Millbrook STC

Odour Management Plan

790101_ERA_OdourMP_MIL

December 2024

V4

from Southern Water

Contents

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
1	June 2022	Olivia Ellson	Shannon Stone	Anita Manns	Version 1
2	February 2024	David Vargas	Shannon Stone	Anita Manns	Version 2
3	July 2024	Amelia Luk	Shannon Stone	Anita Manns	Version 3
4	September 2024	Amelia Luk	Shannon Stone	Anita Manns	Version 3 – minor changes made
5	December 2024	Claire Cowdrey	Claire Cowdrey	Anita Manns	Version 4 update for resubmission

Document reference: 790101_ERA_OdourMP_MIL December 2024

Information class: **Standard**

1. Odour Management Plan

1.1. Introduction

The Odour Management Plan (OMP) for Millbrook Sludge Treatment Centre (STC) and Slowhill Copse sludge reception (SHCSR) (both facilities collectively referred to as 'the Site') has been developed with assistance of Mott MacDonald on behalf of Southern Water Services ('Southern Water' or 'the Operator'). The OMP is 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 with which operations shall comply. It demonstrates how odours shall be managed and controlled to prevent odour impacts from activities during normal operation and during abnormal events.

This OMP has been produced in accordance with the Environment Agency's H4 Odour Management guidance[1], Best Available Techniques (BAT) Reference Document for Waste Treatment[2] and Appropriate measures for the biological treatment of waste[3].

1.2. Objectives

The OMP identifies potential odour emissions from site operations and identifies procedures to manage, control and minimise odour impacts. The plan 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 conditions.

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

- A description of the Site and catchment, including potential 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
- 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
- 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

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

[2] Joint Research Centre (2018) Best Available Techniques (BAT) Reference Document for Waste Treatment. Available online at: https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/JRC113018_WT_Bref.pdf

[3] Environment Agency (2020) Appropriate measures for the biological treatment of waste- Consultation draft July 2020. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/898966/Appropriate_measures_for_the_biological_treatment_of_waste_-_consultation_document.pdf

- 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
- 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 potential odour sources and the risks to receptors. It outlines the measures Southern Water will employ on a daily basis and how Southern Water will respond 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 (O&M) manual and Environmental Management System (EMS) 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 annually as a minimum, or as requested by the Environment Agency. The OMP is incorporated into the Site's EMS.

1.3. Site Location

Millbrook Wastewater Works (WTW) and Sludge Treatment Centre (STC) is located within the Port of Southampton, approximately 3.4km west of the city of Southampton, Hampshire. The WTW was built in in the 1960s. The Site's catchment serves parts of Southampton City.

Site address: Millbrook Wastewater Treatment Works, Western Docks, Millbrook, Hampshire, SO15 0HH

National grid reference: SU 38755 12378

The SHCSR is situated on Bury Road which approximately 1.1km to southeast of the Site. The SHCSR is bordered by green spaces to the east, south, west, and River Test.

Site address: Slowhill Copse Wastewater Treatment Works, Bury Road, Marchwood, Southampton SO40 4UD.

National grid reference: SU 38396 11159

The Site layout and location plan is shown is shown in document reference 790101_MSD_SiteLayoutPlan_MIL&SHC December 2024.

1.4. Best Available Techniques

This document reflects the existing arrangement at site and any commitments Southern Water has already made during the ongoing application process. It is acknowledged that it does not fully meet BAT in some instances. Changes to site will be undertaken and completed to meet BAT, where applicable. The changes required will be submitted to the Environment Agency, in plans to be submitted as part of Improvement Conditions within the permit, for their agreement and Southern Water's subsequent implementation.

As the changes are implemented the documentation will be updated to reflect the changes made to meet BAT.

The OMP addresses the following BAT:

- BAT 1: Environmental Management System to include the Odour Management Plan
- BAT 10: periodically monitor odour emissions
    - Section 5 addresses monitoring
- BAT 12: Implement and regularly review an odour management plan, as part of the environmental management system, including protocols for:
    - Actions and timelines (addressed in Section 4.2 and 5)
    - Conducting monitoring (Section 5)
    - Response to identified odour incidents (Section 7.4 and Appendix G)
    - Odour prevention and reduction (Section 4, 5 and 6)
- BAT 13: Reducing odour emissions through the use of techniques: addressed in Section 4
- BAT 14: Reducing diffuse emissions to air, addressed in Section 3.2
- BAT 33: Reduce odour emissions through pre-acceptance, acceptance and sorting the waste addressed in 790101_MSD_DutyofCare_MIL June 2024.
- BAT 34: Reduce channelled emissions, addressed in Section 4.1.
- BAT 53: Reducing emissions of hydrochloric acid (HCl), ammonia (NH_3) and organic compounds to air in Section 4.1.

This OMP is applicable to the permitted area only and any mention to the wider WTW is for context only.

2. Site Operation

2.1. Overview of Site operations

The Millbrook WTW is operated under the Urban Wastewater Treatment (England and Wales) Regulations 1994 and has a standalone Water Discharge Activity Environmental Permit, this will remain an independent permitted activity. The Millbrook STC operation is a non-hazardous waste activity which is currently carried out under registered a T21 exemption. The site also holds an environmental permit EPR/CP3535XU for a Tranche B specified generator (Combined Heat and Power unit, CHP) and Tranche A CHP, both utilising biogas to generate electricity, and two auxiliary boilers.

The SHCSR has a bespoke permit (EPR/GP3792HY) for the import of tankered waste including sludges and cess.

Millbrook STC handles waste derived from the wastewater treatment process, either indigenously produced on-site or imported from other Southern Water owned assets. The Site directly receives raw sludge cake derived from the wastewater treatment process into its dedicated cake reception area, and raw sludges via a pipeline from SHCSR.

The primary permitted installation activity will be the AD treatment facility. The AD facility will treat indigenously produced and imported sludges. 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.

2.2. Summary of the STC components

Currently the Millbrook STC accepts both indigenous and imported sludge and cake wastes derived from the wastewater treatment process. On average, overall, the permitted area accepts 32 tankers containing tankered waste – sludges and cess – per day. This consists of approximately 19 tankers per day of liquid sludge imports, and an average of 13 tankers of imported cess. All imported liquid waste and sludges are transported in enclosed tankers. The Millbrook STC has up to five 20 tonne lorries delivering raw sludge cake per day. Sewage sludge is directly imported via pipework from Slowhill Copse SR and WTW.

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

2.2.1. Slowhill Copse sludge reception

SHCSR serves as a liquid sludge transit centre, receiving around 3477m^3 per week of liquid sludge from local sites. Tanker imports, including raw and digested liquid sludge, enter the SHCSR via the sludge import reception.

The import of digested sludge into Slowhill Copse is required as a contingency arrangement for a periodically occurring issue at Fullerton.

Slowhill Copse sludge is digested at Millbrook and if required the cake produced is sent to Fullerton and stored in cake bays for maturation.

During extended periods of heavy rain the cake bay drains at Fullerton can become blocked from cake washing out from bays, removing the sludge and transferring to Slowhill significantly reduces the risk of overtopping and release to the environment.

This is planned to be resolved through a combination of measures including IED-related drainage improvements and provision of cake bay covers through a WINEP scheme (which may also required additional IED-related scope subject to the outcomes of the ongoing RBP testing).

The sludge is drawn-off to a tanker and taken to Slowhill Copse where it is received to the sludge reception point. The sludge ultimately returned to the digestion process at Millbrook and returned as cake.

This is acknowledged to be an inefficient solution and remains under review regarding further interim measures for improvement ahead of the planned capital investment.

This is a small proportion of the overall STC throughput and is considerably preferential to the risk of a release to environment.

At the reception point, co-settled primary sludge and imported sludge passes into 3 No. unscreened sludge holding tanks (total volume 5,999m^3) before being screened by 2 No. strain presses. Screened sludge is then pumped to 2 No. post screened sludge tanks (PSST) (1,141m^3 each) before being pumped to Millbrook STC for treatment. As some of the imported sludge is already partially thickened and liquid sludge is pumped off site, minimum sludge decants, or liquor are returned during normal operation at SHC.

Sludge is screened and pumped by a sludge pumping station at SHCSR via a sludge rising main to Millbrook STC. 8,200m^3 of additional sludge storage capacity is provided at SHCSR. This helps to balance the sludge throughput at Millbrook STC. Millbrook serves as a regional STC, accepting both indigenous and imported primary sludge and raw sludge cake for anaerobic digestion, which is received in the sludge cake reception and blending facility.

The inlet screens, cess reception system, all sludge holding tanks and the sludge pumping station wet wells, are covered and odour controlled by a biofilter system.

2.2.2. Sludge treatment at Millbrook STC

Reception and screening of indigenous, imported sludge and sludge cake

The Millbrook STC handles sludge from SHCSR, which serves as a sludge terminal receiving sludge from the New Forest area by tankers. Sludge is stored, screened and pumped by a sludge pumping station at SHCSR via a sludge main to Millbrook STC. Millbrook STC has a sludge cake reception and blending facility which receives approx. 90m^3/week. Imported sludge makes up 71% of the sludge loads to the STC.

Imported pumped sludge is screened at SHCSR and is discharged directly into the post screening storage tanks (PSSTs) at Millbrook.

Sludge storage

Indigenous and imported sludge are pumped through 3 No. sludge screens and stored in 2 No. post screened storage tanks (PSST) (2,500m3 each). Pumped sludge from SHCSR is discharged directly into the PSSTs). This screened sludge is fed to 2 No. belt thickeners and dosed with flocculant polymer.

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 contain odorous air for treatment.

Thickened sludge with 7-8% total dissolved solids (TDS) is stored in 2 No. thickened sludge storage tanks (TSSTs) (639m^3 each) where it is mixed with imported cake.

Liquor from the thickening process is returned to the WTW for further treatment.

