H+H Drainage

Tremayne, Mortimer's Cross, Herefordshire HR6 9TG
Phone: 0845 2008421. Mobile: 07837 628764

Surface and Foul Water Drainage Strategy

The Proposed Barn Conversion at Kempley, Much Marcle, Herefordshire HR8 2NR

27th December 2022

Prepared by Alex Taysum-Hunter

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SUMMARY OF REPORT

The purpose of the work is to demonstrate that foul and surface water drainage arrangements are sustainable and comply with the National Planning Policy Framework.

The site is located within the River Leadon Catchment. The River Leadon is main tributary of the River Severn.

The key outcomes of the work are to ensure that surface water and foul water from the proposed development do not have an adverse effect on the River Leadon or the surrounding area. Wherever possible, the proposed works must improve the current status of the environment and enhance the surrounding habitat.

This report outlines the design of the surface water and foul water strategy, including sewage treatment plants, drainage fields, attenuation and soak-aways.

Outline of Foul and Surface Water Strategy

Foul and surface water at the site are to be managed separately. Surface water runoff is to be managed by the methods outlined in the Surface Water Drainage Strategy and Foul water is to be managed by the methods outlined in the Foul Water Drainage Strategy.

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Site Location and conditions

Kemply, Much Marcle, Herefordshire HR8 2NR

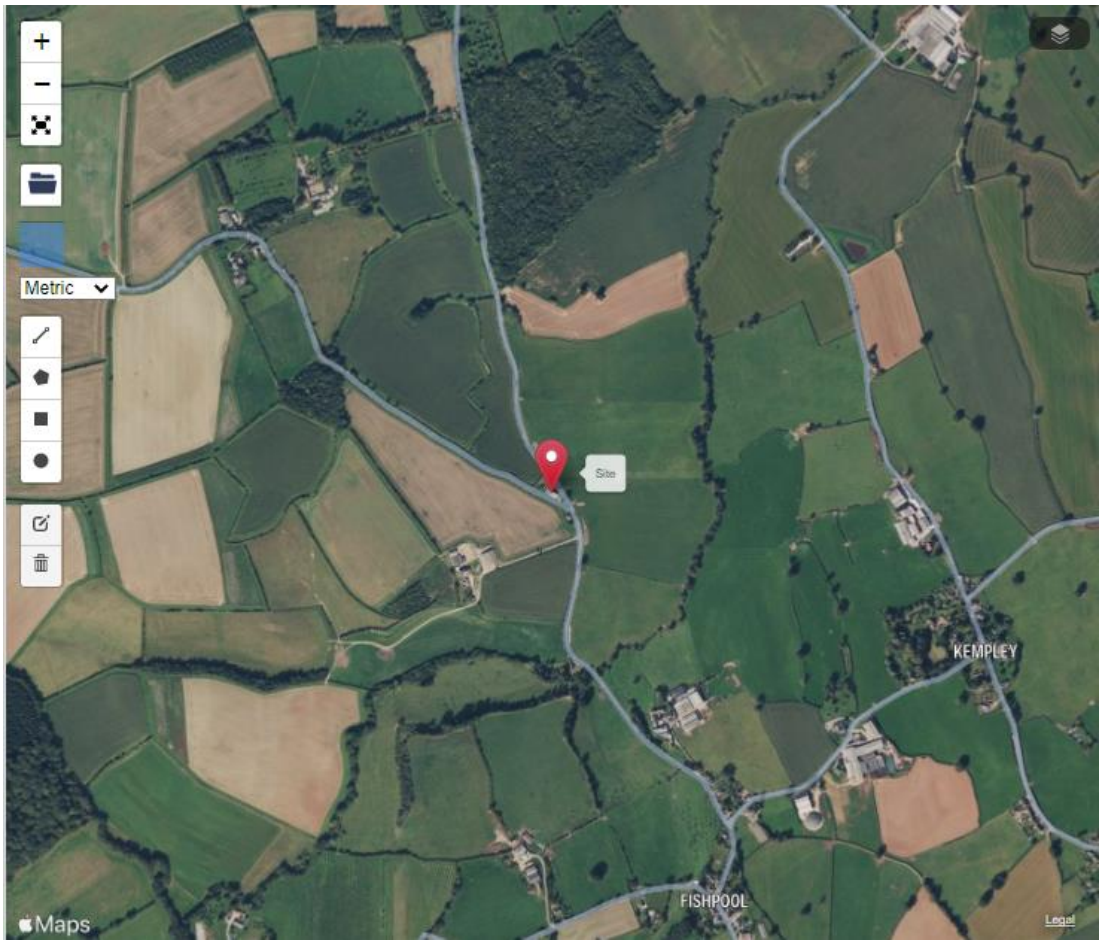
SO 66192 30014

X (Easting): 366192
Y(Northing): 230014

Latitude: 51.967564
Longitude: -2.493501

What3words: inflame.brotherly.goods

Site Location:



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The test area is currently laid to grazing for horses.

As previously noted, the proposed barn conversion is located in the River Leadon Catchment and is just West of the Kemply Brook.

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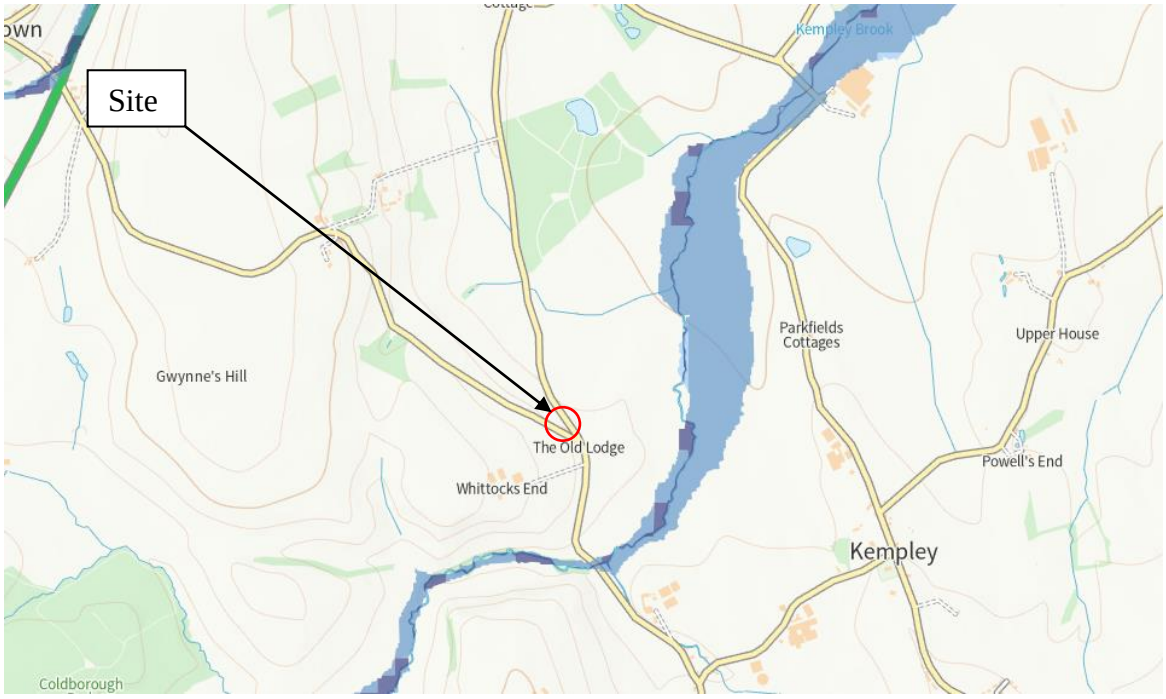
As can be seen below, there is no recorded fluvial flooding at this site. Due to the topography of the local area.



