Yorkshire Water Services Limited

Aldwarke Sludge Treatment Facility (STF)

Application for Environmental Permit Variation

October 2022

Permit Reference: EPR/YP3592ZU

Stantec

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Document Structure

Non-technical Summary

Section I: Environmental Permit Application Forms

Part A
Part C2
Part C3
Part C6
Part F1 (including letter of authorisation)

Section II: Technical Description

Section III: Supporting Information

Section IV: Figures

Figure 1: Site Location Plan
Figure 2: Installation Layout
Figure 3: Principal Emission Points
Figure 4: Drainage Plans

Section V: Appendices

Appendix 1: Relevant Offences
Appendix 2: Technical Competence
Appendix 3: ISO 14001 certificate
Appendix 4: Quality and Environmental Policy
Appendix 5: Site Condition Report
Appendix 6: BAT Assessment
Appendix 7: Air Emissions Risk Assessment
Appendix 8: Odour Risk Assessment
Appendix 9: Noise Impact Assessment
Appendix 10: Odour Management Plan
Appendix 11: Secondary Containment Risk Assessment
Appendix 12: STF Processing Capacity Calculations
Appendix 13: Leak Detection and Repair (LDAR) Plan

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Sign-off Sheet

Project Name	Environmental Permitting Support
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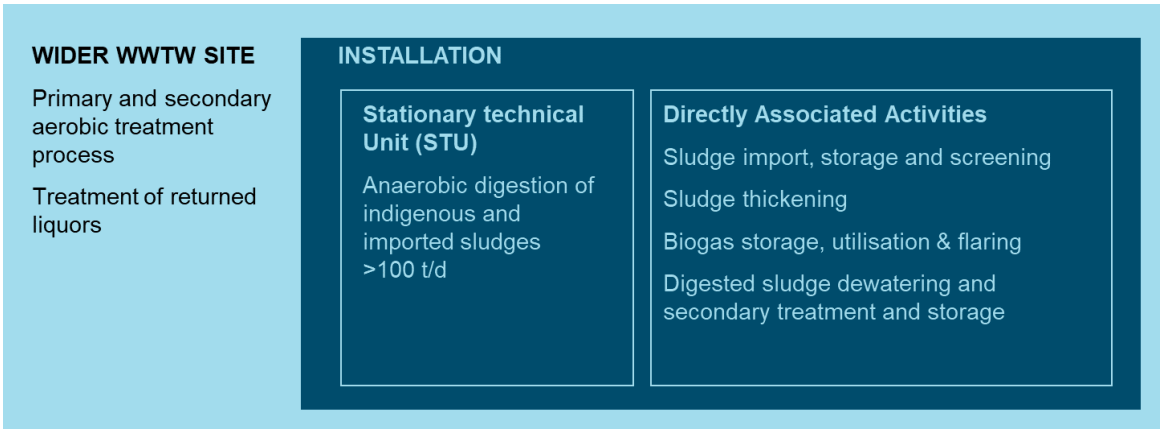
Non-technical Summary

Summary of changes

This application is being made due to changes to the Environment Agency (EA) interpretation of the environmental permitting exclusion for Urban Wastewater Activities (under Environmental Permitting (England and Wales) Regulations 2016 (EPR) Schedule 1, Part 2, Chapter 5, Section 5.4). The EA interpretation now requires that anaerobic digestion (AD) plants with a treatment capacity of over 100 tonnes/day (t/d) are classified as installations for the purposes of EPR. Furthermore, it has been determined that, in calculating digester capacity, there shall be no distinction between imported or indigenous sludges. The Yorkshire Water (YW) Aldwarke Sludge Treatment Facility (STF), part of the wider Aldwarke Wastewater Treatment Works (WwTW), exceeds the 100t/d capacity limit and therefore it has been agreed that a variation to an existing permit is required to add Schedule 5.4 Part A(1)(b)(i) for AD treatment activities currently operated on site. The site has been operating until now within the scope of a registered T21 permit exemption (reference: WEX233108) and Regulatory Position Statement (RPS) 109 in respect of Combined Heat and Power (CHP) operations burning biogas.

A summary description of activities carried out at Aldwarke STF is provided below.

Figure NTS-1 Installation schematic

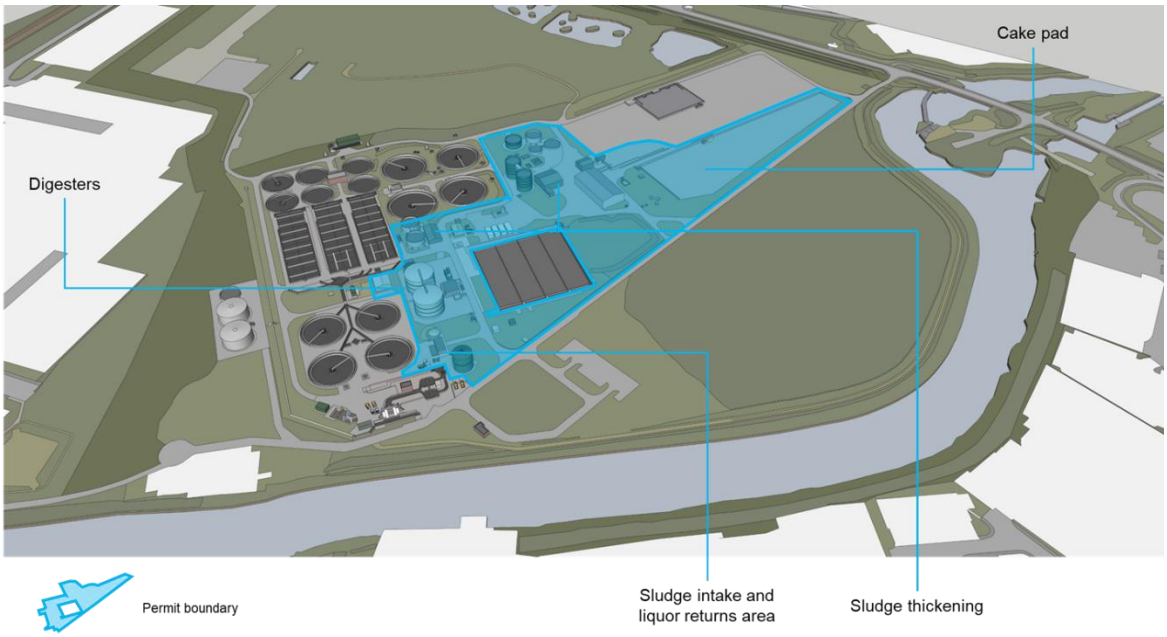


Overview of activities

The Aldwarke STF treats indigenous sewage sludges arising from sewage treatment processes operated within the wider Aldwarke WwTW as well as sewage sludges generated by other YW WwTWs. The principal activities undertaken within the installation include:

- Sludge reception and screening,
- Raw sludge thickening,
- Anaerobic digestion,
- Biogas collection and storage (including flaring if operationally necessary),
- Use of biogas (a renewable energy source) to fuel combined heat and power (CHP) plant, generating electricity and heat and / or boilers used to generate heat for the digesters,
- Digested sludge dewatering,
- Temporary storage of digested sludge prior to transfer off site for landspreading as an agricultural soil conditioning agent,
- Raw material storage and use,
- Surface water and process liquor collection and transfer to Aldwarke WwTW for treatment, and
- Waste storage and transfer off site.

Figure NTS-2 Illustration showing main activity areas



Impact assessment

A detailed assessment of emissions from the process and their potential effects on the environment, including local human and ecological sensitive receptors has been carried out.

An odour risk assessment has been undertaken. The assessment has considered thirteen process activities across the STF and potential odour effect on sixteen receptors. The assessment has been based on a Source-Pathway-Receptor approach and is primarily based upon professional judgement. The assessment concludes that, of the sensitive receptors identified for the purposes of the assessment, twelve are exposed to a negligible adverse odour effect and four are exposed to a slight adverse effect. No receptor is exposed to a moderately adverse odour effect or worse and therefore the odour effect of the site is considered not significant.

A noise impact assessment has been undertaken. The risk of noise and vibration at nearby sensitive receptors is predicted to be low; more detailed assessment and further mitigation is not required, nor is a specific noise management plan. Noise will continue to be managed through operational controls and good practice.

A fugitive emissions/bioaerosol risk assessment has been undertaken, supported by a quantitative bioaerosol survey. The risk assessment, supported by the measured results, concludes that Aldwarke STF installation is unlikely to be a significant source of bioaerosols and further bioaerosols monitoring at Aldwarke is not deemed necessary as adequate control measures are already in place.

An Air Emission Risk Assessment (AERA) utilising atmospheric dispersion modelling has been undertaken. The scope of the assessment is limited to the point source combustion emissions to air at the installation, specifically biogas combustion plant comprising two Combined Heat and Power (CHP) units and two boilers. The biogas flare which is only used for occasional / emergency purposes was screened out of the assessment.

The assessment concludes that, in relation to human health, where impacts are not classified as ‘insignificant’ (i.e. process contribution (PC) less than 1% of the EAL for long-term concentrations or 10% for short-term) the predicted impacts of the installation do not lead to any exceedances of Environmental Assessment Level (EALs) and do not constitute ‘significant pollution’.

In relation to the impact of the installation on ecologically sensitive sites, at all locally designated sites, the predicted PCs from the installation are less than 100% of the applicable annual C_{Le} or C_{Lo}. There are no international or national designated sites within the relevant AERA screening distances. Therefore, the impacts of the installation are considered ‘insignificant’ at all designated ecological sites.

A secondary containment risk assessment has been undertaken to assess whether existing measures to protect the environment in the event of a failure of containment of primary storage tanks are adequate. This study has identified some additional mitigation measures are required in order to enhance environmental protection for the identified sensitive receptors.

Site operational controls

The Aldwarke STF installation is operated in accordance with an Environmental Management System (EMS), which includes controls to minimise point source and fugitive emissions to air, water and land. The YW EMS is certified to ISO 14001 and a planned maintenance and inspection programme is in place to optimise the operation of plant.

A leak detection and repair plan is in place to minimise fugitive emissions to air.

An accident management plan has been prepared to assess risks and identify controls associated with accidents and other unplanned events.

A review of compliance Best Available Techniques (BAT) requirements contained in Best Available Techniques (BAT) Reference Document for Waste Treatment, 2018 has been undertaken. Where it has been identified that BAT is applicable and is not met (either by the stated techniques or alternative techniques) improvements are proposed. These are listed in the Proposed Improvement Programme.

Section I: Application Forms

Form A

Form C2

Form C3

Form C6

Form F1 (including letter of authorisation)

Section II: Technical Description

This section of the application provides a Technical Description of the activities to be operated under the permit.

The Information provided in this section should be viewed in parallel with:

- Section I: Application Forms
- Section III: Supporting Information

Introduction and overview

This application is being made due to changes to the Environment Agency (EA) interpretation of the environmental permitting exclusion for Urban Wastewater Activities (under Environmental Permitting (England and Wales) Regulations 2016 (EPR) Schedule 1, Part 2, Chapter 5, Section 5.4). The EA interpretation now requires that anaerobic digestion (AD) plants with a treatment capacity of over 100 tonnes/day (t/d) are classified as installations for the purposes of EPR. Furthermore, it has been determined that, in calculating digester capacity, there shall be no distinction between imported or indigenous sludges. The Yorkshire Water (YW) Aldwarke Sludge Treatment Facility (STF), part of the wider Aldwarke Wastewater Treatment Works (WwTW), exceeds the 100t/d capacity limit and therefore it has been agreed that a variation to an existing permit is required to add Schedule 5.4 Part A(1)(b)(i) for AD treatment activities currently operated on site. The site has been operating until now within the scope of a registered T21 permit exemption (reference: WEX233108) and Regulatory Position Statement (RPS) 109 in respect of Combined Heat and Power (CHP) operations burning biogas.

YW currently holds a permit for sludge conditioning activities at Aldwarke WwTW. The permit was originally issued as a Waste Management Licence on 17th May 2006 (reference number EAWML/65477) and subsequently transitioned to a waste operation permit (reference number EPR/YP3592ZU) on 9th December 2009. Sludge conditioning activities are no longer carried out on site and therefore this application will vary the permit to remove this activity and add anaerobic digestion and its directly associated activities.

YW will be submitting an application for partial surrender of some areas of land included within the conditioning permit that is the subject of this variation application. A separate surrender application will be submitted to the Environment Agency.

Description of Site Activities

A summary description of all activities carried out at Aldwarke STF is provided below.

Figure A Installation schematic

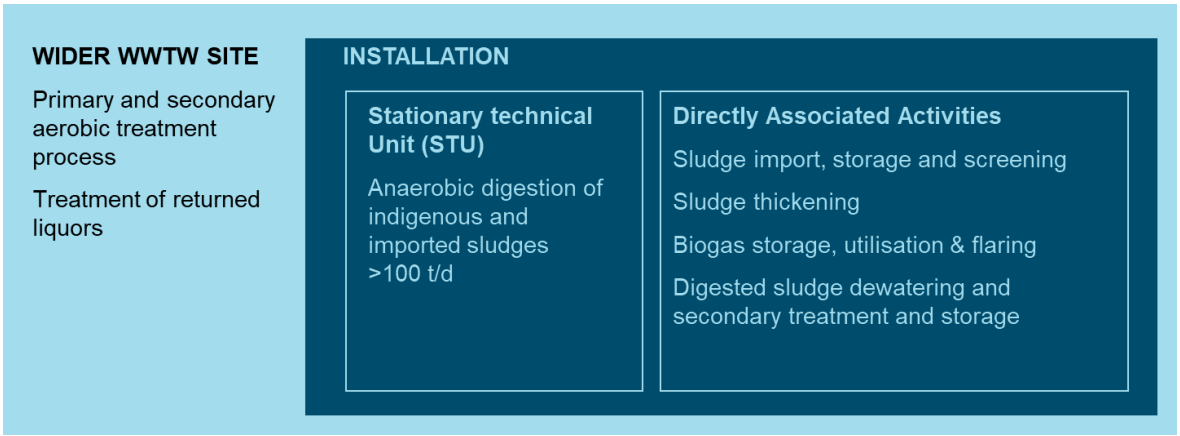


Figure B Installation overview

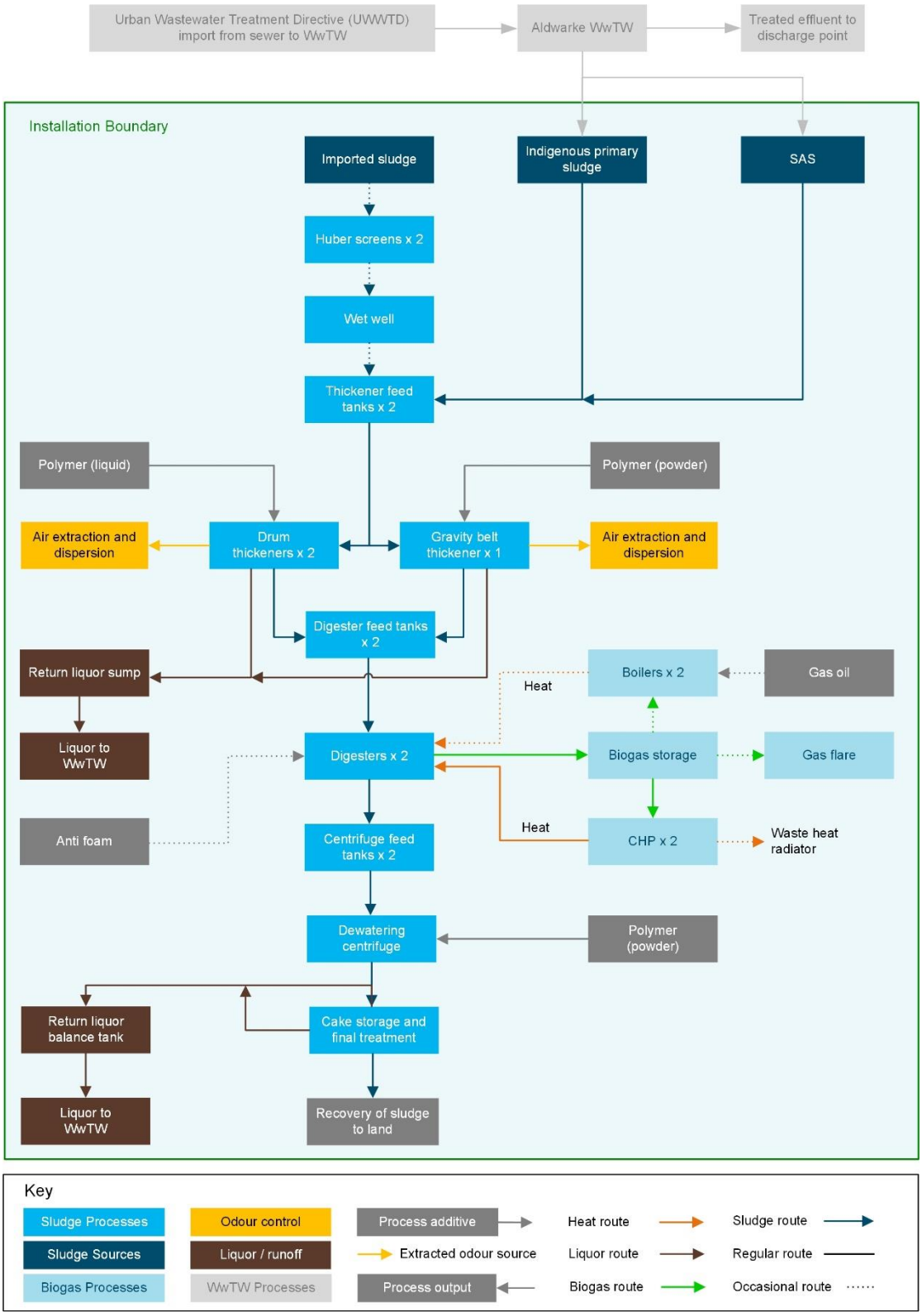
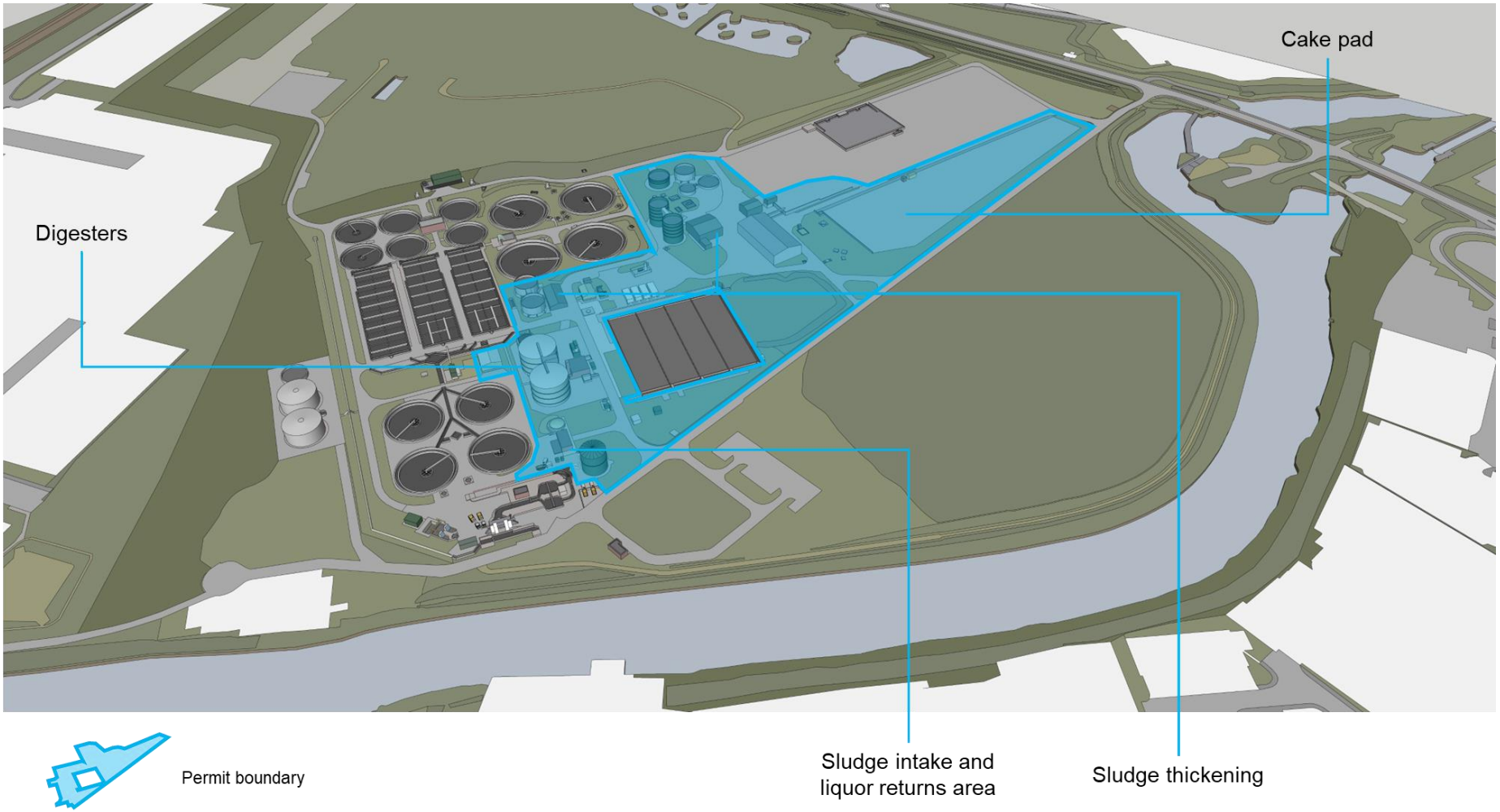


Figure C Installation illustration



Sludge reception, treatment and handling

Aldwarke STF treats the following sewage sludges:

- Indigenous primary sludges and surplus activated sludge (SAS) arising from sewage treatment processes operating within the wider Aldwarke WwTW that are piped directly to the STF.
- Liquid sludges generated by other YW Wastewater Treatment Works (WwTW) (with lower capacity or capability for treating sludges on-site) that are imported to Aldwarke STF for additional treatment.

Imported liquid sludge can be delivered to site by tanker, which would normally unload at the sludge import area. The maximum load is typically 28 tonnes with unloading taking up to 30 minutes. Only appropriately authorised vehicles can discharge at the site. This is controlled using a 'WaSP' logger; valves on the discharge pipework will only open when a driver presents appropriate authentication to the system. The WaSP logger records the source of the sludge, the time and date of delivery, the total volume discharged and average percentage dry solids of the load.

The existing (but currently unused) sludge import facility comprises two Huber ROTAMAT enclosed rotating screens to screen the sludge prior to transfer to a covered, below ground concrete sump of approximately 80 m^3. Screenings drop into a skip and are disposed of off-site (see Part III: Form B3, Question 6e for more details of waste streams). Imported sludge is then passed forward to the thickener feed tanks (see below for more details).

The existing STF sludge import facility is currently not being used due to operational problems. However, there is a programme of works planned to upgrade the STF import facility, either via refurbishment of the existing facility or replacement with a new sludge import facility. The new facility would perform the same function as the existing and would comprise a new sludge screen feed tank with connections for imported and indigenous primary sludge, pipework to bring indigenous primary sludge to this tank, a new import discharge facility with WaSP system, flow meter and other monitoring equipment and pipework. The existing ROTAMAT sludge screens would be refurbished and retained.

There are waste acceptance procedures that deal with the trade waste that is being treated through the WwTW. Some traders may also be subject to trade effluent consents. With regard to the potential for septic sludge imports to be received into the STF, a pre-acceptance process is in place to ensure that it is only received at sites that are capable of processing it without impacting the process (Refer to 'Waste Characterisation (Pre-acceptance & Acceptance' in 3d Management systems, Form B2).

Indigenous primary sludge and surplus SAS from the wider Aldwarke WwTW is pumped via below ground pipework into the thickener feeds tanks (2 no. 1,493 m^3 open topped steel tanks). The liquid sludge is mechanically mixed; the tanks operate in parallel fill mode or operate in fill / draw mode i.e. one fills whilst the other empties.

Figure D Thickener feed tanks

Liquid sludge from the thickener feed tanks is then transferred to either the gravity belt thickener (GBT) building or drum thickener building via below ground pipeline. Forward feed of sludge to the drum thickeners and GBT is controlled via SCADA and each thickener unit can operate either individually or in any combination.

Gravity Belt Thickener

Within the GBT building, potable water is mixed with powdered polymer (stored in 25 kg bags) within the polymer make up tank (approximate capacity 1.5 m^3 steel tank), before transfer to a dosing tank (approximate capacity 1.5 m^3 steel tank). Both polymer tanks are located on a metal grid above a secondary containment sump within the GBT building. The polymer solution is dosed into the sludge stream and fed into the GBT (1 no.). From here the sludge migrates down the moving, porous belt where excess liquid is able to drain away, leaving the thickened sludge on the belt. Thickened sludge is then scraped from the belt and collected in the thickened sludge hopper. Sludge is typically thickened to 5-7% solids.

The GBT is continually cleaned using automatic spray bars. In addition, cold water cleaning using a pressure washer is undertaken as required. This system operates using potable water and wash water leaves via the liquor route.

Air extracted from the GBT unit is discharged to atmosphere via a vent stack (approximately 6 m in height) adjacent to the north west side of the GBT building (referred to as air extraction and dispersion stack 1). Ambient air from the building is passively vented via louvres in the wall without odour treatment; ambient building air is not odorous under normal operating conditions due to the direct GBT extraction.

Figure E Air extraction from GBT

The resulting thickener liquor is transferred to the return liquor sump (covered, underground sump approximately 80 m^3 capacity located adjacent to the sludge import facility). From this sump, liquors are pumped back to the WwTW for full treatment.

Drum Thickeners

From the thickener feed tanks sludge is pumped via underground pipework to the drum thickener building. Liquid polymer is normally delivered to the thickener building in 1,000 litre IBCs, or alternatively may be delivered in bulk. The polymer intake point is located outside the thickener building; polymer is transferred for storage to a bulk storage tank (approximately 5 m^3 capacity), is mixed with final effluent and transferred to the adjacent holding tank (approximately 2.5 m^3 capacity). Both tanks are GRP and located on a metal grid over a secondary containment concrete sump inside the building. The polymer solution is injected into the sludge stream before being introduced to the thickener drums (2 No.). The polymer encourages separation of water from the sludge as the sludge is rotated in the drum to remove excess liquid. The thickener liquor is transferred to the liquor return sump where it is mixed with the GBT thickener liquor (underground sump approximate 80 m^3 capacity located adjacent to the sludge import facility) prior to transfer back to the WwTW for full treatment.

The drum thickeners are equipped with automatic spray bars which provide frequent short cleans. The automatic spray bars operate using treated final effluent. A manual jet wash is also available for additional cleaning requirements; this system utilises potable water and has a dedicated extraction system for the diesel engine fumes which are vented outside the building.

