



Queensferry Sludge Treatment Centre

Residue Management Plan

October 2024

This page left intentionally blank for pagination.

Mott MacDonald
Spring Bank House
33 Stamford Street
Altrincham WA14 1ES
United Kingdom

T +44 (0)161 926 4000
mottmac.com

Queensferry Sludge Treatment Centre

Residue Management Plan

October 2024

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	Dec 2023	Amelia Luk	Shannon Stone	Anita Manns	Draft
B	April 2024	Amelia Luk	Shannon Stone	Anita Manns	For review
C	October 2024	Amelia Luk	Shannon Stone	Anita Manns	Updated for resubmission

Document reference: B16383-123532-XX-XX-PE-NA-DH0107 - QUY Residue Management Plan October 2024

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

1	Introduction	1
1.1	Scope	1
1.2	Objective	1
1.3	Responsibility	1
2	Residues generated on site	3
2.1	Biogas	3
2.2	Secondary Raw Materials	3
2.3	Waste	5
3	Residue Management	9
4	Reducing the production of waste	12
5	Summary	14

Tables

Table 2.1: Raw materials required	4
Table 2.2: Waste streams produced	6
Table 2.3: Waste Containment information	8
Table 3.1: Residues list, fate and potential improvement	9

1 Introduction

Dŵr Cymru Welsh Water (DCWW), also referred to as 'the Operator', manages Sludge Treatment Centres (STC) that operate in line with the Environmental Permit Regulations (EPR) (England and Wales) 2016, as amended. The permits for these facilities apply to anaerobic digestion (AD) of sludge and any directly associated activities (DAA).

This document is submitted as part of the Environmental Permit application for Queensferry STC (the 'Site') to ensure any waste produced as a result of these permitted activities is dealt with in line with the waste hierarchy. Where disposal is necessary, DCWW will ensure this is undertaken in a manner which minimises the impact to the environment.

1.1 Scope

This document forms part of DCWW's Environmental Management System (EMS) and is applicable to all the permitted activities relevant to the AD of sewage sludge and the DAAs at the Site. The AD facility produces biogas to power the site's electrical equipment and processes and heat to maintain temperature within the digestion process. Biogas is combusted in the Combined Heat and Power (CHP) engines, whilst the two dual fuel boilers primarily run on biogas, when available, and gas oil. There is a third boiler that solely runs on gas oil that is predominantly used when biogas is unavailable to combust in the two dual fuel boilers. Combustion of excess biogas is via an on-site waste biogas burner or emergency flare stack.

This document does not focus on the general wastes created from activities outside the scope of the IED permit, for example office buildings, even if they are co-located on the same site, or on gaseous emissions from the processes. There are only a limited number of residue streams that require off-site disposal, treatment or recycling from the STC as it is co-located within a DCWW wastewater treatment works

A list of raw materials on the site is set out below in section 2.

1.2 Objective

The objectives of this plan are to:

- List all raw materials used and stored on site at any time.
- Assess waste produced on the site.
- Review actions employed to minimise waste.

1.3 Responsibility

The Site Manager or Catchment Manager for the Site is responsible for ensuring the environmental permit conditions are complied with, including reviewing this Residue Management Plan. The review should identify any changes to the processes on site that use raw materials, the residues generated and their fate, including minimisation and moving wastes up the waste hierarchy. This should be undertaken on an annual basis. The review process is ongoing as part of the regular performance monitoring for the site.

There are many drivers for reducing use of raw materials, and creation of wastes within the processes, including environmental, financial, and resourcing. It is, therefore, in DCWW's best interests to undertake these reviews regularly, and to include representatives across the full chain of specialist teams involved in the decision-making process. For example, from initial procurement processes, and contractor management, through to operations, alarms, and the

regular maintenance of the installation. These all work together to ensure that the processes utilise the minimum amount of raw materials/water (such as overdosing of chemicals), and that wastes are minimised (such as worn parts or broken machinery) and dealt with as high up the waste hierarchy, as possible.

2 Residues generated on site

2.1 Biogas

Biogas, resulting from the anaerobic digestion of sludge from the wastewater treatment works, is the primary raw material. Its consumption will be monitored. The use of biogas as the fuel source offers the best environmental option and there is, therefore, no environmental incentive to reduce biogas consumption and consider an alternative source of fuel.

Biogas is stored within 1 No. double membrane inflatable bag type holders, constructed of PVC coated polyester fabric, which is resistant to UV and microbial degradation. The base of the holders is constructed from reinforced concrete treated to withstand the potentially acidic conditions within the holder. The gas holder is completely enclosed, so the gas is not in contact with the concrete.

