AD PLANT, WHITWICK MANOR - PERMIT APPLICATION SUPPORTING DOCUMENT

STL Energy Limited

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1 Introduction

1.1 Overview

1.1.1 This document contains supporting information which accompanies the Environmental Permit (EP) application being submitted for the operation of an Anaerobic Digestion (AD) Facility to be operated at Whitwick Manor, Herefordshire. This application has been completed on behalf of STL Energy Limited by Oaktree Environmental Ltd.

1.2 Proposed Activities

1.2.1 The proposed process will be classed as a bespoke installation under the Environmental Permitting (England and Wales) Regulations 2016 ("the permitting regulations"). The activities being applied for are summarised in the tables below.

Table 1.1 – Proposed Schedule 1 Activities

Site Name	Schedule 1 Part 2 Reference Under Permitting Regulations	Description of the Activity	Activity Capacity	Waste Framework Annex I and II Description
Whitwick Manor AD Plant	Section 5.4 Part A1(b)(i)	Anaerobic digestion of non-hazardous wastes	176,000 tonnes/annum	R3: Recycling/reclamation of organic substances which are not used as solvents

Table 1.2 – Directly Associated Activities

Site Name	Directly Associated Activity	Waste Framework Annex I and II Description
Whitwick Manor AD Plant	Physical treatment for the purpose of recycling	R3: Recycling/reclamation of organic substances which are not used as solvents
	Emergency flare operation	D10: Incineration on land
	Gas upgrading	N/A
	Raw material storage	N/A

Site Name	Directly Associated Activity	Waste Framework Annex I and II Description
	Gas storage	R13: Storage of waste pending any of the operations numbers R1 to R12 (excluding temporary storage, pending collection, on the site where the waste is produced).
	Digestate storage	R13: Storage of waste pending any of the operations numbers R1 to R12 (excluding temporary storage, pending collection, on the site where the waste is produced).
	Surface water collection and storage	N/A
	Medium Combustion Plant (2 x Combined Heat and Power (CHP) Units) fuelled by biomethane/biogas	N/A
	2 x backup boilers fueled by biomethane/biogas	N/A
	Discharge of cleaned water	N/A

1.3 Details of Site Operator

1.3.1 This permit has been applied for by STL Energy Limited.

1.4 Permit Boundary

1.4.1 Reference should be made to Appendix I for a map showing the proposed permit boundary for the site.

1.5 Documents Consulted

1.5.1 Legislation and Guidance

1.5.1.1 The following legislative and guidance documents have been consulted for the purpose of completing this supporting document:

- Environmental Permitting (England and Wales) Regulations 2016 (as amended).

- Permitting Risk Assessment Guidance on government website (https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits);
- https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit;
- H5 Guidance, Site Condition Report – Guidance and Templates, V3.0, Environment Agency, 2013;
- H4 Odour Management, Environment Agency, 2011;
- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 Establishing Best Available Techniques (BAT) Conclusions for Waste Treatment, under Directive 2010/75/EU of the European Parliament and of the Council;
- How to Comply with your Environmental Permit: Additional Guidance for Anaerobic Digestion. Reference LIT 8737, Version 1, November 2013; and,
- Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants.

2 Operating Techniques

2.1 Overview

2.1.1 The proposals are for the development of an AD plant. AD is a biological process, which breaks down organic matter within biodegradable feedstocks in the absence of oxygen, through the actions of a variety of micro-organisms. The plant will be capable of processing up to 176,000 tonnes/annum of feedstocks. These will comprise up to 100,000 tonnes/annum poultry manure, up to 16,000 tonnes/annum apple pomace, 35,000 tonnes of digestate from other AD operations and up to 25,000 tonnes/annum of liquid based wastes from agricultural and drinks industry processes.

2.1.2 Reference should be made to Appendix I for the proposed site layout plan. A process flow diagram is included in Appendix X.

