

H+H Drainage

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

Surface and Foul Water Drainage Strategy

The Proposed Dwelling adjacent to Little Birch Church, Little Brich, Herefordshire HR2 8AS

17th 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 comply with Core Strategy of Herefordshire County Council, Natural England and National Planning Policy Framework.

The site is located within the River Wye Catchment SAC (The Purple Zone). The River Wye is a Special Area of Conservation (SAC). SAC's are amongst the most important and sensitive sites across the European Union and are afforded the highest levels of protection under the Habitat Regulations.

The River Wye SAC is in place to maintain or, where necessary, restore the river to high ecological status, including its largely unmodified and undisturbed physical character, so that all of its special features are able to sustain themselves in the long-term as part of a naturally functioning ecosystem.

Allowing the natural processes of erosion and deposition to operate without undue interference and maintaining or restoring connectivity maintains the physical river habitat, which forms the foundation for this ecosystem. The quality and quantity of water, including natural flow variability, and the quality of adjacent habitats are maintained or restored to a level necessary to maintain the features in favourable condition for the foreseeable future.

The presence of the River Wye SAC and its special wildlife enhances the economic and social values of the area by providing a high-quality environment for ecotourism, outdoor activities and peaceful enjoyment by local people and visitors. The river catchment's functions of controlling flooding and supplying clean water are recognised and promoted through appropriate land management. The river is a focus for education to promote increased understanding of its biodiversity and the essential life support functions of its ecosystems.

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 Wye SAC or the surrounding area.

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



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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 strategy and Foul water is to be managed by the methods outlined in the Foul Water strategy.

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 Wye SAC or the surrounding area.

This report outlines the surface water and foul water strategies, including sewage treatment, drainage fields, attenuation and soak-aways.



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Site Location and conditions

Adjacent to Little Birch Church, Little Birch, Herefordshire HR2 8AS

SO 51095 31277

X (Easting): 351095

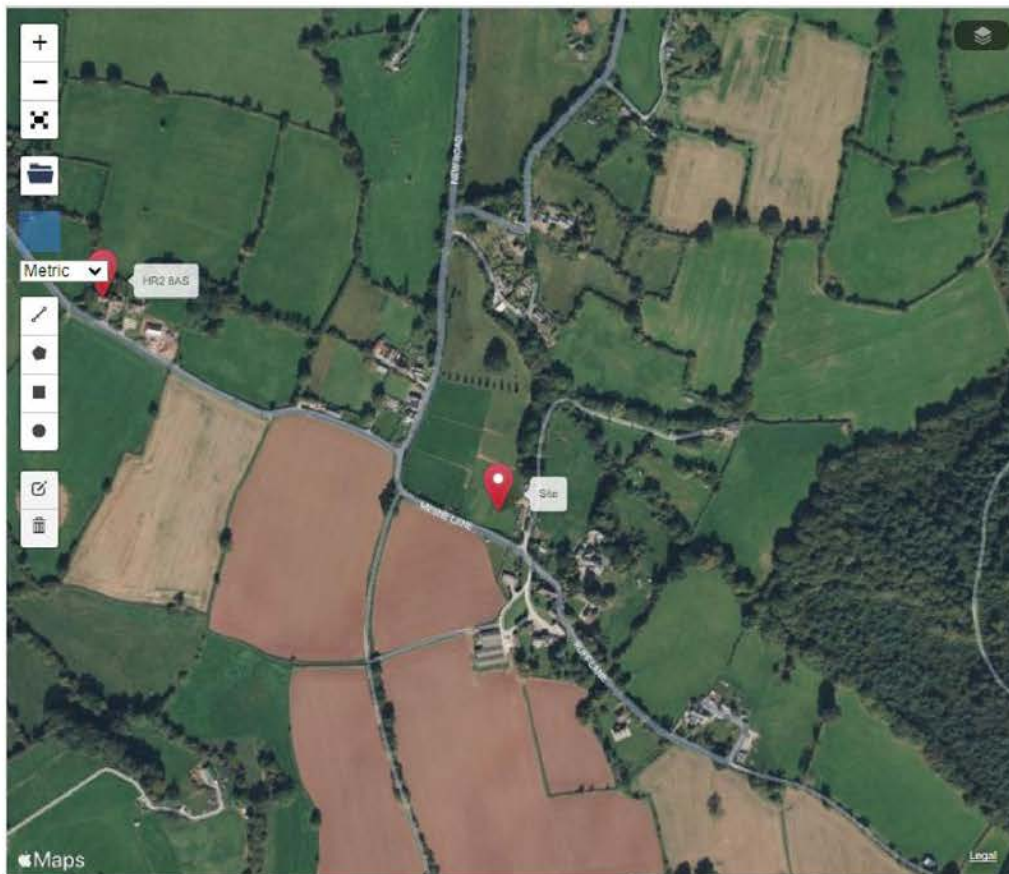
Y(Northing): 231277

Latitude: 52.977794

Longitude: -2.7134101

What3words: hubcaps.presses.huddling.

Site Location:



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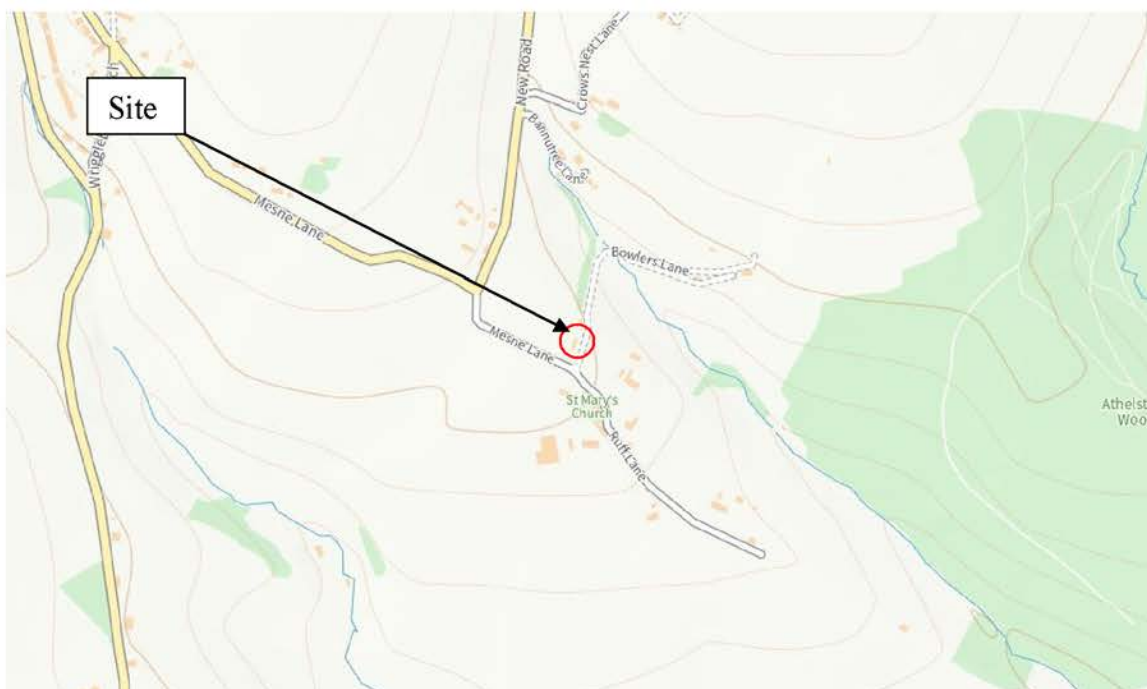
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The test area is currently laid to grazing for sheep and horse.

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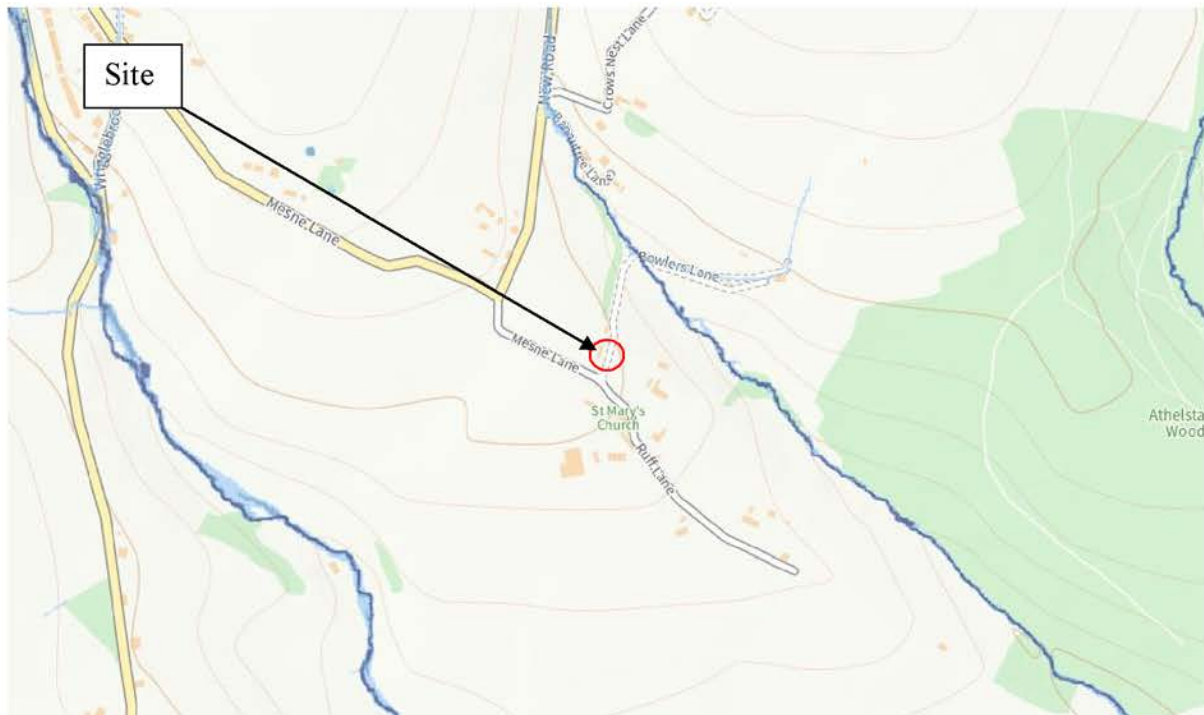
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There is no surface water flooding recorded in the surrounding area. Due to the topography of the area.



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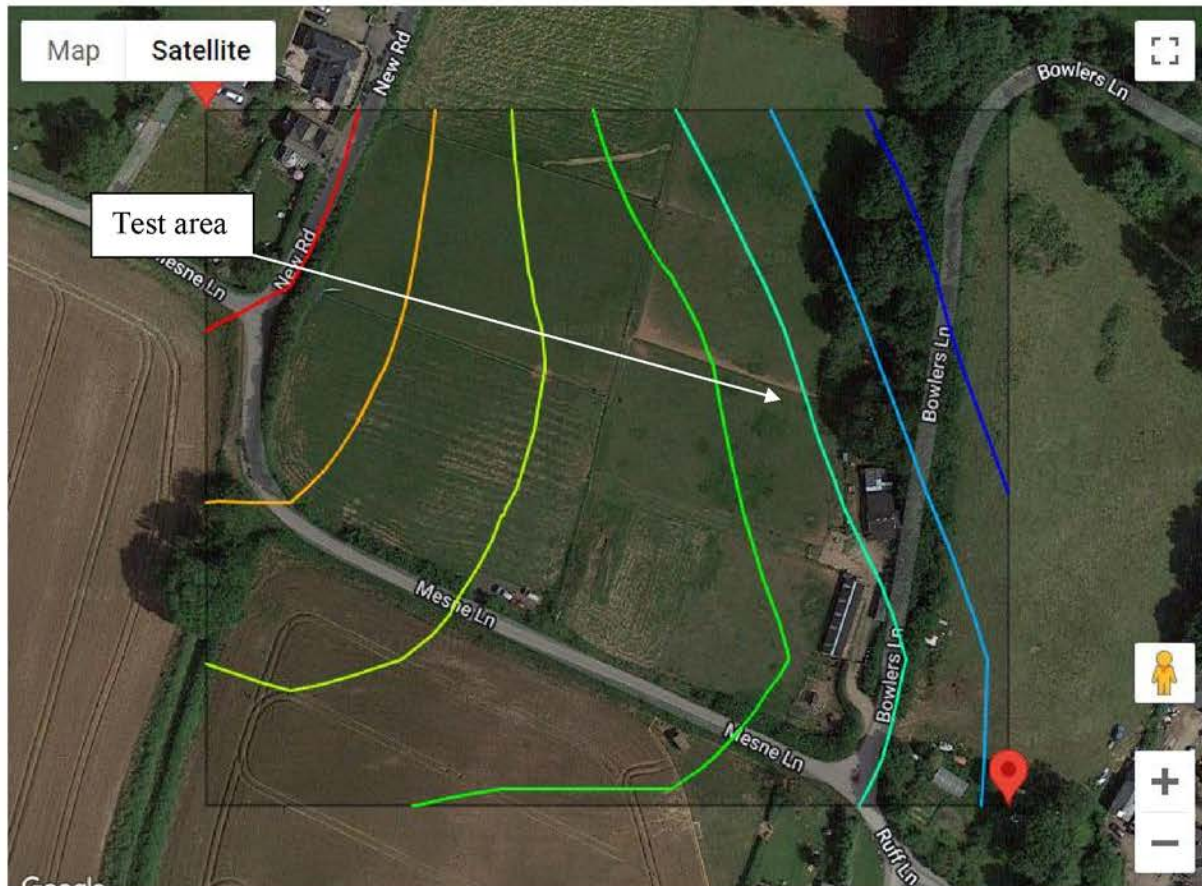
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As can be seen below, the topography of this site slopes towards the Northeast. As such, the percolation tests and the infiltration test were completed downslope of the proposed dwelling.



