Motney Hill WTW & STC

Odour Management Plan

790101_ERA_OdourMP_MOT

March 2021

V1

from Southern Water

Contents

1. Odour Management Plan

1.1. Introduction

The Odour Management Plan (OMP) for Motney Hill Wastewater Treatment Works (WTW) and Sludge Treatment Centre (STC) ("the Site") has been developed by Mott MacDonald on behalf of Southern Water Services (Southern Water). The OMP remains the responsibility of Southern Water Services as the OMP may assume a legal status if it forms part of the planning conditions or other legal agreements with local authorities or other third parties.

The OMP has been designed to be a live working document that forms part of the operational management system of the site. It is a mitigation and control measure document that operations shall comply with. It demonstrates how odours shall be managed and controlled to prevent odour impacts from activities during both normal operation and abnormal events.

The OMP has been produced in accordance with the Environment Agency's H4 Odour Management guidance[1].

1.2. Objectives

The OMP identifies potential odour emissions from site operations and identifies procedures to manage, control and minimise odour impacts. It is based on a plan prepared by Southern Water and provides information about the measures currently implemented to control odour emissions from the Site. It provides sufficient detail to allow operators and maintenance teams to understand the operational procedures for both normal operation and abnormal events.

It is intended to be used as a reference document by operational staff on a day-to-day basis. The OMP includes, and will make reference to, the following:

- A description of the site and catchment, including sources of odour on the site, and location of sensitive receptors;
- The Site's individual process operation descriptions in order to minimise, manage and control odour;
- Characterisation of odours at different points in the treatment process and assessment of risk, particularly during abnormal operating conditions;
- Southern Water Operation and Management (O&M) procedures for the site, including housekeeping measures to minimise odour generation and release;
- The mitigation procedures which should be implemented when foreseeable situations, that may compromise the ability to prevent and minimise odorous releases, occur. These can include both breakdowns and external conditions such as extreme weather;
- Control of Contractors on-site;
- An odour risk assessment identifying any odorous or potentially odorous areas of the works and immediate and longer-term actions required to eliminate odour complaints;

[1] Environment Agency (2011), *Environmental permitting: H4 odour management.* Available online at: https://www.gov.uk/government/publications/environmental-permitting-h4-odour-management

- Containment, enclosure, ventilation, abatement of odours and emission standards;
- Monitoring of odorous emissions and action plans for investigation, remedial measures and procedural changes in the event of abnormal emissions;
- Management of the sludge reception, dewatering and treatment processes;.
- Odour control and management procedures during emergencies and maintenance;
- Routine care and maintenance of critical equipment (extraction and odour abatement plant);
- Monitoring, recording and reporting arrangements;
- The management and operator training requirements and records with respect to odour;
- Staffing, responsibilities, training and procedures;
- Communication strategy and complaint management/resolution procedures;
- OMP updating, review and development procedures; and
- An action procedure for complaints.

The primary responsibility for implementation of the OMP lies with the operational site management. Other business functions support the implementation of the OMP across their areas of responsibility.

The OMP outlines the sources of odours and the risks to receptors. It outlines the measures Southern Water will employ to prevent or minimise odour releases and impacts. The routine assessment of odour and the monitoring and maintenance of plant and equipment at the Site will be carried out according to the schedules given in the Operation & Maintenance manual and Environmental Management System to ensure that performance is optimised.

The OMP will be reviewed, and amended where necessary, following changes in infrastructure or changes in operation that have an impact on odour at the site. Otherwise the OMP will be reviewed every four years as a minimum, or as requested by the Environment Agency.

1.3. Site location

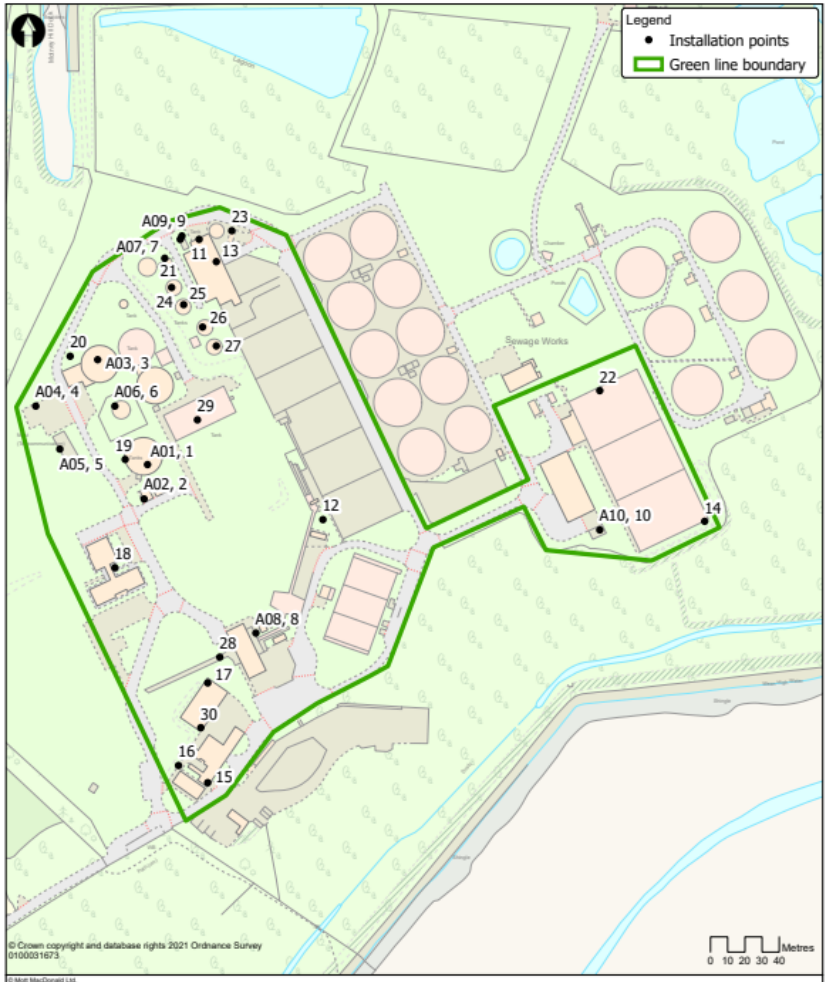
The Site is located in Lower Rainham, on a peninsula surrounded by Barlett Creek, and Otterham Creek.

Site address: Motney Hill Road, Lower Rainham, Gillingham, Kent ME8 7UA

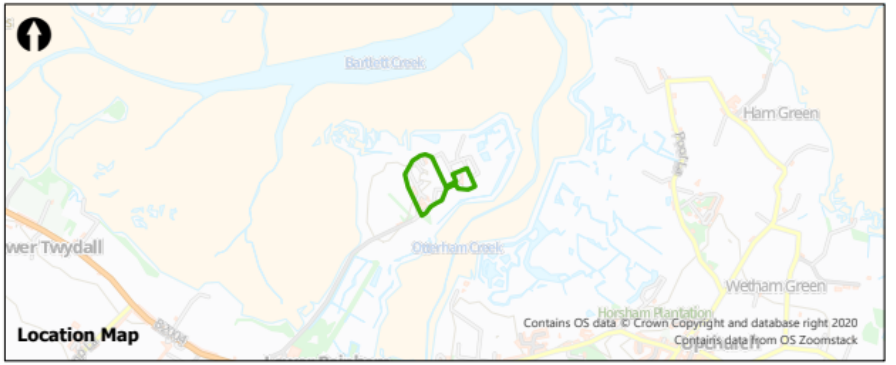
National grid reference: TQ 8295 6838

The site has been in the current location since 1923. It is located on a land outcrop into the River Medway, occupied by only the works and approximately 10 residential properties, close to the entrance of the works. The site location and layout is shown in Figure 1.

Figure 1: Location and layout of the Site



Emissions Ref	Emissions Points	Assets Ref	Assets	X	Y
A01	Whessoe Valve 1	1	Anaerobic Digester 1	582883	168458
A02	Flue 1	2	Boiler 1	582881	168438
A03	Whessoe Valve 2 & Flue 2	3	Anaerobic Digester 2 and boiler 2	582854	168519
A04	CHP Exhaust Stack & CHP Exhaust Emission Monitoring Point	4	Combined Heat and Power Engine	582818	168492
A05	Flare Stack	5	Flare	582832	168467
A06	Whessoe Valve 3	6	Gas Holder	582864	168492
A07	Odour Control Unit 1	7	Odour Control Unit 1	582893	168578
A08	Odour Control Unit 2	8	Odour Control Unit 2	582946	168360
A09	Sludge Treatment Centre Generator	9	Sludge Treatment Centre Generator	582903	168591
A10	Wastewater Treatment Works Generator	10	Wastewater Treatment Works Generator	583146	168420
		11	Polymer Storage Area	582913	168589
		12	Ferric Chemical Store	582985	168426
		13	Centrifuges and thickeners	582923	168576
		14	Gas oil, kerosene, grease and oil storage 1	583207	168425
		15	Gas oil, kerosene, grease and oil storage 2	582918	168273
		16	Gas oil, kerosene, grease and oil storage 3	582901	168283
		17	Gas oil, kerosene, grease and oil storage 4 and WEEE storage	582918	168331
		18	Gas oil, kerosene, grease and oil storage 5 and general waste bins	582864	168398
		19	Gas oil, kerosene, grease and oil storage 6	582870	168461
		20	Gas oil, kerosene, grease and oil storage 7	582838	168521
		21	Gas oil, kerosene, grease and oil storage 8	582902	168589
		22	Gas oil, kerosene, grease and oil storage 9	583146	168501
		23	Sludge Reception Building	582932	168594
		24	Sludge Storage Tank 1	582897	168561
		25	Sludge Storage Tank 2	582904	168551
		26	Sludge Storage Tank 3	582915	168538
		27	Sludge Storage Tank 4	582923	168527
		28	Emergency cess inlet	582925	168346
		29	Emergency sludge tank	582912	168484
		30	General waste bins and scrap metal skip	582914	168305



Title: Motney Hill STC Site Layout Plan					MOTT MACDONALD Mott MacDonald House 8-10 Sydenham Road Croydon T +44 (0)20 8774 2000 W mottmac.com		
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev
25/03/21	L Jenkinson	WJ Goh	A Manns	1:2,500	790101_MSD_SiteLayoutPlan_MOT_v1	INF	01

2. Site Operations

2.1. Overview of site operations

The WTW is operated under the Urban Wastewater Treatment Regulations and has a standalone Water Discharge Activity Environmental Permit, this will remain an independent permitted activity. The STC operation is a non-hazardous waste activity which is currently carried out under a registered T21 exemption.

