

Odour Management Plan

Eign Wastewater Treatment Works
EPR permitted installation

September 2022

Site details

Site name: Eign WwTW
Site address: Eign Wastewater Treatment Works, Outfall Lane, Hereford, HR1 1XY.
Operator name: Dwr Cyrum Welsh Water
Permit Number: EPR/UP3735GH

Document owner

Document author: DCWW
Version number: 1

List of Revisions

Revision number	Date prepared	Date adopted	Revision summary
Version 1	15.9.22	15/11/2022	

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1 Introduction

1.1 Scope

This Odour Management Plan (OMP) is an operational document that has been developed following a review of the potential risk areas for odour release from the permitted area of Eign WWTW. It is primarily a management guide to enable operators and maintenance staff to understand the controls and operational procedures and checks conducted to minimise the impact of odours from the works on neighbouring sensitive receptors.

1.2 Regulatory guidance for odour

The OMP has been prepared in a format that complies with guidelines published by Natural Resource Wales and the Environment Agency:

- H4: Odour Management. Published by the Environment Agency. 4 April 2011.
- How to comply with your permit. Additional guidance for H4 Odour management. Published by Natural Resource Wales. October 2014.

Control measures have been defined by reference to industry best practice, guidance provided in H4 and the following BREF note which is applicable to the permitted operations:

- Best Available Techniques (BAT) Reference Document for Waste Treatment Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control) Antoine Pinasseau, Benoit Zerger, Joze Roth, Michele Canova, Serge Roudier 2018.

The specific BAT requirements relating to odour are summarised as follows:

- BAT12 requires implementation and regular review of an Odour Management Plan (OMP).
- BAT14(A) requires '*minimisation of the number of diffuse (odour) emission sources*' (e.g. ensuring odorous materials which pose a risk of impact are contained or conducted within a building).
- BAT14(B) requires selection of high integrity equipment such as pipework, pumps and gaskets and to minimise leakage of odours or odorous materials.
- BAT14(D) requires containment, collection and treatment of diffuse emissions including control of odours by '*maintenance of an adequate pressure*' within buildings or enclosures and '*directing emissions to an appropriate abatement system*'.
- BAT34 requires a reduction in channelled '*emissions to air of dust, organic compounds and odorous compounds*' to meet specific Achievable Emission Levels (BAT-AELs). E.g. odour treatment systems.

1.3 Maintenance and review of the OMP

The Odour Management Plan forms part of the ISO14001 Environment Management System (EMS). The Site manager is responsible for implementation of the OMP and it's regular review at least once per annum or as required on the basis of any operational changes or experiences, as well as changes to location or nature of nearby sensitive receptors

1.4 Site overview

Eign Wastewater Treatment Works (WwTW) is located approximately 1.8km south-east of the centre of Hereford (Landranger grid SO 52070 38767). The site is bordered by the River Wye to the north-east, east, and south and by arable farmland to the west. The land use then changes to a more urban landscape with residential properties to the north, south and west, and an industrial estate to the east.

Figure 1: Site location



The site treats a combination of domestic and commercial/industrial sewage flows from Hereford and the surrounding area catchment areas, with a population equivalent of approximately 50,000. The incoming sewage is conveyed to the works via a number of offsite pumping stations, rising mains and gravity mains. The full flow to treatment (FFFT) of the works is 861 l/s, 287 l/s of which is treated on site and the remaining 574 l/s is diverted to Eign's sister site at Rotherwas after screening and dewatering. The site also receives tankered cess waste and imported sludge.

The wastewater treatment elements of the site include 2 No. primary settlement tanks, 2 No. high rate filters and 14 No. biological filters with associated humus tanks and final clarifiers. The sludge treatment process involves thickening of the indigenous/imported sludge, following by wet anaerobic digestion and dewatering to sludge cake. The cake is then exported offsite for further treatment at Cardiff WwTW.

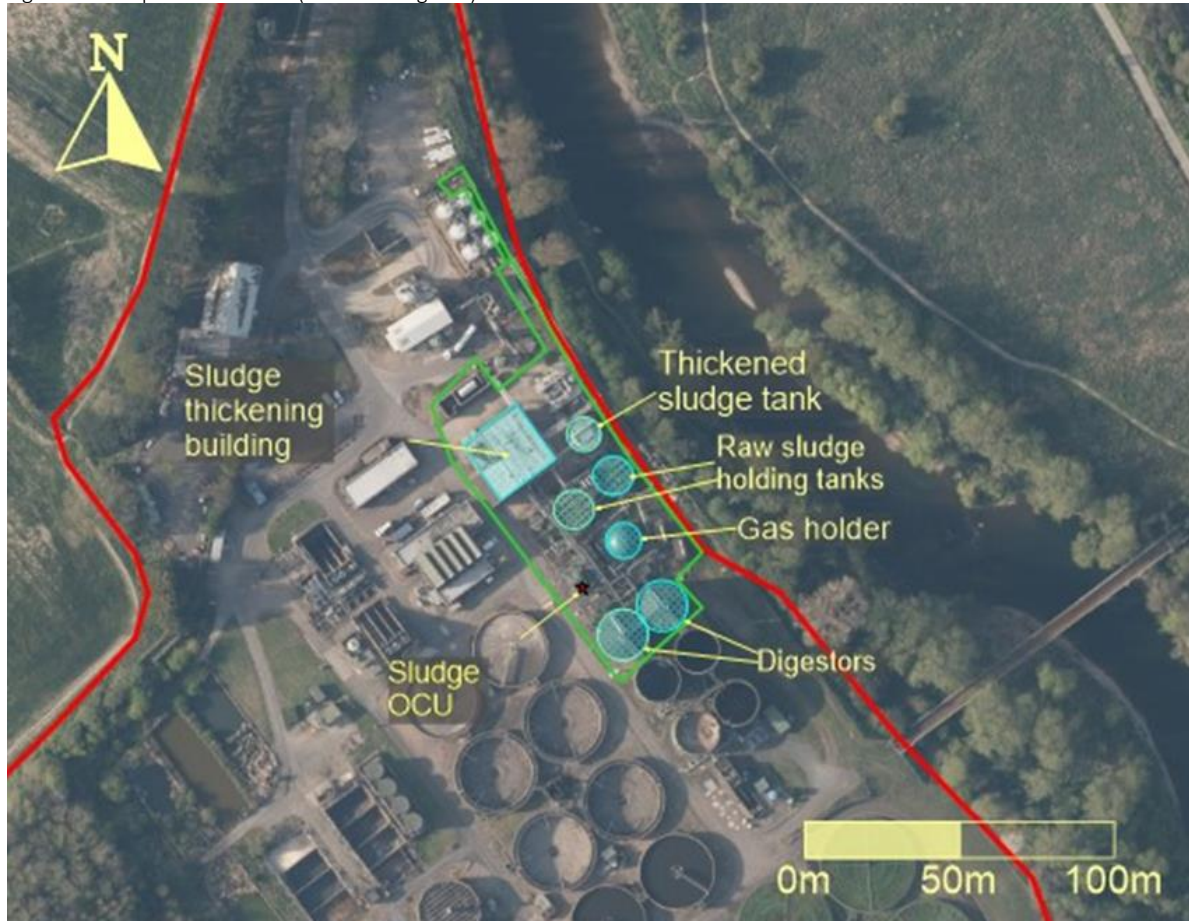
The site operates continuously and is manned as follows:

- 0700 to 1500 Monday to Thursday.
- 0700 to 1400 Fridays
- 0700 to 1200 Saturdays.
- Sundays and Bank holidays as required.

1.5 ERP Permitted area

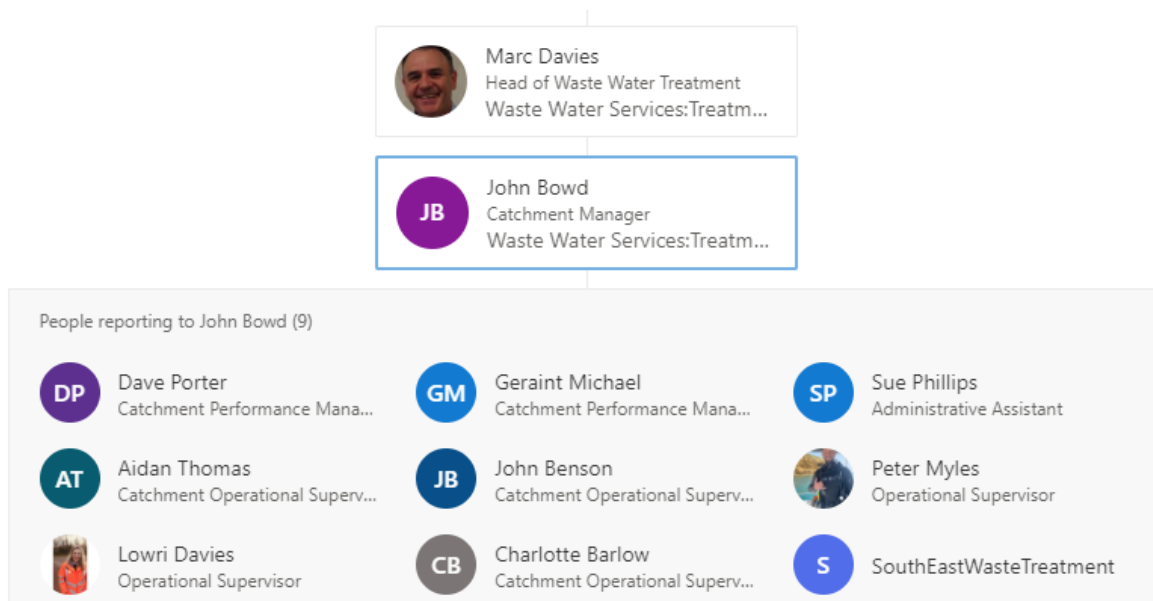
The area of the site that is covered by the IED permit is indicated in Figure 2 below and includes the raw sludge holding tanks, sludge thickening plant, thickened sludge holding tank, wet anaerobic digestion process, and the associated biogas storage and utilisation plant. An odour control system and emergency flare is also within the area. The permitted through-put of the installation is 235,636 tonnes per annum.

Figure 2: EPR permitted area (outlined in green)



2 Responsibilities & training

2.1 Site roles and responsibilities



2.2 Odour management tasks and responsibilities

Table 1:: Tasks and responsibilities

Role	Tasks and responsibilities
Site Manager	Implementation and maintenance of the OMP
Operations supervisor	Supervision and implementation of site operations; investigation of odour complaints; liaison with complainants
Maintenance supervisor	Supervision and coordination of maintenance activities
Customer centre	Receipt of customer calls, logging them and passing them to the appropriate operational departments
Smart Hub	Monitoring of equipment by telemetry and alarm management
Specialist contractors	Completion of allocated maintenance and monitoring tasks

2.3 Key site contacts

Table 2: Key contacts

Role	Name	Email address
Site manager	John Bowd	John.bowd@dwrcymru.com
Operations supervisor	Aiden Thomas	aiden.thomas@dwrcymru.com
Maintenance supervisor	Peter Myles	Peter.myles@dwrcymru.com

2.4 Training

All Operations and Maintenance Staff (including sub-contractors) are trained in the relevant systems and processes employed at the site under DCWW's Competent Operator Training program.

