

SITE DETAILS

Name Mickelholme
Postcode DN15 0AD

BOILER DETAILS

Manufacturer	Model	Capacity	Number of boilers
Heizomat	RHK-AK 1000	990	1

FLUE EMISSIONS CALCULATIONS

The following calculations were carried out using:-

Boiler capacity:

Height of stack above ground:

Diameter of stack:

Height of buildings within

41 m from stack

Emission rate PM₁₀

Emission rate PM_{2.5}

Emission rate NO_x

PM₁₀ annual mean concentration at post code

PM_{2.5} annual mean concentration at post code

NO_x annual mean concentration at post code

NO_x hourly mean concentration at post code

	990	kW
	8.2	m
	510	mm
	6.4	m
	13.7	g/GJ
	13.7	g/GJ
	54.1	g/GJ
	14.6913	µg/m ³
0	7.816	µg/m ³
0	12.2929	µg/m ³
	12.2929	µg/m ³

Results

Effective stack height	2.88	m
Stack diameter	510	mm

	PM10	PM2.5	Annual Mean NOX	Hourly Mean NOX
Biomass Boiler Emission rate, g/s	0.013563	0.013563	0.053559	0.053559
Background concentration, µg m ⁻³	14.6913	7.816	12.2929	12.2929
Background adjusted emission rate g/s	0.000784	0.000789	0.001933	0.012213
Threshold emission rates for above effective stack height and diameter, g/s	0.001800	0.005000	0.005000	0.009100

Executive Summary

The table above shows the threshold emission rates determined for each pollutant metric. In each case the background adjusted emission rate is less than the threshold rate and so more detailed assessment is not required

Calculations

Effective stack height

$$C = 1.6 (U - H)$$

where:

C = effective stack height

U = actual stack height

8.2

H = height of tallest building within 5 x stack height

6.4

C =	2.88
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PM10 Background

$$E_a = E / (32 - G)$$

Where

E_a = background adjusted emissions rate (g/s)

E = emissions rate (g/s)

0.013563

G = annual average background concentration (ug/m³)

14.6913

E = Boiler emissions (g/GJ) x 10⁻⁶ x Boiler net thermal input capacity

Boiler emissions

13.7

10⁻⁶

0.000001

Boiler capacity

990

Emissions rate (g/s)

0.013563

PM10 E _a =	0.00078359
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PM2.5 Background

$$E_a = E / (25 - G)$$

Where

E_a = background adjusted emissions rate (g/s)

E = emissions rate (g/s)

0.013563

G = annual average background concentration (ug/m³)

7.816

E = Boiler emissions (g/GJ) x 10⁻⁶ x Boiler net thermal input capacity

Boiler emissions

13.7

10⁻⁶

0.000001

Boiler capacity

990

Emissions rate (g/s)

0.013563

PM2.5 E _a =	0.00078928
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Nox Background (annual mean)

$E_a = E / (40 - G)$

Where	E_a = background adjusted emissions rate (g/s)	
	E = emissions rate (g/s)	0.053559
	G = annual average background concentration (ug/m3)	12.2929

E = Boiler emissions (g/GJ) x 10^{-6} x Boiler net thermal input capacity

Boiler emissions	54.1
10^{-6}	0.000001
Boiler capacity	990
Emissions rate (g/s)	0.053559

Annual	NOx E_a =	0.00193304
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Nox Background (hourly mean)

$E_a = 40E / (200 - 2G)$

Where	E_a = background adjusted emissions rate (g/s)	
	E = emissions rate (g/s)	0.053559
	G = annual average background concentration (ug/m3)	12.2929

E = Boiler emissions (g/GJ) x 10^{-6} x Boiler net thermal input capacity

Boiler emissions	54.1
10^{-6}	0.000001
Boiler capacity	990
Emissions rate (g/s)	0.053559

Hourly	NOx E_a =	0.01221315
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Compiled by



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Checked by



29/06/2020

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CIBSE LOW CARBON CONSULTANT

Approved for Low Carbon Building Operations to comply with the Building regulations and the EPBD in the United Kingdom

Approved for Low Carbon Building Design to comply with the Building regulations and the EPBD in the United Kingdom