The waste activity comprises imports, physio-chemical and anaerobic digestion (AD) treatment and the storage of waste, all for recovery purposes. The STC solely handles waste derived from the wastewater treatment process, either indigenously produced on-site or imported from other Southern Water owned assets.

The primary permitted installation activity will be the AD treatment facility. The AD facility will primarily treat indigenously produced sludges. Sludge import facilities are installed at the site, however sludge is not routinely imported. Permitted Directly Associated Activities will be the import of waste from other WTW assets; the physio-chemical treatment of imported and indigenously produced sludges; the storage of indigenously produced sludges, imported sludges and the sludge cake from the AD facility; the storage of biogas derived from the AD treatment of waste and the combustion of biogas in an on-site Combined Heat and Power plant (CHP). In the event the CHP cannot run in an emergency or due to operational issues, biogas will be combusted via an on-site flare stack and/or back-up boiler system.

With the changes on the Environmental Permitting Regulations due after 2023, fats, oil and grease and food wastes will be treated (in the future) in the AD facility and co-digested to improve the quality of cake produced and the biogas yields produced for combustion in the on-site CHP.

2.2. Summary of the WTW & STC components

Currently the Site accepts primarily indigenous sludge. Reception facilities for imported sludge are available at the site, however these are not in regular use.

Below is a brief summary of the components for the Site:

2.2.1. Wastewater treatment

Sewage Reception

Sewage is collected by gravity sewers in the east, south and west of the catchment and then transferred by rising mains from a number of catchment transfer and terminal pumping stations. Main terminal and transfer pumping stations include Dockyard Gillingham wastewater pumping station (WPS) from the west, New Brook Chatham WPS and Lower Road Lower Halstow WPS. The bulk of the sewage flow is transferred to the site by a 1.7 km gravity siphon sewer controlled at Berengrave Lane Rainham general drainage structure (GDS). All flows with up to 3,000 l/s of sewage and site surface water drainage, enter the interception chamber. All flows pass through 4 No. 6mm 2D screens, each rated at 1,250 l/s, operating as duty, assist, assist and standby units. Screened sewage then passes through flow measurement. Flows in excess of 1,580 l/s overflow to 2 No. storm tanks.

Preliminary Treatment

The preliminary treatment stage involves mechanical screening of the flow to remove coarse solids, rags and detritus followed by a process to remove grit. Flows up to 1,580 l/s pass forward to 2 No. detritor tanks for grit removal. The screening and grit waste is cleaned and packed into skips for composting off site.

Primary Treatment

Following grit removal, principal wastewater treatment processes consist of:

- A primary settlement tank (PST) handling flows of up to 1,580 l/s;
- Ten circular PSTs equipped with automatic de-sludging pumps; and
- A ferric dosing plant to dose crude sewage before the primary tanks for septicity control.

The primary settlement process is controlled automatically. The sludge that settles out during the primary settlement process is scraped along the bottom of the tank to a sludge reception hopper, where it is then pumped via the primary sludge pumps (1 duty per block) via screens to the thickening tanks for further treatment. PSTs are brought online / taken offline as needed to avoid septicity.

Secondary Treatment

After primary treatment, flows enter the intermediate pumping station. Flows up to 813 l/s, combined with the site return liquor from the return liquor pumping station and flows from surface drainage pumps are lifted by three intermediate pumps (operated as duty, assist and standby) to the activated sludge process. This process consists of six aeration lanes with fine bubble aerators. Mixed liquor from the aeration tanks settles in six radial final settlement tanks (FSTs). Return activated sludge (RAS) is continuously withdrawn from the FSTs and mixed with settled sewage, bypassing the upper chamber of the intermediate pumping station (IPS). Surplus activated sludge (SAS) is withdrawn by the SAS pumping station to the SAS balance tank control suitable mixed liquor suspended solids (MLSS) in the aeration lanes. Final effluent is discharged to Estuarial Waters of River Medway.

2.2.2. Sludge treatment at the STC

The Site contains an STC which has both liquid sludge and indigenous sludge reception facilities.

STC Building

The STC building is a fully enclosed building, which houses the majority of the sludge treatment facilities. This building ensures that odorous air from many processes are effectively captured for treatment. Pumps and thickening equipment are located outside the building, however thickeners have a separate odour extraction system. Some elements, such as the SAS drum do not feature odour control equipment.

All activities concerned with the reception of sludge are housed within the STC building from which air is extracted to the odour control system. Each sludge process unit and the space within which it sits is enclosed to form an odour-controlled enclosure within the building. Sludge is not typically imported to this site.

Sludge Storage

Sludge storage is provided between each of the main sludge processing stages by means of cylindrical storage tanks. Sludge is first screened and stored in two gravity belt thickener (GBT) feed tanks after being produced by the primary settlement stage. After thickening sludge is stored in the thickened sludge tank. After the digestion process, it is stored in the post-digestion sludge storage tank. Most of these tanks are enclosed to capture odorous air for treatment, with the exception of the post-digestion sludge storage tank and the emergency storage tank (2,275m^3). Air is extracted from each tank to the central odour control

system. The sludge storage tanks are mixed using enclosed macerator pumps located outside the digesters. Therefore, there are no mechanical parts inside the tanks requiring access at regular intervals for maintenance purposes.

Thickening of Liquid Sludges

Sludge thickening is undertaken to increase the solids content of the sludge. This is achieved by means of mechanical equipment that is housed within a building to partially contain odorous air for treatment.

Centrate and decant liquor from the thickening process gravitates to the Site's liquor pumping station and is returned to the WTW for secondary treatment.

The sludge is thickened in two duty/standby GBTs. The GBTs are designed to give 150% capacity at average loads when operating 24 hours a day, seven days a week, and receive sludge at approximately 3% dry solids and raise it to 7%. The GBTs are individually covered and vented to odour control and the building is also extracted to the odour control system.

SAS is stored in an SAS buffer tank and thickened by three drum thickeners. Thickened sludge is mixed in one thickened sludge storage tank (2,035m^3) before being fed to two anaerobic digesters.

Digesters

There are two large sealed, conventional mesophilic anaerobic digesters (4,500m^3 and 3,500m^3) operating at around 35^{o}C. The anaerobic digestion process provides a controlled environment where micro-organisms (including bacteria and fungi) can grow, multiply and break-down organic material, releasing water, carbon dioxide and methane (biogas). Gas production, gas pressure and digester temperature are monitored and logged on the SCADA system. The produced gas is stored in one biogas holder (780m^3), which is a double skinned, expandable, hemispherical container. A biogas flare is provided for periods when, for example, the CHP unit is unavailable during maintenance or downtime, to control and manage excess gas during these periods.

In instances where the gas pressure is too high the pressure relief valve system de-pressurises the system. These pressure relief valves are located at the connection point with the biogas distribution system pipework at the top of each digester. Pressure levels are monitored in the gas system and linked to the SCADA system. This is provided with an alarm which can alert operators to increased pressure. The performance of the digesters is monitored daily, through the sampling of inlet and outlet sludge quality.

Combined Heat and Power (CHP)

A CHP plant was installed at the site in 2007 and is designed to use biogas. The biogas produced in the digestion process is fed to the CHP unit and four standby dual fuel (biogas/gas oil) boilers to generate electricity and heat. The electricity is used to partially power the WTW & STC and heat is to be recovered and used to heat the digesters. There are also two backup flares for use when the CHP engine is on downtime for maintenance.

Post Digestion

Digested sludge is stored in one (2,035m^3) open post digestion sludge storage tank prior to being dewatered by two centrifuges.

Dewatering

Dewatering takes place in two centrifuges (both duty). Dewatering further reduces the volume of sludge. Dewatered digested cake is stored in uncovered cake bays, before being transported off-site for storage prior to spreading onto land.

Liquor from the dewatering plant is returned to the WTW for secondary treatment.

The centrifuges are housed within the STC building, which is connected to odour control. The centrifuges are maintained as part of the framework maintenance contract which also provides an emergency response.

Cake storage

Dewatered sludge is stored in the form of a cake in one of 6 cake bays. These cake bays are open to the air. Cake maturation takes approximately 61 days. Liming of cake occurs very occasionally using granular lime to address ‘sloppy’ cake issues.

Odour control equipment

Odorous air is extracted by two sets of 2 No. duty, standby fans and treated by 2 No. bio-scrubbers (using seashell media), one for the inlet works and the other for the STC. An odour suppression unit is fitted adjacent to the emergency tank and is equipped with a mist spray suppressor. All abatement systems are designed, monitored and maintained to treat specified emissions and off gases.

