Minworth Sludge Treatment Centre

Odour Management Plan

Revision	Purpose/Description	Originated	Checked	Reviewed	Authorised	Date
1	Final	Kay Daily	Liz Cherry	Jo Chapman	Jon Wroe	04/10/2019
2	Final – revisions to contacts	Kay Daily	Liz Cherry	Jo Chapman	Jon Wroe	22/05/2020
3	Review	J Chapman	A Easton	J Hall	S Whitehouse	30/07/2024

Contents

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 'Appropriate Measures for the biological waste treatment' requires for activities which are likely to give raise to odour problems, such as anaerobic digestion, an operator shall have and maintain an odour management plan (OMP).

Therefore, this document will be submitted as part of the environmental permit compliance for the Sludge Process at Minworth 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 scope of the OMP is the plant and equipment regulated under Environmental Permit EPR/BP3631SW/V013. It does not include the wider sewage treatment works or any other permitted activities not listed in this Permit. The UWWTR and sludge processes are intricately linked and so some reference to out of scope are made in order to provide a more complete picture of management practices on sites. The majority of wastes are received at Minworth via the wastewater network of pipes and are regulated under the Urban Waste Water Treatment E&W Regulations, and so do not form part of this Odour Management Plan.

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 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 sludge treatment process
- Significant development in the local area

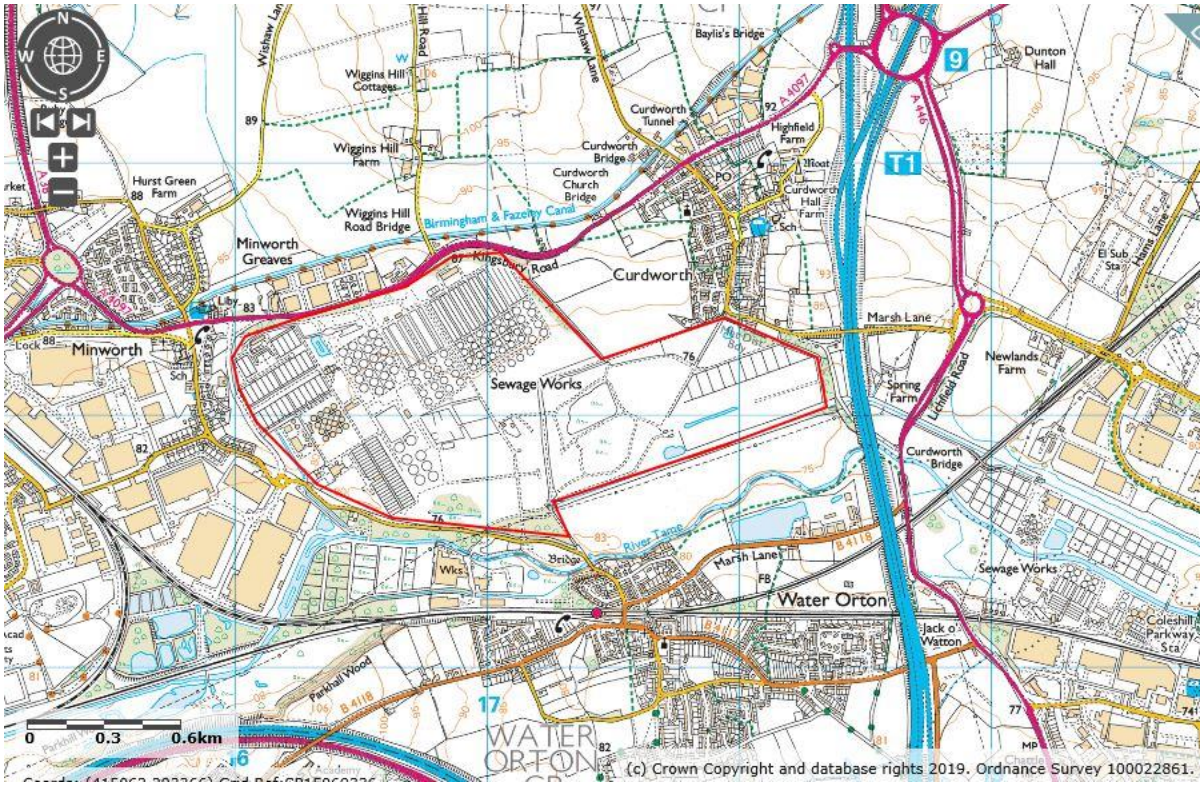
2) Site Overview

Minworth Sewage Treatment Works is located approximately 1km to the north of Water Orton, on the north east edge of Birmingham City. The approximate site centre is at National Grid Reference (NGR) SP 1631 9195.

Minworth STW treats a population equivalent of 1.7 million and imports sludge from neighbouring works such that the sludge load equates to a population equivalent of around 2.3 million. This equates to approximately 25% of all the biosolids produced in the Severn Trent Water region. The current discharge permit levels (on a 95%ile basis) are 20mg/l BOD, 25mg/l SS, 3mg/l ammonia and 1mg/l Phosphorus where the final effluent is discharged to the River Tame.

Figure 1: Site location plan

Figure 2: Minworth Site Boundary



3) Site surrounding

The STW site is bounded to the north by the A4097 Kingsbury Road and Kingsbury Business Park. To the north west lies Minworth village which includes an Infant and Junior School and St George's Church within 500 metres of the permit boundary.

To the west of site is Minworth Parkway, leading to Midpoint Park (Commercial Park) and running alongside the railway line (Water Orton Junction West). This railway curves around the southern boundary of the site before arriving in the village of Water Orton to the south.

To the east sits Curdworth (residential area including Primary school and Church). Further east from Curdworth are the M42 and M6 Toll.

Along the southern boundary is the outfall channel for treated water from Minworth STW, which flows into the River Tame. A public footpath is adjacent to the River.

Sensitive receptors:

- Minworth Infants and Junior School (500 metres to the north east)
- Kingsbury Business Park (460 metres to the north)
- Midpoint Park (300 metres to the west)
- Water Orton railway Station (1.3 km to the south)

- Curdworth village (1.5 km to the east)
- Plantsbrook Reservoirs (Local Nature Reserve) 2 km north west of Minworth

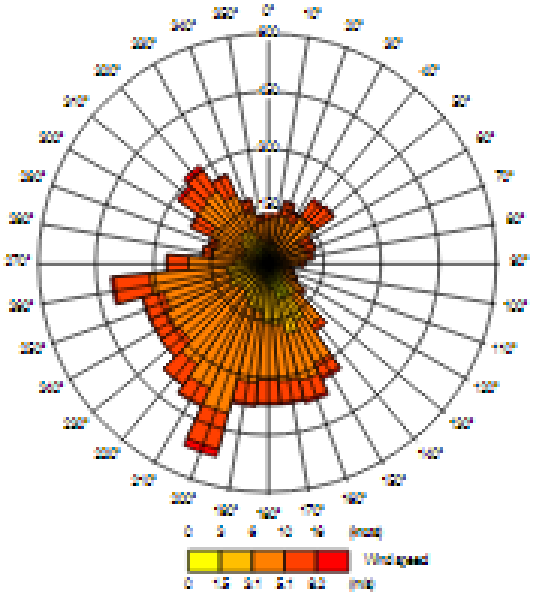
The nearest residential receptor (Mill House) is within 160 metres to the south west of the permit boundary. The next nearest residents are located 250 metres west of the boundary.

Commercial and agricultural odour sources in the area:

- Minworth landfill site
- Minworth UWWT
- Coleshill STW and FWAD plant

Historical prevailing wind data below from the Met Office shows the predominant direction is South, South-West. This windrose is for the nearest available site (Birmingham Airport) and was used in our dispersion modelling. This data has been collected from January to December 2020 and is seen to be representative of the wind direction for the location.

Figure 3: Birmingham Airport Wind Rose



Approximate location of met station at Birmingham Airport is E 417209 N 284115

4) Process Overview

Wastewater Treatment

The majority of wastes are received at Minworth via the wastewater network of pipes and are regulated under the Urban Waste Water Treatment E&W Regulations, and so do not form part of this Odour Management Plan.

Tankered imports to Head of Works

Minworth services a number of trade waste and domestic waste customers that are not able to discharge directly into the sewer network by importing Tankered Trade Waste and Tankered Domestic Waste to Minworth STW head of works (the sewage works inlet). All tankers discharge through a logger which records various details. The majority of the tankered discharge then goes directly into the Urban Wastewater flow, but buffer tanks are also available for strong wastes that need a controlled disposal into the Urban Wastewater flow. Hazardous waste codes are currently on the permit EWC list, but Severn Trent no longer receives hazardous tankered wastes.

The permit is due for variation and a bespoke pre-application request has been submitted.

Sludge Treatment

Process flow diagram can be found in Appendix 1.

