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SPEEDIBAKE
CROSS LANE BAKERY, BRADFORD

AIR QUALITY IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

Enviros Consulting Ltd (Enviros) was commissioned by Speedibake to conduct an air quality dispersion modelling assessment of releases to air from their bakery at the Cross Lane Industrial Estate, Bradford. This air quality assessment was undertaken as part of the PPC Permit Improvement Programme required by the Environment Agency.

An “H1” screening assessment was previously submitted by Enviros on behalf of Speedibake. This assessment followed the methodology given in the Environment Agency’s H1 guidance document. The H1 assessment concluded that a detailed study of the impact from emissions to air of nitrogen dioxide, carbon monoxide and particulate matter was required.

Pollutant concentrations were modelled over a receptor grid and at sensitive receptor locations. The results of the modelling study were compared against air quality guidelines and standards. Overall, because of the conservative assumptions made within the methodology, the results from the modelling assessment are likely to be over predictions of the levels of pollutants which would arise in practice.

The results of the modelling predict that none of the air quality standards or guidelines are exceeded for any of the substances assessed at any of the relevant receptor locations.

Since no air quality standards or guidelines are forecast to be exceeded, it is concluded that emissions from the Speedibake site are acceptable from the perspective of air quality.

It is concluded that no further controls or reductions in emissions are needed.

1. INTRODUCTION

Enviros Consulting Ltd (Enviros) was commissioned by Speedibake to conduct an air quality dispersion modelling assessment of releases to air from their bakery on the Cross Lane Industrial Estate, Bradford. This air quality assessment was produced as part of the Improvement Programme produced by the Environment Agency[1] regarding the site's IPPC permit application[2] which was also produced by Enviros. The following points were raised in the Improvement Programme:

> ***IC3:*** *The Operator shall provide a written report to the Environment Agency on releases of combustion gases from the installation. The report shall identify concentration data, mass release and operational data regarding releases. It shall also assess the dispersion of the releases in the environment and identify the significance of the releases with respect to the Environmental Assessment Levels and Air Quality Standards.*

> ***IC4:*** *The Operator shall provide a written report to the Agency on options to further control and reduce any releases that are identified as significant (as defined in Agency Horizontal Guidance H1, version 6, July 2003) in the report required under IC3. The report shall also include a timetable for implementation of the required work.*

This report is designed to satisfy the requirements of Items IC3 and IC4 in the IPPC Permit Improvement Programme.

At the time of the IPPC application no monitoring data were available to conduct the H1 screening assessment of emissions to air or further detailed assessment if necessary. Subsequently, Speedibake commissioned an air emissions monitoring study[3] from the main oven release points, and the boiler maintenance contractors undertook efficiency testing from the two boiler stacks[4]. Using this information an H1 assessment of the impact of emissions to air[5] was submitted to the Environment Agency following the methodology given in the Environment Agency Guidance Note IPPC H1[6]. The H1 assessment concluded that a detailed study of the impact from emissions of nitrogen dioxide (NO_2), carbon monoxide (CO) and particulate matter was required.

This report comprises the detailed assessment of the impact from emissions to air from the Speedibake site on local human and environmental receptors.

The monitoring results are contained in Chapter 2. Details of the dispersion modelling assessment methodology including study inputs and assumptions are in Chapter 3. Chapter 4 details and interprets the modelling assessment results with conclusions provided in Chapter 5.

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1 Environment Agency, *IPPC Permit No. DP3531SW Improvement Programme Improvement Condition IC3*, 3rd Feb 2006

2 Speedibake, Cross Lane Bakery, Bradford Installation, *IPPC application (Ref: DP3531SW)*, July 2005

3 Resource and Environmental Consultants, *Emissions Monitoring of the Muffin Oven & Mecatherm Oven Processes Speedibake Ltd on 26th & 27th July 2005,* July 2005.

4 Speedibake, Boiler efficiency testing data provided to Enviros by Speedibake, September 2005

5 Enviros Consulting Ltd, Email to Environment Agency - *Re: Speedibake*, 7th December 2005

6 Environment Agency, *IPPC H1 Version 6 - Environmental Assessment and Appraisal of BAT*, July 2003.

2. MONITORING DATA

In order to characterise the emissions from the site a monitoring survey of the concentrations of several substances was undertaken by Resource and Environmental Consultants (REC) on behalf of Speedibake. The range of substances to be measured was determined by discussions between Enviros and the local EA inspector.

