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Report:	**Ambient Bioaerosol Monitoring**
Client:	Severn Trent Green Power Ltd
Date of Site Work:	14th March 2023
Areas:	Boundary Monitoring Around Anaerobic Digestion Facility
Prepared for:	Maria Priestley Permits and Accreditation Officer Parc Stormy Stormy Down Porthcawl Bridgend Mid Glamorgan CF33 4RS
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Issue date:	27th April 2023
Report Ref:	**114501 V1**

CONTENTS

Executive Summary

Maria Priestley of Severn Trent Green Power Ltd requested that Element Materials Technology Environmental UK Limited undertake monitoring of ambient bioaerosols at its Bridgend site. Monitoring was undertaken in accordance with Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities'.

Site work was undertaken by Andy Fisher on 14th March 2023.

The purpose of the bioaerosol monitoring exercise was to establish the amount of bioaerosols being dispersed from the site to the nearest sensitive receptor, as permitted by Natural Resources Wales.

Monitoring Findings:

Sampling Location	Analyte	Permit Limit (CFU/m^3)	Median Concentration of Parallel Samples (CFU/m^3)
Upwind	Total bacteria	1000	<125
	Aspergillus fumigatus	500	<125
Downwind*	Total bacteria	1000	250
	Aspergillus fumigatus	500	<125
Downwind Right Hand Fan	Total bacteria	1000	<125
	Aspergillus fumigatus	500	<125
Downwind Left Hand Fan	Total bacteria	1000	250
	Aspergillus fumigatus	500	<125

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

Below Permit Limit	Exceeds Permit Limit

* tripod sample set blown over during monitoring period

1. Introduction

Element Materials Technology Environmental UK Ltd was commissioned by Severn Trent Green Power Ltd to carry out an ambient bioaerosol monitoring exercise around the Anaerobic Digestion Facility at their Bridgend site.

The purpose of the bioaerosol monitoring exercise was to establish the amount of bioaerosols being dispersed from the site to the nearest sensitive receptor, as per permitted by Natural Resources Wales. 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 Andy Fisher of Element Materials Technology Environmental UK Ltd on 14th March 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.
Due to access issues both upwind and downwind samples were taken within the site boundaries. The site supervisor was not aware of permissions to enter the adjacent arable fields, and because the access road around the perimeter fence was metres lower than the site embankment it was deemed most appropriate to sample inside the site boundary, on top of the embankment.
During any future monitoring events, it would be preferable to sample ouside the boundary on the arable fields, if permissions to access can be arranged.
The upwind sample was positioned withina fence area towards the site entrance, as again, it was not possible for the site to confirm access permssions to the neibouring site.

The upwind sample was taken more north easterly than NW due to ease of access and suitability of surroundings. The wind strength was minimal, and direction was subject to change between northerly and north-easterly during the setup and the monitoring periods.

The onsite weather station did not display wind speed or direction, so reference was made to conditions at ground level and online weather for Bridgend area (predominantly a Westerly wind towards 88 degress).
Downwind and fan sample locations were slightly off the desired bearings, but deemed to be more appropriate due to the topography and access.

Triplicate samples were carried out at each selected sampling location; these were approximately 50 to 85 metres from centre of operations (within the site boundaries). Once completed, filters were transferred to the laboratory. The laboratory reported that samples were not received until 17th March, but deemed the samples of suitable condition to culture and proceeded with analysis.

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 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

Severn Trent Green Power Ltd operates an anaerobic digestion (AD) facility at their Bridgend site, South Wales, which processes mainly local authority waste and also some commercial solid and liquid food waste (including packaging).The Parc Stormy site is located in Stormy Down, near Porthcawl, and shares the site with Cenin Renewables which operate an incinerated Bottom ash concrete processing plant close Cenin is located on the west portion of the site; further west is a quarry.

