





Odour Management Plan

Issue 6.0



Report produced for Birch Airfield Composting Services Limited

Provided by Walker Resource Management Ltd (WRM)

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1.0 INTRODUCTION

This Odour Management Plan (OMP) has been produced in accordance with Environment Agency (EA) guidance on OMPs¹ and EPR H4 Odour Management² and follows the general monitoring procedures detailed in Environment Agency guidance document *Internal Guidance for the Regulation of Odour at Waste Management Facilities*³. Reference has been made to the Association for Organics Recycling *Industry guide for the prevention and control of odours at biowaste processing facilities*⁴ and the Agency document *Technical Guidance on composting operations*⁵.

This OMP is aimed at assisting the operator in effectively managing potential odour releases associated with the operations at the site and minimisation of the risk of abnormal operational conditions, which could result in increased risk of odour generation at the site.

1.1 Current Permitted Activity

Birch Airfield Composting Services Ltd (hereon referred to as “BACS”) is currently permitted to treat a variety of materials at the Blind Lane recycling facility under a Standard rules SR2021 No 8 (previously SR2012 No 8) permit (variation reference EPR/HP3294NJ/V005). Permitted activities are as stated below:

- Open Windrow Composting (OWC) of green wastes (<75,000 tonnes per annum (tpa)).
- Physical treatment for recovery of Non-Hazardous Waste: conditioning and screening of imported soil wastes (for blending into composts produced through the open windrow composting system).

1.2 Structure of Odour Management Plan

The structure of the OMP is laid out in accordance with the EA guidance and considers:

- Feedstock Inventory;
- Process Management;
- Evaporation;
- Containment and abatement;
- Dispersion;
- Sensitive Receptors; and
- Incidents and Emergencies.

1.3 Material Recovery Operations

BACS are recovering biodegradable waste materials and inert soil waste materials through an open windrow composting (OWC) operation.

¹ Appendix 8 of Application for an environmental permit - Guidance notes on part B3 new bespoke installation permit. EPB3 Version 1, January 2010. Environment Agency.

² Environment Agency Technical Guidance Note H4 – Odour management. March 2011.

³ Environment Agency. Odour Guidance, Internal Guidance for the Regulation of Odour at Waste Management Facilities VERSION 3.0. (July 2002).

⁴ The Compost Association. An industry guide for the prevention and control of odours at biowastes processing facilities. Jeremy Jacobs, Nick Sauer and E. Jane Gilbert (2007).

⁵ Environment Agency. Technical Guidance on composting operations, Draft for Internal Consultation Version 3.0. October 2001.

The recovery of both organic waste and inert soil waste material has the potential to generate malodours from site operations. This odour management plan makes an assessment of likely sources of odour generation and sets out the good site practice and mitigation that is employed to minimise where reasonably practicable any odour emitted from site.

The likelihood and frequency of exposure to odour arising from the facility is determined by a combination of the magnitude of release, the prevailing meteorological conditions, and the distance and direction of receptors in relation to the facility. Each of these factors are discussed in the following sections.

1.4 Conceptual Model

The conceptual model for pollutant linkages identified for the release of odours from the composting facility is identified in Figure 1 below.

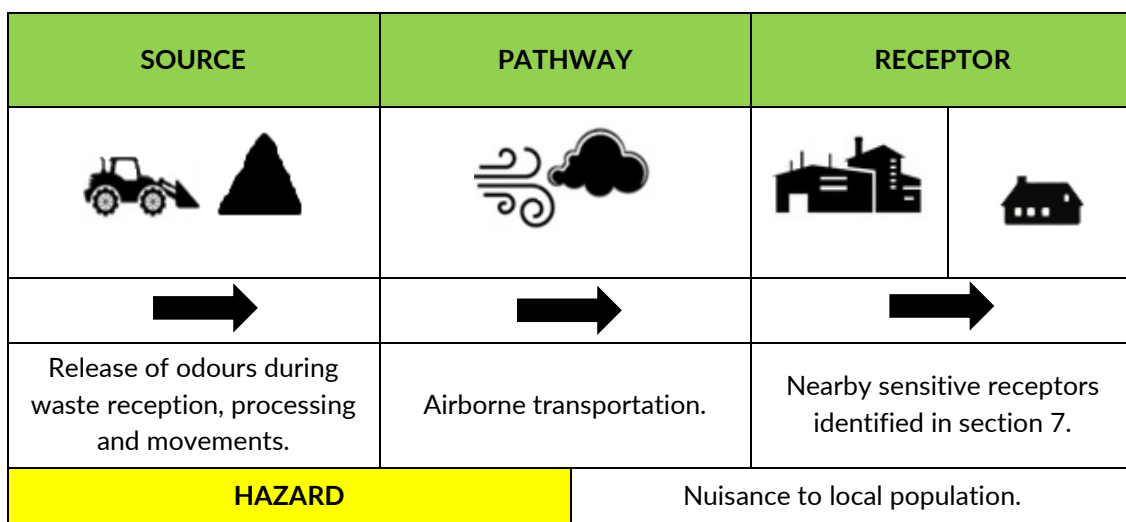


Figure 1 - Conceptual Model for Pollutant Linkages

1.5 Dispersion Modelling

Modelling can be a useful source of predictive information to assess the likely impact of odour. However, there may be much greater uncertainties associated with odour modelling than with the modelling of other pollutants for the following reasons⁶:

The human nose responds to odour exposure over a 1 to 5 second interval. Average exposure levels may very well be below the detection threshold but still expose people to short term concentrations which are much higher.

UK odour benchmark levels are based on research at one particular type of site under distinct dispersion conditions (e.g. ground level emissions in generally flat terrain).

⁶ Environment Agency (2011) Technical Guidance Note H4 – Odour management. Appendix 3.

Further uncertainty is added to the modelling process through the determination of appropriate odour concentrations based upon several factors⁷ including:

- The state and type of raw materials used on site and how they are delivered and stored;
- The process e.g. the control of moisture, temperature and oxygen content; and
- The scale of the operation, e.g. the surface area of the composting process, the quantity and quality of (intermediate) products.

In this instance it is not deemed appropriate to undertake modelling where there has been no site-specific baseline data collected for the exact waste streams to be treated for the technology to be deployed within the site-specific topographical context.

⁷ DEFRA (2009) Good Practice and Regulatory Guidance on Composting and Odour Control for Local Authorities. Defra: London.

2.0 FEEDSTOCK INVENTORY

The site operates a waste recovery operation through the composting of source-segregated biodegradable waste to produce quality compost that is quality assured to PAS100⁸ and the compost Quality Protocol⁹. The composting processes treat biodegradable materials which have the potential to produce odour.

In order to understand the odour potential of the different waste streams that enter these processes, a feedstock inventory has been provided for the various waste types. Table 1 below provides an assessment of each waste type by source of material, identifying the typical and abnormal compositions of those waste types and providing an overall odour potential of that feedstock based upon the likelihood of abnormal compositions being encountered at site.

Table 1 - Assessment of Odour Potential from Feedstock Inventory

Waste Type	Waste Source	Typical Composition	Abnormal Composition	Likelihood	Odour Potential
Green Waste	Kerbside collected.	Mixture of grass clippings and woody plant material. Often several days old.	Mixture of grass clippings and woody plant material that has been stagnant for weeks.	Material is often received from these sources which is several days old.	High – Material may be wet and already started to degrade given the potential age of cut material.
	Civic amenity sites e.g. HWRC.	Mixture of grass clippings and woody plant material. Often several days old.	Mixture of grass clippings and woody plant material that has been stagnant for a few days. Seasonal exceptions e.g. Christmas trees.	Material is often received from these sources which is several days old.	Med – Material may be wet and already started to degrade given the potential age of cut material but is typically fresher than kerbside materials.
	Commercial e.g. landscapers.	Fresh woody plant material and grass clippings / turf.	Large bulky tree stumps/logs. Large load of grass/turf.	Material usually delivered shortly after being collected.	Med – Material is typically fresh and mainly dry woody plant material.

⁸ BSi (2011) *PAS 100: Specification for Composted Materials*. British Standards Institution: London.

⁹ WRAP (2008) *The quality protocol for the production and use of quality compost from source-segregated biodegradable waste*. Waste and Resources Action Programme: Oxon.

Waste Type	Waste Source	Typical Composition	Abnormal Composition	Likelihood	Odour Potential
Biodegradable material unsuitable for consumption or processing	Wastes from animal feed production	Sugar beet pulp. Often several days old.	Sugar beet pulp which is several weeks old.	Material received is several days old.	Med – Material may be wet and already started to degrade.
Wastes from production	Brewing Industry.	Mixture of spent grains, hops and malt husks. Often several days' old.	Mixture of spent grains, hops and malt husks. Which is several weeks old.	Material is often received from these sources which is several days old.	High – Material is wet and already started to degrade.
Inert soil waste	Soil and stones from garden and park waste from local trusted suppliers	Soil and stones made up garden and park waste (including cemetery waste).	Loads containing hazardous waste.	Material is usually delivered promptly from trusted local suppliers.	Low – material is inert
	Soil and stones from contaminated sites, stones and dredging spoil from local trusted suppliers	Soil and stones not containing dangerous substances originating from contaminated sites.	Loads containing hazardous waste.	Material is usually delivered promptly from trusted local suppliers.	Low – material is inert

BACS are treating in the region of 51,000 tonnes per annum of biodegradable plant waste. The predominant waste stream is green waste, but the site does also receive some other waste streams. The main contract is with Essex County Council supplying in the region of 41,000 tonnes per annum. Approximately 5,000 tonnes per annum of green waste is supplied by landscape gardeners and companies which provide a recycling service.

The remaining 4,000 tonnes of inputs are made up of commercial contracts with companies supplying Barley Maltings in the region of 1,000 tonnes per annum and also approximately 2,000 tonnes of waste onions from farms and 1,200 tonnes of paper pulp per annum.

