Thor Design & Management

Architectural/Structural & Civil Engineering and Surveying Consultancy

Tel: 057 91 21688
Fax: 057 91 21692
Mob: 086 872 7752
Ballindarra,
Birr, Co. Offaly.
info@thordesign.ie

To: South Dublin County Council, Date: 30-08-2022

Planning Reference No. SD22A/0045

Project: Proposed Housing Development @ Drumlonagher, Main St. Newcastle, Co. Dublin

Re: Response to Further Information

Dear Sir/Madam,

With reference to the above, please find attached revised surface water calculations which correspond with the revised site layout plan.

- The proposed storm water drainage system was re-assessed with a view to introducing additional SUDS measures. Owing to the topographical layout, the site is not suitable for swales or ponds. We carried out on-site percolation tests in accordance with BRE 365 in 2019 to determine if the existing soil infiltration rates could support this SUDS measure, but unfortunately as outlined in the following report, the site is not suitable for any drainage on site due to the high water table level, and infiltration rates.
  However, as recommended, the water table levels were determined following a 24 hour period after excavating the trial pits, and were found to be as follows:

Trial Pit T1

Ground Level = 92.63

Water table level = 90.58

Trial Pit T2

Ground Level = 93.77

Water table level = 91.57

Trial Pit T3

Ground Level = 93.66

Water table level = 91.86

Owing to the higher than expected water table levels, coupled the adjusted winter water table levels, it was initially proposed to employ a combined attenuation and infiltration system, which would allow for some drainage to ground, while attenuating to the public drainage system, it was found to be unsuitable.

Proposed Discharge Rates

- Having spoken to Mr. Brain Harkin Engineer (South Dublin Co. Council) in relation to the discharge rates. I wish to propose an overall surface water discharge rate of 4l/s for the following two reasons.

(Point 1) Owing to confines of the site, the area required to accommodate an additional attenuation tanks (Tank 1) which would maintain a 2l/s outflow for the entire site would need to be 191 cubic metres which would require a ground area of approximately 13m x 32m, which would impractical for the additional site extension. If an overall site discharge of 4l/s was allowable, the additional storage volume requirement would be reduced to 108 cubic metres which is

more practical constructible sized attenuation tank. (see attached site layout plan). In addition, the attenuation volume calculations have been designed to account for **20% additional rainfall** due to future climate change in accordance with NRA HD 33/15 Design of Earthworks.

- **(Point 2)** The overall site area for the entire development is 2.27 acres (0.72Ha)
  The natural greenfield runoff is taken as follows:
  Total Green Feld Land Area = **2.27Acres**

  Taking a greenfield runoff flow rate of 10 ft³/min/acre to normal land drainage rates
  Quality of surface water from these lands = 10 ft³/min/acre = 283 litres/min/acre
  Total quantity of surface water from these lands = 4.719l/s/acre x 2.27acres = **10.71L/s**
  On this basis, where 4l/s may be allowed, the proposed reduced discharge over natural runoff rates would be **reduced by 62%**

If you require any further information, please do not hesitate to contact me.

Signed .....

