

	Conduit Height ft	100-yr Flow cfs	Tailwater Depth ft	100-yr Velocity fps	Min D50 ft	Min D50 inch	Min Apron Length ft	Actual Apron Length ft
SW River Run RCBC	6	595.61	5.97	12.41	1.52	18.26	42	48
Storm Line C	4	62.3	0	8.43	0.48	5.76	16	24
Storm Line G	3.5	25.36	0	7.66	0.20	2.37	14	30
Storm Line A	2	12.6	0	6.15	0.29	3.45	8	30*
Storm Line A1	1.5	3.14	0	6.92	0.09	1.06	6	20**

* 30 ft apron length at combined ES A-1

** 20 ft apron length at FES A1-2

Rip Rap Sizing (Chapter 10 & Appendix D, HEC 14; Fletcher and Grace (1972))

$$D_{50} = 0.020D \left(\frac{Q}{\sqrt{g \times D^{2.5}}} \right)^{\frac{2}{3}} \left(\frac{D}{TW} \right)$$

D₅₀ = Median Rock Size, ft

Q = Flowrate, cfs

D = Culvert Rise, ft

*TW = Tailwater Depth, ft

1.0D.

If tailwater is unknown, use 0.4D

Slope #	Inlet	Area Number	Area (Acres)	Street Slope (ft/ft)	Max Gutter Flow	Gutter Flow, cfs (+bypass)		Cross Slope (%)	Gutter Spread (ft)		Inlet Length (ft)	Curb Type (A or B)	Inlet Intercept		Inlet Bypass	
						Q-10 yr	Q- 100 yr		10 yr	100 yr			10-Year	100-Year	10-Year	100-Year
1	A-3 (W)	1	0.07	2.18	5.84	0.34	0.60	2	3.97	4.90	5	A	0.33	0.56	0.01	0.03
2	A-3 (E)	2	1.17	6.16	9.81	5.68	9.96	2	9.40	11.60	5	A	1.96	2.08	3.71	7.88
-	A-3 (low pt)	21	1.24	0	-	6.02	10.56	2	-	-	5	A	6.02	10.56	0.00	0.00
1	A-2 (W)	3	0.07	2.18	5.84	0.34	0.60	2	3.97	4.90	5	A	0.33	0.56	0.01	0.03
2	A-2 (E)	4	0.55	6.16	9.81	2.67	4.68	2	7.08	8.74	5	A	1.52	1.88	1.15	2.80
-	A-2 (low pt)	22	0.62	0	-	3.01	5.28	2	-	-	5	A	3.01	5.28	0.00	0.00
4	B-2 (N)	5	0.29	1.84	5.36	1.67	4.26	2	7.44	10.58	5	A	1.43	2.87	0.24	1.39
3	B-2 (S)	6	0.45	3.64	7.54	2.18	3.83	2	7.25	8.95	5	A	1.57	2.19	0.61	1.64
-	B-2 (low pt)	23	0.74	0	-	3.85	8.09	2	-	-	5	A	3.85	8.09	0.00	0.00
4	B-1 (N)	7	0.19	1.84	5.36	2.29	6.13	2	8.38	12.13	5	A	1.85	3.52	0.44	2.61
3	B-1 (S)	8	0.38	3.64	7.54	1.84	3.24	2	6.80	8.40	5	A	1.40	2.01	0.45	1.23
-	B-1 (low pt)	24	0.57	0	-	4.13	9.36	2	-	-	5	A	4.13	9.36	0.00	0.00
8	C-7, D-1	9	1.12	3.78	7.68	6.94	13.43	2	11.10	14.22	5	A	2.68	2.93	4.25	10.50
8	C-6, E-1	10	0.71	3.78	7.68	7.70	16.55	2	11.54	15.38	5	A	2.75	2.95	4.95	13.60
8	C-5	11	0.30	3.78	7.68	3.05	6.79	2	8.16	11.01	5	A	1.92	2.67	1.13	4.12
5	C-4, F-1	12	0.21	1	3.95	2.15	5.91	2	9.18	13.42	5	A	1.89	4.13	0.26	1.79
4	C-3	13	0.40	1.84	5.36	4.21	8.57	2	10.54	13.75	5	A	2.85	4.06	1.36	4.51
8	D-2	14	0.71	3.78	7.68	3.73	6.92	2	8.79	11.09	5	A	2.13	2.68	1.60	4.24
6	F-2 (N)	16	0.46	5.62	9.37	2.23	3.92	2	6.74	8.32	5	A	1.42	1.86	0.81	2.06
5	F-2 (S)	17	0.44	1	3.95	2.14	3.75	2	9.16	11.31	5	A	1.88	2.98	0.26	0.77
-	F-2 (low pt)	25	0.90	0	-	4.37	7.66	2	-	-	5	A	4.37	7.66	0.00	0.00
15	G-4	18	0.31	2	5.59	1.95	3.86	2	7.78	10.04	5	A	1.61	2.64	0.34	1.22
15	G-3	19	0.43	2	5.59	2.21	4.03	2	8.14	10.21	5	A	1.77	2.71	0.44	1.32
6	G-2	20	0.86	5.62	9.37	4.17	7.32	2	8.52	10.52	5	A	1.90	2.16	2.27	5.17

