

Appendix 3

Appendix 3a- SMAF Volume Calculations

TP108 - GRAPHICAL CALCULATION - SMAF VOLUME

HARRISON GRIERSON

Project:	Beachlands South	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM

Input		
ARI(yr)	95%	event
Design rainfall (mm)	36	(From TR035)

	CN	Ia (mm)
Pervious	74	5
Impervious	98	0

Detention Volume from impervious surfaces

$$V_s = Q_{\text{post}} - Q_{\text{pre}} \quad \text{where}$$

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S}$$

Q = runoff depth (mm)

P = rainfall depth (mm)

S = potential maximum retention after runoff begins

$$S = (1000 / CN - 10) 25.4$$

Output

Q _{pre}	7.99
Q _{post}	31.5
V _s	23.5
Detention = V _s - 5mm	18.5

Appendix 3b– Drainage Network Calculations

Stormwater Catchment -Wetland 1
BEACHLANDS STORMWATER NETWORK
 Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 1	MH17-1 - MH1-19	MH17-1	MH1-19	225	20.80	3.00	0.060	2.04	0.078	0.77	YES	PROPOSED LOTS C1: 55
Line 1	MH1-20 - MH1-19	MH1-20	MH1-19	225	55.97	2.50	0.048	1.88	0.071	0.68	YES	PROPOSED LOTS C1: 54
Line 1	CP1-13 - MH1-18	CP1-13	MH1-18	225	10.06	3.00	0.033	1.51	0.079	0.42	YES	PROPOSED ROADS C1: 12
Line 1	MH1-19 - MH1-18	MH1-19	MH1-18	300	25.30	4.00	0.108	2.17	0.193	0.56	YES	
Line 1	MH1-18 - MH1-17	MH1-18	MH1-17	300	34.96	6.00	0.195	3.54	0.238	0.82	YES	PROPOSED LOTS C1: 53
Line 1	CP1-12 - MH1-16	CP1-12	MH1-16	225	3.82	5.00	0.028	1.89	0.100	0.28	YES	PROPOSED ROADS C1: 63
Line 1	MH1-17 - MH1-16	MH1-17	MH1-16	375	44.48	5.00	0.296	3.69	0.395	0.75	YES	PROPOSED LOTS C1: 126
Line 1	DCP1-11 - MH1-15	DCP1-11	MH1-15	300	17.57	2.00	0.012	1.09	0.133	0.09	YES	PROPOSED ROADS C1: 114
Line 1	DCP1-10 - MH1-15	DCP1-10	MH1-15	300	12.78	3.00	0.009	1.15	0.150	0.06	YES	PROPOSED ROADS C1: 73
Line 1	MH1-16 - MH1-15	MH1-16	MH1-15	525	15.12	2.00	0.324	2.18	0.611	0.53	YES	
Line 1	MH16-1 - MH1-14	MH16-1	MH1-14	300	14.04	1.00	0.061	1.27	0.097	0.63	YES	
Line 1	MH1-15 - MH1-14	MH1-15	MH1-14	525	46.50	2.00	0.381	2.12	0.605	0.63	YES	PROPOSED LOTS C1: 52
Line 1	CP1-9 - MH1-13	CP1-9	MH1-13	300	7.11	5.00	0.025	1.89	0.208	0.12	YES	PROPOSED ROADS C1: 80
Line 1	MH1-14 - MH1-13	MH1-14	MH1-13	525	45.10	2.00	0.570	2.93	0.606	0.94	YES	PROPOSED LOTS C1: 8
Line 1	MH14-1 - MH1-11	MH14-1	MH1-11	450	13.65	2.00	0.138	2.07	0.406	0.34	YES	PROPOSED LOTS C1: 18
Line 1	MH15-1 - MH1-11	MH15-1	MH1-11	525	14.13	1.00	0.130	1.52	0.433	0.30	YES	
Line 1	MH1-13 - MH1-11	MH1-13	MH1-11	600	39.19	2.80	0.594	3.46	1.024	0.58	YES	
Line 1	DCP1-8 - MH1-10	DCP1-8	MH1-10	375	4.81	5.00	0.020	1.70	0.400	0.05	YES	PROPOSED ROADS C1: 65
Line 1	DCP1-7 - MH1-10	DCP1-7	MH1-10	375	10.34	3.00	0.019	1.46	0.317	0.06	YES	PROPOSED ROADS C1: 81
Line 1	MH1-11 - MH1-10	MH1-11	MH1-10	825	30.36	1.20	0.882	2.47	1.575	0.56	YES	PROPOSED LOTS C1: 47
Line 1	MH13-1 - MH1-9	MH13-1	MH1-9	450	12.72	3.00	0.169	2.46	0.497	0.34	YES	
Line 1	MH1-10 - MH1-9	MH1-10	MH1-9	900	7.46	1.00	0.920	2.44	1.804	0.51	YES	
Line 1	MH1-9 - MH1-8	MH1-9	MH1-8	900	37.34	1.00	1.089	1.96	1.815	0.60	YES	
Line 1	MH1-8 - MH1-7	MH1-8	MH1-7	900	14.50	1.00	1.099	1.89	1.802	0.61	YES	PROPOSED LOTS C1: 46
Line 1	CP1-6 - MH1-6	CP1-6	MH1-6	225	5.81	5.00	0.022	1.86	0.100	0.22	YES	PROPOSED ROADS C1: 82
Line 1	CP1-5 - MH1-6	CP1-5	MH1-6	225	10.66	5.00	0.023	1.94	0.100	0.23	YES	PROPOSED ROADS C1: 79
Line 1	MH1-7 - MH1-6	MH1-7	MH1-6	900	13.66	1.00	1.105	2.04	1.811	0.61	YES	PROPOSED LOTS C1: 45
Line 1	DCP1-4 - MH1-5	DCP1-4	MH1-5	300	7.87	5.00	0.028	1.96	0.215	0.13	YES	PROPOSED ROADS C1: 68
Line 1	DCP1-3 - MH1-5	DCP1-3	MH1-5	300	11.17	5.00	0.028	1.99	0.215	0.13	YES	PROPOSED ROADS C1: 77
Line 1	MH1-6 - MH1-5	MH1-6	MH1-5	900	83.89	0.80	1.208	2.17	1.611	0.75	YES	PROPOSED LOTS C1: 7
Line 1	MH12-1 - MH1-4	MH12-1	MH1-4	300	66.19	4.20	0.126	2.89	0.197	0.64	YES	PROPOSED LOTS C1: 50
Line 1	MH1-5 - MH1-4	MH1-5	MH1-4	900	31.86	0.80	1.261	2.21	1.617	0.78	YES	
Line 1	CP1-2 - MH1-3	CP1-2	MH1-3	225	16.70	3.88	0.018	1.68	0.090	0.20	YES	PROPOSED ROADS C1: 99
Line 1	CP1-1 - MH1-3	CP1-1	MH1-3	225	14.39	4.89	0.035	2.16	0.100	0.35	YES	PROPOSED ROADS C1: 100
Line 1	MH6-1 - MH1-3	MH6-1	MH1-3	675	27.98	5.10	0.784	4.50	1.912	0.41	YES	PROPOSED LOTS C1: 26
Line 1	MH1-4 - MH1-3	MH1-4	MH1-3	900	19.64	1.10	1.385	2.84	1.897	0.73	YES	
Line 1	MH 155 - MH1-2	MH 155	MH1-2	525	49.42	1.00	0.241	1.70	0.430	0.56	YES	
Line 1	MH1-3 - MH1-2	MH1-3	MH1-2	1050	62.60	2.40	2.233	2.90	4.213	0.53	YES	PROPOSED LOTS C1: 27
Line 1	MH1-2 - MH1-1	MH1-2	MH1-1	1050	3.26	1.50	2.474	2.89	3.299	0.75	YES	
Line 2	CP2-2 - MH2-2	CP2-2	MH2-2	225	2.33	1.00	0.031	1.08	0.045	0.69	YES	PROPOSED ROADS C1: 134
Line 2	MH2-3 - MH2-2	MH2-3	MH2-2	225	45.15	3.00	0.048	2.00	0.079	0.61	YES	PROPOSED LOTS C1: 42
Line 2	CP2-1 - MH2-1	CP2-1	MH2-1	225	1.38	8.59	0.011	1.69	0.138	0.08	YES	PROPOSED ROADS C1: 58
Line 2	MH3-1 - MH2-1	MH3-1	MH2-1	300	50.28	2.80	0.087	2.26	0.161	0.54	YES	PROPOSED LOTS C1: 43
Line 2	MH2-2 - MH2-1	MH2-2	MH2-1	375	66.51	1.00	0.129	1.67	0.174	0.74	YES	PROPOSED LOTS C1: 144
Line 3	MH3-2 - MH3-1	MH3-2	MH3-1	225	54.99	1.00	0.019	1.07	0.044	0.43	YES	PROPOSED LOTS C1: 3
Line 4	CP4-4 - MH4-3	CP4-4	MH4-3	225	11.66	5.00	0.033	2.13	0.100	0.33	YES	PROPOSED ROADS C1: 112
Line 4	CP4-3 - MH4-3	CP4-3	MH4-3	225	17.32	3.00	0.029	1.73	0.078	0.37	YES	PROPOSED ROADS C1: 123
Line 4	DCP4-2 - MH4-2	DCP4-2	MH4-2	300	13.36	1.00	0.050	1.09	0.096	0.52	YES	PROPOSED ROADS C1: 121
Line 4	DCP4-1 - MH4-2	DCP4-1	MH4-2	300	18.20	1.00	0.039	0.98	0.098	0.40	YES	PROPOSED ROADS C1: 86
Line 4	MH4-3 - MH4-2	MH4-3	MH4-2	300	53.09	1.50	0.062	1.39	0.119	0.52	YES	
Line 4	MH5-1 - MH4-1	MH5-1	MH4-1	375	28.75	1.00	0.111	1.45	0.176	0.63	YES	
Line 4	MH4-2 - MH4-1	MH4-2	MH4-1	375	47.86	1.00	0.150	1.69	0.174	0.86	YES	
Line 5	CP5-4 - MH5-2	CP5-4	MH5-2	225	24.19	1.00	0.031	1.17	0.044	0.70	YES	PROPOSED ROADS C1: 135
Line 5	CP5-3 - MH5-2	CP5-3	MH5-2	225	26.05	1.00	0.014	0.97	0.045	0.31	YES	PROPOSED ROADS C1: 122
Line 5	DCP5-2 - MH5-1	DCP5-2	MH5-1	300	15.59	1.00	0.029	0.94	0.100	0.29	YES	PROPOSED ROADS C1: 117
Line 5	DCP5-1 - MH5-1	DCP5-1	MH5-1	300	10.67	1.00	0.038	1.07	0.097	0.39	YES	PROPOSED ROADS C1: 140
Line 5	MH5-2 - MH5-1	MH5-2	MH5-1	300	22.51	1.00	0.046	1.20	0.098	0.47	YES	
Line 6	CP6-9 - MH6-10	CP6-9	MH6-10	225	9.31	4.00	0.028	1.82	0.090	0.31	YES	PROPOSED ROADS C1: 127
Line 6	CP6-8 - MH6-10	CP6-8	MH6-10	225	14.77	2.00	0.023	1.40	0.062	0.37	YES	PROPOSED ROADS C1: 93
Line 6	CP6-7 - MH6-9	CP6-7	MH6-9	225	3.81	5.00	0.013	1.27	0.100	0.13	YES	PROPOSED ROADS C1: 19
Line 6	MH6-10 - MH6-9	MH6-10	MH6-9	300	59.44	3.00	0.096	2.19	0.168	0.57	YES	PROPOSED LOTS C1: 137
Line 6	MH6-9 - MH6-8	MH6-9	MH6-8	300	27.09	4.00	0.126	2.64	0.194	0.65	YES	PROPOSED LOTS C1: 40

Line 6	CP6-6 - MH6-7	CP6-6	MH6-7	225	11.00	1.00	0.041	1.18	0.046	0.90	YES	PROPOSED ROADS C1: 106
Line 6	CP6-5 - MH6-7	CP6-5	MH6-7	225	16.69	5.00	0.028	2.08	0.100	0.28	YES	PROPOSED ROADS C1: 109
Line 6	MH6-8 - MH6-7	MH6-8	MH6-7	300	22.05	6.00	0.147	3.29	0.237	0.62	YES	PROPOSED LOTS C1: 6
Line 6	CP6-4 - MH6-6	CP6-4	MH6-6	225	5.74	6.00	0.012	1.71	0.109	0.11	YES	PROPOSED ROADS C1: 62
Line 6	MH10-1 - MH6-6	MH10-1	MH6-6	375	34.51	1.00	0.123	1.47	0.176	0.70	YES	
Line 6	MH6-7 - MH6-6	MH6-7	MH6-6	375	20.31	6.00	0.229	3.02	0.432	0.53	YES	PROPOSED LOTS C1: 39
Line 6	CP6-3 - MH6-5	CP6-3	MH6-5	225	8.48	4.00	0.035	1.94	0.090	0.39	YES	PROPOSED ROADS C1: 141
Line 6	MH6-6 - MH6-5	MH6-6	MH6-5	450	64.22	2.80	0.409	3.20	0.476	0.86	YES	PROPOSED LOTS C1: 35
Line 6	MH6-5 - MH6-4	MH6-5	MH6-4	525	17.96	3.00	0.453	2.84	0.743	0.61	YES	PROPOSED LOTS C1: 38
Line 6	CP6-2 - MH6-3	CP6-2	MH6-3	225	4.79	5.00	0.028	1.93	0.100	0.28	YES	PROPOSED ROADS C1: 1
Line 6	MH9-1 - MH6-3	MH9-1	MH6-3	300	84.27	1.00	0.083	1.50	0.097	0.86	YES	PROPOSED LOTS C1: 37
Line 6	CP6-1 - MH6-3	CP6-1	MH6-3	300	8.49	5.00	0.021	1.82	0.210	0.10	YES	PROPOSED ROADS C1: 142
Line 6	MH6-4 - MH6-3	MH6-4	MH6-3	525	28.76	3.00	0.461	2.60	0.744	0.62	YES	PROPOSED LOTS C1: 36
Line 6	MH6-3 - MH6-2	MH6-3	MH6-2	525	28.33	3.00	0.610	3.42	0.744	0.82	YES	PROPOSED LOTS C1: 31
Line 6	MH7-1 - MH6-1	MH7-1	MH6-1	375	33.59	1.00	0.129	1.64	0.177	0.73	YES	
Line 6	MH6-2 - MH6-1	MH6-2	MH6-1	525	42.81	6.50	0.637	4.89	1.098	0.58	YES	PROPOSED LOTS C1: 29
Line 7	CP7-2 - MH7-3	CP7-2	MH7-3	225	4.98	5.03	0.020	0.95	0.100	0.20	YES	PROPOSED ROADS C1: 59

Stormwater Catchment -Wetland 2
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
T years	10
Rainfall Depth (mm)	136

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Prepared by: ENW

Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 160	CP160-6 - MH160-8	CP160-6	MH160-8	225	9.57	1.56	0.007	0.890	0.054	0.13	YES	PROPOSED ROADS Ct: 34
Line 160	MH160-8 - MH160-7	MH160-8	MH160-7	375	16.21	1.00	0.103	1.530	0.175	0.59	YES	PROPOSED LOTS Ct: 5
Line 160	MH160-7 - MH160-6	MH160-7	MH160-6	450	54.18	1.00	0.152	1.470	0.287	0.53	YES	PROPOSED LOTS Ct: 3
Line 160	CP160-5 - MH160-6	CP160-5	MH160-6	225	3.28	9.66	0.033	2.480	0.138	0.24	YES	PROPOSED ROADS Ct: 26
Line 160	MH160-6 - MH160-5	MH160-6	MH160-5	450	13.69	1.50	0.185	1.410	0.349	0.53	YES	
Line 160	MH160-5 - MH160-4	MH160-5	MH160-4	450	73.09	1.50	0.324	2.620	0.348	0.93	YES	PROPOSED LOTS Ct: 15
Line 160	CP160-4 - MH160-4	CP160-4	MH160-4	225	3.20	20.90	0.025	3.120	0.208	0.12	YES	PROPOSED ROADS Ct: 14
Line 160	MH160-4 - MH160-3	MH160-4	MH160-3	450	12.18	7.00	0.349	3.060	0.759	0.46	YES	
Line 160	CP160-3 - MH160-3	CP160-3	MH160-3	225	3.21	10.95	0.029	2.520	0.153	0.19	YES	PROPOSED ROADS Ct: 13
Line 160	MH166-1 - MH160-3	MH166-1	MH160-3	375	90.22	3.50	0.188	2.640	0.330	0.57	YES	PROPOSED LOTS Ct: 28
Line 160	MH167-1 - MH160-3	MH167-1	MH160-3	225	28.03	7.00	0.073	3.020	0.118	0.62	YES	
Line 160	MH160-3 - MH160-2	MH160-3	MH160-2	450	69.69	7.00	0.638	4.790	0.760	0.84	YES	
Line 160	CP160-2 - MH160-2	CP160-2	MH160-2	225	12.55	7.85	0.021	2.250	0.131	0.16	YES	PROPOSED ROADS Ct: 16
Line 160	CP160-1 - MH160-2	CP160-1	MH160-2	225	5.39	10.67	0.036	2.750	0.150	0.24	YES	PROPOSED ROADS Ct: 27
Line 160	MH165-1 - MH160-2	MH165-1	MH160-2	525	12.20	4.00	0.224	1.770	0.862	0.26	YES	
Line 160	MH160-2 - MH160-1	MH160-2	MH160-1	600	15.68	4.00	0.919	3.930	1.225	0.75	YES	
Line 160	MH162-1 - MH160-1	MH162-1	MH160-1	675	16.96	1.00	0.116	1.200	0.829	0.14	YES	
Line 160	MH161-1 - MH160-1	MH161-1	MH160-1	450	9.50	7.00	0.410	3.990	0.759	0.54	YES	
Line 160	MH160-1 - Outlet160-0	MH160-1	Outlet160-0	1050	22.25	0.40	1.445	2.140	1.720	0.84	YES	
Line 161	MH161-5 - MH161-4	MH161-5	MH161-4	450	35.75	3.00	0.117	1.520	0.488	0.24	YES	PROPOSED LOTS Ct: 2
Line 161	MH161-4 - MH161-3	MH161-4	MH161-3	450	59.94	3.00	0.337	2.940	0.496	0.68	YES	PROPOSED LOTS Ct: 25
Line 161	MH161-3 - MH161-2	MH161-3	MH161-2	450	41.55	2.60	0.337	2.810	0.462	0.73	YES	
Line 161	MH161-2 - MH161-1	MH161-2	MH161-1	450	73.43	3.50	0.411	3.430	0.534	0.77	YES	PROPOSED LOTS Ct: 23
Line 162	MH162-3 - MH162-2	MH162-3	MH162-2	225	10.00	3.00	0.017	1.370	0.077	0.22	YES	PROPOSED LOTS Ct: 29
Line 162	MH163-1 - MH162-2	MH163-1	MH162-2	225	8.59	1.00	0.018	1.000	0.045	0.40	YES	PROPOSED LOTS Ct: 32
Line 162	MH162-2 - MH162-1	MH162-2	MH162-1	300	33.69	1.00	0.053	1.340	0.098	0.54	YES	PROPOSED LOTS Ct: 33
Line 162	MH164-1 - MH162-1	MH164-1	MH162-1	225	20.64	1.80	0.026	1.410	0.059	0.44	YES	PROPOSED LOTS Ct: 30
Line 162	DCP162-1 - MH162-1	DCP162-1	MH162-1	375	21.94	1.58	0.038	1.430	0.224	0.17	YES	PROPOSED ROADS Ct: 18
Line 164	MH164-2 - MH164-1	MH164-2	MH164-1	225	9.01	2.00	0.017	1.010	0.063	0.27	YES	PROPOSED LOTS Ct: 31
Line 165	MH165-5 - MH165-4	MH165-5	MH165-4	225	36.71	7.00	0.042	2.650	0.120	0.35	YES	PROPOSED LOTS Ct: 6
Line 165	MH165-4 - MH165-3	MH165-4	MH165-3	225	14.14	7.00	0.042	1.930	0.120	0.35	YES	
Line 165	CP165-3 - MH165-3	CP165-3	MH165-3	225	6.87	9.63	0.037	2.710	0.142	0.26	YES	PROPOSED ROADS Ct: 8
Line 165	MH165-3 - MH165-2	MH165-3	MH165-2	225	19.77	7.00	0.079	3.020	0.120	0.66	YES	
Line 165	MH165-2 - MH165-1	MH165-2	MH165-1	450	80.58	1.00	0.177	1.830	0.285	0.62	YES	PROPOSED LOTS Ct: 24
Line 165	CP165-2 - MH165-1	CP165-2	MH165-1	225	4.06	5.64	0.026	1.970	0.104	0.25	YES	PROPOSED ROADS Ct: 20
Line 165	CP165-1 - MH165-1	CP165-1	MH165-1	225	7.08	8.86	0.021	2.290	0.140	0.15	YES	PROPOSED ROADS Ct: 10
Line 167	MH167-2 - MH167-1	MH167-2	MH167-1	225	49.93	7.00	0.031	2.480	0.119	0.26	YES	PROPOSED LOTS Ct: 11
Line 167	CP167-2 - MH167-1	CP167-2	MH167-1	225	5.67	10.56	0.020	2.400	0.143	0.14	YES	PROPOSED ROADS Ct: 22
Line 167	CP167-1 - MH167-1	CP167-1	MH167-1	225	9.36	5.87	0.022	2.020	0.110	0.20	YES	PROPOSED ROADS Ct: 19
Line 168	SD168-1 - Outlet168-0	SD168-1	Outlet168-0	1050	55.55	8.70	1.739	5.710	7.905	0.22	YES	

Stormwater Catchment
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

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Line 70	CP70-13 - MH70-16	CP70-13	MH70-16	225	4.70	5.16	0.021	1.170	0.100	0.21	YES	PROPOSED ROADS C1: 32
Line 70	CP70-12 - MH70-16	CP70-12	MH70-16	225	9.47	2.28	0.013	0.760	0.072	0.18	YES	PROPOSED ROADS C1: 16
Line 70	MH70-16 - MH70-15	MH70-16	MH70-15	225	29.32	2.50	0.043	1.500	0.072	0.60	YES	PROPOSED LOTS C1: 28
Line 70	MH70-15 - MH70-14	MH70-15	MH70-14	225	35.76	2.90	0.071	2.090	0.076	0.93	YES	PROPOSED LOTS C1: 2
Line 70	MH70-14 - MH70-13	MH70-14	MH70-13	300	19.63	1.00	0.071	1.370	0.096	0.74	YES	
Line 70	DCP70-11 - MH70-13	DCP70-11	MH70-13	300	16.58	1.97	0.023	0.940	0.135	0.17	YES	PROPOSED ROADS C1: 19
Line 70	DCP70-10 - MH70-13	DCP70-10	MH70-13	300	12.11	2.59	0.022	0.990	0.157	0.14	YES	PROPOSED ROADS C1: 30
Line 70	MH78-1 - MH70-13	MH78-1	MH70-13	225	12.59	3.00	0.010	1.130	0.077	0.13	YES	
Line 70	MH70-13 - MH70-12	MH70-13	MH70-12	375	31.93	1.00	0.138	1.660	0.177	0.78	YES	PROPOSED LOTS C1: 3
Line 70	CP70-9 - MH70-12	CP70-9	MH70-12	225	11.53	4.38	0.028	1.940	0.093	0.30	YES	PROPOSED ROADS C1: 25
Line 70	MH70-12 - MH70-11	MH70-12	MH70-11	450	63.60	2.65	0.216	2.590	0.460	0.47	YES	PROPOSED LOTS C1: 4
Line 70	CP70-7 - MH70-11	CP70-7	MH70-11	225	10.72	0.77	0.026	0.980	0.040	0.65	YES	PROPOSED ROADS C1: 27
Line 70	CP70-8 - MH70-11	CP70-8	MH70-11	225	5.21	1.77	0.031	1.350	0.061	0.51	YES	PROPOSED ROADS C1: 13
Line 70	MH70-11 - MH70-10	MH70-11	MH70-10	450	26.39	3.00	0.285	2.830	0.491	0.58	YES	PROPOSED LOTS C1: 5
Line 70	MH77-1 - MH70-10	MH77-1	MH70-10	375	33.48	1.00	0.119	1.620	0.175	0.68	YES	
Line 70	MH70-10 - MH70-9	MH70-10	MH70-9	600	62.64	1.00	0.452	2.010	0.611	0.74	YES	PROPOSED LOTS C1: 21
Line 70	MH70-9 - MH70-8	MH70-9	MH70-8	600	16.50	1.00	0.452	2.120	0.611	0.74	YES	
Line 70	CP70-6 - MH70-8	CP70-6	MH70-8	225	15.85	4.85	0.024	1.970	0.100	0.24	YES	PROPOSED ROADS C1: 15
Line 70	CP70-5 - MH70-8	CP70-5	MH70-8	225	11.63	6.62	0.033	2.380	0.114	0.29	YES	PROPOSED ROADS C1: 6
Line 70	MH70-8 - MH70-7	MH70-8	MH70-7	600	68.53	4.70	0.508	3.390	1.337	0.38	YES	
Line 70	CP70-4 - MH70-7	CP70-4	MH70-7	225	6.64	8.23	0.030	2.420	0.130	0.23	YES	PROPOSED ROADS C1: 14
Line 70	CP70-3 - MH70-7	CP70-3	MH70-7	225	14.88	3.41	0.022	1.690	0.081	0.27	YES	PROPOSED ROADS C1: 18
Line 70	MH70-7 - MH70-6	MH70-7	MH70-6	675	14.93	2.00	0.559	2.190	1.189	0.47	YES	
Line 70	DCP70-1 - MH70-6	DCP70-1	MH70-6	300	21.76	1.79	0.009	1.010	0.129	0.07	YES	PROPOSED ROADS C1: 38
Line 70	DCP70-2 - MH70-6	DCP70-2	MH70-6	300	16.16	2.41	0.018	1.370	0.150	0.12	YES	PROPOSED ROADS C1: 40
Line 70	MH70-6 - MH70-5	MH70-6	MH70-5	675	76.96	1.00	0.585	2.110	0.836	0.70	YES	
Line 70	MH70-5 - MH70-4	MH70-5	MH70-4	675	8.81	1.00	0.585	2.230	0.836	0.70	YES	
Line 70	MH76-1 - MH70-4	MH76-1	MH70-4	300	11.21	1.00	0.063	1.340	0.097	0.65	YES	
Line 70	MH70-4 - MH70-3	MH70-4	MH70-3	675	23.18	2.50	0.647	3.020	1.320	0.49	YES	
Line 70	MH70-3 - MH70-2	MH70-3	MH70-2	750	14.19	2.50	0.798	3.110	1.773	0.45	YES	PROPOSED LOTS C1: 7
Line 70	MH73-1 - MH70-2	MH73-1	MH70-2	600	32.60	1.00	0.308	1.980	0.616	0.50	YES	
Line 70	MH71-1 - MH70-1	MH71-1	MH70-1	1050	7.21	1.00	1.664	1.980	2.728	0.61	YES	
Line 70	MH70-1 - Outlet70-0	MH70-1	Outlet70-0	1050	13.96	0.50	1.664	2.270	1.935	0.86	YES	
Line 71	MH71-2 - MH71-1	MH71-2	MH71-1	450	62.38	0.50	0.043	0.860	0.205	0.21	YES	PROPOSED LOTS C1: 17
Line 71	MH72-1 - MH71-1	MH72-1	MH71-1	750	14.52	2.00	0.431	2.010	1.596	0.27	YES	PROPOSED SCHOOL: 29
Line 71	MH70-2 - MH71-1	MH70-2	MH71-1	1050	32.04	1.00	1.107	1.380	2.700	0.41	YES	
Line 71	DCP71-2 - MH71-1	DCP71-2	MH71-1	300	13.87	2.66	0.056	1.840	0.156	0.36	YES	PROPOSED ROADS C1: 31
Line 71	DCP71-1 - MH71-1	DCP71-1	MH71-1	300	9.60	2.27	0.038	1.540	0.146	0.26	YES	PROPOSED ROADS C1: 33
Line 73	MH73-8 - MH73-7	MH73-8	MH73-7	225	27.30	1.50	0.028	1.340	0.055	0.51	YES	PROPOSED LOTS C1: 42
Line 73	CP73-3 - MH73-7	CP73-3	MH73-7	225	2.57	15.52	0.014	2.130	0.175	0.08	YES	PROPOSED ROADS C1: 39
Line 73	MH69-1 - MH73-7	MH69-1	MH73-7	225	24.73	1.50	0.018	1.150	0.055	0.33	YES	PROPOSED LOTS C1: 41
Line 73	MH73-7 - MH73-6	MH73-7	MH73-6	375	42.40	0.60	0.102	1.320	0.136	0.75	YES	PROPOSED LOTS C1: 10
Line 73	MH75-1 - MH73-6	MH75-1	MH73-6	225	9.77	3.80	0.027	1.820	0.087	0.31	YES	PROPOSED LOTS C1: 23
Line 73	MH73-6 - MH73-5	MH73-6	MH73-5	450	20.43	0.80	0.143	1.340	0.255	0.56	YES	PROPOSED LOTS C1: 1
Line 73	MH73-5 - MH73-4	MH73-5	MH73-4	450	18.54	0.80	0.155	1.560	0.254	0.61	YES	PROPOSED LOTS C1: 8
Line 73	MH74-1 - MH73-4	MH74-1	MH73-4	300	23.41	1.20	0.076	1.540	0.106	0.72	YES	
Line 73	MH73-4 - MH73-3	MH73-4	MH73-3	525	35.05	1.00	0.231	1.670	0.428	0.54	YES	
Line 73	MH73-3 - MH73-2	MH73-3	MH73-2	525	15.76	1.00	0.231	1.710	0.428	0.54	YES	
Line 73	MH73-2 - MH73-1	MH73-2	MH73-1	525	42.20	1.00	0.231	1.910	0.428	0.54	YES	
Line 73	DCP73-2 - MH73-1	DCP73-2	MH73-1	300	12.19	2.16	0.032	1.530	0.139	0.23	YES	PROPOSED ROADS C1: 35
Line 73	DCP73-1 - MH73-1	DCP73-1	MH73-1	300	6.88	1.83	0.047	1.520	0.131	0.36	YES	PROPOSED ROADS C1: 11
Line 74	DCP74-2 - MH74-2	DCP74-2	MH74-2	300	7.61	1.77	0.042	0.940	0.131	0.32	YES	PROPOSED ROADS C1: 43
Line 74	DCP74-1 - MH74-2	DCP74-1	MH74-2	300	14.78	1.00	0.034	0.810	0.094	0.36	YES	PROPOSED ROADS C1: 34
Line 74	MH74-2 - MH74-1	MH74-2	MH74-1	300	33.18	1.00	0.076	1.440	0.097	0.78	YES	
Line 75	CP75-1 - MH75-1	CP75-1	MH75-1	225	2.92	17.29	0.012	1.200	0.200	0.06	YES	PROPOSED ROADS C1: 9
Line 76	DCP76-1 - MH76-1	DCP76-1	MH76-1	300	9.64	3.02	0.042	1.100	0.168	0.25	YES	PROPOSED ROADS C1: 12
Line 76	DCP76-2 - MH76-1	DCP76-2	MH76-1	300	13.58	1.00	0.021	0.600	0.095	0.22	YES	PROPOSED ROADS C1: 36
Line 77	MH77-3 - MH77-2	MH77-3	MH77-2	300	45.04	2.00	0.071	1.860	0.137	0.52	YES	PROPOSED LOTS C1: 26
Line 77	MH77-2 - MH77-1	MH77-2	MH77-1	300	49.57	2.00	0.071	1.780	0.137	0.52	YES	
Line 77	CP77-1 - MH77-1	CP77-1	MH77-1	300	2.52	13.00	0.049	2.200	0.350	0.14	YES	PROPOSED ROADS C1: 24
Line 78	CP78-1 - MH78-1	CP78-1	MH78-1	225	5.32	6.04	0.010	1.450	0.111	0.09	YES	PROPOSED ROADS C1: 22
Line 79	SD79-1 - Outlet79-0	SD79-1	Outlet79-0	1050	62.63	0.60	1.784	2.530	2.124	0.84	YES	

Stormwater Catchment -Wetland 4
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
t years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 210	MH210-20 - MH210-19	MH210-20	MH210-19	600	32.47	3.00	0.719	3.09	1.057	0.68	YES	PROPOSED APARTMENT C1: 193
Line 210	MH210-19 - MH210-18	MH210-19	MH210-18	675	5.60	3.20	0.719	2.36	1.498	0.48	YES	
Line 210	MH227-1 - MH210-18	MH227-1	MH210-18	300	16.41	2.00	0.023	1.31	0.135	0.17	YES	PROPOSED LOTS C1: 202
Line 210	CP210-9 - MH210-17	CP210-9	MH210-17	225	3.72	1.00	0.013	0.91	0.043	0.30	YES	PROPOSED ROADS C1: 2
Line 210	MH210-18 - MH210-17	MH210-18	MH210-17	675	27.56	1.70	0.766	2.83	1.094	0.70	YES	PROPOSED LOTS C1: 1
Line 210	CP210-8 - MH210-16	CP210-8	MH210-16	225	4.93	12.55	0.015	2.34	0.167	0.09	YES	PROPOSED ROADS C1: 3
Line 210	MH210-17 - MH210-16	MH210-17	MH210-16	675	59.76	2.30	0.827	3.37	1.272	0.65	YES	PROPOSED LOTS C1: 4
Line 210	MH226-1 - MH210-16	MH226-1	MH210-16	225	28.74	7.00	0.025	2.31	0.119	0.21	YES	PROPOSED LOTS C1: 232
Line 210	CP210-7 - MH210-15	CP210-7	MH210-15	225	3.24	3.47	0.016	1.44	0.080	0.20	YES	PROPOSED ROADS C1: 97
Line 210	MH210-16 - MH210-15	MH210-16	MH210-15	675	30.18	3.70	0.891	3.74	1.620	0.55	YES	PROPOSED LOTS C1: 96
Line 210	MH225-1 - MH210-15	MH225-1	MH210-15	300	54.51	2.50	0.115	2.30	0.153	0.75	YES	PROPOSED LOTS C1: 98
Line 210	MH210-15 - MH210-14	MH210-15	MH210-14	750	35.45	2.80	1.022	2.55	1.858	0.55	YES	
Line 210	DCP210-5 - MH210-14	DCP210-5	MH210-14	300	13.04	1.83	0.022	1.16	0.129	0.17	YES	PROPOSED ROADS C1: 239
Line 210	DCP210-6 - MH210-14	DCP210-6	MH210-14	300	8.81	1.00	0.022	1.00	0.096	0.23	YES	PROPOSED ROADS C1: 102
Line 210	CP210-4 - MH210-13	CP210-4	MH210-13	225	13.08	2.48	0.034	1.65	0.072	0.47	YES	PROPOSED ROADS C1: 159
Line 210	MH210-14 - MH210-13	MH210-14	MH210-13	750	17.01	1.00	1.065	2.45	1.109	0.96	YES	
Line 210	MH224-1 - MH210-13	MH224-1	MH210-13	225	33.67	6.50	0.028	2.33	0.117	0.24	YES	PROPOSED LOTS C1: 45
Line 210	CP210-3 - MH210-12	CP210-3	MH210-12	225	5.84	7.85	0.018	2.09	0.129	0.14	YES	PROPOSED ROADS C1: 157
Line 210	MH210-13 - MH210-12	MH210-13	MH210-12	750	13.68	1.70	1.135	2.97	1.455	0.78	YES	PROPOSED LOTS C1: 44
Line 210	MH210-12 - MH210-11	MH210-12	MH210-11	750	11.83	5.00	1.153	3.58	2.507	0.46	YES	
Line 210	MH210-11 - MH210-10	MH210-11	MH210-10	750	24.49	4.00	1.153	3.28	2.217	0.52	YES	
Line 210	MH210-10 - MH210-9	MH210-10	MH210-9	750	28.62	2.00	1.153	3.14	1.579	0.73	YES	
Line 210	MH210-9 - MH210-8	MH210-9	MH210-8	750	15.67	3.20	1.153	3.96	1.988	0.58	YES	
Line 210	DCP210-2 - MH210-8	DCP210-2	MH210-8	300	9.68	1.95	0.023	1.33	0.135	0.17	YES	PROPOSED ROADS C1: 155
Line 210	MH210-8 - MH210-7	MH210-8	MH210-7	750	32.18	6.50	1.175	4.74	2.866	0.41	YES	
Line 210	MH210-7 - MH210-6	MH210-7	MH210-6	750	14.04	8.00	1.175	4.53	3.176	0.37	YES	
Line 210	CP210-1 - MH210-5	CP210-1	MH210-5	225	5.23	1.00	0.022	1.02	0.046	0.48	YES	PROPOSED ROADS C1: 151
Line 210	MH210-6 - MH210-5	MH210-6	MH210-5	750	14.78	8.00	1.175	4.54	3.176	0.37	YES	
Line 210	MH210-5 - MH210-4	MH210-5	MH210-4	750	14.80	8.00	1.196	4.90	3.147	0.38	YES	
Line 210	MH211-1 - MH210-3	MH211-1	MH210-3	1,050	26.86	1.00	1.914	3.00	2.734	0.70	YES	PROPOSED LOTS C1: 204
Line 210	MH210-4 - MH210-3	MH210-4	MH210-3	750	28.61	8.00	1.196	5.87	3.147	0.38	YES	
Line 210	MH210-3 - MH210-2	MH210-3	MH210-2	1,200	46.72	4.00	3.130	4.19	7.825	0.40	YES	PROPOSED LOTS C1: 242
Line 210	MH223-1 - MH210-1	MH223-1	MH210-1	750	78.43	6.90	1.112	5.06	2.926	0.38	YES	
Line 210	MH210-2 - MH210-1	MH210-2	MH210-1	1,200	26.14	3.80	3.331	3.29	7.570	0.44	YES	PROPOSED LOTS C1: 195
Line 210	MH210-1 - Outlet210-0	MH210-1	Outlet210-0	1,350	23.26	0.80	4.428	3.32	4.761	0.93	YES	
Line 211	CP211-8 - MH211-11	CP211-8	MH211-11	225	9.88	1.00	0.027	1.10	0.045	0.60	YES	PROPOSED ROADS C1: 149
Line 211	MH211-11 - MH211-10	MH211-11	MH211-10	300	19.42	1.00	0.027	1.11	0.096	0.28	YES	
Line 211	CP211-7 - MH211-9	CP211-7	MH211-9	225	3.87	2.43	0.019	1.33	0.070	0.27	YES	PROPOSED ROADS C1: 137
Line 211	MH211-10 - MH211-9	MH211-10	MH211-9	450	37.43	1.40	0.189	2.06	0.338	0.56	YES	PROPOSED LOTS C1: 50
Line 211	MH211-9 - MH211-8	MH211-9	MH211-8	525	11.81	2.70	0.208	1.90	0.717	0.29	YES	
Line 211	DCP211-6 - MH211-8	DCP211-6	MH211-8	225	12.99	1.00	0.017	1.00	0.046	0.37	YES	PROPOSED ROADS C1: 49
Line 211	DCP211-5 - MH211-8	DCP211-5	MH211-8	225	9.95	1.00	0.018	1.01	0.045	0.40	YES	PROPOSED ROADS C1: 134
Line 211	MH219-1 - MH211-8	MH219-1	MH211-8	300	24.45	2.50	0.093	2.14	0.152	0.61	YES	
Line 211	CP211-4 - MH211-7	CP211-4	MH211-7	225	9.73	1.00	0.021	1.04	0.046	0.46	YES	PROPOSED ROADS C1: 138
Line 211	MH211-8 - MH211-7	MH211-8	MH211-7	600	17.01	1.20	0.346	2.23	0.678	0.51	YES	PROPOSED LOTS C1: 41
Line 211	CP211-3 - MH211-6	CP211-3	MH211-6	225	6.64	2.71	0.015	1.34	0.075	0.20	YES	PROPOSED ROADS C1: 139
Line 211	MH211-7 - MH211-6	MH211-7	MH211-6	600	40.34	2.70	0.396	2.84	1.015	0.39	YES	PROPOSED LOTS C1: 40
Line 211	DCP211-2 - MH211-5	DCP211-2	MH211-5	300	12.69	2.41	0.021	1.43	0.150	0.14	YES	PROPOSED ROADS C1: 133
Line 211	DCP211-1 - MH211-5	DCP211-1	MH211-5	300	8.08	4.60	0.023	1.82	0.209	0.11	YES	PROPOSED ROADS C1: 84
Line 211	MH217-1 - MH211-5	MH217-1	MH211-5	825	26.19	6.80	1.354	5.59	3.761	0.36	YES	PROPOSED LOTS C1: 246
Line 211	MH211-6 - MH211-5	MH211-6	MH211-5	600	12.28	3.71	0.410	3.24	1.171	0.35	YES	
Line 211	MH211-5 - MH211-4	MH211-5	MH211-4	1,050	33.30	5.80	1.798	3.49	6.659	0.27	YES	
Line 211	MH211-4 - MH211-3	MH211-4	MH211-3	1,050	15.52	2.30	1.798	2.65	4.181	0.43	YES	
Line 211	MH211-3 - MH211-2	MH211-3	MH211-2	1,050	65.96	1.00	1.852	2.66	2.724	0.68	YES	PROPOSED LOTS C1: 165
Line 211	MH211-2 - MH211-1	MH211-2	MH211-1	1,050	58.58	1.00	1.897	2.67	2.749	0.69	YES	PROPOSED LOTS C1: 213
Line 212	CP212-8 - MH212-10	CP212-8	MH212-10	225	10.49	1.00	0.021	1.05	0.045	0.47	YES	PROPOSED ROADS C1: 140
Line 212	MH212-11 - MH212-10	MH212-11	MH212-10	225	14.19	3.00	0.019	1.53	0.079	0.24	YES	PROPOSED LOTS C1: 91
Line 212	CP212-7 - MH212-9	CP212-7	MH212-9	225	4.80	3.42	0.018	1.52	0.082	0.22	YES	PROPOSED ROADS C1: 141
Line 212	MH212-10 - MH212-9	MH212-10	MH212-9	300	21.88	1.30	0.049	1.32	0.111	0.44	YES	PROPOSED LOTS C1: 243
Line 212	MH215-1 - MH212-8	MH215-1	MH212-8	525	32.87	1.80	0.372	2.45	0.581	0.64	YES	PROPOSED LOTS C1: 76
Line 212	DCP212-6 - MH212-8	DCP212-6	MH212-8	225	12.21	1.00	0.023	1.07	0.046	0.50	YES	PROPOSED ROADS C1: 89
Line 212	DCP212-5 - MH212-8	DCP212-5	MH212-8	375	7.93	1.00	0.024	1.03	0.171	0.14	YES	PROPOSED ROADS C1: 130