A CHP engine and two dual fuel boilers utilise the biogas produced from the AD process. There is one boiler that solely uses gas oil. The heat produced by the CHP engine allows the pasteurisation and digestion process to be optimised in order to maximise biogas production. Overall, this allows a greater efficiency in converting sludge to biogas and power. Key to maximising the energy production of the site is the consistent and predictable production of biogas from the digestion process and the minimisation of the use of electrical power in doing so.

The generation and use of power and heat from a renewable biogas source represents a positive impact with respect to global warming potential. All biogas produced is used on Site to reduce the need to import power from the grid.

2.2 Secondary Raw Materials

There are a limited number of secondary raw materials used in the process. Secondary raw materials include chemicals used in processes such as water treatment, polymer and natural gas/diesel for the boilers and generators. Their consumption will be monitored, based on purchase records.

Water treatment chemicals are stored on impermeable surfaces within a contained area. Polymer is stored in sealed IBC/bags located on bunded areas.

The DCWW purchasing procedures are included in EMS. The procedures ensure purchased items conform to specified requirements, including quality parameters, and review suitability for use, including efficiency and minimisation of use of raw materials.

All substances are assessed for COSHH (Control of Substances Hazardous to Health) compliance, where relevant. Material safety data sheets (MSDS) for all materials used and kept and maintained on Site. Copies of the relevant MSDS's can be found in the accident management plan (B16383-123532-XX-XX-PR-OA-HD0106 - QUY Accident Management Plan October 2024).

All raw materials are handled and stored within the confines of the buildings on Site, or in IBCs or, appropriately constructed, tanks in bunded areas, with the exception of biogas which is contained within the gas handling system.

Releases of raw materials to land are considered to be negligible, due to adequate containment of the materials within suitable storage vessels and presence of a contained drainage system.

Potable water usage on-site include:

- Poly make up - concerns over the impact of using final effluent for this purpose
- Heat exchanger system water - concerns over the impact of using final effluent for this purpose
- Eye baths and safety showers - potable water essential
- Limited wash-down points where it would be uneconomic to extend the final effluent wash-water system
- Office messing facilities - kitchen, washing and welfare facilities etc

To ensure appropriate use of raw materials to prevent releases of substances to the environment and limit environmental impact DCWW will follow quality assurance procedures for the purchasing of materials. The raw materials will be selected from specialist suppliers determined by pre-established material specifications and will include environmental considerations. Priority choice of purchased raw material will be given to those with the least environmentally harmful chemicals compared to their alternatives, wherever practicable.

Resource efficiency will be achieved through the minimum use of raw materials and water (where possible), and DCWW will undertake the following:

- Maintain records of raw materials and water used;
- Routine resource efficiency audits;
- Review the feasibility of alternative materials that could reduce environmental impact or provide further opportunities to improve resources efficiency at least once every four years; and;
- Implement further appropriate measures identified from a review

Good housekeeping measures are employed, and regular preventative maintenance will ensure the operations, and therefore energy efficiency, is optimised. This ensures that there are minimal energy losses from worn parts, thereby maintaining the efficiency of the asset.

The raw materials required to operate the permitted installation are presented in Table 2.1 **Error! Reference source not found..** All raw materials are either stored in bunded tanks, on bunded trays or enclosed within a building.

Table 2.1: Raw materials required

Description of raw material and composition	Maximum amount stored	Annual throughput (Description of the use of the raw material
Diesel in two tanks	33,000litres	10,475 litres	Used in generators and boilers during emergencies, however it is a rare occurrence. Ordered on an ad hoc basis.
Tank 1	20,000litres	4,000litres	
Tank 2	13,000litres	6,475litres	
Poly (Cationic Polyacrylamides)	1.5 tonnes 2,000 litres	Powder 12 tonnes Liquid 8,000 litres	Used as flocculant to enhance thickening and dewatering processes. Amount ordered depends on centrifuge use.
Rock salt/grit	750 kg	750 kg	Used on icy roads to prevent slipping
Lubricant oils	400litres	400litres	For lubrication of CHP engines and other machiner.

2.3 Waste

The waste streams, listed in the Table 2.2, are likely to be generated at the STC. All waste streams shall be managed in accordance with existing EMS, with any final off-site disposal to be carried out by licensed waste contractors in accordance with Duty of Care requirements, and the application of the waste hierarchy is central to any decision-making process.

All residue is removed from site using suitably competent waste contractors to permitted waste facilities. Regular audits are undertaken, by the Contractor Manager/Procurement Manager, of the contractors and destination sites are undertaken to ensure compliance, as part of DCWW's duty of care requirements.

