BURTON AGNES RENEWABLES

BURTON AGNES BIOGAS PLANT

MANAGEMENT PLANS

ACCIDENT MANAGEMENT PLAN

June 2023

ROOTS
RECYCLING OF ORGANICS ▫ TECHNICAL SUPPORT

Prepared by Sarah Manwaring & Angela Cronje
ROOTS - Recycling of Organics Technical Support
On behalf of Burton Agnes Renewables

DOCUMENT CONTROL

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Contents

Introduction

This management plan is produced in compliance with Standard Rules condition 1.1.1 of the Environmental Permitting Regulations 2010 for the Permit application for Burton Agnes Biogas Plant.

Key site information

Site location: Harpham Grange Farm, Burton Agnes, East Riding of Yorkshire, YO25 4NQ.

National Grid reference: 509300 464100

Permit holder: Burton Agnes Renewables Ltd (BAR)

Technically Competent Management: Andy Saunders

Emergency contact numbers

Emergency services numbers (Police, Fire and Ambulance): 999

Environment Agency (Incident hotline 24-hour service): 0300 200 20 24
Call the Environment Agency incident hotline to report pollution resulting to air, land and water from an accident or incident on the site. https://www.gov.uk/report-an-environmental-incident

Site contacts (out of hours): Andy Saunders, Phil Jennings

Emergency services - summary of site activities

- Biogas production by anaerobic digestion
- Biogas treatment to produce biomethane, including enrichment and odourisation
- Biogas consumption to produce electricity and heat
- Digestate drying using heat generated by the Combined Heat and Power (CHP) unit
- Bulk liquid Oxygen storage for dosing into the Digester

The Burton Agnes Biogas Plant is an agricultural anaerobic digestion plant producing biogas. Biogas is approx. 53% methane, 44% carbon dioxide, with traces of by-product gases ammonia, hydrogen, oxygen (<0.5%) and nitrogen, and hydrogen sulphide. Oxygen is dosed into the digester to manage the Hydrogen Sulphide (H_2S) concentration in the biogas. The oxygen is stored in a liquid state inside of a suitably designed vessel situated on the Northern boundary of site. The oxygen passes through a vapouriser to turn it from a liquid into a gaseous state prior to entry into the Digester headspace. Biogas is upgraded for export to the National Gas Network (NGN). Some biogas is used by the CHP to generate heat and electricity for use on site. An emergency flare is in place to consume any biogas that cannot be used.

The site receives and stores crops and crop residues in purpose-built silage clamps. Site also receives animal manures and slurries. Input materials are listed in the Environmental Management System.
Liquid digestate is stored on site in a purpose-built gas-tight storage tank. Some separated digestate solids may be present on site before being dispatched for agricultural land application. A proportion of the separated digester solids are dried, utilising heat generated by the CHP. The dried digester solids are stored temporarily inside a designated storage area prior to being collected for agricultural land application.

Biogas is stored in the gas storage dome covering the digestate storage tank before it is used by the gas upgrading plant and the CHP. Biomethane is >95% methane, 2.5% nitrogen, 1.5% carbon dioxide and <1% oxygen.

Upgrading biogas to biomethane includes the following basic process steps:

- Gas cooling and compression
- Gas drying to remove moisture
- Gas separation to remove carbon dioxide, and contaminant gases by membrane separators.
- Gas monitoring for quality control – biomethane composition, pressure, temperature and flow rate are continuous monitored.
- Biomethane enrichment – addition of propane (to about 4%) and an odouriser

Propane gas is stored in a designated compound located next the biogas upgrading and CHP island.

Management plan overview

The company, Burton Agnes Renewables (BAR), is committed to preventing accidents that could impact on the environment. This accident management plan will be clearly communicated to all employees, managers and contractors who work at the site.

This management plan does not seek to replace any health and safety documentation, a Fire action plan/safety strategy or Emergency response procedures. It is used in conjunction with such documentation for the overall safe operation of the site and plant, and in response to an accident.

For the purposes of this management plan, an accident is defined as any of the following situations:

- Where an accident occurs, which has caused or may have the potential to cause pollution;
- Where any malfunction, breakdown or failure of plant system, equipment or techniques is detected which has caused or may have the potential to cause pollution;
- Where any substance, vibration, heat or noise specified in any Condition of the Permit is detected in an emission from a source not authorised by a Condition of the Permit and in a quantity which may cause pollution;
- Where an emission of any pollutant not authorised to be released under any Condition of the Permit is detected;
- Where an emission of any substance, vibration, heat or noise is detected that has exceeded, or is likely to exceed, any limit on emissions specified in the Permit.

If an accident does occur, it will be reported immediately to BAR management and to the Environment Agency. As the permit holder, BAR will:

- Follow the accident management plan;
- Do whatever else is necessary to minimise the environmental impact;
- Take all precautions to ensure the health and safety of employees and visitors to the facility is not compromised;
- Investigate and accurately record what happened, and take remedial actions to prevent a repeat accident;
- Review the accident management plan.

The management plan will be reviewed, and the review recorded, at least every four years, or as required due to a significant process change or by the Environment Agency. All records required to be made by the standard rules Permit will be:

- Legible;

- Made as soon as reasonably practicable
- Amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval (document control applied), and

- Retained, unless otherwise agreed in writing by the Environment Agency, for at least 6 years from the date when the records are made, or until permit surrender.

