Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Guidance on the Authorisation of Direct Discharges to Groundwater

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Community and Local Government.

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We license the following to ensure that their emissions do not endanger human health or harm the environment:

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- large scale industrial activities (e.g., pharmaceutical manufacturing, cement manufacturing, power plants);
- intensive agriculture;
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- large petrol storage facilities;
- waste water discharges;
- dumping at sea.

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- Working with local authorities and the Gardaí to stamp out illegal waste activity by co-ordinating a national enforcement network, targeting offenders, conducting investigations and overseeing remediation.
- Prosecuting those who flout environmental law and damage the environment as a result of their actions.

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- Assessing the impact of plans and programmes on the Irish environment (such as waste management and development plans).

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- Providing guidance to the public and to industry on various environmental topics (including licence applications, waste prevention and environmental regulations).
- Generating greater environmental awareness (through environmental television programmes and primary and secondary schools' resource packs).

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- Promoting waste prevention and minimisation projects through the co-ordination of the National Waste Prevention Programme, including input into the implementation of Producer Responsibility Initiatives.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

MANAGEMENT AND STRUCTURE OF THE EPA

The organisation is managed by a full time Board, consisting of a Director General and four Directors.

The work of the EPA is carried out across four offices:

- Office of Climate, Licensing and Resource Use
- Office of Environmental Enforcement
- Office of Environmental Assessment
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

GUIDANCE
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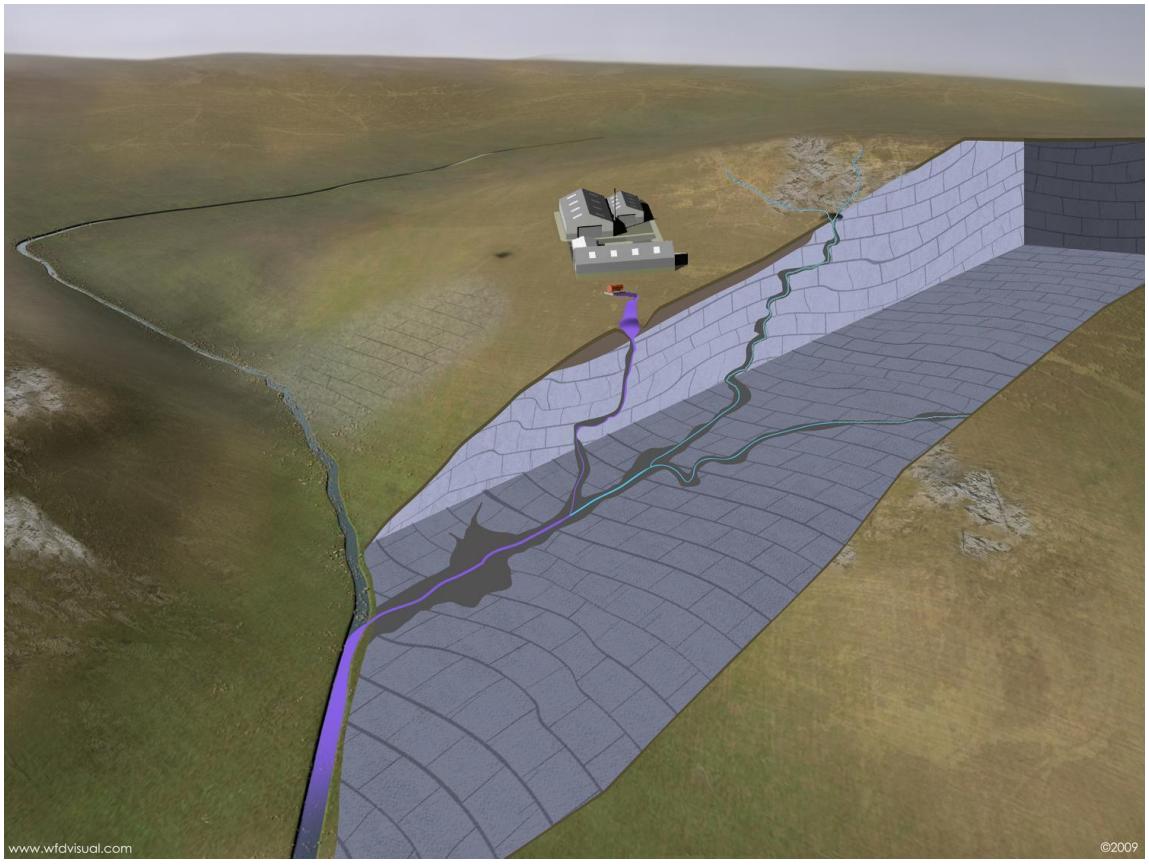

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Published by the
Environmental Protection Agency
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Ireland
Telephone: +353 53 916 0600
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Email: info@epa.ie
Website: www.epa.ie

ISBN: 978-1-84095-545-3

Report available on EPA website www.epa.ie

Table of Contents

List of Figures

Acronyms

CIS	Common Implementation Strategy
CoP	Code of Practice
DEHLG	Department of Environment Heritage and Local Government
DWWTS	Domestic Waste water Treatment Systems
EC	European Commission
EPA	Environmental Protection Agency
EQS	Environmental Quality Standard
EU	European Union
GSI	Geological Survey of Ireland
GWB	Groundwater Body
GWD	Groundwater Directive (European Union)
GWDTE	Groundwater Dependent Terrestrial Ecosystem
GWPS	Groundwater Protection Scheme
ICWs	Integrated Constructed Wetlands
IEA	Industrial Emissions Activity
IED	Industrial Emissions Directive
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevent Control
K	Hydraulic Conductivity
NPWS	National Parks and Wildlife Agency
p.e.	Population Equivalent
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPR	Source-Pathway-Receptor
TVs	Threshold Values
WFD	Water Framework Directive (European Union)

1 Introduction

1.1 Context

This guidance addresses direct discharges to groundwater from point sources of potential pollution. It supplements the earlier report published by the Environmental Protection Agency (EPA) entitled "Guidance on the Authorisation of Discharges to Groundwater" (EPA, 2011) which focused on the technical assessment of indirect discharges to groundwater via percolation systems.

Direct discharges merit further discussion, for two principal reasons:

1. They are, with the exception of a few possible exemptions, prohibited under the European Communities (EC) Environmental Objectives (Groundwater) Regulations, herein referred to as the Groundwater Regulations, which were transposed into Irish Law as Statutory Instrument No. 9 of 2010 (S.I. No. 9 of 2010).

2. They significantly increase the risk to groundwater quality and associated receptors.

In the Irish context, direct discharges are of particular concern in vulnerable hydrogeological settings, in particular the karstified limestone aquifers in counties such as Galway, Clare, Mayo and Roscommon. Nonetheless, direct discharges, primarily of domestic-type wastewater effluent, are known to occur, and where they occur, they are potential contributors to water quality issues.

Accordingly, this report discusses important concepts of direct discharges with respect to: a) existing legislation; and b) hydrogeological features and characteristics that define and amplify risks of impact, with technical rules proposed for the authorisation of direct discharges of domestic-type wastewater effluent.

1.2 Objectives

This Guidance has the following primary objectives:

1. Present an overview of the Groundwater Regulations with respect to direct discharges to groundwater (Section 2).

2. Provide specific examples of different types of direct discharges (Section 3).

3. Describe conditions under which direct discharges of domestic-type wastewater effluents may be considered in the absence of suitable or feasible alternatives (Section 4).

Whereas the first two objectives deal with direct discharges in a general sense, the last objective examines direct discharges of domestic-type wastewater effluent in greater detail. This additional detail is because: a) there are existing cases where direct discharges of such effluents are taking place; and b) it is acknowledged that finding suitable or feasible alternatives may in certain settings be difficult. This is true for the more vulnerable hydrogeological settings e.g. areas with extreme vulnerability, in particular those areas that are underlain by karstified limestone aquifers. These aquifers, whose distribution are broadly shown in **Figure 1**, represent a particularly vulnerable hydrogeological setting in which groundwater moves underground through conduits (underground channels). Such conduits can transport pollutants over large (kilometre-scale) distances in hours or days. Special attention must, therefore, be paid to protect such aquifers from direct discharges, especially where they are used for private and public water supply.

This Guidance is applicable for the authorisation of current and future discharges and is primarily intended for use by EPA personnel, but can also be helpful to other public bodies, local authorities and environmental professionals involved in the preparation or review of applications for discharges to groundwater.