Hugh O'Rourke. CEng. BEng. M.I.E.I

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 299902, Northing: 228811,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.6,	4.3,	5.2,	5.9,	6.5,	8.2,	10.3,	11.7,	13.7,	15.5,	17.0,	19.2,	20.9,	22.4,	N/A ,
10 mins	3.4,	5.0,	5.9,	7.3,	8.3,	9.0,	11.5,	14.4,	16.3,	19.1,	21.7,	23.6,	26.7,	29.2,	31.2,	N/A ,
15 mins	4.0,	5.9,	7.0,	8.6,	9.7,	10.6,	13.5,	16.9,	19.2,	22.5,	25.5,	27.8,	31.5,	34.3,	36.7,	N/A ,
30 mins	5.3,	7.7,	9.0,	11.1,	12.5,	13.6,	17.2,	21.5,	24.3,	28.3,	32.0,	34.8,	39.3,	42.8,	45.7,	N/A ,
1 hours	6.9,	10.0,	11.7,	14.3,	16.1,	17.4,	22.0,	27.2,	30.7,	35.7,	40.2,	43.7,	49.1,	53.3,	56.8,	N/A ,
2 hours	9.1,	13.1,	15.2,	18.4,	20.7,	22.4,	28.0,	34.5,	38.9,	45.0,	50.4,	54.7,	61.3,	66.4,	70.7,	N/A ,
3 hours	10.7,	15.3,	17.7,	21.4,	23.9,	25.9,	32.3,	39.7,	44.6,	51.5,	57.6,	62.4,	69.8,	75.6,	80.4,	N/A ,
4 hours	12.0,	17.0,	19.7,	23.8,	26.6,	28.7,	35.8,	43.8,	49.1,	56.6,	63.3,	68.5,	76.6,	82.8,	88.0,	N/A ,
6 hours	14.1,	19.9,	23.0,	27.6,	30.8,	33.2,	41.3,	50.4,	56.4,	64.8,	72.4,	78.2,	87.2,	94.2,	100.0,	N/A ,
9 hours	16.5,	23.2,	26.7,	32.1,	35.7,	38.5,	47.6,	57.9,	64.7,	74.2,	82.7,	89.2,	99.3,	107.1,	113.6,	N/A ,
12 hours	18.5,	25.9,	29.8,	35.6,	39.6,	42.7,	52.6,	63.9,	71.3,	81.6,	90.9,	98.0,	108.9,	117.4,	124.4,	N/A ,
18 hours	21.7,	30.2,	34.7,	41.4,	45.9,	49.4,	60.7,	73.4,	81.8,	93.4,	103.8,	111.8,	124.1,	133.5,	141.4,	N/A ,
24 hours	24.4,	33.7,	38.6,	46.0,	50.9,	54.7,	67.1,	81.0,	90.1,	102.8,	114.1,	122.7,	136.0,	146.3,	154.8,	184.4,
2 days	30.5,	41.0,	46.5,	54.5,	59.8,	63.9,	77.0,	91.4,	100.7,	113.6,	124.9,	133.5,	146.6,	156.7,	165.0,	193.5,
3 days	35.6,	47.1,	53.0,	61.6,	67.2,	71.5,	85.3,	100.3,	109.9,	123.1,	134.6,	143.3,	156.6,	166.7,	175.0,	203.5,
4 days	40.1,	52.4,	58.7,	67.8,	73.7,	78.2,	92.6,	108.1,	118.0,	131.6,	143.3,	152.2,	165.7,	175.9,	184.3,	212.9,
6 days	48.1,	61.8,	68.7,	78.7,	85.1,	90.0,	105.4,	121.9,	132.3,	146.5,	158.8,	168.0,	181.9,	192.4,	201.0,	230.1,
8 days	55.3,	70.2,	77.7,	88.3,	95.2,	100.4,	116.7,	134.0,	144.9,	159.7,	172.4,	182.0,	196.3,	207.1,	215.9,	245.5,
10 days	61.9,	77.9,	85.8,	97.1,	104.4,	109.9,	127.0,	145.1,	156.4,	171.7,	184.8,	194.6,	209.4,	220.4,	229.4,	259.7,
12 days	68.2,	85.1,	93.5,	105.4,	113.0,	118.7,	136.6,	155.3,	167.1,	182.9,	196.3,	206.4,	221.5,	232.8,	242.0,	272.8,
16 days	79.9,	98.6,	107.7,	120.6,	128.9,	135.1,	154.2,	174.2,	186.6,	203.3,	217.4,	228.0,	243.7,	255.5,	265.0,	296.8,
20 days	90.8,	111.1,	120.9,	134.7,	143.5,	150.1,	170.3,	191.4,	204.5,	221.9,	236.6,	247.6,	263.9,	276.1,	286.0,	318.7,
25 days	103.8,	125.7,	136.4,	151.2,	160.6,	167.6,	189.1,	211.4,	225.1,	243.4,	258.8,	270.3,	287.3,	299.9,	310.1,	343.9,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007). Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Thor Design & Management.
Structural, Mechanical, Surveying
& Building Services Engineering Consultancy

Ballindarra,
Birr,
Co. Offaly,
Tel : 05791-21688
Fax : 05791-21688
Mobile: 086 872 7752

Date: 30th Aug 2022

Development: Additional 6No. Dwellings @ St. Fiaian's Way, Newcastle, Co. Dublin
Developer: Pavement Homes Ltd
PROPOSED HOUSING DEVELOPMENT

Surface Water Design

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from L - M - N - P
Manholes: from S0 to S1

