

Alterations to Existing Pump House at Meadow Grove, Dundalk, Co. Louth
Louth County Council

SURFACE WATER DRAINAGE PROPOSAL

Design Proposal

The proposed alterations provide for the replacement of the existing flat roof with a mono-pitched roof and the creation of a paved area around the perimeter of the building.

Run-off from the existing roof discharges into the public combined sewer network serving Meadow Grove.

This existing drainage arrangement does not comply with current SuDs and Nature Based objectives with respect to SW Drainage. It is therefore proposed to discharge all run-off from the upgraded building through appropriate infiltration devices

A test hole excavated at the site confirmed the sub-soil to comprise of 3no. distinct layers as follows

0m - 0.25m Top Soil

0.25m - 1.2m : silty sand

1.2 - 1.9m: silty clay

Some ingress of water was recorded at 1.9m depth.

Silty sand generally has good infiltration properties while sandy silt is generally poor as per the following extract from the Suds Manual

Soil Texture	ISO 14688-1	Lower (m/s)	Upper (m/s)
Gravel	Sandy GRAVEL	3×10^{-4}	3×10^{-2}
Sand	Slightly silty slightly clayey SAND	1×10^{-5}	5×10^{-5}
Loamy Sand	Silty slightly clayey SAND	1×10^{-4}	3×10^{-5}
Sandy Loam	Silty clayey SAND	1×10^{-7}	1×10^{-5}
Loam	Very silty clayey SAND	1×10^{-7}	5×10^{-6}
Silt Loam	Very sandy clayey SILT	1×10^{-7}	1×10^{-5}
Sandy Clay Loam	Very clayey silty SAND	3×10^{-10}	3×10^{-7}
Silty Clay Loam	-	1×10^{-8}	1×10^{-6}

The relatively poor infiltration characteristics of the lower silty clay layer was confirmed by the Infiltration Test carried out at the site which recorded a drop of only 0.20m within a 5 hour period

It is clear that a deep infiltration device (deep soakage) will not be suitable in this case

It is therefore proposed to avail of the good infiltration available within the top 1.0m of the subsoil by

- 1) Discharging run-off from the roof of the building to a SHALLOW soakage trench
- 2) Constructing the proposed paved area using grasscrete or other similar impermeable paving to allow for direct infiltration of rain falling on this area into the underlying sub-soil

Proposed Site Layout as shown schematically on Fig. 1

Soakage Trench Design

Calculations for Storms with a Return Period (Years) of

30

 plus 20%

The fundamental design formula used in BRE 365 is $S = I - O$, where

S = Storage required in soakaway

I = Inflow from impermeable area draining into soakaways during storm duration

O = Outflow infiltration from soakaway into soil during storm duration

$O = a_{s50} \times f \times D$, where

a_{s50} = Internal surface area of soakaway to 50% effective depth (excluding base)

f = Soil infiltration rate

D = Storm duration

Details of Proposed Soakage Trench

Use 9.0m long x 3.0m wide x 0.5m deep soakage trench constructed 4/200mm stone wrapped in a in permeable geotextile

Trench Length =	9.00	(m)
Trench Width =	3.00	(m)
Trench Depth =	0.50	(m)

Contributing Impermeable Area (m ²)		
Roof Area (m ²)	Paved Area (m ²)	Total (m ²)
110	0	110

Volume of Trench =	13.5	(m ³)
Voids Ratio =	35%	(%)
Storage in Trench =	4.73	(m ³)
Diam. Inlet Chamber =	0.000	(m)
Depth Inlet Chamber	0.00	
Storage in Chamber=	0.00	(m ³)
No. of Chamber =	1	(m ³)
Total Storage in chambers =	0.00	
Total storage in Trench & Chamber	4.73	(m ³)

Soil Infiltration Rates

The BRE Infiltration Test determined the infiltration in the lower depth of the test hole (>1.1m). The soakage trench shall have a base level no more than 1.0m below ground level. i.e all infiltration shall be within the upper silty sand layer. This soil type has an infiltration rate ranging from 1×10^{-4} m/s to 3×10^{-5} m/s - as per SuDs Manual
It is propose to select the low end of this range and apply a further Factor of Safety = 3.0 (i.e infiltration rate = 1.0×10^{-5} m/s) for design purposes

Depth to TWL of Water Table or Rock (m)	Infiltration Rate (f) (mm/minute)	Infiltration Rate (f) m/s
>1.9m	0.6000	0.00001

Internal Surface Area of each Soakaway Trench to 50% Effective Depth (Excluding Base) A_{S50}

A_{S50} per Trench (m^2)	No. of Soakage Trenches	Total Internal Surface Area (a_{S50}) (m^2)
6.00	1	6.00

