

**STORM DRAINAGE DESIGN
2 YEAR RETURN PERIOD**

TITLE			Job Reference		Revision No.		Calculations by		Date																
Housing Units at Crokers Hill, Kilkenny			18KK003		PL1		EH		23.11.18		k _s = 0.06 Coefficient of Friction For uPVC Pipes (i.e. 375mm or less) k _s = 0.6 Coefficient of Friction For Concrete Pipes (i.e. 450mm or greater)														
			SUBJECT			Drawing No.		Status		Checked by															
Storm Water Drainage Design 2 Year Design Period			C-020		Planning		NP																		
Pipe Section	US MH CL	US MH IL	DS MH IL	Length [m]	Pipe Diameter [mm]	Gradient [1 in...]	Cover to US Soffit [m]	Extra Flows [l/s]	Velocity [m/s]	Time of Flow [min]	Time of Conc. [min]	Rate of Rainfall [mm/hr]	Impervious Areas (m ²) Hard Standing Roof	Cumul. Imperv. Area [m ²]	Percentage Impervious Hard Standing Roof	Prop Capacity Max 90% To Allow For Climate Change (%)	Actual Rate of Flow [L/s]	Allow. Rate of Flow [L/s]	Prop. Velocity [m/s]	Partial Velocity [m/s]	Prop. Velocity AT HALF FULL	Partial Velocity AT HALF FULL			
*	S1.0 to S1.1	58.465	57.200	56.965	38.500	225	164	1.040	0.00	1.26	0.511	4.511	50.00	600	670	2470	100	100	69%	34.3	50.0	1.07	1.35	1.01	1.27
	S1.1 to S1.2	58.870	56.965	56.635	33.000	300	100	1.605	0.00	1.57	0.350	4.861	50.00	450	75	3345	100	100	42%	46.5	111.0	0.95	1.49	1.01	1.59
	S1.2 to S1.3	59.225	56.635	56.245	39.300	300	101	2.290	0.00	1.56	0.419	5.280	50.00	220	110	3675	100	100	46%	51.0	110.6	0.98	1.54	1.01	1.58
	S1.3 to S1.4	57.800	54.235	54.160	7.500	300	100	3.265	0.00	1.57	0.080	5.359	50.00	0	0	6040	100	100	76%	83.9	111.0	1.08	1.70	1.01	1.59
	S1.4 to S1.5	57.300	53.760	53.715	4.500	300	100	3.240	0.00	1.57	0.048	5.327	50.00	0	0	6040	100	100	76%	83.9	111.0	1.08	1.70	1.01	1.59
	S1.5 to Attn	57.065	53.715	53.690	2.500	300	100	3.050	0.00	1.57	0.027	5.354	50.00	0	0	6390	100	100	80%	88.8	111.0	1.09	1.71	1.01	1.59
	Attn to S1.6	57.065	53.590	53.575	1.500	300	100	3.175	2.30	1.57	0.016	5.370	50.00	0	0	6390	100	100	82%	91.1	111.0	1.10	1.72	1.01	1.59
	S1.6 to S1.7	57.000	53.575	53.375	20.000	225	100	3.200	2.30	1.31	0.255	5.625	50.00	0	0	0	100	100	4%	2.3	51.9	0.37	0.49	1.01	1.32
*	S1.7 to S1.8	54.500	53.375	53.090	28.700	225	101	0.900	2.30	1.30	0.368	5.993	50.00	0	0	0	100	100	4%	2.3	51.7	0.38	0.49	1.01	1.31
	S1.8 to S1.9	53.885	52.460	52.180	27.900	225	100	1.200	4.60	1.31	0.355	5.980	50.00	0	0	0	100	100	9%	4.6	52.0	0.59	0.77	1.01	1.32
	S1.9 to S1.9	53.000	51.575	51.275	30.100	225	100	1.200	4.60	1.30	0.385	6.377	50.00	0	0	0	100	100	9%	4.6	51.8	0.59	0.77	1.01	1.32
	S1.10 to S1.11	53.100	49.670	49.375	29.600	225	100	3.205	4.60	1.30	0.378	6.756	50.00	0	0	0	100	100	12%	6.2	51.8	0.68	0.89	1.01	1.32