DATE: 08/01/2018		STORM SEWER PIPE AND STRUCTURE TABLE																															
TITLE: WHISPERING WOODS, LEE'S SUMMIT, MO																																	
JOB #: 04078																																	
DESIGN CONDITIONS: PUBLIC - 10 YEAR STORM EVENT																																	
STRUCTURES		RUNOFF CALCULATIONS													PIPE DESIGN																		
FROM	TO	DIRECT AREA (ACRES)	TOTAL AREA (ACRES)	C	KC (K=1.0)	Tc (MIN)	FLOW TIME (MIN)	INTENSITY (IN/HR)	DESIGN Q (CFS)	DESCRIPTION	PIPE LENGTH (L.F.)	PIPE SLOPE (%)	PIPE DIA (IN)	Q FULL (CFS)	PIPE AREA (SQ.FT.)	V FULL (F/S)	DESIGN V (F/S)	HwD	MH TOP ELEVATION	UPSTREAM FLOWLINE	DOWNSTREAM FLOWLINE	DOWNSTREAM WATER ELEVATION	FRICTION HEAD (h f)	ENTRY LOSS COEFFICIENT (K)	ACTUAL ENTRY LOSS (K)	ENTRY LOSS (h m)	h f + h m (FT)	HGL Pipe U/S	HW, INLET CONTROL	HW, OUTLET CONTROL	HYDRAULIC GRADE ELEV.	HYDRAULIC GRADE (MAX)	
H-2		1.53	0.66	0.66	5.00	0.21	7.35	7.43	7.35	Field Inlet	127.25	3.54	24	55.45	3.14	17.65	10.18	0.80	985.57	979.60	975.10	975.67	0.08	0.40	1.00	1.61	1.69	980.17	981.19	979.60	981.19	984.07	
D-2	C-8, D-1, H-1	0.42	0.66	0.66	5.00	0.06	7.35	2.94	7.35	Curb Inlet	34.75	8.63	18	40.23	1.77	22.77	9.90	0.72	982.16	975.00	972.00	972.26	0.01	0.40	1.00	1.52	1.53	975.26	976.09	975.00	976.09	980.66	
E-2	C-8, D-1, H-1	0.53	0.66	0.66	5.00	0.34	7.35	2.57	7.35	Curb Inlet	127.25	2.00	18	19.39	1.77	10.97	6.32	0.73	976.39	970.25	967.70	968.12	0.05	0.40	1.00	0.62	0.67	970.67	971.34	970.25	971.34	974.89	
F-2	C-5, F-1	0.35	0.66	0.66	5.00	0.43	7.35	1.70	7.35	Curb Inlet	97.55	1.59	18	17.27	1.77	9.77	3.80	0.69	968.62	964.20	962.65	963.10	0.02	0.40	1.00	0.22	0.24	964.85	965.24	964.20	965.24	967.12	
C-8, D-1, H-1	C-7, E-1	1.12	0.66	0.66	5.00	0.31	7.35	5.44	7.35	Curb Inlet	250.68	2.79	36	145.22	7.07	20.54	13.87	0.95	982.17	968.00	962.01	964.92	0.35	0.40	0.40	1.16	1.51	970.11	971.85	968.00	971.85	980.67	
C-7, E-1	C-6	0.71	0.66	0.66	5.00	0.06	7.35	3.45	7.35	Curb Inlet	35.75	1.12	36	92.01	7.07	13.02	10.14	1.05	972.69	961.60	961.20	964.21	0.07	0.40	0.40	0.64	0.71	964.28	964.74	964.92	964.92	971.19	
C-6	C-5, F-1	0.30	0.66	0.66	5.00	0.06	7.35	1.46	7.35	Curb Inlet	156.68	2.23	36	129.83	7.07	18.37	13.22	1.07	972.69	961.00	957.51	960.14	0.32	0.40	0.40	1.08	1.40	962.30	964.21	961.54	964.21	971.19	