Line 212	MH212-9 - MH212-8	MH212-9	MH212-8		300	11.30	2.50	0.067	1.91	0.152	0.44	YES	
Line 212	MH214-1 - MH212-7	MH214-1	MH212-7		900	27.08	6.50	1.961	5.93	4.669	0.42	YES	PROPOSED LOTS C1: 230
Line 212	CP212-4 - MH212-7	CP212-4	MH212-7		225	6.57	5.34	0.022	1.92	0.105	0.21	YES	PROPOSED ROADS C1: 126
Line 212	CP212-3 - MH212-7	CP212-3	MH212-7		225	11.67	1.40	0.020	1.17	0.053	0.38	YES	PROPOSED ROADS C1: 206
Line 212	MH212-8 - MH212-7	MH212-8	MH212-7		600	60.71	1.20	0.485	2.44	0.674	0.72	YES	
Line 212	DCP212-1 - MH212-6	DCP212-1	MH212-6		300	11.57	1.00	0.023	1.06	0.096	0.24	YES	PROPOSED ROADS C1: 136
Line 212	DCP212-2 - MH212-6	DCP212-2	MH212-6		300	14.67	1.00	0.018	0.99	0.100	0.18	YES	PROPOSED ROADS C1: 142
Line 212	MH212-7 - MH212-6	MH212-7	MH212-6		1200	13.72	5.50	2.468	4.71	9.141	0.27	YES	
Line 212	MH212-6 - MH212-5	MH212-6	MH212-5		1200	34.04	6.00	2.507	3.97	9.642	0.26	YES	
Line 212	MH212-5 - MH212-4	MH212-5	MH212-4		1200	12.20	4.80	2.507	2.79	8.645	0.29	YES	
Line 212	MH213-1 - MH212-4	MH213-1	MH212-4		525	32.43	2.25	0.301	2.71	0.640	0.47	YES	
Line 212	MH212-4 - MH212-3	MH212-4	MH212-3		1200	116.40	0.80	2.896	2.93	3.489	0.83	YES	PROPOSED LOTS C1: 173
Line 212	MH212-3 - MH212-2	MH212-3	MH212-2		1200	135.39	0.80	2.890	2.83	3.482	0.83	YES	
Line 212	MH212-2 - MH212-1	MH212-2	MH212-1		1200	76.75	0.80	2.882	2.74	3.472	0.83	YES	
Line 212	MH212-1 - Outlet212-0	MH212-1	Outlet212-0		1200	27.20	0.80	2.882	3.05	3.472	0.83	YES	
Line 213	CP213-6 - MH213-4	CP213-6	MH213-4		300	11.01	1.00	0.026	1.08	0.096	0.27	YES	PROPOSED ROADS C1: 174
Line 213	CP213-5 - MH213-4	CP213-5	MH213-4		300	14.88	1.00	0.023	1.04	0.096	0.24	YES	PROPOSED ROADS C1: 179
Line 213	MH213-4 - MH213-3	MH213-4	MH213-3		450	62.83	1.00	0.166	1.92	0.286	0.58	YES	PROPOSED LOTS C1: 205
Line 213	CP213-4 - MH213-2	CP213-4	MH213-2		225	9.43	1.00	0.024	1.07	0.044	0.54	YES	PROPOSED ROADS C1: 196
Line 213	CP213-3 - MH213-2	CP213-3	MH213-2		225	13.44	1.00	0.021	1.05	0.045	0.47	YES	PROPOSED ROADS C1: 188
Line 213	MH213-3 - MH213-2	MH213-3	MH213-2		450	22.76	2.26	0.166	2.03	0.426	0.39	YES	
Line 213	DCP213-2 - MH213-1	DCP213-2	MH213-1		300	10.26	1.00	0.033	1.16	0.097	0.34	YES	PROPOSED ROADS C1: 178
Line 213	DCP213-1 - MH213-1	DCP213-1	MH213-1		225	13.91	1.00	0.032	1.15	0.045	0.71	YES	PROPOSED ROADS C1: 197
Line 213	MH213-2 - MH213-1	MH213-2	MH213-1		450	36.38	2.89	0.237	2.85	0.484	0.49	YES	PROPOSED LOTS C1: 187
Line 214	MH214-31 - MH214-30	MH214-31	MH214-30		225	30.83	3.00	0.019	1.42	0.079	0.24	YES	PROPOSED LOTS C1: 19
Line 214	CP214-35 - MH214-30	CP214-35	MH214-30		225	7.70	4.89	0.013	1.62	0.100	0.13	YES	PROPOSED ROADS C1: 114
Line 214	CP214-34 - MH214-30	CP214-34	MH214-30		225	12.50	2.94	0.014	1.42	0.074	0.19	YES	PROPOSED ROADS C1: 223
Line 214	CP214-33 - MH214-29	CP214-33	MH214-29		225	4.55	1.00	0.019	0.99	0.046	0.41	YES	PROPOSED ROADS C1: 219
Line 214	CP214-32 - MH214-29	CP214-32	MH214-29		225	9.25	1.00	0.019	1.01	0.045	0.42	YES	PROPOSED ROADS C1: 215
Line 214	MH214-30 - MH214-29	MH214-30	MH214-29		300	68.98	2.00	0.082	1.97	0.137	0.60	YES	PROPOSED LOTS C1: 236
Line 214	MH231-1 - MH214-28	MH231-1	MH214-28		300	12.99	5.00	0.080	2.60	0.216	0.37	YES	
Line 214	MH214-29 - MH214-28	MH214-29	MH214-28		375	59.11	2.00	0.152	2.28	0.249	0.61	YES	PROPOSED LOTS C1: 23
Line 214	DCP214-30 - MH214-27	DCP214-30	MH214-27		225	9.94	1.00	0.022	1.05	0.045	0.49	YES	PROPOSED ROADS C1: 104
Line 214	DCP214-31 - MH214-27	DCP214-31	MH214-27		300	5.18	1.00	0.022	1.01	0.096	0.23	YES	PROPOSED ROADS C1: 105
Line 214	MH214-28 - MH214-27	MH214-28	MH214-27		450	26.58	2.00	0.232	2.42	0.400	0.58	YES	
Line 214	MH230-1 - MH214-26	MH230-1	MH214-26		225	14.19	8.00	0.086	3.17	0.128	0.67	YES	
Line 214	MH214-27 - MH214-26	MH214-27	MH214-26		600	11.24	1.00	0.276	1.71	0.613	0.45	YES	
Line 214	MH214-26 - MH214-25	MH214-26	MH214-25		675	25.77	1.00	0.386	1.73	0.839	0.46	YES	PROPOSED LOTS C1: 27
Line 214	DCP214-28 - MH214-25	DCP214-28	MH214-25		225	16.49	1.00	0.024	1.09	0.045	0.53	YES	PROPOSED ROADS C1: 170
Line 214	DCP214-29 - MH214-25	DCP214-29	MH214-25		225	11.01	1.00	0.022	1.06	0.045	0.49	YES	PROPOSED ROADS C1: 148
Line 214	MH214-25 - MH214-24	MH214-25	MH214-24		675	9.18	1.00	0.432	2.19	0.847	0.51	YES	
Line 214	MH214-24 - MH214-23	MH214-24	MH214-23		675	72.27	2.00	0.476	2.92	1.190	0.40	YES	PROPOSED LOTS C1: 31
Line 214	MH214-23 - MH214-22	MH214-23	MH214-22		825	17.11	1.00	0.496	1.50	1.417	0.35	YES	PROPOSED LOTS C1: 20
Line 214	CP214-26 - MH214-22	CP214-26	MH214-22		300	13.45	1.00	0.043	1.24	0.098	0.44	YES	PROPOSED ROADS C1: 166
Line 214	CP214-27 - MH214-22	CP214-27	MH214-22		225	6.69	2.14	0.039	1.54	0.066	0.59	YES	PROPOSED ROADS C1: 147
Line 214	MH245-1 - MH214-21	MH245-1	MH214-21		300	31.45	5.50	0.147	3.24	0.226	0.65	YES	
Line 214	DCP214-25 - MH214-21	DCP214-25	MH214-21		225	14.59	1.00	0.021	1.05	0.045	0.47	YES	PROPOSED ROADS C1: 107
Line 214	DCP214-24 - MH214-21	DCP214-24	MH214-21		225	11.66	1.00	0.020	1.03	0.045	0.44	YES	PROPOSED ROADS C1: 28
Line 214	MH214-22 - MH214-21	MH214-22	MH214-21		825	13.73	1.00	0.577	1.65	1.443	0.40	YES	
Line 214	MH214-21 - MH214-20	MH214-21	MH214-20		825	51.70	1.00	0.799	2.27	1.427	0.56	YES	PROPOSED LOTS C1: 6
Line 214	CP214-22 - MH214-20	CP214-22	MH214-20		225	9.90	1.00	0.018	1.01	0.045	0.40	YES	PROPOSED ROADS C1: 162
Line 214	CP214-23 - MH214-20	CP214-23	MH214-20		225	4.37	4.99	0.023	1.83	0.100	0.23	YES	PROPOSED ROADS C1: 146
Line 214	MH243-1 - MH214-19	MH243-1	MH214-19		300	33.83	2.80	0.102	2.31	0.162	0.63	YES	
Line 214	DCP214-21 - MH214-19	DCP214-21	MH214-19		300	14.55	2.88	0.023	1.56	0.164	0.14	YES	PROPOSED ROADS C1: 106
Line 214	DCP214-20 - MH214-19	DCP214-20	MH214-19		300	11.24	4.84	0.022	1.86	0.200	0.11	YES	PROPOSED ROADS C1: 36
Line 214	MH214-20 - MH214-19	MH214-20	MH214-19		825	13.59	1.50	0.840	2.64	1.750	0.48	YES	
Line 214	MH242-1 - MH214-18	MH242-1	MH214-18		225	34.54	1.80	0.058	1.65	0.060	0.97	YES	
Line 214	MH214-19 - MH214-18	MH214-19	MH214-18		900	52.79	1.50	1.023	2.45	2.224	0.46	YES	PROPOSED LOTS C1: 37
Line 214	CP214-19 - MH214-18	CP214-19	MH214-18		225	5.48	1.00	0.022	1.04	0.044	0.50	YES	PROPOSED ROADS C1: 145
Line 214	MH241-1 - MH214-17	MH241-1	MH214-17		300	12.13	3.00	0.038	1.80	0.165	0.23	YES	
Line 214	CP214-16 - MH214-17	CP214-16	MH214-17		225	9.38	6.43	0.024	2.13	0.114	0.21	YES	PROPOSED ROADS C1: 207
Line 214	DCP214-17 - MH214-17	DCP214-17	MH214-17		300	13.69	2.40	0.022	1.45	0.147	0.15	YES	PROPOSED ROADS C1: 32
Line 214	DCP214-18 - MH214-17	DCP214-18	MH214-17		375	17.98	1.00	0.023	1.05	0.177	0.13	YES	PROPOSED ROADS C1: 110
Line 214	MH214-18 - MH214-17	MH214-18	MH214-17		900	18.16	1.50	1.103	2.45	2.206	0.50	YES	
Line 214	MH214-17 - MH214-16	MH214-17	MH214-16		900	54.17	1.50	1.249	2.58	2.230	0.56	YES	PROPOSED LOTS C1: 11
Line 214	MH239-1 - MH214-16	MH239-1	MH214-16		375	34.08	5.00	0.103	2.88	0.396	0.26	YES	
Line 214	CP214-15 - MH214-16	CP214-15	MH214-16		225	4.53	2.15	0.025	1.37	0.066	0.38	YES	PROPOSED ROADS C1: 144
Line 214	MH214-16 - MH214-15	MH214-16	MH214-15		900	19.55	1.50	1.376	2.77	2.219	0.62	YES	
Line 214	DCP214-14 - MH214-15	DCP214-14	MH214-15		225	18.98	1.00	0.023	1.09	0.046	0.50	YES	PROPOSED ROADS C1: 53
Line 214	CP214-12 - MH214-15	CP214-12	MH214-15		225	9.58	1.00	0.020	1.03	0.044	0.45	YES	PROPOSED ROADS C1: 198
Line 214	DCP214-13 - MH214-15	DCP214-13	MH214-15		225	14.52	1.00	0.022	1.07	0.044	0.50	YES	PROPOSED ROADS C1: 111
Line 214	DCP214-11 - MH214-14	DCP214-11	MH214-14		225	4.62	22.19	0.026	3.33	0.217	0.12	YES	PROPOSED ROADS C1: 143
Line 214	MH237-1 - MH214-14	MH237-1	MH214-14		300	34.21	2.00	0.084	1.92	0.135	0.62	YES	
Line 214	MH214-15 - MH214-14	MH214-15	MH214-14		900	56.67	1.80	1.484	2.63	2.433	0.61	YES	PROPOSED LOTS C1: 51
Line 214	DCP214-9 - MH214-13	DCP214-9	MH214-13		225	10.73	6.98	0.023	2.18	0.121	0.19	YES	PROPOSED ROADS C1: 60
Line 214	MH214-14 - MH214-13	MH214-14	MH214-13		900	13.73	1.80	1.589	2.57	2.445	0.65	YES	
Line 214	DCP214-10 - MH214-13	DCP214-10	MH214-13		225	13.82	7.60	0.023	2.29	0.128	0.18	YES	PROPOSED ROADS C1: 121
Line 214	MH214-13 - MH214-12	MH214-13	MH214-12		900	27.25	1.80	1.648	2.75	2.424	0.68	YES	PROPOSED LOTS C1: 58
Line 214	CP214-8 - MH214-12	CP214-8	MH214-12		225	11.90	6.56	0.022	2.13	0.116	0.19	YES	PROPOSED ROADS C1: 189

Line 214	MH214-12 - MH214-11	MH214-12	MH214-11		900	26.60	1.80	1.692	2.79	2.417	0.70	YES	PROPOSED LOTS C1: 56
Line 214	MH214-11 - MH214-10	MH214-11	MH214-10		900	13.58	1.80	1.692	3.02	2.417	0.70	YES	
Line 214	CP214-7 - MH214-9	CP214-7	MH214-9		225	6.00	6.49	0.014	1.83	0.117	0.12	YES	PROPOSED ROADS C1: 222
Line 214	MH214-10 - MH214-9	MH214-10	MH214-9		900	67.98	1.80	1.694	2.95	2.420	0.70	YES	
Line 214	MH214-9 - MH214-8	MH214-9	MH214-8		900	12.93	1.80	1.705	2.89	2.436	0.70	YES	
Line 214	MH214-8 - MH214-7	MH214-8	MH214-7		900	33.60	1.80	1.705	3.38	2.436	0.70	YES	
Line 214	MH214-7 - MH214-6	MH214-7	MH214-6		900	30.73	2.75	1.729	4.04	2.981	0.58	YES	PROPOSED LOTS C1: 77
Line 214	CP214-6 - MH214-6	CP214-6	MH214-6		225	7.86	1.22	0.017	1.05	0.049	0.35	YES	PROPOSED ROADS C1: 124
Line 214	CP214-5 - MH214-6	CP214-5	MH214-6		225	11.87	2.02	0.016	1.26	0.067	0.24	YES	PROPOSED ROADS C1: 218
Line 214	MH214-6 - MH214-5	MH214-6	MH214-5		900	36.80	4.40	1.782	4.65	3.791	0.47	YES	PROPOSED LOTS C1: 64
Line 214	MH214-5 - MH214-4	MH214-5	MH214-4		900	35.96	4.70	1.802	5.06	3.917	0.46	YES	PROPOSED LOTS C1: 66
Line 214	CP214-4 - MH214-4	CP214-4	MH214-4		225	8.16	2.05	0.020	1.32	0.065	0.31	YES	PROPOSED ROADS C1: 238
Line 214	CP214-3 - MH214-4	CP214-3	MH214-4		225	12.21	1.40	0.018	1.14	0.053	0.34	YES	PROPOSED ROADS C1: 214
Line 214	MH214-4 - MH214-3	MH214-4	MH214-3		900	35.07	7.00	1.853	5.71	4.751	0.39	YES	PROPOSED LOTS C1: 70
Line 214	MH214-3 - MH214-2	MH214-3	MH214-2		900	39.83	7.50	1.876	6.09	4.937	0.38	YES	PROPOSED LOTS C1: 72
Line 214	CP214-2 - MH214-2	CP214-2	MH214-2		225	8.03	3.82	0.020	1.68	0.087	0.23	YES	PROPOSED ROADS C1: 125
Line 214	CP214-1 - MH214-2	CP214-1	MH214-2		225	12.45	2.96	0.019	1.52	0.079	0.24	YES	PROPOSED ROADS C1: 237
Line 214	MH214-2 - MH214-1	MH214-2	MH214-1		900	50.68	8.00	1.945	5.73	5.118	0.38	YES	PROPOSED LOTS C1: 74
Line 215	MH215-7 - MH215-6	MH215-7	MH215-6		225	38.88	6.50	0.036	1.91	0.116	0.31	YES	PROPOSED LOTS C1: 93
Line 215	CP215-2 - MH215-6	CP215-2	MH215-6		225	6.67	4.70	0.017	1.71	0.100	0.17	YES	PROPOSED ROADS C1: 128
Line 215	MH215-6 - MH215-5	MH215-6	MH215-5		225	30.30	6.50	0.070	2.50	0.115	0.61	YES	PROPOSED LOTS C1: 79
Line 215	MH215-5 - MH215-4	MH215-5	MH215-4		225	38.62	6.50	0.097	3.11	0.114	0.85	YES	PROPOSED LOTS C1: 81
Line 215	CP215-1 - MH215-4	CP215-1	MH215-4		225	4.12	1.00	0.017	0.96	0.044	0.39	YES	PROPOSED ROADS C1: 83
Line 215	MH215-4 - MH215-3	MH215-4	MH215-3		300	29.92	6.50	0.132	3.04	0.249	0.53	YES	PROPOSED LOTS C1: 85
Line 215	MH215-3 - MH215-2	MH215-3	MH215-2		300	31.16	6.50	0.158	3.51	0.247	0.64	YES	PROPOSED LOTS C1: 87
Line 215	MH215-2 - MH215-1	MH215-2	MH215-1		450	13.32	1.50	0.158	1.61	0.351	0.45	YES	
Line 215	MH216-1 - MH215-1	MH216-1	MH215-1		300	32.65	6.30	0.186	3.57	0.245	0.76	YES	PROPOSED LOTS C1: 63
Line 216	MH216-6 - MH216-5	MH216-6	MH216-5		225	31.42	6.30	0.027	1.62	0.113	0.24	YES	PROPOSED LOTS C1: 73
Line 216	CP216-2 - MH216-5	CP216-2	MH216-5		225	4.86	1.00	0.017	0.89	0.046	0.37	YES	PROPOSED ROADS C1: 129
Line 216	MH216-5 - MH216-4	MH216-5	MH216-4		225	22.96	6.30	0.062	2.41	0.113	0.55	YES	PROPOSED LOTS C1: 244
Line 216	MH216-4 - MH216-3	MH216-4	MH216-3		225	21.01	6.30	0.081	2.91	0.114	0.71	YES	PROPOSED LOTS C1: 71
Line 216	MH216-3 - MH216-2	MH216-3	MH216-2		300	33.85	6.30	0.104	2.68	0.242	0.43	YES	PROPOSED LOTS C1: 69
Line 216	CP216-1 - MH216-2	CP216-1	MH216-2		225	6.02	1.41	0.030	1.26	0.053	0.57	YES	PROPOSED ROADS C1: 127
Line 216	MH216-2 - MH216-1	MH216-2	MH216-1		300	33.39	6.30	0.157	3.12	0.242	0.65	YES	PROPOSED LOTS C1: 65
Line 217	MH217-25 - MH217-24	MH217-25	MH217-24		225	49.02	2.00	0.034	1.59	0.064	0.53	YES	PROPOSED LOTS C1: 16
Line 217	DCP217-20 - MH217-24	DCP217-20	MH217-24		225	10.37	1.00	0.022	1.05	0.046	0.48	YES	PROPOSED ROADS C1: 227
Line 217	DCP217-21 - MH217-24	DCP217-21	MH217-24		225	5.72	1.00	0.019	1.00	0.044	0.43	YES	PROPOSED ROADS C1: 108
Line 217	MH217-24 - MH217-23	MH217-24	MH217-23		300	7.71	2.00	0.075	1.76	0.136	0.55	YES	
Line 217	MH235-1 - MH217-23	MH235-1	MH217-23		300	13.85	3.00	0.058	2.01	0.166	0.35	YES	
Line 217	MH217-23 - MH217-22	MH217-23	MH217-22		375	73.34	2.00	0.144	2.26	0.248	0.58	YES	PROPOSED LOTS C1: 17
Line 217	CP217-19 - MH217-21	CP217-19	MH217-21		225	4.58	2.11	0.018	1.26	0.067	0.27	YES	PROPOSED ROADS C1: 109
Line 217	MH217-22 - MH217-21	MH217-22	MH217-21		450	12.29	2.00	0.185	1.89	0.402	0.46	YES	PROPOSED LOTS C1: 18
Line 217	MH234-1 - MH217-20	MH234-1	MH217-20		375	17.42	1.50	0.136	1.89	0.216	0.63	YES	
Line 217	DCP217-17 - MH217-20	DCP217-17	MH217-20		225	9.53	1.00	0.019	1.01	0.045	0.42	YES	PROPOSED ROADS C1: 241
Line 217	DCP217-18 - MH217-20	DCP217-18	MH217-20		225	14.95	1.00	0.024	1.09	0.045	0.53	YES	PROPOSED ROADS C1: 240
Line 217	MH217-21 - MH217-20	MH217-21	MH217-20		450	15.82	2.00	0.202	2.28	0.404	0.50	YES	
Line 217	MH217-20 - MH217-19	MH217-20	MH217-19		600	59.39	2.00	0.413	3.12	0.860	0.48	YES	PROPOSED LOTS C1: 235
Line 217	CP217-16 - MH217-19	CP217-16	MH217-19		225	4.94	1.00	0.018	0.98	0.044	0.41	YES	PROPOSED ROADS C1: 14
Line 217	MH217-19 - MH217-18	MH217-19	MH217-18		600	79.53	5.00	0.500	3.43	1.389	0.36	YES	PROPOSED LOTS C1: 176
Line 217	CP217-15 - MH217-18	CP217-15	MH217-18		225	8.12	4.51	0.020	1.78	0.095	0.21	YES	PROPOSED ROADS C1: 62
Line 217	MH217-18 - MH217-17	MH217-18	MH217-17		600	25.70	3.00	0.542	2.80	1.063	0.51	YES	PROPOSED LOTS C1: 183
Line 217	MH217-17 - MH217-16	MH217-17	MH217-16		600	33.05	2.00	0.565	2.97	0.869	0.65	YES	PROPOSED LOTS C1: 192
Line 217	MH233-1 - MH217-16	MH233-1	MH217-16		375	19.15	1.00	0.075	1.43	0.174	0.43	YES	
Line 217	CP217-14 - MH217-16	CP217-14	MH217-16		225	7.29	2.57	0.017	1.38	0.071	0.24	YES	PROPOSED ROADS C1: 201
Line 217	MH232-1 - MH217-15	MH232-1	MH217-15		225	45.64	4.50	0.025	1.98	0.096	0.26	YES	PROPOSED LOTS C1: 61
Line 217	CP217-11 - MH217-15	CP217-11	MH217-15		300	10.62	1.00	0.020	1.02	0.095	0.21	YES	PROPOSED ROADS C1: 184
Line 217	MH217-16 - MH217-15	MH217-16	MH217-15		825	12.62	1.00	0.656	1.87	1.428	0.46	YES	
Line 217	DCP217-12 - MH217-15	DCP217-12	MH217-15		300	12.33	1.00	0.015	0.95	0.100	0.15	YES	PROPOSED ROADS C1: 117
Line 217	DCP217-13 - MH217-15	DCP217-13	MH217-15		300	15.20	1.00	0.017	0.99	0.094	0.18	YES	PROPOSED ROADS C1: 113
Line 217	CP217-10 - MH217-14	CP217-10	MH217-14		225	5.20	2.04	0.013	1.18	0.062	0.21	YES	PROPOSED ROADS C1: 57
Line 217	MH217-15 - MH217-14	MH217-15	MH217-14		825	62.48	1.00	0.769	2.04	1.424	0.54	YES	PROPOSED LOTS C1: 55
Line 217	MH217-14 - MH217-13	MH217-14	MH217-13		825	22.65	1.00	0.790	1.86	1.436	0.55	YES	PROPOSED LOTS C1: 245
Line 217	DCP217-9 - MH217-13	DCP217-9	MH217-13		300	5.80	1.00	0.030	1.10	0.097	0.31	YES	PROPOSED ROADS C1: 123
Line 217	DCP217-8 - MH217-13	DCP217-8	MH217-13		225	10.57	1.00	0.022	1.06	0.045	0.49	YES	PROPOSED ROADS C1: 122
Line 217	MH217-13 - MH217-12	MH217-13	MH217-12		825	11.33	1.00	0.840	2.11	1.424	0.59	YES	
Line 217	CP217-6 - MH217-12	CP217-6	MH217-12		225	10.62	1.22	0.009	0.92	0.047	0.19	YES	PROPOSED ROADS C1: 226
Line 217	CP217-7 - MH217-12	CP217-7	MH217-12		225	6.25	2.80	0.031	1.62	0.076	0.41	YES	PROPOSED ROADS C1: 180
Line 217	MH217-12 - MH217-11	MH217-12	MH217-11		825	68.28	1.00	0.879	2.31	1.441	0.61	YES	
Line 217	MH217-11 - MH217-10	MH217-11	MH217-10		825	13.51	1.00	0.879	2.53	1.441	0.61	YES	
Line 217	CP217-5 - MH217-10	CP217-5	MH217-10		225	12.06	1.00	0.023	1.07	0.045	0.51	YES	PROPOSED ROADS C1: 154
Line 217	CP217-4 - MH217-9	CP217-4	MH217-9		225	3.56	5.53	0.019	1.78	0.106	0.18	YES	PROPOSED ROADS C1: 152
Line 217	MH217-10 - MH217-9	MH217-10	MH217-9		825	49.61	2.00	0.936	3.48	2.035	0.46	YES	PROPOSED LOTS C1: 75
Line 217	CP217-3 - MH217-8	CP217-3	MH217-8		300	10.73	1.00	0.035	1.17	0.095	0.37	YES	PROPOSED ROADS C1: 150
Line 217	MH217-9 - MH217-8	MH217-9	MH217-8		825	40.04	3.80	0.971	3.69	2.774	0.35	YES	PROPOSED LOTS C1: 90
Line 217	MH228-1 - MH217-7	MH228-1	MH217-7		300	18.90	1.20	0.077	1.53	0.105	0.73	YES	
Line 217	MH217-8 - MH217-7	MH217-8	MH217-7		825	20.70	3.80	1.014	3.60	2.817	0.36	YES	PROPOSED LOTS C1: 88
Line 217	CP217-2 - MH217-6	CP217-2	MH217-6		225	3.54	-28.56	0.019	0.76	0.238	0.08	YES	PROPOSED ROADS C1: 161
Line 217	MH217-7 - MH217-6	MH217-7	MH217-6		825	11.85	6.50	1.098	4.41	3.660	0.30	YES	PROPOSED LOTS C1: 86
Line 217	MH217-6 - MH217-5	MH217-6	MH217-5		825	37.30	6.40	1.116	4.90	3.600	0.31	YES	

Line 217	MH217-5 - MH217-4	MH217-5	MH217-4	825	57.37	5.00	1.158	4.54	3.217	0.36	YES	PROPOSED LOTS C1: 82
Line 217	CP217-1 - MH217-4	CP217-1	MH217-4	225	6.60	1.47	0.022	1.19	0.055	0.40	YES	PROPOSED ROADS C1: 131
Line 217	MH217-4 - MH217-3	MH217-4	MH217-3	825	24.46	5.40	1.206	4.45	3.350	0.36	YES	PROPOSED LOTS C1: 80
Line 217	MH218-1 - MH217-2	MH218-1	MH217-2	300	13.69	1.30	0.106	1.62	0.110	0.96	YES	PROPOSED LOTS C1: 38
Line 217	MH217-3 - MH217-2	MH217-3	MH217-2	825	30.10	5.40	1.224	4.29	3.308	0.37	YES	PROPOSED LOTS C1: 78
Line 217	MH217-2 - MH217-1	MH217-2	MH217-1	825	16.96	6.50	1.345	4.65	3.635	0.37	YES	PROPOSED LOTS C1: 92
Line 218	MH218-5 - MH218-4	MH218-5	MH218-4	225	54.30	5.80	0.044	1.79	0.110	0.40	YES	PROPOSED LOTS C1: 47
Line 218	CP218-1 - MH218-4	CP218-1	MH218-4	225	3.44	4.22	0.022	0.59	0.092	0.24	YES	PROPOSED ROADS C1: 132
Line 218	MH218-4 - MH218-3	MH218-4	MH218-3	225	16.42	6.20	0.085	2.75	0.112	0.76	YES	PROPOSED LOTS C1: 39
Line 218	MH218-3 - MH218-2	MH218-3	MH218-2	225	16.98	6.20	0.085	2.59	0.112	0.76	YES	
Line 218	MH218-2 - MH218-1	MH218-2	MH218-1	225	15.10	5.90	0.095	2.67	0.109	0.87	YES	PROPOSED LOTS C1: 46
Line 219	CP219-1 - MH219-3	CP219-1	MH219-3	225	10.92	1.00	0.014	0.69	0.045	0.31	YES	PROPOSED ROADS C1: 48
Line 219	CP219-2 - MH219-3	CP219-2	MH219-3	225	7.04	1.00	0.014	0.83	0.045	0.31	YES	PROPOSED ROADS C1: 135
Line 219	MH219-4 - MH219-3	MH219-4	MH219-3	225	28.91	2.50	0.027	1.16	0.071	0.38	YES	PROPOSED LOTS C1: 231
Line 219	MH219-3 - MH219-2	MH219-3	MH219-2	225	32.11	5.60	0.082	2.83	0.106	0.77	YES	PROPOSED LOTS C1: 43
Line 219	MH219-2 - MH219-1	MH219-2	MH219-1	300	14.46	5.30	0.093	2.30	0.221	0.42	YES	PROPOSED LOTS C1: 42
Line 220	CP220-1 - MH220-4	CP220-1	MH220-4	225	5.20	1.00	0.016	0.95	0.044	0.36	YES	PROPOSED ROADS C1: 225
Line 220	CP220-2 - MH220-4	CP220-2	MH220-4	225	11.17	1.00	0.017	0.99	0.046	0.37	YES	PROPOSED ROADS C1: 221
Line 220	MH222-1 - MH220-3	MH222-1	MH220-3	525	16.54	1.00	0.258	1.52	0.430	0.60	YES	
Line 220	MH220-4 - MH220-3	MH220-4	MH220-3	225	59.14	2.00	0.033	1.58	0.065	0.51	YES	
Line 220	CP220-3 - MH220-3	CP220-3	MH220-3	225	13.52	1.10	0.015	1.00	0.047	0.32	YES	PROPOSED ROADS C1: 158
Line 220	MH221-1 - MH220-2	MH221-1	MH220-2	225	12.73	1.20	0.027	1.17	0.049	0.55	YES	
Line 220	CP220-4 - MH220-2	CP220-4	MH220-2	225	9.60	1.00	0.025	1.08	0.045	0.56	YES	PROPOSED ROADS C1: 229
Line 220	MH220-3 - MH220-2	MH220-3	MH220-2	525	34.94	1.00	0.306	1.67	0.431	0.71	YES	
Line 220	CP220-5 - MH220-1	CP220-5	MH220-1	225	11.13	1.00	0.020	1.04	0.044	0.45	YES	PROPOSED ROADS C1: 160
Line 220	MH220-2 - MH220-1	MH220-2	MH220-1	525	32.79	1.00	0.357	1.86	0.430	0.83	YES	
Line 221	DCP221-1 - MH221-2	DCP221-1	MH221-2	225	13.71	1.00	0.027	1.10	0.045	0.60	YES	PROPOSED ROADS C1: 203
Line 221	MH221-2 - MH221-1	MH221-2	MH221-1	225	16.30	1.10	0.027	1.11	0.047	0.57	YES	
Line 222	MH222-2 - MH222-1	MH222-2	MH222-1	450	16.83	1.50	0.231	1.97	0.350	0.66	YES	PROPOSED LOTS C1: 217
Line 222	DCP222-1 - MH222-1	DCP222-1	MH222-1	225	11.19	1.00	0.027	1.11	0.045	0.60	YES	PROPOSED ROADS C1: 212
Line 223	DCP223-5 - MH223-8	DCP223-5	MH223-8	225	7.94	1.40	0.033	1.29	0.052	0.63	YES	PROPOSED ROADS C1: 156
Line 223	DCP223-3 - MH223-7	DCP223-3	MH223-7	225	18.93	1.00	0.027	1.13	0.045	0.60	YES	PROPOSED ROADS C1: 185
Line 223	DCP223-4 - MH223-7	DCP223-4	MH223-7	225	23.42	1.00	0.035	1.20	0.045	0.78	YES	PROPOSED ROADS C1: 177
Line 223	MH223-8 - MH223-7	MH223-8	MH223-7	450	22.14	1.50	0.249	2.00	0.351	0.71	YES	PROPOSED LOTS C1: 172
Line 223	MH223-7 - MH223-6	MH223-7	MH223-6	525	26.04	1.00	0.310	1.73	0.431	0.72	YES	
Line 223	MH223-6 - MH223-5	MH223-6	MH223-5	675	14.48	1.00	0.632	1.84	0.843	0.75	YES	PROPOSED LOTS C1: 194
Line 223	MH223-5 - MH223-4	MH223-5	MH223-4	675	20.60	1.00	0.631	1.99	0.841	0.75	YES	
Line 223	MH223-4 - MH223-3	MH223-4	MH223-3	675	17.51	1.00	0.631	2.29	0.841	0.75	YES	
Line 223	MH223-3 - MH223-2	MH223-3	MH223-2	675	16.00	2.70	0.631	3.23	1.372	0.46	YES	
Line 223	DCP223-1 - MH223-2	DCP223-1	MH223-2	300	11.89	1.00	0.054	1.30	0.096	0.56	YES	PROPOSED ROADS C1: 153
Line 223	DCP223-2 - MH223-2	DCP223-2	MH223-2	300	5.74	1.00	0.051	1.25	0.096	0.53	YES	PROPOSED ROADS C1: 186
Line 223	MH220-1 - MH223-2	MH220-1	MH223-2	525	47.95	1.00	0.377	2.10	0.428	0.88	YES	
Line 223	MH223-2 - MH223-1	MH223-2	MH223-1	750	59.69	6.60	1.112	5.72	2.851	0.39	YES	
Line 225	CP225-3 - MH225-3	CP225-3	MH225-3	225	5.07	3.27	0.016	1.45	0.080	0.20	YES	PROPOSED ROADS C1: 211
Line 225	MH225-3 - MH225-2	MH225-3	MH225-2	225	14.91	3.00	0.028	1.35	0.080	0.35	YES	PROPOSED LOTS C1: 100
Line 225	CP225-1 - MH225-1	CP225-1	MH225-1	225	10.19	1.00	0.015	0.95	0.045	0.33	YES	PROPOSED ROADS C1: 168
Line 225	CP225-2 - MH225-1	CP225-2	MH225-1	225	5.14	1.00	0.016	0.95	0.044	0.36	YES	PROPOSED ROADS C1: 164
Line 225	MH225-2 - MH225-1	MH225-2	MH225-1	225	16.43	3.00	0.045	1.86	0.078	0.58	YES	PROPOSED LOTS C1: 99
Line 228	CP228-2 - MH228-5	CP228-2	MH228-5	225	2.68	0.60	0.014	0.81	0.034	0.41	YES	PROPOSED ROADS C1: 5
Line 228	MH228-5 - MH228-4	MH228-5	MH228-4	225	22.49	1.00	0.014	1.18	0.045	0.31	YES	
Line 228	MH228-4 - MH228-3	MH228-4	MH228-3	225	27.19	4.00	0.014	1.23	0.088	0.16	YES	
Line 228	MH229-1 - MH228-2	MH229-1	MH228-2	225	43.91	3.80	0.028	1.92	0.088	0.32	YES	PROPOSED LOTS C1: 101
Line 228	MH228-3 - MH228-2	MH228-3	MH228-2	225	6.53	1.50	0.014	0.93	0.054	0.26	YES	
Line 228	CP228-1 - MH228-2	CP228-1	MH228-2	225	4.95	4.09	0.007	1.28	0.088	0.08	YES	PROPOSED ROADS C1: 94
Line 228	MH228-2 - MH228-1	MH228-2	MH228-1	300	28.43	1.40	0.077	1.50	0.115	0.67	YES	PROPOSED LOTS C1: 95
Line 230	MH230-3 - MH230-2	MH230-3	MH230-2	225	24.67	8.00	0.034	1.79	0.131	0.26	YES	PROPOSED LOTS C1: 190
Line 230	CP230-1 - MH230-2	CP230-1	MH230-2	225	9.81	1.00	0.019	1.02	0.045	0.42	YES	PROPOSED ROADS C1: 175
Line 230	CP230-2 - MH230-2	CP230-2	MH230-2	225	7.77	4.65	0.010	1.50	0.100	0.10	YES	PROPOSED ROADS C1: 181
Line 230	MH230-2 - MH230-1	MH230-2	MH230-1	225	28.61	8.00	0.086	3.09	0.128	0.67	YES	PROPOSED LOTS C1: 103
Line 231	MH231-2 - MH231-1	MH231-2	MH231-1	300	80.40	1.30	0.065	1.71	0.110	0.59	YES	PROPOSED LOTS C1: 208
Line 231	CP231-1 - MH231-1	CP231-1	MH231-1	225	4.81	3.33	0.016	1.45	0.084	0.19	YES	PROPOSED ROADS C1: 199
Line 233	CP233-4 - MH233-5	CP233-4	MH233-5	225	9.22	1.00	0.020	1.02	0.045	0.44	YES	PROPOSED ROADS C1: 220
Line 233	CP233-5 - MH233-5	CP233-5	MH233-5	225	5.00	1.00	0.021	1.01	0.046	0.46	YES	PROPOSED ROADS C1: 216
Line 233	DCP233-3 - MH233-4	DCP233-3	MH233-4	225	11.31	1.00	0.013	0.87	0.045	0.29	YES	PROPOSED ROADS C1: 210
Line 233	MH233-5 - MH233-4	MH233-5	MH233-4	300	52.10	1.00	0.040	0.89	0.095	0.42	YES	
Line 233	DCP233-2 - MH233-4	DCP233-2	MH233-4	225	13.49	1.00	0.015	0.79	0.045	0.33	YES	PROPOSED ROADS C1: 224
Line 233	CP233-1 - MH233-3	CP233-1	MH233-3	300	3.51	1.00	0.007	0.74	0.088	0.08	YES	PROPOSED ROADS C1: 228
Line 233	MH233-4 - MH233-3	MH233-4	MH233-3	300	6.45	1.00	0.068	1.22	0.097	0.70	YES	
Line 233	MH233-3 - MH233-2	MH233-3	MH233-2	300	59.76	1.00	0.075	1.38	0.096	0.78	YES	
Line 233	MH233-2 - MH233-1	MH233-2	MH233-1	300	14.92	1.00	0.075	1.40	0.096	0.78	YES	
Line 234	MH234-4 - MH234-3	MH234-4	MH234-3	300	77.75	2.00	0.063	1.86	0.137	0.46	YES	PROPOSED LOTS C1: 163
Line 234	CP234-1 - MH234-3	CP234-1	MH234-3	225	4.58	1.00	0.018	0.97	0.046	0.39	YES	PROPOSED ROADS C1: 209
Line 234	MH234-3 - MH234-2	MH234-3	MH234-2	375	43.70	1.50	0.112	1.60	0.215	0.52	YES	PROPOSED LOTS C1: 167
Line 234	MH234-2 - MH234-1	MH234-2	MH234-1	375	13.91	1.70	0.136	1.73	0.227	0.60	YES	PROPOSED LOTS C1: 171
Line 235	MH236-1 - MH235-1	MH236-1	MH235-1	225	36.16	1.40	0.015	1.13	0.052	0.29	YES	PROPOSED LOTS C1: 182
Line 235	MH235-2 - MH235-1	MH235-2	MH235-1	225	37.30	4.50	0.033	2.14	0.094	0.35	YES	PROPOSED LOTS C1: 191
Line 235	CP235-1 - MH235-1	CP235-1	MH235-1	225	6.06	18.95	0.010	2.17	0.200	0.05	YES	PROPOSED ROADS C1: 200
Line 237	CP237-2 - MH237-2	CP237-2	MH237-2	225	4.25	9.94	0.016	2.17	0.145	0.11	YES	PROPOSED ROADS C1: 115
Line 237	MH238-1 - MH237-1	MH238-1	MH237-1	225	12.86	6.97	0.018	2.06	0.120	0.15	YES	

