**SR2025 No 4: generic risk assessment – heat transfer to ground from closed-loop ground source heating and cooling systems**

The Environment Agency produces the generic risk assessments for all standard rules permits. These list the potential risks and how to manage them.

This generic risk assessment covers activities set out in draft standard rules set SR2025 No. 4, which can be viewed via the [consultation page](https://consult.environment-agency.gov.uk/environment-and-business/standard-rules-consultation-no-30-gw-activities) for these rules. Check this generic risk assessment to understand:

* the potential environmental risks associated with ground source heating and cooling systems
* how to manage the risks effectively

Each risk comprises:

* information about the source, pathway and receptor – and the potential harm to that receptor
* a judgement of the level of risk and justification of that judgement
* actions for managing the risk (through permitting) and a residual risk rating after managing it

Risk management involves breaking or limiting the source-pathway-receptor linkage to reduce the risk. We will control the residual risk (after risk management) when we assess compliance.

If you need to check the meaning of any terms we have used (in the context of this risk assessment), see the explanation of terms at the end of this document. To see the definition of technical terms, see the “Interpretation” section of the Standard Rules associated with this risk assessment.

This generic risk assessment is based on the following parameters.

**Parameter 1**

The permitted activity under schedule 22 3(1) is the transfer of heat to ground from closed loop ground source heat exchangers.

**Parameter 2**

The system must be fully sealed so it does not discharge water or fluids into the environment.

**Parameter 3**

The sub-surface installation must not be within 50 metres of any well, spring or borehole that is used to supply water for domestic drinking or food production purposes.

**Parameter 4**

The sub-surface installation must not be within 50 metres of:

* a wetland designated as a European site
* a Ramsar site
* a water-based Local Nature Reserve (LNR)
* a biological Site of Special Scientific Interest (SSSI)
* an ancient woodland

**Parameter 5**

The installation of the sub-surface system must not mobilise any contamination that may be below the ground and cause groundwater pollution.

**Parameter 6**

The system must not cause pollution of surface or groundwater.

**Parameter 7**

The thermal transfer fluid within the system must not contain any hazardous substances.

**Parameter 8**

All system equipment must meet the relevant British Standards and Ground Source Heat Pump Association Standards.

**Parameter 9**

The net input of heat energy into the ground or groundwater shall not exceed 0.5 kilowatt hours per cubic metre of aquifer per year.

**Parameter 10**

The system must be decommissioned properly when it is no longer in use.

**1. Risk to drinking water supplies**

**1.1 Heat transferred from or into the ground and groundwater**

The input of heat into the ground from closed-loop systems can migrate via the movement of groundwater towards wells, springs, or boreholes used for drinking water or food production purposes.

We have assessed the potential harm to drinking water supplies as follows:

* impact of temperature change resulting in changes to groundwater quality
* impact of temperature change resulting in biofouling

**Judgement of risk**

We have judged the:

* likelihood of the hazard affecting the receptor as low
* overall severity of potential consequences as high
* overall risk rating as medium

The reasons for giving the activity this rating is because temperature changes may impact the quality of groundwater, cause biofouling, or interference of borehole installations.

**Managing the risk**

The following manages the risk:

* the site of a ground source heating and/ or cooling system must be a minimum of 50 metres away from any well, spring or borehole used to supply water for domestic drinking or food production purposes (parameter 3)
* the installation must not mobilise any contamination that may be below the ground (parameter 5)
* the net input of heat energy into the ground or groundwater shall not exceed 0.5 kilowatt hours per cubic metre of aquifer per year (parameter 9)

Taking this action will control the risk and rate it as ‘low’.

**1.2 Releases of hazardous substances and non-hazardous pollutants**

If leaked, hazardous substances and non-hazardous pollutants from thermal transfer fluid within closed loop systems could enter groundwater and migrate towards drinking water supplies.

We have assessed the potential harm to drinking water resources as follows:

* impact upon the chemical quality of groundwater within public drinking water supplies
* impact upon the chemical quality of groundwater within private drinking water supplies

**Judgement of risk**

We have judged the:

* likelihood of the hazard affecting the receptor as low
* overall severity of potential consequences as high
* overall risk rating as medium

The reasons for giving the activity this rating is because the chemicals used in thermal transfer fluid could be harmful to water supplies if leaked.

**Managing the risk**

The following manages the risk:

* the system must be fully sealed so it does not discharge water or fluids into the environment (parameter 2)
* the site of a ground source heating and/ or cooling system must be a minimum of 50 metres away from any well, spring or borehole used to supply water for domestic drinking or food production purposes (parameter 3)
* the thermal transfer fluid within the system must not contain any hazardous substances (parameter 7)
* all system equipment must meet the relevant British Standards and Ground Source Heat Pump Association Standards (parameter 8)
* pressure monitoring of the thermal transfer fluid must be carried out to ensure pressure remains in an acceptable range, to aid as a warning against potential losses of fluid to the environment

Taking these actions will further control the risk and rate it as ‘low’.