Air extracted from each of the drum thickener units is discharged to atmosphere via a dispersion stack (approximately 5 m high) located adjacent to the north of the drum thickener building (referred to as air extraction and dispersion stack 2). Ambient air from the building is passively vented via louvres in the wall without odour treatment; ambient building air is not odorous under normal operating conditions due to the direct drum extraction.

Figure F Polymer tanks in drum thickener building

Best Available Techniques (BAT) Summary: Sludge reception, treatment & handling

- Proprietary enclosed rotating/moving sludge screens reduce odour generation risk.
- The gravity belt and drum thickeners have a cleaning-in-place (CIP) system installed to ensure they operate effectively, efficiently and with reduced odour generation potential.
- Sludge thickener processing capacity includes standby plant provision to minimise potential for reduced process control in the event of mechanical or other breakdowns.
- Final treated effluent is used as a diluted polymer carrier and also for the automatic spray bar cleaning system, reducing potable water demand.
- In-line dosing of polymer ensures levels are controlled and raw materials used efficiently.
- Tank mixing using air injection to avoid settlement, blockage or gas production.
- PLC controlled plant and largely automated. PLC includes level sensors to reduce risk of tank overtopping, resulting in contamination and potential odour generation.
- YW Environmental Management Procedures (EMPs) are in place covering the import process (refer to Section III, Form C2, Q3d Management Systems).

Sludge digestion

The thickened sludge is transferred from the GBT and drum thickener buildings via above and below ground pipework into two digester feed tanks (2 no. open topped 500 m^3 concrete tanks). Sludge within the digester feed tanks is mechanically mixed. The tanks operate in alternate fill and draw mode.

Sludge is pumped from the digester feed tanks to the anaerobic digesters (2 no. 3,167 m^3 concrete tanks, approximately 347 m^3 of each tank's storage capacity is below ground). The anaerobic digesters operate as a continuous process with sludge being added at the bottom, with one tank feeding on the hour every hour and the other on the half hour every hour. Treated sludge is displaced out of the top of the digester, via the outlet pipe, by sludge being fed into the bottom of the digester. The digesters are capable of feeding at up to 475 m^3/day combined at 6% dry solids giving a 12-day retention time as required by Hazard Analysis and Critical Control Points (HACCP) controls. The digesters are mechanically mixed.

Figure G Digester feed tanks

A water circuit filled with potable water is heated to around 70°C by the CHPs and/or boilers; this heats the digesters using tube-in-tube, counter-current heat exchangers ensuring optimum conditions for digester microbial activity. Sludge from the digesters is continually recirculated around the heat exchangers using 2 no. (duty/standby) recirculation pumps per digester. Valves are manually balanced to moderate the amount of hot water that passes into the heat exchanger, depending on the heat demand of the digesters.

Grit build up within digesters is a normal feature of operation; the digesters are cleaned out (including accumulated grit) approximately every 10 years as part of the planned periodic inspection which also includes an internal and external inspection of tank integrity and replacement of instrumentation and gas mixing equipment as required.

An automatic anti-foam dosing system is in place to control digester foaming. This system uses a radar level probe in the digester headspace and compares this to the pressure level sensor at the bottom of the digester to determine the depth of foam. Upon detection of foam, antifoam is automatically dosed into the sludge mixing pumps. This system includes operator-adjustable dosing setpoints; if the foam level continues to increase the digester feed will be inhibited. Antifoam is stored in an IBC within a dedicated cabinet with two dosing pumps to dose into the digesters as required.

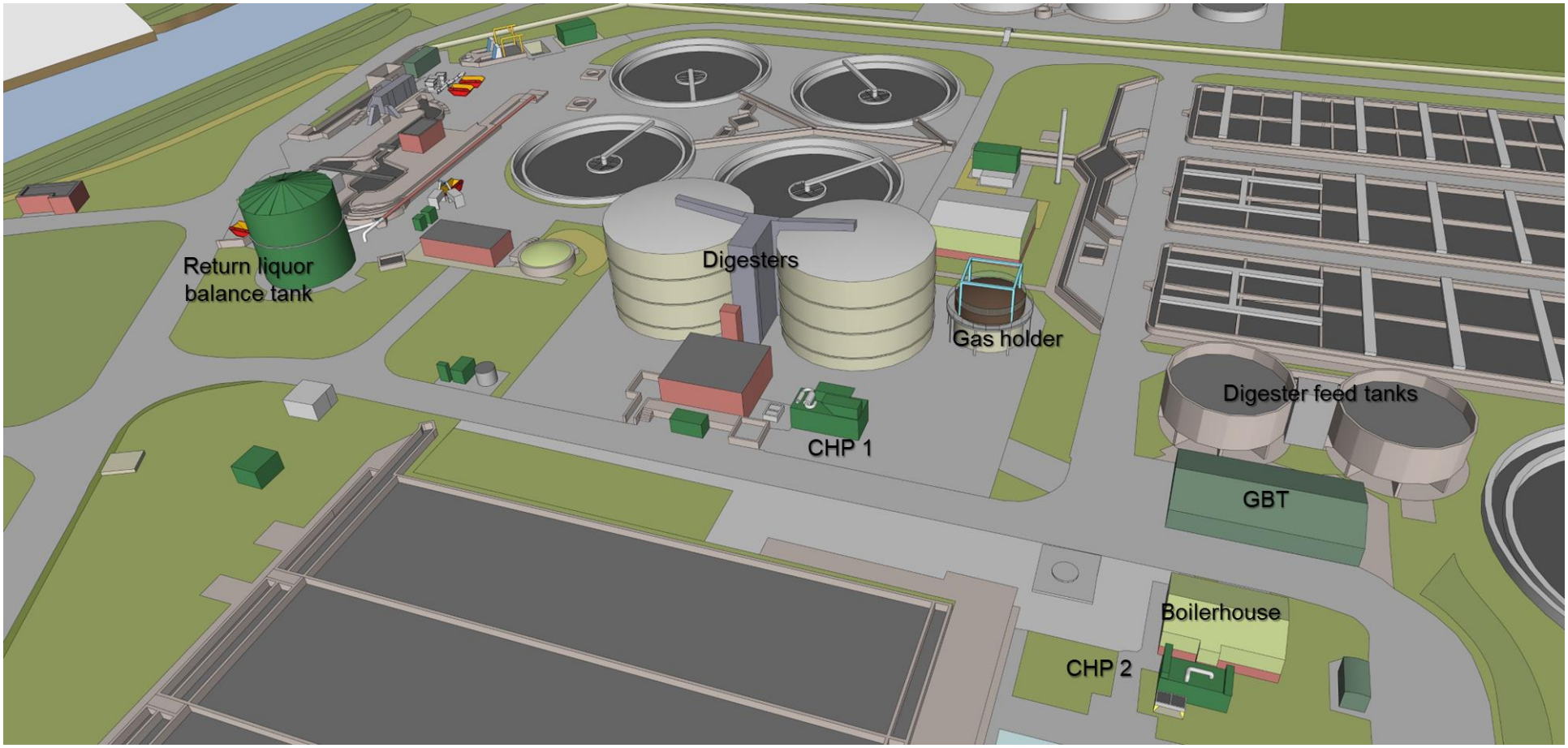
Sludge extracted from the digesters is transferred via below ground pipeline and the interceptor pumping station to the centrifuge feed tanks (see below for further information).

The digesters are due to undergo a major refurbishment by 2024 including improvements to the recirculation system and heat exchangers as well as installing impermeable surfacing to the area around the digesters. It is also proposed that a new sludge transfer tank will be installed adjacent to the digesters to receive sludge and a new transfer pumping station will be installed to transfer sludge to the centrifuge feed tanks.

Best Available Techniques (BAT) Summary: Sludge digestion (*BAT 38*)

- Sludge pumps are on inverters where appropriate for energy efficiency, and typically operate around 75% speed.
- The plant operates under PLC (programmable logic controller) and is largely automated.
- YW procedures are in place covering the digestion process management.
- Monitoring is undertaken to check that the digestion process is healthy and stable. This includes temperature, solids, volatiles, fatty acids and pH, as well as biogas quality (Refer to Section III, Form B2 Q4a for further information on process monitoring).
- Foam levels are actively monitored, and an anti-foam system is used as required.
- Monitoring instrumentation including high level probes and pressure sensors linked to automatic PLC controlled pumps and other equipment to avoid potential loss of containment.
- An inspection and testing programme for above and below ground vessels, pipes and valves is in place. This incorporates a combination of visual examinations and non-destructive testing (e.g. ultrasonic thickness measurements).

Figure H Site view showing western area of the STF



Biogas storage and use

Biogas generated by the digesters is piped via a common biogas discharge line to the biogas holder (200 m^3 working volume) and from there to the CHPs, boiler plant and/or waste gas burner (flare). The biogas holder provides gas buffering capability in order to allow for fluctuations in gas production.

Excess liquids within the biogas are removed via condensate traps on the biogas system. There are five condensate traps in total; one from the digesters to the biogas holder, one from the biogas holder to CHP1, one from the biogas holder to a condensate trap pit where one serves the boilers and CHP2 and one serves the gas burner. The collected liquids are transferred to the WwTW for treatment.

Figure I Digesters and CHP1

On leaving the gas holder, the biogas passes to the CHP engines and boilers via gas boosters (one booster for each CHP/boiler), which increase the pressure of the biogas prior to use.

Pressure relief valves are located on the roof of each digester (two per digester) and a further one is located at the biogas holder. These valves provide an essential safety mechanism and will release gas to atmosphere in the event of a build of pressure preventing damage to equipment e.g. the gas holder. The valves are also an 'anti-vacuum' design to prevent tank damage from negative pressures.

Biogas is used as the fuel source for the site CHPs. The CHP facility comprises two reciprocating engine generator sets which generate electricity which is used to power essential site processes. Heat from the combustion process is used to maintain the required temperature in the anaerobic digesters, with any excess being discharged using air cooled radiators. CHP 1, located adjacent to the north of the digesters has a thermal input of approximately 875 kW and an electrical output of 307 kWe. CHP 2 located to the north of the boiler house has a thermal input of approximately 470 kW and an electrical output of 165 kWe.

The CHPs are located within dedicated enclosures. Engine combustion products are discharged via 5 m high (approximately) stacks above the building roof.

Two dual fuel boilers, located in the boiler house, are used to provide an alternative heat source for the digesters in the event that the CHPs are unavailable or supplementary heat is required. The boilers are fired by biogas with gas oil available as a backup fuel source. Gas oil is stored within an integrally bunded steel tank of 9,717 litres capacity located to the north of the boiler house. Feed lines to the boiler house are located above ground.

Boilers 1 and 2 are identical and have a thermal input of approximately 765 kW and a thermal output of 650 kW. Combustion products from the boilers are discharged via stacks through the roof of the boiler house. The stacks for both boilers extend approximately 2.5 m above the building roof which itself is approximately 4.5 m high.

In periods where the CHP engines and boiler are unavailable, or biogas generation exceeds combustion capacity, biogas is directed to the waste gas burner (464 m^3/hr maximum capacity) which has a stack height of 5 m. This burner, although a purpose-built closed flare system, is not capable of achieving a minimum of 1,000°C with 0.3 seconds retention time at this temperature. Flare stack operation is automated based on gas level within the biogas holder. If the gas level is high then the flare will operate, however utilisation of the gas is preferred over flaring.

The areas around the digesters and gas storage are classified as a potentially explosive atmosphere, with strict provisions on the control of potential ignition sources in line with requirements of the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR). The flare facility is located at a safe distance from the digesters and other biogas handling and treatment activities.

A project is currently being developed to upgrade some of the existing biogas assets. It is proposed that a like-for-like replacement scheme will be undertaken with the existing biogas holder, condensate traps, pipework and flare stack being decommissioned / demolished and new facilities that meet BAT requirements will be installed.

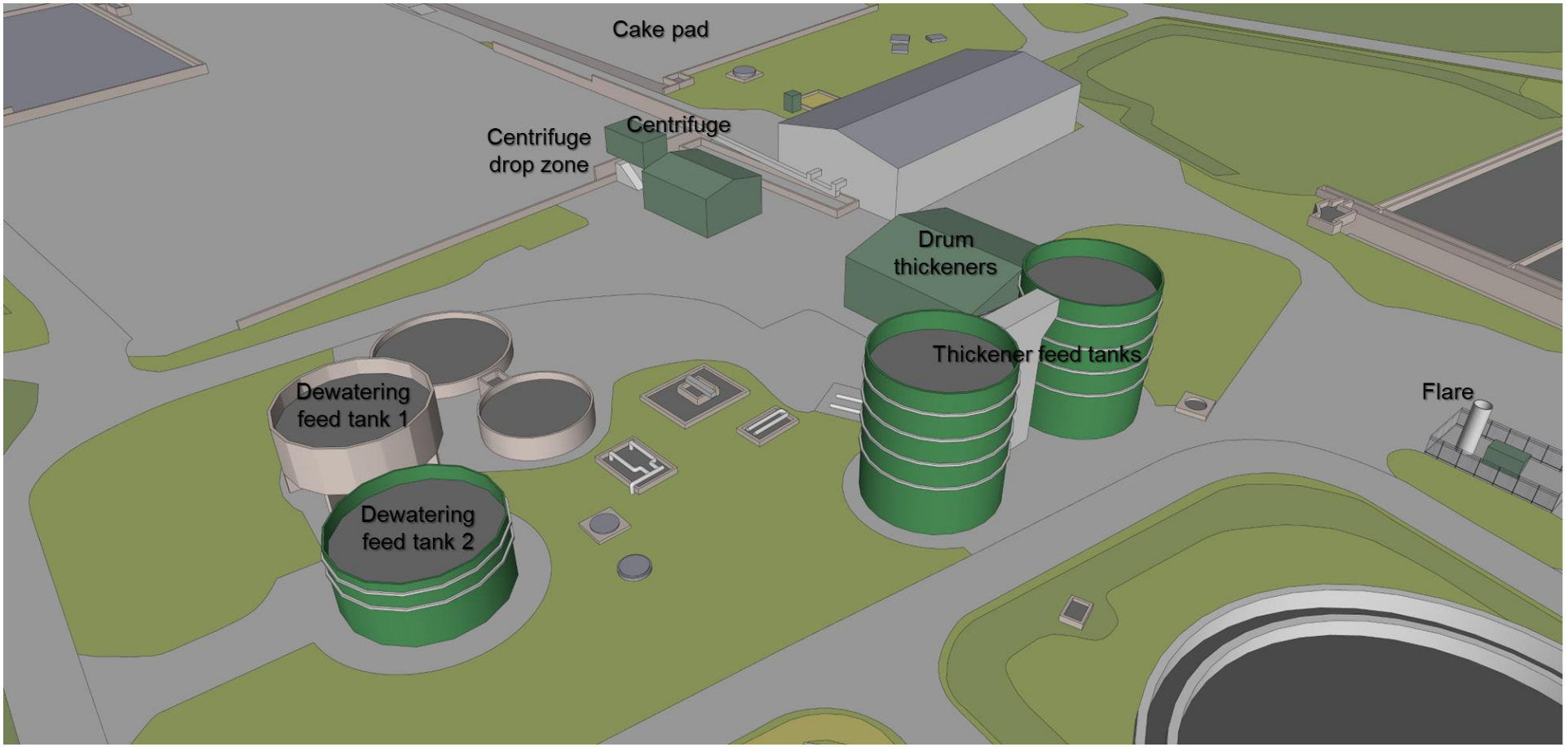
Best Available Techniques (BAT) Summary: Biogas utilisation and flares
(*BAT 15 and 16*) Flame arrestors are fitted to the biogas flare system to reduce the risk of fire / explosion.

- The flare is regularly checked to ensure that it ignites correctly when required and gas flow to the flare is constantly monitored using inline meters.
- Biogas holder provides gas buffering and allowance for fluctuations in gas production.
- Flow meters installed on gas utilisation under PLC control to maximise utilisation efficiency.
- The plant operates under PLC and is largely automated.
- YW procedures are in place covering biogas management.

Digested sludge treatment, handling and disposal

Digested sludge is transferred via below ground pipes and the interceptor pumping station to two centrifuge feed tanks (1 x uncovered 700 m^3 steel/GRP tank (No. 2) and 1 x uncovered 700 m^3concrete tank (No. 1)). In these tanks the digestate is mechanically mixed, to prevent settlement. The tanks operate as a fill/draw pair. From these tanks the digestate is piped to the centrifuge building, which contains one centrifuge.

Figure J Site view showing eastern area of the STF



Within the adjacent polymer room, powdered polymer is dropped from a 700 kg bag into a hopper and then mixed with potable water in a *c.* 5 m^3 polymer blend tank prior to being pumped to an adjacent *c.* 5 m^3 polymer transfer tank where the polymer solution is held prior to use. The digested sludge is mixed with the polymer solution and then passed to the dewatering centrifuge where the sludge coagulates and supernatant liquor is removed by centrifugal forces. The liquor drops from the centrifuge into a wet well and is then pumped to the return liquor balance tank (steel, covered, 1,186 m^3 capacity) located near the WwTW inlet. From here liquors are transferred to the WwTW for full treatment.

Sludge cake handling arrangements are currently being altered; the final digested and dewatered sludge cake will be dropped directly from the centrifuge onto a trailer prior to being transferred by tractor/trailer to the sludge cake pad. The cake pad is an engineered impermeable surface, with water runoff collected in drains running along edges of the pad. These liquids are pumped back to the WwTW (via the return liquor wet well (adjacent to the cake pad) and liquor balance tank) for full treatment.

Sludge cake is moved by mechanical loaders into storage rows on the cake pad area. There is no lime addition at Aldwarke; instead, cake is stored in piles according to age and is left for further pathogen reduction according to the Critical Limit in the HACCP plan. The maximum storage capacity of the cake pads is approximately 2,800 m^3; although less than this is stored under normal operating conditions (normally up to approximately 1,500 m^3). Once treatment is complete, sludge cake is removed from site and landspread in accordance with legislative requirements. Samples of digested, matured cake are taken every 3 months and analysed for metals and pathogens to ensure HACCP standards are being met.

A project is currently being developed to upgrade the digested sludge dewatering facilities including installation of a new raised dewatering sized on the basis of peak digester throughput. The new facility would drop sludge cake directly on to the engineered cake pad. The existing centrifuge would be retained to provide back-up dewatering capacity.

Figure K Cake storage on pad and drainage channel

The cake pad also serves certain contingency functions, for both operations at Aldwarke and to wider strategic regional sewage infrastructure operated by YW. The cake pad may, under exceptional circumstances (such as the failure of assets or non-availability of normal disposal routes on a temporary basis) be used for storage of treated digestate produced at other YW sites, before being recycled to agriculture. Similarly, other contingency measures could require, under exceptional circumstances such as failure of assets, the interim storage of thickened or dewatered sludge on the cake pad, where that sludge originates from another YW site (or from Aldwarke operations), before that material then undergoes AD treatment in the STF at Aldwarke, or if necessary is removed for further treatment at an alternative AD facility. It is recognised that such operations are abnormal and would require initiation of site contingency operating procedures, with the intention of minimising any potential short term adverse environmental effects and returning to normal operations as soon as practicable.

Best Available Techniques (BAT Summary)

- Engineered cake pad with leachate collected for treatment at the WwTW.
- An inspection and testing programme for pipes and valves is in place. This includes periodic surveys using in-pipe crack detection technology.

Section III: Supporting Information

This part of the application provides detailed responses to questions in Section I: Application Forms, where further space is required to provide the necessary information.

Responses are provided only where further information is required, and the questions numbers are as stated in the application forms.

The information provided in this section should be viewed in parallel with:

- Section I: Application Forms
- Section II: Technical Description

Form C2 Supporting Information

2 About your proposed changes

Proposed changes to current activities within this installation are provided in Table C2: 1 below. A full summary of activities it is proposed will be included within this installation are provided in response to Form C3, Table C3: 1a-1 later in this section.

Table C2: 1 - Changes to existing activities

Name	Installation schedule 1 references	Description of the installation activity	Description of waste operation	Description of the mining waste operations	Description of water discharge activity	Description of groundwater activity
Aldwarke STF	Section 5.4 A(1) (b)(i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment	None – previously regulated as a waste operation.	**Removal** from permit: Sludge conditioning, phyto conditioning and processing, including screening, storage, blending, shredding, conditioning and maturation.	N/A	N/A	N/A
		Addition to permit: Anaerobic digestion of UWWT derived sludges.	None – would be regulated as part of an installation level permit	N/A	N/A	N/A
		Addition to permit: DAAs associated with anaerobic digestion: • Treatment of sludge prior to digestion (including reception, bulking, blending, physical handling, screening and thickening). • Treatment of digested sludge produced at Aldwarke STF or other YW sites (including physical handling and dewatering). • Biogas storage and combustion in gas engines, boilers and auxiliary flare. • Interim storage of undigested sludge produced at Aldwarke WwTW or other YW sites before treatment on site or treatment and recovery / disposal at another location. • Interim storage of digested sludge produced at Aldwarke STF or other YW sites, before recovery or disposal at another location.	None – would be regulated as part of an installation level permit	N/A	N/A	N/A

3 Your ability as an operator

3b Technical ability

YW will ensure that there is the necessary technical competence to operate the activities included in this permit application. Technical management will be provided by John Bullivant, Yorkshire Water; his relevant qualifications can be found in Appendix 2.

The environmental permit numbers and site address for all other waste activities that John Bullivant provides technical competence for are provided in Table C2: 3b below.

Table C2: 3b Sites under the technical competence of John Bullivant

Permit number	Site address	Postcode
DP3492ZX	Sandall WwTW Wheatley Hall Road Doncaster South Yorkshire	DN2 4NU

3d Management systems

YW has an established EMS, which is certified to the ISO 14001 standard. A copy of the YW ISO 14001 certificate is provided as Appendix 3. The EMS forms part of a wider corporate Integrated Management System (IMS) which also incorporates quality management, health and safety management, asset management, organisational resilience and business continuity requirements. The management system follows an asset life cycle approach, from design through to decommissioning.

Corporate level management system processes are in place, which are supplemented by site-specific documented procedures and processes. YW's IMS is structured as shown in Table C2: 3d-1 below.

Table C2: 3d-1 Overall IMS structure

Level 1 - IMS Manual	
	YW's IMS manual is a set of documents including records which describe the scope, policy, objectives and overall management responsibility within YW and specifically addresses the requirements of ISO 9001, ISO 14001, ISO 55001 and ISO 45001.
Level 2 - Generic Manuals	
	The level 2 generic manuals detail policies and procedures, concerning the operation and maintenance of systems giving the purpose, scope, responsibilities and operational requirements.
Level 3 - Site Specific Manuals	
	The level 3 site specific manuals detail site specific information and procedures, concerning operations, giving the purpose, scope and responsibilities. Document control procedures are in place to ensure IMS and associated documents and records are identified, controlled, maintained and retained appropriately. Key records maintained in accordance with IMS procedures include training records, internal audit reports, waste transfer and consignment notes, complaint records, risk assessments, legislative records, permits, consents and associated documentation, accident and incident records and monitoring and measurement data.

A summary of the EMS is provided on the following pages, focusing in more detail on how this is applied to the management of sludge treatment operations.

Scope and Policy

The YW EMS has been certified to ISO 14001 since 2004. The certified EMS scope covers:

"The management and operation of clean and waste water assets and associated services".

YW's top level commitment to environmental and quality performance can be found in the Quality & Environmental Policy; a copy of the policy is provided as Appendix 3.

Quality and Environmental Policy

Chief Executive of Yorkshire Water Services Ltd approves and is **accountable** for implementation

Responsibility of **all employees** to comply

Covers **all YW activities**, including Aldwarke STF, and applies to all individuals who are employed by, or carry out work on behalf of YW including contractors, temporary staff and agency workers

Key Roles and Responsibilities

YW has a central team responsible for the implementation of the overall IMS; the YW Bioresources team are responsible for maintaining ongoing compliance and managing the Aldwarke STF.

YW personnel have role statements which provide details of the responsibilities and accountability of individual roles.

Planning Actions

YW has established appropriate forums and mechanisms for the identification and management of risk, including senior leadership teams and governance groups. Actions are cascaded throughout the organisation as appropriate.

In relation to environmental issues, climate change risk assessments are carried out as well as consideration of extreme weather and climate resilience work. Environmental aspects and impacts have been identified and are recorded using the company's software platform for recording risks (currently the '4Risk' system).

YW is committed to comply with all relevant legislation, regulations and any other requirements to which the organisation subscribes. Legislation is analysed so that its relevance to the activities, aspects, products and services of YW are understood, communicated and applied. Registers of relevant legislation and other requirements are maintained and managed via the Evaluation of Compliance (EoC) process held on SharePoint.

Management requirements that arise from risk assessments and evaluation of compliance processes are taken into account in planning operational control and emergency preparedness procedures.

General Operational Controls (Environmental)

Operational facilities, including Aldwarke STF, are managed in accordance with procedures laid down within the EMS. This includes procedures to identify and control environmental issues arising from YW's activities, including specific environmental permit requirements.

Procedures specify environmental best practice requirements, including for example storage of chemicals and oils within a bund (with 110% capacity) which must be maintained in good condition, located inside a building wherever possible, on hardstanding and away from watercourses and site drains.

Waste must be segregated appropriately, and waste containers must be in good condition and located on impermeable hardstanding. Waste storage periods must be minimised in order to prevent unnecessary accumulation of stored wastes and to prevent deterioration of the waste or their containers which may lead to accidents or incidents with environmental consequences.

Procedures are in place to ensure waste 'duty of care' requirements are met including ensuring that waste is only removed from site by contractors properly licenced and approved for use and accompanied by a fully completed waste transfer or hazardous waste consignment note. Waste transfer and consignment note records are retained electronically or as paper copies on site.

YW has developed a biodiversity policy, underpinned by specific processes and procedures, to deliver programmes of work that aim towards a biodiversity net gain. This policy is applicable to contractors delivering work on behalf of YW.

Maintenance (Planned)

A planned maintenance system is in operation at Aldwarke STF covering all electrical and mechanical equipment and calibration of instrumentation and control system. A list of all plant items is stored on the Asset Inventory System (AI2) and the frequency, scope and records of planned maintenance and calibration are stored on SAP. Job cards for planned maintenance are produced through the SAP system giving the necessary work instruction. Planned maintenance requirements are initially based on recommendations provided in Operations and Maintenance (O&M) manuals.

Total Care Plans (TCPs) are produced for all sites and are reviewed at set intervals. TCP reviews set future planned maintenance frequency, the work to be carried out during the planned maintenance and identifies critical and life expired plant items. This is based on the review of the plant item's history and on condition monitoring results.

An inspection and testing programme for above and below ground vessels, pipes and valves is in place. This programme of work to detect any deterioration or weakness of assets typically incorporates a combination of visual examinations and non-destructive testing (e.g. ultrasonic thickness measurements). The frequency of inspection is in accordance with risk-based requirements, which also varies according to the condition of the asset. A clear process to address any identified defects, with assigned responsibilities, is in place.