Line 237	CP237-1 - MH237-1	CP237-1	MH237-1	225	6.12	2.66	0.012	1.28	0.071	0.17	YES	PROPOSED ROADS C1: 52
Line 237	MH237-2 - MH237-1	MH237-2	MH237-1	225	60.36	4.80	0.053	2.48	0.098	0.54	YES	PROPOSED LOTS C1: 233
Line 238	MH238-2 - MH238-1	MH238-2	MH238-1	225	20.91	1.00	0.018	1.31	0.046	0.39	YES	PROPOSED LOTS C1: 59
Line 239	CP239-2 - MH239-2	CP239-2	MH239-2	225	5.19	4.06	0.016	1.58	0.089	0.18	YES	PROPOSED ROADS C1: 118
Line 239	MH240-1 - MH239-1	MH240-1	MH239-1	225	12.53	2.00	0.039	1.56	0.064	0.61	YES	
Line 239	CP239-1 - MH239-1	CP239-1	MH239-1	225	4.23	7.37	0.012	1.80	0.120	0.10	YES	PROPOSED ROADS C1: 12
Line 239	MH239-2 - MH239-1	MH239-2	MH239-1	225	60.35	6.00	0.052	2.69	0.108	0.48	YES	PROPOSED LOTS C1: 10
Line 240	MH240-2 - MH240-1	MH240-2	MH240-1	225	49.87	6.00	0.039	1.86	0.111	0.35	YES	PROPOSED LOTS C1: 54
Line 241	MH241-2 - MH241-1	MH241-2	MH241-1	225	72.02	6.50	0.038	2.56	0.115	0.33	YES	PROPOSED LOTS C1: 13
Line 242	CP242-2 - MH242-2	CP242-2	MH242-2	225	4.12	3.89	0.015	1.49	0.094	0.16	YES	PROPOSED ROADS C1: 119
Line 242	CP242-1 - MH242-1	CP242-1	MH242-1	225	6.08	6.94	0.011	1.75	0.122	0.09	YES	PROPOSED ROADS C1: 35
Line 242	MH242-2 - MH242-1	MH242-2	MH242-1	225	60.22	7.00	0.048	1.78	0.120	0.40	YES	PROPOSED LOTS C1: 33
Line 243	CP243-2 - MH243-3	CP243-2	MH243-3	225	9.33	1.00	0.012	0.78	0.044	0.27	YES	PROPOSED ROADS C1: 15
Line 243	CP243-3 - MH243-3	CP243-3	MH243-3	225	3.84	4.05	0.012	1.42	0.092	0.13	YES	PROPOSED ROADS C1: 120
Line 243	MH243-3 - MH243-2	MH243-3	MH243-2	225	61.06	7.00	0.059	2.93	0.120	0.49	YES	PROPOSED LOTS C1: 7
Line 243	CP243-1 - MH243-2	CP243-1	MH243-2	225	5.20	7.49	0.011	1.78	0.122	0.09	YES	PROPOSED ROADS C1: 9
Line 243	MH244-1 - MH243-1	MH244-1	MH243-1	225	50.04	7.60	0.033	2.59	0.127	0.26	YES	PROPOSED LOTS C1: 34
Line 243	MH243-2 - MH243-1	MH243-2	MH243-1	300	12.75	2.80	0.069	1.66	0.160	0.43	YES	
Line 245	MH245-5 - MH245-4	MH245-5	MH245-4	225	24.45	5.50	0.010	1.41	0.100	0.10	YES	PROPOSED LOTS C1: 30
Line 245	CP245-3 - MH245-4	CP245-3	MH245-4	225	3.28	3.93	0.007	1.24	0.088	0.08	YES	PROPOSED ROADS C1: 112
Line 245	MH245-4 - MH245-3	MH245-4	MH245-3	225	11.30	6.00	0.018	1.25	0.113	0.16	YES	
Line 245	CP245-2 - MH245-3	CP245-2	MH245-3	225	6.79	5.92	0.015	1.79	0.115	0.13	YES	PROPOSED ROADS C1: 22
Line 245	MH247-1 - MH245-2	MH247-1	MH245-2	225	7.78	3.00	0.025	1.31	0.078	0.32	YES	
Line 245	MH245-3 - MH245-2	MH245-3	MH245-2	225	39.14	6.00	0.055	2.35	0.110	0.50	YES	PROPOSED LOTS C1: 26
Line 245	CP245-1 - MH245-2	CP245-1	MH245-2	225	3.62	4.27	0.024	1.71	0.092	0.26	YES	PROPOSED ROADS C1: 25
Line 245	MH245-2 - MH245-1	MH245-2	MH245-1	300	11.80	2.00	0.104	1.95	0.137	0.76	YES	
Line 245	MH246-1 - MH245-1	MH246-1	MH245-1	225	51.68	6.00	0.043	2.39	0.110	0.39	YES	PROPOSED LOTS C1: 8
Line 246	CP246-1 - MH246-1	CP246-1	MH246-1	225	5.39	3.57	0.006	1.19	0.075	0.08	YES	PROPOSED ROADS C1: 116
Line 247	MH247-2 - MH247-1	MH247-2	MH247-1	225	24.87	1.50	0.025	1.34	0.054	0.46	YES	PROPOSED LOTS C1: 24
Line 248	SD248-1 - Outlet248-0	SD248-1	Outlet248-0	1,600	49.36	1.00	7.469	4.11	8.392	0.89	YES	

Stormwater Catchment - Wetland 5
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 40	MH40-17 - MH40-16	MH40-17	MH40-16	225	31.72	2.00	0.028	0.95	0.064	0.44	YES	PROPOSED LOTS C1: 14
Line 40	MH40-16 - MH40-15	MH40-16	MH40-15	225	12.51	2.00	0.060	1.66	0.063	0.95	YES	PROPOSED LOTS C1: 49
Line 40	MH40-15 - MH40-14	MH40-15	MH40-14	300	35.40	3.00	0.123	2.47	0.168	0.73	YES	PROPOSED LOTS C1: 8; PROPOSED LOTS C1: 15
Line 40	CP40-11 - MH40-15	CP40-11	MH40-15	225	5.52	11.42	0.014	2.22	0.156	0.09	YES	PROPOSED ROADS C1: 29
Line 40	MH40-14 - MH40-13	MH40-14	MH40-13	375	27.58	3.00	0.153	2.58	0.300	0.51	YES	PROPOSED LOTS C1: 9; PROPOSED LOTS C1: 16
Line 40	MH40-13 - MH40-12	MH40-13	MH40-12	450	34.95	2.00	0.224	2.38	0.400	0.56	YES	PROPOSED LOTS C1: 5; PROPOSED LOTS C1: 17
Line 40	CP40-10 - MH40-13	CP40-10	MH40-13	225	9.45	8.23	0.016	2.11	0.133	0.12	YES	PROPOSED ROADS C1: 30
Line 40	CP40-9 - MH40-13	CP40-9	MH40-13	225	8.82	9.85	0.007	1.80	0.140	0.05	YES	PROPOSED ROADS C1: 23
Line 40	MH40-12 - MH40-11	MH40-12	MH40-11	450	24.51	3.00	0.241	2.53	0.492	0.49	YES	PROPOSED LOTS C1: 18
Line 40	MH40-11 - MH40-10	MH40-11	MH40-10	450	40.64	3.00	0.288	2.71	0.497	0.58	YES	PROPOSED LOTS C1: 19
Line 40	CP40-8 - MH40-11	CP40-8	MH40-11	225	5.40	11.15	0.017	2.33	0.155	0.11	YES	PROPOSED ROADS C1: 27
Line 40	MH40-10 - MH40-9	MH40-10	MH40-9	450	10.68	3.60	0.295	2.97	0.546	0.54	YES	PROPOSED LOTS C1: 20
Line 40	MH40-9 - MH40-8	MH40-9	MH40-8	600	18.40	6.00	0.309	2.54	1.471	0.21	YES	
Line 40	CP40-7 - MH40-9	CP40-7	MH40-9	225	4.30	9.31	0.014	2.06	0.140	0.10	YES	PROPOSED ROADS C1: 28
Line 40	MH40-8 - MH40-7	MH40-8	MH40-7	675	11.38	2.00	0.523	2.34	1.189	0.44	YES	
Line 40	MH44-1 - MH40-8	MH44-1	MH40-8	375	43.15	1.00	0.073	1.46	0.174	0.42	YES	PROPOSED LOTS C1: 13
Line 40	MH45-1 - MH40-8	MH45-1	MH40-8	375	33.85	4.00	0.141	2.86	0.353	0.40	YES	
Line 40	MH40-7 - MH40-6	MH40-7	MH40-6	675	21.97	2.39	0.570	2.72	1.295	0.44	YES	PROPOSED LOTS C1: 11
Line 40	CP40-6 - MH40-7	CP40-6	MH40-7	225	5.46	14.02	0.011	2.27	0.157	0.07	YES	PROPOSED ROADS C1: 48
Line 40	CP40-5 - MH40-7	CP40-5	MH40-7	225	11.77	8.00	0.011	1.93	0.122	0.09	YES	PROPOSED ROADS C1: 31
Line 40	MH40-6 - MH40-5	MH40-6	MH40-5	675	27.03	2.50	0.577	2.35	1.342	0.43	YES	
Line 40	BC40-1 - MH40-6	BC40-1	MH40-6	225	15.03	7.00	0.007	1.63	0.117	0.06	YES	PROPOSED LOTS C1: 12
Line 40	MH40-5 - MH40-4	MH40-5	MH40-4	675	64.05	2.00	0.894	3.33	1.192	0.75	YES	PROPOSED LOTS C1: 1
Line 40	MH43-1 - MH40-5	MH43-1	MH40-5	525	38.72	1.00	0.229	1.71	0.432	0.53	YES	PROPOSED LOTS C1: 2
Line 40	CP40-4 - MH40-5	CP40-4	MH40-5	225	14.54	9.74	0.039	2.88	0.139	0.28	YES	PROPOSED ROADS C1: 32
Line 40	MH40-4 - MH40-3	MH40-4	MH40-3	1200	20.95	1.00	2.075	2.01	3.915	0.53	YES	
Line 40	MH41-1 - MH40-4	MH41-1	MH40-4	1200	41.17	0.70	1.172	1.38	3.256	0.36	YES	PROPOSED LOTS C1: 10
Line 40	CP40-3 - MH40-4	CP40-3	MH40-4	225	10.97	25.00	0.013	2.98	0.217	0.06	YES	PROPOSED ROADS C1: 33
Line 40	MH40-3 - MH40-2	MH40-3	MH40-2	1200	24.03	1.00	2.075	1.95	3.915	0.53	YES	
Line 40	MH40-2 - MH40-1	MH40-2	MH40-1	1200	18.90	0.70	2.115	2.00	3.254	0.65	YES	
Line 40	CP40-2 - MH40-2	CP40-2	MH40-2	225	14.57	7.57	0.016	2.07	0.123	0.13	YES	PROPOSED ROADS C1: 36
Line 40	CP40-1 - MH40-2	CP40-1	MH40-2	225	7.70	14.30	0.026	2.89	0.173	0.15	YES	PROPOSED ROADS C1: 34
Line 40	MH40-1 - Outlet40-0	MH40-1	Outlet40-0	1200	24.37	0.30	2.115	2.30	2.136	0.99	YES	
Line 41	MH41-6 - MH41-5	MH41-6	MH41-5	225	32.74	3.00	0.046	1.97	0.078	0.59	YES	
Line 41	CP41-8 - MH41-6	CP41-8	MH41-6	225	15.24	7.53	0.029	1.65	0.121	0.24	YES	PROPOSED ROADS C1: 46
Line 41	CP41-7 - MH41-6	CP41-7	MH41-6	225	23.17	4.51	0.017	1.03	0.094	0.18	YES	PROPOSED ROADS C1: 47
Line 41	MH41-5 - MH41-4	MH41-5	MH41-4	300	20.29	1.00	0.046	1.13	0.096	0.48	YES	
Line 41	CP41-6 - MH41-4	CP41-6	MH41-4	225	5.77	3.44	0.036	1.79	0.084	0.43	YES	PROPOSED ROADS C1: 43
Line 41	DCP41-5 - MH41-4	DCP41-5	MH41-4	300	19.24	1.73	0.021	0.91	0.124	0.17	YES	PROPOSED ROADS C1: 44
Line 41	MH41-4 - MH41-3	MH41-4	MH41-3	375	20.61	0.70	0.103	1.34	0.147	0.70	YES	
Line 41	DCP41-4 - MH41-3	DCP41-4	MH41-3	300	17.57	0.95	0.042	1.23	0.093	0.45	YES	PROPOSED ROADS C1: 45
Line 41	DCP41-3 - MH41-3	DCP41-3	MH41-3	300	6.18	3.04	0.027	1.60	0.169	0.16	YES	PROPOSED ROADS C1: 42
Line 41	MH42-1 - MH41-3	MH42-1	MH41-3	900	25.42	1.00	0.958	2.56	1.808	0.53	YES	
Line 41	MH41-3 - MH41-2	MH41-3	MH41-2	1200	10.29	0.70	1.128	1.59	3.223	0.35	YES	
Line 41	CP41-2 - MH41-2	CP41-2	MH41-2	225	6.87	8.69	0.024	2.35	0.133	0.18	YES	PROPOSED ROADS C1: 35
Line 41	CP41-1 - MH41-2	CP41-1	MH41-2	225	18.98	3.08	0.013	1.44	0.076	0.17	YES	PROPOSED ROADS C1: 37
Line 41	MH41-2 - MH41-1	MH41-2	MH41-1	1200	23.83	0.70	1.160	1.71	3.222	0.36	YES	
Line 42	MH42-2 - MH42-1	MH42-2	MH42-1	825	28.62	3.00	0.959	3.14	2.459	0.39	YES	PROPOSED SCHOOL: 41
Line 43	MH43-6 - MH43-5	MH43-6	MH43-5	225	46.13	6.00	0.049	2.38	0.111	0.44	YES	PROPOSED LOTS C1: 6
Line 43	CP43-2 - MH43-5	CP43-2	MH43-5	225	3.60	2.81	0.011	1.23	0.073	0.15	YES	PROPOSED ROADS C1: 21
Line 43	MH43-5 - MH43-4	MH43-5	MH43-4	300	46.87	2.00	0.105	2.05	0.136	0.77	YES	PROPOSED LOTS C1: 4
Line 43	MH43-4 - MH43-3	MH43-4	MH43-3	450	13.90	0.80	0.105	1.07	0.256	0.41	YES	
Line 43	MH43-3 - MH43-2	MH43-3	MH43-2	450	10.10	0.80	0.117	1.11	0.254	0.46	YES	PROPOSED LOTS C1: 50
Line 43	MH43-2 - MH43-1	MH43-2	MH43-1	450	68.65	1.00	0.190	1.85	0.284	0.67	YES	PROPOSED LOTS C1: 3

Line 43	CP43-1 - MH43-1	CP43-1	MH43-1	225	4.89	2.08	0.008	1.05	0.062	0.13	YES	PROPOSED ROADS C1: 51
Line 44	CP44-1 - MH44-1	CP44-1	MH44-1	225	4.34	3.67	0.008	1.26	0.089	0.09	YES	PROPOSED ROADS C1: 26
Line 45	MH45-5 - MH45-4	MH45-5	MH45-4	300	54.10	1.00	0.054	1.61	0.096	0.56	YES	
Line 45	CP45-6 - MH45-5	CP45-6	MH45-5	225	5.02	9.20	0.022	1.98	0.138	0.16	YES	PROPOSED ROADS C1: 38
Line 45	CP45-5 - MH45-5	CP45-5	MH45-5	225	10.16	3.33	0.032	1.79	0.082	0.39	YES	PROPOSED ROADS C1: 22
Line 45	MH45-4 - MH45-3	MH45-4	MH45-3	300	15.32	4.00	0.054	1.93	0.193	0.28	YES	
Line 45	CP45-4 - MH45-3	CP45-4	MH45-3	225	6.42	6.38	0.020	2.00	0.111	0.18	YES	PROPOSED ROADS C1: 39
Line 45	CP45-3 - MH45-3	CP45-3	MH45-3	225	11.21	3.64	0.029	1.83	0.085	0.34	YES	PROPOSED ROADS C1: 24
Line 45	MH45-3 - MH45-2	MH45-3	MH45-2	300	54.31	7.00	0.103	3.17	0.258	0.40	YES	
Line 45	CP45-2 - MH45-2	CP45-2	MH45-2	225	3.67	6.97	0.017	1.89	0.121	0.14	YES	PROPOSED ROADS C1: 40
Line 45	CP45-1 - MH45-2	CP45-1	MH45-2	225	12.69	3.27	0.022	1.64	0.081	0.27	YES	PROPOSED ROADS C1: 25
Line 45	MH45-2 - MH45-1	MH45-2	MH45-1	375	13.97	2.10	0.141	2.28	0.252	0.56	YES	
Line 46	SD46-1 - Outlet46-0	SD46-1	Outlet46-0	1200	42.10	0.50	2.211	2.44	2.764	0.80	YES	

Stormwater Catchment -Wetland 6
BEACHLANDS STORMWATER NETWORK
 Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 50	MH50-11 - MH50-10	MH50-11	MH50-10	300	15.17	1.00	0.008	0.65	0.097	0.08	YES	PROPOSED LOTS C1: 1
Line 50	CP50-10 - MH50-9	CP50-10	MH50-9	300	4.82	11.69	0.024	1.67	0.331	0.07	YES	PROPOSED ROADS C1: 31
Line 50	MH50-10 - MH50-9	MH50-10	MH50-9	375	75.65	2.40	0.113	1.79	0.272	0.42	YES	PROPOSED LOTS C1: 2, 4
Line 50	MH50-9 - MH50-8	MH50-9	MH50-8	375	66.55	3.00	0.230	2.51	0.304	0.76	YES	PROPOSED LOTS C1: 3, 5
Line 50	CP50-9 - MH50-7	CP50-9	MH50-7	300	3.06	12.04	0.021	1.51	0.336	0.06	YES	PROPOSED ROADS C1: 17
Line 50	MH50-8 - MH50-7	MH50-8	MH50-7	375	15.43	2.50	0.229	2.34	0.278	0.82	YES	
Line 50	MH52-1 - MH50-7	MH52-1	MH50-7	300	26.40	5.00	0.062	1.89	0.216	0.29	YES	
Line 50	CP50-8 - MH50-6	CP50-8	MH50-6	225	11.41	6.32	0.026	2.18	0.113	0.23	YES	PROPOSED ROADS C1: 15
Line 50	CP50-7 - MH50-6	CP50-7	MH50-6	225	13.71	5.04	0.036	2.20	0.101	0.36	YES	PROPOSED ROADS C1: 16
Line 50	MH50-7 - MH50-6	MH50-7	MH50-6	375	69.62	6.00	0.373	4.20	0.430	0.87	YES	PROPOSED LOTS C1: 6
Line 50	CP50-6 - MH50-5	CP50-6	MH50-5	300	6.88	1.22	0.021	1.07	0.107	0.20	YES	PROPOSED ROADS C1: 19
Line 50	CP50-5 - MH50-5	CP50-5	MH50-5	300	11.36	7.45	0.028	1.80	0.264	0.11	YES	PROPOSED ROADS C1: 18
Line 50	MH50-6 - MH50-5	MH50-6	MH50-5	450	69.60	6.00	0.487	3.75	0.699	0.70	YES	PROPOSED LOTS C1: 7
Line 50	MH50-5 - MH50-4	MH50-5	MH50-4	450	23.84	5.00	0.546	3.85	0.638	0.86	YES	PROPOSED LOTS C1: 12
Line 50	MH50-4 - MH50-3	MH50-4	MH50-3	450	27.89	7.00	0.567	4.37	0.755	0.75	YES	PROPOSED LOTS C1: 11
Line 50	MH51-1 - MH50-2	MH51-1	MH50-2	300	27.11	2.30	0.093	2.08	0.147	0.63	YES	
Line 50	DCP50-3 - MH50-2	DCP50-3	MH50-2	300	12.53	10.57	0.025	2.55	0.315	0.08	YES	PROPOSED ROADS C1: 21
Line 50	DCP50-4 - MH50-2	DCP50-4	MH50-2	300	20.59	6.85	0.037	2.48	0.253	0.15	YES	PROPOSED ROADS C1: 20
Line 50	MH50-3 - MH50-2	MH50-3	MH50-2	450	32.90	7.00	0.567	4.74	0.755	0.75	YES	
Line 50	CP50-2 - MH50-1	CP50-2	MH50-1	225	21.64	9.56	0.013	2.14	0.139	0.09	YES	PROPOSED ROADS C1: 25
Line 50	CP50-1 - MH50-1	CP50-1	MH50-1	225	10.86	13.94	0.029	3.02	0.168	0.17	YES	PROPOSED ROADS C1: 26
Line 50	MH50-2 - MH50-1	MH50-2	MH50-1	525	28.05	6.50	0.721	4.76	1.098	0.66	YES	
Line 50	MH53-1 - MH50-1	MH53-1	MH50-1	525	22.30	0.80	0.300	1.80	0.385	0.78	YES	
Line 50	MH50-1 - Outlet50-0	MH50-1	Outlet50-0	900	13.62	0.60	1.061	2.15	1.404	0.76	YES	
Line 51	DCP51-1 - MH51-2	DCP51-1	MH51-2	300	18.82	2.93	0.033	0.78	0.166	0.20	YES	PROPOSED ROADS C1: 24
Line 51	DCP51-2 - MH51-2	DCP51-2	MH51-2	300	11.00	4.10	0.060	1.26	0.196	0.31	YES	PROPOSED ROADS C1: 23
Line 51	MH51-2 - MH51-1	MH51-2	MH51-1	300	27.04	1.00	0.093	1.64	0.097	0.96	YES	
Line 52	CP52-2 - MH52-1	CP52-2	MH52-1	300	8.70	7.68	0.025	1.50	0.268	0.09	YES	PROPOSED ROADS C1: 14
Line 52	CP52-1 - MH52-1	CP52-1	MH52-1	300	11.34	3.95	0.037	1.71	0.192	0.19	YES	PROPOSED ROADS C1: 13
Line 53	CP53-3 - MH53-6	CP53-3	MH53-6	225	3.74	2.67	0.024	1.45	0.073	0.33	YES	PROPOSED ROADS C1: 22
Line 53	MH53-7 - MH53-6	MH53-7	MH53-6	300	58.82	3.30	0.112	2.39	0.176	0.64	YES	PROPOSED LOTS C1: 8, 10
Line 53	MH53-6 - MH53-5	MH53-6	MH53-5	300	29.42	6.80	0.171	3.62	0.252	0.68	YES	PROPOSED LOTS C1: 9
Line 53	MH53-5 - MH53-4	MH53-5	MH53-4	450	28.72	1.00	0.171	1.48	0.285	0.60	YES	
Line 53	MH53-4 - MH53-3	MH53-4	MH53-3	450	19.89	0.80	0.171	1.40	0.255	0.67	YES	
Line 53	MH53-3 - MH53-2	MH53-3	MH53-2	450	26.92	0.80	0.171	1.36	0.255	0.67	YES	
Line 53	DCP53-1 - MH53-2	DCP53-1	MH53-2	300	20.87	1.25	0.035	1.21	0.108	0.32	YES	PROPOSED ROADS C1: 28
Line 53	DCP53-2 - MH53-2	DCP53-2	MH53-2	300	14.94	1.27	0.060	1.42	0.109	0.55	YES	PROPOSED ROADS C1: 27
Line 53	MH54-1 - MH53-2	MH54-1	MH53-2	225	41.87	1.10	0.035	1.26	0.047	0.74	YES	
Line 53	MH53-2 - MH53-1	MH53-2	MH53-1	525	21.61	0.80	0.300	1.61	0.385	0.78	YES	
Line 54	CP54-1 - MH54-2	CP54-1	MH54-2	225	20.79	4.80	0.012	0.84	0.098	0.12	YES	PROPOSED ROADS C1: 30
Line 54	CP54-2 - MH54-2	CP54-2	MH54-2	225	10.35	7.92	0.023	1.42	0.127	0.18	YES	PROPOSED ROADS C1: 29
Line 54	MH54-2 - MH54-1	MH54-2	MH54-1	225	45.62	7.00	0.035	1.68	0.119	0.29	YES	
Line 55	SD55-1 - Outlet55-0	SD55-1	Outlet55-0	1050	41.44	0.40	1.105	1.99	1.729	0.64	YES	

Stormwater Catchment - Wetland 7
BEACHLANDS STORMWATER NETWORK
 Jack Lachland Drive



FACTORS

Tc mins	10
t years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 30	CP30-16 - MH30-20	CP30-16	MH30-20	225	16.58	3.69	0.024	1.92	0.086	0.279	YES	PROPOSED ROADS C1: 64
Line 30	MH30-20 - MH30-19	MH30-20	MH30-19	225	25.76	7.00	0.024	2.28	0.120	0.200	YES	
Line 30	MH30-19 - MH30-18	MH30-19	MH30-18	225	47.49	7.00	0.024	1.37	0.120	0.200	YES	
Line 30	CP30-15 - MH30-18	CP30-15	MH30-18	225	6.39	16.21	0.027	1.66	0.180	0.150	YES	PROPOSED ROADS C1: 75
Line 30	MH30-18 - MH30-17	MH30-18	MH30-17	225	74.07	3.00	0.050	2.05	0.077	0.649	YES	
Line 30	CP30-14 - MH30-17	CP30-14	MH30-17	225	4.21	3.22	0.023	1.56	0.079	0.291	YES	PROPOSED ROADS C1: 74
Line 30	MH30-17 - MH30-16	MH30-17	MH30-16	300	88.71	3.00	0.074	1.67	0.168	0.440	YES	
Line 30	CP30-13 - MH30-16	CP30-13	MH30-16	225	3.64	5.88	0.027	1.67	0.108	0.250	YES	PROPOSED ROADS C1: 73
Line 30	CP30-12 - MH30-16	CP30-12	MH30-16	225	13.06	1.56	0.030	1.27	0.057	0.526	YES	PROPOSED ROADS C1: 81
Line 30	MH30-16 - MH30-15	MH30-16	MH30-15	300	90.16	2.50	0.129	2.37	0.152	0.849	YES	
Line 30	CP30-11 - MH30-15	CP30-11	MH30-15	225	4.26	7.47	0.027	2.21	0.123	0.220	YES	PROPOSED ROADS C1: 72
Line 30	CP30-10 - MH30-15	CP30-10	MH30-15	225	13.42	1.14	0.037	1.25	0.047	0.787	YES	PROPOSED ROADS C1: 80
Line 30	MH30-15 - MH30-14	MH30-15	MH30-14	450	90.35	1.00	0.193	1.72	0.284	0.680	YES	
Line 30	CP30-9 - MH30-14	CP30-9	MH30-14	225	4.24	4.14	0.027	1.77	0.090	0.300	YES	PROPOSED ROADS C1: 71
Line 30	MH30-14 - MH30-13	MH30-14	MH30-13	450	90.21	1.00	0.219	2.00	0.284	0.771	YES	
Line 30	CP30-8 - MH30-13	CP30-8	MH30-13	225	5.17	1.00	0.027	1.08	0.044	0.614	YES	PROPOSED ROADS C1: 70
Line 30	MH30-13 - MH30-12	MH30-13	MH30-12	450	89.36	2.00	0.245	2.73	0.402	0.609	YES	
Line 30	CP30-7 - MH30-12	CP30-7	MH30-12	225	9.24	3.46	0.025	1.72	0.083	0.301	YES	PROPOSED ROADS C1: 69
Line 30	MH30-12 - MH30-11	MH30-12	MH30-11	450	24.35	5.20	0.270	3.33	0.659	0.410	YES	
Line 30	MH30-11 - MH30-10	MH30-11	MH30-10	450	16.52	5.60	0.270	3.30	0.675	0.400	YES	
Line 30	MH30-10 - MH30-9	MH30-10	MH30-9	450	14.97	6.00	0.270	3.37	0.692	0.390	YES	
Line 30	MH30-9 - MH30-8	MH30-9	MH30-8	450	15.18	6.50	0.270	3.56	0.730	0.370	YES	
Line 30	MH30-8 - MH30-7	MH30-8	MH30-7	450	22.15	6.60	0.270	3.55	0.730	0.370	YES	
Line 30	CP30-6 - MH30-7	CP30-6	MH30-7	225	10.95	7.74	0.027	2.38	0.123	0.220	YES	PROPOSED ROADS C1: 68
Line 30	MH30-7 - MH30-6	MH30-7	MH30-6	450	85.60	5.00	0.295	3.82	0.641	0.460	YES	
Line 30	CP30-5 - MH30-6	CP30-5	MH30-6	225	8.46	5.24	0.024	1.97	0.104	0.231	YES	PROPOSED ROADS C1: 67
Line 30	MH30-6 - MH30-5	MH30-6	MH30-5	450	87.42	5.70	0.318	2.80	0.677	0.470	YES	
Line 30	CP30-4 - MH30-5	CP30-4	MH30-5	225	8.35	6.35	0.030	2.23	0.115	0.261	YES	PROPOSED ROADS C1: 66
Line 30	MH30-5 - MH30-4	MH30-5	MH30-4	525	12.28	2.00	0.354	1.80	0.894	0.510	YES	PROPOSED LOTS C1: 55
Line 30	DCP30-3 - MH30-4	DCP30-3	MH30-4	300	7.38	11.03	0.023	2.04	0.329	0.070	YES	PROPOSED ROADS C1: 58
Line 30	DCP30-2 - MH30-4	DCP30-2	MH30-4	300	12.27	6.00	0.023	1.67	0.230	0.100	YES	PROPOSED ROADS C1: 57
Line 30	MH30-4 - MH30-3	MH30-4	MH30-3	525	15.42	1.00	0.406	2.01	0.432	0.940	YES	PROPOSED LOTS C1: 54
Line 30	MH30-3 - MH30-2	MH30-3	MH30-2	600	25.22	1.00	0.417	2.04	0.613	0.680	YES	PROPOSED LOTS C1: 53
Line 30	MH31-1 - MH30-2	MH31-1	MH30-2	525	10.40	6.00	0.441	3.53	1.050	0.420	YES	
Line 30	MH30-2 - MH30-1	MH30-2	MH30-1	750	36.13	1.20	0.880	2.31	1.222	0.720	YES	PROPOSED LOTS C1: 49
Line 30	CP30-1 - MH30-1	CP30-1	MH30-1	225	4.40	7.37	0.002	1.18	0.100	0.020	YES	PROPOSED ROADS C1: 56
Line 30	BC30-1 - MH30-1	BC30-1	MH30-1	225	7.30	1.00	0.013	0.92	0.045	0.289	YES	PROPOSED LOTS C1: 48
Line 30	MH30-1 - Outlet30-0	MH30-1	Outlet30-0	825	21.11	0.60	0.895	2.08	1.119	0.800	YES	
Line 31	BC31-2 - MH31-8	BC31-2	MH31-8	225	12.74	6.00	0.062	2.57	0.109	0.569	YES	PROPOSED LOTS C1: 41
Line 31	MH31-8 - MH31-7	MH31-8	MH31-7	300	29.91	1.00	0.076	1.44	0.097	0.784	YES	PROPOSED LOTS C1: 42
Line 31	CP31-6 - MH31-7	CP31-6	MH31-7	225	2.25	13.43	0.027	2.55	0.159	0.170	YES	PROPOSED ROADS C1: 62
Line 31	MH31-7 - MH31-6	MH31-7	MH31-6	450	71.68	1.00	0.214	1.66	0.285	0.751	YES	PROPOSED LOTS C1: 40
Line 31	CP31-5 - MH31-6	CP31-5	MH31-6	225	3.44	9.46	0.019	2.02	0.136	0.140	YES	PROPOSED ROADS C1: 65
Line 31	MH31-6 - MH31-5	MH31-6	MH31-5	450	22.68	1.20	0.259	1.92	0.312	0.830	YES	PROPOSED LOTS C1: 77
Line 31	MH31-5 - MH31-4	MH31-5	MH31-4	450	17.81	2.00	0.281	2.40	0.401	0.701	YES	PROPOSED LOTS C1: 79
Line 31	CP31-4 - MH31-4	CP31-4	MH31-4	225	4.90	12.05	0.010	2.08	0.143	0.070	YES	PROPOSED ROADS C1: 78
Line 31	MH31-4 - MH31-3	MH31-4	MH31-3	450	12.36	4.00	0.291	2.86	0.571	0.510	YES	
Line 31	MH34-1 - MH31-3	MH34-1	MH31-3	225	29.25	5.00	0.059	2.53	0.100	0.590	YES	PROPOSED LOTS C1: 51
Line 31	CP31-3 - MH31-2	CP31-3	MH31-2	225	5.40	15.14	0.006	1.92	0.200	0.030	YES	PROPOSED LOTS C1: 43
Line 31	MH31-3 - MH31-2	MH31-3	MH31-2	450	25.59	6.00	0.371	3.71	0.700	0.530	YES	PROPOSED LOTS C1: 47
Line 31	BC31-1 - MH31-2	BC31-1	MH31-2	225	17.00	4.50	0.012	1.59	0.100	0.120	YES	PROPOSED LOTS C1: 50
Line 31	MH33-1 - MH31-2	MH33-1	MH31-2	225	26.94	1.00	0.012	0.93	0.046	0.261	YES	PROPOSED LOTS C1: 46
Line 31	DCP31-2 - MH31-1	DCP31-2	MH31-1	300	4.98	1.25	0.021	1.07	0.111	0.189	YES	PROPOSED ROADS C1: 61
Line 31	MH31-2 - MH31-1	MH31-2	MH31-1	450	29.51	6.00	0.400	4.17	0.702	0.570	YES	
Line 31	DCP31-1 - MH31-1	DCP31-1	MH31-1	300	10.09	3.86	0.021	1.67	0.191	0.110	YES	PROPOSED ROADS C1: 60
Line 31	MH32-1 - MH31-1	MH32-1	MH31-1	300	14.11	7.00	0.000	0.00	0.100	0.000	YES	
Line 32	CP32-2 - MH32-1	CP32-2	MH32-1	225	10.07	3.65	0.000	0.00	0.100	0.000	YES	
Line 32	CP32-1 - MH32-1	CP32-1	MH32-1	225	6.78	2.94	0.000	0.00	0.100	0.000	YES	
Line 34	CP34-2 - MH34-1	CP34-2	MH34-1	225	4.93	3.75	0.022	0.91	0.088	0.250	YES	PROPOSED ROADS C1: 63
Line 34	CP34-1 - MH34-1	CP34-1	MH34-1	225	9.60	1.89	0.014	0.65	0.061	0.230	YES	PROPOSED ROADS C1: 59
Line 35	SD35-1 - Outlet35-0	SD35-1	Outlet35-0	825	44.11	1.30	0.970	2.92	1.644	0.590	YES	

Stormwater Catchment - Wetland 8
BEACHLANDS STORMWATER NETWORK
 Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	LOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 60	MH64-1 - MH60-9	MH64-1	MH60-9	300	19.11	1.00	0.073	1.47	0.096	0.76	YES	PROPOSED LOTS C1: 7
Line 60	MH60-10 - MH60-9	MH60-10	MH60-9	225	26.79	6.00	0.035	2.21	0.109	0.32	YES	PROPOSED LOTS C1: 8
Line 60	CP60-5 - MH60-8	CP60-5	MH60-8	225	2.87	7.63	0.013	1.81	0.118	0.11	YES	PROPOSED ROADS C1: 19
Line 60	MH60-9 - MH60-8	MH60-9	MH60-8	300	31.68	3.21	0.108	2.22	0.174	0.62	YES	
Line 60	MH63-1 - MH60-8	MH63-1	MH60-8	225	29.40	1.00	0.043	1.24	0.044	0.97	YES	PROPOSED LOTS C1: 9
Line 60	MH60-8 - MH60-7	MH60-8	MH60-7	300	60.44	7.00	0.196	3.86	0.258	0.76	YES	PROPOSED LOTS C1: 11
Line 60	CP60-4 - MH60-7	CP60-4	MH60-7	225	6.34	1.16	0.021	1.07	0.049	0.43	YES	PROPOSED ROADS C1: 13
Line 60	MH60-7 - MH60-6	MH60-7	MH60-6	375	60.78	7.00	0.245	3.61	0.462	0.53	YES	PROPOSED LOTS C1: 6
Line 60	MH60-6 - MH60-5	MH60-6	MH60-5	375	9.50	7.00	0.244	3.23	0.460	0.53	YES	
Line 60	CP60-2 - MH60-4	CP60-2	MH60-4	225	11.83	2.47	0.019	1.44	0.070	0.27	YES	PROPOSED ROADS C1: 15
Line 60	CP60-3 - MH60-4	CP60-3	MH60-4	225	8.08	3.89	0.020	1.66	0.083	0.24	YES	PROPOSED ROADS C1: 14
Line 60	MH60-5 - MH60-4	MH60-5	MH60-4	375	16.32	6.00	0.244	3.18	0.428	0.57	YES	
Line 60	MH60-4 - MH60-3	MH60-4	MH60-3	375	42.51	6.00	0.315	3.65	0.432	0.73	YES	PROPOSED LOTS C1: 5
Line 60	MH61-1 - MH60-2	MH61-1	MH60-2	225	11.44	7.00	0.058	2.75	0.121	0.48	YES	PROPOSED LOTS C1: 3
Line 60	MH62-1 - MH60-2	MH62-1	MH60-2	375	15.04	6.00	0.244	3.57	0.428	0.57	YES	PROPOSED LOTS C1: 4
Line 60	DCP60-1 - MH60-2	DCP60-1	MH60-2	300	8.13	22.98	0.048	3.98	0.480	0.10	YES	PROPOSED ROADS C1: 16
Line 60	MH60-3 - MH60-2	MH60-3	MH60-2	375	31.24	5.00	0.315	3.65	0.394	0.80	YES	
Line 60	MH60-2 - MH60-1	MH60-2	MH60-1	525	27.85	7.00	0.664	4.47	1.145	0.58	YES	
Line 60	MH60-1 - Outlet60-0	MH60-1	Outlet60-0	750	24.90	0.50	0.664	1.88	0.790	0.84	YES	
Line 61	MH61-2 - MH61-1	MH61-2	MH61-1	225	15.82	7.00	0.036	1.97	0.120	0.30	YES	PROPOSED LOTS C1: 10
Line 62	MH62-5 - MH62-4	MH62-5	MH62-4	225	85.75	6.50	0.073	3.01	0.116	0.63	YES	PROPOSED LOTS C1: 1
Line 62	CP62-1 - MH62-4	CP62-1	MH62-4	225	5.89	5.09	0.020	1.83	0.100	0.20	YES	PROPOSED ROADS C1: 12
Line 62	MH62-4 - MH62-3	MH62-4	MH62-3	300	52.53	7.00	0.138	3.20	0.256	0.54	YES	PROPOSED LOTS C1: 18
Line 62	MH62-3 - MH62-2	MH62-3	MH62-2	300	12.67	7.00	0.153	2.79	0.255	0.60	YES	PROPOSED LOTS C1: 17
Line 62	MH62-2 - MH62-1	MH62-2	MH62-1	300	77.53	5.50	0.209	3.53	0.227	0.92	YES	PROPOSED LOTS C1: 2
Line 63	MH63-2 - MH63-1	MH63-2	MH63-1	225	20.06	1.00	0.023	0.79	0.046	0.50	YES	PROPOSED LOTS C1: 20
Line 65	SD65-1 - Outlet65-0	SD65-1	Outlet65-0	750	32.98	3.70	0.762	4.07	2.117	0.36	YES	