Digesters

Thickened sludge is fed to 4 No. anaerobic digesters (total volume 10,751m^3), operating between 33 to 38º C. Sludge is left to digest for an average of 23 days at this Site. The AD 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, which is a double skinned, expandable, hemispherical container. A biogas flare is provided for periods when, for example, the CHP 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. Opening of the pressure relief valves is an emergency response of the system to maintain safety and would be rare, short-lived events. 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 Unit (CHP)

Biogas produced by the digestion process is stored in a double skinned gas bag (1,040m^3). Biogas is fed to the 2 No. CHP plants (2.02MWth and 3.23MWth) where it is used to generate heat (i.e. to control the temperature of the digestion process) and electricity to power the STC's electrical equipment and processes. The CHP units have an aggregated thermal rated input of 5.25MWth. Excess biogas is burned off in the flare.

Post-digestion

Digested sludge discharges into 2 No. post digestion storage tanks (PDST) (535m^3 each) from where it is fed to 3 No. centrifuges for dewatering.

Dewatering

Lime is dosed into digested sludge before the centrifuges to achieve required sludge quality for recycling. The liming plant is now operational and has a storage capacity of 30m^3.

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

The centrifuges are maintained as part of the framework maintenance contract which also provides an emergency response.

Cake storage

Digested cake is stored in a silo (240m3) and transported by covered skips to recycle to agricultural land. When the silo is not in operation, an alternative cake bay (a skip within the building housing the conveyor) (max 15 tonne) is used and removed from Site.

Liquors

Liquors from the STC are pumped from the liquor buffer storage tank (572m^3). No treatment takes place within this tank. From here the liquors are pumped, by the liquor pumping station, upstream of the primary settlement tanks.

Odour control equipment

At Millbrook STC, odour control is provided for the sludge reception tanks, cake blending building, PSSTs, gravity belt thickeners, thickened sludge storage tanks (TSSTs) and centrifuges. Foul air is treated by one caustic and hypochlorite wet chemical scrubber with an odour removal efficiency of 98% (average and peak) and total flow rate of 29,345m^3/hour. Filtered odour streams are discharged into

the environment through OCU stack and are monitored hourly to ensure the absence of odorous compounds.

At Slowhill Copse, the inlet screens, cess reception system, all sludge holding tanks and the sludge pumping station wet wells, are covered and odour controlled by a biofilter system.

Other relevant Site components

Slowhill:

- 2 No. Sludge strain press
- 1 No. Sludge reception point
- 2 No. Post-screened storage tanks (1,141m^3 each) (covered)
- Grit and screening unit
- 1 No. Odour control unit (OCU) (biofilter)
- 3 No. Unscreened sludge tanks (covered)
  - 2 No. 2,055m^3 each
  - 1 No. 1,889m^3 each

Millbrook:

- 1 No. Raw cake reception area (covered)
- 1 No. Cake silo (240m^3) (covered)
- 2 No. Thickened sludge storage tanks (TSSTs) (639m^3 each) (covered)
- 2. No Post screened storage tanks (PSSTs) (2,500m^3 each) (covered)
- 2 No. Post digestion storage tanks (PDSTs) (535m^3 each) (covered)
- 1 No. Alternative cake bay (15 tonnes) (covered)
- 1 No. Cake blending area (covered)
- 2 No. Gravity belt thickeners (GBT) (covered)
- 1 No. Liquor buffer storage tank (572m^3) (covered)
- 4 No. Anaerobic digesters (covered)
  - 3 No. 2,500m^3 each
  - 1 No. 3,251m^3 each
- 3 No. Centrifuges within the former dryer building (covered)
- 1 No. Gas bag holder (1,040m^3)
- 2 No. CHPs powered by biogas
  - 1 No. 2.02MWth
  - 1 No. 3.23MWth
- 1 No. Biogas burner (flare)
- 2 No. Boilers powered biogas (0.8MWth each)
- 1 No. Odour control unit (OCU) (wet scrubber with non-operational carbon filter)

The following are the outputs from the process:

- Screenings and grit – deposited into skips before being removed off-site.
- Biogas – stored in an existing gas holder, then either:
  - Burnt in the CHP or back-up boilers to generate electricity for use onsite
  - Flared in the waste biogas burner
- Digested cake – recycled to agriculture (soil conditioner).

A process flow of the process can be found in Appendix B and as 790101_MSD_ProcessFlow_MIL&SHC December 2024.

The layout of the site is presented in 790101_MSD_SitelayoutPlan_MIL&SHC December 2024.

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 off-site 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 secondary treatment 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. Anaerobic conditions inhibit 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 the 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 section 4.3.3 Abnormal conditions.

Wastes to be accepted at the Millbrook STC, under the Environmental Permit, are shown in Appendix C.

Due to the nature of the site activities, the hedonic tone of odours is neutral at best, whereas most odours generated on site will have a negative hedonic score (therefore deemed offensive). As the local population has already become sensitised to this, it is prudent to reduce the benchmark of the rating associated with sludge treatment. The hedonic score of the material will improve through the sludge treatment process as organic material is digested.

Table 1: Identified odour sources

Process or activity	Plant or equipment (and odour monitoring location)	Potential source of odour	Odour controls in place	Potential for odour emissions during normal conditions
SHCSR				
Cess reception	Cess reception points x 2 SU 38367 11206 SU 38385 11268	Liquid domestic tankered waste	Cess reception points are open, but sludge is directly discharged into XXX. The cess reception system is connected to the OCU. **Maximum storage capacity**: N/A **Waste retention time**: N/A **Open/covered**: Open	Low
Sludge reception	Sludge reception point SU 38394 11172	Raw liquid sludge, untreated air	Sludge reception point is open, but sludge is directly discharged into covered unscreened sludge tanks. **Maximum storage capacity**: N/A **Waste retention time**: N/A **Open/covered**: Open	Low
Sludge Treatment	Unscreened sludge tanks x 3 SU 38410 11146 SU 38428 11140 SU 38413 11129	Liquid sludge	All sludge storage tanks are covered and air is extracted to the OCU. Wash facilities are available for any spillages and drivers are expected to clean up after delivery. The process is monitored and regularly maintained. **Maximum storage capacity**: 5,999m^3 **Waste retention time**: 2hrs **Open/covered**: Covered	Low
	Post-screened storage tanks x2 SU 38372 11175 SU 38375 11156	Liquid sludge, sludge cake	All sludge storage tanks are covered and air is extracted to the OCU Wash facilities are available for any spillages and drivers are expected to clean up after delivery. The process is monitored and regularly maintained. **Maximum storage capacity**: 1,500m^3 **Waste retention time**: 3 days **Open/covered**: Covered	Low
	Odour control unit x 1 SU 38456 11137	Untreated air	There is one OCU at the Site to treat air and remove odorous compounds. The OCU process is monitored, and planned preventative maintenance is regularly undertaken on equipment.	Low

	Sludge strain presses & main transfer line pumps SU 38366 11167 SU 38414 11187	Liquid sludge	Pumps are covered and connected to OCU. **Maximum storage capacity**: 5,999m^3 **Waste retention time**: 2hrs **Open/covered**: Covered	Low
Grit and screenings	Grit and screenings unit SU 38411 11163	Solid matter	From screening of imported sludge prior to discharge into post-screened storage tanks and onward transfer to Millbrook **Maximum storage capacity**: 6yard skips **Waste retention time**: 24hrs **Open/covered**: Covered skips	Low
Millbrook STC				
Sludge reception	Raw cake reception point (pump house) SU 38740 12561	Dewatered sludge/cake	The reception tank and building is enclosed and air is extracted to the OCU. Hoses are in place in case of spills during unloading. **Maximum storage capacity**: N/A **Waste retention time**: 2hrs **Open/covered**: Covered	Low
	Cake blending area SU 38727 12558	Liquid sludge and raw cake	Imported cake is blended with indigenous sludge or imported liquid sludge and pumped through the sludge screens. Hose wash facilities are available at waste receptions. This area is enclosed and air is extracted to the OCU. **Maximum storage capacity**: 50m^3 **Waste retention time**: N/A **Open/covered**: Covered	Low
Sludge storage	Post-screened storage tanks (PSST) x 2 SU 38742 12584 SU 38724 12589	Raw sludge cake	Once screened, sludge is discharged to the covered post screened storage tanks (PSSTs) Imported pumped sludge is screened at Slowhill Copse and is discharged directly into the PSSTs. The PSSTs are covered and enclosed air is extracted to the OCU **Maximum storage capacity**: 2,500m^3 **Waste retention time**: 7 days **Open/covered**: Covered	Low
	Thickened sludge storage tanks (TSST) x 2	Raw liquid sludge	All thickened sludge storage tanks are covered and enclosed air is extracted to the OCU.	Low

