

**RALPH HALL DETENTION POND**

MODIFIED RATIONAL METHOD DETENTION VOLUME CALCULATIONS										
Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
5	0.380	20	5.00	0.35	0.67	0.380	10	7.10	0.90	2.4
Return Period	5									
Q <sub>allow</sub> <sup>3</sup>	0.67									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage	Example (40 min)			
10	7.1	0.342	2.43	1457	399	1058	Inflow Volume = T <sub>d</sub> *Q <sub>p</sub> *60			
20	5.0	0.342	1.71	2052	599	1454	= 40min*1.16cfs*60s/cc/min			
30	4.0	0.342	1.37	2462	798	1664	= 2,791 ft <sup>3</sup>			
40	3.4	0.342	1.16	2791	998	1793	Outflow Volume = 0.5*(T <sub>d</sub> -T <sub>c</sub> )*Q <sub>allow</sub> *60			
50	2.9	0.342	0.99	2975	1197	1778	= 0.5*(40+10)min*0.67cfs*60s/cc/min			
60	2.6	0.342	0.89	3201	1397	1805	= 998 ft <sup>3</sup>			
70	2.4	0.342	0.82	3447	1596	1851	Storage Vol. = Inflow Volume - Outflow Volume			
80	2.2	0.342	0.75	3612	1796	1816	= 2,791 ft <sup>3</sup> - 998 ft <sup>3</sup>			
90	2.0	0.342	0.68	3694	1995	1699	= 1,793 ft <sup>3</sup>			

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
10	0.380	20	5.79	0.35	0.77	0.380	10	7.28	0.90	2.5
Return Period	10									
Q <sub>allow</sub> <sup>3</sup>	0.77									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	7.28	0.342	2.49	1494	462	1032				
20	5.79	0.342	1.98	2376	693	1683				
30	4.76	0.342	1.63	2930	924	2006				
40	4	0.342	1.37	3283	1155	2128				
50	3.45	0.342	1.18	3540	1386	2154				
60	3.04	0.342	1.04	3743	1617	2126				
70	2.73	0.342	0.93	3921	1848	2073				
80	2.46	0.342	0.84	4038	2079	1959				
90	2.27	0.342	0.78	4192	2310	1882				

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
25	0.380	20	6.64	0.35	0.88	0.380	10	8.28	0.90	2.83
Return Period	25									
Q <sub>allow</sub> <sup>3</sup>	0.88									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	8.28	0.342	2.83	1699	530	1169				
20	6.64	0.342	2.27	2725	795	1930				
30	5.48	0.342	1.87	3373	1060	2314				
40	4.63	0.342	1.58	3800	1325	2476				
50	4	0.342	1.37	4104	1590	2514				
60	3.54	0.342	1.21	4358	1855	2504				
70	3.18	0.342	1.09	4568	2119	2448				
80	2.88	0.342	0.98	4728	2384	2343				
90	2.65	0.342	0.91	4894	2649	2245				

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
100	0.380	20	8.30	0.35	1.10	0.38	10	9.80	0.90	3.35
Return Period	100									

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
100	0.380	20	8.30	0.35	1.10	0.38	10	9.80	0.90	3.35
Return Period	100									
Q <sub>allow</sub> <sup>3</sup>	1.10									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	9.8	0.342	3.35	2011	662	1349				
20	8.3	0.342	2.84	3406	994	2413				
30	6.9	0.342	2.36	4248	1325	2923				
40	5.8	0.342	1.98	4761	1656	3105				
50	5	0.342	1.71	5130	1987	3143				
60	4.5	0.342	1.54	5540	2318	3222				
70	4	0.342	1.37	5746	2649	3096				
80	3.7	0.342	1.27	6074	2981	3093				
90	3.5	0.342	1.20	6464	3312	3152				
100	3.4	0.342	1.16	6977	3643	3334				
110	3.2	0.342	1.09	7223	3974	3249				

**MARKET CENTER DETENTION POND**

MODIFIED RATIONAL METHOD DETENTION VOLUME CALCULATIONS										
Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
5	0.590	20	5.00	0.35	1.03	0.590	10	7.10	0.90	3.8
Return Period	5									
Q <sub>allow</sub> <sup>3</sup>	1.03									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	7.1	0.531	3.77	2262	620	1643				
20	5.0	0.531	2.66	3186	929	2257				
30	4.0	0.531	2.12	3823	1239	2584				
40	3.4	0.531	1.81	4333	1549	2784				
50	2.9	0.531	1.54	4620	1859	2761				
60	2.6	0.531	1.38	4970	2168	2802				
70	2.4	0.531	1.27	5352	2478	2874				
80	2.2	0.531	1.17	5607	2788	2820				
90	2.0	0.531	1.06	5735	3098	2637				

