Burnley WwTW Sludge Treatment Facility EPR/HP3509MM

Environmental Permit Application

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Application Support Document

October 2023

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Environmental Permit Application

Contents

[1] Stantec IED Secondary Containment Modelling Assessment Report, dated October 2023 (Issue 3)

Attachment 9 – Burnley EPR Accident Management Plan
Attachment 10 – Burnley Bioaerosol Risk Assessment
Attachment 11 – Energy Review 2021
~~Attachment 12 – Sampling Instruction SSI -~~ WITHDRAWN

1. Introduction

The purpose of this Application Support Document (ASD) is to provide supplementary information to support an environmental permit (EP) application for the screening, thickening and anaerobic digestion of indigenous and imported wastewater (sewage) sludge at Burnley 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:
Burnley WwTW Sludge Treatment Facility
Woodend Lane, off Barden Lane
Burnley
BB12 9DS

NGR: SD 82725 35620

United Utilities Water Limited (UUW) operates a non-hazardous wastewater treatment works at the Burnley WwTW. The works is located approximately 3 kilometres northwest of Burnley town centre and serves the town of Burnley and the neighbouring settlements of Barrowford, Brierfield and Nelson.

The works is situated in an agricultural area with the River Calder flowing approximately 90m to the west and 85m to the south east. There are several isolated farms and residential properties within 500m of the works boundary.

UUW hold a permit for the receipt of industrial wastes by road tanker to the inlet of the Sewage Treatment Works (EPR/QP3791CP). This permit is independent of the activities that are the subject of this application.

The treatment of indigenous sewage sludge arising from the wastewater treatment process at Burnley comprises:

- Sludge screening (solids separation);
- Sludge thickening;
- Thermal hydrolysis;
- Anaerobic digestion;
- Sludge dewatering; and
- Storage of digestate cake.

In addition to indigenous sludge, the facility receives imported sludge from other wastewater treatment works by road tanker. The facility can treat up to 630,720m^3 of wet sludge per year (equating to approximately 630,720 wet tonnes). There is one operational digester, with a storage capacity of 2,250m^3. Biogas produced at the site is combusted in a Combined Heat and Power (CHP) engine with an electrical generating capacity of 637kWe. Excess electricity generated may be exported to the grid. The thermal

input of the CHP engine is 1.6MWth. There is also an auxiliary boiler supplying hot water/steam to the process. The boiler has a thermal input of 1.3MWth.

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 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).

The sludge treatment facility has a total maximum treatment capacity of 1,728m^3 per day (equating to approximately 1,728 wet tonnes per day).

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 Burnley sludge treatment facility located at the Burnley Wastewater Treatment Works (WwTW). The works are operated by United Utilities Water Limited (UUW). This application is for permitting of the facility as an installation undertaking screening, thickening and anaerobic digestion of indigenous and imported sewage sludges 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 Burnley WwTW (on-site) from the urban wastewater flow.

The works is located approximately 3km northwest of Burnley town centre and serves the town of Burnley and the neighbouring settlements of Barrowford, Brierfield and Nelson. It is situated in an agricultural area with the River Calder flowing approximately 90m to the west and 85m to the south east. There are several isolated farms and residential properties within 500m of the works boundary.

The waste to be treated under this permit consists solely of sludges produced from Burnley Wastewater Treatment Works (WwTW) from the urban wastewater flow and sludges imported from other WwTWs. The sludge facility can process up to 630,720m^3 of wet sludge per year (equating to approximately 630,720 wet tonnes).

Indigenous sludge is piped directly from the primary settlement tanks at the WwTW to a wet well at the treatment installation. Imported sludge is received by road tanker and pumped into the same wet well.

Associated activities include:

- Sludge screening (solids separation);
- Sludge thickening by centrifugation;
- Sludge treatment by thermal hydrolysis;
- Sludge treatment by anaerobic digestion;
- Sludge and digested sludge cake storage;
- Storage and combustion (including flaring) of biogas;
- Raw material handling and storage; and
- Odour abatement.

There are no emissions to land or water from this installation. There are seven point source emissions to air for the CHP engines; boiler, flare, odour control unit (OCU) stack and pressure vacuum relief valves (PVRV's) of which there are three, two on the digester and one on the gas holder. Point source emissions to sewer are: biogas condensate; 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 B2 Supporting Information

3.1. Question 3a: Relevant Offences

UUW have been convicted of a number of relevant offences; these are detailed in the document "List of Relevant Offences for United Utilities Water Limited (formerly United Utilities Water Plc and North West Water Limited)" included with the application.

3.2. Question 3b: Technical Ability

Technically competent management will be 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.

3.3. Question 3d: Management Systems

UUW operates a Business Quality and Environmental Management System (BQ&EMS) which is certified against the ISO 9001 and 14001 standards. United Utilities 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 UUW's ISO 14001 certificate is provided at Appendix B – the certificate covers all activities and locations therefore specific sites are not listed.

A Management System Summary for the installation is included at Appendix C. A residue management plan is provided with this document.

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).

3.4. Question 5a: Plans

A site location plan for the WwTW is provided at Appendix D. Permit boundary, site layout and emission points plans for the sludge treatment installation are provided at Appendix E.

3.5. Question 5b: Site Condition Report

A H5 Site Condition Report (SCR) is provided in Section 11.

Geo-technical ground investigations have previously been undertaken at the site which include the Installation area. During ground investigations undertaken in 2012 and 2013, soil samples were tested for a range of metals, pH, sulphate, and total petroleum hydrocarbons. Although the chemical analysis was undertaken eight years previously, the site is mostly hard surfaced and there have been no major spill events since this time. It is therefore considered to be largely representative of current conditions and has been used to provide reference data for the baseline soil conditions.

3.6. Question 5c Provide a Non-Technical Summary of Your Application

Please see Section 2 of this report.

3.7. Question 6: Environmental Risk Assessment

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

4. Application Form B3 Supporting Information

4.1. Question 1: What activities are you applying for

The permitted activities proposed under this application are detailed in Table 4.1.1 (Table 1A of the form).

Table 4.1.1: Permitted Activities

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 tank and subsequent thermal hydrolysis plant through to digestion and recovery of by-products (digestate). Anaerobic digestion of waste in one primary digestion tank followed by burning of biogas produced from the process.
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. Storage of non-hazardous sewage sludge post anaerobic digestion. Blending and mixing of imported sewage sludge with indigenous site-produced sewage sludge from within the works.
Sludge screening and thickening/dewatering associated with the S5.4 A(1)(b)(i) activity.	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) R3: Recycling/reclamation of organic substances which are not used as solvents	Screening and thickening of non-hazardous sewage sludge within the following plant: 2 x sludge screens (strain presses) 5 x centrifuges (including polyelectrolyte dosing) – 2 pre-digestion and 3 post-digestion.
Pre-treatment of centrate by dissolved air floatation	D9: Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any operation numbered D1 to D12	From the receipt of centrate into the dissolved air flotation (DAF) unit from the 2 x thickening centrifuges to the centrate buffer storage tank.

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
Pre-treatment of sewage sludge prior to anaerobic digestion for recovery by means of treatment in a thermal hydrolysis plant.	R3: Recycling/reclamation of organic substances which are not used as solvents	From receipt of non-hazardous sewage sludge into the thermal hydrolysis plant to discharge of treated sludges into the anaerobic digestion S5.4 A(1)(b)(i) activity for recovery.
Cake (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. Storage of thickened digestate cake on an impermeable surface with sealed drainage system.
Odour abatement	Odour control units	From receipt of odours from the sludge presses, screened sludge tank, degassing tank, digested sludge tanks, post digestion dewatering centrifuges and centrate buffer tank to emission to air (1 No. odour control unit).
Biogas storage and combustion	R1: Use principally as a fuel to generate energy	From the receipt of biogas produced at the on-site anaerobic digestion process, followed by siloxane removal in carbon filters and combustion in one combined heat and power (CHP) engine with the associated release of combustion gases.
Combustion of gas oil	Burning of gas oil in steam boiler	From receipt of gas oil, to combustion of fuel and delivery of steam to the thermal hydrolysis plant.
Flaring of excess biogas	D10: Incineration on land	From the receipt of biogas produced at the on-site anaerobic digestion process to incineration with the release of combustion gases. Use of one auxiliary flare required only to manage excess biogas, and/or periods of breakdown or maintenance of the CHP engine.
Raw materials storage and handling	Raw materials storage and handling	From delivery and acceptance of raw materials to storage awaiting use on site.
Disposal of process liquors to the UWWT flow to full treatment	D13	From generation of process liquors (centrate, biogas condensate, blowdown from the steam boiler and spent water from the odour control unit bio-scrubber blowdown water) to discharge into the inlet flows of the WwTW.

Maximum Throughput

The maximum design capacity at the facility is 630,720m^3 of wet sludge per year (equating to approximately 630,720 wet tonnes).

As set out in Table 4.1.2 below, throughput is limited by the operation of the centrifuges which act as a 'pinch point' in the process. There are two thickening centrifuges with the following maximum treatment capability (assuming they both operate continuously throughout the year).

Table 4.1.2: Burnley Treatment Sludge Treatment Capacity Calculation

	Thickening Centrifuges	Units
Number	2	
Operation	D/A	Duty / Assist / Stand By
Design throughput per machine	36	m^3/hr
Maximum no. of machines in use	2	
Maximum combined throughput	72	m^3/hr
Maximum daily throughput	1,728	m^3/day
Maximum annual throughput	**630,720**	**m^3/year**

The operational biological treatment capacity has the potential to be 90,000m^3 per year based on the feed into the digesters. The daily throughput will vary depending on operational needs.

Types of Waste Accepted

Table 4.1.3 details the waste the installation will accept – this waste arises from the on-site, off-installation wastewater treatment works and is also imported from other wastewater treatment works.

Table 4.1.3 Types of Waste

19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**	
19 02	**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: • 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	WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	
19 08	**Wastes from waste water treatment plants not otherwise specified**	
19 08 05	Sludges from treatment of urban wastewater	Sewage sludge only
Comprising: • 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). • Indigenous sludge: sewage sludge arising from Burnley WwTW. * Note: the EWC does not apply for the classification of indigenous sludges and SAS unless these streams are considered for removal off-site.		

4.2. Question 2: Emissions to Air, Water and Land

Point Source Emissions to Air

There are seven point-source emissions to air from the following locations:

- A1 - CHP biogas engine;
- A2 – Steam boiler;
- A3 – Flare;
- A4 – the Odour Control Unit (OCU) serving the sludge screen press enclosure, screened sludge tank, thickening centrifuges, thickened sludge silo, degassing tank, digested sludge tanks, dewatering building (centrifuges/conveyors), dewatering centrate buffer tank, DAF tank (not currently operational) and treated centrate tank (not currently operational);
- A5 & A6 – Digester pressure vacuum relief valves (PVRVs); and
- A7 – Gas holder pressure vacuum relief valve (PVRV).

The location of these discharge points is shown on the air emission points plan at Appendix E, Figure 4.

Please refer to Section 4.4 for details of combustion emissions monitoring and an assessment of these emissions (A1-A3).

Please refer to Sections 6.10 and 6.13 for details of gas emission controls from the AD facility.

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

Point Source Emissions to Sewer, Effluent Treatment Plant or Other Transfers Off-site

Emissions to sewer are all routed into the wastewater treatment works' flow to full treatment. These emissions are limited to the following in Table 4.2.1:

Table 4.2.1: Types of Waste

Emission Point Reference	Nature	Source
W1	Bio-scrubber water	OCU discharge to site drainage
W2	Centrate	Thickening centrate discharge to process pipework
W3	Centrate	Dewatering centrate discharge to process pipework
W4	Leachate and surface water	Cake storage bay discharge to site drainage
W5	Biogas condensate	Biogas condensate catch pot discharge
W6	Biogas condensate	Biogas condensate catch pot discharge
W7	Biogas condensate	Biogas condensate catch pot discharge
W8	Boiler blowdown	Steam boiler water discharge
R1	Centrate	Combined centrate return discharge point
R2	Surface water	Main site drainage discharge point
R3	Leachate and surface water	Drainage from cake storage bay, dewatering centrifuge building and thickening centrifuge area
R4	Bio-scrubber water and surface water	Drainage from OCU and road gulleys

The location of these emission discharge points is shown on the wastewater emissions point plan at Appendix E (Figure 3).

There are no point source emissions to other transfers.

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 is routed into the wastewater treatment works' flow to full treatment.

Fugitive Emissions

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

Further assessment of the potential environmental risks associated with a loss of containment from process tanks at the site[2] 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.

[2] Stantec Secondary Containment Modelling Assessment Report, dated 31 October 2023 (Issue 3)

Please refer to the Burnley 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 6.12 and 6.13 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.

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

4.3. Question 3a: Technical Standards

A block diagram of the process is provided at Appendix G. 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.

4.4. Question 4a: Measures for Monitoring Emissions

Table 4.4.1 below describes the measures used for monitoring emissions at the installation.

Table 4.4.1: Emissions Monitoring

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
Gaseous Emissions					
CHP engine (A1)	SD 82712 35280	Oxides of nitrogen Carbon monoxide Total VOCs Sulphur dioxide	Annually	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526 BS EN 14791 or CEN TS 17021 or by calculation based on fuel sulphur	Sampling undertaken by a third party specialist

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
Boiler (A2)	SD 82712 25295	Oxides of nitrogen	Annually	BS EN 14792	Sampling undertaken by a third party specialist
Flare (A3)	SD 82741 35224	Oxides of nitrogen Carbon monoxide Total VOCs	Running time monitored; emissions only tested in the event that running time exceeds more than 10% of operational hours.	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526	Inspected annually, including mechanical and safety systems.
OCU (A4)	SD 82740 35209	Ammonia Hydrogen Sulphide	6 monthly	EN ISO 21877 CEN TS 13649 for sampling and NIOSH 6013 for analysis	No EN standard available for either ammonia or hydrogen sulphide 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) Hydrogen chloride (HCl)	1 round of monitoring	EN 12619 EN 1911	
Bioaerosol Monitoring	One upwind and 3 downwind locations * The monitoring locations are as shown in the Burnley Bioaerosol Risk Assessment; however, should wind conditions be different on the day	Total mesophilic bacteria Aspergillus fumigatus	1 round of monitoring	In accordance with Technical Guidance Note M9 – Environmental monitoring of bioaerosols at regulated facilities.	As described in the Technical Guidance Note M8, including all the additional data requirements specified therein.

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
	of sampling the monitoring locations may vary.				
Liquid Emissions					
Wastewater Monitoring	R1 - Combined centrate return discharge point (SD 82814 35308)	156 hazardous and priority substances as per separate list	Monthly for 12 months	MCERTS or UKAS where possible*	*Please refer to Section 6.18 for further information
Wastewater Monitoring	W2 – Thickening centrate (SD 82658 35273) W3 – Dewatering centrate (SD 82776 35209)W4 – Leachate and surface water (SD 82792 35217)	pH Total nitrogen COD Total phosphorous Suspended solids Ammonia Hydrocarbon oil index; BTEX; Free cyanide; Halogens (AOX); Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Mn); Mercury Hexavalent chromium(VI)) PFOS and PFOA	Monthly for 12 months	MCERTS MCERTS MCERTS MCERTS MCERTS Accredited by flexible scope to MCERTS EN ISO 9377-2 EN ISO 15680 EN ISO 14403-1 or EN ISO 14403-2 EN ISO 9562 EN ISO 11885, EN ISO 17294-2 or EN ISO 15586 EN ISO 17852 or EN ISO 12846 EN ISO 10304-3 or EN ISO 23913 -	
Wastewater Monitoring	W1 - Bio-scrubber water (SD 82746 35296) W5, W6 & W7 - Biogas condensate (sample from	Total nitrogen COD Total phosphorous Suspended solids pH Ammonia	Monthly for 12 months	MCERTS MCERTS MCERTS MCERTS MCERTS Accredited by flexible scope to MCERTS	

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
	each catch pot to form composite) R2 - Surface water (SD 82688 35258) R3 - Leachate and surface water (SD 82817 35297) R4 - Bio-scrubber water and surface water (SD 82817 35287)	Oil and grease		Visual assessment only	
Wastewater Monitoring	W8 – Boiler blowdown (SD 82726 35297)	pH; COD; Suspended solids; Oil and grease (visual only).	Monthly for 12 months	MCERTS MCERTS MCERTS Visual assessment only	

Point Source Emissions to Air

The CHP engine and boiler emissions will be monitored annually in accordance with LFTGN08 and the relevant MCERTS Standards 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 thermal input of the steam boiler is 1.3MW, which is above the threshold for MCPD controls.

UUW commissioned Jacobs UK Limited to carry out an Air Quality Impact Assessment (AQIA) to assess the potential impact of emissions from the CHP engine (emission point A1) and boiler (emission point A2). The CHP engine is fuelled by biogas and has a thermal input of 1.6MW. The boiler is a dual fuel design and can run on biogas but has only ever been run on gas oil. The emissions were therefore modelled on gas oil. The thermal input of the steam boiler is 1.3MW.

A copy of the AQIA report is provided in Appendix H. The assessment considers:

- The potential impact on human health due to emissions of pollutants. The pollutants considered include nitrogen dioxide (NO_2); carbon monoxide (CO); sulphur dioxide (SO_2), total volatile organic compounds (TVOC's) and particulate matter (PM10, particles with an aerodynamic diameter of 10 microns or less and PM2.5, particles with an aerodynamic diameter of 2.5 microns or less); and

- The potential impact on vegetation and ecosystems due to emissions of oxides of nitrogen (NOx) and SO_2.

For the CHP engine, the NOx, CO and TVOC emission concentrations were derived from the Environment Agency's guidance 'Guidance for monitoring landfill gas engine emissions' (Environment Agency, 2010). For SO_2, in the absence of a specific emission limit value, the SO_2 emission concentration typically used in similar permit applications for biogas fuelled engines has been applied. This is a conservative approach to the assessment as, in practice, the CHP engine SO_2 emission concentration is likely to be lower than that applied in the model. For particulates, in the absence of a specific emission limit value, the emission concentration was derived from a previous study of landfill gas engines (Land Quality Management Ltd, 2002).

For the boiler, as a worst-case approach to the assessment, the NOx emission concentration is based on the emission limit values for existing medium combustion plants other than engines and gas turbines as regulated under the Medium Combustion Plant Directive (MCPD). The SO_2 emission concentrations have been derived based on the fuel consumption and the sulphur content of the diesel fuel of 0.1%. For CO, in the absence of a specific emission limit value, the CO emission concentration was obtained from Defra's Process Guidance Note 1/3,'Statutory Guidance for Boilers and Furnaces 20-50MW thermal input' (Defra, 2012).

The air quality assessment indicates that the predicted off-site concentrations and predicted concentrations at sensitive human and ecological receptors do not exceed any relevant long-term or short-term air quality objectives or guidelines.

Emissions monitoring for the CHP engine stack (A1) was undertaken in May 2020 by EnviroDat Limited on behalf of UUW. The monitoring results are presented in Table 4.4.2 below. There is currently no emissions monitoring data for the boiler stack.

Table 4.4.2: CHP emissions monitoring data

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Estimate of Uncertainty (2σ at 95% confidence)	Units	Reference Conditions	Date of Sampling
CHP Engine	Oxides of Nitrogen (as NO_2)	-	**370**	±19	$mg(N)m^{-3}$	101.3 kPa, 273K, dry gas, 5% O_2	26/05/20
	Carbon Monoxide	-	**992**	±46	$mg(N)m^{-3}$		
	Oxygen	-	**8.20**	±0.44	%		

The actual emissions concentrations (EC) from the monitoring undertaken, when converted to 15% oxygen, are less than the emission concentrations modelled, thus a conservative approach has been used. These values are presented in Table 4.4.3.

Table 4.4.3: CHP emissions monitoring data vs modelled data

Parameter	Modelled EC at 15% O_2	Monitored EC at 5% O_2 (May 2020)	Monitored EC at 15% O_2	MCPD
NO_2	186	992	137	190 (after Jan 1st 2030)
CO	519	370	368	N/A

The emissions for nitrogen oxides have been compared to the specified generator emission limit values set out in the Medium Combustion Plant Directive (transposed by Schedule 25A of The Environmental Permitting (England and Wales) (Amendment) Regulations 2018). For biogas engines the standard emission limit value (ELV) for nitrogen oxides is 190mg/Nm^3 at 15% oxygen. When standardised to an oxygen concentration of 15%, the monitored emission concentration of 137mg/Nm^3 in May 2020 shows that this limit is easily achievable by the engine. The CHP emissions were subsequently monitored in August 2021, recording a concentration of 126mg/Nm^3 for nitrogen oxides at 15% oxygen which confirms the engine can meet the required emission limits. It should be noted that the emission concentrations set out in the MCPD do not apply to existing plant until the 1st January 2030.

There are no emission limits specified for carbon monoxide in the Medium Combustion Plant Directive.

There is no requirement to assess the flare emissions which are of short duration, under abnormal operating conditions. The running time of the flare is recorded.

The CHP engine and boiler are serviced in accordance with the manufacturer's recommended frequency. Additional maintenance tasks are undertaken based on UUW's experience of running such plant.

The OCU stack has been included as a point source emission 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 OCU are available. To meet BAT 8 requirements, monitoring of the OCU for hydrogen sulphide and ammonia[3], once every six months, will be introduced. Total volatile organic compounds (TVOC) and HCl will be 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, the 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.

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.

[3] 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 ten proposed wastewater emissions points from the installation (see Section 6.18). Monitoring is proposed over a 12 month period to characterise the wastewater streams in accordance with BAT 3, BAT 6 and BAT 7.

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 location R1 (the point at which the combined centrate effluent streams leave the installation) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance.

Please refer to Section 6.18 for further information on monitoring of wastewater streams.

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 F. This will be finalised on issue of the permit and incorporated into the company's management systems documentation as a controlled document.

4.5. Question 6a: Describe the Basic Measures for Improving how Energy Efficient the Activities Are

The thickening processes themselves are 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.

Renewable electricity and heat are generated by the CHP engine. The CHP provides heat to assist a boiler, which then provides steam to the Thermal Hydrolysis Plant. All of the electricity produced by the CHP facility is used by the installation and the WwTW.

The following measures are used to improve energy efficiency:

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

AD Plant:

- The digester is suitably insulated. The CHP engine is 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.

The power demand for the site is monitored by UUW's energy team.

4.6. Question 6b: Provide a Breakdown of Changes to the Energy the Activities Use and Create

Energy consumption for the WwTW as a whole is monitored and tracked via the site environmental dashboard. The dashboard can provide reports on energy generation and consumption, including CHP performance and anaerobic digestion performance (e.g. information such as digester feed and biogas yield). UUW monitor and record energy consumption at the Burnley WwTW. Power consumption can be tracked on a half hourly, daily and monthly basis.

Table 4.6.1 provides the kW rating for all of the pumps and mixers used for movement and management of the sludge.

Table 4.6.1: Energy Ratings

Asset	Total kW rating
Centrate Anti-Foam Dosing Unit	0.5
No.1 Polymer Dosing Pump	1.5
No.3 Polymer Dosing Pump	1.5
No.2 Polymer Dosing Pump	1.5
DAF Poly Metering Pump	0.06
DAF Poly Dosing Pump No 1	0.75
DAF Poly Dosing Pump No 2	0.75
No.1 Centrate Transfer Pump	5.5
No.2 Centrate Transfer Pump	5.5
DAF Centrate Transfer Pump 1	7.5
DAF Centrate Transfer Pump 2	7.5
No.1 Centrate Return Pump	15
No.2 Centrate Return Pump	15
Dewatering Centrate Return Pump No.1	1
Dewatering Centrate Return Pump No.2	1
DAF Recirculation Pump No. 1	22
DAF Recirculation Pump No. 2	22
Centrifuge Sludge Feed Pump No.1	7.5
Centrifuge Sludge Feed Pump No.2	7.5
Centrifuge Sludge Feed Pump No.3	7.5

Asset	Total kW rating
DAF Feed Pump No.1	22
DAF Feed Pump No.2	22
DAF Sludge Transfer Pump No.1	2.2
DAF Sludge Transfer Pump No. 2	2.2
No1 Potable Water Booster Pump for Poly	2.39
No2 Potable Water Booster Pump for Poly	2.39
No.1 Polymer Dilution Pump	4
No.2 Polymer Dilution Pump	4
No.3 Polymer Dilution Pump	4
No.1 Polymer Transfer Pump	1.5
No.2 Polymer Transfer Pump	1.5
Centrifuge Final Eff. Booster Pump No.1	1.5
Centrifuge Final Eff. Booster Pump No.2	1.5
Polymer Transfer Pump	0.55
Polymer Recirculation Pump	0.55
Polymer Mixing Pump	1.28
Sludge Recirculation Pump No 1	9.2
Sludge Recirculation Pump No 2	9.2
No.1 Sludge Transfer Pump	7.5
No.2 Sludge Transfer Pump	18.5
Strain Press Feed Pump No.1	15
Strain Press Feed Pump No.2	15
Screened Sludge Transfer Pump 1	15
Screened Sludge Transfer Pump 2	23
Polymer Dosing Pump No. 1	9.2
Polymer Dosing Pump No. 2	9.2
Thickener Basement Supernatant	1.5
Thickener Basement Supernatant	1.5
Thickened Centrate Transfer Pump No. 1	9
Thickened Centrate Transfer Pump No. 2	9
Thickened Centrate Return Pump No. 1	11
Thickened Centrate Return Pump No. 2	11
Sludge Thickening Feed Pump No. 1	22

Asset	Total kW rating
Sludge Thickening Feed Pump No. 2	22
Thickened Sludge Transfer Pump No. 1	22
Thickened Sludge Transfer Pump No. 2	22
Digestor 1 Mixing System Chopper Pump	37
No.1 Strained Sludge P/P to Digester Buffer Tank	15
No.2 Strained Sludge P/P to Digester Buffer Tank	15
Thermal Hydrolysis Feed Pump No. 1	7.5
Thermal Hydrolysis Feed Pump No. 2	7.5
Stream 1 Digester Feed Pump	4
No.1 Digested Sludge Transfer Pump To	15
No.2 Digested Sludge Transfer Pump To	15
Digested Sludge Storage Feed Pump No. 1	2.2
Digested Sludge Storage Feed Pump No. 2	2.2
DAF Flocculator	1
Polymer Mixer	1.138
Polymer Mixing Tank Agitator	1
Total	**589.95 kW**

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 11).

4.7. Question 6c: Specific Measures for Improving Energy Efficiency

The thickening processes themselves are 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.

