401	0.0*	5-S2n	0.620	1.069	0.660	0.811	6.277	1.883
4.14	4.14	78.52	2.518	0.0*	5-S2n	0.632	1.085	0.675	0.823	6.317	1.900
4.28	4.28	78.64	2.639	0.0*	5-S2n	0.645	1.101	0.689	0.836	6.369	1.916
4.42	4.42	78.76	2.765	0.0*	5-S2n	0.658	1.117	0.704	0.849	6.415	1.931
4.50	4.50	78.84	2.838	0.0*	5-S2n	0.666	1.126	0.712	0.855	6.442	1.941
4.70	4.70	79.03	3.028	0.0*	5-S2n	0.684	1.149	0.732	0.872	6.507	1.963
4.84	4.84	79.17	3.166	0.0*	5-S2n	0.697	1.165	0.747	0.885	6.546	1.976
4.98	4.98	79.31	3.307	0.0*	5-S2n	0.710	1.181	0.762	0.896	6.587	1.990
5.12	5.12	79.45	3.453	0.0*	5-S2n	0.723	1.197	0.776	0.907	6.629	2.005
5.26	5.26	79.60	3.601	1.697	6-FFc	0.736	1.200	1.200	0.918	4.651	2.020
5.40	5.40	79.76	3.762	1.844	6-FFc	0.750	1.200	1.200	0.929	4.775	2.033

HY-8 Culvert 18 Analysis Report			
Culvert Data Summary - Culvert 18		Tailwater Channel Data - Culvert 18	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Rectangular Channel
Barrel Span:	1200.00 mm	Bottom Width:	3.00 m
Barrel Rise:	1500.00 mm	Channel Slope:	0.0200
Barrel Material:	Concrete	Channel Manning's n:	0.0200
Barrel Manning's n:	0.0130	Channel Invert Elevation:	68.60 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90° Headwall		
Inlet Depression:	None		

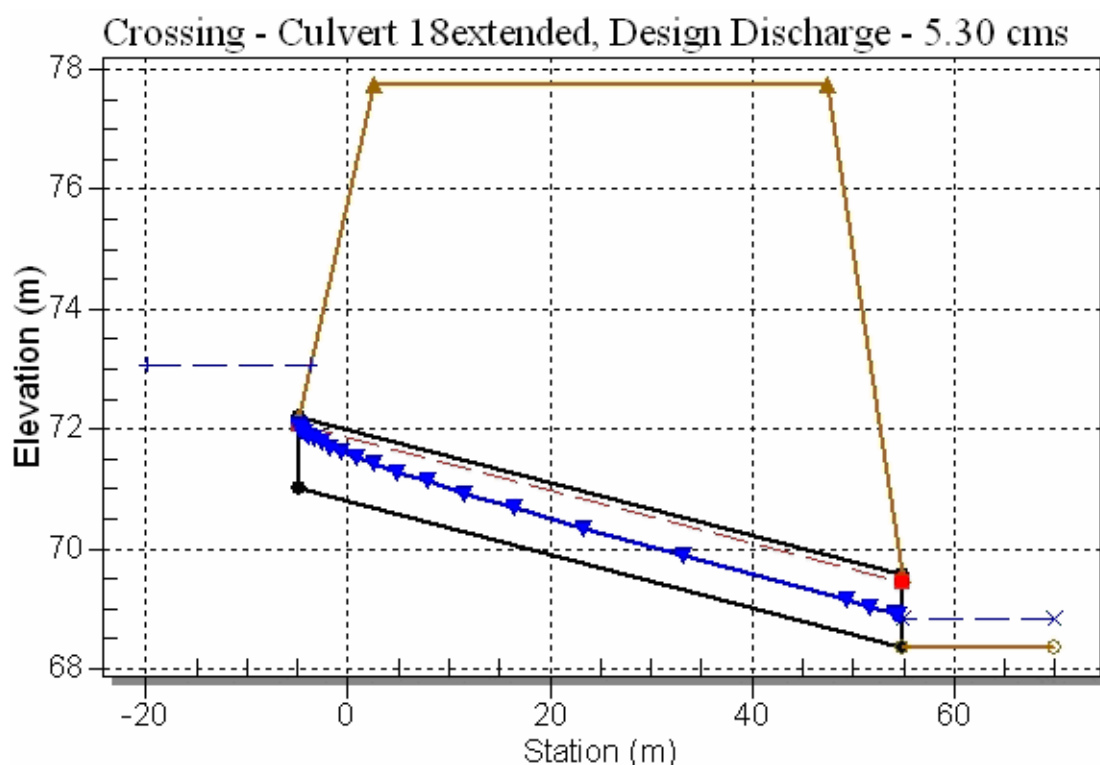
Crossing - Crossing 18, Design Discharge - 5.30 cms