Sludge is produced throughout the sewage treatment process at Minworth STW from primary sludge settlement and surplus activated sludge (SAS). Primary sludge from the primary settlement tanks is pumped into the three balancing tanks, these tanks are covered and have a peacemaker odour control unit. In addition there is a deep well for emergency use adjacent to here which also has a peacemaker module system.

A proportion of indigenous primary sludge is initially passed through the THP route. THP sludge is passed through three enclosed pressure sludge screens and then four thickening belts. The sludge thickening belts are enclosed and air is extracted from these enclosures, as well as from extraction points within the thickening building, to a dedicated Terminodour odour control unit.

Thickened sludge is held in a reception/blending tank prior to digestion in conventional digesters (A block). Digested sludge is then passed to the pre-raw-dewatering buffer tanks and onto the THP. Biogas from the conventional digesters is collected and stored in gas holders.

The remaining indigenous primary sludge is passed through three enclosed pressure sludge screens prior to transfer to two reception/ blending tanks. These tanks are covered and connected to a peacemaker odour control unit.

Indigenous SAS passes via an open balancing tank to ten SAS belt thickeners prior to transfer to the reception/ blending tanks. The SAS belts are enclosed in a building.

Imported liquid sludge is screened prior to discharge into the reception tanks, raw sludge passes through a CDE screen which has a peacemaker odour control unit and imported SAS passed through a Huber screen which also has a peacemaker unit.

Blended sludge is transferred into two dewatering buffer tanks (these are enclosed and vented to odour control) then to four dewatering centrifuges (which are enclosed and could be vented to odour control if required) and finally to the three THP feed silos (which are enclosed and vented to odour control). Malodorous air is extracted from these locations on

site, the THP Feed Silos, Cake Import Bunker and Dewatering Buffer Tanks and fed to the two stage biofilter and carbon filter. The vessel comprises of a single packed bed containing bio-inert pumice media containing odour neutralising bacteria. The air flow passes upwards through the bed and then exits vertically through the outlet. The partially cleaned air is then drawn through the duty/standby fans and sent through the carbon filter. Centrate from the raw dewatering centrifuges is fed to the head of works.

Sludge cake is imported via a cake bin (covered and odour controlled as discussed above) into the THP feed silos. The incoming cake wagons are also covered.

Mixed sludge is transferred from the THP feed silos to the three THP streams each with four reactors. A UV treatment plant is used to treat final effluent for use with the post THP sludge. After reaction, the sludge is fed through the six THP heat exchangers (one for each pair of primary digesters) and the sixteen primary digesters in blocks B, C and D.
Biogas is collect from the digesters and held in 2 biogas holders with 8000m^3 total capacity. Biogas is utilised in either:

- Biogas to grid
- 7 x CHPs
- 3 x Steam Boilers

After digestion, the sludge is transferred to the fourteen post digestion tanks, then to ten Klampress dewatering belts, located in an enclosed dewatering building which is served by wall mounted ventilation fans. Some digested sludge is dewatered in a temporary centrifuge. Centrate from here goes to an additional post digestion tank before going back to head of work.

Once dewatered, the sludge cake is transferred to the existing cake pad and then off site for land spreading in agriculture or to alternative outlets.

Digested sludge liquors from the Klampress dewatering belts are treated in Anammox reactor (2 of), prior to being returned to the head of the works.

5) Hours of operation

Waste is processed through the plant 24 hours a day through a computer controlled process. There are no restrictions on the delivery of tankered waste to the site, it is however anticipated that waste would be delivered between the following working hours to minimise odours. Any tankers received out of hours would be for emergency tankering only.

07:00 to 18:00 Monday to Friday;
07:00 to 16:30 Saturdays; and by exception;
08:00 to 16:30 Sundays and Bank Holidays as required.

6) Tonnages

The average daily throughput is 1200 tDS (tonnes dry solids) taking account of the THP and digesters currently online. The sewage works treats sludge from a population equivalent of 2.3 million made up of indigenous sludge plus imported sludge.

The site is covered by 2 x Waste/Installation permits:

EPR/UP3392FB - permitted to accept 714,440 tonnes of non-hazardous and hazardous waste annually of tankered waste to the head of the wastewater treatment works (excludes sewage sludges imported under CWR exclusion).

EPR/ BP3631SW - permitted to accept 23,264,987 wet tonnes of non-hazardous waste to the THP/digestion facilities, and 10,000 wet tonnes of digestate for dewatering and storage.

The types of waste accepted for each are specified in Schedule 2 of the environmental permit.

7) Waste material accepted

Severn Trent Water accept tankered trade and domestic wastes into the head of the works. Raw sewage sludges (liquid and cake) are accepted into the AD treatment route. Raw cake may also be accepted in sealed skips on a dedicated separate cake pad within the site prior to treatment through the THP/AD route.

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

Trade Waste Rejection Procedure

Any Non-Conforming Tankered loads will be dealt with appropriately as per Standard Operating 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 the latest **SOP03 TTW Nonconformance Procedure** can be found locally on Sharepoint.

Waste imported for dewatering and storage only

Occasionally digested sludges are imported from other Severn Trent STFs for dewatering/ storage. All our sludge is treated in accordance with the site HACCP plan & is tested on a regular basis (periodicity as per the site HACCP plan). Once at the reception site, imported digested sludge is discharged into storage tanks which feed the de-watering process & treated in the same way as indigenous sludge – our centrifuges are enclosed units & cake is stored on the pad in specific numbered bays and recorded on the site stock sheet. Cake movement on the pad is minimised to reduce odour.

If the imported cake does not meet the requirements for recycling, it will be quarantined on site for further sampling & investigation. Additional treatment may be required or disposal via other non-agricultural routes. Additional treatment may include mixing with lime. If this is required, odour management will be included as part of the RAMS (Risk Assessment / Method Statement) of the relevant contractor.

The “oldest” cake on site will generally be recycled first but this could be impacted by operational requirements or customer preference. For example, treated cake could be delivered directly from under the chute in preference to cake stored in bays which reduces cake movement on site providing operational benefits and reduced carbon emissions.

8. Delivery Vehicles

Liquid wastes will be transferred to and from the site in sealed tankers. Solid waste will be imported and 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.

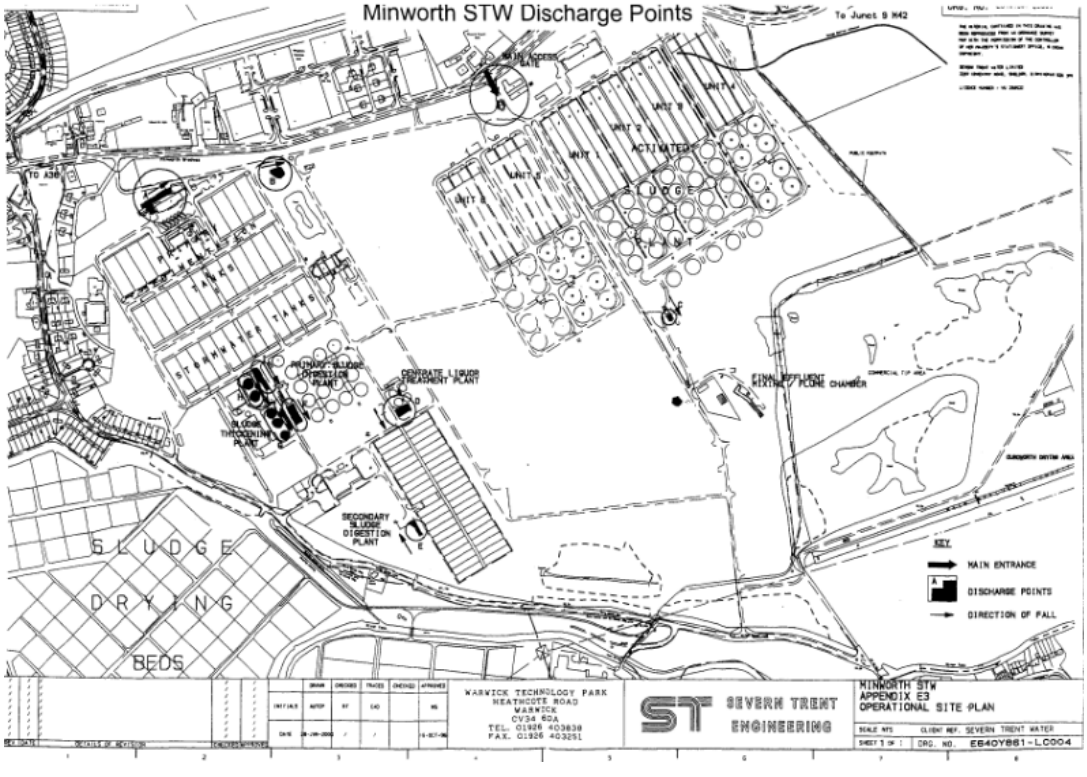
Cake imports to the THP are undertaken in sealed tankers or skips and either discharged directly to the blending tanks for the THP, or stored in sealed skips on the raw cake pad pending availability of capacity in the THP.

