EPR Bespoke Permit Application

Home Farm Grange

November 2025

Project No.: SOL_25_P007_ENG

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Author	Rhys Morgan
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EPR Bespoke Permit Application

Home Farm Grange

Rhys Morgan
Environmental Consultant

Emily Hingston
Client & Project Manager

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Acronyms and Abbreviations

Name	Description
AD	Anaerobic Digestion
BAT	Best Available Techniques
EA	Environment Agency
OMP	Odour Management Plan
CSTR	Continuously Stirred Tank Reactors
PVRV	Pressure Relief Valve
LDAR	Leak Detection and Repair Plan
BUP	Biomethane Upgrade Plant
BUU	Biomethane Upgrading Unit
CHP	Combined Heat and Power Plant
VOC	Volatile Organic Compound
GEU	Grid Entry Unit
DNO	Distribution Network Operator
GSMR	Gas Safety Management Regulations
ROV	Remote Operated Valve
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations 2002
ATEX	The ATEX Directive 2014/34/EU (Atmospheres Explosible)
SCADA	Supervisory Control and Data Acquisition Equipment
PVRV	Pressure Vacuum Relief Valve
EMS	Environmental Management System
AQA	Air Quality Assessment
PPM	Planned Preventative Maintenance
OTNOC	Other Than Normal Operating Conditions
ELV	Emission Limit Value
MCPD	Medium Combustion Plant Directive
OLR	Organic Loading Rate
OIA	Odour Impact Assessment
NIA	Noise Impact Assessment

NON-TECHNICAL SUMMARY

Engie Renewable Gases UK Ltd (Engie) is making a new bespoke Installation Permit Application for the proposed operation of an agricultural Anaerobic Digestion (AD) Facility at their site in Sherburn-in-Elmet.

The proposed Installation is located at farmland at Low Farm, South Milford, Sherburn in Elmet (LS25 6FW). The proposed site covers an area of approximately 6.78ha and currently comprises undeveloped agricultural ground.

Engie's proposed AD plant will accept up to 100,000 tonnes per annum of feedstock including manures and slurries, maize, silage, whole crop rye, vegetable waste and potato rejects from Home Farm and other local farms. Biogas produced by the digestion process will primarily be upgraded to biomethane for injection into the local gas distribution network, with onsite utilisation in a biogas boiler to provide heat to the site processes when required. Additionally carbon dioxide removed from the biogas during upgrading will be exported for use in the food and drinks industry. Two natural gas fired generators (3MWth) will provide electricity to the plant.

The AD facility will meet the definition of an 'Installation' under the EPR Regulations by virtue of Schedule 1, namely;

Section 5.4 Part A(1)(b)(i) *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving Biological Treatment*

The site will also operate a number of Directly Associated Activities (DAA's) onsite which will include all waste storage, biogas upgrading, raw material storage and handling, combustion plant operation, emergency flare, carbon dioxide liquefaction, wastewater management and surface water discharge.

The natural gas fired generators will be subject to the requirements of the Medium Combustion Plant Directive (MCPD) 2015.

General Process Overview

The proposed anaerobic digestion process can be summarised as follows:

- *Feedstock Reception and Storage*: All wastes will be subject to the sites waste pre-acceptance, acceptance and rejection procedures. Incoming wastes such as manures will be delivered to site and stored within the feedstock reception building. Energy crops and silage will be stored externally within the silage clamps while liquid feedstocks, such as slurries, will be stored in sealed reception tanks:
- *Digestion:* Solid feedstocks are fed to a sealed unit via hoppers, where they are mixed with the liquid feedstocks and recirculated liquids to create a substrate which is pumped into the processing vessel (digester). Within the digester, the substrate is mixed and heated to allow the bacteria to break down the organic matter in the absence of oxygen. During digestion, biogas is continuously produced in the vessels, typically around 55% methane and 45% carbon dioxide:
- *Digestate Separation*: Following digestion, the residual digestate material containing indigestible fibre and nutrients is pumped to a separation system, where the solid fraction is

separated from the liquid fraction. Solid digestate is then stored in the dedicated Digestate Storage Area within the enclosed Separator Building and liquid digestate is stored in the engineered covered digestate lagoon prior to being spread to land as fertiliser at the appropriate time;

- *Biogas Upgrading*: The majority of the biogas produced during the process is upgraded to remove CO_2 and convert to pure biomethane. Biomethane is a clean renewable gas that is compliant with the gas grid specifications and regulations. The biomethane is continuously monitored and metered prior to injection into the gas grid;
- *Carbon Dioxide Recovery*: During biogas upgrading, a side stream of clean compressed CO_2 is produced. Future operations will include recovery and liquefaction of this stream before being sent offsite to an end user;
- *Biogas Combustion*: A small portion of the gas produced will be combusted within the onsite biogas boiler (560kWth). This will produce renewable heat to power the on-site demand during start up and periods of extreme cold weather; and
- *Electricity Generation*: Two natural gas generators will be located onsite to provide electricity to the process. These have a thermal input capacity of 3MWth and as such fall within the requirements of the Medium Combustion Plant Directive 2015 (MCPD).

Emissions to Air

A full Air Quality Assessment (AQA) has been completed as part of this application to demonstrate the impact that this proposed site may have on existing air quality. The AQA quantifies the impact to air from all onsite sources, both point and diffuse emission sources.

The site proposes to operate one biogas boiler, 2 natural gas generators and an emergency diesel generator. The diesel generator is for backup use only when the natural gas generators are not operational and will only be used for a maximum of 50 hours per year. There are two on-site flares which will also only be operated during emergency situations, either as a result of system failure or abnormal gas production.

The first flare will be utilised for biogas destruction during periods of fluctuation and short term offtake interruptions where biogas would otherwise be vented through PVRV to atmosphere. The second flare is intended for destruction of propanated biomethane in the event of a grid rejection. Both scenarios are generally unlikely during normal operation and flare usage will be kept to a minimum in line with BAT and Appropriate Measures.

The reception building is fitted with an odour control unit that removes odour and ammonia prior to releasing gas to atmosphere. Emissions from the Separator Building, liquid feedstock reception tanks and the liquid digestate tank will also be directed to this odour control unit. The odour control unit has been designed to achieve a minimum of 97% ammonia removal efficiency and a minimum 90% odour removal efficiency. The remaining emissions are emitted through a 14m high stack.

Further ammonia emissions have been considered from a variety of sources, including the onsite liquid slurry tanks and the lagoon.

The AQA concludes that given the proposed control measures and the modelling of a worst-case scenario emitters, all potential impacts on human and ecological receptors are considered to be not significant.

Odour Emissions

It is acknowledged that due to the nature of feedstocks accepted at the plant, namely agricultural wastes and crops, there is potential for odour emissions from the site. An Odour Impact Assessment (OIA) has been completed. This has assessed emissions from both point and fugitive odour sources and concludes there will be no significant impact at nearby receptors.

The site will have a hierarchy of odour management and control measures in place to minimise any impact on nearby receptors. This includes (but is not limited to):

- Waste pre-acceptance, acceptance and rejection procedures;
- Storage of wastes and putrescible material within an enclosed feedstock reception building;
- Covering of external feedstock stored within storage clamps;
- Minimisation of handling and transfer times;
- Monitoring of meteorological conditions and managing handling operations accordingly;
- The feedstock reception building & separator buildings are fitted with an extraction and abatement system;
- Good housekeeping measures; and
- Covering of all vessels, tanks and lagoons.

The site will be operated in accordance with its Odour Management Plan (OMP).

Noise Emissions

The site has been designed to minimise potential noise impacts during operation. An Environmental Noise Impact Assessment (NIA) has been completed in accordance with BS4142:2014 and has concluded that there will be no significant impact at the nearest sensitive receptors.

Noise impacts will be assessed upon operation of the plant, and should any mitigation measures be required these will be implemented where necessary.

Fugitive Emissions

The proposed facility will minimise any fugitive releases of process emissions, dust or odour.

There are no inherently dusty materials stored onsite. Feedstock stored externally within the silage clamps is covered. All other raw materials are stored internally within the enclosed feedstock reception building, or within sealed tanks / vessels.

It is acknowledged that there is the potential for fugitive odour and dust emissions during unloading of solid feedstock upon the concrete apron prior to storage within the Feedstock Building. This is required both due to space optimisation and to fully provide visual inspection during offloading activities. Mitigation measures implemented will include; minimisation of drop heights, immediate transfer of material to internal storage and undertaking of unloading activities taking note of weather conditions (i.e. not in particularly windy conditions).

Fugitive methane emissions will be appropriately managed and minimised onsite. A Leak Detection and Repair Programme (LDAR) in accordance with the guidance, will be put in place to monitor and assess these emissions, allowing quick implementation of repairs where required.

Emissions to Controlled Water

There are no proposed process emissions to water associated with the proposed Installation.

Clean, uncontaminated surface water will be discharged to Mill Dike. Two main sources will form this discharge; surface water run-off from the process area, which is first held in an attenuation tank for testing prior to discharge and surface water run-off from clean areas via the detention basin.

Both discharge sources are fitted with penstock valves to prevent discharge to the water course in the event of any pollution incident.

Domestic wastewater is treated via package treatment plant and discharged to water course under consent.

Emissions to Sewer

There are no proposed emissions to sewer associated with the proposed Installation.

Emissions to Land

There are no proposed emissions to ground or land associated with the proposed Installation. There will be soft landscaped areas on site to allow a proportion of surface water to soak away into the soil substrate. This water will be clean and uncontaminated and pose no risk to ground or land.

Waste Management

Waste feedstocks will be appropriately accepted, handled, stored and managed onsite. Minimal waste streams will be generated by the process, primarily limited to domestic wastes, spent filter materials, waste oils and scrap metals.

Digestate produced by the process will be sampled and analysed to ensure compliance with the Anaerobic Digestate Resource Framework (EA, October 2025) and will achieve PAS 110 accreditation. As such, digestate will not be considered a waste.

1. INTRODUCTION

This document has been prepared by Sol Environment Ltd on behalf of Engie Renewable Gases UK Ltd ("Engie" or "the Applicant" hereafter) and provides all the necessary supporting information as required by Environmental Permit Application Forms Part B2, Part B2.5 and B3 issued by the Environment Agency (EA).

Engie are making this application for a Bespoke Installation Permit under The Environmental Permitting (England and Wales) Regulations 2018 (as amended) (referred to as 'EPR Regulations' hereafter) in order to operate an Anaerobic Digestion Facility on their site in Low Farm, Elmet.

1.1 Background

Engie is planning to undertake the construction, development, and operation of an Agricultural Anaerobic Digestion (AD) Facility on farmland located at Low Farm, South Milford, Sherburn in Elmet (LS25 6FW).

Anaerobic digestion is a well-established industrial process of utilizing organic materials, largely organic waste products, to generate two primary outputs; biogas and nutrient-rich digestate. This process involves the decomposition of biodegradable waste materials, such as agricultural residues, food waste, and other green or organic matter, in the absence of oxygen.

At the proposed Engie facility, the majority of the biogas will be upgraded and injected into the local gas distribution network for use as a clean, sustainable fuel source. A portion of the biogas generated will be used on-site within a biogas boiler (560kWth) for the production of heat during start up and extreme weather events, ensuring that the facility operates with a sustainable heat supply. The digestate produced at the facility will be distributed to farms or utilised on site, which offers an environmentally friendly alternative to traditional raw manures and synthetic fertilizers, helping to improve soil health and reducing the impact of conventional farming practices. In the future, the site will also be carrying out liquefaction of gaseous CO_2 which will be containerised and sold as a product.

By implementing this AD facility, Engie aims to contribute to the region's renewable energy infrastructure while supporting local agriculture, reducing greenhouse gas emissions, and promoting a circular economy approach to waste management.

The AD facility will meet the definition of an 'Installation' under the EPR Regulations by virtue of Schedule 1:

Section 5.4 Part A(1)(b)(i) *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving Biological Treatment*

Directly Associated Activities (DAA's) onsite will include all waste storage, biogas upgrading, storage and handling, combustion plant operation, emergency flare, carbon dioxide liquefaction, wastewater management and surface water discharge. Two natural gas generator sets will provide the required energy for the site. These have a thermal input of 3MWth, and as such require regulation as Medium Combustion Plant and Specified Generators under the Medium Combustion Plant Directive 2015 (MCPD).

This application support document, as well as the associated annexes and relevant application forms, provide details of the proposed activities to take place at the facility, including a full description of the proposed operations, details on the waste streams to be accepted, potential emissions and their management, as well as general site operations and the required management plans and procedures.

The list of annexes associated with this application are as follows:

- Annex A – Site Plans;
- Annex B – Technical Data;
- Annex C – Environmental Management System Summary;
- Annex D – Odour Management Plan ;
- Annex E – Odour Impact Assessment;
- Annex F – Site Condition Report ;
- Annex G – Environmental and Climate Change Risk Assessment;
- Annex H - Air Quality Assessment;
- Annex I – Noise Impact Assessment ;
- Annex J – Accident Management Plan;
- Annex K – Operator Competency;
- Annex L – Bioaerosol Risk Assessment;
- Annex M – CIRIA 736 Containment Report;
- Annex N – Director Details; and
- Annex O- MCPD Spreadsheet.

2. SITE DETAILS

2.1 Site Location

The proposed site is located at Land East of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW.

The National Grid Reference for the centre of the proposed site is SE 50420 32210.

The site is located within a semi-rural area, with limited human and designated ecological receptors in immediate proximity. The closest human receptor is approximately 150m south of the site on Mill Lane, with the closest designated ecological receptor approximately 50m west and is designated as a local wildlife site (Ash Tree Dike and Ponds). There is one other UK designated site within the relevant 2km screening distance and no European designated sites within the relevant 10km screening distance.

2.2 Infrastructure and Design

2.2.1 Installation Boundary

The proposed site covers an area of approximately 6.78ha and currently comprises undeveloped agricultural ground.

The proposed installation boundary can be found below in Figure 2.1. All activities will take place within the installation boundary.

A Site Condition Report which provides a baseline conceptual model from the site has been completed and included within *Annex F*.

The Site Condition Report draws on information provided third party data sources and does not identify that the existing site presents either a significant contamination risk, nor does it identify any aspect of the new installation that presents a potential contamination risk to the environment when appropriately managed.

The Site Condition Report includes baseline ground condition data obtained during ground investigation undertaken in July 2025 prior to facility construction.

All aspects of the new Installation have been designed in accordance with the Environment Agency's Pollution Prevention Guidance, Horizontal Guidance Notes and Appropriate Measures.

2.2.2 Site Layout and Design

The proposed installation layout plan can be found below in Figure 2.2 and in *Annex A.*

The site currently comprises an undeveloped agricultural field. The installation will be constructed with appropriate hardstanding, sealed drainage and containment in accordance with CIRIA 376 and will comprise:

- Silage Clamps;
- Feedstock Reception Building;
- Feeders;
- Liquid Feed Tanks;
- Digestion Tank;
- 2 x Post Digesters;

- Biogas Upgrading Plant;
- Digestate Lagoon;
- Grid Connection infrastructure;
- CO_2 Building;
- 1 x Biogas Boiler;
- Separator Building;
- Bund (4m in height surrounding tank area).

Ancillary infrastructure will include:

- Weighbridge;
- Odour Control Unit;
- Attenuation Basin;
- 2 x Flares;
- Propane Tanks;
- Site office;
- Lightning Protection Masts;
- Tanker filling station;
- 2 x Natural Gas Generators;
- Emergency Diesel Generator;
- Transformer;
- Substation.

Site surfacing will comprise concrete along all site roadways and the processing area, asphalt beneath the silage clamps (SSAFFO compliant) and impermeable bentomat in the area of the post digester.

