Appendix C
Hydrologic Model Input Data and Results

Content:

- Hydrologic Inputs Table
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- Culvert Data Table
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Table C.1 Middle Creek Hydrologic Inputs

Basin Name	Area (acres)	Basin CN	Basin Lag Time (hr)	Area within Area of Interest (acres)	Percentage of Basin within AOI
MC001	114	76	0.60	89	78%
MC002	122	82	0.49	49	40%
MC003	81	84	0.41	71	88%
MC004	90	84	0.62	90	100%
MC005	162	89	0.38	156	96%
MC006	161	92	0.50	161	100%
MC007	45	85	0.32	21	47%
MC008	154	83	0.54	126	82%
MC009	36	91	0.17	36	100%
MC010	101	91	0.47	101	100%
MC011	61	80	0.41	49	80%
MC012	7	83	0.10	7	100%
MC013	11	93	0.13	11	100%
MC014	87	81	0.62	77	89%
MC015	188	86	0.55	188	100%
MC016	11	81	0.29	11	100%
MC017	166	81	0.66	166	100%
MC018	144	82	0.50	144	100%
MC019	94	82	0.62	94	100%
MC020	7	83	0.12	7	100%
MC021	63	92	0.29	63	100%
MC022	109	90	0.50	109	100%
MC023	165	88	0.52	165	100%
MC024	195	75	0.61	72	37%
MC025	117	72	0.55	24	21%
MC026	79	72	0.52	54	68%
MC027	168	76	0.55	155	92%
MC028	44	80	0.31	44	100%
MC029	133	81	0.41	133	100%
MC030	172	79	0.42	168	98%
MC031	144	78	0.59	8	6%
MC032	86	90	0.31	86	100%
MC033	178	86	0.44	178	100%
MC034	161	85	0.61	161	100%
MC035	91	85	0.45	91	100%
MC036	109	88	0.41	85	78%
MC037	111	89	0.51	111	100%
MC038	147	92	0.70	147	100%
MC039	80	92	0.49	80	100%

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Table C.2 Middle Creek Hydrologic Results

Basin Name	Q, 2yr (cfs)	Q, 5yr (cfs)	Q, 10yr (cfs)	Q, 25yr (cfs)	Q, 50yr (cfs)	Q, 100yr (cfs)	Q, 500yr (cfs)
MC001	62.0	107.7	148.2	186.0	221.8	261.3	349.3
MC002	108.3	171.1	224.8	273.8	319.6	369.4	479.0
MC003	91.4	140.0	180.9	217.9	252.3	289.6	371.3
MC004	75.4	115.8	150.0	181.0	209.9	241.1	309.7
MC005	244.8	351.7	439.4	517.7	590.0	667.9	837.6
MC006	226.8	316.7	390.0	455.4	515.6	580.4	721.7
MC007	63.4	95.6	122.5	146.8	169.3	193.7	247.0
MC008	133.1	208.5	272.6	331.0	385.5	444.7	575.0
MC009	100.5	141.0	174.0	203.4	230.5	259.7	323.2
MC010	143.3	201.7	249.4	291.9	331.1	373.3	465.2
MC011	55.4	89.8	119.4	146.6	172.1	200.0	261.4
MC012	14.1	21.6	27.9	33.6	39.0	44.8	57.4
MC013	34.0	46.6	56.9	66.0	74.5	83.5	103.3
MC014	63.4	101.4	134.1	164.0	192.1	222.6	290.0
MC015	186.4	280.4	358.8	429.7	495.6	566.7	722.3
MC016	13.7	21.8	28.7	35.1	41.0	47.4	61.6
MC017	112.9	181.5	240.4	294.5	345.3	400.6	522.5
MC018	130.0	204.3	267.6	325.3	379.3	437.9	566.5
MC019	69.9	110.9	146.0	178.1	208.2	240.8	312.7
MC020	13.1	20.1	26.0	31.4	36.4	41.7	53.5
MC021	127.0	176.2	216.2	251.9	284.8	320.2	397.3
MC022	140.8	201.4	251.0	295.3	336.3	380.4	476.6
MC023	189.1	277.5	350.5	416.0	476.7	542.1	684.7
MC024	97.3	172.2	239.1	301.8	361.5	427.3	574.4
MC025	49.5	94.0	134.7	173.3	210.5	251.8	345.0
MC026	33.7	64.4	92.6	119.3	145.1	173.7	238.5
MC027	93.8	164.1	226.5	284.9	340.5	401.7	538.1
MC028	49.5	79.5	105.3	129.0	151.2	175.3	228.6
MC029	130.7	207.7	273.5	333.6	389.9	451.1	585.6
MC030	143.9	237.4	318.6	393.4	463.9	541.0	711.7
MC031	92.1	153.8	207.5	257.4	304.4	355.8	469.8
MC032	153.5	218.3	271.2	318.5	362.1	409.0	511.2
MC033	206.9	311.0	397.9	476.2	549.0	627.7	799.8
MC034	141.3	215.8	278.5	335.2	388.0	445.1	570.5
MC035	99.9	151.9	195.7	235.2	272.0	311.7	398.7
MC036	151.5	220.6	277.7	328.8	376.0	427.0	538.0
MC037	138.3	199.2	249.2	293.9	335.2	379.7	476.6
MC038	160.4	225.2	278.0	325.1	368.6	415.3	517.2
MC039	113.5	158.6	195.4	228.1	258.3	290.8	361.6