2.2 Detailed Description of Process

Feedstocks

2.2.1 The following table provides specific details of the wastes and feedstock that will be accepted.

Table 2.1 – Types and Quantities of Wastes/Feedstocks to be Used in AD Process

Waste Stream	Maximum Throughput
Poultry manure	100,000 tonnes/annum
Digestate	35,000 tonnes/annum
Apple pomace	16,000 tonnes/annum
Liquid waste from agricultural processes and drinks industry	25,000 tonnes/annum
	TOTAL = 176,000 tonnes/annum

Feedstock Reception

2.2.2 All feedstocks will be received over a weighbridge. The poultry manure will be stored within an enclosed feedstock building with roller shutter doors. The building will be maintained under negative pressure, with exhaust air from the building directed to the CHP plant for abatement of residual ammonia and odour. Liquid wastes and digestate will be unloaded direct to enclosed tanks prior to introduction to the process. Apple pomace will be stored within clamps. Any liquid residues and/or recirculation water from the end of the process will be stored in one of the large tanks ready for feeding hourly into the pre-treatment process.

Feeders

2.2.3 There will be 4 walking floor feeders of approximately 100m^3 capacity, sufficient for 12 hours. These will be filled twice a day, morning and evening.

Pre-Treatment

2.2.4 There will be three hydrolysis/pasteurisation tanks, each being 1000m^3 in volume to allow for the feedstocks to be pre-processed by hydrolysis, pasteurisation and for ammonia removal. Approximately 55% of the ammonia is removed before the digestion process to prevent the nitrogen from inhibiting the digestion process and to extract 55% of the nitrogen into a concentrated ammonium sulphate solution which can be sold as a fertiliser. A large 6250m^3 ammonium sulphate storage tank is provided for.

Anaerobic Digestion

2.2.5 The pre-treated material is pumped into 4 primary digesters, each 6250m^3 in volume and then into two secondary digesters, also providing 6250m^3 of volume. These will be maintained at over 40 Celsius for the digestion process and fully stirred. The biogas that is produced will bubble up to the headspace in the double membrane roofs. The roof space has support straps and a de-sulphurisation net as well as a flexible gas membrane and air-blown outer weather membrane. The resultant biogas is around 55% methane (CH_4) and

45% carbon dioxide (CO_2) and is piped via desulphurisation tower(s) for use in the CHP units and the biomethane plant.

Nutrient Recovery

2.2.6 The digestate overflow will be treated to extract nutrients in a multi-stage process where the majority of the remaining nitrogen, phosphates and potassium are removed. These processes collect the nutrients in a concentrated form including ammonium sulphate and calcium phosphate, which can be easily transported and then applied as fertilisers where and when agronomically required.

Digestate Separation

2.2.7 The low nutrient digestate is then separated with screw presses and/or decanter centrifuges into a benign solid soil improver and a liquid stream. The liquid stream is still around 1% solids so may require further processing through microfiltration or reverse osmosis/ion exchange plant to create a liquid stream suitable for re-circulation or final polishing in a reed bed before discharge.

Reed Bed and Buffer Lagoons

2.2.8 An area of around 5.33ha has been allocated for a reed bed system which further cleans the water. A buffer storage lagoon has been provided for to allow for maintenance and process control. A second lagoon has also been provided for to capture rain from the site which can be used in the AD process or discharged to the local ditch network. Reference should be made to Appendix VIII for detailed information on reed bed design.

Biomethane Plant

2.2.9 The biogas is first dehumidified and polished with carbon filters prior to compression. The clean dry biogas is then compressed to around 15bar before passing through a 3-stage membrane plant which separates out the gas into a c.98% pure CH_4 biomethane stream and a 99% pure CO_2 stream. The biomethane stream is then piped to the Network Entry Facility (NEF) and then onto the gas grid. The CO_2 stream is then piped to the CO_2 liquefaction plant.

Network Entry Facility (NEF) and Compressor

2.2.10 The NEF unit effectively checks the quality of the biomethane gas meets the network entry requirements. A propane injection system is required to adjust the calorific value (CV) of the gas to meet network settings and also the gas is required to be compressed up to between 19-21bar to match the network pressure.