Distance between Manholes = 50.215 m

Road	=	434.68	m	x	1.0	m	=	434.68	m2	x	95.00% (impermeability)	= 412.946 m2
Footpath	=	53.52	m	x	2.0	m	=	107.04	m2	x	95.00% (impermeability)	= 101.688 m2
Front paved areas	=	345.77	m2	x	1.0	No	=	345.77	m2	x	100.00% (impermeability)	= 345.77 m2
Driveway	=	0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs 1		57.87	m2	x	6.0	No	=	347.22	m2	x	100.00% (impermeability)	= 347.22 m2
Area of Roofs 2	0	0.00	m2	x	8.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Green Area	0	213.54	m2	x	1.0	No	=	213.54	m2	x	10.00% (impermeability)	= 21.354 m2
											Total	1228.98 m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 1228.98 m2 x 0.05 m = 61.45 m3/hr = 17.07 l/s
try 225 diameter pipe at fall 1: 120 Therefore v= 1.15 m/s

Total Area = 1228.98 m2 = 0.30 Acres

Q = 60.5 x Ap x R
Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

Time Taken for Surface Water to travel between Manholes = $\frac{50.215}{1.15}$ = 43.67 = 0.73 mins

Time of Concentration (T) = 0.73 + 3.0 = 3.73 min

$R = \frac{30}{10 + T} = \frac{30}{10 + 3.72775362} =$ **2.19**

Q(actual) = 60.5 x 0.30368 acres x 2.19 inches = 40.15 ft3/min = **18.95** l/s

Therefore use 225 diameter @ fall 1: 120 = 0.833% OK

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from J - K - L - M
Manholes: from S1 to S2

Distance between Manholes = 43.865 m

Road	=	336.48	m	x	1.0	m	=	336.48	m2	x	95.00% (impermeability)	= 319.656 m2
Footpath	=	55.56	m	x	2.0	m	=	111.12	m2	x	95.00% (impermeability)	= 105.564 m2
Front paved areas	=	553.00	m2	x	1.0	No	=	553.00	m2	x	100.00% (impermeability)	= 553 m2
Driveway	=	0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs 1		83.99	m2	x	1.0	No	=	83.99	m2	x	100.00% (impermeability)	= 83.99 m2
Area of Roofs 2	0	57.90	m2	x	8.0	No	=	463.20	m2	x	100.00% (impermeability)	= 463.2 m2
Green Area	0	456.30	m2	x	1.0	No	=	456.30	m2	x	10.00% (impermeability)	= 45.63 m2
											Total	1571.04 m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 1571.04 m2 x 0.05 m = 78.55 m3/hr = 21.82 l/s
try 225 diameter pipe at fall 1: 120 Therefore v= 1.33 m/s

Total Area = 1571.04 m2 = 0.39 Acres

Q = 60.5 x Ap x R

Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

Time Taken for Surface Water to travel between Manholes = $\frac{43.865}{1.33}$ = 32.98 = 0.55 mins

Time of Concentration (T) = 0.55 + 3.0 = 3.55 min

$$R = \frac{30}{10 + T} = \frac{30}{10 + 3.54968672} = \mathbf{2.21}$$

Q(actual) = 60.5 x 0.3882 acres x 2.21 inches = 52.00 ft3/min = 24.54 l/s + 18.95

Therefore use 225 diameter @ fall 1: 120 = 0.833% OK = **43.49L/s**

Surface Water Design

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from G - H - J
Manholes: from S2 to S3

Distance between Manholes = 43.931 m

Road	=	199.64	m	x	1.0	m	=	199.64	m2	x	95.00% (impermeability)	=	189.658	m2
Footpath	=	36.52	m	x	2.0	m	=	73.04	m2	x	95.00% (impermeability)	=	69.388	m2
Front Paved Area	=	311.74	m2	x	1.0	No	=	311.74	m2	x	100.00% (impermeability)	=	311.74	m2
Area of Roofs	=	57.90	m2	x	4.0	No	=	231.60	m2	x	100.00% (impermeability)	=	231.6	m2
Grass Verge		14.40	m2	x	1.0	No	=	14.40	m2	x	10.00% (impermeability)	=	1.44	m2
Area of Roofs		72.87	m2	x	1.0	No	=	72.87	m2	x	100.00% (impermeability)	=	72.87	m2
Green Area		519.23	m2	x	1.0	No	=	519.23	m2	x	10.00% (impermeability)	=	51.923	m2
											Total		928.62	m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 928.62 m2 x 0.05 m = 46.43 m3/hr = 12.90 l/s + 43.49l/s = 56.39l/s
try 225 diameter pipe at fall 1: 160 Therefore v= 1.3 m/s

Total Area = 928.62 m2 = 0.23 Acres

Q = 60.5 x Ap x R

Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

Time Taken for Surface Water to travel between Manholes = $\frac{43.931}{1.3}$ = 33.79 = 0.56 mins