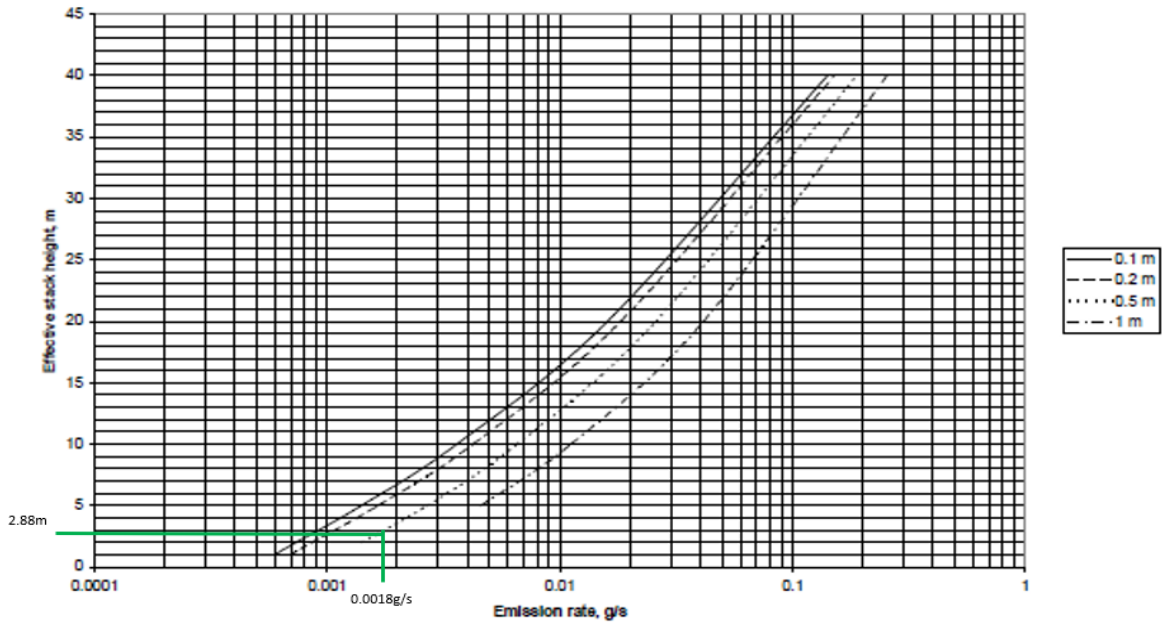
DD 07831 379 766

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Appendix - Threshold Emissions Rates Nomographs

PM10 – nomograph at figure 3.1

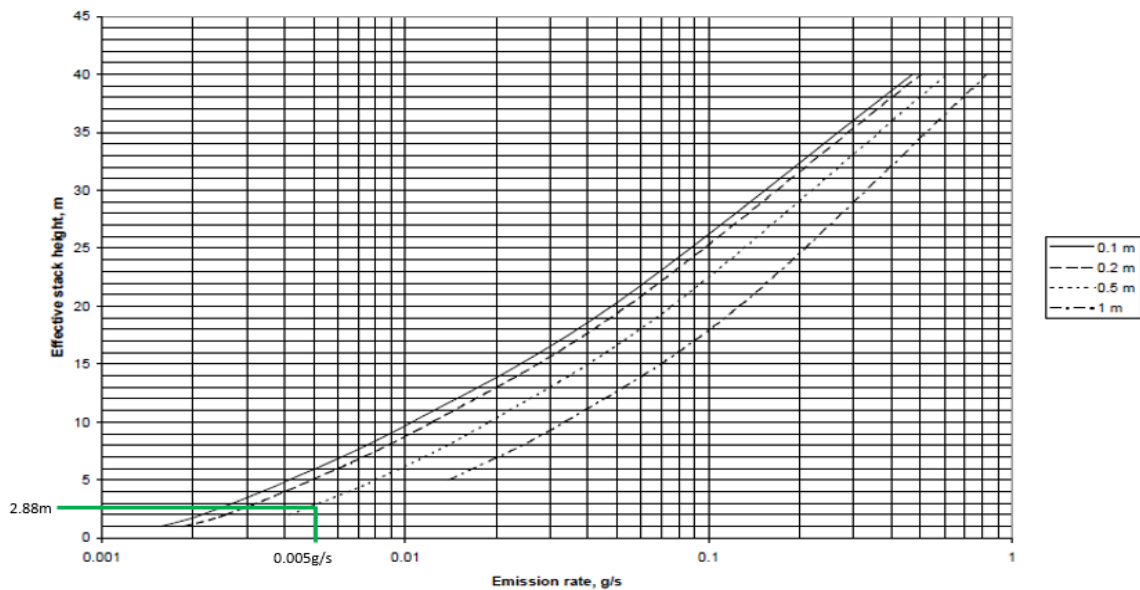
Figure 3.1: Particulate emissions necessary to give a 90th percentile of 24 hour mean ground level concentrations of $1 \mu\text{g m}^{-3}$