Stormwater Catchment -Wetland 9 BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 80	MH80-11 - MH80-10	MH80-11	MH80-10	225	22.77	3.20	0.011	0.58	0.080	0.14	YES	PROPOSED LOTS Ct: 60
Line 80	CP80-7 - MH80-10	CP80-7	MH80-10	225	3.11	18.55	0.008	0.51	0.193	0.04	YES	PROPOSED ROADS Ct: 40
Line 80	MH80-10 - MH80-9	MH80-10	MH80-9	225	85.22	3.80	0.073	2.42	0.088	0.83	YES	PROPOSED LOTS Ct: 59
Line 80	CP80-6 - MH80-9	CP80-6	MH80-9	225	4.56	13.51	0.019	2.55	0.165	0.12	YES	PROPOSED ROADS Ct: 44
Line 80	MH80-9 - MH80-8	MH80-9	MH80-8	300	79.63	4.00	0.150	2.95	0.193	0.78	YES	PROPOSED LOTS Ct: 25
Line 80	MH80-8 - MH80-7	MH80-8	MH80-7	375	14.02	5.50	0.169	3.19	0.411	0.41	YES	
Line 80	CP80-5 - MH80-8	CP80-5	MH80-8	225	3.93	17.92	0.019	2.80	0.190	0.10	YES	PROPOSED ROADS Ct: 7
Line 80	MH88-1 - MH80-7	MH88-1	MH80-7	225	20.83	1.00	0.019	1.04	0.045	0.42	YES	
Line 80	MH86-1 - MH80-7	MH86-1	MH80-7	450	10.91	6.00	0.196	3.32	0.698	0.28	YES	
Line 80	MH80-7 - MH80-6	MH80-7	MH80-6	525	41.24	5.50	0.384	3.21	1.009	0.38	YES	
Line 80	CP80-3 - MH80-6	CP80-3	MH80-6	225	10.58	16.59	0.011	2.45	0.183	0.06	YES	PROPOSED ROADS Ct: 55
Line 80	CP80-4 - MH80-6	CP80-4	MH80-6	225	6.06	25.00	0.011	2.82	0.225	0.05	YES	PROPOSED ROADS Ct: 57
Line 80	MH80-6 - MH80-5	MH80-6	MH80-5	525	63.47	3.00	0.496	3.22	0.745	0.67	YES	PROPOSED LOTS Ct: 43
Line 80	MH85-1 - MH80-5	MH85-1	MH80-5	300	12.89	7.00	0.077	2.93	0.256	0.30	YES	
Line 80	MH80-5 - MH80-4	MH80-5	MH80-4	600	15.44	3.00	0.583	2.46	1.063	0.55	YES	PROPOSED LOTS Ct: 39
Line 80	MH80-4 - MH80-3	MH80-4	MH80-3	600	9.76	2.00	0.595	2.66	0.868	0.69	YES	PROPOSED LOTS Ct: 36
Line 80	DCP80-1 - MH80-3	DCP80-1	MH80-3	300	14.28	12.94	0.039	3.13	0.348	0.11	YES	PROPOSED ROADS Ct: 12
Line 80	DCP80-2 - MH80-3	DCP80-2	MH80-3	300	5.53	25.00	0.036	3.72	0.484	0.07	YES	PROPOSED ROADS Ct: 24
Line 80	MH81-1 - MH80-3	MH81-1	MH80-3	450	25.28	7.00	0.394	4.35	0.754	0.52	YES	PROPOSED LOTS Ct: 28
Line 80	MH80-3 - MH80-2	MH80-3	MH80-2	600	27.00	10.00	1.123	5.63	1.942	0.58	YES	PROPOSED LOTS Ct: 32
Line 80	MH80-2 - MH80-1	MH80-2	MH80-1	825	21.55	1.00	1.123	2.58	1.435	0.78	YES	
Line 80	MH80-1 - Outlet80-0	MH80-1	Outlet80-0	1050	73.74	0.20	1.123	1.85	1.215	0.92	YES	
Line 81	MH81-7 - MH81-6	MH81-7	MH81-6	225	53.12	4.00	0.050	2.27	0.090	0.56	YES	PROPOSED LOTS Ct: 15
Line 81	CP81-5 - MH81-6	CP81-5	MH81-6	225	2.67	16.95	0.017	2.01	0.185	0.09	YES	PROPOSED ROADS Ct: 19
Line 81	MH81-6 - MH81-5	MH81-6	MH81-5	300	29.37	2.00	0.084	1.94	0.137	0.61	YES	PROPOSED LOTS Ct: 45
Line 81	MH81-5 - MH81-4	MH81-5	MH81-4	375	52.99	3.20	0.130	2.68	0.314	0.41	YES	PROPOSED LOTS Ct: 1
Line 81	CP81-4 - MH81-5	CP81-4	MH81-5	225	5.77	4.23	0.013	1.54	0.092	0.14	YES	PROPOSED ROADS Ct: 41
Line 81	MH81-4 - MH81-4	MH81-4	MH81-4	225	37.44	7.00	0.009	1.74	0.119	0.08	YES	PROPOSED LOTS Ct: 27
Line 81	CP81-3 - MH81-4	CP81-3	MH81-4	225	4.19	20.65	0.013	2.71	0.204	0.06	YES	PROPOSED ROADS Ct: 31
Line 81	MH81-4 - MH81-3	MH81-4	MH81-3	375	14.48	7.00	0.152	2.34	0.464	0.33	YES	
Line 81	MH81-3 - MH81-2	MH81-3	MH81-2	375	38.08	4.50	0.281	3.16	0.372	0.76	YES	PROPOSED LOTS Ct: 48
Line 81	CP81-1 - MH81-3	CP81-1	MH81-3	225	10.95	12.30	0.012	2.26	0.157	0.08	YES	PROPOSED ROADS Ct: 53
Line 81	CP81-2 - MH81-3	CP81-2	MH81-3	225	14.54	9.22	0.012	2.05	0.136	0.09	YES	PROPOSED ROADS Ct: 13
Line 81	MH83-1 - MH81-3	MH83-1	MH81-3	300	54.20	3.03	0.088	2.34	0.168	0.52	YES	PROPOSED LOTS Ct: 3
Line 81	MH81-2 - MH81-1	MH81-2	MH81-1	375	13.12	5.00	0.280	3.35	0.392	0.71	YES	
Line 81	MH82-1 - MH81-1	MH82-1	MH81-1	225	23.21	5.50	0.102	2.85	0.105	0.97	YES	PROPOSED LOTS Ct: 20
Line 82	MH82-4 - MH82-3	MH82-4	MH82-3	225	40.44	6.50	0.032	1.78	0.114	0.28	YES	PROPOSED LOTS Ct: 38
Line 82	MH82-3 - MH82-2	MH82-3	MH82-2	225	16.05	6.00	0.057	2.63	0.110	0.52	YES	PROPOSED LOTS Ct: 42
Line 82	MH82-2 - MH82-1	MH82-2	MH82-1	225	16.55	7.00	0.070	2.93	0.119	0.59	YES	PROPOSED LOTS Ct: 16
Line 82	CP82-1 - MH82-1	CP82-1	MH82-1	225	6.90	18.37	0.020	2.99	0.192	0.10	YES	PROPOSED ROADS Ct: 35
Line 83	MH83-2 - MH83-1	MH83-2	MH83-1	225	53.25	2.50	0.042	1.82	0.071	0.59	YES	PROPOSED LOTS Ct: 2
Line 83	CP83-1 - MH83-1	CP83-1	MH83-1	225	5.98	6.38	0.013	1.55	0.113	0.11	YES	PROPOSED ROADS Ct: 52
Line 85	MH85-4 - MH85-3	MH85-4	MH85-3	225	16.99	3.00	0.019	1.25	0.078	0.24	YES	PROPOSED LOTS Ct: 5
Line 85	MH85-3 - MH85-2	MH85-3	MH85-2	225	26.95	3.00	0.037	1.43	0.078	0.48	YES	PROPOSED LOTS Ct: 6
Line 85	MH85-2 - MH85-1	MH85-2	MH85-1	225	50.06	4.00	0.077	2.47	0.090	0.86	YES	PROPOSED LOTS Ct: 4
Line 86	MH86-5 - MH86-4	MH86-5	MH86-4	225	42.33	3.00	0.028	1.28	0.078	0.36	YES	PROPOSED LOTS Ct: 18
Line 86	CP86-5 - MH86-4	CP86-5	MH86-4	225	6.54	8.18	0.019	1.21	0.128	0.15	YES	PROPOSED ROADS Ct: 14
Line 86	MH86-4 - MH86-3	MH86-4	MH86-3	225	46.99	6.80	0.084	3.12	0.117	0.72	YES	PROPOSED LOTS Ct: 22
Line 86	CP86-4 - MH86-3	CP86-4	MH86-3	225	4.97	3.70	0.016	1.51	0.086	0.19	YES	PROPOSED ROADS Ct: 26
Line 86	MH86-3 - MH86-2	MH86-3	MH86-2	300	31.28	2.50	0.099	2.19	0.153	0.65	YES	
Line 86	CP86-3 - MH86-2	CP86-3	MH86-2	225	5.27	9.86	0.019	2.11	0.141	0.13	YES	PROPOSED ROADS Ct: 51
Line 86	MH87-1 - MH86-2	MH87-1	MH86-2	225	56.14	3.00	0.047	2.01	0.078	0.60	YES	PROPOSED LOTS Ct: 30
Line 86	MH86-2 - MH86-1	MH86-2	MH86-1	375	12.49	2.50	0.165	2.33	0.277	0.60	YES	
Line 86	CP86-2 - MH86-1	CP86-2	MH86-1	225	11.69	4.78	0.014	1.70	0.098	0.14	YES	PROPOSED ROADS Ct: 58
Line 86	CP86-1 - MH86-1	CP86-1	MH86-1	225	6.20	9.07	0.016	2.16	0.135	0.12	YES	PROPOSED ROADS Ct: 37

Line 88	CP88-2 - MH88-1	CP88-2	MH88-1	225	10.87	1.72	0.008	0.20	0.059	0.14	YES	PROPOSED ROADS C1: 21
Line 88	CP88-1 - MH88-1	CP88-1	MH88-1	225	12.50	1.64	0.011	0.28	0.057	0.19	YES	PROPOSED ROADS C1: 56
Line 89	SD89-1 - MH89-1	SD89-1	MH89-1	1050	50.89	2.20	1.304	4.96	4.050	0.32	YES	
Line 89	MH89-1 - Outlet89-0	MH89-1	Outlet89-0	1050	51.69	13.80	1.397	5.50	10.144	0.14	YES	

Stormwater Catchment -Wetland 10
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 106	SD106-1 - Outlet106-0	SD106-1	Outlet106-0	675	53.82	11.50	0.475	5.67	2.851	0.17	YES	
Line 200	MH200-6 - MH200-5	MH200-6	MH200-5	225	48.12	0.80	0.029	1.07	0.040	0.72	YES	PROPOSED LOTS C1: 14
Line 200	MH200-5 - MH200-4	MH200-5	MH200-4	300	27.21	0.80	0.047	1.13	0.086	0.54	YES	PROPOSED LOTS C1: 5
Line 200	MH200-4 - MH200-3	MH200-4	MH200-3	450	22.82	0.80	0.198	1.59	0.255	0.78	YES	PROPOSED LOTS C1: 3
Line 200	MH200-3 - MH200-2	MH200-3	MH200-2	600	12.02	0.80	0.198	0.75	0.549	0.36	YES	
Line 200	MH200-2 - MH200-1	MH200-2	MH200-1	600	4.83	0.80	0.454	1.76	0.549	0.83	YES	
Line 200	MH201-1 - MH200-2	MH201-1	MH200-2	375	28.77	1.50	0.172	1.90	0.215	0.80	YES	PROPOSED LOTS C1: 19
Line 200	DCP200-1 - MH200-2	DCP200-1	MH200-2	300	11.96	7.08	0.018	2.02	0.257	0.07	YES	PROPOSED ROADS C1: 4
Line 200	MH203-1 - MH200-2	MH203-1	MH200-2	225	30.71	3.80	0.067	2.33	0.088	0.77	YES	
Line 200	MH204-1 - MH200-4	MH204-1	MH200-4	300	23.52	7.00	0.135	3.45	0.256	0.53	YES	
Line 200	MH200-1 - Outlet200-0	MH200-1	Outlet200-0	675	15.26	0.40	0.454	1.67	0.532	0.85	YES	
Line 201	MH201-4 - MH201-3	MH201-4	MH201-3	300	16.10	1.00	0.055	1.27	0.097	0.57	YES	PROPOSED LOTS C1: 9
Line 201	MH201-3 - MH201-2	MH201-3	MH201-2	300	41.35	1.00	0.055	1.45	0.097	0.57	YES	
Line 201	MH201-2 - MH201-1	MH201-2	MH201-1	300	36.73	1.50	0.055	1.32	0.118	0.46	YES	
Line 201	CP201-1 - MH201-4	CP201-1	MH201-4	225	11.16	2.09	0.008	0.87	0.065	0.12	YES	PROPOSED ROADS C1: 7
Line 203	MH203-3 - MH203-2	MH203-3	MH203-2	225	50.88	7.00	0.043	2.32	0.119	0.36	YES	PROPOSED LOTS C1: 17
Line 203	MH203-2 - MH203-1	MH203-2	MH203-1	225	8.32	7.00	0.051	2.62	0.119	0.43	YES	PROPOSED LOTS C1: 1
Line 203	CP203-1 - MH203-1	CP203-1	MH203-1	225	4.83	8.52	0.016	2.06	0.131	0.12	YES	PROPOSED ROADS C1: 18
Line 204	MH204-5 - MH204-4	MH204-5	MH204-4	225	19.39	1.00	0.039	1.20	0.045	0.87	YES	PROPOSED LOTS C1: 22
Line 204	CP204-4 - MH204-5	CP204-4	MH204-5	225	5.01	8.01	0.015	0.75	0.127	0.12	YES	PROPOSED ROADS C1: 27
Line 204	MH204-4 - MH204-3	MH204-4	MH204-3	300	24.26	1.00	0.058	1.60	0.097	0.60	YES	PROPOSED LOTS C1: 16
Line 204	CP204-3 - MH204-5	CP204-3	MH204-5	225	10.10	3.88	0.016	0.72	0.088	0.18	YES	PROPOSED ROADS C1: 24
Line 204	MH204-3 - MH204-2	MH204-3	MH204-2	300	14.73	3.50	0.058	1.68	0.181	0.32	YES	
Line 204	DCP204-2 - MH204-2	DCP204-2	MH204-2	300	20.75	1.30	0.045	1.20	0.110	0.41	YES	PROPOSED ROADS C1: 21
Line 204	MH204-2 - MH204-1	MH204-2	MH204-1	300	41.90	4.40	0.129	2.92	0.203	0.64	YES	PROPOSED LOTS C1: 2
Line 204	MH205-1 - MH204-4	MH205-1	MH204-4	225	12.73	7.00	0.007	1.20	0.119	0.06	YES	PROPOSED LOTS C1: 28
Line 204	CP204-1 - MH204-1	CP204-1	MH204-1	225	3.35	18.49	0.006	2.07	0.193	0.03	YES	PROPOSED ROADS C1: 15

Stormwater Catchment - Wetland 11
BEACHLANDS STORMWATER NETWORK
Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO: A2515591.00

Prepared by: ENW
 Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 90	CP90-9 - MH90-17	CP90-9	MH90-17	225	12.05	1.84	0.017	1.00	0.061	0.28	YES	PROPOSED ROADS C1: 26
Line 90	CP90-10 - MH90-17	CP90-10	MH90-17	225	7.26	1.10	0.019	0.96	0.046	0.41	YES	PROPOSED ROADS C1: 9
Line 90	MH90-17 - MH90-16	MH90-17	MH90-16	225	17.88	2.00	0.037	1.57	0.064	0.58	YES	
Line 90	CP90-7 - MH90-15	CP90-7	MH90-15	225	11.06	2.10	0.014	1.24	0.067	0.21	YES	PROPOSED ROADS C1: 24
Line 90	CP90-8 - MH90-15	CP90-8	MH90-15	225	6.06	6.65	0.016	1.92	0.114	0.14	YES	PROPOSED ROADS C1: 22
Line 90	MH90-16 - MH90-15	MH90-16	MH90-15	225	39.52	2.30	0.037	1.70	0.069	0.54	YES	
Line 90	MH93-1 - MH90-14	MH93-1	MH90-14	300	13.33	1.00	0.039	1.08	0.098	0.40	YES	PROPOSED LOTS C1: 33
Line 90	MH90-15 - MH90-14	MH90-15	MH90-14	375	53.05	4.00	0.244	2.94	0.354	0.69	YES	PROPOSED LOTS C1: 2
Line 90	DCP90-5 - MH90-13	DCP90-5	MH90-13	300	7.80	3.06	0.026	1.38	0.163	0.16	YES	PROPOSED ROADS C1: 20
Line 90	DCP90-6 - MH90-13	DCP90-6	MH90-13	300	13.80	2.51	0.031	1.39	0.155	0.20	YES	PROPOSED ROADS C1: 32
Line 90	MH90-14 - MH90-13	MH90-14	MH90-13	525	8.01	0.90	0.281	1.33	0.407	0.69	YES	
Line 90	MH90-13 - MH90-12	MH90-13	MH90-12	525	32.21	0.90	0.358	1.74	0.407	0.88	YES	PROPOSED LOTS C1: 1
Line 90	CP90-3 - MH90-11	CP90-3	MH90-11	300	9.55	5.27	0.022	1.91	0.220	0.10	YES	PROPOSED ROADS C1: 15
Line 90	CP90-4 - MH90-11	CP90-4	MH90-11	225	4.22	15.50	0.023	2.80	0.177	0.13	YES	PROPOSED ROADS C1: 13
Line 90	MH90-12 - MH90-11	MH90-12	MH90-11	525	20.20	1.00	0.373	1.96	0.429	0.87	YES	PROPOSED LOTS C1: 8
Line 90	MH90-11 - MH90-10	MH90-11	MH90-10	600	75.04	0.80	0.471	1.96	0.548	0.86	YES	PROPOSED LOTS C1: 7
Line 90	MH90-10 - MH90-9	MH90-10	MH90-9	675	16.84	0.80	0.478	1.51	0.747	0.64	YES	PROPOSED LOTS C1: 6
Line 90	MH90-9 - MH90-8	MH90-9	MH90-8	675	15.29	0.80	0.496	1.61	0.752	0.66	YES	PROPOSED LOTS C1: 5
Line 90	MH90-8 - MH90-7	MH90-8	MH90-7	675	31.89	0.80	0.514	1.64	0.756	0.68	YES	PROPOSED LOTS C1: 4
Line 90	DCP90-1 - MH90-5	DCP90-1	MH90-5	300	9.00	25.00	0.031	3.67	0.517	0.06	YES	PROPOSED ROADS C1: 30
Line 90	DCP90-2 - MH90-5	DCP90-2	MH90-5	300	11.40	19.01	0.027	3.22	0.450	0.06	YES	PROPOSED ROADS C1: 12
Line 90	MH90-7 - MH90-5	MH90-7	MH90-5	675	17.49	0.80	0.520	1.62	0.754	0.69	YES	PROPOSED LOTS C1: 3
Line 90	MH90-5 - MH90-4	MH90-5	MH90-4	675	51.70	0.80	0.620	1.97	0.756	0.82	YES	PROPOSED LOTS C1: 27
Line 90	MH90-4 - MH90-3	MH90-4	MH90-3	675	7.32	2.00	0.619	2.05	1.190	0.52	YES	
Line 90	MH91-1 - MH90-2	MH91-1	MH90-2	525	15.79	1.10	0.307	1.94	0.451	0.68	YES	
Line 90	MH90-3 - MH90-2	MH90-3	MH90-2	675	88.62	0.80	0.619	1.88	0.755	0.82	YES	
Line 90	MH90-2 - MH90-1	MH90-2	MH90-1	825	10.28	0.80	0.919	1.76	1.276	0.72	YES	
Line 90	MH90-1 - Outlet90-0	MH90-1	Outlet90-0	825	11.38	0.50	0.919	2.01	1.021	0.90	YES	
Line 91	MH91-3 - MH91-2	MH91-3	MH91-2	225	33.02	1.00	0.025	1.12	0.045	0.56	YES	PROPOSED LOTS C1: 19
Line 91	DCP91-1 - MH91-2	DCP91-1	MH91-2	300	18.38	4.88	0.053	2.17	0.212	0.25	YES	PROPOSED ROADS C1: 11
Line 91	MH91-2 - MH91-1	MH91-2	MH91-1	450	45.18	1.00	0.201	1.74	0.287	0.70	YES	PROPOSED LOTS C1: 23
Line 91	MH92-1 - MH91-1	MH92-1	MH91-1	300	11.80	2.40	0.108	2.07	0.150	0.72	YES	
Line 92	CP93-6 - MH92-5	CP93-6	MH92-5	225	3.33	5.31	0.016	1.18	0.107	0.15	YES	PROPOSED ROADS C1: 34
Line 92	CP93-5 - MH92-5	CP93-5	MH92-5	225	8.40	2.40	0.016	1.12	0.070	0.23	YES	PROPOSED ROADS C1: 35
Line 92	MH92-5 - MH92-4	MH92-5	MH92-4	225	49.03	3.50	0.031	1.93	0.084	0.37	YES	
Line 92	CP93-4 - MH92-4	CP93-4	MH92-4	225	4.01	21.59	0.012	0.73	0.240	0.05	YES	PROPOSED ROADS C1: 28
Line 92	CP93-3 - MH92-4	CP93-3	MH92-4	225	8.24	12.02	0.014	0.82	0.156	0.09	YES	PROPOSED ROADS C1: 10
Line 92	MH92-4 - MH92-3	MH92-4	MH92-3	225	73.50	2.50	0.057	1.95	0.071	0.80	YES	
Line 92	CP93-2 - MH92-2	CP93-2	MH92-2	225	4.45	3.10	0.027	1.59	0.079	0.34	YES	PROPOSED ROADS C1: 31
Line 92	CP93-1 - MH92-2	CP93-1	MH92-2	225	8.32	3.27	0.025	1.66	0.081	0.31	YES	PROPOSED ROADS C1: 36
Line 92	MH92-3 - MH92-2	MH92-3	MH92-2	300	39.30	2.00	0.057	1.33	0.139	0.41	YES	
Line 92	MH92-2 - MH92-1	MH92-2	MH92-1	300	11.37	3.00	0.108	1.94	0.166	0.65	YES	
Line 93	MH93-3 - MH93-2	MH93-3	MH93-2	225	15.83	7.00	0.019	1.02	0.119	0.16	YES	PROPOSED LOTS C1: 37
Line 93	MH93-2 - MH93-1	MH93-2	MH93-1	225	23.52	1.00	0.033	1.19	0.044	0.75	YES	PROPOSED LOTS C1: 18
Line 94	SD94-1 - Outlet94-0	SD94-1	Outlet94-0	825	28.57	0.50	0.944	2.05	1.015	0.93	YES	

Stormwater Catchment -Rain Garden 1

BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW
Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 175	CP175-5 - MH175-4	CP175-5	MH175-4	225	9.98	1.04	0.016	1.03	0.046	0.35	YES	PROPOSED ROADS C1: 22
Line 175	CP175-6 - MH175-4	CP175-6	MH175-4	225	5.32	5.07	0.015	1.25	0.101	0.15	YES	PROPOSED ROADS C1: 23
Line 175	MH175-4 - MH175-3	MH175-4	MH175-3	225	27.49	5.00	0.031	2.06	0.101	0.31	YES	
Line 175	MH175-3 - MH175-2	MH175-3	MH175-2	225	18.77	4.50	0.031	2.05	0.095	0.33	YES	
Line 175	DCP175-3 - MH175-2	DCP175-3	MH175-2	300	11.73	2.70	0.016	0.67	0.159	0.10	YES	PROPOSED ROADS C1: 29
Line 175	CP175-4 - MH175-2	CP175-4	MH175-2	225	4.68	6.69	0.012	1.48	0.116	0.10	YES	PROPOSED ROADS C1: 24
Line 175	DCP175-2 - MH175-1	DCP175-2	MH175-1	300	9.92	8.80	0.031	2.52	0.287	0.11	YES	PROPOSED ROADS C1: 26
Line 175	DCP175-1 - MH175-1	DCP175-1	MH175-1	300	4.55	22.99	0.029	3.37	0.464	0.06	YES	PROPOSED ROADS C1: 25
Line 175	MH175-2 - MH175-1	MH175-2	MH175-1	300	79.63	3.20	0.092	2.43	0.173	0.53	YES	
Line 175	MH175-1 - Outlet175-0	MH175-1	Outlet175-0	450	14.34	0.40	0.152	1.31	0.180	0.84	YES	
Line 176	CP176-2 - MH176-1	CP176-2	MH176-1	225	4.22	6.95	0.016	1.17	0.118	0.14	YES	PROPOSED ROADS C1: 27
Line 176	CP176-1 - MH176-1	CP176-1	MH176-1	225	10.60	1.03	0.017	0.90	0.046	0.37	YES	PROPOSED ROADS C1: 28
Line 176	MH176-1 - MH175-2	MH176-1	MH175-2	225	17.60	3.00	0.033	1.79	0.078	0.42	YES	
Line 177	SD177-1 - Outlet177-0	SD177-1	Outlet177-0	450	32.44	15.00	0.154	4.70	1.105	0.14	YES	

Stormwater Catchment - Rain Garden 2
BEACHLANDS STORMWATER NETWORK
Jack Lachland Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO: A2515591.00

Prepared by: ENW
Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 170	CP170-3 - MH170-4	CP170-3	MH170-4	225	5.55	11.62	0.016	0.97	0.153	0.10	YES	PROPOSED ROADS Ct: 2
Line 170	CP170-2 - MH170-4	CP170-2	MH170-4	225	12.09	4.08	0.016	0.90	0.091	0.18	YES	PROPOSED ROADS Ct: 3
Line 170	MH170-4 - MH170-3	MH170-4	MH170-3	225	50.90	1.00	0.032	1.13	0.045	0.71	YES	
Line 170	MH170-3 - MH170-2	MH170-3	MH170-2	225	8.45	1.00	0.032	1.14	0.045	0.71	YES	
Line 170	DCP170-1 - MH170-2	DCP170-1	MH170-2	300	5.46	2.15	0.055	1.63	0.142	0.39	YES	PROPOSED ROADS Ct: 1
Line 170	MH170-2 - MH170-1	MH170-2	MH170-1	300	32.89	5.00	0.087	2.28	0.216	0.40	YES	
Line 170	MH170-1 - Outlet170-0	MH170-1	Outlet170-0	375	39.54	0.40	0.087	1.16	0.111	0.78	YES	
Line 171	SD171-1 - Outlet171-0	SD171-1	Outlet171-0	375	23.56	3.00	0.097	2.31	0.304	0.32	YES	

Stormwater Catchment - Rain Garden 3

BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by:

ENW

Checked by:

CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 180	MH180-11 - MH180-10	MH180-11	MH180-10	225	41.31	1.50	0.038	1.450	0.055	0.69	YES	PROPOSED LOTS C1: 11
Line 180	MH180-10 - MH180-9	MH180-10	MH180-9	225	14.98	2.00	0.038	1.570	0.064	0.59	YES	
Line 180	MH180-9 - MH180-8	MH180-9	MH180-8	300	17.04	2.00	0.062	1.420	0.138	0.45	YES	PROPOSED LOTS C1: 7
Line 180	MH180-8 - MH180-7	MH180-8	MH180-7	300	14.15	2.00	0.083	1.640	0.136	0.61	YES	PROPOSED LOTS C1: 13
Line 180	MH180-7 - MH180-6	MH180-7	MH180-6	300	11.96	2.00	0.083	1.490	0.136	0.61	YES	
Line 180	CP180-2 - MH180-6	CP180-2	MH180-6	225	5.50	12.08	0.021	1.900	0.150	0.14	YES	PROPOSED ROADS C1: 17
Line 180	MH180-6 - MH180-5	MH180-6	MH180-5	300	13.08	2.00	0.104	1.880	0.137	0.76	YES	
Line 180	MH180-5 - MH180-4	MH180-5	MH180-4	300	58.08	2.00	0.104	2.030	0.137	0.76	YES	
Line 180	MH180-4 - MH180-3	MH180-4	MH180-3	300	12.58	3.00	0.104	2.080	0.168	0.62	YES	
Line 180	CP180-1 - MH180-3	CP180-1	MH180-3	225	5.98	9.94	0.020	2.340	0.143	0.14	YES	PROPOSED ROADS C1: 12
Line 180	MH180-3 - MH180-2	MH180-3	MH180-2	300	21.64	4.00	0.124	2.850	0.194	0.64	YES	
Line 180	MH180-2 - MH180-1	MH180-2	MH180-1	300	32.16	7.00	0.124	3.440	0.258	0.48	YES	
Line 180	MH181-1 - MH180-1	MH181-1	MH180-1	525	12.74	7.00	0.398	3.010	1.137	0.35	YES	
Line 180	MH180-1 - Outlet180-0	MH180-1	Outlet180-0	675	16.56	0.40	0.521	1.750	0.532	0.98	YES	
Line 181	MH181-5 - MH181-4	MH181-5	MH181-4	225	84.98	3.00	0.065	2.150	0.078	0.83	YES	PROPOSED LOTS C1: 8
Line 181	MH181-4 - MH181-3	MH181-4	MH181-3	300	31.25	3.00	0.065	1.510	0.167	0.39	YES	
Line 181	CP181-3 - MH181-3	CP181-3	MH181-3	225	4.96	5.28	0.016	1.740	0.100	0.16	YES	PROPOSED ROADS C1: 20
Line 181	MH184-1 - MH181-3	MH184-1	MH181-3	300	24.87	4.00	0.085	1.900	0.193	0.44	YES	PROPOSED LOTS C1: 9
Line 181	MH181-3 - MH181-2	MH181-3	MH181-2	300	14.19	6.00	0.165	3.250	0.236	0.70	YES	
Line 181	DCP181-2 - MH181-2	DCP181-2	MH181-2	300	11.98	3.68	0.019	1.620	0.190	0.10	YES	PROPOSED ROADS C1: 14
Line 181	DCP181-1 - MH181-2	DCP181-1	MH181-2	300	7.20	6.18	0.017	1.850	0.243	0.07	YES	PROPOSED ROADS C1: 19
Line 181	MH183-1 - MH181-2	MH183-1	MH181-2	300	32.77	1.00	0.068	1.420	0.097	0.70	YES	
Line 181	MH181-2 - MH181-1	MH181-2	MH181-1	375	40.32	7.00	0.295	4.210	0.461	0.64	YES	PROPOSED LOTS C1: 6
Line 181	MH182-1 - MH181-1	MH182-1	MH181-1	375	20.54	1.00	0.103	1.540	0.175	0.59	YES	PROPOSED LOTS C1: 21
Line 182	MH182-3 - MH182-2	MH182-3	MH182-2	225	16.39	2.00	0.009	0.620	0.060	0.15	YES	PROPOSED LOTS C1: 3
Line 182	MH182-2 - MH182-1	MH182-2	MH182-1	225	16.68	2.00	0.033	1.530	0.065	0.51	YES	PROPOSED LOTS C1: 4
Line 182	DCP182-2 - MH182-1	DCP182-2	MH182-1	300	5.93	4.09	0.024	1.270	0.200	0.12	YES	PROPOSED ROADS C1: 2
Line 182	DCP182-1 - MH182-1	DCP182-1	MH182-1	300	10.43	2.25	0.025	1.120	0.147	0.17	YES	PROPOSED ROADS C1: 15
Line 183	MH183-2 - MH183-1	MH183-2	MH183-1	300	73.83	1.00	0.068	1.400	0.096	0.71	YES	PROPOSED LOTS C1: 5
Line 184	MH184-3 - MH184-2	MH184-3	MH184-2	225	8.99	1.00	0.010	0.720	0.045	0.22	YES	PROPOSED LOTS C1: 18
Line 184	CP184-1 - MH184-2	CP184-1	MH184-2	225	4.35	6.18	0.021	1.630	0.111	0.19	YES	PROPOSED ROADS C1: 16
Line 184	MH184-2 - MH184-1	MH184-2	MH184-1	300	41.28	1.00	0.062	1.570	0.095	0.65	YES	PROPOSED LOTS C1: 10
Line 185	SD185-1 - Outlet185-0	SD185-1	Outlet185-0	675	56.20	15.00	0.563	3.650	3.312	0.17	YES	

Stormwater Catchment - Rain Garden 4

BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO: A2515591.00

Prepared by: ENW
Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 190	CP190-8 - MH190-5	CP190-8	MH190-5	225	8.09	6.90	0.028	1.27	0.122	0.230	YES	PROPOSED ROADS C1: 1
Line 190	CP190-7 - MH190-5	CP190-7	MH190-5	225	10.05	4.55	0.021	1.00	0.095	0.220	YES	PROPOSED ROADS C1: 3
Line 190	CP190-6 - MH190-4	CP190-6	MH190-4	225	6.46	1.79	0.023	1.28	0.059	0.390	YES	PROPOSED ROADS C1: 5
Line 190	CP190-5 - MH190-4	CP190-5	MH190-4	225	8.54	2.42	0.023	1.41	0.070	0.330	YES	PROPOSED ROADS C1: 6
Line 190	MH190-5 - MH190-4	MH190-5	MH190-4	225	87.95	1.50	0.048	1.53	0.055	0.880	YES	
Line 190	CP190-4 - MH190-3	CP190-4	MH190-3	225	6.29	10.05	0.021	2.20	0.140	0.150	YES	PROPOSED ROADS C1: 7
Line 190	MH190-4 - MH190-3	MH190-4	MH190-3	300	89.69	2.50	0.095	2.33	0.153	0.620	YES	
Line 190	CP190-3 - MH190-3	CP190-3	MH190-3	225	9.46	6.70	0.021	1.99	0.117	0.180	YES	PROPOSED ROADS C1: 8
Line 190	MH190-3 - MH190-2	MH190-3	MH190-2	300	85.66	6.90	0.137	2.57	0.254	0.540	YES	
Line 190	DCP190-2 - MH190-2	DCP190-2	MH190-2	300	5.93	1.71	0.033	1.35	0.127	0.260	YES	PROPOSED ROADS C1: 4
Line 190	MH190-2 - MH190-1	MH190-2	MH190-1	300	16.83	5.60	0.202	3.25	0.230	0.880	YES	
Line 190	DCP190-1 - MH190-2	DCP190-1	MH190-2	300	9.26	1.12	0.033	1.20	0.103	0.320	YES	PROPOSED ROADS C1: 2
Line 190	MH191-1 - MH190-1	MH191-1	MH190-1	225	35.77	5.00	0.080	2.70	0.100	0.800	YES	
Line 190	MH190-1 - Outlet190-0	MH190-1	Outlet190-0	525	16.99	0.50	0.282	1.57	0.303	0.930	YES	
Line 191	CP191-4 - MH191-2	CP191-4	MH191-2	225	5.02	6.80	0.020	1.09	0.118	0.170	YES	PROPOSED ROADS C1: 11
Line 191	CP191-3 - MH191-2	CP191-3	MH191-2	225	8.78	2.25	0.020	0.94	0.069	0.290	YES	PROPOSED ROADS C1: 12
Line 191	CP191-2 - MH191-1	CP191-2	MH191-1	225	4.82	3.16	0.020	0.88	0.080	0.250	YES	PROPOSED ROADS C1: 9
Line 191	MH191-2 - MH191-1	MH191-2	MH191-1	225	85.49	1.50	0.040	1.39	0.056	0.720	YES	
Line 191	CP191-1 - MH191-1	CP191-1	MH191-1	225	8.54	1.75	0.020	0.85	0.059	0.340	YES	PROPOSED ROADS C1: 10
Line 192	SD192-1 - Outlet192-0	SD192-1	Outlet192-0	525	48.05	3.00	0.303	3.10	0.739	0.410	YES	

Stormwater Catchment - JLD BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW

Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m³/s)	VELOCITY (m/s)	CAPACITY (m³/s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 100	CP100-1 - MH100-1	CP100-1	MH100-1	225	8.21	5.73	0.031	1.940	0.111	0.28	YES	PROPOSED ROADS Ct: 81
Line 102	CP102-1 - MH102-1	CP102-1	MH102-1	225	5.41	4.41	0.040	2.090	0.095	0.42	YES	PROPOSED ROADS Ct: 83
Line 103	CP103-2 - MH103-3	CP103-2	MH103-3	225	7.99	2.00	0.030	1.430	0.063	0.48	YES	PROPOSED ROADS Ct: 82
Line 103	MH103-3 - MH103-2	MH103-3	MH103-2	225	62.53	2.00	0.030	1.560	0.063	0.48	YES	
Line 103	CP103-1 - MH103-1	CP103-1	MH103-1	225	4.90	7.21	0.054	1.930	0.064	0.85	YES	PROPOSED ROADS Ct: 84
Line 103	MH103-2 - MH103-1	MH103-2	MH103-1	225	64.80	2.00	0.030	1.180	0.120	0.25	YES	
Line 105	CP105-1 - EXSWMH105-0	CP105-1	EXSWMH105-0	225	16.34	2.09	0.035	1.580	0.065	0.54	YES	PROPOSED ROADS Ct: 91
Line 106	CP106-1 - EXCP106-0	CP106-1	EXCP106-0	225	5.06	1.00	0.036	1.140	0.045	0.80	YES	PROPOSED ROADS Ct: 89
Line 107	CP107-1 - EXCP107-0	CP107-1	EXCP107-0	225	19.00	5.44	0.020	1.980	0.105	0.19	YES	PROPOSED ROADS Ct: 90
Line 200478179	MH102-1 - EXCP200478179	MH102-1	EXCP200478179	225	19.65	7.00	0.040	2.590	0.121	0.33	YES	
Line 2000478179	MH100-1 - EXSWMH2000478179	MH100-1	EXSWMH2000478179	225	6.59	5.00	0.030	2.020	0.100	0.30	YES	
Line 2000492122	CP101-1 - EXCP2000492122	CP101-1	EXCP2000492122	225	5.20	4.57	0.032	1.930	0.097	0.33	YES	PROPOSED ROADS Ct: 80
Line 2000827700	MH103-1 - EXSWMH2000827700	MH103-1	EXSWMH2000827700	225	9.59	7.00	0.084	2.900	0.118	0.71	YES	
Line 3000006434	CP 104-1 - EXSWMH3000006434	CP 104-1	EXSWMH3000006434	225	12.82	1.00	0.020	1.040	0.043	0.46	YES	PROPOSED ROADS Ct: 87

Stormwater Catchment - Coastal BEACHLANDS STORMWATER NETWORK

Jack Lachlan Drive



FACTORS

Tc mins	10
f years	10
Rainfall Depth (mm)	136

PROJECT NO:

A2515591.00

Prepared by: ENW

Checked by: CJM

(Note: Data exported from iDAS, using TP108)

