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ODOUR MANAGEMENT PLAN

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1.0 INTRODUCTION

WRM Ltd has been appointed by Resource Recycling Solutions Ltd (RRS) to review the Odour Management Plan (OMP) for their composting facility. The document forms part of their environmental permit management system reference. The site currently undertakes the composting of up to 75,000 tonnes per annum (tpa) of biodegradable green waste using an Open Windrow process. RRS compost source segregated kerbside and civil amenity green wastes to produce an organic soil improver certified to PAS100 and Compost QP.

RRS are also looking to vary their existing environmental permit to include the composting of green waste, comingled food and green waste or food waste only via an In-vessel Composting (IVC) system for sanitisation of the waste followed by maturation in open windrows. The IVC system will be located within an IVC building at the east end of the site. The remainder of this document is written as though permission for this activity has been granted by the Environment Agency (EA).

Such operations will inevitably lead to the generation of odour due to the nature of material and the processes. Effective operation and management of such facilities is therefore required to minimise the odour emissions from routine operations and minimise the risk of abnormal operational conditions resulting in increased risk of odour generation at the site.

This Odour Management Plan (OMP) has been produced in accordance with Environment Agency (EA) guidance on OMPs[1] and EPR H4 Odour Management[2] 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].

[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.

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

1.1 Structure of the 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.

1.2 Material Recovery Operations

RRS is currently permitted to treat a variety of materials at the Iron house Farm facility under a bespoke installation permit. The total annual throughput of materials at the site is 75,000 tonnes. The permitted activities are listed below:

- **Open Windrow Composting:** Composting in open systems of biodegradable wastes for the production of an organic soil improver certified to PAS100 and QP.
- **In-Vessel Composting:** Composting in closed systems of biodegradable wastes for the production of an organic soil improver certified to PAS100 and QP.
- **Screening and blending of waste to produce aggregate or soil.**
- **Treatment of waste wood by chipping, shredding, cutting or pulverising.**
- **Use of waste in construction.**

The recovery of organic waste has the potential to generate malodours from site operations. This odour management plan assesses 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.

1.3 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

SOURCE	PATHWAY	RECEPTOR
		
Release of odours during waste reception, processing and movements.	Airborne transportation.	Nearby sensitive receptors identified in section 7.
HAZARD	Nuisance to local population.	

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 PAS100[6] and the compost Quality Protocol[7]. The green waste and food waste composting process deals with biodegradable materials which have the potential to produce odour. 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. The table also includes the food waste fraction that the site accepts.

Table 1 - Assessment of Odour Potential from Feedstock Inventory

Waste Type	Waste Source	Typical Composition	Abnormal Composition	Likelihood	Odour Potential
Green Waste	Civic amenity sites and kerbside collected.	Mixture of grass clippings and woody plant material. Often several days old.	Mixture of grass clippings and woody plan 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.
	Landscape contractors.	Fresh woody plant material and grass clippings / turf.	Large bulky tree stumps/logs. Large load of grass/turf.	Material is usually delivered to site shortly after being collected.	**Med** – Material is typically fresh and mainly dry woody plant material.
Comingled food and green waste	Kerbside collected	Mixture of food waste and green waste. Typical ratio is 95% green waste to 5% food waste in spring-autumn,	Mixture of food and green waste with a high moisture content that is several days old and has	Material is often received from these sources which is several days old. However, consistent ratio of green	**Med** – Material can often be several days old, but has a high green to food waste ratio and good C:N balance.

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

[7] 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
		with 90% green waste to 10% food waste in winter.	started to degrade.	to food waste results in a more balanced feedstock.	
Food Waste	Kerbside collected	Mixture of all food types associated with kerbside collections which is several days old.	Mixture of food waste with a high moisture content that is several days old and has started to degrade.	Material is often received from these sources which is several days old.	**High** – Material is often wet and may have already started to degrade given the potential age of material.
	Commercial e.g. food production wastes.	Mixture of different types of food waste in singular form and mixed type.	Mixture of food waste with a high moisture content that is several days old and has started to degrade.	Material is sometimes received from these sources which is several days old.	**High** – Material is often wet and may have already started to degrade given the potential age of material.
Waste soil and concrete	Landscape contractors	Mixture of soil, stones and concrete.	High levels of organic contaminants.	Material could contain organic contaminants	**Low** – material likely to consist entirely or inorganic material.

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 and 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 for feed stocks are as follows:

- Grass clipping: 12-15
- Mixed grasses: 19
- Sawdust: 200–500
- Straw, wheat: 128-150

C:N ratio is typically controlled by operator experience as required through the mixing of feed stocks - mixing oversized material/cardboard (high carbon content) from product screening (i.e. carbon source). The decision is subjective but a visual mix of 1:4 green (fresh) to brown (dry non-green material) is appropriate.

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 2 outlines the controls required at the waste feedstock stage.

Table 2 - Feedstock Variation and Management Controls

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source of Material
Kerbside collected green waste.	**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	Degradation could begin rapidly. Excess nitrogen will form ammonia and odorous compounds.	Source additional “woody” / carbonaceous material in anticipation of warm, wet, weather when possible. In the event of sudden summer green waste “surge” overwhelming treatment capacity, broker material to	Local Authority collections undertake on a bi-weekly basis. Material up to 14 days old.

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source of Material
	increasingly compacted due to material density.		other local compost facility.	
	October - March: Increase in "woody" type materials (branches etc), resulting in higher C:N ratios.	Material unlikely to compost rapidly, so odour potential is decreased, but still present if stored too long.	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.	
Civic amenity green waste.	**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 weights / payloads. Potential for waste to be kept in warm conditions prior to delivery (waste exposed to direct	Degradation could begin rapidly. Excess nitrogen will form ammonia and odorous compounds. Increased risk of evaporation.	Source additional "woody" / carbonaceous material in anticipation of warm, wet, weather when possible. In the unlikely event of sudden summer green waste "surge" overwhelming treatment capacity, leading to green stockpile longer than 2 days, broker material to other local compost facility.	Local CA sites where material is stored between 1 and 2 weeks before arriving on site. Material up to 14 days old.

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

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source of Material
	materials (branches etc), resulting in higher C:N ratios.	present if stored too long.	desired C:N ratio. Green wastes loads may need to be blended together to improve C:N ratio.	
Kerbside collected comingled food waste	Seasonal variation is minimal. Waste produced over public holidays could be greater in amount and older / more compacted due to collection round disruptions.	The low C:N ratio of this waste (approx 15) means it is highly susceptible to degradation with age. Treatment as soon as possible is crucial to prevent / minimise nitrogen volatilisation in the form of ammonia and other odours.	Ensure food waste is processed immediately once it is accepted on site. Food waste blended with less odorous \ carbonaceous prior to shredding. If material significantly odorous consider rejection or disposal.	Local Authority collections undertaken on a bi-weekly basis. Material up to 14 days old. Material also delivered to site via a transfer loading station where material is bulked up prior to receipt. Material is transferred within 72 hours of reception. Material up to 17 days old.
Kerbside collected food waste.	Seasonal variation is minimal. Waste produced over public holidays could be greater in amount and older / more compacted due to collection round disruptions.	The low C:N ratio of this waste (approx. 15) means it is highly susceptible to degradation with age. Treatment as soon as possible is crucial to prevent / minimise nitrogen volatilisation in the form of ammonia and other odours.	Ensure food waste is processed as soon as delivered to site. Food waste blended with less odorous \ carbonaceous material immediately following shredding. All food waste material to be	Local Authority collections undertake on a bi-weekly basis. Material up to 14days old.

Waste Source	Seasonal Variation	Odour Implication	Management Controls	Age and Source of Material
			processed and loaded into vessels on same day – no storage in reception building overnight. If material significantly odorous consider alternative disposal: landfill or other local composting facility.	
Commercial food waste	**N/A:** Commercial food waste not affected by seasonality in type or quantity.	**N/A:** No seasonal variation. However, the high nitrogen content of the waste could generate ammonia and odorous compounds, depending on age and type of commercial food waste.	Ensure food waste is processed immediately once it is accepted on site. Food waste blended with less odorous \ carbonaceous material prior to shredding. Limit pre-reception storage period at the pre-acceptance stage. Contractual arrangements will limit pre-acceptance storage to a maximum of 7 days. If material significantly odorous consider rejection or disposal.	Sourced from a variety of food manufacture, retailers of single or mixed food type. Typically delivered directly to site and within a week. Material up to 7 days old.
Commercial waste soil and concrete	In winter months, waste soil may have higher moisture contents. Waste concrete unlikely to be affected by seasonality.	**N/A:** Waste soil and concrete unlikely to be odorous.	Strict waste acceptance procedures are in place to prevent the acceptance onto site of odorous waste.	Sourced from a variety of local contractors. Age of material unlikely to affect its odour.