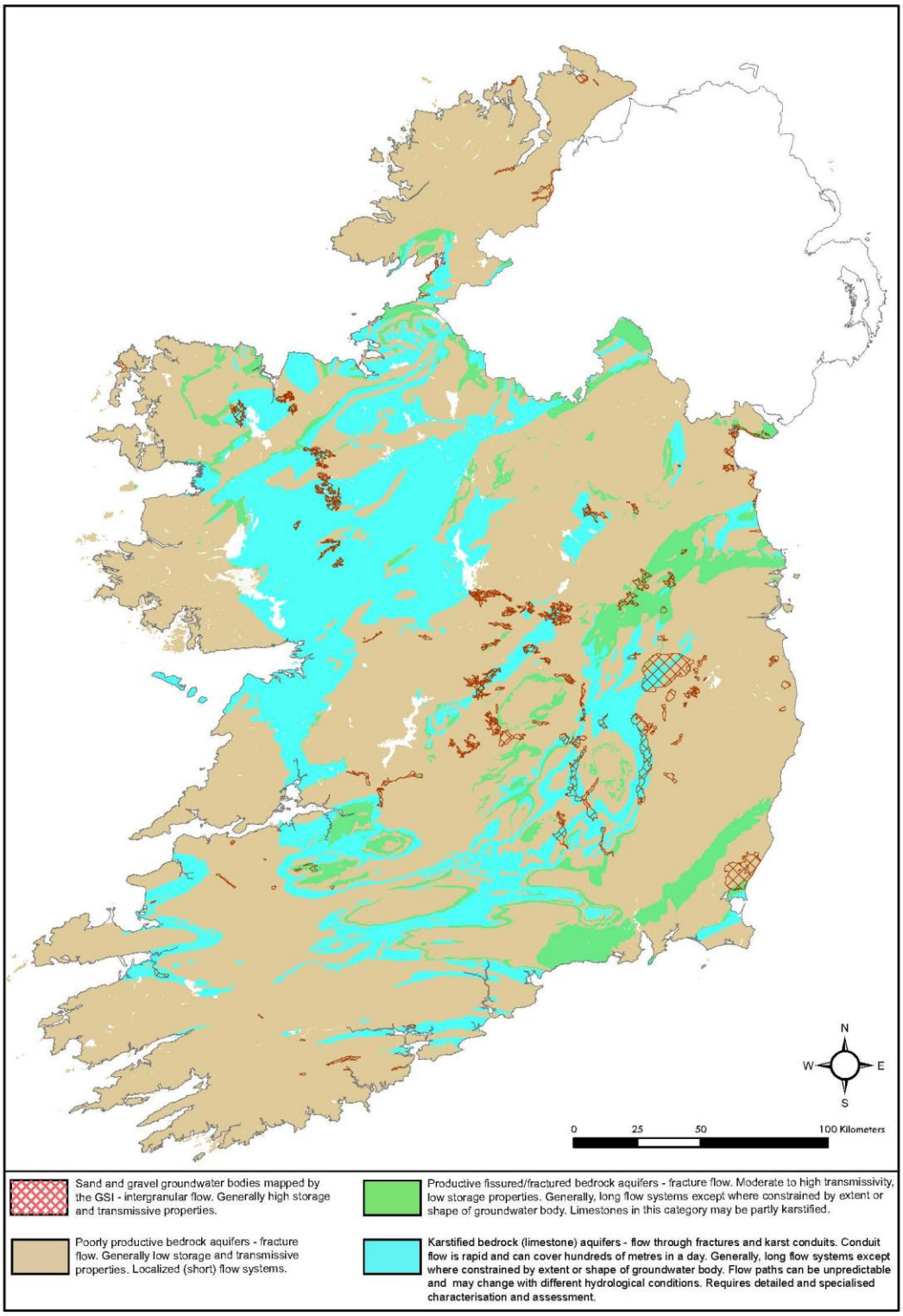

Figure 1: Distribution of karstified limestone aquifers

2 Groundwater Regulations

The Groundwater Regulations define environmental objectives for groundwater that must be achieved to protect groundwater resources and drinking water sources from pollution. The relevant local authority is responsible for authorizing and regulating effluent and trade discharges to waters under the Water Pollution Acts, and the EPA is responsible for regulating specified activities that may have significant polluting potential, encompassing Industrial Emissions Directive licensing, Integrated Pollution Control Licensing, Integrated Pollution Prevention and Control Licensing, Waste Licensing and Waste Water Discharge Authorisation.

2.1 Regulation 4 – Duty of Public Authorities

Under Regulation 4 of the Groundwater Regulations, a duty is placed on public authorities to promote compliance with the requirements of the regulations and to take all reasonable steps including, where necessary, the implementation of programmes of measures, to:

- *"(a) prevent or limit, as appropriate, the input of pollutants into groundwater and prevent the deterioration of the status of all bodies of groundwater;*

- *(b) protect, enhance and restore all bodies of groundwater and ensure a balance between abstraction and recharge of groundwater with the aim of achieving good groundwater quantitative status and good groundwater chemical status by not later than 22 December 2015;*

- *(c) reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater;*

- *(d) achieve compliance with any standards and objectives established for a groundwater dependent protected area included in the register of protected areas established under Regulation 8 of the 2003 Regulations [S.I. No. 722 of 2003] by not later than 22 December 2015, unless otherwise specified in the Community legislation under which the individual protected areas have been established."*

The 'prevent or limit' objective is the core groundwater quality objective addressed by the EPA 2011 guidance. In principle, 'prevent or limit' measures are the first line of defense in restricting inputs of pollutants to groundwater and thereby avoiding or reducing pollution. The 'prevent' objective relates to ***hazardous*** substances, whereby all necessary and reasonable measures should be taken to avoid the entry of such substances into groundwater and to avoid any significant increase in concentration in groundwater, even at a local scale. The 'limit' objective relates to ***non-hazardous*** substances, whereby all necessary measures should be taken to limit inputs into groundwater to ensure that such inputs do not cause pollution, deterioration in status of groundwater bodies, or significant and sustained upward trends in groundwater concentrations.

A classification of hazardous and non-hazardous substances in groundwater has been prepared by the EPA and is available at:
http://www.epa.ie/pubs/reports/water/ground/classificationofhazardousandnon-hazardoussubstancesingroundwater.html

2.2 Regulation 8 – Prohibition of Direct Discharges

Under Regulation 8 of the Groundwater Regulations, as well as Article 11.3(j) of the European Commission Water Framework Directive (2000/60/EC), direct discharges to groundwater are prohibited. However, certain types of direct discharges *may be permissible* subject to a requirement of prior authorisation as outlined in the Regulations and described in Appendix 1 of this guidance. It

should be noted that Regulation 8 does not make specific reference to direct discharges of wastewater effluents.

2.3 Regulation 14 – Possible Exempted Inputs

Under Regulation 14 of the Groundwater Regulations, certain direct and indirect discharges to groundwater may be granted exemptions from measures to prevent or limit the input of pollutants into groundwater, under conditions (technical rules) established by the EPA. Categories and examples of possible exempted inputs are presented in Appendix 2.

In practice, Regulation 14 is broader in scope than Regulation 8 and represents special cases where the need to take all measures necessary to achieve 'prevent or limit' objectives may be relaxed, but not ignored, under case-specific circumstances. Regulation 14(a) specifically covers direct discharges that may be permitted under Regulation 8, which are subject to a requirement of prior authorisation. For the remaining categories of possible exempted pollutant inputs (see Appendix 2) prior authorisation may not necessarily be required, but in some cases it will be. For example, a direct input that is a consequence of an accident, i.e. could not have been foreseen, avoided or mitigated (Regulation 14(c)), will not be subject to prior authorisation, as this is not possible. This type of exemption would not apply to any situation where standard pollution measures and good practice would have prevented the input had they been taken.

Where prior authorisation is required, direct inputs are, as indicated above, subject to technical rules that can be established by the EPA. Technical rules for direct discharges of domestic-type waste water effluent are described in Section 4. Technical rules for other types of discharges may be developed in time, with input from, and in consultation with, relevant public bodies.

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3 Direct Discharges

3.1 Definition of Direct Discharges

As defined by the Groundwater Regulations, a direct discharge is a "*discharge of pollutants into groundwater without percolation throughout the soil or subsoil*". As a consequence direct discharges can therefore also occur where the input bypasses the unsaturated zone via natural or artificial open conduits.

The term 'percolation' means vertical movement of water (or effluent) through the pore spaces of soils and/or subsoils within the unsaturated zone above a groundwater table. Where soils/subsoils are present in the unsaturated zone, pollutants are partially treated during percolation by physical-chemical attenuation processes such as filtration and ion exchange.

The term 'attenuation' means a decrease in pollutant concentrations, flux, or toxicity as a function of physical, chemical and/or biological processes, individually or in combination, in the subsurface environment. Attenuation processes include dilution, dispersion, filtration, sorption, decay, and retardation. Further information on attenuation is provided in the EPA 2011 guidance.

Typical examples of direct discharges include:

- Discharges to surface karst features such as swallow holes and dolines in karstified limestone aquifers, both directly and via surface water courses (e.g. streams that sink underground at swallow holes);
- Discharges directly on bedrock surfaces where subsoils are absent and/or thin;
- Discharges into cesspits and boreholes/wells (e.g. injection wells, mineral exploration wells) that extend down to or below the groundwater table;
- Discharges in, or to, mine adits that extend down to or below the groundwater table.

The Groundwater Regulations also define an input of pollutants as the "*direct or indirect introduction of pollutants into groundwater as a result of human activity"*. The term "input" is different from "discharge" in that it covers all pollutants that enter groundwater and is not restricted to deliberate disposals at point locations. The term input, therefore, covers a broader range of discharge scenarios and situations, including diffuse pollution sources (e.g. landspreading and use of pesticides). The EPA is assigned the power by the Regulations, to review or cause to have reviewed, existing codes of practices (CoPs) for the purpose of preventing or limiting the inputs of pollutants into groundwater.

Figure 2 depicts scenarios of direct inputs to groundwater, whereby the source of pollution:

- Is located beneath or directly in contact with the groundwater table (saturated zone); and/or
- Is periodically in contact with the groundwater table due to seasonal groundwater fluctuations.

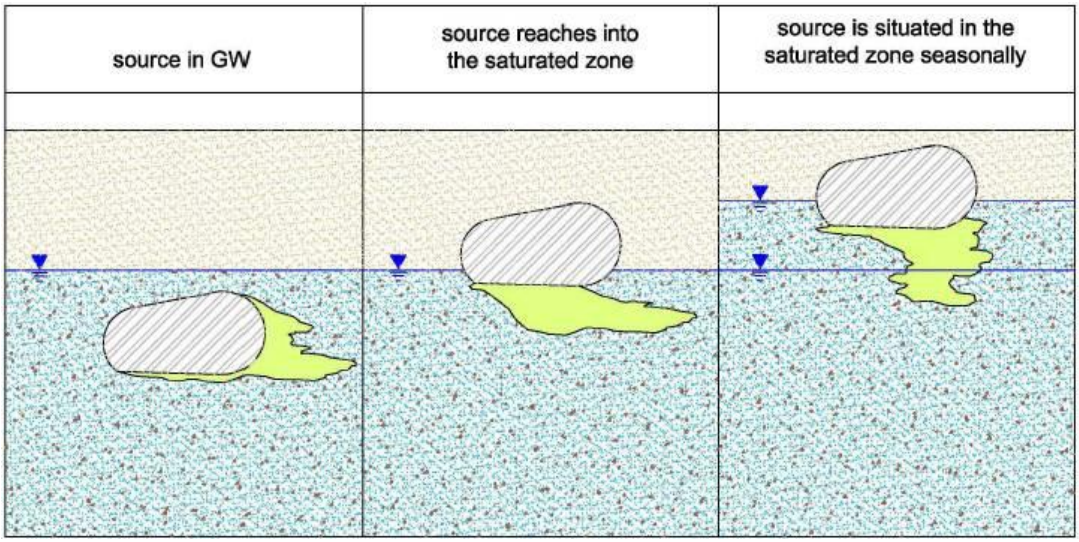


Figure 2: Direct input scenarios (Source: CIS, 2007)

When assessing a new discharge activity with respect to risk of impact to groundwater quality, the presence or absence of soil/subsoil in the unsaturated zone is a key factor to be considered in the assessment (EPA, 2011). As shown in **Figure 3 (a)**, situations exist where soils/subsoils are mainly absent and karstified or fractured bedrock surfaces are exposed at ground surface. In such settings, bedrock aquifers are extremely vulnerable to pollution despite the presence of an unsaturated zone between ground surface and the groundwater table in the rock beneath. This is because the vertical migration of pollutants to the groundwater table takes place through open conduits or fractures in the unsaturated zone within the rock, without attenuation. There is, accordingly, a high risk of impact to groundwater quality, and discharge activities directly onto bedrock surfaces should be avoided.