The average daily amount of green waste received at the site varies throughout the year. In the summer months, the average amount received is approximately 160 tonnes per day but could be as high as 250 tonnes. In the winter months, this reduces to approximately 35 to 80 tonnes of green waste per day. The high-speed Willibald shredder is capable of shredding 70-80 tonnes of green waste per hour.

Sugar beet is received from October to February, with an average range of 4 – 23 tonnes per day. Barley waste is delivered throughout the year in small amounts.

Birch Airfield also receive and treat up to 10,000 tonnes of inert soil waste (non-hazardous). The main waste streams for this inert soil waste will be from trusted local aggregates suppliers who shall provide waste topsoil and stones from garden and park wastes and from agricultural land.

It should be noted that waste ratios will be tempered by the actual constituents of each waste type by C: N ratio. This will depend on seasonality as identified in Table 1.

2.1 C:N Ratios

Nutrient content (typically the C: N ratio) is a critical factor as the micro-organisms require a range of nutrients to flourish. Nitrogen is used for protein manufacture and reproduction whereas carbon is used for energy and growth. Typically, biological organisms require 25 times more carbon than nitrogen and ratios of between 20:1 to 40:1 are generally accepted as capable of achieving good composting results.

Low C: N ratios (<20:1) allow the carbon to be fully utilised without stabilising the nitrogen, which may be lost as ammonia. Such conditions also lead to rapid composting process, resulting in elevated temperatures and the need for frequent (possibly daily) turning to cool the composting mass. High C: N ratios (>40:1) require longer composting periods whilst the extra carbon is used.

Typical C: N ratios of between 20:1 and 35:1 are optimal for the composting process. The site is adopting an optimal range of 25:1 to 30:1, given the inclusion of plant waste from production etc., which equates to approximately 1-part green (nitrogenous) waste to 3 parts brown (carbonaceous) waste.

C:N ratios of green wastes such as grass clippings and vegetable wastes are approximately 10:1, whereas the C:N ratio of brown wastes such as woody branches and oversize are approximately 35:1. Therefore at a ratio of 1-part green waste to 3 parts brown waste an overall C:N ratio for the feedstock mix will be approximately 28:1, at 4 parts brown to 1-part green the overall mix will be 30:1.

Site operatives smell feedstock, prior to mixing, and use a 1-6 scoring system (6 being high). If any feedstock received is assessed to be odourous, and allocated score 3-6, then the rate of woody/amendment material is increased to approx. 4 parts brown to 1 part green. If the feedstock received has the potential to cause odour due to its' age or high nitrogen content the rate of woody/amendment material is increased to approx. 4 parts brown to 1 part green.

Woody oversize material created from the site's own composting process, is stored specifically for the purpose of mixing into new windrows, to ensure an appropriate mix.

Parts will be measured by volume based on a simple approach that allows consistency in batch creation. This will be achieved via a simple loading of feedstock via a loading shovel, where one bucket will equate to 1 part. As a guide, the following wastes anticipated to be processed on

site will require mixing based on C:N ratio as a general classification as brown or green. The table below identifies how the different waste types will be mixed by an operative on site.

Table 2 – C:N Ratio Mixing Guide for Operators

Material	Typical C:N Ratios ¹⁰	General Classification	Mix Requirement	Seasonal Variation
Yard Waste	35	Brown	3:1 with Green	Drop off in winter months. Source additional Carbon as required.
Oversize	35-50	Brown	3:1 with Green 4:1 with odorous material	Available all year around as Carbon balance.
Straw	80	Brown	3:1 with Green 4:1 with odorous material	Available all year around as Carbon balance.
Shrub trimmings	35-50	Brown	3:1 with Green	Increase in autumn and winter months, balance with Nitrogenous materials.
Grass clippings	10-15	Green	1:3 with Brown	Surge in spring time at "first cut". Balance with additional Carbon.
Leaves	35-50	Brown	3:1 with Green	Surge in autumn months. Balance with Nitrogenous materials.
Brewery waste	15	Green	1:3 with Brown	Steady. Blend with Carbon materials.
Waste from animal feed production	35	Brown	3:1 with Green	Steady. Balance with Nitrogenous materials.

2.2 Feedstock Management

As identified in Table 1 there are various potential compositions for the waste types accepted onto site which have a med-high odour potential. In order to manage the feedstock inputs an assessment of the variation by waste source by season is provided, the implication on odour generation, and the management controls to mitigate odours. Table 3 outlines the controls required at the waste feedstock stage.

¹⁰ Aggregated typical values from range of sources including: NRAES (1992) On farm composting handbook (1992); Defra (2009) Good Practice and Regulatory Guidance on Composting and Odour Control for Local Authorities; Lens *et al.*, (2004) Resource Recovery and Reuse in Organic Solid Waste Management.

Table 3 - Feedstock Variation and Management Controls

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source
Kerbside collected.	<p>April – September: Increasing grass clippings content (typically peaking at 40%+ in May-June from experience). Short, sharp, tonnage surges possible (e.g. collections around bank holiday weekends) Accordingly, loads increasingly compacted due to material density.</p>	<p>Degradation could begin rapidly. Excess nitrogen will form ammonia and odorous compounds.</p>	<p>Source additional “woody” / carbonaceous material in anticipation of warm, wet, weather when possible.</p> <p>In the event of sudden summer green waste “surge” overwhelming treatment capacity, broker material to other local compost facility.</p>	<p>Local Authority collections undertaken on a bi-weekly basis.</p> <p>Material up to 14 days old.</p>
	<p>October – March: Increase in “woody” type materials (branches etc.), resulting in higher C:N ratios.</p>	<p>Material unlikely likely to compost rapidly, so odour potential is decreased, but still present if stored too long.</p>	<p>Green waste loads from October to March containing large amounts of “woody” type materials (branches etc.) may need to be blended together to improve C:N ratio.</p>	
Civic amenity (HWRC) green waste.	<p>April – September: Increasing grass clippings content (peaking at 40%+ in May – June). Short, sharp, tonnage surges possible over bank holiday weekends. Accordingly, loads increasingly compacted due to material density, and contractors desire to maximise bin</p>	<p>Degradation could begin rapidly. Excess nitrogen will form ammonia and odorous compounds. Increased risk of evaporation.</p>	<p>Source additional “woody” / carbonaceous material in anticipation of warm, wet, weather when possible.</p> <p>In the event of sudden summer green waste “surge” overwhelming treatment capacity, leading to green stockpile in reception building longer than 2</p>	<p>Local CA sites where material can be stored up to 1 week before arriving on site.</p> <p>Material up to 7 days old.</p>

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source
	<p>weights / payloads.</p> <p>Potential for waste to be kept in warm conditions prior to delivery (waste exposed to direct sunlight in site bins).</p>		<p>days, broker material to other local compost facility.</p>	
	<p>October – March:</p> <p>Increase in “woody” type materials (branches etc.), resulting in higher C:N ratios. Potential for significant “spike” post-Christmas (disposal of Christmas trees).</p>	<p>Material unlikely likely to compost rapidly, so odour potential is decreased, but still present if stored too long.</p>	<p>Adjust green to “woody” green waste ratios during October – March to meet desired C:N ratio. Green wastes loads may need to be blended together to improve C:N ratio.</p>	
<p>Commercial green waste.</p>	<p>April – September:</p> <p>Increasing grass clippings content (typically peaking at 40%+ in May – June from experience). Accordingly, loads increasingly compacted due to material density.</p> <p>Potential for waste to be kept in warm conditions prior to delivery (waste exposed to direct sunlight prior to delivery).</p>	<p>Degradation could begin rapidly. Excess nitrogen will form ammonia and odorous compounds. Increased risk of evaporation.</p>	<p>Source additional “woody” / carbonaceous material in anticipation of warm, wet, weather when possible.</p> <p>In the event of sudden summer green waste “surge” overwhelming treatment capacity, leading to green stockpile in reception building longer than 2 days, broker material to other local compost facility.</p>	<p>Sourced from a variety of local landscape contractors typically within a day of cutting, but potentially up to a week.</p> <p>Material up to 7 days old.</p>

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source
	October to March: Increase in “woody” type materials (branches etc.), resulting in higher C:N ratios.	Material unlikely likely to compost rapidly, so odour potential is decreased, but still present if stored too long.	Adjust green waste to “woody” green waste ratios during October – March to meet desired C:N ratio. Green wastes loads may need to be blended together to improve C:N ratio.	
Sugar Beet Pulp	Sugar Beet is processed from Oct – June. Manufacturing process which produces uniform pulp.	Material may be wet and already started to degrade.	Stock pile material to allow drying out prior to batch Incorporation. If odour present cover with over size. Ensure mixed well.	Various Commercial contracts. Material is several days old.
Wastes from Brewing Industry.	Brewing industry operates all the year around. Similar tonnage accepted on site each month	Material is moist which creates anaerobic conditions	Material is incorporated into a windrow on the day of receipt, Ensure mixed well.	Bairds Malt. Material is several days old.
Inert soil waste	Local suppliers and park/garden waste operate all year round. Similar tonnage accepted each month.	Material likely to be dry and unlikely to produce odour	Ensure it is mixed well.	Various trusted local aggregate suppliers.

2.3 Contractual Arrangements

The majority of waste to be delivered to the site will be from contracted local authority collection rounds.

Prior to contract sign off, agreements with suppliers as to material type and expected quality with appropriate limits will be set both quantitative and qualitative as appropriate. The quality of material delivered to the site will constantly be reviewed and fed back to suppliers in order to minimise odour potential at the point of receipt.

