Best Available Techniques Assessment

Waste4Generation Limited
12b Earlstrees Road
Corby
NN17 4AZ

Permit reference: EPR/CB3902XP/V004

May 2023

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1. Introduction

A Best Available Techniques (BAT) Assessment has been prepared by Waste 4 Generation Limited in collaboration with Earthcare Technical Limited as part of their response to a Regulation 61(1) Notice served by the Environment Agency on 29/09/2022 requesting further information with respect to the Waste 4 Generation Corby anaerobic digestion (AD) plant, 12B Earlstrees Road, Earlstrees Industrial Estate, Corby, Northamptonshire, NN17 4AZ operating under Environmental Permit reference EPR/ CB3902XP/V004. On discussion with the Environment Agency, it was decided to undertake a permit variation in lieu of the Regulation 61 review, and for the facility to be upgraded to a permitted installation.

This report comprises a review of the operation, activities, infrastructure, management systems, etc. for the site, in comparison to the requirements of indicative BAT as stated in the BREF document 'Best Available Techniques Reference Document for Waste Treatment'[1] to ensure that all relevant areas are included to ensure that all relevant areas are included.

The aim of this report is to provide confidence to the Environment Agency that Waste4Generation has both considered the requirements of BAT and operates the site in compliance with the requirements of indicative BAT.

The report is structured in table format in the same order as set out in 2018 Best Available Techniques (BAT) Reference Document for Waste Treatment[1] to ensure a logical review of the requirements of indicative BAT. Next to each relevant requirement there is a summary of the proposals and a comparison against indicative BAT.

The final section comprises conclusions and recommendations.

[1] Best Available Techniques (BAT) Reference Document for Waste Treatment, European IPPC Bureau, 2018

2. BAT Assessment for Waste 4 Generation Corby

Environmental Management System

BAT 1	**BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features**	
I	Commitment of the management, including senior management;	Senior management of Waste4Generation have committed to the establishment and maintenance of an environmental management system (EMS) for which they are working towards ISO14001 certification. Environmental Objectives have been set in the form of Daily KPIs which are reviewed by management on a monthly basis. There is review of the EMS annually to ensure the site is kept up to date with EA requirements & Best Practice. Ref: Environmental Policy
I	Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;	The Environmental Policy includes a commitment to monitoring and continuously improving the performance and application of environmental standards in the work place. Ref: Environmental Policy
III	Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment by the management;	The EMS has been developed and approved by senior management who are also responsible for financial planning and investment decisions.
IV	Implementation of procedures paying particular attention to: • structure and responsibility, • recruitment, training, awareness and competence, • communication, • employee involvement, • documentation, • effective process control, • maintenance programmes,	There are management system documents and procedures covering all of these elements as summarised: • Roles and responsibilities are detailed within Roles and Responsibilities **(Roles & Responsibilities 2023).** • Staff training is carried out in accordance with Section 1.5 of the EMS Manual **(Environmental Management System Manual)** • There is a commitment within the Environmental Policy **(Environmental Policy)** to regularly communicate environmental standards and practices to employees and other significant stakeholders;

BAT 1	**BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features**	
	• emergency preparedness and response, • safeguarding compliance with environmental legislation;	• Document control is in place and all documents benefit from version control which is managed through the Document Control Procedure **(Document Control Procedure)** and recorded in the Document Control Spreadsheet. Records are kept detailing review, understanding and implementation of procedures by staff & personnel. • The process is monitored and controlled in accordance with Section 2.3 (Operating Techniques) of the EMS Manual). • All plant and equipment are subject to a planned preventative maintenance programme in accordance with the maintenance section of the EMS as detailed under BAT 14. • There is a site-specific Accident Management Plan **(Accident Management Plan).** • The EMS **(Environmental Management System**) is in place to ensure compliance with legislation and environmental requirements.
V	Checking performance and taking corrective action, paying particular attention to: • monitoring and measurement, • corrective and preventive action, • maintenance of records, • independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained.	The management system incorporates: • Monitoring and measurement are detailed in Section 3 of the EMS, Emissions and Monitoring. • Corrective and preventative actions are detailed within the Environmental Risk Assessment (**Environmental Risk Assessment**) and the relevant procedures and Management Plans e.g. Spillage Procedure, Odour Management Plan. • Record keeping requirements are detailed in Section 4 of the overarching EMS. • Audits of the Waste Tracking System to ensure waste is being tracked accurately through the system on a monthly basis. • Review & Audits of the waste received, EWC codes and capacity undertaken both weekly, monthly & quarterly.

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VI	Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;	Management Review Meetings are carried out not less than annually. These are attended by Head of Operations, Head of Technical, Head of Finance & Managing Director. Minutes are taken from the meeting, and where actions are allocated sent to out to all relevant parties with completion dates or actions. The Head of Operations is responsible for overseeing completion of tasks.
VII	Following the development of cleaner technologies;	Waste4Generation are members of the industry body Anaerobic Digestion and Bioresources Association (ADBA) and have a network of contacts within the industry to keep well informed of industry developments. Waste4Generation will take the opportunity to adopt cleaner technologies where possible.
VIII	Consideration for the environmental impacts from the eventual decommissioning of the plant at the stage of designing a new plant, and throughout its operating life;	The arrangements for Closure and Decommissioning are detailed in Section 2.11 of the EMS as well as within the Contingency Plan (**Ref EMS Manual & Contingency Plan 2023)**.
IX	Application of sectoral benchmarking on a regular basis;	The Environmental Policy **(Environmental Policy)** includes an objective to meet relevant legislative, regulatory and environmental codes of practice. Through industry connections and networking including membership of ADBA, Waste4Generation compare environmental performance with other operators and strive to improve their performance through environmental objectives. Waste4Generation continually evaluate their performance against a number of their partner sites and have regular meetings on issues that arise and best practice. Waste4Generation work closely with numerous partner AD plants as well as asset firms (who own multiple AD plants) and keep abreast with sector developments and progression.
X	Waste stream management (see BAT 2);	See BAT 2
XI	An inventory of waste water and waste gas streams (see BAT 3)	See BAT 3
XII	Residues management plan - A residues management plan is part of the EMS and is a set of measures aiming to:	The EMS Manual (Section 1.1) includes a commitment to '*undertake appropriate measures to progress to ensure that the progression of the waste hierarchy is maintained'*. Furthermore:

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	• minimise the generation of residues arising from the treatment of waste, • optimise the reuse, regeneration, recycling and/or recovery of energy of the residues, and • ensure the proper disposal of residues.	*'The site's activities themselves are classified as 'waste recovery' and the company actively targets waste streams that can be diverted by landfill. Any wastes generated on site will be disposed of in a manner in keeping with the waste hierarchy. The DAF sludge produced from the site is fed into the feedstock production process which helps generate electricity at recipient AD plants. Any waste disposal from site is undertaken in a manner that minimises its impact on the environment.*
XIV	Odour management plan	See BAT 12.
XV	Noise and vibration management plan	See BAT 17.

Waste Management Measures

BAT 2	**In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.**	
Waste pre-acceptance		
A	Set up and implement waste characterisation and pre-acceptance procedures.	Wastes is only accepted from approved suppliers which have been approved in accordance with the Pre-acceptance Procedure and have been subjected to required due diligence **(Pre-Acceptance Procedure).** This procedure details rigorous waste pre-acceptance checks including waste information, sample analysis and trial loads. Pre-acceptance records for all wastes to be kept for at least 3 years. All wastes are required to be annually re-assessed to determine that pre-acceptance requirements continued to be met. The pre-acceptance procedure was revised to comply with BAT requirements & 'Biological Waste Treatment: Appropriate Measures' published by the Environment Agency September 2022.
Waste acceptance		
B	Set up and implement waste acceptance procedures	Waste is only accepted onto site if the waste meets the pre-acceptance criteria and the waste acceptance criteria which are detailed within the Acceptance & Rejection Procedure **(Acceptance & Rejection).** On acceptance of the waste, the waste then moves into the waste tracking form detailed below. Should the waste be rejected, the waste is to be recorded on a rejection form. If the waste does not conform with pre-acceptance analysis on arrival to site, then a non-conformance form is generated. This is inline with 'Biological Waste Treatment: Appropriate Measures' published by the Environment Agency September 2022 and is reviewed regularly by management. Any non-conformance forms are to be reviewed on generating by management. The odour of the waste is assessed as part of both the pre-acceptance and acceptance analysis. How the odour is scored on acceptance is relayed to staff and additional precautions can be taken where required to ensure environmental compliance. Highly odourous material is rejected from site and is not to be accepted on to site (**Ref Odour Management Plan**).
Waste tracking		
C	Set up and implement a waste tracking system and inventory. A waste tracking system and inventory aims to track the location	Waste is tracked in accordance with a weekly waste input schedule of waste that has met waste pre-acceptance criteria and is booked in for receipt. The schedule determined in

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	and quantity of waste in the plant. It holds all the information generated during waste pre-acceptance procedures (e.g., date of arrival at the plant and unique reference number of the waste, information on the previous waste holder(s), pre-acceptance and acceptance analysis results, intended treatment route, nature and quantity of the waste held on site including all identified hazards), acceptance, storage, treatment and/or transfer off site.	line with storage and treatment capacity and appropriate feed rates to maintain a steady process. From the specification generated from the pre-acceptance analysis (both internal and external), this influences the characteristics of acceptance form (in particular if additional characteristics needed to be added). On arrival to site, the vehicle is assessed as per the acceptance procedures (fit for purpose, contaminated etc), and the driver reports to reception. Following weighing in (and a site induction if required), the tanker moves on to site to be sampled as per procedure. The waste tracker utilises the acceptance analysis to determine (or confirm) the destination on site of the waste. Receiving tanks always checked to determine sufficient capacity prior to filling (Loads booking & scheduling to determine sufficient capacity each day/week). The waste tracker form records the destination process of the incoming waste and to which tank it is received. It also records whether the waste was odourous, if the waste was conforming, non-conforming and whether or not the waste requires quarantine. Initial recording of information includes: • Date & Sign-In Time • Producer, Haulier, Load • Weighed in, out time & weight received • Acceptance analysis • Odour scoring (of the waste & the vehicle) • Conforming / Non-Conforming / Quarantine & if so, Quarantine Destination • Initial Destination The waste tracker form is completed in combination of both the site operators and technical compiling details on the time, date & tonnage received (determined by the calibrated weighbridge). The acceptance analysis is compiled, and it is determined by technical if the waste is conforming, non-conforming, whether it is to be accepted, rejected or quarantined, which is reviewed by Technical. In the case of non-conforming loads, the site's management is to be informed.

