

Severn Trent Water Limited Strongford Sludge Treatment Facility

Permit number EPR/MP3097FY.

Severn Trent Water Limited
Strongford Sewage Treatment Works,
Barlaston Old Road
Barlaston
Stoke-on-Trent
ST12 9EX

Raw Materials, Water and Waste Residue Management Plan

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Executive Summary

In accordance with the consolidated IED Environmental Permit for Strongford and associated written management systems, this is the site management plan covering use of raw materials, water, and residues in relation to permitted activities. Severn Trent Water Limited is required to review and record at least every 4 years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use and to carry out a waste production review.

The prime function of the sludge treatment facility at Strongford Sludge Treatment Plant is to capture the energy potential from the treatment of sewage sludges. The plant is run 24/7 due to the continuous supply of sewage received at the treatment works either from the surrounding catchment, or via tanker discharge.

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1.1 Environmental Management System and Technical Competence

The Severn Trent Water Environmental Management System (EMS) is certified to ISO14001:2015 standard. All permitted IED installations are within the certification scope.

Severn Trent Water is committed to continual environmental improvements, including materials management, water resources and waste management. This commitment is delivered through better control of processes, capital investments, and environmental training.

Under the EMS, a risk assessment has been carried out to evaluate environmental aspects and impacts of the Company's operations. Energy production activities, including use of materials and water as well as waste production have been evaluated. These activities have been considered as having both positive and negative impact. All negative impacts were considered to have a medium impact with appropriate mitigating measures in place without further recommendations (refer to EMS Aspects & Impact Register [see Guidance tab](#)).

The permitted activities are undertaken by technically competent persons, within the scope of Severn Trent Water's Competence Management System. This is certified to the EU Skills CMS Standard and UKAS accreditation.

1.2 Process Responsibility

The Operational Manager for the site has overall responsibility for reviewing the processes on the site that use raw materials, raw water and create residue wastes. This document is reviewed 4-yearly, but in reality 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 our processes, including environmental, financial, and resourcing, so it is in our best interests to undertake these reviews regularly, and to include representatives across the full chain of specialist teams involved in the decisions. 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).

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1.3 Raw Materials and Water Management

There are a limited number of raw materials used in the process. All materials used at the installation are subject to storage and handling procedures. There are no dusty or potentially wind conveyed materials used on the installation.

The use of raw materials is carefully monitored and benchmarked for cost reasons, and in many cases the correct quantity has to be precisely used for proper processing to take place, so there are controls in place through monitoring and optimisation of the process.

Regular preventative maintenance of the installation ensures that there are minimal energy losses from worn parts, thereby maintaining its inherent efficiency.

Biogas

The principal fuel used in the installation is biogas resulting from the anaerobic digestion of sludge from the sewage treatment works (UWWTD sources). Biogas is captured in the roofs of digesters and a further gas holder within the facility boundary. The biogas is either:

- 1) exported to the gas national grid via a gas to grid upgrading facility, or
- 2) combusted in Combined Heat & Power (CHP) engines where heat and power produced is used on site or exported to the grid.

The heat produced by the CHP engine allows the 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.

Natural Gas

One of the CHP engines is also able to be fuelled on natural gas, as a backup. The boilers may also operate on natural gas for supplementary heating. The THP boiler primarily runs on natural gas.

Fuel Oil

There is a maximum of 7,500 litres stored on site as fuel for the temporary boiler on the recovery plant. This may be changed to HVO at a later date which has a lower carbon impact.

Lubrication oil

Lubrication oil used on site in the CHP engines, with the volume dictated by the operational requirements. Severn Trent Water monitors the use of oil to increase its efficiency and reduce quantities required. The monitoring is carried out through a monthly oil analysis programme, which assesses the condition of the oil. The oil is changed if the quality is below pre-defined standards. This minimises consumption of oil as it will only be replaced when

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necessary. Once determined to be below standard, the oil is changed and the replaced oil is sent for recycling off-site.