CO_2 Plant / Dry Ice manufacture

2.2.11 The CO_2 stream is then compressed to around 18bar before cooling to around minus 30 degrees Centigrade to liquify the gas. It passes through a reboiler so that any contaminants including a small amount of residual methane can be separated. This 'reject' gas is then piped back to the AD plant so that the methane can be recovered. A building for a dry ice (solid CO_2) plant can treat a proportion of the CO_2 stream to make dry ice for use in the catering/food delivery industry. The balance of the liquid CO_2 is stored in vacuum insulated tanks prior to collection by Heavy Goods Vehicle (HGV) tankers.

CHP Units

2.2.12 Some of the biogas is used directly in two $1MW_e$ CHPs which are provided to supply power to the plant as well as the farm and grain store. In addition to the green electricity generated the units generate around 2MW of heat which is used to heat the digestion tanks, pre-treatment and nutrient recovery processes. The rated thermal input of each CHP unit will be 2.22MW. Heat from the process will also be used for grain drying in the adjacent grain store. The grain drying activity does not form part of the permitted activities. The grain store is located adjacent to the permit boundary, as shown on the site layout plan.

Backup Boilers

2.2.13 Two backup boilers which can run on biogas will be provided for periods of extreme weather or when a CHP is taken off-line for servicing to allow the plant to maintain its operating temperature. The rated thermal input of each boiler will be 526KW.

Flare

2.2.14 A dual stream flare is to be installed to allow either excess biogas or rejected biomethane to be burned at a high temperature so as to prevent any methane emissions. In practice, it is anticipated that this will be used rarely, such as during maintenance of equipment or for a few minutes when the biomethane is adjusted prior to injection into the grid.

2.3 Environmental Management System

2.3.1 An Environmental Management System (EMS) will be implemented on a day to day basis at the site. This will contain measures and procedures to ensure operations and associated emissions are sufficiently controlled to prevent potential for adverse impacts on air, land or water and to ensure that site staff are appropriately trained to carry out their duties with protection of the environment as a fundamental requirement. Reference should be made to Appendix VII for a copy of the EMS.

3 Raw Materials and Resources

3.1 Table 3.1 outlines the raw materials that will be used along with expected quantities and any relevant hazard codes. Justification for raw materials and resources used has also been provided in the table. The site operator will use appropriate measures to ensure that raw materials and resources are used efficiently and records will be maintained of raw material and resource use.

3.2 Manufacturer's guidelines will be followed when using specific fuels and consideration will be given to environmental impacts when purchasing new plant and equipment for the site. Any compounds utilised as described below will be used as recommended by specialist suppliers. Any quantities of materials used will be the minimum necessary to undertake the required process. A review of raw and auxiliary materials used on site will be carried out on an annual basis to assess whether any alternative materials can be used which would result in improved environmental performance. The reviews will ensure raw materials and resources used are appropriate, are used efficiently and any options for reduction in use identified, as applicable.

3.3 Water use will be regularly monitored and will be kept to a minimum as far as is practicably possible. Opportunities for reduction in water use will be regularly reviewed.

Table 3.1 – Raw Materials

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards/Environmental Impact	Alternatives	Justification for Raw Material Used
Water	Liquid	Variable	Storage lagoon as shown on layout plan	N/A – non-hazardous	No suitable alternative	Required for successful operation of process
Liquefied Petroleum Gas (propane)	Liquid	3,850 litres/annum	Stored within purpose designed specialist storage tanks	Flammable liquid. Irritant to skin and eyes. Toxic to nervous system. Repeated or prolonged exposure to substance can produce damage to target organs	Butane, natural gas, oil, solid fuels such as biomass	Relatively clean fuel source in comparison to other liquid and solid fuels. Propane chosen over butane given the lower boiling point and therefore more suitable for use in colder conditions, ensuring that fuel supply is always available for the process
Lubricant Oil	Liquid	Variable	Stored in sealed tanks	Irritant to skin and eyes. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended oil mist exposure limit.	No suitable alternative	Required as part of the preventative maintenance of the plant
Activated Carbon	Solid / Filter	24m^3/annum	Not stored on site	Flammable solid. Irritant to eyes. May cause respiratory irritation.	No suitable alternative	Required as part of the biological process to remove organics and abate emissions of organic compounds and odour

