



ODOUR MANAGEMENT PLAN
PWLLFAWATKIN LANDFILL SITE

Odour Management Plan
January 2020

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1.0 INTRODUCTION

The following document outlines the odour management procedures that is in place to control odorous emissions from Pwllfawatkin Landfill Site (the Site). The procedures will be employed to ensure that the risk of adverse odour impact at nearby sensitive receptors is minimised as far as possible. The primary objective of the OMP is the minimisation of nuisance at the identified receptors and the informed selection and use of appropriate measures for process control and monitoring techniques. The Site is currently operated by FCC under Permit EPR/BU8819IV.

This document has been prepared based upon guidance presented within the following primary references:

- ☐ Environment Agency (2011); H4 Horizontal Guidance for Odour;
- ☐ Environment Agency (2010); Odour Management Plans for Waste Management Facilities; and
- ☐ Environmental Agency (2006); H1 Environmental Assessment and Appraisal of Best Available Technologies (BAT).

1.1 Scope of Odour Management Plan

This OMP relates specifically to Pwllfawatkin Landfill Site, and responds to Natural Resource Wales (NRW) improvement condition 1a Part 3. This OMP considers:

- ☐ Activities identified that have potential to produce odour and points of release;
- ☐ Process/control failures or abnormal events that could lead to an increased level of exposure;
- ☐ Potential outcome of each failure scenario in respect of odour impact; and
- ☐ Actions to be taken to mitigate the effect of odour release, details of personnel responsible at the installation and record keeping.

The OMP is structured as follows:

- ☐ Section 2.0 – Site Location and Description;
- ☐ Section 3.0 - Review of Potential Sources, Pathways and Receptors;
- ☐ Section 4.0 - Odour Management and Control Measures;
- ☐ Section 5.0 - Summary of Odour Management and Control Measures;
- ☐ Section 6.0 - Landfill Odour Monitoring;
- ☐ Section 7.0 - Record keeping;
- ☐ Section 8.0 - Odour Action Plan/Contingency Control Measures;
- ☐ Section 9.0 - Abnormal Events;
- ☐ Section 10.0 - Incident and Emergency Plans; and
- ☐ Section 11.0 – Liaison and Document Review.

1.2 Status of OMP

This OMP is intended as a live document and should be revised as necessary to ensure that it remains appropriate to the activities proposed for the Site and that any change in conditions relating to odour and odour management are dealt with as part of those revisions.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Description of Site and Surroundings

The Site is located within the Upper Clydach River Valley, approximately 300 m west of the A474. The centre of the Site is located at National Grid Reference 269850, 209000. The Site lies in a predominantly rural area with occasional residential dwellings.

2.2 Topography

The Site is situated in the Upper Clydach River Valley. The valley floor is generally flat and lies at an elevation of approximately 160 m AOD at the river with the land rising steeply at the valley sides to more than 300 m AOD in the surrounding hills.

2.3 Background to Pwllfawatkin Landfill Site

FCC operates the Site for the disposal of domestic, commercial, industrial, civic amenity, and inert waste. The Site has also historically accepted special (hazardous) waste but since July 2004 has been operated as a non-hazardous landfill. The hours of Site operation are between 07:30 and 16:30 Monday – Friday and between 07:30 and 10:30 on a Saturday.

The Site comprises two sections/areas. The southern section (Phase 1) comprises Cells 1 to 4 filled between 1995 and 2005. The northern section comprises cells 1 to 5 (all containing sub-cells). The Phase 2 is subdivided into 5 cells (Cells 1A, 1B, 2A, 2B and 2C) and all those sub-cells in Phase 2 were filled between 2006 and 2010. The cell 3 is divided into two sub-cells – Cell 3 North and Cell 3 South. The Cell 3 North was filled between 2010 and 2012, and the current operational area is Cell 4. The filling is anticipated to continue on the Site until 2021.

3.0 REVIEW OF POTENTIAL SOURCES, PATHWAYS AND RECEPTORS

3.1 Sources

3.1.1 Review of the Mechanisms that May Lead to Odour Generation

The generation of odour is associated with release of odorous volatile compounds which are primarily generated as a result of the biological breakdown of the various organic constituents of the feedstock material.

The characteristics of odour generated from waste deposition, in terms of intensity and offensiveness will primarily depend upon the age, type and quality of landfill material. When anaerobic conditions are allowed to prevail within waste material the intensity and offensiveness of odour emissions will generally be greater. The rate of odour emission is also influenced by the surface area of the materials exposed to the atmosphere.

3.1.2 Potential Odour Sources and Factors which Influence Emissions

The following have been identified as potential odour sources at the Site.

- ☐ Arrival, handling and placement of waste;

- ☐ Landfill gas and leachate odour emissions from the operational area (working face);
- ☐ Odour emissions from cell flanks;
- ☐ Odour emissions from temporary or permanently capped areas;
- ☐ Point source odour emissions from landfill gas and leachate infrastructure;
- ☐ Temporary exposure of older waste;
- ☐ Temporary shutdown or inadequate use of landfill gas extraction systems; and
- ☐ Inadequate daily/intermediate cover or capping of deposited waste materials.
- ☐ Leachate Holding Tanks

Potential odour sources may be influenced by the quality of the material and the speed at which it is landfilled combined with the meteorological conditions at the time.

3.2 Pathways

Odours emitted from the sources identified above are emitted directly to air and have the potential to be conveyed to the nearby receptors via transfer through the atmosphere.

