Sludge Treatment Centre Permitting

Environmental Permit Variation Application - Deephams Resubmission

TW_STC_EPR_23a_DHS_ASD | Resubmission

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Project Manager:	Harindra Gunasinghe
Author:	Mark McAree
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Jacobs House
Shrewsbury Business Park
Shrewsbury
Shropshire SY2 6LG
United Kingdom
T +44 (0)1743 284 800
www.jacobs.com

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Contents

1. Introduction

This substantial variation application relates to a biological treatment permit for the Deephams Sludge Treatment Centre (STC), located at the Deephams Sewage Treatment Works (STW), operated by Thames Water Utilities Ltd (Thames Water). It is being made due to sludge treatment operations within sewage treatment works requiring a suitable Environmental Permit under the Environmental Permitting Regulations 2016 (as amended), in order to comply with the requirements of the Industrial Emissions Directive.

Previously, sewage treatment sites operated by sewerage undertakers treating indigenous sewage sludges ('sludge') separated from the main urban waste water treatment stream at the site along with the importation of similar wastes such as cess wastes and interworks sludge and cake transfers, were regulated under the Urban Waste Water Treatment Directive (UWWTD), and Environmental Permitting Regulations as exempt or waste management activities, although some works had parts of the process, specifically biogas utilisation covered by the Environmental Permitting regime.

Now, all aspects of the sludge treatment process at the site, from the thickening of separated sludge from the main aerobic treatment flow, blending with imported waste of a similar nature to indigenous sludge, anaerobic digestion of sludge, through to the storage of digested sludge cake prior to recovery to land offsite, including biogas storage and utilisation will fall within the scope of this permit variation application.

The previous permit in place at the site for the operation of biogas engines,) standby generators and operation of a biomethane Gas to Grid plant will be merged and remain in place as directly associated activities to this listed process. This application is for the purposes of varying the existing permitted activities to include the anaerobic digestion process as an installation activity.

A number of other sewage treatment related activities are undertaken at the site, outside of the scope of this permit, relating to the treatment of waste waters from the sewer network through aerobic processes. These activities are covered by the UWWTD.

1.1 Non-Technical Summary

This variation application is for a bespoke installation permit for the biological treatment of sludge, by anaerobic digestion, with a capacity above the relevant thresholds. The biological treatment of sludge includes treatment of the indigenous sewage sludge from the onsite aerobic treatment process and treatment of imported sewage sludges from other sites, arriving by road to a sludge import point. The indigenous sewage sludges are generated from the aerobic treatment of both waste waters from the sewer network arriving into site at the Works Inlet, and, from imported waste materials, arriving by road transport into a waste import point. The storage of biogas, biogas filtration for siloxane removal, pressurisation of the biogas using compressors and operation of biogas fuelled Combined Heat and Power (CHP) Engines and boilers for the generation of electricity and heat at the site, which is combustion plant under the Medium Combustion Plant Directive, is already permitted, and will be classified as a directly associated activities to this main listed activity. Indigenous biogas is also subject to upgrading to biomethane in a biomethane Gas to Grid plant which will also be classified as a directly associated activity to the main listed activity.

The Deephams Sludge Treatment Centre (STC) is located within the Deephams Sewage Treatment Works (STW), near to Enfield and Edmonton in the London Borough of Enfield, close to the William Girling reservoir.

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW, which passes through the aerobic treatment process under the UWWTD. Indigenous sludges removed from the aerobic process are subject to thickening in separate Primary Sludge and Surplus Activated Sludge (SAS) Thickening Plant, before thickened sludges are mixed within the Sludge Blending Tank prior to transfer to one of the nine Primary Digester Tanks (PDTs). Liquors from the dewatering processes are returned to Works Inlet of the STW via the site drainage for additional treatment.

Imports of sludge from other works are delivered to a sludge offloading point, is screened and pumped to the Sludge Import Tank. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance. Indigenous thickened Primary sludge, thickened SAS and imported sludge combine in the Sludge Blending Tank and are pumped to the PDTs.

The STC comprises of an offloading point for permitted imported tankered wastes. The waste arrives at the STC via tanker, is discharged and is pumped to the Works Inlet, where it combines with other sewer derived materials and subject to aerobic treatment, under the UWWTD.

All imports will be assessed using the Thames Water standard waste pre-acceptance checks to ensure that they are appropriate for treatment via the UWWTD. Once pre-approved as suitable for treatment via the UWWTD route, the waste carriers are approved. Wastes will be subject to appropriate waste acceptance checks in accordance with Thames Water procedures. Incoming tanker vehicles are directed to the inlet offloading point, which is an impermeable surfaced area, equipped with sealed drainage.

Blended sludge is treated in the PDTs over an appropriate number of days before it gravitates to the Secondary Digester Tanks (SDTs) for further digestion over an appropriate number of days to achieve the required pathogen kill. Sludge gravitates through the four SDTs in series and the Post Digestion Dewatering Feed Tank, before being pumped to the Post Digestion Dewatering Plant for dewatering. Liquor from the dewatering process is captured by the site drainage and transferred to the Works Inlet via the Site Liquor Pumping Station.

Digested sludge cake is conveyed to the Cake Pad, an open engineered area for storage of digested sludge cake prior to its remove from the site under the Sludge (Use in Agriculture Regulations) 1989, and in accordance with the Biosolids Assurance Scheme (BAS).

Biogas from the PDTs and SDTs is captured and stored in two double membrane Biogas Storage holders. Individual biogas lines from each digester join a common line transferring the biogas to the Biogas Storage holders, via condensate pots to capture and remove entrained moisture, which is discharged to the site drainage via Return Liquor Pumping Station 1. Biogas is used on site within the CHP Engines, boilers, biomethane upgrade Gas to Grid plant or Emergency Flare. The Biogas Storage holders, PDTs and SDTs are fitted with pressure release valves as a safety precaution in the event of over pressurising the system. Safety systems are also fitted to the biomethane Gas to Grid plant.

Biogas is combusted within one of two CHP Engines on site, generating electricity for use within the site, and heat is used within the boilers. The CHP Engines are classified as 'existing' combustion plant under MCPD and form part of a Specified Generator. Excess electricity is exported to the National Grid. In the event that additional heat input is required, this is provided by the two onsite boilers which can burn biogas or fuel oil and are classified as 'new' combustion plant under the MCPD. Finally, biogas is used within the biomethane Gas to Grid plant, where the biogas is subject to cleaning and moisture removal, carbon dioxide separation and injection into the medium pressure biogas network.

In the event there is excess biogas, i.e. more than the CHP Engines, biomethane Gas to Grid plant or boilers can utilise, or in the event that the CHP Engines or boilers are unavailable, there are ground mounted Emergency Flares. These are utilised under 10% of the year or less than 876 hours per year. In the event of off-specification biogas there is a dedicated Gas to Grid Emergency Flare within the biomethane upgrade plant is used to dispose of biogas in a controlled manner.

This application includes the import of treated sludge cake from other works, for temporary storage on the Cake Pad, pending offsite recovery. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS.

Imported treated sludge cake is offloaded into an area on the Cake Pad, so as to be stored separately to indigenous sludge cake. The waste stream is the same as that arising from the treatment of sludge within the Deephams STC with the same characteristics, composition and eventual end use – application to land. As such,

the infrastructure which is acceptable for use for site cake is appropriate for the imported material. Cake is stored on an impermeable engineered surface, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

2. Technical Description

This is a substantial variation for a bespoke installation permit under the Environmental Permitting (England and Wales) Regulations 2016 (as amended), following a change of interpretation of the Urban Waste Water Treatment Directive (UWWTD) by the Environment Agency. It relates to a biological waste treatment permit for the Deephams Sludge Treatment Centre (STC), located at the Deephams Sewage Treatment Works (STW), operated by Thames Water Utilities Ltd (Thames Water).

Scope

The variation application covers the biological treatment of sewage sludge, both indigenous and imported from other waste water treatment sites, by anaerobic digestion, with a capacity above the relevant thresholds. It also permits the acceptance of portable toilet wastes, along with cess, septic tank and similar sewage derived materials, to the works inlet for processing through the UWWTD treatment. There are a number of Directly Associated Activities (DAAs), including the operation of a biogas fuelled CHP engines for the generation of electricity and heat at the site, which is classified as an 'existing' combustion source under the Medium Combustion Plant Directive (MCPD). A biomethane Gas to Grid plant is also present at the site taking indigenous biogas and cleaning it prior to injection of biomethane into the medium pressure gas network located approximately 300m away – all operations of the biomethane Gas to Grid plant remain as V007.

The operation of biogas fuelled CHP Engines are classified as 'existing' combustion plant under the Medium Combustion Plant Directive (MCPD). The operation of two dual fuelled boilers is classified as 'new' combustion plant under the Medium Combustion Plant Directive (MCPD). Thames Water holds an existing bespoke Environmental Permit under number EPR/FP3535LD/V007. This permit is subject to a substantial variation to convert it to an installation permit with the biogas storage and associated operations becoming a DAA to the main listed activity, namely biological treatment of sewage sludge.

Site Location

The Deephams site is located in the London Borough of Enfield, to the east of Edmonton and south-east of Enfield in a populated, urban area. The site is bounded by Pymmes Brook, River Lee Navigation and the William Girling Reservoir to the East. To the South are industrial and commercial warehouses, including food distribution, a waste transfer station and also an energy from waste and incinerator facility (600 m distant from site). To the West is the A1055 road and a large residential development while to the North is further housing and the Lee Valley Leisure Complex.

The permitted area of the site sits within a Flood Zone 1, with a low probability of flooding (<1:1000 annual probability of flooding). A small area of the wider sewage treatment works may sit within Flood Zone 2, with a medium risk of flooding (between 1:100 and 1:1000 annual probability of flooding). The site sits within a Source Protection Zone 2 (SPZ) and is inside the Enfield Air Quality Management Area. The AQMA is for both Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) and was declared by London Borough of Enfield.

There is one Local Nature Reserve and two Sites of Special Scientific Interest within 2 km of the Deephams Sewage Treatment Works. Chingford Reservoirs SSSI lies approx. 140 m east of the site and Ainslie Wood LNR lies 2 km south-east of the site. The Epping Forest SAC lies 2.0 km north-east of the Site, and Lee Valley Ramsar and SPA lies 2.5 km south of the site and also 7.2 km to the north of the site. There are no National Nature Reserves within 2 km of the site. There are eight non-statutory designated Local Wildlife Sites (LWSs) within 2 km of the site, the closest of which is located to the immediate east of eastern boundary of the STC and STW. There is one area of Ancient Woodland within 2 km of the site, comprising an un-named Ancient and Semi-Natural Woodland located approximately 2km to the south-east of the site.

A site plan, showing the permitted area of Deephams STC and the wider STW can be found in Appendix A.2 while a block flow diagram summarising the sludge treatment process can be found in Appendix A.5. A site tank

inventory is included below, followed by the site process description which identifies where tanks are located within the sludge treatment process.

Site Tank Inventory

Tank Purpose	Number	Operational Volume (m^3)	Total Operational Volume (m^3)	Construction
Sludge Import Tank	1	283	283	Steel
Sludge Blending Tank	1	804	804	Steel
Primary Digester Tank	8	2,253	18,024	Concrete
	1	2,253	2,253	Steel
Secondary Digester Tanks	4	3,846	15,384	Steel
Post Digestion Dewatering Feed Tank	1	3,846	3,846	Steel
Polymer Silo (SAS)	1	2 tonnes		Steel
Polymer Silo (Primary Sludge)	1	10 tonnes		Steel
Polymer Silo (Digested Sludge)	1	20 tonnes		Steel

Waste Activities

The STC comprises of imports of waste for biological treatment and two additional waste activities (imports of non-hazardous waste to the head of the works and imports of non-hazardous waste to the cake barns). Biological treatment processes at the installation are for indigenous Primary sludge and SAS separated from the UWWTD areas of the site and for treatment processes for imported sludge that arrives at Deephams STC by tanker and consists of sludge from other Thames Water sites.

Imports of non-hazardous waste are considered a secondary waste operation to the main listed activity and consist of portable toilet waste along with cess, septic tank and similar sewage derived materials to the head of the works for processing through the UWWTD treatment and of digested sludge to the Cake Pad. Imports to the Cake Pad are for temporary storage, pending recovery offsite; and are a contingency option primarily that will not be routinely used.

Waste imports are to an offloading point for permitted imported wastes which can be found close to the entrance of the STW and forms a waste activity for the site. These wastes are imported by tanker and consist of liquids and associated sludges from domestic and municipal sources that are similar in composition to those materials derived from the sewer network and managed via the UWWTD route. No wastes are imported packaged in other ways than tankers. Access to the offloading points is controlled by the issue of keys by Thames Water to approved contractors only, who have undergone appropriate waste pre-acceptance checks on the material they wish to import to confirm that it is suitable for treatment via the UWWTD route. These keys enable the delivery tankers to discharge waste into the works, through a data logger using the site supplied flexible hose pipes to prevent misconnection issues.

The data logger records the volume of waste material discharged and this imported waste material is handled via the UWWTD treatment route which is outside the scope of this permit. Waste import of non-hazardous wastes to the head of the works is considered a secondary waste operation to main listed activity. Deliveries are of waste are only allowed during the site's opening hours.