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.

9. Permitted Area

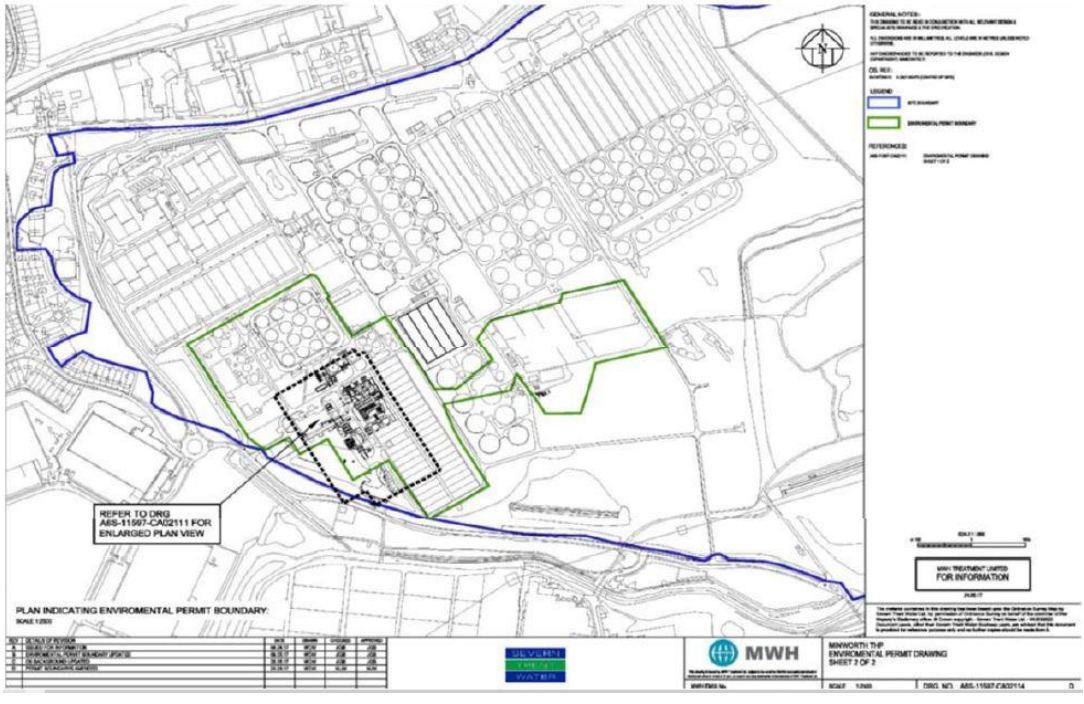
EPR/UP3392FB - The head of the treatment works permit:

Figure 4: Imports Permitted Area



EPR/ BP3631SW – The digestion facilities permit:

Figure 5: Sludge Permitted Area



Minworth's full site boundary lies within the blue periphery, but the permitted area is contained by the green boundary.

There is an adjacent permitted area for Minworth Landfill, covered by permit BV4541IR, which is outside the scope of this odour management plan.

The emission points covered by permit EPR/ BP3631SW are detailed in Schedule 3 of that permit, and summarised in the table below.

Table 1: Air Emissions Points

Emission Point	Source	Location	Components	Odour Risk
A6	CHP 8	SP 16438 91827	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A7	CHP7	SP 16434 91831	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A9	DUEL FUEL BOILER NATURAL GAS BOILER	SP 16431 91799	Products from oil/ biogas combustion	Low - Boiler is regularly serviced.

A13	AIR VIRTUAL STACK	SP 16458 91777		
A14A	MULTIFLUE STACK JENBACHER ENGINES CHP10	SP 16482 91753	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A14B	MULTIFLUE STACK JENBACHER ENGINES CHP11	SP 16482 91753	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A14C	MULTIFLUE STACK JENBACHER ENGINES CHP12	SP 16482 91753	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A14D	MULTIFLUE STACK JENBACHER ENGINE 13	SP 16482 91753	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A14E	MULTIFLUE STACK JENBACHER ENGINE 14	SP 16482 91753	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A14F	MULTIFLUE STACK COMPOSITE BOILERS	SP 16482 91753	Products from oil/ biogas combustion	Low - Boiler is regularly serviced.
A14G	MULTIFLUE STACK COMPOSITE BOILERS	SP 16482 91753	Products from oil/ biogas combustion	Low - Boiler is regularly serviced.
A14H	MULTIFLUE STACK COMPOSITE BOILERS	SP 16482 91753	Products from oil/ biogas combustion	Low - Boiler is regularly serviced.
A15	FIRST UNIT OF TWIN BIOGAS FLARE	SP 16422 91880	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.
A16	SECOND UNIT OF TWIN BIOGAS FLARE	SP 16415 91890	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.

A17	PPTEK SILOXANE FILTER EXHAUST STACK	SP 16506 91720	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
A20	SLUDGE RECEPTION WELL OCU	SP 16251 91996	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
A21	BALANCE TANK 1 OCU	SP 16248 92000	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
A22	BALANCE TANK 2 OCU	SP 16247 91995	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
A23	BALANCE TANK 3 OCU	SP 16246 91995	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
A24	SLUDGE THICKENING CENTRIFUGE OCU	SP 16200 91964	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
A25	NO 2 SLUDGE FACILITY OCU	SP 16306 91899	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

A26	IMPORTED TANK SLUDGE FACILITY	SP 16290 91920	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
A27	RECEPTION TANKS 1,2,3 OCU	SP 16268 91897	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
A28	TANKER TRADE FOOD WELL AND TANKS OCU	SP 16328 91904	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
A29	ACETIC ACID OCU	SP 16325 91919	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
A30	IMPORTED SLUDGE THICKENING BUILDING OCU	SP16279 91834	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
A31-A46	PRESSURE RELEASE VALVES LOCATED ON THE ROOF OF EACH DIGESTER	SP 16394 92042 SP 16366 92030 SP 16341 92013 SP 16317 91996 SP 16410 92016 SP 16381 92001 SP 16357 91986 SP 16329 91970 SP 16426 91993 SP 16398 91977 SP 16377 91961 SP 16346 91945 SP 16442 91965 SP 16414 91947 SP 16391 91934 SP 16363 91918	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.

A49-64	DIGESTER VENT TUBES	SP 16395 92042 SP 16367 92030 SP 16342 92013 SP 16318 91996 SP 16411 92016 SP 16382 92001 SP 16356 91986 SP 16328 91970 SP 16425 91993 SP 16397 91977 SP 16378 91961 SP 16345 91945 SP 16442 91964 SP 16414 91946 SP 16391 91933 SP 16363 91917	Biogas (mixture of methane & carbon dioxide)	Low – Vent tubes are subject to monitoring via site systems and visual checks by site personnel.
A65	BIOFILTER EXHAUST STACK	SP 16335 91805	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
A66	FLARE	SP 16300 91792	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.
A67-68	ACTIVATED CARBON FILTER PURGE VENTS	A67 SP 16420 91862 A68 SP 16327 91799	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
A69-72	GAS COMPRESSORS	A69-70 SP 16316 91775 A71-72 SP 16346 91825	Raw sludge odours e.g. H_2S	Low - the gas compressor units are subject to regular preventative maintenance. Media is replaced in line with the manufacturers' recommendations
A73	ODOUR CONTROL PLANT EMISSION STACK	SP 16512 91777	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
A74	PRESSURE RELEASE VALVE FOR EXISTING BIOGAS HOLDER	SP 16446 91901	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.
A75	PRESSURE RELEASE VALVE FOR EXISTING BIOGAS HOLDER	SP 16480 91923	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.
A76	BIOGAS UPGRADE PLANT EXHAUST FOR ODOUR CONTROL SYSTEM	SP 16390 91854	Products from biogas combustion	Low - Plant is regularly maintained and appropriately sized to manage volumes of gas
A77	BIOGAS UPGRADE PLANT EXHAUST STACK	SP 16382 91845	Products from biogas combustion	Low - Plant is regularly maintained and appropriately sized to manage volumes of gas
A78	H2S carbon filters	SP 16382 91862	Products from biogas combustion	Low - Plant is regularly maintained and appropriately sized to manage volumes of gas
A79	Pressure swing absorbers	SP 16378 91848	Products from biogas combustion	Low - Plant is regularly maintained and appropriately sized to manage volumes of gas

10. 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 2: Minworth site capacity details

Element	Capacity	Total Capacity
Raw sludge balancing tanks (x3)	2 x 1,000m^3 1 x 250m^3	2,250m^3
SAS balancing tank	130m^3	130m^3
Reception/ blending tanks (x3)	760m^3 each	2,280m^3
Raw dewatering buffer tanks (x2)	1,375m^3 each	2,750m^3
Imported cake bin	30m^3	30m^3
THP feed silos (x3)	300m^3 each	900m^3
THP streams (x3)	Pulper Tank 18.73m^3 Flash Tank 18.73m^3 Each reactor 7.6m^3 (4 reactors per stream)	203.58 m^3
Digesters (x16)	Approx. 5,300m^3 each	84,800m^3
Gas Holders (x2)	4,000m^3 each	8,000m^3
Post digestion tanks (x14)	5,200m^3 each	72,800m^3
Anammox	Balance tank 700m^3 Pre aeration tank 785m^3 2 x pre clarifiers 235m^3 2 x reactors 1706m^3	5,367m^3
Digestate Cake Pad (x12 Bays) – no change as a result of accepting digestate from off-site sources.	28,500m^3 (total)	28,500m^3
	Total	**208,011m^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.

