

# Mitchell Laithes 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.

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## **Mitchell Laithes 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 Mitchell Laithes STF**

The nearest residential property to Mitchell Laithes STF is located approximately 240m from the north-northwest of the installation boundary. Emley Moor Meteorological Station is located approximately 8km south-west of Mitchell Laithes STF and it is likely to experience similar wind directions and frequencies as the site. Data for 2018 suggest the frequency of wind direction from the south-east to the north-west was high. This increases the potential for this property to be affected by possible bioaerosol emissions that may arise from the STF.

Although the nearest residential receptor is just under 250m from the installation boundary (therefore within the 100m to 250m range when declines towards background levels are to be expected), a precautionary approach has been taken within this application and consideration has been given to the potential for impact from bioaerosols as a result of activities at Mitchell Laithes STF. This review follows a source-pathway-receptor model to evaluate risk, giving consideration to the characteristics of the waste

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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,

material, plant design and the operational controls in place to mitigate the risks from bioaerosols. This is summarised in Table 1.

Source	Source controls	Pathway	Receptors	Overall risk
Raw sludge reception	Sludge is pumped from tankers initially to an open screen feed tank and then via pipelines to receiving enclosed storage tanks. Displaced air is extracted and dispersed to atmosphere (see separate entry below). Unloading activities occur infrequently. The distance between this source and the nearest residential receptor is >250m.	Airborne dispersion	The nearest residential receptors are Pump House Cottages off Long Lane approximately 240m to the north-northwest of the installation boundary.	Low
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	The nearest industrial site (at Scarr End Mill) is located approximately 235m to the northwest of installation boundary.  Kirklees/Wakefield	Low
Sludge handling – screening, dewatering and digestion	Sludge is fully enclosed within tanks or pipework at all times. Displaced air is extracted and dispersed to atmosphere (see separate entry below).	None	Way passes through woodland approximately 175m to the north-northeast of the digester area,	No risk present – sludge is fully enclosed
Digester feed tank	Sludge is liquid in nature, does not produce dust and is not readily susceptible to airborne dispersion.	None	although this would	No risk present – sludge is fully enclosed

Source	Source controls	Pathway	Receptors	Overall risk
	The digester feed tank is located east of the digester area and therefore at a greater distance from the receptors identified to the north-northwest of the site. The distance between this source and the receptors is approximately 450m and therefore the receptors are unlikely to be affected.		only typically be used in a transitory manner.  There are no other residential or industrial/commercial receptors, and no schools or hospitals within 250m of bioaerosol sources.	
Odour extraction and dispersion stack	Sludge is liquid in nature, does not produce dust and is not readily susceptible to airborne dispersion.  The distance between this source and the nearest residential receptor is >250m. Overall, any effects are likely to be not significant.	Airborne dispersion		Low
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		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.	None		Very low

Source	Source controls	Pathway	Receptors	Overall risk
	Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up.			
Digested sludge dewatering feed tanks (covered) 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 AD achieving high levels of pathogen kill. Bioaerosols generation potential is therefore very low.	None	The nearest residential receptors are Pump House Cottages off Long Lane approximately 240m to the north-northwest	No risk present – sludge is fully enclosed
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 very low. Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion.	Airborne dispersion	of the installation boundary.  The nearest industrial site (at Scarr End Mill) is located approximately 235m	Very low
Digested sludge cake handling (and, as a contingency measure, possible short-term storage) – conditioning pad	Digested sludge has been processed at high temperature via AD achieving high levels of pathogen kill. Bioaerosol generation potential is therefore very low. Digested sludge cake. Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion. The cake is	Airborne dispersion	to the northwest of installation boundary The Kirklees/Wakefield Way paths run adjacent to the northern edge of the	Very low

Source	Source controls	Pathway	Receptors	Overall risk
	delivered to the cake pad, stored in windrows and is then left undisturbed until removal from site.		eastern digested sludge cake pad, although this would only typically be used in a transitory manner.	
Vehicle tracking of materials around on the cake pad and roads, which could dry out and disperse	Regular washdown and wetting 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.			Very low

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

## 1.4 Site Operation and monitoring

Although the individual assets at Mitchell Laithes 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.