Inlet Elevation (invert): 71.00 m	Outlet Elevation (invert): 68.60m	Culvert Length: 50.06 m	Culvert Slope: 0.0479
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	72.56	1.556	0.0*	5-S2n	0.401	0.900	0.426	0.404	6.258	3.297
4.24	4.24	72.64	1.638	0.0*	5-S2n	0.417	0.935	0.421	0.420	6.715	3.363
4.47	4.47	72.72	1.723	0.0*	5-S2n	0.434	0.970	0.465	0.435	6.418	3.426
4.71	4.71	72.81	1.812	0.0*	5-S2n	0.450	1.003	0.483	0.450	6.497	3.486
4.94	4.94	72.91	1.906	0.0*	5-S2n	0.466	1.037	0.503	0.465	6.557	3.546
5.18	5.18	73.00	2.003	0.0*	5-S2n	0.483	1.069	0.521	0.479	6.632	3.601
5.30	5.30	73.05	2.054	0.0*	5-S2n	0.490	1.086	0.531	0.487	6.657	3.629
5.65	5.65	73.21	2.212	0.0*	5-S2n	0.513	1.133	0.559	0.508	6.743	3.708
5.89	5.89	73.32	2.323	0.0*	5-S2n	0.528	1.165	0.577	0.522	6.802	3.757
6.12	6.12	73.44	2.439	0.0*	5-S2n	0.543	1.196	0.595	0.536	6.859	3.806
6.36	6.36	73.56	2.560	0.058	6-FFc	0.558	1.200	0.614	0.550	6.907	3.855

HY-8 Culvert 18 Extended Analysis Report			
Culvert Data Summary - Culvert 18		Tailwater Channel Data - Culvert 18	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Rectangular Channel
Barrel Span:	1200.00 mm	Bottom Width:	3.00 m
Barrel Rise:	1500.00 mm	Channel Slope:	0.0200
Barrel Material:	Concrete	Channel Manning's n:	0.0200
Barrel Manning's n:	0.0130	Channel Invert Elevation:	68.36 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90° Headwall		
Inlet Depression:	None		

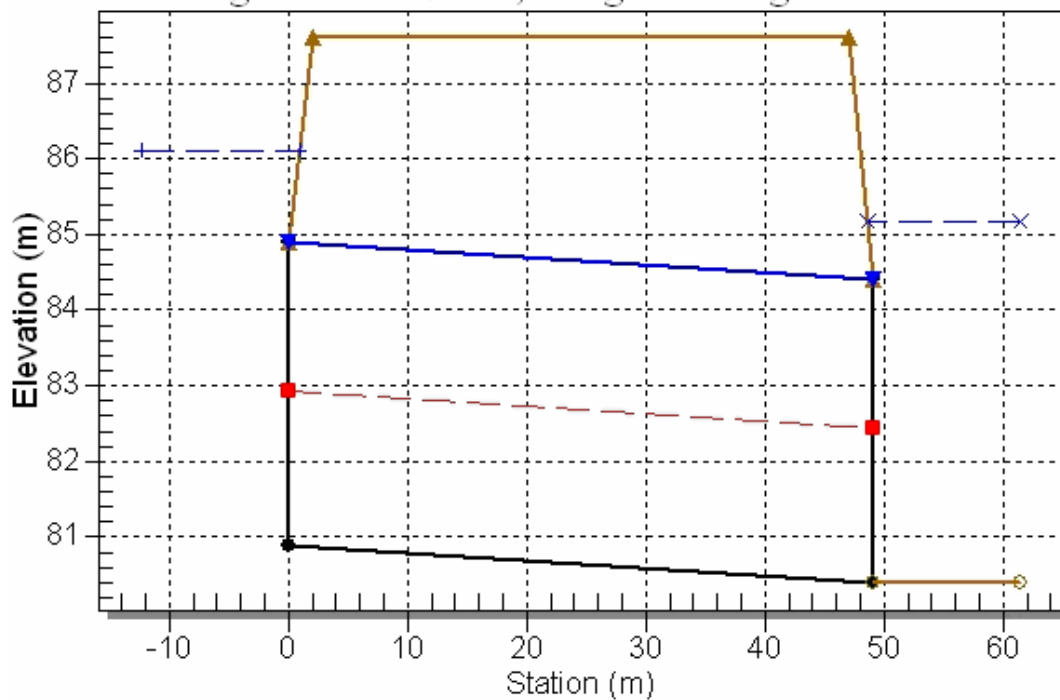


Inlet Elevation (invert): 71.00 m	Outlet Elevation (invert): 68.36m	Culvert Length: 54.94 m	Culvert Slope: 0.0479
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	72.56	1.556	0.0*	5-S2n	0.401	0.900	0.426	0.404	6.258	3.297
4.24	4.24	72.64	1.638	0.0*	5-S2n	0.417	0.935	0.421	0.420	6.715	3.363
4.47	4.47	72.72	1.723	0.0*	5-S2n	0.434	0.970	0.465	0.435	6.418	3.426
4.71	4.71	72.81	1.812	0.0*	5-S2n	0.450	1.003	0.483	0.450	6.497	3.486
4.94	4.94	72.91	1.906	0.0*	5-S2n	0.466	1.037	0.503	0.465	6.557	3.546
5.18	5.18	73.00	2.003	0.0*	5-S2n	0.483	1.069	0.521	0.479	6.632	3.601
5.30	5.30	73.05	2.054	0.0*	5-S2n	0.490	1.086	0.531	0.487	6.657	3.629
5.65	5.65	73.21	2.212	0.0*	5-S2n	0.513	1.133	0.559	0.508	6.743	3.708
5.89	5.89	73.32	2.323	0.0*	5-S2n	0.528	1.165	0.577	0.522	6.802	3.757
6.12	6.12	73.44	2.439	0.0*	5-S2n	0.543	1.196	0.595	0.536	6.859	3.806
6.36	6.36	73.56	2.560	0.058	6-FFc	0.558	1.200	0.614	0.550	6.907	3.855