BAT Improvements

We are committed to covering tanks to limit odour further where required in line with BRef. Our plan is based on a 3-stage approach to covering and abating emissions from tanks.

- The first approach is for the most active tanks. We aim to cover, then harvest the additional gas from the covered tanks and recycle this into the existing CHP engines situated on site.
- For less active tanks, our second approach will be looking at options of covering tanks and then abating emissions via methane/carbon filters and/or OCU's, we are also looking at additional methane removal via new technology (for example Elovac system)
- Lastly, for the low level emissions, we are looking at clay ball style covers (similar to approaches listed in Appendix 9 Guidance on Slurry Lagoons).

In reality we will utilise an amalgamation of all 3 across the sites and are already carrying out some trials with contract partners to help us define the right options.

12. 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 assigned 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 waste water 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.

13. 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 3 - Incident/ emergency control measures.

Table 3: Inventory of Odorous Materials

Stage of treatment	Odour Source	Nature of odorous source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Sewage treatment inlet works	Inlet works	• Raw sewage (not part of the permit) • Imported tankered domestic waste & thin raw sludges. (EWC 200304) • Liquor returns from onsite thickening & dewatering processes.	Dry weather flow for the site is 450,000 m3/d Minimal retention time	**Risk before mitigation - Moderate. Risk after Mitigation - Low** **Risks (before mitigation)** - Localised odour as tankered trade an enter the inlet. These wastes are immediately mixed with crude se UWWT process. Liquor returns & imports have moderate FIDOL s are open. Where wastes are discharged to the covered buffer tank discharge to the inlet UWW flow normally takes no more than 4 da **Source mitigation** - Trade Waste technicians monitor the waste (rejection procedure). We do not accept odorous wastes (see acce Return liquors are processed as soon as possible after production extended to reduce splashing. **Pathway/receptor mitigation** - Inlet works is screened by trees
Pre-digestion sludge holding tanks Enclosed tanks	Sludge handling and treatment	• Raw sludge imports from satellite STWs. (EWC 190805) • Primary and SAS from onsite sewage treatment processes.	3 x primary sludge tanks 3 x reception/ blending tanks	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation)** - raw sludge can have a high FIDOL sc **Source mitigation** - Tank is covered and connected to a Peacem system. **Pathway/receptor mitigation** - n/a odour controlled at source
Primary sludge thickening building Ventilated building	Sludge handling and treatment	• Raw sludge imports from satellite STWs. (EWC 190805) • Primary and SAS from onsite sewage treatment processes.	4 x thickening belts	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation)** - raw sludge can have a high FIDOL sc **Source mitigation** - Belts are enclosed within a ventilated building a terminodour unit. **Pathway/receptor mitigation** - n/a odour controlled at source

Stage of treatment	Odour Source	Nature of odorous source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
SAS thickening building Ventilated building	Sludge handling and treatment	• SAS from onsite sewage treatment process. • Polymer is added to aid thickening. • Liquors are produced.	10 x SAS belts 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. poly **Source mitigation** - SAS is thickened as soon as possible after pr located inside a building. Air is extracted through HEPA filters. Lic of sewage treatment works as soon as possible. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge screens Enclosed screens	Sludge handling and treatment	• Raw sludge imports from satellite STWs. (EWC 190805) • Screenings from raw sludge imports • Liquors from the consolidation process	6 x indigenous primary sludge pressure screens 1 x CDE screen (imported raw) 1 x Huber screen (imported SAS)	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) -** raw sludge can have a high FIDOL sc **Source mitigation** - Screening units are enclosed. CDE and Hube to Peacemaker odour control units. Liquors are returned to the hea soon as possible. **Pathway/receptor mitigation** - n/a odour controlled at source
Imported and indigenous sludge screenings Open skips	Sludge handling and treatment	• Raw sludge imports from satellite STWs. (EWC 190805) • Screenings from raw sludge imports • Liquors from the consolidation process	1 x skip	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) -** raw sludge can have a high FIDOL sc **Source mitigation** - Skips emptied regularly via contract with Biffa to the head of the works as soon as possible. **Pathway/receptor mitigation** - n/a odour controlled at source
THP feed Enclosed tanks	Sludge handling and treatment	• Raw sludge and cake imports from satellite STWs. (EWC 190805)	2 x raw dewatering buffer tanks 1 x imported cake bin 3 x THP feed silos 4 x dewatering centrifuges	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation)** - raw sludge can have a high FIDOL sc **Source mitigation** – Tanks and silos are enclosed and connected carbon odour control unit. Centrifuges are enclosed and can be att control units if required. **Pathway/receptor mitigation** - n/a odour controlled at source
THP stream Enclosed vessels	Sludge handling and treatment		3 x process streams The site HACCP requires a minimum THP batch time (Check HACCP plan	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation)** - raw sludge can have a high FIDOL sc **Source mitigation** - Treatment units are enclosed. **Pathway/receptor mitigation** - n/a odour controlled at source

Stage of treatment	Odour Source	Nature of odorous source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
			on Waterpedia for the latest requirements).	
Anaerobic Digesters Enclosed tanks with Pressure Relief Valves (PRV's)	Sludge handling and treatment	• 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 digestion process.	16 x primary digesters Design manual minimum retention time is 12 days. The current site HACCP plan requires a minimum retention time (check on Waterpedia for the latest requirements)	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digestion takes place in enclosed tank odorous. **Source mitigation -** Digesters are enclosed tanks. PRVs are a fai prevent an unsafe increase in pressure in the digesters and are de activate in an emergency once all other failsafe routes have been inspected weekly by the operational teams and twice yearly by an Our upstream processes ensure that sludges are processed in a ti therefore releases from PRVs are unlikely to cause odour nuisanc **Pathway/receptor mitigation** - n/a odour controlled at source
Digested sludge holding tanks Open tanks	Sludge handling and treatment	Digested sludge from onsite digestion process	14 x post digestion storage tanks Sludge is held in the tanks as specified in the HACCP plan (check HACCP plan on Waterpedia for the latest requirements).	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL sco **Source mitigation -** Odour is minimised through process control. operation to ensure that digested sludge has a low FIDOL score. S the digested sludge tanks for the time required by the site HACCP **Pathway/receptor mitigation** - n/a odour controlled at source
Digested sludge dewatering Ventilated building	Sludge handling and treatment	Digested sludge from onsite digestion process	10 x dewatering belts	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL sco **Source mitigation -** Odour is minimised through process control v building. We optimise digester operation to ensure that digested sl FIDOL score. **Pathway/receptor mitigation** - n/a odour controlled at source
Digested Centrate sump Open sump	Sludge handling and treatment	Centrate from onsite dewatering process		**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) – The reactor vessels have a low FID** **Source mitigation – Odour is minimised through process cont returned to the head of works for treatment as soon as possib** **Pathway/receptor mitigation - n/a odour controlled at source**

Stage of treatment	Odour Source	Nature of odorous source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Anammox liquor treatment plant Open tanks	Sludge handling and treatment	Centrates from onsite dewatering process	1 x balancing tank 1 x pre-aeration tank 2 x pre-clarifiers 2 x reactors	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) – The reactor vessels have a low FID** **Source mitigation – Odour is minimised through process con** **Pathway/receptor mitigation - n/a odour controlled at source**
Sludge cake storage pad Open pad	Sludge handling and treatment	Dewatered cake storage on open pad Deposition, vehicle loading and emptying	28,500 m3 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 sco **Source mitigation -** Digested cake forms a firm crust after 1 -2 da to ensuring that odours are minimised. Once compliance tests are moved offsite to farmers fields for storage. Cake is stored on site f 8 weeks. **Pathway/receptor mitigation** - Keep agitation of cake to a minim vehicles. Cake is not moved on windy days.
CHP engines	Biogas utilisation	Combustion of Biogas produced on site H2S Engine emissions stacks	8 x Jenbacher Combined Heat and Power Units	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmospher **Source mitigation -** Engines are specifically sized for the sites op the amount of excess gas produced. If there are problems with the tankered imports will cease until the CHPs are back online. This m production on site **Pathway/receptor mitigation** - n/a odour controlled at source
Biogas to grid plant Flare CHP Flare	Biogas utilisation	Combustion of biogas produced onsite. Enclosed flare	1 x flare stack 4 x flare stacks	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmospher **Source mitigation -** At times when the CHP engines are down, th ceased, and the storage within the digester roofs and gas holder is excess gas will be flared. **Pathway/receptor mitigation** - n/a odour controlled at source
Gas holders	Biogas utilisation	Biogas Enclosed tanks with emergency vent	2 x gas holders	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmospher **Source mitigation -** At times when the CHP engines are down, th ceased, and the storage within the digester roofs is maximised, the prior to excess gas being flared. **Pathway/receptor mitigation** - n/a odour controlled at source

