

This form will report compliance with your permit as determined by an NRW officer

Site	Hafod Quarry Landfill		Permit Ref	PP3139GB	
Operator/ Permit holder	Cory Environmental (Central) Ltd				
Date	26/11/13 & 12/12/2013		Time in	10:05	Out 14:45
What parts of the permit were assessed	Landfill gas system and emissions audit.				
Assessment	Audit	EPR Activity:	Installation: X	Waste Op:	Water Discharge:
Recipient's name/position	Ian Craven / NW Area Manager				
Officer's name	Aled Zachary		Date issued	20/01/2014	

**Section 1 - Compliance Assessment Summary**

This is based on the requirements of the permit under the Environmental Permitting Regulations. A detailed explanation and any action you may need to take are given in the "Detailed Assessment of Compliance" (section 3). This summary details where we believe any non-compliance with the permit has occurred, the relevant condition and how the non-compliance has been categorised using our Compliance Classification Scheme (CCS). CCS scores can be consolidated or suspended, where appropriate, to reflect the impact of some non-compliances more accurately. For more details of our CCS scheme, contact your local office.

**Permit Conditions and Compliance Summary**

**Condition(s) breached**

Permit Conditions and Compliance Summary	Condition(s) breached
<b>a) Permitted activities</b>	
1. Specified by permit	A
<b>b) Infrastructure</b>	
1. Engineering for prevention & control of pollution	A
2. Closure & decommissioning	N
3. Site drainage engineering (clean & foul)	N
4. Containment of stored materials	A
5. Plant and equipment	A
<b>c) General management</b>	
1. Staff competency/ training	N
2. Management system & operating procedures	C3
3. Materials acceptance	A
4. Storage handling, labelling, segregation	A
<b>d) Incident management</b>	
1. Site security	A
2. Accident, emergency & incident planning	N
<b>e) Emissions</b>	
1. Air	C2
2. Land & Groundwater	A
3. Surface water	N
4. Sewer	NA
5. Waste	N
<b>f) Amenity</b>	
1. Odour	A
2. Noise	A
3. Dust/fibres/particulates	A
4. Pests, birds & scavengers	A
5. Deposits on road	A
<b>g) Monitoring and records, maintenance and reporting</b>	
1. Monitoring of emissions & environment	A
2. Records of activity, site diary, journal & events	A
3. Maintenance records	A
4. Reporting & notification	A
<b>h) Resource efficiency</b>	
1. Efficient use of raw materials	NA
2. Energy	NA

**KEY:** C1, C2, C3, C4 = CCS breach category (\* suspended scores are marked with an asterisk),  
A = Assessed (no evidence of non-compliance), N = Not assessed, NA = Not Applicable, O = Ongoing non-compliance – not scored

<b>Number of breaches recorded</b>	2	<b>Total compliance score</b> (see section 5 for scoring scheme)	35
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If the Total No Breaches is greater than zero, then please see Section 3 for details of our proposed enforcement response

OK FOR PROPOSED REGISTER  
DATE 25/2/14  
CLEAN FOR PROPOSED REGISTER  
JB EOR/M

## Section 2 – Compliance Assessment Report Detail

This section contains a report of our findings and will usually include information on:

- the part(s) of the permit that were assessed (e.g. maintenance, training, combustion plant, etc)
- where the type of assessment was 'Data Review' details of the report/results triggering the assessment
- any non-compliances identified
- any non-compliances with directly applicable legislation
- details of any multiple non-compliances
- information on the compliance score accrued inc. details of suspended or consolidated scores.
- details of advice given
- any other areas of concern
- all actions requested
- any examples of good practice.
- a reference to photos taken

This report should be clear, comprehensive, unambiguous and normally completed within 14 days of an assessment.

**NB:** In this document 'Natural Resources Wales' means the Natural Resources Body for Wales established by Article 3 of the Natural Resources Body for Wales (Establishment) Order 2012.

