# SR2023 No 1: generic risk assessment

SR2023 No 1: standard rules permit for capture, treatment and storage of biogas from lagoons and tanks.

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

Check this generic risk assessment to understand:

* the potential risks of an anaerobic lagoon and gas collection and upgrade facility which includes using the resultant biogas for vehicle use or onward use.
* if your proposed activity has the same risks and can you apply for the standard rules permit
* 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. If we set minimum distances we explain the basis of the distance, for example by modelling.

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.

This generic risk assessment is based on the following parameters.

### Parameter 1

Permitted activities s5.4 A(1)(b)(i) are:

* the storage and recovery of waste (R13, R1, R3)
* incineration on land (D10)

### Parameter 2

The permitted wastes are manures, slurries and biodegradable wastes produced from on-farm and dairy wastes.

### Parameter 3

The maximum quantity of waste received each day shall not exceed the designed storage capacity of the site.

### Parameter 4

Except for the auxiliary flare there will be no combustion of biogas on site.

### Parameter 5

These rules do not allow any point source emission into land, surface waters or groundwater under control of the permit other than rain water.

### Parameters 6 to 13

The site must be a minimum distance from certain types of sensitive receptors. It cannot be within:

(a) 150 metres of a European site (within the meaning of Regulation 8 of the Conservation of Habitats and Species Regulations 2017) or a Site of Special Scientific Interest, including candidate or proposed sites or a marine conservation zone

(b) a groundwater source protection zone 1 or 2, or if a source protection zone has not been defined for the site within 50 metres of any well, spring or borehole used for the supply of water for human consumption (including private water supplies)

(c) 10 metres of any watercourse

(d) 50 metres of a Local Nature Reserve, Local Wildlife Site, Ancient Woodland or Scheduled Monument

(e) 50 metres of a site that has species or habitats of principle importance (as listed in Section 41 of the Natural Environment and Rural Communities Act 2006) that the Environment Agency considers at risk to this activity, these are also often referred to as priority habitats and species

(f) a specified Air Quality Management Area

## 1. Risk to local human population

### 1.1 Releases of emissions NOx, SOx, CO and other gases

NOx, SOx, CO and other gases travel through the air and can be inhaled.

We have assessed the potential harm to human health as follows:

* respiratory irritation
* illness

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because there is potential for exposure to:

* anyone living close to the site
* members of the public at locations to which they could be regularly exposed

#### Managing the risk

The following manages the risk:

* set back distances apply for effective stack height
* lagoons are covered with a fixed cover and an appropriately designed air abatement and gas capture system minimising risk of ammonia and methane loss.
* activities shall be managed and operated in accordance with a management system (including the inspection and maintenance of equipment and engines) and the point source emissions to air with emission limits requirement
* other monitoring shall be reported as permit requirements
* the activities shall not be carried out within a specified Air Quality Management Area for NOx
* leak detection and repair programmes will be in place to mitigate and prevent methane emissions
* gas pressure will be monitored to minimise the release of biogas and all pressure relief systems will be inspected and calibrated as required by the permit

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

### 1.2 Release of micro-organisms (bioaerosols)

Bioaerosols travel through the air and can be inhaled.

We have assessed the potential harm to human health as follows:

* respiratory irritation
* illness

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because there is potential for release:

* when waste is received
* during storage of digestate

#### Managing the risk

The following manages the risk:

* lagoons and tanks are covered minimising risk for release of bioaerosol
* air abatement needs to be deployed to mitigate channelled emissions

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

### 1.3 Odour

Odour travels through the air and can be inhaled.

We have assessed the potential risk to the local population as:

* nuisance
* loss of amenity

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because local residents are sensitive to odour. Odour can result from:

* slurry and manure when received
* the release of biogas
* digestate

#### Managing the risk

The following manages the risk:

* an odour management plan is required
* fugitive emissions from slurry and digestate storage are minimised by covering and other fugitive emissions are not permitted
* all waste is stored for the minimal time and treated as quickly as possible
* all channelled emissions will be treated before release
* fugitive source emissions of biogas shall be minimised by implementing a leak detection and repair programme
* all appropriate measures shall be implemented
* all abatement systems are designed, monitored and maintained to treat specified emissions and off-gases

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

### 1.4 Noise and vibration

Noise travels through the air and vibration through the ground.

We have assessed the potential risk to the local population as:

* nuisance
* loss of amenity
* loss of sleep

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because local residents can be sensitive to noise and vibration. However, there is low potential for exposure.