	SU 38718 12450 SU 38720 12463		The process is monitored and regularly maintained. **Maximum storage**: 1,278m^3 **Retention time**: 5.3 days **Open/covered**: Covered	
Sludge Treatment	Anaerobic digesters and pressure release valve x 4 SU 38764 12458 SU 38785 12454 SU 38782 12435 SU 38752 12491	Biogas Digested sludge	Digesters are covered, and the process is closely monitored and regularly maintained. Planned preventative maintenance undertaken on equipment Opening of the pressure relief valves (whessoe valves) is rare and events are recorded on the SCADA system. **Maximum storage capacity**: 10,751m^3 **Waste retention time**: 23 days **Open/covered**: Covered	Low
	Post-digestion storage tanks (PDST) x 2 SU 38778 12417 SU 38764 12420	Digested liquid sludge	The PDSTs are covered and air is extracted to the OCU. Risk assessment and odour plans put in place before cleaning any tank. **Maximum storage**: 1,070m^3 **Waste retention time**: 1 day **Open/covered**: Covered	Low
	Centrifuges x 3 SU 38749 12395	Digested liquid sludge	Centrifuges are enclosed in the former dryer building and air is extracted to the OCU. Lime is also added at this point. Small amount of gas released from sludge at the centrate discharge point. **Maximum storage**: N/A **Waste retention time**: N/A **Open/covered**: Covered	Low
	Gravity belt thickeners (GBT) x 2 SU 38740 12443	Screened raw sludge	The gravity belt thickeners are enclosed and air is extracted to the OCU. **Maximum storage capacity**: N/A **Waste retention time**: N/A **Open/covered**: Covered	Low
	Odour control unit x1 SU 38738 12455	Untreated air	There is one OCU at the Site to treat air and remove odorous compounds. The OCU process is monitored, and planned preventative maintenance is regularly undertaken on equipment	Low
	Cake silo SU 38791 12401	Sludge cake	The silo is covered and sealed. Deposit of cake into lorries is undertaken as rapidly as possible and lorries covered as soon as	Low

			deposit is completed. Any spills from unloading are cleared as soon as practicable. **Maximum storage**: 240m^3 **Waste retention time**: : two days (to fill the silo) **Open/covered**: Covered	
	Liming plant (within former dryer building with centrifuges) SU 38749 12395	Liquid sludge	Lime is dosed into digested sludge before the centrifuges to achieve required sludge quality for recycling. and has a storage capacity of 30m^3. **Maximum storage:** 30 m^3 **Waste retention time:** N/A **Open/covered**: Covered	Low
	Alternative cake bay SU 38763 12405	Sludge cake	Cake is stored in 1 no. cake bay which is an open skip container sheltered within a building, protected from rainfall. The building does not have doors. Cake is moved via enclosed conveyor belt system to be deposited in the skip container when the cake silo is not available. **Maximum storage:** 15 tonne RoRo **Waste retention time:** 4 hours (to fill the container) **Open/covered**: Covered	Low
Liquors	Liquor buffer storage tank SU 38756 12509	Process liquors	Liquors from the STC processes and site drainage and then pumped from the liquor buffer storage tank (572m^3). No treatment takes place within this tank. **Maximum storage:** 572m^3 **Waste retention time:** 4 hours **Open/covered**: Covered	Low
Biogas combustion	Gas bag holder SU 38774 12393	Biogas	This is a sealed system **Maximum storage**: 1,040m^3 **Waste retention time:** N/A **Open/covered**: Covered	Very low
	Combined Heat and Power (CHP) units SU 38788 12479 SU 38762 12373	Biogas	Planned preventative maintenance undertaken on equipment. If CHP unit is down, gas is burnt in flare	Low
	Boilers x 2 (1 stack)	Biogas	Planned preventative maintenance undertaken on equipment	Low

	SU 38739 12424			
	Flare SU 38829 12369	Biogas	Planned preventative maintenance undertaken on equipment	Low
Cake export	Cake export SU 38791 12401 SU 38763 12405	Sludge cake	Lorries/trailers are covered before leaving or sealed skips are used. Covers only removed when inside building and loading of cake is taking place. Maximum storage: 255m^3	Medium

3.3. Odour impact

3.3.1. Adjoining land use

The Millbrook STC lies within an industrial setting of Southampton Docks, approximately 3.8 km west of Southampton city centre. There are no residential receptors in the immediate vicinity of the site; the nearest residential receptors are located at Millbrook Road West (road), approximately 300 m north of the Site.

The SHCSR is situated on Bury Road which approximately 1.1km to southeast of the Millbrook STC. The SHCSR is bordered by green spaces to the east, south, west, and River Test. The receptor closest to a potential emission source is an industrial facility, which is located approximately 30m southeast of the unscreened sludge tanks.

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[4].

- 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.

[4] 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 magnitude of risk relates to[5]:

- 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.

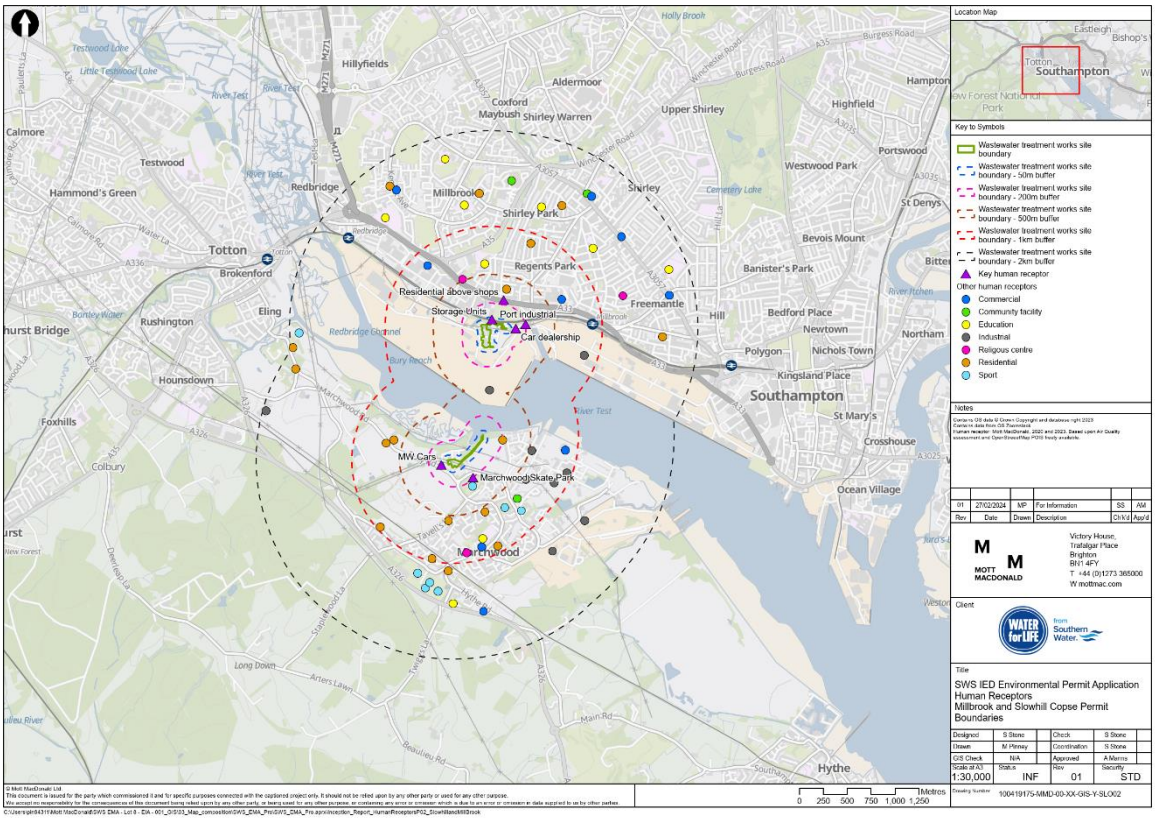
There are a number of sensitive receptors within 500m of the potential emission sources at Millbrook STC. As demonstrated in Figure 5 one area of sensitive receptors (includes residential, industrial, recreational) is found to the northeast of the Site, two areas of industrial receptors are located southwest and northwest of the Site. The nearest of these areas to a potential odour source is the area of industrial land use approximately 40m southwest of the Site.

There are six areas of sensitive receptors found within 500m of potential odour emission sources at Slowhill Copse sludge reception area. Three areas of industrial land use are located to the southeast, west and northwest of the Slowhill Copse sludge reception area, whilst two areas of residential properties are located to the southeast and west. One recreational land use is located to the southeast. The receptor closest to a potential emission source is an industrial facility, which is located approximately 30m southeast of the unscreened sludge tanks.

Figure 1 identifies the sensitive receptors within 2km of the Site. Table 2 and Table 3 identify the sensitive receptors within 500m of the Millbrook STC and Slowhill Copse sludge reception.

[5] 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

Figure 1: Sensitive receptors within 2km of the Site



Source: Mott MacDonald (2023)

Table 2: Receptors within 500m of potential emission sources at Millbrook STC

Nearest potential emission source to receptor	Process	Distance (m) and direction of different receptors[a] from nearest potential emission source [b]		
		Receptors to northeast of Millbrook STC (includes residential, industrial, recreational)	Industrial 2 - southwest of Millbrook STC	Industrial 3 - northwest of Millbrook STC
Sludge reception pump house	Sludge/cake reception and distribution	290, east	140, southwest	100, north
Cake silo	Sludge/cake reception and distribution	300, northeast	90, west	250, north
Cake blending area	Sludge treatment	300, east	120, southwest	105, north
Strain press	Sludge treatment	300, northeast	135, southwest	95, north
Post screening storage tanks (PSSTs)	Sludge treatment	280, northeast	135, southwest	75, north
Gravity belt thickener	Sludge treatment	315, northeast	40, west	210, north
Thickened sludge storage tanks (TSSTs)	Sludge treatment	335, northeast	40, southwest	200, north
Anaerobic digesters	Sludge treatment	275, northeast	75, southwest	160, north
Post digestion storage tanks (PDSTs)	Sludge treatment	295, northeast	65, west	235, north
Alternative cake bay	Sludge treatment	320, northeast	60, west	245, north
Gas bag holder	Biogas combustion	310, northeast	75, west	270, north
CHP	Biogas combustion	340, northeast	65, west	280, north
Flare	Biogas combustion	285, northeast	140, west	290, north
Boilers	Biogas combustion	330, northeast	40, west	240, north

Source: (a) Refers to the receptors presented within Figure 5. (b) Distance from source to receptor is rounded to the nearest 5m

Table 3 Receptors within 500m of potential emission sources at SHCSR

Nearest potential emission source to receptor	Process	Distance (m) and direction of different receptors[a] from nearest potential emission source [b]					
		Industrial land use to southeast of the Slowhill Copse WTW	Industrial land use to west of the Slowhill Copse WTW	Industrial land use to northwest of Slowhill Copse WTW	Residential properties to southeast of Slowhill Copse WTW	Residential properties to west of Slowhill Copse WTW	Recreation land use to southeast of Slowhill Copse WTW
Sludge reception point	Sludge/cake reception and distribution	100, southeast	**50, west**	70, northwest	410, southeast	85, west	280, southeast
Unscreened sludge tanks	Sludge treatment	**30, southeast**	90, west	115, northwest	335, southeast	125, west	215, southeast
Strain press	Sludge treatment	**60, southeast**	95, west	105, northwest	350, southeast	125, west	230, southeast
Screened sludge tanks	Sludge treatment	80, southeast	**55, west**	75, northwest	395, southeast	90, west	260, southeast

Note: (a) Refers to the receptors presented within Figure 5.