Tanks and Bunds

All storage tanks will be installed with secondary containment and be designed to comply with the following standards and guidance[1] requirements;

- Environment Agency Pollution Prevention Guideline Note 2: Above Ground Oil Tanks (PPG2);
- Environment Agency Pollution Prevention Guideline Note 11: Preventing Pollution on Industrial Sites (PPG11);
- Environment Agency Pollution Prevention Guideline Note 26: Pollution Prevention in the Storage and Handling Drums and Intermediate Bulk Containers (IBC's);
- CIRIA 736: Design of Containment Systems for the prevention of pollution;

[1] It is acknowledged that the EA PPG guidance series has been withdrawn, however they are still considered to be best practice and the principles have therefore been adopted where applicable.

- CIRIA C958: Chemical Storage Tank Systems – Good Practice;
- CIRIA 738: Design of Containment Systems for the Prevention of Water Pollution from Industrial Sites;
- Environment Agency, Biological Waste Treatment: appropriate measures for permitted facilities.

All storage tanks associated with the process are detailed within Table 3.3.

Roadways and External Areas

An internal roadway system has been designed to give safe access and egress around site and to keep raw materials and wastes separate as much as practicable.

Separate segregated pedestrian walkways and car parking areas have been provided to allow for safe access and egress of all personnel at site.

2.2.3 Drainage Arrangement

The site will operate a segregated drainage system.

Domestic effluent from site welfare facilities will be treated at the onsite package treatment plant and discharged to water course under consent.

Leachate generated during feedstock storage will be collected in a dedicated tank and recirculated through the digestion process. The leachate tank will be above ground tank, constructed to an approved standard and fitted with leak detection.

Liquid digestate from the process is collected within the digestate lagoon prior to appropriate use as fertiliser. The lagoon will be appropriately engineered, lined, fitted with leak detection and covered in accordance with BAT and appropriate measures. The lagoon will be constructed in accordance with CIRIA 376.

Surface water run-off onsite will be managed in two separate areas dependent upon contamination risk as outlined below.

Surface water (process area)

The process area is the area surrounding the digestate tanks and including the biogas upgrading plant, CHP units and grid connection. A lined cellular storage tank and type-3 gravelled areas lined with an impermeable membrane surrounding the tanks and associated infrastructure will form the main attenuation features serving this area.

A network of perforated pipes located beneath the gravelled areas will direct runoff to an attenuation tank. The tank will discharge via a pumped connection to Mill Dike at a restricted greenfield (QBAR) rate. A penstock valve will be fitted to the flow control chamber which can be operated in the case of a pollution event. The penstock will seal the system in the event that surface water becomes contaminated with pollution. The lined tank and surrounding gravelled area will operate as a closed system, which can then be tested before release, or tankered away by a licensed operator.

Appropriate bunding will be located on the western, eastern and southern boundary edge to prevent untested fugitive runoff into Mill Dike. The outfall to watercourse will be fitted with a non-return valve to prevent water backing up through the system, resulting in onsite flooding.

Surface water (non-process area)

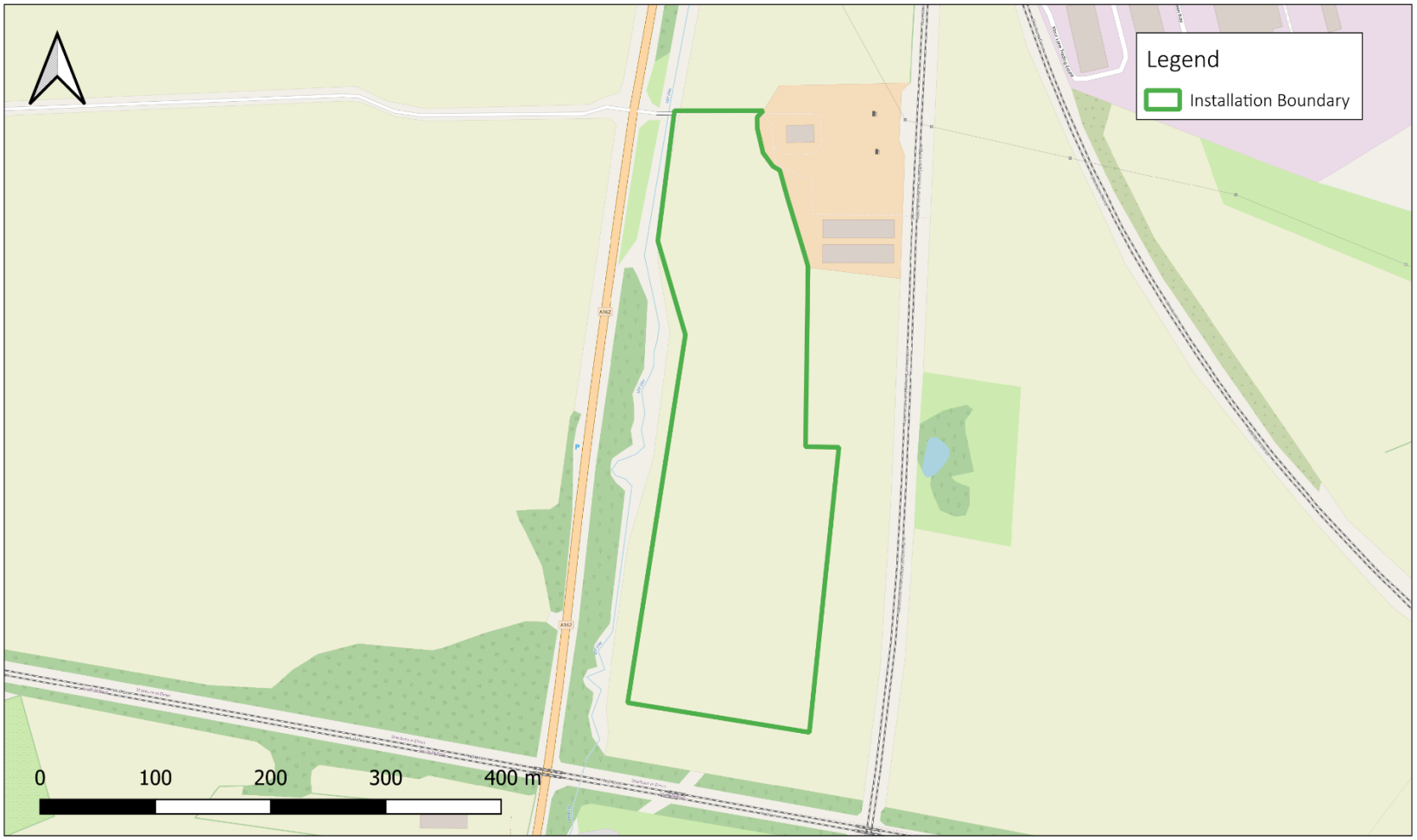
This portion of site does not contain any process features, such as storage tanks, pipework, or anaerobic digestors. As such, the potential for contamination is very low. A detention basin will form the main attenuation feature within the development Site.

Surface water will be directed through drainage gullies located around the perimeter of the buildings and through contouring of the hardstanding areas to an onsite detention basin. The basin will discharge via a pumped connection to Mill Dike at a restricted greenfield (QBAR) rate.

A filter drain along the tarmac access road will provide an initial stage of treatment, before entering the detention basin. The outfall to watercourse will be fitted with a non-return valve to prevent water backing up through the system, resulting in onsite flooding.

In addition to drainage gullies, the current proposed plans feature landscaped areas to allow a proportion of the rainfall to naturally infiltrate into the soil substrate.

The proposed drainage arrangement for the site can be found below in Error! Reference source not found. and in *Annex A*.



Project Number: SOL_25_P007_ENG Doc Ref: Annex B - Site Plans Map Title: Installation Boundary Date: 26/03/2025 Drawn by: RM Checked by: EH	Site Address: Land East of A162, Halstow Energy AD Facility Low Farm South Milford Sherburn in Elmet LS25 6FW	1. Do not scale off this drawing 2. All dimensions to be confirmed on site 3. This drawing is copyright of Sol Environment Ltd 4. This drawing is to be read in conjunction with relevant consultant drawings and specifications 5. QMS Reference: QMS_7.5.39_TEM - Template - GIS Drawing - Horizontal v1

sol environment
a: Unit 5.3 The Paintworks, Bath Road, Bristol, BS4 3EH
w: www.sol-environment.co.uk
e: enquiries@sol-environment.co.uk
t: 01684 572727

Figure 2.1 - Installation Boundary

Figure 2.2 - Installation Layout Plan

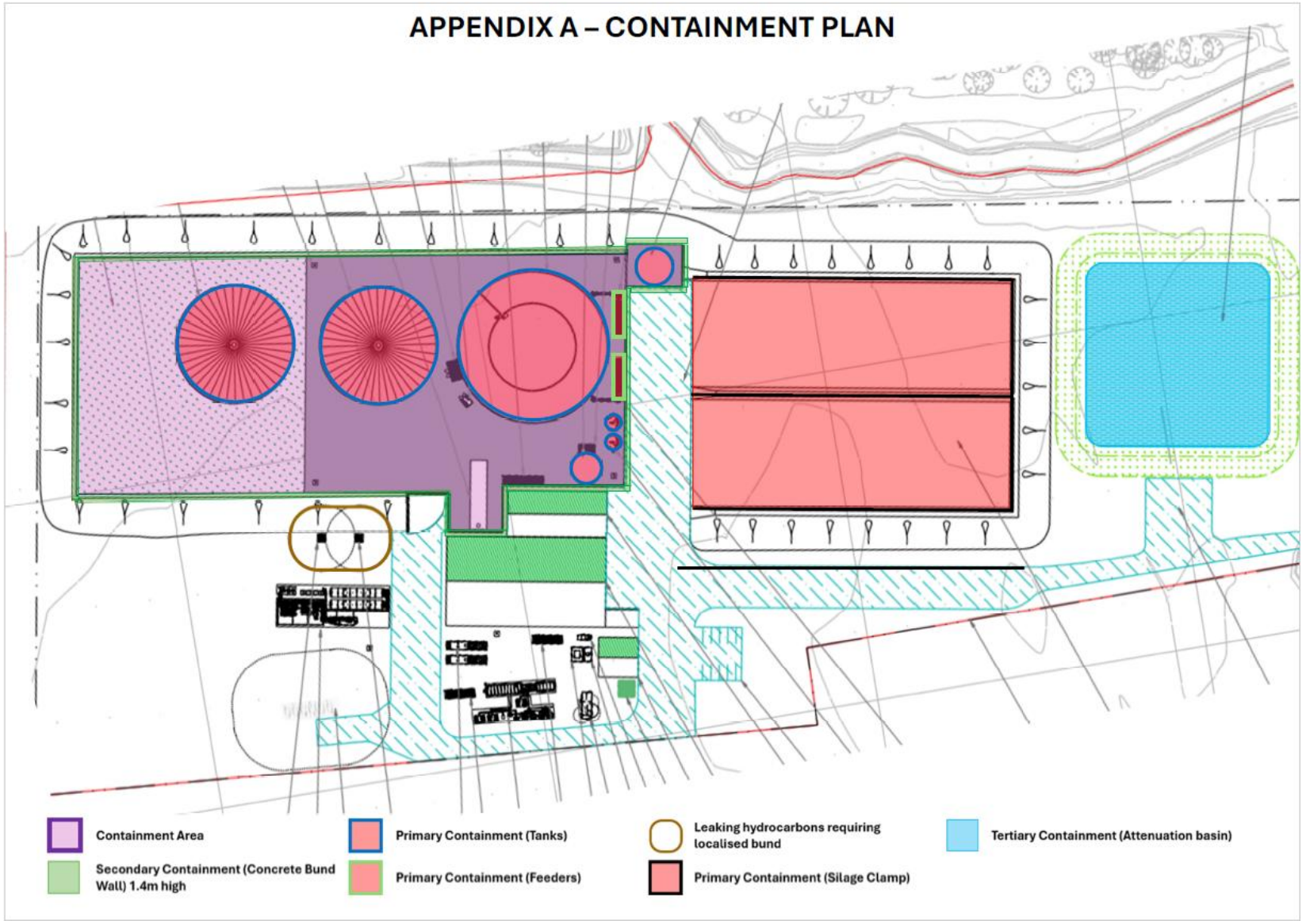


Figure 2.3 - Proposed Drainage Plan

3. PROPOSED ACTIVITIES

3.1 Type of Permit

Engie are making a bespoke permit application for their proposed operation of an agricultural Anaerobic Digestion (AD) plant on a new site located on land east of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW.

Engie's proposed AD plant will accept up to 100,000 tonnes per annum of feedstock including manures and slurries, maize, silage, whole crop rye, vegetable waste and potato rejects from Home Farm and other local farms. The full process description can be found below in Section 3.2.

The proposed activities meet the definition of an *Installation* as defined by Schedule 1 of *The Environmental Permitting (England and Wales) Regulations 2018 (As Amended).*

The applicant wishes the permit to cover the following activities:

Table 3.1 - Proposed Permitted Activities

Activity Reference	Activity Listed in Schedule 1 of the EP Regulations	Description of Specified Activity	Limits of specified activity
A1	Section 5.4 Part A(1)(b)(i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving Biological Treatment	Anaerobic Digestion (with a capacity exceeding 100 tonnes per day) of permitted waste.	Treatment of waste by anaerobic digestion R3 -recycling and reclaiming organic substances which are not used as solvents
Directly Associated Activities			
A2	Physical and Chemical Treatment of Waste	R3 -recycling and reclaiming organic substances which are not used as solvents ▪ physical treatment of waste restricted to de-packaging, removal of plastic and contrary items, shredding, sorting, screening, compaction, baling, mixing and maceration ▪ chemical addition ▪ digestate treatment (other than for the purpose of use as a fuel) restricted to screening to remove plastic residues, separation, centrifuging or pressing, addition of thickening agents (polymers), cooling, pH adjustment and drying	
A3	Biogas storage and supply	Storage of biogas arising from the Anaerobic Digestion Plant and supply to site activities	
A4	Combustion Plant Operation	Combustion of biogas in a biogas boiler (560kWth) R1 – use principally as a fuel or other means to generate electricity	
A5	Biogas upgrading plant operations	Upgrading of biogas to biomethane (including the removal of moisture and other substances such as carbon dioxide, hydrogen sulphide, and non-methane volatile organic compounds) in a biomethane to grid plant for injection into the National Gas Grid. R3 -recycling and reclaiming organic substances which are not used as solvents	

A6	Emergency Flare Operation	Use of auxiliary flares required only in abnormal operations. D10 – incineration on land
A7	Waste Storage	Storage of incoming waste feedstocks, leachate generated and digestate and other wastes produced by the process R13 – storage of waste
A8	Raw Material Storage	Storage of raw materials onsite including chemicals, oils, diesel, activated carbon etc
A9	Cardon Dioxide Liquification	Liquification of gaseous carbon dioxide as a side stream of biogas upgrading including storage and removal offsite to third-party end users
A10	Surface Water Discharge	Discharge of clean, uncontaminated surface water to Mill Dike
A11	Emergency Generator	1 x emergency diesel generator to be used less than 50 hours per year
A12	Medium Combustion Plant Operations	Combustion of natural gas within two 3MWth generator sets

All activities onsite are considered to be technically linked to the main activity and are included within the Installation boundary of the site.

The technical guidance notes used in the preparation of this application document are:

- EU Waste Treatment BREF, August 2018;
- Environment Agency - Biological Waste Treatment: appropriate measures for permitted facilities, September 2022 (updated November 2024);
- EPR – How to Comply with your Environmental Permit (reference EPR 1.00).

3.2 Process Description

The proposed AD plant will process up to 100,000 tonnes per annum of feedstock (including manures and slurries, maize, silage, whole crop rye, vegetable waste and potato rejects) from Home Farm and other local farms.