Time of Concentration (T) = 0.56 + 3.0 = 3.56 min

$$R = \frac{30}{10 + T} = \frac{30}{10 + 3.56321795} = 2.21$$

Q(actual) = 60.5 x 0.22946 acres x 2.21 inches = 30.71 ft3/min = **14.49** l/s + 43.49l/s
= **57.98l/s**

Therefore use 225 diameter @ fall 1: 160 = 0.625% OK

Surface Water Design

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from G to E
Manholes: from S3 to S4

Distance between Manholes = 34.7 m

Road	=	190.24	m	x	1.0	m	=	190.24	m2	x	95.00% (impermeability)	= 180.728 m2
Footpath & Paving	=	48.90	m	x	1.0	m	=	48.90	m2	x	95.00% (impermeability)	= 46.455 m2
Grass Verge	=	49.10	m2	x	1.0	No	=	49.10	m2	x	10.00% (impermeability)	= 4.91 m2
Car Park spaces	=	0.00	m2	x	1.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs		0.00	m2	x	1.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs		0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Green Area		195.60	m2	x	1.0	No	=	195.60	m2	x	10.00% (impermeability)	= 19.56 m2
											Total	251.65 m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 251.65 m2 x 0.05 m = 12.58 m3/hr = 3.50 l/s + **4.0 L/s** **ATTENUATED**
try 225 diameter pipe at fall 1: 160 Therefore v= 0.85 m/s = 7.5l/s

Total Area = 251.65 m2 = 0.06 Acres

Q = 60.5 x Ap x R
Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

Time Taken for Surface Water to travel between Manholes = $\frac{34.7}{0.85}$ = 40.82 = 0.68 mins

Time of Concentration (T) = 0.68 + 3.0 = 3.68 min

$R = \frac{30}{10 + T} = \frac{30}{10 + 3.68039216} =$ **2.19**

Q(actual) = 60.5 x 0.06218 acres x 2.19 inches = 8.25 ft3/min = **3.89** l/s + 7.0L/S
= **10.89l/s**

Therefore use 225 diameter @ fall 1: 160 = 0.625% OK

Surface Water Design

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from B to C
Manholes: from S7 to S8

Distance between Manholes = 21.159 m

Road	=	143.11	m	x	1.0	m	=	143.11	m2	x	100.00% (impermeability)	= 143.11 m2
Footpath & Paving	=	41.20	m	x	1.0	m	=	41.20	m2	x	100.00% (impermeability)	= 41.2 m2
Car Park Spaces	=	0.00	m2	x	1.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Driveway	=	0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs	A	0.00	m2	x	1.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs		0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Green Area		0.00	m2	x	1.0	No	=	0.00	m2	x	10.00% (impermeability)	= 0 m2
Grass Verge	0	56.25	m2	x	1.0	No	=	56.25	m2	x	10.00% (impermeability)	= 5.625 m2
											Total	184.31 m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 184.31 m2 x 0.05 m = 9.22 m3/hr = 2.56 l/s = 0
try 225 diameter pipe at fall 1: 100 Therefore v= 0.76 m/s = 2.56L/S

Total Area = 184.31 m2 = 0.05 Acres

Q = 60.5 x Ap x R
Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

Time Taken for Surface Water to travel between Manholes = $\frac{21.159}{0.76}$ = 27.84 = 0.46 mins

Time of Concentration (T) = 0.46 + 3.0 = 3.46 min

$$R = \frac{30}{10 + T} = \frac{30}{10 + 3.46401316} = \mathbf{2.23}$$

Q(actual) = 60.5 x 0.04554 acres x 2.23 inches = 6.14 ft3/min = **2.90** l/s
= **2.90L/S**

Therefore use 225 diameter @ fall 1: 100 = 1.000% OK

Surface Water Design

Pipe Coefficient k=0.06 (new PVC Pipe), Vmin=0.8m/s, Vmax=4.0m/s, V(ideal)=1.8m/s

