SEPTEMBER 2002 THROUGH AUGUST 2003 AIR DISPERSION MODELING ANALYSIS OF APFO EMISSIONS (Revised)

DuPont Washington Works Facility
Parkersburg, West Virginia

Prepared for:

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May 24, 2004

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1. Introduction

DuPont conducted air dispersion modeling of APFO* emissions from its Washington Works facility located near Parkersburg, WV. Modeling was conducted to predict long-term ambient air concentrations of APFO resulting from actual plant emissions that occurred during the period of September, 2002 through August, 2003. This report describes the APFO emissions inventory used in the modeling analysis, the meteorological data, the dispersion model and modeling procedures, prediction locations (receptor grid), and the results of the modeling analysis.

Compared to the modeling report submitted on October 17, 2003, this revised report incorporates several revisions to stack parameters that were the result of stack testing, and the refinement of UTM coordinates.

2. Emissions Inventory

The following emission inventory information has been assembled in order to conduct the air quality modeling:

1. Stack locations
2. Stack heights
3. Stack diameters
4. Stack gas exit temperatures
5. Stack gas flow rate or exit velocities
6. Detailed plant layout, including all building dimensions
7. Sept. 1, 2002 – Aug. 31, 2003 estimated actual APFO emissions

All of the stack parameters are presented in Table 1, which shows the source representation for modeling purposes. The estimated actual emission rates of APFO, per source, are also presented in Table 1. Figure 1 presents the general locations of the APFO sources.

3. Meteorological Data

One year of on-site meteorological data for the calendar year 1996 was used in this study. Concurrent twice-daily upper air data from the upper air observation station located in Wilmington, OH was used along with on-site surface temperatures to obtain hourly mixing depths. Missing data and measured wind speeds of less than 1.0 m/s were treated consistent with the recommendations made in the EPA's "Meteorological Monitoring Guidance for Regulatory Modeling Applications"[(1)]. An anemometer height of 10 meters was used for the modeling analysis

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* "APFO" means ammonium perfluorooctanoate, and for the purposes of this report includes the anion of the acid perfluorooctanoic acid (PFOA).

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4. Model Selection

The area surrounding Washington Works is primarily non-urban. The U. S. EPA procedures classify land use within 3 kilometers of the site by the Auer method[2]. Previous review of U. S. Geological Survey (USGS) maps, aerial photographs, and site visits clearly indicated that the area is well over 50% non-urban. The Washington Works facility is located within the Ohio River valley, and is surrounded by significant terrain features on both sides of this river valley. As a result, terrain elevations were considered in the modeling analysis.

The Industrial Source Complex Short Term Model (ISCST3) was used as the primary model to estimate long-term pollutant concentrations. ISCST3 is a steady-state Gaussian model recommended by the U.S. EPA. It is included in the "Guideline on Air Quality Models"[3], which is codified as Appendix W to 40 CFR Part 51. It is appropriate for modeling of pollutant emissions from multiple, industrial-type sources subject to significant building downwash. The downwash algorithms in the ISCST3 model provide a representation of the aerodynamic downwash of a stack plume caused by complex building configurations typical of industrial facilities. Refined ISCST3 modeling was conducted using one year (1996) of sequential hourly meteorology from the on-site observation facility, as described above.

5. Receptor Selection

A Cartesian grid of receptors was utilized in this modeling analysis. This grid consisted of the following:

- Fenceline receptors with a 100 m spacing between receptors
- Receptors beyond the fenceline with 100 m spacing on a 5 km by 7 km grid

All receptors are located along or outside the plant fenceline.

A Cartesian receptor grid of this type is considerably more dense than recommended by the U.S. EPA in the Guidelines on Air Quality Models (U.S. EPA, 1998) for modeling a facility of this type. Terrain elevations for each of the receptors were imported from electronic files obtained from the U. S. Geological Survey (USGS) using the "highest" method to assign an elevation to each receptor. The receptor grid used in the modeling analysis is shown graphically in Figure 2.

