Envar Composting Limited

ODOUR MANAGEMENT PLAN

Cambridge Composting Facility

Prepared by: James Cooper Head of Compliance	**Relates to Permit/Site:**	**Assisted by:**
Shiraz Ameer Technical & Compliance Manager and C Trousdell BSc(Hons) MCIWM **Charlie Trousdell Associates Ltd**	Envar Composting Ltd Cheffins, The Heath, Woodhurst, Huntingdon, Cambridgeshire PE28 3BS	D J Baldwin BSc CEnv. MCIWM Technical Director Recogen Ltd Tel: 01743 340630
	Issue Date:	9th May 2017
Version 5.1	Revision Date:	19th August 2017
Version 5.2	Revision Date:	12th October 2017
Version 5.3	Revision Date:	23rd September 2020
Version 6	Revision Date:	27/03/2022
Version 7	Revision Date:	17/08/2022
Version 8	Revision Date:	24/10/2024

INFORMATIVE NOTE REGARDING REVISIONS AND UPDATES:

This Odour Management Plan is a living document and as such is intended to be revised and improved in relation to new practices and procedures at the site and developments in environmental protection best practice. The OMP may also be updated as the site learns and is newly permitted and as legislation changes. Updates will be version numbered from V6 onwards with up one number on each revision.

In order to meet the requirements of developments in the UK's approach to waste management, UK self-sufficiency and the wider environmental needs, the Envar Composting site is undergoing revision with significant investment in energy efficiency and systems that will enable landfill diversion in accordance with the waste hierarchy. The outcome of current and future planning submissions shall be taken into account in the updating of the OMP and will always be carried out with open collaboration with our various regulators.

Box/Table P1. Revisions October 2024 – (Previous revision updates have been removed to ensure the document remains concise, please refer to previous versions for update history)

October 2024	Figure 1: site plan - updated drg.
	Figure 2: odour risk control points updated.
	Added Table 2 b example of additional wastes odour assessment.
	Figure 4 updated operational areas and sensitive receptors
	7.9 and 7.10 Added composting sludge and bio-drying descriptions
	8.3 Revised odour emission rating and projection.
	Appendix 2.1 and 2.2 added to consider additional waste types and uses

PREFACE

Purpose

In keeping with our Environmental Policy, the purpose of this plan is to explain how Envar manage the day-to-day operation of the plant and processes that have a potential to produce odours, and to detail the technological processes and structured procedures that are in place not only for the minimisation and control of the emission of odours.

This is a working document which must be updated periodically to reflect changing circumstances at the facility.

Updates should be undertaken to reflect any changes in the facilities and practices at the facility, and in any case at not less than annual intervals.

Primary Points of Contact in regard to this Odour Management Plan

Neil Hodson	Manager		
James Cooper	Head of Compliance		
Envar Ltd, The Heath, Woodhurst, Huntingdon, Cambridgeshire. PE28 3BS.			

EXECUTIVE SUMMARY

S1 The Site

The Odour Management Plan relates to the Organic Waste Treatment Facility at The Heath, St Ives, Cambridgeshire operated by Envar Composting Ltd.

Historically the site was used for many years as a mushroom compost production facility, then as a large scale commercial 'In-Vessel-Composting' demonstration site recycling >100kt/yr of co-mingled garden waste (plant matter) with domestic and other food waste.

The site covers a large area, but the reception, preparation and primary composting processes are all enclosed and negatively ventilated with discharge through a wet-scrubber and biofilter system. The Vessels are large bunker style enclosures with a one-way flow process; material is received from the reception and preparation areas through a door at one end and once sanitised, is removed from the vessel via the door at the other end. The Vessels have ventilated floors and work on a full recirculatory ventilation design that includes sophisticated temperature moisture and oxygen control.

The composted material is actively managed and stabilised externally in open windrows that are turned by a dedicated windrow-turner as required. The compost is subject to daily management for moisture, temperature, and oxygen refreshment.

Screening for product preparation is undertaken within semi-enclosed facilities or using specialist equipment with dust and emissions control and suppression systems where possible.

Effluent control is via a site wide drainage scheme and rainwater effluent is directed to drains that lead to a series of lagoons and ultimately a waste-water treatment works.

S2 Site Development 2024

The UK Waste Industry is continually changing and improving. Global and UK Government initiatives drive change notably with regard to the Low Carbon Economy and the Circular Economy. Initiatives to divert the segregated collection of food waste (that was previously part of biowaste) to Anaerobic Digestion has released capacity within the biowaste treatment facilities at Envar St. Ives. To remain commercially viable, while improving the site to adapt to these changes and environmental expectations, the site is being developed to accept a more diverse range of inputs to the composting process, and is implementing new and smarter processing technologies for utilising residues from the site while generating a wider range of products from materials recovered and recycled at the site.

Developments have included a 'Grade A waste wood' biomass fuelled boiler with warm air continuous flow drier for drying agricultural crops, woodchip and other organic materials. Re-purposing of the In-Vessel composting facilities enable the site to provide a wider range of environmental services.

S3 This Odour Management Plan (OMP)

This version of the OMP serves to ensure that the changes and re-purposing are properly accounted for within the Environmental Management System. This OMP takes account of direct written

Technical guidance provided the Environment Agency in the recent Pewrmit Variation proposal 2024; as well as the relevant parts of the EA Horizontal Guidance notes [Ref 1], Industry Guidance [Ref 2], the updated Environment Agency Guidance in regard to Odour Management sites [Ref 3] and also Sector Guidance relating to Best Available Technique (BAT) [Ref 4].

Regarding [Ref 3] and [Ref 4] this OMP has been subject to a thorough review and assistance has been sought from independent environmental consultants. The key improvements and updates to this OMP relate to the following areas:

- Due consideration of the wider range of waste types.
- Revised Odour Risk Assessment for the range of waste types so processed.
- Due consideration of changes in the tonnage inputs of waste types

S4 Summary of Critical Controls for Odour Management

Table S1: Summary of Critical Control Points

Ref.	Aspect	Risk	Technological and/or Management Control
a	Inputs: Pre-acceptance	Odorous Materials Mal-odorous Materials	Pre-acceptance Procedures, Acceptance Procedures and retained right to refuse acceptance of non-compliant materials
b	Reception Building. Check/Inspect	Release of mal odours. Channelled emission Fugitive emissions	Enclosure. Acceptance only to enclosed areas. Sealed, negatively ventilated to bio-filtered exhaust. Door closure.
c	Feedstock preparation	Release of mal odours. Channelled emission Fugitive emissions	Enclosure. Shredding only to within enclosed areas. Sealed, negatively ventilated to bio-filtered exhaust. Novel processing of varied waste feedstock types
d	In-Vessel Composting	Mal-Odour generation. Channelled emission Fugitive emission	Sealed Enclosures. Composting process ventilation under tightly controlled management systems for temperature, moisture and oxygen control. Extraction exhaust to scrubber/bio-filter. IVC processing of varied waste feedstock types
e	Vessel out-loading	Release of odorous emissions	Compost to be fully aerobic and aerated, partially cooled and stabilised prior to vessel out-loading. Trained operators.
f	External Windrows	Release of odorous emissions	Compost to be maintained fully aerobic under strict management systems for temperature, moisture and oxygen control. Trained operators. Highly efficient windrow turning equipment. External maturation of varied waste feedstock types
g	Screening	Release of odorous emissions and particulates	Compost is maintained fully aerobic under strict management systems up to time of screening to minimise risk of mal-odour release. Dust emissions are minimised by enclosure or suppression to minimise odour release borne on particulates
h	IVC Effluent	Release of malodorous emissions	Sealed system directed to containment and treatment system
i	External yard rainwater	Release of odorous emissions	Minimise ponding on external yards Drainage system directed to containment and treatment system.
j	Channelled air exhaust (Biofilters)	Odorous emissions	Duplex air treatment system comprising wet scrubber and wood-media deep bed biofilter. System design to industry standards. Managed Biofilter air flow rate, media moisture and temperature.
k	Biomass fuelled boiler	Odorous emissions	Emissions certificate, testing and detailed emissions management system.
l	Drier	Odorous emissions	Emissions management system, condensate/ exhaust filters.
m	Materials Pre-Acceptance	Odorous emissions	Management system, waste acceptance criteria
n	Pre-drier storage	Odorous emissions	Building Enclosure, emissions management systems.
o	Post-drier storage	Odorous emissions	Building Enclosure, emissions management techniques.
p	Waste-water Treatment Plant	Odorous emissions	Aerobic Sequential Batch reactor. Aeration of external lagoons to maintain aerobic. Liquid storage level management to prevent pollution.
q	Abnormal activity management	Odorous emissions during accident, equipment failure or third-party activity (maintenance)	Management Plans and technological systems for dealing with equipment failures or breakdowns, including on-site generator, spare motors, reserve fan, reserve materials handling/ windrow turning equipment, contingency for biofiltration (woodchips stockpile), associations with other sites for diversion of input materials / diversion of effluent for off-site treatment if required.

S5 Personnel Involvement in Odour Management

Envar Composting Ltd. implement a thorough Environmental and Materials Processing training regime and set high standards for Operative participation in Environmental Management, relating to every aspect, including Odours, Dust, Effluent, Fire and litter management. The business is introducing a competence management system at current which will ensure operators have a rounded knowledge of the requirements.

Site Operators are required to immediately report to management any issue or aspect that they find is potentially out of control or failing.

Site Operators are required to be ever mindful and diligent in the way they operate equipment, machinery (especially loading shovels and windrow turners) so as to minimise the release of emissions. Envar Composting Ltd. implement an 'advanced driver/operator' training system.

Site Operations Supervisors are required to be diligent in the required monitoring checks, recording and reporting of information required for any of the processes or for environmental management.

S6 The revised structure of this OMP.

The structure of this OMP has been revised on the basis of the Environment Agency Guidance available at the website and can be seen in the CONTENTS listing that follows here:

https://www.gov.uk/government/publications/environmental-permitting-h4-odour-management

CONTENTS

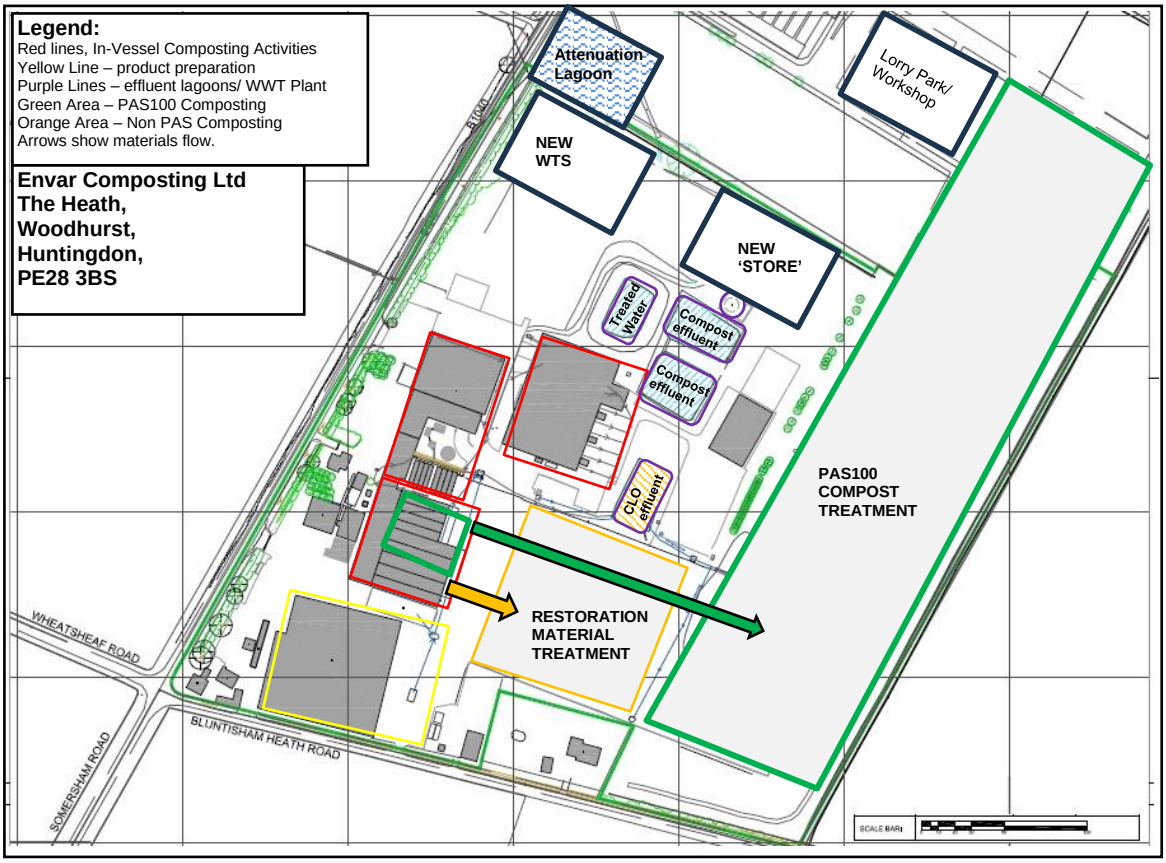
SECTION 1.0 Introduction – Site Location and Layout

1.1 Site Location

The site is located at the following address and grid reference. A location map and site plan is shown below at Figures 1 and 2.

Cheffins, The Heath,
Woodhurst,
Huntingdon,
Cambridgeshire, PE28 3BS.
(Grid Ref Weighbridge on Site) **OS Map Ref: OS Grid ref. TL 33571:75362**

Figure 1. Extract from Map (1km grid) Showing location of Composting Facility



1.2 Site Context

The Envar Composting facility has undertaken the Composting of mixed Food and Green Waste for the past 30 years but prior to that was a major national facility to produce compost for the UK mushroom growing industry. The facility has been upgraded and developed to accommodate green waste and food waste recycling using the 'In-Vessel Technology'. Many English counties are currently are transitioning to segregated food waste collections to be treated by Anaerobic Digestion. Therefore the reduced biowaste tonnages and the segregation of green waste means there is less demand for IVC facilities; and the spare capacity of the 135,000 t/yr IVC's can be used for alternative purposes. The Green Waste composting entails 27,500t throughput on the external pad. To service the effluent drainage requirements for the site and for the benefit of harvesting and storing rainwater, the In-Vessel and External Windrow Composting facility includes its own waste-water treatment plant and woody waste reprocessing facility.

1.3 Site Operation

Currently the process includes enclosed bio-waste reception, shredding, and enclosed IVC treatment in multiple vessels (or tunnels) that is followed by the external compost windrowing and windrow turning, screening and product formation according to the PAS100 'British Standard' quality assurance scheme. The total material on site at any one time shall not exceed 75,000 tonnes. The facility utilises a typical external windrow composting process, capable of up to 162,500+ t/yr. This provides for the external windrow composting/maturation of ~30,000 tonnes of material at any one time on the Maturation Pad Area i.e. on an impermeable concreted surface. Drainage from this is to rain-water storage lagoons to the north of the site.

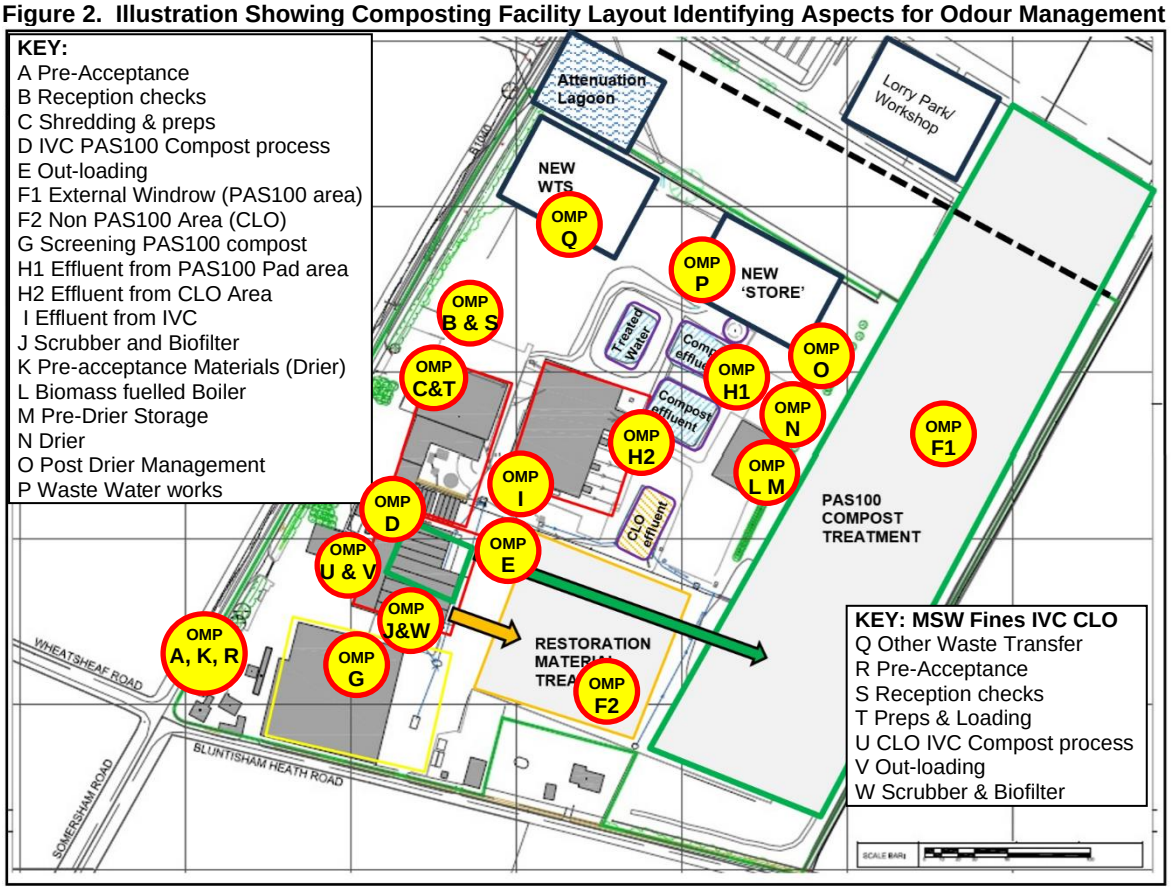
This Plan provides consideration of material that is not PAS100 (Compost Quality Protocol) compliant and these shall have their own area for processing, and shall be drained separately.

The enclosed compost processing facility has been designed to enable delivery vehicles to unload waste material within the large reception buildings to the north. The Main Reception area is 40m x36m. (Table 6). The capacity is 1500-2500t in 3 separated bays of 750m^3 each.

Reception bunkers operated on FIFO regime, one bunker is being loaded (vehicles offloading to the bunker) while one is being used (material removed from the rear of the bunker) and then it alternates. The composting process takes place within specifically assigned and dedicated enclosed bunkers (vessels/tunnels) within the buildings. The process is operated in accordance with DEFRA regulations and controls to ensure the full treatment of the material to the relevant standards. Being contained within the building the operation has full control of any exhaust air from the composting processes and this is cleaned and bio-filtered prior to being released into the environment. Systems are in place to ensure the composting processes are closely monitored, the ventilating air controlled and supplied with fresh air to maximise the quality of the compost produced.

After processing within the IVC vessels, the material in its separate forms is transferred to specific areas of the external composting area to be actively managed, stabilised and screened to form quality compost or compost like organic materials. There are also some peripheral activities on site. Figure 2.

Figure 2. Illustration Showing Composting Facility Layout Identifying Aspects for Odour Management



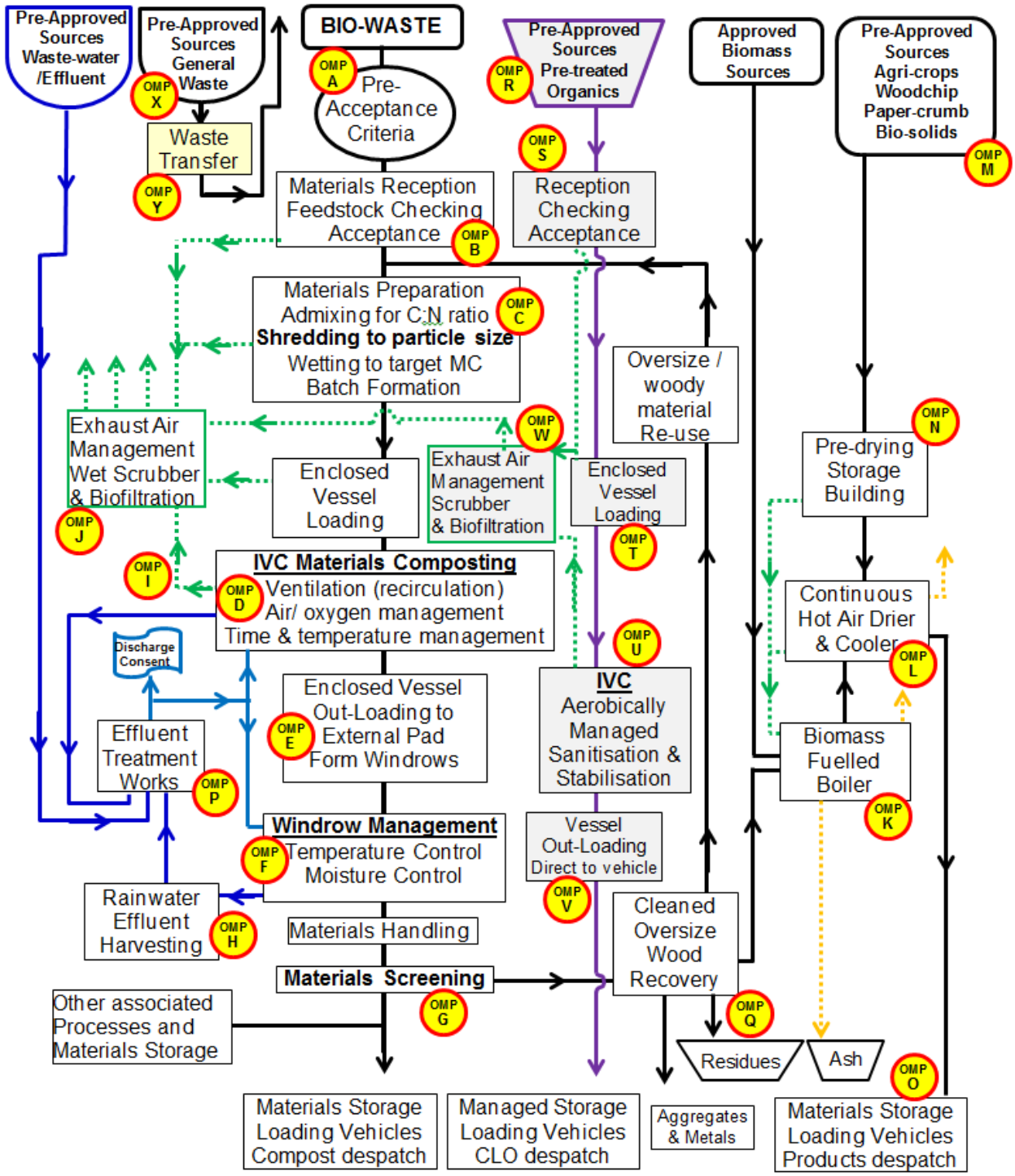
SECTION 2.0 Odours from the Waste Recovery Processes

2.1 The composting scheme

The site currently provides composting facilities for arrange of organic waste materials including 'bio-waste' (mixed food and green waste), green waste, compost oversize and food industry waste

From Figure 2, the flow process can be described by the schematic at Fig 3.

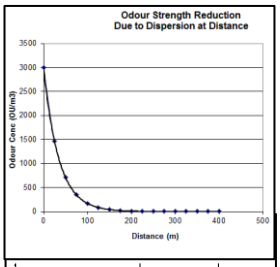
Figure 3. Schematic of The Envar Waste Management Process Flow in regard to Odour



Box 2 Odour Descriptors used within this odour Management Plan

The Odours given off by particular materials, including gases, solids and liquids may be detected by people and are often referred to as the **strength**, the **tone** and the **offensiveness** of the smell. Odours from a specific source whether a single point, a process or a large area will be carried in the wind (like a smoke plume) and will disperse (exponentially) and become diluted as the odour drifts downwind.

The odour strength (or intensity) is a measure of how strong that smell is, whether it is faint (an only just detected if the person stands still and 'sniffs' hard and concentrates; where-as a strong smell may be where even when walking or driving by the smell is immediately apparent. Technically, the strength can be measured by taking a sample of the air and determining the number of times it would need to be diluted before 50% of people in a panel of 8 could not distinguish the diluted sample from clean 'fresh' air. The number of dilutions (often ranging from hundreds to tens of thousands) is a measure of how strong (concentrated) the raw odour is. The measure is termed the 'odour concentration' and the measure is in Odour Units per m^3. Odours rising directly off a mixed organic feedstock may be 100,000 $OU_E m^{-3}$ where-as the final odours rising as treated air off a biofilter may be 200 – 750 $OU_E m^{-3}$. Regardless of whether the odour is pleasant or offensive, the ability to detect it at a distance mainly depends on its concentration and which is why the H4 Guidance provides Odour Unit values to be included in any dispersion modelling as indicators of whether the site Odour emissions will be an issue.



Description	Hedonic Score
Bakery (fresh bread)	3.53
Coffee	2.33
Hay	1.31
Raw potato	0.26
Rope (hemp)	-0.16
Kippery-smoked fish	-0.69
Paint	-0.75
Mothballs	-1.25
Disinfectant, fresh tar	-1.60
Wet wool, wet dog	-2.28

The odour tone (hedonic tone or flavour) is simply the words that are used to describe the flavour or hedonic tone by using descriptors that relate to commonly known plants, materials, perfumes or scents. As some odours may be pleasant and some not so pleasant, a measurement scale of Hedonic scores has been devised where the hedonic tones typically range from +4 for very pleasant odours (bakeries, say) to -4 for foul ones (rotting flesh, for example). **Raw potato is about neutral and is assigned the score 0**. Even smells that most people describe as positive and delicious (such as fried chicken or baking bread) can become annoying to anyone subjected to them continuously. The hedonic score of an emission may be altered by various treatment methods that chemically change some components to less odorous compounds. Odour neutralising compounds can work in this way. This score refers to the type of smell, irrespective of its strength (intensity)

The odour offensiveness (based on the hedonic tone) is another way of expressing whether the odour is pleasant or offensive. For a given concentration of odour, it is likely that an offensive odour will be more noticeable than a pleasant one and is more likely to cause annoyance to any person nearby. Within this OMP, the term 'mal-odours' is used to describe potentially offensive odours.
H4 Guidance provides benchmarks for computer modelling the downwind dispersion of odours. The benchmarks relate to targets that the computerised modelling of the dispersion of the odour should ideally reveal as the levels that would be achieved in any particular scenario of source odour emission, weather and topographical conditions and the separation distance from the source. The Target benchmarks are: 1.5 $OU_E m^{-3}$ for most offensive odours; 3 $OU_E m^{-3}$ for moderately offensive odours; 6 $OU_E m^{-3}$ for less offensive odours.