The monitoring survey took place between the 26th and 27th July 2005.

An electronic copy of the monitoring report has already been provided separately to the EA in partial fulfilment of IC3.

Data from the monitoring survey have been used to address Point IC3 and IC4 in the Improvement Programme.

The locations of all the main release points to air are shown in Figure 1. The results of the monitoring survey are summarised in Table 1. Full details of the release location and characteristics (determinands, efflux velocity, gas flow and vent height) are provided in Appendix 1 for all main emission points to air.

All information provided to Enviros regarding emissions parameters and monitoring data has been accepted *de facto,* assuming its completeness and accuracy.

There are five ovens in operation at the Speedibake installation of two distinct designs. Due to access constraints, not all of these ovens could be monitored, so monitoring was undertaken on two of the five ovens, with data measured for one of each of the principal oven types. Data from these sources have been assumed to be representative of the emissions from the other ovens of the same design.

Table 1 Summary of monitoring survey results

Source	Source description	Diameter (m)	Volumetric flow (Nm^3/s)	Temp (°C)	Measured emission concentration (mg/Nm^3)		
					NO_x as NO_2	CO	Total particulates
A1	Boiler exhaust *	0.43	0.582	141	8.6	5.2	-
A2	Boiler 2 exhaust *	0.43	0.563	155	9.8	9.0	-
A3	Muffin oven 1 burner extract 1 **	0.37	0.274	140	42.0	243.0	3.0
A4	Muffin oven 1 burner extract 2 **	0.37	0.348	54	26.0	168.0	3.0
A5	Muffin oven 1 burner extract 3 **	0.37	0.276	170	74.0	1.0	3.0
A16	Mecatherm C Oven burner discharge **	0.27	0.304	229	36.0	500.0	3.0

*Emissions reported at standard temperature and pressure (273K, 101.3kPa) and normalised to 3% oxygen

**Emissions reported at standard temperature and pressure (273K, 101.3kPa)

3. DISPERSION MODELLING

3.1 Study Description

This chapter contains a brief outline of the dispersion modelling methodology and details of the study inputs.

3.1.1 Use of Dispersion Model

The current industry standard atmospheric dispersion model ADMS version 3.3 was used to model releases of substances identified from the screening assessment. The modelling procedure was as follows:

1. Emissions parameters were entered for each release point (e.g. location, height, efflux velocity, volumetric flow, temperature and release rate for each substance);
2. The locations and dimensions of buildings were supplied by Speedibake and determined from maps and site drawings;
3. Meteorological data provided by the Meteorological Office were used. The meteorological data used are discussed in more detail below;
4. A receptor grid was identified over which concentrations were modelled. This was a 2000m by 2000m grid centred on the site, in an east-west and north-south direction. Concentrations were calculated at 29m intervals within the grid. Specified receptor points representing local residential properties and other sensitive locations were also identified (these are referred to as sensitive receptors and listed below). Concentrations were also calculated at these sensitive receptors;
5. Terrain data tiles, produced by Ordnance Survey, sufficient to cover the modelled receptor grid, were used to represent the topography of the surrounding region;
6. The above information was entered into the dispersion model;
7. The dispersion model was run to provide calculated ground-level concentrations of the substances;
8. The modelled concentrations of pollutants were processed using a widely used contour plotting package (SURFER version 8) to produce pollutant contour plots. These plots have been included for illustrative purposes only; assessment of the model results was based on the highest modelled concentrations at any off-site location;
9. The modelled concentrations of each substance due to the plant emissions were then assessed against the relevant air quality objective/guideline taking baseline air quality into account.

3.1.2 Description of the dispersion model

The dispersion modelling study was carried out using ADMS, (Atmospheric Dispersion Modelling System). ADMS is widely accepted as the current industry standard model for dispersion from point sources such as this plant. The most recent version of the model, version 3.3, was used in this assessment. This model is able to incorporate the influence of buildings on the dispersion of material released from the sources.

ADMS is a computer based model of dispersion in the atmosphere of passive, buoyant, or slightly dense, continuous or finite duration releases from single or multiple sources. The development of ADMS was supported by the Environment Agency. A key improvement in ADMS over older models is its use of the most recent scientific understanding of the structure of the atmospheric boundary layer. In the ADMS approach, the boundary layer structure is defined in terms of measurable physical parameters obtained from meteorological readings, which allow for a more realistic representation of the changing characteristics of dispersion with height. The result is a more accurate and soundly based prediction of the concentrations of pollutants.

