



North London Anaerobic Digestion Facility

**Site Environmental Permit: Attachment 8 – Maintenance  
Schedule**

February 2016

This appendix illustrates the types of management and maintenance checks that will be carried out on site. This list will be reviewed by the site management prior to plant commissioning.

**Table 1 - Daily checks**

CHECK	ACTION
Check waste input	Check contamination is <10%, there is no glass, hypodermic needles and the waste is included in the AD QP and Environmental Permit
Loads	Type is included in the Environmental Permit
Feeding rate	Check feeding rate
Reactor temps	Check temps in reactors 1-4 is between 30 and 50degC
Fault lights	Visual inspection and address any failures
CHP water heating	Top up water system and bleed if required
Desulphurisation System	Test air pumps x 5 reactors and adjust if required
Crusts /floating layers	Visual inspection and adjust stirring time/height
Substrate pumps	Visual inspection
Macerators	visual insp. power consumption and flow rate
Clamping tube	Visual insp. of roof membrane x 5 reactors
Gas level indicator	Visual insp. of rod and tube x 5 reactors
Overflow protection	Visual insp. Of probes in reactor windows
Fill level	Visual and computer check x 5 reactors
High/Low pressure devices	Check antifreeze levels and sealing x 10
Operating data log	Diary complete
Waste water collection	Check outside tank and allow for rain
Monitor biology	PH levels FOS/TAC and record
CCTV	Visual check x 4 cameras
Bunker base pump	Pump out under bunker as required
Biofilter Fan	Check speed and adjust if required
EXTOX system	Check gas levels in all zones
Weighbridge	Check till rolls and correct operation

Security	Check perimeter fence
Odour tour	Complete site odour log
Welfare Cabin	Clean and tidy
Machinery	Complete MMC for CAT
Vermin	Pest control mow and weed as required

**Table 2 Weekly checks**

CHECK	ACTION
Manual air valves	Operate and oil
Pump room1 air valves	manually operate and oil
Past. room air valves	manually operate and oil
Condensate chamber	Ensure liquid is at correct level
Compressor oil levels	Check and top up if required
Leakage detection on digesters	Visual check and inspect pots x 10
Air compressors	Drain condensate
CHP remote valve	Check oil level x 2
Silage clamp drain pots	Empty silage and ensure free flow
Silage bunker	Grease 10 pumps per nipple
Waste bunker	Grease 10 pumps per nipple
Wackerbauer	Grease 10 pumps per nipple
Pasteuriser Tops	Grease 10 pumps per nipple
Mix tank agitator	Check oil level and top up if required
Agitators	Grease cable tubes
Bio Filter	Check air flow and sprinkler position
Scrubber	Check Redox and pH levels
Scrubber	Check chemical levels
Wackerbauer	Check sieves and hammers for wear
Macerators	Check for wear , oil and air levels and stone trap
Glycerine bund	Pump out as required
Signs	Clean as required
Padlocks	Oil as required
Digester 2 pipe seals	Check integrity

**Table 3 Monthly and Annual checks**

<b>FREQUENCY</b>	<b>TASK</b>	<b>ACTION</b>
Monthly	Flare	Check operation
	Drain at vehicle exit	Clean out
	Drain at vehicle entrance	Clean out
	Visitors PPE	Wash
	Portholes	Clean, check for leaks & tightness of bolts
	Biogas Compressors	Grease shaft
4 Monthly	Temp. Probes x8	Calibrate and record
Annually	Lifting equipment	3rd party test and record
	Weighbridges	3rd party test and record
	Fire extinguishers	3rd party inspection
	Klargester	3rd party inspection
	PAT Testing	3rd party inspection
	Digestate pipe pressure test	3rd party inspection



# Preliminary Process Control Philosophy *Agrivert*

## Air Scrubber – Trumps Farm AD Plant

*Issue for construction*

**ERG Doc No:** A2834/PCP01

**Agrivert Doc No:**

Issue	Date	Produced	Checked	Reviewed	Approved	Comments
0	23/08/13	UO	HMW		DG	
A	10/09/13	UO			DG	Changes made in line with client's comments 09/09/13 (Note 1)

### Notes

1. Changes tagged in document.

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**Reference Documents:**

<b>Document Number</b>	<b>Description</b>
A2834/01	P&ID
A2834/10	General arrangement
VERT12A4draft	Odournet report (client specification)
C303.1040	Scrubber specification (client specification)

Date	10/09/201 3	WP Ref:	T:\APC Contracts\A2834 - Agrivert\800 - Engineering\890 Process design and technical\Documents\A2834 PCP01 Rev A -Draft.doc
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## 1.0 INTRODUCTION

### 1.1 Overview

This Process Control Philosophy is intended to give an overview of the operation and control of a water scrubber used to treat air from Agrivert Anaerobic Digester plant. The scrubber has been sized and designed to treat building and soup air extracted from the Anaerobic Digestion plant.

The system comprises:

1 off – uPVC/GRP scrubber with dimensions: 2,400mm diameter x 6,000 mm height. It is supplied with:

- 170° angled full cone spray nozzle to distribute scrubbing liquor.
- A 1m deep bed of polypropylene snowflake packing.
- GRP packing support grid on support beams.
- Chevron polypropylene droplet eliminator.

1 off – Centrifugal, horizontal, recirculation pump with single mechanical sealed (liquor duty 66m<sup>3</sup>/hr).

1 set – Pipe work in uPVC including ball valves, diaphragm valves and butterfly valves.

1 set – Instruments comprising

- 1 off – Scrubber flow indicator.
- 1 off – Scrubber sump conductivity type level control providing high high, high, low and low low level signals.
- 1 off – Poddy type manometer for visual indication of the packing's pressure drop.

### 1.2 Process Description

Refer to Odournet report (VERT12A4draft) for the malodorous air specification.

Odorous air building and soup air is extracted from the anaerobic digestion plant building into the scrubber where it is scrubbed with water in a packed tower. Soluble gases (VOCs) are absorbed by the water. The liquor is continuously re-circulated and fresh water is continuously fed to the sump and contaminated liquor continuously overflows to drain.

The water scrubbed air passes through a droplet eliminator where entrained droplets are removed and then exits the scrubber. The scrubbed air then flows to a fan and bio-trickling filter (supplied by others).

### 1.3 Design Basis

The following information forms the basis of the design of the scrubber. Refer to Odournet's report (VERT12A4draft) and Agrivert's scrubber specification (C303.1040) for further information. The anaerobic digestion plant produces a range of odorous gases. The gases produced are many, but the principal types are alcohols, esters, terpenes, sulphur based volatile organic compounds (VOCs) and other volatile organic compounds (VOCs).

Generic name	Typical compounds (includes but not limited to)
Terpinenes	alpha-pinene, beta-pinene and Limonene
Sulphur VOCs	dimethyl sulphide, dimethyl disulphides and carbon disulphide.
Other VOCs	ethanol, 1-butanol, 2-butanol





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The size of the anaerobic digestion building, air change rate and volumetric extraction rate is as follow.

	Units	Volume
Building volume	m <sup>3</sup>	19,630
Air change rate	hr <sup>-1</sup>	2.5
A Anaerobic digestion building	m <sup>3</sup> /hr	49,075

## 1.4 Legend of Alarm and Control Functions

Throughout this document and in the referenced schedules the following system is used to describe alarm and control functions associated with instrumentation. The table below describes the system.

first letter(s)	second letter	third and subsequent letters
F = flow	A = alarm	HH = high-high
L = level	C = control function	H = high
T = temperature	E = element	L = low
TD = temperature difference		
P = pressure		LL = low-low
PD = pressure difference		X = instrument fault

For example: LAL01 = low level alarm for instrument LS01

## 1.5 General Notes

All setpoints referred to in this document are preliminary and will be confirmed during commissioning.



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## 2.0 SCRUBBER AND LIQUOR RECIRCULATION SYSTEM

### 2.1 Introduction

The scrubber is a vertical packed tower CS01 designed to scrub the odorous air stream which is extracted from the anaerobic digestion plant building prior to further downstream treatment by a bio-trickling filter. The scrubber has water recirculated around the packing which is continuously passed to drain and topped up with mains water.

The recirculation pump P01 draws liquor from the scrubber sump and pumps it around the recirculation pipe work to the spray nozzle at the top of the scrubber CS01. The liquor in the scrubber sump overflows to drain and the sump also receives a constant supply of process water.

### 2.2 Process and Equipment Description

Building and soup malodorous air is drawn from the anaerobic digestion building into the scrubber inlet in the base of the tower and flows upwards through the packed section. The air comes into contact with the downward flow of scrubbing liquor. The soluble gases are absorbed into the liquor. The scrubbed gas exits the tower through a vertical chevron type mist eliminator at the tower outlet to the fan and bio-trickling filter (supplied by others).

The recirculation pump P01 delivers the scrubbing liquor onto the top of the packing by a single spray nozzle, located above packing, which evenly distributes liquor over the surface of the packing.

A constant flow of mains water is supplied to the scrubber sump and a constant and equal amount of liquor from the scrubber sump overflows to drain.

### 2.3 Design Basis

The scrubber is to operate under the following design basis:-

Parameter	Units	Value
Design inlet air flow rate – normal operation	Am <sup>3</sup> /hr	49,075
Design inlet air temperature – normal	°C	20
Design inlet air temperature – maximum	°C	40
Design inlet air relative humidity – normal	%RH	70
Design inlet air relative humidity – maximum	%RH	100

A

#### Notes:

1. The composition and concentration of contaminants can be found in Odournet's report (VERT12A4draft).

### 2.4 Instrument Description, Control and Alarm Functions

#### 2.4.1 Re circulation pump (P01)

The pump is an ATEX rated centrifugal recirculation pump with a 7.5kW motor. It delivers a normal flow of 66 m<sup>3</sup>/hr. Pump failure is determined from the pump contactor for electrical tripping on overload and motor thermistor for thermal overload. Any of these failures will trip the pump and raise an alarm on the control system. Process failure is for low low liquor level- see later.



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#### 2.4.2 Differential Pressure Indicator (PD03)

The pressure drop across the packing is displayed on a Poddy type manometer PD03.

Equipment item	Instrument tag number	Normal value (mmWG)
Scrubber packing	PD03	51

#### 2.4.3 Scrubber Sump Level Switch (LS01)

A clear uPVC stilling tube is installed beside the sump. It includes four probes (three conductivity level probes and one earth probe) in a single unit to provide the following alarms.

Instrument tag	Alarm tag	Height (mm from base)	Action
LS01	LAHH01	1,300	Extremely high liquor level. Alert operator. Raise alarm. Check for blockage in overflow.
	-	1,000	No action. Normal working level.
	LAL01	700	Liquor below normal working level. Raise alarm. Trip sump heater.
	LALL01	500	Extremely low liquor level- close to pump suction. Raise alarm. Trip pump. Disable heater.

#### 2.4.4 Recirculation Flow (FI02)

The recirculation pipe work has a flow indicator mounted within it. This flow instrument provides local indication of the recirculation flow.

#### 2.4.5 Scrubber Base Tank Heater (TS04)

The scrubber sump has a frost protection heater with locally adjustable thermostatic control. The heater operates automatically when ambient conditions fall below 5°C (adjustable). The heater is hard wire interlocked with the tank's low level alarm LAL01 to prevent the heater operating when the tank contains insufficient liquor to cover the element properly.



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### **3.0 START-UP AND SHUT-DOWN PROCEDURES**

#### **3.1 Introduction**

The start-up and shut-down of the scrubbing system is described below.

#### **3.2 Pre start-up Procedure**

It is assumed that the system has been commissioned and air flow has been balanced.

- Confirm that all the air inlet and outlet dampers are set correctly.
- Ensure that make up water is flowing into the scrubber sump by adjusting the diaphragm valve MV01 and the overflow is passing to drain.
- Confirm that the normal working liquor level has been achieved.
- Confirm that the pump isolation valves MV02 and MV03 are open.
- Check that power is available at the sump heater.

#### **3.3 Start-up procedure**

The operator should start the scrubbing system as follow.

- The scrubber pump P01 should be started first and the liquor flowrate confirmed from FI02.
- The fan (supplied by others) should then be started.
- Check scrubber differential pressure is with normal operating limits.
- With air flowing through the system, liquor level achieved, sump make-up water and overflowing the scrubber is fully operating.

#### **3.4 Controlled Shut-down Procedure**

When air extraction and odour removal is no longer required, the plant is shut down in the following sequence:

- Stop the fan.
- Stop the recirculation pump P01
- Close the sump water make-up valve.

The sump heater should be permanently available.

For an extended shutdown, drain the recirculation line and stilling tube. Rotate pump weekly by hand to ensure bearings do not seize.

#### **3.5 Emergency stop**

A local pump emergency stop button (by others) is recommended.



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## 4.0 CONTROL PANEL REQUIREMENTS AND USER SPECIFICATION

### 4.1 User requirements – MCC and C&I

The MCC/C&I panel is supplied by the client

### 4.2 User Requirements

Electrical Requirements

Parameter	Tag	Supply	Rating (kW)	Absorbed (kW)	Starter
Pump Motor	P01	400/50/3	7.5	3.6 (TBC)	DOL
Sump heater	HE01	230/50/1	4	TBC	-



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## 5.0 INSTRUMENT ALARM AND CONTROL FUNCTION SCHEDULES A

The following instruments have control or alarm functions. For further details of all instruments, refer to the instrument schedule A2834/IS101 and Instrument data sheets.

Section	Alarm tag	Alarm set-point	Description
2.4.3	LAHH01	1,300 (mm)	Extremely high liquor level. Alert operator. Raise alarm. Check for blockage in overflow.
2.4.3	LAL01	700 (mm)	Liquor below normal working level. Alert operator. Raise alarm.
2.4.3	LALL01	500 (mm)	Extremely low liquor level Close to pump suction. Alert operator. Raise alarm. Trip pump. Disable heater.



**Odour Complaint Form – AQD 012b**

Site/Contract:
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**Complaints will be treated seriously and referred to management immediately by quickest means available.**

Date:	By: Letter / Fax / Telephone / e-mail / in person	
Name and address of complainant:		
Tel no. of complainant:		
Date, time and duration of offending odour:		
Location of odour, if not above address:		
<b>Include grid ref or postcode</b>		
Weather conditions (i.e. dry, rain, fog, snow)		
Cloud cover (0 = clear – 8 = fog)		
Cloud height (low, high, very high)		
Wind strength (light, steady, strong, gusting):		
Wind direction		
Complainant's description of odour (i.e. comparison with other odours, strong / weak, continuous, fluctuating). Please circle as appropriate:		
Odour Intensity (Detectability): 0 No odour 1 Very faint odour 2 Faint odour 3 Distinct odour 4 Strong odour 5 Very strong odour 6 Extremely strong odour	Hedonic Tone (Offensiveness): +4 Very pleasant +3 Pleasant +2 Moderately pleasant +1 Mildly pleasant 0 Neutral -1 Mildly unpleasant -2 Moderately unpleasant -3 Unpleasant -4 Very unpleasant	Receptor sensitivity: Low (footpath, road) Medium (workplace) High (housing, pub/hotel)
Has complainant 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:		
On-site activities at time the odour occurred and any actions taken:		
Has an odour tour been carried out? YES/NO		
If yes, has an Odour Report Form (AQD012d) been completed? YES/NO		
Complaint received by:	Signed:	
Action:	Action by - Name & Sign:	



## Odour Report Form – AQD 012d

Site:

Your Name:				Date:	
Time of test:					
Location of test:					
Weather conditions					
Temperature					
Wind strength					
Wind direction (e.g. from NE)					
Intensity (see chart below)					
Duration of test					
Persistence (e.g. constant, intermittent)					
What does it smell like?					
Receptor sensitivity (see chart below)					
Is the source evident?					
Other comments or observations (e.g. agricultural practices)					
Has this odour report form been completed in response to an odour complaint? YES/NO If yes, has an Odour Complaint Form (AQD012b) been completed? YES/NO					

<b>Intensity</b>  0 No odour 1 Very faint odour 2 Faint odour 3 Distinct odour 4 Strong odour 5 Very strong odour 6 Extremely strong odour	<b>Receptor sensitivity where odour detected</b>  Low (e.g. footpath, road) Medium (e.g. industrial or commercial workplaces) High (e.g. housing, pub/hotel etc)
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**Odour Report Form – AQD 012d**

Site:

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

A large, empty rectangular box with a thin black border, intended for the user to draw a site plan showing test locations and potential odour sources.



**PART 1 – TO BE COMPLETED BY CUSTOMER**

CONTRACT DETAILS	
Detailed product description	
EWC code	
ABPR Category (only applicable to animal by-products)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> Not applicable Haulier ABP registration No: _____
Acceptable under PAS100 or PAS110	
Gate fee agreed (price is per tonne ex VAT)	£ _____ per tonne/pallet/load/IBC
Invoice will be raised	Monthly
Payment terms	14 days from date of invoice
Customer Purchase Order if applicable	
If you require data reports/invoices to be subdivided by different locations/parts of your business, please provide the name each location/description you require here:	

Facility/waste type	Agrivert Company(ies) with which you wish to open an account	Tick	Account Number (for Agrivert use)
Ardley IVC	Agrivert Ardley Ltd	<input type="checkbox"/>	
Showell OWC	Agrivert Ltd	<input type="checkbox"/>	
Cassington AD	Oxford Renewable Energy Limited	<input type="checkbox"/>	
South Mimms IVC	Agrivert Hertfordshire Ltd	<input type="checkbox"/>	
Wallingford AD	Agrivert Wallingford Ltd	<input type="checkbox"/>	
Wallingford OWC	Agrivert Ltd	<input type="checkbox"/>	
West London AD	Agrivert West London Ltd	<input type="checkbox"/>	

COMPANY DETAILS	
Trading Name of Company	
Trading Address	
Post Code	
Registered Address	
Post Code	
If different from above, haulier name, address and post code	



## NEW CUSTOMER ACCOUNT FORM – AQD 203b

INVOICING CONTACT DETAILS			
Key contact name		Position	
Email address		Telephone no	

OPERATIONS CONTACT DETAILS			
Key contact name		Position	
Email address		Telephone no	

TRADE REFERENCE 1	
Company name	
Address	
Postcode	
Telephone number	

TRADE REFERENCE 2	
Company name	
Address	
Postcode	
Telephone number	

VEHICLE DELIVERIES		
<p>If you will be using more than 5 different vehicles to deliver waste to site we will issue you with Booking References for all of your loads</p> <p>If you will be using 5 or less regular vehicles to bring waste into site we will issue you with weighbridge fobs for each vehicle – please list these vehicles below.</p>		
Vehicle Registration	Vehicle Type (ie skip vehicle/Tipper/Artic etc)	Fob Number (for Agrivert use)

**Waste Acceptance Protocol**

Waste deliveries shall not contain any contamination in excess of the acceptable level of contamination and shall not contain any prohibited materials as detailed below.