Site audit(s) carried out on the 26/11/13 & 12/12/13 as part of the ongoing review of landfill gas collection performance and reduction of fugitive emissions.

### **Auditors Present (26/11/13):**

Tony Roberts (Senior Environment Officer)  
Tyrone Ward (PPC Compliance Officer)  
Neil Herbert (PPC Compliance Officer)

### **Auditors Present (12/12/13):**

Tony Roberts (Senior Environment Officer)  
Aled Zachary (PPC Compliance Officer)

Detailed audit findings are present in the audit report, attached.

### **Non-compliances:**

#### **C2 – Management systems and operating procedures:**

**Requirements** – Condition 1.1.1 states activities shall be managed and operated: (a) in accordance with a management system, which identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents and non-conformances drawn to the attention of the operator as a result of complaints.

**Findings** – Condensate return pipe work on the new knock out pot (KOP) located on the gas main adjacent to LMP2 was observed discharging to the surface of the flank of Cell 3. The discharge was odorous and potentially adding to the instability of the flank in this area. The landfill gas management plan states that condensate will be pumped to specific disposal areas or to the leachate collection system.

The steepness of the Northern flank of Cell 3 is currently a cause of concern to NRW. There is evidence of rotational failures on the slope already having taken place in a number of locations as detailed in the audit report attached. Signs of leachate discharging and seeping down the face of the flank appear to be contributing to this instability.

**Action(s)** – As detailed overleaf and in the audit report attached.

**The above issues have been scored a CCS category 3 breach of permit requirements.**

(continued)

**E1 – Emissions to Air:**

1. **Requirements** – Condition 3.1.1 requires fugitive emissions of substances (excluding odour, noise and vibration) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures have been taken to prevent or where that is not practicable, to minimise, those emissions

**Findings** – High levels of fugitive landfill gas emissions were recorded on the northern flank of Cell 3, around a number of gas wells and from all leachate extraction and monitoring points sampled. The levels of ambient emissions recorded on the flank of cell 3 indicate a significant proportion of landfill gas is going un-collected at present.

2. **Requirements** – Condition 3.3.5: The limits for landfill gas arising from the installation set out in schedule 4 table S4.5 shall not be exceeded.

**Findings** – Of the 17 perimeter monitoring wells analysed on 26/11/13, 9 showed high levels of methane and CO2. The highest reading was in the monitoring well labelled J which showed the following levels:

WELL ID	CH4	CO2	O2
J	56.7	36.8	1.1

This is almost the exact makeup of idealised landfill gas by concentration. This landfill gas migration is of concern as there are receptors closer than 250m from the site boundary.

Four Part A submissions dated 10/9/13, 15/10/13, 6/11/13 and 16/12/13 were received for exceedences of landfill gas in various external monitoring boreholes during August to December. Recorded Methane concentrations ranging from 1 – 50% versus a permit limit of 1 % by volume and carbon dioxide concentrations ranging from 1 – 36% versus a permit limit of 1.5 % by volume.

**Action(s)** – As detailed overleaf and in the audit report attached.

**The above issues have been consolidated and scored a CCS category 2 breach of permit requirements**

	<b>EPR Compliance Assessment Report</b>	Report ID: PP3139GB/0197525
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<b>This form will report compliance with your permit as determined by an NRW officer</b>			
Site	Hafod Quarry Landfill	Permit	PP3139GB
Operator/ Permit	Cory Environmental (Central) Ltd	Date	12/12/2013

<b>Section 3- Enforcement Response</b>		<b>Only one of the boxes below should be ticked</b>	
You must take immediate action to rectify any non-compliance and prevent repetition. Non-compliance with your permit conditions constitutes an offence and can result in criminal prosecutions and/or suspension or revocation of a permit. Please read the detailed assessment in Section 2 and the steps you need to take in Section 4 below.			
Other than the provision of advice and guidance, at present we do not intend to take further enforcement action in respect of the non-compliance identified above. This does not preclude us from taking enforcement action if further relevant information comes to light or advice isn't followed.			
In respect of the above non-compliance you have been issued with a warning. At present we do not intend to take further enforcement action. This does not preclude us from taking additional enforcement action if further relevant information comes to light or offences continue.			X
We will now consider what enforcement action is appropriate and notify you, referencing this form.			