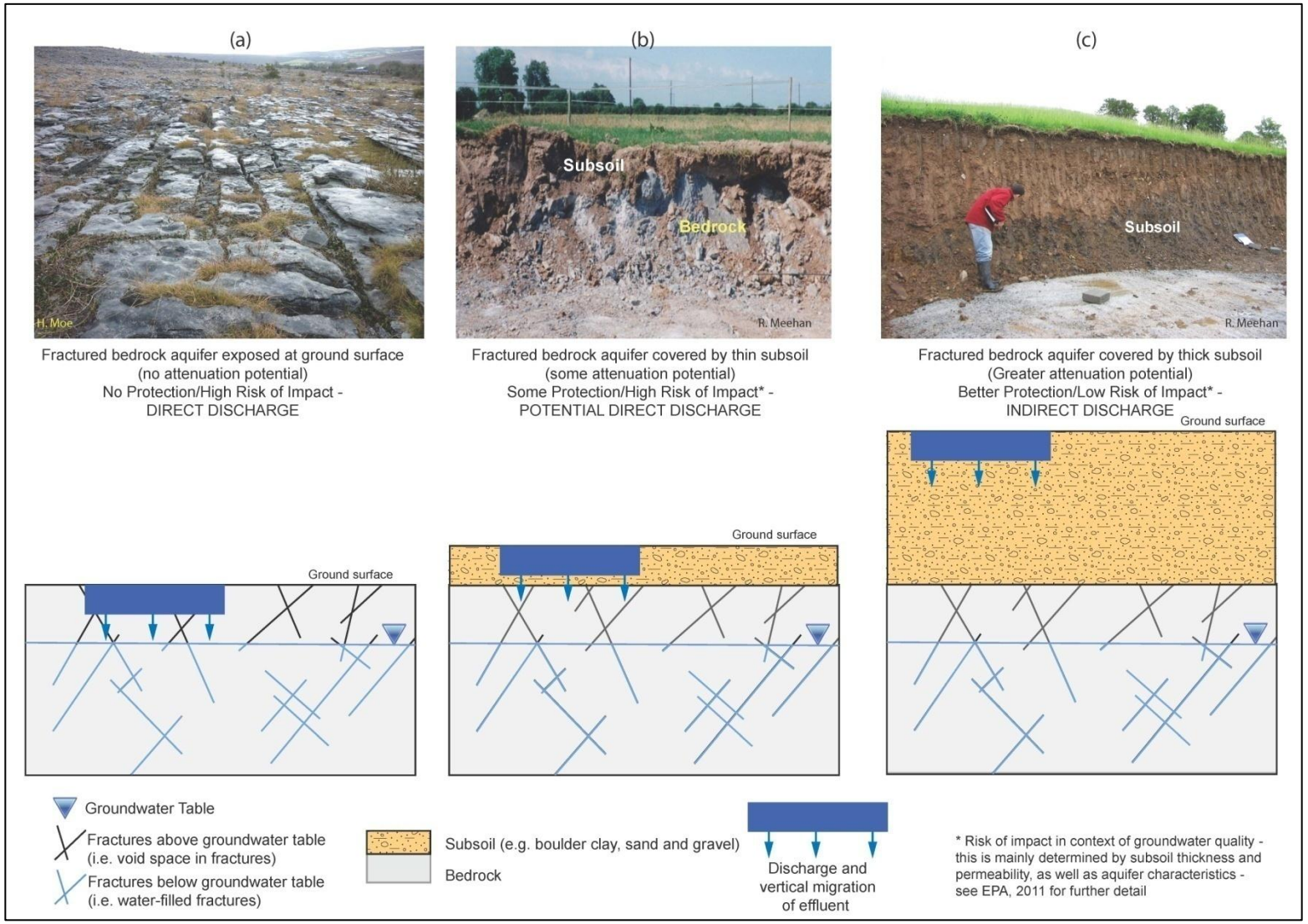


Figure 3: Presence or absence of soil/subsoil as a protective layer

In contrast, where subsoils are present in the unsaturated zone, the bedrock aquifer is offered natural protection by the subsoil cover, whereby pollutants are subjected to attenuation processes during percolation through the unsaturated subsoil. The degree of protection offered by the subsoil is a function of its thickness and permeability. Where subsoils are thick (see **Figure 3 (c)**), the risk of impact to groundwater quality is reduced. Further detail on the role and importance of subsoil characteristics on groundwater protection is provided in the EPA 2011 guidance.

The Geological Survey of Ireland (GSI) has produced a national map of *groundwater vulnerability* which indicates the relative ease with which groundwater may be contaminated by human activities. For bedrock aquifers, the vulnerability categories, which range from 'low' to extreme', are broadly based on combinations of subsoil thickness, type and permeability. For sand and gravel aquifers, the vulnerability categories are based on depth to the groundwater table (i.e. thickness of the unsaturated zone).

Areas of 'extreme' vulnerability are reproduced in **Figure 4**. Further information on groundwater vulnerability, as well as GSI's mapping of vulnerability, is available at www.gsi.ie.

3.2 Examples of Direct Discharges in Ireland

Many types of direct discharge that are seen elsewhere in the world are uncommon in Ireland, e.g. direct discharges via mine adits. The most common examples of direct discharges in Ireland are:

- Direct discharges to swallow holes and dolines;
- Direct discharges to swallow holes via streams, surface drains or open-water peat and wetland areas;
- Direct discharges to bedrock surfaces.

3.2.1 Direct Discharges to Swallow Holes and Dolines

Swallow holes and dolines, see **Figure 5**, are geological features that occur in karstified limestone aquifers. Swallow holes are point locations where surface waters disappear underground, either actively during the entire year or periodically following heavy rains. Dolines are enclosed depressions where surface runoff collects and infiltrates underground.

Swallow holes and dolines are particularly common in counties Clare, Galway, Mayo, Roscommon and Cork, but can also be present in limestone areas elsewhere. A database of karst features is maintained by the GSI and is available at their online web-mapping service (www.gsi.ie/mapping). However, it should be noted that this database is not comprehensive and is periodically updated as detailed mapping of karst features is carried out in new areas, either by the GSI or other entities. Technical assessment of discharge activities in karst areas must be accompanied by detailed karst mapping and study, as outlined in the EPA 2011 guidance.

Both swallow holes and dolines are surface expressions of underground solution features (i.e. conduit systems). These preferentially move water and pollutants at high flow rates (hundreds of metres per day) to discharge points such as streams, natural springs or abstraction wells, see **Figure 6**. Both features are also characterised by vertical conduits at their specific locations. If open (i.e. not filled with sediment), these vertical conduits act as preferential pathways, whereby the vertical flow and transport of associated pollutants can reach the groundwater environment in a matter of minutes or hours, without any attenuation of pollutants in the unsaturated zone.

