

# Old Whittington STF Bioaerosol Risk Assessment

This document discusses the risk associated with bioaerosols that could arise as a result of anaerobic digestion and its directly associated activities

## Document Control

**Document Control Ref:** V001

**Document Location:** IMS Level 2 > Waste and Installation Permits > Attachments

**Document Custodian:**

**Review Period:** Annual and following the bioaerosol risk monitoring being undertaken

## Document Approval

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## Document Revision History

**Version**

**Date**

**Revised By**

**Reviewed By**

**Amendment Details**

1

13/06/2024

Hazel Morgan

New document

2

3



YorkshireWater

## Woodhouse Mill STF: Bioaerosol Risk Assessment

### 1.1 Bioaerosols Introduction

Bioaerosols are defined as micro-organisms suspended in the air and can include bacteria, fungi and viruses, or parts of living organisms, such as spores and plant pollen. Bioaerosols are usually smaller than 10µm in diameter and can cause human health impacts such as allergic responses and inflammation. Bioaerosols are naturally present in the air, but they are also associated with organic waste treatment processes including composting, mechanical biological treatment, and potentially some aspects of anaerobic digestion (AD) which are widely used in the UK.

### 1.2 Receptors

The most recent guidance<sup>1</sup> requires that biological waste treatment facilities provide a site-specific bioaerosol risk assessment if there are sensitive receptors within 250m of activities, regardless of the specific processes carried out at a site. It is noted that the consensus from various studies is that bioaerosols from composting activities decline rapidly within the first 100 metres from a site and generally decline to background levels within 250m<sup>2</sup>. Technical Guidance Note M9<sup>3</sup> states that receptors located more than 250m away should be discounted as they are not likely to be affected.

### 1.3 Old Whittington STF

The nearest residential property to Old Whittington SFT is located approximately 190m from the north of the installation boundary. The nearest industrial installations are 140m from the north-west of the cake pad.

There is a public footpath that runs adjacent to the River Rother to the south-east of the site, approximately 70 m to the east of installation boundary near the site control room. There is also an LNR, where people may occasionally be present some 140 m to the east, and a canal towpath is present approximately 200 m, also to the east. Allotments are located approximately 230 m to the north of the installation boundary. There are also industrial / commercial sites within 250m. Risks associated with industrial, agricultural and amenity receptors are likely to be less significant due to the relatively shorter duration of exposure.

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<sup>1</sup> Environment Agency, consultation draft July 2020, Appropriate measures for the biological treatment of waste.

<sup>2</sup> Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.

<sup>3</sup> Environment Agency Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities', July 2018,

Source	Source controls	Pathway	Receptors	Overall risk
Raw sludge intake	Sludge is pumped from tankers to a covered sludge screen feed tank and then via pipelines to receiving enclosed storage tanks. Unloading activities occur infrequently. Displaced air is extracted and dispersed to atmosphere via an odour control unit (OCU) (see separate entry below). The distance between this source and the nearest residential receptor is <250m.	Airborne dispersion	Residential housing is within 250m, including housing located 190m and 220m to the north of the sludge reception area.	No risk present – sludge is fully enclosed
Sludge reception – screenings skip	Screenings are not subject to regular disturbance and are stored in relatively small quantities (2 x skips). Screenings are wet, do not produce dust and are not readily susceptible to airborne dispersion. The distance between this source and the nearest residential receptor is <250m.	Airborne dispersion	Industrial/commercial sites within 250m including premises 140m north-west of the cake pad.	Low
Raw sludge thickening including thickener feed tanks and drum thickeners	Sludge is fully enclosed within tanks or pipework at all times. Displaced air is extracted and dispersed to atmosphere via a two-stage odour control unit (OCU) (see separate entry below).	None	Amenity areas are within 250m including a public footpath approximately 70m to the south-east of the installation boundary although this would only typically be used in a transitory manner.	No risk present – sludge is fully enclosed
Digester feed tanks	Sludge is fully enclosed within tanks or pipework at all times. Displaced air is extracted and dispersed to atmosphere via an odour control unit (OCU) (see separate entry below).	None		No risk present – sludge is fully enclosed
Odour control units	Air from sludge screen feed tank, thickener feed tanks, drum thickeners and digester feed tanks is treated via one of 2 OCUs prior to discharge to atmosphere.	Airborne dispersion		Very low