The proposed process includes these key stages:

- *Feedstock Reception and Storage*: Incoming wastes such as manures will be delivered to site and stored within the feedstock reception building. Energy crops and silage will be stored externally within the silage clamps while liquid feedstocks, such as, slurries will be stored in sealed reception tanks:
- *Digestion*: Solid feedstocks are fed to a sealed unit via hoppers, where they are mixed with the liquid feedstocks and recirculated liquids to create a substrate which is pumped into the processing vessel (digester). Within the digester, the substrate is mixed and heated to allow the bacteria to break down the organic matter in the absence of oxygen. During digestion, biogas is continuously produced in the vessels, typically around 55% methane and 45% carbon dioxide:

- *Digestate Separation*: Following digestion, the residual digestate material containing indigestible fibre and nutrients is pumped to a separation system, where the solid fraction is separated from the liquid fraction. Solid digestate is then stored within the dedicated segregated Digestate Storage area within the Separator Building and liquid digestate is stored in the engineered covered digestate lagoon prior to being spread to land as fertiliser at the appropriate time;
- *Biogas Upgrading*: The majority of the biogas produced during the process is upgraded to remove CO_2 and convert to pure biomethane. Biomethane is a clean renewable gas that is compliant with the gas grid specifications and regulations. The biomethane is continuously monitored and metered prior to injection into the gas grid;
- *Carbon Dioxide Recovery*: During biogas upgrading, a side stream of clean compressed CO_2 is produced. This will be recovered and liquified before being sent offsite to an end user, likely the food and drinks industry; and
- *Biogas Combustion*: A small portion of the gas produced will be combusted within the onsite biogas boiler (560kWth). This will produce renewable heat to power the on-site demand during start up and periods of extreme cold weather; and
- *Electricity Generation*: Two natural gas generators will be located onsite to provide electricity to the process. These have a thermal input capacity of 3MWth and as such will be regulated as MCPD and Specified Generators under the Medium Combustion Plant Directive 2015 (MCPD).

A simplified process flow diagram is shown in Figure 3.1 below.

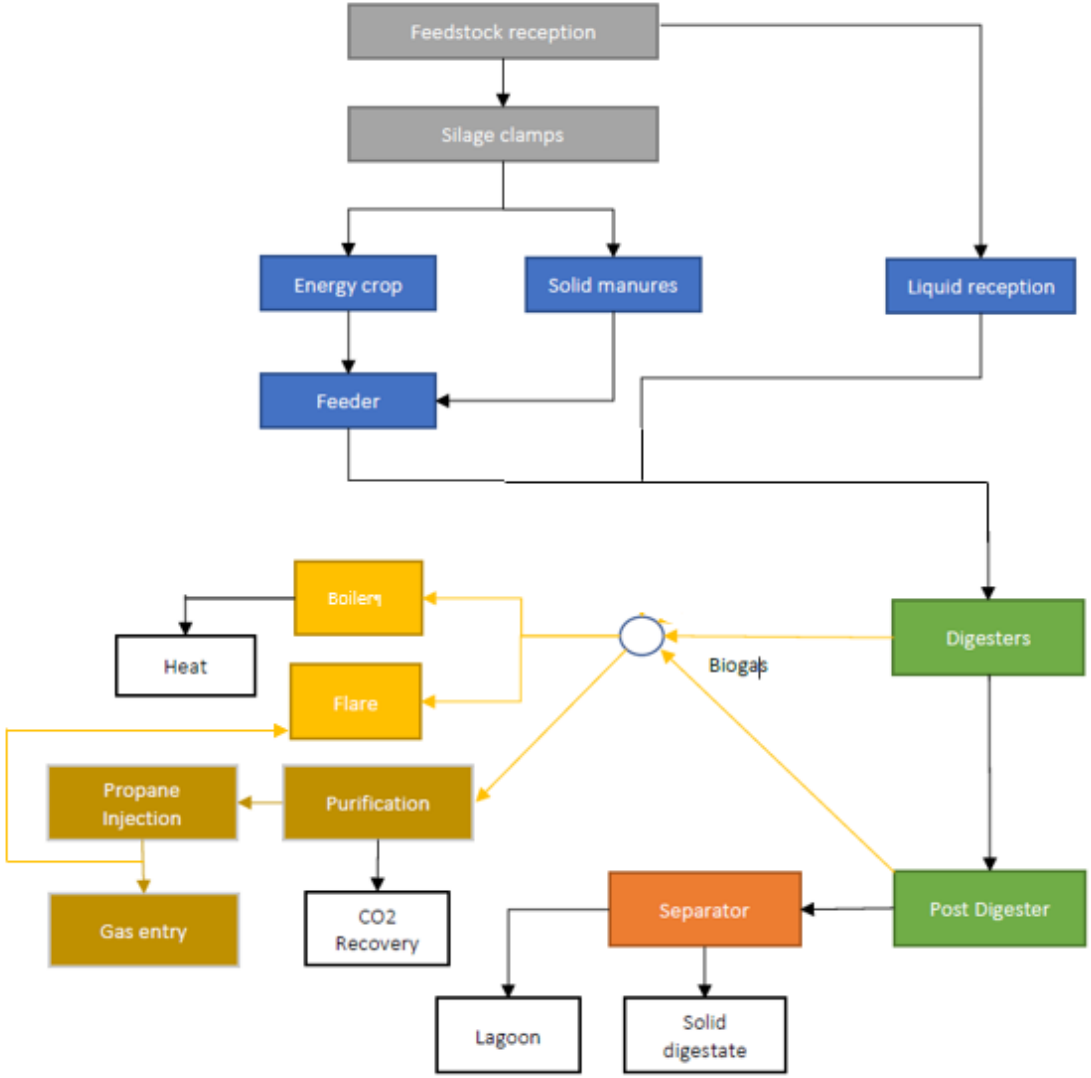


Figure 3.1 - Simplified Process Flow Diagram

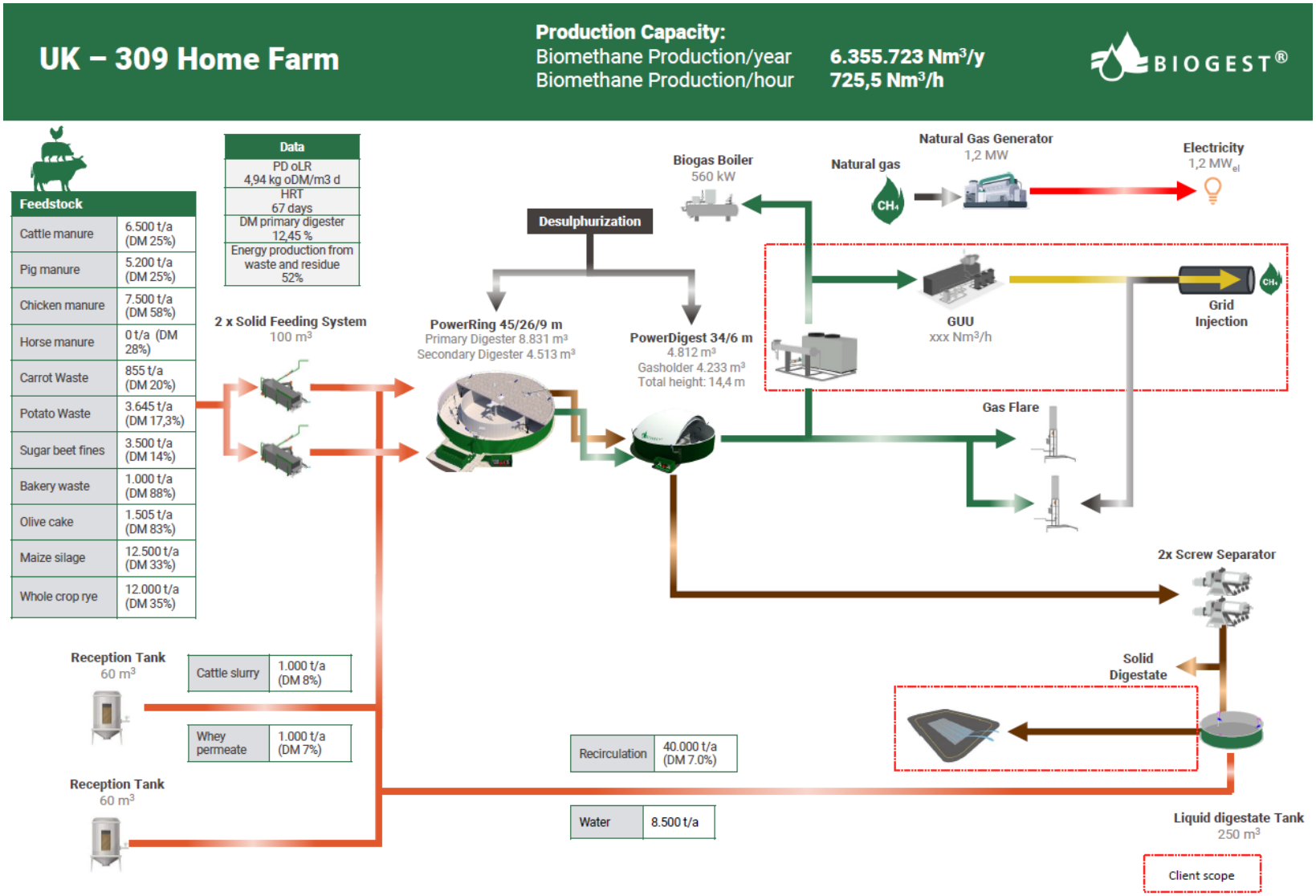


Figure 3.2 Biogest Block Diagram

3.3 Raw Materials

3.3.1 Feedstocks

Engie are applying for a permit application to allow the operation of anaerobic digestion facility at their site in South Milford. The facility will accept and process up to 100,000 tonnes per annum of waste and non-wate feedstocks, including manures and slurries, whey permeate, vegetable waste, potato rejects, bakery waste, maize, silage and whole crop rye.

All wastes will be accepted on site in accordance with the sites proposed Environmental Management System, a summary of which is provided within *Annex C*.

A detailed list of European Waste Catalogue (EWC) codes of wastes that are proposed for acceptance at the site is provided in Table 3.2 below.

Table 3.2 - Proposed Permitted Wastes

Waste Code	Description
02	**Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing**
02 01	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 01	Sludges from washing and cleaning – vegetables, fruit and other crops
02 01 03	Plant-tissue waste
02 01 06	Animal faeces, urine and manure (including spoiled fully biodegradable animal bedding)
02 01 07	Wastes from forestry
02 01 99	Wastes not otherwise specified – spent mushroom compost from commercial mushroom growing only
02 02	Preparation and processing of meat, fish and other foods of animal origin
02 02 04	Sludges from on-site effluent treatment
02 02 00	wastes not otherwise specified – [lairage waste – soiled animal bedding]
02 03	**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**
02 03 01	Sludges from washing, cleaning peeling, centrifuging and separation (including sludge from production of edible fats and oils, seasoning residues, molasses residues, residues from production of potato, corn or rice starch only)
02 03 04	Materials unsuitable for consumption or processing (including waste from production of edible fats and oils, seasoning residues, molasses residues, residues from production of potato, corn or rice starch only)
02 03 05	Sludges from on-site effluent treatment (including sludge from production of edible fats and oils, seasoning residues, molasses residues, residues from production of potato, corn or rice starch only)
02 04	**Wastes from sugar processing**
02 04 01	Soils from washing and cleaning beet
02 04 03	Sludges from on-site effluent treatment; sludges from the processing of sugar
02 05	**Wastes from the dairy products industry**
02 05 01	Materials unsuitable for consumption or processing – biodegradable wastes derived from the processing of dairy products only
02 05 02	Sludges from on-site effluent treatment
02 06	**Wastes from the baking and confectionery industry**

02 06 01	Materials unsuitable for consumption or processing – biodegradable wastes from the processing of materials used in bakery and confectionery
02 06 03	Sludges from on-site effluent treatment; sludges from the processing of materials used in baking and confectionery
02 07	**Wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)**
02 07 01	Wastes from washing, cleaning and mechanical reduction of raw materials Wastes from washing, cleaning and mechanical reduction of raw materials – biodegradable wastes from the processing of the raw materials used in the production of such beverages only (wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa))
02 07 02	Wastes from spirits distillation – spent grains, hops and whisky filter sheets and cloths, yeast and yeast like residues, sludge from production process, or malt husks, malt sprouts, yeasts and yeast-like residues only
02 07 04	Material unsuitable for consumption or processing – biodegradable wastes from the processing of the raw materials used in the production of such beverages only (wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa))
02 07 05	Sludges from on-site effluent treatment – sludges from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
16	**Wastes not otherwise specified in the list**
16 10	**Aqueous liquid waste destined for off-site treatment**
16 10 02	Untreated wash waters from cleaning fruit and vegetables on farm only
16 10 02	Sludges from washing and cleaning fruit and vegetables on farm only
16 10 02	Milk and dairy waste milk from agricultural premises only
19	**Wastes from waste management facilities, off-site wastewater treatment plants and preparation of water intended for human consumption/industrial use**
19 02	**Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation**
19 02 10	Glycerol not designated as hazardous – excludes 19 02 08
19 06	**Waste from the anaerobic treatment of waste**
19 06 03	Liquor from anaerobic treatment of municipal waste (from a process that accepts wastes listed in these standard rules or anaerobic digestion standard rules only) and made up of previously pasteurised and stabilised batches only
19 06 04	Digestate from anaerobic treatment of source segregated biodegradable waste (from a process that treats wastes which are listed in these standard rules only and pasteurised)
19 06 05	Liquor from anaerobic treatment of animal and vegetable waste from a process that accepts wastes listed in these standard rules or anaerobic digestion standard rule permits and made up of previously pasteurised and stabilised batches only
19 08	**Wastes from wastewater treatment works**
19 08 09	Grease and oil mixture from oil and water separation containing only edible oils and fats
19 08 12	Sludges from biological treatment of industrial waste water (from a process that treats wastes which are listed in these standard rules only)
20	**Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions**
20 01	**Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions)**
20 01 25	Edible oils and fats
20 02	**Garden and park wastes (including cemetery waste)**
20 02 01	Biodegradable waste
20 03	**Other municipal wastes**

20 03 02	Waste from markets, allowed only if source segregated biodegradable fractions, such as plant material, fruit and vegetables

Notwithstanding the EWC's codes stipulated in Table 3.2 above, waste shall not be accepted at the site which has any of the following characteristics:

- Do not align with the agreed EWC codes;
- Defined as Infectious;
- Drummed waste; or
- Hazardous waste.

3.3.2 Raw Materials

The table below outlines the raw materials used onsite.

Table 3.3 Raw Materials

Material	Volume	Storage	Use
Liquid Feedstocks, e.g. slurry	2 x 60m^3	Reception Tanks	Digestion Process
Solid Feedstock e.g. maize	25,600 tonnes (2 x clamps)	Storage Clamps	Digestion Process
Solid Waste Feedstock	638 tonnes	Feedstock Building	Digestion Process
Diesel	10,000 litres	Double skinned bunded tank	Emergency Generators & Onsite vehicles
Activated Carbon	25,000 kg (5 x 500 kg sacks)	Covered sealed yard area on bunded tray	Biogas Upgrade System / Odour Abatement plant
Vegetable Oil	100 litre drum	Covered sealed yard area on bunded tray	Anti-foaming agent
Odorant	50 litre drum	Bunded tray within GEU	Biomethane odouring for injection into grid
LPG	12 tonnes	Dedicated sealed area in yard	
Lubricating Oils	2500 litres (205 litre drums)	Covered sealed yard area on bunded tray	Maintenance
Anti-freeze	1000 litres	IBC in covered sealed yard area on bunded tray	Maintenance
Nitrogen	4 cylinders	Gas Cage	Purging systems
Raw Biogas Mixture	5,634.5m^3 (total biogas onsite)	Double membrane gas holder	Digestion Process / Biogas Upgrading
Glycol	2,000 litres	2 x IBCs Covered sealed yard area on bunded tray	Digestion Process
Ferric Chloride	25,000kgs	Bags in covered sealed yard area	Digestion Process
Enzymes	1,000 kgs	Bags in indoor sealed area	Digestion Process
BTL Nutrients	100 litres	Drum in indoor sealed area	Digestion Process

3.4 Proposed Process

The proposed AD plant will accept up to 100,000 tonnes per annum of feedstock (including manures and slurries, maize, silage, whole crop rye, vegetable waste and potato rejects) from Home Farm and other local farms. The AD plant will operate a tank in tank digester system.