At Mitchell Laithes STF, there are a number of sources adjacent to each other, it is therefore not possible to monitor the bioaerosol effect from individual point sources. Bioaerosol monitoring will therefore be considered at the site boundary and sources will be considered a combined single area (fig 1).



Fig 1 – Mitchell Laithes 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 dispersion of odour emissions from site. There is currently no wind station on site to measure meteorological conditions.

Emley Moor meteorological station is the closest representative station for Mitchell Laithes STF. The meteorological station is located approximately 8km south-west of the site and is to be considered comparable to the meteorological conditions on site. The meteorological data from Emley Moor meteorological station has been incorporated into the site's odour



risk assessment whereby wind direction and frequency are used to determine the “pathway effectiveness” from source to receptor. Wind direction and speed is also included as part of the on-site sniff testing (see Section 5.1 Sniff Testing).

The wind rose plot for Emley Moor meteorological station is included in Figure 5. There is currently no wind station on site to measure meteorological conditions. When a meteorological station is installed in line with the site’s environmental permit, onsite wind conditions will be taken into consideration in relation to this site specific bioaerosol risk assessment.

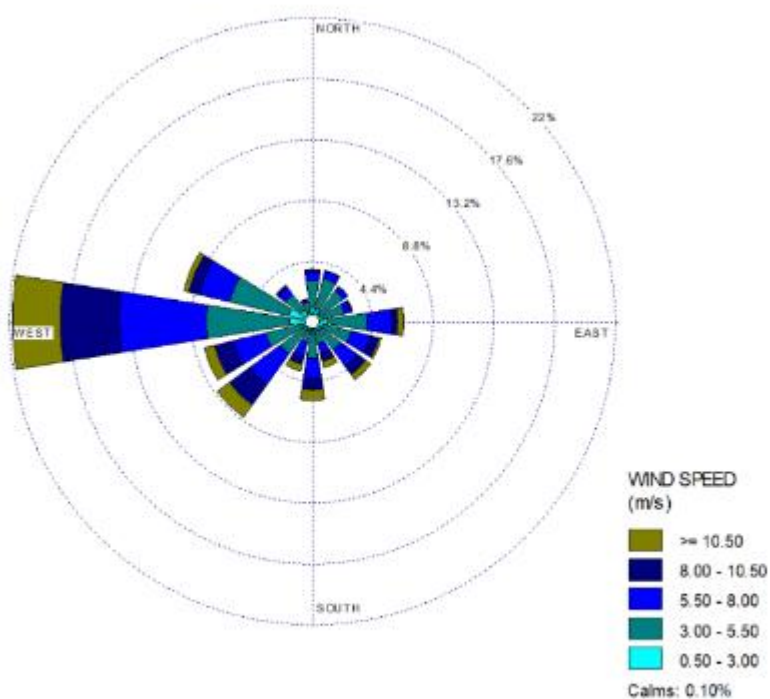


Fig 2 – Emley Moor STF NWP Wind Rose Plot (NWP)

## 1.6 Site Monitoring Locations

The wind conditions will always be taken into consideration when conducting the bioaerosol monitoring. 1 upwind and 3 downwind samples in a fan shape will be undertaken. As the monitoring will be dictated by onsite wind conditions, the sampling locations may not match the prevailing wind as dictated in figure 2.

All sampling will be undertaken in line with EA M9 sampling guidance.

In December 2023, a one off monitoring assessment was undertaken, the monitoring locations are replicated in figure 3. The wind conditions did not match the expected westerly wind results (figure 2). Wind conditions will always be noted and reported within the bioaerosol monitoring report.

One upwind sampling location (marked with a blue dot on fig 3) was used to measure upwind concentrations of bioaerosols. Three samples were taken in a fan shape arrangement downwind of STF operations.

