PercolationTests.ie
Planning Assessments & Land Surveys

Tel: 087 6636 757 Email: percolationtests@gmail.com Web: www.percolationtests.ie

BRE Digest 365 Report.

Prepared on behalf of:

Fort Motors Ltd.

At:

Airton Road,
Tallaght,
Dublin 24.

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Scope of Report.

The findings of this report are the result of a desk study and geological field interpretation. Interpretations and conclusions included in the report are based on knowledge of the ground conditions following detailed investigations, as well as the regional soils, subsoils and bedrock geology, and the experience of the author. David Ryan has prepared this report in line with the best current practice and with all reasonable skill, care and diligence in consideration of the limits imposed by the survey techniques used and resources devoted to it by agreement with the client. The interpretive basis of the conclusions contained in this report should be taken into account in any future use of this report.

David Ryan accepts no responsibility for any matters arising if any recommendations contained in this document are not carried out, or are partially carried out, without further advice being obtained from David Ryan.

David Ryan Consulting Engineer Newtownmoyaghy, Kilcock, Co. Kildare. www.percolationtests.ie Tel: 087 6636757	BRE Digest 365 Test		Revision	1.00
	Job No:	606	Page:	C/01
Section: Fort Motors Ltd, Airton Road, Tallaght, D.24. Test 1.	Prepared By:	DR	Date:	14/02/2018

ALTERNATIVE SOAKAWAY SIZES

	trench soakaways		
width of trench *[mm]*:	450	600	900
required trench length *[m]*:	33.02	25.69	17.79
	ring soakaways		
diameter of ring *[mm]*:	1500	2100	2400
required pit diameter *[m]*:	1.97	1.97	1.97

** Based on effective depth and number of pits as in Soakaway Data table*

SUMMARY OF CALCULATIONS

critical design rainfall duration 't_{crit}' =	1440	*min*
required storage volume 'V_{req}' =	7.24	m^3
provided storage volume 'V_{prov}' =	7.93	m^3
utilisation factor =	**0.91**	***.OK***
required time to discharge 50% 't_{50}' =	20.06	*hours*
utilisation factor =	**0.84**	***.OK***

GENERAL DATA

site location: [redacted] Ireland

soakaway type: **infilled pit or trench**

impermeable area drained to soakaway 'A' *[m^2]* =	**151**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.27**
allowance for climate change:	**10%**

SOAKAWAY DATA

soakaway width 'W' [m] =	**5.52**
soakaway length 'L' [m] =	**3.36**
total depth from ground level 'D_b' *[m]* =	**0.90**
depth to drain invert level 'D_d' *[m]* =	**0.45**
soakaway effective depth 'D_{eff}' *[m]* =	0.45
free volume in infill aggregate *[%]* =	**95**

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base: **100%**

available on-site infiltration test results: (●) Yes ( ) No

use soakage trial pit table below

internal surface area of trial pit 'a_{p50}' [m^2] =	2.44
storage volume between 75-25% 'V_p' [m^3] =	0.29
time for water to fall from 75-25% 't_p' [min] =	808.00
soil infiltration rate 'f' [m/s] =	2.43E-06

SOAKAGE TRIAL PIT DATA

soakage trial pit width 'W_t' *[m]* =	**0.90**
soakage trial pit length 'L_t' *[m]* =	**1.60**
total depth from ground level 'D_{tb}' *[m]* =	**0.90**
depth to pipe invert level 'D_{tp}' *[m]* =	**0.50**
soakage trial pit effective depth 'D_{teff}' *[m]* =	0.40
free volume in infill aggregate *[%]* =	**100**

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

rainfall duration *[min]*	rainfall factor Z1	M5-D rainfalls *[mm]*	M30-D Z2	M30-D rainfalls *[mm]*	M30-D inflow *[m^3]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	outflow from soakaway *[m^3]*	required storage *[m^3]*
5	0.33	5.61	1.45	8.92	1.35							0.02	1.33
10	0.48	8.16	1.47	13.21	1.99							0.03	1.96
15	0.58	9.86	1.49	16.15	2.44							0.05	2.39
30	0.76	12.92	1.49	21.20	3.20							0.10	3.10
60	1.00	17.00	1.49	27.78	4.19							0.20	4.00
120	1.27	21.59	1.47	34.89	5.27							0.40	4.87
240	1.64	27.88	1.45	44.48	6.72							0.79	5.93
360	1.88	31.96	1.44	50.54	7.63							1.19	6.45
600	2.24	38.08	1.42	59.44	8.98							1.98	7.00
1440	3.10	52.70	1.37	79.34	11.98							4.74	**7.24**

** Z2 is a growth factor from M5 rainfalls*

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS

water level measurement N°:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time *[min]* =	0	805																	
	depth to water *[m]* =	0.60	0.80																	
Soakage Trial 2	time *[min]* =	0	805																	
	depth to water *[m]* =	0.60	0.80																	
Soakage Trial 3	time *[min]* =	0	808																	
	depth to water *[m]* =	0.60	0.80																	

David Ryan Consulting Engineer Newtownmoyaghy, Kilcock, Co. Kildare. www.percolationtests.ie Tel: 087 6636757	BRE Digest 365 Test		Revision	1.00
	Job No:	606	Page:	C/01
Section: Fort Motors Ltd, Airton Road, Tallaght, D.24. Test 2.	Prepared By:	DR	Date:	14/02/2018

ALTERNATIVE SOAKAWAY SIZES

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REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