There are no SPZ1 or SPZ2 areas highlighted within 3km of this site.

There is an abstraction point for potable water in the local area; however, this is more than 90m away from the proposed drainage field.



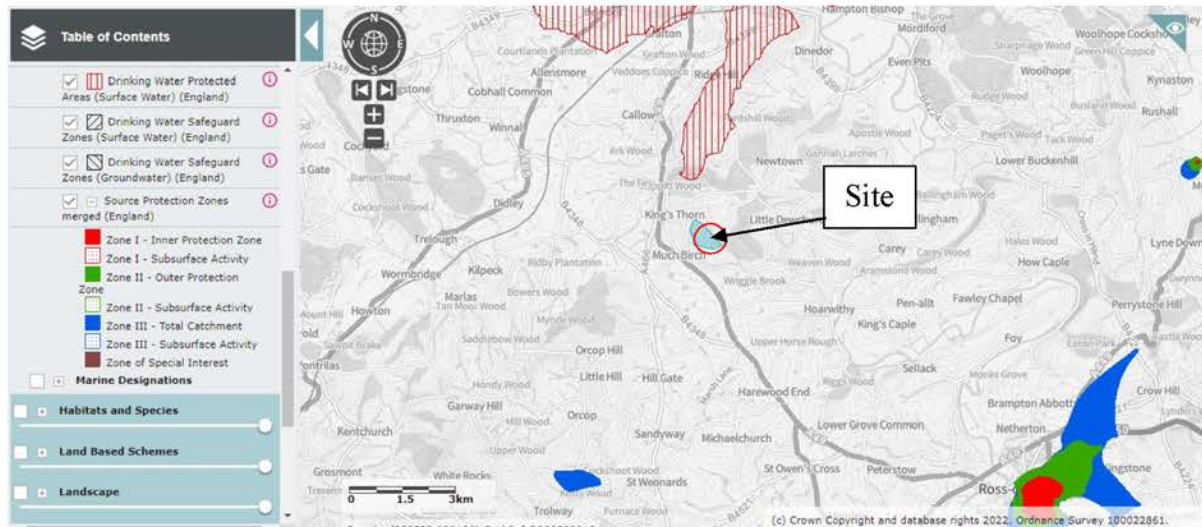
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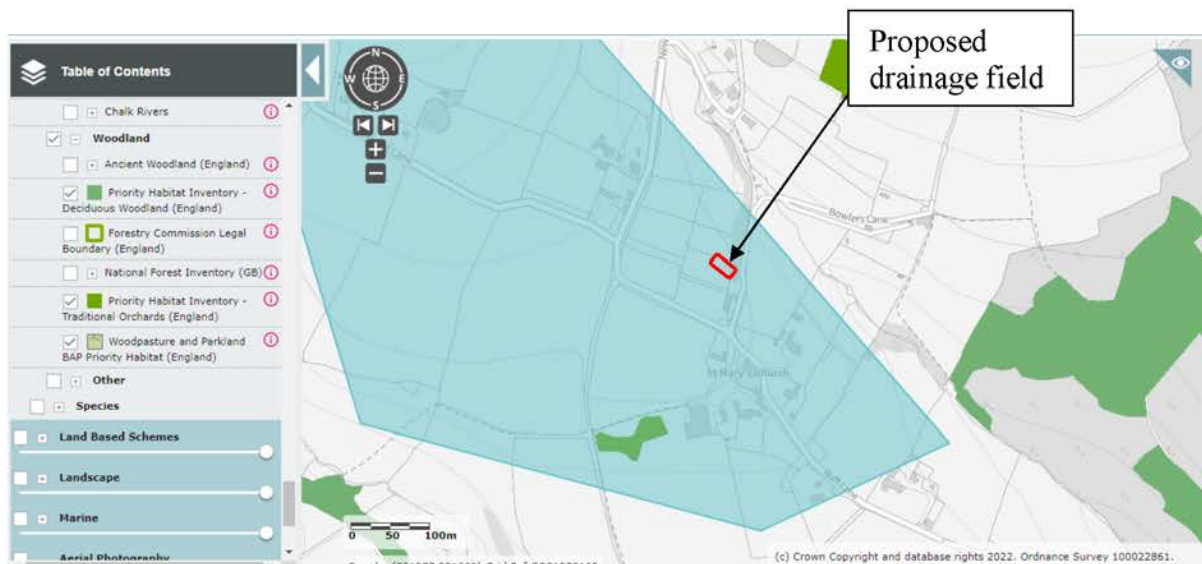
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The site is located within a Nitrate Vulnerable Zone (NVZ).