Product Specification & Rejection Criteria

<b>BIOWASTE</b>	
<b>CONTAMINATION</b>	<b>ACCEPTABLE LEVEL OF CONTAMINATION</b>
<p>Non biodegradable/ non compostable materials, including but not limited to: plastic, textiles, metals, large tree green/ garden waste, treated wood, brown and coloured cardboard, whole newspapers, magazines/directories, concrete, in each case that cannot be accepted under the Anaerobic Digestion or Compost Quality Protocols.</p> <p>For liquid wastes this also includes:                      PTE levels must be less than the upper limit values of digestate as stipulated in PAS 110 Specification (limits available on request)                      For Glycerol as above and also:                      MONG and water content &lt; 5%</p>	<p>Green Waste: 2% by weight of load.</p> <p>AD Plants: 3% by weight of load</p> <p>Primary packaging on foodwaste (packaging in contact with the food product) will be removed prior to loading into the digesters on site and is therefore not classed as contamination.                      Secondary and tertiary packaging will be classed as contamination and will therefore need to fall within the acceptable level above.</p>
<b>PROHIBITED MATERIALS</b>	<b>MAXIMUM CONTAMINATION STANDARD</b>
<ul style="list-style-type: none"> <li>• Noxious weeds</li> <li>• Glass</li> <li>• Cat 1 or 2 ABP waste</li> <li>• Hazardous Waste</li> <li>• Clinical Waste</li> <li>• Nappies</li> <li>• Dog faeces</li> <li>• Residual “black bin” type waste</li> <li>• Malodorous wastes</li> <li>• Any material which gives a positive inhibitor result</li> </ul>	<p>None accepted</p>

**Waste Acceptance Procedure**

Each vehicle will be checked at the weighbridge (using an electronic fob system) to ensure it has been approved to deliver waste.

Each load shall be weighed on entry to Agrivert’s facility and the weight recorded. All invoices will be raised using Agrivert recorded weights.

Agrivert shall undertake a visual and odour inspection of materials delivered to its facility by the customer in accordance with this protocol to ascertain the levels of contamination or prohibited materials present in the load.

If on a visual and odour inspection Agrivert (acting reasonably) considers that the load contains an amount equal to or below the acceptable level of contamination, it will accept and process the load.

If the nature or quality of the waste materially changes from that described on page 1, you will notify Agrivert immediately confirming the new nature of the waste and its continued acceptability under the relevant sites Environmental Permit, the AD or Compost Quality Protocol and PAS100/110 standard.

### **Waste Rejection Procedure**

If on a visual inspection Agrivert (acting reasonably) considers that the load contains Contamination in excess of the acceptable level of contamination or contains any prohibited wastes, Agrivert will, where possible, separate the contamination and/or prohibited materials from the acceptable materials. The weight of contamination and/or prohibited materials shall be recorded.

The customer shall be responsible for the collection and disposal of the remaining contamination at its own cost. Where the customer is unable to collect the contamination on the same day as the waste was delivered, or as otherwise agreed, Agrivert will dispose of any contamination at the customer's cost.

Where this process occurs more than once per week the customer shall pay reasonable management costs accrued by Agrivert for this disposal activity until a solution or management agreement can be agreed.

Notwithstanding the above, the customer may request that Agrivert disposes of any contamination in excess of the acceptable level of contamination or any prohibited materials removed from the load. Agrivert shall dispose of such material in a lawful manner and Agrivert shall recover the cost of doing so from the customer.

Agrivert will email the nominated representative of the customer confirming the presence of contamination and/or prohibited materials. The email shall identify the load (by weighbridge ticket) and shall have attached to it the evidence of the weights of such materials, the evidence of the weight of the original load and colour photographs of the rejected contamination.

### **Waste Carrier Licence**

You must register as a waste carrier, broker or dealer if you do any of the following as part of your business:

- transport your own waste regularly (from January 2014)
- transport or dispose of waste for someone else
- buy or sell waste
- act as a waste broker (arrange for someone to handle other people's waste)

Please tick to confirm you have supplied us with a copy of your Waste Carrier Licence, and that you will provide us with a new copy when your current one expires.

### Waste Transfer Notes

The Waste (England and Wales) Regulations 2011 requires that the producer and receiver of waste record waste transfers. For **repeat transfers** you can use a '**season ticket**'. This is a single transfer note that can cover multiple transfers over a period of up to 12 months.

You can agree to use a season ticket if all of the following stay the same:

- the parties involved in the transfer (the waste producer and the waste carrier or waste disposal business)
- the description of the waste being transferred
- the place where the waste is transferred from one person to the other

Issuing a season ticket means that we can provide your vehicle(s) with an electronic swipe card(s), to make weighing in and out of the site much quicker.

**Agrivert's Annual Waste Transfer Note should be supplied to you as a separate form.**

Please tick to confirm you have either:

Returned Agrivert's Annual Waste Transfer Note with this application

Returned your own Annual Waste Transfer Note with this application

Will supply a Waste Transfer Note with each delivery

### Insurances

Please tick to confirm that your company holds and will maintain motor vehicle insurance comprising a minimum of £5 million third party property damage cover and public liability insurance with £5 million indemnity.

**Terms & Conditions – by applying for a credit account you are accepting the Full Standard Terms and Conditions (available on request) of the Agrivert Group of Companies, which include:**

1. You will comply with all site rules while on an Agrivert site.
2. You will weigh in and out of site, recording the tonnage of green and/or food waste deposited.
3. The weight of waste delivered to site will be calculated from Agrivert's weighbridge. A copy of the weighbridge ticket will be given to the driver for the buyer's records.
4. The agreed gate fee for the waste will not include the transport cost. These costs will be the responsibility of the waste producer.



**NEW CUSTOMER ACCOUNT FORM – AQD 203b**

- 5. Agrivert reserve the right to reject a load of waste if it is highly contaminated with contrary materials or does not reflect the waste description provided on the waste transfer note.
- 6. Agrivert’s payment terms are strictly 14 days from date of invoice. Agrivert reserves the right to charge a penalty interest of 4% over the base rate for late payment. Payment will be made directly to the Agrivert company with whom your account is set up
- 7. All weighbridge transactions recorded against fobs issued to you will be assumed to be carried out with your consent unless Agrivert Ltd has been notified that the fob has been damaged/lost/stolen. Please notify us immediately if any weighbridge fob is lost/stolen or damaged.

Print name.....

I agree to all the above information and the contract terms and conditions

Signed (customer)..... Date.....

**Please return this form to Agrivert either:**

By post:

FAO [INSERT NAME OF PERSON DEALING WITH ACCOUNT]  
 Agrivert Ltd  
 The Stables  
 Radford  
 Chipping Norton  
 Oxfordshire  
 OX7 4EB

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North London Anaerobic Digestion Facility

**Odour Management Plan**

February 2016

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# Revision Schedule

Version	Date	Details	Prepared By	Reviewed By	Approved By
01	05 January 2016	Created	David Olwell	Neil Pollington	Harry Waters

To be reviewed every 12 months. Next review due in January 2017.

## **1. Introduction**

- 1.1 The North London Anaerobic Digestion Facility is located at Coursers Farm, Coursers Road, St Albans, Hertfordshire, AL4 0PG. The site will carry out anaerobic digestion (AD) of wastes and use the biogas in a combined heat and power (CHP) plant. The permitted waste types do not include hazardous wastes and the total quantity of waste accepted (including processing liquids) at the site does not exceed 75,000 tonnes per year.

### **Site Overview**

- 1.2 The site is located at Coursers Farm, part of the Tyttenhanger Estate, and situated approximately 2km north of Junction 22 (London Colney) of the M25 motorway, 2km southwest of Hatfield and less than 1km southwest of the village of the Colney Heath at OS grid reference TL 204 048. It is located within the District of Hertsmere and the Parish of Ridge.
- 1.3 The site, measuring approximately 5.2 hectares (ha), is bordered to the west by Tyttenhanger Quarry which is operated by Lafarge Aggregates. The site is bordered to the east by two large agricultural barns, fields and yards which form the Coursers Farm complex. A footpath runs through Coursers Farm, and approximately 100m from the southern boundary of the application site lies Tyttenhanger Stream. Coursers Road, forming the northern boundary of the application site, links Colney Heath with the Dell roundabout and the M25. In addition, an electricity substation is located adjacent to the northwest corner of the site.
- 1.4 The site is accessed from the existing Coursers Farm access onto Coursers Road which is to be improved by the widening of the bell mouth and improved visibility splays. HGV's leaving the site are required to turn left and travel to the west as there is a 7.5 tonne weight restriction imposed on Coursers Road further to the east. The site is located 2km from Junction 22 and 4km from Junction 23 of the M25. It is close to the A1 (m), A414, M10 and M1.
- 1.5 The built development on site comprises of four digestion tanks and one storage tank, a waste reception building, site office and welfare facilities, biofilter, weighbridge, gas engine units, heating and pumping containers, transformer, energy crop storage area and feeder, access roads, a car parking area and ancillary plant.

### **Previous Experience**

- 1.6 Agrivert operates three similar anaerobic digestion (AD) facilities; 2 in Oxfordshire and 1 in Surrey. Agrivert's Oxford sites; Cassington AD facility and Wallingford AD facility were opened in September 2011 and December 2012 respectively with Agrivert's Surrey site at Trumps Farm opening in January 2013. Agrivert also constructed a plant for Severn Trent at Coleshill in Birmingham which opened in December 2014. All four sites are covered by Environmental Permits operating at OPRA scores A and B.
- 1.7 This Odour Management Plan is underpinned by Agrivert's experience in operating these three facilities.

1.8 Agrivert appreciate that there is a growing trend of certain plants within the Country giving rise to instances of odour through their operations. In particular, many of these instances appear to rise from the spreading of the fertiliser at the end of the process. To this effect, Agrivert have created a process which enables more than double the industry average retention time to be achieved due to the scale of onsite storage. The increased retention time enables effective breakdown of the material, resulting in low odour generating from the digestate and the associated back end process.

1.9 Agrivert recognises that its success in controlling odour in its three existing plants is a result of:

- A tried and tested technology
- A comprehensive and robust process
- A comprehensive Odour Management Plan (OMP)

Seeking to replicate the success of our existing plants with regards to odour management, the North London facility adopts an almost identical approach to technology, process and it's OMP. Our track record in operation of our AD sites is noteworthy as oldest site operating under the same OMP has received only 1 complaint in 5 years of operation.

1.10 Agrivert's design and processes adopts the principles set out in the Environment Agency H4 guidance. These include:

- Considerate controls for receipt and management of odorous materials
- Minimising transfer of odour to air
- Containment of contaminated air
- End of pipe treatment
- Engaging with neighbours
- Ability to divert wastes to other facilities
- Having an action plan in the event of a problem.
- Appropriate measures will be taken by Agrivert site staff and management when performing tasks that may have an impact on odour.

### **Process Overview**

1.11 AD offers a completely sealed liquid management system once pre-treatment is complete. All incoming wastes are swiftly treated then captured in tanks below the reception building and then transferred in sealed pipework to concrete digestion tanks. Agrivert AD facilities are specifically designed to effectively manage any odours generated through the delivery and processing of delivered waste.

1.12 Waste delivery vehicles access the reception building through one of the two fast reacting roller doors, both of which are fitted with vents to enable successful controlled air flow. The doors are programmed to only open once the other roller doors in the reception building are all closed. The building is designed to comply with Part 'L' of Building Regulations even though it is not heated and therefore exempt from those regulations, to ensure a sealed envelope. An effective air extraction system captures odours at source as far as possible and maintains a slight negative

pressure when the doors are closed. The air within the building is changed 2.5 times per hour. These measures help to ensure that the building contains and adequately controls odours from solid and liquid waste being delivered to the site.

- 1.13 Waste is deposited into a recessed bunker. A walking floor moves the waste towards an incline screw which delivers the waste into a macerator, which processes up to 20 tonnes per hour and reduces the particle size of the material to less than 12mm. The macerator also accepts liquid wastes and water to blend the mixture and remove plastic and contaminants. The blended waste (hereafter referred to as soup) is then fed into a submerged mixing tank where elements of grit, bone and glass settle. Point source air extraction is undertaken at both the waste reception bunker and the mixing tank, this air is extracted to a wet scrubber and then to a woodchip biofilter. Liquid wastes are deposited into two submerged liquid storage tanks; vehicles access the building in a similar manner to all other delivery vehicles and stop adjacent to the inlet valves. The liquid tanks are sealed, with the exception of a small hatch, and benefit from point source air extraction.
- 1.14 Any liquid residue or spillage onto the hard surface of the floor is directed towards a large drain within the centre of the reception building. The drain is flushed using clean water and when required, further cleaning and disinfecting can be undertaken with a jet spray. The residue from the drain is directed towards one of the liquid tanks.
- 1.15 The soup is then pumped through sealed, submerged piping into one of the four enclosed primary/secondary digestion tanks where it is digested for approximately 60 days. These tanks are submerged by approximately 600mm. During this retention time, the complex micro-biology breaks down the processed waste (digestate) producing biogas which is collected in the roofs of the tanks.
- 1.16 The digestate within the primary and secondary tanks is then pumped to the fourth tank to further digest. From tank four it is pumped back through similar sealed and submerged pipework into the pasteurisation tanks located in the reception building where, as a requirement of the Animal By-Products Regulations, it is retained for a minimum of an hour at a constant 70°C. The digestate is then pumped into the storage tank. From the storage tank it is tankered away from site either to land or to an offsite storage lagoon using an EA deployment or as PAS110 product.
- 1.17 Ferrous Chloride is added to the substrate entering the primary and secondary digesters. The reaction between the Ferrous Chloride and Sulphur within the substrate causes sulphur crystals to form on netting above the substrate. This assists in reducing the level of Sulphur within the biogas from 2000ppm (parts per million) to <200ppm.
- 1.18 Agrivert's AD system is designed to have a retention period in excess of 60 days. This is vastly greater than the industry average retention time of less than 25 days. Agrivert's longer retention time ensures that the daily material processed into each tank on site is less than 2% of the total tank capacity. This assists in creating a very stable biology which is less susceptible to organic loading issues. Crusting is prevented by 3 directional stirrers within each tank, although should failure occur the tank can operate on a single stirrer until the others are fixed or replaced. In the very



rare occasion where crusting or organic loading overloading occurs, Agrivert are able to isolate the tank without affecting the remaining tanks.

- 1.19 With the exception of the receipt of waste (inside the Reception Building), the whole process is totally enclosed and no liquids (except rainwater from non-waste surfaces under extreme storm conditions) leave the facility other than the treated digestate (liquid fertiliser), which is collected and transported in sealed tankers.
- 1.20 The breakdown of the digestate within the primary and secondary digester tanks produces biogas. The biogas is stored within the roofs of the 4 digester tanks and is also stored within the roof of the storage tank. This enables a constant supply of gas to the two gas engines located on site. The gas is then fed through an underground condensation chamber. Liquid generated through the process from condensation is fed back into the AD system. Once the gas has passed through the chamber, it then flows to the gas drier and activated carbon scrubber which removes additional sulphur elements prior to entering the gas engines. The CHP unit monitors back pressure of biogas supply. If they detect an increase in back pressure (indicating a possible saturated carbon filter) the CHP control system will inform the operator. A gas flare is automatically initiated when the facility is producing too much gas due to an engine failure.
- 1.21 A Site Plan is set out in Appendix 1 of this document. Further information in relation to the AD process at the North London AD facility can be found in Attachment 6 (Non-Technical Summary) of the Environmental Permit Application.

### **Hours of Operation**

- 1.22 Waste is processed through the North London AD site 24 hours a day through a computer controlled process. Waste deliveries are however restricted to the following times.

<b>Day</b>	<b>Time</b>
Monday to Friday	0800hrs to 1800hrs
Saturday	0800hrs to 1300hrs
Sunday / Bank Holidays	None

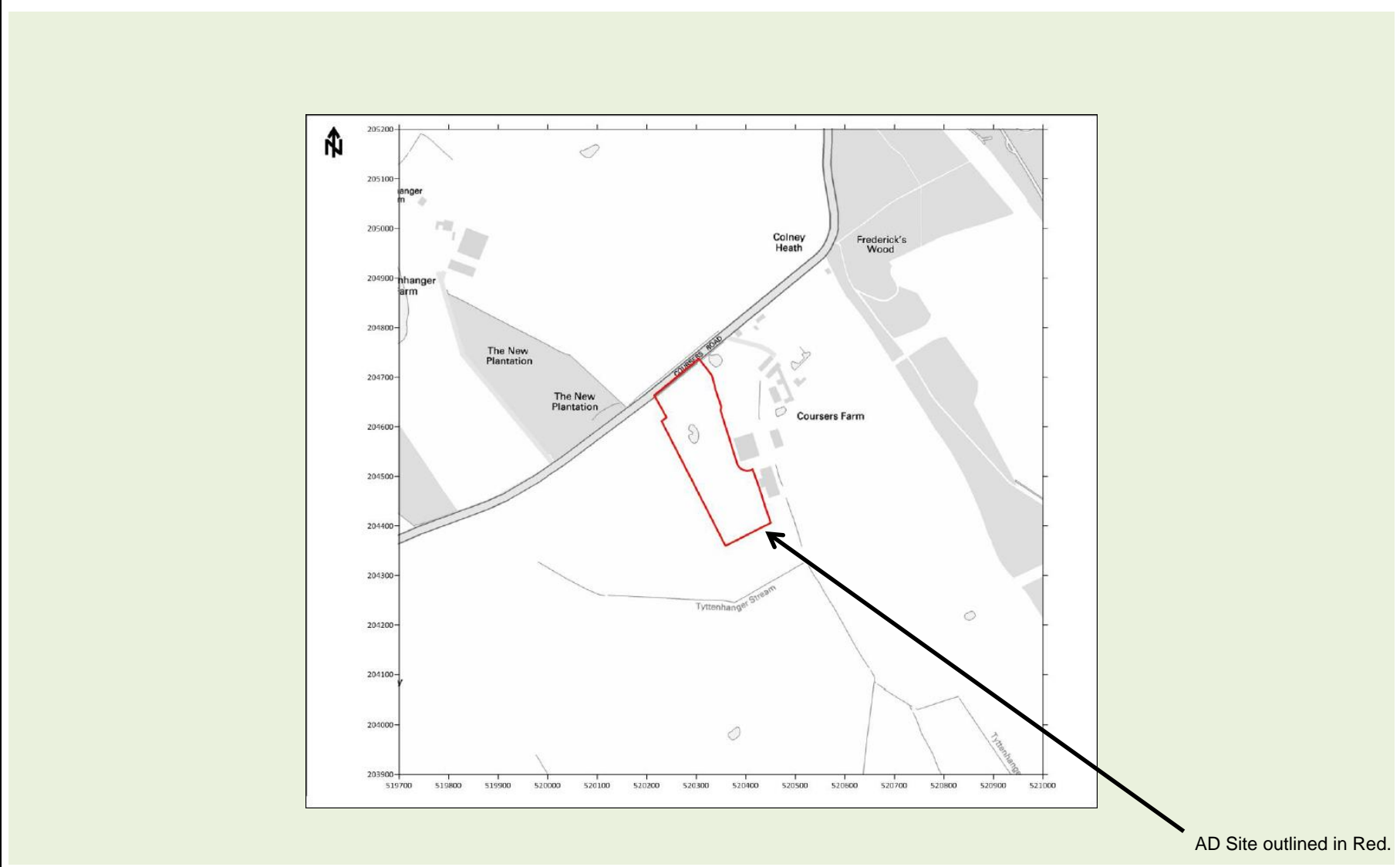
- 1.22 In exceptional circumstances (i.e. plant failure), site operatives may be onsite outside of these hours.