Source	Source controls	Pathway	Receptors	Overall risk
	OCUs subject to monitoring programme and planned maintenance to ensure effective operation.		Allotments are located approximately 230m to the north.	
Emergency scenario – bio-gas venting	As the sludge digestion process is a wet process, biogas is unlikely to contain significant concentrations of bioaerosols. Venting events infrequent and short-lived	Airborne dispersion	There are no schools or hospitals within 250m of bioaerosol sources.	Very low
Emergency scenario – Sludge spillage	Sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Events occur infrequently and in almost all cases will involve small quantities of sludge. Major/catastrophic loss is highly unlikely to occur. Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up.	None		Very low
Digested sludge dewatering feed tanks (uncovered) x 2	Sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Sludge contained within the dewatering feed tanks has been processed at high temperature via the digesters achieving high levels of pathogen kill. Bioaerosols generation potential is therefore low.	None		Low
Digested sludge dewatering centrifuges	Digested sludge has been processed at high temperature via AD achieving high levels of pathogen kill. Bioaerosol generation potential is therefore low.	Airborne dispersion		Low

Source	Source controls	Pathway	Receptors	Overall risk
	Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion.			
Digested sludge cake handling, storage and maturation– conditioning pad	Digested sludge has been processed at high temperature via AD achieving high levels of pathogen kill. Bioaerosol generation potential is therefore low. Digested sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. The cake is delivered to the cake pad, stored in windrows and is then left undisturbed until removal from site.	Airborne dispersion		Low
Vehicle tracking of materials around on the cake pad and roads, which could dry out and disperse	Washdown and wetting as required in order to reduce dust and keep pad area clean.			Very low
Emergency scenario – Sludge cake spillage	Sludge is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. Events occur infrequently and in almost all cases will involve small quantities of sludge. Major/catastrophic loss is highly unlikely to occur. Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up.			Low

**Table 1: Review of potential bioaerosol sources and associated risk**

## 1.4 Site Operation and monitoring

Although the individual assets at Old Whittington STF have been deemed a low or very low bioaerosol risk, there will be a requirement to undertake bioaerosol monitoring as part of the site's Industrial Emissions Directive-Anaerobic Digestion (IED-AD) permit. Monitoring frequency will be dictated by the environmental permit.



Fig 1 – Old Whittington STF showing the installation boundary (green) and associated assets some of which may have the potential to cause bioaerosols

## 1.5 Meteorological Conditions

In the UK, the prevailing wind directions are commonly from the west and south-west. The wind direction and speed will impact the potential dispersion of bioaerosols from site.

Doncaster Sheffield airport meteorological station is 36km north-east of the site. There is also a meteorological station in Sheffield city centre, closer to the works. As both meteorological stations are representative of the local area, Doncaster Sheffield airport has been selected for use due to a complete data set for use in odour assessments being captured at this location. When a meteorological station is installed in line with the site's environmental permit, on-site wind conditions will be taken into consideration in relation to this site specific bioaerosol risk assessment.

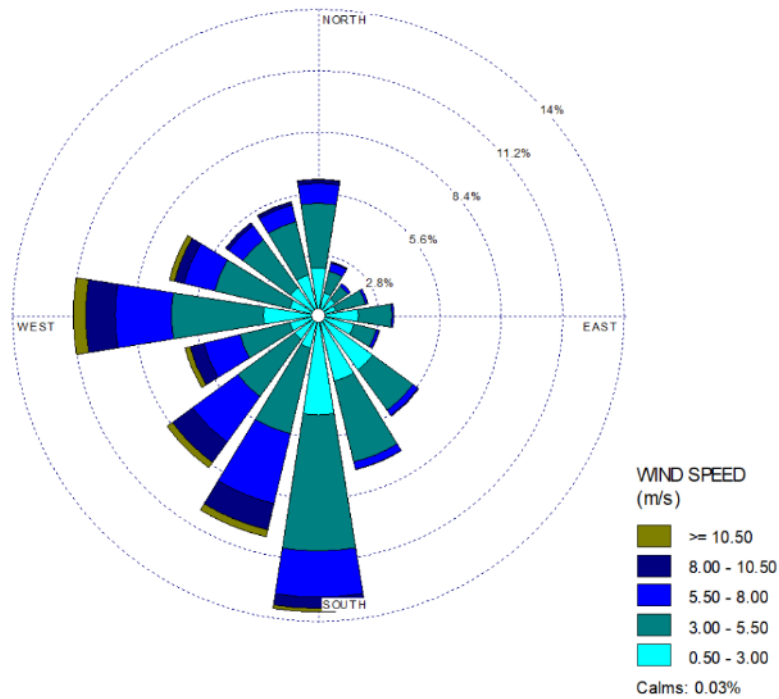


Fig 2 - Doncaster Sheffield Airport Wind Rose Plot (2019)

### 1.6 Site Monitoring Locations

The wind conditions will always be taken into consideration when conducting the bioaerosol monitoring. If the wind is operating in line with conditions as stipulated in figure 2, it's expected the monitoring locations would be situated in line with figure 3, which are positioned downwind of the cake pad, cake barn, centrifuge and dewatering feed area.

