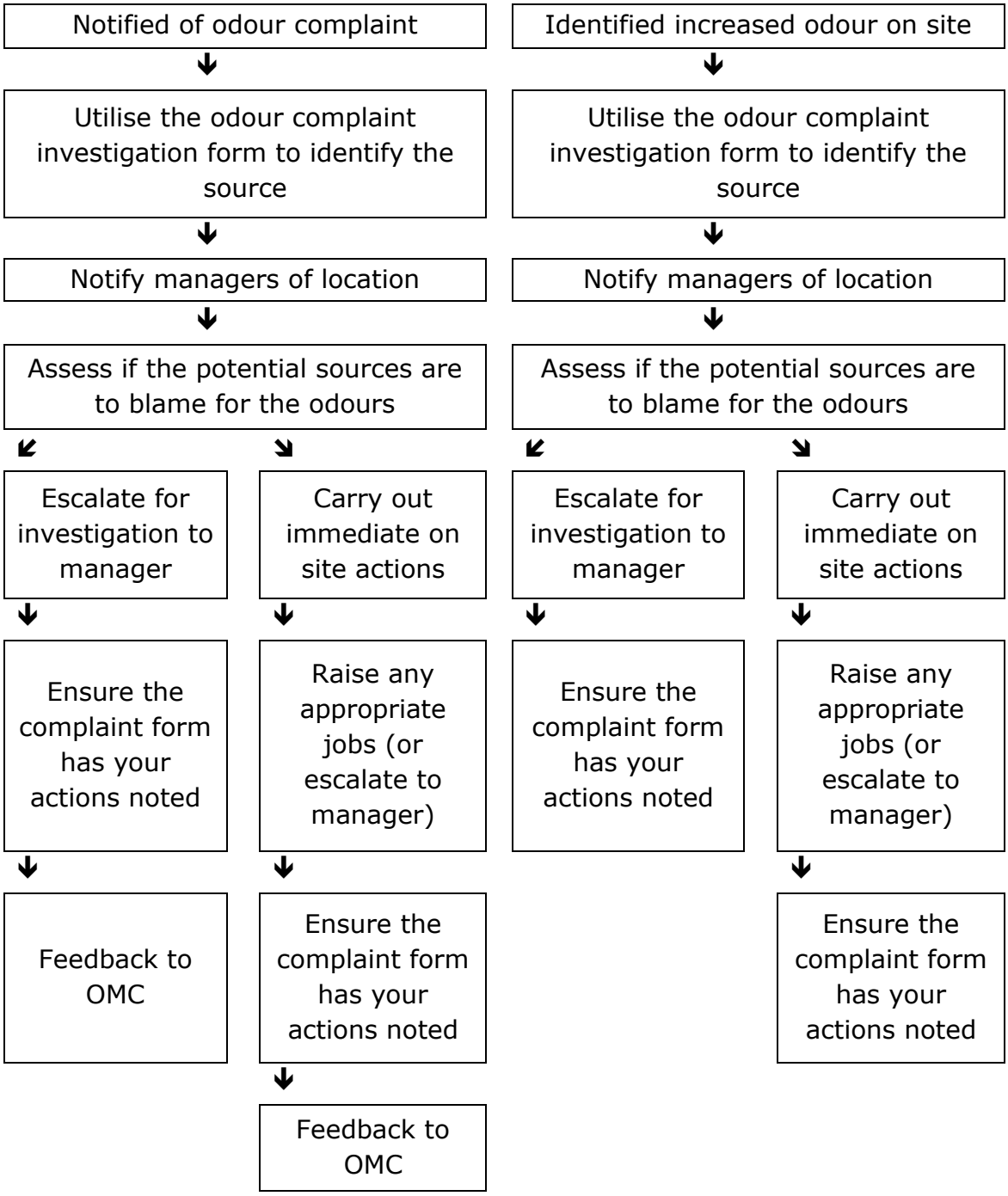
Colchester Sludge Treatment Centre & Water Recycling Centre

Odour Management Plan

This document must be reviewed at intervals not exceeding 12 months

Revision	Authors	Date of Issue	Comments
1.0	C TEDDER	04/07/17	Update
2.0	M Hinson	15/01/2020	Revision
3.0	M Hinson	31/01/2021	Revision
4.0		31/01/2022	No Updates
5.0		31/01/2023	No Updates
6.0	R Dunn D Haymes	15/12/2023	