Intensity

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

Tone (examples. Note: tone may also be something pleasant like chocolate or fresh bread)

Fruity	Acidic	Rotten Veg	Inside dustbin	Damp/Musty	Wet Dog	Blocked drain	Cheesy	Sewage	Rotten eggs	Dead Rat

Offensiveness (Note: scale may also be positive if the odour is regarded as pleasant. 0 is neutral)

0 Neutral	-1 Bearable	-2 Unpleasant	-3 Offensive	-4 Very Offensive	-5 Sickly unbearable

In tables 1, 2 and 3, the value in brackets relates to worst case scenario (e.g. materials stored untreated elsewhere for >10-14 days)

Table 1. Description of the Principal Input Types where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Emission	Odour Rating	Control Required
A	Pre-acceptance for waste Inputs	Raw Feedstock materials from various sources could present issues where material is of varying quality and may have bio-degraded under previous storage. The materials will be odorous and with a **HIGH risk of mal-odorous materials, potentially very offensive odour**	Due to the wide range of materials expected to be received at the site, each material is listed and assessed at Appx 2 (summary at Table 2)	Requires regular management consideration, with detailed '**waste pre-acceptance measures.**

Table 2a. A Summary for the most common PAS100 Input Waste Types is shown here

Code	Description of Waste/Material	Annual Tonnage	Odour Intensity rating	Odour Tone rating	Mal-Odour Risk Rating
20 02 01	Green Waste		1 (2)	-1 (-2)	Low
20 01 18	Mixed Green waste with co-collected (domestic food) waste		2 (3)	-1 (-3)	Med
20 01 18	Commercial Catering Waste		2 (3)	-1 (-3)	Med
02 02 02	Industrial Food Waste – Animal Based (meat/fish etc)		5 (5)	-3 (-4)	V. High
02 03 04	Fruit/veg waste		3 (3)	0 (-1)	Low
02 05 01	Dairy food waste		2 (3)	0 (-3)	Medium
02 06 01	Bakery food waste		2 (3)	-1 (-2)	Low
03 03 10	Bio-solids Paper Crumb		1 (2)	1 (2)	Low

Table 2b. A Summary for the NON- PAS100 Input Waste Types is shown here

Code	Description of Waste/Material	Annual Tonnage	Odour Intensity rating	Odour Tone rating	Mal-Odour Risk Rating
19 08 01	solid waste from primary filtration and screening		1 (2)	-1 (-2)	Low
19 09 01	grit and sludge from treatment of water		2 (3)	-1 (-3)	Med
19 12 10	combustible waste - refuse derived fuel		5 (5)	-3 (-4)	V. High
19 12 12	organic fraction recovered from street sweeping processing		3 (3)	0 (-1)	Low

Table 3(a) Description of the Principal Process Aspects where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Release from the Waste and Emission from Site	Odour Rating	Technological Control Required	Managerial Control Required
A	Inputs; Pre-acceptance of waste	See Table 2	See Table 2	See Table 2	See Table 2
B	Reception Building. Checking Inspection Short Term storage	Odorous materials from third party transfer stations (storage) and time in transit will release odours, most likely mal odours at time of off-loading the vehicles. **This is a point of mal-odour release from the waste** but is subject to channelled pathway prior to emission.	The raw material odours are assessed at Appendix 2. Materials will be partly aerated in storage. Intensity 2 (3) Tone -2 (-3) Risk = Med - High	Reception Capacity details given at Section 1.3. Requires full enclosure with extraction ventilation. Enclosure to have minimal air leakage potential especially at the eaves and high levels. Ventilation design to have known airflow direction	Requires managerial control: Three A, B, C bay system one filling/one emptying i.e. First In – First Out FIFO, materials to start being processed ASAP (95% within 24 hrs: Maximum 48hrs) Regular checks on state of material Checks for Fugitive Odour releases Checks on extraction system
C	Feedstock preparation	Shredding, mixing, wetting etc. exposes surface area, releases trapped air-pockets and is a major emission point where odour intensity is increased. **This is a significant point of mal-odour release from the waste** but is subject to channelled pathway prior to emission.	Intensity 3 (4) Tone -2 (-4) Risk = Med – High Odour may be reduced if material pre-aerated to minimise anaerobic conditions	Fully enclosed with extraction ventilation. Managerial control to treat very offensive material quickly. Attention to mixes to attain correct C:N ratio, moisture content and porosity.	Fully enclosed with extraction ventilation. Managerial control to treat very offensive material quickly. Attention to mixes to attain correct C:N ratio, moisture content, and porosity.
D	In-Vessel Composting	Envar In-Vessel Composting systems are of very high technical standard, are sealed and recirculation ventilated to ensure fully aerobic process is maintained. Odours form material during loading are contained within the building enclosure. Odours released during processing are confined to the channelled system and treated via the wet air scrubber and biofilter (see J). Fugitive odour release in process is minimal.	Material in process is maintained aerobic. While odorous, this is not so unpleasant as for raw material. Thus, the odour rating is Medium, SUBJECT TO the ventilation being maintained. Intensity 3 (4) Tone -1 (-2) Risk = Med	Full enclosure with very high standard of sealing. Ventilation system that maintains aerobic conditions. Ventilation system with negative pressure so that fugitive emissions are minimised. Control systems that monitor air quality within the airflow through the material in process. Contingency measures to ensure electricity supply in event of mains power disruption.	Managerial control to ensure the IVC process operator is fully trained and qualified. Managerial control to ensure that oxygen levels within the process airflow are appropriate to maintain the material aerobic. Management of the Temperature control systems to ensure the appropriate temperatures are maintained for the correct duration. Regular monitoring and checking. Checks to ensure exhaust extraction system is working correctly.
E	Vessel out-loading	The composted material from the IVC's will have elevated temperature in the range 40 – 75° C which the evaporation of volatile gases and moisture vapour is increased. With the disturbance caused at out-loading, this represents a significant point of odour emission and release.	Warmed composted material, likely to release volatile gases and moisture vapour Intensity 3 (4) Tone -1 (-2) Risk = Med	The material has to be out-loaded from the vessels but technologically the release of odours can be minimised by a) prior to out-loading (a period of cold air ventilation), b) extraction during Out loading to entrain air into the channelled system. c) large capacity loading shovels/grabs to minimise surface air/releases from the material.	Management by training of operators especially loading shovel drivers on how to minimise causing releases from material. Management checks to ensure that extraction ventilation system is operated and working appropriately. Management to schedule the un-loading of vessels so that releases are not aggregated within a short time-period.

Table 3(b) Description of the Principal Process Aspects where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Release from the Waste and Emission from Site	Odour Rating	Technological Control Required	Managerial Control Required
F	External Windrows Max 30,000t (Typically, 25kt due to spaces required for loading/ removing windrows)	The site utilises large area for windrow management. It uses a large capacity windrow turner to ensure the material can be fully aerated within the windrow without being lifted /tipped at high levels. Each batch of material may be resident on the pad for several weeks and may be aerated weekly reducing to each 14 days later in the process. Temperatures will be 40° C – 65° C and so there will be regular release of odorous emissions from this large area source Average triangular cross-sectional area of windrows 9-15m^2 with 12 rows at 200-220m and 12 at 105m and 6m wide. Giving us a range 18000-30000T	Large area potential for release and emission; with increased intensity of emission when windrows are 'turned'. Material kept aerobic so tone is bearable. Intensity is elevated due to the large volume of material. Intensity 2 (4) Tone -1 (-2) Risk = Med	Specialised equipment to ensure that the material is always kept aerobic. Technological systems to ensure temperature and moisture are kept appropriately and composting temperature is optimised. Quick removal of effluent to avoid stagnated ponding. Wetting if required to suppress emissions, with clean water applied to surfaces without aerial atomisation.	Management by training of operators especially windrow turning or loading shovel drivers on how to minimise causing releases from material. Management checks to ensure that compost aeration adequately maintains appropriately aerobic conditions. Management of the Temperature and moisture conditions to ensure the appropriate temperatures are maintained for the correct duration. Daily olfactory 'sniff' checks around the perimeter of the site. Regular effluent /dust monitoring and checking with visual inspections especially in very dry or very wet weather.
G	Screening	Release of odorous emissions and particulates when fully composted material is moved to and through the screening process. Material may still be warm >40° C when moved from the windrows. Screening opens up the material and releases air from trapped air pockets.	Large throughput, therefore screening system is a focal point for releases and potential emissions. Compost is stabilised so tone is moderated. Intensity 2 (3) Tone -1 (-2) Risk = Low - Med	Partial Enclosure to minimise emissions with full enclosure of key screening processes Local exhaust ventilation. Dust suppression. Specialised equipment to ensure that the material is not exposed to undue wind blow.	Management by training of operators to undertake relevant checks and tests to ensure material presents least exposure to wind while screening; to ensure enclosures are used where supplied and that dust suppression is used when required. Management observation and checking of the process. The biggest and best screening machines are used to ensure material can be screened quickly and effectively
H	IVC Effluent	IVC effluent is rich in sugars and dissolved or suspended volatile substances. Having high BOD, it can become anaerobic quickly. It is a significant source for the release of potentially highly malodorous emissions	Rich material with potential to quickly become anaerobic and septic. Intensity 3 (4) Tone -2 (-4) Risk = High	Rapid removal via dedicated drains to collection points. Either rapid removal from site via tankers for recovery, else treatment and recovery at site using aerobic treatment systems. Containment, channelled to WWTW	Management to ensure IVC drainage systems operating correctly; to ensure effluent removed and treated or disposed quickly. Management to monitor for leaks, spills or failures in system. Bubbling aerators in lagoon one ensure that the liquid is always aerated which causes a local odour BUT it prevents an odour from developing with a significantly

					worse tone. This treatment also aids in the pre-treatment for the effluent treatment plant which can more effectively clean a liquid with a higher oxygen content and lower BOD/COD
I	External yard rainwater	Rainfall effluent varies in quality depending on storm rainfall. Effluent from external windrowed stabilised compost is much reduced volatility (less dissolved sugars) though due to suspended volatile substances still has high BOD and can become anaerobic and release malodours.	High BOD liquid has potential to become anaerobic. Intensity 1 (3) Tone -1 (-3) Risk = Medium -High	Rapid removal via dedicated drains to collection points. Instigate aerobic treatment and recovery at site using WWTW. Refer to aspect P	Management to ensure yard drainage systems operating correctly; to ensure effluent removed and treated quickly. Management to monitor for leaks, spills or failures in system. Management to monitor lagoon storage capacity and avoided overflow.

Table 3(c) Description of the Principal Process Aspects where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Release from the Waste and Emission from Site	Odour Rating	Technological Control Required	Managerial Control Required
J	Channelled air exhaust (Biofilters)	The channelled airflow from the reception buildings, shredding/preparatory processing areas and the IVC's is ultimately channelled to the biofiltration system. The airflow is generally uniform, but the air quality varies depending on the nature of the wastes received; when shredding is undertaken and when the IVC's go into cooling mode. The ventilation system is high capacity to enable moderation of air quality and the biofiltration system includes a water-based air-scrubber that acts as a buffer and source of air cooling as well as air treatment (gas and particulate scrubbing)	The design and operation of the biofiltration processes is detailed in Section 3. The treated filtered air that is released to exhaust from the surface of the biofilters has been subject to 90% odour reduction; therefore, both tone and intensity are improved. Intensity 1 (2) Tone 0 (-1) Risk = Low	Design include both Water based Air scrubbing and biofiltration. Wet Scrubber contact time Minimum 20 seconds Deep bed woodchip media biofilter air contact time (empty bed volume basis) minimum 45 seconds. Stainless steel airflow channelling with airflow monitoring (temperature and flow) Duplex Stainless-steel airflow extraction/blower fans. Biofilter irrigation. Biofilter temperature monitoring	Management checks to ensure that extraction ventilation system is operated and working appropriately. Management checks to ensure that biofilter system and irrigation is operated and working appropriately with uniform wetting of surface without ponding or localised swamping. Monitoring and checking of airflows, air temperatures, biofilter temperature, moisture and pH. Monitor 'back-pressure' of biofilter as check on media blockage. Management olfactory checks of air quality off biofilter. Preparation of the scrubber and clean out or replacement of the nozzles or pipes when flow is restricted. Monitoring as per the sites permit looking at input post scrub and output to monitor removal efficiency.

K	Biomass fuelled boiler	Odorous emissions could result from combustion of inappropriate fuels, otherwise the combustion is regulated by the emissions tests undertaken and satisfactory evidence from environmental assessment.	Intensity 1 (2) Tone 0 (-1) Risk = Low	Biomass shall be derived from natural biomass or else from Grade A waste wood biomass.	Management checks to ensure that only the correct fuel is used within the boiler. Management checks to ensure that the operational requirements of the boiler are appropriate, e.g. optimum temperature of combustion etc., fuel calorific value and minimised stop/start cycling.
L	Drier	Odorous emissions could result from the drying of very volatile or very wet crops or materials. As materials are warmed within the drier and the exhaust aims to remove moisture rapidly then the odour intensity could be increased.	Intensity 1 (2) Tone 0 (-1) Risk = Low	Materials for drying shall largely be of well stabilised materials of low volatility, including natural woodchip, Grade A wood biomass chip, agricultural crops, materials for animal bedding and materials for commercial products.	Management checks to ensure that only the correct fuel is used within the boiler. Management checks to ensure that the operational requirements of the boiler are appropriate, e.g. optimum temperature of combustion etc., fuel calorific value and minimised stop/start cycling.
M	Materials Pre-Acceptance	The risk of mal-odorous emissions relates to the nature of the crops, commodities or material that are received to be dried. For this reason, the pre-acceptance of materials is an important element, given that some volatile materials could generate high intensity odours when heated.		Testing of the materials in reduced quantities shall be undertaken in order to evaluate the odour emission risk.	Pre-acceptance to consider not just the nature of the materials in its natural state, but also the effect of heating and drying that material and the odours that may be generated, released and emitted as the material is dried.
N	Pre-drier storage	Materials accepted for drying shall be of low volatility and stored in enclosed building with negative ventilation to a channelled system with air treatment.	Low volatility stable materials Intensity 1 (2) Tone 0 (-1) Risk = Low	Prior tested materials with low odour emission risk. Stored in enclosed building with negative ventilation to exhaust air treatment.	Pre-acceptance checking. Pre-testing of materials in reduced quantities. FIFO and avoided long term pre-storage.

Table 3(c) Description of the Principal Process Aspects where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Release from the Waste and Emission from Site	Odour Rating	Technological Control Required	Managerial Control Required
O	Post-drier storage	Dried material shall have low volatility and be even more stabilised by the drying process. Subject to cooling the risk of Odorous emissions is reduced. Dried materials shall be stored in enclosed facilities to maintain dryness and minimise any further emissions.	Low volatility, dried stabilised materials Intensity 1 (2) Tone 0 (-1) Risk = Low	Storage within enclosure	Management checks to ensure that the drying requirements have been achieved, and that the materials are cooled so that any adverse reaction or spontaneous combustion is avoided.
P	Waste-water Treatment Plant	Aerobic treatment expertly managed and with sludge removal. Pre-treatment and powered aeration within the treatment system will minimise odour tone and intensity	Intensity 1 (2) Tone -1 (-2) Risk = Medium	Rapid and high intensity aeration treatment. Purpose built waste-water treatment works plant including: Monitoring, testing and control	Management checks to ensure that the treatment requirements are met. Management monitoring, testing and control procedures.
Q	Residues	Skips for storing, litter, ash, general waste	Intensity 1 (2) Tone -1 (-2)	Skips containers with roofs or covers	Waste skips that may become foul or odorous are removed once filled.

			Risk = Medium		
R	MSW Fines Pre-acceptance	Fines from MSW mechanical Treatment may be volatile and degrade quickly to produce intense foul odours	Intensity 1 (2) Tone -2 (-3) Risk = Medium -High	Defined criteria, analytical testing	Strict pre-acceptance criteria and procedures, including pre-testing of materials
S	Fines Reception	Fines from MSW mechanical Treatment may be volatile and degrade quickly to produce intense foul odours	Intensity 1 (2) Tone -2 (-3) Risk = Medium -High	Enclosed building with negative ventilation, effluent control etc.	Materials off-loaded and loaded to treatment vessels in the same day, normally as they arrive.
T	Loading IVC	Movement of material may release pockets of mal-odorous air	Intensity 1 (2) Tone -2 (-3) Risk = Medium -High	Enclosed building with negative ventilation, effluent control etc.	Materials off-loaded and loaded to treatment vessels in the same day, normally as they arrive.
U	TREAT Fines to CLO Standard	Warmed material, becomes more volatile and without oxygen would generate offensive acidic gases.	Intensity 2 (2) Tone -2 (-3) Risk = Medium -High	Very close attention to process conditions, particularly oxygen levels and pH. Air quality testing. Enclosed process until stabilised. Cooled at end of process. Additional management controls on air exhaust from process.	Increased level of training and operator capability. Increased training for staff and operatives; in relation to quality management and health and safety. Increased monitoring and assessment. Increased testing. Increased attention to air management.
V	Outload	Warmed material, could be more volatile and so end point stability is key	Intensity 1 (2) Tone -2 (-3) Risk = Medium -High	Very close attention to quality criteria at end of process (Stability) Material cooled before Out loading.	Increased end of process checks and testing.
W	Exhaust Air Management	Warmed material, becomes more volatile and may increase odour load to scrubber/biofilter system.	Intensity 1 (1) Tone -2 (-2) Risk = Medium	Very close attention to air quality pre-and post-treatment in Scrubber and Biofilter. Additional management controls on air exhaust from process.	Increased level of training and operator capability. Increased training for staff and operatives; in relation to air quality management. Increased monitoring and testing for air quality management.
X	Waste Acceptance	Pre-acceptance of wastes for transfer and treatment. Limited range expected.	Intensity 1 (2) Tone -1 (-2) Risk = Medium	Defined methods of transfer with fairly limited range of physical/ mechanical treatments	Process is monitoring and assessed; and environmental management requirements considered as required.

Table 3(d) Description of the Principal Process Aspects where there is potential for Odour Release.

Ref.	Aspect	Description of Odour Release from the Waste and Emission from Site	Odour Rating	Technological Control Required	Managerial Control Required
Y	Transfer/Treat	Fairly limited range of physical/ mechanical treatments. Potential for some odour release when materials are moved.	Intensity 1 (2) Tone -1 (-2) Risk = Medium	Defined methods of transfer with fairly limited range of physical/ mechanical treatments	Process is monitoring and assessed; and environmental management requirements considered as required.
Z	Abnormal activity management	Odorous emissions during accident, equipment failure or third-party activity (maintenance)		Accident and spillage management Plans; spill kits and clean-up kits. Contingency equipment Electricity generators Engine driven pumps Tractor driven fans Reserve biofilter system (woodchip or activated carbon) available.	Management training and procedures in place for accidents, spillages, fire and system breakdowns or failures. Operative training including practice sessions to rehearse and procedures for accidents, spillages, fire and system breakdowns or failures.

				Reserve equipment for materials handling and windrow turning.	
Z1	Cleaning and Maintenance (Reception Area) and other areas.	Odorous emissions during Cleaning or Maintenance of the Reception Area		**Cleaning** undertaken for each bunker (bay) as material is emptied from that bay; floor cleared, swept of debris then steam cleaned. Cleaning done with doors closed and extraction system operating. Excess water brushed off to drains. Drains checked / cleared. **Maintenance** undertaken while doors closed and extraction system operating. Secondary air extraction system used if required – Mobile fan and air trunking system.	**Management** training and procedures in place for cleaning down each area. Supervision and cleaning recording system in place. Operative training including practice sessions to rehearse and procedures for breakdowns or failures; and for maintenance routines, Job based risk assessments and 'Permits to Work.'
Z2	Cleaning of the (Stabilisation Pad Area)	Odorous emissions during Cleaning of the Stabilisation Pad Area		**Cleaning** undertaken for each area of the pad as each windrow of material is emptied from that area; floor cleared by loading shovel, swept of debris then cleaned using the road sweeper or wet cleaned by tractor driven brush Excess water brushed off to drains or sucked up by road sweeper. Drains checked / cleared.	**Management** training and procedures in place for cleaning down each area. Supervision and cleaning recording system in place. Operative training including practice sessions to rehearse and procedures for systems of work.

Additional Aspects

The Environment Agency, the Local Authority and any relevant Parish Council representatives may need to be notified, in advance, of any maintenance operations that are likely to cause off site odour impacts. It should be considered in the event of an unforeseen event such as a breakdown likely to cause an adverse environmental affect that some or all of the bodies above be notified immediately.

In addition to the odour risks from the aspects detailed in Table 3, all alterations to normal operations and maintenance works on site should take account of the possibility of generating odours. For critical activities with the potential for odour generation, the Environment Agency, the Local Authority and the Parish Council may need to be notified of such events including:

- Cleaning out any below ground pits or tanks used to collect effluent
- Cleaning out any above ground tanks used to buffer store effluent
- Dredging of lagoons
- Any major equipment failures which may cause elevated odour emissions

SECTION 3.0 Input Wastes & Feedstocks Acceptance Criteria

3.1 Introduction

This section deals with the 'Pre-Acceptance of Waste' for the various processes on site and also the Site Acceptance at Reception of the Waste as it is delivered. This briefly covers the Legal Requirements (Permits, Authorisations and Compliance Requirements) and more specifically relate to Odour Management. This section must be read in conjunction with Appendices 2, 7 and 8, which cover:

APPENDIX 2. List of Wastes – With Odour Inventory Risk Rating
APPENDIX 7. Feedstocks Pre-Acceptance Procedure
APPENDIX 8. Waste Rejection and Diversion Procedures

The site manager and operatives shall be trained have an understanding of the differing characteristics of the feedstock materials that the site is to accept so that they can be reactive to managing the various feedstock wastes and help to limit odour releases during processing and composting.

In order to prevent the acceptance of unsuitable wastes which may lead to adverse reactions or uncontrolled emissions, systems and procedures must be in place to ensure that wastes are subject to **appropriate** technical appraisal.

Points to consider:

- Co-mingled collections can influence the composting process. For example, a high percentage of fresh grass clippings or of wet stale food waste collected within the mixed green/food waste can result in changes in the carbon to nitrogen ratio and moisture control issues.

The Operator must obtain the following information:

- the nature of the process producing the waste, including the variability of the waste
- the composition of the waste and ensure that.
    - a system of representative sample(s) of the waste should be taken from the production process and analysed or assessed.
    - for each new waste enquiry, a comprehensive characterisation of the waste and identification of collection, pre-storage and age of the waste is advised.

See the acceptance and rejection procedure in the IMS.

Operators should ensure that technical appraisal is carried out by suitably qualified and experienced staff who understand the capabilities, capacity and permissions of the site.

The primary objectives for using this standard of practice are to:

- Identify and screen out unsuitable wastes
- confirm the details relating to composition, and identify verification parameters that can be used to
- test and verify the waste arriving at the site

- identify any substances within the waste (for example, by-products) that may affect the treatment process [note especially adverse characteristics of the MSW Fines for CLO]
- accurately define any risks exhibited by the waste
- identify any substances within the waste that may be unaffected by the treatment process and which may transfer in an unaltered state as a residue in the outputs
- determine the route and cost of the disposal option identified
- ensure regulatory compliance, e.g. Animal By-Products Regulations
- ensures effective site management and identification of problematic waste streams.

It is policy that wastes should not be accepted at the facility without prior use of the defined procedure together with defined method for the waste treatment and use or disposal route (with a full costing). The holding of waste while attempting to find alternative disposal routes, which results in some long-standing accumulations of wastes, must be avoided. These precautions (defined route/treatment method and cost) will need to be in place prior to final acceptance of the waste on-site, not necessarily at the tendering stage.

The Sampling programme and procedures can be simple where the waste type is already well characterised and well understood e.g. green and food waste.

More novel, odorous or unstable waste will require more detailed sampling processes.

Sampling and testing of feedstock should reflect:

- the nature of the feedstock and how it arises.
- any potential variation within the feedstock.
- inhibitory values of the feedstock and
- the biodegradability of the feedstock.

The number of samples and period of sampling should reflect the short term and seasonal variation in key parameters to derive a set of data that are representative of the specific feedstock. [Refer to Appendix 7.]

3.2 Inputs to the In-Vessel Composting process

The quality of the feedstocks shall be managed by.

1. Prior agreement and specification of feedstocks that will be accepted
2. Reference to the Environmental Permit and Planning conditions
3. Reference to the ABP Permit conditions (Catering Waste, Cat. 3 and some Cat 2 wastes)
4. Reference to the PAS100:2018 QMS and Compost Quality Protocol Annex B (list)
5. Reference to the Envar Composting Ltd. Environmental Policy

In accordance with the PAS Quality Management Systems, the feedstock deliveries shall be in accordance with the Feedstock Supply Contracts. Waste types shall have been assessed prior to formalisation of contract and relevant conditions shall have been specified.

Where required, the feedstocks may be subjected to scientific evaluation to determine suitability for processing and any contamination issues. **See Appendix 7.**

Envar Composting Ltd. shall reserve the right to refuse to take delivery of specific loads, as and when appropriate to maintain compliance with the QMS. **See Appendix 8.**

Feedstocks Rejection Policy [Refer to Appendix 8]

Envar commit to operate a 'Feedstocks Rejection Policy' that means for circumstances where feedstocks have been assessed or are considered to entail an unacceptable odour risk (based on the pre-acceptance criteria shown at Appendix 7), then that feedstock shall be rejected and the material required to be returned to supplier or sent to alternative disposal. These terms shall form part of the feedstock contracts of supply. Staff at site shall be authorised to reject offensive material or material that has an associated high risk of generating highly offensive odours. The rejection criteria should be read in conjunction with this document and it includes details of options which may be taken in the event of an issue.

3.3 Inputs as fuel to the Boiler process

The quality of the biomass fuel materials shall be managed by.

1. Prior agreement and specification of feedstocks that will be accepted
2. Reference to the Environmental Permit and Planning conditions
3. Reference to the ABP Permit conditions (Catering Waste, Cat. 3 and some Cat 2 wastes)
4. Reference to the PAS111:2010 QMS for Grade A Waste Wood
5. Reference to the Biomass Suppliers List, Boiler Certification and Biomass Test Data

In accordance with the PAS111 Quality Management System, the wood/fuel deliveries shall be in accordance with Supply Contracts. Waste types shall have been assessed prior to formalisation of contract and relevant conditions shall have been specified. The feedstocks may be subjected to scientific evaluation to determine suitability for processing and any contamination issues.

3.4 Input Materials to the Drying process

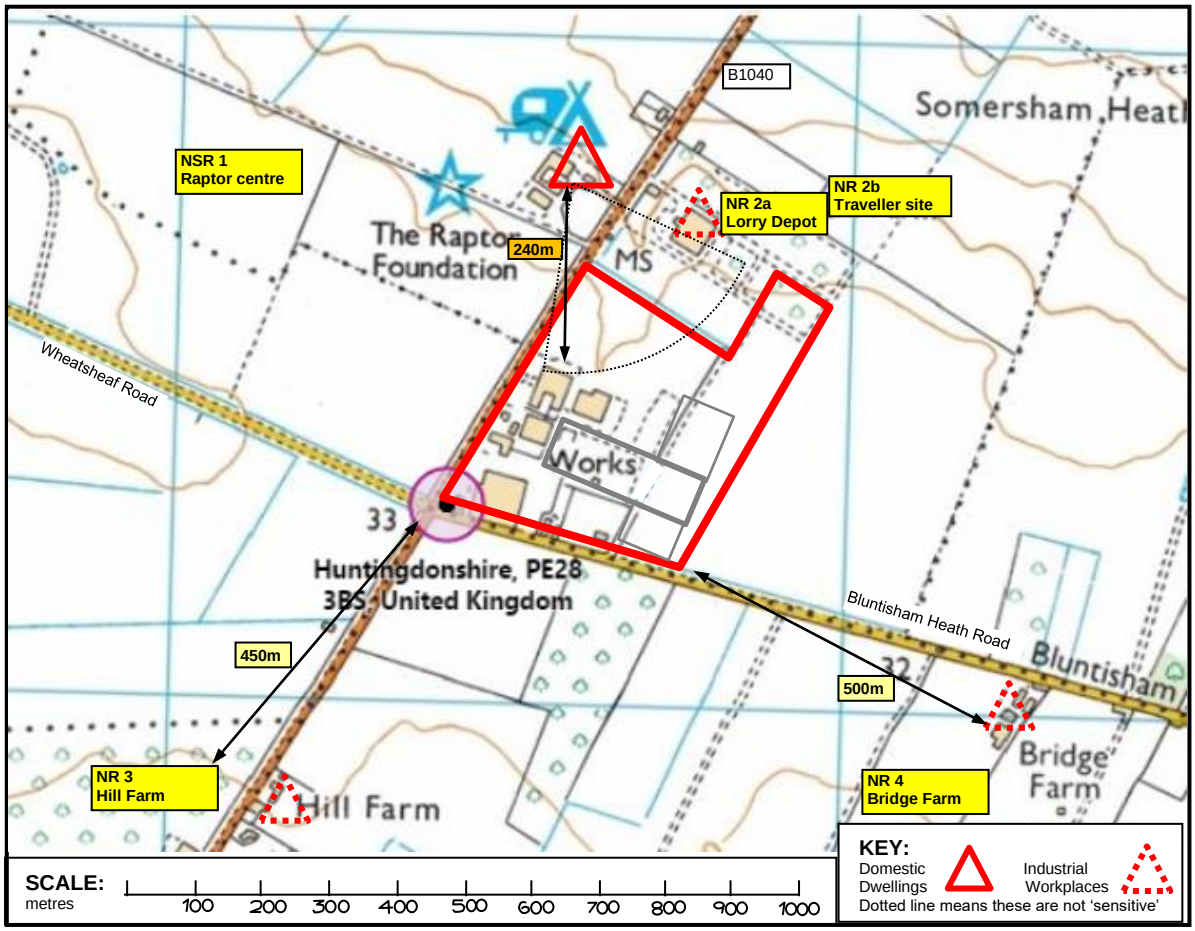
The quality of the input materials shall be managed by;

1. Prior agreement and specification of materials that will be accepted
2. Reference to the Environmental Permit, ABP Permit and Planning conditions
3. Reference to the PAS111:2010 QMS for Grade A Waste Wood
4. Reference to Prior Acceptance Criteria, Trial Test Data and Drier Specification Sheet

SECTION 4.0 Environmentally Sensitive Receptors

4.1 Site Situation with Regard to Environmentally Sensitive Receptors

Figure 4: Map (1km grid) Showing location of Composting Facility and nearby receptors.



There are nearby Sensitive Receptors as follows:

1. To the North there is the redundant Mushroom Farm, that is now a lorry depot. The main part of this is across a grassed field beyond the land boundary that separates the composting site from the Mushroom farm. The nearest parts of the composting site are the doors to the reception buildings at the northern area of the site; and the effluent lagoons and water treatment works to the north-east.

2. To the North there is the Raptor Foundation Site. The centre for this is directly north of the composting site. The nearest parts of the composting site to the Raptor Centre are the doors to the reception buildings to the northern end of the site. The Raptor Centre would be most affected by emissions from the composting site, if the wind was directly from compass bearings between the south and the south-south-east.