Any future monitoring locations will be dictated by the onsite wind conditions at the time of sampling and may or may not match figure 3. Samples will be taken and assessed for the parameters and against the threshold limits given in table 2.

As a one off assessment for the permit application, YW also requested some additional fixed sampling locations. These details and associated results can be found in the bioaerosol monitoring report dated November 2021.



Figure 3 – Mitchell Laithes 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 6<sup>th</sup> December 2023 (appendix 1). Sampling was undertaken at 3 downwind and one upwind location on site, with three parallel samples collected per location. 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 four sampling 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 the Mitchell Laithes STF installation is not considered to be a significant source of bioaerosols and the likelihood of bioaerosols causing negative impacts at nearby receptors is low or very low. This is due to:

- All potential bioaerosol sources at Mitchell Laithes STF are wet, do not produce dust and are not readily susceptible to airborne dispersion.
- Digested sludge has been processed at high temperature via AD achieving high levels of pathogen kill. Bioaerosol generation potential from digested sludge source is therefore very low.

Notwithstanding the conclusions of this risk assessment, as a precautionary measure given the proximity of a small number of receptors, YW has undertaken quantitative bioaerosols monitoring in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'. This risk assessment will be updated upon receipt of the monitoring data.

Appendix 1 – Bioaerosol Monitoring Report by Element Materials Technology Environment UK Limited.



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Report: **Bioaerosol Monitoring**  
Client: Yorkshire Water Services Ltd  
Date of Site Work: 6<sup>th</sup> December 2023

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Issue date: 22<sup>nd</sup> January 2024  
Report Ref: **115637 V2**

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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 Dewsbury site. Monitoring was undertaken in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'.

Site work was undertaken by Ruta Pienauskaite on 6<sup>th</sup> December 2023.

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	<125
	<i>Aspergillus fumigatus</i>	500	<125
Cake Storage Pad	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Rear Digester Compound	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Primary Tank 2 / SAS – Tank 1	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125
Secondary Filter	Total bacteria	1000	<125
	<i>Aspergillus fumigatus</i>	500	<125

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

<b>Below Limit</b>	<b>Exceeds Limit</b>
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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 Dewsbury.

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 Ruta Pienauskaite of Element Materials Technology Environmental UK Ltd on 6<sup>th</sup> December 2023.

## 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 3 ml maximum recovery diluent. The target micro-organisms were cultured using appropriate dilutions on the following media.

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

Samples were incubated for two days at 37°C (total mesophilic bacteria), and for two days at 44°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 Dewsbury. 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 – Standard Samples**

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 air temperature °C	Arithmetic mean of relative humidity (%)	Prevailing weather conditions including cloud cover
				Mean wind speed (mph)	Site Operator	Commissioning Laboratory			
Upwind	120	300	180	3	1	1	81	Sunny, 2/8	
Downwind	300	300	0	3	1	1	81	Sunny, 2/8	
Downwind Left Hand Fan	279	300	30	3	1	1	81	Sunny, 2/8	
Downwind Right Hand Fan	330	300	30	3	1	1	81	Sunny, 2/8	

**Table 2. Environmental Parameters - Bioaerosol monitoring – Additional Boundary Samples**

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 °)	Mean wind speed (mph)	Types of materials processed on site	Arithmetic mean of air temperature °C	Arithmetic mean of relative humidity (%)	Prevailing weather conditions including cloud cover
Cake Storage Pad	320	300	20	3	Waste Water	1	81	Sunny, 2/8
Rear Digester Compound	0	300	300	3		1	81	Sunny, 2/8
Primary Tank 2/SAS – Tank 1	35	300	265	3		1	81	Sunny, 2/8
Secondary Filter	140	300	160	3		1	81	Sunny, 2/8

Site:	Dewsbury	Site Operator	Commissioning Laboratory	Job Number 115637
Date:	6 <sup>th</sup> December 2023	Yorkshire Water Services Ltd	EMT Environmental	Yorkshire Water Services Ltd