### **Daily and Weekly Tonnages**

- 1.23 In any working day, the North London AD facility processes up to 200 tonnes of municipal kerb-side collected food waste and 200 tonnes of other food waste inputs (commercial, leisure, food and beverage manufacturers). In any given week, the facility could process 1200 tonnes of organic wastes.
- 1.24 Daily tonnages are carefully planned by staff to ensure that the facility has the appropriate amount of waste to feed the facility and ensure that the site does not

receive more waste than it can process. In exceptional circumstances, such as those set out in Section 6, waste may be diverted to another suitable facility.

**2. Site Location Plan**



### 3. **Technical Details**

#### **Guidance Utilised**

- 3.1 This Odour Management Plan has been prepared following guidance from the Environment Agency:

H4 – Odour Management.

Odour Management Review Checklist.

Odour Management Plans for Waste Handling Facilities.

- 3.2 The plan has also been prepared following industry guidance from:

An industry guide for the prevention and control of odours at biowaste processing facilities (The Composting Association).

Winterisation: Managing process plant through severe and prolonged cold weather (Chemical Industries Association).

HAZOP process: Hazard and Operability Analysis.

#### **Waste Materials Accepted**

- 3.3 The North London AD site will accept the following EWC wastes, as set out in the sites Environmental Permit (may be amended prior to Permit being issued).

<b>EU Waste Code (EWC)</b>	<b>Permitted Waste</b>
<b>02</b>	<b>Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing</b>
<b>02 01</b>	<b>Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing</b>
02 01 01	Sludges from washing and cleaning – biodegradable only
02 01 02	Animal-tissue waste
02 01 03	Plant-tissue waste
02 01 06	Animal faeces, urine and manure (inc. spoiled straw), effluent, collected separately and treated offsite
02 01 07	Wastes from forestry
02 01 99	Residues from commercial mushroom cultivation
<b>02 02</b>	<b>Wastes from the preparation and processing of meat, fish and other foods of animal origin.</b>
02 02 01	Sludges from washing and cleaning – biodegradable only
02 02 02	Animal-tissue waste
02 02 03	Materials unsuitable for consumption or processing
02 03 04	Sludges from on-site effluent treatment – biodegradable only
02 02 99	Sludges from gelatine production – animal gut contents

<b>02 03</b>	<b>Wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation</b>
02 03 01	Sludges from washing, cleaning, peeling, centrifuging and separation
02 03 04	Materials unsuitable for consumption and processing
02 03 05	Sludges from on-site effluent treatment – biodegradable only
02 03 99	Sludges from production of edible fats and oils – seasoning residues – molasses residues – residues from production of potato, corn or rice starch
<b>02 04</b>	<b>Wastes from sugar processing</b>
02 04 03	Sludges from on-site effluent – biodegradable only
02 04 99	Wastes from sugar processing – biodegradable wastes only allowed if no chemical agents added and no toxic residues
<b>02 05</b>	<b>Wastes from the dairy products industry</b>
02 05 01	Materials unsuitable for consumption or processing including solid and liquid dairy products, milk, food processing wastes, yoghurt, whey
02 05 02	Sludges from on-site effluent treatment – biodegradable only
<b>02 06</b>	<b>Wastes from the baking and confectionary industry</b>
02 06 01	Materials unsuitable for consumption or processing including food condemned, food processing wastes, biscuits, chocolate, yeast, bread, bakery wastes
02 06 03	Sludges from on-site effluent treatment
<b>02 07</b>	<b>Wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)</b>
02 07 01	Wastes from washing, cleaning and mechanical reduction of raw materials including brewing waste, food processing waste, fermentation waste
02 07 02	Wastes from spirits distillation including spent grains, fruit and potato pulp, sludge from distilleries
02 07 04	Materials unsuitable for consumption or processing including brewing wastes, food processing waste, fermentation waste, alcoholic drinks, fruit juice
02 07 99	Spent grains, hops and whiskey filter sheets/cloths, yeast and yeast like residues, sludges from production process
<b>03</b>	<b>Wastes from wood processing and the production of panels and furniture, pulp paper and cardboard</b>
<b>03 03</b>	<b>Wastes from pulp, paper and cardboard production and processing</b>
03 03 02	Green liquor sludge (from recovery of cookie liquor)
03 03 08	Wastes from sorting of paper and cardboard destined for recycling
03 03 10	Fibre rejects and sludges i.e. paper pulp (de-inked only), paper fibre

<b>04</b>	<b>Wastes from the leather, fur and textile industries</b>
<b>04 01</b>	<b>Wastes from the leather and fur industry</b>
04 01 01	Fleshings and lime split wastes
04 01 05	Tanning liquor free of chromium
04 01 07	Sludges, in particular from on-site effluent treatment free of chromium – biodegradable only
<b>04 02</b>	<b>Waste from the textile industry</b>
04 02 10	Organic matter from natural products (for example grease, wax)
<b>15</b>	<b>Waste packaging, absorbents, wiping cloths, filter materials and protective clothing not otherwise specified</b>
<b>15 01</b>	<b>Packaging (including separately collected municipal packaging waste)</b>
15 01 01	Paper and cardboard packaging
15 01 02	Plastic packaging – biodegradable packaging only
15 01 03	Wooden packaging
15 01 05	Composite packaging – biodegradable packaging only
<b>19</b>	<b>Waste from waste management facilities, offsite waste water treatment plants and the preparation of water intended from human consumption and water for industry use</b>
<b>19 02</b>	<b>Wastes from physical/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)</b>
19 02 10	Combustible wastes other than those mentioned in 19 02 08 and 19 02 09 – glycerol not designated as hazardous
<b>19 05</b>	<b>Wastes from aerobic treatment of solid waste</b>
19 05 01	Non-composted fraction of municipal and similar wastes
19 05 02	Non-composted fraction of animal and vegetable wastes
19 05 03	Off-specification compost from source segregated biodegradable waste
19 05 99	Composting liquors
<b>19 06</b>	<b>Wastes from anaerobic treatment of waste</b>
19 06 03	Liquor from anaerobic treatment of municipal waste – liquor/leachate from an anaerobic process that accepts waste input types listed in this table S2.2 only
19 06 04	Digestate from anaerobic treatment of municipal waste (source segregated waste only)
19 06 05	Liquor from anaerobic treatment of animal and vegetable waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
<b>19 08</b>	<b>Wastes from waste water treatment plants not otherwise specified</b>
19 08 09	Grease and oil mixture from oil/water separation containing only edible oil and fats
19 08 12	Sludges from industrial biological treatment of industrial waste

	water other than those mentioned in 19 08 11
<b>20</b>	<b>Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions.</b>
<b>20 01</b>	<b>Separately collected fractions (except 15 01)</b>
20 01 01	Paper and cardboard
20 01 08	Biodegradable kitchen and canteen waste
20 01 25	Edible oil and fat
20 01 38	Untreated wood where there is no non-biodegradable coating or preserving substance present
<b>20 02</b>	<b>Garden and park wastes (including cemetery waste)</b>
20 02 01	Biodegradable waste
<b>20 03</b>	<b>Other municipal wastes</b>
20 03 01	Mixed municipal wastes – separately collected biowastes
20 03 02	Waste from markets – allowed only if source segregated biodegradable fractions e.g. plant material, fruit and vegetables

### Available Onsite Capacity

- 3.4 The following capacity is available across the site and is indicative of the total amount of waste that can be retained onsite on any given day.

Element	Capacity	Total Capacity
Waste reception bunker (x2)	80m <sup>3</sup> per bunker	160m <sup>3</sup>
Liquid Tanks (2 tanks)	250m <sup>3</sup> and 450m <sup>3</sup>	700m <sup>3</sup>
Mixing Tank	860m <sup>3</sup>	860m <sup>3</sup>
Primary Digesters (2 tanks)	5587m <sup>3</sup> per tank	11,174m <sup>3</sup>
Secondary Digesters (2 tanks)	5587m <sup>3</sup> per tank	11,174m <sup>3</sup>
Pasteurisation Tanks (3 tanks)	30 m <sup>3</sup> per tank	90m <sup>3</sup>
Storage Tank	5587m <sup>3</sup> per tank	5587m <sup>3</sup>
Silage Clamp Leachate Tank	100m <sup>3</sup>	100m <sup>3</sup>
	<b>Total</b>	<b>29,845m<sup>3</sup></b>

- 3.5 In addition to the available onsite capacity set out in the above table, Agrivert have the ability to store 300 tonnes of waste on the floor of the reception building. Storage on the floor is only used in the event of plant failure and seasonal peaks (i.e. Christmas period).
- 3.6 The silage clamp located to the north east of the site has the capacity to hold 3,000 tonnes of silage at any one time.

## Delivery Vehicles

- 3.7 Solid waste will be delivered to Agrivert's North London AD facility in Refuse Collection Vehicles (RCV's) or in Heavy Goods Vehicles (HGV's). Liquid wastes will be transferred to and from the site in sealed tankers.
- 3.8 It is the responsibility of the haulier to ensure that the contents of their load are sheeted when delivering waste to the site. Agrivert will enforce a policy of only accepting sheeted or sealed vehicles.
- 3.9 Vehicles arriving at site that are in poor condition (poor sheeting, leaking seals or dirty) such that they may cause odour will be refused re-entry until repairs are made.
- 3.10 Liquid wastes will only be accepted or exported in sealed tankers.
- 3.11 The facilities design allows swift tipping which negates the need for vehicles to queue which will reduce the potential for odour to originate from standing vehicles.
- 3.12 Exiting vehicles are cleaned and disinfected using a pressure washer located in the reception building. It remains the responsibility of the haulier to ensure their vehicle is maintained. All foul water then runs to a central drain in the reception building and is subsequently discharged into the liquid tanks.

## Scrubber and Biofilter

- 3.13 The Scrubber has been selected during facility design, based on experience at other sites. It is designed to handle the required air changes per hour and its primary duty is to remove sulphurous compounds (SO<sub>2</sub>, SO<sub>3</sub>, H<sub>2</sub>S, CS<sub>2</sub>, COS) from the air stream, allowing the biofilter to operate optimally. The scrubber water is continually blown-down, re-supplied with fresh water and the waste water is recycled into the AD facility according to the OEM's operating instructions. The scrubber is inspected daily via tower and pipework windows which will demonstrate correct irrigation when functioning.
- 3.16 The principal behind the Scrubber is such that there is little that can fail as there are no moving parts within the scrubber tower, no chemical additives, start stop operations or consumables besides water. This in turn means that once commissioned, it operates without the need to monitor the output airflow provided the maintenance plan is adhered to. The required water flow into the scrubber tower is 0.5m<sup>3</sup>/hr. This is monitored weekly by way of a variable area flowmeter. A maintenance checklist captures the sign off to prove that these checks have been carried out. Spare parts required are common, readily available electric motors and monitoring probes that are available off-the-shelf at electrical retailers locally.

Action	Frequency				
	Daily	Weekly	Fortnightly	Monthly	Yearly
General Inspection		X			
Check and note readings on all Pressure Gauges			X		
Check and note reading on all Flow Meters		X			



Check scrubber Tank Level Gauge	X				
Check Scrubber Media Chamber					X
Clean Ducting inlets in Reception Building					X
Calibrate pH & ORP Sensors					X
Remove, clean and re-install recirculated liquor line. Ensure spray nozzles are clean and secure with thread locking compound.					X

3.17 The biofilter has been designed using the calculations below by a certified engineer. It has been designed to ensure it can meet the Environment Agency's requirements for a maximum airflow of 100m<sup>3</sup> per m<sup>3</sup> of biofilter media and a total retention time within the biofilter >45 seconds. The biofilter will be irrigated using adjustable water spray which will ensure that the biofilter medium retains the required level of moisture. Bi-weekly monitoring will be undertaken to assess temperature and moisture content.

3.18 The waste reception building has an internal building volume of 14,605.58m<sup>3</sup>, other areas which require treatment include the wet tanks and the basement which account for an additional 3,315.83m<sup>3</sup>.

	Amount
<b>Air Change Requirements</b>	
Total internal volume	17,921.4m <sup>3</sup>
Air exchange rate	2.5 exchanges/hour
Volume of air to be treated	44,803.5 m <sup>3</sup> /hour or 12.45 m <sup>3</sup> /second
<b>Biofilter Size</b>	
Volume of Media above aquavoids	487m <sup>3</sup>
Volume of Air treated/Volume of Media (above aquavoids)	92m <sup>3</sup>
Internal wall length	14.96m
Internal wall width	14.96m
Media Depth	2.5m
Total volume of media	560m <sup>3</sup>
<b>Residency Time in Biofilter</b>	
Air velocity through top surface of plenum	0.064m/s
Air volume through top surface of media	0.056m/s
Residence time of odorous air in media (Total media volume/volume through top surface of media)	45 seconds

3.18 The anticipated loading of odorous compounds for the scrubber and biofilter were determined from the Odour Removal Performance Assessment (VERT1307)

conducted by Odournet UK Ltd in January 2014 at the Agrivert AD plant near Wallingford, Oxfordshire, OMP Appendix (ii). This plant receives similar food wastes at a similar rate.

The extraction system at North London AD is designed to provide 2.5 air changes per hour (acph) for the whole of the Reception Building including the basement. This is based on experience from the Wallingford AD plant.

- 3.19 The biofilter has been designed to ensure it operates consistently in both hot and cold temperatures. The wood medium is established BAT technology which ensures that a full range of odour sources can be appropriately treated without giving rise to nuisance. Both the biofilter and the scrubber can provide a sufficient level of mitigation to treat and limit any odorous particles in the air whilst working singularly which will ensure that routine maintenance can be undertaken without giving rise to any significant increase in the level of odour generated.

## 4. Inventory of Odorous Materials

### Waste Sources and Odour Mitigation

- 4.1 The following list provides an inventory of wastes which may give rise to increased odour on site and their mitigation measures following assessment using FIDOL (Frequency, Intensity, Duration, Offensiveness, Location and Annoyance Factor).

Material	Suppliers	FIDOL Assessment	Odour Mitigation
Municipal Food (stored for less than 2 weeks)	Kerb-side collected by, or on behalf of Local Authorities	Moderate odour intensity. Mildly unpleasant hedonic tone. Age and moisture content known.	Delivered into enclosed reception building. Deposited into recessed bunker. Walking floor in bunker ensures FiFo (First In, First Out) is undertaken. Waste processed within 24 hours of receipt. Point source air extraction to scrubber and biofilter.
Non Municipal Food (stored for less than 2 weeks)	Commercial, leisure, food manufacturers	Moderate odour intensity. Mildly unpleasant hedonic tone. Age and moisture content known.	Delivered into enclosed reception building. Deposited into recessed bunker. Walking floor in bunker ensures FiFo is undertaken. Waste processed within 24 hours of receipt. Point source air extraction to scrubber and biofilter.
Food Waste (stored for over 2 weeks)	Either kerb-side collected or from other sources where waste has been unable to be delivered due to unforeseen circumstances i.e. diverted wastes.	Moderate/high odour intensity. Mildly unpleasant hedonic tone. Odour content varies dependant on type. Age and moisture content known.	Assess if a sample is required before accepting. Only accepted when it can be processed immediately. Delivered into enclosed reception building. Deposited into recessed bunker. Walking floor in bunker ensures FiFo is undertaken. Waste processed within 24 hours of receipt. Point source air extraction to scrubber and biofilter.
Liquid Wastes with	Brewery waste, oils,	Moderate odour intensity.	Supplier chemical analysis undertaken prior to receipt.

low odour potential (delivered in sealed tankers)	other beverage manufacturers	Mildly unpleasant hedonic tone.	Delivered into enclosed reception building. Deposited into recessed liquid tank. Point source air extraction to scrubber and biofilter.
Liquid Wastes with high odour potential (delivered in sealed tankers)	Abattoirs, fish waste etc.	High odour intensity. Unpleasant hedonic tone. Odour content varies dependant on type.	Only accepted when it can be processed swiftly. Supplier chemical analysis undertaken prior to receipt. Delivered into enclosed reception building. Deposited in to recessed liquid tank. Point source air extraction to scrubber and biofilter.
Rainwater Runoff (Leachate)	Runoff from site surfaces and silage clamp	Low odour intensity. Mildly unpleasant hedonic tone.	Runoff pumped back in to the AD system, in sealed submerged pipework, when required.
Silage	Maize, grass and other crops.	Moderate odour intensity. Mildly unpleasant hedonic tone.	Sheeted once delivered to site and remains sheeted until required. Front edge of silage re-sheeted if not required for more than one week. Fed directly into solid feed bunker when required.
Digestate	Final product from AD site	Low odour intensity. Mildly unpleasant hedonic tone.	Pumped from sealed process via sealed pipework to tankers. Limited potential for odour release during cleaning of the pipework following completion of filling.

- 4.2 The list may not incorporate all wastes accepted throughout the operational life and will updated as part of the annual review. Where a contractor wishes to deliver a waste type that has not been previously processed or understood, Agrivert will either undertake detailed chemical analysis of a sample of the waste prior to acceptance or require a sample.

### **Rejection of Malodorous Loads**

- 4.3 As set out within the table above, waste which has been stored in excess of 2 weeks may be accepted at the site, when the site has the capacity to process the waste swiftly. Due to the enclosed nature of the entire AD process following maceration and

the point source air extraction within the reception building, the waste is able to be managed appropriately without giving significant rise to odour

- 4.4 However, there may be occasions where the site is not in a position to receive the waste. Should this be the case, the malodorous load would be dealt with in accordance with Agrivert's Waste Acceptance Protocol (AQD280).

#### **Rejection of Contaminated Loads**

- 4.5 Agrivert will permit a 10% level of contamination (with the exclusion of primary packaging) within any load. The primary packaging will be removed by the macerator prior to the soup entering the mixing tank and is therefore not classified as contamination, however secondary and tertiary packaging would be classified as contamination.
- 4.6 Where the level of contamination exceeds 10%, it would be dealt with in accordance with Agrivert's Standard Operating Procedures (SOPs) for Anaerobic Digestion Systems and the Waste Acceptance Protocol (AQD280).

#### **Waste Rejection Procedure**

- 4.7 Where waste is deemed to contain a level of contamination greater than that set out in paragraph 4.5 or is considered to be a malodorous load, the Site Manager or Site Supervisor will consider the rejection procedure option.
- 4.8 Should a load be considered unacceptable, the Site Manager or Supervisor will quarantine that load in a separate area of the reception building. The relevant Local Authority or waste supplier will be contacted and the reason behind the rejection will be conveyed to them. They will then be requested to either collect the load and dispose of it at their own cost, or in exceptional circumstances provide a pre-determined contribution to Agrivert for the direct on-disposal of the material.
- 4.9 Further details relating to the waste rejection protocol is set out in Agrivert's Quality Documents Rejected Loads Record Sheet AQD 224 and AQD 203b New Customer Account Form as seen in Attachment (i) of this OMP.

## **5. General commitments conforming to principles of H4 guidance**

**To comply with the contents of this Odour Management Plan and to take appropriate measures to control against offensive odours escaping from our site boundary, particularly in sensitive areas.**

5.1 This Odour Management Plan has been prepared by Agrivert to comply with the relevant statutory guidance and will be reviewed annually.

5.2 The Odour Management Plan has been prepared in of operation of the facility.

**To manage all North London AD Facility operations so as to reduce the risk of odour problems. To maintain the site's containment and end of pipe systems to prevent the escape of odour.**

5.3 The installation has been designed so that unloading and processing of waste materials is undertaken within an enclosed reception building, the processed waste is then transferred to other facets of the process via sealed pipework (digester tanks, gas engines, pasteurisation tanks etc.). Site Operations will be managed by technically competent people with support from Agrivert's Head Office personnel and Business Management System procedures.