This application includes a second additional waste operation at the same site is for the import of non-hazardous, treated, dewatered sludge cake from other works, for temporary storage on the site cake pad, pending transfer offsite. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS. The waste stream is the same as that arising from the treatment of sludge within the Deephams STC with the same characteristics, composition and eventual end use – application to land. As such, the infrastructure which is acceptable for use for site cake is appropriate for the imported material.

Cake is stored on an impermeable cake pad, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

Sludge Processes

Indigenous primary sludge and SAS are drawn off the UWWTD process separately. Primary sludges are pumped from the Primary Sludge Buffer Tanks, through screens to remove rag and inorganic content – the Primary Sludge Buffer tanks and Sludge Screens being outside the scope of this permit, these processes prior forming part of the UWWTD process. From the Sludge Screens, the sludge is pumped through a macerator to the Primary Sludge Thickening Plant for thickening with the additional of polymer coagulant and Final Effluent / Potable Water. Polymer powder is stored in a bulk system and is automatically made up to be dosed into each belt thickener. Liquors from the process are returned to the Works Inlet via the Return Liquor Pumping Station 1. Thickened sludge is then pumped to the Sludge Blending Tank to be mixed with imported sludge and indigenous thickened SAS.

A Sludge Odour Control Unit (OCU) is provided to treat potentially malodourous air extracted from the Primary Sludge Thickening Plant, SAS Thickening Plant, Sludge Blending Tank, Sludge Import Tank, and Return Liquor Pumping Station 1.

Indigenous SAS from the aerobic process is pumped from the SAS Tank to the SAS Thickening Plant, where the sludge is thickened with the addition of a bulk polymer coagulant and Final Effluent / Potable Water. The SAS Thickening Plant is the first stage of the permitted installation with the processes prior including the SAS Tank forming part of the UWWTD process. Powdered polymer from a Polymer Silo is made up and stored within a day tank before it is dosed to each belt thickener individually. Liquors from the process are returned to the head of the works without any form of liquor treatment, via the Return Liquor Pumping Station 1. The thickened SAS is then transferred to the Sludge Blending Tank where it is mixed with the imported sludge and indigenous primary sludges.

Imported sludge from other sites can also be made to Deephams STC. The sludge is discharged from tanker vehicles via a dedicated offloading point, consisting of a transfer hose (to prevent misconnections) and sludge logger. Access to the sludge logger is via a key fob that is issued to drivers and the logger records the volume of sludge transferred and the originating site. The sludge is discharged into a Sludge Import Tank passing first through Sludge Screens to remove grit and stones and to remove rag and inorganic materials, which are discharged to a skip for off-site waste disposal. Imported sludge is then pumped via an above ground pipe to the Sludge Blending Tank. The Sludge Import Tank is of steel construction, above ground and situated on a concrete base. There is an ultrasonic level gauge within this tank which measures the level of sludge inside and is connected to the site SCADA system. A macerator pump is used to prevent settling of sludge within the tank. The tank is odour abated by the Sludge OCU.

The Sludge Blending Tank is an aboveground tank which receives the thickened indigenous primary sludge, thickened indigenous SAS and screened imported sludge. It is a flat-bottomed tank with an external mixer pump to prevent settling. The tank has a fixed roof and is constructed from glass reinforced steel. High level alarms

which monitor how full the tank is to prevent overtopping and inhibit feed pumps in the event of a high level being reached. The tank is odour abated by the Sludge OCU.

Digestion Process

From the Sludge Blending Tank, blended sludge is then pumped via subsurface pipes to one of the nine Primary Digester Tanks (PDTs) located at the site. Four pumps operate on a duty/standby basis to pump sludge to the PDTs with one pair pumping to PDTs 1-4 and the other pair pumping to PDTs 5-9.

All nine PDTs are above ground tanks, covered with fixed roofs, with eight of the nine tanks of concrete construction and the ninth tank is of steel construction. The PDTs are fed continuously with batches of sludge continuously transferred to each digester in turn. Fresh sludge enters in at the top of each PDT and is drawn from the base of the PDT and discharges to a limpet chamber. PDTs have a normal retention time of approximately 12 days.

Two temperature probes are located near the base of each PDT to monitor sludge temperatures and pressure transducers monitor the sludge level within each PDT, both connected to the site SCADA system. In the event of high-level alarms, interlocks will inhibit further pumping of sludge to prevent over-filling. Each PDT is fitted with dual pressure relief valves (PRVs). If required, anti-foam, which is stored in a bunded IBC is added to the sludge line of the heat exchange system to reduce foaming in the PDTs. Sludge is recirculated via the heat exchange system which is located within the heater house between the PDTs. There is one heat exchange system per PDT which provides external heat input and consists of the heat exchange plate, sludge pump feeding the heat exchange and hot water pump. Heating is provided from either the CHP Engines or the auxiliary boilers to a hot water circuit, with this hot water drawn off the circuit and to each heat exchange via the hot water pumps.

After the required duration, digested sludge transfers from the PDTs and gravitates via a subsurface sludge line to the Secondary Digester Tanks (SDTs). The SDTs are arranged in series with digested sludge passing from tank to tank. The four tanks are above ground tanks of steel construction that is situated on a concrete base. The normal retention time within the SDTs is a minimum of 5.3 days. SDTs are covered with a membrane style Biogas Storage holder to contain additional biogas that is not harvested within the PDTs and fitted with dual pressure relief valves (PRVs). Each tank is subject to air mixing and fitted with an ultrasonic level gauge that monitors the level within the tank to prevent overtopping, with this displayed on SCADA. Biogas from the SDTs that is captured within the membrane joins a common line and is transferred to the site's Biogas Storage holders via above ground biogas pipeline for use on site. After the required duration, digested sludge is pumped to the uncovered Post Digestion Dewatering Feed Tank.

From the Post Digestion Dewatering Feed Tank sludge is pumped to one of three centrifuges, which are located next to the Cake Pad, as part of the Post Digestion Dewatering process. The centrifuges dewater the digested sludge with the aid of a polymer coagulant. The polymer is made up from a large Polymer Silo tank with the addition of either Final Effluent / Potable Water in a make-up tank and stored within a storage tank for dosing to the centrifuges. Dewatered digested sludge cake is conveyed to the adjacent Cake Pad for temporary storage via a conveyor belt. Liquors from the Post Digestion Dewatering process is pumped back to the works inlet for further treatment via the Site Liquor Pumping Station.

Cake Storage

The produced digested sludge cake is deposited under the conveyors and moved by shovel loader (or similar plant) from under the conveyor and into the centre of the Cake Pad where the digested sludge cake is stored pending collection and removal. The Cake Pad is a large area of engineered concrete bounded by concrete walls which slopes gently from the middle to each edge. Runoff and rainwater drain away to small filter holes in the side walls and off the western edge of Cake Pad where it joins the common line from the centrifuges leading to the wet well, before being returned to the works inlet for further treatment.

Digested sludge cake is stored on the Cake Pad prior to removal from the site under the Sludge Use in Agriculture Regulations 1989 (SUiAR), and in accordance with the Biosolids Assurance Scheme (BAS). Any non-conforming

sludge is isolated on the Cake Pad and quarantined for an extended period of time to achieve the required level of pathogen kill, before removal from site. Although the risk from bioaerosols is considered to be low there are residential and business receptors within 250 metres of the Cake Pad, who may be present for more than six hours. A Bioaerosol Risk Assessment is appended to this application in Appendix F.

Digested sludge cake from other STCs can also be imported for temporary storage at Deephams STC to provide contingency storage in the event of spreading to land being temporarily unavailable. These cake imports are deposited onto the Cake Pad.

Biogas

Biogas produced within the nine PDTs and four SDTs is captured and transferred to two double membrane Biogas Storage holders that are located within the installation. Biogas is transferred via a mainly above ground biogas pipeline, except for a short section that enters each Biogas Storage holder via a condensate pit. The biogas transfer pipeline is fitted with a number of condensate pots that captures entrained moisture from the generated biogas and allows moisture to be removed from the biogas and returned to the Works Inlet for treatment via the site drainage system. Removing the condensate improves the quality of the biogas and reduces impurities that could reduce the efficiency of the CHP Engines. The Biogas Storage holders are dual membrane type with an inner and outer bag that is fitted with biogas detection systems to detect any biogas leaks in the air space between the inner and outer biogas bag, and PRVs that operate in an emergency as a safety precaution in the event of over pressurising the system. An ultra-sonic level gauge measures the height of inflation within the Biogas Storage holder, which is converted into a percentage fill and displayed on SCADA. The Biogas Storage holder is fitted with lightning protection and a secure fence for physical security.

Biogas upgrading plant

The Deephams STC has a biomethane Gas to Grid plant which uses indigenous biogas which is subject to upgrading and cleaning within a biogas upgrader plant followed by injection of biomethane from a Grid Entry Unit via a Remotely Operated Valve to the local gas distribution network. An Emergency Flare is available for the disposal of off-specification biogas that is not suitable for injection into the local gas network. The biogas upgrader also has a 6 m stack which is an emission point. Effluent, consisting of biogas condensate, and surface water runoff are captured by site drainage and returned to the head of the works of the STW for further treatment. All operations of the biomethane Gas to Grid plant are as described in the Environmental Permit variation application V007 (determined 1/11/2021).

Biogas combustion

Alternatively, biogas from the Biogas Storage holders is passed through biogas boosters and transferred via aboveground biogas pipelines to either the CHP Engines or auxiliary boilers. When the levels within the Biogas Storage holders reaches a high setpoint, biogas is automatically diverted to an Emergency Flare located at the site. In the event of an emergency, slam shut valves found on the biogas line would isolate the supply.

A siloxane filter is located upstream of the CHP Engines on the biogas line to remove impurities from the biogas prior to combustion in the CHP Engines. Use of siloxane filters reduces incidence of operational issues for the CHP Engines.

Deephams STC has two MWM TCG 2020V16 CHP Engines which combust indigenous biogas. Both CHP Engines are located externally within self-contained units designed for external use. Both CHP Engines operate continuously on biogas with no back up fuels. The two CHP Engines each have a thermal input of 3.77 MWth, generating electricity for use within the site and low-grade heat to the Primary Digester Tanks. Electricity generated by the CHP Engines is also exported from the site to the National Grid when there is an excess to the site needs. The CHP Engines both emit to atmosphere via a 15-metre flue within a common windshield.

The CHP Engines are classified as 'existing' combustion plant under the Medium Combustion Plant Directive which are permitted by the existing Combined Heat and Power Plant Environmental Permit (EPR/FP3535LD/V007). The CHP Engines also form a Specified Generator.

Low grade heat generated by the CHP Engines is transferred to the digester heating circuit via plate heat exchangers. This low-grade heat is supplemented by combustion of either indigenous biogas or imported fuel oil in one of two dual fuelled auxiliary boilers. The boilers are both 2.0 MWth Bosch boilers located within the boiler house and are classified as 'new' Medium Combustion Plant. Emissions from the boilers are via a 14-metre flue within a common windshield.

In the event there is excess biogas, there are two ground mounted Emergency Flares which are used during periods of essential maintenance and emergency use. Following commissioning of the new biomethane plant, the Emergency Flares are utilised under 10% of the year, less than 876 hours per year.

Emergency Standby Generators

The STW has four emergency standby generators, which are 5.8 MWth each. . All are diesel powered and operate as emergency standby generators, operating for up to 50 hours per annum (per engine) following the end of the TRIAD scheme. The generators are in immediate geographic proximity to each other and as a consequence of each being above 5MWth the 2024/25 MCPD permitting/compliance date applies. None of the emergency standby generators have been identified as a Directly Associated Activity to the STC as they do not meet the criteria under Guidance *'RGN2 - Understanding the meaning of regulated facility'*. As of December 2023, the generators are subject to advice under the enhanced pre-application service to confirm the best approach to permitting (but with the expectation that as being already permitted they are retained, now as a separately listed activity in V008, noting their revised status & associated run hours).

As a point of reference only, there are also two 5.064MWth diesel generators At Deephams noted within the introductory note of V007. However, these have not been operated within the last two years and are out of use, therefore these generators are not subject to attention under EPR.

BAT Considerations

A BAT gap analysis has been completed for the sludge treatment centre against the associated BAT conclusions and this gap analysis is attached as Appendix D.

2.1 BAT 3; 6; 7: Return Liquors

The Deephams STC site does not have a liquor treatment plant. Liquor treatment for waste waters arising within the permitted area is part of the waste water treatment process of the STW and does not fall within the permit boundary.

There are no direct emissions to water from the STC. The only indirect emissions are of the sludge related liquors, primarily sludge dewatering and sludge thickening liquors, and surface (rain) water, which are returned to the wastewater treatment works for aerobic treatment under Urban Wastewater Treatment Regulations.

Return Liquor Monitoring is included in Appendix M.

2.2 Management of Diffuse Emissions – BAT 14

The Post Digestion Dewatering Feed Tank is an open top tank within the permit boundary at Deephams STC.

Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the potential need to cover open topped tanks. Thames is not able to commit to covering tanks by the stated deadline of December 2024, delivery timescales will be subject to the outcome of PR24 and subsequent price review discussions.

2.3 Site Infrastructure

Management of emissions to water – BAT 19

Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the detailed design for Deephams secondary containment, the secondary containment options report (see Appendix G) is an outline solution that may be subject to change. Thames is not able to commit to secondary containment requirements by the stated deadline of December 2024 delivery timescales will be subject to the outcome of PR24 and subsequent price review discussions.