Assessing the Risks

Environmental Risk Assessments are undertaken to apportion a level of significance to the environmental risks, and to identify necessary controls to prevent and mitigate pollution accidents. The risk assessment procedure is a systematic appraisal of the risk and uses a subjective risk rating for each identified hazard, as described in the risk evaluation table below.

Risk rating = Impact rating x Likelihood rating

RISK EVALUATION TABLE

Likelihood		
Score	**Description**	**Examples**
1	Rare	Release unlikely ever to happen Probability of release close to zero
2	Unlikely	Release foreseeable but probably very low Release might be seen once during working life (40 Year Period)
3	Possible	Release may have occurred in the past Expect to see several release during working life (40 year period)
4	Likely	Release has occurred in the past. Expect at least one release per year Personnel would not be surprised by release
5	Almost Certain	Releases are continuous or occur frequently Expect significant number of releases each year

Potential Consequences Environment (Identify worst foreseeable consequence and read off corresponding score)			
Score	**Category**	**Environment**	**Business Impact**
1	Insignificant	Minimal Impact Little or no impact	Little or no impact <£1k
2	Minor	Minor Impact Limited environmental damage	Minor Impact >£1k <£10k
3	Moderate	Moderate Impact Significant environmental damage over short to medium term (<1 year)	Moderate Impact >£10k <£50k
4	Major	Major Impact Significant environmental damage over long term (e.g > 1 year) major environmental damage over short term to medium term (e.g. <1 Year)	Major Impact >£50k <£100k
5	Catastrophic	Catastrophic impact Major environmental damage over long term (e.g. > 1 year)	Catastrophic impact >£100k

RISK						
Severity	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Likelihood				

1-5	Low Risk/Tolerable
6-10	Medium Risk/ Monitor and maintain Controls
12-15	High Risk Monitor and maintain Controls (Increased Supervision)
16-25	Very high (Do not proceed, consult the Operations Manager)

Monitoring and checks are recorded in a format appropriate to the risk e.g. 'High risk' would warrant continuous monitoring of the hazard with daily checks and verification by the Site Manager.

Actions to control a hazard and mitigate risk to an acceptable level are included in site work instructions and plant operating procedures, and are recorded by the Site Manager on an action tracker (or other similar logbook). The status of actions are reviewed quarterly and reported to the BAR management.

The main risks to the environment would be as a result of the following accidents occurring:

1. breach of containment of waste leachate and digestate. This has a high biological oxygen demand, which can render water bodies anoxic and damage ecosystems.
2. Uncontrolled release of biogas and/or biomethane may result in odour complaints, but more importantly, present a risk of explosion, asphyxiation or poisoning by noxious gases.

The last point clearly illustrates the close link between environmental and health and safety risk on site. This accident management plan can assist in the overall risk appraisal for site activities and plant operations, especially during abnormal operations such as start up and shut down the plant and during maintenance of plant and equipment.

All identified hazards, which are likely to cause an accident are subject to strict preventative measures or control at the site to ensure that all risks are minimised.

Techniques to Reduce the Risks

The site holds documentation from the AD plant and Biogas upgrade technology providers, such as operation and maintenance manuals, which provide information on how the plant should be operated so as to prevent accidents. This management plan identifies areas that may present a risk, and how the risks of pollution, not controlled by Regulatory limits or by the use of protective measures, can be minimised and managed.

Operators need to demonstrate that they have an effective management system in place, and that the best available techniques are used to prevent, control and mitigate environmental accidents.

1. Failure of containment

Failure of containment can results from the following:

- Foaming of digestate out of AD plant tanks;
- Spillages and/or overfilling of tanks, vessels and other types of primary containment during transfer of liquid substrates, and
- Damage to / collapse of tanks, vessels and other types of primary containment.

The following liquid substances have the potential to cause pollution and present a risk:

- Leachate from solid input materials;
- Liquid input materials (slurries) and digestate;
- Lagoon dirty water;
- Diesel, oils and lubricants, and
- Other chemical (liquids and soluble powders) stored on site

The following control measures and general techniques are in place to prevent accidents. Mitigation measures will be undertaken immediately if there is a possibility of pollution or harm to minimise the environmental impact.

1.1. Compatibility of substrates

Adding incompatible input materials / feedstocks into the AD process can result in foaming (a result of sudden biogas formation in the digestate) and escape of digestate and biogas (and odours) from the tanks. The compatibility of the input material with the AD process is included in pre-acceptance assessment of input material (see section below on Input materials).

Thick floating layers and crusting on the surface of digestate can also restrict the release of biogas under normal operating conditions, which can result in foaming. Mixing in floating layers can also cause foaming due to sudden increase in organic matter in the biologically active digestate – all this needs to be considered and managed when assessing input material/ feedstock compatibility.

Any escaped digestate will be contained in the secondary containment bund (see below).

1.2. Secondary containment bund

Liquid substances that have the potential to cause environmental damage through an accident are contained in tanks within the site's secondary containment bund, or otherwise in tanks that are self-bunded with a minimum capacity of 110% of the tank's contents. Bund bases and sides will be

impermeable. All vents, sight glasses and pipework connections etc. will be located within the bunded area. Diesel storage is within a double bunded tank.