#### 4. Measurement Results

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

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

Site:		Dewsbury				Site Operator:			Job Number 115637 Yorkshire Water Services Ltd	
Date:		6 <sup>th</sup> December 2023				Commissioning Laboratory:			Waste Water EMT Environmental	
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	
Cake Storage Pad	115637-1 A01	190	20			TB	<125			
	115637-1 A02	190	20	11:23 – 12:23	60	TB	<125	TB: <125	-	
	115637-1 A03	190	20			TB	125			
Cake Storage Pad	115637-1 A01	190	20			AF	<125			
	115637-1 A02	190	20	11:23 – 12:23	60	AF	<125	AF: <125	-	
	115637-1 A03	190	20			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. Sampling Point B: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms									
Site:		Dewsbury		6 <sup>th</sup> December 2023		Site Operator:		Job Number 115637	
Activities affecting Bioaerosol Conc <sup>n</sup>		None		Types of materials processed on site:		Commissioning Laboratory:		Yorkshire Water Services Ltd 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
Rear Digester Compound	115637-1 B01	85	300			TB	<125		
	115637-1 B02	85	300	11:16 – 12:16	60	TB	<125	TB: <125	-
	115637-1 B03	85	300			TB	<125		
Rear Digester Compound	115637-1 B01	85	300			AF	<125		
	115637-1 B02	85	300	11:16 – 12:16	60	AF	<125	AF: <125	-
	115637-1 B03	85	300			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. Sample Point C: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms									
Dewsbury					Site Operator:				
Date: 6 <sup>th</sup> December 2023					Commissioning Laboratory:				
Activities affecting Bioaerosol Conc <sup>n</sup>					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 airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Primary Tank 2 / SAS – Tank 1	115637-1 C01	80	265			TB	125		
	115637-1 C02	80	265	11:08 – 12:08	60	TB	<125	TB: <125	-
	115637-1 C03	80	265			TB	<125		
Primary Tank 2 / SAS – Tank 1	115637-1 C01	80	265			AF	<125		
	115637-1 C02	80	265	11:08 – 12:08	60	AF	<125	AF: <125	-
	115637-1 C03	80	265			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 D: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Dewsbury				Site Operator:		Job Number 115637	
Date:		6 <sup>th</sup> December 2023				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
Secondary Filter	115637-1 D01	90	160			TB	<125		
	115637-1 D02	90	160	11:31 – 12:31	60	TB	<125	TB: <125	-
	115637-1 D03	90	160			TB	<125		
Secondary Filter	115637-1 D01	90	160			AF	<125		
	115637-1 D02	90	160	11:31 – 12:31	60	AF	<125	AF: <125	-
	115637-1 D03	90	160			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 7. Upwind: 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
Upwind	115637-2 UW01	500	180			TB	<125		
	115637-2 UW02	500	180	13:29 – 14:29	60	TB	<125	TB: <125	-
	115637-2 UW03	500	180			TB	<125		
Upwind	115637-2 UW01	500	180			AF	<125		
	115637-2 UW02	500	180	13:29 – 14:29	60	AF	<125	AF: <125	-
	115637-2 UW03	500	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 8. 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	115637-2 DW01	240	0			TB	<125		
	115637-2 DW02	240	0	13:42 – 14:32	60	TB	<125	TB: <125	-
	115637-2 DW03	240	0			TB	<125		
Downwind	115637-2 DW01	240	0			AF	<125		
	115637-2 DW02	240	0	13:42 – 14:42	60	AF	<125	AF: <125	-
	115637-2 DW03	240	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
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**Table 9. Downwind Left Hand Fan: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms**