14. Odour Abatement Systems

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

Element	Odour Abatement Equipment	Location
Raw sludge imports	2 x P8000 CIFs and 2 x P8000 Peacemakers	A25
Raw sludge balancing tanks	3 x Double GRP3000 Peacemakers on tanks and 1 x GRP 3000 Peacemaker on deep sludge well	A20-23
Raw primary sludge belt thickener	3 x P8000 CIF UNITS & 2 x P8000 Peacemakers Terminodour unit	A24
Reception/ blending tanks	3 x GRP3000 Peacemakers	A27
Imported sludge	2 x SINGLE GRP3000 Peacemaker	A26
Food waste imports (not in operation)	1 x GRP 3000 Peacemaker	A28
Acetic Acid	Not in use	A29
Imported sludge thickening building	P8000 Peacemakers Terminodour	A30
Gas to Grid plant	ERG Biofilter and carbon dry scrubber	A65
THP feed (raw dewatering buffer tanks, imported cake bin and THP feed silos)	Bio-trickling filter and carbon filter	A73
Biogas plant	ERG Biofilter and carbon dry scrubber	A76

There are also odour control units fitted on the wastewater treatment route. These are covered by the UWWD and so do not form part of this permit application.

Exact sizes for OCUs will be determined by the manufacturers depending on inlet data provided by Severn Trent. The Severn Trent design standard for odour abatement equipment (ME30) requires 95% total odour reduction and 99% hydrogen sulphide reduction. 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)

Peacemakers and CIFs

The Peacemakers and CIF units (catalytic iron filters) are manufactured by Air-Water Treatments Ltd (AWT). The CIFs are a roughing filter which sits upstream of the peacemaker unit.

Peacemakers are a form of dry chemical scrubbers. These are package units consisting 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.

Terminodour

The Terminodour unit is manufactured by CSO Group. This technology involves the production of negative and positive ions using a reactive plasma generator. Coronar discharge tubes are used to create an electronic field when an electronic current is passed through them. An alternating current is used to produce negative and positive ions in the same 5:4 ratio as found in the atmosphere but at concentrations up to 20 times greater. The polarised air is introduced into the foul air stream where organic odours are oxidised to simpler forms.

THP Feed Bio-trickling Filter

The raw dewatering buffer tanks, imported cake bin and THP feed silos are connected to an enclosed bio-trickling filter and an enclosed carbon filter for sulphur dioxide and odour removal. The bio-trickling filter contains a lava rock media that supports biomass for odour removal. Lava rock has the advantage that it is not consumed in the biological process. A carbon filter has been included as a polishing stage.

This odour abatement system could be extended to treat air from the dewatering centrifuges if required in the future.

ERG Biofilter and Carbon Dry Scrubber

The biogas and gas to grid plants are connected to ERG biofilters. The biofilters are filled with woodchip and enhanced using calcified seaweed. This media supports biomass for odour removal and is kept humid using a spray system. A carbon filter has been included as a polishing stage.

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)

Air-Water Treatments undertake annual health checks on the Biofilters and Peacemakers and report findings back to STW. A copy of the most recent report can be supplied on request.

15. Monitoring Plan

Monitoring is essential to our operational control. Appendix 4 Table A4 sets out the planned monitoring frequency. 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 H_2S (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 4, Table A4).
- 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 4, Table A4 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 3 Odour Risk assessment.
- ***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.***

We do not carry out regular/pro-active sniff testing on site via independent staff other than the onsite operational teams when they are attending and carrying out their daily tasks. Any smells that are reported by residents or operation staff on site are investigated by the operational team.

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.

16. Odour risk assessment

Table 4 Odour risk assessment

Cause of elevated odour	How the severity is measured	Likelihood (pre controls)	Control measures	Reactive Measures/ Actions
Delivery of waste under normal conditions and acceptance of wastes with a strong offensive odour	Inspection, sample and analysis of waste	Low	• 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.
Removal of sludge cake from site under normal conditions	Odour assessment of cake	Low	• Use competent haulage contractors • Collection in sheeted vehicles. Minimise agitation of cake during loading.	Consider weather conditions when moving cake. During adverse weather conditions, review operations and consider cessation of activity in the event of heavy rain, extreme storms or prolonged hot weather.
Damage to tank roofs causing release of odorous gases	Digesters and gas holders are alarmed to indicate loss of pressure	Medium	• 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	Visual inspection 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 activate	Digesters are alarmed to indicate pressure	Medium	• 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	• 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.
Biofilter damaged or malfunctioning	Detected by site staff	Medium	• Regular checks carried out by site staff (Appendix 4). • Annual checks undertaken by Air-Water Treatments to assess of biofilter including condition of medium	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.

Odour scrubber damaged or malfunctioning	Detected by site staff	Medium	• Regular checks carried out by site staff (Appendix 4). • Media pro-actively replaced. • Annual checks undertaken by Air-Water Treatments to assess of scrubber including condition of medium	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.
Sludge 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.	Use of back-up electricity supply.
Human error – staff, managers, visitors	Regular checks Detected by site staff	Medium	Staff training and supervision. Visitor inductions. Regular checks.	Site staff clean any spills promptly. Near misses are reported on SafetyNet.
Malfunction or damage caused by unauthorised visitors (vandalism)	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.	Issues are reported on SafetyNet. Review security measures to prevent recurrence.
Fire and/or explosion results in sludge spill / odour release	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.	Site manager reports issues on SafetyNet & 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	• 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	• 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	• 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 team/site staff.	Low	• 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.

17. 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 15. The results of their investigations can be recorded on the report form in Appendix 5.
- 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 17 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 6 for a full version of the Complaints Response SOP.

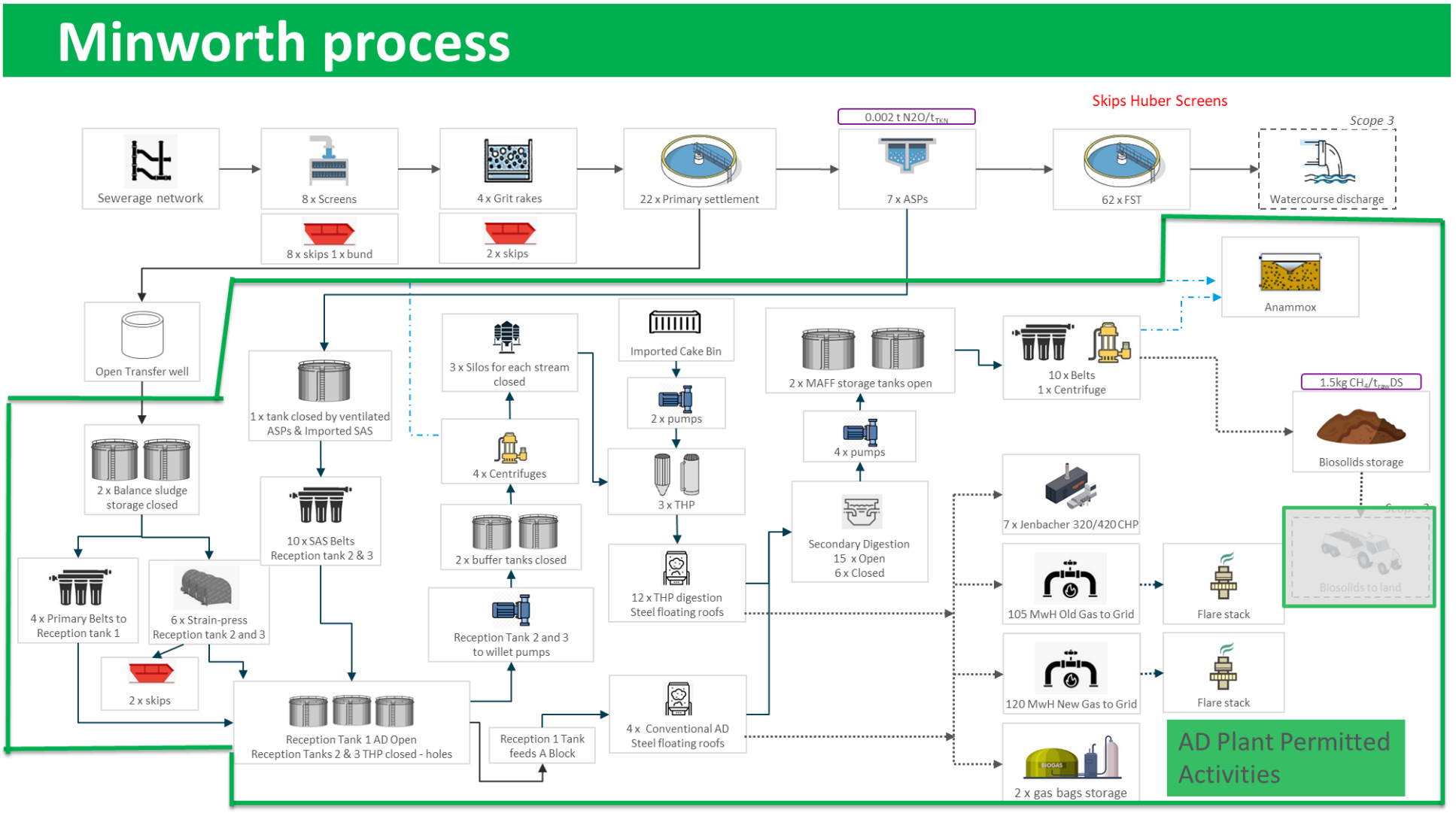
The EMS management review team review the MI (Management Information) data, which will include odour complaints.