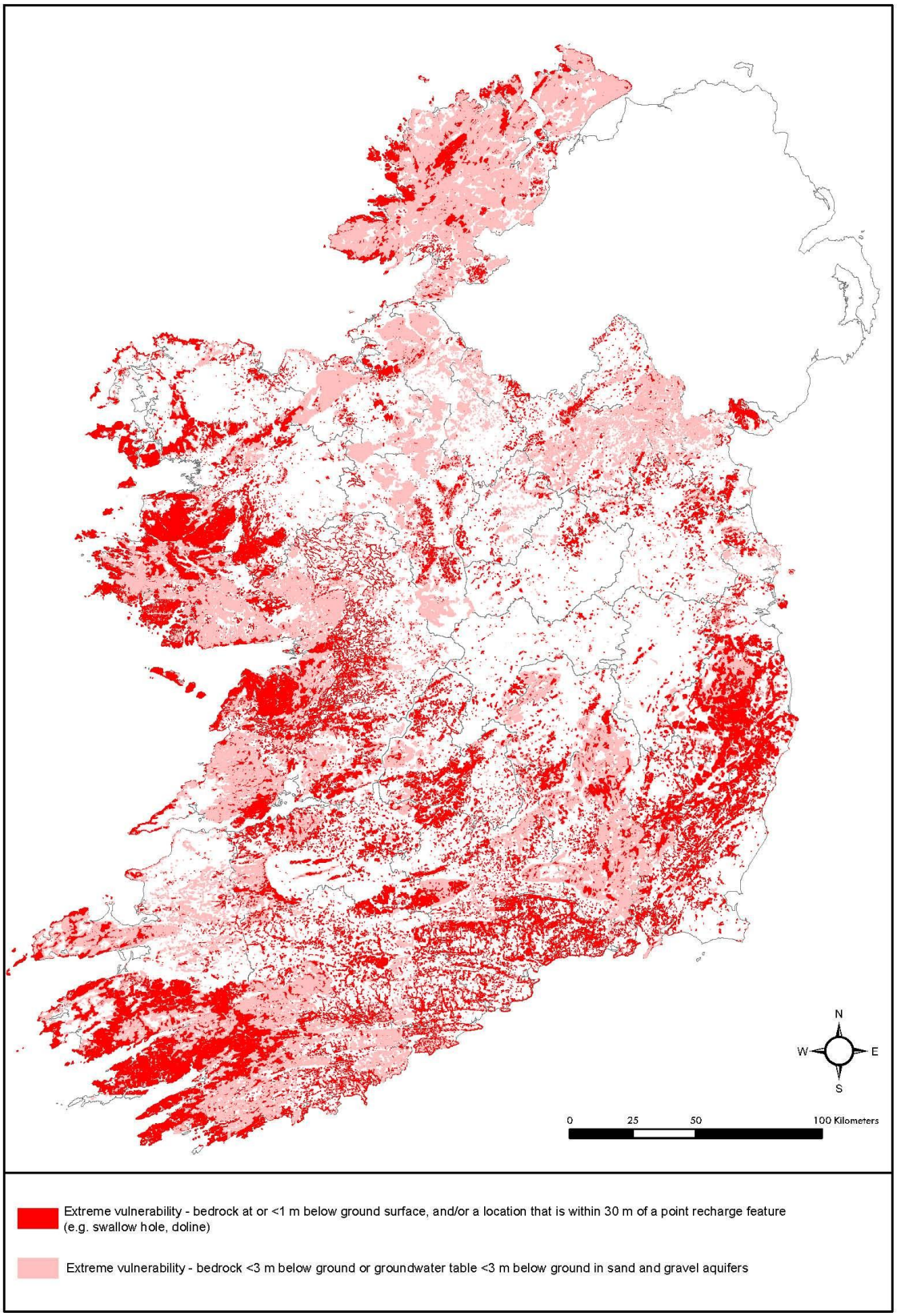


Figure 4: Areas of 'extreme' groundwater vulnerability

Figure 5: Swallow holes and dolines

Some dolines may be partly or wholly filled in with sediment in which case some subsurface attenuation may occur. However, there is no simple means of predicting the attenuation that may occur in such instances without conducting significant hydrogeological field work involving drilling, well construction and sampling. As a rule of thumb, a discharge to a doline should be approached as a direct discharge case, as the degree of attenuation is likely to be inadequate/insignificant due to a relatively high hydraulic loading in a small area and the probable presence of preferential flowpaths beneath the surface. Once a pollutant reaches the groundwater table, the pollutant will be diluted as it mixes with groundwater. The dilution/mixing that actually takes place is both site- and time-specific, depending on relative volumes of effluent and the natural groundwater movement through conduits and fractures.

In karstified aquifers, where a river may flow above ground only to sink below ground and then re-appear at the surface further downstream, the distinction between groundwater and surface water can sometimes be difficult to determine. In the Groundwater Regulations, a river is defined as "*a body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course*". The implication of this definition is that rivers or streams that disappear underground at swallow holes and re-appear further downstream are considered to be rivers in the sections that flow underground. By this definition, it could, therefore, be inferred that the Surface Waters Regulations (2009), as amended (S.I. No. 272 of 2009 and S.I. No. 327 of 2012) would apply to sinking streams/rivers.

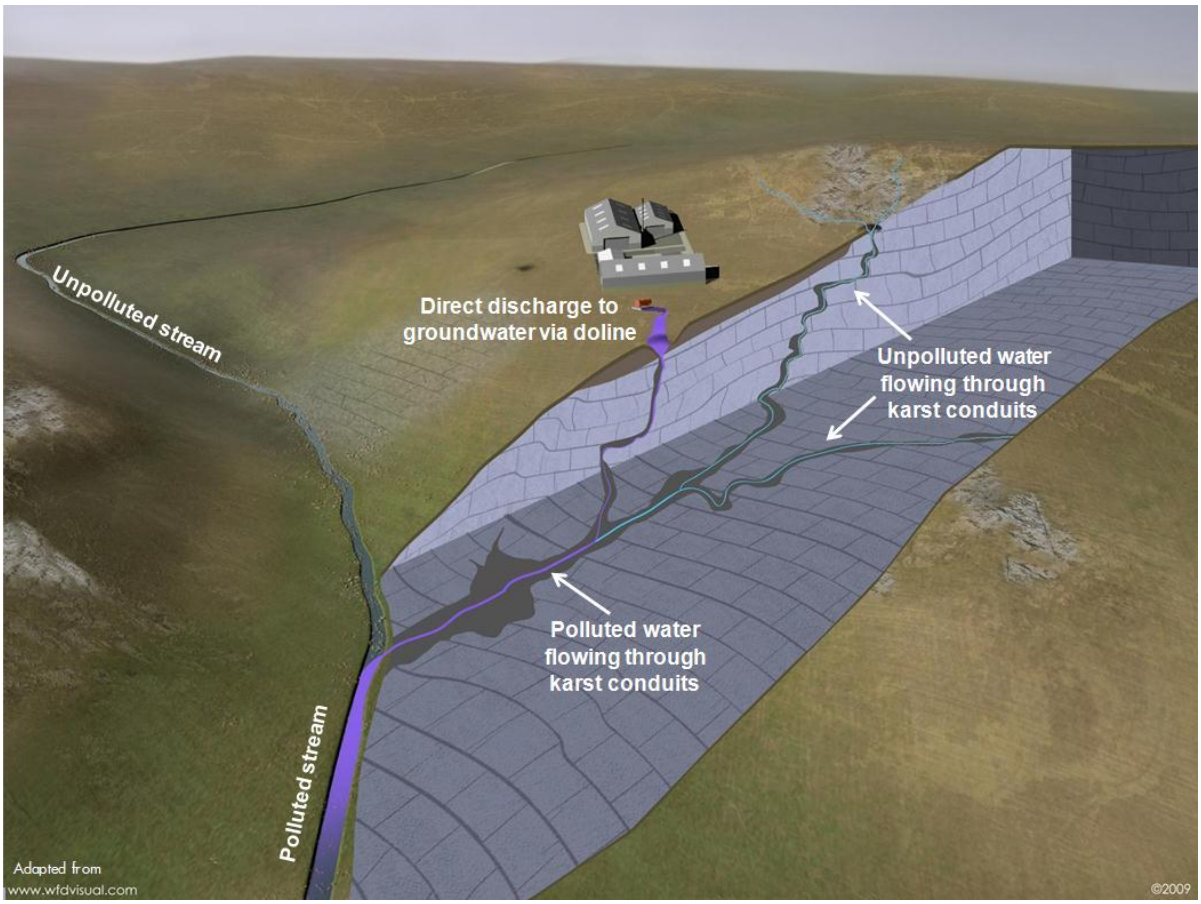


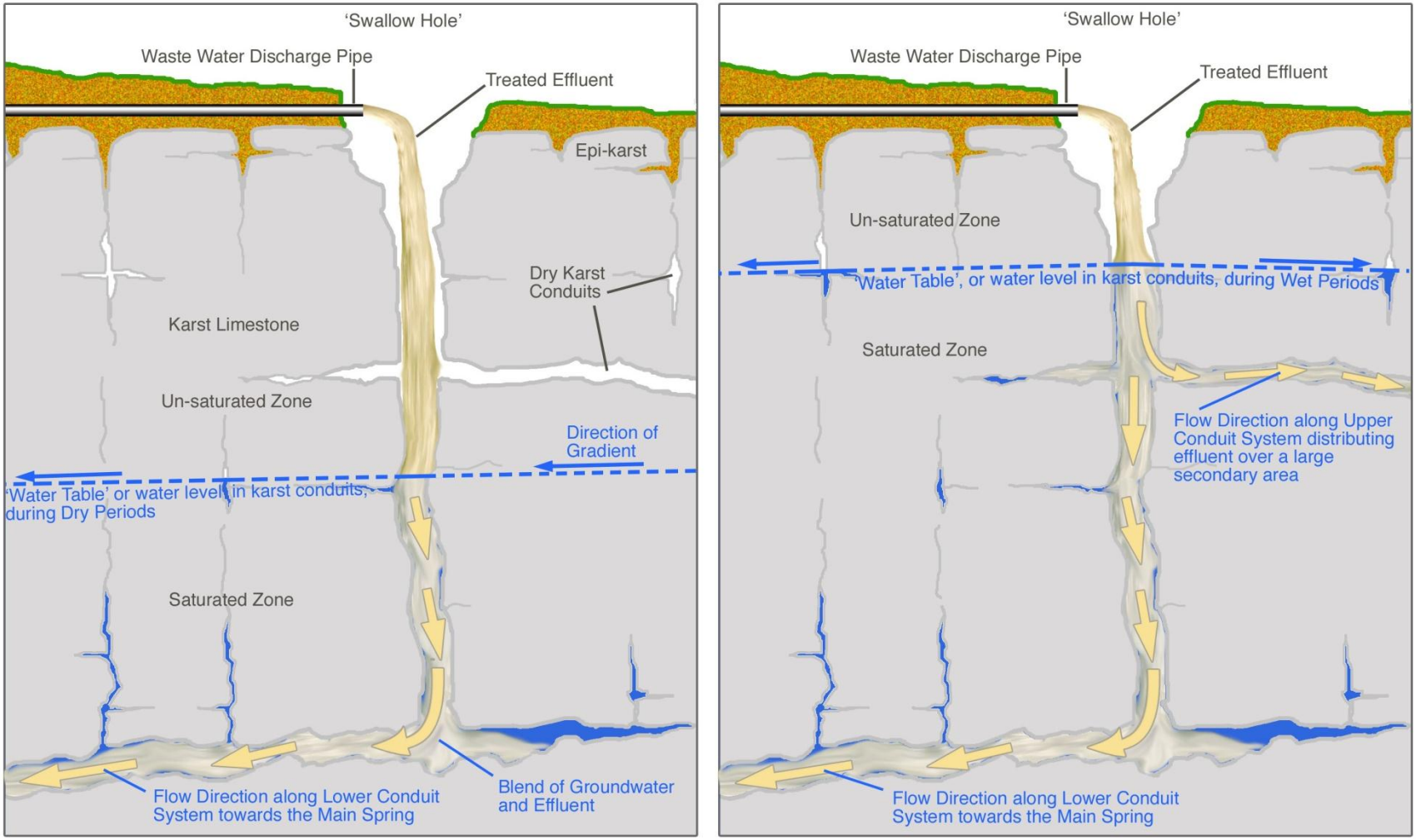
Figure 6: Flow through karst conduits

However, the nature of water movement in karstified aquifers is complex and is not just confined to movement via conduits, so the question of "which regulations apply" also becomes more complex. Importantly, recent tracer testing in the Burren, County Clare (Drew, 2012) demonstrated that dyes that were injected into an active swallow hole migrated to down-gradient springs rapidly via conduit flow, but also to down-gradient private wells via slower and more "diffuse" pathways, represented by fractures, in the same karstified aquifer. The inference of these results is that the consideration of sinking rivers or streams at swallow holes solely as "river water" does not always accurately depict the true nature of water movement in karstified aquifers. Because of the potential that sinking water can flow diffusely away from conduit systems underground, a river or stream that sinks should be regarded as groundwater unless defensible evidence exists that diffuse dispersion (through fracture systems) is not important for a given site or setting.