The extent to which odour is detectable downwind and the intensity and character of such odour is dependent upon the following factors:

- 1) The nature and magnitude of odorous emissions released from the source;
- 2) Wind direction and wind speed; and
- 3) Atmospheric turbulence (vertical and horizontal) which controls the level of dilution and dispersion odours undergo as they travel downwind.

All of these factors can exhibit substantial variation over time. The release points for the potential odour sources stated above are described in Table 1.

Table 1: Odour Sources and Release Pathways

Odour Source	Release Pathway
Received wastes	☐ Waste carriers - vehicles transporting to the Site and operational vehicles on-site; and ☐ Tipping and compacting on the active face.
Tipping Area/Working Face	☐ Fugitive releases from the working face.
Cell Flanks	☐ Fugitive releases through flank areas via cracks, poor capping or due to poor gas extraction.
Temporary/Permanent Capped Areas	☐ Fugitive releases through capped areas via cracks, poor capping or due to poor gas extraction.
Landfill Gas	☐ Fugitive release through cover/capping and cell flanks; ☐ Damages in gas infrastructure; and ☐ Fugitive release at working face.
Leachate	☐ Damages in leachate tank and infrastructure; and ☐ Odour arising from the storage prior to tankering ☐ Fugitive emissions from working face.
Exposed older wastes	☐ Temporary exposure during installation of gas infrastructure. ☐ Temporary exposure during capping works when connecting to existing

capping

- ☐ The removal of temporary or permanent capping during the over-tipping of previously emplaced waste

Odour Source	Release Pathway
Gas Collection/monitoring infrastructure	☐ Fugitive releases through leachate and gas collection infrastructure due to cracks around well/liner interface and/or insufficient gas extraction; and ☐ Fugitive releases due to temporary shutdown of the flare.
Daily/Intermediate Cover	☐ Fugitive releases through daily/intermediate cover.

Windrose data from the Site (Oct / Nov 2019) is presented below, which shows the predominant wind direction is from the south / southwest.

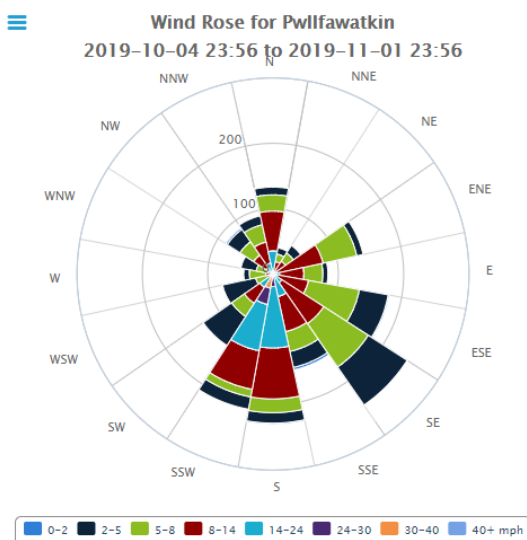


Figure 1: Site Meteorological Station Windrose 2018

3.3 Receptors

The identification of potentially sensitive receptors has been conducted on the basis that the level of exposure to odours that is likely to generate annoyance in residential properties tends to be considerably lower than the levels which may generate annoyance at commercial premises. A higher tolerance to odour exposure can generally be expected at commercial premises.

The key potentially sensitive receptors are therefore considered to be the nearest residential premises as detailed, where possible, on Drawing 1.

3.4 Potential Impacts

The likelihood and potential of exposure to odour release at nearby sensitive receptors will be determined by the prevailing meteorological conditions and the distance and direction of the receptors in relation to the Site. Proactive measures as detailed in this OMP will be taken in order to prevent/reduce the release, impact and spread of odour to these receptors.

4.0 ODOUR MANAGEMENT AND CONTROL MEASURES

4.1 Principles of odour control

Permit condition 4.1 states “The operator shall ensure that all appropriate measures are taken to prevent or where is not practicable to reduce odorous emissions from the permitted installation.”

The following key factors are of relevance in controlling and minimising odour emissions:

- 1) Inventory control;
- 2) Process Control; and
- 3) Containment, collection and treatment of odorous air.

Each of these factors is discussed below.

4.1.1 Inventory Control - Waste Acceptance Procedures

Inventory control is a key part of the odour control strategy for the landfill. The Site accepts municipal, commercial, industrial and inert wastes. Potentially malodorous wastes are screen sewage sludge reject organics and municipal waste from the local authority.

The following responsibilities for waste acceptance on-site have been designated:

- ☐ *Weighbridge Operator* - responsible for visually checking open-topped incoming vehicles and checking documentation is in place to meet waste acceptance criteria;
- ☐ *Landfill Manager* - responsible for the management of odorous waste acceptance, carrying out compliance checks on accepted wastes and recording the results; and
- ☐ *The Compactor Operator* - responsible for carrying out visual inspection of the waste at the tipping face and ensuring all waste is tipped in the designated area.

Odorous waste must be pre-notified to the Landfill Manager before being accepted onto Site. This information will then be communicated to the Weighbridge Operator. Only wastes with their EWC code listed in the Site permit will be accepted. If waste does not meet the criteria further information may be requested from the customer or the waste will be rejected. If rejected, the customer will be informed of the reasons why and the NRW will be notified.

4.1.2 Process Control

The most important parameters in maintaining effective management and control of landfill odour are the operations listed in the source category. The importance of each of these elements is discussed below.

4.1.2.1 Working Face Operations

Exposed waste at the working face is a principal source of odour (from deposited waste, landfill gas and leachate) on a landfill site. Keeping the area of the working face to a minimum will reduce the area of waste exposed to the atmosphere and reduce the source of odour from the Site. Compaction of waste at the working face will reduce the exposed surface area of the waste that could potentially give off odours. The area of the working face will be kept to a minimum at all times in order to both prevent the spread of odour and maintain a safe environment for both FCC employees and lorry drivers.