Table C.3

Middle Creek					Evaluate	GIS Contour Data			Overtopping Evaluation				
OBJECTID *	Shape *	Point_X	Point_Y	Note	Evaluate_(yes/no/insufficient_ data)	Road_ elevation	Channel_ elevation_ Upstream	Channel_depth_ at_Road	Approx_Dist_between_ DNR_Xsect	DS_ Backwater	Approx_100yr_WSE_at_ Road	Road_ Overtopped_per_DNR_Data	Depth_ Overtopped
1	Point	119304.5	221368	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1271	1264	7	0	No	1264.0	No	-7.0
2	Point	119966.9	221368	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1278	1273	5	0	No	1273.0	No	-5.0
3	Point	121600.9	221372	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1285	1281	4	0	No	1281.0	No	-4.0
4	Point	119812.5	216064		Yes	1233	1228	5	1430	No	1232.921678	No	-0.07832168
5	Point	120827.1	216079	No Xsect, unmodeled Tributary	Insufficient	1249	1237	12	0	No	1237.0	No	-12.0
6	Point	122753.9	216074	No Xsect, unmodeled Tributary	Insufficient	1300	1286	14	0	No	1286.0	No	-14.0
7	Point	123490.5	210768	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1223	1220	3	0	No	1220.0	No	-3.0
8	Point	118203.8	210624	Downstream Xsect only	Yes	1210	1183	27	270	No	1205.4	No	-4.6
9	Point	119787.8	208147	No Xsect, unmodeled Tributary	Insufficient	1212	1207	5	0	No	1207.0	No	-5.0
10	Point	120032.7	208351	No Xsect, unmodeled Tributary	Insufficient	1216	1203	13	0	No	1203.0	No	-13.0
11	Point	120121	208437	No Xsect, unmodeled Tributary. Continuation of culvert at Point 10.	Insufficient	1216	1203	13	0	No	1203.0	No	-13.0
12	Point	121227.2	208431	No Xsect, unmodeled Tributary	Insufficient	1209	1193	16	0	No	1193.0	No	-16.0
13	Point	121232.1	208344	No Xsect, unmodeled Tributary. Continuation of culvert at Point 12.	Insufficient	1209	1193	16	0	No	1193.0	No	-16.0
14	Point	122402.2	208424	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
15	Point	122451.7	208339	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
16	Point	123474.7	207244	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
17	Point	123428.9	205481	No Xsect, unmodeled Tributary	Insufficient	1202	1198	4	0	No	1198.0	No	-4.0
18	Point	125388.8	205469	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
19	Point	127157.2	205445	Downstream of DNR study limits. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
20	Point	129954.7	205400	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
21	Point	131387.4	204348	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
22	Point	139143.8	202489	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
23	Point	146985.6	202127	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
24	Point	147053.5	202146	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
25	Point	151267.1	202088	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
26	Point	151279.4	202135	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0