   With the exception of when the reception doors are opened for vehicle entry and there is the risk of fugitive airborne emissions escaping; most of the infrastructure at the composting facility means that the processes closest to the Raptor Centre are fully enclosed. The next nearest activity at the site where the processed material becomes external, is when it is removed from the 'Vessels' or Tunnels after primary sanitisation treatment. This is the

northern-most corner of the compost maturation pad (fig 2) and is circa 350 metres from the Raptor Centre. The separation distance of the compost screening building is 450 metres.

3. The two houses at the site; one nearest the crossroads and one along the Bluntisham Heath Road are part of the Composting Site Property and are not used as dwellings.

4. The next nearest dwellings or workplaces are the two farms: one to the south 'Hill Farm' on the main road, and one to the east 'Bridge Farm'. These are both well beyond the 250 metres distance from the site at circa 500m in each case.

5. The roads that pass by the site; the B1040 (north/south) and the Bluntisham Heath Road are both quite busy with traffic and sometimes there are short queues of traffic waiting to join the main road or turn at the crossroads. There is a speed restriction together with speed cameras on the B1040 outside the site main gates. Even so, in accordance with EA definitions, these are not regarded as sensitive receptors as the duration of any exposure is likely to be less than a minute or so and is well below the 6 hours exposure period.

6. The B1040 includes a footpath, as does the Bluntisham Road and the field to the west of the site where the path follows a double bend along the field boundary. Taking the longest length of footpath across the fields from the west, along the B1040 and then along Bluntisham Road may comprise a distance of 1200metres. At a slow walking speed of 5km/hr this would entail a walk time of approximately 15 mins duration to complete the route.

7. The fields surrounding the site are in agricultural production, typically arable crops. For these it is expected that a tractor driver (or similar machine) may be within the advised 250metre proximity while traversing the field undertaking an agricultural activity, such as cultivations, or harvesting. These are not regarded as sensitive receptors as the duration of any exposure is likely to be only a minute or so and is well below the 6 hours exposure period.

8. Similarly, for the Orchard to the south of Bluntisham Road, which is not in intensive production and labourers or workers may only be present for very short periods at specific times of the year.

9. Staff that work on the site, including the office staff are managed by company operating the Permitted composting site. The well-being of these people is covered by Health and Safety Policies and management. The definitions do not include these staff as being 'sensitive receptors.

SECTION 5.0 Meteorological Conditions for the Site

An associate of the National Meteorology Unit, (Part of the UK National Meteorology office), has supplied data for this site.

This data has been provided from data accumulated over the time (2010 – 15) and is statistically representative of the wind strength and direction averages for this grid reference.

5.1 Background

The dominant wind directions in the UK normally blow from between South and West. However, the direction of the prevailing winds can be modified by local topography. In general, the more pronounced the topography, then the greater the potential influence upon local wind directions.

The Met Office maintains a network of observing stations across the UK. Wind speed and direction information is collected hourly from a number of these stations.
The provision of the data takes account of any topographic effects.

5.2 Analysis of Wind Speeds and Directions

Hourly mean wind speed and direction records were analysed over a recent period, 2011-16. This information is illustrated in Table 4.

Table 4. Percentage Frequency of Wind Directions at this grid reference.

Speed\Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
<0.3	0	0.02	0.01	0.02	0	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.18
0.3 - 1.0	0.16	0.17	0.13	0.14	0.15	0.14	0.15	0.12	0.15	0.15	0.16	0.15	0.14	0.18	0.17	0.14	2.38
1.0 - 2.5	1.03	1.06	1.18	1.11	1.02	0.91	1.05	1.03	1.11	1.16	1.21	1.44	1.31	1.49	1.35	1.09	18.57
2.5 - 5.0	2.32	2.55	2.95	2.17	2.01	1.76	1.99	2.42	3.33	4.71	5.77	5.53	3.87	3.28	2.63	2.34	49.64
5.0 - 7.5	0.47	0.67	0.8	0.53	0.39	0.46	0.79	1.07	2.11	3.26	4.14	3.08	1.8	1.12	0.71	0.56	21.96
7.5 - 10.0	0.03	0.05	0.1	0.03	0.03	0.06	0.14	0.31	0.59	1.34	1.34	0.91	0.47	0.15	0.11	0.09	5.75
10.0 - 12.5	0	0	0	0	0	0	0.01	0.03	0.14	0.27	0.4	0.21	0.07	0.04	0.03	0.03	1.23
>12.5	0	0	0	0	0	0	0	0	0.03	0.04	0.11	0.05	0.01	0.03	0	0.01	0.28
Total	4.01	4.52	5.18	3.99	3.6	3.35	4.14	4.99	7.48	10.9	13.1	11.4	7.69	6.29	5.02	4.27	100.00
Total							~17% Sensitive			Prevailing 35%							

Table 5: Annual Average Wind Speeds at the grid reference - Percentage Frequencies

Speed/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
<0.3	0.01	0.01	0.03	0.03	0.02	0.03	0.02	0.01	0.01	0	0.02	0	
0.3 - 1.0	0.12	0.13	0.3	0.2	0.18	0.35	0.32	0.22	0.23	0.08	0.15	0.09	
1.0 - 2.5	0.92	0.82	1.78	1.72	1.6	1.96	2.69	2.13	2.22	1.21	1.11	0.42	
2.5 - 5.0	3.59	3.54	3.79	4.33	4.74	4.28	4.37	4.94	4.6	4.54	4.22	2.71	
5.0 - 7.5	2.68	2.23	1.78	1.67	1.51	1.28	0.95	1.14	1.11	2.31	1.94	3.37	
7.5 - 10.0	0.97	0.74	0.5	0.28	0.3	0.16	0.18	0.11	0.1	0.35	0.57	1.5	
10.0 - 12.5	0.19	0.23	0.11	0.03	0.05	0.03	0	0.01	0	0.01	0.22	0.35	
>12.5	0.02	0.03	0.04	0	0.02	0.01	0	0	0	0	0.05	0.11	
													100

Notes

- The above table shows the directions FROM which the winds blow.
- The NNE sector covers directions from 15 to 45 degrees and so on in 30-degree sectors.
- 100% of hours in a 30-day month = 720; 20.0% = 144 hours etc.

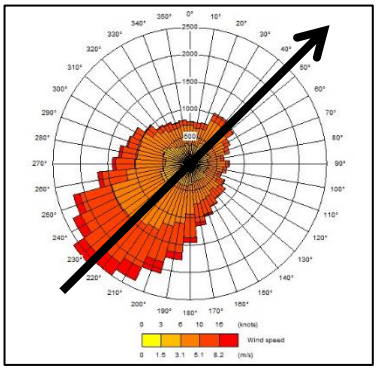
Main Features

- The prevailing winds blow from between the south and the west south-west (~35%)
- The least frequent winds blow from the easterly directions.
- The combination of winds from compass bearings between the south and the south-east is = 17% of the time.

5.3 Frequency of Wind Direction by Speed

The distribution of wind speeds ranges to 10.0 m/s with wind-speeds more than 10 m/s being relatively infrequent. The strongest winds blow from the south-west - Table 5 and Fig 5.

Figure 5: Wind Rose for this grid reference (arrow denotes most frequent direction of wind)



5.4 Wind Direction in relation to The Nearest Sensitive Receptors

The wind-rose shown in Figure 5 provides a useful illustration of where the pre-dominant winds come from and therefore determine the sectors that will be downwind of the composting facility for the greater or lesser percentage of time.

It has been shown that the Raptor Foundation Centre would be most susceptible to winds arriving from the south and south-south-east.

The data taken from Table 4 determines that the frequency of these winds may aggregate to ~12.5% of time which equates to less than 1 day per week.

SECTION 6.0 BUILDING VENTILATION DESIGN AND OPERATION

6.1 Building Ventilation Design by zones

Ductwork arranged within building based on 'zones' of ventilation. The Zones comprise

Zone 1. Reception Halls (partial Pre-treatment)
Zone 2. Transfer Passageway (partial Pre-treatment)
Zone 3. Process Exhaust from Vessels

The ductwork from each zone leads to the scrubber or into the tunnels where it is extracted to the scrubber
, the ventilation fans and then the biofilter.
The through ventilation extraction of air from the Reception buildings also serve to ventilate some parts of the Preparation zone. Preparation is undertaken within the reception area and prior to vessel loading in the Passageway

If we are reaching the point at which a vehicle cannot fully enter the building before closing a door we will switch to only having one door open at a time for the vehicle to move into and out of. This means the building negative air will minimise odour escape. Doors shall be closed at all times except when in use.

6.2 Building Ventilation Requirement for 2 - 3 Air changes/hour

The ventilation requirement is based on 2 - 3 air changes per hour, of void space.
The estimation is based on there being material resident within the reception area that accounts for some of the air-space volume.

The design summary is as follows for the primary IVC Reception and Transfer building.

Table 6 Airflows and Biofilter Sizing

BIOFILTRATION - Building		width	length	eaves ht.	Volume m^3
Reception Area Volume		40	36	6	8640
Transfer Area Volume		15	120	6	10800
Total Volume					**19,920**
		normal			m^3/hr
Air changes/hr		2.5	ac/hr	required	49,800
Individual Blower output	24,840	2 fans		provided	49,680

6.3 Primary Biofilter Ventilation Fan Specification

The Biofilter Fan Specification is determined as:

Twin blower fans, each:

24,840 m^3/hr (6.9m^3/sec) at 350mm water gauge

Operational Blower Fan capacity 49,680 m^3/hr

[Fans are rated at 45,000 m^3/hr at 1200 Pa]

6.4 Process Monitoring

Process monitoring

Envar Composting has operated the Gicom in-vessel composting system with associated bio-filters based on Dutch technology for many years starting with the DEFRA NTDP project in 2007.
The system is highly aerobic and therefore anaerobic conditions that favour the formation of highly odorous volatile organic sulphur compounds are strongly decreased.
Critical process operating parameters.
Feedstock preparation for any forced- aeration is critical to achieve the require aerobic conditions and temperature management during the in-vessel process.
Experienced operators will adjust the C/N and porosity of the feedstock prior to filling into the vessels. Once filled, moisture management is carried out in the vessels via a dedicated sprinkler system.
Temperature, oxygen, moisture delivery, air flow and evaporation rates are all monitored constantly and backed up for historical use or research purposes. (fig 1)

Biofilter

Air exhausting from the vessels are of high humidity due to the frequent watering of the feedstock within the vessels. This exhausted air is further maintained at 100% RH by the wet (water) scrubber through which the air passes through before entering the biofilter. This RH value is measured at the point where the air leaves the scrubber (indicated by the circle in fig 2 below) before entering the biofilter. This therefore ensures the whole depth of the fill-media from the bottom up is maintained at the optimum moisture level required for bacterial action.
The surface of the biofilter is kept moist by a central rotating sprinkler and additional sprinklers at each end of the biofilter.
Biofilter parameters; temperature, moisture (humidification), airflow, back-pressure are also monitored and recorded in the same manner (fig 2)

The site carries out an odour and efficiency test annually on the biofilter via an external contractor to ensure the system is working at an optimum and the report submitted to the Environment Agency as a condition of the Permit.

SECTION 7.0 BIOFILTRATION DESIGN AND OPERATION

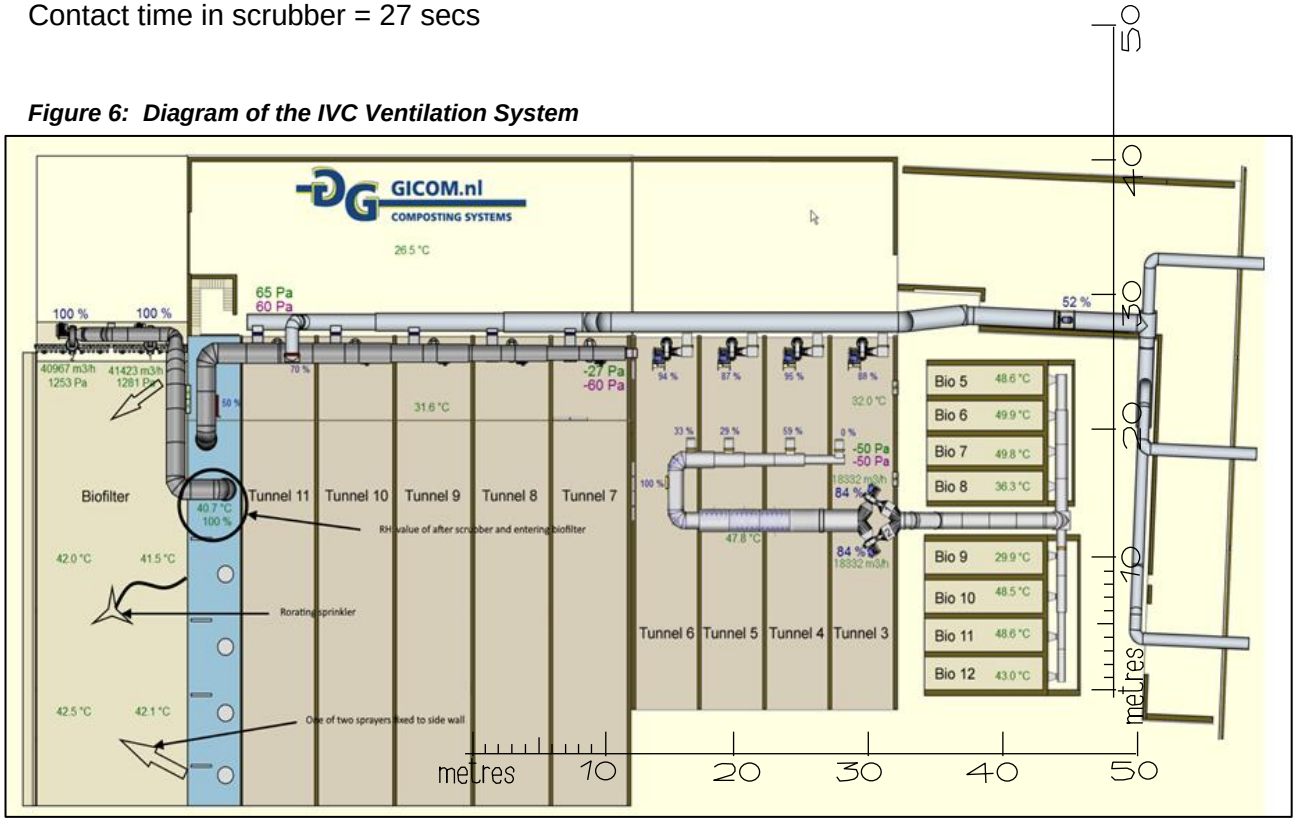
7.1 Wet Scrubber Sizing and Capacity (Existing System for Quality Compost)

The Existing wet scrubber design is based on an Industry Guideline of a minimum of 15 second contact time plus a margin of over-design.

4.5 metres deep chamber
4 metres width
35 metres length

Scrubber volume = 630 cubic metres.
Twin fan airflow delivery = 2 x 41,000 m^3/hr = 23.0 m^3/sec
Contact time in scrubber = 27 secs

Figure 6: Diagram of the IVC Ventilation System



7.2a Biofilter Sizing and Capacity – Existing System (Quality Compost)

The primary biofilter design is based on the EA Guideline of a minimum of 45 second contact time (empty bed volume) plus a margin of over-design.

3 metres deep bed media
13 metres width
40 metres length

Empty bed volume = 1560 cubic metres.

Twin fan airflow delivery = 82,000 m^3/hr = 23.0 m^3/sec

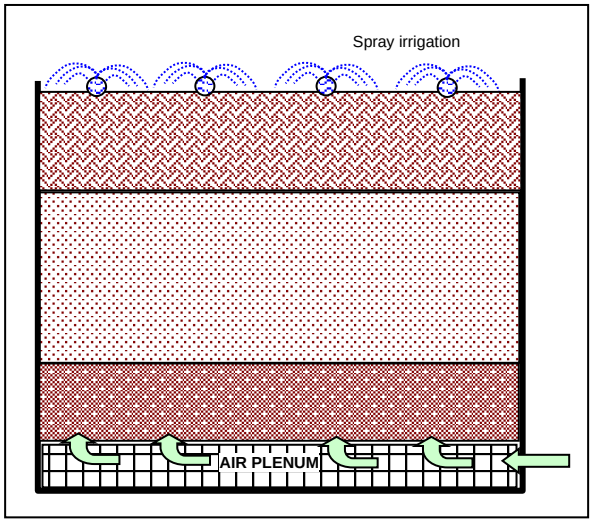
Contact time is bed volume/ airflow = 67 secs

7.2b Biofilter Construction– Existing System (Quality Compost)

The biofilter is formed by concrete solid wall construction, with removable panels on one end for access when the media is to be refreshed. There is a plenum over the whole of the floor area,

covered with the media above. The plenum is sized to enable uniform spread of airflow under the media and therefore uniform flow of air up through the media. The plenum also provides for drainage collection and removal of water roved from the air or from irrigation.

Figure 7: Profile of Air Bio-Filtration Unit

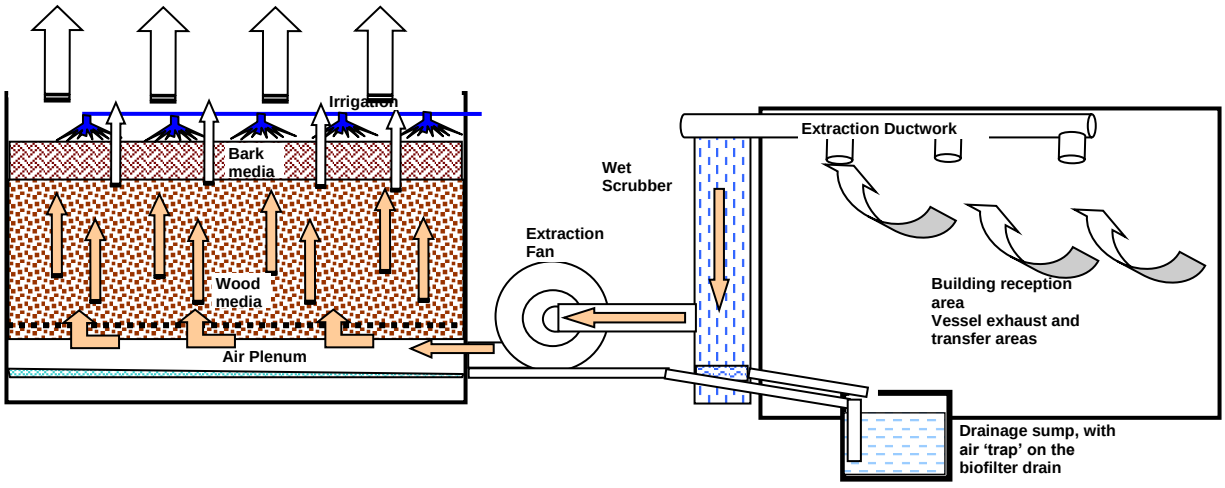


The biofilter is formed by the side of the scrubber building to provide a bunker of 13m width and 41m length and 3m depth. The floor is sealed to the side walls of the plenum to provide air and moisture containment, with drains leading to a 'trapped' sump. The air enters the plenum via two transition ducts (one for each blower fan) and an air distribution system from the fans.

The biofilter media has been designed as a shredded natural wood material, as per manufacturer's recommendations, that has been graded to avoid fines (less than 10mm) and provide the particle size within the range 75mm to 300mm. The bulk of the media is formed to a depth of 3.0metres.

The blower fans associated with the bio-filter are of centrifugal design to assure appropriate pressure characteristics for both the extraction and forced air pressures.
i.e. a duty capability of 350mm air pressure (combined extraction and pressure).

Figure 8a. The Basic Design of the Biofilter and Scrubber Arrangement



The biofilter is sited external to the building and is open topped. The sealed drainage system to drain off condensate or surplus irrigation is provided with a vertical 'drop-pipe' to 350mm below water level to provide a seal.

7.3 Biofilter performance – Temperatures, Sulphurous Gases etc.

Given the large size of the buildings, the airflow rate is high and affords a significant amount of air dilution, prior to biofiltration. This provides dilution of gases and cools the process air from the 60 – 70°C range down to near ambient.
The compost ventilation system utilises forced recirculation of process air. This is far superior to the 'single pass' systems, which generate exhaust that is both very odorous and at compost process temperatures of 60 – 70°C; and which can place significant loadings on the biofilters.

By using the recirculated air design, the exhaust from the compost is only a very small proportion of the airflow and may entail the exhaust of stale air of a given batch for about 15 minutes in each 4 hour period, i.e. only exhausting for 1/16th (6%) of the time, and then is only approximately 10% of the recirculated airflow rate, i.e. less than 1% of air exhausted (varies through the process).

This means that the dilution factor of the building internal air - 1:100 - with process air is extremely beneficial. This is also relevant for the shredding and other pre-process operations when the air change rate may be ramped up and again the dilution effect will be significant.

The biofilter has been designed to provide 90% odour removal efficiency, i.e. in keeping with the typical contemporary design biofilters where 90% is the norm for such packed bed type biofilters. The scrubber is an atomised water spray-based system to avoid the use of chemicals, and provides multiple functions:

- Odorous air impingement (soluble gases)
- Ammonia impingement
- Air cooling
- Air humidity raising (better for the biofilter as reduces risk of media drying)
- Dust removal (as sludge returned to the reception pit)
- Bioaerosol trapping (Aspergillus Fumigatus are inhabited at high moistures)

7.4 Projection of exhaust air quality– Existing System (Quality Compost)

The air quality that entails the highest intensity, over the longest duration will be that which is treated by the biofilter.

The following Table assesses the likely odour concentration within the process and then calculates the likely odour concentration at the discharge to atmosphere. The data is based on measurements made at multiple biofilter installations. The initial estimation is made by calculating the dilution effect of the air from the process, with the air from within the building. Obviously if the initial concentration is stronger so will be the output and therefore assessment should be made on efficiency and not on absolute values.

Table 7: Estimation of Odour Concentrations at each stage of the Air Treatment System

	Rated Performance Odour Removal Efficiency	Airflow (Maximum) m^3/sec	Odour Strength **OU_E/m^3**
Mixed Airflow from building		13.8	14,315
Scrubber	60% odour removal		
Mixed Airflow post scrubber			5,726
Biofilter	90% odour removal		
Post Biofilter		13.8	573

Twin fan airflow delivery = 49,680 m^3/hr = 13.8 m^3/sec

7.5 Quality Compost Process Monitoring and Control

Gicom Batch Tunnel Composting System

Gicom b.v. has designed computer-controlled batch tunnel composting facilities for the mushroom and waste composting industries since 1984.

The Gicom facility consists of multiple double-ended tunnels. These are 5m x 5m x 35m. The walls, doors and roof are insulated, and doors are installed at both ends to allow the separated filling and emptying of the tunnels. The improved technology at St Ives uniquely incorporates heated walls and floors in a number of the newer vessels.

The arrangement of the multiple long, narrow vessels enable the segregation of the processing of different feedstocks and being double ended, means that there is separation of unprocessed material from the processed material; an essential requirement of the ABP Regulations.

The tunnels are arranged in two 'blocks' labelled G3, G4, G5 and G6 etc. and the fan, ventilation and control functions are specific to each individual tunnel. The Technical Area above the tunnels holds the tunnel fans, the boiler to provide heated water to the tunnel walls and floors, and one of two primary scrubbers. The northern block of vessels links to the spray jet type scrubber and directs air to one biofilter; where-as the southern block of vessels direct air to a scrubber chamber and to the southern biofilter. Each scrubber removes, heat, dust, ammonia and other volatile materials from the active tunnel exhaust air. After leaving each scrubber, the exhaust air passes through one or other of the wood media based biofilters situated next to the tunnels. The wetted wood based biofilters remove or stabilise less soluble odorous chemicals from the tunnel exhaust air before the air is released to atmosphere.

The enclosed system also provides facilities to contain and process any leachate produced and treat process air to remove offensive odours and reduce the level of bioaerosols released to the atmosphere.

Gicom Batch Tunnel Composting Technology

The Gicom in-vessel composting technology has the following characteristics to promote optimal composting and production of quality compost:

It is fully enclosed, insulated and independent of the local environment, e.g. changes in ambient temperature.
It Possesses a uniform internal environment for composting to take place, i.e. temperature and oxygen levels being the same in all parts of the composting matrix at the same time.
It has a forced air recirculation ventilation system that enables full control of process temperature to ensure optimal aerobic conditions and temperatures are achieved for each stage of the composting process.
The enclosed air recirculation system based upon the forced jet over-all ventilated floor is designed to ensure that all parts of the composting matrix can be held uniformly at the required ABPR pasteurisation temperatures for the required minimum time.
Multi-point oxygen sensors and computer control of air-mixing for oxygen level control ensure that aerobic conditions are always maintained throughout the treatment.
The control of parameters including oxygen levels, moisture, temperature, airflow and CO2 levels enable very close control for the optimisation of processing, maximised efficiency and confidence in production schedules.
Computerised data-logging of data from multiple sensors enable optimal management supervision, intervention, and correction to be instigated promptly in response to any incidence where process strays from target conditions; and with readings being taken at least every 15 minutes this provides

detailed data collection for further review and analysis of all the required process parameters and provides data recording and storage for compliance purposes.

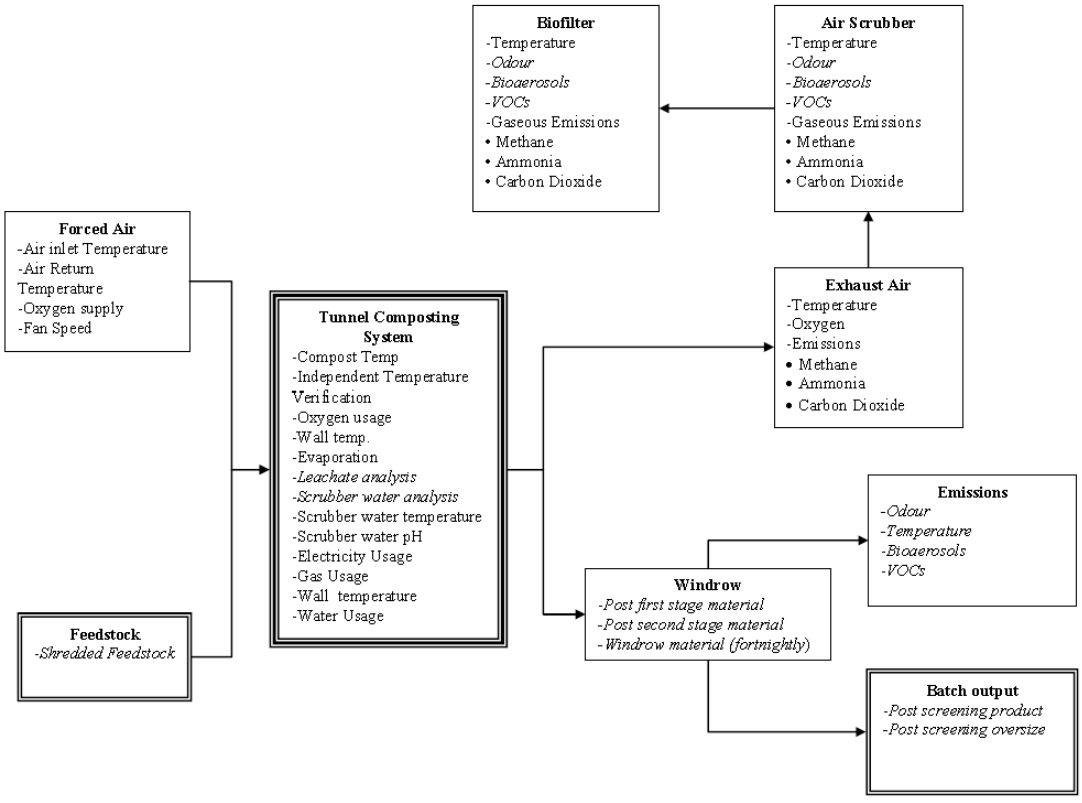
The Technical Area above the tunnels contains all of the equipment used to run and monitor the tunnels. Each tunnel has four temperature probes that are positioned at regular intervals along the central length of the tunnel. Once the tunnel has been filled with feedstock the temperature probes are inserted through the roof of the tunnels to a depth of about 0.5m into the composting material. They are removed prior to the tunnel being emptied. Two additional fixed temperature probes measure the temperature of air entering and leaving the tunnels.

A gas sensing system samples air quality from the recirculation duct from each vessel and this provides data to the computer control system that in turn can adjust ventilation fan speeds, air-pressure, heating, irrigation and air ventilation control valves that provide control of ventilation air quality including oxygen content, temperature, CO2 content, process air temperature and percentage air exhausted to the biofilters.

The air gas sensing system also has the facility for additional sensing elements and can be set to monitor ammonia, hydrogen sulphide, methane, and other trace gases although the full functionality of these is not required and not used.

The monitoring system is not limited to the composting process but also monitors the scrubber and biofilter parameters, including airflow, temperatures, system pressures and other air quality criteria summarised below:

Air and Process Quality Performance Parameters that can be Monitored



7.6 Additional Process – CLO Composting - Process Monitoring and Control

Trials work that continued in **2008-10** provides confidence in Gicom Facility technology as well as in the accumulated knowledge and expertise available. The facility provided the necessary process control for composting Separated MSW fines to produce Compost Like Organics (CLO) to the required quality standard and without environmental impact.