High odour risk waste will be deposited in front of the working face and will be covered immediately by other non-malodorous waste materials.

4.1.2.2 Daily Cover/Intermediate Cover

At the end of each working day approximately 6 inches of cover material, in general accordance with NRW Guidance on Using Landfill Cover Materials will be applied at the end of each working day over any

deposited waste. This cover material will comprise of inert materials, or Site shale from stockpiles or a

combination of these materials as agreed with the NRW. The Site Manager will be responsible for ensuring adequate supplies of cover materials are available.

Approximately 0.5 m of intermediate cover material, generally clay found on-site, will be applied to areas of waste deposition which have been unused for an extended period of time. The waste will be covered with a layer of intermediate cover in general accordance with NRW Guidance on Using Landfill Cover Materials Site Management Plans in order to mitigate the potential for any odour emissions.

4.1.2.3 Gas Collection and Leachate Infrastructure

The gas and leachate infrastructure at the Site may be a source of odour if not maintained adequately. Odour associated with landfill gas and leachate may escape from discrete points around well heads or through cracks in the pipelines. The infrastructure will be checked for signs of physical damage to the integrity of the collection system or the degradation of the seal between gas wells and the landfill surface. All new well heads will be sealed pending connection to the gas management system to prevent odour emissions.

The landfill gas management system at the site is operated in accordance with the Gas Management Plan (GMP). As filling progresses, the gas extraction system will be progressively extended in the parts of the installation that have completed. In addition sacrificial extraction wells and/or horizontal gas extraction pipes may be installed into selected lifts of waste within operational tipping area. Gas collected by the extraction system will be utilised in the power generation plant or flared.

During the installation of gas and leachate monitoring and extraction wells any extracted wastes will be promptly removed and buried in the tipping area.

4.1.2.4 Capping

The Phase 1 and Phase 2 areas of the Site have been permanently capped with approximately 1 m of clay sourced on-site. The remaining Phases of the landfill, cells 3, cells 4 and cells 5, shall be progressively capped using a fully engineered capping system once the agreed levels have been attained. The cap will meet the specified requirements as set out in the Landfill Directive.

4.1.3 Containment, Collection and Treatment of Odour

While all opportunities to prevent or minimise the formation of odours should be taken, the use of containment, collection and treatment techniques is appropriate where additional controls are necessary.

The level of control provided should be proportional to the risk of odour generation from the activity in question. Highly odorous wastes should be enclosed in delivery trucks and placed in an area of the landfill least likely to cause odorous offence at receptors; this should not be landfilled during negative meteorological conditions.

5.0 SUMMARY OF ODOUR MANAGEMENT AND CONTROL MEASURES

Table 2 presents a summary of odour sources associated with the operations conducted and defines the measures adopted to control these risks.

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Table 2: Summary of Odour Management and Control Measures

Hazard	Receptor	Pathway	Probability of Exposure	Consequence	What is the Overall Risk?	Risk Management	Residual Risk
<i>What has the potential to cause harm?</i>	<i>What is at risk? What needs to be protected?</i>	<i>How can the hazard get to the receptor?</i>	<i>How likely is this contact?</i>	<i>What is the harm that can be caused?</i>	<i>What is the risk that still remains?</i>	<i>What measures will reduce the risk?</i>	<i>What is the risk that still remains?</i>
Inadequate Daily Cover	Nearby residential properties and nearby commercial units	Air	Fugitive releases through daily/intermediate cover	Moderate odour annoyance to residents and businesses	Moderate	Routine Olfactory monitoring and visual assessment of deposition area to ensure minimal odours and appropriate thickness of daily cover. Rapid review of management procedures to ensure appropriate thickness of cover material.	Low
				Nuisance low when occurring over a short period of time			
Point source emissions from leachate and landfill gas collection infrastructure	Nearby residential properties and nearby commercial units	Air	Fugitive releases through leachate and gas collection infrastructure due to cracks around well/liner interface and/or	Moderate odour annoyance to residents and businesses	Moderate	The infrastructure will be checked for signs of physical damage to the integrity of the collection system or the degradation of the seal between	Low

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Hazard	Receptor	Pathway	Probability of Exposure	Consequence	What is the Overall Risk?	Risk Management	Residual Risk
			insufficient gas extraction	Nuisance low when occurring over a short period of time		permanent gas wells and the landfill surface. All new well heads will be sealed pending connection to the gas management system to prevent odour emissions.	
Emissions from capped areas	Nearby residential properties and nearby commercial units	Air	Fugitive releases through capping	Moderate odour annoyance to residents and businesses	Moderate	Routine Olfactory monitoring and visual assessment of capped area to ensure minimal odours and appropriate thickness of cap. FID survey of cap to ensure its integrity.	Low
				Nuisance low when occurring over a short period of time			
Emissions from cell flanks	Nearby residential properties and nearby commercial units	Air	Fugitive releases through daily/intermediate cover	Moderate odour annoyance to residents and businesses	Moderate	Routine Olfactory monitoring and visual assessment of flank area to ensure minimal odours and appropriate	Low