PM10 threshold emissions Result: 0.0018 g/s

PM2.5 and annual mean NOx – nomograph at figure 3.2

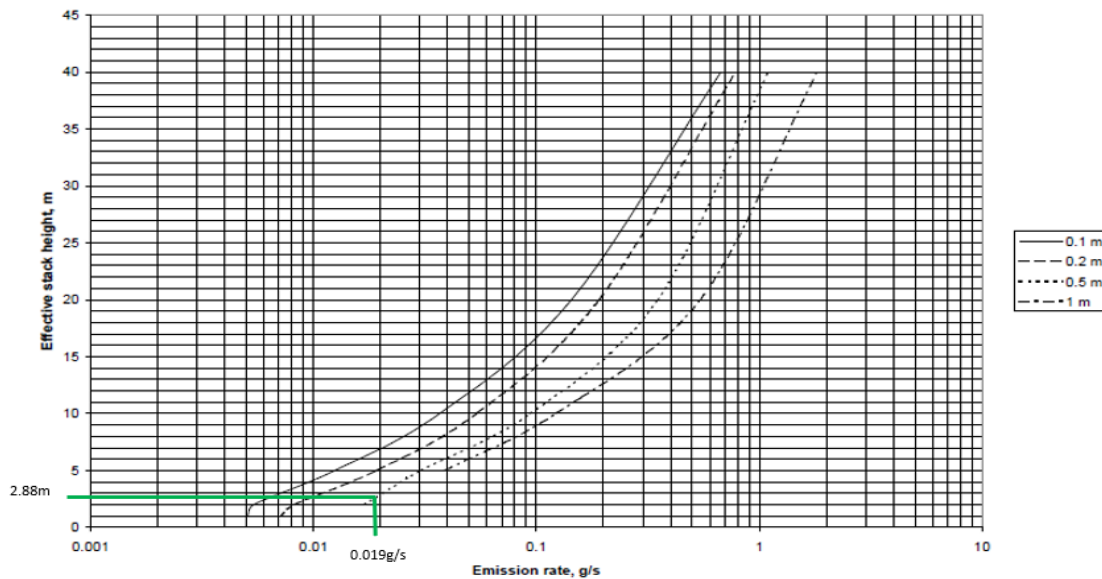
Figure 3.2: Emissions necessary to give an annual mean ground level concentration of $1 \mu\text{g m}^{-3}$ of oxides of nitrogen or particulate matter



PM2.5 and annual mean NOx Result: 0.005 g/s

Hourly mean NOx – nomograph at figure 3.3

Figure 3.3: Emissions of oxides of nitrogen that will give a 99.8th percentile hourly mean concentration of $40 \mu\text{g m}^{-3}$



Hourly mean NO_x Result: 0.019 g/s

Summary

This emissions screening assessment has been undertaken based on the calculation methodology and threshold emissions rates published within 'Technical Guidance: Screening assessment for biomass boilers' prepared by AEA Energy and Environment for DEFRA and the Devolved Administrations.

Sources of data are:

Biomass boiler emissions rates – Boiler RHI emissions certificate, boiler emissions testing undertaken by TUV SUD Industrie Service GmbH

Background concentrations of NO_x, PM₁₀ and PM_{2.5} - DEFRA published Local Air Quality Management data for use with air quality assessments (<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>)

Measurement of flue and surrounding building heights from scale drawings provided by Brown & Co

'Background adjusted emissions rates' have been calculated. These are all significantly lower than the 'threshold emissions rates' for the biomass boiler's effective stack height and diameter. Therefore it is concluded that a more detailed assessment of air quality impact from the biomass installation is not required.