CAMERON+ROSS
CONSULTING CIVIL & STRUCTURAL ENGINEERS

A/15873

MAINS OF PORTLETHEN
PORTLETHEN
ABERDEENSHIRE

DRAINAGE IMPACT ASSESSMENT

AUGUST 2016

MRT Architects

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CONSULTING ENGINEERS
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APPENDICES

REVISION SCHEDULE

Rev No.	Description of Amendment	Prepared By	Approved By	Date
-	Original Issue	K. Fraser	K. Fraser	10/11/16

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DRAINAGE IMPACT ASSESSMENT

1. INTRODUCTION

Cameron + Ross were appointed by MRT Architects to prepare a Drainage Impact Assessment to consider appropriate drainage proposals in accordance with the following documents.

- Drainage Assessment – A guide for Scotland, produced by SEPA on behalf of the Sustainable Urban Drainage Scottish Working Party (SUDSWP), May 2005.
- Planning Advice Note (PAN) 61: Planning and Sustainable Urban Drainage Systems, issued by the Scottish Executive Development Department, July 2001.
- The SUDS Manual – (CIRIA C753)
- Sewers for Scotland, Third Edition, November 2007, published by WRc plc.
- The Water Environment (Controlled Activities) (Scotland) Regulations.

This report will establish the suitability of the site for development and identify the drainage principles in recognition of the aforementioned documents to satisfy source control, conveyance measures, attenuation, treatment and enhanced amenity.

2. LOCATION

The site is located within and extensive group of farm buildings surrounded by agricultural fields. The site can be found approximately 750m east of Portlethen and 500m north of 'old' Portlethen Village.

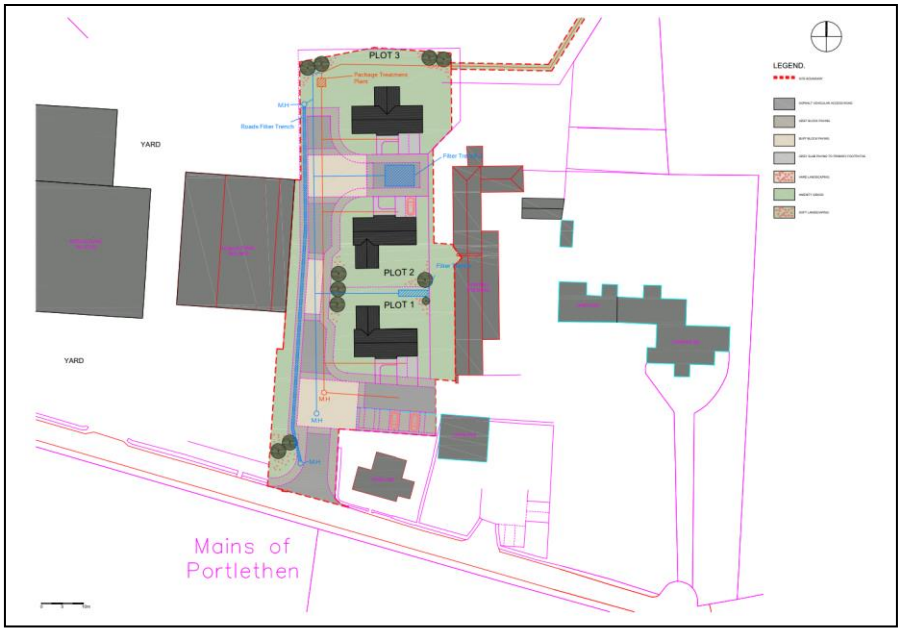
Location Plan

3. DESCRIPTION

The proposed development is to build three new houses within the central area of the existing farmyard properties.

The surface water will be attenuated and treated prior to discharge to the watercourse located 200m north of the site.

The foul water from the development will be treated within a package treatment plant, passed through a partial soakaway and discharge to the watercourse 200m north of the site.



