

Spernal Sewage Treatment Works and Sludge Treatment Centre

Odour Management Plan

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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 2013.

The EA's Guidance '*Biological waste treatment: appropriate measures for permitted facilities*' requires for activities which are likely to give rise 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 Spenal 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

Spenal Sewage Treatment Works is located to the southeast of Studley on the banks of the River Arrow. The approximate site centre is at National Grid Reference (NGR) SP 0824 6273.

Spenal STW treats a population equivalent of approximately 80,000 from Studley and Redditch. The STC also treats raw sludge imports from satellite sites.

The current discharge permit levels (on a 95%ile basis) are 15mg/l BOD, 25mg/l SS, 5/10 mg/l ammonia and 2mg/l phosphorus. The phosphorus consent is due to be tightened in AMP7 – the engineering solution for this is under development. The final effluent is discharged to the River Arrow.

The site location is shown in figure 1.

Figure 1: Site location plan



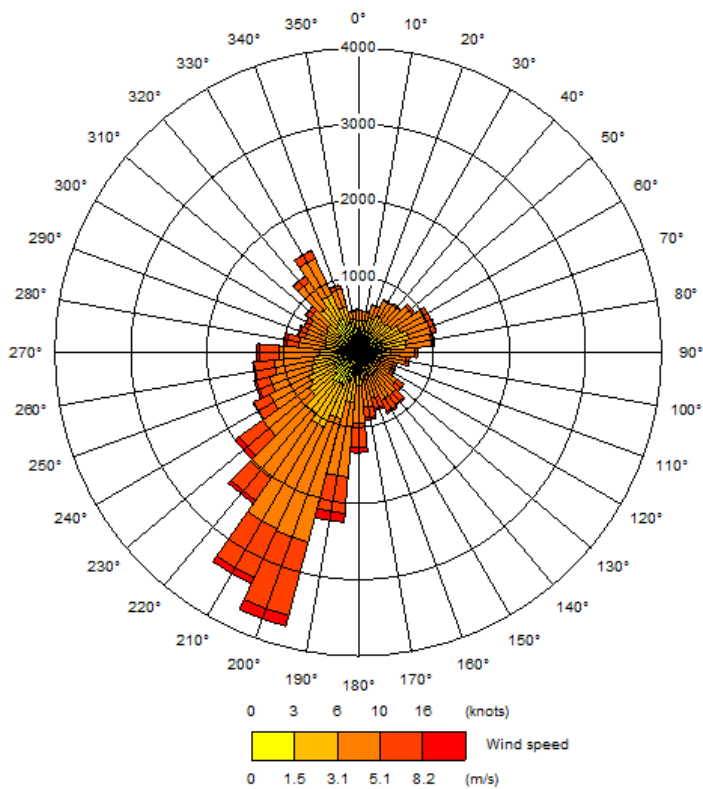
3) Site surroundings

Spenal STW is located in a predominantly rural area to the southeast of Studley. The nearest property (Spenall Hall Farm) is 100m southeast of the site boundary. A public footpath runs along the southern site boundary and the Arden Way long distance footpath runs to the east of the site. Land to the south and west of the works has recently been planted to form part of the Heart of England Forest.

Studley is northeast of Spenal STW. Studley St Mary's C of E Academy is 1 km northeast of the sewage treatment works.

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

Figure 2: Wind rose for Pershore meteorological station 2016 – 2020.



4) Process Overview

A sludge treatment process flow diagram is found in Appendix 1.

Under the Urban Wastewater Treatment Regulations, raw sewage from Studley and Redditch passes through 2 No. screens and 2 No. detritors. The inlet channel is open and the grit and screenings are held in open skips. Tankered domestic waste is also discharged into the inlet channel.

Sewage is settled in 6 No. primary tanks before being split between two secondary treatment streams. Part of the flow is treated in 3 No. diffused air ASP lanes and 3 No. final settlement tanks. The remaining settled sewage is treated on 6 No. biofilters followed by 4 No. final tanks. Effluent from the two secondary treatment streams is combined and passes through a tertiary sand filter prior to being discharged into the River Arrow.