The Severn Trent AD Facility has arable fields to the south and the east of the site.The land just north of the access road appears to be a disused quarry now a water reservoir. The nearest residential sensitive receptor is located east and slightly north on the road approaching the A48. Refer to plans in Section 5 for a map of the local area and a map of the sampling locations on the day of the survey.

A permit had been issued to Severn Trent Green Power Ltd by Natural Resources Wales for the emission of bioaerosols implementing the following limits:

Parameter	Threshold limit (CFU/m^3)
Total bacteria (TB)	1000
Aspergillus fumigatus (AF)	500

Table 1. Environmental Parameters - Bioaerosol monitoring						Job Number 114501	
Site:		Bridgend, S. Wales		Site Operator		Severn Trent Green Power Ltd	
Date:		14/03/2023		Commissioning Laboratory		EMT Environmental	
Estimated Mass of Materials:		50,00 tonnes per year		Types of materials processed on site		Local authority & commercial food waste (solid & liquid)	
Location	**Bearing of samplers from boundary of operational area (degrees º)**	**Mean direction the wind blows to during the sampling period (degrees º)**	**Difference in bearing between location of samplers from boundary and mean direction wind blows to (degrees º)**	**Mean wind speed (mph)**	**Arithmetic mean of air temperature ºC**	**Arithmetic mean of relative humidity (%)**	**Prevailing weather conditions including cloud cover**
Upwind	300	88	212	15	8	65	Mostly cloudy but with sunny spells, windy with occasional strong gusts
Downwind	60	88	22	15	8	65	Mostly cloudy but with sunny spells, windy with occasional strong gusts
Downwind Right Hand Fan	90	88	2	15	8	65	Mostly cloudy but with sunny spells, windy with occasional strong gusts
Downwind Left Hand Fan	30	88	58	15	8	65	Mostly cloudy but with sunny spells, windy with occasional strong gusts

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									Job Number 114501
Site:			Bridgend, S. Wales		Site Operator:				Severn Trent Green Power Ltd
Date:			14/03/2023		Commissioning Laboratory:				EMT Environmental
Activities affecting Bioaerosol Conc^{n}			None		Types of materials processed on site:				Local authority & commercial food waste (solid & liquid)
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 ^{o})**	**Sampling Times**	**Sampling duration (mins)**	**Microbial Type**	**Calculated concentration of airborne microorganisms (CFU/m^3)***	**Median of parallel samples (CFU/m^3)**	**Comments**
Upwind	114501 – 01	75	212	13:28 – 14:28	60	TB	<125	TB: <125	-
	114501 – 02	75	212			TB	<125		
	114501 - 03	75	212			TB	125		
Upwind	114501 – 01	75	212	13:28 – 14:28	60	AF	<125	AF: <125	-
	114501 – 02	75	212			AF	<125		
	114501 – 03	75	212			AF	<125		

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

Below permit limit	**Exceeds permit limit**

Table 3. Downwind: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms								Job Number 114501	
Site:			Bridgend, S. Wales		Site Operator:			Severn Trent Green Power Ltd	
Date:			14/03/2023		Commissioning Laboratory:			EMT Environmental	
Activities affecting Bioaerosol Conc^{n}			None		Types of materials processed on site:			Local authority & commercial food waste (solid & liquid)	
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 ^{o})**	**Sampling Times**	**Sampling duration (mins)**	**Microbial Type**	**Calculated concentration of airborne microorganisms (CFU/m^3)***	**Median of parallel samples (CFU/m^3)**	**Comments**
Downwind	114501 – 04	65	22	13:36 – 14:36	60	TB	250	TB: 250	Samples potentially compromised. Tripod stand situated between AD vessels subjected to gust of wind and blew over during monitoring period.
	114501 – 05	65	22			TB	<125		
	114501 – 06	65	22			TB	375		
Downwind	114501 – 04	65	22	13:36 – 14:36	60	AF	<125	AF: <125	
	114501 – 05	65	22			AF	<125		
	114501 – 06	65	22			AF	<125		

