

# ENVIROARM LTD



## LANDFILL GAS RISK ASSESSMENT FOR WOODCOTE WOOD QUARRY LANDFILL SITE

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Carried out for: **NRS Woodcote Aggregates Ltd**

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## LANDFILL GAS GENERATION AND RISK ASSESSMENT

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## **DRAWINGS**

### **Drawing LFGRA1 Conceptual Model**

The conceptual model has a modular structure. Each module incorporates the effects of additional processes. Progression to successive modules is only necessary if this information is required, e.g. LFG generation and emissions can be determined without proceeding through subsequent modules to optimise time and data collection constraints.

### **Drawing LFGRA2 Landfill Gas Management Plan ESSD7**

A plan of all internal, and external monitoring points for landfill gas and odours. The plan indicates all points where assessment and compliance limits have been set.

## **APPENDICES**

Appendix LFGRA1 Gas monitoring data from the perimeter

## **1.0 INTRODUCTION**

### **1.1 Report Context**

Enviroarm Limited were instructed by NRS Woodcote Aggregates Ltd to undertake the Environmental Permit Application for the site to take account of landfilling with inert waste and recycling at the site, in line with Environmental Permitting (England and Wales) Regulations 2016 requirements for a landfill gas risk assessment and should be read in conjunction with the  
Hydrogeological Risk Assessment  
Site Stability Assessment  
Environmental Site Setting and Design  
Amenity and Nuisance Risk Assessment.

The site is off the A41 in Weston Heath, Sheriffhales, Shropshire, 5km south of Newport town centre and 4.2km north of the A5. The centre of the site is at National Grid reference SJ 77036 14780 and the site entrance is SJ 77388 14944 see Figure 1 and Drawing ESID 1.

The Site comprises 22.4 hectares of agricultural land, which includes a woodland area. The site is a quarry.

This report presents a review of the Landfill Gas potential for generation within the site and in relationship to the surrounding environment.

Boreholes 1, 2 and 3 used for site development have been used for the initial gas risk assessment.

### **1.2 Conceptual Site Model – Landfill Gas**

To include summary details cross referenced to ESSD report relating to the following.

#### **Sources**

- The nature of the waste proposed to be landfilled at Woodcote Wood Quarry Landfill is inert waste producing negligible volumes of methane and carbon dioxide. The permit application is for the site to only take inert waste in the landfill. Therefore there is no likelihood of gas production, and gas extraction will not be required and utilisation is not feasible due to the inert nature of the wastes.
- The design of the containment, collection and treatment systems Not applicable.

#### **Pathways**

- The primary pathways are direct aerial emissions of migration through the sub strata towards the receptors identified in the ESSD Report and detailed on Drawing ESSD 2.

## Receptors

The identification of all potential receptors.

**Table LFGRA 1 Receptor List identified on ESSD 2.**

Type of Receptor	Receptor Name	Location to site	Elevation m AOD
Domestic Dwelling Receptor	DR1	Coach House Cottages and Woodcote Hall, set in woodlands with trees from the site as well protecting it and fields used for agriculture	124m AOD
Domestic Dwelling Receptor	DR2	Brandon House, A41. There are trees and the landfill site and fields used for agriculture	104m AOD
Domestic Dwelling Receptor	DR3	Chadwell Lane. There are trees around the site and fields used for agriculture	108m AOD
Domestic Dwelling Receptor	DR4	Bloomsbury is lower down than the site and the site has trees towards this area and there are fields used for agriculture	114m AOD
Domestic Dwelling Receptor	DR5	Cherry Tree Farm and Broad Oak are at the Same height as the landfill has trees towards this area and there are fields used for agriculture	130m AOD
Domestic Dwelling Receptor	DR6	Ridge Hose is nearest the landfill to the south west at 145m and has trees between it and the landfill	150m AOD
Domestic Dwelling Receptor	DR7	Heath Ridge has trees between it and the landfill and fields used for agriculture	150m AOD
Commercial Receptor	IR1	Bloomsbury Garage 464m away from site with tree line at edge of site	114m AOD
Surface Water Receptor	SW1	Small Pond by Coach House	112m AOD
Surface Water	SW2	Small ponds by Coach	110m AOD

<b>Receptor</b>		House	
<b>Surface Water Receptor</b>	<b>SW3</b>	Bolams Brook which leads into Lynn Brook	104m AOD
<b>Surface Water Receptor</b>	<b>SW4</b>	Small pond at Bloomsbury	112m AOD
<b>Surface Water Receptor</b>	<b>SW5</b>	Pond near Cherry Tree Farm	114m AOD
<b>Surface Water Receptor</b>	<b>SW6</b>	Pond at Barbers Gorse	122m AOD
<b>Roads and highways</b>	<b>HA1</b>	A49 which runs north and south of the site	104m AOD to the north of the site 120m AOD to the south
<b>Roads and highways</b>	<b>HA2</b>	Lynn Road	110m AOD
<b>Roads and highways</b>	<b>HA3</b>	Chadwell Lane	110m AOD
<b>Roads and highways</b>	<b>HA4</b>	B4379	112m AOD
<b>Roads and highways</b>	<b>HA5</b>	Heath Hill Lane	100m AOD
<b>Roads and highways</b>	<b>HA6</b>	Nutty Hill Farm Lane	100m AOD

