Avonmouth Renewable Energy Site (RES)
Site ID: 10409

Odour Management Plan

(Version 4)

No changes or modifications are to be made to this Odour Management Plan without informing the Regional Process Scientist (Odour Management Co-ordinator).

Relevant Documentation:

ENVS120 15: Odour Policy.
TRTWG669: Odour impact and odour risk assessment procedure for existing WRCs/STC/SPS, proposed new expansion/development of a site and potential encroachment around/near a site.

Contents

1. Document Control

Document Control Ref:	Version 3
Document Location:	IMS029
Document Custodian:	Regional Scientist/Odour Management Co-ordinator
Review Period:	This OMP will be reviewed and updated at a minimum annually.

The Odour Management Plan will be utilised by the Food Waste Treatment Plant Supervisor, Renewable Energy Manager, Site Scientist and Odour Management Co-ordinator. The site is close to Avonmouth BC, Avonmouth WRC, BCAF and Bristol TC. Managers and Supervisors will be aware that these sites have their own Odour Management Plans.

Version	Date	Revised By	Reviewed By	Amendment Details
1	30/09/2022	Regional Process Scientist	Process Manager/ Renewable Energy Manager	First version
2	04/11/2024	Regional Process Scientist	Food Waste Treatment Plant Supervisor/Renewable Energy Manager	Update to 3.5.1 and 3.5.2 with asset labels. Update to 3.6.1. Updated flow process diagram. Update to 3.6.2 Update to of current RES assets. Table 3.7.2: New asset IDs. Table 4.1.1: New asset IDs. Table 5.5.1: Addition of new column in table. “Odour improvement plan action required to make BAT 14 compliant.” 6.1 Sniff Testing: Updated to make testing daily and changes to how monthly and 6 monthly are completed.

				Removal of hydrogen sulphide surveys and sniff testing due to DSEAR rules and repeat of part of the procedure in 6.1. Updates to tables 6.3.1 and 6.3.3 to include TVOC and HCl. 9.0: Update to job titles in chapter. 10.0: Training section updated to include “Odour Awareness Course”. 12.0: Odour Improvement plan included.
3	29/01/2025	Regional Process Scientist	Food Waste Treatment Plant Supervisor / Renewable Energy Manager	Table 3.3.1 Customer complaint numbers update. 3.5 Update to Process description. Figure 3.5.1 Flow Process Diagram update. Figure 3.5.2. Schematic of current RES assets update. 5.4.1 Avonmouth RES PORA update. 12: Updated: Reviewer referenced by job title Appendix 1: Updated contact list.
4	25/11/2025	WWE Compliance Manager Process Scientist	Food Waste Treatment Plant Supervisor/Renewable Energy Manager	Table 2.5.1 Update to Waste Codes 3.5 Update to Process Description Figure 3.5.1 Process Flow Diagram update Figure 3.5.2 RES Asset Update Table 3.6.2 Inventory of Odorous Materials update Table 4.1.1 Operational Mitigation update Table 5.5.1 BAT 14d Compliance Techniques update Table 8.1.1 Emergency Control Measures update Table 12.1.1 Odour Improvement Plan update

2. Introduction

This Site Specific Odour Management Plan (OMP) has been produced to comply with the environmental permit application and covers the Avonmouth Renewable Energy Site (RES) (10409). Please note there is a separate odour management plan for Avonmouth Bioresources Centre (BC) (11800). Whilst there are two Odour Management Plans covering the activities within the installation area, all activities are currently under one operator, Wessex Water Services Ltd (WWSL). This Odour Management Plan focuses only on the Biogas and Food Waste Activities.

The OMP has been written using the following documents for guidance.

Environment Agency: Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011).

Environment Agency: Biological waste treatment: appropriate measures for permitted facilities

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning (2018).

2.1. Environmental Permitting

Avonmouth Renewable Energy Site (RES) is subject to Environmental Permitting Regulations. This is regulated by the Environment Agency.

The following documents should be consulted in relation to Environmental Permitting in Wessex Water;

ENVS 120/7: Environmental Permit Plan
EPP001: Environmental Permit Procedure

Where the regulated facility has an environmental permit to treat organic waste the following documents must be consulted:

- Appropriate measures for the biological treatment of waste:
- Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011). Environment Agency.

"The provisions of the OMP are treated as part of your permit and must be complied with. H4 informs that the effectiveness of the odour control measures should be reviewed once a year".

Detailed in the H4 guidance an OMP should:

- *Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution*
- *Prevent unacceptable odour pollution at all times; and*

- *Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.*

2.2 Statutory Nuisance

"A statutory nuisance is defined as a premises which are deemed to be detrimental to health or a nuisance, or are emitting dust, steam, smells, effluvia or noise with this effect. Every Local authority has to inspect the area it covers to check for statutory nuisances, if a complaint of statutory nuisance is made by a resident then the local authority must investigate. If a statutory nuisance is deemed to exist, then a notice will be served requiring the abatement of the nuisance and this notice shall include a list of steps that should be taken to reduce the nuisance."

Under the statutory nuisance regime there is a defence available in the event of either an appeal against an abatement notice, or prosecution for having contravened, or failed to comply with, an abatement notice, for statutory nuisance on industrial, trade or business premises, of having used "best practicable means" to abate the nuisance.

The interpretation of "best practicable means" is described at section 79(9) of the Environmental Protection Act 1990:

a) "practicable" means reasonably practicably having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications:
b) the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures:
c) the test is to apply only so far as compatible with any duty imposed by law;
d) the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances:

From webpage Gov.UK Guidance: Nuisance smells; how councils deal with complaints.

"Councils must look into complaints about smells from industrial, trade and business premises that could be a 'statutory nuisance' (covered by the Environmental Protection Act 1990).

The Environment Agency (EA) controls some potential smell nuisances with environmental permits as part of pollution control.

Councils need to work closely with EA to make sure that people aren't penalised twice for the same activity. If a facility has an environmental permit councils must get the Secretary of State's permission before prosecuting for breach of an abatement notice"

2.3 Wessex Water Odour Management

Wessex Water has adopted the following Odour Policy (ENVS120/15)

Wessex Water shall ensure that new assets are assessed for odour risk and shall be designed and operated to minimise risk of causing odour nuisance to receptors in consultation with planning authorities and environmental regulators.

Existing assets with the potential to generate odours must comply with either generic or site-specific odour management plans to limit risk of causing an odour nuisance.

All Water Recycling Centres (WRCs), Bioresource Centres (BC), Sludge Treatment Centres (STCs) and Sewage Pumping Stations (SPSs), Renewable Energy Sites (RES) are allocated an Odour Management Plan. The type allocated will be dependent on the type of site and regulations applicable to the site.

There are two types of odour management plan within Wessex Water to demonstrate "best practicable means", or BAT where applicable is being applied:

Generic odour management plan: Applicable to all sites which have a small source odour potential and have low levels of odour complaints. These sites are generally small in size and have a small source odour potential. They would usually include small to medium WRCs and SPSs where there is a small source odour potential and there have been low levels of odour complaints received.

Site specific odour management plan: Applicable to the following:

- Sites that have an environmental permit and BAT compliance is applicable.
- Sites that have a large source odour potential where there is the high potential for odour complaints to be received.
- Sites that have received an odour abatement order.
- Sites that have planning restrictions applicable to odour where specific operational measures have to be applied.
- A review of the history of odour complaints requires additional mitigation/management above that stated in a generic odour management to prevent further odour complaints being received.

All Bioresources Centres (BC) which are subject to Environmental Permitting Regulations and BAT are to be categorised as Odour Management Plan Site Specific Category 1:

The odour management plan will define what odour management exists and ensure that "best practice" occurs to minimise odours. Where the site has an Environmental Permit BAT compliance will be detailed. A copy of this odour management plan will be held on site and on the intranet.

Site specific odour management plan sites are identified by an odour sensitive site poster being displayed on site.

The type of odour management plan given to a site is reviewed on an annual basis:
Site specific odour management plan sites are placed into one of three categories depending on a number of factors. The specific category for a site is reassessed on a yearly basis.

- **Category 1**:

- All sites that are subject to Environmental Permitting Regulations and associated BAT requirements.
- All sites that have received an odour abatement order.
- Sites that have a history of odour complaints (>20 complaints per year or previous complaint history deems it necessary)

There must be a review of the odour management plan at a minimum twice a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the site meeting. The OMP must be updated on a minimum of an annual basis. At a minimum a boundary sniff test must completed once a year.

Note: Bioresource Centres or Renewable Energy Sites with Industrial Emissions Directive Environmental Permits require daily boundary sniff tests to be carried out. There will also be further monitoring requirements. Please see chapter 6 of the OMP.

- **Category 2**:

- Sites that have a history of odour complaints (>10 but <20 complaints per year or previous complaint history deems it necessary).

There must be a review and an update of the odour management plan at a minimum once a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the meeting. At a minimum a boundary sniff test must completed once a year.

- **Category 3**:

- Sites that have less then <10 complaints per year but previous complaint history requires more than a generic odour management plan to be in place.
- Site has Odour Control Units (OCUs) on site extracting via a fan from wastewater or sludge assets.
- Planning restrictions applicable to odour where specific operational measures have to be applied.
- Sites that have a large odour source potential. (For example "*large STW, material usage hundreds of thousands of tonnes/m^3 per year, area sources of thousands of m^2. The compounds involved are very odorous having very low Odour Detection Thresholds." extract* from IAQM Guidance on the assessment of odour for planning)

There must be a review of the odour management plan at a minimum once a year.

Avonmouth RES

This site has been categorised as category 1:

Reason: Environmental Permit

2.4 Background

There are four steps generally required to create an odour nuisance. These are:

1) The formation of odorous compounds
2) The transport of odorous compounds in the liquid phase
3) The transfer of odours to the atmosphere
4) The transport of odours to potential complainants.

The ability of the released odour to cause an odour nuisance will depend on:

- How much and where they are released.
- The volume of air in which they become dispersed.
- The proximity and sensitivity of potential complainants.
- The frequency, duration and time of day of such a release.

2.5 List of Waste Codes

Table 2.5.1 Avonmouth RES Waste Codes.

Table S2.3 Permitted waste types and quantities for anaerobic digestion (Activity Reference A2 in Table S1.1)	
Maximum quantity	**Annual throughput shall not exceed 70,000 tonnes**
Waste code	**Description**
02 Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing	
02 01	wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 01	sludges from washing and cleaning – food processing waste, food washing waste
02 01 02	animal tissue waste – category 3 animal by-products (ABP) including blood, animal flesh, fish processing waste, fish carcasses, poultry waste – Category 2 ABP – paunch contents
02 01 03	plant tissue waste – husks, cereal dust, waste animal feeds
02 01 06	animal faeces, urine and manure (including spoiled straw) only
02 01 07	wastes from forestry
02 02	wastes from the preparation and processing of meat, fish and other foods of animal origin
02 02 01	sludges from washing and cleaning− process water − food washing waste
02 02 02	animal tissue waste − Category 3 ABP including blood, animal flesh, fish processing waste, fish carcasses, poultry waste
02 02 03	materials unsuitable for consumption or processing − coffee, food processing waste, jam, kitchen waste, fruit, vegetable oil, tobacco, tea, vegetable waste − waste fat from processing of meat or fish
02 02 04	sludges from on-site effluent treatment
02 03	**wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract**

	production, molasses preparation and fermentation
02 03 01	sludges from washing, cleaning, peeling, centrifuging and separation− coffee, mushroom compost, food processing waste, food washing waste, tobacco
02 03 04	biodegradable materials unsuitable for consumption or processing (other than those containing dangerous substances)
02 03 05	effluent from the processes referred to in sources of waste
02 04	wastes from sugar processing
02 04 03	sludges from on-site effluent treatment – biological sludge
02 05	wastes from the dairy products industry
02 05 01	biodegradable materials unsuitable for consumption or processing (other than those containing dangerous substances) – solid and liquid dairy products, milk, food processing wastes, yoghurt, whey
02 05 02	sludges from on-site effluent treatment
02 06	wastes from the baking and confectionery industry
02 06 01	biodegradable materials unsuitable for consumption or processing (other than those containing dangerous substances) – food condemned, food processing wastes, biscuits, chocolate, yeast, bread, bakery waste
02 06 03	sludges from on-site effluent treatment
02 07	wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials – brewing waste, food processing waste, fermentation waste
02 07 02	wastes from spirits distillation – spent grains, fruit and potato pulp – sludge from distilleries
02 07 04	biodegradable materials unsuitable for consumption or processing (other than those containing dangerous substances) – brewing waste, food processing waste, fermentation waste, beer, alcoholic drinks, fruit juice
03 Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard	
03 03	wastes from pulp, paper and cardboard production and processing
03 03 10	fibre rejects and sludges – paper pulp (de-inked only), paper fibre
03 03 11	wastes not otherwise specified - sludges from on-site effluent treatment other than those mentioned in 03 03 10
04 Wastes from the leather, fur and textile industries	
04 01	wastes from the leather and fur industry
04 01 01	fleshings and lime split wastes
04 02	wastes from the textile industry
04 02 10	organic matter from natural products, e.g. grease, wax

15 Waste packaging, absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	
15 01	packaging (including separately collected municipal packaging waste)
15 01 01	paper and cardboard packaging - must conform to BS EN 13432 - no manmade substances. Only as packaging containing organic waste.
15 01 03	wooden packaging - must conform to BS EN 13432. Only as packaging containing organic waste.
15 01 05	composite packaging - must conform to BS EN 13432. Only as packaging containing organic waste.
19 Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use	
19 02	wastes from physico/chemical treatment of waste
19 02 10	combustible wastes
19 05	Wastes from aerobic treatment of wastes
19 05 01	non-composted fraction of municipal and similar wastes
19 05 02	non-composted fraction of animal and vegetable waste
19 05 03	off-specification compost
19 06	wastes from the anaerobic treatment of wastes
19 06 03	liquor from anaerobic treatment of municipal waste
19 06 04	digestate from anaerobic treatment of municipal waste
19 06 05	liquor from anaerobic treatment of animal and vegetable waste
19 06 06	digestate from anaerobic treatment of animal and vegetable waste
19 08	wastes from waste water treatment plants not otherwise specified
19 08 09	grease and oil mixture from oil/water separation containing edible oils and fats
19 08 12	sludges from biological treatment of industrial waste other than those mentioned in 19 08 11
20 Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
20 01	separately collected fractions (except 15 01)
20 01 01	paper and cardboard - only as packaging containing organic waste.
20 01 08	biodegradable kitchen and canteen waste
20 01 25	edible oil and fat
20 01 38	wood other than that mentioned in 20 01 37, and only where no non-biodegradable coating or preserving substance present - must conform to BS EN 13432
20 02	**garden and park wastes (including cemetery waste)**
20 02 01	biodegradable waste − animal faeces, manure, garden waste, green waste, horticultural waste, plant tissue, parks and garden waste, hedge

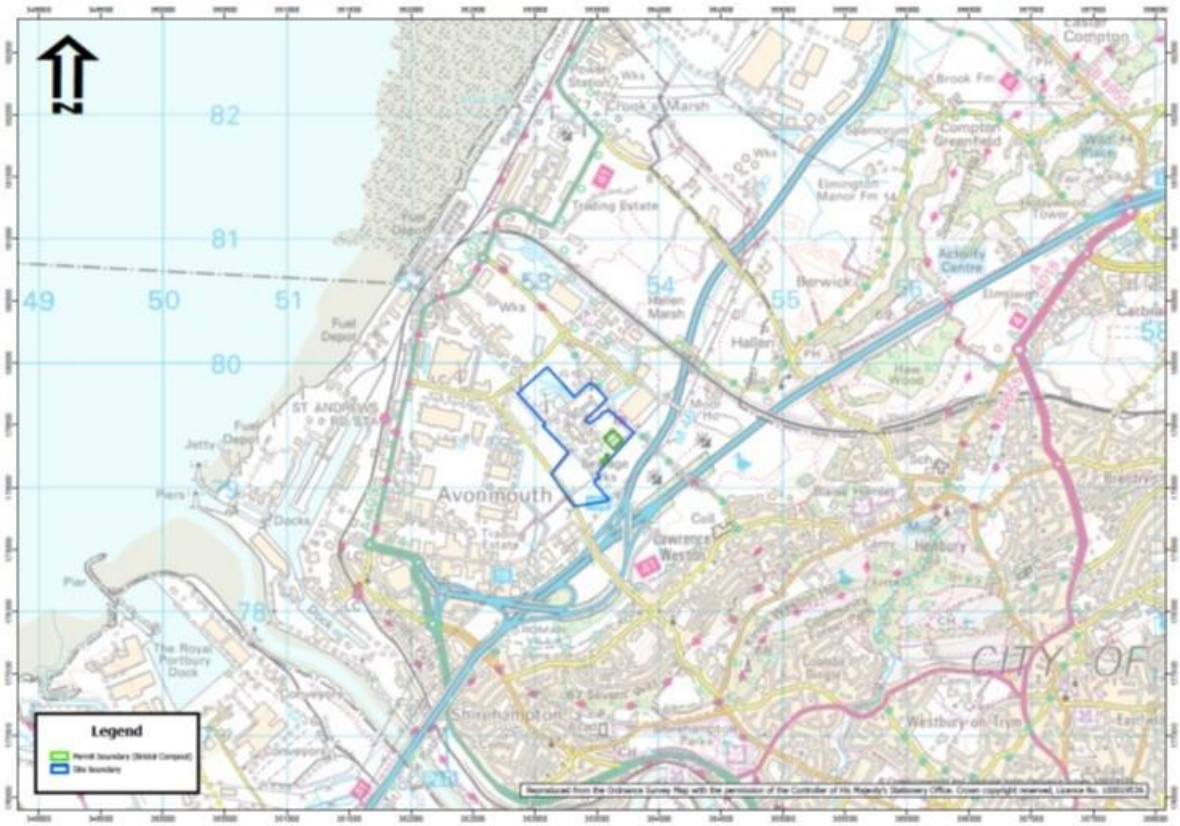
	and tree trimmings, grass cuttings and leafy materials
20 03	**other municipal wastes**
20 03 01	mixed municipal waste − separately collected biowastes
20 03 02	wastes from markets - markets − allowed only if source segregated biodegradable fractions eg. plant material, fruit and vegetables.