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

Below permit limit	**Exceeds permit limit**

Table 4. Downwind Right Hand Fan: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms								Job Number 114501	
Site:			Bridgend, S. Wales		Site Operator:			Severn Trent Green Power Ltd	
Date:			14/03/2023		Commissioning Laboratory:			EMT Environmental	
Activities affecting Bioaerosol Conc^{n}			None		Types of materials processed on site:			Local authority & commercial food waste (solid & liquid)	
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 ^{o})**	**Sampling Times**	**Sampling duration (mins)**	**Microbial Type**	**Calculated concentration of airborne microorganisms (CFU/m^3)***	**Median of parallel samples (CFU/m^3)**	**Comments**
Downwind Right Hand Fan	114501 – 07	50	2	13:39 – 14:39	60	TB	<125	TB: <125	-
	114501 – 08	50	2			TB	125		
	114501 – 09	50	2			TB	<125		
Downwind Right Hand Fan	114501 – 07	50	2	13:39 – 14:39	60	AF	<125	AF: <125	-
	114501 – 08	50	2			AF	<125		
	114501 – 09	50	2			AF	<125		

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

Below permit limit	**Exceeds permit limit**

Table 5. Downwind Left Hand Fan: Bioaerosol monitoring – Estimated Concentrations of Airborne Micro-organisms								Job Number 114501	
Site:			Bridgend, S. Wales		Site Operator:			Severn Trent Green Power Ltd	
Date:			14/03/2023		Commissioning Laboratory:			EMT Environmental	
Activities affecting Bioaerosol Conc^{n}			None		Types of materials processed on site:			Local authority & commercial food waste (solid & liquid)	
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^3)***	**Median of parallel samples (CFU/m^3)**	**Comments**
Downwind Left Hand Fan	114501 – 10	80	58	13:33 – 14:33	60	TB	250	TB: 250	-
	114501 – 11	80	58			TB	<125		
	114501 – 12	80	58			TB	250		
Downwind Left Hand Fan	114501 – 10	80	58	13:33 – 14:33	60	AF	<125	AF: <125	-
	114501 – 11	80	58			AF	<125		
	114501 – 12	80	58			AF	<125		

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

Below permit limit	**Exceeds permit limit**

Table 6. Controls and Filter Counts - Bioaerosol monitoring				Job Number: 114501
Site: Bridgend, S. Wales	Date: 14/03/2023	Site Operator : Severn Trent Green Power Ltd	Commissioning Laboratory : EMT Environmental	
Types of materials processed on site :		Local authority & commercial food waste (solid & liquid)		

