



Water Use

Regulatory Method (WAT-RM-04)

Indirect Sewage Discharges to Groundwater

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Update Summary

Ver.	Description
v1.0	Draft version
v1.1	First issue for Water Use reference using approved content from the following documents: <i>Indirect_to_GW_final_version.doc</i>
v2.0	s 5.5.7 now includes info on how to size soakaways; s7 added (Regulating willow treatment systems); BR478: (Mound Filter Systems) added as reference doc and WAT-RM-22 links now refer to WAT-RM-34. / Various minor edits
v3.0	s3.4 & 5.5.7 text details revised; New base template applied, links to docs revised for new SEPA website, Nov 2008
v4.0	s7 new procedure for regulating willow treatment systems, Figs 1 & 2 minor modifications. (Jan 2011)
v5	Expired CMS links reviewed and updated.
V6	Change to mean effluent standards - new s3.8 and changes to s5.5.6 and 5.6.1
v7	Strengthening of wording that SEPA are minded not to authorise discharges where connection to public sewer is possible.
v7.1	s5.5.7 non-domestic pe now specifies 'standard residential flow', intranet link updated
v7.2	Added: s3.9/3.10 compost toilets/grey water; s5.5.7 non-domestic septic tank p.e loading
v7.3	s3.1 updated to define 'existing' and clarify paper application process.

Notes

References: Linked references to other documents have been disabled in this web version of the document. See the References section for details of all referenced documents.

Printing the Document: This document is uncontrolled if printed and is only intended to be viewed online.

If you do need to print the document, the best results are achieved using Booklet printing or else double-sided, Duplex (2-on-1) A4 printing (both four pages per A4 sheet).

Always refer to the online document for accurate and up-to-date information.

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1. Key Points

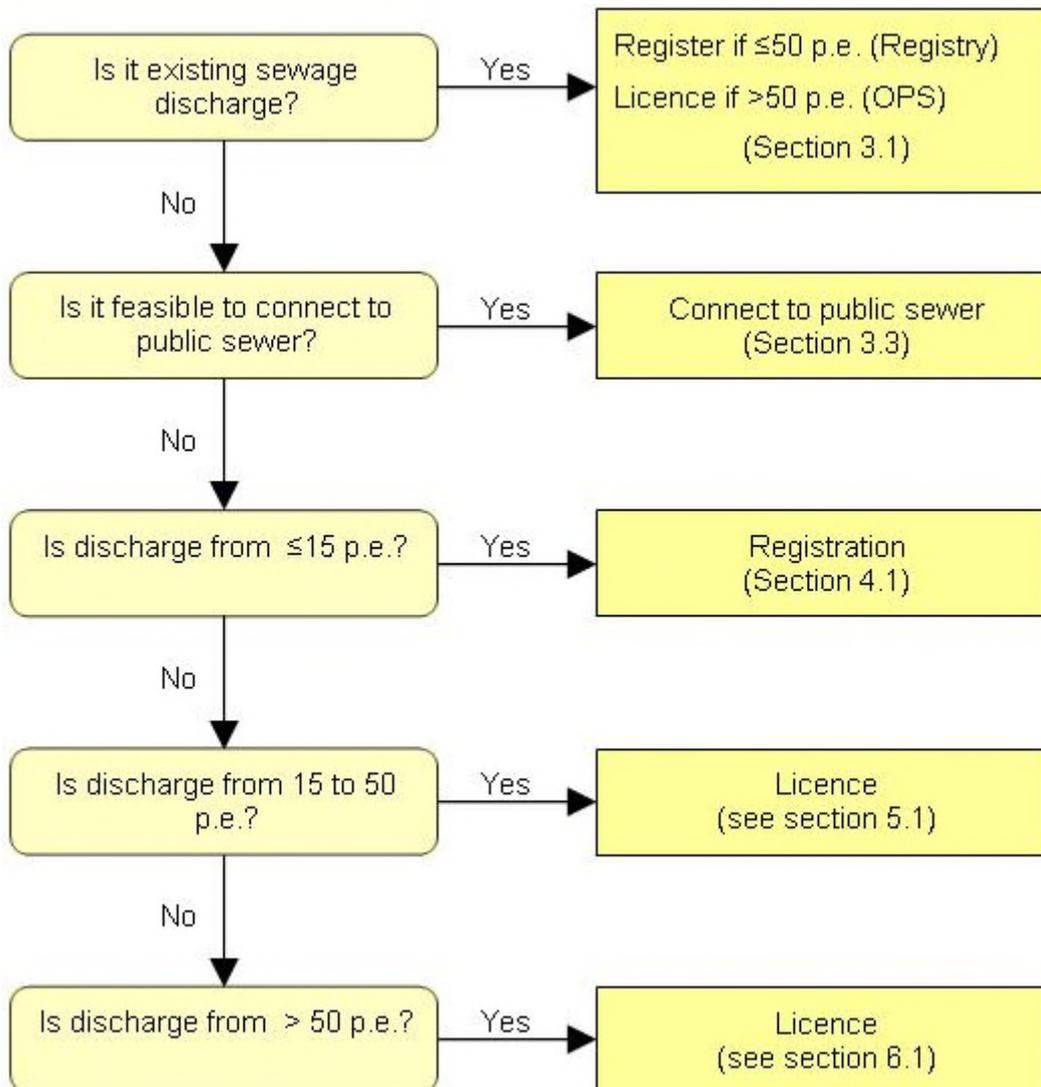
This guidance concerns indirect sewage discharges to groundwater. For sewage discharges to surface waters please refer to *WAT-RM-03: Regulation of Sewage Discharges to Surface Waters* for guidance.

The guidance is designed for use with the following licence templates:

- *WAT-TEMP-04: Septic Tank Licence Template*
- *WAT-TEMP-05: Sewage Treatment Works (15-100pe) Licence Template*

2. Process Flow

Figure 1 Decision Diagram for Sewage Discharges Indirect to Groundwater



3. Pre-Application Consultations

A discharge to land is SEPA's preferred method for the disposal of treated sewage effluent where the ground conditions allow adequate infiltration of the effluent and sufficient attenuation of the polluting nature of the discharge.

Refer to *Other Considerations* for guidance on:

- Multi-ownership discharges
- Separating surface water from treatment plants

All references to the Technical Handbook refer to the *Technical Handbook*: (Section 3: Environment).

3.1 Existing Unauthorised Discharges

When an existing unauthorised sewage discharge from a population equivalent (p.e.) (see section 3.4) of less than or equal to 50 is brought to the attention of SEPA, the discharge should be registered. The threshold of 50 p.e. (9 homes) is used for existing discharges, whereas 15 p.e. should be used for new sewage discharges. 'Existing' means that the treatment system has been in use for more than two years before the date of application.