The final AJ on the SW Network shall be a silt trap AJ

Calculation of Storage Required in Soakage Trench

Met. Eireann Rainfall Data for Meadow Grove, Dunleer				Inflow	Outflow	Storage
Duration	Return Period (Years)	With 20% allowance - climate change	Impermeable Area	Volume (l)	Volume (O)	Required (S = I - O)
	30				$f \times a_{S50} \times D$	
minutes	rainfall-mm	(mm)	(m^2)	(m^3)	(m^3)	(m^3)
60	23.6	28.32	110.00	3.12	0.22	2.90
120	29.6	35.52	110.00	3.91	0.43	3.48
180	33.7	40.44	110.00	4.45	0.65	3.80
240	37.0	44.40	110.00	4.88	0.86	4.02
360	42.2	50.64	110.00	5.57	1.30	4.27
540	48.2	57.84	110.00	6.36	1.94	4.42
720	52.9	63.48	110.00	6.98	2.59	4.39
1080	60.3	72.36	110.00	7.96	3.89	4.07
1440	66.2	79.44	110.00	8.74	5.18	3.55

Maximum Storage Required = 4.42 m^3 → Duration = 6 hours

Minimum Spare Capacity in Soakaway = 0.31 m^3 → Duration = 6 hours

Maximum Storage required = 4.42 m^3
Spare Capacity in Trench = 0.31 m^3
Storage provided in Trench = 4.73 m^3

Time to empty 50% of max storage

$$t \text{ secs} = \frac{(s)(0.5)}{(a_{S50})(f)} = 36820.00$$

$$t \text{ hours} = 10.23 \quad \mathbf{10.23 < 24 \text{ OK}}$$

Will take 10.23 hours for soakaway to empty by 50% after being filled to max. depth