<b>Section 4- Action(s)</b>			
Where non-compliance has been detected and an enforcement response has been selected above, this section summarises the steps you need to take to return to compliance and also provides timescales for this to be done.			
Criteria Ref.	CCS Category	Action Required/Advised	Due Date
See Section 1 above			
C2	C3	1. Condensate return from KOP should be directed to leachate extraction system or disposal point as soon as is practicable to prevent potential odours and slope instability.	31/01/14
		2. Works to address or assess the stability of the Northern Flank of Cell 3 should be progressed as a matter of urgency.	31/01/14
E1	C2	<ol style="list-style-type: none"> <li>Action is required to reduce the level of fugitive emissions from the Northern Flank of Cell 3. Positive gas pressure indicates a lack of gas control, which should be addressed urgently to reduce the health and safety risk from H<sub>2</sub>S alongside the potential for odour nuisance. Temporary capping of this flank or increasing the amount of deep gas extraction infrastructure in this Cell should be investigated as a matter of urgency.</li> <li>A full review of current gas extraction infrastructure should be carried out including whether existing gas wells require dewatering or investment in replacement wells. Dip data for all wells should be supplied to NRW within 2 weeks of this report. The data should include depth to base, depth to slotting and depth to water. CCTV surveys are very helpful in establishing the condition of gas wells and should be considered as part of reviewing the gas infrastructure. Particular attention should be given to gas extraction in the southern area of the site with a view to bringing suspected landfill gas migration under control.</li> <li>Leachate extraction towers should be resealed with bentonite or plastic boot seals to prevent fugitive emissions. Consideration should also be given to "nested" wells in their vicinity to reduce emissions. Side Wall risers should be sealed to prevent fugitive emissions. A small amount of direct gas extraction may be required to reduce emissions from SWR1 &amp; SWR2 infrastructure.</li> <li>Poorly numbered gas collection infrastructure should be marked with a consistent and clear numbering sequence for on-site identification and subsequent review of monitoring data.</li> <li>Please investigate the possibility of sampling for hydrogen from well 32. This well should also be re-sampled for Carbon Monoxide via lab analysis and levels confirmed to Natural Resources Wales (NRW) as soon as is practicable.</li> </ol>	All by the: 31/03/14

## Section 5 - Compliance notes for the Operator

To ensure you correct actual or potential non-compliance we may

- advise on corrective actions verbally or in writing
- require you to take specific actions in writing
- issue a notice
- require you to review your procedures or management system
- change some of the conditions of your permit
- decide to undertake a full review of your permit

Any breach of a permit condition is an offence and we may take legal action against you.

● We will normally provide advice and guidance to assist you to come back into compliance either after an offence is committed or where we consider that an offence is likely to be committed. This is without prejudice to any other enforcement response that we consider may be required.

● Enforcement action can include the issue of a formal caution, prosecution, the service of a notice and or suspension or revocation of the permit.

**See our Enforcement and Civil Sanctions guidance for further information**

This report does not relieve the site operator of the responsibility to

- ensure you comply with the conditions of the permit at all times and prevent pollution of the environment
- ensure you comply with other legislative provisions which may apply.

### Non-compliance scores and categories

CCS category	Description	Score
C1	A non-compliance which could have a <b>major</b> environmental effect	60
C2	A non-compliance which could have a <b>significant</b> environmental effect	31
C3	A non-compliance which could have a <b>minor</b> environmental effect	4
C4	A non-compliance which has <b>no</b> potential environmental effect	0.1

**Operational Risk Appraisal (Opra)** - Compliance assessment findings may affect your Opra score and/or your charges. This score influences the resource we use to assess permit compliance.