As can be seen in the following map, there are no Traditional Orchard 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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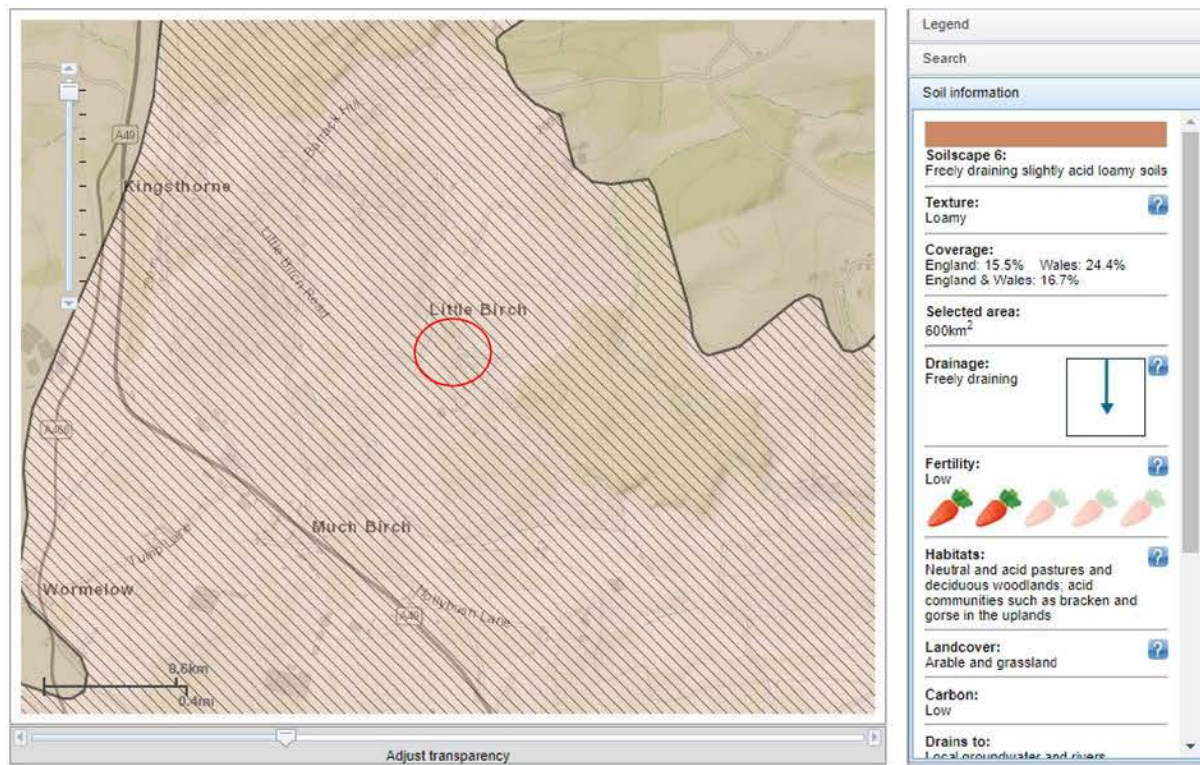
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As can be seen below, the Soilscape Mapping provided by Cranfield University on behalf of DEFRA shows that the site of the proposed development falls on HOST soil class 6, which is described as "Freely drainage slightly acid loam soils".



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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 3×30 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 ($1 \times 30\text{m} = 30\text{m}$) 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 in December 2022.

Initially, a ground water level assessment trial hole (GWLA) was excavated to a depth of 2.60m below local ground level. The GWLA showed that there was no evidence of local ground water at a depth of 1.60m below ground level.

The GWLA trial hole also showed that there is approximately 150mm of clayey loam topsoil. Below this topsoil, there is a soft clayish subsoil. This clayish subsoil was found to extend for the full depth of the excavation.



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Percolation tests

Three 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 following pictures, these percolation tests were completed at a D1 depth of 300mm below ground level.

Test hole 1	Time Filled	Time Empty	Seconds	Hole Average	Test Average
1st test	10.10am	15.14pm	18840	62.8	
2nd test	9.40am	13.50pm	15000	50	
3rd test	9.30am	12.15pm	10500	35	
			44340		49.26
Test hole 2					
1st test	10.15am	14.50pm	16500	55	
2nd test	9.45am	12.57pm	11520	38.4	
3rd test	9.35am	12.17pm	9720	32.4	
					41.93
Test hole 3					
1st test	10.20am	15.01pm	16860	56.2	
2nd test	9.50am	12.40pm	10200	34	
3rd test	9.40am	12.56pm	9840	32.8	
					41

Average Vp = 44.06 seconds/mm



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Percolation test locations



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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 1500mm 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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Infiltration Test Hole 1500 mm Long x 1500 mm Deep x 600 mm Wide Day 01 08-12-22			
Time	Depth of Water	Amount Drained	Remarks
09:00	1300mm	0mm	
09:30	800mm	500mm	
10:00	650mm	650mm	
10:30	530mm	770mm	
11:00	410mm	890mm	
11:30	300mm	1000mm	
12:00	280mm	1020mm	
12:30	230mm	1070mm	
13:00	190mm	1110mm	
13:30	100mm	1200mm	
14:00	70mm	1230mm	
14:50	0mm	1300mm	Drained in 5.5 hrs



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Infiltration Test Hole 1500 mm Long x 1500 mm Deep x 600 mm Wide			Day
02 09-12-22			
Time	Depth of Water	Amount Drained	Remarks
09:00	1300mm	0mm	
09:30	900mm	400mm	
10:00	720mm	580mm	
10:30	610mm	690mm	
11:00	510mm	790mm	
11:30	470mm	830mm	
12:00	400mm	900mm	
12:30	300mm	1000mm	
13:00	265mm	1035mm	
13:30	230mm	1070mm	
14:00	190mm	1110mm	
14:30	140mm	1160mm	
15:00	100mm	1200mm	
15:30	70mm	1230mm	
16:00	30mm	1270mm	
16:45	0mm	1300mm	Drained in 7.5 hrs



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Infiltration Test Hole 1500 mm Long x 1500 mm Deep x 600 mm Wide Day 03 10-12-22			
Time	Depth of Water	Amount Drained	Remarks
09:00	1300mm	0mm	
09:30	850mm	450mm	
10:00	620mm	680mm	
10:30	500mm	800mm	
11:00	420mm	880mm	
11:30	330mm	970mm	
12:00	280mm	1020mm	
12:30	150mm	1150mm	
13:00	130mm	1170mm	
13:30	100mm	1200mm	
14:00	40mm	1260mm	
14:30	0mm		Drained in 5.5 hrs