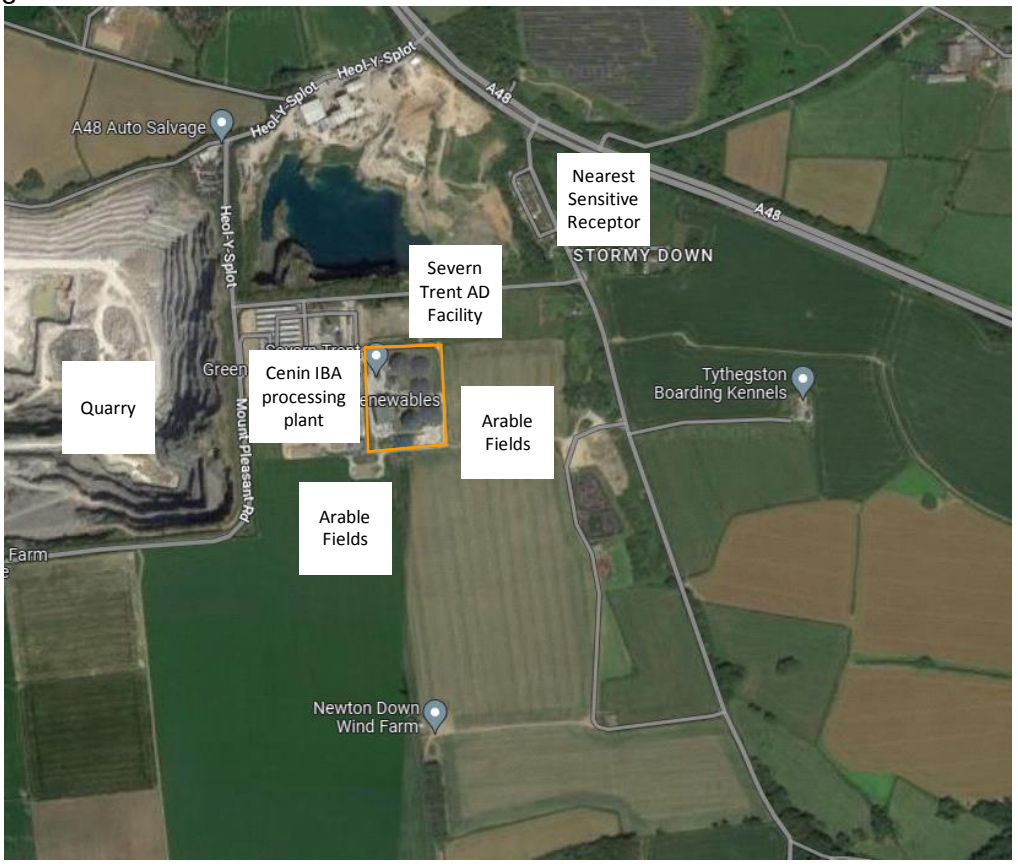
Location	Sample Ref Number	Microbial Type	Average Count of microorganisms (CFU/filter)	Comments
Upwind	114501 – 01	TB	0,0	None received
		AF	0,0	
Upwind	114501 – 02	TB	0,0	None received
		AF	0,0	
Upwind	114501 – 03	TB	1,0	None received
		AF	0,0	
Downwind	114501 – 04	TB	0,0	Samples potentially compromised. Tripod stand situated between AD vessels subjected to gust of wind and blew over during monitoring period.
		AF	2,0	
Downwind	114501 – 05	TB	0,0	
		AF	0,0	
Downwind	114501 – 06	TB	2,1	
		AF	0,0	
Downwind Right Hand Fan	114501 – 07	TB	0,0	None received
		AF	0,0	
Downwind Right Hand Fan	114501 – 08	TB	1,0	None received
		AF	0,0	
Downwind Right Hand Fan	114501 – 09	TB	0,0	None received
		AF	0,0	
Downwind Left Hand Fan	114501 – 10	TB	0,2	None received
		AF	0,0	
Downwind Left Hand Fan	114501 – 11	TB	0,0	None received
		AF	0,0	
Downwind Left Hand Fan	114501 – 12	TB	1,1	None received
		AF	0,0	

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 114501	
Site	Bridgend, South Wales	Site Operator	Severn Trent Green Power Ltd
Date	14/03/2023	Commissioning Laboratory	EMT Environmental
Types of materials processed on site	Local authority & commercial food waste (solid & liquid)		

Site boundary marked in as orange



Bioaerosol Monitoring – Estimated Concentrations of Airborne Micro Organisms		Job Number: 114501	
Site	Bridgend, South Wales	Site Operator	Severn Trent Green Power Ltd
Date	14/03/2023	Commissioning Laboratory	EMT Environmental
Types of materials processed on site	Local authority & commercial food waste (solid & liquid)		

6. Discussion

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

If access permissions to surrounding arable land can be arranged during future site monitoring, this would be preferable to sampling within the boundary of the site.

The operations and site traffic of the adjacent company Cenin Renewables was contributing to some dust generation, but otherwise no nearby activities were observed which could adversely impact the upwind results.

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.