(b) Distance from source to receptor is rounded to the nearest 5m

Value in bold represents the nearest potential emission source for each process which is closest to a sensitive receptor

The bioaerosol risk assessment for the Site (document reference: 790101_ERA_BioaRA_MIL September 2024) addressed the probability of exposure and consequence of the hazards to determine the overall magnitude of the risk to sensitive receptors within 250 metres. A Source-Pathway-Receptor model has been used to help assess the probability of exposure associated with different processes at the Site. This can be related to odour emissions.

The assessment concluded that the overall magnitude of the risk associated with bioaerosols emissions from the Site (including to human health) is considered to be 'low'. This is primarily due to the 'wet' nature of several processes undertaken at the Site and the control measures in place at the Site which are considered to be effective at reducing and containing emissions of bioaerosols, inhibiting the pathway between source and receptor. Concentrations of bioaerosols and odours decline rapidly within the first 100m from a source and generally decrease to background concentrations within 250m.

3.4. Odour modelling

The effectiveness of the pathway for odour impacts associated with the Millbrook WTW has been assessed using wind data and the locations of the nearest sensitive receptors relative to the Site. Modelled wind data for the years 2019-2022 were derived for the Site from an atmospheric hindcast model (Vortex).

The nearest high sensitivity receptors to the site were residential receptors located at Millbrook Road West and South Mill Road which is approximately 310m to the north; one area of medium sensitivity recreational receptors located on Millbrook Road West which is located approximately 100m to the north; and one area of medium sensitivity industrial receptors located on Third Avenue, which is located approximately 80m to the northwest.

During 2019-2022, the mentioned receptors were downwind from the site 39% (recreational receptor), 39% (residential receptor), and 36% (industrial receptor) of the time, respectively. Based on the distance between these receptors and the Site and the frequencies of winds to disperse odours towards these receptors, the pathway for odour impacts from the Site to the industrial and recreational receptors are considered to be highly to moderately effective. Therefore, the potential for odour impacts from the Site cannot be scoped out on the basis of this simple assessment.

No specific odour modelling has been commissioned for this site and modelling has not been undertaken prior to the application for a bespoke installation permit because the OMP consolidates existing odour control measures and will form part of the Operational Techniques. The Site does not meet the criteria for the listed suggestions for odour modelling according to the Environment Agency H4 guidance:

- To predict the impact of a new proposal:
    - The Site is an existing site and structural changes are not proposed as part of the variation application. The sources of odour and their controls are already known.
- To assist in the investigation of the cause of odour complaints:
    - The Millbrook WTW has received 21 odour complaints in the last five years (2019-2023) due to general site activity. Slowhill WTW has received 7 odour complaints in the last five years. At Millbrook WTW, the causes of odour were identified and resolved with no requirement for further investigation to establish significant changes in odour management. It was also confirmed that none of the complaints were substantiated to the Millbrook STC and Slowhill sludge reception area (the Site).
- To compare the cost effectiveness of odour mitigation options:

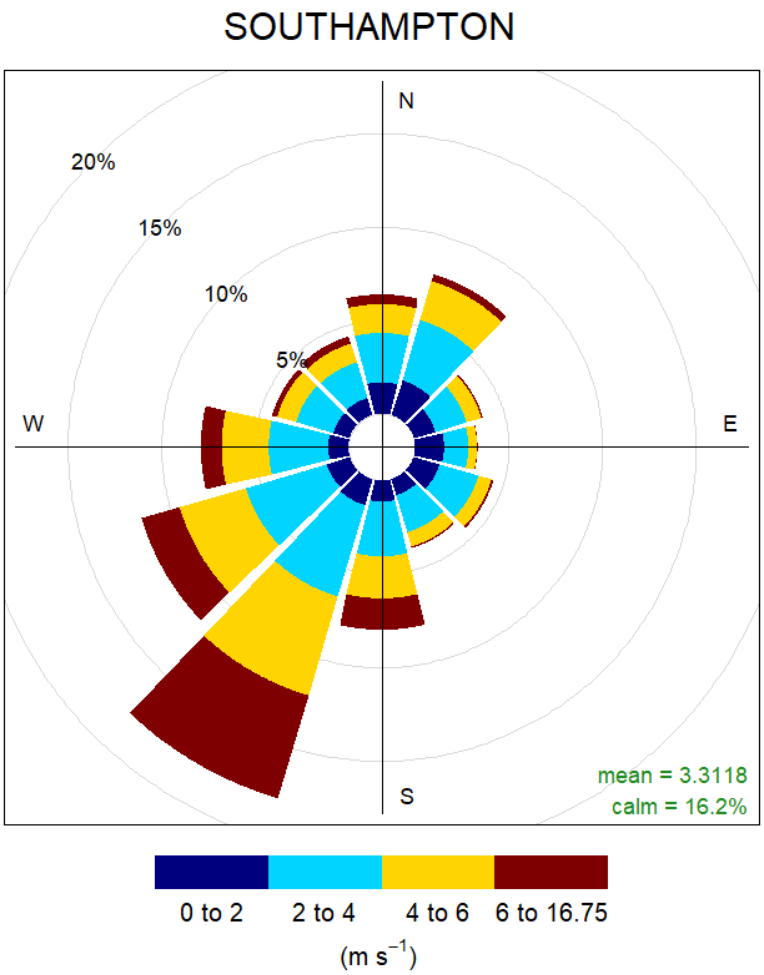
  - Southern Water are not seeking at the time of the Bespoke Installation Permit application to implement additional odour mitigation measures that require capital investment.

- To work out emission limits for point source emissions:
  - The Site presents a low odour risk to sensitive receptors and an Odour Control System is in operation, which will be compliant with design standards or as specified in the Environmental Permit, see Section 5.7.
- To indicate how much improvement is needed or size abatement equipment:
  - Improvements to odour control is implemented through the OMP. The Millbrook WTW only received two complaints in 2020, a decrease from the year prior, which suggests capital investment and improvement on existing abatement equipment is not necessary at present.
- To calculate a suitable chimney height to provide an acceptable exposure at receptors:
  - The chimney heights are fixed structures, since the Site is low risk of odour it is not justified to alter existing odour control structures.

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. The 2019-2023 wind rose for the nearest meteorological site at Southampton (located approximately 8km northeast of the Site), is shown in Figure 2. The Southampton meteorological site experiences the most frequent winds from the west and southwest, although also experiences frequent winds from the northeast.

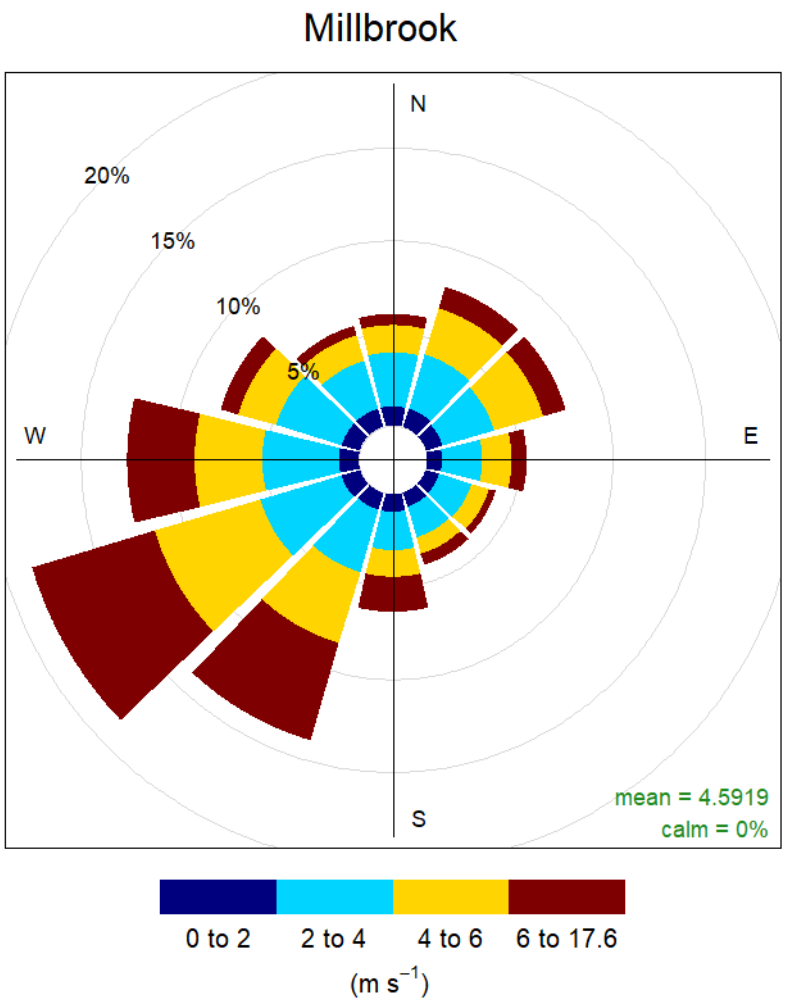
Figure 3 presents the wind rose generated for the Site from the Vortex model for the period from 2019-2023. The wind rose demonstrates that historically this location also experiences strong prevailing winds from the west and southwest. Overall, the two datasets show general agreement, with the modelled data indicating the prevailing winds originate from a west and south westerly direction. This suggests that sensitive receptors located to the east and northeast of the Site would be at the greatest risk from bioaerosol emissions from the Site as they would be downwind of the prevailing wind direction.

Figure 2: Average wind rose for Southampton meteorological site 2019- 2023



Source: NOAA Integrated Surface Database (ISD) (2023)

Figure 3: Average wind rose for the Site from the Vortex model, 2019-2023



Source: NOAA ISD (2023)

4. Odour Management and Control

4.1. Odour control system

All key sludge process and sources of odour identified at the Site have been either covered or are enclosed within buildings.