This odour control system operates with duty and standby fans and recirculation pumps. The odour control system has backup power available from the CHP plant should normal supplies be interrupted. Site personnel check SCADA regularly throughout the day for a range of parameters concerning the odour control unit, including control parameter set points, emission concentrations, alarms and chemical levels. The control system is designed to provide warning alerts at threshold levels. Response procedures, in case of an exceedance event are described elsewhere in this OMP.

3. Potential Odour Sources

3.1. Overview of the mechanisms for odour generation

The generation of odour from the processing of sewage is primarily associated with the release of odorous Volatile Organic Compounds (VOCs) that are generated as a result of the anaerobic breakdown of organic matter by micro-organisms.

Since the main source of odour and VOCs is the solid organic matter, the most intense and offensive odours tend to be generated from the operations involving the handling of sludge i.e. the processes applied to dewater, treat and store raw sludge. These processes are generally considered to present the greatest risk of odour impact offsite unless adequate controls are put in place. Depending on the quality of the sewage presented to the works, aspects of the treatment process involved in the handling of raw sewage (e.g. preliminary and primary treatment stages) may also contribute to offensive odours.

Odours generated from the sewage treatment processes downstream of the primary sludge removal stage (e.g. the activated sludge processes and final settlement) present a significantly reduced risk of odour impact. This is due to the fact that the majority of odorous biogenic material has been removed from the flow at this point, and the treatment processes applied to remove any remaining contaminants in the sewage are aerobic, which inhibits the formation of the majority of the reduced sulphur compounds which are responsible for offensive sewage odours.

The rate of odour release from sewage and sludge sources is primarily dependent on the temperature of the material, and the surface area exposed to the atmosphere. As a result, odorous emissions from sewage treatment operations tend to be highest during the summer months. Furthermore, activities that lead to increases in the surface area of odorous material exposed to the atmosphere (e.g. due to turbulence generated by sewage handling processes and agitation of sludge) will inevitably lead to an increase in the magnitude of odour released.

Southern Water acknowledges that high levels of odour arising from wastewater and sludge treatment are not acceptable and that reasonable and practicable measures must be taken to minimise any nuisance caused to the general public. Southern Water does not operate under a single defined odour exposure standard. Each site is considered individually taking into account the relevant legislation and local authority's conditions. Site specific factors such as site history with regard to odour complaints, potential future encroachment by residential or business developments, and the presence of particularly odour sensitive receptors within the vicinity of the site are also taken into consideration.

3.2. Potential odour sources

Table 1 identifies the plant, equipment and activities which have the potential to generate odours under normal operational conditions. Odour sources under emergencies and abnormal operating conditions are addressed in 4.3.3 Abnormal conditions.

Table 1: Identified odour sources

Process or activity	Plant or equipment	Potential source of odour	Odour controls in place	Potential for odour emissions during normal conditions
Sludge reception	Sludge reception building	Indigenous sludge and liquid sludge	Sludge pumped from tanker directly into covered buffer tank which is odour controlled. The reception area is enclosed. Process is completed as rapidly as possible. Air is extracted to an OCU. Sludge reception at this site is not routinely used, and imports of sludge are uncommon.	Low
Wastewater treatment	Primary Settlement Tanks (PSTs)	Liquid sludge	PST is not enclosed	Medium
	Biological treatment centre with six aeration lanes	Wastewater	Not enclosed	Medium
	Final Settlement Tanks	Wastewater	FST is not enclosed	Medium
Sludge treatment	Sludge thickeners	Sewage sludge	Gravity belt thickeners (GBTs), GBT feed tanks and thickened sludge tank are covered and are located outdoors. Sludge is mixed and regular throughput is maintained	Low
	Emergency sludge storage tank	Liquid sludge	Storage tanks are not enclosed, or odour controlled. Sludge is processed as soon as practicable on arrival. Risk assessment and odour plans put in place before cleaning any tank.	Low
	Anaerobic digesters pressure release valve	Biogas	Digesters covered, sealed and process monitored. Planned preventative maintenance regularly undertaken on digesters and pressure release valve.	Low
	Post-digestion sludge storage tanks	Liquid sludge	Storage tanks are not enclosed, or odour controlled. Risk assessment and odour plans put in place before cleaning any tank.	Medium
	Liquor tank	Liquid sludge	Liquor tanks covered, sealed, and process monitored. Tanks are located below ground.	Low
	SAS balance tanks	Surplus activated sludge	Balance tanks covered, sealed, process monitored and regularly maintained.	Low

	Centrifuge	Sludge cake	Centrifuges are located indoors, and odour controlled. Planned preventative maintenance undertaken on equipment	Low
	Odour control unit	Untreated air	Odour control unit treats air to remove odorous compounds. It is process monitored and maintenance is regularly undertaken on equipment	Low
	Cake storage bays	Sludge cake	While uncovered, cake is moved from the pad adjacent to the centrifuge to the receiving bays at the end of treatment process so odour emissions are minimised. No disturbance of cake while in bays except for removal.	Low
		Liming	Cake is occasionally limed to stabilise sludge after prolonged rainfall. Use of lime increases odour risk	Low
Biogas combustion	Gas holder	Biogas	This is a sealed system	Very low
	Combined Heat and Power (CHP) unit	Biogas	Planned preventative maintenance undertaken on equipment. If CHP unit is down, gas is burnt in flare	Low
	Boilers	Biogas	Planned preventative maintenance undertaken on equipment	Low
	Flare	Biogas	Planned preventative maintenance undertaken on equipment	Low
Sludge export	Cake export	Sludge cake	Lorries/trailers are covered before leaving or sealed skips are used. Covers only removed when inside building.	Low

3.3. Odour impact

3.3.1. Adjoining land use

The site has been in the current location since 1923. It is located on a land outcrop into the River Medway, occupied by only the works and approximately 10 residential properties, close to the entrance of the works. The site is surrounded to the west, north and east by estuarine surface waters of the River Medway. Smaller watercourses connected to the estuary comprise Otterham Creek to the east, Bartlett Creek to the north, and Rainham Creek to the west.

3.3.2. Sensitive receptors

Receptors sensitive to odour include users of the adjacent land, which may vary in their sensitivity to odour. The level of sensitivity will be defined using the Institute of Air Quality Management guidance[2]:

- High sensitivity receptors e.g. residential dwellings, hospitals, schools/education and tourist/cultural.
  - users can reasonably expect enjoyment of a high level of amenity; and
  - people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
- Medium sensitivity receptor e.g. places of work, commercial/retail premises and playing/recreation fields.
  - users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or
  - people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.
- Low sensitivity receptor e.g. industrial use, farms, footpaths and roads.
  - the enjoyment of amenity would not reasonably be expected; or
  - there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.

The magnitude of risk relates to[3]:

- Frequency: How often an individual is exposed to odour
- Intensity: The individual's perception of the strength of the odour
- Duration: The overall duration that individuals are exposed to an odour over time
- Odour unpleasantness: Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/ intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.
- Location/Receptor sensitivity: The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.

The closest sensitive receptors are eight residential properties located adjacent to the site boundary and aligned along the same side of the access road leading to the site entrance. There are three sensitive receptors found within 250m of a potential odour emission source at the Site. As demonstrated in Figure 2, all receptors (residential properties) are found to the south west of the site, upwind of the prevailing wind direction. No sensitive receptors are found to the north east of the site, downwind of the prevailing wind direction.

Table 2 indicates the distance and direction from each potential odour emission source to the closest sensitive receptor. Where multiple assets exist for the same process, such as digesters or settlement tanks, only the closest asset has been presented.

[2] Institute of Air Quality Management (2018) Guidance on the assessment of odour for planning V1.1. Available online at: https://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf

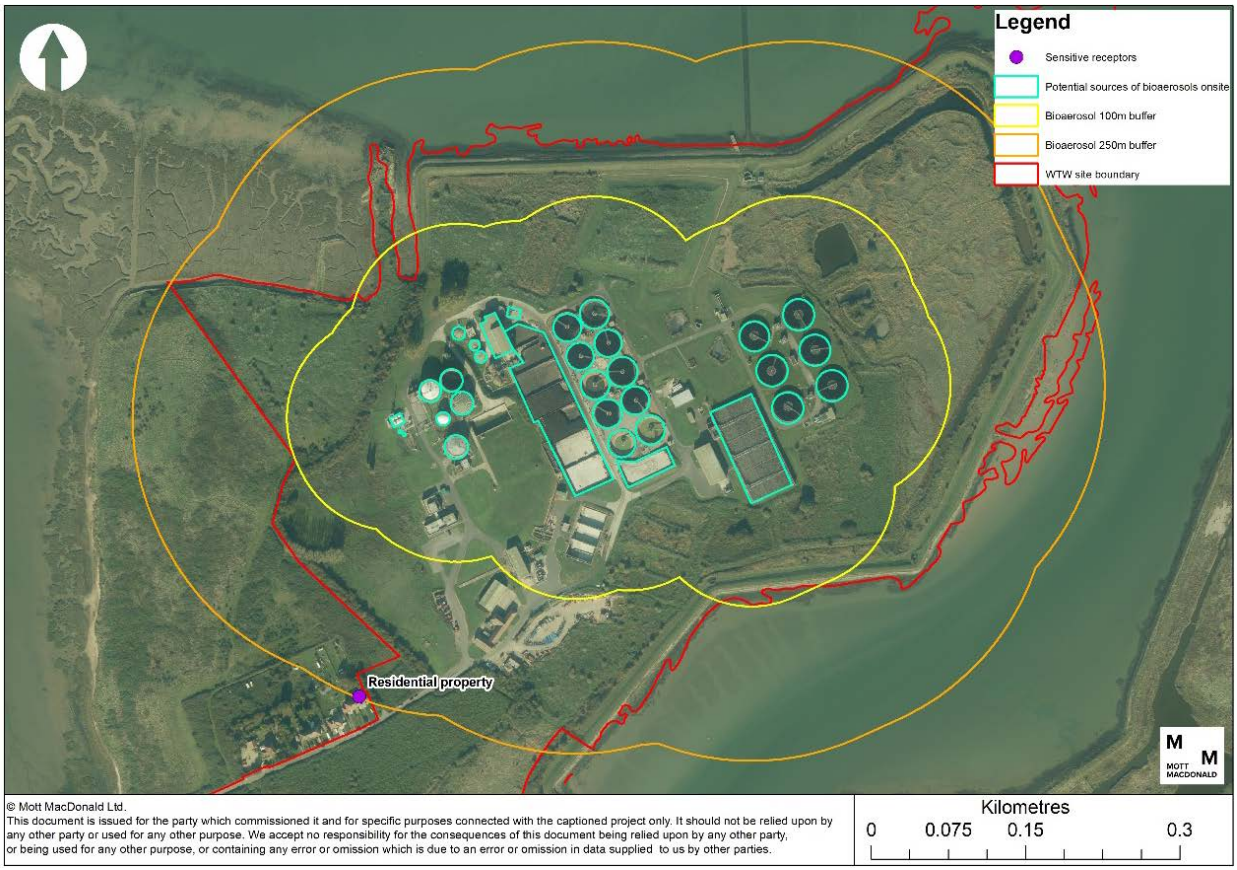
[3] Institute of Air Quality Management (2018) Guidance on the assessment of odour for planning V1.1. Available online at: https://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf

The potential odour emission source closest to a residential property is an odour control unit. The potential emission source located the furthest away from the sensitive receptor are the FSTs.

Table 2: Receptors within 500m of potential emission sources at the Site

Receptor	Nearest potential emission source to receptor	Process	Distance (m) from nearest potential emission source	Direction of receptor from closest emission source
Residential property	Sludge reception	Sludge reception and distribution	395	South west
	Primary settlement tanks	Wastewater treatment	340	South west
	Aeration lanes	Wastewater treatment	430	South west
	Final settlement tanks	Wastewater treatment	485	South west
	Sludge treatment centre and centrifuge	Sludge treatment	355	South west
	Sludge storage tank	Sludge treatment	290	South west
	Digester	Sludge treatment	250	South west
	Liquor tank	Sludge treatment	360	South west
	SAS balance tank	Sludge treatment	345	South west
	Cake bays	Sludge treatment	285	South west
	Odour control unit	Sludge treatment	215	South west
	Gas holder	Biogas combustion	275	South west
	CHP	Biogas combustion	265	South west
	Boiler	Biogas combustion	245	South west
	Flare	Biogas combustion	260	South west

Figure 2: Sensitive receptors within 250m



Source: Mott MacDonald (2021), Motney Hill Bioaerosol Risk Assessment

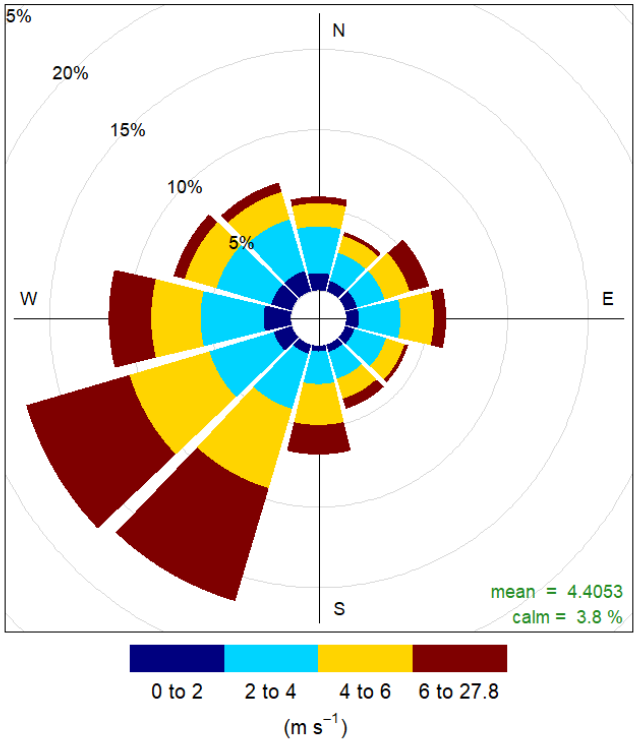
3.4. Odour modelling

No specific odour modelling has been commissioned for this site. Wind rose and information generated for the bio-aerosol risk assessment have been used to determine the direction of any potential odours released from the site, as shown in Figure 2.

The 2015-2019 wind rose for the nearest meteorological site, Southend (located approximately 21km north of the Site), is shown in Figure 3. This monitoring site experiences strong prevailing winds from the south west, with occasional strong winds from the west. However, as this meteorological site is more than 20km from the WTW, an atmospheric hindcast model (Vortex) has also been used to assess the wind conditions at the Site.

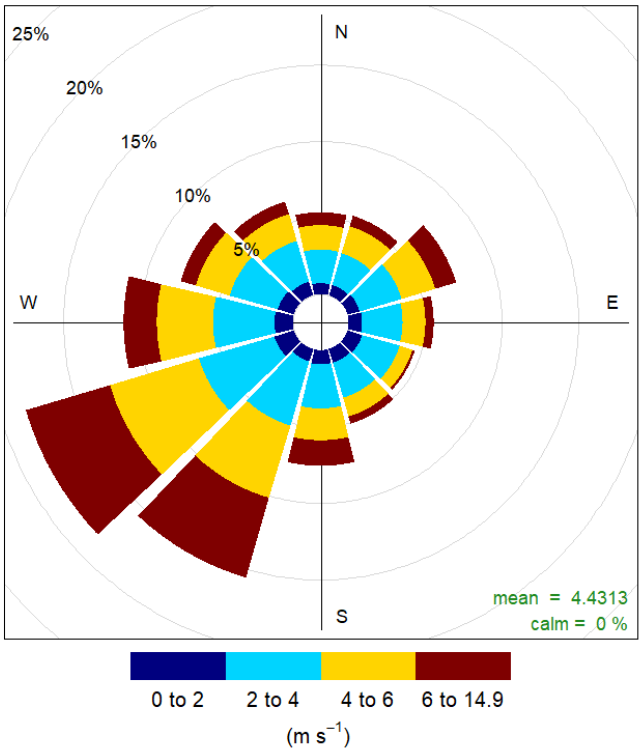
Figure 4 presents the wind rose generated for the Site from the Vortex model for the period from 2015-2019. The wind rose demonstrates that historically this location experiences strong prevailing winds from the south west, demonstrating that both datasets are in agreement with each other. This suggests that sensitive receptors located to the north east of the Site would be at the greatest risk from odours from the Site as they would be downwind of the prevailing wind direction.

Figure 3: Average wind rose for Southend meteorological site, 2015-2019



Source: NOAA Integrated Surface Database (ISD) (2020)

Figure 4: Average wind rose for the Site from the Vortex model, 2015- 2019



Source: NOAA Integrated Surface Database (ISD) (2020)

4. Odour Management and Control

4.1. Odour control system

With the exception of the post-digestion and emergency sludge storage tanks, all sources of odour identified at the Site have been either covered or enclosed and the air is extracted continuously to the odour treatment plant.

The inlet works and sludge treatment processes are covered. Odorous air is extracted by two sets of 2 No. duty, standby fans and treated by 2 No. bio-scrubbers (using seashell media), one for the inlet works and the other for the STC. Odorous gases from tanks and treatment areas will be channelled to the odour control treatment units.

An odour suppression unit is fitted adjacent to the emergency tank and is equipped with a mist spray suppressor. All abatement systems are designed, monitored and maintained to treat specified emissions and off gases.

An odour control checklist can be found in Appendix A.

4.2. Odour control in normal and abnormal conditions

All operating practices must be compliant with the Site's O&M manuals, Southern Water company practices and management systems and the OMP.

In order to achieve overall odour containment and thus to minimise unplanned releases of odour to atmosphere, it is essential that;

- The integrity of all covers over process units is maintained continuously, other than during periods of essential maintenance.
- All doors in buildings ventilated to the odour control system remain closed except when access is required and that the integrity of the buildings fabric is ensured.

Where routine, planned and emergency maintenance of plant items has to be carried out and there is a high risk of odour being released to atmosphere, in quantities sufficient to result in detection off-site, a detailed risk assessment of the activity is conducted, as part of which issues of odour generation, release and control are considered. Where the risk of an off-site odour event occurring is judged to be high, the Southern Water Customer Services call centre will be informed, together with the Environment Agency.

4.2.1. Normal conditions

The operation of individual process units is considered in relation to odour management and control. As part of this, routine operational and maintenance tasks are listed and divided into different classifications according to the level of complexity, speciality and frequency. The scheduling, reporting and completion of these tasks are initiated and controlled under a number of management systems, as indicated below:

- Routine Operations: the daily and weekly routine operations are scheduled regionally through weekly and quarterly programmes of work. Site operators are responsible for carrying out the tasks and FPM for checking completion and quality.
- Planned Maintenance (Ellipse): the programmes for planned maintenance are generated regionally. Jobs are sent direct to mechanical or electrical technicians via electronic communication. Start and completion of tasks, including work done, are logged direct to Ellipse, which produces records of plant performance. Site and regional mechanical and electrical Staff, in conjunction with specialist contractors, are responsible for carrying out the tasks and FPMs for checking completion and quality.

