# Ellesmere Port WwTW EPR/ZP3031LJ

## Environmental Permit Variation Application

## Ellesmere Port WwTW Sludge Treatment Facility

## Application Support Document

### June 2023

## Contents

[1] Stantec Report Ref. 331001867R1 dated 11 March 2022
[2] Stantec Secondary Containment Modelling Assessment Report, dated 12 September 2022

**Attachment 13 – Primary Digestion Foaming Site Specific Instruction (SSI)**

## 1. Introduction

The purpose of this Application Support Document (ASD) is to provide supplementary information to support an environmental permit (EP) variation application for EP ZP3031LJ to include the screening, thickening and anaerobic digestion of indigenous and imported wastewater (sewage) sludge at Ellesmere Port Wastewater Treatment Works (WwTW). This application is being made under the Environmental Permitting (England and Wales) Regulations 2016 (the EPR 2016).

The address of the installation is:
Ellesmere Port WwTW Sludge Treatment Facility
Ring Road,
Little Stanney,
Nr. Chester,
Cheshire
CH2 4FE

NGR: SJ 42475 74328

United Utilities Water Limited (UUW) operates a non-hazardous wastewater treatment facility at the Ellesmere Port WwTW. The treatment process includes screening and then thickening via two gravity belt thickeners (GBT). Thickened sludge is further treated by digestion, consisting of three thermophilic aerobic digestion (TAD) vessels and three mesophilic anaerobic digesters (MAD). Digested sludge is de-watered by three centrifuges prior to being collected for off-site recovery.

Combustion of biogas produced at the facility is already permitted as a waste operation (EPR/ZP3031LJ) and no changes are proposed to this operation.

The maximum treatment capacity at the facility is limited by the feed rate to both the gravity belt thickeners (648,240 wet tonnes per year) and to the forthcoming rotating drum thickeners (1,208,880) wet tonnes per year), providing a total maximum treatment capacity of 1,857,120 tonnes per year.

The sludge treatment activity has not previously required an environmental permit as the digested sewage sludge from the site is normally sent for recovery to land. However this application has been submitted based on the Environment Agency's (EA) recent conclusion that sewage sludge is a waste and therefore the treatment of sewage sludge by anaerobic digestion for recovery is a permittable activity under Schedule 1 of the EPR 2016, specifically Chapter 5, Section 5.4, Part A 1(b)(i).

Due to the non-flammable nature of wastes handled at the installation, the site falls outside the requirement to prepare and operate a fire prevention plan (FPP).

## 2. Non-Technical Summary

This application is for an Environmental Permit for the screening, thickening and anaerobic digestion of indigenous and imported sewage sludges at the Ellesmere Port Wastewater Treatment Works (WwTW). The works are operated by United Utilities Water Limited (UUW).

The Ellesmere Port WwTW permit EPR/ZP3031LJ currently permits the operation of the biogas combustion plant and flare as waste activities as per Table S1.1 of the permit.

This variation is for re-designation of the facility to an installation undertaking treatment of sewage sludge for recovery, including anaerobic digestion of sewage sludge for recovery under Section 5.4 A(1)(b)(i). The waste treated consists of sludges imported from other WwTWs and indigenous sludges produced from Ellesmere Port WwTW (on-site) from the urban wastewater flow.

Additional associated activities include:

- Raw sludge storage;
- Sludge screening (solids separation);
- Sludge thickening by gravity belt thickeners (GBTs);
- Dewatering of digested sludge by centrifuge;
- Sludge and digested sludge cake storage;
- Raw material handling and storage;
- Storage and combustion of biogas in CHP engines and boilers;
- Flaring of excess biogas;
- Siloxane removal from the biogas;
- Disposal of process liquors; and
- Odour abatement.

The additional permitted activities require a change to the current permit boundary and a new layout and emissions point plan for the site. The activities already authorised under the permit remain operational.

There are no emissions to land or water. New point source emissions to air are from the installation's odour control units and the biogas tank and digesters pressure vacuum relief valves (PVRVs). Existing permitted air emissions are from the combined heat and power (CHP) engines, boilers and emergency flare. Point source emissions to sewer are: biogas condensate; filtrate from the GBTs; centrate from the centrifuges; boiler blowdown; leachate from the cake storage bay; and surface water drainage, which are all discharged into the WwTW flow to full biological treatment.

# 3. Application Form C2 Supporting Information

## 3.1. Question 2b and Table 1: Changes to Existing Activities

Table 3.1.1 below summarises the currently permitted activities and the proposed change to those activities.

***Table 3.1.1a: Currently permitted activities***

| Activity Reference and Description | Proposed Change to Activity |
|---|---|
| Combustion of Biogas (R1: Use principally as a fuel or other means to generate energy)<br>Operation of the auxiliary flare (D10: Incineration on land) | Vary existing permit for the combustion of biogas (EPR/ZP3031LJ) to include anaerobic digestion as the primary activity (installation permit) along with associated DAAs |

Table 3.1.1b below introduces the new activities to be added to the permit.

***Table 3.1.1b: New activities to be added***

| Activity listed in Schedule 1 of the EP Regulations | Description of specified activity and WFD Annex I and II operations | Limits of specified activity and waste types |
|---|---|---|
| S5.4 A(1) (b) (i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment. | R3: Recycling/reclamation of organic substances which are not used as solvents. | From receipt of sewage sludge from the thickened sludge tanks through to digestion and recovery of by-products (digestate).<br>Digestion of waste consisting of three thermophilic aerobic digestion (TAD) vessels and three mesophilic anaerobic digesters (MAD). |
| **Directly associated activities** | | |
| Receipt and storage of sludges pending recovery via the S5.4 A(1)(b)(i) activity. | R13: Storage of waste pending the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). | Storage of non-hazardous sewage sludge prior to biological treatment.<br>Blending and mixing of imported sewage sludge with indigenous site-produced sewage sludge from within the works. |
| Sludge screening and thickening/ dewatering | R3: Recycling/reclamation of organic substances which are not used as solvents. | Screening and thickening/dewatering of non-hazardous sewage sludge within the following plant:<br>Sludge screen<br>2 x Gravity belt thickeners<br>3 x Rotating drum thickeners<br>3 x Centrifuges |

| Activity listed in Schedule 1 of the EP Regulations | Description of specified activity and WFD Annex I and II operations | Limits of specified activity and waste types |
|---|---|---|
| | | Polymer dosing |
| Raw material handling and storage. | Raw material handling and storage. | From delivery and acceptance of raw materials to storage awaiting use on site. |
| Odour abatement | Odour control units | From receipt of odours from unscreened raw sludge tanks (4), GBT building, imported sludge tanks, thickened sludge tanks (3), digestate sludge tank, co-settled sludge well, filtrate well, TAD vessels (3), centrifuge building, centrate buffer tank and centrate tank emission to air. |
| Digestate storage | R13: Storage of waste pending the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). | From the receipt of processed digestate produced from the on-site anaerobic digestion process to despatch off-site for recovery to land.<br>Storage of digestate produced at the on-site anaerobic digestion process in post digestion storage tank and centrifuge feed tank prior to treatment.<br>Storage of thickened digestate cake on an impermeable surface with sealed drainage system. |
| Disposal of process liquors to the UWWT flow to full treatment | D13 | From generation of process liquors (filtrate, gas condensate and boiler blowdown water) to discharge into the inlet flows of the WwTW. |

### 3.2. Question 3a to 3d: Technical Competence and Management Systems

Technically competent management is provided by UUW's Environmental Regulatory Advisers (ERAs). A copy of the relevant COTC certificate and continuing competency for the site's ERA is provided at Appendix A.

Note: United Utilities Water Limited environmental management system (EMS) is certified to ISO14001, which covers the management system of UUW Limited for all activities involved in the provision of utility services, including the proposed permitted waste activities. A copy of the ISO14001 certificate is provided in Appendix I - the certification covers all activities and locations therefore specific sites are not listed.

A management systems summary is provided in Appendix B. A residue management plan is provided with this application (see Attachment 1).

### 3.3. Question 5a: Site Plans

The new activity requires an extension to the current permit boundary. A revised site boundary plan is provided at Appendix C. Site layout plans for the sludge treatment installation is provided at Appendix D.

### 3.4. Question 5b: Site Condition Report

This variation includes an extension to the existing installation boundary, as shown on the site boundary plan at Appendix C. A Site Condition Report (SCR) is included in Section 11.

The change to the permit boundary does not include a reduction to the boundary at any point; therefore, a partial surrender application is not required.

There have been six geotechnical ground investigations at the WwTW site, undertaken between 1977 and 2014, associated with various stages of development and expansion of the works. Although only a limited number of soil samples were obtained from the installation area for chemical analysis, the range of results recorded has been presented as being generally indicative of baseline conditions.

### 3.5. Question 5b: Non-Technical Summary of Your Application

Please see Section 2 of this report.

### 3.6. Question 5f: Adding an Installation

Anaerobic Digestion activities shall be added as installation activities.

### 3.7. Question 6: Environmental Risk Assessment

Please see Section 10 of this report for a risk assessment and management plan.

# 4. Application Form C3 Supporting Information

## 4.1. Table 1a: What Activities Are You Applying to Vary?

For changes to activities, please see Tables 3.1.1a and 3.1.1b in Section 3.

The application is to vary the existing permit to include the existing anaerobic digestion (AD) plant and its directly associated activities for recovery. The currently permitted activities (as detailed in Table S1.1 to the permit) will now be directly associated activities to the AD activity. See "Form C2 2b Changes or additions to existing activities" above for full details of the listed activity and its directly associated activities.

**Maximum Throughput**

The maximum design capacity of the facility is limited by the feed rate to the gravity belt thickeners 648,240 wet tonnes per year. As set out in Table 4.1.1 below, throughput is limited by the operation of the gravity belt thickeners (GBT's) as a 'pinch point' in the process. There are two GBTs and the capacity calculation is based on two GBT's running 100% of the time and 5.5% dry solids flow to digestion.

***Table 4.1.1: Ellesmere Port Sludge Treatment Capacity Calculation***

| | GBTs | Units |
|---|---|---|
| Number | 2 | |
| Operation | D/D | Duty / Assist / Stand By |
| Design throughput per machine | 37 | $m^3$/hr |
| Maximum no. of machines in use | 2 | |
| Maximum combined throughput | 74 | $m^3$/hr |
| Maximum daily throughput | 1,776 | $m^3$/day |
| **Maximum annual throughput** | **648,240** | **$m^3$/year** |

The current operational treatment capacity per year is 485,463$m^3$ based on the feed into the digesters. We run a regional system and therefore the actual annual throughput at a site will vary depending on operational needs.

**Total Waste Storage Capacity**

Table 4.1.2 below provides a description of the waste storage vessels.

***Table 4.1.2: Waste Storage Vessels***

| Storage Container | Total Volume |
|---|---|
| Raw sludge tanks (x4) | 660$m^3$ |
| Thickened sludge tanks (x3) | 2,640$m^3$ |

| Storage Container | Total Volume |
|---|---|
| TAD vessels (x3) | 360m$^3$ |
| Digesters (x3) | 10,200m$^3$ |
| Digested sludge overflow tank | 880m$^3$ |
| Post digestion tank | 2,200m$^3$ |
| Digested sludge buffer tank | 30m$^3$ |
| Centrate buffer tank | 40m$^3$ |
| Centrate tank | 1,200m$^3$ |
| **Total storage capacity** | **18,210m$^3$** |

Table 4.1.3 below details the waste types and associated waste codes the installation accepts.

***Table 4.1.3: Types of Waste Accepted***

| **19** | **WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTEWATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE** | |
|---|---|---|
| **19 02** | **Physico/chemical treatments of waste** | **Restrictions** |
| 19 02 06 | Sludges from physico/chemical treatment other than those mentioned in 19 02 05 | Sewage sludge only |
| Comprising:<br>• Thickened Imported Sludge: sewage sludge arising from other WwTW (comprising of thickened sludge arising from sewage settlement and/or surplus activated sludge/humus sludge from biological stages). | | |
| **19 06** | | |
| 19 06 06 | Digestate from anaerobic treatment of animal and vegetable waste | Digestate only |
| Comprising:<br>• Liquid digestate imported from another UUW sludge treatment site in the event that there are treatment issues at the origin site (contingency only). Tankered in for discharge into the indigenous sludge wet well for processing.<br>• Liquid digestate imported from another UUW sludge treatment site if required for digester seeding. | | |
| **19 08** | **Wastes from wastewater treatment plants not otherwise specified** | |
| 19 08 05 | Sludges from treatment of urban wastewater* | Sewage sludge only |
| Comprising:<br>• Imported sludge: sewage sludge arising from other WwTW (comprising of raw sludge from sewage settlement and/or surplus activated sludge/humus sludge from biological stages).<br>• Indigenous sludge: sewage sludge arising from Ellesmere Port WwTW.<br>• Indigenous Surplus Activated Sludge (SAS): Indigenous surplus activated sewage sludge arising from Ellesmere Port WwTW.<br>* Note: the EWC does not apply for the classification of indigenous sludges and SAS unless these streams are considered for removal off-site. | | |

**Point Source Emissions to Air**

There are four point source emissions to air associated with the combustion plant permit (A1-A4). These remain unchanged. There will be 9 additional point-source emissions to air associated with the sludge treatment process from the following locations:

- A5 - A8 Pressure vacuum relief valves (PVRVs) serving the digesters and gas holder;
- A9 - Odour Control Unit (OCU) serving the four raw sludge tanks;
- A10 – OCU serving the GBT building, imported sludge tanks, thickened sludge tanks, post digestion tank, the co-settled sludge well and the filtrate well;
- A11 - OCU serving the three Thermal Aerobic Digesters[3]; and
- A12 – OCU serving the digested sludge buffer tank, centrifuge building (containing cake skips and conveyors), centrate buffer tank and centrate tank.

It should be noted that the odour control units A9-A12 are not currently operational. As the OCUs are not operating and actively drawing air through the units, emissions are currently being released fugitively from the tanks and duct work.

The location of these emission points is shown on the site layout plan at Appendix D.

Please refer to Section 6 for details of gas emission controls from the AD facility.

Please refer to Section 7 for details of odour assessment and control.

Please refer to the Ellesmere Port BAT Improvement Programme submitted with this application for details on reinstatement of the odour control units.

**Point Source Emissions to Sewers, Effluent Treatment Plants or Other Transfers off Site**

Emissions to sewer and effluent treatment plants are all routed into the wastewater treatment works' flow to full treatment. These emissions are limited to the following:

- R1 – Filtrate discharge point (NGR SJ 42061 74169);
- R2 – Centrate discharge point (NGR SJ 42053 74177);
- R3 – Boiler blowdown discharge point (NGR SJ 42455 74257);
- R4 – GBT liquor well and surface water (NGR SJ 42465 74289);
- R5 – Contingency cake storage pad (NGR SJ 42384 74293);
- R6 – Humus return well (including centrate, cake bay run off and surface water) (NGR SJ 42344 74343)

The location of these emission discharge points is shown on the wastewater emissions point plan at Appendix H (Figure 2).

[3] Refurbishment works for this OCU will be assessed in conjunction with reinstatement of the TAD process or replace it with an alternative technology. At this stage, it is considered that a new OCU may be more cost effective than refurbishing the existing unit. The design of the existing refurbished OCU or new OCU will ensure that odour emission limits are met.

**Point Source Emissions to Water and Land**

There are no point source emissions to water or land from this installation.

Surface water from the sealed drainage system will be routed into the wastewater treatment works' flow to full treatment.

All wastewater emission returns into the flow to full treatment are downstream of the storm overflow.

**Fugitive Emissions**

The Environmental Risk Assessment and Management Plan provided in Section 10 assesses potential fugitive emissions from the installation.

An Environmental Quantitative Risk Assessment (EQRA) Report[4] is provided with this application (see Attachment 2). This risk assessment considers the risks to groundwater and surface water receptors from fugitive emissions, in line with CIRIA C552 guidance, which we consider is an appropriate reference because it 'defines the qualitative assessment of consequences/likelihood' in relation to potential contamination.

Further assessment of the potential environmental risks associated with a loss of containment from process tanks at the site[5] is provided in Attachment 3. This assessment was undertaken using the Anaerobic Digestion & Bioresources Association (ADBA) Risk Assessment Tool, which is based on CIRIA 736: Containment systems for the prevention of pollution. The ADBA risk assessment was used to inform hydraulic spill modelling undertaken for the site.

Please refer to the Ellesmere Port BAT Improvement Programme document submitted with this application (see Attachment 4) for details on proposed containment mitigation measures to be installed and timescales for installation. Work is ongoing to provide the Environment Agency with a written secondary containment improvement plan containing the finalised designs and specifications and an implementation schedule for the proposed secondary containment systems. This will be submitted at a date to be agreed with the Environment Agency.

Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves (PVRVs) on gassing tanks or leaks in gas pipework e.g. around flanges.

Please refer to Section 6.10 and 6.11 for details of gas emission controls from the AD facility.

Fugitive odour emissions may arise during normal operations, this is to be mitigated by directing the air flow through OCUs, which are in the process of being reinstated as per the Ellesmere Port BAT Improvement Programme document.

[4] Stantec Report Ref. 331001867R1 dated 11 March 2022
[5] Stantec Secondary Containment Modelling Assessment Report, dated 12 September 2022

Please refer to Section 7 for details of odour assessment and control.

### 4.2. Question 3a: Technical Standards

A block diagram of the process is provided at Appendix E. Please refer to Section 6 for a description of the operating techniques for the installation.

Please refer to Section 9 of this report for the BAT assessment.

### 4.3. Question 3a1: References to any of your own documents or parts of documents submitted as part of a previous application for this site

The current permit does include references within Table S1.2; as these all relate to the existing and ongoing CHP system which is not being varied by this application. There are no changes to these references.

### 4.4. Question 3b: General Requirements

Please refer to Section 10 for the Environmental Risk Assessment and Management Plan. The assessment shows that the:

- Risk associated with emissions of substances not controlled by emission limits is low; and
- Risk of noise and vibration resulting from the changes is low.

Please refer to Section 7 for details of odour assessment and control.

### 4.5. Question 3c: Types and Amounts of Raw Materials

There will be no change to the raw materials associated with the CHP and waste activities currently permitted. Additional raw materials associated with anaerobic digestion and DAAs are:

- Polyelectrolyte;
- Anti-foaming agents; and
- Potable water

Table 4.5.1 below provides details of the raw materials used by the installation. Copies of the Material Specification Data Sheets (MSDS) are provided in Appendix J.

***Table 4.5.1: Raw Materials Use & Storage***

| Schedule 1 Activity | Raw material | Maximum amount stored | Annual throughput | Use and storage of the raw material including any main hazards (include safety data sheets) |
|---|---|---|---|---|
| Anaerobic digestion | Polyelectrolyte powder | Zetag 8160 – 6,000kg<br>Zetag 8167 – 6,000kg | 52.5 tonnes | Used to enhance thickening of the sludge |

| Schedule 1 Activity | Raw material | Maximum amount stored | Annual throughput | Use and storage of the raw material including any main hazards (include safety data sheets) |
|---|---|---|---|---|
| | | Zetag 8180 – 4,500kg | | Powder and liquid polyelectrolyte storage. Storage tanks for liquid polyelectrolyte are located inside the GBT building and centrifuge buildings. Tanks are contained within a concrete bund with additional containment provided by the walls to the building. Bags of powder are stored on impermeable surfacing within the buildings. |
| Anaerobic digestion | Potable water | n/a | Approx. 16,744 tonnes | Used to enhance thickening of the sludge |
| Anaerobic digestion | Anti-foam | 1,000 litres | As required | Used to prevent / reduce foaming.<br><br>IBC stored on hardstanding on a spill pallet. |
| Anaerobic digestion | Gas oil/ PrimeHeat 35 | 15,000 litres | Variable – approx. 300 litres per day if boilers running on fuel | Used to fuel boilers (as last resort, as usually run on biogas)<br><br>Stored in a steel tank within a brick bund with concrete base that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. |
| Anaerobic digestion | Lubricating oil | 4,600 litres | 4,000 litres | Used for CHP maintenance<br><br>Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. |
| Anaerobic digestion | Antifreeze (Mono Ethylene Glycol) | 5 litres | As required | Used in engines to prevent them freezing up during colder weather and acts as a corrosion inhibitor. |

Further information regarding the storage of raw hazardous substances is discussed in Section 6.15 of this document.

### 4.6. Question 4a: Measures you use for Monitoring Emissions

Table 4.6.1 below describes the measures used for monitoring emissions at the installation.