Waste will be initially inspected by the site operative working on the reception area. Site operatives smell feedstock, prior to mixing, and use a 1-6 scoring system (6 being high). If any feedstock received is assessed to be odorous, and allocated score 3-6, the Site Manager will be informed to undertake the inspection and sign off any rejections. Prior to formal rejection

of a load the Site Manager will be informed to undertake the inspection and sign off any rejections. If the material is rejected for odour, a member of the administration team will be utilised for odour assessment to prevent odour adaption of site operatives providing erroneous judgements.

Waste rejection forms will be filled in and the waste provider contacted immediately upon the rejection of a load. The form will include details of the reason for rejection, action taken and photographic evidence as required.

Note: Odour scores are only recorded if the load is rejected.

New customers are informed of our acceptance criteria and informed that odorous material and contaminated loads will be rejected. All waste bought to the site is inspected prior to and after tipping. If the waste contains an unacceptable level of contaminants or is particularly odorous we would reject the load and ensure the customer is reminded of our acceptance criteria for in the future.

BACS have a contract with Essex County Council which stipulates that contaminants must not be included in loads delivered. If a particularly odorous load was delivered BACS shall contact the ECC to ensure similar loads were not delivered in the future. BACS have sent photos of problematic waste to the ECC which has resulted in representatives from the ECC visiting the site to discuss these loads and measures which can be adopted to prevent this reoccurring.

The majority of waste is delivered in covered lorries. A small amount of green waste is delivered in landscape gardener's trucks.

3.0 ODOUR RELEASE POINTS

In order to determine the points that require odour assessment and management, a review of the composting process has been undertaken. The assessment identifies at which physical locations odours may be released from the site to identify where management controls are required to mitigate such release events. The following section breaks down these release points by stage within the composting process and identifies where on site they are situated.

3.1 Reception

The waste reception area will consist of an area on the pad (ORP 1), which will be used to shred and store the material prior to composting. This reception area will have a designated reception area for green waste and a separate designated reception area for the inert soils waste materials.

3.2 Composting Pad

The OWC active processing occurs on external pad which includes operational activities of waste shredding, active composting in open windrows, windrow turning, screening and material movements (ORP 2).

3.3 Product Storage

The product storage area (ORP 3) is utilised for PAS100/QP compliant composts only, prior to removal from the site. Material is stored in open conditions with an odour release potential that requires management procedures to be implemented.

3.4 Leachate Storage Lagoon

Leachate is captured at the composting pad (ORP 4) to prevent pollution to the ground/groundwater. Leachate has the potential to be odorous given the organic component within the water. Management is required to prevent release of odours from this storage lagoon.

3.5 Odour Release Point Inventory

All identified odour release points have been collated into the table below for quick reference. The inventory assists in identifying the physical locations that require management.

Table 4 – Odour Release Point Inventory

Odour Release Point	Description	Location and Process
ORP1	Reception Area	OWC Pad: Material reception
ORP2	Composting Pad	OWC Pad: Material shredding, movement, active composting, windrow turning and screening
ORP3	Product Storage Area	Product Storage Area: storage of PAS100/QP compliant composts

ORP4	Leachate Storage Lagoon	Adjacent to composting pad at the OWC facility
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4.0 ODOUR INVENTORY

In order to determine the points that require odour assessment and management a review of the composting process and odour potential for materials at each stage of the process is provided. The assessment identifies at which physical locations on site potentially odorous materials are stored, upper limits for storage amounts and the potential odour impact of those materials to inform management procedures.

4.1 Waste Reception

Storage limits have been defined by processing space and time to process all material in storage at any one time. Management of storage limits is linked to batch formation records which identify all loads by weight and time of reception that form the batch to be processed. Therefore, for materials awaiting processing, the record sheets provide an age and weight of material within the reception stage.

Location	Storage Limits	Odour Potential	Management
Waste Reception	<1,000t <48hrs from receipt	<u>Medium – High</u> Material could be up to 2 weeks old and started to biodegrade. Depending upon the nature of the material, high nitrogen wastes e.g. cut grass, will have a higher odour potential.	Section 1.2.6. PAS 100 SOPS 3.1

4.2 Rejected Loads

In the abnormal incidents of loads requiring rejection there will be a requirement for holding material for a period of time prior to leaving the site. Depending on the contractual arrangements for the waste the material may be immediately loaded back onto the delivery vehicle thereby not requiring on site storage.

Material can be rejected by staff members or Company Directors, for different reasons, such as not being as described on the waste transfer note, being elevated in level of physical contamination, or being unsuitable for the composting process such as being too wet or too odorous. Storage limits will usually be set by the amount of waste to be rejected which is not expected to be above that of a usual delivery.

A rejected load record sheet will be compiled for all rejected loads awaiting removal from site. The record sheet will link to weighbridge tickets allowing full traceability including time and tonnages to comply with the proposed limits.

Location	Storage Limits	Odour Potential	Management
Waste Reception	<100t <24hrs of receipt	<u>High</u> Material could be rejected due to being abnormally odorous.	Section 4.4.1

4.3 Shredding

Material is shredded prior to the composting phase. The material is continually moved from the shredding area into the active composting area to limit incidental storage. Shredded material is formed into windrows. Any odorous material, which may need to be stored overnight prior to shredding, is covered with oversize material.

Batch record sheets detail when shredding has taken place by batch and therefore the age and tonnage of material that comply with the proposed storage limit.

Location	Storage Limits Before composting	Odour Potential	Management
Composting Pad Shredding Area	<500t	<u>Medium – High</u> Material processed within 48hrs of receipt and agitation could release odour.	Section 1.2.6. PAS 100 3.1

4.4 Sanitisation

Material is formed into 350t batches and processed through an open windrow turned system on the external composting pad.

Batch record sheets detail each batch under process including the age and tonnage of material that comply with the proposed storage limit.

Location	Storage Limits	Odour Potential	Management
OW Concrete Pad	<10,000t <3 weeks	<u>Medium – High</u> Active phase has the potential for odour which diminishes as material ages.	PAS 100 SOPS 4.2

4.5 Stabilisation

A period of stabilisation of post sanitised material takes place in open windrows on the OWC concrete pad. Material is processed for a typical 8-week process to stabilise the compost and meet the quality requirements of PAS100/QP.

Batch record sheets detail each batch under process including the age and tonnage of material that comply with the proposed storage limit.

Location	Storage Limits	Odour Potential	Management
Composting Pad	<10,000t <6 weeks	<u>Medium</u> The material has completed the active composting phase and the odour potential of the material is reduced.	PAS 100 SOPS 4.2

4.6 Screening

Following the completion of each composting process, material is screened to remove contaminants and to a grade suitable for the end market. Material at this stage has completed the active composting phase and is mature with a lower odour potential. Material is batch screened between completion of the composting process and moving into product storage.

Given the losses during the composting process the amount in transitional storage during the screening is approximately half that of the batch at point of formation. Materials are screened at the dedicated screening area.

Batch record sheets detail each batch that is being screened including the age and tonnage of material that comply with the proposed storage limit.

Location	Storage Limits	Odour Potential	Management
Screening Area	<400t <5 days	<u>Low - Medium</u> The material has completed the active composting phase and the odour potential of the material is reduced. Agitation of the material may release odours.	PAS 100 SOPS 8.0

4.7 Product Storage

Following the completion of product screening, material will have completed the PAS100 requirements and reaches end of waste status. Material at this stage has completed the active composting phase and is mature with a low odour potential.

Batch record sheets detail each batch being stored prior to dispatch including the age and tonnage of material that comply with the proposed storage limit.

Location	Storage Limits	Odour Potential	Management
Product Storage Area	<3,000t <12 months	<u>Low</u> The material has completed the active composting phase and the odour potential of the material is greatly reduced.	PAS 100 SOPS 8.4

4.8 Amendment Materials

In order to provide a suitable mix of carbonaceous and nitrogenous materials, a stock of amendment carbon based materials are held on site for blending purposes. The amendment material is a mix of compost oversize, straw and large woody fresh materials, e.g. large branches.

Batch record sheets detail screened oversize being stored including the age and tonnage of material that comply with the proposed storage limit and from which compost batch it was sourced.

Location	Storage Limits	Odour Potential	Management
Amendment Materials Storage Area	<500t <6 months	<u>Low</u> The material is specially selected for low odour potential and is high in carbon for addition to the more unstable nitrogenous wastes.	PAS 100 2.3

4.9 Leachate

All leachate resulting from composting operations on site is captured through the integral drainage and storage system. All external composting activities take place on concrete and hard-standing and leachate is then piped to a dedicated leachate storage lagoon.

Location	Storage Limits	Odour Potential	Management
Leachate Lagoon	<75% capacity	<u>Low - Medium</u> Leachate within the lagoon is aerated and heavily diluted with rainwater falling on the pad, greatly reducing the odour potential.	Section 2.2.6 and 2.2.7

5.0 PROCESS MANAGEMENT

The following sections outline the waste recovery processes operated for the production of PAS100 compost. The monitoring parameters, critical limits, process controls and records at each stage within the recovery process for the minimisation of the production of odours are provided herein. Reference is made throughout to the sites Standard Operating Procedure (SOP) for the production of PAS100 compost.

5.1 Pre-Acceptance

Personnel shall ensure that the site has the required number of qualified staff on site prior to the waste acceptance and rejection procedures. Personnel shall ensure that the site has capacity to store and treat any incoming waste. Personnel shall ensure that the site will not exceed Permit conditions by accepting any incoming wastes.

5.2 Waste Acceptance

5.2.1 All waste materials

All operatives will be advised of a procedure for handling waste materials entering the site.

All vehicles entering or leaving site will be weighed on the site's weighbridge. The following details will be recorded by the weighbridge operative:

- the full address where the waste was produced;
- the identity of the producer;
- delivery vehicle registration no.;
- date and time of vehicle depositing waste;
- description of waste material; and,
- weight of deposited material.

The weighbridge data is emailed to the Site Manager daily and the information is stored in spreadsheets for deliveries and customer information. Paper waste transfer notes are stored in the office.