In addition to planned maintenance activities described above, a programme of daily, weekly and monthly visual inspections and checks are undertaken. This includes, for instance, visual inspections of general site condition and housekeeping including spills and biogas leaks, checks for abnormal heat, noise and vibration, checking the operation of pumps and monitoring instrumentation, checking calibrations are in date etc. Any abnormal observations are recorded in the site logbook.

Odour checks are carried out in accordance with the Odour Management Plan (see Appendix 10).

The designated Technically Competent Manager (TCM) will undertake monthly inspections of the site to identify any potential issues and arrange resolution as necessary. These inspections are recorded and the information is retained by YW.

Maintenance of the CHPs, boilers and de-watering plant are undertaken by specialist contractors. All activities are closely managed from site to ensure that all YW H&S and environmental policies are met. Regular maintenance of plant such as the CHP engines are undertaken in accordance with requirements specified by the equipment manufacturer including routine planned inspections and more in-depth servicing. The frequency of servicing is based on a combination of running hours and condition monitoring data. CHP contractors are on site regularly whilst boiler maintenance normally requires attendance on a less frequent basis. Maintenance contracts include provision for reactive/emergency activities and management of spares.

Processes on site operate continuously, 24-hours per day, 7-days per week, apart from maintenance periods. The plant is designed to operate unattended with process parameters being monitored continuously. Operating logs are stored electronically.

Maintenance (Reactive)

Plant breakdowns are responded to on the basis of a risk assessment matrix (RAM) and prioritised according to consequence of failure and likely time to failure occurring. Amongst other attributes, the RAM takes into account impact to environment, health and safety, cost and flooding.

Site operational staff are responsible for requesting breakdown maintenance and repairs. Any reactive work that achieves a high priority on the RAM is called through to the Engineering Service Desk for progression. These jobs are treated as 'schedule busters' and are progressed accordingly.

Records of all maintenance (planned and reactive) and calibration are retained on the SAP work management system.

Waste Characterisation (Pre-acceptance & Acceptance)

There are waste acceptance procedures that deal with the trade waste that is being treated through the WwTW. Some traders may also be subject to trade effluent consents.

All sludges arriving at Aldwarke STF are either indigenous primary and secondary sludges from the Aldwarke WwTW or imported liquid sludge from other YW sites. As a result, the composition of the sludge is very stable, consistent, and is well understood. The volume and source of imports to the STF is recorded by WaSP loggers. These also ensure that only appropriately authorised drivers can discharge at Aldwarke STF. All sites supplying sludge to Aldwarke have been reviewed to ensure that the typical sludge they produce is suitable and safe for anaerobic digestion. Sludge production problems are rare, but operators and tanker drivers are trained to identify contaminated sludges at source and stop them being transferred to the digestion site. Spot checks are carried out on imported sludges to ensure they are within acceptable parameters and safe for the digestion process.

With regard to the potential for septic sludge imports to be received into the STF via the import route, the exporting site Operator would inform the Logistics co-ordinator. The Logistics co-ordinator would then call the STF Optimisers across the region and find a receiving STF site that could cope with the sludge waste.

The following factors would be key considerations for the Optimiser on whether to accept or reject that waste:

- What the digester performance is like and whether the digester is experiencing any foaming issues. Foaming can be indicative of poor digester health and therefore a subnormal sludge load would not assist in this digester health. The load would likely be rejected in this instance.

- If the WwTW was experiencing any planned or unplanned maintenance on any key assets (activated sludge lanes, aerators etc.). Downtime of an WwTW asset can affect the final effluent performance. In this instance, the decision may be taken to reject any subnormal sludge load into the STF as the risk of high strength liquor returns into the WwTW may not be risked.
- The STF Optimiser may request samples in advance of the delivery of any subnormal load to look at the concentration of the BOD and COD load. This would be done from the holding tank at the exporting sludge site. The strength would determine whether the receiving STF was to accept the tanker load or not.

All cake (digested sludge) exported from Aldwarke has to meet stringent HACCP requirements, including regular sampling to assess safety.

Emergency Preparedness and Response

YW has developed processes to identify, respond to and control emergency situations that may cause adverse environmental consequences. Spill kits are readily accessible at locations where there is a risk of spillage (e.g. delivery, storage and areas of use). Spill control toolbox talks are provided to staff. This includes information about how to prevent and control pollution incidents from accidental spills of oils, fuels, sludge and chemicals.

Contingency plans help minimise potential environmental impacts; this includes emergencies arising from breakdowns, enforced shutdowns, abnormal circumstances such as flooding as well as major fire and spill/loss of containment events. Refer also to the Accident management plan (see Section III; C2, Q 6-7) and the Secondary Containment Risk Assessment (Appendix 11).

The YW Business Continuity Plan is in place to define and prioritise critical business functions, details the immediate response requirements for a critical incident and details strategies and actions to be taken to ensure business continuity. All Bioresources sites, including Aldwarke STF, have the capability of remote monitoring and remote operation of key functions. The site is manned 8 hours per day Monday to Friday and CCTV security cameras are located across the site with monitoring provided 24/7 by the YW Service Delivery Centre. All buildings are alarmed and high-risk equipment is provided with secondary fencing for added security.

Monitoring

Process monitoring is undertaken for all key processes on site. This includes monitoring of operational parameters of plant and equipment to ensure it is operating effectively and efficiently. Further details are provided in Section II Technical Description and in Section III, Form C3, Question 4a.

YW will undertake any air emissions monitoring, including emissions from the CHP/boiler stacks, in accordance with permit requirements (where applicable). Further details are provided in Section III, Form C3, Question 4a. Odour monitoring is described in Appendix 10: Odour Management Plan.

Environmental performance monitoring includes monitoring electricity and gas use, biogas generation, electricity generation, water use and waste arisings. Further details are provided below in Section III, Form C3, Questions 6a, b, c, d and e.

Training, Awareness and Competence

YW maintains processes to ensure that all those working for or on behalf of YW are suitably trained to fulfil their roles efficiently. Assessment of competence and identification of individual training needs is carried out through mutual discussion between the individual and their manager as part of the company performance management process, a fundamental part of which is the competency framework and progression plans which are available for every role in the organisation.

All YW employees receive IMS awareness training, delivered online at induction and periodically thereafter. This includes awareness of the environmental policy and understanding key environmental hazards and risks and the need to comply with IMS requirements.

Staff who work at Aldwarke STF receive specific training in the plant's operation and the potential environmental impact of the process as well as health and safety. Plant operators have a detailed understanding of the operational procedures for the site for both normal and abnormal operation. As part of the training, operators will receive specific instructions relating to those aspects of plant operation that have the potential for a negative impact on the environment. Toolbox talks are used to provide information and training to site staff, including information about environmental requirements/activities and legislative and compliance requirements. Training records for programmes and courses managed centrally are held on the company Learning Management System. Records for specific training managed locally at the Aldwarke site is held by individual managers and/or on the Learning Management System.

Communication

Communication plans are in place to communicate business performance based on the company's 'Big Goals', company objectives and performance commitments, aligned to the quality, safety, environmental and asset management requirements.

The company intranet, called the Hive, provides regular news updates for YW personnel and holds a wide range of information that employees can access. Other key communication channels include regular corporate newsletters, business unit-specific newsletters, and update sessions and events held by senior business leaders. 'Safeguard' communications are used to issue notifications such as Safety Alerts, Toolbox Talks and Lessons Learned from incident investigations to personnel across the business.

At the Aldwarke STF site-level environmental information is communicated primarily via toolbox talks and noticeboards.

Contractors

YW has specific procedures in place for the management of contractors regarding health, safety and environmental requirements. This includes procedures to ensure contractors have the required skills and environmental competencies to carry out works at this site. Initially, contractors are assessed by the procurement department for inclusion on the approved supplier list, which includes health and safety and environmental criteria, for example, waste documentation such as waste carrier's licence/training certificates. Even when contractors are on the approved supplier list, they are still further assessed for each specific contracted activity. The contractor is required to submit a risk assessment method statement (RAMS) prior to any commencement of work, identifying how work is to be undertaken and the associated risks. The RAMS must be approved by the Site Manager or an assessor who is competent at reviewing a RAMS, who will also identify any site hazards and issue an Authorisation to Work/Enter the site, following a site induction. When on-site, the contractor must carry this Authorisation to Work at all times. Contractors must also complete a site induction, which remains valid for up to a year, covering health, safety and environmental requirements whilst on site.

Environmental Improvement

Yorkshire Water's IMS objectives are documented with the 'Big Goals' and 'Performance Commitments' which are available and communicated via the company intranet. Planning to achieve IMS objectives is monitored and reported internally (via Performance Zone) and externally (via the Annual Report).

Aldwarke STF has daily and weekly performance targets including sludge throughput, gas quality, electricity generation and electricity consumption targets. Performance against these targets is reviewed at daily meetings and corrective actions taken as required.

The EMS is subject to periodic Senior Management Reviews to consider environmental performance, objectives and targets and continual improvement.

The Innovations Team at YW undertakes regular monitoring and review of new and innovative technologies and equipment to ensure the business continually improves its operations and activities. This includes consideration of cleaner technologies and improved environmental performance. Sectoral and cross-section benchmarking also takes place as required.

Incidents, non-compliance and complaints

Processes have been developed by YW to identify, respond to and control situations that may cause actual or potential non-conformities. Non-conformities may be identified through internal audits/inspections or may be detected through other means. Incidents are managed in accordance with the Incident Management policy and procedures and Emergency Planning manual. In the event of a significant incident a root cause analysis is conducted. Actions are identified, reported, recorded and communicated to prevent reoccurrence.

Complaints are typically received by YW central Customer Services team, where all complaints are logged on the ICE system. Complaints relevant to Aldwarke STF are passed on to the Site Manager for further investigation. The Site Manager is responsible for ensuring that any complaint is investigated and, if found to be justified, that work is undertaken to resolve the issue, including liaising with the relevant regulatory bodies where appropriate. The Customer Service Team ensure an appropriate response to the complainant in a timely manner including, if and as appropriate, detailing the reason behind the issue and the actions taken to resolve the matter.

All complaints information is recorded on the ICE system in order that this can be monitored, reviewed and analysed.

Auditing

YW operates an internal audit programme delivered by trained internal auditors or suitably qualified external consultants or contractors. This includes the following:

- IMS auditing/inspections undertaken by the IMS Team.
- Regular combined quality, health and safety and environmental inspections performed at all operational sites, including Aldwarke STF.
- Assurance and improvement programme to ensure the health, safety, environmental and technical compliance of contractors delivering capital schemes.
- Audits of contractors delivering repair and maintenance activities.

YW is also subject to regular audits by external auditors to ensure continuing adherence to ISO 14001 requirements.

Management Review

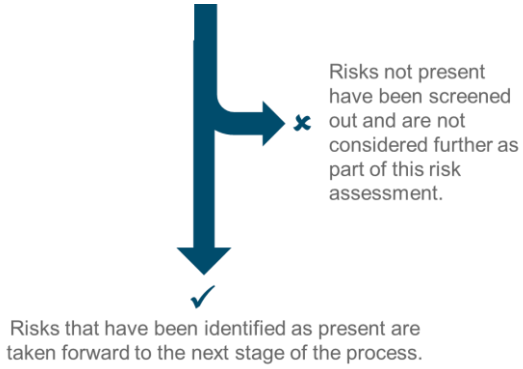
A formal Management Review of YW's IMS is undertaken and recorded at least once a year. The purpose of these meetings is to ensure the IMS' continuing suitability, adequacy and effectiveness as well as to assess opportunities for improvement and the need for changes to the management system, including the policy and objectives.

6 Environmental risk assessment

A review of environmental risks associated with activities covered by the scope of this permit application has been carried out. This review follows EA guidance on risk assessments for environmental permits[1] and adopts the approach outlined below:

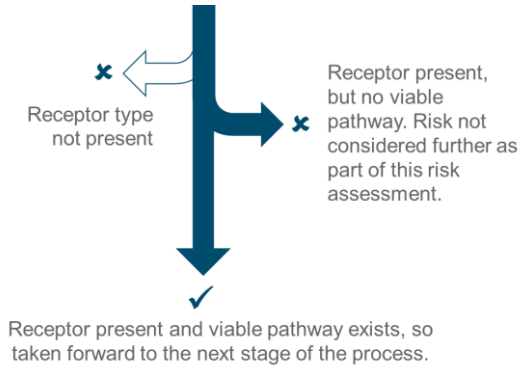
1. Identify and consider risks, and the sources of the risks, and assess whether these require further assessment or can be screened out. Only risks arising from processes that are within scope of this permit variation have been considered.

⇨**Table C2: 6-1**



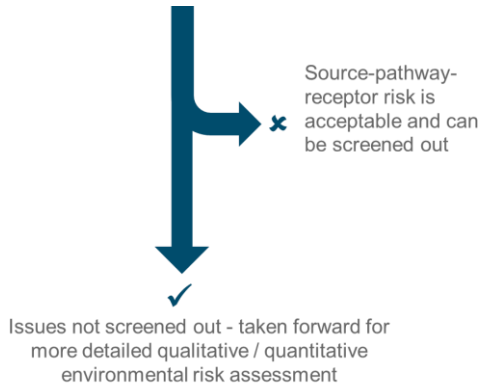
2. Identify and review the receptors (people, animals, property, vegetation and anything else that could be affected by the hazard) at risk. Within each receptor category, the closest receptor(s) has been identified along with possible pathways to link the receptor to the credible site risks from Stage 1.

⇨**Table C2: 6-2**



3. Assess risks relevant to the specific activity and check they are acceptable and can be screened out –provides a summary of the risk-pathway-receptor assessment.

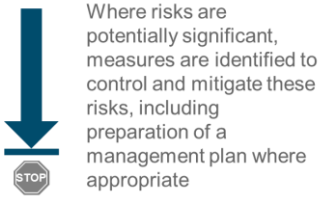
⇨**Table C2: 6-3**



4. Qualitative and quantitative risk assessments for risks which cannot be screened out.

⇨**Q 6-1 to 6-8**

⇨**Appendices 7, 8 and 9**



[1] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit (accessed February 2021)

Table C2: 6-1: Identification of Environmental Risks

Identified risk area		Sources on site	Discussion	Identified risk
	Odour	Air extraction stacks, fugitive releases from tanks and processing facilities, sludge cake storage	There are potential odour sources and fugitive emissions from covered tank vents and uncovered tanks including, thickener feed tanks, digester feed tanks and centrifuge feed tanks. Displaced air (odour) from the drum thickeners and gravity belt thickener is extracted and released to air via stacks. Odour emissions (fugitive) from digested sludge and cake handling facilities are low.	✓ Further review
	Point source emissions to air from fuel combustion	CHPs, boilers, waste gas burner (flare)	Biogas generated by the digester is used as the sole fuel source for the site CHPs; boilers (biogas or gas oil) are available for use as an alternative heat source for the digesters. In periods where the CHPs and boilers are unavailable, or biogas generation exceeds boiler / CHP combustion capacity, biogas is directed to the waste gas burner.	✓ Further review
	Point source emissions to air. Emissions deposited from air to land	Air extraction stacks	Processing of sewage sludges can result in emissions of various compounds with potential human health or ecological impacts. These include Volatile Organic Compounds (VOCs), hydrogen sulphide (H_2S), ammonia, methane and other organics including mercaptans. Point source emissions of these compounds arise from air extraction vents from sludge thickeners. Adopting a precautionary approach, these emissions have been further reviewed. These compounds can also be highly odorous; this aspect is considered separately.	✓ Further review
	Noise	Motors, pumps, blowers, compressors, conveyors, vehicle movements, site personnel CHP, boiler, waste gas burner	Noise sources on site include the CHPs, boilers, waste gas burner, vehicle movements (for sludge cake handling), draught fans associated with air extraction, rotating screens, compressors and air-cooled radiators. Procedures are in place to ensure effective planned maintenance and minimisation of noise and vibration from noise sources associated with sludge treatment and handling facilities.	✓ Further review
	Fugitive and diffuse emissions	Tanks, pipework and containers used for storage, treatment and digestion of sludge	Anaerobic digestion tanks are fully sealed and biogas is captured and transferred to CHPs, boilers and/or flare (see point source emissions to air). Raw and digested sludge is contained in uncovered tanks and has the potential for fugitive emissions, including Volatile Organic Compounds (VOCs), hydrogen sulphide (H_2S), ammonia, methane and other organics including mercaptans. These compounds can also be highly odorous; this aspect is considered separately. Planned maintenance and leak detection and repair programme in place in respect of fugitive emissions.	✓ Further review

Identified risk area		Sources on site	Discussion	Identified risk
	Bioaerosols	Storage and handling of sludge	Raw sludge is contained in uncovered tanks and has the potential for fugitive emissions. Displaced air from the drum thickeners and gravity belt thickener is extracted and released via vent stacks. Digested sludge has been subject to high temperatures and treatment to kill pathogens, and disturbance of cake on the cake pad is minimal, other than initial delivery to the pad and subsequent removal from the pad. Raw and digested sludge has a high water content (approx. 60% after thickening). Potential for generation of dust and bioaerosols from these sources is limited but further review is required.	✓ Further review
	Accidental Releases	All areas / all activities	Emergency/unplanned events have the potential to result in abnormal emissions of odour, noise, or emissions to air, land or water. This includes spillages of potentially contaminative liquids e.g. sludge, chemicals, oils and releases of biogas.	✓ Further review
	Point source emissions to sewer	Surface water run-off, cleaning washwater and liquor from raw sludge thickening and digested sludge dewatering facilities	All process liquids, cleaning washwater and surface water runoff is returned to Aldwarke WwTW (outside of the scope of this permit application) for treatment prior to discharge to the River Don.	✓ Further review
	Adapting to climate change	All areas / all activities	Required only for new bespoke permit applications.	✘ Not considered further
	Point source emissions to surface, groundwater and land	None	There are no direct point source emissions to surface water, groundwater or land within the scope of the permit (refer to Figure 4: site drainage plan and Form C3, Question 2 Point source emissions to water). All process liquids and surface water runoff is returned to Aldwarke WwTW for treatment prior to discharge to the River Don. Risks associated with accidents and other planned incidents are considered separately.	✘ Not considered further
	Visible plumes	CHPs, boilers, waste gas burner	The nature of the combustion sources is such that plume moisture levels will be low and thus in normal operations, and for the majority of weather conditions, plume visibility is expected to be very low.	✘ Not considered further

Identified risk area		Sources on site	Discussion	Identified risk
	Litter	Storage and handling of sludge in open air	The nature of waste treated on site does not result in litter.	✘ Not considered further
	Vermin and Pests	Storage and handling of sludge in open air	The activities within the installation do not give rise to significant pest or vermin issues.	✘ Not considered further
	Dust	Storage and handling of sludge in open air	The facility handles wet wastes which do not result in dusts.	✘ Not considered further
	Global warming potential	CHPs, boilers, waste gas burner, sludge storage tanks	Anaerobic digesters generate biogas which is used in the CHP to generate electricity (used within the installation) as well as heat required for the digesters. Further energy information is provided in a detailed response to Q 6 of Form C3. Emissions of methane may also arise from unsealed sludge holding tanks and fugitive emissions of biogas. Post digestion dewatering feed tanks are uncovered and are aerated in order to inhibit methane generation. This issue is considered in the 'fugitive and diffuse emissions' risk area above.	✘ Not considered further

Table C2: 6-2: Identification of sensitive receptors and pathways

Receptor type	Receptor description and distance	Pathway	Possible pathway from source							
			Odour	Air - combustion	Air -non combustion	Noise	Fugitive / diffuse	Bioaerosol	Accidental releases	Sewer
Human										
Residential housing – North	Nearest residential property located approximately 800 m to the north west of the installation boundary.	Airborne	✓	✓	✓	✓	✓	✗	✓	✗
Residential housing – East	Nearest residential property located approximately 450 m to the south east of the installation boundary.	Airborne	✓	✓	✓	✓	✓	✗	✓	✗
Residential housing – South	Nearest residential property located approximately 350 m to the south of the installation boundary.	Airborne	✓	✓	✓	✓	✓	✗	✓	✗
Residential housing – West	Nearest residential property located approximately 100 m west of the installation boundary.	Airborne	✓	✓	✓	✓	✓	✓	✓	✗
Public amenity areas	A public footpath is located adjacent to the south of the installation. The River Don is located approximately 25 m to the south, at its closest point. The River Don Navigation, including lock gates, cottage and canal boats is located approximately 350 m west. The Silverwood Miners' Welfare Sports Ground is located approximately 450 m east of the installation boundary, Aldwarke Sewage Works Local Wildlife Site (LWS) to the north, west and south, at its closest point is adjacent to the north of the installation.	Airborne Surface water Groundwater	✓	✓	✓	✓	✓	✓	✓	✗
Schools	There are 23 schools within approximately 2km of the installation. The nearest of these is approximately 600 m to the south east.	Airborne	✓	✓	✓	✓	✓	✗	✓	✗

Receptor type	Receptor description and distance	Pathway	Possible pathway from source							
			Odour	Air - combustion	Air -non combustion	Noise	Fugitive / diffuse	Bioaerosol	Accidental releases	Sewer
Hospitals / healthcare facilities	Shakespeare Road Medical Centre is located approximately 900 m to the south west. There are two health centres located approximately 1.4 km and 2 km to the north west and south west respectively. A rehabilitation centre is located approximately 1.4 km to the south of the installation boundary.	Airborne	✗	✗	✗	✗	✗	✗	✓	✗
Industrial / commercial sites	There are multiple industrial / commercial sites surrounding the installation in all directions, the closest (excluding the WwTW) is approximately 70m to the east of the installation boundary at the closest point.	Airborne	✓	✓	✓	✓	✓	✓	✓	✗
Ecological										
Habitat sites – statutory designations	There are no statutory designations within 10 km of the installation boundary.	Airborne	✗	✗	✗	✗	✗	✗	✗	✗
Habitat sites – local sites and non statutory designations	There are a number of other designated habitat sites within 2km of the installation boundary. These include: • Aldwarke Sewage Works Local Wildlife Site (LWS) to the north, west and south surrounding the installation, at its closest point is adjacent to the north of the installation. • Thrybergh Tip LWS is located approximately 1.8km to the north east at its closest point. • Listerdale Wood LWS is located approximately 1.8km to the south east. • New Stubbin Colliery and Stubbin Incline LWS is approximately 1.8km to the north east.	Airborne Surface water Groundwater	✗	✓	✓	✗	✓	✗	✓	✗

Receptor type	Receptor description and distance	Pathway	Possible pathway from source							
			Odour	Air - combustion	Air -non combustion	Noise	Fugitive / diffuse	Bioaerosol	Accidental releases	Sewer
Protected species	Possible presence of protected species on or off site. NB Releases to sewer could only indirectly impact protected species e.g. in the event of a failure of the treatment process outside of the installation boundary.	Airborne Surface water Groundwater	✗	✓	✓	✗	✓	✗	✓	✓
Environment – Other										
Global / regional atmosphere	Regional and global atmosphere.	Airborne	✗	✓	✓	✗	✓	✗	✓	✗
Ground / groundwater	Underlying groundwater classed as a Secondary A aquifer within superficial deposits and bedrock geology; groundwater vulnerability is classed as Medium - High; the installation is not located within a groundwater Source Protection Zone or a groundwater drinking water safeguard zone. NB Releases to sewer could only indirectly impact ground/groundwater e.g. in the event of a failure of the treatment process outside of the installation boundary.	Unmade ground / infiltration / percolation	✗	✗	✗	✗	✗	✗	✓	✓
Surface water	At its closest point the River Don is located approximately 25 m to the south of the installation boundary and is also continuously present to the south at varying distances up to approximately 190 m at its furthest point. It is considered likely that there will be hydraulic continuity between underlying groundwater and the surface water features. NB Releases to sewer could only indirectly impact surface water e.g. in the event of a failure of the treatment process outside of the installation boundary.	Overland runoff / infiltration / percolation	✗	✗	✗	✗	✗	✗	✓	✓

Table C2: 6-3: Assess risks: screening assessment

Table C2: 6-3 below sets out the screening assessment for environmental risks.

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Odour	⇨	Airborne	⇨	Residential land use – north, south, east and west Public amenity areas close to the site. Schools – closest to site Industrial / commercial sites	There are a number of odour sources on site including uncovered thickener feed tanks, digester feed tanks, centrifuge feed tanks sludge cake storage. Air vented via stacks from the drum thickeners and the GBT. Further assessment is required.	**Yes – odour risk assessment is summarised in response to Q 6-2 below. Full assessment is included as Appendix 8.**
Point source emissions to air from fuel combustion	⇨	Airborne	⇨	Residential land use – north, south, east and west Public amenity areas close to the site. Schools – closest to site Industrial / commercial sites Habitat sites – non statutory designations Protected species Global / regional atmosphere	Biogas generated by the digesters is used as the sole fuel source for the CHPs. The CHPs generate electricity for use on site and waste heat is used to maintain the temperature of the digesters. In periods when the CHPs are not available or supplementary heat is required then boilers (dual fuel: biogas or gas oil) may be used to provide heat for the digesters. Any excess biogas which cannot be used by either the CHPs or boilers is sent to the waste gas burner (flare). An air quality impact assessment, including air dispersion modelling is therefore required in order to assess the significance of emissions to air from the process on potentially sensitive receptors, against relevant air quality standards and assessment levels.	**Yes – air quality impact assessment is summarised in response to Q 6-3 below. Full assessment is included as Appendix 7.**

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Point source emissions to air from vent stacks – ammonia / H_2S / other organics	⇨	Airborne	⇨	Residential land use – north, south, east and west Public amenity areas close to the site. Schools – closest to site Industrial / commercial sites Habitat sites – non statutory designations Protected species Global / regional atmosphere	Off gases and vapours from thickeners which are extracted and discharged via stacks can contain substances potentially harmful to human health (e.g. H_2S) and also substances which can contribute to nutrification of habitat sites (ammonia). Odour is considered separately.	**Yes – a review of emissions of substances from point sources (excluding odour and combustion) is summarised in response to Q 6-4 below.**
Noise	⇨	Airborne	⇨	Residential land use – north, south, east and west Public amenity areas close to the site. Schools – closest to site Industrial / commercial sites	There are fixed and mobile noise sources within the installation. Whilst these are not considered to represent a significant contribution to off-site noise levels, there remains some potential to affect the identified off-site receptors and therefore further assessment is required.	**Yes – qualitative risk assessment is summarised in response to Q 6-5 below. Full assessment is included as Appendix 9**
Fugitive / diffuse emissions – ammonia / H_2S / methane / other organics	⇨	Airborne	⇨	Residential land use – north, south, east and west Public amenity areas close to the site. Schools – closest to site Industrial / commercial sites Habitat sites – non statutory designations Protected species Global / regional atmosphere	Off gases and vapours from uncovered tanks can contain substances potentially harmful to human health (e.g. H_2S) and also substances which can contribute to nutrification of habitat sites (ammonia). Digested sludge cake is stored on the cake pad is considered a less significant source of these compounds. Odour is considered separately. It is recognised that methane is also a potentially significant issue in the sector. A leak detection and repair plan is in place in respect of fugitive emissions.	**Yes – a review of diffuse emissions (excluding odour) is summarised in response to Q 6-4 below. In relation to fugitive emissions, proposed BAT controls include a leak detection and repair plan – Refer to Form C3 Q3b and Appendix 13**

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Bioaerosols	⇨	Airborne	⇨	Residential land use – south Public amenity areas close to the site. Industrial / commercial sites	There is residential land use located within 250 m of the site to the west. Other receptors within 250 m of the installation include public amenity and recreational use and a number of industrial and commercial sites. Whilst EA guidance does not consider AD as a significant source it is recognised that there are some potential bioaerosol sources within the installation (e.g. uncovered tanks and cake pad). As a precautionary principle a risk assessment has been undertaken.	**Yes – impact assessment is provided in response to Q 6-6 below.**
Accidental Releases	⇨	Airborne Overland runoff / infiltration / percolation	⇨	Residential land use – north, south, east and west Public amenity areas. Schools and hospital / healthcare facilities Industrial / commercial sites Habitat sites – non statutory designations Protected species Global / regional atmosphere Ground / groundwater Surface water	Pollution prevention infrastructure, operational control and management techniques (including as part of the EMS) are in place to prevent accidents and other unplanned events with environmental consequences, or, in the event that these do occur to minimise or mitigate the environmental impacts.	**Yes – accident management plan is provided in response to Q 6-7 below**
Point source emissions to sewer	⇨	Release to River Don via WwTW Infiltration / percolation	⇨	Protected species Ground/groundwater Surface water	All process liquids, cleaning washwater and surface water runoff is returned to Aldwarke WwTW (outside of the scope of this permit application) for full treatment prior to discharge to the River Don.	**Yes - YW is committed to undertaking a period of monitoring in order to characterise the liquors returned to the WwTW. Further detail is provided in response to Q 6-8 below.**

Q 6-1 Habitat sites risk assessment

There are no statutory designations within 10 km of the installation.