***Table 4.6.1: Emissions Monitoring***

| Location or description | Grid Reference | Parameter | Monitoring Frequency | Monitoring standard or method | Other specifications/ Information |
|---|---|---|---|---|---|
| CHP engines (x2) | A1 – SJ 42428 74277<br>A2 – SJ 42432 742670 | Oxides of nitrogen<br>Carbon monoxide<br>Total VOC's<br>Sulphur dioxide*<br>* To be added at permit issue | Annually | BS EN 14792<br>BS EN 15058<br>BS EN 12619 and/or BS EN 13526<br>BS EN 14791 or CEN TS 17021 or by calculation based on fuel sulphur | Sampling undertaken by a third party specialist |
| OCUs (x4) | A9 - SJ 42456 74359<br>A10 - SJ 42553 74353<br>A11 - SJ 42523 74253<br>A12 - SJ 42351 74337 | Ammonia<br>Hydrogen Sulphide | 6 monthly | EN SIO 21877<br>CEN TA 13649 for sampling and NIOSH 6013 for analysis | No EN standard available for either ammonia or hydrogen sulphide<br>Sampling undertaken by a third party specialist - Taking 3 samples on the inlet and outlet of each OCU for each parameter over the course of 1 day |
| | | Odour concentration | 2 rounds of monitoring | EN 13725 | |
| | | Total volatile organic compounds (TVOC)<br>HCL | 1 round of monitoring | EN 12619<br>EN 1911 | |
| Wastewater Monitoring (combined returns to WwTW) | R1 – filtrate discharge point SJ 42061 74169<br>R2 – centrate discharge point SJ 42053 74177 | 156 hazardous and priority substances as per separate list* | Monthly for 12 months | MCERTS or UKAS where possible* | *Please refer to Section 6.16 for further information |
| Wastewater Monitoring | R3 – Boiler blowdown discharge point SJ 42455 74257<br>R4 – GBT liquor well and surface water SJ 42465 74289 | Total nitrogen<br>COD<br>BOD<br>Total phosphorous | Monthly for 12 months | MCERTS<br>MCERTS<br>MCERTS<br>MCERTS<br>MCERTS | |

| Location or description | Grid Reference | Parameter | Monitoring Frequency | Monitoring standard or method | Other specifications/ Information |
|---|---|---|---|---|---|
| | R5 – Contingency cake storage pad SJ 42384 74293<br>R6 – Humus return well (including centrate, cake bay run off and surface water) SJ 42344 74343 | Suspended solids<br>pH<br>Ammoniacal nitrogen | | MCERTS<br>Accredited by flexible scope to MCERTS | |

**Point Source Emissions to Air**

The current permit was issued in June 2007 and requires that the CHP engines are monitored annually. The CHP engines emissions are monitored annually in accordance with LFTGN08 and the relevant MCERTS Standards and are undertaken by a qualified third party. The results of the monitoring are reviewed by the site's ERA and any other relevant staff to check that they are compliant with the relevant emissions limit value. The CHP stack has an M1 compliant sample location.

The boilers have thermal input of less than 1MW, which is below the threshold for MCPD controls. The EA guidance specifies that only new (post December 2018) MCP are subject to aggregation rules. As the boilers were installed prior to this date, MCPD controls are not considered to apply, and no monitoring is proposed for the emission point from the boilers (A3).

The OCU stacks have been included as point source emissions, as all point source emissions are required to be identified within a permit application. We understand there is no requirement for an M1 compliant sample location. Suitable monitoring locations for the OCUs will be available once operational. To meet BAT8 requirements, monitoring of the OCUs for hydrogen sulphide and ammonia[6], once every six months, will be introduced. Total volatile organic compounds (TVOC) and HCL will monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCL may be added to the bi-annual monitoring schedule. In addition, each stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved. A copy of the site's OMP is supplied with this permit application (Attachment 5), which provides additional detail regarding odour monitoring. Also see Section 7.1 of this application document.

There is no proposal to monitor the PVRV's as these only emit emissions to air in an emergency or when equipment is being serviced/repaired.

[6] No EN standard is available for either ammonia or hydrogen sulphide monitoring.

There is no proposal to routinely monitor the flare, however its running time will be recorded and in the event of the flare operating for more than 10 per cent of a year, emissions monitoring will be undertaken in accordance with permit requirements.

**Point Source Emissions to Sewers, Effluent Treatment Plants or Other Transfers Off Site**

There are six wastewater emissions from the installation. Further monitoring is proposed over a 12 month period to characterise the wastewater streams in accordance with BAT 3, BAT 6 and BAT 7. Please refer to Section 6.16 for further information on monitoring of wastewater streams.
Where monitoring is proposed, 12 samples will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance. Monitoring for hazardous and priority substances will be undertaken at locations R1 and R2 (the points at which the combined effluent streams leave the installation) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance.

**Procedures for Data Review/Evaluation**

A draft Standard Operating Procedure (SOP) detailing the operating requirements, practices and support processes required to undertake emission monitoring as per the environmental permit requirements and to assess the results is contained in Appendix K. This will be finalised on issue of the permit and incorporated into the company's management systems documentation as a controlled document.

## 4.7. Question 6a-b: Energy Efficiency

The thickening process itself is not energy intensive, so there is limited opportunity for improving energy efficiency. When selecting new and/or replacement pumps and motors, energy efficiency is one of the factors considered.

The installation is a net energy exporter providing power to the on-site off-installation wastewater treatment plant and on occasion export to the national grid. The following measures are used to improve energy efficiency:

- All relevant buildings/vessels are appropriately insulated.
- Use of biogas in the CHP engines and/or boilers, with the heat generated recycled to sludge treatment.

The digesters are all suitably insulated. The CHP engines are suitably sized to maximise energy utilisation for the parasitic load, while minimising the use of the flare.

Low energy lighting is installed across the plant.

Current energy reporting requirements under the existing permit are for the following parameters:

- Heat generated - kWth
- Power generated - kWe
- Engine efficiency - kWth input / kWth (equivalent) output

- Boiler efficiency - kWth input / kWth (equivalent) output

Energy consumption for the WwTW as a whole is monitored and tracked via the site environmental dashboard.

The energy demand for plant and equipment is listed in Table 4.7.1.

***Table 4.7.1: Energy demand***

| Plant / Equipment | Total kW rating | Plant / Equipment | Total kW rating |
|---|---|---|---|
| POLYMER DOSING PUMP NO.1 | 0.65 | NO1 SUPERNATANT LIQ.PUMP | 6.125 |
| POLYMER DOSING PUMP NO.2 | 0.65 | NO2 SUPERNATANT LIQ.PUMP | 6.125 |
| POLYMER DOSING PUMP NO.3 | 0.65 | NO 1 GBT FEED PUMP | 11.278 |
| CENTRATE ANTI FOAM PUMP | 1 | NO 2 GBT FEED PUMP | 11.278 |
| CENTRATE PUMP NO.1 (DUTY) | 4 | NO 1 THICKENED SLUDGE PUMP | 11.278 |
| CENTRATE PUMP NO.2 (ASSIST) | 4 | NO 2 THICKENED SLUDGE PUMP | 11.278 |
| SLUDGE TRANSFER PUMP NO.1 (DUTY) | 11 | NO 1 SUPERNATANT LIQUOR RETURN PUMP | 7.29 |
| SLUDGE TRANSFER PUMP NO.2 (ASSIST) | 11 | NO 2 SUPERNATANT LIQUOR RETURN PUMP | 7.29 |
| SLUDGE TRANSFER PUMP NO.3 (S/BY) | 11 | NO 1 RAW SLUDGE FEED PUMP (TAD) | 7.3 |
| NO 1 CONSOLIDATED SLUDGE PUMP | 16.14 | NO 2 RAW SLUDGE FEED PUMP (TAD) | 7.3 |
| CONSOLIDATED SLUDGE PUMP | 12 | NO 1 DIGESTER FEED PUMP | 22 |
| CENTRIFUGE FEED PUMP NO.1 | 7.5 | NO 2 DIGESTER FEED PUMP | 22 |
| CENTRIFUGE FEED PUMP NO.2 | 7.5 | FKL100 STIRRER - LINE 1 ALPHA PLANT | 4 |
| CENTRIFUGE FEED PUMP NO.3 | 7.5 | SCUM CUTTER - LINE 1 ALPHA PLANT | 4 |
| GBT FEED WELL MIXER | 5 | FKL60 STIRRER - LINE 1 ALPHA PLANT | 4 |
| GBT POLY STORAGE TANK MIXER | 4 | NO 1 LINE HOT SLUDGE PUMP ENTRY | 7.5 |
| GBT POLY MIXING TANK MIXER | 1.5 | NO 1 LINE WARM SLUDGE PUMP | 11 |
| GBT POLY/CLEAN WATER TRANSFER PUMP | 12 | FKL100 STIRRER - LINE 2 ALPHA PLANT | 4 |
| POTABLE WATER PUMP No1 | 1 | SCUM CUTTER - LINE 2 ALPHA PLANT | 4 |
| SCRUBBER PUMP FOR ALPHA BIOFILTER | 17.54 | FKL60 STIRRER - LINE 2 ALPHA PLANT | 4 |
| Booster Pump for Hot Water Circuit | 11 | NO 2 LINE HOT SLUDGE PUMP ENTRY | 7.5 |
| HOT WATER CHEMICAL DOSING PUMP | 1 | NO 2 LINE WARM SLUDGE PUMP | 11 |

| Plant / Equipment | Total kW rating | Plant / Equipment | Total kW rating |
|---|---|---|---|
| NO 1 HOT WATER RECIRCULATION PUMP | 11 | FKL100 STIRRER - LINE 3 ALPHA PLANT | 4 |
| NO 2 HOT WATER RECIRCULATION PUMP | 11 | SCUM CUTTER - LINE 3 ALPHA PLANT | 4 |
| SLUDGE SCREEN FEED PUMP NO.1 | 7.3 | FKL60 STIRRER - LINE 3 ALPHA PLANT | 4 |
| SLUDGE SCREEN FEED PUMP NO.2 | 7.3 | NO 3 LINE HOT SLUDGE PUMP ENTRY | 7.5 |
| CDENVIRO SCREEN PLANT WW BOOSTER PUMP | 7.5 | NO 3 LINE WARM SLUDGE PUMP | 11 |
| NO.1 STIRRER | 4 | NO.1 WASH WATER PUMP | 11.295 |
| NO.2 STIRRER | 4 | NO.2 WASH WATER PUMP | 11.295 |
| NO 1 POLYMER PUMP (GBT) | 0.65 | NO 1 BALANCING TANK RETURN PUMP | 25 |
| NO 2 POLYMER PUMP (GBT) | 0.65 | NO 2 BALANCING TANK RETURN PUMP | 25 |
| POLYMER TRANSFER PUMP NO.1 | 7.5 | NO.1 SLUDGE PUMP | 13 |
| POLYMER TRANSFER PUMP NO.2 | 7.5 | NO.2 SLUDGE PUMP | 13 |
| POTABLE WATER PUMP NO.1 | 4 | A1 SLUDGE SCREW PUMP | 15 |
| POTABLE WATER PUMP NO.2 | 4 | B1 SLUDGE SCREW PUMP | 37 |

Periodic targets for energy improvements will be identified as part of the annual energy review, which identifies opportunities for improvement and sets out the site's energy management strategies and energy balance record. This review is set out in the Energy Review FY21, which has been provided with this document (see Attachment 10).

### 4.8. Question 6d-e: Raw Materials and Waste

Please refer to Table 4.5.1 above. Raw materials to be used in the process include polyelectrolyte and potable water that are used in the sludge de-watering process, these are monitored and optimised to achieve the required thickening parameters. The quantity of polyelectrolyte used and the concentration of the polyelectrolyte/water mix will be monitored and recorded; these records will be used to calculate annual potable water consumption.

All raw and other materials used are essential for the efficient and successful operation of the digestion activity and wider on-site off-installation wastewater treatment works. Only the quantities required are used and UUW regularly reviews the types and quantities of materials used.

The treatment process itself produces waste screenings via the raw sludge screens. It is essential that these are removed from the sludge to attain the required sludge quality. Screenings are currently sent to landfill as there are currently no viable recycling or recovery routes available.

The digestion activity is a waste recovery activity and is undertaken to recover energy and organic materials that may otherwise be disposed of. UUW regard the sludge cake and biogas produced as useful resources that are subject to full recovery. They replace fossil fuels and raw materials that would otherwise be required.

Limited amounts of servicing and maintenance waste are expected to be produced and these will be managed in accordance with the waste hierarchy.

## 5. Application Form C6 - Point Source Emission to Water

### 5.1. Question 3b: What is the maximum volume of effluent you will discharge in a day?

The centrate and filtrate combined, gives a total of approximately 2,021m$^3$/day. No figures are currently available for boiler blowdown, leachate and surface water.

### 5.2. Question 3c: What is the maximum rate of discharge in litres per second?

The centrate and filtrate combined, gives a total of 165 litres/second.

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

2,021m$^3$/day.

### 5.4. Question 3f: For each answer in question 3, show how you worked out the figure on a separate sheet

Q3b – The main elements of the effluent generated are the filtrate and centrate.

- Maximum daily filtrate return is approximately 1,166m$^3$/day.
- Maximum daily centrate return is approximately 855m$^3$/day.

Total therefore: 1,166 + 855 = 2,021m$^3$/day

Q3c - The main elements of the effluent generated are the filtrate and centrate.

- Maximum daily filtrate return is approximately 65l/s.
- Maximum daily centrate return is approximately 100l/s.

Total therefore: 65 + 100 = 165l/s

Q3d – The main elements of the effluent generated are the filtrate and centrate.

- Maximum daily filtrate return is approximately 1,166m$^3$/day.
- Maximum daily centrate return is approximately 855m$^3$/day.

Total therefore: 1,166 + 855 = 2,021m$^3$/day

### 5.5. Question 5a: How far away is the nearest foul sewer from the boundary of the premises?

Not applicable – the installation is located within the curtilage of Ellesmere Port WwTWs and the installation wastewater emissions discharge into the works UWWT inlet via the site's sealed drainage system.

### 5.6. Question 5b2: Discharges from all other premises including trade effluent

Not applicable – the installation is located within the curtilage of Ellesmere Port WwTWs and the installation wastewater emissions discharge into the works UWWT inlet via the site's sealed drainage system.

### 5.7. Question 6a: Do you treat your effluent

Wastewaters generated by the sludge treatment process are not subject to pre-treatment. All wastewater emissions are returned to the head of Ellesmere Port WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits. Please see response to Question 6b for details of the treatment carried out on the effluent.

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

No treatment of wastewater is undertaken within the installation boundary. Wastewater emissions are returned to the head of Ellesmere Port WwTW to undergo full biological treatment.

### 5.9. Question 6c: No question

Table 1 identifies that Question 6c should be answered – it is noted that this question does not exist on the form.

### 5.10. Question 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?

No monitoring has been undertaken for the substances listed. See response to question 7e.

### 5.11. Question 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?

No monitoring has been undertaken for the substances listed. See response to question 7e.

### 5.12. Question 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'?

No monitoring has been undertaken for the substances listed. See response to question 7e.

### 5.13. Question 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

There are no direct emissions to surface water or groundwater from this installation therefore monitoring for all substances listed within the referenced risk assessment at the site has not been undertaken. There are emissions to sewer, which are all routed into the wastewater treatment works' flow to full biological treatment via the site drainage system. This is a circular process and is considered to represent BAT. These wastewater emissions are limited to the following:

- R1 – Filtrate discharge point;

- R2 – Centrate discharge point;
- R3 – Boiler blowdown discharge point;
- R4 – GBT liquor well and surface water;
- R5 – Contingency cake storage pad; and
- R6 – Humus return well (including centrate, cake bay run off and surface water)

As Ellesmere Port WwTW final effluent discharges into Thornton Brook, testing for the hazardous and priority substances listed for fresh waters will be undertaken. There are 60 priority hazardous pollutants and 96 specific pollutants listed in the tables contained in the EA Guidance 'Surface water pollution risk assessment for your environmental permit'[7]. The total number of parameters is 156.

UUW is committed to undertaking full characterisation of the wastewater streams to meet BAT3, however we will assess whether it is possible to screen out any of these parameters based on the character of the wastewater coming into the works and, if so, provide a justification to the EA during the permit determination period for any reduction in the list of parameters to be analysed.

Monitoring for hazardous and priority substances will be undertaken at R1 and R2 (the points at which the GBT filtrate and centrate leave the installation (Grid references SJ 42061 74169 and SJ 42053 74177) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance. Laboratory analysis will be undertaken to MCERTS or UKAS ISO17025 standards for determinands where available. However, it should be noted that only around 10% of the 156 hazardous and priority substances can be analysed in-house at UUWs laboratories and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate/ filtrate matrix and potentially may not be able to analyse at all.

Monitoring to characterise wastewater returns to the WwTW inlet has been reviewed against BAT 6 and BAT 7 requirements. Limited monitoring data is currently available, relating to the filtrate and centrate only (weekly testing for BOD, ammonia and suspended solids is undertaken).

BAT 6 specifies that 'for relevant emissions to water, as identified by the inventory of wastewater streams (see BAT 3), BAT is to monitor key process parameters (e.g. wastewater flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)'.

BAT 7 states: BAT is to monitor emissions to water with at least the defined frequency, and in accordance with EN standards. The proposed BAT monitoring requirements for all wastewater streams have been compared with those for biological treatment of waste. The EA has directed that 'treatment of water-based liquid waste' BAT AELs are also appropriate.

[7] Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk)

Based on the BAT 7 requirements, monitoring for the following parameters is proposed to characterise the wastewater streams, with the exception of biogas condensate and boiler blowdown, at the frequency set out in Table 5.13.1 and Table 6.16.2:

- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- BTEX;
- Free cyanide;
- Halogens;
- Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI));
- PFOS; and PFOA.

Flow meters are installed to record the flow of centrate and filtrate to the head of the works. An MCERTS flow meter is installed at the final effluent outlet from the wider WwTW works.

Monitoring of the wastewater returns to the head of the works is summarised below in Table 5.13.1.

***Table 5.13.1 Monitoring of the Wastewater Returns***

| Location | Grid Reference | Parameters | Frequency |
|---|---|---|---|
| R1 – filtrate discharge point | SJ 42061 74169 | • Total nitrogen;<br>• COD;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)).<br>Plus hazardous and priority substances listed for fresh waters; 156 parameters, including PFOS.<br>Samples to be taken from the routine sampling point. | Monthly – 12 samples |
| R2 – centrate discharge point | SJ 42053 74177 | • Total nitrogen;<br>• COD;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide; | Monthly – 12 samples |

| Location | Grid Reference | Parameters | Frequency |
|---|---|---|---|
| | | • Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)).<br>Plus hazardous and priority substances listed for fresh waters; 156 parameters, including PFOS.<br>Samples to be taken from the routine sampling point. | |
| R3 – Boiler blowdown discharge point | SJ 42455 74257 | pH, COD and suspended solids | Monthly – 12 samples |
| R4 – GBT liquor well and surface water | SJ 42465 74289 | • pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). | Monthly – 12 samples |
| R5 – Contingency cake storage pad | SJ 42384 74293 | • pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). | Monthly (subject to flow conditions) – 12 samples |
| R6 – Humus return well (including centrate, cake bay run off and surface water) | SJ 42344 74343 | • pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens; | Monthly – 12 samples |

| Location | Grid Reference | Parameters | Frequency |
|---|---|---|---|
| | | • Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). | |

### 5.14. Question 8d: Discharges to groundwater

Not applicable – the installation does not discharge to groundwater.

### 5.15. Question 8e: Discharges to freshwater (non-tidal) rivers from an installation, including discharges via sewer

No screening or modelling has been undertaken on the wastewater emissions from the installation at present, due to a current lack of quality data for a number of the wastewater emission sources and a lack of flow data. The final effluent discharge from the wider works, which includes the installation wastewater emissions, has previously been subjected to modelling as part of the environmental permitting discharge application process.

### 5.16. Question 8f: Environmental Impact Assessment

Not applicable – an environmental impact assessment has not been undertaken as this is an existing facility/installation.

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

Not applicable to this installation.

### 5.18. Question 9b: What is the national grid reference of the effluent sample point?

R1 – SJ 42061 74169 and R2 – SJ 42053 74177

### 5.19. Question 9d: What is the national grid reference of the flow monitoring point?

TBC

### 5.20. Question 9e: Does the flow monitor have an MCERTS certificate?

No

### 5.21. Question 9f: Do you have a UV disinfection efficacy monitoring point?

No this is not installed as part of this installation.

### 5.22. Question 9h: You should clearly mark on the plan the locations of any of the above that apply to this effluent

The location of all the emission points is shown on the figures included in Appendix H.

### 5.23. Question 9i: Do you intend to do your own effluent monitoring?

Yes. Monitoring will be carried out in accordance with established process monitoring procedures using appropriate equipment, which will be calibrated to manufacturer's instructions where required. All samples will be collected and stored in an appropriate manner by suitably qualified personnel, with analysis carried out in line with BAT 3, as appropriate. All analysis is undertaken at UU Scientific Services Lingley Mere Laboratory, which is a United Kingdom Accreditation Services (UKAS) laboratory accredited to ISO/IEC 17025:2017. Wherever possible sampling and analysis is accredited to MCERTS by UKAS (confirmed by the laboratory for BOD, Suspended Solids, COD, Total nitrogen and Total phosphorous, with Ammonia as N accredited by flexible scope to MCERTS).