The complexity of water movement that can occur in karstified aquifers, and which may influence the transport of pollutants, is exemplified further in **Figure 7**, which shows a direct discharge to a swallow hole under two different hydrogeological conditions:

- Following a period of prolonged dry weather when the karst conduit system has been draining and water levels are low; and

- Following a prolonged or significant wet weather event when rainfall and natural recharge has replenished the karst conduit system and water levels are high.



Source: David Ball

Figure 7: Influence of water levels and hydraulic gradients on flow through karst conduits

In the dry weather scenario, the waste water effluent flows down the swallow hole and into a lower (deeper) conduit system that transports the diluted effluent (after mixing with groundwater) towards an outlet point, typically represented by a spring. In the wet weather scenario, water levels are higher and the diluted effluent (after mixing with groundwater) can now flow along both the lower and the upper karst conduit systems.

As a result, the effluent may be transported via the upper conduit system to a different outlet (discharge) location than the effluent transported via the lower conduit system. There are several examples of such hydraulic behavior from tracer studies in western parts of the country. In the Burren case described by Drew (2012), tracer movement in different directions from the same swallow hole can be attributed to the subsurface presence of alternative pathways which become active/inactive according to prevailing hydrological conditions. It also describes how tracer materials (and effluent) can be dispersed into areas that are away from the main flow axis between a swallow hole and down-gradient springs.

3.2.2 Discharges to Swallow Holes via Streams, Surface Drains or Open-Water Peat and Wetland Areas

A discharge that enters a swallow hole via a stream, surface drain and/or open-water peat and wetland area has direct and rapid access to groundwater with no attenuation occurring except dilution and mixing. The important question in this instance is whether the associated surface water feature has sufficient assimilative capacity under relevant seasonal conditions (WTSG, 2011) to reduce pollutant concentrations to acceptable concentrations in groundwater (and associated receptors) before entering the swallow hole. For this reason, and as a rule of thumb, a discharge to a surface water drain or open water area that flows to a swallow hole should also be approached as a potential direct discharge to groundwater scenario.

3.2.3 Direct Discharges to Bedrock Surfaces

Irrespective of bedrock type, where discharges occur directly onto bedrock surfaces, pollutants can move vertically through the unsaturated zone via open fractures to groundwater without any attenuation. Examples known to occur in the Ireland are:

1) Retention ponds or swales that receive runoff water from urban footprints or motorways, where these have been designed and/or constructed without appropriate liner materials at the base. In this case, the collected runoff can infiltrate freely and directly to groundwater without percolation/attenuation through subsoil or engineered/constructed liner material.

2) Runoff from poorly designed, constructed and/or maintained percolation systems. Experience shows that indirect discharge to groundwater systems (*i.e.* via percolation) are commonly not treated as intended (Moe and Daly, 2012), either because treatment plants fail or sites have insufficient *hydraulic capacity* to 'accept' the effluent (EPA, 2011). In this case, untreated or partially treated effluent may pond and run off to nearby drains or topographic depressions, where it may subsequently find direct pathways into the groundwater via features such as swallow holes, dolines or open bedrock fractures at ground surface.

3) Percolation/infiltration of pollutants in open mine areas and unauthorised waste sites.

4 Technical Rules when considering authorisation of Direct Discharges of Domestic-type Wastewater Effluent

Under Regulation 8 of the Groundwater Regulations, direct discharges to groundwater are prohibited. However, certain types of direct discharges may be permitted subject to a requirement for prior authorisation*, "provided such discharges, and the conditions imposed, do not compromise the achievement of the environmental objectives established for the body of groundwater into which the discharge is made*". Types of direct discharges that may be permitted, subject to prior authorisation, are listed in **Appendix 1**.

Under Regulation 14 of the Groundwater Regulations, the EPA (as the responsible Agency) may establish or direct other public authorities to develop detailed technical rules under which certain inputs may be exempted from the requirements to undertake measures to prevent or limit the input of pollutants into groundwater. Categories and examples of possible exempted inputs are listed in **Appendix 2.**

Technical rules for direct discharges are conditions that are defined by the Agency, or another public authority, for direct discharge activities which, if followed, may exempt the activity from the requirements to undertake measures to prevent or limit the input of pollutants into groundwater.

4.1 Authorisation Approach

The overall approach adopted for consideration of direct discharges of domestic-type waste water effluents under Regulation 14 generally is outlined in **Figure 8**. In short, direct discharges can only be considered if, in order of priority:

a) Discharge options to surface water are precluded (see Section 4.2);

b) Indirect discharges to groundwater (via percolation) are precluded (see Section 4.3).

The onus is on the applicant to make the case that a surface water discharge or indirect discharge to groundwater is not technically feasible or is disproportionately expensive and therefore that a direct discharge requires consideration (see Section 4.4).

Due to the complexities of direct discharges and in particular the site-specific nature of karst hydrogeology, applicants must engage suitably qualified personnel to scope, implement, and report on the Tier 3 technical assessment. Further detail on Tier 3 technical assessments is provided in EPA, 2011 (http://www.epa.ie/water/wm/groundwater/dischgw/). Ideally these personnel should be a professional member of an appropriate organization and should have considerable practical experience in the determination of groundwater flow in karstified aquifers. The applicant should, at an initial scoping meeting with the relevant regulatory body (Agency or Local Authority), indicate and seek agreement on who will undertake the Tier 3 technical assessment by demonstrating why their proposed personnel are suitably qualified to carry out the work.

The applicant should consult with other third-party entities with qualifying interests, e.g. Inland Fisheries Ireland if there is potential for the discharge to impact on receiving salmonid rivers.

A direct discharge of domestic-type waste water effluent should only be considered in areas where the physical landscape is the underlying reason why a surface water discharge or indirect discharge to groundwater is not an option. Consequently if a surface water discharge or indirect discharge to groundwater is feasible then the artificial creation of a direct discharge, e.g. by drilling injection wells or removing sub-soil to improve percolation, will not be considered an acceptable solution.

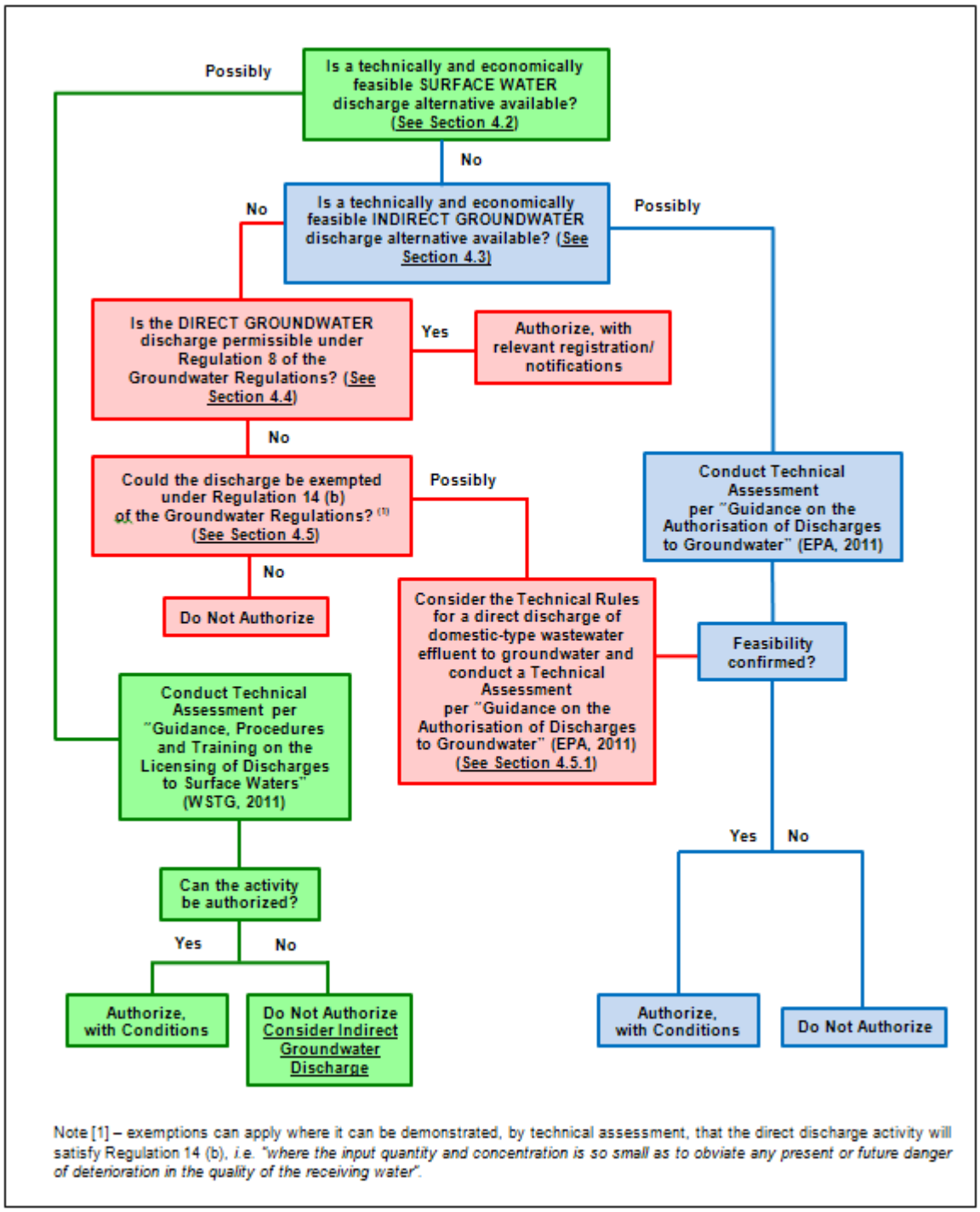


Figure 8: Assessment process when considering authorisation of direct discharges of domestic-type wastewater effluent

4.2 Consideration of discharge options to surface water

Discharges to surface water should always be considered as a first option in the process. An evaluation as to whether a discharge to surface water is feasible should be undertaken in accordance with the technical rules established in the "*Guidance, Procedures and Training on the Licensing of Discharges to Surface Waters*" (WSTG, 2011).

However, it is acknowledged that surface water options may not always be technically feasible or may involve disproportionate cost. Examples would be where:

a) Technical assessment of the discharge to surface water option demonstrates that the assimilative capacity of the target stream is insufficient to meet relevant water quality standards;

b) Where alternative piping of the effluent to the next largest stream in the same area is considered to be prohibitively costly; and/or

c) Improved treatment of the effluent will either not resolve the assimilative capacity issue or still involve prohibitive costs.