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		The waste can be pre-treated as required, however typically it is unloaded into the 2 No. Reception Tanks, utilising the reception pumps to minimise potential odours. The offloading of tankers is to be over-seen by operators and the waste inputs are monitored and measured through monitoring of the level within each tank. From here, should the waste be transferred to a different tank, it is recorded within the waste tracking system including date/time & volume of transfer. Again, destination is checked to ensure sufficient capacity prior to transfer. Transfers between tanks are controlled by the SCADA system, and all of the tanks have high level alarms on them to prevent over-filling. The function of the waste tracking system is to ensure that: • waste is not booked in unless there is sufficient appropriate storage capacity for that waste stream within the 2 No. Reception Tank (as well as other storage tanks following transfers) as appropriate; • the correct types of waste are available to produce the optimum pre-treated waste blend for the AD plant & feedstock; and • waste is handled in accordance with a first-in first out procedure to minimise the odour potential of waste stored pre-treatment and during treatment in the Reception Hall. There may on occasion be exceptions to the first-in /first-out procedure in the case of high value / concentrated wastes or products (for instance concentrated syrups or glycerine), which are only utilised in small volumes at a time. These materials do not typically degrade on the same timescales as typical waste streams; however they are regularly monitored for degradation. • Determination of the exact components of any feedstock load produced for partner AD plants. • Tracking volumes entering into the AD process as well as volumes leaving site via trade effluent discharge. • Tracking volumes leaving site for partner AD plants. Inputs to the waste tracking system are: • Overall site capacity for permitted types and tonnages of waste and waste storage capacities for each waste category (set by the permit and the site

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		infrastructure). These are also recorded and checked on the weekly schedule where loads are booked in, to ensure sites and permit's capacity are not surpassed; • Wastes sources and types which have met pre-acceptance checks and therefore able to be accepted and booked in as required; • Actual individual received waste details including: - a unique identifier reference number (generated at weighbridge). - date and time received; - tonnage / volume received; - producer details and all previous holders of the waste; - a link to all pre-acceptance information on this waste stream; • identification of on-site storage: solids bay or liquid waste storage tank used (this information is entered into waste tracking system by operatives).Waste that is then pre-treated within R&D pre-treatment process to prepare blended feedstock or for digestion via the on-site AD plant. • Waste that is rejected whether this is at acceptance stage, at the weighbridge or once it has been tipped. Note: All the above information is held providing full traceability on waste materials. All waste tracking forms to be kept on site for 3 years (the same as pre-acceptance). Outputs from the waste tracking system are: • The type and amount of all waste on site at any one time and where it is being stored. These details are displayed daily within the site office (and on daily spreadsheet) summarising the activities throughout the day. These are also continually monitored and reported on SCADA.

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		• The type and amount of waste that has been pre-treated in any given period. The current storage levels & capacities of the pre-treatment process are continuously monitored and reported on SCADA. • Daily feed recipe for pre-treated waste production based on optimum balance of waste and also first in – first out for waste for the AD process. • Daily feed recipe for pre-treated waste production for optimum blend of the waste for feedstock generation for off-site generation at partner AD sites. • Daily recipe for feedstock generation (excluding pre-treated wastes). • The remaining storage capacity for all waste types at any point in time. This is collated into a daily spreadsheet for management & operators but is also monitored and recorded continuously through the SCADA system. • Informed decisions on the tonnages of waste streams under supply contracts that are required. • Tracking against permitted limits and production of figures for quarterly waste return submissions to the Environment Agency. **Data Entry Responsibilities** The **Weighbridge Operator / Site Operative** is responsible for ensuring that the following data is entered into the waste tracking system: 1. For each load: • Type of material (description) • EWC code • Source • Waste Transfer note reference • Net weight of waste • Date and time accepted

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		• Haulier • Haulier's license number • Origin of waste • Time and date • Record declaration of previous load acceptable and wash out certificate provided if required (e.g., ABP waste) • Vehicle registration number 2. For each load rejected at the weighbridge: • Type of material • EWC code • Source • Waste Transfer note reference • Tonnage • Date & time rejected • Reason for rejection / potential hazard as appropriate • Rejected by (name of staff member) • Destination of rejected material For each load rejected in the **Site Manager** is responsible for recording the following into the waste tracking system for each load / part load rejected upon visual inspection: • Type of material • EWC code • Source • Waste Transfer note reference

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		• Tonnage • Date & time rejected • Reason for rejection / potential hazard as appropriate • Rejected by (name of staff member) • Destination of rejected material The **Site Manager** is responsible for checking the following data is entered into the waste tracking system correctly: • Waste that has been booked in • Waste that has been received • Waste that is rejected Any wastes rejected from site require a rejection form to be completed. This is to be completed by the site manager and escalated to site management. The supplier is to be informed of any rejections and the reason for rejection. The waste tracking system contains details of the date/time the waste leaves the site and destination. This typically takes three routes: • Treatment via the AD plant and treated effluent leaves site through the trade effluent consented discharge point – for treatment at local sewage works. • Treatment via nano-bubble & chemical treatment through the DAF system where the treated effluent leaves site through the trade effluent consented discharge point – for treatment at local sewage works. • Blended feedstock for off-site generation at a partner AD site.

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Output quality		
d	Set up and implement an output quality management system	<u>Biogas quality</u> Biogas quality is constantly monitored via in-line gas quality sensors, with SCADA alerts signalling any drop in the quality. <u>Digestate</u> The effluent ("liquid digestate") produced by the digesters, due to its low solids content following final polishing is discharged to sewer via trade effluent consent. The low solids and nutrient content (due to the retention of the biological colony within the digester), means that this digestate is not spread to land like traditional AD systems. The effluent quality is monitored through testing to ensure consent compliance. <u>Feedstock Quality – for Offsite Generation</u> The pre-acceptance and acceptance analysis assist with the quality management of the incoming wastes used to be blended into feedstock. The blend of wastes within the feedstock process are analysed for key parameters including: • pH • COD • %DM • Sulphate • Ammonium • Chloride By undertaking analysis, Waste4Generation can then adapt the blend required for each individual recipient site. Waste4Generation issue a quality certificate with each load leaving site detailing the analysis taken on filling the leaving tanker, providing composite analysis, to ensure that a quality product is delivered. The company has a Quality Management Policy, which the site's management has agreed to the quality management policy, it's implementation and enforcement.

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Waste segregation		
e	Ensure waste segregation. Waste is kept separated depending on its properties in order to enable easier and environmentally safer storage and treatment. Waste segregation relies on the physical separation of waste and on procedures that identify when and where wastes are stored.	Feedstock is not stored onsite for more than a week (typically 24-48 hours) and always in sealed tanks. There are 8 feedstock reception tanks to allow separate storage of waste streams prior to processing. Waste4Generation prepares feedstock for off-site generation at partnered sites and has the capacity to individually tailor these blends to the receiving plant's requirements. Only selected waste streams and products are utilised to generate feedstock for offsite treatment. Waste4Generation have the facility to de-water, screen, mix & decant wastes to ensure their optimum quality. The SCADA process controls all aspects of the receiving, transferring, mixing and blending of the feedstock. Tanker reception and filling is all monitored on SCADA and also CCTV and is overseen by site personnel. Sampling and analysis of all incoming waste streams includes: • pH • COD • %DM or TSS • Ammonium • Sulphate • Chloride Wastes which could cause run-away reactions are not accepted on site and the compatibility of all wastes is assessed at pre-acceptance. The site has the ability to enable the flushing of lines throughout the process to clear any residues should it be required.
f	Ensure waste compatibility prior to mixing or blending of waste	Waste pre-acceptance and waste acceptance and rejection procedures are in place to ensure that only compatible waste types are mixed and blended. All wastes brought into site are subjected to pre-acceptance and acceptance analysis and are subject to analysis including Biochemical Methane Potential (BMP), inhibition as well as mixing trials to determine potential reactions. All wastes are non-flammable and not containing chemicals which could lead to reaction. The source of the waste and process generating the waste are verified at the pre-acceptance stage to determine if suitable for the treatment processes on site. The pH,

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		sulphate, chloride and ammonium testing (and pre-acceptance limits) both minimise the risk of any potential chemical characteristics of the waste streams (such as cleaning chemicals) but the strict limits in place minimise the potential concentration should they be present. The site looks to establish long term treatment contracts for the supply of incoming waste streams, and therefore this minimises the swapping between waste streams present on site, and only utilises verified sources. Inhibition and BMP analysis of incoming wastes determines viability of digestion of the incoming wastes. Inhibitory wastes not accepted onto site as these can contain elements that not only prevent digestion, or provide residues into the process, potential elements are more likely to be incompatible. No excessively hot / high temperatures wastes are to be received at site which could cause a thermal reaction with waste streams. On occasion, some syrups typically arrive warm, and although these do not react with any waste streams, these are isolated in their own tank where required until sufficiently cooled. Operatives to understand that cooling times are seasonal. Similarly, the characteristics of the waste are to be observed / determined to ensure sufficient trace heating is applied in winter to prevent the waste from freezing but to also prevent overheating. The laboratory undertakes numerous mixing trials to establish the viability of all combinations of waste (as the general blend of waste rarely changes), so Waste4Generation is able to determine the mix of all the products and sample it's characteristics. The mixes can be made of various percentage composition changes of all the wastes to ensure variations in volumes. All tanks have a high level alarm as well as bund, with the max filling level less than the maximum volume of the tank. This allows room for potential expansion, should there be any reaction or expansion, and sufficient bund capacity to account for any spillages should they occur. There is a number of different storage tanks which can individually store waste types, so that there is always only minimum volumes mixed into each blend at a time, and there is no potential for the combined mixing of all the volumes of waste stored on site, just limited volumes of each types, blended as per specific recipe / design.

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g	Sort incoming solid waste	There is only sufficient capacity for the acceptance of one solids waste type at a time. All solid wastes are checked for compatibility at the pre-acceptance stage. The solids bay is washed down on emptying and between different wastes. Incoming wastes subject to pre-acceptance and acceptance procedures to determine viability, compatibility and any potential odour or environmental risks to be mitigated.

Inventory of Waste Water and Waste Gas

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 following features:**	
i	Information about the characteristics of the waste to be treated and the waste treatment processes, including: • simplified process flow sheets that show the origin of the emissions; • descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;	Origin of Emissions / Emission Points The Process Flow Diagram (Appendix A) shows inputs and outputs including the origin of any emissions. See Emission Point Plan (Appendix D). and Final Effluent Odour Process (Appendix E) which shows how effluent and off-gas treatment are linked. Emissions to air are: • CHP engine stack (A1) – Emission Point 10 • Flare stack (A2) – Emission Point 9 • Auxiliary Boilers stack (A3) – Emission Point 36 • Pressure relief valves on digesters – Emission Points 19 - 22 • Methane Scrubber (Vent on Centralised Odour Scrubbing Unit) – Emission Point 6 • Fuel Storage Tank – Emission Point 35 Emissions to sewer are: • Discharge of treated effluent (liquid digestate/effluent) to Anglian Water sewer Waste-Water Treatment Techniques The following wastewater treatment processes are carried out on site: • Initially the waste is received into reception tank 2 where the waste is allowed to settle and the settled sludge is removed from the base of the tank and is used to supplement feedstock generation. • The waste is processed via the influent DAF (1), to recover any fats, oils & greases and solids, with a target of suspended solids below 1000 mg/L.