Site:		Dewsbury		Job Number 115637		Yorkshire Water Services Ltd			
Date:		6 <sup>th</sup> December 2023		EMT Environmental		Waste Water			
Activities affecting Bioaerosol Conc <sup>n</sup>		None		Commissioning Laboratory:		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 airborne microorganisms (CFU/m <sup>3</sup> )*	Median of parallel samples (CFU/m <sup>3</sup> )	Comments
Downwind Left Hand Fan	115637-2 DWL01	300	30			TB	1375		
	115637-2 DWL02	300	30	13:37 – 14:37	60	TB	125	TB: 125	-
	115637-2 DWL03	300	30			TB	<125		
Downwind Left Hand Fan	115637-2 DWL01	300	30			AF	<125		
	115637-2 DWL02	300	30	13:37 – 14:37	60	AF	<125	AF: <125	-
	115637-2 DWL03	300	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 10. Downwind Right Hand Fan: 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 Right Hand Fan	115637-2 DWR01	200	30	13:44 – 14:44	60	TB	<125	TB: <125	-
	115637-2 DWR02	200	30			TB	<125		
	115637-2 DWR03	200	30			TB	<125		
Downwind Right Hand Fan	115637-2 DWR01	200	30	13:44 – 14:44	60	AF	<125	AF: <125	-
	115637-2 DWR02	200	30			AF	<125		
	115637-2 DWR03	200	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 11. Controls and Filter Counts - Bioaerosol monitoring		Date: 6 <sup>th</sup> December 2023		Job Number: 115637	
Site: Dewsbury		Site Operator : Yorkshire Water Services Ltd		Commissioning Laboratory : EMT Environmental	
Location	Sample Ref Number	Microbial Type	Average Count of microorganisms (CFU/filter)	Types of materials processed on site : Waste Water	
Cake Storage Pad	115637-1 A01	TB	0.0	None received	
		AF	0.0		
Cake Storage Pad	115637-1 A02	TB	0.0	None received	
		AF	0.0		
Cake Storage Pad	115637-1 A03	TB	1.0	None received	
		AF	0.0		
Rear Digester Compound	115637-1 B01	TB	0.0	None received	
		AF	0.0		
Rear Digester Compound	115637-1 B02	TB	0.0	None received	
		AF	0.0		
Rear Digester Compound	115637-1 B03	TB	0.0	None received	
		AF	0.0		
Primary Tank 2 / SAS - Tank 1	115637-1 C01	TB	1.0	None received	
		AF	0.0		
Primary Tank 2 / SAS - Tank 1	115637-1 C02	TB	0.0	None received	
		AF	0.0		
Primary Tank 2 / SAS - Tank 1	115637-1 C03	TB	0.0	None received	
		AF	0.0		
Secondary Filter	115637-1 D01	TB	0.0	None received	
		AF	0.0		
Secondary Filter	115637-1 D02	TB	0.0	None received	
		AF	0.0		
Secondary Filter	115637-1 D03	TB	0.0	None received	
		AF	0.0		