CHP engine oil is monitored for contaminants, which indicate oil performance and general engine condition.

In addition, oil is used in the transformers; this is sampled every two years and only changed if the sample shows any deterioration. Transformer oil does not contain PCBs.

Water

Water used on the installation is mains water, for the following purposes:

- General use;
- Washing of recovered cellulose;
- Make up of polymer;
- Ammonia recovery plant scrubber liquor; and the
- Heating loop and boiler system.

Water within the heating loop and boiler systems are treated with dosing chemicals under the management of a specialist subcontractor. It is in closed loop system which only requires minimal top up and inhibitor chemicals to be added. This is to decrease water hardness that can cause scale build up within the heat exchangers. The system is inspected for leaks, particularly where excess water has to be added to top up the system.

Water is also used within the polymer make up system, which is an automatic system that only uses the necessary volumes of water per cycle.

Water is used in the cellulose recovery plant to wash the extracted cellulose fibres and remove contraries. These arisings are returned to the main flow of the UWWTD.

Water is used in the ammonia scrubber plant to help recover the ammonium sulphate. Initially this will be mains water but treated final effluent will be evaluated as part of the trials process for this use.

Mains water is provided and metered on site by Severn Trent Water. A review has been undertaken of water use within the site, to see if lower grade water, specifically final effluent from the works can be used to replace any potable water. Savings have been identified and implemented, for example, where water is used for washing down purposes within the site, for example if a spillage of sludge occurs, this water is final effluent from the works.

Waste Water Streams

Wastewaters are transferred from the operational areas of the site via the sites drainage system back to the wastewater treatment works inlet for treatment, prior to final discharge to the environment. Where such transfers leave the permitted area, these are marked on the site plan as Transfer Points.

Waste water arises from a number of sources within the works. These include:

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- Surface water drainage (predominately rainfall related);
- Dewatering of digested sewage sludge by centrifuges;
- Wash waters from the cellulose recovery plant;
- Biogas condensate from moisture traps on biogas lines;
- Boiler blowdown;
- Washing / cleaning of surfaces; and
- Liquors from the Liquor Treatment Plant / Ammonia Recovery Plant.

The drainage system at the works collects both process waters and surface water drainage within the same system. In order to reduce the risk of spillages being diverted directly to the adjacent water body, all water in the drainage system is captured and returned to the works inlet for processing within the UWWTD stream at the site. Where drainage leaves the permit boundary, it may include waste waters from within areas of the site which sit outside of the permit boundary, due to the design and configuration of the existing drainage system within the works. These are all collected in the same system and prevented from directly discharging to any watercourse.

To reduce the risk from smaller, accidental spills we have separate controls in place. Tankers offload within impermeable areas and Standard Operational Spill Procedures are in place. Chemicals are stored within impermeable areas and within bunds of sufficient size and material. Secondary containment assessments are being undertaken to show where further improvements are required on site.

Drainage plans are available on site to show any drain leading to the treatment works, and any drain which may lead to controlled waters.

The permit boundary currently encompasses the full site, with UWWTD assets being out of scope. Therefore as pseudo-transfer points, we have identified T1 & T2 on the site layout plan. Please see Figure 1

Emission point reference and location (NGR)	Source	Parameter	Concentration	Units
T1 Liquor Returns 1 NGR SJ 87862 39267	Treated liquors, SAS thickening liquors, dewatering liquors, surface water run off, biogas condensate, boiler blowdown water, contaminated run off, washdown water.	--	--	--
T2 Tanker Imports NGR SJ 87985 39419	Head of Works imports	--	--	--
T3 Cellulose plant returns NGR: SJ 88032 39399	Cellulose plant returns	--	--	--

Sampling of returns of the head of works may be taken at the following points:

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Sampling point reference and location	Sources
S1 NGR: SJ 87974 39198	Treated liquors from Liquor Treatment Plant (LTP)
S2 NGR: SJ 87972 39474	Inlet imports
S3 NGR: SJ 87956 39436	Site returns to Head of Works
S4 NGR: SJ 87815 39191	Digested dewatering centrate return – returns to LTP balance tank in normal operation but may divert to Head of Works
S5 NGR: SJ 87951 38993	SAS Filtrate

The following substances may be present at elevated concentrations in the drainage leaving the permitted activities:

- BOD;
- COD
- Suspended Solids
- Ammonia
- pH

We have always undertaken periodical sampling of ammonia on the LTP returns with regard to loading impacting the operation of the treatment works. More recently, we are shadow sampling twice monthly for Ammonia, Soluble BOD, Total BOD, Orthophosphates and Suspended Solids in return liquors to the inlet, using the sample points noted in the table above. Direct regular sampling of these returns is a fairly recent addition to our processes so our understanding of the variance in these returns is developing. COD, BOD, Total Nitrogen, TOC, Ammoniacal Nitrogen, total Phosphorous, suspended solids and pH are directly available at our UKAS accredited contract laboratory and we will begin sampling for these determinands. Not all processes have flow meters on the return lines, assumptions will be made from the throughput of the asset. Temperature would be a field-based measurement, currently this is not measured. STW will aim to sample for PFOS and PFOA on a six-monthly basis to build up a data set, but due to the two weeks analysis turn around, these are not of use to the live operational process.

The data obtained from the return sampling will be used to optimise the process and STW will carry out root cause investigations with the process support teams to understand what changed on site and ensure that we can reduce the risk to the inlet. If any abnormalities are identified in the sample data following root cause investigations, the Process Team will collaborate with wider site-based teams and the Catchment team to ascertain the root cause.

As part of the new IED permit and in line with BAT 3, we commit to carrying out further chemical analysis of the wastewater, testing for all pollutants expected to be present in the discharge that returns to the inlet. We are currently in discussion with UKAS

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accredited laboratories to see what analysis is possible on our leachate returns, and what 'minimum reporting value' is appropriate. This review will be undertaken in line with EA guidance, for example Surface Water Pollution Risk Assessment for your environmental permit, and Monitoring Discharges to Water. **The sampling will be undertaken by our suitably trained internal teams that already undertake compliance sampling for EA discharge permits to MCERTS standards. Analysis will be contracted to UKAS accredited laboratories.**

Within the existing drainage system, there is no separation between 'clean' sources of returned water, such as surface water run off, or from process related waste waters. Therefore, the most appropriate sample points have been identified as per the emission point plan. The drainage system is equipped with a number of oil interceptors to capture any spilled petrochemicals to prevent them entering the works inlet.

Point T1 accepts the returns from the dewatering plant on site and the LTP. This is the biggest source of waste water within the permitted area, although it will also include other installation related sources of water such as some of the biogas condensate.

The site returns, including those from the Sludge Treatment Facility, will be returned to the effluent flow via pipes to the works inlet.

The permitted return points, and the tankered discharge point for imports are downstream of the storm overflow, so there is no route for those discharges to be present in the storm overflow direct to water course.

Water Usage

Water usage is metered on site by Severn Trent. Present water usage is around 5,000m³ per annum.

Biogas / Biomethane

Biogas production is not subject to direct measurement, due to the difficulty of measuring volumes with or without moisture content. Instead biogas production is monitored by G2G and CHP engine output over time. Flare use is monitored and recorded and an allowance made for gas based on flare capacity.

As production is dependent upon sewage inputs and flows, the volume produced in any month varies.

Waste Gases

Waste gases are generated in a limited number of locations within the site, primarily the air emission points associated with the biogas handling, storage and utilisation system.

Biogas comprises a mixture of approximately 40% carbon dioxide and 60% methane; with low levels of other volatile organic compounds and Hydrogen Sulphide and entrained moisture. Moisture is removed using moisture traps within the biogas handling system, so both the exact composition and volume of biogas handled at the site vary dependent upon the precise location where sampling occurs.