All wastes are handled and stored in such a way as to ensure containment and prevent escape. All raw materials are stored within a building, except diesel which is stored in two appropriately bunded tanks. Fugitive emissions to the environment are, therefore, negligible. Waste oil is stored in a tank within a bunded area, and all other wastes are stored in appropriately labelled containers located in labelled waste collection areas around the Site.

DCWW manages its waste in accordance with the Council Directive 2008/98/EC on waste (the Waste Framework Directive), legal requirements and its EMS, by maximising materials re-use, prevent waste, minimise waste generation and maximise recycling and recovery of waste generated from the operation of the Site.

Further consultation with waste contractors will ensure that all waste streams have been considered. The sampling and characterisation of wastes will be covered under the requirements of Duty of Care. The wastes are handled to a minimum and are stored in suitably designed containers prior to being removed from Site, to minimise releases of pollutants to the environment.

Implementation of EMS procedures and the current Environmental Policy ensures optimum disposal of the wastes produced.

Table 2.2: Waste streams produced

Description of waste	Produced by	Prevent	Reuse	Recycling	Recovery	Disposal
Grit/screenings	Grit removed during digester shutdowns and incoming sludge screening	Waste is in the incoming sludge and cannot be prevented.				Disposed of to a designated landfill site
Oils and filters	CHP engines and generators	Periodic replacement. Quality is monitored to minimise use.			Waste oils are removed through licensed contractor and sent for reprocessing	Waste oils and filters associated with the operation and maintenance of the engines are removed by the waste disposal contractor
Filtrate/ Centrate	Sludge thickening and sludge dewatering				Returned to the WwTW for treatment via LTP	
Biogas	Anaerobic digestion				Transferred to CHP unit for electricity and heat production and boilers for heating process water.	Combustion of excess biogas via an on-site flare stack.
Solid sewage cake	Dewatered digested sludge and maturation stage				Treated sludge is de-watered and then stored in cake bays ready for further processing at Five Fords STC, prior to being recycled to agricultural land as a soil fertiliser.	
General waste	Waste generated from other Site activities (i.e. offices)			Recycled where possible at a materials recycling Site.		Non-recyclable waste is disposed of to a designated landfill site.
Scrap metal				Recycled at scrap metal recycling facilities		
Waste electronic and electrical equipment (WEEE)				Recycled at WEEE recycling facilities		

Description of waste	Produced by	Prevent	Reuse	Recycling	Recovery	Disposal
Intermediate bulk container (IBC)	Chemical storage (i.e. polymer for sludge thickening), anti-foam agents (for digester use)	STC activities involving chemicals are optimised to ensure overuse is minimised. Where feasible, DCWW seeks to obtain chemicals via tanker to prevent this waste occurring.	IBC containers are returned to the manufacturer for re-use			
Condensate	CHP engines, digesters			Returned to STC for treatment		
Wooden Pallets	Bulk, non-tanker deliveries	STC activities involving chemicals are optimised to ensure overuse is minimised.		Wooden pallets (non-tanker deliveries) and plastic containers removed by licensed waste contractors and recycled.		

Only minimal volumes of waste shall be generated at the STC, with waste streams segregated and recovered for recycling where possible.

The RMP will be reviewed an update annually and in particular when the OCU's are fully operational to include the additional materials and waste streams required or generated.

Presented in Table 2.3 are details on containment type and location for the waste generated on site.

Table 2.3: Waste Containment information

Trade Name/Substance	State (solid/liquid/gas/powder)	UN number	Maximum stored on site (m ³)	Location marked on Site Plan	Type of containment
Sludge	Liquid	N/A	2,850	3 x sludge holding tanks (3 lanes)	Tanks
Sludge	Liquid	N/A	486	2 x sludge holding tank	Tanks
Sludge	Liquid	N/A	243	Digester feed tank	Tank
Sludge	Liquid	N/A	3,410	2 x digester	Tanks
Sludge	Liquid	N/A	164	Imported & screened sludge tank	Tanks
Sludge	Liquid	N/A	3,526	Digested sludge holding tanks (concrete)	Tanks
Sludge	Liquid	N/A	936	2 x digested sludge Tanks (GFS)	Tanks
Sludge	Liquid	N/A	159	Centrifuge feed tank	Tank
Sludge cake	Solid	N/A	210	3 x cake bays	Bays
Biogas	Biogas	UN 1971	N/A	Biogas holder Digester headspace	Gas holder Digester Pipelines Flare stack CHP engine

3 Residue Management

This section outlines the measures DCWW takes to:

- Minimise the generation of residues arising from the treatment of waste;
- Optimise handling of wastes in accordance with the waste hierarchy; and
- Ensure the proper treatment, recycling, or disposal of residues.