2.3 Material Treatment by Technology

The facility utilises in-vessel and open windrow composting techniques to treat biodegradable waste. Material that requires in-vessel sanitisation, comingled food and green waste or food waste only will be undertaken by the IVC process. Once sanitised by the IVC process, this material is then stabilised by the open windrow composting (OWC) system.

Materials that do not require sanitisation in the IVC system will be sanitised and stabilised by the OWC process on the external composting pad.

Wood waste and soil and concrete waste shall be treated in the southeast corner of the site on the concrete pad.

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 Green Waste Reception Area

The green waste reception area consists of on area on the impermeable concrete pad in the centre of the site, between the weighbridge and the open windrows (ORP1). Green waste only material will be stored for a maximum of 7 days prior to composting.

3.2 IVC Building

The entrance point to the waste reception area of the building which is located at the northern point on the eastern side, will feature a 2No. of roller shutter doors big enough for Refuse Collection Vehicles (RCV's) to enter and deposit waste. Next to that will be a double roller shutter specifically for a mobile shredder to access the building, that has a dedicated area within the waste reception hall. Finally at the southern portion of the eastern edge another roller shutter door will be in place where the IVC tunnels are located, the primary function will be for non-collection vehicles (e.g., shovel loaders) taking sanitised material out to the OWC area. For pedestrians there will be on 2No. of entrance points. One will be situated next to the waste reception roller shutter door and one situated next to the IVC tunnels roller shutter door. All of the roller shutter doors and pedestrian doors serving the IVC building are combined into one odour release point (ORP2) for the purpose of this document.

3.3 IVC Biofilter

The IVC treatment of biodegradable wastes takes place in the southern portion of the IVC building and consists of four enclosed composting tunnels. All in-vessel composting activities take place within the IVC building and air is extracted through the air extraction system prior to the release to atmosphere via the biofilter (ORP3).

When the tunnel is filled with organic waste, the doors are closed and process air is blown into the composting tunnel via the IVC building. The process air is circulated via ducts and injection fan into the tunnel. When needed, fresh air can be directed to the tunnel. Water can be added when required from the IVC leachate storage tank in the batch formation phase of treatment process, and proceeding this phase clean water from the IVC rain water collection tank will be added to prevent reinoculation of the waste.

3.4 OWC Area

The sanitisation and stabilisation of green waste and the maturation of sanitised comingled food and green waste or food waste only, takes place on the central portion of the site on a purpose built impermeable composting pad. Material is formed into open windrows. The material is only moved during the formation of the windrow, during turning or during transfer to the finished product storage area (ORP4).

3.5 Product Storage

The product storage area (ORP5) located in the southern, central portion of the site 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.

3.6 Leachate Storage

Leachate is captured both at the IVC and the OWC system (ORP6) 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 these storage arrangements.

3.7 Wood, Soil and Concrete Area

Waste wood, soil and concrete are stored and processed in the southeast corner of the site. However, due to the types of material processed, it is considered highly unlikely to be a source of odour and as such is not labelled as an odour release point.

3.8 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 3 - Odour Release Point Inventory

Odour Release Point	Description	Location and Process
ORP1	Green waste reception area	Green Waste Reception Area: Material shredding and movement
ORP2	IVC building roller shutter doors	IVC Facility: material receipt and removal
ORP3	IVC Biofilters	IVC Facility: Constant air treatment system, final exit to atmosphere
ORP4	OWC pad	OWC Pad: composting in windrows
ORP5	Product Storage Area	Product Storage Area: storage of PAS100/QP compliant composts
ORP6	Leachate Storage	Leachate storage tanks at IVC and OWC areas of the site

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.

Materials being received on site may be up to 2 weeks old; this is considered as fresh as it can be without asking the councils to increase the collection rounds from fortnightly to weekly. All waste entering the site is loaded onto vehicles for transfer within 24 hours.

4.1 Waste Reception

Green waste is stored in either the designated waste reception area on the concrete pad or inside the green waste reception building. Comingled food and green waste and food waste

only is stored inside the IVC building. Wood waste and soil and concrete waste are stored in the southeast corner of the site on the concrete pad. 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 records sheets provide an age and weight of material within the reception stage.

Location	Storage Limits	Odour Potential	Management
Green waste	<4,000t <7 days from receipt to next process phase	Medium – High 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 5.3.1
IVC Building Reception Hall	<300t <72hrs from receipt to the next process phase (pre-processing)	Medium – High Material could be up to 2 weeks old and started to biodegrade when delivered to site. Food waste has a higher odour potential.	Section 5.4.1

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 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
OWC Concrete Pad Reception Area	<200t <24hrs of receipt for abnormally odorous loads	High Material could be rejected due to being abnormally odorous.	Section 5.2
IVC Building	<50t <24hrs of receipt for abnormally odorous loads	High Material could be rejected due to being abnormally odorous.	Section 5.2

4.3 Shredding

Material is shredded prior to the active composting phase. Material is batch shredded on the external pad and within 7 days for green only wastes. Green waste, comingled food and green waste or food only waste is shredded in the IVC building and within 72 hours. The odour potential of the material is elevated at this stage as material is agitated and the surface area is increased. In both systems material is continually moved from the pre-processing area into the active composting area to limit incidental storage. The IVC material is moved into tunnels to form a new batch and green waste only is formed into a windrow. Based on visual assessment, material is screened at the start of the process, during the active composting phase or at the end of the process. The data of screening is recorded in the PAS100 Batch Formation Records. Incidental storage is kept to a minimal 300t whilst waiting to be transferred.

Location	Storage Limits	Odour Potential	Management
OWC Concrete Pad Shredding Area	<300t <7 days	Medium - High Material processed within 7 days of receipt and agitation could release odour.	Section 5.3.2
IVC Building	<400t <3 days	Medium – High Material processed within 5 days of receipt and agitation could release odour.	Section 5.4.2

4.4 Treatment in IVC Tunnels

Within the IVC, material is formed into batches up to 400t which are processed through the enclosed tunnels for food only and comingled wastes for sanitisation.

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
IVC tunnels	<1,600t <4,680m^3 <7 days	Medium – High Active phase has the potential for odour which diminishes as material ages.	Section 5.4.3

4.5 Treatment in Open Windrows

Material is processed through open windrows on site. This treats either sanitised IVC material or green waste via sanitisation and stabilisation. Material is formed into approximately 600t batches and processed through an open windrow turned system on the external composting pad. There is space for up to 33 windrows of differing lengths depending on which specific area of the site they are in.

Location	Storage Limits	Odour Potential	Management
OWC Concrete Pad	<14,000t <8 weeks	Medium - High Active phase has the potential for odour which diminishes as material ages.	Section 5.3.4

4.6 Screening

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

Location	Storage Limits	Odour Potential	Management
Screening Area	<300t <7 days	Low - Medium The material has completed the active composting phase and the odour potential of the material is reduced. Agitation of the material may release odours.	Section 5.4

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. Material is held often in combined batches of different grades prior to dispatch to end markets. Under the requirements of the PAS100 standard, the product shall be retested if it reaches 6 months old.

Location	Storage Limits	Odour Potential	Management
Product Storage Area	<2500t <12 months	Low The material has completed the active composting phase and the odour potential of the material is greatly reduced.	Section 5.6

4.8 Amendment Materials

In order to provide a suitable mix of carbonous and nitrogenous materials, a stock of amendment carbon-based materials are held on site for blending purposes. This material is mainly used as an amendment for the IVC process but can also be utilised for abnormal green waste loads such as large volumes of spring cut grass. The amendment material is a mix of compost oversize and large woody fresh materials, e.g. large branches and logs that are odour stable.

Location	Storage Limits	Odour Potential	Management
Amendment Materials Storage Area	<250t <6 months	Low The material is specially selected for low odour potential and is high in carbon for addition to the more unstable nitrogenous wastes.	Section 5.3.1

4.9 Leachate

All leachate resulting from composting operations on site is captured through the integral drainage and storage system and collected. The leachate goes through an internal drainage system and is then stored in one of the three leachate storage tanks on site. All composting activities take place on an impermeable concrete pad and leachate drains to a dedicated catchment tank. Leachate generated on the OWC area is captured via falls in the concrete to the centre of the site where it is directed to sealed drainage channels prior to transfer to one of the two leachate storage tanks which serve this area.

