Yorkshire Water

Huddersfield Energy and Recycling Scheme

Best Available Technique Reference Document

BAT Reference Doc't

Issue | 20 January 2020

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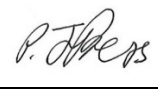
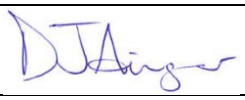
		Signature			
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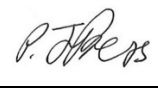
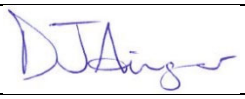
		Signature			
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1 Introduction

This Best Available Techniques Reference (BREF) document conclusions checklist is part of an application submitted by Yorkshire Water, 'the Applicant', to the Environment Agency (EA) for an Industrial Emissions Directive (IED) permit to operate the Huddersfield anaerobic digestion facility.

The checklist has been prepared to identify where evidence is provided in the suite of application documents to demonstrate how the proposed installation will comply with the Best Available Techniques (BAT) requirements set out in the BREF for Waste Treatment, published in August 2018[1].

All BAT requirements that are not relevant to the activities undertaken as part of site operations have been excluded from the report.

The Huddersfield anaerobic digestion facility is, hereafter, referred to as 'the facility'.

[1] European Integrated Pollution Prevention and Control Bureau (EIPPCB), European Commission's Joint Research Centre, 2018. Best Available Techniques (BAT) Reference Document for Waste Treatment. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.208.01.0038.01.ENG&toc=OJ:L:2018:208:TOC

2 Checklist

2.1 Overall Environmental Performance

Table 1: BAT conclusions checklist for overall environmental performance

BAT ref.	Requirements	How the site is compliant	Document reference
BAT 1	In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features:		
	1. Commitment of the management, including senior management;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Appendix A Environmental & Quality Policy & ISO 14001:2015 certification 15 Permit application supporting information: - Section 3.3 Management plans - Section 3.4 Management review.
	2. Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1. The proactive preventative maintenance program will ensure that the operational efficiency of the plant is maintained, emissions limits are met and where possible improvement are made.	08 EMS: - Section 3.2.1 Planned Maintenance - Appendix A Environmental Policy & ISO 14001:2015 certification. 15 Permit application supporting information: - Appendix K Yorkshire Water Services Ltd Quality and Environmental Policy.

BAT ref.	Requirements	How the site is compliant	Document reference
	3. Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 9 Keeping Records - Section 10 Review your management system. 15 Permit application supporting information: - Section 3.3 Management Plans - Section 3.4 Management Review.
	4. Implementation of procedures paying particular attention to: a) structure and responsibility, b) recruitment, training, awareness and competence, c) communication, d) employee involvement, e) documentation, f) effective process control, g) maintenance programmes, h) emergency preparedness and response, i) safeguarding compliance with environmental legislation.	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 7.1 Responsibilities - Section 2.9 Reporting - Section 9 Keeping Records - Section 2.8 Procedures - Section 3. Maintenance Procedures - Section 4 Contingency Plan - Section 5. Accident Prevention and Management Procedures - Appendix K Emergency Plan.
	5. Checking performance and taking corrective action, paying particular attention to:	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 2.7 Monitoring

BAT ref.	Requirements	How the site is compliant	Document reference
	a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED installations – ROM), b) corrective and preventive action, c) maintenance of records, d) 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;		- Section 4 Contingency Plan - Section 9 Keeping Records - Section 6 Complaints - Section 2.8.3 Digestor process monitoring controls - Section 2.8.4 Annual - Section 2.8.5 Analysis Methods.
	6. Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 10 Review your management system.
	7. Following the development of cleaner technologies;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1. Yorkshire Water's (YW) innovation team is dedicated to the review and promotion of new technologies, where there is potential for improved environmental or commercial performance.	08 EMS: - Section 2 Site Operations - Appendix A Environmental Policy & ISO 14001:2015 certification. 15 Permit application supporting information: - Appendix K Yorkshire Water Services Ltd Quality and Environmental Policy.
	8. 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 Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS - Section 2.7 Monitoring, Testing and Reporting - Appendix F Environmental Risk Assessments. 15 Permit application supporting information:

BAT ref.	Requirements	How the site is compliant	Document reference
			- Section 3.4.4 Site Closure Plan - 13 Environmental Risk Assessment.
	9. Application of sectoral benchmarking on a regular basis;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1. Emission to air will meet the emission limit values (ELVs) set out in the Medium Combustion Plant Directive. All aqueous emission from the process will be treated, where necessary, before being returned for treatment with raw sewage.	08 EMS: - Section 2.7 Monitoring Testing and Reporting Waste Management. 15 Permit application supporting information: - Section 3.3 Management Plans.
	10. Waste stream management (see BAT 2);	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 2.3 Waste Management - Section 2.8 Procedures. 15 Permit application supporting information: - Section 6 Waste.
	11. An inventory of waste water and waste gas streams (see BAT 3);	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS - Section 2.7.1 Table 1. Emissions to air. - Section 2.7.3 Table 2. Emission to foul sewer. 15 Permit application supporting information: - Section 2. Emission to air, water land.
	12. Residues management plan;	The Yorkshire Waste Sludge Strategy sets out the plan for the management of the residual material from all anaerobic digestion sites operated by Yorkshire Water.	08 EMS - Section 2.8.7 Digested and Lime Sanitised Cake HACCP Plan. (When available)

BAT ref.	Requirements	How the site is compliant	Document reference
		The sludge treatment, dewatering and storage procedure - Huddersfield Hazard Analysis and Critical Control Point (HACCP) Plan, will be developed during commissioning the site. This document will subsequently be incorporated into the EMS. The treated sludge exported for agricultural use is recorded in Yorkshire Water database, in line with the record keeping requirements set out in the Sewage sludge in agriculture: code of practice, including: - quantity of sludge produced - quantity of sludge supplied - sludge test results - type of sludge treatment use - final location of sludge use.	
	13. Accident management plan;	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	08 EMS: - Section 5 Accident Prevention and Management - Appendix J Accident/ Incident record forms - Appendix K Emergency Plan - Appendix L Flood Management Plan - Appendix N Bund Wall Drawing. 15 Permit application supporting information: - Section 3.4.5 Accidents, incidents and non-conformance.

