
This publication was withdrawn on 21 April 2021

It has been replaced by the updated [Environmental setting and installation design report template](#).

Environmental Permitting (England and Wales) Regulations Information in support of an application for a landfill permit

Conceptual Model, Environmental Setting and Installation Design Report

Notes to the Applicant – Please read before completing this Report

- (a) This template has been designed to be used with the EPR application form and the H1 Environmental Risk Assessment - Annex (i) Landfill. It has been designed to describe the conceptual model and provide the information we need and the way in which we would prefer it to be presented.
- (b) The initial conceptual model should provide an understanding of the installation in its environmental setting and consideration of the design and operation of the site at the time of the application. It should address the source terms of the risk (i.e. waste), all pathways and receptors and should be used as a basis for commencing the risk assessments.
- (c) The final conceptual model report should be prepared on the basis of the findings of the component risk assessments (e.g. hydrogeology, stability, landfill gas, etc.) required for the EPR Application.
- (d) When completing this template, the following is recommended.
 - An entry should be made in each section even if it is to confirm that such features are not relevant to a particular site.
 - All tabulated information should be included within the text of the report at the appropriate point.
 - The conceptual model should be based on the drawings set out within this template; some of which will be “as built” and some will be proposals. One drawing can provide the information for more than one of the requirements as long as the drawing is clearly labelled. Identification numbers must be included for each monitoring point.
 - All drawings, maps or plans should be to recognised scales sufficient to show the following details as specified. Each drawing should have a label that includes:
 - title of drawing;
 - installation name;
 - name and address of the operator;
 - date the drawing was made;
 - drawing identification number;
 - scale of the drawing.
 - Key
 - Grid lines and north point
 - Paper size of the original drawing

CONCEPTUAL MODEL, ENVIRONMENTAL SETTING AND INSTALLATION DESIGN

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TABLES

Tables should be used whenever possible and incorporated within the text to summarise the data and information required for adequate understanding without detailed reference to appendices, as they can summarise large volumes of information/ data into a manageable format. The numbering and content of the tables presented within this report will vary according to site-specific circumstances and whether the information is presented elsewhere (e.g. on a drawing or in an appendix). However, typical examples of tables that could be included are presented below.

Table ESID1	The land-uses, and the relative distances from the installation, that lie within the vicinity of the site.
Table ESID2	The historical activities that have occurred on-site prior to the development of a landfill.
Table ESID3	The regional and local geology and hydrogeology.
Table ESID4	The installation engineering of the installation (to include existing and future phases of development). This table could include; stage of development, extent and depth of phase, containment engineering, leachate drainage systems, landfill gas and groundwater management (if appropriate).
Table ESID5	The conceptualisation of management measures and technical controls throughout the landfill lifecycle.
Table ESID6	The nature and location of leachate monitoring points, wells, sumps and leak detection layers.
Table ESID7	Summary details of leachate heads and quality.
Table ESID8	The nature and location of in-waste landfill gas wells and monitoring points as well as perimeter monitoring boreholes.
Table ESID9	The nature and results of the site investigations that have taken place at the installation.
Table ESID10	The presence of man-made pathways (e.g. underground utilities) that could act as potential pathways.
Table ESID11	Long-term rainfall values.
Table ESID12	Summary details of surface water flows and quality.
Table ESID13	Summary details of groundwater levels and quality.
Table ESID14	Licensed abstractions and private water supplies.

DRAWINGS

Various aspects of the site's conceptual model, environmental setting and installation design will be presented as drawings. The drawings, maps or plans presented below are suggestions that could be used to minimise the total number of separate drawings produced to satisfy this requirement. Other formats could be used as long as all of the required information is presented

Dwg No ESID1, Scale 50,000, Title Location

Detail Site location in relation to surrounding features

Dwg No ESID2, Scale 10,000, Title Environmental Site Setting

- Installation boundary
- Residential areas
- Schools
- Recreational areas
- Waterways
- Water bodies
- Agricultural areas
- Urban sites
- Flood risk map overlay
- Roads, railways

Dwg No ESID3, Scale 25000, Title Cultural and Natural Heritage

- Natural heritage
 - SSSIs, AONBs, National Parks
 - cSACs, cSPAs, Ramsar sites
- Cultural heritage
 - Listed buildings
 - Scheduled ancient monuments