All leachate drainage channels for the waste reception will be cut into the concrete floor and will be lined with reinforced plastic with grating to ensure avoidance of cracking from vehicle movement. Grated channels in the waste reception area will direct leachate from south to north & east to west. The concrete floor also features falls ensuring leachate flows into the designated 'dirty area' channel and does not enter the APBR designated 'clean area' corridor that is situated in front of the tunnels. Leachate exits the building at the southern portion of the western edge into an enclosed external drainage channel to maintain ABPR and odour control. This external channel directs leachate to the leachate storage tank, which is located adjacent to the biofilter. The tank will be constructed of concrete and feature a corrugated steel cladding. Collected leachate is to be re-used when moistening of waste material during the batch formation phase within the tunnels.

Within the IVC tunnels a series of drainage channels run along the floor, these were previously mentioned as the reinforced plastic aeration frames. Leachate will flow from west to east up to the point of the tunnel entrance. A singular enclosed drainage channel runs along the front of the tunnel entrance points. This leachate drainage channel runs south to north and then east to west along the northern edge of the waste reception hall, directing leachate into the enclosed external drainage channel on the western edge of the building. Leachate will then flow northward to the leachate storage tank.

Location	Storage Limits	Odour Potential	Management
OWC leachate storage tank x2	<90% capacity	Low - Medium Leachate within the tanks are heavily diluted with rainwater falling on the pad, greatly reducing the odour potential.	Section 5.7.2
IVC leachate storage tank	<90% capacity	High Leachate generation is elevated with high liquid content food wastes and with no dilution from rainwater has a high odour potential.	

5.0 PROCESS MANAGEMENT

The following sections outline the waste recovery processes operated for the production of PAS100 compost through an open windrow and in-vessel composting process. 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.

The following sections outline the waste recovery processes operated for the production of PAS100 compost through separate processes in combination: IVC and OWC. 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.

The facility deploys two different composting techniques which can be utilised in parallel or series depending upon operational requirements. The flow diagram below outlines the different process routes depending upon material treated and technique employed.

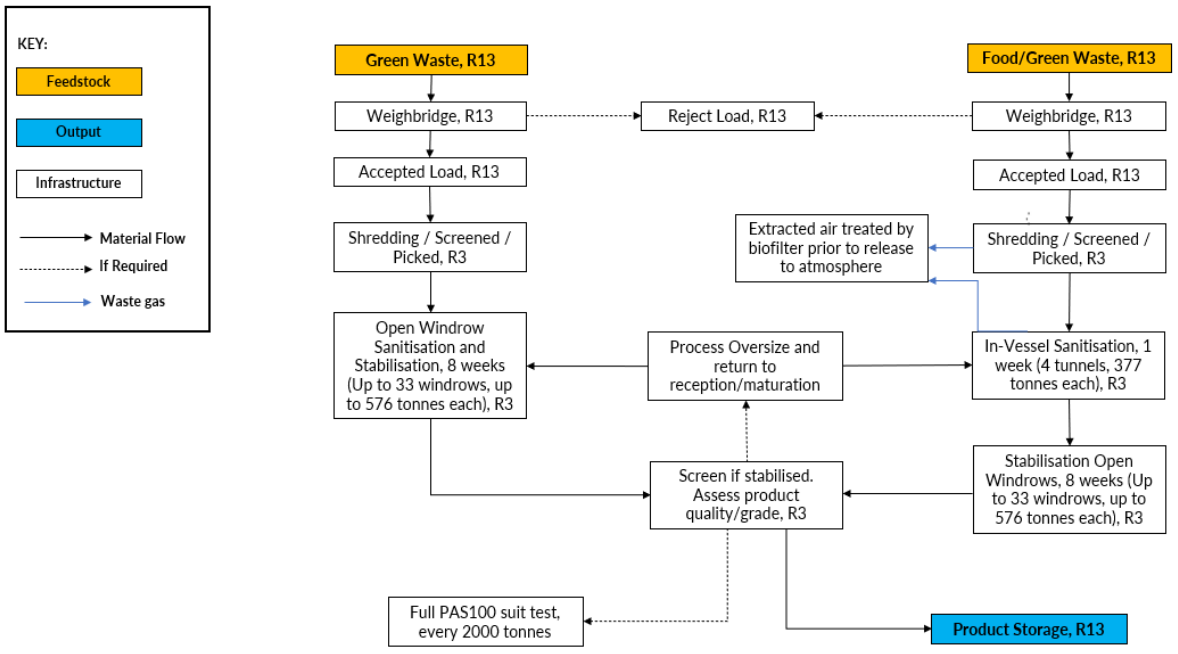

Figure 2 - Process Technique Material Flow Diagram

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.

Prior to the acceptance of wastes being accepted on site, RRS will obtain baseline information in writing relating to:

- the type of process producing the waste
- the specific process from which the waste derives
- the quantity of waste;
- the form the waste takes (solid, liquid, sludge etc)
- presence, strength and description of odour assessment
- physical appearance and colour
- hazards associated with the waste (e.g. low pH)

Hazards will be fully detailed according to the potential for presence within the material and accompanied by laboratory analysis. Hazards will be assessed against the framework for waste material acceptance8 and decisions taken for acceptance based against threshold values and operational controls for mitigation.

On a risk-based approach as recommended in the EC BREF for Waste Treatment Industries, analysis will be undertaken to determine the properties of the waste material where specific hazards are identified at the baseline reporting stage. The analysis will aim to identify the suitability for the proposed treatment method, and any special treatment requirements. Analysis will include the following parameters:

- check on constituents declared by waste producer/holder to ensure Permit compliance, treatment plant specification and final disposal
- all hazardous characteristics
- moisture content
- pH
- C:N ratio
- Alkalinity
- Ammonia and Kjeldahl Nitrogen
- Heavy Metals
- Potentially Toxic Elements (PTE)
- Total organic carbon (TOC)
- Particle size distribution
- Physical contaminants

[8] EA (2013) Framework for assessing suitability of wastes going to anaerobic digestion, composting and biological treatment. Framework Guidance Note.

Sampling will be representative of the type of load that is expected to be received on site and sampling will be obtained from a batch in line with British Standard EN 12579. Sample frequency will be in line with anticipated variation in feedstock, e.g. seasonal variation between summer and winter months.

Verification of the written information provided by the producer may be required, and this will require a visit to the producer (at least annually) specifically where a third party is involved, e.g. waste broker. Following characterisation of the waste, a technical assessment will be made by technical staff of its suitability for treatment or storage to ensure Permit conditions are being met. The assessment will include:

- suitability for process by confirmation of waste classification and physico-chemical properties;
- suitability for treatment in line with operational parameters e.g. C:N ratio allows appropriate blending to target ratio with other waste materials available; and
- suitability for acceptance based on risk to pollution, e.g. odour level.

5.2 Waste Rejection

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

- Dog, cat and horse waste;
- Wood and paper ash;
- Non-organic materials;
- 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 5% 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 techniques9. 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

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

receipt. A waste rejection form will be completed for any such load and the waste producer informed immediately.

5.3 Open Windrow Composting

The processing of source-segregated green waste is carried out in an Open Windrow (OW) composting system in line with PAS100 and the QP.

5.3.1 Waste Reception

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

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Delivery of moist highly nitrogenous material consisting mainly of grass.	Visual Inspection.	Present.	Isolate feedstock from remaining material, add amendment such as woodchip or oversize material and mix thoroughly to open up and aerate the material. On completion the blended material can be covered with woodchip or moistened screened compost which will aid in reducing any odorous emissions to the air.	Rejected Loads Sheet
Delivery of odorous material that is highly degraded which is not recoverable	Visual Inspection.	Present.	Reject load and inform waste supplier.	Rejected Loads Sheet

through mitigation measures.				
Feedstock material becoming odorous from storage prior to treatment.	Visual assessment and record sheets.	Green waste Feedstock shred within 7 days of receipt and not stored over 1000t.	Material will be shredded as soon as possible and within 7 days of receipt. Stockpiled waste material shall not exceed 1000t. Stockpiles will be "batch shredded" which will ensure that all the material available to be shred is processed, or failing that, shred using a first in, first out system.	Batch record sheet.
ORP	1			

5.3.2 Shredding

Following waste acceptance, any large objects, for example tree trunks and root stocks, over 50cm in diameter shall be manually reduced in size before shredding. Material is pre-shred to <400mm prior to the active composting stage using a high-speed shredder located within the reception area.