On entering the site, waste carrying vehicles will initially be visually inspected to ensure that the wastes are as described on the waste transfer note and comply with the waste management licence. If visual inspection of waste prior to tipping identifies unsuitable wastes, the vehicle will not be allowed to unload.

On arrival, vehicles are weighed on the site weighbridge and directed to the reception area on the site where they unload into the specified tipping area. Once offloaded, material is inspected by site staff for contamination and any gross contamination removed by hand (i.e. large objects, plastic etc).

At the same time, for green waste material, the operator undertakes a visual assessment of the likely carbon to nitrogen balance and the likely moisture content to identify the need for the incorporation of other materials i.e. woody material, water. Sufficient stocks of oversize, straw and woody materials will be kept onsite to adjust the feedstock. Should the stock of

amendments run low the site will either screen some compost to replenish the supply or shred some appropriate clean wood waste. Should the site exhaust all supplies of amendment materials, and not be able to obtain any further suppliers, deliveries of feedstock needing amendment will cease.

5.2.2 Inert Waste Soil

At all times, the waste acceptance procedure described in Section 5.2 will be adhered to. Additionally, the site manager/director will undertake site visits of the inert soil waste production facilities of our core suppliers prior to the acceptance of any waste soil, with the aim to visually inspect the source of the inert soil waste, review their operational standards and ensure that these align with the BACS sites strict waste acceptance criteria. The site visits will also be used to educate suppliers on our expectations regarding contamination. Furthermore, all new suppliers will undergo a meeting with the site manager/director where the core requirements of BS 3882 (with respect to sourcing of soil) will be presented. Soil contamination could include (not limited to) exceedances of oil, fuel, hardcore, concrete, green waste, sub soil, clay and excess quantities of stones. Customer responses confirming no contamination are electronically stored on the office computer.

The following waste codes are accepted onto site for inert soil processing:

- 17 05 04 soil and stones other than those mentioned in 17 05 03 (non-hazardous from construction sites)
- 20 02 02 soils and stones (garden and park waste)

All new suppliers will receive an inert waste acceptance leaflet containing details of permitted and non-permitted waste and will include our contact information should a supplier have any queries regarding what waste is accepted on site. Additionally, suppliers are required to sign a formal agreement to say that the soil does not contain such contamination. Any load that is identified as being contaminated on arrival at the BACS site will be rejected as per Section 5.2.2 below.

In accordance with best practice guidelines stated within *BS3882: Specification for topsoil* guidance document, lab testing will be undertaken on samples of topsoil produced at BACS at a frequency of every 2,500 tonnes of screened topsoil that is produced. Each batch of topsoil produced by BACS has traceability. Moreover, an accurate record of weighbridge tickets associated with input material used within each specific batch is maintained digitally on our internal database. Additionally, the database contains details of the customers/buyers of the outgoing topsoil product following treatment at BACS. This process enables full transparency of our supply chain from source to market.

5.3 Waste Rejection

5.3.1 Green Waste

Non-targeted waste materials for recovery through the proposed composting facility shall include:

- Dog, cat and horse waste;

- Wood and paper ash;
- Cardboard;
- Liquid wastes;
- Powders or dusts;
- Highly decomposed wastes e.g. non-stackable;
- Highly odorous wastes, as determined by experienced site operatives.

Any load containing 1% or more non-targeted materials by weight shall be considered above the acceptable contamination threshold and would result in rejection, based on existing contractual arrangements at this percentage level. Percentage contamination will be obtained by visual inspection of the load by a trained operative in line with industry best practice techniques¹¹. Any rejected load will be placed in quarantine, clearly segregated from all other materials and removed from site as soon as possible, and in any case within 24 hours of receipt. A waste rejection form will be completed for any such load and the waste producer informed immediately.

5.3.2 *Inert Waste Soil*

Non-targeted waste materials for recovery through the waste soil treatment facility shall include:

- Oil;
- Fuel;
- Hardcore;
- Concrete;
- Green Waste;
- Sub soil;
- Clay; and
- Excess quantities of stones.

Any load containing 1% or more non-targeted materials by weight shall be considered above the acceptable contamination threshold and would result in rejection. Percentage contamination will be obtained by visual inspection of the load by a trained operative in line with industry best practice techniques. Any rejected load will be placed in quarantine, clearly segregated from all other materials and removed from site as soon as possible and in any case within 24 hours of receipt. A waste rejection form will be completed for any such load and the waste producer informed immediately.

5.4 *Composting*

5.4.1 *Waste Reception*

On arrival, vehicles are weighed on the site weighbridge and directed to the reception area on the site where they unload into the specified tipping area. Once offloaded, materials are inspected by site staff for contamination and any gross contamination removed by hand (i.e. large objects, plastics etc.).

¹¹ ORG (2014) Guidance on visual assessment of light plastics in input materials. Organics Recycling Group.

At the same time the operator undertakes a visual assessment of the likely carbon to nitrogen balance and the likely moisture content to identify the need for the incorporation of other materials i.e. woody material, water. Sufficient stocks of oversize, saw and woody materials will be kept onsite to adjust the feedstock. Should the stock of amendments run low the site will either screen some compost to replenish the supply or shred some appropriate clean wood waste. Should the site exhaust all supplies of amendment materials, and not be able to obtain any further supplies, deliveries of feed stocks needing amendment materials will cease.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Delivery of moist highly nitrogenous material consisting mainly of grass, brewery waste.	Visual Inspection.	Present.	Isolate feedstock from remaining material, add amendment such as woodchip, straw or oversize material and mix thoroughly to open up and aerate the material. On completion the blended material can be covered with oversize or moistened screened compost which will aid in reducing any odorous emissions to the air.	Duty of Care Transfer Note.
Delivery of odorous material that is highly degraded which is not recoverable through mitigation measures.	Visual Inspection.	Present.	Reject load and inform waste supplier.	Duty of Care Transfer Note.
Feedstock material becoming odorous from storage prior to treatment.	Visual assessment and record sheets.	Spring/Summer <1,000t <48 hrs	Material will be shredded as soon as possible and within 48 hrs of receipt. If the waste is very odours or has been stored for more than 1 week before arriving at site, then it will try to be processed within 24hrs but with a maximum of 48hrs. Stockpiles will be "batch shredded" which will ensure that all the material available to be shred is processed, or failing that, the site will shred using a first in, first out system. Odorous waste held overnight will be covered with a layer of oversize	CM PAS100 record sheet
		Autumn/Winter <500t <48hrs		
		Waste >2 weeks old <500t 48hrs		
ORP	1			

5.4.2 Pre-Treatment/ Shredding

Following waste acceptance, a loading shovel is used to deposit the raw material into the hopper of the shredder. The operator can select different loads to achieve the required mix; additionally, the moisture content of the shredded material can be increased. The shredder is located on the reception pad. As part of the existing activities, material is shredded into holding batches prior to windrows being formed, where it is mixed to achieve the appropriate feedstock blend.

Material is batch shredded before being formed into windrows, so obtaining the right carbon: nitrogen ratio during the shredding process is an important factor in reducing odour potential during the shredding and composting process. Typical C: N ratios of between 20:1 and 30:1 are optimal for the composting process. The site is adopting an optimal range of 25:1 to 30:1 which equates to approximately 1-part green (nitrogenous) waste to 3/4 parts brown (carbonaceous) waste.

If there is a NE wind, or a slight wind and off-site odour is detected, consideration will be given to scheduling the shredding to when weather improves. If odour is detected in close proximity to the complainant's house and there is very little green waste waiting to be shredded then staff will stop shredding until the wind direction has changed.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odours to the environment during shredding.	Visual Assessment.	Dry material by visual assessment.	Should material entering the shredder be observed to be dry, water will be added to limit aerial dispersion.(dribble bar situated on exit conveyor of the shredder)	CM PAS100 record sheet
Odours released due to poor mix of feedstock materials.	Visual Assessment.	1:3/4 (green: brown) waste mix.	Waste selected for batch shredding is carried out by visual assessment of green: brown waste ratios. Where there are excessive green waste amounts, clean source-segregated woody fraction, oversize is added to obtain the desired C: N ratio.	CM PAS100 record sheet
		Autumn/Winter <500t 48 hrs		
		Waste >2 weeks old <500t 48hrs		
ORP	2			

5.4.3 Windrow Formation

Green waste is formed into windrows on the composting pad with dimensions of each windrow will be a maximum of 3 metres high and approximately 5 metres wide and 50 metres long to a maximum of 500t per batch. Gaps of suitable width to provide a defined walkway and enable turning/monitoring and litter picking will be left between the windrows. A larger windrow will have a smaller surface area to volume ratio and will therefore reduce the surface area of an odorous material; this will cut the rate of evaporation.