The presence of buildings close to the release point can significantly affect the dispersion of material from a source. This influence can be taken into account by the use of an appropriate module in ADMS. The buildings at the Speedibake site may influence the dispersion of emissions from the oven and boiler stacks. It is therefore important that building effects on dispersion are evaluated in detail. This was done using the ADMS buildings module.

Models of atmospheric dispersion processes are generally more reliable for long period means than short period means. Models are usually more reliable over intermediate distances (100m to 1000m) than very close to the source, or more distant from the source. This reflects the range of data that have been used to compile the models. Where emissions data are less reliable, or averaging periods are shorter, the results are likely to be less accurate.

To acknowledge this potential for variability in dispersion model results, a worst-case approach has been adopted throughout the study. This means that modelled results are likely to be over-estimates of the levels that will arise in practice.

In summary, ADMS was considered to be the most suitable model for this application for the following reasons:

- Industry standard model for atmospheric dispersion modelling;
- Advanced understanding of boundary layer meteorology; and
- Ability to model the influence of buildings on dispersion.

The model takes as a starting point information on emissions from each source, including:

- pollutant release rate;
- release temperature;
- release velocity;
- release point location;
- release point height;
- release point size; and
- the location and dimensions of nearby buildings.

Information characterising a set of meteorological conditions is also required. This includes the wind speed, wind direction, and information relating to the atmospheric stability. This information is normally presented in the form of sequential hourly measurements, obtained from the nearest or most relevant meteorological station. Given this information, the model provides an estimated concentration of the substance of interest at a specified point. This process is repeated for each hour in the year, at each defined grid point and each defined sensitive receptor to build up an estimate of long-term mean and short-term peak concentrations over an area of interest.

The topography of the surrounding area can have an effect on air movements and consequently on the dispersion of emissions from the site. Since the Speedibake site is in an area in which local gradients exceed 10%, the Terrain module of the ADMS model was used to account for any effect this may have.

In any modelling study, there will be a degree of uncertainty in the model results. To acknowledge this potential for variability in dispersion model results, a worst-case approach has been adopted where possible throughout the study. The aim of this is to ensure that modelled results are likely to be overestimates rather than underestimates of the ground level odour concentrations that will arise in practice.

3.1.3 Emissions Parameters

Monitoring was undertaken on a subset of emission points, and emissions from unmonitored locations have been assumed to be identical to those from monitored sources of similar design and process. Full details of the release parameters for each source are provided in Appendix 1.

To ensure a conservative approach to the study, measurements of total particulates have been considered to be PM_{10} (particulate matter with an aerodynamic diameter less than 10 microns) and oxides of nitrogen have been assumed to composed of 50% nitrogen dioxide (NO_2) for comparison with short term standards, and 100% NO_2 for comparison with long term standards.

3.1.4 Meteorological Data

Meteorological data used for the dispersion modelling study were obtained from the Meteorological Office. The most appropriate meteorological station to represent weather conditions at the Cross Lane Bakery is the Finningley weather station, which is located approximately 54km south east of the Speedibake site. Three years of hourly sequential data for the years 1992 to 1994 were used in this assessment, which are the most recent data available from the meteorological station.

3.1.5 Baseline Air Quality

The following sources of information were used to obtain information on baseline air quality:

- local measurements reported through the national air quality archive (www.airquality.co.uk); and
- interpolated maps of air quality also available through the national air quality archive.

The information on baseline air quality was drawn together and a judgement was made to identify an appropriate estimate of baseline levels of each substance in the vicinity of the site.

Table 2 Estimated Baseline Pollutant Concentrations

Airborne Pollutant	Site		Year	Mean ($\mu g/m^3$)	Source
NO_2	Bradford continuous analyser		2005	31.0	Air Quality Archive, DEFRA
	Bradford diffusion tube survey	1N	2004	56.9	Air Quality Archive, DEFRA, NO_2 Diffusion Tube
		3N		46.6	
		4N		17.6	
		5N		54.0	
	Nearest point to site		2005	**33.6**	Active map, Air Quality Archive, DEFRA
	Nearest point to ecological receptor		2005	**22.8**	Active map, Air Quality Archive, DEFRA
CO	Bradford continuous analyser		2005	350	Air Quality Archive, DEFRA
	Nearest point to site		2001	**418**	Active map, Air Quality Archive, DEFRA
PM_{10}	Nearest point to site		2004	**20.9**	Active map, Air Quality Archive, DEFRA

Notes: Value in bold used in this study.

