AMBIENT AIR QUALITY ANALYSIS - PROPOSED S.U.P. SCENARIO - VIRGINIA PAVING

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Ambient Air Quality Analysis – Proposed S.U.P. Scenario – Virginia Paving
Executive Summary

This analysis calculates the ambient air quality impacts of the Virginia Paving (VP) facility, an asphalt batch plant in Alexandria, Virginia and compares results against health-based National and Virginia ambient air quality standards (AAQS) for criteria pollutants and Virginia's Significant Ambient Air Concentration (SAAC) guidelines for hazardous pollutants. Impacts were calculated for two operational scenarios. The first, called the baseline scenario here, assumes constraints and limitations specified in the facility's current air permit, using current annual production. The second assumes conditions and limitations that have been proposed as Special Use Permit (SUP) terms.

This analysis uses procedures prescribed by US EPA for ambient air quality compliance demonstrations. This analysis uses AERMOD-PRIME, a US EPA-approved model for calculating air impacts from industrial sources, including facilities where downwash of plumes due to the presence of onsite and offsite structures affects results. A US EPA-approved algorithm that was recently reformulated for use in AERMOD-PRIME was used to calculate the dimensions of down-washing structures at the facility. Emissions derive from application of US EPA factors, and site-specific characteristics for the wide variety of sources that operate at the plant, including hot mix asphalt batch plants, a hot oil heater, load-out and asphalt storage processes, aggregate handling processes, operation of on-road heavy duty diesel trucks and off-road aggregate handling trucks, and wind erosion of aggregate storage piles.

Impacts were calculated for the baseline scenario assuming total facility asphalt throughput limitations of 24,000 and 900,000 tons per day and year, respectively. Other baseline assumptions include stack heights for each of the asphalt plants equal to 14 meters, hot oil heater stack height equal to 3 meters, and an annual fuel limitation of 125,000 gallons of no. 5 oil in the hot oil heater. Assumptions within the proposed SUP scenario include total facility throughput limitations for asphalt of 10,000 and 1.2 million tons per day and year, respectively. Other assumptions include stack height increases to 20 meters and 6 meters for the asphalt plant stacks and hot oil heater, respectively, and an annual fuel use limitation of 100,000 gallons of no. 2 oil for the hot oil heater. Within the proposed SUP scenario, additional add-on controls and emission mitigation techniques are also assumed, including the Blue Smoke© control and condenser system for the load-out and asphalt storage processes, add-on particulate control for onsite diesel vehicles, commitment to use lower sulfur fuel (to 500 ppm) in onsite equipment one year ahead of the requirements of the federal off-road diesel rule, increased frequency of watering of onsite roadways, wet-spray particulate control of RAP crushing operations, and enclosures around aggregate transfer points at Plant 2.

Impacts were calculated at receptors along the fence line, placed approximately 50 meters apart, at discrete receptors extending from the fence line to distances of approximately 300 meters, at approximately 50 meter spacing, and along radials at ten degree increments extending from 300 meters to two kilometers distance from the facility. Impacts for years 2000 through 2004 were simulated for each of the baseline and proposed SUP scenarios using local meteorological conditions, topography and surface conditions representative of the immediate and surrounding area and worst-case regional background contributions derived from Virginia air monitors. Contributions from the nearby sources of the Covanta municipal solid waste incinerator, Washington Gas and Light, and US Filter were also included in the AAQS analysis

The proposed SUP scenario represents significant short-term improvements in air quality impacts, with short-term maximum impacts from the facility reduced from approximately 10% to 80% from the baseline scenario's impacts, depending on pollutant and averaging period. Annual impacts for the proposed SUP scenario also represent improvements, but to a lesser extent, ranging up to 40% reduction from the baseline scenario's maximum impacts. Results show that for the proposed SUP scenario, maximum potential impacts comply with the respective AAQS for all pollutants except $PM_{2.5}$ (annual) and SO_2 (3-hour). For SO_2, 3-hour impacts exceed the AAQS by 7% at only a limited area immediately on the fenceline. For $PM_{2.5}$, annual impacts exceed the AAQS by no more than 1.3 micrograms per cubic meter; this area of noncompliance is also limited, extending to approximately 150 meters from the northeast fence line, along an arc of approximately 200 meters. However, the facility's contribution to these exceedances is minimal; interacting source contributions and background constitute 15.6 of the 16.3 total micrograms per cubic meter maximum impact. Comparison between nine days of observations from a PM_{10} monitor located closely to this site and AERMOD results shows that for almost all observations, predicted results using AERMOD exceed actual impacts with significant margin, suggesting that application of AERMOD for the baseline and proposed SUP scenarios provides maximum potential facility impacts while also assuring a margin of protection. Results also show that for HAPs, impacts comply with SAAC guidelines for the proposed SUP scenario, in most cases with ample margin.

1. Introduction

This report presents the procedures and results of an analysis to determine ambient air impacts of the Virginia Paving (VP) facility in southwest Alexandria, Virginia. This analysis responds to the interest by the City of Alexandria in evaluating the facility's compliance with federal and Virginia ambient air quality standards (AAQS) for an expansion scenario and special use permit (SUP) request that includes an increase in annual throughput and physical changes and proposed operational procedures intended to mitigate impacts. The expansion scenario's limitations and conditions that this emissions analysis incorporates are listed in the report of a parallel analysis of the facility's impacts by Cambridge Environmental, Inc.[1]

To assure a comprehensive review, this analysis generally follows guidelines and procedures stipulated by the United States Environmental Protection Agency's (US EPA) Guideline on Air Quality Models[2] and New Source Review Workshop Manual.[3] This analysis applies the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD), Version 04300, to determine the ambient air impacts by VP.[4] Results of this analysis include an assessment of VP's compliance with National and Virginia Ambient Air Quality Standards (AAQS) for criteria pollutants. Table 1-1 below shows these AAQS and significant guideline values. Results of this analysis include an assessment of VP's compliance with National and DEQ Ambient Air Quality Standards (AAQS) for criteria pollutants.

The facility's processes also emit hazardous air pollutants (HAPs). Stationary sources' impacts of these pollutants are regulated through Virginia Department of Environmental Quality's (VDEQ) significant ambient air concentration (SAAC) guidelines, prescribed in 9 VAC 5-60-230. These guidelines derive from the Threshold Limit Ceiling (C), Short-term Exposure Limit (STEL) and Time Weighted Average (TWA) exposure criteria developed by the American Conference Governmental and Industrial Hygienists, with scaling factors applied to account for chronic versus worker-based exposure scenarios.[5] Maximum potential emissions of HAPs were determined, and impacts by those HAPs with the greatest potential to exceed guidelines were evaluated.[6]

Table 1-1. National and Virginia Ambient Air Quality Standards (µg/cu.m.).

	CO	NO_2	Lead	$PM_{2.5}$	PM_{10}	SO_2
1-hour	40,000[(d)]	--	--	--	--	--
3-hour	--	--	--	--	--	1300[(d)]
8-hour	10,000[(d)]	--	--	--	--	--
24-hour	--	--	--	65[(a)]	150[(a)]	365[(d)]
Quarter			0.15			
Annual	--	100[(c)]	--	15[(b]	50	80[(c)]

Notes:(a) The fourth highest concentration provides an unbiased estimate of the 99th percentile value; compliance is met when fourth highest value in area is less than or equal to this value (see "User's Guide for the AMS/EPA Regulatory Model – AERMOD").
(b) Compliance is met using average of three consecutive years' values.
(c) Compliance met using highest of years' values.
(d) Compliance met using highest second highest value.

[1] "Results of an Emission and Air Dispersion Modeling Study and Public Health Evaluation of the Virginia Paving Company – 5601 Courtney Avenue – Alexandria, Virginia," Cambridge Environmental, Inc., December, 7, 2005.
[2] "Appendix W to Part 51 – Guideline on Air Quality Models," 40 CFR Ch. 1 (7-1-03 Edition).
[3] "New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting," Draft, US EPA, October, 1990.
[4] AERMOD incorporates recent US EPA improvements in air modeling capability, including PRIME.
[5] Impacts for lead are also evaluated against the DEQ significance guideline for 1-hour and annual periods.
[6] 9 VAC 5 Chapter 50, Hazardous Air Pollutant Sources, Part II, Emission Standards, Article 4.

2. Procedures

2.1 Facility Description

Virginia Paving's facility in Alexandria includes two counterflow drum mix asphalt plants, labeled Plant 1 and 2, rated at 600 and 400 tons per hour, respectively, two liquid asphalt heaters, rated at 5.64 and 2.5 million Btu per hour, and associated ancillary equipment. Processes produce both stack and fugitive emissions, including emissions from asphalt storage silos, load-out and yard processes, the handling and storage of recycled asphalt pavement (RAP), sand and stone, and truck traffic on onsite paved and unpaved road sections.

2.2 Stack Emission Sources: Plants 1 and 2; Heaters 1 and 2; Emissions and Exhaust Characteristics

Stack air emission sources at the site are limited to each plant's dryer, each controlled by a baghouse, and the two asphalt heaters. Distillate and waste fuel oil are combusted within the dryers. Emissions of these sources are currently limited by maximum daily and annual throughput totals stipulated within the facility's Stationary Source Permit to Operate and Modify (PTO) prescribes.[7]

Stack emission factors for the dryers and heaters derive from test data submitted to the City of Alexandria by Cambridge Environmental in August, 2005[8] and US EPA emission factors, respectively. Modeling parameters and downwash building dimensions for these sources were determined using data submitted to the City of Alexandria by Cambridge Environmental in September and October, 2005 and ortho-photography of the facility. [9]

2.3 Fugitive Process Emissions and Modeling Parameters

The fugitive process emissions at the facility derive from RAP, sand and stone handling and storage, asphalt storage silos and load-out of the asphalt product, including on-site emissions deriving from the off-gassing of the asphalt immediately after loading, truck traffic, including combustion emissions, and wind erosion processes. The hydrated lime silo is excluded from the analysis; although this process is listed with corresponding opacity limits in the facility's PTO, recent correspondence indicates that this process is no longer used at the facility.[10]

Factors for asphalt storage, load-out and yard emissions derive from US EPA's AP-42 "Compilation of Air Pollutant Emission Factors" for hot mix asphalt plants (Section 11.1); data specific to drum mix plants were used where available. US EPA's AP-42 factors were also used for calculating emissions from aggregate handling and storage, paved and unpaved roads, crushed stone and mineral processing,[11] open fugitive dust sources, [12] US EPA's MOBILE6.2 emission factor model for combustion emissions from heavy-duty diesel vehicle traffic, and US EPA AP-42 emission factors for diesel engines for onsite diesel-powered equipment (front-end loaders, cats, fork lifts).[13] Site-specific characteristics were used where available, including

[7] "Stationary Source Permit to Modify and Operate," Virginia Paving Company – Alexandria Plant, The Lane Construction Company, February 17, 2005.
[8] Stephen Zemba, Cambridge Environmental to Lalit Sharma, City of Alexandria, August 22, 2005
[9] "GIS Data CD," City of Alexandria, Spring, 2004, Tile F2.
[10] M. Ames of Cambridge Environmental to M. Barrett of Aero Engineering, October 21, 2005.
[11] US EPA's AP-42, "Compilation of Air Pollutant Emission Factors," Section 13.2.1 Paved Roads and Section 13.2.4 Aggregate Handling and Storage Pile, December, 2003, www.epa.gov/ttn/chief/ap42.
[12] "Control of Open Fugitive Dust Sources," Section 4.1.3, EPA-450/3-98-008.
[13] "Mobile Source Emission Factor Model," EPA-420-R-03-010, August, 2003.

process characteristics and site vehicle emission factors described by Cambridge Environmental and local meteorological observations.[14]

Figure 2-1 shows all of the facility processes, approximately to scale as they were defined within AERMOD, on a planview of the facility.[15] Table 2-1 below summarizes some of the key assumptions in the calculation of emissions for the facility.

Table 2-1. Key Emission Assumptions.	
Plant Dryers No. 1 and 2	-PM_{10} and $PM_{2.5}$ derive from results of stack tests conducted in August, 2005, scaled to reflect 0.03 gr/dscf for total PM.[16] -Emission factors for other pollutants derive from maximum cited within AP-42,[17] Section 11.1 "Hot Mix Asphalt Plants" for drum mix plants for all other pollutants.
Asphalt Heaters No.'s 1 and 2	-Short-term and annual emissions use use distillate oil rates. - Short-term emissions unlimited; annual emissions consistent with fuel limit. - Simultaneous operation excluded.
Storage Silos, Load-out, Yard	- Used factors for PM_{10}, $PM_{2.5}$, CO and VOC from AP-42, Section 11.1 "Hot Mix Asphalt Plants;" assumed loss factor of –0.5. -Assumed control efficiency equal to 99% for PM_{10} and $PM_{2.5}$ for Blue Smoke© system for storage and load-out processes only, for proposed scenario only. - Assumed yard emissions equal to 50% of loadout emissions; asphalt storage tank emissions equal to 10% of silo filling emissions.
Aggregate Handling	- For drop and reclaim operations, applied lb-per-ton factor from AP-42's Section 1.3.2.4, "Aggregate Handling and Storage Piles." - For rap crusher, used AP-42's tertiary crushing factor, assuming controls, from AP-42's Section 11.19.2, "Crushed Stone Processing and Pulverized Mineral Processing" at rated capacity for short-term. -Assumed rap/sand/stone total handling rates equivalent to rates for plant throughput; silt content and moisture consistent of aggregate consistent with facility-specific data provided by CE. [18]
Truck Traffic	- For particulate emissions on paved and unpaved site roadways, applied AP-42's Sections 13.2.1 and 13.2.2, "Paved Roads" and "Unpaved Roads," respectively. -Includes travel and idle combustion emission factors derived from

[14] NCDC SAMSON data for DC National Airport, 1986 to 1990.
[15] With Tile F2 as base map, from "GIS Data CD," City of Alexandria, Spring, 2004.
[16] "Source Sampling for Particulate Emissions – Hot Mix Asphalt Plant," Virginia Paving Company, Alexandria Virginia, August 11-12, 2005 (gr/dscf refers to grains per dry standard cubic foot).
[17] AP-42, "Compilation of Air Pollutant Emission Factors," US EPA, www.epa.gov/ttn/chief/ap42.
[18] Spreadsheet labeled "Fugitive Emissions factors silt" and "Fugitive Emissions factors moisture" relayed to AERO Engineering from M. Ames of Cambridge Environmental, September 30, 2005 via email.
[19] "User's Guide to MOBILE 6.1 and MOBILE 6.2, Mobile Source Emission Factor Model," US EPA, 420-R-03-010, August 2003.

Table 2-1. Key Emission Assumptions.	
	US EPA's MOBILE6.2 model for the HDDV6 vehicle class, derived for January conditions (expected worst-case for CO and PM emissions), assuming 15 ppm sulfur in the fuel, consistent with US EPA's "Clean Diesel Trucks and Buses Rule."[19] -Truck trips for asphalt hauling equals 555 for peak daily rates; reduced to annual value according to throughput. - Reduced emissions by 50% to account for application of water; this requires watering every two to three hours. - For paved roadways, applied a reduced $PM_{2.5}/PM_{10}$ factor from the AP-42 value, in accordance with observations for unpaved roads.[20]
On-site Equipment	-Included reduced $PM_{10/2.5}$ and SO_2 rates to reflect US EPA's "Clean Air Nonroad Diesel Rule," that will require fuel sulfur reductions to 500 ppm from 3,000 ppm in 2007 and to 15 ppm by 2010.[21] - Used AP-42 diesel engine emission factors and usage hours provided by CE.[22]
Wind Erosion	- Used meteorological observations of wind speed and rainfall from DC Reagan Airport and SAMSON data. -Applied wind erosion relationship dependent on coal pile size, average height, silt content (as above), and days with precipitation. - Worst-case daily rate of erosion uses maximum daily average wind speed that is reduced from hourly value. - Applied a reduced $PM_{2.5}/PM_{10}$ factor from the AP-42 value, in accordance with observations for construction sites.[23]

2.4 Baseline Scenario

This analysis presents the results for the baseline scenario, simulating the facility's maximum potential short-term and annual impacts under the existing physical configuration and historical operation of each of the dryer stacks, at 14.1 and 14.6 meters height, and heater no. 1's stack, at 2.9 meters. Annual emissions derive from the assumption of annual throughput equal to 900,000 tons total (610,000 and 290,000 tons, for Plants 1 and 2, respectively), and fuel oil consumption in the hot oil heater equal to 125,000 gallons. No Blue Smoke© system control was assumed. Annual emissions for storage, load-out, yard, aggregate handling and truck traffic reflect historical annual throughput levels. Heater no. 2 is not simulated here due to its description as strictly a backup unit.[24]

For this scenario, Table 2-2 shows the facility's and each process's maximum potential short-term and annual emission rates for each of the criteria pollutants (CO, NO_2, $PM_{2.5}$, PM_{10}, SO_2 and VOC),[25] and the corresponding emission release characteristics and source coordinates that were input to AERMOD for the baseline scenario. Total annual emissions for source

[20] "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10," Thompson G. Pace, US EPA.
[21] "New Clean Diesel Rule Major Step in Decade of Progress," EPA Newsroom, www.epa.gov.
[22] Spreadsheet labeled "Fugitive Emissions factors diesel US Filt," relayed to AERO Engineering from M. Ames of Cambridge Environmental, September 30, 2005 via email.
[23] "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10," Thompson G. Pace, US EPA.
[24] Correspondence with M. Ames of Cambridge Environmental, October, 2005. While the facility's PTO currently does not constrain the facility from simultaneous operation of Heaters no. 1 and 2, a new permit should contain that limitation.
[25] While there is no AAQS for VOC, that pollutant is regulated under source permitting requirements on the basis of tons per year; therefore, annual emissions are estimated for it here.

categories and the facility are also shown on Table 2-2. Tables A-1 through A-5 of Appendix A detail the emission factors and rates for each of the facility's processes for the baseline scenario.

2.5 Proposed SUP Scenario

This analysis simulates the facility's maximum potential impact under proposed physical changes to each of the dryer stacks, i.e., height increases to 20 meters, and to heater no. 1's stack, to a height of 6.0 meters. Maximum hourly rates for $PM_{2.5}$ and PM_{10} emissions for this and the baseline scenarios are calculated using total PM levels of 0.03 grains per dry standard cubic foot (dscf). However, annual emissions derive from the assumption of an increase in annual limitation for this proposed SUP scenario equal to 1.2 million tons, with apportionment to each of Plant 1 and 2 at levels equal to 720,000 and 480,000 tons, respectively, while a new daily limitation of 10,000 tons, total, decreases daily emissions from Plants 1 and 2. Additionally, this scenario assumes the application of the Blue Smoke© control system at a rate of 99% to reduce emissions of $PM_{2.5}$ and PM_{10} from the asphalt storage and load-out processes.[26] Table 2-3 summarizes the differences in process limitations, controls and physical configuration from the baseline scenario to the proposed SUP scenario.

Table 2-3. Difference between Baseline and Proposed SUP Conditions and Limitations.

Source Group	Baseline Operation	Proposed SUP Operation	Impact
Hot Mix Plants – Stack Heights	14 m. Height	20 m. Height	*Mitigation of impacts- all pollutants.*
Asphalt Heater Stack Height	3 m. Height	6 m. Height	*Mitigation of impacts – all pollutants.*
Plants 1 and 2 Hourly Throughput	600 tons and 400 tons per hour, resp.	No change.	*-Hourly emissions change only through emission controls and tighter limits.*
Plants 1 and 2 Daily Throughput	14,400 tons and 9,600 tons per day, resp.	6,000 tons and 4,000 tons per day, resp.	*Mitigation in total per day emissions and impacts.*
Total Facility Annual Throughput	900,000 tons	1.2 million tons	*Increase in annual emissions from all source groups.*
Asphalt Heater	-125,000 gallons of no. 5 or no. 2. -No limit on simultaneous operation.	-100,000 gals. No.2 oil. -Limit on simultaneous operation required.	*-Reduction in all pollutants.* *-Mitigation of impacts.*

[26] Correspondence dated October, 20, 2005 via email, from M. Ames of Cambridge Environmental to M. Barrett of Aero Engineering; with vendor's description (R. Hoffman) of the capability of the Blue Smoke™ system to achieve greater than 98% control of $PM_{1.8}$.

Table 2-3. Difference between Baseline and Proposed SUP Conditions and Limitations.			
Source Group	**Baseline Operation**	**Proposed SUP Operation**	**Impact**
Load-out and Silo Storage	-No add-on controls.	-Blue Smoke™ at 99% control.	*-Mitigation of fugitive $PM_{2.5}$ and PM_{10}.*
Combustion Emissions from Onsite Vehicles[27]	-No add-on controls.	-Add-on particulate control, at 90% reduce. -Commitment to use lower sulfur fuel in onsite equipment (to 500 ppm S) in 2006, one year ahead of off-road diesel rule's effect.	*-Mitigation of tailpipe $PM_{2.5}$ and PM_{10}.* *-Reduction in tailpipe SO_2 by 50%.*
Fugitive Dust from Paved Roads	-Best Management Practices.	-Commitment to watering every two to three hours. -Unpaved section next to Plant 2 to be paved.	*-50% reduction in fugitive $PM_{2.5}$ and PM_{10}.* *-Mitigation in fugitive $PM_{2.5}$ and PM_{10}.*
Aggregate Handling	-No controls.	-Addition of enclosure around aggregate transfer points around Plant 2.	*-Mitigation in fugitive $PM_{2.5}$ and PM_{10}.*
Asphalt Storage Tank	-No controls.	-Addition of condensor to control VOCs and PM.	*-Mitigation in $PM_{2.5}$ and PM_{10} and VOCs.*

For the proposed SUP scenario, Table 2-4 shows the facility's and processes' maximum potential emission rates for each of the criteria pollutants (CO, NO_2, $PM_{2.5}$, PM_{10}, SO_2 and VOC), and the corresponding emission release characteristics and source coordinates that were input to AERMOD for each of the processes. Table 2-4 also shows the facility-wide and source categories' annual emissions for the proposed SUP scenario. Table 2-5 below summarizes the differences in emissions on a ton-per-day and ton-per-year basis between the baseline and proposed SUP scenarios, for pollutants with 24-hour ambient standards. These results show that while tons-per-day of each pollutant will be reduced significantly for the revised proposed SUP scenario, emissions on a ton-per-year basis increase or remain the same. These results are expected considering the decrease in daily plant throughput that the revised proposed SUP scenario reflects, and while the annual plant throughput increases significantly for the proposed SUP scenario, proposed controls, lower sulfur fuels and more stringent emission limits mitigate the resulting increase in annual emissions. Tables A-6 through A-9 detail emission rates for each of the facility's processes for the proposed SUP scenario.

Table 2-5. Daily and Annual Emissions (tons) for $PM_{2.5}$, PM_{10} and SO_2 – Baseline vs. Proposed SUP Scenario						
	PM_{10}		**$PM_{2.5}$**		**SO_2**	
	Daily	Annual	Daily	Annual	Daily	Annual
Baseline	0.25	14	0.18	8	0.85	36
Proposed	0.09	14	0.07	9	0.37	43

[27] For off-road vehicles, $PM_{10/2.5}$ and SO_2 emissions are assumed to be 50% and 66% lower, respectively, in the baseline case than in modeling representative of the previous years' operation. Baseline emissions represent an operational year of 2006, without the limits and modifications for the proposed revised SUP. Therefore, due to the staggered changes in diesel sulfur fuel oil that the on-road and off-road diesel rules will produce, even for the baseline scenario, emissions for these sources will be lower than emissions for previous years.

Emissions for wind erosion reflect the assumption that the stockpiles remain essentially the same size in total acreage for both the baseline and proposed scenarios. Therefore, Table A-5 of the baseline scenario presents wind erosion emissions for both scenarios.