**Table 12. Controls and Filter Counts - Bioaerosol monitoring**  
Site: Dewsbury Date: 6<sup>th</sup> December 2023

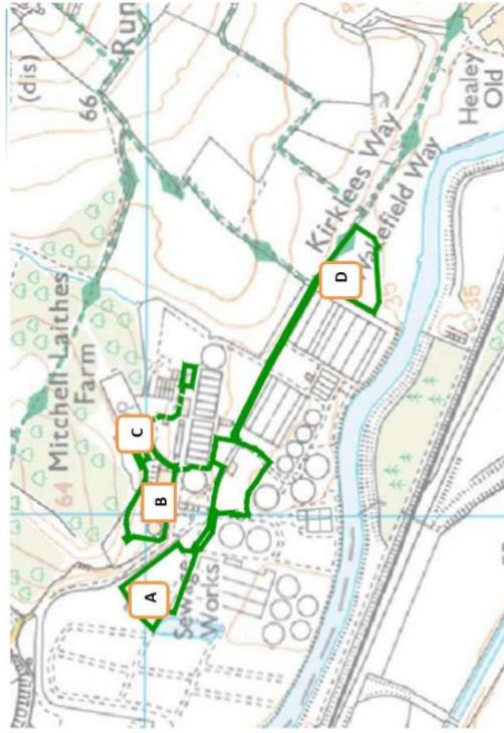
Location		Sample Ref Number	Microbial Type	Types of materials processed on site : Waste Water		Comments
				Average Count of microorganisms (CFU/filter)		
Upwind		115637-2 UW01	TB	0.0		None received
			AF	0.0		
Upwind		115637-2 UW02	TB	0.0		None received
			AF	0.0		
Upwind		115637-2 UW03	TB	0.0		None received
			AF	0.0		
Downwind		115637-2 DW01	TB	0.0		None received
			AF	0.0		
Downwind		115637-2 DW02	TB	0.0		None received
			AF	0.0		
Downwind		115637-2 DW03	TB	0.0		None received
			AF	0.0		
Downwind Left Hand Fan		115637-2 DWL01	TB	10.1		None received
			AF	0.0		
Downwind Left Hand Fan		115637-2 DWL02	TB	1.0		None received
			AF	0.0		
Downwind Left Hand Fan		115637-2 DWL03	TB	0.0		None received
			AF	0.0		
Downwind Right Hand Fan		115637-2 DWR01	TB	0.0		None received
			AF	0.0		
Downwind Right Hand Fan		115637-2 DWR02	TB	0.0		None received
			AF	0.0		
Downwind Right Hand Fan		115637-2 DWR03	TB	0.0		None received
			AF	0.0		

Job Number: 115637  
Commissioning Laboratory : EMT Environmental

## 5. Plan

A standard map is shown on the next page. The sample points are shown and labelled.

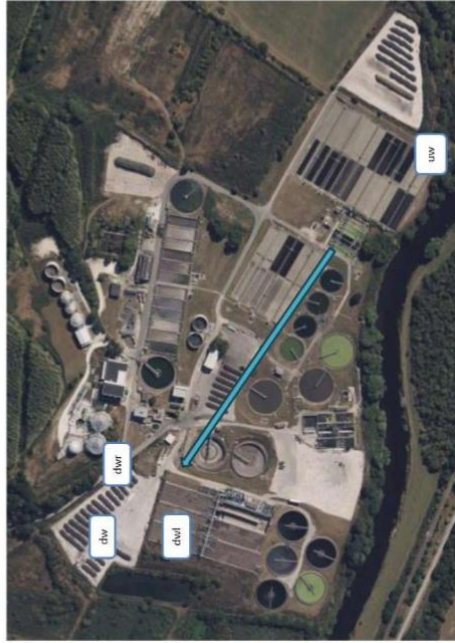
<b>Bioaerosol Monitoring – Estimated Concentrations of Airborne Micro Organisms</b>		Job Number 115637
Site	Dewsbury	Site Operator Yorkshire Water Services Ltd
Date	6 <sup>th</sup> December 2023	Commissioning Laboratory EMT Environmental
Types of materials processed on site	Waste Water	



Location Ref:	Sample Ref:
A	115637-1 A01
B	115637-1 B01
C	115637-1 C01
D	115637-1 D01
	115637-1 A02
	115637-1 B02
	115637-1 C02
	115637-1 D02
	115637-1 A03
	115637-1 B03
	115637-1 C03
	115637-1 D03



Bioaerosol Monitoring – Estimated Concentrations of Airborne Micro Organisms			
Site	Dewsbury	Job Number	115637
Date	6 <sup>th</sup> December 2023	Site Operator	Yorkshire Water Services Ltd
Types of materials processed on site	Waste Water	Commissioning Laboratory	EMT Environmental



Location Ref:	Sample Ref:
UW	115637-2 UW01
DW	115637-2 DW01
DWL	115637-2 DWL01
DWR	115637-2 DWR01
	115637-2 UW02
	115637-2 DW02
	115637-2 DWL02
	115637-2 DWR02
	115637-2 UW03
	115637-2 DW03
	115637-2 DWL03
	115637-2 DWR03

## 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.

Results for *Aspergillus fumigatus* (AF) were low at all sampled locations and below limits.