4.8. Question 6d: Raw Materials

The main raw materials used are polyelectrolyte powder and potable water (for polyelectrolyte make up) and diesel to fuel the steam boiler. Details of storage and usage are provided in Table 4.8.1. Copies of the Material Safety Data Sheets (MSDS) for the polyelectrolyte and antifoam are provided in Appendix J. Further information regarding the storage of raw hazardous substances is discussed in Section 6.17 of this document.

Table 4.8.1: Raw Materials

Schedule 1 Activity	Raw Material	Maximum Storage	Annual throughput (tonnes / year)	Description of the use and storage of the raw material including any main hazards (include safety data sheets)
Anaerobic digestion	Polyelectrolyte powder	For sludge thickening (BASF Zetag 8180) - 6 x 750kg bags (4,500 kg) For the dewatering sludges (BASF Zetag 8187) - 6 x 750kg bags (4,500 kg)	Variable, as required	Used to enhance thickening of the sludge Stored in bags within building with sealed drainage. Made up with potable water and stored in above ground tanks, externally (within a concrete bund) and internally (within the dewatering building)
Anaerobic digestion	Antifoaming agents	FloFoam 755 (for THP) – 2 x 1,000 litre IBC's (2,000 litres) FloFoam H16 (Digester) – 2 x 1,000 litre IBC's (2,000 litres)	Variable, as required	Used to prevent/ reduce foaming IBC's stored on bunds situated within sealed site drainage area
Anaerobic digestion	Boiler water treatment	Hydrex 1386 – 25 litres	Variable, as required	Used to add operation of boiler Stored on a bund within boiler house
Anaerobic digestion	Potable water	60m^3	Variable, as required	Used to enhance thickening of the sludge
Anaerobic digestion	Diesel	15,000 litres	474,500 to 600,000 litres	Used to fuel boiler Stored within a bunded steel tank situated within sealed site drainage
Anaerobic digestion	Final effluent	No storage, pumped directly from final effluent channel at WwTW	Variable, upon demand	Used as wash down waters

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 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.

Anti-foaming solution may be required in the TH plant and/or the digester. Its use will be minimised by process monitoring and optimisation.

4.9. Question 6e: Waste

The treatment process produces waste screenings via the strain press. It is essential that these are removed from the sludge in order to attain the required sludge quality. Screenings are currently sent to landfill as there are currently no viable recycling or recovery routes available. During 2020, 24m^3 of screenings were generated for off-site disposal.

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.

Centrate from the centrifuge processes for thickening and dewatering sludge is returned to the head of the wastewater treatment works (after the storm overflow) for full biological treatment.

Periodically it is necessary to remove grit that has accumulated in the Digester, this is disposed of to landfill as there are currently no viable recycling or recovery routes available.

Ancillary waste streams are limited to spent chemical containers and maintenance generated wastes.

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

4.10. Question 7: Installations that include a Combustion Plant

Biogas is combusted in a Jenbacher JMC312GS-B.L engine, having an electrical output of 637KW/h. The thermal input of the engine is 1.6 MW. The CHP provides heat to assist a boiler, which then provides steam to the Thermal Hydrolysis Plant.

The boiler is a dual fuel design and can run on biogas but has only ever been run on gas oil. The biogas feed line is locked off. The thermal input of the boiler is 1.3MW. Table 4.10.1 provides some further information regarding the combustion plant.

Table 4.10.1: Combustion Plant

Equipment	Fuel Type	Specification	Thermal Input
CHP Engine	Biogas	Electrical output - 637KW/hr	1.6 MWth

Equipment	Fuel Type	Specification	Thermal Input
Hot water/Steam Boiler	Gas oil	Flow rate – 3,640kg/hr	1.3 MWth
Flare	Biogas	Flow rate - 362kg/hr	N/A

5. Application Form B6 - Point Source Emission to Water

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

216m^3 (excluding rainfall dependent element)

5.2 Question 3c: What is the maximum rate of discharge?

2.5 litres per second (excluding rainfall dependent element)

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

216m^3

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

Q3b - The main element of the effluent generated is centrate. The maximum combined daily centrate return from the centrifuges, based on design rate is 2.5 l/s.

- Estimated rate of discharge of centrate is 2.5 l/s
- Assuming a constant discharge over 24 hours (2.5 x 60 x 60 x 24)/1,000 = 216m^3/day
- Condensate, boiler blowdown and OCU scrubber water is estimated to be small quantities, no more than 20 litres/day or 0.02m^3/day.

Total therefore: 216m^3/day + 0.02m^3/day = 216.02m^3/day

Q3c - The only effluent is centrate. Maximum daily combined centrate return is approximately 2.5l/s based on design flow rate.

Q3d – As per Q3b

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 Burnley 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 Burnley 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 own effluent?

Wastewaters generated by the sludge treatment process are not subject to pre-treatment. All wastewater emissions are returned to the head of Burnley WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits.

5.8 Question 6b: Treatments carried out on your effluent in the order in which they are carried out

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

5.9 Question 6c: Details of the final effluent discharge quality that the overall treatment system is designed to achieve

The Burnley WwTW meets the limits of its environmental permit discharge consent (ref. 017160005 at NGR SD 8251 3531) – this consent has limits set for BOD, ammoniacal nitrogen, suspended solids, pH, total iron, COD and total phosphorus.

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: Details of how UUW 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; however, on direction from the EA we propose to carry out monitoring for all substances listed within the referenced guidance documents for the wastewater returns from the sludge treatment process that are routed into the WwTW.

Given the expected low variability of the biogas condensate, it is proposed that samples will be taken from one sampling point for characterisation. See Appendix E Figure 3 for the proposed sampling locations.

The wastewater emissions monitoring points are therefore limited to the following:

- W1 - OCU (A4) bioscrubber discharge to site drainage;
- W2 - Thickening centrate discharge to process pipework;
- W3 - Dewatering centrate discharge to process pipework;
- W4 - Cake storage bay discharge to site drainage;
- W5, W6, W7 – Composite sample from biogas condensate catch pots;
- W8 - Steam boiler water discharge;
- R1 - Combined centrate return discharge point;
- R2 - Main site drainage discharge point;
- R3 – Drainage from cake storage bay, dewatering centrifuge building and thickening centrifuge area; and
- R4 – Drainage from OCU and road gulleys.

As Burnley WwTW final effluent discharges into the River Calder, 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'. The total number of parameters, excluding duplicates between the two lists, 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 location R1 (the point at which the combined centrate effluent streams leave the installation) 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 (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 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. wastewater flow, pH, temperature,

conductivity, COD) 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 requirements, monitoring for the following parameters is proposed at emission points W2, W3 and W4 to characterise the centrate and cake storage bay run off at the frequency set out in Table 6.18.2:

- pH;
- Total nitrogen;
- Ammonia;
- Chemical oxygen demand (COD);
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- Benzene, toluene, ethylbenzene, xylene (BTEX);
- Free cyanide;
- Halogens (AOX);
- 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 to the head of the works.

Monitoring for a more limited suite of parameters is proposed to characterise the biogas condensate, OCU wastewater and site drainage/surface run-off at emission points W1, W5 to W7 (composite sample), R2, R3 and R4 as these are smaller volume wastewater streams and/or have less potential for contaminants such as metals to be present. Monitoring for the following parameters is proposed at the frequency set out in Table 6.18.2:

- pH;
- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Ammonia; and
- Oil and grease (visual assessment only)

Monitoring of the steam boiler discharge at emission point W8 is proposed for the following limited suite of parameters, given the small volume of water and low potential for contamination (refer to Table 6.18.2 for frequency):

- pH;
- COD;
- Suspended solids; and
- Oil and grease (visual assessment only)

Where monitoring is proposed, a minimum of 12 samples will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance.

An MCERTS flow monitoring meter is in place on the WwTW final effluent outlet at NGR SD 82810 35304.

Monitoring of the wastewater returns to the head of the works is detailed in Table 6.18.2.

5.14 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.

5.15 Question 8f: Environmental Impact Assessment

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

5.16 Question 9a: What is the national grid reference of the inlet sampling point?

UWWT influent sampling point – SD 82824 35274.

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

Final effluent sampling sample point – SD 82553 35313

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

MCERTS flow monitoring point on final effluent outlet - SD 82810 35304

5.19 Question 9e: Does the flow monitor have an MCERTS certificate?

Yes

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

No

5.21 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 E.

5.22 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 (included at Appendix L). Wherever possible sampling and analysis is accredited to MCERTS by UKAS.

However, it should be noted that only around 10% of the 156 hazardous and priority substances (to be analysed at monitoring location R1) 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 matrix and potentially may not be able to analyse at all.

5.23 Question 10a: Where the effluent discharges to

Not applicable. There are no direct emissions to water from the sludge treatment activities. The wastewater streams are returned to the head of Burnley WwTW for full biological treatment, before being discharged (indirectly) via the WwTW final effluent discharge into the River Calder (Environmental Permit/Consent (01716005)).

6. Technical Description and Operations

6.1. Pre-acceptance, Acceptance and Storage of Waste

The wastewater sludge received for treatment consists of sludges imported from other WwTW and indigenous sludges produced from Burnley WwTW (on-site). 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 Burnley's Site Specific Instruction (SSI) Waste Characterisation and Acceptance Procedure 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.

Sludge treatment is carried out in accordance with Hazard Analysis and Critical Control Points (HACCP) Code of Practice, which ensures that the quality of the sludge produced is suitable for use on agricultural land. A HACCP Plan is maintained as part of the overall site management system and includes the relevant monitoring and sampling requirements, in addition to process validation data. Any treated sludge that is non-HACCP compliant will be sent for further treatment or disposed of off-site in accordance with all relevant Duty of Care requirements.

Imported wastewater sludge arrives at the site via tanker and is pumped into the wet well within the installation boundary. The following sludge acceptance/recording procedures are used at Burnley and similar sludge reception/treatment sites:

- 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 UUW 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 Burnley site. The Technical Assessment will confirm if the proposed import stream is suitable for processing. The Burnley 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 (DS) content 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.
- However, sampling of all 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 block diagram for the sludge treatment process is included at Appendix G.

Burnley WwTW processes three types of sludge:

- Indigenous sludges arising at Burnley 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 to produce heat and electricity. The sludge cake produced is recovered to land.

De-watered digestate cake is carried by a conveyor and deposited in a concrete surfaced and walled storage bay. The cake is transferred onto trucks using an excavator and loading shovel and removed off site for agricultural land spreading. Cake storage amounts vary depending upon production and availability of the land bank for spreading. Sufficient capacity is provided to enable storage to manage these variables.

6.3. Burnley WwTW Sludge

Indigenous sludge from the WwTW is fed from the three primary tanks automatically by three timer-controlled pumps. This is a combination of raw sludge and surplus activated sludge (SAS). The sludge is pumped into a receiving wet well (Photo 1).

Photo 1: Receiving Wet Well

6.4. Tanker Imported Sludge

The unthickened raw sludge import point is located adjacent to the receiving wet well, see Photos 2 and 3. Imported raw sludges are pumped into the wet well via an underground rigid pipe from above ground flexible pipe and bauer coupling.

Photos 2 & 3: Raw Sludge Tanker Import Point

Sludge tanker imports from other wastewater treatment works are also off-loaded and pumped directly into the wet well.

The untreated sludge is then pumped via a rigid steel underground pipe to a 37m^3 capacity unscreened sludge buffer tank, see Photo 4. This uncovered tank is included in the IED BAT Improvement Programme found in Attachment 4.

Photo 4: Unscreened Sludge Buffer Tank

Unscreened sludge is pumped to the sludge screen (Photo 5). The screening plant comprises two Huber Strainpress units, operating on a duty/stand-by basis. A Strainpress is a horizontal, cylindrical coarse material separator comprising a screening zone, press zone and a discharge section (Photo 6). Coarse material retained on the cylindrical screen is removed by a coaxial screw and pushed into the press zone where the material is compacted and dewatered. The system does not use water as backwash is not necessary. The separated solids are deposited in skips beneath the Strainpresses. The solids skips are housed in a steel-clad enclosure fitted with a roller shutter door, which is kept shut except when the skip requires removing and replacing.

Photos 5 & 6: Sludge Screen Press

6.5. Thickening Centrifuges

From the strainpress units, screened sludge is pumped via a small buffer tank (Photo 7) into the Screened Sludge Tank (Photo 8).


Photos 7 & 8: Buffer storage tank and Screened Sludge Tank

From the screened sludge tank the sludge passes through macerators to two centrifuges to be thickened. The centrifuges are sealed units housed in individual steel enclosures (Photo 9). Polyelectrolyte is automatically dosed into the centrifuges to enhance the sludge thickening process.

Photo 9: Thickening centrifuges and polyelectrolyte dosing system

6.6. Poly-dosing System

Polyelectrolyte powder for sludge thickening and dewatering is stored in 700kg bags. The powder is made up with potable water in the polymer make up tanks and automatically dosed into the centrifuges. The make-up tanks are housed within the centrifuge buildings.

6.7. Thickened Sludge & Thickened Centrate

The thickened sludge from the centrifuges is pumped via a buffer tank (Photo 10) into the thickened sludge silo (Photo 11). Centrate from the thickening centrifuges is transferred into the thickening centrate

collection tank (Photo 12). This tank then controls the return of centrate to the main UWWT works flow for full treatment.

Photo 10: Thickened Sludge Buffer Tank

Photo 11: Thickened Sludge Silo

Photo 12: Thickening Centrate Collection Tank

6.8. Thermal Hydrolysis Plant

Sludge from the silo is fed into a thermal hydrolysis plant (THP) at around 16-18% dry solids (Photo 13). The THP is housed in a dedicated building and comprises a pulper, four reactors and a flash tank. The TH process sterilises the sludge and reduces its viscosity (by breaking down gelatinous cell structures). The process operates at high temperatures and pressure. Steam and heat are provided by a dedicated steam boiler and the CHP engine.

The pulper has the role to homogenise and pre-heat the sludge to a temperature close to 100°C, using steam recovered from the flash tank. From the pulper, the warm sludge is fed continuously to the reactors, in a sequential process that ensures sealed batches of sludge in each reactor. Once a reactor fills up, sludge flows to the next available one. There are four reactor vessels. When the reactor is full and sealed, steam is pumped to raise the temperature to 160 to 180°C at a pressure of about 6 bars. The thermal hydrolysis process is typically set at 30 minutes for each batch, to ensure pathogen kill.

From the final reactor, the now sterilised and hydrolysed sludge is passed to the flash tank, which operates at atmospheric pressure. The sudden pressure drop leads to substantial cell wall destruction of the organic matter in the sludge. The steam generated by the pressure release is returned to the pulper to preheat the incoming sludge. The flash tank is protected from over pressurisation by a bursting disk.

Leaving the flash tank, the sludge is diluted and cooled by the addition of UV treated final effluent water and use of a heat exchanger.

Photo 13: THP

6.9. Anaerobic Digestion

Cooled sludge is batch fed into the digester (Photo 14) at between 2.5 and 6.5m^3/hr. The feed is controlled by actuated valves but can be manually overridden. The digester is a concrete fixed roof tank with a capacity of 2,250m^3.

The digestion process operates under mesophilic conditions, with an optimum temperature range of 40-42^{o}C. The retention time of sludge in the digester is approximately 14 - 20 days. Two temperature probes are fitted to the digester, displaying operating temperatures on the SCADA in the Control Room. The digester operates at 15mBar pressure. Gas pressure in the tank is continually monitored and displayed on

the SCADA. If temperature or pressure levels are out of range, these will display on the control screen. The digester is mixed via an externally fitted chopper/mixer pump.

The digester is provided with overfill protection. An overfill limit stops all pumping if the maximum feed capacity has been pumped into the digester in a 24-hour period. Level indicators connected to a PLC allow tank levels to be monitored on the SCADA. High level alarms are displayed on the control screen.
Sludge can be drawn off from the digester and re-circulated via the TH plant.

In the event of an overtopping or foaming event, the digester can be dosed with antifoam as required to inhibit foam generation. This can be dosed with 1 litre per hour but can vary depending on need (Photo 15).
There is a second digester at the site which is not used and is isolated. This has not been used since the construction of the TH plant. There are no plans to bring this digester back into use.

Biogas generated in the digester is drawn off directly to the CHP engine for combustion. When gas production exceeds the CHP gas consumption, excess biogas is diverted to the biogas storage tank (gas holder). There are two safety pressure vacuum relief valves on the roof of the digester tank, which will operate automatically if a set pressure is exceeded. See Section 6.13 for further details.


Photo 14: Anaerobic Digester


Photo 15: antifoaming agent

6.10. Biogas and Digestate

From the digester, the digested sludge is pumped into a de-gassing tank (Photo 16). The purpose of the de-gassing tank is to blow compressed air into the sludge to cease the anaerobic biogas production. The de-gassing tank vents are connected to an odour control unit (see Section 7.1). The tank is protected from over pressurisation by a bursting disk. From the de-gassing tank, the digested sludge is passed into one of two digested sludge holding tanks (Photo 17) (only one tank is in operation at any given time. As and when

one is required for cleaning and maintenance, the alternate tank is brought back online to allow work on the other tank).

Photo 16: De-gas tank adjacent to Digester

Photo 17: Digested sludge tank

6.11. Dewatering Centrifuges

Following storage in one of the digested sludge tanks, the sludge is fed through a final de-watering process. This is undertaken in a dedicated building (Photo 18) and comprises three macerators, three dewatering centrifuges and a polyelectrolyte make up system.

Liquid separated by the centrifuge process (centrate) may be passed through a dissolved air flotation (DAF) unit (Photo 19) for solids removal. Separated solids are pumped to the digested sludge storage tanks. Treated centrate from the DAF unit is gravity fed to a collection tank and then pumped to the centrate storage tank. The DAF unit can be by-passed with the centrate being pumped directly into the storage tank.

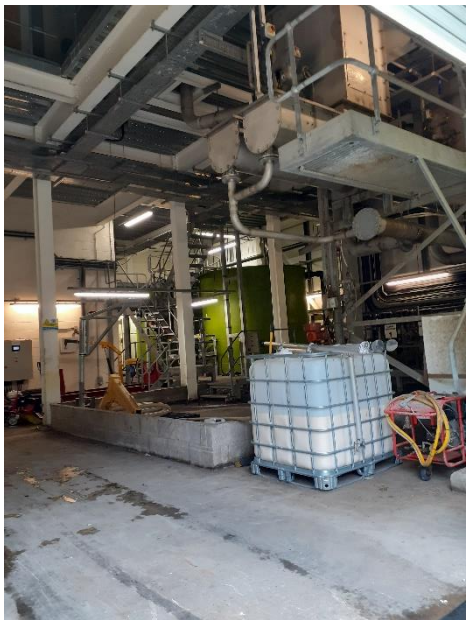


Photo 18: Dewatering Centrifuge Building

Photo 19: DAF Plant

Centrate discharged from the centrifuges is discharged into the dewatering centrate buffer tank (Photo 20) outside the building. The liquor is returned to the inlet (Photo 21) of the WwTW, downstream of the storm tanks. Centrate is returned to the WwTW inlet at a rate of 0.5 litres per second. The design maximum is 2.5 litres per second.

Photo 20: Dewatering Centrate Buffer Tank

Photo 21: Liquor Return to inlet

6.12. Pressure Vacuum Relief Valves (PVRVs)

PVRV's are installed on the primary digester and the gas holder. PVRVs are calibrated, serviced and installed by a trusted competent/specialist contractor. 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 Burnley WwTW are set to operate on the digester at 29mb (300mm H_2O) and on the gas holder, as per the design criteria. Vacuum relief for both the gas holder and digester PVRVs are set to operate at -50 mm H_2O.

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 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 foaming in the digester, 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 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.

6.13. Biogas System

Biogas generated in the digester is drawn off directly to the biogas storage tank (gas holder) (Photo 23). This is a floating roof tank with a storage capacity of 900m^3. The biogas pressure and levels within the gas holder are transmitted to a PLC and displayed on the SCADA. Biogas quality (methane, carbon dioxide and hydrogen sulphide) from the digesters and gas holder are also continuously monitored and displayed on the site SCADA system. There is a pressure vacuum relief valve on the roof of the gas holder tank.

Biogas is drawn off from the tank and passed through one of two carbon filters to remove siloxanes and other VOCs prior to flow to the CHP engine. When biogas containing siloxanes is combusted, deposits of solid silicon dioxide form which can damage the engine, causing more frequent maintenance and lower

generation capacity. Prior to the carbon filters, the biogas passes through a dehumidifier to remove moisture. Gas condensate is discharged to drain and returned to the WwTW for treatment.

Biogas is combusted in a 637KW/h CHP engine. Electricity generated is used to power the process and any excess power may be exported to the grid. The CHP combustion emissions are discharged to the atmosphere via a single stack, emission point A1. There are two heat exchangers associated with the CHP engine. Heated water from the CHP is directed to the steam boiler, with its stack being emission point A2. The gas oil boiler has an annual consumption of fuel oil between 474,500 to 600,000 litres.

If excess biogas is generated or the CHP is not operational (due to maintenance or breakdowns), biogas is automatically diverted to the flare. This is an enclosed, ground gas flare designed, constructed and installed by a specialist contractor in accordance with UU 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. (Additionally, the asset standard includes a requirement to meet the relevant IGEM standards and British Standards to ensure all component parts are adequately heat resistant and designed to a modern standard to minimise noise emissions.

Emissions from the flare are released to the atmosphere (emission point A3) (Photo 22). The flare achieves 1,000^{o}C with 0.3 seconds retention time at this temperature. Biogas flow and quality (methane, carbon dioxide and hydrogen sulphide) from the CHP engine stacks and flare are continuously monitored and displayed on the site SCADA system. The biogas mapping range for CHP operation before the flare is operated is 50% – 70% CH_4 quality.

There are set levels for flaring and CHP biogas feed. When the gas holder reaches 80% this triggers flaring at a flow rate of 328m^3/h. CHP operation is enabled when the gas holder level is 50% and stop level is 30%.

Photo 22: Biogas Flare

Photo 23: Biogas Storage Tank

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 6.12) or leaks in gas pipework e.g. around flanges. LAR 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 digester, gas holder, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis.

6.14. Process Controls

The thermal hydrolysis and anaerobic digestion process are fully automated with key process parameters including flow rates, temperature and pressure continually monitored and displayed on the plant SCADA. The anaerobic digestion process operates within the following process parameters:

- Average retention time - 15 days
- Minimum retention time – 12 days
- Average feed rate - 100m^3/day (2.5-6.5m^3/hr)
- Temperature (range) - 32-38^oC
- Volatile acids - 450-750mg/l, average 600mg/l
- VFA/Alkalinity ratio – 0.3-0.5
- Alkalinity - 6,000-10,000mg/l, average 8,500-9,000mg/l
- Solids – in 10-11%, out 5.5-6.5%
- pH range - 7.8-8.3
- Gas production – 4,500-6,000 m^3/day
- Gas quality - CH_4 –60%, SO_2 – 5-30ppm, CO_2-37%

Process information on gas levels, tank levels, gas quality and temperature are continuously monitored and displayed on the SCADA system 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.

A daily visual tour is also undertaken of the process, including a visual check for foaming in the Digester.

The monitoring of digester key process parameters and biogas key process parameters is summarised in Table 6.14.1.

Table 6.14.1: Summary of Process Monitoring

Parameter	Frequency of measurement	Point of measurement	System of measurement
pH (sludge)	Weekly	Sample taken (digester feed)	Lab analysis
Alkalinity	Weekly	Sample taken (digester feed)	Lab analysis
Temperature - Digester	Continuous	Temperature probe within digester	SCADA
Temperature – Thermal Hydrolysis Plant	Continuous	Temperature probes within reactors	SCADA
Volatile fatty acids concentration	Weekly	Sample taken (digester)	Lab analysis
Ammonia	Monthly	Sample taken (digester)	Lab analysis
Hydraulic loading rate	Continuous/ daily throughout	Digester feed	SCADA
Organic loading rate	Monthly	Calculation from lab analysis and SCADA data	Calculation from lab analysis and SCADA data
Liquid foam levels	Continuous	Level probe	SCADA
Flow	Continuous	Flow meter	SCADA
Methane	Continuous	Gas meter	SCADA
Carbon dioxide	Continuous	Gas meter	SCADA
Oxygen	Continuous	Gas meter	SCADA
Hydrogen sulphide	Continuous	H2S analyser	SCADA
Pressure	Continuous	Pressure transducer	SCADA

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. Digester feed rates are defined in the HACCP Plan and will be maintained unless process control monitoring identifies any problems indicative of a reduction in active volume. If monitoring indicates operational parameters (i.e. digested sludge composition and digester temperatures) are close to compliance limits (as per the HACCP Plan) then digester feeds will be reduced accordingly and appropriate maintenance actions will be taken.

The HACCP sets out the process to be taken in the event of a breach of a critical control point (CCP). Site specific corrective actions are set out below.

Local Action Plan Assumption 1: Failure to Meet Critical Control Point Parameter (HACCP) (Hazard analysis critical control point)

Thermal Hydrolysis Plant:

- Check that Thermal Hydrolysis Plant was operational, interrogate SCADA trends at the time of sampling.
- Check that digestion retention time is 12 days or greater based of digester feed flow calculation.
- Stop all sludge cake movements from site by informing the Recycling Controller or the Biosolids Technical Officer.
- Inform Area Production Manager, Production Manager and Production Engineer.

Local Action Plan Assumption 2: Failure to meet six Log Kill or, a Maximum Allowable Concentration (MAC) of 1,000 E. coli/gram dry solids and be free from Salmonella spp before Disposal to Land

Sludge Disposal/Sludge Management:

- Stop all sludge cake movements from site by informing the Recycling Controller or the Biosolids Technical Officer.
- Inform Area Production Manager and Production Manager.
- Sample sludge cake and send for analysis until it becomes compliant.
- Segregate the cake by placing it into daily piles and send daily samples for analysis.
- Ensure Thermal Hydrolysis Plant is HACCP compliant (temperature, retention) (follow assumption 1).
- Check that Digestion retention time is 12 days or greater.

Several Site Specific Instructions (SSI) (such as Digester High Pressure WwP/I/3017/15/13, Digestion and Biogas Emergency Plan WwP/I/3017/01/16 and the Process Loss Contingency Plan WwP/I/3017/30/01) 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.

6.15. Containment and Drainage

All above ground and below ground tanks and pipework related to the sludge treatment process[4] are constructed of suitable materials, in accordance with UUW asset standards, to ensure longevity and minimise the risks of failure/leaks.

The sludge storage/treatment tanks, their construction details and capacity are summarised in are summarised in Table 6.15.1. The layout of operational tanks at the site is shown in Appendix E.