NOTE: A proposed increase in p.e. for an existing unauthorised discharge should be assessed as a new discharge since there is an increase in environmental risk. However a pragmatic approach should be taken, depending on the scale of the increase and the resultant risk to the environment.

An application should be made, either online or by paper. If a paper application is made, SEPA Registry will register the discharge. It should be noted that for these existing discharges there will be no consultation with OPS and no assessment as to whether the discharge is causing an environmental impact. Furthermore there will be no assessment as to whether the discharge may affect a Protected Area such as an area designated for nature conservation.

N.B. In the situation where there are say 3 small septic tanks discharging to a single soakaway, a registration should be issued for each septic tank. This allows for easier enforcement of registration conditions.

An unauthorised sewage discharge from a p.e. of more than 50 must be licensed. A date for submission of a full application should be agreed with the discharger. Provided there is no evidence of an environmental impact (as determined by a site visit), the discharge should be licensed on the basis of the existing system. If there is an unacceptable impact, progressive improvements within a reasonable timescale, taking account of costs and benefits, should be agreed with the discharger and conditioned within the licence.

3.2 Modifying Authorised Discharges

3.2.1 Modifying Registered Discharges

If the p.e. of an existing registered discharge is increased (e.g. due to a house extension or an additional house joining the system) the registration requires modification. If the p.e increases above 15 then a new application for a simple licence should be made.

The procedure for variation of registrations as described in *WAT-RM-09: Modifications to CAR Authorisations* should be followed.

NOTE: Deemed registrations (previously *Non-subsistence CoPA Consents*) should be assessed in accordance with WAT-RM-09.

3.2.2 Modifying Licensed Discharges

For licensed discharges, changes to the licence such as an increase in loading requires a variation of the licence. Refer to *WAT-RM-09: Modifications to CAR Authorisations* for details.

3.3 Connection to the Public Sewer and Adoption by Scottish Water

The proliferation of small STWs and septic tanks in or near sewered areas is to be discouraged. Disposal of foul drainage to the public sewer should always be sought where practicable. This reinforces the need to take full advantage of the planning consultation process to ensure that, where appropriate, connection to the public sewer is a planning requirement for new developments. If connection to the public foul sewer is not a planning requirement, SEPA must ensure that the discharge is appropriately regulated to provide an adequate level of environmental protection. SEPA may refuse a CAR authorisation if a public foul sewer is in close proximity and the applicant should be made aware of this.

SEPA will normally refuse an application for authorisation to discharge sewage to surface waters or land where the site or proposed discharge point is within, or immediately adjacent to, a Scottish Water sewered area. SEPA seeks to refuse these applications on the basis of this type of treatment being a less efficient and less sustainable use of the water environment. Applications will be considered where it is shown that connection to the sewer network is not reasonably practical.

Reference should be made to Position Statement *WAT-PS-06-08: Policy and Supporting Guidance on Provision of Waste Water Drainage in Settlements* which sets out SEPA's policy principles on the provision of waste water drainage within and outwith settlements served by a strategic sewerage system.

3.4 Population Equivalent

Population equivalent (p.e.) for domestic housing is equivalent to the figure P in *Flows and Loads* (British Water Code of Practice) and should be determined using the number of bedrooms as referred to in section 5 of the code.

The Code of Practice can also be used to determine flow and load figures for various types of non-domestic sewage discharge.

To calculate the population equivalent for non-domestic sewage effluent, multiply the number of people using the system by the BOD load (g/day) and divide by 60 (60g is the average BOD load for one person in one day). Information on BOD loading is contained in *Flows and Loads*.

For large developments an alternative method for deriving p.e. as described in *WAT-SG-13: Municipal Sewage Treatment Works (STW)* can be followed .

3.5 Shared Systems

Some developments are served by more than one treatment system (septic tank/package plant etc) sharing a soakaway.

In this case each treatment system should be separately authorised by registration or licence as appropriate.

3.6 New Discharges - Registrations

If the discharge is from a new development the person should be advised that the sewage disposal system should be installed in accordance with *Technical Handbook: (Section 3: Environment)*, which provides guidance on achieving the standards set in the Building (Scotland) Regulations 2004. Building Control Authorisation will be required for the construction of the soakaway. In most circumstances SEPA will not register the activity unless a Building Control Warrant Number (to indicate a building warrant application is at least being processed) is obtained and supplied in the application form. For further information refer to *Technical Handbook: (Section 3: Environment)*, which provides guidance on achieving the standards set in the Building (Scotland) Regulations 2004.

In those circumstances where the applicant has not applied for a Building Control Warrant (for example, if the applicant wishes to sell a site with a SEPA authorisation but does not intend to develop it), the applicant will be required to carry out a Prior Investigation to show that the ground conditions are suitable for the purposes of a soakaway system. The applicant should be instructed to complete the *Prior Investigation form* (available in Section 5 of Licence Form B – see *CAR Application Forms*).

The applicant should be advised that septic tank treatment is the preferred option where the percolation value V_p is between 15 secs/mm and 100 secs/mm.

In cases where the Vp is greater than 100secs/mm but less than 140 secs/mm then secondary treatment is required prior to discharge to soakaway system.

For discharge with Vp >140secs/mm then applicants should consider other methods of disposal such as mound soakaway or other filtration system as detailed in the *Technical Handbook: (Section 3: Environment)* or appropriate treatment prior to discharge to surface waters (see *WAT-RM-03: Regulation of Sewage Discharges to Surface Waters*).

Guidance on mound soakaways can be found in *Mound filter systems for the treatment of domestic wastewater (BR478)*.

For discharges with Vp less than 15 secs/mm then secondary treatment is normally required (unless applicant can demonstrate through Prior Investigation that primary is acceptable) prior to discharge to an infiltration system that has been designed to ensure a greater distribution of effluent over a larger area (see *Determining Appropriate Treatment* for further details.

In order to determine the application, the applicant will be required to make an on-line or paper application and SEPA will have 30 days to consider the application unless further information is required.

3.7 Licensable Discharges

The applicant should be sent a Licence *Application Form* and advised that, in order for SEPA to determine the application, a Prior Investigation must be undertaken. The Prior Investigation section of the application form must be completed. This will determine the level of treatment that will be required and/or the acceptability of the proposal. See *Licence standards and requirements table*.

The applicant should also be advised that the soakaway (if a suitable option) must be constructed in accordance with the *Technical Handbook* (which provides guidance on achieving the standards set in the Building (Scotland) Regulations 2004).

Soakaway construction is regulated by the local Building Control Authority whom the applicant should contact.