Dwg No ESID4, Scale 2500, Title Site Layout and Waste

- Deposition
- Cell layout
- Filled areas
- Pre-settlement contours

Dwg No ESID5, Scale 2500, Title Restoration

- Post settlement contours
- Topography 500m outside site
- Landscape planting proposals
- Aftercare proposals

Dwg No ESID6, Scale 2500, Title Installation

- Summary of engineering details on a cell by cell basis (in a table on the drawing, if appropriate, accompanied by schematic cross sections of as built and as-proposed). More than one drawing may be necessary e.g. DESID6A, DESID6B etc.

- Security infrastructure
- Groundwater control
- Surface water management features
- Infrastructure (tanks, hard surfacing, quarantine areas)

Dwg No ESID7, Scale 2500, Title Leachate Management

- Leachate sumps, abstraction wells, risers, leak detection layers etc. (sections may be necessary)
- Leachate treatment plant
- Monitoring point location/ construction detail (cross sections will be necessary)

Dwg No ESID8, Scale 2500, Title Landfill Gas Management

- Gas wells (location and construction)
- In waste monitoring points
- Perimeter/external monitoring points
- Flare(s) location
- Energy utilisation plant and exhaust stack(s) location
- Aerial emission monitoring points

Dwg No ESID9, Scale 50000, Title Regional Geology

- Regional geology (taken from BGS Geological Map)
- Any appropriate regional cross sections

Dwg No ESID10, Scale 12500, Title Regional Hydrogeology

- Aquifer classification
- SPZs
- Licensed and private abstractions from ground and surface water
- Springs
- Regional groundwater contours (for each ground water body)
- Groundwater vulnerability
- Off-site groundwater monitoring points (e.g. relevant EA Observation Wells etc)

Dwg No ESID11, Scale 2500, Title Local Hydrogeology and Hydrology

- Groundwater monitoring points (constructional logs should be included within an Appendix)
- Groundwater contours (for each ground water body)
- Local springs
- Surface water monitoring points

Dwg No ESID12, Scale 2500, Title Hydrogeological Cross Sections

- Groundwater levels (for each groundwater body)
- Groundwater flow to discharge points
- Inter-relationship between; site (base and sides), leachate levels,
- Groundwater levels and relevant surface water features

Dwg No ESID13, Scale 2500, Title Source, Pathways, Receptors

- Leachate treatment plant (including process flow block diagram showing how the landfill connects to the leachate treatment plant)
- Landfill gas flares, engines
- Met station location (if on site)
- Receptors
 - Surface water
 - Groundwater
 - Amenity
- Pathways
 - Air-include wind rose
 - Surface water
 - Groundwater
 - Drains, pipes etc
 - Migration through surrounding strata

APPENDICES

The numbering and content of the appendices presented within this report will vary according to site-specific circumstances. However, typical examples of appendices that could be included are presented below.

- Appendix ESID1 Leachate hydrographs showing variations of leachate head with time (relative to assessment and compliance levels)
- Appendix ESID2 Supporting data relating to leachate quality, including any Laboratory Certificates for the analysis of Hazardous substances within the existing leachates
- Appendix ESID3 Site investigation details (e.g. photographs, sampling locations, trial pit/borehole logs, sample descriptions, in-situ test data, monitoring results, equipment details)
- Appendix ESID4 Laboratory analysis relied upon for Site Report Issues
- Appendix ESID5 Laboratory Certificates for tests carried out on the attenuative properties of the soils
- Appendix ESID6 Supporting data relating to the flow and quality of surface waters (including Hazardous substances – see above)
- Appendix ESID7 Surface water hydrographs and chemographs
- Appendix ESID8 Borehole logs for Groundwater/Landfill Gas Monitoring Boreholes
- Appendix ESID9 Supporting data relating to the level and quality of groundwaters (including Hazardous substances – see above)
- Appendix ESID10 Groundwater hydrographs and chemographs.
- Appendix ESID11 Supporting data relating to the on-site and off-site monitoring of landfill gas.
- Appendix ESID12 Gas concentration graphs for off-site monitoring points

1.0 INTRODUCTION

1.1 Report Context

To include details relating to the following.