- The receptors are considered to be of low sensitivity due to the nature of the waste being inert and the distance to the nearest receptors and the fact that passive venting also takes place at the landfill. Baseline data for methane and carbon dioxide has been obtained.
- The prioritisation and initial assessment of the potential impacts on each receptor. No impact is considered on each receptor due to the inert nature of the waste
- Quantification of emissions and dispersion. Only small concentrations of carbon dioxide have been recorded within sand and gravel deposits, typical of soil gas atmospheres, however no methane has been detected within or outside the full and the carbon dioxide levels at baseline are within the OEL.

## **2.0 LANDFILL GAS RISK ASSESSMENT**

### **2.1 The Nature of the Landfill Gas Risk Assessment**

Due to the inert nature of the waste a simple assessment has been carried out which simply states that no gas generation is likely. The site will have no impact on the adjoining agricultural fields and the inert recycling area is above ground. No other assessment has therefore been carried out.

The current boreholes in the site cover the top, middle and bottom of the site and do get carbon dioxide in them at various times.

Quarrying operations started on site in 2018.

### **2.2 The Proposed Assessment Scenarios**

#### **2.2.1 Lifecycle Phases**

The inert landfill has 3 operational phases and each is completed and restored and then undergoes aftercare. There is no change expected in groundwater conditions, there is no mining subsidence and no long-term change expected to the waste mass composition with time.

All phases will have a basal geological barrier and a side wall seal constructed. The side wall seal will be used to prevent any potential gas migration off site.

#### **2.2.2 Accidents and their Consequences**

A primary concern would be due to damage of any internal gas monitoring points. To remove risk it is proposed to retro drill these on completion of each phase.

The justification for whether the specified accidents require quantitative assessment or not is not considered applicable.

Other potential effect include explosion but would require methane concentrations of 5%-15% and is unlikely at an inert landfill site and has been covered in Environmental Management Plans for Accidents and Occurrences and the site has an Emergency Plan.

### **2.3 The Generated Gases to be Modelled**

The actual or potential presence of gases of concern Gas concentrations are set out in Appendix LFGRA 1

No methane gas has been detected and only soil gas atmospheres of carbon dioxide within the external monitoring boreholes. The nature of the waste landfilled is inert and no motive force is likely in the waste mass.

## **2.4 Numerical Modelling**

### **2.4.1 *Justification for Modelling Approach and Software***

Not applicable

### **2.4.2 *Model Parameterisation***

Not applicable

### **2.4.3 *Sensitivity Analysis***

Not applicable

### **2.4.4 *Model Validation***

Not applicable

## **2.5 Risks to the Environment and Human Health**

The landfill gas risk assessment has addressed each of the considered scenarios (i.e. the different modelled phases of the lifecycle and the potential impact of accidents, which remain constant at an inert landfill site).

### **2.5.1 *Landfill Gas Emissions***

Not applicable

### **2.5.2 *Sub-surface Migration and Vegetation Stress***

Predicted leakage through proposed barriers. Not applicable

Comparison of predicted levels with background concentrations and the corresponding environmental benchmarks. See Appendices LFGRA 1

### **2.5.3 *Atmospheric Dispersion and Odour***

This is considered to be zero(0)

### **2.5.4 *Exposure***

The estimates of concentration or doses to which the population may be exposed are considered at all of the receptors to be zero(0).

### **2.5.5 *Global Atmospheric Impact***

The global impact is therefore considered as negligible from the gas monitoring points.



## **2.6 Landfill Gas Completion Criteria**

Landfill completion requires a consideration of whether the site, as a result of the disposal of controlled wastes, is likely or unlikely to cause pollution of the environment or harm to human health. As the landfill gas risk assessment must be undertaken for the whole lifecycle of the landfill, it follows that the process should result in the initial production criteria that identify when the unmanaged site is unlikely to cause pollution or harm and the licence can be surrendered.

No limits are proposed for the landfill and internal monitoring points will be used during closure to assess gas production and flow potential as criteria for the permit surrender.

### **3.0 LANDFILL GAS MANAGEMENT PLAN**

#### **3.1 Control Measures**

Landfill development is to operate the site as an inert landfill.

