

Palm Paper
King's Lynn
Air Quality Impact of Flare

1 Introduction

Fichtner Consulting Engineers Limited ("Fichtner") has been engaged to undertake an Air Quality Assessment to support the Environmental Permit (EP) application for an Anaerobic Digestion (AD) plant. The proposed AD plant will produce biogas which will be processed within a biogas treatment system (BGTS) to produce biomethane which will be used in the existing boilers on site, replacing natural gas. To allow for safe operation the AD plant will include flare.

This air quality technical note has been produced to explain the operation of the flare and the likely air quality impact of its operation.

2 Operation of flare

The flare is only expected to operate when:

- The desulphurisation equipment is out of commission - raw biogas will be flared which would have a hydrogen sulphide (H₂S) concentration of up to 10,000 ppmv.
- The BGTS is out of operation, but the desulphurisation process is running – clean biogas will be flared which would have a H₂S concentration of up to 100 ppmv; and
- The BGTS is operational but fails to achieve adequate biomethane quality for use in the boilers – clean biogas will be flared which would have a very low H₂S content.

The desulphurisation process has two lines to allow for some redundancy in the system to reduce the chance of needing to flare raw biogas. In addition, the AD process includes a large aerobic stage and associated bypass so the plant can reduce the biogas generation in the event that there are issues with the desulphurisation equipment or BGTS.

Generally, the flare is expected to only operate on rare occasions.

The expected exhaust gas parameters for the flare are set out in the following table.

Table 1: Exhaust gas parameters

Parameter	Units	Value
Stack height	m	7.9
Stack internal diameter	m	1.2
Exit flow velocity	m/s	13.3
Temperature	°C	850
Volume flow at operating conditions	Am ³ /h	54,000

Guidance for monitoring enclosed landfill gas flares (LFTGN 05¹) sets out the following emission standards for enclosed gas flares (all expressed at 5% reference oxygen content):

- Oxides of nitrogen – 150 mg/Nm³
- Total volatile organic compounds (TVOC) – 10 mg/Nm³
- Carbon monoxide – 50 mg/Nm³

It is expected that emissions from the flare would comply with these emission standards.

3 Local air quality

The site is located within the jurisdiction of the Borough Council of King's Lynn and West Norfolk (the "Borough Council"). As part of their commitment to LAQM the Borough Council is required to review local air quality. The latest annual status report (ASR) was published in June 2025 and includes monitoring data up to the end of 2024.

The Borough Council has declared an Air Quality Management Area (AQMA) due to concern over annual mean nitrogen dioxide levels. This AQMA is located approximately 2.2 km to the north-east of the proposed flare. The ASR explains that last exceedance of the annual mean Air Quality Assessment Level (AQAL) was during 2019 and there has been an improvement since. However, this AQMA is still in place until the Borough Council better understand the impacts from transport schemes in the local area.

The closest monitoring site is site 62, a roadside diffusion tube located approximately 1.4 km to the north-east of the proposed flare. Given its proximity to the site this will include a contribution from the existing combustion sources which form part of the Palm Paper installation. As set out in the ASR the monitored annual mean concentration between 2020 and 2024 at site 62 was between 7.9 µg/m³ and 10.9 µg/m³ – i.e. a maximum of ~27% of the annual mean AQAL. This demonstrates that local concentrations of nitrogen dioxide are well below the annual mean AQAL.

No monitoring of other substances released from the flare are carried out in the local area.

Figure 1 at the end of this note shows the location of the site and proposed flare. As shown the closest receptor is on the other side of the King's Lynn Power Station approximately 650 m to the south of the proposed flare. In the next closest receptors are the other side of the Palm Paper buildings over 1 km away to the north-east. There is also a residential receptor 1.1 km to the north-west along the A47 on the other side of the River Great Ouse.

4 Impact of the flare on air quality

The Environment Agency's H1 tool can be used to screen out emissions from requiring further assessment. This applies conservative dispersion factors to calculate the expected maximum ground level concentration based on the effective height of a release and the release concentration. The H1 tool does not account for the temperature or velocity of the release which affect the buoyancy and dispersion of the plume, nor does it account for the proximity to sensitive receptors.

As shown in Table 1 the release temperature of the flare is very high (~850°C) and the plume is therefore very buoyant. These characteristics cannot be accounted for within the H1 tool. In addition, as detailed in section 3 there are no sensitive receptors close to the site.

¹ Guidance for monitoring enclosed landfill gas flares (LFTGN05 v2 2010) Environment Agency – available at <https://www.gov.uk/government/publications/monitoring-enclosed-landfill-gas-flares-lftgn-05>

The flare would be a buoyant release but would only operate on rare occasions and for short periods. Given the buoyant nature of the plume, low number of operating hours, low levels of existing pollution, and lack of sensitive receptors close to the site, it is considered unlikely that emissions from the flare would have a significant impact on local air quality.

FICHTNER Consulting Engineers Limited

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Legend

- Residential Receptors
- Flare

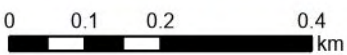
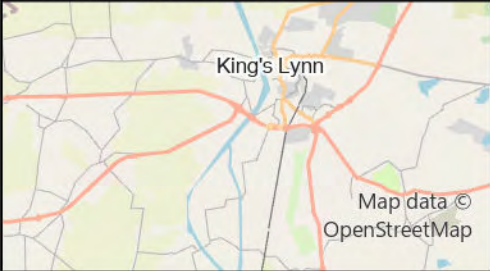
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Figure 1. Local Area

Drawn by: RSF

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Scale: 1:10,000



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