Commented [ESP1]: Add appendix refs

Commented [ESP2]: Add here as per Emission point Plan refs and add other flare / PRVs

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 following features:**	
		• The waste is then stored within the main balance tank for feed testing & analysis. This then determines the feeding rates forward, dosing and recirculation requirements. • Wastewater is treated through the high-rate anaerobic digestion process utilising the 4 No. 60m^3 digesters to generate biogas. Total loading target of 3000 kg of COD per day to produce approximately 150 kW/hour continuous electrical production. • The typical loading rate will be approximately 50 g/L COD at a rate of between 2 – 3 m^3/hour feed flow. Targeted removal rate of COD is 90%. • The reactors are set up so that they can be fed individually, in series as well as in parallel in order to achieve the optimal removal rates for the waste streams in question. • The digesters are closely pH and temperature controlled in order to optimise digestion, with individual conditions set for the acidogenic and methanogenic stages to help culture the individual bacterial subsects. • The treated influent from the digesters is pumped into R1 for aeration / nano bubble treatment to flash aerate the remaining COD, ammonium and other requirements. • This effluent leaving R1 is treated via a secondary DAF unit utilising pH correction, polymer & coagulant addition where required to further polish the effluent to attain targeted suspended solids level of 500 mg/L, providing tertiary treatment. This is then pumped to the final effluent polishing tanks for quaternary treatment, which consists of precipitation, pH correction and chemical addition in order to achieve both trade effluent compliance and the site's odour abatement targets. This effluent then leaves site via the trade effluent consented discharge. Chemical adjustment and oxygenation to be continuously adjusted to ensure that the sufficient treatment capacity within the effluent to scrub odour, whilst maintaining consent compliance. • Effluent leaving site can leave continuously once tested to be in consented limits or there is the facility to have a batch discharge from site following

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		analysis. Final effluent analysis comprises of: pH, COD, TSS, Combined Ammoniacal nitrogen, Sulphate, Sulphide, Chloride, Zinc & Copper analysis. Trade effluent consented limits are displayed in both the site office and in the onsite laboratory. There is no discharge from site without prior analysis and approval from management. • Blending and generation of feedstock for off-site waste recovery / energy generation with partnered AD plants. This includes specifically blending the wastes, improving their calorific value, de-watering, balancing the feedstock composition as well as nutrient addition where required. This provides high quality feedstock for partner sites, balanced in profile to prevent digestive issues such as inhibition and foaming and efficiently removing dilute waste streams for optimal treatment onsite utilising high-rate AD designed for treating effluent. • Aerobic treatment utilising ozone / nano bubbles for tertiary / quaternary polishing of effluent. • R&D hydrolysis of Fats, Oils & Greases provides additional viable COD for digestion and feedstocks, where typically FOGs can only be fed in small volumes to digesters to prevent processing issues as well as plant & equipment issues. <u>Waste Gas Treatment Techniques</u> The following waste gas treatment processes are carried out on site: • Biogas treatment via carbon scrubbers. As per the odour management plan, each individual process has its own dedicated carbon scrubber. The volume of carbon will be calculated on total loading of H_2S and the activated carbon absorption capacity. The carbon scrubbers are on a daily checklist and the spent carbon will be replaced once the H_2S reading is above set limit. Spent carbon will be sent away for regeneration where possible and spare carbon kept on site. Stock levels to be recorded and replacements scheduled. • Pre-acceptance and acceptance analysis on incoming waste streams eradicates high sulphur waste streams both prior to their arrival to site and

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		also on acceptance. Wastes outside of the sulphate acceptance limit to be rejected. High sulphide wastes including highly odorous waste are rejected at both pre-acceptance and acceptance stages. • Dosing to reduce hydrogen sulphide in biogas. Ferric chloride is to be added to the digesters via the AD break tank to remove H_2S produced within the digesters. Reactor KPIs are produced and followed to minimise the production of H_2S, inhibiting sulphate conversion and encouraging methanogen growth within the digesters. The biogas produced will then pass through an independent carbon scrubber to further reduce the H_2S concentration within the biogas to below 150 ppm prior to the CHP engine. • Odour Abatement System treats any entrained gases plus displaced air from dedicated processes of the site as indicated in the odour management plan. The gases / air is pulled from site into the base of the abatement system and is then blown up the flue through packing media, whilst chemical/nano bubble /O_2/O_3 treated effluent cascades down through the packing media removing any residual odours not taken out from the carbon scrubbers. Chemical addition and O_2/O_3 concentrations can be adjusted accordingly to achieve required removal rates. The vent of the scrubber in the centralised odour abatement system is monitored to determine efficiency in odour treatment, with chemical adjustment & parameters adjusted to improve efficiency where required. Odour abatement system design specification to incorporate all off-gases and displaced air from site (excluding those treated by individual scrubbing units). Certain areas of the plant are treated both by a carbon scrubber and then by the centralised odour abatement system. Typically tankers connecting to discharge waste into site do so via the reception pumps to minimise odour. Should the tanker's own pumps required to be used, the displaced air is also connected to the centralised abatement system to system for odour treatment. • The ozone and nano bubble technology on-site delivers high volumes of oxygen available to oxidise and remove odours. This assists with clean down on site but treats the effluent within R1 and the treated effluent within the centralised odour abatement system. The nano-bubble unit comprises of an

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		Oxy 15 with an Ozone Atlas 30, which has the capabilities of delivering O2 at a rate of up to 800g/hour (based on 93% transfer) at a liquid rate of 15m3/hour and an ozone delivery rate of 30g/hour based at a liquid rate of 15m3/hour and 5-14% Ozone by weight (when oxygen fed). These ozone and nano bubble units can be increased to further increase delivery where required.
ii	Information about the characteristics of the wastewater streams	The effluent discharged to sewer is required to meet quality standards in line with the Anglian Water Trade Effluent Consent. The site must maintain consented limits on the trade effluent consent at all times, and it is monitored daily (and more regularly if required) to ensure compliance. The site is designed to be able to test a batch of effluent for compliance prior to discharge as well as discharge continuously. Daily analysis of the effluent leaving the plant is undertaken in-house. Final Effluent Analysis includes: • Sulphide • Suspended Solids • pH • Combined Ammoniacal Nitrogen • Chloride • Chemical Oxygen Demand • Zinc • Copper • Sulphate The temperature of the effluent is also measured, and due to the strict control of the temperature of the AD plant for process condition & optimisation, the site never approaches the temperature consented limit, as this would have a severe detrimental effect on the bacterial colony. The trade effluent discharge from site also needs to meet flow and volume consented limits, which are monitored and controlled by SCADA.

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 following features:**	
		In addition to daily monitoring, the site is sampled by Anglian Water, for consent compliance as well as charging. Anglian Water analyse this sample for all the consented limits provided in the trade effluent consent. In turn, the duplicate sample provided is both analysed in-house for selected parameters and sent away for external analysis of all consented parameters. The trade effluent consent is regularly reviewed in line with Anglian Water's compliance requirements as well as the onsite processes. The volumetric limit for discharge is currently set at 150 m3/day, which is due to be expanded to 300 m3/day with the expansion of site and the addition of tertiary and quaternary treatment methods, effectively reducing the outgoing COD and chemical constituent loading leaving site as Waste4Generation continue to polish the effluent.
iii	Information about the characteristics of the waste gas streams, such as: • average values and variability of flow and temperature; • average concentration and load values of relevant substances and their variability (e.g., organic compounds, POPs such as PCBs); • flammability, lower and higher explosive limits, reactivity; • presence of other substances that may affect the waste gas treatment system or plant safety (e.g., oxygen, nitrogen, water vapour, dust).	<u>Biogas and combustion emissions:</u> Biogas quality is good – slight variances, but generally between 55 - 75% methane and <150 ppm hydrogen sulphide after scrubbers. Biogas has a lower explosive limit of approximately 6% by volume and a higher explosive limit of approximately 12% by volume. Continuous biogas monitoring of the gas quality by the CHP unit, with alarm levels. Spot sampling of the biogas through gas analysers, with reporting limits for low methane, high O_2, high H_2S etc. The resulting biogas is currently used in the 1 No. CHP following treatment via its dedicated carbon scrubber. Carbon within scrubbing unit specifically designed for AD application and biogas specification. Waste gas may arise in the form of biogas during periods of extended breakdown and maintenance. Waste gas is burnt in the flare. Flares designed for complete combustion of waste biogas. Biogas entering flare unit is following carbon scrubber (for CHP), biogas has H_2S removed prior to entering flare.

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 following features:**	
		Odour scrubber The treated off-gases from the odour scrubber should contain very minimal concentrations of H_2S, Ammonia and with neutralised odour, emissions within BAT requirements and controlled through monitoring.

Commented [ESP3]: Add here about likely constituents from scrubber exhaust

Waste Storage

BAT 4	**In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.**	
a	Optimised storage location. This includes techniques such as: • the storage is located as far as technically and economically possible from sensitive receptors, watercourses, etc.; • the storage is located in such a way so as to eliminate or minimise the unnecessary handling of wastes within the plant (e.g., the same wastes are handled twice or more or the transport distances on site are unnecessarily long).	All waste is stored in sealed tanks prior to treatment on site in 2 No. reception tanks and the 4 No. digesters and 8 feedstock reception & blending tanks. The storage is located as far as technically and economically possible from sensitive receptors, water courses, with an additional barrier of a series of ACO drain collection system between sources and sensitive receptors. The storage is located in such a way as so to minimise the unnecessary handling of wastes within the plant. The disposal of waste and collection of feedstock are located at the same area of site, reducing tanker movements, with the view of maximising the use of a single haulage trip by using that same tanker to discharge incoming waste and then immediately re-load and pick up feedstock from the same site & same unloading/loading point. The tanks have their own storage bund, which then has an additional bund outside of the secondary containment system. The site and tanks are located within the Northamptonshire County Council waste spine which is approved for facilities like ours, and focuses areas of waste treatment where required and also to areas of minimal risk. The site is in the middle of a heavily populated industrial estate as far away from sensitive receptors as possible. The site is surrounded by other waste treatment facilities and landfills as well as quarries. The industrial estate itself is reclaimed land.

BAT 4	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.	
b	Adequate storage capacity. Measures are taken to avoid accumulation of waste, such as: • the maximum waste storage capacity is clearly established and not exceeded taking into account the characteristics of the wastes (e.g., regarding the risk of fire) and the treatment capacity; • the quantity of waste stored is regularly monitored against the maximum allowed storage capacity; • the maximum residence time of waste is clearly established.	The feedstock storage capacity is optimal for the volumes that can be received within the proposed permitted limits. This includes the optimum number of tankers that can be efficiently processed as well as allowing for regular maintenance and cleaning. The design and capacity will prevent from the permitted capacity being exceeded. The volume of waste to be received daily to match the volume permitted through the Anglian Water trade effluent discharge. The waste and products received are pre-planned and scheduled in, to deliver the contracted feedstock blend to clients. Weekly & daily schedules are issued and approved in line with the site's permit & EWC code listing. Deviation from the schedule will need approval from both technical and operational senior management. Both daily & weekly volumes are recorded and tracked. In addition to the waste tracking system, they are recorded on the planning board and on a centralised system for quarterly reporting. The weekly volumes for the previous and forthcoming week are clarified and scheduled in the weekly operational meeting. Currently there is a 24 hour storage time of the waste, however operationally a limit of 48 hours is required to allow for de-watering and blending. The contracted waste in and out of the plant means that the waste is not held for more than 48 hours. There are outlets for all incoming waste via feedstock production and the Anglian Water trade effluent discharge. The storage facility will be used for storing additional waste and products along with the prepared feedstock for times the plant/partner plants have scheduled or emergency shut downs, holidays or increased demands The waste storage infrastructure can accommodate the waste tonnages with contingency. The maximum annual tonnage of waste is 109,500 tonnes per year. The maximum storage capacities and residence times are detailed in Table 1 below: Table 1 – Waste Storage

BAT 4	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.	