Emissions standards are not proposed for Woodcote Wood Quarry Landfill due to lack of sensitive receptors.

Collection system (including the year you propose to start collecting landfill gas). Not applicable.

Condensate management. Not applicable

Utilisation, flaring and treatment. Not applicable

Inspection, maintenance and servicing. Check that the vents are free from obstruction on a quarterly basis.

#### **3.2 Monitoring and Sampling Plan**

Gas monitoring boreholes and internal monitoring points within the waste mass are shown on LFGRA 1 and ESSD7. Gas monitoring will be carried out on a quarterly basis at each of the internal gas monitoring points and gas monitoring boreholes using an infra red gas analyser. Gas monitoring boreholes and gas monitoring points are summarised in Table LFGRA 2 below:

Sampling will be undertaken by staff appropriately trained in environmental monitoring procedures, and who are familiar with the equipment and its limitations. The Company warrants that the personnel engaged in monitoring activities are trained to undertake the task. These will comprise the companies own technical personnel, the site manager or nominated deputy, following appropriate training by technical personnel. All monitoring staff undergo a period of job training and in addition external courses are used to supplement internal training. Results will be validated by the sampling personnel detailed above.

Monitoring is to be carried out on a quarterly basis using an infra-red gas analyser.

Gas monitoring from outside the waste mass will include for monitoring methane, carbon dioxide, oxygen, atmospheric pressure, relative pressure and the weather.

Internal gas vents will also be monitored for the same determinands

Data will be stored in the form of hard copies on site and an electronic version of the results.

**Table LFGRA 2: The nature and location of in-waste landfill gas wells and perimeter monitoring points**

<b>Phase 1</b>	<b>GV 1- GV2</b>	Monitoring Point in waste	Design detail on ESSD 7
<b>Phase 2</b>	<b>GV3- GV6</b>	Monitoring Point in waste	Design detail on ESSD 7
<b>Phase 3</b>	<b>GV7-GV11</b>	Monitoring Point in waste	Design detail on ESSD 7
<b>Perimeter</b>	<b>BH 1-8</b>	Monitoring Borehole outside waste. Combined gas and groundwater	Design detail on ESSD 7

**Table LFGRA 3: Monitoring frequencies for landfill gas**

<b>Determinands</b>	<b>Monitoring Frequencies</b>	<b>Units and Accuracies</b>
Methane (CH <sub>4</sub> )	Quarterly	%v/v ±0.5%
Carbon Dioxide (CO <sub>2</sub> )	Quarterly	%v/v ±0.5%
Carbon Monoxide (CH <sub>4</sub> )	Quarterly	-
Oxygen (O <sub>2</sub> )	Quarterly	%v/v ±0.5%
Atmospheric Pressure	Quarterly	±1 mb
Differential pressure	Quarterly	±0.1 mb
Meteorological Data	Quarterly	-

### 3.3 Action Plan

The criteria used to determine the severity of an event. No compliance limits are set for any of the external boreholes for either methane or carbon dioxide due to lack of sensitive receptors near to inert landfill areas

Actions taken by the operator as a result of:

abnormal changes observed in collected monitoring data, frequency of monitoring will be increased;

identified operational problems or failures of the gas control system not applicable;

a reported event e.g. an odour complaint, detailed investigation on site including use of a walk over survey using an FID to attempt to identify the source

Emergency procedures and protocols. Retro drilling and or covering and capping or isolate the area

Remedial actions would include changes to routine monitoring etc.