All results for *Aspergillus fumigatus* (AF) were below the site permit limits.
All of the results were below the site permit limit for total bacteria.

6.1 Mitigation Measures

1. Inspections of buildings and equipment should be made regularly. Also ensure that maintenance is carried out in line with a maintenance schedule.
2. Weather data logged using an onsite weather station.
3. Material transportation should be carried out within sheeted vehicles.

7. Conclusions

Element Materials Technology Environmental UK Limited was commissioned by Severn Trent Green Power Ltd to carry out a bioaerosol monitoring exercise at the Anaerobic Digestion Facility in Bridgend, South Wales.

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.

The data results during this exercise show that median results for total bacteria were within the permit limits.

The data results show that median results for *Aspergillus fumigatus* were below the site permit values.

The site is due to be re-assessed in June 2023.

Appendix 1. Analysis Certificates

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Biodet
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Rob Jones
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Lawton Square,
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Our Ref: ELE/23/02

Date: 22nd March 2023

BIOAEROSOL EXPOSURE REPORT

Log No. 955
Sample date. 14th March 2023
Engineer: Andy Fisher
Job no.: 114501

Fourteen IOM bioaerosol exposure heads were received on 17th March 2023.
Occupational exposure events were monitored:

Sample no.	Sample ID	Date	Volume (litres)
Bio1	UW 01	14/03/2023	120
Bio2	UW 02	14/03/2023	120
Bio3	UW 03	14/03/2023	120
Bio4	DW 01	14/03/2023	120
Bio5	DW 02	14/03/2023	120
Bio6	DW 03	14/03/2023	120
Bio7	DW RHF 01	14/03/2023	120
Bio8	DW RHF 02	14/03/2023	120
Bio9	DW RHF 03	14/03/2023	120
Bio10	DW LHF 01	14/03/2023	120
Bio11	DW LHF 02	14/03/2023	120
Bio12	DW LHF 03	14/03/2023	120
Bio13	Blank 01	14/03/2023	N/A
Bio14	Blank 02	14/03/2023	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*.

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

Results:

Site **114501**
Date 14th March 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 *Aspergillus fumigatus* (cfu per plate)
Bio1	UW 01	120	0, 0	0, 0
Bio2	UW 02	120	0, 0	0, 0
Bio3	UW 03	120	1, 0	0, 0
Bio4	DW 01	120	2, 0	0, 0
Bio5	DW 02	120	0, 0	0, 0
Bio6	DW 03	120	2, 1	0, 0
Bio7	DW RHF 01	120	0, 0	0, 0
Bio8	DW RHF 02	120	1, 0	0, 0
Bio9	DW RHF 03	120	0, 0	0, 0
Bio10	DW LHF 01	120	0, 2	0, 0
Bio11	DW LHF 02	120	0, 0	0, 0
Bio12	DW LHF 03	120	1, 1	0, 0
Bio13	Blank 01	N/A	0, 0	0, 0
Bio14	Blank 02	N/A	0, 0	0, 0

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Table 2. Microbiological Results:

Sample no.	Sample ID	Volume (litres)	Total Bacteria (cfu per m^3)	Total *Aspergillus fumigatus* (cfu per m^3)
Bio1	UW 01	120	<125	<125
Bio2	UW 02	120	<125	<125
Bio3	UW 03	120	125	<125
Bio4	DW 01	120	250	<125
Bio5	DW 02	120	<125	<125
Bio6	DW 03	120	375	<125
Bio7	DW RHF 01	120	<125	<125
Bio8	DW RHF 02	120	125	<125
Bio9	DW RHF 03	120	<125	<125
Bio10	DW LHF 01	120	250	<125
Bio11	DW LHF 02	120	<125	<125
Bio12	DW LHF 03	120	250	<125
Bio13	Blank 01	N/A	<15 per membrane	<15 per membrane
Bio14	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.

22nd March 2023

BIODET