Chapman Lily Planning Limited

Land at Wolfester Paddock, Sparkford Hill Lane, Yeovil, South Somerset, BA22 7JE

Odour Modelling Assessment

May 2019

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1. Introduction

1.1 Introduction

WYG Environment Planning and Transport (WYG) have been commissioned by Chapman Lily Planning Limited to complete an odour modelling assessment to support the planning application for a proposed residential development. The Proposed Development address is: Land at Wolfester Paddock, Sparkford Hill Lane, Yeovil, South Somerset, BA22 7JE.

Site Location and Context

The Proposed Development site is located to the north of Sparkford Hill Lane. The reference should be made to Figure 1 for the site location and surrounding area, and Figure 2 for the proposed development masterplan. The Sparkford Sewage Treatment Works site (STW) is located to the south of Sparkford Hill Lane, approximately 150m south of the closest point of the proposed development site boundary.

1.2 Overview and Scope of Assessment

The objectives of this odour modelling assessment are to study the potential magnitude and significance of odour from the Sewage Treatment Works on sensitive receptor locations at the proposed development site.

The following assessment stages have been undertaken as part of this assessment:

- A site visit to Sparkford Sewage Treatment Works site to meet Wessex Water odour specialist to discuss the site operation processes, the potential odour emission sources and the odour emission rates;
- An odour modelling assessment to study the potential magnitude and significance of odour from the Sparkford Sewage Treatment Works site on sensitive receptor locations at the proposed development site; and
- Odour modelling assessment following the EA's and IAQM's guidance and using Wessex Water modelling procedures, the Wessex Water agreed odour emission sources and odour emission rates.

The results are detailed in the following sections of this report.

2. Odour Assessment Methodology

Following major regulations/guidance/guidelines have been used in the assessment:

- Guidance on the assessment of odour for planning, IAQM, July 2018; and
- H4 Odour Management, How to comply with your environmental permit, March 2011.

2.1 Definition of Impact and Effect

IEMA Guidelines for Environmental Impact Assessment (2004) recommend a clear progression from the characterisation of "impact" to the assessment of the significance of the "effect" taking into account the evaluation of the sensitivity and value of the receptors. The guidelines emphasise the need to clearly define at the outset how the two terms will be used and then to apply them in a consistent fashion. In this IAQM guidance, the following definitions are used:

- **Impacts** – these are changes to the environment attributable to the development proposal.
- **Effects** – these are the results of the changes on specific receptors.
- **Receptors** - are the users of the adjacent land, which may vary in their sensitivity to odour.

An increase in odour levels (the impact) would therefore cause a particular effect (e.g. loss of amenity) if the adjacent land use was residential, and perhaps a lesser effect if the adjacent land use was an industrial facility.

2.2 Odour Benchmarks and Odour Effect Descriptors for Impact Assessment

Environment Agency Guidance H4 Odour Management (March 2011) and the latest Institute of Air Quality Management (IAQM) Guidance on the Assessment of Odour for Planning (July 2018) provides a methodology for assessing the impacts of odour based on the combinations of field odour survey observations and odour dispersion modelling.

The modelling method calculates the 98th percentile of hourly average odour concentrations ($C_{98,\ 1\text{-hour}}$) over a year, (i.e. the levels exceeded for 2% of the time) with the results being expressed as European Odour Unit contours on a map. The exposure contours can then be used to check unacceptable levels of odour pollution against exposure benchmarks at sensitive receptor locations.

The H4 benchmarks are based on the 98th percentile of hourly averages and they are presented in Table 2.1.

Table 2.1 H4 Benchmark Odour Criteria

Criterion C_{98} ou_E/m^3	Offensiveness	Odour Emission Sources
1.5	most offensive odours	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
3.0	moderately offensive odours	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
6.0	less offensive odours	Brewery Confectionery Coffee

The latest IAQM guidance states that the predictive, quantitative approach involves obtaining estimates of the odour source emission rate, use of the emissions in a dispersion model to predict 98th percentile concentration at sensitive receptors and comparison of these with criteria that have evolved from research and survey work. At the present time, this remains an accepted technique and the IAQM supports this.

IAQM confirm that in the absence of comprehensive dose-response information the assessor should allow the derivation of exact C98 concentration metrics for different types of odour, 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 ouE/m^3 as a 98th percentile of hourly mean odour concentrations.*

Taking into account the available scientific evidence and the collective experience of IAQM members involved in drafting this guidance, the odour concentration change descriptors together with impact descriptors in Table 2.2 are proposed by IAQM for an odour at the offensive end of the spectrum. These adopt the C98 as the appropriate frequency metric, encompasses the 1 to 10 ouE/m^3 concentration range referred to above and also considers also the potential sensitivity of different receptors. It is also consistent in format and concept with other guidance in the air quality field.

For odours that are less unpleasant, the level of odour exposure required to elicit the same effect may be somewhat higher, requiring professional judgement to be applied. For example, odours from sewage treatment works plant operating normally, i.e. non-septic conditions, would not be expected to be at the 'most offensive' end of the spectrum (Table 2.1) and can be considered on par with 'moderately offensive' odours such as intensive livestock rearing. Table 2.3 below shows the impact descriptors proposed for a 'moderately offensive' odour.'

Table 2.2 Proposed odour effect descriptors for impacts predicted by modelling – "Most Offensive" odours

Odour Exposure Level C_{98}, ou_E/m^3	Receptor Sensitivity		
	Low	Medium	High
≥10	Moderate	Substantial	Substantial
5-<10	Moderate	Moderate	Substantial
3-<5	Slight	Moderate	Moderate
1.5-<3	Negligible	Slight	Moderate
0.5-<1.5	Negligible	Negligible	Slight
<0.5	Negligible	Negligible	Negligible

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms "adverse" or "beneficial "should be added to the descriptors.

Table 2.3 Proposed odour effect descriptors for impacts predicted by modelling – "Moderately Offensive" odours

Odour Exposure Level C_{98}, ou_E/m^3	Receptor Sensitivity		
	Low	Medium	High
≥10	Moderate	Substantial	Substantial
5-<10	Slight	Moderate	Moderate
3-<5	Negligible	Slight	Moderate
1.5-<3	Negligible	Negligible	Slight
0.5-<1.5	Negligible	Negligible	Negligible
<0.5	Negligible	Negligible	Negligible

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms "adverse" or "beneficial "should be added to the descriptors.

A benchmark odour criterion of 3 OU_e/m^3 has been used in this assessment.

Wessex Water's Generic Odour Management Plan and Odour Policy Plan are presented in Appendix A and Appendix B.

3. Odour and Fly Complaint History

Odour and Fly Complaint History

Consultation has been undertaken with South Somerset District Council with regards to any odour and fly complaints from the Sewage Treatment Works. An email of request for the information was sent to the Council on the 16th April 2019.

Mr Brett Warren, Environmental Health Specialist – Environmental Protection, at South Somerset District Council, emailed WYG on the 21st May 2019 in the confirmation of:

"Following your request for information, I have checked our database system to determine whether we have received complaints about odour and flies from Wessex Water treatment plant located to the south of Sparkford Hill Lane. Our records show than no such complaints have been received."

4. Modelling of Odour Releases

An assessment of odour releases from the Sewage Treatment Works was undertaken using AERMOD modelling software. AERMOD is an US EPA (Environmental Protection Agency) regulatory model and it is an Environment Agency approved model for the prediction of pollutant concentrations from a wide range of sources that are present at typical industrial facilities.

4.1 AERMOD Dispersion Model

The AERMOD model accepts hourly meteorological data to define the conditions for plume rise, transport, diffusion and deposition. It estimates the concentration or deposition value for each source and receptor combination for each hour of input meteorology and calculates annual and user-selected short-term averages. The model also takes into account the local terrain surrounding the facility. Since most air quality standards are stipulated as averages or percentiles, AERMOD allows further analysis of the results for comparison purposes.

4.2 Emission Sources

The following tanks/chambers at the waste water processing plant have been assessed as odour area sources in the modelling.

- The inlet works;
- Primary tanks;
- Primary tank distribution chamber;
- Humus tanks;
- Filter tanks;
- Storm tanks;
- Sludge tank; and
- Sludge beds.

All those emission sources are assessed as either a rectangular area source or a circular area source in the model and they are presented in Figure 3.

4.3 Odour Modelling Scenarios

The following two modelling scenarios have been assessed:

- Scenario 1 'normal operations scenario'. This scenario assesses the odour emissions from the sources listed in Section 4.2 and Table 4.1;
- Scenario 2 'worst-case operations scenario'. This scenario assesses the odour emissions from the sources listed in Section 4.2 and Table 4.1 plus an additional sludge vent emission source representing the sludge being transport out by a tank for treatment.

4.4 Odour Emission Concentrations

It is considered to be appropriate to use the emissions rates detailed both in the Technical Report on Odour Control in Wastewater Treatment – A Technical reference Document (Report Ref. No. UKWIR USE) published by UKWIR (UK Water Industry Research), and in Wessex Water's odour risk assessment procedure for proposed new development. Those emission rates have been discussed and agreed with James Humphries at Wessex Water.

The odour emission rates and the modelled area source parameters are presented in Table 4.1 for both scenarios.

Table 4.1 Odour Area Sources and Emissions

Name	Odour Source	X	Y	Shape	Length (m)	Width (m)	Radius (m)	Area (m^2)	Emission rate ($OU/m^2/s$)	Remarks
INFLOW	Inflow Tank	360434	125128	Rectangular	4	2.5	N/A	10.0	31	UKWIR/Wessex Water emission rates
INLET	Inlet	360471	125143	Rectangular	1	0.5	N/A	0.5	31	UKWIR/Wessex Water emission rates
SCREEN	Inlet Screening	360463	125139	Rectangular	0.4	6	N/A	2.4	31	UKWIR/Wessex Water emission rates
INSTORM	Inlet Storm Tank	360464	125138	Rectangular	0.4	5	N/A	2.0	31	UKWIR/Wessex Water emission rates
PRI_DIS	Primary Tank Distribution	360452	125133	Rectangular	2.5	2.8	N/A	7.0	3	UKWIR/Wessex Water emission rates
STORM	Storm Tank	360456	125134	Rectangular	2.2	2.2	N/A	4.8	0.2	UKWIR/Wessex Water emission rates
FILLDIS	Filter Bed Distribution Tank	360456	125116	Rectangular	1.7	5.2	N/A	8.8	3	UKWIR/Wessex Water emission rates
SLUDT1	Sludge Pump 1	360460	125122	Rectangular	1	1	N/A	1.0	710	UKWIR/Wessex Water emission rates
SLUDT2	Sludge Pump 2	360461	125120	Rectangular	1	1	N/A	1.0	710	UKWIR/Wessex Water emission rates
BEDPUMP	Filter Bed Pump Tank	360456	125118	Rectangular	1.6	2.6	N/A	4.2	3	UKWIR/Wessex Water emission rates
HUMUS1	Humus Tank 1	360459	125114	Rectangular	7.8	7.8	N/A	60.8	1.7	UKWIR/Wessex Water emission rates
HUMUS2	Humus Tank 2	360463	125105	Rectangular	7.8	7.8	N/A	60.8	1.7	UKWIR/Wessex Water emission rates
HUMSLUD	Humus Sludge Tank	360457	125111	Rectangular	2.8	2.2	N/A	6.2	1.7	UKWIR/Wessex Water emission rates
SLUDBE1A	Sludge Bed 1A - Fresh pumped in with disturbance	360473	125157	Rectangular	1.5	1.5	N/A	2.3	710	UKWIR/Wessex Water emission rates
SLUDBE1B	Sludge Bed 1B - Quiescent Raw Sludge	360474	125157	Rectangular	1.5	4.6	N/A	6.9	40	UKWIR/Wessex Water emission rates
SLUDB1C	Sludge Bed 1C - Quiescent Raw Sludge	360473	125155	Rectangular	2.9	6.3	N/A	18.3	40	UKWIR/Wessex Water emission rates
SLUDBED2	Sludge Bed 2 - Sludge Cake	360467	125154	Rectangular	4.6	6.3	N/A	29.0	0.8	UKWIR/Wessex Water emission rates
SLUDBED3	Sludge Bed 3 - sludge Cake	360464	125158	Rectangular	4.6	6.3	N/A	29.0	0.8	UKWIR/Wessex Water emission rates

Name	Odour Source	X	Y	Shape	Length (m)	Width (m)	Radius (m)	Area (m^2)	Emission rate ($OU/m^2/s$)	Remarks
SLUDBED4	Sludge Bed 4 - sludge cake	360471	125161	Rectangular	4.6	6.3	N/A	29.0	0.8	UKWIR/Wessex Water emission rates
PRIMA1	Primary Tank 1	360452	125125	Circular	N/A	N/A	3.5	38.5	1.9	UKWIR/Wessex Water emission rates
PRIMAR2	Primary Tank 2	360459	125129	Circular	N/A	N/A	3.5	38.5	1.9	UKWIR/Wessex Water emission rates
FILBED1	Filter Bed 1	360447	125110	Circular	N/A	N/A	8.8	243.3	1.5	UKWIR/Wessex Water emission rates
FILBED2	Filter Bed 2	360477	125125	Circular	N/A	N/A	8.8	243.3	1.5	UKWIR/Wessex Water emission rates
SLUDMOVE	Sludge Remove truck (worst-case scenario 2)	360478	125153	Circular	N/A	N/A	0.51	0.8	710	UKWIR/Wessex Water emission rates

4.5 Sensitive Residential Receptors

The proposed development receptors and the existing sensitive residential receptors adjacent to the site are contained in Table 4.2 and shown in Figure 4.

It should be noted that these do not represent an exhaustive list of all receptors within the vicinity of the Site, rather worst case representative locations adjacent to the site.

Table 4.2 Modelled Sensitive Residential Receptors

Discrete Receptor		UK NGR (m)	
		X	Y
D1	Sulby, Sparkford Hill Lane	360075	125470
D2	Townsend Farm, Sparkford Road	359816	125272
D3	Mill Farm, Queen Camel	359827	125015
D4	Henshallbrook Farm, High Street	359750	124523
D5	Middle Farm, Weston Bampfylde	360975	124794
D6	The Old Rectory, Weston Bampfuylde	360928	124943
D7	Mill Farm, West Bampfylde	360919	125216
D8	Church View, Church Road	360792	125642
D9	8 Ainstey Drive	360520	125838
D10	Hazelgrove Lodge	360045	125944
D11	New Development 1	360546	125283
D12	New Development 2	360589	125282
D13	New Development 3	360633	125280
D14	New Development 4	360473	125347
D15	New Development 5	360407	125387

4.6 Meteorological Data

The five years of meteorological data used in the assessment are from Yeovilton Meteorological Station (2014 – 2018 inclusive). The meteorological data are considered representative of conditions at the development site. Reference should be made to Figure 5 for an illustration of the prevalent wind conditions at this site.

4.7 Surface Roughness Length

BREEZE AERMET 7 has been used to produce AERMOD-ready meteorological data files (.SFC and .PFL files) using the five year meteorological data from Yeovilton Meteorological Station.

The land uses surrounding the site are described as 'agricultural areas'. Two sectors have been identified to represent the surface roughness characteristics surrounding the site. A sector (0° to 90°) represents tree

area and other sector represents the grassland use. A surface roughness value of 1.0 m for tree area and a surface roughness value of 0.3 for the grassland have been used to produce a worst-case assessment.

4.8 Treatment of Terrain

The presence of steep terrain can influence the dispersion of emissions and the resulting pollutant concentrations. US EPA guidance indicates that terrain effects should be considered if the gradient exceeds 1:10. Two digital terrain files in the UK Ordnance Survey (OS) Landranger format (.NTF) have been used in the assessment.

5. Odour Modelling and Assessment Results

5.1 Odour Modelling Results – Scenario 1

The results of the model predictions at each discrete receptor using 2014, 2015, 2016, 2017 and 2018 met data (odour concentration at the ground level) are summarised in Table 5.1. The results are presented at the 98th%ile of hourly averages (Environment Agency, March 2011).

Table 5.1 The 98th%ile Maximum Short-Term (Hourly) Concentrations of Odour

Receptors		Predicted Hourly PEC (Contribution from the STW) OU_E/m^3				
		2014 Met Data	2015 Met Data	2016 Met Data	2017 Met Data	2018 Met Data
D1	Sulby, Sparkford Hill Lane	0.28	0.18	0.27	0.47	0.47
D2	Townsend Farm, Sparkford Road	0.14	0.13	0.20	0.15	0.23
D3	Mill Farm, Queen Camel	0.04	0.04	0.05	0.03	0.05
D4	Henshallbrook Farm, High Street	0.02	0.02	0.02	0.01	0.02
D5	Middle Farm, Weston Bampfylde	0.08	0.09	0.12	0.21	0.16
D6	The Old Rectory, Weston Bampfuylde	0.12	0.16	0.20	0.37	0.24
D7	Mill Farm, West Bampfylde	0.38	0.28	0.44	0.96	0.58
D8	Church View, Church Road	0.18	0.16	0.16	0.36	0.31
D9	8 Ainstey Drive	0.11	0.11	0.10	0.20	0.19
D10	Hazelgrove Lodge	0.07	0.04	0.07	0.08	0.09
D11	New Development 1	1.66	1.61	1.62	3.53	2.73
D12	New Development 2	1.68	1.49	1.54	3.16	2.96
D13	New Development 3	1.37	1.20	1.37	3.16	2.70
D14	New Development 4	0.98	0.99	1.04	1.75	1.52
D15	New Development 5	0.73	0.53	0.57	1.10	0.77

Notes:
1. There is no background for odour and hence the PC = PEC.

Existing Receptors

The predicted odour concentrations at existing receptors are all below the benchmark odour criterion of 3 OU_e/m^3 for all five year met data.

The Proposed Development Receptors

The predicted odour concentrations at the proposed development receptors are below the benchmark odour criterion of 3 OU_e/m^3 for 4 year met data (2014, 2015, 2016, and 2018). However, the predicted odour concentrations at three proposed development receptors (D11, D12 and D13) are above the benchmark odour criterion of 3 OU_e/m^3 for 2017 year met data.