BAT ref.	Requirements	How the site is compliant	Document reference
	14. Odour management plan (see BAT 12);	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1.	18 Odour Model 19 Odour Management Plan
	15. Noise and vibration management plan (see BAT 17).	The Huddersfield anaerobic digestion facility EMS, submitted as part of the permit application, considers all of the aspects identified as BAT 1. A Noise & Vibration Management Plan is not applicable for the scheme. The area around the site is not historically sensitive to noise or vibration. However, all equipment being installed on the site will comply with the Yorkshire Water noise and vibration Eng. Spec requirements of no more than 80dB from 1m distance. Where this cannot be achieved, acoustic enclosures and/or buildings will be utilised to minimise noise impact. Pre and post scheme noise surveys will be carried out which will ensure noise from the site has not been increased by the scheme, as well as to give the ongoing management plan a baseline to work from. During normal operation equipment will be routinely monitored to check for any increase in noise or vibration, and maintenance jobs raised and carried out where this is the case	20 Noise Assessment 15 Permit application supporting information: - Section 4.1.6 Noise
BAT 2	In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.		
	a) Set up and implement waste characterisation and pre-acceptance procedures. These procedures aim to ensure the technical (and legal) suitability of waste treatment operations for a particular waste prior to the arrival of the waste at the plant. They include procedures to collect information about the waste input and may include waste sampling	All sludges treated at the facility are domestic in nature, EWC code 19 08 05 non-hazardous sewage sludge. All sludges that will arrive at the new facility for treatment will be either indigenous primary and secondary sludges from the Huddersfield Complex, or imported liquid and cake sludge from other STW's in the Yorkshire region. All incoming sludges will always be monitored for volume (m3) and dry solids (%) allowing	08 EMS: - Section 2.8.1.1 Pre-acceptance procedure to asses waste. 15 Permit application supporting information: - Section 1.11 Details of activities

BAT ref.	Requirements	How the site is compliant	Document reference
	and characterisation to achieve sufficient knowledge of the waste composition. Waste pre-acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	tonnes dry solids (tDS) to be calculated. However, these sludges will only ever be conventional sludges from the wastewater treatment process and therefore will not be routinely tested. If there are any sludges which YW know are anything other than conventional, these would be lab tested to ensure suitability, especially for the digestion process. Liquid sludge is brought to site by tankers and sludge cake is brought to site by cake trucks. Sludge cake is tipped at the cake reception area before being transferred for re-wetting, pumped through sludge screens before discharge to the digester feed tanks. Odour control is included for the cake reception facility. Liquid sludge shall be mixed with primary sludge received from Deighton STW within the sludge screens feed tank, passed through a sludge screen before being pumped to the thickener feed tank. All imported sludge is logged through a JRP WASP data acquisition system, logging volume delivered, origin of delivery and average dry solids content of the sludge. The JRP WASP data acquisition system undertakes all tanker offloading control and coordination.	- Appendix L Process Control Description.
	b) Set up and implement waste acceptance procedures. Acceptance procedures aim to confirm the characteristics of the waste, as identified in the pre-acceptance stage. These procedures define the elements to be verified upon the arrival of the waste at the plant as well as the waste acceptance and rejection criteria. They may include waste sampling, inspection and analysis. Waste acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in	All of the waste being treated within the plant is non-hazardous sewage sludge EWC 19 08 05, which is consistent in its characteristics. All incoming sludges will always be monitored for volume (m3) and dry solids (%) allowing tonnes dry solids (tDS) to be calculated. However, these sludges will only ever be domestic sludges from the wastewater treatment process and therefore will not be routinely tested. All imported sludge is logged through a JRP WASP data acquisition system, logging volume delivered, origin of delivery and average dry solids content of the sludge.	08 EMS: - Section 2.8 Procedures. 15 Permit application supporting information: - Section 1.11 Details of activities - Appendix L Process Control Description.

BAT ref.	Requirements	How the site is compliant	Document reference
	terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	The JRP WASP data acquisition system undertakes all tanker offloading control and coordination. Acceptance of sludge will be fully in line with Section 2.1.2 of SGN 5.06	
	c) Set up and implement a waste tracking system and inventory. A waste tracking system and inventory aim to track the location 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. The waste tracking system is risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	Waste tracking and inventory – Imports of sludge are tracked by a logging system (JRP) which records the location of origin, volume, date, time and dry solids (%). The record of each imported consignment is linked to the tanker Dewatered sludge is stored within the cake barn in windrow like piles. Time for cake storage in the barn is recorded in the site diary with individual cake piles a identified using a sign on each individual windrow. The treated sludge exported for agricultural use is recorded in Yorkshire Water database, in line with the record keeping requirements set out in the Sewage sludge in agriculture: code of practice, including: - quantity of sludge produced - quantity of sludge supplied - sludge test results - type of sludge treatment use - final location of sludge use. The sludge treatment, dewatering and storage procedure - Huddersfield Hazard Analysis and Critical Control Point (HACCP) Plan, will be developed during commissioning the site. This document will subsequently be incorporated into the EMS.	15 Permit application supporting information: - Section 1.11.3.2 Acceptance procedure when waste arrives at facility. 08 EMS - Section 2.8.7 Digested and Lime Sanitised Cake HACCP Plan (when available).

