

# **Aire Valley Against Incineration (AVAI) response to the Environment Agency Draft Decision Document**

## **Computer Modelling of Emissions**

### **1. Additional Computer Modelling Work**

The Air Quality Modelling and Assessment Unit (AQMAU) of the Environment Agency (EA) were requested to consider the assessment of air emissions for human health and ecological impacts performed by the applicant's consultants (Ricardo).

In their audit report reference AQMAU\_C1775\_RP01 they suggested that there was a likelihood of inter-model variation at the receptor sites, and that there may also be variations in the meteorological data between the Bingley weather station and the weather at the proposed incinerator site. They undertook additional work using various computer models and a number of different sets of weather data to assess these factors.

Ricardo has consistently asserted that their use of ADMS v5.2 software was totally adequate and did not require the use of any additional tools for the modelling of emissions. The EA obviously did not share this view.

*Why didn't the EA ask Ricardo to submit an updated AQA containing the necessary additional information?*

### **2. Use of Modelling Software and Weather Data by the EA**

The AQMAU state that in their sensitivity tests the consultant's modelling files were used for the cross-check modelling of their results and that three software tools were used, these were ADMS v5.2, Breeze AERMOD and CALPUFF v8.6.

Based on recent information received from the EA the following modelling exercises were carried out by them in their cross-checking exercise:

<b>Software</b>	<b>Weather data used</b>
ADMS v5.2	Bingley 2003
	Bingley 2004
	Bingley 2005
	Bingley 2006
	Bingley 2007
ADMS Higher Resolution Terrain	Bingley 2005
ADMS Surface Roughness	Bingley 2003
ADMS	NWP 2012
AERMOD	Bingley 2003
CALPUFF	MM5 2001

*Why didn't the AQMAU run all three different software tools separately for all the three different sets of weather data obtained from the named sources i.e. the modelled data from NWP, the modelled data from MM5 and the actual weather data from the Bingley Weather Station?*

### **3. Further queries/observations on the weather data and software tools used:**

Two of the sets of weather data used in the AQMAU modelling checks were predictive weather data sets namely NWP and MM5 data, these dated from 2012 and 2001 respectively.

*How representative can such old information possibly be of current conditions?*

*Why was MM5 used, as it is now obsolete and was replaced by WRF in 2005?*

CALPUFF was de-listed by the Environment Protection Agency (EPA) in 2017 as one of their preferred models (<https://www.epa.gov/scram/air-quality-dispersion-modelling-alternative-models>)

### **4. Values for the Maximum Ground Level deposition of Nitrogen Dioxide (NO<sub>2</sub>)**

*Why are the results for the maximum deposition of NO<sub>2</sub> obtained by the AQMAU from all the various combinations of meteorological data and computer models they used all significantly lower than the maximum value obtained by Ricardo?*

The highest maximum Process Contribution for the NO<sub>2</sub> annual mean recorded by the AQMAU for any of their modelling runs was 0.86 µg/m<sup>3</sup> of NO<sub>2</sub>, using ADMS (higher resolution terrain) and Bingley data 2005. This compares with a value of 1.12 µg/m<sup>3</sup> of NO<sub>2</sub> listed in Ricardo's AQA. The AQMAU figure is only 77% of the value obtained by Ricardo. This is in spite of the fact that both modelling exercises used the same version of ADMS software and that the weather data that was used in both cases was from Bingley weather station. The purpose of the EA modelling exercise was to cross-check the modelled values submitted by Ricardo.

*How could such a difference in the results be classed as comparable or acceptable?*

These significant differences in results can surely only be explained by the use of different input data. A significant factor when modelling ground level deposition is the inclusion of building dimensions to take account of downwash effects. This could be the reason for the discrepancy in the values. If the buildings were not included in the modelling, this would not represent a comparable worst-case scenario as expressed by the EA.

*Did the EA modelling exercise include the buildings, if they were included what were the details of these buildings, were they the same as those used by Ricardo and were these from the latest plans?*

Another possible explanation is that the weather data used by the EA did not match with that used by the applicant. The EA's results were largely based on Bingley data from 2003 to 2007 whereas the applicant used data from 2012 to 2016.

***Why wasn't the same weather data from Bingley Weather station for 2012 to 2016 used by the EA when they were cross-check modelling Ricardo's results?***

The other sources of weather data used in the EA checks were NWP and MM5 dating from 2012 and 2001 respectively.

***How representative can such old information possibly be of current conditions?***

## **5. Temperature Inversions**

Many members of the public remain concerned about the likelihood of increased pollution in the areas surrounding the proposed incinerator due to the site's location at the bottom of a steep-sided valley. Temperature inversions are a frequently observed feature in the Aire valley. These inversions are caused by cold air drainage flow in the valley and they can effectively act as a cap on emitted pollutants. We have detailed evidence that the night-time temperatures are often lower and the day-time temperatures higher than those for Bingley weather station.

A very similar situation to that in Keighley was encountered when a permit application was submitted to Natural Resources Wales (NRW) for a waste processing plant at Nine Mile Point, near Caerphilly in 2015. In order to fully quantify the effect of inversions on the maximum ground level pollution of NO<sub>2</sub> the NRW used some German software KLAM\_21. In the permit refusal document reference PAN-000061it was found that there was a significant additive effect to the maximum deposition figure due to cold-air drainage (temperature inversions).

The selection of KLAM\_21 by NRW for the modelling of cold air drainage flow was described as follows on page 32 of the permit decision:

*"Aermod and Calpuff do not account for cold air drainage flow and therefore cannot be used to predict the impact. KLAM21 is the only commercially available software for simulating cold air drainage flow to NRW's knowledge."*

We submitted full details of the NRW permit refusal document to the EA at the first consultation stage. We requested that KLAM\_21 be used by the EA to model the impact of cold-air drainage on the maximum NO<sub>2</sub> ground level pollution. This request was addressed in the Draft Decision Document in the section where the EA responded to queries received during at the first consultation. The text was as follows:

*"KLAM\_21 is a method of assessing cold air drainage that can occur during inversions. We considered temperature inversions in our audit as discussed in section 5.2.4 We are satisfied that no further modelling work is required."*

In section 3.2 of the AQMAU audit document it states that CALPUFF was used to take into account the complex terrain of the Keighley site.

***Does CALPUFF take into account the additional impact of temperature inversions on maximum NO<sub>2</sub> deposition levels, as evidently Natural Resources Wales did not think it did in their decision document?***

Full details of the additive effect of cold air drainage flows should be provided and if not KLAM\_21 should be used in the modelling exercise to obtain this information.

It is essential that this information is provided for the Keighley permit application as it was made available in Wales by a sister organisation of the EA for a facility that had very similar topography.

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