HY-8 Culvert 23 Analysis Report			
Culvert Data Summary - Culvert 23		Tailwater Channel Data - Culvert 23	
Barrel Shape:	User Defined Arch	Tailwater Channel Option:	
Barrel Span:	12000.00 mm	Constant Tailwater Elevation:	85.18 m
Barrel Rise:	4000.00 mm		
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130 (top and sides)		
Manning's n:	0.0250 (bottom)		
Inlet Type:	Conventional		
Inlet Edge Condition:	Thin Edge Projecting		
Inlet Depression:	None		

Crossing - Culvert No. 23, Design Discharge - 109.60 cms

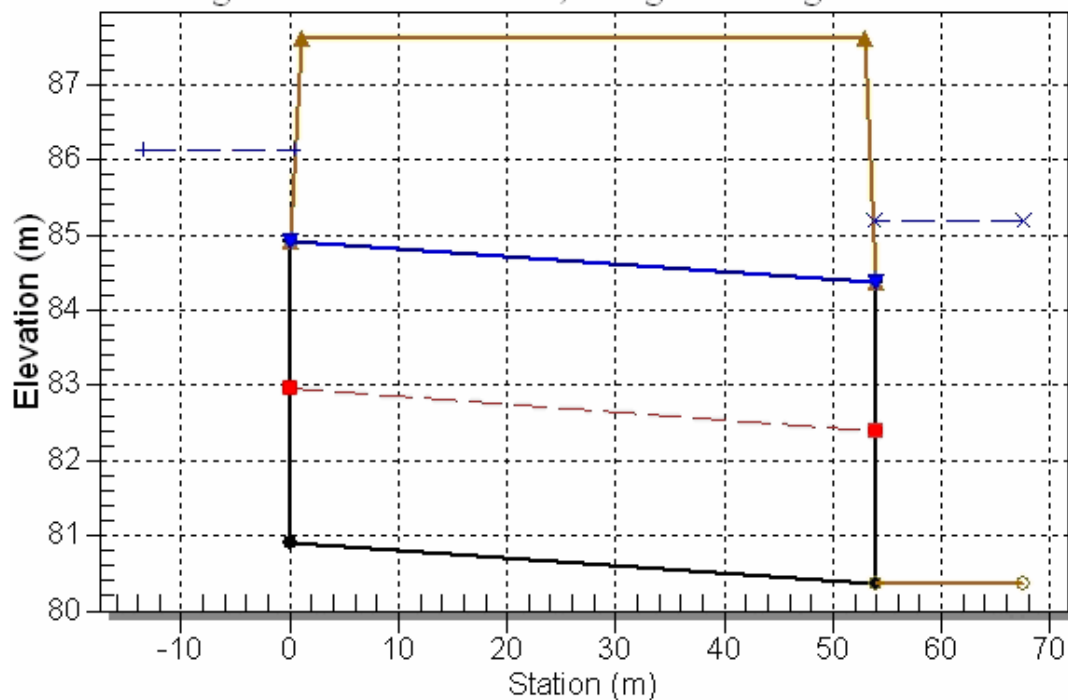


Inlet Elevation (invert): 80.90 m	Outlet Elevation (invert): 80.40 m	Culvert Length: 49.14 m	Culvert Slope: 0.0102
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
91.00	91.00	85.82	3.445	4.921	4-FFf	1.565	1.801	4.000	4.780	2.434	0.000
95.05	95.05	85.88	3.563	4.980	4-FFf	1.612	1.853	4.000	4.780	2.542	0.000
99.10	99.10	85.94	3.681	5.041	4-FFf	1.657	1.906	4.000	4.780	2.651	0.000
103.15	103.15	86.00	3.799	5.104	4-FFf	1.702	1.959	4.000	4.780	2.759	0.000
107.20	107.20	86.07	3.916	5.170	4-FFf	1.747	2.010	4.000	4.780	2.867	0.000
109.60	109.60	86.11	3.986	5.210	4-FFf	1.773	2.038	4.000	4.780	2.932	0.000
115.30	115.30	86.21	4.152	5.310	4-FFf	1.836	2.103	4.000	4.780	3.084	0.000
119.35	119.35	86.28	4.270	5.383	4-FFf	1.881	2.149	4.000	4.780	3.192	0.000
123.40	123.40	86.36	4.387	5.460	4-FFf	1.926	2.196	4.000	4.780	3.301	0.000
127.45	127.45	86.44	4.508	5.538	4-FFf	1.971	2.242	4.000	4.780	3.409	0.000
131.50	131.50	86.52	4.630	5.619	4-FFf	2.015	2.289	4.000	4.780	3.517	0.000