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

Table 6.15.1: Sludge Process Tank Construction and Capacities

Tank Name	Construction	Tank Emplacement	Year of Installation	Tank Capacity m^3
Raw sludge wet well	Concrete	Mostly below ground. Enclosed	Not confirmed	140
Unscreened sludge buffer tank	Glass-fused-to-steel	Above ground. Open	Not confirmed	37
Screened sludge buffer tank	Steel	Above ground. Enclosed	Not confirmed	10
Screened Sludge Tank	Former secondary digester, reinforced concrete	Above ground. Enclosed	refurbished in 2015	2,500
Thickening Centrate Collection Tank	Plastic	Above ground. Enclosed	Not confirmed	8.2
Thickened Sludge Buffer Tank	Glass-fused-to-steel	Above ground. Enclosed	Not confirmed	200
Thickened sludge silo	Glass-fused-to-steel, cylindrical, top fed	Above ground. Enclosed	2015	353
TH Pulper Tank	Stainless steel	Above ground. Enclosed	2015	4
TH Reactor Tank 1	Stainless steel	Above ground. Enclosed	2015	2
TH Reactor Tank 2	Stainless steel	Above ground. Enclosed	2015	2
TH Reactor Tank 3	Stainless steel	Above ground. Enclosed	2015	2
TH Reactor Tank 4	Stainless steel	Above ground. Enclosed	2015	2
TH Flash Tank	Stainless steel	Above ground. Enclosed	2015	4
Digester Tank	Reinforced concrete	Above ground. Enclosed	refurbished in 2015	2,025
Degassing Tank	GRP	Above ground. Enclosed	2015	46
Digested Sludge Tank No.1	Glass-fused-to-steel	Above ground. Enclosed	Not confirmed	763
Digested Sludge Tank No.2	Glass-fused-to-steel	Above ground. Enclosed	Not confirmed	763
Dewatering centrate DAF unit (not currently operational)	Stainless steel	Above ground. Enclosed	Not confirmed	(48)
Treated centrate tank	Glass-fused-to-steel tank	Above ground. Enclosed	Not confirmed	2.5
Dewatering Centrate Buffer Tank	Glass-fused-to-steel tank	Above ground. Enclosed	Not confirmed	217
Total				**Approx. 7,128**

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. A site surfacing plan of the current surfacing arrangements is provided at Appendix K.

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 Burnley 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 736. The proposed mitigation measures to be installed and timescales for installation are detailed in the Burnley BAT Improvement Programme document (Attachment 4) submitted with this application. 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 existing site drainage and any new connections associated with the sacrificial areas within the permit boundary will include locations for isolation (or multiple points of isolation) of the system in the event of a catastrophic failure. The location and full solution will be determined during detailed design and will follow the principles identified in Section 11.2.1 and Figure 11.1 of CIRIA 736 guidance.

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 I.

6.16. Monitoring and Maintenance Plan

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.

6.17. Storage of Hazardous Substance Risk Assessment

Raw hazardous substances are used and stored at the site. Table 6.17.1 sets out the risk assessment of hazardous substances for Burnley WwTW.

Table 6.17.1: 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) used as fuel supply for THP	Yes	15,000 litres	Stored in a double skinned steel fabricated 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
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
Note: Polyelectrolyte (Zetag 8180 and Zetag 8187), Hydrex 1268 (for the boiler treatment) and anti-foam were assessed and determined to be non-hazardous substances.				

6.18. 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 E.

Table 6.18.1 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 engine 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 boiler periodically releases blowdown water into the surface water drainage system for return to the WwTW for full treatment. Boiler blowdown is discharged directly

into a surface water drain. 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 thickening and dewatering 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 445mg/l. Centrate is returned to the WwTW in dedicated pipework at a controlled rate of approximately 2 litres per second for full biological treatment.
- Cake storage bay - digested sludge is stored in a concrete surfaced cake storage 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 as part of the site's containment strategy.
- Odour control unit biofilter system - final effluent is required to irrigate the biological filter beds. A small quantity of wastewater is routinely generated that is discharged to drain for return to the head of the WwTW for full biological treatment.

Waste gas streams at the site consist of:

- Biogas combustion exhaust (from the CHP engine stack 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 boiler) - the boiler is fuelled by fuel oil and as such the emissions will principally comprise carbon monoxide and oxides of nitrogen and sulphur.
- 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 6.12. Biogas composition is monitored continuously for methane and hydrogen sulphide.
- Treated foul air (from the odour abatement plant) – hydrogen sulphide and ammonia readings are used to characterise emissions from the OCU.

Table 6.18.1: Inventory of Wastewater and Waste Gas Streams

Nature	Source	Typical Composition	Variability	Control Measures
Gaseous Streams				
Biogas combustion	CHP engine stack (A1)	Combustion products: NO_2 – 137mg/m^3 CO – 368mg/m^3 VOCs SO_2	*NO_2 137 - 186mg/m^3 *CO 368 - 519mg/m^3 PM10 - <2.7mg/m^3 Total VOCs <371mg/m^3 SO_2 <130mg/m^3	Annual emissions monitoring. CHP maintenance in accordance with engine manufacturers recommended frequency.

Nature	Source	Typical Composition	Variability	Control Measures
			*Range is the measured concentration to the ELV in 'Guidance for monitoring landfill gas engine emissions' (EA, 2010)	Biogas is passed through a carbon filter unit to remove siloxanes and other VOCs prior to flow to the CHP engine.
Fuel Oil combustion	Steam boiler stack (A2)	Combustion products: NO_2, CO, SO_2, particulates Emissions not tested	*NO_2 – <200mg/m^3 **CO – <150mg/m^3 PM_{10} - <50mg/m^3 SO_2 – <130mg/m^3 * MCPD limit for NOx ** ELV from Process Guidance Note 1/3,'Statutory Guidance for Boilers and Furnaces 20-50MW thermal input'	Boiler maintenance in accordance with engine manufacturers recommended frequency. Use of low sulphur gas oil.
Biogas combustion	Flare stack (A3)	Combustion products: NO_x, CO, VOCs Emissions not tested	*NO_x <150mg/m^3 *CO <50mg/m^3 *Total VOCs <10mg/m^3 * 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. Inspected annually, including mechanical and safety systems.
Biogas	Digester PVRVs (A5 & A6)	CH_4 60%, SO_2 5-30ppm, CO_2 37% H_2S - <1,500 ppb NH_4 < 30 mg/Nm^3 Total siloxanes 50 - 400 mg/Nm^3	CH_4 60 – 65%	Inspected and calibrated on a periodic basis to ensure they are operating at the correct set points. Gas quality (CH_4) and flow rate are continuously monitored and displayed on the SCADA system. DSEAR zoning.
Biogas	Gas Holder PVRV (A7)	CH_4 60%, SO_2 5-30ppm, CO_2 37% H_2S - <1,500 ppb NH_4 < 30 mg/Nm^3 Total siloxanes 50 - 400 mg/Nm^3	CH_4 60 – 65%	Inspected and calibrated on a periodic basis to ensure it is operating at the correct set points. Gas quality (CH_4) and flow rate are continuously monitored and displayed on the SCADA system. DSEAR zoning.

Nature	Source	Typical Composition	Variability	Control Measures
Foul air	Odour Control Unit (A4)	H_2S, NH_4, VOCs H_2S - <1,500 ppb	H_2S - <1,500 ppb	Monitored using a telemetry system, which alarms on fault readings that are out of range. The following parameters are monitored continuously: • Influent air – H_2S • Discharge stack - H_2S • Biofilter 1 and 2 - differential pressure • Carbon filter differential pressure Escalation trigger point for H_2S emissions is 50 ppb. Routine operation checks and maintenance to ensure the tank and OCU is functioning as per design.
Liquid Streams				
Gas condensate	Gas de-humidifier on the biogas treatment system	Mildly acidic, organic content No testing available	Not known	None required – process controls in place for biogas quality.
Gas condensate	Condensate pots on the biogas lines (W5, W6 & W7)	Mildly acidic, organic content No testing available	Not known	None required – process controls in place for biogas quality.
Blowdown water	Steam boiler (W8)	Mildly alkaline COD, dissolved solids	Not known	Daily testing for conductivity, pH, sulphite, alkalinity, chloride, polymer and hardness (raw, softened, feed water).
Wastewater	Odour control unit biological scrubber (W1)	Mildly acidic COD, BOD, NH_4 No testing available	pH 5.5 to 6.5	The discharge to drain is tested monthly for pH. All readings are recorded on the daily log sheet.
Centrate	Thickening and Dewatering centrifuges (W2 & W3)	COD, BOD, NH_4, N, P, K suspended solids pH – 8.9	pH – 8.7 - 9.1 NH_4 – 25- 2,300mg/l COD – 1,400 – 3,270mg/l	Centrate is returned to the WwTW at a controlled rate of approximately 2 litres per second. The centrate is sampled and tested on a

Nature	Source	Typical Composition	Variability	Control Measures
		NH_4 – 1,080mg/l COD – 2,120mg/l BOD – 445mg/l Nitrate – 3.2mg/l Phosphate – 18.5mg/l	BOD – 135 - 950mg/l Nitrate – 0.01 – 8.3mg/l Phosphate – 3 – 49mg/l	weekly basis to ensure that the flow rate is appropriate and adjusted if required. The main parameter that requires control is the loading of ammonia to the works.
Cake bay pad leachate	Digested sludge cake	COD, BOD, NH_3 No testing available	Not known	Quality controls for digested sludge. Run-off directed to surface water drainage for return to head of works for treatment.
Surface water	Site drainage	COD, BOD, NH_3 No testing available	Not known	Emergency and Spill Response Procedures to control any unplanned discharges to the drainage system.

Table 6.18.2 summarises the emission points sources to air and water, associated monitoring points and the 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 boiler 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 Burnley WwTW final effluent discharges into the River Calder, 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'. 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 location R1 (the point at which the combined centrate effluent streams leave the installation) 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 (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 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. 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.

Based on the BAT requirements, monitoring for the following parameters is proposed at emission points W2, W3 and W4 to characterise the centrate and cake storage bay run off at the frequency set out in Table 6.18.2:

- pH;
- Total nitrogen;
- Ammonia;
- Chemical oxygen demand (COD);
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- Benzene, toluene, ethylbenzene, xylene (BTEX);
- Free cyanide;
- Halogens (AOX);
- 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 to the head of the works.

Monitoring for a more limited suite of parameters is proposed to characterise the biogas condensate, OCU wastewater and site drainage/surface run-off at emission points W1, W5 to W7 (composite sample), R2, R3 and R4 as these are smaller volume wastewater streams and/or have less potential for contaminants such as metals to be present. Monitoring for the following parameters is proposed at the frequency set out in Table 6.18.2:

- pH;
- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Ammonia; and
- Oil and grease (visual assessment only).

Monitoring of the steam boiler discharge at emission point W8 is proposed for the following limited suite of parameters, given the small volume of water and low potential for contamination (refer to Table 6.18.2 for frequency):

- pH;
- COD;
- Suspended solids; and
- Oil and grease (visual assessment only).

Where monitoring is proposed, a minimum of 12 samples will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance.

Table 6.18.2: Emission Point Sources & Monitoring

Location or description	Grid Reference	Proposed Monitoring	Monitoring standard or method	Other specifications/ Information
Gaseous Emissions				
CHP engine (A1)	SD 82712 35280	Oxides of nitrogen Carbon monoxide Total VOCs Sulphur dioxide	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526 BS EN 14791 or CEN TS 17021 or by calculation based on fuel sulphur	Annually

Location or description	Grid Reference	Proposed Monitoring	Monitoring standard or method	Other specifications/ Information
Boiler (A2)	SD 82712 25295	Oxides of nitrogen	BS EN 14792	Annually
Flare (A3)	SD 82741 35224	Oxides of nitrogen Carbon Monoxide Total VOCs	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526	Running time monitored; emissions only tested in the event that running time exceeds more than 10% of operational hours
OCU (A4)	SD 82740 35209	Ammonia Hydrogen Sulphide	EN SIO 21877 CEN TA 13649 for sampling and NIOSH 6013 for analysis	Monthly
		Odour concentration	EN 13725	2 rounds of monitoring
		Total volatile organic compounds (TVOC) HCl	EN 12619 EN 1911	1 round of monitoring
Bioaerosol Monitoring	One upwind and 3 downwind locations * The monitoring locations are as shown in the Burnley Bioaerosol Risk Assessment; however, should wind conditions be different on the day of sampling the monitoring locations may vary.	Total mesophilic bacteria Aspergillus fumigatus	In accordance with Technical Guidance Note M9 – Environmental monitoring of bioaerosols at regulated facilities.	1 round of monitoring
Liquid Emissions				
Wastewater Monitoring	R1 - Combined centrate return discharge point (SD 82814 35308)	156 hazardous and priority substances as per separate list.	MCERTS or UKAS where possible – please refer to Section 6.18 text for further information	Monthly for 12 months

Location or description	Grid Reference	Proposed Monitoring	Monitoring standard or method	Other specifications/ Information
Wastewater Monitoring	W2 – Thickening centrate (SD 82658 35273) W3 – Dewatering centrate (SD 82776 35209) W4 - Leachate and surface water (SD 82792 35217)	pH Total nitrogen COD Total phosphorous Suspended solids Ammonia Hydrocarbon oil index BTEX Free cyanide Halogens (AOX); Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Mn) Mercury Hexavalent chromium(VI)) PFOS and PFOA	MCERTS MCERTS MCERTS MCERTS MCERTS Accredited by flexible scope to MCERTS EN ISO 9377-2 EN ISO 15680 EN ISO 14403-1 or EN ISO 14403-2 EN ISO 9562 EN ISO 11885, EN ISO 17294-2 or EN ISO 15586 EN ISO 17852 or EN ISO 12846 EN ISO 10304-3 or EN ISO 23913 -	Monthly for 12 months
Wastewater Monitoring	W1 - Bio-scrubber water (SD 82746 35296) W5, W6 & W7 - Biogas condensate (sample from each catch pot to form composite) R2 - Surface water (SD 82688 35258) R3 – Leachate and surface water (SD 82817 35297) R4 - Bio-scrubber water and surface water (SD 82817 35287)	pH Total nitrogen COD Total phosphorous Suspended solids Ammonia Oil and grease	MCERTS MCERTS MCERTS MCERTS MCERTS Accredited by flexible scope to MCERTS Visual assessment only	Monthly for 12 months

Location or description	Grid Reference	Proposed Monitoring	Monitoring standard or method	Other specifications/ Information
Wastewater Monitoring	W8 – Boiler blowdown (SD 82726 35297)	pH COD Suspended solids Oil and grease (visual only)	MCERTS MCERTS MCERTS Visual assessment only	Monthly for 12 months

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. 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).

However, it should be noted that only around 10% of the 156 hazardous and priority substances (to be analysed at monitoring location R1) 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 matrix and potentially may not be able to analyse at all.

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 stack.

7. Odour Control System

7.1. Odour Abatement

There is one odour control unit (OCU) which serves the following tanks and sludge treatment assets:

- Sludge screen press enclosure;
- Screened sludge tank;
- Thickening centrifuges;
- Thickened sludge silo;
- Degassing tank;
- Digested sludge tanks;
- Dewatering building (centrifuges/conveyors);
- Dewatering centrate buffer tank;
- DAF tank (not currently operational); and
- Treated centrate tank (not currently operational).

These connections are shown on the process flow diagram in Appendix G.

The OCU comprises two stages of treatment; two dual bed trickling biofilters operating in parallel followed by an activated carbon adsorption. The first stage biofilters are predominately designed for ammonia, and hydrogen sulphide removal, but are expected to remove approximately 50% of incoming VOCs. Each biofilter has two different layers of media comprising of pumice stone followed by coir fibre. The filter media is wetted with final effluent to maintain biological activity. Spent effluent is discharged to the site's drainage system. The final stage of treatment (adsorption) uses copper impregnated carbon to treat residual sulphide odours as well as VOCs. A dehumidifier (heater unit) is fitted prior to the carbon to enhance the units performance with regard to VOC removal. Treated air discharges via a stack (emission point A4).

The site has an Odour Management Plan. A copy is included with this application (see Attachment 5). This provides details of the odour monitoring carried out at the installation.

The design operating parameters and odour removal efficiencies for the OCU at Burnley 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 (included with this application). The dispersion model included the site layout buildings and infrastructure (as appropriate).

For the modelling exercise, emissions of odour from the on-site OCU 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).

The results, as shown in Table 7.1.1, indicate that the maximum predicted 1-hour mean (98th percentile) odour concentration at the assessed sensitive receptors is less than 0.1 ouE/m^3, which is significantly below the 1.5 ouE/m^3 benchmark.

Table 7.1.1: OCU Operating Parameters and Emission Rates

Emission point	Source	Stack height (m)	Effective stack diameter (m)[1]	Efflux velocity (m/s)	Design air flow rate (m^3/s)	Odour conc. (ou_E/m^3)	Odour release rate (ou_E/s)
A4	Site OCU	15.00	0.39	13.95	1.667	1,000	1666.7

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

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

Photo 24: Odour control unit biofilters and stack

7.2. Odour Monitoring and Management

The odour control unit is monitored using a telemetry system, which allows plant operations personnel to be notified by alarm of faults or readings that are out of range. The following parameters are monitored continuously:

- Influent air – hydrogen sulphide;
- Discharge stack - hydrogen sulphide;

- Biofilter 1 - outlet to drain conductivity;
- Biofilter 2 - outlet to drain pH;
- Biofilter 1 and 2 - differential pressure; and
- Carbon filter differential pressure

The escalation trigger point for hydrogen sulphide emissions is 1,500 ppb.

Site staff also carry out daily checks and inspections of the OCU. This includes but is not limited to checking:

- All monitors are within their ranges;
- The SCADA for indicated faults;
- The OCU fans for excess vibration or heating;
- The bed pressures across the carbon filter bed via the pressure/transmitter; and
- The inlet final effluent conductivity and log.

Odour monitoring will be undertaken on the OCU stack, as detailed in Table 6.18.2. Suitable measurement ports will be provided to allow access and monitoring of the OCU stack. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory.

8. Application Form F1 Charges

The application charges consist of:

- New application for an installation - Charge A 1.16.2.1 Non-hazardous waste installation - biological treatment for recovery;
- Habitats assessment - Charge B 1.19.2;
- Bioaerosol Risk Assessment – Charge B 1.19.5; and
- Odour management plan - Charge B 1.19.6.

The total application fee is therefore £17,250.

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).* UUW operates the site under a fully certified ISO14001 management system. A copy of the ISO14001 certificate is provided in Appendix B and a management systems summary is provided in Appendix C. 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. • *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 Burnley 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. Burnley'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. Sludge treatment is carried out in accordance with Hazard Analysis and Critical Control Points (HACCP) Code of Practice, which ensures that the quality of the sludge produced is suitable for use on agricultural land. A HACCP Plan is maintained as part of the overall site management system and includes the relevant monitoring and sampling requirements, in addition to process validation data. Any treated sludge with is non-HACCP compliant will be sent for further treatment or disposed of off-site in accordance with all relevant Duty of Care requirements.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		• *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 a wet well. Imported sludge from other UUW WwTW sites arrives at the site via road tanker and is pumped from the tanker off-loading point into the wet well. • *Set up and implement a waste tracking system and inventory* - refer to BAT 5 for imported sludge. United Utilities Bioresources monitors and tracks all movements of UUW sludges between wastewater treatment works. Movement of sewage sludge is planned and managed via PODFather. • *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. • *Ensure waste segregation* – not applicable, 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. • *Ensure waste compatibility prior to mixing or blending of waste* - not applicable, only one waste stream is treated at the installation. • *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.* Please see Section 6.18 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 E. Routine operation checks and maintenance are undertaken on all relevant assets. The sites discharge consent limits are being met. A process flow diagram is available at Appendix G. 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 the hazardous and priority substances for fresh waters 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 location R1 (the point at which the combined centrate effluent streams

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		leave the installation 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 (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 matrix and potentially may not be able to analyse at all.
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.* 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 only open storage of waste is the unscreened sludge buffer tank, screening solids arising from the Strainpress and digestate cake. The screenings skip is housed in a building with a roller shutter door to reduce the risk of pests (birds and rats). A Pest Control contractor provides pest control services for the site. See Attachment 4 – Burnley IED BAT Improvement Programme for details on BAT equivalent proposals on the unscreened sludge buffer tank.
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.* Indigenous sludge is piped directly from the primary settlement tanks to a to a wet well within the installation. Imported sludge from other UUW WwTW arrives at the site via tanker. 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. 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

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		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	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 treatment, before being discharged (indirectly) via the WwTW final effluent discharge into the River Calder 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 the River Calder (NGR SD 82513531). Monitoring of wastewater streams is proposed as detailed in BAT 7 below and Section 6.18 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 4.4.1 (Emissions Monitoring), Table 6.18.2 (Emission Point Sources) and Section 6.18 of this document. Where monitoring is proposed, a minimum of 12 samples will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance. Flow meters are installed to record the flow of centrate to the head of the works.
BAT 8.	Emissions to air	*BAT is to monitor channelled emissions to air from physio-chemical treatment processes with at least the frequency given below, and in accordance with EN standards:* • *Dust – once every six months* • *NH_3 - once every six months* *For biological treatment processes BAT is to monitor channelled emissions to air with at least the frequency given below:* • *H_2S – once every six months* • *NH_3 - once every six months* • *Odour concentration – once every six months* The channelled emissions to air i.e. point source emissions are shown on the plan at Appendix E. The only channelled emissions to air from the treatment process, relevant to this BAT requirement, are from the odour control unit (OCU) stack and the pressure vacuum relief valves (PVRVs). 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.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		The discharge stack for the OCU is monitored continuously for hydrogen sulphide. However, spot testing for hydrogen sulphide and ammonia to MCERTS standards will be introduced once every six months. Total volatile organic compounds (TVOC) and HCl will be 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. Measurements will be taken at the OCU inlet and outlet. The potential for dust emissions is very low as it is a wet treatment process.
BAT 9.	Emissions to air	Not applicable – 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.* Odour emissions are monitored in accordance with the OMP and BAT 8 – see Section 7. There is no recent history of odour complaints at the site (within the last ten years).
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.* Meter readings are used to monitor electricity consumption for the WwTW. Currently consumption for the sludge treatment process cannot be differentiated from the water treatment process. Raw material use is measured in accordance with Table 4 to this document. 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 and raw material savings can be delivered. 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.* The site operates an odour management plan, a copy of which is provided in Attachment 5 to support of this application. An odour modelling assessment is also included in Attachment 8.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		There is no recent history of odour complaints at the site (within the last ten years).
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:* • *Minimising residence times of (potentially) odorous waste in storage or in open handling systems* – all of the process tanks at the facility apart from the unscreened sludge buffer tank are covered and equipment such as centrifuges are enclosed. See Attachment 4 – Burnley IED BAT Improvement Programme for UUW's proposed BAT equivalent approach for the unscreened sludge buffer tank. • *Using chemicals to destroy or to reduce the formation of odorous compounds* – this has not been necessary. • *Optimising aerobic treatment* – a DAF unit for the treatment of centrate from the thickening centrifuges forms part of the installation. This is not currently in operation. However, it will be regularly maintained with suspended solids removed to the digestated sludge tanks.
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:* • *minimising the number of potential diffuse emission sources* • *selection and use of high-integrity equipment* • *corrosion prevention* • *containment, collection and treatment of diffuse emissions* • *dampening in dusty areas* • *maintenance* • *cleaning of waste treatment and storage areas* • *leak detection and repair (LDAR) programme* The potential for dust emissions is very low as it is a wet treatment process. Digested sludge is dewatered using centrifuges housed within a building. The sludge cake produced falls into transport trailers located on a cake storage bay where it is stored prior to collection and removal from site for agricultural land spreading. Contingency storage for cake is available within the external storage area. Due to the size of the cake storage bay 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 less than five days. However, notwithstanding this, the bay is emptied each week. 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.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		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 digester, gas holder, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis. Fugitive odour emissions may arise during normal operations, this is to be mitigated by directing the air flow through the OCU, which has been assessed in the Odour Modelling Report (enclosed in Attachment 8) and operated in accordance with the odour management plan (Attachment 5). 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. All processing tanks in the installation are covered apart from the unscreened sludge tank. The IED BAT Improvement Programme for Burnley WwTW documents how BAT will be applied at the installation, this is enclosed in Attachment 4. Refer to the fugitive emissions risk assessment in Section 9.2 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.* The facility has a biogas storage tank that can hold 900m^3 of gas in the event that the CHP is off-line due to maintenance or if 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 engine.
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.* The operation of the flare and its running time are recorded. The quantity of biogas combusted can be approximated from the running time. The flare will be monitored in accordance with the requirements of LFTGN05. A modern enclosed flare is used that meets the standards required by LFTGN05. 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.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		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.* 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.* The permitted activity is not inherently noisy, although the centrifuges, compressors and CHP Plant can be sources of localised noise. In mitigation, the CHP engine is housed in an ISO container which is clad to achieve a noise emission level of 65 dB(A) at 10m and the centrifuges and compressors are also contained within individual steel enclosures. Vibration calibration is undertaken on the centrifuges to check their performance.
BAT 19.	Emissions to water	*In order to optimise water consumption, to reduce the volume of wastewater 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.* • *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. • *Water recirculation* – all wastewater streams are recirculated back to the head of the works for full biological treatment (see BAT 20). • *Impermeable surface* - the majority of the installation area is hard surfaced so that it is impermeable. However, there are some gravelled and landscaped 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

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		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 Burnley WwTW IED BAT Improvement Programme (Attachment 4). The site surfacing plan is found in Appendix K. • *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. • *Roofing of waste storage and treatment areas* – waste treatment mainly takes place in enclosed tanks, vessels and equipment. The only open storage tank is the unscreened sludge buffer tank and contingency storage area for digested cake, which is emptied each week and the sludge screen skip which is emptied regularly. See Burnley WwTW IED BAT Improvement Programme (Attachment 4) for UUW's BAT equivalent proposals for the unscreened sludge buffer tank. • *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. • *Adequate drainage infrastructure* – all surface water drains in the waste treatment area discharge back into the WwTW treatment process to full biological treatment. This forms part of the containment strategy for the site. • *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. . A programme of monitoring to allow detection of leaks from existing below ground is detailed in Table 10.2.1: Fugitive Emissions Risk Assessment of this document. 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. If any evidence of leaks or ground contamination is seen further investigations or remedial actions will be instigated immediately. • *Appropriate buffer storage capacity* – there is adequate buffer storage capacity for the sludge treatment process.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
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.* The principal wastewater stream generated is liquid centrate from the sludge thickening centrifuges and the dewatering centrifuges. The centrate is discharged into a buffer tank at the installation prior being pumped into the WwTW flow for biological treatment. Centrate from the thickening centrifuges can be pre-treated using a dissolved air flotation unit for solids reduction; however, this is currently being by-passed. Small quantities of process wastewater are generated from gas condensate, boiler blowdown and the odour control unit bio-scrubber. The only other wastewater generated routinely is from cleaning activities. All these wastewater streams are discharged into the site drainage system which is returned to the WwTW flow for full biological treatment. This is a circular process and is considered to represent BAT. All wastewater emissions are returned to the head of Burnley WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits.
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.* An Accident Management Risk Assessment is provided within Section 9.4 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. 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. 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. 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 (flare or CHP engines).
BAT 22.	Material efficiency	*In order to use materials efficiently, BAT is to substitute materials with waste.*