BAT ref.	Requirements	How the site is compliant	Document reference
	d) Set up and implement an output quality management system. This technique involves setting up and implementing an output quality management system, so as to ensure that the output of the waste treatment is in line with the expectations, using for example existing EN standards. This management system also allows the performance of the waste treatment to be monitored and optimised, and for this purpose may include a material flow analysis of relevant components throughout the waste treatment. The use of a material flow analysis is risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	The treated sludge is recycled as a soil improver, under the Sludge (Use in Agriculture) Regulations 1989 (SUIA). The sludge treatment, dewatering and storage procedure - Huddersfield Hazard Analysis and Critical Control Point (HACCP) Plan, will be developed during commissioning the site. This document will subsequently be incorporated into the EMS. All movements of exported material from the facility are recorded on a YW controlled database – Gemini. This includes application to land permits. Gemini holds data such as application rates to field, nutrient and metals totals over a ten-year rolling programme. The database is audited annually by the EA. The information is also used for other reporting purposes such as the carbon accounting workbook and the annual returns for OFWAT. Cake is only released to land once the results from the daily checks, as well as the previous day's results, are compliant. If the samples are not compliant then the cake is assumed to be non-compliant and must be quarantined on site in the barn pending pathogen analysis. Storage within the barn is managed to ensure that the location of any day's production is known. This allows any quarantining to be undertaken with relative ease. Cake stored in stockpiles must be either applied to land or moved within a year. This is as per the requirements of the Code of Practice for Good Agricultural Practice.	08 EMS: - Section 2.8.2 Treated Sludge - Section 2.8.7 Digested and Lime Sanitised Cake HACCP Plan. (When available)
	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	The facility treats a single waste stream, sewage sludge.	08 EMS: - Section 2.3 Waste Management - Section 2.5 Materials Storage.

BAT ref.	Requirements	How the site is compliant	Document reference
	physical separation of waste and on procedures that identify when and where wastes are stored.		15 Permit application supporting information - Section 6 Waste Management.
	f) Ensure waste compatibility prior to mixing or blending of waste Compatibility is ensured by a set of verification measures and tests in order to detect any unwanted and/or potentially dangerous chemical reactions between wastes (e.g. polymerisation, gas evolution, exothermal reaction, decomposition, crystallisation, precipitation) when mixing, blending or carrying out other treatment operations. The compatibility tests are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	The facility treats a single waste stream.	Not relevant
	g) Sort incoming solid waste Sorting of incoming solid waste (10) aims to prevent unwanted material from entering subsequent waste treatment process(es).	The facility treats a single waste stream.	Not relevant
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:		
	1. information about the characteristics of the waste to be treated and the waste treatment processes, including:	The scheme will provide extensive PFD's of the water and gas waste streams, as well as data on the characteristics of these wastes. This can then be picked up and used by the operations team as part of their	08 EMS: - Section 2.1 Environmental Permit Activities. 15 Permit application supporting information:

BAT ref.	Requirements	How the site is compliant	Document reference
	a) simplified process flow sheets that show the origin of the emissions; b) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;	overall EMS. All relevant wastes (liquor returns and biogas) are very well known and understood by YW because they are produced, handled and treated on numerous other sites.	- Section 1.7 Process - Section 1.8 Process overview - Appendix B Block flow diagram - Appendix D Raw Materials Justification - Appendix L Process Control Description.
	2. information about the characteristics of the waste water streams, such as: a) average values and variability of flow, pH, temperature, and conductivity; b) average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances/micropollutants); c) data on bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge)) (see BAT 52);		08 EMS: - Section 2.7.3 Table 2. Emission to foul sewer. 15 Permit application supporting information: - Section 2.2. Emission to surface water. - Section 2.3 Emissions foul sewer.
	3. information about the characteristics of the waste gas streams, such as: a) average values and variability of flow and temperature;		08 EMS: - Section 2.7.1 Table 1. Emissions to air. 15 Permit application supporting information: - Section 2.1. Emission to air - Appendix E Air Quality

BAT ref.	Requirements	How the site is compliant	Document reference
	b) average concentration and load values of relevant substances and their variability (e.g. organic compounds, POPs such as PCBs); c) flammability, lower and higher explosive limits, reactivity; d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).		- Appendix F Odour.
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 sludge and chemical storage tanks are located within the site perimeter bund, designed to contain either 110% of the largest tank volume of 25% of the total volume of all tanks within the bund. All sludge handling areas are located away from the River Calder and Reedsmire Pond and over impermeable hardstanding with drainage back to the site drainage sump. This design makes it very unlikely that a spill or catastrophic failure of these tanks would result in pollution of these sensitive receptors. The layout of the plant is also such that transfer of sludge and chemicals are only over relatively short distances between storage/process units.	08 EMS: - Section 2 Site Operations. 15 Permit application supporting information: - Appendix L Process Control Description 09 Site Plan with Permit Boundary.
	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	All sludge, chemical and biogas storage tanks/ vessels have been designed with ample headroom capacity to allow for ramping up of overall plant throughput and/or buffer capacity. Dual level instrumentation will be provided on all storage tanks with display and trending on SCADA to allow effective monitoring by operational staff. Tank level instrumentation will also automatically control upstream and downstream pump control to	08 EMS: - Section 2 Site Operations - Appendix H List of substances stored on site. 15 Permit application supporting information: - Appendix D Raw Materials Justification