However, it should be noted that only around 10% of the 156 hazardous and priority substances (to be analysed at monitoring locations R1 and R2) can be analysed in-house at UUWs laboratories (please refer to Appendix L for a copy of UU's UKAS Accreditation Certificate) and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate/ filtrate matrix and potentially may not be able to analyse at all.

### 5.24. Question 10 : Where will the effluent discharge to?

Not applicable. There are no direct emissions to water from the sludge treatment activities. The wastewater streams are returned to the head of the works for full biological treatment, before being discharged (indirectly) via the WwTW final effluent discharge into Thornton Brook via Outlet 1 or River Gowy via Outlet 2[8] (Environmental Permit/Consent (016810030)).

[8] The normal point of discharge is into Thornton Brook, which is non-tidal. Discharge into the River Gowy has never occurred but could if there was an issue with low flow levels in Thornton Brook.

# 6. Variation Technical Description and Operations

## 6.1. Pre-acceptance, Acceptance and Storage of Waste

The wastewater sludge to be received for treatment consists of sewage sludges imported from other UUW WwTW and indigenous sludges (consisting of surplus activated sludge (SAS)) produced from Ellesmere Port WwTW. The process has been designed to treat sewage sludges generated within the UUW network in compliance with the Biosolids Assurance Scheme (BAS). A BAS risk assessment is carried out for each source of sewage sludge, indigenous sewage sludge and imported raw sludge. A copy of Ellesmere Port's Site Specific Instruction (SSI) Waste Characterisation and Acceptance Procedure for imported sludge is provided with this document (Attachment 6). This includes information regarding staff responsibilities; waste types accepted; waste characterisation; waste acceptance, waste non-conformance and rejection; and waste audit and reassessment.

In summary, the imported sludge is accepted by road tanker and pumped directly into either the raw sludge tanks or thickened sludge tanks. The following sludge acceptance/recording procedures are used at Ellesmere Port:

- United Utilities Bioresources is responsible for the movement of all UUW sludges produced. The "PODFather" system is used to plan and manage the movement of UU tankers transporting UUW sludges between wastewater treatment works. POD stands for "Proof of Delivery".
- Waste characterisation and pre-acceptance is provided for each sewage sludge import. This is provided through completion of the "WwTW Sludge Waste Declaration Form". The WwTW Sludge Waste Declaration Form is completed by a representative of the WwTW production site or production area with knowledge and authority to provide this information (e.g. Process Controller, Technical Officer, Production Manager, or Area Production Manager).
- The characterisation provided on the WwTW Sludge Waste Declaration Form is required in order for a technical assessment of the waste to be completed by the Ellesmere Port site. The Technical Assessment will confirm if the proposed import stream is suitable for processing. The Ellesmere Port Production Manager is responsible for the approval of incoming waste.
- Following approval, the PODFather system provides a link each week to Process Controllers (PC) at export sites, the PC then provides information relating to sludge levels on site and what volume they need exporting the following week.
- Import sites provide information on what volume they are able to accept and ensure that volumes received are within Permit and licence conditions.
- Sludge loggers linked to the PODFather system are present at all import sites; they automatically monitor the quantity and the dry solids of the sludge imports as they are discharged from the tanker.
- The PODFather system records all sludge movements, detailing the site it has come from, the volume, the quality (dry solids content) and date and time delivered. These records are all kept electronically and used in the quarterly submissions to the EA as well as the annual reporting to OFWAT.
- Sampling of imports on arrival is not required as the material consists of sewage sludge which will have undergone pre-acceptance characterisation and technical evaluation. Where there are

operational or technical reasons to carry out sampling these will be done as detailed in the waste acceptance procedure.

- The tanker discharge point has a WaSP system that doesn't allow discharge unless the tanker driver has the correct access fob. As well as allowing the discharge to take place, the driver has to enter details such as name, registration number and sludge source, these records are kept as part of the duty of care compliance.

## 6.2. Waste Treatment and Processing

A process flow diagram for the sludge treatment process is included at Appendix E.

Ellesmere Port WwTW processes three types of sludge:

- Indigenous sludges arising at Ellesmere Port WwTW;
- Imported raw sewage sludge and other sewage related sludges; and
- Imported thickened raw sewage sludge

The processes for treating the different imports of waste are interlinked as detailed in the following sections. Organic matter is digested, resulting in the production of biogas and treated sludge cake. The biogas has a high calorific value and is burned in CHP engines and boilers to produce heat and electricity. The sludge cake produced is recovered to land.

One new waste stream is proposed on a contingency basis:

- Imported digestate from another UUW sludge treatment site in the event that there are treatment issues at the origin site. Liquid digestate would be received by road tanker and discharged into the indigenous sludge wet well for processing. Digestate may also be transferred directly into a digester, if required for seeding purposes.

## 6.3. Ellesmere Port WwTW Sludge

Indigenous sludge is pumped from a wet well to one of two unthickened raw sludge tanks (Tank 1 or Tank 2). In addition, indigenous sludge can be held in two raw sludge holding tanks (Tanks 3 and 4). The raw sludge tanks are partially submerged covered tanks of reinforced concrete construction (see Photo 1 and Photo 2).

Photo 1: Raw sludge tank

Photo 2: Raw sludge holding tank

### 6.4. Tanker Imported Sludge

The unthickened raw sludge import point is located adjacent to the raw sludge tanks, see Photo 3. Imported raw sludges are pumped into either of the raw sludge tanks (1 or 2) via a flexible pipe and bauer coupling.

Photo 3: Raw sludge import point

Unscreened sludge is pumped to the sludge screen (Photo 4), where sludge screenings are collected in an open skip. From here the screened sludge passes to the Gravity Belt Thickening (GBT) feed sump. There are two screens operating as duty/standby.

Photo 4: Sludge screening unit

### 6.5. Gravity Belt Thickeners (GBT)

From the screening unit and feed sump, sludge is pumped into two GBTs for thickening, which are located within a building, see Photo 5. The liquid sludge is dosed with polyelectrolyte prior to the GBTs. The polyelectrolyte make-up and dosing system is located on the basement floor of the GBT building. Potable water is used for polyelectrolyte make up. A water tank is located on the basement level. Final effluent is used to wash out the GBTs. Thickened sludge from the GBTs is passed to the thickened sludge reception tanks. Filtrate is returned to the inlet of the WwTW via a covered well.

Photo 5: GBT Building

### 6.6. Thickened sludge tanks

The thickened sludge tanks consist of three concrete partially submerged tanks (Photo 6). The tanks are mechanically mixed and interlinked with overflow to the adjacent tank.

Photo 6: Thickened sludge tanks

Thickened raw sludge from other UUW works is also accepted at an import point located adjacent to the thickened sludge tanks (Photo 7). Thickened sludges arrive via tanker and are pumped into thickened sludge storage tank No.1 via a flexible pipe and bauer coupling.

Photo 7: Thickened sludge import point

### 6.7. Thermophilic Aerobic Digesters (TADs) (not currently operational)

When operational, pathogen reduction is achieved by Thermophilic Aerobic Digestion (TAD). Thickened sludge is pumped to one of three TAD vessels (Photo 8). It is first held in a heat exchanger, where pumps re-circulate the hot sludge around the heat exchanger for a pre-set time. This process will ultimately warm the cold sludge up and cool the hot sludge down. After a pre-set time, the raw sludge is pumped to the reaction vessel where it is further heated to a pre-set temperature of 54˚C and held for 45 minutes. During this time a new batch of raw sludge has been pumped to the heat exchanger and the hot sludge pumped to one of the mesophilic anaerobic digesters leaving space for a batch of the treated sludge to be pumped into the heat exchanger.

Photo 8: Thermophilic Aerobic Digesters

## 6.8. Mesophilic Anaerobic Digesters (MADs)

From the TAD vessels, sludge is batch fed into one of three MAD tanks (Photo 9). These are fixed roof digesters which are mixed by gas compressors. Digestion takes place at a minimum temperature of 29.7ºC, with a minimum retention time of 12 days. Under normal operating conditions the MADs work continuously and simultaneously.

Photo 9: Mesophilic Anaerobic Digesters

All treated sludge from the digestion process is stored in the post digestion tank. The tank is glass fused to steel construction. An overflow tank located next to the thickened sludge storage tanks is available for contingency storage of digested sludge if required.

Photo 10: Post Digestion tank

## 6.9. Centrifuges

From the post digestion tank, the digested sludge is pumped to the digested sludge buffer tank located next to the centrifuge building (Photo 11). From there it is pumped to three centrifuges via their individually dedicated pumps. Polyelectrolyte is dosed to the sludge prior to it entering the centrifuges.

Photo 11: Digested sludge buffer tank

Sludge cake produced falls into transport containers located on the ground floor level of the centrifuge building, where it is stored before collection and removal from site (Photo 12).

Photo 12: Digested sludge cake storage

Contingency storage capacity is available when required at a cake slab storage area (Photo 13). The bay is constructed from concrete and is laid to a fall to be captured by the site drainage system, from where all drainage is returned to the WwTW flow to full treatment.

Photo 13: Contingency sludge cake storage pad

Centrate from the dewatering process gravitates to a buffer tank and from there it is then pumped to the centrate tank (Photo 14). Centrate from the centrate tank is pumped up to the head of the works (Photo 15).

Photo 14: Centrate tank

Photo 15: Centrate discharge point to head of works

## 6.10. Biogas

The storage of biogas and its combustion are as per the existing permit.

Gas production rates are measured via gas flowmeters; and organic loading is assessed based on the composition of raw digested sludge which is monitored via instrumentation (Metso) and affirmed by regular lab analysis. The calculated digester feed rate is built into the Hazard and Critical Control Point (HACCP) Plan and Biosolids Assurance Scheme (BAS) plans and feed rates are not exceeded to ensure organic loading is controlled.

Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves on gassing tanks (see Section 6.11) or leaks in gas pipework e.g. around flanges. Leak detection for biogas is not currently undertaken unless a fault is suspected. However, a Leak Detection and Repair (LDAR) Plan has been put in place and a Site Specific Instruction (SSI) has been developed for the site which is included with this application (see Attachment 7). Assets (such as the digesters, gas holder, PVRV's, CHP engines, boilers and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on a 6-monthly basis.

## 6.11. Pressure Vacuum Relief Valves (PVRVs)

PVRV's are installed on the primary digesters and the gas holder. PVRVs are calibrated, serviced and installed by a trusted competent/specialist contractor (Qualtech). The PVRVs only operate when the pressures within the system occasionally exceed a set value and this value is set at a level whereby the PVRVs will be able to reduce the excess pressure prior to any critical pressure point being exceeded. The size and number of PVRVs for each vessel is based upon design criteria, taking into account system pressure and biogas volumes. PVRVs at Ellesmere Part WwTW are set to operate on the digesters at 50mb and on the gas holder at 40mb, as per the design criteria.

All PVRV's are installed in accordance with the current Asset Standards which consider current industry best practice. We note that BS EN ISO 28300-2008 is relevant to usage in the petrochemical industry and we consider the current standards, including compliance with IGEM[9] standards, are appropriate for the operating conditions.

PVRVs are installed with wildlife cages to prevent nesting birds; and frost protection measures are not considered necessary due to the normal operating temperature of the biogas, i.e. 10 – 40$^{o}$C. The condition and performance of the PVRVs will be monitored via a 2-yearly service and calibration programme carried out by a specialist contractor in accordance with design specifications and regular site tours by operational staff which include inspection of the PVRVs.

In the event of an overtopping or foaming event, the digester(s) will be dosed with antifoam as required to inhibit foam generation (see Primary Digestion Foaming SSI provided for further information). Once foam levels subside, the PVRVs will be cleaned down and inspected for debris blocking the sealing plate or protective cage: and checked to ensure the PVRV seal is operating correctly. If there is any suspicion that

[9] Institution of Gas Engineers and Managers

the integrity of the PVRV has been affected, then service and calibration by the specialist contractor will be arranged.

Any releases from PVRVs (or foaming events) observed will be recorded in the site diary, along with any escalations or remedial actions taken.

There is no requirement to monitor emissions from the PVRVs as they are a safety critical system that do not operate routinely and, when they do operate, are only open for a very limited period of time (however the volume of gas released can be estimated based on measured gas generation rates at the time of PVRV operation).

The PVRVs will be checked for fugitive biogas leaks on a six-monthly basis with a thermal imaging camera as part of the site LDAR Plan.

### 6.12. Process Controls

The site makes extensive use of SCADA technology, which allows plant operations personnel to monitor, control and record the status and performance of key equipment in the various plant areas. The system also provides alarms in the event of an equipment failure.

The monitoring of digester key process parameters and biogas key process parameters is summarised in Table 6.12.1 below.

***Table 6.12.1: Summary of Process Monitoring***

| Parameter | Frequency of measurement | Point of measurement | System of measurement |
|---|---|---|---|
| pH | Weekly | Sample taken (digester feed) | Lab analysis |
| Alkalinity | Weekly | Sample taken (digester feed) | Lab analysis |
| Volatile fatty acids concentration | Weekly | Sample taken (digesters) | Lab analysis |
| Temperature | Continuous | Temperature probe within digesters | SCADA |
| Sludge feed rate | Continuous | Flow meters | SCADA |
| Flow | Continuous | Flow meter | SCADA/ STS |
| Methane | Continuous | Gas meter | SCADA/ STS |
| Oxygen | Continuous | Gas meter | Engine HMI |
| Hydrogen Sulphide | Continuous | $H_2S$ analyser | SCADA/ STS |
| Pressure | Continuous | Pressure Transducer | SCADA/ STS |

The hydraulic retention time (HRT) of the anaerobic digestion tanks is recorded daily by calculating the ratio of tank volume ($m^3$) to sludge feed rate ($m^3$/day). The required minimum retention time for anaerobic digestion to complete efficiently is 12 days.

Process control monitoring is also used to assess tank and sludge pipework integrity e.g. comparison of flow meters (where present) throughout the system to identify any losses. Flow readings are displayed and monitored continuously via the site SCADA system.

The sludge digestion process is operated under a HACCP Plan which sets out operating conditions, critical control points within the process and sampling requirements. It also sets out a corrective action plan in the event of a critical control point breach. The HACCP sets out the process to be taken in the event of a breach of a critical control point. Examples of site specific corrective actions are provided in Table 6.12.2 below.

Several Site Specific Instructions (SSI) (such as the Digestion and Biogas Emergency Plan and the Process Loss Contingency Plan) are also contained within the overall Environmental Management System for the site. If normal operating parameters are not met, then suitable actions are undertaken in accordance with the relevant SOPs.

***Table 6.12.2: Corrective Actions in the event of a Critical Control Point Breach***

| Problem/CCP Breach | Primary Corrective Action | Secondary Actions | Comments |
|---|---|---|---|
| Primary Digester Retention Time <12 days (Feed Volume > 286m$^3$/digester/day) | Reduce feed volumes to increase retention time | Ensure sludge thickening plant is optimised to reduce volumes | Increase digester feed solids to a maximum of 6.0%<br>Monitor organic loading max 2kgvs/m$^3$ of digester volume per day |
| | | Export thickened sludge to other sites | Contact Agricultural Services for available capacity |
| | | Install mobile centrifuge on thickened sludge and lime/landfill cake | Requires prior agreement with EA Contact local UU ERA for advice |
| Primary Digester temperature low <29.7°C | Increase temperature | Ensure heat output from CHP engines is maximised | Engines are serviced by specialist contractor (Clarke Energy Ltd) in accordance with the manufacturers servicing schedule |
| | | Fire boiler on biogas/oil | The CHP engines should be used as the primary heat source where possible due to their greater efficiency |
| | | Increase feed solids (see above) to reduce water content and heat demand in digesters | See above |
| | | Ensure feed volumes to each digester are equal | Check flow metering accuracy |
| | | Increase TAD reactor minimum residence | Change parameters in a controlled method and assess |

| Problem/CCP Breach | Primary Corrective Action | Secondary Actions | Comments |
|---|---|---|---|
| | | temperature setting. Assess and optimise heat recovery times | |
| TAD temp below 54°C | Ensure control parameters are set correctly | | The plant has a pre-set parameter so the plant will not process below 54°C |

## 6.13. Containment and Drainage

The sludge storage/treatment tanks, their construction details and capacity are summarised in Table 6.13.1 below.

***Table 6.13.1: Sludge Storage/Treatment Tank Construction and Capacities***

| Tank Name | Construction | Tank Emplacement | Year of Installation | Tank Capacity (combined totals) |
|---|---|---|---|---|
| Raw sludge tanks (x4) | Reinforced Concrete | Two partially below ground (1.2m below surface) and two wholly below ground (1.5m below surface) | 1985 (est.) | 660m$^3$ |
| Thickened sludge tanks (x3) | Reinforced Concrete | Wholly below ground (7m below the surface) | 1985 (est.) | 2,640m$^3$ |
| TAD vessels (x3) | Steel | Wholly above ground | 1985 (est.) | 360m$^3$ |
| Digesters (x3) | Reinforced Concrete | Partially below ground (7m below the surface) | 1985 (est.) | 10,200m$^3$ |
| Digested sludge overflow tank | Reinforced Concrete | Wholly below ground (7m below the surface) | 1985 (est.) | 880m$^3$ |
| Post digestion tank | Glass fused to steel | Wholly above ground | 1985 (est.) | 2,200m$^3$ |
| Digested sludge buffer tank | Glass fused to steel | Wholly above ground | 1985 (est.) | 30m$^3$ |
| Centrate buffer tank | Glass fused to steel | Wholly above ground | 1985 (est.) | 40m$^3$ |
| Humus return well | Reinforced concrete | Wholly below ground (6.5m below the surface) | 1985 (est.) | Not known |
| Centrate tank | Glass fused to steel | Wholly above ground | 1985 (est.) | 1,200m$^3$ |

All above ground and below ground tanks and pipework related to the sludge treatment process[10] are constructed of suitable materials, in accordance with UUW asset standards, to ensure longevity and minimise the risks of failure/leaks.

[10] Which also includes the polyelectrolyte mixing and storage tanks.

Sludge storage and treatment areas are situated on a mixture of impermeable hard surfacing and gravel aprons with drains to the sealed site drainage system. There are areas of the site that are not impermeably surfaced, particularly around the post digestion tank, raw sludge tanks, mesophilic digesters, TAD digesters and centrate tank. An external visual inspection by Stantec UK Limited in 2021 identified no signs of wear of any of these tanks (other than isolated weathering on the raw sludge tanks, GBT feed well, GBT supernatant well, thickened sludge tanks, centrate buffer tank, centrate tank, humus wet well, digested sludge overflow tank and boiler fuel tank). A site surfacing plan is provided at Appendix G.

Sludge storage tanks do not currently have secondary containment and rely on tertiary containment provided by the site drainage system. The surface water drains provide a 'self-contained' sealed system, i.e. all drains on site are connected to private drainage leading to the WwTW treatment process.

UUW commissioned Stantec Limited to undertake an assessment of the potential environmental risks associated with a loss of containment from process tanks at the site. The assessment was undertaken using the Anaerobic Digestion & Bioresources Association (ADBA) Risk Assessment Tool, which is based on CIRIA 736: Containment systems for the prevention of pollution. The ADBA risk assessment was used to inform hydraulic spill modelling undertaken for the site. A 2D model of the Ellesmere Port site was constructed in InfoWorks ICM to assess the impact of failure or loss of containment on site. Use of the 2D hydraulic model allows the failure of a containment vessel to be represented, including the subsequent overland flow and ponding of released flow. A copy of the Stantec Secondary Containment Modelling Assessment Report is provided with this application (Attachment 3).

Results from the simulations indicate that the spilled flows from these tanks could reach receptors, as detailed in the Stantec report. High-level containment solutions for each critical asset have therefore been developed to meet the requirements set out in CIRIA c736. Solution modelling has been completed on all tanks to show the simulated flood extents and the depths of the settled sludge with the proposed mitigation measures in place. The modelling has confirmed that the solutions proposed would provide adequate containment, and thus meet the requirements under BAT conclusion 19.

The proposed mitigation measures to be installed and timescales for installation are detailed in the Ellesmere Port BAT Improvement Programme document submitted with this application. Work is ongoing to provide the Environment Agency with a written secondary containment improvement plan containing the finalised designs and specifications and an implementation schedule for the proposed secondary containment systems. This will be submitted at a date to be agreed with the Environment Agency.

In the interim period, site inspection tours of the impermeable surface, storage tanks and drainage system will be carried out on a daily basis by site-based staff and monthly by the site's ERA. These tours will include visual inspection of the site drains to ensure they are working as expected. Once the proposed secondary containment measures are in place, the site inspection tours will be extended to include a visual check of these also.