The system relied **on the same technology as for the production of Quality Compost**; but with additional monitoring systems and sampling for a wider range of gases as part of the trial. On this basis, the design of the CLO Odour Abatement system shall initially be based on that which is currently used and which comprises water-based scrubber and wetted wood media based biofiltration.

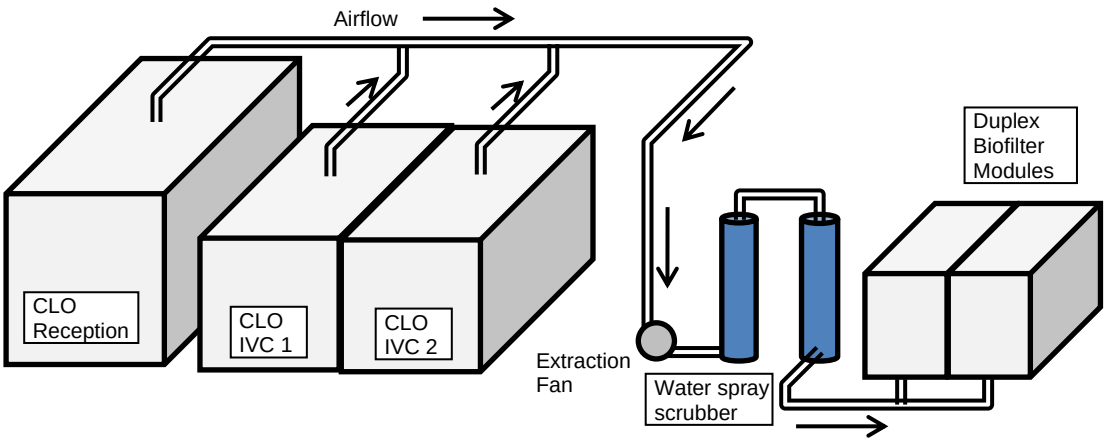
The Initial CLO Composting System shall comprise 2 IVC Vessels, to enable one to be in process, while the other is either being filled or emptied. CLO density is greater and therefore the depth of material within the IVC is lessened and tonnage of 250t composted in any one vessel.

The compost ventilation (aeration) system utilises forced recirculation of process air. The recirculated air design controls and minimises the air released to exhaust. This is only a very small proportion of the recirculation airflow and may entail the exhaust of stale air of a given batch for about 15 minutes in each 4 hour period, i.e. only exhausting for 1/16th (6%) of the time, This is only approximately 10% of the recirculated airflow rate. The recirculation airflow design is based on 10m^3/h/t; i.e. 0.7m^3/sec for 250t material in process. Air exhausted (10%) 0.07m^3/sec

IVC Vessel size 28 x 5m x 6m = 840m3 and therefore during materials movement the airflow capability shall be 3 ac/hr i.e. 2500 m^3/h (one vessel being loaded/emptied at any one time). CLO reception area volume 1500m^3 at 3 ac/h = 4500 m^3/h. Total airflow requirement 7000m^3/h i.e. 2.0m^3/sec and so for a biofilter with 75 secs RT requires 150m^3 biofilter volume. This shall comprise an enclosed facility in 2 parts each 3m width, 10m length and to 2.5m depth fill.

The scrubber design shall be a tower (vertical duct component) with spray jet water injection and drainage removal to specified sealed collection sump. Air contact time shall be minimum 30 seconds within the duplex 40m^3 tower system (or similar ducted venturi scrubber-based system).

Figure 8b. The Design of the CLO System Scrubber and Biofilter Arrangement



The dilution factor of the CLO IVC exhaust air shall be 1:15 - with fresher air is beneficial as this provides buffering of gases and decreases peak loads to the water-based scrubber and to the microbiology of the biofilter.

The primary operating and control parameters for CLO Composting shall include the gas sensing system that samples air quality from the recirculation duct from each vessel the computer control system that adjusts ventilation fan speeds, air-pressure, heating, irrigation, and air ventilation control valves that provide control of ventilation air quality including oxygen content, temperature, CO2 content, process air temperature and percentage air exhausted to the biofilters. The pH can be controlled by adjustment to the initial mix of material and also by adjustment of the oxygen balance, temperature and overall rate of composting using the above controls.

Account will be taken of the differing nature of the CLO compared to the Quality Compost and the loading rate of the vessels will be reduced, air pressure increased, oxygen content levels increased; and the additional monitoring of pH, ammonia and hydrogen sulphide will be undertaken.

7.7 Separate CLO Process – Biofilter Monitoring, Control and Options

The trials work previously undertaken has proven that the current system of scrubber and biofiltration system provides satisfactory exhaust air odour control.

However, it has been recognised (Risk Assessment) that as the processing of the CLO Material is increased, that his may bring additional pressures to the system and so facilities have been provided for the extended treatment of exhaust air from the CLO Composting vessels. This will include additional air quality monitoring both pre and post air treatment system, closer attention to the water quality within the scrubber; closer attention to the media within the biofiltration system, its condition, rate of deterioration, compositional or quality change under extended use, including pH, trace element accumulation, biological and chemical composition. Sampling and testing of thee effluent will be undertaken as a primary means of acquiring data on the chemical and biological characteristics of the scrubber and biofiltration systems.

A review has been undertaken to determine a wider range of options for exhaust air treatment if required, so that these can be brought into use to meet any specific need. These include:

- Installation of a packed bed trickling bio-filter, to increase the use of water as a film to remove ammonia and other soluble gases.
- Installation of an acidified water-based scrubber/trickling filter for the increased removal of ammonia and similar soluble alkali gases and constituents.
- Installation of an alkali based dry scrubber filter for the increased removal of acidic gases (H2S etc) and constituents. Use of dry lime, or wood-ash are options
- Installation of an alkali based wet scrubber/trickling filter for the increased removal of acidic gases and constituents. Use of alkali material, limewater or similar; or else the use of oxygen donating chemical solutions such as hydrogen peroxide would be considered if required.
- Use of activated carbon filtration

7.8 Attention to Process Management for Exhaust Gas Odour Control

The scheme provides the tandem (scrubber plus biofiltration), i.e. serial sequence of air quality management to deal with all aspects of odorous gas management; however, the principle that shall be the Primary method for odour control shall be based on the avoidance (or minimisation) of generating the mal-odour in the first place; and the majority of the focus shall be on optimising the process management to maintain high degree of oxygenation and the avoidance of generating acidic or other mal-odorous gases, rather than end-of-pipe treatment.

The trials work identified the following factors [Refer to Summary at Appendix A9] relating to CLO composting. For each the additional control is identified and is included in this scheme.:

	Process Exhaust Gas (odour) Issue	Scheme Odour Abatement Design
1.	Increased material density therefore reduced vessel loading required.	IVC Loading limited to 250t. Airflow increased, to ensure fast and complete aeration (oxygen supply)
2.	Potential for increased ammonia gas evolved due to pH change and temperature.	Careful control of temperature, add water to process and increase oxygen supply to increase ammonia absorption and NOX capture.
3.	Potential for increased Hydrogen Sulphide due to sulphur residues in the CLO	Monitoring of sulphur and H2S. Increased aeration to oxidise and neutralise heavy acidic gases.
4.	Potential for increased traces of VFA and VOC's and hydrocarbons.	Monitoring of VOC's VFA's including hydrocarbons such as methane. Increased aeration to oxidise and neutralise gases.

7.9 Additional Process – Sludge Composting/Bio-drying

Composting Bio-solids

The composting of sewage sludge solids is well researched and documented, and was the one of the standard methods of treating sludge solids for many years prior to Anaerobic Digestion becoming popularised in the 1970's. There are many references of research and large scale external operations in the USA. The bio-solids are rich in nutrients notably phosphorous and nitrogen, which means that bacteria can metabolise the solids quickly providing there is a useful supply of carbon, oxygen and substrate. Historically wood chips or similar carbon rich materials are provided for the solids to utilise the carbon and maintain an open structure so that the process is supplied with oxygen.

The Envar process will undertake this activity using the Enclosed, closely controlled 'In-Vessel' process to ensure that the sludge solids are properly heat treated, sanitised and de-odorised before the material is moved to the external maturation phase of the process.
The processing can then quickly progress to screening and the friable humus from the biosolids is separated from the woody/carbonaceous matrix (which is re-used) and is available for recycling to land.

Bio-Drying Bio-solids

Alternately, the composting process may be supplied with an alternative carbon rich material such as straw, where the carbon is more readily available, and the sludge generates surplus heat energy that can be utilised to dry the material and form a dried biomass. The use of the IVC environment with recirculatory air ventilation provides a high level of control with minimal exhaust emissions

Environmental Management

Whether composting or bio-drying, the use of the 'In-Vessel' facilities provides a very high level of environmental protection, because the emissions are minimised and controlled. Air emissions are a low exhaust airflow, that is passed to the scrubber and biofilter system before final exhaust.

Effluent including condensation collected in the ventilation ducts, is captured within the drainage system and directed to the buffer tank for waste water treatment.

Once composted in the vessels, the material may be further stabilised, or dependant upon the time within the vessel may quality tested and taken away directly for land application under the Sludge use in Agriculture Regulations; in accordance with the 'Safe Sludge Criteria'.

Air dried material shall be retained within the vessels until the criteria are met and then shall not be stored externally, else that would counter act the benefits of drying. The material would be despatched to its end market as treated and dried bio-solid material.

7.10 Additional Process – Grit/Sludge Composting

Composting Grit/Sludge

The composting of sludge solids from the de-gritting of off site treatment tanks, such as Anaerobic Digesters, may entail the treatment to meet the Animal By-Product Regulations (ABPR) and therefore entails a high standard of sanitisation as part of the treatment.

The Gicom 'In-Vessel' composting system is one of only a very small number of facilities that are designed to achieve the ABPR standards that are required.

The process entails the admixture of amendment material (such as chopped/chipped or shredded woody material recovered from composting) so that the nutrient bearing sludge is mixed with carbon and oxygen, and so that a healthy composting process is developed within the enclosed recirculation ventilated vessel. The sludge is converted to humus and the heating provides the necessary time and temperature criteria of the ABPR to be met and recorded.

The material may be held within the vessel to continue stabilisation and drying, or else matured externally. On account of the carbonaceous amendment and the controlled aerobic process, the odour from the material is of low intensity and an acceptable tone; similar to any other organic waste having undergone composting.

The benefits are that the fragments of residues of ABP material such as bones are quickly consumed by the composting treatment, as are the 'stones' from avocados and similar fruits. This means that the organic material produced can be screened and inert grit material removed and recovered; while the biomass solids may be used as a component of a soil manufacturing process, or used as a 'Non-PAS100' soil conditioner and exported for use in restoration schemes or similar using a Mobile Plant Permit and Deployment.

7.11 Odour Risk Assessment – Biosolids and Grit/Sludge Composting

The novel waste types being added to the permitted inputs have similar odour characteristics to the existing biowaste and though there may be a high odour intensity within the raw material, the constituents of the material bear less odour risk than the Municipal Waste fines that are used to manufacture Compost Like Organics.

Given, therefore, that the composting processes are fully enclosed, and within 'state-of-the-art' composting vessels, with recirculated air and rigorous monitoring and control regimes, then the odour emission from the composting process is of low volume, low intensity and of an acceptable tone.

Furthermore, for logistical and quality management reasons, these materials whether composted dried or blended shall be despatched from site once screened and graded on exit from the IVC.

Conclusion

It may be concluded that the overall odour emission from these additional waste types shall therefore be very low.

Quantitative Assessment

Section 8.0 provides the assessment. On the basis that the output of the IVC's will not be increasing and may well decrease if the IVC treatment duration is extended in order to further stabilise material or air dry solids; then the modelling in section 8 is still relevant and appropriate.

SECTION 8.0 Estimation of Odour Impact at Distance

8.1 Projection of Residual air quality at Distance

The air quality within the external windrows is maintained to be aerobic as measured and managed by the 'Compost Manager' meter and is freshened at least weekly by the Specialist Straddle Type turning machine. The warmth of the windrowed material may lead to water vapour being released however an odour from the fully aerated oxygen rich compost is described as earthy. The highly aerobic process ensures any odours are quickly dissipated.

Figure 8c: The Compost Manager Instrument measures: temperature, moisture, O_2 and CO_2 simultaneously	Figure 8d: Envar Windrow Turner provides water spray wetting of the compost as it turns the material from the 'bottom up' meaning that aeration is introduced by a tumbling action without the material being thrown into the air
	 Turner has water spray irrigation system built into the design

As previously described, the odour intensity is diluted by dispersion into the atmosphere. The dispersion is three dimensional but is restricted due to the ground surface and therefore dispersal is upwards and outwards, predominantly in the downwind direction.

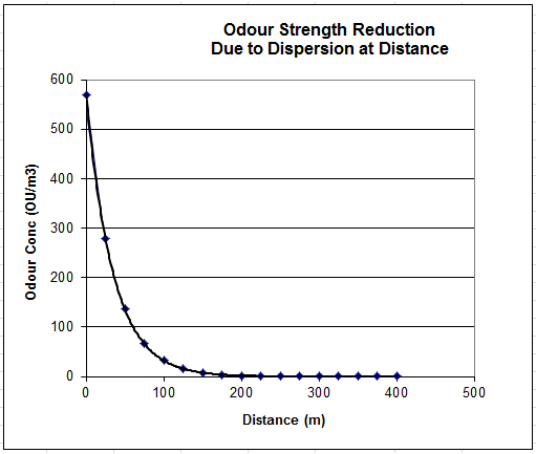
8.2 Projection of Residual air quality at Distance from the Biofilter

An exponential dispersion expression may be applied to the odour concentration from the biofilter to provide a 'quick check' impression to determine if the odour leaving the biofilter can reduce within the distance towards a nearby sensitive receptor.

In this instance the result is predicted in table 8 and illustrated in figure 9.

Table 8 and Figure 9
Odour concentration reducing at distances away from the source.

Distance	OU/ m^3
0	570
25	278
50	136
75	66
100	32
125	16
150	8
175	4
200	2
225	1
250	0.4
275	0.2
300	0.1



The separation distance from the biofilter to the nearest sensitive receptor is greater than 300 metres. It may be concluded that the residual odour concentration will be < 1.5 OU/m^3 within 225m from the biofilter.

8.3 Projection of Residual air quality at Distance from the External Pad

In order to provide an estimation of the residual odour from the external pad, it is first necessary to estimate the odour emission rate from the compost on the pad.

This is based on research data that provides values for the odour emission rate from static windrows, and also from windrows being subjected to turning. The emission rate is the product of the air rise rate and the odour concentration of that air.

The values researched are given as:

0.5 OU/sec/m^2 for static windrow (average based on 2-10 weeks compost has been in process)
6.0 OU/sec/m^2 for turned windrow

The calculation determines the aggregated emission rate based on the surface area of all static windrows and then adds to that the emission from a windrow undergoing turning at any one time.

A single 60m long semi-circular 4m wide windrow surface area is taken as 400 m2.
On the large pad some 60 such rows may be accommodated
The odour emission is therefore 60 x 400 x 0.5 = 12000 OU/sec

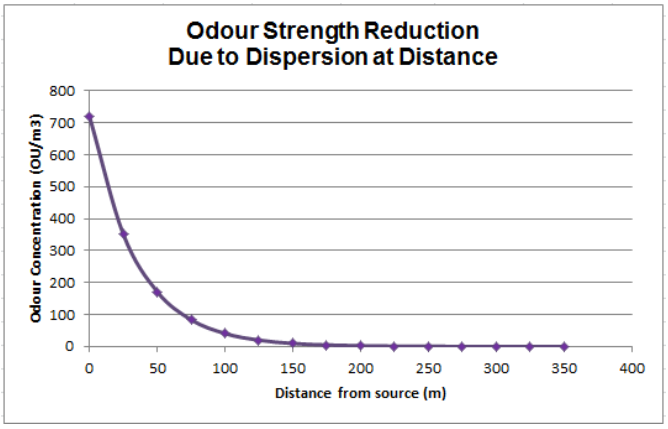
The odour emission from the windrow undergoing turning is 400 x 6.0 = 2400 OU/sec
The total emission is therefore 14,400 OU/sec.

Assuming a slow speed drifting wind moves the odours steadily in the direction of a sensitive receptor, but does not provide massive dilution, then it may be estimated that a 2.4mph, (1 m/sec) wind crossing the site from the south crosses a 200m width, and at least disturbs a 100mm layer of air therefore entailing a volume of airflow equating to 20 m^3 of airflow. If this airflow picks up the odorous emission of 14,400 OU/sec, then this means that the resultant air quality will then include 720 OU/m^3 from the static and turned windrows.

As before an exponential dispersion expression may be applied to the odour concentration from the source to provide an informed estimation and determine if the odour from the windrows can reduce within the distance towards a nearby sensitive receptor. In this instance the result is predicted in table 9 and illustrated in figure 10.

Table 9 and Figure 10 Odour concentration reducing at distances away from the source.

Distance	OU/ m^3
0	720
25	351
50	171
75	84
100	41
125	20
150	10
175	5
200	2
225	1
250	0.6
275	0.3
300	0.1
325	0.1



The separation distance from the external windrow area to the nearest sensitive receptor is greater than 300 metres. It may be concluded that the residual odour concentration will be < 1.5 OU/m^3 within 225m from the activity.

8.4 The Impact of the Residual air quality at The nearest Sensitive Receptor

- The prevailing wind direction is towards the north-east, with only 12.5% of time when the wind is from the south and south east and blowing towards the sensitive receptor.

- Mathematical projections based on odour emissions from the Biofilter and from the external pad area have determined that in each case the odour concentrations are likely to fall to give an impact of less than 1.5 $OUEm^{-3}$ at the location of the nearest sensitive receptor if the wind was blowing in that direction.

- On the basis of these key facts, it is predicted that the likelihood of there being an odour nuisance at the nearest receptor is LOW.

SECTION 9.0 Odour Management Procedures

9.1 Site Wide Odour Management - Routine Tasks

Daily

Operational

a) Ensure all tunnel processes are performing normally, which ensures anaerobic conditions do not occur.
b) Ensure windrows are being turned to ensure aerobic composting. Any “offensive” odours detected, will be investigated and the cause rectified.
c) Lagoon water levels and any apparent odour to be recorded.
d) Quality checks on incoming vehicles.
e) Checks on site for apparent odours.
.

Monitoring

a) Carry out routine upwind and downwind “boundary” odour sniffing by a member of the site management or technical staff Observations to be recorded with reference to wind direction). This will be carried out twice a day, AM and PM. The outcome will be recorded in the Site Diary or similar suitable system as per the monitoring procedure.

Weekly

a) Check that all pumps are operating satisfactorily.
b) Carry out routine checks on the effectiveness of cleaning procedures.
c) Check drains and gullies for stagnant water.If persistent odour is recorded.

Monthly

a) Review odour monitoring records for any trends.
b) Review any complaints to establish any trends.

Six Monthly/Annually

a) Review odour monitoring records for any trends
b) Review any odour complaints records.
c) Local liaison Committee meeting

As Required

Dredging/Cleaning out lagoons

On occasion the lagoons may need to be cleared of silt and sediment which builds up in the bottom of them. This has the potential to generate odour which cannot be easily avoided. The process would require planning to minimise odour and also any disruption the odour would cause. The

method for undertaking the dredging would consider the following in the SOP before the dredging was carried out –

- Time of year, it is less likely people will be in their gardens in the late autumn and winter months meaning there is less likelihood of causing nuisance
- Length of time to undertake the task, the dredging would be undertaken using hydraulic long reach excavators of through hydraulic dredging and would be completed in one hit where possible and required. Measures would be taken to as far as possible ensure the machine runs continuously without stopping to minimise the odour duration
- Waste from the dredging will be taken to reception via tractor or loading shovel as it builds up for composting
- Envar would aim to operate on weekdays during working hours of 8-4 when most people were at work to minimise disruption
- The EA and the local parishes would be notified at least 14 days before undertaking.

9.2.1 General Process Monitoring

Under normal operating conditions the In-Vessel Composting Facility and the Boiler/Drier process can and will be monitored by onsite staff operatives during the day as well as remotely via the use of onsite telemetry data 24hrs a day. This will alert the Site Manager of any potential issues that could develop into odour problems should they arise.

The procedures for the site are based on the measures set out in Section 5 of the EA's H4 odour guidance (where applicable).

Daily site walkover inspections will monitor the facilities processes, buildings, equipment and all point source emissions to ensure that odour releases are being contained and controlled within the system to ensure the site meets with best practice and acceptable standards.

- Routine monitoring of odour will include:
- Sniff testing to a standard as defined by the EA's H4 Guidance.
- Daily monitoring of weather conditions.
- Monitoring of onsite odour abatement equipment.
- Monitoring of process conditions to give early warning of potential odour issues; and
- Monitoring of complaints and other forms of community feedback.

9.2.2 Process Specific Monitoring

IVC for Quality Compost production

The monitoring and control system has been described at Section 7.5.
Within the Quality compost production process, the following are monitored:

Feedstock Quality:	Assessment of Carbon: Nitrogen ratio, moisture content, condition, age, particle size, volatility	To assure correct parameters for optimal composting
Pre-processing/ shredding and mixing	To blend high nitrogen material with further carbon material; provide particle size compliance and optimal size for structure and airflow.	
Airflow	Adequate airflow to maintain aerobic conditions to all parts of the material within the vessel	
Process oxygen level	To ensure the airflow available to the material has adequate oxygen availability	Target above minimum of 7% apart from on initial warm up when its

		normal for oxygen to briefly be below 3% in exhaust due to rapid Oxygen use in the warming material. this has been monitored and the biofilter is more than capable of dealing with this.
Process temperatures	Monitored by probes within the biomass and also within the recirculation air duct	For control of temperature
Air inlet and exhaust	Monitored as part of air temperature control, which with airflow enables process temperature control. Also controls negative (suction) pressure within vessel and minimises fugitive emissions	
Exhaust air quality Exhaust airflow and pressure	Exhaust air Temperature, moisture and trace gases. Biofilter temperature, plenum pressure, airflow. Media moisture content, media degradation. Scrubber and biofilter effluent quality, including ammonia, solids content and trace elements. **SEE APPENDIX 5.**	To assure that heat-load, airflow on scrubber and biofilter is managed.

See 7.5 for further details.

Post-IVC External Composting for Quality Compost production

Within the External Quality compost production process, the following are monitored:

Material Quality:	Assessment of moisture content, and structural condition, particle size and volatility	To assure correct parameters for optimal composting
Process oxygen level	To ensure the airspaces within the material can provide adequate oxygen availability	Target above minimum of 7%
Process temperatures	Monitored by probes within the biomass	For management of temperature
Effect of Turning	Pre and post windrow turning, the key parameters are assessed to determine that the correct management effect has been attained and composting conditions optimised	
Post Screening	The material is sampled and submitted for testing; including tests that reveal physical, chemical and biological quality including the PAS100 stability index.	

IVC for CLO production; and for Sludge Biosolids, and Grit/Sludge Composting

The monitoring and control system has been described at Section 7.5.
Within the Quality compost production process, the following are monitored:

Feedstock Quality:	Assessment of Carbon: Nitrogen ratio, moisture content, condition, age, particle size, volatility	To assure correct parameters for

Pre-processing/ shredding and mixing	To blend high nitrogen material with further carbon material; provide particle size compliance and optimal size for structure and airflow.	optimal composting
Airflow	Adequate airflow to maintain aerobic conditions to all parts of the material within the vessel	
Process oxygen level	To ensure the airflow available to the material has adequate oxygen availability	Target above minimum of 7%
Process temperatures	Monitored by probes within the biomass and also within the recirculation air duct	For control of temperature
Air inlet and exhaust	Monitored as part of air temperature control, which with airflow enables process temperature control. Also controls negative (suction) pressure within vessel and minimises fugitive emissions	
Exhaust air quality Exhaust airflow and pressure	Exhaust air Temperature, moisture and trace gases the air gas sensing system also has the facility for additional sensing elements and can be set to monitor ammonia, hydrogen sulphide, methane and other trace gases. Biofilter temperature, plenum pressure, airflow. Media moisture content, media degradation. Scrubber and biofilter effluent quality, including ammonia, solids content and trace elements. **SEE APPENDIX 5**	To assure that heat-load, airflow on scrubber and biofilter is managed.
CLO Quality	The CLO material is sampled and submitted for testing; including tests that reveal physical, chemical and biological quality including a stability index that determines the material fit for export.	To assure that the material has achieved a minimum quality and is fit for export to another site.

See 7.5 for further details.

Biomass Boilers
The Boilers have automatic control of fan speeds and airflows for the primary and secondary combustion processes. Probes sense temperatures and oxygen levels.
Other systems monitor fuel federate and de-ashing requirement.
The boilers are of a size and fuel type being used where there is the need for annual monitoring of emissions.
The quality of the fuel is monitored and tests undertaken regularly to assure boiler efficiency.

Driers
The driers have built in computer-controlled systems for airflow and temperature regulation.
These parameters are also remotely monitored by the manager.
Air inlet quality, air pressures, airflow; air exhaust quality are monitored to maintain drier efficacy and efficiency.

9.3 Sniff Testing

The Site Manager or delegated Site Operative will undertake a daily sniff test walk around the site perimeter to monitor odours. The walk path will consider sensitive receptors, wind direction, investigating a source of odour or responding to a complaint. The sniff testing will be carried out in the early morning before the member of staff's sense of smell becomes conditioned to any site odours. To improve data quality, another sniff test walk will be undertaken after lunch by a person who has been off site and re-enters the site with a fresh sense of smell. Any adverse results will be recorded to the odours record file and will include details of date, time, location, weather conditions, temperature, wind direction, sensitive receptor, source of odour, description of smell and duration of sniff testing.

9.4 Odour Diaries

Envar Composting Limited will work with any complainants to keep odour diaries as necessary so that any pattern of odour problems may be determined if the odour problems persist. This may be by the use of an electronic or manual system.

9.5 Records

Monitoring results will be retained on site in accordance with Permit requirements. Data collected will be reviewed and used to inform any changes necessary to odour control and abatement techniques, as well as the review and updating of this Odour Management Plan.

9.6 Odour Management Procedures - Responsibilities

Procedures have been designed to take account of the key odour control points listed in Section 2 Table 4.

Table 10 Odour Management Procedures - Responsibilities

Ref.	Aspect	Managerial Control Required	Responsibility
A	Reception of Feedstocks	See Appendix 2 Requires regular management consideration, with detailed '**waste pre-acceptance measures'.**	Facility Manager
B	Reception Building	Requires managerial control First In – First Out FIFO, materials to start being processed ASAP (within 24 hrs) Regular checks on state of material Checks for Fugitive Odour releases Checks on extraction system	Site Operations Manager /delegates to Reception Building Operative Facility Manager checks infrastructure
C	Feedstock preparation	Fully enclosed with local exhaust ventilation. Shredding of ABP feedstock is undertaken within enclosure. Managerial control to treat very offensive material quickly. Attention to mixes to attain correct C:N ratio, porosity & moisture	Site Process Operations Manager
D	In-Vessel Composting	Managerial control to ensure the IVC process operator is fully trained and qualified. Managerial control to ensure that oxygen levels within the process airflow are appropriate to maintain the material aerobic. Management of the Temperature control systems to ensure the appropriate temperatures are maintained for the correct duration. Regular monitoring and checking. Checks to ensure exhaust extraction system is working correctly.	Site Process Operations Manager Site Process Operations Manager with site engineer
E	Vessel out-loading	Management by training of operators especially loading shovel drivers on how to minimise causing releases from material. Management checks to ensure that extraction ventilation system is operated and working appropriately. Management to schedule the un-loading of vessels so that releases are not aggregated within a short time-period.	Site Process Operations Manager
F	External Windrows	Management by training of operators especially windrow turning or loading shovel drivers on how to minimise causing releases from material. Management checks to ensure that compost aeration adequately maintains appropriately aerobic conditions. Windrows are turned as determined by the Compost Manager tool. Management of the Temperature and moisture conditions to ensure the appropriate temperatures are maintained for the correct duration. Daily olfactory 'sniff' checks around the perimeter of the site. Regular effluent /dust monitoring and checking with visual inspections especially in very dry or very wet weather.	Site Process Operations Manager Site Environmental Assistant

G	Screening	Management by training of operators to undertake relevant checks and tests to ensure material presents least exposure to wind while screening; to ensure enclosures are used where supplied and that dust suppression is used when required. Management observation and checking of the process.	Site Process Operations Manager
H	IVC Effluent	Management to ensure IVC drainage systems operating correctly; to ensure effluent removed and treated or disposed quickly. Management to monitor for leaks, spills or failures in system.	Site Process Operations Manager
I	External yard rainwater	Management to ensure yard drainage systems operating correctly; to ensure effluent removed and treated quickly. Management to monitor for leaks, spills or failures in system. And also, lagoon storage capacity and avoided overflow.	Site Process Operations Manager
J	Channelled air exhaust (Biofilters)	Management checks to ensure that extraction ventilation system is operated and working appropriately. Management checks to ensure that biofilter system and irrigation is operated and working appropriately with uniform wetting of surface without ponding or localised swamping. Monitoring and checking of airflows, air temperatures, biofilter temperature, moisture and pH. Monitor 'back-pressure' of biofilter as check on media blockage. Management olfactory checks of air quality off biofilter.	Site Process Operations Manager with assistance from Environmental Engineer
K	Biomass fuelled boiler	Management checks to ensure that only the correct fuel is used within the boiler. Management checks to ensure that the operational requirements of the boiler are appropriate, e.g. optimum temperature of combustion etc., fuel calorific value and minimised stop/start cycling.	Site Biomass Process Operations Manager
L	Drier	Management checks to ensure that only the correct fuel is used within the boiler. Management checks to ensure that the operational requirements of the boiler are appropriate, e.g. optimum temperature of combustion etc., fuel calorific value and minimised stop/start cycling.	Site Biomass Process Operations Manager
M	Materials Pre-Acceptance	Pre-acceptance to consider not just the nature of the materials in its natural state, but also the effect of heating and drying that material and the odours that may be generated, released and emitted as the material is dried.	Site Biomass Process Operations Manager and Facility Manager
N	Pre-drier storage	Pre-acceptance checking. Pre-testing of materials in reduced quantities. FIFO and avoided long term pre-storage.	Site Biomass Process Operations Manager
O	Post-drier storage	Management checks to ensure that the drying requirements have been achieved, and that the materials are cooled so that any adverse reaction or spontaneous combustion is avoided.	Site Biomass Process Operations Manager
P	Waste-water Treatment Plant	Management checks to ensure that the treatment requirements are met. Management monitoring, testing and control procedures.	Site Process Operations Manager
Q	Abnormal activity management	Management training and procedures in place for accidents, spillages, fire and system breakdowns or failures. Operative training including practice sessions to rehearse and procedures for accidents, spillages, fire and system breakdowns or failures.	Facility Manager Site Process Operations Manager Site Biomass Process Operations Manager

9.7 Odour Mitigation Measures for Contractors and Third Parties

Odour risk assessments for routine operations are included below in Appendix 1.
Odour assessments should also be carried for all maintenance work which may involve exceptional or uncontrolled emissions of odour to ensure that all such tasks are carried out taking account of measures needed to minimise odour release. Examples could include periodic dredging of the lagoons and cleaning out below-ground effluent and drainage pits.