4. SITE INVESTIGATION

Site investigation carried out locally suggests that the underlying ground is unsuitable for infiltration surface water disposal techniques. Site investigation will be carried out prior to detailed planning application following site clearance to allow access.

5. SEPA

Internet searches and examination of the SEPA flood inundation mapping do not identify any known flooding issue within the site.

6. EXISTING DRAINAGE

There are no existing public drainage networks in the area. A burn is located 200m to the north of the site. No records exist of historic field drainage and the existing buildings have an informal surface water drainage disposal arrangement.

7. PROPOSED DRAINAGE

Surface Water -

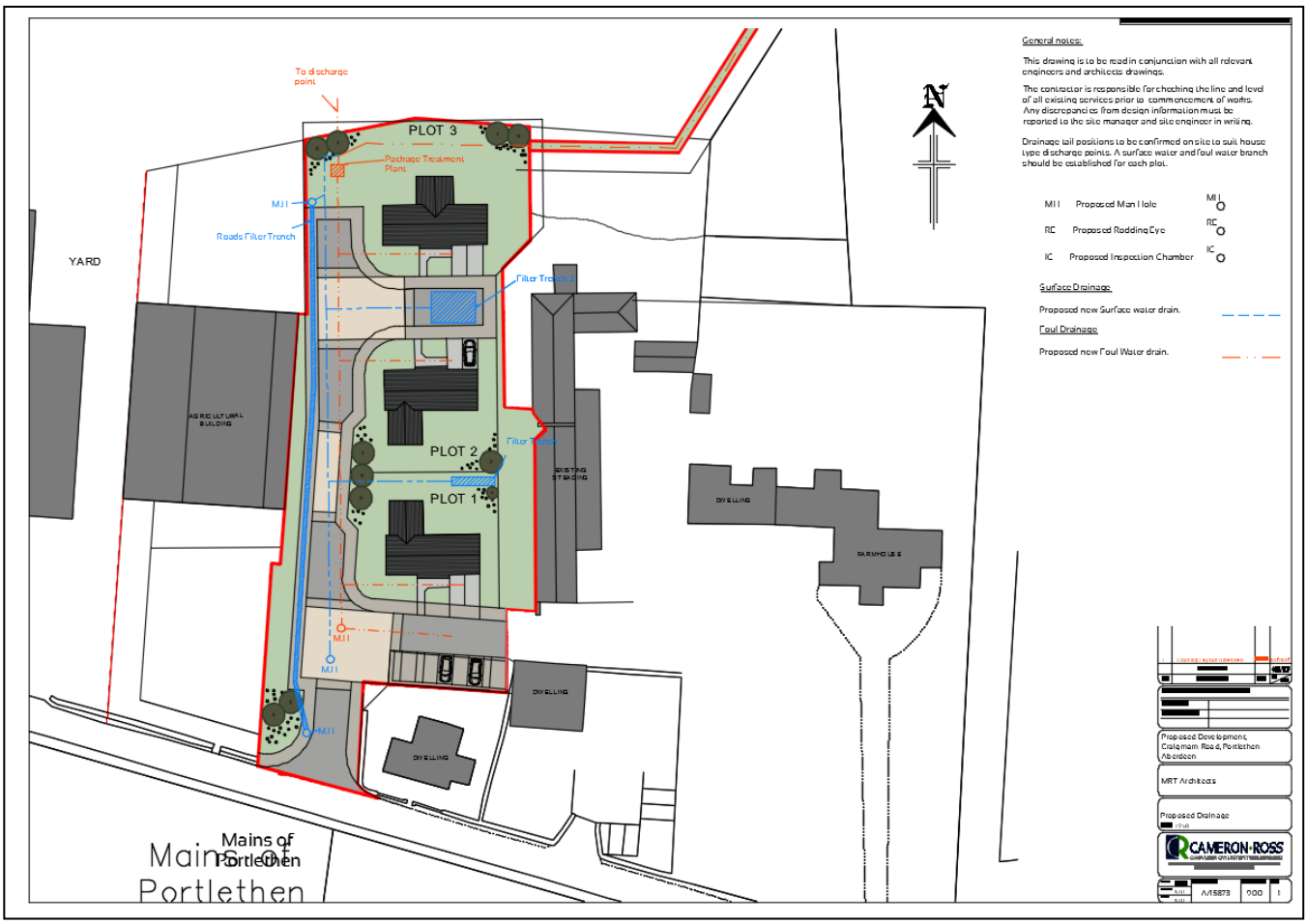
This being a small group of 3 house plots within a rural area we have provided one level of treatment to the surface water run off from the development. The roof and property driveway run off water will be treated an attenuated by filter trenches. Plot 1 will be served by a trench 7m long, 1.5m wide and 1m deep with a 19mm diameter orifice restricting the discharge to 0.8 l/s. Plots 2 and 3 will be served by a shared surface water soakaway 7m long, 5m wide and 1m deep with the flows restricted to 1.6 l/s using a 27mm diameter orifice.