- Contractor Maintenance (CM): the programmes for planned maintenance of some categories of specialist equipment (the sludge dryer, centrifuges, odour control equipment, odour control monitoring equipment, etc.) are generated regionally. Paper records of work carried out, completion and approval are kept on site and by the Supply Agreement Leader.
- Contractor Maintenance (CM): the programmes for planned maintenance of some categories of specialist equipment (the sludge dryer, centrifuges, odour control equipment, odour control monitoring equipment, etc.) are generated regionally. Paper records of work carried out, completion and approval are kept on site and by the Supply Agreement Leader.
- Local Plant Monitoring (LPM): Specific monitoring (for example, hydrogen sulphide at some sites) is carried out by online instrumentation. Information is recorded on SCADA. The plant records (daily plant spreadsheet) are created by site operators and process scientists. Site operations staff are responsible for carrying out the tasks and FPMs for checking completion and quality.
- Contractors Records (CR): Records of sludge deliveries are recorded on site via an electronic logging system and reported monthly. Records are maintained on SCADA on site.
- Material Delivery and Removal: Records of sludge deliveries are recorded electronically. Chemical delivery records are maintained on site logs. Bulk chemical deliveries and consumption are also recorded.

Minor repairs and routine maintenance work are carried out continuously throughout the year during the working day, avoiding evenings and weekends, except in emergencies. Where possible, more major maintenance tasks are carried out in a planned manner according to priority and resources. Odour sensitive major maintenance tasks will be aimed to be undertaken during the winter period (between October and April), where appropriate. The emphasis in planning this maintenance work is to minimise the time required to carry out the work, ensuring as far as possible, that odours are contained or abated during the work, to ensure as far as is reasonable practicable, that odours are contained or abated during the work and to deploy alternative odour suppression or control systems, if required.

Where a high-risk maintenance operation is likely to release quantities of odour likely to be detectable off-site, the relevant authorities, and the Southern Water Regional Call Centre would be informed in advance.

Table 3 highlights the typical maintenance activities for the wastewater and sludge treatment processes.

Table 3: Typical maintenance for wastewater and sludge treatment activities

Process	Period	Typical maintenance activities
Preliminary treatment	Daily	Checks on plant and equipment as per operating plan.
	2-3 times / week	Removal of grit/screening skips.
	Weekly	Operational checks on screens, compactors, and associated equipment as per operating plan.
	Monthly	Checks by mechanical/electrical (M&E) engineers as per regional maintenance schedules.
	Annually	Maintenance of plant and equipment.
Primary Treatment	Annually	Drain-down of and repairs to the tanks.
Secondary Treatment	Daily	SCADA and Visual checks by operations personnel, checks of dissolved oxygen and bubble pattern along with daily sampling.
	Weekly	Clean and check dissolved oxygen probes.

	Dictated by operational performance	Drain and clean lane, replace failed diffuser membranes.
Sludge Import	Ad-hoc	Regular checks on deliveries and operation of exhaust extraction and ventilation, removal of skips from sludge and cess screens.
	Weekly	Routine checks on equipment. Tasks carried out and records maintained under the Site operating and monitoring plan.
	Monthly	Checks by M&E. Tasks carried out and records maintained under regional maintenance schedules.
	Annually	Checks by M&E. Tasks carried out and records maintained under regional maintenance schedules.
Sludge Storage	Daily	Monitoring of levels. Tasks carried out and records maintained under the Site operating and monitoring plan.
	Weekly	Visual inspection of plant & equipment. Tasks carried out and records maintained under the Site operating and monitoring plan.
	Dictated by operational performance	As required drain down and clean tank, inspect structure. Tasks carried out and records maintained under regional maintenance schedules.
Sludge Thickening	Daily	Routine daily checks.
	Weekly	Routine weekly checks and maintenance.
	Monthly	Maintain and adjust plant to maintain efficiency.
	Annually	Checks by M&E as per regional maintenance schedules.
Digestor and degassing tanks	Daily	Feed Volume, Temperature, Dry solids Test, and Visual Inspections (levels and Equipment) monitoring.
	Monthly	Checks of pressure relief valves and plant. Routine maintenance of systems.
	Annually	Checks and service of gas systems.
Centrifuge	Daily	Centrifuge check routine as advised by supplier.
	Weekly	Centrifuge check routine as advised by supplier.
	Monthly	Checked in line with routine service agreement by appointed service provider.
	Annually	Checked/Serviced every six months by appointed service provider.
Odour control units	Daily	Routine daily checks.
	Weekly	Inspection and maintenance routines in accordance with both the frequency and task specified in the regional maintenance schedules.
	Monthly	Inspection and maintenance routines in accordance with both the frequency and task specified in the regional maintenance schedules.
	Annually	Annual service by the Odour control service provider in line with contracted maintenance requirements.

4.2.2. Odour risk assessment

Unless it is in an emergency situation, an odour risk assessment will be undertaken before carrying out maintenance tasks with high odour risk and high odour sensitivity. Examples of such activities are:

- Shutdown of odour control systems for an extended period for maintenance.
- Non-routine draining down of large open process tanks with potential to generate odour.
- Lifting of odour control covers, opening of hatches or keeping doors of odour-controlled building open for an extended period.
- Commissioning of new odour sensitive processes or equipment where odour risk may not be adequately mitigated.
- Significant flow diversion outside odour-controlled processes for an extended period.

A flowchart to identify when an activity requires a separate odour risk assessment is provided in Appendix B.

An odour risk assessment matrix will be used to determine the odour risk for planned and unplanned maintenance work commonly performed. Where an unusual activity not contained in the matrix is planned, a site-specific risk assessment will be carried out according to a standard procedure. The matrix also includes foreseeable situations for emergency breakdown and situations arising as a result of dealing with an emergency where the ability to improve control of or minimise odorous release is compromised. The advice given by the odour risk assessment matrix will be followed, as appropriate, taking into account site conditions.

Table 4 provides an example of a risk assessment for routine maintenance operations, which are reviewed and updated at least annually. The key contact group (the Environment Agency and Southern Water Customer Services) will be informed for high risk activities, in relation to odour, at least 3 days before work is due to commence.

The Regional Control Centre (RCC) will be informed in advance of the nature and duration of maintenance work and measures to be undertaken when a significant odour risk is identified from the Odour Risk Assessment.

Table 4: Example of risk assessment for routine maintenance operations

Event	Implications	Odour Risk (High, Medium, Low)	Proactive Actions	Responsive Actions
Maintenance of processes within WTW	Opening of hatches, and exposure of process units to building.	Low	Processes contained with WTW which itself is odour controlled.	Minimise number of hatches open at any one time.
Maintenance on sludge treatment process (not biogas system)	Potential for odour release if any sludge exposed to atmosphere.	High	Divert or minimise sludge throughput in process area.	Carry out during winter months where possible, if required during summer use portable odour reduction sprays.
Maintenance on odour control system	Reduced capacity for period of maintenance risk of odour release if input peaks received	Medium	Control processes to minimise risk of high peaks of H_2S reaching odour control unit.	Carry out during winter months where possible, if required during summer assess need to use portable odour reduction sprays.

4.2.3. Abnormal conditions

Unanticipated breakdowns of equipment may occur which could require unplanned and emergency maintenance. During periods of abnormal conditions, the normal odour standard and emission standards may not be able to be fully complied with, and/or there may be fugitive emissions of odour from parts of the Site where there are normally none. Exemption would be required for these operations.

In the event of plant failures or emergency situations, this would raise an alarm on the Site SCADA or telemetry systems, which will be reacted to by on-site or regional control room operators and the FPM. Depending upon the nature of the fault or emergency, a mechanical or electrical technician, both of whom are on-call 24-hours, would be contacted and will attend site as soon as practicable if required. Where the on-call technicians are already engaged upon other response work, there is the facility to access staff from other Southern Water geographic divisions, coordinated by the FPM. All faults, breakdowns and emergencies are logged electronically together with records of the action taken and the solutions reached.

Table 5 provides an example of a risk assessment for abnormal and emergency operations, which are reviewed and updated as required. The key contact group (the Environment Agency and Southern Water Customer Services) are informed, for high risk activities, relating to odour, as soon as an event occurs.

Table 5: Risk Assessment for Emergencies and Abnormal Operating Conditions

Event	Potential source of odour	Potential impacts	Odour risk	Measures to prevent or minimise risk	Actions to be taken
Breach of odour-controlled area (excluding sludge containing structures)	Untreated air	Effectiveness of foul air extract system compromised, risk of odour release until repairs completed	Medium	Minimise odour generating activities in area	Temporary containment pending full repair Ensure any interconnecting doors etc secure Minimise odour generating activities in area Assess odour impact with local survey, use portable odour reduction sprays if requirement identified
Breach of odour-controlled area sludge containing structure	Untreated air	Effectiveness of foul air extract system compromised, risk of odour release until repairs completed	High	Review sludge handling operations divert or minimise for duration of breach	Minimise area exposed to atmosphere and surround with portable odour sprays as appropriate
Breach of biogas system/ loss of biogas containment	Leaks from membrane	Uncontrolled release of biogas, risk of odour release until repairs completed Double membrane system with gas pressure between the membranes regulated and monitored Methane detectors operated with alarms to alert operators of any leakage	High	Minimise activities for duration of containment loss	Minimise sludge processing, divert to controlled release point via the combined vacuum and pressure release valve Surround with portable odour sprays as appropriate Diversion of biogas to CHP plant or Waste Gas Burner Inspection maintenance and repairs as appropriate Record details and actions taken in site diary Report to the Environment Agency Emergency response from gas maintenance contractor
Failure of odour control plant	Untreated air	High risk of release of abnormal operational	High	Routine maintenance	Assess need to use portable odour reduction sprays

		odours direct to atmosphere until repaired		Regular monitoring of equipment performance Duty standby functionality Standby capacity in the media beds Emergency call to odour system maintenance contractor Control processes to minimise risk of high peaks of H_2S reaching odour control unit Design provides for degree of redundancy	Investigate and repair
Spillage of sludge on site	Liquid sludge	High risk of odour until cleaned up Low volume spillage likely to go directly to drain which returns to the WwTW for treatment	High	Regular site inspections and monitoring the system through SCADA to detect any spills Priority to clean up as and when detected Pipe work and tanks undergo regular inspections Planned maintenance on equipment	Stop source of spill and immediately wash down area Repair or bypass if possible. If incident prolonged use portable odour sprays until cleared. Record spillage and actions taken in site diary
Sludge thickeners	Sewage sludge	Thickeners are enclosed and air extracted to Odour Control Unit	Medium	Sludge dosed with polymer as required	
High pressure conditions in digestors	Release from Pressure Relief Valve	Biogas would be vented at high pressure to aid dispersion	Medium	Gas pressure is regulated and monitored	Diversion of biogas to Waste Gas Burner Record details and actions taken in site diary
High pressure conditions in biogas holder	Release from Pressure Relief Valve	Biogas would be vented at high pressure to aid dispersion	Medium	Gas pressure is regulated and monitored	Diversion of biogas to Waste Gas Burner Record details and actions taken in site diary