From the meteorological dataset, the year resulting in maximum total short-term odour concentrations was identified as 2017.

5.2 Odour Effects on the Existing and Proposed New Residential Receptors – Scenario 1

The magnitudes of odour effects for the proposed new development receptors for 2017, the year resulting in maximum total short-term odour concentrations, are presented in Table 5.2.

The residential dwellings and the proposed development receptors are assessed as high sensitivity receptors.

Table 5.2 The 98th%ile Maximum Short-Term (Hourly) Concentrations of Odour

Receptors		Predicted Hourly PEC OU_E/m^3	Odour Effect
		2017 Met Data	2017 Met Data
D1	Sulby, Sparkford Hill Lane	0.47	Negligible
D2	Townsend Farm, Sparkford Road	0.15	Negligible
D3	Mill Farm, Queen Camel	0.03	Negligible
D4	Henshallbrook Farm, High Street	0.01	Negligible
D5	Middle Farm, Weston Bampfylde	0.21	Negligible
D6	The Old Rectory, Weston Bampfuylde	0.37	Negligible
D7	Mill Farm, West Bampfylde	0.96	Negligible
D8	Church View, Church Road	0.36	Negligible
D9	8 Ainstey Drive	0.20	Negligible
D10	Hazelgrove Lodge	0.08	Negligible
D11	New Development 1	3.53	Moderate
D12	New Development 2	3.16	Moderate
D13	New Development 3	3.16	Moderate
D14	New Development 4	1.75	Moderate
D15	New Development 5	1.10	Slight

Notes:
1. There is no background for odour and hence the PC = PEC.

The results indicate that the predicted odour concentrations at the existing residential receptors using 2017 meteorological data range from 0.01 OU_E/m^3 to 0.96 OU_E/m^3. The odour effects at the existing receptors are predicted to be 'Negligible".

The predicted odour concentrations at the proposed new development residential receptors using 2017 meteorological data range from 1.10 OU_E/m^3 to 3.53 OU_E/m^3.

The odour effects at the proposed new receptors are predicted to be 'Slight' or "Moderate".

The contour plot of the predicted odour concentrations using 2017 meteorological data for Scenario 1 is presented in Figure 6.

5.3 Odour Modelling Results – Scenario 2

For scenario 2, the odour emission rate for the Sludge Bed 1 is modelled as 710 $OU_E/m^2/s$ and including an additional sludge vent source representing the sludge being transport out by a tank for treatment.

It is assumed the odour emissions from the sludge bed 1 and the sludge vent source are continuous.

The results of the model predictions at each discrete receptor using 2017 met data (the year resulting in a maximum total predicted odour concentration) are summarised in Table 5.3. The results are presented as the 98th%ile of hourly averages (Environment Agency, March 2011).

Table 5.3 The 98th%ile Maximum Short-Term (Hourly) Concentrations of Odour

Receptors		Predicted Hourly PEC (Contribution from the STW) OU_E/m^3 2017 Met Data	Odour Effect 2017 Met Data
D1	Sulby, Sparkford Hill Lane	1.73	Moderate
D2	Townsend Farm, Sparkford Road	0.52	Slight
D3	Mill Farm, Queen Camel	0.11	Negligible
D4	Henshallbrook Farm, High Street	0.05	Negligible
D5	Middle Farm, Weston Bampfylde	0.79	Slight
D6	The Old Rectory, Weston Bampfuylde	1.42	Slight
D7	Mill Farm, West Bampfylde	3.98	Moderate
D8	Church View, Church Road	1.50	Moderate
D9	8 Ainstey Drive	0.81	Slight
D10	Hazelgrove Lodge	0.30	Negligible
D11	New Development 1	16.92	Substantial
D12	New Development 2	15.25	Substantial
D13	New Development 3	14.57	Substantial
D14	New Development 4	8.27	Substantial
D15	New Development 5	5.21	Substantial

Notes:
1. There is no background for odour and hence the PC = PEC.

The results indicate that the predicted odour concentrations at the existing residential receptors using 2017 meteorological data range from 0.05 OU_E/m^3 to 3.98 OU_E/m^3. The odour effects at the existing receptors are predicted to be 'Negligible" to 'Moderate'.

The predicted odour concentrations at the proposed new development residential receptors using 2017 meteorological data range from 5.21 OU_E/m^3 to 16.92 OU_E/m^3. The odour effects at the proposed new receptors are predicted to be 'substantial' if the sludge bed is operating continuously.

It should be noted that the Scenario 2 results are based on the assumption that the high odour emission rates from the sludge bed 1 and the sludge vent source are continuous. In reality, the sludge will be removed by the sludge tank trucks periodically. The odour impact from Scenario 2 should be less than the predicted. However, it is anticipated that the sludge removing from the sludge beds will increased the odour emissions from the site. If the sludge removing activities should be scheduled when wind is not blowing from southwest, the potential odour impact to the proposed development receptors will be reduced.

5.4 Odour Effect Zones

The relevant Preliminary Masterplan for the proposed development and the recommended odour effect zones associated with the operation of the Sewage Treatment Works under the normal operation scenario 1 is provided in Figure 7.

Odour Effect Zone A (Salmon)

Given the results of the modelling assessment, it is considered that odour is likely to be regularly detected over a limited area close to the Sewage Treatment Works. Further mitigation measures, such as, changes of the proposed layout, no private amenity spaces in this area, or providing mechanical ventilation and/or filtration to the proposed properties should be considered.

Odour Effect Zone B (Yellow)

The odour effect of Zone B is only likely to experience odour from time to time, depending on weather conditions and operations at the Sewage Treatment Works. In the Zone B, there remains a risk of odour being detected but the risk is minimal. No further mitigation is required.

Odour Effect Zone C (Green)

The odour effect of Zone C is unlikely to experience odour from the Sewage Treatment Works frequently. It is considered that the odour may be potentially detectable only very infrequently. The potential odour impacts on the proposed residential development from the Sewage Treatment Works are therefore not significant. No further mitigation is required.

6. Pests (Flies) Assessment

6.1 Background

The Clean Neighbourhoods and Environment Act 2005 has amended the Statutory Nuisance provisions under Section 79 of the Environmental Protection Act 1990 (Statutory nuisances and inspections) relating to nuisance from insects. It relates to any insects emanating from relevant industrial, trade or business premises and being prejudicial to health or a nuisance, but excludes:

- Land used as arable, grazing, meadow or pasture land;
- Land used as osier land, reed beds or woodland;
- Land used for market gardens, nursery grounds or orchards;
- Land included in a site of special scientific interest;
- Land forming part of an agricultural unit; and,
- Land covered by and the waters of any river or watercourse that is neither a sewer nor a drain or any lake or pond It does not apply to insects that are categorised as wild animals under the Wildlife and Countryside Act 1981, i.e. animals which are protected.

Most pest complaints are associated with:

- Poultry houses / farms (buildings on agricultural land are not exempt from statutory nuisance from insects, even though the land surrounding them may be);
- Sewage treatment works;
- Manure / silage storage areas;
- Animal housing;
- Stagnant ditches and drains (i.e. containing putrid and anoxic water) (provided they are on relevant industrial etc. premises);
- Landfill sites / refuse tips;
- Qaste transfer premises;
- The commercial parts of mixed commercial / residential blocks of buildings (i.e. excluding the residential premises contained therein);
- Trade or business premises (e.g. contaminated goods, kitchen areas);
- Slaughterhouses; and,
- Used car tyre recycling businesses.

If the local authority is satisfied that the insect problem amounts to a statutory nuisance it will serve an abatement notice. This may require the activity causing the nuisance to stop altogether, or that good practice is adopted to prevent a nuisance.

Just as a noise does not need to be a specific volume to be a nuisance, there is no set number of flies that constitutes a nuisance. Guidance suggests that most people will be irritated by five of more flies flying in any one room, at any one time, on three successive days. When monitoring flies with baited traps, collecting more than 25 in any 48-hour period may indicate grounds for distress.

6.2 Wessex Water's Generic Fly Management Plan

Wessex Water has produced a generic fly management plan, which complies with the Defra guidance on Sections 101 and 103 of Clean Neighbourhoods Protection Act 2005 and Section 79 of the Environmental Protection Act 1990.

The fly management plan consists of Background Information; Good Housekeeping; Recommendations for Reducing Fly Levels at Customer Property; Best Practice to Prevent Fly Nuisance; Larval and Fly Count Method; Procedure for Complaints; Training; and Encroachment by External Developers.

The details of the plan are presented in Appendix C.

Wessex Water has also produced a fly larvae and aerial fly counting procedures, which details methods for the counting of fly larvae and aerial flies to determine whether a fly population is likely to have come from a STW or to determine the frequency of VectoBac dosing.

The details of the procedures are presented in Appendix D.

6.3 Baseline Observations – Fly Observation on the Site Visit

It was observed on the site visit on the 7th May 2019 that the site has a clear Chironomid population. Adult flies were seen on site and there were chironomid helical swarms from the popular trees on the STW site boundary. There were also a few adult window gnat flies spotted close to the filters.

A larvae count was completed on the site and the results are as below:

- Filter bed 1: Chironomid larvae 57; and
- Filter bed 2 Chironomid larvae 158.

These levels are considered as high. Although the filter bed area is not large on this STW site due to the high levels detected it would be recommended that there is no sensitive residential development within 250m of the site boundary as stated in the Generic Fly Management Plan if no any fly control mitigation measures being used.

6.4 Fly Control Measures

There are already grown tall and dense trees on the land between the filter beds and Sparkford Hill Land. The chironomid will stay close to the popular trees next to the STW site boundary. As long as those trees remain those trees will keep the flies staying close to those trees at the waste treatment work boundary, and the flies are unlikely to pose an risk for the proposed new development. Therefore, it is necessary to have the trees remain in place in the long term.

7. Conclusion

WYG Environment Planning and Transport (WYG) have been commissioned by Chapman Lily Planning Limited to complete an Odour modelling assessment to support the planning application for a proposed residential development Land at Wolfester Paddock, Sparkford Hill Lane, Yeovil, South Somerset, BA22 7JE.

The objectives of this odour modelling assessment are to study the potential magnitude and significance of potential odour impact from the STW on the proposed development sensitive receptors.

The assessment has determined odour effect zones associated with the operation of the STW in respect to the masterplan for the proposed development.

South Somerset District Council has confirmed that no odour and fly complaints have been received associated with Sparkford Sewage Treatment works.

Odour Modelling Assessment Results

The odour modelling results indicated that the predicted odour concentrations in a 25 m narrow area at the ELC retained Land next to the southern site boundary (an odour effect zone A) , will be above the benchmark odour criterion of 3 OU_e/m^3.

Odour effect zones associated with the operation of the Sewage Treatment Works under the normal operation scenario have been identified.

Odour Effect Zone A (Salmon)

Given the results of the modelling assessment, it is considered that odour is likely to be regularly detected over a limited area close to the STW. Further mitigation measures, such as, changes of the proposed layout, no private amenity spaces in this area, or providing mechanical ventilation and/or filtration to the proposed properties should be considered.

Odour Effect Zone B (Yellow)

The odour effect of Zone B is only likely to experience odour from time to time, depending on weather conditions and operations at the STW. In the Zone B, there remains a risk of odour being detected but the risk is minimal. No further mitigation is required.

Odour Effect Zone C (Green)

The odour effect of Zone C is unlikely to experience odour from the STW frequently. It is considered that the odour may be potentially detectable only very infrequently. The potential odour impacts on the proposed residential development from the STW are therefore not significant. No further mitigation is required.

Pest Assessment

Larvae count results indicated that the larvae levels are considered as high. Although the filter bed area is not large on this site due to the high levels detected it would be recommended that there is no sensitive residential development within 250m of the site boundary as stated in the Generic Fly Management Plan without any fly control mitigation measures being used. However, there are already grown tall and dense trees on the land between the filter beds and Sparkford Hill Land. The chironomid will stay close to the popular trees next to the STW site boundary. As long as those trees remain those trees will keep the flies staying close to those trees at the waste treatment work boundary, and the flies are unlikely to pose a risk for the proposed new development. Therefore, it is necessary to have the trees remain in place in the long term.