3 Site Location

3.1 Site Location Description

The Avonmouth RES is approximately 10km north-west of Bristol City Centre. The surrounding land use is generally industrial or commercial receptors located to the west and the north. The motorways M49 and M5 are located to the south-east. Lawrence Weston residential area is approximately 1.3km to the south-east and south. Figure 3.1.1 displays the regional setting of the RES. The RES is the area within the red line on the map.

Figure 3.1.1 Site Setting - Regional



3.2 Site Receptors

The surrounding land use is generally industrial or commercial receptors located to the West and the north. Lawrence Weston residential area is approximately 1.3km to the south-east and south. Figures 3.2.1, 3.2.2 and 3.3 3 highlight the sensitive receptors surrounding Avonmouth RES.

Figure 3.2.1 Location of Sensitive Receptor - Residential

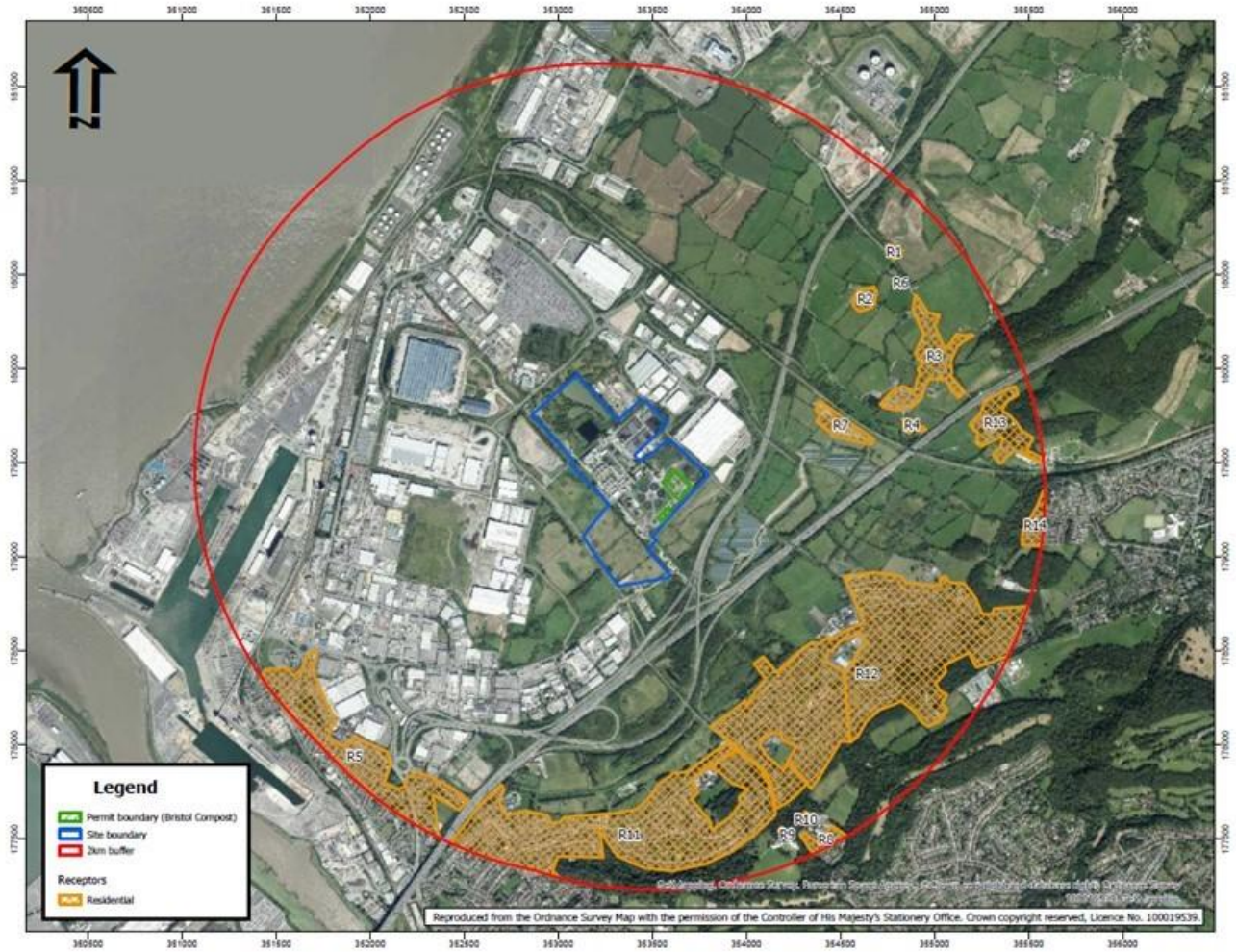


Figure 3.2.2 Location of Sensitive Receptor – Commercial/Industrial

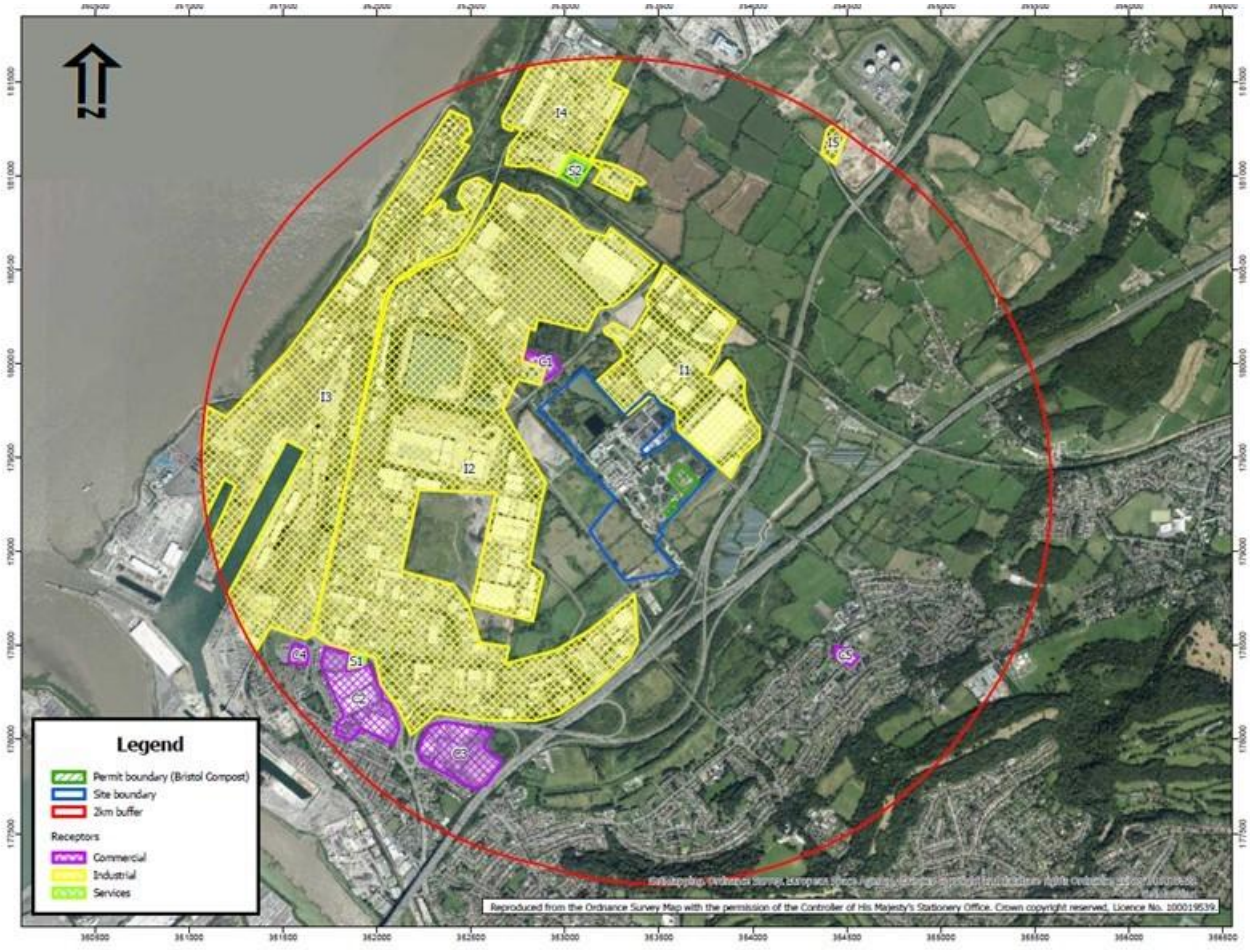


Figure 3.2.3 Location of Sensitive Receptor – Education/Healthcare/Leisure

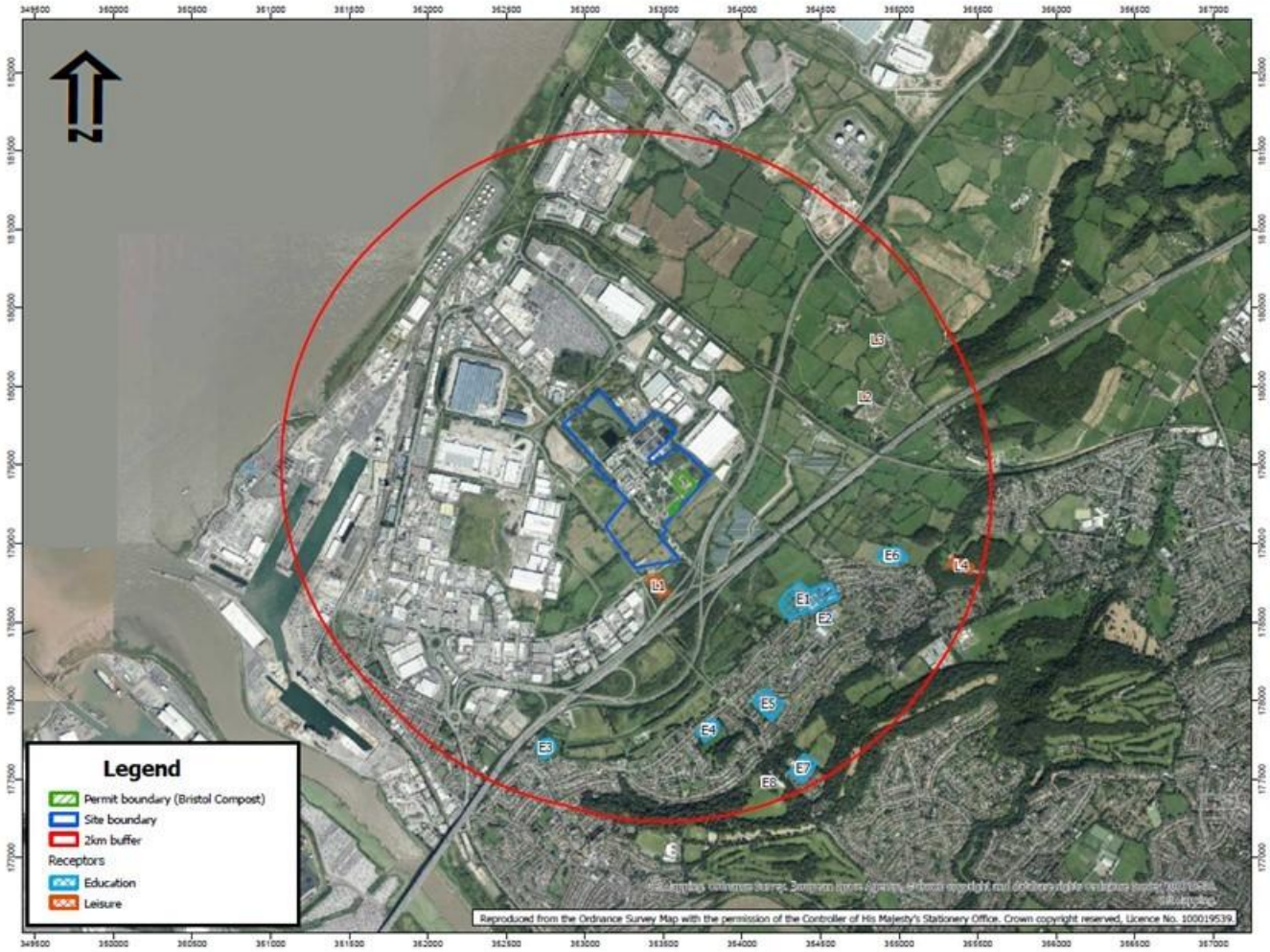


Table 3.2.1 Avonmouth RES Surrounding Receptors

Receptor Name	Receptor Map Reference	Distance from Site (m)	Receptor Type	Receptor Sensitivity
Residential properties to north-east	R1	1,765	Residential	High
Residential properties to north-east	R2	1,440	Residential	High
Residential properties to north-east	R3	1,250	Residential	High
Residential properties to north-east	R4	1,335	Residential	High
Residential properties to south-west	R5	1,685	Residential	High
Residential properties to north-east	R6	1,605	Residential	High
Residential properties to north-east	R7	895	Residential	High
Residential properties to south-east	R8	1,895	Residential	High
Residential properties to south-east	R9	1,810	Residential	High
Residential properties to south-east	R10	1,780	Residential	High
Residential properties to south	R11	1,290	Residential	High
Residential properties to south-east	R12	965	Residential	High
Residential properties to north-east	R13	1,665	Residential	High
Residential properties to east	R14	1,895	Residential	High
Commercial businesses to north-west	C1	420	Commercial	Medium

Receptor Name	Receptor Map Reference	Distance from Site (m)	Receptor Type	Receptor Sensitivity
Commercial businesses to south-west	C2	1,550	Commercial	Medium
Commercial businesses to south-west	C3	1,410	Commercial	Medium
Commercial businesses to south-west	C4	1,745	Commercial	Medium
Commercial businesses to south-east	C5	1,190	Commercial	Medium
Industry to north-east	I1	115	Industrial	Low
Industry to west	I2	210	Industrial	Low
Industry to west	I3	1,180	Industrial	Low
Industry to north	I4	1,250	Industrial	Low
Industry to north-east	I5	1,840	Industrial	Low
Schools to the south-east	E1	980	Education	Medium
Schools to the south-east	E2	1,215	Education	Medium
Schools to the south	E3	1,635	Education	Medium
Schools to the south	E4	1,395	Education	Medium
Schools to the south-east	E5	1,330	Education	Medium
Schools to the east	E6	1,345	Education	Medium
Schools to the south-east	E7	1,815	Education	Medium
Schools to the south-east	E8	1,855	Education	Medium
Leisure to the south	L1	440	Leisure	Medium
Leisure to the north-east	L2	1,310	Leisure	Medium
Leisure to the north-east	L3	1,575	Leisure	Medium
Leisure to the east	L4	1,800	Leisure	Medium
Services to the south-west	S1	1,550	Services	Medium
Services to the north-west	S2	1,345	Services	Medium

3.3 Odour Complaints

Table 3.3.1 shows the odour complaints data received by Wessex Water in respect of the wider Avonmouth Water Recycling Centre (WRC), Avonmouth RES and Avonmouth BC that have been recorded over the last 5 years. Please note that odour complaints received may not be valid as being associated with the RES or BC areas and may be due to the WRC, other Wessex Water assets, local sewage network or due to external reasons outside Wessex Water control. There are a number of other potential odorous industrial processes in the surrounding area. For further odour complaint information for the site please contact the Wessex Water Odour Management Co-ordinator.