The proposed operations will generate biogas which will be upgraded to network complaint biomethane then exported to the local gas distribution network via pipelines directly from the site. A proportion of the biogas will be used to power an onsite biogas boiler (560kWth) for the provision of heat required on site during periods of start up or extreme cold weather. During the digestion process, biogas is continuously produced in the vessels, typically around 55:45 methane to carbon dioxide ratio. During biogas upgrading, the removed carbon dioxide will additionally be recovered, liquified and send offsite.

A secondary output of the anaerobic digestion process is digestate. The digestate produced will consist of liquid and solid fractions and will be used on local farms in place of raw manures and artificial fertilisers.

3.4.1 Feedstock Reception & Storage

Upon arrival at the site, vehicles delivering feedstock will be directed to the site weighbridge where documentation will be reviewed. Solid waste feedstocks will be directed to dedicated unloading area for unloading prior to transfer to the enclosed Feedstock Reception Building for storage. All waste is visually inspected during unloading. Unloading activities take place under supervision of a suitably trained site operative.

The Feedstock Reception Building is fitted with an extraction and odour abatement system. As such, the building is kept under negative pressure preventing release of fugitive emissions whilst roller shutter doors are open.

Other solid feedstocks, such as maize, are directed to the storage clamps for unloading. The storage clamps are SSAFFO compliant, and all feedstocks remain covered during storage in the clamps. Delivery and transfer times are kept to a minimum with the cover sealed as quickly as possible following material handling.

Liquid feedstocks are directed to the relevant reception tanks. All tanks are fitted with level gauges and alarms to prevent overtopping. Transfers are undertaken under supervision of an appropriately trained site operative and upon impermeable hardstanding to prevent and contain any spillages.

3.4.2 Feeding System

Solid Feedstock

Solid feedstock is manually loaded into feed hoppers using a tele-handler or loading shovel, to a pre-defined volume. The site will have two hoppers with volumes of approximately 120m^3 each.

The feed hoppers are covered and will feed solid feedstock to the primary digester via screws and crusher for partial mixing and size reduction.

The feeding system, supplied as a packaged plant with a local control panel, is automated via the AD plant control system, triggered by vessel levels or process timers.

Liquid Feedstock

Liquid feedstocks are transferred from the reception tanks (2 x 60m^3) directly to the primary digester via a pumping system. Liquid volumes are pre-set allowing for a controlled and consistent amount of feedstock addition to the process.

Reception Pit

Liquid digestate from the separation process is fed to the Reception Pit via gravity overflow. From the Reception Pit it is fed via a pumping system to the primary digester when required. The Reception Pit has a volume of 250m^3.

3.4.3 Digestion

The proposed process utilises a Power Ring Digester designed by Biogest. This is essentially a Primary Digester, with a Secondary Digester situated within it in a 'tank in tank'; configuration.

Solid and liquid feedstocks are thoroughly mixed in the primary digester, ensure substrate fed into the secondary digester can be mixed in thoroughly with the rest of the digester contents, smoothing out gas production and avoiding thermal shocks.

The Power Ring Digester tank is cast in-situ from concrete, has a flat concrete roof cover and agitators within both primary and secondary digester.

The temperature will be maintained between 38 °C and 41 °C and controlled to within +/- 0.1°C of the optimal temperature. Due to the thermal insulation provided by the concrete walls and roof, heating is not required under normal operation. However, heating elements have been included in the design to allow for initial commissioning and periods of abnormal operation. The onsite biogas boiler will provide heat where required. Cooling means have also been designed to ensure the temperature of the digester contents can be lowered during the hottest parts of the year, when reliance on natural heat losses cannot be assured to maintain the target temperature range within the digestors.

The highest quality and largest volume of biogas (85% to 95% of the biogas potential) produced throughput the process is from the Power Ring digester.

3.4.3.1 Post Digestion

Two post digester tanks are provided as part of the site design. These Power Digest tanks are equipped with double membrane gas holders and capture all biogas produced by the process, from both the Power Ring digester and the post digestion stage itself.

A portion of residual biogas may be entrained within the residual liquid substrate or trapped in undigested material. As such, to optimise biogas collection, the post-digester tanks are utilised. These tanks are constructed of cast in-situ concrete with a gas-tight double membrane dome and equipped with agitators to maintain the homogeneity of the digestate. The post digester will not be heated under normal operation, however heating elements are provided as described above should they be required in the future.

No pasteurisation stage is required at Home Farm Grange due to the absence of animal by-product (ABP) derived feedstocks.

Table 3.4 Appropriate Measures Compliance for Treatment and Process Control

Appropriate Measure	Site Compliance
Digester Stability	The site processes are automatically monitored via a SCADA system to ensure digester stability, minimise operational difficulties and provide early warning of failures. The main waste and process parameters are monitored as follows: ▪ pH and alkalinity of the digester feed ▪ temperature – continuously ▪ digester operating temperature ▪ concentration of volatile fatty acids (VFA) and ammonia within the digester and digestate (via laboratory testing) ▪ biogas quantity, composition and pressure – continuously (Gas analyser monitoring CH4, CO2, CO, O2, H2S & H2) ▪ liquid and foam levels in the digester This will allow the digester to be maintained at optimum performance, operating temperatures as designed of between 38 - 41°C and allow changes to feedstock and micro-nutrient dosing where required. Hydraulic and Organic loading rates of the digester feed are maintained at 4.9 as calculated but not monitored by SCADA. The digester is fitted with an alarm interlocked to the feeding system, so this automatically stops in relation to gas pressure conditions. Inspection ports on the digester are visibly checked during the sites daily inspection regime.
Foaming and Overtopping	The site will take measures to prevent and detect foaming including active management of the digester feeding rate, monitoring if the digester stability and the implementation of high level sensors. Vegetable oil will be used as a foam suppressant where required. Procedures will be in place to support its deployment. Pressure monitoring will be linked to a remotely monitored alarm system which will provide audible notification in the event of over-filling. Mixing systems are installed on all treatment vessels, appropriate to ensure efficient mixing, uniform heat transfer and prevent sedimentation. Tanks allow for sludge draw off, debris and grit removal.
Pressure and Vacuum Relief Control	PVRVs are installed on all tanks where there is any risk of over or under pressurisation. These will be designed, fitted and tested by an appropriately qualified engineer and in line with recognised standards e.g. BS EN ISO 28300:2008 or API2000. Certified capacity flow curves will be provided to demonstrate adherence to the above standards and each PVRV will have a current functional test certificate. Valves will be set so as not to cause fugitive emissions during normal operation and will be fitted with environmental protections such as frost barriers. Isolating valves will ensure PVRVs can be removed from the system for maintenance without comprising safety or causing large fugitive emissions. Inspection of PVRVs will be undertaken regularly and after foaming, overtopping or other pressure related events. Pressure relief events must be recorded including date, time and duration.

3.4.4 Phase Separation

Upon exiting the post-digester, the digestate is a uniform mixture of liquid effluent and undigested fibre. It is sent to the Separator Building and into a screw press separator system that efficiently separates fibre from liquid. The fibre that has been extracted is stored within the dedicated Digestate Storage area within the Separator Building, from which is exported. This building is segregated from the incoming feedstock building to ensure no cross contamination of digestate and incoming waste feedstocks.

The liquid effluent fraction separated by gravity flows into an above-ground buffer tank and pumping station. From this point, it is directed to the reception pit via gravity overflow and circulated through the process or sent to the digestate lagoon for storage.

There will be two separators onsite, allowing redundancy for maintenance purposes.

Separation is a critical stage in the process for a number of reasons:

- *Optimising Liquid Recirculation*: Several hundred cubic meters of liquid is recirculated daily. Effective separation ensures this liquid fraction is not too thick or viscous. With increasing dry matter content and viscosity, more liquid will be required to produce a pumpable consistency. This unbalance would undermine process kinetics, introducing deviations from the design specifications—such as shortened retention times and over-recycling of methanogens.
- *Prevention of Solid Fiber Buildup in Storage Lagoons:* Only thin liquid fractions are stored within the onsite lagoon. In accordance with best practice and the regulations, the lagoon is covered to minimise fugitive emissions. As such mixing operations are simpler with a thinner liquid fraction; and
- *Improved Handling and Land Application:* Liquid and solid separation simplifies further handling and land spreading, maximizing logistics and reducing costs of operation.

Separation and PAS110

PAS 110 is the UK Standard for the quality of digestate from anaerobic digestion (AD) processes. It is one of the key certifications for ensuring digestates are safe and of a suitable quality for application as a soil improver or fertiliser. PAS 110 specifies the requirements for digestate quality to ensure that it meets strict standards for contaminants, safety, and nutrient content. This is required so that digestate can be used safely and efficiently in agriculture and horticulture.

Digestate separation is a critical stage in the AD process in achieving PAS 110 accreditation. Separation of the liquid and solid fractions allows for the appropriate processing and further treatment to be undertaken to meet the PAS110 standards.

The site's digestate will meet the PAS 110 accreditation standards.

Table 3.5 Appropriate Measures Compliance for Digestate

Appropriate Measure	Site Compliance
Sampling	Sampling will be routinely undertaken to ensure an adequate end-point has been reached and the digestate is of sufficient quality.

Digestate Separation	Digestate separation onsite is undertaken in such a way that emissions are mitigated, being within an enclosed Separation Building, and upon an impermeable surface with a contained drainage system that meets CIRIA 736. Storage of solid digestate onsite is within the dedicated Digestate Storage area within the enclosed Separator Building with a fitted ventilation and extraction system. The dedicated Digestate Storage Area is segregated from the incoming feedstock to prevent risk of cross contamination via different buildings and utilisation of dedicated equipment. It will be ensured that any offsite storage of solid digestate would be in line with the farming rules for water.
Drying Digestate	N/A – there is no onsite digestate drying proposed
Contingency Measures	Contingency measures are in place for managing any untreated or unscreened digestate in the event of technology failure.
Record Keeping	The waste tracking system will include details on the weight of digestate produced. Details of digestate leaving the site will be recorded including the type of material, batch number, date of export, tonnage and area dispatched to.

3.4.5 Lagoons

Liquid digestate will be transferred to the digestate lagoon which has a minimum of three months' storage space. The lagoon will be constructed as an engineered earth-bank structure with liner and cover in accordance with CIRIA 736. The floating cover will prevent rainwater ingress and minimise fugitive emissions such as ammonia and odours. The lagoon will be equipped with several submersible mixers or an equivalent mixing system using pump recirculation, as well as allocated filling and draw-off points.

Additional storage capacity will be provided by off-site lagoons. Engie will ensure that any offsite lagoons utilised will be built to the same high standards and requirements as the onsite lagoon. The combined lagoon capacity will provide a minimum of six months' storage to enable operational resilience and regulatory compliance.

3.4.6 Gas Collection and Distribution System

Biogas is produced throughout the process stages and is collected where practicable. All biogas produced within the primary and secondary digesters is collected within the Power Digest tank within the gas-tight double membrane gas domed roof. The tanks will be fitted with over/under pressure relief valves (PVRV) with the appropriate pressure settings. The PVRVs will be designed to guarantee the conditioned movement of gas throughout the system, sequentially progressing from the digester, post-digesters, and finally to the gas consumers.

This flow of gas assures that any fed oxygen remains within the process with maximum retention time to achieve maximal biological hydrogen sulphide reduction to elementary sulphur. It is the most cost-saving method to purify hydrogen sulphide, minimizing the operational workload for downstream Biomethane Upgrade Plant (BUP) processes significantly.

Key process parameters are continually monitored as part of the gas system, and they provide process interlocks and support in decision-making during operation. The biogas produced will inevitably contain

bacteria and lead to sulphur deposits within the pipework. In an effort to minimize this, the pipework will be designed in such a way as to allow for both in-situ and ex-situ cleaning.

Table 3.6 Appropriate Measures Compliance for Biogas Production and Management

Appropriate Measures	Site Compliance
Production Volumes	Gas production volumes will be managed within the processing constraints of the facility
Contingency Measures	Contingency measures will be in place to manage any excess gas produced including when there is limited gas to grid availability.
Storage Capacity	Changes in climatic conditions have been taken into account when determining gas storage capacity.
Back Up Generator	The site has an emergency back-up diesel generator to maintain power to critical plant, including lighting, gas storage systems and flares, in the event of power failure.
Gas Consumer Protection	The sites BUP and biogas boiler are protected with flame arrestors and slam shut valves.
LDAR	The sites Leak Detection programme identifies methane slippage from across the site. Procedures are in place to make sure propane and odorants are handled appropriately.

3.4.7 Biogas Boiler, Natural Gas Generation Plants & Heat Distribution System

The site will incorporate a biogas boiler to produce heat during start up operations or when required during periods of extreme cold weather to ensure the maintenance of temperature conditions in the digesters. Additional heat will be recovered from the GUU compressor cooling as part of the gas clean up process. The heat distribution system will be provided through a hot water circulation system.

The biogas boiler will have a thermal input capacity of 560kWth, as such it will not be subject to Medium Combustion Plant Directive (MCPD) requirements and will instead be operated in accordance with the Emission Limit Values (ELV's) and monitoring frequencies stipulated within the equivalent EA Standard Rules permits for on-farm anaerobic digestion facilities (e.g. SR2021 No.8).

The site will operate 2 natural gas generation sets to provide power (1.2 Mwe) to the site operations. Each will be a self-contained unit provided by Guascor Energy G-56HM (technical datasheets are provided in Annex B).

It is not proposed at this stage to utilise heat produced by the natural gas generator sets. The plant itself does not require additional heat other than that provided by the GUU unit and biogas boiler.

The natural gas generator sets have a thermal input capacity of 3 MWth. As such they are subject to Medium Combustion Plant Directive (MCPD) requirements including Emission Limit Values and monitoring frequencies.

Table 3.7 Appropriate Measures Compliance for Combustion Units

Appropriate Measures	Site Compliance
Inspection and Maintenance	All combustion units onsite will be inspected and maintained as part of the sites Preventative Maintenance Programme, as a minimum, in line with manufacturers recommendations.
Stacks	The stacks will be vertical and unimpeded by cowls or caps. Dispersion modelling has been undertaken to ensure an effective stack height for emissions.
Emissions	Emissions will be monitored at the frequencies set out within the permit. Adherence to the ELVs set out within the permit will be achieved.
Heat Use	Heat produced by the biogas boiler & GUU unit will be utilised onsite within the digestion process. It is not currently proposed to utilise heat produced by the natural gas gensets, as this is not required by the process.
MCPD	The natural gas generator sets have a thermal input capacity of 3MWth and as such will be operated in accordance with the ELV's and monitoring frequencies stipulated within the MCPD.

3.4.8 Flare

Consumers of biogas onsite comprise the biomethane upgrade plant and biogas boiler. However, in case of downtime with gas consumers or out-of-spec biogas, the AD plant will continue production of biogas but without an immediate shutdown. In this case, the site will have two flares available. The first will have a capacity of 500m^3/hr and will be utilised to destroy any biogas that would otherwise be vented through PVRV due to production fluctuations and short term offtake interruptions. The second will operate at up to 1200m^3/hr and be for the destruction of propanated biomethane in the event of a grid rejection.

The flares shall be packaged plant and be constructed as high temperature, enclosed units, in accordance with the EA biological waste treatment appropriate measures. The flare shall only be operated in emergency or other-than-normal operating conditions (OTNOC).

3.4.9 Biogas Upgrading and CO_2 Recovery

A multi-stage process is utilised for gas upgrade and injection into the local gas distribution network. Initial processing is via the Biomethane Upgrading Plant (BUP), sometimes referred to as the Biomethane Upgrading Unit (BUU). This utilises membrane separation. Raw biogas is initially chilled and reheated to remove condensate and lower the relative humidity prior to filtration through activated carbon.

Two grades of activated carbon are utilised in series. The first removes hydrogen sulphide and the second removes VOCs. VOCs are typically only present in low concentrations but can cause fouling of the downstream separation membranes and cause significant performance loss.

As the feedstocks utilised include high volumes of nitrogen rich pig slurry, high concentrations of ammonia may be present in the biogas. As such, a water washing step is included to reduce ammonia and prevent further fouling of the downstream system.