Regular CCTV inspections are to be carried out (every 5 years) on the drainage systems. If any issues or concerns are identified, they will be logged on the corporate action tracker for prompt remediation. A site drainage plan is provided at Appendix F.

## 6.14. Monitoring and Maintenance

The site operates under an EMS manual detailing the Standard Operating Procedures (SOP's) and Site-Specific Instructions (SSI's) applicable to each process. These instructions have been designed to ensure safe and effective operation and to minimise known hazards from the installation and include procedures for maintenance, training and accident response.

The Production Manager reviews the EMS for the installation and arranges the necessary updates to include the operations, inspection and maintenance of the plant. The Production Manager also arranges staffing resources and training for operation, monitoring and maintenance of the plant.

All scheduled maintenance will be set up on the Mobile Asset Resource Scheduling (MARS) and all proactive and reactive maintenance undertaken will be recorded on MARS against the requirements of the plan.

Equipment and pipework at site are installed in accordance with UUW asset standards to ensure reliability. The UUW standards are based on industry best practice and are regularly reviewed by technical specialists within the business. Assets are also subject to regular inspections and defect management via UUW's statutory maintenance team, which includes checking for corrosion and the general condition of pipework and equipment. In addition, site inspection tours are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Advisor (ERA). These tours include tank level monitoring, visual inspection of asset integrity, where possible, and general ground conditions. If any evidence of leaks or ground contamination is seen further investigations or remedial actions will be instigated immediately.

Critical parts and chemicals are available in the event of equipment failure. Stocks are counted biannually on site, and on a cycle counting basis at the central stores. The central stores is the default storage location for all spares and is a third-party warehouse. All counts are held in SAP, a resource planning software system used across UUW activities. This same SAP system links stock movements to work instructions for the site and reorders via the Purchasing team. Chemicals stocks are managed through procurement framework agreements with suppliers and a quantity is stored on site which may be used in an emergency.

## 6.15. Storage of Hazardous Substance Risk Assessment

Raw hazardous substances are used and stored at the site. Table 6.15.1 sets out the risk assessment of hazardous substances for Ellesmere Port WwTW.

***Table 6.15.1: Hazardous Substances Risk Assessment***

| Hazardous Substance | Capable of Causing Pollution? | Maximum volume stored | Pollution Prevention Measures Assessment | Risk of Soil & Groundwater Contamination |
|---|---|---|---|---|
| Gas oil (diesel or kerosene) or PrimeHeat 35– used as a back-up fuel supply. | Yes | 15,000 litres | Stored in a steel tank within a brick bund with concrete base that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. The bunded area is within a concrete apron that is | Very low as no pathway |

| Hazardous Substance | Capable of Causing Pollution? | Maximum volume stored | Pollution Prevention Measures Assessment | Risk of Soil & Groundwater Contamination |
|---|---|---|---|---|
| | | | drained to the WwTW flow to full treatment via the site's sealed drainage system. | |
| Lubricating oil – clean oil for CHP engine maintenance. | Yes | 4,600 litres | Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. The bunded area is within a concrete apron that is drained to the WwTW flow to full treatment via the site's sealed drainage system. | Very low as no pathway |
| Waste lubricating oil – arising from CHP engine maintenance. | Yes | 4,600 litres | Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. The bunded area is within a concrete apron that is drained to the WwTW flow to full treatment via the site's sealed drainage system. | Very low as no pathway |
| Antifreeze – for use in engines to prevent them freezing up during colder weather and acts as a corrosion inhibitor. | Yes | 5 litres | Kept within a storage cage under cover and within a concrete bund. Any small drums being used will be positioned within plastic bund trays indoors on a concrete base.<br>The storage areas are concrete surfaced and drained to the WwTW flow to full treatment via the site's sealed drainage system. | Very low as no pathway |
| Note: Both polyelectrolyte and anti-foam were assessed and determined to be non-hazardous substances. | | | | |

## 6.16. Process Emissions

There are a number of emission points from the sludge treatment process. The location of all the emission points are shown on the figures included in Appendix H.

Table 6.16.1 sets out the inventory of wastewater and waste gas stream emissions from the sludge treatment process, in line with BAT 3 requirements. Wastewater streams at the site consist of:

- Gas condensate (from the CHP engines, boiler plant and biogas lines) - condensate pots are strategically placed in the biogas pipework systems to collect water that condenses from the biogas. The condensate comprises water with trace components of acid gases. Condensate is automatically discharged from the collection pots to the site's surface water drainage system for return to the WwTW inlet for treatment.
- Boiler blowdown - the steam boilers periodically releases blowdown water into the surface water drainage system for return to the WwTW. Boiler blowdown is discharged directly into a surface

water drain outside the boiler house. Boiler blowdown will contain dissolved solids and may contain traces of the boiler treatment chemicals used to correct the hardness and pH of the water.

- Centrate (from the centrifuges) - centrate is an organic nutrient-rich watery effluent. The centrate contains elevated levels of ammonia, nitrogen and phosphorus, and is typically characterised by a BOD up to approximately 560mg/l. Centrate is bled from the centrate tank to the humus return well. It is then pumped back from the humus well to the head of the works for full biological treatment by level control in dedicated pipework.
- Filtrate (from the GBT's and drum thickeners) - filtrate is an organic nutrient-rich watery effluent. The filtrate contains elevated levels of ammonia, nitrogen and phosphorus, and is typically characterised by a BOD up to approximately 4,033mg/l (from GBTs). The filtrate is discharged into the supernatant well and pumped to the head of the works for full biological treatment.
- Cake storage bay (contingency only) - digested sludge is stored in a concrete surfaced cake bay. Although the sludge is up to 30% dry solids content, there is still some leachate produced during storage which drains to a surface water catchment drain for return to the head of the works for biological treatment. The leachate will be nutrient rich containing elevated levels of ammonia, nitrogen and phosphorus.
- Surface water drainage – surface water run off should be clean and uncontaminated but carries a risk of contamination arising from any spillages of sludge. All surface water drainage is returned to the head of the WwTW for biological treatment (either discharged via the GBT liquor well or via the Humus return well) as part of the site's containment strategy.

On reinstatement of the odour control unit biofilter systems, water or final effluent may be required to irrigate the biological filter beds. For these systems it is anticipated that a small quantity of wastewater will be routinely generated that would be discharged to drain for return to the head of the WwTW. However, recirculatory systems and containment options will be considered as part of the refurbishment programme.

Waste gas streams at the site consist of:

- Biogas combustion exhaust (from the CHP engine stacks and flare) - biogas flow and quality (methane, oxygen and hydrogen sulphide) from the digesters is continuously monitored and displayed on the site SCADA system/ engine HMI.
- Combustion exhaust (from the boilers) - the boilers are fuelled by biogas and as such the emissions will principally comprise methane, carbon monoxide and oxides of nitrogen. The boilers can run on fuel oil but biogas is the primary fuel.
- Biogas releases from PVRVs (digester and gas holder) - the PVRVs are safety devices and as such only operate when the pressure set points are triggered, as described in Section 6.11. Biogas composition is monitored continuously for methane and hydrogen sulphide.
- Treated foul air (from the odour abatement plant) – hydrogen sulphide and ammonia readings will be used to characterise emissions from the OCU's (once operational).

***Table 6.16.1: Inventory of Wastewater and Waste Gas Streams***

| Nature | Source | Typical Composition | Variability | Control Measures |
|---|---|---|---|---|
| **Gaseous Streams** | | | | |
| Biogas combustion | CHP engine stacks (A1 & A2) | Combustion products:<br>$NO_2$ – 463mg/$m^3$<br>CO – 891mg/$m^3$<br>Total VOCs – 670mg/$m^3$<br>$SO_2$ – 2.2mg/$m^3$<br><br>All concentrations are results from 2020 monitoring | *$NO_2$ 463-500mg/$m^3$<br>*CO 891-1,400mg/$m^3$<br>*Total VOCs 670 - 1,000mg/$m^3$<br>**$SO_2$ 2.2-130mg/$m^3$<br>*Range is the measured concentration to the permit emission limit<br>**Range is the measured concentration to the ELV in 'Guidance for monitoring landfill gas engine emissions' (EA, 2010) | Annual emissions monitoring.<br>CHP maintenance in accordance with engine manufacturers recommended frequency.<br>Biogas is passed through a carbon filter unit to remove siloxanes and other VOCs prior to flow to the CHP engine. |
| Biogas combustion | Steam boilers stack (A3) | Combustion products:<br>$NO_2$ – 42.5mg/$m^3$<br>CO – 3.1mg/$m^3$<br>Total VOCs – 7mg/$m^3$<br>$SO_2$ – 4.5mg/$m^3$<br><br>All concentrations are results from 2020 monitoring | *$NO_2$ – 42.5 – 190mg/$m^3$<br>**CO – 3.1 – 150mg/$m^3$<br>Total VOCs – 7mg/$m^3$<br>$SO_2$ – 4.5mg/$m^3$<br><br>*Range is the measured concentration to the MCPD limit for NOx<br>** Range is the measured concentration to the ELV from Process Guidance Note 1/3,'Statutory Guidance for Boilers and Furnaces 20-50MW thermal input' | Annual emissions monitoring.<br>Boiler maintenance in accordance with engine manufacturers recommended frequency. |
| Biogas combustion | Flare stack (A4) | Combustion products: $NO_x$, CO, VOCs<br><br>Emissions not tested | *$NO_x$ <150mg/$m^3$<br>*CO <50mg/$m^3$<br>*Total VOCs <10mg/$m^3$<br><br>* ELVs from 'Guidance for monitoring enclosed landfill gas flares' LFTGN05 v2 2010 | Running time monitored and does not exceed more than 10% of operational hours.<br>Inspected annually, including mechanical and safety systems. |
| Biogas | Digester PVRVs (A5, A6 and A7) | Methane 60 – 70%<br>Hydrogen sulphide – 50ppm | $CH_4$ - 60–70%<br>*$H_2S$ – 50 - <100ppm | Inspected and calibrated on a periodic basis to ensure they are operating at the correct set points. |

| Nature | Source | Typical Composition | Variability | Control Measures |
|---|---|---|---|---|
| | | | *Range is the average measured concentration to the permit limit | Gas quality ($CH_4$), hydrogen sulphide ($H_2S$) and flow rate are continuously monitored and displayed on the SCADA system.<br>DSEAR zoning. |
| Biogas | Gas Holder PVRV (A8) | Methane 60 – 70%<br>Hydrogen sulphide – 50ppm | $CH_4$ - 60–70%<br>*$H_2S$ – 50- <100ppm<br><br>*Range is the average measured concentration to the permit limit | Inspected and calibrated on a periodic basis to ensure it is operating at the correct set points.<br>Gas quality ($CH_4$) and flow rate are continuously monitored and displayed on the SCADA system.<br>DSEAR zoning. |
| Foul air | Biological filter bed (woodchip) and activated carbon bed OCU serving the raw sludge holding tanks (A9) | $H_2S$, $NH_4$, VOCs<br><br>No testing available | Not known | The OCU is not currently operational.<br>Maintain the process within the defined operating conditions for the plant and minimise the potential for odorous emissions.<br>Daily odour tours are conducted by site staff. |
| Foul air | Biological filter (woodchip) and two activated carbon bed OCU serving the GBT building, imported sludge tanks, thickened sludge tanks and post digestion tank, co-settled sludge well and filtrate well (A10) | $H_2S$, $NH_4$, VOCs<br><br>No testing available | Not known | The OCU is not currently operational.<br>Daily odour tours are conducted by site staff.<br>Maintain the process within the defined operating conditions for the plant and minimise the potential for odorous emissions. |
| Foul air | Woodchip biological filter bed OCU serving the Thermophilic Aerobic Digestion (TAD) vessels (A11) | $H_2S$, $NH_4$, VOCs<br><br>No testing available | Not known | The OCU is not currently operational.<br>Daily odour tours are conducted by site staff.<br>Maintain the process within the defined operating conditions for |

| Nature | Source | Typical Composition | Variability | Control Measures |
|---|---|---|---|---|
| | | | | the plant and minimise the potential for odorous emissions. |
| Foul air | Single bed activated carbon OCU serving the centrifuge building, centrate buffer tank and centrate tank (A12) | $H_2S$, $NH_4$, VOCs<br><br>No testing available | Not known | The OCU is not currently operational.<br>Daily odour tours are conducted by site staff.<br>Maintain the process within the defined operating conditions for the plant and minimise the potential for odorous emissions. |
| **Liquid Streams** | | | | |
| Gas condensate | Condensate knock out pots on the biogas lines (PDS1 and PDS2) | Mildly acidic, organic content<br><br>No testing available | Not known | None required – process controls in place for biogas quality |
| Blowdown water | Steam boilers | Mildly alkaline<br><br>No testing available | Not known | Regular testing of conductivity and Total Dissolved Solids from the feed water. |
| Wastewater | Odour control unit biological scrubbers | Mildly acidic<br><br>COD, BOD, $NH_3$<br><br>No testing available | The scrubbers are not currently operating and hence not discharging. | Following recommissioning of the OCUs the discharge of small quantities of wastewater to the site drainage system for return to the head of the WwTW may be required – to be agreed with the EA once the final solution has been determined |
| Centrate | Digested sludge centrifuges | Ammonia as N – 668mg/l<br>BOD – 154mg/l<br>Suspended Solids – 295mg/l | Ammonia as N – 50 – 1,030mg/l<br>BOD – 62 – 560mg/l<br>Suspended Solids – 76 – 4,740mg/l | Centrate is returned to the WwTW at a controlled rate (maximum rate of 100l/s). The centrate is sampled and tested on a weekly basis for BOD, ammonia and suspended solids. The main parameter that requires control is the loading of ammonia to the works. |

| Nature | Source | Typical Composition | Variability | Control Measures |
|---|---|---|---|---|
| Filtrate | Screened sludge gravity belt thickeners (GBTs) | Ammonia as N – 86mg/l<br>BOD – 1,445mg/l<br>Suspended Solids – 1,030mg/l | Ammonia as N – 10 – 153mg/l<br>BOD – 246 – 4,033mg/l<br>Suspended Solids – 87 – 2,870mg/l | Filtrate (inclusive of leachate SW) is returned to the WwTW at a controlled rate (maximum rate of 65l/s). The filtrate is sampled and tested on a weekly basis for BOD, ammonia and suspended solids. |
| Surface water | Site drainage | COD, BOD, $NH_3$, SS<br><br>No testing available | Not known | Emergency and Spill Response Procedures to control any unplanned discharges to the drainage system. |

Table 6.16.2 summarises the emission points sources to air and water, associated monitoring points and the proposed monitoring schedule.

Monitoring for emissions to air has been assessed in relation to the BAT 8 requirements for biological waste treatment processes and BAT 10 for odour emissions. Combustion emissions from the CHP and boilers have been assessed in relation to the MCPD and specified generator monitoring requirements.

The proposed monitoring for wastewater returns to the WwTW inlet has been reviewed against BAT 6 and BAT 7 requirements. On direction from the EA, monitoring requirements have also been assessed with reference to EA Guidance on discharges to surface waters 'Surface water pollution risk assessment for your environmental permit'; Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk). This guidance requires operators to evaluate and assess any hazardous chemicals and elements to be released into surface water. No monitoring has been undertaken to date to investigate the presence of hazardous substances in the wastewater returns.

As the final effluent from Ellesmere Port WwTW discharges into a non-tidal channel, testing will be undertaken for the hazardous and priority substances listed within the guidance for freshwaters. There are 60 priority hazardous pollutants and 96 specific pollutants listed in the tables contained in the EA Guidance on 'Surface water pollution risk assessment for your environmental permit'. The total number of parameters is 156.

UUW is committed to undertaking full characterisation of the wastewater streams to meet BAT3, however we will assess whether it is possible to screen out any of these parameters based on the character of the wastewater coming into the works and, if so, provide a justification to the EA during the permit determination period for any reduction in the list of parameters to be analysed.

Monitoring for hazardous and priority substances will be undertaken at locations R1 and R2 on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the

EA guidance. Laboratory analysis will be undertaken to MCERTS or UKAS ISO17025 standards for determinands where available. However, it should be noted that only around 10% of the 150 hazardous and priority substances can be analysed in-house at UUWs laboratories and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate/ filtrate matrix and potentially may not be able to analyse at all.

Monitoring for wastewater returns to the WwTW inlet has also been reviewed against BAT 6 and BAT 7 requirements.

BAT 6 specifies that 'for relevant emissions to water, as identified by the inventory of wastewater streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)'.

BAT 7. States:
BAT is to monitor emissions to water with at least the defined frequency, and in accordance with EN standards. The proposed BAT monitoring requirements have been compared with those for biological treatment of waste. The EA has directed that 'treatment of water-based liquid waste' BAT AELs are also appropriate.

Based on the BAT 7 requirements, monitoring for the following parameters is proposed to characterise the wastewater streams, with the exception of biogas condensate and boiler blowdown, at the frequency set out in Table 6.16.2:

- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- BTEX;
- Free cyanide;
- Halogens;
- Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI));
- PFOS; and PFOA.

We propose to carry out the additional characterisation monitoring as an improvement condition. If this approach is acceptable, the monitoring will be carried out over a 12 month period. Following an assessment of these results we will review the suitability of the monitoring schedule and update accordingly. We understand that any amendments will be subject to EA approval and may also require a permit variation application to be submitted.

***Table 6.16.2: Emission Point Sources***

| Source | Emission Point | Current Monitoring | Proposed Monitoring |
|---|---|---|---|
| **Gaseous Streams** | | | |
| Biogas combustion | CHP engine stacks (A1 and A2) | Annually for $NO_2$, CO and VOC's | Annually for $NO_2$, CO, $SO_2$ and total VOC's. |
| Biogas combustion | Boiler stack (A3) | None | Annually for $NO_2$, CO, $SO_2$ and total VOC's. |
| Biogas combustion | Flare stack (A4) | None | None |
| Biogas | Primary Digester PVRVs (A5 to A7) | None | None |
| Biogas | Gas holder PVRV (A8) | None | None |
| Foul air | Sludge treatment facility OCU's (A9 to A12) | None | Monitoring of the stacks will be undertaken on a six monthly basis for hydrogen sulphide and ammonia in line with BAT.<br>Daily odour tours by site staff |
| **Liquid Streams** | | | |
| Condensate pots | PDS1 & PDS2 - Biogas condensate<br>Given that there are 14 separate condensate discharges, as shown in Appendix H, Figure 1, it is proposed that samples will be taken from the condensate return drains shown on Figure 3. These drains are listed as emission points PDS1 and PDS2 in the permit. | None | It is proposed that a sample is obtained from the condensate pots identified and tested for pH and COD on 12 occasions over 12 months to characterise the effluent – very little variability is expected. |
| Filtrate from screened sludge GBTs | R1 – Filtrate discharge point<br>Samples to be taken from the routine sampling point.<br>The point of discharge to the works inlet is shown on Figure 2 in Appendix H. | Weekly testing for: BOD, ammonia and suspended solids. | To characterise the filtrate, monthly testing over a 12 month period for:<br>• Total nitrogen;<br>• COD;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)).<br>The filtrate will also be tested for hazardous and priority |

| Source | Emission Point | Current Monitoring | Proposed Monitoring |
|---|---|---|---|
| | | | substances for discharges to fresh waters; 156 parameters including PFOS monthly over 12 months to further characterise the effluent. |
| Centrate from digested sludge centrifuges | R2 – Centrate discharge point<br>Samples to be taken from the routine sampling point.<br>The point of discharge to the works inlet is shown on Figure 2 in Appendix H. | Weekly testing for: BOD, ammonia and suspended solids. | To characterise the centrate, monthly testing over a 12 month period for:<br>• Total nitrogen;<br>• COD;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)).<br>The centrate will also be tested for hazardous and priority substances for discharges to fresh waters; 156 parameters including PFOS monthly over 12 months to further characterise the effluent. |
| Boiler blowdown | R3 - Steam boilers<br>Samples to be taken at the point of discharge to the drainage system R3, as shown on Figure 2 in Appendix H. | None – feedwater only | It is proposed that a sample is obtained from the boiler hot well and tested for pH, suspended solids and COD on 12 occasions over 12 months to characterise the effluent – very little variability is expected. |
| Site drainage | R4 - GBT liquor well and surface water<br>Samples to be taken at the position shown on Figure 2 in Appendix H. | None | A representative 'surface water only' sampling point has not been identified - some surface water is discharged to the GBT liquor well for return to the inlet and some returns via the Humus return well. Both the Humus well and GBT well are proposed as additional sampling points (R4 and R6).<br>To characterise the wastewater, monthly testing over a 12 month period at R4 for: |

| Source | Emission Point | Current Monitoring | Proposed Monitoring |
|---|---|---|---|
| | | | • pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). |
| Run-off from open cake storage bay (contingency use) | R5 – Contingency Cake Storage Pad<br>Run-off directed to surface water drainage for return to the head of works for treatment.<br>Samples to be taken at the position shown on Figure 2 in Appendix H. | Not known | Subject to flow conditions, it is proposed to characterise the wastewater by monthly testing over a 12 month period at R5 for:<br>• pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). |
| Site drainage | R6 – Humus return well (including centrate, cake bay run off and surface water)<br>A representative 'surface water only' sampling point has not been identified - some surface water is discharged to the GBT liquor well for return to the inlet and some returns via the Humus return well. Both the Humus well and GBT well are proposed as additional sampling points (R4 and R6).<br>Samples to be taken at the position shown on Figure 2 in Appendix H. | None | To characterise the wastewater, monthly testing over a 12 month period at R6 for:<br>• pH;<br>• Total nitrogen;<br>• COD;<br>• Ammonia;<br>• Total phosphorous;<br>• Suspended solids;<br>• Hydrocarbon oil index;<br>• BTEX;<br>• Free cyanide;<br>• Halogens;<br>• Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)). |

Monitoring will be carried out in accordance with established process monitoring procedures using appropriate equipment, which will be calibrated to manufacturer's instructions where required. All samples will be collected and stored in an appropriate manner by suitably qualified personnel, with analysis carried out in line with BAT 3, as appropriate. All liquid stream analysis is undertaken at UU Scientific Services Lingley Mere Laboratory, which is a United Kingdom Accreditation Services (UKAS) laboratory accredited to ISO/IEC 17025:2017. Wherever possible sampling and analysis is accredited to MCERTS by UKAS (confirmed by the laboratory for BOD, Suspended Solids, COD, Total nitrogen and Total phosphorous, with Ammonia as N accredited by flexible scope to MCERTS).

