Monkmoor Sludge Treatment Centre

Odour Management Plan

Revision	Purpose/Description	Originated	Checked	Reviewed	Authorised	Date
1	**First Issue**	**Liz Cherry**	**Kay Daily**	**S Whitehouse**	**J Chapman**	**06/12/21**
2	**Update in response to EA Comments**	**J Chapman**	**M McAree**	**S Whitehouse**	**J Chapman**	**30/11/23**

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1) Introduction and scope

Odour from the majority of sewage treatment works is regulated by the local authority under statutory nuisance provisions of the Environmental Protection Act 1990.

However, sites that have the capacity to accept over 100 tonnes of imported waste per day for the purposes of anaerobic digestion have been issued with Environmental Permits under the Environmental Permitting (England and Wales) Regulations 2016.

The EA's Guidance '*Biological waste treatment: appropriate measures for permitted facilities*' requires for activities which are likely to give raise to odour problems, such as anaerobic digestion, an odour management plan (OMP) should be submitted for approval as part of the permitting process.

Therefore, this document will be submitted as part of the environmental permit compliance for the sludge process at Monkmoor Sewage Treatment Works which will be operated by Severn Trent Water.

This OMP has been prepared following guidance from the Environment Agency:

- H4 – Odour Management.
- Odour Management Review Checklist.
- Odour Management Plans for Waste Handling Facilities.

The OMP will form part of the ISO 14001 Environmental Management System (EMS). The Bioresources manager will be responsible for implementation of OMP and its regular review. This odour management plan will be reviewed on an annual basis or more often if any of the following occur:

- Validated odour complaints
- Changes to the sewage or sludge treatment process
- Significant development in the local area

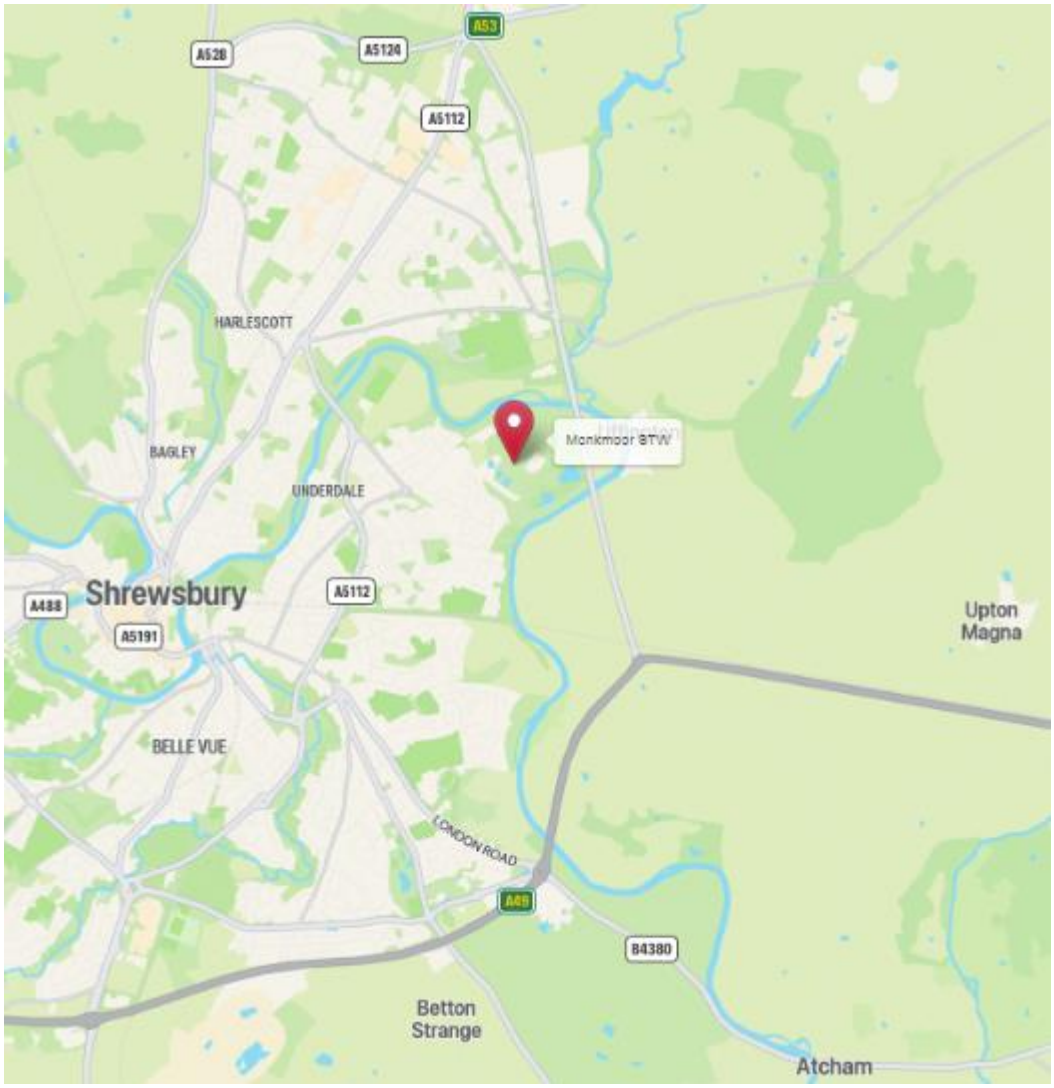
2) Site Overview

Monkmoor Sewage Treatment Works is located near the River Severn to the east of Shrewsbury. A plan of the proposed permitted site boundary can be seen in section 8 of this Odour Management Plan. The approximate site centre is at National Grid Reference (NGR) SJ 5191 1363.

Monkmoor treats a population equivalent of approximately 94,000. The current discharge permit (S/02/56373/R) levels (on a 95%ile basis) are 25mg/l BOD, 45mg/l SS, 10 mg/l ammonia. A 1mg/l phosphorus permit is due to be introduced in AMP 7. The final effluent is discharged to the River Severn

The site is able to import 310,000 m^3 of non-hazardous waste per annum – 300,000 m^3 into aerobic treatment, and 10,000 m^3 for dewatering only. Import of trade waste for digestion only is not permitted on this site.

Figure 1: Site location plan



3) Site surroundings

Monkmoor STW is located to the east of Shrewsbury. The site is surrounded on three sides by the River Severn. The Severn Way footpath runs along the banks of the river, within 200m of the sewage treatment works.