A loading shovel is used to deposit the raw material into the hopper of the low-speed shredder. The operator can select different loads to achieve the required mix; additionally, the moisture content of the shredded material can be increased by spraying with run off derived from water. Material is batch shredded before forming 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 40:1 are optimal for composting which equates to approximately 1 part green (nitrogenous) waste to 4 parts brown (carbonous) waste.

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, then runoff water will be added to limit aerial dispersion.	Batch record sheet.
Odours released due to poor mix of	Visual Assessment.	1:4 (green :brown) waste mix.	Waste selected for batch shredding is carried out by visual assessment of green:brown waste ratios. Where	Batch record sheet.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
feedstock materials.			there are excessive green waste amounts, clean source-segregated wood is added to obtain the desired C:N ratio.	
ORP	1			

5.3.3 Windrow Formation

Shredded material is formed into open-air windrows approximately 4m high, 8m wide and up to 45m long. For each windrow, the sanitisation and stabilisation phase are completed following a minimum 8-week period during which time critical limits must be met for temperature and moisture levels as per the Management System for PAS100 compost (RRS - MS). The site has space within the composting pad for up to 33 windrows at any one time.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Oversize windrow leading to anaerobic conditions.	Visual Assessment	1000 tonnes.	Material is formed into windrows not exceeding 1000 tonnes by way of visual assessment of volume and windrow dimension. Composting process is actively managed to PAS100 to ensure that material is progressing through the system to allow adequate space on the pad.	Batch record sheet.
ORP	4			

5.3.4 Open Windrow Composting

The composting of source-segregated green waste is carried out in line with PAS100, with process monitoring critical limits routinely monitored. The process consists of a sanitisation phase and a stabilisation phase. The sanitisation phase is completed when critical limits for temperature and moisture are met during 7 not necessarily consecutive days across a 2-week composting period. The stabilisation phase is completed when temperature and moisture levels are within the prescribed critical limits except during and up to 48 hours after each turn throughout the minimum 6-week composting period.

Completion of the active composting phase is identified when critical limits are met as recorded within the Batch Record Sheets following a minimum 8-week process. Completion

is recorded by date on the Batch Record Sheet. The critical limits are provided within the table below, a full description of the monitoring process is provided within the Management System for the PAS100 composting process.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Windrow too dry leading to slow process and pad backlog.	Moisture Monitoring.	Squeeze Test >4.	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, fresh runoff water is applied directly to the windrow. Too much water should not be added as it will generate runoff onto the composting pad.	Batch record sheet.
Windrow too wet leading to anaerobic conditions.	Moisture Monitoring.	Squeeze Test <3	The compost windows 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.	Batch record sheet.
Windrow not in optimal temperature range for composting.	Temperature Monitoring.	Sanitisation Phase: 65-85^{0}C. Stabilisation Phase: 45-85^{0}C.	Compost is formed into windrows of adequate size in order to generate required temperatures during active composting phases. Should temperature become elevated above\below critical limits, windrows will be turned as soon as possible to fully aerate.	Batch record sheet.
Release of odour during windrow turning.	Visual assessment and record sheets.	Sanitisation Phase: Min 1 turn. Stabilisation Phase: Min 1 turn.	A regular turning regime is implemented in line with PAS100 that ensures aerobic conditions within the windrow. Turning is carried out on an as required basis to be informed by the monitoring parameters identified against the critical limits.	Batch record sheet.
ORP	4			

5.4 In-Vessel Composting

The sanitisation of comingled food and green waste or food waste only is carried out in an IVC system with subsequent maturation taking place in open windrows in line with PAS100 and the QP.

5.4.1 Waste Reception

On arrival, vehicles are weighed on the site weighbridge and directed to the IVC building where they unload on to the building floor. As vehicles arrive to unload, the roller doors are opened and the vehicles reverse in to tip, negative pressure within the reception hall draws air in the hall preventing the release of odours out of the doors. The doors are immediately closed once the vehicle has finished tipping in the reception hall.

Once offloaded, materials are inspected by site staff for conformity with the waste rejection criteria. Loads are tipped into batches prior to pre-processing allowing traceability of materials and records to be held on batch tonnages and times. Each Batch Record Sheet will record each individual load received within each batch by linking weighbridge tickets with a date and weight in tonnes.

Once accepted, 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. oversize, water. Sufficient stocks of oversize will be kept onsite to adjust the feedstock. Should the stock of amendments run low the site will screen some compost to replenish the supply.

Waste materials awaiting pre-processing following acceptance are stored under normal operations against one of the walls of the reception hall. Material can be stored with breaks denoting batches with associated batch record sheets.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Delivery of moist highly nitrogenous material consisting mainly of grass or food.	Visual Inspection by Volume.	>50% grass >25% food	Isolate feedstock from remaining material immediately, add amendment such as oversize material and mix thoroughly to open up and aerate the material. On completion, the blended material can be covered with moistened screened compost which will aid in reducing any odorous emissions to the air. Material is then processed in line	Duty of Care Transfer Note.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
			with standard controls (i.e. <72hrs of receipt).	
Delivery of odorous material that is highly degraded which is not recoverable through mitigation measures.	Visual Inspection.	Present in load.	Reject load and inform waste supplier within 24hrs of receipt.	Duty of Care Transfer Note.
Feedstock material becoming odorous from storage prior to treatment.	Batch record sheets.	Feedstock pre-processed within 72 hours of receipt and not stored over 377t.	Material will be pre-processed within 72 hours of receipt. Stockpiles will be "batch pre-processed" which will ensure that all the material available to be pre-processed is processed, or failing that, the site will pre-process using a first in, first out system. If limits are exceeded, then the emergency response Section 10.6 will be actioned.	Batch record sheet.
ORP	2			

5.4.2 Pre-Treatment

Following receipt of conforming waste at the IVC building, removal of any large contaminants is undertaken and the waste is handpicked. It is also shredded, if required. Following this, a second assessment is made of C:N ratio and of material structure. Additional coarse or woody oversize materials will be introduced if a greater carbon balance is required or additional coarse oversize material is needed to add structure.

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 food waste, which equates to approximately 1 part green (nitrogenous) waste to 3/4 parts brown (carbonous) waste. It

should be noted that the IVC will be mainly processing co-mingled food and green waste which should reduce the requirement for additional balance materials.

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.

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.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odours to the environment during pre-processing.	Moisture Assessment	Moisture Index: 5	All pre-processing of food and green comingled waste takes place within the sealed, negatively aerated IVC building. Should material undergoing pre-processing be assessed to be dry, clean water will be added to limit aerial dispersion immediately.	Batch record sheet.
Odours released due to poor mix of feedstock materials.	Volumetric Assessment	1:3/4 (green: brown) waste mix.	Waste selected for batch pre-processing is carried out by volumetric assessment of green:brown waste ratios (Section 2.1). Where there is excessive green waste amounts, oversize is added to obtain the desired C:N ratio immediately.	Batch record sheet.
Odours released from storage of feedstocks prior to tunnel loading.	Physical measurement.	<754m^3	Waste awaiting to be loaded into the tunnels after pre-processing, shall not exceed 377t and be loaded within 24 hours of material being blended. If limits are exceeded, then the emergency response Section 10.6 will be actioned.	Batch record sheet.
ORP	2			

5.4.3 In-Vessel Sanitisation

After pre-processing, the feedstock is transferred to the composting tunnels using a front loader. The IVC building consists of 4 tunnels, each with a maximum capacity of 377t. Each vessel is 4m high, 6m wide and 34m long. Following loading the monitoring probes are inserted, doors shut and automated air and water handling system engaged.

One air injection fan supplies air at the base of each tunnel on the western side of the building (4No. in total for all tunnels). These will be linked by a ducted system that will run externally to the building, drawing air from the primary air extraction fan that is connected to the reception hall. This process of forced aeration of the compost pile will take place through the channels in the tunnel floor which also act as the leachate drainage channels. These channels direct airflow at the base of the material which then flows up through the composting mass into a headspace at the top of the tunnel. Air extraction will take place via one extraction fan that is located at the upper portion of each tunnel on the western edge (4No. in total for all tunnels). This will enable air to be drawn up through the waste pile. The tunnel's air extraction fan is linked via an external ducted system that connects to the site's biofilter ducting for odour abatement purposes. The temperature (in the compost) and oxygen concentration (in the airflow) continuously monitored to ensure aerobic conditions and compliance with the requirements of the ABPR. Once the ABPR temperature (and retention time) requirements have been achieved, if temperatures rise to 75°C or oxygen depletes to less than 5%, additional fresh air is introduced.