HY-8 Culvert 23 Extended Analysis Report			
Culvert Data Summary - Culvert 23		Tailwater Channel Data - Culvert 23	
Barrel Shape:	User Defined Arch	Tailwater Channel Option:	
Barrel Span:	12000.00 mm	Constant Tailwater Elevation:	85.18 m
Barrel Rise:	4000.00 mm		
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130 (top and sides)		
Manning's n:	0.0250 (bottom)		
Inlet Type:	Conventional		
Inlet Edge Condition:	Thin Edge Projecting		
Inlet Depression:	None		

Crossing - Culvert 23 extended, Design Discharge - 109.60 cms

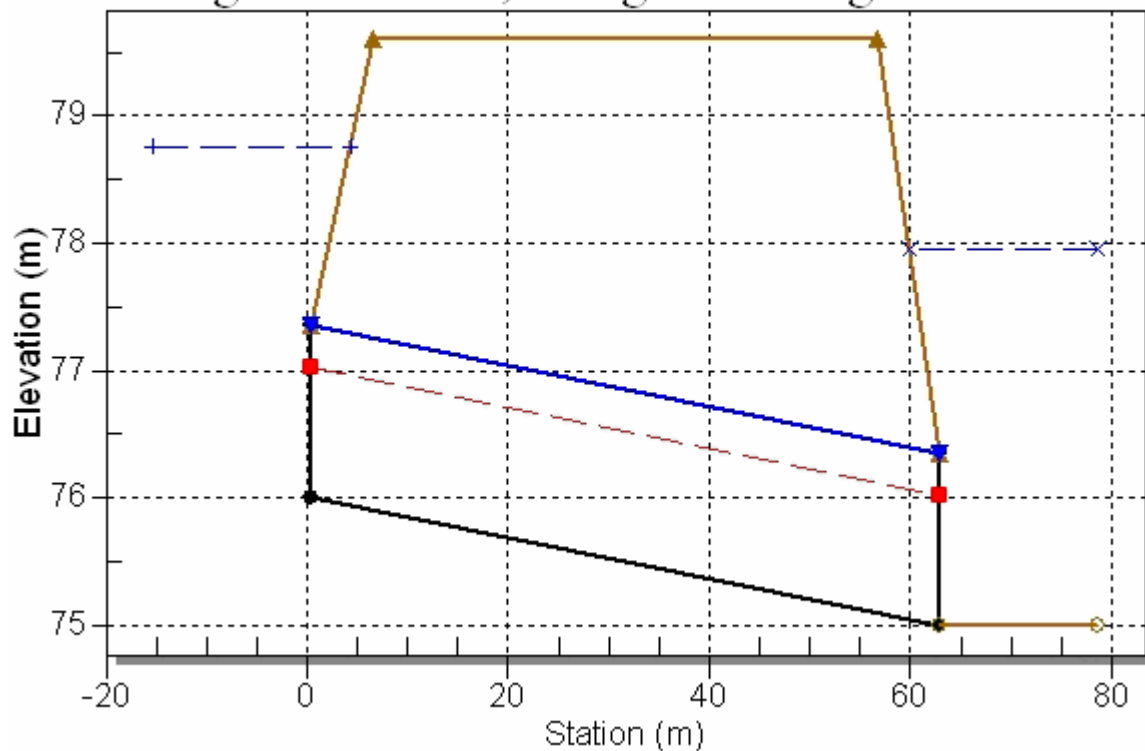


Inlet Elevation (invert): 80.90 m	Outlet Elevation (invert): 80.35m	Culvert Length: 54.02 m	Culvert Slope: 0.0102
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
91.00	91.00	85.83	3.445	4.928	4-FFf	1.565	1.801	4.000	4.830	2.434	0.000
95.05	95.05	85.89	3.563	4.987	4-FFf	1.612	1.853	4.000	4.830	2.542	0.000
99.10	99.10	85.95	3.681	5.049	4-FFf	1.657	1.906	4.000	4.830	2.651	0.000
103.15	103.15	86.01	3.799	5.113	4-FFf	1.701	1.959	4.000	4.830	2.759	0.000
107.20	107.20	86.08	3.916	5.180	4-FFf	1.746	2.010	4.000	4.830	2.867	0.000
109.60	109.60	86.12	3.986	5.220	4-FFf	1.773	2.038	4.000	4.830	2.932	0.000
115.30	115.30	86.22	4.152	5.321	4-FFf	1.836	2.103	4.000	4.830	3.084	0.000
119.35	119.35	86.29	4.270	5.395	4-FFf	1.881	2.149	4.000	4.830	3.192	0.000
123.40	123.40	86.37	4.387	5.472	4-FFf	1.925	2.196	4.000	4.830	3.301	0.000
127.45	127.45	86.45	4.508	5.551	4-FFf	1.970	2.242	4.000	4.830	3.409	0.000
131.50	131.50	86.53	4.630	5.634	4-FFf	2.015	2.289	4.000	4.830	3.517	0.000

HY-8 Culvert 26 Analysis Report			
Culvert Data Summary - Culvert 26		Tailwater Channel Data - Culvert 26	
Barrel Shape:	Circular	Tailwater Channel Option:	
Barrel Diameter:	1350.00 mm	Constant Tailwater Elevation	77.95 m
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130		
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge with Headwall		
Inlet Depression:	None		