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards/Environmental Impact	Alternatives	Justification for Raw Material Used
Diesel	Liquid	100,000 litres/annum	Bunded storage on site	Combustible liquid, harmful if swallowed, causes skin irritation, suspected of causing cancer, may be fatal if swallowed and enters airways, may cause damage to airways through prolonged or repeated exposure	No suitable alternative. To be used in the event of disruption/failure of gas fired CHP plant and for fueling mobile plant and equipment on site	Required to power mobile plant and machinery. Ensures that fuel is always available for powering plant and machinery for successful operation of process.
Ferrous chloride	Liquid	180 tonnes/annum	Integrated within purpose designed specialist digester tank	A corrosive chemical. Harmful or fatal if swallowed. Harmful if inhaled. Eye or skin contact may cause irritation. Contact with liquid or vapor form of this chemical may cause severe injury or death.	No suitable alternative	Required as part of the biological process to remove sulphur and abate emissions of organic compounds and odour from the plant.
Sulphuric acid	Liquid	9,500 tonnes/annum	Stored in appropriately bunded tank(s)	Causes severe skin burns and eye damage. May be corrosive to metals.	No suitable alternative	Required for nitrogen recovery
Magnesium Chloride	Liquid	730 tonnes/annum	Stored in appropriately bunded tank(s)	Causes eye irritation. Causes skin irritation. May cause respiratory irritation.	No suitable alternative	Required for phosphate recovery

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards/Environmental Impact	Alternatives	Justification for Raw Material Used
Ad blue	Liquid	20,000 litres/annum	Stored in sealed containers/tank, in accordance with Health and Safety requirements for substance	Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure. May cause discomfort if swallowed.	None	As recommended by manufacturer to ensure reliable, efficient operation of vehicles and mobile plant.
Maintenance oils/lubricating oils	Liquid	Variable, based on maintenance schedule recommended by manufacturer.	Stored in sealed containers, in accordance with Health and Safety requirements for substance	Constant skin exposure may cause dryness or chapping. May cause physical irritation to eyes if not removed	None	As recommended by manufacture of mobile and static plant and machinery.

4 Wastes

4.1 The table below outlines the anticipated wastes, EWC code, relevant disposal or recovery code, annual throughout and details of how waste disposal is minimised.

Table 4.1 – Types and Quantities of Waste and Recovery/Disposal Routes

Waste Stream	Annex IIA or IIB (Disposal and Recovery Codes) Description	European Waste Catalogue (EWC) Code	Maximum Throughput	Details of How Waste Disposal is Minimised
Poultry manure	R3	02 01 06	100,000 tonnes/annum	Waste imported to site for treatment/recovery
Liquid wastes from agriculture and drinks manufacturing processes	R3	02 01 01 02 03 01 02 03 04 02 03 05 02 04 03 02 05 01 02 05 02 02 06 01 02 06 03 02 07 01 02 07 02 02 07 04 19 06 03 19 06 04 19 06 05 19 06 06 19 08 09	25,000 tonnes/annum	Waste imported to site for treatment/recovery
Digestate	R3	19 06 06	35,000 tonnes/annum	Waste imported to site for treatment/recovery
Carbon filters	R1,R7,D10	To be determined (TBD)	24 tonnes/annum	Disposed/recovered at suitably authorized facility
Biomethane compressor oil filters	R1,R9,D10	TBD	8 tonnes/annum	Disposed/recovered at suitably authorized facility
Membrane pre-filters	R1,R7,D10	TBD	16 tonnes/annum	Disposed/recovered at suitably authorized facility
Engine filters	R1,R7,D10	TBD	16 tonnes/annum	Disposed/recovered at suitably authorized facility
Compressor oils	R1,R9,D10	TBD	3m^3/annum	Disposed/recovered at suitably authorized facility
Engine oils	R1,R9,D10	TBD	4m^3/annum	Disposed/recovered at suitably authorized facility