- The operator of the proposed installation.
- The Agent who completed this report.
- An outline of the proposed installation and how it relates to historically operated areas of landfill.

1.2 Installation Details

To include details relating to the following.

- Site location and access, including appropriate National Grid references.
- Landfill classification.
- Application boundaries and the appropriate elements of site security.
- Any relevant / adjacent former waste management licence boundaries.
- Site context including the local topography and the location of the site in relation to potential local environmental receptors, such as residential and recreational areas, waterways, water bodies, nature protection zones, and other agricultural or urban sites (up to 500m).
- Compliance with the Agency's position statement on the location of landfills (see Groundwater protection policy GPP3) where relevant.

2.0 SOURCE TERM CHARACTERISATION

2.1 The Development of the Installation

All details should refer to the appropriate tables, drawings or appendices.

2.1.1 Historical Development

To include details relating to the following.

- The historical use of the land prior to the development of a landfill.
- Relevant historical areas of landfill that are closed and do not have a waste management licence, including time of operation, the operator, waste types etc.
- Other land uses relevant to assessing the environmental risks from the proposed landfill i.e. any former landuses that may give rise to potential sources of non-landfill related contamination (e.g. sewage sludge spreading).
- Incidents.

2.1.2 Proposed Development

To include details relating to the following.

- The proposed waste types including details relating to volumes, quantities and chemical characteristics.
- The phasing, the location, size and shape of existing (if appropriate) and proposed cells.
- The chemical characteristics of the leachate and the likely presence of Hazardous substances and Non-hazardous pollutants.
- Short-term and long-term changes in leachate quality with time.
- Consideration of whether the Groundwater Regulations 2009 apply (hydrogeological risk screening).

- Consideration of whether arrangements need to be made to collect contaminated water and leachate (hydrogeological risk screening).
- The proposed final landform and after-use.

2.2 Installation Engineering

2.2.1 Groundwater Management System

State whether groundwater management is required and, if it is, describe the system.

2.2.2 Basal Lining System

To include details derived from assessments of the following.

- Geological barrier (should include a consideration of the attenuation capacity of any artificial geological barrier).
- Artificial sealing liner.
- Leachate drainage system.
- Leak detection system (if applicable).
- Construction Quality Assurance.

2.2.3 Side Slope Lining System

Describe side slope engineering system:

- Geological barrier;
- Any artificial component (s) (if appropriate);
- Leachate drainage system (if appropriate).

2.2.4 Capping System

Describe capping system with reference to the following.

- Gas drainage layer (unlikely to be required).
- Sealing layer.
- Drainage layer.
- Restoration soils.

2.2.5 Restoration and Aftercare

Describe approved restoration scheme and afteruse proposals, including the following.

- Surrounding topography.
- Pre-settlement contours.
- Post settlement contours.
- Proposed after-use of installation.

2.3 Leachate Management and Monitoring Infrastructure

2.3.1 Leachate Generation

To include details relating to:

- The water balance calculations, including:
 - volume of leachate currently generated (if appropriate);
 - potential future volumes (water balance considerations);
 - volumes of leachate that may be stored on-site within the cells (i.e. the volume below the existing or proposed compliance head levels).

2.3.2 Leachate Management and Monitoring Infrastructure

To include details relating to the following.

- The extraction and treatment of leachate collected from the installation.
- The proposals for leachate recirculation and on-site treatment.
- The off-site disposal of leachate (foul sewer, tankering etc.).
- The monitoring of existing leachate heads within the site (if appropriate).
- The existing leachate heads present within the site compared against existing compliance levels (if appropriate).
- The proposed monitoring infrastructure.
- The proposed compliance levels, tied into a consideration of maximum acceptable leachate head and contaminant concentrations in leachate.
- The interaction between the leachate and groundwater management systems (if appropriate).
- The operation of the groundwater management system (cross referenced to 2.2.1 above) and the control of external groundwater pressures (if installation is sub-water table).

2.4 Landfill Gas Management and Monitoring Infrastructure

2.4.1 Landfill Gas Generation

To include details relating to the following.

- The likelihood of gas production.
- Present and future gas production rates.
- The requirement for gas extraction.
- The requirement for gas utilisation existing or likely landfill gas component concentrations

2.4.2 Landfill Gas Management

To include details relating to the following.