Overview


Notified of odour complaint
Utilise the odour complaint investigation form to identify the source
Notify managers of location
Assess if the potential sources are to blame for the odours
Escalate for investigation to manager
Carry out immediate on site actions
Ensure the complaint form has your actions noted
Raise any appropriate jobs (or escalate to manager)
Feedback to OMC
Ensure the complaint form has your actions noted
Feedback to OMC
Identified increased odour on site
Utilise the odour complaint investigation form to identify the source
Notify managers of location
Assess if the potential sources are to blame for the odours
Escalate for investigation to manager
Carry out immediate on site actions
Ensure the complaint form has your actions noted
Raise any appropriate jobs (or escalate to manager)
Ensure the complaint form has your actions noted

Introduction

This plan refers to the site mentioned on the cover sheet and is in response to the **F**irst **O**dour **R**isk **A**ssessment process having been completed.
This plan will be reviewed every 12 months, and will be audited as part of the wider business audit programme and ahs been produced in accordance with the Environment Agency's H4 odour management guidance.

Any significant changes, including process changes, plans changes or increase in complaints or odours detected will result in this plan being reviewed.
This plan will be stored on SharePoint.

Site address: Colchester Waste Water Treatment Works, Haven Road, Colchester, Essex, CO2 8HT

National grid reference: NGR TM 0210023400

Treatment Processes

Colchester **STC** is a sludge treatment centre and has recently had a new Advanced Digestion plant built which incorporates the following:

All sludges, indigenous, imported and raw cake imports are treated through the advanced digestion system which is called an H.P.H plant. This stands for Heating, Pasteurisation, and Hydrolysis. A reduction in pathogens is achieved through this process from the untreated incoming sludges to the outgoing treated sludges and is gauged by the amount of reduction in line with the logarithmic table giving the consented pathogen log kill that is needed to be achieved for the end product to be compliant with the bio-solids to land regulations The compliance of the product is maintained by the close monitoring of all CCP's in the process, regular sampling and analysis is carried out by the Bio-solids Team, on site sludge techs and laboratory. The compliant product is then clear to go to agriculture.

Imported sludge loads and on site primary sludge make are pumped into a covered reception tank and are then passed forward through strain presses which take out any rag. This sludge then goes to another tank where it is mixed then to a building that houses two Gravity Belt Thickeners, which thicken the sludge and then into a covered blending tank which also receives the onsite thickened surplus activated sludge. This thickened activated sludge has been pumped through a strain press and thickened by another G.B.T. These thickened sludges then get added to the raw cake imports and are passed forward to the H.P.H plant for enhanced treatment.

Raw cake imports are brought into the STC by skips or articulated vehicles. The cake is unloaded into a cake bunker where conveyors then forward it to a cake silo where it then goes into the blending tank along with all the other sludges. The cake bunker has an automated roller shutter door. When the door is open to accept a delivery of cake a surfactant spray starts automatically for additional odour control whilst the door is open.

From the blending tank it is pumped forward to the HPH process which is a batched system. This allows the correct retention times to be achieved in all of the tanks within the HPH process.

A new steam boiler system has been put in to inject steam into the HPH process for the heating of the sludges.
The first tank where the blended sludges go is the heating tank which has a capacity of 270m3. Here the sludge is heated up before it is pumped forward into 2 pasteurisation tanks. These each have a capacity of 270m3 and the sludge is also heated up further in these tanks. From these it goes into the hydrolysis tank which has a capacity 1000m3
All tanks are enclosed for gas capture.

When the sludges have gone through this process it is then passed forward to two new digesters that have been constructed. Each digester has a capacity of 3,750m3.
These digesters are also enclosed for gas capture. The gases that are produced within these are transferred to a gas holder which will then run the CHP engines of which there are two. This has been put in place to coincide with the new HPH as there will be more gas available through the new process.

Sludge from the digesters will be passed forward to centrifuges where it will be thickened into cake and then taken to land by skips. Digested cake has very little potential for odours.
The centrate from the de-watered cake has a very high ammonia content so is pumped over to a specially built ammonia removal plant to lessen the impact on the WRC process when it is returned for further treatment

The **WRC** treats raw sewage from Colchester area which has a population equivalent (PE) of 134,000.

Sewage enters the works at the high inlet and at the low level pumping station which is then pumped to the first stage in the sewage treatment process; this is known as the Preliminary Treatment

This stage involves the removal of unwanted materials in the sewage such as rag which can be plastics, paper, wood & grit

Rag must be removed before subsequent treatment to prevent blockages or damage to the sewage treatment works. Rag is removed by passing sewage through a screen.

Grit can damage machinery; it is removed by a process of settling. For this to be effective, the flow must be kept at 0.3m/s. if the flow is greater than, the grit will not settle out, if the flow is less, the organics will drop out too. Once grit is settled out, it is removed out via a pump suction or dredging.