2.6 HAP Emissions for Proposed SUP Scenario

For each of the facility's processes, emissions of HAPs were determined using AP-42 emission factors for hot mix asphalt plants, MOBILE6.2 emission factors for onroad diesel trucks, and AP-42 diesel engine factors for diesel-powered onsite equipment. The HAPs for which the ratios of emission factors to SAAC guidelines are greatest for each source category were selected for full impact evaluations with AERMOD (see Table A-10). These pollutants include formaldehyde, acrolein, 1,3 butadiene, benzene, acetaldehyde, quinone and lead. Table 2-6 shows the facility's and processes' maximum potential emission rates for each of these pollutants, and the facility-wide annual emissions for these pollutants for the proposed SUP scenario. Tables A-11 through A-13 in Appendix A detail each process's HAP emission factors and inputs for each of the plant, load-out and vehicle processes. Wind erosion and aggregate handling processes have no emissions of HAPs.

2.7 Structure Downwash Dimensions

Downwash dimensions were input for the structures that influence each of the dryers' and Heater 1's plume behavior; these structure include the baghouse housings for Plants 1 and 2, the lime silo, the asphalt storage silos for each of Plants 1 and 2, and the stone bins. Dimensions for these structures derive from Cambridge Environmental's coordinates,[28] while the layout of structures also derives from inspection of ortho-photography of the site.[29] No downwash dimensions were input to AERMOD for the silo storage, load-out, yard, aggregate handling, wind erosion and truck traffic emissions because these sources are defined as area or volume sources; currently BPIP-PRIME and AERMOD do not have the capability to calculate wake effects on area or volume sources.

The US EPA's Building Profile Input Program with Prime[30] was applied to determine the height, width, and length of down-washing structures, and distance to adjacent structures, for each of the potential 36 wind directions.[31]

Table 2-7 lists each of the facility stack sources and the maximum projected height and width of the structure affecting the source, as calculated by BPIP-PRIME. Appendix B includes a printed listing of the BPIP-PRIME input and output files for this analysis.

Table 2-7. BPIP-PRIME Downwash Dimension Program's calculations of Maximum Height and Widths affecting each Stack, with Associated Structure Indicated.

Source	Maximum Height Affecting Source and Controlling Structure	Maximum Projected Width and Associated Structure
Baghouse 1	19.9 m.: Plant 1 Storage Silos	33.9 m.: Stone Bins
Baghouse 2	19.9 m.: Plant 1 Storage Silos	64.7 m.: Stone Bins
Heater 1	19.9 m.: Plant 1 Storage Silos	33.9 m.: Stone Bins

[28] Spreadsheet labeled "sources and buildings buildings," relayed to Aero Engineering from M. Ames of Cambridge Environmental, October 6, 2005.
[29] "GIS Data CD," City of Alexandria, Spring, 2004 (Tile F2).
[30] http://www.epa.gov/ttn/scram.
[31] "User's Guide to the Building Profile Input Program," US EPA, October, 1993, www.epa.gov/ttn/scram. The BPIP-PRIME program also determines the distance between adjacent structures for each wind orientation.

Figure 2 - 1. Facility processes and locations as modeled in AERMOD.

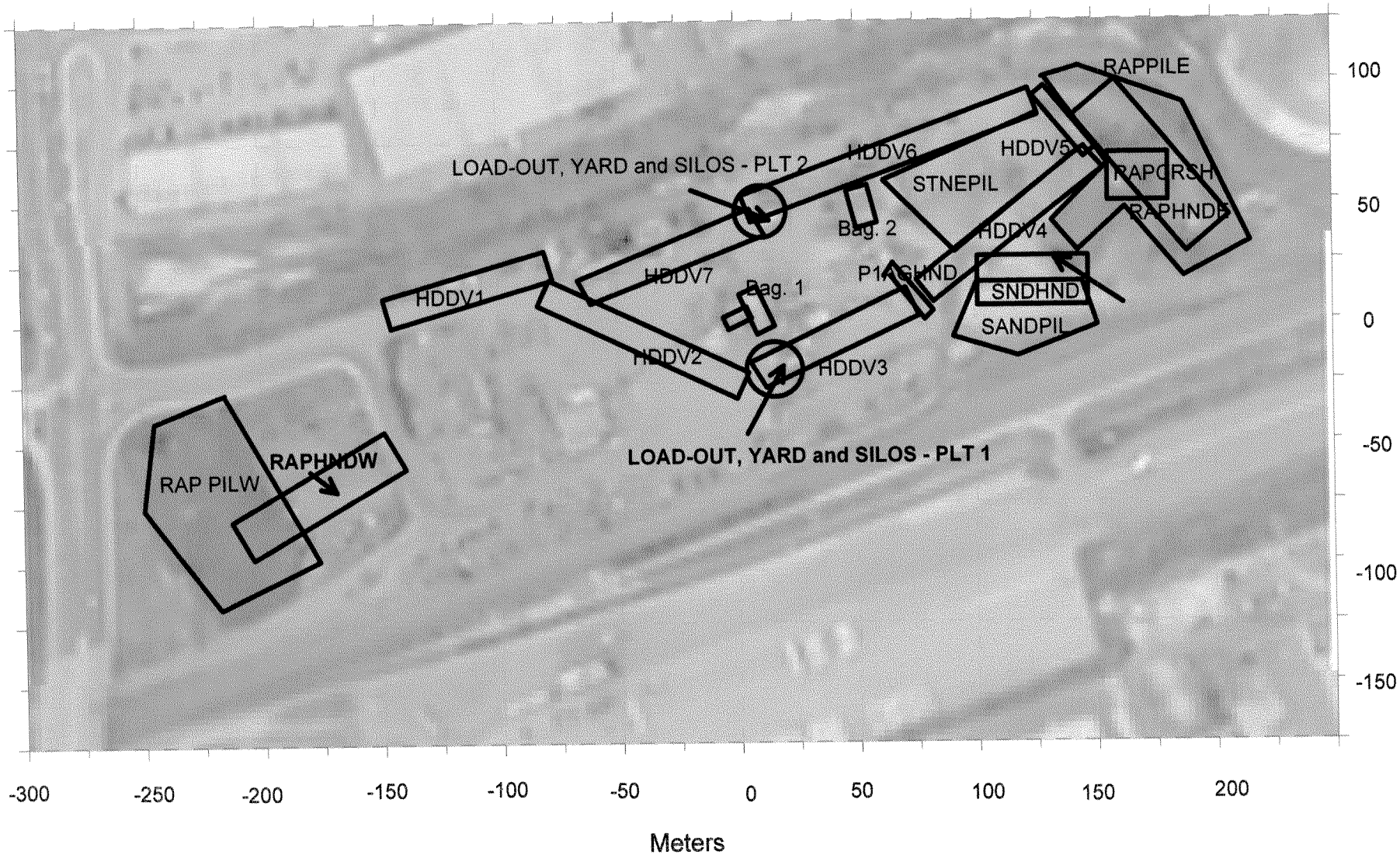

Table 2-2. AERMOD Source Inputs for all Processes - Baseline Scenario - Criteria Pollutants (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	PM_{10}	$PM_{2.5}$	CO	Pb-1hr	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
BAG1	POINT	BAG1	0	0	25.9		1.17	1.15	9.82	1.1E-03	4.91	4.91	0.15	0.15	1.29	0.21	0.64	0.03	g/sec	14.1	364	7.41	1.7				
BAG2	POINT	BAG2	48	67	25.9		0.46	0.44	0.60	7.6E-04	3.27	3.27	0.03	0.03	0.04	0.07	0.20	0.01	g/sec	14.1	366	4.48	1.2				
LIMESIL	POINT	LIMESILO	61	33	25.9		--	--	--	--	--	--	--	--	--	--	--	--	g/sec	no data	293	no data	nd				
HTR1	POINT	HTR1	47	41	25.9		1.7E-02	1.7E-02	6.1E-03	6.1E-06	0.36	0.36	5.9E-03	5.9E-03	2.2E-03	2.2E-06	0.13	0.13	g/sec	2.9	589	0.001	0.4				
HTR2	POINT	HTR2	no data	no data	25.9		--	--	--	--	--	0.00	--	--	--	--	--	--	g/sec	no data	589	no data	nd				
		TOTAL TONS					57.4	55.8	363	0.1	297.2	297	6.5	6.4	46.2	9.7	33.7	5.6									
LOADYD1	AREACIRC	Load-out and yard emissions at Plant 1.	9	-13	25.9	25.0	2.1E-05	2.1E-05	4.2E-05	0	0	0	2.7E-06	2.7E-06	5.5E-06	0	0	1.7E-05	g/(sec*m^2)	3.0							1963.4
STOR1	AREACIRC	Hot mix storage emissions - Plant 1.	6	-8	25.9	25.0	5.9E-06	5.9E-06	2.7E-05	0	0	0	7.8E-07	7.8E-07	3.5E-06	0	0	3.6E-05	g/(sec*m^2)	19.9							1963.4
LOADYD2	AREACIRC	Load-out and yard emissions at Plant 2.	14	54	25.9	25.0	1.4E-05	1.4E-05	2.8E-05	0	0	0	8.3E-07	8.3E-07	1.7E-06	0	0	5.1E-06	g/(sec*m^2)	3.0							1963.4
STOR2	AREACIRC	Hot mix storage emissions - Plant 2.	5	52	25.9	25.0	3.9E-06	3.9E-06	1.8E-05	0	0	0	2.4E-07	2.4E-07	1.1E-06	0	0	1.1E-05	g/(sec*m^2)	21.6							1963.4
		TOTAL TONS					3.0	3.0	7.8	0	0	0	0.3	0.3	0.8	0.0	0.0	4.7									
RAPHNDW	AREA	RAP Drops (twice) - West plus 20% of unpaved (fug., comb., site) emissions.	-225	-75	25.9		1.3E-05	5.0E-06	9.6E-05	0	3.7E-05	3.7E-05	4.8E-06	1.1E-06	1.4E-05	2.7E-05	5.5E-06	2.9E-06	g/(sec*m^2)	2.0				25	75	60	1875.0
RAPHNDE	AREA	RAP Drops (twice) - East plus 20% of unpaved (fug., comb., site) road emissions.	150	88	25.9		1.3E-05	5.0E-06	9.6E-05	0	3.7E-05	3.7E-05	4.8E-06	1.1E-06	1.4E-05	2.7E-05	5.5E-06	2.9E-06	g/(sec*m^2)	2.0				25	75	135	1875.0
SANDHND	AREA	Sand Drops (twice) plus 20% of unpaved road (fug., comb, site) emissions	100	25	25.9		3.1E-05	1.2E-05	1.4E-04	0	5.5E-05	5.5E-05	7.9E-06	1.9E-06	2.2E-05	4.1E-05	8.3E-06	4.4E-06	g/(sec*m^2)	2.0				25	50	90	1250.0
RAPCRSH	AREA	RAP Crusher plus 20% of unpaved (fug., comb., site) road emissions	152	69	25.9		1.6E-04	3.9E-05	4.5E-04	0	1.7E-04	1.7E-04	3.4E-05	7.2E-06	6.8E-05	1.3E-04	2.6E-05	1.4E-05	g/(sec*m^2)	2.0				20	20	90	400.0
P1AGHND	AREA	Agg. Dump at P1 plus 20% of unpaved (fug., comb., site) road emissions.	65	25	25.9		3.9E-04	1.3E-04	3.8E-04	0	1.5E-04	1.5E-04	3.7E-05	1.0E-05	5.8E-05	1.1E-04	2.2E-05	1.2E-05	g/(sec*m^2)	3.0				13	38	135	468.8
		TOTAL TONS					11.6	3.8	31.2	0	12.0	12.0	2.1	0.5	4.7	8.9	1.8	1.0									
HDDV1	AREA	Paved Fugitive and Combustion - Seg. 1	-143	8	25.9		3.7E-05	3.7E-06	2.0E-06	0	5.1E-09	5.1E-09	6.7E-06	6.8E-07	4.7E-07	9.7E-07	1.2E-09	9.7E-08	g/(sec*m^2)	2				20	63	75	1250.0
HDDV2	AREA	Paved Fugitive and Combustion - Seg. 2	-78	18	25.9		3.6E-05	3.7E-06	1.9E-06	0	5.1E-09	5.1E-09	6.6E-06	6.8E-07	4.7E-07	9.7E-07	1.2E-09	9.6E-08	g/(sec*m^2)	2				20	113	135	2250.0
HDDV3	AREA	Paved Fugitive and Combustion - Seg. 3 and Idling Emissions from Plt. 1	5	-13	25.9		3.7E-05	4.8E-06	8.9E-05	0	3.3E-06	3.3E-06	6.7E-06	8.0E-07	1.0E-05	6.6E-06	3.7E-07	4.6E-07	g/(sec*m^2)	2				20	75	70	1500.0
HDDV4	AREA	Paved Fugitive and Combustion - Seg.4	75	13	25.9		3.6E-05	3.7E-06	1.9E-06	0	5.1E-09	5.1E-09	6.6E-06	6.8E-07	4.7E-07	9.7E-07	1.2E-09	9.6E-08	g/(sec*m^2)	2				20	113	50	2250.0
HDDV5	AREA	Paved Fugitive and Combustion - Seg. 5	120	100	25.9		3.6E-05	3.7E-06	1.9E-06	0	5.1E-09	5.1E-09	6.6E-06	6.8E-07	4.7E-07	9.6E-07	1.2E-09	9.6E-08	g/(sec*m^2)	2				20	50	140	1000.0
HDDV6	AREA	Paved Fugitive and Combustion - Seg. 6 and Idling Emissions form Plt. 2	8	50	25.9		3.7E-05	4.1E-06	3.7E-05	0	1.3E-06	1.3E-06	6.7E-06	7.2E-07	3.6E-06	2.8E-06	1.2E-07	2.1E-07	g/(sec*m^2)	2				20	125	70	2500.0
HDDV7	AREA	Paved Fugitive and Combustion - Seg. 7	-63	13	25.9		3.6E-05	3.7E-06	1.9E-06	0	5.1E-09	5.1E-09	6.6E-06	6.8E-07	4.7E-07	9.6E-07	1.2E-09	9.6E-08	g/(sec*m^2)	2				20	75	70	1500.0
		TOTAL TONS					15.6	1.7	8.4	0	0.3	0.3	2.8	0.3	1.0	0.9	0.0298	0.1									
RAPPILW	AREAPOLY	Wind Erosion of RAP Pile - West - Represented by four-sided source - Vertice 1 (to correspond with location)	-218	-33	25.9		7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							4078
		Vertice 2 (CW)	-180	-105	25.9																						
		Vertice 3 (CW)	-225	-120	25.9																						
		Vertice 4 (CW)	-250	-80	25.9																						
		Vertice 4 (CW)	-245	-43	25.9																						
RAPPILE	AREAPOLY	Wind Erosion of RAP Pile - East - Represented by seven-sided source - Vertice 1 (to correspond with location)	130	95	25.9		7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							4078
		Vertice 2 (CW)	150	100	25.9																						

Table 2-2. AERMOD Source Inputs for all Processes - Baseline Scenario - Criteria Pollutants (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	PM_{10}	$PM_{2.5}$	CO	Pb-1hr	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
		Vertice 3 (CW)	163	90	25.9																						
		Vertice 4 (CW)	213	33	25.9																						
		Vertice 5 (CW)	188	20	25.9																						
		Vertice 6 (CW)	163	45	25.9																						
		Vertice 7 (CW)	143	30	25.9																						
		Vertice 8 (CW)	130	65	25.9																						
		Vertice 9 (CW)	155	63	25.9																						
SANDPIL	AREAPOLY	Wind Erosion of Sand Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	145	15	25.9		6.6E-06	6.6E-07	0.00	0.00	0.00	0.00	6.6E-06	6.6E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							1359
		Vertice 2 (CW)	153	0	25.9																						
		Vertice 3 (CW)	120	-13	25.9																						
		Vertice 4 (CW)	93	-5	25.9																						
		Vertice 5 (CW)	100	15	25.9																						
STNEPIL	AREAPOLY	Wind Erosion of Stone Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	113	83	25.9		2.0E-06	2.0E-07	0.00	0.00	0.00	0.00	2.0E-06	2.0E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							2719
		Vertice 2 (CW)	138	55	25.9																						
		Vertice 3 (CW)	90	30	25.9																						
		Vertice 4 (CW)	68	68	25.9																						
		TOTAL TONS					2.7	0.3	0.0	0.0	0.0	0.0	2.7	0.3	0.0	0.0	0.0	0.0									

	Maximum Potential Emissions:						*Maximum Potential Controlled*					
	PM_{10}	$PM_{2.5}$	CO	Pb	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC
Grand Total, by Subtotals for all Processes	90	65	410	0.066	309	309	14	8	53	19	36	11

Table 2-4. AERMOD Source Inputs for all Processes for Proposed SUP Scenario for Criteria Pollutants (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	PM_{10}	$PM_{2.5}$	CO	Pb-1hr	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
BAG1	POINT	BAG1	0	0	25.9		0.49	0.48	9.82	1.1E-03	4.91	2.04	0.16	0.16	1.34	0.22	0.67	0.03	g/sec	20.0	364	7.41	1.7				
BAG2	POINT	BAG2	48	67	25.9		0.19	0.18	0.60	7.6E-04	3.27	1.36	0.06	0.06	0.08	0.16	0.45	0.01	g/sec	20.0	366	4.48	1.2				
LIMESIL	POINT	LIMESILO	61	33	25.9		--	--	--	--	--	--	--	--	--	--	--	--	g/sec	no data	293	no data	nd				
HTR1	POINT	HTR1	47	41	25.9		1.7E-02	1.7E-02	6.1E-03	6.1E-06	0.36	0.36	4.7E-03	4.7E-03	1.7E-03	0.029	0.10	0.00	g/sec	6.0	589	0.001	0.4				
HTR2	POINT	HTR2	no data	no data	25.9		--	--	--	--	--	0.00	--	--	--	--	--	--	g/sec	no data	589	no data	nd				
		TOTAL TONS					24.3	23.6	363	0	297.2	131	8.0	7.7	49.7	14.1	42.6	1.5									
LOADYD1	AREACIRC	Load-out and yard emissions at Plant 1.	9	-13	25.9	25.0	2.9E-06	2.9E-06	4.2E-05	0	0	0	9.7E-07	9.7E-07	5.7E-06	0	0	1.7E-05	g/(sec*m^2)	3.0							1963.4
STOR1	AREACIRC	Hot mix storage emissions - Plant 1	6	-8	25.9	25.0	2.5E-08	2.5E-08	2.7E-05	0	0	0	8.1E-09	8.1E-09	3.7E-06	0	0	3.8E-05	g/(sec*m^2)	19.9							1963.4
LOADYD2	AREACIRC	Load-out and yard emissions at Plant 2.	14	54	25.9	25.0	2.0E-06	2.0E-06	2.8E-05	0	0	0	6.4E-07	6.4E-07	3.8E-06	0	0	1.2E-05	g/(sec*m^2)	3.0							1963.4
STOR2	AREACIRC	Hot mix storage emissions - Plant 2	5	52	25.9	25.0	1.6E-08	1.6E-08	1.8E-05	0	0	0	5.4E-09	5.4E-09	2.4E-06	0	0	2.5E-05	g/(sec*m^2)	21.6							1963.4
		TOTAL TONS					0.3	0.3	7.8	0.0	0.0	0.0	0.1	0.1	1.1	0.0	0.0	6.3									
RAPHNDW	AREA	RAP Drops (twice) - West plus 20% of unpaved (fug., comb., site) emissions.	-225	-75	25.9		4.3E-06	1.1E-06	9.6E-05	0	1.8E-05	7.6E-06	2.1E-06	4.2E-07	8.0E-06	1.5E-05	1.5E-06	1.6E-06	g/(sec*m^2)	2.0				25	75	60	1875.0
RAPHNDE	AREA	RAP Drops (twice) - East plus 20% of unpaved (fug., comb., site) road emissions.	150	88	25.9		4.3E-06	1.1E-06	9.6E-05	0	1.8E-05	7.6E-06	2.1E-06	4.2E-07	8.0E-06	1.5E-05	1.5E-06	1.6E-06	g/(sec*m^2)	2.0				25	75	135	1875.0
SANDHND	AREA	Sand Drops (twice) plus 20% of unpaved road (fug., comb, site) emissions	100	25	25.9		1.2E-05	3.4E-06	1.4E-04	0	2.8E-05	1.1E-05	4.1E-06	9.1E-07	1.2E-05	2.3E-05	2.3E-06	2.5E-06	g/(sec*m^2)	2.0				25	50	90	1250.0
RAPCRSH	AREA	RAP Crusher plus 20% of unpaved (fug., comb., site) road emissions	152	69	25.9		2.1E-05	4.0E-06	4.5E-04	0	8.6E-05	3.6E-05	1.2E-05	2.1E-06	3.8E-05	7.1E-05	7.2E-06	7.7E-06	g/(sec*m^2)	2.0				20	20	90	400.0
P1AGHND	AREA	Agg. Dump at P1 plus 20% of unpaved (fug., comb., site) road emissions.	65	25	25.9		9.8E-05	3.0E-05	3.8E-04	0	7.3E-05	3.1E-05	2.2E-05	6.0E-06	3.2E-05	6.1E-05	6.1E-06	6.6E-06	g/(sec*m^2)	3.0				13	38	135	468.8
		TOTAL TONS					2.9	0.8	31.2	0.0	6.0	2.5	1.0	0.2	2.6	5.0	0.5	0.5									
HDDV1	AREA	Paved Fugitive and Combustion - Seg. 1	-143	8	25.9		7.8E-06	8.1E-07	2.0E-06	0	5.1E-09	2.1E-09	4.1E-06	4.3E-07	4.3E-07	8.8E-07	1.1E-09	8.7E-08	g/(sec*m^2)	2				20	63	75	1250.0
HDDV2	AREA	Paved Fugitive and Combustion - Seg. 2	-78	18	25.9		7.8E-06	8.1E-07	1.9E-06	0	5.1E-09	2.1E-09	4.1E-06	4.3E-07	4.3E-07	8.7E-07	1.1E-09	8.7E-08	g/(sec*m^2)	2				20	113	135	2250.0
HDDV3	AREA	Paved Fugitive and Combustion - Seg. 3 and Idling Emissions from Pit. 1	5	-13	25.9		8.2E-06	1.3E-06	8.9E-05	0	3.3E-06	1.4E-06	4.3E-06	5.9E-07	1.3E-05	8.4E-06	4.9E-07	5.7E-07	g/(sec*m^2)	2				20	75	70	1500.0
HDDV4	AREA	Paved Fugitive and Combustion - Seg.4	75	13	25.9		7.8E-06	8.1E-07	1.9E-06	0	5.1E-09	2.1E-09	4.1E-06	4.3E-07	4.3E-07	8.7E-07	1.1E-09	8.7E-08	g/(sec*m^2)	2				20	113	50	2250.0
HDDV5	AREA	Paved Fugitive and Combustion - Seg. 5	120	100	25.9		7.8E-06	8.1E-07	1.9E-06	0	5.1E-09	2.1E-09	4.1E-06	4.3E-07	4.2E-07	8.7E-07	1.1E-09	8.7E-08	g/(sec*m^2)	2				20	50	140	1000.0
HDDV6	AREA	Paved Fugitive and Combustion - Seg. 6 and Idling Emissions form Pit. 2	8	50	25.9		8.0E-06	9.9E-07	3.7E-05	0	1.3E-06	5.5E-07	4.1E-06	4.8E-07	4.6E-06	3.3E-06	1.6E-07	2.4E-07	g/(sec*m^2)	2				20	125	70	2500.0
HDDV7	AREA	Paved Fugitive and Combustion - Seg. 7	-63	13	25.9		7.8E-06	8.1E-07	1.9E-06	0	5.1E-09	2.1E-09	4.1E-06	4.3E-07	4.2E-07	8.7E-07	1.1E-09	8.7E-08	g/(sec*m^2)	2				20	75	70	1500.0
		TOTAL TONS					3.4	0.4	8.4	0	0.3	0.1	1.8	0.2	1.2	1	0.0	0.1									
RAPPILW	AREAPOLY	Wind Erosion of RAP Pile - West - Represented by four-sided source - Vertice 1 (to correspond with location)	-218	-33	25.9		7.8E-06	7.8E-07	0	0	0	0	7.8E-06	7.8E-07	0	0	0	0	g/(sec*m^2)	5.0							4078
		Vertice 2 (CW)	-180	-105	25.9																						
		Vertice 3 (CW)	-225	-120	25.9																						
		Vertice 4 (CW)	-250	-80	25.9																						
		Vertice 4 (CW)	-245	-43	25.9																						