Where monitoring and/or sampling is undertaken by third party (e.g. gas emissions monitoring from the gas engines) this would be undertaken to similar standards. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory. Suitable measurement ports will be provided to allow access and monitoring of the OCU stacks.

# 7. Odour Control System

## 7.1. Odour Monitoring and Management

An Odour Management Plan (OMP) is established for Ellesmere Port WwTW and subject to regular review. The objective of the OMP is to provide guidance to all Operations and Maintenance staff regarding practices that will minimise the risk of odour emissions being discharged from the Ellesmere Port site. A copy of the OMP is included with this application.

Ellesmere Port WwTW is located to the south of Ellesmere Port town, close to the Cheshire Oaks retail and leisure developments. Stanlow Oil Refinery is located to the north east of the site. There is predominately farmland to the east, south and west of the site.

There are four existing odour control units (OCU) serving the sludge treatment facility[11], namely:

- A biological filter bed (woodchip) and single activated carbon unit serving the four raw sludge tanks (emission point A9);
- A biological filter bed (woodchip) and two activated carbon units serving the GBT building, imported sludge tanks, thickened sludge tanks, post digestion tank, the co-settled sludge well and the filtrate well (emission point A10);
- A woodchip biological filter bed serving the three TAD vessels (emission point A11); and
- A single activated carbon unit serving the digested sludge buffer tank, centrifuge building (containing cake skips and conveyors), centrate buffer tank and centrate tank (emission point A12).

These four odour control units are not currently operational. It should be noted that the TAD process is not currently operational and thus there is no flow to this unit.

The odour control technologies were designed in accordance with UUW's Asset Standard for Odour Control and Removal[12]. A combination of biofilter and activated carbon technologies were chosen for this facility. All of the OCU systems at Ellesmere Port use a combination of technologies; bio-filtration followed by adsorption, with one exception (A12), where the envisaged contaminant load does not warrant pre-treatment and activated carbon/dry scrubbing is sufficient on its own.

The design operating parameters and odour removal efficiencies for the OCUs at Ellesmere Port are detailed in the OMP. The design operating parameters for air flow rate and odour emission concentration were used to conduct odour dispersion modelling using ADMS 5.2.4 software to quantify the odour impacts at relevant sensitive receptor locations, surrounding the site[13] (included with this application as Attachment 8). The dispersion model included the site layout buildings and infrastructure (as appropriate).

For the modelling exercise, emissions of odour from the on-site OCUs were assessed against an odour benchmark level of 1.5 ouE/$m^3$ at nearby sensitive receptors, which is the H4 odour benchmark for the most offensive odours and the UU Odour Control and Removal Asset Standard (for high sensitivity receptors).

[11] These are currently not operational. A programme of works to reinstate the four existing OCUs has been identified and is detailed in the Ellesmere Port Improvement Programme.
[12] Odour Control and Removal Asset Standard, Document Reference 33412
[13] Odour Impact Assessment, UUW Ellesmere Port, Jacobs, September 2022

The results indicate that the maximum predicted 1-hour mean (98th percentile) odour concentration at the assessed sensitive receptors is less than 0.6 ouE/$m^3$, which is well below the 1.5 ouE/$m^3$ benchmark.

***Table 7.1.1: OCU operating parameters and emission rates***

| Emission Point | Source | Stack height (m) | Stack diameter (m) | Efflux velocity (m/s) | Design air flow rate ($m^3$/s) | Temp (K) | Design odour conc. ($ou_e/m^3$) | Design odour release rate ($ou_e$/s) |
|---|---|---|---|---|---|---|---|---|
| A9 | Raw sludge tanks | 2.99 | 0.33 | 15.5 | 1.326 | Ambient | 1,000 | 1,347.22 |
| A10 | GBTs, sludge tanks & wells | 3.54 | 0.53 | 15.0 | 3.309 | Ambient | 1,000 | 3,305.55 |
| A11 | TAD vessels | 3.60 | 0.50 | 5.0 | 0.994 | Ambient | 10,000 | 9,944.44 |
| A12 | Centrifuge building & centrate tanks | 4.00 | 0.48 | 15.0 | 2.714 | Ambient | 1,000 | 2,694.44 |

The odour dispersion modelling demonstrates that the design operation of the OCUs at the site is compliant with H4 standards and with the UUW Odour Control and Removal Asset Standard.

The design of the odour control technologies is considered to comply with BAT for the treatment process.

Engineering studies are being undertaken to allow a programme of refurbishment of the existing OCUs to be costed and funding secured for implementation of the works. The proposed timescale for reinstatement of the OCUs is detailed in the Ellesmere Port BAT Improvement Programme document and is to be agreed with the Environment Agency. It should be noted that despite the OCUs not currently being operational, the site is not receiving odour complaints and there are no on-going odour issues.

Until such time that the OCUs are operating, olfactory monitoring ('sniff' testing) will be undertaken on a weekly basis at the boundary of the sludge treatment facility. Sniff testing will be undertaken in accordance with the guidance contained in H4. In addition, a Jerome hydrogen sulphide monitor will be utilised as hydrogen sulphide is typically the dominant compound of interest. This is detailed in the OMP.

Following recommissioning, odour monitoring will be undertaken from all OCU stacks for the following:

- Hydrogen sulphide once every six months; and
- Ammonia once every six months

Total volatile organic compounds (TVOC) and HCL will monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCL may be added to the bi-annual monitoring schedule. In addition, each stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved.

Suitable measurement ports will be provided to allow access and monitoring of the OCU stacks. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory.

## 8. Application Form F1 Charges

The application charges consist of:

- Application to add a listed activity - Charge A 1.16.2.1 Non-hazardous waste installation - biological treatment for recovery;
- Habitats Assessment - Charge B 1.19.2; and
- Odour Management Plan - Charge B 1.19.6

The total application fee is therefore £16,009.

# 9. BAT Assessment

## 9.1. Assessment Against BAT

As this is a waste treatment operation, an assessment of best available techniques (BAT) has been made for the installation against the BAT Conclusions for Waste Treatment provided within Commission Implementing Decision 2018/1147, published on 17 August 2018. The assessment against BAT is presented in Table 9.1.1 below.

An Environmental Risk Assessment for the installation is contained in Section 10 of this document.

***Table 9.1.1: Assessment against BAT conclusions for waste treatment***

| **BAT conclusions for waste treatment reference:** | | **Treatment of Best Available Technique (BAT)** |
|---|---|---|
| BAT 1. | Overall environmental performance | *In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS).*<br>UUW operates the site under a fully certified ISO14001 management system. A copy of the ISO14001 certificate is provided in Appendix I and a management systems summary is provided in Appendix B. A residue management plan is included with this application (see Attachment 1). |
| BAT 2. | Waste acceptance techniques | BAT is to use all of the techniques given below.<br>• *Set up and implement waste characterisation and pre-acceptance procedures* - the waste received is produced and treated by the same operator (UUW) (it is either indigenous sludges produced by Ellesmere Port WwTW or sludges from other similar WwTW works) and the waste type is well known and controlled. Therefore the applicability of pre-acceptance and acceptance procedures are considered to be very low risk in terms of process safety, occupational safety and environmental impacts. Ellesmere Port's Waste Characterisation and Acceptance Procedure SSI (see Attachment 6) details that each incoming waste stream will be subject to pre-acceptance checks and records will be retained in electronic format for a minimum of 3 years. Only waste codes EWC 19 08 05 (urban wastewater sludges) and 19 02 06 (sludge from physico/chemical treatment, sewage sludge only) are accepted at the facility. It is proposed that for contingency purposes digestate may be accepted from other UUW sludge treatment works under EWC 19 06 06.<br>• *Set up and implement waste acceptance procedures* – as above; indigenous sludge is delivered directly to the installation via an underground pipe from the primary settlement tanks to storage tanks. Imported sludge from other WwTW sites arrives at the site via road tanker and is pumped from the tanker off-loading points into sludge tanks.<br>• *Set up and implement a waste tracking system and inventory* - refer to BAT 5 for imported sludge. United Utilities Bioresources monitors |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | and tracks all movements of UUW sludges between wastewater treatment works. Movement of sewage sludge is planned and managed via PODFather.<br>• *Set up and implement an output quality management system* - treated sludge in the form of digestate cake is recovered to land for agricultural benefit in accordance with The Sludge (Use in Agriculture) Regulations 1988.<br>• *Ensure waste segregation* – not applicable for incoming waste, only sewage sludge is treated at the installation. Digestate cake (output) found to be non-compliant with the required standards (The Sludge (Use in Agriculture) Regulations 1988) will be sent to a regulated waste transfer station (e.g. Halewood). Non-compliant cake will not be stored at site therefore site-based segregation measures are not required. In this situation, waste imports would be suspended until digestate cake production is back in compliance.<br>• *Ensure waste compatibility prior to mixing or blending of waste* - not applicable, only sewage sludge is treated at the installation.<br>• *Sort incoming solid waste* – not applicable. |
| BAT 3. | Inventory of waste water and waste gas streams | *In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of wastewater and waste gas streams, as part of the EMS.*<br>Please see Section 6.16 for an inventory of wastewater and waste gas emission streams for the installation. The location of all the emission points are shown on the figures included in Appendix H.<br>Routine operation checks and maintenance are undertaken on all relevant assets. The sites discharge consent limits are being met.<br>Sampling and analysis will be carried out in line with BAT 3, as appropriate. Sampling and analysis will be undertaken to MCERTs or evidence of equivalent standards. |
| BAT 4. | Storage of waste | *In order to reduce the environmental risk associated with the storage of waste, BAT is to use techniques to optimise storage locations, provide adequate storage capacity and safely store wastes.*<br>The maximum storage capacity of the tanks is adequate for the process flow and the quantity of waste in the tanks is monitored by level probes connected to PLCs and displayed on the SCADA. The optimum residence time of the digesters is 19 - 21 days and is controlled by the feed rate. The TADs operate on a batch process.<br>All sludge treatment tanks and pipework are enclosed. The only open storage of waste is contingency storage of digestate cake and the screenings skip. The contingency storage area for digested cake is emptied each week and the sludge screen skip is emptied regularly. A Pest Control contractor provides pest control services for the site. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| BAT 5. | Handling and transfer of waste | *In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.*<br>Indigenous sludge is pumped from a wet well to one of two unthickened raw sludge tanks. Imported sludge from other similar WwTW sites arrives at the site via tanker.<br>United Utilities Bioresources is responsible for the movement of all UUW sludges produced. The "PODFather" system is used to plan and manage the movement of UU tankers transporting UUW sludges between wastewater treatment works. POD stands for "Proof of Delivery". The system records all sludge movements, detailing the site it has come from, the volume, the quality (dry solids content) and date and time delivered. These records are all kept electronically and used in the quarterly submissions to the EA as well as the annual reporting to OFWAT.<br>Digestate is removed off site in transport containers for agricultural land spreading. The movement of digestate cake is coordinated regionally. A list of potential outlets is maintained and includes suitably regulated storage, enhanced treatment (e.g. lime treatment to increase the scope of onward recovery options); recovery (deposit) and, as a contingency only, disposal facilities (e.g. permitted landfill restoration sites). The availability of potential outlets is constantly reviewed in line with legislative developments and local market changes (e.g. closure of an outlet site). |
| BAT 6. | Emissions to water | There are no direct emissions to water from the sludge treatment activities. The wastewater streams are returned to the head of the works for full treatment, before being discharged (indirectly) via the WwTW final effluent discharge into Thornton Brook or the River Gowy following biological treatment through the WwTW. There is monitoring of these returned wastewater streams for key process parameters, and it should be noted that the WwTW site undertakes regular routine monitoring of final effluent quality and is meeting the discharge consent limits to Thornton Brook (NGR SJ 43200 74650) and the River Gowy (NGR SJ 43120 74560). Monitoring of wastewater streams is proposed as detailed in BAT 7 below and Section 6.16 of this document. |
| BAT 7. | Emissions to water | Additional monitoring is proposed to meet BAT 7 in order to characterise the wastewater streams from the sludge treatment process returned to the wastewater treatment plant. Please refer to Table 4.6.1 (Emissions Monitoring), Table 6.16.2 (Emission Point Sources) and Section 6.16 of this document. |
| BAT 8. | Emissions to air | *BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards:*<br>• *$H_2S$ – once every six months*<br>• *$NH_3$ - once every six months* |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | • *Odour concentration – once every six months (monitoring of $NH_3$ and $H_2S$ can be used as an alternative to monitoring odour concentration)*<br><br>The channelled emissions to air i.e. point source emissions are shown on the Site Layout Plan in Appendix D.<br><br>The only channelled emissions to air from the treatment process, relevant to this BAT requirement, are from the odour control unit (OCU) stacks and the pressure vacuum relief valves (PVRVs). The PVRVs operate on a Duty/Stand-by configuration to protect against over/under pressurisation of the vessel. The PVRVs are maintained, monitored, inspected and calibrated on a periodic basis to reduce emissions (see Section 6 for further information). There is no requirement to monitor emissions from the PVRVs as they are a safety critical system that do not operate routinely and, when they do operate, are only open for a very limited period of time.<br><br>The OCUs serving the sludge treatment and storage areas are not currently operational, but an improvement programme to reinstate these has been identified and is detailed in Ellesmere Port BAT Improvement Programme document. When the OCUs are operational they treat the air by adsorption using carbon filter media (plus pre-treatment with biological filters or pumice stone media). There is currently no monitoring data for the emissions from the OCUs. To meet this BAT requirement, monitoring of the OCUs for hydrogen sulphide and ammonia, once every six months, will be introduced.<br><br>Total volatile organic compounds (TVOC) and HCL will monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCL may be added to the bi-annual monitoring schedule. In addition, each stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved.<br><br>Suitable measurement ports will be provided to allow access and monitoring of the OCU stacks. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory.<br><br>The potential for dust emissions is very low as it is a wet treatment process. |
| BAT 9. | Emissions to air | N/A there are no treatment processes involving solvents |
| BAT 10. | Odour emissions | *BAT is to periodically monitor odour emissions. However, applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.*<br><br>Odour emissions will be monitored in accordance with BAT 8 and the updated OMP, a copy of which is attached to this application. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| BAT 11. | Monitor consumption of water, energy and raw materials | *BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and wastewater, with a frequency of at least once per year.*<br>Current energy reporting requirements under the permit are for the following parameters:<br>• heat generated - kWth<br>• power generated - kWe<br>• engine efficiency - KWth input / kWth (equivalent) output<br>• boiler efficiency - KWth input / kWth (equivalent) output<br>Energy consumption for the WwTW as a whole is monitored and tracked via the site environmental dashboard.<br>Potable water consumption for the sludge treatment process is not recorded separately but is only used for polyelectrolyte make up. The volume of water consumed will recorded based on the use of polyelectrolyte. Final effluent is used for cleaning the GBTs.<br>Raw material use is measured in accordance with Table 4.5.1 to this document and is recorded annually.<br>As part of the permit requirements, UUW will report annual energy consumption and raw material usage to the EA and will conduct periodic reviews to consider where future energy and raw material savings can be delivered.<br>The tonnage of waste screenings is recorded on a monthly basis. |
| BAT 12. | Odour Management Plan | *In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the EMS. The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.*<br>The WwTW Odour Management Plan is attached to the application (see Attachment 5) and is updated regularly. See also Section 7, and 10.1. |
| BAT 13. | Odour Management | *In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of these techniques:*<br>• *Minimising residence times of (potentially) odorous waste in storage or in open handling systems* – all of the process tanks at the facility are covered and equipment such as GBTs are enclosed. There are no open systems within the sludge treatment installation.<br>• *Using chemicals to destroy or to reduce the formation of odorous compounds* – this has not been necessary.<br>• *Optimising aerobic treatment* – not applicable. |
| BAT 14. | Diffuse air emissions | *In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the following techniques:*<br>• *minimising the number of potential diffuse emission sources* |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | • *selection and use of high-integrity equipment*<br>• *corrosion prevention*<br>• *containment, collection and treatment of diffuse emissions*<br>• *dampening in dusty areas*<br>• *maintenance*<br>• *cleaning of waste treatment and storage areas*<br>• *leak detection and repair (LDAR) programme*<br>The potential for dust emissions is very low as it is a wet treatment process.<br>Digested sludge is dewatered using three centrifuges housed within a building. The sludge cake produced falls into transport trailers located on the ground floor level of the building, where it is stored prior to collection and removal from site for agricultural land spreading. Contingency storage for cake is available at an external storage area. Due to the size of the cake pad and the need for continuous operation of sludge production, a maximum of five loads can be stored before being removed. The usual turnaround time for this is five days. However, notwithstanding this the bay is emptied each week.<br>Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves (PVRVs) on gassing tanks or leaks in gas pipework e.g. around flanges. There are a number of PVRVs on the process tanks. The PVRV's are maintained, monitored, inspected and calibrated on a periodic basis to reduce fugitive emissions. Leak detection for biogas is not currently undertaken unless a fault is suspected. However, an LDAR Site Specific Instruction (SSI) has been developed for the site and is included with this application (see Attachment 7). Assets (such as the digesters, gas holder, PVRV's, CHP engines, boilers and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on a 6-monthly basis.<br>Fugitive odour emissions may arise during normal operations, this is to be mitigated by directing the air flow through OCUs, which are in the process of being reinstated as per the Ellesmere Port BAT Improvement Programme document.<br>Any leaks or spills of sludge that may be a source of odour emissions are cleaned up promptly as part of the spill response procedure.<br>Refer to the fugitive emissions risk assessment in Section 10.2 for further information. |
| BAT 15. | Flaring | *BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using the correct plant design and by plant management.*<br>The facility has a gas holder that can hold 1,780m$^3$ of gas in the event that the CHP engines are down or excess gas is being produced. The flare is only used for safety reasons or during periods of planned maintenance if the storage capacity is exceeded. The plant is designed to maximise biogas combustion in the CHP engines and boilers. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| BAT 16. | Flaring | *In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the correct design of flaring devices and monitoring and recording.*<br>Operation of the flare is detailed in the existing permit. A modern enclosed flare is used that meets the standards required by LFTGN05. The flare is monitored in accordance with the requirements of LFTGN05.<br>The flare was designed, constructed and installed by a specialist contractor in accordance with the UUW asset standard to ensure correct operation over the complete range of ambient conditions that can be experienced at the stack location, including the maximum recorded wind speed and precipitation. All component parts are adequately heat resistant and designed to a modern standard to minimise noise emissions.<br>The operation of the flare and its running time are recorded. The quantity of biogas combusted can be approximated from the running time. |
| BAT 17. | Noise and vibration | *In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the EMS. However, the applicability is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated.*<br>The facility does not currently operate a formal noise and vibration management plan. The permitted activity is not inherently noisy and there is no history of noise complaints at the site; therefore a noise and vibration plan is not required |
| BAT 18. | Noise and vibration | *In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of these techniques; appropriate location of equipment and buildings; operational measures, low-noise equipment, noise and vibration control equipment, noise attenuation.*<br>The permitted activity is not inherently noisy, although the centrifuges and CHP Plant can be sources of localised noise. In mitigation, the CHP engines are housed in ISO containers which are clad to reduce noise and the centrifuges are also contained within a building. |
| BAT 19. | Emissions to water | *In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.*<br>• *Water management* – potable water is only used for mixing with polyelectrolyte. Where water is required for dilution, final effluent is used instead of potable water. The opportunity to use final effluent instead of potable water for polyelectrolyte dilution has been considered but it cannot meet the required quality standards. Final effluent is used where it can, such as for washing down the GBTs and for cleaning other assets, where appropriate. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | • *Water recirculation* – all wastewater streams are recirculated back to the head of the works for full biological treatment (see BAT 20).<br>• *Impermeable surface* - the majority of the installation area is hard surfaced so that it is impermeable. However, there are some gravelled areas which are vulnerable to leaks and spillages. Hydraulic spill modelling has been undertaken and identifies permeable areas at risk from potential catastrophic tank failure. Findings of the modelling/assessment, include improvements identified to ensure appropriate measures to meet equivalent BAT containment. A copy of the Secondary Containment Modelling Assessment Report is provided with this application (Attachment 3). Areas at risk will be upgraded to the timescales supplied in Ellesmere Port BAT Improvement Programme (Attachment 4).<br>• *Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels* – the sludge treatment process is fully automated and process tanks are fitted with level indicators connected to PLCs that allow tank levels to be monitored on SCADA.<br>• *Roofing of waste storage and treatment areas* – waste treatment takes place in enclosed tanks, vessels and equipment. The only open storage is a contingency storage area for digested cake, which is emptied each week and the sludge screen skip which is emptied regularly.<br>• *Segregation of water streams* – uncontaminated surface water run-off is not segregated, it is returned to the WwTW flow to full biological treatment. This forms part of the containment strategy for the site.<br>• *Adequate drainage infrastructure* – all surface water drains in the waste treatment area discharge back into the works flow.<br>• *Design and maintenance provisions to allow detection and repair of leaks* – regular visual checks of above ground pipework, pumps and tanks is undertaken. Site inspection tours are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Advisor (ERA). These tours include tank level monitoring, visual inspection of asset integrity, where possible, and general ground conditions. If any evidence of leaks or ground contamination is seen further investigations or remedial actions will be instigated immediately.<br>There is currently no secondary containment for below ground tanks and pipework. A programme of improvements to allow detection of leaks from below ground assets has been proposed and is included with this application in the Ellesmere Port BAT Site Improvement Programme document (Attachment 4). This will be supported by process control monitoring which will also be used to assess tank and pipework integrity, e.g. comparison of flow meters throughout the system to identify any losses. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | • *Appropriate buffer storage capacity* – there is adequate buffer storage capacity for the sludge treatment process. There are four mixing/ balancing tanks that receive sludge from the WwTW and tanker imports and three interconnected thickened sludge storage tanks. A digested sludge overflow tank provides contingency storage for digested sludge. |
| BAT 20. | Treatment of waste water | *In order to reduce emissions to water, BAT is to treat wastewater using an appropriate combination of the techniques stated.*<br>The principle wastewater stream generated is liquor from the gravity belt thickeners and centrifuges. The liquor is discharged into a holding tank prior to being pumped into the WwTW flow to full biological treatment. All wastewater emissions are returned to the head of Ellesmere Port WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits. The treatment processes undertaken at Ellesmere Port works are summarised below:<br>• Primary treatment – includes screens, detritor and primary settlement tanks;<br>• Secondary treatment –includes aeration/activated sludge lanes/process, settlement tanks and scrapers; and<br>• Tertiary treatment – includes nitrifying filters and humus tanks for ammonia removal.<br>The only other wastewater generated routinely is from cleaning activities. This is also returned to the WwTW for biological treatment via the site drainage system. This is a circular process and is considered to represent BAT. |
| BAT 21. | Accidents and incidents | *In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan.*<br>A summary of accident risks is presented in Section 10.4 of this document. There is a site-specific Accident Management Plan for the WwTW, including the sludge treatment processes. A copy of the Accident Management Plan is included with this application, along with the relevant Standard Operation Procedures (SOP) as Attachment 9. These live documents form part of the site's Environmental Management System, which is regularly reviewed and updated.<br>Lightning protection is not currently provided on the site assets. However, lightning protection measures are to be installed imminently on the MAD tanks and Gas Holder.<br>Any operational problem that cannot be dealt with by normal operational procedures is classed as an Incident and the UU Incident Management Procedure and associated Standard Operating Procedure (WP/S/001/30/01 Incident Response) followed. All actions and communications are recorded using form WwP/F/001/31/08 Site Diary Log. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | There is also an Emergency Procedure specifically detailing the procedure to be followed in the event of an emergency situation associated with the digester or biogas assets (boiler, flare stacks or CHP units). |
| BAT 22. | Material efficiency | *In order to use materials efficiently, BAT is to substitute materials with waste.*<br>The only materials used in the treatment process are potable water, polyelectrolyte and antifoaming agents. Where water is required for cleaning, final effluent is used instead of potable water. Potable water is required for polyelectrolyte dilution as final effluent cannot meet the required quality. The polyelectrolyte and other antifoaming agents cannot be substituted for any waste materials. |
| BAT 23. | Energy efficiency | *In order to use energy efficiently, BAT is to maintain an energy efficiency plan and an energy balance record.*<br>The treatment process is inherently sustainable, in that biogas is used to generate renewable electricity which is used to power the process. Energy efficiency is considered when sourcing new plant and equipment.<br>As part of the permit requirements, UUW will report annual energy consumption to the EA and will conduct periodic reviews to consider where future energy savings can be delivered. |
| BAT 24. | Re-use of packaging | *In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan.*<br>Very little packaging waste is generated at the installation. Spent polyelectrolyte bags are disposed of as general waste in the WwTW skips. |
| BAT 25 – BAT 32. | Mechanical treatment of waste | N/A |
| BAT 33. | Biological treatment | *In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input. The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment.*<br>N/A as only indigenous sludge from the Ellesmere Port WwTW and other imported WwTW sludges will be accepted. |
| BAT 34. | Biological treatment, emissions to air | *In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including $H_2S$ and $NH_3$, BAT is to use one or a combination of these techniques; adsorption, biofilter, wet scrubbing.*<br>Once the OCUs are reinstated they will treat odours from the raw sludge tanks, GBT building, thickened sludge tanks, post digestion tank, digested sludge buffer tank, TAD vessels, centrifuge building, centrate buffer tank and centrate tank.<br>A combination of biofilter and activated carbon technologies were chosen for this facility. All of the OCU systems at Ellesmere Port use a combination of technologies; bio-filtration followed by adsorption, with one exception |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| | | (A12), where the envisaged contaminant load does not warrant pre-treatment and activated carbon/dry scrubbing is sufficient on its own. The installation of these techniques complies with BAT. |
| BAT 35. | Biological treatment, water usage | *In order to reduce the generation of wastewater and to reduce water usage, BAT is to recirculate water.*<br>See BAT 20. |
| BAT 36 & 37. | Biological treatment | Not applicable – relates to composting |
| BAT 38. | Anaerobic treatment of waste, emissions to air | *In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.*<br>Process information on gas levels, tank levels, gas quality and temperature are continuously monitored and displayed on the SCADA panels in the control room. Routine process sampling and testing is undertaken for the FOS/TAC ratio (volatile acid to alkalinity ratio), pH and dry solids.<br>A daily visual tour is also undertaken of the process, including a visual check for foaming in the digesters.<br>See Section 6 of this ASD for key process parameter measurements for the primary digesters. A series of SOPs and SSIs related to the primary digestion are also available, which set out recommended actions based on the results of key parameters.<br>A copy of Ellesmere Port Accident Management Plan is also included with this application (see Attachment 9). |
| BAT 39. | Segregation and recirculation of waste gas | *In order to reduce emissions to air, BAT is to:*<br>• *segregate waste gas streams with a high and low pollutant content* – not applicable. Only one gas stream produced.<br>• *recirculate waste gas with a low pollutant content in the biological process followed by waste gas treatment adapted to the concentration of pollutants* – not applicable. All biogas generated in the process is combusted to generate power and heat to sustain the process. |
| BAT 40. | Physico-chemical treatment, waste input | *In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures.*<br>Not applicable as only indigenous and imported sludges from other WwTW will be accepted. |
| BAT 41. | Physico-chemical treatment, emissions to air | *In order to reduce emissions of dust, organic compounds and $NH_3$ to air is to use one or a combination of adsorption, biofilter, wet scrubbing, fabric filter.*<br>See BAT 34. |
| BAT 42. – BAT 52. | Various | Not applicable – relate to waste oil, solvent waste, contaminated soils, PCB containing equipment and liquid wastes. |

