

H+H Drainage

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

Phosphate and hydraulic loadings of the proposed development of The Crown & Sceptre Public House, Bromyard, Herefordshire.

4th July 2021

Completed by Alex Taysum-Hunter



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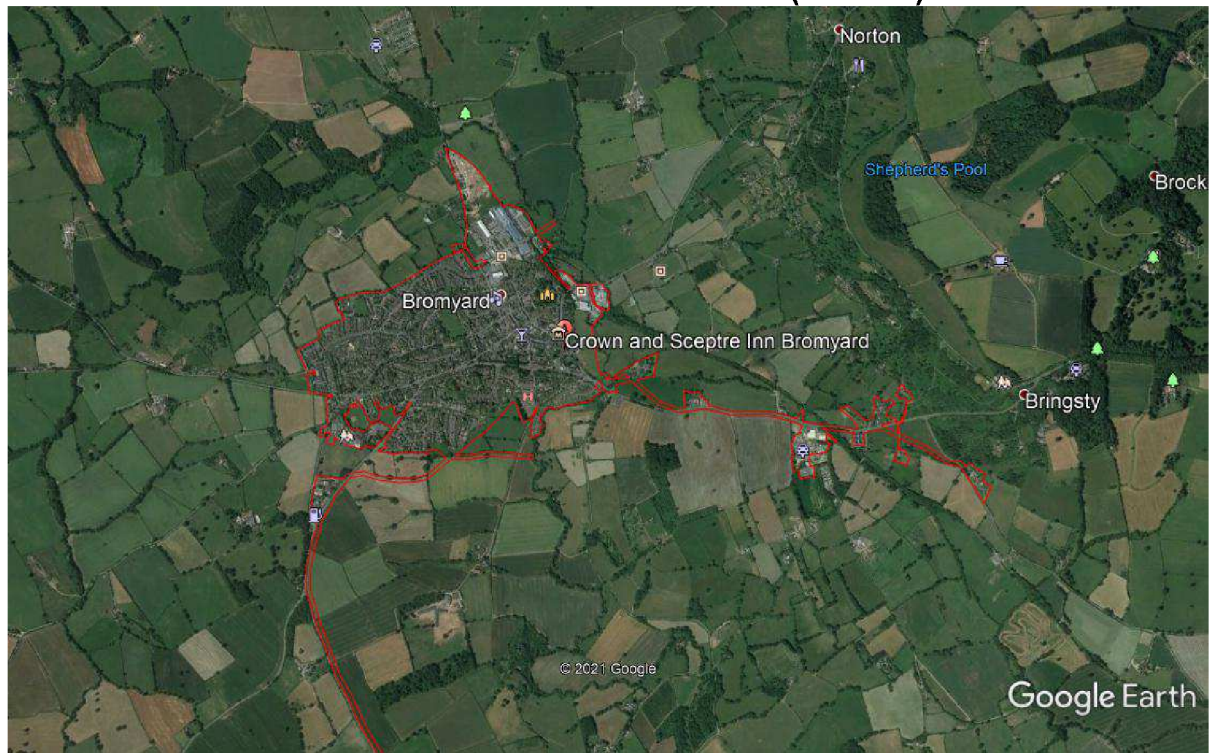
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The Crown & Sceptre is currently a Public House with a domestic dwelling above. The proposal is to develop the existing building and to convert it to one domestic dwelling. The site is located within Bromyard and is currently connected to the Dwr Cymru Welsh Water Public Sewer. This site is also located within the Lugg Catchment phosphate sensitive zone (the red zone).

DCWW Public Sewer Catchment (red line)



River Lugg Catchment phosphate sensitive zone (red zone)