Table 3.3.1 Avonmouth RES Complaint Frequency

Year	No. of Complaints
2024	3
2023	4
2022	55
2021	4
2020	1

*Complaints received are for WRC/BC/RES site as a whole and not specifically for the RES site.

The higher level of odour complaints received in 2022 appears to be in association to a planning application submission for an extension of the WRC plus a higher percentage of NE winds from normal.

3.4 Meteorological Conditions

In the UK, the prevailing wind directions are commonly from the west and south-west. The wind direction and speed will impact the dispersion of odour emissions from site. Wind direction is continually monitored on site. If an odour complaint is received for the site this data should be checked to see if the wind was in the correct direction for an odour nuisance to be caused from site.

Avonmouth meteorological station is the closest representation station for Avonmouth RES. The station closed though in 2021 and is the reason why 2020 met station data is displayed. Due to the meteorological station closing the 2020 wind rose has been compared against NWP data for 2020. This provided a very similar pattern and therefore going forward NWP data will be used for the site as there is no comparable met data station. The meteorological data for Avonmouth BC is adopted for the site for any odour risk assessments that incorporates metrological conditions whereby wind direction and frequency are used to determine the ”pathway effectiveness” from source to receptor. The wind rose plot for Avonmouth meteorological station is included in Figure 3.4.1 and the Avonmouth NWP data is included in Figure 3.4.2. The main wind direction for this site is west and south-west. 2022 NWP data is displayed in figure 3.4.3. This indicated during 2022 an unusual dominance of a NE wind direction as well as the normal SW prevailing wind direction.

Figure 3.4.1 Wind Rose Plot for Avonmouth 2020 (met station)

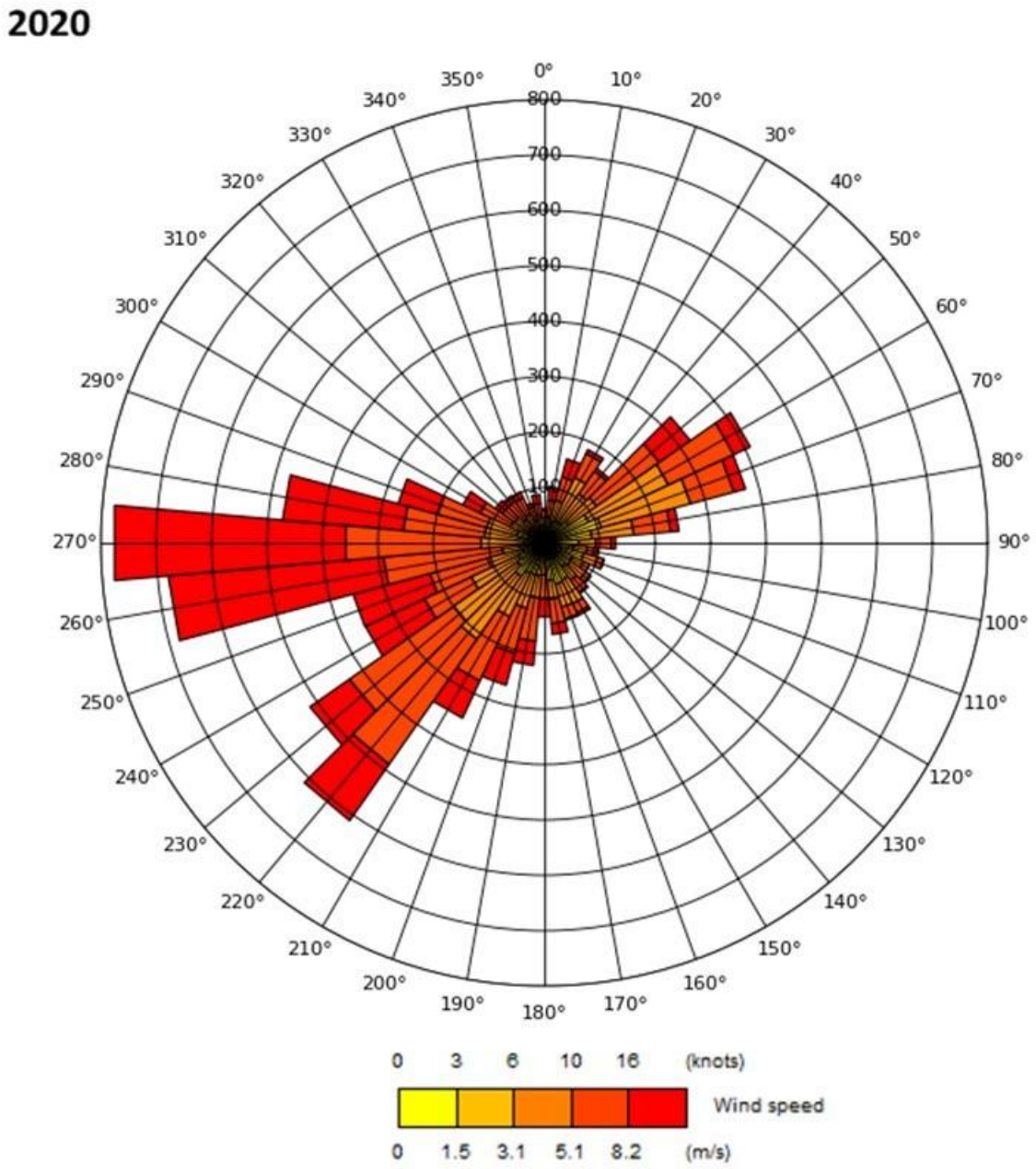


Figure 3.4.2 Wind Rose Plot for Avonmouth 2020 (NWP data)

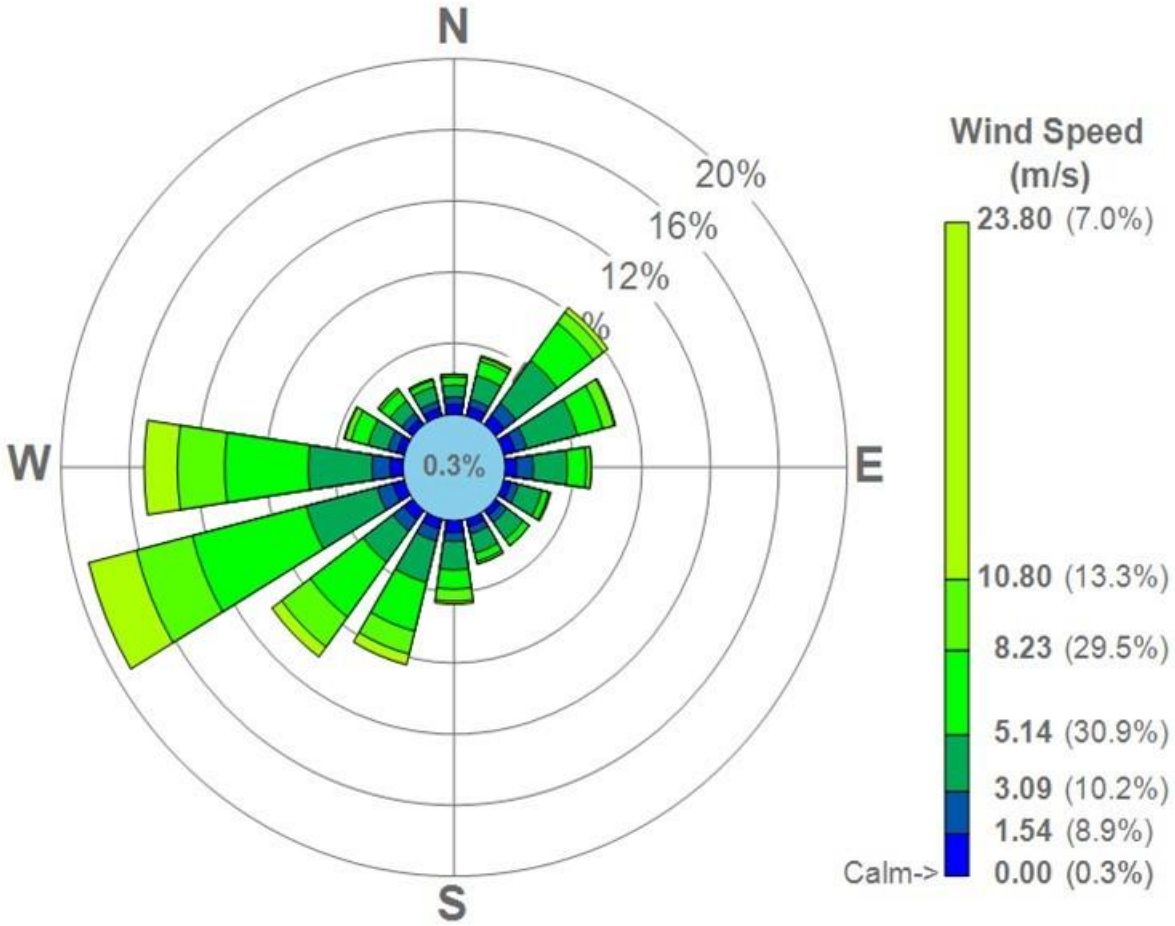
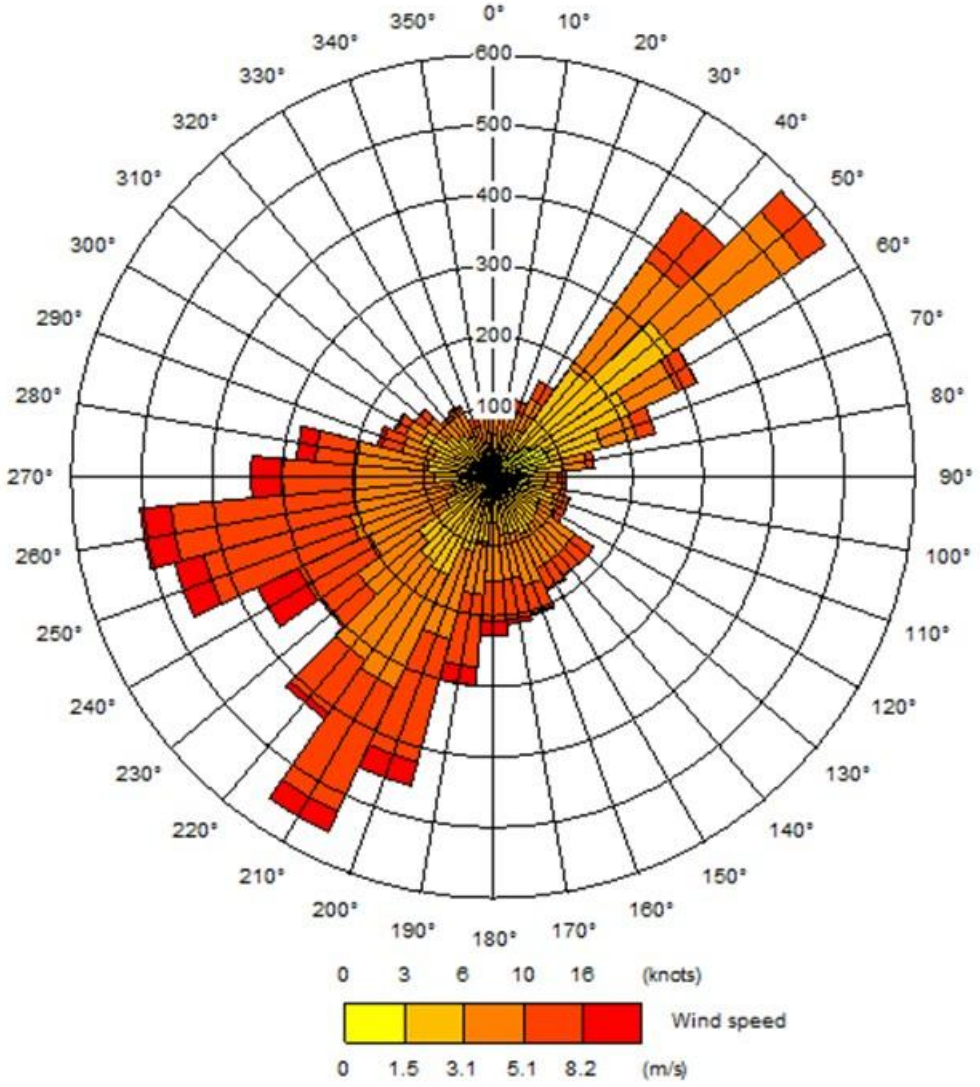


Figure 3.4.3 Wind Rose Plot for Avonmouth 2023 (NWP data)



3.5 Process Description

Bristol Food Waste Recycling Facility

Food Waste De-Packaging

- Source-segregated food waste is delivered in solid form via skips tipped into the Food Waste Reception Hall [BV] which is odour extracted by extraction fans and fed into an Odour Control Unit [BU], a 12m vertical biofilter kept at a constant temperature.

- The Food Waste Reception Hall [BV] is designed to hold one day's worth of organic material. This timeframe was chosen to prevent the organic material to remain in the Reception Hall for extended periods, thus reducing odour generation.

- Food is fed into a fixed shredder to remove any packaging or bulk contamination. The de-packaged solid waste is then loaded into two Turbo-dissolver batch tanks [BK] where the material is liquified using water.

- The shredded packaging and any bulk contamination are pulped in a Hammer mill [BL] to separate any remaining organic material. Milled packaging is then collected in the Plastics & Packaging Skip [BW] to await removal for off-site recycling.

- The liquified food slurry is screened to remove any contaminants larger than 10mm particle size. It then flows by gravity into the buffer tank feed sump where it is mixed with the pulped organic material from the Hammer mill [BL].

- Oversized screenings are loaded back into the Hammer mill [BL] to recover any organic material.

- Food slurry is then pumped into the Hydrolysis Buffer Tank [BM] where it undergoes the natural first stage of anaerobic digestion (hydrolysis) for 1-4 days.

De-packaged Food Waste Pre-Treatment

- Any gas produced by the hydrolysis step (CO_2, H_2S and 0.2% CH_4) in the Hydrolysis Buffer Tank [BM] is diverted to the Odour Control Unit [BU] to be treated before being released to air.

- The hydrolysed food slurry is then fed in batch to three pasteuriser vessels [BN1-BN3] where the slurry is pasteurised at 70°C for an hour to ensure pathogen kill as required by the Animal Plant Health Agency regulations for Animal By-Products Category 3 material.

- The slurry is then cooled down via a heat recovery heat exchanger at 45 - 55°C.

Anaerobic digestion and Biogas Production

- Pasteurised slurry is mixed into two 2,400 m^3 mesophilic anaerobic digesters [BO1-BO2] (also known as MAD 2 digesters 1 & 3) by injection into the pump-mixing loop.

- The digesters are also thoroughly mixed by injection of compressed biogas into draught-tube mixing tubes.

- The pasteurised soup is digested for 18 - 30 days at ~37°C.

Digestate dewatering

- The digested slurry overflows into a side chamber (limpet box) and is pumped via two strain-presses [BP1-BP2] and two strain-press buffer vessels [BY1-BY2] into the Post Digestion Storage Tank (PDST) [BQ]. The strain-presses remove any remaining contaminants such as glass, eggshells or other large organic fibres before the PDST to satisfy the Anaerobic Digestion Quality Protocol (ADQP) PAS110 standard.

- The removed contaminants are stored in the Screenings Skip [BX] to await removal for off-site recycling.

- The digested slurry (digestate) is stored in the PDST [BQ] for 1 - 4 days. This 800 m^3 tank is aerated to stop biogas production and methane emissions, stabilize the slurry and to mix the liquid.

- The aerated digestate is then pumped to one of two decanter centrifuges [BR] using a polyelectrolyte solution to separate solid (fibre) from liquid (centrate).