| BAT conclusions for waste treatment reference: | | Treatment of Best Available Technique (BAT) |
|---|---|---|
| BAT 53 | Emissions to air | *In order to reduce emissions of HCl, $NH_3$ and organic compounds to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below.*<br>• *Adsorption*<br>• *Biofilter*<br>• *Thermal oxidation*<br>• *Wet scrubbing*<br>Refer to BAT 14 and BAT 34.<br>Following recommissioning of the OCUs, total volatile organic compounds (TVOC) and HCL will monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCL may be added to the bi-annual monitoring schedule for OCU emissions. |

## 10. Environmental Risk Assessment and Management Plan

### 10.1. Odour Risk Assessment

***Table 10.1.1: Odour Risk Assessment***

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk*** |
| Raw sludge tanks (4) | Local residents (distance from installation boundary) at:<br>Stoke Grange (500m), Church Farm (800m), Hill Farm (900m), Alnwick Drive (1km), Stanney Mill Lane (500m), Cheshire Oaks (1km) | Air | These tanks are covered and connected to an OCU, which will be reinstated by October 2023.<br>The odour control system consists of a biological filter bed (woodchip) and single activated carbon unit (refer to Section 7 and the OMP). | Moderate | Localised odour annoyance | Low - given the distance to the closest residential receptors |
| Sludge screens | | Air | Main sludge screen is enclosed. Screened material is stored in an open skip which is regularly emptied and cleaned. | Low | | Not significant |
| GBT building<br>Digested sludge buffer tank | | Air | These sources are covered and connected to an OCU, which will be reinstated by October 2023.<br>The odour control system consists of a biological filter bed (woodchip) and two activated carbon units. | Moderate | | Low - given the distance to the closest residential receptors |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk*** |
| Thickened sludge tanks | Local residents (distance from installation boundary) at:<br>Stoke Grange (500m), Church Farm (800m), Hill Farm (900m), Alnwick Drive (1km), Stanney Mill Lane (500m), Cheshire Oaks (1km) | Air | These tanks are covered and connected to an OCU, which will be reinstated by October 2023.<br>The odour control system consists of a biological filter bed (woodchip) and two activated carbon units. | Moderate | Localised odour annoyance | Low - given the distance to the closest residential receptors |
| Thermophilic Aerobic Digester (TAD) vessels | | Air | The enclosed TAD process is not currently operational. Refurbishment works for the OCU serving the TAD process (A11) will be assessed in conjunction with reinstatement of the TAD process or replace it with an alternative technology. At this stage, it is considered that a new OCU may be more cost effective than refurbishing the existing unit. The design of the existing refurbished OCU or new OCU will ensure that odour emission limits are met.<br>The odour control system consists of a woodchip biological filter bed. | Moderate | | Low - given the distance to the closest residential receptors |
| Post digestion tank | | Air | This tank is covered and connected to an OCU, which will be reinstated by October 2023.<br>The odour control system consists of a biological filter bed (woodchip) and two activated carbon units. | Moderate | | Low - given the distance to the closest residential receptors |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk*** |
| Digester tank 1-3 | Local residents (distance from installation boundary) at:<br>Stoke Grange (500m), Church Farm (800m), Hill Farm (900m), Alnwick Drive (1km), Stanney Mill Lane (500m), Cheshire Oaks (1km) | Air | Each tank is gas tight with biogas extracted to the gas holder. Pressure vacuum relief valves are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points (refer to Section 6.11). | Very Low | Localised odour annoyance | Not significant |
| Centrifuge building<br>Centrate buffer tank<br>Centrate tank | | Air | Building is enclosed and tanks are covered and connected to an OCU, which will be reinstated by October 2023.<br>The odour control system consists of a single activated carbon unit. | Moderate | | Low - given the distance to the closest residential receptors |
| Contingency digested sludge cake storage pad | | Air | Pad is uncovered, however digested and dewatered sludge has a relatively low odour potential.<br>Due to the size of this pad and the need for continuous operation of sludge production, a maximum of 5 loads can be stored before being removed. The usual turnaround time for this is 5 days. However, notwithstanding this, the bay will be emptied each week. | Very Low | | Not significant |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk*** |
| Leaks/ spills of sludge from process | | Air | Any leaks or spills of sludge that may be a source of odour emissions are cleaned up promptly as part of the spill response procedure. | Low | | Not significant |
| Leaks in gas pipework e.g. around flanges | | Air | A site-specific leak detection and repair plan has been developed for the site and is included with this application. Assets (such as the digesters, gas holder, PVRV's, CHP engines and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on a 6-monthly basis. | Very Low | | Not significant |
| *Once the OCUs are reinstated, the overall risk will reduce to 'Not Significant' for those sources | | | | | | |

## 10.2. Fugitive Emissions Risk Assessment

***Table 10.2.1: Fugitive Emissions Risk Assessment***

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| Dust, mud and litter | The potential for dust emissions is very low as it is a wet treatment process. The site roadways are predominantly hard surfaced; the potential for mud to be generated and tracked onto the highway is therefore very low. The potential for wind-blown litter is also very low; there are only small amounts of packaging and general waste generated which are stored in covered skips.<br>Processed sludge (average dry solids content of 28%) is deposited onto the contingency cake pad, in order for it to be reloaded into vehicles for transportation to land. Due to the size of this pad and the need for continuous operation of sludge production, a maximum of 5 loads can be stored before being removed. The usual turnaround time for this is 5 days. However, notwithstanding this, the bay will be emptied each week. The storage time for the cake is not sufficient to allow drying out to create a dust nuisance. Therefore, active dust suppression measures are not considered necessary. | | | | | |
| Fine particulate and fumes | The potential for particulate emissions is very low as it is a wet treatment process and the main combustion fuel is biogas in the CHP engines. There are no fume emissions from the process. | | | | | |
| Vermin | All treatment tanks and pipework are enclosed. The only open storage of waste is of screenings solids and digestate cake in the contingency bay. The screenings are stored within a skip. A Pest Control contractor provides pest control services for the site. | | | | | |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| Treatment process and plant and connective pipework | Ground, groundwater and surface waters | Seepage into ground/ groundwater<br>Surface water drainage | All assets are located on extensive impermeably surfaced (concrete) apron areas (the majority of the site is so surfaced), with kerbs to provide containment in case of spills with a sealed drainage system. See site surfacing plan in Appendix G.<br>The sealed drainage system directs spillages to the start of the WwTW treatment process.<br>Sludge storage tanks are fitted with level detectors and alarms.<br>The sludge feed, thickened sludge and tanker sludge loading all have flow meters, displayed locally in the sludge handling building (with totalisers) and on SCADA for instantaneous display.<br>All above ground effluent transfer pipelines within the treatment process run over areas of impermeable concrete with a sealed drainage system. Above ground pipework is regularly inspected for any signs of damage and/or leaks and any issues are rectified promptly. Findings of the 2022 spill modelling/assessment, including | Low | Contamination of near surface soils and permeation into any shallow groundwater within the Glacial Till if left unattended<br>Additional loading on WwTW | Not significant |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| | | | improvements identified to ensure appropriate measures to meet equivalent BAT containment are supplied with this application.<br>Pipework installed in accordance with United Utilities asset standards that applied at the time of construction. Existing pipework will be surveyed to ensure fit for purpose.<br>Leak detection improvements for below ground assets are supplied with this application.<br>Environment Management System in place for inspections, management and monitoring. | | | |
| Bioaerosols | Local residents - closest properties are approximately 500m to the south east of the installation boundary. | Air | The only open storage of waste is the contingency storage of wet digestate cake. On-site storage time of the cake is minimised as far as possible. Due to this and the distance to the nearest sensitive receptors no additional risk management measures are required.<br>The water/wastewater industry understands that there is a low level of risk of bioaerosols from this material. | Low | Potential impacts upon human health | Low[1] |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| Leaks in gas pipework e.g. around flanges | Local residents - closest properties are approximately 500m to the south east of the installation boundary. | Air | A site specific leak detection and repair plan has been developed for the site and is included with this application. Assets (such as the digesters, gas holder, PVRV's, CHP engines and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on a 6-monthly basis. | Low | Localised odour annoyance | Not significant |
| Activation of PVRVs on gassing tanks | Local residents - closest properties are approximately 500m to the south east of the installation boundary. | Air | The PVRVs are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points (refer to Section 6.11). | Low | Localised odour annoyance | Not significant |

Note 1: The water/wastewater industry is not aware of any issues with bioaerosols from the storage of wet digestate cake. This is therefore considered to be a conservative risk level.

## 10.3. Noise and Vibration Risk Assessment

***Table 10.3.1: Noise and Vibration Risk Assessment***

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| Treatment process and associated activities | Local residents | Air | Good practice measures for the control of noise, including suitable noise attenuation and management.<br>Adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise.<br>GBT's and centrifuges installed within enclosed building. | Low | Noise disturbance | Not significant |

## 10.4. Accidents

***Table 10.4.1: Accidents***

| What do you do that can harm and what could be harmed | | Managing the Risk | | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk** |
| Failure of any of the transfer pipework on the installation | Ground / Groundwater / surface water | Seepage into ground/ discharge into drains | All transfer pipework is constructed of suitable materials that are resistant to the contents.<br>The use of flexible pipework is minimised and any such pipes are inspected regularly.<br>All tanker delivery drivers are provided with appropriate training which includes the safe use of tanker equipment and safe unloading/loading procedures. Waste is accepted via a fixed offloading point which includes an alarmed, auto-shutoff when the high level is reached.<br>Most assets are located within impermeably surfaced (concrete) apron areas to provide containment in case of spills. The concrete surfaces are connected to the sealed drainage system that directs spillages to on-site off-installation WwTW flow to full treatment.<br>Environment Management System in place for inspections, management and monitoring. | Low to moderate | Minor localised odour<br>Contamination of soils and groundwater<br>Additional loading on WwTW | Not significant |
| | Local residents | Air | | | | |

| What do you do that can harm and what could be harmed | | Managing the Risk | | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk** |
| | | | Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage. Spillage containment is provided as required. Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage. | | | |
| Loss of containment of vessels | Ground / Groundwater / surface water | Ground | Vessels designed to contain intended material and volumes. Any uncontrolled outflows will go to hard surface areas that drain back to the treatment works.<br>Environment Management System in place for inspections, management and monitoring.<br>Containment is provided for oil and chemical storage. Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage.<br>A release of sludge arising from a catastrophic tank failure has been modelled. Findings of the modelling/ assessment, including improvements identified to ensure appropriate measures to meet equivalent BAT containment, are supplied with this application. | Very low | Minor localised odour<br>Contamination of soils and groundwater<br>Additional loading on WwTW | Not significant |
| | Local Residents | Air | | | | |

| What do you do that can harm and what could be harmed | | Managing the Risk | | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk** |
| Polyelectrolyte spillage or leakage of liquid polymer | Ground / Groundwater / surface water | Seepage into ground/ discharge into drains | Polymer make up tanks are within a building and any leakage would be contained on hard surfaces that drain back to the treatment works. Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage. Spillage containment is provided as required. | Very low | Contamination of soils, ground and surface water drains | Not significant |
| Equipment / plant item fire e.g. electric cabling | Ground / Groundwater | Ground | Accident management plan in place and regularly reviewed.<br>A hazardous areas risk classification has been undertaken in accordance with DSEAR. Equipment is adequately rated in accordance with the zoning classification.<br>Gas monitors connected to local and remote alarms. Low-level alarms on gasholders warn of a low gas volume and activate alarms or isolate the digester.<br>Risk is also managed by the removal of ignition sources and a rigorous permit to work system, backed up by appropriate purging and isolation procedures and staff training.<br>Firefighting systems are in place at the site. | Very low | Possible toxic hazard<br>Fire / explosion<br>Potential contamination of soils, ground and surface waters | Not significant |

| What do you do that can harm and what could be harmed | | Managing the Risk | | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of exposure** | **Consequence** | **Overall Risk** |
| | | | Emergency Response procedure | | | |
| Flood | Ground / Groundwater / surface water | Site drainage/ overland flow | Ensure that surface water drains are adequately maintained and periodically cleaned out to maximise throughflow. Monitor bund water levels and pump out rainwater as required to ensure that pipework, valves and pumps do not become submerged. | Low | Permitted waste types are non-hazardous so any waste washed off site will add to the volume of the local post-flood clean-up workload, rather than the hazard. | Not significant |
| Lightning strike | Air / ground/ groundwater/ surface water | Air/ site drainage/ overland flow | Lightning protection to be installed imminently on the MAD tanks and Gas Holder. | Very low | Possible toxic hazard<br>Fire / explosion<br>Potential contamination of soils, ground and surface waters | Low |

## 10.5. Designated/Protected Sites

***Table 10.5.1: Designated/Protected Sites***

The following Table 10.5.1details the location of designated/protected sites within the conservation screening report provided by the Environment Agency dated 28 January 2021.

| Site Type | Site Name | Distance from Installation | At Risk from Activities? |
|---|---|---|---|
| European Habitats Sites | River Dee and Bala Lake (SAC)<br>Mersey Estuary (SPA)<br>Mersey Estuary (Ramsar) | ~7.8km<br>~2.6km<br>~2.6km | No – see Table15 |
| SSSI's | NA | - | - |
| Ramsar | NA | - | - |
| Local Nature Sites | NA | - | - |
| Local Wildlife Sites | Gowy Meadows and Ditches<br>Shropshire Union Canal (main line) | ~1km<br>~2km | As above |
| Ancient Woodland | NA | - | - |
| Protected Species | European Eel migratory route<br>River Lamprey | ~20m | As above |
| Protected Habitats | Coastal and Floodplain Grazing Marsh | ~20m | As above |
| Air Quality Designation | NA | - | - |

***Table 10.5.2: Risk from onsite activities***

Table 10.5.2 assesses the risks from the permitted activity on designated/protected sites identified within the conservation screening report provided by the Environment Agency dated 26 January 2021.