Area for Road Section: from C to D to E
Manholes: from S8 to S9 to S4

Distance between Manholes = MAX 27.009 m

Road	=	290.38	m	x	1.0	m	=	290.38	m2	x	95.00% (impermeability)	= 275.861 m2
Footpath	=	45.20	m	x	2.0	m	=	90.40	m2	x	95.00% (impermeability)	= 85.88 m2
Car park	=	0.00	m2	x	1.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Driveway	=	0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Area of Roofs		58.54	m2	x	4.0	No	=	234.16	m2	x	100.00% (impermeability)	= 234.16 m2
Area of Roofs		0.00	m2	x	0.0	No	=	0.00	m2	x	100.00% (impermeability)	= 0 m2
Grass Verge		19.90	m2	x	1.0	No	=	19.90	m2	x	10.00% (impermeability)	= 1.99 m2
Green Area		102.58	m2	x	1.0	No	=	102.58	m2	x	10.00% (impermeability)	= 10.258 m2
											Total	608.15 m2

Taking Rain Intensity of 50 mm per Hour

Vol of Water = 608.15 m2 x 0.05 m = 30.41 m3/hr = 8.45 l/s "+" 2.90l/s = 11.35L/s
try 225 diameter pipe at fall 1: 160 Therefore v= 0.9 m/s

Total Area = 608.15 m2 = 0.15 Acres

Q = 60.5 x Ap x R
Where Ap = Impermeable Area (Acres)
R = Rate of Discharge (inches).

$$\text{Time Taken for Surface Water to travel between Manholes} = \frac{27.009}{0.9} = 30.01 = 0 = 0.50 \text{ mins}$$

Time of Concentration (T) = 0.50 + 3.0 = 3.50 min

$$R = \frac{30}{10 + T} = \frac{30}{10 + 3.50016667} = 2.22$$

Q(actual) = 60.5 x 0.15027 acres x 2.22 inches = 20.20 ft3/min = 9.53 l/s + 2.90l/s

Therefore use 225 diameter @ fall 1: 160 = 0.625% OK = **12.43L/s**

TOTAL IMPERMEABLE AREA = 4772 Sq.m

STORMTECH Stormwater Management System Design Tool

ver: Jan18

PROJECT REF:	Proposed Nursing Home Extension Development @ Ard Na Rí NH, Holycros
LOCATION:	Tank 1
DATE:	21-Sep-21
CREATED BY:	Hugh O Rourke

SYSTEM PARAMETERS

Required Total Storage	**108**	m^3
Stormtech chamber model	**SC310**	
Filtration Permeable Geo or Impermeable Geo	Filter geo	
Number of Isolator Rows (IR)	1	

SITE PARAMETERS

Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	*Minimum Requirement*
Stone Above Chambers	0.3	m	*0.15*
Stone Below Chambers	0.23	m	*0.15*
In-between Row Spacing	0.15	m	*0.15*
Additional Storage outside Excavation. E.g manholes, Header Pipe	0	m^3	

HEADER PIPE

Is Header pipe required within excavation	No	
Orientation of Header Pipe	Parrallel to IR	
Diameter of Header Pipe	0.6	m
Length of Header Pipe	0	m

CHAMBER SYSTEM DIMENSIONS	Calculated	Adopted	
Number of Rows		8	ea
Number of units per Row		11	ea
System Installed Storage Depth (effective storage depth)	0.935		m
Tank overall installed Width at base	8.57	8.6	m
Tank overall installed Length at Base	24.57	24.6	m
Total Effective System Storage	**107.9**	**108.3**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC310	
Unit Width	0.865	m
Unit Length	2.17	m
Unit Height	0.405	m
Min Cover Over System	0.25	m
Max Cover Over Chamber (see StormTech for greater cover)	2.4	m
Chamber Internal Storage Vol.	0.42	m^3
Header Pipe Internal Storage Vol in Excavation	0.0	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	215	m^3
Width at base	8.60	m
Width at top	9.68	m
Length at base	24.60	m
Length at top	25.68	m
Depth Of System	0.94	m
Area of Dig at Base of System	212	m^2
Area of Dig at Top of System	249	m^2
Void Ratio	50%	
Stone Requirement - m3	178	m^3
Stone Requirement - tonne	291	tonne

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Birr,
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Tel : 05791-21688

Mobile: 086 8727752

Date: 30th August 2022

Attenuation Storage Tank 1

Attenuation Calculations - Overflow

Development - Newcastle, Co. Dublin

Calculation of storage volumes at surface water outfall

Area of Development (acres)	**2.27**	Acres
Area of Development: (hectares)	0.92	Ha
Impermiable Area (hectares) =	**0.148**	Ha
Total Allowable Outflow	2.00	litres/second

Storm Duration (mins)	*Rainfall (mm)*	20% Increase
15	**27.8**	33.36
30	**34.8**	41.76
60	**43.7**	52.44
120	**54.7**	65.64
240	**68.5**	82.2
360	**78.2**	93.84
720	**98**	117.6