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		The only materials used in the treatment process are potable water and polyelectrolyte. Where water is required for dilution, 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 cannot be substituted by 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.* 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. 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.* Very little packaging waste is generated at the installation. Spent polyelectrolyte bags are disposed of as general waste in the WwTW skips. Empty boiler treatment chemical containers are disposed of by the servicing contractor. Empty IBCs are returned to the supplier.
BAT 25 - 32	Mechanical treatment of waste	Not applicable
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.* Not applicable as only indigenous and imported sludges from other UUW wastewater treatment works 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.* The majority of tanks and sludge treatment assets at the site are connected to one odour control unit, comprising two dual bed trickling biofilters and a single bed activated carbon adsorber polishing unit. This represents BAT. Please refer to the supplied Odour Management Plan (Attachment 5) and odour modelling report (Attachment 8) for further details on OCU techniques.
BAT 35.	Biological treatment, water usage	*In order to reduce the generation of wastewater and to reduce water usage, BAT is to recirculate water.* See BAT 20.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
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.* 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. A daily visual tour is also undertaken of the process, including a visual check for foaming in the Digester. See Section 6.18 of this ASD for key process parameter measurements for the primary digester. 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. A copy of Burnley 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:* • *Segregate waste gas streams with a high and low pollutant content* – not applicable. Only one gas stream produced. *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.* Not applicable as only indigenous and imported sludges from other UUW wastewater treatment works 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.* 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 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. • Adsorption

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		• Biofilter • Thermal oxidation • Wet scrubbing Refer to BAT 14 and BAT 34. Total volatile organic compounds (TVOC) and HCl will be monitored on one occasion to check for their presence in the emissions from the OCU 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**
Fugitive emissions from unscreened sludge buffer tank	Local residents – closest properties are approximately 160m to the north and 400m to the east	Air	This tank holds raw untreated sludge and is open to the atmosphere, however the capacity of the tank is relatively small (37m^3). An emissions monitoring programme for open tanks, to include this chamber, will be instigated. UUW's proposed timeline for delivery of a solution to enclose this tank, if required, is provided in the Site Improvement Programme (see Attachment 4).	Moderate	Localised odour annoyance	Low – given the distance to the closest residential receptors
Fugitive emissions from screenings building and screened sludge tank		Air	These sources are linked to an odour control unit comprising a bio-scrubber and carbon filter (A4).	Low	Localised odour annoyance	Not significant
Fugitive emissions from thickening centrifuges and thickened sludge silo		Air	These sources are enclosed and linked to an odour control unit comprising a bio-scrubber and carbon filter (A4).	Low	Localised odour annoyance	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**
Fugitive emissions from thickening centrate collection tank and thickened sludge buffer tank		Air	These tanks are enclosed but vent to atmosphere.	Moderate	Localised odour annoyance	Low – given the distance to the closest residential receptors
Fugitive emissions from TH vessels, Digester and Gas Holder		Air	These vessels and tanks are connected to the biogas system.	Low	Localised odour annoyance	Not significant
Activation of pressure vacuum relief valves on gassing tanks		Air	The pressure vacuum relief valves are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points.	Low	Localised odour annoyance	Not significant
Fugitive emissions from De-gassing tank		Air	The tank is enclosed and vented through an odour control unit comprising a bio-scrubber and carbon filter (A4).	Low	Localised odour annoyance	Not significant
Digested sludge tanks		Air	These tanks are enclosed and vented through an odour control unit comprising a bio-scrubber and carbon filter (A4).	Low	Localised odour annoyance	Not significant
Dewatering centrifuges		Air	Each centrifuge is housed in its own steel container to attenuate noise and odour emissions. The centrifuge building is	Low	Localised odour annoyance	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**
			connected to the site odour control unit (A4).			
Dewatering centrate, centrate DAF unit and treated centrate tank		Air	These sources are enclosed and connected to an odour control unit comprising a bio-scrubber and carbon filter (A4).	Low	Localised odour annoyance	Not significant
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	Localised odour annoyance	Not significant
Leaks in gas pipework e.g. around flanges		Air	A leak detection and repair (LDAR) plan has been developed for the site and is included with this application. Assets (such as the digesters, gas bag, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis. Refer to the LDAR Plan (Attachment 7).	Low	Localised odour annoyance	Not significant
Emissions from digestate cake storage bay		Air	Bay is uncovered, however digested and dewatered sludge has a relatively low odour potential and is removed as soon as possible.	Low	Localised odour annoyance	Not significant

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 is predominantly hard surfaced and all roadways are in good condition; 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. Processed sludge (average dry solids content of 28%) is deposited onto the digested sludge cake storage bay, in order for it to be reloaded into vehicles for transportation to land. Due to the size of this bay 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 engine. There will be some particulate matter emissions from the combustion of diesel in the boiler. 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. The screenings skip is housed in a building with a roller shutter door to reduce the risk of pests (birds and rats). 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**
Activation of pressure vacuum relief valves on gassing tanks	Local residents – closest properties are approximately 160m to the north and 400m to the east	Air	The pressure vacuum relief valves are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points.	Low	Localised odour annoyance	Not significant
Leaks in gas pipework e.g. around flanges	Local residents – closest properties are approximately 160m to the north and 400m to the east	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 digester, gas bag, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis. Refer to the LDAR Plan (Attachment 7).	Low	Localised odour annoyance	Not significant
Leaks and spills from treatment process and plant	River Calder 90m to west and Pendle Water 85m to south east	Surface water drainage	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.	Low	Localised deterioration in water quality	Not significant following containment mitigation works

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**
			Hydraulic spill modelling indicates that in the event of a catastrophic tank failure the spilled flows could reach surface water receptors. High-level containment solutions for each critical asset have therefore been developed to meet the requirements set out in CIRIA c736. The proposed mitigation measures to be installed and timescales for installation are detailed in the Burnley BAT Improvement Programme document submitted with this application (see Attachment 4). 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. Pipework is installed in accordance with United Utilities asset standards that applied at the time of construction.			

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 and spills from treatment process and plant	Ground and groundwater	Seepage into ground	The majority of the site is hard surface with good quality concrete. The site is visually inspected on a daily basis and any leaks are identified and rectified promptly. A site surfacing plan is provided (refer to Appendix K). Proposed improvement measures include the installation of an impermeable geosynthetic barrier beneath all existing permeable areas with the potential to be impacted by a spill within the installation boundary (refer to the Site Improvement Programme in Attachment 4).	Low to moderate	Contamination of near surface soils and permeation into the alluvial groundwater if left unattended	Low following implementation of mitigation measures
Leaks from below ground tanks and pipework		Seepage into ground / groundwater	Flow meters are installed on the majority of transfer pipework and any significant leaks should be detected by a decrease in flow rate. Where no flow meters are installed pipework with buried mechanical fittings will be surveyed every 2 years and every 5 years where not present, using techniques such as thermal cameras,	Low to moderate	Contamination of soils and permeation into the alluvial groundwater	Low

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**
			magnetic flux leakage and in pipe crack detection technology. CCTV of site drainage undertaken every 5 years. Pipework is installed in accordance with United Utilities asset standards that applied at the time of construction.			
Bioaerosols	Local residents – closest properties are approximately 160m to the north and 400m to the east of the installation boundary.	Air	The only open storage of waste is the wet digestate cake and a small unscreened sludge tank. The cake storage bay is situated approximately 200m from the nearest occupied building (to the north). More detailed assessment is included the Bioaerosol Risk Assessment. Attachment 4 Burnley IED BAT Improvement Programme outlines the site's plan for meeting EA's TGN M9 Environmental monitoring of bioaerosols at regulated facilities. The water/wastewater industry understands that there is a low level of risk of bioaerosols from this material.	Medium	Potential impacts upon human health	Medium[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**
			The cake storage bay is bounded by concrete walls 3.5m tall and the prevailing winds are from the west.			

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 – closest properties are approximately 160m to the north and 400m to the east	Air	The CHP engine is housed in an ISO container which is clad to achieve a noise emission level of 65 dB(A) at 10m. The centrifuges are contained within individual steel enclosures to provide noise attenuation. Vibration calibration is undertaken on the centrifuges to check their performance. All compressors are housed in individual enclosures. Adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise.	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 transfer pipework on the installation	Ground/ groundwater/ surface water	Seepage into ground/discharge into drains	The site is visually inspected on a daily basis and any leaks are identified and rectified promptly. Staff are trained in spill containment and response. Flow meters are installed on the majority of transfer pipework and any significant leaks on below ground pipework should be detected by a decrease in flow rate. Pipework is installed in accordance with United Utilities asset standards that applied at the time of construction. The use of flexible pipework is minimised and any such pipes are inspected on a daily basis.	Moderate	Minor localised odour Contamination of soils and ground 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**
Loss of containment of tanks/ vessels	Ground/ groundwater/ surface water	Seepage into ground/ discharge into drains	Tanks and vessels are designed to contain the intended material and volumes. All of the main tanks are fitted with level probes and transmitters so that tanks levels can be continually monitored via the SCADA display screens. The Digester is provided with overfill protection. An overfill limit stops all pumping if the maximum feed capacity has been pumped into the digester in a 24-hour period. 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 (see Attachment 4). Containment is provided for oil and chemical storage. Staff are trained in the operation of spillage kits to ensure that	Low	Minor localised odour Contamination of soils and ground 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**
			prompt and effective action is taken in the event of accidental spillage. The site is visually inspected on a daily basis and any leaks are identified and rectified promptly. The gas oil tank is internally bunded to 110% of its capacity. The integrity of the bund is inspected regularly.			
Polyelectrolyte spillage or leakage of liquid polyelectrolyte	Ground/ groundwater/ surface water	Seepage into ground/ discharge into drains	Polyelectrolyte in stored in powder form and any spillages are swept up promptly. Polyelectrolyte make up tanks are within a building. Any leakage of polyelectrolyte would be contained on hard surfaces that drain back to the treatment works. Staff are trained in spillage response procedures to ensure that prompt and effective action is taken in the event of accidental spillage.	Very low	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**
Equipment/plant item fire or explosion	Staff, local residents Surface water	Air/Site drainage	A hazardous areas risk classification has been undertaken in accordance with DSEAR. Equipment is adequately rated in accordance with the zoning classification. The digester and gas storage tank are fitted with lightning protection. 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. Firefighting systems. Emergency Response procedure	Very low	Possible toxic hazard Fire / explosion Potential contamination of soils, ground and surface waters	Not significant
Lightning strike	Air / ground/ groundwater/ surface water	Air/ site drainage/ overland flow	Lightning protection is installed on the digester tank.	Very low	Possible toxic hazard Fire / explosion Potential contamination of soils, ground and surface waters	Low
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 water levels in the digester	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	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**
			sludge recirculation pumps bund and pump out rainwater as required to ensure that pipework, valves and pumps do not become submerged.		workload, rather than the hazard.	

10.5. Designated/Protected Sites

Table 10.5.1: Designated/Protected Sites

The following table details the location of designated/protected sites within the conservation screening report provided by the Environment Agency dated 26th January 2021.

Site Type	Site Name	Distance from Installation	At Risk from Activities
European Habitats Sites	South Pennine Moors (SAC)	6 km SE	No – see table below
	Pennine Moors Phase 2 (SPA)	6 km SE	No – see table below
SSSI's	None	-	
Ramsar	None	-	
Local Nature Sites	None	-	
Local Wildlife Sites	Spurn Clough	360m N	No – see table below
	Moor Isles Clough	400m NNW	No – see table below
	Hagg Wood	960m SW	No – see table below
	Oswald Street	900m – 2km E-SE	No – see table below
	Heald Wood	900m – 2km E-SE	No – see table below
	Barden Lane Fields	900m – 2km E-SE	No – see table below
	Roundwood Swamp, Meadows and Swamp	900m – 2km E-SE	No – see table below
	Raven's Clough Wood	1.85km NE	No – see table below
	West Close Clough and Upper Fir Trees Brook	1.95km NW	No – see table below
	Leeds/Liverpool Canal Section, Old Hall Street to M65 Junction 12	2km NE	No – see table below
Ancient Woodland	Hagg Wood	960m SW	No – see table below

Site Type	Site Name	Distance from Installation	At Risk from Activities
	Spring Wood	1km SSE	No – see table below
	Raven's Clough Wood	1.85km NE	No – see table below
	West Close Clough	1.95km NW	No – see table below
Air Quality Designation	None	-	

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 26th 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	South Pennine Moors (SAC) and Pennine Moors Phase 2 (SPA); 6km SE. Designated for habitats and breeding birds	Air	Combustion emissions from the CHP engine, boiler and flare comprise oxides of nitrogen, carbon monoxide, VOCs and sulphur dioxide. The air emissions assessment and dispersion modelling undertaken to support this application demonstrate that the emissions are at insignificant concentrations at this distance from the site and there is negligible risk to the SAC and SPA areas.	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**
Treatment process and associated activities	Local Wildlife Sites; closest approximately 360m to the north.	Air	The air emissions assessment and dispersion modelling undertaken to support this application demonstrate that combustion emissions are at insignificant concentrations at the closest sensitive receptor, approximately 180m to the north, and thus there is a low risk to wildlife sites from the installation.	Low	Damage to vegetation and potential toxicity to animal species	Not significant

11. Site Condition Report

1.0 Site Details	
Name of the applicant	United Utilities Water Ltd
Activity address	Burnley WwTW Sludge Treatment Facility Woodend Lane, off Barden Lane, Burnley, BB12 9DS
National grid reference	SD 82749 35340
Document reference and dates for Site Condition Report at permit application and surrender	This is the permit application SCR
Document references for site plans (including location and boundaries)	See Appendices D and E to Application Support Document.

2.0 Condition of the land at permit issue	
Environmental setting including: • geology • hydrogeology • surface waters	The BGS Digital Geological map of Great Britain at 1:50,000 scale shows that the site is underlain by Alluvial Deposits comprising clay, silt, sand and gravel. The solid geology is shown as the Pennine Lower Coal Measures Formation comprising Mudstone, Siltstone and Sandstone. A fault line runs NW-SE across the central area of the site. Both the superficial deposits and the bedrock in this area are classified as Secondary A Aquifers. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. They are generally aquifers formerly classified as minor aquifers. The site does not lie in a source protection zone. The River Calder flows to the west of the site, approximately 90m from the site boundary. Pendle Water flows approximately 85m to the south-south west of the site and joins with the River Calder. The water quality of River Calder along this stretch was classified as Moderate in 2019.
Pollution history including: 1. pollution incidents that may have affected land 2. historical land-uses and associated contaminants 3. any visual/olfactory evidence of existing contamination	The site has a long history of operation. Historical maps indicate that sewage storage and treatment activities first commenced in the late 1800's. Prior to this, the site was under agricultural usage. The layout of the treatment works has undergone many changes over the years but the area of the site forming the Permit Installation boundary

2.0 Condition of the land at permit issue	
4. evidence of damage to pollution prevention measures	appears to have been predominantly used for sludge beds. The first storage tanks in this area can be identified on the map from 1965. On the 2001 and 2007 maps, a lagoon is shown in the southern section of the Installation area. This was subsequently in-filled and is now the site of the Sludge Dewatering Building and associated tanks. There are no known significant spills or incidents that may have affected soil or groundwater quality.
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	Several ground investigations have been undertaken at the WwTW site for geotechnical purposes. In November 2003 Norwest Holst Soil Engineering Ltd. undertook an investigation within the Installation area. This was associated with the decommissioning of a sludge lagoon and the construction of the new sludge handling facility. Seven boreholes and six trial pits were excavated. The ground investigation logs confirm the published geology with bands of alluvial clay, silt, sand and gravel recorded to depths in excess of 10m below ground level (bgl). Bedrock was encountered at depths of 11.5m to 13m bgl. In several locations made ground was encountered overlying the alluvial strata. This generally comprised brown sandy gravelly silt with gravel up to a maximum depth of 1.7m bgl. In places, ash, brick and timber were recorded within the made ground. Groundwater was encountered at approximately 1.7-2m bgl. Allied Exploration & Geotechnics Limited (AEG) were contracted to perform ground investigation works in connection with the construction of a new pipeline and associated structures in 2012 and 2013. Nineteen of the investigation locations were situated within the installation boundary. The ground investigation logs also confirm the published geology. Made ground was encountered overlying the alluvial strata in all locations up to a depth of 4.5m bgl. The made ground generally comprised sandy gravelly clay or clayey sandy gravel. Gravel consisting of brick, sandstone, limestone and ash was recorded in all locations. Hydrocarbon odours were noted in the made ground in four locations.
Baseline soil and groundwater reference data	Soil samples were obtained for chemical testing by AEG during their 2012 and 2013 ground investigations. The samples were tested for a range of metals, pH, sulphate,

2.0 Condition of the land at permit issue	
	and total petroleum hydrocarbons. Although the chemical analysis was undertaken eight years previously, the site is mostly hard surfaced and there have been no major spill events since this time. It is therefore considered to be largely representative of current conditions and has been used to provide reference data for the baseline soil conditions. The range of contaminant levels recorded within the Installation area are shown in the table below.

Baseline soil reference data

Parameter	Maximum	Minimum
pH	10.4	7.9
Sulphate	0.21	0.05
Arsenic	26	3.4
Boron	1.3	<0.2
Cadmium	4.7	0.6
Chromium	180	12
Hexavalent Chromium	<1.0	<1.0
Copper	190	14
Lead	270	7.2
Mercury	1.9	<0.05
Nickel	69	9.5
Zinc	250	48
Cyanide	7.2	0.3
TPH	280	<10
Total PAHs	44	<1.6
PCB	<0.01	<0.01
Phenol	0.6	<0.3

3.0 Permitted activities	
Permitted activities	As detailed in the Environmental Permit application
Non-permitted activities undertaken	Outside of the sludge treatment installation, that is the subject of the permit application, there are the wider UUW operations associated with the wastewater treatment process.
Document references for: 1. plan showing activity layout; and 2. environmental risk assessment.	1. See Appendix E to Application Support Document 2. See Section 9 to the Application Support Document

Appendix A: CoTC Certificate

wamitab

Operator Competence Certificate

Title:

Anaerobic Digestion

This Certificate is awarded to

Susan Webb

Verification date: 18/06/2019
Authorised:

WAMITAB Chief Executive Officer

Learner ID: 20561
Certificate No.: 5145276
Date of Issue: 18/06/2019

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.

00140779

CIWM

Continuing Competence Certificate

This certificate confirms that

Susan Webb

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 13/01/2023

TSNH	Transfer - Non Hazardous Waste
TMNH	Treatment - Non Hazardous Waste
AD	Anaerobic Digestion

Expiry Date: 13/01/2025

Verification date: 29/12/2022

Authorised:

Professional Services Director

Learner ID: 20561

Certificate No.: 5215073

Date of Issue: 13/01/2023

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

Scan code on reverse to authenticate that this is a genuine paper

Appendix B: ISO14001 Certificate

Certificate GB04/63183

The management system of

United Utilities Water Limited

Haweswater House Lingley Mere Business Park Great Sankey Warrington WA5 3LP United Kingdom

has been assessed and certified as meeting the requirements of

ISO 14001:2015

For the following activities

The provision of utility services through the management of our assets by head office staff. Including, their operation, maintenance and support service activities which strive to meet stakeholder requirements and minimise the impact upon the environment. We manage capital projects by project teams and supply chain arrangements, to achieve sustainable improvement.

This certificate is valid from 23 May 2023 until 23 May 2026 and remains valid subject to satisfactory surveillance audits.

Issue 13. Certified since 28 October 2004

Authorised by
Jonathan Hall
Global Head - Certification Services

SGS United Kingdom Ltd
Rossmore Business Park, Ellesmere Port, Cheshire, CH65 3EN, UK
t +44 (0)151 350-6666 - www.sgs.com

Burnley WwTW Sludge Treatment Facility
EPR/HP3509MM
Environmental Permit Application

Appendix C: Management System Summary

Burnley WwTW Sludge Treatment Facility

Environmental Permit Application

Management System - Summary

December 2022

1. Introduction

As part of our application for an environmental permit for Burnley WwTW Sludge Treatment Facility, United Utilities Water Limited (UUW) is required to provide details of the management system that we will provide for the facility, including a summary of the management system. This document provides that summary.

UUW was awarded certification to BS EN ISO14001:2004 for our Environmental Management System in October 2004 and have maintained this certification. A copy of the latest certificate is provided with this document. In addition, UUW also holds certification to BS EN ISO 9001:2015; this is the quality assurance document management system which supports the ISO14001 and other written procedures for delivering the key aspects of the ISO14001. Together these form the backbone of UUW's Environmental Management System (EMS).

In accordance with the Environment Agency (EA) guidance "Develop a management system: environmental permits" on the gov.uk website, the following sections summarise the management system (MS) that will be provided for Burnley WwTW Sludge Treatment Facility under our ISO14001 EMS.

2. Site Infrastructure Plan

The permit application includes a scaled location plan, a site boundary plan that identified the different elements of the waste treatment process, a process flow diagram and drainage plan. The MS will include suitable plan(s) that meet the requirements of the EA guidance.

3. Site Operations

The site operations and how they are controlled are detailed within the Application Support Document of the permit application package. The MS will include all necessary information about site operations and waste storage and management.

No fire prevention plan is required.

4. Site equipment and maintenance plan

As detailed in the Application Support Document of the permit application package, 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 will review the EMS for the installation and arrange the necessary updates to include the operations, inspection and maintenance of the new plant. The Production Manager will also arrange staffing resources and training for operation, monitoring and maintenance of the new plant.
All scheduled maintenance will be set up on the Master Asset Management System (MAMS)SAP and all proactive and reactive maintenance undertaken will be recorded on MARS against the requirements of the plan. For activities at the facility, please see Table 4.1.1 in Section 4 of the Application Support Document.

5. Contingency Plans

The MS will include contingency plans detailing what actions UUW will take to minimise the impact on the environment for each of the following scenarios:

- breakdowns
- enforced shutdowns
- any other changes in normal operations that may result in an impact on the environment

Many of these have already been detailed within the Environmental Risk Assessment and Management Plan provided in the Application Support Document of the permit application package.

6. Accident prevention and management plan

An accident risk assessment has been provided in Section 10.4 of the Application Support Document. An accident management plan is provided as Attachment 9 of the application.

In accordance with our ISO14001 procedures, UUW will record, investigate and respond to accidents or breaches of any permit conditions.

Any operational problem that cannot be dealt with by normal operational procedures is classed as an Incident and the UUW Incident Management Procedure and associated Standard Operating Procedure will be followed. All actions and communications will be recorded in accordance with the procedure.

7. Climate change

Being a responsible business means understanding the role we play in safeguarding the quality of the environment, protecting and enhancing it whilst delivering our services, now and in the future. Our Environment Policy (and daughter Climate Change Mitigation Policy) sets out our commitments to climate change mitigation and principles to deliver this vision. More specific to our resilience to climate change is how we are Adapting to Climate change. Every 4 to 5 years we report on our progress with climate change resilience, which includes outputs of various risk assessments of our operation and sites to expected (and being experienced) impacts of climate change.

8. Contact information

As with all our other sites holding waste and/or installations environmental permits, we display a notice board at or near the site entrance providing the following information:

- the company name, site name and permit number
- emergency contact details
- a statement that the site is permitted by the Environment Agency

9. Complaints procedure

In accordance with our ISO14001 accreditation, UUW has a well established complaints recording and investigation procedure. This procedure is applied at all other UUW permitted sites and will form part of the MS for this installation.

10. Managing staff competence and training records

In accordance with our ISO14001 accreditation, the MS will detail the management and responsibilities for the operations of the installation, including details of technically competent management (CoTC holders). UUW procedures for checking staff and contractors required training and/or qualifications will be applied at this installation and all training and qualifications will be recorded.

11. Keeping records

In accordance with our ISO14401 and ISO9001 accreditations, UUW will hold and maintain all records appropriate to the operation and management of the installation, including (but not limited to):

- copies of all permits
- risk assessments
- all management system plans
- odour management plan
- site operating procedures
- staff competence and training
- environmental monitoring
- compliance checks, findings of investigations and actions taken
- complaints made, findings of investigations and actions taken
- audits of management system, findings (reports) and actions taken
- management reviews and changes made to the management system

In accordance with the Duty of Care for waste, records will also be kept of all waste movements.

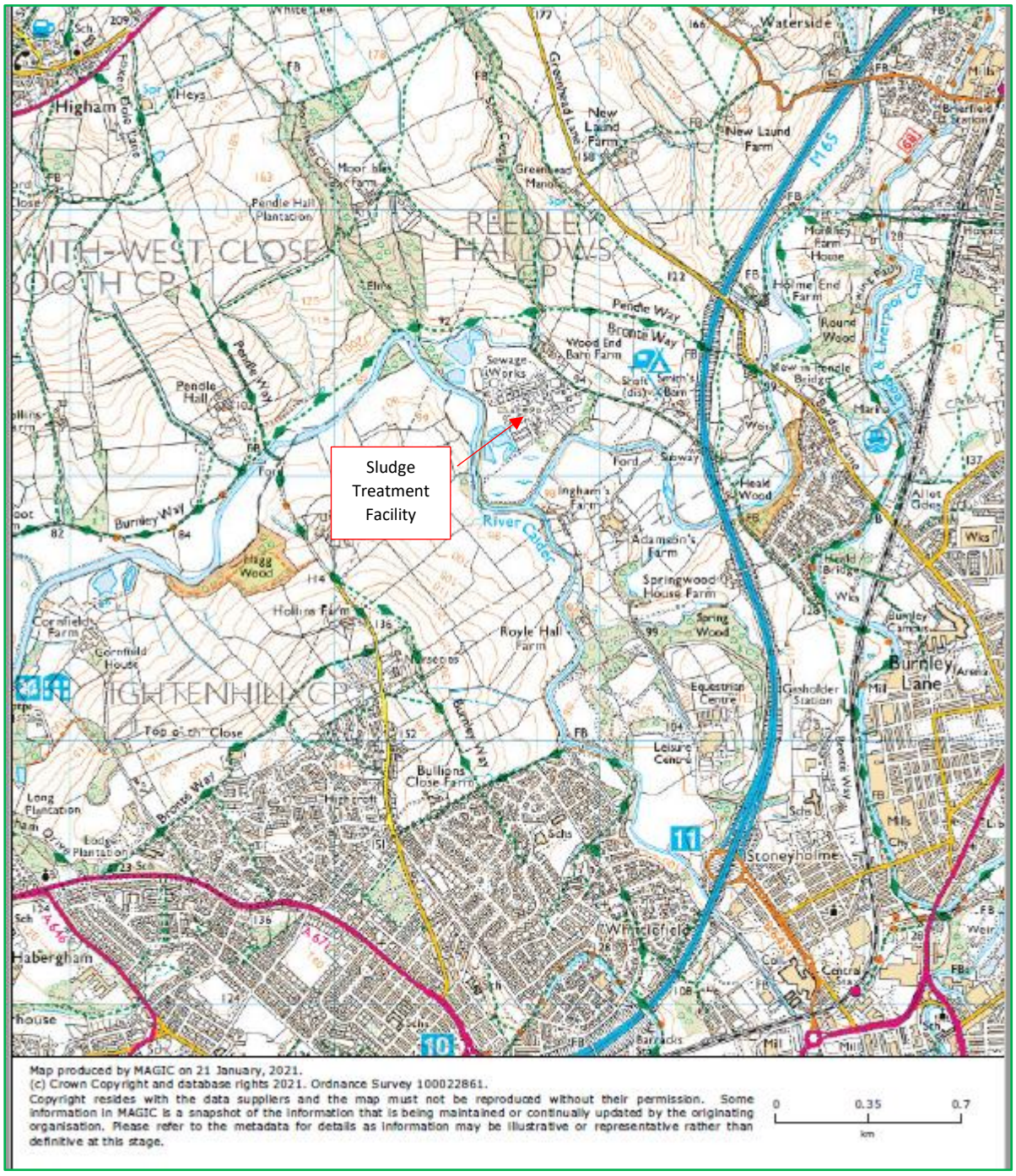
12. Management system reviews

The management system for the installation will be subject to regular review and updating. All reviews and any resulting changes will be recorded.