**If problems arise, to attempt to identify the source and propose / implement measures to reduce the odours.**

5.4 Section 6 contains a range of scenarios that may under exceptional circumstances lead to odour being generated outside the site boundary and the measures (both proactive and reactive) that would be implemented to reduce the risk of this occurring. To identify the source of an odour Agrivert will utilise best practice techniques such as collating information on the System Control Panel, collecting concise and detailed information from a complainant, or conducting odour tours (see Section 8).

**In the event of a serious or on-going odour pollution, to take all reasonable measures to return to compliance as quickly as possible.**

5.5 In exceptional circumstances, the quantity of waste accepted into the site may be reduced or waste may be diverted to a similar facility, if other control measures are deemed not to work. Alternatively, the site may reject specific wastes identified to have created a problem. This, and other contingency measures are set out in Section 6.

**To regularly inspect and maintain the integrity of our site infrastructure (including roads, buildings, ducts, pipes, drainage/sewerage, process equipment and controls).**

- 5.6 Methods and schedules for this are detailed in Agrivert's integrated ISO14001, ISO9001 and OH SAS 18001 externally audited and certificated Business Management system.

**To ensure that our odour control equipment is designed, operated and maintained such that it operates effectively to control odour at all times (including the availability of essential spares and consumables).**

- 5.7 The design and selection of all odour control equipment is considered best practice for the site and the activities taking place. Methods and schedules for operation and maintenance of this equipment are detailed in the sites Standard Operating Procedures (SOPs). Suitable spares and consumables will be kept in stock to ensure that any problems can be resolved in a timely manner so far as reasonably practicable.

**To maintain a high level of site cleanliness, including the prompt clean-up of any potentially odorous spills.**

- 5.8 Site managers are technically competent to implement and maintain site housekeeping measures. Via an employment agency, Agrivert will resource extra suitably experienced operatives at short notice if needed.

**To train our staff in odour management.**

- 5.9 Formal training plans are in place for each site employee which include the prevention of accidents that would result in offensive odour escaping from the site boundary. Our staff are also trained in the processes and equipment on site at a level suitable for their role and responsibilities. After the induction stage this is reinforced with formal and informal training and refreshers, as well as the presence of one or more technically competent managers on site to give advice and instruction.

**To proactively engage with our neighbours to minimise their annoyance including responding to their complaints effectively.**

- 5.10 Members of Agrivert's senior leadership team will get involved in building relationships with our neighbours; this will include attending one or more community meetings and providing information on how we can be contacted with any odour concerns. Please see Section 8 for the details of how we will respond to complaints.

**To notify the Environment Agency in the event of odorous releases or other relevant conditions that have actual or potential to lead to pollution.**

- 5.11 If an incident is likely to increase the potential for odour to be noted at nearby receptors (as set out in Section 9); we will take appropriate and timely action to restrict the release of nuisance odour. As a minimum, this action would follow one or more of the relevant control measures and contingencies detailed in Section 6 of this document.

**To regularly review and update the OMP.**

- 5.12 The OMP and its effectiveness will be reviewed in the event of 12 months elapsing since the last review, odorous releases, substantiated complaints, any significant or relevant changes to the site's operations or infrastructure, relevant changes in legislation and accepted best practice, or if requested by The Environment Agency. To measure effectiveness, the review will take into account the results of odour tours and emissions monitoring for the site as well as any complaints received.
- 5.13 Odour management on site is audited for compliance through Agrivert's business management system.



## 6. Odour Risk Assessment (200m distance from sensitive receptors)

Cause of elevated odour	How the severity is measured	Anticipated odour level	Likelihood (pre controls)	Control measures	Actions if odour starts causing a problem
<b>Receipt and Management of Odorous Materials</b>					
Delivery of waste under normal circumstances	Inspection of waste. Olfactory sniff test assessment	Odour intensity 2/6, or assessed as likely to cause nuisance. Unknown delivery vehicle, or vehicle not contained.	Low	Enclosed reception building FiFo principle Daily wash down at end of day Delivery in contained vehicles. Odour control via extraction Swift roller shutter doors fitted to reduce air escape Doors programmed to only allow one roller door to be open at a time to reduce flow through building Bunker tipping minimises surface area that waste is exposed to, minimises handling, ensures wastes enter contained system in minimal time and ensures FiFo principle is followed. <b>Note: above mitigating principles apply in almost all delivery circumstances and are therefore not replicated below</b>	Consider increasing aeration rate in the reception building Consider reducing volume of waste being accepted Consider introduction of misters to temporarily screen odour

Delivery of waste with a strong offensive odour, e.g. containing sulphates, wet, held for long periods before delivery	Inspection of waste. Olfactory sniff test assessment	Odour intensity 5/6, or assessed as likely to cause nuisance.	High	Written agreements and on-going communication with clients. Follow site procedures for pre-acceptance assessment of waste and quarantine/ rejection of nonconforming loads. Deal with loads promptly after acceptance. Assessment of waste before first delivery, including laboratory analysis or sampling Delivery in contained vehicles. Remove waste to landfill if needed. FiFo principle	Review scheduling of waste to allow immediate processing
Removal of digestate from site under normal conditions	Odour assessment of digestate.  Visual inspection of collection vehicle.	Odour intensity 4/6, or assessed as likely to cause nuisance.  Unknown collection vehicle, or vehicle not contained.	Low	Select competent haulage contractors Driver inductions. Collection in contained vehicles. Long digestion time results in low odour product. Digestate only drawn from tank five (the most matured tank)	Review loading to avoid sensitive wind directions.
Christmas peak maintenance requires floor area to be used in reception building	Visual	Odour intensity 4/6 or assessed likely to cause nuisance	Medium	FiFo principle for delivery into bunker Programming of deliveries to minimise issue When possible programme maintenance with favourable weather conditions Wash down of floor and equipment once peak has been managed	Reducing volumes Scheduling out more odorous loads

Spillage of food waste outside reception building	Daily checks  Detected by site staff	Odour intensity 4/6, or spillage assessed as likely to cause problems.	Low	Drainage system incorporated with interceptors. Spill managed with loading shovel and/or other clean-up equipment. Daily checks. High vigilance of vehicle maintenance Driver induction to minimise accidents. Access routes in concrete to facilitate clean up	Ban customers who cause multiple incidents
Spillage of digestate during loading	Daily checks  Detected by site staff.	Odour intensity 2/6, or spillage assessed as likely to cause problems.	Low	Drainage system with interceptors or feed back into system. Concrete surfaces enable swift and effective clean up Spillage kits kept on site Regular maintenance of valves and pumps Automatic and manual pump shut off. Long digestion time means digestate is comparatively low in odour	Review of digestate loading philosophy
Spillage of foul water	Daily checks  Detected by site staff	Odour intensity 2/6, or spillage assessed as likely to cause problems.	Medium	Contained within Reception Building drainage system. Clean spills promptly. Daily checks. Planned preventative maintenance.	Review use of foul water in process

Failure of odour containment system in delivery or collection vehicle	Detected by site staff Failure reported by client or contractor	Failure of odour containment system.	Medium	Policy of only allowing contained waste vehicles on site Written agreements and on-going communication with clients and contractors to maintain co-operative relationship. Induction of drivers and inspection of new vehicles using site	Ban vehicles with poor containment
Silage material moved	Daily checks. Odour detected by site staff.	Odour intensity 4/6, or assessed as likely to cause nuisance.	Medium	Storage area segregated from reception building to minimise disturbance. Operator training, including use of silage sheets and minimising the fresh face. Daily checks.	Restrict movement of silage through consideration of wind conditions
<b>Containment</b>					
Rapid roller door failure	Immediately apparent	Smelt outside building	medium	Planned Preventative Maintenance programme High specification door Manual override Induction loop on one side of speed doors.	Manually close door and use one of two other doors Stop or reduce deliveries

Damage to tank roofs	Visual inspections and automated system will alarm when loss of pressure	Smelt outside buildings	Low	Regular inspections to check integrity of gas tight covers in AD tanks. Proper maintenance of over flow valves Isolation from other tanks Planned preventative maintenance In-house reaction team trained to maintain and replace roofs	In extreme circumstances isolate and pump out digestate into other tanks. Isolate digester Stop feed to digester
Damage to Reception Building	Visual inspections and automated system will alarm when loss of pressure	Visual breaks in the wall cladding and roof	Low	Regular inspections Planned preventative maintenance In-house reaction team trained to replace cladding if required	Reduce volume of waste delivered to site In extreme circumstances waste may be diverted to a similar suitable facility for processing
Digester over pressure valves	Inspection Gas alarms detect pressure loss	Faint smell of biogas	low	Feed appropriately to maintain safe biogas level Weekly visual inspection checks of valves Top up with water In winter maintain with antifreeze	Refit whole pressure valve Isolate digester Stop feed to digester

Valves, pipes or pumps damaged or malfunctioning	Monthly checks Detected by site staff	Damaged or malfunctioning.	Low	<p>Selection of correct pipework for pressure and flow loads.</p> <p>Monthly checks.</p> <p>Clean any spills promptly.</p> <p>Agreements with suppliers for prompt service.</p> <p>Planned preventative maintenance.</p> <p>Increased ventilation rate during acceptance and pre-treatment. (reception building only)</p> <p>Repair kits kept on site</p>	<p>Reconsider pipe design if repetitive failure</p> <p>Review operations and / or consider sealing off certain pipes.</p>
Extraction fan failure or deterioration.	Daily checks of fan Annual check of airflow through ductwork Detected by site staff	Fan stopped or significant reduction of airflow rate Causing odour outside building	Low	<p>Spare drive belts held in stock by local supplier.</p> <p>Replacement motor available at short notice from local supplier.</p> <p>Planned preventative maintenance.</p>	<p>Consider temporary reduction of material processing.</p> <p>Cease any deliveries of material that may exacerbate problem.</p> <p>Contain air in reception building by strict door control if the extraction fan is not functioning, and stop or divert deliveries when quality of contained air deteriorates. Treat and release air as normal once repair or replacement has been completed.</p>

Ventilation ducts blocked in reception building preventing air flow through building	Daily gas levels check. Detected by site staff	Blocked.	Low	Postpone operations and clean immediately. Reception building gas levels checked daily. Agreements with suppliers. Annual cleaning. Six monthly checks.	Consider temporary reduction in wastes deliveries
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**End of Pipe Treatment**

Biofilter damaged or malfunctioning	Weekly and bi-annual checks Detected by site staff	Odour intensity above 3/6, or assessed as likely to cause nuisance.	Medium	Weekly checks of moisture and temperature levels. Bi-annual agitation/checks of medium. Managed in accordance with sections 8.2.2 – 8.2.6 of “An industry guide for prevention and control of odours at bio waste processing facilities”. Agreements with suppliers for prompt service. Planned preventative maintenance.	Air treated via wet scrubber only. Consider temporary reduction of material processing or stop deliveries of more odorous wastes In extreme circumstances, contain air in reception building, stop or divert deliveries. Treat and release air as normal once repair or replacement has been completed.
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Odour scrubber or damaged malfunctioning	Weekly checks  Detected by site staff	Odour intensity 6/6, or assessed as likely to cause nuisance.	Medium	Weekly checks. Audible alarm when adjustments are needed. Agreements with suppliers for prompt service. Planned preventative maintenance.	Air treated by biofilter only.  Consider temporary reduction of material processing or stop deliveries of more odorous wastes  In extreme circumstances, contain air in reception building, stop or divert deliveries. Treat and release air as normal once repair or replacement has been completed.
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### Transport and Dispersion

Wind blowing towards sensitive receptor	Odour tours  Investigation of complaints received	Nuisance odour found outside site boundary, or assessed as likely to happen.	Medium	Weather prediction and monitoring.	Schedule maintenance activities that could cause odour outside sensitive weather windows.
Strong winds	Weather monitoring	Severe wind predicted, or damage/ disruption caused by wind.	Low	Weather prediction and monitoring. Take appropriate action to mitigate wind damage to equipment and facilities. Emergency callout contracts for selected equipment and facilities.	Assess to reject high odorous deliveries  Reduce volumes



Vehicles	Smell	Associated with site	Low	<p>Clients agreements to co-operate</p> <p>Visual checks</p> <p>Wash down facilities provided</p> <p>Quick tip avoids standing vehicles</p>	Ban suppliers from site who refuse to co-operate with site practices.
<b>Other</b>					
Processing equipment or damaged malfunctioning	Regular checks. Detected by site staff	Damaged or malfunctioning	Medium	<p>Emergency callout contracts for selected equipment and facilities.</p> <p>Regular checks.</p> <p>Planned preventative maintenance.</p> <p>3 pasteurisation tanks available.</p> <p>Physical protection from vehicle collision etc.</p> <p>(reception building only) Increased ventilation rate during acceptance and pre-treatment.</p>	Consider temporary reduction of site activities.

Weather assessments	Weather monitoring (from weather station at Site Office)	Severe heat predicted, or damage / disruption caused by severe heat.	Medium	<p>Weather prediction and monitoring through weather station.</p> <p>Weather details collated on Daily Site Record.</p> <p>Take steps to mitigate against accelerated decay of waste inputs, for example dealing with loads promptly after acceptance using FiFo practices.</p> <p>Design of equipment and facilities.</p> <p>Continuous computer monitoring of whole process.</p> <p>Emergency callout contracts for selected equipment and facilities.</p> <p>Increased ventilation rate during acceptance and pre-treatment.</p> <p>Control of biofilter and scrubber.</p>	<p>Reject more odorous inputs</p> <p>Reduce volumes</p>
Failure of electricity supply	Lights and equipment not functioning	Odour as a result of failure of air extraction system.	Medium	<p>Reduce site activities where possible.</p>	<p>Arrangements in place to deliver emergency generator.</p>
Failure to obtain consumables or raw materials needed that directly impact odour (e.g. biofilter medium)	<p>Failure of planned delivery.</p> <p>Items out of stock.</p>	No reliable supply of items needed for operations.	Medium	<p>Appropriate stock levels held on site at all times.</p> <p>Consider reducing the affected site activities.</p> <p>(reception building only) Increased ventilation rate during acceptance and pre-treatment.</p>	<p>Consider reduction in feedstock</p>

Staff shortages	Feedback from line managers	Staffing levels below 51% of usual, or assessed as likely to cause problems.	Medium	<p>Prediction of staff shortages (e.g. upcoming busy periods on site).</p> <p>Diversion of operatives from other Agrivert sites.</p> <p>Agreements with employment agencies.</p> <p>Consider temporary reduction of incoming waste.</p> <p>Increased ventilation rate during acceptance and pre-treatment. (Reception Building only)</p>	Consider reduction in feedstock
Human error – staff, managers, visitors	Regular checks Detected by site staff	Damage or malfunction caused.	Medium	<p>Staff training and supervision.</p> <p>Visitor inductions.</p> <p>Regular checks.</p> <p>Clean any spills promptly.</p> <p>Near miss reporting.</p> <p>(reception building only) Increased ventilation rate during acceptance and pre-treatment.</p>	Consider temporary reduction of site activities.
Malfunction or damage caused by unauthorised visitors	Regular checks Detected by site staff	Malfunction or damage caused.	Medium	<p>Security procedures including identified key holders and daily checks.</p> <p>Perimeter fence and CCTV.</p> <p>Establish contact with local Police and Fire Services.</p> <p>Repair damage and clean spills promptly.</p> <p>(reception building only) Increased ventilation rate during acceptance and pre-treatment.</p>	Consider reduction in feedstock

Fire and/or explosion	Detected systems by  Detected site staff by	Fire or explosion caused.	High	Staff training and supervision. DSEAR zones identified on map. Fire extinguishers placed for quick access and checked regularly. Establish contact with local Fire Service. Annual fire safety review. Shut down ventilation system. (reception building only)	Consider temporary reduction of site activities.
General Maintenance of equipment or facilities	Detected site staff by	Release of odour intensity 3/6, or assessed as likely to cause nuisance.	Medium	Staff training and supervision. Competent contractors used. Schedule work when conditions are favourable. Permit to Work used where there is a risk of spillage or other substance release. Mobile Odour misters deployed if needed. Increased ventilation rate during acceptance and pre-treatment.	Consider temporary reduction of feedstocks
CHP gas engine emissions – normal operation at peak capacity	Odour detected by site staff.	Odour intensity 3/6, or assessed as likely to cause nuisance.	Low	Design - 10m stack height. Scheduled stack emissions testing. Follow supplier recommendations.	Shut down engine and use flare  Reduce feedstock to reduce gas production

CHP gas engine emissions – damaged or malfunctioning	Detected by site staff.	Damaged or malfunctioning.	Medium	Design – 10.5m stack height. Planned preventative maintenance. Scheduled stack emissions testing. Agreements with suppliers. Follow supplier recommendations.	Shut down engine and flare the biogas Reduce feedstock to reduce gas production
Poor housekeeping on site	Daily checks.  Detected by site staff.	Odour intensity 3/6, or assessed as likely to cause nuisance.	Low	Daily Inspection Routine Fly and vermin control. Daily cleaning around site. Pressure washers on site.	Deep clean areas that identified as causing odour
High organic loading rate into digesters	Inspections of mixture entering digesters.	Strength of soup and daily volume indicates loading rate is too high.  Likely to have odorous digestate	Medium	Externally audited to PAS110 specifications. Operator training, including addition of correct amounts of liquid waste and inspection of mixture entering digesters.	Reduce feed rates to digesters

## 7. **Monitoring Plan**

7.1 Monitoring is essential to our operational control. These are some of the benefits it provides:

- Assessing the nature and extent of a potential risk of odour pollution
- Investigating sources and pathways
- Measuring releases
- Showing patterns that can be used to plan the timing of operations and predict potential risks of odour pollution
- Aiding management and control of the process, including in exceptional circumstance the diversion of waste to a similar facility
- Control measures identified in the Risk Assessment in Table six are to be enacted if required

7.2 Some of the monitoring methods that we use are as follows:

- Detailed waste predictions for the forthcoming week to enable the Site Manager and Operatives to understand the daily and weekly expected tonnages (as a large percentage of the feedstock is municipal waste it means that predictions can be more accurate than merchant based feed stock plants).
- Sniff testing (olfactometry) as part of site routines and in response to concerns or complaints or when a potential risk of odour pollution is suspected. An assessment will be made factoring in the dilution and adaption principles. As a minimum the date and time, location, odour intensity and wind direction are recorded after each test, using the Odour Observation Log (AQD 258e) as seen in Attachment (i) of this OMP.
- Continuous meteorological monitoring
- Continuous monitoring of the AD process
- Scheduled emissions monitoring by a specialist contractor
- As part of our commitment to proactively engage with our neighbours, where there is an appropriate opportunity we may look to recruit one or more community members to take part in monitoring. Designated residents could, for example, do walk-over surveys (offsite), either on a regular basis or in

response to complaints, or keep odour diaries for a certain time period to help build a pattern of odour problems.

- Dynamic monitoring of odour is not undertaken on site, however there are sensors within the air extraction system which monitor the levels of methane, carbon monoxide and sulphur in the extracted air. Should these sensors fail or high levels of chemicals be noted in the extracted air an alarm will sound to notify Operatives that the levels of chemicals passing through the biofilter are above acceptable levels.