The run off from the mutual access road will run to a roadside filter trench where it will be treated and attenuated prior to discharge to the carrier pipe which will convey water to the existing watercourse. The filter drain will run the whole length of the road and will be a minimum of 0.6m wide and 1m deep. The discharge rate from the road filter trench will be restricted to 2 l/s using a 30mm diameter orifice.

Foul Drainage -

The foul drainage from this development will be collected within a private drainage system treated using a package treatment plant prior to discharge to a partial soakaway. In accordance with SEPA guidance contained within WAT-RM-04 this soakaway will be 75m long, 0.9m wide and 0.6m deep.

Ownership - All drainage, both foul and surface water including the treatment plant and soakaways will remain private.



7. CONSTRUCTION STAGE DRAINAGE

It is anticipated that the contractor will agree construction stage SUDs with SEPA and the planning authority prior to the start of works.

8. SUMMARY

Surface Water Drainage

A single level of treatment is provided to treat the surface water discharge from this development. The houses will be treated within filter trenches with a controlled discharge located within the boundary of each property. The roads water will be treated in a separate filter trench located adjacent to the road. The flows will be restricted to 0.8 l/s from each house and 2 l/s from the road. The attenuated flows will be conveyed within a pipe to discharge to the watercourse 200m north of the site.

Foul Drainage

Foul effluent treatment will be provided using a package treatment plant with the treated effluent disposed by infiltration trench 5m x 5m x 0.6m deep

Ownership

All drainage, both foul and surface water including the treatment plant and soakaways will remain private.