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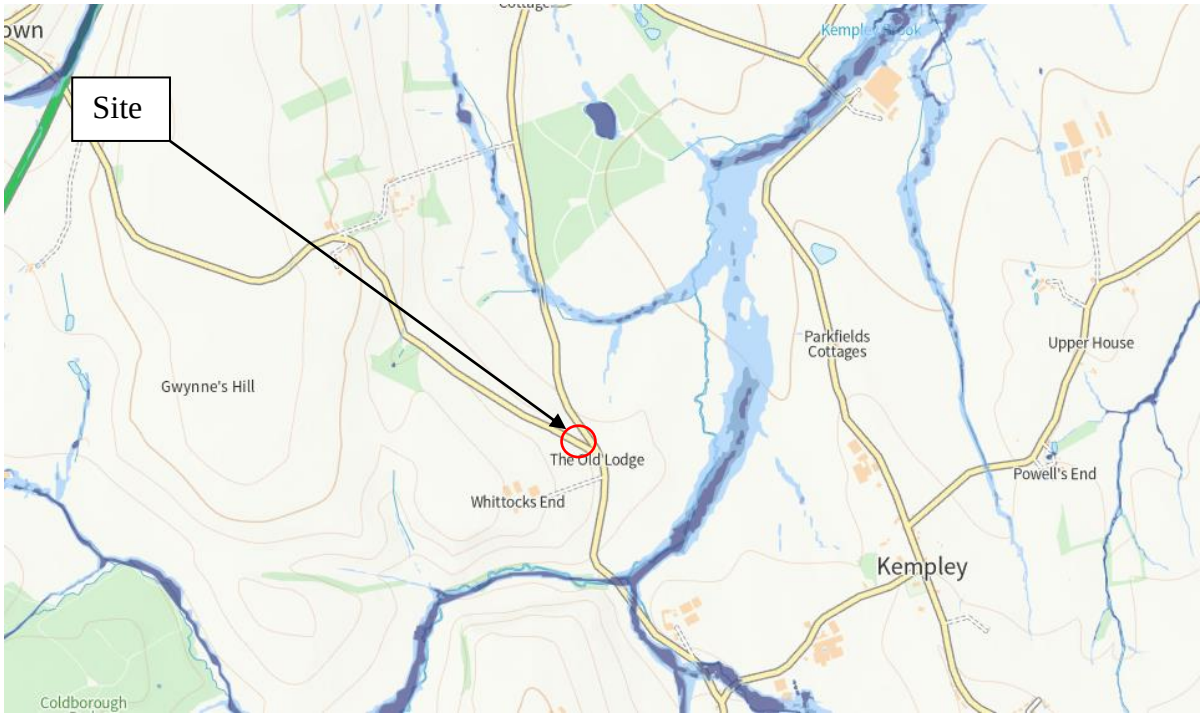
There is no surface water flooding recorded in the surrounding area. Due to the topography of the area.



Neither the fluvial nor surface water flooding affects this site due to the topography of the local area. The topography prevents fluvial flooding and surface water flooding of the site and test area.

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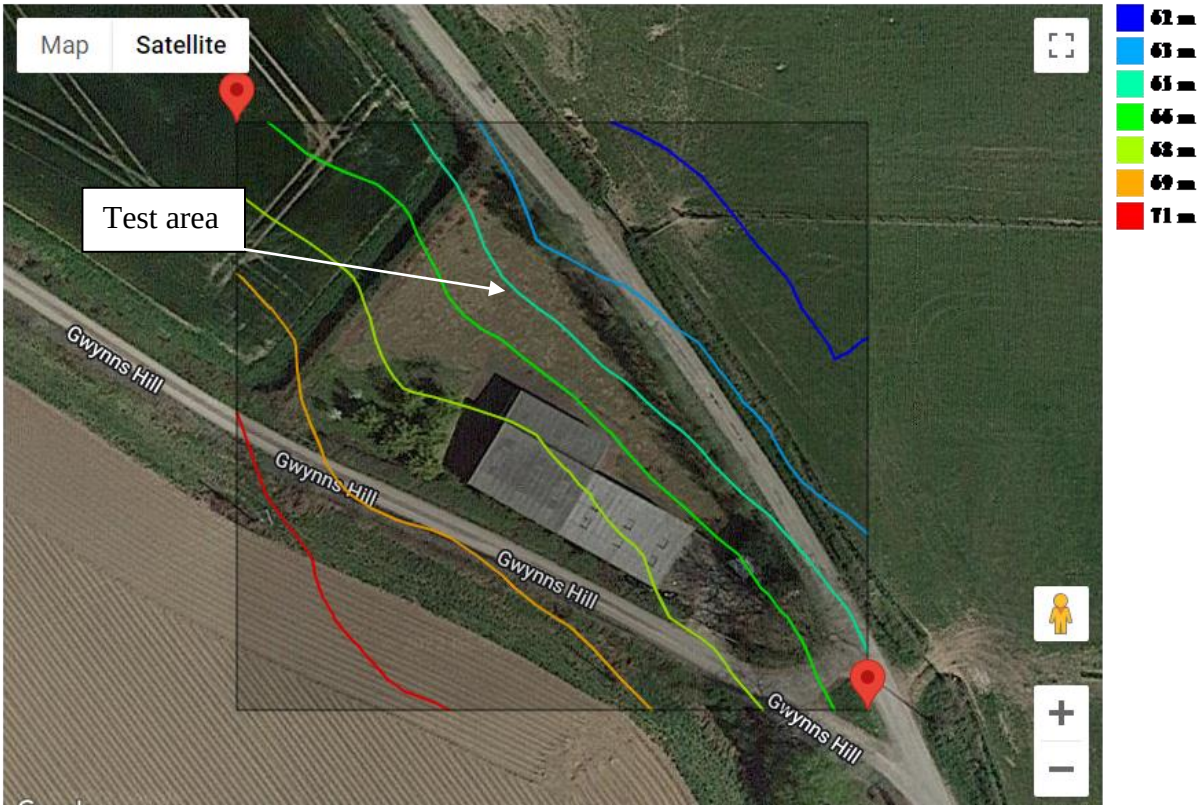
As can be seen below, the topography of this site slopes towards the Northeast. As such, the percolation tests and the infiltration test were completed downslope of the proposed dwelling.



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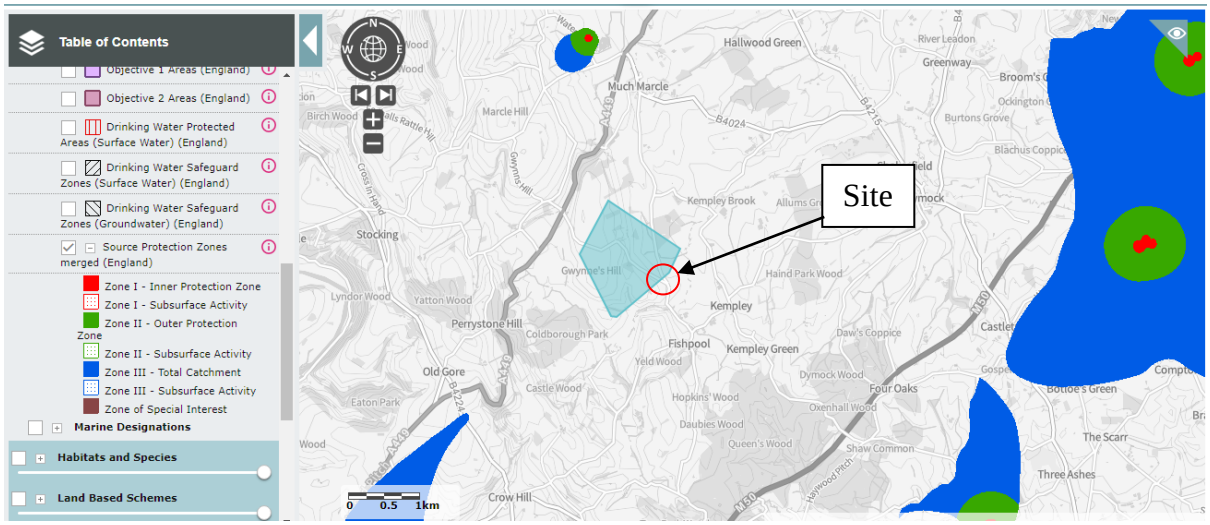
There are no SPZ1 or SPZ2 areas highlighted within 1km of this site.

There is an abstraction point for potable water in the at the dwelling to the South of the site; however, this is more than 110m away from the proposed drainage field.



The site is located within a Nitrate Vulnerable Zone (NVZ).

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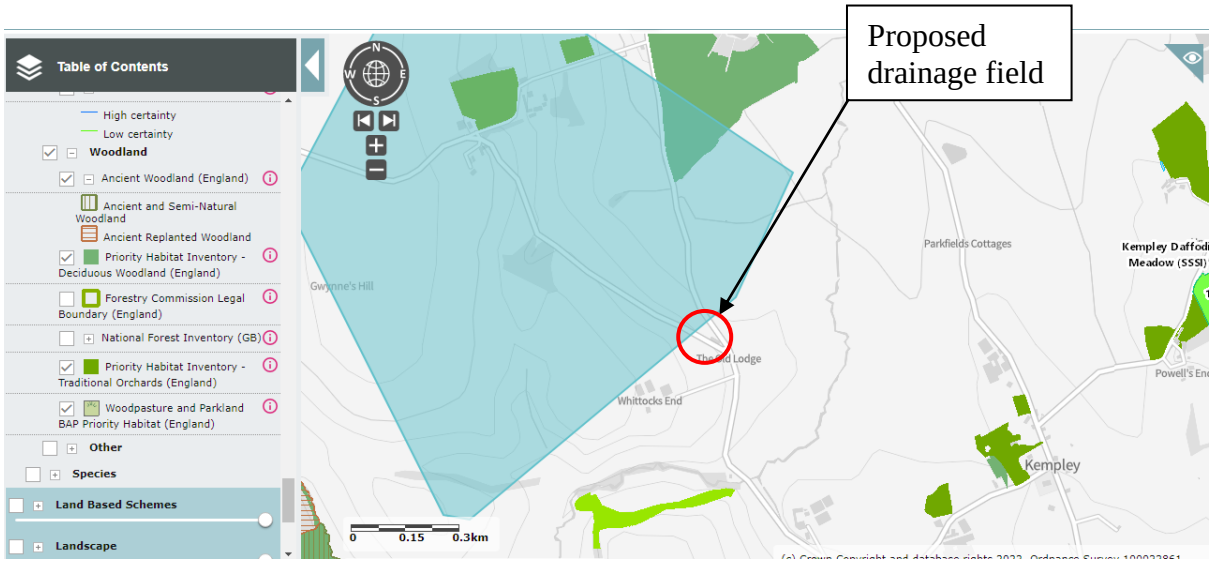
As can be seen in the following map, there are no Priority Habitats within 50m of the test area.