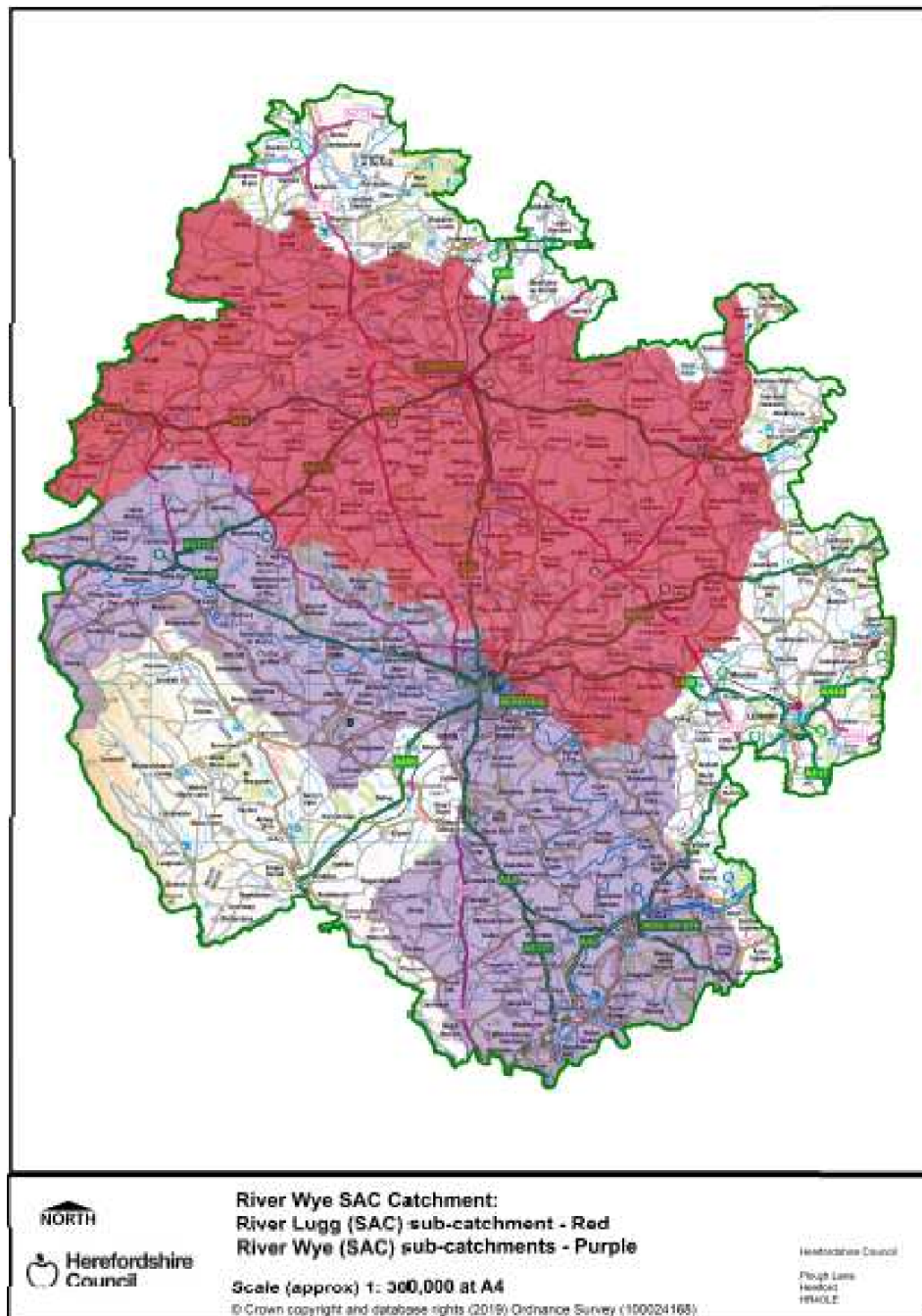
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With regards to the current Herefordshire Council Position Statement, we are mindful that any phosphate discharge must be neutral or demonstrate betterment. In order to assess this issue, we must first consider the current usage of the building in question.

The building is a Public House, incorporating a domestic dwelling (flat). The current usage is:

1x 2-bedroom dwelling (flat)
1x Public House

The proposed development is to convert the public house into a domestic dwelling. The proposed usage is:

1x 5-bedroom dwelling (house)

In accordance with British Water Flows & Loads 4 (BWF&L4), the current public house has the following hydraulic loadings:

(In addition to the hydraulic loadings, the red figures show the nitrogen levels in the effluent. BWF&L4 does not list phosphate as a separate figure, but it is generally agreed that Phosphate loadings are similar to nitrogen loadings)

Existing loadings:

Potential customers (meals):

42x covers per sitting. Although multiple sittings could be achieved, we must assume that there would be no more than three sittings per day. This would give a total loading of 126 sittings per day.

Using BWF&L4 this would equate as follows:

126x 25-litres/head = 3,150-litres/day.

3,150-litres / 150-litres = 21 domestic population equivalence.

4ppm N x 3,150-litres = 12,600mg/day



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Staff:

4x full-time staff

Using BWF&L4 this would equate as follows:

4x 90-litres/head = 360-litres/day

360-litres / 150-litres = 2.4 domestic population equivalence.

5ppm N x 360-litres = 1,800mg/day

Potential customers (drinkers):

20x drinkers

Using BWF&L4 this would equate as follows:

20x 12-litres/head = 240-litres/day

240-litres / 150-litres = 1.6 domestic population equivalence.