Under the installations environmental permit, primary and co-settled humus sludge is screened and then thickened in the 3no. batch thickening tanks. The batch thickeners are covered and connected to an odour control unit. Thickened primary sludge is then passed to the pre-digestion blending tank. This is also covered and connected to odour control.

Indigenous SAS is held in 1 No. buffer tank prior to being thickened using 2 No. belt thickeners. Polymer is added to aid the thickening process. Thickened SAS is then stored in the consolidation tanks prior to being combined with other raw sludge in the pre-digestion blending tank.

Imported raw sludge is screened and combined with the indigenous sludge in the pre-digestion blending tank. Blended sludge is passed to 4 No. mesophilic primary anaerobic digesters. Sludge is held in the primary digesters for the required time as stated in the HACCP plan. Biogas is collected from the digesters, stored in 1 No. gas holder and utilised in 1 No. CHP engine.

The primary digesters operate on a continual basis with incoming sludge added to the process as digested sludge is removed. Following digestion, digested sludge is transferred to one of the four above ground, open topped, concrete construction pathogen kill tanks (path kill tanks) at the site.

Sludge is transferred and mixed with a polymer coagulant and dewatered using one of two centrifuges. The supernatant liquor is transferred to the centrate tank, prior to being returned to the head of the STW for aerobic treatment via the UWWTD treatment route.

Digested cake is held on the cake pad bays before being recycled to agricultural land.

Spernal STW is also the home of a test bed facility. This does/ does not form part of this odour management plan and is for sewage treatment processes only.

The location of these assets on site is shown in figure 3.

Figure 3: Spernal STW and STC



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

Spenal STW served a population equivalent of 80,291 in 2020/21. The digestion plant has capacity to treat 6,795 tds/annum.

The site currently accepts interworks sludges under a T21 exemption (up to 100,000 tonnes per annum), and this will be replaced by the IED permit in 2024.

7) Waste material accepted

Spenal currently does not accept any tankered trade wastes into the sewage treatment works or the sludge treatment route. Tankered domestic waste is accepted into the sewage treatment route. Raw sewage sludge is accepted under a T21 waste exemption.

The full list of EWC wastes that we are permitted to accept at the site can be found in Schedule 2 of the permit. This permit is available to site staff.

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. Tankers can be unloaded using gravity only (no pressure discharge) to reduce potential odour egress.

Exiting cake vehicles are cleaned using the wheel wash before leaving site. 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.

Waste imported for dewatering and storage only

Spernal does not generally receive imports of digested sludge though it does have the facility to do so.

8) Permitted Area

The area covered by the permit is shown in figure 4.

Figure 4: Permitted Area -



Table 1: Air Emission Points

Emission point reference and location	Source	Parameter	Quantity	Unit
A1 SP 08218 62629	CHP engine	NOx	500	mg/m ³
		SO ₂	107	mg/m ³
		CO	1400	mg/m ³
A2a SP 08227 62615	Auxiliary Boiler 1	No limits set	-	-
A2b SP 08227 62615	Auxiliary Boiler 2	No limits set	-	-
A2c SP 08227 62615	Auxiliary Boiler 3	No limits set	-	-
A3 SP 08139 62659	Emergency Flare	NOx	150	mg/m ³
		CO	50	mg/m ³
		Total VOCs	10	mg/m ³
A4	Primary digester PRVs	No limit set	-	-

Emission point reference and location	Source	Parameter	Quantity	Unit
SP 08170 62634				
A5 SP 08188 62640	Primary digester PRVs	No limit set	-	-
A6 SP 08204 62647	Primary digester PRVs	No limit set	-	-
A7 SP 08221 62653	Primary digester PRVs	No limit set	-	-
A8 SP 08160 62661	Gas holder PRV	No limit set	-	-
A9 SP 08253 62688	Odour Control Unit	No limit set	-	-
A10 SP 08246 62710	Odour Control Unit	No limit set	-	-
A11 SP 08278 62688	Odour Control Unit	No limit set	-	-

9) Available on site 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 1: Sernal site capacity details

Element	Capacity	Total Capacity
SAS buffer tank	1 x 188 m ³	188 m ³
Consolidation tanks	2 x 150 m ³	300 m ³
Batch thickeners	3 x 170 m ³	543 m ³
Pre-digestion blending tank	1 x 666 m ³	666 m ³
Primary digesters	4 x 2,700 m ³	10,800 m ³
Path kill tanks	4 x 4,462 m ³	17,848 m ³
Centrate tank	1 x 2,000 m ³	2,000 m ³
Cake pad	11,025 m ³ (assume sludge 1.5m high)	11,025 m ³

	Total	32,570m³
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10) 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.

