# SOAKAWAY DESIGN BRE 365 DIGEST

Client: Eoin & Aisling McKenna
Site Location: 37 Butterfield Avenue, Rathfarnham, Dublin 14.

Prepared By:
Paul Martin Arch Tech. Fetac level 6 Site Assessor.

PAUL MARTIN PLANNING & DESIGN SERVICES
Domestic & Commercial Planning Surveying & Site Suitability Assessment

The Brambles Arthurstown Ardee Co. Louth Ireland.
Tel / Fax +353416855419 Mob:+ 353 87 6390590
Email: pmsurvey.design@gmail.com

**Introduction**

This report details the design of a soakaway to cater for a proposed extension to a dwelling at 37 Butterfield Avenue, Rathfarnham Dublin 14. The total roof area of the proposed extension is 75m2. Given that thereare existing outbuildings to be demolished, situated on existing concrete / paved areas in the location where the dwelling is to be extended to the side, the surface water run-off from the proposed extension to the rear of the dwelling consisting of 43m2 is catered for in the design herein as is denoted A on the enclosed drawing. As a prudent approach the soakaway designed will cater for surface water run-off for an area of 50m2. Thus, the post development run-off will not exceed the pre-development run-off in accordance with the Greater Dublin Strategic Drainage Study, (GDSDS). Surface run-off from additional footpaths will drain to permeable surfaces via sheet flow. A trial pit was hand dug indicated a moderately drained subsoil profile. (See photographs).

Take note that in addition to the soakaway design, source control is to be provided by means of water butts and draw off taps for external reuse only. A rainwater planter is also intended to be installed. This will also reduce the water consumption required.

The site assessment was undertaken on the 3th & 4th of June 2022.

The assessment and report have been undertaken in accordance with the following documents.

BRE Digest 365 CIRIA Guidance Documents

Met Eireann rainfall return periods for Rathfarnham, Dublin 14 Co. Dublin.

Irish Grid Coordinates Easting 313146 Northing 228446

**The design method for sizing a soakaway is based on the equation of volumes:**

**S = I – O**

S = Soakaway storage volume (m3)

I = Inflow from the impermeable area drained to the soakaway

O= Outflow infiltrating into the soil (m3)

**Site Location & Description**

The site is located at 37 Butterfield Avenue, Rathfarnham Dublin 14. The topography of the site is relatively flat. Dwellings are served by mains water & the combined foul & storm sewer system. Soil types in the area are moderately drained.

**Trial pit**

A trial pit measuring 0.9mL x 0.9mW x 1.2D was hand dug. The soil / subsoil profile consisted of firm friable topsoil over a yellowish brown coloured clay layer overlying brownish gray coloured gravelly silt / clay layer. The soil types observed in the trial hole are consistent with the Ashbourne / Dunboyne soil Series. These can be gleyed and poorly drained in low lying topography, however more elevated sites can be moderately to well drained.

The effective depth of the soakaway test was 0.6m. The time for water to infiltrate from 75% to 25% of the effective depth was 625 minutes or 37500 sec.

Assessment of inflow to the Soakaway

Inflow: I = A x R

A: Impermeable area to be drained to the soakaway (m2)
R: Total rainfall in design (m)

| | |
|---|---|
| Total Impermeable Area | 50.0m2 |

Met Eireann Rainfall Data

Data for Rathfarnham Dublin 14. IR Grid Ref E 313146, N 228446
30 Return Periods
1440min storm Duration (worst case scenario)
Rainfall Depth = 89.7mm + 20% for climate change = 107.64mm

A void ratio of 30% or 0.3 was used to in this design to allow for granular fill. A safety factor was taken as 1

Inflow:
I = A x R
A: Impermeable area to be drained to the soakaway (m2)
R: Total rainfall in design (m)
Impermeable Area =50m2 @ runoff coefficient 1.0
Rainfall = 107.64mm
50m2 x 107.64mm = 5.32m3 Thus I = 5.32m3

Assessment of outflow to the Soakaway

Outflow: $O = As50 \times F \times D$

As50: Internal surface area of soakaway pit to 50% effective depth (excluding base)
F: Soil infiltration rate (m/s)
D: Storm duration (sec)

The soil infiltration rate F was then obtained using the formula.