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There are four main potential sources:

- Pressure relief valves;
- Boiler emissions;
- CHP/Gas to Grid stacks; and
- Flare stacks.

There are potentially low volumes of waste gases not captured from open topped secondary digesters and pathogen kill tanks at the site, as well as from cake stored on the cake pad.

Pressure relief valves, if operated, will release raw biogas.

CHP stacks, boilers and flare stacks combust biogas, so will release primarily CO₂, and NO_x with low volumes of SO₂ volatile organic compounds (VOCs) and CO.

The CHP is subject to routine maintenance and annual air emission monitoring. The flare stack is not monitored unless its operational hours exceed 10% of the year.

There are also low volume emissions from the odour control units on site, although the full composition of these is not analysed. **As part of the new IED permit, we commit to carrying out a review of our abatement plants, to determine whether measures have been effective, and to further characterising emissions from the odour control units in line with BAT 3 and 8 to demonstrate that H₂S, NH₃, TVOC and HCl are not present in the waste gas stream.** If H₂S, NH₃, TVOC or HCl are found to be present, or any improvements to equipment required, a monitoring and improvement plan will be put in place in agreement with the EA.

These release points are shown on the site plan.

Emission point reference and location (NGR/Latitude & Longitude)	Source	Parameter	Concentration	Units
A1 NGR: SJ 87925 39139	CHP engine 1 (running on biogas)	NO _x	500	mg/m ³
		SO ₂	350	mg/m ³
		CO	1400	mg/m ³
		Total VOCs	1000	mg/m ³
A2 NGR: SJ 87941 39150	CHP engine 2 (running on natural gas)	NO _x	95	mg/m ³
		CO	No limit set	mg/m ³
	CHP engine 2 (running on biogas)	NO _x	500	mg/m ³
		SO ₂	350	mg/m ³
		CO	1400	mg/m ³
		Total VOCs	1000	mg/m ³
A6 NGR: SJ 87835 39067	Auxiliary flare stack for CHP engines	NO _x	150	mg/m ³
		CO	50	mg/m ³
		Total VOCs	10	mg/m ³

A7 NGR: SJ 87993 38935	Biogas upgrading plant stack	No parameter set	No limit set	-
A8 NGR: SJ 88035 38968	Auxiliary flare for gas to grid plant	NOx	150	mg/m ³
		CO	50	mg/m ³
		Total VOCs	10	mg/m ³
A9a NGR: SJ 88039 39214	CHP engine 3 (running on biogas)	NOx	500	mg/m ³
		SO ₂	350	mg/m ³
		CO	1400	mg/m ³
		Total VOCs	1000	mg/m ³
A9b NGR: SJ 88039 39214	Package boiler 1 (fuelled on biogas) [Note 4]	NOx	200	mg/m ³
		SO ₂	100	mg/m ³
		CO	No limit set	mg/m ³
A9c NGR: SJ 88039 39214	Package boiler 2 with HRSG (fuelled on natural gas)	NOx	100	mg/m ³
		CO	No limit set	mg/m ³
A10 – A13 NGR: SJ 87859 39079 NGR: SJ 87878 39096 NGR: SJ 87896 39112 NGR: SJ 87915 39129	Digester pressure relief valves	No parameters set	-	-
A14 - A15 NGR: SJ 87868 39064 NGR: SJ 87891 39081	Gas storage vessels pressure relief valves	No parameters set	-	-
A16 -A18 NGR: SJ 87896 39017 NGR: SJ 87908 39003 NGR: SJ 87924 38984	Digester pressure relief valves	No parameters set	-	-
A19 NGR: SJ 87991 39020	Odour control unit (imported sludge well)	No parameter set	-	-
A20 NGR: SJ 87922 39059	Odour control unit (buffer tank)	No parameter set	-	-
A21 NGR: SJ 87959 38987	Ventilation system (SAS belts)	No parameter set	-	-
A22 SJ 87992 39213	Odour Control unit (THP)	No parameter set	-	-
A23 SJ 87828 39037	Gas storage vessels pressure relief valves	No parameters set	-	-