Following this, the gas is boosted and compressed to 10 – 12 bar prior to passing through the membranes to separate carbon and methane. 3 – 4 stage membrane filtration will be utilised to maximise methane recovery.

The separated carbon dioxide off-gas, which has historically been vented to atmosphere, will be captured and exported to end users. Additional processing through further membrane filters removes any residual methane, producing two gas streams; a low volume methane rich stream which is recirculated through the BUP, and a highly purified liquified CO_2 stream for export.

The additional CO_2 recovery process further reduces methane slip from the plant improving sustainability.

Following the separation, the biomethane flows to the Grid Entry Unit (GEU) for further processing and metering into the grid.

Table 3.8 Appropriate Measures Compliance for Biogas Treatment and Storage

Appropriate Measure	Site Compliance
Biogas Treatment	Biogas treatment within the BUP and GEU has been designed appropriately to create biomethane of sufficient quality for injection into the grid and use at the onsite biogas boiler. This includes the removal of H_2S, VOCs, particulates, CO_2 and addition of propane. Gas quality is monitored at both the inlet and outlet of gas treatment. Flow, quality, pressure and composition monitoring systems are interlocked and have remote alarm capability.
Condensate	Condensate is removed from the biogas prior to the BUP. Condensate is then recirculated into the process.
Biogas Collection	The digesters are fitted with gas collection systems. Vents from liquid feed tanks, blending tanks and overpressure vents are connected to the abatement system within the Feedstock Building.
Biogas Storage	All storage facilities for biogas are gas tight, pressure resistant, weatherproof and resistant to UV light and temperature fluctuations.
Oxygen	Injection of oxygen into the PowerRing and PowerDigest tanks is undertaken to reduce H_2S within the biogas. High level alarms are present to automatically stop the addition of oxygen prior to the lower explosive limit being reached. Other than at this stage, biogas and air are prevented from mixing.
Carbon Filters	Procedures will be in place to minimise the risk of exothermic reactions during maintenance of the carbon filters. This will comprise nitrogen purge. All purge gases will be contained and treated.
Flares	The site will operate two flares of enclosed (ground) design capable of achieving a minimum of 1,000°C with 0.3 seconds retention time. The design is weatherproof and heat resistant. Flare use is only in emergencies and used minimally during maintenance if required. The sites SCADA system continuously monitors gas flow during flare use, allowing quantification of emissions to identify improvements where applicable. Records of flare usage including date, duration and number of events will be kept. Routine measurements of pollutants from the flare will be undertaken should repeated and extended use be identified.

	Noise prevention measures are included in flare design.

3.4.10 Grid Entry and Propane

The biogas produced by the BUP has a high methane content, typically 97% v/v, with an energy content of approximately 36 MJ/Sm³. To meet the requirements of the distribution network operator (DNO) and the Gas Safety Management Regulations (GSMR), the methane-rich biogas requires further processing prior to injection to the grid.

First, propane must be added to the methane to increase its calorific value to the level necessary for the grid, typically 39.5 MJ/Sm³. Then, an odorant must be added in compliance with regulatory standards. Once these operations have been completed, along with other compliance parameters such as dew point, oxygen levels, Wobbe Index, temperature, and pressure, the gas may be injected into the grid. The compliant gas will travel through the Remote Operated Valve (ROV), which is directly controlled by the DNO.

During the startup period, the gas must continue to flow to allow the system to make the necessary adjustments and get the gas within the specification. To manage this, the GEU will have a reject or recycling line. This will allow the upgraded but still not in-spec biomethane to go back to a flare or, best-case scenario, the AD gas system. A pressure reducing station will take the pressure down to the required level.

The propane unit is a self-contained packaged plant, including propane tanks, pumps, instrumentation, and a control panel. The propane controls will be integrated into the GEU control system.

If required, a compressor will be used to increase the pressure of the gas from 8 bar to 10 bar (the normal operating pressure of the BUP and GEU) , up to the required injection pressure. The compressor will be located between the GEU and ROV, ensuring the gas is at the appropriate pressure before injecting it into the grid.

3.4.11 SCADA Control

The facility will be fully automated to the point that all process activities will be PLC controlled, and SCADA monitored. The installation will have on-line monitoring which can be administered remotely to ensure the process is optimised and operating correctly.

3.5 Energy and Water

The facility will be constructed in-line with Best Available Techniques (BAT) for energy usage. Biogas produced by the digestion process will be utilised in a biogas boiler to provide the parasitic heat requirements of the plant.

Water will be segregated and recirculated through the process where possible. Minimal mains water will be required, leachate, condensate and contaminated surface water run-off will generally meet the water requirements of the process.

Where possible, the site will use the most resource efficient option for onsite appliance and utilities, including the installation of energy-efficient lightbulbs and eco-flush toilets.

All plant and equipment have been chosen both on ability to perform and on its energy efficiency. Engie will have an operation and maintenance programme in place to undertaken routine inspections and checks.

Plant will be monitored to ensure that no plant is operating ineffectively leading to the loss of energy. Regular maintenance will take place on site and any inefficient plant will be replaced.

4. BEST AVAILABLE TECHNIQUES

The Anaerobic Digestion Facility will be designed and constructed in accordance with BAT as outlined by the Waste Treatment BREF, 2018[2] and the Biological Waste Treatment Appropriate Measures for Permitted Facilities guidance (Environment Agency, 2022). A full review of the BAT Conclusions specified in the Waste Treatment BREF is provided below. Compliance with the appropriate measures is demonstrated in the relevant sections throughout this application document.

[2] 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 (notified under document C(2018) 5070)

Table 4.1 BAT Justification: Waste Treatment BREF

BAT Reference	BAT Conclusion	Justification
GENERAL BAT CONCLUSIONS		
Overall Environmental Performance		
BAT 1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates the features provided within the BREF document.	Engie has an Environmental Management System in place that incorporates the features provided within the BREF document. Please refer to Annex C for a copy of the EMS Summary.
BAT 2	In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques provided within the BREF document.	Engie will implement the following on site: ▪ Waste Pre-acceptance procedures, ▪ Waste Acceptance procedures, ▪ A waste tracking system and inventory; ▪ An output quality management system to ensure the digestate meets PAS110; ▪ Ensure waste segregation during storage; and ▪ Ensure waste compatibility during waste inspection.
BAT 3	In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the features provided within the BREF document.	There will be seven emission points to atmosphere, one biogas boiler, two from the natural gas generator sets, one from the odour abatement unit on the feedstock reception building, two emergency flares and one emergency diesel generator. The site will develop an inventory of these waste gas streams upon operation. There will be no wastewater emissions from the process. Leachate from the silage clamps and liquor from the process is recirculated through the digestion process. Liquid digestate is stored in an engineered lagoon, covered and tankered off site for use as fertiliser.
BAT 4	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques provided within the BREF document.	The following is carried out on site to reduce the environmental risk associated with the storage of waste: ▪ Optimized storage locations – malodourous waste will be stored in the feedstock reception building, which is fully enclosed and kept under negative pressure; ▪ Adequate storage capacity – the feedstock reception building can store up to 638 tonnes at any given time; and ▪ Safe storage operation. No hazardous waste is accepted on site.

		Digestate produced by the process in is accordance with the Anaerobic Digestate Resources Framework (EA, 2025) and will be accredited to PAS110. As such it is not considered a waste.
BAT 5	In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.	All handling and transfer of waste is carried out by competent staff and documented via the sites acceptance procedures and management system. Any spillages on site will be detected via the site's site walkover procedure and managed accordingly.
Monitoring		
BAT 6	For relevant emissions to water as identified by the inventory of waste water streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pretreatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	N/A – there are no emissions to water arising from the process. The process generates liquid digestate which is contained within the dedicated lagoon and removed as necessary, to be spread on agricultural land for its nutrient benefit. All surface water discharges from site are tested to ensure it is clean and uncontaminated.
BAT 7	BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	
BAT 8	BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	Emissions from the sites biogas boiler will be monitored on an annual basis in line with permit requirements. Emissions from the sites natural gas generators will be monitored annually in line with MCPD requirements. Emissions from the feedstock building odour abatement unit will be monitored every 6 months.
BAT 9	BAT is to monitor diffuse emissions of organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given in the BREF guidance note.	N/A – no solvents are processed on site.
BAT 10	BAT is to periodically monitor odour emissions	Odour will be managed and monitored in accordance with the Odour Management Plan provided within *Annex D.*
BAT 11	BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and waste water, with a frequency of at least once per year.	All raw material usage will be monitored on site, and where possible, substituted for a waste alternative. Where additional water is required in the AD plant, surface water from the attenuation tank or detention basin will be used to prevent using mains water.

		The facility will implement annual review of the energy consumption of the plant including electricity, raw materials and water.
Emissions to Air		
BAT 12	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1).	Odour will be managed in accordance with the Odour Management Plan provided within *Annex D*. It is not anticipated that the site will be a cause of odour nuisance at nearby sensitive receptors.
BAT 13	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given in the BREF Guidance: a) Minimising residence times; b) using chemical treatment; c) optimizing aerobic treatment.	An odour control unit is in place in the feedstock reception building to remove odour and ammonia. The extraction system for the Separator Building is also directed through this abatement system. The unit is designed to effectively remove a minimum of 97% ammonia and a minimum of 90% odour compounds. Minimizing residence times onsite is often not practicable for an AD facility where throughput of material is dependent upon conditions in the digester. Where possible, residence times are minimized.
BAT 14	In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given in the BREF guidance: a) Minimising the number of potential diffuse emission sources; b) Selection and use of high integrity equipment; c) Corrosion prevention; d) Containment, collection and treatment of diffuse emissions; e) Dampening; f) Maintenance; g) Cleaning of waste treatment and storage area; h) Leak detection and repair programme.	Diffuse emissions are reduced onsite using the following measures: ▪ Malodourous waste is stored in the feedstock reception building, where doors remain shut between deliveries, and the building is kept under negative pressure. The feedstock reception building is fully enclosed; ▪ Feedstock stored externally within the silage clamps are kept covered; ▪ Treatment of the odour emissions using an odour control unit; ▪ All equipment on site is subject to inspection and preventative maintenance work as required. ▪ A Leak Detection and Repair Programme (LDAR) for methane emissions will be in place, incorporating all the requirements of the guidance. ▪ Cleaning of waste storage areas and general good housekeeping practices. ▪ The AD process is inherently “wet” and poses minor risk of dust or particulates. The site will continually monitor their processes for signs of dust or particulates and appropriate actions taken to address them.
BAT 15	BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given in the BREF Guidance.	The onsite flares will only be used during emergency scenarios, such as unplanned shutdowns or plant failure.
BAT 16	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given in the BREF Guidance.	The onsite flares have been designed in line with BAT and will be operated in such a way as to ensure that both techniques described are met. This includes continuous monitoring of the quantity of gas sent to flaring, and the correct design of the flaring device.

Noise & Vibration		
BAT 17	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see BAT 1).	The site is not anticipated to cause a nuisance at nearby receptors regarding noise or vibration. An environmental Noise Impact Assessment has been undertaken to assess the potential impact from the development and has shown that the site will have no significant impact. Delivery volumes of some feedstock, such as crops, will vary throughout the year, with peak deliveries occurring during harvest times. There will be a greater volume of crops during this time, and therefore longer operating hours for deliveries will be required. Wastes such as slurry are not seasonal will likely be available as a consistent stream. Where practicable the site will only accept deliveries in the daytime. This management practice will help to minimize the noise impact on receptors. Due to the low predicted impact, noise and vibration management is not considered necessary, but will be implemented if substantiated noise complaints are received upon operations commencing. This is considered BAT for the site.
BAT 18	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given in the BREF Guidance.	Noise and vibration emissions are reduced on site via the following measures: ▪ Appropriate location of site buildings to attenuate noise impacts; and ▪ Operational measures that include: o Inspection and maintenance of all equipment o Closure of roller shutter doors when not in use on the feedstock building; o Equipment only operated by experienced staff; and o Deliveries only taking place in daytime hours and the avoidance of noisy activities at night.
Emissions to Water		
BAT 19	In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given in the BREF Guidance.	There are no wastewater emissions arising from the process. Leachate and liquor produced onsite is recirculated into the process. Liquid digestate produced by the process is contained within the dedicated lagoon and removed as necessary, for spreading on agricultural land for its nutrient benefit. All surface water discharges from site are tested to ensure it is clean and uncontaminated prior to emission to Mill Beck.

		The following measures are in place to reduce emission to soil and water: ▪ Water management and recirculation – water consumption is optimized by using clean runoff contained within the site's detention basin for fire water and to dampen roads if required. Leachate and liquor produced onsite is recirculated into the process; ▪ Impermeable Surface – Feedstock reception and storage is conducted on an impermeable concrete surface. ▪ Adequate drainage infrastructure – the onsite drainage system has been designed to effectively manage appropriate volumes suitable for the site's context and requirements. ▪ Segregation of water streams – clean surface water run-off is segregated from leachate from the silage clamps and other wastewater streams. ▪ Design and maintenance provisions to allow detection and repair of leaks – regular monitoring is conducted for potential leaks.
BAT 20	In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of the techniques given in the BREF Guidance.	N/A – there are no wastewater emissions to controlled water arising from the process. Liquid digestate produced is contained within the dedicated lagoon and removed as necessary for spreading on agricultural land for its nutrient benefit. All surface water discharges from site are tested to ensure it is clean and uncontaminated prior to discharge to Mill Beck. Domestic effluent is treated onsite within a package treatment plant prior to discharge. This will be operated in accordance with the general binding rules for small sewage discharges.
Emissions from Accidents and Incidents		
BAT 21	In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan (see BAT 1).	The site has an Accident Management Plan which is provided within *Annex J*. Engie uses the following techniques to prevent or limit environmental consequences of accidents and incidents: ▪ Protection measures through security fencing, CCTV, and intruder alarms; ▪ Robust management of accidental emissions i.e spillage procedures and containment of liquid digestate; and ▪ Incident / accident system – all accidents will be recorded in the site diary, procedures will be reviewed to ensure appropriateness for site, and training/refresher training for staff to minimize future risk.
Material Efficiency		

BAT 22	In order to use materials efficiently, BAT is to substitute materials with waste.	A significant proportion of the site feedstock will be waste materials, such as vegetable rejects, manures and slurries. . Raw materials used in the process are limited to diesel which is used for emergency onsite generators. Heat required for the process is primarily waste heat recovered from the GUU compressor. The process is exothermic and thermally efficient due to the use of insulated concrete tank design, as such, use of the biogas boiler to provide an additional heat source will be minimal. The site boiler will operate using biogas produced by the process as an alternative to diesel/natural gas to limit raw material usage. Where additional water is required in the AD plant, contained surface water from the attenuation tank or detention basic will be used to prevent using mains water.
Energy Efficiency		
BAT 23	In order to use energy efficiently, BAT is to use both of the techniques given in the BREF guidance.	The site will maintain an Energy Efficiency Plan and Energy Balance in place.
Reuse of Packaging		
BAT 24	In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan (see BAT 1).	N/A – waste is received on site loose therefore no packaging is used.
BAT 25 – BAT 33	**General BAT conclusions for the mechanical treatment of waste**	**N/A**
BAT Conclusions for Biological Treatment of Waste		
BAT 33	In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.	Due to the seasonal nature of feedstocks for the AD plant there is limited ability to select less odorous feedstocks to balance inputs to the plant.
BAT 34	In order to reduce emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below: a) Adsorption b) Biofilter c) Fabric filter d) Thermal oxidation e) Wet scrubbing BAT associated emission levels are as follows (average over the sampling period): - NH_3: 0.3 – 20 mg/Nm^3	External feedstock storage within the storage clamps is not appropriate for fitment of abatement. The feedstock reception building is fitted with odour abatement which is considered to meet the requirements of BAT. Extraction from the Separator Building will also be directed to this odour abatement plant. Bi-annual monitoring will be undertaken and the abatement will be sufficient to reach the BAT-AELs for ammonia and odour required.