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.

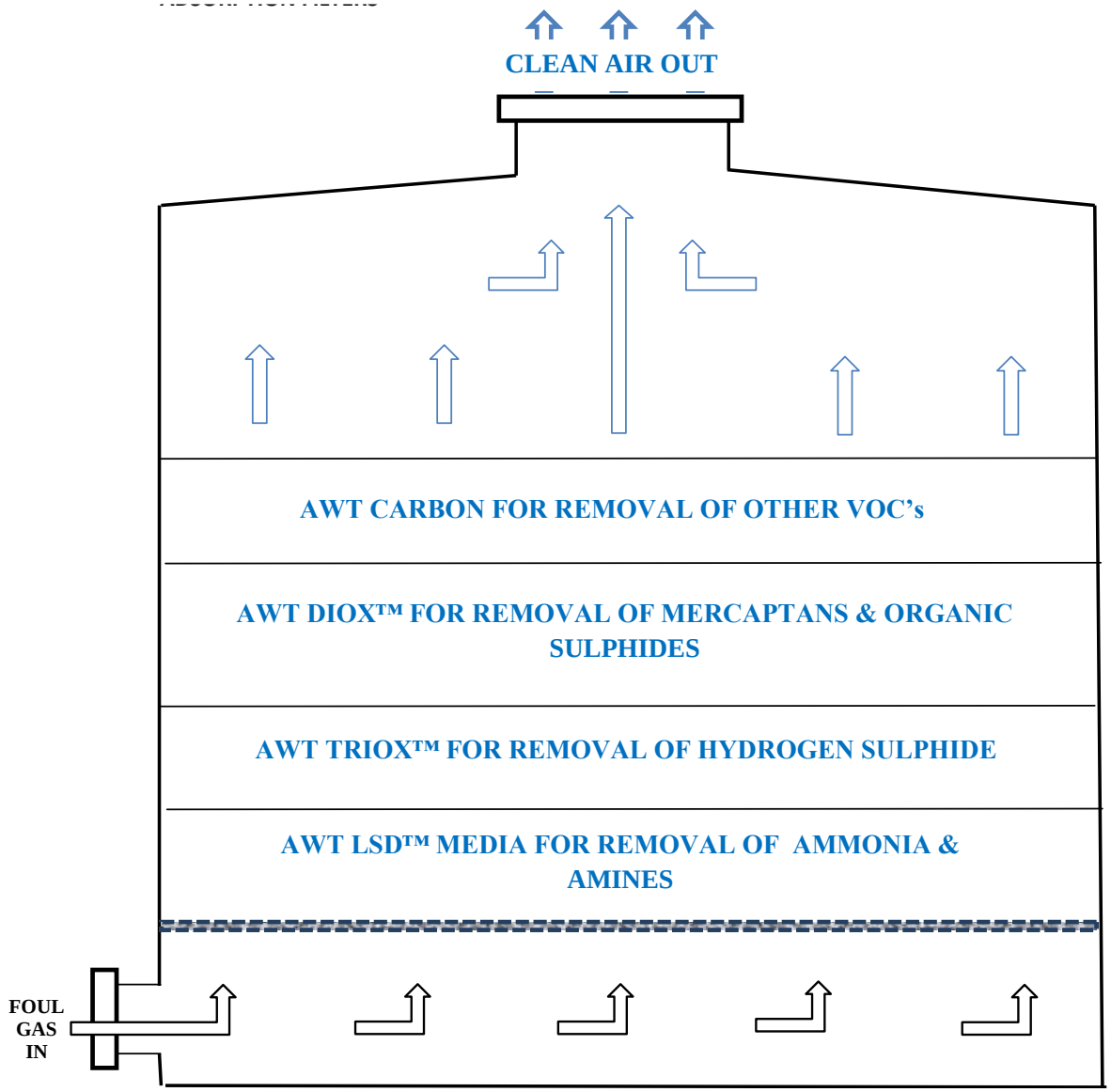
Where odour issues are prevalent, we would adopt the stance taken at our Wanlip Sewage Treatment Works during 2017/18. Live odour surveys were set up weekly with the local Council. Severn Trent also engaged with local residents and invited customers to site to investigate the locations on site and potential odour olfactory variances. In 2022, a mixture of methods was used at Roundhill, including customer odour diaries, installation of new abatement units, sniff testing with an adjacent installation, the scheduling of potentially odorous activities outside of bank holidays or weekends.

Engagement with the Environment Agency for process issues, pollutions that could cause odours or validated odour complaints would be through either a Schedule 5/6, or a phone call to the Local Environment Officer as per the contacts section (Appendix 7).