$$F = \frac{V_p (75\text{-}25)}{Ap50 \times T_p (75\text{-}25)}$$

Where:

Vp75 - 25 = the effective storage volume of water in the trial pit between 75% and 25% effective depth

Ap50 = the internal surface area of the trial pit up to 50% effective depth and including the base area

tp75 - 25 = the time for the water level to fall from 75% to 25% effective depth

$F = \frac{V_p (75\text{-}25)}{Ap50 \times T_p (75\text{-}25)}$ Thus F calculated at 0.0034mm / sec

Outflow:
O = As50 x F x D
(6.30m2 x 0.0034) x (1440 x 60) / 1000 = 1.87m3 Thus outflow (O) = 1.87m3
Storage = I – O = S
(I) 5.38m3– (O) 1.87m3 = 3.52m3 Thus storage (S) = 3.52m3

Soakaway Volume Required:
Void Ratio 0.3 Volume: = 3.52m3 ÷ 0.3 = 11.73m3

Soakaway Volume Provided = 12.60m3 Inc 30% voids

Total Trench Soakaway Total Size **Length :- 6.0m Width 3.0m Depth 078m**

Construct 1 Soakaway trench. See enclosed drawing.

Half Empty Time = $Ts50 = \frac{S \times 0.50}{As50 \times f} = \frac{(3.52 \times 0.5)}{(6.30 \times 0.0000034 \times 60)}$ = 1356mins. 22hr 36mins

The soakaway design is based on the variables as shown in the enclosed calculation sheet. These variables are:

- Impermeable Areas
- Rainfall Data
- Soil infiltration Rates
- Void Ratio
- Factor of safety
- Volumetric Runoff Coefficient

The enclosed designs detail the following:

- Trench soakaway Length x Width x Depth.
- Surface area of exfiltration (As50)
- Half Empty time.
- Precast concrete ring soakaway if preferred.

**Soakaway Construction**

The inlet pipe at the soakaway pit to be set at 0.45m below Existing ground level.

The soakaway is to be excavated to a depth of 0.7m below the inlet level and filled to 0.7m effective depth with clean hardcore with a min void ratio of 30%, The hardcore should be surrounded with a suitable geotextile to prevent migration of fines.

The soakaway should have at least two inspection points, one at each end of a straight trench, with a horizontal porous or perforated distributor pipe linking the ends along the top of the granular fill.

A silt trap is to be incorporated into the soakaway system. Inflow from any permeable paved areas must pass through a suitable geotextile to ensure filtration of fines. Any run-off from car parking must pass through hydrocarbon retention geotextile before discharge to the soakaway.

Granular fill used in the soakaway must have a free volume of not less than 30%

The above design is in accordance with BRE365 24hr maximum limit for half empty time.

The base of the soakaway has not been included in the design calculations.

An overflow from the soakaway to the existing surface water network in included in the design as per requested by the local authority.

The soakaway must be maintained on a regular basis, i.e., silt traps / interceptors to be cleaned periodically.

Signed

Paul Martin. Arch. Tech. Date: 14th June 2022

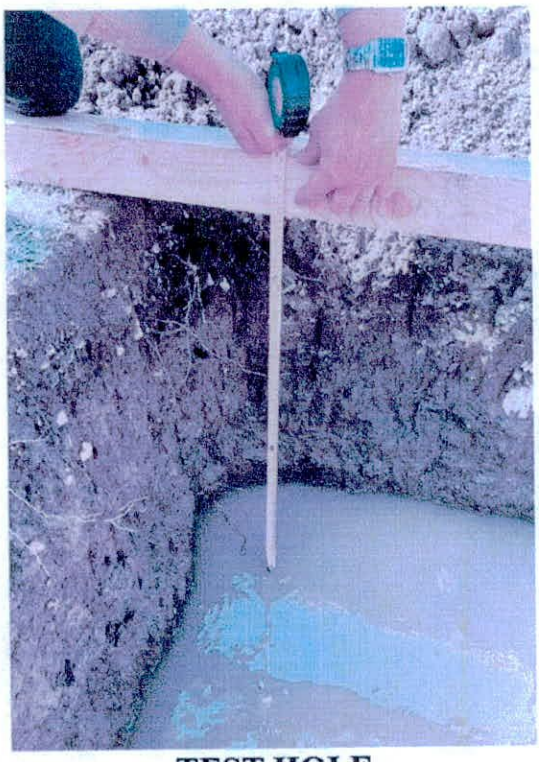
**PAUL MARTIN**
PLANNING & DESIGN SERVICES
ARTHURSTOWN, ARDEE, CO. LOUTH
PH/FAX: 041-6855419 / 087 6390590