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Little Birch

Revision

Job No:

Page:

C/01

Prepared By:

Alex Hunter

Date:

16/12/2022

ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench [mm]:	450	600	2000
required trench length [m]:	35.29	27.74	10.24
	ring soakaways		
diameter of ring [mm]:	1050	1200	1350
required pit diameter [m]:	2.23	2.23	2.23

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

SUMMARY OF CALCULATIONS	
critical design rainfall duration 't _{cr} ' =	600 min
required storage volume 'V _{req} ' =	26.56 m ³
provided storage volume 'V _{prov} ' =	30.26 m ³
utilisation factor =	0.88 .OK
required time to discharge 50% 't ₅₀ ' =	23.98 hours
utilisation factor =	1.00 .OK

GENERAL DATA	
site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m ²] =	360
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] =	5.00
soakaway length 'L' [m] =	4.90
total depth from ground level 'D _g ' [m] =	1.50
depth to drain invert level 'D _d ' [m] =	0.20
soakaway effective depth 'D _{eff} ' [m] =	1.30
free volume in infill aggregate [%] =	95

SOIL INFILTRATION DATA	
allowance for infiltration through soakaway base:	No
available on-site infiltration test results:	<input checked="" type="radio"/> Yes <input type="radio"/> No
use soakage trial pit table below	
internal surface area of trial pit 'a _{p50} ' [m ²] =	3.35
storage volume between 75-25% 'V _p ' [m ³] =	0.49
time for water to fall from 75-25% 't _p ' [min] =	178.13
soil infiltration rate 'I' [m/s] =	1.38E-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 _g ' [m] =	1.50
depth to pipe invert level 'D _p ' [m] =	0.20
soakage trial pit effective depth 'D _{eff} ' [m] =	1.30
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION ⁽⁷⁾													
rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M100-D			outflow from soakaway [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.39	7.80	1.21	13.18	4.74	1.46	15.97	5.75	1.86	20.28	7.30	0.05	7.25
10	0.54	10.80	1.22	18.49	6.66	1.50	22.62	8.14	1.92	29.07	10.47	0.11	10.36
15	0.65	13.00	1.23	22.42	8.07	1.51	27.52	9.91	1.96	35.64	12.83	0.16	12.67
30	0.82	16.40	1.24	28.47	10.25	1.53	35.16	12.66	2.00	45.95	16.54	0.32	16.23
60	1.00	20.00	1.24	34.72	12.50	1.54	43.21	15.56	2.03	56.84	20.46	0.63	19.83
120	1.19	23.80	1.24	41.32	14.87	1.54	51.17	18.42	2.01	67.13	24.17	1.26	22.91
240	1.38	27.60	1.23	47.51	17.10	1.52	58.85	21.18	1.99	76.86	27.67	2.52	25.15
360	1.51	30.20	1.22	51.56	18.56	1.51	63.94	23.02	1.97	83.22	29.96	3.79	26.18
600	1.68	33.60	1.21	56.88	20.48	1.50	70.40	25.34	1.94	91.31	32.87	6.31	26.56
1440	2.03	40.60	1.19	67.57	24.33	1.46	83.21	29.95	1.89	107.15	38.58	15.14	23.44

* 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
Soakage Trial 1	time [min] =	0	30	60	90	120	150	180	210									
	depth to water [m] =	0.20	0.70	0.85	0.97	1.09	1.20	1.22	1.27									
Soakage Trial 2	time [min] =	0	30	60	90	120	150	180	210	240								
	depth to water [m] =	0.20	0.60	0.78	0.89	0.99	1.03	1.10	1.20	1.24								
Soakage Trial 3	time [min] =	0	30	60	90	120	150	180	210									
	depth to water [m] =	0.20	0.65	0.88	1.00	1.08	1.17	1.22	1.35									

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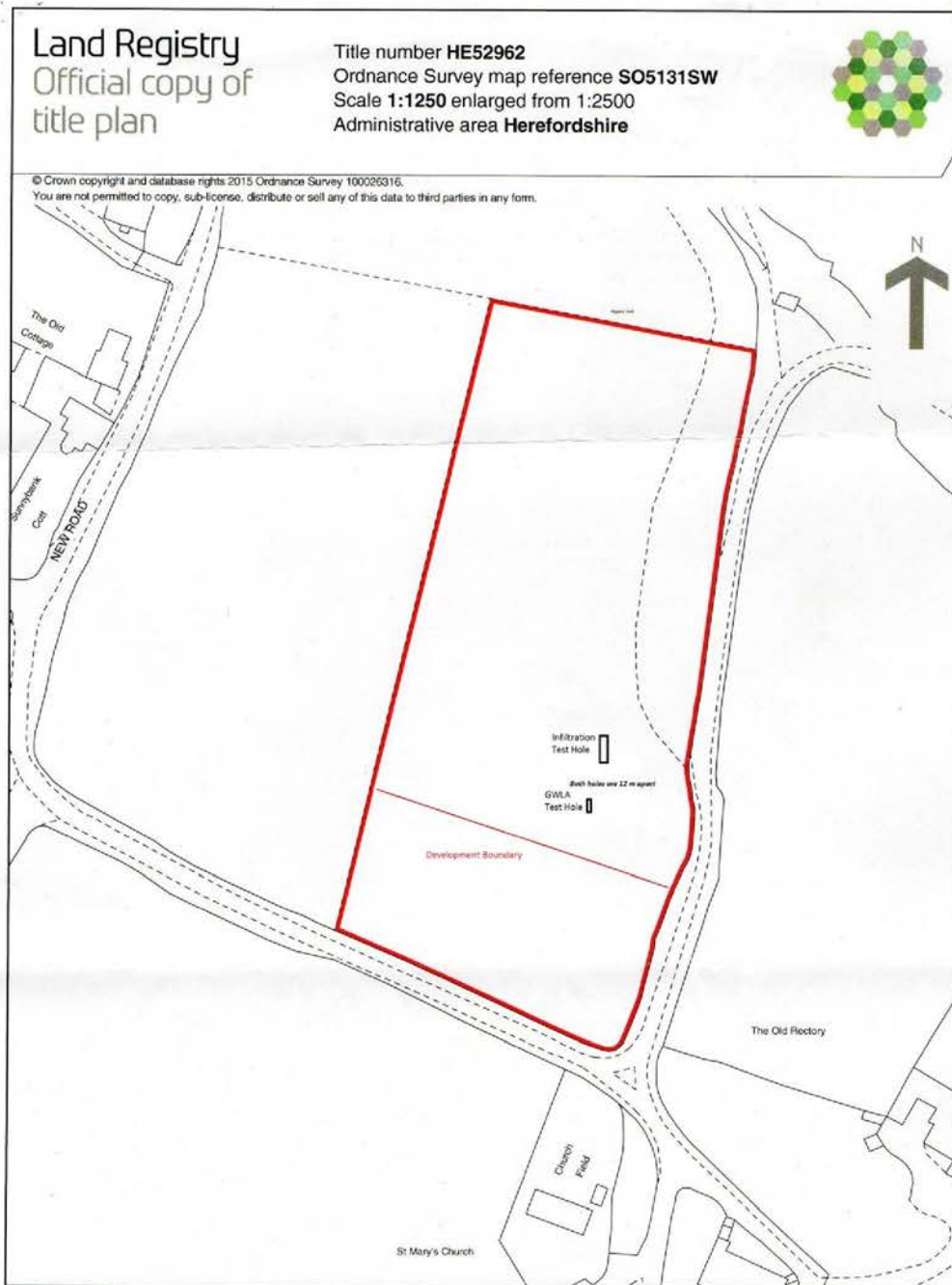
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Infiltration test & GWLA hole locations