- The liquors (centrate) are discharged into the sewer where they are treated through the adjacent Avonmouth Water Recycling Centre. A portion can also be pumped via the Centrate Return [BT] to the Turbo-dissolver tanks for recycling in the process.

- The solid fibres are collected in two skips. If they satisfy the ADQP PAS110 standard, the fibres will be recycled to farmland for food crop growth via the PAS110 Cake Skip [BS1]. If they do not meet the PAS110 standard, they will be used for land reclamation instead via the Non PAS110 Cake Skip [BS2].

Food Waste Soup Exports

In periods of maintenance, where AD operations cannot occur, food waste ‘soup’ can be exported to other AD plants for off-site recycling as a contingency. This is to enable the BFWRF to continue accepting food waste from across the Bristol Unitary Authority.

The process follows the same de-packaging and pre-treatment steps as mentioned above:

Source-segregated food waste is delivered via skips into the Food Waste Reception Hall [BV] where it is shredded, diluted (Turbo Dissolvers [BK]), and screened to create a de-packaged food waste slurry.

Shredded packaging is pulped (Hammer mill [BL]) to separate any remaining organic material. The organic material is then blended with the de-packaged food slurry. This resulting slurry (food waste soup) is then pumped into the Hydrolysis Buffer Tank [BM] for storage. Food waste soup can then be exported for off-site recycling via a tanker loading point within the Food Waste Reception Hall.

To satisfy the APHA regulations for Animal By-Product Category 3 material, food waste soup can be pasteurised at 70°C for one hour in the Pasteurisers [BN1-BN3].

Pasteurised food soup can also then be exported for off-site recycling via another tanker loading point within the Food Waste Reception Hall.

Biogas storage, utilisation, and flaring

- The biogas generated from the digestion process is collected and stored within two Gas Holder bags [V].

- To ensure that no biogas is vented to the atmosphere, the site has a waste gas burner (Flare Stack) [W], that utilises any excess biogas when the Gas Holders reach a selected setpoint level and the biogas cannot be utilised by other primary consumers.

- Biogas can either be used as fuel for the site CHPs [BI1 – BI5] or cleaned and injected into the Gas to Grid process.

Gas to Grid Plant

Biogas optimization and Injection to National Grid

- The preferred consumer is the Gas to Grid plant. The biogas passes through a pre-treatment plant chiller [X] to remove moisture from the gas and to protect the downstream gas utilisation equipment.

- The biogas is then introduced to an absorption column [Y] where undesirable compounds (H_2S and CO_2) are removed by absorption with water.

- The contaminated water then passes through a flash column [Z] to separate any methane. This is then transferred from the top of the column for recycling to the absorption column [Y] via the gas compression stage.

- The water from the flash column is then fed to the top of a desorption column [BA] where all the undesirables are removed so the water can be recycled.

- The waste gas is vented to the atmosphere through a biofilter and GAC odour unit control [BF].

- Biomethane from the absorption column is then inserted through two carbon filters [BB] to remove any remaining impurities before the Grid Entry Unit [BC].

- To achieve National Grid required parameters, the biomethane is optimized by increasing its calorific value. This is done by injecting propane from the Propane Tank [BD].

- Odour is also added to comply with these parameters.

- The Grid Entry Unit [BC] checks the biogas for quality, calorific value, soot index, incomplete combustion factor, Wobbe index, temperature, and flow rate.

- Any gas that is not compliant or any surplus gas is by the Biomethane waste gas burner [BE].

Combined Heat & Power Plant

- Biogas from the Gas Bags [V] is cycloned to lower the moisture [BG] before being boosted together with natural gas towards the 5x CHP engines [BI1 – BI5].

- The exhaust gas from the engines is cooled down via a heat exchanger. The water from this process is used to keep the digesters [BO1-BO2] at a constant temperature of 36-40°C.

- The electricity is used for power of the whole site. Any surplus electricity is exported.

- If the CHP engines cannot run, there is a backup boiler [BH] as an alternative.

Figure 3.5.1: Process Flow Diagram

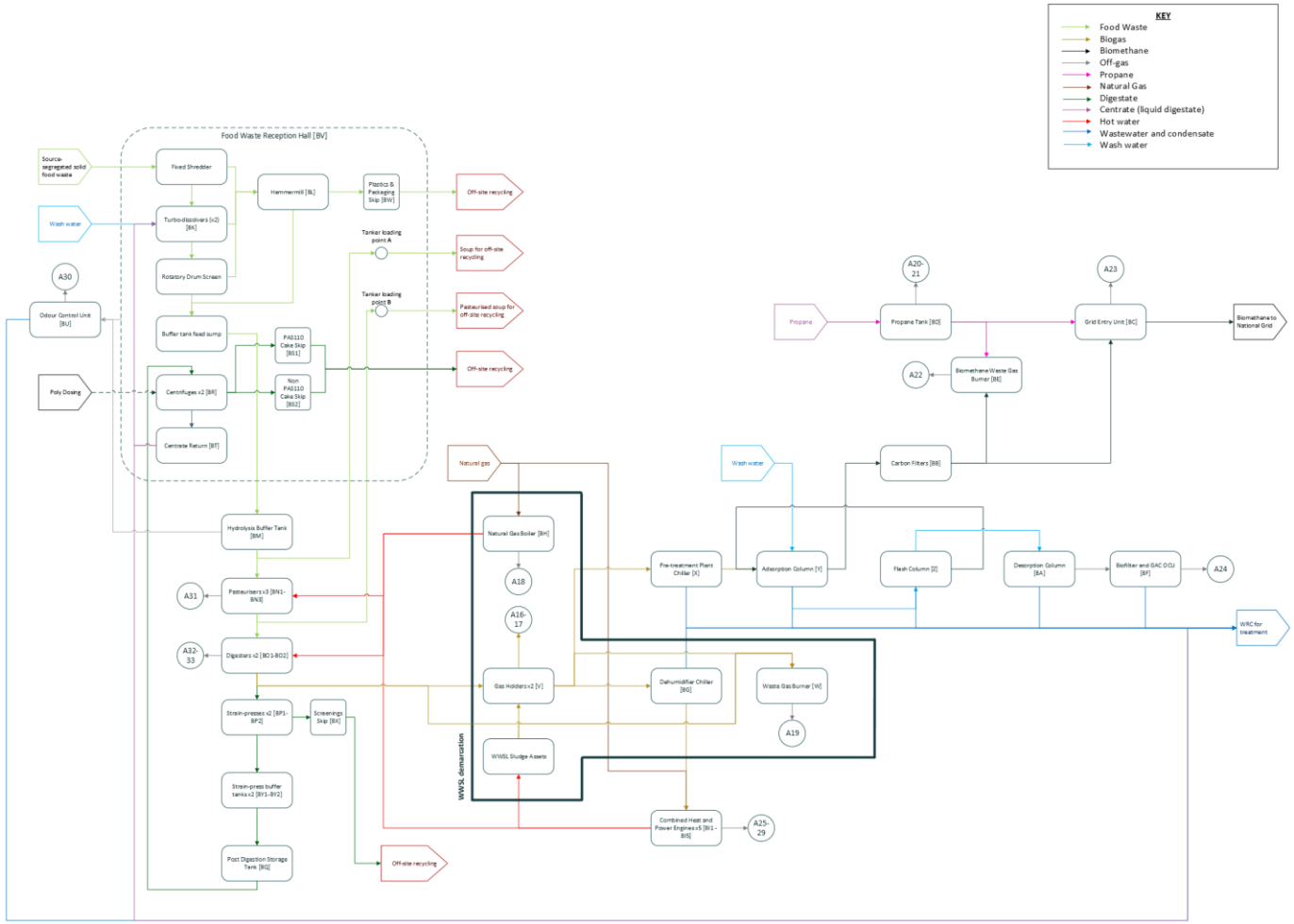


Figure 3.5.2 Schematic of Current RES Assets

3.6 Process Odour Sources

The odour potential of a source can be broken down into three key considerations:

How inherently odorous the compounds present are.
The unpleasantness of the odour.
The magnitude of the odour release.

When trying to determine the offensiveness of an odour source, site-specific odour sampling should be considered in the first instance. In the absence of source odour emission data, the assessment criteria will consider the Environment Agency's Horizontal Guidance Note (H4). H4 looks to categorise how offensive odours are with sources/processes/activities that are considered 'most offensive' odours include septic effluent or sludge and biological landfill odours. All raw sludge treatment processes would be considered to have a high odour offensiveness unless source-specific odour sampling is undertaken demonstrating a low level of odorous compounds. Processes containing the below material are considered to represent a high odour offensiveness:

- Food Waste
- Gas stream from Gas to Grid Process

Processes containing the below material are considered to represent a medium odour offensiveness:

- Screenings
- Digested sludge.
- Digested sludge liquors.
- Digested sludge cake (stored)
- Digested sludge liquors.

No processes on Avonmouth RES are considered to store material that represents a low odour offensiveness unless supported by source-specific odour sampling.

The unpleasantness of an odour can be used in defining the source odour offensiveness. This is typically achieved through source material hedonic tone assessments, however; these types of assessments are not typically available for a site without source-specific sampling.

The risk source odour potential critical risk scoring for odour offensiveness and mitigation / control adopted is summarised in Table 3.6.1.

Table 3.6.1 Source Odour Potential Risk Scoring.

Source	Risk Rating		
	High	**Medium**	**Low**
Odour Offensiveness	Very odorous compounds (H_2S, Mercaptans) with low odour threshold. Unpleasant odour - "Most Offensive". Unpleasant hedonic tone. Large, permitted process / Surface Area.	Compounds involved are moderately odorous. Unpleasantness - process classed in H4 as "Moderately Offensive" or where odours have neutral or slightly unpleasant hedonic tone. Smaller permitted process / Surface Area.	Compounds involved are only mildly offensive. Unpleasantness - process classed in H4 as "Less Offensive". Neutral to positive hedonic tone.
Emission Risk (Mitigation / Control)	Open air operation with no containment. Reliance solely on good management techniques and best practice.	Some mitigation measures in place but significant residual odour remains.	Effective mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.

Table 3.6.2 Avonmouth RES Inventory of Odorous Materials.

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Food Waste Reception Hall	BV	Food waste	140 tonnes	24hrs	Daily	Decomposing food waste	-3/-4 Unpleasant/Very Unpleasant	High	Contained within building which has extraction to an odour control unit. Asset BU	Point	Low
Food Waste Pre Treatment (including de-packing shredder, turbo dissolver, rotary drum screen 10mm and hammer mill).	BK/BL(Contained within building BV)	Food waste and food waste packaging	N/A	N/A	Daily Intermittent	Screenings	-3 Unpleasant	High	Contained within building which has extraction to an odour control unit. Asset BU.	Point	Low
Plastics and Packaging Skip	BW	Plastic wrapping and screenings	8 tonnes	1-2 days	Continuous	Musty and decomposing of any remaining organic waste	-3/-4 Unpleasant	High	Contained within building which has extraction to an odour control unit. Asset BU.	Point	Low
Hydrolysis Buffer Tank	BM	Food waste	808	1-4 days	Continuous	Septic Food Waste	-3/-4 Unpleasant/Very Unpleasant	High	Covered with extraction to an odour control unit. Asset BU.	Point	Low
Pasteurisers (x3)	BN1-BN3	Sludge	15	1hr-2hrs	Continuous	Food Waste	-3 Unpleasant	High	Completely enclosed vessels with extraction to an odour control unit. Asset BU.	Point	Low

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Digester Nr1. and Nr3.	B01-B02	Digesting Sludge	2332	18days-30days	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered and extracted to biogas storage Full containment of biogas is a critical safety consideration.	Abnormal - fugitive only as biogas is collected for use on site.	Low
Biogas Relief Valves	B01-B02	Digested Sludge	N/A	N/A	Emergency operation	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Critical process safety requirement. Operates only as required under abnormal process conditions	Point	Low (Used in emergency only)
Biogas Holders (x2) (Shared assets with Avonmouth BC)	V	Biogas	1,800	N/A	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Enclosed vessel. Full containment of biogas is a critical safety condition.	Abnormal, fugitive only as biogas is collected for use on site.	Low
Waste Gas Burner/Flare (Shared assets with Avonmouth BC)	W	Combusted Biogas	N/A	N/A	Emergency Operation	Combustion	Neutral	Low	Biogas is combusted.	Point	Low
Post Digestion Storage Tank	BQ	Digested Sludge	863	1-4 days	Continuous	Digested sludge / earthy	-1/-2 Mildly/Moderately unpleasant	Medium	Open to atmosphere (DSEAR requirements),	Diffuse	High
Strain-presses	BP1-BP2	Digested Sludge	N/A	N/A	Daily Intermittent	Digested sludge / earthy	-1/-2 Mildly/Moderately unpleasant	Medium	Contained.	Diffuse	Medium
Strain Press Buffer Tanks (x2)	BY1-BY2	Digested Sludge	$3m^3$ each	N/A	Continuous	Digested sludge / earthy	-1/-2 Mildly/Moderately unpleasant	Medium	Open to atmosphere	Diffuse	High

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Screenings Skip	BX	Digested Sludge screenings	30 yards	6-8 weeks	Continuous	Screenings	-1/-2 Mildly/Moderately unpleasant	Medium	Open to atmosphere	Diffuse	High
Centrifuge (x2)	BR (Contained within building BV)	Digested Sludge	N/A	N/A	Daily Intermittent	Digested sludge / earthy	-1/-2 Mildly/Moderately unpleasant	Medium	Contained within building which is extracted to an odour control unit. Asset BU.	Point	Low
Digested Sludge Cake Skip (x2)	BS1-BS2 (Contained within building BV)	Digested sludge	15 tonnes per skip	1 day	Continuous	Digested sludge/earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Contained within building, which is extracted to an odour control unit. Asset BU.	Point	Low
Centrate Return	BT (Contained within building BV)	Digested sludge liquor	5m3	<24hr	Continuous	Digested liquors	-1/-2 Mildly/ Moderately unpleasant	Medium	Contained within building, which is extracted to an odour control unit. Asset BU.	Point	Low
Gas to Grid Plant	X/Y/Z/BA	Gas stream from digesters	N/A	N/A	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Contained vessels. Last vessel extracted to an odour control unit. Asset BF.	Point (Siloxane Plant is fugitive as does not vent to atmosphere as carbon filter type).	Low

3.7 Odour Control Units

3.7.1 Avonmouth RES Food Waste Odour Control Unit (Asset BU).

Odorous air is extracted from the food waste building, pasteurisation tanks and hydrolysis buffer tank. Firstly, potentially odorous air is extracted to a pumice and coir biofilter. Biofilters utilise the ability of micro-organisms developing on a support medium to oxidise malodorous compounds to less odorous compounds. The media used in this circumstance is pumice and coir. The drying out of the filter bed should be avoided. A biofilter was used as they are versatile in treating a wide variety of odorants with high efficiency. It was known that there would be a consistent flow of organic waste in the form of odorous air to maintain a source of energy for the biomass. Finally, after treatment, the air is vented via the ventilation stack.

Table 3.7.1 Avonmouth RES Food Waste OCU Performance Parameter

Parameter	Biological Filter
Media Type	Pumice and Coir
Media Life (Yrs)	Min: 3 years
Inlet Parameters	
Airflow (m^3/hr)	20,000
Stack Outlet Performance	
Odour Concentration (OUg/m^3)	2,000-3,000

3.7.2 Avonmouth RES Gas to Grid Odour Control Unit (Asset BF)

Potentially odorous air is extracted from the stripping column on the Bristol Gas to Grid Facility. The odours air is drawn through a pumice biofilter with a polishing granular activated carbon (GAC) unit. Biofilters utilise the ability of micro-organisms developing on a support medium to oxidise malodorous compounds to less odorous compounds. The media used in this circumstance is pumice. The drying out of the filter bed should be avoided. A biofilter was used as they are versatile in treating a wide variety of odorants with high efficiency. It was known that there would be a consistent flow of organic waste in the form of odorous air to maintain a source of energy for the biomass. The odour control unit also has a carbon absorber acting as a polishing stage. Finally, after treatment, the air is vented via the ventilation stack.

Table 3.7.2 Avonmouth RES Gas to Grid OCU Performance Parameters

Parameter	Biological Filter	Carbon Filter
Media Type	Pumice	Carbon
Media Life (Yrs)	Min: 20 years	Min 1 years
Inlet Parameters		
Airflow (m^3/hr)	5,250	
Hydrogen Sulphide (ppm)	233 / 355 (average / peak)*	

Parameter	Biological Filter	Carbon Filter
Stack Outlet Performance		
Odour Concentration (ou_E/m^3)	1,000	
Hydrogen Sulphide (ppm)	0.1	

See chapter 7.1 for key process monitoring completed on these odour control units. See appendix 5 and appendix 6 for OCU checklist and OCU performance checklist.