## Section 6 – General Information

### Data protection notice

The information on this form will be processed by the Natural Resources Wales (NRW) to fulfill its regulatory and monitoring functions and to maintain the relevant public register(s). The NRW may also use and/or disclose it in connection with:

- offering/providing you with its literature/services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, local authorities) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving its service
- Freedom of Information Act/Environmental Information Regulations request.

The NRW may pass it on to its agents/representatives to do these things on its behalf. You should ensure that any persons named on this form are informed of the contents of this data protection notice.

### Disclosure of information

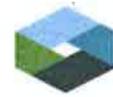
The NRW will provide a copy of this report to the public register(s). However, if you consider that any information contained in this report should not be released to the public register(s) on the grounds of commercial confidentiality, you must write to your local area office within twenty working days of receipt of this form indicating which information it concerns and why it should not be released, giving your reasons in full.

### Customer charter

#### What can I do if I disagree with this compliance assessment report?

If you are unable to resolve the issue with your site officer, you should firstly discuss the matter with the officer's line managers. If you wish to raise your dispute further through our official Complaints and Commendations procedure, phone our general enquiry number 0300 065 3000 (Mon to Fri 08.00–18.00) and ask for the Customer Contact team or send an email to [enquiries@naturalresourceswales.gov.uk](mailto:enquiries@naturalresourceswales.gov.uk). If you are still dissatisfied you can make a complaint to the Public Services Ombudsman for Wales. For advice on how to complain to the Ombudsman phone their helpline on 0845 607 0987.





## Methane Emissions Survey Sheet

<b>Site</b>	Hafod Landfill Site.	<b>Date</b>	12 <sup>th</sup> December 2013	<b>Time</b>	in: 10.00
					out: 14.45
<b>Instrument</b>	Gazomat Inspectra TDL (Serial No.: 1470311)	<b>Test gas reading</b>	N/A	<b>Time</b>	10.00
<b>Next Calibration due</b>	2014	<b>Background reading</b>	2.8ppm	<b>Time</b>	10.15
<b>Weather conditions:</b>	Overcast & Cold			<b>Atm. Press.</b>	
<b>Survey Undertaken by:</b>	T. Roberts / A. Zachary				

### General comments / observations

This technical review is being carried out as a key part of Natural Resources Wales Strategy to reduce methane emissions from active landfill sites in England and Wales. The objectives of the site review include ensuring that the site is being operated and maintained so as to maximise gas collection efficiency and minimise fugitive landfill gas emissions. Treating the gas in a manner that minimises point source emissions.

An ATEX certified, Gazomat Inspectra Laser Methane Analyser was used to perform emissions testing at the site. Surface capping, seams and structures on the site were tested in order to establish potential sources of methane egress. Grid references were taken (using a Garmin satellite positioning system) at each point where raised levels of methane were detected. Photos were taken and any point showing greater than 10ppm CH<sub>4</sub> was recorded in the table below.

**NB: For the purposes of the table below 1000ppm is the equivalent to 0.1% ambient methane.**

Point ref.	Methane Reading	Feature and / or Grid Reference	Description / Comment
1	11.2ppm		Odour detected in ambient air at the midway point on the tarmac site road leading to the base of the site.
2	80ppm		As previous but at the bottom of the tarmac site road
3	14.3ppm	10m east of the previous point at the juncture with the mid section of the batter (Western side)	Odour detected in the air
4	32.9ppm	10m to the East of the previous reading	
5	400-1000ppm	SJ 3085545504	A variation of emission temporally with a maximal reading of 1000ppm from western mid part of batter. PHOTO 01.
6	50ppm	SJ 3086445483	Mid flank of batter. Very steep area showing signs of stress and stress lenses where material has fallen away from the flank. PHOTO's of stress failures below.
7	250ppm	SJ 3086945474	Emission close to the largest stress fracture on the flank