11) 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. 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

Stage of treatment	Nature of source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Sewage treatment Inlet works	<ul style="list-style-type: none"> • 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 27,500 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 & is screened by trees. The screens are enclosed.
Sludge handling and treatment Raw sludge handling	<ul style="list-style-type: none"> • Raw sludge imports from satellite STWs. (EWC 190805) • Screenings from raw sludge imports 	Import well and sludge screen 1 x SAS buffer tank (188 m ³ total capacity) 3 x batch thickener tanks Sludge screen	Risk before mitigation - High. Risk after Mitigation - Low Risks (before mitigation) - raw sludge can have a high FIDOL score. Source mitigation - Import facility, pre-digestion blending and primary thickening are all enclosed and connected to odour control systems. Skips emptied regularly via contract with Biffa. Liquors are returned to the head of the works as soon as possible.

	<ul style="list-style-type: none"> • Liquors from the consolidation process • Primary and SAS thickening • Pre-digestion blending 	<p>(543 m³ total capacity)</p> <p>1 Pre-digestion blending tank (666m³ total capacity)</p>	<p>Pathway/receptor mitigation - Odour is minimised through process control. Imported, primary and pre-digestion blending tanks are covered.</p>
Sludge handling and treatment Digesters	<ul style="list-style-type: none"> • Blended raw sludges • Antifoam may be added. • Biogas is produced as part of the digestion process. 	<p>4 x mesophilic primary anaerobic digesters (10,800 m³ total capacity)</p> <p>Design manual minimum retention time is 12 days. Check HACCP plan on Waterpedia for the latest requirements.</p>	<p>Risk before mitigation - Low. Risk after Mitigation - Low</p> <p>Risks (before mitigation) - digestion takes place in enclosed tanks. Antifoam is not odorous.</p> <p>Source mitigation – Primary digesters are enclosed tanks. Pressure relief valves (PRVs) are a fail-safe mechanism to prevent an unsafe increase in pressure in the digesters and are designed to only activate in an emergency once all other failsafe routes have been utilised. They are inspected weekly by the operational teams and twice yearly by an external contractor. Our upstream processes ensure that sludges are processed in a timely manner and therefore releases from PRVs are unlikely to cause odour nuisance.</p> <p>Pathway/receptor mitigation - n/a odour controlled at source</p>
Sludge handling and treatment Pathogen kill tanks	Digested sludge from onsite digestion process	<p>4 x path kill tanks (17,848 m³ total capacity)</p> <p>Sludge is held in the tanks as specified in the HACCP plan. Check HACCP plan on Waterpedia for the latest requirements.</p>	<p>Risk before mitigation - Low. Risk after Mitigation - Low</p> <p>Risks (before mitigation) - digested sludge has a low FIDOL score</p> <p>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 path kill tanks for the time required by the site HACCP plan.</p> <p>Pathway/receptor mitigation - n/a odour controlled at source</p>
Sludge handling and treatment Digested sludge dewatering	<ul style="list-style-type: none"> • Digested sludge from onsite digestion process. • Polymer is added to aid the dewatering process. • Dewatering liquors are produced. 	<p>2 x centrifuges</p> <p>Maximum 1 day retention time - time is required to even out the ammonia load to the sewage treatment process.</p>	<p>Risk before mitigation - Moderate. Risk after Mitigation - Low</p> <p>Risks (before mitigation) - digested sludge has a low FIDOL score. Polymer is odourless. Liquors may have a moderate FIDOL score.</p> <p>Source mitigation - The centrifuge is an enclosed unit. Odour from liquors is minimised through process control - they are returned to the head of the works as soon as possible after production.</p> <p>Pathway/receptor mitigation - n/a odour controlled at source</p>