3.7.1 Discharge ≥ 50 p.e

The applicant should be advised that, in general, discharges to ground from more than 50 p.e. are not encouraged due to the risk that they pose to the water environment. Applicants should be advised that stringent treatment standards and significant investigatory and monitoring work will be required.

An intrusive site investigation and simple quantitative assessment should be carried out by a competent person on behalf of the developer. In most cases a down-gradient monitoring point, such as a borehole, should be provided by the developer so that ongoing monitoring can be carried out. (see *Monitoring*

the Discharge). Due to the large volume of the discharge, the potential for nitrate pollution needs to be considered and some form of treatment to reduce the nitrate loading may be required. The Area Hydrogeologist should be contacted to discuss possible investigatory requirements for discharges of this size.

3.8 Package Treatment Plant Certification to EN12566 Part 3

New sewage domestic discharges from package treatment plants serving up to 50pe require to be treated by a plant tested and certified to EN12566 Part 3. To obtain certification to EN12566, plants must undergo rigorous independent testing which results in a documented mean discharge standard and percentage reduction in pollution across the plant.

The mean standard in the EN12566 Part 3 certificate is a clear and unambiguous assessment of the performance of the plant, and is used in the CAR authorisation for unsampled sewage discharges.

3.9 Urine Diverting Dry Toilets (UDDT) and Composting Toilets

Often referred to incorrectly as composting toilets, UDDTs are a type of dry toilet which diverts urine from the solid fraction of the toilet waste. In true composting toilets the liquid fraction remains within the waste matter and is disposed of together with no need for a discharge authorisation as there is no discharge.

The liquid fraction from a UDDT can be discharged via a soakaway designed as normal with the soil passing the usual percolation tests. This can be discharged to land with a Registration or Licence according to the population served as calculated as usual using the Flows and Loads document.

Advice on the disposal of the solid fraction can be obtained (and the waste from true composting toilets) from SEPA National Waste Policy.

3.10 Grey Water

Grey water is all wastewater excluding discharges from toilets i.e. greywater should not have significant faecal contamination, Sources of greywater include sinks, baths, showers and washing machines.

Greywater must not be allowed to discharge directly to the water environment but should be directed to a soakaway with an appropriate CAR authorisation. The design of the soakaway should be compliant with the *Technical Handbook*: (Section 3: Environment), which specifically refers to greywater.

4. Registrations

4.1 Introduction

Sewage discharges to the water environment from a population equivalent of less than or equal to 15 are assumed to be relatively low risk. Registered discharges do not have to specify a responsible person and will not be routinely monitored. CAR allows escalation of authorisations, but for sewage discharges ≤ 15 p.e. indirect to groundwater, escalation to Licence level should only occur in exceptional circumstances and should be agreed beforehand with the Area Licensing Team.

For new discharges SEPA needs to ensure that the treatment proposed for the discharge provides an adequate level of environmental protection for groundwater. SEPA also intends to assess cumulative impacts of sewage discharges using a database of authorised discharges. For example, a proliferation of indirect discharges to groundwater may result in an unacceptable impact on groundwater quality. Therefore information relating to the proposed sewage discharge must be kept by SEPA. In addition certain specific items, such as NGR, population equivalent and type of treatment must be entered into CLAS to enable electronic interrogation of the database.

4.2 Determining the Registration Application

For guidance on multi-ownership discharges/separating surface water from treatment plants, refer to *Other Considerations* for details.

4.2.1 Existing Discharges

The applicant should be advised that SEPA will register the existing discharge but that if the system causes pollution, then SEPA may, at some time in the future, require the upgrading of the system.

The applicant will be required to make an on-line or paper application and SEPA will register the activity within 30 days unless further information is required.

4.2.2 New Discharges

Registration applications for new discharges require additional information over and above that required for existing discharges - a Building Control Number and the percolation value (V_p) from the Prior Investigation.

- Connection to the public sewer should be promoted where it is reasonably practicable to do so (WAT-RM-21). SEPA will normally refuse an application where the site or proposed discharge point is within, or immediately adjacent to a sewered area. See section 3.3.

If the applicant has submitted a Building Control Authorisation number and the V_p value is between 15 and 100secs/mm then Registry will register the application. OPS staff will only become involved in circumstances where the

Building Control Number has not been submitted or the Vp value is outwith this range.

4.3 Determining Appropriate Treatment

If the Vp value is:

- <15 secs/mm
Consider alternative disposal options including discharge to mound soakaway or alternatively discharge to surface waters. If none available then secondary treatment is required. Only in unusual circumstances will SEPA allow primary treatment and after the applicant has demonstrated through prior investigation that primary treatment is sufficient. In such circumstances the OPS officer should discuss the matter with the Area Hydrogeologist and her/his Unit Manager. If discharge to land is the only option, the applicant should consider increasing the area of distribution of the effluent with a minimum size of area of $A \text{ (m}^2\text{)} = 3.6 \times \text{p.e.}$ and consider a pumped dosing system to ensure effective distribution of effluent throughout the soakaway system.
- Between 15 and 100 secs/mm
Septic tank to soakaway in accordance with the details in the *Technical Handbook*.
- Between 100 and 140 secs/mm
Consider other disposal options including appropriately treated effluent to surface waters or, for a discharge to land, secondary treatment including constructed wetland to soakaway.
- >140 secs/mm
Consider other disposal options including appropriately treated effluent to surface waters (normally via a partial soakaway) or for a discharge to land, a filtration system or construction of a mound soakaway in accordance with the aforementioned Technical Handbook.

4.3.1 Prior Investigation

Discharges of sewage effluent from dwellings serving less than or equal to 15 p.e. are considered by SEPA to present low risk to the water environment if the prior investigation and soakaway construction are undertaken to comply with the guidance in the Technical Handbook.

Enforcement of these regulations by the local authority Building Control Department is considered to be sufficient to ensure compliance with the requirements of the *Groundwater Directive 1980/68/EC* (CELEX: 31980L0068).

Document *PPG 4 Treatment and disposal of sewage where no foul sewer is available* provides guidance to dischargers on percolation tests, minimum tank sizes and soakaway construction.

4.3.2 Insufficient or Incorrect Information

If the applicant has not supplied a Building Control Number (BCN) then, in the first instance, they should be contacted and asked to submit a BCN. Failure to do so may result in refusal of the application. If the applicant has not applied for a Building Control Warrant, for example, where the applicant wishes to sell land with SEPA authorisation but does not intend to develop the land themselves, then the applicant must carry out a Prior Investigation in order to comply with the *Groundwater Directive 1980/68/EC* (CELEX: 31980L0068). The applicant should be sent a Prior Investigation form which can be obtained from the Licence application form.