- The existing and proposed collection and extraction of landfill gas.
- The treatment and disposal of the landfill gas including the utilisation plant.
- An estimation of the proportion of landfill gas generated that is likely to be utilised, flared and emitted via sidewalls or the cap.

2.4.3 Landfill Gas Monitoring Infrastructure

To include details relating to:

- the existing and proposed landfill gas monitoring infrastructure within the site (e.g. extraction wells, flare and engine monitoring) and off-site (around the perimeter).

2.5 Surface Water Management System

To include details relating to the following.

- The water management system for the proposed installation, to include the collection, treatment, drainage and discharge of water.
- The location of surface water monitoring points.
- The quality and quantity of discharges from existing management systems (if appropriate).

2.6 Post Closure Controls

To include details relating to the following.

- The proposed (post closure) management of the landfill throughout its lifecycle.
- The minimum design requirements of the Landfill Directive, capping proposals and long-term leachate and landfill gas management.
- The potential for future degradation or failure of management systems, drains, sealing liners.
- Likelihood of mining related subsidence, differential settlement and structural failure.
- Conditions when permit surrender is accepted (detailed criteria to be identified within the risk assessment).

3.0 PATHWAY AND RECEPTOR TERM CHARACTERISATION

3.1 Climate

To include details relating to the following.

- Method of obtaining meteorological information (e.g. on-site weather station or local met station).
- Total rainfall and effective rainfall.
- Prevailing wind direction and strength.

3.2 Geology

To include details relating to:

- The site investigations that have occurred at the installation.
- The local and regional geology as shown on available BGS maps (identify maps and scales) and confirmed/refined through site investigation.
- Description of local and regional soil and or rock strata, stratigraphical and structural relationships including plans and vertical cross sections.
- Potential inhomogeneity due to fissures, fracturing, sand lenses, vertical and lateral variability in lithology etc.

3.3 Man-made Subsurface Pathways

To include details relating to:

- The presence of any man-made pathways such as field drains, buried services, mine workings, boreholes etc.

3.4 Hydrology

To include details relating to the following:

- The description of the water courses that may influence and/ or interact with the site's hydrogeology and surface water discharges (cross reference to Section 2.5).
- The flows within the water courses and any management systems that are operated by a third party (e.g. Internal Drainage Boards).
- Flood risk and the presence of indicative flood plains.
- Water quality and any existing sources of contamination (both landfill or non-landfill related).
- The ecological importance of the watercourses and the presence of any natural heritage and/or nature protection zones (site of special scientific interest within the meaning of section 52 of the Wildlife and Countryside Act 1981(a) or a European site within the meaning of regulation 10(1) of the Conservation (Natural Habitats, &c.) Regulations 1994(b)).

3.5 Hydrogeology

3.5.1 Aquifer Characteristics

To include details relating to the following.

- The location of Source Protection Zones.
- Vulnerability and aquifer status as shown on published groundwater vulnerability maps.
- Interpretation of geology in terms of spatial distribution of aquifers, aquicludes and aquitards. Identification of natural geological barriers.
- Relevant hydrogeological parameters (e.g. permeability, porosity) and consideration of lab/field scales.
- Location of licensed abstractions, private water supplies.
- Consideration of the significance of heterogeneity (3.2) to hydrogeological interpretation.

3.5.2 Groundwater Flow

To include details relating to the following.

- What groundwater monitoring has been done.
- Groundwater levels (or heads), hydraulic gradients in all relevant deep, shallow or perched groundwater and interpretation of lateral flow directions, interconnections and confining layers.
- Whether the existing or proposed installation will be partially or totally sub-water table.
- Local and regional groundwater flow regimes.
- Conceptual understanding of groundwater movements in a wider context including consideration of groundwater/surface water interaction and surface discharge.
- Potential or known long-term influences on hydraulic balance arising from future mine-water rebound or changes in abstraction regime.

3.5.3 Groundwater Quality

To include details relating to the following.

- Regional groundwater quality and its significance to existing and potential ground/surface water uses. The historical and baseline groundwater analyses to establish natural quality and current pollution impacts.
- Local groundwater quality and possible confounding factors for identifying the impact of the proposed landfill (e.g. existing old landfills, sludge spreading etc.).
- Justification for regarding any groundwater as 'permanently unsuitable for other uses' (which may include consideration of quantity as well as quality).
- The nature and effectiveness of any remediation works that may have been carried out.