The following map also shows that there are no SSSI's or SAC's within 200m of the test area.



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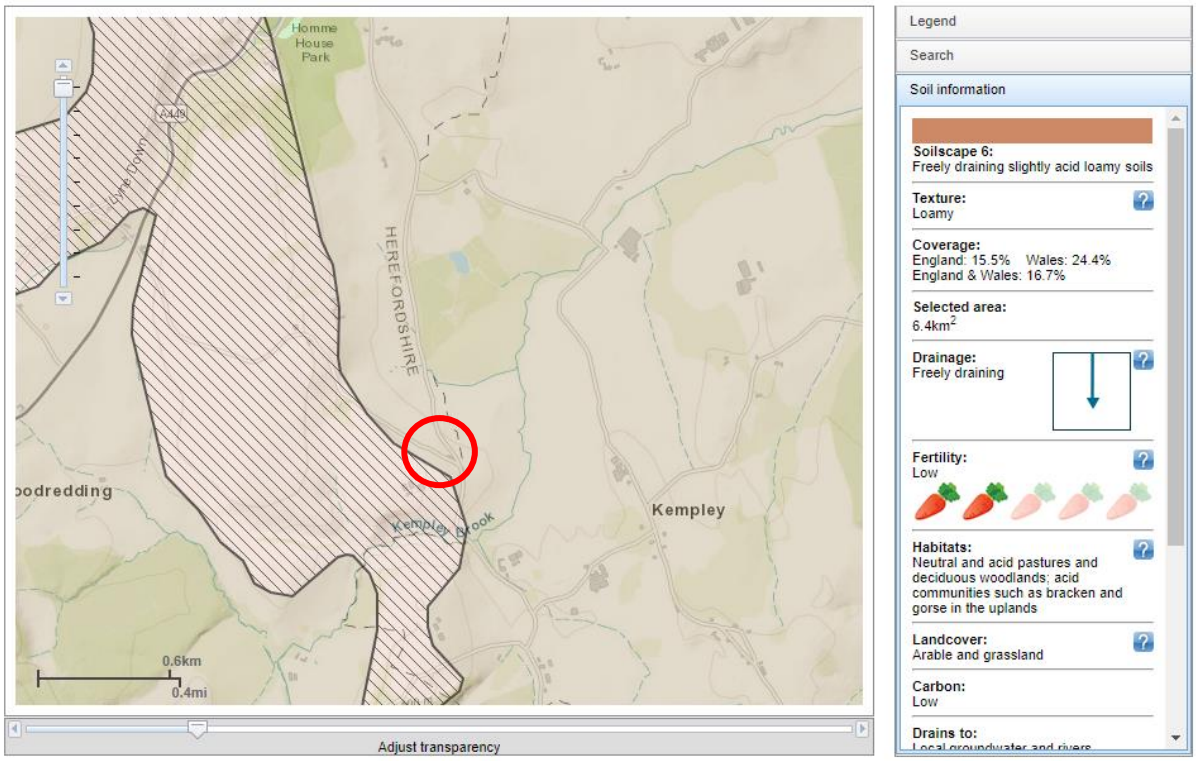
As can be seen below, the Soilscape Mapping provided by Cranfield University on behalf of DEFRA shows that the site of the proposed barn conversion lies on the edge of an area of HOST soil class 6, which is described as "Freely drainage slightly acid loam soils" and are area of HOST soil class 8, which is described as "Slightly acid loamy and clayey soils with impeded drainage"



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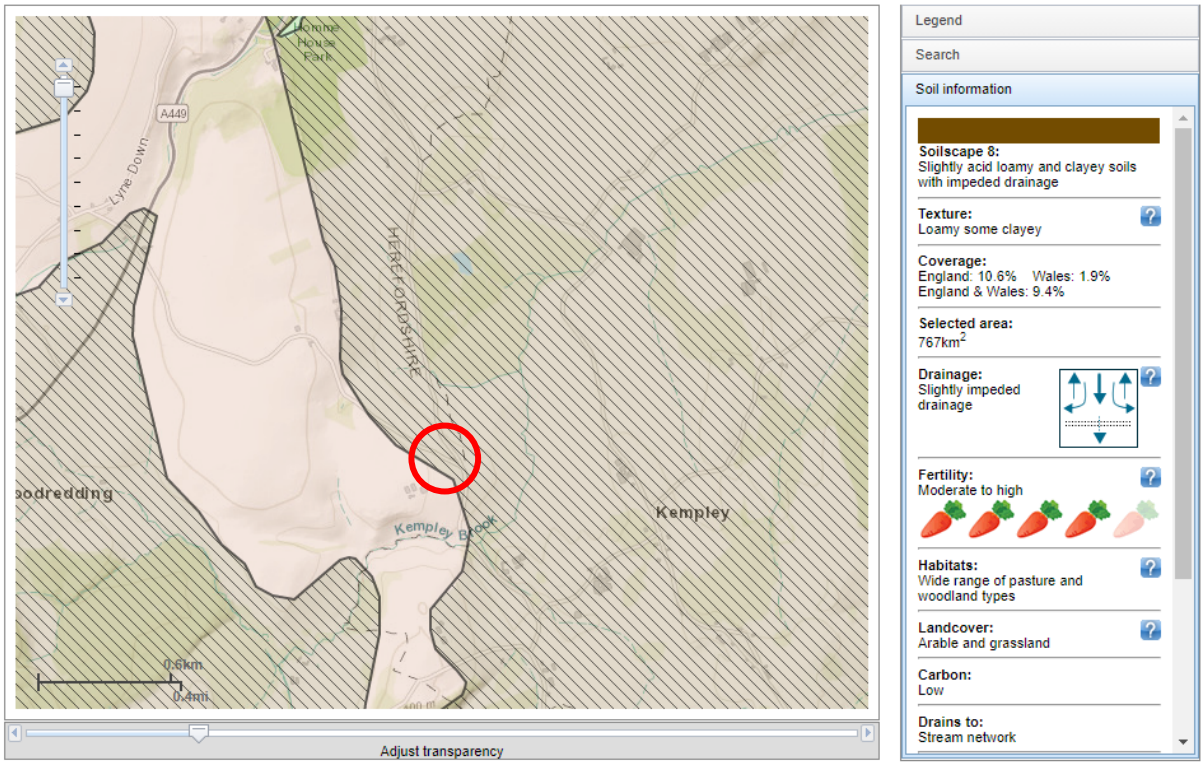

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Environment Agency General Binding Rules

As specified in the General Binding Rules: *'If any part of the building(s) your treatment plant serves is within 30 metres of a public sewer, the Environment Agency will not allow you to start a new discharge from a sewage treatment plant under the general binding rules.*

If you are building a development of more than one property, this distance must be multiplied by the number of properties, eg if there are 3 properties then the distance will be 3 x 30 metres = 90 metres.

If there is a good reason why you can't connect to the sewer (eg there is a river or a hill in the way) then you must apply for a permit so that the Environment Agency can decide whether to allow you to use a sewage treatment plant instead. Contact the Environment Agency'

The proposed development is for one dwelling. Using the Environment Agency parameter, we can see that a Public Foul Sewer within 30m (1 x 30m = 30m) would be considered the favoured option.

The local Sewerage Undertaker is Welsh Water and we can confirm that there is no Public Foul Sewer within 30m of the proposed site.

Considering the location and general site conditions, the development is unable to connect to the Public Foul Sewer and so a private off-mains foul drainage system is the correct solution.

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Ground testing and on-site investigation

Site investigations were undertaken on the 20th December 2022.

Initially, a ground water level assessment trial hole (GWLA) was excavated to a depth of 1.9m below local ground level. The GWLA showed that there was no evidence of local ground water at a depth of 1.9m below ground level.

The GWLA trial hole also showed that there is approximately 300mm of loam topsoil. Below this topsoil, there is a soft/light clayish subsoil. This light clayish subsoil continued to a depth of 1.8m below ground level; rock was encountered at 1.9m below ground level.

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Percolation tests

Five percolation test holes were excavated in accordance with BS.6297. These test holes were filled with test water and the results were recorded.