BAT ref.	Requirements	How the site is compliant	Document reference
	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.	ensure over-filling does not normally occur. Level alarms and emergency overspills to site drainage will ensure any loss of containment is contained and mitigated promptly.	- Raw materials list - Site layout showing storage areas - Appendix L Process Control Description.
	c) 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.	Sewage sludge will release toxic and flammable gases such as Methane and Hydrogen Sulphide. Where methane and Hydrogen sulphide has the potential to be released this will be well ventilated to ensure it does not reach an explosive range or toxic concentration. This ventilation will be achieved by natural means such as open top tanks and louvres in buildings, or by forced air mechanical ventilation such as fans or extraction to an odour control unit. Where methane is intentionally produced, such as during anaerobic digestion, the digesters and downstream biogas handling plant will be air-tight to prevent an explosive atmosphere being created. Any potential for methane to be periodically released from the system, such as pressure release valves (PRV's) will always be into a zoned area of the plant which will be stringently controlled to ensure no ignition sources are ever present in these areas. All vessels that are used for storage of liquids, including IBCs, etc. will be subject to regular inspecting as part of the proactive maintenance regime.	08 EMS: - Section 2 Site Operations - Section 3 Maintenance - Appendix I List of substances stored on site. 15 Permit application supporting information: - Appendix D Raw Materials Justification - Raw materials list - Site layout showing storage areas.
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 procedures aim to ensure that wastes are safely handled and transferred to the respective storage or treatment. They include the following elements:	Transfer of imported sludges will be carried out by competent liquid tanker and cake wagon drivers, using systems which will record and log key data such as	08 EMS: - Section 2 Site Operations.

BAT ref.	Requirements	How the site is compliant	Document reference
	- handling and transfer of waste are carried out by competent staff; - handling and transfer of waste are duly documented, validated prior to execution and verified after execution; - measures are taken to prevent, detect and mitigate spills; - operation and design precautions are taken when mixing or blending wastes (e.g. vacuuming dusty/powdery wastes). Handling and transfer procedures are risk-based considering the likelihood of accidents and incidents and their environmental impact.	sludge dry solids, volume and site of origin. All indigenous sludges from the STW will be logged for flow and dry solids as it enters the site via pipeline. All waste storage tanks will have dual-level instrumentation with alarms and emergency overspills to site drainage to allow overspill detection and mitigation. Impermeable surfaces with drainage and local wash-water hoses will be provided within 10m of all potential sludge/chemical spill areas to ensure any spills are contained and cleaned up quickly. Operational teams will ensure specific work procedures are in place to further mitigate and manage spills.	15 Permit application supporting information: - 1.11.3 Import and Storage /treatment of waste - 4 Monitoring.

2.2 Monitoring

Table 2: BAT conclusions checklist for monitoring

BAT ref.	Requirements	How the site is compliant	Document reference
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).	All liquors/foul drainage will be returned to the wastewater treatment works (WwTW) where they will be combined with the incoming sewage, which will be subject to the relevant monitoring prior to full treatment. The treated final effluent will be discharged to river under the conditions of the WwTW environmental permit.	Not relevant for the scheme.
BAT 7	BAT is to monitor emissions to water with at least the frequency provided, 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:	All liquors/foul drainage will be returned to the wastewater treatment works (WwTW) where they will be combined with the incoming sewage prior to full treatment. The treated final effluent will be monitored and then discharged to river under the conditions of the WwTW environmental permit.	Not relevant for the scheme.
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.	Emission to air from the site CHP will be monitored in line with the conditions set out in the environmental permit. Assets on site that have the potential to produce significant levels of odour will be ventilated to an odour control unit. Accessible sample ports will be provided in this odour control unit to allow regular monitoring of final odour (including H2S) emissions to atmosphere.	08 EMS: - Section 2.7. Monitoring, Testing and Reporting. 15 Permit Application Supporting Document: - Section 4.1 Emissions to air.
BAT 10	BAT is to periodically monitor odour emissions.	Extensive odour surveys and modelling was done as part of the scheme to establish the risk of odour nuisance from the site activities. This highlighted the need for some odour treatment systems on site which have been incorporated into the scope of works under the scheme and will subsequently reduce odour to very low levels. Periodic odour monitoring will only take place if there are public complaints and/or significant changes in the	08 EMS: - Section 2.7.2 Odour control stack. 15 Permit Application Supporting Document: - Appendix F Odour Modelling Report - Appendix X Odour Management Plan.

		plant or process. This will be reflected in the site Odour Management Plan.	
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.	The scheme will provide relevant instrumentation linked to SCADA display, recording and trending, which will allow monitoring of annual consumption of potable water, final effluent and power generation and consumption. This will also include the ability to monitor raw materials such as chemicals and the production of final product sludge cake wastes to be taken off site. Imports and exports are fully tracked to determine where they have come from and are going to.	15 Permit Application Supporting Document: - Section 4 Monitoring.