If the mandatory boxes have not been completed on the application form, it should be returned to the applicant and they should be informed that their application cannot be processed until all mandatory information is supplied. Alternatively, the applicant may be contacted by the SEPA officer and, if the applicant agrees, the application can be amended by the SEPA officer.

If the level of treatment set out in the application is not of a sufficient standard to meet SEPA's requirements, for example only primary treatment being proposed in an area where the $V_p < 15$ secs/mm, the SEPA officer should contact the applicant and discuss the available options that would be acceptable to SEPA. If agreement cannot be reached then SEPA may refuse the application. Refer to *WAT-RM-34: Derogation Determination - Adverse Impacts on the Water Environment* for further details.

N.B. Before a registration is refused, consideration should be made as to whether escalation to a licence would be acceptable and provide the necessary safeguards.

Where agreement is reached between the applicant and the SEPA Officer, the officer may, with the applicant's consent, amend the application details. Alternatively the application form can be returned to the applicant for amendment.

Changes to the application details should only be made by a SEPA officer with the full consent and understanding of the applicant and should be recorded. Written consent should be obtained wherever possible.

Where the SEPA officer requests further information [Regulation 14(1)] and considers that the discussions will extend beyond the 30 days statutory determination period [Regulation 16(1)(a)] then the officer should request the information in writing as part of a request for further information (Refer to *WAT-LETT-14: Letter Requesting Further Information*). This effectively stops the determination and will only begin again once the required information has been supplied [Regulation 16(2)(b)].

4.3.3 Setting Conditions

Once the information supplied is acceptable, the activity should be registered. SEPA Registry then forwards to the applicant the Notification of

Registration (*WAT-LETT-10: Discharge Notification (Sewage)*), which contains the registration details that the discharger is legally required to comply with. This includes address of site, NGR, population equivalent and type of treatment. The registration also requires that the treatment system will not cause pollution and requires the treatment system (septic tank, biodisc etc) to be maintained.

The Notification will also give the applicant the right to appeal any conditions of the Registration.

4.3.4 Upgrading Treatment for Existing Registered Discharges

There may be occasions when a registered discharge is causing a significant environmental impact, requiring remedial action. Upgrading in treatment can be addressed by various means such as:

- A SEPA-initiated variation of the registration details to require improved treatment.
- Serving a Notice under Regulation 32 requiring specific work to be undertaken.
- A Licence can be imposed under Regulation 10.

4.3.5 Variation of Registered Discharge Details

SEPA may vary or the operator may apply to vary a registration. If the details associated with a registration (such as the p.e., houses associated with the discharge etc) change, then an operator-initiated variation must be submitted with the appropriate fee. Variations may be administrative variations (i.e. with no environmental implications) or technical variations. Refer to *WAT-RM-09: Modifications to CAR Authorisations* for details.

5. Licences (<50 p.e.)

Refer to *Other Considerations* for guidance on:

- Multi-ownership discharges
- Separating surface water from treatment plants
- Non-domestic effluent
- Seasonal flow variations

See the following documents for further information:

- *CAR Application Forms*
- *Environmental Regulation (Scotland) Charging Scheme*

5.1 Introduction

All new sewage discharges to soakaway over 15 p.e. will require a SEPA licence and will be determined by OPS staff. Refer to section 6 for further considerations for discharges >50 p.e.

5.2 Existing Unlicensed Discharges

Refer to section 3.1.

5.3 General

New sewage discharges to the water environment from a population equivalent of more than 15 must be licensed by SEPA. Due to their size, these discharges are of intrinsically higher risk than registered sewage discharges.

A responsible person must be named on the licence. The responsible person is the person specified in a licence who shall secure compliance with the terms of the licence. The responsible person can be a named individual or a body corporate.

Sewage discharges from 15 to 50 p.e. require to pay the simple or lower licence application fee.

- Connection to the public sewer should be promoted where it is reasonably practicable to do so (WAT-RM-21). SEPA will normally refuse an application where the site or proposed discharge point is within, or immediately adjacent to a sewered area. See section 3.3.

5.3.1 Advertising

Refer to *WAT-RM-20: Advertising and Consultation*.

5.3.2 Consultation

Refer to *WAT-RM-20: Advertising and Consultation*.

5.4 Check Areas on GIS

The following areas identified on GIS should be checked:

- Check the Groundwater water body is not at risk of failing good status from pollution. If so identify the parameters and consider whether the sewage discharge will contribute to the problem.
- Depending on the officer's local knowledge, it may be necessary to check GIS for other discharges to land in order to assess pollution pressures on the water environment.
- Sites listed for nature conservation -
 - GIS should be checked for Sites of Special Scientific Interest (SSSIs). If the discharge is likely to damage any features specified in a SSSI notification, SNH should be consulted.
 - Non-statutory conservation designations e.g. SWT and RSPB reserves on GIS