As can be seen from the results sheet, these percolation tests were completed at various depths (D1) in order to assess the local soils:

Percolation test hole 1 (P1):	300mm below ground level.
Percolation test hole 2 (P2):	300mm below ground level.
Percolation test hole 3 (P3):	600mm below ground level.
Percolation test hole 4 (P4):	600mm below ground level.
Percolation test hole 5 (P5):	1000mm below ground level.





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Site Name: Kemply

Date: 21/12/2022

Weather conditions: Dry

(initial drain)

Hole reference	Hole Depth	Water Drop	Time (secs)	Av. Drop
1				
Test 1	300mm	250	1200	4.8
Test 2	300mm	250	3300	13.2
Test 3	300mm	250	3900	15.6
			Hole Average:	11.2

Hole reference	Hole Depth	Water Drop	Time (secs)	Av. Drop
2				
Test 1	300mm	250	1500	6
Test 2	300mm	250	1800	7.2
Test 3	300mm	250	1800	7.2
			Hole Average:	6.8

Hole reference	Hole Depth	Water Drop	Time (secs)	Av. Drop
3				
Test 1	600mm	250	5400	21.6
Test 2	600mm	250	6000	24
Test 3	600mm	250	7200	28.8
			Hole Average:	24.8

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Hole reference	Hole Depth	Water Drop	Time (secs)	Av. Drop
4				
Test 1	600mm	250	5100	20.4
Test 2	600mm	250	6000	24
Test 3	600mm	250	5400	21.6
			Hole Average:	22

Hole reference	Hole Depth	Water Drop	Time (secs)	Av. Drop
5				
Test 1	1000mm	250	5700	22.8
Test 2	1000mm	250	6300	25.2
Test 3	1000mm	250	7200	28.8
			Hole Average:	25.6

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Calculation of soak-away (Summary & Calculation sheet)

Site Name: Kemply

Date: 21/12/2022

Weather conditions: Dry

Average calculation

Hole reference	Depth below ground		Average time
1	300mm		11.20
2	300mm		6.80
3	600mm		24.80
4	600mm		22
5	1000mm		25.60
6			-
7			-
8			-
9			-
		Vp:	**24.14**

Assumed maximum population: 6pe 1x 4-bedroom dwelling

Method of treatment: Package Sewage Treatment Plant
Standard of treatment: Secondary
GBR factor: 0.2

ASSUMED POPULATION X AVERAGE TIME X FACTOR A =

6 x 24.14 x 0.20 =	28.97

Minimum Drainage Field (Sewage treatment) :	**29m²**

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BRE Digest 365 Infiltration Tests.

One infiltration test hole was excavated in line with BRE Digest 365. This test hole was excavated to a depth of 1200mm below ground level.

The infiltration test hole was filled with water and the water drop was recorded; the results are shown in the following calculations spreadsheet.

BRE Infiltration test hole:

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I ♥ SEWAGE .co.uk	Kemply Barn Conversion		
		Revision	
	Job No:	Page:	C/01
Section:	Prepared By: Alex Hunter	Date:	23/12/2022

ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench *[mm]* :	450	600	2000
required trench length *[m]* :	32.66	26.13	9.59
	ring soakaways		
diameter of ring *[mm]* :	1050	1200	1350
required pit diameter *[m]* :	1.52	1.53	1.53

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

SUMMARY OF CALCULATIONS		
critical design rainfall duration 't_{crit}' =	360	*min*
required storage volume 'V_{req}' =	18.22	m^3
provided storage volume 'V_{prov}' =	18.24	m^3
utilisation factor =	**1.00**	***.OK***
required time to discharge 50% 't_{50}' =	10.76	*hours*
utilisation factor =	**0.45**	***.OK***

GENERAL DATA		
site location:	England and Wales	
soakaway type:	geocellular units	(?)
impermeable area drained to soakaway 'A' $[m^2]$ =	280	
60 min rainfall depth of 5 year return period 'R' *[mm]* =	20	(?)
M5-60 to M5-2d rainfall ratio 'r' =	0.50	
allowance for climate change:	40%	

SOAKAWAY DATA		
soakaway width 'W' [m] =	9.60	
soakaway length 'L' [m] =	2.00	
total depth from ground level 'D_b' *[m]* =	1.20	
depth to drain invert level 'D_d' *[m]* =	0.20	
soakaway effective depth 'D_{eff}' *[m]* =	1.00	
free volume in infill aggregate *[%]* =	95	(?)

SOIL INFILTRATION DATA		
allowance for infiltration through soakaway base:	No	(?)
available on-site infiltration test results:	(●) Yes ( ) No	(?)
use soakage trial pit table below		
internal surface area of trial pit 'a_{p50}' $[m^2]$ =	2.75	
storage volume between 75-25% 'V_p' $[m^3]$ =	0.38	
time for water to fall from 75-25% 't_p' [min] =	112.00	
soil infiltration rate 'f' [m/s] =	2.03E-05	

SOAKAGE TRIAL PIT DATA		
soakage trial pit width 'W_t' *[m]* =	0.50	(?)
soakage trial pit length 'L_t' *[m]* =	1.50	
total depth from ground level 'D_{tb}' *[m]* =	1.20	
depth to pipe invert level 'D_{tp}' *[m]* =	0.20	
soakage trial pit effective depth 'D_{teff}' *[m]* =	1.00	
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]*	M10-D Z2	M10-D rainfalls *[mm]*	M10-D inflow $[m^3]$	M30-D Z2	M30-D rainfalls *[mm]*	M30-D inflow $[m^3]$	M100-D Z2	M100-D rainfalls *[mm]*	M100-D inflow $[m^3]$	outflow from soakaway $[m^3]$	required storage $[m^3]$
5	0.39	7.80	1.21	13.18	3.69	1.46	15.97	4.47	1.86	20.28	5.68	0.07	5.61
10	0.54	10.80	1.22	18.49	5.18	1.50	22.62	6.33	1.92	29.07	8.14	0.14	8.00
15	0.65	13.00	1.23	22.42	6.28	1.51	27.52	7.71	1.96	35.64	9.98	0.21	9.77
30	0.82	16.40	1.24	28.47	7.97	1.53	35.16	9.84	2.00	45.95	12.87	0.42	12.44
60	1.00	20.00	1.24	34.72	9.72	1.54	43.21	12.10	2.03	56.84	15.92	0.85	15.07
120	1.19	23.80	1.24	41.32	11.57	1.54	51.17	14.33	2.01	67.13	18.80	1.69	17.10
240	1.38	27.60	1.23	47.51	13.30	1.52	58.85	16.48	1.99	76.86	21.52	3.39	18.13
360	1.51	30.20	1.22	51.56	14.44	1.51	63.94	17.90	1.97	83.22	23.30	5.08	**18.22**
600	1.68	33.60	1.21	56.88	15.93	1.50	70.40	19.71	1.94	91.31	25.57	8.47	17.09
1440	2.03	40.60	1.19	67.57	18.92	1.46	83.21	23.30	1.89	107.15	30.00	20.34	9.67

** Z2 is 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	60	120	180	240	300													
	depth to water *[m]* =	0.30	0.80	0.94	1.00	1.08	1.12													
Soakage Trial 2	time *[min]* =	0	60	120	180	240	300													
	depth to water *[m]* =	0.30	0.75	1.02	1.09	1.10	1.19													
Soakage Trial 3	time *[min]* =																			
	depth to water *[m]* =																			