Figures

Figure 1 Site Location

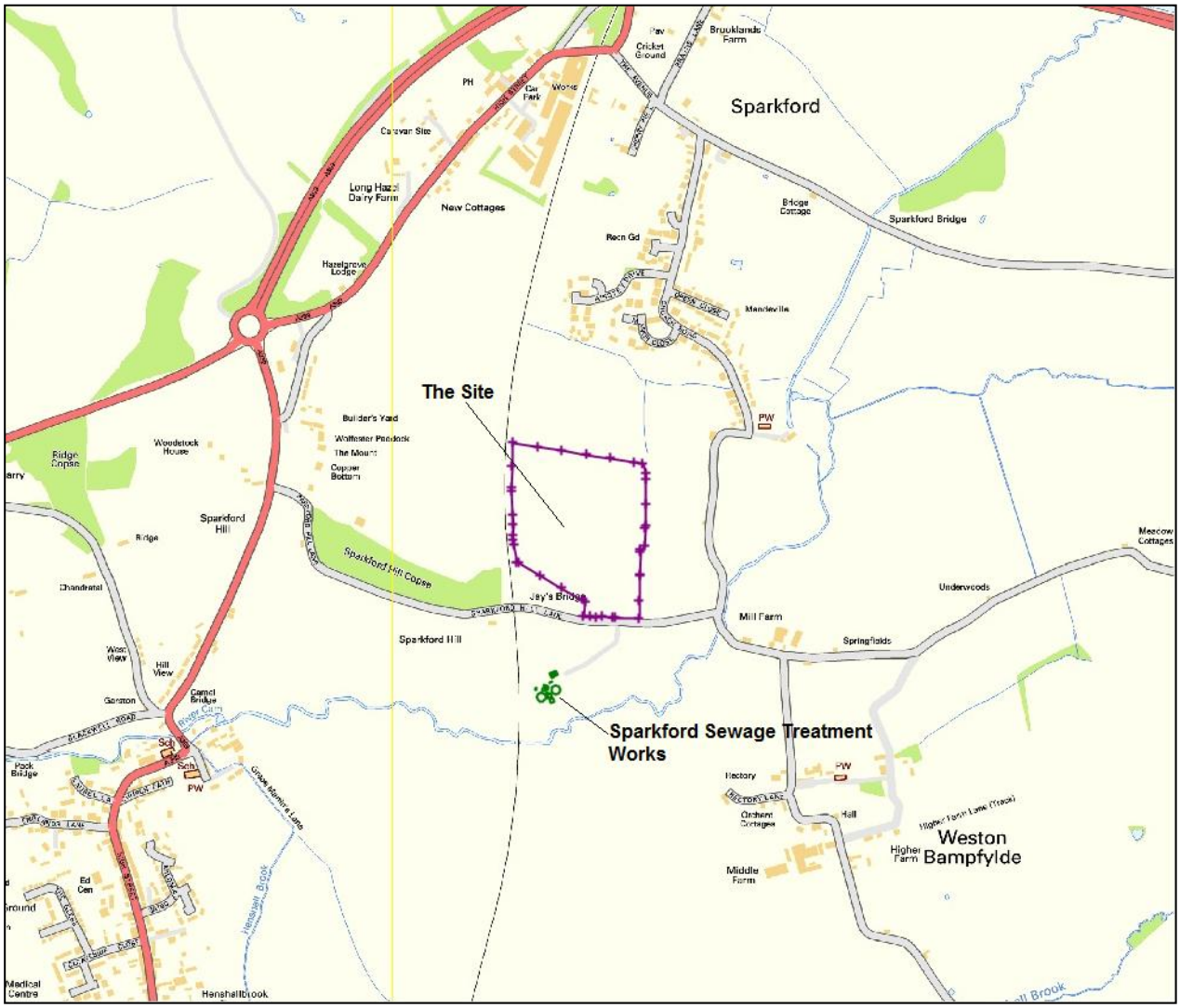


Figure 2 Illustrative Masterplan

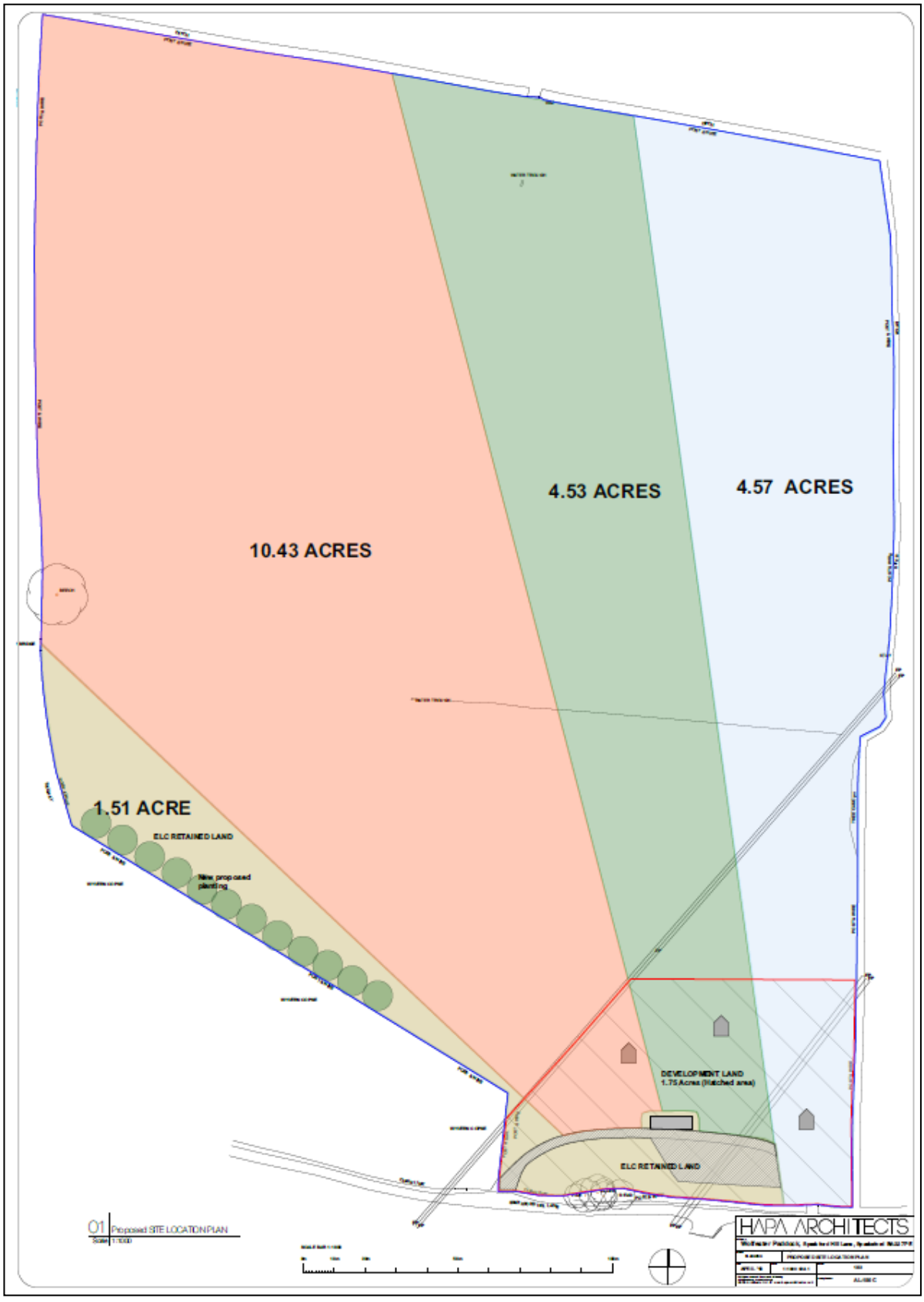


Figure 3 Modelled Emission Sources

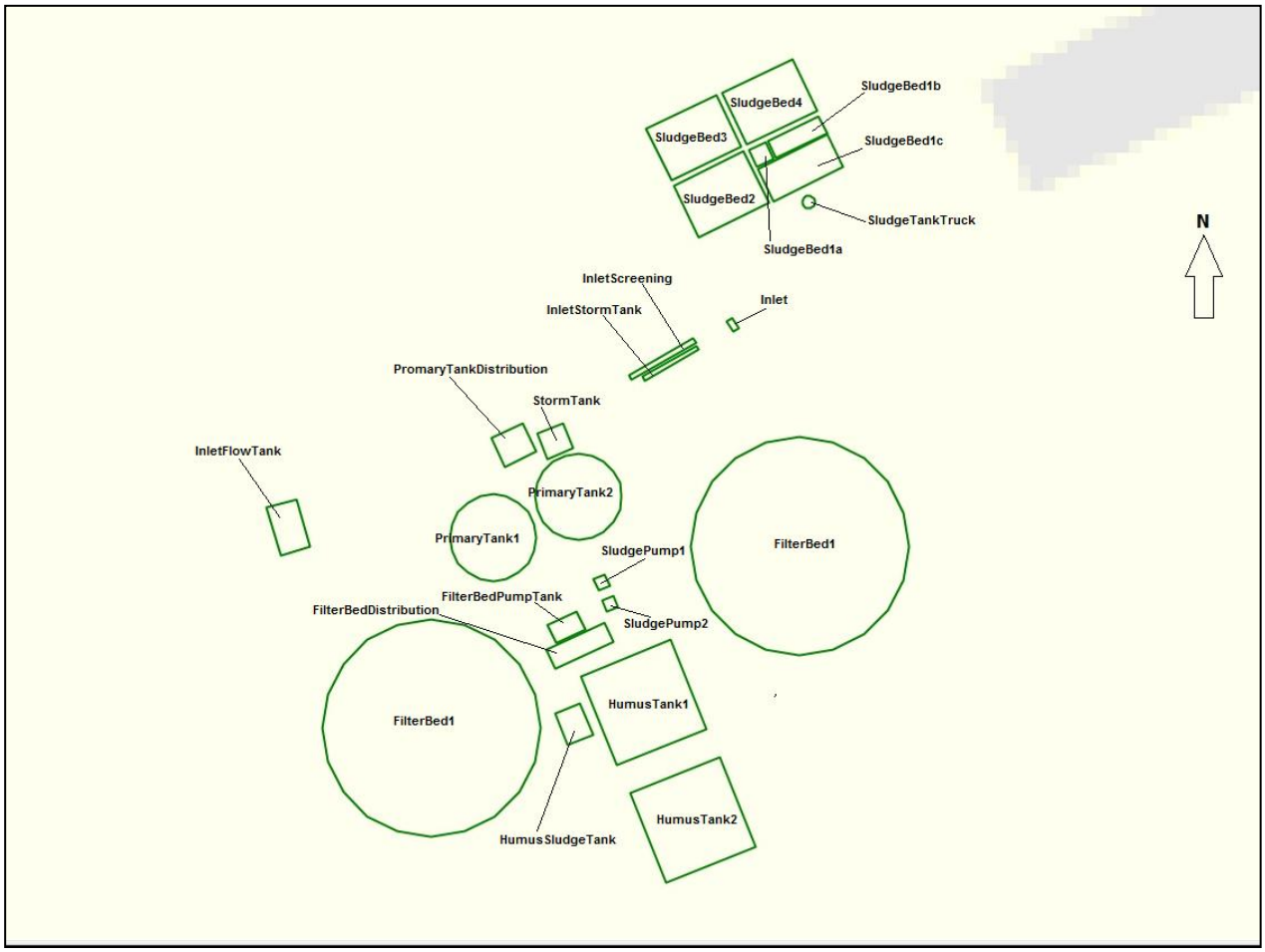


Figure 4 Modelled Receptors

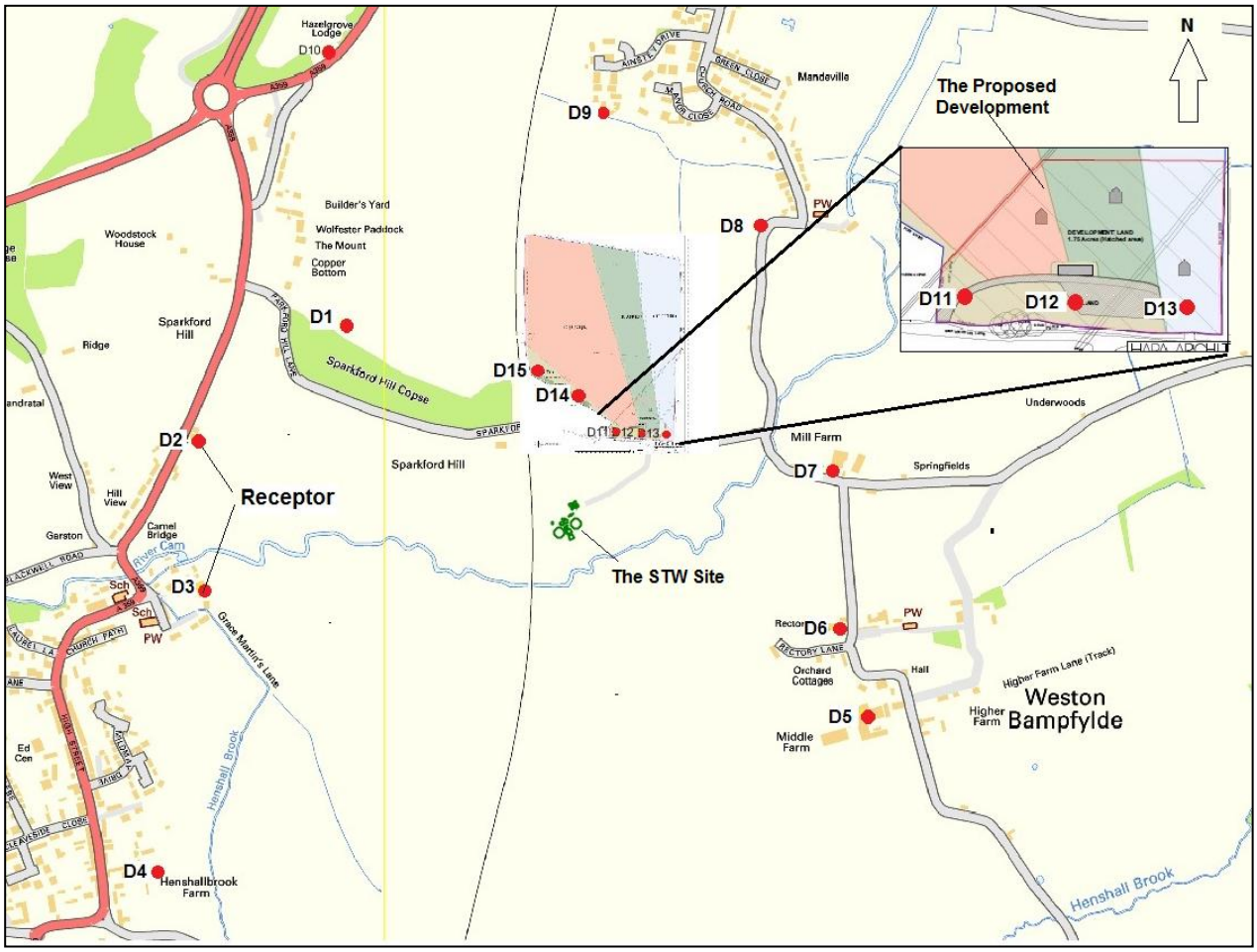
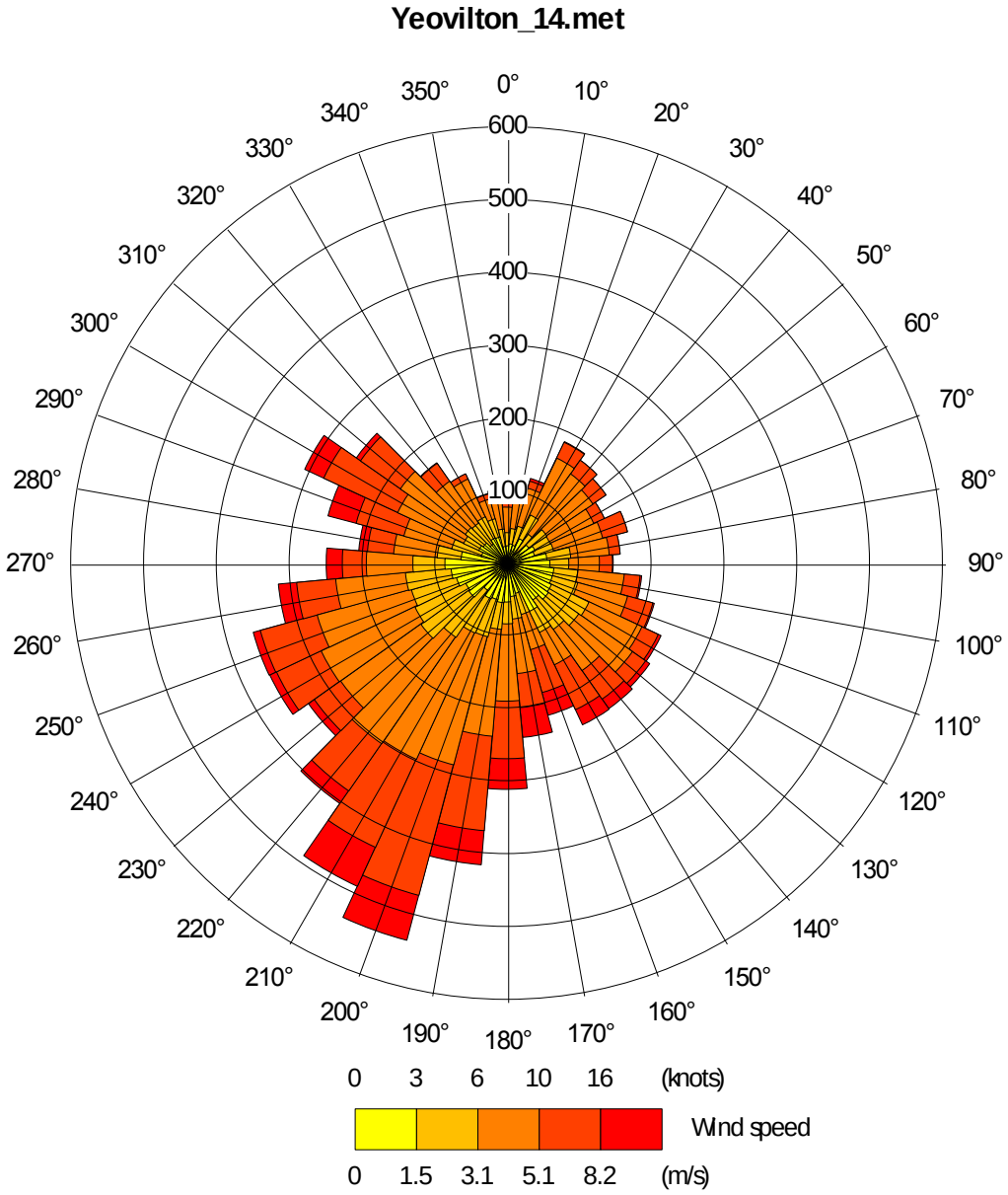
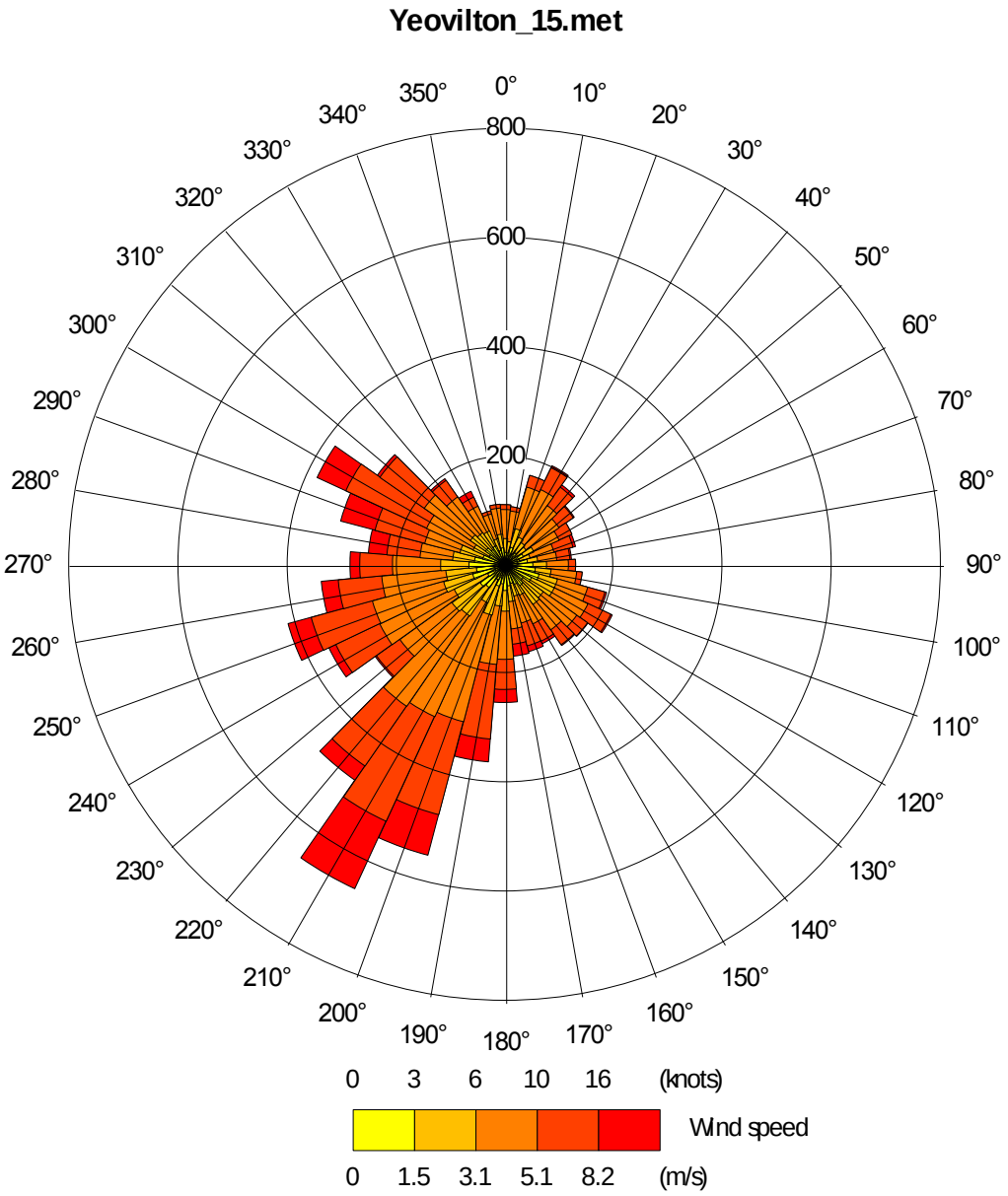
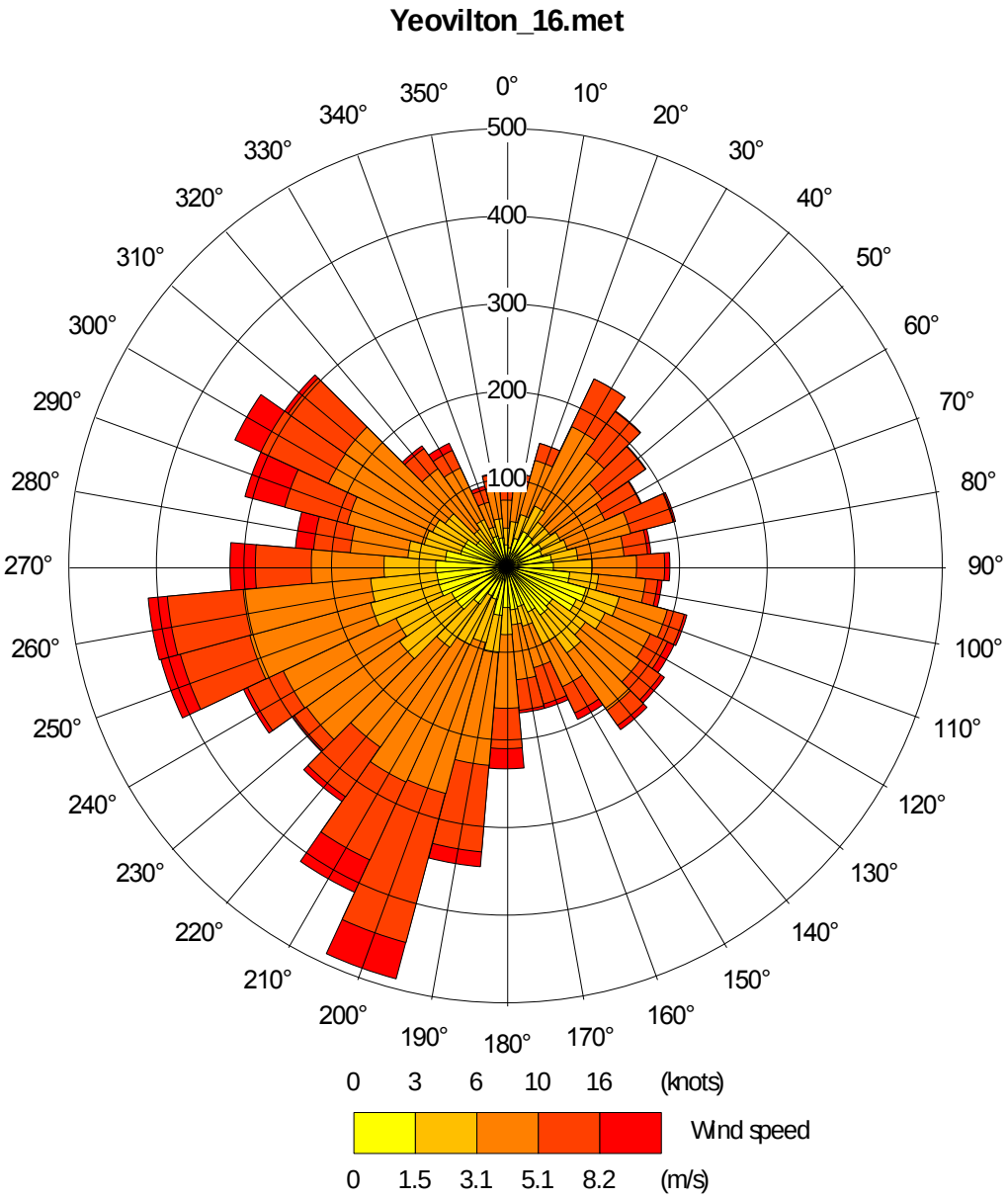
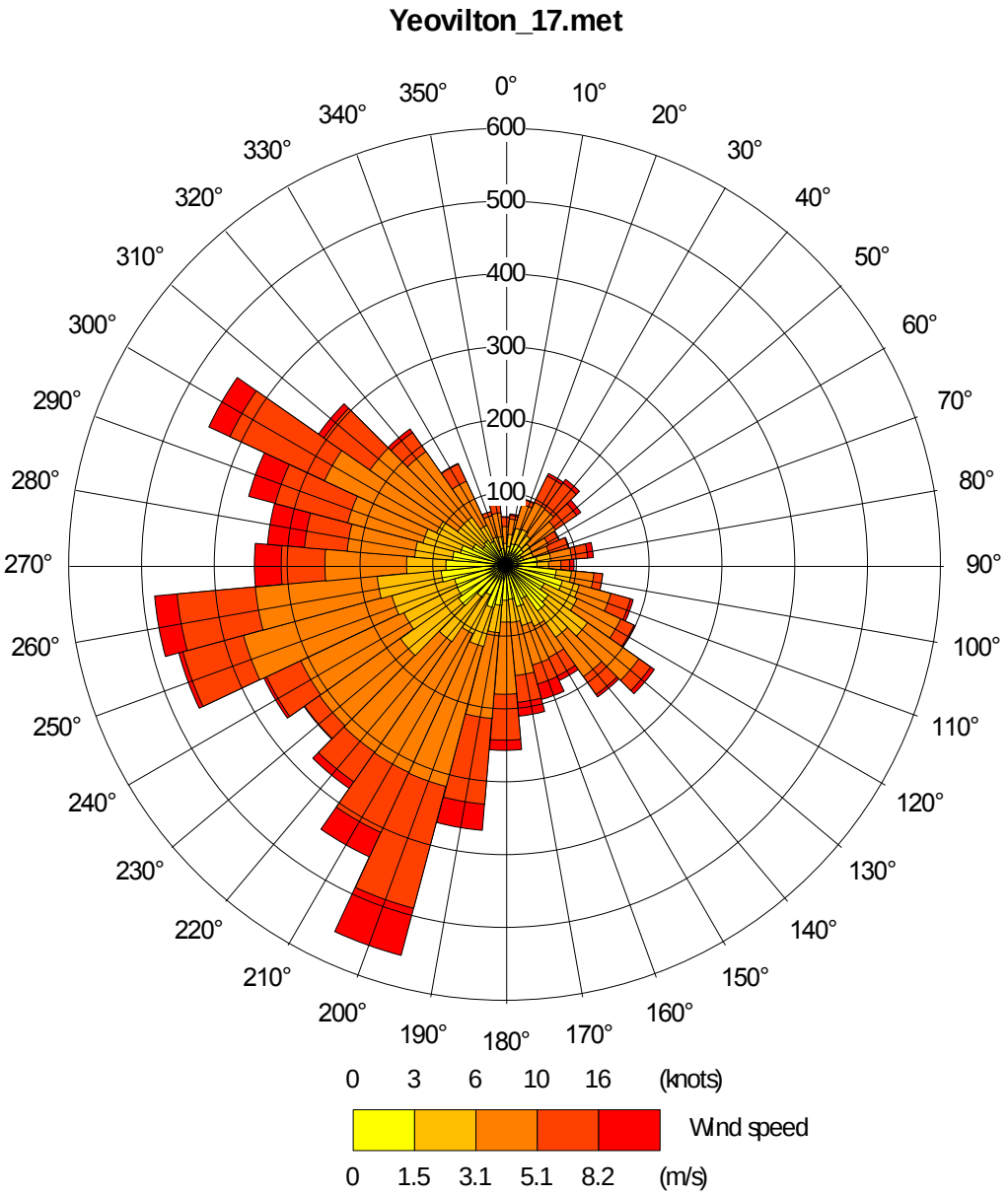