Results for median total bacteria at all locations were below the stated limits. However, total bacteria measured on one of the three samples at DWL01 was higher than the stated limit. Since the results from DWL02 and DWL03 do not correlate with the result for DWL01, it is reasonable to assume that the result measured is anomalous.

## 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 Dewsbury.

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 *Aspergillus fumigatus* (AF) were below the limits and all total median bacteria were below the limits.

Results for median total bacteria at all locations were below the stated limits. However, total bacteria measured on one of the three samples at DWL01 was higher than the stated limit. Since the results from DWL02 and DWL03 do not correlate with the result for DWL01, it is reasonable to assume that the result measured is anomalous.

The site would be due to be re-assessed in June 2024 assuming the standard frequency requested by the Environment Agency.

### Appendix 1. Analysis Certificates

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Fax 01707 285046Ruta Pienauskaite  
Element Materials Technology,  
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Delph,  
Oldham,  
OL3 5DT

Our Ref: ELE/23/34

Date: 2<sup>nd</sup> January 2024**BIOAEROSOL EXPOSURE REPORT 115637-1**Log No. 4810  
Sample date. 6<sup>th</sup> December 2023  
Engineer: Ruta Pienauskaite  
Job no.: 115637-1Fifteen IOM bioaerosol exposure heads were received on 7<sup>th</sup> December 2023.  
Occupational exposure events were monitored:

Sample no.	Sample ID	Date	Volume (litres)
Bio1	A01	06/12/2023	120
Bio2	A02	06/12/2023	120
Bio3	A03	06/12/2023	120
Bio4	B01	06/12/2023	120
Bio5	B02	06/12/2023	120
Bio6	B03	06/12/2023	120
Bio7	C01	06/12/2023	120
Bio8	C02	06/12/2023	120
Bio9	C03	06/12/2023	120
Bio10	D01	06/12/2023	120
Bio11	D02	06/12/2023	120
Bio12	D03	06/12/2023	120
Bio13	Blank01	06/12/2023	n/a
Bio14	Blank02	06/12/2023	n/a
Bio15	Blank03	06/12/2023	n/a

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 (mesophilic bacteria) and for 2 days at 44C (*Aspergillus fumigatus*).

**Results:**

**Site** 115637-1

**Date** 6<sup>th</sup> December 2023

**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	A01	120	0, 0	0, 0
Bio2	A02	120	0, 0	0, 0
Bio3	A03	120	1, 0	0, 0
Bio4	B01	120	0, 0	0, 0
Bio5	B02	120	0, 0	0, 0
Bio6	B03	120	0, 0	0, 0
Bio7	C01	120	1, 0	0, 0
Bio8	C02	120	0, 0	0, 0
Bio9	C03	120	0, 0	0, 0
Bio10	D01	120	0, 0	0, 0
Bio11	D02	120	0, 0	0, 0
Bio12	D03	120	0, 0	0, 0
Bio13	Blank01	N/A	0, 0	0, 0
Bio14	Blank02	N/A	0, 0	0, 0
Bio15	Blank03	N/A	1, 0	0, 0

**Table 2. Microbiological Results:**

Sample no.	Sample ID	Volume (litres)	Mesophilic Bacteria (cfu per m <sup>3</sup> )	Total <i>Aspergillus fumigatus</i> (cfu per m <sup>3</sup> )
Bio1	A01	120	<125	<125
Bio2	A02	120	<125	<125
Bio3	A03	120	125	<125
Bio4	B01	120	<125	<125
Bio5	B02	120	<125	<125
Bio6	B03	120	<125	<125
Bio7	C01	120	125	<125
Bio8	C02	120	<125	<125
Bio9	C03	120	<125	<125
Bio10	D01	120	<125	<125
Bio11	D02	120	<125	<125
Bio12	D03	120	<125	<125
Bio13	Blank01	N/A	<15 per membrane	<15 per membrane
Bio14	Blank02	N/A	<15 per membrane	<15 per membrane
Bio14	Blank03	N/A	15 per membrane	<15 per membrane