There are no Sites of Special Scientific Interest (SSSI) within 2 km of the installation, although the following Local Wildlife Sites (LWS) have been identified: Aldwarke Sewage Works LWS is located to the north, west and south of the installation. At its closest point this site is adjacent to the northern installation boundary; Thrybergh Tip is located approximately 1.8 km to the north east at its closest point; Listerdale Wood is located approximately 1.8 km to the south east; and New Stubbin Colliery and Stubbin Incline is approximately 1.8 km to the north east.

The accidents risk assessment (Q 6-7 below) and Site Condition Report (Appendix 5) consider the potential for effects on designated sites as a result of emissions to water or groundwater.

Potential effects on designated sites associated with emissions to air from combustion sources have been considered in the air emissions risk assessment (Appendix 7). Diffuse and point source (non-combustion) emissions of organic substances are considered in response to Q 6-4 below. A leak detection and repair plan is in place in respect of fugitive emissions (further detail is provided in response to Q 6-8 below).

Q 6-2 Summary of the Odour Risk Assessment

A qualitative odour risk assessment has been undertaken to assess the risk of odours from Aldwarke STF on the surrounding area (included in full as Appendix 8). The assessment has considered thirteen process activities across the STF and potential odour effect on sixteen receptors. The assessment has been based on a Source-Pathway-Receptor approach and is primarily based upon professional judgement. The assessment concludes that, of the sensitive receptors identified for the purposes of the assessment, twelve are exposed to a negligible adverse odour effect and four are exposed to a slight adverse effect. No receptor is exposed to a moderately adverse odour effect or worse and therefore the odour effect of the site is considered not significant.

The YW complaints log recorded no odour complaints over the last five years for the site as a whole (i.e. the YW Aldwarke WwTW and STF).

Q 6-3 Summary of the Air Emissions Risk Assessment

An Air Emission Risk Assessment (AERA) utilising atmospheric dispersion modelling has been undertaken to support this application. The scope of the assessment is limited to the point source combustion emissions to air at the installation, specifically biogas combustion plant comprising two CHP units and two boilers. The biogas flare which is only used for occasional / emergency purposes was screened out of the assessment.

The AERA report (included in full as Appendix 7) outlines the approach, methodology and results in full. A number of worst-case assumptions were used to ensure a conservative assessment, including continuous operation of the boilers and CHPs (which is not a typical real world operating scenario). The results of the assessment have been interpreted in accordance with the requirements of the EA to identify if impacts represent 'significant pollution' as required by the EA to determine an EP application. The AERA has been undertaken in accordance with relevant legislation, policy and guidance.

Emissions of NOx (in the form of nitrogen dioxide (NO_2)) and SO_2 were assessed against the relevant Air Quality Standards for NO_2 and SO_2 for the protection of human health. An assessment was also carried against the relevant Critical Levels (C_{Le}) for NOx and SO_2, and Critical Loads (C_{Lo}) for nitrogen and acid deposition which are designed for the protection of designated ecological sites.

The assessment concludes that, in relation to human health, where impacts are not classified as 'insignificant' (i.e. process contribution (PC) less than 1% of the EAL for long-term concentrations or 10% for short-term) the predicted impacts of the installation do not lead to any exceedances of Environmental Assessment Level (EALs) and do not constitute 'significant pollution'.

In relation to the impact of the installation on ecologically sensitive sites, at all locally designated sites, the predicted PCs from the installation are less than 100% of the applicable annual C_{Le} or C_{Lo}. There are no international or national designated sites within the relevant AERA screening distances. Therefore, the impacts of the installation are considered 'insignificant' at all designated ecological sites.

Q 6-4 Review of emissions of substances from diffuse and point sources (excluding odour and combustion)

It is recognised that emissions of organic compounds may arise from uncovered sludge sources (including uncovered tanks and the cake pad) as well as from the air extraction stacks associated with the sludge thickeners. This includes ammonia, hydrogen sulphide, volatile organic compounds (VOCs) and methane. Odour is considered separately (refer to Appendix 10 – Odour Management Plan). Furthermore, it is noted that BAT conclusion 14d specifies that diffuse emissions should be contained, collected and treated. Table C2: 6-4 provides results of emissions monitoring at key locations and summarises the BAT assessment undertaken.

Table C2: 6-4: Review of diffuse and point source emissions

Table C2: 6-4 below sets out the BAT assessment for emissions of organic compounds from uncovered and unabated sludge sources.

Sludge source	Monitoring data		Existing emissions controls	BAT assessment
Sludge screens	No data – facility is not currently operational		Sludge screens are covered / contained. Residence time and hours of operation of the intake sludge screens is limited (each delivery is processed within approximately 15 mins; approximately 4 – 8 deliveries per day) and therefore emissions are not considered to be significant.	BAT in place. No further mitigation is proposed.
Sludge intake wet well	No data – facility is not currently operational		Below ground sump, covered and small footprint; sludge is contained but passive emissions arise via vent.	No further mitigation is proposed at this stage as wet well not currently in use. The need for emissions abatement will be assessed as part of the planned intake facility refurbishment / replacement scheme.
Thickener feed tanks	H_2S (ppm)	0.41	Mixing is used to: • promote aerobic conditions to inhibit methane generation. • prevent settlement and reduce likelihood of septic conditions developing. Operator control of tank mixing allows selection between continuous and intermittent operation. This allows the operator to manage the degree of mixing necessary to inhibit methane and septic conditions whilst avoiding unnecessary agitation of the tank contents reducing the dispersal of gases from tank head space. Sludge typically stored for no longer than 24 hours before thickening to reduce likelihood of septic conditions developing.	BAT not in place. YW will undertake an options appraisal of measures to cover undigested sludge tanks (i.e. thickener feed tanks and digester feed tanks). This includes an engineering assessment of the viability of retrofitting a fixed roof and undertaking trials of floating media (either balls or plastic plates) as an alternative approach to tank covering for existing uncovered tanks. Proposals to cover undigested sludge tanks at Aldwarke will be developed once these investigations and trials have been completed. Refer to Proposed Improvement Programme.
	Ammonia (ppm)	<0.1		
	Total VOCs (ppm)	0.3		
Drum thickeners	No data available.		Thickeners are contained and located within a building. Sludge passes through thickeners quickly, limiting potential for septicity to develop.	BAT in place (see below for BAT assessment for extraction and dispersion stack)
Drum thickeners – air extraction and dispersion stack	H_2S (ppm)	31.8	Active extraction and release of gases via a 5m high stack promotes dispersion of gases reducing potential for odours and health impacts.	BAT not in place. YW will install an OCU at this stack. Refer to proposed improvement programme.
	Ammonia (ppm)	<0.1		
	Total VOCs (ppm)	7.1		

Sludge source	Monitoring data		Existing emissions controls	BAT assessment
Gravity belt thickener	No data available.		Thickener is contained and located within a building. Sludge passes through thickener quickly, limiting potential for septicity to develop.	BAT in place (see below for BAT assessment for extraction and dispersion stack)
Gravity belt thickener – air extraction and dispersion stack	H_2S (ppm)	31.8[2]	Active extraction and release of gases via a 5m high stack promotes dispersion of gases reducing potential for odours and health impacts.	BAT not in place. YW will install an OCU at this stack. Refer to proposed improvement programme.
	Ammonia (ppm)	<0.1[2]		
	Total VOCs (ppm)	7.1[2]		
Digester feed tanks	H_2S (ppm)	0.14	Mixing is used to: • promote aerobic conditions to inhibit methane generation. • prevent settlement and reduce likelihood of septic conditions developing. Operator control of tank mixing allows selection between continuous and intermittent operation. This allows the operator to manage the degree of mixing necessary to inhibit methane and septic conditions whilst avoiding unnecessary agitation of the tank contents reducing the dispersal of gases from tank head space. Sludge typically stored for no longer than 24 hours before digestion to reduce likelihood of septic conditions developing.	BAT not in place. YW will undertake an options appraisal of measures to cover undigested sludge tanks (i.e. thickener feed tanks and digester feed tanks). This includes an engineering assessment of the viability of retrofitting a fixed roof and undertaking trials of floating media (either balls or plastic plates) as an alternative approach to tank covering for existing uncovered tanks. Proposals to cover undigested sludge tanks at Aldwarke will be developed once these investigations and trials have been completed. Refer to Proposed Improvement Programme.
	Ammonia (ppm)	<0.1		
	Total VOCs (ppm)	0.3		
Digesters	No data – tanks are fully sealed.		Digesters are fully sealed with gases collected and combusted in CHP engines / boilers / flare. No diffuse emissions (see also Form C3 Q3b for summary of LDAR – leak detection and repair plan).	BAT in place.
Centrifuge feed tanks	H_2S (ppm)	0.01	Mixing is used to:	BAT not in place. Emissions of H_2S, ammonia and VOCs (and odour – refer to
	Ammonia (ppm)	0.5		

[2] Monitoring at GBT vent stack was not possible as the GBTs were not operational at the time of the sampling visit (due to maintenance work being carried out). Data for the drum thickener vent has been used as both thickener facilities draw from the same feed tank and therefore have the same characteristics.

Sludge source	Monitoring data		Existing emissions controls	BAT assessment
	Total VOCs (ppm)	0.3	• promote aerobic conditions to inhibit methane generation. • prevent settlement and reduce likelihood of septic conditions developing. Operator control of tank mixing allows selection between continuous and intermittent operation. This allows the operator to manage the degree of mixing necessary to inhibit methane and septic conditions whilst avoiding unnecessary agitation of the tank contents reducing the dispersal of gases from tank head space. Sludge typically stored for no longer than 48 hours before dewatering to reduce likelihood of septic conditions developing.	Odour Management Plan) are low as this is a digested sludge source. No data is currently available for methane emissions from these tanks but it has been identified that this requires further investigation. Therefore, an evaluation of biogas emissions from these tanks will be carried out and an options appraisal of measures to mitigate emissions will be undertaken. This includes consideration of options to capture the biogas from these tanks, digestion process changes and/or technologies to optimise biogas generation within the digesters.
Dewatering centrifuge	No data available.		Centrifuge is contained and located within a building. Centrifuge handles only digested sludge, which is inherently less odorous than raw sludge. Residence time and hours of operation of the centrifuge is limited and therefore emissions are not considered to be significant.	BAT in place: No further mitigation is proposed.
Cake pad	H_2S (ppm)	0.007 (fresh cake) 0.006 (stored cake)	Odour management techniques in use rather than specific BAT containment measures. Digested sludge only, which is inherently less odorous, during normal operating conditions. Disturbance of digested sludge is minimised, other than initial deposit of fresh cake onto the pad and subsequent transfer to windrows for storage and maturation.	BAT not in place. However, no further mitigation is proposed due to the low emissions of stored cake, and relatively low (and short term / lower volume) nature of emissions from fresh cake. The use of enclosed equipment or buildings is constrained by the volume of material.
	Ammonia (ppm)	3.8 (fresh cake) 0.6 (stored cake)		
	Total VOCs (ppm)	0.1 (fresh cake) <0.1 (stored cake)		
Return liquor sump	No data available.		Below ground sump, covered; sludge is contained but passive emissions arise via a vent. Due to the size of the sump, liquors are not stored and pass promptly to the WwTW to reduce likelihood of septic conditions developing.	Sump is covered and small footprint. No further mitigation is proposed.

Sludge source	Monitoring data		Existing emissions controls	BAT assessment
Return liquor balance tank	H_2S (ppm)	0.007[3]	Tank is covered and contains only liquor arising from digested sludge sources which is inherently less odorous than raw sludge. Measured emissions from this source are low (NB measurements taken from a wet well with cover removed. In practice fugitive emissions escaping from the covered tank are likely to be significantly lower). Liquors are typically stored for no longer than 24 hours before being returned to the WwTW to reduce likelihood of septic conditions developing.	Sufficient control is provided given lower odour generation potential of the source material (i.e. digested sludge liquor). This is supported by monitoring data. No further mitigation is proposed.
	Ammonia (ppm)	1.5[3]		
	Total VOCs (ppm)	<0.1[3]		

[3] Monitoring at the return liquor balance tank was not possible due to the significant height of this tank. The tank is covered. Therefore sampling was undertaken at the (covered) centrate wet well located adjacent to the cake pad, which directly feeds the return liquor balance tanks and therefore is assumed to have the same characteristics.

Conclusions

YW recognise EA concerns around emissions of organic compounds from uncovered and unabated sludge sources and are committed to improvements as follows:

- Undigested (raw) sludge tanks (2 no. thickener feed tanks and 2 no. digester feed tanks) will be covered in order to mitigate emissions. An options appraisal will be undertaken to establish the appropriate approach.

- Although odour complaints have not been received at Aldwarke, survey data has indicated that emissions from 2 no. thickener air extraction stacks are high. Therefore OCU(s) will be installed to treat these emissions.

- Emissions from uncontained digested sludge sources is significantly lower than from undigested sludge sources. However, it has been identified that biogas emissions from centrifuge feed tanks requires further investigation and an options appraisal of measures to mitigate these emissions will be undertaken.

Refer to Proposed Improvement Programme.

Q 6-5 Summary of the Noise Impact Assessment

Potential sources of noise resulting from the activities proposed in this permit application, have been identified and assessed in Table C2: 6-4. Further detail is provided in Appendix 9. For scoring mechanism refer to Q 6-9.

Table C2: 6-5: Noise risk assessment

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Noise: CHP	Residential	Airborne	Plant is located such that surrounding structures shield the closest receptors from the noise source. CHP set 1 is located in a dedicated container, CHP set 2 is located in the boiler room. Good maintenance of plant to ensure that excessive noise levels are not generated, under Operations & Maintenance contract Regular checks of noise mitigation measures fitted to items of plant. Where repair or replacement is required, the plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	Unlikely	Mild	Low
Noise: CHP Exhaust	Residential	Airborne	Plant is located such that surrounding structures shield the closest receptors from the noise source. It is noted that the CHP set 1 is fitted with a silencer. Regular checks of noise mitigation measures fitted to items of plant. Where repair or replacement is required, the plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	Unlikely	Mild	Low
Noise: Fans on air cooled radiators	Residential	Airborne	Fans subject to regular checks and maintenance. Plant is located such that surrounding structures shield the closest receptors from the noise source. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear (e.g. fan motor bearing failure), under Operations & Maintenance contract.	Unlikely	Mild	Low
Noise: Waste Gas Burner	Residential	Airborne	Waste gas burner operates only when required e.g. CHPs and boilers are unavailable. Plant is located a suitable distance from receptors. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear (e.g. fan motor bearing failure), under Operations & Maintenance contract.	Unlikely	Mild	Low
Noise: Vehicular movements around site	Residential	Airborne	Deliveries would take place during the daytime hours only when background sound levels are higher.	Unlikely	Mild	Low
Noise: Sludge delivery / reception / pumping / screening	Residential	Airborne	Deliveries would take place during the daytime hours only when background sound levels are higher.	Unlikely	Mild	Low
Noise: Centrifuge / thickening processes	Residential	Airborne	The thickener and centrifuge plant are located in separate buildings a suitable distance from receptors. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear under Operations & Maintenance contract.	Unlikely	Mild	Low

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Noise: Boiler	Residential	Airborne	Boilers are located within a building and surrounding structures shield the closest receptors from the noise source. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear (e.g. fan motor bearing failure), under Operations & Maintenance contract.	Unlikely	Mild	Low

Q 6-6 Bioaerosol assessment

Bioaerosols are defined as micro-organisms suspended in the air and can include bacteria, fungi and viruses, or parts of living organisms, such as spores and plant pollen. Bioaerosols are usually smaller than 10µm in diameter and can cause human health impacts such as allergic responses and inflammation. Bioaerosols are naturally present in the air, but they are also associated with organic waste treatment processes including composting, mechanical biological treatment, and potentially some aspects of anaerobic digestion (AD) which are widely used in the UK.

There is minimal regulatory guidance available for assessing bioaerosol emissions from AD facilities. Regulatory Position Statement 031[4], states that bioaerosol concerns would normally be associated with composting activities, and in particular:

'Operations…likely to result in the uncontrolled release of high levels of bioaerosols' are defined as including '*the shredding of waste and the turning of waste in the sanitisation, stabilisation and maturation stages of composting where these operations are not contained or are not subject to exhaust ventilation and scrubbing/filtering'*.

These activities do not take place at Aldwarke STF. Furthermore, Environment Agency guidance (2012)[5] states that:

"We do not consider that bioaerosols from anaerobic digestion are a serious concern.

However, the most recent guidance[6] requires that biological waste treatment facilities provide a site-specific bioaerosol risk assessment if there are sensitive receptors within 250 m of activities, regardless of the specific processes carried out at a site. It is noted that the consensus from various studies is that bioaerosols from composting activities decline rapidly within the first 100 metres from a site and generally decline to background levels within 250 m[7]. Technical Guidance Note (TGN) M9[8] states that receptors located more than 250 m away should be discounted as they are not likely to be affected.

The nearest residential housing is located approximately 100 m to the west of the installation boundary at the closest point. The nearest commercial / industrial receptors are present approximately 70 m to the east. There are amenity / habitat receptors located within 100 m to the south, west and north where people may also be present on an occasional basis.

Risks associated with industrial and amenity receptors are likely to be less significant due to the relatively shorter duration of exposure (i.e. on the basis of approximately 8 hour/day, 5 days / week working pattern, or less in the case of visitors to these sites.

A review of the potential for impact from bioaerosols as a result of activities at Aldwarke STF has been undertaken. This review follows a source-pathway-receptor model to evaluate risk, giving consideration to the characteristics of the waste material, plant design and the operational controls in place to mitigate the risks from bioaerosols. This is summarised in Table C2: 6-5 overleaf.

[4] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.
[5] Environment Agency. 2012. Guidance for developments requiring planning permission and environmental permits.
[6] Environment Agency, consultation draft July 2020, Appropriate measures for the biological treatment of waste.
[7] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.
[8] Environment Agency Technical Guidance Notes (TGN) M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities', July 2018.

Table C2: 6-6: Review of potential bioaerosol sources and associated risk

Source	Source controls	Pathway	Receptors	Overall risk
Raw sludge intake and screening (intake and screening facilities not currently in use)	Sludge reception sump is below ground and covered. Additionally, sludge is liquid, does not produce dust and is not readily susceptible to airborne dispersion. Sludge is fully enclosed within pipework when being transferred to the thickener feed tanks. Screens are enclosed but screenings (i.e. waste solids / contaminants) are collected in uncovered skips prior to off site disposal. Screenings are wet, do not produce dust and are not readily susceptible to airborne dispersion.	Airborne dispersion	Residential housing within 250 m, including approximately 100 m west. Industrial / commercial sites within 250 m including premises approximately 70 m east. Amenity areas within 250m including a public footpath adjoining the south, and LWS south, west and north.	Low
Thickener feed tanks x 2	Thickener feed tanks are uncovered and mechanically mixed. However, sludge is liquid, does not produce dust and is not readily susceptible to airborne dispersion. Sludge is fully enclosed within pipework when transferred between tanks and the drum thickeners and gravity belt thickener.	Airborne dispersion		Low
Gravity belt thickener	The gravity belt thickener (GBT) is enclosed within a building. Displaced air is extracted from the GBT and dispersed to atmosphere via a vent stack (see separate entry below). Thickened sludge is fully enclosed within pipework when transferred between the gravity belt thickener and the digester feed tanks.	None		Risk not present – sludge is fully enclosed
Vent stacks from GBT	Air from the gravity belt thickener is extracted and discharged to atmosphere via a vent stack. However, sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion.	Airborne dispersion		Low
Drum thickeners	Drum thickeners are enclosed within a building. Displaced air is extracted from the thickeners and dispersed to atmosphere via a vent stack (see separate entry below). Thickened sludge is fully enclosed within pipework when transferred between the thickeners and the digester feed tanks.	None		Risk not present – sludge is fully enclosed
Vent stack from drum thickeners	Air from the drum thickeners is extracted and discharged to atmosphere via a vent stack. However, sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion.	Airborne dispersion		Low
Digester feed tanks x 2	Digester feed tanks are uncovered and mechanically mixed. However, sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Sludge is fully enclosed within pipework when transferred between tanks and digesters.	Airborne dispersion		Low

Source	Source controls	Pathway	Receptors	Overall risk
Emergency scenario – biogas venting	As the sludge digestion process is a wet process, biogas is unlikely to contain significant concentrations of bioaerosols. Venting events infrequent and short-lived.	Airborne dispersion	Residential housing within 250 m, including approximately 100 m west. Industrial / commercial sites within 250 m including premises approximately 70 m east. Amenity areas within 250m including a public footpath adjoining the south, and LWS south, west and north.	Very low
Emergency scenario – Sludge spillage	Sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Events occur infrequently and in almost all cases will involve small quantities of sludge. Major/catastrophic loss is highly unlikely to occur. Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up.	Airborne dispersion		Very low
Anaerobic digesters	Sludge is fully contained during digestion process with biogas collected and combusted in CHP, boiler and/or flare.	None		Risk not present – sludge is fully enclosed
Centrifuge feed tanks x 2	The centrifuge feed tanks are uncovered. However, sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Sludge contained within these tanks has been processed at high temperature in the digesters, achieving high levels of pathogen kill. Bioaerosol generation potential is therefore very low.	Airborne dispersion		Low
Digested sludge dewatering centrifuge	Digested sludge has been processed at high temperature in the digesters, achieving high levels of pathogen kill. Bioaerosol generation potential is therefore very low. Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. The centrifuge is located within a building.	Airborne dispersion		Very Low
Digested sludge cake handling (and, as a contingency measure, possible short-term storage) – cake pad	Digested sludge has been processed at high temperature in the digesters achieving high levels of pathogen kill. Bioaerosol generation potential is therefore very low. Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. The cake is delivered to the cake pad, stored in windrows and is then left undisturbed until removal from site.	Airborne dispersion		Low
As a contingency measure handling and possible short-term storage of undigested sludge cake – cake pad	Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. The cake is delivered to the cake pad and is then left undisturbed until treatment and/or removal from site.	Airborne dispersion		Low

Source	Source controls	Pathway	Receptors	Overall risk
Vehicle tracking of materials around on the cake pad and roads, which could dry out and disperse	Washdown if required in order to reduce dust and keep pad area clean. Digested sludge has been processed at high temperature in the digesters achieving high levels of pathogen kill and only small quantities would be spread via vehicle movements.	Airborne dispersion	Residential housing within 250 m, including approximately 100 m west. Industrial / commercial sites within 250 m including premises approximately 70 m east. Amenity areas within 250m including a public footpath adjoining the south, and LWS south, west and north.	Very low
Emergency scenario – Sludge cake spillage	Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. Events occur infrequently and in almost all cases will involve small quantities of sludge. Major/catastrophic loss is highly unlikely to occur. Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up.	Airborne dispersion		Very low

Bioaerosol Risk Assessment – conclusions

The bioaerosol risk assessment undertaken concludes that the Aldwarke STF installation is unlikely to be a significant source of bioaerosols. This is due to:

- All potential bioaerosol sources at Aldwarke STF are liquid / wet, do not produce dust and are not readily susceptible to airborne dispersion.
- Digested sludge has been processed at high temperature via the digesters achieving high levels of pathogen kill. Bioaerosol generation potential from digested sludge sources is therefore very low.

The consensus of studies is that bioaerosols decline to background levels within 250m and guidance states that receptors located more than 250m away should be discounted as they are not likely to be affected. However, there are a number of potential bioaerosol receptors located within 250 m of Aldwarke STF. This includes residential housing, commercial/industrial and local amenity sites, as follows:

- Residential dwellings are located closer than 250 m from the installation boundary. The nearest residential housing is located approximately 100 m to the west of the installation boundary.
- Commercial/industrial receptors that are closer than 250 m from the installation boundary. Risks associated with these types of receptors are likely to be less significant due to the relatively short duration of exposure.
- Local amenity land use (public footpath and LWS) is located closer than 250 m from the installation boundary. These are likely to be less significant as receptors due to the anticipated infrequent and/or short duration of potential exposure.

Notwithstanding the conclusions of this risk assessment, as a precautionary measure given the proximity of a small number of residential buildings, YW has undertaken quantitative bioaerosols monitoring in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. This monitoring exercise was carried out by Element Materials Technology Environmental UK Ltd on 28th June 2022. Sampling was undertaken at eight locations on site, with three parallel samples collected per location. The median concentration of total bacteria and of *Aspergillus fumigatus* in the parallel samples collected were found to be below the guidance limit (1000 and 500 CFU/m^3 respectively) at all eight sampling locations.

On this basis, further bioaerosols monitoring at Aldwarke is not deemed necessary as adequate control measures are already in place to minimise the release of bioaerosols as a result of permitted activities. This conclusion is consistent with bioaerosol monitoring undertaken at other YW AD sites and with Environment Agency guidance which states that this topic is not typically a material consideration for AD activities such as that carried out at Aldwarke STF.

Q 6-7 Accident Management Plan

The potential for accidental releases resulting from the activities proposed in this permit application are identified and assessed in Table C2: 6-6 below. This includes a summary of measures in place to manage/reduce accident risks. Refer to Q 6-9 for the scoring mechanism.