The next stage of the process is Primary Treatment which is a physical process. Its purpose is to remove heavier organic solids from the sewage. During this treatment, it is held in a tank known as a **P**rimary **S**edimentation **T**ank (Colchester has four) for a period of time in order to settle out the sludge. The settled sludge can then be removed from the bottom of the tank for further treatment.

Secondary Treatment removes unwanted pollutants biologically in the presence of oxygen and a food source. Natural processes break down and remove substances that might harm the environment. To encourage the growth of micro-organisms we create ideal controlled conditions.

The liquors from the Secondary Treatment are a mix of sewage and micro-organisms known as **M**ixed **L**iquors **S**uspended **S**olids. This is passed to the **F**inal **S**ettlement **T**anks (Colchester has six). The design of the FST's is to separate out MLSS through the bottom of the tank and return back to Secondary Treatment. The remaining effluent will discharge to the next stage which is **U**ltra **V**iolet Treatment.

The UV energy permanently alters the DNA structure of the micro-organism. The micro-organism is "inactivated" and unable to reproduce or infect. The effect is instantaneous. Cell damage depends on the dose of UV absorbed and the micro-organisms resistance to the UV, then the effluent is returned to the river.

Odour Control Units

In developing a new BioSolids treatment process at Colchester WRC/STC, it was necessary to consider the potential odour impact that the plant could cause. As part of the design process odour modelling was carried out and areas where such risk could occur were identified. This lead to the installation of a new odour control system and the refurbishment of the existing odour control system.

The new OCU servers the Primary/Imported sludge reception tank, Screened Primary/Import sludge storage tank, Primary and imported sludge GBT's, Blended sludge/HPH feed tank, Cake reception bunker and cake conveyors and the cake reception silo.

The OCU system is installed near the sludge blending tank. The system comprises of a 1st stage Bio-trickling filter, a 2nd stage Dry iron oxide media scrubber and a 3rd stage Dry activated carbon scrubber combined in two parallel vessels, a duty/standby fan and the treated air is discharged via a 12.5m stack.

New ductwork will extract the contaminated air from the above areas to the new OCU system.

A bypass arrangement is installed around the various stage scrubbers/filters to allow a media change without interrupting the process.

The capacity of the new OCU system 4398 m3/h.

There is also an existing somewhat smaller OCU system that serves the SAS buffer tank and SAS gravity belt thickener building.

Maintenance **and monitoring requirements in relation to the odour control systemto be undertaken at the site** including daily/weekly/monthly/annual checks and servicing (links to log books and check sheets to be included)

Emission Point Type	Parameter	Monitoring Frequency	Monitoring standard or method
Channelled emission to air (biofilter and scrubbing system	Ammonia	Once every 6 months or more frequent if stated in the permit.	Emissions of pollutants into the environment through any kind of duct pipe stack etc. As per design and manufacturer's specifications EN ISO 21877
	H_2S		CEN TS 13649 for sampling NIOSH 6013 for analysis
	Odour concentration		BS EN 13725
	Efficiency checks	Annual	Annual report detailing the removal efficiency of all abatement systems and planned maintenance including media health air flow distribution and emissions removal efficiency BS EN 13275
	Media moisture andgas flow temperature	Weekly	Recorded using a moisture meter and temp probe
	Gas stream flow	Continuous	As per design and manufacturer's specifications
	Surface condition	Weekly	Visual assessment
	Thatching and compaction	Weekly	Back pressure

Control Measures

Anglian Water's overall strategy for East Anglia will provide 10% spare capacity in enhanced sludge treatment centres. This will allow some flexibility in redirecting sludge imports to ensure sludge is treated in a timely manner and not allowed to build up and become septic.

It is difficult, however, for Works Technicians to refuse imports arriving at the site as there is no clear indication that a particular tanker will present an odour problem until the sludge is discharged. It is therefore critical that sludge imports to Colchester are managed such as sludge is collected on a regular and frequent basis from export sites and that the Treatment Manager is made aware of potential operational problems at these sites which could give rise to odorous sludge. In Anglian Water, sludge movements are managed by RES who prioritise the sites based on consents, operating conditions and storage capacities such that sludge does not build up in any export sites. In the event of a breakdown at the STC, RES will also redirect sludge to an alternative treatment centre.

Sludge levels and throughputs for imported and indigenous sludge are recorded on the STC SCADA system. Liquid sludge is completely mixed in the import tank.

