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Green Power

Parc Stormy Anaerobic Digestion Facility (EPR/AB3191FR)

Site Specific Bioaerosols Risk Assessment – Improvement Condition 2

Severn Trent Green Power (Bridgend) Ltd.

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

This Site Specific Bioaerosol Risk Assessment (SSBRA) has been compiled to discharge the requirements of Improvement Condition 2 of the Parc Stormy Anaerobic Digestion Facility environmental permit (EPR/AB3191FR) and has been produced in accordance with the technical guidance note 'M9: environmental monitoring of bioaerosols at regulated facilities'.

The purpose of this Site Specific Bioaerosol Risk Assessment is to:
- Establish the likely sources of bioaerosols arising from proposed operations at the site
- Assess the potential for significant risk of impact at sensitive locations due to emissions from the identified sources
- Identify any additional mitigation required to control potential effects

This report also suggests a bioaerosols monitoring regime for Parc Storm AD facility taking account of the data from bioaerosols monitoring undertaken at other STGP sites, Roundhill FWAD and Colehill FWAD facilities.

1.1.1 Bioaerosols and health effects

A bioaerosol can be defined as a micro-organism and their reproductive structure, cells and cellular waste material, suspended in the air. This can include: moulds, bacteria, fungus and their degradation products and toxins. These particles come from organic matter, including plants, soil, animals and humans.

Bioaerosols are generally 0.02-100 μm in size and can therefore by-pass the hairs and specialised cells that line the nose. As such, they are able to penetrate deep into the lungs, causing respiratory inflammation, cough, gastrointestinal illness, eye irritation and dermatitis. Particularly relevant to this assessment is Aspergillus Fumigatus which mainly arises from waste recycling processes, including anaerobic digestion. Exposure to Aspergillus Fumigatus can result in severe infections which particularly effect individuals with immunodeficiency.

Although some data is available, one of the major knowledge gaps for bioaerosols is their associated dose-response relationships. It is not currently possible to state with any certainty that a given concentration will result in a particular health impact. This is due to the number of bioaerosols that are naturally present within the environment as well as the complexities associated with human responses to different microorganisms.

Permit condition 3.6.1 specifies that bioaerosols monitoring must be undertaken, with the limits at sensitive receptors specified in Table S3.4:
- Aspergillus fumigatus - 500cfu/m3
- Total bacteria - 1,000cfu/m3.

1.2 Site Location and Context

Parc Stormy Anaerobic Digestion facility is located at Stormy Down, Porthcawl, Bridgend, CF33 4RS and incorporates: primary and secondary digester tanks, storage tank, pumping containers, pasteurisation tanks, CHP units and associated ancillary equipment, silage clamp, reception building, bio-filter and a site office. The facility is permitted under S5.4 Part A(1)(b)(i) of the Environmental Permitting (England and Wales) Regulations 2016 as amended (environmental permit reference EPR/AB3191FR). The site layout and permit boundary is marked on the plan included in Schedule 7 of the permit.

The process can be briefly described as:

- **Feedstock** - The site will operate using biodegradable organic waste feedstock in the form of solid and liquid waste. The feedstock will be delivered to site and weighed before unloading within an enclosed reception building. This will be kept at negative pressure and vented air will be treated by a biofilter to minimise the potential for the release of pollutants.
- **AD operation** - The feedstock will be digested within the plant in completely sealed tanks. The biogas produced (a mixture of methane (CH_4) and carbon dioxide (CO_2)) will be stored in the digesters and storage tanks prior to use in a biogas engine where it will be combusted for the generation of electricity. Exhaust gases will be released through a dedicated stack via the biofilter.
- **Digestate** - The process will create digestate which can be used as a high-quality fertiliser. Sealed tankers will be used to transport the material off-site for final utilisation.

A flare is also included at the plant for emergency venting of biogas during emergency/ abnormal operation.

The operation of the plant may result in bioaerosol emissions and the potential to cause impacts at sensitive locations within the vicinity of the site have therefore been assessed within this report.

2.0 BASELINE

2.1 Sources of bioaerosols

The proposed AD facility has the potential to release bioaerosols from the following sources:

- Reception building - during the handling and preparation of incoming waste;
- Biofilter

These potential sources have been considered in the following Sections.