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| Treatment process and associated activities | River Dee and Bala Lake (SAC)<br>Mersey Estuary (SPA)<br>Mersey Estuary (Ramsar)<br>Shropshire Union Canal (main line)<br>European Eel migratory route River Lamprey<br>Coastal and Floodplain Grazing Marsh | Water | The risk of a spill reaching a watercourse is very low due to the topography and design of the site; all surface water drains are directed to the inlet of the wastewater treatment works via a sealed drainage system. | Low | Disturbance to habitats or species | Low |
| Treatment process and associated activities | As above and Gowy Meadows and Ditches | Air | The primary emissions to air from the sludge treatment process are combustion emissions from the CHP engines and boilers. These emissions were previously assessed by the EA during the application for the current combustion plant permit and no concerns were identified. | Very Low | Damage to vegetation and potential toxicity to animal species | Not significant |

| What do you do that can harm and what could be harmed | | | Managing the Risk | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Receptor** | **Pathway** | **Risk Management** | **Probability of Exposure** | **Consequence** | **Overall Risk** |
| | | | As there is very limited potential for any significant fugitive emissions from the sludge treatment facilities at the site, it is not considered that the operations will have any impact upon the designated sites. | | | |

## 11. Site Condition Report

| 1.0 Site Details | |
|---|---|
| Name of the applicant | United Utilities Water Ltd |
| Activity address | Ellesmere Port WwTW<br>Ring Road,<br>Little Stanney,<br>Nr. Chester,<br>Cheshire.<br>CH2 4FE |
| National grid reference | SJ 42475 74328 |
| Document reference and dates for Site Condition Report at permit application and surrender | This is the permit application SCR for the extension to the permit boundary. Site investigations were undertaken in 1977, 1997 and 2012 (Strata Surveys), 2012 (AEG), 2014 and 2015 (BAM). |
| Document references for site plans (including location and boundaries) | See Appendices C, D and G to the Application Support Document. |

| 2.0 Condition of the land at permit issue | |
|---|---|
| Environmental setting including:<br>• geology<br>• hydrogeology<br>• surface waters | The published British Geological Survey (BGS) map for Ellesmere Port shows the installation area is underlain by:<br>• Drift geology consisting of Tidal Flat Deposits (clay, silt and sand)<br>• Bedrock Geology consisting of Triassic Sandstone of the Wilmslow Sandstone Formation.<br>A northwest trending fault is indicated to cross the western part of the WwTW. The western part of the site is underlain by Glacial Till.<br>There are no surface water features within the installation boundary.<br>Mill Brook, a tributary of the River Gowy flows through the installation area. The confluence with the River Gowy is approximately 1km downstream of the site.<br>The Tidal Flat deposits are classified as a Secondary (minor) aquifer. The glacial till superficial deposits are classified as Unproductive Strata with very limited permeability and groundwater flow potential. |

| 2.0 Condition of the land at permit issue | |
|---|---|
| | The permeability of the bedrock is likely to be variable due to the range of lithologies present and the characteristic sandstone layers, however the sandstone bedrock is classified as a Principal aquifer. Such aquifers have a high level of water storage and may support water supply, although there are no source protection zones (SPZ) within 4km of the site.<br><br>The site is located in a Nitrate Vulnerable Zone. |
| Pollution history including:<br>1. pollution incidents that may have affected land<br>2. historical land-uses and associated contaminants<br>3. any visual/olfactory evidence of existing contamination<br>4. evidence of damage to pollution prevention measures | There are no known pollution incidents that may have affected the land within the installation boundary.<br><br>A site walkover conducted in November 2020 did not identify any visual or olfactory evidence of contamination of concern, nor any evidence of damage to pollution prevention measures.<br><br>Historical ordnance survey plans show that the installation area was agricultural land prior to the construction of the WwTW in the early 1970s. |
| Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available) | There have been six geotechnical ground investigations at the WwTW site, undertaken between 1977 and 2014, associated with various stages of development and expansion of the works. Boreholes drilled within the installation area confirm the published geology; with superficial drifts deposits comprising bands of sand, gravel and peat. Underlying these at a depth of around 5m clay was proven to in excess of 20m. Made ground was recorded overlying the drift deposits, comprising clayey sandy silt and gravel. In some locations clinker, concrete and brick were recorded within the made ground.<br><br>Groundwater was encountered within the permeable drift deposits at depths of around 3m. |
| Baseline soil and groundwater reference data | A limited number of soil samples from the installation area were subject to chemical analysis, principally from an investigation by Bam Ritchies in 2014. The range of results recorded has been presented as being generally indicative of baseline conditions in the installation area:<br><br>• pH 6.0 – 10.3<br>• Ammoniacal nitrogen – <0.2 – 49 mg/kg<br>• Cyanide - <1<br>• Phenols - <0.2 mg/kg<br>• Arsenic – 3 – 76 mg/kg<br>• Boron – <1.0 – 3.7 mg/kg<br>• Cadmium – <0.5 - 1.1 mg/kg |

| 2.0 Condition of the land at permit issue | |
|---|---|
| | • Copper – 10 - 97 mg/kg<br>• Chromium – 23 - 48 mg/kg<br>• Lead – 3 - 82 mg/kg<br>• Mercury – <0.1 – 2.78 mg/kg<br>• Nickel – <1 – 78 mg/kg<br>• Zinc – 6 - 128 mg/kg<br>• Total TPH - <0.1 – 38.7 mg/kg<br>• BTEX - <0.01 mg/kg<br>• Total PAHs - <0.08 – 1.45 mg/kg |

| 3.0 Permitted activities | |
|---|---|
| Permitted activities | As detailed in the Environmental Permit application and this variation application. |
| Non-permitted activities undertaken | Outside of the sludge treatment installation, that is the subject of the permit application, there are the wider UUW WwTW operations. |
| Document references for:<br>1. plan showing activity layout; and<br>2. environmental risk assessment. | 1. See Appendix D to Application Support Document.<br>2. See Section 10 to the Application Support Document. |

## Appendix A: CoTC Certificate

Previously supplied – not resent this time

# Ellesmere Port WwTW EPR/ZP3031LJ
## Environmental Permit Variation Application

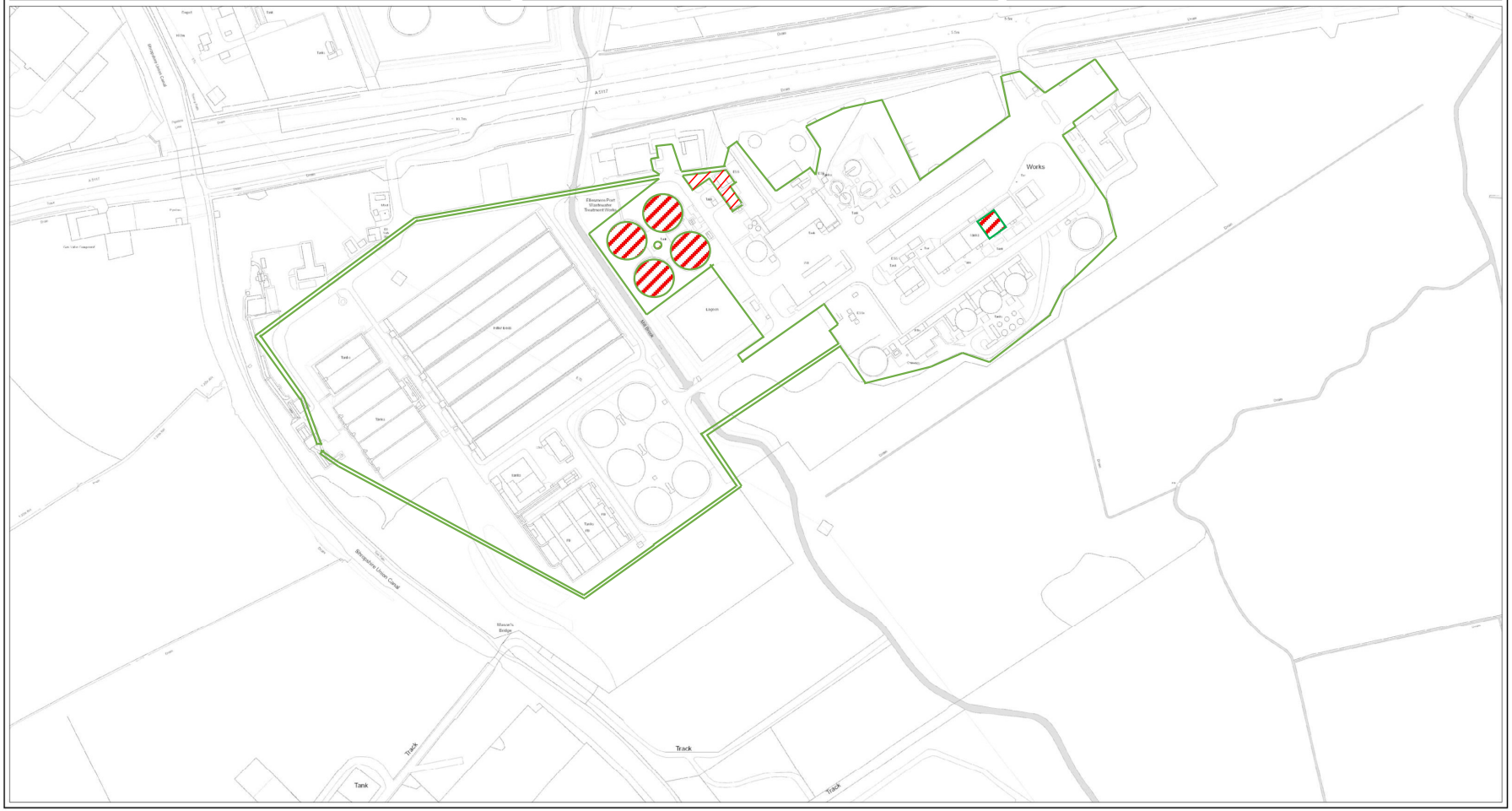
### Appendix B: Summary of Management System

Previously supplied – not resent this time

**Appendix C: Site Boundary Plan**

# Ellesmere Port

| Centre : | X : 342354 | Y : 374208 | Date : 17/03/2021 | Scale Approx : 2500 |
|---|---|---|---|---|



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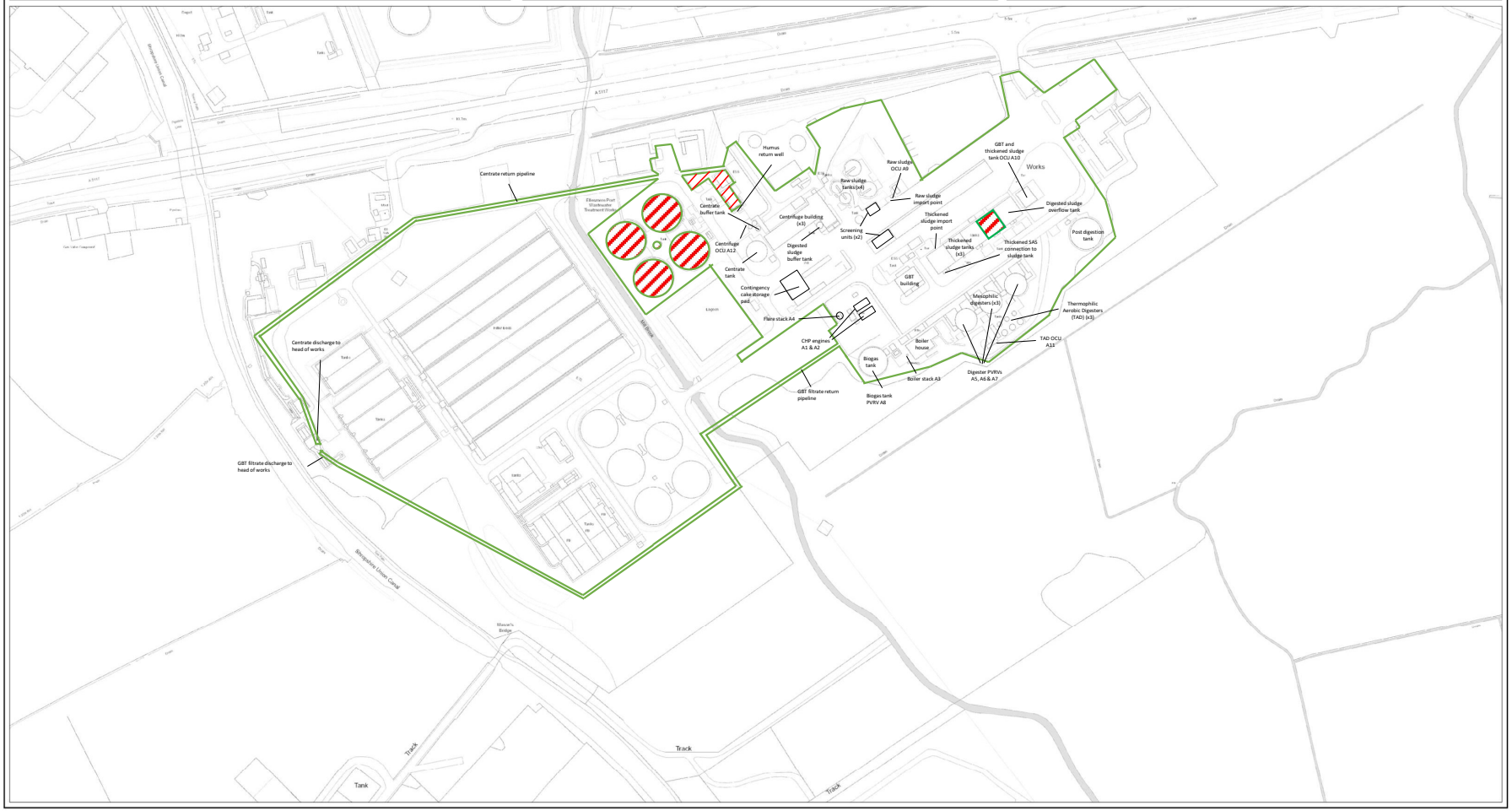
# Ellesmere Port WwTW EPR/ZP3031LJ

## Environmental Permit Variation Application

**Appendix D:  Site Layout Plans**

# Ellesmere Port

| Centre : | X : 342354 | Y : 374208 | Date : 17/03/2021 | Scale Approx : 2500 |
|---|---|---|---|---|




The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.



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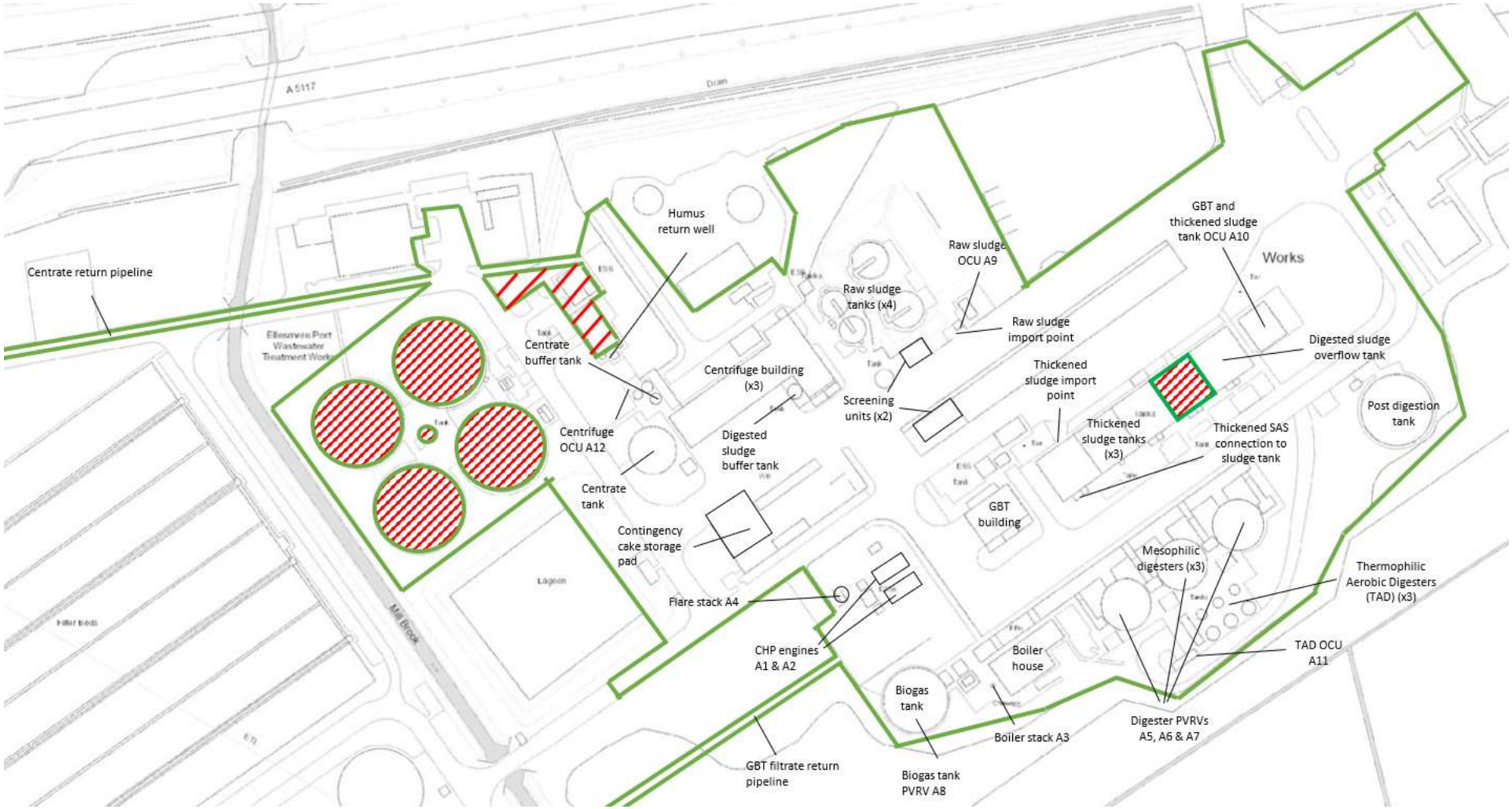
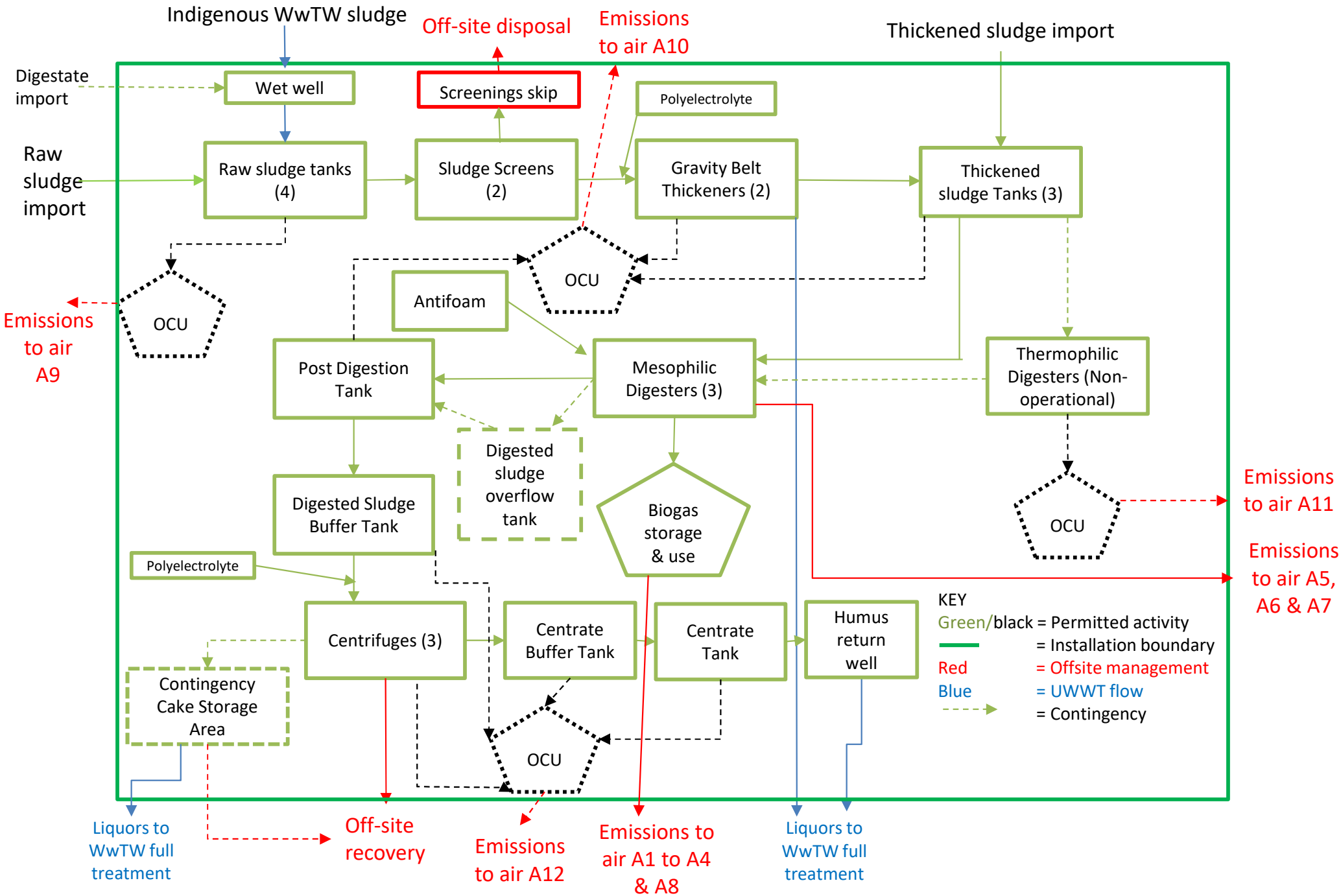