#### Managing the risk

The following manages the risk:

* noise and vibration shall be minimised and not cause nuisance
* flares must be kept to a minimum to reduce noise impact and a record of use kept and reported
* a noise and vibration management plan may be required

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

## 2. Risk to local human population, livestock and wildlife

### 2.1 Gaining unauthorised access to site

There is a risk of direct physical contact with all on-site hazards such as wastes, machinery and vehicles.

There is a risk of causing injury to humans or livestock.

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because it is carried out within covered lagoons and tanks so physical contact is minimised.

#### Managing the risk

The following manages the risk:

* activities shall be managed and operated in accordance with a management system which includes site security measures to prevent unauthorised access
* all sites will have a DSEAR assessment which covers unauthorised access to site
* maintenance workers or contractors are not permitted on site without a suitable qualification and they must have permission to do the work

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

## 3. Risk to local human population and local environment

### 3.1 Arson and vandalism

Arson and vandalism risk causing the release of polluting materials to the air (smoke or fumes), water or land.

Arson and vandalism can cause:

* smoke to travel through the air
* spillages and contaminated firewater to run-off from the site and through surface water drains and ditches

We have assessed the potential harm as:

* respiratory irritation, illness and nuisance to local population
* injury to staff, fire fighters, arsonists or vandals
* pollution of water or land

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because:

* biogas is flammable
* the risk of direct physical contact is reduced by the activity being carried out within enclosed systems
* the consequences of an incident may be serious, including risk to the safety and wellbeing of people and loss of containment causing releases to the environment

#### Managing the risk

As risk 2.1 plus the following manages the risk:

* an accident management plan is required as part of the management system (covers fire and spillages)
* all areas of risk are identified in the DSEAR assessment
* a Hazard and Operability Study (HAZOP) or similar risk identification technique is done to produce a schedule of planned maintenance (as identified by the HAZOP or risk assessment or suppliers), and is documented
* warning signs are clearly displayed and personnel know gas alarm procedures
* visitors shall be accompanied
* repair and maintenance can only happen if the plant manager gives permission and signs to the effect
* fire control processes and procedures as set out in the DSEAR plan and they shall be communicated to the local fire service
* leak detection schemes are in place to prevent and minimise fugitive biogas release
* the site shall be secure
* any breaches shall be reported
* contingency measures must be in place in the event of loss of plant

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

### 3.2 Accidental explosion of gas

An explosion of biogas risks causing fire and smoke to travel through the air.

We have assessed the potential harm as:

* respiratory irritation, illness and nuisance to the local population
* injury to staff or fire fighters
* air, water or land pollution

#### 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 low

The reasons for giving the activity this rating is because the risk is reduced by an effective management system being in place, as required by the permit.

However, biogas is flammable, and the consequences are likely to be serious, including risk to:

* safety and wellbeing of those working or in close proximity to the site
* loss of containment may be detrimental to the environment

#### Managing the risk

This risk is managed in the same way as risks 2.1 and 3.1 and these additional measures:

* the management system is required to include the risk management measures specified in the HAZOP and DSEAR plans and cover planned maintenance
* the measures and procedures for any potential accidents are fully documented in the accident prevention and management plan, as part of the management system
* training and regular ‘toolbox’ talks are given to site operators and all staff understand their role in an emergency
* the management system must include measures for bunding of tanks
* leak detection and repair is required
* gas pressure in monitored continuously
* storage of biogas and biomethane is restricted to limits as set out in the Control of Major Accident Hazard Regulations 2015 (COMAH)

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

### 3.3 Accidental fire

Fire can cause polluting materials (smoke or fumes) to travel through the air, water or land. We have assessed the potential harm as:

* respiratory irritation, illness and nuisance to local population
* injury to staff or fire fighters
* air, water or land pollution

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because the risk is reduced by an effective management system.

#### Managing the risk

This risk is managed in the same way as risks 2.1, 3.1 and 3.2 along with:

* assessing the need for lightning conduction equipment which must be put in place where necessary or required for insurance purposes
* safe storage of activated charcoal and other combustible materials is required

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

## 4. Risk to surface waters close to and downstream of site

### 4.1 Spillage of digestate tank failure liquids, including oil – acute effects

We have assessed the acute effects as:

* water supply pollution
* fish kills

We have assessed the harm as:

* direct run-off from the site across the ground and through surface water drains and ditches

#### 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 low

The reasons for giving the activity this rating is because of the potential for spillage or over topping from lagoon or tanks and storage vessels.