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Hazard	Receptor	Pathway	Probability of Exposure	Consequence	What is the Overall Risk?	Risk Management	Residual Risk
				Nuisance low when occurring over a short period of time		thickness of daily cover. Review of management procedures to ensure fast appropriate thickness of cover material.	
Uncontrolled release of landfill gas in active cell	Nearby residential properties and nearby commercial units	Air	High- prevailing winds in direction of receptor	Moderate odour annoyance to residents and businesses	Moderate	Installation and regular monitoring and maintenance of gas extraction system (including sacrificial system, where required). Refer to Gas Risk Assessment for emergency procedures.	Low
			Low –prevailing winds away from receptor	Nuisance low			
Acceptance of odorous waste	Nearby residential properties and commercial units	Air	High- prevailing winds in direction of receptor	Moderate odour annoyance to residents and businesses	Moderate	Waste will be covered with inert materials on a daily basis. Odorous waste should be pre-notified and specific procedures are in place for accepting odorous wastes as detailed in the OMP in Section 4.0 and 9.2.	Low
			Low –prevailing winds away from receptor	Nuisance low when occurring over a short period of time			

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Hazard	Receptor	Pathway	Probability of Exposure	Consequence	What is the Overall Risk?	Risk Management	Residual Risk
Specific odorous waste stream	Nearby residential properties and commercial units	Air	High prevailing wind in direction of receptor	Moderate odour annoyance to residents and businesses	Moderate	Delivery of odorous waste will be pre-notified and a specific time arranged for its acceptance. Waste will be tipped in most suitable area to mitigate odour emissions during low wind speeds at a time when further waste and daily cover can be emplaced over it. Measures are detailed further in the OMP Section 4.0 and 9.2.	Low
			Low- prevailing wind away from receptor, waste accepted for short periods of time	Low nuisance, small amounts of odorous waste deposited over a short period of time			
Waste tipping at working face	Nearby residential properties and commercial units	Air	High- prevailing wind in direction of receptor	Moderate annoyance to residents and businesses	Moderate	Tipping face to be kept as small as practicable in order to limit potential for odour. Waste to be covered on a daily basis. Measures are detailed in the OMP	Low
			Low- prevailing winds away from receptors	Low nuisance, for short periods of times			

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Hazard	Receptor	Pathway	Probability of Exposure	Consequence	What is the Overall Risk?	Risk Management	Residual Risk
						Section 4.0.	
Temporary shutdown or malfunction of Gas Extraction System	Nearby residential properties and commercial units	Air	High- prevailing wind in direction of receptor	Moderate annoyance to residents and businesses for a short period of time	Moderate	Gas field will be monitored and balanced adequately and spares will be held on-site. A back up flare is available on-site should it be required. Any nuisance will be short-term.	Low
			Low- prevailing winds away from receptors	Low nuisance, for short periods of times			

6.0 LANDFILL ODOUR MONITORING

In order to assess the effectiveness of the control measures presented above and whether operational procedures will be undertaken, the following monitoring will be conducted.

All monitoring equipment used will be calibrated in accordance with manufacturer's recommendations, or on a 12 monthly basis (whichever is sooner) with all calibration records kept by the monitoring company and accessible to FCC on request. The monitoring company will maintain a calibration schedule, listing all monitoring equipment and calibration periods/re-calibration dates. Any equipment which has failed calibration will be clearly marked "failed calibration – do not use" and removed from use. The equipment will be repaired or replaced immediately.

6.1 Monitoring

6.1.1 General/O odour Monitoring

All Site personnel will be responsible for immediately reporting any odour problems detected to the Site Manager on an ongoing basis. In addition, the following formal odour monitoring regime will be implemented:

A daily olfactory inspection of the Site will be conducted during operational hours by the Site Manager or another appropriate representative and observations made concerning the type/nature of any odours detected including the likely source. The inspection will pay particular attention to any issues or areas of concern by the NRW officers or local environmental health officers. An inspection of all plant/infrastructure that are critical from an odour risk perspective (side risers, gas pipelines, extraction pipes, detailed in Table 1) will be conducted to ensure that they are operational and functioning correctly.

The results will be recorded on a Daily Odour Inspection Form (Appendix A) and immediate investigation/remediation action will be undertaken where necessary. The forms will be inspected by the Site Manager on a weekly basis to ensure actions have been implemented as required.

If notable odours are detected from other premises and activities in the vicinity of the Site these will also be noted on the form.

Meteorological conditions are continuously monitored using the on-site Weather Station. The data will be used to assist in complaint investigation and analysis and to anticipate times of increased off-site odour impact risk in order to reschedule the acceptance of malodorous waste.

6.1.3 Landfill Gas Monitoring

Landfill gas is monitored, by Infinis, in accordance with the conditions set in the Site permit Schedule Table S4.7 which provides for the monthly monitoring of landfill gas extraction wells together with weekly gas composition to the engine. The gas extraction system will be balanced using the control valves to optimise the performance of the engines and flare. The integrity of the gas infrastructure will be checked during regular monitoring. Should any remedial works be required, records of these will be kept in the Site Diary.

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In order to ensure all elements of the on-site landfill gas infrastructure are intact, additional monitoring will be carried out at the Landfill Managers discretion. Unfavourable meteorological conditions may require monitoring events to be rescheduled. Should this occur, the weather forecast will be checked in order to arrange a more favourable time to complete the monitoring.

6.1.4 Leachate Management Infrastructure

The integrity of the leachate management infrastructure including the holding tanks will be assessed on a regular basis. Any defects will be recorded in the installation check log along with remedial action plans, time scales and completion dates.

6.1.5 Gas Flares and Engines (Gas Management)

The efficiency of the gas flare and engines will be regularly assessed in order to ensure combustion conditions are maintained at an optimum level. In accordance with permit Schedule 2 Table S5.1, flare and engine emissions monitoring results will be reported on an annual basis.