When a windrow is small, the core zone of the pile may not reach ambient temperatures and will therefore lose its heat very rapidly. As a result, this can lead to moisture being retained in the windrow meaning it is a cooler windrow. High temperatures are required to ensure pathogens and weed seeds are killed off. Oxygen consumption by microbes ensures the compost is biodegraded, however when there is a lack of oxygen the composting process slows down and odours may result. The readings from the monitoring will determine when the windrows should be turned and when moisture needs to be added.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Over-size windrow leading to anaerobic conditions.	Visual Assessment.	650 tonnes.	Material is formed into windrows with a target wt. of 350 t not exceeding 500 tonnes by way of visual assessment of volume and windrow dimension and green waste accepted tonnages. Composting process is actively managed to PAS100 to ensure that material is progressing through the system to allow adequate space on the pad.	CM PAS100 record sheet
ORP	2			

5.4.4 Sanitisation

The sanitisation phase is a minimum of 7 days at 60 degrees centigrade during which time monitoring equipment will be used for temperature monitoring and moisture levels will be assessed by both Compost Manager ((CM) (which recommends when to irrigate)) and a grip test to ensure critical limits for composting are being met and over watering does not occur. Oxygen monitoring will also be undertaken to directly monitor oxygen levels within the windrow, using Compost Manager. During this period a minimum of 1 turn is made to fully incorporate the compost by 360 excavator or sometimes a loading shovel.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Windrow oxygen levels low leading to anaerobic conditions	Temperature, Oxygen and Moisture Monitoring.	As below	Oxygen levels are directly related to temperature and moisture levels. Where these are elevated above critical limits, windrows will be turned to fully aerate.	CM PAS100 record sheet
Windrow too dry leading to slow process and pad backlog.	Moisture Monitoring.	Moisture Index: 5. CM <35%	Additions of water to compost should be done on a little and often basis. If additional moisture is required by monitoring moisture content less than the critical limit, process water is applied directly to the windrow. Too much water should not be added as it will generate excessive runoff onto the composting pad.	CM PAS100 record sheet
Windrow too wet leading to anaerobic conditions.	Moisture Monitoring.	Moisture Index: 1-2 CM >65%	The compost windrows are free draining onto a concrete pad to enable runoff from excessive moisture content. If elevated moisture levels are encountered, windrow is turned as soon as possible to fully aerate.	CM PAS100 record sheet

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Windrow not in optimal temperature range for composting.	Temperature Monitoring.	>70°C.	Compost is formed into windrows of adequate size in order to generate required temperatures during active composting phases. Should temperature become elevated above critical limits, windrows will be turned as soon as possible to fully aerate.	CM PAS100 record sheet
Windrow becoming anaerobic due to lack of oxygen within the material.	Oxygen Monitoring	< 5%	Compost is fully aerated to ensure adequate levels of oxygen within the windrows. Oxygen levels are directly monitored in the windrow profile. Should monitoring indicate a diffusion problem the windrow will be turned to introduce fresh air within 1 day (turning is usually undertaken using a 360 excavator).	CM PAS100 record sheet
Evaporation from windrow surface.	Visual Assessment.	Large amounts of steam from windrow by visual assessment.	Should there be large amounts of steam visible from a composting windrow, the windrow will be temperature monitored to ensure the windrow is within critical limits. If not the windrow is turned as soon as possible in order to fully aerate.	CM PAS100 record sheet
Release of odour during windrow turning.	Visual assessment and record sheets.	Minimum 1 and as required	A regular turning regime is implemented in line with PAS100 that ensures aerobic conditions within the windrow. Turning is carried out once in this phase and again as required by monitoring parameters.	CM PAS100 record sheet
	Local Time.	Outside of core hours.	Where outside of core hours, turning of compost windrows shall not take place.	Site Diary.
	Weathervane	Wind direction NE	If the wind is blowing towards the NE, then consideration will be given to delaying windrow turning. Should this not be possible sniff testing will take place during the turning period.	Site Diary.
ORP	2			

5.4.5 Stabilisation

Following completion of the sanitisation phase, materials are further processed to mature. Stabilisation of these materials is undertaken in open windrows on the external composting pad.

The stabilisation phase is a minimum 7-week process during which time monitoring equipment will be used for temperature monitoring and moisture levels will be assessed by grip test to ensure critical limits for composting are being met. Oxygen monitoring undertaken to directly monitor oxygen levels within the windrow. During this period a minimum of 1 turn is made to fully incorporate the compost by loading shovel.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Windrow too dry leading to slow process and material backlog.	Moisture Monitoring.	Moisture Index: 5 CM <35%	Additions of water to compost should be done on a little and often basis. If additional moisture is required by monitoring moisture content less than the critical limit, clean water only is applied directly to the windrow.	CM PAS100 record sheet
Windrow too wet leading to anaerobic conditions.	Moisture Monitoring.	Moisture Index: 1-2 CM >65%	The compost windrows are free draining onto a drainage system to enable runoff from excessive moisture content. Aeration of windrows will aid the drying of material to prevent high moisture levels occurring. If elevated moisture levels are encountered, additional air is introduced as soon as possible to fully aerate via turning.	CM PAS100 record sheet
Windrow not in optimal temperature range for composting.	Temperature Monitoring.	> 70°C.	Compost is formed into windrows of adequate size in order to generate required temperatures during active composting phases. Should temperature become elevated above critical limits, windrows will be turned to introduce fresh air as soon as possible to fully aerate.	CM PAS100 record sheet
Windrow becoming anaerobic due to lack of oxygen within the material.	Oxygen Monitoring	< 5%	Compost is fully aerated to ensure adequate levels of oxygen within the windrows. Oxygen levels are directly monitored in the windrow profile. Should monitoring indicate a diffusion problem the windrow will be turned to introduce fresh air within 1 day (turning is usually undertaken using a 360 excavator).	CM PAS100 record sheet
Evaporation from windrow surface.	Visual Assessment.	Large amounts of steam from windrow by visual assessment	Should there be large amounts of steam visible from a composting windrow, the windrow will be temperature monitored to ensure the windrow is within critical limits. If not, the windrow is turned as soon as possible in order to fully aerate.	CM PAS100 record sheet
Release of odour during turning.	Visual assessment and record sheets.	Minimum of 2 turns and as required.	A regular turning regime is implemented in line with PAS100 that ensures aerobic conditions within the windrow. Turning is carried out twice in this phase and again as required by monitoring parameters.	CM PAS100 record sheet

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
	Local Time.	Outside of core hours.	Where outside of core operational hours, turning of compost windrows shall not take place.	Site Diary.
	Weathervane	Wind direction NE or slight wind	If the wind is blowing towards the NE, or if there is a slight wind and off-site odour is detected, then consideration will be given to delaying windrow turning. If odour is detected in close proximity to the complainant's house and there are very few windrows which require turning, then windrow turning will be delayed until the wind direction has changed. Should this not be possible sniff testing will take place during the turning period	Site Diary.
ORP	2			

5.4.6 Screening

Screening of the compost following the active composting phase shall be carried out with a trommel or vibrating screen to create a soil improver, certified to PAS 100 & CQP. The date(s) on which each batch is screened and its batch code shall be recorded on the CM PAS100 record sheet. Oversize material coming off the screener shall only be re-composted if visual assessment confirms that physical contaminants will not adversely affect the composting process or prevent effective control of compost quality (as stated in the quality policy). Addition of oversize material to a batch of composting material shall only be carried out when it is being formed. If the oversize material is too heavily contaminated for re-composting, it shall be rejected and disposed of.

Screening of matured material can result in increased emissions due to agitation. However, screening is typically not a significant odour source unless the material has become anaerobic or is still actively composting. The latter is prevented through robust monitoring and management as identified in the table below.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odorous compounds to the atmosphere.	Monitoring records.	Spring/Summer <400t <5 days	Compost that is to be screened shall only take place if the material has completed the active composting phase and met the critical limits throughout this period.	CM PAS100 record sheet
ORP	2			

5.4.7 Product Storage

Following screening, products are stored on the storage area to the north of the OWC site in the product storage area ready for dispatch to the end markets. Each product batch is identifiable in its storage location by a marker that displays its unique product batch code and may be stored for a maximum of 12 months before dispatch to the customer.

During product storage there is not a significant source of odour generation given the age of material at this point following a typical 8-week minimum composting process. However, if oxygen, moisture and temperature are not controlled the biological processes can re-accelerate and result in the onset of anaerobic conditions. The process control is outlined below.

Products will be stored no higher than 3m to ensure that the centre of the pile does not become too high in temperature with minimal levels of oxygen.

The length of time screened compost is stored on site varies depending on customer demand. Up to 1500 tonnes of 0-20mm compost and 500 tonnes of 0-10mm compost could be stored on site.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odours from anaerobic product storage conditions.	Visual Assessment	Steaming from product storage piles. Temperature : >45°C <5,000t <12 months	Compost that is to be stored shall only be material that has completed the active composting phase and met the critical limits throughout this period. Temperature spots checks are carried out. Should any visual signs of steaming from the product storage pile be identified, temperature readings are taken and if temperatures exceed the critical limit, stockpiles are turned to fully aerate.	Site Diary.
ORP	3			

5.5 Site Infrastructure

The composting facility has infrastructure to control emissions from site at various stages of the process, namely leachate management and odour treatment units.

5.5.1 Drainage System

The open windrow composting pad is laid to a 1 in 50 fall which drains into an open ditch, which is then piped to a dedicated leachate lagoon. Routine monitoring is carried out to ensure the lagoon is operating below maximum capacity.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Blocking of drains leading to pooling of leachate on concrete surfacing.	Visual Assessment	Particulate blockages.	Site inspections are made to ensure that no drains are blocked by loose compost. Where identified, material is swept up immediately and re-processed as soon as practicably possible.	Site Diary.
Release of odours from leachate storage conditions on OWC.	Visual Assessment	<90% Capacity	In order to prevent the overflowing of the leachate storage lagoon, a visual assessment is made weekly to ensure that levels are within 90% of tank capacity. When this critical limit is met, leachate is pumped out within 48hrs. Leachate will either be spread to land or should Compost Manager indicate a requirement for moisture it is spread onto windrows during the first 2 weeks of the composting process.	Site Diary.
ORP	4			

5.6 Management System

The Management System includes details of maintenance and housekeeping schedules. Housekeeping and cleaning schedules ensure organic material does not adhere or aggregate in any areas of the site to produce an odour.

5.7 Process Monitoring

Additional information regarding the specific monitoring regimes for the waste treatment processes are presented within the sites Standard Operating Procedures. The table below identifies the monitoring frequency for the various parameters as identified throughout section 3, as well as the calibration schedule for monitoring equipment.