A5117
Drain
Centrate return pipeline
Ellesmere Port Wastewater Treatment Works
Humus return well
Centrate buffer tank
Centrifuge OCU A12
Centrifuge building (x3)
Digested sludge buffer tank
Centrate tank
Contingency cake storage pad
Lagoon
Mill Brook
Flare stack A4
CHP engines A1 & A2
Biogas tank
GBT filtrate return pipeline
Biogas tank PVRV A8
Boiler house
Boiler stack A3
Raw sludge tanks (x4)
Raw sludge OCU A9
Raw sludge import point
Screening units (x2)
Thickened sludge import point
Thickened sludge tanks (x3)
GBT building
GBT and thickened sludge tank OCU A10
Works
Digested sludge overflow tank
Post digestion tank
Thickened SAS connection to sludge tank
Mesophilic digesters (x3)
Thermophilic Aerobic Digesters (TAD) (x3)
TAD OCU A11
Digester PVRVs A5, A6 & A7

# Ellesmere Port WwTW EPR/ZP3031LJ
## Environmental Permit Variation Application

**Appendix E:  Block Process Diagram**

# Ellesmere Port WwTW Sludge Treatment Installation



# Ellesmere Port WwTW EPR/ZP3031LJ
## Environmental Permit Variation Application

### Appendix F:  Drainage Plan

Previously supplied – not resent this time

# Ellesmere Port WwTW EPR/ZP3031LJ

## Environmental Permit Variation Application

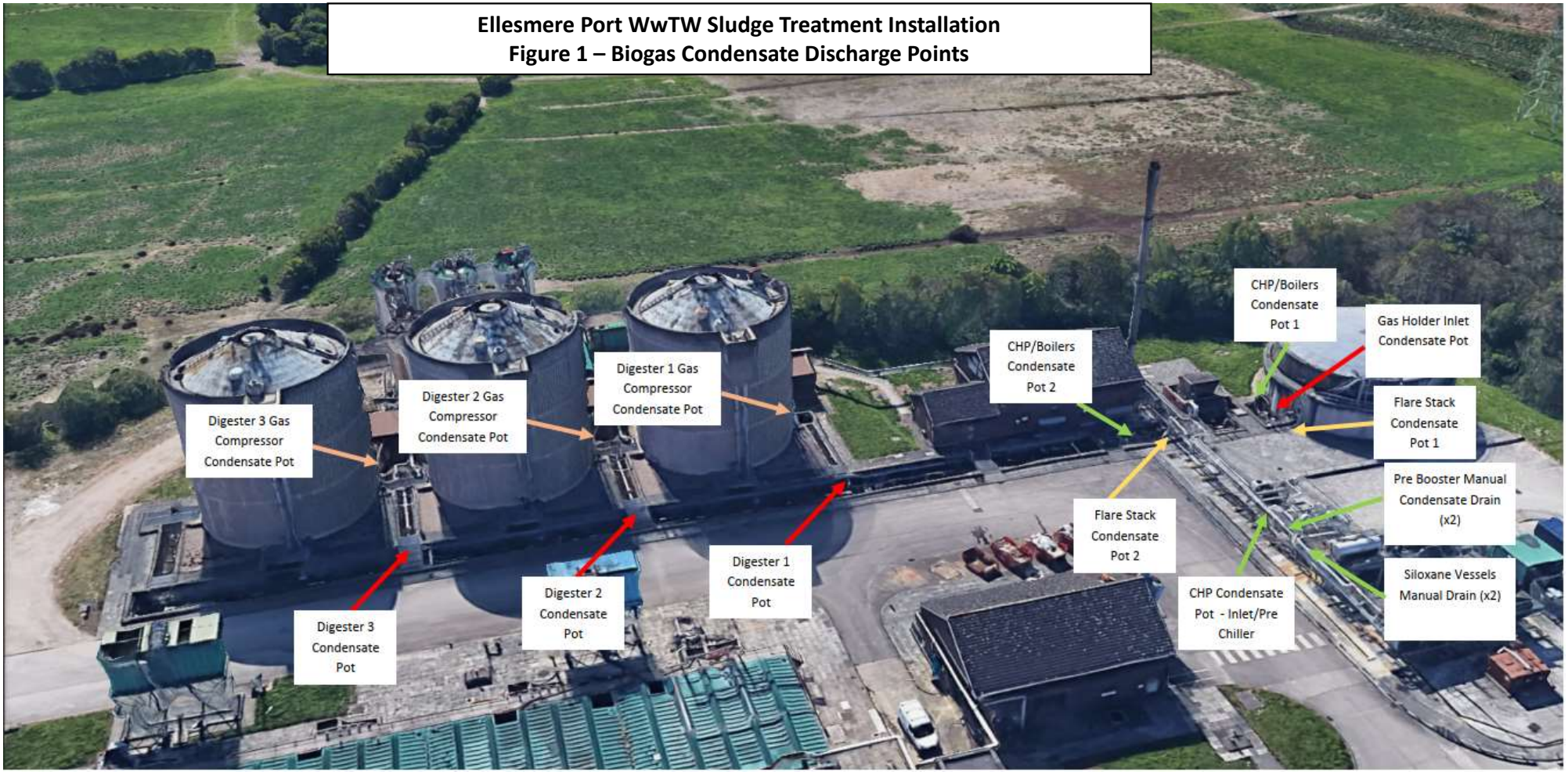
**Appendix G: Site Surfacing Plan**

# Ellesmere Port WwTW EPR/ZP3031LJ

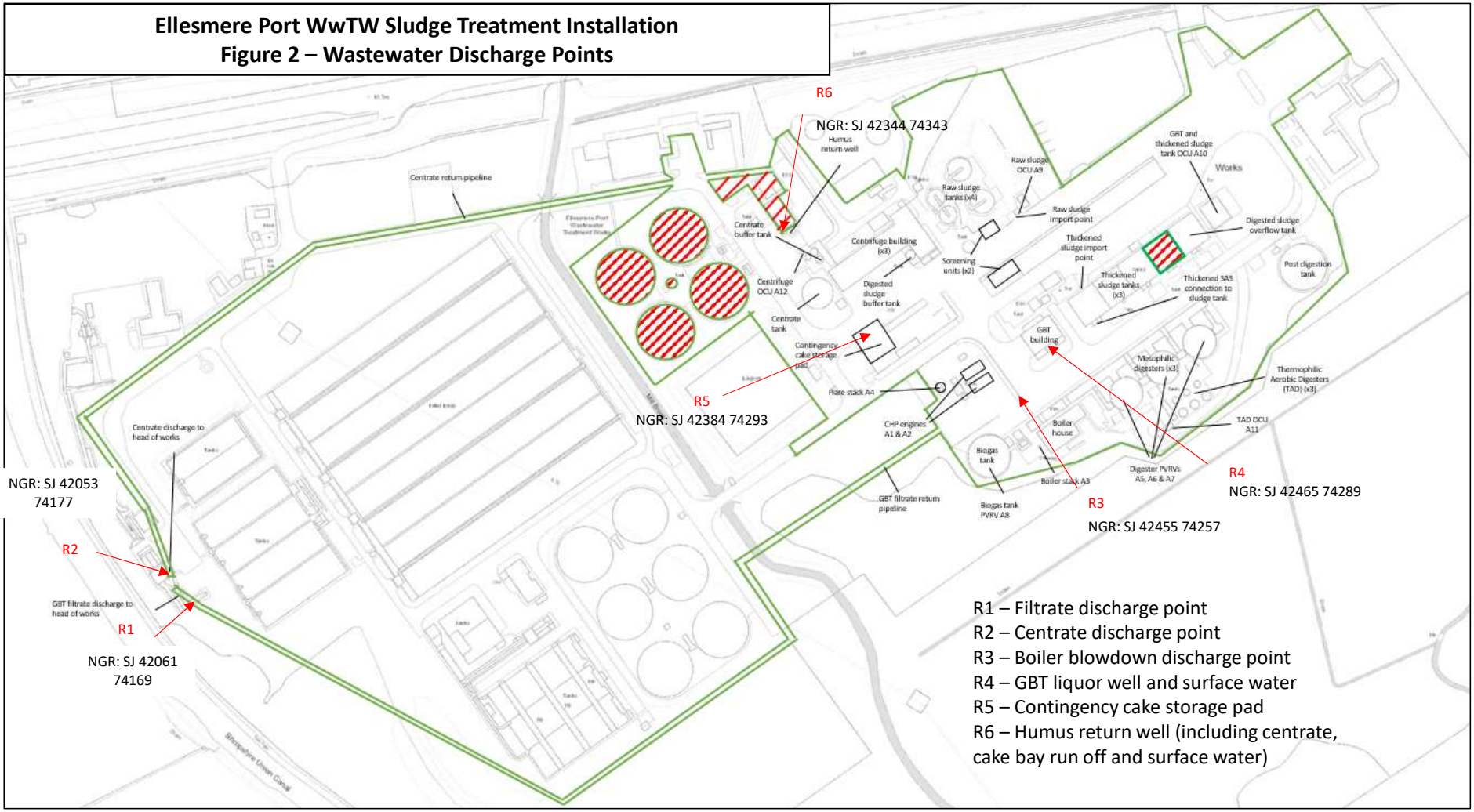
## Environmental Permit Variation Application

**Appendix H: Emission Point Plans**

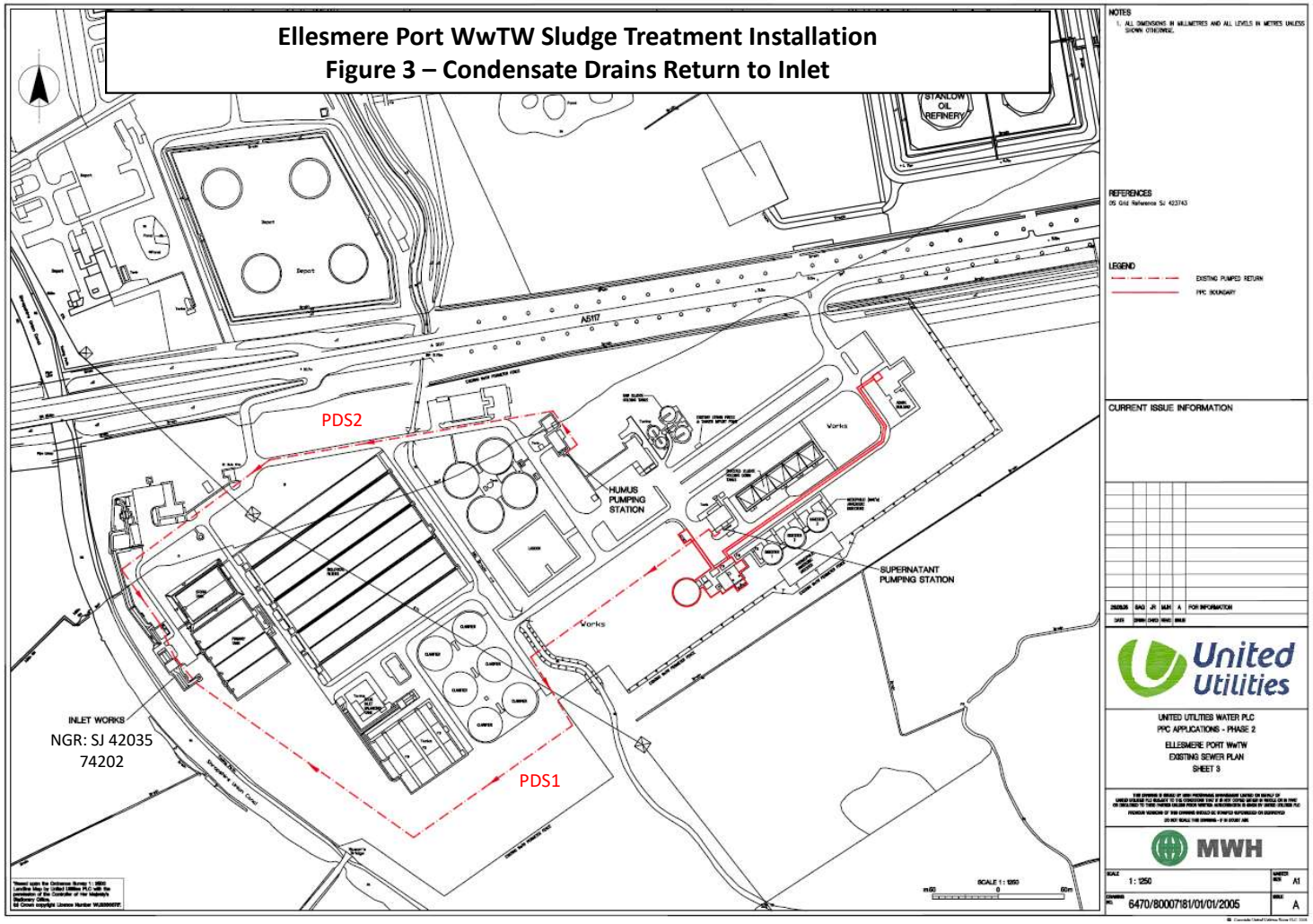
**Ellesmere Port WwTW Sludge Treatment Installation**
**Figure 1 – Biogas Condensate Discharge Points**



**Ellesmere Port WwTW Sludge Treatment Installation**
**Figure 2 – Wastewater Discharge Points**



**Ellesmere Port WwTW Sludge Treatment Installation**
**Figure 3 – Condensate Drains Return to Inlet**



## Appendix I: ISO14001 Certificate

Previously supplied – not resent this time

## Appendix J: Raw Materials - Material Specification Data Sheets

Previously supplied – not resent this time

**Appendix K: Draft SOP – Installation Emissions Monitoring**

# DRAFT STANDARD OPERATING PROCEDURE

## INSTALLATION EMISSIONS MONITORING

## 1. Purpose

1.1 This Standard Operating Procedure (SOP) details the operating requirements, practices and supports the process required to assess emission monitoring as per the environmental permit requirements.

1.2 The purpose of this SOP is to ensure that all relevant personnel are provided with the appropriate information to enable them to monitor, record and assess emissions in a safe, consistent, optimum and compliant manner.

## 2. Scope

2.1 This SOP applies to all sites where waste and installation permit (formerly PPC permits) activities require point source emission monitoring and testing within the Environmental Permitting Regulations 2016/18 (as amended).

## 3. Definitions

### Emissions Monitoring

3.1 The relevant site permit will specify the parameters and frequency of monitoring.

3.2 A point source emission is localised and emission points are listed in the Environmental Permit (refer to relevant tables). There shall be no other point source emissions than those listed.

3.3 Emission values specified in the Permit must be met.

## 4. Procedure

### Health and Safety

4.1 All the relevant United Utilities Safe Systems of Works and Health & Safety Procedures must be applied and the required PPE worn at all times.

4.2 Before operating, inspecting or cleaning equipment all personnel must have received appropriate training in the operation of the membrane and the relevant Safe Systems of Works and Health & Safety Procedures.

These instructions and procedures may include:-

- SSW 4 Mechanical Handling Equipment
- SSW 10 Portable Access Equipment
- SSW 12 Isolation of Plant and Machinery
- H&S Procedure No. 220 Management of Confined Space Entry
- H&S Procedure No. 223 Manual Handling
- Restricted Ops/Hygiene Procedures

4.3 All other local procedures must be applied prior to any maintenance taking place, and full risk assessment of all actions taken place.

4.4 Where appropriate periodic visual and olfactory assessments should be made to ensure that all final releases to air are essentially colourless free from persistent trailing mist or fume and free from droplets and odour.

4.5 All monitoring points are identified and labelled. Access shall be maintained and available at any time.

4.6 Monitoring must be performed at the point source emission points as listed in Schedule of emission & monitoring in the Permit.

4.7 Permanent access must be provided to enable sampling and monitoring of emission points as specified in the Environmental Permit.

4.8 Monitoring equipment and techniques, personnel and organisations employed for the emissions monitoring programme shall have either MCERTS certification or MCERTS accreditation.

4.9 Emissions can only be made from identified emission points; emissions from any uncontrolled point source emissions which are from unidentified points are not permitted or are in breach of permit conditions.

4.10 If during monitoring there are any breaches of the specified permit limits contact your local ERA. Refer to SOP WwP/S/001/01/14 Incident Reporting.

## 5. Record Keeping

5.1 Reporting must be completed as specified in Schedule 5 (Reporting) of the Permit. Emission point and monitoring information is listed in tables of the Permit.

5.2 Records of all monitoring must be maintained; this includes records of the sample taken, the analysis of the sample, instrument measurements (periodic and continual), calibrations, examinations tests and surveys and any assessment or evaluation made on the basis of such data.

5.3 All records taken relating to the permit/emissions shall be retained on site and shall be available at any time for inspection by the EA. All records to be made available on request within a maximum of 14 days. Records shall be legible and retained for at least 6 years. Any amendments should ensure that the original entry remains legible. Any monitoring data used for the annual EA submission shall be in electronic format and shall not be overwritten.

5.4 Reliable Monitoring data as specified in the Permit shall be recorded electronically and submitted to the WW Operations Technical Team. This shall be submitted quarterly/annually on an agreed date within the permit.

## 6. Assessment of Monitoring Results

6.1 Following receipt of monitoring results from third party contractors the Environmental Compliance Team (ECT) will cross reference with the specific sites permit emission limits.

6.2 The ECT may also consult internal specialists e.g. odour, to verify monitoring results.
6.3 If monitoring is undertaken in house then the results will be shared with the ECT who will assess with site specific permit emission limits.
6.4 Non compliant emission monitoring will be highlighted and reported as per any permit requirements.
6.5 Non compliant monitoring will be raised on the relevant internal systems for further investigation and action by the ECT.
6.6 Specific monitoring guidance will also be consulted to verify the correct standards have been applied dependant on the monitoring type.

## 7. Human Senses Tour

7.1 The routine inspection of an installation, known as a Human Senses Tour, is required. This is to monitor for unusual occurrences and signs which may indicate the deterioration and/or potential failure of plant and equipment. This may include:-

7.2 Vibration
7.3 Heat
7.4 Noise
7.5 Smell
7.6 Leakage
7.7 Power
7.8 Pressure

## 8. References

8.1 The Environmental Permitting Regulations 2018 (as amended)
8.2 Environmental permit (site specific)
8.3 Environmental Permit ('How to comply with your permit' – EA Guidance Document')
8.4 Monitoring stack emissions for Environmental permits (formerly M2 guidance)
8.5 SOP WwP/S/001/01/14 Incident Reporting