A residue is defined as the solid waste generated by the permitted waste treatment activity. With that definition, this document does not focus on the general wastes created from activities outside the scope of the permit, for example office buildings, even if they are co-located on the same site, or on gaseous emissions from the processes.

There are only a limited number of residue streams that require off-site disposal, treatment or recycling because this sludge treatment facility is co-located with DCWW's sewage treatment works.

The residues are stored within designated areas.

Oil filters and some contaminated maintenance wastes are hazardous and are, therefore, segregated from non-hazardous wastes for disposal in line with appropriate legislation. Where waste is required to be sent offsite, it is sent to a suitably permitted facility for disposal / treatment by approved third party waste management contractors.

Framework suppliers are all vetted as part of DCWW's tendering process, which helps ensure they have the relevant expertise, competency and access to appropriately permitted facilities appropriate to each transferred waste stream. All successful Suppliers need to meet the qualification criteria, which include but not limited to evidence of required levels on insurance, financial stability, Health and Safety Accreditation and Quality Management Systems. Suppliers are also vetted for their policy on other criteria such as their Anti-Slavery Policy.

The waste contractors will supply us with a Waste Transfer Note (WTN) and/or Hazardous Waste Consignment Note (HWCN) - dependant on what type of waste is being removed from Site. All waste documentation for the installation is retained for the appropriate length of time at the site (two years for WTN and three years for HWCN).

Table 3.1 presents the residues produced by the permitted processes, the current management in line with the waste hierarchy and areas for potential or proposed improvement.

Table 3.1: Residues list, fate and potential improvement

Description of residues	Management method	WFD Fate	Proposal/potential improvement
Grit and screenings	As much grit and rags/screenings as possible are screened out during earlier processes (outside the scope of this permit) to minimise that entering anaerobic digestion process	Disposed - Disposed to landfill	No improvement opportunities foreseen or proposed at present. Current route considered to be BAT. Currently only commercial outlet is landfill. Grit / screenings fate reviewed on a periodic basis to identify alternative routes for this waste stream.

Description of residues	Management method	WFD Fate	Proposal/potential improvement
OCU chemicals	Chemicals recirculate through OCU with small amounts released to site drainage in blowdown and condensates.	Recovered – removed from site by licensed waste contractor	No improvement opportunities foreseen or proposed. Current route considered to be BAT
	Bulk chemical waste transferred for off-site recovery at appropriately permitted facility	Disposed - Disposal via adjacent WwTW following treatment	
OCU filters	Maintained via the Odour Management Plan, with periodic replacement. Replaced as required after inspection from OCU maintenance contractor	Recovered – carbon filters regenerated, where feasible	No improvement opportunities foreseen or proposed. Current route considered to be BAT
		Disposed - Disposed to landfill.	
Waste oil, oily rags and filters	Periodically replaced. The quality is monitored to minimise its replacement. Waste oil and filters are recycled. Waste oil is stored in a tank within a bunded area inside the installation boundary.	Recovered/recycled - as hazardous waste.	No improvement opportunities foreseen or proposed. Current route considered to be BAT
	Filters and other oily items are stored within appropriate segregated containers in the waste storage area.		
	Off-site recovery at an appropriately permitted facility		
Biogas condensate	Condensate is removed from the biogas lines	Disposed - Disposal via adjacent WwTW following treatment	No improvement opportunities foreseen. Current route considered to be BAT
	Released to site drainage and returned to works inlet for processing at the adjacent WwTW		
Centrate	Sludge thickening and sludge dewatering process waters, removed.	Disposed - Disposal via adjacent WwTW following treatment	No improvement opportunities foreseen. Current route considered to be BAT
	Released to site drainage, and returned to works inlet for processing at the adjacent WwTW		
Solid sewage cake/biosolids*	Sludge cake is stored in bays and transported for further processing at Five Fords STC. It is covered when being transported	Recycled/recovered - Removed from site, transported for further processing at Five Fords STC through its THP where checks to determine its quality and adherence to appropriate requirements, and spread to land in accordance with the Sludge Use in Agriculture Regulations	No improvement opportunities foreseen. Current route considered to be BAT.