A figure showing the current site surfacing within the permit boundary is included within Appendix A, Figure A.3.

Process Controls

Anaerobic digestor operations are monitored automatically from the control centre at the site and outside of normal operational hours, from the regional control centre. Checks include digester health, temperature and operation. As described, tanks are equipped with appropriate high-level alarms and automatic cut off valves to minimise releases. The Primary Digester Tanks, Secondary Digester Tanks and Biogas Storage holders are also fitted with dual pressure relief valves which operate in an emergency to minimise releases from over- or under-pressurisation. Site operations are covered by Thames Water's management system, including the preventative maintenance programme for the site.

A range of process parameters are subject to routine monitoring or checking to ensure that the digestion process is operating optimally so that the required sewage cake output quality is achieved.

- pH: At a conventional digestion site such as Deephams the process is maintained around pH 7 but within the range 6.72 – 7.6 (this is % dry solids and digester load dependant) for healthy operation.
- alkalinity: Levels dependant on feedstock characteristics (primary sludge: surplus activated sludge (SAS) ratio). Conventional digestion typically, 3,500 - 5,000mg/litre range.
- temperature: minimum target of 38°C. This is maintained within the range 36-40°C.
- HRT (hydraulic retention time): minimum target is 15-days, there is no upper limit. Retention times shall not be less than 12-days during plant outages to keep the product pathogen kill efficiency control.
- OLR (organic loading rate): see table below - this is dependent on the primary/SAS ratio. Deephams fits into the first row of the table.
- Dry solids feed: see table below, Deephams has a target of 6%DS, but this can vary between 3-8%DS and impacts the HRT.

Type of Digestion	0%- 35% SAS[x]	36%- 45% SAS	46%- 50% SAS	51%- 55% SAS	>55% SAS	Max Feed %DS
MAD* in Conventional Digestion	3	2.5	2	1.75	n/a	6
MAD after Pre-pasteurisation	4.5	4	3.5	3	n/a	7
MAD after Acid Hydrolysis	4.5	4	3.5	3	n/a	7
MAD after Thermal Hydrolysis	7	6.5	6	5.5	5.5	14

* mesophilic anaerobic digestion

[x] surplus activated sludge, arising from the UWWTD treatment route.

- VFA (volatile fatty acid) concentration: There is no specific range for VFAs as it depends on the feedstock. It is used as an indicator of digester health rather than a process control. The production of organic acids depends on the volume of solids fed to the digester. The typical range for VFAs in a primary digester is between 50 and 800 mg/L. When VFA concentrations climb above 1000 mg/L, the digester could be overloaded or experiencing other problems.

- Ammonia - Ammonia concentrations of 50 to 1000 mg/L are beneficial, but ammonia levels of 1500 to 3000 mg/L (pH greater than 7.4) could be inhibitory but not always. An ammonia concentration higher than 3000 mg/L for prolonged period is toxic.

- VFA to Alkalinity ratio: Very important parameter to monitor for digestion process. The VFA to alkalinity ratio of below 0.4 is good and above this threshold value means diminishing alkalinity and low pH i.e. sour digester content. As long as this ratio is maintained higher VFA and alkalinity digester content can be acceptable and the digestion process is deemed healthy. Anaerobic digestion process is always controlled based on holistic parameters but not based on single parameter.

Waste Tracking

Because of the nature of the waste accepted at the site for treatment, and the processes undertaken, the location of any specific load of waste cannot be tracked directly within the installation. Instead, tracking, if required, is based on the normal operational periods for treatment, which can locate the approximate location of the imported material with the process, based on the number of days post acceptance.

Cake imports are stored separately on the cake pad, and their location can be identified on this basis.

Odour

The facility has an Odour Management Plan which is supplied as Appendix E.

Bioaerosols

Digested sludge cake at Deephams is stored on a Cake Pad which is within 250 m of the nearest sensitive receptor, where people live or work for more than 6 hours at a time. See Appendix F for the site specific Bioaerosol Risk Assessment.

Other Items

Please see Appendix A, A.6 for photographs of key plant infrastructure.

A leak detection and repair (LDAR) plan has been prepared for the site and this is presented as Appendix H.

An air dispersion model has previously been provided for the site. Combustion processes on the site are currently permitted and there are no changes to these units as part of this application. As such, the previous modelling remains valid and all emission limits are unchanged.

Other Risk Assessments

There is no requirement for a fire prevention plan, due to the nature of the wastes treated at the site and the processes utilised, in accordance with Environment Agency guidance.

2.4 Regulatory listing

The installation is permitted as a Schedule 1 listed activity under the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

The relevant listing under Schedule 1 is:

Section 5.4 Disposal, recovery or a mix of disposal and recovery of non-hazardous waste

Part A(1) (b); 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 one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC—

i. biological treatment;

The site includes the following Directly Associated Activities (DAA):

- Imports of waste, including sludge from other sewage treatment works for treatment;
- Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;
- Storage of digestate prior to dewatering;
- Dewatering of digested sewage sludge
- Transfer of dewatering liquors via site drainage back to the head of the sewage treatment works;
- Transfer of surface water runoff via site drainage back to the head of the sewage treatment works;
- Storage of dewatered digested sludge cake prior to offsite recovery;
- Storage of biogas;
- Transfer of biogas condensate via site drainage back to the head of the sewage treatment works;
- Combustion of biogas in a MCPD and Specified Generator (SG) compliant biogas CHP Engines;
- Combustion of biogas or diesel in MCPD boilers (that operate fore <500 hours per annum);
- Operation of Emergency Flares;
- Operation of siloxane filter plant;
- Pressurisation of biogas in biogas compressors;
- Storage of fuels including: fuel oil, diesel and propane;
- Storage of wastes, including waste oils;
- Storage of raw materials;
- Upgrading of biogas to biomethane in a biomethane Gas to Grid plant;
- Operation of biogas filter plant using condensers, activated carbon filters and membrane technology; and
- Injection of biomethane to the medium pressure gas grid.

The waste activities at the site are:

- Imports of waste to the works inlet for treatment through the UWWTD route and;
- Imports of digested sludge cake for temporary storage pending off-site removal.

In addition to the listed activity at the site, there is directly associated activity of a biogas combustion plant. This comprises:

- 2x 3.77 MWth CHP Engines;
- 2x 2.0 MWth boilers;

There are also 4x 5.8 MWth emergency standby generators that are already permitted.

The two CHP Engines are MCPs and form a Specified Generator.

The two boilers are classified as Medium Combustion Plant.

Total thermal input of the STC is approximately 34.74Wth when including the excluded generators of which approximately 11.54 MWth is in routine use.

3. Form C2 Questions

1 About the permit

1a Discussions before your application

The pre-application process is currently not available due to Environment Agency resourcing issues, discussions have been held with the local area Environment Agency staff. Nature and heritage conservation screening was requested and received via email from the pre-application advice service of the Environment Agency.

1b Permit number

What is the permit number that this application relates to?

EPR/FP3535LD/V007 issued 01/11/2021.

1c What is the site name, address, postcode and national grid reference?

Thames Water Utilities Limited

Deephams Sludge Treatment Centre (Combined Heat and Power Plant)

Deephams Sewage Treatment Works

Pickett's Lock Lane

London

N9 0BA

TQ 35872 93365

2 About your proposed changes

2a Type of variation

This is a substantial variation.

2b Changes or additions to existing activities

Table C2-1 Proposed changes to current activities.

Name	Installation schedule 1 references	Description of the installation activity	Description of waste operations	Proposed changes document reference
Deephams STC	*Section 5.4 Part A(1) (b); i*	Biological treatment by means of Anaerobic digestion		This document
Deephams Combined			Operation of CHP engines and boilers,	

Heat and Power Plant			now a DAA to installation	
Deephams Biomethane Gas to Grid Plant			Operation of a biogas to biomethane upgrade plant now a DAA to installation.	

2c Consolidating (combining) or updating existing permits

Yes

2c1 Do you want to have a modern style permit?

Yes

2c2 Identify all the permits you want to consolidate (combine)

EPR/FP3535LD/V007 – Deephams Combined Heat and Power Plant

2d Treating batteries

2d1 Are you planning to treat batteries?

No, this application is not for the treatment of batteries.

2e Ship recycling

2e1 Is your activity covered by the Ship Recycling Regulations 2015?

No, this application is not covered by the Ship Recycling Regulations 2015

2f Low impact installations (installations only)

2f1 Are any of the regulated facilities low impact installations?

No, this application is not for a low impact installation.

2g Multi - operator installation

No. This is not a multi-operator installation.

3 Your ability as an operator

3a Relevant offences

3a1 Have you, or any other relevant person, been convicted of any relevant offence?

Yes. The applicant has been convicted of a relevant offence within the last 12 months.

Event Name	Court	Date of hearing	Fine	Summary
EA v Thames Water Utilities Limited	Lewes Crown Court	3rd & 4th July 2023	Fine: £3,334,000.00 Prosecution Costs: £128,961.05 and victim surcharge of £120.00	Thames Water pleaded guilty to four charges under the Environmental Permitting (England and Wales) Regulations 2016. The detail of each summons is included below: Summons 1: Between 9 October 2017 and 14 October 2017 TW caused a water discharge activity, namely A discharge of sewage effluent from Crawley Sewage Treatment Works into the Gatwick Stream and the River Mole, except under and to the extent authorised by an environmental permit contrary to Regulation 38(1)(a) and Regulation 12(1)(b) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 2: On and /or before 14 October 2017 TW did contravene condition 11 of environmental permit CNTM.1402 by failing to have capacity of not less than 11,000 m3 in the storm lagoon at Crawley Sewage Treatment Works contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 3: Between 9 October 2017 and 14 October 2017 TW contravened condition 12 of environmental permit CNTM.1402 by failing to discharge when the rate of flow at the inlet sewer at Crawley Sewage Treatment Works is in excess of 840 l/s due to rainfall and /or snowmelt contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 4: On and /or before 14 October 2017 TW did contravene condition 13 of environmental permit CNTM.1402 by failing to empty the storm lagoon at Crawley Sewage Treatment Works and return the contents for full treatment as soon as practicable after cessation of the overflow to the lagoon contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2016.

3b Technical ability

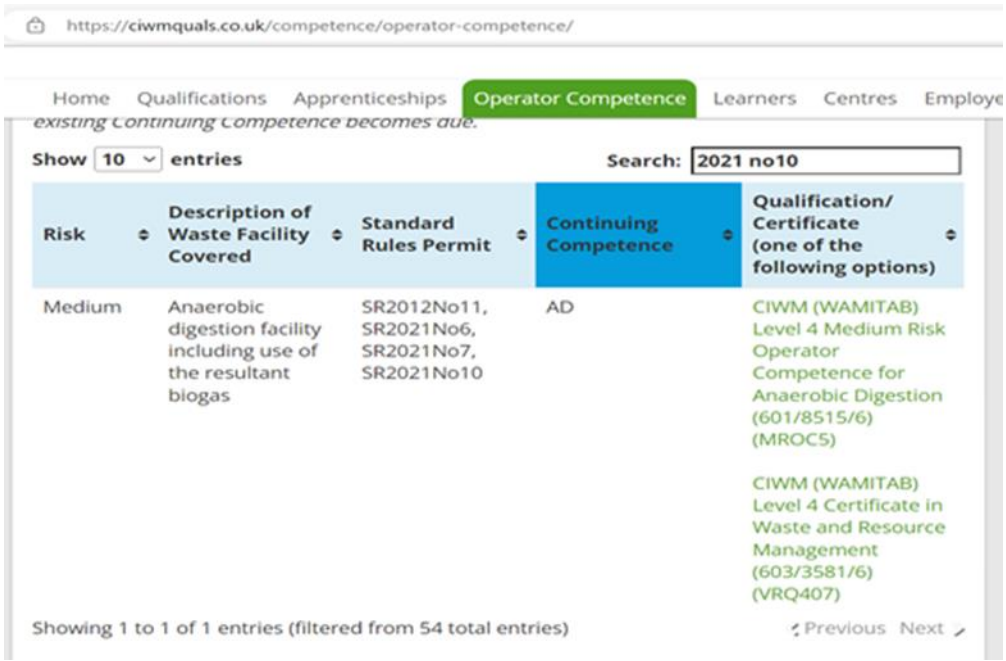
Thames Water uses WAMITAB qualified staff at their waste facilities. The relevant person for the site has been named below and full details have been provided separately on a spreadsheet.

Jacob Noble

Please see Appendix B for evidence of competency.

Following discussions with CIWM (WAMITAB), Thames Water understands there are two routes to holding an appropriate CoTC for the permit as laid out in the screen shot below:

a) CIWM (WAMITAB) Level 4 medium risk operator competence for anaerobic digestion (MROC5)
b) CIWM (WAMITAB) Level 4 Certificate In waste and Resource Management – VRQ" and optional "VRQ407 – Principles and practices of managing a biological treatment processing facility (Anaerobic Digestion and Composting)"



Thames intend to follow option B at this site.

Thames Water understands from the CIWM website that the proposed option is acceptable.

3c Finances

Installations, waste operations and mining waste operations only.

Do you or any relevant person or a company in which you were a relevant person have current or past bankruptcy or insolvency proceedings against you?

No.

3d Management systems

What management system will you provide for your regulated facility?

Identify the form of the management system from the list:

• Own management system

Thames Water has a SharePoint based Environmental Management System, with site specific elements and procedures linked from across the organisation Thames Water also has an Asset Management System accredited to ISO 55001 and an Energy Management System accredited to ISO 50001.