Figure 5 5-Year Meteorological Data/Windrose




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Wind speed
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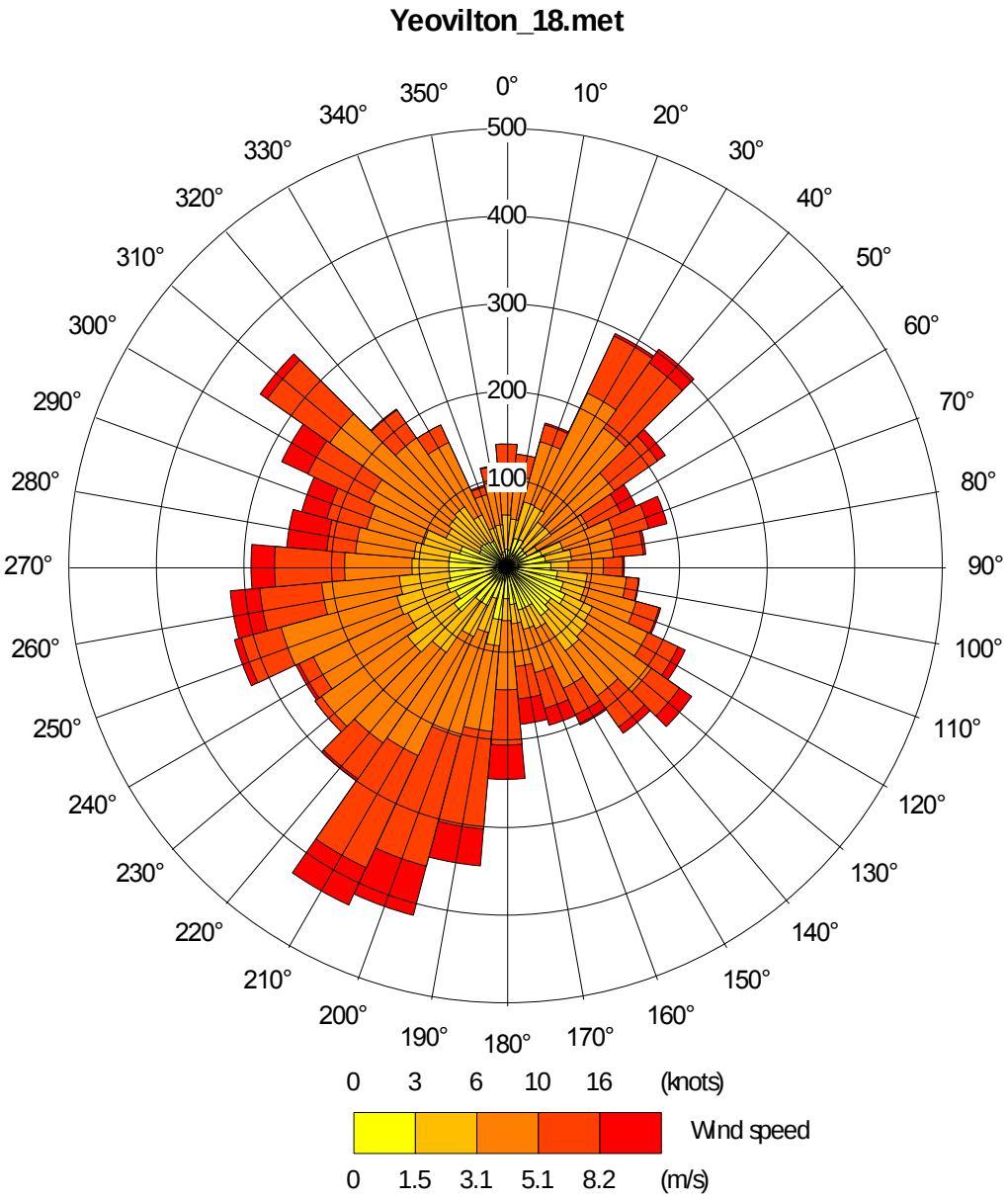

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Wind speed
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Figure 6 Contour Plot of the Predicted Odour Concentrations Under the Normal Scenario Using 2017 Meteorological Data

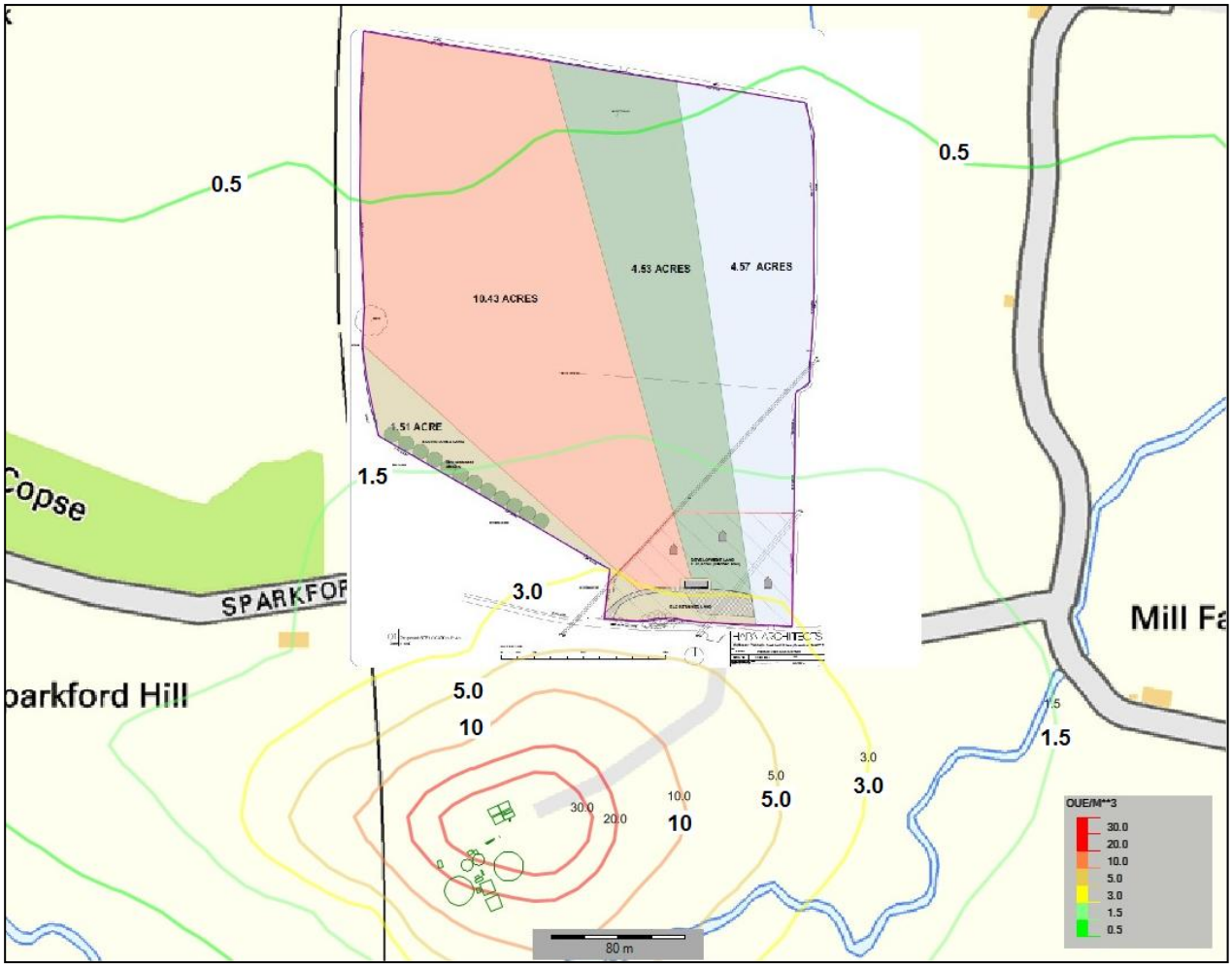


Figure 7 Odour Effect Zones



Appendix

Appendix A – Wessex Water's Generic Odour Management Plan

Generic Odour Management Plan

Water Recycling Centres

(Including biosolids and food digestate to land)

March 2019
Issue 15



Wessex Water
YTL GROUP

Generic Odour Management Plan

Water Recycling Centres

(including biosolids and food digestate fibre to land)

Contents

1.0 Introduction.
2.0 Contacts.
3.0 Environmental permitting.
4.0 Good housekeeping.
5.0 Procedure for complaints.
6.0 Emergency breakdown response.
7.0 Training.
8.0 Preliminary Odour Risk Assessment Procedure (PORA).
9.0 Encroachment by external developer.
10.0 Odour modelling.
11.0 Odour risk assessment for haulage, storage and spreading of biosolids and food digestate fibre to land.

1.0 Introduction:

Odour from the majority of Sewage Treatment Works (called Water Recycling Centres in Wessex Water) is regulated by local authority Environmental Health Practitioners under the statutory nuisance provisions of the Environmental Protection Act 1990.

"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:

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.

There are two types of Odour Management Plan within Wessex Water to demonstrate "best practicable means" is being applied:

Generic Odour Management Plan: Applicable to all sites which do not have a history of odour problems.

Site Specific Odour Management Plan: Applicable to sites with a significant history of odour complaints and/or sites which have odour control plant.

The type of Odour Management Plan given to a site is reviewed on an annual basis on the production of the Odour Management Co-ordinator's annual odour report which is compiled from Wessex Water odour complaint data. A change in type of Odour Management Plan given to a site may occur if there has been a change in the number of odour complaints received by Wessex Water for the site or the process on site has been changed.

The Generic Odour Management Plan will describe what measures need to be followed to achieve "Best Practice" to prevent odours. A copy of the Generic Odour Management Plan for Water Recycling Centres is held on the Wessex Water intranet.

The Generic Odour Management Plan for Water Recycling Centres will be reviewed on an annual basis by the Odour Management Co-ordinator. A review of a site's odour management will occur if:

- Notice is received from an Environmental Health Practitioner that an abatement order for odour nuisance is being considered for the site.
- More than 2 odour complaints for the site per month are recorded on the Ops Contact Reporting system.
- More than 9 odour complaints for the site in a rolling year are recorded on the Ops Contact Reporting system.

Figure 1 displays the step-wise Good Practice Approach that Wessex Water will apply if any of the above statements occur.