At Millbrook STC, odour control is provided for the sludge reception tanks, cake blending building, PSSTs, gravity belt thickeners, TSSTs and centrifuges. Foul air is treated by one caustic and hypochlorite wet chemical scrubber with an odour removal efficiency of 98% (average and peak) and total flow rate of 29,345m^3/hour. Filtered odour streams are discharged into the environment through OCU stack and are monitored hourly to ensure the absence of odorous compounds.

At Slowhill Copse, the inlet screens, cess reception system, all sludge holding tanks and the sludge pumping station wet wells, are covered and odour controlled by a biofilter system.

The key parameters are described in Table 4.

Table 4: Odour Control Unit details

Specification	OCU Description	
	SHCSR	Millbrook STC
Model type	Biofilter	Wet chemical scrubber
Odour removal efficiency	>95%	98%
Total Flow m^3/h	9,650	29,345
Makeup/blowdown rates		100l/h

In line with BAT 34 and 53, the Millbrook Site utilises a wet chemical scrubber and SHCSR utilises a biofilter to treat and reduce channelled emissions to air, however, neither are passed through an operational carbon filter. Details of the monitoring carried out on the OCUs are outlined within this section and in Section 5.

Southern Water do not believe the installed OCUs currently meets BAT 34. Southern Water is progressing detailed survey and assessment of the existing OCUs to understand the additional measures required to meet BAT 34.

The OCUs are monitored through SCADA 24/7, with duty operator instructed to investigate any alarms raised immediately. Trigger level information is not available. This will form part of the monitoring and reporting plan and include timescales for implementation of work required to remediate any identified gaps.

Leak detection by means of a methane gas analyser is installed on biogas holder/s to ensure any leaks from the inner bag are detected. Any leaks detected on the biogas system would always be fixed immediately by Southern Water due to the process safety risk posed by biogas.

The removal of biosolids off-site will be undertaken as soon as practically possible whilst considering prevailing weather conditions.

A process flow diagram showing which assets are covered by the OCUs can be found in Appendix B.

Odour control checklists can be found in Appendix D.

4.2. Odour control in normal and abnormal conditions

All operating practices must be compliant with the Sites O&M manuals, Southern Water company practices and management systems and the OMP. Routine and non-routine activities are reviewed for their impact upon the potential for odour generation in line with Southern Water's EMS.

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.
- If an alarm is generated within a building monitoring H2S levels, all doors in buildings ventilated to the odour control system remain closed until alarm ceases following the treatment and extraction of odour.
- Imports of pre-digested cake are to be offloaded within buildings with closed doors and Odour Control Unit extraction operating.
- Any imports to the head of works to be undertaken as quickly as possible to limit odour emissions. Additional imports to head of works are on an emergency basis, for example if a pumping station goes down or there is a burst rising main, the waste would be transferred via tanker to the head of works and only from assets that would already discharge to the Site (indigenous).

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

There will be regular occasions throughout the year when routine, planned and reactive maintenance are carried out in order to ensure continued optimum operation of wastewater treatment and sludge recycling. Routine and planned maintenance tasks are divided into different classifications according to the level of complexity, speciality and frequency. The classifications are:

- 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 the Field Performance Manager (FPM) for checking completion and quality.
- Planned Maintenance (Ellipse): the programmes for planned maintenance are generated regionally. Jobs are sent direct to qualified 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 the FPM for checking completion and quality.
- Contractor Maintenance (CM): the programmes for planned maintenance of some categories of specialist equipment (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 (LPS): 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 in real time on-site via an electronic logging system and reported monthly. Records are available via online database.
- Material Delivery and Removal: Records of sludge deliveries are recorded electronically in real time. Chemical delivery records are maintained on site logs. Bulk chemical deliveries and consumption are also recorded on SCADA in real time.

Minor repairs and routine maintenance works 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 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 and to deploy alternative odour suppression systems, if required.

Where a 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.

The OCU maintenance report can be referred to for more detailed actions required on site (Appendix E).

Table 5 highlights the typical maintenance activities for the wastewater and sludge treatment processes.

Table 5: Typical maintenance for 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.

Process	Period	Typical Maintenance activities
	Weekly	Routine checks on equipment. Tasks carried out and records maintained under the Site operating and monitoring plan. Inlet gas temperature, gas flow rate, pressure differential, inlet gas moisture content, and leak detection.
	Monthly	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 including cleaning.
	Six monthly	Checked/Serviced every six months by appointed service provider.
	Annually	Checks by M&E as per regional maintenance schedules.
Digester 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.
	Six monthly	Checked/Serviced every six months by appointed service provider.
Odour control unit	Daily	Routine daily checks
	Monthly	Inspection and maintenance routines in accordance with both the frequency and task specified in the regional maintenance schedules. Pressure, flow rate for both gas and liquid, the pH/OPR of scrubbing liquid is checked during monthly service.
	Bi-annually	Inspection and maintenance routines in accordance with both the frequency and task specified in the regional maintenance schedules. This includes service to the inlet gas temperature, gas

Process	Period	Typical Maintenance activities
		flow rate, pressure differential, inlet gas moisture content, and leak check monitoring.
	Annually	Annual service by the Odour control service provider in line with contracted maintenance requirements. This includes the cleaning of the nozzle of the liquid feeding system and checking of the gas pips of the scrubber.

Diffuse emissions from open storage areas, including the alternative cake bay, are minimised by:

- Limiting, or ceasing, the volume of cake to be dropped during windy weather, to ensure cake lands within the container and limit transport of VOCs and bioaerosols.
- Ensuring optimisation of the digestion process to limit the bioaerosol potential of post-digested sludge and dewatered cake.
- Minimising the volume of sludge cake being stored to eliminate the risk of cake overspilling.
- The sludge cake not being handled once in the cake bay until it is being removed from site.
- Reducing movement of cake across the site, cake is only moved when required.
- All sludge cake being exported is transported in covered lorries.

To minimise odour nuisance, it is important to ensure that the Site is operating as designed. Covers and hatches are replaced to maintain the integrity of enclosures provided to collect odorous air.

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; and
- 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 F.

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 6 provides an example of a risk assessment for routine maintenance operations. The risk assessment 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.

Southern Water's 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 6: Example of risk assessment for routine maintenance operations

Event	Implications	Odour Risk (High, Medium, Low)	Proactive Actions	Responsive Actions
Maintenance of processes within STC	Opening of hatches, and exposure of process units to building.	Low	Processes contained within the STC 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 of 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. Or use of temporary plant to maintain function. Reduce or replan site import schedule.

4.2.3. Abnormal conditions

Unanticipated breakdowns of equipment may occur which 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. An exemption may be required for these operations, but mitigation ought to be documented in an odour risk assessment.

In the event of plant failures or emergency situations, this would raise an alarm on the Site's SCADA or telemetry systems, which will be reacted to by on-site or regional control room operators and 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 the 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.

If any waste arrives on-site that fails to provide correctly completed paperwork this is immediately reported to the Industrial Waste Services Team, who will decide if it can be accepted or rejected, as per Southern Water's Quarantine procedure.

Cake leaving Site is quarantined in any of the following circumstances:

- Hazard Analysis Critical Control Point (HACCP) critical limit breach
- Maximum Acceptable Concentration (MAC) sample failure
- Measured cake DS% on-site has dropped below 20% (the 20% has to be confirmed by second sample)

If any of these take place, then material will need to be quarantined in line with the Biosolids Assurance Scheme procedures.

If quarantining is required, then the quarantined digested material is placed in an empty bay on site. If a storage bay is not available, then the Biosolids Compliance Team should be contacted to arrange alternative storage.

When the breach is HACCP or MAC failure related, the cake will be held at the quarantine location until compliant results are received from the laboratory provider. After bacti compliance is confirmed, the relevant stakeholders will be notified by a certificate of compliance that cake from the site in question can be recycled to land.

When the breach is related to DS% content of the cake being below 20% then the affected cake will be held in quarantine until alternative treatment or disposal can be arranged by Southern Water.

If, on sampling and testing, waste does not meet the specific pH limits in the Environmental Permit, then further advice is sought from the Industrial Waste Services Team, who will decide if it can be accepted or rejected. If rejected, then the Waste Rejection and Incident Note is completed, and the load is turned away.

Table 7 provides an example of a risk assessment for abnormal and emergency operations, which is reviewed and updated as required. The key contact group (the Environment Agency and Southern Water Customer Services) is informed, for high-risk activities, relating to odour, as soon as event occurs.

Table 7: 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 (loss of untreated air to atmosphere)	Untreated air	Effectiveness of foul air extraction 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 (loss of liquid sludge to environment)	Spilt sludge	Effectiveness of foul air extract system compromised, risk of odour release until repairs completed, risk of odour from split sludge	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 Gas Burner Inspection maintenance and repairs as appropriate

Event	Potential source of odour	Potential impacts	Odour risk	Measures to prevent or minimise risk	Actions to be taken
					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 odours direct to atmosphere until repaired	High	Regular monitoring of equipment performance. Duty standby functionality. Standby capacity in the media beds. Emergency call to odour maintenance contractor. Control processes to minimise risk of high peaks of H2S reaching odour control unit.	Assess need to use portable odour reduction sprays 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 WTW 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.	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

Event	Potential source of odour	Potential impacts	Odour risk	Measures to prevent or minimise risk	Actions to be taken
				Planned maintenance on equipment	
Failure of sludge thickeners	Sewage sludge	Thickeners are enclosed and air extracted to OCU	Medium	Sludge dosed with polymer as required	
High pressure conditions in digesters	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 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 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 temporary plants (including portable odour sprays spread around process units) Reduce imports of sludges as required
Prolonged hot and dry period	High strength / septic sludge	Potential for septicity to develop throughout the works.	High	Increased monitoring. Planned maintenance on equipment	Record details and actions taken in site diary

Event	Potential source of odour	Potential impacts	Odour risk	Measures to prevent or minimise risk	Actions to be taken
		Issues with temperature sensitive components			
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 OCU and repair as required (check performance of sludge pumping stations, clearance of road drainage may be required following flooding)

The import of digested sludge into Slowhill Copse is required as a contingency arrangement for a periodically occurring issue at Fullerton. Millbrook STC does not have the facility to directly accept digestate for dewatering, therefore, it has to go through the Slowhill Copse sludge import and storage process and mix with raw sludge before being transferred to Millbrook. Millbrook accepts sludge from SHCSR for digestion. If required, the cake produced is sent to Fullerton and stored in cake bays for maturation.