Waste Stream	Annex IIA or IIB (Disposal and Recovery Codes) Description	European Waste Catalogue (EWC) Code	Maximum Throughput	Details of How Waste Disposal is Minimised
Inert skip waste	R5	TBD	12 tonnes/annum	Disposed/recovered at suitably authorized facility
General waste (office etc	R1,R4,R5,D10,	TBD	1 tonne/annum	Disposed/recovered at suitably authorized facility

4.2 EC Directive 2006/12/EC consolidated and replaced directive 75/442/EC but maintained the duty on member states to encourage the hierarchy approach to managing waste whereby the most desirable option is to prevent/minimise waste. The site operator is committed to following the above requirements at STL Energy Ltd. The operator will carry out an annual review to demonstrate that the best environmental options are being used for dealing with the waste from the installation and to ensure that resource efficiency is maximised.

4.3 For all wastes received on site, the following information will be recorded:

- The date and time of delivery;
- The name and address of the waste producer;
- The detailed and accurate description of the waste including type, quantity (in tonnes or cubic metres) and EWC codes;
- How the waste is contained e.g. loose, container type;
- The carrier's name and address;
- Driver’s name, signature and vehicle registration No;
- Signature or initials of person’s producing/accepting/inspecting/carrying the waste;
- Additional handling details/notes made by the driver after inspection of the load;
- SIC code of the premises which produced the waste;
- Waste hierarchy declaration; and,
- Information on previous treatment of the waste e.g. manual or mechanical.

4.4 Reference should be made to the site EMS in Appendix VII for more details of waste handling and acceptance procedures.

5 Emissions to Air, Land and Water

5.1 Fugitive Emissions to Air

5.1.1 The AD process will be enclosed and therefore there will be negligible potential for fugitive emissions from the process itself. Poultry manure will be delivered to site in covered trailers and unloaded to an enclosed building. Therefore, this presents negligible potential for fugitive emission. The manure storage area will maintained under negative pressure with exhaust air abated within the CHP plant. This will ensure that most residual ammonia and odour is destructed. Liquid feedstocks and digestate will be delivered to site in enclosed tankers and unloaded via enclosed line to storage tanks. Apple pomace and crop wastes will be stored within clamps, prior to transfer to the process.

5.2 Point Source Emissions to Air

5.2.1 There will a number of point source (channelled) emissions to air associated with the process, including the following:

- Emission points A1 and A2 - Two CHP Units (Edina MWM 1000KW_e TCG2020 V12M), fuelled by biogas/biomethane – served by exhaust flues 7m in height from ground level. Each CHP unit will have a rated thermal input of 2.22MW;
- Emission points A3 and A4 - Two back up boilers (Ryla, Twin Viesmann 500KW_{th} output), fuelled by biogas/biomethane – served by exhaust flues 6.5m in height from ground level. Each boiler will have a rated thermal input of 526KW;
- Emission point A5 - Safety flare (Uniflare Bivalent dual stream UF10-2600 high temperature), to safely combust excess biogas/biomethane, 8.293m in height from ground level; and,
- Emission point A6 – stack associated with biogas upgrading unit.

5.2.2 Reference should be made to the layout plan in Appendix I for details of point source emission (stack) locations.

5.2.3 The CHP units will be of the latest design with over 42% electrical efficiency and an overall efficiency of 85%, designed to ensure complete and efficient combustion. The flare will be

designed to achieve a minimum 0.3 second residence time at 1000 degrees Celsius to ensure complete and efficient combustion.

5.2.4 The tables below contain expected process parameters for the emission points, which is based on information provided by the technology provider.