The Environment Agency, the Local Authority and any relevant Parish Council representatives may need to be notified, in advance, of any maintenance operations that are likely to cause off site

odour impacts. It should be considered in the event of an unforeseen event such as a breakdown that some or all of the bodies above be notified immediately.

9.8 Control Measures during Routine Maintenance

When maintenance work is undertaken, there is the potential that the facility is more vulnerable, or there is a risk of a small odour release, e.g. removing a pump, replacing a pipeline, or rodding/flushing a particular pipe/chamber/stone trap etc.
Maintenance works will be completed by suitably qualified and competent contractors. Rules/work permits will be required for all Contractors working on site.
Sections of the plant which require maintenance will be sealed off from the main process to control and limit the potential release of odours during maintenance works.

9.9 Diverted Wastes during Operational Difficulties

In the event of a critical failure during the usual operating procedure of the facility which would result in restricted reception capacity, additional mitigation measures will be put in place to minimise the impact of the incident. These shall include:

- No receipt of waste during times of plant failure;
- Containment of spillages or odour releases.
- Clean-up procedures.
- Wash-down procedures; and
- Removal of waste either into tanks or to an alternative facility within 48hrs.

9.10 Odour Risk Assessments

In addition to the risk assessments carried out, all alterations to normal operations and maintenance works on site should take account of the possibility of generating odours. For critical activities with the potential for odour generation, the Environment Agency, the Local Authority and the Parish Council may need to be notified of such events including:

- Cleaning out any below ground pits or tanks used to collect effluent
- Cleaning out any above ground tanks used to buffer store effluent
- Dredging of lagoons
- Any major equipment failures which may cause elevated odour emissions

9.11 Contingency Procedures and Alarms

All site operatives should be trained to deal with a range of operational emergencies. There should also be a clear structure of responsibility which allows operational staff to call in specialist engineering, process, and H&S staff to deal with emergencies and unplanned events.

Where possible all maintenance work and alterations to the process system are carried out in a planned manner, with odour abatement measures carried out as part of the planning process, using the Odour Risk Assessment procedure.

9.12 Environmental Monitoring Log Maintenance And Content

Operational parameters, site specific events, weather etc., will be recorded in the Site Diary.

Odour complaints must be recorded and investigated by the Facility Manager, who will also prepare suitable feedback. All complainants should receive feedback within 24-48 hours. In absence of the Facility Manager the Compliance Manager, will carry out the Facility Manager's tasks.

9.13 Weather Monitoring System

There is an automatic recording system on site. This system is located at the site operations building and is also remotely accessible, which allows the site staff to monitor the weather and any trigger conditions. Local weather data is also accessed via the internet when required.

9.14 Staff Training - Methods

All site operations are geared to maintain aerobic processes.
All Site Staff will undergo an agreed programme on the impact, effects and countermeasure actions related to odour and the site operations, whenever odour is perceived to be a problem on site.

Training Frequency
Frequency of training is determined by site specific needs.

Training records
All employees have a comprehensive training record, which is held on site.

9.15 Review and Reporting Procedures

Reviewing System Performance

The effectiveness of the system will be monitored by the olfactory method and by the amount of complaints that have been logged in the site diary daily.

This data is also required to be submitted to the Environment Agency as a part of the annual Environment Monitoring Review.

SECTION 10.0 Odour Management – Contingency Measures

10.1 Odour Management Contingencies

Taking into account the Odour Sources, the risks of emission and the Odour Rating (Intensity and Duration), and with attention to the odour management procedures in SECTION 2 and 9, the following contingencies have been designed to provide improvements to the management and control at times when required; and to establish quick response procedures in the case of an accident, spillage, emergency or sudden failure..

Contingency Requirements have been identified as follows, and 5th column advises point at which intake of waste is STOPPED in order to avoid exacerbating the situation:

11 – Odour Management Contingencies

	Contingency Event	Uncorrected Outcome	Contingency Measure	Point at which intake of waste is Stopped
C1	Electrical Power Failure	Fan stops extracting air from buildings / IVC vessels potentially leading to fugitive emissions from building, or from process	Bring in or utilise stand-by power supply (e.g. run CHP on gas). Have name of generator rental company within management system.	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that doing this only causes problems with odours elsewhere where the waste is stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule
C2	Fan Motor Failure	Fan stops extracting air from buildings / IVC vessels potentially leading to fugitive emissions from building, or from process	Replacement motor can be obtained within 24 hrs. Motors are very reliable. Option to bring in alternative fan likely to prolong the time taken to fix existing one. If possible, Restrict process activity, and main door opening during down-time.	If extraction fan is stopped for more than 2h, then arrange alternative temporary fans or 'mobile' engine driven fan.
C3	Ventilation extraction-duct failure	Cracked, broken or failed duct joint, prior to fan, decreases extraction effect.	Can be temporarily repaired with polythene sheet and Duct tape, until full and proper fixing can be undertaken.	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that

				doing this only causes problems with odours elsewhere where the waste is stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule
C4	Ventilation fan outlet duct failure	Cracked, broken or failed duct joint, prior to biofilter, means odorous air released prior to filtration	Can be temporarily repaired with polythene sheet, backed with sealant and strong plastic sheeting, held with and Duct tape and wire straps or bands. Make arrangement for full and proper fixing as soon as possible.	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that doing this only causes problems with odours elsewhere where the waste is stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule

	Contingency Event	**Uncorrected Outcome**	**Contingency Measure**	**Point at which intake of waste is Stopped** STOP
C5	Biofilter structural failure	Broken or failed biofilter panel or joint, means odorous air released prior to full filtration	Walling is formed of concrete panels. Seal gap with expanding foam. Call manufacturer/suppliers, or engineers for repair or replacment panels For serious failure, by-pass the biofilter to a temporary biofilter comprising wood-chip pile, and/or carbon filtration module. Use appropriate sized fan for system.	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that doing this only causes problems with odours elsewhere where the waste is

			DO NOT modify the biofilter until approved by management, and then make use of gas detectors, independent air supply etc.	stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule
C6	Final exhaust duct failure, blockage or breakage	Broken, blocked or failed duct, means cleaned air is released but not benefitting from biofiltration effect.	If duct is failed, then renew the failed piece. Duct work is easily sourced and easy to fit. If blockage is the problem, then unclip the sections, rod and clean blockage, provide a drain plug and drain pipe as required and re-fit ductwork.	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that doing this only causes problems with odours elsewhere where the waste is stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule
C7	Main Door stuck open	Extraction effect is minimised, risk of fugitive emission, when wind blows across doorway	Turn fan to full speed to maximise extraction effect. Erect tarpaulin cover to minise air movemnt through doorway.	When tarpaulin sheet door implemented, repair works shall be completed within 4-8 days depending on objective assessment of odour.
C8	Odorous Effluent spillage, somewhere in system	Odour emitted from release of liquid	**Use slurry tanker to suck up liquid immediately**, and feed it into the system, or dispose off site at permitted facility. Use absorbant material, woodchip, sawdust, sand to absorb liquid and dispose to approved site	Effluent spills to be reacted to immediatley.

			(composting). Use flexible hose ducting to generate extraction of odorous air from the area, into the building.	
C9	Odorous gas release, on ventilation extraction system pipework	Odour emitted from release of odorous air, gas or vapours. Odorous gas may be H2S, which is extremely dangerous toxic even in low concentrations, e.g. in confined spaces. Effluent off-gas is potentially toxic, and is an asphixiant.	Inform manager and seek approval regarding safety of working in the affected area. Take caution in regard to explosion or fire. Take caution regarding health and safety, DO NOT enter confined spaces due to toxic gas potential. Isolate the affected section of pipe by turning off valves. **Use flexible hose ducting to generate extraction of odorous air from the area, into the building and main biofilter.** Use stand-by fan and carbon barrel filter to draw in and treat the odorous air	If problem not resolved in 24-48 h then stop receiving feedstock for this process. Its worth noting that doing this only causes problems with odours elsewhere where the waste is stored. Stopoing of waste should be undertaken in conjuntion with advice from the EA. Because if the wind is no where near a sensitve receptor then there is essentially no one to cause pollution to even if it does smell so a decision should be based on all the variabnles at the time not on one blanket rule

SECTION 11.0 Odour Management – Community Relations

11.1 Engagement with Neighbours

In the event of odour issues, the operator Envar Composting Ltd will ensure that their complaints procedure is followed and will engage with the public in an appropriate and timely fashion. See Appendix 4.

Envar Composting Ltd were very proactive in engaging with their neighbours during the planning and permitting application process to ensure there was clear and robust consultation both with statutory consultees and the public,

Envar Composting Ltd shall regularly keep the public up to date as the project is developed.

Envar Composting Ltd aims to maintain an open and transparent approach and intends to continue engaging with the local community upon commencement of operations.

11.2 Responding to Complaints

The site office telephone number will be made available for the public to use should they wish to register a direct complaint to the operator. Following any complaints received, the operator will endeavour (where possible) to contact the complainant to provide feedback on actions taken to both assess the event and convey any remedial actions taken.

Any external request for information will be acknowledged, recorded and dealt with on an individual basis as the type of information provided will depend on the content and source of the request. All communications will be reviewed during routine management review meetings.

11.3 Documentation of Complaints and Record Keeping

Envar Composting Ltd shall utilise the standard template documents provided by the Environment Agency as part of H4. This will enable the complainant a better opportunity to explain and describe the nature of the problem and will enable Envar Composting Ltd a clearer understanding on where to look in order to resolve the issue and either make the required rectification or implement revised procedures.

The recording Templates include:

- H4 Odour form sniff test
- Online odour log – MyCompliance or a similar system

The templates are provided at **Annex 4.**

11.4 Odour Complaints / Incident Review

It is vital to record and act upon complaints received and communicate the outcome of the investigation to the complainant. It is equally vital to undertake a review following complaints or incidents to implement further control measures or change behavioural practices on site to prevent the event from occurring again. The site operator, Envar Composting Ltd, will undertake a formal review of onsite processes following any major incident, and will routinely review any complaints received as and when they occur.

All records of events and actions taken will be retained as required by the Environmental Permit.

11.5 Notifying the Environment Agency

If an accident or incident occurs Envar Composting Ltd will notify the Environment Agency as soon as practically possible, using the emergency 24hr phone line (08708807060). The TCM for the facility will also notify the Regulatory Officer should any material complaints be received directly to site and advise what remedial measures or actions have been taken to address the problem. Copies of any material complaints received will be made available to the Environment Agency for review.

SECTION 12.0 Emergency Plans

12.1 General

Operators must consider what incidents or emergencies might adversely affect the control of odour pollution in order that they can plan and take appropriate steps to reduce the likelihood of the incident occurring, minimise any impacts if the incident were to occur, and recover control of the process as quickly as possible.

It is not necessary to consider events which are either very unlikely to occur or where odour would be a minor element of the overall environmental impact. For example, if there were to be a major environmental incident in the area that affected the site and prevented staff from getting to work, then odours would be a relatively minor aspect of the overall disruption and environmental impact.

However, events that are uncommon but reasonably foreseeable which could affect the running of the site and cause odour problems should be addressed e.g. deliveries may be affected from time to time or staff (internal and external) may be unavailable for some reason e.g. illness.

12.2 Abnormal Meteorological Conditions

In the event that meteorological conditions prevent delivery or dispatch vehicles, or staff arriving on site, emergency contingency plans will need to be followed to ensure the site can be remotely managed until the plant can return to operation under normal conditions. The site manager and staff operatives will undertake daily weather checks to ensure that any abnormal weather conditions can be foreseen as much as possible and contingency arrangements can be put in place prior to any problem occurring on site. If the site has to be closed due to severe weather conditions deliveries will be diverted to an alternative suitably authorised site for either recovery or disposal.

12.3 Breakdown of Process Equipment and Plant

In the event that there is a breakdown of equipment or plant during out-of-hours operations the standby and duty staff will be alerted to the problem immediately via text message. Telemetry will also be sent to the off-site control centre where the alarm can be raised to ensure the standby duty staff is aware that attendance is required.
Reserve equipment will be kept on site so that any failed parts are quickly replaced and unnecessary delays in ordering parts can be avoided. When a spare part is used, the Site Manager will be made aware and another replacement part ordered to ensure the stock of spare parts is replenished.

12.4 Staffing Issues

The facilities standby staff rota will be actively managed, and in the event of staff illness, the next name will be drawn down from the list, and the standby system will continue. Equally during staff holidays the standby rota will be updated to ensure there is suitable cover continuously.

All staff listed on the standby rota will be provided with a list of emergency contact names and numbers.

12.5 Incident (Accident) Plan

Likewise, in the event of an emergency local emergency services contact numbers will be displayed in the site office or provided to the standby duty person.

In the event that the site has to be closed and is given restricted access, staff will be contacted and prevented from travelling to work. Contractors will be contacted to cease deliveries / collections / services to the site and to arrange alternative disposal options for the interim period.

Risk assessments will be undertaken during and after any incident to ensure the site is safe to re-enter. Refer to Appendix 4 to find a template for undertaking an Odour Risk Assessment

SECTION 13.0 Senior Management Responsibilities & Review

13.1 Policy and Commitment

Envar Composting Ltd is committed to effectively managing the offsite impacts of odour from the Integrated Composting and Treatment facility at The Heath, St. Ives composting site. This commitment extends from company policies produced at Director level, through to on site resources managing odour-critical work-based activities onsite.

13.2 Roles and Responsibilities

The responsibility for this OMP is as described below:

The operation of the Envar Composting Ltd is the responsibility of the Directors of the company.

The Facility has a dedicated Facility Manager who has overall responsibility for the daily operations of the site.

The facility's designated Technically Competent Person will be responsible for ensuring the site complies with the conditions of the Environmental Permit and will be the primary point of contact for the Environment Agency.

The Operations Manager will be responsible for maintaining an awareness of general site performance during daily activities. Staff will be instructed to report any unusual odour occurrences without delay.

13.3 Site Management and Manning

The site receives feedstock during working hours of 07:00 to 18:00 Monday to Friday and 07:00 to 13:30 on Saturdays. No feedstock is accepted on Sundays and public and or bank holidays. Operational hours are 07:00 to 18:00 any day of the week. Outside these hours there is a site emergency contact number.

FACILITY MANAGER – Neil Hodson

Envar Ltd, The Heath, Woodhurst, Huntingdon, Cambridgeshire. PE28 3BS.

Contact – Site Emergency number (Out of Hours)
Envar Composting Ltd, The Heath, Woodhurst, St Ives, Cambridgeshire.
Mobile - 07980 854073

13.4 Odour Management Plan Review

The Odour Management Plan will be reviewed by senior management **at least once every year** or immediately following **any change** or any major incident / event. Any technical and managerial changes on site will also initiate a review of the OMP to ensure that the odour control techniques and abatement systems remain appropriate for the site.

APPENDICES
Appendix 1 Site History and List of OMP Revisions
Appendix 2 List of Wastes, with rating for Odour Risk Potential
Appendix 3 Contractor Odour Risk Assessments
Appendix 4 Odour Risk Assessments
Appendix 5 Odour Incident Report Forms

APPENDIX 1. Site History and OMP Revisions

History

The Site originally started making Compost in 1964, and started using batch tunnels in1969, and continued mainly in the production of mushroom compost (the largest UK producer, producing 60,000 tpa from straw, horse manure and chicken litter) until 1985. Post 1985 the company developed an interest in using mushroom composting technology to compost other waste materials, including a venture with Anglian Water to trial composting wet sludge with straw through the batch tunnel process.

In 2000 the site was sold to Blue Prince Mushrooms who in 2002 gained a waste management license to process 40,000 tpa of waste. In 2003 Paul Rackham purchased the site from Blue Prince Mushrooms and continued with the co-production of mushroom compost and green waste compost.

The site was leased to Envar Limited on a thirty-year lease, who are currently composting green waste and kerbside collected kitchen waste with a permitted throughput of 200,000 tpa. 135 of which is F&G and 27500 green

In 2013 the site underwent significant re-development by the addition of five larger capacity composting tunnels and doubling the windrow composting area.

In 2016 the site was acquired by FGS Organics Ltd. and is currently undergoing significant development for commercial and environmental improvement in order to assure long term sustainability. In 2017 Heathcote holdings acquired the land freehold and the full and ongoing ownership of the business. This has been incorporated into the larger Envar group of companies which cover much of the country.

OMP Revisions

Date	Ref	Revised	Revision
05/17	a	Re-styled Summary	For clarity and overall understanding of the site context, and activities.
08/17	b	Appx. 4 Odour Risk	Thorough revision of the Odour Risk Assessment – to cover all processes.

			Identifies risk with CLO composting and therefore informs improvement incorporated in this process.
	c	Appx. 1 Waste Inventory	Detailed Waste inventory, assessing waste types, odour risk and detailing process flow capacities, throughputs storage of waste and procedures.
	d	Process Monitoring	Extended at Section 7.5 – 7.8 and at 9.2
	e		
4/10/17		EA advised revisions	See Information Note - Table of revisions at page2
9/12/21		Permit update and changes to make more realistic	Small changes making the realistic response times clear

APPENDIX 2.0 List of Wastes – With Odour Inventory Risk Rating

This part of the odour management plan identifies the key odour sources of the inventory and the quantities. This information links to the Risk Assessment at Appendix 1.

Part 1 of the **Odour Inventory** to the inventory looks at the Location and Extent of the Odour Risk within the process flows and provides an indication of the impact of mass process movement (or storage) of the wastes at that point. This information is used to further develop the odour Risk assessment for where within the processes the scale (extent) of odour generation and potential release presents greater odour emission risk.

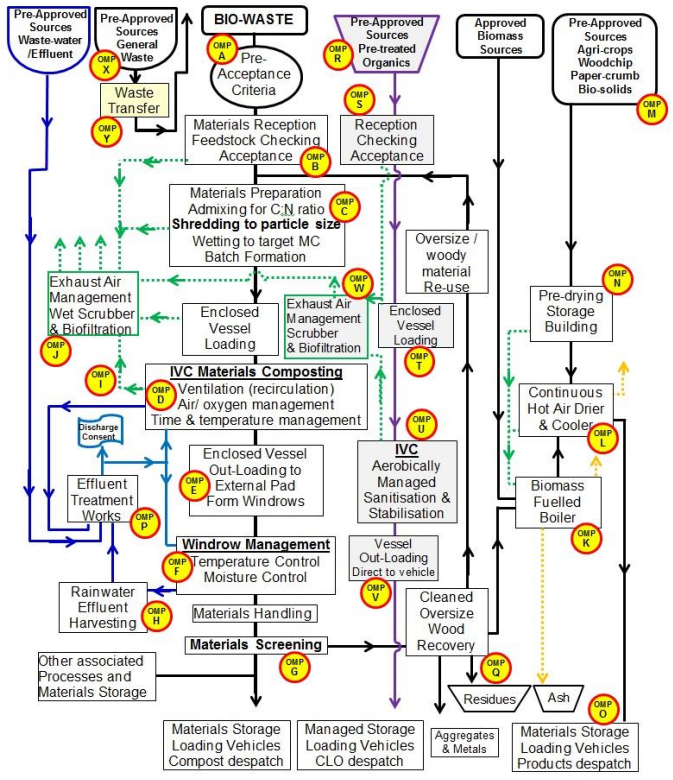
Part 2 of the **Odour Inventory** provides a comprehensive list of waste types which present an odour risk and their risk category (high, medium and low) based on odour intensity and odour tone (offensiveness). The presented list is provided in sections which reflect the types of wastes (and age) imported for treatment within each process flow of the site. This inventory is subject to revision and the risks should be re-assessed annually.

Part 3 of the **Odour Inventory** confirm the maximum age of waste on arrival and confirmation of the contractual arrangements (**Part 3b)** to ensure that waste is not going to be older than specified.

A2.1 Part 1. Location and Extent of Odour Risk

The following Schematic identifies the locations and the adjacent table provides a schedule of the maximum quantities of waste stored in each storage area throughout the different processes, the maximum quantities of waste treated per day for each treatment activity.

Process Flow Schematic – Labels relate to key Odour Control points or Aspects



Ref	Aspect or OMP point	Annual Throughput	Daily throughput	Stored/ duration
A	IVC Intake biowaste	95 -130 kt/yr	750t/day (1-2 vessels)	1500t < 5 days
B				
C	Mix & shred	ditto	100 tph	48 hrs
D	IVC Composting	ditto	Fill 1-2 vessels/day 350t each	5 – 10 days
E	Unload vessels	15% -20% Reduced	500-600t (2 vessels)	Unload 3-4 h each
F	Windrow composting	75-100 kt/y reducing	500-600t/d 1 turn/wk Turn 550 t/d	Process 6 weeks 25kt at any time
G	Screening	65-90kt/y	400-500t/d	Post screen 5kt. 10-30d
H	Rain/runoff	20,000m^3/y	2,000m^3/d	5 – 10d
I	Exhaust air	750million m^3/yr	2million m^3/d	80-90,000 m^3/h
J	Scrubber & biofilter	45 sec CT in Scrubber 1000 m^3 Biofilter 12x36x3m 1300 m^3 = 56 sec CT		
K	Biomass 1.9MW	7500 t/yr	22-25t/d both boilers	0.9-1.2t/h
L	Drier (various wastes)	<65,000t/y	100-200t/d	8-10t/h 200t store
M	Commodities For drying	Biomass 50% Bedding 20% Crops 25% Other 5% Bulk or in containers		2 – 5 days
N	Pre-drying	Biomass & bedding Crops /other (containerised)		2 – 5 days 2 days
O	Post drying	<60,000t/y		2 days
P	WWT Wks	20,000m^3/y	2,000m^3/d	5 – 10d
Q	Residues	3500	10t/d	14-28 d
R S	Ex MRF Fines- CLO	5-10kt/y to <35kt/y 3.5kt/y/IVC	Nom 45t/d Up to 250t/d	loaded as arrives/ same day
T	CLO IVC loading	Per vessel 3.5 kt/y ea.	300m^3 input in 2-5d	2 d filling

	U	CLO IVC treatment	Per vessel 3.5 kt/y ea.	300m^3 input	2 d filling
	V	CLO Out	ditto	250m^3 out	4h outload
	W	Air out	Scrubber 45 sec CT Biofilter 56 sec CT		
	Y	Waste Transf.	Enclosed General Waste Tip and reload		

Part 2. Odour Inventory and Waste Age Related Odour Risk

The following provides a very brief explanation of the terms used and the ratings given throughout the assessment of Odour Risk. Odours are often rated based on the **strength**, the **tone** and the **offensiveness** of the smell.

Hedonic scores for everyday odours

Description	Hedonic Score
Bakery (fresh bread)	3.53
Coffee	2.33
Hay	1.31
Raw potato	0.26
Rope (hemp)	-0.16
Kippery-smoked fish	-0.69
Paint	-0.75
Mothballs	-1.25
Disinfectant, fresh tar	-1.60
Wet wool, wet dog	-2.28

The odour strength (intensity) is a measure of how strong that smell is, whether it is faint (an only just detected if the person stands still and 'sniffs' hard or else a strong smell and is immediately apparent.

The odour tone (hedonic tone or flavour) is a phrase used to describe the hedonic tone based upon commonly known plants, materials, perfumes or scents. A scale of Hedonic scores has been devised where the hedonic tones typically range from +4 for very pleasant odours (bakeries, say) to -4 for foul ones (rotting flesh, for example). **Raw potato is about neutral and is assigned the score 0**.

The odour offensiveness (based on the hedonic tone) is another way of expressing whether the odour is pleasant or offensive. For a given concentration of odour, it is likely that an offensive odour will be more noticeable than a pleasant one and is more likely to cause annoyance to any person nearby. Within this OMP, the term 'mal-odours' is used to describe potentially offensive odours.