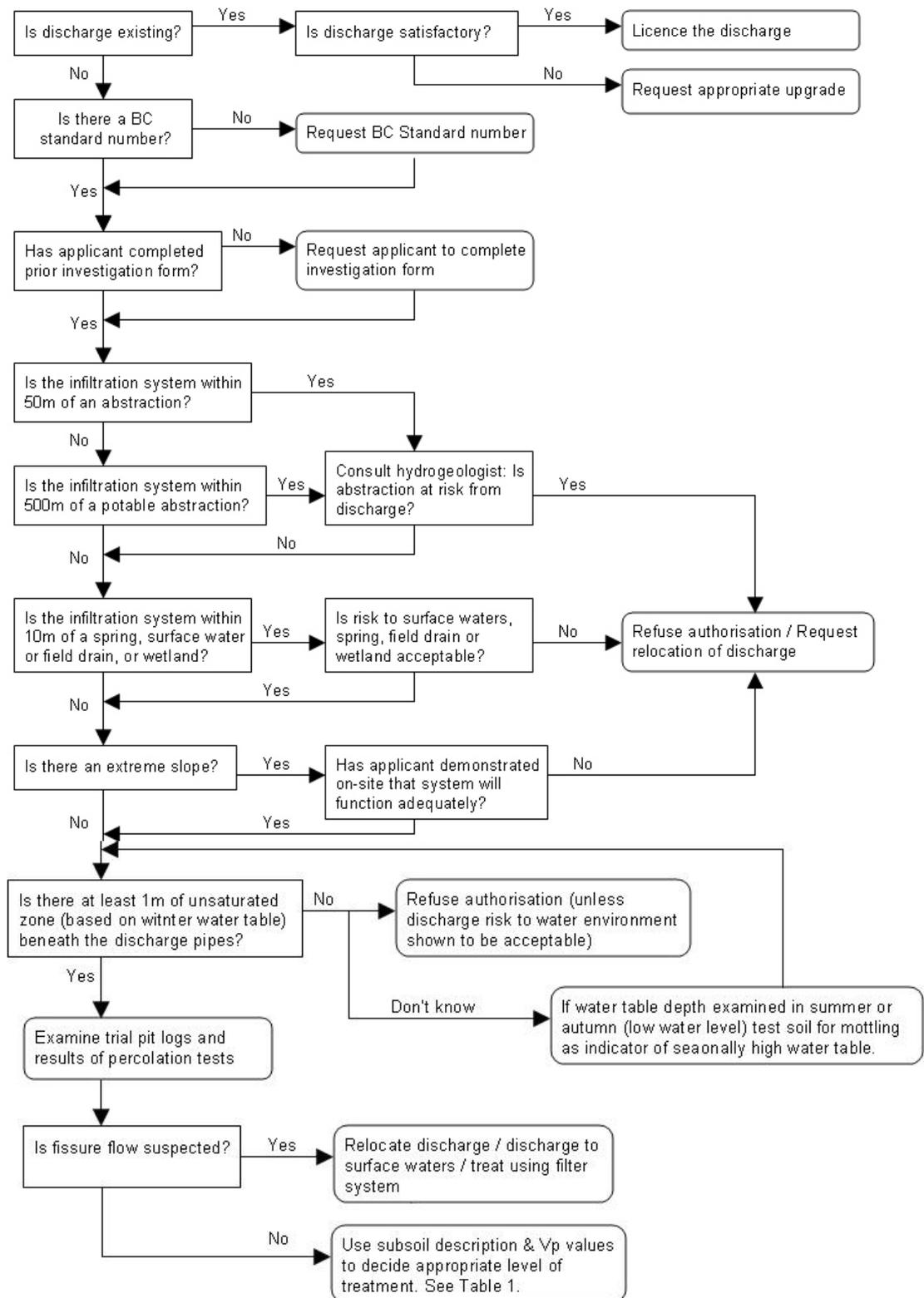
Furthermore note that the Nature Conservation (Scotland) Act 2004 has a duty on SEPA to further the conservation of biodiversity. This general duty should be taken into account when issuing a licence.

5.4.1 Protected Areas

Protected Areas are given particular protection under the Water Framework Directive. They include areas designated under a number of other EU Directives as well as areas identified to protect the surface water or groundwater within them (Drinking Water Protected Areas).

- Any relevant potable water abstractions should be highlighted in the Prior Investigation and should be taken into consideration during the determination process.
- Areas designated for the protection of habitats and species –
 - Groundwater dependent Natura 2000 sites (SPAs and SACs). If SEPA is reasonably certain that the discharge shall have no significant effect on any such area then no consultation with SNH is required. Licence conditions must be set so as to protect the objectives of any water dependent SACs and SPAs.

Figure 2 Process Flow for Licences Between 15 and 50 p.e.



5.5 Prior Investigation

To comply with the Water Environment (Controlled Activities) (Scotland) Regulations 2005, which requires compliance with the *Groundwater Directive 1980/68/EC* (CELEX: 31980L0068), applications for sewage discharges from dwellings serving >15 p.e. must be accompanied by a prior investigation form.

The prior investigation determines whether the discharge can be made without causing pollution of groundwater and assists in determining the appropriate level of treatment for the discharge.

OPS staff should undertake this assessment of the Prior Investigation using the following guidelines. Advice should normally only be required from the Area Hydrogeologist where indicated in the guidance below.

5.5.1 Using Prior Investigation Form to Determine the Application

IMPORTANT:

This section provides guidance on how the information in the Prior Investigation form should be used to decide in the acceptability of the discharge. If an applicant can provide sufficient technical information and justification as to why the approach provided here should not be followed, this should be considered and passed to the hydrogeologist to check that any alternative measures will be protective of groundwater.

5.5.2 Groundwater Abstractions

The prior investigation should have identified all local abstractions. The location of each should be marked on a map indicating whether it is a spring, well or borehole.

The prior investigation should have confirmed if the development is to be supplied by mains water or a private water source and whether, if applicable, the source location is marked on the map.

If there are any abstractions within 50m of the discharge (including that of the property of discharge application) the discharge should normally not be permitted and must be relocated. (Where the discharge is down gradient of the abstraction it may be possible to allow the discharge but assessment by a SEPA hydrogeologist will be needed to confirm this.)

If there are any abstractions used for drinking, food processing or farm dairies within 500m of the disposal site then a SEPA hydrogeologist should be consulted.

If there are any disused or backfilled wells, springs or boreholes within 50m consideration should be given to the possibility that they could act as a preferential flow path for contaminants to enter groundwater. Subject to this assessment soakaways could be constructed within 50m of a disused or

filled in well, spring or boreholes as long as the prior investigation demonstrates that the risk to general groundwater quality is low.

The applicant may need to supply further information, such as the use of the water supply, and/or a site visit might be necessary.

5.5.3 Surface Water, Springs, Field Drains and Wetlands

Groundwater supplies base flow to adjacent surface waters and so discharges to groundwater have the potential to impact on nearby surface waters. In addition, field drains can provide a rapid flow path for any discharged effluent to be routed into surface waters. Springs are a reflection of the groundwater table at the ground surface. Any effluent discharged to a soakaway system could appear at the surface in nearby springs, this is especially the case in fissured aquifer systems where springs can be intermittent and the effluent is subject to only limited attenuation and dilution.

Due to the risk of contamination of surface water, springs, field drains and wetlands, any proposed discharge within 10m of surface waters, springs, field drains and wetlands should be avoided unless SEPA can be satisfied that the risk of impact is negligible. It is recommended that any discharge in a flood risk area should also be avoided.

Where the discharge is located within 10m of a surface water course, a spring or a field drain, or in an area at risk of flooding, the applicant should be contacted to seek agreement on a more appropriate location

5.5.4 Unsaturated Zone

Superficial deposits overly bedrock and have a primary porosity whereby water can move through the pore spaces between the grains of material. Where these materials are unsaturated, pollutant attenuation processes are often enhanced.

The depth of the unsaturated superficial material can be determined from the information on depth to groundwater from the trial pits as well as the depth of the invert of the distribution pipes.

The unsaturated superficial material can provide some attenuation of contaminants. For example, in silty material, ammonia can be retarded by the process of cation exchange. This delays the arrival of ammonium at the water table in continuous discharges. It should be noted that, where ammonia concentrations are elevated the exchange sites quickly become exhausted (filled with ammonium ions) and the capacity of the material to retard ammonia is reduced.

In addition, the unsaturated zone superficial material may be effective in removing pathogens and in low permeability situations can slow the flow of effluent providing some time for contaminants to break down before they enter groundwater.