2.3 Emissions to air

Table 3: BAT conclusions checklist for emissions to air

BAT Ref.	Requirements	How the site is compliant	Document Reference
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; - a protocol for conducting odour monitoring as set out in BAT 10; - a protocol for response to identified odour incidents, e.g. 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 scheme will include the creation of a new odour management plan, developed to consider the current and new plant on the site and the odour survey and modelling work that was done to support the scheme design and permit application.	08 EMS: - Section 2.7.2 Odour control stack. 15 Permit Application Supporting Document: - Appendix F Odour Modelling Report - Appendix F Odour Management Plan.
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. Minimising the residence time of (potentially) odorous waste in storage or in handling systems (e.g. pipes, tanks, containers), in particular under anaerobic conditions. When relevant, adequate provisions are made for the acceptance of seasonal peak volumes of waste. Only applicable to open systems.	a) The plant has been designed to process sludges in as little time as possible to ensure new sludges created by the wastewater treatment works and importing satellite sites are constantly received and processed. The longest time that raw sludge (with the potential to create odour) will remain in a storage tank would be 24 hours. The longest residence time on the site for sludge that could potentially escape as an odour emission is the 7 days storage barn - but the treated	15 Permit Application Supporting Document: - Section 1.10.1 Average Treatment Capacity - Appendix F Odour Management Plan. - Appendix L Process Description, Section 21 Return Liquor Treatment Plant (RTLP)

	b) Using chemical treatment. Using chemicals to destroy or to reduce the formation of odorous compounds (e.g. to oxidise or to precipitate hydrogen sulphide). Not applicable if it may hamper the desired output quality. c) Optimising aerobic treatment. In the case of aerobic treatment of water-based liquid waste, it may include: use of pure oxygen, removal of scum in tanks, frequent maintenance of the aeration system. In the case of aerobic treatment of waste other than water-based liquid waste, see BAT 36.	cake at this part in the process has been shown to be low in odour. b) Not expected to be required. Potential odour emission sources will be collected and treated in an odour control unit employing either biological and/or activated carbon technology. The performance of the odour control unit would be monitored and reviewed (as per BAT 8) by the operations team to determine if chemical treatment is also required in the future. c) The return liquor treatment plant that will be installed to treat return liquors generated by the sludge dewatering process will be designed to achieve treatment using air. The design naturally prevents the formation of scum or foam. There is also anti-foam dosing of the return liquors upstream of the treatment plant to ensure foaming/scum is minimised upstream. The plant will also be included in YW's maintenance programme, ensuring it is frequently maintained and in a timely manner - especially given its criticality in ensuring final effluent compliance of the downstream wastewater treatment works.	
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; b) selection and use of high-integrity equipment;	a) The entire site has undergone odour surveying and modelling to determine which assets/areas of the plant will produce diffuse emissions of odour. Where these are deemed significant, they have been covered to prevent fugitive emissions and/or include within an odour control unit, which will ventilate and treat this odorous air. Traffic speeds will be controlled to 10mph around the entire site to ensure	15 Permit application supporting information: - Section 4.1 Emissions to air - Appendix E Air Quality - Appendix F Odour Modelling Report. 15 Permit application supporting information - Section 2.1 Emissions to air

	c) corrosion prevention; d) containment, collection and treatment of diffuse emissions; e) dampening; f) maintenance; g) cleaning of waste treatment and storage areas; and h) leak detection and repair (LDAR) programme. Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant.	vehicle emissions are reduced/controlled. Biogas pipework and ducting will be of 316L welded stainless steel to ensure corrosions and leaks from biogas pipework are minimised. Cake storage barn will have 2m high walls on all sides which will reduce the likelihood of wind blowing through and diffusing any odour/dust in this area. b) Where odour emissions have been identified as significant by the odour survey/modelling these assets/areas will covered with specially designed covers which ensure a high level of odorous air containment (95% and greater). The other area of potential odour emission is from the biogas system. All biogas pipework will be of 316L stainless steel with welded joints to minimise the likelihood of leaks. Frequently calibrated PRV's will be used on the biogas system to minimise biogas emissions from the system. c) All pipework, tanks and equipment that comes into contact with sludge, chemicals, biogas etc has undergone the appropriate materials selection as per the YW asset standards and engineering spec. This will ensure corrosion and subsequent odour/biogas leaks are minimised. The condition and integrity of pipework, tanks, covers etc will be frequently assessed to determine if repair/replacement is required. d) All identified significant sources of odour (via sampling and modelling survey) will be covered or housed in buildings, and in many cases, ventilated to	- Section 4.1 Emissions to air - Appendix E Air quality management - Appendix M Design Statement.

		and treated by an odour control unit to ensure fugitive/diffuse emissions are minimised. e) Dust is not relevant - no significant potential dust sources on site. (The cake export area will include a wheel-wash facility to ensure cake does not track onto roads, dry and become a dust problem. f) The YW asset standards required permanent access be provided to all M&E equipment on site. This will be included in the design of the plant. In addition to this, general accessibility requirements for maintenance of any potential diffuse emission sources (e.g. tank covers) will be studied (via ALM studies) and implemented in the design of all new equipment and assets installed under the scheme. g) Most of the process is designed to be self-contained, however where there are leaks or spills of sludge, there will always be adequate impermeable surfaces in potential spill areas with drainage and local wash-water hoses provided to enable prompt clean up, thus minimising any diffuse odour emissions. All sludge processing equipment will have automatic wash-down sequences to ensure the equipment is left clean when it is dormant (e.g. drum thickeners, centrifuges, sludge screens). The cake export barn area will include a wheel wash to ensure any cake sludge that might stick to the cake wagon wheels is not tracked around the site/roads – which could otherwise lead to odour emissions. h) Uncontrolled releases of biogas will be monitored by pressure instrumentation of the system pressure relief valves, resulting in alarm conditions to warn	