- 7.3 We keep records of the information received from this monitoring, and act promptly on any findings that suggest there is a potential risk of odour pollution.
- 7.4 The maintenance schedule for the Scrubber is listed within the OEM maintenance manual and will take the form of weekly, fortnightly and monthly etc. checks.

## **8. Responding to Odour Concerns and Complaints**

8.1 Odour complaints are always taken seriously and given immediate attention. All reports are referred immediately to Agrivert's Management Team. There is a direct site contact number for any odour complaints: TBD. An Odour Complaint Form (AQD 012b) is completed by either the Site Manager or the Site Supervisor and this is then added to the Odour Complaint Log (AQD 012c) by the Compliance Department when completed and closed out.

8.2 The minimum information required on the form at this stage is:

- Complainant's name
- Date complaint received
- Person receiving complaint
- Method of receiving complaint
- Complaint details

8.3 The Management Team will then:

- Determine the action to be taken
- Validate the complaint and make an odour tour of the site's sensitive receptors using the Odour Report Form (AQD 012d). Inform the complainant and/or Regulator immediately if complaint is substantiated (i.e. EA must be informed within 24 hours if odour pollution has occurred).
- Assign a member of staff to investigate the complaint and work with the site manager to manage any relevant activities.
- Investigator to follow the site Odour Management Plan.
- Assign a person to write the corrective/preventive report (could be part of the complaint form). Where the complainant can be contacted, the Site Manager will inform them of the actions that have been taken and where appropriate to advise keeping a diary detailing any further incidents that occur.
- Distribute copies to the relevant people.

8.4 All reports of an environmental investigation will follow the same format:

Background and completion of Odour Complaint Form (AQD 012)

Investigation and results



Conclusions and recommendations

Discussions with relevant Regulators

Communication with the complainant

Preventive measures to reduce the probability of re-occurrence

- 8.5 The Compliance Director compiles a report for Management Review and will then distribute copies of the completed action report to persons mentioned in the report. Copies of all reports and documentation will be stored and maintained by the Compliance Director.
- 8.6 As part of our commitment to proactively engage with our neighbours to minimise their annoyance, we will encourage odour reporting from neighbours and take action on the information received. The aim of this is to improve our relations with key members of the community and to improve the measures we take to ensure there are no offensive odours escaping from our site boundary, particularly in sensitive areas. Our staff are also given the opportunity to raise concerns about odour at any time, in addition to any routine or one-off sniff testing duties they are given.
- 8.7 Odour concerns and complaints will be substantiated by 'sniff testing' carried out by an employee. Where it is reasonably practicable, two employees will do the test independently at the same time to help ensure data quality. Sniff testing will be done at the location of any concern or complaint, at sensitive receptors relevant to the wind direction, and finally at the site boundary. If testing is done from a vehicle, it must not contain strong scents such as deodorisers.
- 8.8 Employees with a cold, sinusitis, sore throat or who have had strong food or drinks (e.g. coffee) within the last 30 minutes will not be able to carry out sniff testing. Employees who are routinely exposed to the odours may not be able to detect or reasonably judge the intensity of odours off-site. Where it is reasonably practicable, we will use office staff or people who have not recently been working on the site to do this where a concern or complaint has been received.
- 8.9 The sniff test will also identify 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, taking into account that an odour may become diluted or even change over a distance.
- 8.10 Where odours are substantiated as coming from our activities, the following questions as a minimum will be asked as part of the investigation process.

- Is the process under control? (Have we received exceptionally odorous wastes, for example? Have putrescible wastes been left for too long before processing?)
- Have odour containment measures failed? (Has a door been left open, for example? Have adverse conditions, such as weather, overwhelmed containment structures?)
- Have odour scrubbing measures failed? (Has a biofilter been temporarily overloaded? Does a wet scrubber need maintenance?)
- Have dispersion methods failed? (Have stable atmospheric conditions failed to disperse an odorous plume, for example? Have our neighbours been exposed to emissions because of unfavourable night-time inversion conditions?)
- Is there a health risk to the local community?

8.11 An investigation could show that we need to temporarily stop some site activities or take some other remedial action, and we have appropriate contingency plans in place for this. A written record will be kept outlining the chosen course of action.



No.	Receptor Address	Receptor Type	Approximate distance to the nearest site boundary	Direction from site	NGR	
					X	Y
R1 & R2	Coursers Farm Ground (Residential)	Commercial and Residential	0.3km	East	520496.2	204690.5
R3 & R4	3 Coursers Road Ground (Residential)	Residential	0.2km	Northeast	520566.7	204906.5
R5 & R6	5 Coursers Road Ground (Residential)	Residential	0.15km	Northeast	520424.7	204808.8
R7 & R8	2 Coursers Road Ground (Residential)	Residential	0.1km	Northeast	520384.7	204780.1
E1	Colney Heath (LNR)	Ecological	0.5km	Northeast	520550.0	204959.0
E2	Redwell Wood (SSSI)	Ecological	2km	Southeast	521159.0	202977.0

## **R10. Commercial and agricultural odour sources in the area**

10.1 The following sites are considered to have the potential to generate an alternative source of odour.

- Various agricultural operations which involve fertiliser spreading and other odorous activities at certain times of year
- Various quarrying operations within the area which may be odorous in certain conditions.

## **Appendix 1**

Please see Attachment 4(ii) of the Environmental Permit Application - Site Plan

## Appendix 2

AQD 012b Odour Complaint Form

AQD 012c Odour Complaint Log

AQD 012d Odour Report Form

AQD 224 Rejected Loads Record Sheet

AQD 258 Odour Observation Log

AQD 203b New Customer Account Form

VERT1307 January 2014 Odour Efficiency Report

A2834 PCP01 Rev A Process Control Philosophy

A2834 ES01 Rev A Equipment Schedule

## **Odour abatement efficiency assessment for an odour control system at the Agrivert Compost & AD Site in Wallingford**

VERT13A\_07\_draft\_Wallingford, January 2014  
Odournet UK Ltd



title: **Odour abatement efficiency assessment for an odour control system at the Agrivert Compost & AD Site in Wallingford**

report number: **VERT13A\_07\_draft\_Wallingford**

project code: **VERT13A**

key words:

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## Executive summary

Odournet UK Ltd were commissioned by Agrivert to undertake an assessment of the odour abatement performance of an odour control system (scrubber and open biofilter) at their food waste anaerobic digestion facility located near Wallingford in Oxfordshire.

The specific objectives of the assessment were as follows:

- To measure the odour concentration at the inlet, mid stage and outlet of the system using olfactometry.
- To determine the composition of the air presented to and from the unit in terms of specific odorous Volatile Organic Compounds (VOCs).
- To assess the overall odour abatement performance of the system.

The sampling was undertaken by Odournet on 14<sup>th</sup> October 2013, and the key findings of the study are as follows:

- The results of the olfactometry analysis indicate that overall the scrubber/biofilter system provided a high level of abatement of the odours presented to it during the test period (>95%). The majority of the odour abatement is provided by the biofilter stage of the system (approximately 95%).
- The residual concentration of the air emitted from the biofilter (385 ou<sub>E</sub>/m<sup>3</sup>) is indicative of an optimally operating unit.
- Due to the possible ingress of ambient air into the system prior to the biofilter, the abatement efficiencies should be taken as indicative only.
- Compounds from the aldehyde, ester, ketone, mercaptan, organic acid, sulphur containing compounds and terpene groups were present at concentrations above their specific odour threshold values in the scrubber inlet and outlet airstreams. The scrubber provided a reduction in the concentration of some of these compounds (including most Sulphur compounds and all Terpenes), with higher outlet concentrations observed in some cases. At the biofilter outlet very few compounds were present at concentrations above their specific odour threshold value. The only compounds detected at concentrations above their specific OTV were dimethylsulfide, nonanal and propanal 2 methyl.

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# 1 Introduction and scope

## 1.1 Introduction

Odournet UK Ltd were commissioned by Agrivert to undertake an assessment of the odour abatement performance of an odour control system (scrubber and open biofilter) at their food waste anaerobic digestion facility located near Wallingford in Oxfordshire.

The sampling was undertaken by Odournet on 14<sup>th</sup> October 2013 and this report details the approach adopted, results and key findings of the study.

## 1.2 Scope

The specific objectives of the assessment were as follows:

- To measure the odour concentration at the inlet, mid stage and outlet of the system using olfactometry.
- To determine the composition of the air presented to and from the unit in terms of specific odorous Volatile Organic Compounds (VOCs).
- To assess the overall odour abatement performance of the system.

This report presents the findings of the assessment.

## 1.3 Structure of report

The structure of the report is as follows:

- Section 2 presents the approach adopted for the study.
- Section 3 details the results of the odour sampling and analysis exercise.
- Section 4 summarises the key findings of the study.

Supporting information is provided in the annex.

## 1.4 Quality Control and Assurance

Odournet's odour measurement, assessment and consultancy services are conducted to the highest possible quality criteria by highly trained and experienced specialist staff. All activities are conducted in accordance with quality management procedures that are certified to ISO9001 (Certificate No. A13725).

All sensory odour analysis and odour sampling services are undertaken using UKAS accredited procedures (UKAS Testing Laboratory No. 2430) which comply fully with the requirements of the international quality standard ISO 17025: 2005 and the European standard for olfactometry EN13725: 2003. Where required, Odournet are accredited to conduct odour sampling from stacks and ducts in accordance to ISO 17025: 2005 and EN13725: 2003 under the MCERTS scheme. Odournet is the only company in the UK to have secured UKAS accreditation for all elements of the odour measurement and analysis procedure.

The Odournet laboratory is recognised as one of the foremost laboratories in Europe, consistently out performing the requirements of the British Standard for Olfactometry in terms of accuracy and repeatability of analysis results.

## 2 Description of approach

### 2.1 Odour sampling

Odour sampling was undertaken on the 14<sup>th</sup> of October 2013. The following approach was adopted:

1. Odour samples were collected using UKAS accredited sampling techniques compliant with the requirements of BSEN13725:2003<sup>1</sup>, using procedures which conform to the requirements of ISO 17025:2005<sup>2</sup>. Further details of these procedures are provided in Annex A.
2. Samples were collected simultaneously in triplicate from the airstream presented to and emitted from the scrubber and from the surface of the biofilter. Samples from the air presented to and emitted from the scrubber were collected directly from ventilation ductwork. The treated air emitted from the biofilter was collected from below a certified odour free polythene sheet that was used to isolate the treated biofilter emissions from the ambient air.
3. At the inlet and mid-stage sample locations measurements of volumetric airflow rate were also undertaken using measurement techniques that are compliant with procedures specified in ISO 10780<sup>3</sup>.
4. The collected samples were transported to the Odournet UK Ltd UKAS accredited (No. 2430) testing laboratory in Bradford-on-Avon, Wiltshire, and analysed within 30 hours of collection in accordance with BSEN 13725:2003<sup>1</sup> to determine their odour concentration in terms of European Odour Units (ou<sub>E</sub>m<sup>3</sup>).
5. One sample of the scrubber inlet, outlet and biofilter outlet triplicate sets was also analysed using a full-scan odour specific Gas Chromatography - Time of Flight Mass Spectroscopy (GC-MS-ToF) technique (to determine the concentration of specific odorous chemical components present in the airstream). The concentration of each compound detected was compared to its odour threshold value (OTV) to determine which compounds were likely to contribute to odours within the airstream at each stage. Further details of the GC-MS-ToF technique are presented in Annex A. It should be noted that the biofilter outlet GC-MS-ToF sample was collected on 25<sup>th</sup> November 2013.
6. The overall odour abatement performance of the unit on was then determined as described in clause 9.5 of BSEN 13725, using the following calculation:

$$\eta_{od} = \frac{q_{od,crude} - q_{od, clean}}{q_{od,crude}}$$

Where  $q_{od, crude}$  is the pre-treatment emission and  $q_{od, clean}$  is the post-treatment emission. If the flow rates remain unchanged by the abatement measure, the odour concentrations can be used instead of the flow rates. It should be noted that this is a technical efficiency assessment, disregarding possible changes of intensity or quality.

<sup>1</sup> BSEN 13725:2003, Air quality - Determination of odour concentration by dynamic olfactometry

<sup>2</sup> ISO 17025: 2005, General requirements for the competence of testing and calibration laboratories

<sup>3</sup> ISO 10780: 1994, Stationary source emissions -- Measurement of velocity and volume flow rate of gas streams in ducts

## 3 Results

### 3.1 Olfactometry results

The results of the Olfactometry analysis conducted on the collected samples are presented in Table 1 below:

Table 1: Results of olfactometry analysis and airflow measurements

Sample location	Time	Odour concentration [ou <sub>E</sub> /m <sup>3</sup> ]				Airflow [Nm <sup>3</sup> /s] <sup>4</sup>	Odour emission [ou <sub>E</sub> /s]
		Geomean	1	2	3		
Inlet to scrubber	12:10 - 12:40	8818	7046	10838	8979	4.3	37917
Outlet of scrubber	12:10 - 12:40	7939	9424	6195	8571	*	.*
Outlet of biofilter	12:10 - 12:40	368	457	316	344	-	-

\* Due to the configuration of the ductwork, the airflow measurements obtained at the Scrubber outlet flow location were unsuitable for calculating airflow.

### 3.2 Biofilter / scrubber abatement efficiency

The odour abatement efficiencies for the scrubber, biofilter and system as a whole is presented in table 2 below. Due to the absence of suitable airflow measurement locations, the abatement efficiencies have been calculated using odour concentration data, rather than odour emissions data. However observations during the sampling indicated that ambient air may have been introduced into the system prior to the mid-stage (outlet of scrubber) sample location<sup>5</sup>, and as such the abatement efficiencies presented should be taken as indicative only.

Table 2 Odour abatement efficiency assessment results

Odour concentration [ou <sub>E</sub> /m <sup>3</sup> ]		Scrubber abatement efficiency (%)	Odour concentration [ou <sub>E</sub> /m <sup>3</sup> ]		Biofilter abatement efficiency (%)	Overall removal efficiency
Inlet to scrubber	Outlet from scrubber		Inlet to biofilter	Outlet from biofilter		
8818	7939	10	7939	368	95%	96%

### 3.3 Results of VOC speciation

The results of the GC-MS-ToF speciation analysis for the scrubber inlet, outlet and biofilter outlet airstreams are summarised in Table 3 below. Within the table the ratio of measured concentration to odour detection threshold (OTV) for each odorous compound detected is presented to provide an indication of which compounds may contribute to odours in each airstream. The results are presented in full in Annex B.

Table 3 GC-MS analysis results - compounds above their odour threshold values

Chemical group	Compound	Relative odour threshold value vs. detected concentration.		
		Inlet to scrubber	Outlet of scrubber	Outlet of biofilter
Aldehydes	2-Propenal	1.9	2.5	*
	Propanal	21.5	20.4	ND

<sup>4</sup> Standardised volume flow rate for Odour (293K) (Nm<sup>3</sup>/s). Scrubber inlet flow location non-compliant with the requirements of ISO 10780, therefore the uncertainty cannot be quantified.

<sup>5</sup> Effective sealing of the 2 sections of ductworks where a second fan could be installed does not appear to have taken place.

	Propanal, 2-methyl-	*	*	1.1
	Butanal, 3-methyl-	2.0	7.7	ND
	Nonanal	3.0	5.0	2.6
Esters	2-Butyl acetate	*	1.3	ND
	Ethyl butanoate	289.4	289.2	ND
	Ethyl pentanoate	25.8	29.2	ND
Ketones	2,3-Butanedione	87.0	ND	ND
Mercaptans	Methanethiol	28.9	63.8	ND
Organic Acids	Acetic acid	10.0	4.9	ND
	Butanoic acid	4.5	ND	ND
Sulfur-containing compounds	Dimethyl sulfide	7.2	3.8	2.9
	Disulfide, dimethyl	1.6	*	*
Terpenes	a-Pinene	1.2	1.0	ND

\*Compound not detected at a concentration above its specific OTV

ND denotes not detected

### 3.4 Review of biofilter / scrubber performance

When interpreting the results of the study it should be remembered that ambient air may have been introduced into the system prior to the mid-stage (outlet of scrubber) sample location, and as such the abatement efficiencies presented should be taken as indicative only.

The results of the olfactometry analysis indicate that the scrubber provided no significant reduction in the odour concentration of the air presented to it for treatment, as the difference in inlet and outlet concentrations fall within the uncertainty range of the analysis technique.

The biofilter provides a high level of odour abatement (approximately 95%), and the outlet residual concentration ( $385 \text{ ou}_E/\text{m}^3$ ) is indicative of an optimally operating unit. Overall the system provides a high level of odour abatement at greater than 95%.

The VOC speciation analysis of the scrubber inlet and outlet samples indicates that compounds from the aldehyde, ester, ketone, mercaptan, organic acid, sulphur containing compounds and terpene groups were present at concentrations above their specific OTVs. While the concentration of some of these compounds is lower in the outlet airstream than the inlet airstream (including most Sulphur compounds which are generally considered to be the most 'offensive' odours, and all Terpenes), this is not the case for many of the compounds. This broadly corresponds with the odour concentration data that indicates that no overall decrease in odour concentration is provided by the scrubber.

Analysis of the samples collected from the biofilter outlet indicate a high level of abatement of the majority of odourous compounds presented to it, with very few compounds present at concentrations above their specific odour threshold value. The only compounds detected at concentrations above their specific OTV's in the biofilter outlet sample were dimethylsulfide, nonanal and propanal 2 methyl, with dimethylsulfide present at the highest concentration to threshold value.

### 3.5 Uncertainty

It should be noted that there is an element of uncertainty associated with the odour analysis techniques employed. The uncertainty levels for the techniques are presented in the table below:

Table 4 Uncertainty

Component	Relative standard uncertainty	Note
Laboratory odour concentration	$C_{od} / 1.58 < C_{od} < 1.58 * C_{od}$	For triplicate sample sets when analysed in accordance with BS EN13725



## 4 Summary of findings

The findings of the study are summarised as follows:

- The results of the olfactometry analysis indicate that overall the scrubber/biofilter system provided a high level of abatement of the odours presented to it during the test period (>95%). The majority of the odour abatement is provided by the biofilter stage of the system (approximately 95%).
- The residual concentration of the air emitted from the biofilter (385 ou<sub>E</sub>/m<sup>3</sup>) is indicative of an optimally operating unit.
- Due to the possible ingress of ambient air into the system prior to the biofilter, the abatement efficiencies should be taken as indicative only.
- Compounds from the aldehyde, ester, ketone, mercaptan, organic acid, sulphur containing compounds and terpene groups were present at concentrations above their specific odour threshold values in the scrubber inlet and outlet airstreams. The scrubber provided a reduction in the concentration of some of these compounds (including most Sulphur compounds and all Terpenes), with higher outlet concentrations observed in some cases. At the biofilter outlet very few compounds were present at concentrations above their specific odour threshold value. The only compounds detected at concentrations above their specific OTV were dimethylsulfide, nonanal and propanal 2 methyl.

## Annex A Odour sampling and analysis techniques.

### A.1 Collection of odour samples from odour control plant

Collection of samples from ducts or stacks was conducted using the 'Lung' principle. A 50 l Nalophane sample bag was placed in a rigid container and connected to the duct containing odorous gas using a PTFE sample line. Air was withdrawn from this container using a pump which caused a sample of the odorous air to be drawn through the line into the bag.