The effective capacity of the AD plant's secondary containment and any self-bund tanks will be maintained at all times.

Engineered containment systems are regularly inspected and maintained, as necessary, to ensure their integrity is retained, and are fit for purpose throughout the operational life of the site.

Small quantities of lubricating oils and greases and other substances required for maintenance of site machinery and plant equipment are kept on the site in the store room and workshop. Leaks from these containers would be small due to volumes kept on site and would be contained within the store cabins containment.

1.3. Silage clamps and site drainage system

Storage of solid input materials (silage, crops and crop residues, and manures) is on an impermeable asphalt surface in purpose built clamps, with a drainage system designed to give an added level of protection to soils, surface water and groundwater.

The sealed drainage system is design to prevent the risk of run-off, leachate and slurry entering the ground and surface water. The pollution control measures for each of the three individual drainage areas are detailed in the BAR's flood risk assessment and drainage strategy document.

The sealed drainage system, asphalt silage clamps and roadways are checked weekly. Any sign of damage, regardless of how minor, is reported immediately to the site manager. Following inspection, repairs will be made as necessary and as soon as possible to ensure that the impermeable surfaces retain their integrity.

The clean water and dirty water lagoons are checked weekly. Any sign of contamination is reported immediately to the site manager so that measures can be taken mitigate the potential for pollution.

1.4. Transfer of liquids control

To prevent overfilling, the volume of liquid in all tanks is recorded and clearly marked on the outside of the tank / vessel or indicted on the HMI of a local or the main control panel. The level in the tank is checked before liquid transfers made to ensure there is sufficient capacity within (including an allowance for head space or ullage).

The AD plant SCADA system monitors, controls and maintains the levels in the AD process tanks at the set point value. Changes to level set point values are only allowed to be undertaken by authorised persons via password secure access to the control system. Safety alarms and interlocks are in place to prevent overfilling the buffer tank, digesters and digestate storage tank during substrate transfer.

Spill kits, drip trays and absorbent material are available on site, and are used to contain and treat any spillage, even minor spillages, and minimise contamination washing into the draining system, and then into the lagoons. Any used, absorbent material will be removed and stored in a sealed container, prior to authorised disposal.

Spill kits, drip trays and bags of absorbent material are kept in the workshop / store room in an easily accessible location, clearly labelled for purpose of use, and in good working condition. If work is being done that could possibly result in a spillage, a spill kit or bags of absorbent material are taken to the area in preparation.

1.5. Barriers to prevent damage

Barriers, curbing and adequate space and areas for vehicular access are in place to prevent damage to plant infrastructure and equipment from the movement of vehicles.

Any damage, regardless of how minor, is reported immediately to the site manager and as necessary to the BAR management and the Regulators.

If there is a potential for pollution or harm, mitigation measures will be implemented immediately, including:

- Removal of liquid from a damaged tank and transfer to a replacement tank or sealed container;
- Immediate repair of any damaged bund and/or removal of any liquid contained therein;
- Temporary disuse of any damaged tank or container.

2. Release of biogas and/or biomethane

The release of biogas and/or biomethane can result from the following:

- Foaming of digestate out AD plant tanks;
- Overpressure in AD plant gas system (via PRVs), and
- Damage the gas system structures.

NB. Biogas can cause asphyxiation and contains noxious gases. A personal gas monitor must be worn at all times when and where there is the potential for controlled and uncontrolled release of biogas.

Main Components of biogas/ biomethane	**Biogas**	**Biomethane**
Methane (CH_4)	50 - 75 %	> 95 %
Carbon dioxide (CO_2)	23 - 47 %	< 3 %
Oxygen (O_2)	<1 %	< 0.5 %
Hydrogen sulphide (H_2S) [1]	0 – 6000ppm	< 10 ppm

[1] H_2S levels depends on the types of input material and measures used to reduce levels in the biogas.

The following control measures and general techniques are in place to prevent accidents. Mitigation measures will be taken immediately if there is a possibility of pollution or harm to minimise the environmental impact.

2.1. Compatibility of substrates

See for Section 1.1 above.

Biogas will be released from the head space in the digester and from the digestate during a foaming incident. Depending on which AD plant tank foams and whether the gas lines are blocked by the foam, there may or may not be a dramatic loss in gas pressure in the gas system.

Measures will be taken to isolate the tank and gas lines affected by the foaming in accordance with the technology provider's trouble shooting instructions, as long as it is safe to do so.

2.2. Gas pressure monitoring and control

The gas pressure in the gas system is monitored continuously along with the gas level in the gas storage dome. The SCADA system modulates the gas upgrading system, CHP and flare operation in

response to the gas level and gas pressures. Over/under pressure safety alarms will be generated by the SCADA system.

Gas emissions from the pressure relief devices (PRVs) on the AD plant tanks are in place for emergency venting only under abnormal operating conditions due to faults or unplanned downtime with the biogas combustion and upgrading equipment.