		the operations team to take corrective action. In addition to this pressure instrumentation across the biogas system with trending will highlight any significant leaks. Operational teams will also visually inspect pipework at frequent intervals to check for integrity, corrosions and leaks. Leak detection (methane gas analyser) is also installed on biogas holder/s to ensure any leaks from the inner bag are detected. Any leaks detected on the biogas system would always be fixed immediately by YW due to the process safety risk posed by biogas.	
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; and b) plant management.	a) The biogas system is designed to safely collect, store and convey biogas to the CHP's and Boilers. The CHP's have been sized to ensure that peak biogas production from the anaerobic digester plant can always be fully utilised ensuring flaring will not occur under normal operation. The gas holder is sized to provide several hours of buffer storage to allow for short periods of downtime on the CHP's without the need to flare. The boiler will be dual-fuel so will also be able to utilise the biogas, ensuring as much of the biogas is put to good use prior to flaring as a last resort. b) The biogas system will have asset standard instrumentation and equipment to ensure the biogas created by the anaerobic digestion process is always effectively collected, stored and utilised. Normal operation will by fully automated, ensuring CHP's always get primary use of the biogas, with boilers also able to use it when sufficient quantities are available. Use of the flare-stack will always be a last resort. In addition to this, extended periods of downtime on the CHP's would always be planned in	15 Permit application supporting information: - Section 1.11.6 Emergency Flare Operation - Section 2.1 Emissions to air.

		advance where possible, allowing sludge feeds to the digesters and thus biogas production to be reduced as much as possible to prevent or minimise flaring while a CHP is offline.	
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; and b) monitoring and recording as part of flare management.	a) The flare stack has been designed to accomodate a gas flow equal to 200% of the output from the peak sludge processing capacity. The flare stack will be designed to normally operate automatically when required. The combustion of the biogas by the flare is as efficient as possible and produces a smokeless emission. This has been proved by numerous flare stacks operating around YW based on the same asset standards and suppliers. b) The flare stack will have flow instrumentation recording and trending the amount (m3/hr) of biogas that is consumed by the flare. In addition to this there will be upstream gas analysers that records and trends the methane (CH4) and Hydrogen Sulphide (H2S) content of the biogas being sent to the flare.	15 Permit application supporting information: - Section 1.8 Process Overview - Section 1.9.2 Table 2 - Section 1.11 Details of activities - Section 2.1 Emission to air - Section 4.1.3 Gas Flare

2.4 Noise and vibration

Table 4: BAT conclusions checklist for noise and vibration

BAT ref.	Requirements	How the site is compliant	Document reference
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: 1. a protocol containing appropriate actions and timelines; 2. a protocol for conducting noise and vibration monitoring; 3. a protocol for response to identified noise and vibration events, e.g. complaints; 4. 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.	The areas around the site is not historically sensitive to noise or vibration. However, all equipment being installed on the site will comply with noise and vibration Engineering Specification requirements of no more than 80dB from 1m distance. Where this cannot be achieved, acoustic enclosures and/or buildings will be utilised to minimise noise impact. Pre and post scheme noise surveys will be carried out which will ensure noise from the site has not been increased by the scheme, as well as to give the ongoing management plan a baseline to work from. During normal operation equipment will be routinely monitored to check for any increase in noise or vibration, and maintenance jobs raised and carried out where this is the case. Any noise complaints received about the site will be dealt with and actioned immediately. The noise emitted from site has been shown by noise modelling not to cause nuisance off-site. The mechanical plant on site will be inspected and maintained regularly. Due to the location not being sensitive and the design of the plant, a Noise & Vibration Management Plan is not necessary for the scheme.	15 Permit application supporting information: - Section 4.1.6 Noise - Appendix G Noise Modelling Report.
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; b) operational measures; c) low-noise equipment; d) noise and vibration control equipment; and	a) Assets that have been identified as having the potential to emit noise and/or vibration (e.g. RLTP blowers, digester mixing, CHP's and boilers) will all be either housed inside buildings and/or acoustic enclosures. Assets with potential to emit vibration (e.g. centrifuges) will include vibration dampening technology and monitoring to ensure vibration remains within tolerable limits. HGV movements will be speed restricted and speed calming	15 Permit application supporting information: - Section 4.1.6 Noise - Appendix G Noise Modelling Report.

	e) noise attenuation.	measures will consider the potential for things like speed humps to create noise as HGV's drive over them. b) The scheme will provide all relevant services and equipment to facilitate operational measures to monitor and control noise and vibration emissions from site including acoustic enclosures, buildings, traffic calming measures. Operations will ensure acoustic enclosures and buildings are closed during normal operating conditions. They will also carry out daily/weekly routine checks of M&E equipment and raise any maintenance work required as a result of increased noise or vibration. c) All installed equipment will comply with Yorkshire Water Engineering Specification, section 12, of no more than 80dB from 1m away. Where this cannot be achieved acoustic enclosures will be employed. d) All assets that have potential to emit noise greater than 80db at 1m distance (e.g. RLTP blowers, digester mixing, CHP's and boilers) will all be either housed inside buildings and/or acoustic enclosures. Assets with potential to emit vibration (e.g. centrifuges) will include vibration dampening technology and monitoring. e) Not relevant given the measures already taken in BAT 18a, 18b, 18c and 18d.	