Crossing - Culvert 26, Design Discharge - 14.76 cms

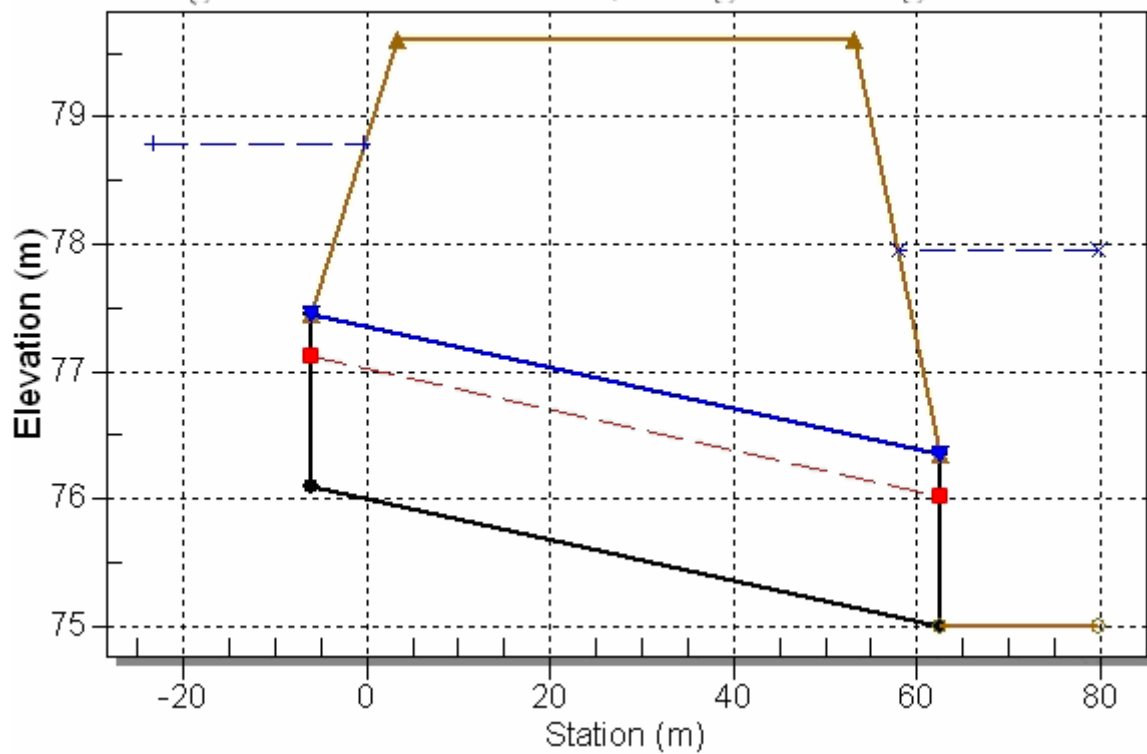


Inlet Elevation (invert): 76.00 m	Outlet Elevation (invert): 75.00m	Culvert Length: 62.62 m	Culvert Slope: 0.0160
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HY-8 Culvert 26 Extended Analysis Report			
Culvert Data Summary - Culvert 26		Tailwater Channel Data - Culvert 26	
Barrel Shape:	Circular	Tailwater Channel Option:	
Barrel Diameter:	4 x 1350.00 mm	Constant Tailwater Elevation	77.95 m
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130		
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge with Headwall		

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
12.30	12.30	78.51	1.504	2.509	4-FFf	0.638	0.938	1.350	2.950	2.148	0.000
12.84	12.84	78.56	1.558	2.559	4-FFf	0.654	0.958	1.350	2.950	2.243	0.000
13.38	13.38	78.61	1.613	2.612	4-FFf	0.671	0.976	1.350	2.950	2.337	0.000
13.92	13.92	78.67	1.670	2.667	4-FFf	0.687	0.995	1.350	2.950	2.432	0.000
14.46	14.46	78.72	1.729	2.723	4-FFf	0.702	1.013	1.350	2.950	2.526	0.000
14.76	14.76	78.76	1.762	2.755	4-FFf	0.711	1.024	1.350	2.950	2.578	0.000
15.55	15.55	78.84	1.854	2.843	4-FFf	0.734	1.051	1.350	2.950	2.715	0.000
16.09	16.09	78.91	1.920	2.907	4-FFf	0.750	1.069	1.350	2.950	2.810	0.000
16.63	16.63	78.97	1.988	2.972	4-FFf	0.765	1.085	1.350	2.950	2.904	0.000
17.17	17.17	79.04	2.059	3.040	4-FFf	0.781	1.098	1.350	2.950	2.999	0.000
17.71	17.71	79.11	2.133	3.109	4-FFf	0.797	1.112	1.350	2.950	3.093	0.000
Inlet Depression:		None									