5ppm N x 240-litres = 1,200mg/day

Existing dwelling (flat)

1x 2-bedroom dwelling (flat) = 1x 4 population equivalence = 4pe

4pe x 150-litres = (600-litres/day) 4pe

8ppm N x (4pe x 150-litres) = 4,800mg/day N



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As can be seen from the previous calculations, the total potential loading for the current property is:

Total potential Hydraulic loading: $21\text{pe} + 2.4\text{pe} + 1.6\text{pe} + 4\text{pe} = 29\text{pe}$.
(4,350-litres/day)

Total Nitrogen loading: $12,600 + 1,800 + 1,200 + 4,800 = 20,400\text{mg/day}$

In accordance with British Water Flows & Loads 4 (BWF&L4), the proposed development will have the following loadings:

Proposed Loadings:

1x 5-bedroom dwelling (house) = 7pe

7pe x 150-litres = (1,050-litres/day) 7pe

8ppm N x (7pe x 150-litres) = 8,400mg/day N

As can be seen, the above calculations demonstrate that the proposed development is likely to reduce the hydraulic discharge and the nitrogen discharge, by removing the potential loadings of the public house and replacing these with the potential loadings of the proposed dwelling.

As mentioned, we can assume that the phosphate discharge will follow a similar pattern to the nitrogen loading. Therefore, it is more than likely that the proposed development will reduce the phosphate discharge by 12,000mg/day.

In addition, the hydraulic discharge will also be reduced by 22pe (3,300-litres/day). This will reduce the potential hydraulic loading on the local Dwr Cymru Welsh Water WwTW. By reducing this hydraulic loading, the efficiency of the local WwTW will be increased.



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The increased efficiency of the local WwTW will increase its ability to reduce all potential pollutants and discharge a higher standard of treated effluent to the environment.

However, the above calculations are based on Potential Population (as specified by British Water Flows & Loads 4).

It should be noted that the Crown & Sceptre is currently not trading. Therefore, if we consider the current loads of the current dwelling, we must still show a reduction of Phosphate loading in order to satisfy the current Position Statement.

The current loading is from the existing dwelling:

Existing dwelling (flat)

1x 2-bedroom dwelling (flat) = 1x 4 population equivalence = 4pe

4pe x 150-litres = (600-litres/day) 4pe

8ppm N x (4pe x 150-litres) = 4,800mg/day N

As can be seen there is a design nitrogen discharge of 4,800mg/day. This must be compared to the proposed nitrogen discharge of 8,400mg/day for the proposed dwelling.

Proposed Loadings:

1x 5-bedroom dwelling (house) = 7pe

7pe x 150-litres = (1,050-litres/day) 7pe

8ppm N x (7pe x 150-litres) = 8,400mg/day N

As can be seen the proposed dwelling would have a higher potential discharge of nitrogen (and therefore phosphate) than the current dwelling.



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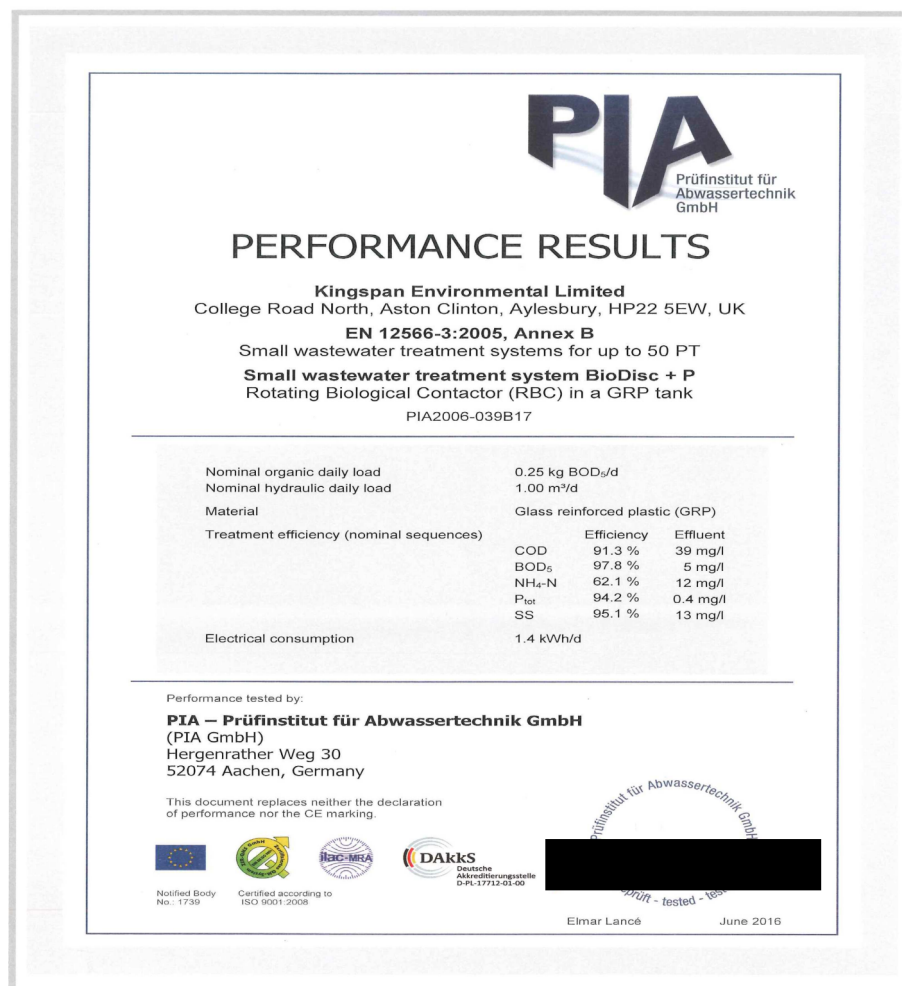
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In order to reduce this phosphate discharge, a phosphate reducing packaged sewage treatment plant should be installed.