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 313146, Northing: 228446,

| | Interval | | Years | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DURATION | 6months, | 1year, | 2, | 3, | 4, | 5, | 10, | 20, | 30, | 50, | 75, | 100, | 150, | 200, | 250, | 500, |
| 5 mins | 2.6, | 3.8, | 4.5, | 5.6, | 6.3, | 6.9, | 8.7, | 11.0, | 12.4, | 14.6, | 16.5, | 18.0, | 20.3, | 22.2, | 23.7, | N/A , |
| 10 mins | 3.6, | 5.3, | 6.3, | 7.8, | 8.8, | 9.6, | 12.2, | 15.3, | 17.3, | 20.3, | 23.0, | 25.1, | 28.3, | 30.9, | 33.1, | N/A , |
| 15 mins | 4.3, | 6.3, | 7.4, | 9.1, | 10.3, | 11.2, | 14.3, | 18.0, | 20.4, | 23.9, | 27.0, | 29.5, | 33.3, | 36.4, | 38.9, | N/A , |
| 30 mins | 5.6, | 8.2, | 9.6, | 11.7, | 13.2, | 14.4, | 18.2, | 22.6, | 25.5, | 29.7, | 33.5, | 36.5, | 41.0, | 44.6, | 47.6, | N/A , |
| 1 hours | 7.5, | 10.7, | 12.5, | 15.1, | 16.9, | 18.4, | 23.0, | 28.4, | 32.0, | 37.0, | 41.5, | 45.1, | 50.5, | 54.8, | 58.3, | N/A , |
| 2 hours | 9.9, | 14.0, | 16.2, | 19.5, | 21.7, | 23.5, | 29.2, | 35.7, | 40.0, | 46.1, | 51.5, | 55.7, | 62.2, | 67.3, | 71.4, | N/A , |
| 3 hours | 11.6, | 16.3, | 18.8, | 22.6, | 25.1, | 27.1, | 33.5, | 40.8, | 45.7, | 52.4, | 58.4, | 63.1, | 70.3, | 75.8, | 80.4, | N/A , |
| 4 hours | 13.0, | 18.2, | 21.0, | 25.1, | 27.9, | 30.0, | 37.0, | 44.9, | 50.1, | 57.4, | 63.9, | 68.9, | 76.6, | 82.6, | 87.5, | N/A , |
| 6 hours | 15.3, | 21.3, | 24.4, | 29.1, | 32.2, | 34.6, | 42.5, | 51.4, | 57.2, | 65.3, | 72.5, | 78.0, | 86.5, | 93.1, | 98.5, | N/A , |
| 9 hours | 18.1, | 24.8, | 28.4, | 33.7, | 37.2, | 40.0, | 48.9, | 58.7, | 65.2, | 74.2, | 82.2, | 88.3, | 97.7, | 104.9, | 110.9, | N/A , |
| 12 hours | 20.3, | 27.7, | 31.6, | 37.4, | 41.3, | 44.3, | 53.9, | 64.6, | 71.6, | 81.3, | 89.9, | 96.4, | 106.5, | 114.2, | 120.6, | N/A , |
| 18 hours | 23.9, | 32.4, | 36.8, | 43.4, | 47.8, | 51.1, | 61.9, | 73.9, | 81.7, | 92.4, | 101.9, | 109.2, | 120.3, | 128.8, | 135.8, | N/A , |
| 24 hours | 26.8, | 36.2, | 41.0, | 48.2, | 52.9, | 56.6, | 68.3, | 81.3, | 89.7, | 101.3, | 111.4, | 119.2, | 131.1, | 140.2, | 147.7, | 173.6, |
| 2 days | 33.4, | 44.1, | 49.6, | 57.5, | 62.8, | 66.8, | 79.6, | 93.5, | 102.4, | 114.6, | 125.3, | 133.4, | 145.7, | 155.0, | 162.7, | 189.0, |
| 3 days | 38.7, | 50.5, | 56.5, | 65.1, | 70.8, | 75.1, | 88.7, | 103.4, | 112.8, | 125.7, | 136.8, | 145.2, | 158.0, | 167.6, | 175.6, | 202.5, |
| 4 days | 43.4, | 56.0, | 62.5, | 71.7, | 77.7, | 82.3, | 96.6, | 112.1, | 121.9, | 135.3, | 146.9, | 155.6, | 168.8, | 178.8, | 186.9, | 214.6, |
| 6 days | 51.6, | 65.8, | 72.9, | 83.1, | 89.7, | 94.7, | 110.4, | 127.1, | 137.7, | 152.1, | 164.4, | 173.7, | 187.6, | 198.1, | 206.7, | 235.7, |
| 8 days | 58.8, | 74.3, | 82.1, | 93.1, | 100.2, | 105.6, | 122.4, | 140.2, | 151.4, | 166.6, | 179.6, | 189.3, | 204.0, | 215.0, | 223.9, | 254.1, |
| 10 days | 65.4, | 82.1, | 90.4, | 102.2, | 109.8, | 115.5, | 133.3, | 152.1, | 163.8, | 179.7, | 193.3, | 203.5, | 218.7, | 230.2, | 239.5, | 270.8, |
| 12 days | 71.6, | 89.4, | 98.2, | 110.6, | 118.6, | 124.6, | 143.3, | 163.0, | 175.3, | 191.9, | 206.0, | 216.6, | 232.3, | 244.2, | 253.8, | 286.1, |
| 16 days | 83.1, | 102.8, | 112.5, | 126.1, | 134.9, | 141.4, | 161.7, | 182.9, | 196.2, | 213.9, | 229.0, | 240.3, | 257.1, | 269.6, | 279.8, | 313.9, |
| 20 days | 93.7, | 115.1, | 125.6, | 140.3, | 149.7, | 156.8, | 178.4, | 201.1, | 215.1, | 233.9, | 249.9, | 261.8, | 279.4, | 292.6, | 303.3, | 339.0, |
| 25 days | 106.2, | 129.5, | 140.9, | 156.8, | 166.9, | 174.5, | 197.8, | 222.0, | 236.9, | 256.9, | 273.8, | 286.4, | 305.1, | 319.0, | 330.2, | 367.6, |