Table C2: 6-6: Potential accidental releases and associated risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Site Wide - general						
Flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / overland runoff / infiltration / drainage systems	**Preventative controls** • Flood risk review undertaken. The site is located within fluvial a Flood Zone 2 (medium probability of flooding from rivers, defined as having between 0.1% and 1% chance of flooding from rivers in any year). • There is a history of flooding at the site, from the River Don. • Vulnerable Asset Protection Plan details flooding actions including how river levels should be monitored and what actions are required. **In the event of an incident/accident** • Initiate site emergency plan. • Remove mobile fuel/ chemical sources away from flood risk, if appropriate and safe to do so.	Likely	Mild	Moderate / low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Flooding due to drain blockages and/or excessive rainfall causing localised on-site surface water flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / overland runoff / infiltration / drainage systems	**Preventative controls** • Drains are monitored for blockages and cleaned as required. • Materials are stored in appropriately sealed containers (preferably bulk or semi-bulk), or proprietary secondary containment cabinets, such that the risk of contents being mobilised or containers being washed away in a flood event is low. • Vulnerable Asset Protection Plan specifically details flooding actions. • Planned maintenance / inspection of site drainage systems. **In the event of an incident/accident** • Initiate site emergency plan. • Remove mobile fuel/ chemical sources away from flood risk, if appropriate and safe to do so.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Fire leading to damage to site processes and/or release of polluting materials	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • Regular maintenance of equipment; LDAR programme in place. • Fire alarms are fitted in CHP / boiler rooms. • DSEAR assessment has been completed for site and only appropriate ATEX rated equipment may be used in high-risk areas. • Access controls in place for digester compound and portable gas monitor use required when inside compound. • Site does not treat combustible wastes. Sludge is wet. • Gas slam shut valves on biogas feeds to the CHP / boiler. • Gas and fire detection in the boiler / CHP rooms, and other key AD plant areas. • Lightning protection provided for biogas storage. **In the event of an incident/accident** • Follow site emergency procedure. • Hydrants connected to a final effluent supply can be used by the fire service. • Excess biogas created by the site will be burnt through the flare.	Highly unlikely	Severe	Moderate / low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure to contain firewater following fire / explosion event leading to localised on site surface water flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / overland runoff / infiltration / drainage systems	**Preventative controls** • Site drainage collects and returns surface/yard water to WwTW for treatment. • Site drainage systems, hardstanding, sumps, storm tanks etc will minimise flow of firewater to receptors. **In the event of an incident/accident** • Initiate site emergency procedure.	Highly unlikely	Medium	Low risk
Excessively low temperatures leading to blockages or damage to pipework, valves or equipment and unplanned release of gas with fire / explosions risks and/or release of potentially polluting liquids	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • 'Winterisation' procedures. • Bunding provided to environmentally critical plant and equipment. • Current YW technical standards include trace heating for vulnerable pipework. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required).	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Generalised or localised power failure leading to failure of pumps / control systems and escape of sludge and/or biogas	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • Process for recovering from power failure has been planned and recorded. • In the event of power failure, sludge transfers will stop but this will not affect security of containment e.g., tanks will not overflow. **In the event of an incident/accident** • Halt sludge imports to site. • Confirm backup power supply is online. • Confirm that all systems are operating normally.	Unlikely	Mild	Low risk
Vandalism / site security failure leading to unplanned release of gas with fire / explosions risks and/or release of potentially polluting liquids (chemicals, oils, sludges)	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • High level of security on site with 24 hr security monitoring, secure entry gate systems and locked cabs and control units. • In addition to perimeter fencing around site, key digestion equipment sits within a separate fenced area. • Storage containers bunded. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required). • Review security measures on site.	Highly unlikely	Mild	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of chemical or oil containment due to deterioration of storage containers, pipework or valves leading to spillage	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • All oil storage and waste oil storage tanks are fully bunded (using either fixed or mobile bunds). • Tank and pipework inspections undertaken as part of routine maintenance. • Operational procedures for refilling oil and chemical storage tanks. Spill kit available at tanks. • Any oil spilt around engines during maintenance will be cleaned up and disposed of appropriately. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required). • Review systems to prevent recurrence.	Unlikely	Mild	Low risk
Failure of chemical or oil containment during delivery	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Delivery procedures inc. supervision by site staff, check on space available in receiving tank. • Storage containers bunded. • Site drainage collects and returns surface/yard water to WwTW for treatment. **In the event of an incident/accident** • Follow incident plan.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Vehicle impact leading to loss of pressurised gas and explosion / fire risk or loss of liquid containment (chemicals, oils, sludges)	Nearby human receptors Contribution to local air pollution and global warming Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • Site speed limits in place to reduce chance and consequence of collision. • Key areas include barriers to prevent collision with equipment. • Key digestion assets including digestion tanks are set back from road and surrounded by a fence. • Site drainage collects and returns surface/yard water to WwTW for treatment. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required).	Highly unlikely	Medium	Low risk
Excessive noise from plant or equipment e.g., due to equipment deterioration or failure	Nearby human receptors	Air	**Preventative controls** • Procurement controls mean plant are selected to comply with relevant noise limits. • Regular maintenance completed to ensure equipment operates within normal noise parameters. • Acoustic enclosures / controls on some noise generating plan (e.g. CHP exhaust silencer). **In the event of an incident/accident** • Investigate cause and implement preventive measures, which may include system maintenance interventions.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Site wide - sludge pipework, tanks, valves						
Spillage of sludge during transfer / handling activities	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Staff training on system operation. • Hardstanding in key/high risk areas. • Site drainage collects and returns surface/yard water to WwTW for treatment. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately.	Likely	Minor / negligible	Low risk
Failure (cracks, splitting) of underground pipework (e.g. fuel, chemicals, sludge, site drains) and other underground infrastructure (e.g. sumps, wet wells)	Ground / groundwater / surface waters	Infiltration, lateral movement through groundwater	**Preventative controls** • A programme of inspections and monitoring has been established for below ground tanks/chambers and pipework – refer to Secondary Containment Assessment (Appendix 11). • Where new pipework at the site has to be underground, the containment provision will be risk assessed and appropriate design specification implemented, which may include secondary containment and leak detection. **In the event of an incident/accident** • Damaged pipe will be isolated. • Spill management procedure will be followed. • Repairs to damaged pipework will be arranged.	Unlikely	Medium	Moderate/Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Minor failure of above ground sludge storage tanks / digester tanks e.g., tank overtopping, pipework leaks	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • High level probes to prevent overtopping of tanks. • Tanks also have emergency overspill facility connected to site drainage (discharged back to WwTW) as last line of defence. • Trace heating is provided to tank level gauges to prevent freezing and reduce the risk of false readings. • Site is monitored on a daily basis. • Infrastructure maintenance and inspections. • Protective measures as for sludge spillage. • Site drainage collects and returns surface/yard water to WwTW for treatment. • Refer to Appendix 11 for details of secondary containment risk assessment. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately. • Arrange repairs.	Likely	Minor / negligible	Minor risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Major failure of above ground sludge storage tanks / digester tanks or associated pipework leading to large scale sludge loss/spillage	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Design and construction of assets is governed by relevant YW technical standards to ensure it is fit for purpose. • Infrastructure maintenance and inspections. • Existing and planned bunding/secondary containment (Refer to Appendix 11 secondary containment risk assessment). • Site drainage collects and returns surface/yard water to WwTW for treatment. **In the event of an incident/accident** • Cancel all sludge deliveries to site. • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately.	Highly unlikely	Severe	Moderate/Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Biogas pipework, valves, vents						
Failure of biogas pipework, valves and biogas holder (corrosion, cracks, material defects etc) leading to **minor** release of biogas and slight fire / explosion risk	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Design and construction of pipework is governed by relevant YW technical standards to ensure it is fit for purpose. • Most biogas pipework operates at low pressures. • Pipework/gas holders protected from excessive pressure by pressure relief valves. • Pipework is above ground where possible to facilitate inspection and maintenance. • Maintenance schedule defined as part of LDAR strategy at site. • Requirements around use of ATEX rated equipment control risk of leak leading to fire/explosion. **In the event of an incident/accident** • Consider need to isolate pipework. • Consider need to initiate emergency response procedures. • Arrange repair to affected asset.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of biogas pipework, valves and biogas holder (corrosion, cracks, material defects etc) leading to **major** release of biogas and fire/ explosion risk	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Design and construction of pipework is governed by relevant YW technical standards to ensure it is fit for purpose. • Most biogas pipework operates at low pressures. Pipework/gas holders protected from excessive pressure by pressure relief valves. • Pipework is above ground where possible to facilitate inspection and maintenance. • Maintenance schedule defined as part of LDAR strategy at site. • Standard operational H&S requires staff to wear personal gas monitors at all times, these will detect large scale leakage from pipes (PPE and personal gas detectors represent the final layer of protection from a safety perspective and are not relied upon for detection). **In the event of an incident/accident** • Immediately follow safety control mechanisms in place to isolate pipework / equipment. • Consider need to initiate emergency response procedures.	Highly Unlikely	Medium	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Breakdown or other damage to on site gas consumers e.g. CHPs/boilers leading to disposal of biogas without energy recovery	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Site is designed to minimise risk of uncontrolled release to air. • Operational and maintenance controls in place to ensure reliability of equipment and minimise requirement to send biogas to flare. • There are two CHP engines and two boilers with biogas firing capability, minimising requirement to flare. **In the event of an incident/accident** • Any remaining capacity on on-site gas storage will fill. • Once gas storage is full flare will operate, ensuring proper combustion of biogas. • If flare fails, gas will vent through PRVs to prevent damage to site gas system.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of flare leading to release of unburnt biogas to atmosphere	Local air quality and global climate impacts	Air	**Preventative controls**. • Operational and maintenance controls in place to minimise requirement to send biogas to flare. • Flare has control system that ensures ignition e.g., flame detection. • Maintenance programme in place to ensure that flare is always in good operational condition. **In the event of an incident/accident** • Raise urgent maintenance request for repairs to flare. • If flare fails, valve will automatically shut down flow of gas to flare. • Once all site gas containment is full, pressure will release through PRVs to prevent damage to equipment and uncontrolled release of biogas.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Incorrect setting or damage to emergency pressure relief valves leads to premature release of gas or valve fails to reseat after release leading to uncontrolled release of biogas to atmosphere	Local air quality and global climate impacts	Air	**Preventative controls** • Inspection and maintenance of PRVs carried out on a routine basis to ensure they are set and operate correctly. • Checks on PRVs part of normal operational routine. • Over-pressure alarms in control system will alert site staff to incidents that could trigger PRV release. **In the event of an incident/accident** • Follow management procedures to ensure that the valves are re-seated/pressure setting adjusted rapidly and without putting staff at risk.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Digester foaming blocks gas lines, leading to release of biogas and/or foam through PRVs	Local air quality and global climate impacts	Air	**Preventative controls** • Feed rate to digesters is controlled to prevent organic overloading. • Digester mixing is regularly assessed as part of operational checks to ensure that it is functioning effectively. • Feedstock assessment ensures that composition and quality of feedstock is understood. • Final effluent spray / anti-foam system is fitted to digesters to control foaming. **In the event of an incident/accident** • Follow site procedures for dealing with foaming. • Investigate cause and implement preventive measures. • Ensure that PRVs are not blocked with foam and operating correctly to protect tanks. • Ensure PRVs reseat once pressure in headspace returns to normal levels.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Digester grit build-up, leading to reduced working volumes and inefficient digestion, leading to wear on mixing and heating equipment, including pump and pipe blockages (which may lead to sludge spillages).	Nearby human receptors Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Digester mixing is regularly assessed as part of operational checks to ensure that it is functioning effectively. • Digester clean up required approximately every 10 years by trained professionals. **In the event of an incident/accident** • Clear up any spills and blockages. • Ensure all valves are operating correctly. • Ensure mixers and pumps are operating correctly.	Unlikely	Minor / negligible	Low risk
Spillage / loss of containment of liquids	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Checks on condensate traps and valves are part of regular operational routine. • Condensate runs to site drainage for treatment. • Digester operation is controlled to minimise risk of foaming, which could lead to blockages on condensate system. **In the event of an incident/accident** • Clear up any spills. • Ensure all valves are operating correctly.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Sludge treatment processes						
Import of sludge which does not meet waste acceptance criteria leading to disruption to sludge treatment processes and potential for increased odour releases and accidental sludge spillages	Nearby human receptors Ground / groundwater / surface waters	Spread to land as part of disposal. Overland runoff / infiltration / drainage systems	**Preventative controls** • YW control all sites supplying sludge to the STF. Only YW sewage waste is imported to Aldwarke STF, this has a consistent composition and comes from carefully controlled treatment processes. • Under normal operation, JRP WaSP system records the dry solids, volume and origin of every import brought to site. • Site operators and tanker drivers are trained to identify problem sludges and divert them to alternative sites for treatment (Refer to C2 Q3d Management Systems). **In the event of an incident/accident** • Digester health will be investigated to understand cause of problem and best route to resolution. • Digestate being removed from digesters will be subject to enhanced monitoring to ensure that there is no environmental risk. Note this is also a HACCP requirement. • Where relevant the Environment Agency will be alerted that a problem has occurred. • The root cause of the problem will be investigated and procedures updated in order to minimise reoccurrence.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Sludge contamination leading to inhibition of microbial activity / process disruption, insufficient digestion and build up of H_2S and CO_2	Ground Local air quality and global climate impacts	Spread to land as part of disposal Air	**Preventative controls** • Management controls to identify potentially problematic sludges at source. • All sludge imports are from YW sites where sludge characteristics are considered stable. • Contamination levels would need to be very severe to significantly impact digestion processes due to the very large digester volume. **In the event of an incident/accident** • Assess digester content to decide best route to normal digester health. • Sample cake prior to export from site to confirm it is safe to spread to land. • Review acceptance procedures.	Highly Unlikely	Medium	Low risk
Excessive feeding of digester leads to reduced retention time and failure to meet pathogen kill requirements	Ground / groundwater / surface waters	Spread to land as part of disposal. Overland runoff / infiltration / drainage systems	**Preventative controls** • Staff training • Digesters have a maximum feed interlock ensuring that a set daily feed volume cannot be exceeded. This limit has been calculated to ensure digester stability and environmental safety. • HACCP monitoring. **In the event of an incident/accident** • Turn off digester feed. • Stop additional sludge imports until normal operational situation returns.	Highly Unlikely	Medium	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of dewatering process leading to discharge to cake pad of cake with high water content	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Liquid runoff from sludge cake pad collected and directed to WwTW for treatment. System has large storage and handling capacity. **In the event of an incident/accident** • Switch off centrifuge and identify cause of problem.	Unlikely	Minor/negligible	Negligible risk
Temporary cessation of land spreading e.g., due to extreme weather conditions, leading to build up of digested sludge cake and potential for increased odour	Nearby human receptors	Air	**Preventative controls** • Cake storage is on a pad, which under normal circumstances, has spare capacity. • Additional storage is available at nearby Yorkshire Water sites. **In the event of an incident/accident** • Monitor available storage on cake pad and reduce/stop sludge imports as required. • Divert sludge imports to alternative YW sites for storage.	Likely	Minor/negligible	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Very warm weather leading to increase in odour generation from sludge cake	Local air quality	Air	**Preventative controls** • Under normal circumstances only digested sludge is stored on cake pad under standard operating conditions. This has less odour potential than untreated sludge. • Only likely to happen during a prolonged period of an extreme weather event. **In the event of an incident/accident** • Initial response would be to review operating times and avoid cake generation during problematic weather events, considering both temperature and wind. • If this was not sufficient, YW would look to remove cake from site and store elsewhere.	Likely	Minor/negligible	Low risk
Air extraction and dispersal						
Failure of components within extraction and dispersal systems leading to reduced dispersion of odorous emissions to air	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Regular operational checks on systems (e.g. fan operation). • Inspection and maintenance schedule to ensure reliability of extraction system. **In the event of an incident/accident** • Follow operational procedures to minimise generation of emissions until system is repaired.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
CHPs, Boilers and other gas consumers						
Excessive emissions to air from boilers and CHPs e.g., due to equipment failure, poor performance or malfunction leading to incomplete or inefficient combustion	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Planned preventative maintenance in place for equipment to ensure assets continue to meet original specification on emissions. • Site operational knowledge supported through contracts with specialist providers. **In the event of an incident/accident** • Investigate cause and implement preventive measures, which may include system maintenance interventions.	Unlikely	Mild	Low risk

Q 6-8 Assessment of point source emissions to sewer

All liquor from raw and digested sludge thickening and dewatering processes, condensate (e.g. from biogas handling), cleaning / washdown effluent and all surface water runoff is collected and discharged via underground drainage systems to Aldwarke WwTW for full treatment prior to discharge to the River Don. This position has been managed for a long period within YW without a requirement for a formal discharge consent between YW STF and YW WwTW. The WwTW treats effluent from off site and from the STF, and has consent limits in place covering all outputs. Therefore, there has been no requirement to separately characterise or assess the outputs from the STF, or any effects of these on receiving waters, separately from the wider WwTW. As such there is no such information available at this time.

YW is committed to undertaking a period of monitoring in order to characterise the liquors returned to the WwTW. The programme of monitoring is identified in Table C2: 6-7 below. Samples will be taken manually from suitable location(s) upstream of the liquor return point to the WwTW inlet, and will be submitted to a laboratory facility that can test to the appropriate standard. It is proposed this sampling will be carried out for a period of 12 months. The data will be used to undertake an environmental impact assessment in accordance with Environment Agency guidance. The findings of the monitoring, analysis and impact assessment will be provided to the Environment Agency within 18 months of permit issue (refer to Proposed Improvement Programme below).

Table C2: 6-7 – Return liquor characterisation programme

Substance / Parameter	BAT-AEL	Waste Treatment Process to which the BAT-AEL applies	Monitoring Frequency	Monitoring Standard
Arsenic (expressed as As)	0.01 – 0.05mg/l	Mechanical biological treatment of waste. Physico-chemical treatment of solid and/or pasty waste.	Once a month	Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586)
Cadmium (expressed as Cd)	0.01 – 0.05mg/l		Once a month	
Chromium (expressed as Cr)	0.01 – 0.15mg/l		Once a month	
Copper (expressed as Cu)	0.05 - 0.5mg/l		Once a month	
Lead (expressed as Pb)	0.05 -0.1mg/l (37)		Once a month	
Nickel (expressed as Ni)	0.05 – 0.5mg/l		Once a month	
Mercury (expressed as Hg)	0.5 – 5 ug/l		Once a month	Various EN standards available (i.e. EN ISO 17852, EN ISO 12846)
Zinc (expressed as Zn)	0.1 – 1 mg/l		Once a month	Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586)

Q 6-9 Risk assessment methodology

The risk assessment methodology employed for the noise impact assessment (Q 6-5) and accident management plan (Q 6-7) is summarised in Tables C2 6-8 to 6-11 below.

The overall risk rating for each of the identified risk scenarios is determined on the basis of the probability of the scenario occurring (the probability/likelihood score) and the environmental consequence(s) if the scenario were to occur (the consequence score). The probability and consequence categories used in this methodology are provided in Tables C2: 6-8 and 6-9 below.

Table C2: 6-8: Classification of Consequences

Classification	Definition
Severe	• Acute risks to human health • Short-term risk of pollution of sensitive water resource (e.g. major spillage into controlled waters) • Impact on controlled waters e.g. large-scale pollution or very high levels of contamination • Catastrophic damage to buildings or property (e.g. explosion causing building collapse) • Ecological system effects – irreversible adverse changes to a protected location. Immediate risks
Medium	• Chronic risks to human health • Pollution of sensitive water resources (e.g. leaching of contaminants into controlled waters) • Ecological system effects – substantial adverse changes to a protected location • Significant damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage)
Mild	• Non-permanent health effects to human health • Pollution of non-sensitive water resources (e.g. pollution of non-classified groundwater) • Damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage) • Substantial damage to non-sensitive environments (unprotected ecosystems e.g. crops)
Minor/Negligible	• Non-permanent health effects to human health (easily prevented by appropriate use of PPE) • Minor pollution to non-sensitive water resources • Minor damage to non-sensitive environments (unprotected ecosystems e.g. crops) • Easily repairable effects of damage to buildings, structures, services or the environment (e.g. discoloration of concrete, loss of plants in a landscaping scene)

Table C2: 6-9: Classification of probability / Likelihood

Classification	Definition
High Likelihood	An event is very likely to occur in the short term, and is almost inevitable over the long term OR there is evidence at the receptor of harm or pollution
Likely	It is probable that an event will occur. It is not inevitable, but possible in the short term and likely over the long term
Unlikely	Circumstances are possible under which an event could occur. It is by no means certain that even over a longer period such an event would take place, and less likely in the short term
Highly Unlikely	Probability is so low that it is close to zero; It is improbable that an event would occur even in the very long term

Table C2: 6-10 below provides the matrix used to identify the overall risk category using these consequence and probability categories.

Table C2: 6-10: Risk Matrix and Terminology Used for Risk Assessments

		Consequence			
		Severe	**Medium**	**Mild**	**Minor/Negligible**
Probability (Likelihood)	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate/Low risk
	Likely	High risk	Moderate risk	Moderate/Low risk	Low risk
	Unlikely	Moderate risk	Moderate/Low risk	Low risk	Negligible risk
	Highly Unlikely	Moderate/Low risk	Low risk	Negligible risk	Negligible risk

The overall risk categories are described in Table C2: 6-11 below.

Table C2: 6-11: Description of Risk Categories

Term	Description
Very high risk	Severe harm to a receptor may already be occurring OR a high likelihood that severe harm will arise to a receptor, unless immediate remedial action works / mitigation measures are undertaken.
High risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short term, but likely to be required over the long term.
Moderate risk	Possible that harm could arise to a receptor but low likelihood that such harm would be severe. Harm is likely to be medium. Some remedial works may be required in the long term.
Moderate / low risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as medium. It can be driven by cases where there is an acute risk which carries a severe consequence, but where the exposure is unlikely.
Low risk	Possible that harm could arise to a receptor. Such harm would at worse normally be mild.
Negligible risk	Low likelihood that harm could arise to a receptor. Such harm unlikely to be any worse than mild.

Form C3 Supporting Information

1 What activities are you applying for?

Activities to be included within this installation are provided in Table C3: 1a-1 below. A summary of the activities to be removed from, and added to, the permit is provided above in C2: Table 1 above in response to Form C2, Question 2.

Table C3: 1a-1 – Types of activities

Installation name	Schedule 1 references	Description of the Activity	Activity Capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
Aldwarke STF	Section 5.4 A(1)(b)(i)	**Anaerobic digestion** of indigenous and imported UWWT-derived sludges: Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment	>100 tonnes per day	R3: recycling/ reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)	N/A	Total digester treatment capacity combined 475 m^3/day (at 6% dry solids), 28.5 tonnes dry solids (TDS) per day. Refer to Appendix 12 for supporting calculations spreadsheet.

Directly Associated Activities (including description)	
Import and treatment of sludges prior to digestion, including screening, mixing, thickening and dosing of thickening liquors	R3: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)
Secondary treatment of digestate (including physical handling and dewatering) before being recycled to agriculture, including digestate produced on site or, as a contingency measure, from other YW sites.	R3: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)
As a contingency measure**, storage** of digestate, produced on site at Aldwarke or at other YW sites, before removal from site for recovery or, if necessary, disposal.	R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) D15: Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced)
As a contingency measure, the **interim storage** of undigested sludge produced at Aldwarke or other YW sites, before treatment on site at Aldwarke or, if necessary, treatment and recycling or disposal at an alternative site.	R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) D15: Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced)
Storage and treatment of biogas	R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)
Use of biogas as a fuel	R1: Use principally as a fuel to generate energy
Incineration of biogas	D10: Incineration on land
Raw material (non-waste) **storage**	No applicable waste codes
Surface water collection, including **temporary storage**	No applicable waste codes

Total storage capacity (tonnes)	Sludge storage capacity within STF vessels provided in Table 1a-2 overleaf.
Annual throughput (tonnes each year)[9]	**Liquid sludge (indigenous primary):** 149,318 tonnes (maximum) **Liquid sludge (indigenous SAS):** 738,444 tonnes (maximum) **Liquid sludge (import)**: 189,800 tonnes/year (maximum) Refer to Appendix 12 for supporting calculations spreadsheet.

[9] All figures have been calculated on the basis of maximum tonnes of dry solids per year, converted to m^3/year on the basis of the minimum % dry solids (which varies according to sludge source) and then presented as tonnes per year based on an assumed 1:1 volume to weight ratio. The calculation uses minimum % dry solids in order to present the maximum throughput figure. Refer to Appendix 12 for supporting calculations spreadsheet.

Table C3: 1a-2 – Storage capacities

Vessel	Nominal capacity (m^3)
Wet well	80
Thickener feed tanks (x 2)	1,493 each
Return liquor sump	80
Digester feed tanks (x 2)	500 each
Digesters (x2)	3,167 each
Centrifuge feed tanks (x2)	700 each
Liquor return balance tank	1,186
Cake pad	
Maximum storage capacity is 2,800 tonnes. Under normal circumstances the amount of cake stored will be significantly below this quantity.	

Table C3: 1b-1 – Types of waste accepted - Imported and Indigenous wastes to the sludge AD process (digesters)

Waste Code	Description of the waste
19	Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
19 02	Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sewage sludge
19 06	Wastes from anaerobic treatment of waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
19 08	Wastes from waste water treatment plants not otherwise specified
19 08 05	Sludges from treatment of urban waste water

Table C3: 1b-2 – Types of waste accepted - Imported wastes for dewatering/storage only (prior to recovery)

Waste Code	Description of the waste
19	Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
19 02	Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sewage sludge.

Waste Code	Description of the waste
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sewage sludge conditioned with sanitised green waste.
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sewage sludge conditioned with wood waste.
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sludge phyto conditioned.
19 06	Wastes from anaerobic treatment of waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
19 08	Wastes from waste water treatment plants not otherwise specified
19 08 05	Sludges from treatment of urban waste water

2 Point source emissions to air, water and land

A full inventory of emission points is provided in Table C3: 2-1 below and illustrated in Section IV, Figure 3. Proposals for monitoring emissions to air are provided in Table C3: 4a-1.