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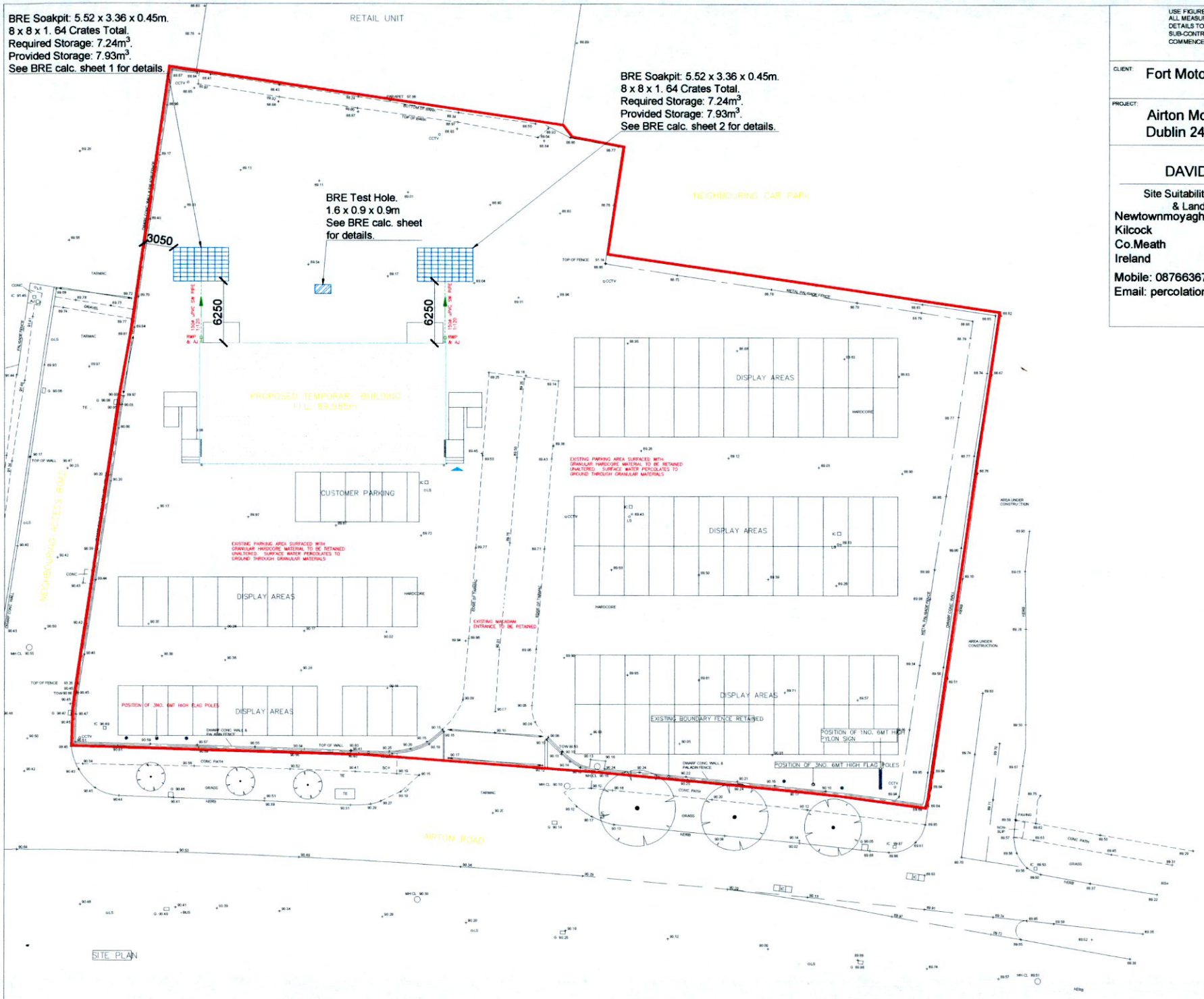
	depth to water *[m]* =	0.60	0.80																	

BRE Soakpit: 5.52 x 3.36 x 0.45m.
8 x 8 x 1. 64 Crates Total.
Required Storage: 7.24m^3.
Provided Storage: 7.93m^3.
See BRE calc. sheet 1 for details.

BRE Soakpit: 5.52 x 3.36 x 0.45m.
8 x 8 x 1. 64 Crates Total.
Required Storage: 7.24m^3.
Provided Storage: 7.93m^3.
See BRE calc. sheet 2 for details.

BRE Test Hole.
1.6 x 0.9 x 0.9m
See BRE calc. sheet
for details.



SITE PLAN

USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING FROM DRAWINGS ALL MEASUREMENTS, HEIGHTS, AREAS, LEVELS AND CONSTRUCTIONAL DETAILS TO BE CHECKED AND VERIFIED BY THE BUILDING CONTRACTOR, SUB-CONTRACTOR OR DIRECT LABOUR CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS OR AGREEMENTS.

CLIENT: Fort Motors Ltd.

PROJECT: Airton Motors, Tallaght, Dublin 24.

DAVID RYAN
Site Suitability Assessments & Land Surveys
Newtownmoyaghy
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Mobile: 0876636757
Email: percolationtests@gmail.com

DRAWN BY:	SCALE: 1:500
ORIGIN DATE: 14/02/2018	DRAWING NUMBER:

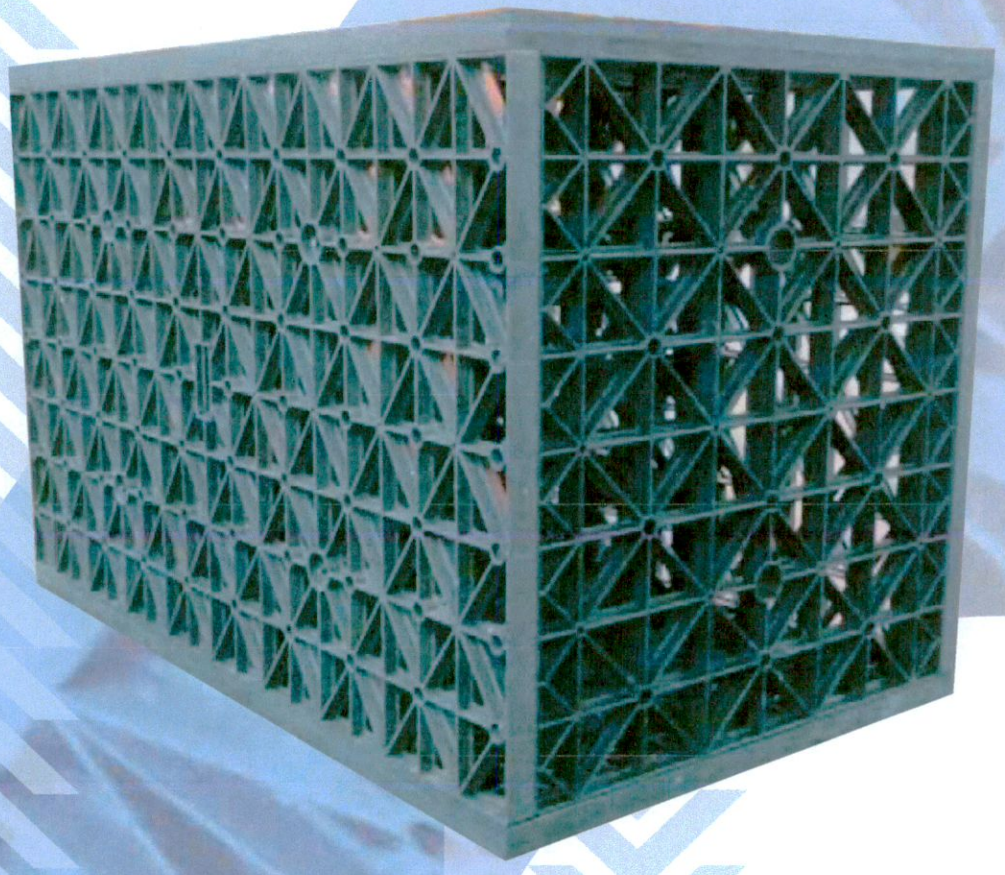
FOR PLANNING PURPOSES ONLY

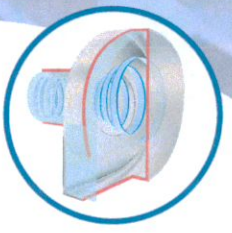
Modular Geo-Void Systems

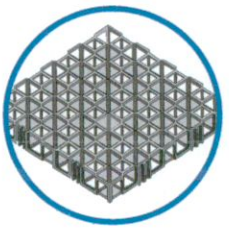
Total Water Management

ESS EcoCell

Ecological Tank Systems







ENVIRONMENTAL SUSTAINABLE SOLUTIONS LTD

Environmental Sustainable Solutions

Welcome to Environmental Sustainable Solutions; specialist suppliers and designers of geocomposites and water re-use systems. Environmental Sustainable Solutions can help you achieve innovative results for all your requirements:-

- Stormwater Management
- Gas Barrier Protection
- Stormwater Attenuation
- Contaminated Land Development
- Stormwater Drainage
- Ground Stabilisation
- Rainwater Recycling Management
- Structural Waterproofing
- Gas Venting Systems
- Damp-proofing projects

Over the last 12 years Environmental Sustainable Solutions, and associated companies, have designed and installed thousands of water recycling, drainage and attenuation tank systems for schools, car parks, retail parks, offices and sports arenas throughout Ireland, UK, Europe and the Middle East.

Our wide range of environmental protection products, surface water drainage modules and modular water storage tank systems provides maximum design flexibility for engineers and architects working on even the most demanding of storm water storage and recycling projects.

Stormwater Management And Design

Stormwater is the phrase used to describe the excess rainwater that flows from rooftops, roads, car parks and other buildings. This water can contain many pollutants picked up from roofs and highways. In extreme weather conditions sudden heavy downpours of rain can cause major environmental disasters. Using our Rainmanager products; stormwater can not only safely be removed, but it can be stored and recycled for commercial and domestic use.

How it works - ESS Attenuation Tank

Stormwater enters the attenuation tank via the inlet manhole, which incorporates a silt collection sump and a galvanised leaf collection basket. Water passes through the tank and exits through the outlet manhole, which contains an AquaBrake flow control device.
This flow control device regulates the release rate of water from the tank, and in so doing, enables the tank to fill. As a result of water entering the tank at a greater rate than it can exit, the void space then fills with water. While the tank fills, air is vented from the tank.
The Inlet/Outlet pipe will act as a flushing channel. This perforated pipe is wrapped completely in High Flow Filtering Geotextile, which prevents silt entering the block area. As the tank continues to empty at a pre-determined rate, air re-enters the tank via the same air vent system. **The roof of the completed tank must be lower than the lowest gully trap on site.**

Benefits

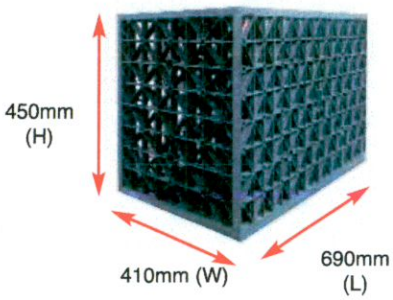
- 100% sealed tank
- Full installation service provided
- 12 years experience as market leader
- Quick installation – reduce site access delays
- Increased land usage – tanks are sub surface
- Economical – generally more cost efficient than any other equivalent sealed tank
- Cost effective – reduced costs for excavation and disposal of material
- Modular – easy to create any shape
- Strong – designed to support shear loading
- Lightweight – no cranes required
- Determinate volume – one cubic metre of matrix tank modules contain 950 litres of water, whereas stone fill will only provide 300 litres of storage per cubic metre.

Soakaway

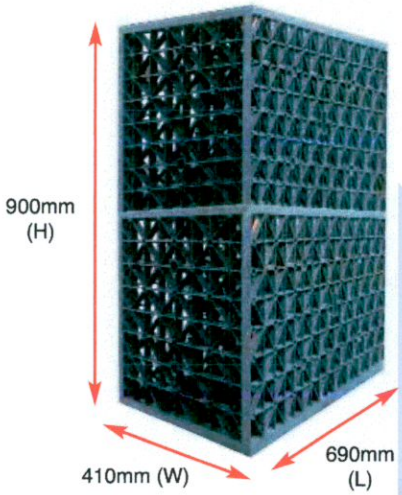
The soakaway is normally best built as a long narrow structure.
The inlet pipe comes in at roof level and faces downwards so that the water can percolate into the tank.
The blocks are wrapped in Geotextile, to protect them and also to keep clay from filling up the void.
An air vent pipe is installed on the highest point with a cowl on top or vented back to an inlet manhole.
There is no outlet from a soakaway, therefore no flow control unit is required.

Stormwater Storage Tank

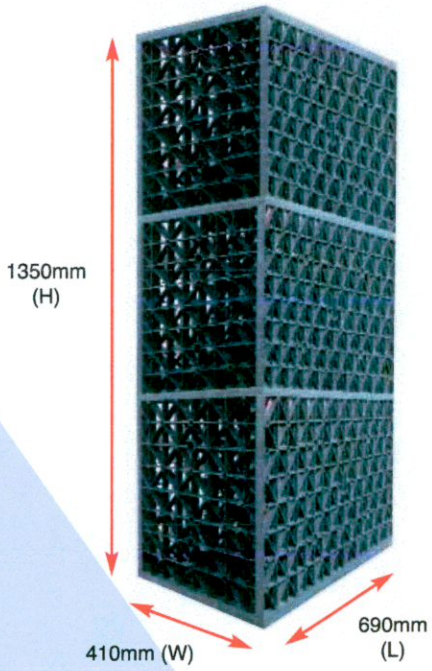
SUITABLE FOR USE UNDER:
- **Roadways**
- **Car parks**
- **Green areas**