	S1.11 to S1.12	50.800	47.600	47.325	28.650	225	104	2.975	4.60	1.28	0.373	7.129	50.00	0	0	0	100	100	12%	6.2	50.9	0.68	0.88	1.01	1.29
	S1.12 to S1.13	48.750	45.545	45.260	28.550	225	100	2.980	4.60	1.30	0.365	7.494	50.00	0	0	0	100	100	12%	6.2	51.9	0.68	0.89	1.01	1.32
*	S1.13 to S1.14	46.620	45.260	44.800	45.850	225	100	1.135	4.60	1.31	0.584	8.078	50.00	0	0	0	100	100	12%	6.2	52.0	0.68	0.89	1.01	1.32
	S1.14 to Outfall	46.250	44.800	44.700	6.200	225	62	1.225	4.60	1.66	0.062	8.140	50.00	0	0	0	100	100	9%	6.2	66.1	0.61	1.01	1.01	1.68
*	S2.0 to S2.1	56.140	55.075	54.655	26.000	225	62	0.840	0.00	1.66	0.260	4.260	50.00	0	275	275	100	100	6%	3.8	66.2	0.45	0.75	1.01	1.68
	S2.1 to S2.2	56.140	54.655	54.435	32.000	225	145	1.260	0.00	1.08	0.494	4.754	50.00	370	310	955	100	100	31%	13.3	43.0	0.86	0.93	1.01	1.09
	S2.2 to S1.3	56.720	54.435	54.235	30.150	225	151	2.060	0.00	1.06	0.474	5.228	50.00	140	220	2365	100	100	78%	32.8	42.2	1.09	1.15	1.01	1.07
*	S3.0 to S3.1	54.400	53.135	52.630	50.650	225	100	1.040	0.00	1.30	0.647	4.000	50.00	375	675	1050	100	100	28%	14.6	51.8	0.84	1.10	1.01	1.32
	S3.1 to S3.2	54.500	52.630	52.220	41.000	225	100	1.645	0.00	1.31	0.523	4.523	50.00	350	300	1700	100	100	45%	23.6	51.9	0.98	1.28	1.01	1.32
	S3.2 to S3.3	53.650	51.820	51.760	6.450	225	107	1.605	0.00	1.26	0.085	4.609	50.00	160	0	1860	100	100	52%	25.8	50.1	1.02	1.28	1.01	1.27
	S3.3 to Attn	53.330	51.760	51.725	3.700	225	106	1.345	0.00	1.27	0.049	4.657	50.00	0	0	2210	100	100	61%	30.7	50.5	1.06	1.35	1.01	1.28
	Attn to S3.5	53.330	51.625	51.615	1.050	225	105	1.480	2.30	1.27	0.014	4.671	50.00	0	0	0	100	100	5%	2.3	50.7	0.38	0.49	1.01	1.29
	S3.5 to S1.9	53.150	51.615	51.575	4.000	225	100	1.310	2.30	1.31	0.051	4.722	50.00	0	0	0	100	100	4%	2.3	51.9	0.37	0.49	1.01	1.32
	S4.0 to S4.1	55.190	53.280	52.755	52.600	225	100	1.685	0.00	1.30	0.672	4.000	50.00	0	350	350	100	100	9%	4.9	51.9	0.61	0.79	1.01	1.32
	S4.1 to S4.2	54.800	52.755	52.100	65.500	225	100	1.820	0.00	1.31	0.836	4.836	50.00	375	450	1175	100	100	31%	16.3	51.9	0.87	1.13	1.01	1.32
*	S4.2 to S3.2	53.225	52.100	51.820	29.800	225	106	0.900	0.00	1.27	0.393	5.229	50.00	225	50	1450	100	100	40%	20.1	50.3	0.93	1.18	1.01	1.28
*	S5.0 to S5.1	58.600	57.360	57.265	9.500	225	100	1.015	0.00	1.31	0.121	4.000	50.00	700	500	1200	100	100	32%	16.7	51.9	0.87	1.14	1.01	1.32
*	S5.1 to S1.0	58.600	57.265	57.200	12.850	225	198	1.110	0.00	0.92	0.232	4.232	50.00	0	0	1200	100	100	45%	16.7	36.8	0.98	0.90	1.01	0.93
	S6.0 to S1.1	58.800	57.185	56.965	21.700	225	99	1.390	0.00	1.31	0.275	4.000	50.00	0	350	350	100	100	9%	4.9	52.3	0.60	0.80	1.01	1.33