**Key**

- 0 - 50ppm
- 50 - 100ppm
- 101 - 500ppm
- 501 - 1000ppm
- 1001 - 5000ppm
- 5001 - 10000ppm
- >1% v/v



Point ref.	Methane Reading	Feature and / or Grid Reference	Description / Comment
8	10%	SJ3092745439	Emission from LEACHATE TOWER half way down the main flank of Cell 3. NOTE: Air is being drawn into the gas system at the well head jubilee clip and through the brown tape at the juncture of the well head and the tower PHOTOS 02 & 03. The KOP condensate return in this area was also discharging directly onto the flank. This area was very odorous.
9	120-200ppm	SJ3092445383	Reading taken in trenched waste close to the Leachate well in question. (Temporal variation in odour and gas readings). NOTE: Unattached well in this area. PHOTO 04.
10	50ppm	SJ3096745434	
11	100ppm	SJ3097045426	Black surface standing leachate at the edge of the working face. This area was very odorous. Gas was noted bubbling through leachate.
12	100ppm	SJ3097845441	A very strange white and green coloured precipitate was noted running down the flank in various places in this area. It may be useful to test this discharge. PHOTO 05
13	2000ppm	SJ3097645445	Emanating from an unmarked well on the flank, no flow and POSITIVE PRESSURE (Ref GA2000+ reading) and high H2S. Well must be marked as such. PHOTO 06.
14	120-86ppm	SJ3094945458	Emission close to well HFDGW005
15	3000ppm	SJ3095445451	Emission detected on upper third of flank close to well HFDGW005
16	100ppm		Emission from base of well HFGW030
17	81-100ppm		In air around well HFGW030. Significant ambient reading.
18	23%-36%	SJ3093945404	High emission at the base of a second Leachate well on the eastern side of the site close to the working face. PHOTO 07.
19	67ppm		Unsealed port on top of leachate storage tank on the eastern side of the site.
20	18.7%		High emission from sidewall riser (SWR1) on the Eastern side of the site. NOTE: Gaffer tape sealing end cap and no gas extraction on this riser. PHOTOS 08 & 09.
21	64%	SJ31056454397	Disconnected valve on riser (SWR1) showing very high concentrations of methane, suspect enrichment due to water. No extraction. PHOTOS 08 & 09.
22	7.7%		Second sidewall riser (SWR2) on the Eastern flank. End cap again sealed with gaffer tape. PHOTOS 08 & 09.

**Hafod Landfill Site**

**Surface Emissions Survey  
09/08/2011**

## Findings/Recommendations

### Findings (26/11/13):

#### **Landfill gas control.**

1. Analysis of the monthly balancing data submitted for October 2013 shows that 16 wells have high extraction pressure. That is > 50mb. This is likely to increase proximal and distal air ingress and the potential for thermal events in the landfill.
2. Of the 40 wells tested during the audit 26 (65%) were off or had no apparent flow recorded. It is suspected that some of the wells are flooded with perched leachate.
3. Carbon monoxide was detected at high levels in gas extraction wells at the Southern end of the site. The well 32 reading was particularly high, peaking at 1250ppm. The Hydrogen Sulphide filter was introduced to remove the cross interference effects inherent in the GA2000+ gas monitor and the reading was still 610ppm. This reading is of concern as it may be indicative of a thermal event in the landfill.

Well 32 showed additional heating at its juncture with the site surface and the GA2000+ was registering Hydrogen as a medium reading. As hydrogen in older waste is usually associated with the thermal decomposition of waste in reduced oxygen conditions in the presence of water, it is likely that there has been a subsurface heating event at the site. Consequently, an increase in hydrogen gas concentrations allied to the Carbon Monoxide reading could be indicative of a subsurface landfill thermal decomposition.

The Carbon Monoxide sample taken from Well 32 for lab analysis in February 2013 showed a reading of 43ppm which is still a strong indicator that the area under this well has potentially been thermally active.