Fig. 1 - Proposed Site Layout - Schematic

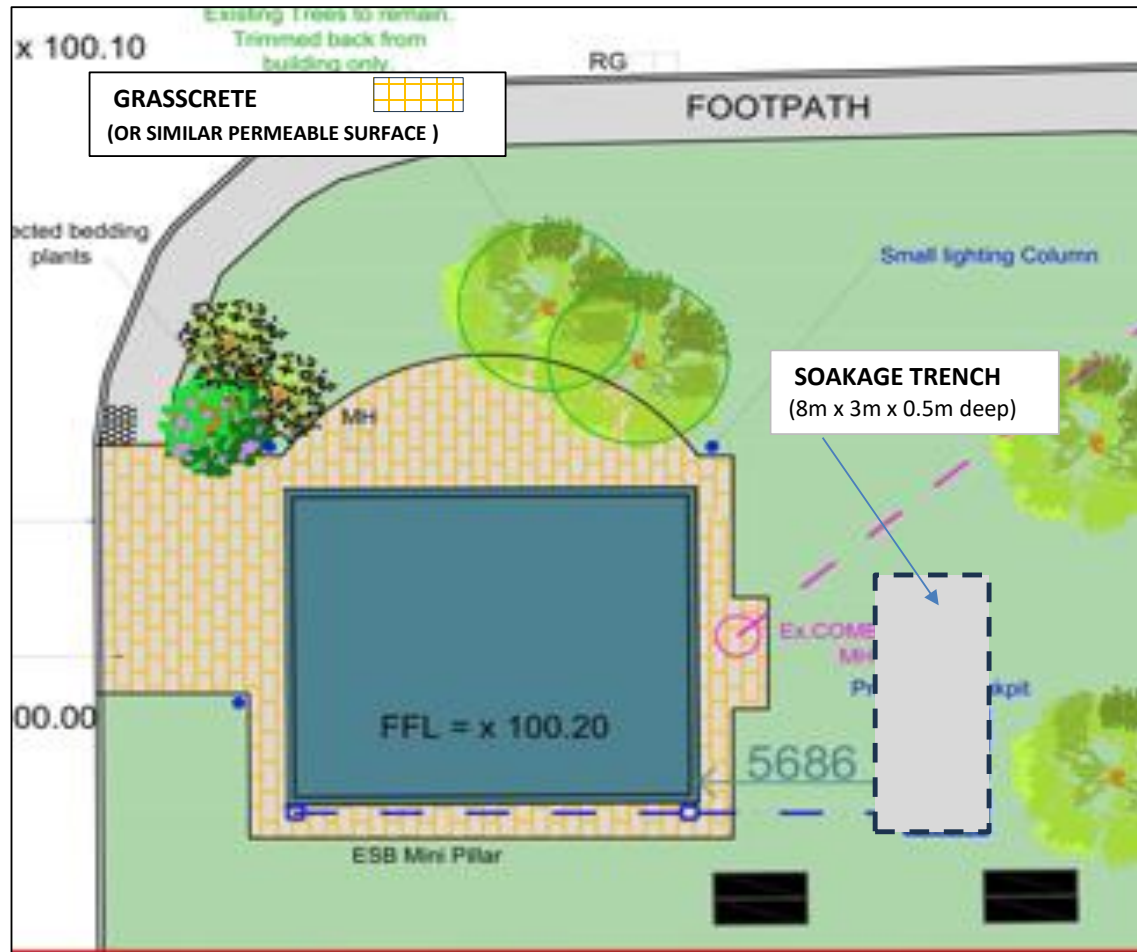
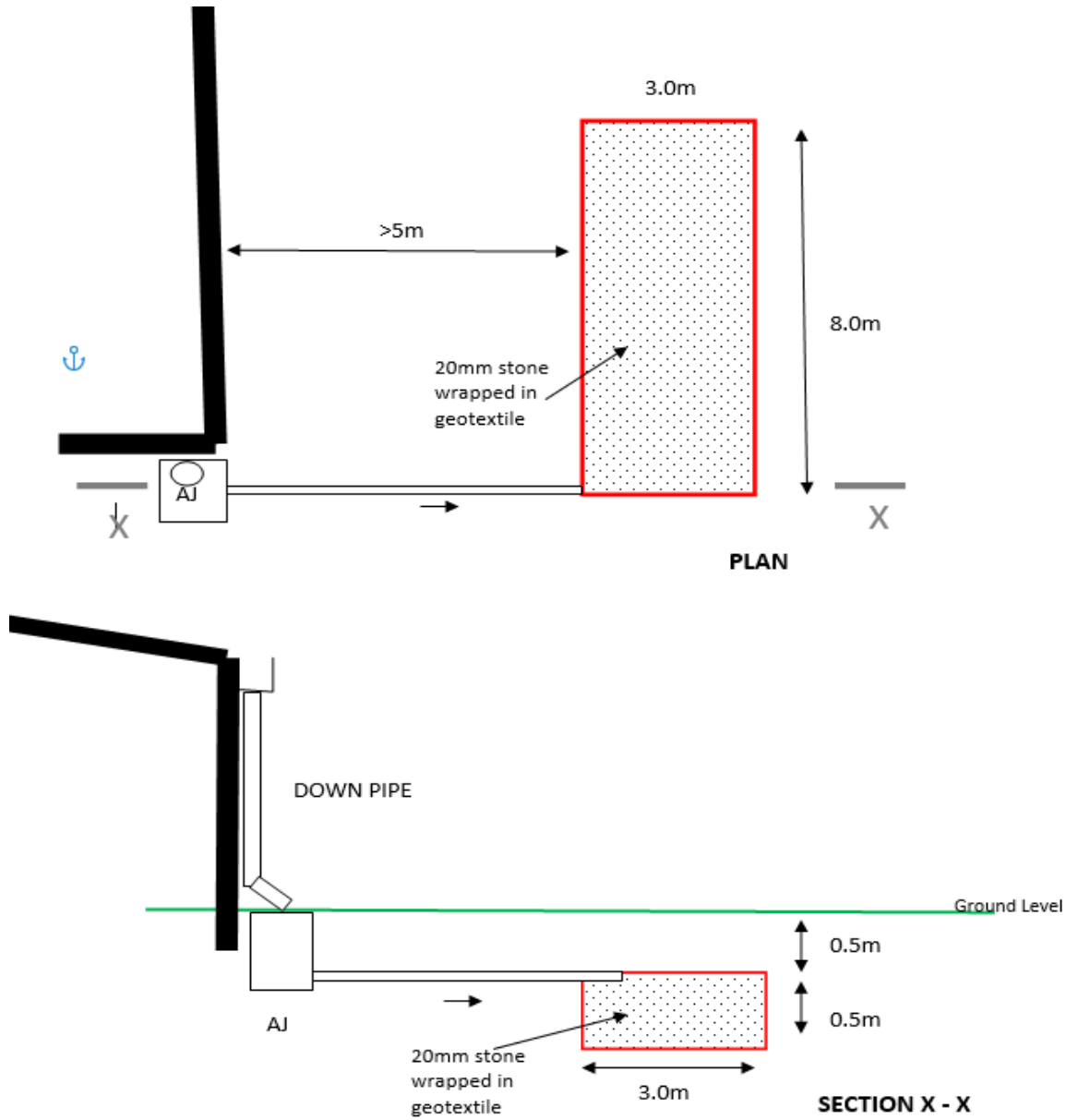


Fig. 2 - Proposed Soakage Trench Details (Schematic)