Scope

Thames Water has an EMS in place for its permitted assets.

Environmental Policy

Implementation of Thames Water's Environmental Policy is approved by the Thames Water Executive Committee of the Thames Water Board and is the responsibility of all employees, with the Chief Executive being accountable for its implementation. The policy covers all company activities, including this installation, and applies to all individuals who are employed by, or carry out work on behalf of, any Thames Water company including contractors, temporary staff and agency workers. The Management Systems Team is responsible for the implementation and assurance of the EMS, the site operations teams will be responsible for maintaining ongoing compliance with the EMS and managing the site.

Management and Responsibilities

The Management Systems Team (EMS specialists) have responsibility for the management and upkeep of the EMS. Compliance with specific elements of environmental legislation is managed by the relevant Business Areas across the Company. The Environmental Assurance Team maintain a Legal Register and, in consultation with Operations Teams, the environmental permitting team and other specialists, assess environmental risks for in-scope areas using a significance scoring method under normal, abnormal and emergency conditions. Significant environmental aspects and impacts consider legal and other requirements, cost to the business, scale of impact and interested parties.

Management Systems Team are responsible for setting internal environmental standards which are then implemented by the relevant business areas. The Standards and other relevant information are communicated through several routes. Incident and corrective action routes exist to promote continual improvement. The team run a programme of Management System Audits to determined adherence to the environmental policy and environmental standards.

Local operating procedures are the responsibility of the operational teams that operate the sewage works.

The defined roles and responsibilities are allocated to relevant personnel, depending on their job description, qualifications, knowledge, experience and training. Training and competency are based on specific roles.

Operational Control

Procedures are in place within the EMS to identify and control environmental issues arising from company activities. Each department is required to achieve operational control of its activities using standardised systems.

Routine sewage treatment operations and activities are recorded within the corporate management database, SAP. These include routine inspections, monitoring and maintenance tasks.

Non-routine activities, such as major overhauls/refurbishments, which involve the use of sub-contractors are assessed for health & safety concerns; relevant environmental risks and with accompanying method statements to respond to these. Contractors who are required to carry out major services are closely managed by operational or other staff to ensure that compliance with Thames Water's H&S and environmental policies is achieved. No contractors may work on site without having undergone a full site induction and being issued with a Thames Water Operational Safety Authorisation (TWOSA) for the task(s) they intend to complete.

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 and Monitoring

Management will have the ultimate responsibility for the effective maintenance of plant throughout the company. The facility has named staff that are responsible for day-to-day maintenance operations and contractors are also used as required. All maintenance is logged on SAP. The following basic inspections and maintenance activities are indicative of those carried out on site:

- Daily operation of plant (24/7) involves visual inspection of operational assets;
- Daily inspection of temporary pipe work installed;
- Routine maintenance programme for plant; and
- Routine lubrication programme.

Personnel responsible for the inspection, testing and maintenance of pollution prevention infrastructure are trained to an appropriate level.

All regular maintenance of all plant and equipment will be completed on the time scale specified by the equipment manufacturer including routine inspections.

Environmental Improvement

Thames Water is committed to environmental improvements and has established environmental targets and plans relating to materials and waste management, transport, climate change mitigation and adaptation (energy efficiency and renewable energy generation), water resources, biodiversity, river water quality, and drainage asset performance. TWUL's Environmental Governance Board meets on a regular basis to provide strategic direction, and interrogative review, attached to any environmental issue of substantive concern including emerging risks as well as current topics.

Competence, Training and Training Records

Thames Water aims to ensure that all employees are in possession of the knowledge, skills and experience necessary to perform their role in accordance with the company's operating procedures and in full compliance with the law. Training needs are identified by the employee's immediate supervisor or line manager.

For those sites treating 'waste' as defined by the Waste Regulations 2011, coverage at all permitted sites by staff who hold the appropriate level of WAMITAB 'Certificate of technical Competence' is monitored centrally. This aspect of the staff training is currently being reviewed in light of the change in permitting requirements for sludge treatment centres.

For each internal training course held a Training Record is issued.

Induction training is carried out by the responsible line manager and consists of an introduction to the Company's Environmental Health and Safety Policy and description of emergency response and spill prevention procedures.

Staff receive specific training in the plant's operation and the environmental impact of the process as well as health and safety. The operators will 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. This training will be provided by the equipment manufacturers or in-house staff as appropriate.

Contractors

There are several procedures to ensure contractors have the required skills and environmental competencies to carry out works at the 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 the contractors are on the approved supplier list, they are still further assessed for each specific contracted activity.

The contactor is required to submit a method statement prior to any commencement of work, identifying how work is to be undertaken and the associated risks. The method statement must be approved by the Site Manager, 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.

Incidents, Non-Compliances and Complaints

Thames Water has procedures for incidents, non-compliances and environmental complaints.

Incidents are managed through corporate and site-specific procedures which ensure that all incidents are logged and that necessary preventative and/or corrective actions are taken.

Customer complaints are made via the Customer Services Centre which will log all complaints electronically. An action is raised to Waste Operations Control Centre (WOCC) who contact the CSM by telephone and email the complaint information to both the CSM and Performance Manager. The CSM and Performance Manager will review the complaint and take action to investigate the complaint. The CSM is responsible for contacting the customer and updating them on the outcome of the investigation and any actions taken. Where complaints relate to odour/noise/amenity, typical follow up action would include physical checks onsite of the operation of plant; offsite checks where needed; with all the actions taken being logged. Where appropriate, site management may contact the customer to discuss the outcome of the complaint, otherwise, there is a customer communication plan that identifies how and when contact will be made with customers and other stakeholders.

Information regarding complaints is recorded to allow determination of an appropriate response (corrective action) and identify what measures need to be taken in the future to prevent its reoccurrence (preventive action).

Communication

There are regular meetings held on site to discuss all aspects of the treatment works and performance against targets. These meetings include the operation and performance of the installation. Other communication methods to promote environmental management issues and continual improvement include: toolbox talks, environmental alerts, OSC portal forums, formalised event learning processes following an operational incident and compliance audits.

4 Consultation

Could the waste operation or installation involve releasing any substance into any of the following?

4a A sewer managed by a sewerage undertaker?

Yes. The site discharges into a drainage system of the wider sewage treatment works, controlled and operated by the applicant.

4b A harbour managed by a harbour authority?

No

4c Directly into relevant territorial waters or coastal waters within the sea fisheries district of a local fisheries committee?

No

4d Is the installation on a site for which:

4d1 a nuclear site licence is needed under section 1 of the Nuclear Installations Act 1965?

No

4d2 a policy document for preventing major accidents is needed under regulation 5 of the Control of Major Accident Hazards Regulations 2015, or a safety report is needed under regulation 7 of those Regulations?

Yes, Deephams Sewage Treatment Works is a Lower tier site under COMAH due to flammable liquids and gases. The existing policy document remains at present.

5 Supporting information

5a Provide a plan or plans for the site

Please see Appendix A for:

- A.1 Site Location Plan
- A.2 Installation Boundary and Emission Point Plan
- A.3 Site Impermeable and Permeable Surfaces Plan
- A.4 Site Drainage Plan
- A.5 Process Flow Diagram
- A.6 Site Photographs

5b Do any of the variations you plan to make need extra land to be included in the permit?

Yes. See Appendix C for the Site Condition Report.

5c Provide a non-technical summary of your application

Please see earlier text in Section 1.

5d Risk of fire from sites storing combustible waste

No. The site processes sit outside the scope of the Environment Agency fire prevention plan guidance, as set out in the Environment Agency guidance.

5f Adding an installation

Please see the response to Q5b for the baseline report which is in the H5 template.

6 Environmental risk assessment

An environmental risk assessment of the site changes has been carried out in line with the requirements of the Horizontal Guidance Note H1 and Guidance given on gov.uk. This guidance specifies the following approach to carrying out an environmental risk assessment for a proposed activity:

- Identify potential risks that your activity may present to the environment;
- Screen out those that are insignificant and don't need detailed assessment;
- Assess potentially significant risks in more detail if needed;
- Choose the right control measures, if needed; and
- Report your assessment.

Designated Site Review

Site Name	Designation	Direction from site	Distance from site
Epping Forest	SAC	North-East	2,000 m
Lee Valley	Ramsar	South North	2,500 m 7,200 m
Lee Valley	SPA	South North	2,500 m 7,200 m
Chingford Reservoirs	SSSI	East	138 m
Ainslie Wood	LNR	South-East	2,000 m
Un-named	Ancient & Semi-Natural Woodland	South-East	2,000 m

List of Local Wildlife Sites	
Mansfield Park Lea Valley Banbury Reservoir Chingford Mount Cemetery Tottenham Marshes Tottenham Hale to Northumberland Park Railsides Pymme's Park and Pymme's Brook	All sites <2,000 m

Data taken from MAGIC.gov.uk website, accessed February 2022. For habitat sites, the relevant distance for consideration are: International designations (SAC, MPA, SPA and Ramsar - 10km); National designations (SSSI – 2km); Local and National Nature Reserves, Local Wildlife Sites (LWS) and Ancient Woodland (AW) (2km).

The nearest designated habitat to Deephams Sewage Treatment Works is Chingford Reservoirs SSSI situated 138 m to the East of the site. The Epping Forest SAC is situated approximately 2 km to the North-East of the site, and Lee Valley Ramsar and SPA are located approximately 2.5 km to the South of the site and approximately 7.2 km to the North of the site.

There are no Local or National Nature Reserves within 2 km of the site.

There are eight non-statutory designated LWS's within 2 km of the site, the closest of which is located to the immediate East of eastern boundary of the Deephams Sewage Treatment Works.

There is one area of Ancient Woodland within 2 km of the site, comprising an un-named Ancient and Semi-Natural Woodland located approximately 2km to the South-East of the Deephams Sewage Treatment Works.

The site is within a Source Protection Zone 2 (SPZ).

The permitted area of the site sits within a Flood Zone 1, with a low probability of flooding (<1:1000 annual probability of flooding). There are small portions of the wider sewage treatment works that sit within Flood Zone 2, with a medium risk of flooding (between 1:100 and 1:1000 annual probability of flooding).

The site is located within the boundaries of the Enfield Air Quality Management Area (AQMA). The AQMA has been declared in March 2001 for the following pollutants: Nitrogen dioxide (NO2) – Annual Mean and Particulate Matter (PM_{10}) – 24-Hour Mean.

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
Amenity issues: Litter, vermin and pests	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, amenity and recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. The site is located within an industrial estate approximately 1.5 km to the West of Edmonton, London and is bounded on the West by the A1055 and to the East by the River Lee Navigation. Th nearest residential dwellings are located approximately 45 m to the North of the STW site boundary, a development of houses on Pickett's Lock Lane. Further residential properties are located approximately 75 m to the West of the STW, on the other side of the A1055 and a railway line. Immediately to the South of the site are a number of industrial warehouses and commercial premises including two permitted waste facilities. Ecological receptors: A SSSI, Chingford Reservoirs, is located approximately138m to the East of the site and a LNR, Ainslie Wood, is located 2 km to the South-East of the site. A SAC, Epping Forest is located approximately 2.2. km to the East of the site and a Ramsar and SPA, Lee Valley, is located approximately 2.5 km to the South of the site.	The wastes handled at the site are primarily liquids and sludges, along with UWWTD derived material delivered by sewer. As such, there is no source of litter within the materials handled at the site. In the unlikely event pests or vermin are observed on site a suitable contractor is called in as soon as practicable.	X
Dust and bioaerosol	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Litter above. The impact of dust on human health will depend on the distance and wind direction. For bioaerosols this distance is 250 m.	The wastes handled at the site are liquids, sewage sludges and digested sludge cake, along with UWWTD derived material delivered by sewer. The site will not be handling inherently dusty or powdery wastes. Digested sludge cake retains a high moisture content and is not dusty and the cake pad is located on the Southern side of the site, away from residential receptors but close to commercial receptors. Roads will be maintained to avoid the production of dust. Digested sludge cake has sufficient moisture content to ensure it does not give rise to dust. Anaerobic digestion of sludge takes place within a closed system. Digested sludge cake is stored on the Cake Pad comprising a large area of engineered concrete bounded by concrete walls.	✓

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
		The Cake Pad is situated less than 250 m away from the nearest sensitive receptors (commercial units) who may be present for more than 6 hours. A bioaerosol risk assessment is presented in Appendix F	
Assessment of point source emissions to air Emissions deposited from air to land	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Amenity issues above. The impact of emissions from air on human health will depend on the distance and wind direction.	The site is located within the boundaries of the Enfield AQMA. The AQMA has been declared in March 2001 for the following pollutants: Nitrogen dioxide (NO_2) – Annual Mean and Particulate Matter (PM_{10}) – 24-Hour Mean. Air emissions have previously been assessed by the Environment Agency and deemed satisfactory. Use of the Emergency Flares are limited to emergency situations and during planned maintenance activities to either the CHP Engines or boilers. Pressure relief valves are not used routinely to control biogas volumes and would only operate in an emergency. Fugitive emissions to air are assessed in Table C3-3b(i).	X
Assessment of point source and fugitive emissions to water	A culverted brook, Pymmes Brook, is located within the central area of the wider sewage treatment works, while the Pymmes Brook is also found 30m to the East of the site and the River Lee Navigation is located approximately 80m to the East of the site. A large reservoir, William Girling Reservoir, is located approximately 170m to the East of the site boundary. Thepermitted area of the site sits within a Flood Zone 1, with a low probability of flooding (>1:1000 annual probability of flooding) with parts of the wider sewage treatment works within Flood Zone 2, with a medium risk of flooding (between 1:100 and 1:1000 annual probability of flooding). Surface water drainage within the site is returned to the inlet via one of the pumping stations on site for full treatment prior to discharge.	The main product of the process is a digested sludge cake, which is stored within Flood Zone 1, on a concrete Cake Pad equipped with drainage that returns to the works inlet. Other aqueous discharges generated by process are limited (comprising only dewatering liquors, biogas condensate and surface water run off). These sources are discharged to the on-site drainage system where they are transferred to main sewage works inlet. Due to the nature and small quantity of these emissions no further assessment of point source emissions is deemed necessary.	X