If, based on the seasonally highest water table, there is less than 1m of unsaturated superficial material beneath the discharge only limited attenuation of contaminants and bacteria is likely. In this situation authorisation of the discharge should be refused unless it can be demonstrated that it will not cause pollution of groundwater. This demonstration will involve further investigations and probably a quantitative risk assessment involving fate and transport modelling.

Sites assessed in the summer when the water table is low, should be examined for soil mottling, which can indicate the position of a seasonally high water table.

Soil colour is a good indicator of the state of aeration of the subsoil:

- Brown, reddish brown and yellowish brown
Indicates free draining unsaturated subsoil that is in the oxidised state at all times.
- Dull Grey
Indicates saturated subsoil, in a reduced state.

Mottling of the soil layer can indicate the height to which the water table rises in periods of high rainfall. Mottling in a grey matrix (grey with reddish brown or rusty mottles or staining) indicates aeration along old root channels and cracks while the matrix remains reduced; this soil layer is saturated during part of the year. Mottling in a reddish brown matrix (reddish brown soils with grey mottles or staining) indicates that although the soil is predominantly unsaturated, some areas of the matrix remain reduced for part of the year.

If the nearby surface water is subject to flooding then it is possible that the unsaturated zone beneath the soakaway could be reduced at these times. This should be taken account of when considering the depth of the unsaturated zone in flood risk areas.

5.5.5 Slope

It is more difficult to install pipework and ensure that the wastewater will stay in the soil if the land has an extreme slope. For this reason areas with extreme slopes are not suitable for the location of soakaways unless the applicant can demonstrate via on site assessment that the soakaway will adequately function in these areas.

5.5.6 Vp Values and the Subsoil

Sites which have a low Vp value present a high risk to groundwater, as low Vp values indicate rapid infiltration of effluent which results in limited attenuation of contaminants. Low Vp values could be due to high permeability strata such as gravels or flow through preferential pathways such as those caused by tree roots, fissuring in high clay content soils or in bedrock.

To determine whether low Vp values are due to flow through fissures or high permeability strata such as sands and gravels, check the trial pit information. This should indicate whether bedrock has been encountered, whether there are any preferential flow paths present (such as those caused by tree roots) and the nature of the subsoil.

In many Scottish bedrock aquifers groundwater flows via fissures. Fissure flow should therefore be suspected if:

- Bedrock has been encountered;
- If a preferential flow path has been noted on the trial pit log, or
- If low Vp values are present in moderate to low permeability strata such as silts.

Where fissures are present, if possible, the soakaway should be relocated, the effluent discharged to surface waters or treated using a mound filter system (single dwellings only), rather than being allowed to enter the bedrock aquifer.

The *Technical Handbook* requires construction of a mound system in accordance with BR478, *Mound filter systems for the treatment of domestic wastewater*. The level of treatment required will depend upon the permeability of the material. For example, discharges to systems constructed with moderate permeability material may not need to be treated to as high a standard as that for discharges to a filter system constructed with a higher permeability material because of the greater retention time of the former. Table 1 (Licence standards and requirements) gives some indication of the relative percolation rates from different filtration materials and discharge quality required to prevent groundwater pollution.

For discharges where the Vp values and information from the trial pits indicate that the strata are not fissured, the Vp values should be used in conjunction with the description of the subsoil to derive an appropriate level of treatment. The Licence standards and requirements table below gives some guidelines on the level of treatment required and the ammonia standard which could be set in the licence. It should be noted that these standards are intended as a guide only and other standards could be used if they are adequately justified (in a quantitative manner).

Table 1 Possible licence standards and requirements*

Material	Typical percolation rate (sec/mm)	Possible Licence Standard
Medium fine SAND	<15	Secondary treatment designed to meet an effluent of mean quality not exceeding 5mg/l ammonia
Silty SAND	15-75	At lower end of range consider Secondary treatment – upper range primary may be sufficient.**
Sandy SILT	>75 and <100	Primary treatment.
	>100 and <140	Secondary treatment or wetlands
	>140	Consider other disposal options such as discharge to surface waters or constructed wetland or propriety filtration system.***

* From Table 5 of *Code of Practice: Wastewater Treatment Systems for Single Houses*.

**The requirement for secondary treatment should be assessed on whether there are nearby surface waters which would be at risk from ammonia (which is a List II substance under the *Groundwater Directive 1980/68/EC* (CELEX: 31980L0068)). The secondary treatment plant should be designed to produce effluent with a mean ammonia concentration of no more than 10mg/l.

*** As required by *Technical Handbook*: (Section 3: Environment).

If the subsoil is composed of clay then it is likely to have a low permeability and so the effluent may not soak away. In these cases a discharge to surface water may be required.

Peat can be excellent at attenuating contaminants. However, peat often indicates wet conditions where soakage of effluent is inhibited to an unacceptable degree. In some areas peat is drier and subject to cracking which would allow effluent to rapidly by-pass this layer. Consequently Vp values in peat can be variable. Discharges to peat may therefore be acceptable in some locations but only after careful consideration of the proposed measures and prior investigation information.

5.5.7 Area and Length of Soakaway

The area of soakaway is usually calculated based on the Vp value as follows:

$$A = V_p \times p.e. \times 0.25$$

(A in m² and Vp in sec/mm)

Population equivalent (p.e.) for domestic housing is equivalent to the figure P in the British Water Code of Practice *Flows and Loads* and should be

determined using the number of bedrooms as referred to in section 5 of the code.

p.e. for non-domestic secondary treated sewage effluent should be determined by multiplying the number of people using the system by the flow for that activity and dividing by the flow for one person in one day. Information on flow loading is contained in *Flows and Loads*.

Non-domestic septic tank effluent, from a cafe etc, is often significantly stronger than domestic effluent. In this case it would be desirable to determine the p.e. based on the BOD loading – refer to section 3.4. This ensures that the soakaway has adequate attenuation capacity for the stronger effluent. NB this only applies for septic tank non-domestic effluent.

Example 1: House with 3 bedrooms

$$A = V_p \times 5 \times 0.25$$

Example 2: Office / Factory without canteen serving 10 people

$$A = V_p \times 10 \times 50/150 \times 0.25$$

For **secondary treated effluent**, the area can be reduced by 20%, i.e.

$$A = V_p \times \text{p.e.} \times 0.2$$

This results in small soakaway areas for low V_p values. Maximising the area of the soakaway maximises any cation exchange available. Research also has suggested that bacteriological groundwater pollution is minimised as long as the loading is not too great. Therefore it is recommended that where V_p values are less than 15 sec/mm, which could result in a small soakaway area and a high loading, that the area of the area of distribution should be increased.