27	Point	150413.4	200731	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
28	Point	149544.4	200855	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
29	Point	149503.2	200805	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
30	Point	149485.6	200784	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
31	Point	150363.8	200083	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
32	Point	150252.3	199336	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
33	Point	150187.3	199339	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
34	Point	149483.8	198570	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
35	Point	149491.7	197623	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
36	Point	146906.3	201402	No Xsect, unmodeled Tributary. Subject to backwater from Middle Mainstem.	Insufficient			0	0	Yes	0.0	Yes	0.0
37	Point	145471.9	200110	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
38	Point	145434	199752	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
39	Point	133017.5	200114	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
40	Point	135889	200095	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
41	Point	141569	200155	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
42	Point	143416.6	200125	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
43	Point	143131	198886	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
44	Point	125083.1	210765	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1223	1220	3	0	No	1220.0	No	-3.0
45	Point	127632	210716	No Xsect on this tributary fork, nearest section is downstream 2700 ft with no indication of flow splitting.	Insufficient	1220	1214	6	0	No	1214.0	No	-6.0
46	Point	131033.6	210720	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
47	Point	120986.5	205520	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
48	Point	126821.9	208202	No Xsect, unmodeled Tributary. US DNR Section crosses both tributary forks, with no indication of flow split.	Insufficient	1210	1193	17	960	No	1199.3	No	-10.7
49	Point	126832.6	208283	No Xsect, unmodeled Tributary. US DNR Section crosses both tributary forks, with no indication of flow split.	Insufficient	1210	1193	17	970	No	1199.3	No	-10.7
50	Point	125811.3	208297	Flow will bypass east to other tributary or over road low point (elevation indicated), not at crossing structure	Insufficient	1208	1198	10	1170	No	1202.1	No	-5.9
51	Point	125809	208383	Flow will bypass east to other tributary or over road low point (elevation indicated), not at crossing structure	Insufficient	1208	1198	10	1180	No	1202.3	No	-5.7
52	Point	120412.1	210779	US Xsect only, DS subject to backwater from Middle Mainstem	No	1204	1185	19	610	Yes	1205.0	Yes	1.0
53	Point	130287.5	207774	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
54	Point	130202.9	207698	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
55	Point	149459.3	198099	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0

56	Point	146818.1	202087	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
57	Point	137360.6	202788	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0
58	Point	126666	207880	US Xsect only, DS subject to backwater from Middle Mainstem	Insufficient	1215	1190	25	861	Yes	1196.1	No	-18.9
59	Point	121261	207175	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
60	Point	119686	206803	No Xsect, unmodeled Tributary.	Insufficient			0	0	No	0.0	Yes	0.0
61	Point	123293.9	207680	Within FEMA FIS model limits	Insufficient			0	0	No	0.0	Yes	0.0