If necessary, samples were pre-diluted with nitrogen at the point of collection to prevent condensation from forming in the sampling lines and odour bag, which may influence the odour concentration prior to analysis. Pre-dilution was conducted using Odournet's patented Sample Master stack sampling system.

The temperature and velocity of the airflow at each point was also determined using suitable monitoring techniques.

The emission rate of odour was then calculated by multiplying the measured odour concentration by the volume flow rate ( $\text{m}^3/\text{s}$ ) as measured in the duct.

### A.2 Collection of odour samples from sources with outward flow

Collection of samples from sources with outward flow (biofilter surface) was conducted using the sheeting and 'lung' principle. Polythene sheeting was used to cover a portion of the biofilter surface, which was allowed to inflate, with air escaping through ventilation holes cut into the sheet. A 60l Nalophane sample bag was placed in a rigid container and connected to the inflated sheet containing odorous gas using a PTFE sample line. Air was withdrawn from this container using a pump which caused a sample of the odorous air to be drawn through the line into the bag.

### A.3 Measurement of odour concentration using olfactometry

Odour measurement is aimed at characterising environmental odours, relevant to human beings. As no methods exist at present that simulate and predict the responses of our sense of smell satisfactorily, the human nose is the most suitable 'sensor'. Objective methods have been developed to establish odour concentration, using human assessors. A British standard applies to odour concentration measurement:

- BSEN 13725:2003, *Air quality - Determination of odour concentration by dynamic olfactometry.*

The odour concentration of a gaseous sample of odorants is determined by presenting a panel of selected and screened human subjects with that sample, in varying dilutions with neutral gas, in order to determine the dilution factor at the 50% detection threshold ( $D_{50}$ ). The odour concentration of the examined sample is then expressed as multiples of one European Odour Unit per cubic meter [ $\text{ou}_E/\text{m}^3$ ] at standard conditions.

### A.4 Gas chromatography - time of flight mass spectroscopy (GC-MS-ToF) analysis

GC-MS-ToF analysis comprises of two analytical techniques in combination which separate and then detect individual chemical components from a gaseous mixture. During gas chromatography (GC) the sample is vaporised and the mixture of chemicals is passed through the GC column. Differing chemical and physical characteristics of the molecules cause chemicals to interact with the column media to different degrees, resulting in different chemicals passing through the media at different speeds and allowing separation into individual chemicals.

Following GC separation, individual chemical species are identified using Time of Flight Mass Spectroscopy (ToFMS). During ToFMS a chemical is broken down into charged fragments. The masses of individual fragments are analysed to give the mass of the original molecule, the "parent mass." From the

molecular mass and the mass of the fragments, the individual chemical can be identified. The sensitivity and thus ability to detect compounds at low concentrations is significantly improved for time of flight MS when compared to the more commonly utilised quadrupole MS.

Analytical capabilities are offered by the Odournet SL Molecular Odour Laboratory in Barcelona, Spain. The laboratory operates a state of the art GC-MS-ToF analyser that has been set-up specifically for the purpose of identification and quantification of odorous chemicals.

A broad range of Volatile Organic Compounds (VOC) can be detected with a GC-MS analysis. The detectable compounds generally have a molecular mass in the range between 30 and 200/300. Detection also depends on volatility (vapour pressure/boiling point) of the compound. Compounds which are extremely volatile (e.g. methane, hydrogen sulphide and ammonia) will not be detected, since these are not retained in the 'cold trap' of the system. Other factors influencing the detectability are the stability of the compound during sampling and analysis, the weight of the molecular fragments (detection starts at a mass of  $m/z = 30$ , hence lighter fragments are not detected).

## Annex B GC-MS analysis results

Table 5 GC-MS analysis results

Compound group	Compound	Concentration ( $\mu\text{g} / \text{m}^3$ )		
		Inlet to scrubber	Outlet of scrubber	Outlet of biofilter
Alcohols	Ethanol	ND	ND	2.6783802
	Cyclobutanol	433.5	679.2	ND
	Isopropyl Alcohol	42.184622	58.695879	ND
	2-Butanol, (R)-	1112.4606	468.86559	ND
	1-Propanol, 2-methyl-	23.994115	26.379446	ND
	1-Butanol	14.452074	13.306897	14.49375
	2-Pentanol	ND	0.6380227	ND
	1-Butanol, 2-methyl-	5.0179025	5.6024737	ND
	1-Pentanol	2.7187956	3.6267817	ND
	Eucalyptol	5.4564206	4.5286938	ND
	1-Hexanol, 2-ethyl-	4.0491208	4.9152513	ND
Aldehydes	2-Propenal	16.019383	21.384666	4.0377858
	Propanal, 2-methyl-	ND	ND	1.1142065
	Propanal	51.991602	49.267809	ND
	Methacrolein	2.4476173	2.4827915	ND
	Butanal, 3-methyl-	1.2213376	4.6629991	ND
	Benzaldehyde	50.617005	83.210359	ND
	Nonanal	6.0206023	10.147305	5.2584919
	Decanal	ND	2.456963	ND
Aliphatic Hydrocarbons	Propene	69.7	59.757759	ND
	Isobutane	22.750317	76.039168	2901.9546
	Butane	4.9112479	10.753563	2843.1574
	1-Propene, 2-methyl-	ND	ND	31.611642
	Butane, 2-methyl-	7.1883503	8.065773	77.68997
	1-Pentene	0.9888675	ND	2.7830579
	Pentane	12.912664	17.323991	76.715428
	1-Butyne, 3-methyl-	1.6939117	ND	ND
	1,3-Pentadiene	1.5554788	1.7006484	ND
	Pentane, 2-methyl-	1.0870599	ND	ND
	Pentane, 3-methyl-	ND	1.3114405	ND
	1-Pentene, 2-methyl-	0.657294	ND	ND
	Hexane, 3-methyl-	ND	ND	0.7371999
	n-Hexane	1.9699492	1.8421183	ND
	Heptane	9.9845623	7.6415013	0.2571837
	Heptane, 2-methyl-	ND	1.0194448	ND
Octane	13.3	8.5665776	ND	

	Octane, 4-methyl-	2.8676371	3.5186638	ND
	Octane, 3-methyl-	2.5518975	ND	ND
	Nonane	ND	9.9045782	ND
	1-Hexene	ND	1.9153381	ND
	Undecane, 6,6-dimethyl-	1.6294165	1.32	ND
	Heptane, 3-ethyl-	ND	1.4532969	ND
	2,6-Dimethyl-2-trans-6-octadiene	7.2556893	6.1312189	ND
	3-Hexene, 3-ethyl-2,5-dimethyl-	0.6117939	ND	ND
	β-Myrcene	29.554871	30.05678	ND
	Nonane, 2,6-dimethyl-	2.0518383	2.8215297	ND
	Undecane	6.2561508	5.4443554	38.690745
	Dodecane	5.5049301	5.3616656	ND
	Tetradecane	3.587687	4.0609651	ND
	C8H18	2.5849734	2.6157301	ND
Aromatic compounds	Benzene	ND	59.090263	11.80738
	Toluene	32.304451	37.998615	400.36985
	Ethylbenzene	12.774866	12.433891	3.7483362
	m,p-Xylene	42.088666	42.062161	ND
	Phenylethyne	0.2393034	0.519151	ND
	o-Xylene	11.465372	8.4	7.3046791
	Styrene	5.159828	2.7084007	1.2292005
	Benzene, 1-ethyl-4-methyl-	5.4619977	5.2077715	ND
	Benzene, (1-methylethyl)-	1.8357958	1.5337227	0.7922715
	o-Cymene	5557.7829	4718.8154	ND
	Benzene, tert-butyl-	1.3731196	1.1531841	ND
	Benzene, 1-methyl-4-(1-methylethenyl)-	12.978526	19.109275	ND
	Naphthalene, 2-methyl-	0.3693292	ND	ND
	Diphenylmethane	ND	0.4033025	ND
	Σ C10H14	1.5943803	2.4447183	ND
Chlorine-containing compounds	Methylene chloride	ND	ND	1.3463237
Cyclic Hydrocarbons	Cyclobutane	ND	ND	1.1743045
	Cyclopropane, ethyl-	ND	1.3800771	ND
	Cyclohexane, methyl-	7.9553635	7.82941	ND
	Cyclohexane, ethyl-	0.9995385	0.85	ND
	Cyclohexane, 1,3,5-trimethyl-	0.3135309	ND	ND
	Cyclohexane, 1-ethyl-2-methyl-	1.4883607	ND	ND
	Cyclopropane, propyl-	1.8184019	ND	ND
	Cyclohexane, 1-ethyl-2-methyl-, trans-	1.0313168	ND	ND
	Cyclohexane, propyl-	2.3128012	1.69	ND

	Camphene	8.9298328	8.79	ND
	C5H10	23.986936	27.375064	ND
	C10H18	6.5009346	6.2174702	ND
Esters	Ethyl formate	4.9534901	ND	ND
	Methyl acetate	95.469291	86.131448	ND
	Ethyl Acetate	1802.1654	1731.6475	2.3188893
	Methyl propionate	0.6980176	ND	ND
	Ethyl propanoate	12.275331	13.59765	ND
	n-Propyl acetate	627.48531	567.59944	ND
	Methyl butanoate	2.0231799	ND	ND
	2-Butyl acetate	9.9722761	15.390154	ND
	Ethyl butanoate	55.943151	55.920263	ND
	Propyl propionate	4.420355	3.4407504	ND
	Butyl acetate	14.260714	17.522059	ND
	sec-Butyl acetate	ND	ND	3.3459339
	Methyl valerate	0.4864202	0.4189707	0.3455089
	Methyl isovalerate	ND	ND	0.5204254
	Isoamyl acetate	7.4887668	3.5524023	ND
	Propyl butanoate	23.528153	23.177239	ND
	Ethyl pentanoate	15.386952	17.373328	ND
	Methyl hexanoate	3.9589489	3.5973226	ND
	Ethyl hexanoate	135.77716	106.07704	ND
	Propyl hexanoate	39.174439	29.067043	ND
	Ethyl heptanoate	ND	2.3427573	ND
	Ethyl octanoate	3.5671457	2.86	ND
	1,3-Dioxolane, 2-methyl-	1.6971696	2.3692898	ND
	Propanoic acid, ethyl ester	ND	ND	0.3657904
	Carbonic acid, dimethyl ester	ND	ND	0.8588446
	Ethanol, 2-ethoxy-	ND	ND	2.1614886
Furans	Furan	1.6681247	0.1890407	3.6578599
	Furan, 2-methyl-	2.1236915	2.3291597	ND
	Furan, 2-ethyl-	0.6105239	0.7647493	ND
	Furan, 2,5-dimethyl-	1.1615911	1.2517906	ND
	Furan, 2-pentyl-	ND	2.6616444	ND
	Isobenzofuran	ND	0.3264797	ND
Halogen-containing compounds	Dichlorodifluoromethane	2.6611198	2.9507687	ND
	Ethyl Chloride	0.8060251	0.9994281	ND
	Trichloromonofluoromethane	0.9469152	0.8941539	ND
	Methylene chloride	0.9523405	0.4212209	ND
	1,1-Difluoro-tetramethylcyclopropane	1.7946027	ND	ND

	Decane, 1-iodo-	ND	2.2767987	ND
Ketones	Acetone	137.97065	221.14032	ND
	Methyl vinyl ketone	4.4	5.2	ND
	2,3-Butanedione	17.4	ND	ND
	2-Butanone	344.06679	640.63952	ND
	2-Pentanone	5.6153258	5.8925229	0.4977734
	Methyl Isobutyl Ketone	19.217766	25.668065	ND
	2-Heptanone	ND	1.7339728	ND
	2-Hexanone	ND	ND	1.8534696
	3,4-Hexanedione, 2,2,5-trimethyl-	ND	1.2479115	ND
	Acetophenone	1.8272507	8.0377082	ND
	4,6-Octadiyn-3-one, 2-methyl-	ND	8.9815174	ND
	Ethanone, 1-(4-methylphenyl)-	ND	1.3669903	ND
Mercaptans	Methanethiol	1.907856	4.21	ND
Nitrogen-containing compounds	Acetonitrile	5.9879129	3.0489058	ND
	Diazene, dimethyl-	1.1955643	ND	ND
	Benzonitrile	2.9414781	5.5134476	ND
Organic Acids	Acetic acid	149.32109	73.825829	ND
	Propanoic acid	3.4811152	2.5820468	ND
	Butanoic acid	3.1258667	ND	ND
	Pentanoic acid	0.1331043	ND	ND
	Benzoic acid	ND	19.142531	ND
	1,2-Benzenedicarboxylic acid	ND	2.7006563	ND
Sulfur-containing compounds	Carbonyl sulfide	5.0214503	1.4	ND
	Sulfur dioxide	250.39381	ND	38.890179
	Dimethyl sulfide	7.0860856	3.683712	2.8691882
	Carbon disulfide	5.2249445	ND	ND
	Methanesulfonic anhydride	3.5506906	3.1181637	ND
	Disulfide, dimethyl	13.55295	4.6140617	6.4134149
	Thiophene, 2-methyl-	0.7655499	1.7843597	ND
	Thiophene, 3-methyl-	0.3836585	ND	ND
	Disulfide, methyl propyl	13.260375	ND	ND
	Diethyl disulfide	ND	ND	0.4776237
	Dimethyl trisulfide	4.2206572	ND	ND
	Disulfide, dipropyl	6.5064289	2.3819624	ND
Terpenes	a-Pinene	120.643	103.85385	ND
	(-)-B-Pinene	245.42112	199.91	ND
	D-Limonene	6043.3434	5595.8933	142.74271
	t-Terpinene	38.438955	35.399367	ND
	Tricyclo[2.2.1.0(2,6)]heptane,	21.490975	20.121721	ND

	1,3,3-trimethyl-			
	2-Menthene	12.982708	8.8110025	ND
	Terpinolen	8.6682902	7.0633631	ND
	$\beta$ -Phellandrene	17.924492	12.31	ND
	$\alpha$ -Phellandrene	11.565663	10.54	ND
Heterogroups	N-Methyltaurine	ND	23.437788	ND
	Sulphuric acid dibutyl ester	1.1645315	ND	ND
	Ethanamine, 2-methoxy-	3.8076777	ND	ND
	Benzoic acid, hydrazide	0.483466	0.8612989	ND
	2-Phenylisopropanol	0.9287483	0.768228	ND
	Ethyl benzoate	1.4127113	2.1915413	ND

ND denotes compound not detected



## Noise Mitigation Measures and Monitoring

### **Purpose:**

To ensure sensitive receptors from the site boundary, Visitors and Operators are protected from significant noise.

### **Actions for mitigation of noise:**

- Sensitive site location.
- Considerate opening hours.
- Selection and purchase of suitable plant and equipment.
- Significant noise producers are enclosed in acoustic sheds (AFARP).
- Routine maintenance of plant and equipment.
- Good operational site practises.
- Timely reporting and repairs to damaged and faulty plant and equipment.

### **Training that includes:**

- Appropriate techniques to keep site noise to a minimum.
- Regular advice on proper use and maintenance of tools and equipment.
- Positioning of machinery to reduce noise impact on neighbourhood and site personnel.
- Avoidance of unnecessary noise when carrying out operations.
- Protection of persons from noise and why (aware of harmful effects of noise).
- How to use the sound measuring equipment (selected personnel).
- How to use relevant attenuation PPE/C (hearing defence).
- Requirements for monitoring and appropriate record to use.

### **Methodology for monitoring noise levels:**

- Site map to identify monitoring points to include identification of fixed and semi fixed plant and equipment for site personnel.
- Monitoring to be undertaken at monthly intervals during commissioning thereafter at six monthly interval. The frequency to be included on the site Tests Matrix.
- The sample points at the site boundary must be > 1.2m above ground.
- >3.5m from the nearest vertical structure (i.e. bund, building).

## Noise Mitigation Measures and Monitoring

- Wind speed < 5mph (leaves gently moving).
- Weather and site conditions recorded (avoid extreme weather conditions).
- Time of day (not during breaks).
- Levels to be recorded at hourly intervals over 1 work shift.
- All equipment running (record what).
- The measurement should be Fast response LpA.
- Levels not to exceed:
  - 65 dB (A) at the site boundary (or those set out within the relevant planning permission, whichever is lower).
  - 80dB(A) or 85dB(A) daily or weekly for site personnel.
- Monitoring to be recorded on relevant site map record form, filed and kept on site.
- Any external noise sources experienced during monitoring are to result in an additional sample being taken and the previous sample discredited. This includes but is not limited to passing vehicle/air traffic, birds, wind etc.

### **Monitoring equipment:**

- Sound Level Meter, Type 2 – calibrated annually.

### **Reference documents:**

- Horizontal Guidance Note IPPC H3 (part 2) Noise Assessment & Control.
- The Control of Noise at Work Regulations 2005.
- BS 5228-1:2009 Code of Practise for noise and vibration control on construction and open sites.
- BS 7445-1:2003 Description and Measurement of Environmental Noise.
- BS 4142:1997 Rating industrial noise affecting mixed residential and industrial areas.
- Control of Pollution Act 1974 (includes consents under Section 61).
- Environmental Protection Act 1990.

# Standard Operating Procedures (SOPs) for Anaerobic Digestion Systems operated in accordance with the Biofertiliser Certification Scheme

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	Annex I

## 1 Company details and responsible person

### Company name, address and telephone number

Agrivert Ltd, The Stables, Radford, Chipping Norton, Oxfordshire, OX7 4EB

### Anaerobic digestion facility name, address and telephone number

Agrivert Wallingford Anaerobic Digestion Facility, Benson Lane, Wallingford, Oxfordshire, OX10 6SQ

Telephone number: 01491 835861

### Process employed

Agrivert's AD process at Wallingford is a wet, mesophilic anaerobic digestion process followed by pasteurisation.

### Current person with overall responsibility for compliance with BSI PAS 110:2010, the Anaerobic Digestate Quality Protocol and the Biofertiliser Certification Scheme Rules

Karen Moutos, Compliance Manager at Agrivert

## 1.1 General description of the anaerobic digestion process and its outputs

Agrivert's AD process is a wet, mesophilic anaerobic digestion process. The process minimum retention time is 60 days.

The product types for which conformance with PAS 110 and the Anaerobic Digestate Quality Protocol is intended to be claimed are:

- Whole, pumpable digestate

This AD process is operated under:

- Planning permission granted by Oxfordshire County Council on 28<sup>th</sup> February 2012 (Application No. MW.0159/11);
- Bespoke Environmental Permit EPR / GB 3530AD granted by the Environment Agency; and
- Approval 33/211/8002/ABP/BIO granted by the Animal Health to treat animal-by products category 3 including catering wastes under Regulation (EC) 1069/2009 and the Animal by-Products Regulations 2011.

The site is permitted to treat 65,000 tonnes per annum of input materials (of which 50,000 tonnes are waste materials). The estimated input material in 12 months is 45,000 tonnes and the estimated output of digestate is 40,000 tonnes.

## 2 Input materials

### 2.1 Types of input materials and sources

The following wastes input materials are digested:

- a. Liquid biodegradable wastes:

- Run-off water from Agrivert's PAS 100 & CQP certified IVC process PR249 (Ardley, Chipping Norton, Oxfordshire);
- Run-off water from Agrivert's South Mimms IVC facility;
- Run-off water from Buckinghamshire County Council's High Heavens IVC facility;
- Liquid waste from factory washings (Brewery waste);
- ABPR Category 3 abattoir wastes.

b. Solid biodegradable wastes:

- Kerbside collected source-segregated food waste from municipal (local authority) and commercial sources (local authorities); and
- Food waste, mainly packaged, from local supermarkets and commercial sources.

c. Viscous biodegradable wastes:

- Glycerol coming from biodiesel production.