Table 5.1 - Expected Emission Source Process Parameters – Proposed Flare

Process Parameter	Value
Flare National Grid Reference (NGR) (X,Y)	360462.014, 245590.864
Exhaust internal diameter (m)	2.436
Flare height (m)	8.293
Expected Exhaust efflux velocity ($m.s^{-1}$)	11.5
Expected Exhaust volumetric flowrate ($m^3.s^{-1}$)	53.6
Expected Exhaust volumetric flowrate, normalised to reference conditions, 3%O_2 dry gas, 273K, 101.3Kpa ($Nm^3.s^{-1}$)	4.14
Expected stack efflux temperature (K)	1273
Expected oxygen content of exhaust gas (dry basis) (v/v, %)	14.07
Expected moisture content of exhaust gas (v/v, %)	6.53
Expected absolute stack pressure (KPa)	101.3

Table 5.2 - Expected Emission Source Process Parameters for CHP Exhausts

Process Parameter for Each CHP Exhaust	Value
Stack NGRs (X,Y)	CHP 1 = 360531.772, 245699.903 CHP 2 = 360536.674, 245703.628
Exhaust internal diameter (m)	0.325
Stack height (m)	7
Expected Exhaust efflux velocity ($m.s^{-1}$)	24.59
Expected Exhaust volumetric flowrate ($m^3.s^{-1}$)	2.04
Expected Exhaust volumetric flowrate, normalised to following reference conditions: 5%O_2 dry gas, 273.15K, 101.3Kpa ($Nm^3.s^{-1}$)	0.8
Expected Exhaust volumetric flowrate, normalised to following reference conditions: 15%O_2 dry gas, 273.15K, 101.3Kpa ($Nm^3.s^{-1}$)	2.14
Expected Exhaust volumetric flowrate, normalised to following reference conditions: 273.15K, 101.3Kpa ($Nm^3.s^{-1}$)	1.33
Expected stack efflux temperature (K)	418

Process Parameter for Each CHP Exhaust	Value
Expected oxygen content of exhaust gas (dry basis) (v/v, %)	10.33
Expected moisture content of exhaust gas (v/v, %)	9.71
Expected absolute stack pressure (KPa)	101.3

Table 5.3 - Expected Emission Source Process Parameters for Backup Boiler Exhausts

Process Parameter for Each Backup Boiler Exhaust	Value
Stack NGR (X,Y)	Backup Boiler 1 = 360510.583, 245713.65 Backup Boiler 2 = 360514.431, 245716.555
Exhaust internal diameter (m)	0.35
Stack height (m)	6.5
Expected Exhaust efflux velocity ($m.s^{-1}$)	1.8
Expected Exhaust volumetric flowrate ($m^3.s^{-1}$)	0.173
Expected Exhaust volumetric flowrate, normalised to following reference conditions: 3%O_2 dry gas, 273.15K, 101.3Kpa ($Nm^3.s^{-1}$)	0.094
Expected Exhaust volumetric flowrate, normalised to following reference conditions: 273.15K, 101.3Kpa ($Nm^3.s^{-1}$)	0.097
Expected stack efflux temperature (K)	488
Expected oxygen content of exhaust gas (dry basis) (v/v, %)	3.5
Expected moisture content of exhaust gas (v/v, %)	0.1
Expected absolute stack pressure (KPa)	101.3

5.2.5 The flare will be required to meet emission limits in accordance with EA Guidance on monitoring of enclosed landfill gas flares. These are summarised in the table below.

Table 5.4 – Flare Pollutant Emission Limits

Pollutant	Maximum Emission Concentrations Normalised to 273K, 101.3KPa, dry gas, 3% O_2 ($mg.Nm^{-3}$)
NO_x	150
Total Volatile Organic Carbon (TVOC)	10
CO	50

5.2.6 Given that the rated thermal input of each CHP unit is greater than 1MW, they will be required to comply with emission limits within the Medium Combustion Plant Directive (MCPD). The MCPD contains emission limits for NO_x and SO_2. These are outlined within the table below. Additional limits will also apply for CO, Total Volatile Organic Compounds (TVOC) including methane and non-methane VOCs. The plant will include substantial abatement for VOCs with the biogas subject to carbon filtration. The subsequent combustion within the CHP units or boilers will provide further destruction of volatile compounds. As such, the maximum emission concentration presented in the tables below for non-methane VOCs for the boilers and CHP units are considered to provide a conservative estimate of residual concentrations.