All relevant staff are also trained out in the procedures relating to odour control and implementation of the site Odour Management Plan, by the Site Manager.

Staff training records are located on success factors (SAP) system.

In addition, DCWW have requested Olfasense to support site operation teams to undertake regular checks on the OCU's for the first six months, so they understand what checks and reporting is required in the future.

2.5 Location of receptors

The location of odour sensitive receptors in relation to the site are illustrated in Figure 3 below. Residential receptors are coloured in blue and commercial/industrial receptors in yellow.

The nearest residential receptors are located approximately 94 m to the south as per location 1 and 2. Additional residential areas are located to the west and north as indicated.

The nearest commercial/industrial facilities are located in the Thorn Business Park 180 m to the east of the site (location 9).

Figure 3: Location of nearby sensitive receptors



Table 3: Nearby sensitive receptors

Receptor	Land use	Direction	Distance from site (m)	Sensitivity to odour
1	Residential	Southeast	110	High

2	Residential	South	94	High
3	Residential	Southwest	250	High
4	Residential	West	425	High
5	Residential	Northwest	480	High
6	Residential	North northwest	285	High
7	Residential	North	120	High
8	Residential	Northeast	450	High
9	Industrial	East	180	Low

2.6 Other potential odour sources in the area

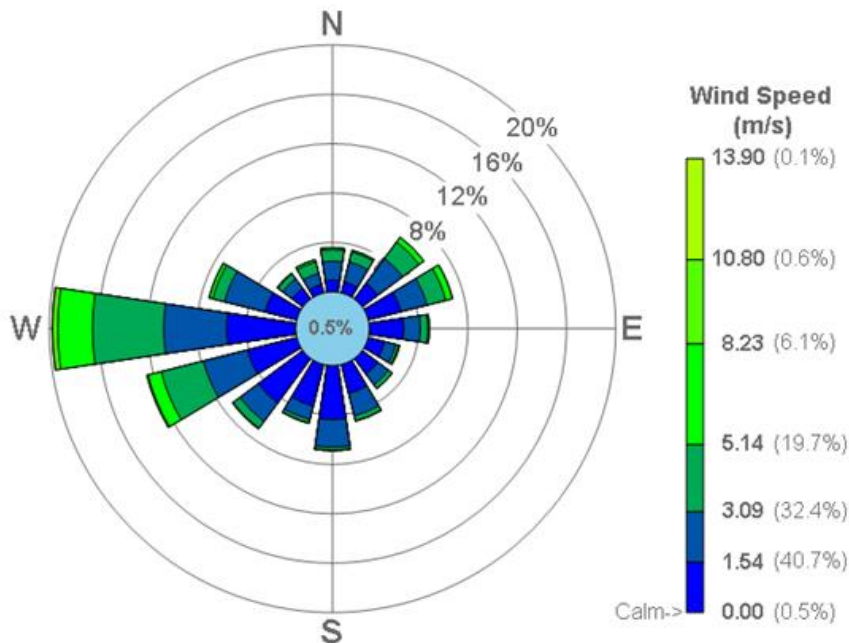
The following odour sources have been identified in the area:

- Periodic muck spreading activities on the adjacent farmland.
- Eign’s sister site Rotherwas is located approximately 1 km to the east.

2.7 Windrose and weather data

A wind rose obtained from the nearest meteorological station to the site at Hereford is presented in Figure 4 below. The prevailing wind direction is generally from the west.

Figure 4: Windrose (2017 to 2020)



2.8 Odour complaints history

It is understood that no odour complaints have been linked to the site in the last three years.

3 Process description, material inventory and odour sources

3.1 Process description and assets

The permitted area of the site contains the raw sludge holding tanks, sludge thickeners, wet anaerobic digestion process, biogas collection, utilisation and flaring plant, and the sludge odour control system.

Indigenous is pumped from the wastewater treatment works primary settlement tanks to 2 No. covered raw sludge holding tanks which also receive imported sludge via road tankers. The sludge is screened in 2 No. strain presses and thickened by either a drum or belt thickener, prior to pumping to a covered thickened sludge tank. Digestion is conducted in 2 No. Digestors for 10 to 14 days. The sludge is then discharged to a digestate tank which is located in the none permitted area prior to dewatering and export offsite.

Gas is utilised in 2 No. spark ignition CHP units rated at 1.725MW thermal input each with an electrical generating capacity of 0.716MW each and a thermal generating capacity of 0.722MW. There are also 2 No. dual fuel hot water boilers with 570kW thermal input and 400kW output on standby to provide standby heat and utilisation capacity when a CHP is not in operation. In the absence of sufficient levels of biogas to run the boilers, the boilers can use diesel as a fuel to generate the steam for the digesters. There are also two low level gas flares capable of burning biogas at a rate of 200 Nm³/hr and 400 Nm³/hr respectively.

A process schematic is presented in Annex A

Table 4; EPR permitted assets

Stage of process	Assets
Sludge treatment (permitted)	2 No. raw sludge holding tanks (1000 m ³ capacity)
	3 No. Strain press
	1 No. thickened sludge tank (478 m ³ capacity)
	1 No. belt press and 1 No. drum press
	2 No. Anaerobic digestors (2345 m ³ capacity each)
	1 No. odour treatment system
	1 Each Cake Silo & Cake bay
	2 Centrifuge
	1 No. Digestate Tank
	2 No. Boilers (570 and 400 kW each)
	2 no. CHP engines (1.725 MW each)
	1 No. gas storage bag
	2 No. Enclosed waste gas burner (200 and 400 Nm ³ /hr)

3.2 Odour treatment

A single Odour Treatment System is installed at the site which is designed to extract odours from the 2 No. Raw Sludge Holding Tanks and Sludge Thickening Building. The OCU comprises a biofilter as a first treatment stage followed by a polishing carbon filter, and a 4 m discharge stack. The biofilter removes odorous components from the airstream by a process of absorption and microbial breakdown. The carbon filter then removes residual odorous components by a process of adsorption onto the activated carbon media.