LINE NETWORK	PIPE LINE	INLET	OUTLET	DIAMETER (mm)	LENGTH (m)	SLOPE (%)	FLOW (m ³ /s)	VELOCITY (m/s)	CAPACITY (m ³ /s)	FLOW/CAPACITY	CAPACITY CHECK	CATCHMENT
Line 110	MH110-3 - MH110-2	MH110-3	MH110-2	225	63.45	2.00	0.044	1.670	0.063	0.70	YES	PROPOSED LOTS EXMH: 94
Line 110	MH111-1 - MH110-1	MH111-1	MH110-1	225	4.58	7.00	0.043	2.400	0.119	0.36	YES	PROPOSED LOTS EXMH: 96
Line 110	MH110-2 - MH110-1	MH110-2	MH110-1	225	57.10	7.00	0.082	3.150	0.119	0.69	YES	PROPOSED LOTS EXMH: 93
Line 111	MH111-2 - MH111-1	MH111-2	MH111-1	225	40.10	1.20	0.036	1.320	0.049	0.74	YES	PROPOSED LOTS EXMH: 95
Line 112	CP112-2 - MH112-1	CP112-2	MH112-1	225	15.76	2.53	0.024	1.530	0.071	0.34	YES	PROPOSED ROADS C1: 103
Line 112	CP112-1 - MH112-1	CP112-1	MH112-1	300	3.56	3.47	0.046	1.230	0.177	0.26	YES	PROPOSED ROADS C1: 104
Line 112	MH112-2 - MH112-1	MH112-2	MH112-1	225	6.15	7.00	0.015	1.640	0.115	0.13	YES	PROPOSED LOTS EXMH JLD: 101
Line 130	MH130-8 - MH130-7	MH130-8	MH130-7	375	71.59	3.80	0.229	2.910	0.342	0.67	YES	PROPOSED LIGHT INDUSTRY: 105
Line 130	MH135-1 - MH130-6	MH135-1	MH130-6	225	7.80	6.80	0.050	2.560	0.116	0.43	YES	
Line 130	MH130-7 - MH130-6	MH130-7	MH130-6	525	24.77	3.00	0.621	3.380	0.748	0.83	YES	PROPOSED LIGHT INDUSTRY: 13
Line 130	MH134-1 - MH130-5	MH134-1	MH130-5	450	11.70	1.00	0.242	1.800	0.285	0.85	YES	
Line 130	MH130-6 - MH130-5	MH130-6	MH130-5	675	32.02	3.00	0.677	2.810	1.440	0.47	YES	PROPOSED LIGHT INDUSTRY: 16
Line 130	CP130-2 - MH130-4	CP130-2	MH130-4	225	8.03	20.01	0.026	3.320	0.200	0.13	YES	PROPOSED ROADS C1: 19
Line 130	MH133-1 - MH130-4	MH133-1	MH130-4	225	33.93	4.60	0.025	1.990	0.096	0.26	YES	
Line 130	MH130-5 - MH130-4	MH130-5	MH130-4	675	27.51	3.00	0.920	3.580	1.460	0.63	YES	
Line 130	MH131-1 - MH130-3	MH131-1	MH130-3	225	14.34	7.00	0.068	2.880	0.119	0.57	YES	
Line 130	CP130-1 - MH130-3	CP130-1	MH130-3	225	7.45	25.00	0.016	3.150	0.229	0.07	YES	PROPOSED ROADS C1: 20
Line 130	MH130-4 - MH130-3	MH130-4	MH130-3	675	45.57	4.00	1.005	3.970	1.675	0.60	YES	PROPOSED LOTS C1: 8
Line 130	MH130-3 - MH130-2	MH130-3	MH130-2	675	22.94	5.00	1.088	4.210	1.876	0.58	YES	
Line 130	MH130-2 - MH130-1	MH130-2	MH130-1	675	14.84	7.00	1.088	5.080	2.220	0.49	YES	
Line 130	MH130-1 - Outlet130-0	MH130-1	Outlet130-0	675	82.26	7.00	1.088	5.880	2.220	0.49	YES	
Line 131	MH132-1 - MH131-2	MH132-1	MH131-2	225	19.62	2.50	0.023	1.050	0.072	0.32	YES	PROPOSED LOTS C1: 15
Line 131	CP131-1 - MH131-2	CP131-1	MH131-2	225	2.20	4.16	0.012	0.610	0.092	0.13	YES	PROPOSED ROADS C1: 23
Line 131	MH131-3 - MH131-2	MH131-3	MH131-2	225	43.79	1.80	0.033	1.290	0.061	0.54	YES	PROPOSED LOTS C1: 7
Line 131	MH131-2 - MH131-1	MH131-2	MH131-1	225	21.73	4.30	0.068	2.420	0.093	0.73	YES	
Line 133	MH133-2 - MH133-1	MH133-2	MH133-1	225	29.01	4.50	0.025	1.950	0.096	0.26	YES	PROPOSED LIGHT INDUSTRY: 14
Line 134	CP134-2 - MH134-2	CP134-2	MH134-2	225	3.03	23.93	0.009	1.600	0.225	0.04	YES	PROPOSED ROADS C1: 21
Line 134	MH134-3 - MH134-2	MH134-3	MH134-2	300	33.24	5.00	0.112	2.950	0.215	0.52	YES	PROPOSED ROADS C1: 2
Line 134	CP134-1 - MH134-1	CP134-1	MH134-1	225	5.91	9.90	0.015	1.900	0.136	0.11	YES	PROPOSED ROADS C1: 22
Line 134	MH134-2 - MH134-1	MH134-2	MH134-1	375	58.97	4.00	0.227	2.720	0.349	0.65	YES	PROPOSED LIGHT INDUSTRY: 12
Line 135	MH135-2 - MH135-1	MH135-2	MH135-1	225	51.65	7.00	0.050	2.580	0.119	0.42	YES	PROPOSED LIGHT INDUSTRY: 9
Line 136	MH136-4 - MH136-3	MH136-4	MH136-3	375	26.81	1.50	0.180	2.000	0.214	0.84	YES	PROPOSED LIGHT INDUSTRY: 25
Line 136	MH136-3 - MH136-2	MH136-3	MH136-2	375	26.75	2.00	0.180	2.270	0.247	0.73	YES	
Line 136	MH137-1 - MH136-1	MH137-1	MH136-1	300	12.14	7.00	0.184	3.470	0.256	0.72	YES	PROPOSED LIGHT INDUSTRY: 24
Line 136	MH136-2 - MH136-1	MH136-2	MH136-1	450	81.22	5.00	0.405	3.140	0.643	0.63	YES	PROPOSED LIGHT INDUSTRY: 26
Line 136	MH136-1 - Outlet136-0	MH136-1	Outlet136-0	450	6.52	9.75	0.588	4.510	0.891	0.66	YES	
Line 138	MH138-4 - MH138-3	MH138-4	MH138-3	300	38.44	1.30	0.060	1.470	0.111	0.54	YES	PROPOSED LOTS OUTLET 138-0: 32
Line 138	MH138-3 - MH138-2	MH138-3	MH138-2	300	50.83	3.00	0.091	2.590	0.169	0.54	YES	PROPOSED LOTS OUTLET 138-0: 31
Line 138	MH139-1 - MH138-1	MH139-1	MH138-1	225	9.93	6.00	0.028	2.180	0.108	0.26	YES	
Line 138	MH138-2 - MH138-1	MH138-2	MH138-1	300	45.27	7.00	0.091	3.190	0.253	0.36	YES	
Line 138	MH138-1 - Outlet138-0	MH138-1	Outlet138-0	300	25.12	11.99	0.119	4.120	0.331	0.36	YES	
Line 139	MH139-3 - MH139-2	MH139-3	MH139-2	225	15.25	1.30	0.008	0.980	0.050	0.16	YES	PROPOSED LOTS OUTLET 138-0: 27
Line 139	MH140-1 - MH139-1	MH140-1	MH139-1	225	9.24	7.00	0.013	1.890	0.118	0.11	YES	PROPOSED LOTS OUTLET 138-0: 29
Line 139	MH139-2 - MH139-1	MH139-2	MH139-1	225	15.14	6.00	0.015	1.410	0.107	0.14	YES	PROPOSED LOTS OUTLET 138-0: 28
Line 140	MH140-2 - MH140-1	MH140-2	MH140-1	225	13.33	7.00	0.007	1.160	0.140	0.05	YES	PROPOSED LOTS OUTLET 138-0: 30
Line 141	MH141-7 - MH141-6	MH141-7	MH141-6	225	17.66	8.40	0.013	1.670	0.130	0.10	YES	PROPOSED LOTS OUTLET 141-0: 38
Line 141	MH141-6 - MH141-5	MH141-6	MH141-5	225	25.32	10.00	0.027	2.040	0.142	0.19	YES	PROPOSED LOTS OUTLET 141-0: 37
Line 141	MH144-1 - MH141-4	MH144-1	MH141-4	225	8.28	5.00	0.014	1.160	0.100	0.14	YES	PROPOSED LOTS OUTLET 141-0: 39
Line 141	MH141-5 - MH141-4	MH141-5	MH141-4	225	6.16	3.80	0.027	1.760	0.087	0.31	YES	
Line 141	MH143-1 - MH141-3	MH143-1	MH141-3	225	4.70	7.00	0.009	1.650	0.129	0.07	YES	PROPOSED LOTS OUTLET 141-0: 33
Line 141	MH141-4 - MH141-3	MH141-4	MH141-3	225	19.65	7.00	0.040	2.600	0.118	0.34	YES	
Line 141	MH142-1 - MH141-2	MH142-1	MH141-2	225	19.37	6.00	0.016	1.910	0.114	0.14	YES	PROPOSED LOTS OUTLET 141-0: 35
Line 141	MH141-3 - MH141-2	MH141-3	MH141-2	225	19.78	7.00	0.057	2.820	0.119	0.48	YES	PROPOSED LOTS OUTLET 141-0: 34
Line 141	MH141-2 - MH141-1	MH141-2	MH141-1	225	6.39	10.00	0.073	3.160	0.143	0.51	YES	
Line 141	MH141-1 - Outlet141-0	MH141-1	Outlet141-0	225	12.53	15.00	0.073	3.910	0.174	0.42	YES	

Line 142	MH142-2 - MH142-1	MH142-2	MH142-1	225	17.06	7.00	0.007	1.070	0.117	0.06	YES	PROPOSED LOTS OUTLET 141-0: 56
Line 144	CP144-1 - MH144-1	CP144-1	MH144-1	225	6.72	3.33	0.007	1.000	0.088	0.08	YES	PROPOSED ROADS OUTLET 141-0: 36
Line 145	CP145-2 - MH145-7	CP145-2	MH145-7	225	6.04	4.57	0.004	0.300	0.100	0.04	YES	PROPOSED ROADS OUTLET 145-0: 46
Line 145	MH145-8 - MH145-7	MH145-8	MH145-7	225	21.11	1.20	0.014	0.720	0.048	0.29	YES	PROPOSED LOTS OUTLET 145-0: 47
Line 145	CP145-1 - MH145-6	CP145-1	MH145-6	225	2.64	5.77	0.008	0.710	0.114	0.07	YES	PROPOSED ROADS OUTLET 145-0: 52
Line 145	MH145-7 - MH145-6	MH145-7	MH145-6	225	24.09	1.50	0.034	1.640	0.055	0.62	YES	PROPOSED LOTS OUTLET 145-0: 41
Line 145	MH148-1 - MH145-5	MH148-1	MH145-5	225	7.58	1.00	0.009	0.690	0.043	0.21	YES	PROPOSED LOTS OUTLET 145-0: 55
Line 145	MH145-6 - MH145-5	MH145-6	MH145-5	225	17.02	7.00	0.042	2.320	0.120	0.35	YES	
Line 145	MH145-5 - MH145-4	MH145-5	MH145-4	300	33.81	1.00	0.067	1.390	0.096	0.70	YES	PROPOSED LOTS OUTLET 145-0: 53
Line 145	MH147-1 - MH145-3	MH147-1	MH145-3	225	34.14	7.00	0.022	2.250	0.116	0.19	YES	
Line 145	MH145-4 - MH145-3	MH145-4	MH145-3	300	37.12	1.80	0.088	1.570	0.129	0.68	YES	PROPOSED LOTS OUTLET 145-0: 48
Line 145	MH146-1 - MH145-2	MH146-1	MH145-2	225	17.25	7.00	0.031	2.430	0.119	0.26	YES	PROPOSED LOTS OUTLET 145-0: 44
Line 145	MH145-3 - MH145-2	MH145-3	MH145-2	300	31.01	2.20	0.130	2.100	0.144	0.90	YES	PROPOSED LOTS OUTLET 145-0: 51
Line 145	MH145-2 - MH145-1	MH145-2	MH145-1	300	13.96	5.00	0.161	3.470	0.218	0.74	YES	
Line 145	MH145-1 - Outlet145-0	MH145-1	Outlet145-0	300	37.60	18.00	0.161	5.270	0.413	0.39	YES	
Line 146	MH146-3 - MH146-2	MH146-3	MH146-2	225	20.33	10.00	0.015	2.280	0.136	0.11	YES	PROPOSED LOTS OUTLET 145-0: 42
Line 146	MH146-2 - MH146-1	MH146-2	MH146-1	225	27.15	7.00	0.023	1.990	0.115	0.20	YES	PROPOSED LOTS OUTLET 145-0: 43
Line 147	CP147-1 - MH147-2	CP147-1	MH147-2	225	3.13	6.15	0.008	0.990	0.114	0.07	YES	PROPOSED ROADS OUTLET 145-0: 50
Line 147	MH147-3 - MH147-2	MH147-3	MH147-2	225	10.88	5.00	0.007	0.920	0.100	0.07	YES	PROPOSED LOTS OUTLET 145-0: 49
Line 147	MH147-2 - MH147-1	MH147-2	MH147-1	225	13.90	7.00	0.022	2.170	0.116	0.19	YES	PROPOSED LOTS OUTLET 145-0: 54
Line 149	CP149-2 - MH149-4	CP149-2	MH149-4	225	4.56	7.39	0.004	0.330	0.133	0.03	YES	PROPOSED ROADS OUTLET 149-0: 70
Line 149	MH149-5 - MH149-4	MH149-5	MH149-4	225	18.30	1.50	0.015	0.840	0.054	0.28	YES	PROPOSED LOTS OUTLET 149-0: 74
Line 149	MH151-1 - MH149-3	MH151-1	MH149-3	225	5.74	5.00	0.021	1.010	0.100	0.21	YES	
Line 149	CP149-1 - MH149-3	CP149-1	MH149-3	225	1.53	18.52	0.009	0.570	0.180	0.05	YES	PROPOSED ROADS OUTLET 149-0: 60
Line 149	MH149-4 - MH149-3	MH149-4	MH149-3	225	35.01	1.50	0.033	1.240	0.056	0.59	YES	PROPOSED LOTS OUTLET 149-0: 69
Line 149	MH149-3 - MH149-2	MH149-3	MH149-2	225	15.26	4.00	0.063	2.270	0.090	0.70	YES	
Line 149	MH150-1 - MH149-1	MH150-1	MH149-1	225	19.41	10.00	0.021	2.510	0.140	0.15	YES	PROPOSED LOTS OUTLET 149-0: 59
Line 149	MH149-2 - MH149-1	MH149-2	MH149-1	300	40.34	3.50	0.089	2.460	0.182	0.49	YES	PROPOSED LOTS OUTLET 149-0: 58
Line 149	MH149-1 - Outlet149-0	MH149-1	Outlet149-0	300	34.64	25.00	0.110	5.420	0.500	0.22	YES	
Line 151	MH151-2 - MH151-1	MH151-2	MH151-1	225	23.69	2.00	0.021	1.390	0.064	0.33	YES	PROPOSED LOTS OUTLET 149-0: 68
Line 152	MH152-9 - MH152-8	MH152-9	MH152-8	300	12.26	1.00	0.025	0.660	0.096	0.26	YES	PROPOSED LOTS OUTLET 152-0: 61
Line 152	MH152-8 - MH152-7	MH152-8	MH152-7	300	53.04	1.00	0.075	1.460	0.097	0.77	YES	PROPOSED LOTS OUTLET 152-0: 63
Line 152	MH152-7 - MH152-6	MH152-7	MH152-6	375	35.71	1.00	0.100	1.360	0.175	0.57	YES	PROPOSED LOTS OUTLET 152-0: 64
Line 152	MH152-6 - MH152-5	MH152-6	MH152-5	375	29.87	1.00	0.125	1.770	0.176	0.71	YES	PROPOSED LOTS OUTLET 152-0: 65
Line 152	MH152-5 - MH152-4	MH152-5	MH152-4	375	26.27	3.00	0.149	2.300	0.304	0.49	YES	PROPOSED LOTS OUTLET 152-0: 66
Line 152	MH152-4 - MH152-3	MH152-4	MH152-3	375	30.89	3.00	0.175	2.580	0.302	0.58	YES	PROPOSED LOTS OUTLET 152-0: 67
Line 152	MH152-3 - MH152-2	MH152-3	MH152-2	375	26.47	5.00	0.201	3.880	0.394	0.51	YES	PROPOSED LOTS OUTLET 152-0: 62
Line 152	MH152-2 - MH152-1	MH152-2	MH152-1	375	54.52	20.00	0.226	5.320	0.779	0.29	YES	PROPOSED LOTS OUTLET 152-0: 72
Line 152	MH152-1 - Outlet152-0	MH152-1	Outlet152-0	375	35.66	12.10	0.226	4.890	0.611	0.37	YES	
Line 153	MH153-4 - MH153-3	MH153-4	MH153-3	225	17.80	7.00	0.055	2.700	0.120	0.46	YES	PROPOSED LOTS OUTLET 153-0: 77
Line 153	MH154-1 - MH153-2	MH154-1	MH153-2	225	16.45	1.00	0.026	1.110	0.046	0.57	YES	PROPOSED LOTS OUTLET 153-0: 75
Line 153	MH153-3 - MH153-2	MH153-3	MH153-2	225	14.07	7.00	0.055	2.270	0.120	0.46	YES	
Line 153	MH153-2 - Outlet153-0	MH153-2	Outlet153-0	300	7.60	5.00	0.105	2.550	0.206	0.51	YES	PROPOSED LOTS OUTLET 153-0: 76
Line 155	MH155-10 - MH155-9	MH155-10	MH155-9	225	25.01	7.00	0.054	2.440	0.120	0.45	YES	PROPOSED LOTS OUTLET 155-0: 79
Line 155	MH155-9 - MH155-8	MH155-9	MH155-8	300	25.02	1.00	0.079	1.440	0.096	0.82	YES	PROPOSED LOTS OUTLET 155-0: 80
Line 155	MH155-8 - MH155-7	MH155-8	MH155-7	375	42.23	1.00	0.105	1.280	0.175	0.60	YES	PROPOSED LOTS OUTLET 155-0: 78
Line 155	MH155-7 - MH155-6	MH155-7	MH155-6	375	38.44	1.00	0.155	1.700	0.174	0.89	YES	PROPOSED LOTS OUTLET 155-0: 81
Line 155	MH155-6 - MH155-5	MH155-6	MH155-5	450	67.32	1.00	0.207	1.640	0.284	0.73	YES	PROPOSED LOTS OUTLET 155-0: 82
Line 155	MH155-5 - MH155-4	MH155-5	MH155-4	450	12.90	1.00	0.207	1.540	0.288	0.72	YES	
Line 155	MH155-4 - MH155-3	MH155-4	MH155-3	450	28.10	1.00	0.207	1.520	0.288	0.72	YES	
Line 155	MH155-3 - MH155-2	MH155-3	MH155-2	450	27.55	1.00	0.232	1.570	0.286	0.81	YES	PROPOSED LOTS OUTLET 155-0: 85
Line 155	MH155-2 - MH155-1	MH155-2	MH155-1	450	55.27	1.00	0.281	2.680	0.284	0.99	YES	PROPOSED LOTS OUTLET 155-0: 83
Line 155	MH155-1 - Outlet155-0	MH155-1	Outlet155-0	450	66.90	14.50	0.281	5.590	1.081	0.26	YES	
Line 156	MH156-4 - MH156-3	MH156-4	MH156-3	225	49.74	1.80	0.051	1.650	0.061	0.84	YES	PROPOSED LOTS OUTLET 156-0: 86
Line 156	MH157-1 - MH156-2	MH157-1	MH156-2	225	14.32	1.00	0.043	1.200	0.045	0.96	YES	PROPOSED LOTS OUTLET 156-0: 88
Line 156	MH156-3 - MH156-2	MH156-3	MH156-2	300	42.95	2.70	0.083	1.820	0.160	0.52	YES	PROPOSED LOTS OUTLET 156-0: 87
Line 156	MH156-2 - MH156-1	MH156-2	MH156-1	300	9.02	4.40	0.126	2.400	0.203	0.62	YES	
Line 156	MH156-1 - Outlet156-0	MH156-1	Outlet156-0	300	14.57	4.40	0.126	2.690	0.197	0.64	YES	
Line 157	MH157-4 - MH157-3	MH157-4	MH157-3	225	11.63	1.30	0.012	0.770	0.052	0.23	YES	PROPOSED LOTS OUTLET 156-0: 89
Line 157	MH157-3 - MH157-2	MH157-3	MH157-2	225	30.44	1.20	0.021	1.070	0.049	0.43	YES	PROPOSED LOTS OUTLET 156-0: 90
Line 157	MH157-2 - MH157-1	MH157-2	MH157-1	225	30.55	1.90	0.032	1.080	0.062	0.52	YES	PROPOSED LOTS OUTLET 156-0: 91
Line 158	MH180-1 - Outlet158-0	MH180-1	Outlet158-0	225	21.03	1.00	0.042	1.220	0.045	0.94	YES	PROPOSED LOTS OUTLET 158-0: 98
Line 180	MH180-4 - MH180-3	MH180-4	MH180-3	225	18.37	10.00	0.010	1.460	0.143	0.07	YES	PROPOSED LOTS OUTLET 158-0: 99
Line 180	MH180-3 - MH180-2	MH180-3	MH180-2	225	15.84	7.00	0.021	1.060	0.117	0.18	YES	PROPOSED LOTS OUTLET 158-0: 100
Line 180	MH180-2 - MH180-1	MH180-2	MH180-1	225	12.44	1.00	0.032	0.940	0.045	0.71	YES	PROPOSED LOTS OUTLET 158-0: 97
Line 2000059296	MH112-1 - EXSWMH2000059296	MH112-1	EXSWMH2000059296	300	26.26	2.80	0.085	2.200	0.160	0.53	YES	
Line 2000859546	EXSWMH2000859546 - EXSWMH2000859546	EXSWMH2000859546	EXSWMH2000859546	375	18.46	2.94	0.125	2.400	0.298	0.42	YES	
Line 2000965967	MH110-1 - EXSWMH2000965967	MH110-1	EXSWMH2000965967	300	4.31	10.00	0.125	3.350	0.305	0.41	YES	

Appendix 3c – Wetland Sizing Calculations

WETLAND/RAIN GARDEN SIZING

Sensitivity: General



Detailed Design Runoff TP108 HGCL

*REFER TO PROPOSED SW LAYOUT DRAWING REF. a2001228.00-HG-S1-SK-C-052_Rev A FOR POND REFERENCING AND CATCHMENT ILLUSTRATIONS

**See Catchment Tabs below for direct reference

Detailed Design Runoff TP108

Event	Rainfall Depth (mm)	CC % Increase	CC Rainfall Depth (mm)
95th percentile			36.0
1/3 2 year	26.3		26.0
2 year	79.0	15.1%	90.9
10 year	136.0	17.0%	159.1
100 year	210.0	32.7%	278.7

confirmed using 90th%ile from GD01 map

*2.1°C 9

*2.1°C 13.2

*3.8°C 16.8

Lost Floodplain Storage - Prorated Across Catchments 1 & 2			
Stream	Volume (m³)	Area1 (m²)	Area2 (m²)
1	4530	440000	289046
2	4585	296000	127360
3	0	1216000	346074
4	0	409000	26403
5	0	751000	0

Attenuation Std% Embankment Buffer (%) Access & Batters (%)

70%	130%	170%
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Live Storage Depth (m)

1.5

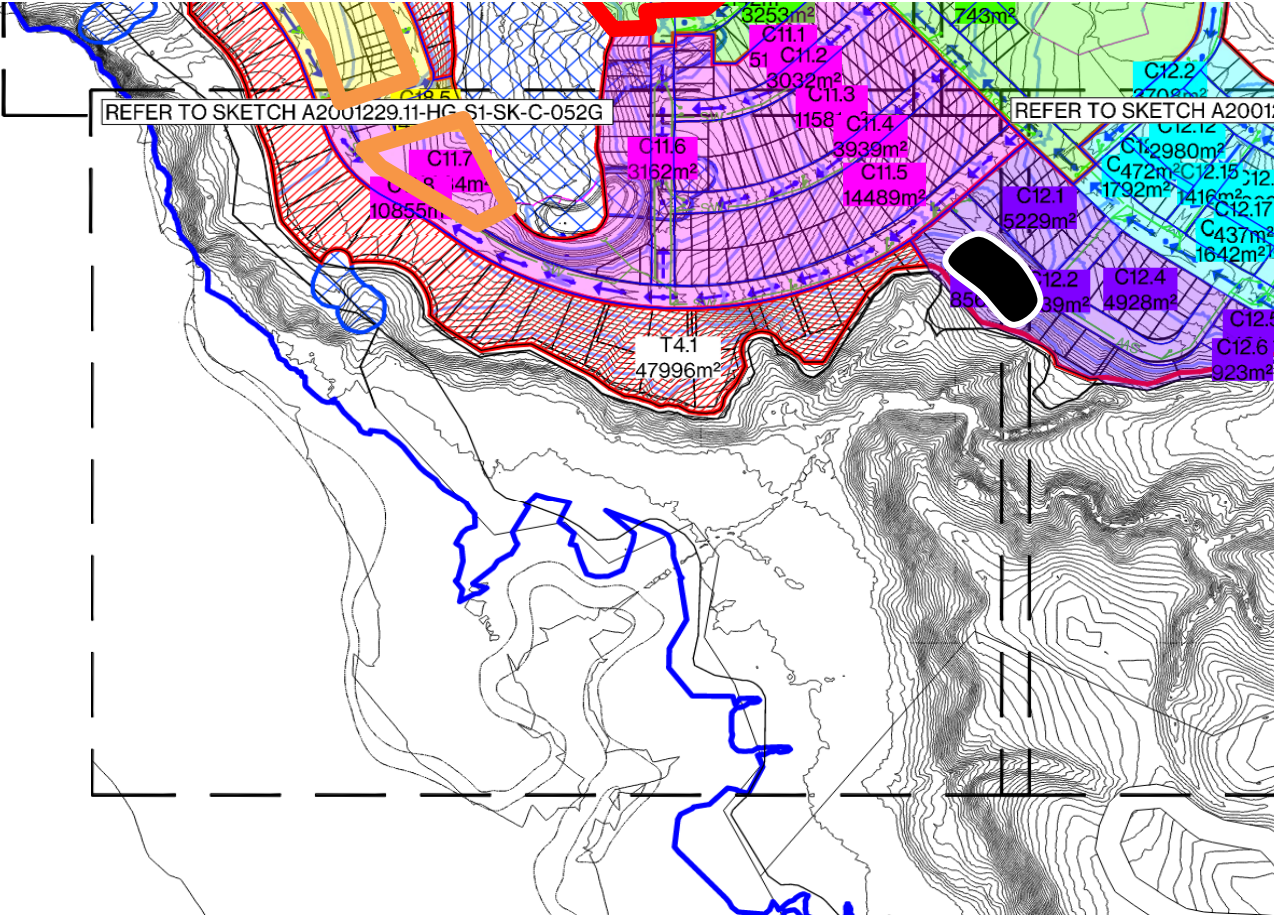
Pond Catchment	Total Area (m²)	Pervious (m²)	UAP Zone Description	Impervious Coverage (%)	Impervious (m²)	Receiving Environment	Attenuation Standard	Stream Catchment	Specified Attenuation Standard						Approx. Attenuation Footprint (m²)	Approx. Attenuation Footprint (m²) Including Access and Batters	90th %ile	95th Percentile	2 year	10 year	100 year
									Flow In (m³/s)	Flow Out (m³/s)	Flow Difference (m³/s)	Volume Difference (m³)	Lost FP Storage Prorated (m³)	Approx. Attenuation Volume (m³)							
01	88,738	19,283	Resi - Mixed Housing	78%	69,455	Stream	2 year	1	1.249	0.736	0.513	3,047	1,391	3,107	2,692	4,600	791	1631	3047	3924	4668
02	62,764	16,940	Resi - Mixed Housing	73%	45,824	Coast	95th Percentile	3	0.298	0.093	0.205	1,076	0	753	653	1,100	531	1076	2010	2589	3080
03	74,420	17,680	Resi - Mixed Housing	76%	56,740	Stream	2 year	1	1.036	0.617	0.419	2,489	1,166	2,559	2,218	3,800	650	1332	2489	3206	3813
04	283,310	50,960	Multiple	82%	232,350	Coast	95th Percentile	3	1.458	0.420	1.038	5,455	0	3,818	3,309	5,600	2620	5455	10194	13127	15616
05	125,888	34,282	Resi - Mixed Housing	73%	91,606	Stream	2 year	1	1.720	1.043	0.677	4,019	1,973	4,194	3,635	6,200	1061	2151	4019	5175	6157
06	36,407	9,577	Resi - Mixed Housing	74%	26,830	Stream	2 year	2	0.500	0.302	0.198	1,177	1,311	1,741	1,509	2,600	310	630	1177	1516	1803
07	28,058	5,607	Resi - Mixed Housing	80%	22,451	Stream	2 year	2	0.398	0.233	0.166	985	1,010	1,397	1,210	2,100	255	527	985	1268	1509
08	24,362	6,338	Resi - Mixed Housing	74%	18,024	Stream	2 year	2	0.335	0.202	0.133	791	877	1,167	1,012	1,700	208	423	791	1018	1211
09	38,533	9,327	Resi - Mixed Housing	76%	29,206	Stream	2 year	2	0.535	0.319	0.216	1,281	1,387	1,868	1,619	2,800	335	686	1281	1650	1963
12	26,403	6,859	Resi - Mixed Housing	75%	19,544	Coast	95th Percentile	4	0.127	0.039	0.088	483	0	324	281	500	227	463	866	1115	1326
16 (10)	37,600	10,448	Multiple	72%	27,152	Coast	95th Percentile	1	0.177	0.056	0.121	637	589	859	744	1,300	315	637	1191	1534	1825
18 (11)	41,564	9,741	Multiple	77%	31,823	Coast	95th Percentile	3	0.204	0.062	0.142	747	0	523	453	800	364	747	1396	1798	2139
TOTAL	868,047	196,852			671,195				8.04	4.12	3.92	22,200	9,700	22,300	18,100	31,000	7669	15757	29448	37920	45110

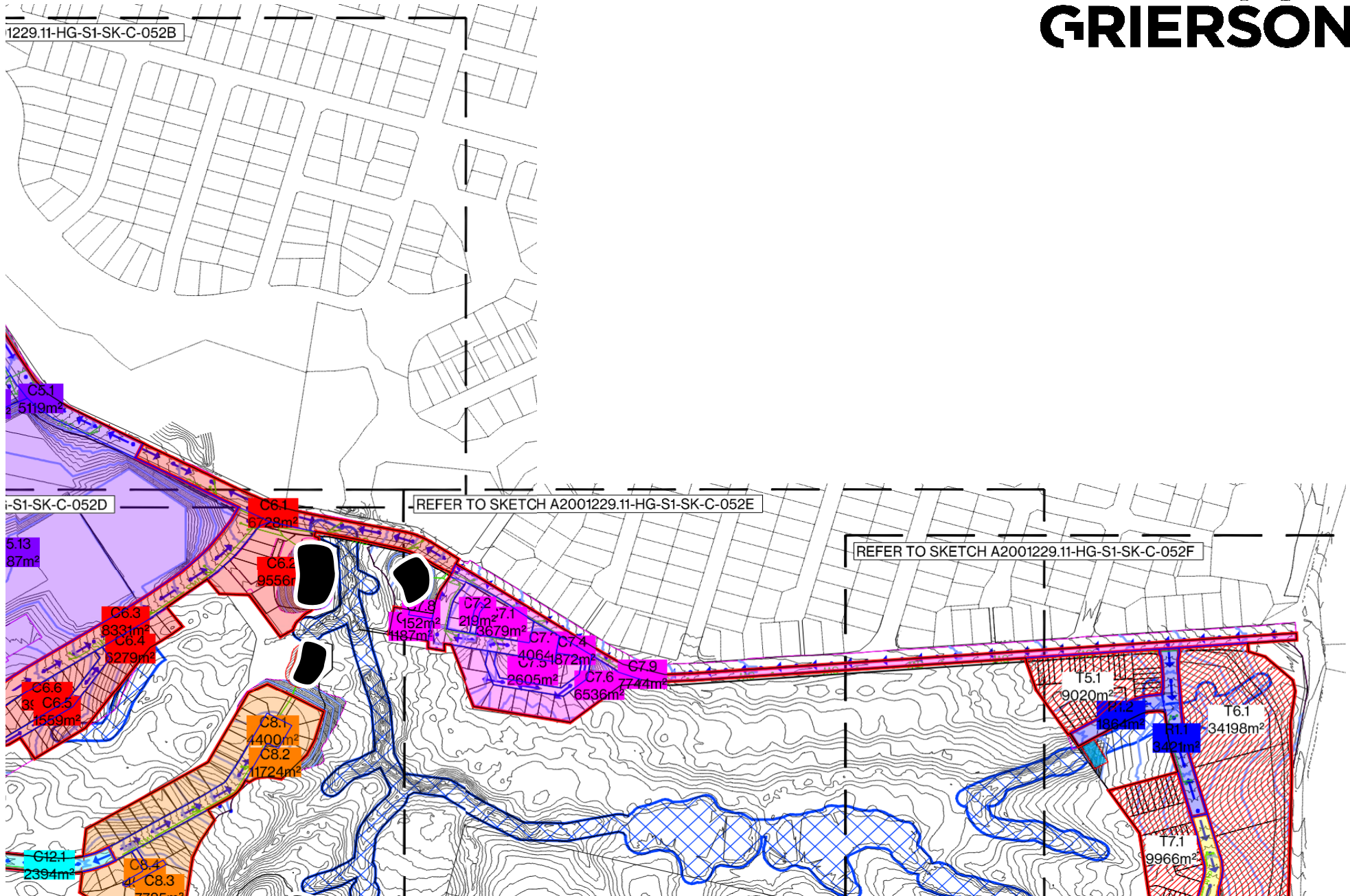
TOTAL =	22,300	18,100	31,000
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ZONE	Recommend.	Max. Imp.	Utilised Coverage	
Mixed Housing - Urban	60%	60%	70%	*Conservatively above AUP zoning recommendation to provide buffer for future rezone potential (to THAB)
Mixed Housing - Suburban	60%	60%	70%	Unrequired
THAB	70%	70%	70%	**Maintained maximum AUP zoning coverage
Residential - Large Lot - Medium				Unrequired
Residential - Large Lot - Low	35%	35%	50%	***Assumed as 'Medium' Density Large Lots
Business - Light Industry	90%	100%	100%	Unrequired
Business - Local Centre	100%	100%	100%	****Applied only to 40% of Catchment 4 (see Red Boundary in 'Catchment Plan' tab
Business - Mixed Use	80%	100%	100%	Unrequired
Future Urban Zone (FUZ)	70%	70%	75%	Unrequired

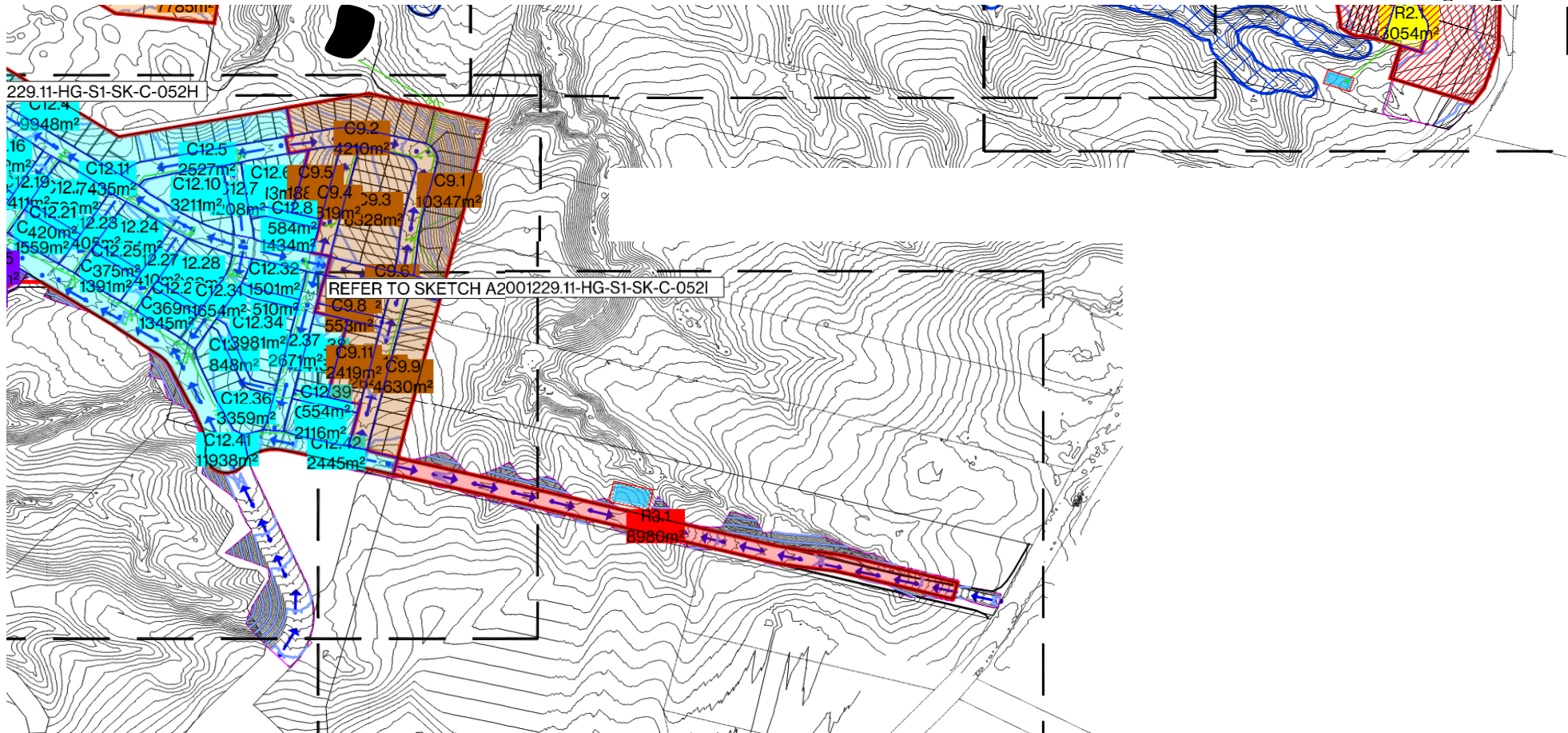
Proposed Road Network	90%	90%	90%	*****Assumed coverage throughout entire development - including Jack Lachlan Drive
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*Reduced flow rate = Q₁₀ mil





HARRISON



SPILLWAY SIZING

*REFER TO PROPOSED SW SKETCH LAYOUT DRAWING REF. "STORMWATER OLFP Subcatchments" FOR SECONDARY FLOW CATCHMENT DELINEATION AN

*Sketch file located here - "C:\Autodesk\AccDocs\ACCDocs\Harrison Grierson_US\Beachlands South Fast Track Consent\Project Files\01_Design\05_Three_Wat

**Where catchments overlap, the higher impervious value has been adopted - unless catchment is identified as ROAD ONLY, then 90% adopted

***Remaining catchment areas adjacent to site boundary are to freely discharge offsite

Detailed Design Runoff TP108				
Event	Rainfall Depth (mm)	CC % Increase		CC Rainfall Depth (mm)
95th percentile				36.0
1/3 2 year	26.3			26.0
2 year	79.0	15.1%		90.9
10 year	136.0	17.0%		159.1
100 year	210.0	32.7%		278.7

confirmed using 90th%ile from GD01 map

9

13.2

16.8

- colour indicates a catchment with a wetland spillway.