Culverts to Evaluate 2

Table C.3

DNR HYDRAULIC STUDY DATA								County Culvert Data						
OBJECTID *	US_100yr_ depth	US_100yr_ Elevation	US_Q100	US_Distance_ to_point_ (ft)	DS_100yr_ depth	DS_100yr_ Elevation	DS_ Q100	DS_Distance_ to_point_(ft)	County_ Longitude	County_ Latitude	Known_ WSE_100yr	Road_ Name	Culvert_ Description	Culvert_ Openings
1									119306.49871	221368.92329		M88	9'x6'x45'	SINGLE
2									120297.74476	221371.16082		M89	4'x3'x24'	SINGLE
3									121592.75234	221370.99481		M90	8'x4'x27'	SINGLE
4	5.2	1234.6	3846	250	5.6	1225	3846	1180	119814.19061	216080.58610	1233.6	M105	10'x5'x44'	TWIN
5									120793.82120	216079.93387		M104	5'x5'x60'	SINGLE
6									122768.81003	216080.78163		M103	4'x4'x79'	SINGLE
7									123499.89223	210784.66329		M131	8'x4'x28'	SINGLE
8					22.4	1208	10800	270	118184.59643	210617.65050	1209.1	M127	19'x129'	TWIN
9									119798.74215	208167.38047		M184	8'x8'x42'	SINGLE
10														
11														
12														
13														
14														
15														
16									123465.15805	207254.06503	1194.1	M147	30'x203'	TRIPLE
17														
18														
19														
20														
21									131381.59464	204346.62105	1180.2	M194	28'x124'	TRIPLE
22									139176.70438	202439.57794	1164.8	L218	28'x112'	TRIPLE
23														
24														
25														
26														

27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39									133012.76658	200119.78075		M199	66"x94'	SINGLE
40									135924.76206	200103.57835		L68	10'x4'x33'	SINGLE
41														
42														
43														
44									125078.64498	210765.02947		M132	5'x4'x32'	SINGLE
45									127627.87249	210736.35006		M134	10'x6'x26'	SINGLE
46									131013.59439	210719.41408		M136	10'x5'x32'	SINGLE
47														
48	6.3	1201.7	3241	960										
49	6.3	1201.7	3241	970										
50	6.1	1205.5	3241	1050	6.3	1201.7	3241	120						
51	6.1	1205.5	3241	980	6.3	1201.7	3241	200						
52	10.1	1213.5	3846	610		1205.008929			120407.58312	210778.75976	1197.9	M129	12'x14'x67'	SINGLE
53														
54														
55														

56														
57														
58	6.1	1205.5	3241	861		1194.6								
59									121247.53256	207016.21249		M183	72"x50'	SINGLE
60														
61														