Table 5.5 – CHP Pollutant Emission Limits

Pollutant	Maximum Emission Concentrations Normalised to 273.15K, 101.3KPa, dry gas, 15% O_2 ($mg.Nm^{-3}$)	Maximum Emission Concentrations Normalised to 273.15K, 101.3KPa, dry gas, 5% O_2 ($mg.Nm^{-3}$)	Maximum Emission Concentrations Normalised to 273K, 101.3KPa, ($mg.Nm^{-3}$)
NO_x	190	-	-
SO_2	40	-	-
CO	-	1400	-
Total VOC (Including Methane)	-	1000	-
Total Non Methane VOCs	-	-	10

5.2.7 Emission limits which will apply to the backup boilers are outlined in the table below.

Table 5.6 – Backup Boilers Pollutant Emission Limits

Pollutant	Maximum Emission Concentrations Normalised to 273.15K, 101.3KPa, dry gas, 3% O_2 ($mg.Nm^{-3}$)	Maximum Emission Concentrations Normalised to 273K, 101.3KPa, ($mg.Nm^{-3}$)
NO_x	500	-
SO_2	350	-
CO	1400	-
Total VOC (Including Methane)	1000	-

Pollutant	Maximum Emission Concentrations Normalised to 273.15K, 101.3KPa, dry gas, 3% O_2 ($mg.Nm^{-3}$)	Maximum Emission Concentrations Normalised to 273K, 101.3KPa, ($mg.Nm^{-3}$)
Total Non Methane VOCs	-	10

5.2.8 Potential impacts from point source air emissions have been assessed within an emissions modelling assessment, demonstrating that potential impacts as a result of residual emissions to air will not be significant. Reference should be made to Appendix II for a copy of the modelling assessment.

5.3 Point Source Emissions to Water

5.3.1 Reference should be made to the water risk assessment within Appendix IX for details of point source emissions to water and potential impacts. This demonstrated that potential impacts will not be significant. Emission points are illustrated on the site layout plan within Appendix I.

5.4 Point Source Emissions to Land

5.4.1 There will be no point source emissions to land from the process.

5.5 Point Source Emissions to Sewer

5.5.1 There will be no point source emissions to sewer from the process.

5.6 Odour Emissions

5.6.1 Given the enclosed nature of the AD process and nature of the AD process itself, which includes the breaking down of odour generating substances, odour is not expected to be a significant issue. However there is potential for odour emissions associated with the transportation of feedstocks to site, storage and transfer to the process. As such, an Odour Management Plan (OMP) will be implemented during the day to day operation of the plant. Reference should be made to Appendix III for a copy of the OMP, which outlines procedures

for odour control during normal and abnormal operation, monitoring procedures and complaints procedures which will be implemented at the site.

5.7 Noise Emissions

5.7.1 Consideration has been given to potential sources of noise during the detailed plant design stage. Therefore, adequate noise abatement measures have been integrated into plant design. Plant and machinery will be subject to regular maintenance in accordance with manufacturer recommendations to ensure all equipment is in good working order. Any defects/faults that should occur will be rectified/repaired as soon as is practicably possible.

5.7.2 A detailed noise assessment supported by Noise Management Plan (NMP) has been submitted as part of this application, demonstrating that impacts will not be significant in this regard. Reference should be made to Appendix IV for the noise assessment and NMP.

6 Point Source Emissions Monitoring

6.1 Point Source Air Emissions

6.1.1 Reference should be made to the site layout drawing within Appendix I for details of emission point locations. Stack sampling arrangements will be deigned to accord with the following:

- Sampling locations will be designed to meet BS EN 15259 Clause 6.2 and 6.3;
- Sample locations will be at least 5 Hydraulic Diameters (HD) from the stack exit;
- Sample locations will be at least 2 HD upstream from any bend or obstruction; and,
- Sample locations will be at least 5 HD downstream from any bend or obstruction.

6.1.2 The following table outlines proposed methods for monitoring of point source emissions to air, in accordance with the relevant guidance.