END OF REPORT

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APPENDIX A

Calculations

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APPENDIX B

Drainage Layout

Summary of Results for 50 year Return Period

Half Drain Time : 46 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.143	0.643	0.0	0.6	0.6	2.0	O K
30 min Summer	99.341	0.841	0.0	0.7	0.7	2.6	O K
60 min Summer	99.473	0.973	0.0	0.7	0.7	3.0	O K
120 min Summer	99.530	1.030	0.0	0.8	0.8	3.2	O K
180 min Summer	99.517	1.017	0.0	0.8	0.8	3.1	O K
240 min Summer	99.483	0.983	0.0	0.7	0.7	3.0	O K
360 min Summer	99.403	0.903	0.0	0.7	0.7	2.8	O K
480 min Summer	99.324	0.824	0.0	0.7	0.7	2.5	O K
600 min Summer	99.254	0.754	0.0	0.7	0.7	2.3	O K
720 min Summer	99.192	0.692	0.0	0.6	0.6	2.1	O K
960 min Summer	99.089	0.589	0.0	0.6	0.6	1.8	O K
1440 min Summer	98.943	0.443	0.0	0.5	0.5	1.3	O K
2160 min Summer	98.814	0.314	0.0	0.4	0.4	0.9	O K
2880 min Summer	98.736	0.236	0.0	0.4	0.4	0.7	O K
4320 min Summer	98.654	0.154	0.0	0.3	0.3	0.4	O K
5760 min Summer	98.610	0.110	0.0	0.2	0.2	0.3	O K
7200 min Summer	98.585	0.085	0.0	0.2	0.2	0.2	O K
8640 min Summer	98.568	0.068	0.0	0.2	0.2	0.1	O K
10080 min Summer	98.557	0.057	0.0	0.2	0.2	0.1	O K
15 min Winter	99.225	0.725	0.0	0.6	0.6	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	54.669	0.0	2.5	22
30 min Summer	38.415	0.0	3.5	32
60 min Summer	25.629	0.0	4.6	52
120 min Summer	16.554	0.0	6.0	86
180 min Summer	12.719	0.0	6.9	120
240 min Summer	10.526	0.0	7.6	154
360 min Summer	8.040	0.0	8.7	218
480 min Summer	6.633	0.0	9.6	282
600 min Summer	5.710	0.0	10.3	346
720 min Summer	5.050	0.0	10.9	406
960 min Summer	4.160	0.0	12.0	528
1440 min Summer	3.164	0.0	13.7	770
2160 min Summer	2.405	0.0	15.6	1128
2880 min Summer	1.978	0.0	17.1	1480
4320 min Summer	1.499	0.0	19.4	2208
5760 min Summer	1.231	0.0	21.3	2936
7200 min Summer	1.056	0.0	22.8	3672
8640 min Summer	0.932	0.0	24.2	4400
10080 min Summer	0.839	0.0	25.4	5088
15 min Winter	54.669	0.0	2.8	22

Summary of Results for 50 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.453	0.953	0.0	0.7	0.7	2.9	O K
60 min Winter	99.603	1.103	0.0	0.8	0.8	3.4	O K
120 min Winter	99.645	1.145	0.0	0.8	0.8	3.5	O K
180 min Winter	99.601	1.101	0.0	0.8	0.8	3.4	O K
240 min Winter	99.536	1.036	0.0	0.8	0.8	3.2	O K
360 min Winter	99.401	0.901	0.0	0.7	0.7	2.8	O K
480 min Winter	99.283	0.783	0.0	0.7	0.7	2.4	O K
600 min Winter	99.184	0.684	0.0	0.6	0.6	2.1	O K
720 min Winter	99.101	0.601	0.0	0.6	0.6	1.8	O K
960 min Winter	98.975	0.475	0.0	0.5	0.5	1.4	O K
1440 min Winter	98.819	0.319	0.0	0.4	0.4	0.9	O K
2160 min Winter	98.703	0.203	0.0	0.3	0.3	0.6	O K
2880 min Winter	98.644	0.144	0.0	0.3	0.3	0.4	O K
4320 min Winter	98.588	0.088	0.0	0.2	0.2	0.2	O K
5760 min Winter	98.563	0.063	0.0	0.2	0.2	0.1	O K
7200 min Winter	98.549	0.049	0.0	0.2	0.2	0.1	O K
8640 min Winter	98.540	0.040	0.0	0.1	0.1	0.1	O K
10080 min Winter	98.535	0.035	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	38.415	0.0	3.9	33
60 min Winter	25.629	0.0	5.2	54
120 min Winter	16.554	0.0	6.7	92
180 min Winter	12.719	0.0	7.7	128
240 min Winter	10.526	0.0	8.5	164
360 min Winter	8.040	0.0	9.7	232
480 min Winter	6.633	0.0	10.7	296
600 min Winter	5.710	0.0	11.5	360
720 min Winter	5.050	0.0	12.2	422
960 min Winter	4.160	0.0	13.4	542
1440 min Winter	3.164	0.0	15.3	782
2160 min Winter	2.405	0.0	17.5	1132
2880 min Winter	1.978	0.0	19.1	1484
4320 min Winter	1.499	0.0	21.8	2208
5760 min Winter	1.231	0.0	23.8	2936
7200 min Winter	1.056	0.0	25.6	3664
8640 min Winter	0.932	0.0	27.1	4344
10080 min Winter	0.839	0.0	28.4	5064

