

Proceedings of the Fifth Air Pollution Forecasting Seminar –  
The Air Quality Impact of the Buncefield Oil Depot Explosion  
Thursday 22<sup>nd</sup> June 2006

Culham Science Centre, near Abingdon, Oxfordshire

The Fifth Annual Air Pollution Forecasting Seminar - hosted by Netcen on behalf of the Department for the Environment, Food and Rural Affairs (Defra) and the Devolved Administrations – was held on Thursday 22<sup>nd</sup> June 2006 at Culham Science Centre, near Abingdon in Oxfordshire.

The seminar was the latest of an ongoing series of events, hosted by the Met Office and Netcen to report on improvements to the air-quality forecasting service commissioned by Defra and the Devolved Administrations.

The air-quality forecasting service has a number of aims:

- To issue timely air quality forecast information to government departments, local authorities, media groups, health services and the general public.
- To give prior notice to groups sensitive to high levels of pollution, so that they can take action to reduce any risk.
- To encourage members of the public to be more environmentally friendly, particularly during periods of poor air quality.
- To provide advance warning of the length and severity of pollution episodes to the Government and health services.

The information is made as widely accessible as possible through national media weather bulletins, as well as:

- The Air Pollution Bulletin Service on freephone 0800 556677
- The UK Air Quality Archive on [www.airquality.co.uk](http://www.airquality.co.uk)
- Web-based air quality archives for the Devolved Administrations
- TV Teletext 156
- Email bulletin service [http://www.airquality.co.uk/archive/bulletin\\_reg.php](http://www.airquality.co.uk/archive/bulletin_reg.php)

More than 70 delegates and speakers attended the event. These included delegates from medical and health organisations, industry, local authorities, scientific officers, environmental health and pollution control academics, consultants, representatives from Defra and the devolved administrations and the Environment Agency.

The seminar this year provided a forum for organisations involved in the Buncefield incident to present the results of their work. The presentations provoked much useful and informative discussion.

We here provide:

- 1) A summary of main issues addressed by the presentations and discussions
- 2) Sources for further information
- 3) A programme of the seminar

## **The following is a brief summary of the presentations and discussion:**

Buncefield was the largest industrial fire in Europe for over 50 years. Estimations using the National Atmospheric Emissions Inventory have shown that the fire released 5% or more of annual UK air emissions of some pollutants – PM<sub>10</sub>, PM<sub>2.5</sub> and benzo(a)pyrene. Emissions of other pollutants such as NO<sub>2</sub>, CO and NMVOC were lower at < 0.1% of total annual emissions.

The emergency response team of the Chemical Hazards and Poisons Division (CHaPD) of HPA was quickly in action following the explosion, which took place at around 06:00. The team worked with local and regional services and the NHS to form the Health Advisory Team (HAT) that advised multi-agency GOLD command. The team quickly received modelling input from the Met Office and the Environment Agency and requested environmental monitoring.

Local, portable indicative air quality monitoring by Netcen showed high concentrations of particulate matter and unburnt hydrocarbons close to the fire. The Netcen team could see the plume rising quickly overhead, but could not detect increased concentrations downwind, where the plume appeared to be close to the ground. Concentrations of pollutants measured in nearby residential areas were low. There was much discussion of the methods used by Netcen and the difficulties in deploying emergency-response air quality monitoring equipment quickly to the scene of such an incident.

Data from UK national air monitoring networks were analysed in detail but, to-date, these show no evidence of significant ground level air quality impacts from the Buncefield plume. Likewise, similar analysis of national monitoring data from Northern France also showed no evidence of any major ground-level impacts.

Additional data available from the local and regional monitoring networks co-ordinated by King's College Environmental Research Group has shown some small and short-term (15-minute) PM<sub>10</sub> peaks at a few sites in Hertfordshire, North London, Surrey and Sussex. Modelling by the Met Office using the advanced NAME III system confirms that the air arriving at these sites at the times of the peaks could have come from the Buncefield area.

Despite these sporadic transient events, comparison of ground-level air quality data with health-based air quality standards shows that pollution levels remained "low" or just into the "moderate" category at all national and regional monitoring locations in the southeast, for the duration of the incident.

Airborne air quality measurements of the plume by the Met Office instrumented FAAM aircraft showed that the plume was mainly composed of black soot. Carbon Monoxide (CO) and Oxides of Nitrogen (NO<sub>x</sub>) were detected but not in large quantities. Concentrations of toxic PAHs and Dioxins measured in the plume were small.

The Met Office undertook detailed modelling of the plume both before and after the event. This involved large uncertainties, especially in the early stages when the composition and amount of fuel burning was not known accurately. Observations by civilian aircraft helped to fine-tune the Met Office model results. Due to the exceptional plume buoyancy and meteorological conditions, the smoke and other emissions from the fires rose high into the atmosphere before dispersing. This helps explain why ground level impacts on air quality were minimised.

Was it fortunate that the plume dispersed in this way or inevitable given the nature of the fire? To answer this question, the Met Office has modelled several "what-if?" scenarios as follows:

- Windy conditions.
- Uncontrolled burning.
- Summer convective conditions.

Their conclusion was that, even under this wide range of conditions, the modelled predicted ground-level pollution concentrations would not have been significantly worse.

The Health Protection Agency has carried out three surveys of the public health impact of the incident:

- Review of A&E case notes (acute effects)
- Population survey (public concerns)
- Occupational Health survey ('high exposure' group)

The A&E case notes review discovered that 77% of those attending A&E due to the impact of Buncefield were from the emergency services. In most cases, this was because standard advice was issued suggesting that they should do so. Of the 244 cases reported, only 22 required further attention such as admission or referral to GP. This included the physical injuries from the explosion itself. There was an initial 65% increase in A&E workload but, after 24-hours, this returned to normal.

A random sample of 5,000 people was also surveyed for their concerns following the explosion; a 40% response was obtained- typical for this kind of study. Almost half of the people surveyed were worried about potential long-term health impacts, whilst around a quarter were worried about short-term effects. Only 6% said they were specifically concerned about the smoke plume. Over 40% indicated that they were satisfied with the advice obtained.

A comprehensive survey of occupational health departments in the agencies involved in the incident is currently underway.

**For further related information on Buncefield please see:**

Buncefield Investigation

<http://www.buncefieldinvestigation.gov.uk/index.htm>

Defra

<http://www.defra.gov.uk/environment/airquality/buncefield/index.htm>

Health Protection Agency

<http://www.hpa.org.uk/>

Met Office

<http://www.meto.gov.uk/index.html>

King's College London Environmental Research Group

<http://www.erg.kcl.ac.uk/erg/asp/erghome.asp>

Department of Health

<http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/AirPollution/fs/en>

The UK Air Quality Archive

[www.airquality.co.uk](http://www.airquality.co.uk)

Copies of all the presentations from the seminar are provided in pdf format in the Research Information section of the Air Quality Archive ([www.airquality.co.uk](http://www.airquality.co.uk)).

Much of the work is reported in the recent publication '[Interim Review of Air Quality Aspects of the Buncefield Oil Depot Explosion](#)' - authored for Defra by Netcen, the Met Office and the Health Protection Agency.

For further details of the UK air quality forecasting service, please contact

[paul.willis@aeat.co.uk](mailto:paul.willis@aeat.co.uk).

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The Air Quality Impact of the  
Buncefield Oil Depot Explosion**

**Thursday 22<sup>nd</sup> June 2006  
Culham Science Centre, Oxfordshire**

<b>Programme</b>	
10:00 – 10:30	Coffee & Registration
10:30 – 10:45	Welcome and Introduction from Netcen / Defra Paul Willis / Dr. Janet Dixon
10:45 – 11:15	The Chemical Hazards and Poisons Division, Health Protection Agency and response to the Buncefield fire. Richard Mohan, HPA.
11:15 – 11:30	Near-site monitoring carried out by Netcen. Paul Willis, Netcen
11:30 – 12:00	National Air Quality Monitoring and Forecasts, emissions estimates, and data analysis for the incident. Jon Bower, Netcen
12:00 – 12:15	Discussion
<b>12:15 – 13:00</b>	<b>Lunch</b>
13:00 – 13:30	Regional Air Quality Monitoring, Data Analysis and Information Dissemination during the incident. Gary Fuller, King's College London, Environmental Research Group.
13:30 – 14:00	Met Office Flight, plume measurements Dr. Jon Taylor, Met Office
<b>14:00 – 14:30</b>	<b>Tea</b>
14:30 – 15:00	NAME modelling, emergency response and subsequent analysis Helen Webster, Met Office
15:00 – 15:30	Investigation for health effects after the Buncefield fire. Oliver Morgan, Acting Regional Epidemiologist who works with East of England Regional Epidemiology Unit of the HPA.
15:30 – 16:00	Discussion & Close