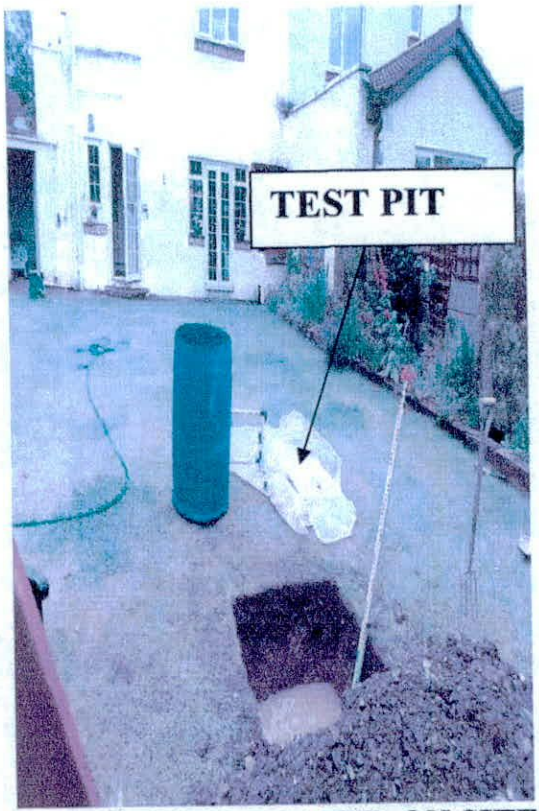
NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