NOTES: uPVC PIPES ASSUMED AS THE DRAINAGE MATERIAL, PLEASE NOTIFY ENGINEER IF DIFFERENT
 * = CONCRETE PROTECTION WILL BE PROVIDED OVER PIPES

ATTENUATION TANK DESIGN FOR 100 YEAR STORM EVENT

TITLE Crokers Hill, Kilkenny	Job Reference 18KK008	Revision No. P1	Calculations by EH	Date 23/11/2018
	Drawing No. C20	Status Planning	Checked by NP	

Site	Area (m ²)	Area (hectares)	Percentage Drained
Total Site Area	12800	1.28	--
Roof Area	2350	0.2350	95%
Hard Standing /Road Area	2400	0.2400	95%
Lake Area	0	0.0000	--
Open Area	8050	0.8050	5%

Note:
1 hectare = 10,000m²

Allowable Outflow **2** Litres/second/hectare

Rainfall Intensity Records for
Kilkenny

Duration	Rainfall	Intensity	Rainfall	Proposed Runoff	Lake Area Flow	Total Runoff	Allowable Outflow	Storage Req'd
(min)	(mm)	(mm/hr)	(m ³ /ha)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
15	32.0	128.00	320	157	0	157	2	155
30	37.4	74.80	374	184	0	184	5	179
60	43.7	43.70	437	215	0	215	9	206
120	51.0	25.50	510	251	0	251	18	232
240	59.6	14.90	596	293	0	293	37	256
360	65.3	10.88	653	321	0	321	55	266
720	76.3	6.36	763	375	0	375	111	264
1440	89.1	3.71	891	438	0	438	221	217
2880	98.6	2.05	986	485	0	485	442	42

Maximum Storage Volume Required **292** m³ (Including a 10% Provision for Climate Change)

Storage Volume Provided **300** m³ Tank Dimensions (if required)

Width **m**
Length **m**
Depth **m**

Therefore Volume of Storage Tank Provided OK

**ATTENUATION TANK DESIGN
FOR
100 YEAR STORM EVENT**

TITLE Crokers Hill, Kilkenny	Job Reference 18KK008	Revision No. P1	Calculations by EH	Date 23/11/2018
	Drawing No. C20	Status Planning	Checked by NP	

Site	Area (m ²)	Area (hectares)	Percentage Drained
Total Site Area	10500	1.05	--
Roof Area	2225	0.2225	95%
Hard Standing /Road Area	2000	0.2000	95%
Lake Area	0	0.0000	--
Open Area	6275	0.6275	5%

Note:
1 hectare = 10,000m²

Allowable Outflow **2** Litres/second/hectare

Rainfall Intensity Records for
Kilkenny

Duration	Rainfall	Intensity	Rainfall	Proposed Runoff	Lake Area Flow	Total Runoff	Allowable Outflow	Storage Req'd
(min)	(mm)	(mm/hr)	(m ³ /ha)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
15	32.0	128.00	320	138	0	138	2	137
30	37.4	74.80	374	162	0	162	4	158
60	43.7	43.70	437	189	0	189	8	182
120	51.0	25.50	510	221	0	221	15	206
240	59.6	14.90	596	258	0	258	30	228
360	65.3	10.88	653	283	0	283	45	237
720	76.3	6.36	763	330	0	330	91	239
1440	89.1	3.71	891	386	0	386	181	204
2880	98.6	2.05	986	427	0	427	363	64

Maximum Storage Volume Required **263** m³ (Including a 10% Provision for Climate Change)

Storage Volume Provided **270** m³

Tank Dimensions (if required)

Width **m**
Length **m**
Depth **m**

Therefore Volume of Storage Tank Provided OK