Any air which is not recirculated is directed to the dedicated odour abatement system (biofilter) prior to release to atmosphere. After typically 7 days the waste will have been turned a minimum of 2 times and having met the requirements of ABPR and critical composting limits, the sanitisation phase is complete.

To minimise the potential for odours and to maintain air quality for operatives inside, the doors of the IVC can be completely sealed, extractor fans create negative pressure in the building and the air extracted from the building is directed through IVC tunnels as required and then on to the biofilter or directly to the biofilter, depending on the number of tunnels in use. The airflow through each tunnel is on average 41m^3 of air per m^2 of tunnel per hour. This means an average air consumption of 8,364m^3/h/tunnel or a total demand of 33,456m^3/hr. Therefore, the IVC building is ventilated by 3.01ae/h (air exchanges per hour), based on a volume of 11,111m^3 in the IVC building. The waste reception hall fan system has a suitable airflow capacity to the meet the required ae/h demand. If in the case all the tunnels are not in operation, the number of air exchanges per hour in the IVC building would fall below 3. To counteract this, there is the ability to direct air extracted from the IVC building directly to the

biofilter at such a time when there are less than 4 IVC tunnels in operation to ensure that the 3.01ae/h in the IVC building is maintained. The air extracted from tunnels is directed to the external mixing ducted. An injection fan located at the biofilter draws from this external air mixing duct therefore directing a combined airflow from the reception hall and tunnels into the biofilter.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Tunnel too dry leading to slow process and material backlog.	Moisture Monitoring.	Moisture: <40%	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 (sanitisation only) is applied immediately directly to the tunnel.	Process Computer Records.
Tunnel too wet leading to anaerobic conditions.	Moisture Monitoring.	Moisture: >65%	The compost tunnels are free draining onto an enclosed drainage system to enable runoff from excessive moisture content. Aeration of tunnels will aid the drying of material to prevent high moisture levels occurring. If elevated moisture levels are encountered, additional air is introduced immediately to fully aerate.	Process Computer Records.
Tunnel not in optimal temperature range for composting.	Temperature Monitoring.	>75^{0}C	Compost is formed into tunnels of adequate size in order to generate required temperatures during active composting phases. Should temperature become elevated above critical limits, tunnels will be flushed with fresh air immediately to fully aerate.	Process Computer Records.
Tunnel 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 tunnels. Oxygen levels are directly monitored in the airflow. Where these are elevated above critical limits, tunnels will be flushed with fresh air immediately to fully aerate.	Process Computer Records.

ORP	3

5.4.4 Tunnel Unloading

Following completion of the active composting sanitisation phase material is unloaded from the compost tunnels. For biosecurity following the sanitisation phase material is unloaded through the IVC building roller shutter doors in front of the IVC tunnel.

Prior to tunnel unloading the material is taken through a cool down phase in the process control system. During this period the batches in the tunnel are actively cooled by introducing more air into the tunnels to ensure prior to unloading the material is cooled to below 25°C and fully aerated. This is a minimum 72hr process period that ensures material is matured and cooled ready for unloading.

Only one tunnel is unloaded at any one time to minimise exposure to the atmosphere of sanitised waste materials.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odorous compounds to the atmosphere.	Monitoring records.	Composting process complete.	Compost that is to be unloaded from the tunnels shall only take place if the material has completed the sanitisation phase and met the critical limits throughout this period. If it fails this process, the batch remains in the tunnel and reprocessed from point zero.	Batch record sheet.
Release of odours dispersed towards sensitive receptor.	Monitoring Records.	Completion of cool down process. <25^{0}C	Compost that is to be unloaded from the tunnels shall only take place if the material has completed the cool down phase ensuring that the material is fully aerobic and cool prior to opening of tunnel doors. Material will not exit the tunnels until the cool down phase has been completed.	Batch record sheet.
ORP	2 and 3			

5.4.5 Material Transportation

Once material has been loaded into the transportation vehicles from the tunnel system, it is transported to the OWC system via the internal site access routes. There will be a single approved route for transportation which all vehicles will strictly adhere to.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of dust and odour during open transportation to the atmosphere.	Moisture Assessment.	Moisture Index: 5	As material is loaded for transportation a moisture assessment is undertaken to ensure materials are not too dry that could lead to elevated dust generation during transportation. If material is too dry, then it is damped down using clean water only.	Site Diary.
Release of odorous compounds to the wider atmosphere.	Visual observations of vehicle movements.	Transport Route.	Compost that is to be transferred to the OWC system shall be done so via the appropriate transportation route. The route is entirely within the permitted site boundary. No other routes shall be taken.	Site Diary.
Release of odours from open top transport to the atmosphere.	Visual observations of vehicle movements.	10mph	At all times vehicles within the site are restricted to the site speed limit of 10mph. Any exceedances are recorded and staff retrained as appropriate on site rules.	Site Diary.
ORP	Not static – along route between the IVC facility and ASP system			

5.5 Screening

Screening of the compost following the active composting phase shall be carried out with a Doppstadt Screener and results 0 to 40 mm, defined as the Principal Grade and 0 to 10 mm soil improver and 10 to 60 mm compost grade, defined as the Additional Grades.

The date(s) on which each batch is screened and its batch code shall be recorded on the batch record sheet. Oversize material coming off the screen 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.	Composting process complete.	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.	Batch record sheet.
ORP	4			

5.6 Product Storage

Products are stored on the concrete storage pad following screening 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. Each product batch contains compost from no greater than 6 batches and may be stored for a maximum of 12 months before dispatch to the customer. Turning is required to ensure the product does not become anaerobic and as such the turning of the stockpiles will not take place when the wind is in the direction of sensitive receptors to the north.

During product storage there is not a significant source of odour generation given the age of material at this point following a full 8-weeks 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.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odorous from anaerobic product storage conditions.	Visual Assessment.	Steaming from product storage piles. Temperature: >45^{0}C	Compost that is to be stored shall only be of material has completed the active composting phase and met the critical limits throughout this period. Should any visual signs of steaming from the product storage pile be	Site Diary.

			identified, temperature readings are taken and if temperatures exceed the critical limit, stockpiles are turned to fully aerate to redistribute moisture and material.	
ORP	5			

5.7 Site Infrastructure

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

5.7.1 Odour Treatment Unit

The IVC incorporates an air extraction system and a biofilter to abate odour generated during the most active stage of the composting process. The biofilter will contain suitable biofiltration media (e.g. untreated woodchip); the dimensions of the biofilters are approximately 27m x 10m x 1.53m and receive an air load of 122$m^3/m^2/h$. In the instance where all tunnels are operating at once, all air extracted from the IVC building will be directed through the tunnels before being directed through the biofilter. In the scenario where not all of the tunnels are in operation, air removed from the reception hall is integrated with air that has been fed through the operational tunnels prior to treatment in the biofilter via the external mixing duct. This acts to dilute the odorous air from the tunnels prior to treatment. The biofilter is an open system with the final discharge point to the atmosphere at the top of the biofilter unit.

Management of the biofilter includes moisture and temperature monitoring, performance monitoring and the establishment of a maintenance schedule. The biofilter system will require regular inspection, monitoring and maintenance to ensure optimal performance and therefore the following monitoring will be conducted.