Good housekeeping plays an essential part in reducing odour emissions at the site. Works Technicians perform daily site inspections to ensure there are no spillages from tanks or tanker deliveries and are instructed to clean spillages as soon as possible. Tanker drivers have been instructed to clear their discharge pipes with the tanker still connected so that any remaining odorous gases are contained within the import tank and odour abated. Any sludge spillages during discharge are immediately hosed into the adjacent drain and returned to the WRC. Tanks that have been taken out of service must be kept empty and clean to avoid odour.

Reduction of Emissions

All tanks used for treatment of sludge are covered, sludge and cake reception areas are covered and odours are controlled through both suppression and odour control units. Digested cake, with a low odour profile, is stored on an open air pad. The capacity is monitored and when the volume or odour profile increases jobs are raised with RES (AWS bio solids spreading team) who are informed of the requirement for increased removals, where land bank is available. Cake will only be on the pad for the shortest duration possible accounting for transportation delays.

Breakdowns

In the event of a breakdown of any equipment but specifically the odour control equipment the responsible person creates a job requisition which is then processed and initiated through Anglian Water's **O**perational **M**anagement **C**entre. The response time for remedying breakdowns is dependent upon the criticality of the plant, response codes are:

A0 Within 1 hour.
A1 Within 4 hours.
A2 Within 1 day.
A3 Next day.

A4 Next 2 days.

All critical plant at Colchester is allocated a response code of A1. Jobs are allocated by the OMC via Anglian Water's electronic scheduling tool, 'Oracle'. This identifies an appropriately qualified person who is able to respond within the timescales determined by the response code.

Examples of incidents or emergencies that could affect odour could be a breakdown of the masking unit. This impact is reduced by holding key spares on site and the plant be designed with Duty/Standby arrangements on plant items.

Other breakdowns to vehicles are overcome readily by having several vehicles within our own Fleet or alternatively hiring in additional vehicles.

The site holds many spares for key equipment and framework arrangements are in place for critical plant including lead times for delivery to site. These would be fitted immediately to recover the process as quickly as possible. In addition, maintenance contracts are in place with many suppliers and include the requirement for them to store spares on Anglian Water's behalf.

Odour modelling

The frequency of wind direction and the distance to the nearest properties are key factors in determining likely odour impacts.

Odour modelling has been commissioned for this site as part of the IED permit application – refer to this for more information (Colchester Odour Modelling Report). 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 (Colchester Bioaerosol Risk Assessment).
The model was run using the meteorological 2018 to 2020 years to test the variability of the odour concentration results among the different years.

On any future odour modeling report this is how the odour offensiveness will be categorised. In the odour modelling report these contour lines are shown for the odour concentrations of 1.5, 3, 5, and 10 OUE/m3. The significance of these odour concentrations is explained below:

- 1 OUE/m3 is the level of odour detection under laboratory conditions.

- 3 OUE/m3 is the level of odour detection in open environment. Complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution.

- 5 OUE/m3 is when odour becomes detectable & recognisable. Complaints may occur and de-pending on the sensitivity of the locality and nature of the odour.

- 10 OUE/m3 is when odour becomes distinct and intrusive. Complaints are highly likely and odour exposure at these levels represents an actionable nuisance.

An odour concentration of 1.5 Odour Units Per Cubic Metre (OU/m3) has been taken as the benchmark level at which nuisance and potential loss of amenity would be anticipated. This assessment criterion for the protection of public nuisance/amenity is in line the Environment Agency (EA) H4 Planning Guidance, including septic effluent and sludge in amongst a range of substances categorised as most offensive and for which a low detection threshold should be taken into consideration.

1. 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 guidance2

- High sensitivity receptors e.g. residential dwellings, hospitals, schools/education and tourist/cultural.
  - users can reasonably expect enjoyment of a high level of amenity; and
  - people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.

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

The magnitude of risk relates to:

- 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 receptors in relative close proximity to the site. The sensitive receptors of the site are identified in the Bioaerosol Risk Assessment (Colchester Bioaerosol Risk Assessment).

Receptor	Nearest potential emission source to receptor	Process	Distance (m) from nearest potential emission source [a]	Direction of receptor from closest emission source
Sensitive receptors near the Site (places of work, amenity areas)	PSTs	Water Recycling Centre	50	West
	Biofilters	Water Recycling Centre	N/A	
	Aeration lanes	Water Recycling Centre	75	West
	FSTs	Water Recycling Centre	75	West
	Anaerobic digesters	Sludge Treatment Centre	260	West
	Pasteurisation Tank	Sludge Treatment Centre	250	West
	Centrifuge building	Sludge Treatment Centre	225	West
	Hydrolysis Tank	Sludge Treatment Centre	225	West
	HPH Heating Tank	Sludge Treatment Centre	230	West
	Cake storage	Sludge Treatment Centre	105	West North West