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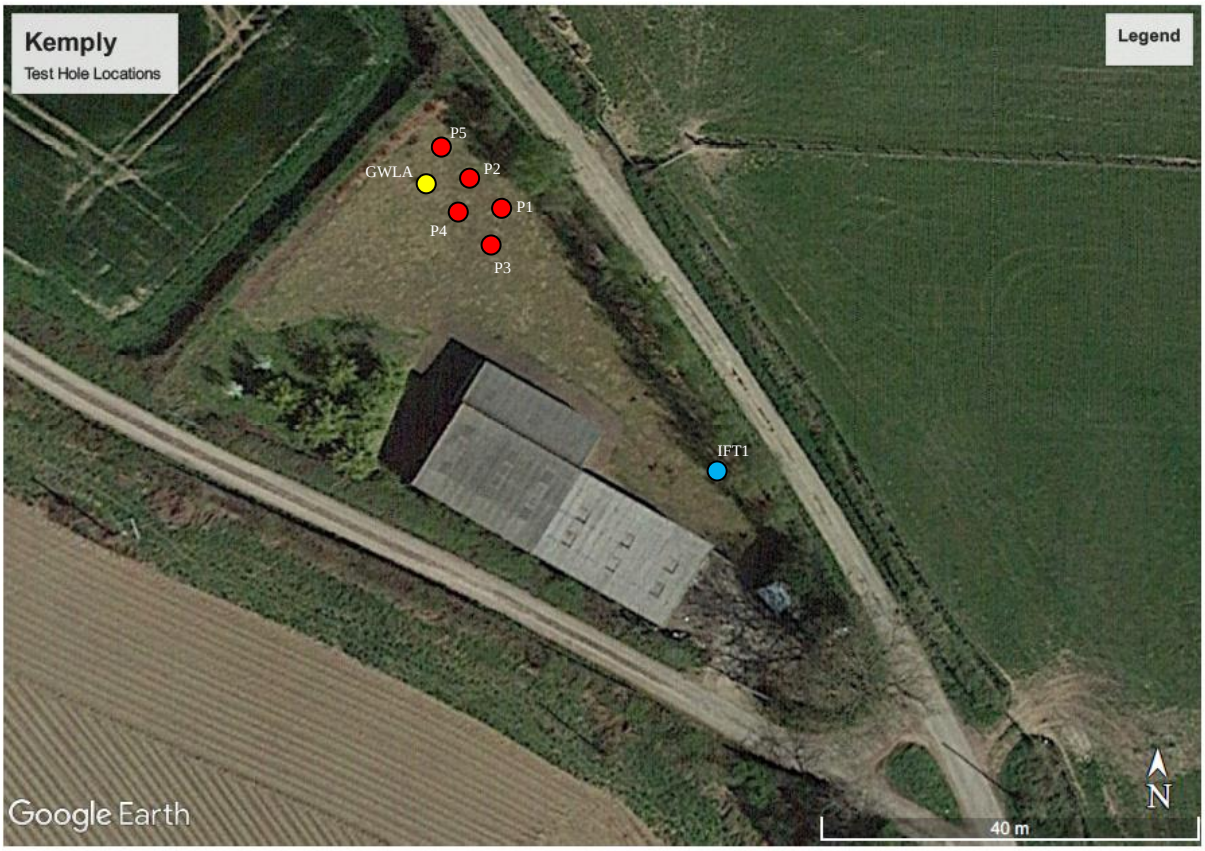
Test Hole locations



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Surface Water Design

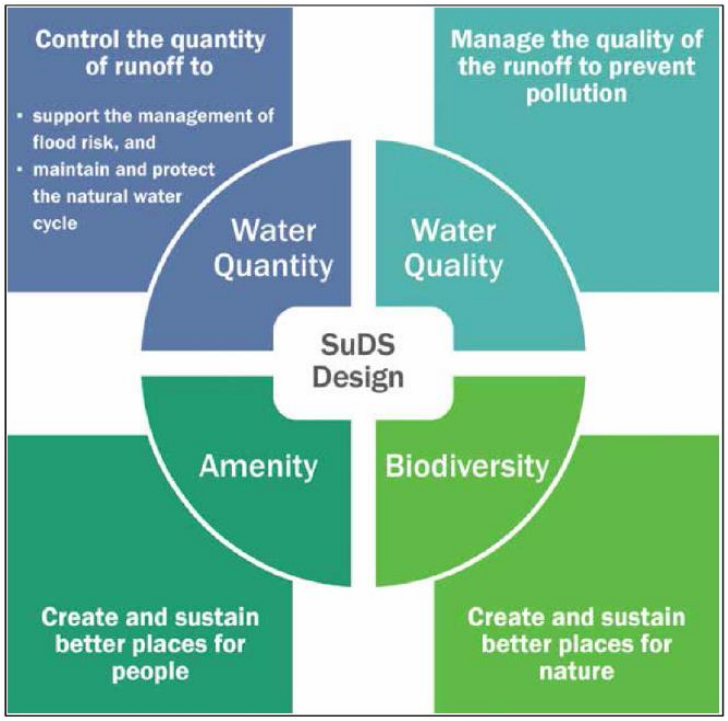
The site is an existing barn and the test area is laid to grazing.

The primary concerns of any proposed surface water management are laid out in SuDS and should be considered to ensure minimal impact to the surrounding area.

Sustainable (urban) Drainage Systems
To satisfy the requirements of current best national surface water management guidance, SuDS are required to manage, attenuate and treat surface water runoff before discharging from the site.

Current best practice guidance relating to sustainable surface water management is outlined in the SuDS Manual (CIRIA, 2015) which provides details on the use of SuDS for managing surface water runoff.

There are four main categories of SuDS which are referred to as the 'four pillars of SuDS design' as shown below:



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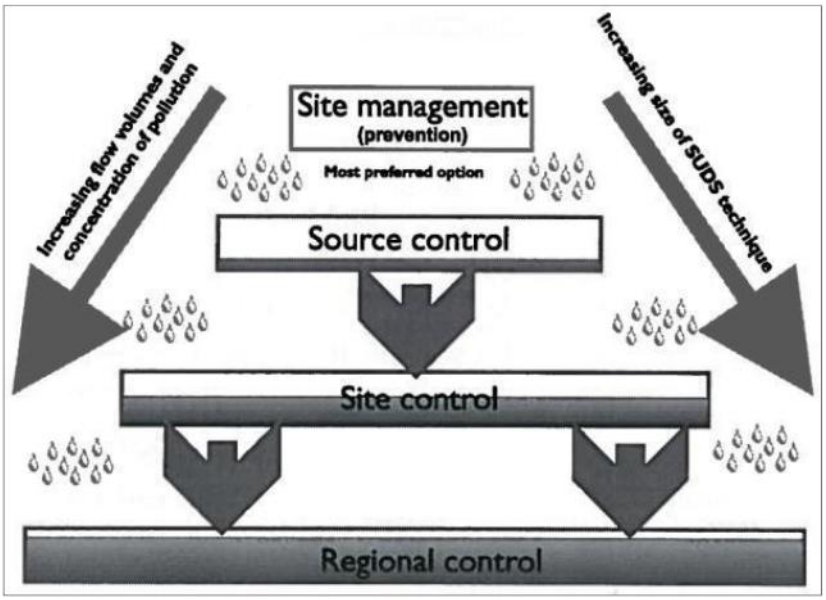
The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train':



SuDS Management Train

1. **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
2. **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting, permeable paving and green roofs).
3. **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one / several soakaways, below ground storage units or attenuation ponds for the whole site).
4. **Regional Control** – management of runoff from several sites, typically in a retention pond or wetland.

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It is generally accepted that the implementation of SuDS as opposed to conventional drainage systems, provides a number of benefits by:

1. Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
2. Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
3. Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
4. Reducing potable water demand through rainwater harvesting;
5. Improving amenity through the provision of public open spaces and providing biodiversity and wildlife habitat enhancements; and
6. Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

Proposed Surface Water Discharge Location(s)
In accordance with CIRIA Report C753, the hierarchy of preferred disposal options for surface water runoff from development sites is as follows:
1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

It should be noted that the building is existing and that there is existing guttering and rainwater downspouts. However, it is unclear as to where the roof water is drainage discharges.

We can confirm that the current roof water drainage system shows no evidence of failure or surface flooding. However, it would be prudent to install a new soak-away.

As demonstrated by the previous calculations, the local soils will support a surface water soak-away. As such, the roof water from the barn conversion should be discharged to ground. Considering the previous infiltration test results, it is generally regarded that the favoured method of surface water disposal is infiltration to ground in line with the Drainage Hierarchy.

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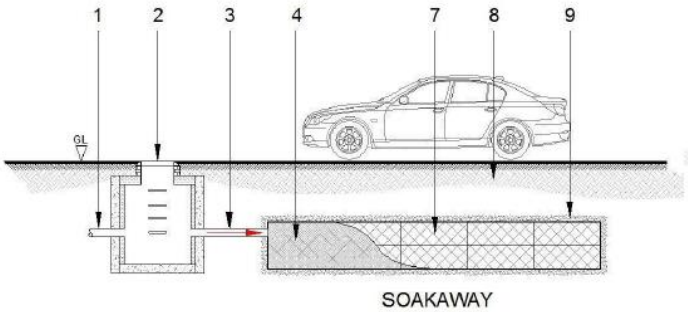
With reference to CIRIA C753, post development surface water runoff generated by the site (via building roofs, access roads and external car parking areas) is considered to have a 'very low' to 'low' *Pollution Hazard Level* as set out in the following excerpt:

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	*Metals*	*Hydro-Carbons*
Residential Roofs	Very Low	0.2	0.2	0.05
Residential Car Parks	Low	0.5	0.4	0.4

Due to the low pollution hazard, we do not consider roof water pollution to be a risk to the local environment.

With the previous information in mind, and as demonstrated by the on-site infiltration testing, the local soils in the test area will support a surface water soak-away. As such, the resulting surface water from the proposed development should be discharged to a soak-away constructed from wrapped attenuation crates. The soak-away should be at least 2m x 9.6m x 1.2m deep and should have an inlet pipe invert of no more than 200mm below ground level, as demonstrated in the previous calculation spreadsheet.