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
Assessment of odour	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Amenity issues above. The impact of emissions from odour on human receptors will depend on the distance and wind direction.	The wider sewage treatment works, which includes the area of the STC to be permitted, has processes in place to minimise odour which includes physical containment, odour abatement, management systems, procedures and monitoring to control fugitive emissions of odour at the plant. Odour from the STC cannot be considered in isolation from the wider works. The sewage treatment works has an odour management plan which is appended as Appendix E. Odour emissions are assessed in Table C3-3b(ii).	**X**
Energy	Global atmosphere (direct and indirect emissions)	Use of biogas on site within the CHP Engines to generate electricity and in the boilers to generate heat minimises the need to import non-renewable electricity and gas from the National Grids. Export of renewable electricity to the National Grid can offset consumption of fossil fuels within the energy mix, lowering the carbon intensity of power. Use of biogas, which is upgraded to biomethane within the biomethane Gas to Grid plant, introduces a renewable methane to the local gas network which can be consumed by off-site sources and lowers the carbon intensity of gas. Good maintenance procedures will help plant run efficiently and reduce site energy consumption. Insulated hot water pipes minimises heat losses during transmission. Use of LED lighting reduces consumption.	**X**
Land and disposal of waste to other processes	Rivers and streams – see Assessment of point source and fugitive emissions to water above. Drainage systems/sewers. The site is within a Groundwater Source Protection Zone (SPZ) Zone 2. Aquifers are classified as Unproductive (bedrock) and Secondary A (superficial drift).	All waste streams are disposed of off-site for recovery or disposal and will continue to be transferred (and consigned where hazardous) to appropriately permitted facilities.	**X**

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
Noise and vibration	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, amenity and recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. The site is located within an industrial estate approximately 1.5 km to the West of Edmonton, London and is bounded on the West by the A1055 and to the East by the River Lee Navigation. Th nearest residential dwellings are located approximately 45 m to the North of the STW site boundary, a development of houses on Pickett's Lock Lane. Further residential properties are located approximately 75 m to the West of the STW, on the other side of the A1055 and a railway line. Immediately to the South of the site are a number of industrial warehouses and commercial premises including two permitted waste facilities. Ecological receptors: A SSSI, Chingford Reservoirs, is located approximately138m to the East of the site and a LNR, Ainslie Wood, is located 2 km to the South-East of the site. A SAC, Epping Forest is located approximately 2.2. km to the East of the site and a Ramsar and SPA, Lee Valley, is located approximately 2.5 km to the South of the site.	Site design has been chosen to minimise the impact of noise on offsite receptors through building orientation, finishes and location of openings. Combustion plant is located within self-contained units or buildings, away from sensitive receptors. Noise from plant and equipment will be minimised through purchasing decisions and a robust preventative maintenance programme. There will be no sources of vibration within the facility. Noise and vibration emissions are assessed in Table C3-3b(iii).	**X**
Other issues (including visual impact, protected species and protected habitats)	Protected Species and Habitats	Habitats and Nature Screening did not identify protected habitats or protected species within the relevant distance of Deephams STC (500m).	**X**
Climate Change	Risks of increased temperature impacts resulting in digesters heating beyond optimal operating temperature and increased odour potential from site process. For human health and ecological receptors, see notes for Amenity issues above.	Primary Digester Tanks may require reduced heat input to digester via heat exchange system and Primary Digester Tanks are insulated against worse impacts. Warmer temperatures may require less boiler input/use as a result of less heat demand, or increased heat dumping via air cooled radiator. If less biogas is used, the site may require a new consumptive biogas solution, e.g. a CHP engine or other technology that is appropriately sized to utilise additional biogas. However, the CHP Engines will need	**X**

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
		to be replaced prior to 2050 when they reach the end of their operational lifespans.	
Climate Change	Risks of increased storm events that causes surface water runoff exceeds capacity of site drainage system, or additional dewatering operations due to rainwater ingress, or caused bunds to infill. Increased precipitation may increase flooding on agricultural land, decreasing ability to spread digested sludge cake to land. For water environment receptors, see notes for Assessment of point source and fugitive emissions to water above	The STW design may require expansion or additional storm capacity; however, this would apply to UWWTD operations at the site rather than permitted activities. May need to increase bund or containment volume for sewage treatment works or individual assets. Land spreading activities could be restricted during very wet, winter months. Although the site has a large Cake Pad which would allow digested sludge cake to be stored prior to application, contingency plans to move digested sludge cake to other sites may be required.	**X**

Appendix 2 – Date of birth information for Relevant offences and/or Technical ability questions only

This information has been supplied separately for the ease of exclusion from the public register.

4. Form C3 Questions

1 – What activities are you applying to vary?

Table C3-1a – Types of activities

Installation name	Schedule 1 references	Description of the Activity	Activity Capacity	Annex I and II codes and descriptions	Non-hazardous waste treatment capacity
Deephams Sewage Treatment Works AR1	S5.4 A1 (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. Anaerobic digestion of permitted waste in 9 Primary Digester Tanks and 4 Secondary Digester Tanks followed by combustion of biogas produced from the process	From receipt of permitted waste through to digestion and recovery of by-products (digestate and biogas).	2,063 wet tonnes per day (throughput based on 24,750 m^3/12 = 2,063 m^3 per day)	R1: Use principally as a fuel or other means to generate energy. R3: Recycling reclamation of organic substances which are not used as solvents. R13: Storage of waste 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.	Maximum waste throughput 2,720,000 wet tonnes per annum including indigenous UWWTD derived sludge from within the wider Sewage Treatment Works. As per volume calculations in Note 3 below.
Directly Associated Activities					
AR2	Imports of waste, including sludge from other sewage treatment works for treatment;				
AR3	Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;				
AR4	Storage of digestate prior to dewatering;				
AR5	Dewatering of digested sewage sludge				

AR6	Transfer of dewatering liquors back to the head of the sewage treatment works;
AR7	Transfer of surface water runoff back to the head of the sewage treatment works;
AR8	Storage of dewatered digested sludge cake prior to offsite recovery;
AR9	Storage of biogas;
AR10	Transfer of biogas condensate via site drainage back to the head of the sewage treatment works;
AR11	Combustion of biogas in a MCPD and Specified Generator (SG) compliant biogas CHP engines
AR12	Combustion of biogas or diesel in MCPD boilers (that operate fore <500 hours per annum);
AR13	Operation of emergency flares;
AR14	Operation of siloxane filter plant;
AR15	Pressurisation of biogas in biogas compressors;
AR16	Storage of fuels including: fuel oil and propane;
AR17	Storage of wastes, including waste oils;
AR18	Storage of raw materials;
AR19	Upgrading of biogas to biomethane in a biomethane Gas to Grid plant;
AR20	Operation of biogas filter plant using condensers, activated carbon filters and membrane technology; and
AR21	Injection of biomethane to the medium pressure gas grid.

Specified Generator Activities					
	National Grid Reference and/or activity reference/emission point	**Activity listed in the EP Regulations**	**Description of specified generator**	**Fuel**	**Operating hours limit per unit per annum**
AR22	A13a and A13b operated through common stack at flue at NGR TQ 35824 93312	Schedule 25A – Medium Combustion Plant as detailed in Schedule 8	2 x 2 MWth boilers [note 2]	Biogas Gas oil	<500 hours
AR23	Emergency Standby Generator TQ 35779 93766 TQ 35779 93767	Excluded Generator	1 x 5.8 MWth engine 1 x 5.8 MWth engine	Diesel	<50 hours

	Emergency Standby Generator TQ 35780 93765		1 x 5.8 MWth engine		
	Emergency Standby Generator TQ 35780 93767		1 x 5.8 MWth engine		
	A10a CHP4		1 x 3.77 MWth CHP [note 1]	Biogas	Unlimited
	A10b CHP5		1 x 3.77 MWth CHP [note 1]		

Medium combustion plant and Specified generator Notes:

Note 1 – The two CHP engines are both waste operations and part of the specified generator.

Note 2 – The boilers are both waste operations and medium combustion plant.

Waste Operations

	Description of the waste operation	**Annex I (D codes) and Annex II (R codes) and descriptions**	**Hazardous waste treatment capacity**	**Non-hazardous waste treatment capacity**
AR24	Imports of wastes: to the works inlet for treatment through the UWWTD route	D13: Blending or mixing prior to submission to any of the operations numbered D1 to D12	n/a	Maximum waste throughput 10,000 wet tonnes per annum
	Digested sludge cake for temporary storage pending off-site removal	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). R3: Recycling or reclamation of organic substances which are not used as solvents	n/a	Maximum waste throughput 2,500 wet tonnes per annum

For all Waste Operations	**Total capacity**	**45,454 wet tonnes**	**[a] + [b]**
	Total STC treatment capacity (tank volume)	40,954 wet tonnes	[a]
	Total Cake Pad storage capacity	4,500 wet tonnes	[b]
For waste imports to the head of the works	Annual throughput (tonnes each year)		Imports: 10,000 wet tonnes
For waste imports of digested sludge cake for temporary storage	Annual throughput (tonnes each year)		Imports: 2,500 wet tonnes
Note 3: Treatment Calculation based on: Unthickened Primary: 45.08 tds/day: worse case 1.50% dry solids = 3,005 m3/day = 1,096,832 m3/year Unthickened SAS: 26.17 tds/day: worse case 0.60% dry solids = 4,362 m3/day = 1,592,175 m3/year Imports - Liquid: 1.45 tds/day: worse case 2.00% dry solids = 73 m3/day = 26,536 m3/year Total combined import calculation: 2,715,543 m3/year, rounded to 2,720,000 m3/year			

Table C3-1b Types of waste accepted

Table C3-1b(i): Waste accepted for Anerobic Digestion

Waste Code	Description of Waste
19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge only)
19 06 06	digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only)
19 08 05	sludges from treatment of urban wastewater
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11 (sewage sludge only)

Table C3-1b(ii): Waste accepted at the head of the works import point

Waste Code	Description of Waste

16 10 02	aqueous liquid wastes other than those mentioned in 16 10 01 [note 1]
Note 1 – comprising but not limited to: Thickening and dewatering liquors, centrate and filtrate derived from TWUL processes Waste from a portable toilet	

Table C3-1b(iii): Waste accepted for temporary storage and transfer off-site

Waste Code	Description of Waste
19 06 06	digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only)

1c Recovery of hazardous waste on land

Are you applying for a waste recovery activity involving the permeant deposit of inorganic hazardous waste to land for construction or land reclamation?

No - Where the answer is no, there is no requirement to answer further questions in 1c.

2 – Point source emissions to air, water and land

Table C3-2a – Emissions to Air

Air emission points currently permitted under permit EPR/FP3535LD/V007 are in bold.