EWC codes of the source-segregated biodegradable wastes that are digested are all listed in Schedule 2 of the facility's bespoke permit referred to in section 1.1 above.

Waste types 02 03 99, 07 02 13 and 15 01 05 are listed in the permit, but are not currently treated as they are not included in Appendix B of the AD Quality Protocol.

All wastes treated in this AD plant are included in Appendix B of the AD Quality Protocol.

## 2.2 Waste Disposal Enquiries

The following written information is obtained for each proposed waste input:

- The type of process producing the waste
- The quantity of waste
- a written description of the waste confirmed by our assessment of a representative sample.
- The form of the waste (for example solid, liquid, sludge).
- Hazards associated with the waste.
- Storage and preservation techniques required for samples of the waste.

Prior to acceptance of any new waste type the waste is analysed. The analysis required will vary depending upon the nature of the waste, the process to be used and what is known about the waste already. Results of analysis are kept within the tracking system. These details should include:

- Whether the waste is suitable for AD treatment.
- A check on the constituents declared by the waste producer/holder to ensure Permit compliance, treatment plant specification and final disposal.
- Confirmation that there are no hazardous characteristics, which cannot be controlled.
- Physical appearance and colour
- pH
- Assessment of odour: presence, strength and description.

Prior to acceptance of any new liquid waste type a representative sample of the waste is sent to the laboratory to undergo an inhibitor test and a theoretical biogas production test. The inhibitor test is designed to identify if there is anything within the proposed waste that can negatively disrupt the biology of the digesters and therefore a 'negative' inhibitor result makes the feedstock unsuitable for use. The method is held by Sciantec Laboratories reference S2127. The theoretical biogas production test determines how much biogas the waste may produce and hence helps us to develop the feeding plan for the digesters. The method is held by Sciantec Laboratories reference S1104.

The type of information that would demonstrate the reliability of the sample includes:

- Location of sampling point, for example, effluent tank
- Method of sampling, eg sampling tap (mid flow), "top" sample
- 
- Preservation techniques

The sample must also be representative of the waste and obtained by a person who is technically competent to undertake the sampling process. Samples will be clearly labelled and any hazard identified.

Records of Waste Disposal Enquiries from which samples are taken will be kept for a minimum of 3 years.

### **2.3 Agreements with input material suppliers**

A contractual arrangement (Council Contracts and Waste Acceptance Protocol AQD 280) is made with each waste supplier including criteria for acceptance / rejection of loads delivered to the AD facility.

The organisations with which such contractual arrangements are held:

For waste materials:

- Oxfordshire County Council,
- Essex County Council
- Pembrokeshire County Council
- SITA South Gloucestershire
- Buckinghamshire County Council
- Cawleys
- Grundon
- Bioco
- Mutch Meats
- M&M Skip Hire
- Agrivert (Ardley)
- Agrivert (Hertfordshire)

Whenever the criteria specified in the contractual arrangements are not met, the load shall be rejected and this shall be clearly communicated to the waste supplier and records of the communication shall be kept. This will be in accordance with Agrivert's waste acceptance procedure. This includes:

Improved instructions, reminders of the AD operator's acceptance / rejection criteria, contractual arrangements, control measures, and further clarification of any of the above shall be sent to the relevant waste supplier(s) when deemed appropriate by the AD operator.

The staff on site shall be made aware of the acceptance / rejection criteria, any contractual arrangements and control measures.

The site shall cease accepting loads from a particular source if contamination has occurred repeatedly yet the supplier has not attempted corrective action or, in the AD operator's opinion, the action taken has been ineffective.

## **2.4 Inspections of input materials against acceptance criteria**

Each load of biodegradable waste delivered for anaerobic digestion shall enter the site via the weighbridge. Details of the waste type, waste code, client/source, quantity (tonnes) of waste and delivery date shall be recorded on a Weighbridge Ticket.

The driver then proceeds to the reception building, where a site operative shall ensure the waste carrier discharges its load inside enclosed waste reception building.

Solid wastes are tipped into the solid waste reception pit in the enclosed reception building. A small amount of waste is tipped into the bunker for inspection and assessment. A site operative inspects each load delivered and rejects it if the level of contamination is above the criteria specified in the Council Contract or Waste Acceptance Protocol (the load shall be rejected if, by subjective assessment, it contains >10% weight of litter/contrary material unsuitable for digestion). If accepted, the rest of the load will then be tipped into the bunker.

In addition to this inspection, spot sampling is carried out on deliveries where there is cause for concern and sent to a laboratory for retrospective analysis.

The following information about rejected loads is recorded on the printed Weighbridge Ticket and the Rejected Load Record sheet, AQD 224:

- Input material type and EWC code
- Source
- Amount
- Date rejected
- Reason for rejection, and
- Where it was sent.

Before removal from the site, each load or part-load due for rejection shall be kept separate from loads awaiting inspection or those accepted for treatment.

If the inspected load contains less than 10% of litter/contrary material unsuitable for digestion, this shall be removed as far as practically possible and placed into a 'rejects' container stored on site. The container's contents shall regularly be removed for disposal.

Liquid wastes are delivered to the liquid waste reception area in the reception building.

### **3 Process management**

#### **3.1 Process flow diagram**

A flow diagram of Agrivert's AD process is shown in Annex I to these Standard Operating Procedures.

#### **3.2 Input materials pre-treatment**

From the solid waste reception pit, solid wastes are fed into a de-packaging hammermill unit and macerated until a particle size <12 mm is achieved in at least one dimension. Daily visual checks are carried out by a site operative to ensure the particle size is adequate and in compliance with the ABP Regulations' particle size requirements.

The de-packaging hammermill unit is inspected weekly for damage, wear and tear and the outcome of such inspection is recorded on the Wallingford Management, Maintenance and Emissions Task Schedule.

Any packaging (mainly plastic) removed at this stage is sent to an Energy from Waste plant for incineration.

The accepted liquid wastes are discharged into the lighter or heavier liquid fraction underground storage tanks. The lighter liquid fraction is added to the solid wastes prior to maceration via the hammermill.

Heavier liquid fractions are pumped through a macerator to join the <12mm solid fractions and are then transferred into an underground 400 m<sup>3</sup> mixing tank (B841), where the two fractions are mixed together by an agitator (propeller).

#### **3.3 Anaerobic digestion stage**

From the underground mixing tank the fermentation substrate is conveyed via pumps to a series of digestion reactors. In this process a flow meter records the quantities that are pumped into the AD reactors. The flow meter is connected to a central automated control system, which instructs the opening and closing of the pneumatic valves and pump operation.

The maximum organic loading rate to the digestion process is 4 Kg organic matter / m<sup>3</sup> per day.

The portion of production for this system is defined as the amount of substrate processed in a day. This is typically within 200 m<sup>3</sup> per day.

The fermentation process takes place in a dual-step anaerobic process that operates in the mesophilic range (at approximately 40 °C).

The substrate is firstly fed to two primary digesters (Digester 1 and Digester 2, of 4,500 m<sup>3</sup> capacity each) that operate in parallel and a secondary digester (Digester 3).

After primary digestion, the substrate is fed into two identical secondary digesters that operate in line (Digester 3 and 4 of 4,500 m<sup>3</sup> capacity each). Primary and secondary digestion critical limits are specified in Table 1 below.



**Table 1. Critical limits for the anaerobic digestion process**

Reactor	Parameter	Critical limits
AD Reactor 1	Temperature	30 to 50 °C
	Minimum HRT	30 days
AD Reactor 2	Temperature	30 to 50 °C
	Minimum HRT	30 days
AD Reactor 3	Temperature	30 to 50 °C
	Minimum HRT	20 days
AD Reactor 4	Temperature	30 to 50 °C
	Minimum HRT	20 days
AD Reactor 5	Temperature	20 to 40 °C
	Minimum HRT	n/a
	Substrate Feeding Rate	Max 200m <sup>3</sup> /day

Temperatures are monitored via one PT100 probe installed in each AD reactor unit and connected to the central control computer. HRT and maximum organic loading rate are monitored via the flow meter and the retention can therefore be calculated and recorded on the central computer.

The critical limits specified in Table 1 are appraised every day on the overview screen on the central control system.

Further parameters/operational conditions monitored in the digesters are:

- Level of substrate monitored through a pressure sensor installed on the digestion tanks
- Volume / capacity of digestion tanks utilised (digester running at 95% of capacity)

Samples are taken daily from the first three digesters and tested on site for:

- pH, as an indicator of the production of digester gas (biogas), expected range: 7.5 -8.5
- Organic acids (FOS), expected range 2000-5000 mg/l
- Total inorganic carbon (TAC), expected range 10000-30000 mg/l and
- FOS:TAC Ratio, expected range <0.5

These are indicators of the potential fermentation process. Acids must be compensated by the buffer capacity of the substrate to prevent acidification in the reactors.

The test results obtained are recorded in the FOS/TAC Results Book kept in the Storage room. In the event the pH is < 7.5, Calcium carbonate is added to the tank as a buffer. If the FOS/TAC Ratio approaches 0.4 the feeding rate will be reduced and if it is >0.5 the feeding will be stopped. This action is recorded in the FOS/TAC Results Book.

The test results are sent monthly to German manufacturer (Biogas Weser-Ems) who monitors them. Any required actions are recorded in the Site Diary.

A description of the testing methodology is kept on site in the factsheet entitled 'Determination of FOS/TAC value in Biogas Reactor'.

A description of the sampling methodology adopted is given in the Sampling of Process Material at AD (WI94).

### **3.4 Pasteurisation**

From Digester 4, the material is transferred to the pasteurisation room. Three pasteurisation units of 25 m<sup>3</sup> (pasteurisers 1, 2 and 3), running in parallel, pasteurise the homogenous material until >70 °C for 60 consecutive minutes is achieved. It typically takes approximately 4 hours to achieve these conditions.

Continuous monitoring of the temperatures in the pasteurisers is performed by PT100 probes (one per pasteuriser) connected to a central computer, located in the control room.

The temperature and time critical limits specified above in pasteurisers 1, 2 and 3 are appraised every day from computer screen named Trend 911, 921 and 931 on the central control computer and recorded on Wallingford Management, Maintenance & Emissions Task Schedule.

The temperature probes are 'fail safe' and if the connection to the computer is broken then no signal is received and the temperature will read zero. The pasteuriser will then continue to run trying to reach temperature until the temperature probe is replaced from calibrated stocks. This replacement is recorded on the System or Equipment Failure Record AQD 282.

### **3.5 Post pasteurisation stage**

Only when pasteurisation is achieved, the material is moved into Digester 5. For the purpose of compliance with the ABP Regulations, a sample is taken post pasteurisation every month and tested for E. coli and Salmonella.

### **3.6 Biogas production**

The biogas is stored directly in the Digesters, under a bi-foil roof which consists of a membranous gas-storage foil and a weatherproofing foil. The gap between the two foil sheets is filled with air. The gas-storage foil adjusts the storage volume to the available quantity of gas, so that the pressure in the gas tank remains constant.

Volume and quality of the biogas produced (methane, oxygen and H<sub>2</sub>S contents) are also checked.

The biogas is then converted in block-type thermal power stations to electric power and to heat (CHP unit of 2.4 MWE). The electricity is sent to the national grid, while the heat is entirely used on the site.

Ranges are:

CH<sub>4</sub> level = 45-65% (Biology Indicator)

O<sub>2</sub> level < 3% (Safety risk)

H<sub>2</sub>S level before Carbon Filter <300ppm (Engine longevity)

H<sub>2</sub>S level after Carbon Filter <100ppm (Carbon Filter performance)

A reading of these levels is taken every 30 minutes and recorded on the central computer where three months data is held before being over written.

If the O<sub>2</sub> level increases this indicates that air is being drawn into the system due to the engines demanding more gas than that is being produced and the computer will automatically stop the engines. The gas being generated will then drive the O<sub>2</sub> out and the engines will be re-started at a lower rate. There is a warning alarm at 3% and if the level reaches 6% the engines will shut down automatically. This action is recorded in the Site Diary.

If the H<sub>2</sub>S level before the Carbon Filter is <150ppm no action is required.

If the H<sub>2</sub>S level before the Carbon Filter >150ppm but <250ppm add 250l/day of Ferrous Chloride until the level reduces.

If the H<sub>2</sub>S level before the Carbon Filter >250ppm add 500l/day of Ferrous Chloride until the level reduces.

If the H<sub>2</sub>S level after Carbon Filter <100ppm change the Carbon Filter. These actions are recorded in the Site Diary.

### **3.7 Monitoring equipment calibration**

The monitoring system, including the monitoring equipment, is as follows:

- Probes PT100, one per each pasteuriser and digestion unit;
- Pressure sensors for determining the substrate level in the digesters;
- Titration device HACH LANGE for determining pH, FOS and TAC; and
- Flow meter that measures the feeding rates and transfer quantities.

Temperature probes are calibrated every 6 months using Calibration of Temperature Probes Work Instruction, WI 100, including an annual calibration by an external company. The outcome of the calibration is recorded on the Calibration Matrix for Temperature Probes, AQD 019.

If a probe fails or is damaged, it will be replaced with a spare, precalibrated probe held in HO stocks. Such action is recorded on the System or Equipment Failure Record AQD 281.

The Pressure Sensors are connected to the central computer and any faults would result in an alarm email being sent to the Site Manager. There is a daily visual check through the port holes of the digesters to check that the levels are at approximately the same as the pressure sensors read and this is recorded on the Cassington Management, Maintenance and Emissions Task Schedule. There is also a high level alarm in the digesters that would sound and stop pumping if the digestate reached that level.

The flow meter is factory sealed and the flow rate is set by the computer. If the meter reads different to the computer then the pump will stop. This would show as an alarm on the central computer screen and also send an alarm email to the Site Manager. The flow meter would be replaced and this action would be recorded on the System or Equipment Failure Record AQD 281.

The titration device is calibrated approximately every week when required by the device by using two buffer solutions at pH 4 and 7. Refer to the Biogas Titration User Manual and follow the on-screen instructions on the device. The outcome of the calibration is stored in the device as well as recorded in the FOS/TAC Results Book kept in the Storage room.

### **3.8 Maintenance and processing equipment checks**

Document entitled WI82c Wallingford AD – Equipment Management, Maintenance and Emissions work instructions states how often equipment shall be checked, what checks shall be carried out and the contingency arrangements in the event of equipment failure. The results of each check shall be recorded on the Wallingford Management, Maintenance and Emissions Schedule.

### **3.9 Vermin control**

Risk of vermin on all site area is controlled by:

- Mowing the grass as necessary,
- Litter picking activities,
- Pest control to control rodents every 6 weeks by Terminator Pest Control.
- Keeping the reception building closed and the silage clamps tidy.

Pest control is recorded on the Cassington Management, Maintenance and Emissions Task Schedule and Terminator Pest Control maintain a folder kept on site.

### **3.10 Incident and accident**

Any accidents and other incidents that occur on site, the known or suspected cause(s), and the actions taken are recorded on Accident & Incident Report AQD 18.

The need for preventive action shall be considered, and any such action taken shall be recorded on the above record.

### **3.11 Vehicle cleanliness**

The cleanliness of the parts of mobile plant that will be in contact with the digestate shall be inspected by a site operative. Before product is loaded up, the transportation vehicle shall also be inspected for cleanliness, especially the surfaces that will be in contact with the product.

If unsuitable for contact with the product, the mobile plant and/or transportation vehicle shall be cleaned or not used. If a vehicle is judged to be unclean, a record shall be made of vehicle identification details, the date and actions/outcome in the site diary.

### **3.12 Complaints**

Any complaint or concerns expressed by interested parties, including operatives, customers, clients and regulatory authorities about quality or usability of the whole digestate, shall be recorded on the Complaint record sheet AQD 12 or 12b if its odour related and entered onto the Complaint Log.

Such record shall include:

- name and contact details of the person who expressed concern or made a complaint;
- specific subject(s) of the concern or complaint;
- date and time communicated to the producer and name of the person to whom it was communicated;
- nature and date(s) of any actions and checks and who carried them out;
- nature and date of any response to the person who expressed a concern or made the complaint; and
- name of the person who communicated the response.

## **4 Sampling and testing**

### **4.1 Process validation and after validation**

The process validation phase shall be carried out when first evaluating conformity with PAS 110. Process validation shall also be carried out when decided necessary as a result of regular or change-triggered management reviews.

For validation purposes, three portions of whole digestate shall be sampled from Digester 5 according to the Sampling of Process Material at AD WI 94. The samples shall be tested for each parameter in Table 1 of PAS 110 by a BCS approved laboratory.

Given that 22.5 days is the minimum time<sup>1</sup> for a portion of production to be completely replaced by a new portion in Digester 5, the minimum time interval between the three samples taken for validation purposes is 22.5 days.

After validation, different portions of whole digestate shall be sampled from Digester 5 according to the frequencies specified in Table 4 of PAS 110 and following the Sampling of Process Material at AD. The samples shall be tested for each parameter in Table 3 of PAS 110.

The portions assessed for process validation and after validation shall be:

- digested for the minimum process timescale;
- appraised against the critical limits specified in these SOPs, and
- sampled promptly when the digestion process has been completed and the digestate is ready for use.

Each sample of whole digestate shall be representative of a portion of production.

For each sample, record named Whole Digestate Sampling Analysis Request AQD 225d shall be made including the following information:

- sampling date;
- sample type (whole digestate);
- code for or reference to the sampled portion of production;
- digestion facility name; and
- name of the person who carried out the sampling.

One copy of the record shall be kept, another copy shall be sent to the laboratory with the sample.

Test results shall be evaluated by Karen Moutos, Compliance Manager against the minimum quality criteria specified in PAS110.

#### **4.2 Dealing with sampled and tested portions that fail to comply with the PAS 110 quality criteria**

Any sampled and tested portion that does not conform to the PAS 110 quality criteria shall:

1. undergo corrective action\* then be sampled and tested in terms of the parameter(s) relevant for evaluating efficacy of the corrective action; or
2. be dispatched for use, processing elsewhere or disposal, and the recipient and regulator notified of the nature of its non-conformity with PAS 110.

The actions taken and the destiny of each such batch shall be recorded in the relevant QMS document(s).

\*For example, additional portions of digested material can be pumped into Digester 5 and after thorough mixing a sample representative of the tank content will be sampled for testing. The associated test results shall be taken into account when evaluating conformance with PAS 110 minimum requirements.

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<sup>1</sup> Digester 5 is fed at a max loading rate of 200 m<sup>3</sup>/day, and has a capacity of 4,500 m<sup>3</sup>.

## **5 Product dispatch, storage and use**

The whole digestate shall be removed from Digester 5, delivered to farm or pumped into the lagoon and delivered to farms according to demand.

### **5.1 Product labelling and supply documentation**

Information supplied to the customer shall include the obligatory information required by PAS 110 section 14 and the Anaerobic Digestate Quality Protocol Appendix G.

Prior to dispatch, each load shall be checked to ensure information supplied to the recipient and kept on record by the AD operator is correct.