Receptor	Nearest potential emission source to receptor	Process	Distance (m) from nearest potential emission source [(a)]	Direction of receptor from closest emission source
	Boilers	Biogas combustion	250	West
	CHPs	Biogas combustion	215	West
	Flare	Biogas combustion	265	West
Residential properties near the Site (residential)	PSTs	Water Recycling Centre	350	North
	Biofilters	Water Recycling Centre	N/A	
	Aeration lanes	Water Recycling Centre	400	North
	FSTs	Water Recycling Centre	500	North
	Anaerobic digesters	Sludge Treatment Centre	675	North
	Pasteurisation Tank	Sludge Treatment Centre	600	North
	Centrifuge building	Sludge Treatment Centre	650	North
	Hydrolysis Tank	Sludge Treatment Centre	600	North
	HPH Heating Tank	Sludge Treatment Centre	600	North
	Cake storage	Sludge Treatment Centre	215	West South West
	Boilers	Biogas combustion	550	North
	CHPs	Biogas combustion	500	North
	Flare	Biogas combustion	700	North
Amenity area near the Site	PSTs	Water Recycling Centre	350	South
	Biofilters	Water Recycling Centre	N/A	
	Aeration lanes	Water Recycling Centre	350	South
	FSTs	Water Recycling Centre	300	South
	Anaerobic digesters	Sludge Treatment Centre	150	South
	Pasteurisation Tank	Sludge Treatment Centre	250	South
	Centrifuge building	Sludge Treatment Centre	**200**	South
	Hydrolysis Tank	Sludge Treatment Centre	250	South
	HPH Heating Tank	Sludge Treatment Centre	250	South
	Cake storage	Sludge Treatment Centre	270	South East
	Boilers	Biogas combustion	325	South
	CHPs	Biogas combustion	310	South
	Flare	Biogas combustion	**125**	South

Note:

(a) 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

Monitoring of Odours

If an elevated odour level is detected on site, sources will be investigated to determine the source. If the source can be identified, actions will be taken to stop odour generation or stop the activity responsible. If the activity cannot be stopped immediately for operational reasons, the Environment Agency will be informed, with a time scale to affect a permanent solution.

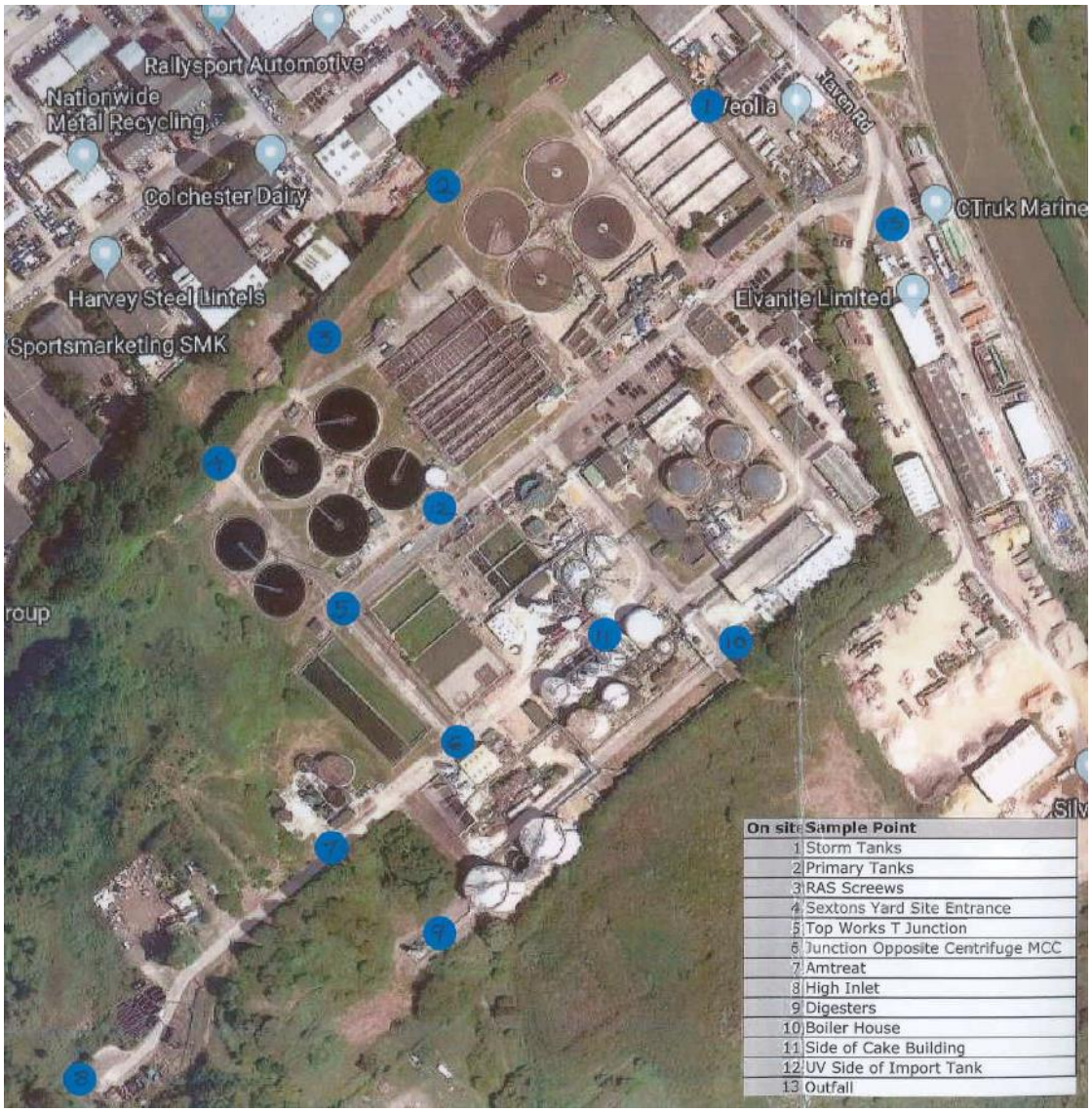
A record will also be maintained of any known off-site activities that may have an impact on odour, such as agricultural practices.