Table C3:2-1: Emissions Inventory to air

Emission Point Ref	Source	Emissions parameter	Quantity / unit		Techniques to minimise emissions
A1	CHP 1 engine exhaust	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	190[10]	$mgNm^3$	Engine servicing and maintenance
		Sulphur dioxide (SO_2)	60[10]	$mgNm^3$	Sludge management techniques
		Carbon monoxide (CO)	324[11]	$mgNm^3$	Engine servicing and maintenance
		Total VOCs (as carbon)	501[11]	$mgNm^3$	Engine servicing and maintenance
A2	CHP 2 engine exhaust	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	190[10]	$mgNm^3$	Engine servicing and maintenance
		Sulphur dioxide (SO_2)	60[10]	$mgNm^3$	Sludge management techniques
		Carbon monoxide (CO)	121[11]	$mgNm^3$	Engine servicing and maintenance
		Total VOCs (as carbon)	134[11]	$mgNm^3$	Engine servicing and maintenance
A3	Boiler 1 exhaust (biogas)	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	250[12]	$mgNm^3$	Boiler servicing and maintenance
		Sulphur dioxide (SO_2)	200[12]	$mgNm^3$	Sludge management techniques
		Carbon monoxide (CO)	Not quantified[13]		Boiler servicing and maintenance
		Total VOCs (as carbon)	Not quantified[13]		Boiler servicing and maintenance
	Boiler 1 exhaust (fuel oil)	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	200[14]	$mgNm^3$	Servicing and maintenance
		Sulphur dioxide (SO_2)	Not quantified[13]		Low sulphur gas oil used
		Carbon monoxide (CO)	Not quantified[13]		Boiler servicing and maintenance
		Total VOCs (as carbon)	Not quantified[13]		Boiler servicing and maintenance
A4	Boiler 2 exhaust (biogas)	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	250[12]	$mgNm^3$	Boiler servicing and maintenance
		Sulphur dioxide (SO_2)	200[12]	$mgNm^3$	Sludge management techniques
		Carbon monoxide (CO)	Not quantified[13]		Boiler servicing and maintenance
		Total VOCs (as carbon)	Not quantified[13]		Boiler servicing and maintenance

[10] Emission value of 190 mg/Nm^3 for NO_x (MCPD ELV) and 60 mg/Nm^3 for SO_2 (MCPD ELV) presented for consistency with numbers used in the AERA. These are stated at reference conditions: 273 degrees Kelvin, 101.3kPa, dry gas, 15% O_2. It should be noted that the CHP units are below the MCPD threshold, and as such there are no directly relevant ELVs.
[11] Emissions data presented are indicative figures taken from a single round of stack emissions monitoring undertaken on 11/2/2021 with allowance for measurement uncertainty, using reference conditions: 273 degrees Kelvin, 101.3kPa, dry gas, 15% O_2. No ELV for these determinands proposed in permit. No appropriate reference limit value identified.
[12] Emission value from MCPD of 250 mg/Nm^3 for NOx and 200 for mg/Nm^3 SO_2 presented for consistency with numbers used in the AERA. These are stated at reference conditions 273 degrees Kelvin, 101.3kPa, dry gas, 3% O_2. It should be noted that the boilers are below the MCPD threshold, and as such there are no directly relevant ELVs.
[13] No appropriate reference limit value identified and no emissions data available. No ELV for these determinands proposed in permit.
[14] Emission value from MCPD of 200 mg/Nm^3 for NOx used. These are stated at reference conditions 273 degrees Kelvin, 101.3kPa, dry gas, 3% O_2.

Emission Point Ref	Source	Emissions parameter	Quantity / unit		Techniques to minimise emissions
	Boiler 2 exhaust (fuel oil)	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	200[14]	$mgNm^3$	Boiler servicing and maintenance
		Sulphur dioxide (SO_2)	5.2[15]	$mgNm^3$	Low sulphur gas oil used
		Carbon monoxide (CO)	1,489[15]	$mgNm^3$	Boiler servicing and maintenance
		Total VOCs (as carbon)	135[15]	$mgNm^3$	Boiler servicing and maintenance
A5	Waste gas burner	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	Not quantified[13]		Servicing and maintenance
		Carbon monoxide (CO)	Not quantified[13]		Servicing and maintenance
		Sulphur dioxide (SO_2)	Not quantified[13]		Sludge management techniques
		Total VOCs (as carbon)	Not quantified[13]		Flame temperature and residence
A6	Air extraction and dispersion stack 1 (GBT)	Odour	258,886[16]	ouE/m^3	Sludge management techniques. OCU to be installed - refer to proposed improvement programme.
		Hydrogen Sulphide (H_2S)	31.8[16]	ppm	
		Ammonia (NH_3)	<0.1[16]	ppm	
		Total volatile organic compounds (TVOC)	7.1[16]	ppm	
		Mercaptan	3.6[16]	ppm	
		Dimethyl sulphide (DMS)	<0.1[16]	ppm	
A7	Air extraction and dispersion stack 2 (drum thickeners)	Odour	258,886[16]	ouE/m^3	Sludge management techniques. OCU to be installed - refer to proposed improvement programme.
		Hydrogen Sulphide (H_2S)	31.8[16]	ppm	
		Ammonia (NH_3)	<0.1[16]	ppm	
		Total volatile organic compounds (TVOC)	7.1[16]	ppm	
		Mercaptan	3.6[16]	ppm	
		Dimethyl sulphide (DMS)	<0.1[16]	ppm	
N/A	PRVs - other	Biogas	Not quantified – emergency use only[13]		None - emergency use only

[15] Emissions data presented are indicative figures taken from a single round of stack emissions monitoring undertaken on 11/2/2021 with allowance for measurement uncertainty, using reference conditions: 273 degrees Kelvin, 101.3kPa, dry gas, 3% O_2. No ELV for these determinands proposed in permit. No appropriate reference limit value identified.
[16] Emissions data presented represent the mean of 4 samples collected across 2 days on 27th and 28th April 2022. Note that monitoring at GBT vent stack (A6) was not possible as the GBTs were not operational at the time of the sampling visit (due to maintenance work being carried out). Data for the drum thickener vent stack (A7) has been used as both thickener facilities draw from the same feed tank and therefore have the same characteristics.

Emissions to sewer and water

All liquor from raw and digested sludge thickening and dewatering processes, and condensate (e.g. from biogas handling) and cleaning / washdown effluent is collected and discharged via underground drainage systems to Aldwarke WwTW for full treatment prior to discharge to the River Don. Surface water runoff, including all run off from the cake storage pad, is also discharged via the WwTW.

Discharge points are shown on Figure 3. The drainage plan is included as Figure 4. Key sources are as follows:

- Discharge point S1 comprises liquor from the drum thickeners and gravity belt thickener, cleaning washwater from the thickeners and centrifuge, biogas condensate, boiler blowdown and surface water runoff from some areas of the installation, including roadways / hardstanding areas and roofwater. This is returned to Aldwarke WwTW via the return liquor sump for full treatment prior to discharge to the River Don. Note that the condensate collected in condensate traps to the south of the boilerhouse (condensate from biogas pipework feeding the boilers, CHP 2 and flare) is manually pumped from the concrete condensate pit to MH12 (refer to Figure 4 for details of these drainage features).
- Discharge point S2 comprises dewatering liquor from the centrifuge, cleaning washwater from the centrifuge and surface water runoff from some areas of the site, including the cake pad, roadways / hardstanding areas and roofwater. This is returned to Aldwarke WwTW via the return liquor balance tank for full treatment prior to discharge to the River Don.

It has been identified that there is a small area on site (in the roadway to the east of the GBT building) where the drains are blocked. This will be repaired and drainage reinstated – refer to proposed improvement programme.

Aldwarke WwTW is permitted to discharge flows related to the treatment of sewage to the River Don which is wholly separate to this permit application and discharges from the WwTW are monitored accordingly. Processes and controls in place in respect of wastewater handling and treatment are adequate to prevent significant negative impacts on the receiving environment as a result of site activities. Notwithstanding this, YW is committed to undertake a 12-month programme of monitoring of process liquors returned to the WwTW to characterise the emissions – refer to Form C2 Q6-8 for details of the proposed monitoring programme.

Table C3: 2-2 – Emissions to sewer and water

Emission Point Ref.	Source	Parameter	Expected Emissions	
			Quantity	Unit
S1	Raw sludge thickener liquors Cleaning washwater Surface water runoff (roadways / hardstanding areas and roofs) Biogas condensate Boiler blowdown	Suspended solids BOD Ammonia Volume	Not yet quantified. Characterisation of emissions will be undertaken in line with BAT – refer to information provided in response to Form C2 Q6-8 for more details.	

Emission Point Ref.	Source	Parameter	Expected Emissions	
			Quantity	Unit
S2	Digested sludge dewatering centrate Surface water runoff (roadways / hardstanding areas, roofs and cake pad) Cleaning washwater	Suspended solids	Not yet quantified. Characterisation of emissions will be undertaken in line with BAT – refer to information provided in response to Form C2 Q6-8 for more details.	
		BOD		
		Ammonia		
		Volume		

3 Operating techniques

3b General requirements

Fugitive emissions management plan – Leak Detection and Repair (LDAR) plan

YW has a defined maintenance plan for biogas pipework at Aldwarke STF – this is included as Appendix 13. This includes regular visual inspections, as well as more detailed investigations such as use of a methane detecting camera to identify leaks. Any leaks identified are assigned a priority for repair, the priority recognises potential as both an environmental and safety hazard. Key section headings in the LDAR management procedure (which forms part of the EMS) include:

- Introduction, scope, responsibilities, assurance.
- LDAR considerations including summary of equipment, techniques and approaches.
- Site specific LDAR plan:
  - STF Tanks (Anaerobic Digesters);
  - Pressure Relief Valves;
  - Biogas pipework from AD to biogas treatment and storage;
  - Biogas storage;
  - Pipework from biogas treatment to flare stack and engine;
  - Biogas Engines;
  - Boilers;
  - Flare Stack;

The majority of biogas pipework is within a secure area to reduce the risk of physical damage. A DSEAR review of the site has been completed and installed equipment is appropriate for the zone in which it is installed.

Best Available Techniques: Reducing diffuse (fugitive) emissions to air (*BAT 14*)

The design and operation of Aldwarke STF ensures diffuse (fugitive) emissions to air are minimised. This includes the following measures:

- H_2S levels are monitored in the biogas and are recorded.
- Emissions of odour and organic compounds from digested material (post AD) is very low. Refer to the odour risk assessment and odour management plan (Appendices 8 and 10, respectively) for more details.
- All pipework design is subject to Water Industry Mechanical and Electrical Specifications (WIMES), which ensures correct material selection, corrosion prevention and valve type.
- Regular inspections of tanks and pipework undertaken in line with the LDAR programme.
- Biogas pipework largely above-ground, allowing easy inspection/leakage detection.
- Sludge and sludge cake is wet at all times and therefore potential for generation of dust is very limited. This is not an issue of concern (see bioaerosol risk assessment, Section 6).
- Traffic speed limits of 10mph are enforced on site.

3c Types and amounts of raw materials

Table C3: 3c-1 – Types and amounts of raw materials

Description of raw material	Use	Maximum storage capacity	Annual throughput[17]	Main hazards	Alternative
Polymer (powder) (GBT)	Coagulant used for sludge thickening and dewatering	Storage in 25 kg bags (~15 no.), 1.5 m^3 make up tank and 1.5 m^3 dosing tank	10 tonnes	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Polymer (liquid) (drum thickener)	Coagulant used for sludge thickening	Storage in 1 m^3 containers (~10 no.), 5 m^3 bulk tank, and 2.5 m^3 polymer solution tank	26 m^3	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Polymer (powder) (centrifuge)	Coagulant used for sludge thickening and dewatering	Storage in 700 kg bags (~5 no.), 5 m^3 blend tank and 5 m^3 transfer tank	37 tonnes	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Antifoam	Digester antifoaming agent	Storage in 20kg containers (~15 no.) and 1 m^3 containers (~2 no.)	2,000 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative

[17] Raw materials use data is estimated on the basis of typical storage volumes and data available for usage at this and at other YW STF sites.

Description of raw material	Use	Maximum storage capacity	Annual throughput[17]	Main hazards	Alternative
Boiler treatment chemicals	Boiler treatment	Not normally stored on site	<250 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Glycol	Antifreeze	Not normally stored on site	500 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Lubrication oil	Equipment lubricant	Not normally stored on site	1,800 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Gas oil	Back up boiler fuel	9,717 litres	114,000 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Diesel	Fuel for mechanical loaders	1,300 litres	5,200 litres[18]	Polluting to watercourses in the event of a spillage/loss	No viable alternative

[18] Annual throughput data includes some use outside of the installation boundary (within the wider Aldwarke WwTW)

4 Monitoring

4a Describe the measures you use for monitoring emissions

Proposals for monitoring point source emissions to air and sewer are shown in Table C3: 4a-1.

Table C3: 4a-1 Proposed emissions monitoring requirements

Emission point	Parameter	Monitoring technique	Monitoring frequency
Emissions to air			
A1 CHP 1	NOx (NO and NO_2 expressed as NO_2)	None, due to small size of plant (below MCP threshold).	
	CO		
	Sulphur dioxide (SO_2)		
	Total VOCs		
A2 CHP 2	NOx (NO and NO_2 expressed as NO_2)	None, due to small size of plant (below MCP threshold).	
	CO		
	Sulphur dioxide (SO_2)		
	Total VOCs		
A3 Boiler 1	NOx (NO and NO_2 expressed as NO_2)	None, due to small size of plant (below MCP threshold).	
	CO		
	Sulphur dioxide (SO_2)		
	Total VOCs		
A4 Boiler 2	NOx (NO and NO_2 expressed as NO_2)	None, due to small size of plant (below MCP threshold).	
	CO		
	Sulphur dioxide (SO_2)		
	Total VOCs		
A5 Waste gas burner	NOx (NO and NO_2 expressed as NO_2)	None. Use of waste gas burner is used only when required.	
	CO		
	Total VOCs		
A6 Air extraction and dispersion stack 1	Odour concentration	None currently. No odour treatment function. OCU to be installed and odour monitoring will then be undertaken in line with BAT requirements.	
	H_2S		
	NH_3		
A7 Air extraction and dispersion stack 2	Odour concentration	None currently. No odour treatment function. OCU to be installed and odour monitoring will then be undertaken in line with BAT requirements.	
	H_2S		
	NH_3		

Emission point	Parameter	Monitoring technique	Monitoring frequency
PRVs - other	No emissions monitoring proposed due to nature of release point as an essential safety mechanism with very occasional and short duration use.		
Emissions to sewer			
S1-S2 Liquors and surface water to WwTW	A 12-month programme of monitoring of return liquors is proposed in order to characterise emissions – refer to Q 6-8 Assessment of point source emissions to sewer and proposed improvement programme for more details. Any ongoing monitoring requirements will be established after this initial monitoring, and subsequent analysis and assessment, has been completed.		

Selected process monitoring parameters are illustrated in Table C3: 4a-2. The site is operated under full PLC SCADA control with data logging and interrogation of key parameters to maintain safe, efficient and low emissions operation.

Table C3: 4a-2 Key process monitoring provisions

Emission point / description	Parameter	Monitoring approach	Monitoring frequency
Sludge intake	Intake volume	JRP/WaSP	Continuous during unloading operations
	% dry solids	JRP/WaSP	Continuous during unloading operations
CHPs (A1 and A2)	Operating hours	SCADA	Continuous data logging
	Electricity generated	SCADA	Continuous data logging
	Load required / actual (%)	SCADA	Continuous data logging
	Biogas flow / pressure to CHP	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
Boilers (A3 and A4)	Load required / actual (%)	SCADA	Continuous data logging
	Biogas flow / pressure to boiler	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
	Heat circuit flow	SCADA	Continuous data logging
Flare compound (A5)	Biogas to flare (m^3)	SCADA	Continuous data logging
Biogas storage	Gas level (%)	SCADA	Continuous data logging
	Gas pressure (mb)	SCADA	Continuous data logging
	Methane %	SCADA	Continuous data logging
Digesters	Volume	SCADA	Continuous data logging
	Volatile Fatty Acids (VFAs)	Manual	Periodic
	Alkalinity	Manual	Periodic
	Process temperature	SCADA	Continuous data logging
	% solids (intake)	SCADA	Continuous data logging

Emission point / description	Parameter	Monitoring approach	Monitoring frequency
	Retention (hours)	SCADA	Continuous data logging
	Temperature	SCADA	Continuous data logging
	H_2S (ppm)	SCADA	Continuous data logging
	Foam level	SCADA	Continuous data logging
Thickeners (drum and gravity belt)	Dry solids (%) – inlet and outlet	SCADA	Continuous data logging
	Flow – inlet and outlet	SCADA	Continuous data logging
Centrifuge	Dry solids (%) - inlet	SCADA	Periodic
	Dry solids (%) - outlet	Manual	Periodic
	Flow (m^3/hr) at inlet	SCADA	Continuous data logging

4b Point source emissions to air only

The proposed sampling locations and facilities are assessed in Table C3: 4b-1, based on the requirements and recommendations provided in BS EN 15259 and Environment Agency Technical Guidance Note (TGN) M1[19]. A recent one-off characterisation MCERTS accredited stack emission test[20] carried out at the site on both the CHPs (2 no.) and Boiler 2, reported the following for all tested plant:

"The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations."

Table 4b-1: BS EN 15259 / TGN M1 Assessment - Sampling Requirements

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
Sample plane location	6.2	As far downstream or upstream from any disturbance, which could produce a change in direction of flow (e.g. bends, fans).	Sampling ports are installed on a straight section of stack, substantially downstream of the termination point of the stack and bends. A constant cross-sectional area is present within the flues, which are narrow in design.		Sampling point is are located near the back of the boiler. A constant cross-sectional area is present within the flue, which is narrow in design.
	6.2	In a section of duct with constant shape and cross-sectional area.			
	6.2	Recommend five hydraulic diameters* upstream and two hydraulic diameters downstream (or five hydraulic diameters from the top of the stack)			

[19] Environment Agency Technical Guidance Note (Monitoring) M1 (2010)

[20] Element Materials Technology (2021), Job Reference Number EMT00063

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
Sample plane orientation	6.2	Installation of sample plane in vertical stacks is preferred to horizontal ducts	The sampling plane is vertical.	The sampling plane is vertical	The sampling plane is horizontal.
Exploratory survey	6.2	It is advised that an exploratory velocity traverse is carried out before committing to installation	The ports are installed and reported as adequate. Due to the narrow diameter, homogeneity testing in line with the requirements set out in BS EN 15259 is not required, as per guidance[21].		
Flow criteria	6.2	Angle of gas flow less than 15° to duct axis.	Compliant		
	6.2	No local negative flow.	Compliant		
	6.2	Minimum velocity (a differential pressure of 5Pa, which equates to 3 ms-1).	85Pa	94Pa	42Pa
	6.2	Ratio of the highest to lowest gas velocity less than 3:1.	<3.1	<3.1	<3.1
Measurement ports	6.2	Planned at detailed design stage because retrofitting can be expensive (for example ducts may have protective linings).	The number, location and type of measurement ports were designed having regard to TGN M1.		N/A
	6.2	Allows access to sample points.	Yes	Yes	Yes

[21] Method Implementation Document for EN 15259:2007, Environment Agency, v3, May 2019

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
	Annex A	It is recommended that for small stacks (less than 0.7m diameter) a socket of 75mm is acceptable.	Suitable size (50mm BSP)	Suitable size (50mm BSP)	Adequate, 8mm drilled hole in ducting
	-	The port socket must not project into the gas stream.	Compliant	Compliant	N/A
	Annex B	Additional ports may be required to allow access for measurement of other quantities (for example velocity and water vapour)	N/A	N/A	N/A
	6.2	Additional ports for CEMS (if applicable)	No CEMS is installed or proposed – not applicable		
	-	The operator must maintain the ports in good condition and free them up prior to work being undertaken	The ports are accessible		
Identification	6.2	Clearly identified and labelled measurement section	The ports are clearly identifiable.		

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
Load bearing capacity	6.2	Permanent and temporary working platforms must have a load bearing capacity sufficient to fulfil the measurement objective	A temporary working platform is provided when required; the structure is designed for appropriate loading for all sampling and maintenance activities. Facilitates manipulation of probes and operation of measuring instruments.	A temporary working platform is provided when required; the structure is designed for appropriate loading for all sampling and maintenance activities. Facilitates manipulation of probes and operation of measuring instruments.	Ground level, no platform, adequate working area.
Position and working space	6.2	Sufficient working area to manipulate probe and operate the measuring instruments, without equipment overhanging guardrails			
	6.2	A sufficient depth of the working area is given by the internal diameter or depth of the duct and the wall thickness plus 1.5 m			
	6.2	If two opposite measurement ports are installed for one measurement line, a correspondingly smaller working area is required	N/A		

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
	6.2	It is recommended that vertical ducts have a working height from the platform to the ports of 1.2 to 1.5m	A temporary working platform is provided when required; the structure is designed for appropriate loading for all sampling and maintenance activities.	A temporary working platform is provided when required; the structure is designed for appropriate loading for all sampling and maintenance activities.	Ground level, no platform, adequate working area.
	-	Removable chains or self-closing gates at the platform to prevent workers falling through access hatches or ladders.	Safe access is provided, including fall protection.	Safe access is provided, including fall protection.	N/A, ground level
Fall prevention	-	Upper handrails at a minimum of 950mm (910mm allowed for old handrails). Gaps in rail no bigger than 470mm. Toe boards required	Handrails (2 levels) and toe boards provided.	Handrails (2 levels) and toe boards provided.	N/A, ground level
	-	Consider installing personal protection systems on vertical ladders	N/A	N/A	N/A, ground level
Access	6.3	Easy and safe access available	Temporary access provisions are reported by the MCERTS contractors as ‘safe’ and ‘easy’	Temporary access provisions are reported by the MCERTS contractors as ‘safe’ and ‘easy’	Access is reported by the MCERTS contractors as ‘safe’ and ‘easy’

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
	-	Consider installing work restraint systems on vertical ladders	N/A	N/A	N/A, ground level
Power supply	6.3	Single phase 110V electrical power of a suitable current provided by a suitable number of sockets at the platform	Adequate and safe electrical supply provisions are made.		
Lifting equipment	6.3	Lifting systems for raising and lowering of equipment, where access to the sampling platform is by vertical, or steeply inclined, ladders or stairs	Not required	Not required	Ground level
	-	Lifting systems (for example, hoists) and attachments (for example, eyes) must be inspected and maintained by a competent person			
	-	Installation of a support structure for securing portable lifting systems (handrails are not usually suitable for supporting lifting systems)			

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
Monorails	-	Consider sampling monorails above the sampling ports to enable certain designs of sampling train to be suspended.	Not applicable		
Exposure to gas	6.3	Avoid areas of sources which emit unexpectedly, for example rupture discs, overpressure valves and steam discharges.	Compliant		
Exposure to stack gas	6.3	Avoid areas of significant positive pressure.	Monitoring takes place externally; natural ventilation reduces risk of exposure to stack gases.		Adequate ventilation reduces risk of exposure to stack gases
Awareness	6.3	Consider how stack emission monitoring personnel are informed of operating faults that may endanger them?	All monitoring works would be under a permit to work scheme, which includes a detailed Risk Assessment and Method Statement (RAMS).		
Ventilation	-	Well ventilated.	Monitoring takes place externally which provides natural (passive) ventilation		Monitoring takes place internally, adequate ventilation
Heat and dust	6.3	Protection of the working area from heat and dust.	No dust sources within working space No specific personnel protection required for heat above normal safe site working conditions.		

M1 Characteristic	BS EN 15259 relevant clauses	Requirement	CHP 1	CHP 2	Boiler 2
Weather protection	6.3	Protective measures (for example, weather protection and heating to ensure conditions are appropriate for personnel and equipment).	The suitability of weather conditions is assessed as part of the risk assessment and monitored during the course of the sampling exercise. If weather conditions were deemed unsafe by dynamic risk assessment following commencement, work would be halted and rescheduled.		Internal measurement location
Lighting	-	Artificial lighting or facilities for temporary lighting.	Need is assessed on a case by case basis, but preference is for monitoring to take place during daylight hours. Area and task lighting would be provided as required.		Internal measurement location

6 Resource efficiency and climate change

6a Describe the basic measures for improving how energy efficient your activities are

YW consumption and generation data is collated and stored within a web-based energy database. This enables the business to produce bespoke reports as required by internal stakeholders.

Monthly energy consumption hubs are held to review ongoing energy use and performance. These are supported with discussions regarding how asset operation can be modified, or capital intervention made, to reduce energy use. This is further supported by YW requirements under the Energy Saving Opportunity Scheme (ESOS) compliance programme. YW conducts energy surveys that are discussed with the site operational teams. The findings of the surveys are collated into a final report and presented to senior management.

YW have published performance commitments in relation to the amount of biogas that is derived from the sludge processed. The higher the efficiency of biogas production the greater the potential for electricity generation. There is a daily generation hub that seeks to identify any generation issues and rectify them promptly.

Overall annual energy and carbon performance is publicly shared via the company annual report as part of the Streamlined Energy and Carbon Reporting (SECR) requirements.

Energy is monitored and managed on a regular basis through the Energy and Recycling Team. Energy consumption and energy generation reports are run and reviewed regularly and are recorded on YW's Performance Zone. YW also participates in a number of mandatory and voluntary carbon reporting schemes. YW sets itself targets for energy consumption and energy generation at both a strategic and operational level. YW has dedicated teams which focus on:

- Maximising renewable energy generation; and
- Implementing strategic and site-specific energy efficiency projects.

Table C3: 6a-1 below describes the measures taken on site to minimise energy use.

Table C3: 6a-1 – Energy efficiency measures

Operating and maintenance	Documented measures in place	
Regular testing and maintenance of biogas systems for leaks, seals, and condensate traps	Yes	Maintenance/servicing undertaken by qualified technicians and registered organisations. Records are maintained on site.
Operation of motors and drives	Yes	Regular inspections/lubrication & maintenance undertaken by qualified technicians and specialist contractors. Records are retained.
Compressed air systems	Yes	On-going leak detection and repair programme undertaken by qualified technicians.
Hot water systems	Yes	Digester system monitored constantly and inspected and tested regularly by an operator and recorded.
Lubrication to avoid high friction losses	Yes	Technicians and specialist contractors carry out regular lubrication, including CHP engine oil change, and records are maintained.
Boiler maintenance e.g. optimising excess air	Yes	Carried out as per legislative requirements and YW procedures.
Physical measures	Documented measures in place	
Sufficient insulation of heated vessels and pipework	Yes	Inspection and housekeeping to check condition of insulation; repair or replacement carried out as necessary
Provision of sealing and containment methods to maintain temperature	Yes	Anaerobic digesters are enclosed.
Other appropriate measures	Yes	Daily operational inspections are conducted to check for aspects such as leaking tanks and pipework
Building services	Documented measures in place	
Energy efficient lighting is in place	Yes	There are limited building service requirements on site, energy efficient options are provided where readily available, and when equipment comes up for renewal
Space heating	Yes	
Hot water	Yes	
Temperature control	Yes	
Ventilation	Yes	
Draft proofing	Yes	
BAT conclusions for energy recovery	Documented measures in place	
Heat recovery (please specify where from and add more lines if appropriate)	Yes	Heat recovered from CHP engines used to maintain anaerobic digester temperature.
Heat exchangers (explain where fitted and add more lines if appropriate)	Yes	Heat exchangers are used in the CHP engines and in the anaerobic digesters.
Re-use of spent cooling water	N/A	
Minimisation of water use and re-circulating water systems for energy saving	Yes	Preference is given to the use of treated final effluent rather than mains water where water quality demand allows.
Good insulation	Yes	Boilers, anaerobic digesters and pipework are insulated
Plant layout to reduce pumping distances	Yes	Where existing layout allows

6b Provide a breakdown of any changes to the energy your activities use up and create

The main site energy sources are electricity from the public supply, gas oil (used as a back up fuel for the boilers) and biogas generated by the anaerobic digesters which is combusted in the CHP engines to generate electricity and/or is used as a fuel source by the boilers.