## **4.0 CONCLUSIONS**

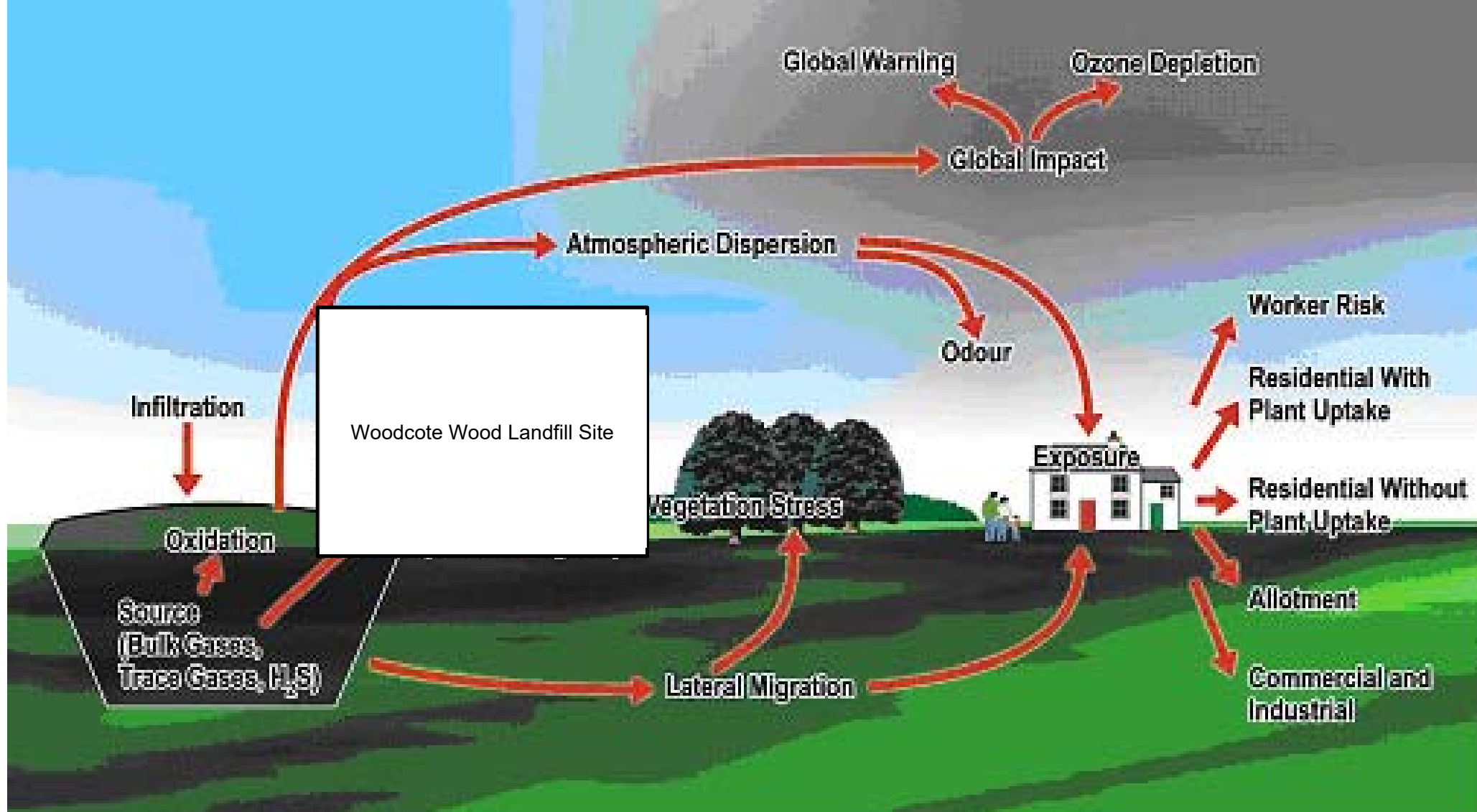
### **4.1 Compliance with the Environmental Permitting Regulations, 2016**

The Woodcote Wood Quarry Landfill site will operate as an inert site and are in accordance with the requirements of the Environmental Permitting (England and Wales) Regulations 2016. These relate to the following.

The Woodcote Wood Quarry Landfill site is an inert site and will therefore not produce gas and gas migration is therefore not considered an issue.

Due to the location of Woodcote Wood Quarry Landfill no compliance limits are proposed for methane or carbon dioxide.

# **DRAWINGS**





**APPENDIX A:**  
**Gas Monitoring Data from the  
perimeter**



	BH1			BH2			BH3			mb	RP	Weather	Temp
DATE	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2				
19/05/2022	0.0	0.5	19.9	0.0	0.6	19.7	0.0	0.2	20.2	1005	-0.01	Sun	16
29/06/2022	0.0	0.2	20.4	0.0	0.2	20.3	0.0	0.1	20.4	1020	0	Cloud	19
26/7/2022	0.0	0.3	20.5	0.0	0.5	20.0	0.0	0.1	20.6	1010	-0.15	Sun	24
15/08/2022	0.0	0.6	20.1	0.0	1.2	18.9	0.0	0.3	20.3	1004	0.12	Sun	21
30/09/2022	0.0	0.4	20.2	0.0	1.3	19.2	0.0	0.2	20.4	1021	-0.15	Sun	17
14/10/2022	0.0	4.0	18.3	0.0	6.2	16.8	0.0	0.8	19.7	995	-0.09	Sun	16
18/11/2022	0.0	4.2	18.1	0.0	6.5	16.9	0.0	1.2	19.4	987	-0.05	Overcast	12
2/12/2022	0.0	0.3	20.2	0.0	0.3	20.1	0.0	0.1	20.4	1008	-0.09	Fog	6
11/1/2023	0.0	4.1	18.2	0.0	6.4	17.1	0.0	1.0	19.8	993	0.06	Rain	6
21/2/2023	0.0	3.2	19.6	0.0	5.7	18.3	0.0	0.8	20.3	999	-0.07	Sun	10

**Trigger Level**

**4.5**

**7.0**

**2.0**