During extended periods of heavy rain the cake bay drains at Fullerton can become blocked from cake washing out from bays, removing the sludge and transferring to Slowhill Copse significantly reduces the risk of overtopping and release to the environment.

This is planned to be resolved through a combination of measures including IED-related drainage improvements and provision of cake bay covers through a WINEP scheme (which may also required additional IED-related scope subject to the outcomes of the ongoing RBP testing).

The sludge is drawn-off to a tanker and taken to Slowhill Copse where it is received to the sludge reception point. The sludge ultimately returned to the digestion process at Millbrook and returned as cake.

This is acknowledged to be an inefficient solution and remains under review regarding further interim measures for improvement ahead of the planned capital investment.

This is a small proportion of the overall STC throughput and is considerably preferential to the risk of a release to environment.

5. Monitoring

5.1. Routine 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.

In the event of an out-of-specification plant item is operating beyond normal operating ranges, the process parameters are outside optimum or an any other alarm being initiated, appropriate remedial actions would be instigated. Operatives will follow the Awareness Raising Instruction in Appendix A, and further measures are dealt with in subsequent sub-sections.

Any odour detected on-site during normal operation will be rectified using measures described in Table 6 to implement actions and prevention protocol. Routine sniff tests at the potential odour sources listed in Table 1 are in place to proactively mitigate odour reaching and exceeding the site boundary. If detected, investigation into odour source is undertaken and contingency measures listed in Table 8 are implemented.

Site personnel periodically assess the performance of odour containment and extraction systems utilising specialist equipment (such as but not limited to Optical Gas Imaging) to compare actual vs. designed air changes per hour, or to identify leakage points on systems. Any issues identified will be addressed and then a re-assessment performed to confirm issue resolution.

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; and
- 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 G.
- Record actions taken in respect of odour investigations.
- Conduct weekly sniff tests.
- Record and report incidents that caused significant odorous emission, and follow the Awareness Raising Instruction in Appendix A.
- Produce other records as required by the OMP.

- Undertake the Site odour monitoring and controls listed in Table 9.

Drivers delivering odours loads shall carry out the following tasks:

- Ensure loads are sealed and covered when arriving the Site and approaching the sludge reception.
- Covers to only be removed within the sludge reception building with the doors closed.
- Follow the spillage management procedures set out in section 5.1.6 if odour materials are spilled.
- Any wastes that are not authorised to be accepted must not enter the Site (as referred to in the Duty of Care).

Table 8: Site odour monitoring and detection processes

Potential Odour Source	Routine Actions Required	Risk pre-control measures	Monitoring Frequency	Attention Level	Action level	Preventative Action	Risk post-control measures
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	Medium	Daily	Noticeable odour in tanker unloading area	Follow the Awareness Raising Instruction, Appendix A.	Check containment, hoses connected to exhaust. Follow the Awareness Raising Instruction, Appendix A.	Low
Lime dosing for stabilisation of cake	Dose lime only when necessary	Low	Into digested cake prior tocentrifuge	Noticeable dour	Follow the Awareness Raising Instruction, Appendix A.		
Transportation	Ensure only sealed or covered skips/trailers used. No removal of covers whilst parked waiting to load/unload	Medium	Every week day	Noticeable odour from vehicle	Follow the Awareness Raising Instruction, Appendix A.	If necessary, implement special odour mitigation measures to reduce the risk of odour nuisance.	Low

Potential Odour Source	Routine Actions Required	Risk pre-control measures	Monitoring Frequency	Attention Level	Action level	Preventative Action	Risk post-control measures
	Monitor odours during cake loading					Make contractor aware of requirements in OMP	
Sludge holding tanks	Minimising retention time Monitor odour levels around tank	Medium	Daily	Noticeable odour from tank	Noticeable odour from tank Follow the Awareness Raising Instruction, Appendix A.	Increase sludge treatment rate to reduce retention Hose spillage's Increase de-sludge ops up stream Run odour masking system (Short term)	Low
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; Prevention of sludge accumulation in off-line tanks; and Proactive identification of potential problems	Medium	Daily	Increased odours from area	Noticeable odour from area and/or complaint received Follow the Awareness Raising Instruction, Appendix A.	Quality checks Undertake process in an enclosed building with appropriate odour abatement tankering of sludges to other sites without odour abatement	Low

Potential Odour Source	Routine Actions Required	Risk pre-control measures	Monitoring Frequency	Attention Level	Action level	Preventative Action	Risk post-control measures
	and tankering of sludges to other sites with odour abatement.						
Secondary Digesters	Check for strong and uncharacteristic odours	Low	Daily	Investigate unusual odours	Investigate and report strong/unusual odours to FPM and Scientist Follow the Awareness Raising Instruction, Appendix A.	Regular checks and investigative action	Low
Centrifuge	Check for strong and uncharacteristic odours	Low	Daily	Investigate unusual odours	Investigate and report strong/unusual odours to FPM and Scientist Follow the Awareness Raising Instruction, Appendix A.	Regular checks and investigative action	Low
	Check polymer dosing	Low	Daily	Polymer dosing rates exceeds set limits	Polymer dosing exceeds upper or lower threshold limits Follow the Awareness	Take remedial action to return polymer dosing to correct rate	Low

Potential Odour Source	Routine Actions Required	Risk pre-control measures	Monitoring Frequency	Attention Level	Action level	Preventative Action	Risk post-control measures
					Raising Instruction, Appendix A.		
Gas flare stacks	Complete biogas combustion should give clean emissions with blue or non-visible flame	Low	Daily	Occasional orange flame or black smoke visible	Constant orange flame or black smoke visible Follow the Awareness Raising Instruction, Appendix A.	Routine contractor checks or maintenance to clean nozzles of carbon build-up	Low
Whessoe valves on digesters	Check they are clear from foam residue	Low	Daily		Not seating correctly Follow the Awareness Raising Instruction, Appendix A.	Engage service contractor to resolve any problems	Very low
OCU	Check pH Check media condition	Medium	Daily	pH<8.9, ORP<750	pH >3 Sudden drop in performance Follow the Awareness Raising Instruction, Appendix A.	Ensure media is damp Change media as per schedule	Low
Whole Permitted Site	Doors to operational buildings will remain	Medium	Daily	Increased odours	Follow the Awareness	Doors and hatches will only	Low

Potential Odour Source	Routine Actions Required	Risk pre-control measures	Monitoring Frequency	Attention Level	Action level	Preventative Action	Risk post-control measures
	closed and hatches will be latch closed.				Raising Instruction, Appendix A.	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 daily walkover survey incorporating a “sniff-test”. Sniff testing will be undertaken at the operational area boundary, starting at an upwind location, at Slowhill Copse sludge reception area and Millbrook STC. 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 a person working at the beginning of their shift.

During each walkover, the person undertaking the “sniff-test” must stand nearby to each potential source of odour identified in Table 1 and at least one location for the north, south, east and west of the site boundary (as close to the perimeter as practicable) and note on a map the location of the perimeter checks. Checks in each location should be undertaken for at least 20 seconds and the monitoring form completed, see Appendix H.

During this walkover, over a period of approximately 30 minutes, perceptive “sniff-testing” of the ambient atmosphere is conducted and observations are recorded on a daily check sheet. If odour is likely to exceed the site boundary and, therefore, has potential to cause a complaint, the procedure in Appendix A will be followed.

The results of the sniff test will be recorded in the site diary or an appropriate form, which will be sent to customers services and the management team. 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 Site 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 twice 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 and 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 and 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 the Site 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
- Wind Direction
- Wind Speed

Meteorological data will be reviewed in advance of activities that may present an odour concern, including non-routine activities such as emptying of sludge cake, to consider suitable measures to 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. Wind direction, wind speed and temperature will be sourced online from the Met Office or onsite weather station.

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 the 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 are responsible for cleaning up spillages after every load. A 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

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 Site operates under a site-specific Accident Management Plan, and associated Site Emergency Incident Plan, to prevent and manage environmental related accidents. The site-specific AMP (790101_MSD_AMP_MIL June 2024) includes a description of nominated key personnel and their responsibilities, emergency response procedures, contact details of internal contacts (Works Manager, Team Leader, Process Technician, Regional Control staff and key H&S staff), national and regional (where appropriate) contact details of emergency services and environmental regulators.

The AMP is distributed to key staff, to supervise the implementation of the Plan, and shared with external contacts (emergency services and the Environment Agency). The AMP is accompanied by a site plan that identifies the locations of designated storage areas (e.g. for chemicals, flammable compounds, bottled gas etc), spill kits, firefighting equipment, site entrances and access routes, gas bags and gas pipeline routes, gas isolation valves, major electrical equipment and possible isolation points, and other significant plant items.

The key procedures relating to environmental accident and incident management are set out in Southern Water's ISO14001 accredited EMS.

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
- EMS388 – Waste permit breaches and near miss reporting procedure

5.2. Monitoring of the odour abatement system

Table 9 identifies the parameters and monitoring requirements in relation to the odour control system that needs to be undertaken at the Site.

Table 9: 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 (scrubbing system)	Hydrogen chloride	Once every 6 months	As per design and manufacturer's specifications Southern Water are to initially undertake characterisation of emissions from the odour control units, in line with BAT 3, to demonstrate if TVOC and HCI are present in the waste gas stream. If TVOC and HCI are identified as relevant in the waste gas streams Southern Water will monitor these emissions in line with BAT requirements and the Environmental Permit.
	TVOC	Once every 6 months	
	Ammonia	Once every 6 months	As per design and manufacturer's specifications
	H_2S	Once every 6 months	Maintenance undertaken by service provider, or otherwise as specified in the Environmental Permit
	Efficiency checks	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 and SCADA, or otherwise as specified in the Environmental Permit
	Overall operation, including air circulation	Daily	Visual assessment or otherwise as specified in the Environmental Permit

Monthly service visits for the OCU's are undertaken by ERG (the current contractor). A service visit report is issued after each visit which identifies priority actions required, other faults and comments as well as condition monitoring and observations. A copy of an example site visit report (October 2023) is presented in Appendix E.