The biofilter is continuously irrigated using final effluent which is recirculated through the media with a partial bleed off to waste. The system is fitted with duty and standby fans which draw air through the biofilter and carbon filter. By-pass provisions are in place to enable both stages to be isolated for maintenance. Following treatment, the treated air is discharged through a 4 m height stack.

The design flow of the system is 1.4 m³/s.

3.3 Odorous materials inventory

The permitted area of the site treats surplus activated sludge from the wastewater treatment, works and imported sludge cake which is conveyed by road from other Welsh Water sites.

The main odorous exports are digested sludge which is pumped to the dewatering plant located on the wastewater treatment works.

Details of the odorous materials stored within the permitted area are provided in the table below:

Table 5: Odour material inventory: Permitted operations

Odorous material	Odour potential	Maximum quantity	Maximum time held	Location
Sludge screenings	High	12 m ³	2 weeks	Skip below strain press
Indigenous/imported sludge	High	2,000 m ³	36 hours	2 No. Raw Sludge holding tanks
	Low	478 m ³	120 Hours	1 No. Thickened sludge tank
Digesting sludge	High	4,690 m ³	504 Hours	Anaerobic digesters
Biogas	High	-	-	Biogas holder

3.4 Odour sources

The following potential odour sources were identified within the permitted area:

Table 5: Potential odour sources

Stage of treatment	Potential Odour source	Odorous material	Odour potential	Potential emission route
Sludge storage and treatment (permitted)	Raw sludge holding tanks	Indigenous/import sludge	High	Fugitive
	Strain press screenings skip	Screenings	High	Diffuse
	Sludge thickeners	Indigenous/import sludge	High	-
	Thickened sludge tank	Thickened sludge	High	Fugitive

	Anaerobic digestors	Digesting sludge/biogas	High	Fugitive
	Biogas flare	Biogas	High	Channelled
	CHPs / boilers	Biogas	High	Channelled

3.5 Odour composition and offensiveness

The odours generated from raw sewage and sewage sludge comprises a wide range of odorous organic and inorganic volatile compounds. The precise composition can vary depending upon the type of sludge, age and level of decomposition, but generally include aldehydes, ketones, fatty acids and reduced sulphur compounds, as well as hydrogen sulphide and ammonia.

A summary of the typical odorous chemicals found in sewage and their odour threshold is presented in Annex B.

4 Odour control measures

4.1 Process related Odour control measures and monitoring

The key control and monitoring measures applied at the site to control odorous emission are summarised in the table below.

Table 8: EPR permitted processes odour control and monitoring

Process	Odorous material	Odour potential	Control measure	Monitoring	Monitoring frequency	Responsibility
Strain press screenings skips	Sludge screenings	High	Skips are removed regularly to minimise odour generation	Visual	Weekly	Operator
			Skips are covered prior to removal	Visual	Daily	Operator
Sludge imports	Imported sludge	High	Sealed pipework to discharge point in raw sludge tanks	Visual	Daily	Operator
Raw sludge tanks	Indigenous / imported sludge	High	Tanks are covered and hatches are kept shut when not in use	Visual	Daily	Operator
			Tanks are designed to be extracted to the odour control system.	Visual	Daily	Operator
Raw sludge thickening	Mixed sludge	High	The thickening plant is fitted with close fitting enclosures and located in an enclosed building which is extracted to the odour treatment system	See OCU checks in section 5.6		
Thickened sludge tank	Mixed sludge	High	The tank is enclosed	-	-	-
			The tank will be connected to the OCU system	See OCU checks in section 5.6		
Digestion	Digested sludge; biogas	High	The digestors are covered and any biogas and odorous emissions are collected into the sealed biogas system, prior to incineration in the CHP plant, boilers or high temperature flare.	Leak testing	Annual	Marches biogas

			Digester gas pressure and CHP/boiler/flare operation is continually monitored to ensure pressure release via the Whessoe valves are minimised as far as possible.	Continuous	Continuous	Operator
			Whessoe valves are located at the top of the digestors (~ 26 m) to maximum dispersion in the event of a release	-	-	-
CHPs	Biogas	High	The CHPs and flares are operated to ensure incineration of the biogas	Combustion system emission monitoring	Annual	Specialist monitoring contractor
Flare	Biogas	High	Excess biogas is incinerated to oxidise odorous compounds to water and carbon dioxide,	Continuous	Continuous	Operator

4.2 Waste acceptance procedure

Cess waste and imported sludge in liquid form are delivered to the site by tanker to the none permitted area of the site.

All waste deliveries are pre-booked into the site and subject to pre-acceptance testing to confirm their suitability for treatment at the site. Upon arrival, waste transfer notes are checked against the pre-acceptance information. A sample of waste is taken from the tanker sight glass and confirmatory testing carried out prior to offloading.

Following checking, the tanker or trailer is allowed to be discharged. Where loads do not comply with these requirements, they are rejected. Vehicles arriving at site that are in poor condition (leaking seals or dirty) such that they may cause odour will be refused re-entry until repairs are made. All deliveries to the site are by tanker and discharged via a data logger to measure import volumes.

4.3 Routine and reactive maintenance

Routine checks and maintenance are defined within the DCWW SAP system, which is a centralised data management system that collects and processes data from across DCWW and is used by DCWW staff to define work schedules and record work related information amongst other applications.