TEST HOLE

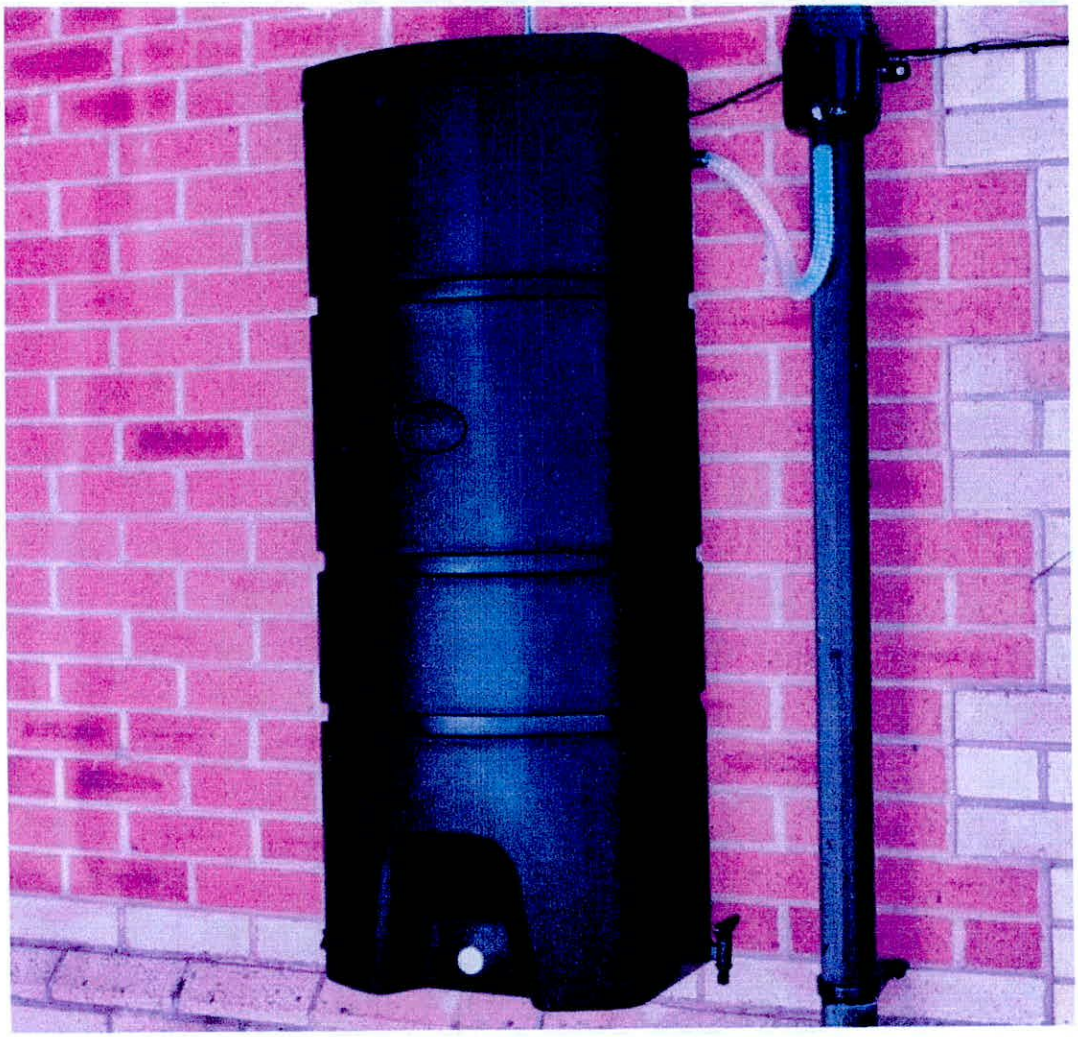


TEST HOLE

TEST HOLE EMPTY




TEST HOLE LOCATED ON SITE



**Height 1.22cm Width 45cm Depth 30cm**

The 160 Litre Terracottage Wall Mounted Water Butt is manufactured from 100% recycled plastic and is perfect for gardens where space is limited as it fixes securely to the wall.

The space-saver Terracottage includes three outlet connections at the bottom of the water butt and can be used for the tap supplied or for connecting to another water butt.