The Good Practice Approach for Dealing with Odour Nuisance at WRCs

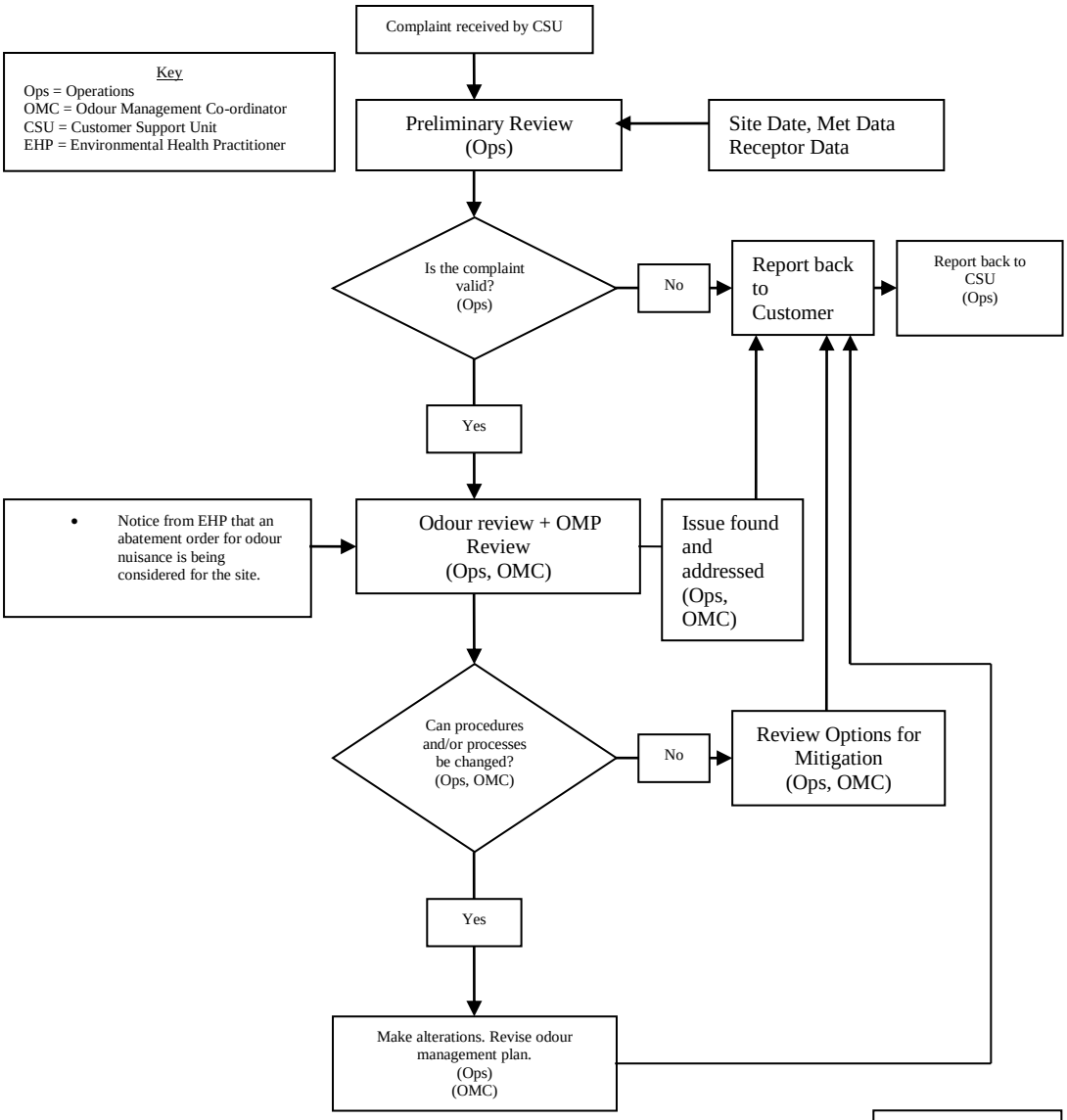


Figure 1

2.0 Contacts:

Customer Service Unit: Wessex Water 03456 004600

(For direct contacts please request via main switch board)

Odour Management Co-ordinator: Jim Humphries

3.0 Environmental permitting

A number of Wessex Water sites have areas which are subject to Environmental Permitting Regulations. This is regulated by the Environment Agency. The Environment Agency have produced H4 Odour Management Guidance.

H4 states the following:

The current form of odour condition used in our environmental permits is shown below and usually consists of two elements:

- *the odour boundary condition, which specifies the outcome which the operator must achieve (i.e. no pollution beyond the site boundary); and*

- *a condition requiring compliance with an OMP (where activities are considered likely to give rise to odour)*

There may also be specific operational conditions relating to odour control which require certain techniques or specify emission limits.

The Odour Boundary Condition

> *Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Agency, unless the operator has used appropriate measures, including, but not limited to those*

The Odour Management Plan Conditions

For the activities listed in Annex 2 of How to Comply with your Permit which are likely to give rise to odour problems an OMP has to be submitted for approval as part of the permitting process. There is a general operational condition (2A), in such permits, that requires that operator to comply with this plan and to submit revisions of the plan in the future, should this prove necessary.

2A (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in Schedule 1, Table S1.2 unless otherwise agreed in writing by the Environment Agency.

(b) If notified by the Environment Agency that the activities are giving rise to pollution, the operator shall submit to the Environment Agency for approval within the period specified, a revision of any plan specified in Schedule 1, Table S1.2 or otherwise required under this permit, and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Agency.

Permits for sites carrying out activities that have a low odour risk will contain condition 2B below, which allow us to require an OMP should there be an unexpected odour problem aft the permit has been granted.

2B The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, a new or revised odour management plan;

(b) implement the approve odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

The provisions of your 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 review 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.*

For Standard Permits the Standard Rules, which may have odour requirements, must be applied for these specific areas.

Standard Permits with Standard Rules applicable to Wessex Water are:

Standard Rules SR2008 No 19_250kte-non hazardous sludge, biological, chemical and physical treatment site

Standard Rules SR2009 NO4 – Combustion of biogas in engines at a sewage treatment works

Bespoke Permits, which have specific odour requirements will be covered by as Site Specific Odour Management Plan.

4.0 Good housekeeping:

A lack of good housekeeping can result in elevated levels of residual odour, and at times more serious emissions. Measures constituting Best Practicable Means for housekeeping are listed below (NB: this is not an exhaustive list).

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 sewage and sludge should be minimised as much as possible.
- Aim to minimise turbulence at the inlet of the works.
- Spillages must be avoided. Ensure that any spillage is cleared as soon as is reasonably practical.
- Where plant failures may lead to increase in odour emissions repairs should be done as soon as possible.
- New or temporary plant should be assessed for odour. A Process Risk Assessment must be completed before temporary plant is used on site. This Process Risk Assessment must consider possible odour nuisance that could be caused by the temporary plant in question.
- The Odour Management Co-ordinator must be contacted if the temporary plant is connected with sludge dewatering, thickening or liming.
- Report any raised odour levels to the Treatment Controller immediately who will liaise with the Area Scientist.

Storm Tanks

- Only fill storm tanks when it is essential to do so.
- Where possible aim to minimise retention of sewage and sludges in storm tanks.
- Storm water tanks should be emptied and cleaned as soon as possible after use.

Screw Pumps

- Minimise as much as possible septicity of effluent before screws pumps.

Screens/Grit Systems

- Ensure that screenings and grit systems are working correctly.
- Ensure regular cleaning and flushing of screens and influent channels.
- Skips that contain clean screenings or grit must be covered before being removed from site.
- Ensure the regular cleaning of scum and grease removal equipment.
- Ensure regular cleaning and flushing of screens and influent channels.
- Ensure baffles on grit systems are positioned correctly and flow is evenly distributed.
- Remove any build up of rag from baffles and scraper on grit systems.
- Ensure full skips containing screenings and grit are removed from site as soon as is practicable.

Primary Treatment

- Ensure primary tanks are cleaned on a regular basis to prevent long-term accumulation of sewage, sludge or floating debris, which could become

septic and give rise to the generation and emissions of odours. Draining of tanks for maintenance should be scheduled to minimise possible impact.

- Sludge levels in primary tanks should be checked on a regular basis and the sludge level within the tanks should not be allowed to get too high. The desludging system should be adjusted as necessary.
- On a regular basis the scum box on the primary tank should be cleaned to prevent blockages. Excess scum from the tank surface should be cleared. The build up of scum or foam on tank surfaces can at times lead to odour and should generally be avoided. If there is build up of scum or foam on primary tank surfaces the Duty Operator must contact the Area Scientist for advice.
- The stilling box on a primary tank should be kept free of debris.

Secondary Treatment

Filter Beds

- Biological filters should not be overloaded and the media should not be allowed to deteriorate so that ponding occurs. Ensure even distribution of flow across the filter. Aim to minimise splashing of sewage at surface
- Where possible weeds should be removed from filter beds.
- The sparge holes on the distribution of the biological filter should be regularly cleared.
- The discharge from the biological filter should be checked to ensure the under drains are clear.

High Rate Filters

- High rate filters should not be overloaded. Ensure even distribution of flow across the filter.
- Routine cleaning of the high rate filter should proceed at a time that will cause the least predicted impact and the process should be done as quickly as is practically possible.

BAF Plants

- BAF plants have a risk of odour generation if anaerobic conditions are allowed to develop. This could occur for example from overloading or inadequate backwash procedures.
- Backwash returns may be malodorous and should be handled so as to minimise turbulence.

Activated Sludge Plants

- For activated sludge plants dissolved oxygen levels should be maintained at all times to avoid the development of septic conditions, except where there are anoxic zones. The build up of scum or foam on tank surfaces can at times lead to odour and should generally be avoided. If there is build up of scum or foam on tank surfaces the Duty Operator must contact the Area Scientist for advice.
- Ensure SBR tanks are maintained on a regular basis to prevent long-term accumulation of sewage, sludge or debris, which could become septic and

give rise to the generation and emissions of odours. Any draining of tanks for maintenance should be scheduled to minimise impact.

Oxidation Ditches

- Oxidation ditches should not be overloaded.
- Ensure oxidation ditches are maintained on a regular basis to prevent long-term accumulation of sewage, sludge or debris, which could become septic and give rise to the generation and emissions of odours.
- Do not allow the surface of an oxidation ditch to become obstructed.

Final Tanks/Humus Tanks

- Ensure final/humus tanks are cleaned on a regular basis to prevent long-term accumulation of sewage, sludge or debris, which could become septic and give rise to the generation and emissions of odours. Draining of tanks for maintenance should be scheduled to minimise possible impact.
- Sludge levels in final/humus tanks should be checked on a regular basis and the sludge levels within the tanks should not be allowed to get too high. The desludging system should be adjusted as necessary.
- On a regular basis the scum box on the final/humus tanks should be cleaned to prevent blockages. Excess scum from the tank surface should be cleared. The build up of scum or foam on tank surfaces can at times lead to odour and should generally be avoided. If there is build up of scum or foam on humus tank surfaces the Duty Operator must contact the Area Scientist for advice.
- The stilling box on the final tank should be kept free of debris.

Sludge Storage and Treatment

- Sludge storage, particularly of primary or mixed primary and biological sludges may allow odour generation, which may be emitted when the sludges are disturbed by a discharge into tanks, mixing or during subsequent treatment. Therefore sludge should be processed as soon as is reasonably practical. Where possible, sludges should be discharged at low level in the tank and where possible, below normal liquid level.
- Where equipment for mechanical thickening and dewatering is not operated continuously the plant should be cleaned after use. This will remove sludges retained on equipment that may continue to produce malodours.
- Returned liquors may be highly odorous. Aim to minimise turbulence when discharging and where possible discharge under liquid level.
- Aim to balance the flow of sludge liquors to even the load over the day where process loading allows.
- Aim to minimise turbulence when pumping sludge. 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 are covered and removed from site as soon as is practicable.
- Vehicles that are for skip removal must be kept as clean as is practicable.
- It is important there is the correct dose and mixing on lime plants at all times.

- Ensure within digesters that there is good mixing. This is to ensure all sludge is digested and that no short-circuiting occurs.
- The whessoe (pressure/vacuum relief) valves on the digesters should be checked for leaks on a regular basis. It should be checked on a regular basis that the correct weight on the valve is being used.
- Siloxane removal plants which have automatic thermal regeneration of media should have this to set to run during a non sensitive time. In Wessex Water, regeneration of these plants is usually set to start at midnight.

Digesters

- Ensure within digesters that there is good mixing. This is to ensure all sludge is digested and that no short-circuiting occurs.
- The whessoe (type) valves on the digesters should be checked for leaks on a regular basis
- Siloxane removal plants which have automatic thermal regeneration of media should have this to set to run during a non sensitive time. In Wessex Water regeneration on these plants is usually set to run at midnight.

Odour Control Equipment (Where present)

- Check fans and drive belts on a regular basis.
- Check media condition on a regular basis.
- Check irrigation systems, nozzles and spray patterns on a regular basis.

Composting

- Ensure control of delivered feedstock.
- Reducing spillages to a minimum;
- Use good practice procedures to prevent anaerobic conditions occurring.
- Avoid delaying the piling of newly delivered and rapidly decomposable feedstock materials.
- Regular cleaning of operational areas such as road and drainage channels will discourage odour generation from old degrading materials.
- If possible, turning of compost windrows should be carried out when the wind direction is not towards sensitive receptors.
- Minimise leachate ponding.

Sludge Cake Barns

- Sludge cake must only be stored within the cake barn and designated areas of the site.

- Sludge cake must not be stored over summer months unless due to the following circumstances:

1. Emergency circumstances such a plant break down or transport network issues outside Wessex Water control.

2. There is a national/regional reason why sludge cake can't be recycled to land (e.g. restrictions brought into force such as happened in the foot-and-mouth outbreak in 2001 not allowing access to farm land.)
3. Continued very wet weather such as the summer of 2012, which caused flooding of the Somerset Levels.

- Removal of sludge cake from barns should not be completed during a bank holiday unless in emergency circumstances.

- Sludge cake skips should be covered before leaving site.

Biosolids and Food Digestate Fibre to Land

- Odour risk assessment in chapter 11 to be completed**.**
- Stockpile site should be situated a suitable distance from any residence.
- Stockpile should not be situated directly upwind of prevailing wind direction of any residence.
- Stockpile should be created and completed within as short a timescale as practicable.
- Stockpile should be "smooth sided" to prevent slumping and aid water runoff.
- Stockpile area should be tidy and there should be no pooling of leachates.
- Check wind direction is unlikely to cause an issue during spreading
- At spreading contractors should have sufficient machinery to spread within allotted time frame.
- At spreading the farm should incorporate material within 24-48hrs.
- Once stockpile has been spread the area should be cleaned.
- Vehicles should be cleaned before leaving site

5.0 Procedure for complaints

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 Services Unit (CSU). The complaint details are placed onto the Ops Contact Reporting system. CSU forward the complaint details to the Treatment Manager for the site via email or text alert. It is the Treatment Manager's responsibility to make sure there is liaison with the local authority, 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 at all times that communication between all interested parties is maintained.

The initial action following a complaint will be as follows:

- The Duty Operator will perform a general check of the site.

- The Duty Operator will check that there are no on going process issues or activities that would give rise to odour emissions.

- The Duty Operator will check that levels of 'Good Housekeeping' are being maintained.

- The Duty Operator will check the working of any odour control equipment.

- The Duty Operator will perform a sensory evaluation down wind of discharge or sensory evaluation in proximity to discharge point.

- The Duty Operator will consider if the WRC itself is the source of the problem, or whether the odour at the WRC results from a problem further upstream, or in a remote part of network, or at a 3rd party.

- The results of this initial action will be reported to the Treatment Manager, and Senior Operator.

From the initial action it must be decided if the complaint is likely to be valid. Complaints may be considered potentially non-valid if:

- The wind was not blowing towards a complainant at the relevant time.
- There were other known sources of odour in the vicinity at the time and no odour on site.
- There are good grounds for believing a complaint is frivolous or vexatious.

Where there is doubt, however, complaints should be given the benefit of the doubt.

If the complaint is likely to be valid and the reason not immediately identified and rectified an odour review will be conducted. This will be initiated by the Treatment Manager and may involve the Area Scientist, Senior Operator and Odour Management Co-ordinator. The approach used will be in line with the DEFRA Code of Practice on Odour Nuisance from Sewage Treatment Works. Follow up investigations could involve the following:

- Senior Operator and Odour Management Co-ordinator perform general check of the site.
- Odour Survey.
- H_2S Survey.
- Process diagnosis.
- Asset investigations.

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

- Operational Solutions.
- Process Solutions.
- Maintenance Procedures.
- Investment Solutions.

Summary

It is important that at all times the Treatment Manager/Biosolids Controller or Assistant Treatment Manager is in liaison with the local authority and with local stakeholders (including the complainant). It is important that all parties are informed on the outcome of the assessment of the complaint and whether or not any action is to be taken. At each stage of the complaint procedure documentation of the decisions and findings will be made by the Treatment Manager, Biosolids Controller or Assistant Treatment Manager to justify the measures chosen to resolve the odour nuisance. The Treatment Manager, Biosolids Controller or Assistant Treatment Manager will forward any action taken to the Customer Services Unit to be recorded on the Ops Contact Reporting System for future reference. Any further investigation or further action taken may result in a revision of the Odour Management Plan.

6.0 Emergency breakdown response

All failures of a site process should be reported to the Treatment Manager and Area Scientist and recorded in the Site Operation Manual. If the failure of the site process has the potential to cause an odour nuisance the Odour Management Co-ordinator 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 Treatment Managers' responsibility to inform the Environmental Health Practitioner for the area.

7.0 Training

Each operator, controller and scientist are trained on all processes with which they are associated. The training is supported by a number of process manuals. Upon completion of the training, every operator is assessed on each process of every site they work on, as well as a 'basic' site assessment.

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 Wessex Water 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. All new operators receive the "Operator Passport" when starting. Odour awareness training is one of the criteria contained within this document to be completed by the new employee.

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

8.0 Preliminary Odour Risk Assessment Procedure (PORA)

The Preliminary Odour Risk Assessment (WECEP004) is a procedure that provides guidance on how to assess the potential odour impact from a proposed development scheme during the design phase. It seeks to identify schemes where the risk of the development creating an odour nuisance is high and where odour control technology, changes to plant handling or other odour mitigation methods need to be built into project design.

THE PROCEDURE APPLIES TO CAPITAL WORKS PROJECTS THAT INCLUDE PERMANENT OR TEMPORARY WORKS

The need for a PORA will be identified in the Environment and third party management plan (E3MP) procedure. The assessment will determine whether the scheme is at a Low or High risk of creating an odour nuisance at sensitive receptors and the appropriate action required. For example this may include the undertaking of an odour survey and/or model, alter mode of operation or install odour control equipment.

It is important as part of the Preliminary Odour Risk Assessment Procedure that the Odour Management Co-ordinator is contacted to confirm current Odour Management Plan status for the site, current operational issues and odour complaint history.