Sludge reception unit roller shutter door failure	Release from behind the shutter door in sludge reception	Effectiveness of odour control measures compromised, risk of odour release until repairs completed	Medium	Minimise sludge reception activities until repairs have been completed	Record details and actions taken in site diary
Failure of treatment process	Release from untreated sludge	Risk of odour from incomplete biological treatment until plant recovery achieved	Medium	Process monitoring and having closed covers. Immediate involvement of process support team to identify cause of process failure and aid recovery	Assess need to use portable odour sprays spread around process unit
Prolonged hot and dry period	High strength / septic sludge	Potential for septicity to develop throughout the works Issues with temperature sensitive components	High	Increased monitoring. Planned maintenance on equipment	Record details and actions taken in site diary
Very high rainfall	Flooding causing failure of odour control equipment	Flooding on site causing failure of equipment	Low	Increased monitoring. Installing new equipment above water levels, if known to be an issue on site Planned maintenance on equipment	Check the performance of the Odour Control Unit when water levels drop and replace media as required (if media has been flooded it may need replacing)

5. Monitoring

5.1. Routine site observation monitoring

As part of the general operation of the Site, control room operators monitor the SCADA outputs on a routine basis, in order to ensure that individual process units on and off the site are performing within specification. In the event of an out-of-specification plant item or an alarm being initiated, appropriate remedial actions would be instigated and this is dealt with in subsequent sub-sections.

5.1.1. General duties

Operators shall carry out routine duties according to the relevant operational and maintenance schedules and procedures to ensure effective operation of plants. Specific tasks include:

- Perform daily, weekly and monthly maintenance tasks as scheduled
- Make regular observation of critical processes and equipment including odour sensitive and odour control systems
- Carry out routine performance tests and recording
- Order and take deliveries of chemicals and other consumables
- Report performance issues or equipment problems promptly to Process Scientists, Mechanical & Electrical (M&E) technicians, Instrumentation, Control & Automation (ICA) technicians or Specialist Contractors as appropriate.

5.1.2. Duties for odour control

Operators shall carry out the following tasks:

- Undertake and record any inspections in the site diary, along with any actions undertaken
- Investigate odour complaints following the Complaints Procedure as shown in Appendix D
- Record actions taken in respect of odour investigations
- Conduct weekly sniff tests
- Record and report incidents that caused significant odorous emission
- Produce other records as required by the OMP
- Undertake the site odour monitoring and controls listed in Table 6.

Table 6: Site odour monitoring and control processes

Potential Odour Source	Routine Actions Required	Monitoring Frequency	Attention Level	Action level	Preventative Action
STW Inlet & pumping station	Check condition of sewage entering works for unusual odours	Every site visit	Increased Odour from sewage	Noticeable odour from sewage	Take sample and get analysed for BOD, COD etc. Check consented discharge
Inlet Screen	Check screen for build-up of rag & fat Clean weekly	Every site visit	Increased odour from screen Build-up of rag & fat on/or around screen	Noticeable odour from screen Large build-up of rag & fat on/or around screen	Clean inlet screen and remove rag and fat from equipment
Screening and Grit skip	Skips containing screenings and grit will be covered Filled skips will be removed from site as soon as is practicable Spilled screenings and grit will be cleared as soon as possible	Every site visit	Increased odour from skip – based on sniff testing	Noticeable odour from skip	Consider covering skips
Raw sludge reception	Avoid excessive turbulence (open tanks) Ensure doors are closed before discharging or unloading Connect foul air exhaust to hose before loading Ensure vehicles cleaned after loading/unloading Hose down any spillage after each load/unload Clean contaminated wheels before leaving site Doors closed after unloading/discharging	Every site visit			

Storm tanks	Empty and wash down after storm event	After every storm event	Tanks full 2 days after storm event	Tanks full 5 days after storm event	Empty and wash down ASAP
PSTs	Remove fat/scum Maintain auto de-sludge system to maintain frequency Log sludge blanket levels	Every site visit	Rising sludge Bubbling on surface Sludge blankets < 3m below surface	Large amounts of rising sludge Bubbling Increased odour Aqueous sulphide level = > 5.0ppm	Increase de-sludge frequency Spray surface to remove scum
Aeration lanes	Check for unusual odours or growths	Every site visit	Investigate unusual odours	Investigate and report unusual odours to TM/Scientist	Regular checks and investigative action
ASTs	Check for strong and uncharacteristic odour Regular observations will be made on biological trickling filters to detect faults such as failed distribution arms, uneven distribution, blockage of drainage or surface ponding	Every site visit	Deviation of MLSS levels from norm	Significant deviation of MLSS levels from norm	Routine sampling and review of sample results against DO levels, suspended solids, and influent strength
FSTs	De-sludge frequently Remove fat/scum	Every site visit	Rising sludge Bubbling on surface	Large amounts of rising sludge Bubbling Increased odour level	Increase de-sludge frequency
Cake Storage (pad/silo)	Check that no cake has been tipped on the pad	Every site visit			Make provision to recover any cake to skips and inform relevant authorities of infringement
Lime dosing for stabilisation of cake after prolonged rain	Dose lime only when necessary Monitor odour during liming	After prolonged rain	Increased odour from sludge / lime	Noticeable odour from sludge / lime	Halt liming until odour reaches acceptable levels
Transportation	Ensure only sealed or covered skips/trailers used				If necessary implement special odour mitigation

	No removal of covers whilst parked witing to load/unload Monitor odours during cake loading				measures to reduce the risk of odour nuisance Make contractor aware of requirements in OMP
Sludge holding tanks	Minimising retention time Monitor odour levels around tank	Every site visit	Increased odour from tank	Noticeable odour from tank	Increase sludge treatment rate to reduce retention Hose spillage's Increase de-sludge ops up stream Run odour masking system (Short term)
Sludge thickening/ blending	Minimise retention prior to thickening, dewatering or digestion; Discharge sludges and liquors, including imported sludges, to covered tanks, with displaced air passed through an Odour Control Units; Air mixing of sludge storage tanks, to ensure aerobic conditions to minimise the production of odours; Prevention of sludge accumulation in off-line tanks; and Proactive identification of potential problems and tankering of sludges to other sites with odour abatement.	Every site visit	Increased odours from area	Noticeable odour from area and/or complaint received	Undertake process in enclosed building with appropriate odour abatement
Secondary Digesters	Check for strong and uncharacteristic odours	Every site visit	Investigate unusual odours	Investigate and report strong/unusual odours to FPM and Scientist	Regular checks and investigative action
Centrifuge	Check for strong and uncharacteristic odours	Every site visit	Investigate unusual odours	Investigate and report strong/unusual odours to FPM and Scientist	Regular checks and investigative action

	Check polymer dosing	Weekly	Polymer dosing rates exceeds set limits	Polymer dosing exceeds upper or lower threshold limits	Take remedial action to return polymer dosing to correct rate
Gas Flare Stacks	Complete biogas combustion should give clean emissions with blue or non-visible flame	Weekly	Occasional orange flame or black smoke visible	Constant orange flame or black smoke visible	Routine M&E checks or maintenance to clean nozzles of carbon build-up
Whessoe valves on digesters	Check they are clear from foam residue	Monthly		Not seating correctly	Engage service contractor to resolve any problems
OCU	Check pH Check media condition	Weekly	pH>3	pH >3 Sudden drop in performance	Ensure media damp Change media as per schedule
Whole site	Doors to operational buildings will remain closed and hatches will be latch closed.	Every visit	Increased odours		Doors and hatches will only be opened for minimum periods while access is required for planned operational and maintenance activities.

5.1.3. Visual and olfactory inspections

There will be a weekly walkover survey incorporating a “sniff-test”. Sniff testing will be undertaken at the security fence boundary, starting at an upwind location. Where possible, the sniff testing will be carried out by a person who is not accustomed to the odour generated by on site activities i.e. a person who has recently entered the site boundary such as an FPM.

Results of the sniff test will be recorded in the site diary or appropriate form. Sniff testing is designed to detect any abnormal plant odour emissions. In addition, it is important to document any potential contribution from other off-site sources of potential odour nuisance located outside of the facility boundary.

In the event that abnormal plant odour is detected, the source of the odour will be investigated, as appropriate, and remedial action taken, as necessary, following measures addressed in the OMP. The approximate extent of the downwind odour will be established to determine whether this reaches the downwind post and rail fence boundary. During maintenance and/or emergency conditions which are likely to result in release of odours, the frequency of “sniff-testing” will be increased to daily, or more frequently as appropriate.