4.3 Consideration of options for indirect discharges to groundwater (via percolation)

If discharge to surface water is not an option because of technical feasibility or disproportionate cost, then discharge to groundwater via percolation (i.e. indirect discharge to groundwater) is the next preferred option. This option should undergo a technical assessment in the manner described in the "*Guidance on the Authorization of Discharges to Groundwater*" (EPA, 2011). This technical assessment should demonstrate whether an indirect discharge is technically feasible or disproportionately expensive, which will allow the Agency or appropriate public authority to make a decision as to whether the discharge can be authorised.

4.4 Consideration of permissible direct discharges to groundwater

Direct discharges to groundwater should only be considered if a discharge to surface water or an indirect discharge to groundwater via percolation is not possible on the grounds of technical feasibility or is disproportionately expensive.

Although Regulation 8 prohibits direct discharges to groundwater, it does allow certain types of direct discharge subject to a requirement for prior authorisation. Types of direct discharges that may be permitted are listed in **Appendix 1**.

4.5 Consideration of option for direct discharges to groundwater

Direct discharges that are not permissible under Regulation 8 may be exempted from the requirements to undertake measures to prevent or limit the input of pollutants into groundwater under Regulation 14 (**see Appendix 2**). However, to avail of this exemption, applicants must comply with technical rules that are established by the appropriate public authority.

Regulation 14(b) allows for exemptions of direct discharges where inputs are "*considered to be of a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater*". In practice, for domestic-type waste water effluents, this relates primarily to effluents that have received a high level of treatment and/or types of effluents where hazardous substances are generally or typically not present.

If a direct discharge to groundwater of domestic-type waste water effluents cannot meet the requirements stipulated in these technical rules then the activity should not be authorized.

4.5.1 Technical Rules for Direct Discharges Under Regulation 14(b)

Listed below are minimum criteria that must be met/demonstrated by the applicant before the Agency or a Local Authority would be in a position to review and render a verdict on potential exemption cases for direct discharge of domestic-type wastewater effluents:

- A Tier 3 technical assessment akin to those described in EPA, 2011 has to be carried out with inputs from relevant and suitably qualified professionals.

- The treated effluent quality has to meet a high standard to be determined by full technical assessment that is both site and case-specific. Achieving a high standard of treatment means that tertiary treatment, via sand or other filter systems, and possibly also sterilization techniques must be included in the treatment process prior to discharge. Treatment designs and achievable quality standards must be clearly identified and presented.

- Chemical analyses and routine reporting of effluent and groundwater quality must include total Nitrogen, ammonia (NH_3), molybdate reactive phosphorus (MRP), and pathogens (coliforms, *E. coli*), and other parameters that may be considered appropriate on a site by site basis. In the case of trade effluent, other parameters may be needed depending on the nature and composition of the effluent.

- In terms of treatment of nutrients and potential impacts on groundwater quality, ammonia has to be nitrified to the point that after dilution in groundwater, relevant receptor-based water quality standards are met (EPA, 2011). For example, where a receptor includes a down-gradient spring or well used for public or private water supply, the drinking water standard at the spring/well location must be met.

- Individual discharges to karstified limestone aquifers, of which many have been classified by the EPA as being of poor chemical status (EPA, 2009), should not be of a magnitude that would cause the status of associated receptors to be failed. In addition, the technical assessment must examine cumulative impacts on groundwater bodies using the methodology outlined in EPA (2011) for groundwater assimilative capacity, so that discharge activity does not result in deterioration of groundwater body status.

- Results of the full technical assessment must be prepared in a hydrogeological report and submitted to the relevant body (Agency or Local Authority) for review.

The above conditions imply that a direct discharge activity must include strict source controls and rigorous technical assessment before authorisation can be granted. Source controls involve good engineering design and subsequent good operations and maintenance practice. Rigorous technical assessment involves a detailed hydrogeological study following Tier 3 assessment guidance as outlined in the EPA 2011 guidance. Decisions shall be made on a case-by-case basis.

4.5.1.1 Direct Discharges to Swallow Holes or Injection Wells in Karstified Aquifers

Direct discharges to swallow holes or injection wells in karstified aquifers present a particular challenge in the Irish hydrogeological context. Although direct discharges represent poor practice and are generally prohibited under Regulation 8 of the Groundwater Regulations, discharges to swallow holes are known to occur and are known to have caused impacts to drinking water supplies.

A direct discharge activity that falls into this category requires a comprehensive Tier 3 technical assessment (EPA, 2011) involving a karst study, which typically requires extensive hydrometric monitoring over ranges of hydrogeological conditions and the use of dye tracing techniques to demonstrate source-pathway-receptor linkages (EPA, 2011).

A well developed and acceptable scope for technical assessment is one that typically:

a) Identifies all relevant, potential receptors ‘downstream’ of the discharge site;

b) Establishes the infiltration or injection capacity of the direct discharge point under flood conditions;

c) Addresses a sound hydrogeological model of source-pathway-receptor linkages;

d) Quantifies effluent volumes (mean and maximum);

e) Describes groundwater and surface water conditions in sufficient detail to define “representative” discharges and flows under dry and wet weather/season conditions;

f) Accounts for water balances of natural groundwater discharge points (springs) with respect to estimated groundwater recharge and zones of contributions (to discharge points);

g) Is capable of defining expected mixing/dilution of effluents in groundwater under dry weather/season conditions; and demonstrating that the resulting dilution will meet the groundwater quality objectives defined in the Groundwater Regulations; and

h) Adequately monitors appropriate and relevant receptors, including private and public water supplies, for impacts on groundwater quality.

The Tier 3 assessment will be, in all likelihood, iterative by nature, whereby the scope, schedule and results of the assessment evolve as knowledge improves with time.

Exemption cases involving activities such as those described in Section 4.4 will also be expected to operate and maintain waste water treatment systems to proper standards, and conduct long-term monitoring on effluent quality and receptor quality at appropriate compliance point locations (per EPA, 2011).

Inspections and reviews shall be conducted periodically by the regulatory body. Adequate monitoring programmes must be put in place for both the source and potential receptors. The nature and scope of monitoring will be defined by the Tier 3 technical assessment.

4.5.1.2 Direct Discharges to Swallow Holes via Surface Water Features

With respect to the swallow hole scenario described in Section 3.2.2, the principles described in Section 4.4.1.1 also apply. In addition:

a) There should be no significant impacts to local populations, economic activity (e.g. farming), and sensitive ecosystems (e.g. wetlands) along associated surface pathways and/or floodplains. Potential impacts would have to be examined and assessed under both low-flow and flood-flow conditions, and would be subject to existing discharge to surface water guidance (WSTG, 2011).

b) There should be no adverse direct or indirect exposure risk to pollutants in terms of human health and related ecosystems.

The principles described above also apply to direct discharges to bedrock surfaces, as defined by Section 3.2.3.

5 Summary

Direct discharges to groundwater are, with few exceptions, prohibited under the Groundwater Regulations. They are prohibited because they significantly increase the risks of impact to groundwater quality and because they, typically, contradict the 'prevent or limit' objective which forms the core environmental quality objective as set forth by the Groundwater Regulations.

In the Irish context, direct discharges are of particular concern due to the often vulnerable hydrogeological settings that are associated with some of the highest-yielding aquifers in the country, represented mainly by karstified limestone aquifers in counties such as Galway, Clare, Mayo and Roscommon. Nonetheless, direct discharges are known to occur, and where they occur, they are potential contributors to water quality issues reflected in EPA's poor chemical status classification of certain groundwater bodies and specific impacts to groundwater-based water supplies.

Preventing or mitigating the direct input of pollutants into the groundwater environment represents a particular challenge in karstified limestone aquifers, as karstic conduits can transport pollutants over large (kilometre-scale) distances in hours or days, often in directions and following underground pathways that are difficult to predict, and which require detailed field study and technical assessment to ascertain.

In practice, and in certain physical settings, direct discharges may be unavoidable if there are no 'suitable' alternatives, whereby 'suitable' is judged on a case by case assessment of technical feasibility and disproportionate costs. Direct discharges to groundwater should only be considered if, in order of priority:

a) Discharge options to surface water are precluded;

b) Indirect discharges to groundwater (via percolation) are precluded.

Where consideration of direct discharges becomes necessary, detailed technical assessment will be needed involving relevant and suitably qualified professionals. The technical assessment must be based on a carefully developed scope of work, an appropriate field investigation programme (including monitoring), and judicious analysis of results. Judging 'suitability', therefore, is a process which defines the details of the technical assessment that is required and results in a technically-based verdict on whether or not a prior authorisation can be granted or should be denied.

This Guidance details the technical rules for direct discharges of domestic-type wastewater effluent to groundwater. They are intended to contribute towards existing groundwater and environmental protection initiatives by the EPA and other public authorities and to be a useful reference document for public bodies and private entities alike. As such, it supplements and should be read in context of the previously published report by the EPA entitled "*Guidance on the Authorisation of Discharges to Groundwater*" (EPA, 2011).

6 References

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Glossary of Terms

Agreed Limit of Detection
The lowest concentration or quantity of a substance that can be distinguished from the absence of that substance. It should be agreed between the regulator and the applicant.

Appropriate Assessment
In accordance with Article 6(3) of the Habitats Directive (92/43/EEC), an Appropriate Assessment is an evaluation of the potential impacts of a plan or project on the conservation objectives of a Natura 2000 site (European network of special areas of conservation and special protection areas), and the development, where necessary, of mitigation or avoidance measures to mitigate negative effects.

Aquifer
A subsurface layer or layers of rock, or other geological strata, of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater (Groundwater Regulations, 2010).

Attenuation
A decrease in pollutant concentrations, flux, or toxicity as a function of physical, chemical and/or biological processes, individually or in combination, in the subsurface environment. Attenuation processes include dilution, dispersion, filtration, sorption, decay, and retardation.

Capacity
A measure of the ability of groundwater to assimilate or absorb pollutants whilst still maintaining acceptable water quality in relation to applicable groundwater quality standards. The term relates primarily to the chemical status of a groundwater body.

Coastal Water
The area of surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate to the outer limit of transitional waters.

Compliance Point
The point (location, depth) at which a compliance value should be met. Generally it is represented by a borehole or monitoring well from which representative groundwater samples can be obtained.