6.1.6 Surface Methane Emission Surveys

In accordance with permit Schedule 2 Table S4.6, surface emission rates from the permanently capped zone and temporary capped zones will be measured on an annual basis using a Flame Ionisation Detector (FID) with periodic flux box monitoring of newly capped areas. Should any exceedance occur remedial measures will be undertaken as necessary.

6.1.7 Trace Gas Analysis

Trace gas analysis will be carried out on an annual basis at the input to the flare and engine compound in accordance with the permit requirements of Schedule 4, Table S4.7. The results will be compared against the predictions made in the Gas Risk Assessment and dispersion models (Golder, 2013). Results will be submitted to NRW accordingly.

7.0 RECORD KEEPING

7.1 Odour Complaints

All odour complaints received at the Site will be investigated and recorded on the Daily Odour Inspection Form (Appendix A) as well as FCC's Incident Management Software (Safeguard). This will contain details of the time/location of detection, odour intensity, description of odour, weather conditions and any responsive action taken to address the complaint. The Site Manager or another appropriate Site representative will complete the form, and these will be kept on file in the Site Office. Any remedial action to address the odour, should one be detected, will be corresponded to the regulator. Complaints received at a later date will be recorded in the Site Diary and onto Safeguard and investigated as fully as possible in accordance with Section 8.0.

7.2 Monitoring Results

An Olfactory odour assessment is carried out each working day on-site by the Site Supervisor or another appropriate representative (Appendix A). This requires records of meteorological conditions, gas extraction utilisation performance and details of any odour detected (or not detected). These records will be kept in the Site Office. All weather data can be accessed and downloaded via the Site's weather station which records Site weather conditions continuously.

FID monitoring results will be recorded and results kept on file in the Site Office.

7.3 Weather Conditions

Weather data is continuously recorded by the Site Weather Station. Weather data is also recorded by the Site Manager and on the Daily Odour Inspection Form. All records are kept on file in the Site office.

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7.4 Operational Issues

Any operational issues such as malfunctions and equipment downtime which may lead to the release of odour will be recorded in the Site Diary by the Site Manager or another appropriate representative. Each working day the Site Foreman or another appropriate representative completes daily checks, on plant and gas/leachate infrastructure, recording any operational issues. This is written up at the end of the working day.

Where a malfunction or breakdown that could lead to significant odour pollution is recorded, the details will be noted on a Schedule 6 Form and the NRW will be notified.

7.5 Details of Corrective Actions

Any corrective action taken in response to operational issues/malfunction or equipment downtime will be recorded in the Site Diary by the Site Manager. This includes changes to management plans and operational procedures.

8.0 ODOUR ACTION PLANS/CONTINGENCY CONTROL MEASURES

8.1 Odour Complaint Investigation

The following actions will be taken on receipt of an external odour complaint:

Any complaints received at the Site will be logged on an odour complaint report form (Appendix C). NRW will be informed immediately that a complaint has been received.

- ☐ The Site Manager will be given the details of the odour complaint as soon as practicable including the location, nature, time and date of the complaint;
- ☐ If complaints are recent/current, a sniff test will be conducted by office-based Site personnel in the area from which the complaint is received in order to assess the presence/absence of any odours, and their characteristics and intensity. Where possible the likely cause of the odour will be identified; and
- ☐ For all complaints, reference will be made to the Site activities at the time of the complaint and the corresponding Daily Inspection Form and further on-site investigations conducted to determine whether any abnormal operations are/were occurring (failure in odour critical plant etc.).

The following key potential causes of abnormal odour emissions will be investigated:

- ☐ Has waste arriving at the Site been correctly assessed at the weighbridge, and by the Site Manager once tipped?
- ☐ Are there any unusual characteristics evident in the waste on-site (composition, age, condition, etc.)?
- ☐ Are/were waste reception and deposition processes occurring as per normal?
- ☐ Are/were there any unusual activities taking place off-site e.g. agricultural operations?

Once the cause has been established, appropriate actions (see below) will be immediately implemented and procedures updated to prevent a recurrence of the incident.

- ☐ In all cases the data from the on-site weather station from the time of the complaint will be reviewed and recorded in addition to details of any unusual events conducted on-site;
- ☐ FCC will make a record; detailing the complaint(s) received, the investigations conducted, the findings of those investigations, whether the complaint was substantiated, any remedial measures implemented and any ongoing improvement actions to be implemented with a target period of seven days from receipt of the complaint; and

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- Records of all complaints, subsequent investigations, and remedial actions will be kept for at least five years. The Site Manager shall ensure they are readily retrievable and maintained as fit for retention.

8.1.1 Odour Complaint History

Since the beginning of 2013 the Site has received two incident numbers relating to Site odour. Incident number 01077782 relates to a complaint from a resident regarding odour from the landfill Site which was unsubstantiated by the NRW. Incident number 1077868 relates to a slight odour detected by an NRW representative at the main gate to the Site which was attributed to the Site landfill. Since October 2019 there has been a significant increase (100+) in odour complaints from residents in the vicinity of Cwn Gors. These have been investigated whenever possible (most events recorded after hours) and nothing has been detected. NRW have been on site and conducted a walkover with very little odour detected. Some minor remedial works were identified such as tightening of a couple of seals. Additional gas wells were already planned installed on the 16th December 2019. Independent weekly odour monitoring has been arranged with the results recorded. Reports of odours dramatically reduced after the 11th December with only a handful being received

8.2 Action Plans

In the event that an odour complaint is proven to be justified and attributable to Site odours, or a 'non-conformance' occurs, a defined action plan (below) will be implemented. The following odour 'non-conformances' have been identified for the Site:

- 1) Abnormal odour emissions occur;
- 2) Significant odour is detected on-site that has the potential to pose a risk of off-site odour impact; and
- 3) Significant Site odour is detected off-site.