A weekly visual inspection of the condition of the biofilter media of all biofilters shall be conducted by a trained operative, to identify areas of drying, weed growth, shrinkage of the bed, cracks and fissures, etc. The results will be recorded on the Site Diary and any remedial action taken as necessary. There shall be continuous monitoring of temperature and daily monitoring of moisture levels for the biofilter. The back pressure of the biofilter will be monitored daily with an annual calibration Results for all monitoring aspect will be recorded in the Site Diary.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Biofilter not in optimal moisture content.	Air humidity within plenum chamber.	<75% >125%	Air entering the biofilter is constantly measured within the plenum chamber beneath the biofilter for humidity. The humidity level is constantly monitored to ensure that the correct moisture content is delivered to the biofilter to keep consistently within operation critical limits. This is backed up with visual inspections of the media every week to ensure humidity critical limits are still appropriate.	Process Computer Records.
Biofilter not in optimal temperature range for performance.	Temperature Monitoring.	>45^{0}C for more than 48hrs	Elevated temperature readings indicate that biodegradation of biofilter media is occurring. Should temperature become elevated above critical limits the system alarm will trigger and water will be added to the biofilter media. The media will also be inspected and replaced if required, as soon as reasonably practicable.	Process Computer Records.
Biofilter degraded closing structure preventing airflow through biofilter.	Back pressure at inlet to biofilters.	>2.5kPa	Should backpressures be elevated above critical limits then the biofilter media will be inspected and replaced as appropriate with clean woodchip as soon as practicably possible.	Process Computer Records.
ORP	3			

5.7.2 Drainage System

All leachate resulting from composting operations on site is captured through the integral drainage and storage system and collected. The leachate goes through an internal drainage system and is then stored in one of the two of the OWC leachate storage tanks onsite. All composting activities take place on an impermeable concrete pad and leachate drains to a dedicated central collection sump via falls in the concrete. Underground pumps will direct leachate to the 2No. of leachate storage tanks.

In the IVC building all leachate drainage channels for the waste reception will be cut into the concrete floor and will be lined with reinforced plastic with grating to ensure avoidance of cracking from vehicle movement. Grated channels in the waste reception area will direct leachate from south to north & east to west. The concrete floor also features falls ensuring leachate flows into the designated 'dirty area' channel and does not enter the APBR designated 'clean area' corridor that is situated in front of the tunnels. Leachate exits the building at the southern portion of the western edge into an enclosed external drainage channel to maintain ABPR and odour control. This external channel directs leachate to the leachate storage tank, which is located adjacent to the biofilter. The tank will be constructed of concrete and feature a corrugated steel cladding. Collected leachate is to be re-used when moistening of waste material during the batch formation phase within the tunnels.

Within the IVC tunnels a series of drainage channels run along the floor, these were previously mentioned as the reinforced plastic aeration frames. Leachate will flow from west to east up to the point of the tunnel entrance. A singular enclosed drainage channel runs along the front of the tunnel entrance points. This leachate drainage channel runs south to north and then east to west along the northern edge of the waste reception hall, directing leachate into the enclosed external drainage channel on the western edge of the building. Leachate will then flow northward to the leachate storage tank.

For the OWC system, the leachate flows out of the front of the floor areas and into a drainage run to one of two OWC leachate storage tanks. From the tank, the leachate is pumped back to the OWC floor areas, to be applied to the piles via the sprinkler system, as required or removed from site.

Potential Odour Issue	Monitoring	Critical Limits	Process Controls	Records
Release of odours from overflowing leachate storage.	Electronic alarm.	<90% Capacity.	In order to prevent the overflowing of leachate storage, dip readings are taken weekly to ensure that levels are within 90% of storage capacity. When this critical limit is met, leachate is pumped out within 48hrs and disposed of to a suitably licensed facility.	Process Computer Records.
Blocking of drains leading to pooling of	Visual Assessment.	Particulate blockages.	Daily site inspections are made to ensure that no drains are blocked by	Site Diary.

leachate on concrete surfacing.			loose compost. Where identified, material is swept up immediately and re-processed as soon as practicably possible.	
ORP	6			

5.8 Management System

The RRS 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.

5.9 Process Monitoring

Additional information regarding the specific monitoring regimes for the waste treatment processes are presented within the sites Standard Operating Procedures. Table 4 below identifies the monitoring frequency for the various parameters as identified throughout section 3, as well as the calibration schedule for monitoring equipment.

Table 4 - Process Monitoring Frequency

Parameter	Process Stage	Frequency	Calibration
Temperature	IVC Tunnels	Four probes per tunnel (continuous). Records kept on computer.	Annually by external company.
	OWC Sanitisation	Hand-held temperature probe measuring 4 points per windrow 1m below windrow surface.	
	OWC Stabilisation	Hand-held temperature probe measuring 4 points per windrow 1m below windrow surface.	
	Biofilter	Continuous 0.5m below surface, 2 readings per biofilter by probe.	
	Oversize Storage	Hand-held temperature probe measuring 4	

Parameter	Process Stage	Frequency	Calibration
		points per windrow 1m below windrow surface.	
Moisture	IVC Tunnels	I point per tunnel at air exit vent (continuous). Records kept on computer.	Calibrated to dry oven and balance annually by external company.
	OWC Sanitisation	Daily. 2m below surface, 4 readings per pile by grip test.	
	OWC Stabilisation	Weekly. 2m below surface, 4 readings per pile by grip test.	
	Biofilter.	Daily. Visual assessment 0.5m below the surface, 2 readings per biofilter.	
Oxygen	IVC Sanitisation	1 point per tunnel at air exit vent (continuous). Records kept on computer.	Annually

5.10 Temperature

Temperature monitoring is carried out during the active composting period. Although the probes will reach the core zone, the temperatures at the edge of the piles will be lower. However, the turning schedule or forced aeration will ensure that whole batch will reach the temperatures required during sanitisation and stabilisation.

5.11 Moisture

A ‘squeeze’ test, for all moisture testing, of materials 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.

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

5.12 Oxygen Monitoring

Oxygen monitoring is not undertaken during open windrow composting as accurate gas readings from an open structure are inherently complex and the accuracy of measured readings can be limited. Furthermore, where high temperatures are encountered such as within compost windrows issues regarding evaporation at the sensor can lead to false readings. Oxygen measurements from composting systems operated at high temperatures cannot be used directly to assess whether conditions are aerobic or anaerobic. Further uncertainty over the threshold values for oxygen levels dependent upon waste feedstocks indicate unsuitability of direct oxygen monitoring:

"saturation concentrations below 2 parts per million (ppm) in active composting systems may not prevent anaerobic conditions from developing. Highly active or wet materials, such as food waste, may require 3 ppm or more of dissolved oxygen to prevent anaerobic conditions and their associated odours."[10]

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.

Should an appropriate method for accurately monitoring direct oxygen levels within an open windrow be made available then this will be carefully considered against current management processes and based upon odour history at the facility.

[10] Environment Agency (2012) *Odour Technical Guide 03: Oxygen Solubility in Compost - Version 1.0.*

Oxygen monitoring is undertaken with an automated system controlled as part of the IVC system. The airflow into each vessel is controlled by an air handling system and have individual aeration arrangements. Optimum oxygen levels can be maintained within each vessel/floor area by adjusting the airflow by increasing the fan speed. The system automatically adjusts the airflow to ensure the critical limits for temperature and oxygen are maintained. Fresh air is introduced into the vessel via the adjustable aeration fans. Oxygen is continually monitored to ensure that the aerobic conditions are maintained. The system automatically increases airflow where oxygen levels drop below the set point critical limits.

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.

5.13 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.

5.14 Internal Odour Assessment and Monitoring

RRS will carry out odour checks at 6 points around the perimeter of the site on a daily basis. Findings will be recorded in the Odour Assessment Report (Annex B) or noted in the site diary. Odour assessment will be undertaken by a suitably trained member of staff. The odour assessor may not be subject to significant compost odour in the 30 minutes prior to the assessment. 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 Operations Manager and the Managing Director, unless the number of odour incidents warrants additional reviews.

5.15 Internal Odour Assessment and Monitoring

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. Through undertaking recognised best practice will minimise any opportunities for odour generation from the site.

5.16 Daily Checks

A Daily Checklist (Annex C) has been produced which is to be carried out daily and available to the EA on inspection. The 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.

5.17 Finished Product

Finished compost is stored within a designated area adjacent to the composting pad at the south of the site. Materials are stored for up to 12 months following completion of the active composting phase and can take up to 6 batches. The finished product storage area is approximately 2000m^2, providing adequate storage capacity for the proposed tonnage. Markets are well established for compost products (PAS100), therefore material is constantly leaving the facility reducing the storage requirements within the 12 month upper limit.

6.0 EVAPORATION

Evaporation from the open-air maturation system is likely to be prevalent given the nature of the process and external location. Over the 8-9 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 4 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. Windrows consist of material up to 400t which enables adequate temperatures to be reached to effectively compost material to the required level of stability. Smaller windrows are not appropriate for open windrow composting sites as this increase the surface area resulting in greater evaporation from the windrow surface. By maintaining a suitable windrow size used throughout the industry, evaporation is reduced, and stable temperatures maintained.