	- Odour: 200 – 1000 ouE/Nm^3	
BAT 35	In order to reduce the generation of waste water and to reduce water usage, BAT is to use all of the techniques given below: a. Segregation of water streams b. Water recirculation c. Minimisation of the generation of leachate	The drainage systems onsite will ensure segregation of all water streams. Leachate and liquor produced by the process will be recirculated, with additional water needs met by the surface water run off collected within the detention basin, Leachate generation is minimized through the covering of all feedstock within the storage clamps.
BAT 36 - 37	**BAT conclusions for the aerobic treatment of waste**	**N/A**
Anaerobic treatment of waste		
BAT 38	In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.	All key waste and process parameters will be monitored and controlled, as necessary. The process is controlled by an automatic SCADA system which ensures stable digester operation, minimizes operational difficulties such as foaming and provides a sufficient early warning system should any issues arise.
BAT 39	**BAT conclusions for the mechanical biological treatment (MBT) of waste**	**N/A**
BAT 40 – BAT 51	**BAT conclusions for the physico-chemical treatment of waste**	**N/A**
BAT 52 – BAT 53	BAT conclusions for the treatment of water-based liquid waste	N/A

5. SITE OPERATIONS

The following sections outline key site operations relevant for this permit application.

5.1 Environmental Management System

Engie will operate the site in accordance with an approved Environmental Management System which will be structured to meet the requirements of the Environmental Permitting Regulations and follows a similar structure to the ISO 14001:2015 standards for environmental management systems (EMS). The EMS will be designed to ensure:

- The identification of all foreseeable environmental impacts and risk that the activities pose to the environment.
- Prevention or minimisation of any identified risks to a practical minimum.
- Legal Compliance assurance.
- Identification of risks of pollution including those arising from operations, maintenance, accidents, incidents, non-conformances and complaints, and how these will be minimised.
- Activities at the site will be managed in accordance with the management system, which will be subject to continuous review, audit and improvement. Specific detailed management system reviews will take place if there is a significant change to the activities, following an accident or if a non-compliance is found.
- Furthermore, the whole management system will be subject to annual external audit by competent third parties.
- The key aspects of the EMS for the site will include:
    - Preventative maintenance;
    - Operator requirements;
    - Training and Competence;
    - Emergency response and incident management; and
    - Monitoring, measurement and reporting.

The environmental management system and procedures will be written to ensure that the environmental risk and impact of the normal running of the site activities are documented and minimised.

The EMS will be fully developed, implemented and in operation at the time of plant commissioning and a copy of the management system will be kept at a convenient location on site.

A summary of the EMS has been provided in *Annex C.*

5.1.1 Site Operational Procedures

The site will operate under a suite of operational procedures which form part of the EMS. These will always ensure the safe and efficient running of site operations. These operational procedures will be in place prior to the operation of the site and all staff will be trained in their contents.

5.2 Operating Hours

The AD plant will operate on a continuous 24/7 basis, with the hours of operation limited for deliveries and mobile plant usage to between 07:00 and 19:00.

For up to 30 days per calendar year, hours of operations for deliveries and mobile plant usage will be extended to between 07:00 and 21:00. This is to accommodate for crop harvests.

5.3 Operator Competency

All personnel working at the facility will be trained in the necessary sections of the EMS and any associated procedures. All staff working for and on the behalf of the site will be suitably trained and competent (e.g. professional maintenance engineers, electricians, equipment operators etc.).

The primary role of day staff is to ensure and oversee plant loading operations, feedstock deliveries, digestate transfers and plant management.

Additional activities will include general site housekeeping and administration activities. Additional staff attending the site will be visiting engineers from the equipment manufacturers who are adequately trained to perform their duties at the site. The site will maintain written operation instructions all for the plant and monitoring equipment present on site.

The Health, Safety and Environmental Manager, Mr Iain Kerr, will provide the technical competency required for the site (Level 4 WAMITAB qualifications as required by the WAMITAB competency scheme).

Evidence of WAMITAB certification is provided in *Annex K*.

5.4 Site Security

The perimeter of the developable area will be secured by a 2.4m high steel paladin type fence and gates.

The site will be fully covered by CCTV and the control building will be protected with a burglar alarm. Motion detection security lighting will be in operation at the site.

The drainage basin will be surrounded by a 1-metre-high fence to prevent accidental entry and deter unauthorised access. Appropriate safety signage will be displayed in this area.

5.5 Site Inspections and Maintenance

The site will be subject to a regular inspection and maintenance program to ensure the integrity of the site infrastructure remains high in order to prevent pollution to the environment. Site inspections will aim to detect signs of degradation, damage or erosion of any of the site features, including (but not limited to) hardstanding, storage clamps, feedstock building, separator building, drainage systems, fencing, tanks and lagoon. .

All maintenance activities on site will be carried out in accordance to the manufacturers' recommendations and will be integrated within the company's environmental management system.

The key aspects of the maintenance management programme will include:

- A programme of Planned Preventative Maintenance (PPM) is undertaken to ensure ongoing management and replacement of key plant and equipment rather than waiting for the equipment to fail and the maintenance of any critical environmental equipment.

- The inspection and maintenance schedules that the manufacturer recommends are adhered to, including any period of recommended shut-down.
- Predictive maintenance is carried out to prevent any catastrophic breakdown.

The detailed management system operated by the site will include procedures for ensuring that adequate maintenance is undertaken at the site.

The maintenance programme will ensure that all equipment or infrastructure that is deemed essential in the prevention of pollution to the environment (e.g. hard-standing, bunds, abatement plant etc.) or the prevention of local nuisance impacts (e.g. odour abatement etc.) is maintained and kept in good operating condition.

5.6 Accident and Emergencies

The following sections outline the proposed accident management procedures.

5.6.1 Accident Management Plan

Engie has developed its own Accident Management Plan based around the specific risks associated with the site operations.

The key aspects of the site's Accident Management Plan are:

- Reviewed by Site Management annually, and as soon as practicable after an accident.
- Considers hazards presented by: emergency shut-down procedures;
  - actions in case of emergencies;
  - spillages and uncontrolled releases;
  - failure of any equipment;
  - plant or equipment failure (e.g. blocked drains);
  - contaminated firewater;
  - vandalism; and
  - flooding.
- Identify events or failures that could damage the environment.
- Assesses the likelihood and the potential environmental consequences from accidents at the site.
- Proposes action to minimise the potential causes and consequences of accidents.

Specific emergency response procedures will be developed by the operator in conjunction with the plant manufacturer. These procedures will be completed prior to operations commencing at the site.

In the event of an accident, the EA will be immediately informed and necessary measures to limit the environmental impact of the accident will be carried out, as well as measures to prevent further possible accidents.

5.6.2 Incident Response

The reporting of incidents and non-conformities will form a key component of the Engie's Environmental Management System (EMS). Identified non-conformities under the system include, but are not limited to the following:

- Non-compliance to any permitted conditions or consent limit (excessive waste being stored, missing of reporting deadlines, breach of any permitted limits etc);
- Internal Audit findings (legal non-compliances, EMS procedural breaches, system non-compliances);
- External and Internal Complaints; and
- Whenever a plant malfunction, breakdown or failure, or any near miss occurs.

The company's EMS will undergo periodic external audit and review to ensure that both compliance and continuous improvement is achieved. The EMS requires that all identified incidents, and non-conformities will be investigated and closed out.

6. EMISSIONS

The following sections discuss the emissions to air, controlled waters, ground or land and sewer that may arise from the proposed activities.

6.1 Emissions to Air

The site will have 7 channelled emission points to atmosphere as follows:

- A1 – Biogas boiler 560kWth (7.7m high stack);
- A2 – Natural Gas Generator 3MWth (14.0m high stack;
- A3 – Natural Gas Generator 3MWth (14.0m high stack);
- A4 – Emergency Diesel Generator (9.8m high stack);
- A5 – Flare (11m high stack);
- A6 – Flare (11m high stack);
- A7 – Reception Building Odour Abatement (14.0m high stack); and
- A8 – BUP Unit (14.0m high stack).

A2, A3, A7 and A8 will be in continuous operation, with the biogas boiler only utilised when required, emergency generator used as back up and the flares only under abnormal operation.

A full Air Quality Assessment (AQA) has been completed as part of this application to demonstrate the impact that this proposed site may have on existing air quality. The AQA quantifies the impact to air from all onsite sources, both point and diffuse emission sources. The AQA has been provided in *Annex H*.

Combustion-associated Products

Combustion products associated with the AD process will be emitted from dedicated stacks associated with the Biogas Boiler. The site proposes to one biogas boiler, in addition to 1 emergency diesel generator and 2 natural gas fired generator sets. Table 6.1 details the combustion emission process conditions used in the Air Quality Assessment. The diesel generators are for backup use only when the natural gas generators are not operational and will only be used for a maximum of 50 hours per year. [a: referenced wet gas flow rate]

Table 6.22 to

Table 6.3 detail the emission rates for the natural gas generator, the backup diesel generator and the biogas boiler respectively.

Table 6.1 - Combustion Emission Process Conditions

Parameter	Unit	Natural Gas Genset1	Natural Gas Genset2	Diesel Generator	Biogas Boiler
Stack location	X, Y	450464, 432083	450464, 432082	450467,450467	450478, 432071
Height	m	14.0	14.0	9.8	7.7
Stack Exit diameter	m	0.5	0.5	0.2	0.3
Exit Temperature	˚C	470	470	590	170
Volumetric flow rate (at 0°C/wet)[a]	Nm3/h	5065	5065	-	800

Volumetric flow rate (Actual)	m3/s	3.83	3.83	0.79	0.33
Flue gas efflux velocity	m/s	19.5	19.5	25.15	4.67

a: referenced wet gas flow rate

Table 6.2 – Natural Gas Generators Emission Rates

Pollutant	Maximum Emission Concentration (mg/Nm^3)	Mass Emission Rate (g/s)
NO_x	95	0.267

Table 6.3 - Diesel Generator Emission Rates

Pollutant	Emission (g/kWh)	Mass Emission Rate (g/s)
NO_x	8.008	0.654
CO	0.112	0.009
TVOC	0.332	0.027
PM_{10}	0.137	0.011
$PM_{2.5}$	0.137	0.011

Table 6.4 – Biogas Boiler Emission Rates

Pollutant	Maximum Emission Concentration (mg/Nm^3)	Mass Emission Rate (g/s)
NO_x	200	0.049
CO	40	0.004
SO_2	100	0.015

The on-site flares will also only be operated during emergency situations, either as a result of system failure or abnormal gas production. Given the limited operating schedule, impacts relating to the flare emission are considered not significant and have not been assessed further within the AQA.

Emissions from Storage

The reception building is fitted with an odour control unit that removes odour and ammonia prior to releasing gas to atmosphere. Extraction from the Separator Building is also directed to this abatement system. The odour control unit has been designed to achieve a minimum of 97% ammonia removal efficiency and a minimum 90% odour removal efficiency. The remaining gas is emitted through the stack, the details of which can be seen in Table 6.5.

Table 6.5 - Reception Building Stack

Parameter	Unit	Value
Approx. Stack Location	X,Y	450429, 432031
Stack Height	m	14.0
Stack Exit diameter	m	0.8

Exit Temperature	˚C	15 (ambient)
Volumetric flow rate	m3/s	7.866
Flue gas efflux velocity	m/s	15.649

Further ammonia emissions have been considered from a variety of sources, including the onsite liquid slurry tanks and the lagoon. In both cases, worst case scenario was assumed based on the project emissions from pig slurry. Full details can be found in *Annex H*.

The AQA concludes that given the proposed control measures and the modelling of a worst-case scenario emitters, all potential impacts on human and ecological receptors are considered to be not significant.

A bioaerosol risk assessment has been undertaken as the nearest sensitive receptor is located within 250m (Mill Lane, 150m south). The site will have in place a number of measures to minimise the release of bioaerosols from the process including covering of stockpiles, monitoring of meteorological conditions and undertaking handling and transfer of material accordingly and dampening roads etc where required.

Bi-annual bioaerosol monitoring around the site including within the feedstock building and separator building will be undertaken to ensure health and safety compliance.

The following table summarises how the site complies with the Biological Waste Treatment: appropriate measures relevant to air emissions.

Table 6.6 Appropriate Measures Compliance for Emissions to Air

Appropriate Measure	Site Compliance
Emissions Inventory	The site will identify, characterise and control all emissions and maintain a formal emissions inventory onsite.
Monitoring	The site will monitor all emissions to air in accordance with the frequencies and methodologies defined in the permit.
Emission Limits	The site will adhere to the ELVs set out within the permit and based on the BAT-AELS from the waste treatment BREF & MCPD where appropriate.
Meteorological Conditions	The site will install a weather station to allow the monitoring and recording of meteorological data relating to wind speed, direction and air temperature. This will be installed at appropriate locations onsite and will be calibrated every 4 months or in line with manufacturer recommendations.
Bioaerosols	The site will minimise the release of bioaerosols from the process, maintaining an inventory of potential sources and utilising measures such as covering feedstock, internal storage of waste, minimising handling times, dampening roads and monitoring weather and managing activities accordingly to reduce potential emissions. The nearest sensitive receptors are located approximately 150m from the site boundary. As such a bioaerosol risk assessment has been undertaken and is implemented onsite. Appropriate bioaerosol monitoring will be undertaken to ensure control measures are effective.
Odour	The site will implement an Odour Management Plan as provided in Annex D. This includes the requirements of the guidance as follows: ▪ actions and timelines to address any issues ▪ a procedure for doing odour monitoring ▪ a procedure for responding to identified odour incidents (e.g. complaints) ▪ an odour prevention and reduction programme designed to identify odour sources, characterise the contributions of the sources and implement prevention and reduction measures
Abatement	Abatement will be installed on the extraction system from the Feedstock Reception Building including extraction from the Separator Building. This system will be

	monitored on a bi-annual basis and be subject to the sites inspection and preventative maintenance plan. Procedures will be in place for replacement of activated carbon filters or replenishment of chemical reagents where required. An annual efficiency assessment of the abatement system will be undertaken.
Activated carbon	Activated carbon will be used for the treatment of emissions from the raw gas treatment unit. The site will monitor the activated carbon filter for the following parameters: inlet and outlet gas temperature and flow rate by continuous monitoring ▪ inlet moisture content or humidity ▪ back-pressure ▪ carbon bed temperature ▪ ammonia ▪ hydrogen sulphide ▪ odour The carbon will be regenerated / replaced prior to saturation. Manufactures recommendations (e.g. operating temperature) will be followed. Activated carbon will not be stored onsite, filters will be replaced when required.
Stacks & Vents	Dispersion modelling has been undertaken to ensure appropriate stack heights onsite All stacks will be installed with appropriate monitoring points with safe access.

6.2 Emissions to Water

There are no proposed process emissions to water as part of this application.

Clean, uncontaminated surface water will be discharged to Mill Dike. Two main sources will form this discharge; surface water run-off from the process area, which is first held in an attenuation tank for testing prior to discharge and surface water run-off from clean areas via the detention basin.

Both discharges sourced are fitted with penstock valves to prevent discharge to the water course in the event of any pollution incident.

Domestic wastewater is treated via package treatment plant and discharged to water course under consent.

Drainage arrangements are further described in Section 2.2.3**.** The table below summarises how the site complies with the Biological Waste Treatment: appropriate measures relevant to water emissions.

Table 6.7 Appropriate Measures Compliance for Emissions to Water

Appropriate Measure	Site Compliance
Emissions Inventory	The site will identify, characterise and control all emissions and maintain a formal emissions inventory onsite. This inventory will include all relevant characteristics as detailed in the appropriate measures
Monitoring	The site will monitor all water discharges using the relevant key process parameters to prevent accidental release of contaminants to surface water
Efficiency Measures	All water efficiency measures will be reviewed when considering the use of neutralising agents and topical barriers
Discharges to water	All discharges to water will be clean and uncontaminated. Compliance with the environmental permit will be ensured.
Treatment	No water treatment is undertaken on site so appropriate measures relating to this are not applicable
Wash Waters	Direct wash waters will be contained for offsite disposal or recirculation where applicable. No wash waters will sent for discharge to surface water or storm drains. All the techniques listed in the appropriate measures with respect to wash waters will be followed.