2.5 Emissions to water

Table 5: BAT conclusions checklist for emissions to water

BAT ref.	Requirements	How the site is compliant	Document reference
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 b) Water recirculation c) Impermeable surface d) Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels e) Roofing of waste storage and treatment areas f) Segregation of water streams g) Adequate drainage infrastructure h) Design and maintenance provisions to allow detection and repair of leaks i) Appropriate buffer storage capacity.	a) As per YW asset standards all process water and final effluent used on site will be monitored and recorded so consumption can be tracked and optimised. Final effluent recycled from the wastewater treatment process will be used instead of potable water wherever possible. Hoses around site will have trigger ends to control use, while process equipment that uses water from automatic washdowns etc will be optimised in terms of set points etc. b) The site will use final effluent recirculated from the wastewater treatment process whenever possible instead of potable water. c) The areas where there is potential for sludge spillage will be covered with an impermeable surface. This will drain to the site drainage system and be returned to the Lower Brighouse WwTW for treatment. d) A bund wall shall be constructed that encloses sufficient volume to contain 25% of the total stored volume in all the tanks containing liquids (excluding chemical tanks which are separately bunded) within the bund. The bund wall and all areas within the bund wall shall be constructed of impermeable materials to provide containment. The surface within the bund will be impermeable and will fall to the site drainage. e) This is only applicable to the digested sludge cake storage area, where sludge cake of ~25% dry solids will be stored	15 Permit application supporting information: - Section 4.2 Emissions to Surface Water - Section 4.3 Emissions to foul sewer - Section 4.4 Emissions to land - Appendix H Site Drainage Plans - Appendix M Supporting Information Document Section 3.1 Bunding. EMS: - Section 2.5 Material Storage - Section 5.2 Procedures - Appendix E Site drainage plans - Appendix N Bund wall drawing

		for up to 7 days. This area is within a covered barn to prevent rewetting of the sludge cake by rainwater before it is exported from site. The drop-zones underneath the centrifuge conveyers will not be covered, however cake will be moved into storage or loaded directly into a cake wagon for export, by the contractor operating the cake export area. In the event of rain cake will not be left in the drop zone for more than 4 hours, it will be moved to the storage barn. All cake will be removed from the drop zone by the end of each day. f) Areas of site with the potential for contamination of surface water will drain back to the wastewater treatment works for treatment, Areas that are deemed to be free from the risk of contamination will be designed to drain to soakaway. g) All areas of site with the potential for contamination of surface water will drain back to the wastewater treatment works for treatment. This system will contain sufficient attenuation/storage capacity to contain below ground storm events up to 1 in 30 years. h) Above ground sludge pipework will be stainless steel installed on pipe supports. Pipe routes will be situated over concrete hardstanding, with appropriate fall to site drainage. This ensures that any leakage can be identified quickly and cleaned away by site operators. Underground de-grit and sludge tank outlet pipework are to be dual-contained. i) Any wastewater generated by the site under normal operating conditions will be returned to the wastewater treatment works for treatment. Centrate return will have a	Design Statement Huddersfield ERF: - Section 2.3 Above ground pipework - Section 2.4 Underground pipeline design - Section 3 Tanks - Section 4.1 Drainage for spills and liquors.

		24-hour buffer storage tank to allow returns to the wastewater treatment works to be delayed if required.	
BAT 20	In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of the techniques given below: - preliminary and primary treatment; - physico-chemical treatment; - biological treatment; - nitrogen removal; and - solids removal.	All process returns and site drainage from the STF will be returned to the wastewater treatment works for treatment before being discharged in combination with treated urban waste water to the River Calder. The centrate from dewatering will be treated using the Treated Liquor Treatment Plant which uses the Amtreat process to reduce ammonia to acceptable levels before the centrate is transferred to the Lower Brighouse WwTW. The treatment process at this site is a conventional nitrifying activated sludge system Filtrate from the drum thickeners (thickening untreated sludge) is pumped to the Upper Brighouse WwTW for full treatment. The treatment at this site is a nitrifying Sequence Batch Reactor (SBR) plant using the Cyclic Activated Sludge System (CASS) process.	15 Permit application supporting information: - Section 2.2 Emissions to Surface Water - Section 2.3 Emissions to foul sewer - Section 2.4 Emissions to land - Appendix H Site Drainage Plans. - Appendix L Process Description, Section 21 Return Liquor Treatment Plant (RTLP)

2.6 Emissions from accidents and incidents

Table 6: BAT conclusions checklist for emissions from accidents and incidents

BAT ref.	Requirements	How the site is compliant	Document reference
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; b) management of incidental/accidental emissions; and c) incident/accident registration and assessment system.	a) The entire site will include high levels of security protection to prevent malevolent acts. This will include security fencing, gates, barriers, CCTV and intruder alarm systems. The digesters, biogas and energy systems will all be located within a separate secure compound, with control of work access only. The site will also include a fire and gas detection and alarm system on all areas of the plant that are deemed to be a risk. Critical process, safety and electrical equipment will be flood protected to ensure the process can be brought back online/mitigated as soon as possible following a flood event. Finally, the plant will include numerous process safety measures including high-integrity devices designed to protect against process safety events such as over-pressurisation, fire and explosion and over-filling. These measures will ensure the plant would always remain in a safe state in the event that access to the site/control systems could not be obtained for a period b) The process will have adequate isolation, including automatic emergency slam-shut valves and manual isolation points to help manage/mitigate an incident or loss of containment. Adequate washwater points and hydrants will be across the site allowing firefighting connections, as well as adequate access roads to all areas of the site. The scheme will also provide an emergency action plan which will include details on what to do in the event of an accident or incident which may harm the	08 Environmental Management System: - Section 5 Accident Prevention and Management - Appendix J Accident/ Incident record forms - Appendix K Emergency Plan - Appendix L Flood Management Plan 15 Permit application supporting information: - Section 3.4.5Accidents, incidents and non-conformance.

		environment. This will be embedded into the operations team in the form of emergency procedures. c) YW Operations will utilise YW's H&S reporting system to ensure any accidents or incidents are fully reported, investigated and learning applied back into relevant actions and changes to working procedures and process plant.	

2.7 Material efficiency

Table 7: BAT conclusions checklist for material efficiency

BAT ref.	Requirements	How the site is compliant	Document reference
BAT 22	In order to use materials efficiently, BAT is to substitute materials with waste.	The Huddersfield STF uses a by-product of waste water treatment to create biogas which is used to produced heat and power (renewable energy) for the site. Following the digestion process, the digestate is lime treated to meet the quality requirement set out in the Safe Sludge Matrix and to comply with the requirements as detailed in BAT 2. The treated sludge is recycled to agricultural land. Final effluent produced by the wastewater treatment works will be used on the site wherever possible instead of potable water.	15 Permit application supporting information: - Appendix D Material Justification.