Type of waste	Storage location	Maximum tonnage at any one time (tonnes)	Maximum residence time
Brewery waste	RT2	25T	48 hours
Effluent waste streams	RT2	25T	48 hours
Food waste	RT2	25T	48 hours
Yeast	Grey tank	26T	48 hours
DAF sludges	Grey tank	26T	48 hours
Syrups	Silver tank	20T	48 hours
Chicken waste	RT6	54T	48 hours
Glycerine	Gold tank	54T	72 hours
Veg/Fruit waste	RT1	28T	48 hours
FOG	FOG reception tank	30T	48hours
Leachate /Complex waste	Complex waste reception tank	30T	48hours

<table>
<tr><td>BAT 4</td><td colspan="2">In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Product</td><td>3 x 30t Product storage tanks</td><td>90T</td><td>72hours</td></tr>
<tr><td>Waste</td><td>3 x 30t Product storage tanks</td><td>90T</td><td>72hours</td></tr>
<tr><td>Feedstock</td><td>3 x 30t Product storage tanks</td><td>90T</td><td>72hours</td></tr>
<tr><td>Still 5 storage</td><td>24 IBCs stored in warehouse</td><td>24T</td><td>96hours</td></tr>
<tr><td>Solid Waste i.e. Fruit, Grains, Chicken Litter</td><td>Solids storage bay</td><td>30T</td><td>48hours</td></tr>
<tr><td colspan="2">Total storage capacity</td><td>667T</td><td></td></tr>
</table>
Waste tonnages are monitored and controlled through the Waste tracking system (see BAT 2c).
</td></tr>
<tr><td>c</td><td>Safe storage operation. This includes measures such as:
• equipment used for loading, unloading and storing waste is clearly documented and labelled;
• wastes known to be sensitive to heat, light, air, water, etc. are protected from such ambient conditions;
• containers and drums are fit for purpose and stored securely.</td><td>All waste is stored in sealed tanks prior to treatment either in the digesters or feedstock blending tanks, thus wastes are protected from ambient conditions.
A dedicated high specification hose has been procured for the unloading/loading of specific wastes/feedstock, which are kept and maintained on site. These are regularly checked and inspected prior to loading & unloading. Valves are either steel or stainless steel, with their operation checked daily (or weekly if not operated that week).</td></tr>
</table>

BAT 4	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.	
		The pipework is MDPE and is inspected weekly with failures or leaks to get repaired/replaced immediately by staff on site. Spares and equipment required to be kept on site. All levels are recorded on SCADA as well as operational logs. The JCB is serviced and maintained as per manufacturers' instructions. All wastes are stored as required. Waste4Generation does not accept any waste which is sensitive to light, heat, air or water and is protected from ambient conditions within sealed tanks. The only materials sensitive to ambient conditions would be site chemicals which are stored as required for safety and to protect their integrity for instance hydrogen peroxide stored inside within black IBCs (to prevent reaction with light). Caustic concentrations at minimal concentration for both safety and to prevent freezing. Waste4Generation ensures that all storage is fit for purpose where: • All individual containers have their lids fitted & secured • All tank hatches to be fitted securely • Any higher risk tank to be double bunded • Tanks inspected and cleaned out monthly • All tanks inspected and pressure tested prior to installation • Tanks are all designed to contain both the material and volumes they are receiving. The feedstock process has its own dedicated pipework system and pre-acceptance of the feedstock materials (including wastes) are tested for compatibility. Only compatible wastes will be accepted on to site. The AD plant has its own dedicated pipework system. All waste temperatures are within the tanks and pipework & equipment specifications. Where wastes (particularly syrups etc) where their viscosity increases significantly where the material cools, it will be ensured that the receiving tanks are suitable. There is a set 60^{o}C maximum temperature limit on incoming wastes to prevent any process issues. On occurrence of inclement (or cold) weather, the feedstock tanks can be on continuous re-circulation to reduce the likelihood of freezing. Trace heating and lagging on all essential lines.

BAT 4	**In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.**	
		Drums and containers are fit for purpose and stored securely in the warehouse within IBC storage area. Each IBC received is labelled with all potential hazards and is logged within IBC tracking system. Any potentially hazardous waste (mirror non-hazardous etc) received is stored within a dedicated hazardous waste reception and treatment facility located within the warehouse. This area is independent and entirely segregated from the AD & feedstock process. This process when in operation has its own tanks, pipework, and all associated equipment. All individual pumping systems & pipework have the ability to be flushed through and cleaned. Cleaning is part of the site hygiene & cleaning procedures (**Ref Site Cleaning & Hygiene Procedures**)
d	Separate area for storage and handling of packaged hazardous waste. When relevant, a dedicated area is used for storage and handling of packaged hazardous waste.	The site has separate storage areas for hazardous wastes, as well as being able to individually quarantine these wastes with each suitably segregated.

Waste Handling & Transfer

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.**	
	Handling and transfer of waste are carried out by competent staff.	All waste handling and transfer activities are carried out by trained staff in accordance with Handling & Transfer Procedure **(Ref Handling & Transfer Procedure**) and the Training Procedure **(Ref Training Procedure)**. All the operators have been trained by high qualified managers. All the operators are fully trained and accessed prior to carrying out waste handling duties. Operators must pass an internal competency operator exam prior to passing their probationary period, and prior to accepting waste. The operators are required to demonstrate they understand the waste hierarchy, the EWC code list, the pre-acceptance, acceptance and rejection procedures as well as understanding the operation of the weighbridge.
	Handling and transfer of waste are duly documented, validated prior to execution and verified after execution;	Waste is tracked in accordance with a weekly waste input schedule of waste that has met waste pre-acceptance criteria and is booked in for receipt. The schedule determined in line with storage and treatment capacity and appropriate feed rates to maintain a steady process All feedstocks coming into site are recorded on the weighbridge and the data stored on the weighbridge computer. This includes feedstock type, tonnage, date, and time. Waste inputs to the 2 No. Reception Tanks and therefore the AD process is monitored through a level sensor in each tank. All staff have a copy of the daily delivery schedule. Operatives are trained in the following: • Waste hierarchy • Full compliance with the waste transfer paperwork and consignment notes where required. • Understanding of the site's EWC code list • Understanding of acceptance procedures & waste within specification • Site's SIC Code

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.**	
		• Approved Haulier details, qualified to transfer the waste • Source of waste • Weights recorded The site operates with a WAMITAB / COTC manager on site overseeing operations.
	Measures are taken to prevent, detect and mitigate spills;	The entire site is bunded with sealed drainage to ensure that all run off, rainwater and any spillages are reused and treated within the AD process. The Standard Operating Procedures include measures to prevent spillages occurring. However, in the case of a spillage occurring the Spillage & Drainage Plan **(Spillage Procedure & Site Cleaning & Hygiene Procedures)** is enacted. Only approved hauliers are used to deliver / remove waste from site. There is dedicated hoses and fittings for loading & unloading. There is regular testing of the valves to ensure operation. Cleaning and maintenance of the hoses, which are properly stored and maintained when not in use. The site utilises level sensors to check and ensure levels are accurate in addition to physical checks to validate levels. There is regular reception tank cleaning to prevent any potential sediment build-up. The unloading and loading of tankers is supervised by a Waste4Generation operative at all times, with unloading/loading to only occur in designated areas designed to retain any spillages. Any spills to be immediately cleaned up and disinfected. All unloading will be done into an empty vessel where possible. Tank levels are to be checked to ensure that there is sufficient capacity prior to unloading. All hauliers are required to have a site induction on their first arrival to site. Wastes are to be unloaded utilising the reception pumps (in preference over the tanker's own pumps), allowing control to be monitored and controlled by the SCADA system and operatives.
	Operation and design precautions are taken when mixing or blending wastes (e.g., vacuuming dusty/powdery wastes).	Waste is only mixed within the enclosed waste treatment infrastructure – all of the waste is liquid or pumpable (apart from the 30T of solids which is contained in the sealed solids bay). The liquid waste received is of varying viscosities. The wastes are mixed via

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.**	
		recirculation and a paddle mixer. The paddle mixer is enclosed and the pumping mixing system is also an enclosed system.

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 pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).**
	There are no emissions to water. The entire site is bunded with sealed drainage to ensure that all run off, rainwater and any spillages are reused and treated within the AD process.

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.**
	Not applicable, see BAT 6.

Monitoring of Point Source Emissions to Air

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.**	
H_2S	Once every six months. No EN standard available. See BAT 34	Carried out every 6 months as per BAT 34. The odour abatement system utilises the existing methane scrubber on site.
NH_3	Once every six months. No EN standard available. See BAT 34	Carried out every 6 months as per BAT 34.
Odour concentration	Once every six months EN 13725. The monitoring of NH_3 and H_2S may be used as an alternative to the monitoring of the odour concentration. See BAT 34	Odour monitoring will be carried out every 6 months as per BAT 34.

BAT 9 Not Applicable

Commented [ESP4]: As per our discussion, check that this is the monitoring that you would prefer to do over NHs and H2S

BAT 10	**BAT is to periodically monitor odour emissions.**	
	Odour emissions can be monitored using: • EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure); • when applying alternative methods for which no EN standards are available (e.g., estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. The monitoring frequency is determined in the odour management plan (see BAT 12).	Monitoring will be carried out in accordance with EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration) in accordance with BAT 8 and BAT 34.

Material Efficiency

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.**	
	Monitoring includes direct measurements, calculation or recording, e.g., using suitable meters or invoices. The monitoring is broken down at the most appropriate level (e.g., at process or plant/installation level) and considers any significant changes in the plant/installation	Waste4Generation maintains a log of: • Wastes accepted for treatment via weighbridge computer and Waste Transfer Notes • Treated effluent (digestate) discharged from site via sewer • Any other residual waste removed off site (Waste Transfer Notes / Quarterly Waste Returns /) • Energy used • Raw materials used: oil, carbon for scrubbers • Biogas production, electricity, and heat generation Waste, raw materials and energy use are recorded and audited annually. In other cases where waste is generated from one process which is fed into another, this is recorded by the waste tracking system (for instance the production of DAF sludge recovered from DAF 1 into the feedstock process). Waste4Generation will report the following to the Environment Agency on an annual basis, or as stipulated in the Environmental Permit. • Waste in and out (waste returns) on a quarterly basis • Treated effluent (digestate) discharged from site via sewer • Raw material usage • CHP engine usage • CHP engine efficiency • Emergency flare operation • Electricity exported • Energy usage; and • Water usage

Fugitive 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), that includes all of the following elements:**	
	A protocol containing actions and timelines;	An Environment Agency approved Odour Management Plan (OMP) **(Reference W4G Odour Management Plan)** is in place as part of the Environmental Management System and includes a protocol containing actions and timelines.
	A protocol for conducting odour monitoring as set out in BAT 10;	The OMP contains a section on odour monitoring as described in BAT 10. Point source emission monitoring from the odour abatement plant stack will be carried out periodically and in accordance with EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration).
	A protocol for response to identified odour incidents, e.g., complaints;	The OMP contains a section detailing the protocol for responding to odour incidents including complaints.
	An odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.	The OMP includes an odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.