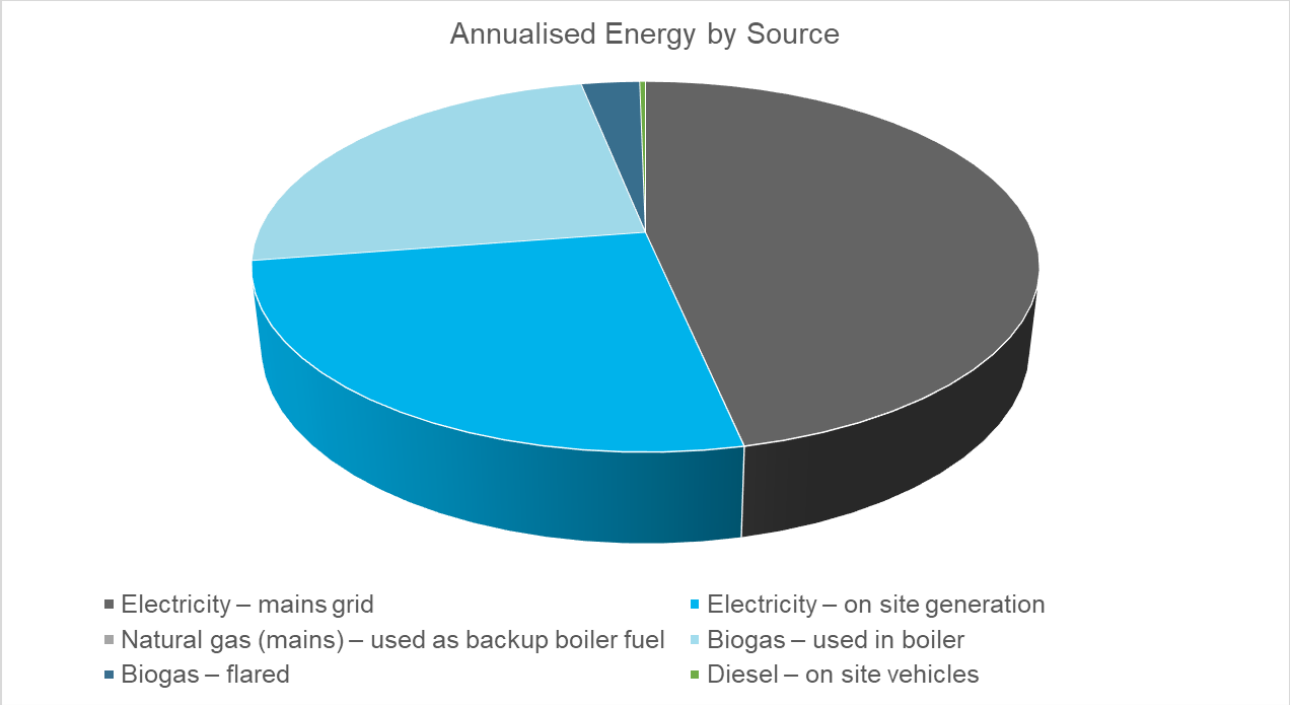
Table C3: 6b-1 shows the energy balance for the site. Electricity generated on site is used to power site equipment. There is currently no facility to export any excess to the national grid. To maintain control of energy consumption, and improve it where possible, electricity and fuel consumption is reported and reviewed on a regular basis.

Table C3: 6b-1 – Typical annual energy use

Energy Source	Energy Consumption MWh [22] [23]		
	Delivered	Primary	% of total (primary)
Electricity – mains grid [24]	3,790	9,095	43.9
Electricity – on site generation from biogas [25] [26]	2,019	5,048	24.4
Biogas used in boilers[26]	4,738	4,738	22.9
Gas oil used in boilers[27]	1,225	1,225	5.9
Biogas flared[26]	558	558	2.7
Diesel – on site vehicles	55	55	0.3
Totals	9,248	18,766	*100*

[22] Figures presented are based on data gathered for the period 2019 to 2021, or a representative sub-set of this data where abnormal process operations, metering or other data issues exist.
[23] Gross calorific value of biomethane used in calculations was 37.706 MJ per m^3 (OFGEM 2016 / ISO 6976:1995).
[24] Electricity (imported) figures include the use for the whole site not just the permitted activities due to metering arrangements.
[25] Delivered value derived from measured biogas methane content of 60.6%, and recorded electricity generated (no export of electricity). Does not take account of heat generated.
[26] Total annualised biogas generation was 10,344 MWh, of which 5,048 MWh was calculated usage in electricity generation and 4,738 MWh calculated usage in boiler. Biogas flared reported as balance.
[27] Gas oil, predominantly utilised within the boiler is also used as engine fuel for other site machinery.

Figure C3: 6b-1 – 2020 energy by source



Global warming potential (GWP)

The CHP is operated as renewable energy generation plant; therefore there are no direct emissions of fossil carbon dioxide (a greenhouse gas) resulting from the combustion of biogas in the CHP. However, there are direct fossil CO_2 emissions as a result of combustion of gas oil in the boilers.

There are also indirect emissions of CO_2 resulting from the use of imported electricity. At present, due to metering arrangements, it is not possible to apportion electricity usage to just the permitted activities within the installation, therefore site wide (Aldwarke WwTW) usage is reported in this section. The CO_2 equivalent (CO_2e) emissions for the plant are set out in Table C3: 6b-2, together with overall GWP calculation.

There will be some losses of biogas (methane) from the plant (a substance with a high global warming potential, at least 21 times higher than CO_2), resulting from unquantified fugitive losses from the biogas system (see LDAR programme). These have not been included in the GWP calculation as no data is available.

Table C3:6b-2 – Global warming potential

Substance	Energy source	Energy Consumption in 2020– Primary (MWh)	CO_2 emission factor (T/MWh) [28]	Mass CO_2 released (tonnes/yr)	Global warming potential	Overall Global Warming Potential (TCO_2 / yr) [29] [30]
Carbon dioxide	Electricity (mains) imported	9,095	0.166	1,510	1	1,510
	Gas oil	1,225	0.25	306	1	306
	Biogas	10,344	0	0	0	0
	Diesel	55	0.25	14	1	914
Total GWP						1,830

6c Have you entered into, or will you enter into, a climate change levy agreement?

No, the activities are not eligible to take part in the CCL Scheme.

The production and use of biogas to produce heat (which is used in the process) and electricity used on site, is the single greatest measure which allows the site to minimise its use of fossil fuels and maximise the use of energy, whilst recovering biological wastes. Biogas may be used in the CHPs or boilers on site and biogas flaring is used only when the CHPs and boilers are unavailable or when biogas generation exceeds combustion capacity.

6d Explain and justify the raw and other materials, other substances and water that you will use

Information related to raw materials use and selection is provided above in response to Q3c.

Water minimisation

Water use within the installation is not significant due to the nature of operations/activities undertaken within the installation. Water is used in small quantities for domestic use within control buildings and is also used as make up fluid for chemicals (polymer) for sludge thickening and dewatering processes, as boiler feed water and for some cleaning activities e.g. thickener drums / centrifuges, washdown in some areas.

Measures are in place to ensure that water is used only where necessary, mains (potable) water use is minimised and final effluent from the co-located WwTW is utilised wherever possible.

[28] Factors from https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming
[29] These calculations do not consider the CO_2 equivalent amount which is avoided through the avoidance of releasing methane which has a much higher GWP than CO_2
[30] Does not include fugitive losses of methane, which are considered low and are not quantified (see LDAR)

The main use of potable water on site is for the makeup of a polymer solution which is used to thicken sludge (for drum thickener and centrifuge) and boiler feed water. In both cases potable water is required in order to prevent process issues if treated effluent were used. Potable water is also provided for domestic use, wash down inside buildings, emergency showers and emergency eye baths (for health and safety reasons).

Final effluent is recycled from the co-located WwTW for use to clean external hard standing areas (where required), sludge import screen washing, polymer carrier water (to dilute the polymer already made up with potable water for drum thickener and centrifuge process units) and some thickener and centrifuge cleaning activities.

The primary water users are listed below, along with the source of water.

Table C3:6d-1 – Water use

Use	Source
Domestic use within control / welfare building	Mains potable water
General cleaning/hosing of hardstanding surfaces	Treated final effluent (external areas) and potable for internal cleaning activities
Mixing with powder and liquid polymer for sludge thickening and dewatering processes	Mains potable water used for product make-up. Treated final effluent is used as the carrier water during dosing.
Drum thickener cleaning	Automatic spray bars operate using treated final effluent Manual jet wash system utilises mains potable water
Boiler feed water	Mains potable water

STF process liquors are not utilised within the STF boundary as it would require a storage tank, separate pipelines, additional booster pumps and a back up infrastructure (i.e. final effluent) in the event that the quantity was not sufficient. As suspended solids can be variable in STF return liquors it can lead to pipe work becoming clogged with solids, causing more operational cleaning and a reduction in asset availability. Use of recycled final effluent from the WwTW significantly reduces potable water use within the STF.

6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

Waste Minimisation

The site is designed and operated as a waste recovery plant and as such minimises waste generation from its own operations. Other than sludge cake, generation of waste is generally minimal and largely limited to packaging or scrap materials associated with engineering projects. Where practical materials are transported to site and stored in bulk or containers are returned to the supplier.

A summary of waste generated as a result of activities undertaken within the Aldwarke STF is provided in Table C3 6e-1 below. Typical treatment / disposal routes are outlined; YW work with waste management contractors to ensure that waste generated as a result of STF activities is managed in line with the waste hierarchy. Recycling and recovery routes are used where possible.

Table C3 6e-1 – Waste streams

Waste Type	Nature of material	Storage arrangements	Treatment/disposal method	Annual production[31]
Waste oil	Hazardous	Stored in containers within bunded areas	Recycle	1,735 litres
Screenings	Non-hazardous	Stored within dedicated skips located on hardstanding	Landfill	100 tonnes
General waste	Non-hazardous	Stored within dedicated skips and smaller containers located on hardstanding	Recycle or energy from waste	10 tonnes
Wood	Non-hazardous	Stored within a skip prior to collection	Recycle (or if contaminated may be energy from waste)	1.5 tonnes
Oil contaminated absorbents	Hazardous	Stored in covered steel drums	Recycle	20 kgs
Oil filters	Hazardous	Stored in covered steel drums	Recycle	17 kgs
Metals	Non-hazardous	Stored within a skip y	Recycle	4 tonnes

[31] Waste data is estimated on the basis of available waste arisings data for Aldwarke STF and from waste data for comparable YW STF sites.

Waste Type	Nature of material	Storage arrangements	Treatment/disposal method	Annual production[31]
Mixed recycling	Non-hazardous	Stored within a skip and smaller containers	Recycle (or if contaminated may be energy from waste)	0.6 tonnes
Empty IBCs	Hazardous	Stored within dedicated contained area on hardstanding	Recycle	80 units
Antifreeze	Hazardous	Stored in bunded containers	Recycle	470 litres

Best Available Techniques: Waste storage, handling and transfer (*BAT 4 and 5*)

IMS procedures specify appropriate measures to ensure compliance with applicable legislation and to control and minimise pollution risks. Controls to minimise environmental risks associated with waste storage, handling and transfer include:

- Waste materials are stored on site for the shortest practicable period of time, in suitable, fit for purpose containers located on areas of hardstanding and away from sensitive receptors such as watercourses. Waste containers are clearly labelled with their intended contents and container storage capacities are not permitted to be exceeded. Site housekeeping inspections are undertaken to ensure these standards are maintained.
- Very limited quantities of hazardous waste are generated by site activities. This is limited to items such as waste oil, oil filters and oil contaminated absorbents and may also include batteries, aerosols and fluorescent tubes. Hazardous waste is always stored in secure containers, away from sensitive receptors and segregated from other waste types.
- Procedures are in place to ensure waste 'duty of care' requirements are met including ensuring that waste is only removed from site by contractors properly licenced and approved for use and accompanied by a fully completed waste transfer or hazardous waste consignment note. Waste transfer and consignment note records are retained electronically or as paper copies on site. Effective implementation of these procedures is supported by training for YW personnel as appropriate.
- YW work with waste management contractors to ensure that waste generated as a result of STF activities is managed in line with the waste hierarchy. Recycling and recovery routes are used where possible.
- Controls are in place to prevent pollution as a result of sludge storage and handling. Following reception on site, sludge is fully contained within tanks and pipework until it is deposited, as digested sludge cake on the cake pad. Surface water runoff from the cake pad is fully contained and is discharged back to Aldwarke WwTW for treatment.

Form C6 Supporting Information

3 How much do you want to discharge?

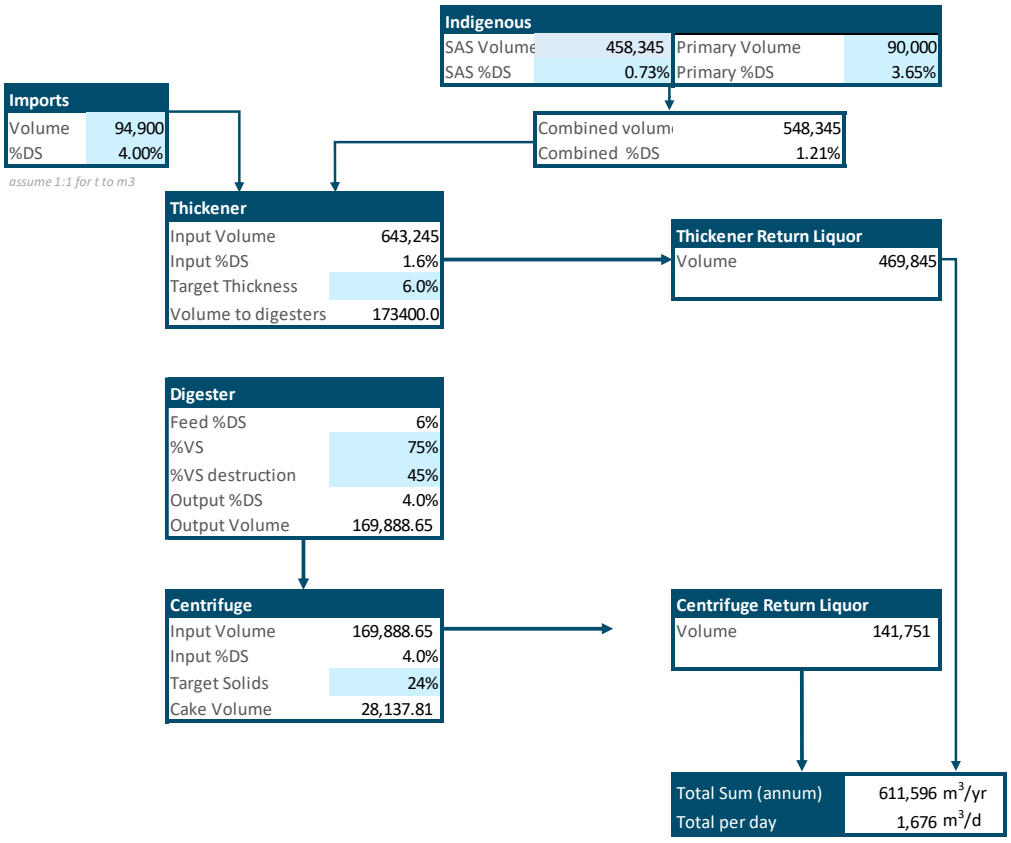
3b, c, d and f

All liquor from raw and digested sludge thickening and dewatering processes, condensate (e.g. from biogas handling), cleaning / washdown effluent and all surface water runoff is collected and discharged via underground drainage systems to the Aldwarke WwTW for full treatment prior to discharge to the River Don.

YW do not currently undertake any routine monitoring of this discharge. It is noted that these discharges include surface water runoff from hardstanding areas within the installation, including the large cake pad and therefore discharges will vary according to rainfall.

Calculations have been used to estimate the volume of effluent returned to Aldwarke WwTW. These values have been provided for indicative purposes and not for the purpose of deriving any permit conditions at this time. The estimated figures presented have been calculated as follows:

Process return calculation



Rainfall plus process return calculation

Cake pad surface area	8,933	m^2	→ Expected cake pad runoff (annum)	8,933,000	Litres	~	24.47 M^3/d
Average Rainfall (annum)	1000	mm					

Source: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/north-east-england_-climate---met-office.pdf

Source: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/north-east-england_-climate---met-office.pdf

Highest monthly rainfall (mm)	92	mm			
↓					
Daily rainfall (mm) (averaged)	3.07	mm	→ Estimated cake pad runoff per day (based on highest monthly rainfall data	27,394.53	l/d
Cake pad surface area	8,933.00	m^2	↓		
			Highest run off (cubic metres per day)	27.39	m^3/d
			+		
			Process returns	1675.60	m^3/d
			=		
			Sum worst case cake pad run off and process returns	**1703.00**	**m^3/d**

5a, b2 Should your discharge be made to the foul sewer?

Form C6 directs YW to answer questions 5a and 5b2. These questions cannot be answered by YW as the STF is co-located on site with the WwTW. These questions appear to be directed at applicants who wish to discharge to surface water or groundwater, which does not apply to YW (all effluent/contaminated water is returned to the WwTW).

No further information is therefore provided in relation to these specific questions.

6a, b, c How will the effluent be treated?

All liquor from raw and digested sludge thickening and dewatering processes, condensate (e.g. from biogas handling), cleaning / washdown effluent and all surface water runoff is collected and discharged via underground drainage systems to the co-located Aldwarke WwTW for full treatment prior to discharge to the River Don. YW do not undertake effluent treatment within the STF installation boundary.

7b, c, d, e, f, g What will be in the effluent?

All liquor from raw and digested sludge thickening and dewatering processes, condensate (e.g. from biogas handling), cleaning / washdown effluent and all surface water runoff is collected and discharged via underground drainage systems to the Aldwarke WwTW for full treatment prior to discharge to the River Don. This position has been managed for a long period within YW without a requirement for a formal discharge consent between the YW STF and the YW WwTW. The WwTW treats effluent from off site and from the STF, and has consent limits in place covering all outputs. Therefore, there has been no requirement to separately characterise or assess the outputs from the STF, or any effects of these on receiving waters, separately from the wider WwTW. As such there is no such information available at this time.

YW is committed to undertake a period of monitoring in order to characterise the liquors returned to the WwTW. The programme of monitoring is identified in response to Form C2, Q6 (Table C2: 6-7). Samples will be taken manually from a suitable location(s) upstream of the WwTW inlet, and will be submitted to a laboratory facility that can test to the appropriate standard. It is proposed this sampling will be carried out for a period of 12 months. The data will be used to complete an environmental impact assessment in accordance with Environment Agency guidance. The findings of the monitoring, analysis and impact assessment will be provided to the Environment Agency within 18 months of permit issue (refer to Proposed Improvement Programme below).

8d, e, f Environmental risk assessments and modelling

Refer to information provided above in response to question 7.

9a, b, d, e, f, h, i Monitoring arrangements

YW do not currently undertake any routine monitoring of effluent discharged to the co-located Aldwarke WwTW. There is no flow monitoring and sampling equipment currently in place or proposed at this time. The grid reference of emission points and proposed sampling points for S1 and S2 (refer to Figure 3) are as follows:

Emission Point Ref	Location	
	Emission point	Proposed sampling point
S1	SK 44527 94321	SK 44557 94332
S2	SK 44527 94317	SK 44746 94449

10a, b, c Where will the effluent discharge to

Form C6 directs YW to answer questions 10a, b and c. These questions cannot be answered by YW as there is no option that applies to discharges from the installation. These questions appear to be directed at applicants who wish to discharge treated effluent to the receiving environment, which does not apply to YW (all effluent/contaminated water is returned to the WwTW).

No further information is therefore provided in relation to these specific questions.

Proposed Improvement Programme

IP Ref.	Related Section	Requirement	Time from receiving permit
1	Form C3: Q2 and Q4, Form C6: Q7	YW is committed to undertake a period of monitoring in order to characterise the liquors returned to the WwTW. It is proposed this sampling will be carried out for a period of 12 months, at which point analysis and assessment of emissions will be conducted and any ongoing monitoring requirements will be established. The data will be used to complete an environmental impact assessment in accordance with Environment Agency guidance. The findings of the monitoring, analysis and impact assessment will be provided to the Environment Agency within 18 months of permit issue.	18 months
2	Form C2: Q6	Undertake an options appraisal of measures to cover undigested sludge tanks (i.e. thickener feed tanks and digester feed tanks). This includes an engineering assessment of the viability of retrofitting a fixed roof and undertaking trials of floating media (either balls or plastic plates) as an alternative approach to tank covering for existing uncovered tanks. Proposals to cover undigested sludge tanks at Aldwarke will be developed once these investigations and trials have been completed.	6 months- completion of tank covering trials and report findings and submit proposals for tank covering at Aldwarke 18 months – to implement tank cover solution
3	Form C2: Q6	Undertake an options appraisal of measures for the mitigation of biogas emissions from post digestion tanks (i.e. centrifuge feed tanks). This includes consideration of options to capture the biogas from these tanks, digestion process changes and/or technologies to optimise biogas generation within the digesters.	12 months
4	Form C2: Q6, C3: Q2	Installation of OCUs at 2 no. thickener air extraction stacks	By 2025 (end of AMP period)
5	Appendix 11 (Containment Risk Assessment)	Implementation of the identified secondary containment solutions. YW commits to undertake a staged programme of work to implement the required secondary containment solution including: procurement, tender and contract award, detailed design and construction.	By 2025 (end of AMP period)
6	Form C3: Q2	A small area of blocked drains to be repaired.	12 months

Section IV: Figures

Figure 1 Site Location Plan

Figure 2 Site Layout Plan

Figure 3 Principal emission points

Figure 4 Drainage Plan

Section V: Appendices

Appendix 1 Relevant Offences

Form C2 / Q3a Have you, or any other relevant person, been convicted of any relevant offence?

Yorkshire Water Services Ltd Relevant Prosecutions Record

Huddersfield Magistrates' Court 9 February 2011

On the above date YW pleaded guilty to breach of Section 85 (1) and (3) of the Water Resources Act 1991.

This incident relates to the Heaton Lodge site which partially treats sewage and then transports this treated sewage to the Cooper Bridge site.

On 9 August 2009 at approximately 4.10pm, an Environment Agency officer found a discharge to the River Don from the Heaton Lodge site. This was reported to YWS at 4.47pm but an off-duty YW colleague had already noted the discharge and reported it proactively 30 minutes earlier. An operator attended site at 4.30pm and identified the cause of the discharge to be a burst from a cracked rising main on the Heaton Lodge site.

The sludge pumps were immediately isolated, stopping the discharge some 30 – 40 minutes after it had first been noted by the off duty YW operator and the matter was escalated to senior management to inform them of the incident in line with the usual process.

YW offered to clean up the affected area but were informed by the EA officer that no clean-up was necessary. Service partners for YW attended on 10 August to locate the exact position of the main burst which was caused by excessive pressure thought to have been due to a blockage. The discharge from the main occurred in the area where it goes under the river. The area around the main was also bunded to contain any future spillages pending confirmation of the structural condition of the main. Visual inspections of the pipe work were maintained for a number of weeks following this incident as part of the site visits that are routinely undertaken.

Repairs were completed by 12 August when sludge transfer and full operations returned. The length of damaged pipe, 20m, was replaced and 75 metres of the main were jetted and CCTV was also carried out to ensure there were no other defects in the main. The total cost of the works was £16,800.

Since the incident, the main had been pressure tested to ensure the integrity of the main – no further incidents have occurred since August 2009 and the further testing did not establish any need for further repair works. The volumes and pressures pumped in this main were reduced following the incident due to a change in the process of transporting the sludge.

The evidence from the EA covered the potential effect, and the actual chemistry/biology however there's no indication that this incident affected the watercourse in terms of its flora and fauna. There was no fish kill. In fact, YWS offered to clean up the watercourse on the day of the incident and were informed that this was not necessary.

The watercourse recovered rapidly. There was no evidence put forward by the EA to suggest that the effect was medium or long term, supported by the EA's contention that a clean-up was not required.

There was no evidence that the recreational use around the discharge point had been adversely affected. The Magistrates accepted that there had been no "flaunting of the law" by the Company. They noted that there was no significant damage to flora or fauna and that the watercourse recovered rapidly. On the issue of culpability, they accepted that the Company did not deliberately break the law and they further noted that the Company did not achieve any economic gain through the commission of this offence.

YWS was fined £10,000 and ordered to pay the EA's costs of £1,164.34.

Huddersfield Magistrates' Court 9 February 2011

On the above date YW pleaded guilty to breach of Section 85 (1) and (3) of the Water Resources Act 1991. This incident occurred on what is known as the Deighton site. This site receives crude sewage and undertakes preliminary treatment in the form of screening of any debris. The main in question transports this treated sludge to the Calder Valley incinerator, at the time of this incident.

At 7.45pm on 9 September 2009, a call was received from the EA that there had been a report of sewage from a local resident and it is noted what the EA state this resident said when reporting this issue. I would ask the Court to be mindful of the terminology used and place the appropriate reliance on this when considering what the customer may or may not have meant by this comment as there is no further evidence with regard to this statement and it clearly could not relate to actual measured flow. RTS which is the alarm system used by Yorkshire Water on its assets was checked immediately for any alarms but none were found.

An operator attended site at 8.30pm and was unable to safely locate the discharge as daylight was fading and for health and safety reasons, the operator ceased his investigation. Service partners for YW had previously been isolating the pumps on a daily basis as the pumps were being commissioned and therefore these pumps were only running between the hours of 7.30am – 6.00pm at the time of this incident. On 9 September, the pumps had been turned off when the operator attended so there was not a discharge left to continue by the operator leaving site.

On the morning of 10 September, the pumps were set running again at 9.05am. The exact point of the discharge which had proved difficult to find due to the excess of overgrowth on the wall was then located. An EA officer was on site and aware that the pumps had been set to run again and at 10.15am witnessed the discharge point. The pumps were immediately stopped.

On 10 September at 11.30am, service partners for YW began the repairs to the main which resulted in a 4m length being replaced. The repairs were made difficult by the presence of a large tree adjacent to the burst. This is believed to have been a contributing factor to the cause of the burst as the tree had displaced the main. CCTV operations were also undertaken on the main, 100m to establish its overall condition with no defects found.

All sludge was tankered from site and any debris observed in the river was completely removed by YW operations. The main was subsequently flushed with treated final effluent and a full CCTV survey was undertaken with no defects identified, the main was found to be in good condition and was brought back into service on 12 September.

Following this incident, the tree and its roots were completely removed to avoid any repeat incident once YW were aware of the contribution of this tree to this incident. The entire length of the main has been cleaned out and a pressure monitor has been placed on the main so that in future, if the pressure rises due to a blockage or any problem, the pumps will cease pumping to avoid a burst. The monitor is alarmed to notify YW of a problem. Together with the cost of the repair works immediately after the incident and the further cleaning works, a total of approximately £375k has been spent on this main.