**NOTE:**
**FOR PLANNING PERMISSION ONLY**

Approximate drainage lines layout only!
Drainage layout as per engineers building control drawings

Soakaway to located a minimum distance of 5.0m to and building foundation

Soakaway to located a minimum distance of 5.0m to any percolation area

I.L. into soakaway 55.45

New SMH Silt trap
CL. 55.90
IL. In 55.60

6000

+55.90

3000

6000

Over flow from silt trap 55.52

Connect overflow back to Ex. Mh at 55.43

100mmø @ 1:60 Fall

New SMH
CL. 56.05
IL. 55.70

+56.05

Ex. MH
CL. 56.10
IL. 55.30

A

Water Butt

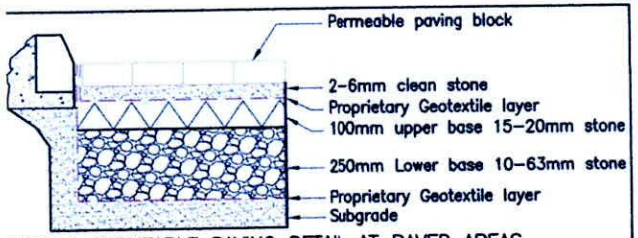
100mmø @ 1:60 Fall

Soakaway filter trench for areas denoted A
Area drained to soakaway 50m2
Storage volume required inc voids 3.52m3
Storage Trench sized at 6.50m L x 3.0W x 0.7m D
Inlet level: Datum 55.45 or 0.45m below Ex GL
Trench base level: Datum 54.75 or 1.15m below Ex GL

FFL 56.22

Existing buildings and hardstanding surfaces in-situ at location of proposed extension