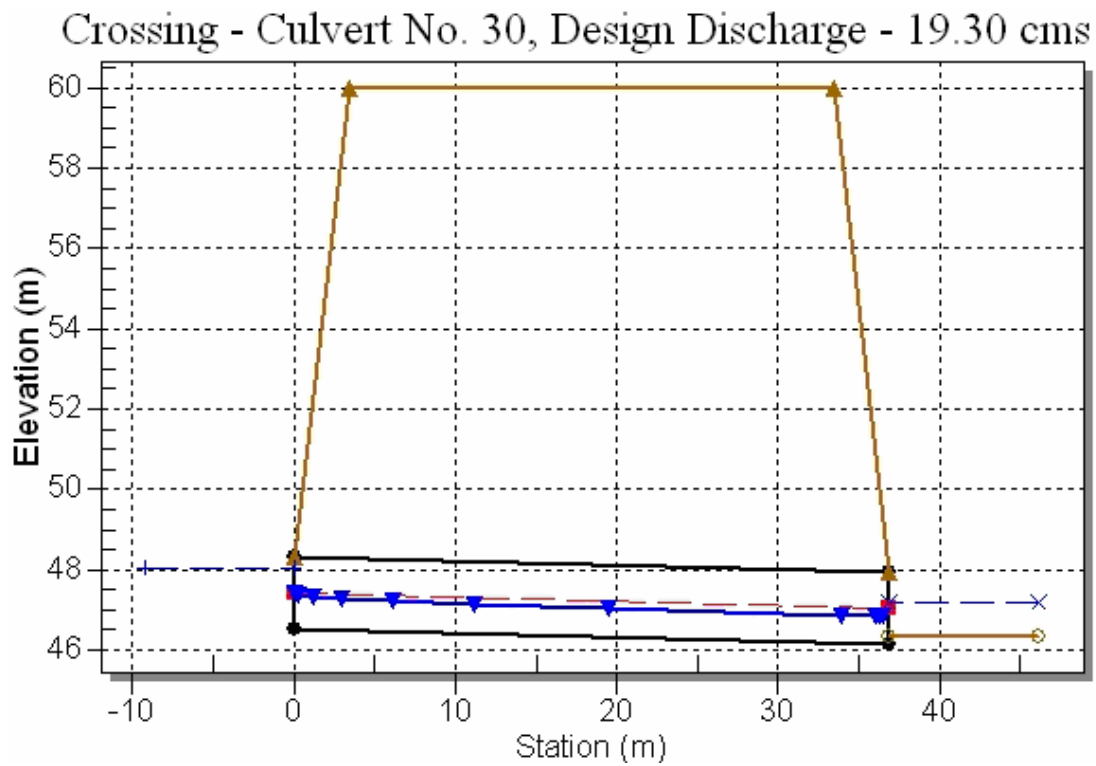
Crossing - Culvert 26 Extended, Design Discharge - 14.76 cms



Inlet Elevation (invert): 76.10 m	Outlet Elevation (invert): 75.00m	Culvert Length: 68.72 m	Culvert Slope: 0.0160
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HY-8 Culvert 30 Analysis Report			
Culvert Data Summary - Culvert 30		Tailwater Channel Data - Culvert 30	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	10.00 m
Barrel Rise:	1800.00 mm	Side Slope (H:V):	3.00 (1:1)
Barrel Material:	Concrete	Channel Slope:	0.0100
Embedment	0.00 mm	Channel Manning's n:	0.0400
Barrel Manning's n:	0.0130	Channel Invert Elevation:	46.35 m
Inlet Type:	Conventional		

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
12.30	12.30	78.53	1.504	2.429	4-FFf	0.637	0.938	1.350	2.950	2.148	0.000
12.84	12.84	78.58	1.558	2.481	4-FFf	0.654	0.958	1.350	2.950	2.243	0.000
13.38	13.38	78.64	1.613	2.536	4-FFf	0.670	0.976	1.350	2.950	2.337	0.000
13.92	13.92	78.69	1.670	2.592	4-FFf	0.686	0.995	1.350	2.950	2.432	0.000
14.46	14.46	78.75	1.729	2.651	4-FFf	0.702	1.013	1.350	2.950	2.526	0.000
14.76	14.76	78.78	1.762	2.684	4-FFf	0.711	1.024	1.350	2.950	2.578	0.000
15.55	15.55	78.88	1.854	2.776	4-FFf	0.733	1.051	1.350	2.950	2.715	0.000
16.09	16.09	78.94	1.920	2.841	4-FFf	0.749	1.069	1.350	2.950	2.810	0.000
16.63	16.63	79.01	1.988	2.909	4-FFf	0.765	1.085	1.350	2.950	2.904	0.000
17.17	17.17	79.08	2.059	2.979	4-FFf	0.780	1.098	1.350	2.950	2.999	0.000
17.71	17.71	79.15	2.133	3.051	4-FFf	0.796	1.112	1.350	2.950	3.093	0.000
Inlet Edge Condition:		Square Edge 90° Headwall									
Inlet Depression:		None									