2.8 Energy efficiency

Table 8: BAT conclusions checklist for energy efficiency

BAT ref.	Requirements	How the site is compliant	Document reference
BAT 23	In order to use energy efficiently, BAT is to use both of the techniques given below: a) energy efficiency plan; and b) energy balance record.	a) The scheme will provide instrumentation and sub-metering that will allow clear understanding, and trending of energy use by each part of the process. There will also be a great deal of flexibility within the process software to allow set-points to be changed. This will allow operations to implement an energy efficiency plan that will monitor, manage and optimise energy use in balance with the required parameters of the treatment/digestion process. b) A detailed heat-energy balance will be carried out for the new plant in order to justify equipment and material selection. It will also ensure the production and utilisation of biogas will be optimised to minimise the waste of and unnecessary import of other energy sources (i.e. natural gas and electricity). The scheme will provide instrumentation (flow, temperature, pressure etc) and sub-metering that will allow clear understanding, and trending of energy use/generation by each part of the process.	08 EMS: - Section 2.2 Resource Use - 15 Permit application supporting information: - Section 5 Resource efficiency and climate change.

2.9 Biological treatment of waste

Table 9: BAT conclusions checklist for the biological treatment of waste

BAT ref.	Requirements	How the site is compliant	Document reference
BAT 33	In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.	Covered in BAT 2.	15 Permit application supporting information: - Section 1.11.3 Import and Storage/treatment of waste.
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; b) biofilter; c) fabric filter; d) thermal oxidation; and e) wet scrubbing.	Two odour control units will be installed on site. One odour control unit will treat air from the cake reception plant and the second will treat air from the thickeners, thickener liquors and the digester feed tanks. Carbon scrubbers will be used for OCu1 AND the second stage of OCU 2. The first stage in OCU2 will be biological. The exhaust stack will be supplied with a discharge cone at the top of the stack to increase the velocity for maximum dispersion.	15 Permit application supporting information: - Section 1.11 Details of activities - Appendix I Odour Modelling Report - 18 Odour Modelling Report - 19 Odour Management Plan.
BAT 35	In order to reduce the generation of waste water and to reduce water usage, BAT is to use all of the techniques given below: a) segregation of water streams; b) water recirculation; and c) minimisation of the generation of leachate.	a) Areas of site with the potential for contamination of water (e.g. cake loading area where leachate may be generated) will always drain back to the wastewater treatment works for treatment. b) The new site will use final effluent generated by the wastewater treatment works wherever possible instead of potable water. c) Final product (digested sludge) will be dewatered to at least 25% dry solids, and then will be stored in a covered barn to prevent it becoming wet and creating leachate.	08 EMS: - Section 2.2 Resource Use. 15 Permit application supporting information: - Appendix H Drainage Plans.

2.10 Anaerobic treatment of waste

Table 10: BAT conclusions checklist for the anaerobic treatment of waste

BAT ref.	Requirements	How the site is compliant	Document reference
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.	The anaerobic digestion process and auxiliary systems will be fully automated using key process instrumentation (temperature profiles, feed volume and dry solids, pressure, foam level and biogas production and quality) to effectively monitor and optimise key process parameters to ensure stable digester operation. This includes automatic fail-safe systems which will revert the digester into a safe and stable condition in the event of an incident or episode of instability (e.g. If foam levels reach a critical level the digester feed and mixing systems would be inhibited - requiring an operator to reset following an alarm). Digesters will contain foam detection instrumentation, and anti-foam FE and chemical dosing systems to suppress foam in the digester headspace. Anti-foam lance and biogas off-take swan-neck pipework arrangement will minimise the risk of foam entering the biogas system and causing issues downstream. The digesters and auxiliary plant contain instrumentation that will provide early warning of a loss of containment or explosion risk, with appropriate fail-safe operation included within the software or hardwired into the control systems. These include dual-level instrumentation within the digester headspace as well as level switches in the digester overspill chamber to warn of blockage in the downstream pipework. The digester headspace also contains pressure instrumentation which warns of over pressurisation of the digesters. This is backed up by dual pressure and vacuum relief valves on the digester roof which ventilate to atmosphere. A foam-radar in the digester headspace, combined with an automatic anti-foam dosing system ensures foam does not escape through the biogas off-take pipework, or the PRV's. There is pressure	15 Permit application supporting information: - Section 4.1 Emissions to air - Appendix G Air Quality.

		monitoring throughout the biogas system, as well as leak detection on the gas holder and gas detection within buildings to warn of an explosion risk. These systems are linked to fast-acting slam-shut valves which isolate all fuels to combustion plant to remove the risk of a fire or explosion.	

2.11 Treatment of water-based liquid waste

Table 11: BAT conclusions checklist for the treatment of water-based liquid waste

BAT ref.	Requirements	How the site is compliant	Document reference
BAT 52	In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2).	As per BAT 2 for liquid sludges.	08 EMS: - Section 2.8 Procedures. 15 Permit application supporting information: - Section 1.11 Details of activities. - Appendix L Process Control Description.
BAT 53	In order to reduce emissions of HCl, NH_3 and organic compounds to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below: a) adsorption; b) biofilter; c) thermal oxidation; and d) wet scrubbing.	Same as BAT 14.	15 Permit application supporting information: - Section 4.1 Emissions to air - Appendix E Air Quality - Appendix F Odour Modelling Report.