Immediately to the west of the site there is a housing estate and industrial estate. Some houses located on Hamilton Drive back directly onto the site boundary. Houses on Conway Drive are within 50m of the raw sludge treatment process units and digesters. Belvidere Primary School and Severndale Specialist Academy are 500m southwest and northwest of Monkmoor STW respectively.

There are sports facilities approximately 500m north of the site. Beyond this there is a housing estate and two schools.

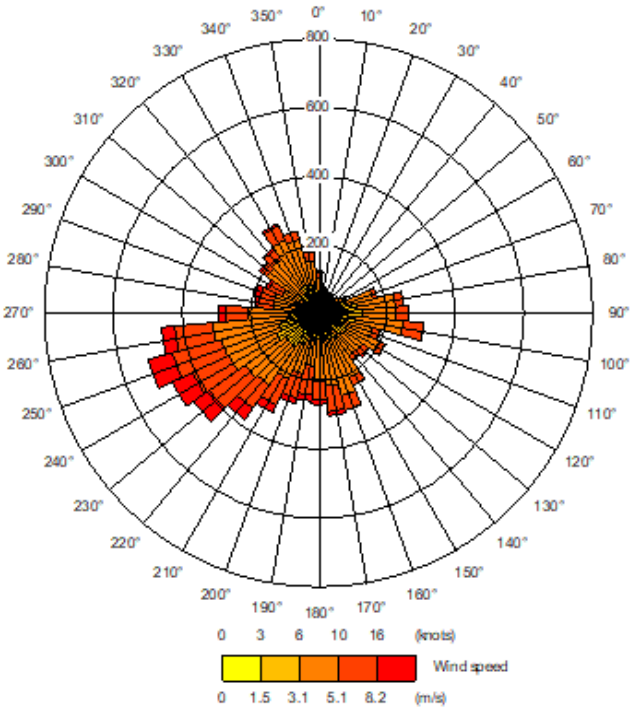
Land to the east and south is predominantly rural. The A49 is 200m east of the site and beyond that (within 1km of the sewage works) is Uffington village.

Monkmoor has a history of odour complaints from local residents. As result the raw primary and imported sludge routes are covered and vented to odour control units. The digested sludge tanks are open, however, these are located away from the built up areas.

Figure 2: Monkmoor - Sensitive Human Receptor Locations

Historical prevailing wind data below from the Met Office shows the predominant direction is South-West. This wind rose is for the nearest available site (Shawbury) and has been used in our dispersion modelling. Monkmoor STW is surrounded by sensitive receptors so the aim is to keep odours to a minimum whatever the wind direction.

Figure 3: Wind rose for Shawbury meteorological station 2015-2019



4) Process Overview

A process flow diagram is found in Appendix 1.

Figure 4: Monkmoor STW and STC – Location of Assets

Sewage is settled in 4 No. circular primary settlement tanks before flowing down a long open channel to the activated sludge plant. Two screw pumps (one covered) raise flows up to the ASP. There are 4 No. lanes with diffused aeration and 4 No. circular final settlement tanks. Final effluent is discharged into the River Severn. Sewage may be held in 4 No. rectangular storm tanks. These are fitted with an Amajet cleaning system.

Trade wastes are imported via 3 No. open tanks and are then combined with incoming sewage. Under the Urban Wastewater Treatment Regulations, sewage and imported trade wastes are screened and then pass through a detritor. The screens are enclosed, however, the detritor and inlet channel are open. Screenings and grit are stored in open skips.

The sludge processes described below are covered by the permit EPR/ RP3799CW.

Indigenous primary sludge is desludged into the main sludge pumping station. This is covered and vented to a Peacemaker odour control unit (OC1). From here sludge is pumped

into 4 No. rectangular consolidation tanks. These are also covered and vented to a separate Peacemaker odour control unit (OC2).

Sludge can be imported via the covered sludge import tank into the consolidation tanks. The sludge import tank is vented to a Peacemaker odour control system (OC4).

From the consolidation tanks, the sludge is passed to the crude belt feed tank. This is covered and vented to a Peacemaker odour control unit (OC3). From the crude belt feed tank, sludge is screened and thickened on a belt. The screen is enclosed and vented to the same odour control unit as the crude belt feed tank. The belt thickener is located within a building. Polymer is added to assist the thickening process.

Thickened indigenous sludge is pumped to the pre-digestion blending tank. The pre-digestion blending tank is covered and vented to a CIF/ Peacemaker odour control unit (OC5).

SAS is held in the SAS belt feed tank prior to being thickened using two belt thickeners and then pumped to the pre-digestion blending tank. Polymer is added to assist the thickening process. The SAS belt feed tank is not covered. The SAS belts are situated in a building.

From the pre-digestion blending tank sludge passes to 3 No. mesophilic anaerobic primary digesters. The primary digesters have retention times as stipulated in the current site HACCP plan. Biogas is collected and used in 1 No. CHP engine.

After digestion, sludge is held in 5 No. rectangular storage tanks (brick) and 4 No. open steel pathogen kill tanks. These are open but located away from the housing estate.
Digested sludge is exported as a liquid to Rushmoor STC for dewatering prior to being spread on agricultural land.

5) Hours of operation

Waste is processed through the plant 24 hours a day through a computer-controlled process. There are no permitted restrictions on the delivery of tankered waste to the site. Severn Trent will aim to only allow waste via tankers to be accepted between normal working hours to minimise odours. Any tankers received out of hours would be for emergency tankering only.

6) Tonnages

Monkmoor STW served a population equivalent of 94,285 in 2020/21. The sewage treatment works accepts tankered trade and tankered domestic waste imports into the inlet works.

The digestion plant has capacity to treat 4,012 tds/annum.

The site is permitted to accept 310,000 tonnes of non-hazardous waste annually (excluding indigenous UWWTD derived sludge from within the sewage treatment works). This total is made up of the following types of waste:

- Imports of tankered waste – 200,000 per annum.
- Storage of off spec waste to landfill via Moos skip – 10,000 per annum
- Imports of interworks sludges – *currently accepted under a T21 Exemption, therefore allowance of 100,000t per annum*.

7) Waste material accepted

Severn Trent Water do not accept any trade wastes into the sludge route for treatment. Raw sludge is accepted into the sludge treatment route.