Table 2-4. AERMOD Source Inputs for all Processes for Proposed SUP Scenario for Criteria Pollutants (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	PM_{10}	$PM_{2.5}$	CO	Pb-1hr	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
RAPPILE	AREAPOLY	Wind Erosion of RAP Pile - East - Represented by seven-sided source - Vertice 1 (to correspond with location)	130	95	25.9		7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	7.8E-06	7.8E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							4078
		Vertice 2 (CW)	150	100	25.9																						
		Vertice 3 (CW)	163	90	25.9																						
		Vertice 4 (CW)	213	33	25.9																						
		Vertice 5 (CW)	188	20	25.9																						
		Vertice 6 (CW)	163	45	25.9																						
		Vertice 7 (CW)	143	30	25.9																						
		Vertice 8 (CW)	130	65	25.9																						
		Vertice 9 (CW)	155	63	25.9																						
SANDPIL	AREAPOLY	Wind Erosion of Sand Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	145	15	25.9		6.6E-06	6.6E-07	0.00	0.00	0.00	0.00	6.6E-06	6.6E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							1359
		Vertice 2 (CW)	153	0	25.9																						
		Vertice 3 (CW)	120	-13	25.9																						
		Vertice 4 (CW)	93	-5	25.9																						
		Vertice 5 (CW)	100	15	25.9																						
STNEPIL	AREAPOLY	Wind Erosion of Stone Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	113	83	25.9		2.0E-06	2.0E-07	0.00	0.00	0.00	0.00	2.0E-06	2.0E-07	0.00	0.00	0.00	0.00	g/(sec*m^2)	5.0							2719
		Vertice 2 (CW)	138	55	25.9																						
		Vertice 3 (CW)	90	30	25.9																						
		Vertice 4 (CW)	68	68	25.9																						
		TOTAL TONS					2.7	0.3	0.0	0.0	0.0	0.0	2.7	0.3	0.0	0.0	0.0	0.0									

	Maximum Potential Emissions:						Maximum Potential Controlled					
	PM_{10}	$PM_{2.5}$	CO	Pb	SO2-3hr	SO2-24hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO2	VOC
Grand Total, by Subtotals for all Processes	34	25	410	7.E-02	304	134	14	9	55	20	43	8

Table 2-6. AERMOD Source Inputs for all Processes - Proposed SUP Scenario - HAPs (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	form.	acrol	1,3 bu	benz	aceta.	quin.	form.	acrol	1,3 bu	benz	aceta.	quin.	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
BAG1	POINT	BAG1	0	0	25.9		2.3E-01	2.0E-03	0	3.0E-02	9.8E-02	9.8E-02	3.2E-02	2.7E-04	0	4.1E-03	1.3E-02	2.9E-02	g/sec	20.0	364	7.41	1.7				
BAG2	POINT	BAG2	48	67	25.9		1.6E-01	1.3E-03	0	2.0E-02	6.5E-02	6.5E-02	2.1E-02	1.8E-04	0	2.8E-03	9.0E-03	1.9E-02	g/sec	20.0	366	4.48	1.2				
LIMESIL	POINT	LIMESILO	61	33	25.9		--	--	--	--	--	--	--	--	--	--	--	--	g/sec	no data	293	no data	nd				
HTR1	POINT	HTR1	47	41	25.9		1.7E-04	0	0	1.1E-06	0	0	4.7E-05	0	0	3.1E-07	0	0	g/sec	6.0	589	0.001	0.4				
HTR2	POINT	HTR2	no data	no data	25.9		--	--	--	--	--	--	--	--	--	--	--	--	g/sec	no data	589	no data	nd				
		TOTAL TONS					13.6	0.1	0	2	5.7	5.7	1.9	0.0	0.0	0.2	0.8	1.7									
LOADYD1	AREACIRC	Load-out and yard emissions at Plant 1.	9	-13	25.9	25.0	4.7E-08	0	0	4.E-09	0	0	6.5E-09	0	0	5.E-10	0	0	g/(sec*m^2)	3.0							1963.4
STOR1	AREACIRC	Hot mix storage emissions - Plant 1.	6	-8	25.9	25.0	1.2E-07	0	0	9.2E-09	0	0	1.7E-08	0	0	1.3E-09	0	0	g/(sec*m^2)	19.9							1963.4
LOADYD2	AREACIRC	Load-out and yard emissions at Plant 2.	14	54	25.9	25.0	3.2E-08	0	0	2.4E-09	0	0	4.3E-09	0	0	3.3E-10	0	0	g/(sec*m^2)	3.0							1963.4
STOR2	AREACIRC	Hot mix storage emissions - Plant 2.	5	52	25.9	25.0	8.1E-08	0	0	6.1E-09	0	0	1.1E-08	0	0	8.4E-10	0	0	g/(sec*m^2)	21.6							1963.4
		TOTAL TONS					0.019	0	0	0.001	0	0	0.003	0	0	0.000	0	0									
RAPHNDW	AREA	RAP Drops (twice) - West plus 20% of unpaved (fug., comb., site) emissions	-225	-75	25.9		9.4E-08	7.3E-09	3.2E-09	7.2E-08	6.0E-08	0	2.1E-08	1.6E-09	8.2E-10	1.5E-08	1.3E-08	0	g/(sec*m^2)	2.0				25	75	60	1875.0
RAPHNDE	AREA	RAP Drops (twice) - East plus 20% of unpaved (fug., comb., site) road emissions.	150	88	25.9		9.4E-08	7.3E-09	3.2E-09	7.2E-08	6.0E-08	0	2.1E-08	1.6E-09	8.2E-10	1.5E-08	1.3E-08	0	g/(sec*m^2)	2.0				25	75	135	1875.0
SANDHND	AREA	Sand Drops (twice) plus 20% of unpaved road (fug., comb. site) emissions	100	25	25.9		9.4E-08	7.3E-09	3.2E-09	7.2E-08	6.0E-08	0	2.1E-08	1.6E-09	8.2E-10	1.5E-08	1.3E-08	0	g/(sec*m^2)	2.0				25	50	90	1250.0
RAPCRSH	AREA	RAP Crusher plus 20% of unpaved (fug., comb., site) road emissions	152	69	25.9		9.4E-08	7.3E-09	3.2E-09	7.2E-08	6.0E-08	0	2.1E-08	1.6E-09	8.2E-10	1.5E-08	1.3E-08	0	g/(sec*m^2)	2.0				20	20	90	400.0
P1AGHND	AREA	Agg. Dump at P1 plus 20% of unpaved (fug., comb., site) road emissions.	65	25	25.9		9.4E-08	7.3E-09	3.2E-09	7.2E-08	6.0E-08	0	2.1E-08	1.6E-09	8.2E-10	1.5E-08	1.3E-08	0	g/(sec*m^2)	3.0				13	38	135	468.8
		TOTAL TONS					0.019	0.001	0.001	0.015	0.012	0	0.004	3.E-04	2.E-04	0.003	0.003	0									5868.8
HDDV1	AREA	Paved Fugitive and Combustion - Seg. 1	-143	8	25.9		1.4E-08	6.3E-10	1.1E-09	1.9E-09	5.2E-09	0	7.4E-09	3.3E-10	5.8E-10	1.0E-09	2.7E-09	0	g/(sec*m^2)	2				20	63	75	1250.0
HDDV2	AREA	Paved Fugitive and Combustion - Seg. 2	-78	18	25.9		1.4E-08	6.3E-10	1.1E-09	1.9E-09	5.2E-09	0	7.4E-09	3.3E-10	5.8E-10	9.9E-10	2.7E-09	0	g/(sec*m^2)	2				20	113	135	2250.0
HDDV3	AREA	Paved Fugitive and Combustion - Seg. 3 and Idling Emissions from Plt. 1	5	-13	25.9		1.4E-07	6.3E-09	1.1E-08	1.9E-08	5.2E-08	0	5.3E-08	2.4E-09	4.1E-09	7.1E-09	2.0E-08	0	g/(sec*m^2)	2				20	75	70	1500.0
HDDV4	AREA	Paved Fugitive and Combustion - Seg.4	75	13	25.9		1.4E-08	6.3E-10	1.1E-09	1.9E-09	5.2E-09	0	7.4E-09	3.3E-10	5.8E-10	9.9E-10	2.7E-09	0	g/(sec*m^2)	2				20	113	50	2250.0
HDDV5	AREA	Paved Fugitive and Combustion - Seg. 5	120	100	25.9		1.4E-08	6.2E-10	1.1E-09	1.9E-09	5.1E-09	0	7.4E-09	3.3E-10	5.7E-10	9.9E-10	2.7E-09	0	g/(sec*m^2)	2				20	50	140	1000.0
HDDV6	AREA	Paved Fugitive and Combustion - Seg. 6 and Idling Emissions form Plt. 2	8	50	25.9		6.5E-08	2.9E-09	5.1E-09	8.8E-09	2.4E-08	0	2.2E-08	9.9E-10	1.7E-09	3.0E-09	8.1E-09	0	g/(sec*m^2)	2				20	125	70	2500.0
HDDV7	AREA	Paved Fugitive and Combustion - Seg. 7	-63	13	25.9		1.4E-08	6.2E-10	1.1E-09	1.9E-09	5.1E-09	0	7.4E-09	3.3E-10	5.7E-10	9.9E-10	2.7E-09	0	g/(sec*m^2)	2				20	75	70	1500.0
		TOTAL TONS					0.017	0.001	0.001	0.002	0.006	0	0.007	3.E-04	0.001	0.001	0.003	0							613		12250
RAPPILW	AREAPOLY	Wind Erosion of RAP Pile - West - Represented by four-sided source - Vertice 1 (to correspond with location)	-218	-33	25.9		0	0	0	0	0	0	0	0	0	0	0	0	g/(sec*m^2)	5.0							4078
		Vertice 2 (CW)	-180	-105	25.9																						
		Vertice 3 (CW)	-225	-120	25.9																						
		Vertice 4 (CW)	-250	-80	25.9																						
		Vertice 4 (CW)	-245	-43	25.9																						
RAPPILE	AREAPOLY	Wind Erosion of RAP Pile - East - Represented by seven-sided source - Vertice 1 (to correspond with location)	130	95	25.9		0	0	0	0	0	0	0	0	0	0	0	0	g/(sec*m^2)	5.0							4078

Table 2-6. AERMOD Source Inputs for all Processes - Proposed SUP Scenario - HAPs (continued).

			LOCATION (OR VERTICES, FOR AREACIRC SOURCE)[c]			AREACIRC INPUTS	MAXIMUM SHORT-TERM EMISSIONS						ANNUAL EMISSIONS						SOURCE INPUTS		POINT SOURCE INPUTS			AREA OR VOL. INPUTS			
NAME	AERMOD Source Type	DESCRIPTION	EAS,M	NOR,M	B.ELEV, M	RADIUS, M	form.	acrol	1,3 bu	benz	aceta.	quin.	form.	acrol	1,3 bu	benz	aceta.	quin.	EMIS UNITS	HT, M[d]	TMP K	VEL., MPS	DIA, M	X,INIT,M	Y,INIT, M	ROT ANG, DEG.	TOT.AREA, SQ.M.
		Vertice 2 (CW)	150	100	25.9																						
		Vertice 3 (CW)	163	90	25.9																						
		Vertice 4 (CW)	213	33	25.9																						
		Vertice 5 (CW)	188	20	25.9																						
		Vertice 6 (CW)	163	45	25.9																						
		Vertice 7 (CW)	143	30	25.9																						
		Vertice 8 (CW)	130	65	25.9																						
		Vertice 9 (CW)	155	63	25.9																						
SANDPIL	AREAPOLY	Wind Erosion of Sand Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	145	15	25.9		0	0	0	0	0	0	0	0	0	0	0	0	g/(sec*m^2)	5.0							1359
		Vertice 2 (CW)	153	0	25.9																						
		Vertice 3 (CW)	120	-13	25.9																						
		Vertice 4 (CW)	93	-5	25.9																						
		Vertice 5 (CW)	100	15	25.9																						
STNEPIL	AREAPOLY	Wind Erosion of Stone Pile - Represented by four-sided source - Vertice 1 (to correspond with location)	113	83	25.9		0	0	0	0	0	0	0	0	0	0	0	0	g/(sec*m^2)	5.0							2719
		Vertice 2 (CW)	138	55	25.9																						
		Vertice 3 (CW)	90	30	25.9																						
		Vertice 4 (CW)	68	68	25.9																						
		TOTAL TONS					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									

	Maximum Potential Emissions:						Maximum Potential Permitted					
	form.	acrol	1,3 bu	benz	aceta.	prop.	form.	acrol	1,3 bu	benz	aceta.	prop.
Grand Total, by Subtotals for all Processes	14	0.1	0.002	2	6	6	2	0.016	0.001	0.2	0.79	1.68

2.8 Receptors

Significance impact levels are defined by federal guidelines for ambient air quality standards analyses for each of the criteria pollutants; a source's impacts do not have to be reviewed against the AAQS in areas where its impacts fall below these significance levels.[32] Table 2-8 below shows the significant impact levels for each of the criteria pollutants of this analysis. Previous simulation of ambient impacts for this facility showed that for these pollutants, impacts either fall below or are equal to significance levels at the two-kilometer radius.[33]

Table 2-8. Criteria Pollutants' Significant Impact Levels (µg/cu.m.)									
CO		NO_2	$PM_{2.5}$		PM_{10}		SO_2		
1-hr	8-hr	Ann.	24-hr	Ann.	24-hr	Ann.	3-hr	24-hr	Ann.
2,000	500	1.0	5.0	1.0	5.0	1.0	25.0	5.0	1.0

The receptor grid of this analysis is defined in polar coordinates, with receptors placed at 300, 400, 500, 750, 1000, 1500 and 2000 meters distance, along every 10 degree radial from the facility. Due north is equivalent to 0/360 degrees. Plant 1's baghouse stack location represents (0,0) on the coordinate system. Discrete receptors were placed along the facility's fence line, and in areas between the fencline and the first radial ring, at approximately 50-meter spacing. Figure 2-2 also shows these discrete and fenceline receptors.

The AERMAP[34] processor was used to determine geographic elevations for all receptors using United State Geological Services (USGS) digital elevation models for the 'Anacostia' quadrangle and quadrangles for the surrounding areas[35] ('Alexandria, VA-DC-MD,' 'Mount Vernon' and 'Fort Belvoir').

2.9 Nearby Source Contributions

Sources of NO_2, PM_{10} and SO_2 provided by DEQ located within 10 kilometers from the facility were reviewed for possible inclusion in the modeling analysis. Sources with potential-to-emit levels less than the major source threshold of 100 tons per year were eliminated. Additionally, major sources were eliminated when their ratios between actual emissions and potential to emit were very low, and for which sources consist of boilers and generators providing strictly backup power. Emissions from the Potomac River Generating Station in Alexandria exceed major source thresholds and also show high annual capacity factors; however, results of a separate analysis show that its emissions of NO_2, PM_{10} and SO_2 are insignificant beyond approximately 7 kilometers; distance between it and Virginia Paving is greater than 8 kilometers. While its impacts may be slightly over significant impact levels at the outer edge of this modeling domain, its permitted emission levels are expected to decrease in the future as a result of VDEQ-issued Order by Consent.

[32] "New Source Review Workshop Manual," US EPA, October, 1990.

[33] "Ambient Air Quality Analysis – Virginia Paving – Alexandria, Virginia," Aero Engineering Services, October, 2005. See Table 3-4.

[34] "Revised Draft for the User's Guide for the AERMOD Terrain Preprocessor (AERMAP)," US EPA, April 24, 2004.

[35] Digital elevation model data are available in 7.5 minute quadrangles; AERMAP reads these data to determine elevation and hill height scales for AERMOD processing. Digital elevation models were relayed to AERO on November 3, 2004 by Steve Reiter of USGS via file transfer protocol.

Consequently, only contributions by the nearby interacting major sources of the Covanta municipal solid waste incinerator and Washington Gas Light Company, and the adjoining US Filter plant, were included in this analysis. While annual emissions of SO_2 from Covanta are very low compared to its potential to emit, its potential to emit may reflect permitted combustion with oil and should therefore was included in the short-term analysis. For both of the major facilities, annual and potential emissions of PM_{10} are very low; these emissions were therefore not included. However, due to the proximity of US Filter, its emissions of PM_{10}, NO_2 and SO_2 were also included. Table 2-9 lists these interacting sources and their emission and exhaust parameters.

2.9 Minor and Area Source Contributions (Background Air Quality)

Background ambient air concentrations are attributable to the many minor and area sources of pollutants in a given area.[36] The existing background ambient concentrations of this analysis derive from DEQ monitoring results for years 2002, 2003 and 2004[37]. For short-term averaging periods, the analysis uses the highest-monitored concentration from the nearest monitor within the three-year period. For annual averaging periods, the analysis uses the average of annual observations over the three-year period. Table 2-10 shows the resulting selected background concentrations for each of the criteria pollutants.[38]

2.10 Meteorological Input Data

As US EPA guidelines stipulate, a period of analysis of five years is sufficient but necessary to account for meteorological variability on impacts;[39] therefore, this analysis will assess compliance using for the full five-year period. Surface observations derive from the National Weather Service's meteorological records for Ronald Reagan Airport for the years 2000 through 2004. Corresponding upper air measurements derive from the National Weather Service's observations from Sterling, Virginia, the closest location for which upper air data are available. Both sets of data were obtained through the National Climatic Data Center in Asheville, North Carolina.[40] The AERMET preprocessor (Version 02222) [41] was used to process and merge these data prior to application of AERMOD, with VP's coordinates specified as the source location.

For input to the preprocessor AERMET, surface characteristics for the three-kilometer area around VP were determined using terrain and surface features shown on theUSGS's Alexandria and Annandale quadrangles.[42] Figure 2-3 shows how the sectors were divided;

[36] "Appendix W to Part 51 – Guideline on Air Quality Models," 40 CFR Ch. 1 (7-1-03 Edition).
[37] "Virginia Ambient Air Monitoring 2003 Data Report," Department of Environmental Quality (parallel report for years 2002 and 2001), from www.state.deq.gov/airmon/publications.html.
[38] Background values for HAPs are not included in this analysis.
[39] "Appendix W to Part 51 – Guideline on Air Quality Models," 40 CFR Ch. 1 (7-1-03 Edition).
[40] Five years of observations from each of the Ronald Reagan Airport and Sterling, Virginia stations were transferred to AERO Engineering Services by Sharon Capps-Hill of the National Climatic Data Center on March 14, 2005 through file transfer protocol.
[41] "Revised Draft for the User's Guide for the AERMOD Meteorological Preprocessor (AERMET)," November, 1998. An updated version of AERMET (Version 04300) was released in mid-June of 2005. However, due to the very recent date of that version's release, this analysis uses data processed according to version 02222. Personal correspondence with Warren Peters of US EPA indicates that AERMET Version 04300 produces meteorological data that for this analysis's purposes that are equivalent to data from Version 02222. As suggested by Mr. Peters, the headers of the AERMET meteorological data file of this analysis were modified to allow them to be read by AERMOD 04300.
[42] "Alexandria Quadrangle," Virginia-District of Columbia-Maryland, 7.5 Minute Series (Topographic-Bathymetric), United States Geological Survey, 1994.

sectors were selected to group areas with maximally common characteristics. Table 2-11 below shows the resulting land use apportionment per sectors, and Table 2-12 shows the resulting sector values for albedo, surface roughness and Bowen ratio that were input to AERMET. Selection of sectors and assignment of surface characteristics conforms to guidance procedures stipulated for the AERMET preprocessor. Inspection of Figure 2-3 and Table 2-11 shows that the area within the three-kilometer radius circle around VP encompasses land uses that are mixed, including water, deciduous forest, grassland and urban settings.[43]

Table 2-11. Land Use Types

Sector	Degrees	Water	Deciduous Forest	Grassland	Urban
1	301 - 76	0.05	0.45	0.25	0.25
2	76 - 118	0.05	0.30	0.30	0.35
3	118 - 210	0.05	0.50	0.20	0.25
4	210 - 301	0.05	0.65	0.15	0.15

[43]Although the area immediately surrounding the facility to the west and south is dominated by urban land uses, urban land uses do not form a majority of the three kilometer area.

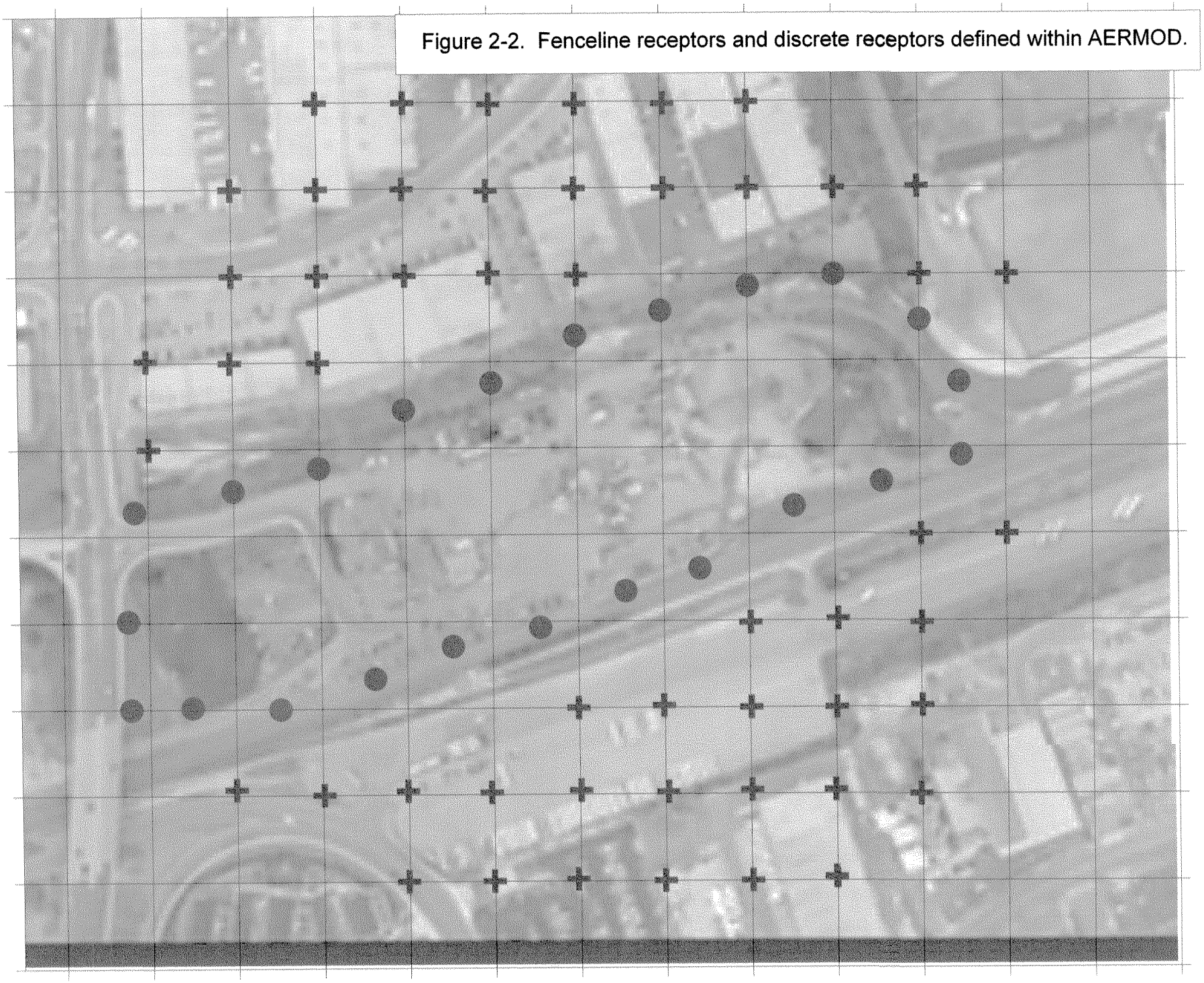

Figure 2-2. Fenceline receptors and discrete receptors defined within AERMOD.