Active map grid references for the Speedibake site refer to centre of 1 km × 1 km grid square (420500, 429500).

Active map grid references for the ecological receptor refer to centre of 1 km × 1 km grid square (423500, 435500).

The most representative sources of baseline data are listed in Table 2. There is currently limited information on air quality at locations situated outside main urban areas and city centres in the region. More data are available for urban areas; however as urban areas contain large volumes of traffic, which emit the pollutants shown above, the concentrations measured at such locations are likely to be higher than those in the vicinity of the Speedibake site.

Since the data taken from the Air Quality Archive are only available for urban areas, the active map data have been used to represent baseline air quality. The values used as the baseline concentration in this assessment are shown in bold in Table 2.

3.1.6 Receptors

Details of the sensitive receptors for emissions to air are provided below. Air quality standards must be achieved at all off-site locations for the substances included in this study.

To this end a 2km by 2km grid centred on the site, in an east-west and north-south direction, was also specified to allow calculation of maximum off-site concentrations and to provide graphical presentations of the model results. Concentrations were calculated at 29m intervals within the grid, giving a total of 5041 calculation points for pollutant concentrations.

In addition, sensitive receptor locations have been identified by Enviros which represent schools, residential properties, recreational areas and habitats located in the vicinity of the plant at areas where the highest levels of pollutants were expected. There is one sensitive habitat location within a 10km radius of the site; this is a Site of Special Scientific Interest (SSSI) cited as a slow flowing fresh-water habitat. There are no National Nature Reserves, RAMSAR Sites, Special Protection Areas or Special Areas of Conservation within this area.

A description of the sensitive receptors is given below in Table 3, and all sensitive receptor locations within 2km of the site are shown in Figure 2.

Table 3 Sensitive receptor locations

No.	Receptor Description	Grid Coordinate		Approximate distance from site boundary (m)
		E	N	
1	Residential property on Westgate Hill Street	420434	429540	195
2	School	420286	429680	382
3	Residential property on Westgate Hill Street	420611	429550	47
4	Public House	420851	429520	67
5	Residential property on Crescent Lane	420798	429205	148
6	School	420545	428905	428
7	Residential property on Moorlands Road	420477	429170	188
8	Residential property on Thorndene Way	420451	429480	175
9	Habitat – Leeds-Liverpool Canal	423346	435782	6900

3.1.7 Miscellaneous

The site typically operates for 24 hours per day, 5 days per week, occasionally 6 days per week. In this study, a conservative approach has been taken and the site has been assumed to be operational continuously throughout the year, with constant emission rates based on the monitoring data.

The surface roughness is a length scale used to represent the turbulent effect of obstructions in the surrounding area. The surface roughness used in this study was 0.3m which is appropriate for an area where the local land use is categorised as agricultural.

Buildings or other structures can have a significant influence on local airflows that under certain circumstances may draw an emission plume down towards ground level. This is referred to as “building downwash”. The effects of the main site buildings are considered likely to be significant, and have been included in the study.

Table 4 Significant Building Details

Description	Grid Coordinates	Height (m)	Length (m)	Width (m)	Angle to North (°)
Main process building	(420704, 429463)	8.7	149	80	278
Central cold store	(420639, 429382)	18.0	49	47	278
South cold store	(420625, 429341)	18.0	74	36	278
Storage silos	(420773, 429493)	21.0	6	9	8

Given the worst case assumptions adopted, overall, the results from the modelling assessment are likely to be over predictions of the levels of pollutants which would arise in practice.

3.1.8 Behaviour of released substances in the atmosphere

In most cases, substances released from the proposed process will not change character significantly as they disperse in the atmosphere.