A24 NGR: SJ 87935 39069	Ventilation system (Imported Sludge Screenhouse)	No parameter set	-	-
A25 NGR: SJ 87875 39077	ELOVAC vent	No parameter set	-	-
A26 NGR: SJ 87883 39068	ELOVAC vent	No parameter set	-	-
A27 NGR: SJ 88046 39414	Cellulose recovery plant exhaust vent	No parameter set	-	-
Vents from tank(s)	Oil / fuel storage tanks	-	-	-

Inventory

Biogas production is monitored at the site, based upon two parameters. The first is major use of the biogas, the metered export of upgraded biomethane from the gas to grid plant and the second is the electrical output of the CHP engines in kWh, based around a standard consumption of biogas per kWh, from the manufacturer's specification for the CHP engine. An allowance can then be added for flare use, which is minimal at sites. This will give a volume of produced biogas following the removal of gross moisture within the handling system.

As the production is dependent upon sewage inputs and flows, the volume produced in any month varies.

2025 calculated figures show biogas generated as 7,332,056m³ per annum and biomethane exported as 3,909,375 m³ per annum.

Other Raw Materials

The site has three areas covered by odour control units (OCUs) located within the installation. A GRP 3000 Peacemaker is located at the raw import sludge reception tank, three biofilters followed by a GRP 6000 Peacemaker cover the sludge buffer tanks and SAS belts, and the THP cake reception, silo and centrifuges is covered by a biofilter followed by GRP 2000 Peacemaker. Each of the OCUs comprises a layered dry chemical scrubbing system using dry impregnated media granules, and biofilter media.

These units are monitored for performance and are subject to an annual maintenance check by a specialist contractor. Media in the OCUs is not subject to annual replacement, as per manufacturer's recommendation. Media does require ad hoc replacement after approximately five years, whereby the spent pellets can be recycled. They have been sized appropriately for the odour source.

Ammonia recovery plant: There is an additional carbon filter on the boiler stack of the new Ammonia Recovery Plant. Details of this will be recorded once the trial and commissioning are complete.

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In addition to the raw materials, there is also a 100m³ bunded tank for the storage of ammonium sulphate which is the output of the ammonia recovery plant.

Table 3 below lists all the raw materials used on site.

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Raw Material List

Description of raw material and composition	Maximum storage amount	Annual throughput (tonnes per annum or as stated)	Description of the use of the raw material	Storage	Alternatives
Anti foam: KemFoamX 2599 Burst 5400	Liquid: 11,000 litres (11IBC's)	<200,000 litres (500 litres/day)	Added to primary digesters to reduce foaming.	Standard plastic IBCs, stored on bunded pallet trays	Standard product used for this purpose within the industry
Polymer: Liquid: Flopam EM 640 Solid: Flopam FO 4490	Polymer liquid: 4,000 litres (4IBC's) Polymer solid: - 6,750kg (9x 750kg powder bags – to be mixed with water) - 25 tonne polymer silo	Polymer liquid: <20,000 litres (50 litres/day) Polymer solid: <100,00 litres (250 litres/day)	Flocculant added to digested sludge to aid centrifugation and dewatering.	Delivered by bulk tanker and stored in powder silo	Standard product used for this purpose within the industry
Hydrex	600 litres	<800 litres (70 litres/month)	Protect water treatment systems against scale deposition, corrosion, fouling and biological problems.	Delivered by bulk tanker and stored in dedicated container	Standard product used for this purpose within the industry
Caustic soda	5 tonnes	20 tonnes	Used in Amtreat process.	Delivered in drums and stored in silo	Standard product used for this purpose within the industry
Ferrous chloride	94,000 litres	2 deliveries of 94,000 litres per week	Removal of phosphate.	Delivered by bulk tanker and stored in dedicated container	Standard product used for this purpose within the industry
Lubricating oil	14,200 litres (2x 4,600 litre tanks; 1x 5,000 litre tank)	<15,000 litres	Equipment lubricant.	Delivered in metal drums and stored on bunded pallet trays	Standard product used for this purpose within the industry
Fuel oil	7,500 litres	As required	Fuel for ammonia plant boiler plant.	No storage of bulk material	Standard product used for this purpose within the industry. May be replaced with HVO if this can be sourced