2.1.1 Reception Building

Any disturbance of the dry waste material stored in the reception building will have the potential to cause bioaerosol emissions. After the waste is deposited into the reception building, it is shredded and separated. This will result in the emission of bioaerosols; however, the reception building is fully enclosed with material only deposited once doors are closed. The building will be maintained under negative pressure and the air will be passed through the biofilter, carrying any bioaerosols through the filter. Water is added after the shredding process and the potential for bioaerosol release is therefore eliminated.

The anaerobic digestion process is an enclosed, wet process with the air directed to the biofilter. This ensures there is no potential for bioaerosol release from this source.

2.1.2 Biofilter

The biofilter is an enclosed vessel containing a packed bed of organic material, such as peat, which acts as a substrate for micro-organisms. When the air from other sources within the process is directed through the biofilter, it is contacted with the micro-organisms which degrade the pollutants in the air stream. The cleaned air is then dispersed with any residual pollutants through a dedicated exhaust. As such, there is the potential for bioaerosols to be emitted from this source. The stack height is 6m to assist dispersion.

2.1.3 Other off-site sources of Bioaerosols

A desk-top study indicated that the proposed development is located in a predominantly agricultural location with significant industrial premises to the West including a large quarry and mineral processing facility. Agricultural activities surrounding the site may also contribute to background bioaerosol levels.

2.2 Sensitive Receptors

Technical Guidance Note 'M9: environmental monitoring of bioaerosols at regulated facilities' defines a sensitive receptor as follows:

"Nearest sensitive receptor means the nearest place to the permitted activities where people are likely to be for prolonged periods. This term would therefore apply to dwellings (including any associated gardens) and to many types of workplaces. We would not normally regard a place where people are likely to be present for less than 6 hours at one time as being a sensitive receptor. The term does not apply to those controlling the permitted facility, their staff when they are at work or to visitors to the facility, as their health is covered by Health and Safety at Work legislation but would apply to dwellings occupied by the family of those controlling the facility.

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that required specific consideration during the assessment - the assessment has focused on risks within 250m of the facility. The sensitive receptors identified are summarised in Table 1. Reference should be made to Appendix 1 for a visual representation of the sensitive receptor location.

Table 1 Sensitive Receptor

Receptor		NGR (m)		Distance from facility (m)	Direction from Facility
		X	Y		
I1	Industrial – Cenin Ltd	284119	180093	105	West

2.3 Meteorological Conditions

The potential for bioaerosols to impact at sensitive locations depends significantly on the meteorology, particularly wind direction, during emissions. In order to consider prevailing conditions at the site review of meteorological data was undertaken. The closest observation station to the facility is Pyle, Bridgend which is approximately 2.5km northwest of Parc Stormy AD facility. It is considered that conditions are likely to be reasonably similar over a distance of this magnitude and the information is a suitable source of data for an assessment of this nature. Reference should be made to Figure 1 for Wind speed and Figure 2 for Wind rose of the meteorological data. Please note that the concentric circles on the wind rose are hours per year the wind blows from a direction.

From Figure 2 it can be seen that the total wind frequency for westerly- north westerly winds is 3.4%. This is the direction most likely to impact the sensitive receptor shown in Table 2.