TP108 Methodology - See CN values for Wetland sizing (CN98 and CN74) using TP108 Calculator for below values (assuming 10min Tc)

Peak flow rate, $q_p = q^* A P_{24}$ (m³/s)

Catchment/Wetland Ref.	Total Area (m ²)	Impervious (%)	Area, Imp (m ²)	Area, Perv (m ²)	100-yr ARI Runoff, Q (m ³ /s)		
					Impervious	Pervious	Total
CT1.1	5,226	78%	4,090	1,136	0.188	0.044	0.23
C1.1	94,958	78%	74,324	20,635	3.411	0.798	4.21
C1.2	81,579	78%	63,851	17,727	2.930	0.685	3.62
C1.3	4,622	78%	3,617	1,004	0.166	0.039	0.20
C2.1	5,943	73%	4,339	1,604	0.199	0.062	0.26
C2.2	29,976	73%	21,886	8,091	1.004	0.313	1.32
C2.3	3,761	73%	2,746	1,015	0.126	0.039	0.17
C3.1	30,175	76%	23,006	7,169	1.056	0.277	1.33
C3.2	38,427	76%	29,298	9,129	1.345	0.353	1.70
C4.1	13,176	82%	10,806	2,370	0.496	0.092	0.59
C4.2	38,128	82%	31,270	6,858	1.435	0.265	1.70
C4.3	230,504	82%	189,043	41,462	8.676	1.603	10.28
C5.1	7,344	73%	5,344	2,000	0.245	0.077	0.32
C5.2	11,614	73%	8,451	3,163	0.388	0.122	0.51
C5.3	88,354	73%	64,293	24,061	2.951	0.930	3.88
C6.1	16,126	74%	11,884	4,242	0.545	0.164	0.71
C6.2	8,775	74%	6,467	2,308	0.297	0.089	0.39
C6.3	5,086	74%	3,748	1,338	0.172	0.052	0.22
C6.4	3,327	90%	2,994	333	0.137	0.013	0.15
C6.5	12,960	74%	9,551	3,409	0.438	0.132	0.57
C7.1	26,063	80%	20,854	5,208	0.957	0.201	1.16
C7.2	21,743	80%	17,398	4,345	0.798	0.168	0.97
C7.3	1,333	80%	1,067	266	0.049	0.010	0.06
C8.1	16,883	74%	12,491	4,392	0.573	0.170	0.74
C8.2	13,272	74%	9,819	3,453	0.451	0.134	0.58
C9.1	11,027	76%	8,358	2,669	0.384	0.103	0.49
C9.2	32,253	76%	24,446	7,807	1.122	0.302	1.42
C10.1	3,582	72%	2,586	995	0.119	0.038	0.16
C10.2	19,914	72%	14,380	5,534	0.660	0.214	0.87
C10.3	11,462	73%	8,369	3,094	0.384	0.120	0.50
C11.1	4,844	90%	4,359	484	0.200	0.019	0.22
C11.2	5,055	77%	3,871	1,185	0.178	0.046	0.22
C11.3	10,481	77%	8,024	2,456	0.368	0.095	0.46
C11.4	10,381	77%	7,948	2,433	0.365	0.094	0.46
C12.1	15,789	75%	11,802	3,988	0.542	0.154	0.70
CR1.1	43,145	90%	38,830	4,314	1.782	0.167	1.95
CR2.1	18,064	90%	16,257	1,806	0.746	0.070	0.82
CR2.2	-	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
CR3.1	1,941	75%	1,451	490	0.067	0.019	0.09
CR4.1	11,236	90%	10,112	1,124	0.464	0.043	0.51

*Impervious % assumed same as Catchment 01

*90% Impervious as catchment is exclusively road

*90% Impervious as catchment is exclusively road

*Assumed at 100% for industrial zone

*Assumed at 100% for industrial zone

*Contributing catchment area to be determined

*90% Impervious as catchment is exclusively road

PRIMARY NETWORK CATCHMENTS - Based on current Primary Network Catchments - see "Catchment Plan" Tab						
01	88,738	78%	64,788	23,950	2.973	0.926
02	62,764	73%	45,824	16,940	2.103	0.655
03	74,420	76%	56,740	17,680	2.604	0.684
04, 11, 12	283,310	82%	232,350	50,960	10.663	1.970
05	125,888	73%	91,606	34,282	4.204	1.326
06	36,407	74%	26,830	9,577	1.231	0.370
07	28,058	80%	22,451	5,607	1.030	0.217
08	24,362	74%	18,024	6,338	0.827	0.245
09	38,533	76%	29,206	9,327	1.340	0.361
12	26,403	75%	19,735	6,669	0.906	0.258
16	37,600	72%	27,152	10,448	1.246	0.404
18	41,564	77%	31,823	9,741	1.460	0.377
TOTAL	868,047	77%	666,527	201,520		

Updated TOTAL (first part of table)	1,008,530	0.786721318	793,432	215,098
Total (bottom part of table)	868,047	0.767847154	666,527	177,569

Appendix 3d – Wetland Spillway Calculations

SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 1

Consider all the relevant dimensions of the structure to be:

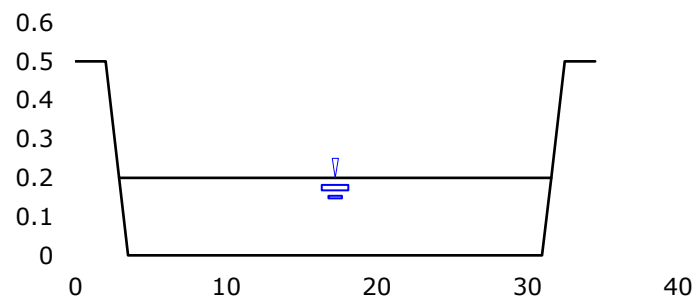
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **4.21** m³/s
Height of water above wier crest (h) = **0.20** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 27.5 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 2

Consider all the relevant dimensions of the structure to be:

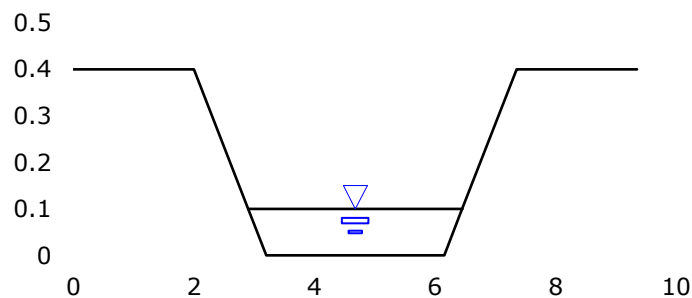
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.17** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 3.0 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 3

Consider all the relevant dimensions of the structure to be:

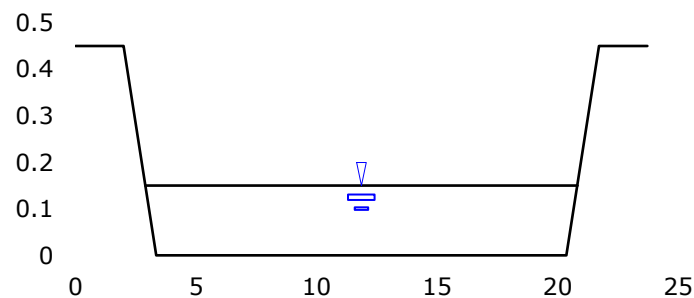
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **1.70** m³/s
Height of water above wier crest (h) = **0.15** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 17.0 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 4

Consider all the relevant dimensions of the structure to be:

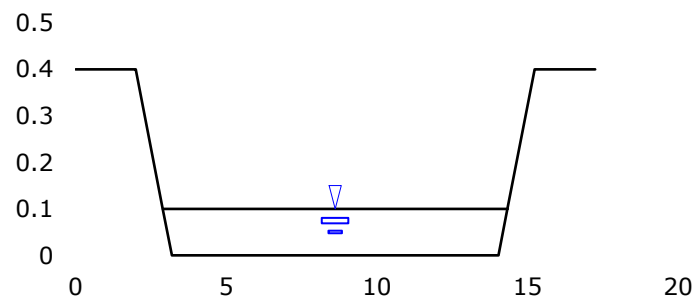
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.59** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 10.8 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 5

Consider all the relevant dimensions of the structure to be:

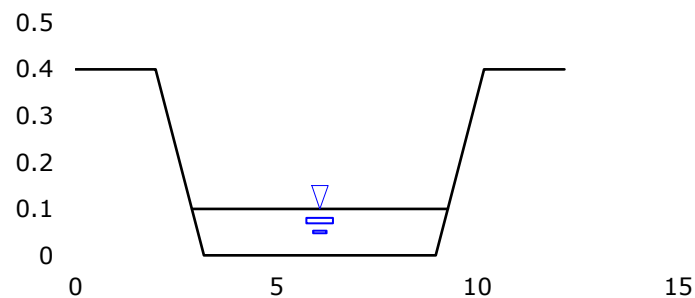
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.32** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 5.8 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 6

Consider all the relevant dimensions of the structure to be:

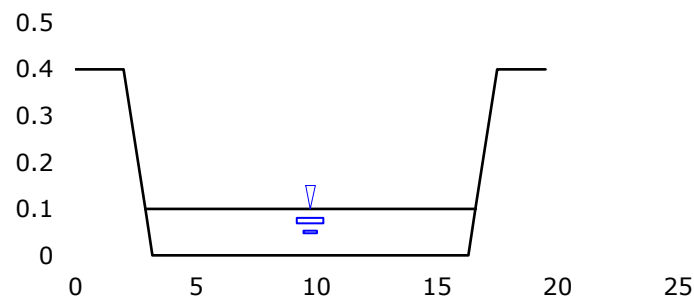
Designed for rainfall event =	100	% AEP
100% AEP flow rate =	0.71	m ³ /s
Height of water above wier crest (h) =	0.10	m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 13.1 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
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Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 7

Consider all the relevant dimensions of the structure to be:

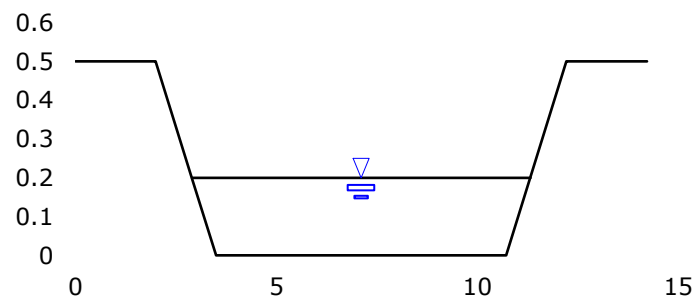
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **1.16** m³/s
 Height of water above wier crest (h) = **0.20** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 7.2 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	14/04/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 8

Consider all the relevant dimensions of the structure to be:

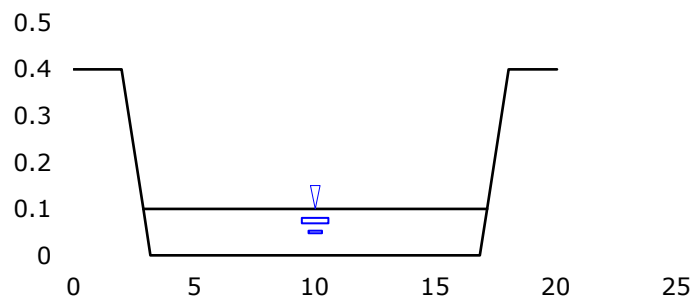
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **0.74** m³/s
 Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 13.7 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 9

Consider all the relevant dimensions of the structure to be:

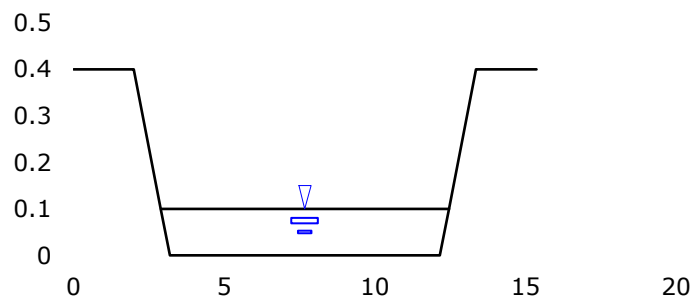
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.49** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 9.0 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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Office / Region:	Auckland	Approved By	

SPILLWAY Wetland 10

Consider all the relevant dimensions of the structure to be:

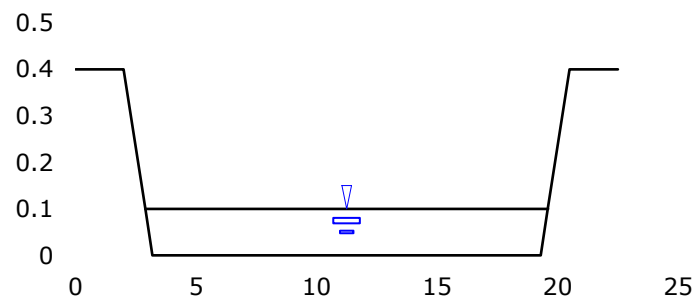
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.87** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 16.1 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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SPILLWAY Wetland 11

Consider all the relevant dimensions of the structure to be:

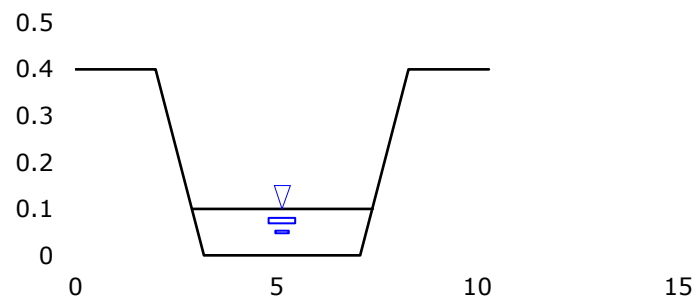
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **0.22** m³/s
 Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 3.9 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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SPILLWAY RG 1

Consider all the relevant dimensions of the structure to be:

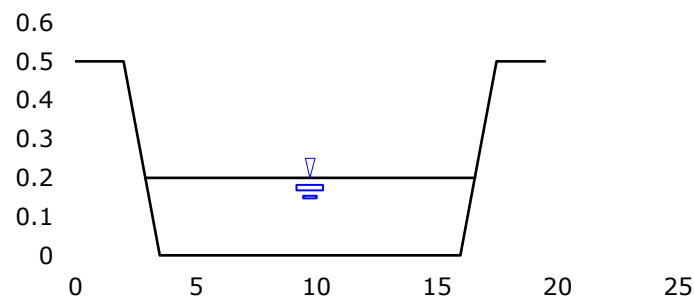
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **1.95** m³/s
 Height of water above wier crest (h) = **0.20** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 12.5 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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SPILLWAY RG 2

Consider all the relevant dimensions of the structure to be:

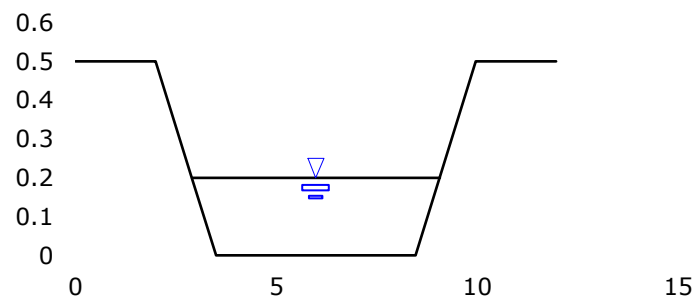
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **0.82** m³/s
 Height of water above wier crest (h) = **0.20** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 5.0 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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Office / Region:	Auckland	Approved By	

SPILLWAY RG 3

Consider all the relevant dimensions of the structure to be:

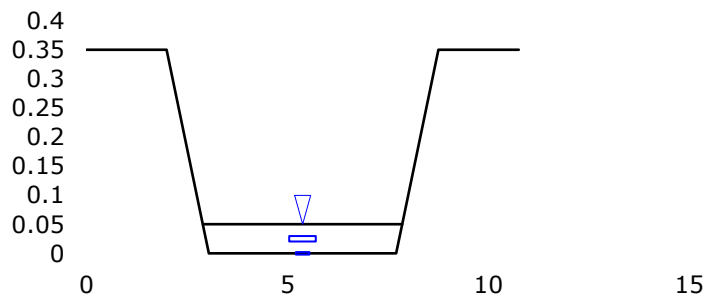
Designed for rainfall event = **100** % AEP
 100% AEP flow rate = **0.09** m³/s
 Height of water above wier crest (h) = **0.05** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 4.7 metres

Spillway



SPILLWAY CALCULATION

HARRISON GRIERSON

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SPILLWAY RG 4

Consider all the relevant dimensions of the structure to be:

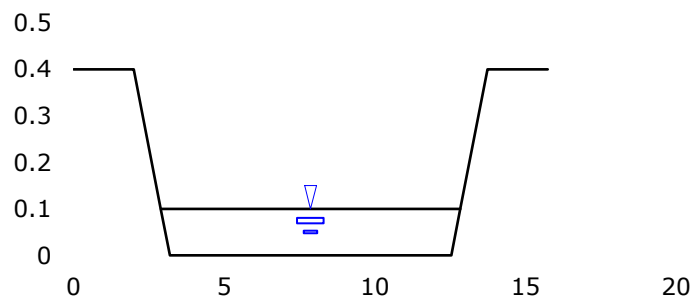
Designed for rainfall event = **100** % AEP
100% AEP flow rate = **0.51** m³/s
Height of water above wier crest (h) = **0.10** m

Using the formula

$$Q_{100} = 0.57 \cdot (2 \cdot g)^{1/2} \cdot (2/3 \cdot L \cdot h^{3/2} + 8/15 \cdot z \cdot h^{5/2})$$

so, L = 9.3 metres

Spillway

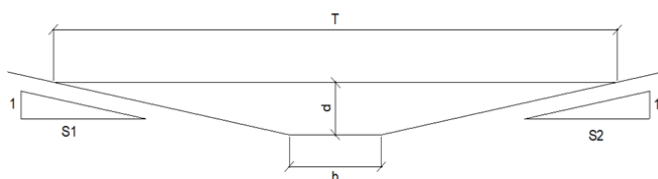


Appendix 3e - Wetland Spillway Riprap Calculations

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 1

INPUTS

Q₁₀₀ Peak Flow 4210 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 27.50 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.06 m

Cross - sectional Area A 1.52 m²

Water surface width 'T' 27.61 m

Wetted Perimeter W 27.66 m

Hydraulic Radius 0.055

Velocity 2.77 m/s

Velocity Head 0.390

Ped safety 0.2 m/s OK $d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$

Capacity 4.210 m³/s

Capacity 4210 l/s REDO

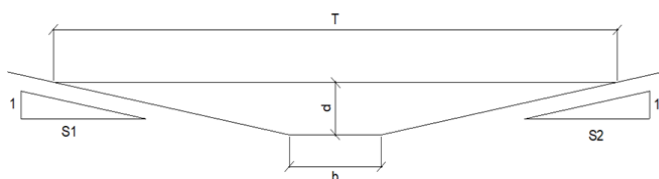
Froude number (Fo)=	$V/(\sqrt{g \times (A/T)})^{0.5}$	1.20
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.38
Thickness of Riprap (DA)=	$1.5 \times d50$	0.58
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.68

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
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Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 2

INPUTS

Q₁₀₀ Peak Flow 170 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 3.00 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.09 m²

Water surface width 'T' 3.06 m

Wetted Perimeter W 3.09 m

Hydraulic Radius 0.030

Velocity 1.84 m/s

Velocity Head 0.173

Ped safety 0.1 m/s OK

$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$

Capacity 0.170 m³/s

Capacity 170 l/s OK

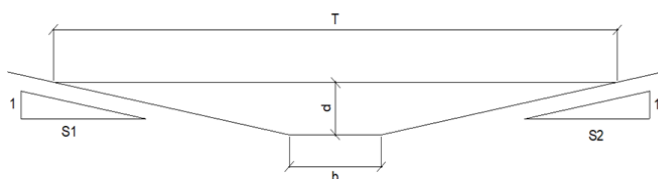
Froude number (Fo)=	$V/(\sqrt{g \times (A/T)})^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.17
Thickness of Riprap (DA)=	$1.5 \times d50$	0.26
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
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LOCATION:

WETLAND 3

INPUTS

Q₁₀₀ Peak Flow 1700 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 17.00 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.04 m

Cross - sectional Area A 0.73 m²

Water surface width 'T' 17.09 m

Wetted Perimeter W 17.12 m

Hydraulic Radius 0.043

Velocity 2.33 m/s

Velocity Head 0.277

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 1.700 m³/s

Capacity 1700 l/s

REDO

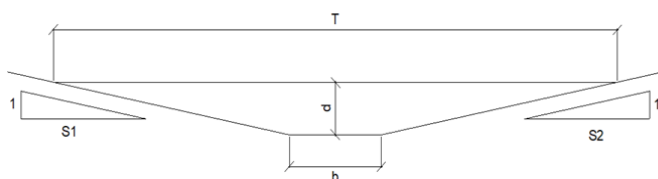
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.15
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.27
Thickness of Riprap (DA)=	1.5 x d50	0.41
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.52

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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LOCATION:

WETLAND 4

INPUTS

Q₁₀₀ Peak Flow 590 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 10.80 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.32 m²

Water surface width 'T' 10.86 m

Wetted Perimeter W 10.88 m

Hydraulic Radius 0.030

Velocity 1.83 m/s

Velocity Head 0.171

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.590 m³/s

Capacity 590 l/s REDO

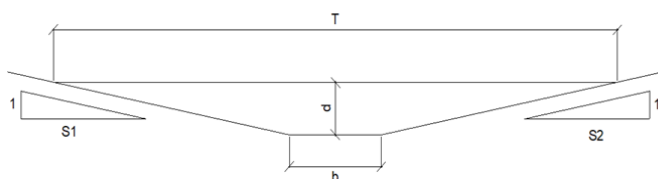
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.17
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.30

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 5

INPUTS

Q₁₀₀ Peak Flow 320 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 5.80 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.17 m²

Water surface width 'T' 5.86 m

Wetted Perimeter W 5.88 m

Hydraulic Radius 0.030

Velocity 1.83 m/s

Velocity Head 0.171

Ped safety 0.1 m/s OK $d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$

Capacity 0.320 m³/s

Capacity 320 l/s REDO

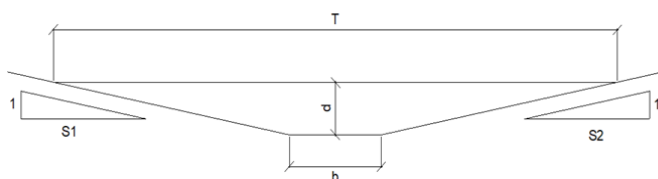
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.17
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 6

INPUTS

Q₁₀₀ Peak Flow 710 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 13.10 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.39 m²

Water surface width 'T' 13.16 m

Wetted Perimeter W 13.18 m

Hydraulic Radius 0.029

Velocity 1.83 m/s

Velocity Head 0.170

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.710 m³/s

Capacity 710 l/s OK

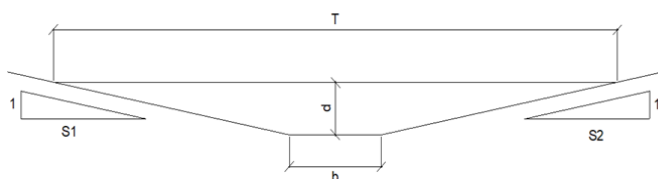
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v2/K(Ss-1)g$	0.16
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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LOCATION:

WETLAND 7

INPUTS

Q₁₀₀ Peak Flow 1160 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 7.20 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.06 m

Cross - sectional Area A 0.41 m²

Water surface width 'T' 7.31 m

Wetted Perimeter W 7.36 m

Hydraulic Radius 0.056

Velocity 2.81 m/s

Velocity Head 0.401

Ped safety 0.2 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 1.160 m³/s

Capacity 1160 l/s OK

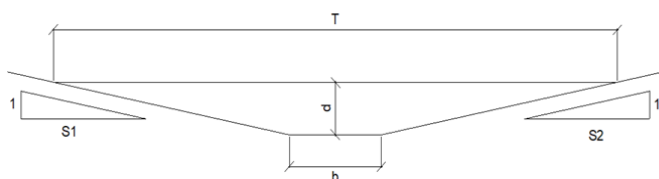
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.20
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.39
Thickness of Riprap (DA)=	$1.5 \times d50$	0.59
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.68

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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LOCATION:

WETLAND 8

INPUTS

Q₁₀₀ Peak Flow 740 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 13.70 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.41 m²

Water surface width 'T' 13.76 m

Wetted Perimeter W 13.78 m

Hydraulic Radius 0.029

Velocity 1.82 m/s

Velocity Head 0.169

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.740 m³/s

Capacity 740 l/s OK

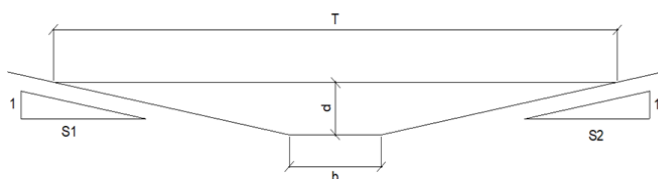
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.16
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

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Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 9

INPUTS

Q₁₀₀ Peak Flow 490 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 9.00 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.27 m²

Water surface width 'T' 9.06 m

Wetted Perimeter W 9.08 m

Hydraulic Radius 0.030

Velocity 1.83 m/s

Velocity Head 0.170

Ped safety 0.1 m/s OK

$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$

Capacity 0.490 m³/s

Capacity 490 l/s REDO

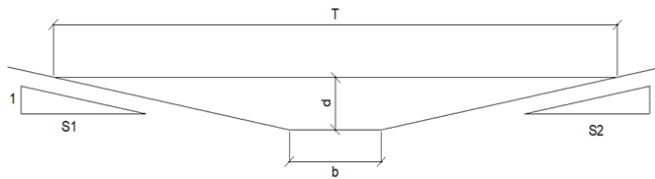
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.16
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 10

INPUTS

Q₁₀₀ Peak Flow 870 l/s

Channel

S1	1.00	:1 Vertical
S2	1.00	:1 Vertical
Base width 'b'	16.10	m
Slope	0.33	m/m
Manning Coefficient 'n'	0.03	

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.48 m²

Water surface width 'T' 16.16 m

Wetted Perimeter W 16.18 m

Hydraulic Radius 0.029

Velocity 1.82 m/s

Velocity Head 0.170

Ped safety 0.1 m/s OK

Capacity 0.870 m³/s

Capacity 870 l/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

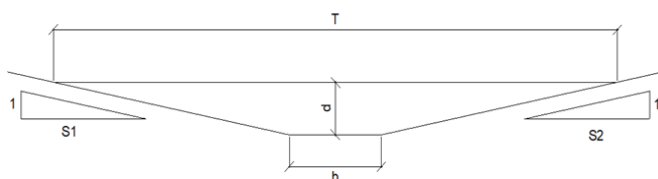
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v2/K(Ss-1)g$	0.16
Thickness of Riprap (DA)=	$1.5 \times d50$	0.25
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

WETLAND 11

INPUTS

Q₁₀₀ Peak Flow 220 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 3.90 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.12 m²

Water surface width 'T' 3.96 m

Wetted Perimeter W 3.99 m

Hydraulic Radius 0.030

Velocity 1.84 m/s

Velocity Head 0.173

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.220 m³/s

Capacity 220 l/s

REDO

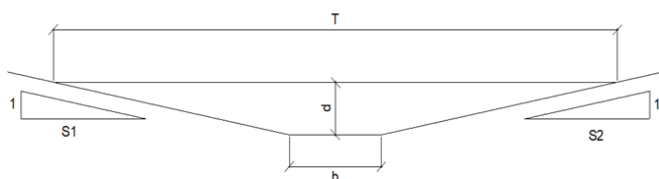
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.08
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.17
Thickness of Riprap (DA)=	1.5 x d50	0.26
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.29

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

Raingarden 1

INPUTS

Q₁₀₀ Peak Flow 1950 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 12.50 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.06 m

Cross - sectional Area A 0.70 m²

Water surface width 'T' 12.61 m

Wetted Perimeter W 12.66 m

Hydraulic Radius 0.055

Velocity 2.78 m/s

Velocity Head 0.394

Ped safety 0.2 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 1.950 m³/s

Capacity 1950 l/s OK

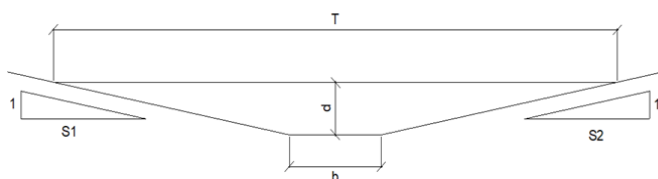
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.20
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.38
Thickness of Riprap (DA)=	1.5 x d50	0.58
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.68

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
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LOCATION:

Raingarden 2

INPUTS

Q₁₀₀ Peak Flow 820 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 12.50 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.03 m

Cross - sectional Area A 0.42 m²

Water surface width 'T' 12.57 m

Wetted Perimeter W 12.59 m

Hydraulic Radius 0.033

Velocity 1.97 m/s

Velocity Head 0.198

Ped safety 0.1 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.820 m³/s

Capacity 820 l/s OK

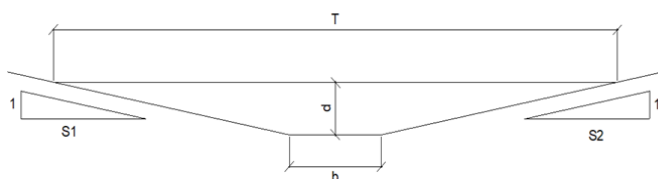
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.10
Riprap Diameter (d50)=	$D50 = v^2 / (K(Ss-1)g)$	0.19
Thickness of Riprap (DA)=	$1.5 \times d50$	0.29
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.36

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

Raingarden 3

INPUTS

Q₁₀₀ Peak Flow 90 l/s

Channel

S1 1.00 :1 Vertical

S2 1.00 :1 Vertical

Base width 'b' 4.70 m

Slope 0.33 m/m

Manning Coefficient 'n' 0.03

Flow Depth 'd' 0.02 m

Cross - sectional Area A 0.07 m²

Water surface width 'T' 4.73 m

Wetted Perimeter W 4.74 m

Hydraulic Radius 0.016

Velocity 1.20 m/s

Velocity Head 0.074

Ped safety 0.0 m/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Capacity 0.090 m³/s

Capacity 90 l/s OK

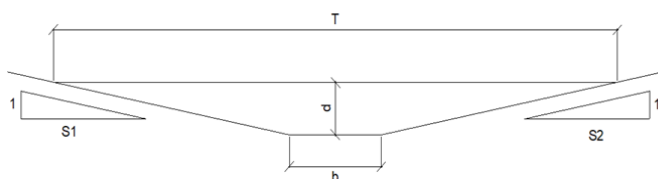
Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	0.97
Riprap Diameter (d50)=	$D50 = v2/K(Ss-1)g$	0.07
Thickness of Riprap (DA)=	1.5 x d50	0.11
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	3.91

Min thickness 300mm

RIP RAP SIZING CALCULATION - SPILLWAY

HARRISON GRIERSON

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM



LOCATION:

Raingarden 4

INPUTS

Q₁₀₀ Peak Flow 510 l/s

Channel

S1	1.00	:1 Vertical
S2	1.00	:1 Vertical
Base width 'b'	4.70	m
Slope	0.33	m/m
Manning Coefficient 'n'	0.03	

Flow Depth 'd' 0.04 m

Cross - sectional Area A 0.21 m²

Water surface width 'T' 4.79 m

Wetted Perimeter W 4.83 m

Hydraulic Radius 0.044

Velocity 2.39 m/s

Velocity Head 0.291

Ped safety 0.1 m/s OK

Capacity 0.510 m³/s

Capacity 510 l/s OK

$$d_g \times V_{ave} \leq 0.4 \text{ m}^2/\text{s}$$

Froude number (Fo)=	$V/(g \times (A/T))^{0.5}$	1.15
Riprap Diameter (d50)=	$D50 = v^2/K(Ss-1)g$	0.28
Thickness of Riprap (DA)=	1.5 x d50	0.43
Length of Riprap (La)=	$D \times (8 + 17 \times \text{LogFo})$	4.53

Min thickness 300mm

Appendix 3f – Culvert Calculations

HY-8 Culvert Analysis Report

Crossing Input: Crossing 1

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.200	cms
Design Flow	0.229	cms
Maximum Flow	0.250	cms
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	2.500	m
Side Slope (H:V)	4.000	_:1
Channel Slope	0.1500	m/m
Manning's n (channel)	0.030	
Channel Invert Elevation	48.000	m
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	235.000	m
Crest Length	20.000	m
Crest Elevation	54.350	m
Roadway Surface	Paved	
Top Width	16.600	m

Culvert Input: Crossing 1

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 1	
Shape	Circular	
Material	Concrete	
Diameter	600.000	mm
Embedment Depth	0.000	mm
Manning's n	0.013	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	m
Inlet Elevation	52.500	m
Outlet Station	35.000	m
Outlet Elevation	48.050	m
Number of Barrels	1	

Computed Culvert Slope	0.127143	m/m
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Table 1 - Culvert Summary Table: Culvert 1

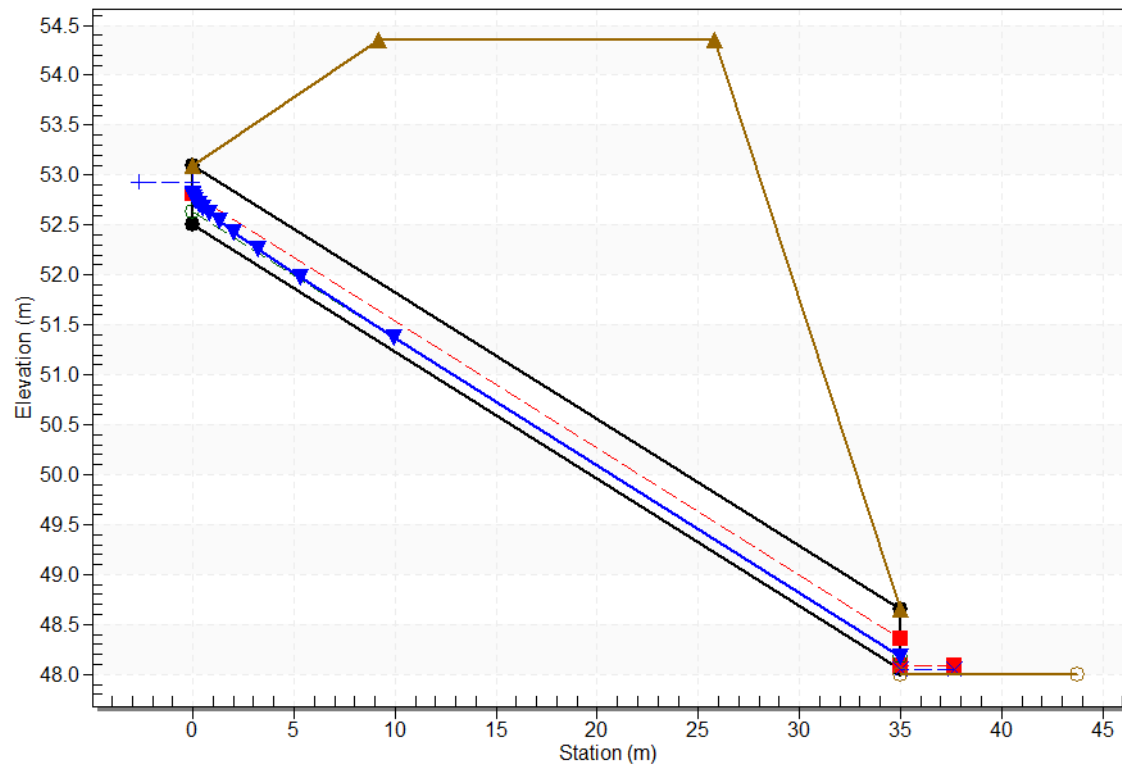
Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.20	0.20	52.89	0.39	0.0*	0.20	1-S2n	0.12	0.29	0.12	0.05	4.83	1.60
0.20	0.20	52.89	0.39	0.0*	0.20	1-S2n	0.12	0.29	0.12	0.05	4.87	1.61
0.21	0.21	52.90	0.40	0.0*	0.20	1-S2n	0.13	0.30	0.13	0.05	4.90	1.62
0.21	0.21	52.90	0.40	0.0*	0.21	1-S2n	0.13	0.30	0.13	0.05	4.94	1.64
0.22	0.22	52.91	0.41	0.0*	0.21	1-S2n	0.13	0.30	0.13	0.05	4.97	1.65
0.22	0.22	52.92	0.42	0.0*	0.21	1-S2n	0.13	0.31	0.14	0.05	4.67	1.67
0.23	0.23	52.92	0.42	0.0*	0.21	1-S2n	0.13	0.31	0.13	0.05	4.95	1.68
0.24	0.24	52.93	0.43	0.0*	0.22	1-S2n	0.13	0.31	0.13	0.05	5.07	1.69
0.24	0.24	52.94	0.44	0.0*	0.22	1-S2n	0.13	0.32	0.13	0.05	5.10	1.71
0.25	0.25	52.94	0.44	0.0*	0.22	1-S2n	0.14	0.32	0.14	0.05	5.13	1.72
0.25	0.25	52.95	0.45	0.0*	0.23	1-S2n	0.14	0.32	0.14	0.05	5.16	1.73
0.98	0.96	54.36	1.86	0.0*	0.94	5-S2n	0.28	0.55	0.29	0.12	7.07	2.80

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Crossing 1, Design Discharge - 0.23 cms

Culvert - Culvert 1, Culvert Discharge - 0.23 cms



HY-8 Culvert Analysis Report

Crossing Input: Crossing 2

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.366	cms
Design Flow	0.369	cms
Maximum Flow	0.372	cms
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	3.300	m
Side Slope (H:V)	4.000	_:1
Channel Slope	0.1500	m/m
Manning's n (channel)	0.030	
Channel Invert Elevation	51.200	m
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	295.000	m
Crest Length	20.000	m
Crest Elevation	53.650	m
Roadway Surface	Paved	
Top Width	16.600	m

Culvert Input: Crossing 2

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 2	
Shape	Circular	
Material	Concrete	
Diameter	750.000	mm
Embedment Depth	0.000	mm
Manning's n	0.013	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	m
Inlet Elevation	52.200	m
Outlet Station	23.000	m
Outlet Elevation	51.230	m
Number of Barrels	1	

Computed Culvert Slope	0.042174	m/m
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Table 1 - Culvert Summary Table: Culvert 2

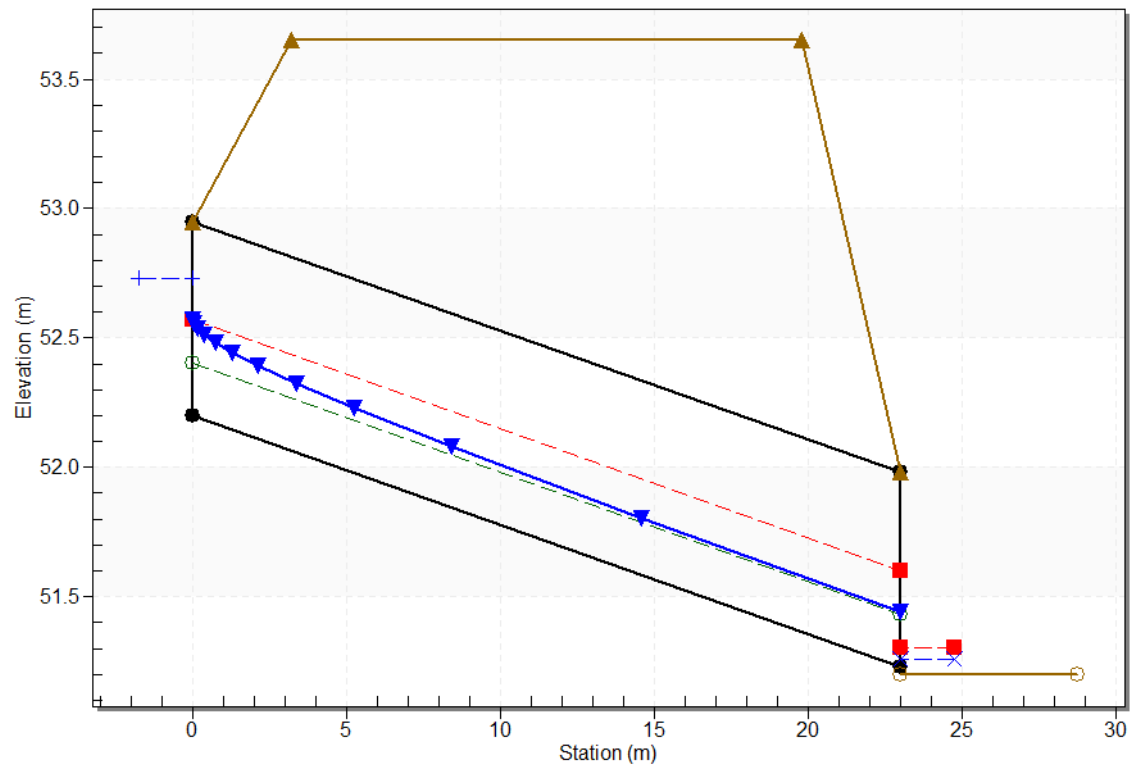
Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.55	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.55	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.56	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.56	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.56	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.56	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.56	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.57	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.57	1.83
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.57	1.84
0.37	0.37	52.73	0.53	0.0*	0.22	1-S2n	0.20	0.37	0.21	0.06	3.57	1.84
1.25	1.21	53.66	1.46	0.584	0.59	5-S2n	0.39	0.67	0.43	0.12	4.66	2.84

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Culvert 2

Crossing - Crossing 2, Design Discharge - 0.37 cms

Culvert - Culvert 2, Culvert Discharge - 0.37 cms



HY-8 Culvert Analysis Report

Crossing Input: Crossing 3

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	1.500	cms
Design Flow	1.530	cms
Maximum Flow	1.540	cms
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	3.300	m
Side Slope (H:V)	4.000	_:1
Channel Slope	0.1000	m/m
Manning's n (channel)	0.030	
Channel Invert Elevation	49.260	m
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	400.000	m
Crest Length	20.000	m
Crest Elevation	53.760	m
Roadway Surface	Paved	
Top Width	16.600	m

Culvert Input: Crossing 3

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 3	
Shape	Circular	
Material	Concrete	
Diameter	1050.000	mm
Embedment Depth	0.000	mm
Manning's n	0.013	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	m
Inlet Elevation	52.400	m
Outlet Station	25.000	m
Outlet Elevation	49.260	m
Number of Barrels	1	

Computed Culvert Slope	0.125600	m/m
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Table 1 - Culvert Summary Table: Culvert 3

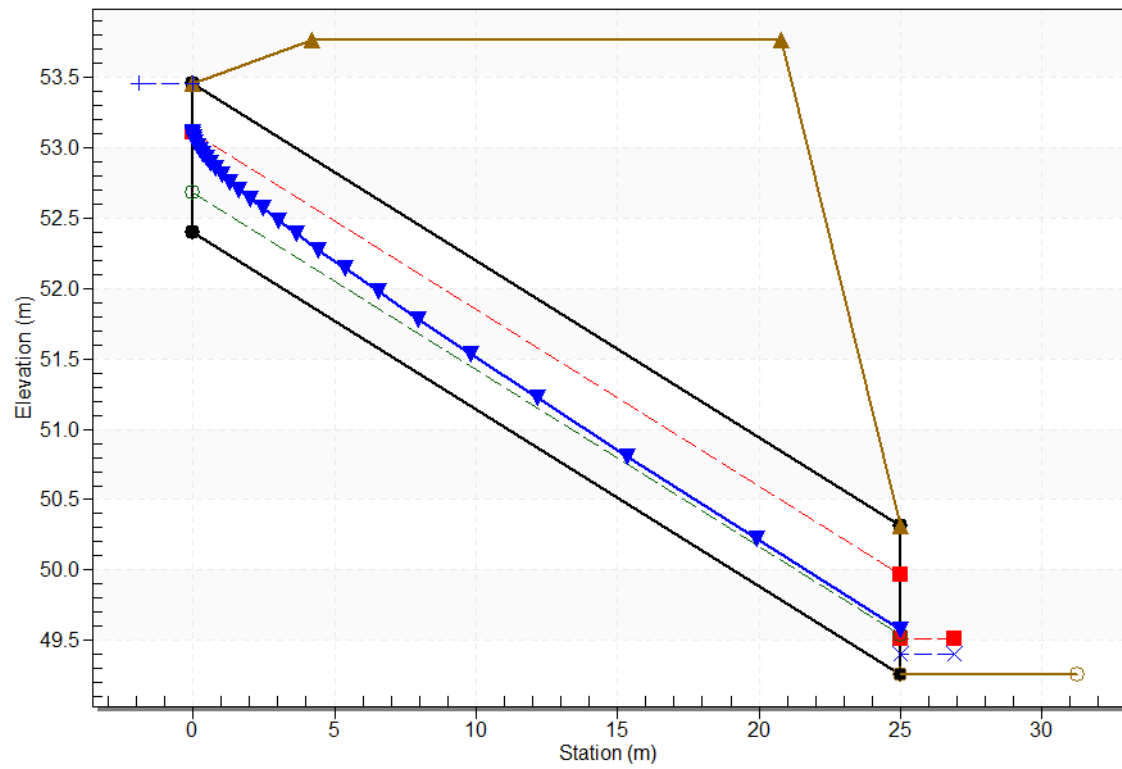
Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
1.50	1.50	53.43	1.03	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.04	2.65
1.50	1.50	53.44	1.04	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.04	2.65
1.51	1.51	53.44	1.04	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.05	2.65
1.51	1.51	53.44	1.04	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.05	2.65
1.52	1.52	53.44	1.04	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.06	2.66
1.52	1.52	53.45	1.05	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.06	2.66
1.52	1.52	53.45	1.05	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.07	2.66
1.53	1.53	53.45	1.05	0.0*	0.30	1-S2n	0.28	0.70	0.31	0.15	7.07	2.66
1.53	1.53	53.45	1.05	0.0*	0.31	5-S2n	0.28	0.70	0.31	0.15	7.07	2.66
1.54	1.54	53.45	1.05	0.0*	0.31	5-S2n	0.28	0.71	0.31	0.15	7.08	2.67
1.54	1.54	53.46	1.06	0.0*	0.31	5-S2n	0.28	0.71	0.31	0.15	7.09	2.67
2.24	2.08	53.79	1.39	0.0*	0.40	5-S2n	0.33	0.82	0.38	0.18	7.46	3.03