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



2<sup>nd</sup> January 2024

Richard Smith  
DIRECTOR OF BIODET

ELE/23/35  
Issue no.1**University of  
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Fax 01707 285046Ruta Pienauskaite  
Element Materials Technology,  
Lawton Square,  
Delph,  
Oldham,  
OL3 5DT

Our Ref: ELE/23/35

Date: 18<sup>th</sup> December 2023**BIOAEROSOL EXPOSURE REPORT 115637-2**Log No. 4810  
Sample date. 6<sup>th</sup> December 2023  
Engineer: Ruta Pienauskaite  
Job no.: 115637-2Fifteen IOM bioaerosol exposure heads were received on 7<sup>th</sup> December 2023.  
Occupational exposure events were monitored:

Sample no.	Sample ID	Date	Volume (litres)
Bio1	UW01	06/12/2023	120
Bio2	UW02	06/12/2023	120
Bio3	UW03	06/12/2023	120
Bio4	DW01	06/12/2023	120
Bio5	DW02	06/12/2023	120
Bio6	DW03	06/12/2023	120
Bio7	DWLD1	06/12/2023	120
Bio8	DWLD2	06/12/2023	120
Bio9	DWLD3	06/12/2023	120
Bio10	DWR01	06/12/2023	120
Bio11	DWR02	06/12/2023	120
Bio12	DWR03	06/12/2023	120
Bio13	Blank01	06/12/2023	n/a
Bio14	Blank02	06/12/2023	n/a
Bio15	Blank03	06/12/2023	n/a

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 (mesophilic bacteria) and for 2 days at 44C (*Aspergillus fumigatus*).

**Results:**

**Site** 115637-2

**Date** 6<sup>th</sup> December 2023

**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	UW01	120	0, 0	0, 0
Bio2	UW02	120	0, 0	0, 0
Bio3	UW03	120	0, 0	0, 0
Bio4	DW01	120	0, 0	0, 0
Bio5	DW02	120	0, 0	0, 0
Bio6	DW03	120	0, 0	0, 0
Bio7	DWL01	120	10, 1	0, 0
Bio8	DWL02	120	1, 0	0, 0
Bio9	DWL03	120	0, 0	0, 0
Bio10	DWR01	120	0, 0	0, 0
Bio11	DWR02	120	0, 0	0, 0
Bio12	DWR03	120	0, 0	0, 0
Bio13	Blank01	N/A	0, 0	0, 0
Bio14	Blank02	N/A	0, 0	0, 0
Bio15	Blank03	N/A	0, 0	0, 0

**Table 2. Microbiological Results:**

Sample no.	Sample ID	Volume (litres)	Mesophilic Bacteria (cfu per m <sup>3</sup> )	Total <i>Aspergillus fumigatus</i> (cfu per m <sup>3</sup> )
Bio1	UW01	120	<125	<125
Bio2	UW02	120	<125	<125
Bio3	UW03	120	<125	<125
Bio4	DW01	120	<125	<125
Bio5	DW02	120	<125	<125
Bio6	DW03	120	<125	<125
Bio7	DWL01	120	1375	<125
Bio8	DWL02	120	125	<125
Bio9	DWL03	120	<125	<125
Bio10	DWR01	120	<125	<125
Bio11	DWR02	120	<125	<125
Bio12	DWR03	120	<125	<125
Bio13	Blank01	N/A	<15 per membrane	<15 per membrane
Bio14	Blank02	N/A	<15 per membrane	<15 per membrane
Bio14	Blank03	N/A	<15 per membrane	<15 per membrane

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



18<sup>th</sup> December 2023

Richard Smith  
DIRECTOR OF BIODET