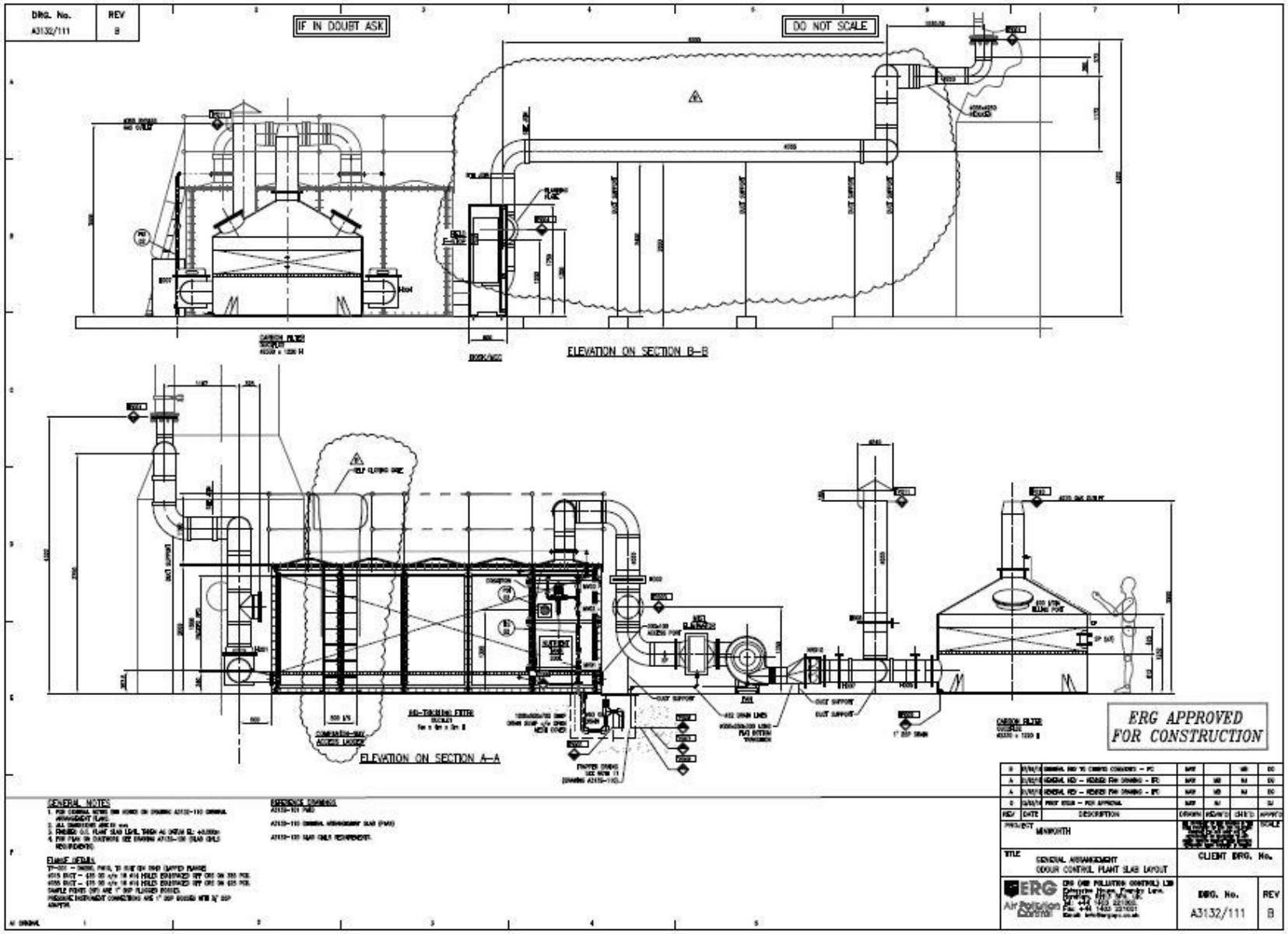
Appendix 1: Process Flow Diagrams

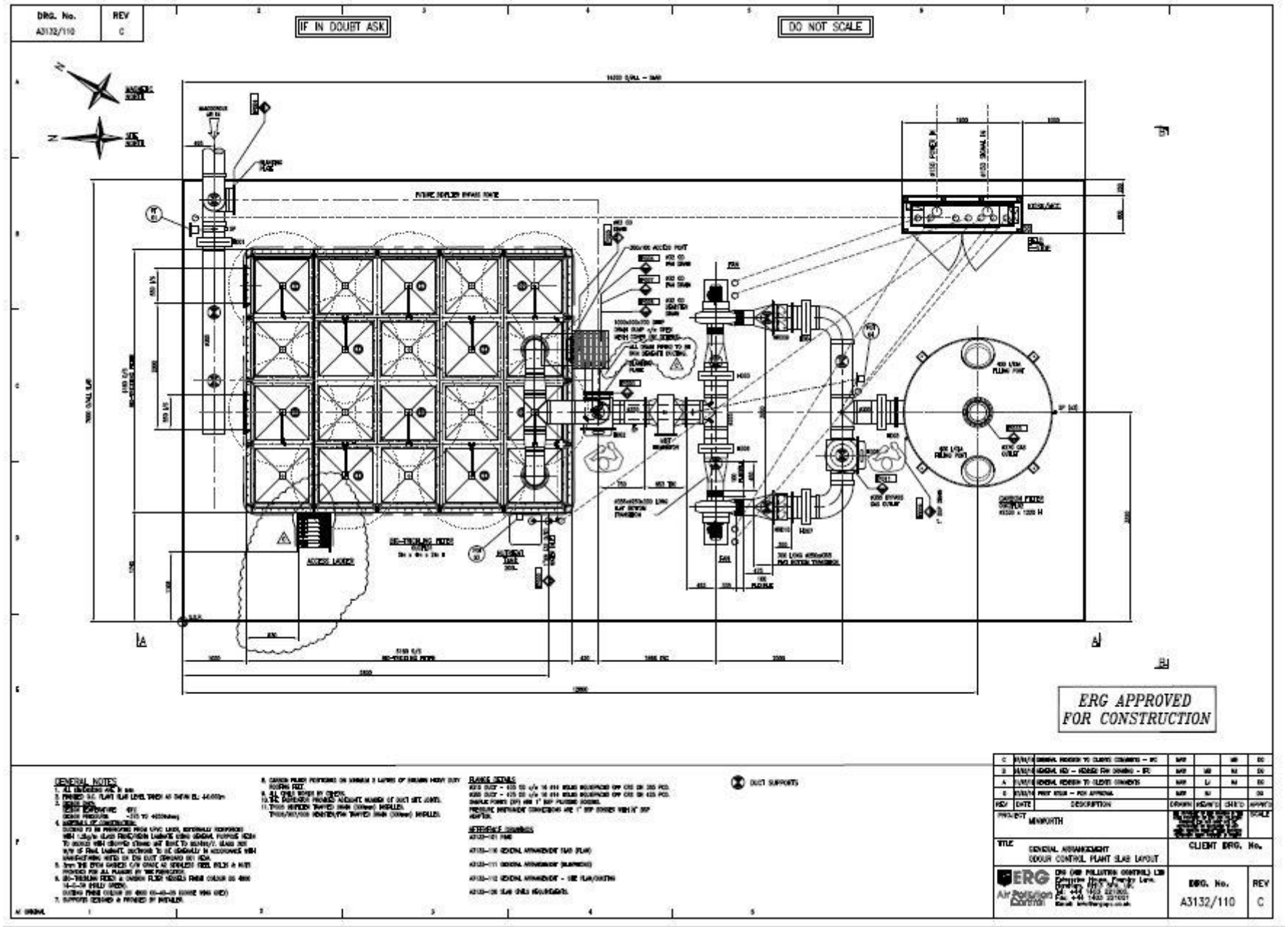


Appendix 2 Odour Abatement System: Peacemaker



Appendix 3: Odour Abatement System: ERG & Carbon Filters

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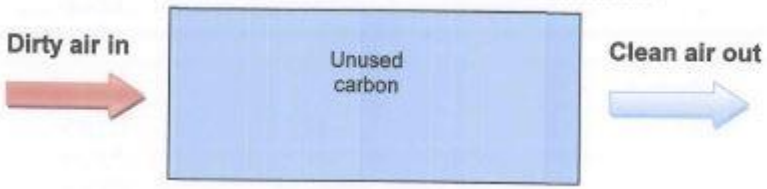
9 How a Carbon Bed is used up

This example is a carbon filter with a 36 month bed life

1. Fresh carbon bed – 0 months of use



2. Partially spent carbon bed – 6 months of use

3. Partially spent carbon bed – 18 months of use

4. Breakthrough of odour – 36 months of use

5.