Tankered trade and domestic wastes are accepted into the inlet of the sewage treatment works. A list of EWC codes accepted for import into the head of the works is found in section 2 of the current permit. This is available to site staff.

Waste imported for dewatering and storage only

Monkmoor STW does not have dewatering equipment and so is unable to accept digested sludge imports.

8) Delivery Vehicles

Liquid wastes will be transferred to and from the site in sealed tankers. Solid waste will be removed from site in sheeted Heavy Goods Vehicles (HGV's).

It is the responsibility of the haulier to ensure that the contents of their load are sheeted when removing waste from site as per our agreement with our approved framework contractors. Vehicles arriving at site that are in poor condition (poor sheeting, leaking seals or dirty) such that they may cause odour issues will be refused re-entry until repairs are made.

Liquid wastes will only be accepted or exported in sealed tankers. All trade waste loads will be tested on arrival at site as per the trade waste Standard Operating Procedure (SOP) **SOP03 TTW Nonconformance Procedure**. Any loads with odour potential will be assessed by the trade waste technicians during the lab testing process. Tankers can be unloaded using gravity only (no pressure discharge) to reduce potential odour egress. If loads are deemed too odorous for discharge, the trade waste technicians will reject the tanker and send the haulier offsite as per the SOP.

It remains the responsibility of the haulier to ensure their vehicle is maintained. All foul water then runs into the site drainage and is directed back to the head of the works for treatment.

Any Nonconforming Tankered Trade or Tankered Domestic loads will be dealt with appropriately as per Standard Operating Procedure.

Trade Waste Rejection Procedure

Where waste is deemed to contain a level of contamination greater than that set out above or is considered to be a malodorous load, the Trade Waste Technicians will consider the rejection procedure option.

Should a load be considered unacceptable, the Trade Waste Technicians will quarantine that load in a separate area of the reception roadway. The relevant haulier or waste supplier will be contacted and the reason behind the rejection will be conveyed to them. They will then be requested to remove the load from site, if deemed too malodorous to discharge.

Severn Trent Water's document: **SOP03 TTW Nonconformance Procedure** addresses:

1. Identified Risks
2. Roles and Responsibilities
3. Training and Competence
4. Duty of Care paperwork
5. Contaminated Loads
6. Differences against approval analysis
7. Other non-conformances
8. Load rejection

A full version of **SOP03 TTW Nonconformance Procedure** can be found locally on Sharepoint.

9) Permitted Area

The proposed installation boundary and air emission points are shown in figure 5. Further details of the potential gas releases from the air emission points are shown in Table 1.

Figure 5: Permitted Area

Table 1: Air Emission Points

Emission point	Source	Components	Odour Risk
A1	CHP Engine	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A2	Emergency Flare	Products from biogas combustion	Low - the flare is utilised for the safe disposal of surplus gas in the event of plant breakdown, or a surplus of gas above the level that can be safely stored or utilised. Use of emergency flare is recorded.
A3, A4 & A5	Auxiliary Boilers 1, 2 & 3	Products from oil/ gas combustion	Low - Boiler is regularly serviced.
A6	Gas holder pressure relief valve	Biogas (mixture of methane & carbon dioxide)	Low - the floating roof gas holder is suitably sized to manage biogas generation.
A7, A8 & A9	Pressure relief valves on digesters	Biogas (mixture of methane & carbon dioxide)	Low - PRVs are only activated in emergency situations to maintain safety within the biogas system and are re-seated/repaired promptly to minimize biogas emissions. PRVs are subject to monitoring via site systems and visual checks by site personnel.
A10, A11, A12, A13 & A14	Odour Control Units	Raw sludge odours e.g. H_2S	Low - the odour control units are subject to regular preventative maintenance. Media is replaced in line with the manufacturers' recommendations

10) Available onsite capacity

The following capacity is available across the site and is indicative of the total amount of waste that can be retained onsite on any given day.

Table 2: Monkmoor site capacity details

	Element	Capacity	Total Capacity
	Trade waste import tanks	3 x 161m^3	482m^3
Covered by environmental permit EPR/ RP3799CW	Sludge import tank	1 x 50m^3	50m^3
	Main sludge pumping station		10m^3 (estimated)
	Sludge consolidation tanks	4 x 175m^3	697m^3
	Crude belt feed tank	1 x 150m^3	150m^3
	Pre-digestion blending tank	1 x 400m^3	400m^3
	SAS belt feed tank	1 x 150m^3	150m^3
	Primary Digesters	1 x 1,431m^3 1 x 1,476m^3 1 x 1,479m^3	4,386 m^3
	Storage tanks	5 x 495m^3	2,476m^3
	Pathogen Kill Tanks	4 x 1,800m^3	7,200 m^3
		Total	**16,001m^3**

11) Our Approach to Odour Nuisance

Prevention of nuisance is preferable to mitigation of its effects so we use a phased approach to dealing with the risk of odours.

Sewage and sludge treatment facilities should be designed with nuisance in mind. Where possible the most odorous activities should be located away from sensitive receptors. Long open channels should be avoided and potentially odorous tanks designed so that they can be covered if required.

On existing sites, the following approach is used to minimise the risk of odour nuisance:

1. Where possible operational methods should be used first e.g. improving housekeeping or increased maintenance and servicing of assets. Odorous activities such as moving sludge cake should be avoided on days when the prevailing wind is towards sensitive receptors.
2. The last resort is to contain the nuisance e.g. by covering odour sources. If covers are required, then small odorous areas such as desludging and return liquor wells should be addressed first.

3. Ventilation may be required to prevent the build up a corrosive atmosphere. Odour abatement equipment should be sized to cope with any variations in odour levels.

We assess odour risk using FIDOL (Frequency, Intensity, Duration, Offensiveness, Location) and the source/ pathway receptor model. See Inventory of odorous materials.

Odour risk is assessed if the treatment processes on site are altered, in this case odour control measures are paid for as part of the capital scheme. If the need for odour control is identified under other circumstances, e.g. development close to the site, then the site manager adds the issue to STORM and a capital project is created to install odour control.

Severn Trent Water is also committed to the following principles of H4 guidance:

- The integrity of the site infrastructure (including roads, buildings, ducts, pipes, drainage/sewerage, process equipment and controls) are regularly inspected and maintained.
- A high level of site cleanliness is maintained and is enforced by the site management
- Company will engage with the neighbours to minimise their concerns including responding to their complaints effectively

The Environment Agency will be notified in the event of odorous releases detected outside of the site that are or may be caused by the activities authorised by the environmental permit. In the event of an olfactory egress, the Environment Agency will be informed using a Schedule 5 Notification Form, located in Schedule 5 of the permit.