The minimum area required (A) can be calculated by:

$$A(\text{m}^2) = 3.6 \times \text{p.e.}$$

Maximising the area of distribution, perpendicular to the groundwater flow direction (or the slope of the topography which can be used as a guide to the groundwater flow direction in absence of more detailed information) maximises the dilution with the groundwater flowing under the site. Developers should also consider a dosing pumped system which will help ensure an even distribution of the treated effluent.

5.6 Setting Licence Conditions

When setting licence conditions staff should use *WAT-TEMP-04: Septic Tank Licence Template* or *WAT-TEMP-05: Sewage Treatment Works (15-100pe) Licence Template*

The conditions should cover the following points:

- Responsible Person
- Location of Property/ies
- Location of discharge/soakaway
- Type of treatment e.g. septic tank/package plant
- Size of soakaway
- Numeric conditions on discharge where appropriate, see section 5.6.1
- Maintenance of system

5.6.1 Setting Numeric Conditions

For septic tank discharges SEPA will not set a numeric condition for suspended solids (unless the discharge is on the sampling programme) but will include a condition on the authorisation that will require that the facility is maintained to prevent blinding of the soakaway system that will prevent it from operating effectively.

For circumstances that require a biological treatment plant then SEPA will require secondary treatment designed to produce an effluent with a mean ammonia concentration of no more than 10mg/l

Refer to *WAT-RM-03: Regulation of Sewage Discharges to Surface Waters* for details.

Where ground conditions result in a low Vp value and a significant reduction in ammonia is required then SEPA officers should require the installation of a secondary treatment designed to produce effluent with a mean ammonia concentration of no more than 5mg/l.

The discharge should be assessed in order to determine the requirement for routine monitoring. Refer to *DREAM* (Dynamic Regulatory Effort Assessment Model).

Where the discharge is to be monitored SEPA will set two-tier standards. Refer to *WAT-RM-03: Regulation of Sewage Discharges to Surface Waters* for details.

5.6.2 General Conditions

Maintenance

Conditions requiring operation and maintenance of the treatment facility in accordance with the manufacturer's instructions and provision of a record of maintenance for inspection by SEPA, on request, should be included in descriptive licences. Septic tanks and primary settlement tanks should be desludged at appropriate intervals to prevent excessive carry-over of

suspended solids – a minimum frequency of once every two years is advised. Most package sewage treatment plants require a power source and licences should include a condition requiring the provision of a visual or audible alarm system to notify of plant breakdown or power failure.

Flow Monitoring

Flow monitoring is not normally required for discharges of sewage effluent from septic tanks or small STW. Where justified, conditions specifying the maximum daily flow and/or instantaneous flow rate and provision of appropriate flow monitoring/recording equipment can be included. Flow recording equipment can be costly and should only be required in exceptional circumstances. Readings from a water supply flow meter could be used in place of a flow meter on the discharge.

Sampling Points

A facility for inspecting and obtaining representative samples of the discharge is required. The sample point, at which point the effluent numeric conditions would apply, should be immediately after the treatment system and prior to the discharge to soakaway.

Details of a sampling chamber allowing easy access into the manhole to sample using a container can be found in the *Technical Handbook* (Section 3: Environment).

If the discharge is to be routinely monitored, the site will require a health and safety risk assessment. For new developments, where the sampling point has not yet been constructed, the requirement for safe access should be discussed with the discharger prior to the licence being granted.

5.7 Other Considerations

5.7.1 Ownership / Discharges from Multiple Dwellings

SEPA's preference is for a single treatment system shared by a number of properties rather than individual systems provided for each dwelling. The 'responsible person' is responsible for ensuring compliance with the conditions of the licence. (This contrasts with the previous position SEPA took under COPA where individual systems were preferred due to concerns regarding enforcement). Performance of a single plant is normally more consistent because of better balanced flows and loads and monitoring and enforcement by SEPA is simpler.

5.7.2 Surface Water

Surface water from hardstanding and paved and roofed areas etc must be excluded from a STW or septic tank to avoid hydraulic overloading during rainfall and possible impacts on the treatment process and discharge quality.

Where a significant input of surface water is unavoidable, the use of a Dry Weather Flow condition may be appropriate.

5.7.3 Non-Domestic Effluent

Non-domestic sewage inputs to a STW or septic tank can adversely affect performance. For instance, commercial kitchen waste from hotels and restaurants with a high fat and grease content can cause blockages. The provision of grease traps, separate treatment/disposal options for waste fat needs to be agreed with the discharger. Further information regarding factors affecting small STWs can be found in *Flows and Loads*.

5.7.4 Flow Variations at Package Treatment Plants

Flow variations affecting effluent quality may occur due to

- Seasonal factors
- Variations in influent pumping

Seasonal flow variations

Seasonal flow variations may be most marked at camping and caravan sites (where the whole site may close for the winter) and to a lesser extent at STWs serving hotels and chalets/holiday homes. These variations can be addressed by installing two or more units to operate in parallel, so that more units can be operated as the loads increase, and also by recirculating the effluent so that the medium is kept wet with a viable population of bacteria. For sites receiving no flow for part of the year, consideration should be given to reseeded the plant.

Flow variations due to pumped influents

Effluent quality at treatment works receiving pumped influent can be adversely affected by flow variations. Therefore flow balancing may require to be considered.

6. Discharges from Properties Serving >50 p.e.

6.1 Further Requirements when Dealing with a Discharge >50 p.e.

The Area Hydrogeologist should always be consulted when dealing with discharges from dwellings serving more than 50pe.

Due to the potential impact upon groundwaters from such a large sewage discharge, applicants should be advised that stringent treatment standards and significant investigatory and monitoring work will be required.

An intrusive site investigation and simple quantitative assessment should be carried out by a competent person on behalf of the developer. In most cases a down-gradient monitoring point, such as a borehole or peizometer, should be provided by the developer so that ongoing monitoring can be carried out.

As a minimum it is recommended that the intrusive investigation should include the installation of at least 3 boreholes/peizometers. The following information should be recorded/interpreted from the boreholes:

- Location of boreholes
- Groundwater quality (including nitrate, ammoniacal-nitrogen, phosphorus)
- Depth to groundwater (in mAOD and mbgl and should record the seasonally highest water table)
- Groundwater flow direction
- Hydraulic gradient
- Aquifer permeability (from testing of the boreholes)
- Description of the unsaturated zone (depending on the scale of the discharge cation exchange capacity testing may be requested)

The above information, together with consideration of the presence and concentration of various substances in the effluent, should be used to quantify the impact that the discharge will have on groundwater. This should then determine the level of treatment required and what monitoring should be carried out.