Storm return peroid of 1 in 100 years

Storm Duration (mins)	*Rainfall (mm)*	*Rainfall Intensity (mm/hr)*	*Flow Rate (l/s)*	*Excess Flow Above Outflow (l/s)*	*Storage (m3)*
15	33.36	133.44	59.89	57.89	52.10
30	41.76	83.52	37.48	35.48	63.87
60	52.44	52.44	23.53	21.53	77.53
120	65.64	32.82	14.73	12.73	91.65
240	82.2	20.55	9.22	7.22	104.01
360	93.84	15.64	7.02	5.02	108.41
720	117.6	9.80	4.40	2.40	103.60

Therefore, storage volume required = **108.41 m3**

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Mobile: 086 8727752

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Attenuation Tank 2

Attenuation Calculations - Overflow

Development - Newcastle, Co. Dublin

Calculation of storage volumes at surface water outfall

Area of Development (acres)	**2.27** Acres
Area of Development: (hectares)	0.72 Ha
Impermiable Area (hectares) =	**0.25** Ha
Total Allowable Outflow	4.00 litres/second

Storm Duration (mins)	*Rainfall (mm)*	**20% Increase**
15	**27.8**	33.36
30	**34.8**	41.76
60	**43.7**	52.44
120	**54.7**	65.64
240	**68.5**	82.2
360	**78.2**	93.84
720	**98**	117.6

Storm return peroid of 1 in 100 years

Includes 2L/s from Tank 1

Storm Duration (mins)	*Rainfall (mm)*	*Rainfall Intensity (mm/hr)*	*Flow Rate (l/s)*	*Excess Flow Above Outflow (l/s)*	*Storage (m3)*
15	33.36	133.44	103.16	99.16	89.24
30	41.76	83.52	65.32	61.32	110.37
60	52.44	52.44	41.75	37.75	135.92
120	65.64	32.82	26.88	22.88	164.74
240	82.2	20.55	17.58	13.58	195.54
360	93.84	15.64	13.86	9.86	212.90
720	117.6	9.80	9.43	5.43	234.55

Therefore, storage volume required = **234.55** m3

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Tel : 05791-21688

Mobile: 086 8727752

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Attenuation Tank 3

Attenuation Calculations - Overflow

Development - Newcastle, Co. Dublin

Calculation of storage volumes at surface water outfall

Area of Development (acres)	**2.27**	Acres
Area of Development: (hectares)	0.92	Ha
Impermiable Area (hectares) =	**0.079**	Ha
Total Allowable Outflow	4.00	litres/second

Storm Duration (mins)	*Rainfall (mm)*	**20% Increase**
15	**27.8**	33.36
30	**34.8**	41.76
60	**43.7**	52.44
120	**54.7**	65.64
240	**68.5**	82.2
360	**78.2**	93.84
720	**98**	117.6

Storm return peroid of 1 in 100 years

Includes 4L/s From Tank 2

Storm Duration (mins)	*Rainfall (mm)*	*Rainfall Intensity (mm/hr)*	*Flow Rate (l/s)*	*Excess Flow Above Outflow (l/s)*	*Storage (m3)*
15	33.36	133.44	35.97	31.97	28.77
30	41.76	83.52	24.01	20.01	36.01
60	52.44	52.44	16.56	12.56	45.23
120	65.64	32.82	11.86	7.86	56.61
240	82.2	20.55	8.92	4.92	70.89
360	93.84	15.64	7.75	3.75	80.93
720	117.6	9.80	6.35	2.35	101.42

Therefore, storage volume required = **101.42** m3

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Co. Offaly,
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Mobile: 086 8727752

Date: 30th Aug. 2022

Total Overall Site Volume Storage Requirement

Attenuation Calculations - Overflow

Development - Drunlonagher, Newcastle, Co. Dublin

Calculation of storage volumes at surface water outfall

Area of Development (acres)	**2.27**	Acres
Area of Development: (hectares)	0.92	Ha
Impermiable Area (hectares) =	**0.4772**	Ha
Total Allowable Outflow	4.00	litres/second

Storm Duration (mins)	*Rainfall (mm)*	**20% Increase**
15	**27.8**	33.36
30	**34.8**	41.76
60	**43.7**	52.44
120	**54.7**	65.64
240	**68.5**	82.2
360	**78.2**	93.84
720	**98**	117.6