This official copy issued on 18 July 2015 shows the state of this title plan on 18 July 2015 at 10:26:50. It is admissible in evidence to the same extent as the original (s.67 Land Registration Act 2002).
This title plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale.
Measurements scaled from this plan may not match measurements between the same points on the ground.
This title is dealt with by Land Registry, Telford Office.



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Surface Water Design

The site is an existing private stable complex, and the test area is laid to grazing.

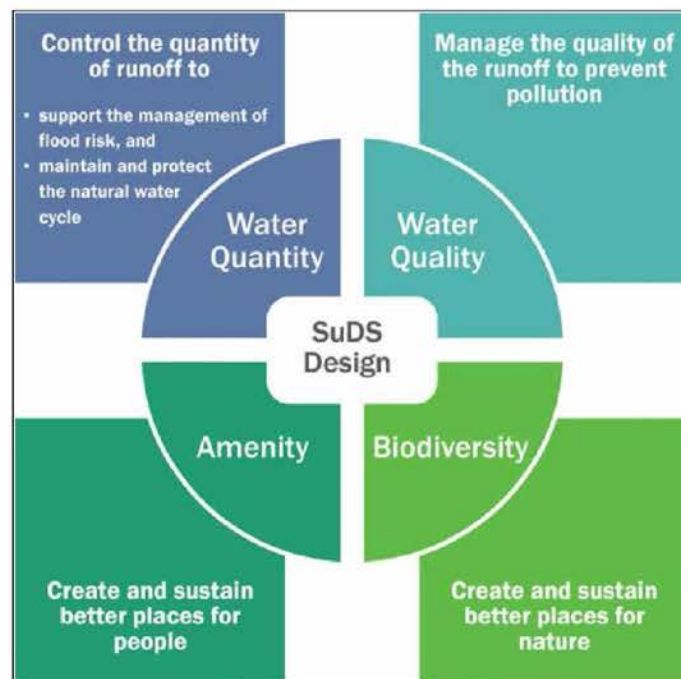
The primary concerns of any proposed surface water management are laid out in SuDS and should be considered to ensure minimal impact to the surrounding area.

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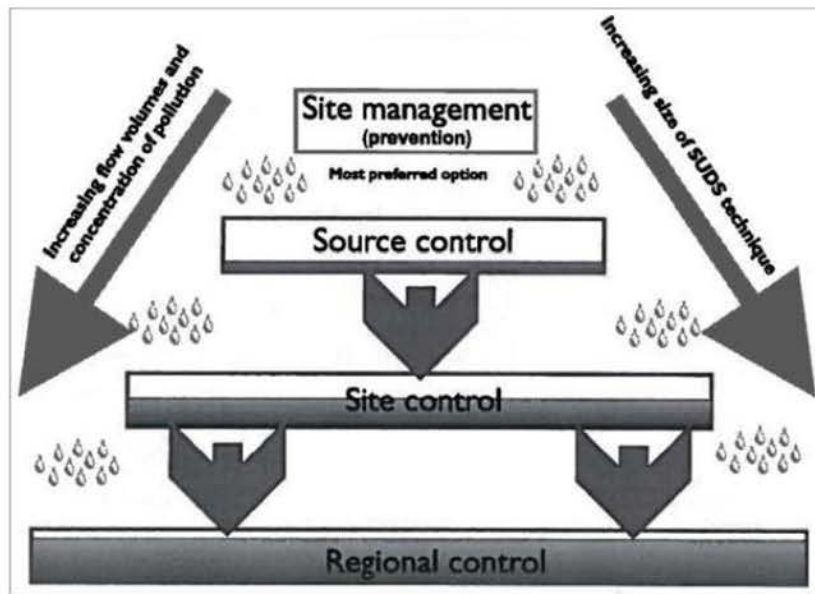
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The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train':



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.

As demonstrated by the previous calculations, the local soils will support a surface water soak-away. As such, the roof water from the proposed dwelling, garage and impermeable hardstanding area 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.