Training

The Environmental Policy is communicated to all persons doing work under the organisations control. Policies, Standards and procedures around permit compliance and operational controls are available and accessed through an online system.

Environmental Management Systems (EMS) basic level awareness e-learning is mandatory to all operational staff. EMS e-Learning Nuisance module includes odour pollution and the Site Permit module includes understanding permits. EMS e-learning is recorded as a skill on SAP.

Competency Management Systems (CMS) Technically Competent Persons are trained on requirements of Environmental Permits including nuisances, control measures and Schedule 5 reporting. CMS Technical Competence is recorded as a skill on SAP.

Severn Trent also schedules regular training modules throughout the year. CABWI (Diploma in Water and Wastewater Engineering) can be undertaken by Operators and Managers wishing to upskill across aspects of wastewater and includes reference to odour issues and mitigation within the training.

Training is monitored and managed by line managers in the first instance.

Site visitors are inducted and made aware of relevant issues or reporting requirements.

12) Inventory of Odorous Materials

Waste Sources and Odour Mitigation

The following list provides an inventory of wastes which may give rise to increased odour on site and their mitigation measures following assessment using **FIDOL** (Frequency, Intensity, Duration, Offensiveness, Location) assessment and the source/ pathway/ receptor model. The risks in the table are those that occur during normal operation. For exceptional circumstances see Table 5 - Incident/ emergency control measures.

Table 3: Inventory of Odorous Materials

Location on site	Nature of Odorous Material	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Sewage treatment Inlet works	• Raw sewage (not part of this permit) • Imported tankered domestic waste & thin raw sludges. (EWC 200304) • Liquor returns from onsite thickening & dewatering processes.	Dry weather flow for the site is 20,838 m^3/d Minimal retention time - inlet works are designed to process flows not store them.	**Risk before mitigation - Moderate. Risk after Mitigation - Low** **Risks (before mitigation) -** Liquor returns & imports have moderate FIDOL score. Inlet channels are open **Source mitigation** - We do not accept odorous wastes (see acceptance criteria). Return liquors are processed as soon as possible after production. Import pipes are extended to reduce splashing. Raw sewage dilutes the other wastes. **Pathway/receptor mitigation** - Inlet works is located away from residential properties
Sewage treatment Trade waste tanks	• Open Tanks	3 x trade waste reception tanks (482 m^3 total capacity) Approx. 3 days retention time	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) –** trade waste can have a high FIDOL score. **Source mitigation** – Pre-digestion procedures ensure odorous wastes are not accepted. Import facility is enclosed and connected to a Peacemaker odour control system.

			Pathway/receptor mitigation - minimised through process control
Sludge handling and treatment Raw sludge handling	• Raw sludge imports from satellite STWs. (EWC 190805) • Screenings from raw sludge imports • Liquors from the consolidation process	1 x pumping station, 4 x consolidation tanks, 1 x crude belt feed tank & 1 x pre-digestion blending tank (1,260m^3 total capacity) Tanks have approx. 3 days retention time	Enclosed well and tanks.Tanks are covered and vented to odour control **Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) -** raw sludge can have a high FIDOL score. **Source mitigation** - Import facility is enclosed and connected to a Peacemaker odour control system. Skips emptied regularly via contract with Biffa. Liquors are returned to the head of the works as soon as possible. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment SAS	• SAS from onsite sewage treatment process. • Polymer is added to aid thickening. • Liquors are produced.	1 x SAS belt feed tank (150m^3 total capacity) Minimal retention time – belts process sludge rather than storing it.	**Risk before mitigation – Low. Risk after Mitigation – Low** **Risks (before mitigation) –** raw SAS has a low FIDOL score. Polymer is odourless. **Source mitigation** – SAS is thickened as soon as possible after production. Polymer is odourless. Belts are located inside a building. Liquors returned to head of sewage treatment works as soon as possible. **Pathway/receptor mitigation** – n/a odour controlled at source.
Sludge handling and treatment Digesters	• Blended raw sludges (raw sludge imports from satellite STWs. Primary & SAS from onsite sewage treatment). • Antifoam may be added. • Biogas is produced as part of the	3 x mesophilic anaerobic primary digesters (4,386 m^3 total capacity) Design manual minimum retention time is 12 days. Check HACCP plan on Waterpedia for the latest retention time requirements.	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL score **Source mitigation -** Odour is minimised through process control. We optimise digester operation to ensure that digested sludge has a low FIDOL score. Sludge is only kept in the secondary sludge tanks and sludge to land tanks for the time required by the site HACCP plan. **Pathway/receptor mitigation** - n/a odour controlled at source

	digestion process.		
Sludge handling and treatment Post digestion storage	• Open tanks • Digested sludge from onsite digestion process	5 x storage tanks 4 x path kill tanks (9,675 m^3 total capacity) Check HACCP plan on Waterpedia for the latest retention time requirements.	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL score **Source mitigation -** Odour is minimised through process control. We optimise digester operation to ensure that digested sludge has a low FIDOL score. Sludge is only kept in the secondary sludge tanks and sludge to land tanks for the time required by the site HACCP plan. **Pathway/receptor mitigation** - n/a odour controlled at source.
Biogas utilisation CHP engines	Engine emission stacks	1 x Jenbacher combined heat and power unit (425 kW)	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmosphere **Source mitigation -** Engines are specifically sized for the sites operation to minimise the amount of excess gas produced. If there are problems with the CHP engines, sludge imports will cease until the CHPs are back online. This minimises gas production on site **Pathway/receptor mitigation** - n/a odour controlled at source
Biogas utilisation Flare stack	Combustion of biogas produced onsite.		**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmosphere **Source mitigation -** At times when the CHP engines are down, the imports have ceased, and the storage within the digester roofs and gas holder is maximised, the excess gas will be flared. **Pathway/receptor mitigation** - n/a odour controlled at source

13)Odour Abatement Systems

The following odour abatement systems have been installed on the Monkmoor sludge route:

Table 2: Monkmoor Odour Abatement Systems

Parameter	Main sludge pumping station	Consolidation tanks, HACCP & sludge PS	Screen and primary sludge buffer tank	Imported sludge tank	Pre digestion sludge blending tank.
OCU Type	Moderator/ 3000 Peacemaker system	Moderator/ 3 x GRP3000 Peacemaker system	P2000 Peacemaker	P1000 Peacemaker	P6000 C.I.F. and P3000 Peacemaker
System details	Fully enclosed systems, vent to atmosphere via a single exhaust point				
Media type	Oxidising Chamber - pellets impregnated with stabilised chlorine dioxide. Polishing stage - Absorptive (carbon) media.				
Media Quantity (kg)	2,080	3 x 2,080	1,800	1,000	5,700 + 2,080
Media Life (Years)	Media pro-actively replaced every 5 years. ME30 specifies design life of 5 year minimum				
Design Inlet Parameters					
Airflow (m3/hr)	200	625	225	234	562
Hydrogen Sulphide	Average 50mg/m3, Peak 200mg/m3 (design manual)				
Stack Outlet Performance					
Odour Conc. (OUE/m3)	95% reduction (design manual & ME30)				
Hydrogen Sulphide	99% reduction (design manual & ME30)				

Figure 5: P6000 CIF and P3000 Peacemaker on the pre-digestion sludge blending tank

The Severn Trent design standard for odour abatement equipment (ME30) requires 95% total odour reduction and 99% hydrogen sulphide reduction.

The CIF (catalytic iron filter) is a pre-treatment unit that contains iron media. Peacemakers are a form of dry chemical scrubber that contains a media that oxidises hydrogen sulphide, mercaptans and other odorous compounds. A diagram of a dry chemical scrubber is found in Appendix 2.

The odour control units are all enclosed systems that vent to atmosphere. Their locations are shown in figure 4 (section 8).

The following documents are used for the design and operation of the OCU's, which are available upon request:
- ME30 Odour Control Equipment and Building Ventilation (version 4.01) - Design manual ME30 for Odour control is adhered to for all Tier One supply chain partners.
- STW design manual – Sewage Treatment Odour Control (version 1.1)

14) Monitoring Plan

Monitoring is essential to our operational control. These are some of the benefits it provides:

- Assessing the nature and extent of a potential risk of odour pollution
- Investigating sources and pathways
- Measuring releases
- Showing patterns that can be used to plan the timing of operations and predict potential risks of odour pollution
- Aiding management and control of the process, including in exceptional circumstance the diversion of waste to a similar facility

Some of the pro-active monitoring methods that we use are as follows:

- All Tanker trade waste is booked into the site to enable the Site Manager and Operatives to understand the daily and weekly expected tonnages and potential gas production.
- Monitoring the process controls of the Anaerobic Digestion and Urban Waste Water process. For example digesters are monitored for %DS, feed rate (both recorded on JRP), temperature, pH, VFA, gas quality and H2S (site manual readings) as part of the “golden measures” programme.
- We have established a time-based media change programme whereby media in our odour control units is replaced every five years in accordance with manufacturers specifications and ME30. We also carry out regular checks to ensure that our odour control equipment continues to be fit for purpose (see Appendix 3 Odour Management Tanks).
- We measure the performance our odour abatement equipment on a regular basis. Tasks are assigned to site operators on the SAP/ Sitemate system (See Appendix 3 Odour Management Tasks).
- We review our OMPs annually. This includes a review of the FIDOL and source/ pathway/ receptor assessment found in Table 2 Inventory of Odorous Materials.
- We have a series of control and reactive measures identified for areas of site that have the potential to be odorous. See Table 4 Incident/ emergency control measures.
- As part of the new IED permit, we commit to carrying out a review of our abatement plants, to determine whether measures have been effective, and to further characterising emissions from the odour control units in line with BAT 3 and 8 to demonstrate that H2S, NH3, TVOC and HCI are not present in the waste gas stream. If H2S, NH3, TVOC or HCI are found to be present, or any improvements to equipment required, a monitoring and improvement plan will be put in place in agreement with the EA.

If we were to receive odour complaints or suspected that there was a risk of odour nuisance, then reactive monitoring would be implemented:

- Sniff testing (as described in H4) would be carried out by members of staff from the offices/ other areas of the business (who are less sensitised to sewage treatment odours) in order to pinpoint the source of the odour nuisance. This assessment would focus on the works perimeter as well as the sewage and sludge treatment routes. Sniff testing would include the non-permitted area of site in order to ensure that all potential sources of nuisance are accounted for. Forms for recording observations can be found in the Appendix 4 (Forms).
- Results from the sniff testing assessment would be evaluated and if necessary, further investigation would be carried out via gas bag testing, or GCMS if required. A specialist contractor would be hired to undertake this work.

15) Odour risk assessment

Table 4 Odour risk assessment

Cause of elevated odour	How the severity is measured	Likelihood (pre controls)	Control measures
Delivery of waste under normal conditions and acceptance of wastes with a strong offensive odour	Inspection, sample and analysis of waste	Low	Follow site procedures for pre-acceptance assessment of waste and quarantine/ rejection of nonconforming loads. Deal with loads promptly after acceptance. As specified in EA-approved Waste Acceptance Procedures for Trade Waste, a full assessment of waste is undertaken before first delivery, including laboratory analysis/sampling. Then, sampling of each load before allowing discharge at site. Delivery in contained vehicles. Scheduling of waste to allow immediate processing.
Removal of digested sludge from site under normal conditions	Odour assessment of cake	Low	Use competent haulage contractors Collection in sealed tankers vehicles. Minimise agitation during loading.
Damage to tank roofs	Digesters and gas holders are alarmed to indicate loss of pressure	Medium	Routine inspection regime of digester roofs. They are maintained in line with Gas Holder Regulations.
Damage to fabrication of sludge building	Visual inspections	Medium	Visual inspection of the sludge building fabrication
Digester pressure valves activate	Digesters are alarmed to indicate pressure	Medium	Control digester feeds and volumes to maintain safe biogas level
Valves, pipes or pumps damaged or malfunctioning	Routine site checks Detected by site staff	Low	Selection of correct pipework for pressure and flow loads. Frequent on site checks Clean any spills promptly.
Odour scrubber damaged or malfunctioning	Detected by site staff	Medium	Regular checks carried out by site staff. Media pro-actively replaced.