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Glycol coolant	Not stored on site	As required	CHP engine coolant.	Delivered in metal drums and stored on bunded pallet trays	Standard product used for this purpose within the industry
Waste oil	9,600 litres (1x 4,600 litre tank; 1x 5,000 tank)	<10,000 litres	Waste oil from the CHP.	Collected in dedicated bunded tank	None.
Propane	12,000 litres (LPG)	40,000m ³	Additive to biogas to ensure suitability of CV.	Delivered and stored in dedicated container	No viable alternative
Odorant	50 litres (used at rate of 12mg/m ³)	100kg	Additive to biomethane for gas safety.	Delivered and stored in dedicated container	No viable alternative
Sulphuric acid	2 x 30m ³ tanks	To be determined based on plant performance	Reagent for ammonia recovery plant	Dedicated carbon steel bunded tank	Acid choice determined by chemistry of output

Raw Material Composition and Fate

Raw Material	Composition	Fate
Biogas	Methane (57.2%) Carbon dioxide (41.6%) Other (1.2%)	Electrical and heat energy Air emissions of carbon monoxide, carbon dioxide, sulphur dioxide and nitrogen oxides
Lubricating oil	Oil (100%)	Waste – Recycled
Gas oil	Ultra Low Sulphur Light Fuel Oil (100%)	Waste - Recycled
Polymer – Liquid: Flopam EM 640 Solid: Flopam FO 4490	Polyacrylamide copolymer	Absorption into sewage sludge or centrifuged cake. Leftover polymer returned to head of works via centrate liquors.
Anti-Foam KemFoamX 2599 Burst 5400	Polyalkoxylate Mixture of fatty acid ester and surfactants	Absorption into sewage sludge. Waste product to be recycled.
Hydrex		Absorption into water treatment system. Waste product to be recycled.
Caustic Soda	Sodium hydroxide	Absorption into sewage sludge. Waste product to be recycled.
Glycol	Ethylene glycol	Degradation over time. Waste product to be recycled.
Ferrous chloride	Iron(II) chloride	Absorption into sewage sludge. Waste product to be recycled.
Propane	Propane (100%) – C ₃ H ₈	Addition to generated biogas to raise the energy content, prior to transfer to the network.
Odorant		Addition to generated biogas, prior to transfer to the network (re-odourisation for safety purposes).
Sulphuric acid	96% sulphuric acid	Chemical reagent to form ammonium sulphate in reaction with ammonia
Ammonium sulphate	Ammonium sulphate	Generated through operation of ammonia recovery plant