Sludge handling and treatment Cake pads	Dewatered cake from the onsite digestion process	4 x cake bays (11,025 m ³ total capacity if cake is stacked to 1.5m) The intention is to ensure that cake is not stored on the pad for >12 months	Risk before mitigation - Low. Risk after Mitigation - Low Risks (before mitigation) - digested sludge has a low FIDOL score Source mitigation - Digested cake forms a firm crust after 1 - 2 days, which is essential to ensuring that odours are minimised. Once compliance tests are passed it can be moved offsite to farmers fields for storage Pathway/receptor mitigation - cake is not moved on windy days.
Biogas utilisation CHP engine	Engine emission stacks	1 x 836 kW CHP	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 Sernal sludge route:

Table 2: Sernal Odour Abatement Systems

Parameter	Pre-digestion sludge blending tank	Batch thickeners	Imported raw sludge reception tank, transfer pumping station & screens
OCU Type	2 x biofilters in parallel c/w prefilter	2 x biofilters in parallel	2 x moderators in parallel followed by GRP 3000 Peacemaker
System details	Fully enclosed system, vents to atmosphere via a single exhaust point	Fully enclosed system, vents to atmosphere via a single exhaust point	Fully enclosed system, vents to atmosphere via a single exhaust point
Media type			<u>1st Stage:</u> Catalytic iron filter <u>2nd Stage:</u> Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media.
Media Quantity			2,800 kg
Media Life (Years)			<u>First Stage</u> C.I.F. 25 years <u>Second Stage</u> Media pro-actively replaced every 5 years. ME30 specifies design life of 5 year minimum
Design Inlet Parameters			
Airflow (m ³ /hr)	765	607	690
Hydrogen Sulphide	Average 42ppm, Peak 200mg/m ³ (original design)	Average 36ppm, Peak 200mg/m ³ (original design)	Average 1.5ppm, Peak 200mg/m ³ (design manual)
Stack Outlet Performance			
Odour Conc. (OU _E /m ³)	95% reduction (design manual & ME30)	95% reduction (design manual & ME30)	95% reduction (design manual & ME30)
Hydrogen Sulphide	99% reduction (design manual & ME30)	99% reduction (design manual & ME30)	99% reduction (design manual & ME30)

Performance checks for the odour control unit are described in section 14) monitoring plan and Appendix 3.

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

CIF/ Peacemakers

The CIF/ Peacemaker system is manufactured by Air-Water Treatments Ltd (AWT). They are fully enclosed units with an exhaust point.

The CIF (catalytic iron filter) is a pre-treatment unit that contains iron media. Peacemakers are a form of dry chemical scrubber that consists of two stages. The first stage consists of pellets impregnated with stabilised chlorine dioxide which oxidise hydrogen sulphide, mercaptans and other odorous compounds. The second polishing stage serves to remove ammonia and other compounds not oxidised by chlorine dioxide. A diagram of the Peacemaker unit is found in Appendix 2.

Biofilters

The biofilter contains a peat media that supports biomass for odour removal. The media is kept moist using an irrigation system. A diagram of the biofilter is found in Appendix 2.

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)

Site operators carry out regular checks on the odour abatement equipment (see appendix 3 for details). Abatement equipment media is pro-actively replaced on a 5 yearly basis.

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 monitoring methods that we use are as follows:

- All Tanker trade waste is booked into the site (if applicable) 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 is replaced every five years. This programme and simple operator checks to indicate the condition of the asset ensure that our odour abatement equipment continues to be fit for purpose.
- We measure the performance of 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 3 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 5 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 HCl are not present in the waste gas stream. If H₂S, NH₃, TVOC or HCl 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) Incident/ emergency control measures

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	<ul style="list-style-type: none"> • Site procedures for pre-acceptance assessment of waste & quarantine/ rejection of nonconforming loads. • Loads are dealt with 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 lab analysis/sampling. Then, sampling of each load before allowing discharge at site. • Delivery in contained vehicles. • Scheduling of waste to allow immediate processing. 	Site staff reject odorous loads. Tanker drivers clear up any spills promptly
Removal of sludge cake from site under normal conditions	Odour assessment of cake	Low	<ul style="list-style-type: none"> • Use competent haulage contractors • Collection in sheeted vehicles. • Minimise agitation of cake during loading. 	Consider weather conditions when moving cake.
Damage to tank roofs causing release of odorous gases	Digesters and gas holders are alarmed to indicate loss of pressure	Medium	<ul style="list-style-type: none"> • Digesters & gas holders are alarmed to indicate loss of pressure. • Digester roofs are routinely inspected & maintained in line with Gas Holder Regs. 	Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget.