9.0 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 a WRC or Sewage Pumping Stations (SPS). The following policies and guidance below must also be consulted.

The National Planning Policy Framework (NPPF) (2012) (updated February 2019)

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

"180. *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".*

Guidance on the assessment of odour for planning (Institute of Air Quality Management, V1.1 2018)

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

The guidance states

"The planning system has the task of guiding development to the most appropriate locations; ideally' significant sources of odour should be separate from odour-sensitive users of the surrounding land (sensitive receptors): failing this, it may be possible to employ control and mitigation measures to make a proposed development acceptable from a land-use perspective. New proposals for such a development may require an odour impact assessment to be submitted, either as a stand-alone assessment or as part of an Environmental Statement, to accompany the planning application"

The NPPF informs that policies and decisions must take into account the likely effect of pollution on living conditions. The IAQM guidance informs 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"

IAQM guidance details what would be expected in regard to assessing odour effect for planning. The guidance preference is towards combining a number of assessment tools.

"Most of the odour assessment tools measure odour exposure (i.e. impact), or some other parameter; very few of the tools measure the resulting effect (e.g. annoyance or nuisance) directly – and none measures disamenity specifically".

"Therefore an assessment has to go further than simply estimating the odour exposure/impact and attempt to gauge the magnitude of the effect resulting from that impact on a receptor of a particular sensitivity."

The main technique recommended by the IAQM guidance for planning is the predictive, quantitative approach of the use of emission values in a dispersion model to predict 98th percentile concentration at sensitive receptors and comparison of these with criteria. Odour modelling is described in chapter 10. Wessex Water Odour Plan ENVS120/15 details the criteria used in Wessex Water, which is based on IAQM guidance table 6 and 7, CIWEM position policy statement (2012), EA Horizon Guidance Document H4 (2012) and previous statutory nuisance cases and planning appeals, which are detailed below.

CIWEM position policy statement (2012)

"*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 (2011)

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).

Statutory nuisance cases and planning appeals

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 3-5ou_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.

10.0 Odour modelling

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 take into account unexpected events (e.g. breakdowns) and abnormal operations which can account for a number of odour episodes.

Results from previous odour modelling must be used with caution as they will use only use source and emission data available at the time, which may be different to the current situation or of a different standard to current best practice. Wessex Water procedure TRTWG669 must be consulted when reviewing odour models or constructing them from new.

11.0 Biosolids and food digestate fibre to land odour risk assessment

Below is a copy of the odour risk assessment to be completed as part of "Best Practice" when putting biosolids or food digestate fibre to land. "Good Housekeeping" for this process is including in chapter 4.

Odour Risk Assessment

	SITE	**0**	**Date:**	**23-Jan-12**	**Assessor**			
	FIELDS		RISK RATING C L R pre - control	PRECAUTIONS TO BE TAKEN	RISK RATING C L R post - control	PERSONS RESPONSIBLE ACTIVITY & COMMENTS	DRIVER SITE SPECIFIC ASSESSMENT	
	ACTIVITY	HAZARD AND POTENTIAL CONSEQUENCE						
	Delivery to site	Odour from truck	2 2 4	Use sheet to cover load	2 1 2	Dampney		
1		Public nuisance		Do not overfill truck		Personnel		
				Keep truck body clean of fibre debris				
	Tipping on site	Risk of increased odour once unsheeted	2 2 4	Keep tip site away from habitation	2 1 2	GENeco		
		Fresh material with increased odour		Screen stockpile with another suitable product		Personnel		
2		potential.		Sheet stockpile				
		Wind direction and habitation		Stockpile Risk assessment				
	Stockpile management	Wind direction and habitation	5 3 15	Farmland Assessment	5 2 10	GENeco		
3				Field Site Assessment		Personnel		
	Spreading operation	Wind direction	2 2 4	Aseess wind direction prior to spreading	2 1 2			
		Loading equipment		Properly maintained and serviced		Dampney		
4		Spreading equipment		Properly maintained and serviced for accuracy		Personnel		
		Weather conditions - incorpoartion		Suitable weather to incorporate product to eliminate odour				
	Post spreading	Remnants of fibre left on the surface	5 2 10	Spread all product	5 1 5	Dampney-GENeco		
5		around stockpile site		Scrape clean stockpile area		Personnel		
			0 Date:	23-Jan-12 Assessor				

References

Wessex Water Documents

- DS464 - Odour Management
- DS 540 - Sewage Pumping Stations and Pumping Mains
- ENVS120/15-Odour Plan
- NTKWP222 – Pumping Station Generic Odour Management Plan
- TRTWP102 – Generic Odour Management Plan
- TRTMAN007 - Odour Control
- TRTWG669 - Odour Risk Assessment Procedure for Proposed New Development
- WECEP004 - Preliminary Odour Risk Assessment

Applicable regulation

- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969
- The National Planning Policy Framework (NPPF) (2012) (updated February 2019)

Further Guidance

- 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, V1.1 2018)
- H4 Odour Management Guidance (How to comply with your Environmental Permit), Environment Agency, 2011.

Revision History

Issue	Date	Description	Changes made/requested by
5	1/01/2006	General review	Jim Humphries
6	27/03/2009	General review – minor changes made	Jim Humphries
7	1/01/2010	Document update	Jim Humphries
8	3/02/2012	Addition of the following sections: Environmental Permitting, Emergency Breakdown Response, Training and Preliminary Odour Risk Assessment Procedure. Section 1.0, 4.0 and 5.0 also updated.	Jim Humphries
9	27/01/2013	Chapter 1: Update to how a change in the type of OMP to a site is recorded (TRTWG618) Chapter 8: Addition of PORA ref number	Jim Humphries

		(WECEP004),	
10	30/01/2014	General review – minor changes made	Jim Humphries
11	30/01/2015	General review – minor changes made	Jim Humphries
12	18/09/2015	Chapter 1: Inclusion of odour policy ENVS 120/15. Chapter 3: Inclusion of Environmental Permit SR2010 No 4. Chapter 4: Inclusion of "Good Houskeeping" for Biosolids and Digested Food Fibre to Land. Chapter 5: Customer complaint procedure updated to include Biosolids Controller. Chapter 9: Biosolids and Digested Food Fibre to Land Odour Risk Assessment.	Jim Humphries
13	20/03/2017	Chapter 4: Inclusion of "Good Housekeeping" for Digesters Addition of the following section: Encroachment by External Developers, References	Jim Humphries
14	26/02/2018	Chapter 1: Update to chapter since the withdraw of the DEFRA Code of Practice in September 2017 Chapter 3: Review and update. Chapter 4: Addition of composting best practice. Chapter 9: Addition information on the The National Planning Policy Framework (NPPF) (2012), CIWEM Policy Position Statement (2011), EA Horizon Guidance Document H4 (2012) and specific statutory nuisance and planning appeal cases. Addition of the chapter: "Odour Modelling"	Jim Humphries
15	21/03/2019	Sewage Treatment Works (STW) renamed Water Recycling Centres (WRC) Chapter 4: Addition of sludge cake barns Chapter 9: Update to reflect NPPF February 2019 version.	Jim Humphries

Appendix B – Wessex Water's Odour Policy Plan

ODOUR PLAN

Purpose

To ensure that impacts associated with odour are dealt with appropriately during the design, construction, maintenance and operation of Wessex Water assets.

Scope

All applicable design, construction, maintenance and operational activities.

Status

Mandatory

Contents

Company Requirements
1. Odour Policy
2. Nuisance
3. Odour Standards for New Assets or Extensions to Existing Assets
4. Odour Standards for Existing Assets
5. Encroachment
6. Monitoring
7. Effect of Non-compliance with Policy

COMPANY REQUIREMENTS

1. Odour Policy

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.

2. Nuisance

Odour arising from the construction, operation or maintenance of assets has the potential to cause nuisance or a loss of amenity to nearby receptors (which can include individuals, households, commercial premises or public facilities). Odour can be regulated by local authority Environmental Health Officers (EHO) under the statutory nuisance provisions of the Environmental Protection Act 1990. This process allows EHO's to place an abatement notice on a source of nuisance which must be complied with. The only defence available is ensuring that we have used best practical means to abate this nuisance.

Some operational sites will be subject to odour regulation through Environmental Permit conditions (regulated by the Environment Agency) and/or planning conditions set by Local Planning Authorities.

3. Odour Standards for New Assets or Extensions to Existing Assets

Odour nuisance can be deemed to lead to loss of amenity and so may be conditioned in planning consent (or as part of an Environmental Permit for a site, where applicable) for new

or extended sewage treatment sites and other potential odour generating assets (such as Sewage Pumping Stations).

WECEP004 Preliminary Odour Risk Assessment Procedure must be used to determine whether a proposed development is at risk from odour nuisance. Where required, odour modelling will be used to provide an indication of risk. All odour modelling should be directed through the Odour Management Co-ordinator to ensure that suitable techniques and processes are employed and are in accordance with the Odour Modelling Specification (WECEP004 Appendix 4). Once odour emissions have been modelled, the design parameters shall not be altered without the emissions being re-modelled. Particular care is required in the design of sewers and rising mains to avoid septicity at the treatment works which will increase the probability of odour in sewage and sludge treatment downstream.

Odour modelling will identify probability of odour complaints and the extent of any necessary odour mitigation to meet best practicable means (subject to cost benefit assessment) to achieve odour emissions at the following levels:

- For assets affecting low sensitivity receptors - a level that will prevent exposure to odours in excess of C^{98} 1-hour 5 OU_E/M^3 at the nearest receptor
- For assets affecting medium and high sensitivity receptors - a level that will prevent exposure to odours in excess of C^{98} 1-hour 3 OU_E/M^3 at the nearest medium - high sensitivity receptor;
- For assets affecting especially high sensitivity receptors – levels to be determined subject to site specific agreement.

Receptor sensitivity should be determined using the following criteria:

- **Low sensitivity receptor -** Surrounding land where:
    - The enjoyment of amenity would not reasonably be expected; or
    - There is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
    - Examples may include industrial use, farms, footpaths and roads.
- **Medium sensitivity receptor -** Surrounding land where:
    - Users would expect to enjoy a reasonable level of amenity.
    - Examples may include commercial/retail premises and playing/recreation fields.
- **High sensitivity receptor -** Surrounding land where:
    - Users can reasonably expect enjoyment of a high level of amenity; and
    - People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
    - Examples may include residential development
- **Especially highly sensitive receptors** - hospitals, care homes and homes for the elderly, schools/education and tourist/cultural facilities may be considered especially sensitive.

However, if the site is subject to a conditioned odour limit which differs from the above established through either the planning consent process or an Environmental Permit, the levels in the planning consent or Permit will be applied. Extensions to existing sites where odour levels already exceed thresholds stated should have all processes on site assessed and modelled to determine options to meet best practicable means (subject to cost benefit assessment) and the odour emission levels suitable for receptor sensitivity.

The design principles and standards for odour treatment are given in DS464, Design Standard for Odour Management.

4. Odour Standards for Existing Assets

All sites which have the potential to give rise to odour will be managed in accordance with either a generic or site specific odour management plan with the objective of preventing causing an odour nuisance to receptors and to meet the requirements outlined in the DEFRA Code of Practice on Odour Nuisance from Sewage Treatment Works. The Management Plans set out the action to take in the event of complaints from receptors or notice from EHOs being received.

Sites operating under an Environmental Permit may be required to produce a specific Odour Management Plan if conditioned as part of the Permit. Any such plan must be approved by the Environment Agency and follow Environment Agency Odour Management Guidance (H4).

Control of septicity from rising mains and specification of odour control and abatement equipment which may be used on sites is detailed in DS 464 Odour Management Design Standard & DS 540 Sewage Pumping Stations and Pumping Mains.

5. Encroachment

Proposed development (e.g. housing, commercial or public buildings) in proximity to potential odour generating assets which may create new receptors or affect existing receptors will be identified by the Planning Liaison Group. If a proposed development falls within a consultation zone around a potential odour generating asset, then a Preliminary Odour Risk Assessment (PORA) will be undertaken, following the process in TRTWG669 – Odour Risk Assessment Procedure for Proposed New Development. This should include information obtained from the developer on the location, layout and type of development proposed.

Where the PORA indicates a high risk of potential odour impact, then odour modelling should be carried out by the developer to more accurately establish potential impacts, using the following emissions levels:

- For assets affecting low sensitivity receptors - a level that will prevent exposure to odours in excess of a 1 hour average odour concentration of C^{98} 1-hour 5 OU_E/M^3 at the nearest low sensitivity receptor;
- For assets affecting medium and high sensitivity receptors – a level that will prevent exposure to odours in excess of a 1 hour average odour concentration of C^{98} 1-hour 3 OU_E/M^3 at the nearest medium or high sensitivity receptor.
- For assets affecting especially high sensitivity receptors – levels to be determined subject to site specific agreement with Wessex Water.

In addition, a site's odour complaint history and odour management plan will also be reviewed. Where modelling indicates that development in proximity to an odour generating asset may either be at risk of the development's occupants experiencing odour nuisance, or where mitigation at Wessex Water's assets may be required, then the Planning Liaison Group will maintain an objection through the planning system and enter into discussions with a site's developer with a view to obtaining suitable mitigation, redesign, relocation or other measures to ensure both the development and Wessex Water's assets are not exposed to increased probability of creating a statutory nuisance or loss of amenity. Encroachment within an odour sensitive area may be possible subject to the provision by a developer of the whole life cost of any required mitigation to Wessex Water.

The Planning Liaison Group will seek to encourage local planning authorities to create and/or maintain suitable policies or buffer zones within Local Plans regarding known potential odour generating assets.

6. Monitoring

Monitoring will be defined in site specific Odour Management Plans which will incorporate any requirements or conditions imposed by a site's Environmental Permit or conditions imposed by planning permission. Survey specification for baseline and odour treatment plant performance monitoring shall be specified or approved by Wessex Water's Odour Management Co-ordinator (or the GENeco Technical Manager for GENeco managed sites).

7. Effect of Non Compliance with Policy

Non-compliance with this policy may make Wessex Water and/or a contractor liable to enforcement action. Odour can be considered to form statutory nuisances under the Environmental Protection Act 1990 and Local Authorities have powers to issue abatement notices to control levels. The Environment Agency may also have enforcement powers in relation to sites or activities operating under an Environmental Permit. Failure to properly assess, manage and monitor odour impacts may delay consent acquisition, create customer complaints and affect new development around our assets incurring additional costs.

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 Risk Assessment Procedure for Proposed New Development
- WECEP004 - Preliminary Odour Risk Assessment
- NTKWP222 – Pumping Station Generic Odour Management Plan

Applicable regulation

- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969

Further Guidance

- Code of Practice on Odour Nuisance from Sewage Treatment Works (DEFRA, 2006)
- 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
- BS – EN 12255-9:2002 – Waste Water Treatment Plants – Part 9: Odour Control and Ventilation
- Best Practical Means (BPM), A Guidebook for Odour Control at Wastewater Treatment Works, UKWIR 06/WW/13/8

Revision history

Issue	Date	Description	Prepared by	Approved by
1	June 2015	First issue	D Jones	Matt Wheeldon
2	February 2016	Update to odour levels for encroachment	D Jones	Matt Wheeldon

Appendix C – Wessex Water's Generic Fly Management Plan

Generic Fly Management Plan

Water Recycling Centres

April 2019

Issue 4



Wessex Water
YTL GROUP

Generic Fly Management Plan

Water Recycling Centres

Contents

1.0 Introduction
2.0 Contacts
3.0 Background
4.0 Good housekeeping
5.0 Recommendations for reducing fly levels at customer property
6.0 Best practice to prevent fly nuisance
7.0 Larval and fly count method
8.0 Procedure for complaints
9.0 Training
10.0 Encroachment by external developers

1.0 Introduction

This Generic Fly Management Plan is relevant to all Sewage Treatment Works (called Water Recycling Centres (WRCs) in Wessex Water) unless there is a specific plan in place for that site.

The Generic Fly Management Plan has been produced to comply with The DEFRA guidance on Sections 101 and 103 of Clean Neighbourhoods Protection Act 2005 and Section 79 of the Environmental Protection Act 1990. Section 101 added to the description of statutory nuisances listed in section 79(1) of the Environmental Protection Act 1990:

'(fa) any insects emanating from relevant industrial, trade or business premises and being prejudicial to health or a nuisance'.

Statutory nuisance provisions of the Environmental Protection Act 1990:

"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:*

To assist Local Authorities with establishing a statutory nuisance from flies DEFRA published guidance in 2006:

"Statutory Nuisance from Insects and Artificial Light"

The guidance states the following:

"There are no objective levels at which sewage filter flies do or may cause a statutory nuisance. As a general guideline, they might cause an occupier distress if 50 or more 'flying' sewage filter flies are present in a room on three successive days, though obviously this indication will vary and depend on such factors as room size etc."

There are two types of Fly Management Plan within Wessex Water.

Generic Fly Management Plan: Applicable to all sites which do not have a history of fly complaints.

Site Specific Fly Management Plan: Applicable to sites with a significant history of fly complaints.

The type of Fly Management given to a site is reviewed on an annual basis on the production of the Fly Management Co-ordinator's annual fly report which is compiled from Wessex Water fly complaint data. A change in type of Fly Management Plan given to a site may occur if there has been a change in the number of fly complaints received by Wessex Water for the site or the process on site has been changed.

Wessex Water's Fly Management Plans will describe what measures need to be followed to achieve "Best Practice" to prevent a fly nuisance occurring. A copy of this Fly Management Plan is held on the Wessex Water intranet. The Fly Management Plan will be reviewed on an annual basis by the Fly Management Co-ordinator. A review of a site's fly management will occur if:

- Notice is received from an Environmental Health Practitioner that an abatement order for fly nuisance is being considered for the site.

- More than 2 fly related complaints for the site per month are recorded on the Ops Contact Reporting system.

- More than 9 fly related complaints for the site in a rolling year are recorded on the Ops Contact Reporting system.

Figure 1, displays the step-wise Good Practice Approach that Wessex Water will apply if any of the above statements occur.