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:



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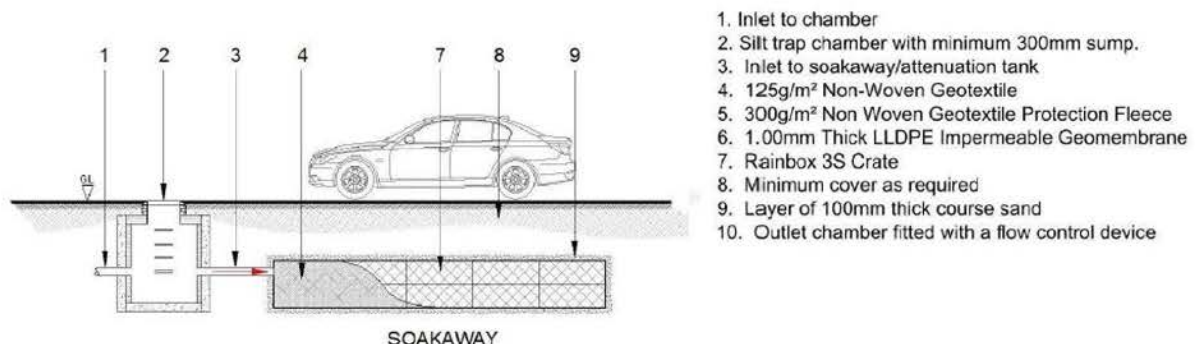
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Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Residential Roofs	Very Low	0.2	0.2	0.05
Residential Car Parks	Low	0.5	0.4	0.4

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 5m x 4.9m x 1.5m deep and should have an inlet pipe invert of no more than 200mm below ground level, as demonstrated in the previous calculation spreadsheet.



Surface water is 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.



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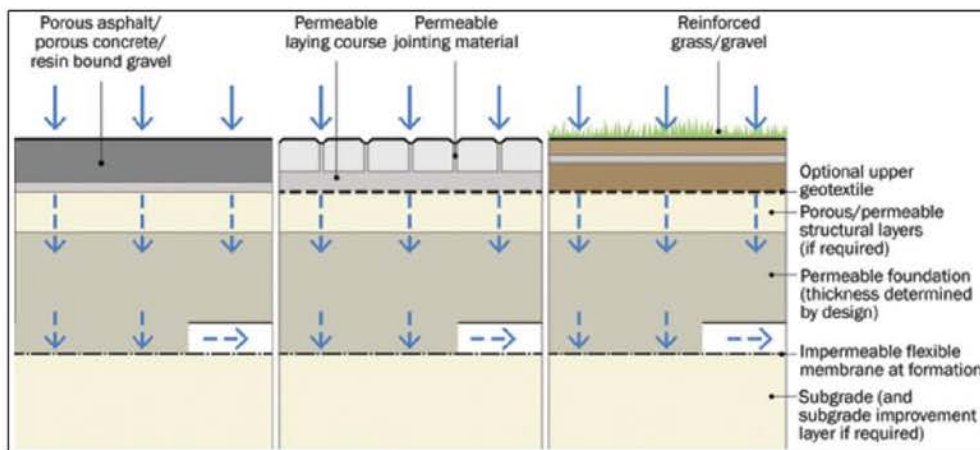
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In addition to roof water, run-off will need to be managed from the driveway and paths.

The proposed development will include a driveway and paths. As previously demonstrated by the on-site testing, the soils at this site were found to be permeable and therefore these hardstandings should be laid as permeable surfaces.

Where the hardstandings are laid, SuDS recommends the use of non-infiltration systems where appropriate. As shown in the following diagram, there are many ways of designing such permeable paths and driveways:



By installing the driveway and paths as permeable surfaces, any run-off will be reduced as will run-off pollution. This method of drainage will have a minimal impact on the local habitat, and the permeable surface will attenuate the surface water thus reducing the current green field run-off rate. In addition, this type of hardstanding would be in-keeping with the surrounding area and natural habitat.



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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 and patio run-off can be discharged to ground by means of a soak-away and all paths and hardstandings can be permeable. The previous spreadsheets show the dimensions of the necessary soak-away.

Therefore, we propose the following:

- Roof water from the proposed dwelling and garage will be discharged via rainwater goods and underground pipework conforming to Building Regulations Part H.
- Roof water from the proposed dwelling and garage 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 5m wide x 4.9m long x 1.5m 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 new driveway and paths will be constructed to be permeable. 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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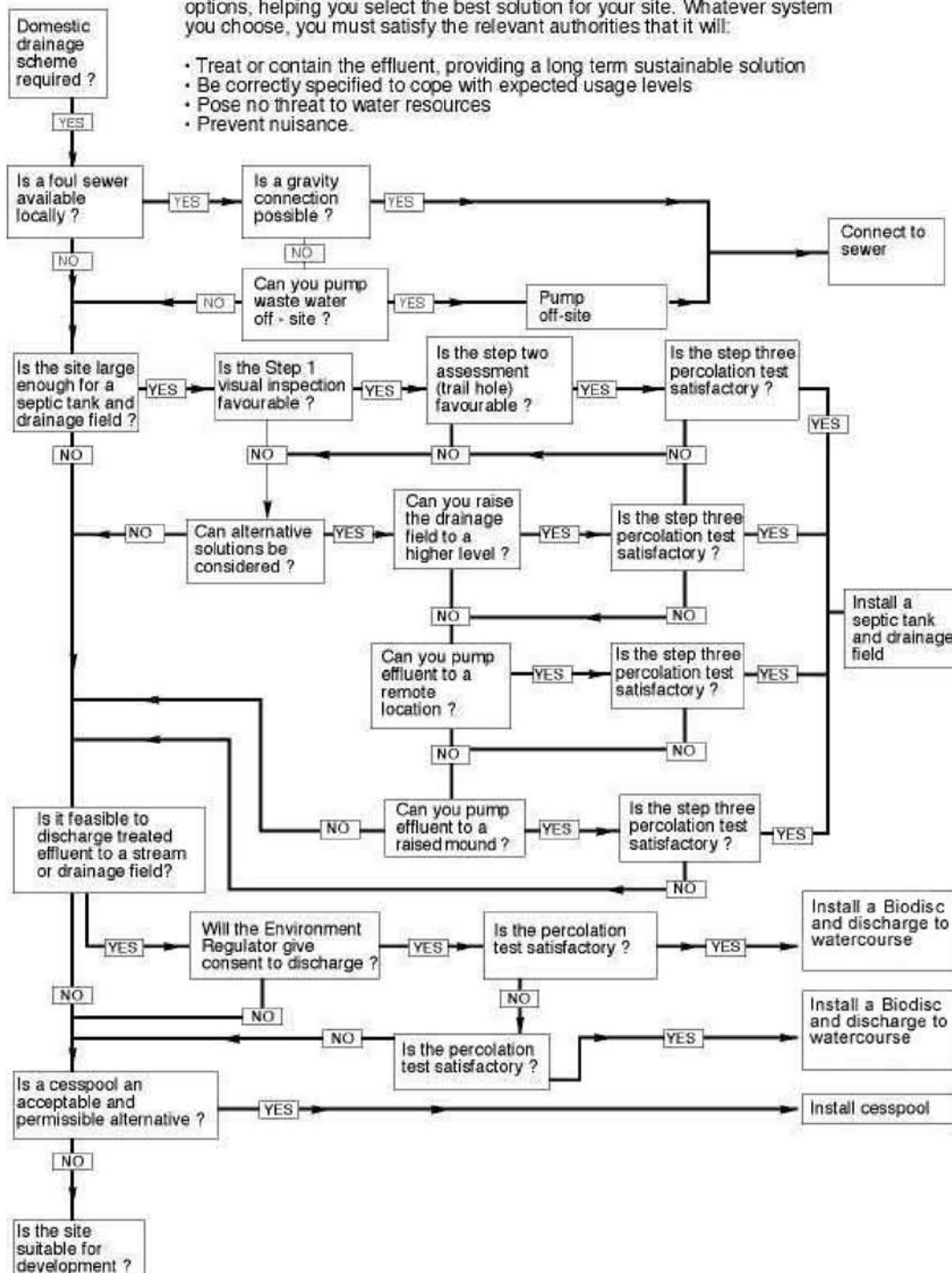
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Site assessment and system selection