All sampling will be undertaken in line with EA M9 sampling guidance. 1 upwind and 3 downwind samples in a fan shape will be taken.

As the monitoring will be dictated by onsite wind conditions, the sampling locations may not always match the prevailing wind as dictated in figure 2.

In September 2022, a one-off monitoring assessment was undertaken (appendix 1). The wind conditions did not match the expected wind results (figure 2) on the day of assessment. Wind conditions will always be noted and reported on within the bioaerosol monitoring report.



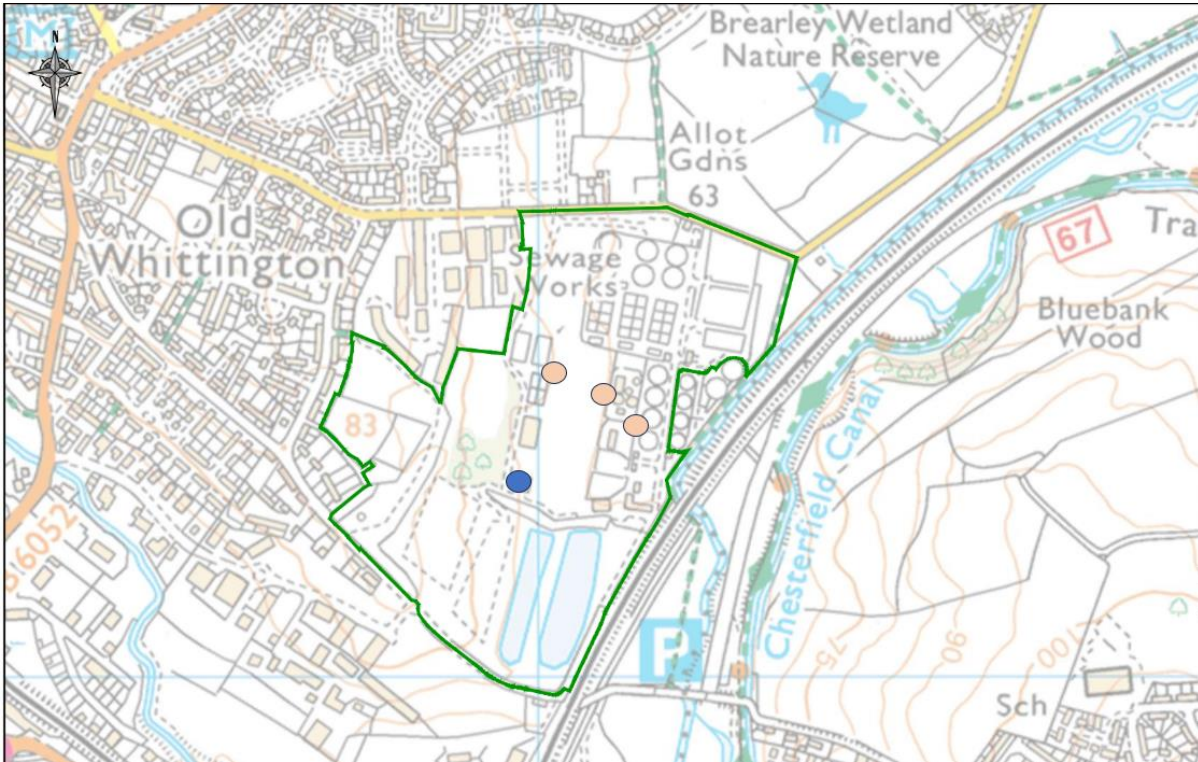


Figure 3 – Old Whittington STF Site Plan showing the installation boundary (green) with bioaerosol monitoring locations marked (blue dot = upwind, pink dot = downwind)

Parameter	Threshold limit (CFU/m <sup>3</sup> )
Total bacteria (TB)	1000
<i>Aspergillus fumigatus</i> (AF)	500

Table 2 – Bioaerosol monitoring parameters and threshold limits

### 1.7 Bioaerosol Monitoring Results

YW has undertaken quantitative bioaerosols monitoring in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. This monitoring exercise was carried out by Element Materials Technology Environmental UK Ltd on 5<sup>th</sup> September 2022 (appendix 1). Sampling was undertaken at 3 downwind and one upwind location on site, with three parallel samples collected per location. Four one off monitoring points were also assessed. All median concentration results for total bacteria and *Aspergillus fumigatus* were found to be below the guidance limit (1000 and 500 CFU/m<sup>3</sup> respectively) at all locations.