Segregation	Water streams onsite are segregated. Surface water from process areas and non-process areas are collected in an attenuation tank and detention basin respectively. These are tested prior to discharge. Leachate produced from the storage clamps is collected within an above ground tank prior to recirculation through the process. Process liquids, including condensate and end liquors are also recirculated through the process.
Fugitive Emissions	Appropriate measures are followed to prevent fugitive emissions to water, including impermeable surfaces, spill containment kerbs, sealed construction joints and connection to a contained drainage system. Bunding is located around site to prevent fugitive runoff. All uncontaminated water streams are segregated from contaminated water.
Spillage	The site will prevent spillages from entering drains, channels, gullies, watercourses and unmade ground by using an appropriate combination of sorbent materials, sand and booms/drain mats. The spillage response plan will detail how to dispose of waste produced from a spillage.
Inspection and Maintenance	The site will have an inspection and maintenance programme that fulfils all of its duties when reviewing onsite infrastructure including water containment facilities and impermeable concrete.
Subsurface Structures	The sites drainage system will be subsurface. An up to date and correct Drainage Plan will be maintained onsite, identifying all sub surface sumps and storage vessels. The system will be engineered to minimise leaks and allow rapid detection. CCTV and pressure testing will form part of the site inspection and maintenance programme.

6.3 Emissions to Ground or Land

There are no proposed emissions to ground or land associated with this Installation. The site will have soft landscaped areas on site to allow a proportion of surface water to soak away into the soil substrate. This water will be clean and uncontaminated and pose no risk to ground or land.

6.4 Emissions to Sewer

There are no proposed emissions to sewer associated with this Installation.

6.5 Odour Emissions

It is acknowledged that due to the nature of the feedstocks utilised by the anaerobic digestion process there is potential for odour emissions to arise from the site. As such the site will implement a number of control measures to manage and minimise potential impacts to nearby sensitive receptors The nearest residential receptor is 150m south of the site on Mill Lane.

A full odour impact assessment utilising dispersion modelling has been completed, concluding that odour emissions generated by the AD facility will not have a significant impact on nearby receptors.

Nevertheless, an Odour Management Plan (OMP) has been produced to practically manage and control the odour emissions generated on site. The site will use an effective combination of management techniques, containment and treatment including (but not limited to):

- Covering feedstock within the storage clamps;
- Minimisation of handling times with materials quickly covered following delivery / transfer to the process;
- Storage of malodourous wastes within a fully enclosed building;
- Installation of an extraction and odour abatement system on the building;

- The odour abatement unit has been designed to reduce odour emissions by 90% (and ammonia by 97%);
- Negative pressure from extraction system ensuring no fugitive emission when roller shutter doors are open;
- Covering of the digestate lagoon and any tanks/vessels;
- Storage of solid digestate within a dedicated area within an enclosed building (Separator Building) fitted with an extraction and abatement system;
- Vents from liquid feed tanks / blending tanks and PVRVs are connected to the abatement system in the building;
- Treatment of biogas prior to its use in combustion onsite.

The OMP includes procedures for routine olfactory odour surveys and complaints procedures. The OMP has been provided in *Annex D*.

Table 6.8 Odour Management Summary

Tier	Reference	Description
1	Inventory Control	The Installation will process 100,000 tonnes per annum of feedstock which are by their nature potentially odorous. This includes, energy crops, silage, manures, slurries and other green wastes. The site will be managed in a manner that prevents wastes being accepted into the site in the event that the site is inoperable. The site will operate waste pre-acceptance, acceptance and rejection procedures.
2	Containment	Putrescible wastes, and potentially malodorous wastes such as pig slurry will be stored within the feedstock reception building. This building is enclosed, fitted with an extraction system to retain negative pressure when doors are open, and will be managed to ensure all doors remain closed except during deliveries. Feedstocks stored externally within the silage clamps will be covered. Exposure of the face will only take place for short periods of time when transferring feedstock to the feeder hoppers.
3	Treatment	To avoid any odour emissions from the feedstock reception building and separator building, an extraction system and odour abatement unit will be installed. Emissions treated via the odour abatement plant will be emitted via the 14m high stack. Biogas produced by the process undergoes treatment prior to use at the onsite biogas boiler. This comprises adsorption, activated carbon and particulate filters. During this process potentially odorous hydrogen sulphide will be removed.

Although minimal odour from the plant is anticipated, odour shall be routinely monitored at points around the site boundary and observations shall be noted in the site diary and/or on a daily monitoring document.

In the event that there is any discernible odour detected at the site boundary and the odour is judged to be 'moderate' (i.e. odour Intensity Rank 3), then the Site Manager will be notified immediately, and the olfactory survey will continue to attempt to determine the source and extent of the odour plume, as follows:

- A suitable location downwind of the site and potentially sensitive receptor at which the odour plume is unlikely to extend will be selected for assessment;
- Survey will continue toward the facility until a site-related odour is perceived; and

- Assessment points perpendicular to the plume axis and equidistant from the site will then be monitored, subject to access requirements.

The main aim of monitoring will be to test if any odours emitted from the site will be causing the nearest receptors nuisance. In scenarios where nuisance is being caused then operations will be suspended until the conditions improve. The Site Manager may deem it necessary to find the precise source of the odour and attempt to eliminate it or neutralise it immediately.

The table below summarises how the site complies with the Biological Waste Treatment: appropriate measures relevant to odour emissions.

Table 6.9 Appropriate Measures Compliance for Odour Emissions

Appropriate Measures	Site Compliance
Odour Management Plan	An odour management plan will be in place to effectively control the risk of impact posed by odour emissions and clearly states the maximum storage capacity of the site and designated areas. The odour management plan will be regularly reviewed as part of the site's EMS. The odour management plan has been provided in Annex D.
Masking agents, chemical neutralising agents and topical barriers	It is not considered that the site will be required to use masking agents, chemical neutralising agents and topical barriers. If odour becomes an onsite issue, these will only be used alongside comprehensive process management control to prevent or minimise odour emissions. Care will be taken when using masking agents to prevent additional or alternative pollution.
Waste Management procedures	Odour potential will be assessed as part of the waste pre-acceptance procedures used on site. Waste acceptance procedures characterise the risk of odour and other emissions and appropriate measures are followed to control it, including storing all waste within an enclosed building. Due to the nature of waste storage onsite i.e. storage clamps, it is not always practicable to follow the "first in, first out" principle. However where appropriate this will be undertaken and particularly malodorous materials will be processed as quickly as possible to further control odour risk.
Drainage	Debris, litter and waste is removed from channels and sumps to prevent odour nuisances. This is undertaken as part of the sites daily inspection regime.
Sensitive Receptors	Odour pollution at sensitive receptors is not expected. If substantiated, monitoring of odour will be undertaken to the prescribed standards in the appropriate measures. This will include: ▪ using dynamic olfactometry following EN 13725 to determine the odour concentration ▪ to EN 16841 1 or 2 to determine the odour exposure ▪ to an alternative ISO, national or other international standards
Abatement	The site will monitor and maintain all forms of abatement to achieve optimum conditions. This will include ammonia, hydrogen sulphide and odour concentrations in both inlet and outlet.
Stack	Dispersion modelling has been undertaken to ensure the stack height of 14m for the odour abatement unit from the Feedstock Reception & Separator Buildings is optimum to ensure no impact at sensitive receptors. This modelling forms part of the Odour Impact Assessment provided in Annex E. All stacks onsite are fitted with appropriate monitoring points with safe access.
Emission Limits	The site will adhere to the ELVs set out within the permit and based on the BAT-AELS from the waste treatment BREF. For odour this is 1,000oE/Nm^3 and for ammonia 20 mg/m^3. Monitoring of emissions will take place at the frequency outlined within the permit (i.e. biannual) and will be undertaken in line with the relevant guidance and standards.

Meteorological Conditions	The site will have onsite a weather monitoring station to record meteorological data at the location. This will include wind speed, air temperature and wind direction and will allow management of external handling activities to minimise odour emissions appropriately. The weather stations will be calibrated every 4 months or in line with manufacturer recommendations.

6.6 Noise Emission

The design of the installation has taken into account the potential noise impacts on the environment and neighbouring receptors. The site is not considered to be in an area particularly sensitive to noise. The nearest residential receptors are located on Mill Lane beyond a railway line 150m to the south.

The plant and associated equipment has been designed in accordance with best practice and to ensure that that internal noise does not present an issue to the employees at the site under the Control of Noise at Work Regulations and to ensure that noise breakout does not lead to noise nuisance at the identified sensitive receptors.

A full noise impact assessment has been completed to assess the noise impacts which is provided in *Annex I*. Sound levels generated by the proposed development were predicted using CadnaA and assessments were made in accordance with the guidance contained in BS4142:2014+A1:2019. The assessment showed that the predicted daytime sound rating levels are significantly lower than midweek and weekend measured background levels, indicating the site would have a low impact on daytime sound levels.

The assessment showed that the predicted nighttime sound rating levels are slightly above measured weekend sound background levels, indicating the site would have a less than adverse impact on nighttime sound levels.

The Noise Impact Assessment did not require any mitigation measures to be put in place in order to meet the predicted sound rating levels. The site will be constructed to meet all the necessary BAT requirements necessary for noise. During the commissioning and operation of the proposed plant, all noise sources will be assessed and further mitigation measures will be implemented if considered necessary.

The table below outlines how the site complies with the biological waste treatment: appropriate measures relevant to noise emissions.

Table 6.10 Appropriate Measures Compliance for Noise Emissions

Appropriate Measures	Site Compliance
Noise Management Plan	Due to the low potential for noise impact at the site, demonstrated by the Environmental Noise Impact Assessment, it is not considered that a noise management plan is required onsite. Should noise nuisance become an issue in the future, the site will develop and implement a noise management plan alongside its existing EMS documentation.
Site Design	Earth bunding around the southern boundary of the site will provide a measure of noise attenuation in the direction of the nearest sensitive receptor.
Abatement and Minimisation	Due to the low potential for noise impact at the site, demonstrated by the Environmental Noise Impact Assessment, it is not considered that abatement is currently required on any plant items. Instead the site will implement a number of noise control measures to prevent potential noise impact in line with the appropriate measures. To minimise noise emissions, waste will be stored within an enclosed building that should provide a dampening effect to any noise arising from this activity. Doors and

	entrances to building have been located away from the location of any potentially sensitive receptors. The following measures will also be deployed to minimise noise emission: ▪ Maintain plant and equipment parts that may become noisy through normal wear-and-tear ▪ Closing doors and windows to prevent noise breakthrough ▪ Avoiding noisy activities, such as deliveries, at night ▪ Minimising drop heights of waste during loading/unloading ▪ Low onsite speed limits ▪ Using white noise tonal reversing alarms on vehicles ▪ Adequate training and supervision of staff
Flare	The onsite flares have been designed to minimise noise emissions. Operating the flares will not result in excessive noise emissions and will only be used during OTNOC.

6.7 Fugitive Emissions

The proposed facility will minimise any fugitive releases of process emissions (including ammonia, methane and bioaerosols), dust or odour.

Odour, bioaerosols and noise emissions are discussed in the sections above.

There are no inherently dusty materials stored onsite. Feedstock stored externally within the silage clamps is covered. All other raw materials are stored internally within the enclosed feedstock reception building, or within sealed tanks / vessels.

Fugitive methane emissions may occur during the transfer and production of biogas. A Leak Detection and Repair Programme (LDAR) in accordance with the guidance, will be put in place to monitor and assess these emissions, allowing quick implementation of repairs where required.

Additionally, pressure relief valves within the facility may be a source of fugitive emissions. All PVRVs will be appropriately installed, weather protected and subject to routine inspection and maintenance.

The table below outlines the sites compliance with the Biological Waste Treatment: appropriate measures in relation to fugitive emissions.

Table 6.11 Appropriate Measures Compliance for Fugitive Emissions

Appropriate Measure	Site Compliance
Emissions Inventory	The site will identify, characterise and control all emissions, include fugitive, and maintain a formal emissions inventory onsite. This inventory will include all relevant characteristics as detailed in the appropriate measures
Site Design	The site, including waste reception building, has been designed to prevent fugitive emissions. The feedstock reception building will be kept under negative pressure and fitted with an odour control unit that effectively removes ammonia and odour emissions to a minimum efficiency of 90% (97% for ammonia emissions). The site has a dedicated quarantine area within the feedstock reception building.
Operations	The site will operate in a such a manner as to prevent fugitive emissions. This includes: ▪ Good housekeeping measures including daily inspections; ▪ Storage times for particularly malodorous wastes will be kept as low as possible. ▪ Transfer to and from tankers will only take place following waste acceptance checks and under the authority of the designated responsible person ▪ Pressure and Vacuum Relief Valves (PVRVs) will be set so they do not produce fugitive emissions during normal tank pressure fluctuations. Isolating valves will

	be incorporated so PVRVs can be removed for maintenance without producing fugitive emissions or compromising site safety ▪ The site will use contained plant and equipment ▪ All digestate and is tested to ensure it has minimal biogas potential to prevent fugitive emissions ▪ Fugitive emissions from dewatered digestate will be effectively managed by storage in an enclosed building fitted with an odour control unit.
Fugitive emissions to air	The following measures are undertaken to prevent or minimise fugitive emissions to air: ▪ Minimising drop heights ▪ Regular inspections and maintenance of plant and equipment, including protective equipment used for containment of contaminated air ▪ Carry out waste pre-acceptance and acceptance checks on all waste ▪ Enclosing all waste in a reception building ▪ Keping roller shutter doors to building closed when not in use ▪ Keeping building under negative pressure to prevent fugitive emissions when doors are open. ▪ Covering external feedstock within clamps ▪ Dampening source of fugitive emissions where necessary The effectiveness and integrity of the building containment will be reviewed upon commissioning and then every 2 years subsequently. This will be done to a recognised standard, such as BS EN ISO 9972:2015.
Leak Detection and Repair	A Leak Detection and Repair programme will be produced which links to the sites Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) Plan, to the following standards ▪ BS EN 15446:2008, Fugitive and diffuse emissions of common concern to industry sectors – Measurement of fugitive emission of vapours generating from equipment and piping leaks ▪ BS EN 17628:2022, Fugitive and diffuse emissions of common concern to industry sectors – Standard method to determine diffuse emissions of volatile organic compounds into the atmosphere. ▪ BS ISO 15259:2023, Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report The plan will include: ▪ a map of the site and an inventory that identifies locations (point and area sources) for potential emissions ▪ a method for locating unknown emission sources ▪ estimates of the type and volume of release from each leak location ▪ prioritised locations (from highest risk to lowest risk) based on the potential quantity of release, its environmental impact, and DSEAR ▪ your monitoring methods and frequency to quantify significant emissions ▪ mitigation measures All potential sources of onsite leakage will be considered, including (but not limited to); double membrane roofs, PVRVs, roofs, feeding units, digestate separation units, pipework, compressors, methane slippage, BUP, grid injection, condensate pits, feedstock storage, digestate storage lagoon, building containment, vents, etc. Regular monitoring (LDAR Survey) using an accredited third party will be undertaken to ensure leaks are rapidly identified and repaired and emissions quantified.
Fugitive emissions to land and water	The site utilises appropriate measures to prevent emissions to land and water. These include; ▪ Impermeable hardstanding areas of site to capture runoff; ▪ Bunding on the western, southern and eastern boundary; ▪ Sealed construction joints; ▪ Sealed drainage system, fitted with a penstock-type valve; ▪ Testing of water prior to discharge; ▪ Non-return valve fitted to the outfall pipe; ▪ Leak detection on all subsurface pipework and tanks; ▪ Spillage Response Plan;

	▪ Appropriate staff training; ▪ Inspection and maintenance programme.

6.8 Pest management

It is acknowledged that due to the nature of the wastes stored and utilised onsite pests, such as rats and flies, may be attracted to site. The site will be operated in such a way as to prevent pests where possible and will implement a Pest Management Plan as part of the EMS to manage the potential issue.