Figure 1 – Wind Speed taken from Observation station at Pyle, Bridgend

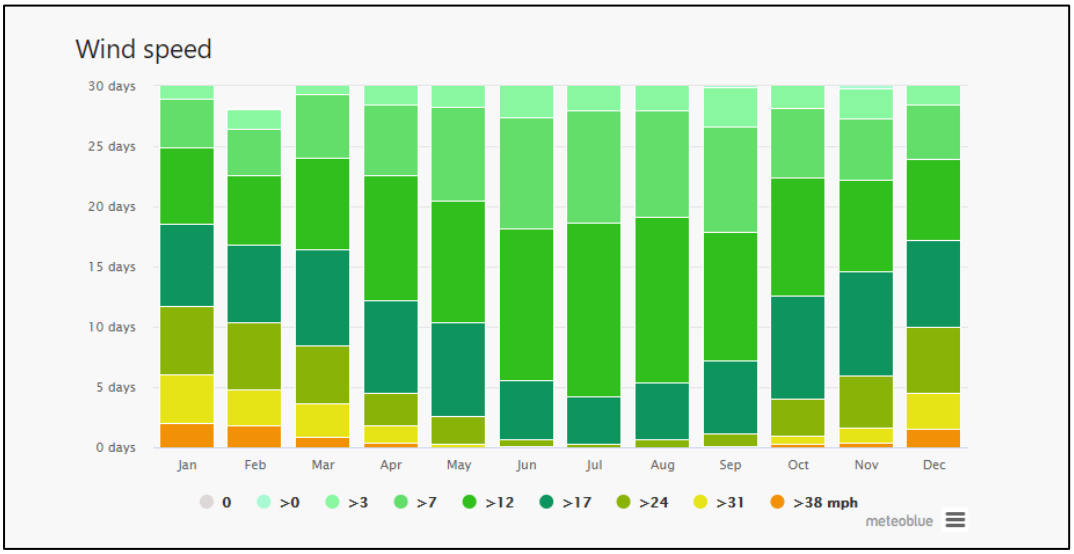
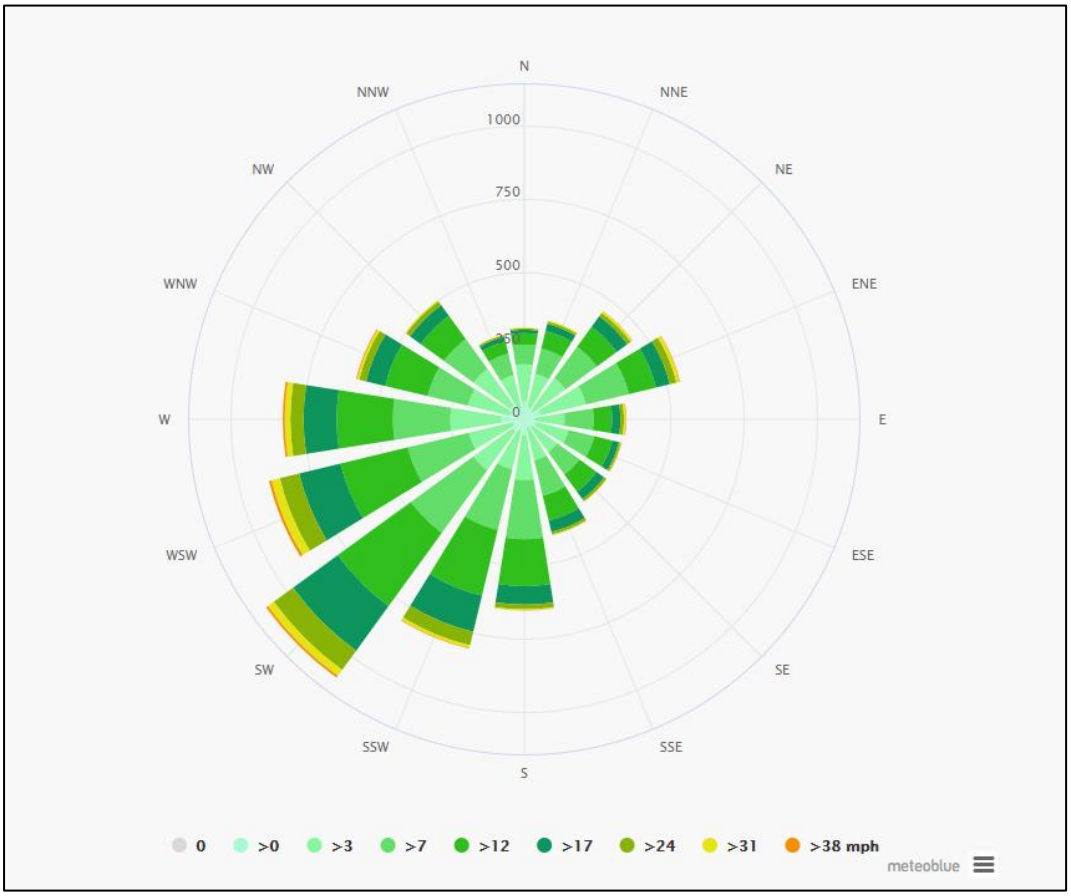


Figure 2 – Wind Rose for Pyle, Bridgend



All meteorological data used in the assessment was taken from https://www.meteoblue.com

3.0 RISK ASSESSMENT

3.1 Key Parameters for this Assessment

The Risk Assessment has been undertaken in accordance with the general principles of EA document 'Horizontal Guidance Note H1: Environmental Risk Assessment for Permits' and associated annexes. This included consideration of the following:

- Receptor - what is at risk? What do I wish to protect?
- Source - what is the agent or process with potential to cause harm?
- Harm - what are the harmful consequences if things go wrong?
- Pathway - how might the receptor come into contact with the source?
- Probability of exposure - how likely is this contact?
- Consequence - how severe will the consequences be if this occurs?
- Magnitude of risk - what is the overall magnitude of the risk? and,
- Justification for magnitude - on what did I base my judgement?