In addition, the PAS100 compost is turned only, when necessary, in order to fully aerate and incorporate material from the windrow surface, core and basal zones. Turning too often can lead to the central zone of the windrow not becoming hot enough as required as such temperature monitoring will dictate when turning is needed. 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.

6.1 Leachate Tanks

The leachate tanks in the OWC and IVC areas are fully covered to prevent evaporation from the surface of the tank. Levels within tanks are automatically monitored to ensure they are within 90% of full capacity. The tank integrity's are also regularly investigated to ensure no leaks are present which could lead to evaporation.

7.0 CONTAINMENT AND ABATEMENT

The site will employ containment with air treatment at the IVC building. Details of the system is outlined below.

7.1 IVC Containment System

The IVC tunnel system is a fully enclosed system incorporating waste reception and preparation and enclosed tunnel composting process. In addition, there is an aeration system for the forced aeration of process tunnels and extraction of treatment air from the tunnels and IVC building for biofiltration prior to release.

The ventilation system is operated under a negative pressure principle that draws air through the process building via fan system connected to an external duct maintaining a negative pressure, that links to the process tunnels. The negative pressure systems enable changing of the air space within the waste reception hall & tunnels of 3.01 air exchanges per hour under normal operating conditions.

7.2 IVC Building

The IVC building is an enclosed system for the reception and pre-treatment of waste to be processed within the composting tunnels and operated under negative pressure. The IVC building includes roller shutter doors, operated during waste delivery. The IVC building includes waste storage prior to pre-treatment and pre-processing operations prior to tunnel loading. Pre-processing includes hand picking and shredding.

The IVC building has a total air space volume of 11,111m^3. The IVC building is continually vented as the source of air for aerating the compost tunnels. During normal composting operations (including cool-down) on average a tunnel will consume 41m^3 of air per m^2 of tunnel per hour. This means an average air consumption of 8,364m^3/h/tunnel, or a total air demand of 33,456m^3/h. Therefore, the IVC building is ventilated by 3.01ae/h (air exchanges per hour).

7.3 Process Tunnels

There are 4 tunnels in total with an internal dimension of each tunnel of 34m x 6m x 4m (l * w * h). One air injection fan supplies air at the base of each tunnel on the western side of the building (4No. in total for all tunnels). These will be linked by a ducted system that will run externally to the building, drawing air from the primary air extraction fan that is connected to the reception hall. This process of forced aeration of the compost pile will take place through the channels in the tunnel floor which also act as the leachate drainage channels. These

channels direct airflow at the base of the material which then flows up through the composting mass into a headspace at the top of the tunnel. Air extraction will take place via one extraction fan that is located at the upper portion of each tunnel on the western edge (4No. in total for all tunnels). This will enable air to be drawn up through the waste pile. The tunnel's air extraction fan is linked via an external ducted system that connects to the site's biofilter ducting for odour abatement purposes. When needed, fresh air can be directed to the tunnel and water can be added via the sprinkler system.

By circulating the process air, it is possible to control parameters that are important to the composting process, such as temperature, humidity and oxygen concentration. The composting conditions can be optimised through the automated system.

7.4 Air Treatment

After the tunnel has been filled with waste feedstock the door is closed and the tunnel climate control program is initialised. The composting tunnels will be managed with respect to temperature and moisture to optimise the process, attain pathogen reduction requirements, and meet process objectives. All exhaust process and ventilation air is extracted from the IVC tunnels via a fan and is directed to the odour control system via a valve system, a motor and a pressure-controlled blower via enclosed aluminium ductwork. This system contains a biofilter.

The air supply to the tunnels is drawn from the IVC building and the tunnels via an external ductwork system with managed controls. The process air exhausted from the tunnels, directly links into the external mixing duct before reach the biofilter. Additional ventilation air can by-pass the tunnels from the reception hall into the external mixing duct. This means the air going into the biofilter system is a mixture of process air and additional ventilation air. Under normal operational conditions the total process airflow will be 33,456m^3/h is treated by the biofilter.

7.5 Biofiltration

There is one biofilter for the treatment of air from the IVC building and 4No. compost tunnels. The internal dimensions of the biofilter housing is approximately 27.3m x 10m x 1.53m (l * w * h) with a maximum air load of 122.6m^3/h/m^2. The biofilter is built with a spigot floor, for an optimal air distribution. The maximum airflow through the 4 tunnels during normal operation is 33,456m^3/hr. The biofilter has been sized accordingly to be able to treat the air extracted from the IVC building and tunnels.

The biofilter will be constructed of coarse shredded untreated wood. The biofilters will be filled to 1.5m^3 of media per m^2 of biofilter.

Over time biofilter material loses its coarseness. This is identified by visual inspection of the biofilter media and backpressure. Once the media has been identified as requiring replacement, fresh wood chip material is brought in and the spent biofilter media composted.

Temperature monitoring is undertaken within the biofilter media and any temperature above 42°C triggers the system to ventilate the biofilters to cool them down. In the plenum chamber, pressure and energy uptake are measured. These parameters help running the facility at its maximum efficiency.

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, RRS can trigger contingency measures to temporarily enhance other odour controls.

Information on wind direction has been derived from Garstang over the last 30 years. This data is illustrated by the wind rose in Figure 2. Wind direction and percentage occurrence are tabulated below with a wind rose of direction presented in Figure 3.

Table 5 - Wind Direction and Occurrence on Site

Wind Direction (from)	N	NE	E	SE	S	SW	W	NW
% Occurrence	6	11	9	9	16	28	16	5

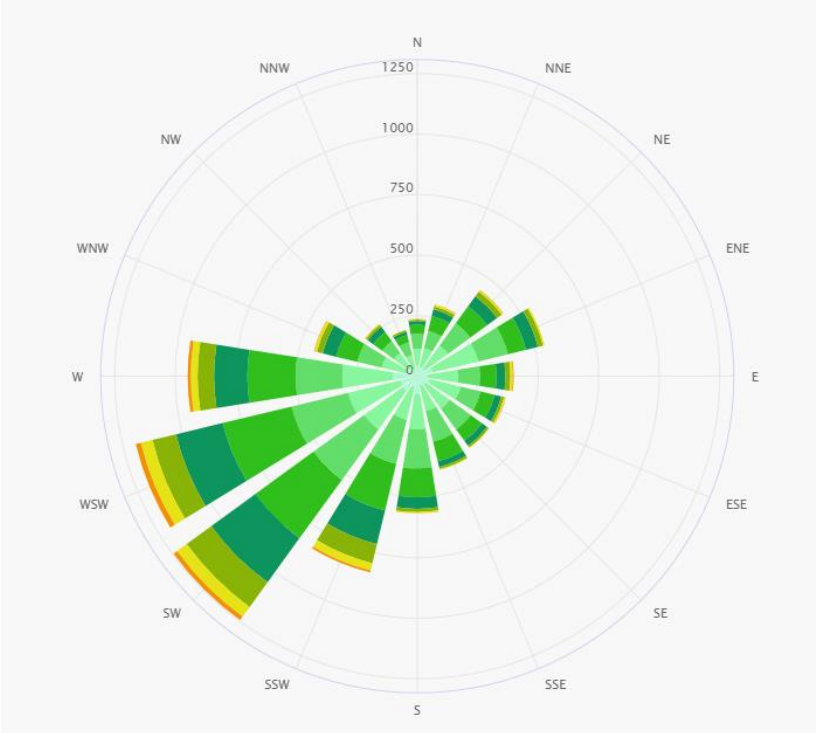

Figure 3 – Windrose for Garstang

RRS operate a weather station on site. The station records wind speed and direction, temperature, relative humidity, and rainfall, and enables the site management team to monitor site specific weather conditions.

9.0 SENSITIVE RECEPTORS

There are potential residential sensitive receptors within 1km of the site in most directions of the facility and there are no commercial units within 1km of the facility other than farming properties. Wind is blowing in the direction of these sensitive receptors 51% of the time.