The system allocates a criticality for each asset and a defined maintenance frequency which ranges from quarterly to every 2 years. Maintenance is undertaken in accordance with the relevant plant operation and maintenance manuals.

Critical electrical and mechanical elements of the process are also continuously monitored via the site SCADA system and/or telemetry to Smart Hub and are allocated priority levels ranging from 1-6, with 1 being the lowest criticality and 6 being the highest e.g. immediate repair. Smart Hub is DCWW's alarm management centre, based in South Wales. The team are in place to specifically monitor the thousands of assets owned by Welsh Water around the clock, 365 days a year. The team of dedicated analysts work shifts to monitor our alarm systems, receiving early warning alerts of any problems at our sites or in our water and sewerage network.

In the event of a failure, an alarm is sent to SCADA and/or Smart hub and a ticket will be raised in SAP for remedial action based on the priority level. Remedial actions are undertaken by the operations maintenance team during working hours, or the standby team out of hours. For specialist tasks, action will be allocated to a suitably qualified contractor e.g. Marches look after the biogas system.

Remedial action for any faults identified as part of routine operation inspections are also raised through the SAP system.

Where faults are not immediately repaired, they are also logged into the site diary

4.4 Critical spares

Spares for critical equipment are either held on site or on short notice order, as defined in SAP.

4.5 Housekeeping and spillages

The site is operated in a manner to minimise odour release during general day-to-day operations. The site is monitored for spillages as part of routine inspections. If a spillage occurs, it is washed into site drainage or removed to an appropriate disposal location as soon as possible. If spillages are a recurring incident, investigations into the cause of such occurrences are undertaken, and action taken to minimise these occurrences.

4.6 Odour treatment system monitoring

The following monitoring checks are conducted on the sludge odour control system. If faults are identified or trigger levels exceeded, an investigation will be launched and remedial action conducted as soon as possible.

Table 6: OCU monitoring

OCU	Parameter	Frequency	Trigger level	Owner
OCU1	Fan operation	Continuous	-	Operator
	Irrigation pump operation	Continuous	-	Operator
	Hydrogen sulphide at outlet	Continuous	< 1ppm	Operator
	OCU checks (See Annex C)	Monthly/6 monthly	-	Operator / odour control contractor
	Outlet air flow	6 Monthly	1.4 m ³ /hr	Specialist monitoring contractor
	Odour (olfactometry) inlet & outlet		>1,000 ou _E /m ³	
	Flow balancing	Annual	As per design	Odour control contractor?
	Replace media (carbon filter)	As required ¹	-	
	Check media (biofilter)	5 years	-	

4.7 Improvement plan

Planned improvements are detailed in the Improvement Plan contained in Annex E. This includes recommendations made in the site Odour Impact Assessment conducted in 2022 the executive summary of which is presented in Annex F.

¹ Determined by OCU odour removal performance or excessive back pressure

5 Odour reporting

5.1 Odour Complaints recording and investigation

Dwr Cymru Welsh Water takes any environmental complaints very seriously and have procedures in place to record and investigate. Incidents are managed through standard procedures which ensure that all incidents are logged and that necessary preventative and/or corrective actions are taken.

5.1.1 Odour complaint recording

Complaints are logged from customers at DCWW Customers Care Centre in accordance with the WO (3) 10 – Level 3 Complaint Handling Procedure. These complaints are forwarded to Operations for investigation or customers can contact Operational staff directly. If the latter occurs, the operator will obtain customer details and forward them to the DCWW Customer Care Centre so they can be logged as a complaint in SAP.

5.1.2 Investigation procedure

On receipt of a complaint, the complainant will be contacted for more information if required and a site visit will be made as soon as practicable to investigate the cause of the complaint as per the procedure summarised in Annex F. Should the cause be found to be the result of malfunction of any process, then corrective action will be taken as soon as is practicable.

The results of any investigations will be recorded on SAP and the complainant will be contacted by DCWW Customers Care Centre to inform them of the results and any mitigation action.

If the complaint is not resolved or there are repeat incidents, the Wastewater Assets team will be contacted to provide further support and investigation.

Complaints related to the permitted area of the site will be forwarded to Natural Resource Wales (NRW).

5.2 Local liaison and notification of an incidental risk of offsite odour impact

Should any planned, routine or abnormal operation and/or maintenance activities be required which could lead to an odour release that could impact local receptors, then the Local Environmental Health Officer (EHO) and/or Natural Resource Wales officer shall be advised by phone.

5.3 Proactive odour monitoring

Odour monitoring at the boundary and surrounding area is not routinely conducted. However, in the event of repeated complaints proactive monitoring can be implemented at the discretion of the Wastewater Assets Team.