Pressure relief devices (shown as red dots on the site plan) are located on the following tanks:

- The buffer tank;
- Both digesters;
- The digestate storage tank (which has the gas storage dome fitted above)

SCADA controls the following biogas use hierarchy (in order of priority):

A. Normal gas consumption by Gas Upgrading System (Gas to Grid) & CHP (biogas combustion)
B. Gas dome storage to High-High level in case of insufficient biogas consumption,
C. Flare (biogas combustion),
D. Biogas venting from PRVs, and use auxiliary boiler (some biogas combustion), if possible.

Under pressure readings in the gas system will trigger safety alarms from the SCADA system. A sudden drop in gas pressure would normally indicate rapid release of biogas due to damage to the gas system equipment, or for example a faulty PRV, or damage to the gas storage dome.

The integrity of the gas lines, PRVs and the gas dome is checked for gas leaks. Any signs of damage, or alarms on personal gas monitors will be reported immediately to the site manager.

2.3. Control Aspects

The AD and Biogas plant's SCADA system is the master controller. The CHP and biomethane upgrading plant's PLCs and any other controller send status signals to the master controller.

Operation of the AD and Biogas plant is subject to continuous process controls. The site manager monitors the process regularly during the day to ensure effective function of all process steps.

Remote access to the plant's master controller from the technology and service provider's central control room will provide round the clock monitoring of the biogas plant, and biomethane production and injection to the gas pipeline and grid network.

2.4. Barriers to prevent damage

Barriers, curbing and adequate space and areas for vehicular and other mobile plant and equipment access are in place to prevent damage to gas system infrastructure and equipment from the movement of vehicles.

Any impact with and damage to the gas lines and equipment, regardless of how minor, is reported immediately to the site manage.

3. Input Materials – Compatibility and Storage

3.1. Pre-acceptance and acceptance procedures

Pre-acceptance and acceptance procedures are in place to ensure compliance with:

- The list of permitted waste types in Table 2.3 of the Standard Rules 2012 No 11
- Conditions 2.3.1 and 2.3.2 of the Standard Rules 2012 No 11

Manure and slurries are supplied from local farms - a known source. No animal manures and slurries will be supplied from any livestock with health problem to minimise biohazard risk.

Input materials (both wastes and non-wastes) delivered to and received at site for processing in the AD plant will be assessed on their risk rating combination and backed up by acceptance procedures documented in site work instructions / operating procedures. Compatibility of the input material when mixed in the AD process is also included in the assessment.

Loads delivered will be checked against the details given on waste transfer notes or description of non-waste materials (part of a waste register). All solid loads will be visually checked as soon as safely possible after tipping in the designated storage bunkers or silage clamp. Any non-permitted wastes and out of spec. material delivered to, and tipped at the site will be reloaded onto the delivery vehicle for removal off-site or placed in quarantine.

Liquid wastes i.e. slurries, will be delivered to site in suitable tankers and unloaded directly into the buffer tank. Samples of liquids will be taken from the tanker or from the buffer tank, whichever is the more suitable, to visually check it is as expected and for periodic, or as often as required testing.

3.2. Storage and inventory control

Adequate storage is provided for the anticipated volumes and types of input material. Only compatible input materials will be stored together in the designated clamps. Storage of incompatible materials could result in uncontrolled chemical or biological reactions resulting in the uncontrolled release of noxious gases, and is avoided.

Silage stored in the clamps is fully sheeted covering the entire area of the stored material. Keeping the silage tightly sheeted to prevent the ingress of air is important to ensure the production of organic acids for the AD process. This process requirement fits with the requirement to cover the clamps to reduce odour and other emissions of volatiles and bioaerosols from poorly stored silage.

Inventory control is exercised such that manure, crops and crop residues, and silage are not left in un-managed in storage. All storage piles are monitored and managed.

4. Site security – unauthorised access and vandalism

The site is secured by either perimeter fencing and lockable gates at the entrance or by CCTV. When the site is unmanned, all buildings, cabins and control rooms will be locked.

Only authorised persons are allowed on site and around the AD and biogas upgrading plant. Security measures will be reviewed and upgraded as necessary, if an unauthorised person gains access to the site during work hours or out of hours.

Access to some process areas will be restricted and permits to work will be required in these areas.

The AD and biogas plants are controlled by automated SCADA systems. The access to the controller program and process set points are password protected to ensure only authorised and technically competent personnel can access and make changes both on site and remotely.

5. Fire

In the event of a fire, the Fire Action Plan / Safety Strategy and Emergency response procedures will be followed. This accident management plan is used to minimise the impact on the environment that may occur as a result of a fire and the actions taken to fight the fire.

5.1. Control measures

No wastes will be burned within the boundaries of the site. The Company have a strict No smoking policy on site and have a designated smoking area provided in the visitors car park.

An inventory will be maintained to record the substances used or produced at the site. A register of chemicals with their Data sheets and COSHH assessments is maintained. Incompatible materials are stored separately to prevent adverse reactions. Storage of other potentially hazardous materials (e.g. diesel fuel oil) is indicated on a site plan in the COSSH register. The plan will be made available to the Emergency Services when necessary (e.g. in the event of a fire).

Equipment for use in explosive atmospheres are regularly inspected and maintained to ensure it does not pose an increased risk of causing a fire or explosion. Maintenance of the equipment is carried out by people who are competent to do so.