Damage to fabrication of sludge building	Visual inspections	Medium	Regular visual inspections of the sludge building fabrication	Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget.
Digester pressure valves (PRVs) activate & biogas is released.	Digesters are alarmed to indicate pressure	Medium	<ul style="list-style-type: none"> Digesters are alarmed to indicate pressure Control digester feeds and volumes to maintain safe biogas level 	Site manager investigates the cause of gas release.
Valves, pipes or pumps damaged or malfunctioning	Routine site checks Detected by site staff	Low	<ul style="list-style-type: none"> Regular site checks carried out. Design includes selection of correct pipework for pressure and flow loads. 	Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget. Site staff ensure that any spills are cleaned promptly.
Odour abatement equipment damaged or malfunctioning	Detected by site staff	Medium	<ul style="list-style-type: none"> Regular checks carried out by site staff (Appendix 3). Media pro-actively replaced. 	Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget. Site staff carry out checks to ensure that the odour control unit is working correctly once repairs are carried out.
Processing equipment damaged or malfunctioning	Regular checks. Detected by site staff	Medium	Regular checks carried out by site staff	Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site 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	<ul style="list-style-type: none"> • Staff training and supervision. • Visitor inductions. 	Site staff clean any spills promptly. Near misses are reported on Safety Net.
Malfunction or damage caused by unauthorised visitors	Regular checks Detected by site staff	Medium	<ul style="list-style-type: none"> • Security measures are in place including controlled access gates operated in accordance with our closed gate policy. • Sites have perimeter fences & CCTV. 	Report issues on Safety Net
Fire and/or explosion	Detected by systems Detected by site staff	Medium	<ul style="list-style-type: none"> • Staff training and supervision. • DSEAR zones identified on map & on site. • Fire extinguishers accessible & checked regularly. • Established contact with local Fire Service who have undertaken a site specific assessment. 	Site manager reports issues on Safety Net & investigates causes. Site staff clean any spills promptly and carry out checks on affected equipment.
CHP gas engine emissions	Odour detected by site staff.	Low	<ul style="list-style-type: none"> • Scheduled stack emissions testing in accordance with requirements set out in the Environmental Permit. • CHPs serviced by STW trained technicians as per manufactures recommendations & 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 emissions 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	<ul style="list-style-type: none"> Regular checks carried out by site staff who complete the Site Standards Records check list (found on Sharepoint) Spill training is undertaken by Wholesale Ops and spill kits/hoses are readily available 	Site staff ensure spills are cleaned up promptly.
Flooding from river/ blocked drains results in sludge spills	Detected by site staff.	Low	<ul style="list-style-type: none"> The general site has wider works designed to minimise risk of localised works flooding due to storm surges. Site wide drainage system linked to main sewage works, which includes additional capacity in storm tanks within the works to manage additional flows 	Site staff follow the site incident response plan & inform relevant authorities Clean up any sludge spills as soon as possible to minimise odour nuisance.
Staff absence	Detected by planning/ site staff.	Low	<ul style="list-style-type: none"> Staff from other sites will cover the work of the absent staff 	Ensure site log is up to date so that returning member of staff knows what is going on.

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 14. 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 11 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.