Table 6 - Distance to Nearest Sensitive Receptors

Receptor Reference	Receptor	Land Use	Distance from Site (m)	Direction from Site	Occurrence that Wind Blows in Direction of Receptor (%)	Sensitivity to Odour
HR01a	Moss Cottage Farm	Residential / Agricultural	130 (N)	N	6	High
HR01b	Light Industrial Unit	Commercial	165 (N)	N	6	High
HR02	Lousana Farm Works	Agricultural	488 (E)	E	9	Low
HR03	Mose Side Farm	Residential / Agricultural	491 (E)	E	9	High
HR04	Prospect Farm	Residential / Agricultural	1,043 (SE)	SE	9	High
HR05	The Bungalow	Residential	814 (SE)	SE	9	High
HR06	Mayfair	Residential	984 (SE)	SE	9	High
HR07	Chathill Farm	Residential / Agricultural	439 (S)	SE	9	High
HR08	Bull Foot Cottage	Residential	1,144 (S)	S	16	High
HR09	Freshfields Farm	Residential / Agricultural	1,109 (W)	W	16	High
HR10	Birchcroft	Residential	1,162 (W)	W	16	High
HR11	Residential Property	Residential	990 (NW)	NW	5	High
HR12	Clark Cottage	Residential	1,018 (NW)	NW	5	High
HR13	Carr House	Residential	1,069 (NW)	NW	5	High
HR14	Invergorden	Residential	1,132 (NW)	NW	5	High
HR15	Ivy Farm	Residential / Agricultural	1,074 (NW)	NW	5	High
HR16	Brook Farm	Residential / Agricultural	618 (N)	N	6	High

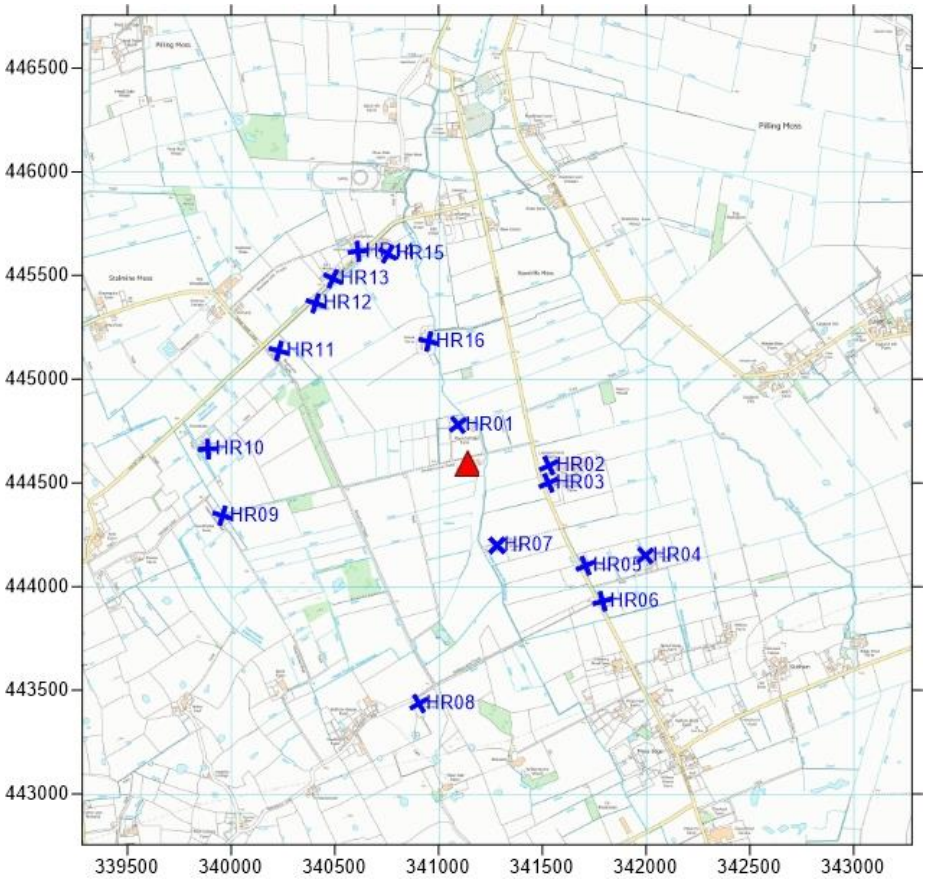

Figure 4 - Map of Sensitive Receptors

9.1 Dispersal Control

There are potential sensitive receptors in various directions from the site which include residential and farming properties. Given the varying directions to receptors it will not be practicably possible to restrict activities by wind direction given the wind may blow to such receptors at 64% of the time. As the sensitive receptors are a mix of residential and farming properties it would also not be possible to restrict activities by time.

9.2 Community Engagement

RRS will strive to educate the local community through the use of site tours both for schools and local resident groups.

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 to the complaints procedure. In the event of a significant odour incidence 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 RRS 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 Companies' Managing Director, Anthony Walker. Day to day operational responsibility for the OWC is maintained by the Site Manager and site's competent persons or COTC holders (Certificate Of Technical Competence holders).

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 Procedures

RRS has 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 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 Managing Director. Staff taking note of the complaint will use the appropriate Odour Complaint Form (see Annex A). Once the complaint is taken, the Managing Director 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.

9.6 Response to Complaints

Receipt of an 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.

9.7 Detection of Moderate Odour during Olfactory Survey

Detection of a "distinct odour" (3+ 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 the olfactory survey will continue to attempt to determine the scope and extent of the odour plume, as follows:

- A suitable location downwind of RRS 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.

The following 6 locations will be where olfactory surveys take place:

- Site Entrance – Hornby Road
- Reception – Centre of site where all waste is received
- Windrow Area – Where green waste starts the sanitation process to the west of the site
- Site Office – To the east of the site
- Septic Tank – To the south of the site
- IVC – Far west of site

These 6 locations were chosen as this ensures all areas of the site are covered. The survey will be undertaken by a member of staff that have not been on site that day, this may be management or administration staff as necessary who are working from the office away from the site.

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

- A review of the site activities at RRS 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.

9.8 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.

9.9 Reporting

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

- Nature of the incident / location where incident occurred;
- 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.

9.10 Review of Control Mechanisms

A full review, 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.

9.11 Review of Control Mechanisms

There have been several complaints made to the site which the Environment Agency are aware of. The complaints have come from the North of the site. All complaints have been dealt with.

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.

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.

Spare components are stored on site for the IVC abatement system including fans which are immediately replaced as required. An overview of machinery and equipment employed is itemised below with impact on odour release and contingency plans for replacement.

A- Machinery Breakdown	
Mitigation Measure	The potential failure would be minimised through routine maintenance of equipment, servicing in accordance with manufactures guidelines, provision of adequate spares, and a service level agreements to replace plant (or source hire plant) within 48 hours.

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.

B - Staff Absence	
Mitigation Measure	In the event of prolonged absence of staff members, temporary staff will be recruited and appropriately trained to fulfil noncritical

B - Staff Absence	
	roles whilst other more experienced staff members are reassigned. If widespread illness occurs 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.

C - Flooding	
Mitigation Measure	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 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.

D - Fire	
Mitigation Measure	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.

E - Site at Full Capacity	
Mitigation Measure	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 Persistent Odour

Should persistent odour be identified either through external complaints received, or through internal odour monitoring, then a contingency plan will be implemented as below:

- Any activity identified as the source of odour complaints or exceeded odour levels during monitoring is immediately stopped.

- If the IVC is the suspected cause of the odour issues, then no material will be accepted at the site for treatment through the IVC.
- If the OWC system is the suspected cause of the odour issues, then no material will be accepted at the OWC areas for treatment either for fresh green waste or for sanitised material from the IVC.
- Any material that cannot be processed, as a result of a shutdown of another process, will be exported to a suitably licensed facility within 48hrs of the implementation of the action plan.

These actions shall be implemented until odour has been satisfactorily controlled as detailed within an investigation report and as confirmed by odour monitoring during recommencement of activities.

10.7 Odour Accident Management Plan

Procedures are in place as identified in the table 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 7 - Odour Accident Management Plan

Accident Type	Potential Occurrence	Consequences	Actions
Plant or Equipment failure	Seldom. Stringent preventative maintenance procedures in place to ensure all machinery remains functioning	• If waste is not processed or a long period compaction reduces the available oxygen which will lead to odours once the machinery is fixed.	• Inform management • Establish time frame for repairs to be undertaken. • 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
Fire - contaminated water and polluting smoke	Extremely rarely. Moisture content of delivered materials and temperature	• Potentially polluting liquids flowing onto hard standing and leachate collection area	• 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.

Accident Type	Potential Occurrence	Consequences	Actions
	profile of process restricts excessive heat generation.	where they will have the potential to generate odours. • Polluting smoke. • Exploding of fuel containers. • Wind dispersal of pollutants.	• 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.