Table 6.12 Appropriate Measures Compliance for Pests

Appropriate Measure	Site Compliance
Pest & Vermin Management Plan	The sites pest and vermin management plan will include procedures for: ▪ inspecting for pests and vermin and for controlling them ▪ rejecting loads of infested waste ▪ treating pest and vermin infestations promptly ▪ storing, handling and using approved pest and vermin control products
Fly Prevention & Management	All appropriate measures will be implemented to decrease fly incidence on site. A process will be developed to count and record and the number of flies on site, as well as a process to investigate and resolve fly infestation, including regular housekeeping practices like cleaning. The site will reject all maggot and fly infested waste. All fly treating equipment and chemicals will be used where appropriate, and by suitably trained staff and to the manufacturers' instructions. All activities involving pesticides will be documented as per the COSHH Regulations (2002) and kept on record for at least 3 years
Site Management	The site will implement several management measures to prevent pest nuisance, including: ▪ All quarantined waste that is infested will be removed within 24 hours ▪ Removal of debris from the drainage system to prevent pest attraction

6.9 Waste Generation and Management

There will be limited waste generated on site, with the only potential waste streams generated listed below:

Table 6.13 - Waste Generated on Site

Waste Code	Description
02	**Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing**
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 10	waste metal
10	**Waste from thermal processes**
10 01	**wastes from power stations and other combustion plants**
10 01 18	wastes from gas cleaning containing hazardous substances
13	**Oil wastes and wastes of liquid fuels (except edible oils and those in chapters 05,12 and 19)**
13 02	**waste engine, gear and lubricating oils**
13 02 05	mineral-based non-chlorinated engine, gear and lubricating oils

15	**Waste packaging, absorbents, wiping cloths, filter materials and protective clothing not otherwise specified**
15 02	**absorbents, filter materials, wiping cloths and protective clothing**
15 02 02	absorbents, filter materials (including oil filters not otherwise specified) wiping cloths, protective clothing contaminated by hazardous substances
16	**Wastes not otherwise specified in the list**
16 01	**end of life vehicles from different means of transport (including off road machinery) and wastes from dismantling of end**
16 01 07	oil filters
20	**Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions**
20 03	**other municipal wastes**
20 03 01	mixed municipal waste

This waste will be managed accordingly and in accordance with the waste hierarchy.

Digestate produced by the process will be sampled and analysed to ensure compliance with the Anaerobic Digestate Resource Framework (EA, 2025) and will achieve PAS 110 accreditation. As such, digestate will not be considered a waste.

The majority of waste onsite will be present as feedstock. The table below summarises the sites compliance with the biological waste treatment: appropriate measures in relation to waste storage and management.

Table 6.14 Appropriate Measures Compliance for Waste

Appropriate Measures	Site Compliance
Site Design	The site has been designed to meet all appropriate measures when it comes to the storage of waste, including: ▪ Storing and handling of waste will be located as far as technically and economically possible from water courses and sensitive receptors ▪ The feedstock reception building has been designed to store waste in a way as to minimise fugitive emissions. ▪ All waste will be stored under cover during its time on site, with storage taking place within the enclosed feedstock reception building ▪ Adequate space has been designed for to allow the safe operation of plant and equipment, as well as the environmentally safe storage and treatment of waste. The site has been designed to accept up to 100,000 per annum of material with up to 638 tonnes storage at any one time in the feedstock reception building. This will be detailed fully in the management system. ▪ The site will have safe pedestrian and vehicular access to storage areas for the safe retrieval of feedstock
Waste pre-acceptance	The site will have comprehensive waste pre-acceptance procedures in place to meet the requirements of the appropriate measures when to comes to storing waste. This will include: ▪ Full waste pre-acceptance and characterisation procedures for all new waste streams to ensure that the technical classification of the waste (through use of WM3 Assessment) is understood prior to storage. ▪ Pre-acceptance information will be reassessed on an annual basis ▪ Pre-acceptance records will be kept for at least 3 years in the electronic tracking system.
Waste acceptance, rejection and tracking	The site will have comprehensive waste acceptance procedures in place to meet the requirements of the appropriate measures when it comes to storing waste. This will include:

	▪ Following successful inspections, waste will be offloaded directly into the dedicated reception area for that waste type. Waste that requires further inspection will be offloaded in a separate location ▪ All non-conformances will be recorded, including waste assessed as acceptable for storage ▪ The waste will operate full written procedures for recording and reporting non-conforming and rejected wastes, and will include a suitable quarantine storage area ▪ The onsite waste inventory will be readily available at all times ▪ An electronic tracking system will be utilised to track the progress of waste throughout the site ▪
Drainage	The storage area will be able to ▪ contain all possibly contaminated runoff ▪ prevent incompatible wastes coming into contact with each other ▪ make sure that fire cannot spread ▪ be designed to allow access for inspection and cleaning All waste will be stored on an impermeable hardstanding with drainage that meets the recommendations of CIRIA 736.
Monitoring, Maintenance and Inspection	All storage areas will be inspected on a daily basis. This includes the area itself, waste bays, storage vessels and containers, as well as any associated infrastructure. A written record of all inspections will be maintained. The quantity of waste on site will be regularly monitored and assessed to ensure that maximum storage capacities at not exceeded. All storage vessels will be monitored for substrate levels, with a freeboard allowance maintained as per the manufacturer's instructions. All vessels will be equipped with an automatic level monitoring system and associated alarm and cut-out system to protect against overfilling. Procedures will be in place to ensure the safe loading, unloading and storage of all waste. The removal of grit and sediment from storage tanks and lagoons will be scheduled at appropriate intervals.
Storage Areas	Putrescible wastes will be stored within a sealed container or within the enclosed feedstock reception building, the latter of which is fitted with an odour unit and kept at negative pressure. The storage areas have been designed to be large enough to manage foreseeable changes and feedstock supply and the site's ability to dispatch without causing pollution. Such events include bank holidays, periods of adverse weather and seasonal peak volumes. This will aid the site in preventing accumulation of wastes and treating and removing waste as soon as possible. The site will follow the "first in, first out" principle, where practicable, to prevent waste remaining on site for excessive lengths of time. The storage areas will be made from concrete that is suitable for cleaning and disinfecting. Procedures will be in place to ensure surfaces are regularly cleaned and/or disinfected. The storage areas are designed as to prevent cross-contamination of inputs and outputs. Inputs and outputs are never stored in the same bay. Large volumes of ammonia rich feedstock, such as manures are stored in such a way that minimised release of ammonia. This is typically through covering or within a 3-sided walled area.

	Liquid storage tanks are designed to CIRIA standards, covered and are located on an impermeable surface. The onsite lagoon has been designed to ensure there is enough capacity at all times, with a freeboard allowance of 750mm at all times and covered with an impermeable cover. The lagoon will be constructed to CIRIA 736 standards. No high-risk activities involving fire or heat, such as grinding, welding, or smoking will take place in the storage areas. There will be a designated smoking area on site, and any emergency repairs needed to any of the plant or equipment will be done so in a safe location.
Waste Transfers	The site will have a documented process for transferring wastes to and from tankers, and all staff relevant to this activity will be suitably trained. Receipt of waste from a tanker will only be undertaken after waste acceptance checks, and approval from a responsible person. The moving of wastes to different locations will only be carried out following the creation of written procedures.

7. EMISSIONS MONITORING

7.1 Emissions to Air

Emissions to atmosphere are as detailed within Section 6.1.

Biogas Boiler

The biogas boiler will be monitored annually in accordance with EA guidance Monitoring Stack Emissions: environmental permits (formerly M2).

Emission Limit Values and monitoring standards are outlined in the table below.

Table 7.1 Biogas Boiler Emissions to Air Monitoring

Parameter	Limit (mg/m3)	Monitoring Standard
NO_2	500	EN 14792
CO	1400	EN 15058
SO	107	EN 14791
TVOC	1000	EN 12619
Note: ELVs are defined at a temperature of 273.15 K, a pressure of 101.3 kPa and after correction for the water vapour content of the waste gases at a standardised O2 content of 5% for gas engines		

Natural Gas Generators

The natural gas generator sets will be monitored annually in accordance with the requirements of the Medium Combustion Plant Directive 2015. ELV's will be set as outlined in Annex II Part 2 Table 2 of the MCPD summarised in the table below. Monitoring will be undertaken for CO and set pollutants.

Table 7.2 Natural Gas Generator Sets ELV's

Pollutant	Type of MCP	Gas Oil	Liquid fuels other than gas oil	Natural Gas	Gaseous fuels other than natural gas
SO2	Engines & gas turbines	-	120	-	15
Nox	Engines	190	190	95	190
	Gas Turbines	75	75	50	75
Dust	Engines & gas turbines	-	10	-	-
Note: ELV's are defined at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O2 content of 6 % for medium combustion plants using solid fuels, 3 % for medium combustion plants, other than engines and gas turbines, using liquid and gaseous fuels and 15 % for engines and gas turbines					

Odour Abatement Unit

Emissions from the odour abatement unit will be monitored bi-annually and in accordance with the BAT-AEL from the Waste Treatment BREF as outlined in the table below.

Table 7.3 BAT-AELs for Odour Abatement Plant

Parameter	Limit	Monitoring Standard
Ammonia	20 mg/Nm^3	EN ISO 21877
Odour	1000 OE/Nm^3	BS EN 13725

Emergency Diesel Generator & Flare

The emergency diesel generator will operate for less than 50 hours per year and as such no regular monitoring is proposed. Similarly, the flare will only be operated in emergencies, the SCADA system will monitor the frequency and duration of flare use.

7.2 Emissions to Controlled Water

There is no process emissions to water associated with this installation, as such there is no monitoring proposed.

Testing of surface water held in the attenuation tank will take place prior to discharge into Mill Dike to ensure all surface water discharged is clean and uncontaminated. Testing will take place on an as-required basis.

It is proposed to undertake periodic visual compliance monitoring of the detention basin to ensure that this discharge to surface water is free from contaminants. Visual inspection will take place as part of the sites daily inspections.

7.3 Emissions to Land

There are no emissions to land associated with the installation.

Periodic monitoring shall be carried out every 5 years for groundwater and 10 years for soil.

7.4 Emissions to Sewer

There are no emissions to sewer associated with the installation.

7.5 Fugitive Emissions

7.5.1 Odour

As part of the site's OMP, olfactory odour monitoring has been proposed at a minimum frequency of 1 survey per day. The surveys shall be carried out in accordance with the monitoring protocol contained in the EA's *Technical Guidance Note H4.* Records of all odour surveys shall be kept on site as part of the site's Duty of Care responsibilities.

A recording of Odour Intensity ≥3 during routine olfactory monitoring or the receipt of a complaint will necessitate further investigation into the causes and indicate whether further monitoring is required. Actions to be taken in the event of an exceedance will be dictated by the nature and extent of the exceedance(s) (e.g., by considering the magnitude of exceedance and whether it was event driven or on-going).

A review of the site activities, meteorological conditions and effectiveness of control produces will be undertaken on detection of a moderate odour.

The full monitoring to be undertaken on site can be seen in the OMP in *Annex D*.

7.5.2 Bioaerosols

As outlined within the Bioaerosol Risk Assessment, monitoring of bioaerosols by a competent accredited third party will take place on a bi-annual basis. Monitoring will be in accordance with the Environment Agency protocol, Technical Guidance note (Monitoring) M9 Version 2 July 2018.

7.6 Noise Emission

It is not proposed to monitor noise emissions on an ongoing basis during site operation. Initial monitoring will be undertaken upon commissioning to validate the conclusion of the noise assessment and determine whether any further mitigation measures are required. If noise complaints are received by nearby, local residents, a full investigation will be instigated to determine the source of the noise and corrective actions put in place to mitigate on an ongoing basis.

8. IMPACTS TO THE ENVIRONMENT

8.1 Impacts to Air

An assessment has been carried out to determine the potential air quality impacts associated with the emissions from the site. This includes both combustion and ammonia emissions.

8.1.1 Introduction

An assessment has been carried out to determine the potential air quality impacts associated with the proposed facility.

The scope of the assessment has been determined in the following way:

- review of air quality data for the area surrounding the Site, including data from the Defra Air Quality Information Resource (UK-AIR);
- desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- review of emission parameters for the BREF and dispersion modelling using the ADMS 6 dispersion model to predict concentrations of pollutants at sensitive human and habitat receptor locations.

8.1.2 Sensitive Human Receptors

Specific receptors have been identified where people are likely to be regularly exposed for prolonged periods of time (e.g. residential areas). The location of the discrete sensitive receptors is presented in Table 8.1 below.

Table 8.1: Sensitive Human Receptors (extracted from Enzygo AQA provided in Annex H)

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
HR1	Mill Lane, South Millford	Residential	450305.1	431848.1	386	1.5
HR2	Craglands, South Millford	Residential	449699.2	431969.0	765	1.5
HR3	Home Lea Cottage	Residential	449607.5	432319.2	823	1.5
HR4	22 Milford Road/Primary School	Residential/ School	449489.4	432659.7	1,034	1.5
HR5	10 Bartlett View, Sherburn in Elmet	Residential	449726.1	432886.8	968	1.5
HR6	25 Egremont Place, Sherburn in Elmet	Residential	450062.1	433040.2	900	1.5
HR7	Saxon Mews, Sherburn in Elmet	Residential	450412.9	433404.5	1,189	1.5
HR8	Ashfield	Residential	451647.9	433670.0	1,901	1.5
HR9	Lennerton Lodge	Residential	452093.9	432927.7	1,816	1.5
HR10	Norden's Barn Farm	Residential	451236.8	431807.9	910	1.5

The report concludes that impacts on existing pollutant concentrations are not predicted to be significant at any location within the assessment extents. Please refer to *Annex H* for more information.

8.1.3 *Impact on Sensitive Habitat Sites*

The Environment Agency's H1 guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive ;
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive ; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance .

Within 2km of the source:

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local wildlife sites (Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- Ancient woodland.

Habitat receptor designations and locations relevant to the assessment are presented in the table below.

Table 8.2: Sensitive Ecological Receptors (extracted from Enzygo AQA provided in Annex H)

Ecological Receptor		Designation	NGR (m)		Distance (m)
			X	Y	
ER1	Hook Moor	SSSI	443427.5	435265.5	7,675
ER2	Micklefield Quarrys[1]	SSSI	444615.3	432429.3	5,810
ER3	Roach Lime Hills	SSSI	441990.1	431344.0	8,459
ER4	Townclose Hills	SSSI	440926.3	430490.2	9,623
ER5	Madbanks and Ledsham Banks	SSSI	446379.8	430284.3	4,422
ER6	Fairburn and Newton Ings Woodland	SSSI	446889.6	427704.8	5,629
ER7	Fairburn and Newton Ings Woodland	SSSI	447403.9	427268.6	5,687
ER8	Fairburn and Newton Ings Woodland	SSSI	445494.8	427887.6	6,472
ER9	Sherburn Willows	SSSI	448818.7	432351.2	1,618
ER10	Stutton Ings	SSSI	448268.8	440334.9	8,518
ER11	Kirkby Wharfe	SSSI	450848.3	439479.3	7,400
ER12	Bolton Percy Ings	SSSI	453469.8	439900.1	8,384
ER13	Burr Closes	SSSI	459523.5	433981.9	9,302
ER14	Ash Tree Dike and Ponds	SINC	450236.2	432011.4	197
ER15	Sherburn Willows	Yorkshire Wildlife Trust Reserve	448820.6	432350.6	1,616

1: Geological designation and therefore not considered further as a sensitive receptor

The AQA concludes that the results indicate that emissions from the plant would not significantly impact or effect existing conditions at any designations.

Please refer to *Annex H* for the Air Quality Assessment.

8.2 Impacts to Controlled Waters

There are no impacts to controlled water relating to this proposed Installation.

Discharges to Mill Dike comprise only uncontaminated surface water.

8.3 Impacts to Land

There will be no impacts to land arising from any of the operations associated with the proposed Installation.

8.4 Impacts to Sewer

There will be no impacts to sewer arising from any of the operations associated with the proposed Installation.