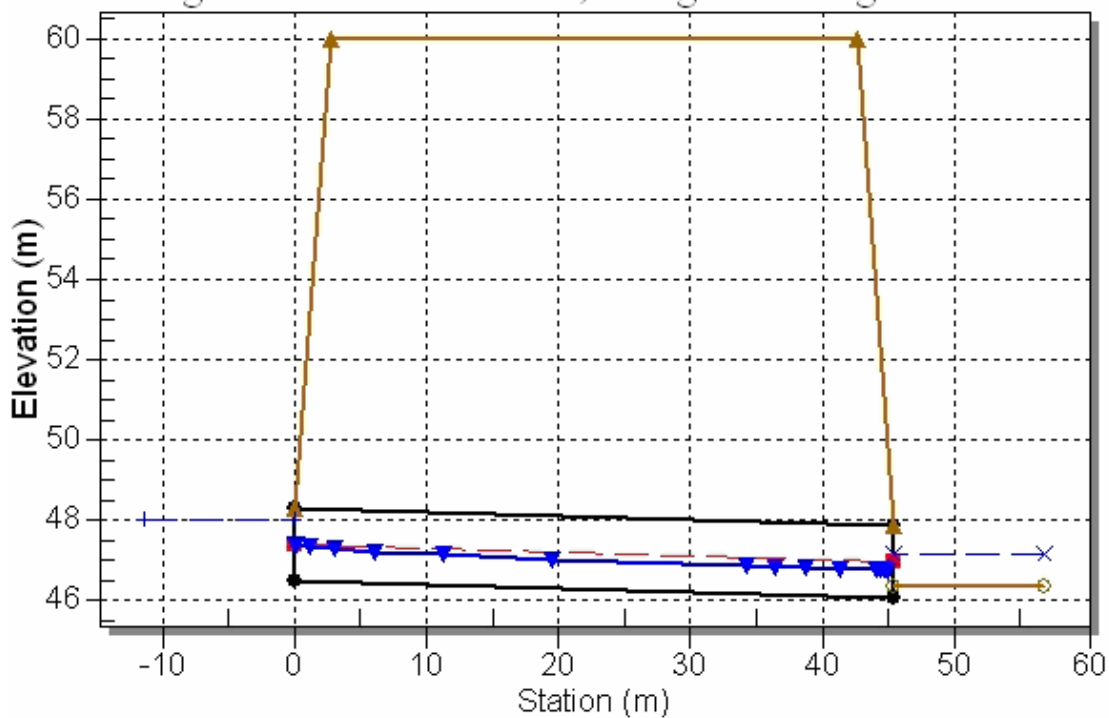


Inlet Elevation (invert): 46.50 m	Outlet Elevation (invert):46.15m	Culvert Length: 36.90 m	Culvert Slope: 0.0095
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
16.00	16.00	47.84	1.340	0.0*	1-S2n	0.561	0.797	0.598	0.731	3.716	1.796
16.72	16.72	47.88	1.379	0.0*	1-S2n	0.577	0.821	0.618	0.749	3.759	1.822
17.43	17.43	47.92	1.417	0.0*	1-S2n	0.594	0.844	0.637	0.767	3.801	1.847
18.15	18.15	47.96	1.456	0.0*	1-S2n	0.611	0.867	0.656	0.785	3.841	1.872
18.86	18.86	47.99	1.493	0.0*	1-S2n	0.627	0.890	0.674	0.802	3.885	1.895
19.30	19.30	48.02	1.516	0.0*	1-S2n	0.637	0.903	0.686	0.812	3.906	1.910
20.30	20.30	48.07	1.568	0.0*	1-S2n	0.661	0.934	0.712	0.836	3.958	1.941
21.01	21.01	48.11	1.605	0.0*	1-S2n	0.677	0.956	0.731	0.853	3.994	1.962
21.73	21.73	48.14	1.642	0.0*	1-S2n	0.694	0.977	0.749	0.869	4.030	1.984
22.44	22.44	48.18	1.679	0.0*	1-S2n	0.710	0.999	0.767	0.885	4.063	2.005
23.16	23.16	48.22	1.716	0.0*	1-S2n	0.727	1.020	0.785	0.901	4.096	2.024

HY-8 Culvert 30 Extended Analysis Report			
Culvert Data Summary - Culvert 30		Tailwater Channel Data - Culvert 30	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	10.00 m
Barrel Rise:	1800.00 mm	Side Slope (H:V):	3.00 (1:1)
Barrel Material:	Concrete	Channel Slope:	0.0100
Barrel Manning's n:	0.0130	Channel Manning's n:	0.0400
Inlet Type:	Conventional	Channel Invert Elevation:	46.35 m
Inlet Edge Condition:	Square Edge 90° Headwall		
Inlet Depression:	None		