Single
8 Modules/m³
Flowrate - 2300 l/min



Double
4 Modules/m³
Flowrate - 4600 l/min



Triple
2.6 Modules/m³
Flowrate - 6900 l/min

Notes:
Blocks must be positioned in the correct orientation.
See opposite above

SPECIFICATION (SINGLE)

Weight (maximum)		9.17kg
Crush Strength (up to)		400kN/m²
Lateral Strength		80kN/m²
Minimum Cover	(green areas)	500mm
	(trafficked areas)	650mm
Maximum Cover		3m
Material		Polypropylene
Void Ratio (Internal)		>95%

Design Requirements:

Tank storage capacity (m³)
Depth restrictions
Location (Road, Car Park, Green Area)
Design constraints on site

A set of loading calculations specific to the site requirement will be done by ESS and submitted on all tanks

DESIGN CRITERIA

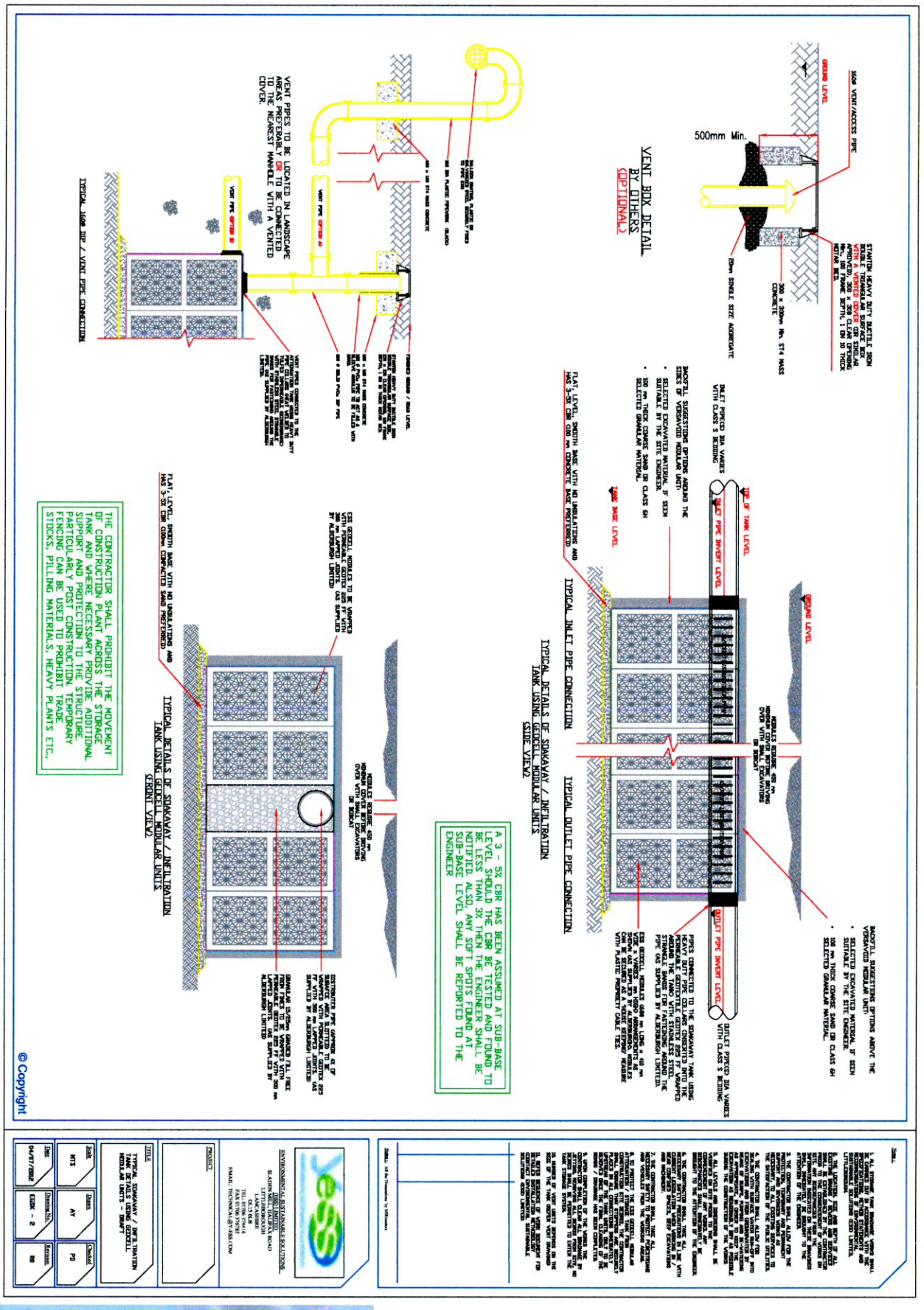
The attenuation tank is constructed using matrix module blocks. These blocks can take passing loads of up to 40 tonnes/m². The void ratio of each block is 95%. The blocks are made from polypropylene.

The tank is sealed with a layer of Tuflex membrane, which is fully welded together to form a 100% seal. All pipe penetrations are fully sealed to the membrane. The Tuflex membrane is protected by a layer of heavy duty protection geotextile, to prevent damage from construction or backfilling. A number of air extraction vents/flushing points are placed in the roof of the tank.

Note:
It is vital that the underground tanks are fully sealed, otherwise ground water and silt particles may enter the void space and use up capacity. Preferably, the base of the tank should be 500mm above the ground water level. Otherwise ground water relief measures should be implemented.