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Culvert 3

Crossing - Crossing 3, Design Discharge - 1.53 cms

Culvert - Culvert 3, Culvert Discharge - 1.53 cms



HY-8 Culvert Analysis Report

Crossing Input: Crossing 4

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.513	cms
Design Flow	0.543	cms
Maximum Flow	0.573	cms
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	3.300	m
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0100	m/m
Manning's n (channel)	0.030	
Channel Invert Elevation	58.800	m
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	640.000	m
Crest Length	20.000	m
Crest Elevation	61.290	m
Roadway Surface	Paved	
Top Width	16.600	m

Culvert Input: Crossing 4

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 4	
Shape	Circular	
Material	Concrete	
Diameter	600.000	mm
Embedment Depth	0.000	mm
Manning's n	0.013	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	m
Inlet Elevation	59.050	m
Outlet Station	25.000	m
Outlet Elevation	58.800	m
Number of Barrels	1	

Computed Culvert Slope	0.010000	m/m
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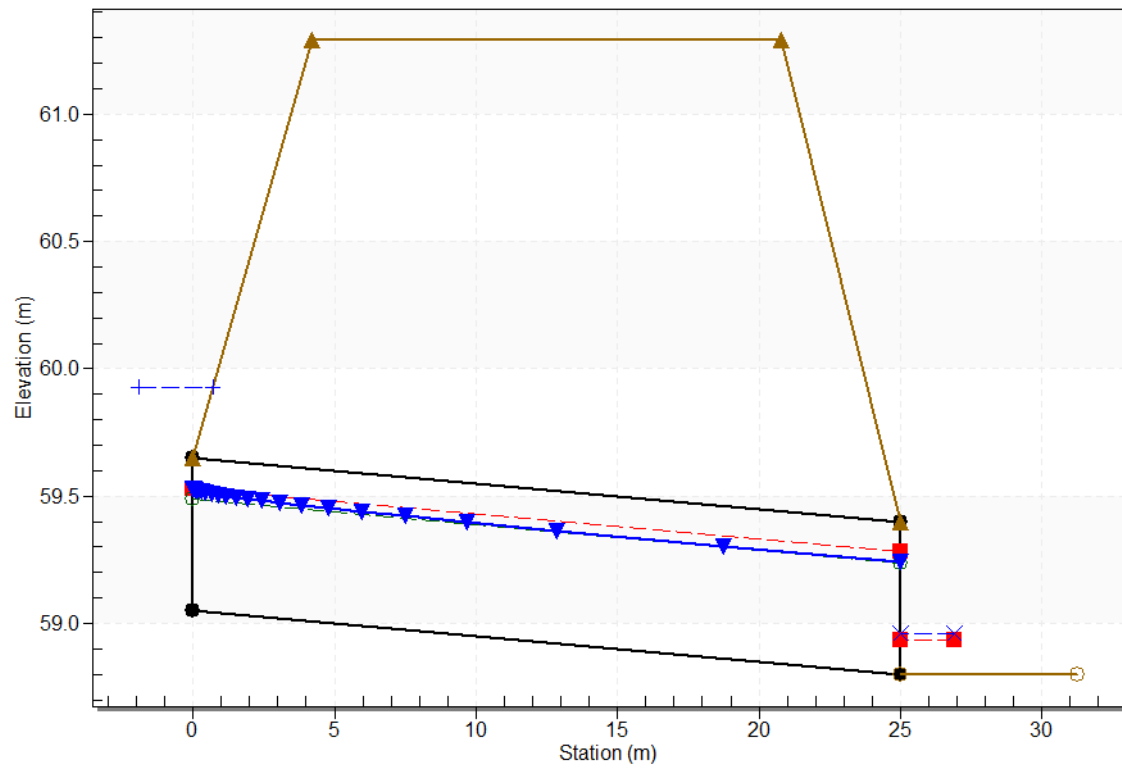
Table 1 - Culvert Summary Table: Culvert 4

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.51	0.51	59.88	0.83	0.709	0.42	5-S2n	0.42	0.47	0.42	0.15	2.42	0.86
0.52	0.52	59.89	0.84	0.721	0.43	5-S2n	0.42	0.47	0.42	0.15	2.43	0.86
0.52	0.52	59.90	0.85	0.732	0.43	5-S2n	0.43	0.47	0.43	0.15	2.43	0.87
0.53	0.53	59.91	0.86	0.744	0.44	5-S2n	0.43	0.48	0.43	0.16	2.44	0.87
0.54	0.54	59.92	0.87	0.755	0.44	5-S2n	0.43	0.48	0.44	0.16	2.44	0.87
0.54	0.54	59.93	0.88	0.767	0.45	5-S2n	0.44	0.48	0.44	0.16	2.45	0.88
0.55	0.55	59.94	0.89	0.779	0.45	5-S2n	0.44	0.48	0.44	0.16	2.45	0.88
0.55	0.55	59.95	0.90	0.791	0.46	5-S2n	0.45	0.49	0.45	0.16	2.45	0.88
0.56	0.56	59.96	0.91	0.803	0.46	5-S2n	0.45	0.49	0.45	0.16	2.46	0.89
0.57	0.57	59.97	0.92	0.815	0.47	5-S2n	0.45	0.49	0.46	0.16	2.46	0.89
0.57	0.57	59.98	0.93	0.827	0.47	5-S2n	0.46	0.49	0.46	0.16	2.47	0.89
1.09	1.06	61.30	2.25	2.155	1.14	6-FFc	0.60	0.60	0.60	0.23	3.74	1.10

Water Surface Profile Plot for Culvert: Culvert 4

Crossing - Crossing 4, Design Discharge - 0.54 cms

Culvert - Culvert 4, Culvert Discharge - 0.54 cms



Appendix 3g – Culvert Riprap Sizing

RIP RAP SIZING CALCULATION - CULVERTS



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	

LOCATION:

CULVERT 1

Pipe Dia. (Do):	0.6	m
Slope:	12.71	%
Flow (Q):	0.25	m ³ /s
Velocity (V):	5.16	m/s
Depth of flow in pipe(dp):	0.3	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	3.01	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.45	m
Thickness of Riprap (DA)=	$2 \times d50$	0.90	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \log Fo)$	9.68	m
Width of Riprap (WA)=	$3 \times Do$	1.80	m
Height of Riprap (H)=	crown of pipe +300mm	0.90	m

< Wingwall Width

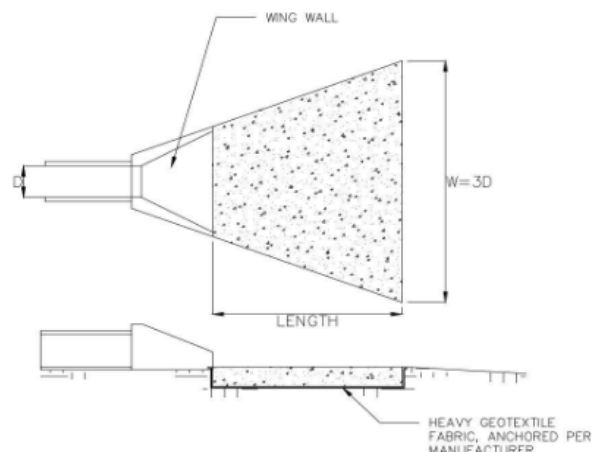
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m
Height of Wingwall (Hw)=	0.91	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.50
Thickness of Riprap (DA)=	0.90
Length of Riprap (La)=	9.68
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION - CULVERTS



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	

LOCATION:

CULVERT 2

Pipe Dia. (Do):	0.75	m
Slope:	4.22	%
Flow (Q):	0.372	m ³ /s
Velocity (V):	3.57	m/s
Depth of flow in pipe(dp):	0.4	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.87	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.35	m
Thickness of Riprap (DA)=	$2 \times d50$	0.70	m
Lengh of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	9.48	m
Width of Riprap (WA)=	$3 \times Do$	2.25	m
Height of Riprap (H)=	crown of pipe +300mm	1.05	m

< Wingwall Width

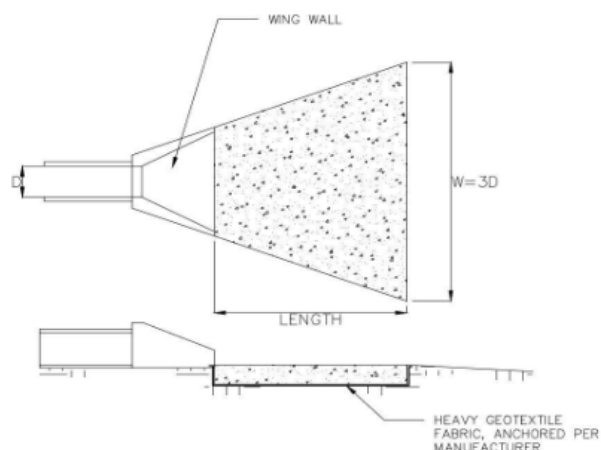
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m
Height of Wingall (Hw)=	1.595	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.40
Thickness of Riprap (DA)=	0.70
Lengh of Riprap (La)=	9.48
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION - CULVERTS



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	

LOCATION:

CULVERT 3

Pipe Dia. (Do):	1.05	m
Slope:	12.50	%
Flow (Q):	1.54	m ³ /s
Velocity (V):	6.18	m/s
Depth of flow in pipe(dp):	0.7	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	2.34	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.61	m
Thickness of Riprap (DA)=	$2 \times d50$	1.23	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \log Fo)$	15.00	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

< Wingwall Width

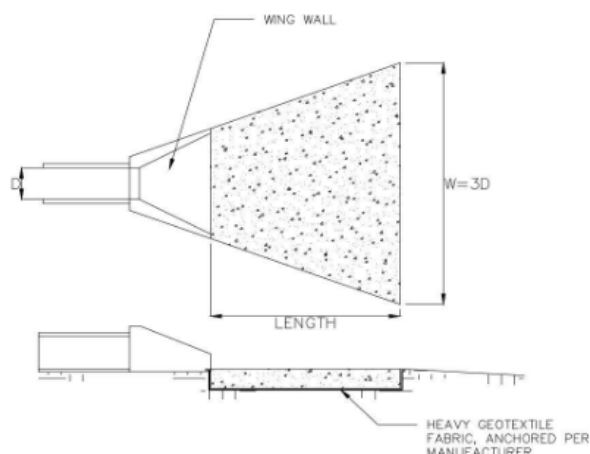
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingwall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.60
Thickness of Riprap (DA)=	1.20
Length of Riprap (La)=	15.00
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION - CULVERTS



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	

LOCATION:

CULVERT 4

Pipe Dia. (Do):	0.6	m
Slope:	1.00	%
Flow (Q):	0.573	m ³ /s
Velocity (V):	2.47	m/s
Depth of flow in pipe(dp):	0.5	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.13	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.17	m
Thickness of Riprap (DA)=	$2 \times d50$	0.34	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \log Fo)$	5.33	m
Width of Riprap (WA)=	$3 \times Do$	1.80	m
Height of Riprap (H)=	crown of pipe +300mm	0.90	m

< Wingwall Width

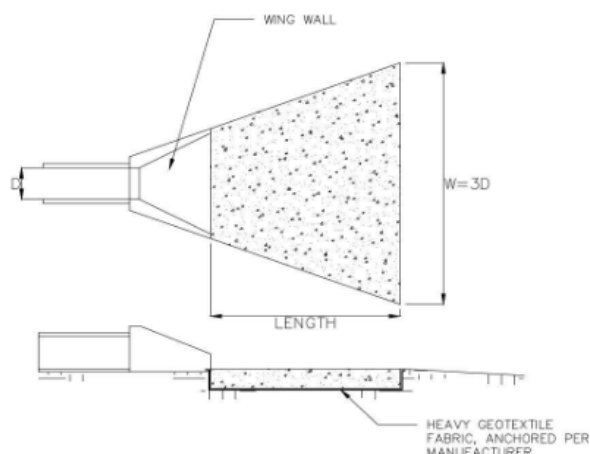
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m
Height of Wingwall (Hw)=	0.91	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	5.33
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



Appendix 3h - Manhole Weir Calculations

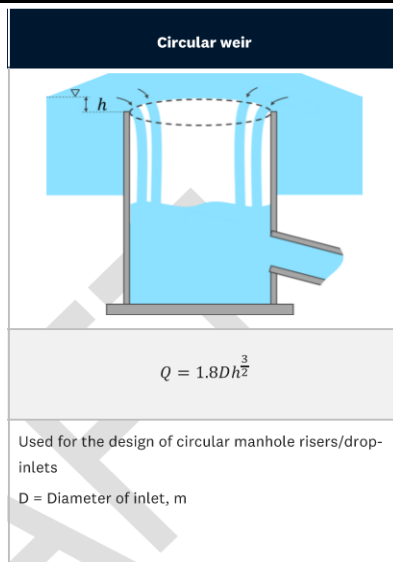
MANHOLE WEIR CALCULATION

HARRISON GRIERSON

Project:	Beachlands FT	Date	8/06/2026
Project No:	A2515591.00	Completed by	CJM
Office / Region:	Auckland	Approved By	CJM

Manhole Circular Weir

Wetland/ Rain Garden	Q (m³/s) Flow	h (mm)	D (mm)	Q Calc	Check $Q_{calc} > Q_{Flow}$
Wetland 1	2.72	500	1400	3.04	ok
Wetland 2	1.44	500	1050	2.28	ok
Wetland 3	1.66	500	1050	2.28	ok
Wetland 4	7.47	600	3000	8.56	ok
Wetland 5	2.12	500	1050	2.28	ok
Wetland 6	1.06	500	1050	2.28	ok
Wetland 7	0.9	500	1050	2.28	ok
Wetland 8	0.66	500	1050	2.28	ok
Wetland 9	1.12	500	1050	2.28	ok
Wetland 10	0.45	500	1050	2.28	ok
Wetland 11	0.92	500	1050	2.28	ok
RG 1	0.15	500	1050	2.28	ok
RG 2	0.09	500	1050	2.28	ok
RG 3	0.52	500	1050	2.28	ok
RG 4	0.28	500	1050	2.28	ok



Appendix 3i – Outlet Riprap Calculations

RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 1-0

Pipe Dia. (Do):	1.20	m
Slope:	0.40	%
Flow (Q):	2.47	m ³ /s
Velocity (V):	2.50	m/s
Depth of flow in pipe(dp):	1.00	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.80	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.24	m
Thickness of Riprap (DA)=	$2 \times d50$	0.48	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	7.62	m
Width of Riprap (WA)=	$3 \times Do$	3.60	m
Height of Riprap (H)=	crown of pipe +300mm	1.50	m

< Wingwall Width

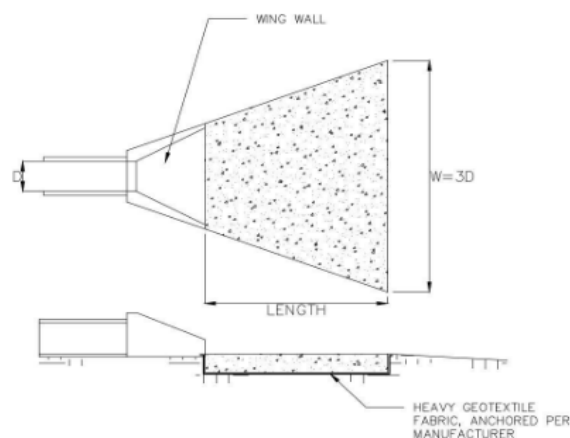
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m
Height of Wingall (Hw)=	1.875	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	7.62
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 4-0

Pipe Dia. (Do):	0.53	m
Slope:	0.50	%
Flow (Q):	0.26	m ³ /s
Velocity (V):	1.50	m/s
Depth of flow in pipe(dp):	0.38	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.77	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.10	m
Thickness of Riprap (DA)=	$2 \times d50$	0.20	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	3.21	m
Width of Riprap (WA)=	$3 \times Do$	1.58	m
Height of Riprap (H)=	crown of pipe +300mm	0.83	m

< Wingwall Width

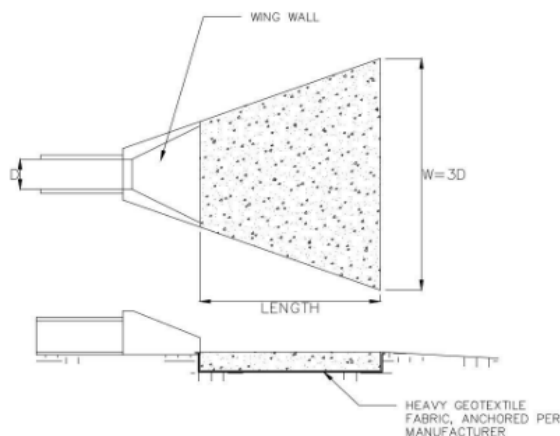
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m
Height of Wingwall (Hw)=	0.91	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.20
Length of Riprap (La)=	3.21
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 30-0

Pipe Dia. (Do):	0.83	m
Slope:	0.60	%
Flow (Q):	0.90	m ³ /s
Velocity (V):	2.10	m/s
Depth of flow in pipe(dp):	0.62	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.85	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.18	m
Thickness of Riprap (DA)=	$2 \times d50$	0.35	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	5.63	m
Width of Riprap (WA)=	$3 \times Do$	2.48	m
Height of Riprap (H)=	crown of pipe +300mm	1.13	m

< Wingwall Width

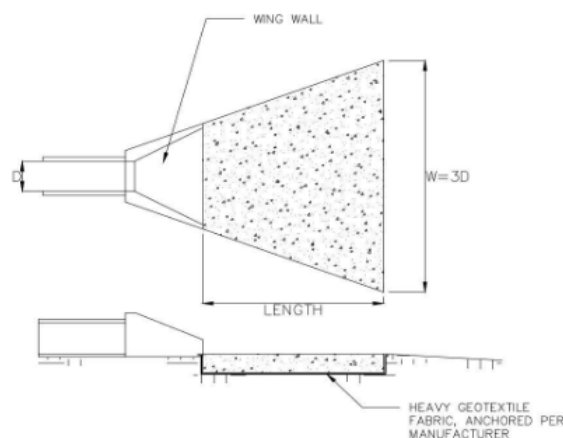
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m
Height of Wingall (Hw)=	1.595	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	5.63
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 40-0

Pipe Dia. (Do):	1.20	m
Slope:	0.30	%
Flow (Q):	2.12	m ³ /s
Velocity (V):	2.30	m/s
Depth of flow in pipe(dp):	0.91	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.77	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.23	m
Thickness of Riprap (DA)=	$2 \times d50$	0.46	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	7.27	m
Width of Riprap (WA)=	$3 \times Do$	3.60	m
Height of Riprap (H)=	crown of pipe +300mm	1.50	m

< Wingwall Width

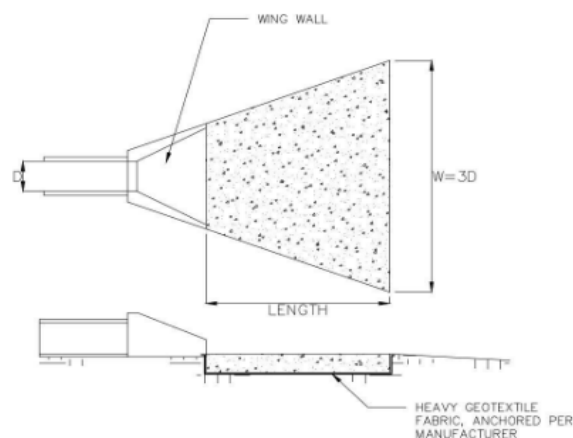
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m
Height of Wingwall (Hw)=	1.875	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	7.27
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 50-0

Pipe Dia. (Do):	0.90	m
Slope:	0.60	%
Flow (Q):	1.06	m ³ /s
Velocity (V):	2.20	m/s
Depth of flow in pipe(dp):	0.65	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.87	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.20	m
Thickness of Riprap (DA)=	$2 \times d50$	0.39	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	6.29	m
Width of Riprap (WA)=	$3 \times Do$	2.70	m
Height of Riprap (H)=	crown of pipe +300mm	1.20	m

< Wingwall Width

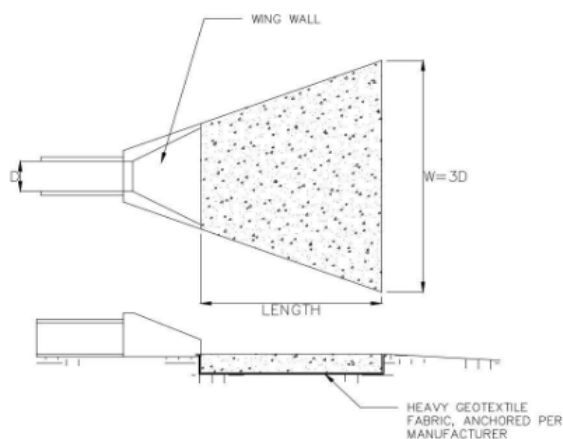
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingwall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	6.29
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 60-0

Pipe Dia. (Do):	0.75	m
Slope:	0.50	%
Flow (Q):	0.66	m ³ /s
Velocity (V):	1.90	m/s
Depth of flow in pipe(dp):	0.56	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.81	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.15	m
Thickness of Riprap (DA)=	$2 \times d50$	0.30	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	4.83	m
Width of Riprap (WA)=	$3 \times Do$	2.25	m
Height of Riprap (H)=	crown of pipe +300mm	1.05	m

< Wingwall Width

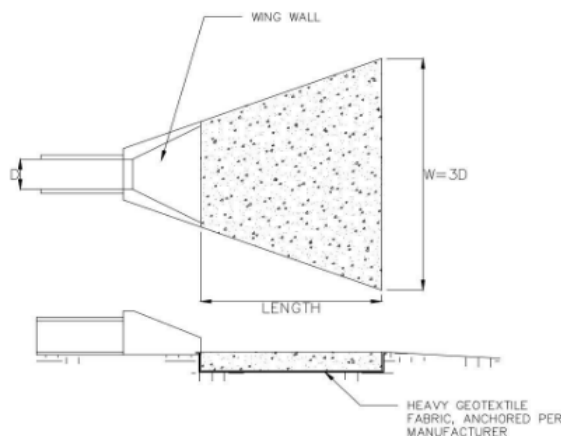
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m
Height of Wingwall (Hw)=	1.595	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	4.83
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 70-0

Pipe Dia. (Do):	1.05	m
Slope:	0.50	%
Flow (Q):	1.66	m ³ /s
Velocity (V):	2.30	m/s
Depth of flow in pipe(dp):	0.90	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.77	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.20	m
Thickness of Riprap (DA)=	$2 \times d50$	0.41	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	6.40	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

< Wingwall Width

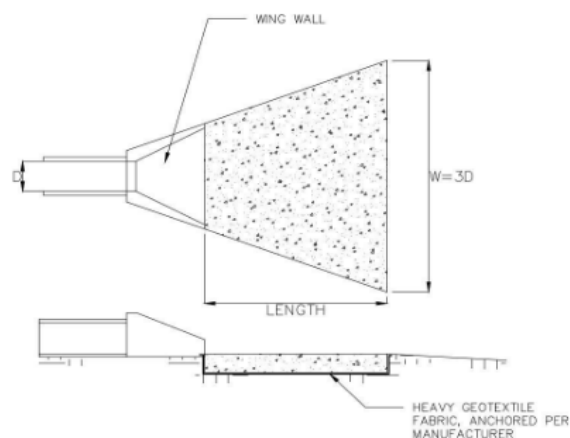
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	6.40
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 80-0

Pipe Dia. (Do):	1.05	m
Slope:	0.20	%
Flow (Q):	1.13	m ³ /s
Velocity (V):	1.80	m/s
Depth of flow in pipe(dp):	0.69	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.69	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.18	m
Thickness of Riprap (DA)=	$2 \times d50$	0.36	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	5.53	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

< Wingwall Width

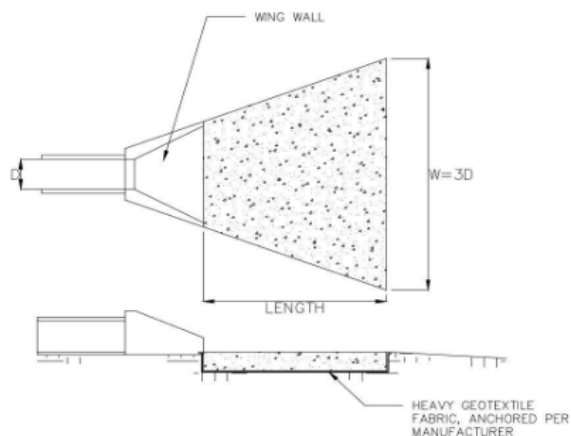
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingwall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	5.53
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 90-0

Pipe Dia. (Do):	0.83	m
Slope:	0.50	%
Flow (Q):	0.92	m ³ /s
Velocity (V):	2.00	m/s
Depth of flow in pipe(dp):	0.66	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.79	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.16	m
Thickness of Riprap (DA)=	$2 \times d50$	0.32	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	5.13	m
Width of Riprap (WA)=	$3 \times Do$	2.48	m
Height of Riprap (H)=	crown of pipe +300mm	1.13	m

< Wingwall Width

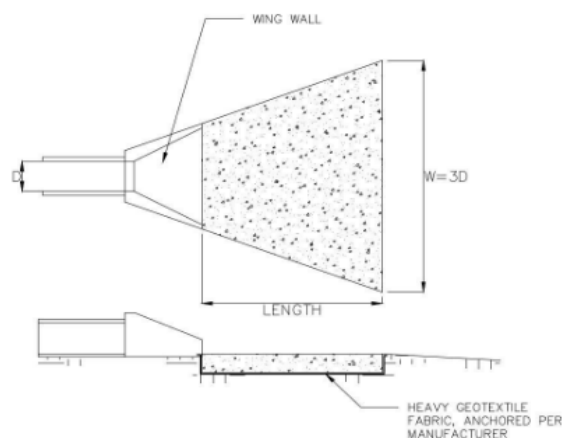
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m
Height of Wingall (Hw)=	1.595	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	5.13
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 160-0

Pipe Dia. (Do):	1.05	m
Slope:	0.40	%
Flow (Q):	1.44	m ³ /s
Velocity (V):	2.10	m/s
Depth of flow in pipe(dp):	0.77	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.77	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.20	m
Thickness of Riprap (DA)=	$2 \times d50$	0.40	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	6.33	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

< Wingwall Width

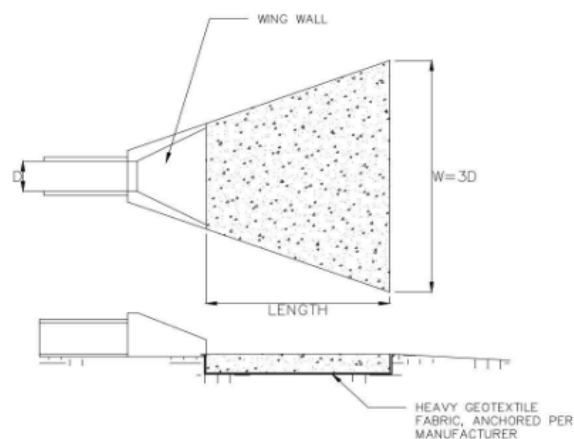
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingwall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	6.33
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 170-0

Pipe Dia. (Do):	0.38	m
Slope:	0.40	%
Flow (Q):	0.09	m ³ /s
Velocity (V):	1.20	m/s
Depth of flow in pipe(dp):	0.24	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.78	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.07	m
Thickness of Riprap (DA)=	$2 \times d50$	0.15	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	2.32	m
Width of Riprap (WA)=	$3 \times Do$	1.13	m
Height of Riprap (H)=	crown of pipe +300mm	0.68	m

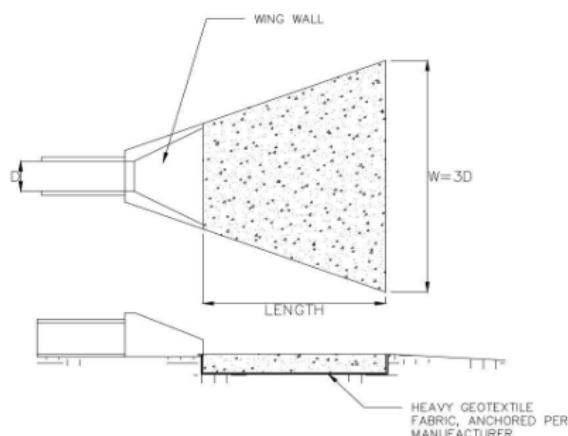
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m	Based on Humes details
Height of Wingall (Hw)=	0.91	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.10
Length of Riprap (La)=	2.32
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 175-0

Pipe Dia. (Do):	0.45	m
Slope:	0.40	%
Flow (Q):	0.15	m ³ /s
Velocity (V):	1.30	m/s
Depth of flow in pipe(dp):	0.31	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.75	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.08	m
Thickness of Riprap (DA)=	$2 \times d50$	0.17	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	2.65	m
Width of Riprap (WA)=	$3 \times Do$	1.35	m
Height of Riprap (H)=	crown of pipe +300mm	0.75	m

< Wingwall Width

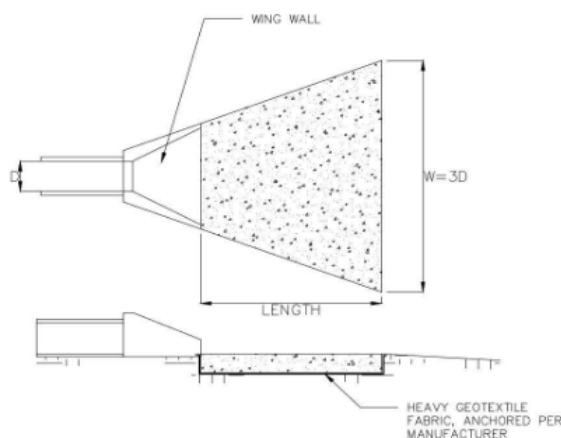
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m
Height of Wingwall (Hw)=	0.91	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.20
Length of Riprap (La)=	2.65
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 180-0

Pipe Dia. (Do):	0.68	m
Slope:	0.40	%
Flow (Q):	0.52	m ³ /s
Velocity (V):	1.80	m/s
Depth of flow in pipe(dp):	0.52	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.80	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.13	m
Thickness of Riprap (DA)=	$2 \times d50$	0.27	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	4.27	m
Width of Riprap (WA)=	$3 \times Do$	2.03	m
Height of Riprap (H)=	crown of pipe +300mm	0.98	m

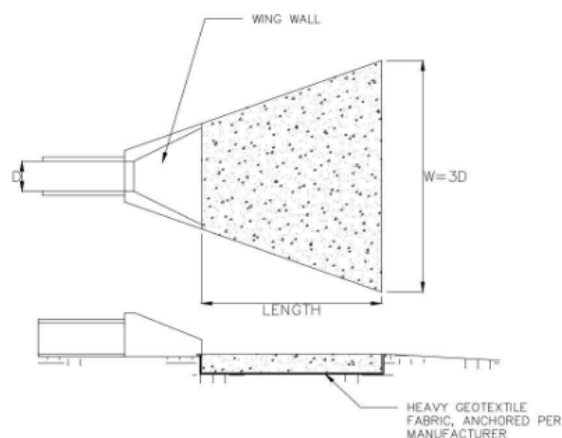
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m	Based on Humes details
Height of Wingall (Hw)=	1.595	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	4.27
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 190-0 RG4

Pipe Dia. (Do):	0.53	m
Slope:	0.50	%
Flow (Q):	0.28	m ³ /s
Velocity (V):	1.60	m/s
Depth of flow in pipe(dp):	0.40	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.80	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.11	m
Thickness of Riprap (DA)=	$2 \times d50$	0.21	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	3.35	m
Width of Riprap (WA)=	$3 \times Do$	1.58	m
Height of Riprap (H)=	crown of pipe +300mm	0.83	m

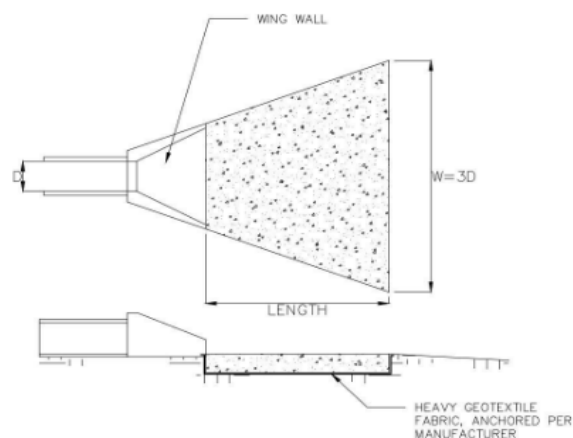
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WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m	Based on Humes details
Height of Wingall (Hw)=	0.91	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.20
Length of Riprap (La)=	3.35
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 200-0

Pipe Dia. (Do):	0.68	m
Slope:	0.40	%
Flow (Q):	0.45	m ³ /s
Velocity (V):	1.70	m/s
Depth of flow in pipe(dp):	0.48	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.78	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.13	m
Thickness of Riprap (DA)=	$2 \times d50$	0.26	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	4.19	m
Width of Riprap (WA)=	$3 \times Do$	2.03	m
Height of Riprap (H)=	crown of pipe +300mm	0.98	m

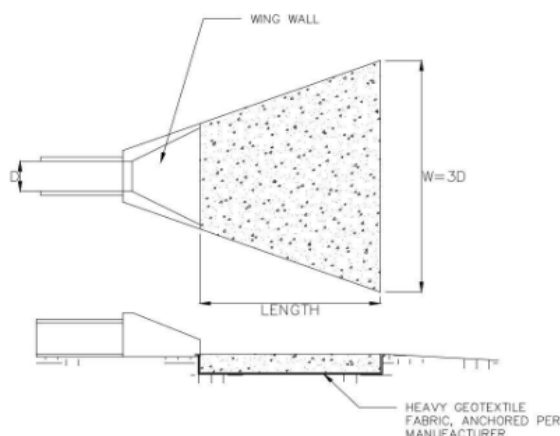
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WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m	Based on Humes details
Height of Wingall (Hw)=	1.595	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	4.19
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 210-0 Pond 4 Outlet

Pipe Dia. (Do):	1.35	m
Slope:	0.80	%
Flow (Q):	4.43	m ³ /s
Velocity (V):	3.30	m/s
Depth of flow in pipe(dp):	1.19	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.97	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.33	m
Thickness of Riprap (DA)=	$2 \times d50$	0.65	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	10.46	m
Width of Riprap (WA)=	$3 \times Do$	4.05	m
Height of Riprap (H)=	crown of pipe +300mm	1.65	m

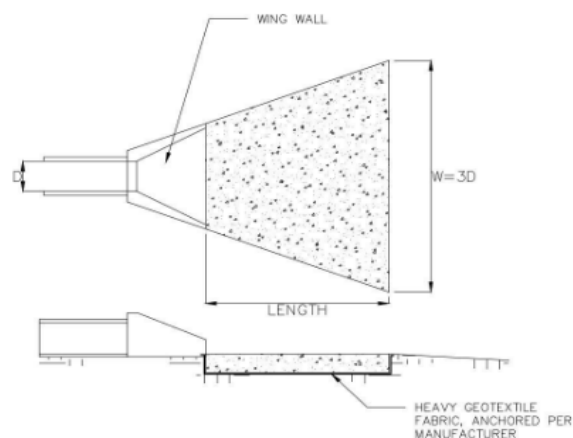
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WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m	Based on Humes details
Height of Wingall (Hw)=	1.875	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.30
Thickness of Riprap (DA)=	0.70
Length of Riprap (La)=	10.46
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 210-0 Pond 9 Outlet

Pipe Dia. (Do):	1.20	m
Slope:	0.80	%
Flow (Q):	2.88	m ³ /s
Velocity (V):	3.00	m/s
Depth of flow in pipe(dp):	0.94	m

0.78 0.936

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.99	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.30	m
Thickness of Riprap (DA)=	$2 \times d50$	0.59	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	9.51	m
Width of Riprap (WA)=	$3 \times Do$	3.60	m
Height of Riprap (H)=	crown of pipe +300mm	1.50	m

< Wingwall Width

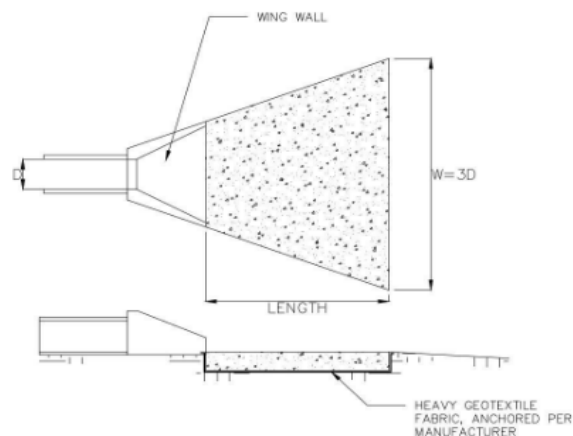
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m
Height of Wingwall (Hw)=	1.875	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.30
Thickness of Riprap (DA)=	0.60
Length of Riprap (La)=	9.51
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 19-0

Pipe Dia. (Do):	1.20	m
Slope:	1.10	%
Flow (Q):	3.00	m ³ /s
Velocity (V):	3.50	m/s
Depth of flow in pipe(dp):	0.88	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.19	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.36	m
Thickness of Riprap (DA)=	$2 \times d50$	0.72	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	11.17	m
Width of Riprap (WA)=	$3 \times Do$	3.60	m
Height of Riprap (H)=	crown of pipe +300mm	1.50	m

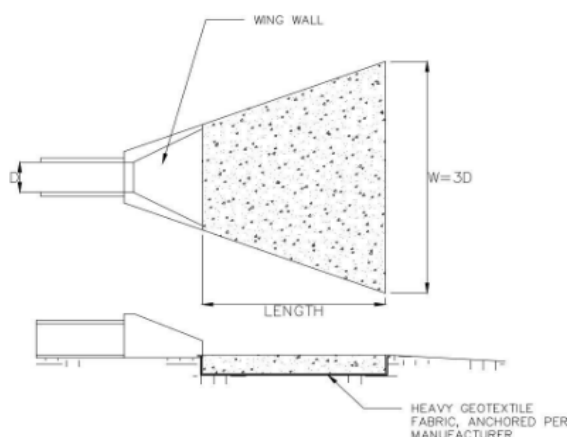
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m	Based on Humes details
Height of Wingall (Hw)=	1.875	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.40
Thickness of Riprap (DA)=	0.70
Length of Riprap (La)=	11.17
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 35-0

Pipe Dia. (Do):	0.83	m
Slope:	1.30	%
Flow (Q):	0.97	m ³ /s
Velocity (V):	2.90	m/s
Depth of flow in pipe(dp):	0.50	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.31	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.27	m
Thickness of Riprap (DA)=	$2 \times d50$	0.54	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	8.22	m
Width of Riprap (WA)=	$3 \times Do$	2.48	m
Height of Riprap (H)=	crown of pipe +300mm	1.13	m