Wind direction will be considered before any non routine work likely to cause odour is carried out. If there are problems with the OCU performance, tanker imports may also be diverted dependant on wind direction.

The following maps show the site, odour sources, odour investigation points, weather information and sensitive/common receptors.

WRC & STC Potential Sources Sampling Log Locations

These points on the map below will be surveyed using the Jerome meter on a 2-weekly basis, records will be kept electronically on the 'Potential Sources Sampling Log' and reviewed for trends.



Colchester Complaint Investigations Sampling Log Locations

Following a complaint received, this segmented map shows initial investigation points which will be surveyed using a Jerome meter and sniff testing in conjunction with the WRC/STC.

WRC/STC Management decisions involved

The site is operated to maximise efficiency and to ensure compliance with various operational and regulatory thresholds.

Some of the operations on site may, inadvertently, cause an odour to escape, however, this is unavoidable in these circumstances. An example of this would the Whesso valves operating to relieve the pressure in the gas system to prevent health and safety problems. Our primary concern must be health and safety where our gas systems are concerned. Venting gas through Whesso valves also means we lose the value of that gas. If these valves operate it would be for as short duration as possible and the odour should be minimal although unavoidable.

When investigating odour on the site it may become clear that the odour arising is caused by an off-site asset, for instance if there is a septicity issue in the network. This can occasionally be caused by a change in the dosing operations within the network and if it was identified as a septicity issue this would be passed the relevant team within the business and would be removed from site operational control. The solution to this would be to review the dosing. There are a number of factors involved in this assessment and it is outside the site management ownership.

This section will be continually reviewed to address any longer term management changes that may impact the odour profile of the site.

WRC/STC Mitigation on site

To manage odour on site it is required that we understand the profile of the odours.

To manage the day to day fluctuations in odour and operations, the site has developed a fortnightly assessment of odour on site. This is the routine checks of odour at points listed as potential odour sources. It is intended that this activity will: a) give us a real data, long term profile of odours on site, b) highlight any points that deteriorate over time through the drifting upwards of odour levels recorded on the Jerome, and c) highlight any point sources that have spiked indicating potentially unidentified operational problems.

It is acknowledged that at times it is difficult for operational staff to detect odour changes, however where this occurs, or where the routine investigation highlights an issue, or a complaint is received the site personnel will use the same Jerome equipment and assess the odours off-site and at the boundary for the section in which the odour occurs as detailed in the map earlier in this plan.

The intention of this approach is to ensure that there is a recordable odour present in the area of concern and back track the source to our site. This will also involve the wind direction being considered. If the odour is close to the boundary and the wind direction indicates there is some chance of the odour crossing the boundary, it is expected that the operative carrying out the assessment will include the second section in their assessment.

All staff will be briefed on this new process and it will be routinely carried out and discussed.