Based on the Risk Assessment outcomes potential mitigation and control options were identified.

Further explanation for the key assessment areas is provided below.

3.1.1 Harm

The severity of harm from a risk depends on:

How much a person or part of the environment is exposed; and,
How sensitive a person or part of the environment is.

Some parts of the environment can be very sensitive. For example, serious health effects can occur if humans are exposed to certain chemicals for only short periods of time.

3.1.2 Consequence of Risk

The consequence of risk considers the nature of the source, the hazard and the risk. It also considers the likelihood of exposure of the specific receptor to the identified source. This depended on several factors, such as:

- Distance between source and receptor;
- Dispersion potential of emission;
- Duration of emission; and,
- Frequency of emission.

3.1.3 Magnitude of Risk

The level of risk is a combination of:

- How likely a problem is to occur; and,
- How serious the harm might be.

Risk is highest where both the likelihood of a problem is high and the potential harm is severe. Risk is lowest where a problem is unlikely to occur and the harm that might result is not serious.

3.2 Risk Assessment - Problem Definition

The objective of this risk assessment is to assess the potential of risk to human health as a result of exposure to bioaerosol emissions associated with the AD facility. Only sensitive receptors within 250m have been considered in this assessment.

3.3 Tier 1 Risk Assessment- Screening

The potential for a receptor to be impacted upon by bioaerosols has been assessed in Section 2.2. This indicates there is one sensitive receptor location positioned within the 250m zone of influence from the site. As such, a potential risk has been identified and Tier 2 - Generic Assessment is required.

3.4 Tier 2 - Generic Risk Assessment

Potential risks are summarised in the conceptual model in Table 2.

Table 2 Conceptual Model

Consideration	Comment
Source	Release of micro-organisms through the biofilter stack
Harm	Respiratory inflammation, coughs, gastrointestinal illness, eye irritation, dermatitis etc.
Transport Mechanism	Air-borne particles transported via the wind
Pathway	Inhalation, ingestion or absorption
Medium of Exposure	Air and deposited material
Receptor	Humans in industrial property

3.4.1 Probability of Harm

The probability of harm examines the likelihood of someone being exposed, which assists in assessing the scale of the consequence of the harm being realised. The descriptors for the probability of harm which are summarised in Table 3.

Table 3 Probability of Harm

Probability	Descriptor
High	Exposure is probable, direct exposure likely with no / few barriers between the source and receptor
Medium	Exposure is fairly probable, barriers less controllable
Low	Exposure unlikely, barriers exist which provide some mitigation
Very Low	Exposure very unlikely, multiple, effective barriers provide mitigation

Based on the descriptors provided within Table 3, it is considered that the probability of harm is low. The predominant wind direction is south Westerly, which is in the opposite direction to the industrial premises, Cenin Ltd. Additionally, the biofilter is fitted with a 6m high stack which will enable dispersion of emissions.

3.4.2 Consequence of Risk

The consequence of risk considers the nature of the source, the hazard and the receptor. Descriptors for the consequence of risk which are summarised in Table 4.

Table 4 Consequence of Risk

Probability	Descriptor
High	Severe Consequences, evidence that exposure may result in serious damage
Medium	Significant consequences, evidence that exposure may result in damage that is not severe and is reversible
Low	Minor consequences, damage is not apparent and reversible adverse changes possible
Very Low	Negligible consequences, no evidence for adverse change

The consequence is also based on the distance between the source and receptor and any mitigating factors. The sensitive receptor is located 105m away from the site boundary, as shown in Table 1. Between the biofilter and the sensitive receptor building there is the AD reception building which may impede the transport of bioaerosols towards the sensitive receptor.