Table 2-9. Interacting Sources of Criteria Pollutants Included within AAQS Analysis[b]

Facility	Units	Location (m) X	Location (m) Y	Base Elev. m	Stack Height m	Stack Diam. m	Stack Temp. K	Stack Velocity mps	POTENTIAL TO EMIT[d] SO_2 TPY	POTENTIAL TO EMIT[d] SO_2 GPS	POTENTIAL TO EMIT[d] NO_2 TPY	POTENTIAL TO EMIT[d] NO_2 GPS	POTENTIAL TO EMIT[d] PM_{10} TPY	POTENTIAL TO EMIT[d] PM_{10} GPS	ACTUAL EMISSIONS SO_2 TPY	ACTUAL EMISSIONS SO_2 GPS	ACTUAL EMISSIONS NO_2 TPY	ACTUAL EMISSIONS NO_2 GPS	ACTUAL EMISSIONS PM_{10} TPY	ACTUAL EMISSIONS PM_{10} GPS
US Filter		-43.00	33.00	25.00	6.00	0.4	589.00	0.2		0.2		0.01		0.01		0.2		0.01		0.01
Covanta MSW Stack 1	MSW Unit 1			33.5	64	1.6	457	15.6	68.7		--		1.3		4.6		178.3		1.3	
	MSW Unit 2			33.5	64	1.6	457	15.6	68.7		--		0.5		4.0		191.6		0.5	
	MSW Unit 3			33.5	64	1.6	457	15.6	68.7		--		0.7		4.0		178.1		0.7	
Covanta -- Stacks Combined		**400**	**-200**	**33.5**	**64**	**1.6**	**457**	**15.6**		**5.9**	(e)	(e)		**0.1**		**0.4**		**15.7**		**0.1**
Washington Gas Light Co.	Eng.'s 1 & 2; Boiler 1		4.1	70.1	18	0.6	322	2.4	64.7		--		1.7		64.7		19.1		1.7	
	Eng.'s 3 & 4, Boiler 2		4.1	70.1	18	0.6	322	2.4	64.5		--		1.4		64.5		19.1		1.4	
	Eng.'s 4 & 5; Boiler 3		4.1	70.1	18	0.6	322	2.4	74.2		--		1.8		74.2		21.9		1.8	
Wash. Gas Light Co. -- Stacks Combined		**-4,100**	**-500**	**70.1**	**18**	**0.6**	**322**	**2.4**		**5.8**	(e)	(e)		**0.1**		**5.8**		**1.7**		**0.1**

Notes:

b) DEQ sources were provided in response to a request for all NOx, SO2, PM10 major sources within 20 kilometers of the Potomac River Generating Station in Alexandria, for the purposes of an unrelated ambient air quality analysis. This list was then revised to provide distances of sources from Virginia Paving.

c) GPS = grams per second.

d) For Covanta PM10 and SO2 emissions, potential to emit were assumed equal to actual emissions for PM10, no pte data are available, and for SO2, actual exceed pte values.

e) NO2 is modeled on an annual basis only, using actual emissions.

Table 2-10. Criteria Pollutant Ambient Background Concentrations (micrograms per cubic meter).[e]

	CO[a,b]		NO_2[d]	Pb[f]	$PM_{2.5}$[a]		PM_{10}[a]		SO_2[a,d]		
	517 N. St. Asaph St., Alexandria		517 N. St. Asaph St., Alexandria	from US EPA's NATA program	Fairfax County, Lee District Park		6120 Brandon Ave., Springfield		517 N. St. Asaph St., Alexandria		
	1-hour	8-hour	annual	annual	24-hour	annual	24-hour	annual	3-hour	24-hour	annual
2002	4,580	2,748	47.0	0.013	37.9	13.2	41.0	19.0	238.3	55.0	15.7
2003	4,008	3,206	43.3	0.013	32.6	13.2	38.0	20.0	185.9	60.2	15.7
2004	3,321	2,290	45.1	0.013	35.3	13.9	43.0	19.0	141.4	55.0	15.7
Selected Value [b,c]	4,580	3,206	45.1	0.013	35.3	13.4	43.0	19.3	238.3	60.2	15.7

Notes:

a) Short-term values shown are 2nd maximum values, except for PM2.5, for which values shown are 98th percentile.

b) For CO, NOx, PM10 and SO2, selected concentration is the greatest among the monitor's values for the three years.

c) For PM2.5, selected concentration is the average of the monitor's values for the three years.

d) CO, NO2 and SO2 converted assuming 1 ppm of CO equals 1,145 micrograms per cubic meter; 1 ppm of NO2 equals 1,881 micrograms per cubic meter; and 1 ppmv of SO2 = 2,619 micrograms per cubic meter.

e) Source for concentrations: "Virginia Ambient Air Monitoring 2003 Data Report," Department of Environmental Quality, www.state.deq.gov/airmon/publications.html (and parallel reports for years 2002 and 2001 also).

f) "Estimated Annual Average Ambient Concentrations for Virginia," October 2001 version, Results: Map of 1996 Modeled Ambient Concentrations, Technology Transfer Network, National Air Toxics Assessment on http://www.epa.gov/ttn.

Figure 2-3. Three Kilometer Radius for Purposes of Surface Classification around Virginia Paving Facility.

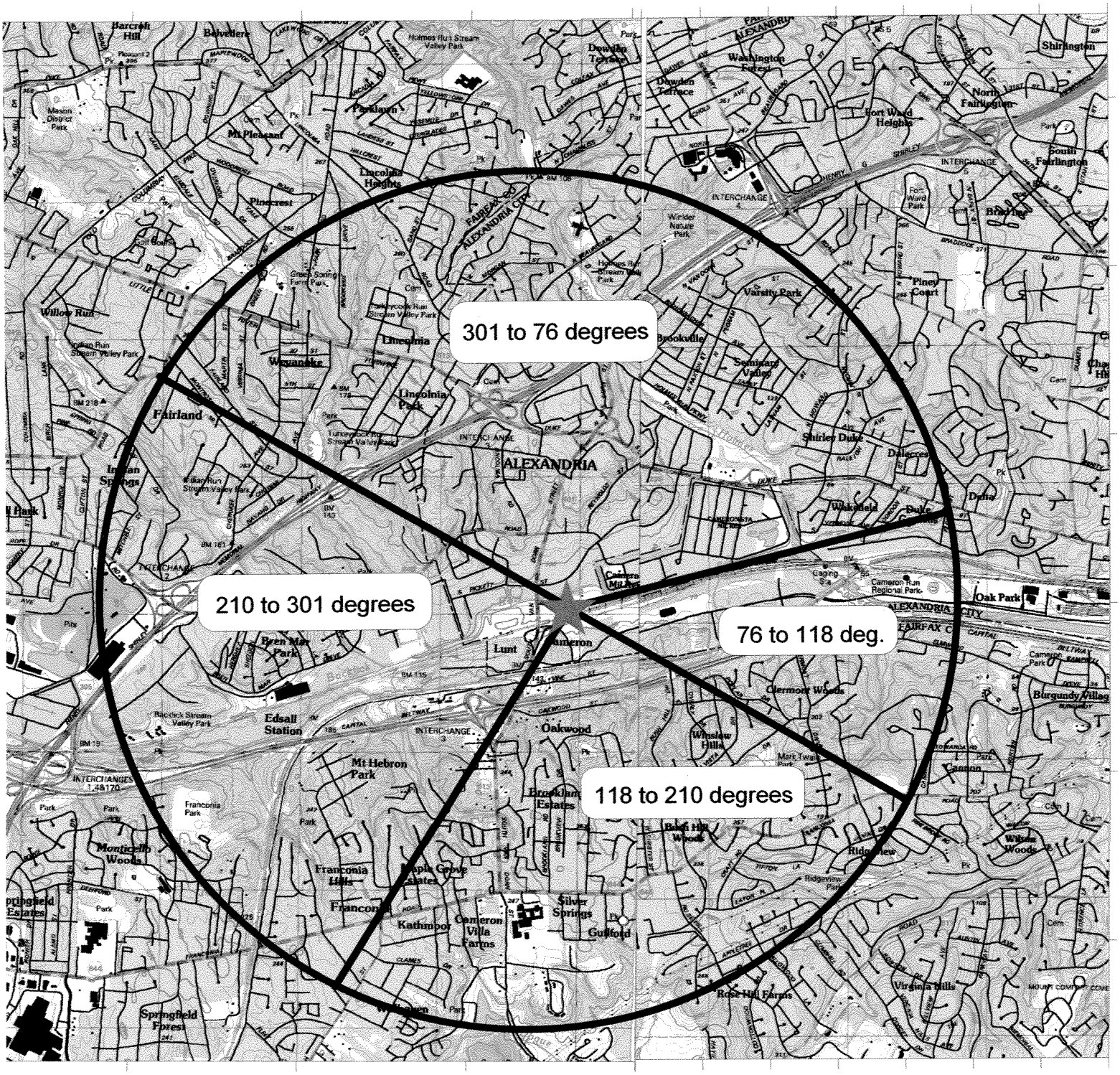

Table 2-12. Surface Characteristics of Sectors Defined within AERMET for Three-Kilometer Radius Around Virginia Paving(a,b)

		Land Type Portion of Sector				Albedo				Bowen Ratio				Roughness			
Sector	Degrees	Water	Deciduos Forest	Grassland	Urban	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
1	301 - 76	0.05	0.45	0.25	0.25	0.31	0.14	0.14	0.16	1.21	0.67	0.84	1.21	0.54	0.71	0.86	0.61
2	76 - 118	0.05	0.30	0.30	0.35	0.31	0.15	0.15	0.17	1.29	0.69	1.04	1.31	0.55	0.67	0.77	0.59
3	118 - 210	0.05	0.50	0.20	0.25	0.31	0.14	0.14	0.15	1.19	0.69	0.82	1.21	0.58	0.76	0.92	0.65
4	210 - 301	0.05	0.65	0.15	0.15	0.31	0.13	0.13	0.14	1.11	0.67	0.62	1.11	0.57	0.81	1.01	0.67

Notes:

a) suburban-type settings are assumed to split evenly to deciduous forest, grassland and urban characteristics.

b) See Tables 4-1(a), 4-1(b), 4-2 and 4-3 within "Revised Draft....Preprocessor (AERMET)," November, 1998 for each season's surface parameter value. As recommended by AERMAP guidance, values for each land type for winter equal mid-point of fall/winter values to account for milder winter conditions (see Chapter 4 of AERMAP manual, Table 4-1, 4-2-b, and 4-3). Winter, spring, summer and fall are labeled as 1, 2, 3, and 4 in AERMET, respectively.

3. Results and Conclusions

3.1 Maximum Potential Impacts of Criteria Pollutants

Results of maximum short-term and annual impacts for CO, NO_2, Lead, $PM_{2.5}$, PM_{10}, and SO_2 are shown in Table 3-1 for the proposed SUP scenario for each of the five years of simulation. Table 3-2 shows impacts from each of the facility's processes for the year resulting with the highest total facility impact for each pollutant. Table 3-2 also shows the receptor at which each process's, and the facility's maximum impact occurs. The maximum impact of each source category frequently occurs at a different receptor than the receptor for which the facility's total impact occurs; therefore, each process's maximum impact does not necessarily equal its contribution to the facility's maximum impact. Table 3-3 shows the maximum short-term and annual impacts for the baseline scenario for each pollutant for the year for which the proposed SUP scenario's impacts are greatest.

Results show that for the proposed SUP scenario maximum impacts comply with the respective AAQS for all pollutants except $PM_{2.5}$ (annual) and SO_2 (3-hour). However, maximum short-term impacts for the proposed SUP scenario are generally significantly improved over the baseline scenario. Table 3-4 compares these impacts between the baseline and proposed SUP scenario, showing the relationship between maximum impacts and the AAQS for each of the pollutants except CO and lead (for which impacts are significantly less than the AAQS).

Table 3-4. Summary of Maximum Impacts (µg/cu.m.) - Proposed SUP vs. Baseline.

NO_2	$PM_{2.5}$		PM_{10}		SO_2		
Ann.	24-hr	Ann.	24-hr	Ann.	3-hr	24-hr	Ann.
AAQS							
100.	65.	15.	150.	50.	1,300.	365.	80.
Proposed SUP Scenario vs. Baseline Scenario - Impacts							
63 vs. 74	58 vs.125	16.2 vs.18	124 vs. 346	30 vs. 35	1,392 vs. 2,508	326 vs. 648	56 vs. 58.
Proposed SUP vs. Baseline - Ratio of Impact to Standard							
<1 (both)	<1 vs. 1.9	1.1 vs. 1.2	<1 vs. 2.3	<1 (both)	1.1 vs. 1.9	<1 vs. 1.8	<1 (both)

Four sets of contour plots display impacts for NO_2, $PM_{2.5}$, PM_{10} and SO_2: a) Figures 3-1 through 3-8 show plots of maximum total impacts for the baseline scenario, b) Figures 3-9 through 3-16 show plots of maximum total impacts for the proposed SUP scenario, c) Figures 3-17 through 3-24 show plots of the total impacts for the proposed SUP scenario, as a fraction of the total impacts for the baseline scenario, and d) Figures 3-25 through 3-32 show plots of the percent reduction in the facility's contribution to impacts that the proposed SUP scenario provides from the baseline scenario. These figures show that exceedances of $PM_{2.5}$ and SO_2 occur in fairly limited areas.

3.2 Maximum Potential Impacts of HAPs

Table 3-5 shows the maximum potential short-term and annual facility impacts for HAPs. Results show that for these pollutants, which represent the HAPs with the greatest potential for exceedances, impacts comply with SAAC guidelines, in most cases with ample margin.

3.3 Conclusions

Based on the identified emissions and site characteristics, these AERMOD results show that VP's proposed SUP scenario results in significant improvements in predicted air quality adjacent to the facility. Areas of non-compliance for the proposed SUP scenario are limited, occurring for $PM_{2.5}$ and SO_2 for the annual and 3-hour time periods only, with levels ranging to 10% over the AAQS.

Review of Table 3-2 shows that the hot oil heater represents a relatively large component of total facility impacts for the pollutants which exceed the AAQS. Therefore, if additional mitigation of impacts is required, potential remedies to achieve compliance might include, for the hot oil heater, raising the stack height and a commitment to combustion of lower sulfur fuel oil (below the 0.05% level), which would reduce $PM_{2.5}$ and SO_2 impacts by this source.

Comparison between observations on nine days from a PM_{10} monitor located closely to this site and the results of the AERMOD baseline scenario for these same nine days, shows that the AERMOD results exceed observations for almost all days with a large margin (see Table 3-6). This suggests that application of AERMOD for the baseline and proposed SUP scenarios, both of which derive from similar modeling configurations, provides results of the maximum potential facility impacts while also assuring a margin of protection.

Table 3-6. PM_{10} Monitoring Results from Armistead Booth Park and Baseline Scenario's Predicted PM_{10} Result (micrograms per cubic meter).[44]

Date (2004)	Primary Wind Direction	PM_{10} Monitored Result	Baseline Scenario's PM_{10} Result at Monitor's Approximate Location with Background.[45]
Aug. 6	N	18.9	44 to 44[46]
Aug. 9	SW - ENE	51.2	69 to 95
Aug. 10	S - SSW	66.5	71 to 81
Aug. 11	S- SSW	31.3	62 to 78
Aug. 16	NNW - S	53.9	55 to 84
Aug. 17	S - SSW	50.7	65 to 75
Aug. 18	SSW - S	40.4	68 to 96
Aug. 23	N - SSW	56.4	81 to 122
Aug. 24	S - ESE	70.8	63 to 127

[44] "COA123Tables PM Monitoring Results PM10_TSP Results," Relayed via e-mail from L. Sharma, City of Alexandria to M. Barrett, AERO Engineering Services, February 16, 2006.

[45] AERMOD results are for an arc extending from 20 to 60 degrees at the approximate distance of the monitor from the model's center point, i.e., 300 meters.

[46] Modeling results equal less than one microgram per cubic meter at these locations, while maximum background equals 44 micrograms per cubic meter.

Table 3-1. Maximum Impacts for Years 2000 - 2004 inc. Background vs. Ambient Air Quality Standards (microg. per cubic meter). Proposed SUP Scenario[e].

	CO[a]		NO_2	Pb[e]	$PM_{2.5}$[b]		PM_{10}[b]		SO_2[a]		
	1-hour	8-hour	annual	quart.	24-hour	annual	24-hour	annual	3-hour	24-hour	annual
2000	1230.7	638.0	17.4	0.013	22.6	2.8	72.6	9.2	1153.6	257.8	38.2
2001	1236.8	680.8	17.4	0.010	22.2	2.9	81.0	10.5	888.5	207.8	39.9
2002	1236.7	612.7	16.2	0.011	21.8	2.8	74.6	9.4	1056.0	233.2	33.5
2003	1162.8	484.5	15.8	0.013	21.8	2.4	76.0	8.7	961.9	265.8	29.7
2004	1121.6	578.7	15.4	0.017	23.2	2.7	62.9	8.2	849.1	254.5	29.9
Maximum Facility and Interacting Source Impact	1236.8	680.8	17.4	0.017	22.3	2.7	81.0	10.5	1153.6	265.8	39.9
Background Value	4,580	3,206	45	0.013	35.3	13.4	43	19	238	60	15.7
Total Maximum Impact [c,d]	**5,817**	**3,887**	**63**	**0.03**	**58**	**16.2**	**124**	**30**	**1,392**	**326**	**56**
National and DEQ Ambient Air Quality Standards	***40,000***	***10,000***	***100***	***0.15***	***65***	***15***	***150***	***50***	***1,300***	***365***	***80***

Notes:

a) For SO_2 and CO, maximum short-term values equal the highest-second-highest value among all receptors.

b) To allow year-by-year processing rather than multiyear processing, this analysis presents the highest fourth-highest among all receptors for each year for $PM_{2.5}$ and PM_{10}.

c) Total maximum impacts for CO, NO_2, PM_{10} and SO_2 equals highest among years' values added to background.

d) Total maximum impacts for $PM_{2.5}$ equals the average of the maximum values among years added to background.

e) Lead impacts were modeled using hourly rates and monthly averages. Therefore, impacts presented here overstate expected quarterly impacts.

Table 3-2. Maximum Impacts for Worst-case Year[(e)] inc. Background vs. Ambient Air Quality Standards (micrograms per cubic meter). Proposed SUP Scenario[(e)] - Locations of Maximum Impacts are Shown in Parantheses.

	CO[(a)]		NO_2	Pb[(g)]	$PM_{2.5}$[(b)]		PM_{10}[(b)]		SO_2[(a)]		
	2001		*2001*	*2004*	*2004*	*2001*	*2001*	*2001*	*2000*	*2003*	*2001*
Facility Process	1-hour	8-hour	annual	quarter	24-hour	annual	24-hour	annual	3-hour	24-hour	annual
Dryer Stacks on Plants	703 (100,225)	427 (50,108)	5.0 (50,108)	0.017	16.3 (50,108)	0.9 (50,175)	12.2 (50,108)	0.9 (50,175)	266.6 (-25,-75)	77.9 (50,108)	4.5 (50,175)
Heater				0.010	8.0 (100,118)	0.61 (50,108)	7.5 (100,118)	0.6 (50,108)	1053.5 (100,118)	201.3 (100,118)	12.9 (50,108)
Load-out, Yard, Storage Silos	505 (0,85)	221 (0,85)	--	--	5.3 (0,85)	0.6 (0,85)	6.2 (0,85)	0.6 (0,85)	--	--	--
Unpaved Roads and Agg. Handling	1140 (200,100)	533 (225,63)	14.7 (200,100)	--	11.3 (75,-43)	0.6 (125,25)	44.6 (75,-43)	2.7 (125,-25)	328.3 (200,100)	50.3 (200,100)	1.5 (200,100)
Vehicles on Paved Roads	262 (25,-68)	118 (25,-68)	2.6 (75,-43)	--	2.9 (25,-75)	0.4 (100,118)	35.5 (- 25,75)	4.0 (-25,-75)	13.2 (25,-68)	2.0 (100,118)	0.14 (75,-43)
Material Storage Piles	--	--	--	--	1.5 (200,100)	0.43 (200,100)	17.3 (200,100)	4.3 (200,100)	--	--	--
Interacting Off-site Sources	33.3 (-50,60)	15.4 (0,85)	3.9 (-50,60)	--	4.9 (-50,60)	2.2 (-50,60)	6.4 (-50,60)	2.2 (- 50,60)	269. (-50,60)	113. (-50,60)	36.9 (50,60)
Total Facility and Interacting Source Impact	1236.8	680.8	17.4	0.017	23.2	2.9	81.0	10.5	1153.6	233.2	39.9
Location of Maximum, meters	(200, 100)	(225, 63)	(200,100)	(50,108)	(50,108)	(-50,60)	(200,100)	(150, 125)	(100,118)	(100, 118)	(-50,60)
Background Value	4,580	3,206	45	0.013	35.3	13.4	43	19	238	60	15.7
Total Maximum Impact [(c,d)]	**5,817**	**3,887**	**63**	**0.03**	**58**	**16.3**	**124**	**30**	**1,392**	**293**	**56**
National and DEQ Ambient Air Quality Standards	***40,000***	***10,000***	***100***	***0.15***	***65***	***15.0***	***150***	***50***	***1,300***	***365***	***80***

Notes:

a) For SO_2 and CO, maximum short-term values equal the highest second highest value among all receptors.
b) To allow year-by-year processing rather than multiyear processing, this analysis presents the highest fourth-highest among all receptors for each year for $PM_{2.5}$ and PM_{10}.
c) Total maximum impacts for CO, NO_2, PM_{10} and SO_2 equals highest among years' values added to background.
d) Total maximum impacts for $PM_{2.5}$ equals the average of the maximum values among years added to background.
e) Worst-case year evaluated on the basis of total facility impact, which may be different for separate source processes.
f) Values shown only for processes with non-zero emissions of each particular pollutant.
e) Lead impacts were modeled using hourly rates and monthly averages. Therefore, impacts presented here overstate expected quarterly impacts.

Table 3-3. Maximum Impacts for 2002 inc. Background vs. Ambient Air Quality Standards (micrograms per cubic meter).