6.2 Monitoring the Discharge

If the discharge presents a significant risk to the environment then the discharge should be monitored. The nature of the monitoring should be discussed with the Area Hydrogeologist and the OPS Unit Manager. Refer to *DRM-G-006*.

7. Regulating Willow Treatment Systems

7.1 Introduction

Willow treatment systems generally consist of a septic tank or other treatment system followed by one or more wetlands, with the effluent then being discharged to an area of planted willows where evapotranspiration takes place. In such systems the willows both reduce the volume of water and improve its quality.

An unlined willow soakaway in an area of permeable soils is effectively a soakaway and the proposal should be regulated as an indirect discharge to groundwater. However, where infiltration is limited an overflow from the willow area into a nearby watercourse or created wetland may be incorporated into the design.

Under rare circumstances, 'sealed' willow systems can be designed so there is no discharge from the system; either from the base or by overtopping the sides, but there is no evidence that these would be suitable for continuous year round use in a Scottish climate. Therefore **any proposals for sealed systems without a designed-in overflow should be for seasonal summer use only** and applicants will need to demonstrate that:

- The evapotranspirational capacity of the willows is sufficient for the discharge
- The area is sufficient to prevent overtopping

Clearly, these seasonal systems are more likely to operate without overtopping if they are located in areas of lower rainfall.

For year round use an overflow from the system should be included to accommodate periods when inputs exceed the evapotranspiration capacity.

7.2 Level of Authorisation

The use of a willow treatment system is considered to be an activity liable to cause pollution of the water environment, i.e. a controlled activity. The level of authorisation should be the same for other treatment systems of sewage effluent.

7.3 Design and Construction

For small scale developments in low permeability soils, e.g. where the percolation value (V_p) is >100 secs/mm, a liner would not normally be required. Larger scale developments in similar situations will require a risk assessment, details of which should be agreed with SEPA.

Lined systems pose an environmental risk where:

- There is a rupture or overtopping of the liner

- Where an inadequate liner has been installed
- Where installation has not been appropriately undertaken

The following information regarding lined systems may need to be submitted to and agreed with SEPA to ensure an appropriate degree of environmental protection. Consultation with SEPA's hydrogeologists may be necessary;

- Type (e.g. HDPE, clay) and specification (thickness, permeability etc) of the liner. In general some sort of mineral liner such as re-engineered clay or a geosynthetic clay liner should be used rather than a membrane liner
- Sub-grade preparation and liner protection
- Method of installation (e.g. welding etc)
- Any construction quality assurance (CQA) checking
- Action in the event of any defect being detected.
- Any maintenance of the system that is required.
- Deleted paper

7.4 Environmental Risk Assessment

The level of risk assessment will depend upon the geological conditions, the size of the discharge and whether the system is for seasonal use only.

Liner requirements are discussed in section 7.3.

A water balance calculation may be required to determine the size of the system, taking into account local evapotranspiration rates and seasonal usage.

An appropriately designed and constructed system should not discharge to groundwater. Therefore, a prior investigation, as required by the Groundwater Directive, may not be absolutely necessary. However, strong evidence of evapotranspiration values will be required before some form of assessment is undertaken to consider sensitive receptors which could be impacted should a failure of the treatment system take place. As a minimum, the applicant should be asked to confirm that these systems are not located within 250m of a drinking water abstraction or 10m of a field drain, surface water or wetland.

7.5 Licence Conditions

The relevant licence template should be used.

Numeric conditions are normally not necessary but licence conditions should cover the following general points.

- The controlled activity shall be the treatment of sewage effluent in a wetland system.
- For sealed systems with no overflow, the associated waters should be groundwater. For those systems with a designed in overflow, the relevant receiving surface water is the associated water.
- Any monitoring required where appropriate will need to be specified – see section 7.6.

7.6 Monitoring

For those systems with a designed in overflow, *DRM-G-006* should be used to determine any requirement for routine monitoring. For sealed systems, groundwater monitoring is not usually required. However groundwater monitoring will probably be required for large lined willow bed systems (serving over 100PE) in vulnerable groundwater situations (for example on sand and gravels or where another sensitive receptor exists nearby).

Monitoring should consist of at least one down gradient groundwater monitoring point which should be sampled for relevant chemical parameters, usually ammonia and/or nitrate. Alternative monitoring could be considered in some situations, for example at a nearby downstream watercourse.

A hydrogeologist should be contacted for specific advice on groundwater monitoring requirements.

References

NOTE: Linked references to other documents have been disabled in this web version of the document.

See the Water >Guidance pages of the SEPA website for Guidance and other documentation (www.sepa.org.uk/regulations/water/guidance/).

All references to external documents are listed on this page along with an indicative URL to help locate the document. The full path is not provided as SEPA can not guarantee its future location.

Key References

- *WAT-PS-06-08: Policy and Supporting Guidance on Provision of Waste Water Drainage in Settlements*
- *WAT-RM-03: Regulation of Sewage Discharges to Surface Waters*
- *WAT-RM-09: Modifications to CAR Authorisations*
- *WAT-RM-20: Advertising and Consultation*
- *WAT-RM-34: Derogation Determination - Adverse Impacts on the Water Environment*
- *WAT-SG-13: Municipal Sewage Treatment Works (STW)*

Other Documents

- *Code of Practice: Wastewater Treatment Systems for Single Houses* Environmental Protection Agency, Ireland (www.epa.ie)
- *DREAM (Dynamic Regulatory Effort Assessment Model)* SEPA Intranet
- *DRM-G-006 DREAM Hazard and Risk Assessment Guidance: Compliance Monitoring (Inspection, Sampling & Data Returns)*
- *Environmental Regulation (Scotland) Charging Scheme 2016* (www.sepa.org.uk)
- *Flows and Loads* British Water Code of Practice (www.britishwater.co.uk/)
- *Groundwater Directive 1980/68/EC CELEX: 31980L0068* (<http://eur-lex.europa.eu/homepage.html>)
- *Mound filter systems for the treatment of domestic wastewater BR478*, (www.brebookshop.com)
- *PPG 4 Treatment and disposal of sewage where no foul sewer is available* NetRegs (www.netregs.org.uk)
- *Technical Handbook: Section 3: Environment* (www.scotland.gov.uk/)

Forms & Templates

- *CAR Application Forms including Guidance for Applicants*
(www.sepa.org.uk)
- *WAT-LETT-10: Discharge Notification (Sewage)*
- *WAT-LETT-14: Letter Requesting Further Information*
- *WAT-TEMP-04: Septic Tank Licence Template*
- *WAT-TEMP-05: Sewage Treatment Works (15-100pe) Licence Template*

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