wp




TYPE A PERMEABLE PAVING DETAIL AT PAVED AREAS
FULL FILTRATION TO PERMEABLE GROUND SCALE 1:25

100mmø combined sewer pipe

Ex. MH
CL. 55.90
IL. 54.68

+55.90

ROAD

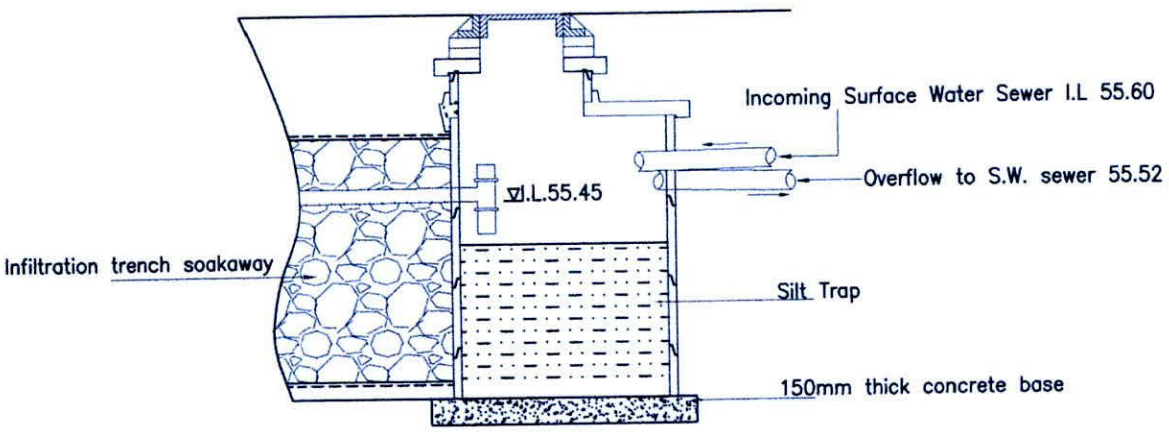
KEY:
IMPERMEABLE AREAS A SHOWN

A

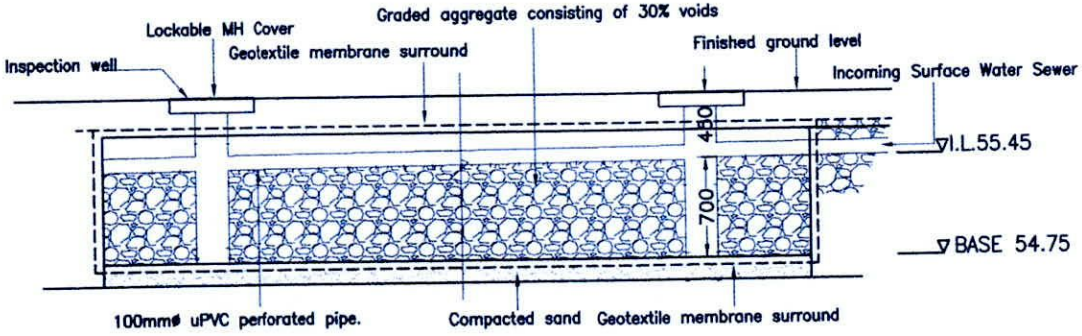
EXISTING BUILDINGS TO BEDEMOLISHED

# SITE LAYOUT FOR PLANNING PERMISSION

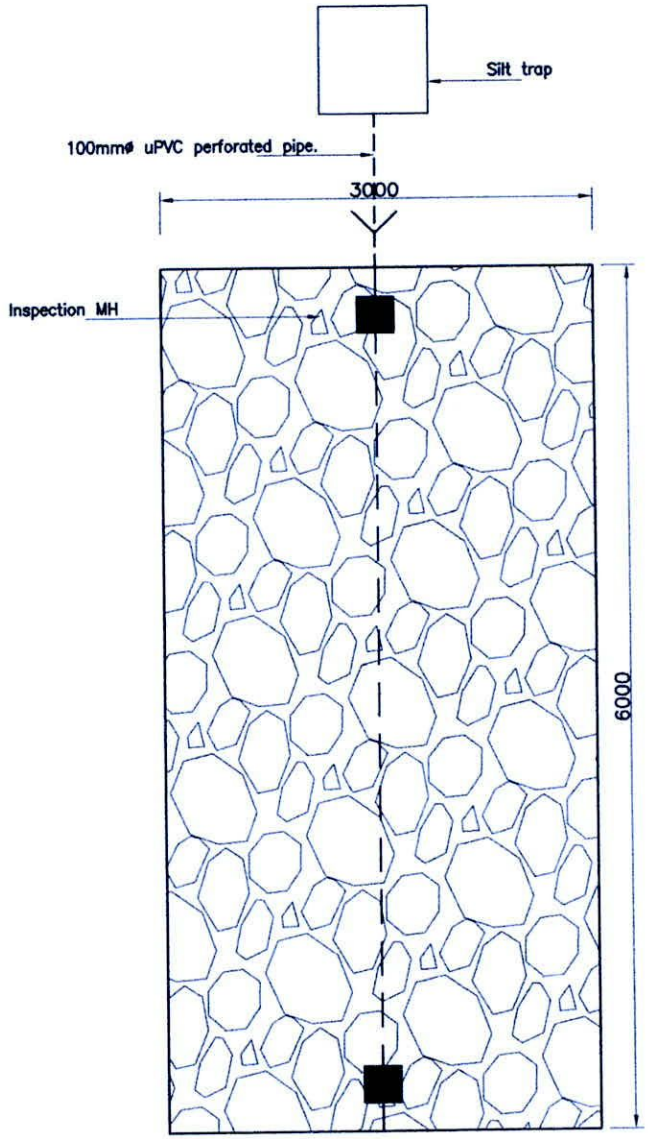
| | | | | | |
|---|---|---|---|---|---|
| PROJECT:<br>Exrension to Dwelling at<br>37 Butterfield Avenue, Rathfarnham<br>Dublin 14 for Eoin & Aisling McKenna. | TITLE:<br>SURFACE WATER DRAINAGE<br>& SOAKAWAY DESIGN | DWG NO:<br>D2211-01<br>REVISION:<br>- | DATE:<br>10-06-2022<br>SCALE:<br>1:250 ON A4 | DWN BY:<br>PM<br>CHK BY:<br>PM | **Paul Martin Planning & Design Services**<br>The Brambles Arthurstown Ardee Co. Louth Ireland<br>Tel/Fax:+353 416855419 Mob +353876390590<br>Email: pmsurvey.design@gmail.com |




TYPICAL SILT TRAP SCALE 1:50




SOAKAWAY LONGITUDINAL SECTION SCALE 1:50




SOAKAWAY PLAN SCALE 1:50

| | | | | | |
|---|---|---|---|---|---|
| PROJECT:<br>Exrension to Dwelling at<br>37 Butterfield Avenue, Rathfarnham<br>Dublin 14 for Eoin & Aisling McKenna. | TITLE:<br>SOAKAWAY DETAILS | DWG NO:<br>D2211-02 | DATE:<br>10-06-2022 | DWN BY:<br>PM | Paul Martin Planning & Design Services<br>The Brambles Arthurstown Ardee Co. Louth Ireland<br>Tel/Fax:+353 416855419 Mob +353876390590<br>Email: pmsurvey.design@gmail.com |
| | | REVISION:<br>– | SCALE:<br>AS SHOWN ON A4 | CHK BY:<br>PM | |

