Division of Air Quality
Bureau of Technical Services
Air Quality Evaluation Section
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January 22, 2009

MEMORANDUM

TO: Steve Maybury, Chief
Bureau of Case Management

FROM: John Jenks, Chief
Bureau of Technical Services

SUBJECT: DuPont Chambers Works Telomer Manufacturing
Air Dispersion and Deposition of Perfluorooctanoic Acid

By request of the Site Remediation Program, the Bureau of Technical Services (BTS) has conducted air dispersion modeling of Perfluorooctanic Acid (PFOA) emissions at the DuPont Chambers Works Facility to verify and detail the extent of PFOA emissions from the facility between 1999 and 2005. PFOA concentrations of 0.0006 $\mu g/m^3$ are predicted out to distance of 2 miles southeast from the facility. Based on predictions of dispersion and deposition from PFOA emission points at the facility, any monitoring or sampling investigation of PFOA should be focused on an area that extends two miles east and south of the facility.

As you know, it is my belief that presence of PFOA in the ground and groundwater is not only from the direct transport of PFOA emitted from the source. The PFOA in the groundwater may also be there as a result of other perfluorinated substances; perfluorooctane sulfonate and perfluorooctanol, that are oxidized and degraded into PFOA. Our modeling only considered the emission of PFOA and therefore is likely to underestimate the net burden to groundwater if other perfluorooctane species were emitted.

If there are any questions, please call Greg John at (609) 633-1106.

Attachment

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DuPont Chambers Works Telomer Manufacturing
Air Dispersion and Deposition of Perfluorooctanoic Acid
Air Quality Modeling Summary
January 2009

CONCLUSION

Perfluorooctanoic Acid (PFOA) concentrations of 0.0006 $\mu g/m^3$ are predicted out to distance of 2 miles southeast from the DuPont Chambers Works Facility. Based on predictions of dispersion and deposition from PFOA emission points at the facility, any monitoring or sampling investigation of PFOA should be focused on an area that extends two miles east and south of the facility.

PROJECT DESCRIPTION

BTS modeled PFOA emissions points at the DuPont Chambers Works Facility, located in Carneys Point and Pennsville Townships, Salem County, to verify PFOA modeling results submitted by DuPont, and to detail the extent of dispersion and deposition of PFOA emissions. BTS used information provided in the document, *DuPont Telomer Manufacturing Sites: Environmental Assessment of PFOA Levels in Air and Water* (Project No. 508501, 18983843.00003), dated September 2003, and prepared by the Corporate Remediation Group, and additional air dispersion modeling and emissions data submitted on November 6, 2008.

SOURCES AND EMISSION RATES

Eight point sources of PFOA emissions identified by DuPont were modeled. Table 1 lists the point sources, their PFOA emission rates, and stack parameters.

Table 1 . Emission Rates and Stack Parameters for PFOA Point Sources at DuPont Chambers Works

Point Source	Emission Rate (g/s)	Stack Height (m)	Stack Diameter (m)	Stack Temp. (degrees K)	Exit Velocity (m/s)
DMAROOF	0.7635E-06	21.34	0.05	338.71	3.96
1156HW	0.5607E-05	3.66	0.05	338.15	0.01
185HW	0.3704E-06	0.0	0.15	313.15	0.00
TS45TANK	0.2041E-06	7.62	0.08	343.15	3.05
DJETS	0.2570E-06	26.82	0.91	Ambient	7.19
DROOF	0.2356E-05	16.76	0.05	Ambient	0.23
EOCENTER	0.2759E-05	25.91	0.10	Ambient	4.66
DDE	0.4158E-02	7.62	0.79	363.15	27.94

Additional description for the point sources is provided below:

DMAROOF - Telomer A DMA Roof #1
1156HW - ZFAN Crude from 1156 Building Hotwell
185HW - Alcohol Drying from 185 Building Hotwell
TS45TANK - Alcohol Drying from TS-45 Tank vent
DJETS - D Building Jets
DROOF - D Building Roof
EOCENTER - Hotwell and Stack
DDE - Tenant Operation, Building 1163 Stack

MODELING METHODOLOGY

The PFOA emissions at DuPont Chambers Works were modeled with USEPA's ISCST3 dispersion model (version 02035). The ISCST3 model was applied in this situation so that the modeling could also incorporate deposition results. Five years of surface observations (1990-1994) from Wilmington International Airport and concurrent upper air data from Dulles International Airport in Sterling, Virginia were used to model the PFOA emissions. Rural dispersion coefficients were used.

A Cartesian Grid of receptors was used with receptors extending at 200-meter intervals out to approximately 6 kilometers east and north of the PFOA emission points, and at least 2 kilometers west and 4 kilometers south of the emission points. Property/fenceline receptors were placed at 50 meters intervals. A total of 2,344 receptors were modeled.

The following deposition factors were input: PFOA density of 1.8 g/cm^3, and precipitation scavenging coefficients of 6.8E-4 hr/s-mm for liquid and 2.2E-4 hr/s-mm for ice. The particle distribution used in deposition modeling was taken from the document, *Particle Size Distribution of PFOA in Ambient Air Data Summary and Analysis*, dated May 2004, and prepared by DuET Engineering for DuPont Fluoroproducts. The size distribution of PFOA emissions are listed in Table 2.

Table 2. Particle Size Distribution for PFOA Emissions (1995)

Particle Diameter (microns)	Mass Fraction
4.0	0.033
2.0	0.127
0.75	0.035
0.4	0.267
0.2	0.538

MODELING RESULTS

The maximum predicted annual average off-site PFOA concentration of 0.00279 $\mu g/m^3$ is located along U.S. Route 130, just north of Deepwater. This value is well below the established inhalation reference concentration of 1 $\mu g/m^3$. More importantly for this modeling application, PFOA concentrations of 0.0006 $\mu g/m^3$ are predicted out to distance of 2 miles southeast from the facility. Figure 1 shows the predicted annual average ground level air concentrations in $\mu g/m^3$ of PFOA based on ISCST3 modeling using 1990-1994 Wilmington data.

Figure 2 shows the predicted annual deposition of PFOA in grams per square meter. As expected, due to the fall-out of larger-sized PFOA particles, the furthest extent of significant concentrations of PFOA due to deposition is closer to the facility, but in the same approximate direction – to the southeast.

Based on predictions of dispersion and deposition from PFOA emission points at DuPont Chamber Works Facility, any monitoring or sampling investigation of PFOA should be focused on an area that extends 2 miles east and south of the facility. While the dispersion pattern may change slightly between periodic meteorological datasets, five years of data statistically characterizes what would usually occur for a region representative of the observing station.

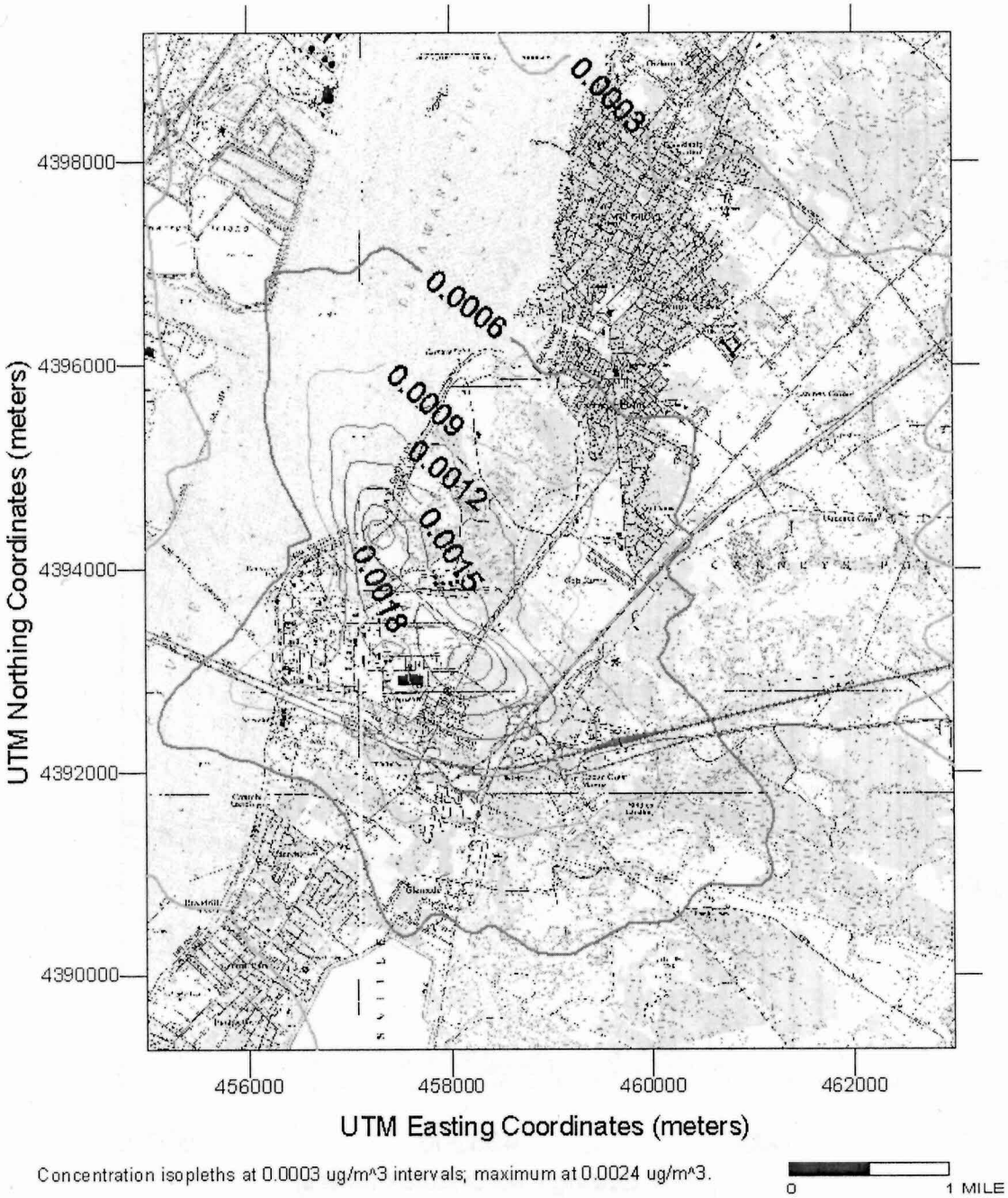

Figure 1. Predicted Annual Average Groundlevel Concentrations of PFOA (ug/m^3)
ISC3 / Wilmington Meteorological Data (1990-1994)

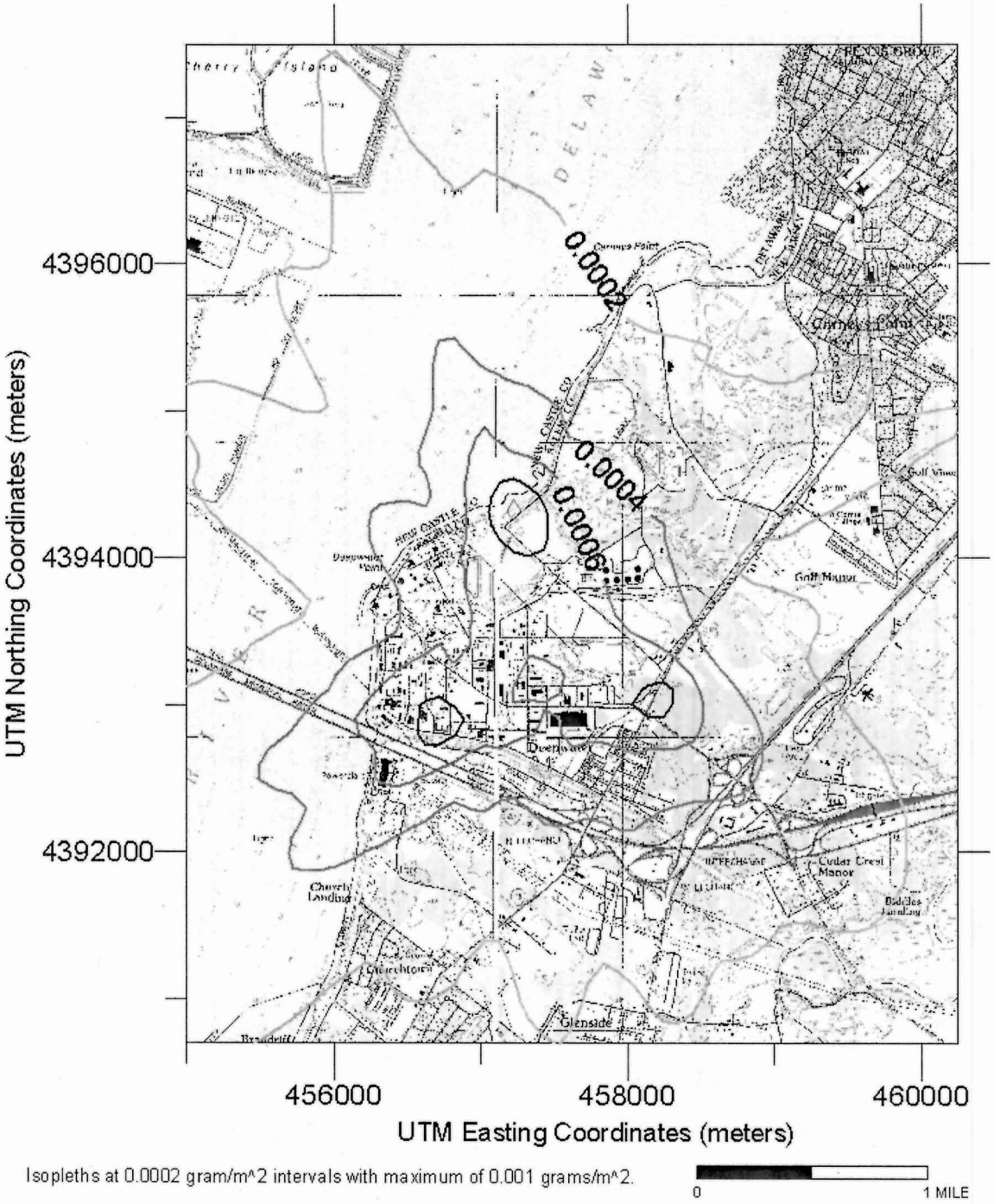

Figure 2. Predicted Annual Deposition of PFOA (grams/m^2)
ISC3 / Wilmington Meteorological Data (1990-1994)