6 Abnormal events, incidents and emergencies

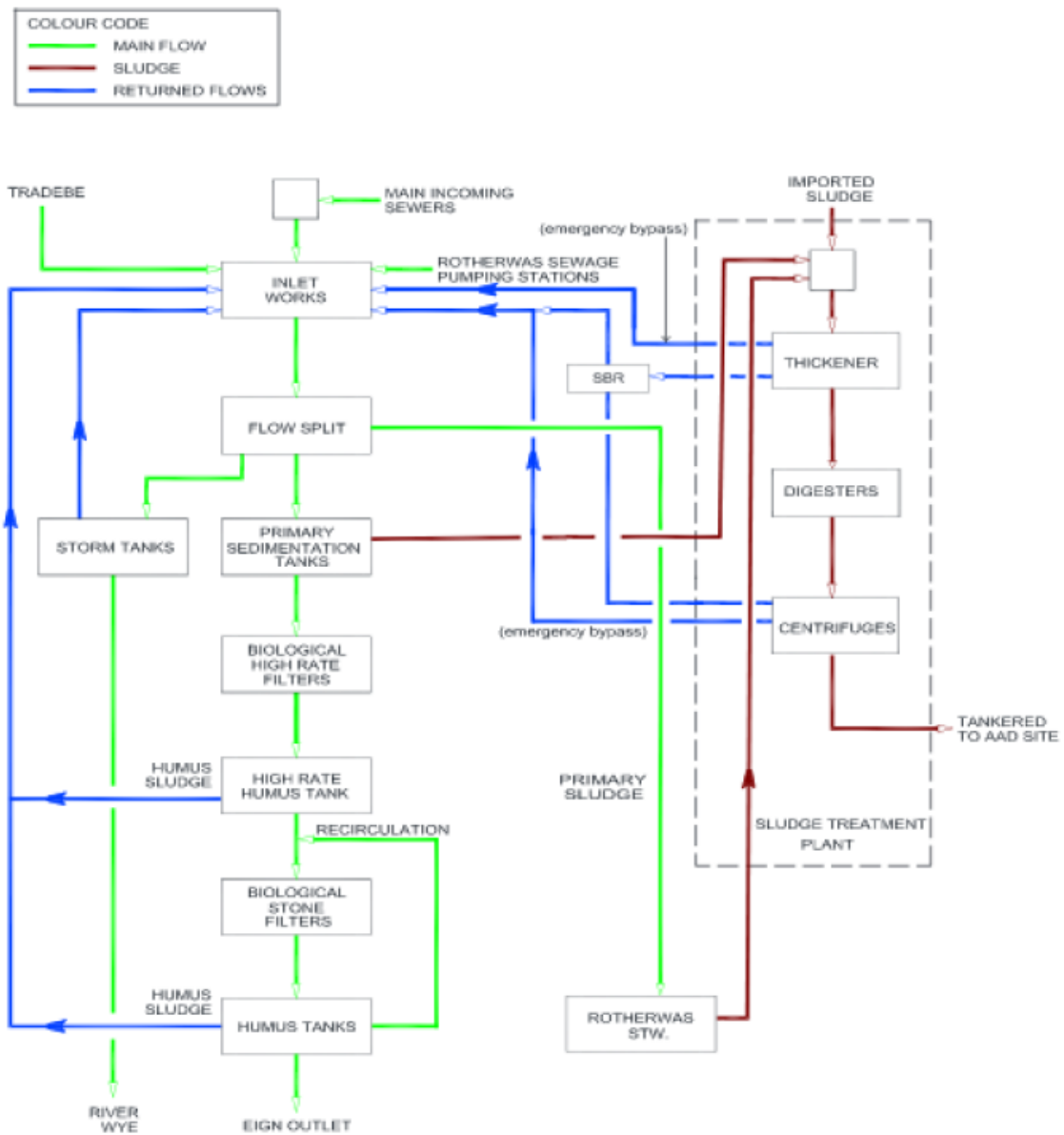
6.1 General

Potential abnormal events that could impact odour control at the site, and the recovery steps to restore effective odour control are summarised below:

Table 7:: Response to abnormal events, incidents and emergencies (general)

Abnormal event	Recovery steps
Equipment breakdown	<p>All mechanical and electrical equipment is connected to the DCWW Smart HUB by telemetry which enables breakdowns to be quickly identified and resolved with minimal impact on the process and odour generation.</p> <p>If an element of the process cannot be brought back online in a timely manner, temporary/mobile equipment will be utilised for the task required.</p> <p>Use of this equipment would be agreed with the NRW where relevant prior to use and risk assessments and plans for operation would be agreed beforehand.</p>
Tank cleaning	Tanks will be drawn down as soon as practicable and cleaned prevent stagnation of any retained material
Power failure	The site is provided with a back-up generator which provides sufficient power to ensure all critical processes continue until the power supply can be restored. This included the operation of the Odour Control Unit.
Absence of staff	Personnel from other sites can be called upon to cover, if required.
Fire, flood and severe weather	A risk assessment for site is located on source

Annex A: Process flow



Annex B: Typical odorants in sewage

Table 2.1 Typical odorants in sewage and their odour thresholds

Substance	Mol. Mass	CAS number	Odour descriptor	Detection threshold. (low)		Detection threshold (high)		Long term occupational exposure limit (LEV)	
				ppb	$\mu\text{g}\cdot\text{m}^{-3}$	Ppb	$\mu\text{g}\cdot\text{m}^{-3}$	Ppm	$\mu\text{g}\cdot\text{m}^{-3}$
Acids									
Acetic acid	60	64-19-7	Vinegar	16	43	N/A	N/A		² 25,000
Butyric Acid	88	107-92-6	Rancid	0.1	0.35	22	86		N/A
Valeric acid	102	109-52-4	Sweat, transpiration	1.8	8	2,635	12000		N/A
Nitrous									
Ammonia	17	7664-41-7		132	100	15,285	11600	23.7	² 18,000
Methylamine	31	74-89-5	Rotten fish	0.9	1.2	47	65	8.7	³ 12,000
Ethylamine	45	75-04-7	Ammoniac	3236	6500	N/A	N/A		N/A
Dimethylamine	45	124-40-3	Dead fish	23	47	80	160	9.0	² 18,000
Indole	117	120-72-9	Fecal, nauseating	0.1	³ 0.6	1.4	7.1		N/A
Scatole	131		Fecal, nauseating	0.002	0.012	0.06	0.35		N/A
Sulphides and thiols (mercaptans)									
Hydrogen sulphide	34	7783-06-4	Rotten egg	0.5	0.76	N/A	N/A	9.2	³ 14,000
Methylmercaptan	48	74-93-1	Cabbage, garlic	0.001	0.003	18	38	0.47	³ 1,000
Ethylmercaptan	62		Rotten cabbage	0.016	0.043	N/A	N/A	1.1	² 3,000
Dimethylsulphide	62	75-18-3	Rotten vegetable	0.123	0.34	0.4	1.1		N/A
Diethylsulphide	90	352-93-2	Ether	0.35	1.4	N/A	N/A		N/A
Dimethyldisulphide	94		Putrefaction	0.26	1.1	11	46		N/A
Aldehydes and ketones									
Butyraldehyde	72	123-72-8	Rancid	4.7	15	7	22		N/A
Isobutyraldehyde	72	78-84-2	Fruit	0.8	2.5	11	34		N/A
Formaldehyde	30	50-00-0	Acrid, suffocating	366	490	N/A	N/A		N/A
Acetaldehyde	44	75-07-0	Fruit, apple	0.005	0.01	2	4		N/A
Acetone	58	67-64-1	Fruit, sweet	251	³ 650	5,368	13900	12.5	³ 2,400,000
Butanone	72		Green apple	9	³ 30	271	870		N/A