Actions for remediation will be assigned by the FPM following the issue of an odour record. Once actions are completed, additional sniff tests at least once a day for minimum three days at the source of the odour will be carried out to determine whether further actions are required. Whereby odour is no longer detected the record will be closed. If odour remains the OMP and maintenance records will be reviewed to determine alternative actions to be taken, this process will continue until the odour issue is no longer on-going.

5.1.4. House keeping

Good housekeeping improves efficiency, creates a pleasant environment to work within and makes the site less likely to cause odour nuisance. Operators have a responsibility to keep sites clean and tidy. The “Top 10 Tips to Minimise Odour Impact” will be communicated to the site.

- Ensure that your odour control plants are fully operational & maintained.
- Keep all Doors and Hatches latch closed at all times to contain odour.
- Clean up debris / spillages as soon as practicable.
- Monitor sludge levels within Primary Treatment to avoid septicity.
- Hose down and clean process Tanks / Channels after draining.
- Monitor Digesters / Whessoe Valves & Gas Flares.
- Report any Odour activity caused by Contractors to your Senior Manager.
- Where possible, don’t undertake Odour sensitive work if it cannot be completed before or continued during the weekend.
- Follow business procedures and respond to all odour complaints.
- If you See it, Smell it, do something about it. (DON’T IGNORE IT)

Additional reminder signs will be displayed in prominent positions at sites where open doors, covers and skips present an odour risk and include:

- Keep all doors shut
- Keep all covers / lids latch closed
- Clean up spills immediately using disinfectant if required
- Monitor odour control systems
- All rubbish / waste to be disposed of immediately to relevant skip

5.1.5. Meteorological observations

Southern Water will record daily in the site diary the following meteorological data:

- Air temperature
- Relative Humidity
- Wind Direction
- Wind Speed
- Rainfall

Meteorological data will be reviewed in advance of activities that may present an odour concern, such as movement of sludge cake, to consider suitable measures to reduce or limit odour. For example, time such activities when wind speed is low (if possible).

Meteorological data will also be available to complete odour records to establish potential trends.

5.1.6. Spillage management

All staff on site have a responsibility to maintain good housekeeping and clear spillages at the earliest opportunity to prevent odour. If a spillage occurs from a process, operators will carry out clean up as soon as possible (using disinfectant, where necessary). If a spillage is caused by a lorry or tanker, the driver is responsible to clean up before leaving site. If a lorry or tanker left a spillage behind, operators will log and report any incident observed. The driver or company involved will be asked to return to the site immediately to clean up. Significant spillage incidents will be recorded in the site diary.

Key areas at risk from spillage (and the control measures):

Sludge reception area

- Tanker drivers responsible for cleaning up spillages after every load. Hose is supplied

Cake bay area

- Drivers are responsible for cleaning up spillages after every load.

Inlet works

- Spillages around the inlet area must be cleaned up immediately after spillage

Digester

- Anti-foam used to suppress foaming of sludge within the digester or dewatering process.

Entire site

- Routine site inspections by FPM and site manager – a minimum of once per month

5.1.7. Accident management

The key procedures relating to environmental accident and incident management is set out in Southern Water's ISO14001 accredited Environmental Management System.

The relevant procedures in the EMS relating to environmental accident and incident management includes:

- EMS234 – Chemical and oil storage
- EMS240 – Nuisance management
- EMS260 – Pollution prevention
- EMS275 – Emissions to air
- EMS308 – Site housekeeping checklist
- EMS340 – Nuisance management procedure

- EMS341 – Air quality/odour management procedure
- EMS360 – Pollution prevention procedure
- EMS363 – Procedure for managing oil spills on sites
- EMS364 – Lime spill management
- EMS381 – Operational waste procedure
- EMS387 – Procedure for the acceptance of tankered commercial waste
- EMS388 – Waste permit breaches and near miss reporting procedure

5.2. Monitoring of the odour abatement system

Table 7 identifies the parameters and monitoring requirements in relation to the odour control system that needs to be undertaken at the site.

Table 7: Parameters and monitoring requirements in relation to the odour control system to be undertaken at the site

Emission point type	Parameter	Monitoring frequency	Monitoring standard or method
Channelled emissions to air (biofilter and scrubbing system)	Ammonia	Once every 6 months	As per design and manufacturer's specifications EN ISO 21877 or otherwise as specified in the Environmental Permit
	H_2S		CEN TS 13649 for sampling NIOSH 6013 for analysis or otherwise as specified in the Environmental Permit
	Efficiency checks	Annual	Annual maintenance undertaken by service provider, or otherwise as specified in the Environmental Permit
	Gas stream flow	Continuous	As per design and manufacturer's specifications
	Overall operation, including air circulation	Daily	Visual assessment or otherwise as specified in the Environmental Permit

6. Training

6.1. Staff training

Southern Water provides a comprehensive programme of Health and Safety and operational awareness training which is carried out for new starters and as an ongoing programme of refresher courses.

All new starters receive a comprehensive programme of health and safety training and on-going refresher courses. All staff receive induction and on-the-job training to cover operations at the site. On the job training is provided to all staff through a rolling training programme.

Training on the following technical subjects relevant to odour control will be provided to operational staff according to needs and site requirements:

- Wastewater treatment processes.
- Sludge treatment processes.
- Checks for odour control equipment.
- Risk assessment of odour sensitive maintenance activities.
- Deployment of temporary odour control measures, for sites where these are present.
- Site requirements in relation to the Odour Management Plan.

The training needs of each individual are assessed during personal performance appraisal and reviews.

Formalised training for all grades of staff on the site is undertaken relevant to job role. All staff are made fully aware of the need to be constantly vigilant with regard to site odour control and management procedures.

Records for training received by all staff are held electronically. Records of environmental training are kept with Southern Water EMS.

Relevant components of the OMP should form part of the induction process for all site staff and contractors, to ensure they are aware of the procedures and responsibilities in relation to odour.

7. Communication

The objective of communication in odour management is to raise the profile and awareness of the importance of odour control and to keep stakeholders informed of odour incidents and management practices. Appendix C provides an example of an awareness raising instruction.

7.1. Internal communication

Odour control will be regularly included by FPMs as an agenda item for team meetings.

Statistics of odour complaints and progress of actions to address odour issues will be updated monthly and communicated to Wastewater and Network Area Managers and other key personnel with odour management responsibilities.

7.2. External communication

Southern Water is committed to work closely with stakeholders to achieve sustainable reduction of odour nuisance. Southern Water is committed to making available relevant records and information to regulatory and local stakeholders, where appropriate, and communicating and engaging, in advance, with stakeholders where appropriate, any relevant activities that may generate odours.

7.3. Reporting

Southern Water will send all reports and notifications required by the Environmental Permit, or upon request by the Environment Agency, within the given timescales.

7.4. Complaints management and resolution procedure

All customer complaints about odour are stored in the Southern Water Customer Services Management System (CSMS). The details of the complaints procedure are provided in Appendix D.

8. Reviews and Auditing

8.1. Reviews

8.1.1. Periodic reviews

A review of this OMP will be carried out by the FPM every four years, unless agreed otherwise, and in accordance with the Environment Agency's H4 guidance (or current existing guidance should this change).

8.1.2. Ad-hoc reviews

This OMP will be reviewed when any significant changes in operational practice are made and on completion of any capital scheme which could impact the OMP.

8.2. Auditing

The regulatory authorities, where required, will be provided with reasonable access to audit the implementation of the OMP upon request.

8.3. Records

The following records will be maintained:

- Record of complaints are stored on CSMS;
- Reports of investigations are held electronically; and
- Odour issues which require a capital scheme to be raised to resolve them.