4.4 Odour Critical Plant Operation

4.4.1 Odour Critical Sources

Given the control measures that are in place during operation of the facility, these contributions (if any) are unlikely to increase the odour impact on the receptors outside of the site boundary.

Management of releases includes reducing turbulence, containment and abatement. Where odorous gasses are finally released, controlling the height of release through a stack or the timing of releases through management of activities can influence dispersion before there is an impact on people. Potential on site odour releases associated with Avonmouth RES are given in Table 4.4.1.

Table 4.1.1 Avonmouth RES Odour Critical Sources- Operational Mitigation

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Food Waste Reception Hall	BV	Food Waste	Contained within building which has extraction to an odour control unit. Doors to remain closed except for access.	Unlikely with odour control measures in place.	Extraction failure. Doors unable to be closed. Damage to building.	Investigate reason for failure and arrange for repair. Investigate reason for failure and arrange for repair. Temporary repair to be made and arrange for permanent repair.	Same day as observed. Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manger/Site Operator. Site Manger/Site Operator
Food Waste Pre Treatment including de-packing, turbo dissolver, hammer mill and rotary drum screen.	BK/BL(Contained within building BV)	Food Waste	Contained within building which has extraction to an odour control unit. Doors to remain closed except for access.	Unlikely with odour control measures in place.	Extraction failure. Doors unable to be closed. Damage to building.	Investigate reason for failure and arrange for repair. Investigate reason for failure and arrange for repair. Temporary repair to be made and	Same day as observed. Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manger/Site Operator. Site Manger/Site Operator

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
						arrange for permanent repair.		
Plastics and packaging skip	BW Contained within building BV)	Plastic wrapping and screenings	Skip has built on cover. Contained within building which has extraction to an odour control unit. Doors to remain closed except for access.	Unlikely with odour control measures in place.	Extraction failure. Doors unable to be closed. Damage to building.	Investigate reason for failure and arrange for repair. Investigate reason for failure and arrange for repair. Temporary repair to be made and arrange for permanent repair.	Same day as observed. Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manger/Site Operator. Plant Manger/Plant Operator
Hydrolysis Buffer Tank.	BM	Food waste	Covered with extraction to an odour control unit.	Unlikely given odour control measures in place.	Extraction failure. Access hatch removed/ unable to close. Damage to cover with missing sections.	Investigate reason for extraction failure and arrange for repair. Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed. Same day as observed.	Plant Manager/Plant Operator Plant Manager/Plant Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
						Cover damage section with temporary cover where possible. Arrange for a permanent fix.		Plant Manager/Plant Operator.
Pasteurisers (x3).	BN1-BN3	Sludge	Sealed tanks which have extraction to an odour control unit.	Unlikely given odour control measures in place	Damage to tank.	Temporary repair where possible and arrange for a permanent fix.	Same day as observed.	Plant Manager /Plant Operator.
Digester Nr1. and Nr3.	B01-B02	Digested Sludge	Tanks are covered and biogas extracted	Unlikely given control measures in place.	Loss of digester performance (see table 7.2.1 for monitor parameters).	Investigate Digester performance and schedule reactive maintenance.	Same day as incident.	Plant Manager.
Biogas Relief Valves.	B01-B02	Biogas	Planned maintenance on equipment. Monitoring of digester pressures. Flare available to burn excess gas.	Unlikely given the control measures in place. Critical safety system.	Prolonged/frequent use of safety valve.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.
Biogas Holders (x2) (Shared assets with Avonmouth BC).	V	Biogas	Planned maintenance on equipment.	Unlikely given the control measures in place.	Prolonged/frequent use of safety valves	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.
Waste Gas Burner/Flare	W	Biogas	Planned maintenance on equipment.	Unlikely given the control	Prolonged/frequent use of safety valve.	Failures are investigated and reactive	Same day as incident.	Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
(Shared assets with Avonmouth BC)			Monitoring of digester pressures. Flare available to burn excess gas.	measures in place. Critical safety system.		maintenance undertaken.		
Post Digestion Storage Tank	BQ	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Area/Development Scientist, Plant Manager, Plant Operator.
Strain-presses	BP1-BP2	Digested Sludge	Contained. Inspection hatches kept closed.	Unlikely given the control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Plant Manager/Plant Operator. Plant Manager.
Strain Press Buffer Tanks (x2)	BY1-BY2	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type	Increase in complaint frequency and odour sniff test identifies asset to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Plant Manager/Plant Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Centrifuge (x2)	BR (Contained within building BV)	Digested Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance.	Same day as incident. Immediately.	Plant Manager/Plant Operator. Plant Manager.
Digested Sludge Cake Skip (x2)	BS1-BS2 (Contained within building)	Digested Sludge	Skips to be covered before it leave site.	Unlikely given the control measures in place.	Skip not covered when leaving site.	Ensure skip is covered before leaving site	Immediately	Skip Operator
Centrate Return	BT (Contained within building BV with extraction to odour control unit)	Digested sludge liquors	Covered tank withing building with extraction to odour control unit.	Unlikely given the control measures in place.	Damage to tank.	Temporary repair where possible and arrange for a permanent fix.	Same day as observed.	Plant Manager /Plant Operator.
Gas to Grid Plant (Including Siloxane Plant)	X/Y/Z/BA/BB	Gas stream from digesters.	Sealed vessels. Extraction to an odour control unit on the third vessel.	Unlikely given the control measures in place.	Damage to vessels. Failure of the extraction system Damage to siloxane plant. Expiration of carbon media	Arrange for repair. Investigate reason for extraction system failure. Arrange for repair. Regular planned media change.	Same day as incident. Same day as incident. Same day as incident. Planned maintenance.	Plant Manager Plant Manager. Plant Manager Plant Manager.

5 Odour Impact

5.1 Odour Dispersion Model

Odour modelling can be a way to establish a sensitive receptor(s) potential exposure to odours from a site. Dispersion modelling is inherently uncertain but is nonetheless a useful tool to predict potential odour risk. Odour modelling is only likely to characterise normal conditions. It will not usually consider unexpected events (e.g., breakdowns) and abnormal operations which can account for a number of odour episodes.

An odour dispersion model has not been developed specifically for Avonmouth RES as part of this OMP due to the infrequent nature of valid odour complaints within the last 5 years and perceived low risk of potential odour impact (see chapter 5.4).

Odour dispersion modelling including site specific olfactometric surveys shall be undertaken in the event of increased frequency of valid odour complaints or operational changes with a perceived increase in odour impact risk.

5.2 Olfactometry Surveys

Olfactometry sampling is not routinely undertaken due to the low level of valid odour complaints received at this site perceived low risk of potential odour impact (see chapter 5.4).

5.3 Odour Risk Assessment

All EA permit areas must have a Preliminary Odour Risk Assessment (PORA) and odour radius calculation completed as detailed in TRTWG669.

The PORA assesses potential odour impact and odour risk of the Avonmouth RES site on sensitive receptors. The PORA appraises the following information:

- The type of Odour Management Plan in place.
- Specific odour prevention already in place.
- Historical odour complaints for the site.
- The odour radius calculation for the site. The odour radius calculation will list the following information:
  - Each process stage of the site.
  - Indicates process stages with potential hedonic tones scores of -3/-4.
  - Number of units within each process stage.
  - The exposed surface area per unit.

- Specific odour emission rate for each unit (library values are used, see TWTG669).
- Whether the emission rate is low, typical or high (typical values are used unless there is has been specific olfactometry sampling carried out on the site that demonstrates a low or high value can be used).
- Total odour emission rate.
- Expected radius distance odour may be detectable.

  (note: This does not necessary mean a complaint will be received as this will also depend on the offensiveness and hedonic tone of the odour)
- Details the % of total BC emission rate that has a hedonic tone score of -3/-4)
- Source-Pathway-Receptor Model.

The odour radius calculation is a “worse case” prediction under normal operating conditions. It is a simple calculation not using meteorological data to predict potential odour risk. The higher the percentage emission rate at predicted hedonic tone -3/-4 the greater the risk of a sensitive receptor is of being impacted by odour if within the odour radius calculated contour.

(Note: The PORA is only assessing potential risk of odour complaints. BAT conclusions are assessed in chapter 5.5)

The completion of the PORA identifies whether further odour modelling of the site with different scenarios is required. It also identifies to the business where there is potential odour risk and indicates where there is the potential for future odour improvements. The identified odour risks can be then placed on the RES asset improvement log.

5.4 Preliminary Odour Risk Assessment (PORA) Results

Table 5.4.1 Avonmouth RES PORA results

Type of Odour Management Plan	Site Specific
2024 received odour complaint locations.	R5 2 I1 1
2023 received odour complaint locations.	R5 1 R12 3
2022 received odour complaint locations. (This is number of complaints received for the WRC,BC and RES areas and not whether they have been classified as valid to be caused by the RES).	Only 30 different addresses supplied from the 55 odour complaints received. R5 6 R11 3 R12 10 R13 2 5 complaints were received from outside the 2km radius from the BC site. Therefore, due to distance it is extremely unlikely these complaints are valid to be caused by the BC assets. In 2022 a planning application was submitted for an extension of the WRC. Figure 3.4.3 NWP meteorological windrose data also indicates an unusually high % of winds from the NE. This would have potentially affected R5 receptors. The level of complaints received in 2022 appears to be associated by these two events
Predicted total library odour emission rate for site (ou_E/s^{-1})	18,297
Higher Warren Spring Laboratory Constant 2.2 (m) (for hedonic tone odours –2 to -4)	37
Lower Warren Spring Laboratory Constant 0.7 (m) (for hedonic tone odours –2 to -4)	18
Predicted % that is potentially hedonic tone -3/-4 odours	0
Largest odour emission source	Food waste odour control unit stack.

Table 5.4.2 Avonmouth RES Source-Pathway-Receptor Model

Receptor	Source of Odour Potential	Pathway Effectiveness	Receptor Sensitivity	Risk of Odour Exposure	Likely Magnitude
R1	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R2	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R3	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R4	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R5	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R6	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R7	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R8	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R9	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R10	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R11	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R12	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R13	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R14	Medium	Ineffective Pathway	High	Negligible Risk	Negligible Effect
C1	Medium	Moderate Effective Pathway	Medium	Low Risk	Slight Adverse Effect
C2	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C3	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C4	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C5	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
I1	Medium	Highly Effective Pathway	Low	Medium Risk	Negligible Effect
I2	Medium	Highly Effective Pathway	Low	Medium Risk	Negligible Effect
I3	Medium	Ineffective Pathway	Low	Negligible Risk	Negligible Effect

I4	Medium	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
I5	Medium	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
E1	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E2	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E3	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E4	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E5	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E6	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E7	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E8	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
S1	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
S2	Medium	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect

The PORA is predicting there is a **Low Risk** of odour complaints being received for the Avonmouth RES under normal operating conditions when following this OMP. This is validated by the extremely low number of valid odour complaints received for the Avonmouth RES site in the last 5 years. In terms of this specific assessment there is currently no requirement for further olfactometry sampling or odour modelling of the site. There are no actions required to be place on the RES improvement log due to the associated low odour complaint risk identified in the PORA. A reassessment will be required if:

- Valid odour complaints are received for the Avonmouth RES site.
- If there is planned new process or site expansion for the Avonmouth RES site.
- Proposed encroachment of high sensitive receptors around the Avonmouth RES site.

5.5 BAT Conclusions

BAT Conclusion 14 describes specific measures which may be appropriate for the prevention or reduction of diffuse emissions to air. BAT Section 14d is associated with the “containment, collection and treatment of diffuse emissions” and includes techniques such as:

- Storing, treating, and handling waste and materials that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g. conveyor belts);
- Maintaining the enclosed equipment or buildings under adequate negative pressure;
- Collecting and directing emissions to an appropriate abatement system via an air extraction system and/or air suction systems close to the emission sources.

In terms of the applicability of this technique it is noted that: “The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen

depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste."

An assessment of RES processes carried out at Avonmouth RES has been undertaken against BAT 14d. Table 5.5.1 provides a summary of compliance for diffuse and untreated odour sources. Abnormal / fugitive only release (associated with failure of the OCU or off gas collection system) have not been considered here.

Table 5.5.1 BAT 14d Compliance/Alternative Techniques

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Food Waste Reception Hall.	BV	Within building with extraction to an odour control unit.	Building also fitted with fast acting doors and there is a cleaning maintenance regime in place within food waste building.	None	N/A
Food Waste Pre Treatment including de-packing, turbo dissolver, hammer mill and rotary drum screen.	BK/BL (Contained within building BV)	Within building with extraction to an odour control unit.	Building also fitted with fast acting doors and there is a cleaning maintenance regime in place within food waste building.	None	N/A
Plastics and Packaging Skip	BW (Contained within building)	Skip has built-on cover. It's within building with extraction to an odour control unit.	Building also fitted with fast acting doors and there is a cleaning maintenance regime in place.	None	NA
Hydrolysis Buffer Tank	BM	Tank is covered and extracted to an odour control unit.	N/A	None	N/A
Pasteurisers (x3)	BN1-BN3	Tank is covered and extracted to an odour control unit.	N/A	None	N/A
Digester Nr1. and Nr3.	B01-B02	Gas collection	N/A	None	N/A
Post Digestion Storage Tank	BQ	Tank open to atmosphere with	Tank contains digested	Risk of creating an explosive	Improvement number 2

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
		no containment or treatment of emissions.	sludge only which is inherently less odorous. No sensitive receptors in close proximity. Adequate measures considered to be in operation.	atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	
Strain-presses	BP1-BP2	Strain press contained process without foul air extraction. Sludge screens, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment..	Enclosed process, but without extraction and abatement of process air. Small size of source, intermittent use. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	N/A
Strain-Press Buffer Tanks (x2)	BY1 and BY2	Small tanks are open to atmosphere with no containment or treatment of emissions.	Tank contains digested sludge only which is inherently less odorous. No sensitive receptors in close proximity. Adequate measures considered to be in operation.	Risk of creating an explosive atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	Improvement Number 1
Screenings Skip	BX	Skip is open to atmosphere with no containment or treatment of emissions.	Skip contains screenings only which is low in odour. . No sensitive receptors in	Uncovered	Improvement Number 1

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
			close proximity. Adequate measures considered to be in operation.		
Centrifuge (x2)	BR (Contained within building BV)	Within building that has extraction to an odour control unit.	There is a cleaning maintenance regime in place within food waste building.	None	N/A
Digested Sludge Cake Skip (x2)	BS1-BS2 (Contained within building BV)	Within building that has extraction to an odour control unit.	N/A	None	N/A
Centrate Return	BT (Contained within building BV)	Within building that has extraction to an odour control unit	N/A	None	N/A
Gas to Grid Plant (including Siloxane Plant)	X/Y/Z/BA/BB	Extracted to an odour control unit.	N/A	N	N/A

Of the sources on site, the screenings skip and strain press buffer tanks do not adopt the specific conclusions outlined in BAT 14d. These assets are considered small area sources and would not typically be considered to be a significant source of overall site odours.

Additionally, the post digestion storage tank does not adopt the specific conclusions outlined in BAT 14d. There is a risk that covering the secondary digester could create an explosive (post-digestion) atmosphere.

Where specific conclusions outlined in BAT 14d are not adopted or are partially adopted this has been placed on the RES improvement log.

Odour surveys at other sites within the UK have identified that post digestion emissions are more akin to non-septic wastewater emissions than sludge emissions and therefore, unlikely to have the same odour offensiveness as indigenous / untreated sludges and may not warrant the same level of odour mitigation. The hedonic tone of digested sludge has also increased compared to that of raw sludge as the sludge has passed through a treatment process. This reduces the risk further.

Given the lack / infrequency of valid odour complaints, as long as the site adheres to the odour management plant and limits activities such as sludge cake double handling, the risk of odour impact from the Avonmouth RES site is limited and does not require additional mitigation measures. It would be considered that additional odour mitigation would be warranted if valid complaint frequency increases and was attributed to the Avonmouth RES emissions, or if there was a process change and significant increase in raw sludge diffuse emissions.

6 Monitoring and Control of Odours

All monitoring should clearly relate to the assessment of odour control and complete records must be kept in an auditable format. The only way to determine whether the processes on site are under control, and to keep them under control, is to do appropriate monitoring.