Odour Intensity			Odour Tone	Pleasantness
			Pleasant	+2
				+1
0 No odour	(barely detectable, need to stand still and inhale facing into the wind)		**Neutral**	**0**
1 Very faint odour			**Bearable**	**-1**
2 Faint odour	(odour easily detected while walking and breathing normally, possibly offensive)		**Unpleasant**	**-2**
3 Distinct odour	(bearable, but offensive odour - will my clothes/hair smell?)		**Offensive**	**-3**
4 Strong odour	(this is when you really wish you were somewhere else)		**Very Offensive**	**-4**
5 Very strong odour			**Sickly - unbearable**	**-5**
6 Extremely strong odour				

EWC Codes	FEEDSTOCK FOR THE IVC Definition	Fresh Material Intensity x Tone	Fresh Material Odour Risk	Aged Material Intensity x Tone	Aged Material Odour Risk	Pre-received Max age
02 01 01	Sludges from washing and cleaning	Int 2 Tone -1	Med	Int 3 Tone -2	Med	<5days
02 01 02	Animal-tissue waste	Int 4 Tone -3	High	Int 5 Tone -4	V.High	<2days
02 01 03	plant -tissue waste	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
02 01 06	Animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site	Int 2 Tone -1	Med	Int 3 Tone -2	Med	<15days
02 01 07	Wastes from forestry	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<30days
02 02 01	sludges from washing and cleaning	Int 2 Tone -1	Med	Int 3 Tone -2	Med	<5days
02 02 02	Animal-tissue waste	Int 4 Tone -3	V.High	Int 5 Tone -4	V.High	<5days
02 02 03	Materials unsuitable for consumption or processing	Int 2 Tone -2	Med	Int 4 Tone -3	High	<5days
02 02 04	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 02 99	wastes not otherwise specified	Int 3 Tone -2	Med	Int 3 Tone -2	Med	<5days
02 03 01	Sludges from washing, cleaning, peeling, centrifuging and separation	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 03 04	Materials unsuitable for consumption or processing	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<5days
02 03 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 04 01	soils from cleaning and washing beet	Int 1	Low	Int 2	Low	<30days

		Tone 0		Tone -1		
02 05 01	Materials unsuitable for consumption or processing	Int 2 Tone 0	Med	Int 3 Tone -3	Med	<5days
02 06 01	Materials unsuitable for consumption or processing	Int 2 Tone -1	Med	Int 3 Tone -2	Med	<5days
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<5days
02 07 02	wastes from spirits distillation	Int 1 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 07 04	Materials unsuitable for consumption or processing	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 07 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<10days
02 07 99	Wastes not otherwise specified	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<5days
03 01 01	waste bark and cork	Int 1 Tone 1	Low	Int 2 Tone 0	Low	<30days
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer not containing dangerous substances	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<30days
03 03 01	waste bark and cork	Int 1 Tone 1	Low	Int 2 Tone 0	Low	<30days
03 03 07	mechanically separated rejects from pulping of wastepaper and cardboard	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
03 03 08	wastes from sorting of paper and cardboard destined for recycling	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
03 03 10	Fibre rejects, fibre-, filler- and coating-sludges from mechanical separation	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<15days
03 03 11	sludges from on-site effluent treatment other than those mentioned in 03 03 10	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
04 01 09	wastes from dressing and finishing (only to include untreated and unsalted shoddy)	Int 3 Tone -2	Med	Int 3 Tone -2	Med	<15days
04 02 21	Wastes from processed fibres (e.g. wool and cotton, not including synthetic fibres)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
04 02 22	Wastes from processed textile fibres	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
07 05 14	Solid wastes other than those mentioned in 07 05 13 (to include only sterilised / uncontaminated mycelial wastes)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
15 01 01	paper and cardboard packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
15 01 03	wooden packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 05	composite packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 09	textile packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
17 02 01	wood (only uncontaminated and untreated wood)	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 02 03	premixed wastes composed only of non-hazardous wastes	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<5days
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<5days
19 05 01	non-composted fraction of municipal solid waste	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<10days
19 05 02	non composted fraction of animal and vegetable wastes	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<10days
19 05 03	Off-specification compost	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<25days
19 05 99	wastes not otherwise specified	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 06 03	liquor from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<5days
19 06 04	digestate from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<25days
19 06 05	liquor from anaerobic treatment of animal and vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 06 06	digestate from anaerobic treatment of animal and vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 08 05	Sludges from treatment of urban wastewater	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days

19 12 01	paper and cardboard	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
20 01 01	paper and cardboard	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 01 08	Biodegradable kitchen and canteen waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 01 25	edible oil and fat	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<5days
20 01 38	Wood not containing dangerous substances	Int 1 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 02 01	Biodegradable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
20 03 01	mixed municipal waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 03 02	waste from markets	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days

EWC Codes	BMW FEEDSTOCK FOR THE IVC (CLO)	**Fresh Material**		**Aged Material**		**Pre-received Max age**
	Definition	**Intensity x Tone**	**Odour Risk**	**Intensity x Tone**	**Odour Risk**	
02 02 04	sludges from on-site effluent treatment	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 03 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 04 01	soils from cleaning and washing beet	Int 2 Tone 0	Low	Int 2 Tone -1	Low	<15days
02 07 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 07 99	Wastes not otherwise specified	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<15days
03 03 07	mechanically separated rejects from pulping of wastepaper and cardboard	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
03 03 08	wastes from sorting of paper and cardboard destined for recycling	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
04 01 09	wastes from dressing and finishing (only to include untreated and unsalted shoddy)	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<15days
04 02 21	Wastes from unprocessed fibres (e.g. wool and cotton, not including synthetic fibres)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
04 02 22	Wastes from processed textile fibres	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
15 01 01	Paper and cardboard packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 03	wooden packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 05	composite packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
15 01 09	textile packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
19 01 99	wastes not otherwise specified (only those suitable for CLO)	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 02 03	premixed wastes composed only of non-hazardous wastes	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
19 05 01	non-composted fraction of municipal solid waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
19 05 02	non composted fraction of animal and vegetable wastes	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 05 03	Off-specification compost	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 05 99	wastes not otherwise specified (only those suitable for CLO)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
19 06 03	liquor from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days

19 06 04	digestate from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 06 05	liquor from anaerobic treatment of animal and vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 06 06	digestate from anaerobic treatment of animal and vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 06 99	wastes not otherwise specified (only those suitable for CLO)	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 08 01	screenings	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 08 02	waste from de-sanding	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 08 05	sludges from treatment of urban wastewater	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
19 08 12	sludges from biological treatment of industrial wastewater other than those mentioned in 19 08 11	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 08 14	sludges from other treatment of industrial wastewater other than those mentioned in 19 08 13	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 08 99	wastes not otherwise specified (only those suitable for CLO)	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 09 01	solid wastes from primary filtration and screenings	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 09 02	sludges from water clarification	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 09 03	sludges from decarbonation	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
19 09 04	spent activated carbon	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
19 12 01	Paper and cardboard	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<35days
19 12 07	Wood other than wood containing dangerous substances from separately collected fractions of municipal wastes (household & similar industrial, commercial wastes)	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<35days
19 12 08	Textiles	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<35days
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes not containing dangerous substances	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<15days
20 01 01	Paper and cardboard	Int 1 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 01 08	Biodegradable kitchen and canteen waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 01 11	Textiles	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<35days
20 01 38	Wood not containing dangerous substances	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days
20 03 01	Mixed municipal waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 03 03	street-cleaning residues	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<25days

EWC Codes	FEEDSTOCK FOR THE DRIERS	**Fresh Material**		**Aged Material**		**Pre-received Max age**
	Definition	**Intensity x Tone**	**Odour Risk**	**Intensity x Tone**	**Odour Risk**	
02 02 04	sludges from on-site effluent treatment	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<35days
02 03 01	sludges from washing, cleaning, peeling, centrifuging and separation	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<35days
02 03 04	Materials unsuitable for consumption or processing	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<35days
02 03 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<35days
02 04 01	soils from cleaning and washing beet	Int 2 Tone 0	Low	Int 2 Tone -1	Low	<35days
02 07 05	sludges from on-site effluent treatment	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<35days
02 07 99	Wastes not otherwise specified	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<35days
03 01 01	waste bark and cork	Int 1	Low	Int 2	Low	<35days

		Tone 1		Tone 2		
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer not containing dangerous substances	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<35days
03 03 07	mechanically separated rejects from pulping of wastepaper and cardboard	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
03 03 08	wastes from sorting of paper and cardboard destined for recycling	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
03 03 09	03 03 09 lime mud waste	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
03 03 10	Fibre rejects, fibre-, filler- and coating-sludges from mechanical separation	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<35days
03 03 11	sludges from on-site effluent treatment other than those mentioned in 03 03 10	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
04 01 09	wastes from dressing and finishing (only to include untreated and unsalted shoddy)	Int 3 Tone -2	Med	Int 3 Tone -2	Med	<35days
04 02 21	Wastes from processed fibres (e.g. wool and cotton, not including synthetic fibres)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
04 02 22	Wastes from processed textile fibres	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
15 01 01	paper and cardboard packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 03	wooden packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 05	composite packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 09	textile packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
17 02 01	wood (only uncontaminated and untreated wood)	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 01 99	wastes not otherwise specified (only those suitable for CLO)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 02 03	premixed wastes composed only of non-hazardous wastes	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 05 01	non-composted fraction of municipal solid waste	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 05 02	non composted fraction of animal and vegetable wastes	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 05 03	Off-specification compost	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<35days
19 05 99	wastes not otherwise specified	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 06 03	liquor from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 06 04	digestate from anaerobic treatment of municipal waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 06 05	liquor from anaerobic treatment of animal / vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 06 06	digestate from anaerobic treatment of animal and vegetable waste	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 06 99	wastes not otherwise specified (only those suitable for CLO)	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
19 08 01	screenings	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 08 05	waste from de-sanding	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 08 05	Sludges from treatment of urban wastewater	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<15days
19 08 12	sludges from biological treatment of industrial wastewater other than those mentioned in 19 08 11	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 08 14	sludges from other treatment of industrial wastewater other than those mentioned in 19 08 13	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 08 99	wastes not otherwise specified (only those suitable for CLO)	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 09 01	solid wastes from primary filtration and screenings	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 09 02	sludges from water clarification	Int 1 Tone -1	Low	Int 2 Tone -2	Med	<35days

19 09 03	sludges from decarbonation	Int 1 Tone -1	Low	Int 2 Tone -2	Med	<35days
19 09 04	spent activated carbon	Int 2 Tone -1	Low	Int 3 Tone -2	Med	<35days
19 12 01	paper and cardboard	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 12 07	Wood other than wood containing dangerous substances from separately collected fractions of municipal wastes (household and similar industrial & commercial wastes)	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 12 08	Textiles	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	Int 2 Tone -1	Med	Int 3 Tone -3	Med	<35days
20 01 01	paper and cardboard	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 01 08	Biodegradable kitchen and canteen waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<7days
20 01 11	Textiles	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
20 01 38	Wood not containing dangerous substances	Int 1 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 03 01	mixed municipal waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<35days
20 03 03	street-cleaning residues	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<35days

EWC Codes	BMW FEEDSTOCK FOR THE TRANSFER & TREAT	**Fresh Material**		**Aged Material**		**Pre-received Max age**
	Definition	**Intensity x Tone**	**Odour Risk**	**Intensity x Tone**	**Odour Risk**	
02 01 03	plant -tissue waste	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 01 06	Animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site	Int 3 Tone -2	Med	Int 3 Tone -2	Med	<15days
02 01 07	Wastes from forestry	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
02 02 09	Horse manure, farmyard manure and bedding	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
02 02 99	wastes not otherwise specified	Int 3 Tone -2	Med	Int 3 Tone -2	Med	<15days
02 03 04	Materials unsuitable for consumption or processing	Int 3 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<15days
02 07 04	Materials unsuitable for consumption or processing	Int 2 Tone 0	Low	Int 3 Tone -1	Low	<15days
03 01 01	waste bark and cork	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer not containing dangerous substances	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<35days
03 03 01	waste bark and cork	Int 1 Tone 1	Low	Int 2 Tone 0	Low	<35days
03 03 10	Fibre rejects, fibre-, filler- and coating-sludges from mechanical separation	Int 1 Tone 1	Low	Int 2 Tone 2	Low	<35days
04 02 10	Organic and natural products (un-dyed and untreated)	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
15 01 01	paper and cardboard packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 03	wooden packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 05	composite packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 06	Mixed packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 07	Glass packaging	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
15 01 09	textile packaging	Int 1	Low	Int 1	Low	<35days

		Tone -1		Tone -2		
17 02 01	wood (only uncontaminated and untreated wood)	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<35days
17 05 06	Dewatered dredging spoil and plant tissue waste from inland waters, not containing Japanese Knotweed and not containing dangerous substances	Int 1 Tone -1	Low	Int 1 Tone -2	Low	<15days
19 05 03	Off-specification compost	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<15days
19 12 05	Glass	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
19 12 07	Wood not containing dangerous substances	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes not containing dangerous substances	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<15days
20 01 01	paper and cardboard	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 01 02	Glass	Int 1 Tone 0	Low	Int 2 Tone -1	Low	<35days
20 01 38	Wood not containing dangerous substances	Int 1 Tone -1	Low	Int 2 Tone -2	Low	<35days
20 02 01	Biodegradable waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 03 02	waste from markets	Int 1 Tone -1	Low	Int 2 Tone -2)	Low	<15days

APPENDIX 2.1 List of Additional Wastes – With Odour Risk Rating

EWC Codes and Process	ADDITIONAL FEEDSTOCK FOR TRANSFER & TREATMENT	**Fresh Material**		**Aged Material**		**Pre-received Max age**
	Definition	**Intensity x Tone**	**Odour Risk**	**Intensity x Tone**	**Odour Risk**	
03 03 10 (For PAS100)	fibre rejects and sludges including mineral based fillers and coatings only (only allowed if not mixed with, or does not contain, de-inking sludge and meets the site input contamination limits.)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 09 01 (For PAS100)	Grit and sludges from the treatment of water in preparation for human consumption (sludges from water clarification)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 09 02/03 (For PAS100)	Grit and sludges from the treatment of water in preparation for human consumption (sludges from water clarification)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 08 01 (For Treat & Transfer)	Solid waste from primary filtration and screenings	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 12 10 (For Treat & Transfer)	Combustible waste (refuse derived fuel)	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<15days
19 08 02 (For CLO)	Waste from de-sanding/ de-gritting	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<35days
19 12 12 (Restoration compost)	Organic fraction recovered from street sweeping processing	Int 2 Tone -1	Low	Int 2 Tone -2	Low	<15days
19 12 12 (Restoration compost)	Silt from non-hazardous road sweepings conforming to the verification process as set out in the risk assessment and sampling plan	Int 2 Tone -1	Low	Int 2 Tone -2	Med	<15days

APPENDIX 2.2 List of Additional Wastes – With Odour Risk Rating

EWC Codes and Process	ADDITIONAL FEEDSTOCK FOR NOVEL USE – ENERGY RECOVERY ETC.	Fresh Material		Aged Material		Pre-received Max age
	Definition	Intensity x Tone	Odour Risk	Intensity x Tone	Odour Risk	
02 01 03	plant-tissue waste	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
02 01 06	animal faeces, urine and manure (including spoiled straw) only	Int 2 Tone -2	Low	Int 3 Tone -3	Med	<45days
02 01 07	wastes from forestry (biodegradable only)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
02 03 04	materials unsuitable for consumption or processing (biodegradable only)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
03 01 01	waste bark and cork – virgin timber only	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
03 01 05	sawdust, shavings, cuttings, wood and particle board other than those mentioned in 03 01 04 – virgin timber only	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
03 03 01	waste bark and wood	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 02 06	Sludge from the dewatering of sludge with the use of chemical additives Septic tank sludge from the dewatering of septic tank sludge with the use of chemical additives Septic tank sludge stabilised using non-waste lime Sludge stabilised using non-waste lime Sludge mixed with non-waste straw, non-waste wood or other non-waste plant tissue material Septic tank sludge mixed with non-waste straw, non-waste wood or other non-waste plant tissue material	Int 2 Tone -2	Low	Int 3 Tone -3	Med	<45days
19 05 03	Compost oversize from aerobic treatment (wood fraction only)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
19 06 06	Digestate from anaerobic treatment of sludge with the addition of treated sewage effluent produced at the sludge producer's wastewater treatment plant Digestate from anaerobic treatment of septic tank sludge	Int 2 Tone -2	Low	Int 3 Tone -3	Med	<15days
19 06 06	Digestate from the treatment of non-source segregated municipal waste, to including digestate from anaerobic treatment of municipal waste from a process that accepts waste input types listed in this table, or anaerobic digestion or appropriate permit. Digestate from segregated biodegradable waste that has been sourced from municipal waste.	Int 2 Tone -2	Low	Int 4 Tone -4	High	<15days
19 08 05	sludges from treatment of urban wastewater	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days
20 02 01	Biodegradable waste (plant matter only)	Int 1 Tone -1	Low	Int 2 Tone -1	Low	<45days

Part 3 of the Odour Inventory

Part 3a of the **Odour Inventory** confirms the maximum age of waste on arrival and **Part 3b** describes the contractual arrangements in place to help ensure that the specification is adhered to.

Based on the Odour Inventory The wastes that are regarded as of higher Odour Risk are determined as the following; and for these the condition of the material and its age are given further consideration and restrictions that will be applied are detailed.

02 01 02 02 02 02	Animal-tissue waste	Int 4 Tone -3	High	Int 5 Tone -4	V.High	<2days
02 02 03	Materials unsuitable for consumption or processing	Int 2 Tone -2	Med	Int 4 Tone -3	High	<5days
19 05 01	non-composted fraction of municipal solid waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 01 08	Biodegradable kitchen and canteen waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days
20 02 01	Biodegradable waste	Int 2 Tone -1	Med	Int 4 Tone -3	High	<15days

*These data relate to the reception of waste prior to the IVC process. Municipal biodegradable waste is not intended for the drying process. 20 01 08 for transfer and treatment area shall be <7 days age.

These wastes are of increased odour risk primarily because of the increased Protein, nitrogen and sulphur constituents, where if left to putrefy will become anaerobic and reduced gases such as hydrogen sulphide may be evolved.

Also, due to the way in which Local Authorities undertake household (domestic) collections; the catering waste from domestic kitchens may be disposed of to the bins, but not collected or up to 14 days (alternating weekly collection cycle) and so that waste may be aged before being collected. In this instance at sometimes of the year, this is buffered by additional green waste in the collection; and at other times there may be very poor buffering. The following procedures relate:

IVC Process (To PAS100 Quality Standard)

For mixed biowaste being directed to the IVC reception building, there is an operating procedure that enables the waste to be processed within **a MAXIMUM of 48 hours** of reception. If a load of waste is delivered and is identified as entailing a high proportion of aged bio-waste including food waste, then that load will be directed for immediate processing. **The target is to process 95% of bio-waste within 24 hours of arrival at the site.**

IVC CLO MSW Fines Composting Process

For organic fine particles (fines) from mixed Biodegrade-able Municipal Solid Waste being directed to the IVC building for composting as 'Compost Like Organics', the vehicles shall be directed to off-load so that the MSW Fines can be loaded immediately to the relevant IVC Vessel. The operating procedure that requires the waste to be loaded to the treatment system on the day of its arrival.

This is because the material may have been prepared from aged MSW at the third-party site; then processed and bulked up. The MSW fines may have begun to heat up during bulking and transportation. In astatic pile the MSW fines do not self-aerate due to the density of the stock, the particle sizes and lack of porosity. Consequently, there is the need to place these to a controlled, forced-air aeration system within 24 hours of arrival. The MSW Fines, CLO processing are all undertaken within buildings that have suction extraction ventilation. **The target is to start the processing of MSW Fines during the same day of arrival at the site.**

The Drying Process

The drying process is primarily intended for Biomass, Paper Mill Waste for conversion to animal bedding and agricultural crops/produce (Grain, grass etc.). These materials are determined as NOT entailing undue Odour Risk. For any other materials a case by case Assessment shall be undertaken and the EA informed of the procedures to be adopted in each instance.

The Waste Transfer Process

This is primarily intended for low-risk same-day transfer (bulking) of materials, without storage.

Part 3b of the **Odour Inventory** describes the contractual arrangements in place to help ensure that the specification regarding 'odorous materials' is adhered to.

In accordance with the PAS Quality Management Systems, the feedstock deliveries shall be in accordance with the Feedstock Supply Agreements. Waste types shall have been assessed prior to formalisation of agreement and relevant conditions shall have been specified. The feedstocks may be subjected to scientific evaluation to determine contamination levels and suitability for processing.

The Feedstock Supply Agreements shall address quality in regard to odour, as well as the type, nature, chemical, biological and physical nature of the material. This shall refer to age, freshness and storage conditions at the source of the food/feedstock.

As and when required, (e.g. new suppliers/sources of feedstock) the Feedstocks shall be pre-assessed for: dry matter, Volatile solids content (organic dry matter), pH, consistency, contamination pte's, nutrients and trace elements, volatility and age. [Refer to Pre-acceptance Procedure at Appendix 7).

Suppliers of food/feedstocks shall be registered and then 'approved' based on agreements and performance, and any default or deviation in regard to feedstock quality (in particular odour quality) shall mean that incident record and investigation undertaken and the supplier and / or feedstock may be determined as being unacceptable, subject to the opportunity for rectifications and a tightening of the specifications.

The Feedstock Supply Agreement forms part of the Quality Management System, and a**n example is shown at Appendix 7b**. The PRE-ACCEPTANCE **Assessment** Form is shown at **Appendix 7a**

Loads not conforming to the above general quality requirements; or failing to confirm to the quality requirements (contamination levels etc.) may be rejected unless a suitable pre-treatment can be agreed and undertaken.

Envar Ltd. shall reserve the right to refuse to take delivery of specific loads, as and when appropriate to maintain compliance with the QMS and with this Odour Management Plan.

Box 1. Commitment to 'Feedstock Refusal' based on the PRE-ACCEPTANCE Form **(Appendix 7)**

Envar Ltd. hereby commit to REFUSE feedstocks that do not conform to the Odour Inventory.

Envar Ltd. hereby commit to REFUSE feedstocks in instances where use of the **Appendix 7** Pre-acceptance check for odour Strength, Tone and Offensiveness indicates that there is a highly unacceptable odour risk.

The REFUSAL of feedstocks shall mean that they are NOT brought to the **Envar Composting** Facility and that where for any reason material may have been brought to the facility and on secondary inspection is deemed a high odour risk then it may either be rejected or else the procedure for 'Priority Treatment' shall apply and the material shall NOT be stored for any longer than is absolutely necessary and at the very latest shall be processed into the sealed system within 4 hours of reception.

QMS procedures shall comprise the following 'Odorous Feedstock Pre-Acceptance and Control Criteria'

SEE APPENDIX 8

APPENDIX 3. Guidance for Contractors or New Works

Third Party Engineering Contractor Odour Risk Assessment Guidance

This section gives some guidance to filling out odour risk assessment forms when necessary.

STEP 1 Look for the hazards you could reasonably expect to result in significant production of odour or exacerbation of odour within the site. Consult with those carrying out the work and if you are unsure of anything ask for help.

STEP 2 Identify who may be affected. Think about groups of people who may be affected, and in particular members of the public (neighbours) who may require to be informed by letter (these should be listed) e.g.:

LIST OF HAZARDS:

1.	**Wind Direction**		
2.	**Wind Speed**		
3.	**Temperature**		
4.	**Rain (Wet/Dry)**		
5.	**Use of Chemicals**		
6.	**Door/Covers Opened**		
7.	**Use of equipment that may exacerbate odour**		
8.	**Maintenance of plant**		
9.	**Installation of new equipment**		
10.	**Timescale of work**		
11.	**Other(s) – SPECIFY**		

People Who May Be Affected:

Members of the Public *	Maintenance Personnel	Emergency Services Personnel
Operators	Contractors	Local Residents
Environment Agency	People Sharing your Workplace	Local Authority

Note: Pay particular attention to those identified with an *

STEP 3 Identify existing control measures. Have you already taken precautions against the risks from the hazards identified? E.g. have you provided adequate information, systems or procedures, instruction or training? Do the precautions:

- ♦ Meet the standards set by legal requirement
- ♦ Represent good practice?
- ♦ Reduce the risk of odour as far as is reasonably practicable?

STEP 4 Determine what further action is necessary to control risk of odour. What more could you reasonably do for those risks you found that were not adequately controlled? You will need to give priority to those risks which affect large numbers of people and/or could result in odour complaints. Apply the principles below when taking further action, if possible, in the following order:

1) Eliminate odour at source
2) Reduce odour at source
3) Contain odour by enclosure
4) Reduce exposure to employees/neighbours
5) Systems of work
6) Personal protective equipment (PPE)

APPENDIX 4.1 Odour Management Risk Assessments

Risk Assessment Part 1

This section provides a risk assessment to assess the incremental risk caused by the proposed changes in terms of odour.

Here we provide a revised assessment, taking into consideration all proposed changes including: The environmental risks associated with the **increased throughput** and addition of **new waste and installation** operations.

The risk associated with incremental increase of waste, its impact on the adequacy of existing odour control measures and a demonstration of whether or not further measures are necessary in line with Best Available Techniques to minimise the risk of significant emissions (see composting guidance referenced in the BAT section of this notice).

Risk Assessment Part 2

Part 2 of this Risk Assessment includes consideration to less frequent/intermittent or abnormal operating scenarios including:

Cleaning

Maintenance

abnormal operations

emergencies

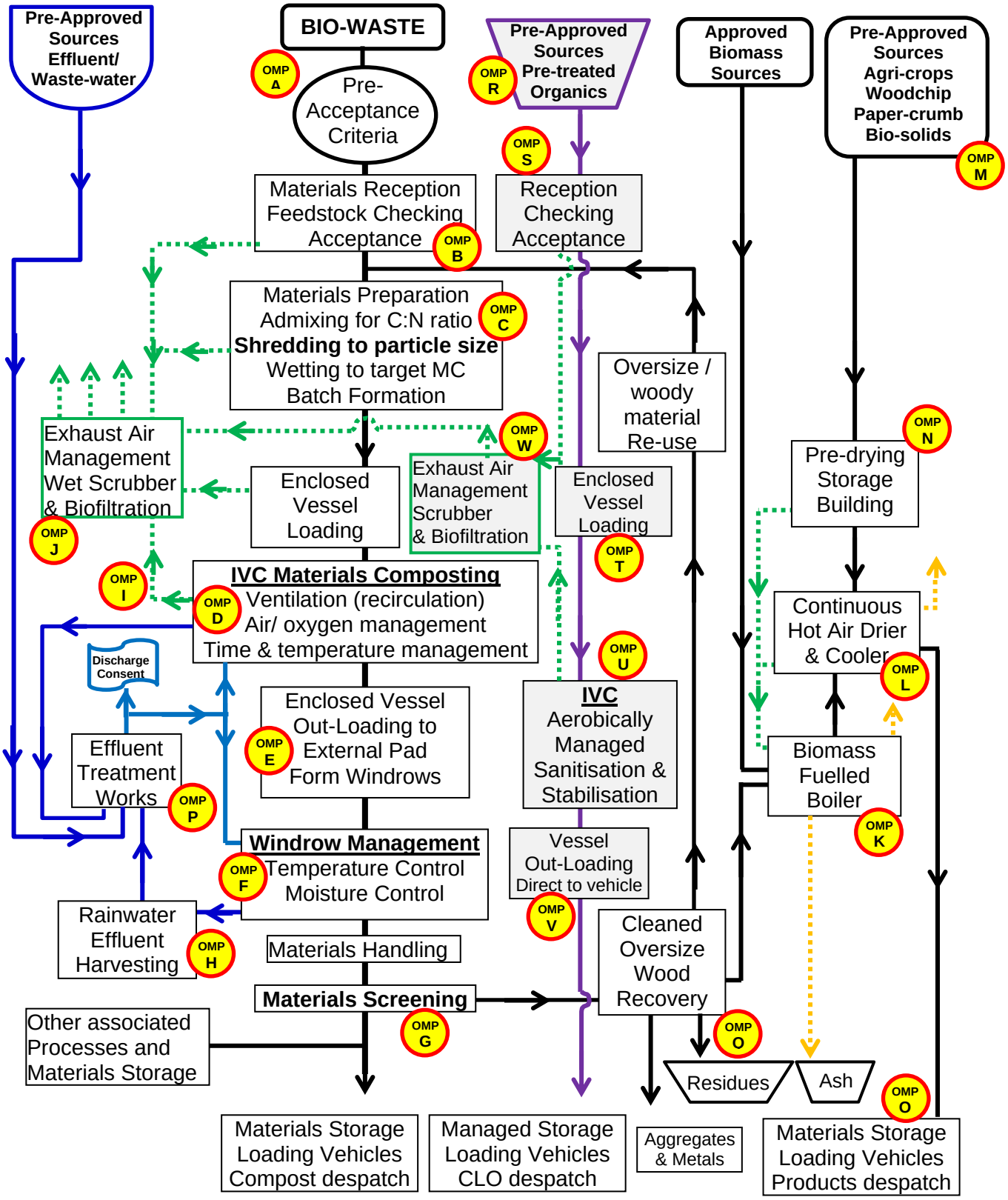
processes

Risk Assessment Part 3 – Summary and Conclusions

Part 3 of this Risk Assessment draws together the key aspects and significant issues raised, provides a summary and determines the conclusions.

For ease of reference, the key conclusions are as follows:

Figure A4. Schematic of The Envar Waste Management Process Flow in regard to Odour (CLO Flow path shown highlighted – process steps R to W)



APPENDIX 4.2 Odour Management Risk Assessment Table

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
A	Bio-Waste PRE-Acceptance	Variable, volatile material buffered by green waste. Potentially musty/fruity/silage odour Stale or putrid wastes Commercial wastes	Pre-acceptance criteria with attention to odour rating and ability to decline or reject mal-odorous wastes	Increased risk in peak season in hot weather.	MEDIUM risk as vast majority of material is mixed green waste with small % food inclusion.	Undertake source odour assessments Reject mal-odorous waste; Reject supplier where material is stored too long. Refer to waste type odour assessment.	Checks pre-acceptance are done. Contracts flexible to enable rejections
B	Bio-Waste Acceptance And reception	Variable, volatile material buffered by green waste. Potentially musty/fruity/silage odour Each day Mon to Sat.	Vehicles offload inside enclosed building that has suction extraction to scrubber & biofilter. Process without undue delay	High daily throughput X Moderate Odour Potential but well controlled	MEDIUM risk at doorways. Overall LOW via scrubber & biofilter	Reject very mal-odorous waste; reduce throughput; reduce storage period. Use of 'airlocks'	Doors closed Air management system to spec. Test on Scrubber/ Biofilter
C	Materials Preparation	Disturbance of material opens up trapped odorous air pockets. Material may be stored for up to 48 h (food waste) 5 weeks (green Waste carbon sources)	Control of time in the Reception Area- max 48h. Enclosed workspace, suction extraction to scrubber /biofilter. Process without undue delay target 95% <24h	Ability to mix materials and buffer volatile with carbon sources; enclosed process	LOW risk due to enclosure and extraction ventilation	Increased recycling of carbon material to buffer volatile material. Faster preparation, reduce time before IVC	System efficiency in IVC's; throughput capability. Air extraction system
D	IVC composting	Compost process entails temperature rise and evaporation of volatiles. Relies on air flow and so entails exhaust gas removal and final exhaust.	Gicom System provides means of very high standard of control. Use of air (oxygen) quality control system, air extraction, scrubber and biofilter	Air-tight vessels During process, the odour risk is LOW due to enclosed system; refer to OMP I and OMP J	During composting process in IVC the odour risk is LOW	Gicom vessels represent Best Practice. Check maintenance, and door seals.	Ultimately, dependent on the control system, the manager and the final exhaust of the air OMP I & J

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4) continuation i)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
E	IVC Outloading	Warm compost, partly processed, evaporation of gases.	Relies on composting process being aerobic; and material conditioned before out-loading	Daily activity on high volume of material with Low - moderate odour potential	Low to moderate	Extended aerobic processing, cooling Water damping, minimisation of dust. Loading shovel operation.	Relies on aerobic composting, healthy oxygen levels In compost. Known stability at out-loading
F	Windrow Management	Exposed open surfaces, warm material; turned to aerate. Subject to wind. Musty earthy odour disperses.	Relies on maintained aerobic conditions, good management. Monitored daily	Daily activity on high volume of material with Low - moderate odour potential	Moderate due to tonnage on pad at any time	Increased frequency aeration.	Relies on aerobic composting, with healthy oxygen levels In compost.
G	Compost Screening	Transfer to screener and passage through screener system entails opening up surfaces; stabilised material, earthy odour	Screening process is semi enclosed, dry material, low volatility, stabilised low odour strength	Low risk despite tonnage throughput due to stabilised low odour material	Low Risk	Increased cooling in windrows prior to screening. Increase stability requirement	Aerobic treatment through whole of process. O2, temp. & stability tests.
H	Rainwater Effluent	Fresh rainwater entails minimal issues; but stagnated ponding of surface water could generate odours	Rainwater drainage to dedicated point; pits/sumps/lagoons are monitored and managed. Alpheus (external support)	Low odour risk on pad. Risk is from lagoons. Treatment system used.	Low Risk	Aeration of lagoons. Lagoon covers (floating balls etc) or similar to minimise odour release.	Checks and monitoring of standing water; checks of lagoons & treatment system.
I	Fan suction extraction air handling system	Releases (leaks) of air from Air Management system. Warmed odorous air.	Fan system is mostly under suction pressure	Low risk as stainless-steel system with monitoring	Low Risk	Expand the extraction and biofiltration system	Monitoring, servicing and checks.