Emission point reference and location [note 3]	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method see Note 1
A10a	**Combustion exhaust gases from CHP Engine 4 via multi-flue stack A10a**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**190**	**mg/Nm^3**	**-**	**Annually**	**BS EN 14792 (permanent sampling access not required)**
		Carbon Monoxide	**530**	**mg/Nm^3**	**-**	**Annually**	**BS EN 15058 (permanent sampling access not required)**
		Total Volatile Organic Compounds	**No limit set**	**-**	**-**	**Annually**	**BS EN 12619:2013 (permanent sampling access not required)**

Emission point reference and location [note 3]	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method see Note 1
A10b	**Combustion exhaust gases from CHP Engine 5 via multi-flue stack A10b**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2) NOx**	**190**	**mg/Nm^3**	**-**	**Annually**	**BS EN 14792 (permanent sampling access not required)**
		Carbon Monoxide	**530**	**mg/Nm^3**	**-**	**Annually**	**BS EN 15058 (permanent sampling access not required)**
		Total Volatile Organic Compounds	**No limit set**	**-**	**-**	**Annually**	**BS EN 12619:2013 (permanent sampling access not required)**
A13a and A13b	**New medium combustion plant other than engines and gas turbines fuelled on biogas (Boilers 4 & 5)**	**Sulphur dioxide**	**No limit set**	**-**	**Hourly average**	**Once every 500 hours of operation with a minimum frequency of every three years**	**MCERTS BS EN 14791 (permanent sampling access not required)**
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	**No limit set**	**-**	**Hourly average**	**Once every 500 hours of operation with a minimum frequency of every three years**	**MCERTS BS EN 14792 (permanent sampling access not required)**
		Carbon monoxide	**No limit set**	**-**	**Hourly average**	**Once every 500 hours of operation with a minimum frequency of**	**MCERTS BS EN 15058 (permanent sampling access not required)**

Emission point reference and location [note 3]	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method see Note 1
						every three years	
A13a and A13b	**New medium combustion plant other than engines and gas turbines fuelled on gas oil operating less than 500 hours per annum (Boilers 4 & 5)**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**No limit set**	**-**	**-**	**Once every 500 hours of operation with a minimum frequency of every three years**	**MCERTS BS EN 14792 (permanent sampling access not required)**
		Carbon monoxide	**No limit set**	**-**	**-**	**Once every 500 hours of operation with a minimum frequency of every three years**	**MCERTS BS EN 15058 (permanent sampling access not required)**
A14	**Biogas upgrader exhaust stack**	**No parameters set**	**No limit set**	**-**	**-**	**-**	**Permanent sampling access not required**
A15	**Biomethane to Grid Flare**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**150**	**mg/m^3**	**Hourly average**	**Annually [note 2]**	**BS EN 14792**
		Carbon Monoxide	**50**	**mg/m^3**	**Hourly average**	**Annually [note 2]**	**BS EN 15058**
		Total Volatile Organic Compounds	**10**	**mg/m^3**	**Hourly average**	**Annually [note 2]**	**BS EN 12619:2013**
A16	Primary Digester Tank PRV	-	-	-	-	-	-

Emission point reference and location [note 3]	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method see Note 1
A17	Primary Digester Tank PRV	-	-	-	-	-	-
A18	Primary Digester Tank PRV	-	-	-	-	-	-
A19	Primary Digester Tank PRV	-	-	-	-	-	-
A20	Primary Digester Tank PRV	-	-	-	-	-	-
A21	Primary Digester Tank PRV	-	-	-	-	-	-
A22	Primary Digester Tank PRV	-	-	-	-	-	-
A23	Primary Digester Tank PRV	-	-	-	-	-	-
A24	Primary Digester Tank PRV	-	-	-	-	-	-
A25	Secondary Digester Tank PRV	-	-	-	-	-	-
A26	Secondary Digester Tank PRV	-	-	-	-	-	-
A27	Secondary Digester Tank PRV	-	-	-	-	-	-

Emission point reference and location [note 3]	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method see Note 1
A28	Secondary Digester Tank PRV	-	-	-	-	-	-
A29	Biogas Storage PRV	-	-	-	-	-	-
A30	Biogas Storage PRV	-	-	-	-	-	-
A31	Sludge Odour Control Unit – biofilter	Hydrogen sulphide	No limit set	-	Average over sampling period	Once every 6 months	CEN TS 13649 for sampling. NIOSH 6013 for analysis OR US EPA M11
		Ammonia	20	mg/m3		Once every 6 months	EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis
A32	Emergency Flare Stack	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	150	mg/m^3	Hourly average	Annually [note 2]	BS EN 14792
		Carbon Monoxide	50	mg/m^3	Hourly average	Annually [note 2]	BS EN 15058
		Total Volatile Organic Compounds	10	mg/m^3	Hourly average	Annually [note 2]	BS EN 12619:2013

Note 1: For all emission points, monitoring requirements are defined at a temperature of 273.15K, a pressure of 101.3 kPa and after correction for water vapour content of the waste gases at standardised O2 content of 6% for solid fuels, 15% for engines and gas turbines and 3% all other MCPs and other combustion processes including the Emergency Flares.

Note 2: Monitoring required if flare operates for more than 10% of the year.

Note 3: Emission points A1-A8 have been removed by previous variations.

Table C3-2b – Emissions to Sewer

Emission point reference and location	Source	Parameter	Limit	Unit
T1 (TQ 35808 93445)	Primary Sludge Thickening Liquors, SAS Thickening Liquors, OCU Waste Water, Biogas Condensate, Gas to Grid Waste Waters, Surface Water Run Off	No parameters set	No limit set	-
T2 (TQ 36014 93372)	Post Digestion Dewatering Liquors, Surface Water Run Off	No parameters set	No limit set	-
T3 (TQ 35647 93703)	Head of Works Imports	No parameters set	No limit set	-

There are no permitted emissions to water or land from the activities covered by this permit.

There are no changes to existing Process Monitoring requirements covered by this permit.

3 – Operating techniques

3a - Technical standards

Description of the schedule 1 activity or directly associated activity	Relevant technical guidance note or Best available techniques as described in BAT conclusions under IED	Document Reference
Anaerobic Digestion plant S5.4A1(b)(i); Storage of waste (DAA)	Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.) BAT Conclusions for Waste Treatment	

3a1 Does your permit (in Table 1.2 Operating Techniques or similar table in the permit) have references to any of your own documents or parts of documents submitted as part of a previous application for this site?

Yes, please refer to ADMS modelling from the previous application which remains valid.

Please refer to variation application V007 for all aspects of the operation, technical details and environmental risk assessment for the biomethane Gas to Grid plant.

3b - General requirements

If the TGN or H1 assessment shows that emissions of substances not controlled by emission limits are an important issue, send us your plan for managing them.

Although screened out of the detailed Risk Assessment (Question C2 Q6), due to the nature of the process the installation has the potential to generate fugitive emissions to air and water, which are subject to a number of process controls.

Risk Matrix and Terminology for Accident for Risk Assessment

	Consequence		
Likelihood ↓	**Low**	**Medium**	**High**
Low	Low	Low	Medium
Medium	Low	Medium	High
High	Medium	High	High

Classification	Likelihood	Consequence	Risk
Low	Probability of an event is low and likely only to occur in the long-term (a yearly basis or less frequent).	Impact is low or a minor, short-term nuisance. Minor release to a non-sensitive receptor or pollution of water course. Non-permanent health effects to human health (preventable by appropriate PPE). Minor surface damage to buildings; structures; services; or the environment which can be repaired immediately.	A level of harm is possible although this may not be noticeable to a receptor and would be a short-term event without lasting effects. Level of harm can be reduced using industry best practice and appropriate management techniques.
Medium	It is probable that an event will occur periodically in the medium-term (twice yearly basis).	Impact is noticeable in the short to medium-term. Large release impacting on the receiving media killing flora and fauna and requires remediation. Nuisance causing non-permanent health effects to human health. Damage to buildings; structures; services; or the environment preventing short-term use and/or requiring repair.	A level of harm may arise to a receptor which is noticeable although not long-lasting and may require some remedial actions in order to prevent re-occurrences.
High	An event is very likely to occur in the short-term (monthly or weekly basis) and is almost inevitable over the long-term OR there is evidence at the receptor of harm or pollution.	Impact is significant, wide-ranging and long-lasting effect. Has a chronic or acute impact on human health. Very large release that has a major impact on flora and fauna which may be very difficult to remediate. Significant damage to buildings; structures; services; or the environment which prevents use long-term and may require complete replacement. May cause a long-term impact or contribute towards a global issue due to releases of greenhouse gases.	A level of harm is likely to arise to a receptor that is severe causing significant harm to human health or the environment without appropriate remedial and mitigation measures being implemented. Remedial works to infrastructure and processes is required in the long-term.

Although screened out of the detailed Risk Assessment (Question C2 Q6), due to the nature of the processes, the anaerobic digestion operations and digested sludge cake storage, along with biogas utilisation have the potential to generate fugitive emissions to air and water, which are subject to a number of process controls.

Table C3-3b(i) Fugitive emissions risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
Emissions to air of NOx, SO_2, CO_2 and VOCs	Normal	Emissions to air and dispersion leading to inhalation by local human and animal receptors	High	Low	Medium	Activities are managed and operated in accordance with the site management system (including inspection and maintenance of equipment, including engine management systems), point source emissions to air (CHP Engines; biogas upgrader stack, boilers and Emergency Flares stacks) have emission limits. Emergency Flares stack height approx. 6m, CHP Engines share a common 15m stack and boilers share a common 14m stack. Site has a siloxane filter fitted on the main biogas pipeline connected upstream of the CHP engines. to remove impurities within the biogas. Biogas pipeline has condensate traps to remove impurities. Previous modelling, which remains unchanged, did not find unacceptable impacts.	Low
Biogas transfer systems, Biogas Storage holder, CHP Engines, Emergency Flares	Abnormal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors. Odour impact. Global	Low	Medium	Low	The plant is designed to capture and utilise all biogas possible, either combusting the biogas in order to maximise recovered value from the biological treatment of sludge. Or upgrading it for injection into the national gas grid.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
or PRVs failure causing emissions of biogas		warming potential. Risk of fire and explosion				The biogas system utilised is subject to regular preventative maintenance, including a LDAR plan, to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of methane monitors, pressure and flow sensors and with automatic slam shut isolation valves to minimise the potential for release if a leak is detected. Personnel on site wear portable biogas detectors in order to alert staff to presence of biogas. Emergency Flare stacks are utilised for the safe disposal of surplus biogas in the event of plant breakdown, or a surplus of biogas above the level that can be safely stored or utilised. Use of the Emergency Flares is recorded. Dual duty/standby PRVs are in place on the Biogas Storage holders to be operated in the event of failure of the Emergency Flares to prevent over pressurisation and catastrophic failure. Two Biogas Storage holders are available to store biogas in the event of planned maintenance.	
Catastrophic loss of biogas emissions from biogas transfer	Abnormal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors.	Low	High	Medium	The plant is designed to capture and utilise all biogas possible, either combusting the biogas in order to maximise recovered value from the biological treatment of sludge. Or upgrading it	Medium

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
systems, Biogas Storage holders, CHP Engines, Emergency Flares or PRVs		Odour impact. Global warming potential. Risk of significant fire and explosion				for injection into the national gas grid. The biogas system utilised is subject to regular preventative maintenance, including a LDAR plan, to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of methane monitors, pressure and flow sensors and with automatic slam shut isolation valves to minimise the potential for release if a leak is detected. Emergency Flare stacks are utilised for the safe disposal of surplus biogas in the event of plant breakdown, or a surplus of biogas above the level that can be safely stored or utilised. Use of Emergency Flares is recorded. Dual duty/standby PRVs are in place on the Biogas Storage holders to be operated in the event of failure of the Emergency Flares to prevent over pressurisation and catastrophic failure. Two Biogas Storage holders are available to store biogas in the event of planned maintenance.	
Combustion of biogas within CHP Engines and Emergency Flares. Combustion of biogas or fuel oil within boilers	Normal	Emissions to air and dispersion leading to inhalation by local human and animal receptors. Global warming potential	High	Low	Medium	Combustion plant is regularly maintained and appropriately sized to manage volumes of biogas with multiple outlets providing contingency.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						Combustion plant operates within permitted ELVs subject to routine monitoring against permit compliance. All combustion plant is located within the South of the site and the nearest commercial buildings are approx. 60m South while the nearest residential buildings are approx. 300m West.	
Release of bioaerosols and dust	Normal	Emissions to air and dispersion leading to inhalation by local human and animal receptors. Odour impact of bioaerosols. Nuisance impact of dust.	High	Medium	High	The risk of bioaerosol and dust is a result of digested sludge cake storage within an open, engineered Cake Pad. This is located within the southern side of the site, approx. 65m from the nearest receptors, commercial warehouse buildings. Produced digested sludge cake is deposited on the northern end of the Cake Pad away from receptors which increases the separation distance and there is a stand of trees between the Cake Pad and receptor, providing a natural barrier. The predominant wind is from a south and west direction reducing the likelihood of dispersion towards these receptors. Digested sludge cake also retains a high moisture content and is not prone to windblown dispersion leading to the generation of dust.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						Internal site roads are made from concrete/asphalt and not prone to the generation of dust.	
Release of bioaerosols and dust from spillages	Abnormal	Emissions to air and dispersion leading to inhalation by local human and animal receptors with potential harm to health. Odour impact of bioaerosols. Nuisance impact of dust.	Low	Medium	Low	Staff responsible for site housekeeping and cleaning of spillages in a timely manner. Spill kits available on site. Staff are trained in their use. Areas around digester tanks are largely made ground meaning spillages can be more easily contained and cleaned. Sludge retains a high moisture content and is not prone to windblown dispersion which could cause the generation of dust. Internal site roads are made from concrete/asphalt and not prone to the generation of dust.	Low
Spillage of liquids, including chemicals and oils.	Abnormal	Emissions to surface waters close to and downstream of site. Acute effect resulting in loss of flora and fauna. Chronic effect resulting in deterioration of water quality. Emissions to ground and ground water.	Low	Medium	Low	The closest surface water body is the Pymmes Brook that runs within the perimeter of the wider STW and to the East of the installation boundary. All combustion plant and associated fuel tanks are situated on concrete hardstanding. Chemicals and oils all stored within suitably bunded tanks and IBCs. Tanks and bunds are subject to regular inspection with defects	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						addressed, e.g. rainwater removed as required to maintain 110% capacities. Handling and use of chemicals and oils is carried out by trained personnel. COSHH data sheets available. Penstock valves are installed within bulk chemical delivery areas. Spill kits available on site. Staff are trained in their use.	
Spillage from sludge/cake storage and digestion tanks, overtopping of tanks, leakage from same tanks and from buried pipes	Abnormal	Emissions to surface waters close to and downstream of site. Acute effect resulting in loss of flora and fauna. Chronic effect resulting in deterioration of water quality. Emissions to ground and ground water.	Low	High	Medium	The installation is within a Groundwater Source Protection Zone 2(SPZ) and close to a SPZ 1. The closes surface water body is the Pymmes Brook that runs within the perimeter of the wider STW and to the East of the installation boundary. Surface water run-off drains from the Cake Pad to a drainage channel on the West of the Cake Pad and is returned to the works inlet via site drainage. Provision of suitable structurally integral tanks constructed from pre-cast concrete, or steel with glass reinforced plastic. All tanks are subject to asset inspection and proactive maintenance programme including regular visual inspection for cracks or weeping.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						Visual checks during regular day-to-day operations and scheduled preventative maintenance of equipment, such as pumps, pipes, joins etc. Spill kits available on site. Staff are trained in their use. Biogas condensate discharged back to the works inlet through site drainage system.	
Generation of solid waste resulting in litter	Normal	Releases of litter to the environment. Visual nuisance and local loss of amenity	Low	Low	Low	Site operations do not give rise to large amounts of solid wastes and litter that would be prone to dispersion by wind. Rags are stored within skips and retain high moisture content. Waste is stored securely for collection by appropriately licensed approved contractors. Litter picking activities are completed as required.	Low

Where the TGN or H1 assessment shows that odours are an important issue, send us your odour management plan.