The evidence from the EA covers the potential effect, and the actual chemistry/biology however there's no indication that this incident affected the watercourse in terms of its flora and fauna.

There was no fish kill. YWS offered to clean up the watercourse and carried out these operations immediately with the agreement of the EA. No further actions were requested by the EA following their further investigations.

There was no evidence put forward by the EA to suggest that the effect was medium or long term. There was no evidence that the recreational use around the discharge point has been adversely affected. They noted that this was a Category 1 offence. It was however noted that there was no significant permanent damage to the flora or fauna. In respect of culpability, there was no deliberate pollution to the watercourse and no economic gain. They had considered all the environmental credentials and investment for the company and they also noted the significant investment in this main since the incident had occurred.

YWS was fined £12,000 and ordered to pay the EA's costs of £1,897.93.

Scarborough Magistrates' Court 6 May 2011

YWS was prosecuted for an offence that on or before 26 April 2010 it did cause a water discharge, namely the entry of waste into the Runswick Beck, Runswick Bay other than in accordance with an environmental permit contrary to Regulations 12 (1) (b) and 38 1 (a) of the Environmental Permitting (England and Wales) Regulations. This was the first offence to be prosecuted under the new regulations.

At 4:26pm on 26 April, YWS was contacted by the EA via Loop informing it of potential pollution incident at Runswick Beck. YWS was directly informed by Loop at 4.40pm and a job was raised for the standby operator who was on site for 5:05pm (some 40 minutes after the first contact).

The operator confirmed that the detention tank on site was full and the overflow was active. The pumps appeared to be running but they were failing to keep on top of the flow. No alarms had been received from the site as it was established that the ultrasonic head that records levels in the tank was inoperable as it had been removed from the tank and placed on top of the tank. The reasons for this were unknown as was both the identity of the person who removed the ultrasonic head and when this was done.

The tank was pumped down by the operator by putting both pumps on hand. The site was not designed to operate using both pumps and was on a duty standby arrangement, however, to try to solve the problem both pumps were in use. At 6:45pm, approximately two hours from the report of the incident by the EA, the discharge was stopped. The operator later noted a discharge from the rising main at Hinderwell and believed the rising main to be blocked which would have had the effect of reducing the SPS's capacity to pump in any event. As the operator had stopped the discharge, before he left site, he checked the watercourse and beach for any signs of debris. He found no such debris as the detention tank has a screened overflow.

A high-level flow was placed in the tank as a temporary indicator for any future high levels. The operator confirmed to the EA that he had stopped the discharge. The EA informed YWS that it would be attending the following day to take samples and requested a clean-up of the beck.

A job was raised for Lumsden and Carroll to clean up Runswick Beck but it did seem that the vegetation in the Beck had contained the majority of the flow. No debris was found. In agreement with the EA, only the top 20 metres of the Beck were cleaned for health and safety reasons. Investigations into YWS's own assets on 27 April established that the detention tank was full of sewage debris. The STRATE pump unit was also cleaned out.

On 28 April, the STRATE tank was cleaned out and its controls were also checked by an electrician. A large quantity of silt was found in the unit and the pumping propellers were also found to be worn. The detention tank had been cleaned out two years prior to this in accordance with our accepted process. It was cleaned out on 29 April and impellors were ordered which had to be delivered from Germany.

The rising main was found to have two of the three air valves clogged with fat and the third valve was found to be damaged – all of which were cleaned and replaced. Approximately £6k in costs was incurred in both the clean-up operation and repair and replacement of the relevant assets. Following the incident, the site was visited every other day, with daily monitoring of RTS.

Sample results taken by the EA showed a significant impact at the point of discharge. Sample results 300 metres downstream of the discharge point on 26 April, showed a lesser impact. Samples taken from the same place 300 metres downstream on 27 April showed a greatly reduced impact suggesting that the watercourse had improved significantly within 24 hours of the incident. The site now has an updated maintenance plan and the telemetry has been fully tested.

The Magistrates made the following comments: "We have listened very carefully to all that has been said today regarding this unfortunate incident at Runswick Bay. We have acknowledged that Yorkshire Water did respond exceedingly quickly. In our view, a response time of 25 minutes is exceptional. We have also noted the early guilty plea and given maximum credit for this."

YWS was fined £7,500 fine and ordered to pay the EA's costs of £1,581.67.

Rotherham Magistrates' Court 10 June 2011

YWS was prosecuted for an offence that on or before 24 April 2010 it did cause a water discharge, namely the entry of waste into the Blackwater Dyke, Aldwarke Lane, Rotherham other than in accordance with an environmental permit contrary to Regulations 12 (1) (b) and 38 1 (a) of the Environmental Permitting (England and Wales) Regulations.

At 11:05am on 26 April, YWS was informed via the EA of a discharge to Blackwater Dyke. YWS operatives were on site at Aldwarke Lane SPS at 12:30pm and found that both pumps at the site were inoperative. Pump no 1 was found to be blocked and the fuses had blown at pump no 2.

A job was immediately raised for an electrician and fitter to attend site. In the interim, straw bales were delivered to site and placed at the confluence of the Dyke and River Don to prevent solids moving into the River Don. Pump No 1 was lifted, unblocked and restored to normal operation on the same afternoon but pump no 2 was found to be burnt out so was removed from the wet well. The pumping station operated on a duty/standby basis and therefore one pump was capable of dealing with the flows.

The site was monitored overnight by standby operatives to ensure the pumping station continued to operate satisfactorily using one pump. No further issues were noted. On 27 April, a replacement pump no 2 was delivered but was not immediately fitted due to wet well restrictions. The site was monitored again overnight. Pump No 2 was installed on 28 April. On 30 April, the EA requested a clean-up of the Dyke and a recycler/vactor unit was requested which removed the surface liquids from the Dyke. No further works were required by the EA.

Aldwarke Lane SPS was monitored by telemetry, however, a telemetry failure was identified on 9 December 2009 which was not rectified until 28 April 2010. The pumping station was visited on a monthly basis prior to the incident and the last visit prior to the incident being on 1 April. The EA did not take any samples of the Dyke nor did it produce any photographs. There was therefore no evidence of the impact on the Dyke.

An employee of the EA witnessed this incident on Saturday 24 April whilst in the area socially. For reasons which had not been explained in his statement or elsewhere, he did not report this incident to any party until two days later on 26 April.

The Magistrates made the following comments: "We have been hearing a case prosecuted by the Environment Agency against Yorkshire Water. We have taken into account the statement from the Environment Agency that the breakdown of the telemetry had no bearing on the subsequent breakdown of the pumps. However, telemetry would have given an early indication of the problem and should not have taken 5 months to repair. We do however appreciate that Yorkshire Water took early action on being informed by the Environment Agency. We would have fined the company £5,000 but give maximum credit for the early guilty plea".

YWS was fined £3,750 fine and ordered to pay the EA's costs of £835.38.

Wakefield Magistrates' Court 18 July 2011

YW was prosecuted for an offence that on or before 7 April 2010 it did cause the entry of polluting matter, namely sewage waste, into the un-named tributary of the River Don to the North of Pugneys Country Park in the district of Wakefield, a controlled water, other than in accordance with a discharge consent contrary to section 85 (1) and 85 (6) of the Water Resources Act 1991.

On 7 April at 11.38am, YWS were informed of a discharge to the tributary by the EA. An operator was sent to site and noted a problem with the Denby Dale Road CSO. Around 1.5 tonnes of fat, rags, silt and grit were removed from the CSO chamber. At the time of the incident, the CSO telemetry data was not visible due to a fault with the alarm points. Data recovered since the incident indicates that the CSO began to discharge to the site detention tank on 11 February 2010 and ceased on 7 April 2010. The flow was being returned to sewer and there is no recorded data to indicate when the discharge to the watercourse may have commenced.

On the day of the incident, a bund was created using straw bales to prevent solid material reaching the River Don. A litter pick around the CSO outfall was also carried out. On 9 April, fat was again found to be accumulating in the CSO chamber which became partially blocked again. This blockage was cleared on the same day and the asset was proactively checked over the weekend and the watercourse also monitored.

On 12 April, the CSO and continuation sewer were completely cleansed by high pressure jetting. One storm pump was also found to be blocked, this blockage was also cleared that day. During that week, the CSO telemetry was also repaired and modified to make graphical data visible and a supplementary “pollution incident” alarm was created. On 13 April, YWS met with the EA and agreed to bund off the dyke upstream of the overflow and that the site would be monitored daily.

Since this incident, potential sources of the fact have been investigated but have not identified a source. All of these businesses who could be the potential source of the fat have been contacted to inform them of the problem and provide guidance on the correct disposal method. A cyclical monthly inspection of the asset has been raised to help identify any future accumulations of fat. This involves checking the CSO itself and a visual check of the outfall.

Prior to the incident, the Detention Tank was inspected on a routine visit on 2 March with no faults found. The pumping station was visited on 11 March which found a partial blockage in the CSO caused by fats which was removed during the same visit. The CSO itself receives a 3-monthly inspection – YWS guidance is that it should be every 6 months so the asset was already being visited more frequently.

The EA took two sets of samples on 8 April and 16 April. The former sample was taken from the point where the drain emerges from culvert into an open ditch. This sample does demonstrate an impact on the watercourse. The second sample taken by the outfall itself some 9 days after the incident was reported, show significantly lower levels for all of the components tested on 8 April. A number of photographs have also been provided.

YWS was fined £10,500 and ordered to pay the EA's costs of £2,324.67.

Calderdale Magistrates’ Court 4 January 2012

On 4 January 2012 YWS pleaded guilty to an offence that on or before 1 April 2011 it failed to comply with Schedule 1, Conditions 11 (a) and 9 (a) (iii) of an environmental permit for waste water treatment and discharge, number WRA7510 in that the levels of biochemical oxygen demand and suspended solids discharged from the works were in excess of the permitted maximum amounts allowed under the said permit and caused pollution of the River Don contrary to Regulations 12 (1) (a) and 38 (2) of the Environmental Permitting (England and Wales) Regulations 2010 and Section 2 of the Pollution Prevention and Control Act 1999. The levels of BOD were 3.6mg/l over the levels normally permitted to be discharged to the watercourse being 73.6 mg/l rather than 70 mg/l or under.

The works in question suffered greatly as a result of the intense winter of 2010/11. The weather had affected a great deal of authorities and the public alike. By way of background, during this period maintenance work in the area, including this sewage treatment works, increased by 374% in January and 240% in February. The impact on the Copley works was severe. A number of assets were affected at the works which resulted in the increase in the levels of sludge being held back for treatment which resulted in the breach of the permit. It can be described almost as a domino effect on preceding treatment assets caused by the winter which then impacted the operation of the centrifuges which were required to operate consistently in a manner for which they are not designed.

A centrifuge is a large drum which is motorised and spins very fast like a washing machine. Wet sludge enters the drum and is spun such that the water is removed and the thickened sludge is passed forward as a cake. It is one part of the overall treatment process at the works.

At the works, there are two centrifuges and the design is for them to operate on what is known as a duty/standby basis. The importance of that is that only one centrifuge is ever required to operate. The standby is there to be called into operation should a problem arise with the duty asset.

The centrifuges are maintained on a 6-monthly basis by a specialist contractor and were last inspected on 3 February 2011 and in July 2010 prior to that. An issue was identified with one of the centrifuges which in turn led to its removal for repair on 10 February leaving one still in situ which is still within the design capacity.

The remaining centrifuge continued to operate at a lower continuous level of operation. It is important to note that this asset did not fail. However, as it was struggling to maintain required levels, a decision was made to bring in a further centrifuge unit which eventually ran on a 24-hour basis, 7 days a week. This arrived on site on 2 April. The levels of BOD on 10 March were 136mg/l. By 1 April 2011, YW had reduced the level of BOD by 50% to 73.6mg/l, 3.6mg/l over the permitted levels of discharge i.e. the levels which are set by the EA that can be safely discharged without any impact. Therefore, clearly the activity by YW had made a significant impact to the BOD levels.

This incident came to the prosecution's attention as a result of self-reporting by YW, there was no attempt to conceal the events on site nor any potential impact on the watercourse. YW were proactive in their communication to the EA to ensure there was full visibility of what was occurring on site. The EA attendance on site was solely in response to the YW contact.

There was no evidence from the EA of any impact on the watercourse other than the sample results provided and some photographic evidence. The sample results show that the levels of BOD were 3.6mg/l over the levels normally permitted to be discharged to the watercourse. It was submitted therefore that taking this into account, the impact on the watercourse was minimal given the close proximity of the final sample result to what is allowed to be safely discharged in all normal circumstances. Any impact in any event was short term if at all.

There was no fish kill nor is there any evidence submitted by the EA of any damage to flora/fauna or impact on recreational or amenity value.

The Yorkshire Water response was timely and effective with costs of approximately £60k being incurred as an immediate and subsequent consequence of the incident. Since the incident occurred, a full root cause analysis was undertaken resulting in a full review of the maintenance procedures to equipment upstream as it were of the centrifuge assets. Those assets were already on an appropriate system of inspection and maintenance which was adhered to prior to this incident. A further new action is a robust two-phase escalation process to reinforce monitoring levels on site in terms of sludge levels which now instigate new actions within the company. A new team leader has also been brought to the site to give more focus to these sorts of issues.

Yorkshire Water self-reported this incident to the EA and fully cooperated with them under interview. Yorkshire Water now has an understanding as to the impact of such a severe winter event which had not previously been seen for in excess of 30 years.

A fine of £5,000 was imposed against a maximum of £50,000. Costs were also awarded to the EA in the sum of £1,593.98.

Bradford Magistrates' Court 20 March 2012

On 20 March 2012 YWS pleaded guilty to 3 offences all contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2010 as follows:

1. Between 17 April and 3 June 2011 at Copley Sewage Treatment Works there was a failure to comply with the permit in that the works were not operated in accordance with that permit through the storage of sludge in external areas.
2. Between 1 April and 24 June 2011 at South Elmsall Sewage Treatment Works there was a failure to comply with the permit in that sludge originating from Copley works and Wheldale works was stored and treated at the site.
3. Between 1 April and 24 June 2011 at South Elmsall Works there was a failure to comply with the permit through the storage of sludge in external areas for more than 2 days and was not stored in sludge skips.

The works at Copley suffered greatly as a result of the intense winter of 2010/11 which affected a great deal of authorities and the public alike.

By way of background, during this period maintenance work in the area, including this sewage treatment works, increased by 374% in January and 240% in February of 2011. The impact on the Copley works was severe. A number of assets were affected at the works which resulted in the increase in the levels of sludge being held back for treatment which resulted in a discharge outside of the permit for Copley. The Company having seen this discharge occur wished to take all measures to repeat a discharge to the watercourse outside of permitted levels.

There were 3 offences before the court relating to permits at 2 sites Copley and South Elmsall sewage treatment works (STW). The background to all 3 offences is as described above. As a result of the issues being seen on site against the backdrop of the situation referred to, a Company Response Management Team (CRMT) was set up on 5 April to make risk based assessments and decisions on the process to be undertaken to deal with the sludge storage. Both sites have permits to regulate the storage of sludge, at Copley, there is an internal storage area and at South Elmsall, the sludge is permitted to be stored externally in skips for no more than 2 days. The offences were not financially motivated. The Company having set up a CRMT which consists of senior management and operators alike, considered all options for the storage of this sludge. The usual process would have been to send the sludge to the Calder Valley incinerator. This incinerator was undergoing its annual programme of planned maintenance between 1-18 April. This is done on an annual basis with no previous impact on operations.

The other appropriate option was another site which due to potential employee risk, had been temporarily closed down pending works to remove that risk.

The final potential option, other than that taken, was to take this matter to landfill. As an environmental option, due to this not being a particularly environmentally friendly option against all others, the decision was taken not to do so. Therefore, the option to store this substance elsewhere or indeed to use alternative containers was not appropriate or indeed a viable option. In all the circumstances, considering availability and indeed environmental impact, the decision taken was the only decision available so it certainly was not a decision taken without full consideration and assessment of the company's responsibilities both with regards to its regulatory duties but also its duties to the environment.

Offence 1:

The internal storage area was full to capacity by 14 April. The decision was made to store the overflow externally which could be safely stored on areas which were considered appropriate to avoid any external impact via drainage or ground impact. Bales of hay were also placed around the stored substance to protect against any issues in the event of rainfall and to protect against seepage outside of these areas. As soon as the incinerator was available, the sludge was removed from site starting from 23 April and completely removed by 3 June with the vast majority having been removed by 27 May.

Offence 2:

This relates to the transporting of sludge from Copley and Wheldale STW to South Elmsall STW. The sludge was only stored on site but no treatment actually took place. In respect of this offence, during the Environment Agency's (EA) own visit report of 11 May 2011, it was deemed that this was "a non-compliance which has no potential environmental impact". The sludge was transported from Wheldale to South Elmsall from 1 April to ensure as much storage was available at Copley as possible.

Offence 3:

It is permitted to store sludge externally at South Elmsall although it is accepted that this should be carried out by virtue of the use of skips and for no more than 2 days. The background explained above explains the duration and it is estimated that approximately 38 skips would have been required for this storage. As the company was continually making arrangements for transporting of this sludge appropriately and it was not known where 38 skips could have been obtained from, the option was taken to store the substance on the ground which was protected from any escape from the site whether by virtue of drains or ground contamination.

The removal of sludge from Copley was prioritised but as soon as possible with complete removal in accordance with the date on the summons.

The context of these incidents was to be considered amongst Yorkshire Water's regional operations. The issues explained on these sites due to the winter and its longstanding impact were felt regionally. Had the Company been in a position to consider any other options, it would have done so but was heavily constricted by events occurring which were caused by issues outside its control.

Effect on environment

There is no evidence from the EA of any impact on the environment save for reference to complaints of odour which the company does not seek to disregard or indeed argue against the impact. The EA's own guidance on incident classification for odour for significant effects is in summary, odour offensive and persistent enough to cause significant effect on human senses… which lead to some disturbance and significantly more intrusive than normal background and potentially with a significant effect on amenity value. There were two odour complaints on 3 May for South Elmsall over the period of external storage for the duration between 1 April to 24 June. There were 6 complaints from the same two customers over the period of external storage for Copley between 17 April and 3 June.

It was submitted that the odour complaints did not fall within this classification and therefore the incidents should be considered against the EA's own guidance of what constitutes a significant impact.

Further the considered actions taken by Yorkshire Water with regard to actual storage areas were to avoid an impact to the environment via a discharge to a watercourse or otherwise as previously seen.

The response by Yorkshire Water

It was submitted that the Yorkshire Water response was as timely and effective as possible in all the circumstances considering the options available in respect of the shut down for planned and unplanned reasons, of the usual process sites. Costs of approximately £55k were incurred as an immediate and subsequent consequence of the incident. Since these incidents occurred, the level of resource focused on audits and compliance has been increased with further training to be provided for responsible managers and teams.

Yorkshire Water now has an understanding as to the impact of such a severe winter event and the impact this had on assets and resulting operations such as the storage of sludge.

Following the EA's visit on 5 May, an action plan was agreed with them for South Elmsall in which Yorkshire Water confirmed that no additional material would be added to that already in placer and it was fully communicated that all of the cake would be removed by 4 July. There was no requirement by the EA at that stage to remove this material any quicker.

For the Copley site, from 10 May, the Company was in contact with the EA regarding its plans for removal of the sludge from the site. To this extent, in respect of both sites, from 5 May onwards, Yorkshire Water was in regular communication informing them of their plans and next steps.

A fine of £17,000 was imposed per offence against a maximum of £50,000. Costs were also awarded to the EA in the sum of £3,935.70.

Huddersfield Magistrates' Court 25 September 2012

On 25 September 2012 YWS pleaded guilty to one offence contrary to Regulations 12 and 38 (2) of the Environment Permitting (England and Wales) Regulations 2010 as follows:

That on or before 14th June 2011 at Huddersfield (Upper Brighouse) Sewage Treatment Works, Yorkshire Water Services Limited did fail to comply with an Environmental Permit, namely conditions 9 and 10 of Schedule 7 of the conditions of consent to discharge number WRA7409 in that a standby pump was not present.

Upper Brighouse is part of a complex of waste water treatment works which treats effluent from Huddersfield town and the surrounding area. Upper Brighouse is subject to conditions contained within permit number WRA7409. In particular, the discharge of settled sewage in an emergency is subject to conditions set out in Schedule 7 to permit WRA7409. Conditions 9 and 10 provide:-

> "9. The duty pump(s) shall be maintained in good working order, and at least one standby pump shall be provided and maintained.
>
> 10. Standby pump(s) shall automatically activate should the duty pump(s) become inoperative for reasons other than power failure. The pumping station shall be maintained so that the pump shall automatically reactivate as soon as is practical after the power is restored after interruption to the supply".

Conditions 9 and 10 relate to an interstage pumping station at Upper Brighouse. There are three pumps available within the pumping station. Pump A acts as a duty pump which pumps flows forward to treatment, pump B is used intermittently to assist the duty pump at times of high flow following heavy rainfall and pump C acts as the standby pump.

At the end of October 2010 pump A failed and could not be repaired in situ. The pump was removed and sent to the manufacturer for assessment. A decision was taken at that time, based on an assessment of operational risk not to source an alternative pump as pump B was capable of pumping flows to treatment and that pump C (formerly the standby pump) could be used as the assist pump. The permit does not, in any event, specify that an assist pump has to be provided. At the end of January 2011 the manufacturer (Hydrosteel) confirmed that the pump was capable of being repaired and gave a lead time for the work of approximately 3 weeks. As there had been no operational difficulties with the pumping arrangements at Upper Brighouse, the decision not to source a temporary third pump was not reviewed.

As with most large organisations, YWS operates a dedicated work and job scheduling system (SAP). The system has been in place for approximately 10 years and is used to schedule and allocate individual jobs. Each job is given its own individual SAP number but there is no overall unique number given to the whole life of a problem or a piece of work, so that a job such as the removal, repair and reinstatement of a pump is not given a single unique SAP reference number which allows it to be traced and remain "visible" until completed in its entirety. Instead, the current operation of the SAP system breaks jobs down into individual stages with each stage having to be separately scheduled and being capable of being completed without there being visibility for the whole job.

The repaired pump was returned to site at the beginning of March and a job raised for its installation. Throughout this period, there were no operational difficulties with the pumping arrangements and again, the decision to use two pumps was not reviewed. A pump was installed at the interstage pumping station in early May however, that pump that was not correctly rated and had to be removed. On 14th June prior to the correct pump (the repaired pump A) being installed, pump B developed an electrical fault which meant that although it was running and showing on the monitoring system as running, it was not actually pumping. At the same time, pump C which was acting as the assist pump, developed a mechanical failure. The failure of pumps B and C resulted in a discharge of settled storm sewage into the River Don. That discharge was permitted under the terms of condition 3 of Schedule 7 to consent number WRA7409.

Effect on the Environment

There was no impact on the environment as a result of this offence.

Response by Yorkshire Water

YWS had, prior to the instigation of the prosecution, identified limitations within its current organisational working practices and structures and the current use of the SAP system for allocating and assigning jobs. A review and a programme for change (Operating for Excellence) commenced in 2011 and aims to ensure across all of YWS's business and operational functions that there are effective systems and processes in place, so that there is greater clarity and visibility as to how, when and why decisions are taken and work programmed. One of the issues to be taken into account in considering the criticality of a particular asset will be ensuring full permit compliance can be achieved and maintained. The Operating for Excellence project, which commenced in September 2011, is now in its pilot phase. In relation to Engineering & Reliability, one of the outcomes identified to date, is the need for there to be a central engineering reliability hub to allow improvements in the way that workflows are managed within operational teams including scheduling, planning and procurement.

The Magistrates made no comment when imposing the fine and costs award, save for confirming that the company had been given credit for an early guilty plea. A fine of £1,200.00 was imposed against a maximum of £50,000.00. Costs were also awarded to the Environment Agency in the sum of £913.42.

01 October 2013

Beverley magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR 2010 on 12 October 2011 at Beverley Waste Water Treatment Works, Beverley.

Fine - £4,000.
Costs - £1,248.70.

01 October 2013

Beverley magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR 2010 on 18 April 2012 at Beverley Waste Water Treatment Works.

20 February 2014

Wakefield magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR on 06 March 2013 at Wash Dyke, Pontefract (Sowgate Lane SPS).

19 January 2016 – Shay Lane Pumping Station

Shay Lane pumping station Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR 2010 05 October 2013.

Negligent Harm 2 £600,000 £24,000.

28 April 2016 – Naburn WWTW

3 charges of contravening Regulations 12 and 38 EPR 2010:

1. Discharge of polluted water from Naburn WwTW into the River Ouse on 23 August 2013.

2. Failure to provide and maintain at least one standby pump at Naburn WwTW between March and October 2013.

3. Failure to provide and maintain at least one standby pump at Naburn WwTW between 17 August and 29 September 2014 See under “Offence(s).

Charges 1 and 2 - high degree of negligence.

Charge 3 – Reckless.

Charges 1 and 2 – Harm 3.

Charge 3 – Harm 4 Charges 1 and 2 - £500,000.

Charge 3 - £600,000.

17 August 2016 – Sherwood CSO

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR 2010 12 April 2013.

Negligent Harm 2 £350,000 £30,000.

13 July 2017 – Hinderwell WWTW

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR in July 2015.

Culpability – Reckless.
Harm – 2.
Fine - £600,000.

27 November 2017 – Sandy Lane (aka Belle Vue) Pumping Station, Doncaster

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR in 24 / 25 April 2014.

Culpability – Negligent.
Harm – 3.
Fine - £45,000.

8 September 2021 – Potteric Carr Nature Reserve (Balby STW)

Sheffield magistrates’ court in connection with two offences on 28 March 2017 at Mother Drain at Potteric Carr Nature Reserve (Balby STW). Yorkshire Water pleaded guilty to a water discharge activity contrary to Reg 12 and 38 of the EPR and a breach of condition of the environmental permit. A fine of £150,000 was imposed against offence 1.

28 January 2022 – Dale Road SPS

Leeds Crown Court in connection with one offence on 3-9 November 2017 at Dale Road SPS. Yorkshire Water pleaded guilty and a fine of £233,000 was imposed.

18 July 2022 – Bradford Beck (George Street Detention Tank)

Leeds Magistrates' Court in connection with three offences between September 2017 and June 2019. Yorkshire Water pleaded guilty and a fine of £1,600,750.00 and £22,112.79 in costs was imposed.

Appendix 2 Technical Competence

Appendix 3 ISO 14001 Certificate

Appendix 4 Quality and Environmental Policy

Appendix 5 Site Condition Report

Appendix 6 BAT Assessment

Appendix 7 Air Emissions Risk Assessment

Appendix 8 Odour Risk Assessment

Appendix 9 Noise Impact Assessment

Appendix 10 Odour Management Plan

Appendix 11 Secondary Containment Risk Assessment

Appendix 12 STF Processing Capacity Calculations

Appendix 13 Leak Detection and Repair (LDAR) Plan