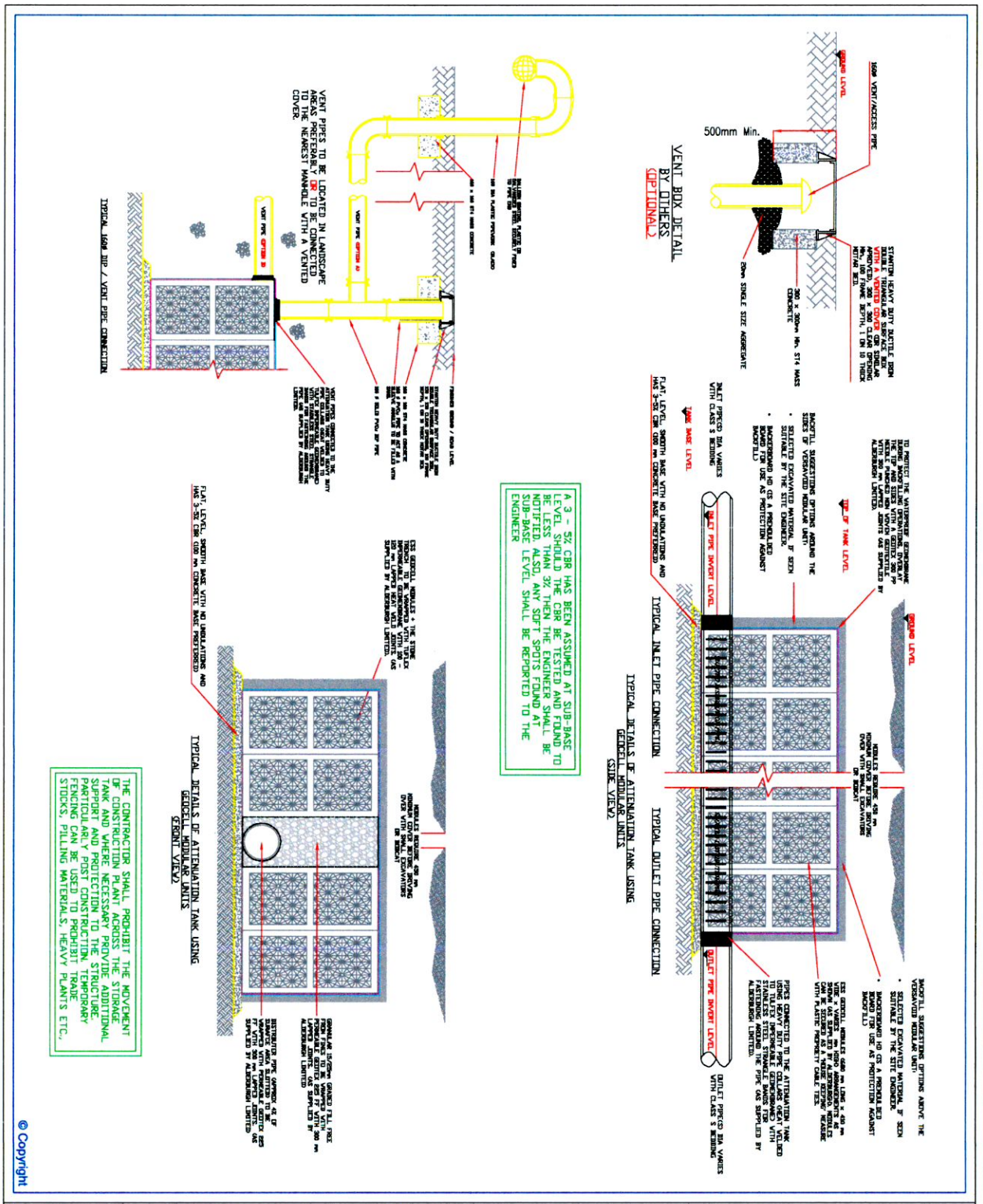
Infiltration System

Typical arrangement using ESS Ecological Tank System for water quality



Retention System

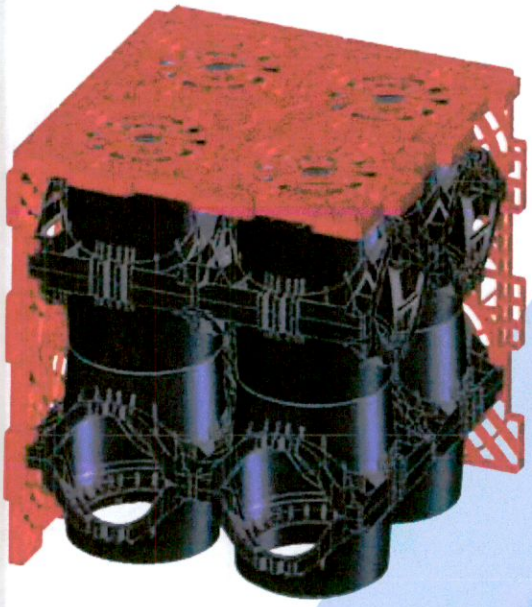
Typical on site collection and recycling arrangement using ESS Ecological Tank System



Infiltration Swales & Underground Channels

Please refer to separate data sheets for the following products

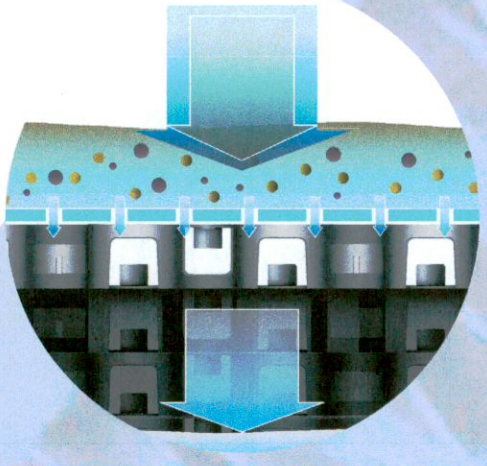
Modular VersaVoid System



Benefits

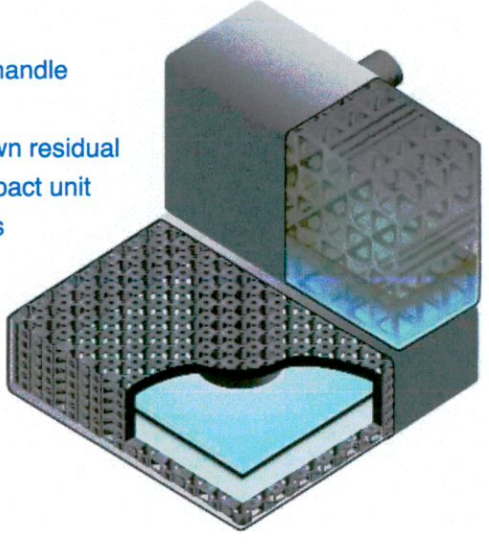
- **Quick**
  Reduce site access delays
- **Lightweight**
  No cranes required
- **Strong**
  Designed for maximum anticipated loads
- **Maintenance Free Tank**
  All debris and sediment is pre-filtered
- **Determinate Volume**
  One cubic metre of Tank modules contain 950 litres of water
- **Cost Effective**
  Reduces excavation and disposal by up to 5 x compared with conventional soak wells
- **High Infiltration**
  98% void surface area
- **Totally Modular**
  For greatest flexibility designed to cope. Units start at 300mm deep for shallow inverts to 3050mm+ deep in 250mm increments.
- **Designed by Engineers for Engineers** – to specify with confidence.
- **Designing out Problems**
  with such systems (access, maintenance, loading etc.)
- **Designing in Answers**
  to design requirements.
- **Total 3D Access**
  For total maintenance with total confidence.
- **Structurally Designed**
  with built in safety factor to carry all loads with complete confidence.
  16 clear vertical access chambers per m2.
- **Total Void Creation**
  With the greatest strength from any modular systems.