The next bioaerosol monitoring will be carried out in line with permit responsibilities. The results will be updated here.

### 1.8 Bioaerosol Risk Assessment - conclusions



The bioaerosol risk assessment undertaken concludes that Old Whittington STF installation is unlikely to be a significant source of bioaerosols. This is due to:

- All potential bioaerosol sources at Old Whittington STF are wet, do not produce dust and are not readily susceptible to airborne dispersion.
- Digested sludge has been processed at high temperature via the digesters achieving high levels of pathogen kill. Bioaerosol generation potential from digested sludge sources is therefore very low.
- Undigested sludge sources are fully contained with displaced air extracted and treated in a two-stage biofilter prior to release to atmosphere.

The consensus of studies is that bioaerosols decline to background levels within 250m and guidance states that receptors located more than 250m away should be discounted as they are not likely to be affected. However, there are a number of potential bioaerosol receptors located within 250m of the STF. This includes residential housing, industrial and commercial sites and local amenity areas. Therefore, as a precautionary measure given the proximity of potential receptors, YW will undertake quantitative bioaerosol monitoring in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. The median concentration of total bacteria and of *Aspergillus fumigatus* was found to be below the guidance limit (1000 and 500 CFU/m<sup>3</sup> respectively) at all sampling locations.

Further bioaerosol monitoring will be conducted in line with the site's Environmental Permit.

## Appendix 1 – Bioaerosol Monitoring Results September 2022



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Report: **Bioaerosol Monitoring**  
Client: Yorkshire Water Services Ltd  
Date of Site Work: 5<sup>th</sup> September 2022

Prepared for: Mr Tom Broderick  
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A handwritten signature in black ink, appearing to read 'Pickard', written over the printed name of the preparer.

Issued by:  
Issue date: 21/10/2022  
Report Ref: **113844 V1**

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### Executive Summary

Tom Broderick of Yorkshire Water Services Ltd requested that Element Materials Technology Environmental UK Limited undertake monitoring of bioaerosols at its Old Whittington site. Monitoring was undertaken in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'.

Site work was undertaken by Abigail Pickard on 5<sup>th</sup> September 2022.

The purpose of the bioaerosol monitoring exercise was to establish the concentration of bioaerosols being dispersed from the site to the nearest sensitive receptor.

#### Monitoring Findings:

Sampling Location	Analyte	Guidance Limit (CFU/m <sup>3</sup> )	Median Concentration of Parallel Samples (CFU/m <sup>3</sup> )
Upwind	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Downwind	Total bacteria	1000	125
	<i>Aspergillus fumigatus</i>	500	<125
Downwind Left Hand Fan	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Downwind Right Hand Fan	Total bacteria	1000	250
	<i>Aspergillus fumigatus</i>	500	<125
Sampling Point 1	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Sampling Point 2	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Sampling Point 3	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Sampling Point 4	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125

< Less than CFU/m<sup>3</sup> Colony Forming Units Per Cubic Metre

Below Limit	Exceeds Limit
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## 1. Introduction

Element Materials Technology Environmental UK Ltd was commissioned by Yorkshire Water Services Ltd to carry out a bioaerosol monitoring exercise at the Waste Water Treatment Works at their site in Old Whittington.

The purpose of the bioaerosol monitoring exercise was to establish the concentration of bioaerosols being dispersed from the site to the nearest sensitive receptor, as part of a permit application.

Monitoring was undertaken in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. This report details the survey methodology and results on the monitoring of all locations.

Site work was undertaken by Abigail Pickard of Element Materials Technology Environmental UK Ltd on 5<sup>th</sup> September 2022.

## 2. Measurement Methodology

Measurements were carried out in accordance with parameters specified in Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. Of the methods suggested in the protocol, the filter method was utilised in this project.

On site calibration checks were performed on the pumps used and were found to be within the permitted tolerance of the standard.

For all measurements the sample head was located 1.5 metres above ground level. The upwind sample was taken further away from the centre of operations than recommended in the guidance. This was to ensure the sample was outside the operational area and represented a true upwind value.

Triplicate samples were carried out at each selected sampling location. Once completed, filters were transferred in a refrigerated container to the laboratory within 24 hours.

The IOM heads containing a polycarbonate filter were used to determine the bioaerosol exposure under the test conditions. Upon arrival at the laboratory the bioaerosols impacted on each filter were recovered in 2 ml maximum recovery diluent. The target micro-organisms were cultured using appropriate dilutions on the following media.