3.6 Off-site Landfill Gas Monitoring

To include details relating to the following.

- The historical and baseline landfill gas analyses to establish natural background concentrations and current pollution impacts.
- An assessment of whether the existing monitoring indicates any potential or existing pathways/receptors for landfill gas migration.

- The nature and effectiveness of any remediation works that may have been carried out.

3.7 Receptors and Compliance Points

To include details relating to the specific receptors and compliance points that will need to be considered within the risk assessments.

Groundwater

- For Hazardous substances, the receptor/compliance point will need to be the point at which the substance will enter the groundwater below or adjacent to the site.
- For Non-hazardous pollutants, the primary receptor/compliance point will normally be the downstream boundary of the site. Alternative down gradient compliance points may be applicable but must be fully justified.

Secondary receptors could include existing or potential users of groundwater (e.g. licensed groundwater abstractions, private water supplies), river base-flows, springs within plausible range of impact.

Surface Water

Landfill Gas

- The environmental setting in which the site is located including identification of all relevant receptors including global atmosphere.

Amenity (Nuisance and Health Issues), particularly dust.

- Identify receptors

Habitats (where required)

- A consideration of the location and distribution of sensitive features in relation to the installation and possible pathways.
- An assessment of whether the interest features are sensitive to the potential hazards.

4.0 SITE CONDITION REPORT

The detail of when an SCR is necessary is set out in our regulatory guidance *Demonstrating land and groundwater are protected to assist the surrender of an environmental permit* (RGS EPR 9). The SCR is not applicable to parts of a permitted landfill that have permanent deposits of waste and mobile plant.

An SCR describes and records the condition of the land and groundwater at a site. It will enable you to demonstrate that you have protected land and groundwater during the lifetime of the site and it is in a satisfactory state when you come to surrender your permit.

The SCR needs to be a factual “baseline” account of the land that may later be compared against the findings of a surrender SCR, or the results of other investigations. It allows pollutants that were present on site prior to the issue of the permit to be distinguished from those that occurred as a result of its operation under the permit.

Much of the information required for the SCR should be presented within Sections 1, 2 and 3. Where this occurs, this section need not repeat this information but summarise it and refer to other sections of the document.

4.1 Introduction and Background Information

To include details relating to the following.

- Site details (refer to Section 1.2).
- Outline of proposed development (refer to Sections 1.2, 2.1 and 2.2).
- Any former land-uses that may give rise to potential sources of non-landfill related contamination (refer to Section 2.1).
- Sources of Information (refer to appropriate Sections as and when required).
- Geology and hydrogeology (refer to Sections 3.2 and 3.5).
- Archive search and land-use chronology (refer to Section 2.1.1).
- Relevant information relating to potential contaminants (refer to Section 2.1.1).
- Any history of incidents (refer to Section 2.1.1. where appropriate).

4.2 Objectives of this Assessment

To include details relating to the following.

- Context within EPR regime (e.g. to define initial site conditions etc.).
- Description of general approach (e.g. following Agency guidance etc.).
- Different types of contaminants to be considered (refer to Section 2.1.2).

4.3 Site Investigation (Data Collection) Details

To include details relating to the following.

- Description of site investigation and related work activities.
 - Description of laboratory analysis.
- (refer to Sections 3.2 to 3.6 where appropriate)

4.4 Summary of Site Investigation and Analysis Findings

To include details relating to the following.

- On-site observations.
 - In-situ testing results.
 - Monitoring data.
 - Laboratory test (QA/QC) data.
 - Identification of invalid data.
 - Data summaries.
- (refer to Sections 3.2 to 3.6 where appropriate)

4.5 Data Interpretation

To include details relating to the following.

- Proposal of baseline conditions for the site.
 - Main limitations/constraints on the investigation findings/baseline proposals.
- (refer to Sections 3.2 to 3.6 where appropriate)

4.6 Conclusions

To include details relating to the following.

- Proposal of baseline conditions for the site.
- Main limitations/constraints on the investigation findings/baseline proposals,

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(refer to Sections 3.2 to 3.6 where appropriate)