Oil Filtration

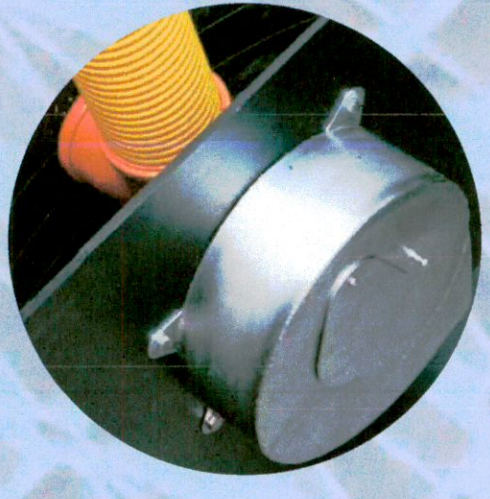


Benefits

- Source control designed to handle catastrophic spillages
- Capture, filter and break down residual hydrocarbons - all in one compact unit
- Self-maintaining ecosystems decompose hydrocarbon compounds and clean filters
- Load bearing, modular components provide up to 200t/m² loading capacity

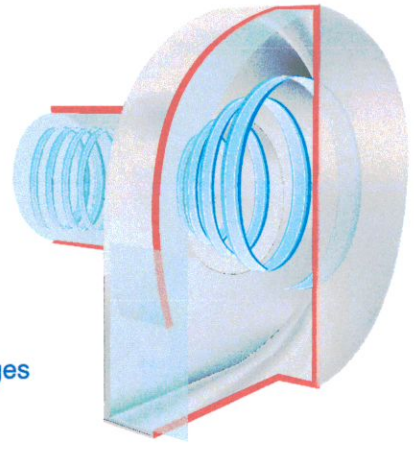


Aquabrake



Benefits

- **Cost Savings**
  Can reduce upstream storage requirements by up to 30%.
- **Durability**
  Corrosion resistant stainless steel.
- **No energy requirements**
  Self-activating solution with no moving parts.
- **Clog Resistant**
  AquaBrake design prevents blockages likely to occur in traditional orifices.
- **Flexible Design**
  Several options for attachment available.



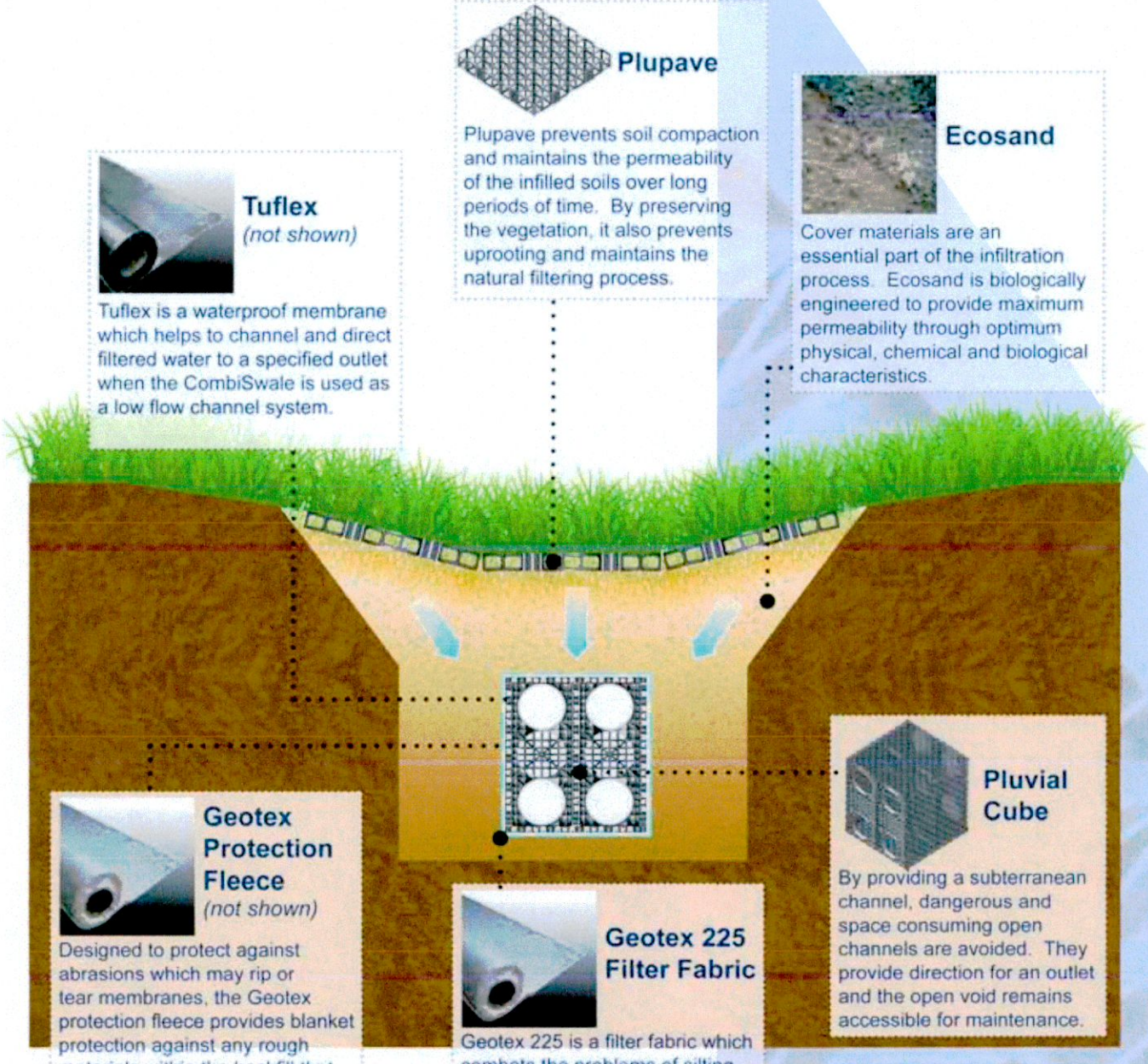
The ESS CombiSwale

Please refer to separate data sheets for the following products

Water Sensitive Urban Channels

Surface and Sub-Surface Water Treatment

By combining surface and sub-surface channeling and treatment solutions, ESS has created the ideal in bioswale water management.
The CombiSwale system includes the addition of permeable sub-surface waterways that further restore water quality and recharge the natural environment. The sub-surface ESS channel system provides a unique way of working with nature to solve the enormous problems currently associated with open concrete channels and swales.