A contractual arrangement (Model contract for digestate use in agriculture and soil-grown horticulture) with any farmers/contractors that take the whole digestate to store it and spread it on agricultural land is signed by both parties, the AD operator and the digestate recipient.

Each load is dispatched to the recipient with a dispatch / delivery note including information about the quantity dispatched and the date of dispatch.

### **5.2 Quarantine policy for sampled and tested portions**

When possible, test results for all parameters specified in Tables 1 and 3 of PAS 110 except for the RBP (turnaround time of about 5 weeks for the lab to provide the related test results) will be checked for conformance with PAS110 before the tested portion of production is dispatched.

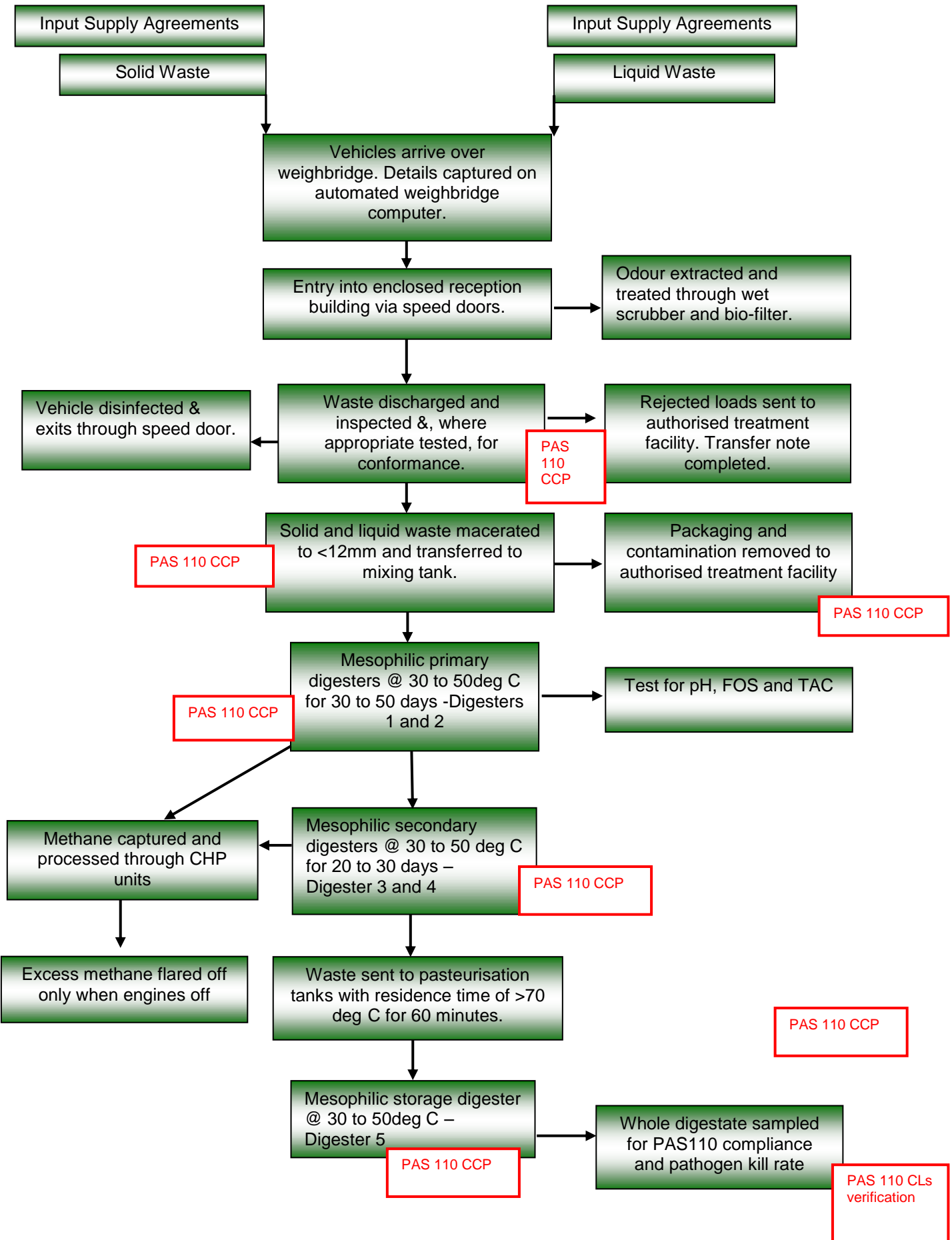
However with regard to the RBP results, by the time these results are provided, it is very likely that the portion of production would have been dispatched for use.

If any portion that is sampled and tested is dispatched with claim of conformance to PAS 110 and the AD Quality Protocol before its test results have been received from the laboratory and evaluated and such dispatched portion is subsequently found to have failed to comply with any of the PAS 110 quality criteria, the digestate recipient and the regulator shall be notified of the nature of its non-conformity with PAS 110.

### **5.3 Digestate storage and use in agriculture, forestry and soil/field-grown horticulture**

Terms and conditions included in the contractual arrangement with the digestate recipient clearly state that whole digestate shall be stored and used according to the AD Quality Protocol's section 4.2 and Appendixes F and H. Those requirements are complied with by using: the Excel spreadsheet equivalent to the 'QP Manager', record template Excel-based record of digestate storage and use in agriculture, forestry and soil/field-grown horticulture.

**ANNEX I**





**PART 1 – TO BE COMPLETED BY CUSTOMER**

CONTRACT DETAILS	
Detailed product description	
EWC code	
ABPR Category (only applicable to animal by-products)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> Not applicable Haulier ABP registration No: _____
Acceptable under PAS100 or PAS110	
Gate fee agreed (price is per tonne ex VAT)	£ _____ per tonne/pallet/load/IBC
Invoice will be raised	Monthly
Payment terms	14 days from date of invoice
Customer Purchase Order if applicable	
If you require data reports/invoices to be subdivided by different locations/parts of your business, please provide the name each location/description you require here:	

Facility/waste type	Agrivert Company(ies) with which you wish to open an account	Tick	Account Number (for Agrivert use)
Ardley IVC	Agrivert Ardley Ltd	<input type="checkbox"/>	
Showell OWC	Agrivert Ltd	<input type="checkbox"/>	
Cassington AD	Oxford Renewable Energy Limited	<input type="checkbox"/>	
South Mimms IVC	Agrivert Hertfordshire Ltd	<input type="checkbox"/>	
Wallingford AD	Agrivert Wallingford Ltd	<input type="checkbox"/>	
Wallingford OWC	Agrivert Ltd	<input type="checkbox"/>	
West London AD	Agrivert West London Ltd	<input type="checkbox"/>	

COMPANY DETAILS	
Trading Name of Company	
Trading Address	
Post Code	
Registered Address	
Post Code	
If different from above, haulier name, address and post code	





## NEW CUSTOMER ACCOUNT FORM – AQD 203b

INVOICING CONTACT DETAILS			
Key contact name		Position	
Email address		Telephone no	

OPERATIONS CONTACT DETAILS			
Key contact name		Position	
Email address		Telephone no	

TRADE REFERENCE 1	
Company name	
Address	
Postcode	
Telephone number	

TRADE REFERENCE 2	
Company name	
Address	
Postcode	
Telephone number	

VEHICLE DELIVERIES		
<p>If you will be using more than 5 different vehicles to deliver waste to site we will issue you with Booking References for all of your loads</p> <p>If you will be using 5 or less regular vehicles to bring waste into site we will issue you with weighbridge fobs for each vehicle – please list these vehicles below.</p>		
Vehicle Registration	Vehicle Type (ie skip vehicle/Tipper/Artic etc)	Fob Number (for Agrivert use)

**Waste Acceptance Protocol**

Waste deliveries shall not contain any contamination in excess of the acceptable level of contamination and shall not contain any prohibited materials as detailed below.

Product Specification & Rejection Criteria

<b>BIOWASTE</b>	
<b>CONTAMINATION</b>	<b>ACCEPTABLE LEVEL OF CONTAMINATION</b>
<p>Non biodegradable/ non compostable materials, including but not limited to: plastic, textiles, metals, large tree green/ garden waste, treated wood, brown and coloured cardboard, whole newspapers, magazines/directories, concrete, in each case that cannot be accepted under the Anaerobic Digestion or Compost Quality Protocols.</p> <p>For liquid wastes this also includes:                      PTE levels must be less than the upper limit values of digestate as stipulated in PAS 110 Specification (limits available on request)                      For Glycerol as above and also:                      MONG and water content &lt; 5%</p>	<p>Green Waste: 2% by weight of load.</p> <p>AD Plants: 3% by weight of load</p> <p>Primary packaging on foodwaste (packaging in contact with the food product) will be removed prior to loading into the digesters on site and is therefore not classed as contamination.                      Secondary and tertiary packaging will be classed as contamination and will therefore need to fall within the acceptable level above.</p>
<b>PROHIBITED MATERIALS</b>	<b>MAXIMUM CONTAMINATION STANDARD</b>
<ul style="list-style-type: none"> <li>• Noxious weeds</li> <li>• Glass</li> <li>• Cat 1 or 2 ABP waste</li> <li>• Hazardous Waste</li> <li>• Clinical Waste</li> <li>• Nappies</li> <li>• Dog faeces</li> <li>• Residual “black bin” type waste</li> <li>• Malodorous wastes</li> <li>• Any material which gives a positive inhibitor result</li> </ul>	<p>None accepted</p>

**Waste Acceptance Procedure**

Each vehicle will be checked at the weighbridge (using an electronic fob system) to ensure it has been approved to deliver waste.

Each load shall be weighed on entry to Agrivert’s facility and the weight recorded. All invoices will be raised using Agrivert recorded weights.

Agrivert shall undertake a visual and odour inspection of materials delivered to its facility by the customer in accordance with this protocol to ascertain the levels of contamination or prohibited materials present in the load.

If on a visual and odour inspection Agrivert (acting reasonably) considers that the load contains an amount equal to or below the acceptable level of contamination, it will accept and process the load.

If the nature or quality of the waste materially changes from that described on page 1, you will notify Agrivert immediately confirming the new nature of the waste and its continued acceptability under the relevant sites Environmental Permit, the AD or Compost Quality Protocol and PAS100/110 standard.

### **Waste Rejection Procedure**

If on a visual inspection Agrivert (acting reasonably) considers that the load contains Contamination in excess of the acceptable level of contamination or contains any prohibited wastes, Agrivert will, where possible, separate the contamination and/or prohibited materials from the acceptable materials. The weight of contamination and/or prohibited materials shall be recorded.

The customer shall be responsible for the collection and disposal of the remaining contamination at its own cost. Where the customer is unable to collect the contamination on the same day as the waste was delivered, or as otherwise agreed, Agrivert will dispose of any contamination at the customer's cost.

Where this process occurs more than once per week the customer shall pay reasonable management costs accrued by Agrivert for this disposal activity until a solution or management agreement can be agreed.

Notwithstanding the above, the customer may request that Agrivert disposes of any contamination in excess of the acceptable level of contamination or any prohibited materials removed from the load. Agrivert shall dispose of such material in a lawful manner and Agrivert shall recover the cost of doing so from the customer.

Agrivert will email the nominated representative of the customer confirming the presence of contamination and/or prohibited materials. The email shall identify the load (by weighbridge ticket) and shall have attached to it the evidence of the weights of such materials, the evidence of the weight of the original load and colour photographs of the rejected contamination.

### **Waste Carrier Licence**

You must register as a waste carrier, broker or dealer if you do any of the following as part of your business:

- transport your own waste regularly (from January 2014)
- transport or dispose of waste for someone else
- buy or sell waste
- act as a waste broker (arrange for someone to handle other people's waste)

Please tick to confirm you have supplied us with a copy of your Waste Carrier Licence, and that you will provide us with a new copy when your current one expires.

**Waste Transfer Notes**

The Waste (England and Wales) Regulations 2011 requires that the producer and receiver of waste record waste transfers. For **repeat transfers** you can use a '**season ticket**'. This is a single transfer note that can cover multiple transfers over a period of up to 12 months.

You can agree to use a season ticket if all of the following stay the same:

- the parties involved in the transfer (the waste producer and the waste carrier or waste disposal business)
- the description of the waste being transferred
- the place where the waste is transferred from one person to the other

Issuing a season ticket means that we can provide your vehicle(s) with an electronic swipe card(s), to make weighing in and out of the site much quicker.

**Agrivert's Annual Waste Transfer Note should be supplied to you as a separate form.**

Please tick to confirm you have either:

Returned Agrivert's Annual Waste Transfer Note with this application

Returned your own Annual Waste Transfer Note with this application

Will supply a Waste Transfer Note with each delivery

**Insurances**

Please tick to confirm that your company holds and will maintain motor vehicle insurance comprising a minimum of £5 million third party property damage cover and public liability insurance with £5 million indemnity.

**Terms & Conditions – by applying for a credit account you are accepting the Full Standard Terms and Conditions (available on request) of the Agrivert Group of Companies, which include:**

1. You will comply with all site rules while on an Agrivert site.
2. You will weigh in and out of site, recording the tonnage of green and/or food waste deposited.
3. The weight of waste delivered to site will be calculated from Agrivert's weighbridge. A copy of the weighbridge ticket will be given to the driver for the buyer's records.
4. The agreed gate fee for the waste will not include the transport cost. These costs will be the responsibility of the waste producer.



**NEW CUSTOMER ACCOUNT FORM – AQD 203b**

- 5. Agrivert reserve the right to reject a load of waste if it is highly contaminated with contrary materials or does not reflect the waste description provided on the waste transfer note.
- 6. Agrivert’s payment terms are strictly 14 days from date of invoice. Agrivert reserves the right to charge a penalty interest of 4% over the base rate for late payment. Payment will be made directly to the Agrivert company with whom your account is set up
- 7. All weighbridge transactions recorded against fobs issued to you will be assumed to be carried out with your consent unless Agrivert Ltd has been notified that the fob has been damaged/lost/stolen. Please notify us immediately if any weighbridge fob is lost/stolen or damaged.

Print name.....

I agree to all the above information and the contract terms and conditions

Signed (customer)..... Date.....

**Please return this form to Agrivert either:**

By post:

FAO [INSERT NAME OF PERSON DEALING WITH ACCOUNT]  
 Agrivert Ltd  
 The Stables  
 Radford  
 Chipping Norton  
 Oxfordshire  
 OX7 4EB

Or by email:

[INSERT EMAIL ADDRESS OF PERSON DEALING WITH ACCOUNT@agrivert.co.uk]



## Control Of Documents And Records QP 02

### 1 Objectives

This procedure establishes how the documents and records required by the management procedures, work instructions and process flow charts of the integrated Business Management System are controlled.

### 2 Responsibilities

It is the responsibility of all employees and contractors to follow the requirements of this procedure and for managers responsible for a specific contract, site or activity to ensure that the necessary documents are provided and maintained and the necessary records taken and kept.

### 3 Procedure

#### 3.1 Business Management System Documents

3.1.1 The Business Management System documents are those which define the company's Business Management System and are:

- 1) The integrated Business Management System manual, incorporating the quality, environmental and health and safety policies
- 2) Management procedures (QP)
- 3) Work instructions (WI)
- 4) Process flowcharts (APC's)
- 5) Agrivert Quality Documents (AQD)

Documents within the Business Management System which have a suffix of 'e' indicates documents referring to Human Resources, for example AQDe and 'c' indicates construction documentation, for example QPc.

3.1.2 The Compliance Department shall maintain the Business Management System documents. They are available as "read only" documents on the company computer system to limit access to alter them to personnel acting on the instructions of the relevant Line Manager to be approved by the Compliance Manager or Director. Access to these documents is available to Agrivert personnel working on sites away from Head Office by a remote connection.

3.1.3 Any hard copies of the Business Management System documents must be considered as uncontrolled.

3.1.4 Where relevant, any proposed changes to Business Management System documents shall be discussed with relevant personnel, in accordance with the Internal Communications and Consultation procedure (QP20).

3.1.5 Any amendments shall be notified to relevant personnel where appropriate by email via a BMS Alert. Line Managers must communicate the changes where users do not have email access, and ensure that changes are implemented.

3.1.6 Changes to Quality Procedures will be identified by a dark line in the margin and the date of change / update shown. The identification of changes will be removed as a minimum 1 year after the change, by the compliance

## Control Of Documents And Records QP 02

department with the approval of the Compliance Manager. Changes to documents will be kept in the appropriate superseded folder (q drive) once changes have been agreed with appropriate Line Managers. Amendments made to all Agrivert BMS documents are done using track changes. A version with track changes is to be saved in the appropriate superseded document folder on the Q Drive. The Q Drive is separate from the G drive to prevent superseded documents appearing in a general search.

### 3.2 Documents and records referred to in the Business Management System

#### Internal Documents

3.2.1 These documents are defined as those to which the Business Management System refers, e.g., risk assessments, audit schedules, etc.

3.2.2 Where these documents are based on a company standard format, those formats are listed in the INDEX (AQD 001). All documents listed on the INDEX (AQD 001) are maintained on the computer system and controlled as in Section 3 of this procedure. Where the document is a blank form to be completed by the user, the form may be copied ('save as' facility on Microsoft) and used to generate a specific document or record.

3.2.3 Completed documents and records shall be maintained in the relevant file at Head Office or an identified offsite location and for the length of time specified on the INDEX (AQD 001). Records shall only be destroyed when the minimum time has elapsed and following a written instruction from the relevant Executive Director, a copy of which shall be retained by the Compliance Department.

Contract specific documents, e.g., correspondence, tender/contract documents, meeting minutes, instructions, etc. shall be filed in the relevant contract file and appropriate copies held on site by the Line Manager and/or in Head Office. On completion of the contract the files shall be amalgamated and archived. The records shall be held at Head Office or an offsite location in a controlled environment for the duration of time specified in the contract, and/or as specified in AQD 001. The earliest date the records can be destroyed will be displayed on the outside of the archive box. Written instructions from the relevant Executive Director to destroy files shall be signed and approved by the Compliance Director and retained by the Compliance Department.

3.2.5 Records of environmental, health and safety and quality performance shall be maintained by the Compliance Director with the records of management review for four years.

#### External Documents

3.2.6 The Compliance Department maintains an External Document INDEX (AQD 003) which includes legislation and standards that affect the business that form part of the requirements of the integrated Business Management System. This list is reviewed annually and is added to or marked superseded or obsolete as appropriate in response to information obtained from sources including the following:



## Control Of Documents And Records QP 02

- a) HSE book catalogue
- b) HSE website
- c) Subscription to ENDS report
- d) Environment Agency website
- e) IOSH magazine – Safety and Health Practitioner
- f) Emailed information from Business Link
- g) DEFRA

In addition to the annual review, the relevant department head has a responsibility to communicate changes to documents which affect the business to the relevant departments. Communicated changes are to be logged on the External Document INDEX (AQD 003).

Documents which are no longer in use are transferred from External Document INDEX (AQD 003) to External Document INDEX (of docs not in Use) (AQD 003a).

3.2.7 The implication of amendments/additions to the external documents list shall be assessed by the relevant Executive Director or nominee as each document is obtained. In addition, the importance of new legislation, guidelines, etc. is also assessed and reviewed as part of the management review (Agenda 2) in accordance with the Management Review (QP01) procedure.

### Supporting Documents

AQD 001 INDEX  
AQD 003 External Documents INDEX  
AQD 003a External Document Index (of docs not in use)  
QP 01 Management Review  
QP 20 Internal Communications and Consultation  
Agenda 2