6. Saturated carbon – more than 36 months of use

Appendix 4: Odour Abatement System: Terminodour

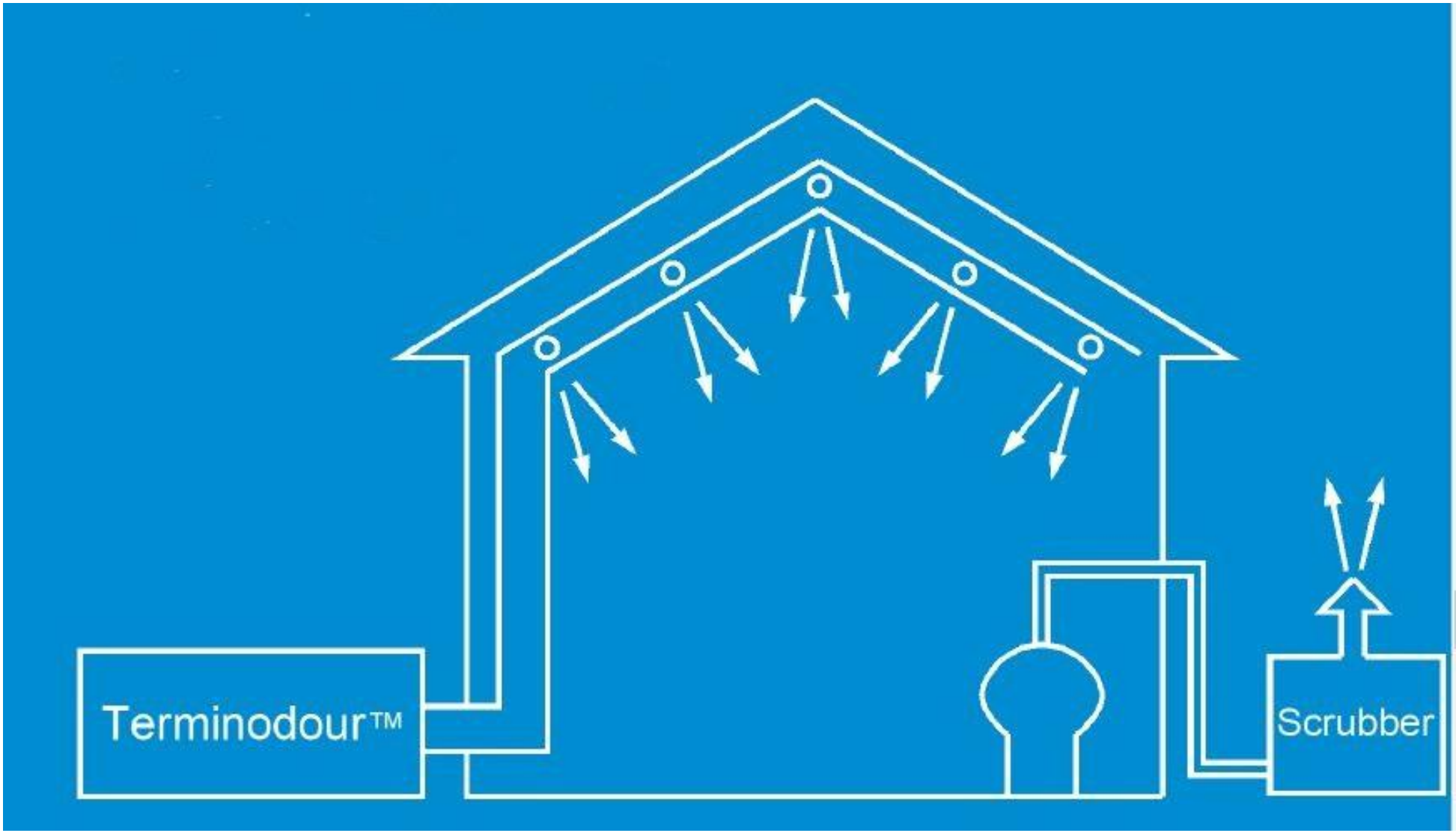


Table A4 Inspection Programme

Block Name	Task	Block line lead text	Task Description	Frequency
Odour Control Covers	Cover Inspection	For each Cover -	1010/10 For each Odour Control Cover - Check integrity of cover/fixings/seals & report any reactive work required	Visit
Odour Control - Bio Filter Preliminary	Operator Checks	For each Odour Control unit -	1078/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control - Bio Filter Preliminary	Operator Checks	For each Odour Control unit -	1078/20 For each Odour Control unit - Check inlet/outlet H2s & record	Weekly
Odour Control - Bio Filter Preliminary	Operator Checks	For each Odour Control unit -	1078/30 For each Odour Control unit - Check outlet filtrate & record Ph levels	Weekly
Odour Control - Bio Filter Preliminary	Operator Checks	For each Odour Control unit -	1078/40 For each Odour Control unit - Check irrigation & adjust as required	Weekly
Odour Control - Bio Filter Preliminary	Operator Checks	For each Odour Control unit -	1078/50 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control - Bio Filter Preliminary	Replace Blower Filters	For each Odour Control unit -	1078/60 For each Odour Control unit - Replace blower suction filters where required	6 Monthly
Odour Control Plant - Filter Preliminary	Operator Checks	For each Odour Control unit -	1079/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control Plant - Filter Preliminary	Operator Checks	For each Odour Control unit -	1079/20 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control Plant - Filter Preliminary	Replace Blower Filters	For each Odour Control unit -	1079/30 For each Odour Control unit - Replace blower suction filters where required	6 Monthly

Odour Control Plant - Peace Maker Preliminary	Operator Checks	For each Odour Control unit -	1080/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control Plant - Peace Maker Preliminary	Operator Checks	For each Odour Control unit -	1080/20 For each Odour Control unit - Check covers on tanks are closed	Visit
Odour Control Plant - Peace Maker Preliminary	Operator Checks	For each Odour Control unit -	1080/30 For each Odour Control unit - Check irrigation & adjust as required	Weekly
Odour Control Plant - Peace Maker Preliminary	Operator Checks	For each Odour Control unit -	1080/40 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control Plant - Peace Maker Preliminary	Replace Blower Filters	For each Odour Control unit -	1080/50 For each Odour Control unit - Replace blower suction filters where required	6 Monthly
Odour Control - Bio Filter Primary	Operator Checks	For each Odour Control unit -	1094/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control - Bio Filter Primary	Operator Checks	For each Odour Control unit -	1094/20 For each Odour Control unit - Check inlet/outlet H2s & record	Weekly
Odour Control - Bio Filter Primary	Operator Checks	For each Odour Control unit -	1094/30 For each Odour Control unit - Check outlet filtrate & record Ph levels	Weekly
Odour Control - Bio Filter Primary	Operator Checks	For each Odour Control unit -	1094/40 For each Odour Control unit - Check irrigation & adjust as required	Weekly
Odour Control - Bio Filter Primary	Operator Checks	For each Odour Control unit -	1094/50 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control - Bio Filter Primary	Replace Blower Filters	For each Odour Control unit -	1094/60 For each Odour Control unit - Replace blower suction filters where required	6 Monthly

Odour Control Plant - Filter Primary	Operator Checks	For each Odour Control unit -	1095/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control Plant - Filter Primary	Operator Checks	For each Odour Control unit -	1095/20 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control Plant - Filter Primary	Replace Blower Filters	For each Odour Control unit -	1095/30 For each Odour Control unit - Replace blower suction filters where required	6 Monthly
Odour Control Plant - Peace Maker Primary	Operator Checks	For each Odour Control unit -	1096/10 For each Odour Control unit - Check functionality of unit/s & any associated equipment	Visit
Odour Control Plant - Peace Maker Primary	Operator Checks	For each Odour Control unit -	1096/20 For each Odour Control unit - Check covers on tanks are closed	Visit
Odour Control Plant - Peace Maker Primary	Operator Checks	For each Odour Control unit -	1096/30 For each Odour Control unit - Check irrigation & adjust as required	Weekly
Odour Control Plant - Peace Maker Primary	Operator Checks	For each Odour Control unit -	1096/40 For each Odour Control unit - Record appropriate data as required	Visit
Odour Control Plant - Peace Maker Primary	Replace Blower Filters	For each Odour Control unit -	1096/50 For each Odour Control unit - Replace blower suction filters where required	6 Monthly

Appendix 5: 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 6: Standard Operating Procedure for Complaints Responses

Standard Operating Procedure (SOP)

Title	***Bioresources - Customer Odour Complaints***

Purpose	To ensure that our neighbours do not suffer from odour nuisance from our sludge treatment centres and to ensure compliance with our environmental permits.
Who	The Bioresources Team Manager has responsibility for implementing this procedure. The procedure must be followed by Technical Operators and Senior Technicians responsible for the day-to-day operation of sludge treatment centres.

Must Have (H&S, Quality, Quantity, Environment, Training, Resources)
• Standard PPE when carrying out site odour assessments • Up to date odour management plan for the site • Access to CROSS complaints database • Weather station should be installed at sludge treatment centres
Remember – 'Stop, Think, Take 20'

Summary Must Do
1. Ensure that each sludge treatment centre has an up to date Odour Management Plan. 2. Aim to prevent odour nuisance by ensuring good housekeeping and process control. 3. If complaints are received, ensure that the customer is kept informed of the actions that are taken to address their issue.

SOP - Proactive Measures

1. Ensure that the site has an odour management plan (OMP) in place and that this is available to all site staff. The OMP includes an odour risk assessment in the "Inventory of Odorous Materials" table. The OMP should be reviewed annually 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. We aim to proactively prevent odour nuisance by ensuring good housekeeping and process control. Ensure that Golden Measures are recorded and any issues acted on. Ensure that good housekeeping practices are used - sludge spills should be cleared up as soon as possible.
3. Where odour control units are installed, ensure that regular checks are carried out and the results of these checks are recorded. Details of the required checks are included in the OMP.
4. The steps in the incident/ emergency control table in the OMP can be used to develop a response to any issues that are picked up as part of the regular monitoring.
5. Be aware of weather conditions such as wind direction when carrying out potentially odorous operations such as moving cake.

SOP - Reactive Measures

Complaint received via COSC or direct customer contact

1. Customer complaints can be received via phone, email, letter or social media.
2. If a complaint is received directly by the site, then COSC should be contacted so that the complaint can be recorded centrally.
3. If a complaint is received via COSC, then site staff should contact the customer directly within 24 hours.
4. Customer details should be recorded on the odour complaint investigation report form (found in the appendix of the OMP).
5. Keep the customer informed at all steps of the odour investigation.

Carry out odour investigation

6. Use the odour complaint investigation report form. Record the following information:
   - time & date of odour complaint
   - Weather conditions at time of complaint
   - Operating conditions at the time of the complaint.
7. Walk the sewage and sludge treatment route and carry out a sniff testing assessment. If possible, use office based staff to carry out this assessment (they will not be accustomed to the odours on site). Record details of the assessment on the odour report form for sniff testing (in the appendix of the OMP).

8. If necessary, engage a specialist contractor to carry out further testing using olfactometry.
9. If a persistent odour issue is identified, then further engagement with local residents may be required. The process used at Wanlip STW in 2017/18 could form a basis for actions taken. 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.
10. Inform the EA via a schedule 5 where necessary.
11. Store investigation reports electronically.

Develop a Solution

12. The steps in the incident/ emergency control table in the OMP can be used to develop a response to any issues that are picked up as part of the odour investigation.
13. Where possible operational methods should be used to control odours e.g. improving housekeeping or increased maintenance and servicing of assets.
14. The last resort is to contain the nuisance e.g. covering odour sources. Ventilation may be required to prevent the build up of a corrosive atmosphere under the covers.
15. Update the OMP to reflect the findings of the investigation.
16. Continue to monitor the odours to ensure that the solution is successful.

Appendix 7: Minworth 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	STW		
Trade / Domestic Waste	STW		
Biosolids / Cakepad	STW		
Permit Compliance	STW		
Bioresources / Sludge	STW		
Warwickshire Council	-		
Environment Agency	-		