Due to the nature of the process, the installation has the potential to generate odorous emissions resulting from the permitted activities. Odour management is a key operational objective, as summarised in the risk assessment table below. A copy of the site-specific odour management plan has been appended to this application as Appendix E.

Table C3-3b(ii) Odour risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
H_2S/biogas emissions from uncovered tanks	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Medium	Low	Low	Biogas will principally be generated in Primary Digester Tanks and captured for storage within the Biogas Storage holders. Small amounts of biogas is also generated in the Secondary Digester Tanks, which are covered to capture the biogas. Of the tanks used under normal operating conditions, only the Post Digestion Dewatering Feed Tank is uncovered. The nearest residential properties approx. 460m West from the uncovered digester and nearest commercial buildings approx. 120m South. H_2S production is controlled through the digestion process which can be manually overridden if required. Ferric dosing of occurs outside of the installation boundary to control hydrogen sulphide levels in biogas and minimise odour.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
Loss of containment from Biogas Storage holder and biogas pipework	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Medium	Low	Biogas is principally stored within the double membrane Biogas Storage holders which are suitably sized to manage biogas generation. The biogas is delivered by an aboveground stainless-steel pipework system and is subject to regular preventative maintenance, including a LDAR plan, to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of methane monitors, pressure and flow sensors and with isolation valves to minimise the potential for release if a leak is detected. Personnel on site wear portable gas detectors in order to alert staff to presence of biogas. Physical protection measures in place for Biogas Storage holders, including lightning protection, fencing and pipework is guarded. PRVs available to safely manage pressures within the Biogas Storage holders and prevent under or over pressurization.	Low
Activation of biogas pressure relief valve	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors	Low	Low	Low	PRVs are only activated in emergency situations to maintain safety within the biogas system and are re-seated/repaired promptly to minimize biogas emissions.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
		Loss of amenity from odour nuisance				PRVs subject to visual checks by site personnel. Biogas is principally stored within the two double membrane Biogas Storage holders which are suitably sized to manage biogas generation and act as buffer storage for biogas. Site has multiple outlets to use biogas - two CHP Engines, two boilers and two Emergency Flares which are used in order of preference to maximise recovery of energy. Biogas is also used within the biomethane Gas to Grid plant. CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with Emergency Flares maintained in good working order should they need to be used. The nearest residential and commercial receptors are approx. 310m and 140m from Biogas Storage holders.	
H_2S/biogas emitted when biogas cannot be combusted in CHP Engines, boilers or Emergency Flare	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	Biogas is principally stored within the two double membrane Biogas Storage holders which are suitably sized to manage biogas generation and act as buffer storage for biogas. Site has multiple outlets to use biogas – it is used within the biomethane Gas to Grid plant preferentially, then the two CHP Engines, two boilers and two Emergency Flares. It is	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						therefore unlikely that all outlets would be unavailable. The nearest residential and commercial receptors are approx. 310m and 140m from Biogas Storage holders. CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with the Emergency Flares maintained in good working order should it need to be used.	
Storage of treated digested sludge cake	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	High	Low	Medium	Digested sludge cake is stored on an open, engineered Cake Pad which is located within the Southern side of the site, approx. 65m from the nearest receptors (although sludge is stored on the Northern end of the Cake Pad in the first instance). Digested sludge cake is an inherently low odour material. Should any odorous sludge cake be produced, this will be subject to process checks undertaken to identify root cause of production and removed from site expediently.	Low
Failure of Odour Control Units	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors	Low	High	Medium	There is one Odour Control Unit at Deephams STC which is subject to regular preventative maintenance.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
		Loss of amenity from odour nuisance				Media is replaced as per the manufacturer's recommendations	
Storage of site generated wastes	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	Wastes generated on site are not inherently odorous and is stored securely for collection by appropriately licensed approved contractors.	Low

If the TGN or H1 assessment shows that noise or vibration are important issues, send us your noise or vibration management plan (or both)

The installation has the potential to generate noise as a result of the permitted activities. Potentially noisy activities are subject to a number of process controls and noise management is a key operational objective, as summarised in the risk assessment table below. Note there is no history of substantiated noise complaints relating to the site:

Table C3-3b(iii)Noise risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
Operation of CHP Engines	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	High	Medium	High	Combustion assets are all contained within self-contained units. These provide a level of containment of noise and contained units are acoustically baffled and designed for external applications. Therefore, noise emissions are already low. Nearest sensitive receptors are commercial buildings, which are approx. 60m South while	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						the nearest residential buildings are approx. 300m West of the CHP Engines. Good inspection regimes and maintenance of plant to ensure that excessive noise levels are not generated. Regular checks of noise mitigation measures fitted to items of plant. Such measures include silencers and baffles fitted to specific areas of plant. Where repair or replacement is required, having two engines means plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	
Operation of fans on air cooled radiators	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	High	Low	Medium	Air cooled radiators do not give rise to high levels of noise and are only used as required. They are located approx. 60m from nearest sensitive human receptors. Good inspection and maintenance of fans to ensure that excessive noise levels are not generated. Where repair or replacement is required, this will be completed promptly.	Low
Operation of site vehicles	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors.	High	Medium	High	Vehicle movements across the site subject to speed limit to reduce generation of noise. Deliveries to Cake Pad limited to daytime only.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
		Generation of vibration with ground transmission, causing loss of amenity to local human receptors.				Shovel loading of digested sludge cake takes place on the engineered Cake Pad which is located in the Southern part of the site.	
Vehicle movements - tanker deliveries of sludge and bulk collections of digested sludge cake	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors. Generation of vibration with ground transmission, causing loss of amenity to local human receptors.	High	Low	Medium	Vehicle movements across the site subject to speed limit to reduce generation of noise. Shovel loading of digested sludge cake takes place on the engineered Cake Pad which is located in the Southern part of the site	Low
Vehicle movements - tanker deliveries of chemicals and raw materials	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors. Generation of vibration with ground transmission, causing loss of amenity to local human receptors.	High	Low	Medium	Deliveries are not a daily occurrence. Vehicle movements across the site subject to speed limit to reduce generation of noise.	Low
Operation of Emergency Flares	Abnormal	Generation of noise with air transportation, causing loss of amenity to local human receptors.	High	Low	Medium	Use of the Emergency Flares are minimized by prioritizing use of the biogas upgrading plant, CHP Engines and boilers with use of the Emergency Flares recorded.	Low

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
						Emergency Flares are located away from sensitive receptors, over 70 from nearest commercial property.	

Table C3-3b (iv) - Environmental Risk Assessment and Accident Management Plan

A site specific Accident Management Plan (AMP) is located in Appendix J.

Table C3-3b (v) - Bioaerosol Risk Assessment

The installation has the potential to generate bioaerosols which may pose a risk to nearby sensitive receptors. Please see a site specific Bioaerosol Risk Assessment presented as Appendix F.

3c - Types and amounts of raw materials

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

Type and amounts of raw materials used by the installation are summarised in the site specific Residue Management Plan (RMP) which is located in Appendix I.

4 - Monitoring

4a - Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

Air emission points A1-A9 have been removed previously. A12 is removed via this variation application.

Points A10a and A10b (2x CHP Engines) and A13a and A13b (2x boilers) are subject to gas monitoring in accordance with the requirements of existing permit and MCPD requirements and EA guidance.

Hours of operation of the Emergency Flare (A32) and biomethane Gas to Grid Emergency Flare (A15) are monitored and logged. In the unlikely event that the total annual hours of operation exceed 10% of the hours in a year (876 hours), emissions from the Emergency Flares as per the existing permit would be subject to monitoring in accordance with EA guidance.

Point A31 (OCU) will be subject to bi-annual testing.

There is no routine monitoring proposed for points A14 (biogas upgrader exhaust stack), A16-A30 (PRVs). In respect to A14, improvement conditions IC9 and IC10 (monitoring & assessment) were confirmed as closed out in CAR, Report ID: 400021/047992, issued 9/11/2023.

Table C3-4a – Emission Monitoring

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A10a (CHP Engine 1)	TQ 35805 93323	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792
		Carbon Monoxide – Annually		BS EN 15058
		Total Volatile Organic Compounds – Annually		BS EN 12619:2013
A10b (CHP Engine 2)	TQ 35805 93323	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) NOx – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792
		Carbon Monoxide – Annually		BS EN 15058
		Total Volatile Organic Compounds – Annually		BS EN 12619:2013
A13a and A13b (Boilers)	TQ 35805 93309	Sulphur dioxide – Once every 500 hours of operation with a	-	MCERTS BS EN 14791

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
		minimum frequency of every three years		
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Once every 500 hours of operation with a minimum frequency of every three years	-	MCERTS BS EN 14792
		Carbon monoxide – Once every 500 hours of operation with a minimum frequency of every three years	-	MCERTS BS EN 15058
A13a and A13b (Boilers)	TQ 35805 93309	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Once every 500 hours of operation with a minimum frequency of every three years	-	MCERTS BS EN 14792
		Carbon monoxide – Once every 500 hours of operation with a minimum frequency of every three years	-	MCERTS BS EN 15058
A14 Biogas upgrader exhaust stack (Gas to Grid)	TQ 35779 93376	No parameters set	-	
A15 (Gas to Grid Emergency Flare)	TQ 35753 93370	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period.	In accordance with Environment Agency guidance note *'M2 Monitoring of stack emissions to air'.*	BS EN 14792
		Carbon Monoxide Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period.		BS EN 15058
		Total Volatile Organic Compounds Annual monitoring is only required when flare		BS EN 12619:2013

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
		operates in excess of 10% of the time, taken on an annual assessment period.		
A16 (Primary Digester Tank PRV)	TQ 35839 93387	No parameters set	n/a	n/a
A17 (Primary Digester Tank PRV)	TQ 35857 93382	No parameters set	n/a	n/a
A18 (Primary Digester Tank PRV)	TQ 35834 93368	No parameters set	n/a	n/a
A19 (Primary Digester Tank PRV)	TQ 35852 93364	No parameters set	n/a	n/a
A20 (Primary Digester Tank PRV)	TQ 35892 93373	No parameters set	n/a	n/a
A21 (Primary Digester Tank PRV)	TQ 35912 93369	No parameters set	n/a	n/a
A22 (Primary Digester Tank PRV)	TQ 35888 93353	No parameters set	n/a	n/a
A23 (Primary Digester Tank PRV)	TQ 35907 93349	No parameters set	n/a	n/a
A24 (Primary Digester Tank PRV)	TQ 35929 93364	No parameters set	n/a	n/a
A25 (Secondary Digester Tank PRV)	TQ 35970 93319	No parameters set	n/a	n/a
A26 (Secondary Digester Tank PRV)	TQ 35934 93298	No parameters set	n/a	n/a
A27 (Secondary Digester Tank PRV)	TQ 35963 93291	No parameters set	n/a	n/a
A28 (Secondary Digester Tank PRV)	TQ 35924 93259	No parameters set	n/a	n/a
A29 (Biogas Storage)	TQ 35806 93398	No parameters set	n/a	n/a

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A30 (Biogas Storage)	TQ 35800 93371	No parameters set	n/a	n/a
A31 (Sludge OCU)	TQ 35815 93438	Hydrogen Sulphide – Once every 6 months	CEN TS 13649 for sampling NIOSH 6013 for analysis OR US EPA M11	-
		Ammonia – Once every 6 months	EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis	-
A32 (Emergency Flare)	TQ 35778 93302	Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period.	n/a	n/a
S1 (Liquor Sampling Point)	TQ 35806 93411	n/a	MCERTS or ISO/IEC 17025 where available	
S2 (Liquor Sampling Point)	TQ 35998 93348	n/a	MCERTS or ISO/IEC 17025 where available	

4b - Point source emissions to air only

4b1 Has the sampling location been designed to meet BS EN 15259 clause 6.2 and 6.3?

No.

4b2 Are the sample ports large enough for monitoring equipment and positioned in accordance with section 6 and appendix A of BS EN 15259?

No.

4b3 Is access adjacent to the ports large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the test?

No.

4b4 Are the sample location(s) at least 5 HD from the stack exit

No.

4b5 Are the sample location(s) at least 2 HD upstream from any bend or obstruction?

No.

4b6 Are the sample location(s) at least 5 HD downstream from any bend or obstruction?

No.

4b7 Does the sample plane have a constant cross sectional area?