Plupave

Plupave prevents soil compaction and maintains the permeability of the infilled soils over long periods of time. By preserving the vegetation, it also prevents uprooting and maintains the natural filtering process.

Ecosand

Cover materials are an essential part of the infiltration process. Ecosand is biologically engineered to provide maximum permeability through optimum physical, chemical and biological characteristics.

Tuflex
(not shown)

Tuflex is a waterproof membrane which helps to channel and direct filtered water to a specified outlet when the CombiSwale is used as a low flow channel system.

Pluvial Cube

By providing a subterranean channel, dangerous and space consuming open channels are avoided. They provide direction for an outlet and the open void remains accessible for maintenance.

Geotex Protection Fleece
(not shown)

Designed to protect against abrasions which may rip or tear membranes, the Geotex protection fleece provides blanket protection against any rough materials within the backfill that may cause the membrane to tear. Only needed when Tuflex is used.

Geotex 225 Filter Fabric

Geotex 225 is a filter fabric which combats the problems of silting and clogging, by allowing water to pass into the sub-surface system, but preventing the movement of subsoils.

All products are manufactured to the highest quality, being subject to rigid quality control. However, the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. ESS Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products. All transactions are subject to our standard condition of sale, copies of which are available on request.

To find out more about these systems and products please contact us

Environmental Sustainable Solutions Ltd

Sladen Mill, Halifax Road, Littleborough,
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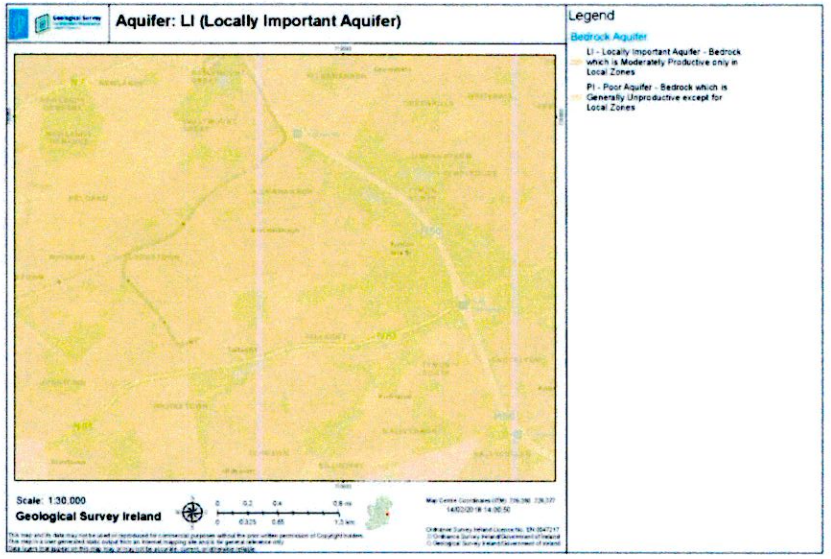
An Alderburgh Group Company