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 below.**	
a	Minimising residence times	See BAT 4 b – Table 1 which includes waste storage residence times.
b	Using chemical treatment	Utilisation of the following for treatment of liquid effluent and off-gases from the process: • pH adjustment utilising sodium hydroxide (22%) • Sodium Hypochlorite addition (14-15%) • Polymers & Coagulants • Hydrogen Peroxide (35%)
c	Optimising aerobic treatment	Aerobic treatment utilising ozone / nano bubbles is in place for tertiary / quaternary polishing of effluent prior to discharge to the sewer. As above this also relates to treatment of the off-gases. See Appendix E – Final Effluent Odour Process.

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 below.**	
a	Minimising the number of potential diffuse emission sources. This includes techniques such as: • appropriate design of piping layout (e.g., minimising pipe run length, reducing the number of flanges and valves, using welded fittings and pipes); • favouring the use of gravity transfer rather than using pumps; • limiting the drop height of material; • limiting traffic speed; and • using wind barriers.	The plant design is optimised to reduce pipe run lengths, flanges and valves. Vehicles are restricted to 10 miles per hour on site as a health and safety measure; this also reduces potential noise and dust emissions. Fugitive emissions of odour are monitored daily in accordance with the Odour Management Plan **(Odour Management Plan)** and recorded in the Daily Checks **(Daily Operational Checks).**
b	Selection and use of high- integrity equipment. This includes techniques such as: • valves with double packing seals or equally efficient equipment; • high-integrity gaskets (such as spiral wound, ring joints) for critical applications; • pumps/compressors/agitators fitted with mechanical seals instead of packing; • magnetically driven pumps/ compressors/agitators;	The plant has been designed and specified to utilise high quality equipment and fittings throughout. All process pipework is stainless steel or MDPE with the appropriate EPDM gaskets and bolted flanges. The over-pressure relief valves use simple gravity controlled, weighted metal plates or set springs to avoid the need for any electronic/mechanical controls within an ATEX zone. Their release pressure (tested) is set to vent at 60-70mb, whereas the maximum operating pressures of tanks is 100 mb. The mixing is provided by the injection velocity of the waste and the internal gas mixing and packing media, so there are no mechanical parts to the tanks, thus there is no regular maintenance liability. The mixer injection points are stainless steel and all joints are threaded and sealed. Pumps have been chosen for both ease and speed of maintenance to reduce the odour potential and process down time. All pumps have now been fitted with mechanical seals. All valves are double sealed with EPDM compression seals, stainless steel bolts & washers.
c	Corrosion prevention	Materials are selected for suitability and longevity.

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 below.**	
d	Containment, collection and treatment of diffuse emissions	Odour emissions from the building are minimised by the building benefitting from roller shutter doors which are kept closed unless a vehicle is entering or exiting. The building is under negative pressure and the air is treated by an odour scrubber.
e	Dampening	Due to the hard surfaces throughout the site dust raising is not an issue. However, if there were any emissions of dust observed as part of daily site inspections then dampening would be carried out using rainwater collected alternatively through water hoses onsite.
f	Maintenance	All plant and equipment are subject to a planned preventative maintenance programme in accordance with the Section 1.4 of the EMS Manual (**Ref Environmental Management Manual**) and associated check lists and maintenance logs.
g	Cleaning of waste treatment and storage areas	Cleaning of the waste treatment and storage areas is carried out in accordance with the site cleaning and hygiene procedures **(Ref Site Cleaning & Hygiene Procedures)**.
h	Leak detection and repair (LDAR) programme	A Leak Detection and Repair (LDAR) programme will be developed to measure diffuse emissions of ammonia, VOCs including methane and odour from all sources identified in the LDAR.

Emissions from Flaring

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 below.**	
a	Correct plant design. This includes the provision of a gas recovery system with sufficient capacity and the use of high-integrity relief valves.	During commissioning and start-up, there are two flares on site which facilitate commissioning. The CHP is maintained under a service contract providing the maximum up time of the engine. As soon as the gas is produced, it leaves the digesters and enters the gas line. There is minimal storage within the roof of the digesters. Approximately 2 Nm^3 of biogas storage. The CHP consumes on average 65.2 Nm^3 per hour in total (at maximum production), therefore the gas storage capacity does not account for more than 1 hours production. Therefore feeding is to always match production requirements. Ahead of longer periods of maintenance the feeds are completely reduced or even stopped. reduced to minimise gas production; i.e. Can be ramped down to allow for longer periods of downtime prior to ignition of flare. Due to the high-rate design of the digesters and the process, the retention time is approximately 24 hours, therefore when feeding is ceased, production immediately drops off. The CHP capacity is more than the design and the loading capacity of the AD system, meaning that gas production will not exceed the CHP capacity. Biogas is not routinely flared to atmosphere. The flare is only used during periods of extended CHP maintenance and during abnormal operating conditions. Flaring volumes are minimised through reduced feeding and in turn reducing imports to the AD process. In the case of CHP maintenance or shut-down the auxiliary boilers are used to generate heat for the process. The regulation of gas pressure is fully automated. The control of the biogas plant and of the flare stack are interlocked such that if the gas pressure reaches a trigger level of 40 mbar the flare will automatically start. This is before the set point at which the PRVs release biogas (60 - 70 mbar). The pressure relief valves are calibrated to 60 – 70 mb trigger pressure. The gas pressure in the digesters is 20-30 mb. The flare is set to activate at % average gas level / 40 mb across the digesters. The flare settings always ensure the flare ignites prior to any gas venting through the PRVs.

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 below.**	
		There are pressure relief valves situated on each reactor. These valves are checked monthly and are sent away for servicing as per the manufacturer's instructions. The reactors also have an integrated water trap that releases any built-up pressure and has been designed to release pressure at 80-90 mb. Flaring is a more favourable environmental outcome than release of raw biogas through pressure relief valves. Venting is used only in extreme circumstances as a precautionary approach to prevent catastrophic pressure build up within the system. Both are minimised as much as possible by monitoring and efficient operation of the site. The SCADA control system has alarms for all of the above stages, so that site's management is aware of the biogas transfer and use through site at all times.
B	Plant management. This includes balancing the gas system and using advanced process control.	Gas pressure, feed analysis and reactor conditions are monitored in accordance with Section 2.3 (Operating Techniques) of the EMS Manual. Process management includes regulation of feed rate. The loading rates of the AD facility is calculated to produce 150 kWh, with the CHP capacity of 150 kWh. Waste4Generation will aim to achieve maximum kWh production from the engine which will automatically ramp up and down regulated by the pressures in the reactors. The pressures and volume of gas production are controlled via the feeding and recirculation rates of each individual reactor.

BAT 16	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use (both of) the techniques given below.	
a	Correct design of flaring devices. Optimisation of height and pressure, assistance by steam, air or gas, type of flare tips, etc., to enable smokeless and reliable operation and to ensure the efficient combustion of excess gases.	The flare is a ETC 100 model number round enclosed ground flare manufactured by Flare Products. It is suitable for 100 Nm3/hr Biogas. There are two flares on-site, an initial commissioning flare and an emergency flare (which enables the gas to always be flared even at small volumes). Both are auto-igniting and monitored through SCADA, which required associated alarm systems. Both flares are to be optimised to reach emission regulations. The flares are maintained by experienced qualified contractors. In line with BAT, the flaring system will be optimised to burn at >1,000^{o}C for in excess of 0.3 seconds. The larger flare has double the capacity of the CHP design capacity, enabling it to burn surplus gas above CHP's capabilities. The flares are serviced and optimised every year. The plant's design and controls on the AD process facilitates H_2S management in conjunction with the activated carbon minimises the H_2S concentration on to both the CHP and the flare. The $\%CH_4$ is of a much higher than traditional AD facilities with a target percentage of 70+%. As high-rate AD retention time is based upon 24 hours, should the CHP be down for maintenance, the feeding is then reduced / halted to prevent further flaring beyond what is already within the digesters.
Biological waste treatment: appropriate measures for permitted facilities	You should use enclosed (ground) design flares on all new plants. They should be capable of achieving a minimum of 1,000oC with 0.3 seconds retention time at this temperature.	As above the proposed new flaring system meets BAT requirements
b	Monitoring and recording as part of flare management. This includes continuous monitoring of the quantity of gas sent to flaring. It may include estimations of other parameters (e.g.,	The number of operating hours for the flare is recorded on the SCADA System and this information will be submitted to the Environment Agency annually in accordance with the varied Environmental Permit.

BAT 16	**In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use (both of) the techniques given below.**	
	composition of gas flow, heat content, ratio of assistance, velocity, purge gas flow rate, pollutant emissions (e.g., NO_X, CO, hydrocarbons), noise). The recording of flaring events usually includes the duration and number of events and allows for the quantification of emissions and the potential prevention of future flaring events.	The recording of the time that the flare is in use along with a cumulative gas flow meter allows a calculation to be made to estimate the quantity of emissions. In addition to being recorded, these can be historically reviewed via the SCADA system. Daily gas analysis is recorded alongside flow rates and pressures. There is a gas flow recorder in line with the flare which displays current gas flow and records the daily volume also. It is in economic interests of Waste4Generation to reduce the amount of biogas lost to flaring and to conduct a root cause analysis to reduce the potential for future flaring events.

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), that includes all of the following elements:**	
	A protocol containing appropriate actions and timelines;	The applicability of BAT 17 is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated. Waste4Generation commissioned a Noise and Vibration Assessment[2] which concluded that sensitive receptors would not be affected. The Noise & Vibration Assessment found that the noise from the facility will not affect the background noise level at the nearest sensitive receptor. The CHP, plant & equipment were found not to contribute to noise beyond the site boundary. The CHP is acoustically insulated to prevent excessive noise onsite. In accordance with permit conditions, a Noise and Vibration Management Plan will be developed for Environment Agency approval and implemented if activities are giving rise to pollution outside the site due to noise and vibration.
	A protocol for conducting noise and vibration monitoring;	As above.
	A protocol for response to identified noise and vibration events, e.g., complaints;	As above.
	A noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.	As above.