The principal exception is oxides of nitrogen, which are a mix of two substances - nitric oxide (NO), which is less harmful, and nitrogen dioxide (NO_2) which is more harmful of the two. These substances convert from one to the other in the presence of sunlight, and by reaction with other trace constituents in the atmosphere. The key reaction steps are:

$$NO + O_3 \rightarrow NO_2 + O_2$$

$$NO_2 + \text{sunlight} \rightarrow NO + O$$

$$O + O_2 \rightarrow O_3$$

The majority of emissions (typically 95%) from combustion sources such as boilers, ovens or other combustion sources are in the form of nitric oxide. The conversion rate to nitrogen dioxide will be limited by the availability of ozone to react with nitric oxide between the source and a nearby receptor. To provide a conservative assessment, it was assumed that 50% of the oxides of nitrogen are present as nitrogen dioxide for comparison with the short term benchmarks, and 100% are present as nitrogen dioxide for comparison with long term benchmarks.

3.1.9 Air quality standards

The modelled ground-level concentrations were compared with air quality standards and guidelines to establish the significance of any air quality effects. These standards and guidelines are established by a range of governmental and other bodies, primarily on the basis of the known health risks associated with various substances. Standards and guidelines have been identified following Environment Agency guidance.

The air quality standards and guidelines used in this study are shown in the table below, along with the receptor types at which they are expected to be compliant.

Table 5 Air quality standards and guidelines

Substance	Period	Value ($\mu g/m^3$)	Receptor type
NO_2	Annual mean	40	Any off-site location
NO_2	99.8th percentile of hourly means (18 exceedences allowed)	200	Any off-site location
NO_2	Annual mean	30	Sensitive ecological receptors
CO	Maximum 8 hour mean	10,000	Any off-site location
PM_{10}	Annual mean	40	Any off-site location
PM_{10}	90.4th percentile of 24 hourly means (35 exceedences allowed)	50	Any off-site location

The dispersion modelling study results which represent the process contribution (PC) have been processed to provide the maximum predicted environmental concentration (PEC) for each substance as modelled at relevant receptor locations for that substance.

For short-term air quality impacts (averaging time 24 hours or less), the PEC value is calculated by adding twice the baseline concentration to the process contribution (PC) value (following the approach in the H1 Guidance Note). For calculating the PEC value for the 90.4th percentile of 24 hour mean particulate levels, this is unduly onerous. In this case, the PEC value is calculated by adding 1.79 × baseline concentration to the PC value, following guidance for local air quality management[7].

7 DEFRA, *Local Air Quality Management Technical Guidance – LAQM TG (03)*, 2003

4. STUDY RESULTS

The levels of each substance forecast to arise at the relevant sensitive receptors close to the Speedibake facility are set out in Table 5. The results presented are the maximum concentrations from the three years that were assessed. The relevant standard or guideline is also included for comparison.

Table 6 Results of Modelling and Impact Assessment

Substance	Averaging time	EAL (µg/m^3)	Background (µg/m^3)	Maximum modelled concentration at any off-site location (PC) (µg/m^3)	Predicted Environmental Concentration (PEC) (µg/m^3)	PC/EAL	PEC/EAL
Nitrogen dioxide	Annual mean	40	33.6	3.9	37.5	9.7%	94%
Nitrogen dioxide	99.8th percentile of hourly mean	200	33.6	18.2	85.4	9.1%	43%
Oxides of nitrogen (ecological receptor) *	Annual mean	30	22.8	0.011	22.8	0.04%	76%
Carbon monoxide	Maximum 8 hour mean	10,000	418	148	984	1.5%	10%
PM_{10}	Annual mean	40	20.9	0.3	21.2	0.7%	53%
PM_{10}	90.4th percentile of 24 hour mean	50	20.9	0.7	38.1	1.4%	76%

PC: Process contribution (levels of substances due to emissions from the site alone)
PEC: Predicted environmental concentration (levels of substances due to emissions from the site combined with background levels)
* The terrain module was not used to model the predicted concentrations of NO_2 at the ecological receptor because it was outside the terrain data tile. A sensitivity case was run to investigate the effect of this. Use of the terrain module increased the modelled maximum concentration on the receptor grid by 2%. Therefore the modelled concentrations at the ecological receptor have been increased by 2% to allow for the likely impact of terrain on dispersion.

5. CONCLUSIONS

The results of the modelling predict that none of the air quality standards or guidelines are exceeded for any of the substances at any off-site location.

The maximum PEC at any off-site location is 94% of the air quality standard or guideline for any substance. The maximum PEC is predicted to occur for annual mean NO_2 concentrations. However, the PC from the Speedibake site comprises only 9.7% of the Environmental Assessment Level (EAL), reflecting the more significant contribution of background sources. Figure 3 presents the annual mean process contributions of NO_2 from the Speedibake site.

The contribution from the Speedibake site to the PC or PEC for CO and PM_{10} over any averaging period is less significant still. Figures 4 and 5 present the modelled process contributions for EAL with the greatest impact on the environment for CO and PM_{10} respectively.

Since no air quality standards or guidelines are forecast to be exceeded, it is concluded that emissions from the Speedibake site are acceptable from the perspective of air quality. No further controls or reductions in emissions are required.

FIGURES

Figure 1 Speedibake site showing buildings and modelled air emission points

Figure 2 Speedibake site and sensitive receptor locations

Figure 3 Modelled process contribution of annual mean nitrogen dioxide concentrations

Figure 4 Modelled process contribution of maximum 8 hour mean of CO concentrations

Figure 5 Modelled process contribution of the 90.4th percentile of hourly mean PM_{10} concentrations

APPENDICES

1. Release Inventory

Emission Point	OS Grid coordinate		Height (m)	Diameter (m)	Emission point used to derive emissions parameters	Velocity (Nm/s)	Volumetric flow (Nm^3/s)	Temp (°C)	Modelled Release Rate (g/s)		
	x	y							NO_x as NO_2	CO	PM_{10}
A1	420777	429490	21.7	0.43	NA	4.01	0.582	141	4.28×10^{-3}	2.60×10^{-3}	NM
A2	420773	429485	22.2	0.43	NA	3.88	0.563	155	5.53×10^{-3}	5.05×10^{-3}	NM
A3	420760	429456	8.0	0.37	NA	2.55	0.274	140	1.15×10^{-2}	6.66×10^{-2}	8.22×10^{-4}
A4	420750	429456	8.0	0.37	NA	3.23	0.348	54	9.04×10^{-3}	5.84×10^{-2}	1.04×10^{-3}
A5	420740	429456	8.0	0.37	NA	2.57	0.276	170	2.04×10^{-2}	2.76×10^{-4}	8.28×10^{-4}
A6*	420758	429456	8	0.2	NA	NM	NM	NM	NM	NM	NM
A7*	420748	429456	8	0.2							
A8*	420738	429456	8	0.2							
A9*	420732	429456	8	0.2							
A10	420714	429468	8.0	0.37	A3, A4, A5	2.78	0.299	121	1.42×10^{-2}	4.11×10^{-2}	8.98×10^{-4}
A11	420705	429469	8.0	0.37	A10	2.78	0.299	121	1.42×10^{-2}	4.11×10^{-2}	8.98×10^{-4}
A12*	420724	429469	8	0.2	NA	NM	NM	NM	NM	NM	NM
A13*	420717	429469	8	0.2							
A14*	420706	429469	8	0.2							
A15*	420698	429469	8	0.2							
A16	420695	429487	8.7	0.27	NA	5.31	0.304	229	1.10×10^{-2}	1.52×10^{-1}	9.13×10^{-4}
A17*	420695	429489	8.7	0.2	NA	NM	NM	NM	NM	NM	NM
A18*	420704	429488	8.7	0.2							
A19	420695	429481	8.7	0.27	A16	5.31	0.304	229	1.10×10^{-2}	1.52×10^{-1}	9.13×10^{-4}
A20*	420695	429482	8.7	0.2	NA	NM	NM	NM	NM	NM	NM

Emission Point	OS Grid coordinate		Height (m)	Diameter (m)	Emission point used to derive emissions parameters	Velocity (Nm/s)	Volumetric flow (Nm^3/s)	Temp (°C)	Modelled Release Rate (g/s)		
	x	y							NO_x as NO_2	CO	PM_{10}
A21*	420704	429482	8.7	0.2							
A22	420691	429457	8.0	0.37	A10	2.78	0.299	121	1.42×10^{-2}	4.11×10^{-2}	8.98×10^{-4}
A23	420681	429457	8.0	0.37	A10	2.78	0.299	121	1.42×10^{-2}	4.11×10^{-2}	8.98×10^{-4}

Note: All figures are quoted at STP (273k, 101.3kPa)

* Deemed an insignificant release and not included in modelling study

NA: Not applicable

NM: Not measured

There are five ovens in operation at the Speedibake installation of two distinct designs. Due to access constraints, not all of these ovens could be monitored, so monitoring was undertaken on two of the five ovens, with data measured for one of each of the principal oven types. Data from these sources has been assumed to be representative of the emissions from the other ovens of the same design.