Table 5 - Process Monitoring Frequency

Parameter	Process Stage	Frequency	Calibration
Temperature	Sanitisation	Daily. 1.2m below surface, 1 reading per 250m ³ by CM probe.	CM - 12 monthly
	Stabilisation	Weekly. 1.2m below surface, 1 reading per 250m ³ by CM probe.	
Moisture	Sanitisation	Daily. 1.2m below surface, 1 reading per 250m ³ by CM probe or grip test.	Calibrated to dry oven and balance 12 monthly. CM - 12 Monthly
	Stabilisation	Weekly. 1.2m below surface, 1 reading per 250m ³ by CM probe or grip test.	

5.8 Temperature

Temperature monitoring is carried out during sanitisation and stabilisation on the open windrow composting pad. Spot checks are carried out on screened compost in storage. Temperature is measured using Compost Manager by inserting the probe from the top of the windrow/storage pile to ensure the core is reached. Although the probes will reach the core zone where the temperatures will be read the temperatures at the edge of the windrow will be lower. However, the turning schedule will ensure that this area does reach the temperatures required during sanitisation and stabilisation.

5.9 Moisture

Moisture is generally taken using the 'Compost Manager'(CM) probe which gives a percentage reading for moisture. In the event of the failure of the CM system, moisture can be assessed manually using the 'squeeze' test, which will be conducted using procedures in accordance with BS EN 12579 by a suitably trained site operative to check moisture content as follows: *The sample of the material is selected in accordance with the standard then grasped and clenched in a gloved hand for approximately ten seconds, then the hand is opened and the moisture content assessed using the information below.*

Table 6 - Moisture Assessment Index

Index number	Sample Moisture Behaviour	Interpretation
1	Water seeps out	Too wet. CM >65 %
2	More than one droplet appears	Too wet CM >65 %
3	One droplet appears	OK CM 50 - 65%
4	Compost particles remain packed together and no droplets appear	OK CM 35-50%
5	Compost particles fall away from each other	Too dry CM <35 %

Figure 2 below shows the core area of the compost windrow. As the CM probe will be inserted to a depth of 1.2m the readings will indicate core zone temperatures and moisture as the core area is large. A 1.2m probe will be more than effective at taking a core zone reading.

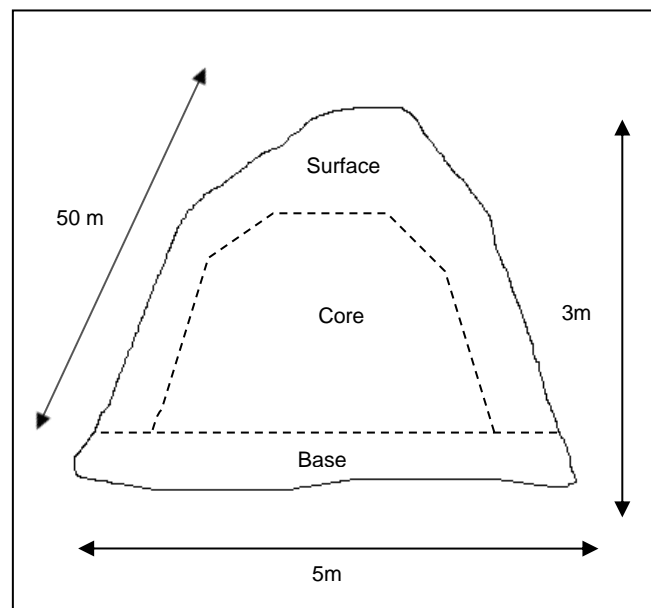


Figure 2 – Typical Batch Size and Zones

5.10 Oxygen Monitoring

Oxygen monitoring is undertaken using the Compost Manager System (CM).

In order to ensure aerobic conditions are being met, management processes will be employed at all stages of the composting process including:

- Feedstock blending to appropriate structure and ratio;
- Moisture and temperature monitoring to ensure active biodegradation can take place;
- Turning as required by monitoring parameters to fully aerate each windrow.

Birch Airfield Composting Services Ltd actively manage the composting process to ensure the correct structure and ratio is maintained. Moisture readings are undertaken regularly by a trained site operative and calibrated temperature probes take readings of the windrows. Turning is undertaken to ensure the windrows are fully aerated.

5.11 Contingency Planning

Should the above process controls fail at any point within the processing of wastes through either of the operational processes, acceptance of waste into the site will cease and the odorous material taken off site for disposal at a suitably licensed waste management facility. Receipt of feedstock materials shall not recommence until a full review of this Odour Management Plan has been conducted and process controls (including critical limits) amended as required.

5.12 Internal Odour Assessment and Monitoring

Birch Airfield Composting Services Ltd will carry out odour checks at 6 points around the perimeter of the site on a twice daily basis. Monitoring is undertaken once in the morning following a period of operational activity (typically 9am) and once in the afternoon (typically

2pm). Abnormal findings will be recorded in the Odour Assessment Report (Annex B) or noted in the site diary. The odour assessment will be undertaken by the Site Manager, or Director who has been trained in odour assessment. The Directors are not directly involved in material movements, this is to ensure that the assessor is not suffering from odour fatigue and will be sensitive to composting odours.

Any odours found to be present onsite will be recorded and their source investigated and steps will be taken to mitigate the sources of odours using the strategies to control odour as outlined above. The internal monitoring procedure, including a survey of odour reports will be re-assessed on a yearly basis by the Managing Director, unless the number of odour incidents warrants additional reviews.

5.12.1 *Passive Odour Management*

Compost pad surface improvements:

Each year further concrete is laid, reducing the area of hard core and uneven surfaces which encourage pooling of water. The exposed area of the pad is scraped and brushed to keep the area clean, this operation will take place daily. Large straw bales are pushed along to soak up water. If the daily site checks identify leachate puddles, or any areas which could cause odour, these are soaked up with woodchip and brushed away.

Site operatives will undertake daily site checks and will scrape up any loose materials to minimise, where reasonably practicable, any materials that are left on edges or corners of the site.

The site operates to a standard operating procedure and to BSI PAS 100:2018 where material on site is batched and traceable. Batches will be monitored for temperature once they have been placed in the maturation stockpile. Undertaking recognised best practice will minimise any opportunities for odour generation from the site.

5.13 *Daily Checks*

A Site Diary (Annex C) has been produced. This checklist will be filled in daily by the site manager in order to monitor the site cleanliness and weather conditions which may affect odour controls. The monitoring will take place on a daily basis and is designed to reduce the potential for odour. This checklist will be kept in the site office and will be produced upon the request of the EA.

The Directors assess priorities on a daily basis, taking into consideration weather conditions, when making decisions as to whether or not operations should be permitted.

6.0 EVAPORATION

Evaporation from the OWC process is likely to be prevalent given the nature of the process and external location. Over the 8 weeks of active composting, compost moisture levels can drop from 65% to 40% representing a loss (predominantly of moisture) of the total weight of the windrow. The moisture within the compost is lost to the atmosphere through evaporation from the surface of the windrow, and may be the vector for odorous chemicals to enter the atmosphere. As detailed within Section 3 there are several process controls in place to minimise the evaporation potential of the composting processes.

In summary, the process controls include the moisture monitoring of PAS100 compost to ensure that the composting process is in line with industry guidelines. This will prevent an overly wet windrow being formed on the composting pad which could lead to elevated levels of evaporation from the site. In addition, the PAS100 compost is regularly turned in order to fully aerate and incorporate material from the windrow surface, core and basal zones. This turning, in addition to other process controls, will prevent the creation of anaerobic conditions which will enable the production of odorous compounds which could then be lost to the atmosphere through evaporation.

Additionally, windrows are formed of adequate size to reduce the overall surface area of compost exposed to the wind driving evaporation. Smaller windrows increase the surface area and thus increase the amount of evaporation encountered.

6.1 Leachate Lagoon

The leachate level within the lagoon is regularly monitored to ensure they are within 75% of full capacity. The lagoon capacity is approximately 370,000 gallons.

The lagoon is aerated on a daily basis during site opening hours:

Monday – Friday	07.00 – 18.30
Saturday	07.00 – 17.00
Sunday and Public Holidays	09.00 – 16.00

Leachate can be removed off site as Birch Airfield Composting Services Limited has a current deployment in place. This must be done in compliance with deployment conditions.

There is a separate land spreading OMP for the Deployment.

The level of silt in the lagoon will be monitored to assess when a further de-silt will be required, based on historical data this is likely to be in several years hence.

The intention is to test leachate on an annual basis.

7.0 CONTAINMENT AND ABATEMENT

The site currently does not employ a containment system on site.

7.1 Abatement System

Odour abatement systems are not used, however a dust control system is in use.

1. **Front Boundary.** A dust control system is fixed at high level along the track that exists between the site and the solar array. This is a traditional 'wet' system with water atomised into the air via a high-pressure nozzle line.
2. **Shredding.** Water is added to material whilst being shredded via a spray bar.

The dust control system is automatically controlled by wind direction sensors. Manual override of this facility is possible should extreme conditions prevail.

8.0 DISPERSION

The following section identifies the prevailing weather conditions on site, in particular the wind direction in order to predict the path of likely aerial dispersion of odours generated on site. By constant monitoring and even forecasting of poor dispersion conditions, Birch Airfield Composting Services Ltd can trigger contingency measures to temporarily enhance odour controls.

Information on wind direction has been derived from the weathervane situated on site. This data is illustrated by the wind rose in Figure 5. Wind data is collected daily as part of the routine monitoring on site. 8-point wind directions are provided below produced from data collected 01 Jan 2022 – 22 Jul 2022.