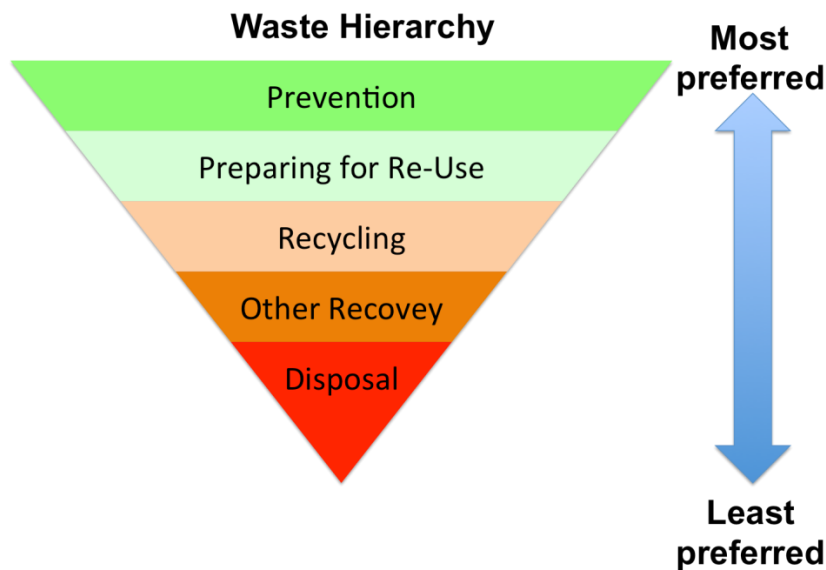
1.4 Residue Management

This document records the measures we take to:

- Minimize the generation of residues arising from the treatment of waste
- Optimise the waste hierarchy
- Ensure the proper 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 collocated on the same site, or on gaseous emissions from the processes. Nor does it include the solid sewage cake produced by dewatering digested sewage sludge, which is removed from site, following checks to determine its quality and adherence to appropriate requirements, and spread to land in accordance with the Sludge Use in Agriculture Regulations 1989 and the Biosolids Assurance Scheme (BAS).

The Waste Hierarchy demonstrates the most preferred options for waste management, and Severn Trent Water commits to achieving waste targets by utilizing its approach.



There are only a limited number of residue streams that require off-site disposal, treatment or recycling because this sludge treatment facility is collocated with Severn Trent Water’s sewage treatment works (see Table 4).

The residues are stored within designated areas as described within the Waste Management Standard Operating Procedures.

Oil filters and some contaminated maintenance wastes are considered hazardous and are therefore segregated from non-hazardous wastes for disposal in line with 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.

All waste contractors used will be registered with the Environment Agency / Natural Resources Wales and have a current Waste Carriers Licence. Our waste contractors will supply us with a Waste Transfer Note (WTN) and/or Waste Consignment Note (WCN) - 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 WCN)

The residues produced by the permitted processes including management in line with the waste hierarchy and areas for potential improvement and future review are detailed in Table 2 below:

Table 4: Residue List

Residue Type	Current Measures	In line with Waste Hierarchy	Potential Improvements
Waste lubrication oil	The quality of the oil is monitored so as to minimise its replacement. Any waste oil is recycled. Waste oil is stored in a tank within a bunded area inside the installation boundary. Off site recovery at appropriately licensed facility	Recycled	No improvement opportunities foreseen. Current route considered to be BAT
Waste transformer oil	The quality of the oil is monitored so as to minimise its replacement. Any waste oil is recovered. Off site recovery at appropriately licensed facility (by specialist contractor)	Recovery	No improvement opportunities foreseen. Current route considered to be BAT
Waste coolant	Glycol coolant is monitored and replaced as required to protect the CHP engine. Any waste coolant is recovered. Off site recovery at appropriately licensed facility (by specialist contractor)	Recovery	No improvement opportunities foreseen. Current route considered to be BAT
Biogas condensate	Condensate is removed from the biogas lines using moisture traps Released to site drainage and returned to works inlet	Disposal following treatment	No improvement opportunities foreseen. Current route considered to be BAT

	for processing within the UWWTD stream		
General engineering waste (e.g. oily rags, oil filters, air filters)	Stored within appropriate segregated containers in the waste storage area. Disposed of (as hazardous waste) by specialist contractor	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Contaminated PPE	Stored within appropriate segregated containers in the waste storage area. Disposed of (as hazardous waste) by specialist contractor	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Spill kit materials	Minimisation of spillages through regular maintenance, pollution prevention infrastructure, and staff training on Standard Operational Procedures. Spill kits used for hazardous materials (oil or fuel) will be managed as hazardous waste. Spillages of liquids will be contained and treated on site where possible.	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Fluorescent tubes	Stored within appropriate segregated containers in the waste storage area. Removed from site (as hazardous waste) by specialist contractor for offsite recycling	Recycling	No improvement opportunities foreseen. Current route considered to be BAT
Dry chemical pellets from OCU	Removed from OCU during servicing for regeneration. Off site recovery at appropriately permitted facility	50% recycled 50% disposal	No improvement opportunities foreseen, as returned to manufacturer for refreshing, Current route considered to be BAT
Scrap Metal	Stored within appropriate segregated skip. Off site recovery at appropriately licensed facility	Recycled	No improvement opportunities foreseen. Current route considered to be BAT
Empty chemical containers	Use of chemical is minimised in the processes by performance monitoring, which results in decreasing the amount of waste containers produced.	Reuse	Bulk chemicals currently delivered by tanker to reduce use of individual containers No improvement opportunities foreseen.