Half-strength nutrient agar (1/2NA) plates were used for total mesophilic bacteria. Malt extract agar (MEA) plates were used for *Aspergillus fumigatus*.

Samples were incubated for up to seven days at 37°C (total mesophilic bacteria), and for two days at 45°C (*Aspergillus fumigatus*).

The laboratory retained information regarding each sample. Dates and times of preparation, incubation times, batch numbers, personnel responsible, storage medium and incubator temperature were all recorded.

### 3. Site Information

Yorkshire Water Services Ltd operates a Waste Water Treatment Works at their site in Old Whittington, Yorkshire. The site currently is not required to undertake ambient air monitoring but has done so to support a permit application.

The site is not currently permitted, with an application being submitted in the near future. As such the limits used are the standard limits used by the Environment Agency (EA).

Parameter	Threshold limit (CFU/m <sup>3</sup> )
Total bacteria (TB)	1000
<i>Aspergillus fumigatus</i> (AF)	500



**Table 1. Environmental Parameters - Bioaerosol monitoring**

Site:		Old Whittington, Yorkshire		Site Operator		Yorkshire Water Services Ltd	
Date:		05/09/22		Commissioning Laboratory		EMT Environmental	
Location	Bearing of samplers from boundary of operational area (degrees °)	Mean direction the wind blows to during the sampling period (degrees °)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Types of materials processed on site		Arithmetic mean of relative humidity (%)	Prevailing weather conditions including cloud cover
				Mean wind speed (mph)	Arithmetic mean of air temperature °C		
Upwind	180	10	170	7	21	70	Cloudy. 4/8
Downwind	0	10	10	7	21	70	Cloudy. 4/8
Downwind Left Hand Fan	330	10	320	7	21	70	Cloudy. 4/8
Downwind Right Hand Fan	30	10	20	7	21	70	Cloudy. 4/8

#### 4. Measurement Results

The results for measurements undertaken at all locations are shown within a number of standardised tables on the following pages:

Table 2. Upwind: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms									
Site:		Old Whittington, Yorkshire				Site Operator:			
Date:		05/09/22				Commissioning Laboratory:			
Activities affecting Bioaerosol Conc <sup>n</sup>		None				Types of materials processed on site:			
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Upwind	UW1	70	180			TB	375		
	UW2	70	180	11:49 – 12:49	60	TB	<125	TB: <125	-
	UW3	70	180			TB	<125		
Upwind	UW1	70	180			AF	<125		
	UW2	70	180	11:49 – 12:49	60	AF	<125	AF: <125	-
	UW3	70	180			AF	<125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup> Aspergillus fumigatus (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

**Table 3. Downwind: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Downwind	DW1	75	0			TB	125		
	DW2	75	0	12:12 – 13:12	60	TB	125	TB: 125	-
	DW3	75	0			TB	<125		
Downwind	DW1	75	0			AF	<125		
	DW2	75	0	12:12 – 13:12	60	AF	<125	AF: <125	-
	DW3	75	0			AF	<125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

**Table 4. Downwind Left Hand Fan: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Old Whittington, Yorkshire			Site Operator:			Job Number 113844	
Date:		05/09/22			Commissioning Laboratory:			Yorkshire Water Services Ltd	
Activities affecting Bioaerosol Conc <sup>n</sup>		None			Types of materials processed on site:			Waste Water	
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Downwind Left Hand Fan	LHS1	90	30			TB	<125		
	LHS2	90	30	11:50 – 12:50	60	TB	<125	TB: <125	-
	LHS3	90	30			TB	<125		
Downwind Left Hand Fan	LHS1	90	30			AF	<125		
	LHS2	90	30	11:50 – 12:50	60	AF	<125	AF: <125	-
	LHS3	90	30			AF	<125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

Table 5. Downwind Right Hand Fan: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms									
Site:		Old Whittington, Yorkshire				Site Operator:			
Date:		05/09/22				Commissioning Laboratory:			
Activities affecting Bioaerosol Conc <sup>n</sup>		None				Types of materials processed on site:			
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Downwind Right Hand Fan	RHS1	80	110			TB	250		
	RHS2	80	110	11:55 – 12:55	60	TB	250	TB: 250	-
	RHS3	80	110			TB	<125		
Downwind Right Hand Fan	RHS1	80	110			AF	<125		
	RHS2	80	110	11:55 – 12:55	60	AF	<125	AF: <125	-
	RHS3	80	110			AF	<125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup> Aspergillus fumigatus (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit



**Table 6. Sample Point 1: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Old Whittington, Yorkshire			Site Operator:			Yorkshire Water Services Ltd			Job Number 113844			
Date:		05/09/22			Commissioning Laboratory:			EMT Environmental			Waste Water			
Activities affecting Bioaerosol Conc <sup>n</sup>		None			Types of materials processed on site:			Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*			Median of parallel samples (CFU/m <sup>3</sup> )		Comments	
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )						
Sample Point 1	S1A	70	250			TB	<125							
	S1B	70	250	10:22 – 11:22	60	TB	<125		TB: <125			-		
	S1C	70	250			TB	125							
Sample Point 1	S1A	70	250			AF	<125							
	S1B	70	250	10:22 – 11:22	60	AF	<125		AF: <125			-		
	S1C	70	250			AF	<125							

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit	Exceeds permit limit
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**Table 7. Sampling Point 2: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Old Whittington, Yorkshire			Site Operator:			Yorkshire Water Services Ltd		Job Number 113844	
Date:		05/09/22			Commissioning Laboratory:			Waste Water		EMT Environmental	
Activities affecting Bioaerosol Conc <sup>n</sup>		None			Types of materials processed on site:			Waste Water		Comments	
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )			
Sample Point 2	S2A	20	120			TB	<125				
	S2B	20	120	10:38 – 11:38	60	TB	<125	TB: <125	-		
	S2C	20	120			TB	<125				
Sample Point 2	S2A	20	120			AF	<125				
	S2B	20	120	10:38 – 11:38	60	AF	<125	AF: <125	-		
	S2C	20	120			AF	<125				

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

**Table 8. Sample Point 3: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Old Whittington, Yorkshire			Site Operator:			Job Number 113844	
Date:		05/09/22			Commissioning Laboratory:			Yorkshire Water Services Ltd	
Activities affecting Bioaerosol Conc <sup>n</sup>		None			Types of materials processed on site:			Waste Water	
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Sample Point 3	S3A	140	150			TB	625		
	S3B	140	150	10:57 – 11:57	60	TB	125	TB: 125	-
	S3C	140	150			TB	<125		
Sample Point 3	S3A	140	150			AF	<125		
	S3B	140	150	10:57 – 11:57	60	AF	<125	AF: <125	-
	S3C	140	150			AF	<125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

**Table 9. Sample Point 4: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Old Whittington, Yorkshire				Job Number 113844			
Date:		05/09/22				Yorkshire Water Services Ltd			
Activities affecting Bioaerosol Conc <sup>n</sup>		None				EMT Environmental			
Location	Sample REF	Distance from centre of operational area (m)	Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees °)	Sampling Times	Sampling duration (mins)	Microbial Type	Calculated concentration of airborne microorganisms (CFU/m <sup>3</sup> )	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Sample Point 4	S4A	80	120			TB	<125		
	S4B	80	120	13:03 – 14:03	60	TB	<125	TB: <125	-
	S4C	80	120			TB	<125		
Sample Point 4	S4A	80	120			AF	<125		
	S4B	80	120	13:03 – 14:03	60	AF	<125	AF: <125	-
	S4C	80	120			AF	125		

\* Site permit limits: Total Bacteria (TB) = 1000 CFU/m<sup>3</sup>      *Aspergillus fumigatus* (AF) = 500 CFU/m<sup>3</sup>

Below permit limit

Exceeds permit limit

Table 6. Controls and Filter Counts - Bioaerosol monitoring		Site Operator : Yorkshire Water Services Ltd		Job Number: 113844
Site: Old Whittington, Yorkshire		Date: 05/09/22		Commissioning Laboratory : EMT Environmental
Location	Sample Ref Number	Microbial Type	Average Count of microorganisms (CFU/filter)	Comments
Upwind	UW1	TB	3	None received
		AF	0	
Upwind	UW2	TB	0	None received
		AF	0	
Upwind	UW3	TB	0	None received
		AF	0	
Downwind	DW1	TB	1	None received
		AF	0	
Downwind	DW2	TB	1	None received
		AF	0	
Downwind	DW3	TB	0	None received
		AF	0	
Downwind Left Hand Fan	LHS1	TB	0	None received
		AF	0	
Downwind Left Hand Fan	LHS2	TB	0	None received
		AF	0	
Downwind Right Hand Fan	RHS3	TB	0	None received
		AF	0	
Downwind Right Hand Fan	RHS1	TB	2	None received
		AF	0	
Downwind Right Hand Fan	RHS2	TB	2	None received
		AF	0	
Downwind Right Hand Fan	RHS3	TB	0	None received
		AF	0	