**2. Risk to protected sites and ancient woodlands**

**2.1 Heat transferred from or into the ground and groundwater**

Protected sites are listed in parameter 4.

The input of heat into the ground from closed-loop systems can migrate via the movement of groundwater towards protected sites, ancient woodlands, or enter surface waters associated with these sites. Groundwater can reach some receptors via root uptake.

We have assessed the potential harm to these receptors as follows:

* impact or damage to protected sites, habitats or ecosystems as a result of changes in groundwater temperature or chemistry
* impact upon the health of trees in ancient woodlands as a result of changes in groundwater temperature or chemistry

**Judgement of risk**

We have judged the:

* likelihood of the hazard affecting the receptor as low
* overall severity of potential consequences as medium
* overall risk rating as medium

The reasons for giving the activity this rating is because temperature changes may affect the health of the flora and fauna within the protected sites or ancient woodlands.

**Managing the risk**

The following manages the risk:

* the site of a ground source heating and/ or cooling system must be a minimum of 50 metres away from any protected site or ancient woodland (parameter 4)
* The net input of heat energy into the ground or groundwater shall not exceed 0.5 kilowatt hours per cubic metre of aquifer per year (parameter 9)

Taking this action will control the risk and rate it as ‘low’.

**2.2 Releases of hazardous substances and non-hazardous pollutants**

If leaked, hazardous substances and non-hazardous pollutants from thermal transfer fluid within closed loop systems could enter groundwater and migrate towards protected sites and ancient woodlands.

We have assessed the potential harm to these receptors as follows:

* impact upon the chemical quality of water at water-dependent protected sites as a result of changes in groundwater chemistry
* impact upon the health of trees in ancient woodlands as a result of changes in groundwater chemistry

**Judgement of risk**

We have judged the:

* likelihood of the hazard affecting the receptor as low
* overall severity of potential consequences as medium
* overall risk rating as medium

The reasons for giving the activity this rating is because some water-dependent protected sites are sensitive to changes in water chemistry.

**Managing the risk**

The following manages the risk:

* the system must be fully sealed so it does not discharge water or fluids into the environment (parameter 2)
* the site of a ground source heating and/ or cooling system must be a minimum of 50 metres away from any protected sites or ancient woodlands (parameter 4)
* the thermal transfer fluid within the system must not contain any hazardous substances (parameter 7)
* all system equipment must meet the relevant British Standards and Ground Source Heat Pump Association Standards (parameter 8)
* pressure monitoring of the thermal transfer fluid must be carried out to ensure pressure remains in an acceptable range, to aid as a warning against potential losses of fluid to the environment

Taking these actions will further control the risk and rate it as ‘low’.

**Explanation of terms**

**Receptor**

The things at risk and that need protecting.

Receptors considered include atmosphere, land, surface waters, groundwater, humans, wildlife and their habitats.

A single receptor may be at risk from several different sources and all must be addressed.

**Source**

The agent or process that has the potential to cause harm.

A contaminant or pollutant (a hazard) that has the potential to cause harm. For example, the activity or operation taking place for which a particular hazard may arise.

**Harm**

The harmful consequence to the receptor if the hazard is realised.

**Pathways**

The route or means by which a defined hazard may affect a receptor.

**Source-pathway-receptor linkage**

There has to be a link between the source, pathway and receptor for there to be a risk.

**Likelihood of exposure**

This is the likelihood of the receptors being exposed to the hazard. The meaning of the definitions are:

* high – exposure is probable – direct exposure is likely with no or few barriers between the hazard source and the receptor
* medium – exposure is fairly probable – feasible exposure is possible as the barriers to exposure are less controllable
* low – exposure is unlikely – several barriers exist between the hazard source and receptor to reduce exposure
* very low – exposure is very unlikely – effective, multiple barriers are in place to reduce exposure

**Overall magnitude of potential consequence**

This is the severity of the consequence if the hazard is realised and may cause actual or potential harm.

This will have a high, medium, low or very low rating using attributes and scaling to consider ‘harm’.

**Risk rating**

We work out the risk rating by combining the likelihood of exposure with the magnitude of the potential consequences.

We assign these ratings:

* high risk – requires additional assessment and active management
* medium risk – requires additional assessment and may need active management and, or monitoring (or both)
* low and very low risks will require a periodic review