As far as possible, Avonmouth RES is operated to minimise odour generation and release. As long as the treatment process satisfies the normal design criteria, odour should be minimal. To minimise odour nuisance, it is important to ensure that Avonmouth RES is operating at its optimum.

6.1 Sniff Testing

The approach Wessex Water adopts is fundamentally based on the approach as outlined in H4 Odour Management Guidance. Wessex Water procedure for site boundary sniff test assessments is contained within procedure TRTWP558.

Sniff testing is recognised by Wessex Water as a useful technique to build up a picture of the impact the odour has on the surrounding environment over time. Sniff testing shall be used to support profiling site odour impact, investigate odour complaints and to introduce temporary odour mitigation measures. Sniff testing shall be undertaken on site, on a daily basis. by site operational staff. It is accepted that operational staff may not be ideal for sniff testing of site odours as they have adapted to odours from the site. However, this will provide a baseline for routine observations. The daily operator sniff tests shall assess the site boundary and focus on the detection of any odours that could potentially be leaving site. If boundary sniff test is being completed for a permit area regular/routine assessment and an odour intensity of ≥4 is detected, that is believed to be coming from within the permit area, this must be reported to the Area Scientist/Site Manager. Offsite downwind sniff testing may be required to be carried out if there are high sensitive receptors downwind of the permit area.

The recommendation for downwind sniff testing at high sensitive receptors is required where the following requirements are met:

- Where recent odour complaints for the site have been received.
- Where detected odour at downwind boundary sampling points is intensity ≥4 and believed to be coming from the permit area and where high sensitive receptors are within 250m downwind of the permit boundary.
- Where detected odour at downwind boundary sampling points is intensity 5 and believed to be coming from the permit area and where high sensitive receptors are within 500m downwind of the permit boundary.

- Where detected odour at downwind boundary sampling points is intensity 6 and believed to be coming from the permit area and where high sensitive receptors are within 1km downwind of the permit boundary.

A monthly sniff tests shall be carried out by non-site based staff (Regional Scientist/Graduate Scientist/Area Scientist/Operational Managers and Supervisors) who are not adapted to site odours.

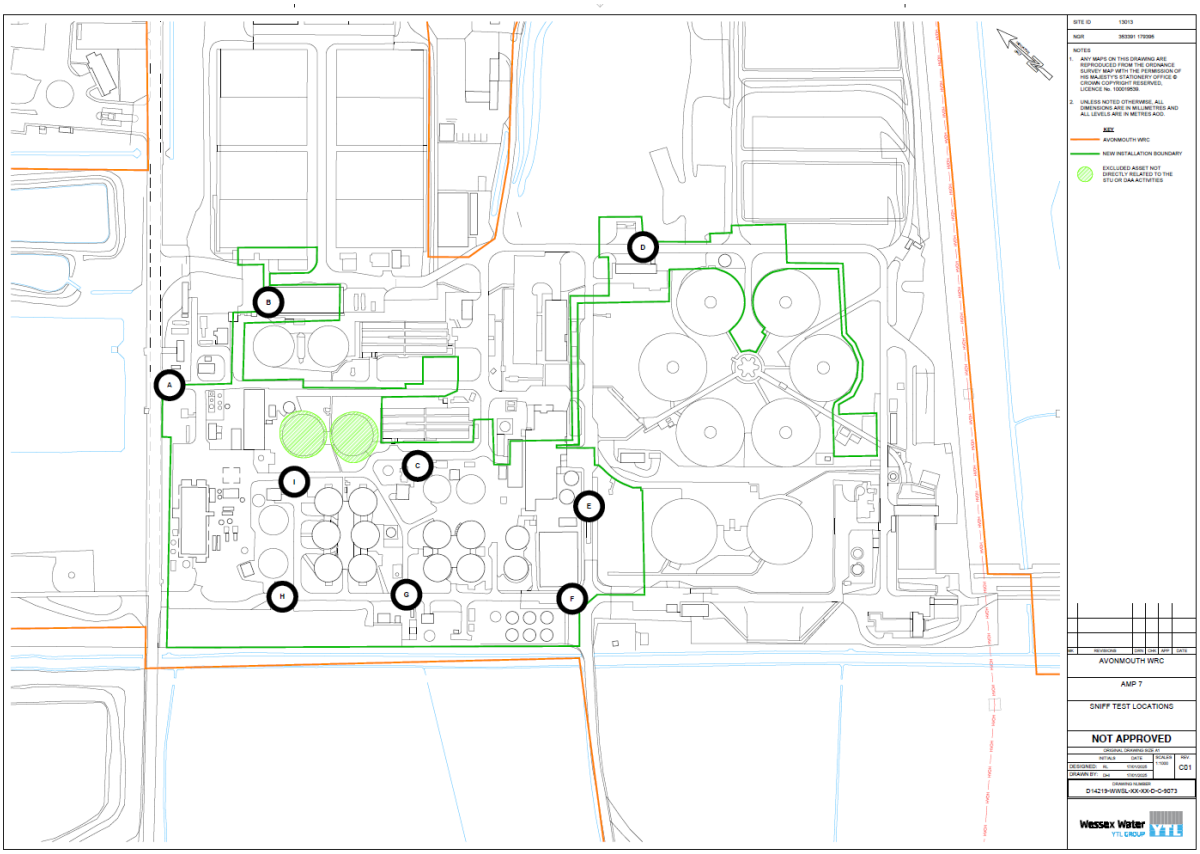
In the event of odour complaints being received, site operators shall undertake a sniff test including off-site sniff testing local to the complaint location(s) if possible and the nearest key receptor(s) to the complainant. In the occurrence of a significant odour event or repeated complaints the following will happen.

An internal member of staff, who has received specific odour sniff test training from a third-party specialist but is not specially based to the site, will carry out an “Enhanced” sniff test survey. This is including off-site sniff testing local to the complaint location(s) and within the identified sensitive receptors locations. If a level of complaints received continue and a reason for the complaints cannot be determined this survey will be repeated. A third-party specialist can be engaged for an additional odour investigation including on and off-site sniff testing where required.

A six monthly “Enhanced” sniff testing survey should be carried out by an internal member of staff, who has received specific odour sniff test training from a third-party and who is not specifically based to this site. Or the testing can be completed by a third-party specialist. This is for comparison with Wessex Water daily and monthly observations. This sniff test shall include both on and off-site locations based on surrounding sensitive receptors and complaint locations.

The location of daily on-site sniff testing locations has been included in Figure 6.1.1. Figure 6.1.1 also includes sniff test locations for the Avonmouth RES site.

Figure 6.1.1 Daily Sniff Testing Locations



6.2 Source Odour Monitoring

Odour Emissions can be monitored using:

- EN standards (e.g. dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure);
- When applying alternative methods for which no EN standards are available (e.g. estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific duality.

The applicability of BAT10, that is, to periodically monitor odour emissions, is restricted to cases where odour nuisance at sensitive receptors is expected and/or has been substantiated. Due to the very low levels of valid odour complaints received associated with RES treatment and handling activities, no routine diffuse odour monitoring is undertaken.

An olfactometry sampling survey may be completed if there is an increase in the number of valid odour complaints being received for the Avonmouth RES site and this would be triggered by the customer complaint procedure if no reason for the increase in odour complaints can be referred from other monitoring assessments.

The PORA will assess the requirement for future olfactometry sampling to be carried out on an annual basis. Olfactometry sampling must be carried out to the procedure set out in Wessex Water procedure TRTWG669 and only if it is safe to do so.

6.3 Channelled Emissions

BAT 8 is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards.

Table 6.3.1 BAT 8 Channelled Emission Parameters.

Substance / Parameter	Standards	Minimum Monitoring Frequency	Monitoring in association with
Ammonia	No EN standard available	Once every six months	BAT 34
Hydrogen Sulphide	No EN standard available	Once every six months	BAT 34
Odour Concentration	EN 13725	Once every six months	BAT 34
TVOC	EN 12619	Once every six months*	BAT 53

(*The monitoring only applies when the substance concerned is identified as relevant in the waste gas stream based on the inventory mention in BAT 3)

Table 6.3.2 BAT 34 BAT-AELS for channelled emissions to air.

Parameter	Units	BAT-AEL (Average over the sampling period)
Ammonia (1)	mg/Nm^3	0.3 - 20
Odour Concentration	ou_E/m^3	200 – 1,000

(1) Either the BAT-AEL for NH3 or the BAT-AEL for the odour concentration applies

Table 6.3.3 BAT 53 BAT-AELS for channelled emissions of HCL and TVOC to air from the treatment of water-based liquid gas.

Parameter	Units	BAT-AEL (Average over the sampling period)
Hydrogen chloride (HCl)	mg/Nm^3	1-5
TVOC	mg/Nm^3	3-20(2)

(1) These BAT-AELs only apply when the substance concerned is identified as relevant in the waste gas stream, based on the inventory mention in BAT 3.

(2) The upper end of the range is $45mg/Nm^3$ when the emission load is below 0.5kg/hr at the emission point.)

6.4 Housekeeping

A lack of good housekeeping can result in elevated levels of residual odour, and at times, more serious emissions. Measures constituting to Best Practicable Means for housekeeping that are adopted at Avonmouth RES are listed below.

6.4.1 General

- Ensure that doors to buildings that may contain odours are kept closed except for access. Maintain signage on doors for operational, visiting and contract personnel.
- Ensure that inspection covers or hatches fitted to contain odours are closed immediately after use.
- Where possible covers should be sealed.
- Where sealing strips are fitted to covers check for integrity.
- Retention of sludge should be minimised as much as possible.
- Spillages must be avoided. Ensure the immediate clear up of any spillage.
- Where plant failures may lead to increase in odour emissions repairs should be done as soon as possible.
- New and temporary plant must be assessed for odour and there is a requirement for this Odour Management Plan to be updated. The Odour Management Co-ordinator must be contacted if new or temporary plant is proposed. A Pre Odour Risk Assessment and Process Risk Assessment must be completed before temporary plant is used on site. This Process Risk Assessment must consider possible odour complaint risk that could be caused by the new or temporary plant in question. Plant must be assessed that it will be BAT compliant before it is installed. Environment Agency: Appropriate measures for the biological treatment of waste must be consulted at the design stage.
- Report any raised odour levels to the Site Manager immediately who will liaise with the Odour Management Co-ordinator.

6.4.2 Food Waste

- Ensure that doors to Food Waste Hall are kept closed except for access.
- Ensure control of delivered feedstock.
- Feedstock should be processed as quickly as possible.
- Regular cleaning of operational areas such as road, food waste hall floor. and drainage channels will discourage odour generation from old degrading materials.

- Sludge storage may allow odour generation, which will be emitted when the sludges are disturbed by a discharge into the tanks, mixing or during subsequent treatment. Therefore, sludge should be processed as soon as is possible. Any mixing should be at low speed and operated continuously. Where possible sludges should be discharged at low level in the tank and, wherever possible, below normal liquid level.

- Equipment for mechanical thickening and dewatering should be operated continuously where practicably possible. This is to ensure that sludges are rapidly handled and provide a continuous stream of return liquor, rather than intermittently with consequent high odour emissions. If not continuous operation, the plant should be cleaned after use. This will remove sludges retained on equipment that may continue to produce malodours.

- Returned liquors can be highly odorous. Aim to minimise turbulence when discharging or discharge under liquor level where possible.

- Aim at balancing the flow of sludge liquors to even the load over the day where process loading allows.

- Aim to minimise turbulence when sludge pumping. Where possible discharges to sumps should be at low level to minimise turbulence and hence odour emissions.

- Ensure that skips containing dewatered sludge cake are not overfilled and removed from site as soon as is practicable.

- Vehicles for skip removal must be kept as clean as is practicable.

6.4.3 Odour Control Equipment

- Check fans and drive belts on a regular basis.

- Check media condition on a regular basis.

- Check irrigation systems, nozzles and spray patterns on biofilter odour control units on a regular basis.

6.5 Pre-Acceptance, Acceptance and Rejection of Waste Procedure

Avonmouth RES have the following procedures in place:

- Pre-acceptance procedure GENWMG144A
- Waste acceptance procedure GENWMP 152
- Waste rejection procedure GENWMP 50

6.6 Changing Dispersion Conditions

The site is operated in accordance with this Odour Management Plan to minimise the risk of odour complaints being received. It is recognised there are dispersion conditions where the potential risk of odour complaints being received increases. The three major factors which determine when poor dispersion conditions have been reached would be:

- Wind direction.
- Wind speed.
- Temperature.

The PORA indicates that there are no high sensitive receptors classified at a risk of odour exposure and likely magnitude above negligible risk and negligible effect for the Avonmouth RES site. When reviewing odour complaints received for the Avonmouth WRC, Avonmouth BC and Avonmouth RES sites in 2022 the majority of the odour complaints are being received for receptors to the SE-SW of the site. To reduce this risk of odour complaints being received from high sensitive receptor in these areas the following must be completed:

1. The weather forecast for the week ahead will be checked on a Monday morning by site staff and recorded for the week ahead. The predicted weather for the day must be check at the start of each day and recorded.
2. Where the following poor dispersion condition parameters are met on checking the predicted weather forecast all Site Staff, Site Manager and the Odour Management Co-ordinator must be notified that it is predicted there is the potential for poor dispersion conditions and the risk of an odour complaint being received is higher than normal.

- **Wind direction: NW-NE**
- **Wind speed: Beaufort wind scale 0 (Wind speed 0ms^{-1}) Wind descriptive = Calm to Beaufort wind scale 3 (Wind speed 4-5ms^{-1}) Wind descriptive = Gentle Breeze**
- **Temperature: Day time temperatures to go above 28^{o}C**

3. Site should be checked that housekeeping set out in section 6.5 of this Odour Management Plan is in place. This is carried out by the Site Operator. Check should be recorded.
4. Key process monitoring set out in section 7.1 of this Odour Management Plan should be checked by the Site Manager.
5. Weekly Operator sniff test assessment may need to be increased and coincide with day(s) of poor dispersion conditions. Site Manage to discuss with Odour Management Co-ordinator. The number of sniff test assessments required will be dependent on the predicted duration of poor dispersion condition being present.
6. The fullness skips must be checked by the Duty Operator. If close to full where possible the skip should be arranged by the Site Manager to be removed from site before the onset of poor dispersion conditions.
7. Where there are pre-planned maintenance activities outside the normal RES operation detailed in this Odour Management Plan, these should be where possible, not be completed at the identified time of the predicted poor dispersion conditions. There will be events where it is not possible to change the date and time of planned maintenance or emergency maintenance.
8. Where it is not possible to change planned maintenance or emergency maintenance then community engagement described in chapter 9.1 may need to be carried out.

If an odour complaint(s) are received this chapter of the odour management plan should be reviewed to whether poor dispersion conditions trigger points require changing, including whether further mitigation actions during poor dispersion need considering.

7 Inspection / Monitoring / Maintenance Schedules and Records.

7.1 Key Process Monitoring

The site is operated under PLC control with data logging and interrogation of key parameters to maintain safe, efficient, and low emissions operation. Table 7.1.1 includes the key process monitoring provisions for processes associated with emissions to air.

Table 7.1.1 Key monitoring provisions for process associated with emission to air.