SOAKAWAY

1. Inlet to chamber
2. Silt trap chamber with minimum 300mm sump.
3. Inlet to soakaway/attenuation tank
4. 125g/m² Non-Woven Geotextile
5. 300g/m² Non Woven Geotextile Protection Fleece
6. 1.00mm Thick LLDPE Impermeable Geomembrane
7. Rainbox 3S Crate
8. Minimum cover as required
9. Layer of 100mm thick course sand
10. Outlet chamber fitted with a flow control device

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Surface water must be directed to the crate structure via a silt trap chamber. As the crate structure fills, water begins to exfiltrate from the tank into the surrounding ground. The crate structure must be surrounded with a permeable non-woven geotextile to prevent any ingress of silt to the crate structure.

The new soak-away must be located in the location of the recent infiltration test hole. This is downhill of the dwelling and more than 5m away from any structure.

Hardstandings

In addition to roof water, run-off will need to be managed from the driveway and paths.

There is an existing hardstanding yard at this site and a pedestrian path around the South side of the barn. These hardstandings are constructed from stone and are permeable.

These hardstandings should be retained as permeable hardstandings.

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Surface Water Disposal Conclusion.

Considering SuDS and the specifics of this site, and after completing the necessary infiltration tests and on-site observations, we can confirm that the resulting roof water run-off can be discharged to ground by means of a soak-away.

Therefore, we propose the following:

- Roof water from the proposed barn conversion will be discharged via rainwater goods and underground pipework conforming to Building Regulations Part H.
- Roof water from the proposed barn conversion will be discharged to a soak-away at least 5m from any building. This soak-away will be installed in the vicinity of the recent infiltration test hole.
- It is necessary to have one soak-away. This soak-away will be constructed with wrapped geo-cellular attenuation crates.
- The soak-away will be at least 2m wide x 9.6m long x 1.2m deep with a maximum inlet invert depth of 200mm below ground level.
- A silt trap will be installed immediately upstream on the soak-away. This chamber or silt trap will be maintained correctly to prevent debris entering the soak-away.
- The existing driveway and paths will be retained as permeable hardstandings. By doing so, any run-off should be reduced. In addition, these porous surfaces will also reduce run-off pollution.

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Foul Water / Sewage Treatment System Design

As previously identified, there is no local Public Foul Sewer.

Using the following flow diagram, the site can be assessed:

As can be seen from the flow diagram, the favoured option would be to connect the foul drainage system to the **local Public Sewer**. However, as previously mentioned, there is no available public foul Sewer near to this site. Therefore, connection to the local Public Foul Sewer is not possible at this site.

Following the flow diagram, a septic tank would be favoured. However, the installation of a **packaged sewage treatment plant** would reduce the size of the necessary drainage field and would lengthen the potential lifespan of the drainage field. In addition, the resulting secondary treated effluent contains far less pollutants than septic tank effluent.

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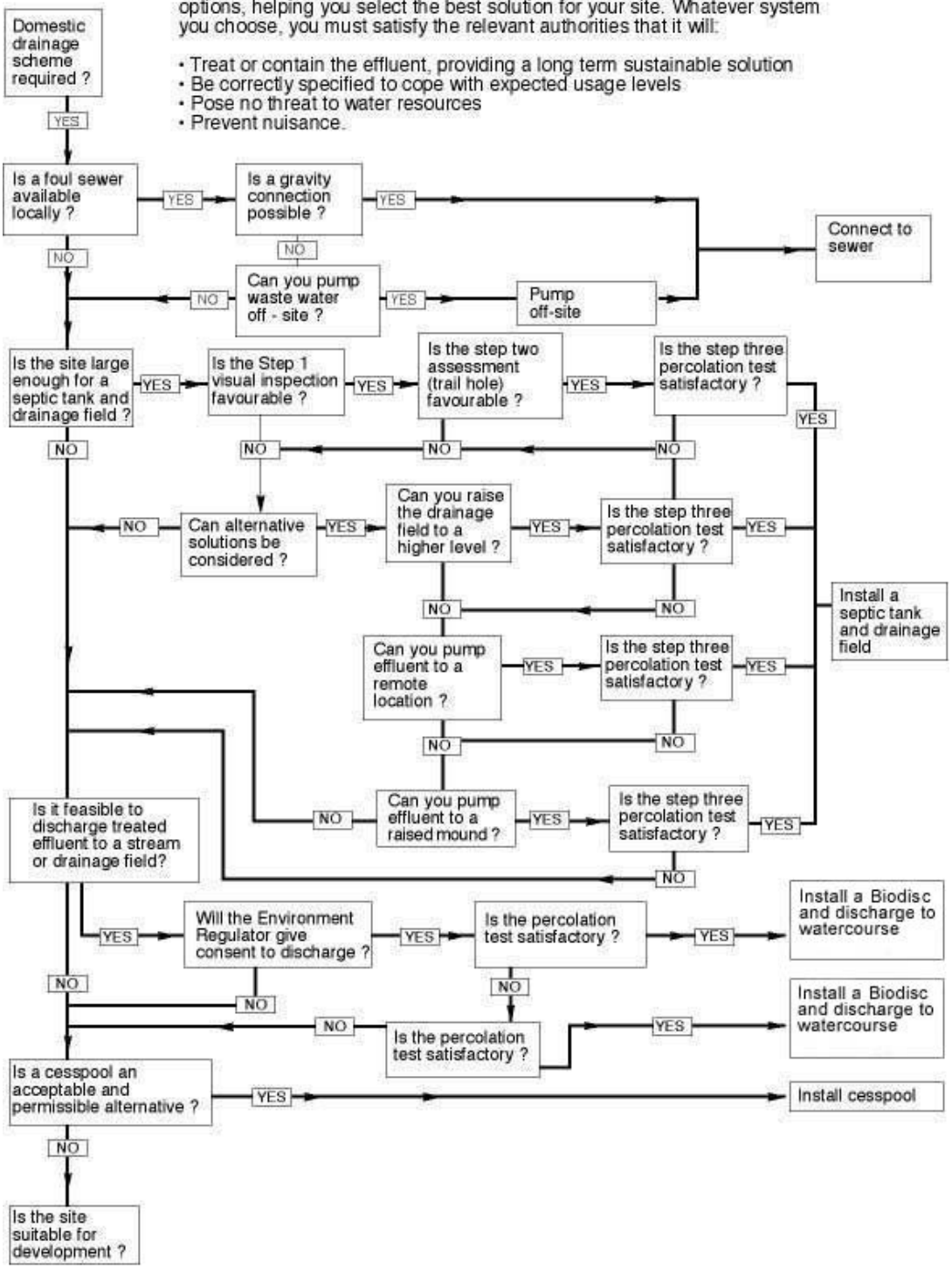
Site assessment and system selection

The flow chart below gives an overview of the principal off-mains drainage options, helping you select the best solution for your site. Whatever system you choose, you must satisfy the relevant authorities that it will:

- Treat or contain the effluent, providing a long term sustainable solution
- Be correctly specified to cope with expected usage levels
- Pose no threat to water resources
- Prevent nuisance.



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Packaged Sewage Treatment Plant

The proposed dwelling is to have 4-bedrooms. The domestic sewage discharge loading must be designed in line with British Water Flows and Loads 4.

In line with British Water Flows & Loads 4, the potential population of a 4-bedroom dwelling/cottage is 6-persons. Therefore, the proposed off-mains foul drainage system must be designed for a potential population of 6-persons (6pe).

5 Domestic housing

- A treatment system for a single house with **up to and including 3 bedrooms** shall be designed for a minimum population (P) of 5 people.
- The size of a treatment system for a single house with more than 3 bedrooms shall be designed by **adding 1 P for each additional bedroom** to the **minimum single house value of 5 P,** eg:
  - house with 3 bedrooms = **minimum 5 P system**
  - house with 4 bedrooms = **minimum 6 P system (5+1)**
  - house with 6 bedrooms = **minimum 8 P system (5+3).**
- For groups of small 1 and 2 bedroom houses or flats
  - flat with 1 bedroom = **allow 3 P**
  - flat with 2 bedrooms = **allow 4 P**
- A treatment system serving a group of houses shall be designed by adding together the P values for each house calculated independently, eg:
  - for a group of two houses (3 and 4 bedrooms, respectively) the system shall be for a minimum of 11 P (5+6)
- **If the calculated total P for a group of houses exceeds 12 P then some reduction may be made** to allow for the balancing effects on daily flow of a group of houses (round UP not down)
  - **Where the total is 13-25 P** multiply the total by 0.9 to give an adjusted P value, e.g. if there are four four-bedroom houses the total P will be 24 P (4 x 6) and the adjusted P will be 22 P (24 x 0.9 = 21.6)
  - **Where the total is 26-50 P** multiply the total by 0.8 to give an adjusted P value, e.g. if there are four three-bedroom houses and three four-bedroom houses the total P will be 38 P (4 x 5 and 3 x 6) and the adjusted P will be 31 P (38 x 0.8 = 30.4)
- Where there are larger groups of houses, the P should be estimated using both the expected total load and the flow, considering both peak and total flow
- These are minimum recommended population (P) loads, they should not be modified downwards, upward modification may be necessary because of particular characteristics of each property or groups of properties.
- The above assessments of population (P) should be used for both existing and new properties

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It should be noted that the proposed sewage treatment plant should be located at least 7m away from the dwelling. In addition, the packaged sewage treatment plant should be within 30m of a tanker access hardstanding.