[2] Noise & Vibration Assessment (Environmentally Sound)

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 below.**	
a	Appropriate location of equipment and buildings. Noise levels can be reduced by increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating building exits or entrances.	The CHP is located in the furthest corner off the site away from sensitive receptors.
b	Operational measures. This includes techniques such as: • inspection and maintenance of equipment; • closing of doors and windows of enclosed areas, if possible; • equipment operation by experienced staff; • avoidance of noisy activities at night, if possible; • provisions for noise control during maintenance, traffic, handling and treatment activities.	Operational measures to reduce noise emissions include: • Planned preventative maintenance of plant and equipment including the CHP, flare and auxiliary boilers. • White noise reversing bleepers are fitted as standard on all mobile plant operated on the site. • Only trained staff are able to operate equipment. • Due to the location on a busy industrial estate, the site is not restricted on operating hours with the surrounding businesses operating 24/7. However Waste4Generation are mindful of noise and do not undertake maintenance outside of standard business hours where possible. • There is a 5 mph speed limit on site.
c	Low-noise equipment. This may include direct drive motors, compressors, pumps and flares	This technique is not used.
d	Noise and vibration control equipment. This includes techniques such as: • noise reducers; • acoustic and vibrational insulation of equipment; • enclosure of noisy equipment;	The only piece of plant on site that has the potential to generate noise is the CHP engine. The CHP engine is relatively small, only having a capacity of 150kW. The CHP is contained within acoustically insulated shipping container. All the other plant and equipment produces minimal amounts of noise.

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 below.**	
	• soundproofing of buildings.	
e	Noise attenuation. Noise propagation can be reduced by inserting obstacles between emitters and receivers (e.g., protection walls, embankments and buildings).	This technique is not used.

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 below.**	
a	Water management. Water consumption is optimised by using measures which may include: • water-saving plans (e.g., establishment of water efficiency objectives, flow diagrams and water mass balances); • optimising the use of washing water (e.g., dry cleaning instead of hosing down, using trigger control on all washing equipment);	Rainwater is collected from the roof and discharged to the surface water sewer under controlled conditions. The collected water can also be used in the following processes: Still 5 & FOG process water. All rainwater collecting in the bunded area is stored and used within the AD process. No additional water is required for the process. Discharge of water from process to trade effluent consented discharge, within consented limits. Trigger hoses used to improve water use efficiency.
b	Water recirculation	As described above the recirculation of water is optimised.
c	Impermeable surface. Depending on the risks posed by the waste in terms of soil and/or water contamination, the surface of the whole waste treatment area (e.g., waste reception, handling, storage, treatment and dispatch areas) is made impermeable to the liquids concerned.	The whole site benefits from an impermeable concrete surface with a sealed drainage system from which water is collected and reused in the process.
d	Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels. Depending on the risks posed by the liquids contained in tanks and vessels in terms of soil and/or water contamination, this includes techniques such as: • overflow detectors; • overflow pipes that are directed to a contained drainage system (i.e., the relevant secondary containment or another vessel);	All the tanks benefit from high level sensors and alarms. If a high-level alarm in a digester is activated the SCADA system will automatically stop the pumps from the feedstock tank(s) until alarms are cleared. The level is maintained by a 4" overflow. Should the overflow somehow become blocked, the following alarms will be raised: • High gas pressure. • Low level in main break tank. The overflows are checked daily to check clear and flowing.

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 below.**	
	• tanks for liquids that are located in a suitable secondary containment; the volume is normally sized to accommodate the loss of containment of the largest tank within the secondary containment; • isolation of tanks, vessels and secondary containment (e.g., closing of valves).	The water trap on overflows if a spillage occurs it is contained by overflow pipe work and contained in an IBC with a pumping system that pumps spillages into RT2. The containment capacity is in accordance with CIRIA C736, with the calculations demonstrating that the secondary containment capacity is greater than 25% of the combined tank volume (110% of largest tank was less than 25% of total tankage). A report of the suitability of the secondary containment system with respect to CIRIA C736[3] was commissioned in January 2023 and has been submitted as a supporting document to this submission. Additional control measures include: • Unloading and loading of tankers are supervised. • Tank levels checked prior to filling to ensure adequate capacity. • High level sensors checked and cleaned daily • Overflows Grey to Gold • White tank overflows to Grey • R6 overflows to Grey • Spillages in the feedstock bund get pumps back into either the White, Grey or Gold which ever has the available capacity. • AD spillages are contained within its designated bund and returned to RT2 for reprocessing. • Any tank that has a spillage will be immediately isolated.
e	Roofing of waste storage and treatment areas	All waste storage and treatment are carried out in the FOG Reception and Pre-treatment Centre or within the enclosed AD plant infrastructure.

[3] CIRIA 736 Assessment – Sandfield Engineering

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 below.**	
f	Segregation of water streams	There is no requirement to segregate water streams as all of the water collected within the bunded can be utilised on site. Collected rainwater can be used within the process or discharge to the surface water or final effluent consented discharge points as long as within limits.
g	Adequate drainage infrastructure. The waste treatment area is connected to drainage infrastructure. Rainwater falling on the treatment and storage areas is collected in the drainage infrastructure along with washing water, occasional spillages, etc. and, depending on the pollutant content, recirculated or sent for further treatment.	As previously described the waste storage and treatment area benefits from a building and an appropriate drainage arrangement; all dirty water is reused in the process or can be discharged via the Trade Effluent Consent.
h	Design and maintenance provisions to allow detection and repair of leaks. Regular monitoring for potential leaks is risk-based, and, when necessary, equipment is repaired. The use of underground components is minimised. When underground components are used and depending on the risks posed by the waste contained in those components in terms of soil and/or water contamination, secondary containment of underground components is put in place.	The tanks benefit from leak detection / all tanks are totally above ground and within the concrete bunded area to allow physical inspection of the infrastructure. Underground tanks and pipes have been avoided in the design where possible. Most pipework is above ground. However, the final effluent line from the to the final effluent sewer connection that runs underground. It is a single continuous HDPE pipe without any underground junctions. It uses a secure fusion welding jointing system. As a result of this BAT review, it is proposed to carry out a pressure test on this pipe and then add a 5 yearly pressure check to the planned preventative maintenance programme. This is the only section of underground pipework carrying potentially polluting substances.
i	Appropriate buffer storage capacity is provided for waste water generated during other than normal operating conditions using a risk-based approach (e.g. taking into account the nature of the pollutants, the effects of downstream waste water treatment, and the receiving environment). The discharge of waste water from this buffer storage is only possible after appropriate measures are taken (e.g., monitor, treat, reuse).	Wastewater generated during abnormal operating conditions would be discharged to sewer in accordance with the trade effluent consent which allows contingency for additional flow during exceptional downpours/storms. Additional wastes or storage requirements will be provided by the additional tank storage within the warehouse.

BAT 20 – not applicable (waste water treatment)

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)**	
a	Protection measures. These include measures such as: • protection of the plant against malevolent acts; fire and explosion protection system, containing equipment for prevention, detection, and extinction; and • accessibility and operability of relevant control equipment in emergency situations.	The plant can be operated remotely via a secure remote login in system which ensure a direct link to the SCADA system. The site benefits from perimeter fencing, a locked gate at the entrance, motion sensitive security lighting and a CCTV system which can be remotely monitored via computers and mobile devices with alarms in the office. A DSEAR assessment has been carried out and recommendations for remedial action are being / have been carried out. This ensures appropriate explosion protection measures are in place. Waste4Generation have an external contractor who assess, supply and maintain fire extinguishers, ensuring all extinguishers are fit for purpose in location and in good, working condition.
b	Management of incidental/accidental emissions. Procedures are established and technical provisions are in place to manage (in terms of possible containment) emissions from accidents and incidents such as emissions from spillages, firefighting water, or safety valves	There are procedures in place for emergency situations: • Fire Prevention Plan • Fire Action Plan • Leaks and Spills Action Plan • Contingency plans for fire, severe weather and breakdown of essential machinery. • Overarching Accident & Amenity Management Plan • Emergency Full Shutdown • Emergency Electrical Generation Shutdown
c	Incident/accident registration and assessment system. This includes techniques such as:	Accidents are recorded on the Daily Checklist. H&S incidents/accidents segregated on own recording system. Near misses are recorded and investigated in Incident/Near Miss log.

Commented [ESP5]: Add ref to new form? H&S different system?

	• a log/diary to record all accidents, incidents, changes to procedures and the findings of inspections; and • procedures to identify, respond to and learn from such incidents and accidents.	

Material Efficiency

BAT 22	**In order to use materials efficiently, BAT is to substitute materials with waste.**	
a	Waste is used instead of other materials for the treatment of wastes (e.g., waste alkalis or waste acids are used for pH adjustment, fly ashes are used as binders).	The process makes good use of recycled dirty water and liquid waste to create a prepared feedstock in the correct dry matter range for anaerobic digestion. There is limited use of raw materials. The AD process uses only waste materials in order to recover biogas. In accordance with the EMS Manual regular assessment of the efficiency of the treatment process including the use of raw materials will be undertaken. A list of raw materials is maintained. Opportunities will be sought to use waste materials in place of raw materials.

Energy Efficiency

BAT 23	**In order to use energy efficiently, BAT is to use both of the techniques given below.**	
a	Energy efficiency plan. An energy efficiency plan entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (for example, specific energy consumption expressed in kWh/tonne of waste processed) and planning periodic improvement targets and related actions. The plan is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.	A Heat Flow Diagram is in Appendix B. Heat and electricity are provided by the CHP engines except in the case of power failure. In the case of CHP downtime, heat will be generated by the auxiliary boilers. Power will then be provided by the on-site stand-by generator. Heat generated is used to maintain temperature within the digesters to optimal conditions for biogas generation. Energy consumption is continuously monitored, and records are retained and reviewed to understand energy flows around the site. Records of primary energy used, energy generated, and energy exported, etc. are maintained and an annual return will be made to the EA in accordance with permit requirements under an Installation permit.
b	Energy balance record. An energy balance record provides a breakdown of the energy consumption and generation (including exportation) by the type of source (i.e., electricity, gas, conventional liquid fuels, conventional solid fuels, and waste). This includes: • information on energy consumption in terms of delivered energy; • information on energy exported from the installation; • energy flow information (e.g., Sankey diagrams or energy balances) showing how the energy is used throughout the process. The energy balance record is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.	A Sankey Diagram has been developed and forms Appendix C of this document.

Waste Reduction

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).**	
	Packaging (drums, containers, IBCs, pallets, etc.) is reused for containing waste, when it is in good condition and sufficiently clean, depending on a compatibility check between the substances contained (in consecutive uses). If necessary, packaging is sent for appropriate treatment prior to reuse (e.g., reconditioning, cleaning).	IBCs containing hazardous waste are sent back to the producer for reuse. Similarly the IBCs containing caustic are sent back to the producer for reuse. Any IBCs used for incoming non-hazardous wastes are recycled as current best option in accordance with the waste hierarchy unless these can be re-used.

BAT 25-32 Not Applicable (mechanical treatment of waste when it is not combined with biological treatment)

General BAT conclusions for the 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.**	
	The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment, e.g., in terms of nutrient balance, moisture or toxic compounds which may reduce the biological activity.	The EMS procedures for waste pre-acceptance and acceptance (see BAT 2) ensure that waste is only accepted at the facility if it is suitable for treatment within an anaerobic digester. All liquid waste is processed within 48 hours. All solid waste is processed within 48 hours of receipt. The AD plant is fed in accordance with a daily feedstock input schedule which is informed by feedstock supply planning, process monitoring and process management by balancing dry matter content and digestibility to maximise plant efficiency and reduce odour emissions from both the AD facility and the resulting digestate.