# CALCULATION OF SOAKAWAY FILTER TRENCH BRE DIGEST 365

**Trial pit**

| Length of trial pit m. | Width of trial pit m. | Effective depth of pit m. | 75% of Eff. depth of pit m. | 25% of Eff. depth of pit m. | Vol. between 75% and 25% cu.m | Area of Wetted surface to 50% depth sq.m. (includes area of base) | Time of drop from 75% to 25% full secs | Soil Infiltration Rate 'f' mm/sec | Infiltration Rate 'f' m./hr |
|---|---|---|---|---|---|---|---|---|---|
| ~~1.8~~ | ~~0.6~~ | ~~1.8~~ | ~~1.35~~ | ~~0.45~~ | ~~0.972~~ | ~~5.4~~ | ~~20700~~ | ~~0.0087~~ | ~~0.0313~~ |
| 0.9 | 0.9 | 0.6 | 0.45 | 0.15 | 0.243 | 1.89 | 37500 | 0.0034 | 0.0123 |
| ~~0.75~~ | ~~0.6~~ | ~~0.75~~ | ~~0.5625~~ | ~~0.1875~~ | ~~0.16875~~ | ~~1.4625~~ | ~~2380~~ | ~~0.0485~~ | ~~0.1745~~ |
| | | | | | | | | 0.0034 | |

Cell above used for direct insert for f

**Soakaway**

| Length of Soakaway m. | Width of Soakaway m. | Eff. Depth of Soakaway m. | % Voids | Storage in Soakaway cu.m. | 50% of Surface area sq.m. | Outflow Factor cu.m./sec |
|---|---|---|---|---|---|---|
| 6 | 3 | 0.7 | 30 | 3.78 | 6.3 | 0.0000216 |

Inc 20% Climate Change

| Storm dur. mins. | Area ha | Rainfall mm. | Inflow cu.m. | Outflow cu.m. | Storage reqd. cu.m. | Is storage provided = or > vol. reqd. ? | Time to empty 50% minutes | Is time satisfactory i.e. < 24 Hours ? |
|---|---|---|---|---|---|---|---|---|
| 5 | 0.005 | 12.4 | 0.74 | 0.01 | 0.74 | Yes | 284.54 | Yes |
| 10 | 0.005 | 17.3 | 1.04 | 0.01 | 1.03 | Yes | 395.46 | Yes |
| 30 | 0.005 | 25.5 | 1.53 | 0.04 | 1.49 | Yes | 575.28 | Yes |
| 60 | 0.005 | 32 | 1.92 | 0.08 | 1.84 | Yes | 710.74 | Yes |
| 120 | 0.005 | 40 | 2.40 | 0.16 | 2.24 | Yes | 865.93 | Yes |
| 240 | 0.005 | 50.1 | 3.01 | 0.31 | 2.69 | Yes | 1039.72 | Yes |
| 360 | 0.005 | 57.2 | 3.43 | 0.47 | 2.97 | Yes | 1144.07 | Yes |
| 720 | 0.005 | 71.6 | 4.30 | 0.93 | 3.36 | Yes | 1297.41 | Yes |
| 1440 | 0.005 | 89.7 | 5.38 | 1.87 | 3.52 | Yes | 1356.39 | Yes |
| 2880 | 0.005 | 102.4 | 6.14 | 3.73 | 2.41 | Yes | 930.37 | Yes |

As per the above table 3.52cu.m. of storage is required based on a 1440 minute storm duration. Including 20% in rainfall data for climate change

SOAKAWAY SIZE 6.0m L x 3.0m W x 0.70m D

Construct 1 Soakaway Trench See Drgs

PAUL MARTIN PLANNING & DESIGN SERVICES.
The Brambles Arthurstown, Ardee, Co. Louth.
0416855419 0876390590
pmsurvey.design@gmail.com

**JOB NO. D2211 Eoin & Aisling McKenna**

**DEVELOPMENT: Extension to dwelling at 37 Butterfield Avenue, Rathfarnham, Dublin 14.**

Date: 14/06/2022