Baseline Scenario[e]

	CO[a]		NO_2	Pb[e]	$PM_{2.5}$[b]		PM_{10}[b]		SO_2[a]		
Year Simulated	***2001***		***2001***	***2002***	***2004***	***2001***	***2001***	***2001***	***2000***	***2003***	***2001***
Facility Process	1-hour	8-hour	annual	quarter	24-hour	annual	24-hour	annual	3-hour	24-hour	annual
Dryer Stacks on Plants	1598.5	642.9	2.7	0.027	60	1.6	55.7	1.6	563.5	355.0	7.9
Heater				0.001	14.5	1.0	14.2	1.0	2027.3	443.2	21.2
Load-out, Yard, Storage Silos	505.3	220.8	--	--	37.2	1.0	43.9	1.0	--	--	--
Unpaved Roads and Agg. Handling	2703.3	1267.1	26.6	--	48.7	1.4	173.6	6.0	657.2	187.5	5.4
Vehicles on Paved Roads	634.4	284.9	2.2	--	13.0	0.7	154.3	6.4	13.2	3.3	0.1
Material Storage Piles	--	--	--	--	1.5	0.4	17.3	4.3	--	--	--
Interacting Off-site Sources	33.3	15.4	3.9	--	4.9	2.2	6.4	2.2	269.8	127.0	36.3
Total Facility and Interacting Source Impact	2887.2	1614.1	28.8	0.028	89.7	4.5	303.0	15.7	2269.5	588.2	42.3
Location of Maximum, meters	(200,100)	(225,63)	(200,100)	(50,108)	(100,118)	(50,108)	(200,100)	(150,125)	(100,118)	(100,118)	(-50,60)
Background Value	4580.0	3206.0	45.1	0.013	35.3	13.4	43.0	19.3	238.3	60.2	15.7
Total Maximum Impact [c,d]	**7,467**	**4,820**	**74**	**0.04**	**125**	**18**	**346**	**35**	**2,508**	**648**	**58**
National and DEQ Ambient Air Quality Standards	***40,000***	***10,000***	***100***	***0.15***	***65***	***15***	***150***	***50***	***1,300***	***365***	***80***

Notes:

a) For SO_2 and CO, maximum short-term values equal the highest second highest value among all receptors.

b) To allow year-by-year processing rather than multiyear processing, this analysis presents the highest fourth-highest among all receptors for each year for $PM_{2.5}$ and PM_{10}.

c) Total maximum impacts for CO, NO_2, PM_{10} and SO_2 equals highest among years' values added to background.

d) Total maximum impacts for $PM_{2.5}$ equals the average of the maximum values among years added to background.

e) Lead impacts were modeled using hourly rates and monthly averages. Therefore, impacts presented here overstate expected quarterly impacts.

Table 3- 5. Maximum Potential Impacts of HAPs for Year 2002 vs. SAAC Guidelines (micrograms per cubic meter)
Proposed SUP Scenario

Facility Process[i]	formaldehyde		acrolein		1,3 butadiene		benzene		acetaldehyde		quinone		lead[h,j]	
	1-hour	annual (f)	1-hour	annual	1-hour	annual	1-hour	annual	1-hour	annual	1-hour	annual	1-hour	annual
Plant Dryer Stacks(a)	22.0	1.7	0.18	0.014	--	--	2.80	0.22	9.1	0.7	9.1	0.72	0.10	0.009
Heater	1.3	0.02	--	--	--	--	0.01	0.000	--	--	--	--	0.04	0.001
Load-out, Yard, Storage Silos	0.6	0.03	--	--	--	--	0.04	0.002	--	--	--	--	--	--
Unpaved Roads and Agg. Handling	1.3	0.1	0.10	0.004	0.04	0.002	1.00	0.04	0.81	0.03	--	--	--	--
Vehicles on Paved Roads	1.0	0.04	0.05	0.002	0.08	0.003	0.13	0.01	0.38	0.02	--	--	--	--
Material Storage Piles(b)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Facility Impact	22.6	1.7	0.200	0.016	0.09	0.004	2.9	0.22	9.3	0.7	9.1	0.70	0.11	0.007
Location of Maximum, meters	(230,193)	(50,175)	(230,193)	(50,108)	(-25,-75)	(75,-43)	(230,193)	(50,175)	(230,193)	(50,175)	(230,193)	(50,175)	(230,193)	(50,175)
Total Maximum Impact [c,d]	**22.6**	**1.7**	**0.20**	**0.02**	**0.09**	**0.004**	**2.9**	**0.2**	**9.3**	**0.7**	**9.1**	**0.70**	**0.1**	**0.007**
DEQ SAAC Guideline	***62.5***	***2.4***	***17.3***	***0.46***	***1100***	***44***	***1600***	***64***	***6750***	***360***	***22***	***0.8***	***7.5***	***0.3***

Notes:

a) The dryer stacks also emit HCL. However, the ratio between emission rate to standard is more than two orders of magnitude less for HCL than it is for for formaldehyde. Therefore, if the facility complies for formaldehyde, the facility complies for HCL.

b) Material storage piles do not emit HAPs.

d) Annual background concentrations are not included within the total impact. While monitoring results of HAPs are scarce, the US EPA's National Air Toxics Assessment program estimated modeled background concentrations of HAPs. This program's results for HAPs in Arlington (results for Alexandria were not derived show background values, in micrograms per cubic meter, of 1.96 for formaldehyde, 0.18 for acrolein, 0.13 for 1,3 butadiene, 2.0 for benzene, 1.1 for acetaldehyde, 4.5e-8 for quinone, and 0.013 for lead compounds, respectively.

f) Annual impacts derived using 1-hour rates; therefore, these results overstate maximum impacts for all processes.

g) SAAC guidelines based on 1991/1992 TLVs and STEL's. These values are generally much less protective than SAAC guidelines based on 2005 TLVs and STELs.

h) Values for lead are for the year 2000. Variation between the five years is much less than the difference between this maximum value and the standard.

I) Values are shown only for processes with emissions of each particular pollutant.

j) Lead impacts were modeled using hourly rates and monthly averages. Therefore, impacts presented here overstate expected quarterly impacts.

Figure 3-1.
Total PM2.5 short-term impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2004).

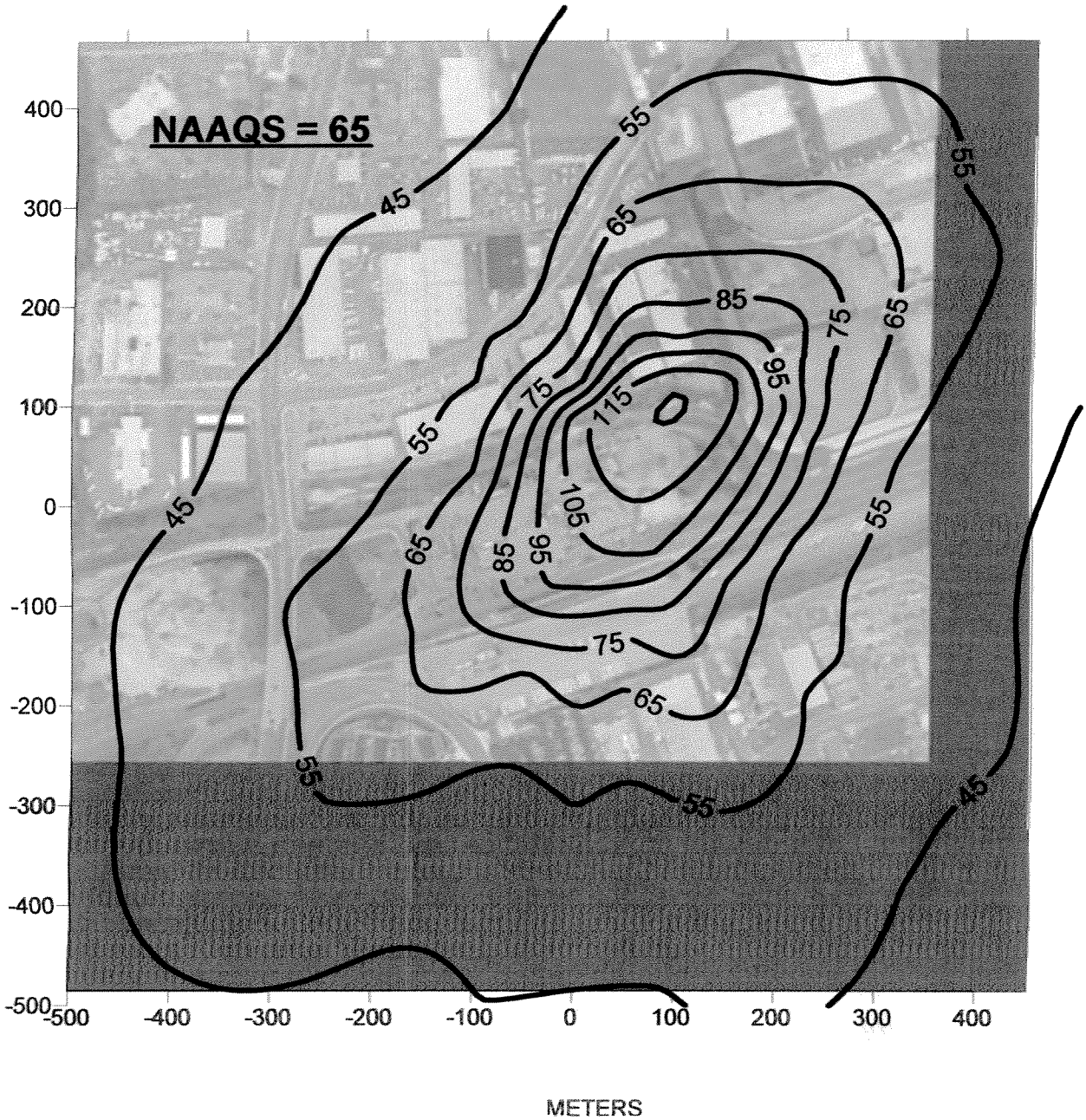

Figure 3-2.
Total PM2.5 annual impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2001).

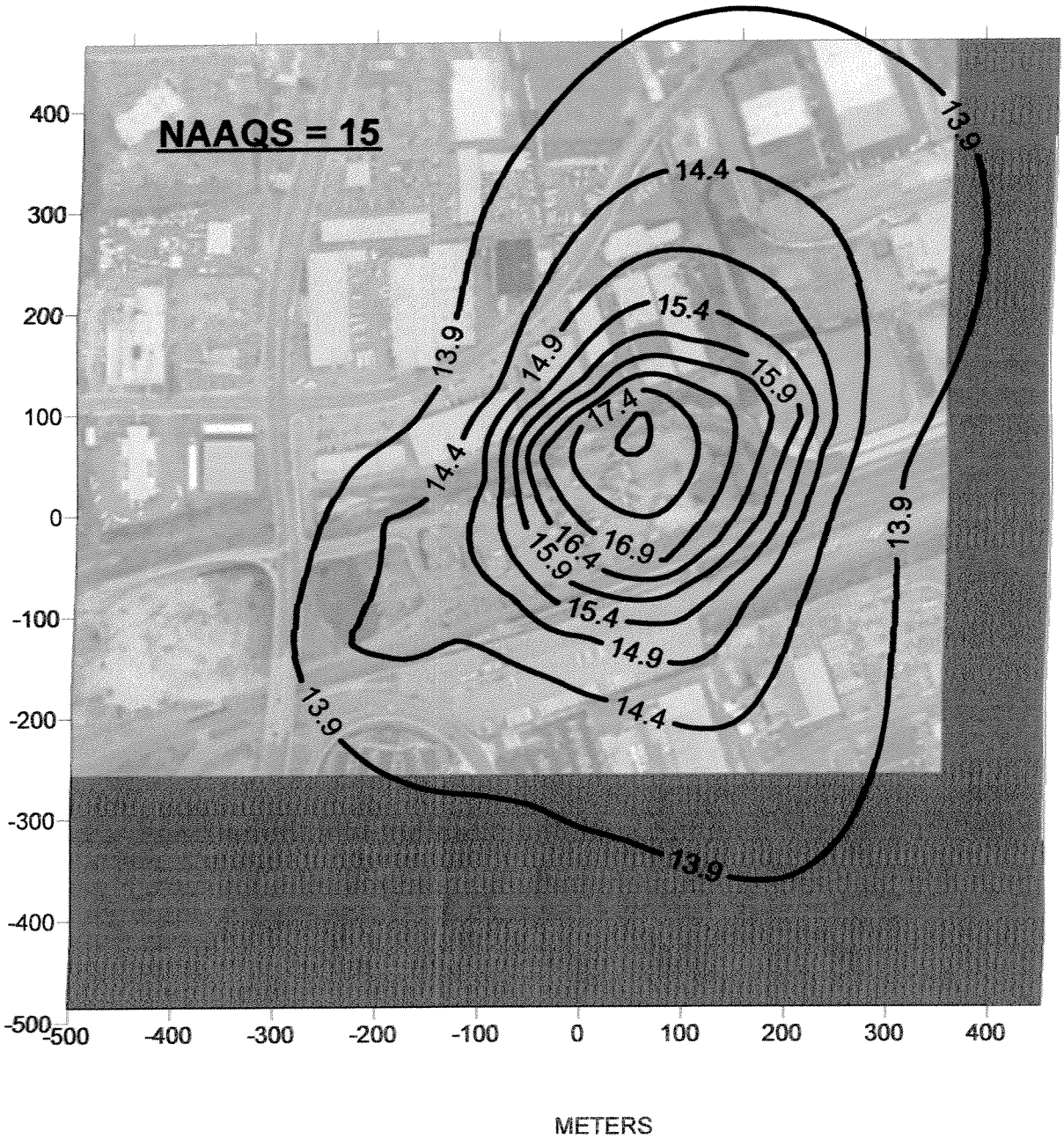

Figure 3-3.
Total PM10 short-term impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2001).

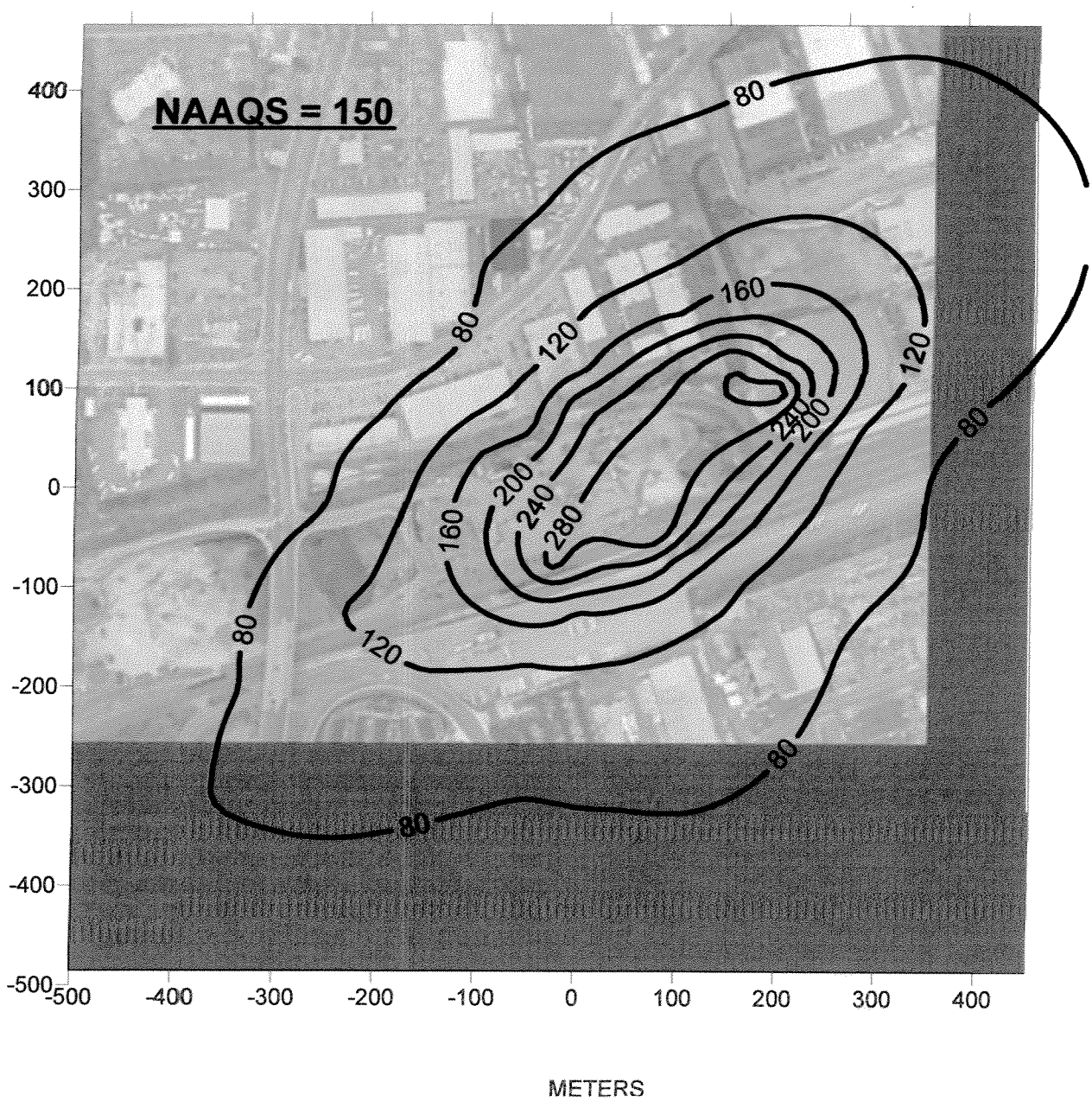

Figure 3-4.
Total PM10 annual impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2001).

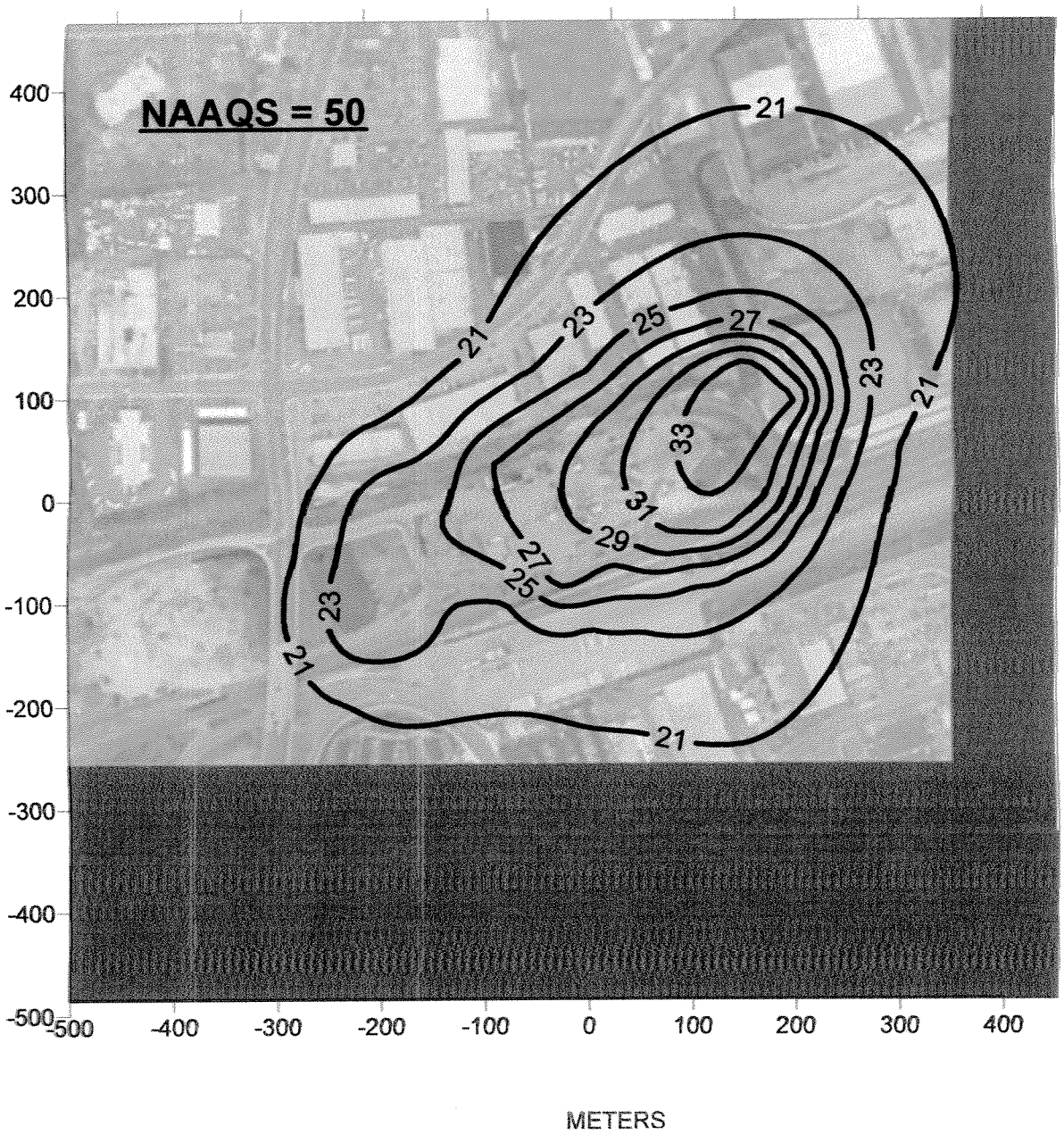

Figure 3-5.
Total SO2 3-hour impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2000).

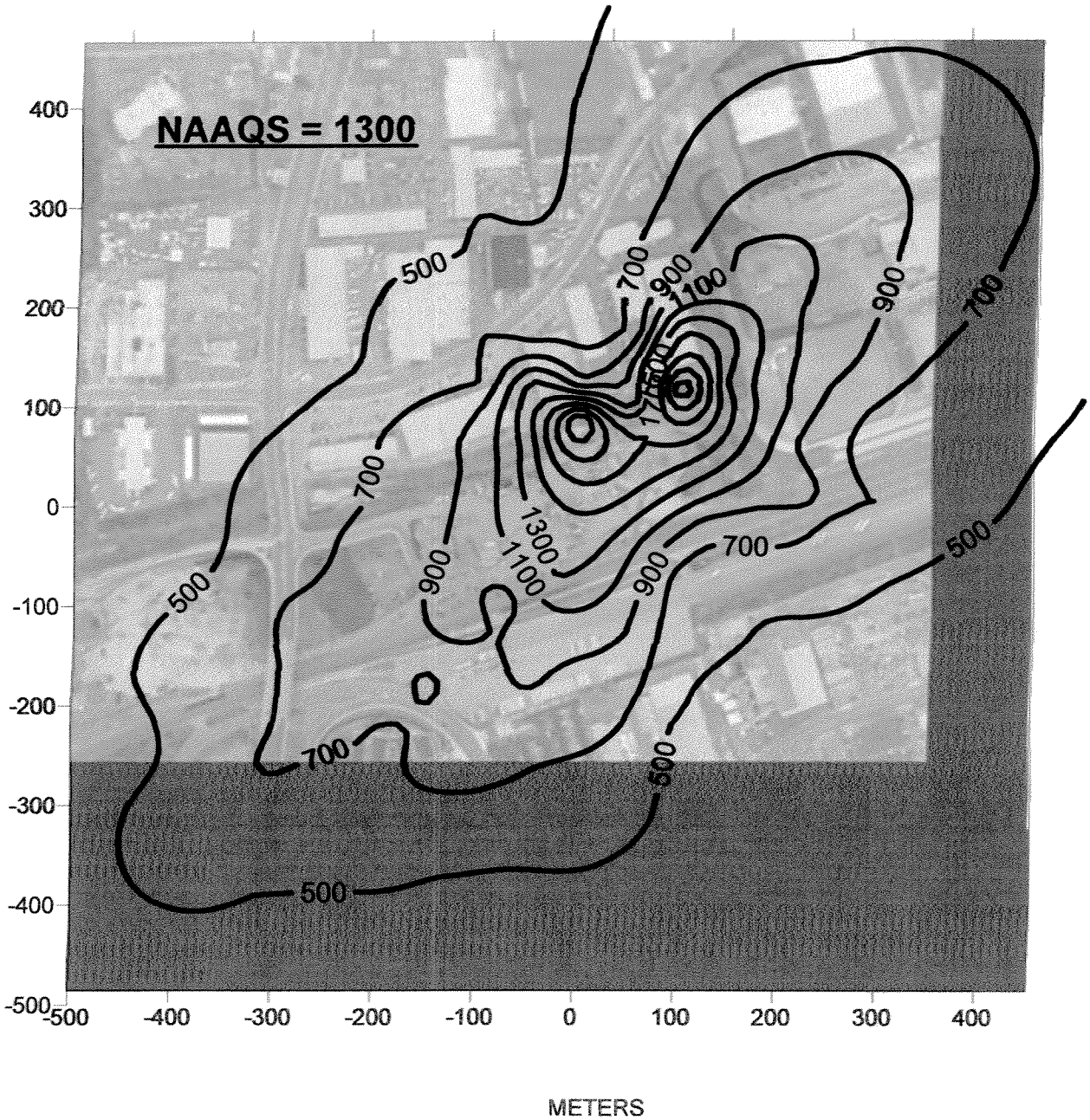

Figure 3-6.
Total SO2 24-hour impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2003).