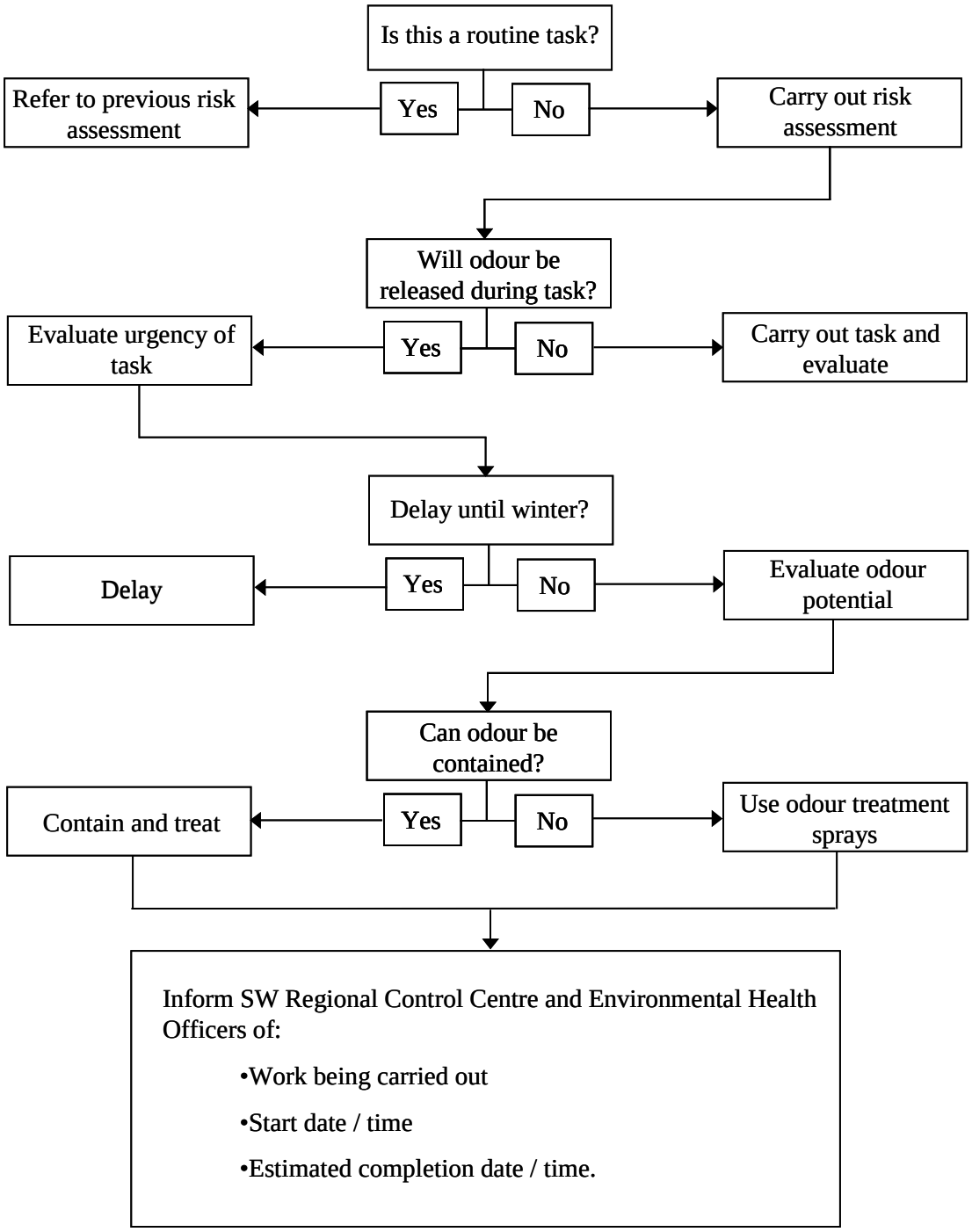
A. Odour Checklist

Area of works	Potential issue		Follow up action
Odour management plan (OMP)	Is the site operated according to t he OMP?	YES / NO	Make changes to site operation to minimise odour production and release
Site - general	Are all covers in place?	YES / NO	Replace covers and close hatches as required
	Are all access hatches closed?	YES / NO	
Inlet works	Is the crude sewage black and/or smelly?	YES / NO	Check incoming sewage for septicity (in communication with Operations Support Team)
			Contact Industrial Waste to check for potential septic discharges
Screening	Are there any spilled screenings?	YES / NO	Clean up spills
	Are the compacted screenings cle an	YES / NO	Optimise operation of screenings handling equipment
Grit removal	Is there any spilled grit?	YES / NO	Clean up spills
	Is the grit clean	YES / NO	Optimise operation of grit handling equipment
Screening and Grit Skips	Do the screening skips smell?	YES / NO	Check that screenings are clean and free from organic material;
	Do the grit skips smell?	YES / NO	Check that grit is clean and free from organic material; optimise grit cleaning system if needed
	Are the screenings skips too full?	YES / NO	Empty skip(s)
	Are the grit skips too full?	YES / NO	Empty skips as needed
Storm tanks	Have the storm tanks been left full following a storm?	YES / NO	Empty and clean out tanks as needed
	Is there any sludge left in the bott om of the tanks?	YES / NO	
Primary tanks	Are the tanks black and / or smell y?	YES / NO	Check inlet for septicity

Area of works	Potential issue		Follow up action
	Are the tanks gassing?	YES / NO	Check levels of sludge in the tank and increase de-sludge rate if needed.
	Is there excess scum on the surface	YES / NO	Remove excess scum
Biological filtration	Are the aeration vents blocked?	YES / NO	Unblock aeration vents
	Is there any ponding?	YES / NO	Consider increasing flushing rate and/or forking media
Activated sludge	Do the dissolved oxygen levels in the aeration lanes match the setpoint(s)?	YES / NO	Adjust dissolved oxygen levels as required
	Do the MLSS fall within the timelines for the site?	YES / NO	Increase / decrease RAS rate as needed
Final tanks	Are the tanks black and/or smelly	YES / NO	Check inlet of tanks for septicity
	Are the tanks gassing?	YES / NO	Check levels of sludge in the tank and increase de-sludge rate if needed
	Is there excess scum on the surface	YES / NO	Remove excess scum
Tertiary treatment	Any there any site-specific issues?	YES / NO	Investigate and rectify
Sludge treatment	Are there any sludge spills?	YES / NO	Clean up spills
Imports and Exports	Does the tanker filling and emptying process cause significant release of odour?	YES / NO	Investigate whether the process can be modified to reduce odour emissions
			Consider changing timing of tanker operations to reduce nuisance potential
Sludge Thickening and Storage	Are all covers in place?	YES / NO	Replace covers and close hatches as required
	Are all access hatches closed?	YES / NO	
	Are the doors to sludge treatment buildings / sludge cake stores kept closed?	YES / NO	Close doors as required
Anaerobic Digestion	Is all excess gas flared?	YES / NO	Contact contractor to investigate
	Is flare stack ignition immediate and reliable?	YES / NO	
	Are the whessoe valves / PRVs operating prematurely?	YES / NO	
	Are the seals on the condensate traps intact?	YES / NO	

Area of works	Potential issue		Follow up action
Odour abatement	Is there any detectable odour downwind of the stack?	YES / NO	Check Odour Control Unit using additional checklist
	Is the fan(s) working?	YES / NO	Arrange for fan to be repaired
General	Are there any outstanding actions from a previous investigation?	YES / NO	Complete actions

B. Risk Assessment Flowchart



C. Awareness Raising Instruction

Failure of plant that may result in an odour nuisance

All Process Operations staff must ensure that if a failure of plant, equipment or a system occurs, which may lead to complaints from customers, that the Regional Control Centre/Customer Services are informed in a timely manner.

Listed below (but not limited to) are some examples of the type of incident that are to be reported.

- Odour control plant failure
- Spillage of wastewater/sewage
- Spillage of sludge or sludge cake
- Failure of chemical dosing systems
- Odour monitoring equipment failure
- STC flare stack ignition failure
- Liming
- Removal of cake from the site

If the RCC or Customer Services are made aware of the problem, it means that they give a more constructive response to the person making the enquiry/complaint.

- In normal working hours contact Customer Services on 01903 272685
- Outside normal working hours contact the RCC and request information is added to the 24-hour report.

Every effort must be made to carry out the above request, a short phone call to share information with colleagues dealing directly with the Customer will greatly help them deliver a more valid and informed response.

Be proactive, not reactive!

D. Complaints Management

D.1 Management of odour complaints

D.1.1 System overview

Southern Water operates an integrated process to receive and record odour complaints by members of the public. It is designed to ensure complaints are dealt with promptly and consistently and a comprehensive record is kept. The following system ensures these objectives are achieved:

- A unique and recognised point of contact for members of public and Southern Water staff to report odour incidents and issues
- A straightforward process for operational staff to investigate and mitigate odour issues after a complaint is received.
- A recognised point to provide feedback to customers
- A mechanism to review recent odour complaints and actions
- A database to capture trends and potentially serious problems to guide future improvement

The following sections describe how odour complaints are received and handled. This procedure may be augmented by local arrangement to provide a tailored service to meet local council requirements.

D.1.2 Receipt of odour complaints

The Customer Services centre is the first point of contact for members of the public to report odour incidents during normal working hours.

The Regional Control Centre can deal with odour complaints out of hours.

When a member of the public phones in to report odour from a Southern Water site, relevant information will be taken from the caller, including name, phone number, address, time, duration, the characteristics of the odour experienced and whether the customer would like to receive a feedback by phone. Each call is assigned a unique CSMS number. The information is entered into the CSMS Database under a designated sort code.

Verification of the complaint is made through identification of the caller's property and the Southern Water site in question on electronic GIS maps. Following verification, a CSMS summary sheet is generated and transmitted immediately to the relevant FPM.

Where odour complaints are received directly by other Southern Water staff, the receiver of the call will contact Customer Services to log the call on behalf of the caller. The caller will be provided with the telephone number for Customer Service for future use.

All CSMS records of odour complaints are stored in the Corporate Information System to ensure transparency, visibility and consistency of the information.

D.1.3 Follow up actions

Initial action by Field Performance Manager

The FPM upon receiving a CSMS summary of odour complaint will investigate the issue as soon as practicable. Based on the sensitivity of the site, the investigation may range from remotely checking the site alarms to the assignment of an operator to conduct a site investigation. Site investigation will be guided by and recorded on a site odour incident form if available or on a generic Odour Risk Checklist. Where possible, actions will be undertaken by the operator to improve control of odour emission. Following the investigation, the FPM or the investigator will forward the findings to the Customer Liaison Officer during normal working hours or to the FPM at other times. If required in the site specific OMP, FPM will also produce reports to the regulator within an agreed time period.

Feedback to the customer by Customer Liaison Officer or Field Performance Manager

Unless the customer had indicated that they would not wish to receive a feedback, a feedback will be provided at the earliest opportunity by the Customer Liaison Officer during normal working hours or by the FPM at other times. The Customer Liaison Officer or FPM will then close the CSMS call.

Action by Process Scientist

If requested by a FPM, a process scientist will carry out a further investigation where a site has received reoccurring odour complaints. Process scientists will advise FPMs of available options to mitigate odour, e.g., re-adjusting sludge disposal activities or process parameters. Process scientists will provide technical support if such measures are adopted. Process scientists will produce a written report for each investigation and follow up any further actions.

Action by Southern Water Managers

Managers will carry out regular reviews of odour complaints to all Southern Water sites and inform relevant FPMs where a trend is developing. Southern Water Managers will deploy additional monitoring resources where necessary to support the resolution of significant odour issues.