Model Details

Storage is Online Cover Level (m) 100.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	7.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	98.500	Cap Infiltration Depth (m)	0.000

Orifice Outflow Control

Diameter (m) 0.019 Discharge Coefficient 0.600 Invert Level (m) 98.500

Summary of Results for 50 year Return Period

Half Drain Time : 57 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.023	0.523	0.0	1.1	1.1	4.2	O K
30 min Summer	99.187	0.687	0.0	1.2	1.2	5.6	O K
60 min Summer	99.303	0.803	0.0	1.4	1.4	6.5	O K
120 min Summer	99.363	0.863	0.0	1.4	1.4	7.1	O K
180 min Summer	99.364	0.864	0.0	1.4	1.4	7.1	O K
240 min Summer	99.346	0.846	0.0	1.4	1.4	6.9	O K
360 min Summer	99.291	0.791	0.0	1.3	1.3	6.5	O K
480 min Summer	99.234	0.734	0.0	1.3	1.3	6.0	O K
600 min Summer	99.181	0.681	0.0	1.2	1.2	5.5	O K
720 min Summer	99.132	0.632	0.0	1.2	1.2	5.1	O K
960 min Summer	99.050	0.550	0.0	1.1	1.1	4.4	O K
1440 min Summer	98.928	0.428	0.0	1.0	1.0	3.4	O K
2160 min Summer	98.812	0.312	0.0	0.8	0.8	2.4	O K
2880 min Summer	98.741	0.241	0.0	0.7	0.7	1.8	O K
4320 min Summer	98.661	0.161	0.0	0.6	0.6	1.2	O K
5760 min Summer	98.619	0.119	0.0	0.5	0.5	0.8	O K
7200 min Summer	98.593	0.093	0.0	0.4	0.4	0.6	O K
8640 min Summer	98.576	0.076	0.0	0.4	0.4	0.4	O K
10080 min Summer	98.564	0.064	0.0	0.3	0.3	0.3	O K
15 min Winter	99.088	0.588	0.0	1.2	1.2	4.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	54.669	0.0	5.1	22
30 min Summer	38.415	0.0	7.2	33
60 min Summer	25.629	0.0	9.6	52
120 min Summer	16.554	0.0	12.4	88
180 min Summer	12.719	0.0	14.3	122
240 min Summer	10.526	0.0	15.8	156
360 min Summer	8.040	0.0	18.1	222
480 min Summer	6.633	0.0	19.9	288
600 min Summer	5.710	0.0	21.4	350
720 min Summer	5.050	0.0	22.7	414
960 min Summer	4.160	0.0	25.0	536
1440 min Summer	3.164	0.0	28.5	778
2160 min Summer	2.405	0.0	32.5	1132
2880 min Summer	1.978	0.0	35.6	1500
4320 min Summer	1.499	0.0	40.5	2208
5760 min Summer	1.231	0.0	44.3	2936
7200 min Summer	1.056	0.0	47.5	3672
8640 min Summer	0.932	0.0	50.3	4400
10080 min Summer	0.839	0.0	52.8	5128
15 min Winter	54.669	0.0	5.7	22