Compliance Value
The concentration of a substance and associated compliance regime that, when not exceeded at the compliance point, will prevent pollution and/or achieve water quality objectives at the receptor.

Contaminant (Chemical) Load
The volume and concentrations of chemical substances (pollutants) discharged to soil or groundwater.

Diffuse Sources
Diffuse sources of pollution are spread over wider geographical areas rather than at individual point locations. Diffuse sources include general land use activities and landspreading of industrial, municipal wastes and agricultural organic and inorganic fertilisers.

Direct Input
An input to groundwater that bypasses the unsaturated zone (e.g. direct injection through a borehole) or is directly in contact with the groundwater table in an aquifer either year round or seasonally.

Domestic Waste Water
Waste water of a composition and concentration (biological and chemical) normally discharged by a household, and which originates predominantly from the human metabolism or from day to day domestic type human activities, including washing and sanitation, but does not include fats, oils, grease or food particles discharged from a premises in the course of, or in preparation for, providing a related service or carrying on a related trade. (Water Services Act, 2007).

Domestic Waste Water Treatment Systems (DWWTS)
A generic term for small-scale waste water treatment systems associated with single houses and small communities or facilities, and mostly associated with septic tanks and intermittent filter systems offering secondary treatment of raw waste water effluent.

Down-gradient
The direction of decreasing groundwater levels, i.e. flow direction. Opposite of upgradient.

Dry Weather Flow (Effluent)
For a waste water treatment plant, the Dry Weather Flow is the average daily flow to the plant without any contribution from stormwater inflow or infiltration of groundwater into the waste water collection system.

Dry Weather Flow (Receiving Water)
The Dry Weather Flow of a stream or river is the annual minimum daily mean flow rate with a return period of 50 years. The Dry Weather Flow is a statistical measure of low flow and usually requires reliable long term low flow data or sufficient information that would allow the estimation of the Dry Weather Flow.

Environmental Quality Standard (EQS)
The concentration of a particular pollutant or group of pollutants in a receiving water which should not be exceeded in order to protect human health and the environment.

Good Groundwater Chemical Status
The chemical status of a body of groundwater which meets all the conditions for good chemical status set out in Groundwater Regulations 2010, regulations 39 to 43.

Good Groundwater Status
Achieved when both the quantitative and chemical status of a groundwater body are good.

Groundwater
All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil (Groundwater Regulations, 2010).

Groundwater Body (GWB)
A volume of groundwater defined as a groundwater management unit for the purposes of reporting to the European Commission under the Water Framework Directive. Groundwater bodies are defined by aquifers capable of providing more than 10 m^3 per day, on average, or serving more than 50 persons.

Groundwater Dependent Terrestrial Ecosystems (GWDTEs)
These are groundwater dependent wetlands, whereby the dependency is either on groundwater flow, level or chemistry as the controlling factors or qualifying interests of associated habitats. Examples are raised bogs, alkaline fens and turloughs. Groundwater dependent terrestrial ecosystems are listed on the EPA's register of protected areas in accordance with Regulation 8 of the Water Policy Regulations, 2003.

Groundwater Protection Scheme (GWPS)
A scheme comprising two principal components: a land surface zoning map which encompasses the hydrogeological elements of risk (of pollution); and a groundwater protection response matrix for different potentially polluting activities (DELG/EPA/GSI, 1999).

Groundwater Recharge
Two definitions: a) the process of rainwater or surface water infiltrating to the groundwater table; b) the volume (amount) of water added to a groundwater system.

Groundwater Resource
An aquifer capable of providing a groundwater supply of more than 10 m^3 a day as an average or serving more than 50 persons.

Hazardous Substances
Substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern. A list of hazardous substances has been published by the EPA (2010a).

Hydraulic Conductivity
The rate at which water can move through a unit volume of geological medium under a potential unit hydraulic gradient. The hydraulic conductivity can be influenced by the properties of the fluid, including its density, viscosity and temperature, as well as by the properties of the soil or rock.

Hydraulic Gradient
The change in total head of water with distance; the slope of the groundwater table or the piezometric surface.

Indirect Input
An input to groundwater where the pollutants infiltrate through soil, subsoil and/or bedrock to the groundwater table.

Industrial Emissions Activity (IEA) Licence
A licence for activities issued by the EPA under the Environmental Protection Agency (Industrial Emissions)(Licensing) Regulations.

Input
The direct or indirect introduction of pollutants into groundwater as a result of human activity.

Integrated Constructed Wetlands (ICWs)
Constructed wetlands are artificially constructed or modified wetland systems supporting vegetation, which provide secondary treatment, by physical and biological means, to effluent from a primary treatment step. Constructed wetlands may also be used for tertiary treatment (EPA, 2009a). “Integrated constructed wetlands” have been developed in Ireland to integrate water quality, management of landscape-fit towards improving site aesthetics and enhancement of biodiversity. ICWs can primarily treat domestic waste water and farmyard soiled water. Guidance (DEHLG, 2010) is available that outlines the ICW concept, and provides information on site assessment, design, construction, operation, maintenance and monitoring.

Integrated Pollution Control (IPC) Licence
A licence for industrial and other activities issued by the EPA under the Environmental Protection Agency Act 1992, as amended.

Integrated Pollution Prevention and Control (IPPC) Licence
A licence for industrial and other activities issued by the EPA under the Environmental Protection Agency Acts, 1992 to 2011.

Karst
A distinctive landform characterised by features such as surface collapses, sinking streams, swallow holes, caves, turloughs and dry valleys, and a distinctive groundwater flow regime where drainage is largely underground in solutionally enlarged fissures and conduits.

Lake
A body of surface water, which may be artificial or natural.

Limit Objective
This objective requires the implementation of all measures necessary to limit inputs of non-hazardous substances, into groundwater to ensure that such inputs do not cause deterioration in status or significant and sustained upward trends in their concentrations in groundwater.

Limit Value
The mass, expressed in terms of a specific parameter, concentration or level of an emission, or both a specific concentration and level of an emission, that may not be exceeded during one or more periods of time. In this guidance, when not exceeded at the source, the limit value will prevent an unacceptable release to groundwater.

Minimum Reporting Value (MRV)
The lowest concentration of a substance that can be determined with a given degree of confidence using commonly available analytical methods, primarily used in the context of hazardous substances. MRVs are not necessarily equivalent to limits of detection. A list of substances and concentrations considered as MRVs has been produced by the EPA and is contained in **Appendix C** of EPA, 2011.

Non-hazardous Substances
Pollutants listed in Schedule 2 of the Groundwater Regulations 2010 that are not considered hazardous, as well as any other non-hazardous pollutants not listed in Schedule 2 but presenting an existing or potential risk of pollution. Non-hazardous substances are listed in a document by the EPA (2010a).

Pathway
The route which a particle of water and/or chemical or biological substance takes through the environment from a source to a receptor location. Pathways are determined by natural hydrogeological characteristics and the nature of the contaminant, but can also be influenced by the presence of features resulting from human activities (e.g., abandoned ungrouted boreholes which can direct surface water and associated pollutants preferentially to groundwater).

Permeability
A measure of a soil or rock's ability or capacity to transmit water under a potential hydraulic gradient (synonymous with hydraulic conductivity).

Point Source
Any discernible, confined or discrete conveyance from which pollutants are or may be discharged. These may exist in the form of pipes, ditches, channels, tunnels, conduits, containers, and sheds, or may exist as distinct percolation areas, integrated constructed wetlands, or other surface application of pollutants at individual locations. Examples are discharges from waste water works and effluent discharges from industry.

Pollution
The direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems which result in damage to material property, or which impair or interfere with amenities and other legitimate uses of the environment (Groundwater Regulations, 2010).

Population Equivalent (p.e.)
A conversion value which aims at evaluating non-domestic pollution in reference to domestic pollution fixed by EEC directive (Urban Waste Water Treatment Directive 91/271/EEC) at 60 g/day BOD_5.

Pore water
Water that occupies void spaces between mineral grains in unlithified (uncemented) sediments.

Preferential Flow
A generic term used to describe water movement along favoured pathways through a geological medium, bypassing other parts of the medium. Examples include pores formed by soil fauna, plant root channels, weathering cracks, fissures and/or fractures.

Prevent Objective
Taking all measures necessary and reasonable to avoid the entry of hazardous substances into groundwater and to avoid any significant increase in their concentration in groundwater.

Receptor-based Water Quality Standards
Standards developed to protect receptors, which include drinking water standards, environmental quality standards for surface waters and minimum reporting values. They are used to develop compliance values for assessing inputs to groundwater.

Receptors
Receptors are existing and potential future groundwater resources, drinking water supplies (e.g. springs and abstraction wells), surface water bodies into which groundwater discharges (e.g. streams) and groundwater dependent terrestrial ecosystems (GWDTEs).

Regulator
In this document, the EPA or the relevant local authority depending on the type of discharge licence and location.

River
A body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course (Groundwater Regulations, 2010). Upland rivers are generally fast flowing and lowland rivers are generally slow flowing and meandering.

River Basin
The area of land from which all surface water run-off flows, through a sequence of streams, rivers and lakes, into the sea at a single river mouth, estuary or delta.

River Basin District (RBD)
A group of river basins formally defined by Water Policy (2003) for the purposes of reporting Water Framework Directive requirements to the European Commission.

River Basin Management Plan (RBMP)
A detailed document describing the characteristics of a river basin district, the environmental objectives that need to be achieved, and the pollution control measures required to achieve these objectives through a specified work programme.

Saturated Zone
The zone below the water table in an aquifer in which all pores and fissures and fractures are filled with water at a pressure that is greater than atmospheric.

Section 4 Licence
A discharge licence given by local authorities under the Local Government (Water Pollution) Acts 1977 to 1990.

Significant and Sustained Upward Trend
Any statistically and environmentally significant increase in concentration of a pollutant, group of pollutants, or indicator of pollution in groundwater (EPA, 2010b).

Soil (topsoil)
The uppermost layer of soil in which plants grow.

Source Pathway Receptor (SPR) Model
A SPR model involves identifying whether and how pollution sources are connected to a receptor via a pathway. A conceptual model provides an understanding of all the relationships between SPR factors in a particular hydrogeological setting.

Special Areas of Conservation (SACs)
Areas selected and designated by NPWS under the Natural Habitats Regulations, 1997 (as amended in 1998 and 2005) for the protection of certain habitats and species.