The resulting secondary treated effluent will be discharged from the sewage treatment plant to a new drainage field.

There are a number of suitable packaged sewage treatment plants available. The Environment Agency and Building Regulations specify that a sewage treatment plant must conform to BSEN.12566-3. All the mainstream sewage treatment plant manufacturers should be able to provide a suitable sewage treatment plant.

With the previous information in mind, the proposed packaged sewage treatment plant is an Ensign EN6 packaged sewage treatment plant, manufactured by Marsh Industries. This unit is a SAF (Submerged aeration filtration) system that conforms to BSEN.12655-3.

PROTOCOL

ON PRODUCT TYPE TESTING

Registration No. 1017 – CPD – 05.686.914

Domestic Wastewater Treatment Plant

Type range: Marsh Uni Ensign

EN 12566-3:2005+A1:2009

MARSH INDUSTRIES LIMITED

Units 3-13, Little Addington Business Park, Mihngborough Road, Little Addington, Kettering NN14 4AS UNITED KINGDOM

Place of the production: See above

TÜV SÜD Czech s.r.o. performed the initial testing of the respective product characteristics described in Annex ZA of the standard

EN 12566-3:2005+A1:2009

The testing results are presented in the Evaluation Report Reg.No. 05.686.242 from 20-04-2012, which consists of 3 pages and forms an inseparable part of this Product Type Testing Protocol.

In Prague, 03.05.2012

ZERTIFIKAT ◆ CERTIFICATE ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

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Drainage Field.

Percolation tests have been completed in line with BS.6297 and Building Regulations. As can be seen from the previous calculations, the percolation tests have demonstrated that the local soils will support a drainage field. The Vp of the tested soil is 24.14s/mm.

With this in mind, the new drainage field should be located in the test area, and we can see that a drainage field of at least 29m^2 is required:

Population equivalence x Vp x factor 0.2 =

6 x 24.14 x 0.2 = 28.97

(Values should be rounded up in line with British Water Flows & Loads 4)

Total minimum drainage field area = 29m^2

As demonstrated by the percolation tests, the drainage field would need to be at least 29m^2. In addition, the percolation testing has demonstrated that the new drainage field must have an invert depth (D1) of 600mm below ground level.

As can be seen from the percolation test results, the upper soils (P1 and P2) drained too quickly (faster than 12s/mm. As such, these tests have not been used.

Noting the previous information, the new drainage field should be laid as a continuous loop drainage field in line with Building Regulations Part H and should have an invert (D1) of 600mm below ground level.

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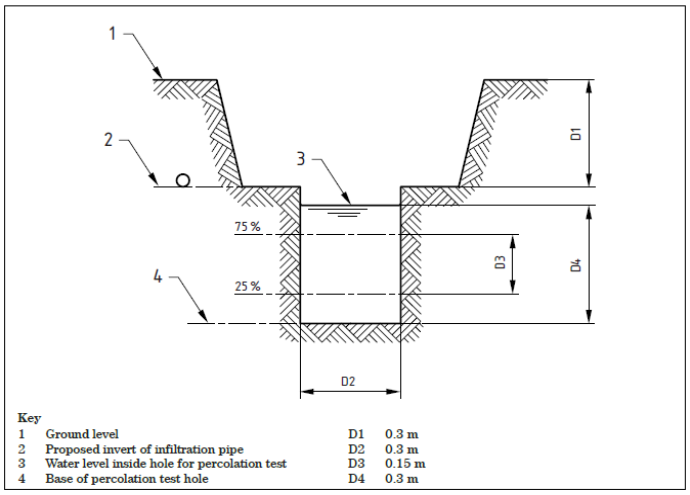
Figure 2 Cross-section of typical percolation test hole

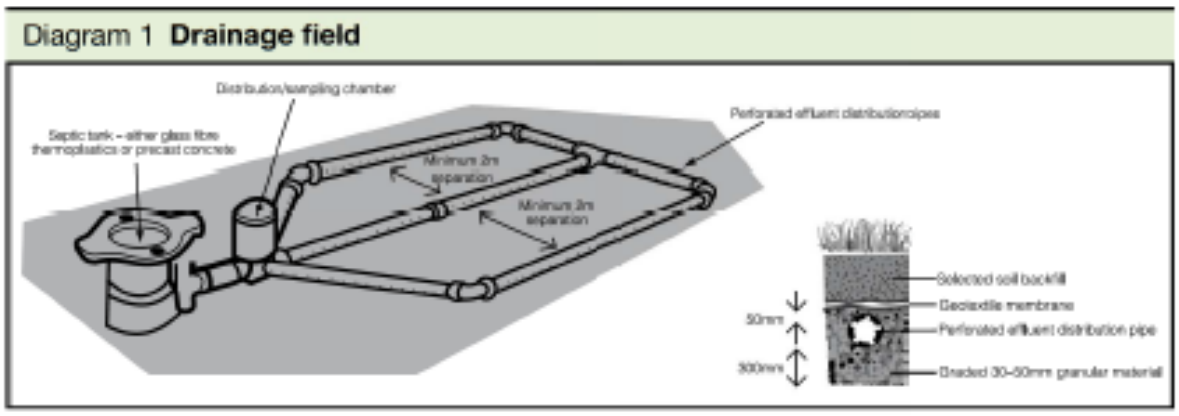


Key

1	Ground level	D1	0.3 m
2	Proposed invert of infiltration pipe	D2	0.3 m
3	Water level inside hole for percolation test	D3	0.15 m
4	Base of percolation test hole	D4	0.3 m

Dimension D1 = 600mm in line with BS.6297

Continuous loop drainage field:



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Foul Water Disposal Conclusion.

After considering the site location and geology, the on-site testing has shown that the site is suitable for an off-mains foul drainage system.

The evidence shows that the foul sewage treatment system should be designed as follows:

- The foul drainage must be kept separate to the surface water and roof water drainage system.
- The foul drainage from the dwelling will be laid to a Marsh Industries EN6 packaged sewage treatment plant sized for a potential population of 6pe.
- The packaged sewage treatment plant will be located at least 7m from all dwellings.
- The packaged sewage treatment plant will be located within 30m of a tanker access hardstanding.
- The packaged sewage treatment plant will be installed so as to allow a gravity system.
- The resulting effluent will be discharged to a 29m^2 high-level continuous loop drainage field laid at a 600mm deep invert (D1).
- The drainage field will be located within the percolation test area.
- The foul drainage system will be maintained in line with the Manufacturer's Guidelines and the Environment Agency General Binding Rules.

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Environment Agency Consent to Discharge

The total design discharge will be 900-litres per day. (6pe x 150-litres)

The Environment Agency General Binding Rules state that a small sewage discharge (SSD) is a discharge of domestic sewage effluent of **2 cubic metres or less per day to ground from septic tanks or small sewage treatment plants**, or 5 cubic meters or less per day to surface water from small sewage treatment plants.

As this proposed development has a design discharge of 900-litres per day, a Permit to Discharge or Exemption Certificate **will not** be required from the Environment Agency.

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The proposed off-mains foul drainage system must comply with the Environment Agency General Binding Rules. These rules are shown below:

#	Discharges to surface water	Discharges to ground	General binding rule	
1		X	The discharge must be 2 cubic metres or less per day in volume.	✓
2	X		The discharge must be 5 cubic metres or less per day in volume.	**N/A**
3	X	X	The sewage must only be domestic.	✓
4	X	X	The discharge must not cause pollution of surface water or groundwater.	✓
5		X	The sewage must receive treatment from a septic tank and infiltration system (drainage field) or a sewage treatment plant and infiltration system.	✓
6	X		The sewage must receive treatment from a sewage treatment plant.	**N/A**
7		X	The discharge must not be within a groundwater Source Protection Zone 1 or within 50 metres from any well, spring or borehole that is used to supply water for domestic or food production purposes.	✓
8	X		For discharges in tidal waters, the discharge outlet must be below the mean spring low water mark.	**N/A**

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#	Discharges to surface water	Discharges to ground	General binding rule	
9	X	X	All works and equipment used for the treatment of sewage effluent and its discharge must comply with the relevant design and manufacturing standards ie the British Standard that was in force at the time of the installation, and guidance issued by the appropriate authority on the capacity and installation of the equipment.	✓
10	X	X	The system must be installed and operated in accordance with the manufacturer's specification.	✓
11	X	X	Maintenance must be undertaken by someone who is competent.	✓
12	X	X	Waste sludge from the system must be safely disposed of by an authorised person.	✓
13	X	X	If a property is sold, the operator must give the new operator a written notice stating that a small sewage discharge is being carried out, and giving a description of the waste water system and its maintenance requirements.	✓
14	X	X	The operator must ensure the system is appropriately decommissioned where it ceases to be in operation so that there is no risk of pollutants or polluting matter entering groundwater, inland fresh waters or coastal waters.	**N/A**