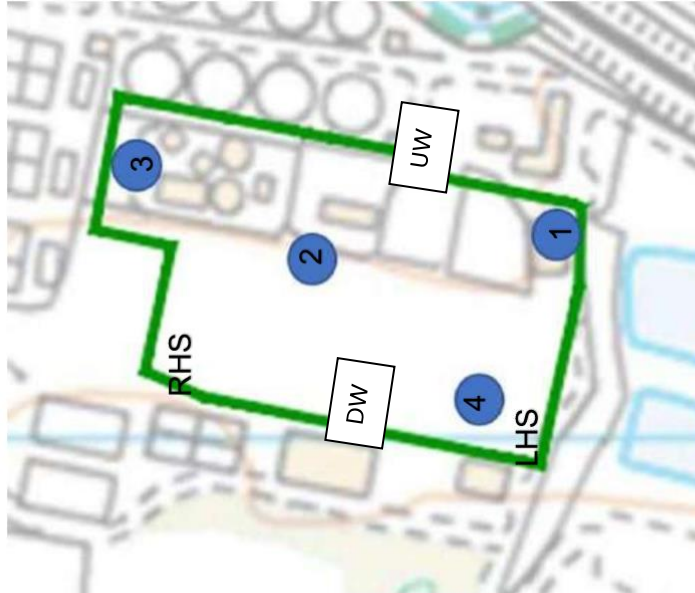
## 5. Plan

A standard map is shown on the next page. The operational boundary of the site is shown in red and the sample points are shown and labelled.



Bioaerosol Monitoring – Estimated Concentrations of Airborne Micro Organisms		Job Number 113844
Site	Old Whittington, Yorkshire	Site Operator
Date	05/09/22	Yorkshire Water Services Ltd
Types of materials processed on site	Municipal solid waste	Commissioning Laboratory
		EMT Environmental

Site boundary marked on in Green.



## 6. Discussion

Samples for this monitoring were collected using the filter option of the guidance document M9.

It is important to continue to monitor the site. It would be particularly useful to monitor on a day when the prevailing wind is in a different direction.

Whilst it is possible to replicate the sampling points, many other variables will have changed such as temperature, wind speed and wind direction. As such this monitoring is only a snapshot of the situation on site, not a complete picture. The sampling should be carried out at least quarterly to build up an idea of the characteristics of the site.

There were no nearby activities observed which could adversely impact the upwind results.

All results for total bacteria and *Aspergillus fumigatus* (AF) were below the limits.

It should be noted that the fixed points were undertaken in addition to the required sampling locations at the request of Yorkshire Water.

## 7. Conclusions

Element Materials Technology Environmental UK Limited was commissioned by Yorkshire Water Services Ltd to carry out a bioaerosol monitoring exercise at the Waste Water Treatment Works at their site in Old Whittington, Yorkshire.

Measurements were carried out in accordance with parameters specified in Technical Guidance Note M9 'Environmental monitoring of bioaerosols at regulated facilities'. Of the methods suggested in the protocol, the filter method was utilised in this project.

All results for total bacteria and *Aspergillus fumigatus* (AF) were below the limits.

The site would be due to be re-assessed in December 2022 assuming the standard frequency requested by the Environment Agency.

### Appendix 1. Analysis Certificates



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**Biodet**

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OL3 5DT

Our Ref: ELE/22/15

Date: 22<sup>nd</sup> September 2022

**BIOAEROSOL EXPOSURE REPORT**

Log No. 3077  
Sample date. 5<sup>th</sup> September 2022  
Engineer: Abigail Pickard  
Job no.: 113844

Twenty-six IOM bioaerosol exposure heads were received on 6<sup>th</sup> September 2022.  
Occupational exposure events were monitored:

Sample no.	Sample ID	Date	Volume (litres)
Bio1	S1A	05/09/2022	120
Bio2	S1B	05/09/2022	120
Bio3	S1C	05/09/2022	120
Bio4	S2A	05/09/2022	120
Bio5	S2B	05/09/2022	120
Bio6	S2C	05/09/2022	120
Bio7	S3A	05/09/2022	120
Bio8	S3B	05/09/2022	120
Bio9	S3C	05/09/2022	120
Bio10	S4A	05/09/2022	120
Bio11	S4B	05/09/2022	120
Bio12	S4C	05/09/2022	120
Bio13	UW 01	05/09/2022	120
Bio14	UW 02	05/09/2022	120
Bio15	UW 03	05/09/2022	120
Bio16	DW RHS 01	05/09/2022	120
Bio17	DW RHS 02	05/09/2022	120
Bio18	DW RHS 03	05/09/2022	120
Bio19	DW 01	05/09/2022	120
Bio20	DW 02	05/09/2022	120
Bio21	DW 03	05/09/2022	120
Bio22	DW LHS 01	05/09/2022	120