In the event that any of the above occurs, the following actions may be taken:

- 1) A walkover survey of the entire Site and a review of the Daily Inspection Form will be conducted in order to identify the likely cause(s) of the odour;
- 2) Upon identification of the likely odour source(s), appropriate corrective and preventative measures shall be identified and implemented;
- 3) If odours are generated from the accumulation of leachate/landfill gas ensure leachate collection and containment systems are operating effectively and that the gas extraction field is balanced and working correctly; and
- 4) Clean/remediate as necessary.
- 5) Deployment of odour station
- 6) Installation of aerators in the leachate holding tanks
- 7) Addition of chemicals to suppress / breakdown odour causing compounds

Details of any odour 'non-conformances' including the nature of the incident, results of investigations, action taken and any required amendments to the OMP will be made available to the NRW on request.

8.3 Situations which May Give Rise to Odours at Site Boundary

The NRW H4 Guidance document states contingency plans have been necessary to react to situations where 'monitoring indicates that a potential odour source is not completely under control, meteorological conditions are unfavourable or that adverse impact has occurred'.

This encompasses events which would result in the loss of control of odorous substances and have the potential to cause a short-term impact on the local community, but are not considered an emergency situation. These situations have been defined below and related to operations at Pwllfawatkyn Landfill Site.

8.4 Responsible Person(s)

FCC's primary point of contact will be the Site Manager, Richard Thomas, for all matters associated with Site operations and environmental performance. In the event that the Site Manager is unavailable or non-contactable, the contingency management staff to be contacted will be Russell Bromage (Environment Manager) and Shaun Seaward (Weighbridge Operator).

Mark Vaughan and Ian Rees, plant operations, are responsible for managing response procedures should an odour complaint be received and confirmed.

9.0 ABNORMAL EVENTS

A range of possible abnormal events considered to have the potential to result in increased risk of off-site odour impact have been considered. The events and response measures to be implemented are discussed below.

Following the occurrence of any abnormal event a post event review will be conducted and if necessary modifications to the control measures, mitigation equipment, training and contingency actions will be implemented and the OMP updated accordingly.

Where an event is found to be due to deviation from the operational procedures in place staff will be re-trained in use of procedures as necessary.

9.1 Abnormal Meteorological Conditions

Certain meteorological conditions can promote the generation of odour and inhibit its effective dispersion. Factors affecting this include high temperatures and stable conditions making the air somewhat stagnant and hence preventing dispersion and mixing. Certain contingency measures are in place to deal with such events as and when they occur. Responsive and preventative actions are as follows:

- ☐ Re-balancing the gas field as required;
- ☐ Continuous download of weather data using on-site meteorological station;
- ☐ Monitoring of wind direction;
- ☐ More frequent application of daily cover as and when required;
- ☐ Minimising deposition area should the need arise;
- ☐ Increasing depth of daily cover should the need arise; and
- ☐ Using odour suppression units to aid in odour neutralisation.

9.2 Receipt of Malodorous Waste (Without Prior Notification)

Should any malodorous waste be brought to Site without notification, the weighbridge operator will advise the plant operative of its arrival in order that suitable preparations can be made for its appropriate disposal so as not to cause environmental nuisance. The waste will be deposited in a suitable location within the working face and will be immediately covered with non-malodorous wastes.

Consideration will always be made to meteorological conditions and the location of the active face (i.e. its proximity to sensitive receptors) before disposal. Should conditions be necessary, placing the waste in an alternative area or rejecting the load will be considered. This will be informed through assessment of meteorological conditions.

Should any unacceptable odour exposure be traced back to a particular type of waste, further acceptance of this waste may be put on hold pending further investigations and identification of a solution so as to prevent odour nuisance. The operator will notify the regulator and waste producer of this occurrence.

9.3 Minor Leachate Breakout

Should leachate escape from the containment cells suitable action will be taken in order to mitigate the odour potential. Should the problem arise due to an increase in leachate head above the limit set in the Site permit (Table S4.1), the cells will receive additional pumping in order to prevent ponding. Ponded leachate would be removed by pumping to a suitable treatment facility. Should the containment system fail, for example due to a rip in the liner, and this be identified as the source of odour nuisance, then repair will be initiated immediately.

9.4 Detection of Landfill Odour at the Site Boundary or Off-site During Routine Odour Surveys

During Site walkovers or routine inspections the olfactory survey should be followed and the source of the odour identified and recorded. Should any odour be found then the contingency actions to be followed may include:

- ☐ Increasing the amount of daily cover if necessary;
- ☐ Increasing the depth of daily cover if necessary;
- ☐ Turning on mobile odour neutralising system; and
- ☐ Re-balancing of gas field.

Meteorological conditions are recorded first thing in the morning (Monday - Saturday) prior to waste acceptance and Olfactory Odour Assessments are carried out each day.

9.5 Excavation of Waste

Where possible measures will be taken to ensure that previously emplaced waste is not exposed to the atmosphere. In the event that emplaced waste becomes exposed, for example during installation of leachate wells, and results in an odour nuisance the exposed area is to be covered with appropriate cover materials (geotextiles/clay, construction and demolition, quarry materials) as soon as practicable.

Ideally any well installation/excavation activities will be conducted at a time where both Site and weather conditions are more favourable in order to reduce the potential for operations to give rise to any significant off-site odour impact.