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4) continuation ii)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
J(a)	Scrubber	Fugitive emissions from system	Closely monitored; pressure checked. Negative Pressure	Low risk sealed system under suction pressure	Low Risk	Expand the wet scrubber system	Monitoring, servicing and checks. Clean water use; spray system
J(b)	& Biofilter	Final Exhaust off biofilter. Potential for warm air; odorous entailing varying gases. 24/7 high airflow	Closely monitored pre-treatment. Exhaust gas quality, cooled, and water scrubbed. Biofilter to industry standards and parameters. Checked daily.	Low to moderate odour risk. High heat load from vessels; buffered in upstream system and water cooled, dust & NH3 removed.	Low to Moderate Risk, due to high extraction volume.	Expand biofilter to increase residence time, air flow path distance. Biofilter media and irrigation system upgrades.	Air contact time; biofilter porosity; media type; settlement and compaction; dust deposits; waterlogging (drainage) monitoring. Contingencies.
K	Biomass fuelled boiler	Hot surfaces and stack emissions from Grade A Wood	Boilers are within building that has airflow into building. High temperature combustion with oxygen control; oxidises exhaust gases (odours). Controlled wood fuel types	Low odour risk, due to thermal oxidation of odours/ gases. High degree of control of oxygen in hearth system.	Low odour risk	Increased height of boiler exhaust stacks	Boiler controls; fuel feed rate; oxygen supply rate; fuel quality.
L	Hot air drier(s)	Hot surfaces and damp materials generating moisture emission; increased porosity; heated any volatiles; disturbance releases trapped air/gases	Warmed air driers with regulated airflow; exhaust to building that boiler plant draws air for combustion	Odour risk relates to material being dried. High carbon, wood or paper proposed	Low odour risk from these materials	Additional cooling for materials dried. Additional forced air ventilation in building	Depends on materials being dried. Tests to be done when varied.

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4) continuation iii)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
M	Materials to be dried	Virgin Woodchip (biomass), fresh with pine odour regarded as pleasant. Low odour 'damp' emission during drying. Paper pulp; low odour, comprises carbon and limestone chalk with 'damp paper' odour.	When any new materials are proposed for drying, then these shall be risk assessed; and tests undertaken on limited quantities	Odour risk is LOW. Based on enclosure building, technology used, and types of materials proposed.	Low	Storage and handling arrangements; dried in situ in containers, air exhaust extraction directed to biomass burners or else to biofiltration system.	Depends on materials intended to be dried. Prior approval by management if materials varied.
N	Pre-drying storage	Virgin Woodchip (biomass), fresh with pine odour regarded as pleasant. Low odour emission in storage. Paper pulp; low odour, stored in containers prior to use comprises carbon and limestone chalk and damp paper odour.	When any new materials are proposed for drying, then these shall be risk assessed; and tests undertaken on limited quantities	Odour risk is LOW. Based on enclosures, technology used, and types of materials proposed.	Low	Storage and handling arrangements; dried in situ in containers, air exhaust extraction directed to biomass burners or else to biofiltration system.	Depends on materials intended to be dried. Prior approval by management if materials varied.
O	Post-drying storage	Virgin Woodchip biomass, fresh with pine odour regarded as pleasant. Some pleasant odour emission when warmed. Paper pulp; low odour, stored in containers silos prior to despatch. Low intensity limestone chalk or damp paper odour.	Odour release after drying may depend on temperature and release of volatiles; however, these materials are low volatility or else entail pleasant 'pine' odour	Odour risk in storage is LOW. Based on enclosure in dry building or in containers, , technology used, and types of materials proposed.	Low	Storage and handling arrangements; dried in situ in containers, air exhaust extraction directed to biomass burners or else to biofiltration system.	Depends on materials being dried and cooling after drying to provide stable conditions.
P	Effluent Treatment	Musty dirty water odour	Lagoons open, but treatment enclosed. Aerator installed 2012, works well.	Moderate From lagoon surface. Avoided atomisation	Low	Bubble aeration, lagoon covers (balls) or granules	Early aerobic treatment. Avoided atomisation.

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4) continuation iv)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
Q	Process residues	Oversize aggregates (low odour), litter (composted plastics etc. – low odour) Oversized wood – low odour; ash from boiler (low odour)	Control materials to prevent regression in storage piles to anaerobic condition, waterlogging or recontamination. Wastes disposed of from site without undue storage.	Low. Oversize wood kept in managed storage, retained aerobic.	Low odour risk	Managed storage of aggregates and oversized wood.	Avoid poor storage condition; excessive wetting and contamination by other materials, dust or sludge.
	NOTE	CLO = Compost Like Organics, at the stage of receipt to site is the product from a physical Treatment of MSW and comprises the 'fines' being particles of organics and inert material that are less than a specified particle size e.g. 15mm CLO –owing to the pre-treatments of the MSW, the CLO material is reasonably standardised in: density, physical, chemical and biological quality; however having passed through a process that is well aerated, the organics within the moist close packed environment will begin to compost, generating heat and a rise in temperature may already have taken place.					
R	CLO Pre-acceptance	CLO that was pre-treated and then left to age, will have undergone change and the temperature rise will increase the rate of volatile emissions. CLO entails an intense/ offensive odour when warm; and a mixture of gases may be generated.	Material to be subject to Pre-defined, pre-specified quality criteria that addresses organic content stability and volatile organics constituents.	The risk of intense odour generation is greater when it is warm. Fresh cool pre-treated material is less odorous but still moderate to strong			
S	CLO RECEPTION	Due to its density, the CLO does not easily self-ventilate and therefore should be moved from offloading direct to IVC	Ideally material should be off-loaded and moved swiftly to the IVC tunnel.	Facilities are required to be fully enclosed and extraction ventilated.	Moderate to High especially if warm	Suction ventilated floor within the reception area. Increased suction airflow of building.	Quality of CLO material. Enclosures and suction ventilated

Odour Risk Assessment – Whole of Site Processes. (Refer to Appendix 4 Figure A4) continuation v)

Aspect Ref	Aspect (Process etc.)	Nature of Odour Hazard	Control	Extent of Odour Risk	Residual Odour Risk	Optional Extra controls	Dependencies
T	CLO Vessel Loading	Disturbance of material releases odour from air pockets/Pungent odour, high intensity if warm.	Offload-and load to IVC immediately same working day. Full enclosures	Moderate, due to enclosure control and -ventilation extraction	Moderate risk; subject to treatment.	Mechanical system for loading material to treatment quickly and remotely.	Enclosure; suction ventilation; speed of operation.
U	CLO COMPOSTING And AFTER CARE	CLO to be uniformly treated to elevated temperatures 60 -70 C, which will increase volatile emissions from material. Variety of chemical compounds; but mal odours mitigated by degree of oxidation.	Very close Control of composting process is essential, in order to mitigate mal odours. Extended monitoring of Gases is required.	Within or fugitive odours escapes from the vessels will be Low during the treatment phase.	At elevated temperature, there may be legacy increased volatility that may remain, so HIGH Odour risk	Volatility managed and controlled by extended treatment within the vessels; and stability index used as measure of 'end of process'. Material cooled to ambient prior to release.	Very close management and process control during treatment; with close monitoring of exhausted air/gases as indicators.
V	CLO OUTLOADING	Direct to vehicles; stabilised cooled 'dry' CLO of reduced volatility, but potential for mal-odour releases as material disturbed.	Essential that parameters for full stability and end temperature are met prior to out-loading.	Odour risk is mitigated by thorough conditioning of the material; and stabilisation so that Odour risk is Low.	Parameters set to ensure stability and low moisture criteria are met; odour risk is Low	Increased range of tests and specifications in order to provide additional confidence that Low Odour Risk criteria is met.	Process control; known pre-defined criteria for end of treatment quality criteria.
W	CLO IVC EXHAUST AIR MANAGEMENT	Exhaust gas from composting may comprise CO_2, H_2S, NH_3, CH_4, and various VOC's PAH's etc. Heavy/acidic gases may be most pungent and less easily mitigated in biofiltration.	Additional exhaust gas control system to be implemented; with twin stages of air cooling/ scrubbing and biofiltration.	Trials work undertaken has demonstrated ability to control odours, due to the high level of control of the aerobic composting process.	Residual odours may be Low to Moderate.	Scheme designed to enable additional air/ gas scrubbing in stage 1 exhaust air treatment. Option to use alkali / other chemical scrubbing; and enhanced trickle biofiltration	Air exhaust quality control; known pre-defined criteria for end of exhaust air treatment quality criteria.

X & Y	Waste Acceptance Waste Transfer & Waste Treatment	Potential for release of trapped gases/odours from materials once offloaded and moved.	Pre-acceptance decisions. Ensure only short-term storage of waste;	Simple physical treatments, short term storage, Extraction LEV	Low release rate, low tonnages LOW RISK	No extended treatments. Use LEV in treatment building.	Doors closed and extraction system operating.

Risk Assessment – Part 2 – Odour Risks Caused by Occasional or Abnormal Events

Aspects	Process	Occasional or Abnormal Event	Odour Risk	Actions Required
A / B	IVC Biowaste composting process, from pre-acceptance to product despatch	Part Load or loads of stale, aged material are received, but pass through to reception hall before problem is seen.	Stale, putrid degraded material produces very intense, very offensive odours. Environmentally, reloading of the material could cause wider odour risk. **Risk is LOW** due to volumes of buffer material, the enclosed reception hall, and negative ventilation system	Once noticed, the operative calls the manager and decision may be taken to short circuit the offensive material directly into the shredder and to the IVC. Haulier and Source of waste are notified, evidence collected (photographs etc.) and further deliveries become subject to guarantees for quality.
C	Materials preparation – Shredding/mixing	Shredder breaks down; is out of service	Could mean that material remains in reception longer than acceptable and degrades, generating early release of odours. Risk is **LOW** due to reserve shredding capacity	Site has two primary shredders and one standby shredder. Site has engineering workshop onsite and due to scale of operation has emergency call out priority with dealership.
A to C	IVC Biowaste reception area to loading of vessel	Mains electricity electrical failure, causing ventilation fan becoming idle and potential for mal-odour escape as fugitive emissions.	Fugitive odour escape; potentially high intensity and offensive.	Electricity generator available. Reserve generator can be brought to site within 1 hour from dealer.
A to C	IVC Biowaste reception area to loading of vessel	Cleaning, maintenance.	If doors are opened for extended periods (door gear failure) then fugitive odour escape; potentially high intensity and offensive.	Ventilation odour extraction system shall be operating during facility cleaning, During ventilation system maintenance this can be scheduled for when the loading on the facility is reduced (wintertime)

A to C	IVC Biowaste reception area to loading of vessel	Emergencies. Accident Spillage FIRE	Accident or spillage can be contained within the enclosed extraction system. In case of FIRE, then decision has to be made whether to starve the fire of oxygen or maintain ventilation to clear the building. Burning or smouldering material has potentially high intensity and very offensive.	Ventilation odour extraction system shall be operating during Cleaning up any spillages etc. Ventilation system shall be maintained in use, until/unless fire officer orders it to be switched off. Refer to Fire Prevention Plan

Risk Assessment – Part 2 – Odour Risks Caused by Occasional or Abnormal Events

Aspects	Process	Occasional or Abnormal Event	Odour Risk	Actions Required
A to C	IVC Biowaste reception area to loading of vessel	Main Ventilation Extraction fan failure, causing ventilation becoming ineffective and potential for mal-odour escape as fugitive emissions.	Fugitive odour escape; potentially high intensity and offensive.	Stainless steel fans working as a duplex system; two fans for each scrubber/biofilter provides partial reserve capacity. Mobile fan equipment available; and engineering workshop onsite, with spare motor/parts in stock.
D	IVC Biowaste processing within vessel	IVC Ventilation Recirculation / Extraction fan failure, causing ventilation becoming ineffective and potential for process to become anaerobic and release offensive as well as dangerous gases.	Fugitive odour escape; potentially high intensity and offensive. Release of offensive as well as dangerous gases (H2S and methane)	Spare fan equipment available; and engineering workshop onsite, with spare motor/parts in stock. Ability to move material to another vessel/tunnel (use turn/aeration as means of aerobic control)
E	IVC Biowaste vessel Out-loading	Failure of loading shovel etc.	Material not moved incorrect sequence, causing ‘log-jam’ effect.	Multiple loading shovels available on site; workshop on site; dealer gives priority service to Envar Ltd due to scale of operation.
F	External Windrow turning/aeration	Failure of windrow turning equipment etc.	Material not moved incorrect sequence, causing ‘log-jam’ effect. Odours released from stagnated windrow.	Multiple loading shovels available on site; workshop on site; dealer gives priority service to Envar Ltd due to scale of operation.*[1]

G	Screening Equipment	Failure of screening equipment etc.	Material not screened, causing 'log-jam' effect. Odours released from stagnated windrow.	Multiple loading shovels available on site; workshop on site; dealer gives priority service to Envar Ltd due to scale of operation.
H & P	Effluent System	Failure of drainage, or wastewater treatment works equipment etc.	Effluent not removed causing odours to be released from stagnated effluent.	Workshop engineers on site. Site has suction tankers available to suck up and transfer effluent and remove to sewage works or for land-spreading under deployments.
I and J	Scrubber and Biofilter system	Robust yet simple construction. In case of need to upgrade or refresh the biofilter, a temporary biofilter system can be provide as a 2 stage containerised biofilter plus a simple above ground duct system with wetted woodchip media. i.e. a substitute biofilter of similar dimensions to the normal one.	Biofilter unlikely to suffer complete catastrophic failure, but (could) but will deteriorate in the longer term and need replenishing. Release of fugitive emissions would be very likely.	Containerised wetted biofiltration system can be established within 2-4 hrs. Articulated lorry bulker is fitted with air pipes and filled with woodchip, providing 110m3 of media volume. Bulk biofilter can be established in 8 - 24 hrs.

Risk Assessment – Part 2 – Odour Risks Caused by Occasional or Abnormal Events

Aspects	Process	Occasional or Abnormal Event	Odour Risk	Actions Required
K to O	Biomass woodchip and Paper crumble drying	If Boiler ceases working, then unlikely to release intensely strong offensive odour Possibility that material will not be dried and could become odorous.	LOW risk of odour in event of breakdown or failure. Some risk if it caught fire, due to other materials being involved.	Fire protection procedures, in-built sprinkler system/ or fire extinguisher system.
R, S & T	IVC CLO composting process, reception and vessel loading	CLO Ventilation Extraction fan failure, causing ventilation becoming ineffective and potential for mal-odour escape as fugitive emissions.	Fugitive odour escape; potentially high intensity and offensive.	Stainless steel fans working as a duplex system; two fans for each scrubber/biofilter provides partial reserve capacity. Mobile fan equipment available; and engineering workshop onsite, with spare motor/parts in stock.
U & V	IVC CLO composting process, to product despatch	CLO IVC Ventilation Recirculation / Extraction fan failure, causing ventilation becoming ineffective and potential for process to become anaerobic and release offensive as well as dangerous gases.	Fugitive odour escape; potentially high intensity and offensive.	Spare fan equipment available; and engineering workshop onsite, with spare motor/parts in stock.

			Release of offensive as well as dangerous gases (H2S and methane)	Ability to move material to another vessel/tunnel (use turn/aeration as means of aerobic control) Multiple loading shovels available on site; workshop on site; dealer gives priority service to Envar Ltd due to scale of operation.
V	IVC CLO composting product despatch	Failure of or incomplete processing	Material not adequately treated; is unstable and liable to become volatile when wetted or warmed. LOW Risk due to controls in place and testing done.	Material is held in Vessel for longer, is further composted or aerated to stabilise the material. Further tests done.
W	Scrubber and Biofilter servicing the **CLO** IVC system	Robust yet simple construction. In case of need to upgrade or refresh the biofilter, a temporary biofilter system can be provide as a 2-stage containerised biofilter plus a simple above ground duct system with wetted woodchip media. i.e. a substitute biofilter of similar dimensions to the normal one.	Biofilter unlikely to suffer complete catastrophic failure, but (could) but will deteriorate in the longer term and need replenishing. Release of fugitive emissions would be very likely.	Containerised wetted biofiltration system can be established within 2-4 hrs. Articulated lorry bulker is fitted with air pipes and filled with woodchip, providing 110m3 of media volume. Bulk biofilter can be established in 8 - 24 hrs. Option to utilise containerised, wet scrubber or activated carbon filter.
X and Y	Waste Acceptance Waste Transfer & Waste Treatment	Potential for release of trapped gases/odours from materials once offloaded and moved.	Simple physical treatments, short term storage, Extraction LEV airflow from enclosed building. LOW RISK	Pre-acceptance decisions. Ensure only short-term storage of waste; with no extended treatments. Use LEV in treatment areas when required.

*1

Should the windrow turner break down the windrows shall be turned as required using mechanical excavators or loading shovels. Loading shovels may not always have the best access for efficient turning as they may have to travel a distance to tip the moved row in another row location using fuel in the process. Excavators can sit atop a windrow and turn it in place although they are less efficient than using the turning machine. Excavators would turn a windrow working backwards so as the tracks were running on material before it was turned over. This is to relieve any compaction.

The site has two excavators and multiple loading shovels. Where turning is required, it may be prioritised. An excavator or loading shovel turn takes about 6 hours. This means that should the site required 4 rows could be turned per day if required despite it being more difficult than using the turning machine.

Summary and Conclusions of the Odour Risk Assessment – part1

Aspects	Process	Summary	Conclusion	Actions Required
A to G	IVC Biowaste composting process, from pre-acceptance to product despatch	Critical control points are at the pre-acceptance point (OMP A) to avoid reception of mal-odorous/offensive putrid wastes and at (OMP E) Outloading from the Vessels, where quality assurance is critical to avoid the elevated temperature material releasing undue volatile emissions. OMP F is key, as it entails a large volume of material outside and so close process control, monitoring and management are essential. Increased throughput from 95,000t/yr to 125,000 t/yr is proposed.	Experience has shown that odours relating to the composting of biowaste have been well managed by close attention to process control; and the high level of IVC process control that the Gicom system with recirculation aeration and oxygen monitoring provides. **On this basis, Increasing the tonnage throughput is considered manage-able.**	Attention to the service plan of the Gicom system; training of staff and assurance that expert management shall be available 24/7. Attention to alarm systems. This high degree of dependency on the Gicom system emphasises the need for contingencies to be in place due to power outages accidents or breakdowns.
H and P	Wastewater	Subject to the continuing good practices regarding site drainage; the lagoon management is key and the trials work has shown the value of aerobic control of wastewater in the lagoons.	Continue trials work and look to implement aeration capability for other lagoons. The drainage scheme (lagoons) is being extended.	Attention to training and management of drainage and access to expertise with the waste-water treatment systems.
I and J	Scrubber and Biofilter servicing the Biowaste IVC system	Due to the preparatory treatment of material and oxygen control within the vessels, the biofiltration system operates more uniformly than is often the case; leading to steady state conditions in the biofilter and an enhance air treatment effect	**On this basis, Increasing the tonnage throughput will not adversely affect the downstream air management and this is considered manage-able.**	The increased tonnage throughput shall be made possible by improvements to the utilisation efficiency of the vessels, with reduced Tunnel vacant time. Management training, monitoring and review of parameters will be key.
K to O	Biomass woodchip and Paper crumble drying	The boiler emissions have been assessed in detail. Emissions from the drier are managed and determined as of low to moderate odour; and are managed with air exhaust via the boiler house.	For the materials specified, odours from drying shall either be pleasant (pine) or neutral (paper); there are more options available for odour control	To monitor, evaluate and improve the odour management if required. Ensure 'new' materials are properly evaluated before large volume drying is commissioned.

Summary and Conclusions of the Odour Risk Assessment – Part 2

Aspects	Process	Summary	Conclusion	Actions Required
R to V	IVC CLO composting process, from pre-acceptance to product despatch	Critical control points are at the pre-acceptance point (OMP R) to avoid reception of mal-odorous/offensive putrid CLO wastes and at (OMP V) Out loading CLO from the Vessels, where quality assurance is critical to avoid the CLO material releasing undue volatile emissions. Single batch 350 t, in a 4-week process allows up to 10 batches per year per tunnel (3500t/yr per tunnel) Throughput starting from a trial 5,000t/yr to rising to 10,000 t/yr is proposed.	Trials have been undertaken previously and experience has shown that odours relating to the composting of CLO have been well managed by close attention to process control; and the high level of IVC process control that the Gicom system with recirculation aeration and oxygen and associated trace gas monitoring provides. **On this basis, the proposal to trial an increase in CLO tonnage throughput is considered manage-able.**	Attention to the training of staff regarding CLO Management and assurance that GICOM expert assistance shall be available 24/7. Attention to alarm systems. This high degree of dependency on the Gicom system emphasises the need for contingencies to be in place due to power outages accidents or breakdowns. **Risk assessment suggests that the CLO vessels should have dedicated air exhaust system and primary stage air treatment.**
W	Scrubber and Biofilter servicing the **CLO** IVC system	Due to the potential for a wider range of volatile gases being evolved from the CLO composting process, it is prudent to implement a dedicated primary stage gas scrubbing and biofiltration sequence for the air from these vessels. Previous research has shown that the system as currently used can provide the necessary level of treatment; however, the mixing of the two air streams poses a risk, in that if an acidic or similarly harmful gas is present in air from the CLO then it could harm the Biowaste air exhaust treatment system and cause the need for a wide-spread shut-down.	On this basis, there should be a dedicated air handling system, scrubber facility (ideally twin stage to enable later adaption if required) with dedicated deep bed wood-based media biofilter. (Based on trials work). A trickling filter LECA bead aggregate biofilter may be an enhancement if ammonia gases are elevated. Chemical scrubbing (diluted Hydrogen Peroxide – H_2O_2) may be and option to be utilised if acidic/ heavy gases are prevalent.	The treatment of CLO shall be made possible by installation of a dedicated system for exhaust air odour management with enhancements to provide for optional improvements to be added if required. Management training, monitoring and review of the exhaust gas parameters will be key. **The Gicom sensors for these gases shall be checked, updated and calibrated. Envar shall work with the EA regarding trials and while establishing exhaust gas quality parameters.**
X and Y	Waste Acceptance Waste Transfer	Potential for release of trapped gases/odours from materials once offloaded and moved.		

APPENDIX 5. Scrubber/Biofilter Monitoring & Management

Table A5 Schedule of Odour Management System Monitoring Checks

Ref	Location	Instrument	Rationale	Freq.
1.	**Intake Manifolds: Fans 1 and 2**	Pressure sensor, visual	Proves system is performing OK	daily
2.	**Fan Motors & Belts**:	Visual, alarmed	Evidence of system operation	daily
3.	**Scrubber Water Pump**:	Visual, alarmed	Evidence of system operation	daily
4.	**Water supply**:	Flow meter	Evaluates water usage	as required
5a.	**Biofilter air supply:**	Pressure, visual	Checks back pressure on media	daily
5b.	**Biofilter air supply**:	Temperature sensor	Evaluate temp. drop across filter	daily
5c.	**Biofilter air supply**:	Air humidity sensor	Assess water requirement	daily
6.	**Biofilter Exhaust**:	Sampling (odour)	Biofilter performance	annual by external contractor
7.	**Biofilter**:	Temperature sensor	Evaluate temp. drop across filter	daily
8.	**Biofilter Media**	Check media pH and condition	Check pH, settlement, slumping, fungi, weeds, waterlogging	quarterly
9.	**Irrigation System:**	Check irrigation system	Check sprinkler blockages, spread pattern.	when in operation

APPENDIX 6. Odour Monitoring & Complaint Management

Example odour reporting form (sniff testing)

The use of this form is not mandatory. The information may be recorded in any form.

You may need to carry out an assessment either to work out whether you are complying with your permit, or as a part of an investigation into a complaint.

You can use routine assessments to build up a picture of the impact the odour has on the surrounding environment over time. You can develop 'worst case' scenarios by doing assessments during adverse weather conditions or during particularly odorous cycles of an operation. Ideally, you should use the same methodology to follow up complaints.

Please note:

- Staff normally exposed to the odours may not be able to detect or reasonably judge the intensity of odours off-site. You might be better off using office staff or people who have not recently been working on the site to do this.
- Anyone who has a cold, sinusitis or a sore throat, is likely to underestimate the odours.
- To improve (or to check) data quality, you can get two people to do the test independently at the same time.
- Those doing the assessment should avoid strong food or drinks, including coffee, for at least half an hour beforehand. They should also avoid strongly scented toiletries and deodorisers in the vehicle used during the assessment.

Where you test will depend on:

- whether you are responding to a complaint.
- whether you are checking your state of compliance at sensitive receptors.
- whether you are trying to establish the source of an odour.
- wind direction.

The assessment may involve someone walking along a route that you have selected either because of these factors, or in response to the conditions they found when they got there. Another option is to choose fixed points so that you can evaluate the changing situation over several weeks or months. Or the test points may vary from test to test according to local conditions, which would help you identify worst case conditions.

You should also keep a note of any external activities (such as agricultural practices) that could be either be the source of the odour, contribute to the odour, or be a confounding factor. Remember that an odour will become diluted and may change character as this happens.

You should also take the factors given in H4 Section 5.2 Monitoring – Ambient Air into account.

Odour report form					Date
Time of test					
Location of test e.g. street name etc					
Weather conditions (dry, rain, fog, snow etc):					
Temperature (very warm, warm, mild, cold, or degrees if known)					
Wind strength (none, light, steady, strong, gusting) Use Beaufort scale if known					
Wind direction (e.g. from NE)					
Intensity (see below)					
Duration (of test)					
Constant or intermittent in this period or persistence					
What does it smell like?					
Receptor sensitivity (see below)					
Is the source evident?					
Any other comments or observations					

Sketch a plan of where the tests were taken, the potential source(s).