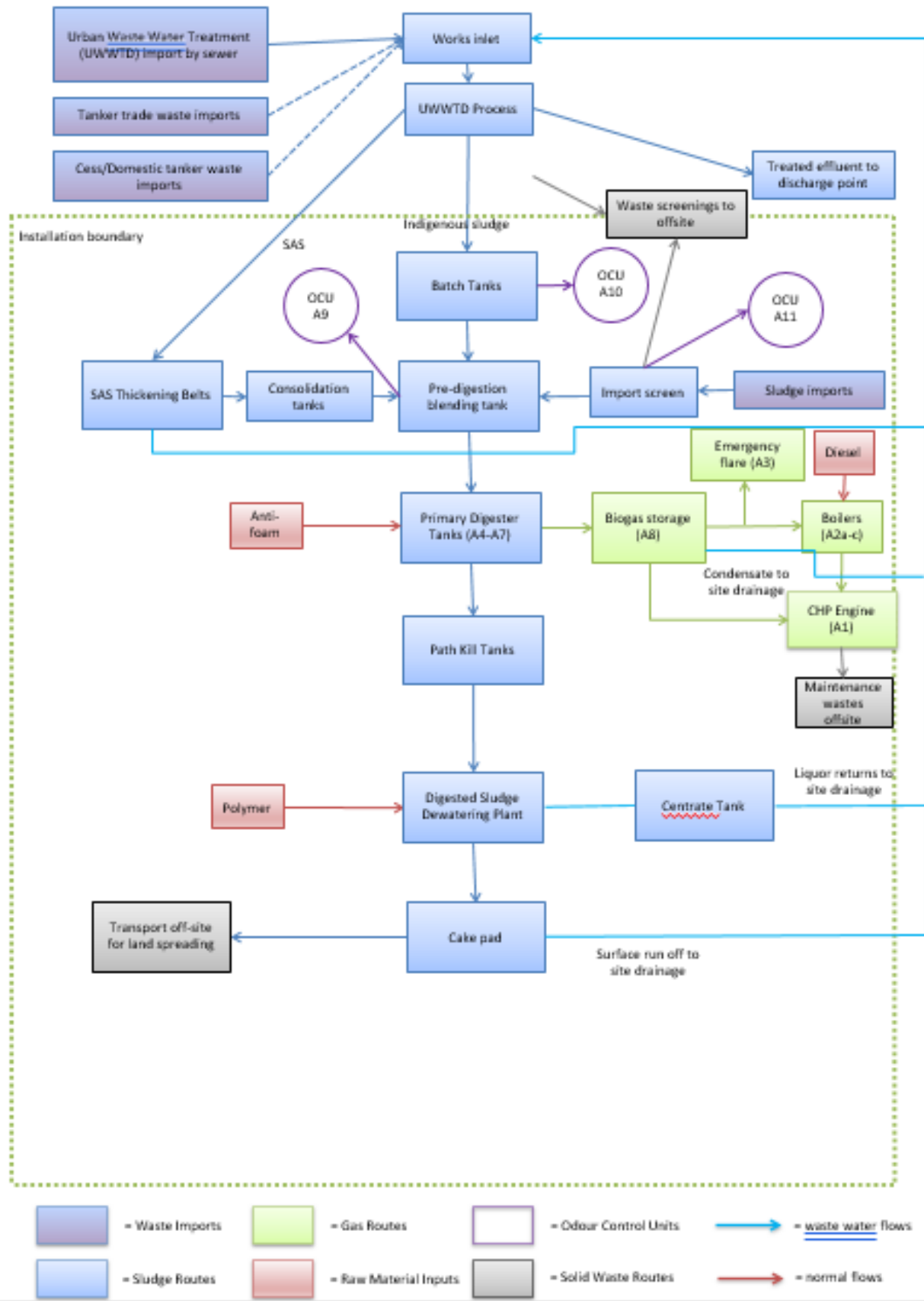
The EMS management review team review the MI (Management Information) data, which will include odour complaints.

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.

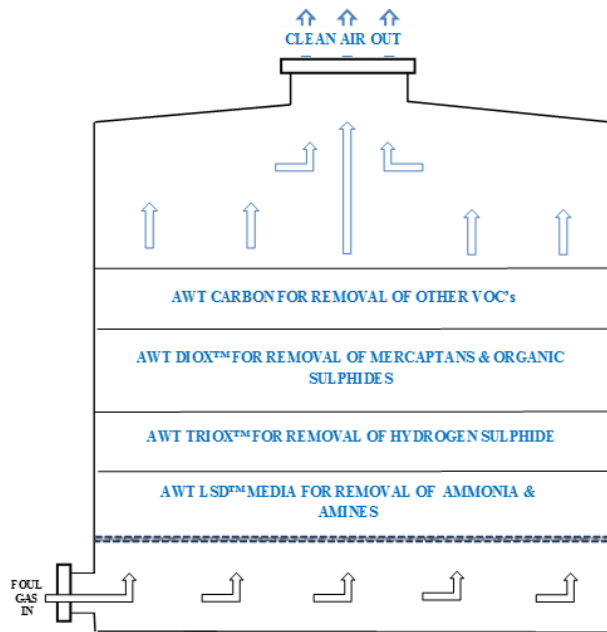
Engagement with the Environment Agency for process issues, pollutions that could cause odours or validated odour complaints would be through either a Schedule 5, or a phone call to the Local Environment Officer as per the contacts section (Appendix 6).