9.6 Surface Monitoring of Temporary/Intermediate Cover Indicates Fugitive Emissions of Methane

Should gas monitoring (FID) of areas of temporary cover or intermediate cover reveal that emissions of methane exceed 100 ppm, or >1000 ppm at any discrete receptor, remedial action will be undertaken. This will primarily involve the emplacement of additional cover or a different cover material to prevent egress of methane. Furthermore, the gas extraction system may require re-balancing to direct more methane to the on-site flare. Following the implementation of remedial actions, gas monitoring will be repeated. Should levels remain elevated then further remedial action will be taken until full compliance is achieved.

9.7 Gas Field Monitoring Indicates Ineffective Extraction

The Gas Risk Assessment (Golder, 2013) details the actions to be taken in the case of failure of the gas containment, infrastructure or the flare/engine compound. Should the infrastructure be damaged, repairs to pipelines, wellheads, knock out pots and the flare will be carried out as soon as practicable. Where gas is causing an odour on-site, the suction on the extraction lines can be increased and operate outside of normal conditions.

9.8 Damage or Failure of the Gas Containment, Infrastructure or Utilisation Compound

Should any of the gas infrastructure on-site become damaged or fail, procedures will be followed in order to restore the effectiveness of the extraction system as soon as possible. The aim will be to initiate prompt temporary measures first hand before implementing a permanent repair to prevent further landfill gas release.

9.9 Seals and Joints (Leachate and Gas Wells or Joints)

Should it be reported that seals and joints at leachate points or gas wells are damaged action will be taken to implement repair and thus prevent further egress of potentially odorous gas becoming an environmental

ODOUR MANAGEMENT PLAN - PWLFAWATKIN LANDFILL SITE

nuisance. All damages should be reported to the landfill Site Manager and dealt with as soon as is practicable.

10.0 INCIDENT AND EMERGENCY PLANS

A range of possible emergency events considered to have the potential to result in increased risk off-site odour impact have been considered. The events and response measures to be implemented are presented below. In the case of a Site emergency the primary point of contact should be the Site Manager, Richard Thomas.

10.1 Failure of Gas Collection System

Should the landfill gas management system be damaged or fail to operate correctly the NRW will be informed of such an occurrence. Action will be taken as soon as possible to investigate and remediate the situation and organise repairs. Provision will be made for sufficient capping materials to be present on-site, and sufficient gas equipment spares will be stored either on-site or available at short notice to carry out a short-term repair.

10.2 Failure of Leachate Management System

Details of emergency procedures to be implemented in the event of failure of the leachate containment system are detailed in the Emergency Plan held in the Site Office. All spillages are to be reported to the Site Manager and action will be taken as soon as possible to contain and remediate the spillage. Details will be recorded in the Site Diary.

10.3 Sub-Surface/Landfill Fire

Emergency actions to deal with landfill fire are detailed within the Site's Emergency Plan held in the Site Office. The key priority will be to attempt to contain any fire that should occur and attempt to extinguish it in order to minimise damage to the containment system and gas infrastructure. The NRW will be informed of any such occurrence and, should it be required, information made available to local residents on response plans.

10.4 Landslip/Failure of Containment

It is unlikely that a landslip resulting in exposure of waste will occur on-site. However in the event that a failure should occur the primary emergency response will be to apply additional cover material to the exposed waste in order to prevent/reduce the emission of odour. The NRW will be informed of any such occurrence with details on remedial actions taken and the completion timescale to be expected. A review of working operations and/or revision of the design of future phases including gradients, slope heights and placement of waste types in areas which may be at risk will be carried out to prevent any failure.

10.5 Abnormal Meteorological Conditions

Should abnormal meteorological conditions prevail there will be a progressive initiation of control measures as necessary (previously stated in Section 9.1). In the event that meteorological conditions, such as snow fall, has prevented delivery of waste and results in increased waste deliveries once collection resumes the Site Manager shall ensure that stocks of daily cover material are adequate to allow for cover of deposited material. Daily monitoring and inspections shall continue as detailed previously to ensure that an increase in odour does not occur as a result of an increase in waste deliveries.

10.6 High Sulphur Content in Landfill Gas

In the event that elevated levels of odorants are identified within the landfill gas at the Site (e.g. $>500 \text{ mg/m}^3 \text{ H}_2\text{S}$) the Site will implement corrective actions, if necessary, including the non-acceptance of material that has the potential to contribute to malodorous landfill gas emissions and the placing of additional daily/intermediate cover to reduce emissions to ambient air. Waste acceptance procedures will be reviewed to ensure that only wastes with their EWC code listed in the Site permit will be accepted.

11.0 LIAISON AND DOCUMENT REVIEW

11.1 Liaison

FCC will ensure that established clearly defined and accessible communication channels are set up for residents to report odour issues. These include:

- Contact details (telephone number and address), displayed on the main Site notice board (positioned at entrance to Site); and
- Website giving relevant contact details: e-mail, telephone, postal address etc.

Local residents and the NRW will be informed of any imminent events (resulting from planned or unplanned activities) that pose a risk of off-site odour impact at off-site locations, including an explanation of why the occurrence is unavoidable. A commitment will be made to residents that any increase in odour will be of a temporary nature, their inconvenience will be minimised and an apology given in advance for any discomfort that may be caused.

Where routine complaints are received, local residents may be asked to complete odour diaries (Appendix D), the results of which will be reviewed to identify trends such as key odour exposure times and locations. Any trends identified will be used to focus the daily Site inspections and weekly sniffing exercises, and the Site operations/meteorological conditions at these times reviewed. FCC is committed to ensuring any issues identified by the community are promptly acted upon to ensure the ongoing co-operation between the two parties.