The Good Practice Approach for Dealing with Fly Nuisance at WRCs

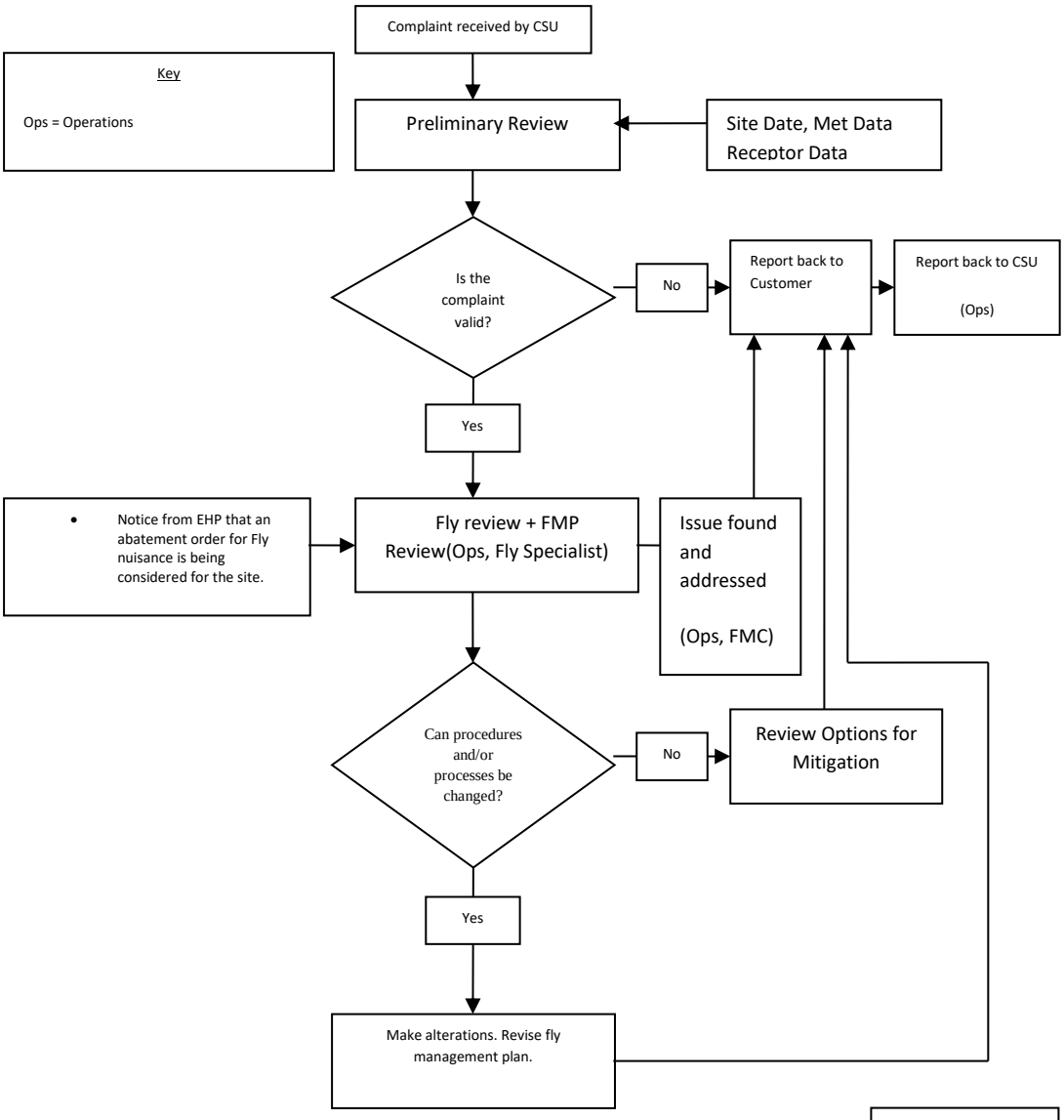


Figure 1

2.0 Contacts

Customer Service Unit: Wessex Water 03456 004600

(For direct contacts please request via main switch board)

Fly Management Co-ordinator: Jim Humphries

3.0 Background information

The following locations and activities have the potential to give rise to an aerial population of insects capable of potentially causing fly complaints to be received:

- Abandoned open tanks holding water.
- Flooded, ponding or overloaded reed beds.
- Open percolating filter beds.
- Piles of uncontained or spilled sludge.
- Piles of waste vegetation (moss, grass etc.) from filter beds, left for more than one week.
- Uncovered skips with excess organic material or open sludge cake skips or composting units, left for more than one week.

The common species that may inhabit WRCs that have the potential to result in large populations of flies are as follows:

- ***Anisopodidae –Sylvicola fenestralis*** **(Window Gnat)**.

    - Medium sized gnat (6-10mm).
    - Do not generally swarm.
    - Associated with filter beds with dry/wet patches.
    - Shade seeking tendency
    - Three blackish stripes on thorax
    - Antennae longer than head
    - Dark brown wings with scattered pale spots.



Figure 2: *Sylvicola fenestralis* (Window Gnat) adult fly



Figure 3: *Sylvicola fenestralis* (Window Gnat) adult fly



Figure 4: *Sylvicola fenestralis* (Window Gnat) larvae



Figure 5: *Sylvicola fenestralis* (Window Gnat) larvae



Figure 6: Example of large *Sylvicola fenestralis* population on filter bed structure

- **Chironomidae – *Metriocenemus eurynotus* (Large Black Midge) and *Limonophyes minimus* (Small Black Midge)**.

  - Informally known as non-biting midges.
  - Many species superficially resemble mosquitoes, but they lack the wing scales and elongated mouthparts.
  - Favour filter beds that have a relative light organic loading and a long wetting rate (rotation frequency), resulting in a thin biofilm thickness.
  - Good flyers, fly up to 2km
  - Form tall helical mating swarms on leeward side of buildings and large standard trees.
  - Mating couplets fall out of swarm and usually return to filter beds to lay eggs.
  - Very visual when in helical mating swarms. Only in severe cases do they generally go into properties.



Figure 7: Chironomidae adult fly



Figure 8: Chironomidae adult fly



Figure 9: Chironomidae larvae

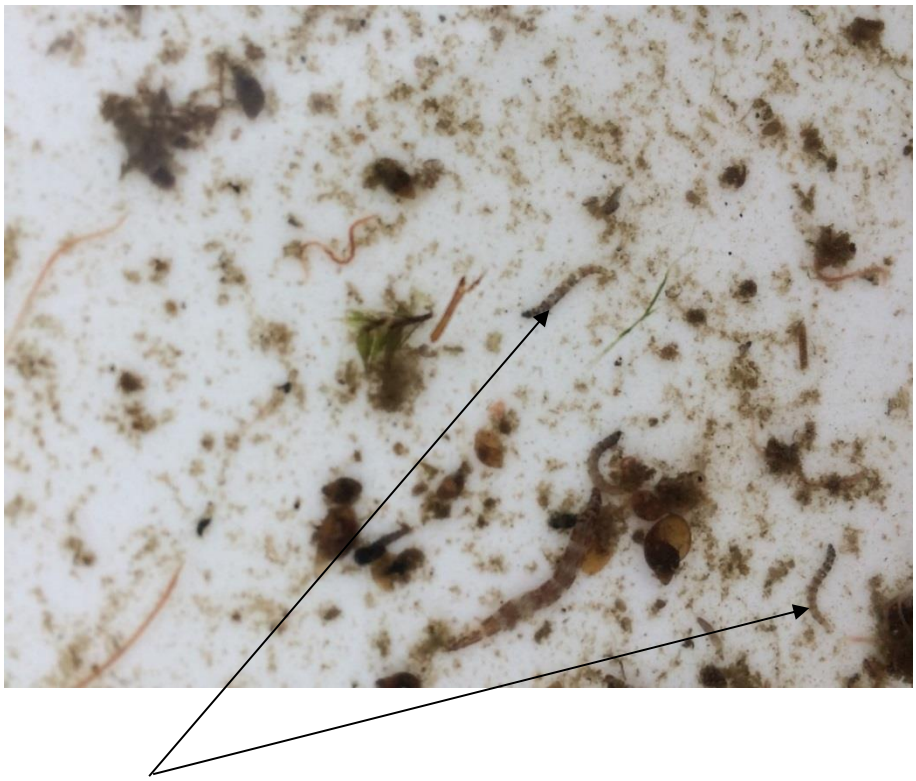


Figure 10: Chironomidae larvae



Figure 11: Chironomidae helical mating swarm



Figure 12: Chironomidae helical mating swarm

- ***Culicidae* – Mosquitoes**

  - Small, midge-like flies.
  - Associated with large, still, open bodies of water.

- ***Muscidae* – *Musca domestica* and *Fannia canicularis***

  - Some are commonly known as house flies.
  - Associated with open skips and composting units.

- ***Psychodidae* – *Psycoda/Tinaeria alternate* (Moth or Owl Midge)**

  - Generally weak flyers.
  - Stay close to ground and are not normally blown off sites.
  - Can swarm.
  - Can cause irritation to eyes and nose.
  - Associated with filter beds with high organic loading, reed beds and composting units.



Figure 13: *Psychoda alternate* adult fly



Psychoda alternate

Figure 14: *Psychoda alternate* adult fly



Figure 15: *Psychoda alternate* adult fly



Figure 16: *Psychoda alternate* larvae

The majority of fly complaints Wessex Water receive are from WRCs which use trickling filter beds (also known as percolating filters).



Figure 17: Filter bed

Whilst a large percentage of Wessex Water's WRCs use trickling filter beds, only a very small percentage of these works receive fly complaints. Trickling filter beds work by the following mechanism:

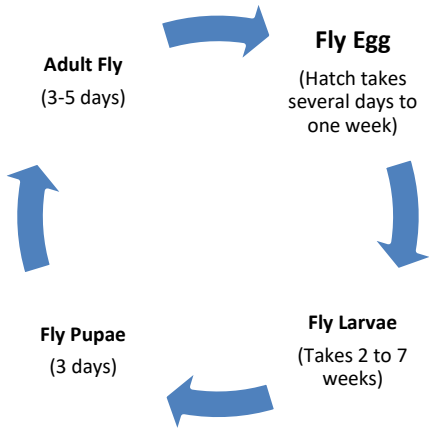
As sewage percolates through the filter a biofilm develops. The microorganisms that form this biofilm remove organic matter from the sewage and utilise it as a nutrient. A large number of macroinvertebrate species feed and breed on this biofilm. These include insect larvae. The macroinvertebrate species are an important part of the filter bed ecology as it prevents the biofilm becoming too thick and eventually clogging the filter. It is important that a mixed and diverse ecology is maintained for the efficient working of a filter. Fly larvae are an important grazer. The film thickness will impact the fly larvae species present on the filter bed. Lower levels of film will generally support large population of Chironomidae where filters with high film levels will be dominated by Psychodinae. Chironomidae must rely on diffusion through the body surface where as Psychodinae and Anisopodidae are able to project their posterior respiratory siphons clear of the film.

Fly complaints can be received from sensitive receptors nearby when populations of specific fly species rise to a certain level. From the DEFRA Report (2006): *Insect Nuisance Associated with Sewage Treatment Works (pg46).*

"The public are advised that the majority of nuisance insects associated with STWs are harmless, non-biting, flies, that are weak fliers and unlikely to cause long-term adverse effects".

The majority of fly complaints received by Wessex Water are for the fly species Chironomidae. Chironomidae have the following life cycle.

Chironomidae fly life cycle



The fly larvae stage is further broken down into four instar stages

Figure 18: Chironomidae fly life cycle

In the summer months, the life cycle can be completed in 2-3 weeks. In winter months the larvae can suspend development as mature larvae and not pupate until late March and early April.

4.0 Good housekeeping

A lack of good housekeeping can result in situations that can lead to a bloom in existing fly populations or the creation of new fly populations. Measures constituting Best Practicable Means for good housekeeping are listed below.

- Ensure that doors to buildings that contain process plant or skips remain closed except for access.
- Spillages must be avoided whenever possible. Ensure that any spillage is cleared as soon as is reasonably practical.
- Retention of sewage and sludge should be minimised as much as possible.
- Where plant failures may lead to an increase in fly populations, repairs should be done as soon as possible.
- Ensure that screenings and grit systems are operating correctly.
- Ensure regular cleaning and flushing of screens and influent channels.
- Ensure the regular cleaning of scum, grease and grit removal equipment.
- Skips that contain screenings and grit must be emptied on a regular basis.
- Ensure tanks are cleaned on a regular basis to prevent long-term accumulation of sewage, sludge or floating debris.
- Redundant tanks should be emptied as soon as practicable after use.
- Ensure percolating filter beds are operating efficiently. Clear blocked sparge holes and resolve any distributer problems as soon as practicable.
- Keep vegetation and weed growth to a minimum on the filter beds surfaces. Once the vegetation has been removed is should be removed from site as soon as is reasonably practical.
- Ponded, flooded or significantly overloaded reed beds, where infestation identified should be resolved as soon as practicable.
- Open sludge skips or composting units where infestation identified are to be cleared/covered as soon as practicable.
- Temporary plant should be assessed for potential populations capable of causing a fly nuisance.
- Report any significant changes in fly emergence of aerial flies to the Treatment Manager and Area Scientist.

5.0 Recommendations for reducing fly levels at customer property

- Cover entry points; For example, keep doors and windows closed where possible especially at night.
- Fit fly screens to doors and windows.
- In hours of darkness draw curtains/blinds to prevent flies being attracted by lights on in the house.
- Keep bins, sinks and food areas clean.
- Keep food covered.

- Fix leaky taps and blocked drains where water can gather.
- Some flies don't "like" variable airflows. An oscillating fan can help to make a room unattractive to flies.
- Electric fly killers (Electrocutors) will kill flies but they can also attract numbers into the property due to the light they emit.
- Surface fly killer may be applied to walls, window frames, door frames etc (follow all precautions stated on the product before using).
- If flies gain entry to room, aerosol fly sprays can be used to knock down flies. The only generally work for a short period of time (follow all precautions stated on the product before using).

The DEFRA Report (2006): *Insect Nuisance Associated with Sewage Treatment Works (pg46),* recommends the following;

- *Simple screening measures (i.e. keeping windows and doors closed at peak times will normally suffice to reduce the incidence of nuisance insects in the home.*
- *Where this is impractical, other simple measures, such as fly screens and deterrents (e.g. Deet) may be equally effective.*
- *Persistent problems with nuisance insects may arise from many different sources (e.g. nearby lakes, streams, standing water, drains, garden ponds, water butts and decaying plant matter) and the public are advised to contact their LA and seek help in ascertaining the most likely origin of insects that occur in or near the home (this will not necessarily be an STW).*

6.0 Best practice to prevent fly nuisance

There are a small number of Wessex Water sites that utilise alternative "best practice techniques" to prevent fly complaints being received. It is important to note that no "best practice technique" will completely remove all the larvae and flies from a filter bed. Some "best practice techniques" may not be suitable for every WRC. "Best practice techniques" may include one or more of the control methods which are described below along with information on operational maintenance.

Before making any operational changes, a Process Risk Assessment must be carried out in accordance with the procedure: "Working on Operational Sites" (OPSP001). This may require notification to the EA.

Operational changes

Operational changes may not be able to be made due to Environmental Agency effluent quality consent limits on the WRC.

Changes to the following may have a beneficial effect in reducing fly numbers:

Filter beds:

- Re-circulation rates
- Spülkraft factor (flushing intensity of percolating filters).

Lagoons:

- Retention time

Physical barriers

Netting on filter beds: Netting on the surface of the filter bed can restrict emergence of flies. This is achieved due to a layer of biofilm growing on the netting preventing the adult flies escaping. There are a number of negative issues with netting filter beds. The netting and subsequent biofilm production can reduce the dissolved oxygen in the lower section of the bed leading to poor performance of the filter.

Weed growth can be extremely difficult to clear and cause binding of the filter. The weed growth can lead to further fly populations. It is likely the netting will require to be replaced on regular intervals for it to be continually effective. Generally, the netting can only be used once. *"….it is difficult to ensure the total enclosure of filter beds and insect numbers can still be problematic"* DEFRA (2006) *Insect Nuisance Associated with Sewage Treatment Works (pg32).*

Netting on the filters may encourage certain species such as *Sylvicola fenestralis* (Window Gnat). Netting changes the characteristics of the film, thickness, deposition and zone distribution through the filter. As the dominant fly is linked to this, the dominant fly species. changes and potentially promotes *Sylvicola fenestralis* (Window Gnat) over *Chironomidae*. Where *Sylvicola fenestralis* (Window Gnat) is identified on a site as causing previous complaint, netting on filter bed surfaces should not be used.

If netting is fitted, ensure that there are no rips in the fabric or splits in any seams and no piece of netting will restrict rotation of the filter distribution arms. Check monthly the surface for build-up of vegetation/debris and remove where possible.

Netting should not be used on trickling filter beds that have a problem with weed growth or where there is a potential compliance issue as netting could stop the filter from functioning correctly.



Figure 19: Example of netting on a filter bed

Netting around filter beds: Netting around filter beds can prevent flies from leaving site. It works better with weak fliers such a *Psychoda* flies. The benefits are limited as flies may simply just fly over the top of netting. Netting around filters is very easily damaged by strong winds.

If there is netting around filters check for rips in the fabric or splits in any seams on a regular basis.



Figure 20: Netting around filter beds

Insectocutors: Kills flying adults but to be effective a number of them need to be placed around the filter beds. They are prone to blocking and the grid requires regular cleaning. They only kill a percentage of the flies that are attracted to them.

Insectocutors work best in a sheltered area or surrounded by natural or artificial wind breaks such as trees or netting screens.

Check daily that operational insectocutors are working, that all bulbs are on and grids are clear of debris.



Figure 21: Fly insectocutor

Biological control

This control is based on the reduction of the fly population by their natural predators such as birds, other fly species, spiders or infected by other parasites. Wessex Water on numerous sites have installed bird boxes to encourage bird population to reduce adult fly numbers.