Processing equipment damaged or malfunctioning	Regular checks. Detected by site staff	Medium	Any equipment failures and associated risks requiring capital maintenance recorded on Severn Trent Operational Risk Matrix (STORM). Short term maintenance issues resolved through site manager OPEX budget.
Failure of electricity supply	CHP engines and flare will fail to work/ ignite	Medium	Dual electricity supply to site.
Human error – staff, managers, visitors	Regular checks Detected by site staff	Medium	Staff training and supervision. Visitor inductions. Regular checks. Clean any spills promptly. Near miss reporting.
Malfunction or damage caused by unauthorised visitors	Regular checks Detected by site staff	Medium	Security measures are in place including controlled access gates operated in accordance with our Closed gate policy. Perimeter fence and CCTV.
Fire and/or explosion	Detected by systems Detected by site staff	Medium	Staff training and supervision. DSEAR zones identified on map and on site. Fire extinguishers placed for quick access and checked regularly. Established contact with local Fire Service who have undertaken a site specific assessment.
CHP gas engine emissions	Odour detected by site staff.	Low	Scheduled stack emissions testing in accordance with requirements set out in the Environmental Permit. Serviced by STW CHP trained technicians as per manufactures recommendations and after each 1000hr service the emissions are monitored using calibrated handheld Testo unit. 3rd party MCerts approved contractor monitors the exhaust emission once per year in line with permit requirements. If emission are found to be outside of the expected range then they are investigated and rectified by replacement of parts or bringing forward the service interval.
Poor housekeeping on site	Detected by site staff.	Low	Ensure spills are cleaned up promptly. Spill training is undertaken by Wholesale Ops and spill kits/hoses are readily available.

16) Responding to Odour Concerns and Complaints

Severn Trent Water takes any incidents, non-compliances and environmental complaints very seriously and have procedures in place to record and investigate these. Incidents are managed through standard procedures which ensure that all incidents are logged and that necessary preventative and/or corrective actions are taken.

Complaints are managed by Customer Services, where all complaints are logged on the Complaints Records Online Storage System (CROSS). Customer complaints can be received via phone, email, letter or social media. Customer services operatives follow a script to ensure that standard details are recorded. If a complaint is made directly to the site operators, then they contact Customer Services to ensure that the issues are recorded centrally.

Site Managers are responsible for

- investigating complaints using the reactive monitoring measures described in section 10. The results of their investigations can be recorded on the report form in Appendix 4.
- providing a timely response to the complainant detailing the reason behind the issue and the actions taken to resolve the matter.
- liaising with the relevant regulatory bodies (where appropriate)
- ensuring that work is undertaken to resolve the issue. See section 7 Our Response to Odour Nuisance for more details of possible actions.

Information regarding complaints is recorded to allow determination of an appropriate response (corrective action) and to determine what measures need to be taken in the future to prevent its reoccurrence (preventive action). Please see Appendix 5 for a full version of the Complaints Response SOP.

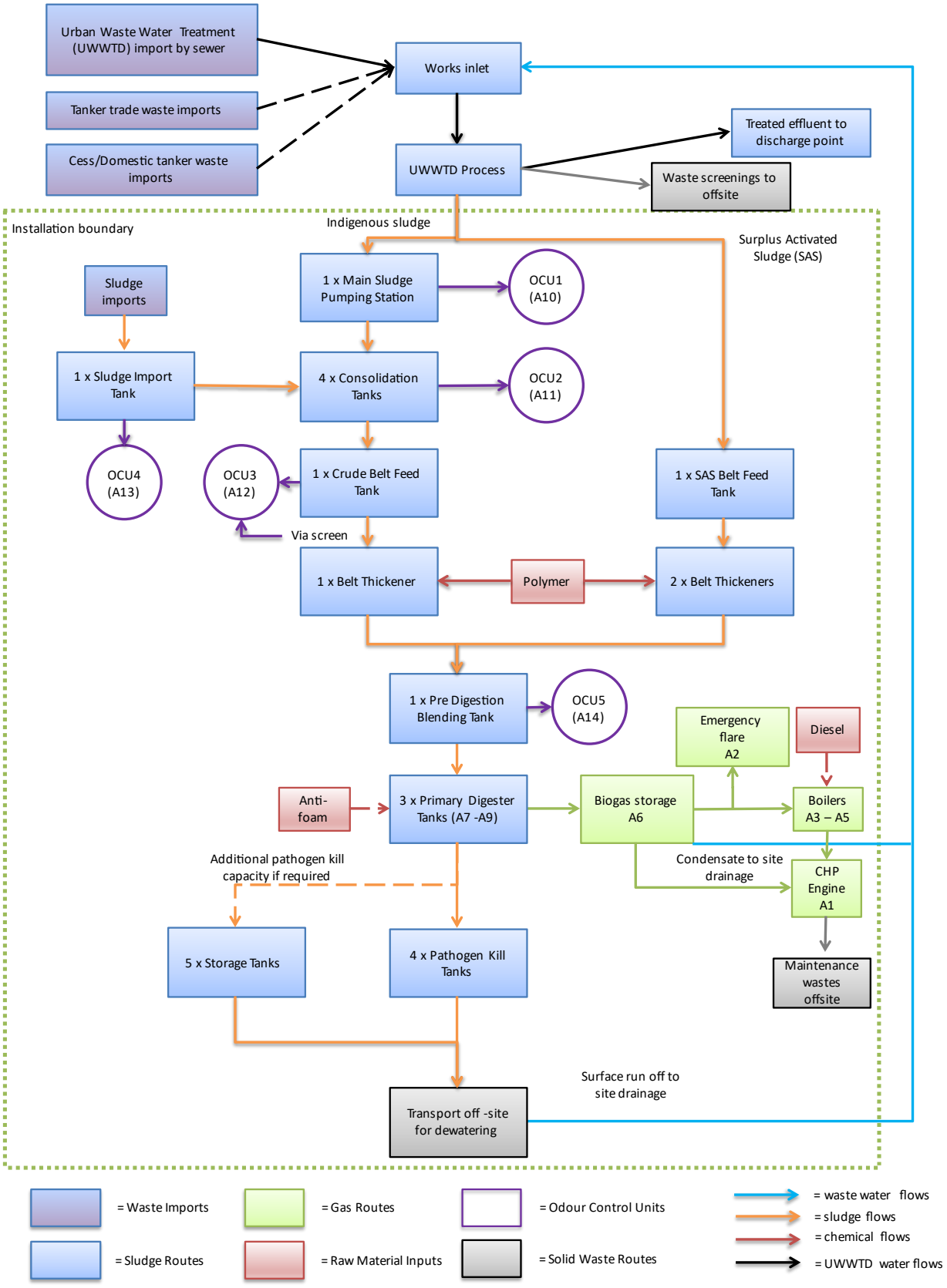
The EMS management review team review the MI (Management Information) data, which will include odour complaints.