Works Technician Weekly Schedule

Information on the routine tasks carried out by the Works Technicians is below

Potential Source /likely Odour	Routine Actions Required	Monitoring Frequency	Action level	Preventative Action	Actions to take if odour confirmed
Colchester WRC	Maintain site condition	Daily	• Routine activity	• Vehicles carrying sludge/cake to wash down in the area of the site provided to limit contamination	• Contracted road sweeping
Liquid Sludge imports to tank	Visual check of condition	Weekly	• Evidence of damage of leak	• Raise maintenance jobs accordingly • Tanks are positively odour controlled to OCUs	• Check OCU status and follow action levels
Tankers off-loading liquid sludge	Visual inspection of site	Daily	• Spills of liquid sludge noted	• Briefing of all tanker drivers to ensure clean ups completed by drivers or works technicians	• Contracted road sweeping / jetting
Cake sludge imported to hopper	Alarmed for malfunctions Check odour suppressant levels	Continuous	• Hopper malfunction • Failure of odour suppressant units	• Raise maintenance jobs accordingly • Odour suppressant units operating at the door of the cake hopper for tipping activities	• Close site to imports • Switch odour suppressant units to constant

Primary and imported Gravity Belt Thickeners building	Check odour control units functioning Building door functionality checked	Continuous Daily	• Door malfunction • Failure of OCU	• Raise maintenance jobs accordingly	• Check OCU status and follow action levels
HPH plant	Sealed units	Continuous	• Failure of plant	• Raise maintenance jobs accordingly	• None expected
Digesters	Sealed units	Continuous	• Failure of plant	• Raise maintenance jobs accordingly	• None expected
Digested Cake Storage Pad	Check storage capacity	Daily	• Capacity of storage pad being reached	• Contact RES (tankering arm of AWS) to alert them of impending maximum and request increased removals • Operations to decrease production	• Verify the source of the odour is storage pad • Deploy sites mobile masking unit
2 x Screening Skips H2S	Visual check of condition	Daily	• Evidence of overtopping / poor housekeeping	• Raise housekeeping jobs accordingly	• Increase removals • Deploy sites mobile masking unit
Boiler exhausts	• Alarmed for malfunctions • Regular maintenance programme	Continuous Annual programme	• Alarm	• Raise maintenance jobs accordingly	• Short lived odour generated by malfunction – process likely to be shut down for repairs therefore no ongoing odour

Engine exhausts	• Alarmed for malfunctions • Regular maintenance programme	Continuous Annual programme	• Alarm	• Raise maintenance jobs accordingly	• Short lived odour generated by malfunction – process likely to be shut down for repairs therefore no ongoing odour
Whesso valves	• System alarmed for malfunctions which triggers whesso operation • Regular maintenance programme	Continuous Annual programme	• Alarm	• Raise maintenance jobs accordingly	• Notify EA of malfunction as per permit requirements which has triggered ongoing whesso operation
Flare stack	• Alarmed for malfunctions • Regular maintenance programme	Continuous Annual programme	• Alarm	• Raise maintenance jobs accordingly	• Short lived odour generated by malfunction – process likely to be shut down for repairs therefore no ongoing odour

Note to operations:
Any odour generated that could impact your local community ensure you contact the Site Manager.

Communications

On receiving a customer complaint we will follow our code of practice.

We will communicate planned activities with the potential to cause odours and any other identified issues on-site, to the following;

Environmental Health	Rebecca Buckles	Rebecca.buckles@colchester.gov.uk
Environment Agency		
Anglian Water Customer Service	Customer Issues	CustService@anglianwater.co.uk
Anglian Water Customer Liaison Manager	Emma Crush	eCrush@anglianwater.co.uk
Anglian Water Customer Liaison Team Leader	Victoria Skipp	vSkipp@anglianwater.co.uk