< Wingwall Width

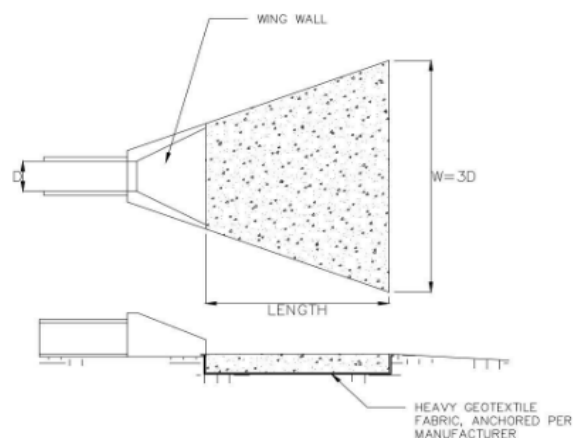
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m
Height of Wingwall (Hw)=	1.595	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.30
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	8.22
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 46-0

Pipe Dia. (Do):	1.20	m
Slope:	0.50	%
Flow (Q):	2.21	m ³ /s
Velocity (V):	2.40	m/s
Depth of flow in pipe(dp):	0.92	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.80	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.24	m
Thickness of Riprap (DA)=	$2 \times d50$	0.48	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	7.59	m
Width of Riprap (WA)=	$3 \times Do$	3.60	m
Height of Riprap (H)=	crown of pipe +300mm	1.50	m

< Wingwall Width

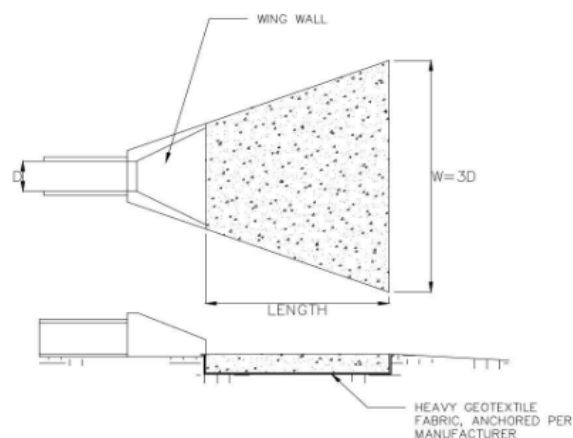
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.1	m
Height of Wingall (Hw)=	1.875	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	7.59
Head Width of Riprap (WH)=	4.1
Tail Width of Riprap (WT)=	4.1
Height of Riprap (H)=	1.875



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 55-0

Pipe Dia. (Do):	1.05	m
Slope:	0.40	%
Flow (Q):	1.10	m ³ /s
Velocity (V):	2.00	m/s
Depth of flow in pipe(dp):	0.65	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)0.5$	0.79	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.21	m
Thickness of Riprap (DA)=	$2 \times d50$	0.42	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	6.59	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

< Wingwall Width

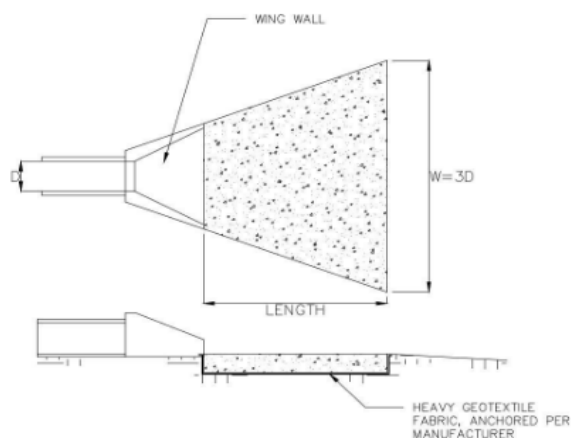
WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m
Height of Wingall (Hw)=	1.55	m

Based on Humes details

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.40
Length of Riprap (La)=	6.59
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet65-0 Pond 8 Outlet

Pipe Dia. (Do):	0.75	m
Slope:	3.70	%
Flow (Q):	0.76	m ³ /s
Velocity (V):	4.10	m/s
Depth of flow in pipe(dp):	0.35	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	2.20	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.41	m
Thickness of Riprap (DA)=	$2 \times d50$	0.83	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	10.38	m
Width of Riprap (WA)=	$3 \times Do$	2.25	m
Height of Riprap (H)=	crown of pipe +300mm	1.05	m

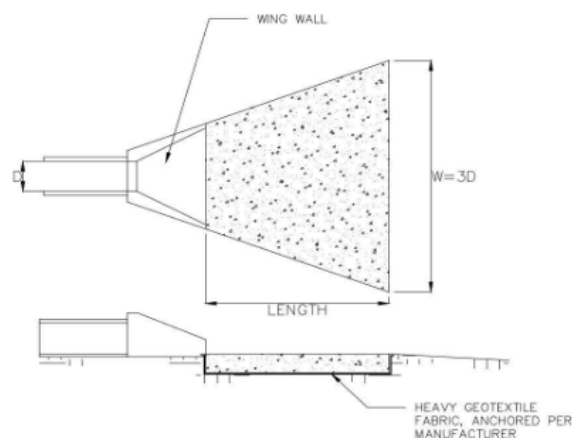
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m	Based on Humes details
Height of Wingall (Hw)=	1.595	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.40
Thickness of Riprap (DA)=	0.80
Length of Riprap (La)=	10.38
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION:

Outlet 79-0

Pipe Dia. (Do):	1.05	m
Slope:	0.60	%
Flow (Q):	1.78	m ³ /s
Velocity (V):	2.50	m/s
Depth of flow in pipe(dp):	0.83	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.88	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.23	m
Thickness of Riprap (DA)=	$2 \times d50$	0.46	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	7.38	m
Width of Riprap (WA)=	$3 \times Do$	3.15	m
Height of Riprap (H)=	crown of pipe +300mm	1.35	m

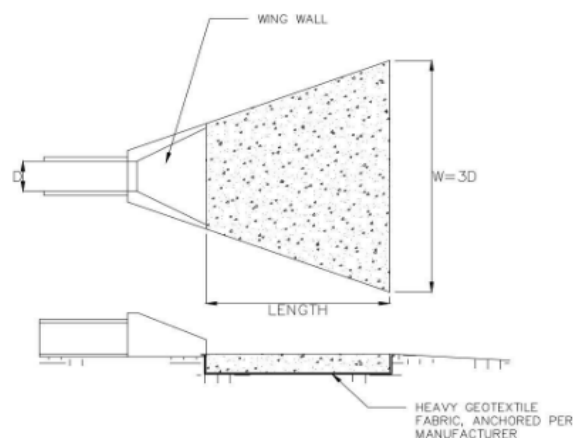
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.8	m	Based on Humes details
Height of Wingall (Hw)=	1.55	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	7.38
Head Width of Riprap (WH)=	3.8
Tail Width of Riprap (WT)=	3.8
Height of Riprap (H)=	1.55



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 94-0 Pond 9 Outlet

Pipe Dia. (Do):	0.83	m
Slope:	0.50	%
Flow (Q):	0.94	m ³ /s
Velocity (V):	2.00	m/s
Depth of flow in pipe(dp):	0.67	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	0.78	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.16	m
Thickness of Riprap (DA)=	$2 \times d50$	0.32	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	5.10	m
Width of Riprap (WA)=	$3 \times Do$	2.48	m
Height of Riprap (H)=	crown of pipe +300mm	1.13	m

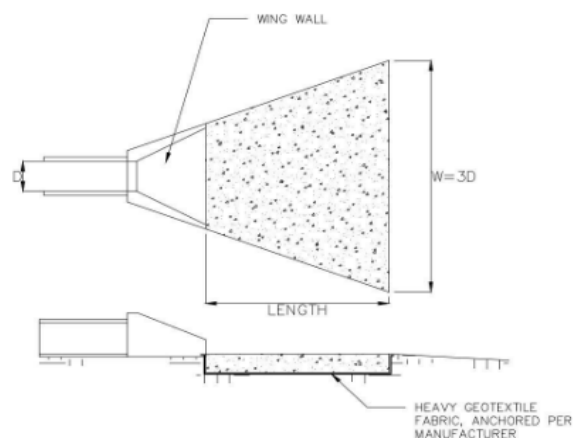
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	3.35	m	Based on Humes details
Height of Wingall (Hw)=	1.595	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	5.10
Head Width of Riprap (WH)=	3.35
Tail Width of Riprap (WT)=	3.35
Height of Riprap (H)=	1.595



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 192-0 Pond 9 Outlet

Pipe Dia. (Do):	0.30	m
Slope:	5.00	%
Flow (Q):	0.10	m ³ /s
Velocity (V):	2.60	m/s
Depth of flow in pipe(dp):	0.17	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	2.03	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.15	m
Thickness of Riprap (DA)=	$2 \times d50$	0.30	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	3.96	m
Width of Riprap (WA)=	$3 \times Do$	0.90	m
Height of Riprap (H)=	crown of pipe +300mm	0.60	m

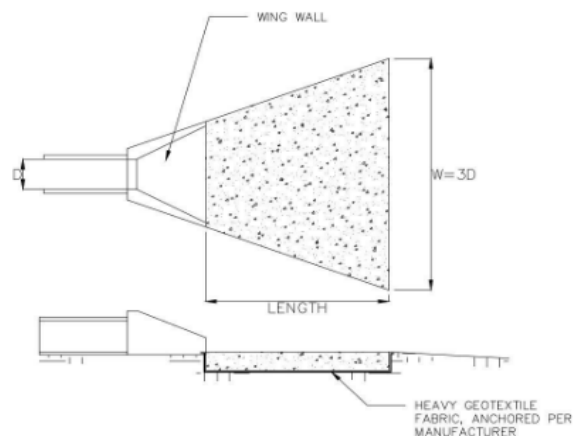
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	0.99	m	Based on Humes details
Height of Wingall (Hw)=	0.6	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	3.96
Head Width of Riprap (WH)=	0.99
Tail Width of Riprap (WT)=	0.99
Height of Riprap (H)=	0.6



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 192-0 Pond 9 Outlet

Pipe Dia. (Do):	0.30	m
Slope:	4.40	%
Flow (Q):	0.13	m ³ /s
Velocity (V):	2.70	m/s
Depth of flow in pipe(dp):	0.19	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.98	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.15	m
Thickness of Riprap (DA)=	$2 \times d50$	0.30	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	3.92	m
Width of Riprap (WA)=	$3 \times Do$	0.90	m
Height of Riprap (H)=	crown of pipe +300mm	0.60	m

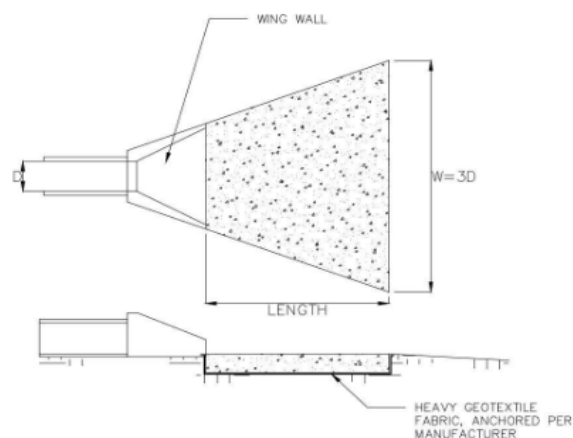
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	0.99	m	Based on Humes details
Height of Wingall (Hw)=	0.6	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.10
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	3.92
Head Width of Riprap (WH)=	0.99
Tail Width of Riprap (WT)=	0.99
Height of Riprap (H)=	0.6



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 171-0 Pond 9 Outlet

Pipe Dia. (Do):	0.38	m
Slope:	3.00	%
Flow (Q):	0.10	m ³ /s
Velocity (V):	2.30	m/s
Depth of flow in pipe(dp):	0.16	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.85	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.17	m
Thickness of Riprap (DA)=	$2 \times d50$	0.35	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	4.70	m
Width of Riprap (WA)=	$3 \times Do$	1.13	m
Height of Riprap (H)=	crown of pipe +300mm	0.68	m

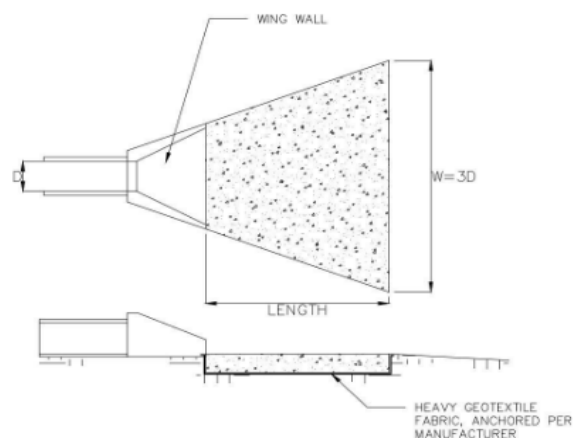
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m	Based on Humes details
Height of Wingall (Hw)=	0.91	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.20
Thickness of Riprap (DA)=	0.30
Length of Riprap (La)=	4.70
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 192-0 Pond 9 Outlet

Pipe Dia. (Do):	0.53	m
Slope:	3.00	%
Flow (Q):	0.30	m ³ /s
Velocity (V):	3.10	m/s
Depth of flow in pipe(dp):	0.25	m

GD01/ TR2013-018

Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.98	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.26	m
Thickness of Riprap (DA)=	$2 \times d50$	0.52	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{Log}Fo)$	6.85	m
Width of Riprap (WA)=	$3 \times Do$	1.58	m
Height of Riprap (H)=	crown of pipe +300mm	0.83	m

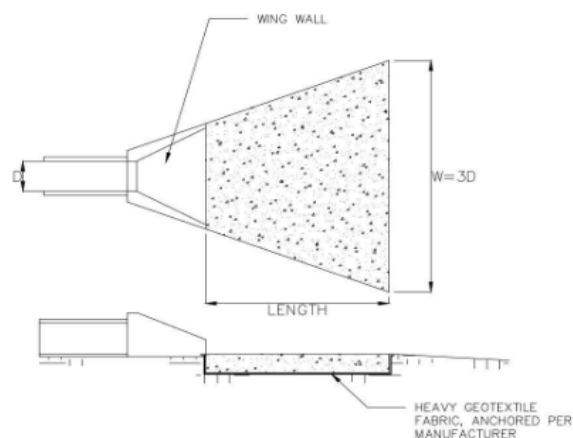
< Wingwall Width

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	2.3	m	Based on Humes details
Height of Wingall (Hw)=	0.91	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.30
Thickness of Riprap (DA)=	0.50
Length of Riprap (La)=	6.85
Head Width of Riprap (WH)=	2.3
Tail Width of Riprap (WT)=	2.3
Height of Riprap (H)=	0.91



RIP RAP SIZING CALCULATION



Project:	Beachlands South Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

LOCATION: Outlet 248-0 Pond 4

Pipe Dia. (Do):	1.60	m
Slope:	1.00	%
Flow (Q):	7.47	m ³ /s
Velocity (V):	4.10	m/s
Depth of flow in pipe(dp):	1.39	m

GD01/ TR2013-018

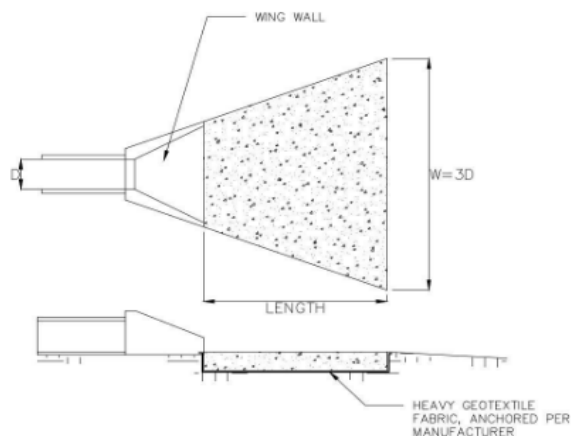
Froude number (Fo)=	$V/(g \times dp)^{0.5}$	1.11	
Riprap Diameter (d50)=	$0.25 \times Do \times Fo$	0.44	m
Thickness of Riprap (DA)=	$2 \times d50$	0.89	m
Length of Riprap (La)=	$Do \times (8 + 17 \times \text{LogFo})$	14.03	m
Width of Riprap (WA)=	$3 \times Do$	4.80	m
Height of Riprap (H)=	crown of pipe +300mm	1.90	m

WINGWALL DIMENSIONS

Tail Width of Wingwall (Ww)=	4.6	m	Based on Humes details
Height of Wingall (Hw)=	2.4	m	

RIPRAP DIMENSIONS

Riprap Diameter (d50)=	0.40
Thickness of Riprap (DA)=	0.90
Length of Riprap (La)=	14.03
Head Width of Riprap (WH)=	FALSE
Tail Width of Riprap (WT)=	4.8
Height of Riprap (H)=	2.4



Appendix 3j – Bubble up Manhole Calculations

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 130-0
Incoming pipe Dia (D)	675 mm
Slope	0.07 V/H
Q	1.09 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **1012.5** mm dia
1050 mm dia (install)

h_1/D_w 0.09 From fig 12.3 Hec14

h_1 **0.09**

$h_2 = 2(D)$ **1.35**

$h_w = h_1 + h_2$ **1.44**

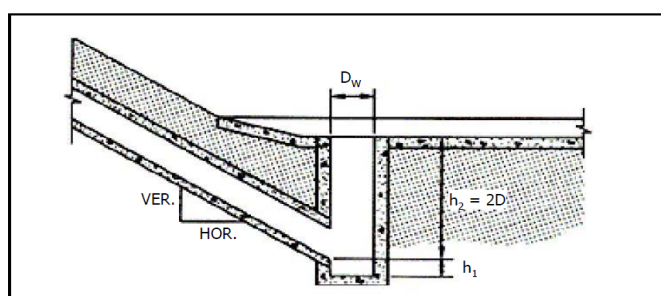


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 136-0
Incoming pipe Dia (D)	450 mm
Slope	0.0975 V/H
Q	0.59 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **675** mm dia
1050 mm dia (install)

h_1/D_w 0.11 From fig 12.3 Hec14

h_1 **0.08**

$h_2 = 2(D)$ **0.9**

$h_w = h_1 + h_2$ **0.98**

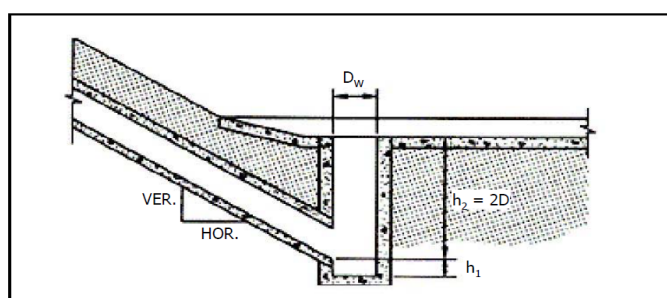


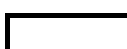
Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **5.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm



Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 138-0
Incoming pipe Dia (D)	300 mm
Slope	0.12 V/H
Q	0.12 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **450** mm dia
1050 mm dia (install)

h_1/D_w 0.14 From fig 12.3 Hec14

h_1 **0.14**

$h_2 = 2(D)$ **0.6**

$h_w = h_1 + h_2$ **0.74**

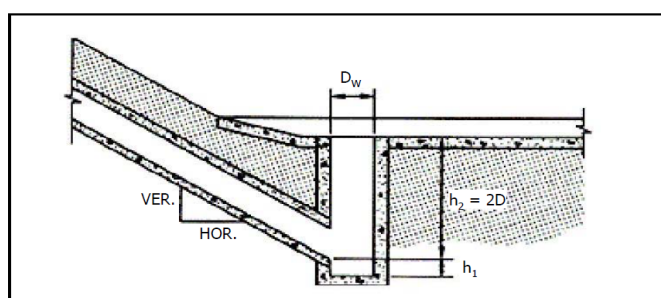


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 141-0
Incoming pipe Dia (D)	225 mm
Slope	0.15 V/H
Q	0.07 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **337.5** mm dia
1050 mm dia (install)

h_1/D_w 0.16 From fig 12.3 Hec14

h_1 **0.17**

$h_2 = 2(D)$ **0.45**

$h_w = h_1 + h_2$ **0.62**

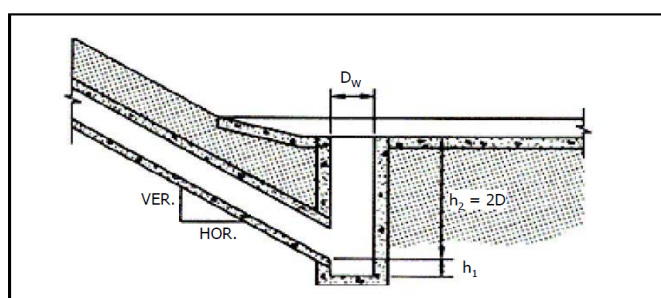


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 145-0
Incoming pipe Dia (D)	300 mm
Slope	0.18 V/H
Q	0.16 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **450** mm dia
1050 mm dia (install)

h_1/D_w 0.19 From fig 12.3 Hec14

h_1 **0.20**

$h_2 = 2(D)$ **0.6**

$h_w = h_1 + h_2$ **0.80**

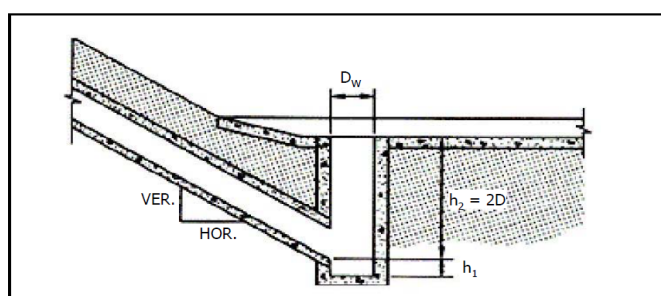


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 149-0
Incoming pipe Dia (D)	300 mm
Slope	0.25 V/H
Q	0.08 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **450** mm dia
1050 mm dia (install)

h_1/D_w 0.25 From fig 12.3 Hec14

h_1 **0.26**

$h_2 = 2(D)$ **0.6**

$h_w = h_1 + h_2$ **0.86**

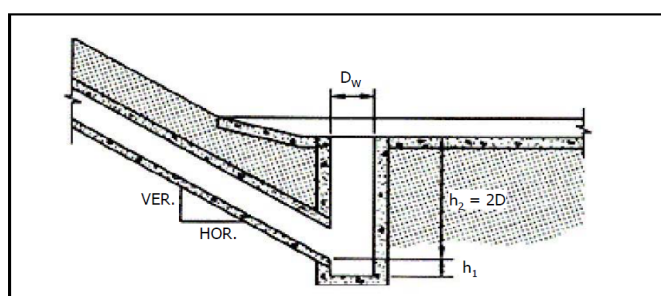


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 152-0
Incoming pipe Dia (D)	375 mm
Slope	0.121 V/H
Q	0.23 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **562.5** mm dia
1050 mm dia (install)

h_1/D_w 0.14 From fig 12.3 Hec14

h_1 **0.14**

$h_2 = 2(D)$ **0.75**

$h_w = h_1 + h_2$ **0.89**

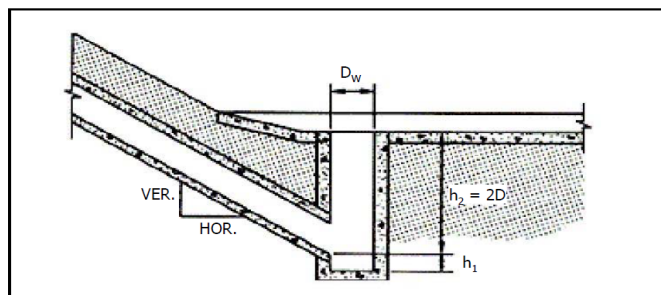


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 155-0
Incoming pipe Dia (D)	450 mm
Slope	0.145 V/H
Q	0.23 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **675** mm dia
1050 mm dia (install)

h_1/D_w 0.16 From fig 12.3 Hec14

h_1 **0.17**

$h_2 = 2(D)$ **0.9**

$h_w = h_1 + h_2$ **1.07**

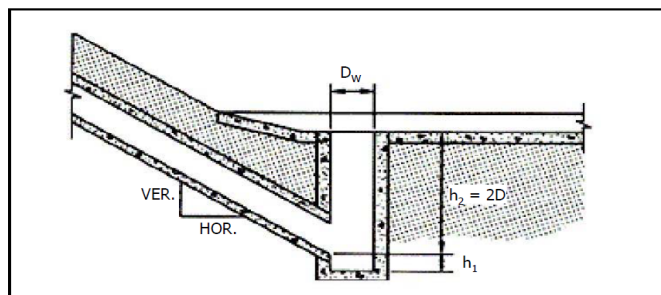


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 158-0
Incoming pipe Dia (D)	225 mm
Slope	0.01 V/H
Q	0.04 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **337.5** mm dia
1050 mm dia (install)

h_1/D_w 0.02 From fig 12.3 Hec14

h_1 **0.03**

$h_2 = 2(D)$ **0.45**

$h_w = h_1 + h_2$ **0.48**

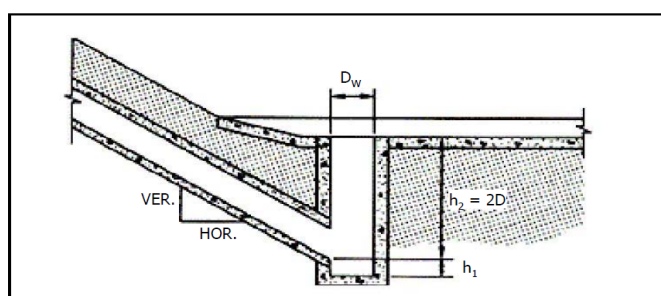


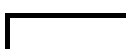
Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **100** mm



Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 168-0
Incoming pipe Dia (D)	1050 mm
Slope	0.087 V/H
Q	1.74 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **1575** mm dia
1800 mm dia (install)

h_1/D_w 0.10 From fig 12.3 Hec14

h_1 **0.19**

$h_2 = 2(D)$ **2.1**

$h_w = h_1 + h_2$ **2.29**

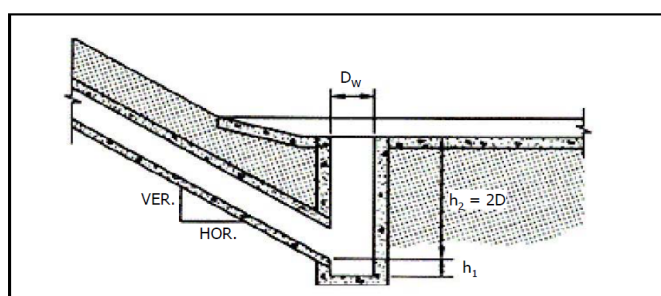


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **5.4** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **14.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **300** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 177-0
Incoming pipe Dia (D)	450 mm
Slope	0.15 V/H
Q	0.15 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **675** mm dia
1050 mm dia (install)

h_1/D_w 0.16 From fig 12.3 Hec14

h_1 **0.17**

$h_2 = 2(D)$ **0.9**

$h_w = h_1 + h_2$ **1.07**

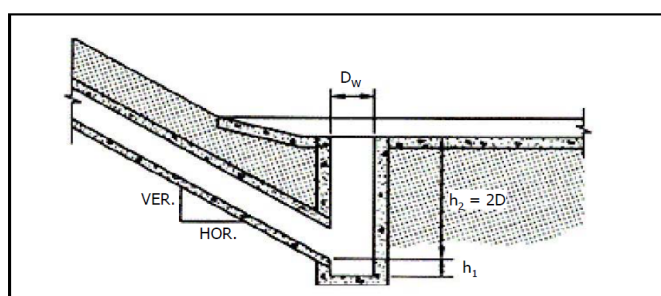


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 185-0
Incoming pipe Dia (D)	675 mm
Slope	0.15 V/H
Q	0.56 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **1012.5** mm dia
1050 mm dia (install)

h_1/D_w 0.16 From fig 12.3 Hec14

h_1 **0.17**

$h_2 = 2(D)$ **1.35**

$h_w = h_1 + h_2$ **1.52**

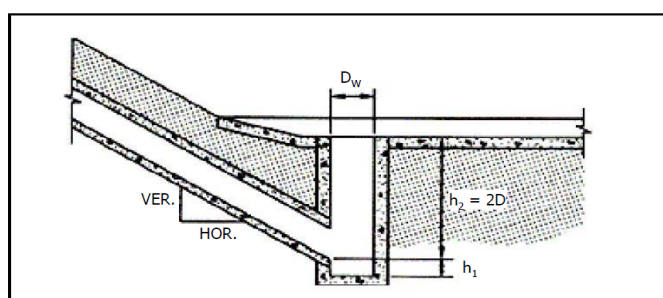


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 89-0
Incoming pipe Dia (D)	1050 mm
Slope	0.138 V/H
Q	1.4 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **1575** mm dia
1800 mm dia (install)

h_1/D_w 0.15 From fig 12.3 Hec14

h_1 **0.28**

$h_2 = 2(D)$ **2.1**

$h_w = h_1 + h_2$ **2.38**

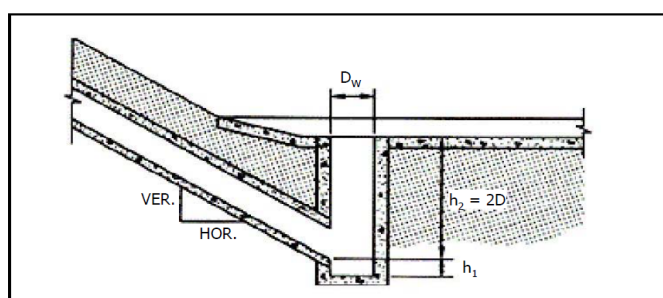


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **5.4** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **14.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **300** mm

Use 100 to 200mm riprap

Project:	Beachlands Fast Track	Date	8/06/2026
Project No:	A2515591.00	Completed by	SCT
Office / Region:	Auckland	Approved By	CJM

HEC 14, 2006 METHOD OF CALCULATING BUBBLE UP MANHOLE DIAMETER AND HEIGHT CHARACTERISTICS

Relevant Device information:

Device Name	Outlet 206-0
Incoming pipe Dia (D)	675 mm
Slope	0.115 V/H
Q	0.48 m ³ /s

MANHOLE DATA

$D_w = 1.5D$ **1012.5** mm dia
1050 mm dia (install)

h_1/D_w 0.13 From fig 12.3 Hec14

h_1 **0.14**

$h_2 = 2(D)$ **1.35**

$h_w = h_1 + h_2$ **1.49**

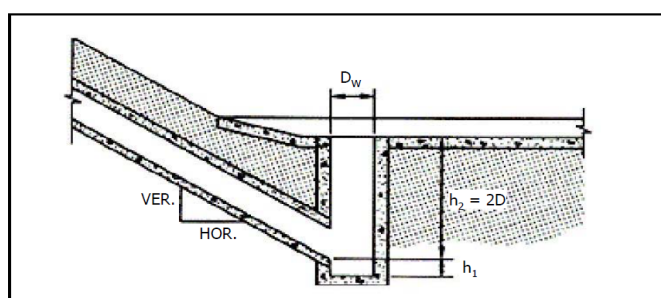


Figure 12.1. US Army Corps of Engineers' Stilling Well (USACE, 1963)

RIP RAP SIZING

Width $W_a = 3D_o$ **3.15** m

Length(L_a) $L_a = D_o(8 + (17 \log F_o))$ **8.4** m

Size $d_{50} = 0.25 \times D_o \times F_o$ **200** mm

Use 100 to 200mm riprap

Appendix 3k – Raingarden Calculations

RAIN GARDEN - CATCHMENT SUMMARY

**HARRISON
GRIERSON**

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

CATCHMENT SUMMARY

Location =	Beachlands
Sub-Catchment Name =	Raingarden 1

Input

ARI (yr)	Retention	Detention
Design Rainfall (mm)	5	17.9

Catchment Area (ha)

	POST	
Dwellings	0.0000	
Paving	0.4745	
Total	0.4745	Area excludes Raingarden

Rain Garden Construction

Layer	Material	Depth (mm)	Void Ratio
Ponding Layer		0.20	100%
Mulch		0.05	100%
Media	Bio Media	0.50	30%
Transition	Coarse Sand	0.10	30%
Drainage	Metal 40/20	0.10	35%
Storage	Metal 40/20	0.45	35%

Infiltration and Evapotranspiration rate

Infiltration Rate	2	mm/hr
Evapotranspiration rate	3	mm/day

Catchment Retention/Detention Volumes

Retention Volume	23.7	m ³ required
Detention Volume	84.9	m ³ required

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

Ponding Footprint Requirement

Catchment x SMAF 237 m²

Design Area 240 m²

Infiltration Footprint Requirement

Catchment Area x SMAF 166 m²

Design Area 170 m²

Detention Volume

$V_{(pond)} = \text{Design area} \times d_{(pond)}$	48.00
$V_{(media)} = av(\text{Pond}_{(footprint)} + \text{Infiltration}_{(footprint)}) \times d_{(media)} \times \text{Void}_{(media)}$	36.90
$V_{(drainage)} = \text{Infiltration}_{(footprint)} \times d_{(drainage)} \times \text{Void}_{(drainage)}$	5.95
$V_{(detention)} = V_{(pond)} + V_{(media)} + V_{(drainage)}$	90.85

Retention Volume

$V_{(storage)} = \text{Infiltration}_{(footprint)} \times d_{(storage)} \times \text{Void}_{(storage)}$	26.78
$V_{(infiltration)} = \text{Infiltration}_{(footprint)} \times 72 \times K_{(subsoil)}$	24.48
$V_{(Evapotranspiration)} = \text{Infiltration}_{(footprint)} \times 3 \times \text{ET}$	0.45
$V_{(Retention)} = V_{(infiltration)} + V_{(evapotranspiration)}$	24.93

CHECK

$V_{(detention)} > CA_{(detention)}$	Yes -no change
$V_{(Storage)} > CA_{(retention)}$	Yes -no change
$V_{(Storage)} \geq V_{(infiltration)}$	Yes -no change

RAIN GARDEN -CATCHMENT SUMMARY

**HARRISON
GRIERSON**

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

CATCHMENT SUMMARY

Location =	Beachlands
Sub-Catchment Name =	Raingarden 2

Input

ARI (yr)	Retention	Detention
Design Rainfall (mm)	5	17.9

Catchment Area (ha)

	POST	
Dwellings	0.0000	
Paving	0.2749	
Total	0.2749	Area excludes Raingarden

Rain Garden Construction

Layer	Material	Depth (mm)	Void Ratio
Ponding Layer		0.20	100%
Mulch		0.05	100%
Media	Bio Media	0.50	30%
Transition	Coarse Sand	0.10	30%
Drainage	Metal 40/20	0.10	35%
Storage	Metal 40/20	0.45	35%

Infiltration and Evapotranspiration rate

Infiltration Rate	2	mm/hr
Evapotranspiration rate	3	mm/day

Catchment Retention/Detention Volumes

Retention Volume	13.7	m ³ required
Detention Volume	49.2	m ³ required

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

Ponding Footprint Requirement

Catchment x SMAF 137 m²

Design Area 140 m²

Infiltration Footprint Requirement

Catchment Area x SMAF 96 m²

Design Area 100 m²

Detention Volume

$V_{(pond)} = \text{Design area} \times d_{(pond)}$	28.00
$V_{(media)} = av(\text{Pond}_{(footprint)} + \text{Infiltration}_{(footprint)}) \times d_{(media)} \times \text{Void}_{(media)}$	21.60
$V_{(drainage)} = \text{Infiltration}_{(footprint)} \times d_{(drainage)} \times \text{Void}_{(drainage)}$	3.50
$V_{(detention)} = V_{(pond)} + V_{(media)} + V_{(drainage)}$	53.10

Retention Volume

$V_{(storage)} = \text{Infiltration}_{(footprint)} \times d_{(storage)} \times \text{Void}_{(storage)}$	15.75
$V_{(infiltration)} = \text{Infiltration}_{(footprint)} \times 72 \times K_{(subsoil)}$	14.40
$V_{(Evapotranspiration)} = \text{Infiltration}_{(footprint)} \times 3 \times \text{ET}$	0.45
$V_{(Retention)} = V_{(infiltration)} + V_{(evapotranspiration)}$	14.85

CHECK

$V_{(detention)} > CA_{(detention)}$	Yes -no change
$V_{(Storage)} > CA_{(retention)}$	Yes -no change
$V_{(Storage)} \geq V_{(infiltration)}$	Yes -no change

RAIN GARDEN - CATCHMENT SUMMARY

**HARRISON
GRIERSON**

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

CATCHMENT SUMMARY

Location =	Beachlands
Sub-Catchment Name =	Raingarden 3

Input

ARI (yr)	Retention	Detention
Design Rainfall (mm)	5	17.9

Catchment Area (ha)

	POST	
Dwellings	0.7578	
Paving	0.5645	
Total	1.3223	Area excludes Raingarden

Rain Garden Construction

Layer	Material	Depth (mm)	Void Ratio
Ponding Layer		0.20	100%
Mulch		0.05	100%
Media	Bio Media	0.50	30%
Transition	Coarse Sand	0.10	30%
Drainage	Metal 40/20	0.10	35%
Storage	Metal 40/20	0.45	35%

Infiltration and Evapotranspiration rate

Infiltration Rate	2	mm/hr
Evapotranspiration rate	3	mm/day

Catchment Retention/Detention Volumes

Retention Volume	66.1	m ³ required
Detention Volume	236.7	m ³ required

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

Ponding Footprint Requirement

Catchment x SMAF 661 m²

Design Area 665 m²

Infiltration Footprint Requirement

Catchment Area x SMAF 463 m²

Design Area 465 m²

Detention Volume

$V_{(pond)} = \text{Design area} \times d_{(pond)}$	133.00
$V_{(media)} = av(\text{Pond}_{(footprint)} + \text{Infiltration}_{(footprint)}) \times d_{(media)} \times \text{Void}_{(media)}$	101.70
$V_{(drainage)} = \text{Infiltration}_{(footprint)} \times d_{(drainage)} \times \text{Void}_{(drainage)}$	16.28
$V_{(detention)} = V_{(pond)} + V_{(media)} + V_{(drainage)}$	250.98

Retention Volume

$V_{(storage)} = \text{Infiltration}_{(footprint)} \times d_{(storage)} \times \text{Void}_{(storage)}$	73.24
$V_{(infiltration)} = \text{Infiltration}_{(footprint)} \times 72 \times K_{(subsoil)}$	66.96
$V_{(Evapotranspiration)} = \text{Infiltration}_{(footprint)} \times 3 \times ET$	0.45
$V_{(Retention)} = V_{(infiltration)} + V_{(evapotranspiration)}$	67.41

CHECK

$V_{(detention)} > CA_{(detention)}$	Yes -no change
$V_{(Storage)} > CA_{(retention)}$	Yes -no change
$V_{(Storage)} \geq V_{(infiltration)}$	Yes -no change

RAIN GARDEN - CATCHMENT SUMMARY

**HARRISON
GRIERSON**

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

CATCHMENT SUMMARY

Location =	Beachlands
Sub-Catchment Name =	Raingarden 4

Input

ARI (yr)	Retention	Detention
Design Rainfall (mm)	5	17.9

Catchment Area (ha)

	POST	
Dwellings	0.0000	
Paving	0.8496	
Total	0.8496	Area excludes Raingarden

Rain Garden Construction

Layer	Material	Depth (mm)	Void Ratio
Ponding Layer		0.20	100%
Mulch		0.05	100%
Media	Bio Media	0.50	30%
Transition	Coarse Sand	0.10	30%
Drainage	Metal 40/20	0.10	35%
Storage	Metal 40/20	0.45	35%

Infiltration and Evapotranspiration rate

Infiltration Rate	2	mm/hr
Evapotranspiration rate	3	mm/day

Catchment Retention/Detention Volumes

Retention Volume	42.5	m ³ required
Detention Volume	152.1	m ³ required

Project:	Beachlands	Date	8/06/2026
Project No:	A2515591.00	Completed by	JEP
Office / Region:	Auckland	Approved By	CJM

Ponding Footprint Requirement

Catchment x SMAF 425 m²

Design Area 425 m²

Infiltration Footprint Requirement

Catchment Area x SMAF 297 m²

Design Area 300 m²

Detention Volume

$V_{(pond)} = \text{Design area} \times d_{(pond)}$	85.00
$V_{(media)} = av(\text{Pond}_{(footprint)} + \text{Infiltration}_{(footprint)}) \times d_{(media)} \times \text{Void}_{(media)}$	65.25
$V_{(drainage)} = \text{Infiltration}_{(footprint)} \times d_{(drainage)} \times \text{Void}_{(drainage)}$	10.50
$V_{(detention)} = V_{(pond)} + V_{(media)} + V_{(drainage)}$	160.75

Retention Volume

$V_{(storage)} = \text{Infiltration}_{(footprint)} \times d_{(storage)} \times \text{Void}_{(storage)}$	47.25
$V_{(infiltration)} = \text{Infiltration}_{(footprint)} \times 72 \times K_{(subsoil)}$	43.20
$V_{(Evapotranspiration)} = \text{Infiltration}_{(footprint)} \times 3 \times ET$	0.45
$V_{(Retention)} = V_{(infiltration)} + V_{(evapotranspiration)}$	43.65

CHECK

$V_{(detention)} > CA_{(detention)}$	Yes -no change
$V_{(Storage)} > CA_{(retention)}$	Yes -no change
$V_{(Storage)} \geq V_{(Infiltration)}$	Yes -no change