Summary of Results for 50 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.277	0.777	0.0	1.3	1.3	6.3	O K
60 min Winter	99.412	0.912	0.0	1.4	1.4	7.5	O K
120 min Winter	99.467	0.967	0.0	1.5	1.5	7.9	O K
180 min Winter	99.448	0.948	0.0	1.5	1.5	7.8	O K
240 min Winter	99.407	0.907	0.0	1.4	1.4	7.4	O K
360 min Winter	99.311	0.811	0.0	1.4	1.4	6.6	O K
480 min Winter	99.221	0.721	0.0	1.3	1.3	5.9	O K
600 min Winter	99.142	0.642	0.0	1.2	1.2	5.2	O K
720 min Winter	99.074	0.574	0.0	1.1	1.1	4.6	O K
960 min Winter	98.966	0.466	0.0	1.0	1.0	3.7	O K
1440 min Winter	98.826	0.326	0.0	0.9	0.9	2.5	O K
2160 min Winter	98.714	0.214	0.0	0.7	0.7	1.6	O K
2880 min Winter	98.655	0.155	0.0	0.6	0.6	1.1	O K
4320 min Winter	98.597	0.097	0.0	0.4	0.4	0.6	O K
5760 min Winter	98.570	0.070	0.0	0.4	0.4	0.4	O K
7200 min Winter	98.556	0.056	0.0	0.3	0.3	0.3	O K
8640 min Winter	98.546	0.046	0.0	0.3	0.3	0.2	O K
10080 min Winter	98.540	0.040	0.0	0.2	0.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	38.415	0.0	8.1	34
60 min Winter	25.629	0.0	10.8	56
120 min Winter	16.554	0.0	13.9	94
180 min Winter	12.719	0.0	16.0	130
240 min Winter	10.526	0.0	17.7	166
360 min Winter	8.040	0.0	20.3	236
480 min Winter	6.633	0.0	22.3	302
600 min Winter	5.710	0.0	24.0	368
720 min Winter	5.050	0.0	25.5	430
960 min Winter	4.160	0.0	28.0	554
1440 min Winter	3.164	0.0	31.9	794
2160 min Winter	2.405	0.0	36.4	1148
2880 min Winter	1.978	0.0	39.9	1500
4320 min Winter	1.499	0.0	45.3	2208
5760 min Winter	1.231	0.0	49.6	2936
7200 min Winter	1.056	0.0	53.2	3672
8640 min Winter	0.932	0.0	56.4	4376
10080 min Winter	0.839	0.0	59.2	5080

Model Details

Storage is Online Cover Level (m) 100.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	4.0
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	7.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	98.500	Cap Infiltration Depth (m)	0.000

Orifice Outflow Control

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 98.500

Summary of Results for 50 year Return Period

Half Drain Time : 66 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.215	0.715	0.0	1.6	1.6	6.7	O K
30 min Summer	99.358	0.858	0.0	1.7	1.7	9.0	O K
60 min Summer	99.461	0.961	0.0	1.8	1.8	10.7	O K
120 min Summer	99.512	1.012	0.0	1.9	1.9	11.5	O K
180 min Summer	99.515	1.015	0.0	1.9	1.9	11.6	O K
240 min Summer	99.502	1.002	0.0	1.9	1.9	11.4	O K
360 min Summer	99.462	0.962	0.0	1.8	1.8	10.7	O K
480 min Summer	99.417	0.917	0.0	1.8	1.8	10.0	O K
600 min Summer	99.371	0.871	0.0	1.7	1.7	9.2	O K
720 min Summer	99.327	0.827	0.0	1.7	1.7	8.5	O K
960 min Summer	99.248	0.748	0.0	1.6	1.6	7.3	O K
1440 min Summer	99.124	0.624	0.0	1.5	1.5	5.3	O K
2160 min Summer	98.994	0.494	0.0	1.3	1.3	3.3	O K
2880 min Summer	98.899	0.399	0.0	1.2	1.2	2.2	O K
4320 min Summer	98.776	0.276	0.0	1.0	1.0	1.0	O K
5760 min Summer	98.701	0.201	0.0	0.8	0.8	0.5	O K
7200 min Summer	98.653	0.153	0.0	0.7	0.7	0.3	O K
8640 min Summer	98.623	0.123	0.0	0.6	0.6	0.2	O K
10080 min Summer	98.602	0.102	0.0	0.6	0.6	0.1	O K
15 min Winter	99.273	0.773	0.0	1.6	1.6	7.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	54.669	0.0	8.3	22
30 min Summer	38.415	0.0	11.7	34
60 min Summer	25.629	0.0	15.6	56
120 min Summer	16.554	0.0	20.1	90
180 min Summer	12.719	0.0	23.2	126
240 min Summer	10.526	0.0	25.6	160
360 min Summer	8.040	0.0	29.3	228
480 min Summer	6.633	0.0	32.2	294
600 min Summer	5.710	0.0	34.7	360
720 min Summer	5.050	0.0	36.8	424
960 min Summer	4.160	0.0	40.4	548
1440 min Summer	3.164	0.0	46.1	790
2160 min Summer	2.405	0.0	52.6	1148
2880 min Summer	1.978	0.0	57.7	1500
4320 min Summer	1.499	0.0	65.6	2208
5760 min Summer	1.231	0.0	71.8	2936
7200 min Summer	1.056	0.0	77.0	3672
8640 min Summer	0.932	0.0	81.5	4320
10080 min Summer	0.839	0.0	85.6	5072
15 min Winter	54.669	0.0	9.3	23