Fire extinguishers are located at key locations around the site suitable for the type of fire that may occur in that area. All fire extinguishers are clearly marked and, tested at the required intervals, to confirm their integrity. Site operators are aware of their location and trained in their correct use.

A Fire Safety Strategy is set out as follows:

- Separation and / or control of hazards;
- Control / elimination of ignition sources;
- Adequate passive fire safety measures; fire doors, clear means of escape and exit routes;
- Detection systems to provide an early warning of fire;
- Fire-fighting equipment suitable for use in enclosed spaces and on electrical equipment.

5.2. Dealing with Fires

The consequences of fire, should it occur, could be harmful, with staff, site personnel and visitors at most risk. The site manager and/or site fire warden will implement the Fire Action Plan/ Safety Strategy, evacuate all personnel from site and alert the emergency services. If a fire develops, there could also be a risk of harm to local residents.

In the case of a fire on site, the supply of run-off water collected in the clean water &/or the dirty water lagoons is available for use by the Emergency Services to tackle fires.

5.3. Dealing with Firewater

Firewater will be contained in the secondary containment bund, within the silage clamps and in the sealed drainage system. Isolation valves on the site drainage allow contaminated firewater to be directed to and collected in the dirty water lagoon.

6. Failure of main services

6.1. Loss of electrical power

If there is an extended loss of electrical power to the plant, e.g. a power cable to the plant damaged by excavation works on site, biogas will still be being produced (to a lesser extent as feeding the plant will have stopped) and the gas will fill the gas dome storage to the high-high level and then if the gas pressures continue to rise the excess biogas will be consumed by the emergency flare that is operated and controlled by the master controller, powered by the emergency generator.

7. Emergency Response

The company will implement Emergency response procedures which identifies the people and their roles the management of a number of serious accidents which may necessitate attendance of emergency services.

The company has established communication routes with the relevant authorities such that these will be immediately available in the event of an accident. Information is maintained up to date.

Operating procedures also include the safe shut down of the plant and equipment in an emergency.

Accident Plan Summary

Accident / Hazard	Environment affect	Risk without Controls			Mitigation	Risk with Controls			Remedial actions
1. Loss of containment									
1.1. Spillages									
Spillage during transfer of input materials (Slurries), and process substrates (feedstock and digestate).	Contamination of land, drains, surface and groundwater and watercourses.	4	3	**12**	Site drainage is contained Pre-acceptance & acceptance criteria and procedures, including RAMS. Staff/site operator training. Supervision of deliveries. Use of drip trays and absorbent materials. Stand-by pump & spares.	2	2	**4**	Follow the spill response procedure. It describes: • What to do in the event of a spill; • Where the spill kit, drip trays and absorbent material is kept on site; • Where/how to dispose of absorbed material. Re-train staff / site operators.
Spillage during delivery of oil or fuel.		3	3	**9**	Site drainage is contained Review of RAMS. Supervision of deliveries. Staff/site operator training. Use of designated drip tray and spill kit.	2	2	**4**	
Spillages during refueling of plant and equipment.		3	3	**9**	Site drainage is contained Review of RAMS. Plant and equipment refueling in designated areas with impermeable surface, and away from drains. Staff/site operator training. Use of designated drip tray and spill kit.	2	1	**2**	

Accident / Hazard	Environment affect	Risk without Controls			Mitigation	Risk with Controls			Remedial actions
Spillage of oil and other chemicals during plant and equipment maintenance.	Contamination of land, drains, surface and groundwater and watercourses.	3	3	**9**	Site drainage is contained Review of RAMS. Supervision of maintenance contractors. Site operator training. Use of designated drip tray and spill kit.	2	1	**2**	Follow the spill response procedure. It describes: • What to do in the event of a spill; • Where the spill kit, drip trays and absorbent material is kept on site; • Where/how to dispose of absorbed material. Re-train staff / site operators.
Leachate from input material stored in silage clamps. Slow seepage can be less noticeable than 'spills'.		4	3	**12**	Site drainage is contained Review of RAMS. Pre- acceptance & acceptance criteria and procedures. Use of absorbent materials as an absorbent bund in silage clamps if notable leachate. Drains free of debris to ensure rainwater drains freely.	2	1	**2**	
1.2. Overfilling									
Overfilling of buffer tanks during delivery of liquid input materials (slurry).	Contamination of land, drains, groundwater and watercourses.	4	3	**12**	Tanks sit in impermeably lined area Site drainage is contained Review of RAMS. Process control and visual level checks. Stock levels checks and inventory control. Supervision of deliveries. Site operator training. SCADA system high level alarms.	1	2	**2**	Follow spill response procedure described in 1.1. Retrain staff / site operators. Check /calibrate level sensors.
Overfilling of oil / fuel tanks during delivery.		2	4	**6**	Review of RAMS. Check stock levels. Supervised deliveries. Train site operators Use tanks fitted with side sight glasses, level markers and/or high level alarms.	1	2	**2**	Follow spill response procedure described in 1.1. Retrain staff / site operators. Check /calibrate level sensors.

Accident / Hazard	Environment affect	Risk without Controls			Mitigation	Risk with Controls			Remedial actions
1.3. Failure of Plant or Equipment									
Leaks of substrates from faulty / damaged pipe work, pumps, connections/flanges, couplings, valves, pressure relief vents etc.	Contamination of land, drains, groundwater and watercourses.	3	3	**9**	Tanks sit in impermeably lined area Site drainage is contained Daily visual checks and completion of weekly inspection checklist record. Planned preventative maintenance. Insulation and protection of pipework. Equipment correctly specified for substrates. Barriers for pipework near roadways / trafficked areas.	2	2	**4**	Follow spill response procedure as described in 1.1. Use manual shut off valves if appropriate. Repair or replace leaking pumps, pipework, or connections / couplings. Retrain staff / site operators
Leaks from damaged containers, vessels and tanks etc. due to impact or corrosion.		3	3	**9**	Tanks sit in impermeably lined area Site drainage is contained Barriers and/or high curbing for containers, vessels and tanks, tanks near roadways and trafficked areas. Drums and non-permanent vessels stored on impermeable surface and protected with barriers. Drums and containers handled using safe techniques. Containers, tanks etc. correctly specified for substrates. Supervision of contractors.	2	2	**4**	Follow spill response procedure as appropriate to tank & substrate spill. • Remove liquid from a damaged tank; • Transfer to a replacement tank or sealed container; • Repair any damaged bund and/or remove of any liquid contained; • Temporary disuse of any damaged tank or container.

Accident / Hazard	Environment affect	Risk without Controls			Mitigation	Risk with Controls			Remedial actions
Failure of containers, vessels (including lagoons) and tanks due to land movement, impact or corrosion	Contamination of land, drains, groundwater and watercourses. Pollution to air by uncontrolled loss of biogas and odours.	2	4	**8**	Site drainage is contained Tanks and vessels located within secondary containment bund or with self-bunding. Inspect primary and secondary containment regularly. Check leak detection system of tanks and bunds & pressure loss alarms. Barriers and/or high curbing for tanks near roadways and trafficked areas. Containers, tanks etc. correctly specified for substrates. Supervision of contractors.	2	3	**6**	Follow Spill response procedure described above, or Emergency response plan procedure, as appropriate to tank failure & substrate spillage.
2. Fire									
Fires caused by faulty electrical equipment.	Pollution of air by smoke, dust, emissions, and odour. Pollution of air by uncontrolled release of biogas. Explosion. Contamination of land, groundwater and watercourses by firewater.	3	4	**12**	Regular checks on condition of electrical equipment for signs of damage and defects. Fire Alarms and Detectors present throughout site. Contracted electrical safety and conformity inspections, and functionality tests including control panels and all site and plant electrical equipment. Strict use of only 'ATEX' equipment on and around the AD/biogas plant. Correct fire extinguishers located in all electrical panel / control rooms. Fire Supression located in Biogest Control Room	2	3	**6**	Follow the Fire Action Plan. It describes: • What to do in the event of a fire; • Details about fire alarms, exit routes and muster points; • Responsible personnel such as a fire warden; • The location and safe use of emergency fire equipment such as extinguishers.

Accident / Hazard	Environment affect	Risk without Controls			Mitigation	Risk with Controls			Remedial actions
Fires caused by ignition of combustible materials.		4	4	**16**	CCTV in operation and monitored throughout site Incompatible materials stored separately Inventory control of input materials in silage clamps. Safe storage of combustible materials away from sources of ignition. Storage of oxidising chemicals in a COSSH cabin. A strict No smoking policy on site. Maintenance of a tidy site. Staff and site operator training on fire and emergency drills.	2	4	**8**	Follow Emergency response procedures and the Fire Action Plan. Isolate burning material from other combustible material and AD/ Biogas plant if possible and safe to do so. Direct contaminated firewater to dirty water lagoon for containment.
Fires caused by combining and mixing incompatible materials or drainage cross connections.		2	4	**8**	Maintenance of an up-to-date drainage strategy / plan. No disposal of combustible / flammable material to drains. Maintain inventory control of substances with datasheets. Procedure for contractors to work on site, induction training and permit to work.	1	3	**3**	Follow the Fire Action Plan described above. Direct contaminated firewater to one of the water lagoon for containment.
3. Flood									
Ingress of watercourse floodwater, blocked drains, burst water mains, fire water etc.	Contamination of input materials, buildings, land, drainage system, groundwater and watercourses with fire or flood water.	3	3	**9**	Maintenance of clear flowing drainage system. Fitting of flap / non return valves on drains and discharge points. Safe location for storage of hazardous substances.	2	2	**4**	Follow Emergency response procedures or Flood management describing what to do in the event of a flood warning such as, use of sandbags, safe storage of hazardous substances.

Accident / Hazard	Environment affect				Mitigation				Remedial actions
4. Failure of Services									
Power cut to the supply of mains electricity.	Pollution of air uncontrolled release of biogas and odour. Explosion potential	5	5	**25**	Emergency diesel generator so AD and biogas plant continue to operate and biogas consumed by gas flare. Call out rota to respond to alarms out of hours SCADA system (local and remote access) and gas pressure and production monitoring. Safety start-up & shut down procedures for P&E. Up to date plans showing location of utility services. Procedures for contractors to work on site, induction training and permit to work.	2	2	**4**	Follow plant shut down / start-up procedure. It describes: • What to in the event of power cut; • Start-up of emergency generator; • Plant start-up checks; • Manual shut down and/or start-up of process equipment, if required.
5. Vandalism									
Unauthorised entry and tampering or malicious damage to property, plant and equipment, and/or starting of fires.	See section 2. Fires. Contamination of land, drains, groundwater and watercourses.	4	5	**20**	Security gates and perimeter fence or CCTV Site offices, cabins, store and control rooms locked when not in use out of hours Tanks and valves locked off when not in use out of hours.	2	3	**6**	Emergency response procedures. Review of site security.

Site Inventory

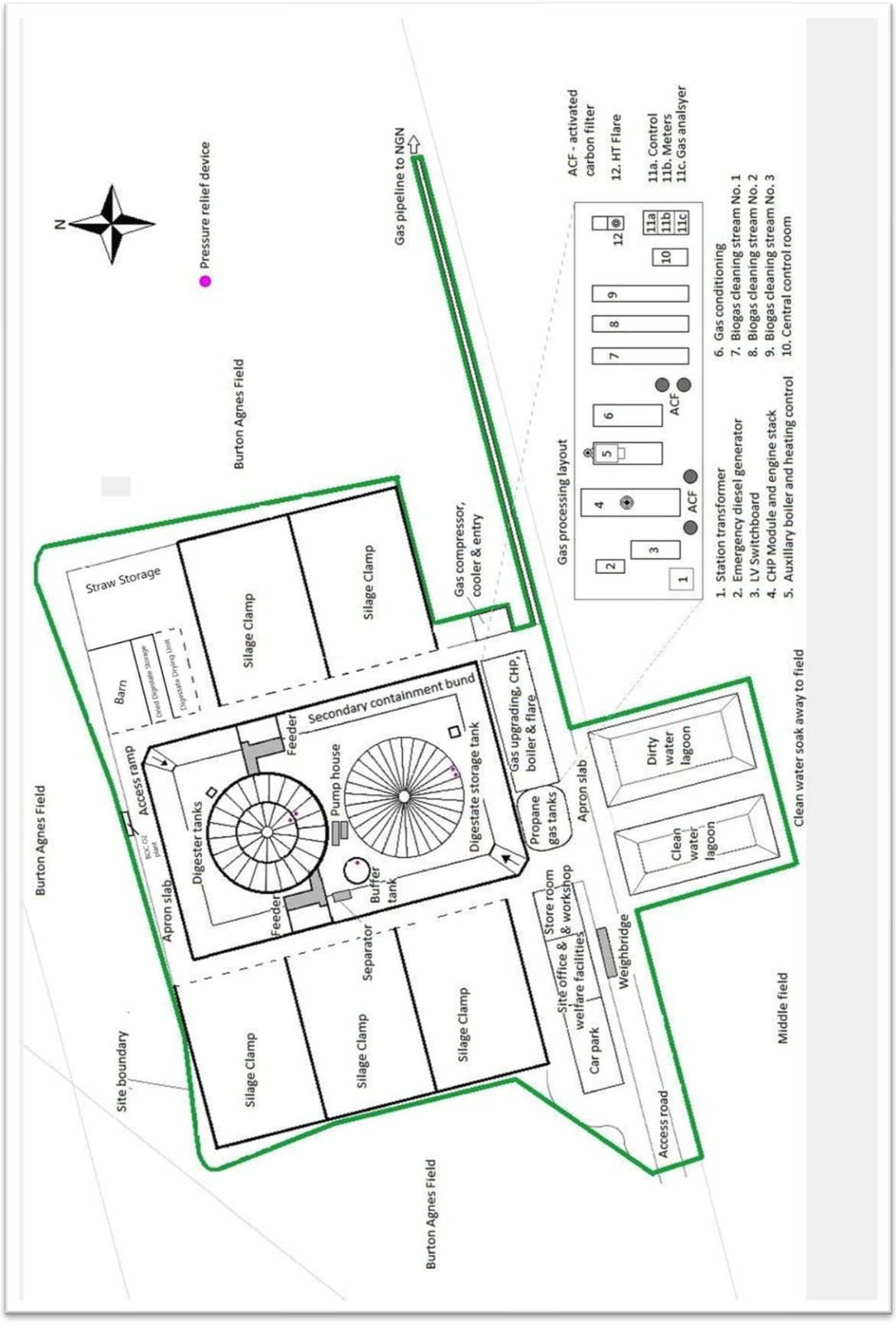
Maximum quantities at peak times

Material Name / Product Description	Container Size	Maximum Quantity (at one time)	Annual Quantity Used	Location on Site / Storage Facilities
Gases				
Traceable Reference Gas Mixture (C6)	10L	1	1L	GEU
Traceable Reference Gas Mixture (BIO)	10L	1	20L	GEU
Helium (He)	50L	2	50L	GEU
Natural Gas	50L	1	10L	GEU
Nitrogen (N2)	16x50L	1	800L	Outside Biomethane Plant
Odourant NB (16410)	40kg	1	80Kg	NGN Compound
Propane (Liquefied Propane Gas)	8000kg	3	230,000kg	Calor Compound
Biogas (CH4, CO2 plus traces H2S)	8000m3	4	8,760,000m3	Biogas storage dome above post digesters
Calgaz Blackline Monitor Cal Gas	1.7L	2	1.7L	Site Office
Liquid Oxygen	4000m3	1	58,900m3	BOC Oxygen Plant (Northern Concrete Road)
Lubricants and Maintenance Oils				
Adicomp Oil ADI BIO-G	19	4	360L	Oil Storage Area
Shell Morlina S2 BL 10	250ml	2	50ml	GEU
Fuchs Renolin PG 220	20L	5	180L	Oil Storage Area
Fuchs Titan Mineral Gear Oil 85W-140	20L	5	330L	Oil Storage Area
Fuchs Renolin CLP Gear Oil 460	20L	5	260L	Oil Storage Area
Fuchs Titan EP90 Gear Oil 80W-90	5L	20	180L	Oil Storage Area
Fuchs Renolin B 46 HVI	20L	5	260L	Oil Storage Area
Fuchs Renolit LX-EP 2	400g	20	4,800g	Workshop
Spirax S3 AX 85W-140 Axle Oil	20L	5	80L	Oil Storage Area
Omala S2 G 460 MIN IND Gear Oil	20L	5	360L	Oil Storage Area
CHP Engine OIl	1,000L	1	2000L	CHP

Fermenter Additives (liquid)				
T16	1,000L	1	1,825L	Bunded Area
Fermenter Additives (solid)				
Alltech Digest P3 Enzymes	500g	700	2,190kg	Container next to Feeding System 2
FM Bio Energy ATOX SCON	20kg	0	1,080kg	Container next to Feeding System 2
FM Bio Energy BG MAGXX	15kg	78	840kg	Container next to Feeding System 2
Miscellaneous Substances				
Activated Carbon, Impregnated. Filtracarb SA70	25kg	15	0	Store
Activated Carbon, Impregnated. Filtracarb SA70	500kg	8	2,000kg	Carbon Towers
Feedstock (solid)				
Chicken Manure	15t	2	1,423t	Clamp
Wheat Straw Bales	300kg	600	628t	Clamp, Barn, Behind Barn
Maize	18,000t		10,761t	Clamp
Rye	18,000t		19,133t	Clamp
Feedstock (liquid)				
Pig Slurry	125m3	1	12,943t	Reception Tank
Wastes				
Waste Engine Oil	1000L	1	2,000L	CHP
Waste Oil	1000L	1	2,000L	Waste Oil Area
Waste Coolant	1000L	2	2,000L	Waste Oil Area
Empty Oil Containers	20L	100		Waste Oil Area
Municipal non-recyclable waste	1100L	1	4t	Outside Office Area
Municipal non-recyclable waste	16yd Skip	1	12t	Outside Office Area
Metal Waste	8yd Skip	1		Outside Office Area
Process Material				
Whole Digestate	7,000m3	1		Primary Digester
Whole Digestate	3,500m3	1		Secondary Digester
Whole Digestate	62m3	1		Digestate Tank
Separated Liqour Digestate	11,500m3	1	26,843t	Digestate Storage Tank
Separated Liqour Digestate	62m3	1		Separated Liqour Tank
Separated Fibre Digestate	50t	1	3,331t	Separation Area

Separated Fibre Digestate	500t	1		Clamp

Site Plan and Plant Layout



Incident and Near Miss Investigation Report Form

futurebiogas

Incident and Near Miss Investigation Form

TITLE OF INVESTIGATION				INCIDENT/NEAR MISS NUMBER
NEAR MISS	Reported by:			Other
Date:		Time:		Location:

Incident/Near Miss Type (NOTE: you can have more than one type)

Injury/Illness	Fire/explosion	Environmental	Dangerous Occurrence	Property Damage	Financial	Reliability	Other (please state)

Name of Supervisor:		
Activity being carried out:		
Equipment Involved:		
Injury type: (if applicable)		Accident book completed?
Contractor name: (if applicable)		

DESCRIPTION OF INCIDENT/NEAR MISS (Who was involved, what happened, specific equipment, immediate response actions and any relevant pictures)

What was the worst thing that could have happened assuming all barriers failed?

INVESTIGATION ROOT CAUSE ANALYSIS

Why did the Incident/Near Miss occur? (Ask why? at least 5 times and tick factors that apply)

HUMAN FACTOR:		ORGANISATIONAL FACTOR:	
-1 INDIVIDUAL DID NOT UNDERSTAND DUE TO LACK OF TRAINING OR EXPERIENCE		-5 PROCEDURES OR STANDARDS NOT IN PLACE OR INADEQUATE	
-2 CONSCIOUS SHORTCUTTING		-6 EXPECTATIONS AND STANDARDS HAVE NOT BEEN MADE CLEAR OR COMMUNICATED	
-3 SHORTCUTTING IS POSITIVELY REINFORCED OR TOLERATED		-7 INADEQUATE TOOLS OR EQUIPMENT	
-4 UNCONSCIOUS BEHAVIOUR E.G. BAD HABITS		-8 EXTERNAL FACTORS	

Root Cause Factor (select)	ACTION DESCRIPTION - What changes need to me made to prevent the incident/near miss from occurring again?	Person Responsible	Target Date
Root Cause?			
Root Cause?			
Root Cause?			
Root Cause?			
Root Cause?			