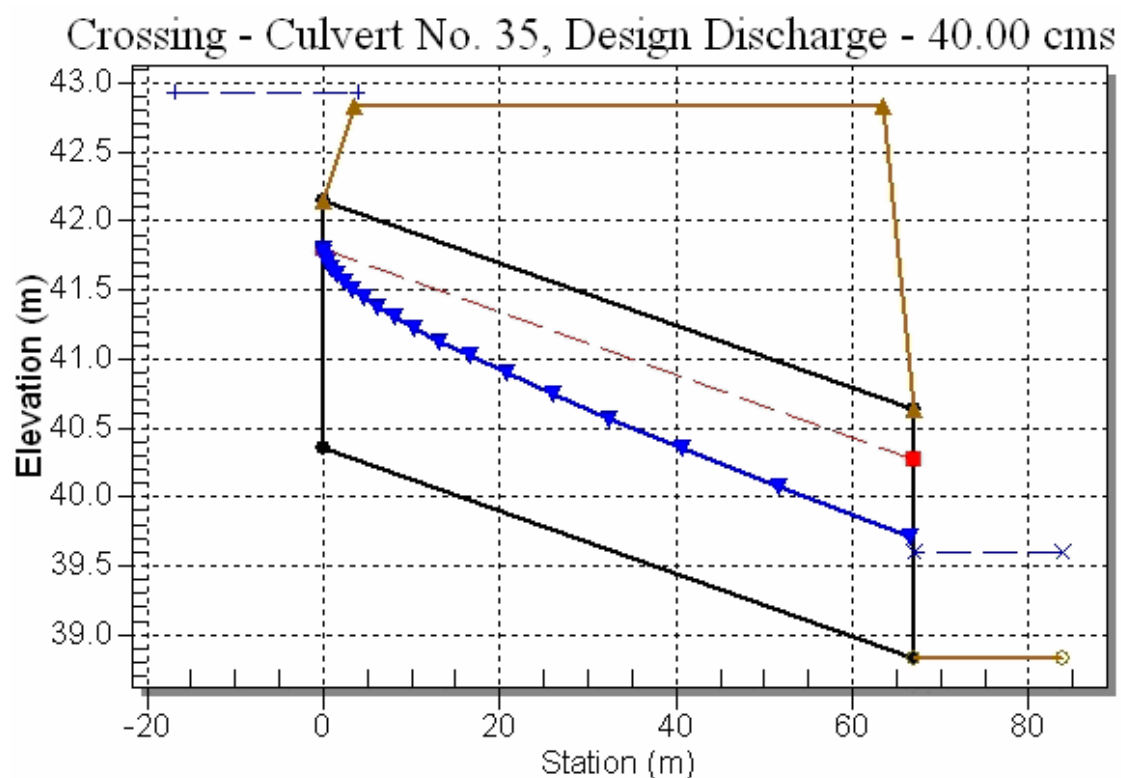
Crossing - Culvert 30 extended, Design Discharge - 19.30 cms



Inlet Elevation (invert): 46.50 m	Outlet Elevation (invert): 46.07m	Culvert Length: 45.44 m	Culvert Slope: 0.0095
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
16.00	16.00	47.84	1.340	0.0*	1-S2n	0.561	0.797	0.590	0.731	3.766	1.796
16.72	16.72	47.88	1.379	0.0*	1-S2n	0.578	0.821	0.609	0.749	3.811	1.822
17.43	17.43	47.92	1.417	0.0*	1-S2n	0.594	0.844	0.628	0.767	3.858	1.847
18.15	18.15	47.96	1.456	0.0*	1-S2n	0.611	0.867	0.647	0.785	3.899	1.872
18.86	18.86	47.99	1.493	0.0*	1-S2n	0.628	0.890	0.665	0.802	3.939	1.895
19.30	19.30	48.02	1.516	0.0*	1-S2n	0.638	0.903	0.677	0.812	3.961	1.910
20.30	20.30	48.07	1.568	0.0*	1-S2n	0.661	0.934	0.702	0.836	4.013	1.941
21.01	21.01	48.11	1.605	0.0*	1-S2n	0.678	0.956	0.721	0.853	4.050	1.962
21.73	21.73	48.14	1.642	0.0*	1-S2n	0.694	0.977	0.738	0.869	4.086	1.984
22.44	22.44	48.18	1.679	0.0*	1-S2n	0.711	0.999	0.756	0.885	4.121	2.005
23.16	23.16	48.22	1.716	0.0*	1-S2n	0.727	1.020	0.774	0.901	4.158	2.024

HY-8 Culvert 35 Analysis Report			
Culvert Data Summary - Culvert 35		Tailwater Channel Data - Culvert 35	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	5.00 m
Barrel Rise:	1800.00 mm	Channel Slope:	0.0500
Barrel Material:	Concrete	Channel Manning's n:	0.0150
Barrel Manning's n:	0.0130	Channel Invert Elevation:	38.83 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90° Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 40.35 m	Outlet Elevation (invert): 38.83m	Culvert Length: 67.02 m	Culvert Slope: 0.0227
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Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
30.00	30.00	42.41	2.060	0.0*	5-S2n	0.640	1.212	0.705	0.634	5.909	9.464
32.00	32.00	42.52	2.168	0.0*	5-S2n	0.670	1.265	0.741	0.661	5.998	9.678

34.00	34.00	42.63	2.280	0.0*	5-S2n	0.700	1.317	0.777	0.688	6.077	9.883
36.00	36.00	42.75	2.395	0.0*	5-S2n	0.729	1.369	0.812	0.715	6.155	10.073
38.00	37.86	42.86	2.506	0.0*	5-S2n	0.755	1.415	0.845	0.740	6.222	10.265
40.00	39.00	42.93	2.577	0.0*	5-S2n	0.771	1.444	0.865	0.766	6.265	10.445
42.00	39.94	42.99	2.636	0.0*	5-S2n	0.784	1.467	0.881	0.791	6.295	10.621
44.00	40.78	43.04	2.690	0.0*	5-S2n	0.796	1.487	0.896	0.816	6.322	10.785
46.00	41.55	43.09	2.740	0.0*	5-S2n	0.806	1.506	0.909	0.840	6.352	10.948
48.00	42.27	43.14	2.788	0.0*	5-S2n	0.816	1.523	0.922	0.865	6.370	11.102
50.00	42.95	43.18	2.834	0.0*	5-S2n	0.826	1.540	0.933	0.889	6.394	11.254