Packaged Sewage Treatment Plant Design

There are a limited number of package sewage treatment plant manufacturers that can offer a phosphate reduction system.

Kingspan offer the Biodisc packaged sewage treatment plant with a tested phosphate reduction system. This installation can reduce the phosphate discharge level to below 0.4mg/L. This is demonstrated and certified below:



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The Kingspan BAX Biodisc package sewage treatment plant is designed for a potential population equivalence of 9pe. This treatment plant conforms to BSEN.12566-3 and is acceptable to the Environment Agency. This size of packaged sewage treatment plant would be sufficient for the design population of the proposed dwelling:

	
ETS Ltd Trading as: Kingspan Environmental College Road North Aston Clinton Aylesbury Buckinghamshire HP22 5EW United Kingdom	
07	
EN 12566-3	
BA - BF BioDisc	
Hydraulic daily load:	1.2m ³ /day - 10m ³ /day
Material:	GRP Glass Reinforced Plastic
Watertightness (water test):	Pass
Structural Calculation:	Pass
Treatment efficiency:	COD: 89%
	BOD ₅ : 96%
	SS: 95%
	Total P: 48%
	NH ₄ : 89%
	Total N: 46%
Electrical consumption:	1.3 kWh/d - 3.1 kWh/d
Sludge production:	0.21 litres per person per day

Based on the site assessment and above information, the Kingspan BAX Biodisc packaged sewage treatment plant should be installed with the integral Polyaluminium chloride chemical dosing assembly. By doing so, the discharge of phosphate would be reduced from approximately 8ppm down to 0.4ppm.



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Using the phosphate level of 0.4ppm, we can recalculate the potential loading from the proposed development:

Proposed Loadings with phosphate treatment:

1x 5-bedroom dwelling (house) = 7pe

7pe x 150-litres = (1,050-litres/day) 7pe

0.4ppm N x (7pe x 150-litres) = 420mg/day N

As can be seen, this equipment would then offer more than 90% reduction in the design phosphate discharge.

The proposed phosphate treatment plant uses a dosing agent to reduce phosphate. It is unsatisfactory to discharge this dosing agent directly to the environment. This dosing agent reacts well to settled sludge and is bound within the sludges during the traditional treatment of sewage.

Therefore, this proposed packaged sewage treatment plant should be used for phosphate reduction and then the discharge of treated effluent should be made to the local DCWW Public Sewer.

By discharging to the local Public Sewer, the dosing agent will be processed at the local DCWW WwTW.

At the WwTW, the dosing agent will be held in the settled sludge and not released to the local watercourse. Any trace dosing agent will then be disposed of legally during the process of desludging.



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In conclusion, when looking at potential loadings, we can see that the proposed development will reduce both phosphates and nitrogen by more than 55% and the hydraulic discharge will be reduced by over 75% in comparison to the potential reinstatement of the Crown & Sceptre.

In addition, with the installation of a phosphate reducing BAX Biodisc packaged sewage treatment plant, we can also see that the reduction of phosphate will be more than 90% effective and that the dosing agent will not enter the River Lugg or any tributary of the River Lugg.

These calculations demonstrate that the proposed development would offer a reduction of phosphate and therefore betterment in line with the current Herefordshire Council Phosphate Position Statement.

In addition, this development would reduce the loading on the Welsh Water WwTW and thus increase the efficiency of the WwTW. This would show further benefit to the local environment and habitat.

Therefore, 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 should be laid to a Kingspan BAX Biodisc sewage treatment plant with an integral phosphate reduction system.
- The secondary treated effluent should then be discharged to the Public Foul Sewer.



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Environment Agency Consent to Discharge

The total design discharge will be 1,050-litres per day. The Environment Agency General Binding Rules state that any discharge to surface water (a watercourse) of more than 5,000-litres per day will require a Permit to Discharge or Exemption Certificate.

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

However, the discharge from this site is to be to the local DCWW Public Sewer. Therefore, an Environment Agency Permit to Discharge would **NOT** be required.



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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 'maintenance checks' to be undertaken by the homeowner.

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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