3.4.3 Magnitude of Risk

By examining the probability of harm and the consequence of risk together the magnitude of risk can be determined. This is summarised in Table 5.

Table 5 Magnitude of Risk Matrix

Probability	Consequence			
	Very Low	**Low**	**Medium**	**High**
High	Low	Medium	High	High
Medium	Low	Medium	Medium	High
Low	Low	Low	Medium	Medium
Very Low	Very Low	Low	Low	Medium

A summary of the risk assessment for bioaerosols based on the descriptors provided in Table 4 and Table 5 and the matrix provided in Table 5 is summarised in Table 6.

Table 6 Bioaerosol Risk Assessment

Receptor	Source	Harm	Pathway	Probability of Exposure	Consequence	Magnitude of Risk	Justification	Risk Management	Residual Risk
Industrial – Cenin Ltd.	Reception building and biofilter	Human Health - respiratory inflammation, coughs, gastrointestinal illness, eye irritation, dermatitis etc.	Inhalation, ingestion or absorption	Low	Low	Low	Receptor is an industrial processing facility. The wind direction with the potential to transport bioaerosols in the direction of the receptor occurs for only 3.4 % of the year. The predominant wind direction is South Westerly. Dispersion is limited due to rainfall and wind speed	The reception building is an enclosed wet process and the building is kept at negative pressure. Vented air is treated by a biofilter to minimise releases. The stack will also aid the dispersion of potential emissions	Low **Not Significant**

4.0 PROPOSED BIOAEROSOLS MONITORING

In accordance with the EA's RPS 209 'Bioaerosol monitoring at Regulated Facilities', all existing permit holders had until 31 March 2019 to meet the bioaerosols monitoring requirements as specified in M9 if the facility is within 250m of a sensitive receptor. Two of our other AD plants in the north of STGP's area, Coleshill and Roundhill, were identified as requiring monitoring in line with this RPS. These two sites are sister sites to Parc Stormy, both designed and constructed by Agrivert. Both of these facilities are located on the Severn Trent sewage treatment works and therefore there is more likely to be a higher potential background of bioaerosols, particularly from the cake pads. Also, the screening of the digestate at the time of monitoring was being undertaken outside and therefore provided an additional source of bioaerosols compared to Parc Stormy AD plant.

Appendix 2 shows the reports from the quarterly bioaerosols monitoring undertaken at both these sites during 2019 with no exceedances of the limit specified on Table 3.4 of the permit:

- Aspergillus fumigatus - 500cfu/m3
- Total bacteria - 1,000cfu/m3.

As the monitoring reports at Roundhill and Coleshill AD facilities provide evidence that there is very low risk to sensitive receptors from our AD facilities, we propose that two rounds of bioaerosols monitoring within 12 months of approval by NRW are undertaken at Parc Stormy AD facility. Providing that these results are below the permit threshold we propose that no further bioaerosols monitoring will be required.

5.0 CONCLUSION

Bioaerosol emissions from a number of sources on site have the potential to cause impacts at sensitive receptors located within the vicinity of the site. A SSBRA was therefore undertaken to consider effects in the vicinity of the facility in accordance with Improvement Condition 2 of the permit.

Potential sources of bioaerosol emissions were identified and assessed: Tier 1 was utilised to identify any issues for assessment and Tier 2 provided a Generic Risk Assessment which summarises risk using a conceptual model and assessed them based on the probability of harm, consequence and magnitude of risk. The overall bioaerosol impacts as a result of the Parc Stormy AD facility are considered to be **not significant**.

Bioaerosols monitoring at Coleshill AD and Roundhill AD plants in 2019 demonstrate that the permit limit for Aspergillus fumigatus and Total bacteria were not exceeded and therefore the risk of bioaerosols to the sensitive receptor from Parc Stormy AD Facility are also very low.

Considering the above, we propose that two rounds of bioaerosols monitoring are undertaken within 12 months of approval by NRW at Parc Stormy AD facility. Providing that these results are below the bioaerosol permit limits we propose that no further bioaerosols monitoring will be required.

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APPENDIX 1 – Sensitive receptor location

Sensitive receptor

250m zone of influence

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APPENDIX 2 – Coleshill and Roundhill bioaerosol monitoring reports

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Roundhill AD facility bioaerosols monitoring reports (2019) – Enitial