### Findings (12/12/13):

#### **Landfill gas control and fugitive emissions.**

A number of significant fugitive landfill gas emissions were detected during the audit as detailed in the table above. Photos of these emission points are included below:

Emissions on flank of Cell 3, Point 5, Photo 01:





Landfill gas emissions from Leachate tower LMP2, Point 8, Photos 02 & 03:



Unattached gas well, Point 9, Photo 04:



Precipitate / leachate on flank, Point 12, Photo 05:



Fugitive Gas Emissions from gas well on flank, Point 13, Photo 06:



Emissions from leachate tower (LMP1?) on working area, Point 18, Photo 07:



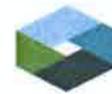


Gas emissions from sidewall risers (SWR1 & SWR2), Points 20 – 22, Photos 08 & 09:



Concerns over lack of deep well coverage on part of the working area on Cell 3:





**In Summary:**

- Strong odour was encountered on various parts of the Northern flank of Cell 3. Due to the nature of the area and the level of odour encountered it was decided not to take readings from the base of the flank. This area was considered to be a H&S risk as a result.
- A significant proportion of the gas infrastructure on Cell 3 is turned off and in some places appears inadequate to control gas emissions from the site.
- High H<sub>2</sub>S (224ppm) was recorded from an unmarked gas well under positive gas pressure on the Northern flank of Cell 3.
- Significant levels of fugitive emissions were recorded from all leachate collection infrastructure sampled.
- Gas and leachate collection infrastructure is poorly marked with confusing nomenclature and difficult to identify.

**Recommendation(s) from 26/11/13 & 12/12/13:**

1. Action is required to reduce the level of fugitive emissions from the Northern Flank of Cell 3. Positive gas pressure indicates a lack of gas control, which should be addressed urgently to reduce the health and safety risk from H<sub>2</sub>S alongside the potential for nuisance from odour. Temporary capping of this flank or increasing the amount of deep gas extraction infrastructure in this Cell should be investigated as a matter of urgency.
2. A full review of current gas extraction infrastructure should be carried out including whether gas wells require dewatering or investment in replacement wells. Dip data for all wells should be supplied to NRW within 2 weeks of this report. The data should include depth to base, depth to slotting and depth to water. CCTV surveys are very helpful in establishing the condition of gas wells and should be considered as part of reviewing the gas infrastructure.
3. Leachate extraction towers should be resealed with bentonite or plastic boot seals to prevent fugitive emissions. Consideration should also be given to "nested" wells in their vicinity to reduce emissions. Side Wall risers should be sealed to prevent fugitive emissions. A small amount of direct gas extraction may be required to reduce emissions from this infrastructure.
4. Poorly marked gas collection infrastructure should be marked with a consistent and clear numbering sequence for on-site identification and subsequent review of monitoring data.
5. Please investigate the possibility of sampling for hydrogen from well 32. This well should also be re-sampled for Carbon Monoxide via lab analysis and levels confirmed to Natural Resources Wales (NRW) as soon as is practicable.

**(Continued)**



### **Stability of the northern flank of Cell 3.**

Due to the increased tipping heights in this cell the Northern Flank now appears to be too steep. Areas of this flank appeared to be demonstrating a gradient of up to 1:2; waste and temporary capping materials are also showing signs of tension cracking and there are areas that have slipped already indicating some degree of instability. Leachate outbreaks on the flank are most likely contributing to the instability issues. Photos of the flank are included below for reference:

Rotational failures on Northern Flank of Cell 3:





Tension cracking and slope steepness on North West area of Cell 3 Flank:



**Recommendations:**

Consideration should be given to reducing the steepness on this flank, in particular the NW area pictured above. The addition of a bench at each waste lift may also reduce the instability that appears to be present. Specialist advice and guidance from suitably qualified engineering person(s) should be sought to assess if further works are required in this area.