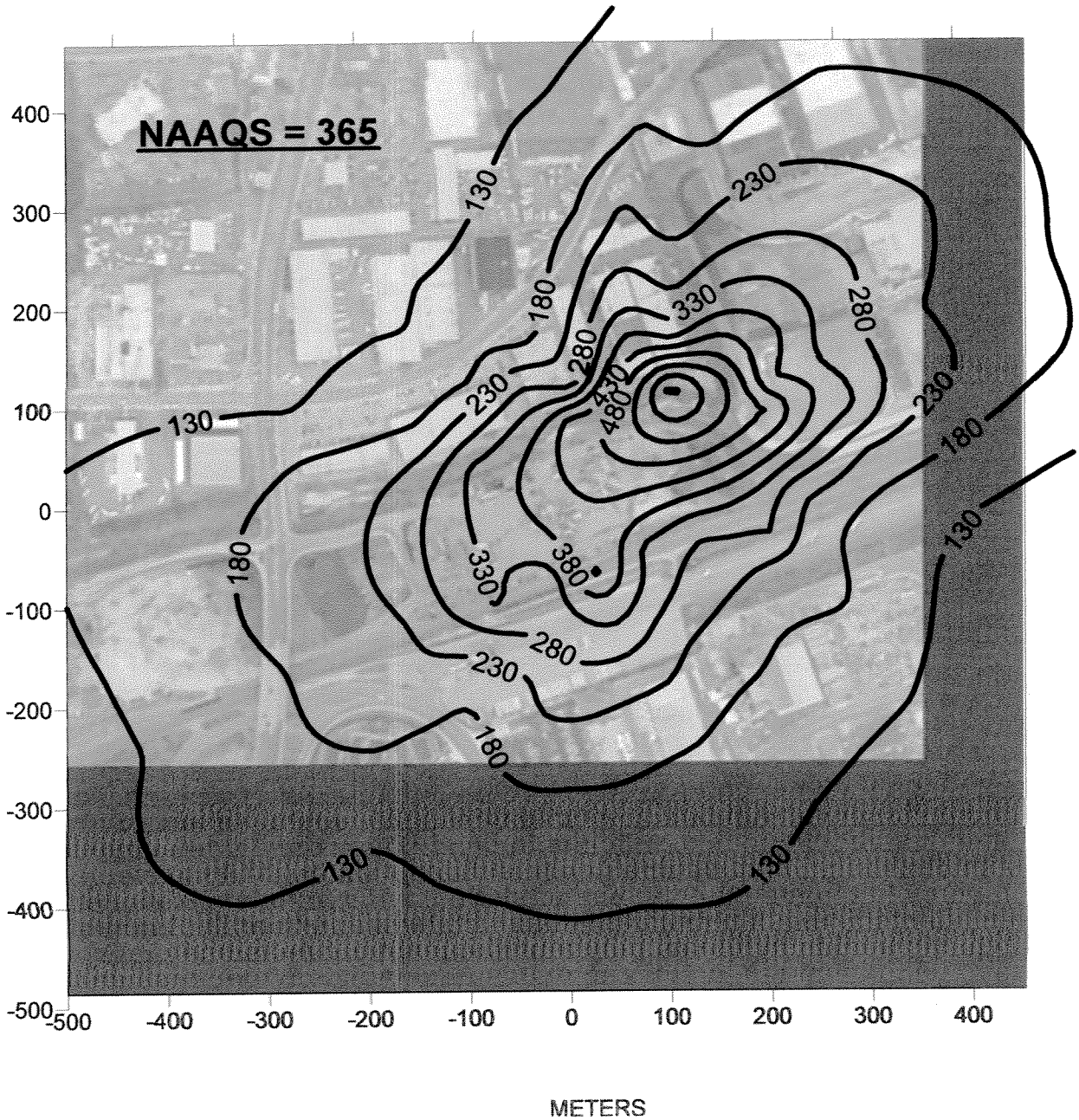

Figure 3-7.
Total SO2 annual impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2001).

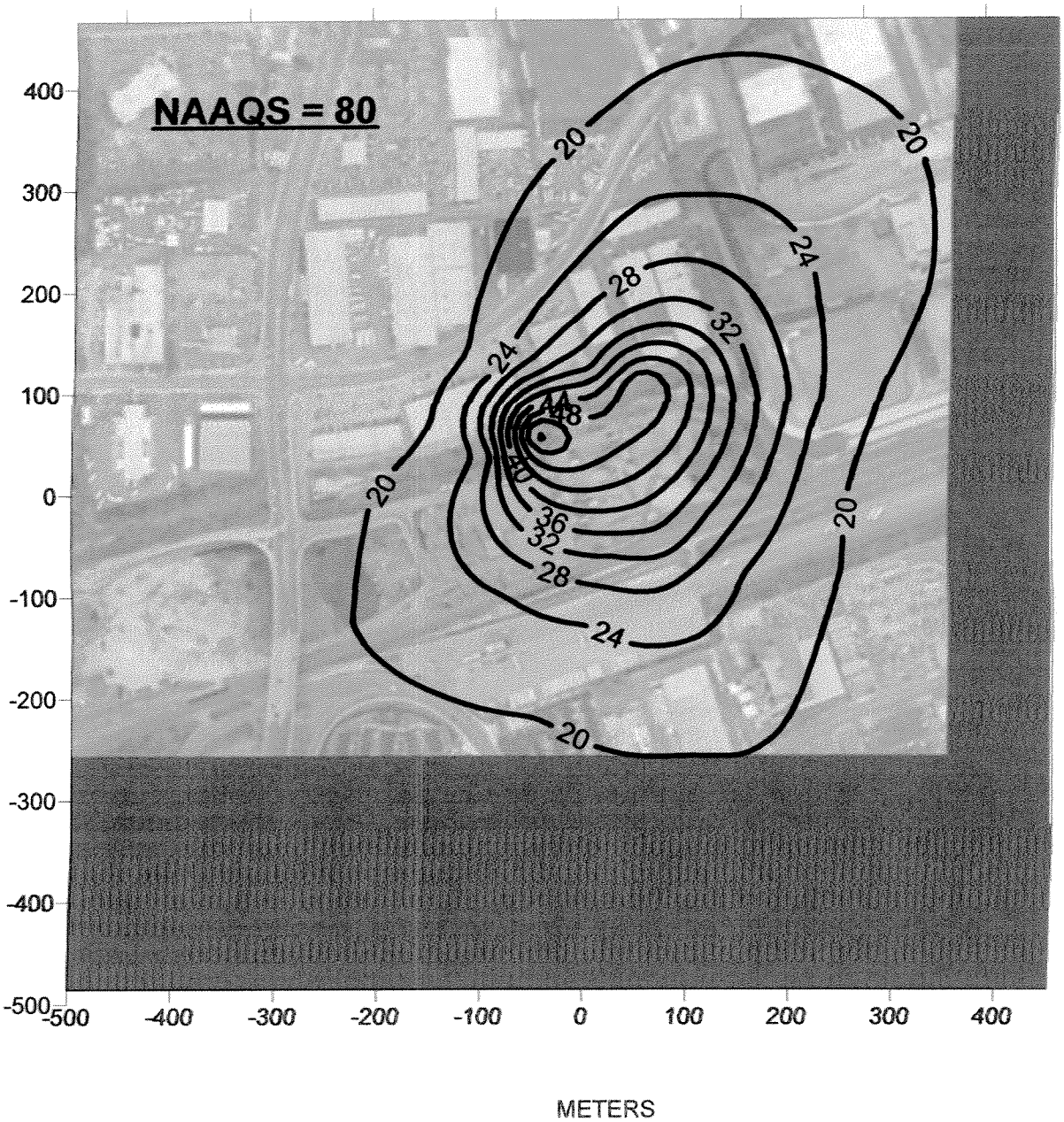

Figure 3-8.
Total NO2 annual impacts including background (micrograms per cubic meter) of the Baseline Scenario (year 2001).

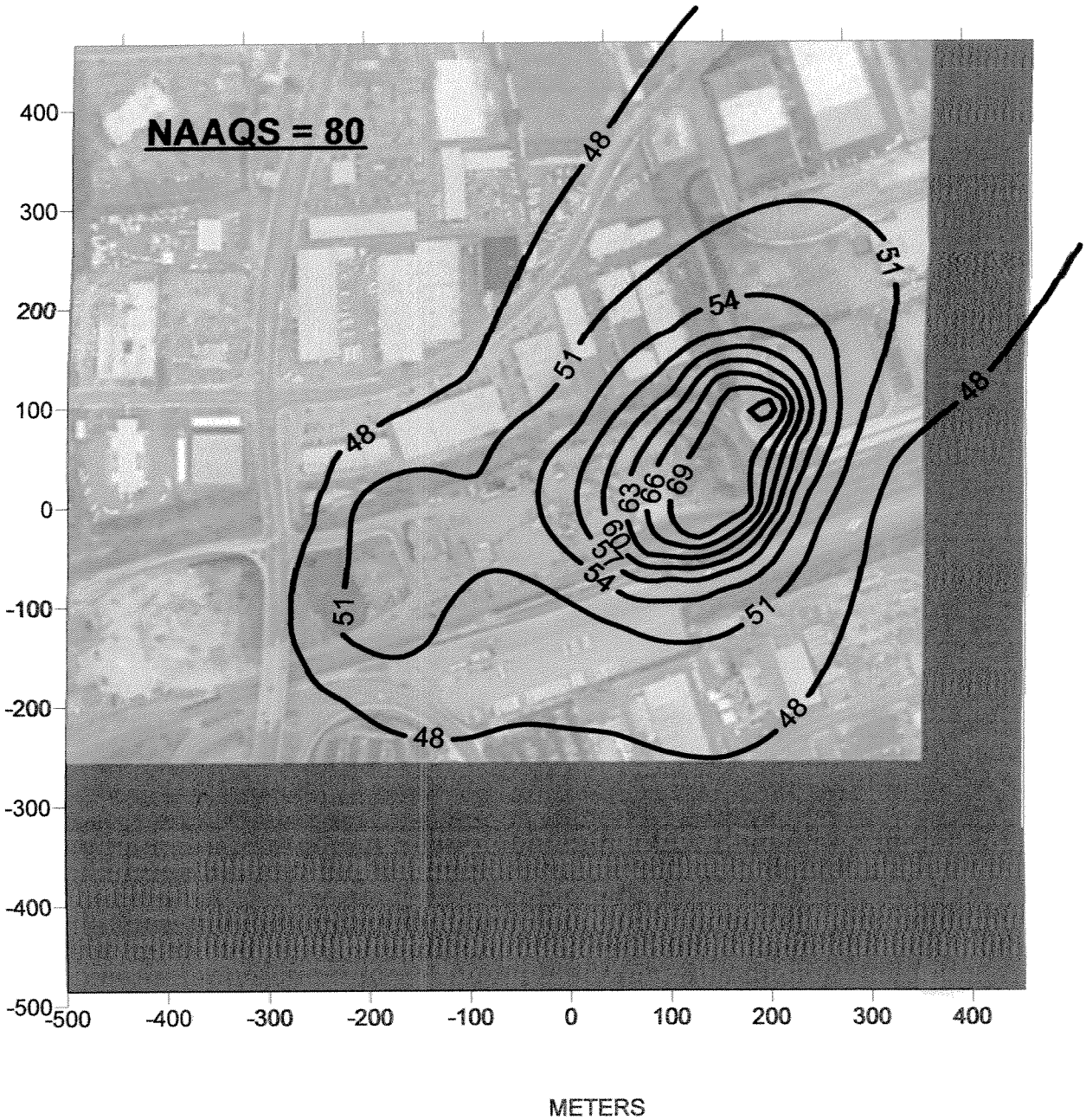

Figure 3-9.
Total PM2.5 short-term impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2004).

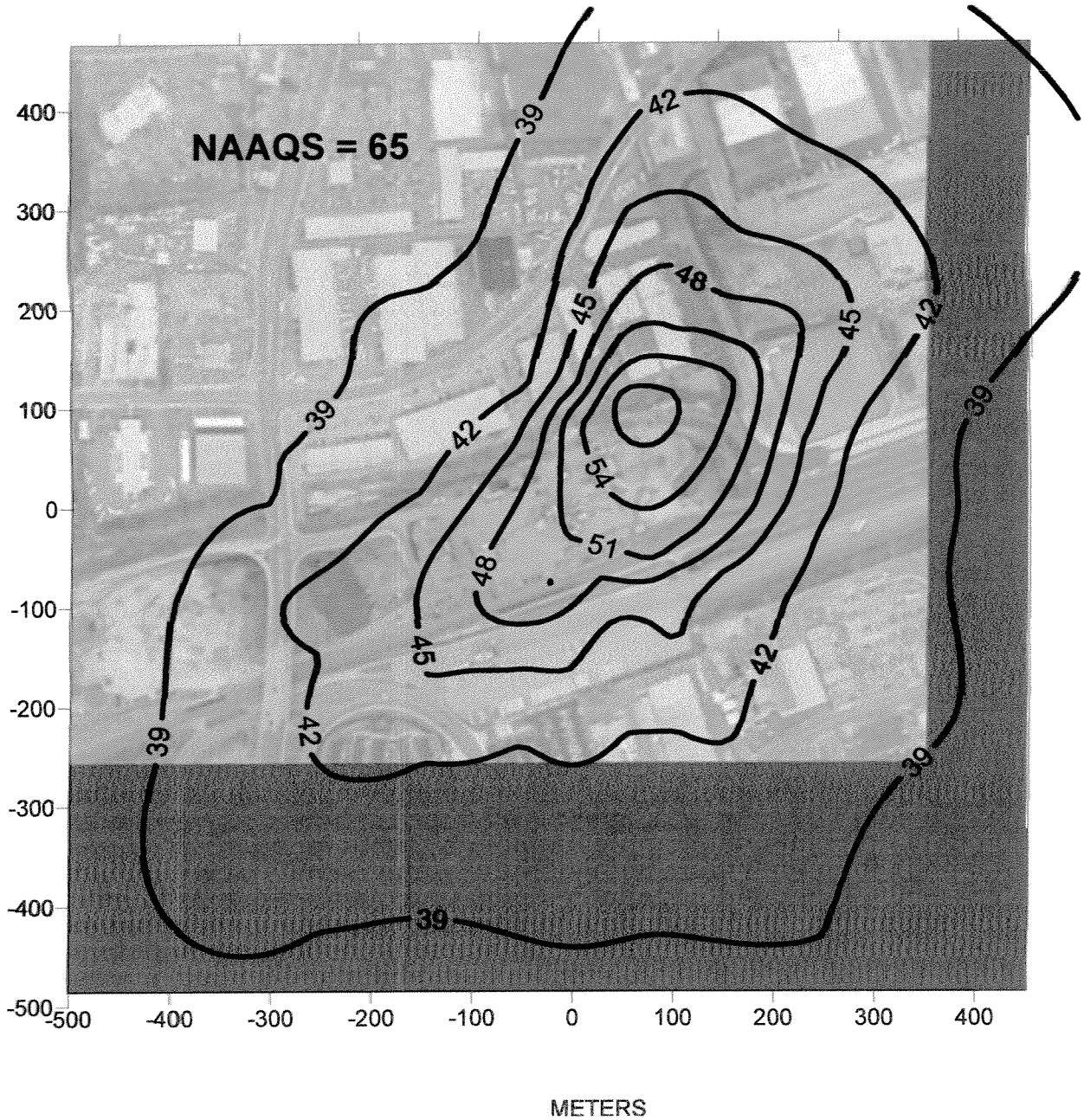

Figure 3-10.
Total PM2.5 annual impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2001).

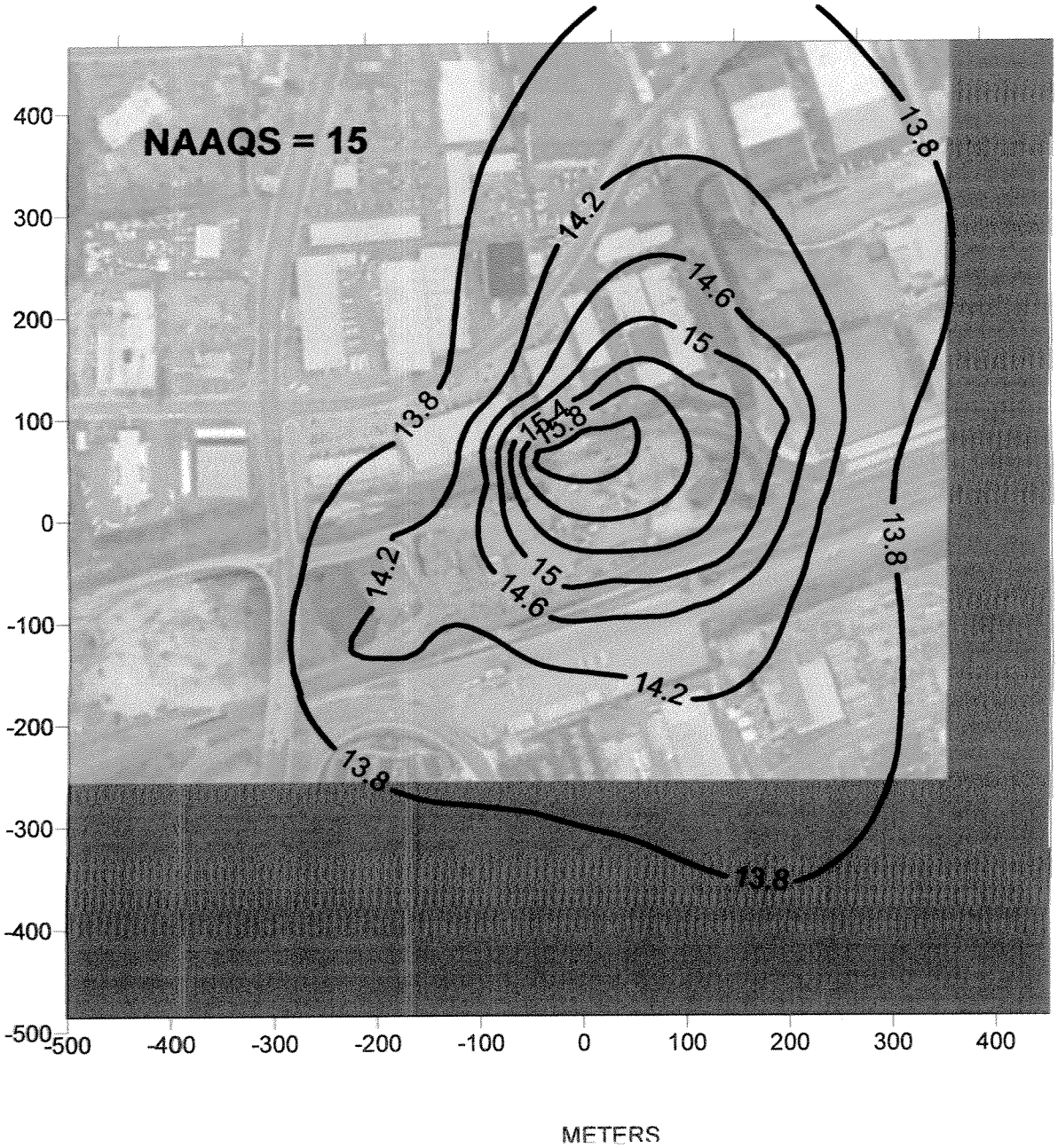

Figure 3-11.
Total PM10 short-term impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2001).

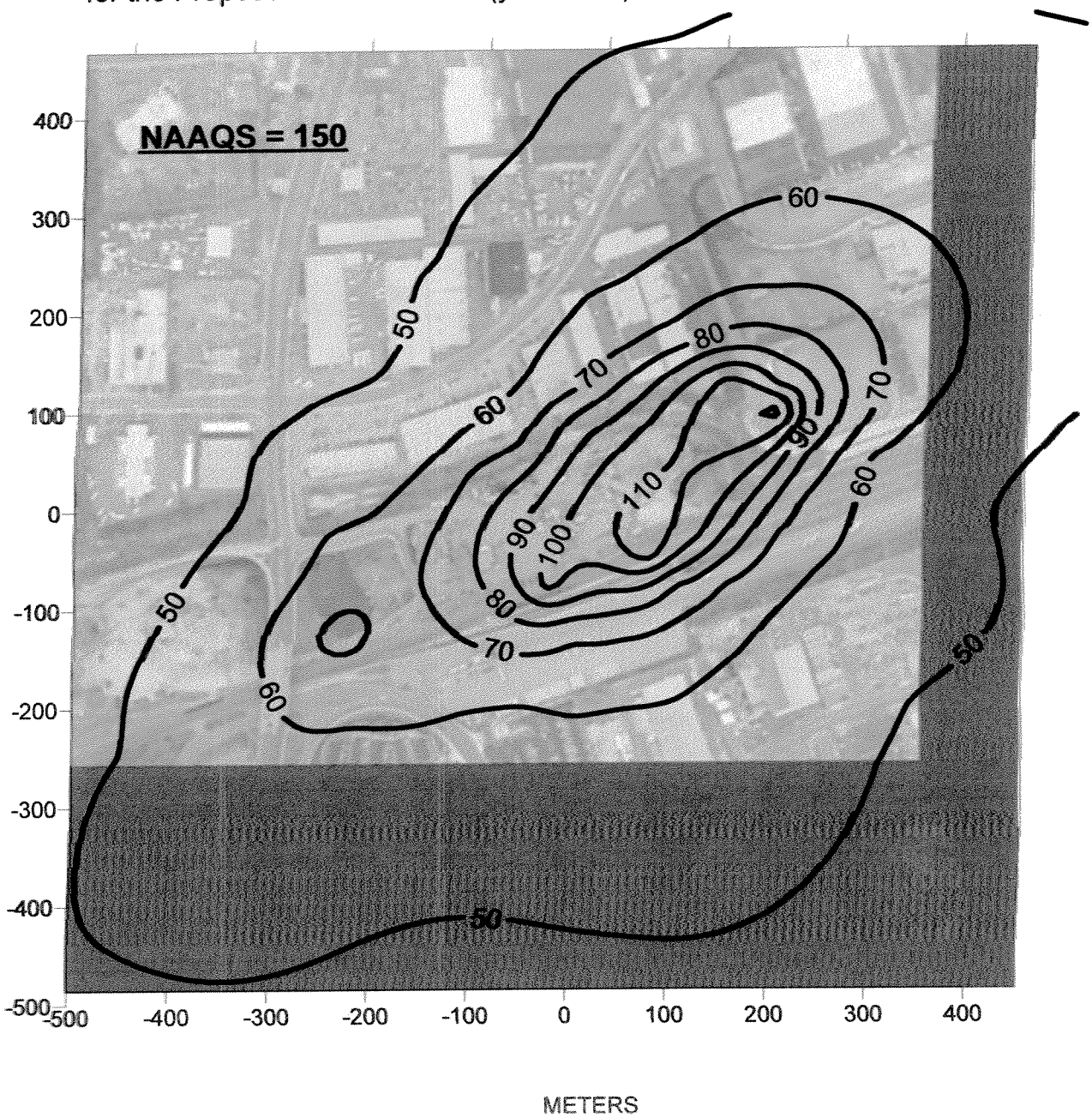

Figure 3-12.
Total PM10 annual impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2001).