Appendix 1 - Sernal Sludge Process Flow Diagram

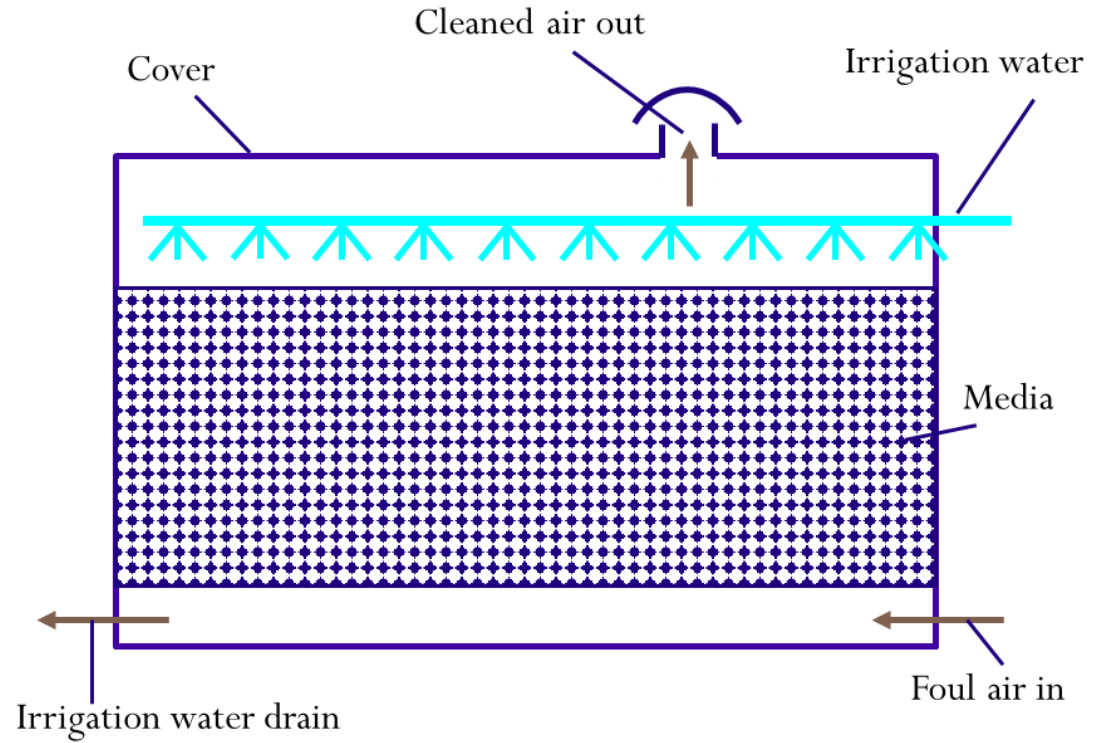


Appendix 2: Odour Abatement Systems

Peacemaker



Biofilter



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 ₂ S)	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: <ul style="list-style-type: none"> 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	<i>Odour Customer Complaints On-site (Waste)</i>
Why	<i>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.</i>
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

- | | |
|--|---|
| <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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 liaise 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 occurred 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 occurred 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

<i>Version 1</i>	<i>Date</i>	<i>Notes</i>
	<i>04/05/2017</i>	<i>First issue</i>
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: Sernal Site Contact Details

Area of Site	Company Responsible	Contact Name	Phone Number
Sludge Screening Rag Skips		REDACTED	
Odour Control Units			
CHP Units			
Trade / Domestic Waste			
Biosolids / Cakepad			
Permit Compliance			
Bioresources Operations			
Production Operations			
Redditch Borough Council			
Environment Agency			