Appendix 1 Windrose for STC

Figure 3: 2018 wind rose for Wattisham Meteorological Station

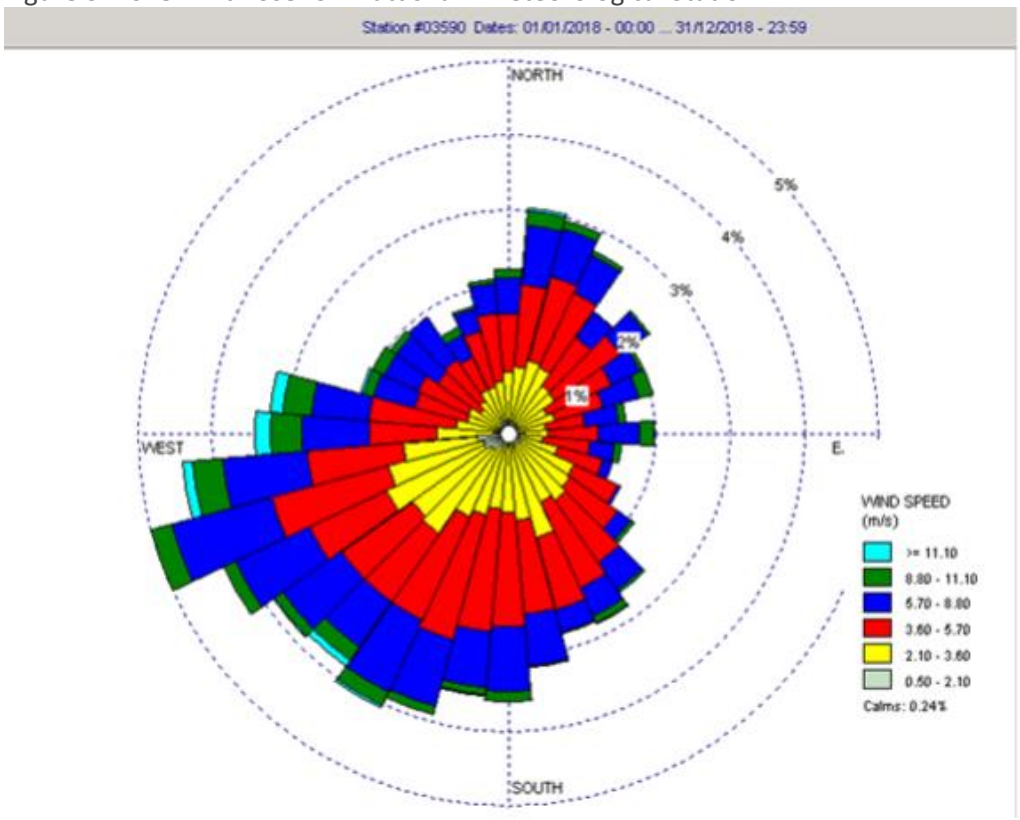


Figure 4: 2019 wind rose for Wattisham Meteorological Station

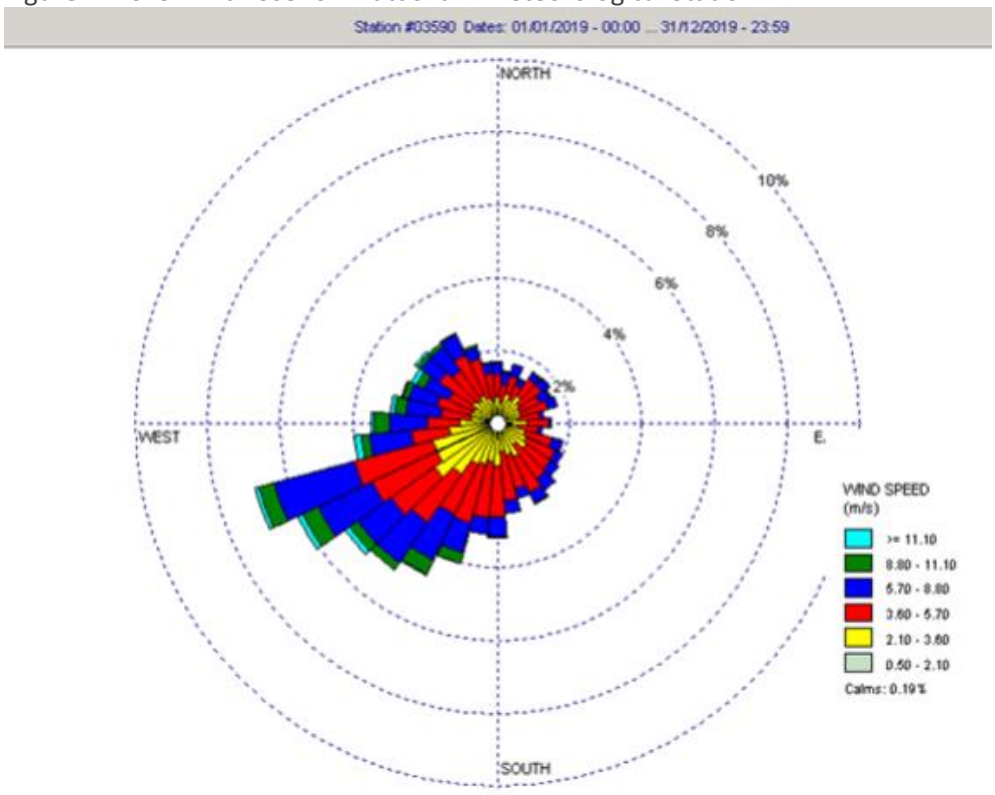


Figure 5: 2020 wind rose for Wattisham Meteorological Station