Table 7 - Wind Direction Data

Wind Direction (from)	N	NE	E	SE	S	SW	W	NW
% Occurrence	9	13	6	9	3	195	14	27

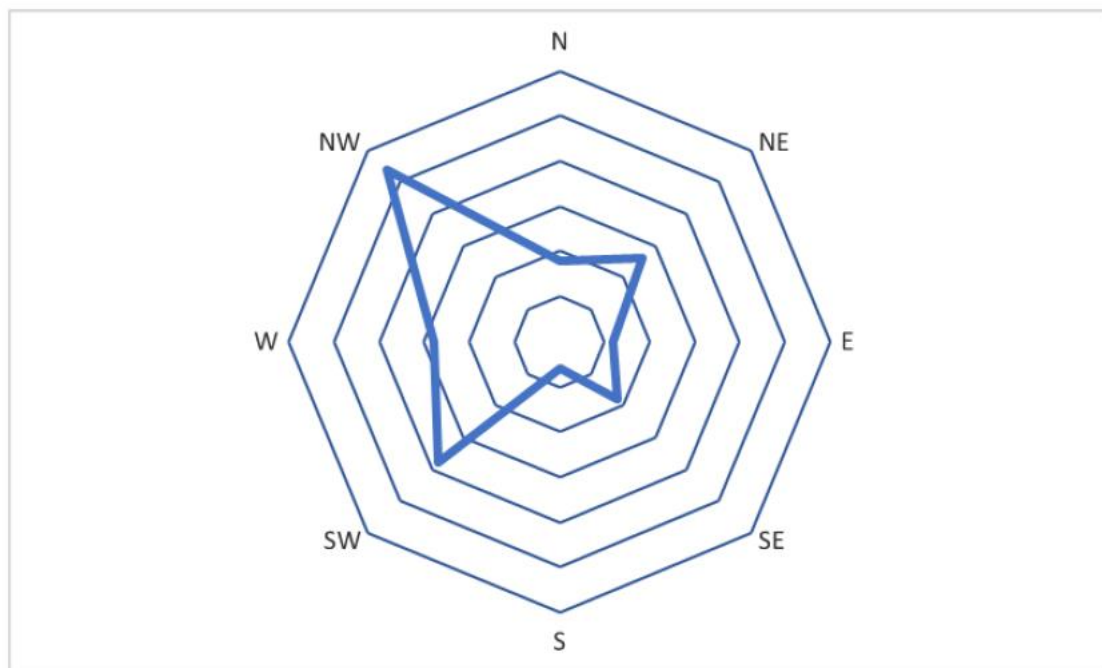


Figure 3 - Wind Direction Rose

Birch Airfield Composting Services Ltd operate a weathervane to provide an instant visual guide as to the wind strength and direction to assist site operatives carrying out daily operations on site.

9.0 SENSITIVE RECEPTORS

The site is situated within a rural area and surrounded predominantly by agricultural land. Villages within proximity to the site include that of Messing, located approximately 1.4 km to the southwest; Smythe’s Green 1.5km to the southeast, Easthorpe 1.6 km to the northeast, north, northwest and Birch approximately 2.2 km east-northeast of the site. There are no sensitive receptors within 250m, the nearest residential properties to the site are detailed in Table 8.

Table 8 - Distance to Nearest Identified Sensitive Receptors

Receptor Reference	Receptor Name	Land Use	Approximate Distance from Site (m)	Direction from Site	Occurrence that Wind Blows in Direction of Receptor (%)	Sensitivity to Odour
A	Cantfield's Farm	Commercial	640	NNE	11	Medium
B	Birch Holt	Residential	800	SSE	21	High
C	Messing Lodge	Residential	850	W	6	High
D	Sandford Hall Green	Residential	1100	ENE	23	High
E	Palmers Farm	Commercial	1,300	ESE	17	Medium
F	Birch Holt Cottages	Residential	1,400	SE	27	High
G	Messing Village	Residential	1,400	WSW	10	High
H	Smythe's Green Village	Residential	1,500	SE	27	High
I	Easthorpe Village	Residential	1,600	N	3	High
J	Birch Village	Residential	2,200	ENE	17	High

The locations of the sensitive receptors are presented in Figure 4 below.



Figure 4 - Map of Sensitive Receptors

9.1 Dispersal Control

There are residential sensitive receptors within close proximity of the site. Site operations take place with due regard to wind direction. Site operations are under the direct control of the Site Manager and or Directors.

9.2 Community Engagement

Birch Airfield Composting Services Ltd will strive to educate the local community through the use of site tours both for schools and local resident groups including businesses.

If an action is being considered that may cause temporary odour, outside of the normal operational procedures identified previously, then before such action is taken the operations manager will be informed. The EA and neighbours who may be affected will be contacted to advise them of the operation being undertaken, and that any increase in odour will be of a temporary nature.

All complaints will be recorded and actioned in accordance with the complaints procedure. In the event of a significant odour incident caused by the facility, a letter of apology will be sent out within a week to all affected sensitive receptors. The apology will include a written commitment from the operator to try and prevent further odour occurrences, with an

explanation of what those preventative methods will be. Feedback will be given to any complainants on the findings of odour investigations when/if they are known. A summary will be provided of any remedial measures taken to rectify odour problems and ensure that the problem has been suitably resolved.

9.3 Responsibilities

The overall responsibility for the site shall remain with the Company's Director, Angela Morton. Day to day operational responsibility for the open windrow is maintained by the site's competent persons or COTC holders (Certificate of Technical Competence holders); Angela Morton.

In the event of an odour incident the odour accident plan will come into force which will initially deal with the accident, the causes and consequences of the accident, and then look to mitigate any potential odour issues which may have resulted from the accident.

9.4 Training

The Site Manager or Director is responsible for leading training on the Odour Management Plan to staff once a year. The Odour Management Plan is stored electronically at site on the laptop located within the site office. The plant operators have digital access to the Odour Management Plan and a printed copy is stored in the site office in a folder.

9.5 Procedures when Odours Arise

There is an internal odour procedure (see Annex B) and an external complaints procedure (as outlined below and in Annex A) to ensure any odour issues are dealt with quickly and effectively.

9.5.1 External Complaints Procedure

Any complaints relating to the odour of the site will be taken seriously and channelled through a senior member of staff, in this case the Director. Staff taking note of the complaint will use the appropriate Odour Complaint Form (see Annex A). Once the complaint is taken, the Site Manager will investigate the complaint and the site activities and respond to the complainant in writing outlining any findings and actions taken to mitigate the source of odours.

Any complaints, investigations and mitigating actions will be recorded in the site diary. The complaints procedure, including a survey of the complaints to date will be re-assessed by the Operations Manager and the Managing Director on a yearly basis, unless the number of complaints warrants additional reviews.

9.5.2 Response to Complaints

The receipt of a single odour complaint during normal composting operations is treated as an exceedance of control levels. The primary response will be as detailed in accordance with the site's complaints procedure. An investigation shall be initiated into the cause of the complaint; this will involve as necessary:

- An olfactory survey as outlined below;
- An examination of the site activities at the time of the complaint;

- An examination of the meteorological conditions at the time of the complaint; and
- A review of the effectiveness of operational and odour control procedures.

If the complaint is validated it will be treated as an exceedance of the control level. The outcome of the investigation will determine the corrective actions to be implemented.

9.5.3 *Detection of Moderate Odour during Olfactory Survey*

Detection of a “distinct odour” or stronger (3-6 on odour scale, Annex B) will initiate a more extensive olfactory survey to determine the extent of the odour plume. The composting facility Manager (or Deputy) will be notified immediately, and a member of site from the office who has not been on the composting site that day will join the surveyor in undertaking the olfactory survey, and the survey will continue to attempt to determine the scope and extent of the odour plume, as follows:

- A suitable location downwind of the site and potentially sensitive receptor at which the odour plume is unlikely to extend will be selected for assessment;
- Survey will continue toward the composting facility until a composting odour is perceived; and
- Assessment points perpendicular to the plume axis and equidistant from the composting site will then be monitored, subject to access requirements.

An investigation will be initiated into the cause of the odour. This shall involve as necessary:

- A review of the site activities at site and other nearby potential sources at the time of the olfactory survey;
- A review of the meteorological conditions at the time of the olfactory survey; and
- A review of the effectiveness of process operations and odour control procedures.

9.5.4 *Corrective Actions*

The outcome of an investigation will determine the corrective actions to be implemented, they will consider, but not be limited to:

- Alteration to waste reception procedures and odour control measures employed;
- Effectiveness of methods used to mix waste to achieve a compost of suitable structure and moisture for composting and to avoid formation of anaerobic conditions;
- Review of compost process monitoring results;
- Turning frequencies and meteorological conditions under which turning should be carried out;
- Consider removal of material from site responsible for unacceptable offsite impacts;
- Consider ceasing the reception of further material from site until issue resolved;
- Activities that are necessary to bring the process back under control shall not be suspended without detailed consideration of risks; and
- Update of OMP if new procedures are created.

9.5.5 *Reporting*

Exceedance of the offsite odour control level will be investigated (as described above) and recorded in accordance with current procedures. This includes recording the following:

- Nature of the incident;
- Date of occurrence/s;
- Results of the investigation;
- Details of responses/ action plans implemented; and
- The event will be marked within the site's incident log.

The report will be made available to the Environment Agency upon request.

9.5.6 Review of Control Mechanisms.

A full review of the Odour Management Plan, taking note of all the internal odour report forms and external complaints will be made on a yearly basis, or as necessary after an odour incident in order to assess the site's operational procedure and odour control management plan. Findings from the review will then be incorporated into an updated plan which will replace the original OMP.

Additionally, the OMP will be reviewed including a Risk Assessment of impact on odour pollution following any operational changes to those identified in Section 4 and 5 or changes to site containment and abatement systems identified in Section 7.

9.6 History of Complaints

Birch Airfield Composting Services Ltd has also engaged with the community (where possible) and transitioned to a modern permit to tighten regulation and install best practice operational plans including an EA approved Odour Management Plan. This included improvements to site management practices as detailed in the OMP.

Today the site predominantly accepts only household organic waste, and the company is continuing to make improvements to the site and invest in new waste infrastructure where appropriate.

2020

BACS only received 1 complaint in 2020 on 23 September 2020.

2021

BACS received 1 complaint in 2021 on 29 December 2021.

2022

BACS have not received any complaints in 2022.