APPENDIX 1 - INFILTRATION TEST RESULTS AND PHOTOS

P. HERR & ASSOCIATES
CIVIL ENGINEERS & BUILDING SURVEYORS

BRE 365 INFILTRATION TEST AT MEADOW GROVE, DUNDALK, CO. LOUTH

Date: 03/07/26

Client: Louth County Council

Test Carried Out by: Louth County Council

Test Hole Location: Open Space/ Green Area to rear (east) of pumphouse

Dimensions of Test Hole: 1.7x 0.90m x 1.90m deep

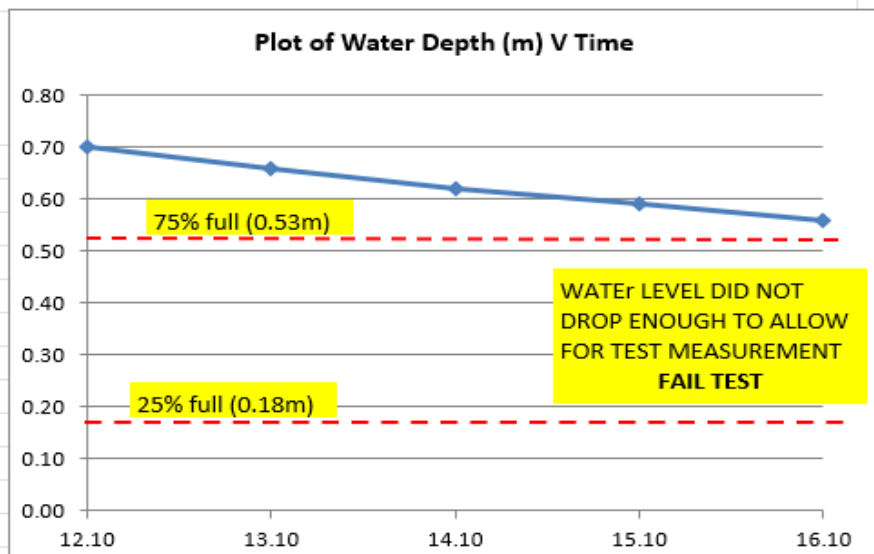
Description of sub-soil: Topsoil (0-0.25m), Silty Sand (0.25m - 1.2m) Sandy Silt (> 1.2m)

Depth to Groundwater: Some minor infiltration of water into base of test hole

Depth to Rock: None Encountered

Time
Depth of
water(m)

12.10	0.70
13.10	0.66
14.10	0.62
15.10	0.59
16.10	0.56



	TEST DATA & RESULTS
Length of Test Hole (m)	1.7
Width of Test Hole (m)	0.9
100% depth water (m)	0.7
75% depth (m)	0.53
25% depth (m)	0.18
Time to drop 75% to 25% (mins)	NA
Depth of water infiltrated during test period	NA
Vol of water infiltrated during test period (m3)	NA
Surface Area through which water infiltrates during test period (m2)	NA
Soil Infiltration Rate (m/min)	FAIL
Soil Infiltration Rate (m/sec)	FAIL



APPENDIX 2 - RAINFALL DATA - MEADOW GROVE, DUNDALK, CO.LOUTH

Met Éireann
Return Period Rainfall Depths
Coordinates: 54.002844, -6.391262

Duration	0.5 yrs	1 yrs	2 yrs	3 yrs	4 yrs	5 yrs	10 yrs	20 yrs	30 yrs	50 yrs	75 yrs	100 yrs	120 yrs
15 mins	4.3	5.9	6.7	7.9	8.7	9.3	11.4	13.6	15.1	17.1	18.9	20.2	21.1
30 mins	5.7	7.7	8.7	10.2	11.2	12	14.4	17.1	18.9	21.3	23.4	25	26.1
1 hour	7.5	10	11.3	13.1	14.3	15.3	18.3	21.5	23.6	26.5	29	30.9	32.2
2 hours	9.9	13	14.6	16.9	18.4	19.5	23.1	27.1	29.6	33	36	38.2	39.7
3 hours	11.7	15.2	17	19.6	21.3	22.5	26.6	30.9	33.7	37.5	40.8	43.3	44.9
4 hours	13.1	17	18.9	21.7	23.6	25	29.3	34	37	41.1	44.6	47.3	49
6 hours	15.4	19.9	22.1	25.2	27.3	28.8	33.7	38.9	42.2	46.7	50.6	53.5	55.4
9 hours	18.2	23.2	25.7	29.2	31.5	33.3	38.7	44.5	48.2	53.1	57.4	60.6	62.7
12 hours	20.4	25.9	28.6	32.5	35	36.8	42.7	49	52.9	58.2	62.7	66.2	68.4
18 hours	24	30.3	33.3	37.6	40.4	42.5	49.1	56	60.3	66.2	71.2	74.9	77.4
24 hours	27	33.8	37.1	41.8	44.8	47.1	54.1	61.6	66.2	72.5	77.8	81.8	84.4
2 days	33.3	41.2	44.9	50.3	53.7	56.2	64.1	72.3	77.4	84.2	90	94.3	97.1