Burnley WwTW Sludge Treatment Facility
EPR/HP3509MM
Environmental Permit Application

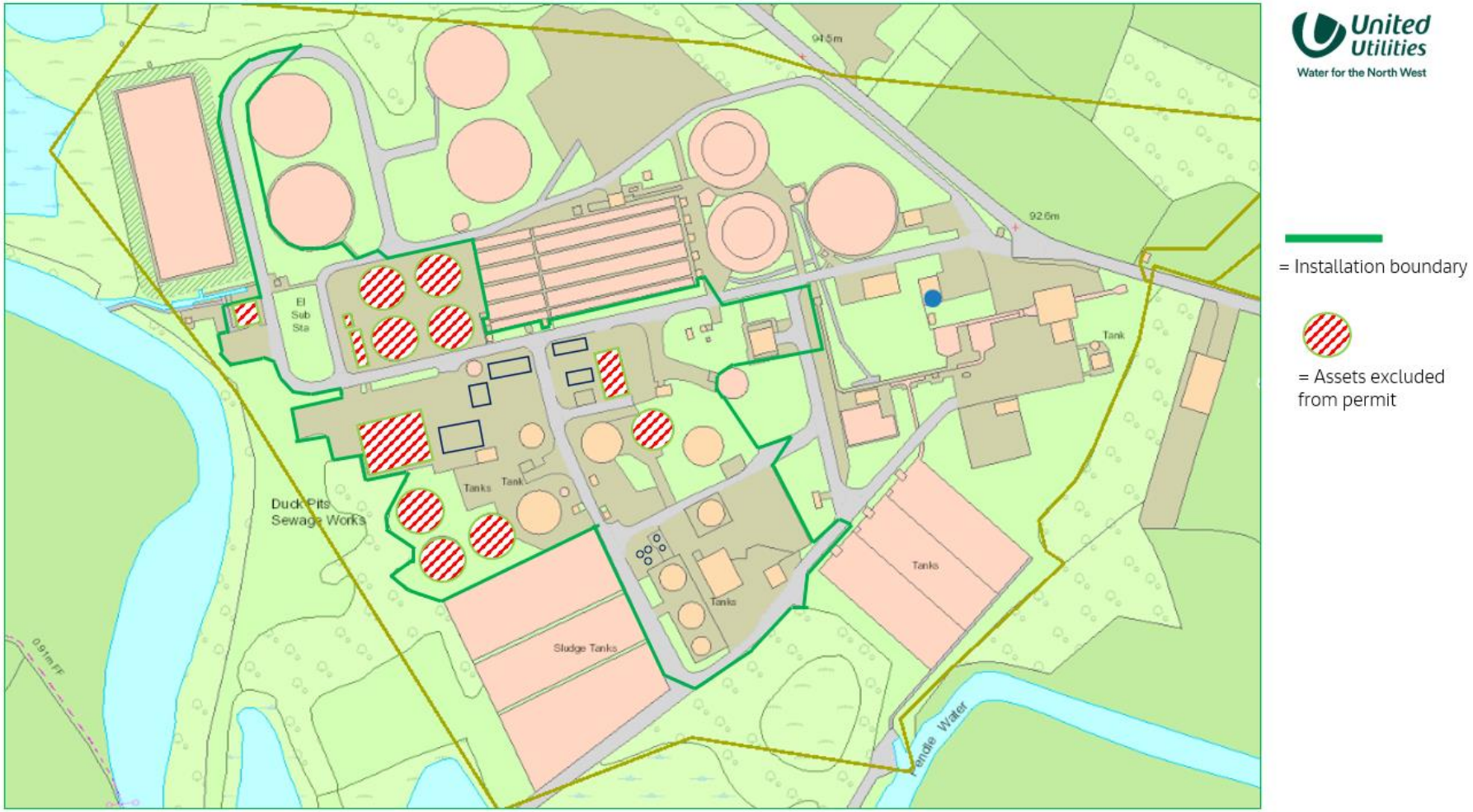
Appendix D: Site Location Plan

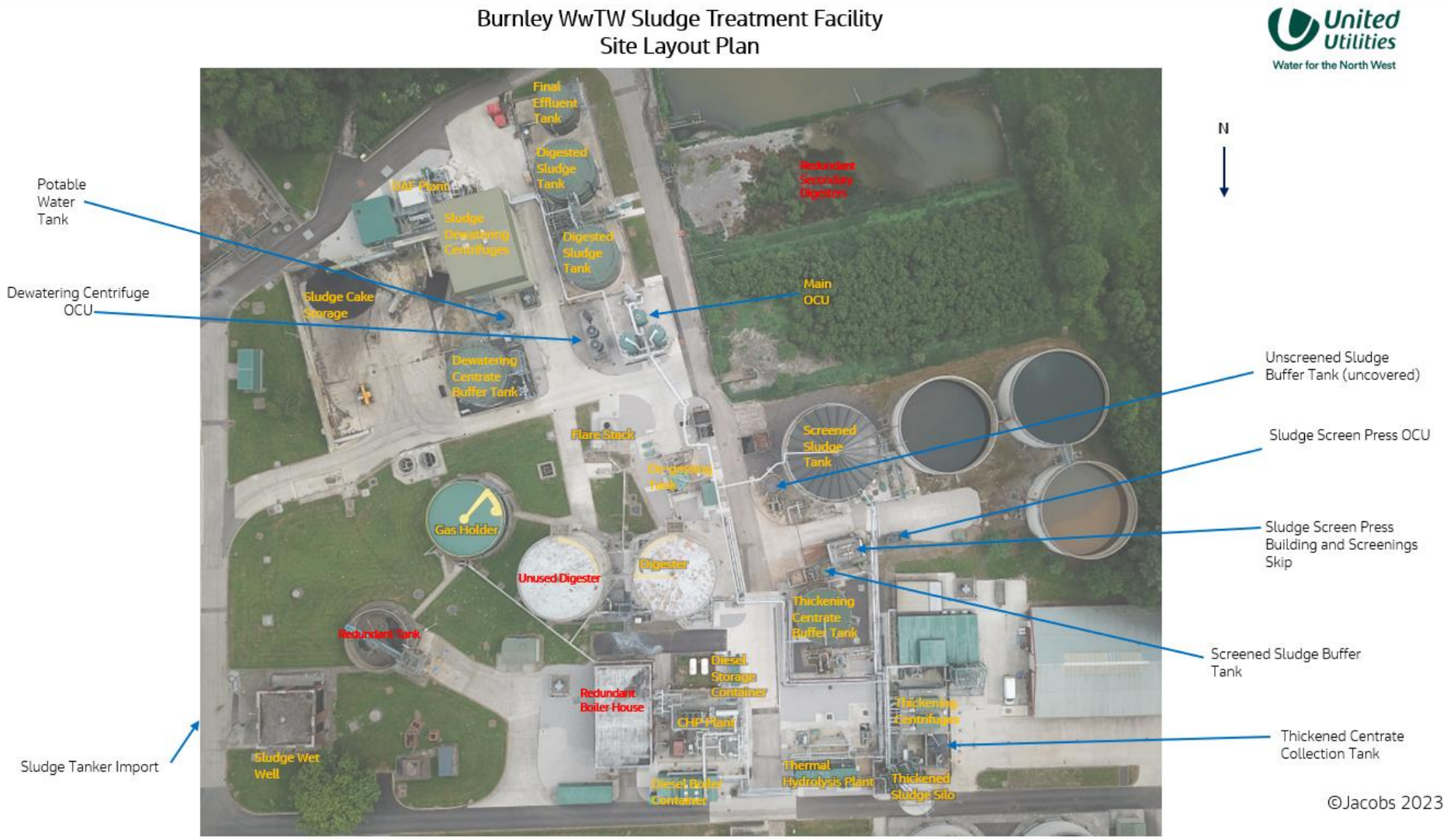
Burnley WwTW Sludge Treatment Facility - Site Location Plan



Appendix E: Site Permit Boundary, Layout Plan and Emissions Points Plans

Burnley WwTW Sludge Treatment Facility Installation Boundary Plan





Appendix E Figure 3 - Burnley WwTW Sludge Treatment Facility Wastewater Emission Points – Returns to WwTW

KEY:

Sample Points

W1 – A4 OCU Discharge to surface water drain

W2 – Thickening centrate discharge to process pipework

W3 - Dewatering centrate discharge to process pipework

W4 – Cake bay drainage discharge to surface water

W5 – Biogas condensate catch pot discharge

W6 - Biogas condensate catch pot discharge

W7 - Biogas condensate catch pot discharge

W8 – Boiler blowdown

Return Points to Head of WwTW

R1 – Combined centrate return discharge point

R2 – Main site drainage discharge point

R3 - Drainage from Cake Bay, Dewatering Centrifuge Building and Thickening Centrifuge area

R4 – Drainage from OCU's and road gulleys

Appendix E Figure 4 - Burnley WwTW Sludge Treatment Facility Air Emission Points

KEY:

Emission Points

A1 – CHP biogas engine

A2 – Steam boiler

A3 - Flare

A4 – Odour Control Unit

A5 & A6 – Digester PVRVs

A7 – Gas holder PVRV

Appendix F: Installation Emissions Monitoring SOP

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

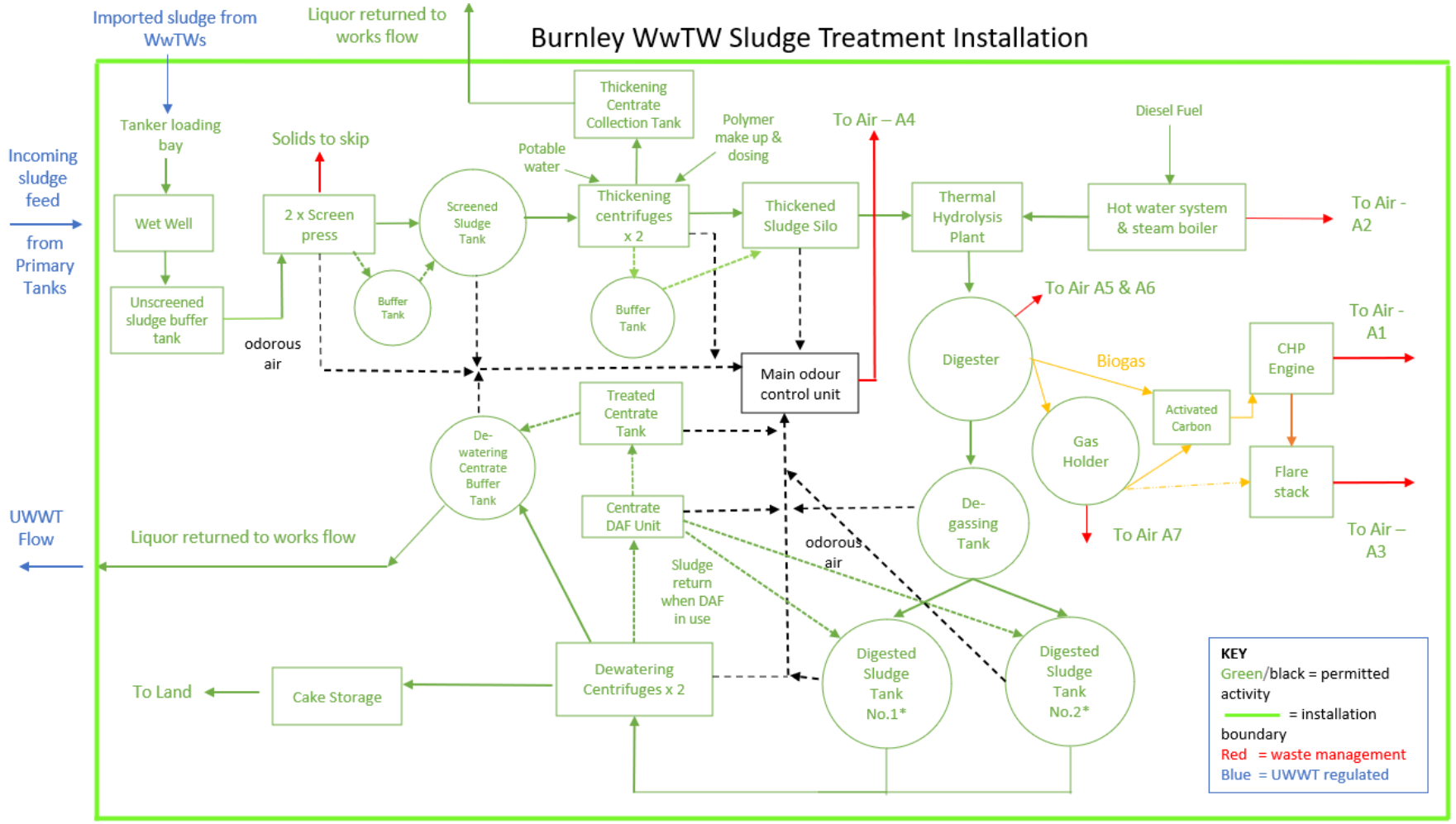
7.1 The routine inspection of an installation, known as a Human Senses Tour, is required. This is to monitor for unusual occurrences and signs which may indicate the deterioration and/or potential failure of plant and equipment. This may include:-

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

Appendix G: Block Process Diagram



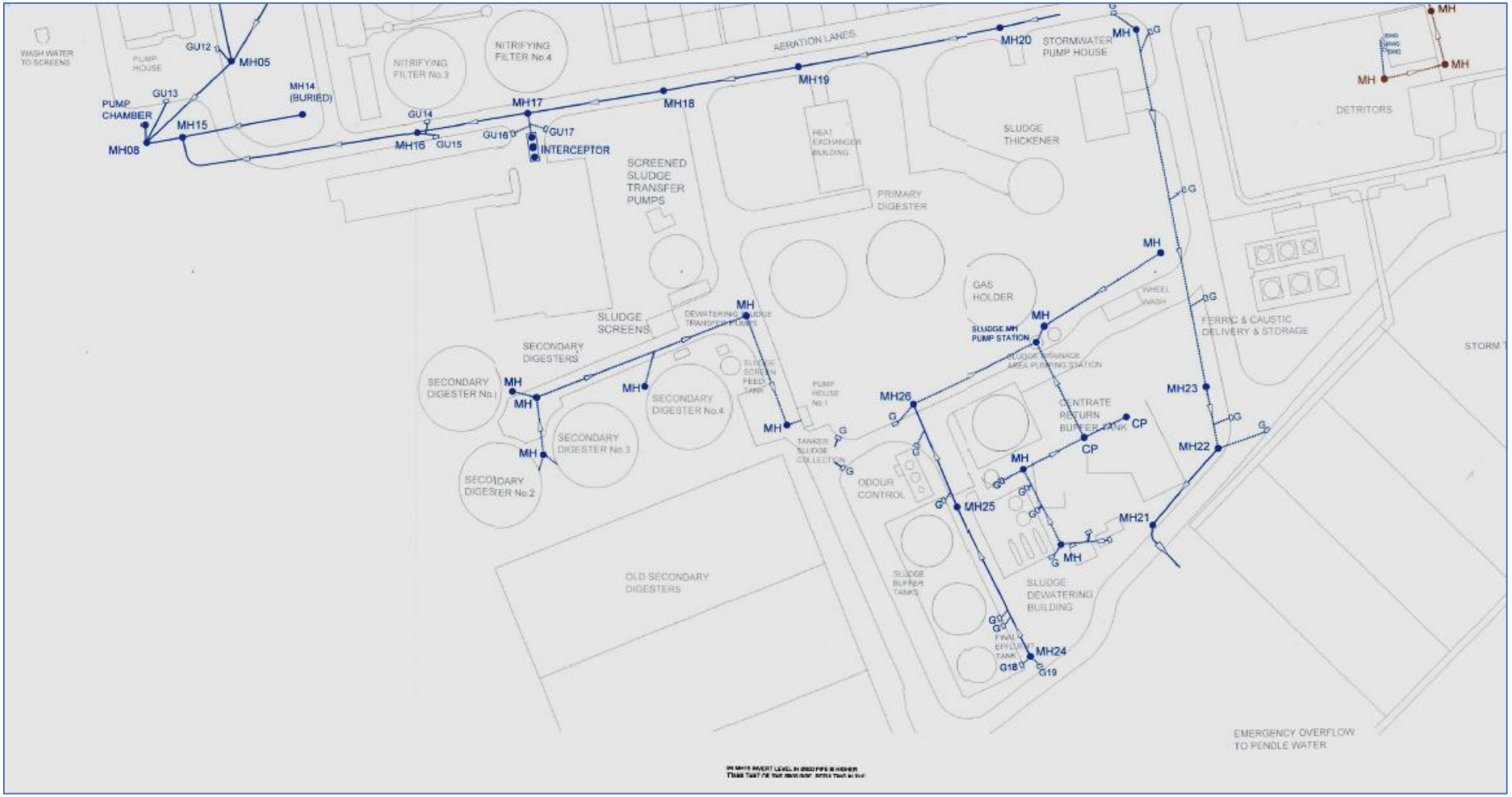
Burnley WwTW Sludge Treatment Facility EPR/HP3509MM

Environmental Permit Application

Appendix H: Air Quality Impact Assessment Report

Provided separately/previously

Appendix I: Site Drainage Plan



Burnley WwTW Sludge Treatment Facility
EPR/HP3509MM
Environmental Permit Application

Appendix J: Raw Materials – Safety Data Sheets

We create chemistry

Safety data sheet

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Zetag 8180

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.3. Details of the supplier of the safety data sheet

Company:
BASF SE
67056 Ludwigshafen
GERMANY

Contact address:
BASF plc
PO Box 4, Earl Road, Cheadle Hulme,
Cheadle, Cheshire
SK8 6QG, UNITED KINGDOM

Telephone: +44 161 485-6222
E-mail address: product-safety-north@basf.com

1.4. Emergency telephone number

International emergency number:
Telephone: +49 180 2273-112

SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

According to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC

Possible Hazards:

May cause some eye irritation which should cease after removal of the product.
May cause some irritation to the respiratory system if dust is inhaled.
Prolonged contact with the product can result in skin irritation.
This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.
Very slippery when wet.
Low acute LC50/EC50 to aquatic organisms, but does not cause long-term adverse effects in the aquatic environment. See section 12 for details.
The product is under certain conditions capable of dust explosion.

2.2. Label elements

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

2.3. Other hazards

According to Regulation (EC) No 1272/2008 [CLP]

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

SECTION 3: Composition/Information on Ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Chemical nature

polyacrylamide
cationic

Hazardous ingredients (GHS)
according to Regulation (EC) No. 1272/2008

adipic acid

Content (W/W): >= 2 % - <= 6 % CAS Number: 124-04-9 EC-Number: 204-673-3 REACH registration number: 01-2119457561-38 INDEX-Number: 607-144-00-9	Eye Dam./Irrit. 2 H319 Differing classification according to current knowledge and the criteria given in Annex I of Regulation (EC) No. 1272/2008 Eye Dam./Irrit. 1 H318

Hazardous ingredients
according to Directive 1999/45/EC

adipic acid

Content (W/W): >= 2 % - <= 6 %
CAS Number: 124-04-9
EC-Number: 204-673-3
REACH registration number: 01-2119457561-38
INDEX-Number: 607-144-00-9
Hazard symbol(s): Xi
R-phrase(s): 36

For the classifications not written out in full in this section, including the indication of danger, the hazard symbols, the R phrases, and the hazard statements, the full text is listed in section 16.

SECTION 4: First-Aid Measures

4.1. Description of first aid measures

Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms: No significant symptoms are expected due to the non-classification of the product.

Hazards: No hazard is expected under intended use and appropriate handling.

4.3. Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

SECTION 5: Fire-Fighting Measures

5.1. Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet, carbon dioxide

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

5.2. Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

5.3. Advice for fire-fighters

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

SECTION 6: Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

6.2. Environmental precautions

Do not discharge into drains/surface waters/groundwater.

6.3. Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.
For large amounts: Contain with dust binding material and dispose of.
Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

6.4. Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

SECTION 7: Handling and Storage

7.1. Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

7.2. Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:
Avoid extreme heat.

7.3. Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Components with occupational exposure limits

none

8.2. Exposure controls

Personal protective equipment

Respiratory protection:
Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:
Chemical resistant protective gloves (EN 374)
Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):
e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other
Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:
light protective clothing

General safety and hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. No eating, drinking, smoking or tobacco use at the place of work.

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Odour threshold:	
	No applicable information available.
pH value:	3.5 - 4.5
	(10 g/l)
Melting point:	
	The substance / product decomposes therefore not determined.
Boiling point:	
	not applicable
Flash point:	
	not applicable
Evaporation rate:	
	The product is a non-volatile solid.
Flammability:	not highly flammable
Lower explosion limit:	
	For solids not relevant for classification and labelling.
Upper explosion limit:	
	For solids not relevant for classification and labelling.
Vapour pressure:	
	The product has not been tested.
Solubility in water:	Forms a viscous solution.
Partitioning coefficient n-octanol/water (log Kow):	
	Study scientifically not justified.
Self ignition:	not self-igniting
Thermal decomposition:	No decomposition if stored and handled as prescribed/indicated.
Viscosity, dynamic:	
	not determined
Explosion hazard:	not explosive

Fire promoting properties: not fire-propagating

9.2. Other information

Self heating ability: It is not a substance capable of spontaneous heating.

Bulk density: approx. 700 kg/m3
Hygroscopy: Non-hygroscopic
Other Information:
If necessary, information on other physical and chemical parameters is indicated in this section.

SECTION 10: Stability and Reactivity

10.1. Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

10.2. Chemical stability
The product is stable if stored and handled as prescribed/indicated.

10.3. Possibility of hazardous reactions
The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

10.4. Conditions to avoid
Avoid extreme temperatures. Avoid humidity.

10.5. Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

10.6. Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

SECTION 11: Toxicological Information

11.1. Information on toxicological effects

Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 5,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Assessment of sensitization:
Based on the ingredients, there is no suspicion of a skin-sensitizing potential.

Germ cell mutagenicity

Assessment of mutagenicity:
Based on the ingredients, there is no suspicion of a mutagenic effect.

Carcinogenicity

Assessment of carcinogenicity:
The whole of the information assessable provides no indication of a carcinogenic effect.

Reproductive toxicity

Assessment of reproduction toxicity:
Based on the ingredients, there is no suspicion of a toxic effect on reproduction.

Repeated dose toxicity and Specific target organ toxicity (repeated exposure)

Assessment of repeated dose toxicity:
Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statement has been derived from the properties of the individual components.

Aspiration hazard

No aspiration hazard expected.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

SECTION 12: Ecological Information

12.1. Toxicity

Assessment of aquatic toxicity:

Acute effects on aquatic organisms are due to the cationic charge of the polymer, which is quickly neutralised in natural water courses by irreversible adsorption onto particles, hydrolysis and dissolved organic carbon. Fish toxicity and aquatic toxicity are drastically reduced by rapid irreversible adsorption onto suspended and/or dissolved organic matter. The hydrolysis products are not acutely harmful to aquatic organisms. Tested was a substance with a high cationic charge density. As the acute effects are associated with the charge density, substances with a lower charge density are expected to have a lower toxicity.

Toxicity to fish:
LC50 (96 h) 1 - 10 mg/l, Fish (static)

Aquatic invertebrates:
EC50 (48 h) 10 - 100 mg/l, daphnia

12.2. Persistence and degradability

Assessment biodegradation and elimination (H2O):
Not readily biodegradable (by OECD criteria).

Information on Stability in Water (Hydrolysis):
> 70 % (28 d) (pH value > 6)
In contact with water the substance will hydrolyse rapidly.

12.3. Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

12.4. Mobility in soil

Information on: cationic polyacrylamide
Assessment transport between environmental compartments:
Adsorption in soil: Adsorption to solid soil phase is expected.

12.5. Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

12.6. Other adverse effects

The product does not contain substances that are listed in Annex I of Regulation (EC) 2037/2000 on substances that deplete the ozone layer.

12.7. Additional information

Other ecotoxicological advice:
The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

SECTION 14: Transport Information

Land transport

ADR

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

RID

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

Inland waterway transport

ADN

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable

UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known
Transport in inland waterway vessel:	Not evaluated

Sea transport

IMDG

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

Air transport

IATA/ICAO

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

14.1. UN number
See corresponding entries for “UN number” for the respective regulations in the tables above.

14.2. UN proper shipping name
See corresponding entries for “UN proper shipping name” for the respective regulations in the tables above.

14.3. Transport hazard class(es)
See corresponding entries for “Transport hazard class(es)” for the respective regulations in the tables above.

14.4. Packing group
See corresponding entries for “Packing group” for the respective regulations in the tables above.

14.5. Environmental hazards
See corresponding entries for “Environmental hazards” for the respective regulations in the tables above.