Table C.3

Modeled Culvert																
OBJECTID *	Structure_ Type		Downstream _ Flowline_ (ft)	Tailwater_ Elevation_ (ft)	Assumed_Cre st_ Length_ (ft)	Embedment_d epth_(in)	Culvert_ type	Inlet_ Configuration	Number_of_ba rrels	Inlet_ Elevation_ (ft)	Outlet_ Elevation_ (ft)	Crest_ Elevation_ (ft)	Extra	Roadway Overtopped?	Overtopping Elevation (ft)	Overtopping Depth (ft)
1	BBCBC															
2	CBC															
3	CBC															
4	CBC		1225.4	1231	50	0	straight	30-75° flare	3	1225.5	1225.4	1232.9	v of 1233.2	Yes	1237.61	4.71
5	CBC															
6	CBC															
7	CBC															
8	SB/DSGB															
9	CBC															
10																
11																
12																
13																
14																
15																
16	DSGB															
17																
18																
19																
20																
21	DSGB															
22	CB															
23																
24																
25																
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27																
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37																
38																
39	CMP															
40	CBC															
41																
42																
43																
44	CBC															
45	CBC															
46	CBC															
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50																
51																
52	CBC															
53																
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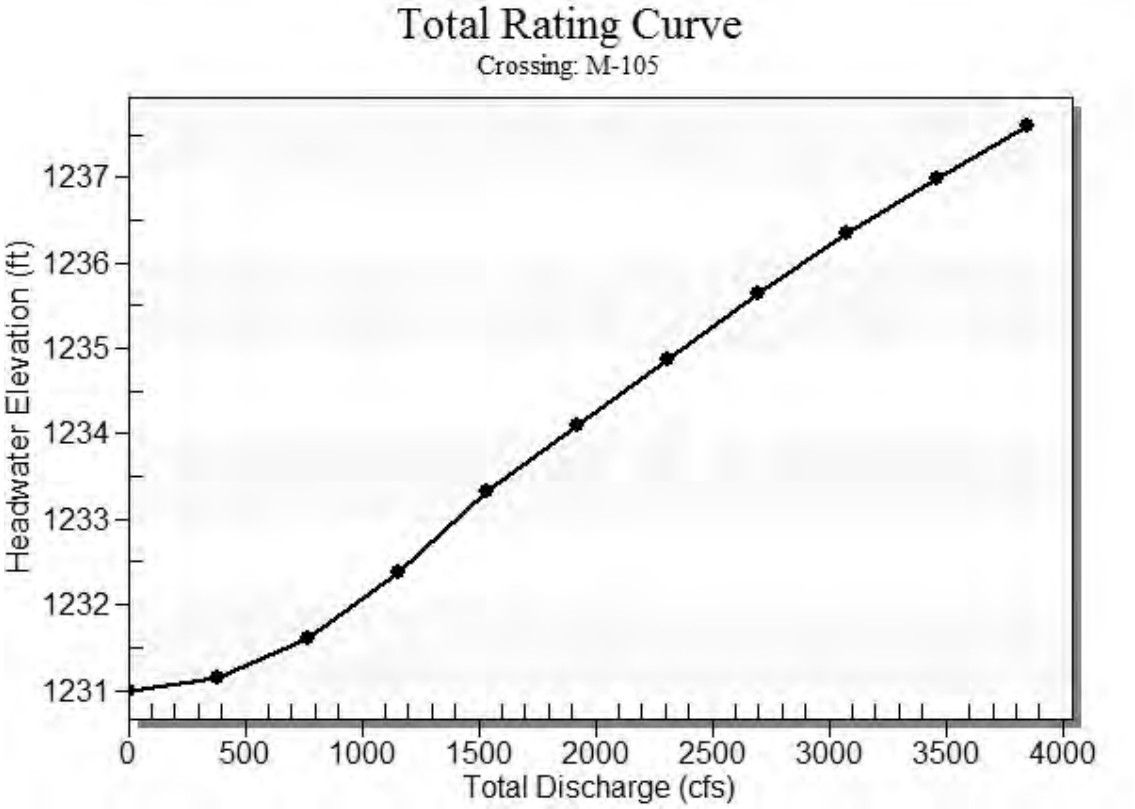
56																
57																
58																
59	BBCMP															
60																
61																

Appendix C
HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: M-105

Headwater Elevation (ft)	Total Discharge (cfs)	M-105 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1231.00	0.00	0.00	0.00	1
1231.15	384.60	384.60	0.00	1
1231.62	769.20	769.20	0.00	1
1232.39	1153.80	1153.80	0.00	1
1233.33	1538.40	1495.79	42.59	3
1234.10	1923.00	1724.29	198.62	3
1234.88	2307.60	1886.48	421.15	3
1235.64	2692.20	2004.27	687.86	3
1236.34	3076.80	2106.55	970.17	3
1236.99	3461.40	2196.58	1264.74	3
1237.61	3846.00	2278.30	1567.61	3
1232.90	1350.61	1350.61	0.00	Overtopping