C-5, F-1	C-4	0.21	0.66	0.66	5.00	0.09	7.35	1.02	7.35	Curb Inlet	45.52	0.66	42	106.54	9.62	11.07	8.50	0.88	967.50	957.00	956.70	959.65	0.04	0.40	0.40	0.45	0.49	959.69	960.07	960.14	960.14	966.00	
C-4	C-3	0.40	0.66	0.66	5.00	0.07	7.35	1.94	7.35	Curb Inlet	35.75	0.57	42	99.01	9.62	10.29	8.13	0.89	966.76	956.50	956.30	959.20	0.04	0.40	0.40	0.41	0.45	959.24	959.63	959.65	959.65	965.26	
C-3	C-2	0.40	0.66	0.66	5.00	0.33	7.35	1.94	7.35	Curb Inlet	157.63	0.51	48	133.72	12.57	10.64	7.87	0.79	966.74	955.80	955.00	958.73	0.09	0.40	0.40	0.38	0.47	958.81	958.98	959.20	958.73	960.56	
C-2	C-1	0.00	0.66	0.66	5.00	0.63	7.35	0.00	7.35	Curb Inlet	284.05	0.46	48	126.87	12.57	10.10	7.57	0.79	962.06	954.80	953.50	958.12	0.16	0.50	0.50	0.44	0.61	958.28	957.98	958.73	958.73	960.56	
G-5, N-1	G-4	0.36	0.66	0.66	5.00	0.52	7.35	1.75	7.35	Curb Inlet	330.30	2.42	24	45.89	3.14	14.61	10.63	1.08	991.98	977.40	969.40	971.40	0.79	0.40	0.40	0.70	1.49	978.29	979.57	977.40	979.57	990.48	
G-4	G-3	0.31	0.66	0.66	5.00	0.07	7.35	1.50	7.35	Curb Inlet	34.21	1.17	24	31.90	3.14	10.15	8.24	1.15	978.38	969.10	968.70	970.61	0.09	0.40	0.40	0.42	0.52	970.71	971.40	971.13	971.40	976.88	
G-3	G-2	0.53	0.66	0.66	5.00	0.07	7.35	2.57	7.35	Curb Inlet	78.42	5.87	24	71.44	3.14	22.74	15.58	1.31	978.38	968.00	963.40	964.18	0.29	0.40	0.40	0.41	1.79	968.78	970.61	968.00	970.61	976.88	
G-2	G-1	0.06	0.66	0.66	5.00	0.18	7.35	0.29	7.35	Curb Inlet	135.32	3.77	36	168.81	7.07	23.88	12.88	0.76	976.44	960.80	955.70	958.43	0.06	0.40	0.40	1.03	1.09	961.55	963.07	960.80	963.07	974.84	
G-1	G-0	0.00	0.66	0.66	5.00	0.10	7.35	0.00	7.35	Junction Box	42.50	0.70	42	109.84	9.62	11.42	6.97	0.71	964.01	954.20	953.90	958.12	0.01	0.40	0.40	0.30	0.31	958.13	956.68	958.43	958.43	962.51	
A-3	A-2	1.24	0.66	0.66	5.00	0.15	7.35	6.02	7.35	Curb Inlet	43.00	0.58	15	6.41	1.23	5.23	4.90	1.44	959.85	956.19	955.94	956.93	0.22	0.40	1.00	0.37	0.60	957.16	957.99	957.79	957.99	958.35	
A-2	A-1	0.62	0.66	0.66	5.00	0.06	7.35	3.01	7.35	Curb Inlet	44.20	5.32	24	68.02	3.14	21.65	12.43	0.83	959.70	955.15	952.80	953.36	0.04	0.40	0.40	0.96	1.00	955.71	956.81	955.15	956.81	958.20	
A1 - 2	A1 - 1	0.50	0.66	0.66	5.00	0.25	7.35	2.43	7.35	FES	106.90	1.81	18	18.44	1.77	10.44	5.99	0.72	956.23	954.44	952.50	953.38	0.03	0.40	1.00	0.56	0.59	954.86	955.52	954.44	955.52	954.73	