14.6. Special precautions for user
See corresponding entries for “Special precautions for user” for the respective regulations in the tables above.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Regulation:	Not evaluated
Shipment approved:	Not evaluated
Pollution name:	Not evaluated
Pollution category:	Not evaluated
Ship Type:	Not evaluated

SECTION 15: Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

15.2. Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

SECTION 16: Other Information

Assessment of the hazard classes according to UN GHS criteria (most recent version)

Aquatic Acute 2

Full text of the classifications, including the indication of danger, the hazard symbols, the R phrases, and the hazard statements, if mentioned in section 2 or 3:

Xi	Irritant.
36	Irritating to eyes.
Eye Dam./Irrit.	Serious eye damage/eye irritation
H319	Causes serious eye irritation.
H318	Causes serious eye damage.

If you have any queries relating to this MSDS, it's contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Vertical lines in the left hand margin indicate an amendment from the previous version.

Annex: Exposure Scenarios

Index

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1. Short title of exposure scenario

Manufacture of substance
SU3; ERC1; PROC1, PROC2, PROC3, PROC4

****

2. Short title of exposure scenario

Consumer applications
SU2a; ERC4; PROC8a, PROC8b, PROC9

****

3. Short title of exposure scenario

Formulation
SU10; ERC2; PROC1, PROC2, PROC3, PROC4, PROC5

****

We create chemistry

Safety data sheet

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Zetag® 8187

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

1.3. Details of the supplier of the safety data sheet

Company:
BASF plc
PO Box 4, Earl Road, Cheadle Hulme,
Cheadle, Cheshire
SK8 6QG, UNITED KINGDOM

Telephone: +44 161 485-6222
E-mail address: product-safety-north@basf.com

1.4. Emergency telephone number

Telephone: +49 180 2273-112

SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

According to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

2.2. Label elements

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

2.3. Other hazards

According to Regulation (EC) No 1272/2008 [CLP]

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

SECTION 3: Composition/Information on Ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Chemical nature

polyacrylamide, cationic

Hazardous ingredients (GHS)
according to Regulation (EC) No. 1272/2008

adipic acid

Content (W/W): >= 2 % - <= 6 %	Eye Dam./Irrit. 2
CAS Number: 124-04-9	H319
EC-Number: 204-673-3	
REACH registration number: 01-2119457561-38	Differing classification according to current knowledge and the criteria given in Annex I of Regulation (EC) No. 1272/2008
INDEX-Number: 607-144-00-9	Eye Dam./Irrit. 1
	H318

For the classifications not written out in full in this section, including the hazard classes and the hazard statements, the full text is listed in section 16.

SECTION 4: First-Aid Measures

4.1. Description of first aid measures

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

4.2. Most important symptoms and effects, both acute and delayed
Symptoms: No significant symptoms are expected due to the non-classification of the product.

Hazards: No hazard is expected under intended use and appropriate handling.

4.3. Indication of any immediate medical attention and special treatment needed
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

SECTION 5: Fire-Fighting Measures

5.1. Extinguishing media
Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet, carbon dioxide

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

5.2. Special hazards arising from the substance or mixture
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

5.3. Advice for fire-fighters
Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

SECTION 6: Accidental Release Measures

Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Avoid the formation and build-up of dust - danger of dust explosion. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Forms slippery surfaces with water.

6.1. Personal precautions, protective equipment and emergency procedures
Use personal protective clothing.

6.2. Environmental precautions
Do not discharge into drains/surface waters/groundwater.

6.3. Methods and material for containment and cleaning up
For small amounts: Pick up with suitable appliance and dispose of.
For large amounts: Contain with dust binding material and dispose of.
Avoid raising dust.

6.4. Reference to other sections
Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

SECTION 7: Handling and Storage

7.1. Precautions for safe handling
Breathing must be protected when large quantities are decanted without local exhaust ventilation.
Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Protection against fire and explosion:
Avoid dust formation. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres.

7.2. Conditions for safe storage, including any incompatibilities
The product in undamaged packing need not be stored separately.
Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:
Avoid extreme heat.

Protect from temperatures below: -20 °C
Protect from temperatures above: 50 °C

7.3. Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Components with occupational exposure limits

Particles, not otherwise specified, respirable
TWA value 4 mg/m3 (WEL/EH 40 (UK)), Respirable dust
Particles, not otherwise specified, inhalable
TWA value 10 mg/m3 (WEL/EH 40 (UK)), Inhalable dust

8.2. Exposure controls

Personal protective equipment

Respiratory protection:
Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:
Chemical resistant protective gloves (EN 374)
Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):
e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other
Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:
Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:
light protective clothing

General safety and hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. No eating, drinking, smoking or tobacco use at the place of work.

Environmental exposure controls
For information regarding environmental exposure controls, see Section 6.

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Form:	amorphous powder	
Colour:	off-white	
Odour:	almost odourless	
Odour threshold:		
	No applicable information available.	
pH value:	4.6	
	(1 %(m), 25 °C)	
Melting point:	> 250 °C	(capilliary tube method)
Boiling point:		
	not applicable	
Flash point:		
	not applicable	
Evaporation rate:		
	The product is a non-volatile solid.	
Flammability:	not highly flammable	
Lower explosion limit:		
	For solids not relevant for classification and labelling.	
Upper explosion limit:		
	For solids not relevant for classification and labelling.	
Vapour pressure:		
	The product has not been tested.	
Solubility in water:	readily soluble	
	> 10 g/l	
Solubility (qualitative) solvent(s):	polar solvents	
	soluble	
Partitioning coefficient n-octanol/water (log Kow):		
	Study scientifically not justified.	
Self ignition:	not self-igniting	
Thermal decomposition:	No decomposition if stored and handled as prescribed/indicated.	
Viscosity, dynamic:		
	not determined	
Explosion hazard:	not explosive	
Fire promoting properties:	not fire-propagating	

9.2. Other information

Self heating ability:	It is not a substance capable of spontaneous heating.
Bulk density:	700 kg/m3
Hygroscopy:	hygroscopic

Other Information:
If necessary, information on other physical and chemical parameters is indicated in this section.

SECTION 10: Stability and Reactivity

10.1. Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

10.2. Chemical stability
The product is stable if stored and handled as prescribed/indicated.

10.3. Possibility of hazardous reactions
The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

10.4. Conditions to avoid
Avoid extreme temperatures. Avoid humidity.

10.5. Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

10.6. Hazardous decomposition products

Hazardous decomposition products:
No hazardous decomposition products if stored and handled as prescribed/indicated.

SECTION 11: Toxicological Information

11.1. Information on toxicological effects

Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 5,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Assessment of sensitization:
Based on the ingredients, there is no suspicion of a skin-sensitizing potential.

Germ cell mutagenicity

Assessment of mutagenicity:
Based on the ingredients, there is no suspicion of a mutagenic effect.

Carcinogenicity

Assessment of carcinogenicity:
The whole of the information assessable provides no indication of a carcinogenic effect.

Reproductive toxicity

Assessment of reproduction toxicity:
Based on the ingredients, there is no suspicion of a toxic effect on reproduction.

Specific target organ toxicity (single exposure)

No data available.

Repeated dose toxicity and Specific target organ toxicity (repeated exposure)

Assessment of repeated dose toxicity:
Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statement has been derived from the properties of the individual components.

Aspiration hazard

No aspiration hazard expected.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

SECTION 12: Ecological Information

12.1. Toxicity

Assessment of aquatic toxicity:
Acute effects on aquatic organisms are due to the cationic charge of the polymer, which is quickly neutralised in natural water courses by irreversible adsorption onto particles, hydrolysis and dissolved organic carbon. Fish toxicity and aquatic toxicity are drastically reduced by rapid irreversible adsorption onto suspended and/or dissolved organic matter. The hydrolysis products are not acutely harmful to aquatic organisms. Tested was a substance with a high cationic charge

density. As the acute effects are associated with the charge density, substances with a lower charge density are expected to have a lower toxicity.

Toxicity to fish:
LC50 (96 h) 1 - 10 mg/l, Fish (static)

Aquatic invertebrates:
EC50 (48 h) 10 - 100 mg/l, daphnia

12.2. Persistence and degradability

Assessment biodegradation and elimination (H2O):
Not readily biodegradable (by OECD criteria).

Information on Stability in Water (Hydrolysis):
> 70 % (28 d) (pH value > 6)
In contact with water the substance will hydrolyse rapidly.

12.3. Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

12.4. Mobility in soil

Information on: cationic polyacrylamide
Assessment transport between environmental compartments:
Adsorption in soil: Adsorption to solid soil phase is expected.

12.5. Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

12.6. Other adverse effects

The product does not contain substances that are listed in Annex I of Regulation (EC) 2037/2000 on substances that deplete the ozone layer.

12.7. Additional information

Other ecotoxicological advice:
Must not be discharged into the environment. The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

SECTION 14: Transport Information

Land transport

ADR

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

RID

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

Inland waterway transport
ADN

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for	None known

user:

Transport in inland waterway vessel
Not evaluated

Sea transport

IMDG

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

Air transport

IATA/ICAO

	Not classified as a dangerous good under transport regulations
UN number:	Not applicable
UN proper shipping name:	Not applicable
Transport hazard class(es):	Not applicable
Packing group:	Not applicable
Environmental hazards:	Not applicable
Special precautions for user	None known

14.1. UN number
See corresponding entries for “UN number” for the respective regulations in the tables above.

14.2. UN proper shipping name
See corresponding entries for “UN proper shipping name” for the respective regulations in the tables above.

14.3. Transport hazard class(es)
See corresponding entries for “Transport hazard class(es)” for the respective regulations in the tables above.

14.4. Packing group
See corresponding entries for “Packing group” for the respective regulations in the tables above.

14.5. Environmental hazards
See corresponding entries for “Environmental hazards” for the respective regulations in the tables above.

14.6. Special precautions for user
See corresponding entries for “Special precautions for user” for the respective regulations in the tables above.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Regulation:	Not evaluated
Shipment approved:	Not evaluated
Pollution name:	Not evaluated
Pollution category:	Not evaluated
Ship Type:	Not evaluated

SECTION 15: Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Prohibitions, Restrictions and Authorizations

Annex XVII of Regulation (EC) No 1907/2006: Number on List: 28

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

15.2. Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

SECTION 16: Other Information

Assessment of the hazard classes according to UN GHS criteria (most recent version)

Aquatic Acute 2

Full text of the classifications, including the hazard classes and the hazard statements, if mentioned in section 2 or 3:

Eye Dam./Irrit.	Serious eye damage/eye irritation
H319	Causes serious eye irritation.
H318	Causes serious eye damage.

If you have any queries relating to this MSDS, it's contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. This safety data sheet is neither a Certificate of Analysis (CoA) nor technical data sheet and shall not be mistaken for a specification agreement. Identified uses in this safety data sheet do neither represent an agreement on the corresponding contractual quality of the substance/mixture nor a contractually designated use. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Vertical lines in the left hand margin indicate an amendment from the previous version.

GAS OIL
ChemWatch Review SDS

Chemwatch Hazard Alert Code: **2**

Chemwatch: **1202**
Version No: **5.1.1.1**
Safety Data Sheet (Conforms to Regulation (EU) No 2015/830)

Issue Date: **27/06/2017**
Print Date: **27/10/2020**
L.REACH.GBR.EN

SECTION 1 Identification of the substance / mixture and of the company / undertaking

1.1. Product Identifier

Product name	GAS OIL
Chemical Name	gas oil
Synonyms	gas-oils; cracker; diesel oil; furnace oil; absorption oil; gas oil, blend; Maggie Oil 535; Generex 57; Gas Oil, Light ..C11-20 401F-653F; Distillates (petroleum), straight-run middle
Proper shipping name	GAS OIL or DIESEL FUEL or HEATING OIL, LIGHT
Chemical formula	C11H10
Other means of identification	Not Available
CAS number	64741-44-2
EC number	265-044-7
REACH registration number	01-2119486889-09-XXXX

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Used as an absorption oil and in the manufacture of ethylene.
Uses advised against	Not Applicable

1.3. Details of the supplier of the safety data sheet

Registered company name	**ChemWatch**
Address	Australia
Telephone	Not Available
Fax	Not Available
Website	Not Available
Email	Not Available

1.4. Emergency telephone number

Association / Organisation	**Not Available**
Emergency telephone numbers	Not Available
Other emergency telephone numbers	Not Available

SECTION 2 Hazards identification

2.1. Classification of the substance or mixture

Classification according to regulation (EC) No 1272/2008 [CLP] and amendments [1]	H336 - Specific target organ toxicity - single exposure Category 3 (narcotic effects), H226 - Flammable Liquid Category 3
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI*

2.2. Label elements

Hazard pictogram(s)	
Signal word	**Warning**

Page 1 continued...

Hazard statement(s)

H336	May cause drowsiness or dizziness.
H226	Flammable liquid and vapour.

Supplementary statement(s)

Not Applicable

Precautionary statement(s) Prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P271	Use only outdoors or in a well-ventilated area.
P240	Ground and bond container and receiving equipment.
P241	Use explosion-proof electrical/ventilating/lighting/intrinsically safe equipment.
P242	Use non-sparking tools.
P243	Take action to prevent static discharges.
P261	Avoid breathing mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s) Response

P370+P378	In case of fire: Use alcohol resistant foam or normal protein foam to extinguish.
P312	Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Precautionary statement(s) Storage

P403+P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.

2.3. Other hazards

Inhalation and/or ingestion may produce health damage*.

Cumulative effects may result following exposure*.

May produce discomfort of the eyes, respiratory tract and skin*.

Repeated exposure potentially causes skin dryness and cracking*.

REACh - Art.57-59: The mixture does not contain Substances of Very High Concern (SVHC) at the SDS print date.

SECTION 3 Composition / information on ingredients

3.1.Substances

1.CAS No 2.EC No 3.Index No 4.REACH No	**%[weight]**	**Name**	**Classification according to regulation (EC) No 1272/2008 [CLP] and amendments**
1.64741-44-2 2.265-044-7 3.Not Available 4.01-2119486889-09-XXXX	>98	gas oil	Specific target organ toxicity - single exposure Category 3 (narcotic effects), Flammable Liquid Category 3; H336, H226 [1]
Not Available		A mixture of petroleum hydrocarbons.	Not Applicable
Not Available		Consists mainly of C9-C16 linear and branched	Not Applicable
Not Available		aliphatics, olefins, cycloparaffins and	Not Applicable
Not Available		aromatics.	Not Applicable

Legend: *1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 3. Classification drawn from C&L; * EU IOELVs available*

3.2.Mixtures

See 'Information on ingredients' in section 3.1

SECTION 4 First aid measures

4.1. Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Wash out immediately with fresh running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper

Continued...

	and lower lids. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes or combustion products are inhaled remove from contaminated area. ▸ Lay patient down. Keep warm and rested. ▸ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ▸ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ▸ Transport to hospital, or doctor.
Ingestion	▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Seek medical advice. ▸ Avoid giving milk or oils. ▸ Avoid giving alcohol. ▸ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11

4.3. Indication of any immediate medical attention and special treatment needed

For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

- Primary threat to life, from pure petroleum distillate ingestion and/or inhalation, is respiratory failure.
- Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnoea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO2 50 mm Hg) should be intubated.
- Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
- A chest x-ray should be taken immediately after stabilisation of breathing and circulation to document aspiration and detect the presence of pneumothorax.
- Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitisation to catecholamines. Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
- Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. [Ellenhorn and Barceloux: Medical Toxicology]

SECTION 5 Firefighting measures

5.1. Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility	▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

5.3. Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves. ▸ Prevent, by any means available, spillage from entering drains or water course. ▸ If safe, switch off electrical equipment until vapour fire hazard removed. ▸ Use water delivered as a fine spray to control fire and cool adjacent area. ▸ Avoid spraying water onto liquid pools. ▸ **DO NOT** approach containers suspected to be hot. ▸ Cool fire exposed containers with water spray from a protected location. ▸ If safe to do so, remove containers from path of fire.
Fire/Explosion Hazard	▸ Liquid and vapour are flammable. ▸ Moderate fire hazard when exposed to heat or flame. ▸ Vapour forms an explosive mixture with air. ▸ Moderate explosion hazard when exposed to heat or flame. ▸ Vapour may travel a considerable distance to source of ignition. ▸ Heating may cause expansion or decomposition leading to violent rupture of containers. ▸ On combustion, may emit toxic fumes of carbon monoxide (CO). Combustion products include: carbon monoxide (CO) carbon dioxide (CO_2) other pyrolysis products typical of burning organic material. **CARE**: Water in contact with hot liquid may cause foaming and a steam explosion with wide scattering of hot oil and possible severe burns. Foaming may cause overflow of containers and may result in possible fire. * Flammable or combustible liquid. Flashpoint varies according to grade and components of the distillate. Gas oils with a flash point >61 C. are not classed by IMO and ACTDG as a flammable liquid, Class 3.

SECTION 6 Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Continued...

See section 8

6.2. Environmental precautions

See section 12

6.3. Methods and material for containment and cleaning up

Minor Spills

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

Major Spills

Chemical Class: aliphatic hydrocarbons
For release onto land: recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS
LAND SPILL - SMALL				
cross-linked polymer - particulate	1	shovel	shovel	R, W, SS
cross-linked polymer - pillow	1	throw	pitchfork	R, DGC, RT
wood fiber - pillow	2	throw	pitchfork	R, P, DGC, RT
treated wood fibre- pillow	2	throw	pitchfork	DGC, RT
sorbent clay - particulate	3	shovel	shovel	R, I, P
foamed glass - pillow	3	throw	pitchfork	R, P, DGC, RT
LAND SPILL - MEDIUM				
cross-linked polymer - particulate	1	blower	skiploader	R,W, SS
cross-linked polymer - pillow	2	throw	skiploader	R, DGC, RT
sorbent clay - particulate	3	blower	skiploader	R, I, P
polypropylene - particulate	3	blower	skiploader	W, SS, DGC
expanded mineral - particulate	4	blower	skiploader	R, I, W, P, DGC
polypropylene - mat	4	throw	skiploader	DGC, RT

Legend
DGC: Not effective where ground cover is dense
R; Not reusable
I: Not incinerable
P: Effectiveness reduced when rainy
RT:Not effective where terrain is rugged
SS: Not for use within environmentally sensitive sites
W: Effectiveness reduced when windy
Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;
R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

6.4. Reference to other sections

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

7.1. Precautions for safe handling

Safe handling

- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.
- **DO NOT** allow clothing wet with material to stay in contact with skin
- Electrostatic discharge may be generated during pumping - this may result in fire.
- Ensure electrical continuity by bonding and grounding (earthing) all equipment.
- Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<=1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec).
- Avoid splash filling.
- Do NOT use compressed air for filling discharging or handling operations.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.

Continued...

	▸ Use in a well-ventilated area. ▸ Prevent concentration in hollows and sumps. ▸ **DO NOT** enter confined spaces until atmosphere has been checked. ▸ Avoid smoking, naked lights or ignition sources. ▸ Avoid generation of static electricity. ▸ **DO NOT** use plastic buckets. ▸ Earth all lines and equipment. ▸ Use spark-free tools when handling. ▸ Avoid contact with incompatible materials. ▸ When handling, **DO NOT** eat, drink or smoke. ▸ Keep containers securely sealed when not in use. ▸ Avoid physical damage to containers. ▸ Always wash hands with soap and water after handling. ▸ Work clothes should be laundered separately. ▸ Use good occupational work practice. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. ▸ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Fire and explosion protection	See section 5
Other information	▸ Store in original containers in approved flammable liquid storage area. ▸ Store away from incompatible materials in a cool, dry, well-ventilated area. ▸ **DO NOT** store in pits, depressions, basements or areas where vapours may be trapped. ▸ No smoking, naked lights, heat or ignition sources. ▸ Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access. ▸ Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances. ▸ Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems. ▸ Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors. ▸ Keep adsorbents for leaks and spills readily available. ▸ Protect containers against physical damage and check regularly for leaks. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. In addition, for tank storages (where appropriate): ▸ Store in grounded, properly designed and approved vessels and away from incompatible materials. ▸ For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents with flame arrestors; inspect tank vents during winter conditions for vapour/ ice build-up. ▸ Storage tanks should be above ground and diked to hold entire contents.

7.2. Conditions for safe storage, including any incompatibilities

Suitable container	▸ Packing as supplied by manufacturer. ▸ Plastic containers may only be used if approved for flammable liquid. ▸ Check that containers are clearly labelled and free from leaks. ▸ For low viscosity materials (i) : Drums and jerry cans must be of the non-removable head type. (ii) : Where a can is to be used as an inner package, the can must have a screwed enclosure. ▸ For materials with a viscosity of at least 2680 cSt. (23 deg. C) ▸ For manufactured product having a viscosity of at least 250 cSt. (23 deg. C) ▸ Manufactured product that requires stirring before use and having a viscosity of at least 20 cSt (25 deg. C): (i) Removable head packaging; (ii) Cans with friction closures and (iii) low pressure tubes and cartridges may be used. ▸ Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages ▸ In addition, where inner packagings are glass and contain liquids of packing group I there must be sufficient inert absorbent to absorb any spillage, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.
Storage incompatibility	**CARE**: Water in contact with heated material may cause foaming or a steam explosion with possible severe burns from wide scattering of hot material. Resultant overflow of containers may result in fire. ▸ Avoid reaction with oxidising agents

7.3. Specific end use(s)

See section 1.2

SECTION 8 Exposure controls / personal protection

8.1. Control parameters

Ingredient	DNELs Exposure Pattern Worker	PNECs Compartment
gas oil	Dermal 2.91 mg/kg bw/day (Systemic, Chronic) Inhalation 16.4 mg/m³ (Systemic, Chronic) Inhalation 1 500.8 mg/m³ (Systemic, Acute) *Dermal 1.25 mg/kg bw/day (Systemic, Chronic) ** *Inhalation 4.85 mg/m³ (Systemic, Chronic) ** *Oral 1.25 mg/kg bw/day (Systemic, Chronic) ** *Inhalation 900.48 mg/m³ (Systemic, Acute) **	Not Available

* Values for General Population

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

Continued...

Not Applicable

Emergency Limits

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
gas oil	Mineral oil, heavy or light; (paraffin oil; Deobase, deodorized; heavy paraffinic; heavy naphthenic); distillates; includes 64741-53-3, 64741-88-4, 8042-47-5, 8012-95-1; 64742-54-7	140 mg/m3	1,500 mg/m3	8,900 mg/m3

Ingredient	Original IDLH	Revised IDLH
gas oil	2,500 mg/m3	Not Available

MATERIAL DATA

Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.
OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

for petroleum distillates:
CEL TWA: 500 ppm, 2000 mg/m3 (compare OSHA TWA)
(CEL = Chemwatch Exposure Limit)
for mineral oils (excluding metal working fluids), pure, highly and severely refined:
Human exposure to oil mist alone has not been demonstrated to cause health effects except at levels above 5 mg/m3 (this applies to particulates sampled by a method that does not collect vapour). It is not advisable to apply this standard to oils containing unknown concentrations and types of additive.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Employers may need to use multiple types of controls to prevent employee overexposure.

For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant.
Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

8.2.2. Personal protection

Eye and face protection

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in

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	their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]
Skin protection	See Hand protection below
Hands/feet protection	▸ Wear chemical protective gloves, e.g. PVC. ▸ Wear safety footwear or safety gumboots, e.g. Rubber The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended. Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: · frequency and duration of contact, · chemical resistance of glove material, · glove thickness and · dexterity Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent). · When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. · When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. · Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use. · Contaminated gloves should be replaced. As defined in ASTM F-739-96 in any application, gloves are rated as: · Excellent when breakthrough time > 480 min · Good when breakthrough time > 20 min · Fair when breakthrough time < 20 min · Poor when glove material degrades For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended. It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times. Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task. Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example: · Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. · Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended. ▸ Neoprene rubber gloves
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ PVC Apron. ▸ PVC protective suit may be required if exposure severe. ▸ Eyewash unit. ▸ Ensure there is ready access to a safety shower. ▸ Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity. ▸ For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets). ▸ Non sparking safety or conductive footwear should be considered. Conductive footwear describes a boot or shoe with a sole made from a conductive compound chemically bound to the bottom components, for permanent control to electrically ground the foot an shall dissipate static electricity from the body to reduce the possibility of ignition of volatile compounds. Electrical resistance must range between 0 to 500,000 ohms. Conductive shoes should be stored in lockers close to the room in which they are worn. Personnel who have been issued conductive footwear should not wear them from their place of work to their homes and return.

Respiratory protection

Type A-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	A-AUS / Class1 P2	-
up to 50	1000	-	A-AUS / Class 1 P2
up to 50	5000	Airline *	-
up to 100	5000	-	A-2 P2
up to 100	10000	-	A-3 P2
100+			Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.