BAT 34	**In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H_2S and NH_3, BAT is to use one or a combination of the techniques given below.**		
a	Adsorption	Carbon filters are used to treat off gases from tankers and tanks. Each carbon scrubber has a $2m^3$ capacity and is dedicated to a process. The activated carbon volume in each vessel is between 250-500kg. Daily checks will monitor the performance of the carbon and as soon as odour becomes detectable, the carbon shall be changed. The carbon scrubber is designed for the low flows and low concentrations of VOCs and H_2S produced on site.	
b	Biofilter	Not applicable	
c	Fabric filter	Not applicable.	
d	Thermal oxidation	Not applicable.	
e	Wet scrubbing	The odour abatement system uses treated nano bubble (additionally ozone where required) effluent which is pumped over the packing media within the abatement system, creating a trickle filter. The off-gases pass through the packing media as the treated effluent trickles through the media, removing any odours prior to release. The effluent prior to the ozone/nano bubble treatment has been pH corrected (and has the potential for peroxide/sodium hypochlorite dosing) subject to requirements, to facilitate the removal of odour from both the off-gases and the effluent. Once treated the off-gases are released into the atmosphere, where there is regular monitoring & process optimised, in particular H_2S & NH_3. The off-gases have already been primarily treated via a carbon scrubber to optimise removal efficiency.	
BAT-associated emission levels (BAT-AELs) for channelled NH_3, odour, dust and TVOC emissions to air from the biological treatment of waste			
Ref	**Parameter**	**BAT-AEL (Average over the sampling period)**	
Table 6.7	NH_3 - mg/Nm^3 *	0.3 - 20	Either the BAT-AEL for NH_3 or the BAT-AEL for the odour concentration applies. It is proposed that odour monitoring will be carried out.

Commented [ESP6]: What monitoring is carried out on the off-gases? You can put this data in to show constituents?

	Odour concentration - ou_E/Nm^3 *	200 - 1,000	Odour monitoring against this BAT-AEL will be carried out every 6 months in accordance with BAT 8

* Either the BAT-AEL for NH_3 or the BAT-AEL for the odour concentration applies.

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	This is detailed within the response to BAT 19.
b	Water recirculation	This is detailed within the response to BAT 19.
c	Minimisation of the generation of leachate	No leachate is produced at site.

BAT 36-37 Not Applicable

BAT conclusions for the anaerobic treatment of waste

Process Monitoring

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.**	
	Implementation of a manual and/or automatic monitoring system to: • ensure stable digester operation, • minimise operational difficulties, such as foaming, which may lead to odour emissions, • provide sufficient early warning of system failures which may lead to a loss of containment and explosions. This includes monitoring and/or control of key waste and process parameters, e.g.: • pH and alkalinity of the digester feed; • digester operating temperature; • hydraulic and organic loading rates of the digester feed; • concentration of volatile fatty acids (VFA) and ammonia within the digester and digestate; • biogas quantity, composition (e.g., H_2S) and pressure; • liquid and foam levels in the digester.	The following process monitoring takes place: **Continuous monitoring (recorded on SCADA):** 1. Gas production 2. Gas pressure 3. Gas volume 4. Gas quality 5. Temperature **Daily Process Monitoring:** 6. Odour at site boundary and main potential odour sources 7. Gas readings (CH_4, H_2S and O_2) 8. Visual check on appearance and level of digesters (crust, foam, mixing speed) **On-site testing:** 9. The on-site testing equipment is used to test: • FOS/TAC in digesters on a weekly basis • pH and dry matter in digesters on a daily basis • Feedstock dry matter content. Buffer tank feedstock is tested daily and feedstocks arriving in tankers are tested per load as appropriate. **Samples for laboratory testing:** 10. A sample is taken from each of the digesters approximately monthly in accordance with the Sampling Procedure (add ref) and sent off to a UKAS Accredited laboratory for analysis including:

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.**	
		• pH • FOS/TAC • Dry matter • Volatile fatty acid speciation • Trace elements • BOD, COD, conductivity/salinity Frequency of testing is increased if required to enhance process monitoring around abnormal operation events. Process monitoring data is used by the Site Manager to inform process decisions including the feed plan, mixing regime and the addition of trace elements.

BAT 39-53 Not applicable (other waste treatment activities)

3. Conclusions and Recommendations

The BAT review has highlighted that proposals are compliant with indicative BAT as stated in Best Available Techniques Reference Document for Waste Treatment.[1]

From conducting this BAT BREF assessment, Waste4Generation plan to integrate additional energy efficiency measures in particular to reduce parasitic load.

A further recommendation is to undertake ISO 14001 accreditation to ensure Waste4Generation management is continued to be held to a high standard.

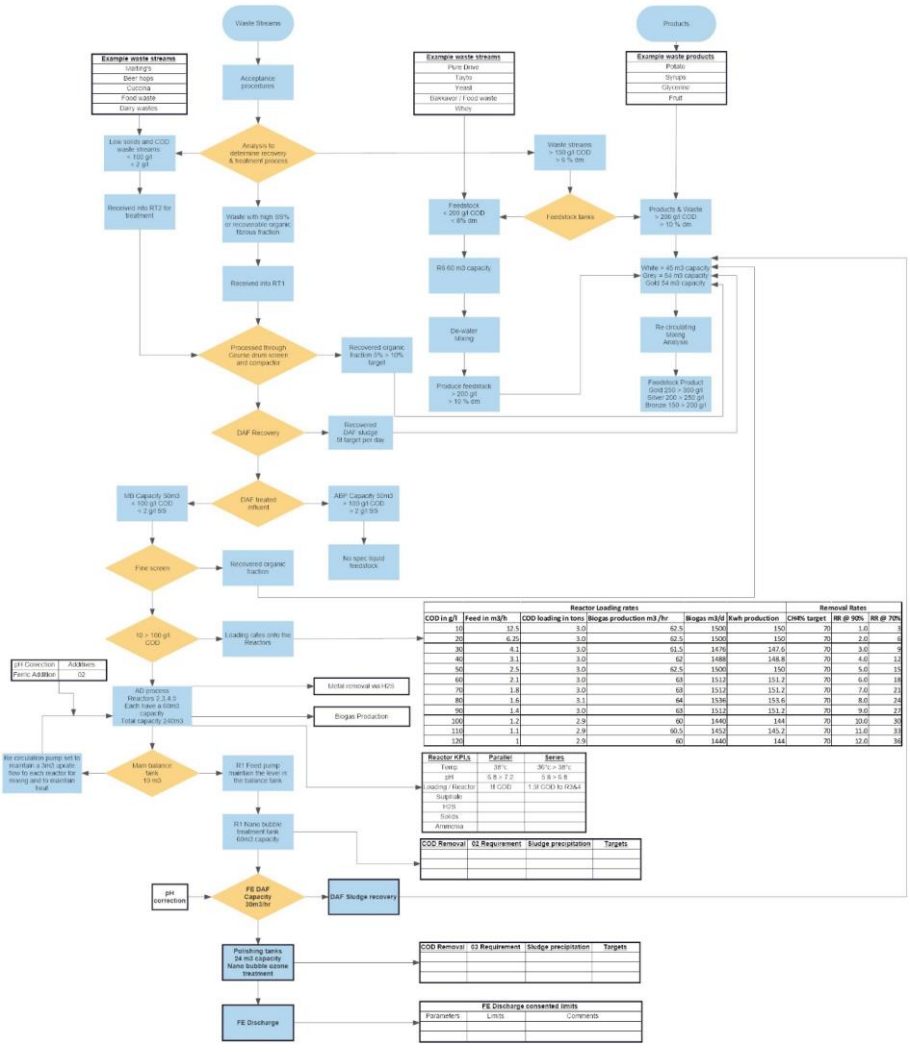
With the proposed upgrades, the primary and secondary containment upgrades will take place in line with the CIRIA 736 assessment undertaken, and additional maintenance put in place to ensure integrity.

Commented [ESP7]: Could be better to add something that you have completed or are doing as a result of this review?