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#	Discharges to surface water	Discharges to ground	General binding rule	
15	X	X	New discharges must not be within 30 metres of a public foul sewer.	✓
16	X	X	For new discharges, the operator must ensure that the necessary planning and building control approvals for the treatment system are in place.	✓
17	X		New discharges must not be in or within: 500 metres of a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, biological Site of Special Scientific Interest (SSSI), freshwater pearl mussel population, designated bathing water, or protected shellfish water; 200 metres of an aquatic local nature reserve; 50 metres of a chalk river or aquatic local wildlife site.	**N/A**
18		X	New discharges must not be in, or within 50 metres of, a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, or biological Site of Special Scientific Interest (SSSI), and must not be in an Ancient Woodland.	✓
19	X		New discharges must be made to a watercourse that normally has flow throughout the year.	**N/A**
20	X		For new discharges, any partial drainage field must be installed within 10 metres of the bank side of the watercourse.	**N/A**
21	X		New discharges must not be made to an enclosed lake or pond.	**N/A**

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Ongoing Maintenance
Once the sewage treatment system has been installed. It will need to be Commissioned and maintained.

H+H Drainage would be pleased to complete the initial Commissioning in line with Manufacturers Guidelines and The Environment Agency guidelines.

The installed equipment will require monthly 'checks' to be undertaken by the operator/homeowner(s).

Sewage Treatment Plant:

The sewage treatment plant will require desludging at least 12-monthly; depending on usage. The frequency will depend on usage; H+H drainage will be able to measure the sludge density in order to initiate the correct desludging regime.

In accordance with the General Binding Rules, the sewage treatment plant will require maintenance in line with the Manufacturer's Guidelines. As British Water Accredited Engineers, H+H drainage will complete this maintenance annually.

In order to conform to the General Binding Rules and to ensure that the off-mains sewage system is maintained correctly, a maintenance agreement should be undertaken once the new system has been installed.

Following is a copy of such an example maintenance agreement.

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Annual Maintenance agreement

MAINTENANCE AND SERVICING OF SMALL WASTEWATER TREATMENT SYSTEMS (PACKAGE PLANTS) UP TO 50 POPULATION (PE) AND LARGER SYSTEMS UP TO 1000 PE.

Customer: ####################

Site Address: ##################

H+H Drainage herewith agree to complete a scheduled maintenance visit (in accordance with the manufacturer's instructions and British Water Guidelines) at ###### **MONTHLY** intervals on the following equipment:

1x ########## Sewage Treatment Plant

1x ########## Pumping station

H+H Drainage also agree to replace any minor parts (up to the value of **£50.00** excluding VAT) where necessary in order to maintain operations and prevent pollution. Where parts costs exceed £50.00 excluding VAT, H+H Drainage will first attain permission from you before fitting new parts. Any parts supplied/fitted are to be invoiced additionally.

H+H Drainage will complete and submit a maintenance record sheet for each visit completed, as specified in the General Binding Rules. In addition, H+H Drainage will retain a duplicate copy of each maintenance record sheet.

The Customer will provide a clean water supply and a 230-volt domestic power supply at the sewage treatment plant. In addition, the Customer will grant H+H Drainage access to the plant(s) when necessary.

Exemptions:

H+H Drainage cannot be held responsible for any failures of the sewage treatment plant. In addition, H+H Drainage cannot be held responsible for the standard of final effluent leaving the sewage treatment plant. In order to maintain a high standard of discharge effluent, we ask all users of the sewage treatment plant to follow the attached guidelines.

Further, we ask all users of the sewage treatment plant not to flush items or chemicals that may be dangerous to our operators and engineers.

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Where new parts are required, H+H Drainage cannot be held responsible for late deliveries or delays, although every effort will be made to order by express delivery where necessary

Payment Terms:

All invoices exclude VAT. (unless stated otherwise)

Invoices are due for payment within 14-days from the date of invoice.

Any price increases by H+H Drainage will be notified prior to on-site works.

Termination.

The Client will give at least 30-days' notice of termination.

H+H Drainage will give at least 30-days' notice of termination.

The Agreement

This document, hereto signed by both parties shall constitute the entire binding agreement between H+H Drainage and the Customer. The Customer represents that they are the owner of the sewage treatment plant(s), or joint owner, subject to this agreement.

'Please complete the necessary maintenance visits on the sewage treatment plant(s) as per this agreement and current pollution Law;

Signed (On behalf of the Customer):

Position:

Date:

Signed (on behalf of H+H Drainage):

Position:

Date:

H+H Drainage

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HOW TO KEEP YOUR SEWAGE TREATMENT PLANT RUNNING SWEETLY

Sewage treatment plants use colonies of live natural micro-organisms to break down pollutants in domestic sewage. Many chemicals found in the household can inhibit or kill these micro-organisms, particularly if used in excessive amounts.

Bear in mind that treatment plants serving a few houses do not have the benefit of dilution that occurs at a large sewage works. A bottle of bleach tipped down the toilet in Birmingham would be virtually lost amongst the millions of gallons of sewage arriving at city's treatment works; a bottle of bleach in a plant serving half a dozen houses could be a lethal dose.

If the micro-organisms are damaged, they will usually recover in time. But in the meanwhile, one of the more obvious symptoms is an unpleasant smell, so it is in residents' interest to avoid this.

Generally speaking, all common household cleaning fluids are acceptable, provided they are used in accordance with the makers' instructions and stipulated concentrations.

The following are some of the most common chemicals found in household situations. It is not an exhaustive list and the golden rule is "If in doubt - leave it out." Bear in mind too that it isn't only the toilet that is connected to the treatment plant; anything that goes down the sink, bath etc. also ends up there.

Washing machine and dishwasher detergents, washing up liquids:
Perfectly all right in normal concentrations and usage. Problems can occur if, for instance, you are washing the jerseys of the local rugby club's five teams! Excess amounts of biological detergent can affect the biomass development. So, if you have to do unusual amounts of clothes washing it would be a good idea to spread it over a few days.

Floor cleaners, disinfectants and bleaches:
These are safe to use in accordance with the makers recommendations and in the minimum necessary concentration. Do not pour neat disinfectant or bleach down the sink or outside gullies. If these are smelly it usually indicates a buildup of decaying material or a plumbing problem and should be dealt with accordingly.

Nappy disinfectants and bottle sterilizing fluids eg. Milton:
When disposing of the used fluid, ensure that it is well diluted with water. The easiest way of doing this is usually to flush it away down the toilet.

Waste disposal units:
These do not inhibit the micro-organisms, but, depending on use, they can present the treatment plant with considerable extra load. Much better to compost your vegetable peelings etc. - it's cheaper and environmentally friendly.

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Home beer and wine making.
This presents a similar problem to waste disposal units. The treatment plant has to work as hard to treat one pint of beer tipped down the drain as it does to treat all the normal waste produced by one person in 24 hours. See also the notes above regarding Sterilizing fluids.

THE FOLLOWING MUST NOT BE DISCHARGED INTO THE DRAINS OF EITHER A SEWAGE TREATMENT PLANT OR SEPTIC TANK.

Motor oil, grease, anti-freeze, brake fluid etc.
Motor oil and grease are basically fats. Fat build-up is the most common reason for treatment plant failure, while anti-freeze and brake fluid are poisonous to microscopic organisms.

Cooking oil and fat.
Fat build-up is the most common reason for treatment plant failure. The human body, cooking and washing all result in fats and oils being discharged into the treatment plant, so it is best to keep fats to a minimum where possible.

Weed-killers, insecticides, fungicides and other gardening chemicals.
Fluids that kill germs in the kitchen, bathroom or garden also kill useful germs in your sewage treatment plant.

Paint, thinners, white spirit, turpentine, creosote etc.
Medicines
Take unused medicines to a pharmacist for safe disposal.

Photographic developing fluids.

Nappies, sanitary towels, wipes, syringes, soft toys, tennis balls etc.
It may seem a bit obvious to say this, but it is amazing what gets flushed down the loo from time to time. Although such items are not directly damaging to the micro-organisms, they can cause problems, not the least of which is simple blockage of the drains.

Even so-called disposable nappies, flushable-wipes, thread, kitchen paper-towel and sanitary towels often do not degrade fully in the treatment plant and can lead to malfunction, so it is best to dispose of them by other means.

In an ideal world, only toilet tissue and human waste should be flushed!

Finally, it is now a legal requirement to ensure that your sewage treatment plant is maintained correctly. This includes regular desludging/emptying and an annual maintenance visit by a British Water Accredited Engineer.