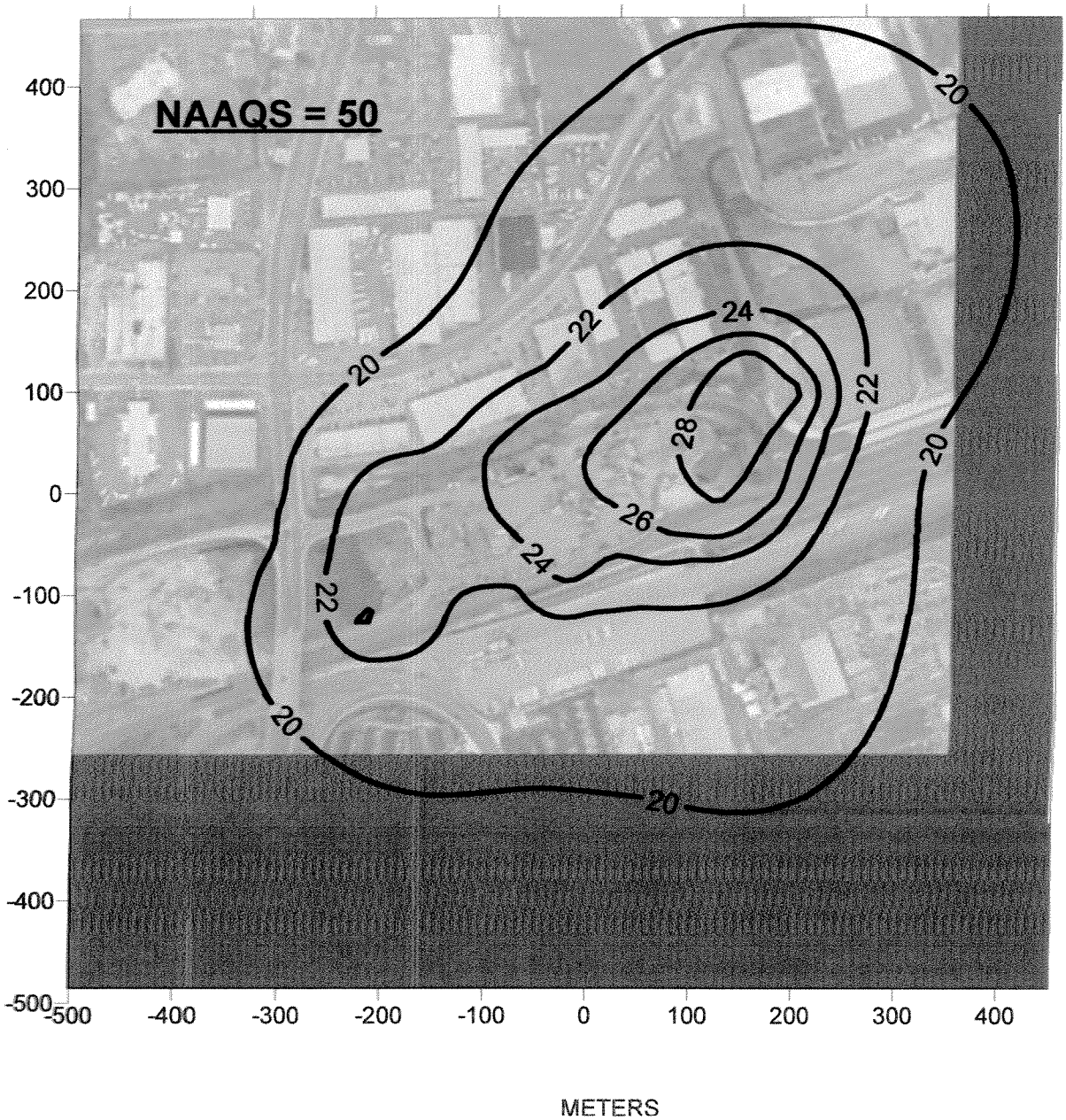

Figure 3-13.
Total SO2 3-hour impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2000).

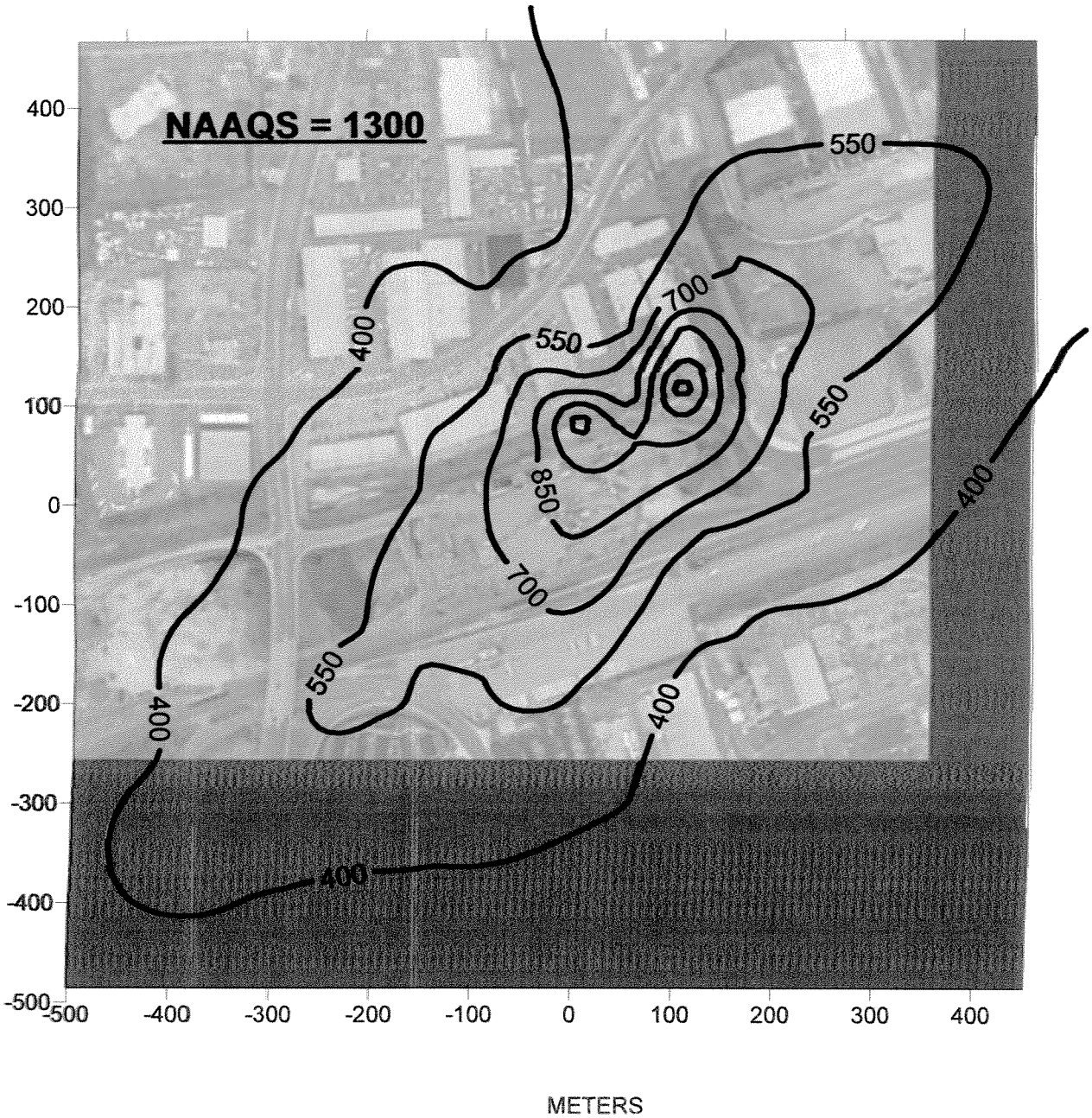

Figure 3-14.
Total SO2 24-hour impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2003).

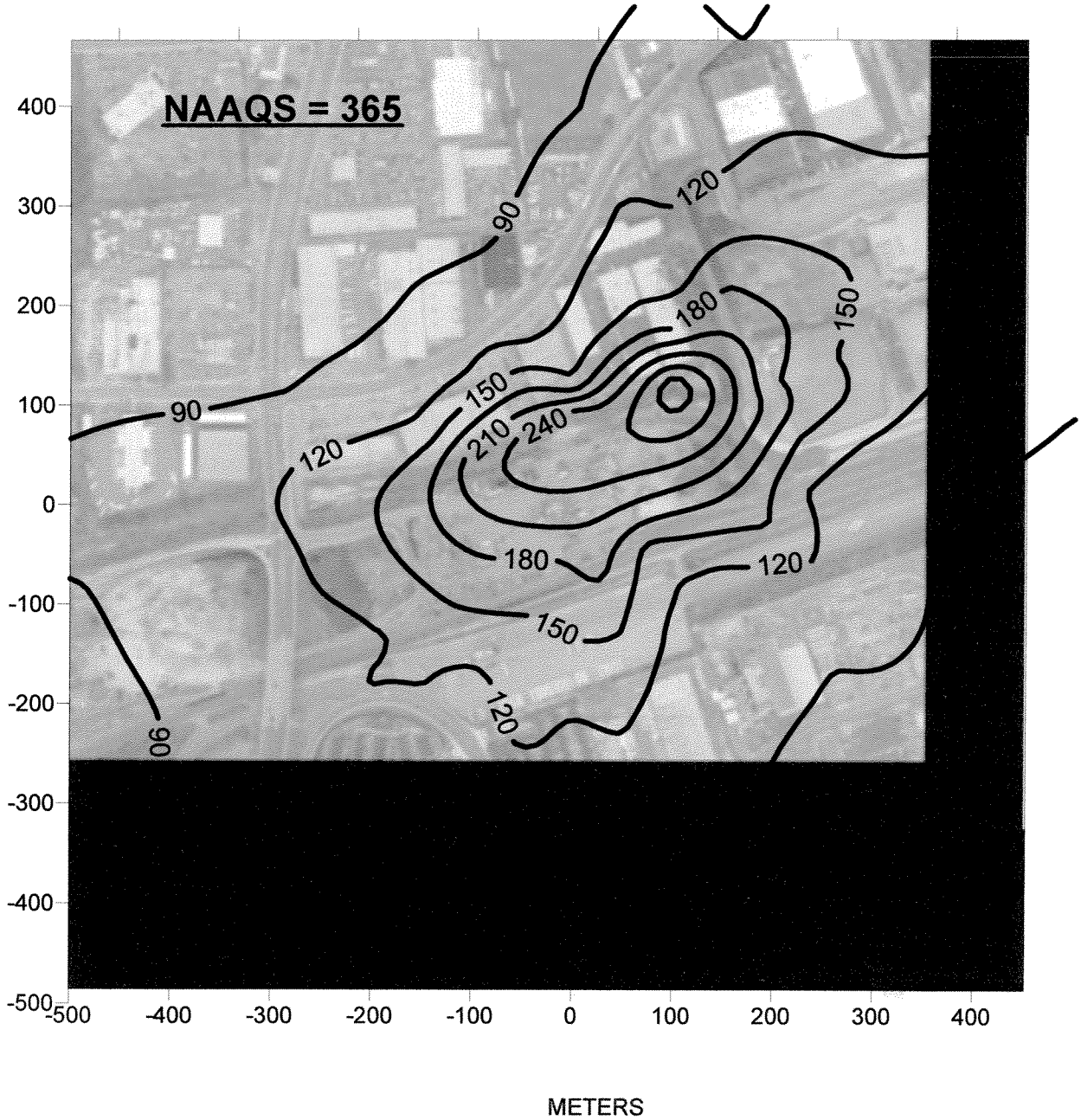

Figure 3-15.
Total SO2 annual impacts including background (micrograms per cubic meter) for the Proposed SUP Scenario (year 2001).

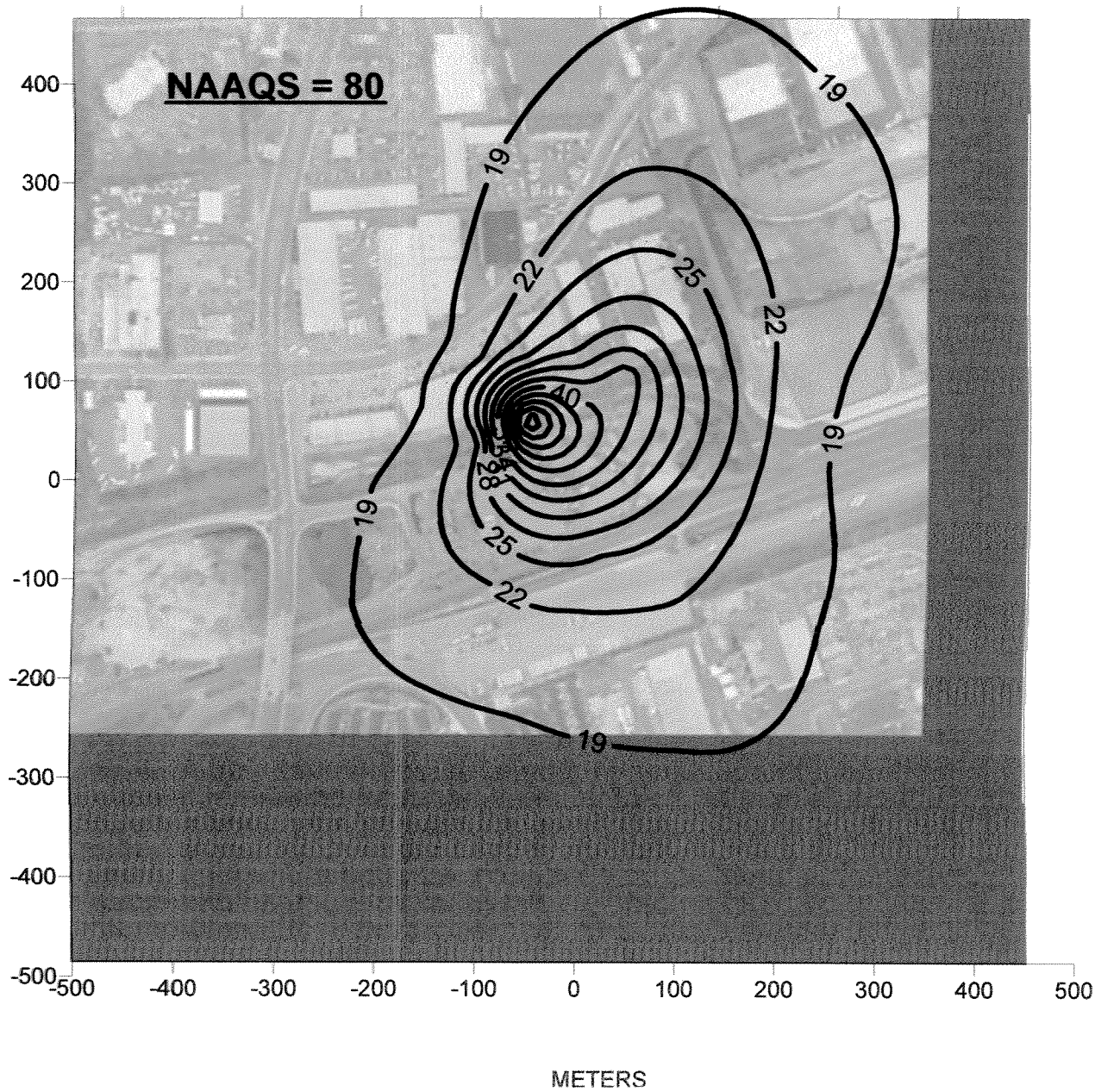

Figure 3-16.
Total NO2 annual impacts including background (micrograms per cubic meter) of the Proposed SUP Scenario (year 2001).

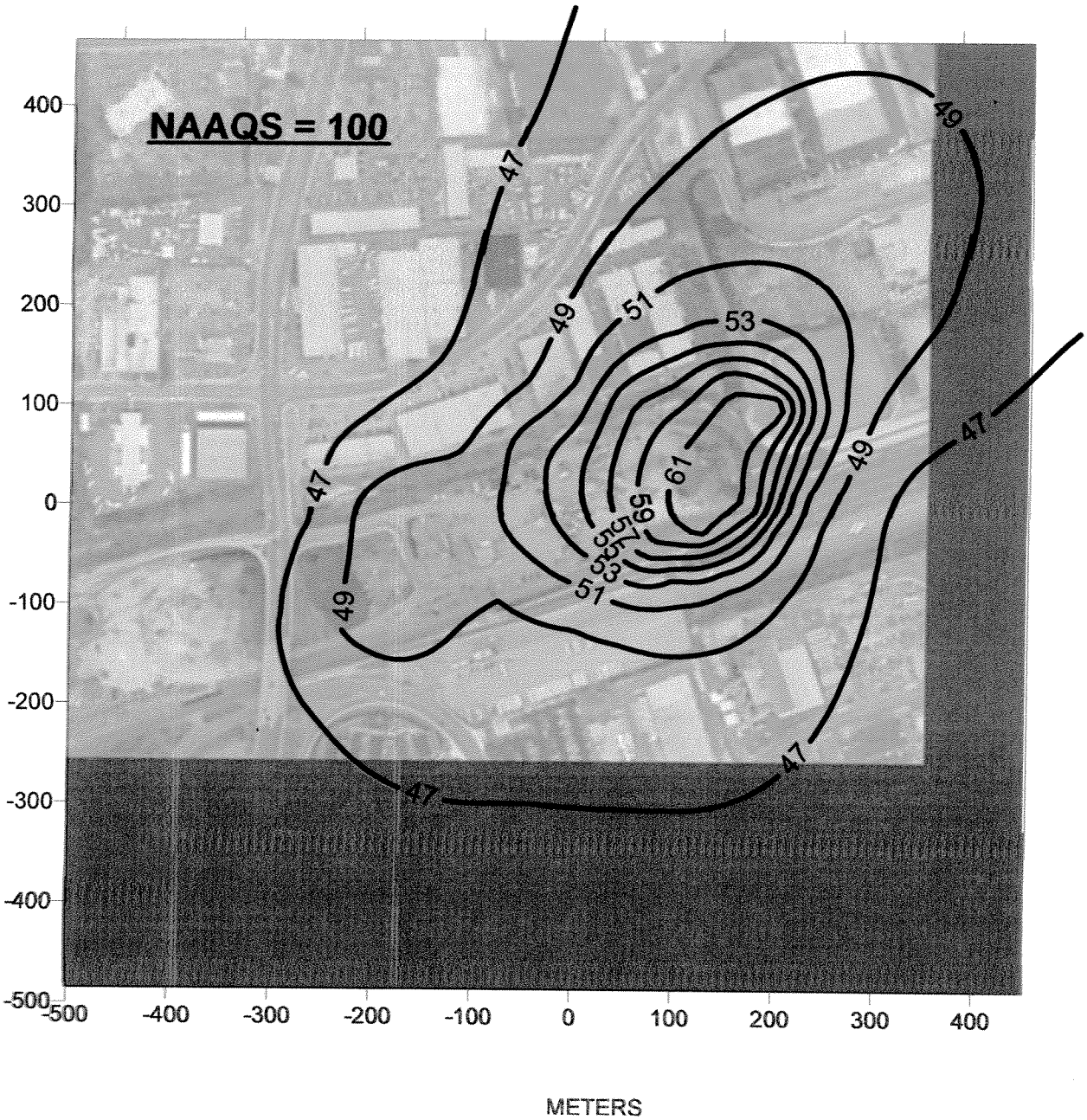

Figure 3-17.
Total PM2.5 short-term impacts (with background) of the Proposed SUP Scenario versus the Baseline Scenario (year 2004).

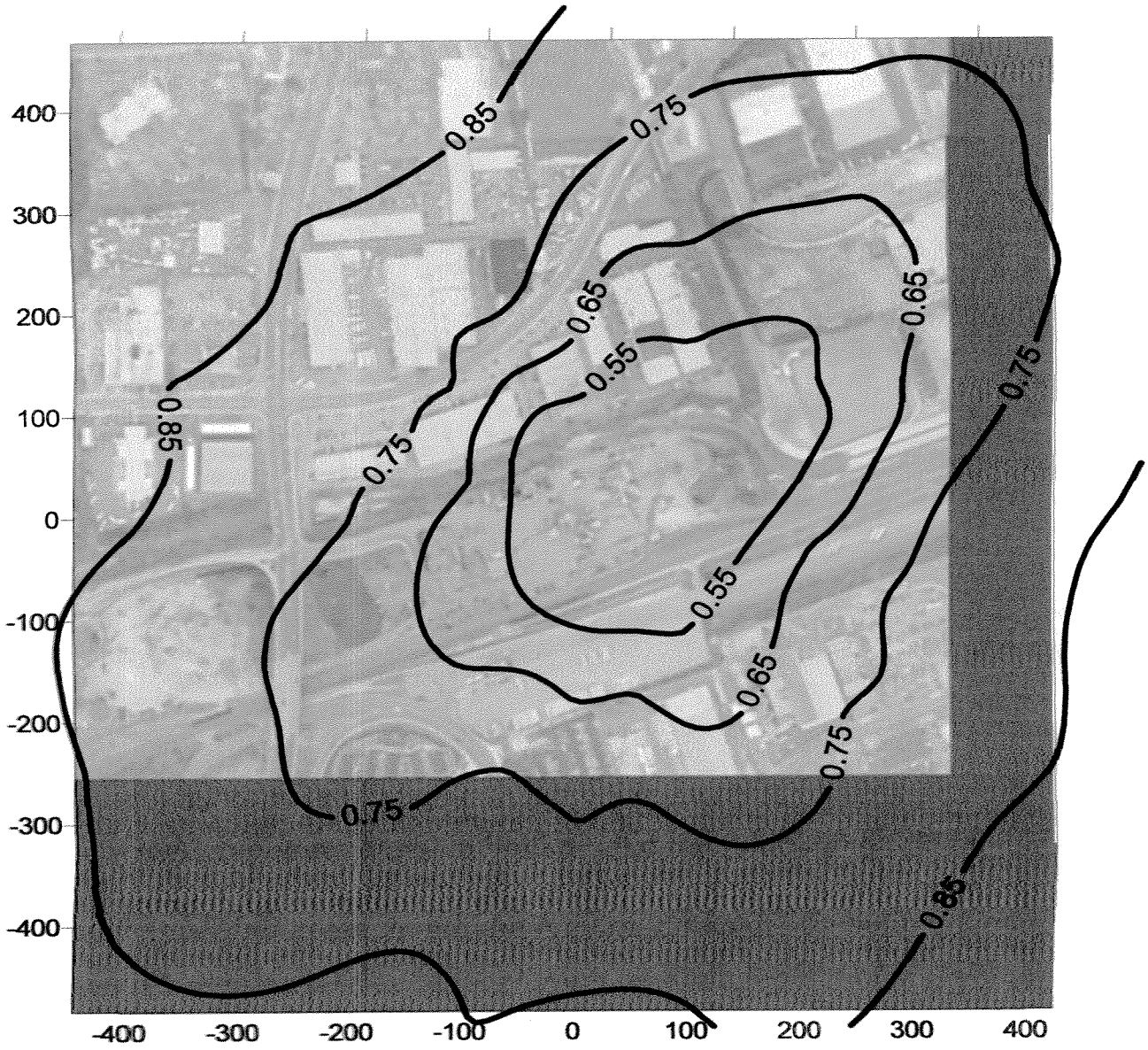

Figure 3-18.
Total PM2.5 annual impacts (including background) of the Proposed SUP Scenario versus Baseline Scenario (year 2001).