Emission Point / Description	Parameter	Monitoring Approach	Monitoring Frequency	Trigger level	Action
Waste Reception Hall	Contaminants	Visual	Daily	Visual gross contamination	Removal of contamination, quarantine or rejection depending on level seen.
	Air Extraction (2 x volume per hour)	On-line	Continuous	Duty/Standby blower failure.	Repair standby on same day.
	Total quantity of material	Visual	Daily	Over-full storage area. That would cause waste to be unable to be treated within 24hrs.	Divert waste or contingency export to another AD plant.
Food Waste Pre-Treatment Waste Mixing Hall	Direct air extraction from equipment	Visual	Weekly	Damage to extraction ducts	Repair on same day
Food Waste Pre-Treatment Turbo Dissolver and Hammer Mill	% dry solids (screen to buffer)	Manual sample: Processed on site lab.	Daily	<9%->14%	Adjust recipe mix parameter to target 12%. Adjust water flow to hammer mill.
Food Waste Pre-Treatment Rotary Drum Screen.	Particle size	Visual screen Inspection	Daily	>12mm particle size. Refer to HACCP CCP	Repair on same day.
Hydrolysis, Pasteuriser and feed to digester.	Volatile Fatty Acids (VFAs)	Samples sent to offsite lab	Twice a week	Monitoring trends for information purposes only.	Results when reviewed may lead to changes to operation.
Food Waste Odour Control Unit	Olfactometry	Manual	Biannual	>3,000OU_E	Investigate why odour control unit is not preforming

	Moisture of filter bed	Manual	Daily	Media bed is dry	Investigate why there is no irrigation and repair where necessary.
	Water flow discharged onto the biofilter media bed.	Recorded on HMI	Daily	No water flow	Investigate why there is no water flow and repair where necessary.
	Temperature of airflow	Manual	Daily	Monitoring trends for information purposes only.	Monitoring for information purposes. Results when reviewed may lead to changes to operation.
	Volume	SCADA	Daily	HRT<18days average over 3 days. Refer to HACCP CCP	Operator invention only if PLC automated control was to fail.
	Volatile Fatty Acids (VFA)s	Manual/Lab samples	Twice per week		Modulate feed rate
	Alkalinity	Manual/Lab sample	Twice per week.	pH<7.4	Monitoring for information purposes. Results when reviewed may lead to changes to operation.
Digesters	Process Temperature	On-line	Continuous	>38 degrees/40 degrees	Feed to digesters is automatically modulated.
	pH	Manual/Lab Sampling	Daily	7.4-8.5	Check VFA/Alkalinity ratio. Reduce feed if over 0.30
	Retention (hours)	On-line	Daily	Refer to HACCP CCP ABP regulations are minimum 18 days HRT.	Modulate feed to digester in line with HACCP CCP Modulate feed if outside CCP
Centrifuge digestate quality.	Dry solids (%)	Manual/Operator processes sample.	Daily	Digestate <20%	Operator intervention if falls below.
Centrate Quality	Dry solids (%)	Manual/Operator processes sample.	Daily	Centrate >2%	Operator intervention
CHP	Operating hours	On-line	Continuous	Gas too low, cut out.	Generator will stop-wait for gas to build up.
	Electricity generated	On-line	Continuous	Monitoring for information purposes only	Monitoring for information purposes only

	Load required/actual (%)	On-line	Continuous	Monitoring for information purposes only	Monitoring for information purposes only
	Biogas flow/pressure to CHP	On-line	Continuous	Pressure sensor record, no pressure transducer. Low pressure it won't run.	Low pressure- Gas holder high, operator intervention.
	Heat Circuit temperatures (deg. C)	On-line	Continuous	<80 degrees	Boilers starts
Boilers	Biogas/natural gas flow/pressure to boiler	On-line	Continuous	Monitoring for information purposes only	Monitoring for information purposes only.
Desorption column	Air Flow	On-line	Continuous	<1600Nm3/hr	Automatic plant shutdown. Operator to investigate fault
	Off gas flow outlet	On-line	Continuous	<0.4 L/min	Automatic plant shutdown. Operator to investigate fault
	Level	On-line	Continuous	High level	Automatic plant shutdown. Operator to investigate fault
	Level	On-Line	Continuous	Low Level	Automatic plant shutdown. Operator to investigate fault
Flash column	Pressure	On-line	Continuous	3 bar	Automatic plant shutdown. Operator to investigate fault
	Pressure	On-line	Continuous	Low pressure	Automatic plant shutdown. Operator to investigate fault
	Level	On-line	Continuous	High level	Automatic plant shutdown. Operator to investigate fault
	Level	On-Line	Continuous	Low Level	Automatic plant shutdown. Operator to investigate fault
Absorption column	Water level	On-Line	Continuous	<300mm	Automatic plant shutdown. Operator to investigate fault
Biogas room	LEL, H2S	On-line	Continuous	20% of LEL 1% CH4 and 5.52% H2S	Automatic plant shutdown. Operator to investigate fault
Gas compressors 1-4	Pressure in low	On-Line	Continuous	<0.10bar	Automatic plant shutdown. Operator to investigate fault
	Pressure out high	On-line	Continuous	>8 bar	Automatic plant shutdown.

					Operator to investigate fault
	Temp gas out high	On-Line	Continuous	>200 °C	Automatic plant shutdown. Operator to investigate fault
	Oil pressure high	On-line	Continuous	>1.6 bar	Automatic plant shutdown. Operator to investigate fault
Gas Blowers 1 and 2	Pressure out	On-Line	Continuous	>1.3bar	Automatic plant shutdown. Operator to investigate fault
	Temperature out	On-line	Continuous	>150°C	Automatic plant shutdown. Operator to investigate fault
Gas to Grid Odour Control Unit	Pressure	On-Line	Continuous	< 9 mbar	Automatic plant shutdown. Operator to investigate fault
	Pressure	On-line	Continuous	>150mbar	Automatic plant shutdown. Operator to investigate fault
	O2	On-line	Continuous	>1%	Automatic plant shutdown. Operator to investigate fault
	Olfactometry	Manual	Biannual	>1,000OU_E	Investigate why odour control unit is not preforming
	H_2S	Manual	Periodically	Level recorded would indicate breakthrough of carbon media	Replace carbon
	Siloxane	Manual	Periodically	Level recorded would indicate breakthrough of carbon media	Replace carbon
	Pressure	On-line	Continuous	25mbar	Automatic plant shutdown. Operator to investigate fault
	LEL	On-line	Continuous	High Level 23.5%	Automatic plant shutdown. Operator to investigate fault

7.2.1 Maintenance

Avonmouth RES has a comprehensive maintenance and repair programme set up.

Food Waste: A Work Management System is available for Wessex Water EM&I department to schedule and record maintenance activities. Operator daily task are completed using daily, weekly and monthly task sheets.

Gas to Grid: There is a dedicated, specially trained, maintenance and operations team assigned to the biomethane plant. They deal with the day to day running of the plant including pre planned maintenance and reactive work when required. The plant is maintained on a daily, two weekly, and monthly basis and the team follow manufacturers instructions on how to perform these checks. Certain work can only be performed by specialist contractors and the contractors are organised and managed by the Gas to Grid team. The plant is also covered by maintenance contracts which cover the major services and larger tasks. There are a number of annual regulatory requirements the plant must adhere to which again is organised and managed by the Gas to Grid team. There is also a quarterly audit performed by an OFGEM examiner to ensure compliance.

8 Emergency and Incident Response

This section addresses the issue of appropriate response to odour incidents caused by process failure or equipment breakdown. These emergency procedures include the:

- Foreseeable situations that may compromise the ability to prevent and minimise odorous releases from the process.
- Actions to be taken to minimise the impact.
- Person responsible for initiating the action.

Table 8.1.1 summarises emergency/incident control measures in place. The Wessex Water odour emergency contact details for Avonmouth RES are available in Appendix 1.

Where abnormally high odour levels are observed from either general observations, routine sniff testing or odour complaint being received the following measure should be undertaken:

- Investigating the odour incident and its cause(s).
- Bringing the process back under control; and
- Minimising exposure or annoyance effects.

All failures of a site process should be reported to Site Manager/Supervisor. If the failure of the site process has the potential to cause an odour impact the Odour Management Co-ordinator and the Regional Manager must be informed.

In the event of a failure of a site process or an odour control system, that may give rise to odour, it is the Site Managers responsibility to inform the local EA Officer for the area/ Environmental Health Practitioner.

If the event is a critical failure of plant/process that will mean the plant/process is out of operation for an extended period of time a PORA is required to be ran to assess the potential

odour impact. It may be that the PORA indicates that the critical failure and change of process is low impact due to the potential odour emission rate and hedonic tone score. Therefore, further odour impact mitigation may not be required. The local EA Officer for the area/ Environmental Health Practitioner are to be informed of the outcome of the PORA and whether further odour impact mitigation is to be put in place and likely timeframes involved. This may include the following:

- Updating potential sensitive receptors.
- Informing Wessex Water CSU department that odour complaint may be received so correct information can be relayed.
- Setting up odour monitoring.
- If critical failure is a spillage report how quickly repair can be made and clean up ASAP.
- Temporary covering of plant (H&S risk must be assessed before any covering is completed).
- Temporary odour control plant installed.
- Further odour modelling and odour risk assessment required.
- Raise risk on site improvement log.
- Odour Management Plan may require updating.

At each stage it must be documented by the Site Manager for the site the actions put in place to minimise the odour impact.

Table 8.1.1 Avonmouth RES Incident/Emergency Control Measures:

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
Food Waste Spillage outside reception hall from vehicle movements	Food Waste	Medium to High depending on volume spilt	Vehicles have covers and unload in waste reception building.	Stop source of spill and clear up. Immediately wash down area.	Immediate	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
Failure of the Food Waste Odour Control Unit (mechanical/ structure/ treatability)	Untreated air	High-OCUs provide treatment for odorous air from the Permitted site. Failure of OCU would result in release of abnormal operational fugitive odours direct to atmosphere.	Routine maintenance Regular monitoring of equipment performance.	For plant failure- investigate and repair.	Site Operator to investigate on same working day. Support from OCU supplier to be arranged for next availability.	Site Operator

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
Failure of digestion process (treatment)	Partially treated sludge odours Increased odours from post-digestion sources	Medium	Performance monitoring of key parameters Laboratory sampling (see key process monitoring 7.1.1)	Initial investigation by Operator Changes made to bring digester back into operational parameters.	Immediate	Site Operator/Site Manager
Strain Press Buffer Tanks	Digestate	Low	Pipework and tanks undergo regular inspections. Planned maintenance on equipment	Record spillage and actions taken.	Same day as incident	Site Operator
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
Centrifuges	Increased retention as digester unable to be fed.	Low	Sludge to be exported if thickener down for long period	Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
Centrate Tank	Centrate	Medium – High depending on volume spilt.	Pipework and tanks undergo regular inspections. Planned maintenance on equipment	Record spillage and actions taken.	Same day as incident	Site Operator
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
Failure of the Gas to Grid Odour Control Unit (mechanical/ structure/ treatability)	Untreated air	High-OCUs provide treatment for odorous air from the Permitted site. Failure of OCU would result in release of abnormal	Routine maintenance Regular monitoring of equipment performance.	For plant failure- investigate and repair.	Site Operator to investigate on same working day. Support from OCU supplier to be arranged	Site Operator

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
		operational fugitive odours direct to atmosphere.			for next availability.	
Staff unavailability	Risk of increase to site odours due to limited operational resources	Low	Staff replacement	Call in other staff where possible. Reduce site activities to only critical jobs	Same day / For next working day	Site Manager
Asset Fire	Risk of increase to site odours due to limited access and inability to operate assets	Medium	Regular inspection and planned maintenance	Remote monitoring from Control Room / off-site / another site	Immediate	Site Manager
Power Failure	Risk of increase to site odours due to inability to operate assets	Medium	Standby generator on site	Mains power failure alarm and switch over to generator. Duty operator to check and make sure plant has reset.	Immediately	Site Operator
Very high rainfall	Flooding	Low	Assets unlikely to flood.	Plan put in place to remove floodwater from assets.	Immediately	Site Operator

9 Customer Communications

Complaints are the primary indicator of nuisance and other community dissatisfaction. It is important that complaints are properly and systematically recorded and acted upon.

Complaints of odour are dealt with and recorded by the Customer Support Unit (CSU). The complaint details are placed onto the Ops Contact Reporting System and a unique rapid reference number is created. Customer odour complaints are allocated by CSU/scheduling team to the most relevant Wessex Water department based on initial information provided by the customer when they first contact Wessex Water. There are a number of mechanisms of how a customer can contact Wessex Water. These include telephone, email, letter, social media or via a third party (EA, EHO, Councillor, MP). There are occasions when initially a sewerage crew, sewage pumping station crew, WRC operator is dispatched to investigate the odour complaint as it is believed the source of the odour is from other Wessex Water assets and not the BC in the first instance on information provided by the customer. If on investigation by these other departments, it is identified the source of the odour may be the BC site it will be reallocated to the BC site for investigation.

The initial odour complaint action is to be completed within 24hrs of the complaint being allocated by CSU/scheduling team to the RES site.

Note: There may be occasions when the initial action cannot be completed in full within 24hrs. For example, the customer has informed in the initial complaint information the odour only occurs on a certain day and time. Investigation must be therefore completed when the odour is most likely to be occurring. Sniff test assessments should be scheduled in for the most appropriate time that the odour is likely to be present.

It is the Food Waste Treatment Plant Supervisor and Renewable Energy Manager responsibility to make sure there is liaison with the local stakeholders (including the complainant) and CSU on progress. Any complaints made directly to site staff must be reported to CSU so they can be placed on the Ops Contact Reporting system. It is important that communication between all interested parties at all times is maintained.

The initial odour complaint action following a complaint will be as follows:

- The Site Operator will inform operator of the Avonmouth WRC, BC, BCAF and Bristol TC so requirements of these sites OMPs can be followed.
- The Site Operator will check wind direction on Prism for the time and date of when the odour was detected.
- The Site Operator will perform a general check of the site.
- The Site Operator will check that there are no on-going process issues or activities that would give rise to odour emissions.
- The Site Operator will check that levels of ‘Good Housekeeping’ are being maintained (see chapter 6.5).

- The Site Operator/Area Scientist will check the Key Process Monitoring are within limits (see chapter 7.1)

- The Site Operator will complete a Sniff Test Assessment (see section 6.1 and appendix 2)

- The Site Operator will perform a sniff test (if access possible) at the location the odour complaint has been reported for. If the wind direction has changed a sniff test should also be completed downwind of the RES site. In some cases the customer does not provide details of the actual location of the odour. This is quite often the case in email, social media and 3rd party contacts. If this is the case CSU should request whether more information can be gained from the customer so a sniff test assessment can be carried out.

- As part of the overall investigation the following should be reported to the Food Waste Treatment Plant Supervisor, Renewable Energy Manager and Odour Management Co-ordinator where the Site Operator has investigated and found the following.

  - The odour is being generated from the WRC or in a remote part of the sewage network. This may require a job to be raised for a WRC operator, sewerage crew, pumping station crew to carry out odour investigations on other Wessex Water assets outside the RES boundary.

  - There were other known sources of odour in the vicinity at the time.
    - Private issue on customer property.
    - Environmental, especially coastal areas and rotting seaweed, tide times may need to be checked.
    - Muckspreading.
    - Other industry.
    - Other 3rd party e.g. Landfill site.

  - There are good grounds for believing a complaint is frivolous or vexatious.
    - This is rare but has happened where odour complaints have been received for particular sites where the customer does not reside or is in the area when the complaint was made. If this is the case then the odour complaint should still be investigated as normal and boundary sniff testing carried out.

- Even if the odour is believed to be coming from another source Sniff Test Assessment as detailed in section 6.1 must be completed.

- The customer complaint form in appendix 3 must be completed.

- The results of this initial action and the customer complaint form will be reported to the Food Waste Treatment Plant Supervisor and Renewable Energy Manager.

There is the potential for *"no reason to be found*" for the customers reported odour complaint as there is no detectable odour present at the time when the initial odour complaint action was

carried out. Further sniff tests may be required to be carried out at a later date and the customer should be informed of timescales for their completion. If the customer is complaining that they are detecting an odour on a regular occurrence the customer should complete an odour diary (appendix 4). The completed odour diary should be sent by the customer to be reviewed by the Site Manager and Area Scientist.

Following the completion of the customer complaint form in appendix 3 it must be decided whether the odour management plan is being followed. If the plan is not being followed then the Site Manager will need to complete an action plan to make sure the plan is followed, which is to be briefed out to site staff. The action plan shall be audited by the Odour Management Co-ordinator on the 6 monthly review meeting that this has been completed. If the odour management plan is being adhered to and investigations demonstrate the RES is the cause of the odour complaint the following will need to be conducted. This will be initiated by the Food Waste Treatment Plant Manager, Renewable Energy Manager, Area Scientist and Odour Management Co-ordinator.

Further investigations that could involve the following:

- Site Manager/Supervisor perform general check of the site.
- “Sniff test” survey
- H_2S Survey.
- Measure the performance of abatement equipment.
- Process diagnosis.
- Asset investigations.
- Olfactometry surveys.

Following investigation further action may be required to abate odour emissions. It may require the following.

- Operational solutions.
- Process solutions.
- Maintenance procedures.
- Investment solutions.

If operational solutions and maintenance procedures are required the Food Waste Treatment Plant Manager and Renewable Energy Manager must put together an implementation plan. It is the Food Waste Treatment Plant Manager and Renewable Energy Manager responsibility to action and review the implementation plan. If process solutions or investment solutions are required a Corporate Risk System action must be raised. This should be completed by the Food Waste Treatment Plant Manager and Renewable Energy Manager If process solutions or investment solutions are required the Odour Improvement Plan must be updated by the Odour Management Co-ordinator and reviewed by the Food Waste Treatment Plant Manager and Renewable Energy Manager for the site.