Description of residues	Management method	WFD Fate	Proposal/potential improvement
1989 and the Biosolids Assurance Scheme (BAS).			
Packaging waste – wooden pallets, and cardboard/plastic packaging	Bulk, non-tanker deliveries to STC activities involving chemicals etc	Recycled – removed by a licensed contractor and recycled.	Discussion with the product supplier to avoid by using alternatives. Current route considered to be BAT
Intermediate bulk container (IBC) and other packaging wastes	Bulk, non-tanker deliveries to STC activities involving chemicals (i.e. polymer for sludge thickening), anti-foam agents (for digester use).	Re-used – IBCs are returned to the manufacturer for re-use.	Intermediate bulk container (IBC) and other packaging wastes. Current route considered to be BAT
Metal	Redundant or replacement of equipment	Recycled – removed by a licensed contractor and recycled.	No improvement opportunities foreseen. Current route considered to be BAT.
WEEE	Redundant or replacement of equipment. Segregated and sent for recycling	Recycled – removed by a licensed and specialist WEEE contractor for recycling.	No improvement opportunities foreseen. Current route considered to be BAT.

* Our biosolids are fully compliant with all relevant regulations, and we hold BAS certification for safe recycling of our product to agriculture. However, we are mindful the biosolids to agricultural land recycling route is likely to partly (or totally) disappear in future, due to a number of factors (e.g. emerging contaminants, tightening of regulations, public perception etc.).

An annual summary of volumes is reviewed for reporting purposes and options for reduction are assessed by the Catchment Manager. The RMP will be reviewed an update annually and in particular when the OCU's are fully operational to include the additional materials and waste streams required or generated.

4 Reducing the production of waste

Only minimal volumes of waste shall be generated at the STC, with waste streams segregated and recovered for recycling where possible. All waste streams shall be managed in accordance with existing EMSs, with any final off-site disposal to be carried out by licensed waste contractors in accordance with Duty of Care requirements, and the application of the waste hierarchy is central to any decision-making process.

Implementation of EMS procedures and the current Environmental Policy ensures optimum disposal of the wastes produced. Submission of a detailed assessment is not considered necessary due to the minimal quantity of waste produced.

Further consultation with waste contractors will ensure that all waste streams have been considered. The sampling and characterisation of wastes will be covered under the requirements of Duty of Care. The wastes are handled to a minimum and are stored in suitably designed containers prior to being removed from Site, to minimise releases of pollutants to the environment.

The main wastes produced by the installation, which are typically outside the scope of this permit, include waste oils and filters associated with the operation and maintenance of the engines. Other wastes include from site office (paper, packaging etc), waste collected from general housekeeping across the Site (debris, litter), scrap metals and waste electronic and electrical equipment (WEEE, such as computer equipment, printers etc).

Waste generation from the operation of the plant is minimal and limited only to essential maintenance fluids and materials. Waste streams are segregated and recovered for recycling where possible. General waste is sent for recycling, where possible, scrap metal is sent to metal merchants for recycling and WEEE sent to specialist WEEE recycling facilities. DCWW apply a Duty of Care by ensuring waste is removed by a suitably licenced waster carrier.

To reduce volumes of waste:

- All materials and consumables delivered to Site are inspected to ensure that they are fit-for purpose.
- Damaged items are refused and returned to the supplier.
- Sewage sludge is thickened at the works to be treated at the site. Treated sludge is de-watered and then stored in a cake bays, ready for further processing at Five Fords STC, prior to being recycled to agricultural land as a soil fertiliser.
- The biogas from the AD process is burned either in a CHP engine or boilers, to provide power or heat for the Site processes.
- The biogas is also connected to a flare stack and excess biogas is burnt under normal operating conditions.
- The condensate overflow is contained and returned to treatment via condensate lines and does not spill to land.
- Polymer intermediate bulk containers (IBCs) are sent back to the supplier for re-use
- All skips and containers are located on a hardstanding to prevent leaching into the ground.

Skips and containers are clearly labelled. If a complaint is made with respect to litter the complaints procedure will be followed. The Site Manager will arrange for litter pickers to clear up as appropriate and will assess whether further control measures will be required to ensure that the risk of recurrence is minimised. The details of the complaint and actions taken to resolve the issue will be recorded in the Site Diary and the complaints register.

As part of the quarterly health and safety checklist the site is screened for general litter, mud, and debris both within and outside site boundaries.

5 Summary

Currently, there are no additional techniques or raw material alternatives known, which could be implemented on site to reduce environmental impact or improve the efficiency of raw materials or water usage.

Where raw, potable, water can be replaced with lower grade water on site, for example for washing down small spillages, this has already been implemented.

Due to the number and types of residue streams, there was very little scope for further reduction of those generated on site.