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 training to cover operations at the Site. On the job training is provided to all staff through a rolling training programme.

Southern Water has developed its own Competency Management System (CMS), which identifies the training required for different roles on site.

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 in the 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 A 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 working 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 entered on the Southern Water Customer Services Management System (CSMS), the details of which are detailed in Appendix G.

8. Reviews and Auditing

8.1. Reviews

8.1.1. Periodic reviews

A review of this OMP will be carried out by the FPM annually, 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 significant capital scheme which could impact the OMP.

8.2. Auditing

The regulatory authorities, where required, will be provided with reasonable access, in order 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.
- Odour issues which require a capital scheme to be raised to resolve them.

A. Awareness Raising Instruction

Activities 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 RCC/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

If the Operational Control Centre 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.

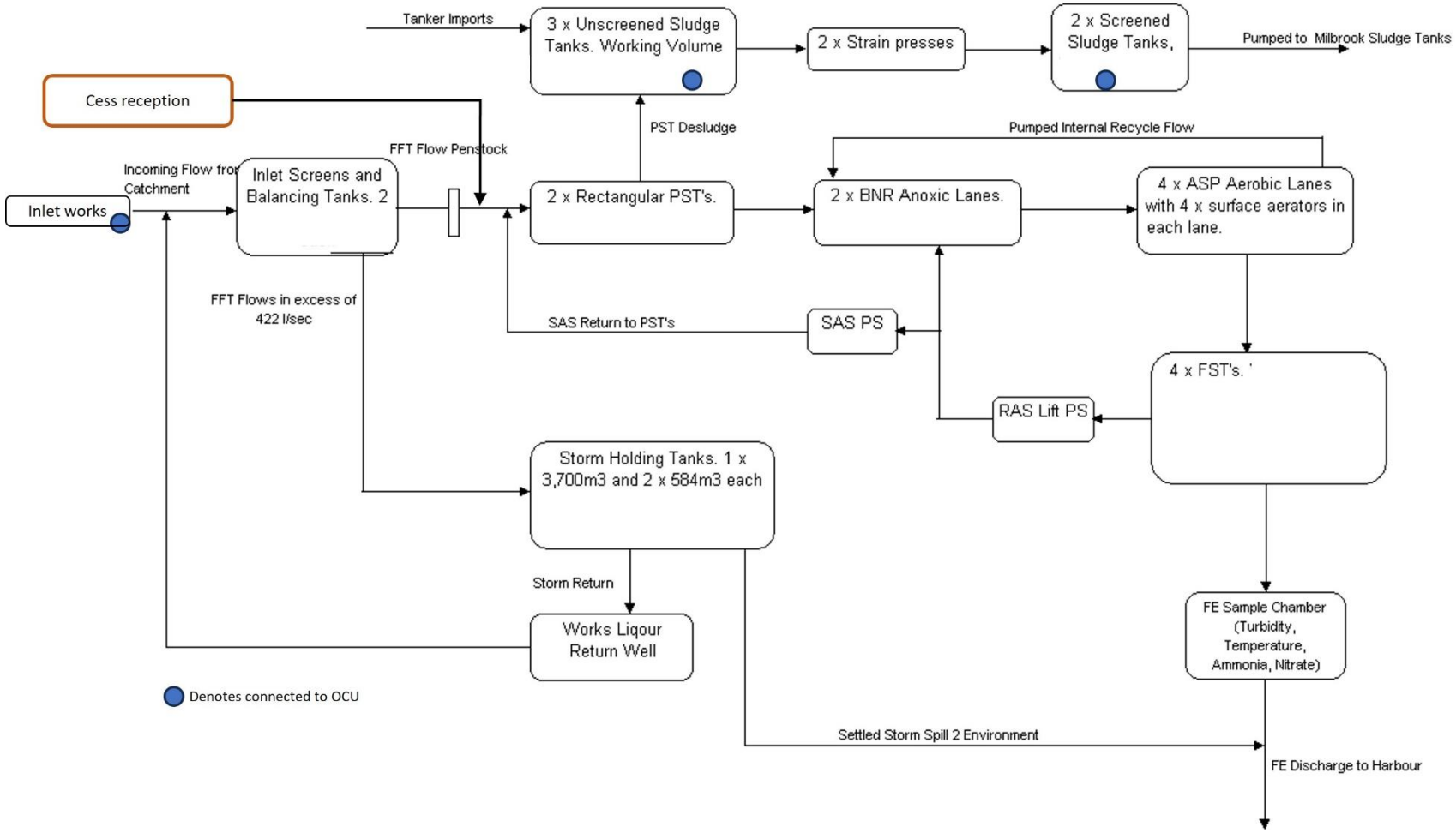
Please contact the OCC and request information is passed to the Customer Contact Team and added to the Operational Business Report.

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.

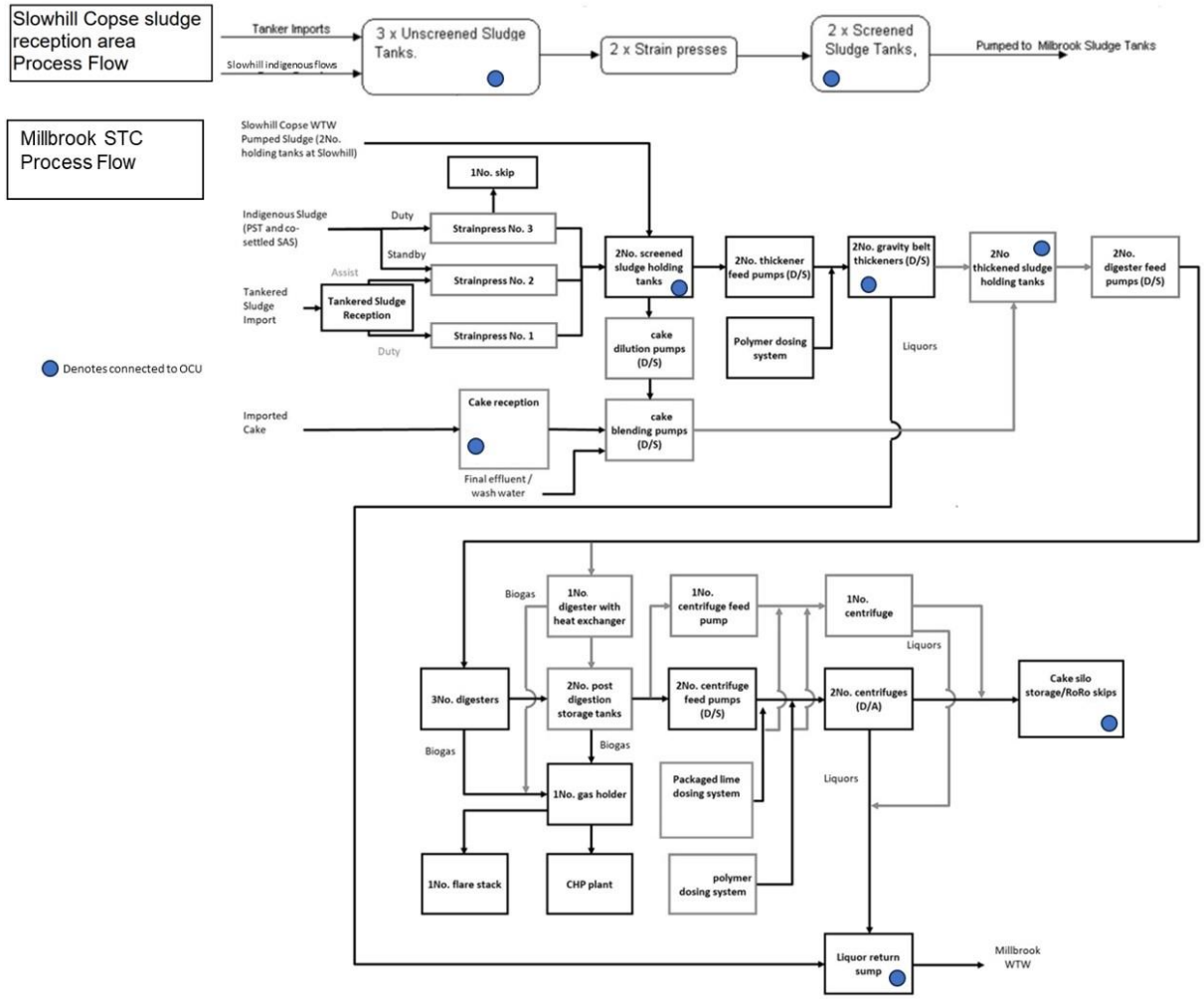
Be proactive, not reactive!

B. Odour Schematic

B.1 SHCSR



B.2 Millbrook STC



C. Waste Codes

It is requested that the annual quantity of indigenous sludge and liquid sludge imports to be accepted is 700,000 (wet) tonnes. Annual throughput volumes are presented in document reference 790101_IED_MIL&SHC Annual Throughput Diagram.

EWC codes are as per Environmental Permit EPR/CP3535XU for waste to be accepted to the Site.

The Waste Permit EPRGP3792HY – for Slowhill Copse tankered waste imports remains unchanged, but will be consolidated into the installation permit, if appropriate. It is requested that the annual quantity tankered waste imports to be accepted remains at 375,000 (wet) tonnes.

D. Odour checklist

This is a generic checklist applicable to all sites and aspects that are not applicable to a particular site should be ignored.