Storm return peroid of 1 in 100 years

Storm Duration (mins)	*Rainfall (mm)*	*Rainfall Intensity (mm/hr)*	*Flow Rate (l/s)*	*Excess Flow Above Outflow (l/s)*	*Storage (m3)*
15	33.36	133.44	193.10	189.10	170.19
30	41.76	83.52	120.86	116.86	210.35
60	52.44	52.44	75.88	71.88	258.78
120	65.64	32.82	47.49	43.49	313.15
240	82.2	20.55	29.74	25.74	370.61
360	93.84	15.64	22.63	18.63	402.45
720	117.6	9.80	14.18	10.18	439.83

Therefore, storage volume required = **439.83 m3**

NS PLASTIC BYPASS SEPARATORS
DECLARATION OF PERFORMANCE

No. KEL-CPR-010

1. Unique identification code of the product-type:

Separator Systems for Light Liquids, Plastic Construction
NSBP003, NSBP004 & NSBP006

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of the CPR:

Serial Number/Works Order Number printed on the Product Information Label & affixed to product

3. Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:

Collection & Separation of Light Liquids from Waste Water by means of gravity and/or coalescence

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5):

Kingspan Environmental Ltd
College Rd North
Aston Clinton, Aylesbury, Buckinghamshire
HP22 5EW

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2):

N/A

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V:

System 3

7. In case of the declaration of performance concerning a construction product covered by a harmonized standard:

EN 858-1:2002
BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ
Has executed initial type testing according to system 3 and delivered the test report

KINGSPAN ENVIRONMENTAL LTD
180 Gilford Road, Portadown
Co. Armagh, BT63 5LF

+44 (0) 28 3836 4400
+44 (0) 28 3836 4445
enquiry@kingspanenv.com
kingspanenv.com

Registered in N. Ireland
Company Reg. No. NI17631

8. Declared performance:

Essential Characteristics		Performance			Harmonised technical specification
Crushing Resistance (vertical load test)		Pass (also wet conditions)			EN 858-1:2002
Structural Behaviour		Pass			
Resistance to fire		Class E			
Water Tightness (water test)		Pass			
Material Durability		MFR (190/2,16) = 3.0± 1g/10 min (ISO 1133)			
		Density ≥ 939 kg/m³ (ISO 1872)			
		Yield Stress ≥ 19 Mpa (ISO 527-2)			
		Pressure A1 = 1 (EN1778)			
		Pressure A2K = 1 (EN1778)			
Treatment Efficiency	Sample	Specified Maximum Light Liquid (mg/l)	Actual Light Liquid (mg/l)		
	1	≤10	0.37	Pass	
	2	≤10	0.22	Pass	
	3	≤10	0.35	Pass	
	4	≤10	0.23	Pass	
	5	≤10	0.35	Pass	
	Average	≤5	0.30	Pass	
Electrical Consumption		n/a			

Signed for and on behalf of the manufacturer by:

Paul Copping – Technical Director

.....

(Name and function)

Aylesbury – 13th May 2013

.....

(Place and date of issue)

P Copping

.....

(Signature)

KINGSPAN ENVIRONMENTAL LTD
180 Gilford Road, Portadown
Co. Armagh, BT63 5LF

+44 (0) 28 3836 4400
+44 (0) 28 3836 4445
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Detention • Retention • Recharge
Subsurface Stormwater Management℠

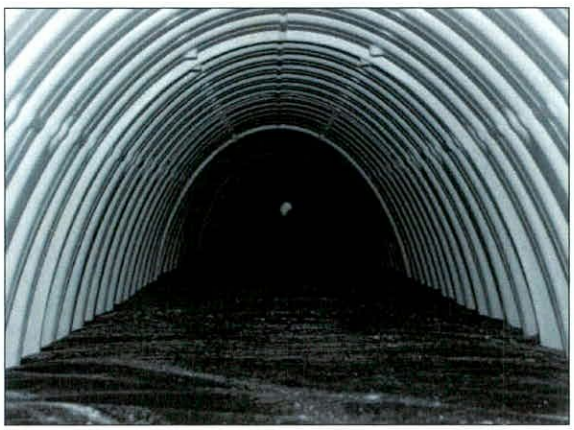
Isolator™ Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator™ Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.



Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR™ ROW

The Isolator Row is a row of StormTech chambers, either SC-310, SC-740 or MC-3500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

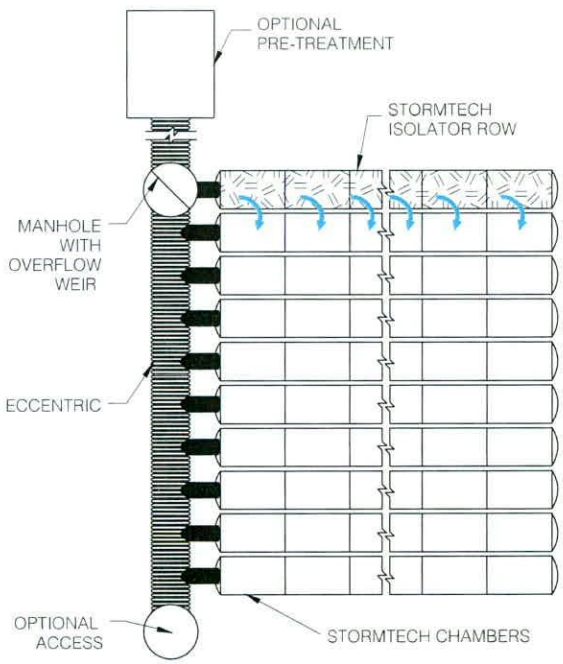
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.0 Isolator Row Inspection/Maintenance

2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

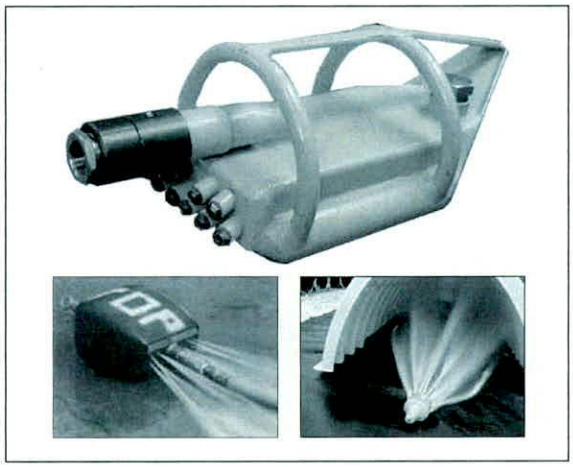
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

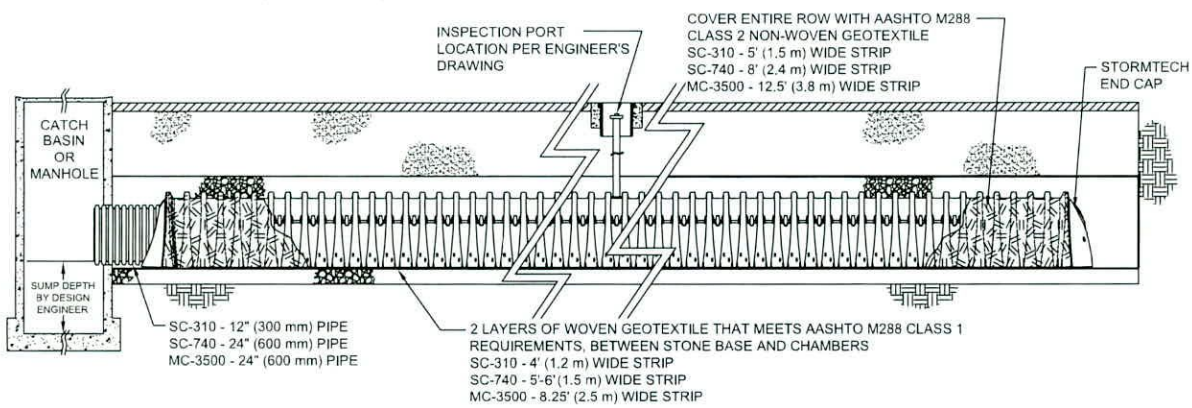
The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.

iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows

i. Remove cover from manhole at upstream end of Isolator Row

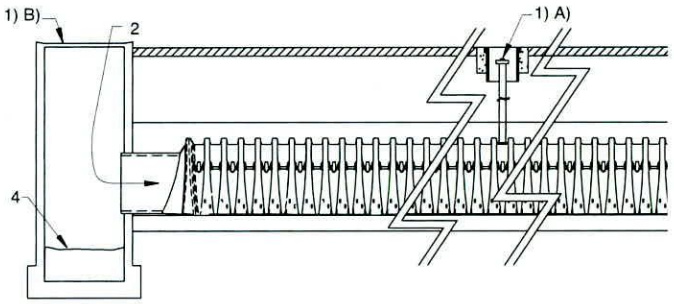
ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry

2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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