#### Managing the risk

The following manages the risk:

* digestion tanks require appropriate design and validation
* an impermeable surface is required for storage of all wastes
* no point source emissions are allowed to water
* run-off is restricted to clean surface water using appropriate measures
* the site drainage plan is documented
* all staff are trained in the event of an emergency or accident
* primary infrastructure is bunded in line with CIRIA 736 and industry standards
* run-off is restricted by the ‘emissions of substances not controlled by emission limits’ rule

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

### 4.2 Spillage of digestate tank failure liquids, including oil – chronic effects

We have assessed the chronic effects as deterioration of water quality.

We have assessed the harm as:

* direct run-off from the site across the ground surface and through surface water drains and ditches
* spillages and digestate through direct run-off from site and through surface water drains and ditches
* indirect run-off through the soil layer or from loss of containment

#### 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 of the potential for spillage or over topping from lagoon or tanks and storage vessels.

#### Managing the risk

The following manages the risk:

* controls on site location
* preservation of critical infrastructure requirements
* all storage areas shall be constructed to an approved standard
* secondary containment is in place and validated by a chartered engineer to CIRIA 736 standard
* all lagoons are constructed to CIRIA 736 standard
* lagoons are inspected to ensure appropriate freeboard is maintained
* all transfer of digestate and material is supervised

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

## 5. Risk to water abstracted from a watercourse

These risks relate to watercourses downstream of a facility and to water for agricultural or potable use.

This receptor is at risk from spillage of digestate liquids due to or over topping from lagoon or tanks and storage vessels.

There is a risk of contaminants travelling through direct run-off from the site across ground surface, via surface water drains and ditches and finally through abstraction. This could have acute effects and cause the closure of abstraction intakes.

### 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 of the potential for spillage from digestion tanks and storage vessels.

### Managing the risk

Risk management is as set out in risks 5.1 and 5.2 along with:

* the activities cannot take place within groundwater source protection zone 1 or 2, or if a source protection zone has not been defined, then within 50 metres of any well, spring or borehole used for the supply of water for human consumption (including private water supplies)
* all primary tanks undergo a delegated inspection regime and the process parameters are monitored and understood by site operatives
* lagoons are SAFFO or CIRIA compliant
* lagoons and tanks are fitted with a high level alarm
* 750 mm free board is maintained

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

## 7. Risk to groundwater

Groundwater is at risk from spillage or over topping from lagoon or tanks and storage vessels.

There is a risk of contaminants travelling through soil to groundwater which can then be abstracted from a borehole. This could have a chronic effect resulting in the groundwater requiring treatment or causing closure of a borehole.

### 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 of the potential for spillage or over topping from lagoon or tanks and storage vessels.

### Managing the risk

Risk management is as set out in risks 5.1, 5.2 and 6.1 and:

* process parameters are monitored and understood by site operatives

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

## 8. Risk of diffuse emissions from polluting and greenhouse gases such as methane and ammonia

There is a risk of fugitive releases of volatile organic compounds such as methane from storage of gas bags, lagoons, tanks, vents and pipe work.

We have assessed the harm as:

* acute effects and long term effects on air quality
* longer term effects of volatile organic compound releases and adding to global climate change

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because:

* biogas contains high levels of methane and is a known contributor to climate change
* digestate and digestate storage releases ammonia which can severely impact air quality
* burning biogas and biomethane can produce harmful pollutants

#### Managing the risk

The following manages the risk:

* storage tanks and lagoons are covered and where necessary emissions are abated
* venting is minimised by correctly fitting under and over pressure relief valves and is recorded as abnormal events
* gas pressures are continually measured within the design of the plant
* leak detection and repair is employed
* gas holders are maintained and replaced as needed
* emissions are controlled by emission limit values with a requirement to monitor and report
* no fugitive releases are permitted
* operators must install a surplus gas burner or flare to combust surplus biogas

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

## 9. Risk to protected sites

Protected sites include:

* National Parks and Areas of Outstanding Natural Beauty
* Marine Conservation Zones
* Sites of Special Scientific Interest
* Special Areas of Conservation
* Special Protection Areas
* Ramsar wetland sites

Protected sites can be at risk from any source and by any pathway. However, the main risk is from ammonia.

The risk of harm to protected sites include (but are not limited to) the following:

* toxic contamination
* nutrient enrichment
* leachate
* contaminated surface water run-off
* smothering
* disturbance
* predation from pests and vermin

#### Judgement of risk

We have judged the:

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

The reasons for giving the activity this rating is because waste composting operations may cause harm to and deterioration of nature conservation sites.

#### Managing the risk

The following manages the risk:

* the parameters listed at the beginning of this document do not allow operations in close proximity of conservation sites
* emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution
* emission limits are in the permit
* all lagoons and tanks are covered and the air abated
* a fugitive emission plan will be implemented where necessary

Taking this action will 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