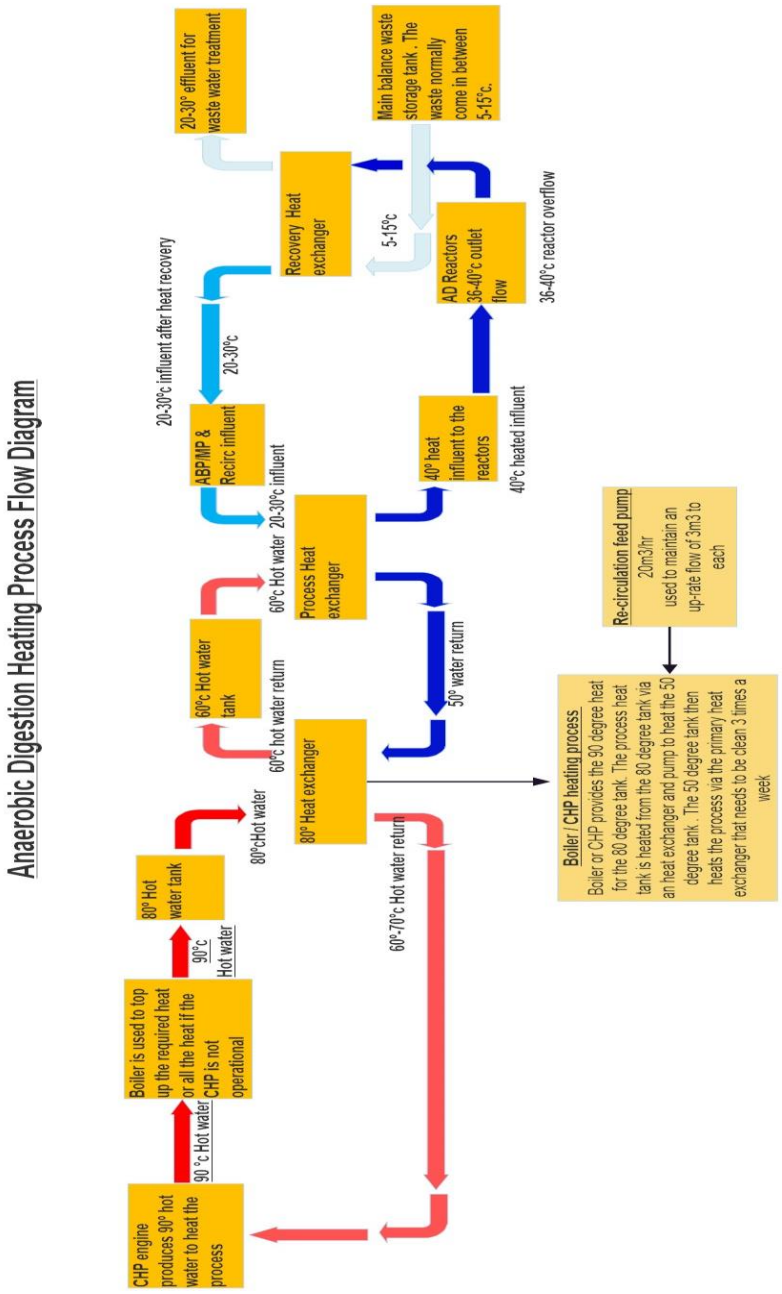
Appendix A – Process Flow Diagram

WASTE4GENERATIONS LTD CORBY

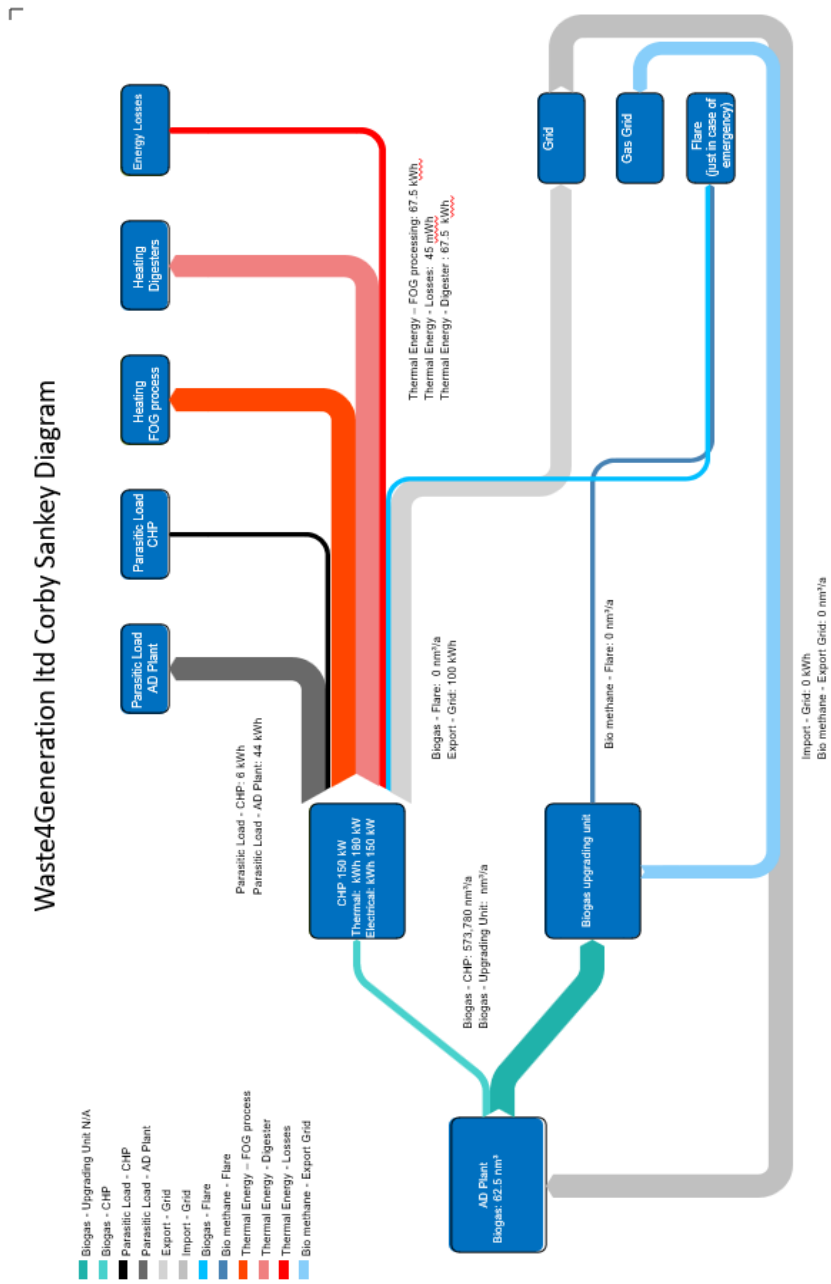
Waste process decision chart-diagram



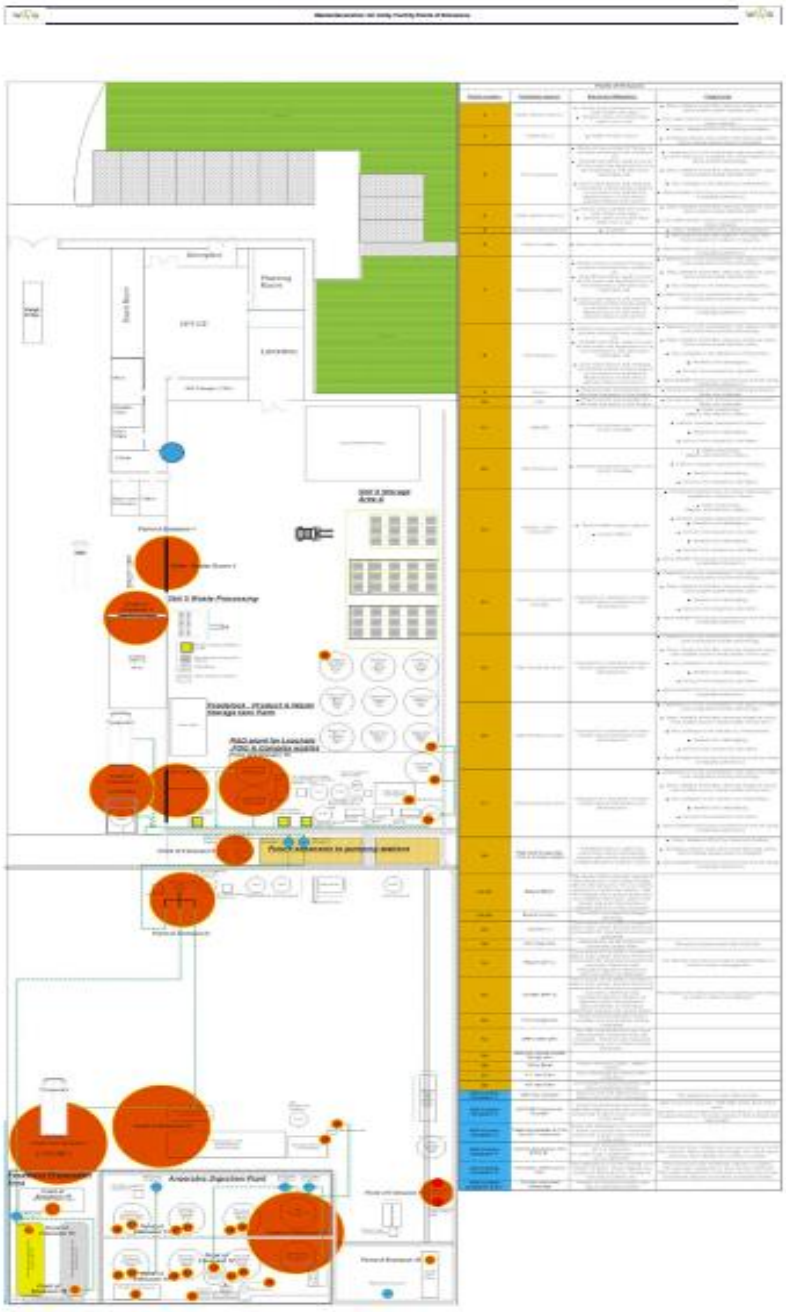
Appendix B - Heat Flow Diagram



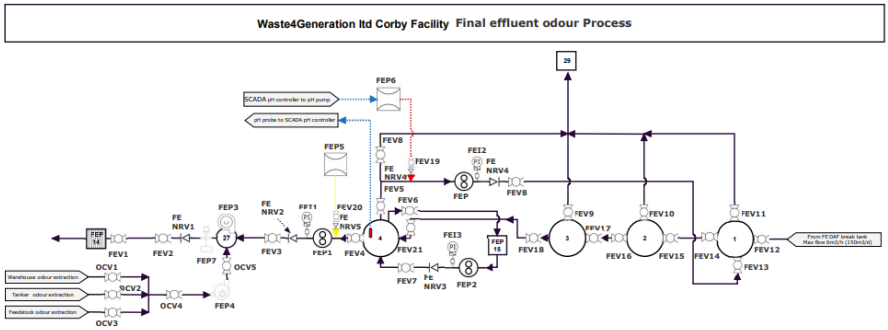
Appendix C – Sankey Diagram



Appendix D – Points of Emission



Appendix E – Centralised Odour Abatement System Process Flow



FE Plant & Equipment			
FE Plant no	Description	Specification	Comments
FEP1	Final effluent pump	10m3/hr Roto pump	Supplier Roto Pumps
FEP2	Nano bubble pump	TBD	
FEP3	Methane scrubber blower		
FEP4	Odour extraction blower		
FEP5	Peroxide dosing pump	Watson&Marlow peristaltic pump	Supplier Watson & Marlow
FEP6	pH dosing pump	Watson&Marlow peristaltic pump	Supplier Watson & Marlow
FEP7	Odour scrubber submersible pump	20m3/hr	Supplier whisper pumps
FEI1	FE pump pressure instrument	0-10 bar 4/0-20MA	Supplier RS Components
FEI2	Nano unit pump pressure instrument	0-10 bar 4/0-20MA	Supplier RS Components
FEI3	Nano re-circulation pump pressure instrument	0-10 bar 4/0-20MA	Supplier RS Components
FEP14	Ceramic filter	6m3/hr	Supplier OXYFUSION
FEP15	Nano bubble unit		Supplier OXYFUSION
FEP16	Nano bubble re-circulation pump		

Tank Capacities			
Item no	Description	Specification	Comments
1	Polishing tank A	10 m3	
2	Polishing tank B	7 m3	
3	Polishing tank C	7 m3	
4	FE / Nano bubble Ozone unit	10 m3	
27	Odour scrubber	1m3	
29	Onsite pumping station	1m3	

Valve Schedule			
Valve no	Description	Specification	Comments
FEV1	Ceramic filter valve	TBD	
FEV2	Submersible pump valve		
FEV3	Odour scrubber valve		
FEV4	Nano bubble outlet valve		
FEV5	Nano bubble re-circulation valve		
FEV6	Nano bubble unit feed valve		
FEV7	Nano bubble tank inlet valve		
FEV8	Re-circulation pump valve		
FEV9	Polishing tank C sludge valve		
FEV10	Polishing tank B sludge valve		
FEV11	Polishing tank A sludge valve		
FEV12	FE DAF inlet valve		
FEV13	Nano re-circulation inlet valve		
FE14	Polishing tank A outlet valve		
FE15	Polishing tank B inlet valve		
FE16	Polishing tank B outlet valve		
FE17	Polishing tank C inlet valve		
FE18	Polishing tank C outlet valve		
FE19	Caustic isolation valve		
FE20	Peroxide isolation valve		
FEV21	Nano bubble tank inlet valve		
FENRV1	Submersible pump NRV		
FENRV2	Final Effluent pump NRV		
FENRV3	Nano bubble pump NRV		
FENRV4	Re-circulation pump NRV		
OCV1	Odour control valve 1	Warehouse odour extraction	
OCV2	Odour control valve 2	Tanker odour extraction	
OCV3	Odour control valve 3	Feedstock odour extraction	
OCV4	Odour control valve 4	Odour extraction blower	