Bacteria-derived larvicides

Larvicide: Currently the only larvicide available for the UK water industry to use is Bactimos SC (originally called VectoBac). Bactimos SC is a particular strain of Bacillus *thuringiensis israelensis* (Bti). The supplier in the UK of Bactimos SC is Resource Chemicals Ltd. Bactimos SC works by breaking down the gut lining of the larvae that ingest it. Larvae in the early development stage (e.g. 1st or 2nd instar) are more susceptible to Bactimos SC. Dose rate is extremely important as at too low a concentration it may be too weak to cause significant or fatal damage. At too high a concentration it is believed the larvae may be able to "taste" the chemical in the biofilm and stop feeding. It is also important there is adequate mixing at the dosing point. Filter beds should be dosed evenly for a 30 minute period under normal/regular flows conditions. There should be no interruption in flow during or immediately after the dose period as it may result in chemical not being accurately dosed to all the surface area or reaching the correct depth of the filter bed. It is also important that the filter bed is clear of weed growth. It should be noted that Chironomidae spp are generally harder to kill than *Psychoda alternate and Sylvicola frenstralis* when applying Bactimos SC. Bactimos SC has not been tested on all *Chironomid spp*. Resource Chemicals Ltd recommended the following dose rates:

Chironomidae/Sylvicola*:** Concentration of 1.25ml/l ***Psychodidae: Concentration of 0.781ml/l

Procedure TRTWG103: "Control of Biofilter flies with Bacillus *thuringiensis* var *israelensis* (Bti)" must be adhered to for Bactimos SC dosing.

It is important to be aware of the following:

- **Only larvae that are actively feeding are susceptible to Bactimos SC.**
- **VectoBac dosing cannot provide 100% control of larvae and flies from filter beds.**

Frequency of dosing is carried out with reference to the fly life cycle (figure 18), weather conditions, previous history, complaint data, designated high sensitivity sites, from regular larvae/fly counts (see Section 7). Dosing frequency is reassessed annually or, more frequently, if fly complaints are received.

If Bactimos SC is being dosed on a site regularly check that dosing equipment is in good condition. Calibrate the dosing pump before each dosing event. Only dose Bactimos SC that is within the use by date and has been stored correctly.

Chemical control

Insecticide (Aerial Flies): Insecticide has in the past been used to kill aerial flies. This is considered a last resort and must be only carried out by trained personnel.

No insecticides are to be directly applied to the trickling filter beds themselves.

Best practice report

In 2018 Wessex Water commissioned Isle Utilities to complete a global review of available techniques. Isle Utilities (2019) *Fly removal techniques in filter beds to prevent fly nuisance complaints* (pg21). The report concluded the following:

"Isle conducted a comprehensive review of the existing and emerging techniques and solutions to fly management within and outside of the water sector. This comprised the identification of solutions from the Isle technology database and open source literature, a review of available research projects, and interviews with relevant water utilities across the globe.

Alternative techniques to those employed by Wessex Water were identified, but these were either not approved for use in the UK, were not available on the market here, or were not yet proven to be effective.

The key finding from this review was that there are currently no viable alternatives to the methods used by Wessex Water to control flies in filter beds. It can thus be stated that Wessex Water are using the best available techniques."

7.0 Larval and fly count method

To determine whether an aerial fly population is likely to originate from the filter beds or to determine the frequency of VectoBac dosing, refer to procedure TRTWP511.

8.0 Procedure for complaints

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

Complaints about flies are dealt with and recorded by the Customer Services Unit (CSU). The complaint details are placed onto the Ops Contact Reporting system. CSU forward the complaint details to the Treatment Manager/Assistant Treatment Manager for the site via email or text alert. It is the Treatment Manager's responsibility to make sure there is liaison with the local authority, 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 at all times that communication between all interested parties is maintained.

The initial action following a complaint will be as follows:

- The Duty Operator will perform a general check of the site.
- The Duty Operator will check that there are no on-going process issues or activities that would give rise to fly populations.
- The Duty Operator will check that levels of "Good Housekeeping" are being maintained (see Section 4).

- If the WRC is a trickling filter bed works the Duty Operator will carry out larval and fly count methods as described in Section 7. Results must be sent to the Area Scientist and the Fly Management Co-ordinator to review.
- The Treatment Manager/Assistant Manager will arrange for a fly sample and photographic evidence to be collected from the customer's property. This must be sent to the Area Scientist and Fly Management Co-ordinator for fly identification. An estimation of the number of flies within the customer's property should also be gained.

From the initial action it must be decided if the complaint is likely to be valid. Complaints may be considered non-valid if:

- The fly species is identified as being a species not associated with a WRC.
- There were other known sources of fly emergence or release in the vicinity at the time.
- There are good grounds for believing a complaint is frivolous or vexatious

Where there is doubt complaints should be given the benefit of the doubt.

If the complaint is valid it must be decided whether the Fly Management Plan is being followed. If it is not being followed, then the procedures set in the Fly Management Plan should be followed. If it is being followed, then further investigation may be required. This will be initiated by the Treatment Manager and may involve the Assistant Treatment Manager, Area Scientist, Operator and the Fly Management Co-ordinator.

The mitigation approach used will be in line with the DEFRA guidance (2006) – *Statutory Nuisance from Insects and Artificial Light.* Follow up investigation could include the following:

- Treatment Manager, Assistant Treatment Manager, Area Scientist and Operator perform a general check of the site.
- Fly survey of WRC, including skips, open water and other relevant areas and a detailed survey of percolating filter beds (larval count and adult emergence).
- Investigation of other potential sources of fly emergence from outside the WRC.

Following investigation further action may be required to control fly emergence and release. Further action will be initiated by the Treatment Manager, it may require the following:

- Operational Solutions.
- Process Solutions.
- Maintenance Procedures.
- Investment Solutions.

<u>Summary</u>

It is important that at all times the Treatment Manager or Assistant Treatment Manager is in liaison with the local authority and with local stakeholders (including the complainant). It is

important that all parties are informed on the outcome of the assessment of the complaint and whether or not any action is to be taken. At each stage of the complaint procedure documentation of the decisions and findings will be made by the Treatment Manager or Assistant Treatment Manager.

9.0 Training

Operators using Bactimos SC dosing systems will be trained by Resource Chemicals Ltd. This will include storage, handling and dosing of the product. Training referring to customer complaint procedure and how to complete fly larvae and aerial fly counting will be carried out by the Fly Management Co-ordinator.

10.0 Encroachment by external developers

Any encroachment around a trickling (percolating) filter WRC will increase the potential for fly complaints to be received. A WRC will be designated a fly sensitive site if there is a history of fly complaints, larvicide for fly control had previously been dosed, filters have been previously netted for fly control or the site is known to have high populations of fly larvae and adult flies. It is important to note that no "best practice technique" will completely remove all the larvae and flies from a filter bed. The DEFRA Report (2006) *Insect Nuisance Associated with Sewage Treatment Works (pg45),* recommends the following;

"The planning of new residential housing, camp sites, caravan parks etc, should always take into consideration the location of STWs and should preferably not be located within 1 km of an established works".

Therefore, it is recommended that on a designated fly sensitive site there is no sensitive receptor development within a minimum of 250m of the boundary of the Water Recycling Centre and there should be consultation on suitable development within 1km of the boundary of the site.

References

Wessex Water documents

- TRTWG103: Control of Biofilter flies with *Bacillus Thurengiensis var Israelensis* (Bti)
- TRTWP511: Fly Larvae and Aerial Fly Counting Procedures

Applicable regulation

- Clean Neighbourhoods and Environment Act 2005
- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969

Further guidance

- DEFRA (2006): Insect Nuisance Associated with Sewage Treatment Works
- DEFRA (2006): Statutory Nuisance from Insects and Artificial Light: Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005

- Valent BioSciences: Nuisance Fly Control in Wastewater Treatment Systems and in Lakes and Ponds; Biological Insecticide, VectoBac 12AS; Technical Use Bulletin

Scientific papers

- Coombs, Dancer, Davies, Learner 1989: Control of *Sylvicola fenstralis* by application of *Bacillus thuringiensis var israelensis:*
- Coombs R 1997; The control of nuisance *Diptera* breeding in sewage biological filters by low Frequency dosing and application of the insect growth regulator *Pyriproxyfen*: Robert Coombs PHD Thesis 1997
- Houston J, Dancer B, N. Dancer and Learner M.A (1988): Control of sewage filter flies using *Bacillus thuringiensis var israelensis*-I. Acute toxicity tests and pilot scale trial.
- Wenjere S. 2017. Assessment of the Efficacy of BTI Larvicide, VectoBac 12AS® (BTI AM65-52) Against "Nuisance" Flies at Water Treatment Plants in North West England. PhD Thesis, University of Stanford, Manchester.

Reports

- Bitton A, Humphries J (2017). Investigating Bti dosing for fly control at Frome STW (internal report Wessex Water)
- Humphries J (2018). Frome STW: Fly larvae toxicity trial and dye testing of VectoBac dosing regime 15th-16th January 2018 and 7th -8th February 2018. (Internal Report Wessex Water)
- Isle Utilities (2019) *Fly removal techniques in filter beds to prevent fly nuisance complaints*

Revision History

Issue	Date	Description	Changes made/requested by
1	01/06/2016	First addition	Jim Humphries
2	29/01/2017	General Review: Addition of actual site photos of fly type. Addition of the following Chapters Recommendations for Reducing Fly Levels at Customer Property Encroachment by External Developers References	Jim Humphries
3	08/02/2019	General Review Change of name of Sewage Treatment Works to Water Recycling Centre. Review of the regulation Review of Best Practice. Example of Best Practice from the DEFRA Report (2006) *Insect Nuisance Associated with Sewage Treatment Works* added. Conclusions were added from the Isle Utilities (2019) *Fly removal techniques in filter beds to prevent fly nuisance complaints.* Recommendation for the distance sensitive receptor should be allowed to encroach on an existing site added from the DEFRA (2006) *Insect Nuisance Associated with Sewage Treatment Works.*	Jim Humphries
4	01/04/2019	Chapter 6: Netting on filter beds section updated to include information that netting may encourage *Sylvicola fenestralis* (Window Gnat).	Jim Humphries

Appendix D – Wessex Water's Fly Larvae and Aerial Fly Counting Procedure

FLY LARVAE AND AERIAL FLY COUNTING PROCEDURES

Scope

This procedure details methods for the counting of fly larvae and aerial flies to determine whether a fly population is likely to have come from a STW or to determine the frequency of VectoBac dosing.

Fly Larvae Counting Procedure

NB: Fly larvae counts can only be carried out on stone trickling filter beds and not plastic media.

1. Wear suitable gloves.
2. Take 3-5 stones (depending on size of filter substrate, eg: if the filter has small stones then use 5 stones) from approximately 100mm- 150mm down in the filter bed.
3. Wash the stones thoroughly in 1 litre of tap water in a beaker to dislodge material.
4. The 1 litre of tap water should be poured into a white plastic sorting tray. See figure 1.
5. Count the total number of fly larvae of each species identified and record on the site's results sheet.
6. Record the following information: date, time, ambient air temperature, weather conditions and date of last VectoBac dose.
7. Send results to the Fly Management Co-ordinator for recording.



Figure 1: White plastic sorting tray containing *Chironomid* larvae

Aerial Fly Counting Method

NB: Aerial fly counting method can be carried out on both stone and plastic trickling filter media.

1. To the underside of a known sized plastic container attach a fly sticky trap.
2. Place the plastic container on the trickling filter bed for the agreed period of time. i.e. 1hr, 4hr, 24hr, 1 week (site specific). See figure 2 and 3.

3. Place sufficient rocks (or other weight) on top of the upturned container to prevent it blowing away, ensuring that it will not restrict filter arm rotation.
4. At the end of the specific time period the container can be removed from the filter and the flies trapped on the fly sticky trap can be identified, counted and recorded on the site's results sheet. See figure 4.
5. Record the following information: date, time, ambient air temperature, weather conditions and date of last VectoBac dose.
6. Send results to the Fly Management Co-ordinator for recording.



Figure 2: Fly trap set up on stone media bed.



Figure 3: Fly trap set up on plastic media filter.



Figure 4: *Chironomid flies* trapped on the fly sticky trap

FLY AND FLY LARVAE IDENTIFICATION PICTURES

Chironomid (non-biting midge)

- Favour filter beds that have a relative light organic loading and a long wetting rate (rotation frequency), resulting in a thin biofilm thickness
- Good flyers, fly up to 2 miles
- Form tall helical mating swarms on leeward side of buildings and large standard trees
- Mating couplets fall out of swarm and usually return to filter beds to lay eggs
- Very visual when in helical mating swarms. Only in severe cases do they generally go into property.



Figure 5: *Chironomid*

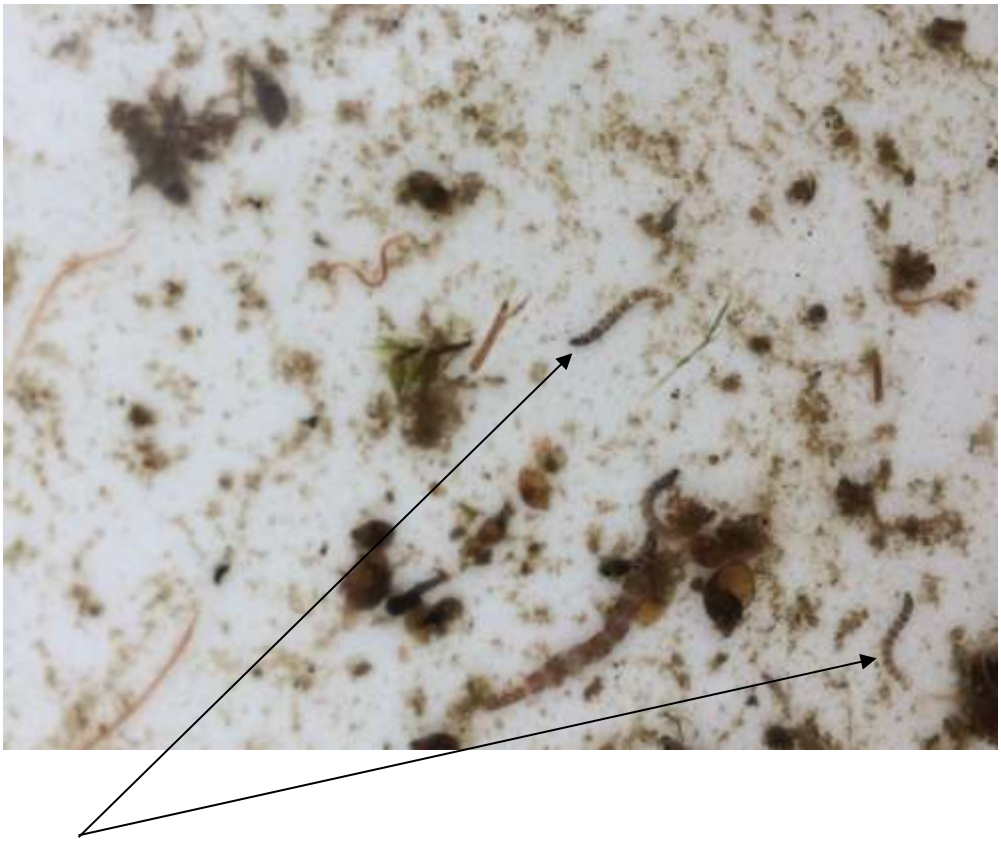


Figure 6: *Chironomid* Larvae



Figure 7: *Chironomid* helical mating swarm



Figure 8: *Chironomid* helical mating swarm

Psychoda alternate

- Weak flyers
- Stay close to ground and are not normally blown off sites
- Can swarm
- Can cause irritation to eyes and nose.



Figure 9: *Psychoda alternate*

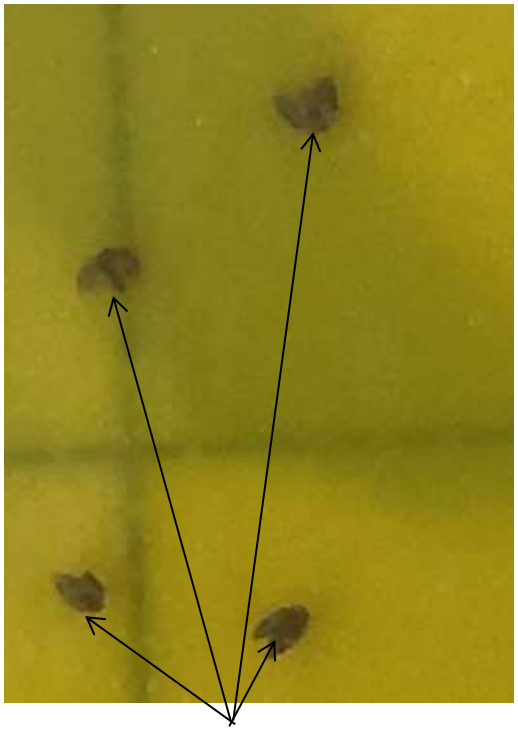


Figure 10: *Psychoda alternate*

Psychoda alternate larvae



Figure 11: *Psychoda alternate larvae*

Sylvicola frenstralis

- Medium sized gnat (6-10mm).
- Do not normally swarm.
- Can be a public health risk as adults crawl over surfaces looking for damp areas to lay eggs.



Figure 12: *Sylvicola frenstralis*



Figure 13: *Sylvicola frenstralis*



Figure 14: Large *Sylvicola frenstralis* population on filter bed structure



***Sylvicola frenstralis* larvae**

Figure 15: *Sylvicola frenstralis* larvae



Figure 16: *Sylvicola frenstralis* larvae

Issue	Date	Description	Prepared By
1	June 2016	First Issue	Jim Humphries
2	October 2016	General Review	Jim Humphries
3	December 2016	Review following updates to TRTWG103	Jim Humphries
4	January 2018	Addition of further identification photos	Jim Humphries

Appendix E – Report Terms & Conditions

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The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

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