Rating Curve Plot for Crossing: M-105



Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	1231.00	0.000	5.500	0-NF	0.000	0.000	5.000	5.600	0.000	0.000
384.60	384.60	1231.15	2.646	5.654	4-FFf	1.895	1.722	5.000	5.600	2.564	0.000
769.20	769.20	1231.62	4.225	6.116	4-FFf	3.060	2.733	5.000	5.600	5.128	0.000
1153.80	1153.80	1232.39	5.689	6.886	4-FFf	4.099	3.581	5.000	5.600	7.692	0.000
1538.40	1495.79	1233.33	7.203	7.830	4-FFf	5.000	4.258	5.000	5.600	9.972	0.000
1923.00	1724.29	1234.10	8.409	8.597	4-FFf	5.000	4.681	5.000	5.600	11.495	0.000
2307.60	1886.48	1234.88	9.375	9.206	4-FFf	5.000	4.971	5.000	5.600	12.577	0.000
2692.20	2004.27	1235.64	10.138	9.684	5-FFf	5.000	5.000	5.000	5.600	13.362	0.000
3076.80	2106.55	1236.34	10.842	10.122	5-FFf	5.000	5.000	5.000	5.600	14.044	0.000
3461.40	2196.58	1236.99	11.494	10.525	5-FFf	5.000	5.000	5.000	5.600	14.644	0.000
3846.00	2278.30	1237.61	12.111	10.906	5-FFf	5.000	5.000	5.000	5.600	15.189	0.000

Table 2 - Culvert Summary Table: M-105

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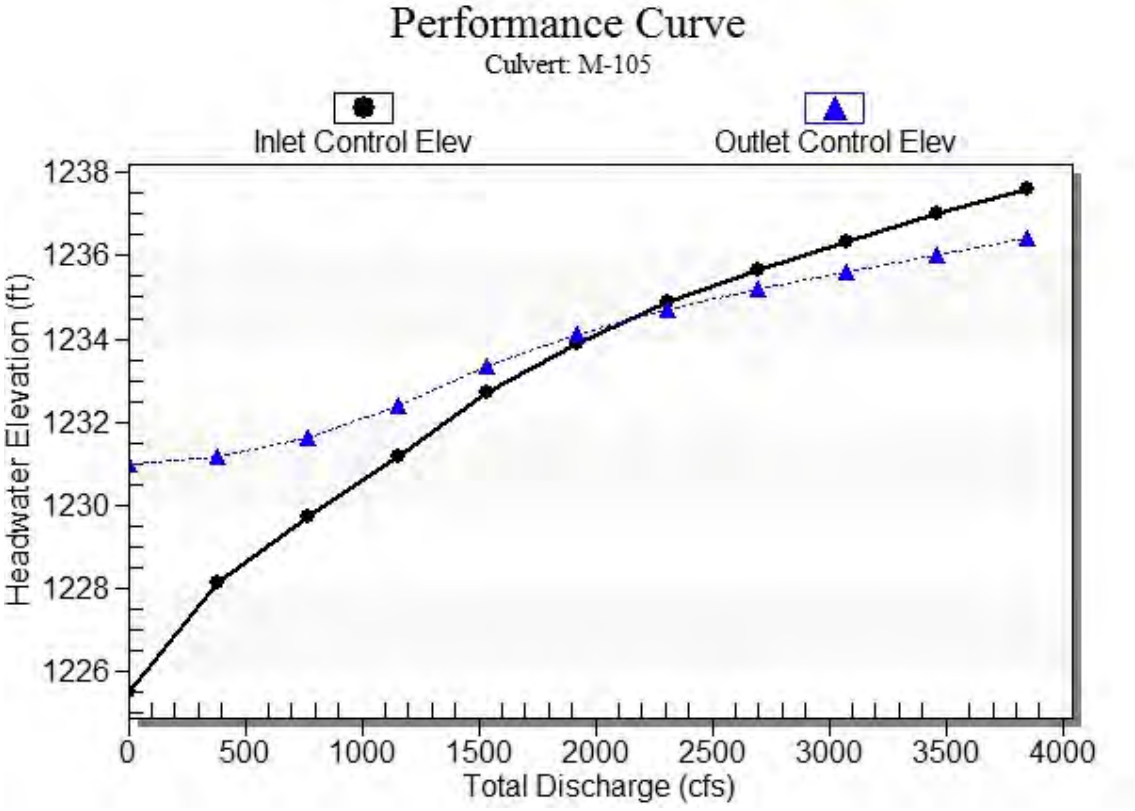
Straight Culvert