Storm Water
Runoff of rainwater mainly in urban settings during high intensity rainfall events. Stormwater may enter and discharge to groundwater or other receptors through storm drains.

Subsoil
Unlithified (uncemented) geological strata or materials beneath the topsoil and above bedrock.

Surface Water
An element of water on the land's surface such as a lake, reservoir, stream, river or canal. Can also be part of transitional or coastal waters. (Surface Waters Regulations, 2009.).

Surface Water Bodies
Inland waters, except groundwater, which are on the land surface (such as reservoirs, lakes, rivers, transitional waters, coastal waters and, under some circumstances, territorial waters) and which occur within a WFD River Basin District.

Sustainable Urban Drainage Systems (SuDS)
Generic term used to describe conveyance systems and control structures designed to intercept, manage, and dispose of surface drainage and stormwater in urban settings and the built environment. Components of SuDS may include drains, ponds, soakaways, recharge basins, and porous pavements.

Threshold Values (TVs)
Chemical concentration values for substances listed in Schedule 5 of the Groundwater Regulations (2010), which are used for the purpose of chemical status classification of groundwater bodies.

Trade Effluent
Effluent from any works, apparatus, plant or drainage pipe used for the disposal to a waste water works of any liquid (whether treated or untreated), either with or without particles of matter in suspension therein, which is discharged from premises used for carrying on any trade or industry (including mining), but does not include domestic waste water or storm water (Water Services Act, 2007).

Transitional Waters
Bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to saline coastal waters, and which are substantially influenced by freshwater flows.

Trigger Level
A parameter value specified in a licence or authorisation, the achievement or exceedance of which requires certain actions to be taken by the licensee.

Unacceptable Input to Groundwater
An input of hazardous substances to groundwater, or pollution resulting from an input of non-hazardous substances to groundwater, where these inputs are not exempted by the provisions of Regulation 14 of the Groundwater Regulations (2010).

Unsaturated Zone
The zone between the land surface and the water table, in which pores, fractures and fissures are only partially filled with water. Also known as the vadose zone.

Vulnerability
The intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities (Fitzsimmons et al, 2003).

Waste Licence
A licence for activities in the waste sector given by the EPA under the Waste Management Act 1996, as amended.

Waste Water Effluent
Any quantity or volume of waste water generated from a domestic, industrial, or commercial facility. Typically disposed of via an onsite waste water treatment system or a specially designed treatment facility such as a waste water treatment plant.

Waste Water Discharge Licence or Certificate of Authorisation
Issued by the EPA to sanitary authorities under the Waste water Discharge (Authorisation) Regulations 2007 and 2011.

Water Body
A WFD management unit. It refers to all types of waters, including surface water bodies, transitional and coastal water bodies, as well as groundwater bodies.

Water Table
The uppermost level of saturation in an aquifer at which the pressure is atmospheric.

Appendix 1 - Permissible Direct Discharges under Regulation 8 that require Prior Authorisations

Discharge Type (as specified in Regulation 8b and 8c)
i. *Injection of water containing substances resulting from the operations for exploration and extraction of hydrocarbons or mining activities, and injection of water for technical reasons, into geological formations from which hydrocarbons or other substances have been extracted or into geological formations which for natural reasons are permanently unsuitable for other purposes. Such injections shall not contain substances other than those resulting from the above operations.*
ii. *Reinjection of pumped groundwater from mines and quarries or associated with the construction or maintenance of civil engineering works.*
iii. *Injection of natural gas or liquefied petroleum gas (LPG) for storage purposes into geological formations which for natural reasons are permanently unsuitable for other purposes.*
iv. *Injection of natural gas or liquefied petroleum gas (LPG) for storage purposes into other geological formations where there is an overriding need for security of gas supply, and where the injection is such as to prevent any present or future danger of deterioration in the quality of any receiving groundwater.*
v. *Discharges resulting from construction, civil engineering and building works and similar activities on, or in the ground which come into contact with groundwater. Such activities may be treated as having been authorised provided that they are conducted in accordance with general binding rules which are applicable to such activities.*
vi. *Small quantities of substances for scientific purposes for characterisation, protection or remediation of water bodies limited to the amount strictly necessary for the purposes concerned.*
c) *Reinjection of water used for geothermal purposes into the same aquifer.*

Appendix 2 - Categories of Exempted Pollutant Inputs under Regulation 14

Regulation 14 specifies that the Agency shall prepare and make publicly available a technical report setting out technical rules to be used by authorizing authorities for identifying exempted pollutant inputs. Exemptions can be authorised by following and meeting the terms and conditions, i.e. technical rules, that are established by relevant EPA staff or by other public authorities, following consultation with the EPA.

Regulation 14 applies to both direct and indirect discharges, but only *"where the Agency is satisfied that adequate monitoring of the bodies of groundwater concerned, in accordance with point 2.4.2 of Annex V to Directive 2000/60/EC* [i.e. Water Framework Directive]*, or other appropriate monitoring, is being carried out."* In practice, the categories of exempted pollutant inputs represent special cases where the need to take all measures necessary to achieve 'prevent or limit' objectives may be relaxed, but not ignored, under case-specific circumstances.

Any direct discharge activity that may be or is considered for exemption should be registered by the relevant public authority with the Agency. The Agency is required by Regulation 15 of the Groundwater Regulations to maintain an inventory of these exempted activities. The need for prior authorisation remains valid and the discharge activity must be carried out in accordance with its case-specific conditions. Where the prior authorisation involves a public authority other than the Agency, e.g. a local authority, the Agency may, according to Regulation 14, "*direct a public authority to provide information in relation to the location and nature of inputs of pollutants, and any other information, which it considers necessary. The relevant public authority, shall take the steps necessary to provide the information requested by the Agency. The information shall be provided to the Agency in a timely manner".*

Category (as specified in Regulation 14)	**Example Scenarios**[1]
(a) *Inputs that are the result of direct discharges authorised in accordance with Regulation 8.*	See **Appendix 1**. Regulation 8 concerns direct discharges only, whereas Regulation 14 concerns both direct and indirect discharges and, therefore, a broader set of potential cases and circumstances. With regard to Regulation 8, the prevent or limit objectives outlined in Section 2 still apply, but the direct discharge activity may be exempted from the *need to take all necessary measures* to prevent or limit pollutant inputs. Exemptions may also apply where groundwater is unsuitable for use for natural reasons (e.g. deep aquifers that contain brines or hydrocarbons). There are no known cases in Ireland.
(b) *Inputs considered to be of a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater.*	Under Regulation 14(b) a general "de minimis" exemption can be granted for **both** direct and indirect discharges if the regulatory bodies are satisfied that inputs of pollutants will not result in deterioration of groundwater quality, and/or are of a magnitude and persistence that would not result in a sustained increase in groundwater concentrations. Such inputs present a low risk of impact on receptors. Examples are: • Discharge of highly treated effluent. • Use of non-hazardous drilling fluids during drilling

[1] It is not intended to take account of all possible scenarios in this Guidance

Category (as specified in Regulation 14)	Example Scenarios[1]
	operations. • Inputs arising from essential use and maintenance of construction equipment, provided all reasonable precautions are taken. • Discharge of mains water or potable water quality. • Discharge from clean water use applications. • Discharge of 5 m^3/d or less of water with no discernible hazardous substances or significant concentrations of non-hazardous substances. In the context of Regulation 14(b), hazardous substances are given special mention as it is not possible or practical in some cases to completely prevent such inputs from occurring. Hazardous inputs may be exempted where: a) it is obvious, from simple examination, that the input is not environmentally significant (*i.e.* the "de minimis" exemption); and b) technical assessment demonstrates that pollutant migration through the unsaturated zone will provide sufficient attenuation to meet groundwater quality objectives. For example, an exemption might apply where the concentration of a hazardous substance in a direct discharge is less than its Minimum Reporting Value (MRV) or limits of detection (defined by Appendix C of EPA, 2011), or might apply where the concentration in the effluent is so small that it does not result in a quantifiable/detectable concentration in groundwater, after mixing/dilution. The goal is always to prevent the input of hazardous substances to groundwater. The means of testing for presence in groundwater is to sample and monitor groundwater quality at suitable locations ('compliance points') as presented in the EPA 2011 guidance.
(c) *Inputs that are the consequences of accidents or exceptional circumstances of natural cause that could not reasonably have been foreseen, avoided or mitigated.*	This would not apply to inputs that are the result of poor design and/or maintenance practices. Exempted inputs could result from accidental spills or phenomena that are caused by extreme weather events (e.g. flooding) that fall outside normal bounds of prediction. It could also apply to non-hazardous substances arising from the emergency treatment of water for drinking supply (e.g. in response to unforeseen spills).
(d) *Inputs that are the result of artificial recharge or augmentation of bodies of groundwater authorised in accordance with Article 11(3)(f) of Directive 2000/60/EC.*	Prior authorisation will be required with a technical assessment of the risk of impact to potential groundwater-based receptors, per the EPA 2011 guidance. Prior authorisation would also require an adequate groundwater monitoring programme which can demonstrate representative monitoring of potential pollutants of concern.
(e) *Inputs considered incapable, for technical reasons, of being prevented or limited without using:* *(i) measures that would increase risks to human health or to the quality of the environment as a whole, or* *(ii) disproportionately costly measures to*	For instance, exemption may apply to discharge of substances/pollutants resulting from the use of approved chemicals or foams for the purpose of emergency fire fighting (not including training exercises or non-emergency use). Exemptions may also apply to contaminated land sites.

Category (as specified in Regulation 14)	Example Scenarios[1]
remove quantities of pollutants from or otherwise control their percolation in, contaminated ground or subsoil.	
(f) *Inputs that are the result of interventions in surface waters for the purposes, amongst others, of mitigating the effects of floods and droughts, and for the management of waters and waterways, including at international level. Such activities, including cutting, dredging, relocation and deposition of sediments in surface water, shall be conducted in accordance with general binding rules, and, where applicable, with permits and authorisations issued on the basis of such rules, developed by the relevant authority for that purpose, provided that such inputs do not compromise the achievement of the environmental objectives established for the water bodies concerned.*	Case-specific exemption could apply to diversions for flood relief, temporary dredging works and other activities that require prior authorisation, but returns waterways channel to prior conditions after works are completed. The input cannot cause deterioration in status for any water body.

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil, Pobal agus Rialtais Áitiúil.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail;
- scardadh dramhuisce;
- dumpáil mara.

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

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