Sources:

CIWEM Monographs on Best Practice No.2., Odour Control, 1998

² Odour Control - A Concise Guide, 1984

³ Hyder

Annex C: Odour control system checklist

Treatment technique	Operational check
Biofilter (OCU1)	Check irrigation pumps for leaks
	Check fans for excessive noise or defects
	Check irrigation water supply
	Check irrigation system incl. nozzles
	Check general OCU condition & integrity
	Check general duct condition & integrity
	Check dampers are operational and in good condition
	Inspect electrical control panel and check for faults
	Simulate duty / standby changeover
	Measure back pressure
Carbon (OCU1)	Check fans for excessive noise or damage
	Check general OCU condition & integrity
	Check general duct condition & integrity
	Check dampers are operational and in good condition
	Measure back pressure across carbon filter

Annex D: Improvement plan

Table 4: Improvement actions

Area	Action	Status	Timeframe
OCU1	Optimise the OCU to achieve the BAT- AEL of 1000 ou _E /m ³ at the outlet of the system as required by BAT34.	Active	12 months
OCU1	Implement OCU monitoring and maintenance checks in SAP / fan and pump connectivity to Smart Hub	Active	12 months
Raw sludge tanks	Refurbish/replace the covers on the raw sludge tank (BAT14D).	Active	12 months
Raw sludge tanks and thickened sludge tanks	Reconnect the raw sludge tank and thickened sludge tank to the Odour Treatment system (BAT14D).	Active	12 months

Annex E: 2022 Odour impact assessment executive summary

Dŵr Cymru Welsh Water (DCWW) are currently applying to Natural Resource Wales (NRW) for an EPR² permit for the sludge digestion operations at Eign WWTW. The permit is required following reinterpretation of the Industrial Emissions Directive (IED) which brings such processes into the Environmental Permitting regulatory regime.

To support the permit application, an odour impact assessment was conducted to evaluate the risk of odour impact of the permitted activities on nearby sensitive receptors. The impact assessment was conducted in accordance with the requirements of odour guidance published by Natural Resource Wales (NRW)³, using dispersion modelling techniques which have an established history of application for assessing odour impact in the UK. The dispersion model included all sources of odour associated with the permitted operations which have the potential to travel offsite. Odour emissions from each source were defined using a combination of site-specific survey data (olfactometry) and library data collected from other waste-water treatment processes by Olfasense.

The results of the survey and impact assessment were then used to identify improvement measures which are required to mitigate any impact risk identified and achieve compliance to the requirements of BATC for odour control, as defined in the Best Available Techniques (BAT) Reference Document for Waste Treatment, August 2018. These requirements are summarised below:

- BAT12 requires implementation and regular review of an Odour Management Plan (OMP).
- BAT14(A) requires '*minimisation of the number of diffuse (odour) emission sources*' (e.g. ensuring odorous materials which pose a risk of impact are contained or conducted within a building).
- BAT14(B) requires selection of high integrity equipment such as pipework, pumps and gaskets and to minimise leakage of odours or odorous materials.
- BAT14(D) requires containment, collection and treatment of diffuse emissions including control of odours by '*maintenance of an adequate pressure*' within buildings or enclosures and '*directing emissions to an appropriate abatement system*'.
- BAT34 requires a reduction in channelled '*emissions to air of dust, organic compounds and odorous compounds*' to meet specific Achievable Emission Levels (BAT-AELs). E.g. odour treatment systems.

The findings of the assessment are as follows:

1. The following odour sources were identified within the permitted area of the site:
 - a. Fugitive release of odours from the raw sludge holding tanks.
 - b. Fugitive release of odours from the thickened sludge tank.
 - c. Channelled emissions from the sludge Odour Control Unit which is not currently working as intended due to exhaustion of the carbon filter media and problems with the stage 1 treatment stream.

² Environment Permitting Regulations (England and Wales) 2016

³ H4 Odour Management, Environment Agency, March 2011

- d. Diffuse emissions from the sludge screenings storage skip.

The odours released are likely to be classified as highly offensive.

2. Odour emissions from the permitted site are currently predicted to pose a risk of impact up to 430 m from the site boundary. This includes the nearest residential receptor to the north of the site. Bearing in mind that the emissions have the potential to vary in strength and intensity, it is plausible that the impact risk could extend further afield. However, it is understood that no odour complaints have been reported in the last 3 years.
3. In order to mitigate the predicted impact risk and meet the specific odour related requirements of EPR and BATC, the following improvements are recommended.
 - a. Prepare and implement an Odour Management Plan (OMP) for the permitted operations.
 - b. Refurbish/replace the covers on the raw sludge tank (BAT14D).
 - c. Connect the raw sludge tank and thickened sludge tank to the Odour Treatment System to eliminate fugitive emissions (BAT14D).
 - d. Refurbish and optimise the Odour Treatment System so that it achieves BAT- AEL of $1000 \text{ ou}_E/\text{m}^3$ at the outlet as required by BAT34.