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
10	0.590	20	5.79	0.35	1.20	0.590	10	7.28	0.90	3.9
Return Period	10									
Q <sub>allow</sub> <sup>3</sup>	1.20									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	7.28	0.531	3.87	2319	717	1602				
20	5.79	0.531	3.07	3689	1076	2613				
30	4.76	0.531	2.53	4550	1435	3115				
40	4	0.531	2.12	5098	1793	3304				
50	3.45	0.531	1.83	5496	2152	3344				
60	3.04	0.531	1.61	5811	2511	3300				
70	2.73	0.531	1.45	6088	2870	3219				
80	2.46	0.531	1.31	6270	3228	3042				
90	2.27	0.531	1.21	6509	3587	2922				

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
25	0.590	20	6.64	0.35	1.37	0.590	10	8.28	0.90	4.40
Return Period	25									
Q <sub>allow</sub> <sup>3</sup>	1.37									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	8.28	0.531	4.40	2638	823	1815				
20	6.64	0.531	3.53	4231	1234	2997				
30	5.48	0.531	2.91	5238	1645	3592				
40	4.63	0.531	2.46	5900	2057	3844				
50	4	0.531	2.12	6372	2468	3904				
60	3.54	0.531	1.88	6767	2879	3888				
70	3.18	0.531	1.69	7092	3291	3801				
80	2.88	0.531	1.53	7341	3702	3638				
90	2.65	0.531	1.41	7599	4113	3485				

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
100	0.590	20	8.30	0.35	1.71	0.59	10	9.80	0.90	5.20
Return Period	100									

Return Period	Existing					Proposed				
	Existing Area	T <sub>c</sub>	i	c	Q <sub>exist</sub>	Detained Area	T <sub>c</sub>	i	c	Q <sub>p</sub>
100	0.590	20	8.30	0.35	1.71	0.59	10	9.80	0.90	5.20
Return Period	100									
Q <sub>allow</sub> <sup>3</sup>	1.71									
T <sub>c</sub> prop (min)	10									
T <sub>d</sub> (min)	I (in/hr)	CA	Q <sub>p</sub> (cfs)	Vol <sub>in</sub> (ft <sup>3</sup> )	Vol <sub>out</sub> (ft <sup>3</sup> )	Total Storage				
10	9.8	0.531	5.20	3122	1028	2094				
20	8.3	0.531	4.41	5289	1543	3746				
30	6.9	0.531	3.66	6595	2057	4538				
40	5.8	0.531	3.08	7392	2571	4821				
50	5	0.531	2.66	7965	3085	4880				
60	4.5	0.531	2.39	8602	3599	5003				
70	4	0.531	2.12	8921	4113	4807				
80	3.7	0.531	1.96	9431	4628	4803				
90	3.5	0.531	1.86	10036	5142	4894				
100	3.4	0.531	1.81	10832	5656	5176				
110	3.2	0.531	1.70	11215	6170	5045				

Ralph Hall Detention Pond Storage Calculations					
Elevation	Incr (ft)	Area (ft <sup>2</sup> )	Average Area (ft <sup>2</sup> )	Incremental Storage (ft <sup>3</sup> )	Cumulative Storage (ft <sup>3</sup> )
541.50	0	25	0	0	0
541.75	0.25	104	65	16	16
542.00	0.25	300	202	51	67
542.25	0.25	353	327	82	148
542.50	0.25	724	539	135	283
542.75	0.25	1105	915	229	512
543.00	0.25	1497	1301	325	837
543.25	0.25	1878	1688	422	1259
543.50	0.25	2416	2147	537	1795
543.75	0.25	3458	2937	734	2530
544.00	0.25	4651	4055	1014	3543

Ralph Hall Detention Pond Summary				
Return Period	Q <sub>allow</sub> (cfs)	Required Storage (ft <sup>3</sup> )	Min. Pond Elevation (ft)	Q <sub>released</sub> at Min. Pond Elev. (cfs)