Area of works	Potential issue		Follow up action
Odour management plan (OMP)	Is the Site operated according to the OMP?	YES / NO	Make changes to site operation to minimise odour production and release
Site - general	Are all covers in place?	YES / NO	Put back 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)
			Check for potential septic discharges
Screening	Are there any spilled screenings?	YES / NO	Clean up spills
	Are the compacted screenings clean	YES / NO	Optimise operation of screenings hand ling 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 bottom of the tanks?	YES / NO	
Primary tanks	Are the tanks black and / or smelly?	YES / NO	Check inlet for septicity
	Are the tanks gassing?	YES / NO	Check levels of sludge in the tank and increase de-sludge rate if needed.

Area of works	Potential issue		Follow up action
	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 requ ired
	Do the MLSS fall within the timelines for the Site?	YES / NO	Increase / decrease RAS rate as needed
Final settlement 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	Put back 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 / pressure relief valves operating prematurely?	YES / NO	
	Are the seals on the condensate trap s intact?	YES / NO	
Odour abatement	Is there any detectable odour downwind of the stack?	YES / NO	Check OCU using additional checklist

Area of works	Potential issue		Follow up action
	Is the fan(s) working?	YES / NO	Arrange for fan to be repaired
General	Are there any outstanding actions fro m a previous investigation?	YES / NO	Complete actions

E. ERG Odour Control Unit Service Report

ERG (Air Pollution Control) Ltd
Bridge House Lane, Five Oaks Road,
Slinfold, Horsham, West Sussex, RH13 0QW, UK
tel: +44 1403 292000 e-mail: maintenance@ergapc.co.uk web: www.ergapc.co.uk

Visit

Service Visit Report: SV10 of 12 – October 2023

Project Name	Southern Water Maintenance	Project Number	AM7143

Visited	Millbrook	**Report By**	[redacted]
Company	Southern Water	**Tel**	
Tel		**Mobile No**	
Email		**Date**	18/10/2023
Contacts	[redacted]	**Reviewed By**	TJS
		Copy To	HMcW, RW, TJS
Purpose of Visit	**Monthly Service Visit of Chemical Scrubbers OCU**		

1. Actions required:
   - 1.1. On arrival, sample line strainer was totally blocked by sulphur and limescale. Due to the hard water and lack of adequate chemical dosing.
   - 1.2. Fan 1 is off and locked off by ERG. Requires Dynamic Fans to visit and inspect balancing, possibly replacing bearings and assess for further damages on impeller shaft. PO received for fan inspection – to be carried out 1-11-23.
   - 1.3. Fan 2 was found with no belts, replaced, tensioned and put back in operation, however it does not run in auto as the differential pressure switches do not appear on the SCADA. It was left running in hand, requires ICA to access the PLC ASAP to rectify this condition. ICA were on site following day 19/10/23 After ruling out a plc fault and successfully testing the operation of the pressure switches it was discovered that the switches were operating at incorrect pressures. Further investigation by ERG identified the fault as a blocked port on both pressure sensors. Blockage removed and pressure switches were tested and operated correctly at the correct pressures. The system was returned to a running state and monitored for 1 hour with no faults.
   - 1.4. Caustic dosing failed as the tank is empty.
2. Other faults and actions required:

   None.
3. Other comments:
   - 3.1. Both recirculation pumps and fan control panels display a sign saying the "isolator does not isolate all supplies to this starter". All service engineers to be made aware.
   - 3.2. The mesh filter at the inlet of scrubber was removed by 'others'. ERG is currently reviewing how this affects the scrubber and are monitoring over the next few months of operation.
   - 3.3. On arrival the water softener water was tested hard and salt tank was completely empty. Topped up and still tested hard. When ERG was trying to calibrate the probes, ERG observed quiet a lot of limescale around both probes. Cleaned them and all worked as it should be.
   - 3.4. Several water softener leaks were repaired and no other leaks were found. Please check that the floor in the chemical room is dry at the next visit as this also affects the ability to see and source chemical leaks. No leaks found at this visit.

4. Condition monitoring:

Condition monitoring	Units	Oct	Sep	Aug	Design
Velocity at Ø1,000mm OCU outlet	m/s	6.5	6.53	6.28	
Airflow volume rate at Ø1,000mm OCU outlet	m^3/h	18,460	18,461	17,763	TBC
ΔP across Scrubber	kPa	0.44	0.44	0.54	TBC
H_2S inlet reading (using Gastec)	ppm	5	10	5	TBC
Stack H_2S reading	ppb	0	0	2	TBC
Calculated OCU H_2S reduction efficiency	%	98	99	60	TBC

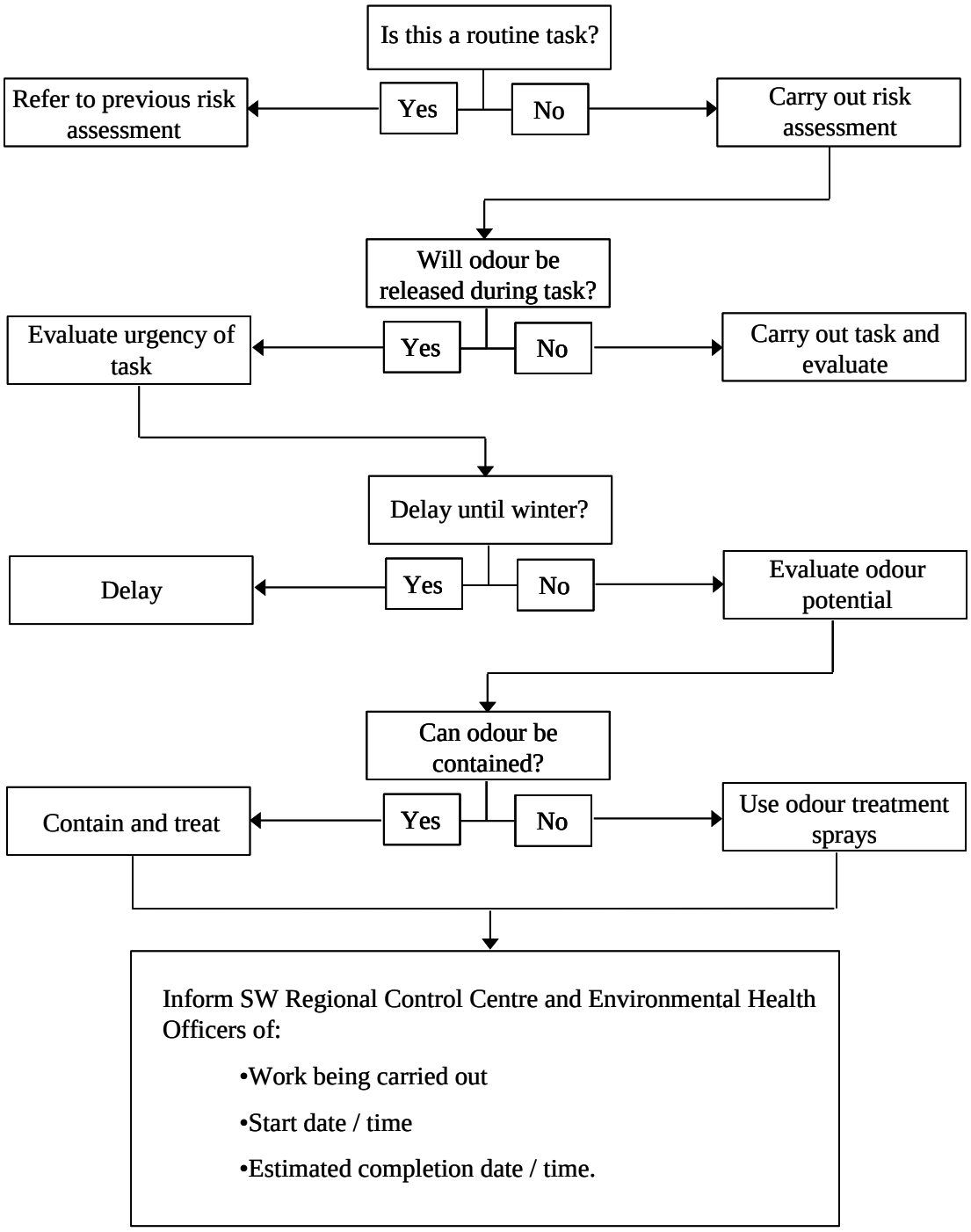
Observations & other information:

H_2S outlet monitor:	0 ppb.
Caustic tank HMI level:	0 m^3
Hypo tank HMI level:	12.11 m^3
Water Softener:	Salt tank empty, water hard. Topped up. Checked still hard.
Make up water:	300 l/h.
Extraction fan 1 hours:	91,869 hrs (AUTO)
Extraction fan 2 hours:	14,330 hrs (AUTO) @40A
Recirculation pump 1 hours:	13,378 hrs (AUTO) @26A
Recirculation pump 2 hours:	14,066 hrs (AUTO)
pH/redox on arrival:	9.65 pH/ 694mW
Sample line flow:	O.K.
Fan belts type:	GT2 14MGT-3360 USA 268V14 (4 spares available in kiosk)

5. Historical faults

	Item	Diagnosed
5.1.	None…	

F. Risk Assessment Flowchart



G. Complaints Management

G.1 Management of odour complaints

G.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 that 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.

G.1.2 Receipt of odour complaints

The Customer Services 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 or the Regional Controller.

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.

G.1.3 Follow up actions

Initial action by Field Performance Manager

The FPM or Regional Controller 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 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 from Customer Liaison Officer

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. The Customer Liaison Officer 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.

H. Odour Monitoring Form

Odour Monitoring Form

Date:	
Name:	Visitor or staff:

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

Receptor Sensitivity

Low (e.g. footpath, road)
Medium (e.g. Industrial or place of work)
High (e.g. housing)

Location	Time	Weather conditions (dry, rain, snow etc)	Temperature (very warm, mild) *Use degrees when known*	Wind strength (light, strong) *Use Beaufort scale if known*	Wind direction (e.g. SE)	Intensity *(See above)*	Duration	Constant or intermittent in this period or persistence	Receptor sensitivity *(See above)*	Is source evident?	Any other comments or observations