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 3-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 3-bedroom dwelling/cottage is 5-persons. Therefore, the proposed off-mains foul drainage system must be designed for a potential population of 5-persons (5pe).

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

Issued in compliance with Article 5 Section 1 Clause (b) of Government Order No. 100/2002 Coll. and in compliance with Council Directive No. 90/269/EEC of 21st December, 1989, on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products, amended by Council Directive 93/68/EEC, by the Notified Body No. 1017.

Domestic Wastewater Treatment Plant
Type range: Marsh Uni Ensign
Types: 60PE, 100PE, 120PE, 150PE, 250PE, 250PE, 300PE, 300PE, 400PE, 400PE, 600PE

EN 12566-3:2005+A1:2008

MARSH INDUSTRIES LIMITED
Units 3-13, Little Addington Business Park, Millingborough Road, Little Addington,
Kettering NN16 4AS UNITED KINGDOM
VAT Ident. No.: GB000000000

Place of the production: See above

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

EN 12566-3:2005+A1:2008

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.

Test item efficiency as organically loading	BOD ₅	SS ₂₀	TKN	TP
300L x 649 kg/day	90.0 %	91.0 %	91.0 %	91.0 %
	90.0 %	91.0 %	91.0 %	91.0 %
	90.0 %	91.0 %	91.0 %	91.0 %

Characteristics:
Discharge temperature:
Discharge rate:
Discharge volume:

In Prague: 03.05.2012

TUV SUD Czech s.r.o. • Newby House 199 • 142 21 • Prague 4 • Czech Republic • info@tuv-sud.cz



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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 44.06mm/s.

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 45m² is required:

Population equivalence x Vp x factor 0.2 =

$$5 \times 44.06 \times 0.2 = 44.06$$

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

Total minimum drainage field area = 45m²

As demonstrated by the percolation tests, the drainage field would need to be at least 45m². In addition, the percolation testing has demonstrated that the new drainage field must be a high-level drainage field with an invert depth (D1) of no more than 300mm below ground level.

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 100mm below ground level.



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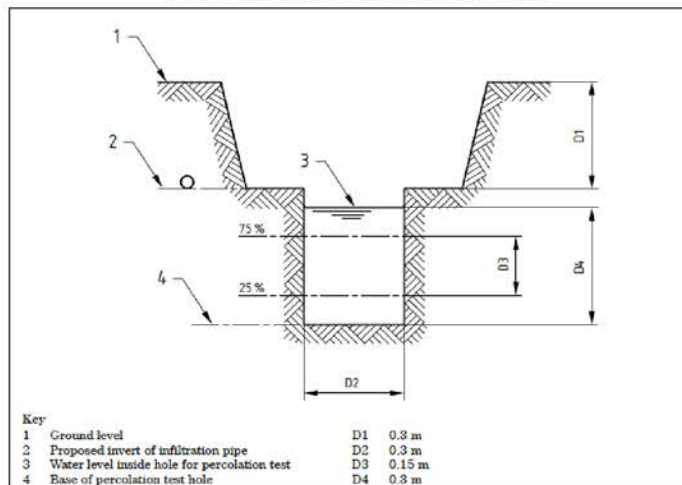
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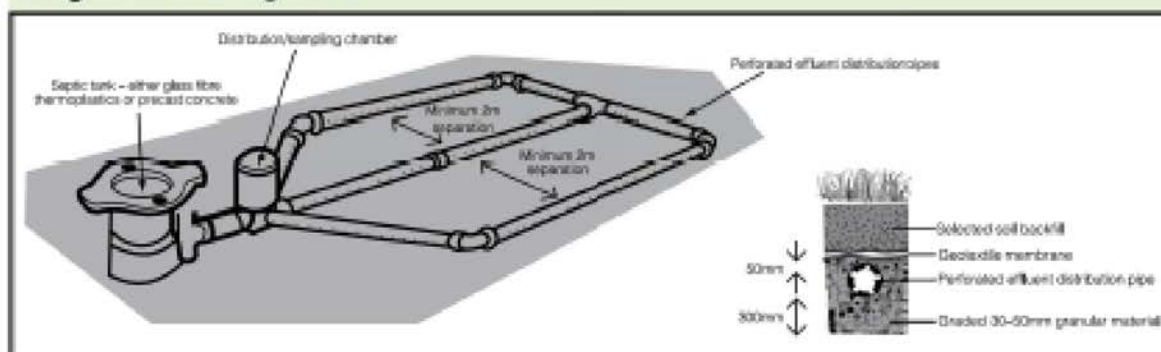
Figure 2 Cross-section of typical percolation test hole



Dimension D1 = 300mm in line with BS.6297

Continuous loop drainage field:

Diagram 1 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 45m² high-level continuous loop drainage field laid at a 300mm 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 750-litres per day. (5pe 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 750-litres per day, a Permit to Discharge or Exemption Certificate **will not** be required from the Environment Agency.

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



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#	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:



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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.



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