Recurring odours may require investigation by our Process Design Engineering teams (PDE). FIDOL assessments (Frequency, Intensity, Duration, Offensiveness and Location) are undertaken to assess whether any changes to the process are required.

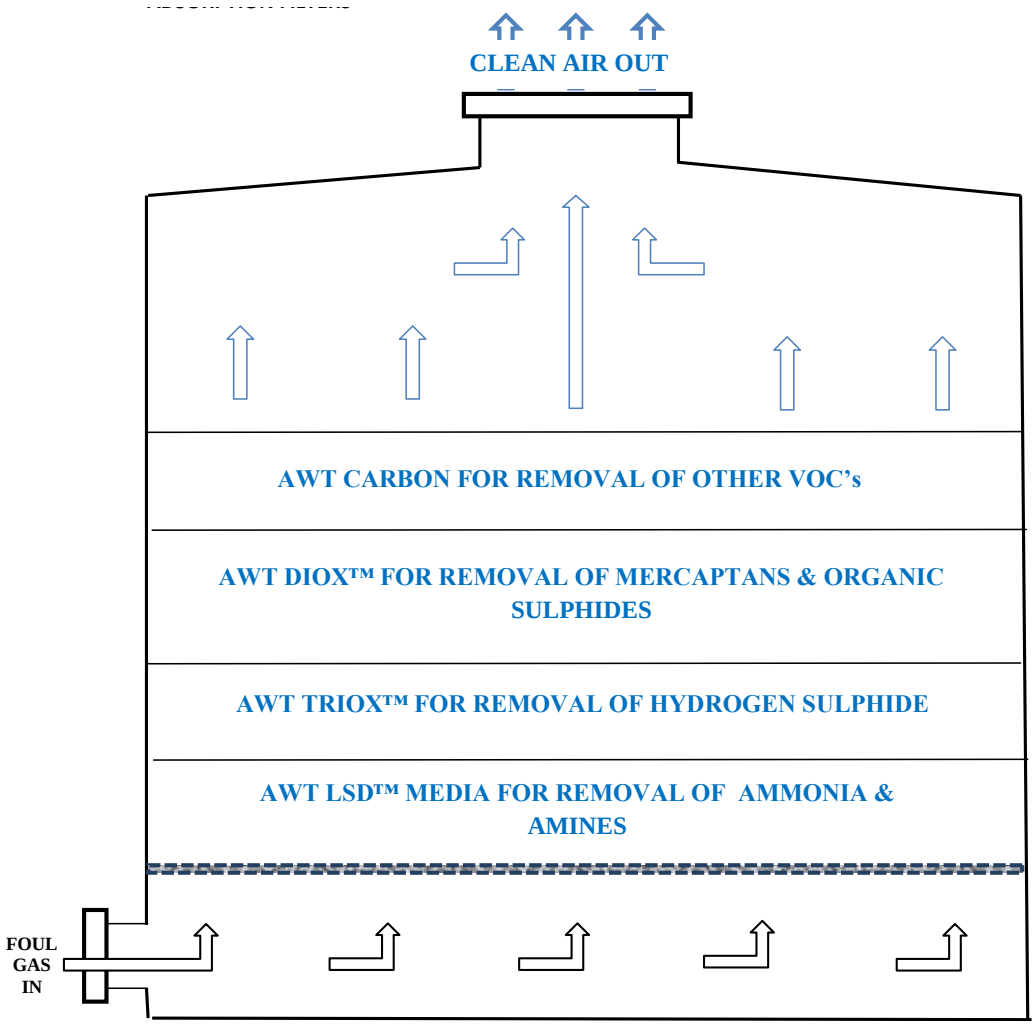
Where odour issues are prevalent, we would adopt the stance taken at our Wanlip Sewage Treatment Works during 2017/18. Live odour surveys were set up weekly with the local Council. Severn Trent also engaged with local residents and invited customers to site to investigate the locations on site and potential odour olfactory variances.

Engagement with the Environment Agency for process issues, pollutions that could cause odours or validated odour complaints would be through either a Schedule 5, or a phone call to the Local Environment Officer as per the contacts section (Appendix 6).

Appendix 1: Process Flow Diagram



Appendix 2: Odour Abatement System - Peacemaker



Appendix 3: Odour Management Tasks

Task	Frequency	Performance Indicators	Method	Remedial Actions
Extraction fan visual inspection	Weekly	No damage/ leakage/ signs of corrosion	Visual inspection	If fan is damaged raise a job via site OPEX or STORM
Extraction fan noise	Weekly	Increase noise or vibration from the fan motor	Listen	If fan is damaged raise a job via site OPEX or STORM
Check physical integrity of ducting and covers	Weekly	No signs of degradation or other damage and no holes. Covers on tanks closed	Visual inspection	Close covers If ducting/ covers are damaged raise a job via site OPEX or STORM
Check media pressure drop	Monthly	As per O&M		Check fan performance
Check fan motor, belt condition and tension	Annually	As per O&M	As per O&M	Adjust tension. If parts need repair/ replacement raise a job via site OPEX/ STORM
Measure hydrogen sulphide in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 doesn't mention H_2S)	External contractor CEN TS 13649 for sampling NIOSH 6013 for analysis	Check functionality of odour control unit & if necessary arrange for media replacement
Measure ammonia in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 requires 0.3 - 20mg//Nm^3)	External contractor EN ISO 21877	Check functionality of odour control unit & if necessary arrange for media replacement
Measure odour in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 requires 200-1,000 ouE/Nm^3)	External contractor BS EN 13725	Check functionality of odour control unit & if necessary arrange for media replacement

Appendix 4: Forms

Odour report Form for Sniff Testing

Odour Report Form for Sniff Testing				Date	
Report completed by					
Time of test					
Location of test (area of site)					

Weather conditions (dry, rain, fog, snow etc.)					
Temperature (warm, mild, cold or degrees if known)					
Wind strength & direction					
Odour Intensity (see below)					
Duration of test					
Constant or intermittent odour in this period?					
Describe the smell					
Is the source evident?					
Other comments					