No.

4b8 If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)

No.

4b9 If you have answered 'No' to any of the questions 4b1 to 4b8 above, provide an assessment to how the standards in BS EN 15259 will be met.

As an existing operational site entering environmental permitting for the first time, sampling locations and sampling ports may not meet all of the requirements for BS EN 15259, but these are being checked onsite. Where a permanent sampling platform is not provided, a temporary sampling platform is utilised to provide sufficient space, in accordance with standard industry practice, where sampling cannot be undertaken from the ground.

5 - Environmental impact assessment

5a Have your proposals been the subject of an environmental impact assessment under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment]?

No.

6 - Resource efficiency and climate change

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

The Primary Digester Tanks are suitably insulated and are heated using the recovered heat from the CHP engines. Heat generated from the CHP engines is used to provide heat to the Primary Digester Tanks and minimises the need to combust fuel within the boilers. The heating water from the CHP Engines is located in close proximity to the digester heat exchangers and transferred in insulated pipes to minimise heat losses in transmission. The CHP Engines are suitably sized to maximise energy utilisation for the parasitic load, while minimising use of the Emergency Flares.

Maintenance activities and low energy lighting is installed across the plant.

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

The main site energy source is electricity from the site CHP combusting indigenous biogas, balanced with exports of electricity to the National Grid during periods of low site demand and imports by electricity imports from the public supply via the National Grid, during high site demand. The CHP also provides useable heat to the Primary Digester Tanks, via the heat exchangers.

Imported fuel oil is also combusted within the boilers when required to meet additional heat demands from the Primary Digester Tanks. Use of waste heat reduces the demand on fuel oil in the boilers.

The site also puts biomethane to the public supply via the biomethane Gas to Grid plant.

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.

Describe the specific measures you use for improving your energy efficiency

The production and use of biogas to generate electricity and to produce heat (which is used in the digestion process) on site minimises the use of fossil fuels onsite and within the energy mix for the National Grid, whilst recovering biological wastes. The location of the heat exchange, boilers, CHP Engines and Primary Digester Tanks within close proximity minimises transmission losses on site, improving the efficiency of the process.

Regular and proactive maintenance of pumps and insulation of pipework will improve efficiency and minimise the electrical demands and heat losses on site.

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

See response to question 3c above.

The processes take digested sludge which would otherwise require additional disposal and recovers energy and nutrients which can be put to beneficial use.

Small quantities of chemical raw materials are required to control and maintain the process. These are all proven materials that are extensively used within the water industry.

The other main raw materials are used in the generation of electricity and heat, and maintenance of combustion plant, which is supplied to the treatment process.

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

The facility is a waste treatment plant, and the primary wastes produced through the processes on site are maintenance wastes. Production of maintenance waste is minimised by ensuring that preventative maintenance is carried out based on a combination of manufacturers' best practice and operational experience.

5. Form C4 Questions

1 About the permit

1a What waste operations are you applying to vary?

Waste operations which do not form part of an installation

The original CHP permit was a waste level permit. This has now been incorporated within the waste installation permit as a DAA. This permit application is for two new waste operations for temporary storage as secondary activities to the main listed installation.

1b –Types of waste accepted and restrictions

The EWC list is included in the responses to form C3

1c Deposit for recovery purposes

This is not a deposit for recovery application.

2 Point source emissions to air, water and land

Please see responses to form C3

3 Operating techniques

3a Technical standards

Please see responses to form C3

3b General requirements

Please see responses to form C3

4 Monitoring

4a Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

Please see responses to form C3

4b Point source emissions to air only

Please see responses to form C3

6. Form C6 Questions

The relevant questions within the form are those applicable to effluent and / or surface water run-off arising from the operation of an installation.

Q1About the effluent – details and type, continued

1a Give a brief description of the effluent discharge you want a permit for, for example, treated domestic sewage effluent

This effluent is a mixture of waste liquors from the operation of the installation for the anaerobic treatment of separated sewage sludge. It primarily comprises of dewatering liquors returned to the work inlet following the dewatering of treated sewage sludge and thickening processes within the installation. Lower volume constituents will include rainfall; biogas condensate; siloxane filtrate; contaminated run off and washdown water. The only wastes treated within the installation are sewage related, either being separated from the UWWTD flow in the wider works, or comprise of waste imports, principally of sludge from smaller satellite treatment works.

1b Give this effluent a unique name

Liquor returns.

1d Have you obtained all the necessary permissions in addition to this environmental permit to be able to carry out the discharge (see C6 guidance notes for more details)?

Yes. The discharge is into the inlet of a sewage works controlled by the applicant.

Q2 About the effluent – how long will you need to discharge the effluent for?

2c Will the discharge take place all year?

Yes, the discharge will take place all year.

Q3 How much do you want to discharge?

3b What is the maximum volume of effluent you will discharge in a day?

7,345 Cubic metres

3c What is the maximum rate of discharge?

85.02 Litres / second

3d What is the maximum volume of non-rainfall dependent effluent you will discharge in a day?

7,345 cubic metres

3f For each answer in question 3, show how you worked out the figure on a separate sheet

Q3b – The liquor arisings must come from the installation inputs as there is limited additional water inputs. The maximum volume of effluent discharged per day will consist of primary thickening liquors, post-digestion dewatering liquors and biogas condensate generated from the inputs and outputs to/from the Primary Digester Tanks

Q3c – Maximum rate of discharge (L/second) is generated from the maximum volume of effluent per day, [7,345.340 m3 x 1000] / 86,400 seconds (24 x 60 x 60) from sources such as the thickening and dewatering.. This gives a value of 85.015509 litres, rounded up to 85.02 litres per second.

Q3d – The liquor arisings must come from the installation inputs as there is limited additional water inputs. The maximum volume of effluent discharged per day will consist of primary thickening liquors, post-digestion dewatering liquors and biogas condensate generated from the inputs and outputs to/from the Primary Digester Tanks

Q4 No questions

Q5 Should your discharge be made to the foul sewer?

5a How far away is the nearest foul sewer from the boundary of the premises?

Not applicable, the site is located within the curtilage of a sewage treatment works and discharges into the works inlet via the site drainage system.

5b2 Discharges from all other premises including trade effluent

Not applicable, the site is located within the curtilage of a sewage treatment works and discharges into the works inlet via the site drainage system.

Q6 How will the effluent be treated?

6a Do you treat your effluent?

No. The Effluent generated by the process of treating sludge within the installation is returned to the inlet of the wider Deephams STW, where it is subject to aerobic treated in a mixture with UWWTD related waste waters.

6b Fill in Table 2 for each stage of the treatments carried out on your effluent in the order in which they are carried out

Order of Treatment	Code Number	Description
First	09	Primary settlement within sewage works
Second	31	Activated sludge process
Third	21	Sand filtration

6c You must provide details on a separate sheet of the final effluent discharge quality that the overall treatment system is designed to achieve

The final effluent discharge from the wider sewage treatment works is specified in Environmental Permit TH/CNTD.0072/011.

Q7 What will be in the effluent?

7b Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' added to or present in the effluent as a result of the activities on the site?

At present, no sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken. Only limited chemicals are added to the process within the installation boundary, primarily antifoam (in low doses, as required) and polymer to aid dewatering of sludge. A review of the appropriate MSDS data does not indicate the presence of 'specific substances' within those chemicals.

Sampling and analysis of the liquor returns to fully characterise the waste streams in accordance with BAT 3 will be undertaken at the site, in line with what is technically achievable, as per the commitment to undertake a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

7c Have any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' been detected in samples of the effluent or in the sewerage catchment upstream of the discharge?

At present, no routine sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken either for effluent from the installation or within the wider sewerage catchment. Thames Water commits to undertaking a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

7d Are there any other harmful or specific substances in your effluent not mentioned in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater'?

At present, no sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken. A review of the MSDS sheets for chemicals used within the installation does not indicate the presence of any other harmful or specific substances. Thames Water commits to undertaking a chemical analysis of the installations effluents as per "Return Liquors BAT 3, 6, 7 within Appendix M.

7e If you have answered 'No' to any of questions 7a to 7d provide details on a separate sheet of how you have established that the effluent is not likely to contain specific substances

Thames Water commits to undertaking a chemical analysis of the installations effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

A review has been undertaken of the relevant MSDS sheets for chemical used routinely within the installation to look for substances identified within the risk assessments listed.

7f What is the maximum temperature of your discharge?

20°C back into the sewage works.

7g What is the maximum expected temperature change compared to the incoming water supply?

0°C.

Q8 Environmental risk assessments and modelling

8b Discharges to lakes, estuaries, coastal waters or bathing waters

The installation does not discharge to lakes, estuaries, coastal waters or bathing waters.

8d Discharges to groundwater

The installation does not discharge to groundwater.

8e Discharges to freshwater (non-tidal) rivers from an installation, including discharges via sewer

No modelling has been undertaken on the output from the installation at present. The final effluent discharge from the wider works, which includes the installation arisings has previously been subjected to modelling as part of the environmental permitting discharge application process.

8f Environmental impact assessment

No environmental impact assessment has been carried out on the installation, as it is an existing facility.

Q9 Monitoring arrangements

9a What is the national grid reference of the inlet sampling point? (for example, SJ 12345 67890)

Not applicable to this installation.

9b What is the national grid reference of the effluent sample point?

No sampling point installed at present. Effluents will be sampled from the Sample points identified in Table C3-4a (approximately) within the installation.

9d What is the national grid reference of the flow monitoring point?

No flow meter installed.

9e Does the flow monitor have an MCERTS certificate?

No. No flow meter installed.

9f Do you have a UV disinfection efficacy monitoring point?

No. Not installed as part of this installation.

9h You should clearly mark on the plan the locations of any of the above that apply to this effluent

Please see site emission point plan.

Q10 Where will the effluent discharge to?

10a Where the effluent discharges to

Non-tidal river, stream or canal.

10b Is this effluent discharged through more than one outlet?

No

10c If you answered yes to question 10b above make sure you show clearly on your discharge point appendix or appendices and site plan that this one effluent can discharge to more than one discharge point

N / A

Appendix 5 – Discharges to non-tidal river, stream or canal

A5.1 Give the discharge point a unique name For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan)

Outlet 1.

A5.2 Give the national grid reference of the discharge point

TQ 35660 93170.

A5.3 Give the name of the watercourse, canal or the main watercourse it is a tributary of if you know it

Salmons Brook, via the wider UWWTD sewage treatment works.

A5.4 Is the discharge into a:

Non-tidal river.

A5.5 Does the discharge reach the watercourse or canal by flowing through a surface water sewer?

No.

A5.6 Does the watercourse dry up for part of the year?

No.

A5.61 If the watercourse does dry up for part of the year can you indicate a typical period when the surface water runs dry each year – start and finish (in months)

N / A.

A5.6.2 If the watercourse does dry up for part of the year, how many metres downstream of the discharge is it before the discharged effluent soaks in?

N / A.

A5.7 Is the discharge made to a roadside drain or ditch?

No.

Appendix A. Figures

A.1 Site Location Plan

See document: B22849AM-JAC-DHS-DR-0001

A.2 Installation Boundary and Air Emission Point Plan

See document: B22849AM-JAC-DHS-DR-0002

A.3 Site Impermeable and Permeable Surface Plan

See document: B22849AM-JAC-DHS-DR-0003

A.4 Site Drainage Plan

See documents: TW_STC_EPR_23a_DHSS1ZZ-DPL-001

A.5 Process Flow Diagram

See document: B22849AZ-DEEPS1ZZ-LSX-DR-P-0003

A.6 Site Photographs

See document: TW_STC_EPR_23a_DHS_APPA.6

Appendix B. CoTC

See document: TW_STC_EPR_23a_DHS_APPB

Appendix C. Site Condition Report – H5

See document: TW_STC_EPR_23a_DHS_APPC

Appendix D. BAT Assessment

See document: TW_STC_EPR_23a_DHS_APPD

Appendix E. Odour Management Plan

Includes: Odour Management Plan and Odour Risk Assessment. See document: TW_STC_EPR_23a_DHS_APPE

Appendix F. Bioaerosol Risk Assessment

See document: TW_STC_EPR_23a_DHS_APPF

Appendix G. Containment Assessment

G.1 Containment Options Report (CIRIA 736)

See document: B22849AZ-JA- DEEPS1ZZ-100-RP-Z-0001

G.2 Containment Assessment

See document: B22849AZ-JA- DEEPS1ZZ-100-CA-P-0001

Appendix H. Leak Detection and Repair (LDAR) Plan

See document: TW_STC_EPR_23a_DHS_APPH

Appendix I. Residue Management Plan

I.1 Residue Management Plan

See document: TW_STC_EPR_23a_DHS_APPI.1

I.2 MSDS Zip File

See zip folder: TW_STC_EPR_23a_DHS_APPI.2

Appendix J. Accident Prevention and Management Plan

See document: TW_STC_EPR_23a_DHS_APPJ

Appendix K. Acceptance of Third-Party Waste Imports

K.1 Acceptance of Third-Party Waste Imports

See document: TW_STC_EPR_23a_DHS_APPK.1

K.2 Acceptance of Thames Water Inter-Site Sludge and Cake

See document: TW_STC_EPR_23a_DHS_APPK.2

Appendix L. Air Quality Assessment

Not Required.

Appendix M. Liquor Monitoring

See document: TW_STC_EPR_23a_DHS_APPM