6. Modeling Procedures

The most recent version of ISCST3 (version 02035) was used in the air quality dispersion modeling of all receptors. All model options were set to the U.S. EPA regulatory default version of ISCST3. The model was run in the rural mode since the land area in the immediate vicinity of Washington Works is more than 50% rural. Any effects of aerodynamic downwash caused by structures adjacent to each modeled stack were included in the ISCST3 modeling analysis along with a summary of the building downwash input files (BPIP). Air quality dispersion modeling was conducted on an hour-by-hour basis using the one year of meteorological data described above. The APFO modeling results were summarized for the annual averaging time period.

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7. Results

The results of the modeling analysis indicate a maximum predicted annual average APFO concentration of 0.70 ug/m^3. This maximum is located along the northern property fenceline, along the Ohio River, at UTM 442043 E, 4346883 N. The maximum predicted APFO concentration in an area where people may reside is 0.17 ug/m^3. This prediction is located at UTM 442600 E, 4347600 N, on the Ohio side of the river. The results are presented graphically in Figure 3.

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Table 1

*** POINT SOURCE DATA ***

Vent ID	UTM-E	UTM-N	Stack Diameter ft	Stack Height ft	Stack Flow ACFM	Stack Velocity ft/sec	Stack Temp F	Actual C8 Emissions lb/yr	Actual C8 Emissions lb/hr
699	442098	4346843	4	170	12,000	15.9	124	1,463	0.1670
697	442128	4346829	2.25	45	2,000	8.4	176	0.7	0.0001
694	442101	4346815	1.67	45	344	2.6	112	1.0	0.0001
658	441928	4346757	1.5	63	6,478	61.1	142	55	0.0063
652	441926	4346758	0.88	64	4,031	111.7	139	30	0.0034
231	441953	4346766	0.67	92	510	24.4	148	1,950	0.2227
232	441952	4346776	0.67	99	710	33.9	128	1,975	0.2254
242	441945	4346746	0.5	114.5	1,048	89.0	117	537	0.0613
274	441787	4346744	0.65	110	718	36.6	163	860	0.0982
268	441774	4346753	0.27	72.5	100	28.7	110	35	0.0040
276	441842	4346772	1.5	75	5,000	47.2	amb	0.16	0.000018
RO22EEF6	442086	4346624	2.5	47	8836		80	12	0.00045
RO22EEF86	442069	4346627	2	49	7540		80	0.3	0.00045
RO22EEF87	442058	4346634	2	49	1885		80	3	0.00045
RO22EEF89	442063	4346635	2	49	3770		80	0.6	0.00045

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Figure 1

Source and Building Locations

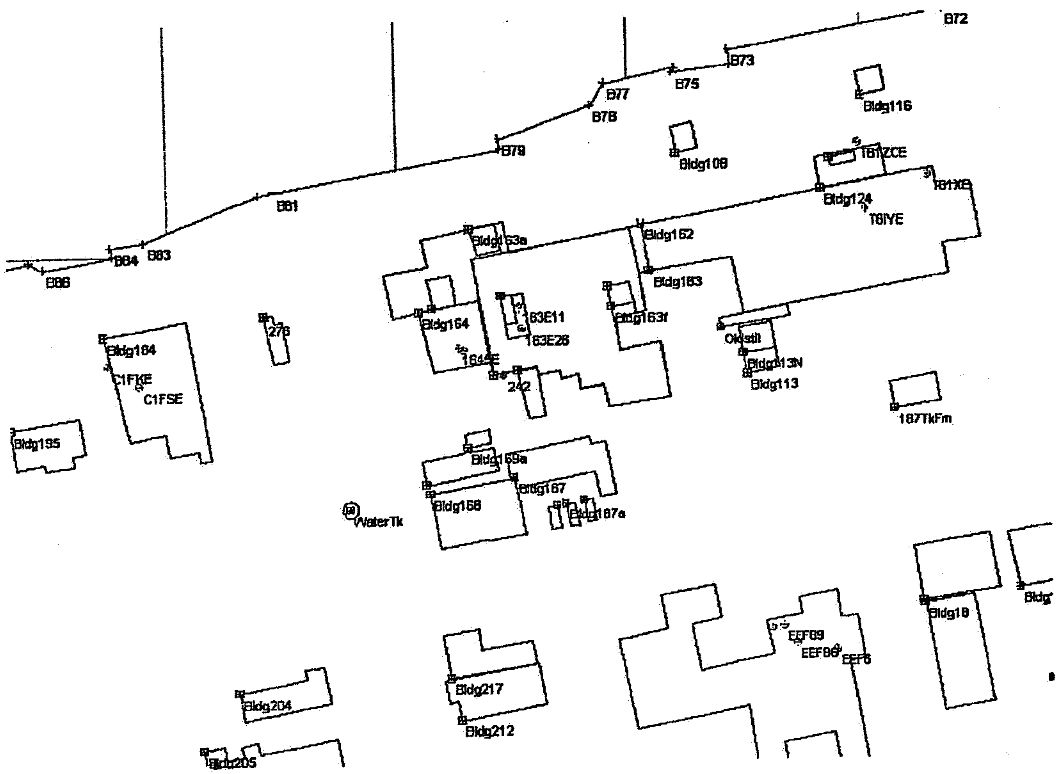

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Figure 2

Receptor Grid Used in the Modeling Analysis

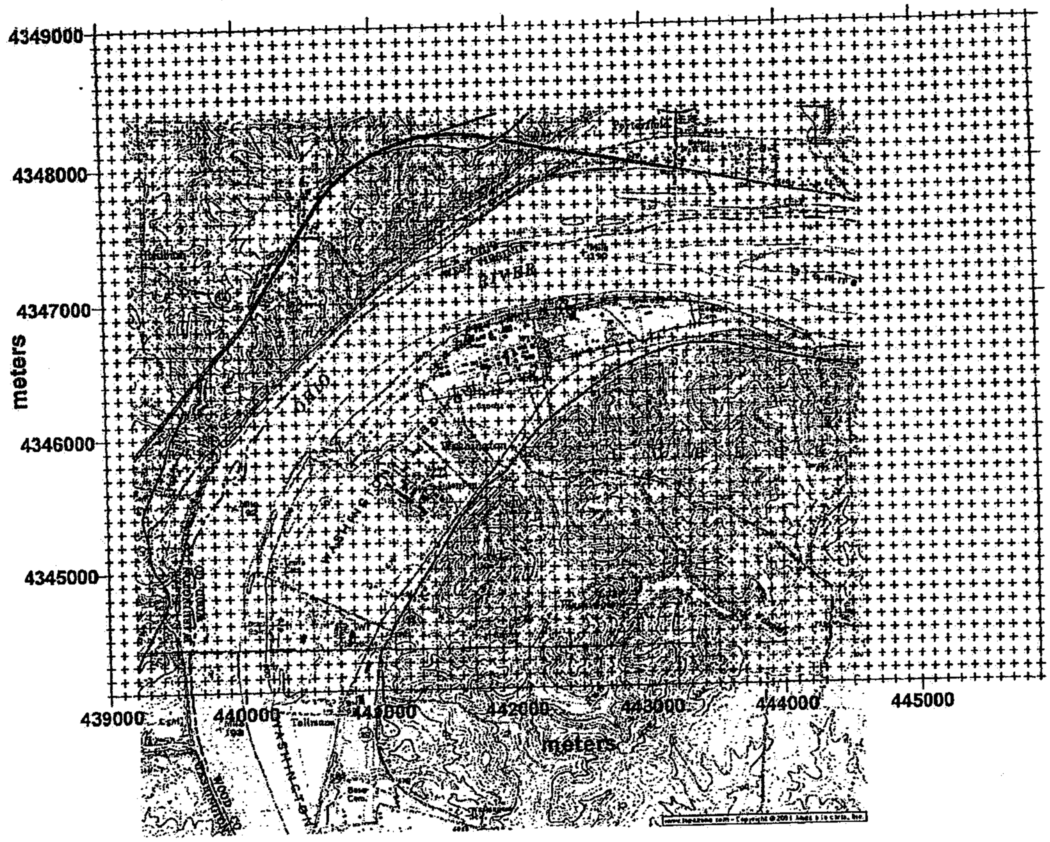

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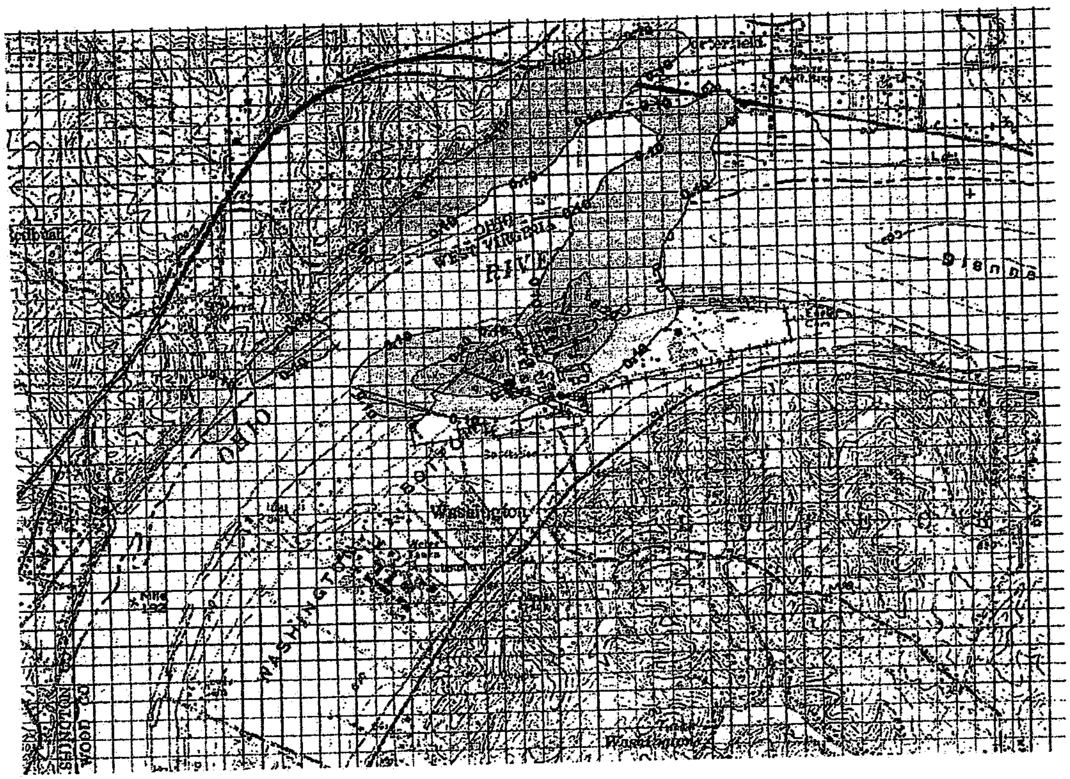
Figure 3

September 2002 – August 2003 APFO Modeled Emissions



Annual Average Concentrations (ug/m³)

Contour Interval 0.1 ug/m³

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References

(1) U. S. EPA, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, Office of Air Quality Planning and Standards, February, 2000.

(2) Auer, A. H., "Correlation of Land Use Cover with Meteorological Anomalies", Journal of Applied Meteorology, Vol. 17, pp. 636-643, 1978.

(3) U. S. EPA, Guideline on Air Quality Models (Revised), EPA-450/2-78-027R-C, 2001.

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