Receptor sensitivity where odour detected
Low (e.g. footpath, road)
Medium (e.g. industrial or commercial workplaces)
High (e.g. housing, pub/hotel etc)

Intensity

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

Tone (examples. Note: tone may also be something pleasant like chocolate or fresh bread)

Fruity	Acidic	Rotten Veg	Inside dustbin	Damp/Musty	Wet Dog	Blocked drain	Cheesy	Sewage	Rotten eggs	Dead Rat

Offensiveness (Note: scale may also be positive if the odour is regarded as pleasant. 0 is neutral)

0 Neutral	-1 Bearable	-2 Unpleasant	-3 Offensive	-4 Very Offensive	-5 Sickly unbearable

Odour Complaint Report Form

Time and date of complaint:	Name and address of complainant:
Telephone number of complainants:	

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

Form completed by:	Date	Signed

Intensity

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

Tone (examples. Note: tone may also be something pleasant like chocolate or fresh bread)

Fruity	Acidic	Rotten Veg	Inside dustbin	Damp/Musty	Wet Dog	Blocked drain	Cheesy	Sewage	Rotten eggs	Dead Rat

Offensiveness (Note: scale may also be positive if the odour is regarded as pleasant. 0 is neutral)

0 Neutral	-1 Bearable	-2 Unpleasant	-3 Offensive	-4 Very Offensive	-5 Sickly unbearable

Odour Diary	Form version 110319	Sheet No
Name: Telephone Number:	Address:	

Date of odour:						
Time of odour:						
Location of odour, if not at above address (indoors, outside):						
Weather conditions (dry, rain, fog, snow etc):						
Temperature (very warm, warm, mild, cold or degrees if known):						
Wind strength (none, light, steady, strong, gusting):						
Wind direction (e.g. from NE):						
What does it smell like? How unpleasant is it? Do you consider this smell offensive?						
Intensity – How strong was it? (see below 1-6):						
How long did go on for? (time):						
Was it constant or intermittent in this period?						
What do believe the source/cause to be?						
Any actions taken or other comments:						

Intensity

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

Tone (examples. Note: tone may also be something pleasant like chocolate or fresh bread)

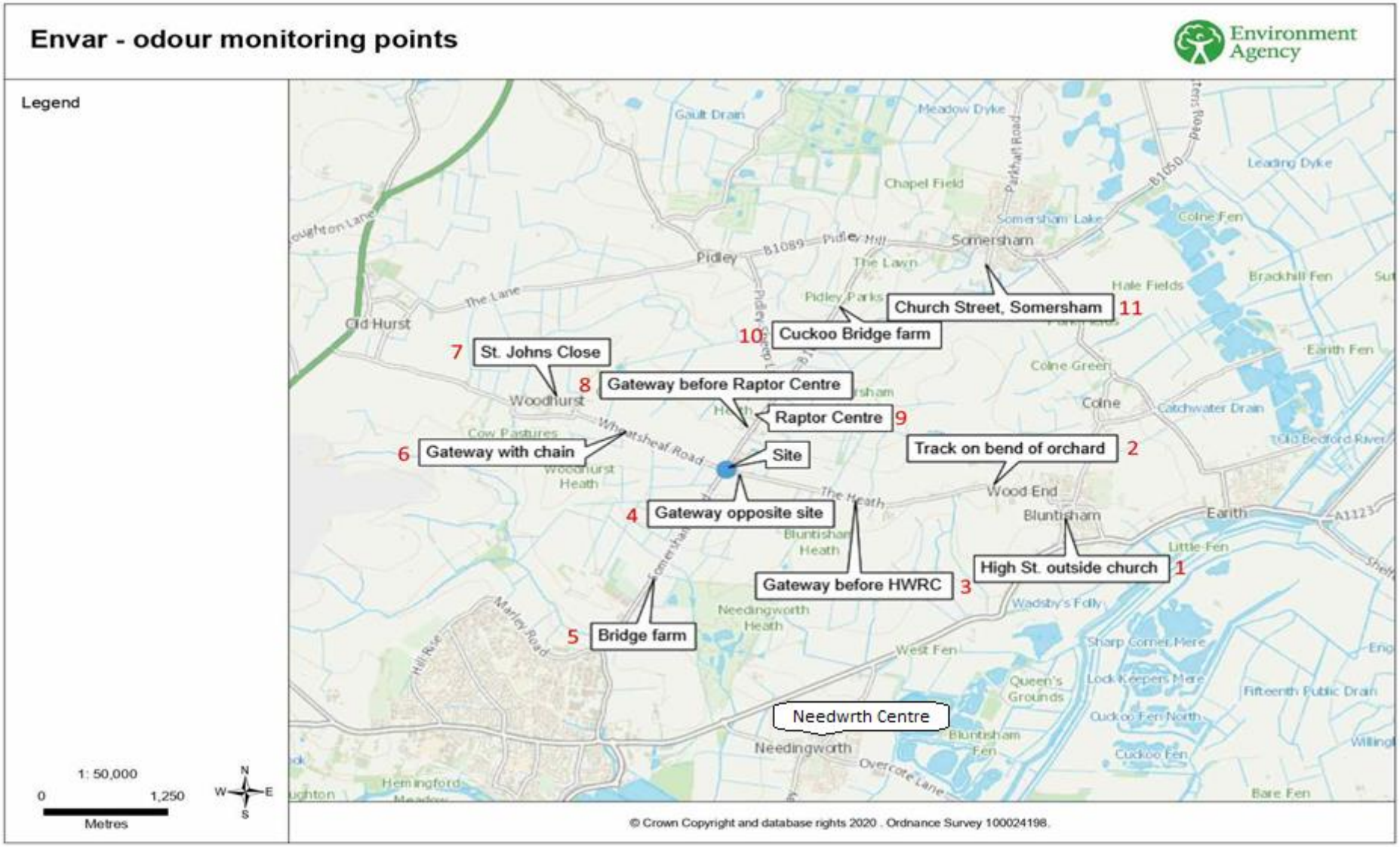
Fruity	Acidic	Rotten Veg	Inside dustbin	Damp/Musty	Wet Dog	Blocked drain	Cheesy	Sewage	Rotten eggs	Dead Rat

Offensiveness (Note: scale may also be positive if the odour is regarded as pleasant. 0 is neutral)

0 Neutral	-1 Bearable	-2 Unpleasant	-3 Offensive	-4 Very Offensive	-5 Sickly unbearable

Odour monitoring and recording at the Envar Site

At the recommendation of the Environment Agency the following locations on the map below will be visited daily, depending on the direction of the prevailing wind.
Each numbered location visited will be given an intensity score between 1-6, 1 being slight and 6 being very strong. Observations made will be recorded in the Site Diary, Version 07.4.1(see below)
Therefore this document will also now in effect incorporate the odour diary for the Site.
It is important to note that paper copies of documents are being replaced with electronic systems. This process is rapidly evolving for example odour checks are being loaded onto an app known as “MyCompliance”. Therefore, this document may be outdated regularly. For this reason it should be understood that although the forms and records may change the processes and data shall not and shall still be available.


Envar - odour monitoring points
Environment Agency
Legend
Church Street, Somersham 11
Cuckoo Bridge farm 10
St. Johns Close 7
Gateway before Raptor Centre 8
Raptor Centre 9
Gateway with chain 6
Site
Track on bend of orchard 2
Gateway opposite site 4
High St. outside church 1
Gateway before HWRC 3
Bridge farm 5
Needwrth Centre
Somersham
Pidley
Woodhurst
Old Hurst
Wood End
Bluntisham
Needingworth
Somersham Lake
Colne
Colne Green
Earith
Meadow Dyke
Chapel Field
Leading Dyke
Colne Fen
Bradkhill Fen
Hale Fields
Earith Fen
Catchwater Drain
Old Bedford River
Cow Pastures
Woodhurst Heath
The Heath
Bluntisham Heath
Needingworth Heath
Wadsthy's Folly
Sharp Comet Mere
Lock Keepers Mere
Queen's Grounds
Fifteenth Public Drain
Cuckoo Fen North
Cuckoo Fen
Bluntisham Fen
Bare Fen
West Fen
Overcote Lane
Hemingford
1: 50,000
0
1,250
Metres
N
W
E
S
© Crown Copyright and database rights 2020 . Ordnance Survey 100024198.

APPENDIX 7. Feedstocks Pre-Acceptance Procedure

Please see waste acceptance IMS procedure

APPENDIX 8. Waste Rejection and Diversion Procedures

'Odorous Feedstock Acceptance and Control Criteria'

A8-Criteria 1 Feedstock supply agreement.
In addition to the feedstock supply agreement and all of the criteria that are included there-in, there will also be odour risk criteria and conditions of supply in regard to the age and degree of degradation of the material. Within the agreement, a measure of the odour intensity and offensiveness of the material shall be included where there is an elevated risk and, in such cases, the right to refuse acceptance of the material shall be a pre-condition.

A8-Criteria 2 Feedstock Delivery Terms and Conditions.
As part of the supply agreement, or as part of any contracted haulier's terms and conditions, there shall be measures put in place to ensure that the material is delivered to site without undue delay, is kept contained and under appropriate environmental conditions (e.g. not left standing in the vehicle for any number of days), and is not altered or added to by mixing materials that could trigger foul odours (acids and alkali; volatile admixtures).

A8-Criteria 3 Feedstock Rejection Terms and Conditions.
One of the terms of acceptance shall be that if the material is non-conformant with the specification, then it shall be returned to the supplier or disposed of at their expense.

A8-Criteria 4 Feedstock Mal-Odour Pre-Acceptance Risk Assessment.
Prior to the arrival at the facility, an assessment shall be undertaken to determine whether the feedstock entails chemical or biological constituents that are deemed to be 'contrary' to the acceptance criteria, and this shall include an assessment of the 'Odour Footprint' so that the management can determine whether the waste is acceptable. The Pre-Acceptance odour check described in Appendix 7 shall be undertaken for each consignment that is being collected.

The 'Odour Footprint' check considers the nature of the material, its current odour intensity, odour offensives, its type, chemistry (pH, Volatility, VFA's, C:N ratio) its source, age and microbiological characteristics i.e. degree of anaerobism or putrefaction.

Checks are also made to ensure that the material is from a pre-approved source and is an approved type.

Where material is marked as being acceptable, but with elevated or 'high' odour risk then a number of measures shall be required in order to transport and offload the material with least environmental impact.

A record of implementation of these measures shall be retained.

A8-Criteria 5 Feedstock Rejection
Where the material is deemed to be excessively mal-odorous in its intensity or offensiveness, then it SHALL BE REFUSED. If it is assessed as being a high risk then it may be offloaded directly into the IVC system so that the risk of it generating odorous emissions is minimised. The assessment will take into account the merits of accepting and treating the material quickly versus rejecting the material when it may need to be

stored untreated onsite while further inspection is awaited, during which time its condition could worsen.

A8-Criteria 6 Daily Intake 'Additional' Capacity.
The ultimate controlling parameter for determining the feed rate of the In-Vessel Composting is not specifically the IVC Vessel Capacity, but it is also determined by the ability to balance volatile (high nitrogen/ high Volatile Solids material) with carbon material. This is determined based on the C;N Ratio and moisture quality characteristics of the feedstock determined from the dry matter content, (the dry solids content) and the volatile solids proportion that make up the dry matter content. For the Envar IVC system, the C:N Ratio of feedstock shall be between 25:1 and 35:1 and the moisture content between 40% and 60%.

The daily intake may be within the range 750 – 1000 tonnes per day subject to an average of 750 tonnes per day equating to two vessels being filled each working day.

In the instance when very high volatility material is to be utilised, this can be buffered with shredded oversize woody material brought back from compost product screening.

A8-Criteria 7 Weekly Intake 'Additional' Capacity.
Where a seasonally high volume of material (weekly volume) is received, then the IVC capacity has in built tolerance to accept the increase in material within the reception area. This is subject to the Animal By-Product requirement that processing must begin within 48 hours of reception (if the material contains ABP's) Also, there is accommodation for shredded (pre-processed) material to be stored ready for fully loading a vessel at a high rate (up to 100t/h), as soon as a vessel becomes available, rather than loading the vessel at the rate of shredding.

A8-Criteria 8 Re-direction of incoming loads to alternative Facilities.
In the event of the intake capacity being at risk of being exceeded; then communications shall be made immediately with the 'Contingency Facilities' [Listed at section 9 of this OMP] and arrangements made to re-direct material to one of these facilities.

A8-Criteria 9 Storage of Rejected Contaminated Material.
Where waste arrives at site and is rejected due to contamination (physical or chemical) and then is quarantined until it can be further assessed, then the means of storage shall also take into account the odour risk posed by the quarantined material; and shall take into account its odour footprint as described earlier. The Odour Check Procedure Appendix 7 can be used to re-evaluate the material.

A8-Criteria 10 Storage of Rejected Mal-Odorous Material.
Where waste arrives at site and is rejected due to being excessively mal-odorous and has to be quarantined until it can be further assessed, then the means of storage shall as a priority, take into account the odour risk posed by the material; and shall take into account its odour footprint as described earlier.

In such instances, the material shall be stored within a confined area within the reception building, under the benefit of the exhaust ventilation and odour management system.

A8-Criteria 11 Records.
In all instances where material is subjected to the Pre-Acceptance Procedure described earlier in this section, the Pre-Acceptance Odour Check sheet shall be retained and held as a key record in the management system.

In all instances where odorous materials having been received, whether accepted or accepted and later rejected, a record shall be made so that management can take appropriate actions with the supplier; and to reinforce the position for the right to refuse acceptance of material where it is excessively mal-odorous.

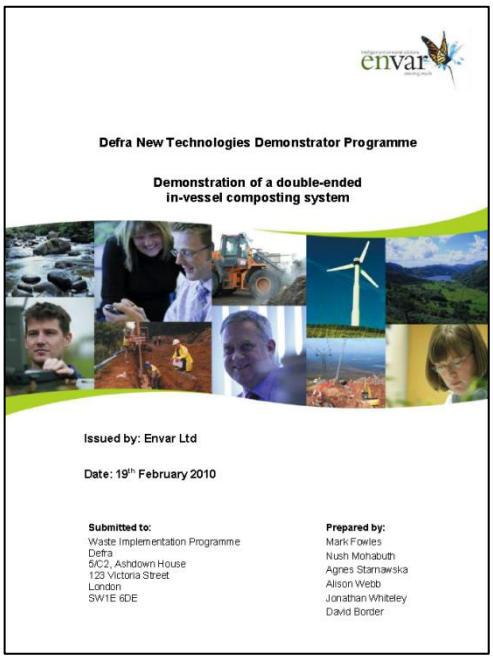
APPENDIX A9. Envar CLO Trials 2008-2009 – Report Summary 2010

Introduction to the Research Project

Plant design

The project was carried out at the Envar Ltd (part of the ADAS Group of Companies) commercial composting site at St Ives Cambridgeshire. The project used four double-ended tunnels designed and built by the Dutch company Gicom b.v.

The Gicom batch tunnel composting system provided the following attributes:



- Fully enclosed, insulated and independent of the local environment, e.g. changes in ambient temperature.
- Possessing a uniform internal environment for composting to take place, i.e. temperature and oxygen levels being the same in all parts of the composting matrix at the same time. This is accomplished by recirculating air through the composting material by means of fans.
- Having full control over temperature to ensure optimal temperatures for each stage of the composting process. This is accomplished by allowing fresh air to mix with the recirculated air under computer-controlled conditions.
- Able to guarantee that all parts of the composting matrix can be held at the required ABPR pasteurisation temperatures for the required minimum time.
- Able to control oxygen levels to ensure that aerobic conditions are always maintained.
- Allowing a tight control over production schedules.
- Allowing detailed data collection, storage and analysis of all the required process parameters, with readings being taken every 15 minutes.
- Having a small foot print for maximum use of available space.
- Able to expand in a modular way in order to respond to increases in feedstock intake.
- Containing and storing any leachate produced.
- Treating process air to remove offensive odours and reduce the level of bioaerosols released to the atmosphere.
- Operating with the minimum amount of labour.
- Fully compliant with ABPR.

Project waste streams

The project waste streams consisted of varying proportions of mixtures of comingled waste and the organic fines separated from mixed Municipal Solid Waste.

Construction process

The tunnels were constructed with an associated enclosed reception area. The tunnels were fitted with an air scrubber and biofilter assembly to remove volatile organic compounds and odours from the process air prior to release to atmosphere. Nearby composting tunnels were converted into biofilters to remove odours from the tunnel process air during composting.

Site operations monitoring

The project monitored each stage of the composting process from waste reception, through shredding, batch tunnel composting, windrow composting and screening.

Process monitoring

A range of feedstock types were processed by the project. The compost temperatures during treatment were measured at multiple points and showed that all parts of the composting matrix were above 60°C for 48 hours during the required pasteurisation stage as required by ABPR. Minimum air temperatures recorded within the tunnels were also above 60°C during this period.

Oxygen levels were measured throughout the tunnel composting process. Levels were not allowed to drop below 7% in order to ensure aerobic conditions. Carbon dioxide levels were measured throughout the tunnel composting process. Levels of carbon dioxide in the exhaust gas up to 110,000 ppm (the limiting level of detection) were detected.

Small quantities of methane were detected for a short time during the first stage of tunnel composting. This was interpreted as being produced by some of the feedstock becoming anaerobic when stored prior to arrival at the site. No methane was detected after a few hours of composting in the tunnels.

Ammonia levels were monitored. An ammonia detection system was set up and operational during the project.

The rate of water evaporation was determined throughout each run. This lost water was partially replaced during the tunnel composting process using spray bars within the tunnels. The decision as to when to add water, and how much water to add, was a decision made by the site Operations Manager based on an inspection of the moisture of the feedstock.

Parameters that were monitored in order to control the composting process included i.e. temperature, oxygen levels, time, the additional parameters that can be monitored and quantified e.g. ammonia production, carbon dioxide production, methane detection, add valuable information as to how the composting process takes place.

General Monitoring of emissions

The volume of leachate produced by the tunnel composting process was determined and analysed at intervals throughout the duration of the project for a wide range of chemical and physical parameters including heavy metals and biological oxygen demand (BOD).

A range of volatile organic compounds (VOCs) were measured in the tunnel process air using the methods of top ten screen, thermal desorption and the infrared sensors within tunnels. The top ten method was found to be not sensitive enough to detect VOCs at some of the composting stages. The thermal desorption method was found to be the most useful. Twenty-four different VOCs were detected in an analysis of one run.

Ammonia levels in the tunnel process air were detected using Dräger tubes, a bubbler method, and, at the latter part of the project, by the ammonia probes installed in the tunnels. The efficiency of the scrubber was determined using these methods. The efficiency of the scrubber was found to vary considerably from 0 to 89% depending upon the method of detection used and the stage at which the sampling was carried out.

The efficiency of the scrubber in reducing odours in the tunnel exhaust air ranged from 18-67%. The efficiency of the biofilter system in further reducing odour ranged from 42-96%. The overall efficiency of the scrubber/biofilter system in reducing odours ranged from 33-98%. This variation was in part due to the difficulty in obtaining representative odour readings from the exhaust air.

Process Monitoring of Tunnel Composting of MSW organic fines (CLO)

The project undertook the processing of organic fines separated from mixed Municipal Solid Waste to form Compost Like Organics (CLO)
The tunnels successfully processed the material under aerobic composting.

The feedstock was composted in the tunnels in the same way as with the mixtures of kitchen waste and green waste. This was to demonstrate that this mixed-waste feedstock could be successfully composted in the tunnels to produce a compost-like output (CLO).

In two of these trials the material was taken through an extended second stage of tunnel composting. The extended times in the second stage were employed to bio-dry the material to produce refuse derived fuel (RDF).

The residence time for the composting of the CLO varied from 8 days to 16 days.

The compost temperatures during pasteurisation were measured at 6 different points and showed that all parts of the composting matrix were above 60°C for 48 hours during the required pasteurisation stage. Minimum air temperatures were also above 60°C during this period.

Oxygen levels were measured throughout the tunnel composting process.
Levels were not allowed to drop below 7% in order to ensure aerobic conditions. Total oxygen consumption was also measured for each run.

In the 8 MSW runs producing CLO the composting consumed between 6.3 and 18.7 tonnes of oxygen depending upon composting activity.

Carbon dioxide levels were measured throughout the tunnel composting process. Levels of carbon dioxide in the exhaust gas up to 110,000 ppm were detected. In the 8 MSW runs producing CLO the total amount of carbon dioxide produced during the two stages varied from 15.1 tonnes to 40.30 tonnes depending upon the activity of the compost.

Small quantities of methane (0.3 to 11.1 kg) were detected for a short time during the first stage of tunnel composting the MSW runs producing CLO. This methane was thought to be introduced by some of the feedstock arriving on site containing anaerobic portions, created during the storage of the feedstock before transport.

Ammonia levels were detected for each run. The total amount of ammonia produced in both stages of MSW runs producing CLO varied from 7.9 to 89.8 kg. In the two runs producing RDF the equivalent figures were 55.8 and 57.5 kg. In addition to the ammonia data collected by the tunnel computer, two other methods of ammonia detection were utilised.

The rate of water evaporation was determined throughout each run. The total amount of water evaporated from both stages of the MSW runs producing CLO varied from 11.4 to 43.2 tonnes depending upon the activity of the compost and management practices relating to water replacement. This lost water was partially replaced during the tunnel composting process using spray bars within the tunnels. In the two MSW runs producing RDF the total water lost varied from 36.3 to 39.1 tonnes.

Volatile organic compounds

VOCs are a large group of anthropogenic (derived from human activities) or biogenic organic compounds with relatively high vapour pressures. VOCs can be potential air pollutants, due to their malodorous and hazardous properties (although normally only hazardous at much higher concentrations than those experienced downwind of composting installations). In addition, VOCs

can contribute to global warming, stratospheric ozone depletion and tropospheric ozone formation. VOC sampling is not routinely measured in most composting facilities.

There have been many studies carried out on VOC emissions from landfills, but little data is available for the composting process. This gap was identified in the Defra Report. In particular, the Defra Report indicated a lack of knowledge of volatile organic compounds as a whole as well as specific chemicals including 1,1-dichloroethane, chloroethane, chloroethene, chlorobenzene, tetrachloroethene, and benzene.

In order to apply most appropriate sampling method to emissions from the Gicom tunnels, a comprehensive assessment of available equipment was undertaken.

The following technologies were examined during the intensive runs carried out by the project:

1. Infrared sensors and probes;
2. Photo Ionisation Detectors (PID);
3. Photo-acoustic analysers;
4. Gas chromatography-mass spectrometry (GC-MS):
    - Top ten screen;
    - Thermal desorption (TD).

One of the major restrictions in choosing a VOC sampling method was the high temperature (up to 70°C) and high moisture levels of the exhaust air from the tunnels, as most of the above listed equipment cannot operate efficiently under such extreme conditions.

After initial trials with the first three methods it was determined that the GC-MS method would be the most appropriate method. This sampling method included collection of triplicate samples from vessels during warming up, during process and during cooling down. Initial sampling and analysis using top ten screen method showed the following VOCs emissions.

Table 15: VOCs emissions detected by top ten screen method

Volatile Organic Compound	Concentration (ppm)
2- butanone	89
Branched benzene circa C10	21
Ethanol	21
Acetone	11
Unidentified cyclic alkene circa C10	16
Unidentified terpene	31

The limit of detection of the top ten screen method (10 ppm) was found to be too low to detect VOCs in the exhaust gases from the tunnels during the process and cooling down stages and after the scrubber.

Thermal desorption TD was also used to determine VOCs from the exhaust air.

Samples were collected during an intensive run of the composting of co-mingled kitchen waste and green waste and another four during an intensive MSW run and sent to accredited laboratories for TD GCMS analysis.

The levels of most of the detected VOCs were highest at the warming up stage of tunnel composting and are likely to originate from the fresh feedstock. One VOC (trimethylamine) was present at its highest level at the cooling down stage, although this level was itself very low. A few VOCs (dimethyl disulphide, 2-nonanone, fenchone and camphor) had highest levels during the pasteurisation stage. With the exception of trimethylamine, levels of all the detected VOCs were greatly lower after the scrubber. The only VOC that showed high values after the scrubber was limonene, and this was at only 1.6% of the high level found during the warming up stage.

The levels of most of the detected VOCs were highest at the warming up stage of tunnel composting and are likely to originate from the fresh feedstock. With the exception of trimethylamine, levels of all the detected VOCs were greatly lower after the scrubber. Three VOCs (trimethylamine, 2-pentylfuran and camphor) had the highest levels at the cooling down stage, although all levels were low. The only VOC that showed high values after the scrubber was dimethyl sulphide, and this was at a very low level.

Table 16: Volatile organic compounds (ng/litre) in processing of co-mingled kitchen waste and green waste feedstock (and Table 17: MSW Feedstock)

Table 16: Volatile organic compounds in processing of co-mingled kitchen waste and green waste feedstock

Retention time (minutes)	Assignment	Approximate Concentration (ngl¯)			
		G3 Tunnel Warming up	G3 Tunnel pasteurisation	G3 Tunnel cool down	After the scrubber
3.20	Trimethylamine	nd	nd	170	170
4.93	Dimethyl sulphide	550	170	nd	16
5.90	1-Propanol	15 000	nd	nd	4.3
7.02	2-Butanone (MEK)	620 000	23 000	3.1	56
7.11	2-Butanol	66 000	260	0.40	3.1
7.55	Ethyl acetate	13 000	nd	nd	nd
7.91	2-Methyl- 1-propanol	6 400	nd	nd	1.8
8.79	3-Methylbutanal	930	130	nd	10
8.96	1-Butanol	1 700	nd	nd	nd
9.07	2-Methylbutanal	610	60	nd	4.1
9.99	3-Pentanone	1 900	890	7.9	12
10.70	Methyl butanoate	370	nd	nd	nd
11.00	3-Methyl-1-butanol	8 600	nd	nd	nd
11.12	2-Methyl-1-butanol	3 700	nd	nd	nd
11.58	Dimethyl disulphide	100	120	6.8	8.1
12.81	Ethyl butanoate	920	nd	3.7	nd
15.19	2-Heptanone	940	360	2.6	5.1
16.62	α-Pinene	29 000	27 000	330	420
17.51	Sabiene ?	13 000	6800	56	71
17.62	β-Myrcene	12 000	7 400	110	140
18.76	Limonene	390 000	250 000	5600	6400
19.80	2-Nonanone	350	480	nd	nd
20.25	Fenchone	380	690	6.9	7.3
21.57	Camphor	1 000	4 400	160	160

1ng is 1 millionth of a mg. 1 nanogram/litre = 0.000001 part per million

Table 17: Concentrations of volatile organic compounds during processing of MSW feedstock

Retention time (minutes)	Assignment	Approximate Concentration (ng/m³)			
		G3 Tunnel Warming up	G3 Tunnel pasteurisation	G3 Tunnel cool down	After the scrubber
2.48	Acetaldehyde	1 100	nd	430	24
3.24	Trimethylamine	nd	nd	55	10
3.48	Ethanol	170 000	nd	360	300
5.12	Dimethyl sulphide	nd	37	140	150
6.70	2-Methyl propanal	460	110	160	82
6.93	2,3-Butanedione	3 100	60	130	42
7.17	2-Butanone	68 400	320	950	1 600
7.26	2-Butanol	22 500	nd	nd	210
7.70	Ethyl acetate	170 000	nd	nd	290
8.05	2-Methyl 1-propanol	11 000	nd	48	37
8.92	3-Methylbutanal	590	180	290	140
9.21	2-Methylbutanal	1 100	83	150	89
10.49	Propanoic acid ethyl ester	5 900	nd	nd	nd
11.12	3-Methyl butanol	19 000	31	110	58
11.23	2-Methyl butanol	4 100	nd	nd	8.1
12.00	Pentanol	430	nd	nd	nd
13.48	3-Methyl butanoic acid	75	nd	nd	nd
15.28	2-Heptanone	5 000	41	230	140
16.71	α-Pinene	25 100	4 000	8 800	2 400
17.58	β-Myrcene	7 700	2 600	780	660
17.75	2-Pentylfuran	600	nd	1 600	260
18.85	d-Limonene	250 000	29 000	84 000	30 000
19.86	2-Nonanone	2 500	43	410	72
21.63	Camphor or isomer	1 000	430	3 300	220
22.00	Borneol or isomer	740	47	nd	nd
24.12	Bornyl acetate	1 300	nd	240	nd

1ng is 1 millionth of a mg. 1 nanogram/litre = 0.000001 part per million

Ammonia

Ammonia is an easily dispersible gas and air pollutant of malodorous and potentially toxic nature. It is produced during the composting process and often represents the main nitrogen-containing gas present in composting exhaust air.

In order to remove ammonia from the exhaust air and reduce odour emissions from the Gicom tunnels, a wet scrubber was installed within the exhaust ducting and its performance was monitored during the course of the project.

Ammonia emissions from the Gicom composting tunnels were determined using Dräger Gas detection tubes and an Infrared probe (installed in the ducting of the Gicom tunnels and monitored by the tunnel computer).

Gas Detection Tubes

Ammonia emission readings using Dräger tubes were taken on a weekly basis and involved measuring emissions from the exhaust air in the ducting before and after the scrubber.

Ammonia emissions data are listed in the Table below. Samples taken during the processing of MSW material are determined.

Ammonia in MSW Composting producing CLO

The ammonia levels (ppm) within the ducting during normal composting and MSW composting were determined and these data have been averaged to provide simplified useful data.

		Number Tests	Max In ppm	Max Out ppm	Av In ppm	Av Out ppm	Reduction
Dräger Data	Quality Compost	24	204	204	68	48	30%
" "	CLO	5	30	15	13	8	38%
Infra-Red Probe Data	Quality Compost	10	47	21	19	10	48%
" "	CLO (inc. 1 out-lyer)	3	239	113	104	53	49%
" "	CLO	2	52	32	36	23	38%

Methane detected in MSW Composting producing CLO
As the composting process is fully aerobic, the presence of methane in the recirculated air would not be expected. However, in the early part of the first stage of some runs, small quantities of methane were detected (on one occasion 506ppm). This was taken to mean that there are elements of gases trapped in the incoming material that have been generated prior to reception and are a function of the history of the material, its nature, its prior treatment and its age.

Conclusions from the Trials

1. Trapped gases generated in storage or prior treatment may be present in the feedstock arriving. These may be released during movement, or during the initial purging with air within the vessels.
2. Methane is an example of this and was found in one instance at 506ppm
3. Ammonia gas is generated and released when the process pH and temperature rises towards the end of the processing period. This may be contained by added moisture, pH adjustment or otherwise is exhausted to the scrubber which may be circa 38% efficient. Ammonia levels at the exhaust output may be increased up to 150 to 200 ppm
4. VOC's are present in very small concentrations. E.g. Butanone at 1600ng/litre (0.0016ppm), pinene 2400ng/l (0.0024ppm) and limonene 30,000ng/l (0.03ppm).
5. Dimethyl Sulphide 150ng/l (0.00015ppm) indicated low levels of sulphide.

APPENDIX A10. Summary of Site Storage and Treatment Capacities

IVC Quality Compost
Max stored feedstock for Quality compost 1500t
Max Feedstock processing into IVC 750t/day
Max Composting on external pad 30,000kt /instant
Compost loaded to external pad max 750 t/day
Compost Screening from pad 1500t/day

CLO Composting
Max stored feedstock for CLO compost 750t
Max CLO Feedstock processing into IVC 750t/day
(Note typically 250t stored and 25t/day treated but more than 1 vessel could start process on any day)

Drying Biomass etc.
Max 200 t in free storage at Drier Building
Throughput of drying 8-10 /h 24/7 so ~240 t/day

Waste Transfer and Treat
Max 1500 t
Throughput 500t/day