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 311788, Northing: 234101,

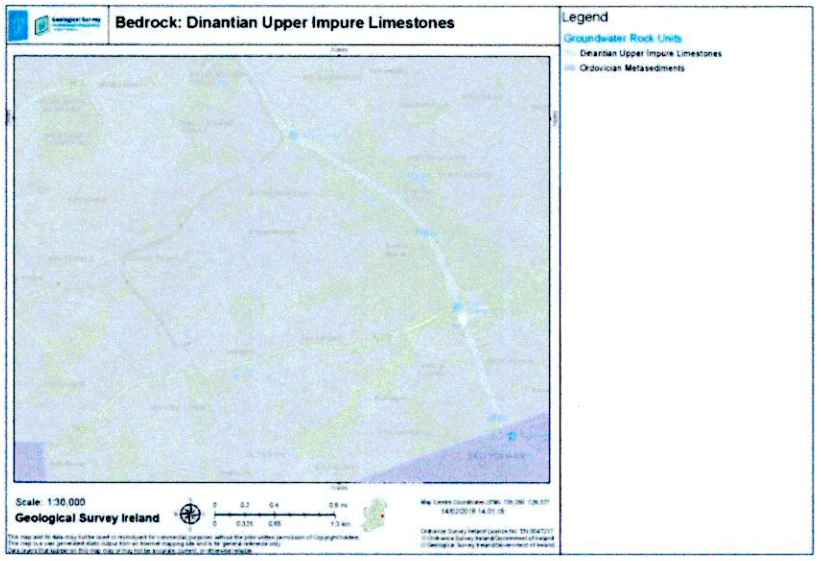
	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.5,	4.1,	5.0,	5.7,	6.2,	7.8,	9.7,	10.9,	12.7,	14.4,	15.6,	17.6,	19.1,	20.4,	N/A ,
10 mins	3.4,	4.9,	5.7,	7.0,	7.9,	8.6,	10.9,	13.5,	15.2,	17.8,	20.0,	21.8,	24.5,	26.7,	28.5,	N/A ,
15 mins	4.0,	5.8,	6.7,	8.2,	9.3,	10.1,	12.8,	15.9,	17.9,	20.9,	23.5,	25.6,	28.9,	31.4,	33.5,	N/A ,
30 mins	5.2,	7.5,	8.7,	10.6,	11.9,	12.9,	16.2,	19.9,	22.5,	26.0,	29.2,	31.7,	35.5,	38.5,	41.0,	N/A ,
1 hours	6.9,	9.8,	11.3,	13.7,	15.2,	16.5,	20.5,	25.1,	28.1,	32.4,	36.2,	39.2,	43.7,	47.3,	50.2,	N/A ,
2 hours	9.1,	12.8,	14.7,	17.6,	19.6,	21.1,	26.0,	31.6,	35.2,	40.3,	44.9,	48.4,	53.8,	58.0,	61.5,	N/A ,
3 hours	10.8,	14.9,	17.1,	20.4,	22.6,	24.3,	29.9,	36.1,	40.2,	45.9,	50.9,	54.8,	60.8,	65.4,	69.2,	N/A ,
4 hours	12.1,	16.7,	19.1,	22.7,	25.1,	26.9,	33.0,	39.7,	44.1,	50.2,	55.7,	59.9,	66.3,	71.2,	75.3,	N/A ,
6 hours	14.2,	19.4,	22.2,	26.3,	29.0,	31.1,	37.9,	45.4,	50.3,	57.1,	63.1,	67.8,	74.8,	80.3,	84.8,	N/A ,
9 hours	16.7,	22.7,	25.8,	30.5,	33.5,	35.9,	43.5,	51.9,	57.4,	65.0,	71.6,	76.7,	84.5,	90.5,	95.4,	N/A ,
12 hours	18.8,	25.4,	28.8,	33.8,	37.2,	39.7,	48.0,	57.1,	63.0,	71.1,	78.3,	83.8,	92.1,	98.5,	103.8,	N/A ,
18 hours	22.1,	29.6,	33.5,	39.2,	43.0,	45.9,	55.1,	65.3,	71.8,	80.9,	88.8,	94.9,	104.1,	111.1,	116.9,	N/A ,
24 hours	24.9,	33.1,	37.3,	43.5,	47.7,	50.8,	60.8,	71.8,	78.9,	88.6,	97.1,	103.6,	113.4,	121.0,	127.1,	148.3,
2 days	30.6,	39.9,	44.7,	51.6,	56.1,	59.5,	70.3,	82.0,	89.5,	99.7,	108.5,	115.2,	125.4,	133.1,	139.4,	160.8,
3 days	35.3,	45.5,	50.6,	58.0,	62.9,	66.5,	78.0,	90.4,	98.2,	108.9,	118.1,	125.1,	135.6,	143.5,	150.0,	171.9,
4 days	39.4,	50.3,	55.8,	63.7,	68.8,	72.7,	84.8,	97.7,	105.9,	117.0,	126.5,	133.7,	144.5,	152.7,	159.4,	181.9,
6 days	46.5,	58.7,	64.8,	73.5,	79.1,	83.3,	96.4,	110.4,	119.2,	131.0,	141.2,	148.8,	160.2,	168.8,	175.8,	199.3,
8 days	52.8,	66.1,	72.7,	82.0,	88.0,	92.6,	106.6,	121.4,	130.7,	143.2,	153.9,	161.9,	173.8,	182.8,	190.1,	214.6,
10 days	58.6,	72.9,	79.9,	89.8,	96.2,	101.0,	115.8,	131.4,	141.2,	154.2,	165.4,	173.7,	186.2,	195.5,	203.0,	228.4,
12 days	64.0,	79.1,	86.6,	97.0,	103.7,	108.8,	124.3,	140.6,	150.8,	164.4,	176.0,	184.6,	197.5,	207.1,	214.9,	241.0,
16 days	73.9,	90.7,	98.8,	110.3,	117.6,	123.1,	139.9,	157.5,	168.4,	182.9,	195.3,	204.5,	218.1,	228.3,	236.6,	264.1,
20 days	83.1,	101.3,	110.1,	122.4,	130.2,	136.1,	154.1,	172.7,	184.3,	199.7,	212.7,	222.4,	236.8,	247.5,	256.1,	284.9,
25 days	93.9,	113.6,	123.1,	136.4,	144.9,	151.1,	170.4,	190.3,	202.6,	219.0,	232.7,	243.0,	258.1,	269.4,	278.5,	308.7,

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

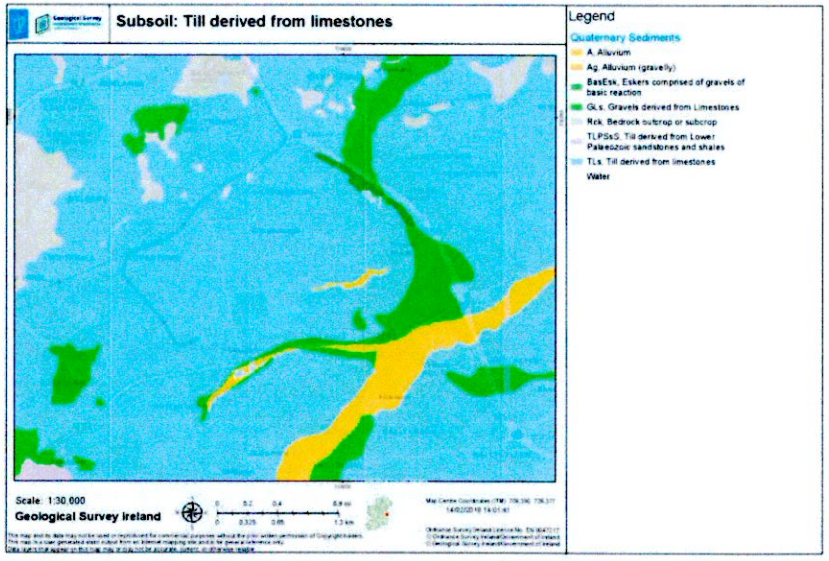
Aquifer Map



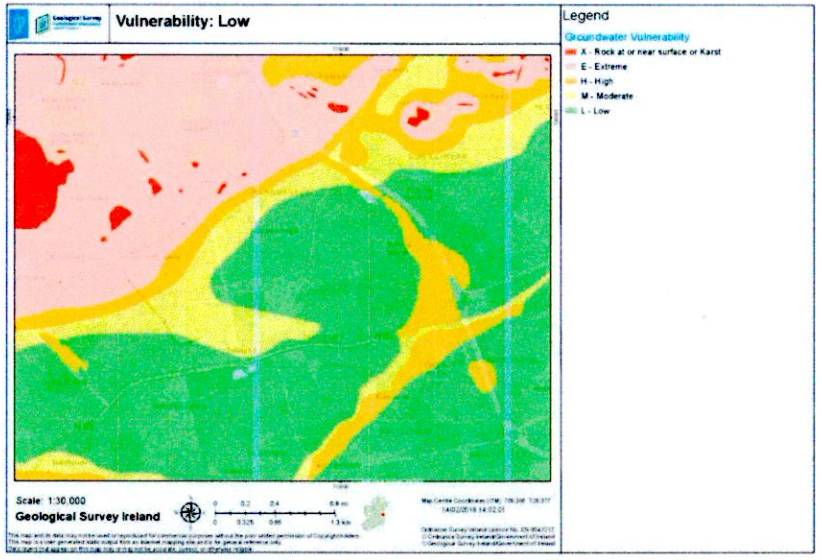
Bedrock Map



Subsoil Map



Vulnerability Map



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