Communication with the customer will be via the mechanism that they originally made contact with Wessex Water. They will be informed of the outcome of the initial odour complaint investigation, whether further investigation should be carried out and what action has been taken where it has been required. Wessex Water aim to respond within 5 working days of the complaint being made unless the customer has requested they do not wish further contact. Following contacting the customer the rapid reference will be closed out unless there are further odour investigations required. The customer will be updated on the results of these odour investigations before the complaint can be closed out.

In the event of an odour issue affecting multiple customers within the community Wessex Water site management team will decide the level of response that is required. This could include, but not be restricted to, stakeholder liaison (communication through local councillors and local resident representatives), community engagement meetings to discuss the odour issues being experienced and actions that will be undertaken, site open days, local media liaison and writing to local residents via a letter drop. Customers may also be requested to complete odour diaries (see appendix 4).

10 Training

RES Operators working on this site will be provided with:

“OMP Awareness Training”.

This will be completed either in person with a competent trainer or an online format. The training should be refreshed on an annual basis. The training content will be prepared by the Odour Management Co-ordinator and it is the Food Waste Treatment Plant Supervisor and Renewable Energy Manager responsibility that all staff working in the permit area has received the training.

RES Operators required to carry out boundary sniff testing/olfactometry testing will be trained and assessed that they are competent by a competent trainer.

A copy of the Odour Control Operation Manual is kept on the odour page of the Wessex Water intranet for reference. Odour Control Operation Manual: TRTMAN007.

Records for training received by all employees are held electronically.

Staff required to carry out boundary sniff testing/olfactometry testing will be trained and assessed that they are competent.

Staff at all levels having duties related to the management, operation, maintenance or repair of odour-critical plant will be trained, competent and have documented training records. All staff involved with odour-critical plant will have access to the Wessex Water Operating Manual on Odour Control and undertake associated training and competency assessments.

Records for training received by all employees are held electronically.

11.0 Encroachment by External Developers

Where potential new development falls within the Wessex Water consultation zone TRTWG669 is to be followed. The potential developer must request a copy of the procedure from Wessex Water Planning Liaison Team. The procedure provides guidance on how to assess the odour impact from Sewage Treatment Works (STW), Sewage Pumping Stations (SPS) or other waste assets. The following policies and guidance below must also be consulted.

The National Planning Policy Framework (NPPF) (2012)

The NPPF describes the policy context in relation to pollutants, including atmospheric pollution.

'The Government's objective is that planning should help to deliver a healthy natural environment of the benefit of everyone and safe places which promote well being.

To achieve this objective, the planning system should aim to conserve and enhance the natural and local environment by:

[…]preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of land, air, water or noise pollution or land instability.'

Where pollution is defined as:

'Any consideration of the quality of land, air, water, soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam and odour.'

The NPPF specifically requires consideration of pollution on health and the natural environment as part of the planning decision process:

'To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning

The Institute of Air Quality Management (IAQM) published guidance on the assessment of odour for planning in 2014 (updated 2018). The guidance is for assessing odour impacts for planning purposes.

The guidance states that "*IAQM is of the opinion that the practitioner should observe, from the various scientific studies, case law and practical examples of the investigation of odour annoyance cases that in any specific case, an appropriate criterion could lie somewhere in the range of 1 to 10* $ou_E m^{-3}$ *as a* 98^{th} *percentile of hourly mean odour concentrations."*

The guidance states that *"Loss of amenity or disamenity does not equate directly to nuisance and significant loss of amenity will often occur at directly lower levels of emission then would constitute a statutory nuisance"*

CIWEM Policy Position Statement (2011)

"*CIWEM considers that the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:*

• C98, 1-hour >10 ou_E/m^3 - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;

• C98, 1-hour >5 ou_E/m^3, - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance;

• C98, 1-hour <3 ou_E/m^3, - complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature."

EA Horizon Guidance Document H4 (2012)

Benchmark levels

"The benchmarks are based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

- *1.5 odour units for **most offensive** odours:*
- *3 odour units for **moderately offensive** odours;*
- *6 odour units for **less offensive** odours.*

(caution should be used as these benchmarks were not from a sewage treatment works and the benchmarks were designed to be applied to those industrial processes regulated by an Environmental Permit. It is generally considered that sewage treatment works odours fall into the middle category (3 ou_E/m^3) unless there is septic wastewater or sludge on the site, in which case the most stringent criterion may apply).

Examples of previous decisions in statutory nuisance cases and planning appeals are listed below (caution should be exercised as decisions will have been based solely on the evidence presented at the time, which may have been incomplete or of a different standard to current best practice).

- Newbiggin appeal (1993) reference APP/F2930/A/92/206240; adoption of a level of 5ou/m^3 ($C_{98,1hr}$) (caution required as units are given as ou/m^3 and not ou_E/m^3) is both reasonable and cautious.

- Leighton Linslade appeal (2010) reference APP/P0240/A/09/2110667. At a threshold of 5, evidence of no harm is not convincing and there could be a risk of regular and unacceptable odour annoyance to such an extent that it would detract from the future resident's living conditions.

- Mogden case (statutory nuisance) [2011] EWHC 3253 (TCC). Nuisance certainly established at $5ou_E/m^3$

- Cockermouth appeals (2012) references APP/G0908/E/11/2152403 and A/11/2151737. $3ou_E/m^3$ for medium offensiveness.
- Stanton appeal (2012) reference APP/E3525/A/11/2162837. More appropriate threshold $3\text{-}5ou_E/m^3$.

- Gillingham (Dorset) (2016) appeal APP/N1215/W/15/3005513. I conclude that the appropriate parameter to apply in this case is the $3ou_E/m^3$ contour line.

12.0 Odour Improvement Plan

This section is to be completed by the Odour Management Co-ordinator if improvements are required to meet BAT, or customer odour complaints are received and further process and investment solutions are required to prevent further complaints. Each entry must be reviewed by the Site Manager/Supervisor for the site.

Table 12.1.1 Avonmouth RES Odour Improvement Plan.

Requirement Number	Requirement	Reviewed by:
1	Cover the Strain Press Buffer Tanks (BY1 and BY2) and the screenings skip (BX). Extract from buffer tanks to OCU or biogas removal system.	Supervisor
2	Cover/replace post digestion storage tank (BQ). An assessment of residual biogas potential to determine whether the tank is extracted to an OCU or biogas removal installation. This will also inform what type of covering is required.	Supervisor
3	Food Waste Odour Control Unit (BU) to be upgraded or replaced to meet the requirements of BAT and Appropriate Measures.	Supervisor
4	Identification of whether HCL and TVOCs are in the waste stream in high enough quantities to conclude whether monitoring described in Chapter 6.3 is required to be carried out.	Manager/Supervisor

References

Wessex Water Documents
• DS464 - Odour Management
• DS 540 - Sewage Pumping Stations and Pumping Mains
• TRTWP102 – Generic Odour Management Plan
• TRTMAN007 - Odour Control
•TRTWG669 - Odour impact and odour risk assessment procedure for existing WRCs/STC/SPSs, proposed new expansion/development of a site and potential encroachment around/near a site.
• WECEP004 - Preliminary Odour Risk Assessment
• NTKWP222 – Pumping Station Generic Odour Management Plan

Applicable regulation

- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969
- The National Planning Policy Framework (NPPF) (2012)

Further Guidance

- Appropriate measures for the biological treatment of waste: Environment Agency
- Best Practical Means (BPM), A Guidebook for Odour Control at Wastewater Treatment Works, UKWIR 06/WW/13/8
- BS – EN 12255-9:2002 – Waste Water Treatment Plants – Part 9: Odour Control and Ventilation
- Code of Practice on Odour Nuisance from Sewage Treatment Works (DEFRA, 2006) (withdrawn September 2017)
- Guidance on the assessment of odour for planning (Institute of Air Quality Management, 2014)
- H4 Odour Management Guidance (How to comply with your Environmental Permit), Environment Agency

Appendix 1: Emergency Contacts

Table Appendix 1 Avonmouth RES Contact:

Avonmouth RES odour related contact	**Wessex Water 03456 004600**

Appendix 2: Sniff Testing Record Sheet

Basic boundary sniff test record sheet (Daily: Operator).

Basic boundary sniff testing assessment form												Date
Weather conditions	(dry, rain, fog, snow)											
Temperature	(very warm, warm, mild, cold or degrees if known)											
Wind strength	(none, light, steady, strong, gusting or m/s if known)											
Wind direction												
Sample Location												
Time of Sample												
Intensity (See appendix 2)												
If intensity ≥3 Odour description (see appendix 3)												
Is the odour constant (C) or intermittent (I)												
Any comments (This might include likely source of any odour detected)												

Enhanced boundary sniff test

Sniff Test Assessment Date: Sampling period 5 minutes

Assessor: Confirmation assessor has met the following requirements on the back of this sheet: Y/N
Weather Conditions:

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Odour Assessor Requirements:

The odour assessor should confirm the following requirements to safeguard the quality of the sensory assessment are met.

- That the odour assessor has not got a blocked nose, cold, covid, virus, sore throat, sinus trouble, headache or generally feeling unwell.
- The odour assessor is not hungry or thirsty.
- The odour assessor must not work within half an hour of the end of their last meal.
- The odour assessor must not smoke, vape or consume strongly flavoured food or drink, including coffee, for at least half an hour before the field odour survey is carried out, or during the survey. The odour assessor should not consume confectionery or soft drinks for at least half an hour before the field odour survey is carried out, or during the survey.
- Scented toiletries, such as perfume/aftershave should not be used on the day of the field survey.
- The vehicle used during the field odour survey should not contain any deodorisers.
- Where the odour assessor has travelled to site then a rest period must be taken before starting the survey.

Method:

- SSoW must be consulted before start of assessment. Odour assessor requirements must be confirmed and recorded on sheet before starting assessment.
- Wind direction, wind speed and air temperature are to be recorded.
- The assessor breathes normally. The assessor should inhale ambient air samples through the nose every 10 seconds.
- The odour intensity (I) (0-6) should be recorded for each 10 second period for a period of 5 minutes at each sampling point.
- Where the sniff testing is off site for potential encroachment. If odour intensity is a continuous 4-6 then the odour assessor should avoid olfactory fatigue/desensitisation by alternating each sample sniff of ambient air with a sniff of odour-free air from an ori-nasal face mask fitted with carbon filters.
- Where the sniff testing is on site or boundary sniff testing for customer complaints or EA permit requirements if odour intensity is a continuous 4-6 then the odour assessor should avoid olfactory fatigue/desensitisation by stopping sampling after a max of 1 minute (or before) if extremely strong and move to cleaner air.
- Sampling must stop immediately, and the assessor must move to cleaner air if the assessor becomes unwell due to the strength of the odour.
- If an (I) of >2 has been recorded the hedonic tone must be recorded along with an odour description.
- Where sniff testing is being completed for potential encroachment Max (I) should be plotted on a map for each sampling point to identify the sites odour plume and the matrix to assess the odour exposure and odour effect at individual receptors must be calculated.

Where sniff testing is being completed for EA permitting requirements due to an EA Approved Odour Management Plan (OMP) the Max (I) and Hedonic Tone must be recorded for each boundary sampling point on the form contained in Appendix 2 of the OMP.

Appendix 3 Customer Complaint Form:

Wessex Water Rapid reference number (Customer complaint name and address to be kept on rapid system for GDP)	
Receptor location using location of sensitive receptors figures 3.2.1/3.2.2/3.2.3. (E.G. R18)	
Receptor sensitivity (High, Medium, Low)	
Date of odour	
Time of odour	
Wind direction (e.g. from the NE)	
Wind strength (none, light, steady, strong, gusting)	
Weather conditions i.e. dry, rain, fog, snow)	
Temperature (very warm, warm, mild, cold or degrees if known)	
Complainants description of odour: • What does it smell like?	
Intensity (see below)	
Duration (time)	
Constant or intermittent in this period.	
Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation (permit area), or to that location? (either previously or relating to the same exposure)	
Any other relevant information	
Is the odour complaint considered valid and likely to be caused by activities happening within the permit area.	
Operating conditions at time the odour occurred: See Housekeeping. Key Performance Monitoring.	
Action take:	
Does a Corporate Risk System action require raising? Date action raised if required:	
Form completed by:	
Date	

Intensity

0 No odour
1 Very faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour

Appendix 4 Odour Diary

Odour Diary					
Name Telephone number	Address				Sheet Number
Date of odour					
Time of odour					
Location of odour if not at above address (inside/outside)					
Weather conditions (dry, rain, fog, snow etc)					
Temperature (very warm, warm, mild, cold or degrees if known:)					
Wind strength (none, light, steady, strong, gusting).					
Wind direction (e.g. from NE)					
Describe the Odour (rotten eggs, musty, earthy, fishy, urine, sweet, vinegar)					
Intensity: How strong was it? See below 0-6					
How long did it last for (time)?					
Was it constant or intermittent in this period?					
Comments					

Intensity

0 No odour
1 Very faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour

Appendix 5 OCU Checklist

Area of Works	Healthy	Action
Daily Checks		
Check vessel access hatches are closed	**Yes/No**	Close if open
Check that there is an airflow	**Yes/No**	If no airflow investigate reason and resolve/repair.
Duty fan is running	**Yes/No**	If not running Investigate reason and resolve/repair
Check standby fan is operational	**Yes/No**	If not operational investigate reason and resolve/repair.
Check the duty and standby and irrigation pumps are operational	**Yes/No**	If not operational investigate reason and resolve/repair.
Check irrigation drain for flow (when irrigation pumps are working) and check for any blockages	**Yes/No**	If no irrigation investigate reason and resolve/repair. If blockage unblock.
Monthly Checks		
Process covers and building integrity	**Yes/No**	If damage raise job for repair.
Check odour extraction ductwork	**Yes/No**	If damage raise job for repair.
Fans -Grease fan motor -Check running current -Check air is being pulled into the unit	**Yes/No**	Repair as necessary or rise job for repair to be completed.
Check irrigation nozzles are clean and spray pattern is good.	**Yes/No**	Clean if required. Replace nozzles where required.
3 Monthly Check		
Fans (Generic List) -Visual check for earthing and bonding. -Visual check for damage. -Check bearing noise. -Check running current. -Check panel indication. -Check oil levels if gear box fitted -Check fan belt condition and tension. -Check motor impeller and shaft for corrosion. -Check guards. -Check fan case and clean drain point. -Check lubrication. -Test run	**Yes/No**	Undertake reactionary maintenance on day of inspection if possible. Escalate faults that cannot be fixed on day to site manager and order additional items to ensure fans can be returned to service. If fan is unable to be returned to service, arrange for full service or raise job for fan to be replaced.
Irrigation pumps (as fans, where applicable	**Yes/No**	Undertake reactionary maintenance on day of inspection if possible. Escalate faults that cannot be fixed on day to site manager and order additional items to ensure fans can be returned to service. If fan is unable to be returned to service, arrange for full service or raise job for pump to be replaced.

Appendix 6 OCU Performance Checklist

Task	Frequency	Performance	Method	Action	Responsible Person
Check H_2S stack outlet level	Monthly	<0.1ppm	Gastec tube	If >0.1ppm Check fans are working correctly. Investigate air flows. Check media condition Assess irrigation rate of biological filter.	**Duty Operator**
Check odour removal at stack outlet -Odour.	6 monthly	As per BAT 8 / BAT34 (odour <1,000$OU_E m^3$**)**	EN13725	If >1,000$OU_E m^3$ (Note: The food waste odour control unit was not designed to meet <1,000$OU_E m^3$ as built before this was a requirement. Therefore actions require if result is >3,**000** $OU_E m^3$**).** Check fans are working correctly. Investigate air flows. Check media condition Assess irrigation rate of biological filter.	**3rd Party Specialist**
Check H_2S stack outlet level	6 monthly	<0.1ppm	Gastec tube	If >0.1ppm Check fans are working correctly. Investigate air flows. Check media condition Assess irrigation rate of biological filter.	**3rd Party Specialist**

Check Ammonia Stack outlet level	6 monthly	<20ppm	Gastec tube	If >20ppm Check fans are working correctly. Investigate air flows. Check media condition Assess irrigation rate of biological filter.	**3rd Party Specialist**