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- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

8.2.3. Environmental exposure controls

See section 12

SECTION 9 Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Yellow to brown liquid with a petroleum odour; floats on water. Mixes with many other organic solvents. A complex combination of hydrocarbons produced by the distillation of crude oil. It consists of hydrocarbons having carbon numbers predominantly in the range of C11 through C20 and boiling in the range of 205 C to 345 C

Physical state	Liquid	**Relative density (Water = 1)**	0.848 ~
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	338
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not available.	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	190-426	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	65.5 (typical)	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Combustible.	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	13.5	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	6.0	**Volatile Component (%vol)**	Not available.
Vapour pressure (kPa)	Not available.	**Gas group**	Not Available
Solubility in water	Immiscible	**pH as a solution (1%)**	Not Applicable
Vapour density (Air = 1)	3.4	**VOC g/L**	Not Available

9.2. Other information

Not Available

SECTION 10 Stability and reactivity

10.1.Reactivity	See section 7.2
10.2. Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ Hazardous polymerisation will not occur.
10.3. Possibility of hazardous reactions	See section 7.2
10.4. Conditions to avoid	See section 7.2
10.5. Incompatible materials	See section 7.2
10.6. Hazardous decomposition products	See section 5.3

SECTION 11 Toxicological information

11.1. Information on toxicological effects

Inhaled	Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo. Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. Limited evidence or practical experience suggests that the material may produce irritation of the respiratory system, in a significant number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterised by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary oedema, pneumonitis and pulmonary haemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species (typically C2-C12) may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowsiness, tremors and anaesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apnoeic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro-haemorrhage of focal post-inflammatory scarring may produce epileptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with oedema and haemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Pulmonary irritancy increases with carbon chain length for paraffins and olefins. Alkenes produce pulmonary oedema at high concentrations. Liquid paraffins may produce anaesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C5-7 paraffins may also produce

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	polyneuropathy. Aromatic hydrocarbons accumulate in lipid rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue and vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitisers and may cause ventricular fibrillations. Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal. Inhalation of oil droplets/ aerosols may cause discomfort and may produce chemical pneumonitis. Acute effects from inhalation of high concentrations of vapour are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterised by headache and dizziness, increased reaction time, fatigue and loss of co-ordination Systemic effects may include stimulation followed by depression of the central nervous system which, in severe cases, may progress to coma and death following. An irregular heartbeat may be a complication.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, oesophagus, stomach and small intestine with oedema and mucosal ulceration resulting; symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anaesthetise the tongue. Aspiration into the lungs may produce coughing, gagging and a chemical pneumonitis with pulmonary oedema and haemorrhage.
Skin Contact	Repeated exposure may cause skin cracking, flaking or drying following normal handling and use. The material may produce moderate skin irritation; limited evidence or practical experience suggests, that the material either: ▸ produces moderate inflammation of the skin in a substantial number of individuals following direct contact and/or ▸ produces significant, but moderate, inflammation when applied to the healthy intact skin of animals (for up to four hours), such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis. The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives . The material may accentuate any pre-existing dermatitis condition Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. Aromatic hydrocarbons may produce skin irritation, vasodilation with erythema and changes in endothelial cell permeability. Systemic intoxication, resulting from contact with the light aromatics, is unlikely due to the slow rate of permeation. Branching of the side chain appears to increase percutaneous absorption.
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation.
Chronic	Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paraesthesias of the extremities, weight loss and anaemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers, to the lighter hydrocarbons, has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paraesthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localised dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms. One epidemiological study of petroleum refinery workers has reported elevations in standard mortality ratios for skin cancer along with a dose-response relationship indicating an association between routine workplace exposure to petroleum or one of its constituents and skin cancer, particularly melanoma. Other studies have been unable to confirm this finding. Hydrocarbon solvents are liquid hydrocarbon fractions derived from petroleum processing streams, containing only carbon and hydrogen atoms, with carbon numbers ranging from approximately C5-C20 and boiling between approximately 35-370 deg C. Many of the hydrocarbon solvents have complex and variable compositions with constituents of 4 types, alkanes (normal paraffins, isoparaffins, and cycloparaffins) and aromatics (primarily alkylated one- and two-ring species). Despite the compositional complexity, most hydrocarbon solvent constituents have similar toxicological properties, and the overall toxicological hazards can be characterized in generic terms. Hydrocarbon solvents can cause chemical pneumonitis if aspirated into the lung, and those that are volatile can cause acute CNS effects and/or ocular and respiratory irritation at exposure levels exceeding occupational recommendations. Otherwise, there are few toxicologically important effects. The exceptions, n-hexane and naphthalene, have unique toxicological properties Animal studies: No deaths or treatment related signs of toxicity were observed in rats exposed to light alkylate naphtha (paraffinic hydrocarbons) at concentrations of 668, 2220 and 6646 ppm for 6 hrs/day, 5 days/wk for 13 weeks. Increased liver weights and kidney toxicity (male rats) was observed in high dose animals. Exposure to pregnant rats at concentrations of 137, 3425 and 6850 ppm did not adversely affect reproduction or cause maternal or foetal toxicity. Lifetime skin painting studies in mice with similar naphthas have shown weak or no carcinogenic activity following prolonged and repeated exposure. Similar naphthas/distillates, when tested at nonirritating dose levels, did not show any significant carcinogenic activity indicating that this tumorigenic response is likely related to chronic irritation and not to dose. The mutagenic potential of naphthas has been reported to be largely negative in a variety of mutagenicity tests. The exact relationship between these results and human health is not known. Some components of this product have been shown to produce a species specific, sex hormonal dependent kidney lesion in male rats from repeated oral or inhalation exposure. Subsequent research has shown that the kidney damage develops via the formation of a alpha-2u-globulin, a mechanism unique to the male rat. Humans do not form alpha-2u-globulin, therefore, the kidney effects resulting from this mechanism are not relevant in human.

gas oil	**TOXICITY**	**IRRITATION**
	Inhalation (rat) LC50: 1.7 mg/l/4h[2]	Eye: no adverse effect observed (not irritating)[1]
	Oral (rat) LD50: =5000 mg/kg[2]	Skin: no adverse effect observed (not irritating)[1]
Legend:	*1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*	

Continued...

GAS OIL	The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

Acute Toxicity	✗	**Carcinogenicity**	✗
Skin Irritation/Corrosion	✗	**Reproductivity**	✗
Serious Eye Damage/Irritation	✗	**STOT - Single Exposure**	✓
Respiratory or Skin sensitisation	✗	**STOT - Repeated Exposure**	✗
Mutagenicity	✗	**Aspiration Hazard**	✗

Legend: ✗ *– Data either not available or does not fill the criteria for classification*
✓ *– Data available to make classification*

SECTION 12 Ecological information

12.1. Toxicity

gas oil

Endpoint	Test Duration (hr)	Species	Value	Source
LC50	96	Fish	1.301mg/L	2
EC50	48	Crustacea	2mg/L	2
EC50	72	Algae or other aquatic plants	1.8mg/L	2
NOEL	504	Crustacea	0.167mg/L	2

Legend: *Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

for gas oils and distillate fuels:
The gas oils category includes both finished products (distillate fuels) and the refinery streams (gas oils) from which they are blended. The materials in this category, together with those in the Jet Fuel/Kerosene category, constitute a generic class of petroleum substances commonly known as middle distillates. The distillate fuels covered in this category are used in diesel engines and for both industrial and domestic heating. While within the refinery the gas oil streams exist primarily as intermediates in closed systems. Selected gas oil streams may ultimately be blended into distillate fuels, marine bunker fuels and occasionally into lubricants. At ambient temperatures, all the substances in this category are liquids. Gas oil streams and distillate fuels are complex petroleum mixtures, composed primarily of saturated (paraffinic and naphthenic) or aromatic hydrocarbons with carbon numbers ranging from C9 to C30.
Gas Oils are similar from both a process and physical-chemical perspective, being differentiated from each other primarily by their aromatic and saturated hydrocarbon content. The compositions of the gas oil streams range from those that are predominantly saturated hydrocarbons to those that are predominantly aromatic hydrocarbons. Consequently, the category can be considered a continuum, bounded by materials that are compositionally either high in saturated hydrocarbons or aromatic hydrocarbons. While the ratio of the saturated and aromatic hydrocarbons may vary between category members the saturated and aromatic hydrocarbons species that make up the category members are similar. Based on the available data, the physical-chemical properties of an individual category member depend on its compositional makeup, vis a vis saturated and aromatic hydrocarbons. Therefore, gas oil streams that are predominantly saturated hydrocarbons will have similar physical-chemical properties, while those that are composed predominantly of aromatic hydrocarbons will have somewhat different properties. As products that are blended from the gas oil streams, the compositions of the distillate fuels fall within the range of the compositions shown by the gas oil streams and reflect the characteristics of the gas oils streams from which they are blended.
Boiling Point Gas oils do not have a single numerical value for boiling point, but rather a boiling or distillation range that reflects the individual components in the hydrocarbon mixture. Distillation ranges for a variety of gas oils have been reported for a number of blended gas oil products and individual gas oil production streams . Typical distillation ranges for blended fuels are 160 to 390 C for an automotive gas oil (diesel fuel), 160 to 400 C for a heating oil, and 170 to 420 C for a distillate marine fuel Typical low end and high end distillation temperatures for gas oil production streams were 172 and 344 C for a hydrodesulfurised middle distillate (65.6% -79.4% saturated hydrocarbons), 185 and 391 C for a straight-run middle distillate (78.8 saturated hydrocarbons), and 185 and 372 C for a light catalytic cracked distillate (60.8% -79.8% aromatic hydrocarbons). No substantial differences in boiling range were apparent for gas oils with high concentrations of either aromatic or saturated hydrocarbons
Vapor Pressure : For mixtures such as petroleum products, the vapor pressure of the mixture is the sum of the partial pressures of the individual components (Dalton's Law of Partial Pressures). Gas oils are expected to have low vapor pressure due to their boiling range (150 to 450 C) and molecular weights of the constituent hydrocarbons (C9 – 30 carbon atoms). Because the physical-chemical characteristics of distillate fuels reflect the gas oil streams from which they were produced, these vapor pressure measurements are expected to approximate the vapor pressures of individual gas oils. Vapour pressure estimates of low molecular weight hydrocarbons of varying isomeric structures fell within a range of 0.01-1.6 kPa, with higher molecular weight hydrocarbons showing very low vapour pressures (e.g., 10-8 to 10-10 kPa).
Partition Coefficient The percent distribution of the hydrocarbon groups (i.e., paraffins, olefins, naphthenes, and aromatics) and the carbon chain lengths of hydrocarbon constituents in gas oils largely determines the partitioning characteristics of the mixture. Generally, hydrocarbon chains with fewer carbon atoms tend to have lower partition coefficients than those with higher carbon numbers Because gas oils are complex mixtures, it is not possible to determine their log Kow values. Rather, partition coefficients have been calculated for individual component hydrocarbons from known hydrocarbon composition Those calculated Kow values ranged from 3.9 to >6.0 for a hydrodesulfurised middle distillate ((65.6% -79.4% saturated hydrocarbons), straight-run middle distillate (78.8% saturated hydrocarbons), and a light cat-cracked distillate (60.8% -79.8% aromatic hydrocarbons). There are no apparent differences in the range of Kow values determined for gas oils with high concentrations of either aromatic or saturated hydrocarbons. A similar range of partition coefficients would be expected for component hydrocarbons in distillate fuels.
Environmental fate:
Photodegradation : The direct aqueous photolysis of an organic molecule occurs when it absorbs sufficient light energy to result in a structural transformation. Only light energy at wavelengths between 290 and 750 nm can result in photochemical transformations in the environment, although absorption is not always sufficient for a chemical to undergo photochemical degradation. Saturated and one-ring aromatic hydrocarbons do not show absorbance in the 290 to 800 nm range and would not be expected to be directly photodegraded. Polyaromatic hydrocarbons, on the other hand, have shown absorbance of the 290 to 800 nm range of light energy and could potentially undergo photolysis reactions. The degree and rate at which these compounds photodegrade depends upon whether conditions allow penetration of light with sufficient energy to effect a change.
Components in gas oils that do not directly photodegrade (e.g., paraffins, naphthenes, and one-ring aromatic compounds) may be subject to indirect photodegradation. Indirect photodegradation is the reaction with photosensitised oxygen in the atmosphere in the form of hydroxyl radicals (OH).
Atmospheric oxidation rates and half-lives were calculated for the low and high end of the range of molecular weight constituents of gas oils (e.g., C9 and 30 hydrocarbon structures). Half-life estimates for these compounds ranged from 0.1 (for various C9 to C30 olefinic structures and C30 2+ring aromatic compounds) to 1.5 days (for a C9 one-ring aromatic structure). Based on the calculated half-life values calculated no substantial differences in indirect photodegradation potential is expected between gas oils with high concentrations of either aromatic or saturated hydrocarbons. A similar range of water solubility values would be expected for component hydrocarbons in distillate fuels.
Water Solubility : When released to water, gas oils will float and spread at a rate that is viscosity-dependent. Component hydrocarbons in gas oils will partition to water according to their individual solubility values. For individual hydrocarbon constituents in gas oils, water solubility values vary by orders of magnitude. Molecular weight and chemical structure have a great influence on the ultimate degree of solubility. Calculated water solubility ranged from essentially insoluble (approximately 10-8 mg/L) for the higher molecular weight fractions (e.g., C30) within gas oil to approximately 52 mg/L for a C9 alkylbenzene.
Hydrolysis: The materials in the gas oils category do not contain chemical moieties that undergo hydrolysis.
Transport and Distribution in the Environment (Fugacity) Models have been used to estimate the percent distribution in environmental media (i.e., air, water, soil, sediment, and fish) of various C9 to C30 compounds representing the different classes of hydrocarbons found in gas oils (e.g., paraffins, olefins, naphthenes, and aromatics). Hydrocarbons having nine carbon atoms showed a tendency to partition to air (up to 98%). As molecular weight increases, partitioning shifts to soil, which accounts for 98% of the distribution of the C30 components. This trend was similar for saturate and aromatic structures alike. Therefore, gas oils with high concentrations of either aromatic or saturated hydrocarbons are expected

Continued...

to partition in the environment in a similar manner
Biodegradation : Much of what is known is based on information gained from testing hydrocarbon mixtures of other petroleum products. Under standard biodegradability tests, hydrocarbon compounds representative of those found in gas oils typically do not pass ready biodegradability test conditions. Although those compounds are not recognized as being readily biodegradable, most hydrocarbon species present in gas oils are known to be ultimately degraded by aerobic microorganisms Lower molecular weight compounds may be expected to be degraded relatively quickly in aerobic conditions, while higher molecular weight compounds, particularly polycyclic aromatics, will degrade slower. Much of this evidence is based on bioremediation studies of contaminated soils, which have shown that hydrocarbon components in gas oils are degraded in the presence of oxygen.
Bioremediation of a diesel fuel spill has also been demonstrated under Arctic conditions
Under anaerobic conditions, such as anoxic sediments, rates of biodegradation of gas oils components are negligible and the gas oils may persist under those conditions for some time. Degradation then will be dependent on bioturbation or resuspension to provide microbes with access to oxygen.
Ecotoxicity:
Multiple ecotoxicological studies on heating and transportation fuels (e.g., no. 2 fuel oil and diesel fuel) have been conducted. In general, these commercial distillate fuels show moderate toxicity to aquatic life. LC50 values for fish ranged from 3.2 to 65 mg/L , while EC50 values for invertebrates ranged from 2.0 to 210 mg/L
DO NOT discharge into sewer or waterways.

12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
	No Data available for all ingredients	No Data available for all ingredients

12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

12.4. Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

12.5.Results of PBT and vPvB assessment

	P	B	T
Relevant available data	Not Available	Not Available	Not Available
PBT Criteria fulfilled?	Not Available	Not Available	Not Available

12.6. Other adverse effects

No data available

SECTION 13 Disposal considerations

13.1. Waste treatment methods

Product / Packaging disposal	Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate: ▸ Reduction ▸ Reuse ▸ Recycling ▸ Disposal (if all else fails) This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. ▸ **DO NOT** allow wash water from cleaning or process equipment to enter drains. ▸ It may be necessary to collect all wash water for treatment before disposal. ▸ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. ▸ Where in doubt contact the responsible authority. ▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Waste treatment options	Not Available
Sewage disposal options	Not Available

SECTION 14 Transport information

Labels Required

	
Marine Pollutant	NO
HAZCHEM	3Y

Land transport (ADR)

Continued...

14.1. **UN number**	1202
14.2. **UN proper shipping name**	GAS OIL or DIESEL FUEL or HEATING OIL, LIGHT
14.3. **Transport hazard class(es)**	Class: 3 Subrisk: Not Applicable
14.4. **Packing group**	III
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	Hazard identification (Kemler): 30 Classification code: F1 Hazard Label: 3 Special provisions: 640K 640L 640M 664 Limited quantity: 5 L Tunnel Restriction Code: 3 (D/E)

Air transport (ICAO-IATA / DGR)

14.1. **UN number**	1202
14.2. **UN proper shipping name**	Heating oil, light; Gas oil; Diesel fuel
14.3. **Transport hazard class(es)**	ICAO/IATA Class: 3 ICAO / IATA Subrisk: Not Applicable ERG Code: 3L
14.4. **Packing group**	III
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	Special provisions: A3 Cargo Only Packing Instructions: 366 Cargo Only Maximum Qty / Pack: 220 L Passenger and Cargo Packing Instructions: 355 Passenger and Cargo Maximum Qty / Pack: 60 L Passenger and Cargo Limited Quantity Packing Instructions: Y344 Passenger and Cargo Limited Maximum Qty / Pack: 10 L

Sea transport (IMDG-Code / GGVSee)

14.1. **UN number**	1202
14.2. **UN proper shipping name**	GAS OIL or DIESEL FUEL or HEATING OIL, LIGHT
14.3. **Transport hazard class(es)**	IMDG Class: 3 IMDG Subrisk: Not Applicable
14.4. **Packing group**	III
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	EMS Number: F-E , S-E Special provisions: Not Applicable Limited Quantities: 5 L

Inland waterways transport (ADN)

14.1. **UN number**	1202
14.2. **UN proper shipping name**	GAS OIL or DIESEL FUEL or HEATING OIL, LIGHT
14.3. **Transport hazard class(es)**	3 | Not Applicable
14.4. **Packing group**	III
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	Classification code: F1 Special provisions: 640K; 640L; 640M Limited quantity: 5 L Equipment required: PP, EX, A Fire cones number: 0

Continued...

14.7. Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 Regulatory information

15.1. Safety, health and environmental regulations / legislation specific for the substance or mixture

gas oil is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 1 : Carcinogenic to humans

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2015/830; Regulation (EC) No 1272/2008 as updated through ATPs.

15.2. Chemical safety assessment

For further information please look at the Chemical Safety Assessment and Exposure Scenarios prepared by your Supply Chain if available.

ECHA SUMMARY

Ingredient	CAS number	Index No	ECHA Dossier
gas oil	64741-44-2	Not Available	01-2119486889-09-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Flam. Liq. 3; Asp. Tox. 1	GHS02; GHS08; Dgr	H226; H304

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

National Inventory Status

National Inventory	Status
Australia - AIIC	Yes
Australia - Non-Industrial Use	No (gas oil)
Canada - DSL	Yes
Canada - NDSL	No (gas oil)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (gas oil)
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
Legend:	*Yes = All CAS declared ingredients are on the inventory* *No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 Other information

Revision Date	27/06/2017
Initial Date	28/12/2003

Full text Risk and Hazard codes

H304	May be fatal if swallowed and enters airways.

SDS Version Summary

Version	Issue Date	Sections Updated
4.1.1.1	23/08/2008	Acute Health (inhaled), Acute Health (skin), Appearance, Classification, Environmental, Ingredients, Synonyms, Transport

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:
EN 166 Personal eye-protection

Continued...

EN 340 Protective clothing
EN 374 Protective gloves against chemicals and micro-organisms
EN 13832 Footwear protecting against chemicals
EN 133 Respiratory protective devices

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average
PC—STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index

SAFETY DATA SHEET

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name or designation of the mixture	HYDREX 1368
Registration number	-
Synonyms	None.
Issue date	19-December-2017
Version number	01

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Boiler Water Treatment
Uses advised against	None known.

1.3. Details of the supplier of the safety data sheet

Supplier	VWS UK Ltd T/A Veolia Water Technologies
Address	Windsor Court Kingsmead Business Park High Wycombe-HP11 1JU - United Kingdom
Contact person	Hydrex Product Manager
Telephone	+44 1628 897 000
Fax	+44 1628 897 001
e-mail	hydrex.watertech@veolia.com
National Emergency Number	+44 1628 897 295
Global Emergency Contact	1-760-476-3961 (code: 333239)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

The mixture has been assessed and/or tested for its physical, health and environmental hazards and the following classificatior applies.

Classification according to Regulation (EC) No 1272/2008 as amended

Health hazards

Acute toxicity, oral	Category 4	H302 - Harmful if swallowed.
Acute toxicity, dermal	Category 4	H312 - Harmful in contact with skin.

Hazard summary Causes severe skin burns and eye damage. May cause irritation to the respiratory system. May cause an allergic skin reaction. Occupational exposure to the substance or mixture may cause adverse health effects.

2.2. Label elements

Label according to Regulation (EC) No. 1272/2008 as amended

Contains: Maleic acid, Potassium hydroxide, Sodium sulfite

Hazard pictograms

Signal word Danger

Hazard statements

H312	Harmful in contact with skin.
H302	Harmful if swallowed.

Precautionary statements

Prevention

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P270	Do not eat, drink or smoke when using this product.

P262 Do not get in eyes, on skin, or on clothing.

Response

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P301 + P310 If swallowed: Immediately call a poison centre/doctor/.

P330 Rinse mouth.

P352 Wash with plenty of soap and water.

Storage

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

Disposal

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Supplemental label information None.

2.3. Other hazards None known.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

General information

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	INDEX No.	Notes
Sodium sulfite	10 - < 30	7757-83-7 231-821-4	-	-	
Classification:	Acute Tox. 4;H302				
Maleic acid	1< 10	110-16-7 203-742-5	-	607-095-00-3	
Classification:	Acute Tox. 4;H302, Acute Tox. 4;H312, Skin Irrit. 2;H315, Skin Sens. 1;H317, Eye Irrit. 2;H319, STOT SE 3;H335, Aquatic Chronic 2;H411				
Potassium hydroxide	1 - < 10	1310-58-3 215-181-3	01-2119487136-33-XXXX	019-002-00-8	
Classification:	Met. Corr. 1;H290, Acute Tox. 4;H302, Skin Corr. 1A;H314				
Polymaleic Acid, Aqueous	1 - < 5	26099-09-2 -	-	-	
Classification:	Met. Corr. 1;H290, Eye Irrit. 2;H319				
Other components below reportable levels	70 - < 90				

List of abbreviations and symbols that may be used above

#: This substance has been assigned Union workplace exposure limit(s).
M: M-factor
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.
All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Composition comments The full text for all H-statements is displayed in section 16.

SECTION 4: First aid measures

General information If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

4.1. Description of first aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTRE or doctor/physician if you feel unwell.

Skin contact Remove contaminated clothing immediately and wash skin with soap and water. Call a physician or poison control centre immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control centre immediately.

Ingestion Call a physician or poison control centre immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

4.2. Most important symptoms and effects, both acute and delayed	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation.
4.3. Indication of any immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.

SECTION 5: Firefighting measures

General fire hazards	No unusual fire or explosion hazards noted.
5.1. Extinguishing media	
Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
5.2. Special hazards arising from the substance or mixture	During fire, gases hazardous to health may be formed.
5.3. Advice for firefighters	
Special protective equipment for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Special fire fighting procedures	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapour. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained.
For emergency responders	Keep unnecessary personnel away.
6.2. Environmental precautions	Avoid discharge into drains, water courses or onto the ground.
6.3. Methods and material for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use.
6.4. Reference to other sections	Not available.

SECTION 7: Handling and storage

7.1. Precautions for safe handling	Avoid forming spray/aerosol mists. Do not breathe mist or vapour. Do not get in eyes, on skin, or on clothing. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
7.2. Conditions for safe storage, including any incompatibilities	Protect from sunlight. Store in original tightly closed container. Store in cool, dry place.
7.3. Specific end use(s)	Not available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

UK. EH40 Workplace Exposure Limits (WELs)

Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	STEL	2 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Recommended monitoring procedures	Follow standard monitoring procedures.
Derived no effect levels (DNELs)	Not available.
Predicted no effect concentrations (PNECs)	Not available.

8.2. Exposure controls

Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

General information	Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.
Eye/face protection	Before any handling, wear protective glasses side-shields complying with the NF EN 166.
Skin protection	
- Hand protection	Chemical resistant gloves. Suitable gloves can be recommended by the glove supplier. Wear protective gloves which comply with the NF EN 374.
- Other	Wear appropriate chemical resistant clothing. Chemical resistant gloves.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
Hygiene measures	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Contaminated work clothing should not be allowed out of the workplace.
Environmental exposure controls	Environmental manager must be informed of all major releases.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Colour	Brown
Odour	Not available.
pH	10 - 12
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Flammability (solid, gas)	Not applicable.
Vapour pressure	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Solubility (other)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Viscosity	Not available.
Explosive properties	Not explosive.
Oxidising properties	Not oxidising.

9.2. Other information

Density	1.16 - 1.20 g/cm³ (16°C)

SECTION 10: Stability and reactivity

10.1. Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability Material is stable under normal conditions.

10.3. Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.

10.4. Conditions to avoid Contact with incompatible materials.

10.5. Incompatible materials Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products Irritating and/or toxic fumes and gases may be emitted upon the product's decomposition.

SECTION 11: Toxicological information

General information Occupational exposure to the substance or mixture may cause adverse effects.

Information on likely routes of exposure

Inhalation May cause irritation to the respiratory system. Prolonged inhalation may be harmful.

Skin contact Causes severe skin burns. May cause an allergic skin reaction.

Eye contact Causes serious eye damage.

Ingestion Causes digestive tract burns.

Symptoms Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation.

11.1. Information on toxicological effects

Acute toxicity May cause respiratory irritation. May cause an allergic skin reaction.

Product	Species	Test results
HYDREX 1368		
Acute		
Dermal		
LD50	Rabbit	60604 mg/kg estimated
	Rat	42 g/kg Calculated
Oral		
LD50	Mouse	5763 mg/kg Calculated
	Rat	3846 mg/kg Calculated

Components	Species	Test results
Maleic acid (CAS 110-16-7)		
Acute		
Dermal		
LD50	Rabbit	1560 mg/kg
Oral		
LD50	Rat	708 mg/kg
Potassium hydroxide (CAS 1310-58-3)		
Acute		
Oral		
LD50	Rat	273 mg/kg
Sodium sulfite (CAS 7757-83-7)		
Acute		
Dermal		
LD50	Rabbit	10000 mg/kg
Oral		
LD50	Mouse	820 mg/kg
	Rat	3650 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory sensitisation Due to partial or complete lack of data the classification is not possible.

Skin sensitisation May cause an allergic skin reaction.

Germ cell mutagenicity Due to partial or complete lack of data the classification is not possible.

Carcinogenicity Due to partial or complete lack of data the classification is not possible.

IARC Monographs. Overall Evaluation of Carcinogenicity

Sodium sulfite (CAS 7757-83-7) 3 Not classifiable as to carcinogenicity to humans.

Reproductive toxicity Due to partial or complete lack of data the classification is not possible.

Specific target organ toxicity - single exposure May cause respiratory irritation.

Specific target organ toxicity - repeated exposure Due to partial or complete lack of data the classification is not possible.

Aspiration hazard Due to partial or complete lack of data the classification is not possible.

Mixture versus substance information No information available.

Other information Not available.

SECTION 12: Ecological information

12.1. Toxicity Based on available data, the classification criteria are not met for hazardous to the aquatic environment.

Product		Species	Test results
HYDREX 1368			
Aquatic			
Fish	LC50	Fish	751 mg/l, 96 hours Calculated
Acute			
Crustacea	EC50	Daphnia	2033 mg/l, 48 hours Calculated

Components		Species	Test results
Maleic acid (CAS 110-16-7)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	250 - 400 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	5 mg/l, 96 hours
Potassium hydroxide (CAS 1310-58-3)			
Aquatic			
Acute			
Crustacea	EC50	Daphnia	60 mg/l, 48 hours
Fish	LC50	Western mosquitofish (Gambusia affinis)	80 mg/l, 96 hours
Sodium sulfite (CAS 7757-83-7)			
Aquatic			
Crustacea	LC50	Water flea (Daphnia magna)	273 mg/l, 50 hours
Fish	LC50	Western mosquitofish (Gambusia affinis)	660 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

12.2. Persistence and degradability No data is available on the degradability of this product.

12.3. Bioaccumulative potential

Partition coefficient n-octanol/water (log Kow)

Maleic acid -0.48

Bioconcentration factor (BCF) Not available.