Odour Intensity:
0 - no odour
1 - very faint odour
2 - faint odour
3 - distinct odour
4 - strong odour
5 - very strong odour
6 - extremely strong odour

Odour Complaint Investigation Report Form

Odour Complaint Investigation Report Form	
Time and date of complaint	
Name & contact details of complainant	

Date of odour	
Time of odour	
Location of odour	
Weather conditions (dry, rain, fog, snow etc.)	
Temperature (warm, mild, cold or degrees if known)	
Wind strength & direction	
Weather conditions (dry, rain, fog, snow etc.)	
Complainant's description of odour: • What does it smell like? • Intensity • Duration (time) • Constant or intermittent? • Other comments?	
Are there any other complaints in relation to the installation/ location (either historically or at the same time)	
Any other relevant information	
Do you accept that the odour is likely to be from your activities?	
What was happening on site at the time the odour occurred?	
Operating conditions at the time the odour occurred	
Actions taken	
Form completed by	

Odour Intensity:

0 - no odour 1 - very faint odour 2 - faint odour
3 - distinct odour 4 - strong odour 5 - very strong odour
6 - extremely strong odour

Appendix 5: Standard Operating Procedure for Complaints Responses

Standard Operating Procedure (SOP)

Title	*Odour Customer Complaints On-site (Waste)*

Why	*To improve our ODI SIM (Service Incentive Mechanism) Compliance and improve the customer experience, also this will provide Severn Trent with a procedure for any odour complaints if Enviromental Health ask for evidence.*
Who	The Wholesale Operations Non Infra Team Manager shall have overall responsibility for implementing this procedure. The procedure must be followed by Technical Operators and Senior Technicians responsible for the day to day operation of sewage treatment works.
Scope	This SOP covers how to respond on-site to customer complaints relating to odour at a sewage treatment works.

Must Haves (H&S, Quality, Quantity, Environment, Training, Resources)

- Standard PPE
- Up to date site odour checklist highlighting areas on site that have odour issues
- Access to CROSS
- Must have a Wind Sock on all occupied sewage treatment sites

Remember – 'Stop, Think, Take 20'

Summary Must Do's

Enter here no more than 10 key points / requirements of this SOP

1. Contact the customer within 24hrs of complaint (Team Manager)
2. All customer complaints must be investigated via reactive site odour check within 3 days of complaint (Operative)
3. Proactive site odour checklist once a month, except once a week June-August
4. Pass on completed site odour checklist to Environmental Health
5. All complaints recorded on CROSS (Team Manager)
6. Detailed report of customer complaints sent to COSC to form central record (Team Manager)
7. Must complete next steps/actions from site odour check (Team Manager/Operative)

Detailed step-by-step guide: Proactive

Step	Procedure	Why
1	If possible liase with Environmental Health and walk around site to identify areas where odour is present	Developing good working relationship with external regulators
2	Create a site odour checklist and site map highlighting areas with odour issues (see Wanlip STW as an example in references)	It provides a structured and consistent approach to checking site odour levels
3	Every month a site operative must complete a site odour checklist, every week during summer months	This is to create an audit trail to act as evidence of site odour
4	Carry out site odour checklist using site map of highlighted areas where historic odour issues have occured and record next steps throughout the process	If assets are out of service or not operating correctly this can affect odour levels
5	Check wind direction using on site wind sock where present	Is customer complaint up wind or down wind of site
6	Check weather conditions	Dry or misty conditions will increase the likelihood of odour issues
7	Record flows into works	Higher flows can flush septic sewage out of the network
8	Check site golden measures for action limit breaches and specify any that could influence odour levels	For example high sludge levels in a primary settlement tank can lead to septic sludge
9	Check if there is a increase in odour levels around plants operated by other companies on a Severn Trent site (e.g. Biffa food waste plant at Wanlip STW)	
10	Check if there are any other operational issues potentially effecting odour	There could have been a change in circumstances on site (e.g. an incident has occurred or new assets/processes installed)
11	Check if there are any factors outside of the site that are influencing site odour levels	E.g. Petfoods in Melton discharging high strength waste into the network
12	Carry out and complete next steps	
13	Store proactive site odour reports electronically and forward onto Environmental Health (if applicable)	To create records to refer to, to build relationship with Environmental Health and allow customers to view a public record

Detailed step-by-step guide: Reactive

Step	Procedure	Why
1	Team manager/site operative receive customer complaint via COSC or direct customer contact	
2	Record customer details in actions/next steps of the site odour check list	Help track and keep a record on site of customer odour complaints
3	If contacted by COSC, must contact customer within 24 hours of complaint	To ensure that we maintain a good relationship with our customers
4	If direct customer contact then liase with COSC and inform them of the odour complaint	To ensure that Severn Trent have a central record of customer odour complaints
5	Create site odour checklist if not already produced as part of proactive work	
6	Carry out site odour checklist using site map of highlighted areas where historic odour issues have occured and record next steps throughout the process (follow from step 4 in proactive process)	If assets are out of service or not operating correctly this can affect odour levels
7	Carry out and complete next steps	
8	Store reactive site odour reports electronically **and forward onto Environmental Health (if applicable) CROSS**	To create records to refer to, to build relationship with Environmental Health and allow customers to view a public record
9	**What do we do now? Who contacts the customer? (COSC or team manager is it COSC unless direct contact?)**	
10	If persistent or compliant is escalated (Severn Trent heirachy or local MP) then invite customer for site visit	

Records, Appendices & References

Site specific odour checklist form

Document Control & Governance:

Owners Name	James Stalbow
Owners Role	Non-Infra Improvement Manager
Date of Next Review	*TBC*
Version Number	*Draft1*
Revision History	*First draft*

Version 1	*Date* *04/05/2017*	*Notes* *First issue*
The only valid version of this SOP is the electronic version held in Waterpedia. If this is a printed version it is only valid on the date of printing. Ensure this SOP is still within the current review period If not 'DO NOT USE' and contact your line manager for the new version		

Appendix 6: Monkmoor Site Contact Details

Area of Site	Company Responsible	Contact Name	Phone Number
Sludge Screening Rag Skips		REDACTED FOR EA ISSUE	
Odour Control Units			
CHP Units			
Trade / Domestic Waste			
Biosolids / Cake pad			
Permit Compliance			
Bioresources Operations			
Production Operations			
Shrewsbury Town Council			
Environment Agency			