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	Returned to producer for reuse where possible, or removed from site by specialist sub-contractor.		Current route considered to be BAT
Grit and screenings from digester cleansing	As much grit and screenings as possible are screened out during earlier processes (outside the scope of this permit) to minimise that entering anaerobic digestion process. Grit and screenings removed from digesters are screened to segregate the waste streams. Grit can be recycled. As screenings originate from non-segregated sources, there are currently no alternatives to landfill.	Grit: Recycled Screenings: Landfill	No improvement opportunities foreseen. Current route considered to be BAT Screenings fate reviewed on a periodic basis to identify alternative routes for this waste stream
Cellulose fibres	Will be recovered from bulk UWWTD flow, rather than as present being treated within that flow. Separated and stored following washing and drying process in sealed skips pending offsite transfer	Recovered off site	Reviewing potential end markets for recovered cellulose, following optimization of trial plant
Ammonium sulphate	Recovered from ammonia plant as a liquid and transferred to a dedicated bunded tank on site pending collection by a third party and removal from site	Currently disposed of off site	Data will be collected to support an end of waste classification for the output to allow sale as a product into fertiliser industry

1.5 Energy Review

Site Energy Management Plan reviews are carried out at all of our permitted sites at frequent intervals.

Sites with Gas to Grid or CHP engines have a KPI target for export of biomethane and generation of electricity from biogas, and excess energy is exported from the site where possible.

Flare use is monitored to ensure that the use of flaring to control biogas volume is minimised and where appropriate, additional CHP resource is deployed to a site where excess flaring occurs. Where possible, other green energy sources are deployed at works. The onsite generation and use of power and heat from a renewable biogas source represents a positive impact with respect to global warming potential and reduces imports of energy from the grid.

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All capital projects consider whole life costs, including energy usage for schemes, and design concepts such as gravity transfers are implemented where possible over pumping. Where possible, low energy lighting is specified and all pumps and motors are appropriately sized for their location. Pumps which may be impacted by rags and solid material are checked and cleaned in accordance with the sites preventative maintenance program, which is developed from a combination of manufacturers recommendations and operational experience of issues with specific pumps within the site network.

Insulating materials are applied to transfer pipelines for hot water and digesters to reduce heat losses, which reduces energy consumption.

1.6 Summary and recommendations

Raw Materials and Water Usage Review

Strongford has been designated as our first site where we aim to achieve Net Zero by 2030. Therefore a number of emission mitigations, or alternative technologies will be trialled and installed there over this period to ensure better use of our site derived wastes, and less reliance on external resources. This latest permit application has added a few of these novel technologies already, but with further planned to come, examples being Elovac and Ephyra.

Additional techniques and/or raw material alternatives are constantly being reviewed by our Innovations Team, which could be implemented on site to reduce environmental impact or improve the efficiency of raw materials or water usage. This document will be reviewed regularly to keep up to date with these changes.

A number of monitoring programmes are being put in place for understanding our waste composition better (wastewater returns and waste emission in OCUs). With the outcomes of those activities there may be further improvements available to us.

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.

Residue Production Review

Due to the small number and type of residue streams, there was very little scope for further reduction of those generated on site. All current waste disposal/recovery routes are considered to be BAT and utilise application of the Waste Hierarchy.

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