10.0 INCIDENTS AND EMERGENCIES

In accordance with the requirements of Environment Agency’s Technical Guidance Note H4, types of failure or abnormal events considered to have the potential to result in an odour impact have been considered. These have been identified as abnormal meteorological conditions and failure of aspects of the composting process during any of the process stages previously described. Failure and abnormal event scenarios with response requirements are summarised below. The Site Manager will be responsible for enacting the emergency responses outlined within this section.

10.1 Machinery Breakdown

Breakdown of shredding or turning equipment, which may result in a delay in processing the material received or turning of windrows. Magnitude of impacts will depend on the length of the breakdown, the type and volume of waste received and the prevailing meteorological conditions but could potentially result in elevated odour concentrations at receptor locations.

The potential failure would be minimised through routine maintenance of equipment, servicing in accordance with manufacturers guidelines, provision of adequate spares, and a service level agreement to replace plant (or source hire plant) within 48 hours.

In the event of machinery breakdown, the service provider will be immediately informed and called in to repair as required. All repairs or replacement machinery will be made within 48hrs as per the service agreement. This does not affect operations as no stage within the process requires a maximum holding period less than the 48hrs within the agreement.

An overview of machinery and equipment employed is itemised below with impact on odour release and contingency plans for replacement.

Table 9 – Machinery Breakdown Contingency Actions

Equipment	Location	Odour Impact	Contingency Plan
Shredder	OWC Pad	<u>Low</u> Prevention of shredding does not in itself lead to increased odour generation.	Service arrangement for plant repair or replacement within 48hrs. Does not affect holding times for material prior to shredding. Emergency Action However, if breakdown prevents processing stockpiles within limits identified in Section 5 then material reception will cease (see 10.5).
Loading Shovel	OWC Pad	<u>Low</u> Prevention of material movement does not itself lead to increased odour generation.	Service arrangement for plant repair or replacement within 48hrs. Prevention of material movement at the OWC site are not adversely affected at this timescale. Emergency Action

Equipment	Location	Odour Impact	Contingency Plan
			However, if breakdown prevents processing stockpiles within limits identified in Section 5 then material reception will cease (see 10.5).
Screeener(s)	OWC Pad	Low Prevention of screening material does not in itself lead to increased odour generation.	Service arrangement for plant repair or replacement within 48hrs. Does not affect holding times for material awaiting screening. Emergency Action However, if breakdown prevents processing materials within limits identified in Section 5 then material reception will cease (see 10.5).

10.2 Staff Absence

Short-term staff shortages (such as a few days' illness) will not affect the ability of the site to operate effectively as other staff members can be reassigned to critical operations. Magnitude of impacts will depend on the length of the absence, the number of staff absent at any one time, and the seniority of the staff member, but could potentially result in elevated odour concentrations at receptor locations should process controls not be managed effectively.

In the event of prolonged absence of staff members (>5 working days), temporary staff will be recruited and appropriately trained to fulfil non-critical roles whilst other more experienced staff members are reassigned.

If widespread illness occurs (>3 operational staff) amongst staff members (such as food poisoning), the delivery of waste to the site will be suspended until sufficient staff are present to operate the site. The maturation area does not require daily turning, so for a limited period of time the odour risk would not be significant.

If prolonged, widespread absence occurs, the operators would contact alternative operators, such as other composting site operators for emergency assistance.

10.3 Flooding

If the site becomes flooded, this will inhibit effective aeration of the composting material and therefore increase the risk of anaerobic conditions. The composting pad is elevated from the surrounding area, so would not flood under any circumstances. Widespread flooding might prevent access to site, although this is very unlikely given the close proximity of the operators to the site.

In a flooding situation no further waste would be able to access the site and priority would be given to ensuring the on-going effective processing of waste.

Where waste is saturated and cannot be processed due to flood waters, waste will be disposed of from site to a suitably licensed waste management facility.

10.4 Fire

Fire at a composting site can spontaneously occur if the composting material is allowed to become too dry, equally it could be as a result of accident or mechanical failures, arson or even

lightning strike. As with all fires the immediate response would be the responsibility of the Fire Brigade and odour would not be the primary concern. Once the fire has been extinguished there is likely to be a quantity of saturated waste material that could become anaerobic and odorous.

Any waterlogged material present on site would with be remixed with dry feedstock and reprocessed. Where waste is saturated and cannot be processed due to flood waters, waste will be disposed of from site to a suitably licensed waste management facility.

Any burnt compost material will be deemed not suitable for re-composting and will be disposed of from the site to a suitably licensed waste management facility. Depending on the severity of the fire, site critical equipment may have been damaged and no further reception or processing of waste would be undertaken until agreed with the EA. If equipment will be inoperable for extended periods of time, consideration will be given to the removal of material from site until repairs are effectuated.

10.5 Site at Full Capacity

The site is currently operating below the permitted capacity on site. There is the potential that should new contracts be won for processing wastes that the site will be operating closer to full capacity which could lead to stretching of the sites resources during busy periods. The site could generate odours during this period if material is not processed as soon as is required within the process controls. Capacity also applies to distinct process stages on site, e.g. waste reception with a maximum capacity at any one time. The same mitigation measures apply to the overall annual throughput as for individual process stages.

The site will not accept more waste that it can process effectively at any one time and not above the permitted tonnage per annum.

In the event that the site reaches its maximum capacity, the operational manager will divert any further incoming waste from the sites to neighbouring facilities that are able to process the same types of waste until such a time when the site can resume operations within its normal operating capacity.

10.6 Odour Accident Management Plan

Procedures are in place as identified in Table 10 below for the management of odour accidents. The identified accident, potential for occurrence and anticipated consequences has been discussed. A set of actions to be taken in order to priority is presented to be carried out by the site operatives and management.

Table 10 - Odour Accident Management Plan

Accident Type	Potential Occurrence	Consequences	Actions
Plant or Equipment failure	Seldom. Stringent preventative	<ul style="list-style-type: none"> If waste is not processed for a long period compaction reduces the 	<ul style="list-style-type: none"> Inform management. Implement contingency plan in Section 10.1. Establish time frame for repairs to be undertaken.

Accident Type	Potential Occurrence	Consequences	Actions
	<p>maintenance procedures in place to ensure all machinery remains functioning</p>	<p>available oxygen which will lead to odours once the machinery is fixed.</p>	<ul style="list-style-type: none"> • Hire or source an alternative piece of equipment. • If no replacements are available divert waste to another site. • If diversion is not available cease accepting waste • Inform the EA if necessary. • Record and review the incident.
<p>Fire - contaminated water and polluting smoke</p>	<p>Extremely rarely.</p> <p>Moisture content of delivered materials and temperature profile of process restricts excessive heat generation.</p>	<ul style="list-style-type: none"> • Potentially polluting liquids flowing onto hard standing and leachate collection area where they will have the potential to generate odours. • Polluting smoke. • Exploding of fuel containers. • Wind dispersal of pollutants. 	<ul style="list-style-type: none"> • Raise alarm on-site • Ensure personnel evacuated and accounted for from danger area. • Ensure all staff are alerted. • Call fire service and other emergency services as required. • Inform site management. • If necessary, inform EA. • Post member of staff at entrance to site to direct emergency services. • Liaise and follow instructions of emergency team making them aware of any hazards on-site. • Consult site register for COSHH if appropriate. • Prevent fire waters causing pollution on-site. • Excess water should be removed from site to prevent odours • Address potential odour issue in waterlogged compost by spreading the compost thinly on the pad and adding additional course material (screened oversize) to it in order to aid the drainage of water and retention of airspaces. • Record and review incident.

ANNEX A: FORM 1 ODOUR COMPLAINT REPORT

Date:		Ref No.	
Name, address and phone number of complainant.			
Time and date of complaint.			
Date, time and duration of offending odour.			
Weather conditions (dry, rain, fog, snow, sunshine).			
Cloud Conditions (quarter, half etc.).			
Wind strength and direction (e.g. light, steady, strong, gusting).			
Complainant's description of odour -What does it smell like -Intensity (use intensity scale) -Duration -Constant or intermittent			
Has complainant any other comments about the offending odour.			
Any other previous known complaints relating to installation (all aspects, not just odour).			
Any other relevant information.			
Location of Odour Source.			
Potential odour sources that could give rise to the complaint.			
Operating conditions at the time offending odour occurred.			
Action taken			
Final outcome			
Form completed by (signed):		Date	
Intensity Scale	1: Very faint odour	3: Distinct Odour	5: Very Strong Odour
0: No Odour	2: Faint Odour	4: Strong Odour	6: Extremely Strong Odour

ANNEX B: FORM 2 ODOUR ASSESSMENT REPORT

Date and time		Assessor	
Weather conditions		Wind direction	

Location	Time	Odour				
	Start/Finish	Y/N	Intensity	Extent	Description	Source

Order of location sniff tests: Upwind locations first as indicated by wind direction data.

Intensity Scale	0: No Odour	1: Very faint odour	2: Faint Odour	3: Distinct Odour
	4: Strong Odour	5: Very Strong Odour	6: Extremely Strong Odour	
Extent Classification	I: Intermittent	P: Persistent		

ANNEX C: SITE DIARY

Name: _____

SITE DIARY

EAWML/ _____

day	date	weather (i.e. precipitation, wind direction/ strength)

Management attendance

role	name	time in	time out	comment

Checks

	checked by	time(s)	comments
perimeter check -litter			
perimeter check -security			
check containers for leaks			
mud on road			
dust			
odour			
pests (Monday)			
site board (Monday)			

Site Activities

Construction work	
Maintenance work	
Breakdown	
Emergencies/ incidents	
Problems with incoming wastes	
Records sent to Environment Agency	
Complaints about operations/ actions taken	

General comments (include more details of matters recorded in previous sections, as appropriate)

Completed/checked, by _____ Signature _____



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