Annex F: Odour complaint investigation procedure

Upon receipt of an odour complaint, a member of the operational team will visit the complaint area to investigate the presence and likely source of any odours. Note that complaint will need to be received promptly for an effective investigation. If the receipt of the complaint is delayed or wind conditions change, the value of the investigation may be compromised.

Where it is reasonably practicable, the site will assign employees who have not recently been working on site or who are routinely exposed to site odours to ensure as objective an assessment as possible. The following criteria will also be applied:

- The assessor should not consume strongly flavoured food or drink (this includes coffee) at least half an hour before conducting the assessment.
- The assessor should not smoke at least half an hour before conducting the assessment.
- Consuming, confectionary or soft drinks must be avoided for the duration of the assessment
- Scented toiletries including perfume, deodorant or aftershave should not be applied less than an hour before conducting the assessment
- If the assessment requires travelling between locations in a vehicle, this vehicle must not contain deodorisers / air fresheners
- If the assessor has a cold, sore throat or sinus trouble they should not conduct the assessment.

The investigation procedure is summarised below:

1. The assessor will first collect details of the complaint either directly from the customer or DCWW Customer Care Centre.
2. The assessor will visit the location and investigate whether an odour can be detected. This will involve a walk around of the area and regular 'sniff testing' to assess whether any odour can be detected. Sniff testing should be conducted for a minimum of 5 minutes facing into the wind.
3. The assessor will then move back towards the site and conduct sniff testing along the downwind site boundary to assess whether a specific source of odour can be identified. Site operations will be reviewed to identify any abnormal site operations or activities that could be responsible for elevated odour levels.
4. The assessor will also note any external activities that could be either be the source or contribute to any off site odour exposure.
5. The findings of the investigation will be recorded and submitted to the DCWW Customer Care Team so that feed-back can be provided to the complainant. The following information should be recorded:
 - a. Weather conditions incl. wind direction, speed and temperature.
 - b. The type of odour(s) detected and its intensity, on a scale of 0 to 6.



- c. The persistence of the detected odour i.e. the percentage of time it is detectable over monitoring of period of 5 minutes.
- d. The perceived source of the odour. i.e. site or another source in the area.
- e. Any abnormal conditions on site that account for the odour.

Annex G: EWC Codes

EWC Code	Description
16	Other wastes from industrial processes
16 10	Aqueous liquid wastes defined for off-site treatment
16 10 02 ⁴	Aqueous liquid wastes other than those mentioned in 16 10 01, including cesspit and sewage sludge
19	Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use
19 02	Description wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)
19 02 06	Sludges from physico-chemical treatment other than those mentioned in 19 02 05 (sewage sludge only)
19 05	Description non-composted fraction of municipal and similar wastes
19 05 03	Off-specification compost (sewage sludge only), Sewage sludge composted with biodegradable non-wastes only
19 06	Description digestate from anaerobic treatment of animal and vegetable waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only).
19 08	Wastes from wastewater treatment plants not otherwise specified
19 08 05	Sludges from treatment of urban wastewater
19 08 99 ⁵	Wastes not otherwise specified (biological waste from Integrated Constructed Wetlands only)
19 09	Wastes from the preparation of water intended for human consumption or water for industrial use
19 09 02	Sludges from water clarification
19 09 03	Sludges from decarbonation
19 09 06	Solutions and sludges from regeneration of ion exchangers
19 12	Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 12	Wastes from mechanical treatment of wastes other than those mentioned in 19 12 11 (sewage sludge only)
20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions
20 03	Other municipal wastes
20 03 04	Septic tank sludge
20 03 06	Waste from sewage cleaning

⁴ *wastes accepted under 16 10 02:

- sludge from production of edible fats and oils, seasoning residues, molasses residues, residues from production of potato, corn or rice starch only, not containing substances at levels that will inhibit biological treatment
- waste effluents from the baking and confectionery industry, sludges from cleaning, flushing of equipment. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- aqueous process waters and washwaters from the leather, fur and textile industries; not containing substances at levels that will inhibit biological treatment
- wastes effluents/liquors from the MFSU of fertilisers including lagoon leachate, effluent and run-off; not containing substances at levels that will inhibit biological treatment
- waste biodegradable liquors/effluents from MFSU of basic organic chemicals. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- biodegradable effluent/liquors from the MFSU of pharmaceuticals. Aqueous process waters and, washwaters not containing substances at levels that will inhibit biological treatment
- biodegradable effluent/liquors from the MFSU of detergents, disinfectants and cosmetics. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- waste effluents, liquors, sludges from the MFSU of fine chemicals and chemical products not otherwise specified. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- waste effluents, liquors arising from the washing, rinsing of material from the steel and iron industry. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- waste waters/effluents from the cleaning and pressure testing of storage tanks and barrels. Washwaters not containing substances at levels that will inhibit biological treatment
- liquor/leachate from an aerobic composting process that accepts municipal, animal and vegetable wastes
- run-off liquors, leachates that arise from the aerobic treatment of municipal, vegetable waste types.
- liquor/leachates from an anaerobic composting process that accepts municipal, animal and vegetable wastes
- centrate liquor from waste water treatment only. Aqueous process waters and washwaters not containing substances at levels that will inhibit biological treatment
- chemical toilet waste

⁵ EWC 19 08 99 DCWW may wish to anaerobically digest, sludge from their own integrated constructed wetlands - the 'gardened' plant matter; the sludge from the lagoons and mycelium filters. All wastes from wastewater treatment plants' but clearly wastes not otherwise specified'.