11.2 Review Requirement and Timescale

This OMP will be formally reviewed by FCC on an annual basis, as a minimum, to ensure that the controls described are effective and reflect best available techniques. In addition the OMP will be reviewed following any relevant changes in Site operations or procedures that are likely to have implications from an odour generation/impact perspective.

DRAWINGS

APPENDIX A

Daily Odour Inspection Plan

Daily Odour Inspection Form		Date
Time of test		
Weather conditions		
Temperature		
Wind strength		
Wind direction		
Intensity (see below)		
Duration of test		
Location of Odours detected (if any)		
Are odours constant or intermittent?		
Type of Odours Detected?		
Possible Source		
Receptor sensitivity (see below)		
Any other comments , observations or actions required		

Intensity	Receptor sensitivity where odour detected
0 No odour	
1 Very faint odour	Low (e.g. footpath, road)
2 Faint odour	Medium (e.g. industrial or commercial workplaces)
3 Distinct odour	High (e.g. housing, pub/hotel etc.)
4 Strong odour	
5 Very strong odour	
6 Extremely strong odour	
Ref: German Standard VDI 3882 Part 14	

APPENDIX B

APPENDIX B

Sniff Test Protocol/Form

APPENDIX B

January 2020

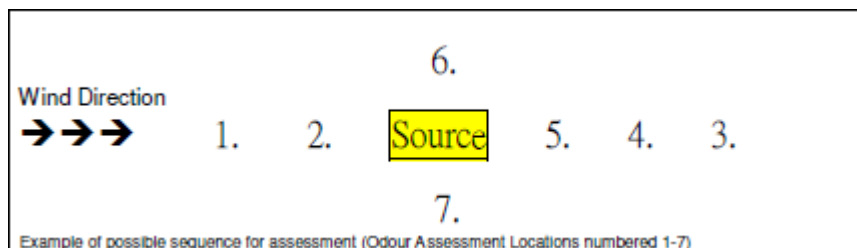
SNIFF TEST PROTOCOL

The Site personnel carrying out the sniff test should be trained in this procedure and in a fit condition and adhere to the following rules:

- ☐ If they have a cold, sore throat etc. they should not carry out the assessment and a suitable replacement should be found;
- ☐ They should not smoke;
- ☐ They should not consume strongly flavoured food or drink for at least 30 minutes before the assessment;
- ☐ They should not consume food or drink (other than water) during the assessment;
- ☐ Scented toiletries and perfumes should not be applied immediately before or during the assessment; and
- ☐ The vehicle used during the assessment should not contain any deodorisers or air fresheners.

The odour investigator should record meteorological conditions prevalent during the assessment and any Site-specific activities which are being undertaken. A note should also be made of any activities and odours noted from off-site sources in the area in which observations are being made.

When the assessment is being carried out routinely (as opposed to complaint investigation) the following sequence of sampling stations is recommended, with areas of weaker strength inspected prior to those of stronger strength.



(Northern Ireland Environment Agency (August 2012), *Odour Impact Assessment Guidance for Permitted and Licensed Sites*)

At each assessment location, the odour investigator should get out of the car (if used) and make an observation of the odour. The period of assessment should be the same at each location (five minutes recommended minimum). At the conclusion of the sampling period, the Sniff Test Report Form should be completed and all the details required logged for that sampling location. When an odour is detected a determination of the extent of the odour plume may be carried out at points perpendicular to the plume axis and equidistant from the source (i.e. locations 6 and 7 in the above diagram); again this is done prior to visiting any suspected odour source.

APPENDIX B

SNIFF TEST REPORT FORM

Assessed By:		Date:	
Start Time:		End Time:	

Observer Location	Wind Speed/Direction	Meteorological Details	Time	Odour Rating ¹	Odour Description	Is the Source evident?

¹Odour Intensity:

- 0 No detectable odour
- 1 Very Faint Odour
- 2 Faint Odour
- 3 Moderate Odour
- 4 Strong Odour
- 5 Very Strong Odour

APPENDIX C

Odour Complaints Form

Appendix C

Odour Complaint Report Form		
Time and date of complaint:	Name and address of complainant:	
Telephone number of complainant:		
Date Of Odour:		
Time of odour:		
Location of odour, if not at above address:		
Weather conditions (i.e., dry, rain, fog, snow):		
Temperature (very warm, warm, mild, cold or degrees if known):		
Wind strength (none, light, steady, strong, gusting):		
Wind direction (e.g. from NE):		
Complainant's description of odour:		
☐ What does it smell like?		
☐ Intensity (see below):		
☐ Duration (time):		
☐ Constant or intermittent in this period:		
☐ Does the complainant have any other comments about the odour?		
Are there any other complaints relating to the installation, or to that location (either previously or relating to the same exposure)?		
Any other relevant information:		
Do you accept that odour likely to be from your activities?		
What was happening on-site at the time the odour occurred?		
Operating conditions at time the odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet):		
Actions taken:		
Form completed by:	Date	Signed

Intensity

- | | | |
|--------------------|------------------|--------------------------|
| 0 No odour | 3 Distinct odour | 5 Very strong odour |
| 1 Very faint odour | 4 Strong odour | 6 Extremely strong odour |
| 2 Faint odour | | |

APPENDIX D

Odour Diary

Appendix D

Pwllfawatkin ODOUR SUMMARY SHEET 2020											
Date	Complaints Received	Site Odour / Installation Checks	NRW Visits / Comms	FCC Works Carried Out On site	Action Plan Updates	Infinis On Site	INFINIS Works On Site	Site Odour Issues	FID Surveys	Engineering Works	Additional Information
	0	1x am	none	none	none	no	none	no	no	no	no issues