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Bio23	DW LHS 02	05/09/2022	120
Bio24	DW LHS 03	05/09/2022	120
Bio25	Blank 01	05/09/2022	120
Bio26	Blank 02	05/09/2022	120

The IOM heads containing a polycarbonate filter were used to determine the bioaerosol exposure under the test conditions. Upon arrival at the laboratory the bioaerosols impacted on each filter were recovered in 3 ml maximum recovery diluent. The target micro-organisms were cultured using appropriate dilutions on the following media.

Nutrient agar (NA) agar plates were used for total bacteria.  
Malt extract agar (MEA) agar plates were used for *Aspergillus fumigatus*.

The samples were incubated for 2 days at 37C (total bacteria) and for 2 days at 44C (*Aspergillus fumigatus*).



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**Results:**

**Date** 5<sup>th</sup> September 2022

**Comments:** All polycarbonate filters and filter heads were in good condition.

**Table 1. Microbiological Culture Plate Data:**

Sample no.	Sample ID	Volume (litres)	Total Bacteria (cfu per plate)	Total <i>Aspergillus fumigatus</i> (cfu per plate)
Bio1	S1A	120	0, 0	0, 0
Bio2	S1B	120	0, 0	0, 0
Bio3	S1C	120	1, 0	0, 0
Bio4	S2A	120	0, 0	0, 0
Bio5	S2B	120	0, 0	0, 0
Bio6	S2C	120	0, 0	0, 0
Bio7	S3A	120	4, 1	0, 0
Bio8	S3B	120	1, 0	0, 0
Bio9	S3C	120	0, 0	0, 0
Bio10	S4A	120	0, 0	0, 0
Bio11	S4B	120	0, 0	0, 0
Bio12	S4C	120	0, 0	0, 0
Bio13	UW 01	120	2, 1	0, 0
Bio14	UW 02	120	0, 0	0, 0
Bio15	UW 03	120	0, 0	0, 0
Bio16	DW RHS 01	120	1, 1	0, 0
Bio17	DW RHS 02	120	1, 1	0, 0
Bio18	DW RHS 03	120	0, 0	0, 0
Bio19	DW 01	120	1, 0	0, 0
Bio20	DW 02	120	1, 0	0, 0
Bio21	DW 03	120	0, 0	0, 0
Bio22	DW LHS 01	120	0, 0	0, 0
Bio23	DW LHS 02	120	0, 0	0, 0
Bio24	DW LHS 03	120	0, 0	0, 0
Bio25	Blank 01	n/a	5, 7	0, 0
Bio26	Blank 02	n/a	1, 0	0, 0

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**Table 2. Microbiological Results:**

Sample no.	Sample ID	Volume (litres)	Total Bacteria (cfu per m <sup>3</sup> )	Total <i>Aspergillus fumigatus</i> (cfu per m <sup>3</sup> )
Bio1	S1A	120	<125	<125
Bio2	S1B	120	<125	<125
Bio3	S1C	120	125	<125
Bio4	S2A	120	<125	<125
Bio5	S2B	120	<125	<125
Bio6	S2C	120	<125	<125
Bio7	S3A	120	625	<125
Bio8	S3B	120	125	<125
Bio9	S3C	120	<125	<125
Bio10	S4A	120	<125	<125
Bio11	S4B	120	<125	<125
Bio12	S4C	120	<125	<125
Bio13	UW 01	120	375	<125
Bio14	UW 02	120	<125	<125
Bio15	UW 03	120	<125	<125
Bio16	DW RHS 01	120	250	<125
Bio17	DW RHS 02	120	250	<125
Bio18	DW RHS 03	120	<125	<125
Bio19	DW 01	120	125	<125
Bio20	DW 02	120	125	<125
Bio21	DW 03	120	<125	<125
Bio22	DW LHS 01	120	<125	<125
Bio23	DW LHS 02	120	<125	<125
Bio24	DW LHS 03	120	<125	<125
Bio25	Blank 01	n/a	180 per membrane	<15 per membrane
Bio26	Blank 02	n/a	15 per membrane	<15 per membrane

Exposure results are expressed as total micro-organisms per cubic metre collected during the exposure time.

BIODET



22<sup>nd</sup> September 2022

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