12.4. Mobility in soil No data available.

12.5. Results of PBT and vPvB assessment Not available.

12.6. Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Residual waste	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.
EU waste code	The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Disposal methods/information	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Special precautions	Dispose in accordance with all applicable regulations.

SECTION 14: Transport information

ADR

14.1. - 14.6.: Not regulated as dangerous goods.

RID

14.1. - 14.6.: Not regulated as dangerous goods.

ADN

14.1. - 14.6.: Not regulated as dangerous goods.

IATA

14.1. - 14.6.: Not regulated as dangerous goods.

IMDG

14.1. - 14.6.: Not regulated as dangerous goods.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code	Not established.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and II, as amended

Not listed.

Regulation (EC) No. 850/2004 On persistent organic pollutants, Annex I as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 1 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 2 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 3 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex V as amended

Not listed.

Regulation (EC) No. 166/2006 Annex II Pollutant Release and Transfer Registry, as amended

Not listed.

Regulation (EC) No. 1907/2006, REACH Article 59(10) Candidate List as currently published by ECHA

Not listed.

Authorisations

Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorization, as amended

Not listed.

Restrictions on use

Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended

Not listed.

Directive 2004/37/EC: on the protection of workers from the risks related to exposure to carcinogens and mutagens at work, as amended.

Not listed.

Other EU regulations

Directive 2012/18/EU on major accident hazards involving dangerous substances, as amended

Not listed.

Other regulations	This Safety Data Sheet complies with the requirements of Regulation (EC) No 1907/2006, as amended.
National regulations	Follow national regulation for work with chemical agents. Young people under 18 years old are not allowed to work with this product according to EU Directive 94/33/EC on the protection of young people at work, as amended.
15.2. Chemical safety assessment	No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

List of abbreviations	Not available.
References	Not available.
Information on evaluation method leading to the classification of mixture	The classification for health and environmental hazards is derived by a combination of calculatior methods and test data, if available.
Full text of any H-statements not written out in full under Sections 2 to 15	H290 May be corrosive to metals. H302 Harmful if swallowed. H312 Harmful in contact with skin. H314 Causes severe skin burns and eye damage. H315 Causes skin irritation. H317 May cause an allergic skin reaction. H319 Causes serious eye irritation. H335 May cause respiratory irritation. H411 Toxic to aquatic life with long lasting effects.
Revision information	None.
Training information	Follow training instructions when handling this material.
Disclaimer	Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Appendix K: Site Surfacing Plan

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES AOD UNLESS NOTED OTHERWISE.

KEY

- A. THICKENED SLUDGE SILO
- B. THICKENING CENTRATE COLLECTION TANK
- C. BOILER
- D. TH PLANT
- E. CHP
- F. SLUDGE THICKENING CENTRIFUGES
- G. ODOUR CONTROL UNIT - TO BE DECOMMISIONED
- H. SLUDGE SCREEN (STRAINPRESS)
- I. DIGESTER
- J. GAS HOLDER
- K. FLARE
- L. DE-GAS TANK
- M. SCREENED SLUDGE TANK
- N. DEWATERING CENTRATE BUFFER TANK
- O. CAKE STORAGE
- P. ODOUR CONTROL UNITS
- Q. SLUDGE DEWATERING CENTRIFUGES
- R. DIGESTED SLUDGE TANKS
- S. FINAL EFFLUENT TANK
- T. TANKER POINT
- U. RAW SLUDGE WET WELL
- V. DAF PLANT
- W. NOT IN USE
- X. THICKENED SLUDGE BUFFER TANK
- Y. UNSCREENED SLUDGE BUFFER TANK

LEGEND

- Revised Permit Boundary
- Hardstanding / Concrete
- Permeable areas
- Roadways (Concrete / Tarmac)
- Assets excluded from Permit Boundary

O.S. MAP REFERENCE:

SD 8235.

CURRENT ISSUE INFORMATION

B. EXCLUSION AND HATCHING ZONES UPDATE

CURRENT DRAWING STATUS	Approved
FOR INFORMATION	06/11/2023
REASON FOR ISSUE	DATE

United Utilities
Water for the North West

IED - SITE SURVEYS AND PERMITTING
BURNLEY WwTW
SITE SURFACING

SCALE 1:1250	SHEET SIZE A3
DRAWING NUMBER 80063025-BURNL-DR-C-000001	REVISION B

TO BE REPRODUCED IN COLOUR ONLY

SCALE 1 : 1250

m50 0 50m

Burnley WwTW Sludge Treatment Facility EPR/HP3509MM

Environmental Permit Application

Appendix L: UU UKAS Accreditation Certificate

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

1494

Accredited to ISO/IEC 17025:2017

United Utilities Water Ltd operating as United Utilities Scientific Services

Issue No: 099 **Issue date:** 03 May 2022

Lingley Mere Laboratory
PO Box 458
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

Contact: Mr J Perry
Tel: +44 (0)1925 677077
Fax: +44 (0)1925 678933
E-Mail: jeff.perry@uuplc.co.uk

Testing performed by the Organisation at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details	Activity	Location code
Address Lingley Mere Laboratory PO Box 458 Lingley Green Avenue Great Sankey Warrington WA5 3LP **Local contact** Mr J Perry Tel: +44 (0)1925 677077 Fax: +44 (0)1925 678933 E-Mail: jeff.perry@uuplc.co.uk	Environmental Analysis	A

Site activities performed away from the locations listed above:

Location details	Activity	Location code
Waste Water Treatment Works (WWTW) Water Treatment Works (WTW) Service Reservoirs and Domestic Premises Ground and Surface Water Sources	Sampling and on-site testing	B
All locations suitable for the activities listed	Sampling and Testing of Bituminous materials	C

1494 Accredited to ISO/IEC 17025:2017	**Schedule of Accreditation** **issued by** **United Kingdom Accreditation Service** 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK
	United Utilities Water plc **operating as United Utilities Scientific Services** **Issue No:** 099 **Issue date:** 03 May 2022
Testing performed by the Organisation at the locations specified	

This schedule is ordered as follows:

Section 1
ISO 17025 + DWTS
Inorganic Chemistry
Organic Chemistry
Sensory
Radiochemistry
Microbiology and Cryptosporidium
Sampling

Section 2
ISO 17025 + MCERTS (waters)
Inorganic Chemistry
Organic Chemistry
Sampling

Section 3
ISO 17025 only
Inorganic Chemistry Waters
Organic Chemistry Waters
Inorganic Chemistry Sludges and Soils
Microbiology

Section 4
Flexible scopes

Note: accreditation to MCERTS (waters) and DWTS automatically confers an equivalent accreditation to ISO/IEC 17025:2017

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 1			
WATERS Raw (surface water and groundwater), and drinking waters	Analysis for the purpose of enforcement of "The Water Supply (Water Quality)" (England) Regulations	Methodology meeting the requirements of The Drinking Water Testing Specification	
	<u>Chemical Tests</u>	Documented In-House Methods:	
	Ammonia Chloride Nitrate (by calculation) Nitrite Total Oxidised Nitrogen	QI 231/62 by Quattro Continuous flow analyser	A
	Alkalinity	QI231/64 by Robotic Titrator	A
	Total Organic Carbon	QI 231/15 using persulphate oxidation by non-dispersive infra-red detector	A
	pH	QI 230/28 using pH Meter	A
	Turbidity, Electrical Conductivity and Colour	QI231/77 using robotic system	A
	Total Cyanide	QI 231/53 using SFA and colorimetry	A
	Mercury	QI 231/50 using Cold Vapour Atomic Fluorescence Spectroscopy	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd) Raw (surface water and groundwater), drinking waters and bottled waters	<u>Chemical Tests</u> (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
	Elements including: Antimony Arsenic Cadmium Chromium Copper Lead Nickel Selenium Silver Zinc Uranium	QI 231/73 by ICP-MS	A
	Elements including: Antimony Arsenic Cadmium Chromium Copper Lead Nickel Selenium Silver Zinc	QI 231/16 by ICP MS	A
	Elements including: Aluminium Manganese Iron Phosphorus Sodium Calcium Magnesium Potassium Barium Boron Total Hardness (as Calcium Carbonate)	QI 231/80 By ICP-OES	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd) Raw (surface water and groundwater), drinking waters and bottled waters	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
	Sulphate Fluoride Bromide	QI 231/54 by ion chromatography	A
Raw (groundwater) and drinking waters	Hexavalent Chromium	QI 231/74 by Ion chromatography	A
Drinking, surface and Groundwaters	Bromate	QI 231/70 by Ion chromatography	A
Drinking, surface and Groundwaters	Chlorate Chlorite	QI 231/72 by Ion chromatography	A
Drinking, surface and Groundwaters (cont'd)	Halogenated Hydrocarbons including THM: Elements including: Trichloromethane° Bromodichloromethane° Dibromochloromethane° Tribromomethane° Tetrachloromethane Trichloroethene[1] Tetrachloroethene[1] Total THM (total of 4 THMs marked °) Total CHC (total of 2 CHCs marked [1])	QI 260/11 using Headspace - Gas Chromatography with electron Capture Detector (Headspace - GC-ECD)	A
	Polyaromatic Hydrocarbons: Elements including: Benzo(b)fluoranthene* Benzo(k)fluoranthene* Indeno(1,2,3-cd)pyrene* Benzo(g,h,i)perylene* Benzo(a)pyrene Fluoranthene Total PAH (total of 4 PAHs marked *)	QI 260/03 using solvent extraction followed by HPLC with fluorescence detection	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw (surface water and groundwater), drinking waters	Glyphosate AMPA Glufonisate-Ammonium	QI 260/69 Using LC-MS-MS	A
Raw (surface and groundwater) drinking waters	Asulam Metaldehyde	QI260/78 using LC MS-MS	A
Raw (surface and groundwater) drinking waters	Geosmin 2-Methyl isoborneol	QI260/71 using GCMS	A
Raw (surface and groundwater) drinking waters	Geosmin 2-Methylisoborneol 2,4,6-Trichloroanisole	QI260/99 using DiLLME-GCMS	A
Raw (surface water and groundwater) and drinking water	Clopyralid Dicamba Fluroxypyr Bromoxynil 2,4-D MCPA Trichlopyr Ioxynil Dichlorprop 2,4,5-T Mecoprop 2,4-DB MCPB Pentachlorophenol Bentazone	QI 260/92 by direct injection LC-MS-MS	A
Raw (surface water and groundwater) and drinking water	BTEX: Benzene 1,2- Dichlorethane MTBE Toluene Ethylbenzene m/p-Xylene o-Xylene Total Xylene	QI 260/52 by Headspace GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw (surface water and groundwater) and drinking water	Haloacetic Acids: Monochloroacetic Acid Dichloroacetic Acid Trichloroacetic Acid Monobromoacetic Acid Dibromoacetic Acid Tribromoacetic Acid Bromochloroacetic Acid Bromodichloroacetic Acid Dibromochloroacetic Acid	QI 260/05 by LC-MS/MS	A
Raw (surface water and groundwater) and drinking water	Herbicides and Pesticides: Chlorotoluron Metazachlor Isoproturon Diuron Linuron Carbetamide Metribuzin Simazine Atrazine Propyzamide Diazinon	QI 260/73 by LCMS-MS	A
Raw (surface water and groundwater) and drinking water	Polycyclic Aromatic Hydrocarbons Benzo (b) fluoranthene Benzo (k) fluoranthene Benzo (a) pyrene Benzo (g,h,i) perylene Indeno (1,2,3-cd) pyrene Fluoranthene	QI 260/40 by GCMS/MS	A
	Sensory Tests		
Raw and drinking water	Quantitative Odour Quantitative Taste	QI 233/02 using assessed panel – SCA blue book: determination of taste and odour in drinking water (2014)	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (Cont'd)	Radiochemical Tests	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw and drinking water	Gross alpha	QI 232/10 using α/B multi-detector based on ISO9696:2007	A
Raw and drinking water	Gross beta	QI 232/10 using α/B multi-detector based on ISO9697:2008	A
Drinking Water	Gamma emitting radionuclides Range 59-2000keV	QI 232/04 by Gamma Spectrometry	A
Drinking and Raw Waters	Radon 222 Range 1-120Bq/l	QI 232/05 determined from Bi-214 and Pb-214 in secular equilibrium by Gamma Spectrometry	A
WATERS (cont'd)	Microbiological Tests	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	
	Enumeration of:		
Drinking Water, Ground water and surface water	Colony count at 22 °C and 37 °C	QI 240/11 using manual pour plate method based on MODW 2012 Part 7	A
	Isolation and enumeration and confirmation of: total coliforms and *Escherichia coli*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2016 Part 4	A
	Isolation and enumeration and confirmation of *Enterococci*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2012 Part 5	A
	Isolation, enumeration and confirmation of *Clostridium perfringens*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2015 Part 6	A
	Speciation of *Enterobacteriaceae* & Intestinal *Enterococci*	QI 240/19 using vitek system based on in house metjod	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Microbiological Tests (cont'd)	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	
Drinking Water, Ground water and surface water	Cryptosporidium	QI 243/01 - using Filta-Max xpress, Dynal IMS procedure Staining, examination and identification based on MODW 2010 Part 14	A
Drinking water	Legionella	QI 241/15 by membrane filtration based on ISO 11731-2:2008 (withdrawn)	A
Surface water	Isolation and enumeration and confirmation of *Salmonella* spp (excluding *Salmonella typhi*)	QI 241/01 membrane filtration using selective enrichment and MPN based on MORW 2016 Part 8	A
Drinking and Groundwater	Enumeration/Confirmation *Escherichia coli* Total Coliforms	QI240/54 using defined substrate MPN method and Colilert – 18 Quanti- tray based on MODW 2016 Part 4	A
Transport Swabs	Recovery of Coliform Organisms after upto 24 hours refridgeration	Method QI240/30 based on in house method	A
Microscopically confirmed Cryptosporidium spp oocysts from treated and raw water sources on slides	Cryptosporidium oocyst speciation and identification	Documented in-house methods QI 243/05 and 243/06, Extraction, PCR amplification of oocyst DNA and sequencing using SeqStudio Analyser	A
Drinking Water (Surface and Ground)	Detection and Enumeration of *Pseudomonas aeruginosa*	QI 240/15 using IDEXX Pseudalert Reagent and Quantitray based on MODW 2015 Part 8	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Drinking, ground and surface waters	For the purpose of enforcement of The Water Supply (Water Quality) Regulations 2000 (SI 2000/3184)	Where applicable the methodology meeting the requirements of The Drinking Water Testing Specification	
From: Consumer taps Standpipes Service reservoirs Water treatment works	Sampling: For Chemical and Microbiological Testing ((including cryptosporidium)	Documented In-house Procedures QI638/01	B
Raw waters including: Surface Waters: impounding reservoirs, canals, lakes Groundwater: boreholes	<u>On-site Testing</u>	Documented In-House Methods:	
Raw (groundwater and surface water) and Drinking Water	pH	Method QI640/01	B
Raw (groundwater) and Drinking Water	Free Residual Chlorine Total Residual Chlorine	Method QI510/17	B
Drinking Water only	Qualitative Taste and Odour	Method QI626/01 based on SCA determination of taste and odour in drinking waters (2014)	B

END OF SECTION 1

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 2			
WASTE WATERS	Chemical Testing	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Trade Effluents	Ammonia Total Oxidised Nitrogen	QI251/44 using Skalar Analyser	A
Untreated sewage Treated sewage effluent Trade effluent	Total nitrogen	QI 251/39 using Formacs total N analyser	A
Untreated sewage Treated sewage effluent Trade effluent	Chloride Phosphate	QI 251/45 using continuous flow analyser	A
Untreated sewage, Treated sewage effluent Trade effluent	Suspended solids	QI 250/12 by gravimetry	A
Treated sewage effluent	Anionic Surfactants	QI 251/06 by sealed tube	A
Treated sewage effluent	Ammonia –low level Orthophosphate Total Oxidised Nitrogen (TON)	QI250/46 using Quattro analyser	A
Untreated Sewage Treated sewage effluent Trade effluent (to controlled water)	Mercury	QI 251/42 by AFS	A
Untreated sewage Treated sewage effluent Trade Effluent	Biochemical Oxygen Demand (BOD)	QI 251/17 based on 5-day biochemical oxygen demand, semi-automated, 2nd edition, HMSO 1998	A
Untreated sewage Trade effluent	Chemical Oxygen Demand	QI251/19 high range by sealed tube automated and manual Readback	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Treated sewage effluent	Chemical Oxygen Demand	QI251/19 low range by sealed tube	A
Treated sewage effluent Trade effluent	Metals:		
Treated Sewage Effluent, Untreated Sewage and Trade Effluents	Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Nickel Molybdenum Selenium Thallium Zinc	QI 231/40 using ICP-MS	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Aluminium Calcium Cobalt Iron Magnesium Manganese Phosphorus Potassium Sodium Vanadium	QI 231/75 using ICP-OES	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Untreated Sewage Treated Sewage Trade effluent to controlled waters Trade effluent to sewer	Antimony, Arsenic Beryllium Cadmium Chromium Copper Lead Molybdenum Nickel Phosphorus Selenium Thallium zinc	QI 231/79 By ICP-MS	A
Untreated Sewage Treated Sewage Effluent	OrthoPhosphate High level Ammonia Total Oxidised Nitrogen (TON)	QI251/51 using Skalar analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Total Nitrogen	QI 251/41	A
Treated Sewage Effluent	Chemical oxygen demand	QI 251/54 by automated equipment.	A
Treated sewage effluent Untreated Sewage Trade Effluent	Organotin Compounds: Tributyltin Triphenyltin	QI 260/29 by Iso-octane extraction and derivatisation and analysis by GC-MS	A
Trade Effluent	Cadmium Chromium Copper Lead Nickel Zinc	QI 231/76 by ICP-OES	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Untreated Sewage, Treated Sewage and Trade Effluent	VOC's: Elements including: Dichloromethane Chloroform Carbon Tetrachloride 1,2 Dichloroethane Trichloroethene Tetrachloroethene Toluene o-xylene m+p-xylene 1,2,3 trichlorobenzene 1,2,4 trichlorobenzene 1,3,5 trichlorobenzene Bromoform Benzene MTBE n-hexane 1,1,1 trichloroethane 1,1,2 trichloroethane Dicyclopentadiene Hexachloro-1,3-butadiene	QI 260/09 by GC-MS	A
Treated sewage effluent	On-site measurement of: pH	Documented in-house methods: QI 640/01 using pH meter	B
Trade effluent	Total residual chlorine	Documented in-house method QI 510/17 using hand held	B

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Sampling	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Treated sewage effluent Trade effluent to controlled waters	For chemical testing	Method QI 510/05 using manual spot sampling	B

END OF SECTION 2

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 3			
WATERS	<u>Chemical Tests</u>		
Untreated Sewage Trade Effluent	Chemical oxygen demand	QI 251/19 by sealed tube method High Range	A
Treated Sewage Effluent	Chemical oxygen demand	QI 251/19 by sealed tube method Low Range automated and manual Readback	A
Untreated Sewage Trade Effluent Treated Sewage Effluent	Free and easily liberated cyanide	QI 251/53	A
Untreated Sewage Treated Sewage Effluent Mixed liquor	Suspended solids	QI 250/12 based on HMSO 1980 using gravimetric technique	A
Untreated sewage Mixed liquor	Suspended solids, volatile material and ash	QI 250/12 based on HMSO 1980	A
Untreated (Crude) Sewage Treated Sewage Effluent Raw Surface Water	Total organic carbon LOD – 25 mg/L	QI 251/40 using Formacs H analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Total Nitrogen	QI 251/39 using Formacs Analyser	A
Trade Effluents Treated Sewage Effluent	Ammonia Nitrate Nitrite Total Oxidised Nitrogen	QI251/44 using Skalar Analyser	A
Treated Sewage Effluent Trade Effluent	Nitrite	QI251/48 using Skalar Analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Chloride Phosphate	QI 251/45 using continuous flow analyser	A
Treated Sewage Effluent	Ammonia –low level Orthophosphate Total Oxidised Nitrogen (TON)	QI250/46 using Quattro analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Treated Sewage Effluent Trade Effluent	Fluoride	QI251/35 using Ion Selective Electrode	A
Untreated Sewage Treated Sewage Effluent Trade Effluent (to controlled water)	Mercury	QI 251/42 by AFS	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Mercury	QI 251/55 using Cold Vapour Atomic Absorption Spectroscopy	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Alkalinity	QI251/47 using robotic potentiometric titration	A
Treated Sewage Effluent	Anionic Surfactants	QI 251/06 by sealed tube	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Separable oils and grease	QI 251/10 based on suspended settleable and total dissolved solids in waters and effluents HMSO 1980	A
Untreated Sewage Treated Sewage Effluent Trade Effluent Surface Water	Biochemical oxygen demand (BOD)	QI 251/17 based on 5-day biochemical oxygen demand, semi-automated, 2nd edition, HMSO 1988	A
Untreated Sewage Trade Effluents	Total Sulphide	QI251/33 by air segmented flow analyser	A
Treated and Untreated Sewage, Trade Effluent	Sulphate	QI251/52 by continuous flow analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Untreated Sewage Treated Sewage Effluent Trade Effluent	Organotin Compounds: Tributyltin Triphenyltin	QI 260/29 by Iso-octane extraction and derivatisation and analysis by GC-MS	A
Trade Effluent Treated Sewage Effluent	Elements including: 2-chlorophenol 4-chlorophenol 3,5-dimethylphenol 4-chloro-3-methylphenol Phenol 2-methylphenol 3 and 4-methylphenol 4-chloro-3,5-dimethylphenol 2,4-dichloro-3,5-dimethylphenol 2,4-dichlorophenol	QI 260/24 using GC-FID	A
Landfill Leachate Trade Effluent Surface Water	Methane	QI 260/75 using Gas Chromatography with Flame Ionisation Detector (GC-FID)	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	VOC's: Elements including: Dichloromethane Chloroform Carbon Tetrachloride 1,2 Dichloroethane Trichloroethene Tetrachloroethene Toluene o-xylene m/p-xylene 1,2,3 trichlorobenzene 1,2,4 trichlorobenzene 1,3,5 trichlorobenzene Bromoform Benzene Naphthalene MTBE n-hexane 1,1,1 trichloroethane 1,1,2 trichloroethane Dicyclopentadiene Hexachloro-1,3-butadiene	QI 260/09 by GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Trade effluents, Treated Sewage Effluents Crude Sewage	Chlorobenzene Ethylbenzene Styrene 4-chlorotoluene 2-chlorotoluene 3-chlorotoluene 2-ethylhexanol 1,2-diclorobenzene	QI 260/95 by GC-MS	A
	Chemical Tests	Documented In-House Methods	
SOILS only	Extractable phosphate	QI 252/14 using segmented continuous flow analyser	A
SLUDGE only	pH	QI 252/07 using pH electrode	A
Sludge Only	Dry solids at 105 °C Organic and volatile matter at 700 °C	QI252/19 using thermogravimetric analyser	A
Sludge Only	Fluoride	QI251/35 using Ion Selective Electrode	A
Sludge	Ammonia	QI251/51 using Skalar Analyser	A
Sludge and sludge filtrate	Alkalinity	QI251/47 using robotic potentiometric titration	A
Mixed Liquor (sludge)	Suspended Solids	QI250/12 using gravimetric technique	A
Filtered Sludge Liquor	Sulphate	QI251/52 by continuous flow analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Raw Sewage Sludge Digested Sludge Sludge Cake Sludge Limed Cake Soils	Aluminium Arsenic Cadmium Chromium Copper Iron Lead Magnesium Mercury Molybdenum Nickel Phosphorous Potassium Selenium Zinc	QI231/78 by Aqua Regia Digestion followed by ICP-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
PROCESS WATERS, BATHING WATERS, SEWAGE AND WASTE WATERS	Microbiological Tests	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	A
Treated sewage	Isolation, enumeration and confirmation of Coliforms and *Escherichia coli*	QI 240/02 manual method using membrane filtration & QI 240/05 based on MORW 2016 Part 3	A
Untreated sewage and treated sewage	Isolation, enumeration and confirmation of *enterococci*	QI 240/02 manual method using membrane filtration & QI 240/05 based on MORW 2015 Part 4	A
Untreated sewage, treated sewage and sewage sludge	Isolation and enumeration and confirmation of *Salmonella* spp (excluding *Salmonella typhi*)	QI 241/01 membrane filtration using selective enrichment and MPN based on MOSS 2004 Part 4 and MORW 2016 Part 8	A
Surface water	Identification of Algal spp	QI 242/01 by membrane filtration and optical microscopy based on Blue Book 139 1990	A
Surface Water	Chlorophyll a	QI242/02 by Fluorimeter based on Blue Book 65, 1980	A
Groundwater, Man-made Recreational Water and Drinking (Non regulatory)	Enumeration/Confirmation *Escherichia coli* Total Coliforms	QI240/54 using defined substrate MPN method and Colilert – 18 Quanti- tray based on MODW 2016 Part 4	A
Sewage sludge	*Isolation, enumeration and confirmation of Escherichia coli*	QI 241/29 using Colillert based on MOSS 2003 Part 3	A
Sewage sludge	Isolation and enumeration of *Escherichia coli*	QI 241/29 manual method using membrane filtration based on MOSS 2003 Part 3	A
Recreational Waters	Detection and Enumeration of *Pseudomonas aeruginosa*	QI 240/15 using IDEXX Pseudalert Reagent and Quantitray based on MODW 2015 Part 8	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Reinstatement Of Opening In Highways	<u>Pavement Construction</u>	Methods of test required for the New Roads and Street Works Act (1991) (Specification for the Reinstatement of Openings in Highways) using data from the test methods detailed below:	
	Sampling of laid and compacted materials by coring	BSEN 12697-27: 2017	C
	Determination of the thickness of a bituminous pavement - destructive measurement	BSEN 12697-36:2003	C
	Bulk density - sealed specimen (wax)	BSEN 12697-6:2020	C
	Maximum density - volumetric procedure	BSEN 12697-5:2018	C
	Air void content	BSEN 12697-8:2018	C

END OF SECTION 3

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Section 4			
As listed on fixed scope	<u>Chemical Tests</u> The laboratory holds a flexible scope of accreditation for chemistry test methods at the Lingley Mere Site covering the following: • Incorporation of additional determinands or matrices covered by fixed scope to existing accredited methods. • Authorising the use of replacement equipment for existing methods. • Development of new methods for matrix types and using techniques and instruments that appear on the fixed scope. Please contact the laboratory for details of the individual determinands and matrices that can be analysed.	Meeting the requirements of The Drinking Water Testing Specification (DWTS) where applicable Meeting the requirements of Environment Agency MCERTS Performance Standard for Chemical Testing of Water where applicable Documented In house generic protocol QI 275//04 for analysis using analytical techniques included in this schedule	A A
END			