Inlet Elevation (invert): 1225.50 ft, Outlet Elevation (invert): 1225.40 ft

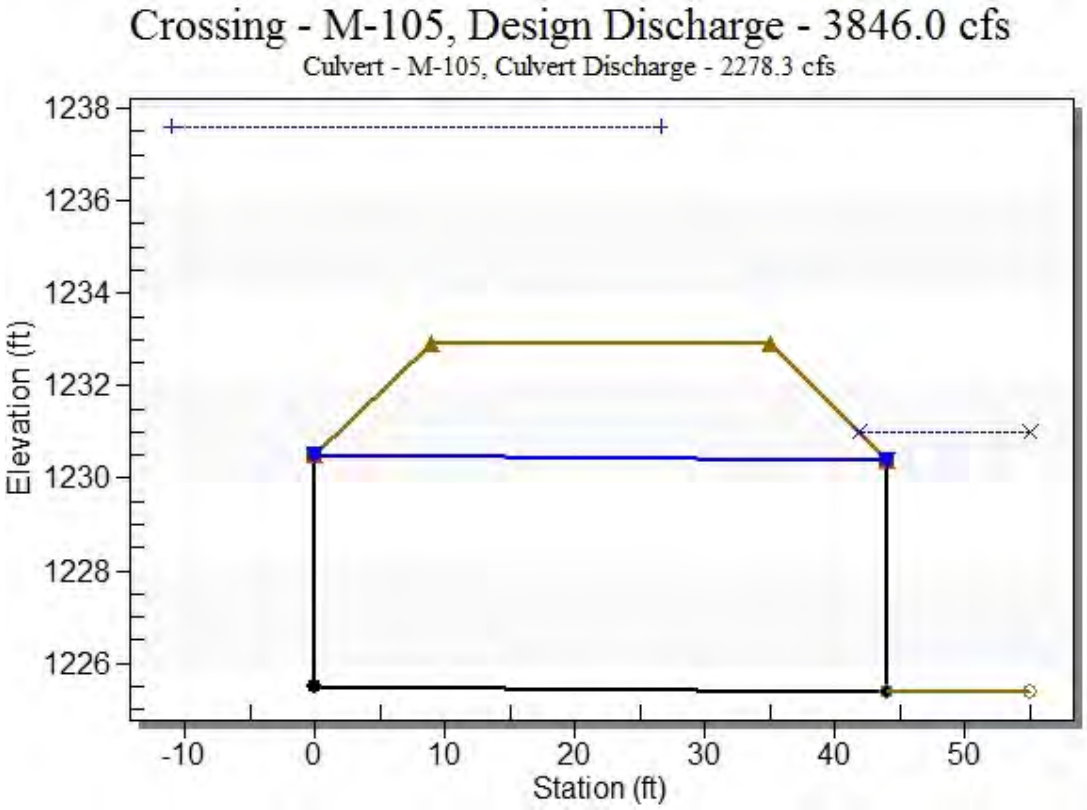
Culvert Length: 44.00 ft, Culvert Slope: 0.0023

****

Culvert Performance Curve Plot: M-105



Water Surface Profile Plot for Culvert: M-105



Site Data - M-105

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1225.50 ft

Outlet Station: 44.00 ft

Outlet Elevation: 1225.40 ft

Number of Barrels: 3

Culvert Data Summary - M-105

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: M-105)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	1231.00	5.60
384.60	1231.00	5.60
769.20	1231.00	5.60
1153.80	1231.00	5.60
1538.40	1231.00	5.60
1923.00	1231.00	5.60
2307.60	1231.00	5.60
2692.20	1231.00	5.60
3076.80	1231.00	5.60
3461.40	1231.00	5.60
3846.00	1231.00	5.60

Tailwater Channel Data - M-105

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 1231.00 ft

Roadway Data for Crossing: M-105

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 1232.90 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft