Report Details	Emissions Monitoring Plan UP3909SG
Head Office Address	Cliniwaste Health South Limited 35 Duchess Road Rutherglen Glasgow G73 1AU
Site details	Cliniwaste Nottingham Unit A Crossgate Drive Queens Drive Industrial Estate NG2 1LW
Date	July 2024
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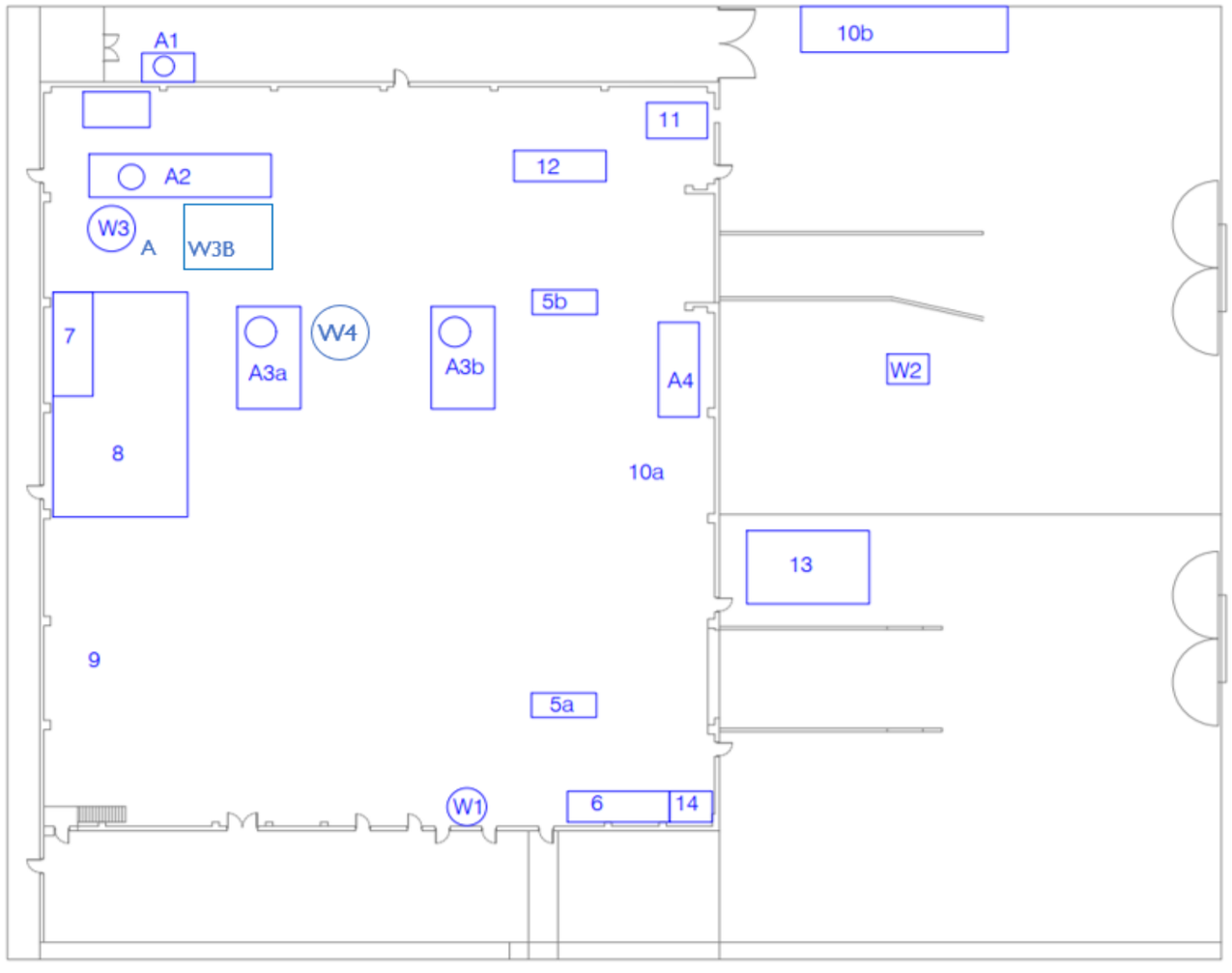
1. Site Emission Points:



Location Map Area	Description
A1	Boiler
A2	Autoclave
A3A / A3B	Shredder/s
A4	Bin Wash
W2	Surface Water Drain
W3	Condensate Holding Tank
5A / 5B	Weighing Scales
6	Quarantine Area
7	Fridge
8	Non-Hazardous Waste Storage Area
9	Hazardous Waste Storage Area
10A 10B	Internal Storage for Bales of Treated/Shredded Material Curtain Sided Trailer for bales of Treated/Shredded Material
11	Compactor Skip for Treated/Shredded Material
12	Baler & Wrapper for Treated/Shredded Material
13	Enclosed Roro for Un-Shredded Offensive Waste
14	Raw Materials Storage

Emission Points	Description
A1	Boiler Exhaust Stack
A2	Autoclave Exhaust (Emergency Vent Only)
A3 A & B	Shredder One (A3B) & Shredder Two (A3A)
A4	Bin Wash
W1	Water Sampling Location for W1 on Site Drainage Plan: Boiler Blow Down, Autoclave Condensate, Bin Washing Effluent & Domestic Effluent.
W2	Surface Water on Drainage Plan: Clean Uncontaminated Roof & Yard Water.
W3A	Condensate Water/Process Effluent Holding Tank (Discharge to Sewer)
W3B	2 x IBCs for Effluent Generated Whilst Processing Yellow Waste
W4	Liquor containment point, from any liquid residues from shredding the waste (IBC)

2. Site Emissions Monitoring Plan

Permit Table reference	Emission point & location	Parameter	Limit	Reference Period	Frequency	Monitoring Standard or method	Current emission monitoring requirement or new?
S3.1 point source emissions to air	Boiler plant exhaust stack: A1	No parameters set	No limit set	-	-	-	Current, the boiler remains the same. No changes in the variation that affect this emission
	Emergency autoclave Vent: A2 (this will need to be added into the permit based on the information provided in point 3 regarding the abatement.	No parameters set	No limit set	-	-	-	New, please see section 3.
	Emission from the abatement plant serving the autoclave: A2	Total volatile organic compounds (TVOC)	30mg per cubic metre	Average of 3 consecutive measurements of at least 30 minutes each.	Every 6 months	BS EN 12619	Current, however based on point 3 we would argue that
	Emission from the abatement plant serving the autoclave: A2	Bacillus spores	1000cfu per cubic meter	HCW:AM	Annually	HCW:AM:	Current, no changes required.
	LEV system serving the shredder: Carbon and HEPA filter A3a and A3b	Bacillus spores	1000cfu per cubic meter	HCW:AM	Annually	HCW:AM	Current, no changes required.
		Total volatile organic compounds (TVOC)	30mg per cubic metre	Average of 3 consecutive measurements of at least 30 minutes each.	Every 6 months	BS EN 12619	Current for both shredders
		Particulate Matter	5mg per cubic metre			BS EN 13284-1	Current for both shredders
S3.2 point source emissions to sewer	Clean uncontaminated roof and yard surface water (not from waste storage or treatment area) W2	No parameters set	No limit set	-	-	N/A	Current, no changes in the variation that affect this emission
S3.3 point source emissions to sewer	Boiler blow down, autoclave condensate, bin washing effluent, general domestic effluent and surface run off: W2	Bacillus spores (spiked organisms)	300cfu	-	Annually	HCW: AM.	Current, no changes required these source emissions are consented to discharge to sewer. Our discharge point is fitted with a flow meter. And the consent requires that we release water not exceeding 43 deg.C, No: oils, spirits, calcium carbide, halogenated carbons, flammable material. The orange waste that is processed and sent to drain is infectious material only and does not possess any of those properties. Please see the point below for yellow waste effluent.
Not currently listed in the permit	Autoclave condensate from batch treating yellow sharps: still potentially contaminated with pharmaceutical residues.	Bacillus spores (spiked organisms)	300 cfu	-	Annually	HCW: AM.	New, but this effluent will be diverted from drain into an IBC that houses a high-level probe, once full it diverts into the other empty IBC. This aqueous waste stream will go to a suitably permitted site that can accept aqueous waste contaminated with residual pharmaceutical, EWC 160210.
S3.4 microbial emissions to air and surface	Microbial emissions to air <10m from the treatment plant	Bacillus spores	1000 cfu per cubic metre	HCW:AM	Annually	HCW:AM	Current, no changes required.

	Microbial emissions to air >10m from the treatment plant		300cfu per cubic metre				
	Microbial emissions to surface <10m from the treatment plant		20,000 cfu per cubic metre				Current, no changes required.
	Microbial emissions to surface >10m from the treatment plant		5000 cfu per cubic metre				
S3.5- process monitoring requirements	Routine efficacy monitoring	Cliniwaste will be using spore strips to complete monthly efficacy testing.	Minimum: 4 log reduction required.	HCW:AM	Monthly as batches are >501kg per batch.	HCW:AM	Current, however after validation, spore testing frequency will change to weekly in the first 6 months of operation as this is a new waste type being processed.
	Plant validation	Spores			Every 4 years	HCW:AM	Validation will be redone to show compliance with a different waste stream.

3. Closed Loop Design of the Autoclave to remove any Emissions from the Exhaust Stack

McQuillan Boiler Services have designed and are installing the closed loop system, having previously installed it successfully at Cliniwaste's old site at Newcastle. This will be completed mid-July.

MBS offer a full turnkey solution and have evolved over their 35 years during industry. Andy Robinson (Technical Lead) designed the system and is highly regarded in the steam and heat exchange industry, carrying out lectures for the CEA (Combustion Engineers Association) and having worked in the industry since 1991 and on many projects, including the design and development of the Hydrogen combustion burner packages for the HyNet Scheme.

The closed loop design is developed for both operational efficiency and vapour abatement. The process is to ensure Cliniwaste are providing their clients with lowest autoclave process reportable carbon emissions and zero vapour release to atmosphere.
The system is designed to:

- Condense all the vapour from the ejector and capture all of the hot water to ensure the previously wasted energy is transferred to the start of the process
- Reuse the energy rather than disperse it or electrical power via air cooling to discharge to drain. The thermal energy usually dispersed to air is an estimated 8-10%
- By removing the release of vapour and transferring this into a water bath, removes the odour emissions from the site process and capture these in water to be discharged to drain under the current discharge consent license.
- The total removal of vapour will remove the air emissions completely as this is the transfer route for the odours from the autoclave process to atmosphere.
- The capture of the available excess energy from the autoclave process to a central energy store rather than the direct emission of the energy to atmosphere. The central energy store of hot water is used to preheat the water within the steam boiler cycle which is directly injected back into the autoclave for the next process.
- The autoclave process is a continuous batch operation and an estimated 2,000kW of energy is used to generate the thermal energy for each process cycle, of which an estimated 8-10% is usually exhausted to atmosphere. The exhaust would then, and an amount of electrical power is used to reduce the vented energy to a suitable level of hot water at 40- 45 deg C to put down the drain. The heat recovery shall take this high temperature exhaust energy and initially store this in a "dirty" water tank to then enable the transfer via two heat exchange processes to 70-80 deg C hot water for the steam boiler water tank and 60-65 deg C water hot water for the bin wash. This heat recovery process shall capture an average of 140-170 kW of energy from the available 160-200kW energy captured therefore also reducing the energy required to put to drain the "dirty" wastewater with limited operation of the air-cooled condensing package. The range of heat recovery available in this process is not a constant or stable process and is dependent upon the product and amount of product within each individual autoclave process cycle. Using the above heat recovery process, rather than using additional natural gas, and the autoclave operating an estimated 20 cycles per day for 260 days would equate to a reduction of 130 – 161 tonnes of CO_2 emissions per year. This is based upon the estimated reduction of CO_2 emissions as part of the steam boiler products of combustion range of 25 to 31 kg. There will then be a reduction in the products of combustion which would have included the additional CO and NOx emissions.

During an emergency where stored energy needed to be released from the autoclave such as an over pressurisation, the autoclave is fitted with an emergency release valve, as required by the pressure safety system regulations, should this occur then the heat exchange system would be bypassed, and the emissions would be released to air. Cliniwaste have not had this specific event occur at any of their sites whilst operational, owing to the regular maintenance and safety system checks that occur with associated pressure vessels. Therefore, the balance of risk and probability is that it is very unlikely to occur, and should it occur the time period would be minimal, whilst the pressure reduces and then the emergency vent would close. Should an event of this nature occur we would investigate and notify the regulator within 24 hours.

Cliniwaste therefore believe there is no air emissions to be tested based on the above information and would request that the air emissions from A2 are removed with no set parameters to be tested, which is what was referenced in the Newcastle's permit.