Summary of Results for 50 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.437	0.937	0.0	1.8	1.8	10.3	O K
60 min Winter	99.563	1.063	0.0	1.9	1.9	12.4	O K
120 min Winter	99.617	1.117	0.0	2.0	2.0	13.2	O K
180 min Winter	99.609	1.109	0.0	2.0	2.0	13.1	O K
240 min Winter	99.580	1.080	0.0	1.9	1.9	12.6	O K
360 min Winter	99.504	1.004	0.0	1.9	1.9	11.4	O K
480 min Winter	99.427	0.927	0.0	1.8	1.8	10.2	O K
600 min Winter	99.355	0.855	0.0	1.7	1.7	9.0	O K
720 min Winter	99.289	0.789	0.0	1.7	1.7	7.9	O K
960 min Winter	99.177	0.677	0.0	1.5	1.5	6.1	O K
1440 min Winter	99.017	0.517	0.0	1.3	1.3	3.6	O K
2160 min Winter	98.857	0.357	0.0	1.1	1.1	1.7	O K
2880 min Winter	98.760	0.260	0.0	0.9	0.9	0.9	O K
4320 min Winter	98.660	0.160	0.0	0.7	0.7	0.3	O K
5760 min Winter	98.613	0.113	0.0	0.6	0.6	0.2	O K
7200 min Winter	98.587	0.087	0.0	0.5	0.5	0.1	O K
8640 min Winter	98.571	0.071	0.0	0.4	0.4	0.1	O K
10080 min Winter	98.561	0.061	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	38.415	0.0	13.1	35
60 min Winter	25.629	0.0	17.4	60
120 min Winter	16.554	0.0	22.5	96
180 min Winter	12.719	0.0	26.0	134
240 min Winter	10.526	0.0	28.6	172
360 min Winter	8.040	0.0	32.8	244
480 min Winter	6.633	0.0	36.1	314
600 min Winter	5.710	0.0	38.9	380
720 min Winter	5.050	0.0	41.2	446
960 min Winter	4.160	0.0	45.3	570
1440 min Winter	3.164	0.0	51.7	808
2160 min Winter	2.405	0.0	58.9	1152
2880 min Winter	1.978	0.0	64.6	1500
4320 min Winter	1.499	0.0	73.5	2204
5760 min Winter	1.231	0.0	80.4	2936
7200 min Winter	1.056	0.0	86.3	3672
8640 min Winter	0.932	0.0	91.3	4400
10080 min Winter	0.839	0.0	95.9	5088

Model Details

Storage is Online Cover Level (m) 100.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	90.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	98.500	Cap Infiltration Depth (m)	0.000

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 98.500