Table 6.1 – Point Source Air Emissions Monitoring – Emission Points A1 and A2

Emission Point	Source of Emission Release	Parameter	Frequency of Monitoring	Measurement Method
A1 and A2	Emissions Stacks Serving CHP Units	NO_x	Annual	Manual extractive test – EN14792
		SO_2	Annual	Manual extractive test – EN14791
		CO	Annual	Manual extractive test – EN15058
		Total VOC	Annual	Manual extractive test – EN12619

Table 6.2 – Point Source Air Emissions Monitoring – Emission Points A3 and A4

Emission Point	Source of Emission Release	Parameter	Frequency of Monitoring	Measurement Method
A3 and A4	Emissions Stacks Serving Backup Boilers	NO_x	Annual	Manual extractive test – EN14792
		SO_2	Annual	Manual extractive test – EN14791
		CO	Annual	Manual extractive test – EN15058
		Total VOC	Annual	Manual extractive test – EN12619

Table 6.3 – Point Source Air Emissions Monitoring – Emission Point A5

Emission Point	Source of Emission Release	Parameter	Frequency of Monitoring	Measurement Method
A5	Flare	NO_x	Upon commissioning and in the event that the flare is operational for more than 10 percent of the year	Manual extractive test – EN14792
		CO		Manual extractive test – EN15058
		Total VOC		Manual extractive test – EN12619

6.2 Point Source Water Emissions

6.2.1 The table below outlines emission limits which are proposed for emission point W1. Monitoring is required on a monthly basis. Reference should be made to the water risk assessment within Appendix IX for more details.

Table 6.4 – Point Source Water Emission Limits – Emission Point W1

DETERMINAND	LIMIT
Chloride	30mg/l
BOD	6.5mg/l (O)
pH	Between 6 and 9
Phosphorous	0.05mg/l (P)
Ammoniacal Nitrogen (as N)	0.13 mg/l

7 Energy Efficiency

7.1 Basic Measures for Efficient Use of Energy

7.1.1 All mobile and stationary plant and equipment utilised at the site will be subject to regular maintenance to optimise operating efficiency. A record of fuel consumption will be maintained and will be used to identify any abnormal fuel consumption that requires investigation. All staff will receive appropriate training for operations at the site which will include maintenance procedures and basic housekeeping (e.g. switching lights and equipment off when not in use). Low energy lighting systems will be used within the building.

7.1.2 The operator will review and record opportunities to improve energy efficiency on an annual basis and take any appropriate action as deemed necessary by the review. This will include preparation of an annual report on energy consumption and will identify areas for potential reduction in energy use.

7.1.3 The plant will be a net generator of energy. The CHP units will combust biogas/biomethane to meet the heat and power demand of the plant, maximizing the sustainability.

8 Environmental Risk Assessment

8.1 Reference should be made to the Environmental Risk Assessment (ERA) within Appendix VI for a summary of potential risks to the environment and summary of mitigation that will be used to control potential impacts to an acceptable level.

9 Site Condition

9.1 Reference should be made to Appendix V for a Site Condition Report which includes an assessment of current ground conditions at the site.

10 Best Available Techniques

10.1 An assessment of Best Available Techniques (BAT) has been undertaken against the relevant BAT measures within the following documents:

- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 Establishing Best Available Techniques (BAT) Conclusions for Waste Treatment, Under Directive 2010/75/EU of the European Parliament and of the Council.[1]; and,
- How to Comply with your Environmental Permit: Additional Guidance for Anaerobic digestion. Reference LIT 8737, Version 1, November 2013.

10.2 Reference should be made to Appendix XI for a copy of the BAT Assessment

[1] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 Establishing Best Available Techniques (BAT) Conclusions for Waste Treatment, Under Directive 2010/75/EU of the European Parliament and of the Council.

Appendix I

Site Location Plan, Permit Boundary Plan and Site Layout Plans

Appendix II

Emissions Modelling Assessment

Appendix III

Odour Management Plan

Appendix IV

Environmental Noise Assessment

Appendix V

Site Condition Report

Appendix VI

Environmental Risk Assessment

Appendix VII

Environmental Management System

Appendix VIII

Reed Bed Design Details

Appendix IX

Water Emissions Risk Assessment

Appendix X

Process Flow Diagram

Appendix XI

BAT Assessment

Appendix XII

Accident Management Plan