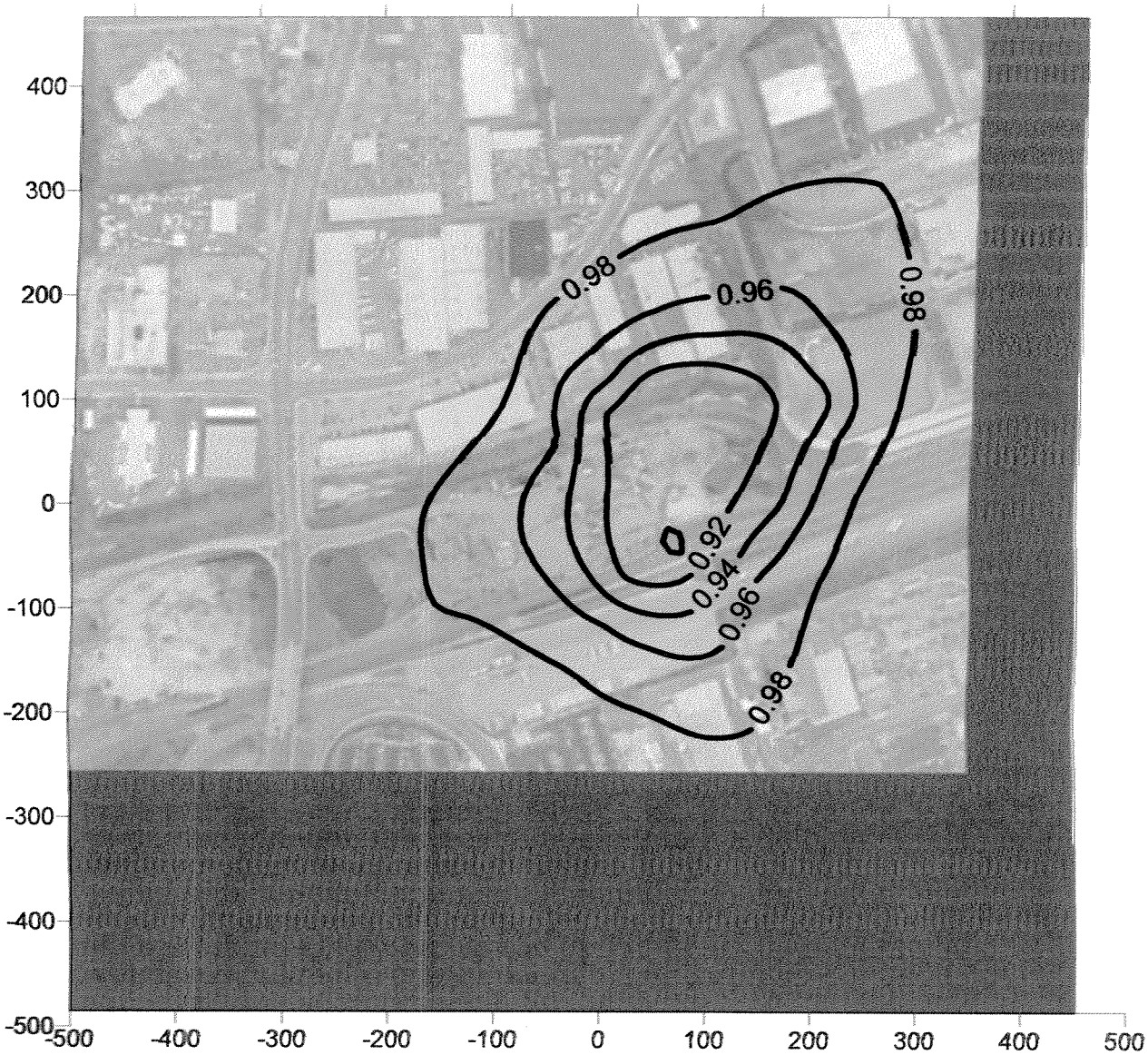

Figure 3-19.
Total PM10 short-term impacts (including background) of the Proposed SUP Scenario versus Baseline Scenario (year 2001).

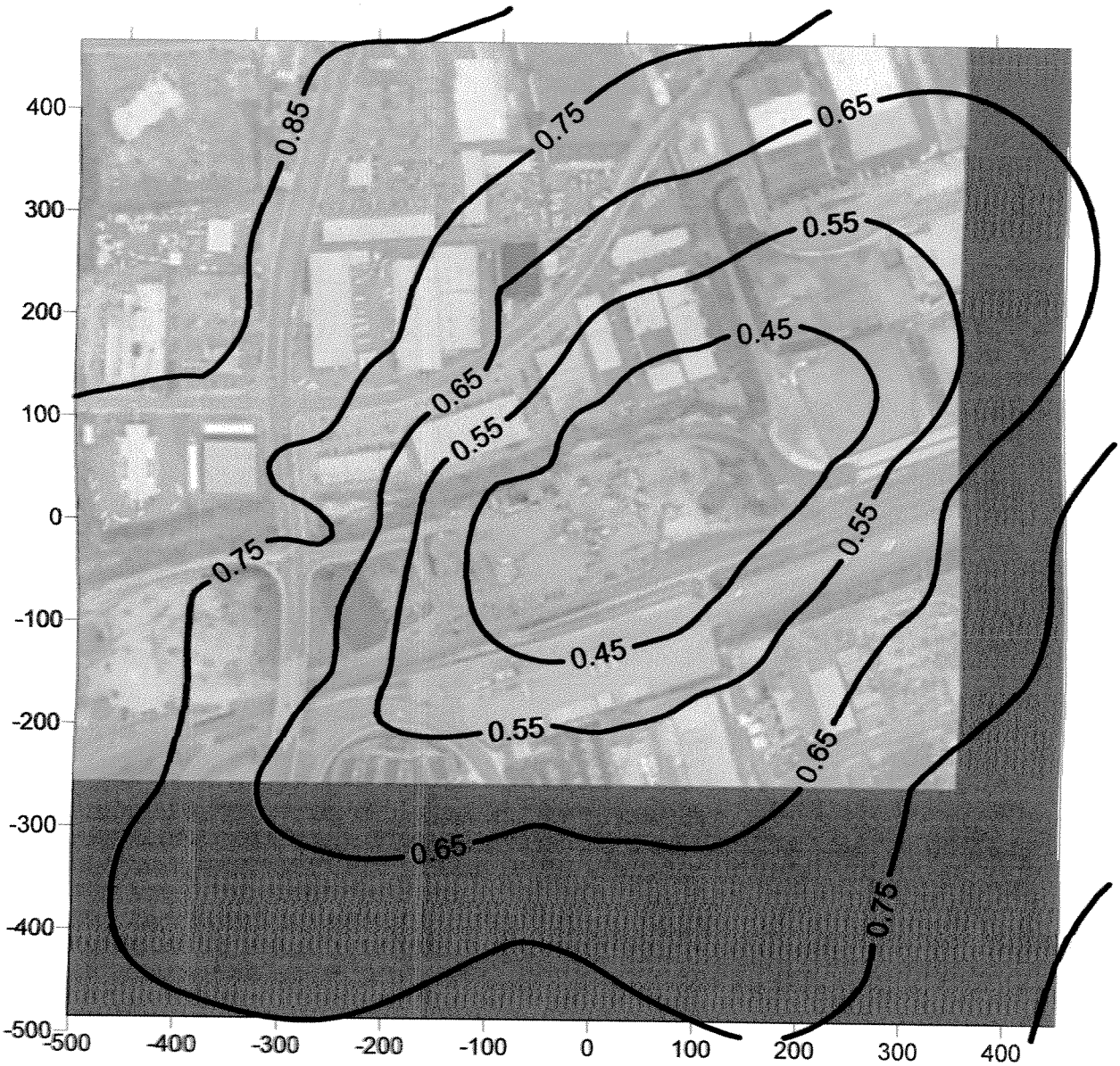

Figure 3-20 .
Total PM10 annual impacts (background included) for the Proposed SUP Scenario versus the Baseline Scenario (year 2001).

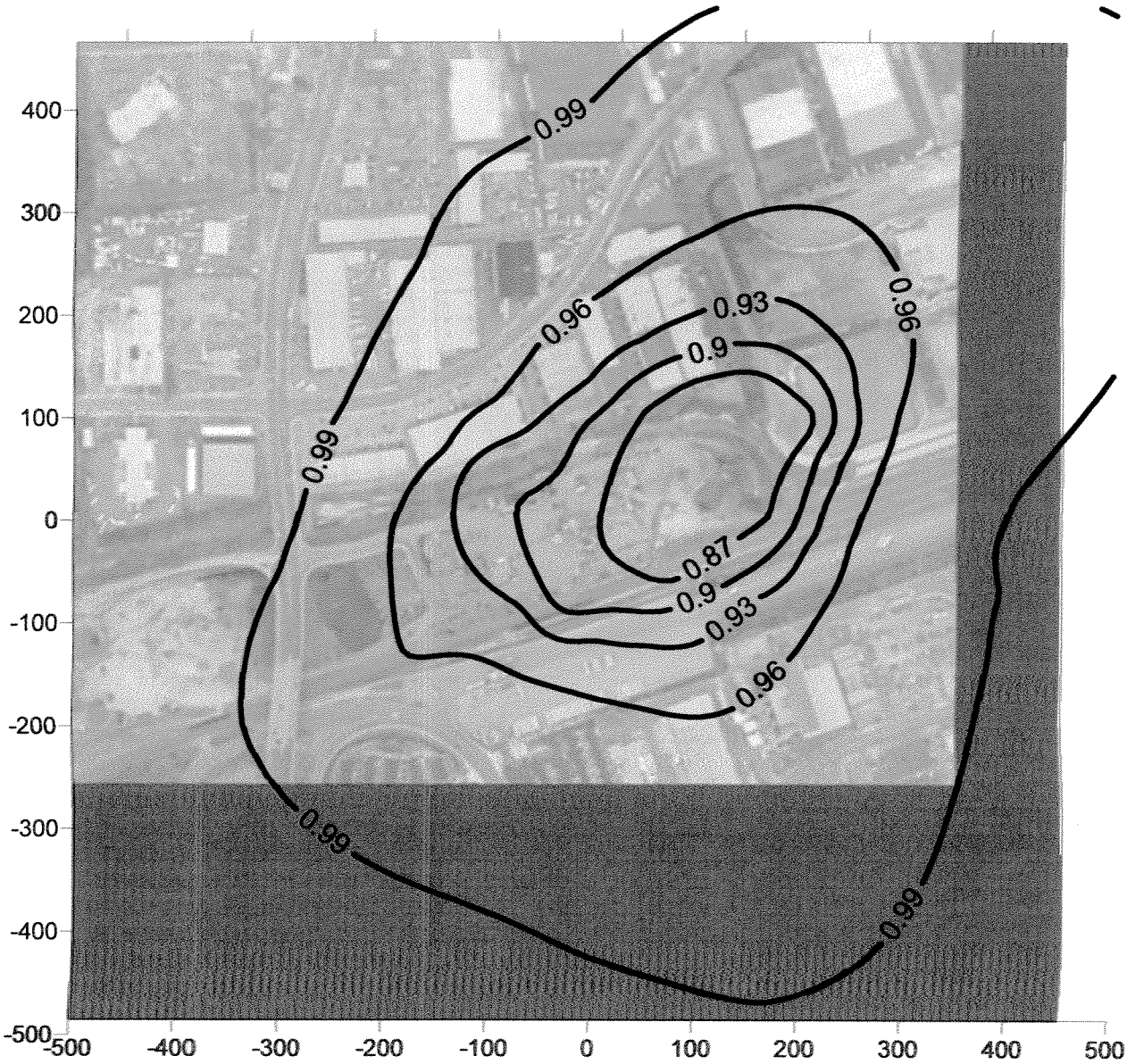

Figure 3-21.
Total SO2 3-hour Impacts (including background) for the Proposed SUP Scenario versus the Baseline Scenario (year 2000).

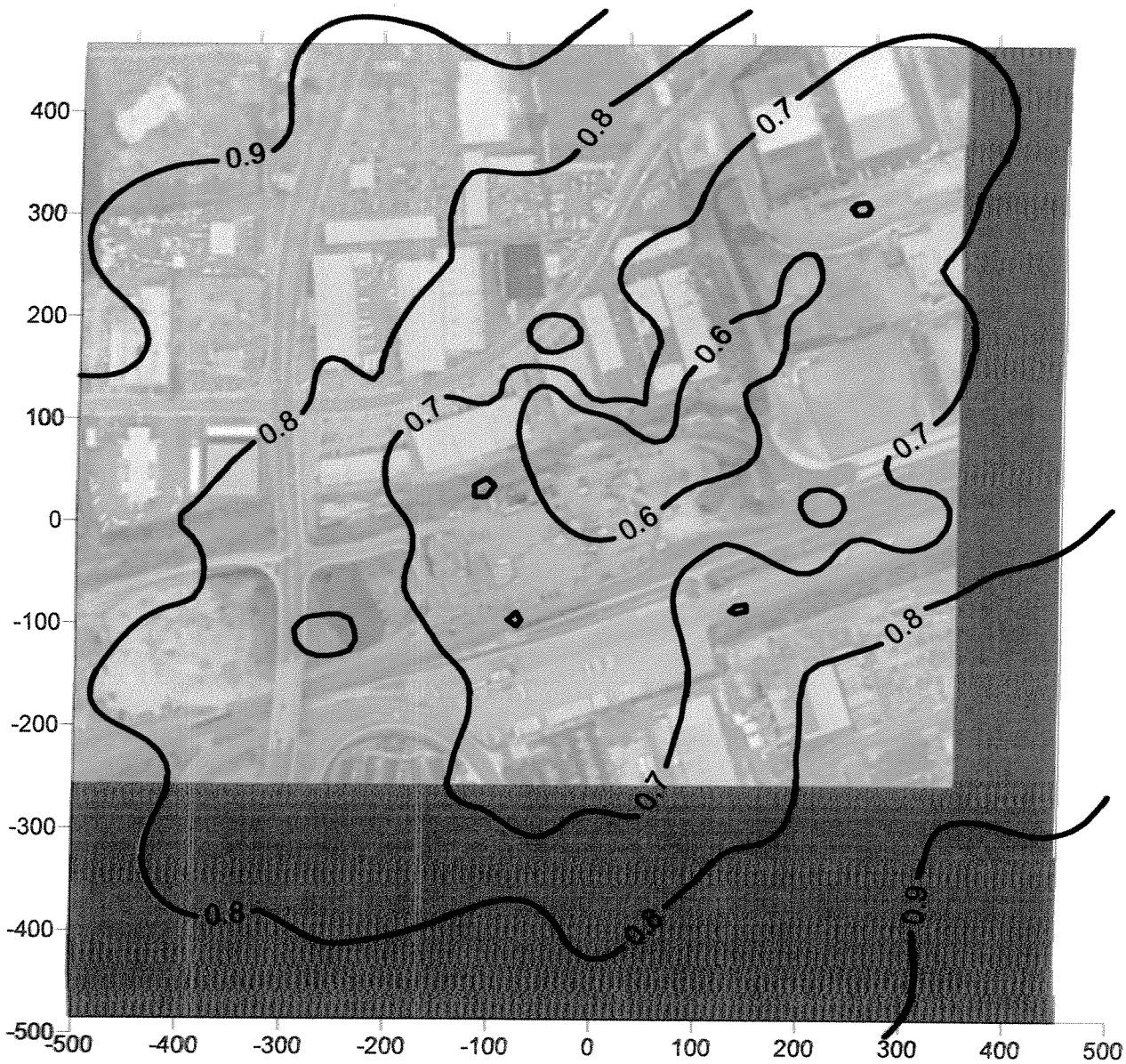

Figure 3-22.
Total SO2 24-hour Impacts (including background(of the Proposed SUP Scenario versus the Baseline Scenario (year 2003).

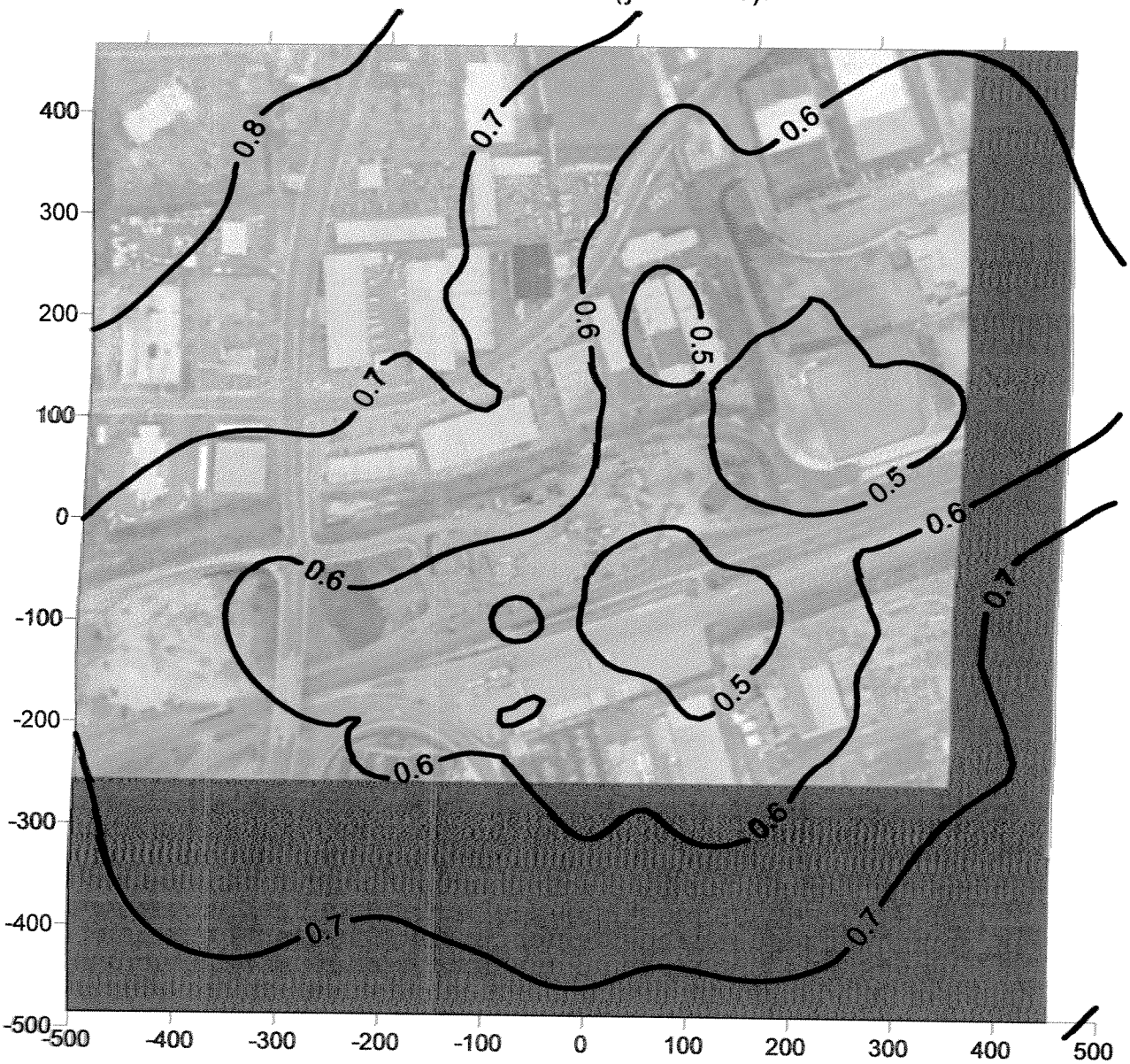

Figure 3-23.
Total SO2 Annual Impacts (including background) of the Proposed SUP Scenario versus Baseline Scenario (year 2001).

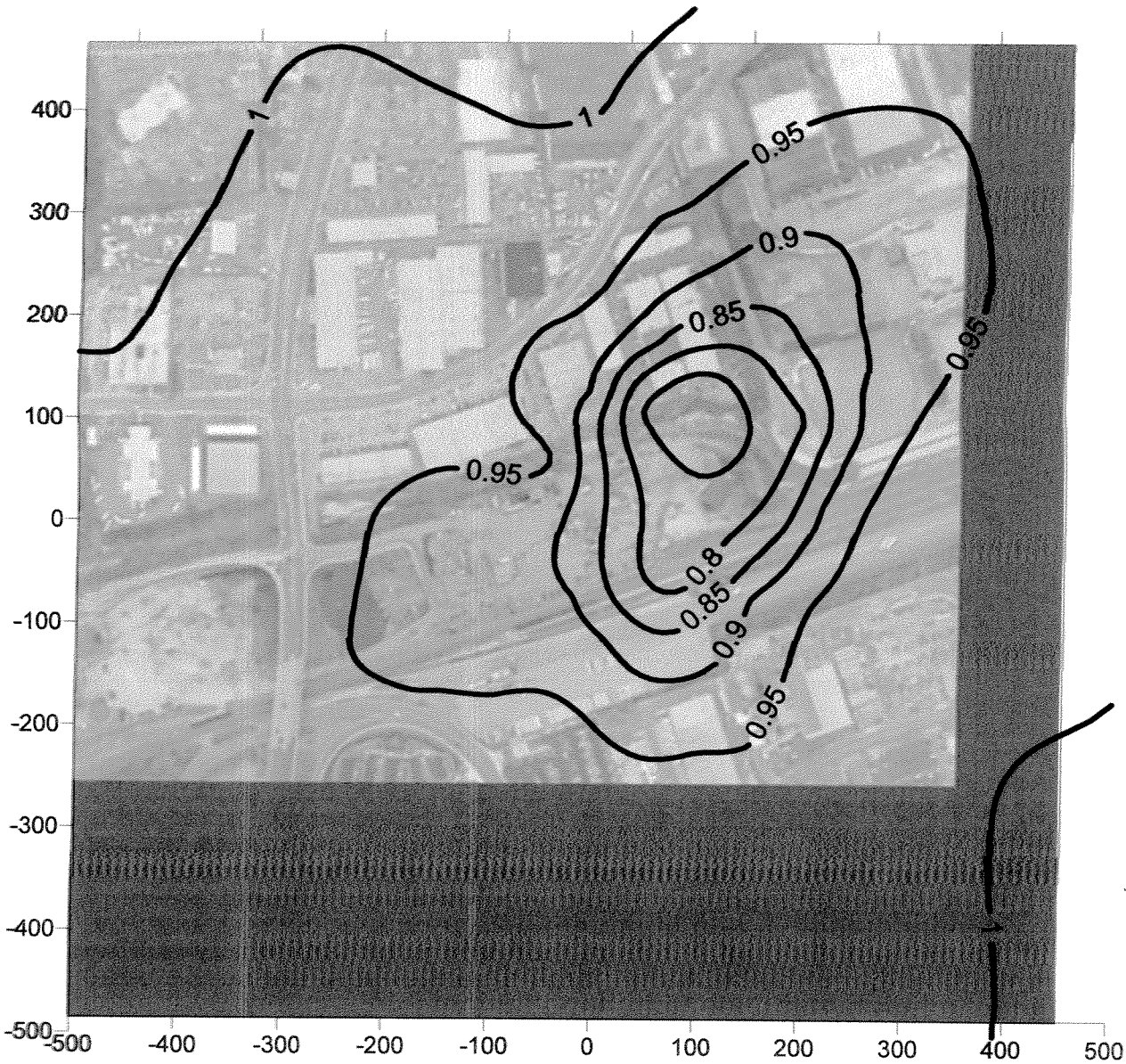

Figure 3-24.
Total NO2 annual impacts (including background) of the Proposed SUP Scenario versus Baseline Scenario (year 2001).

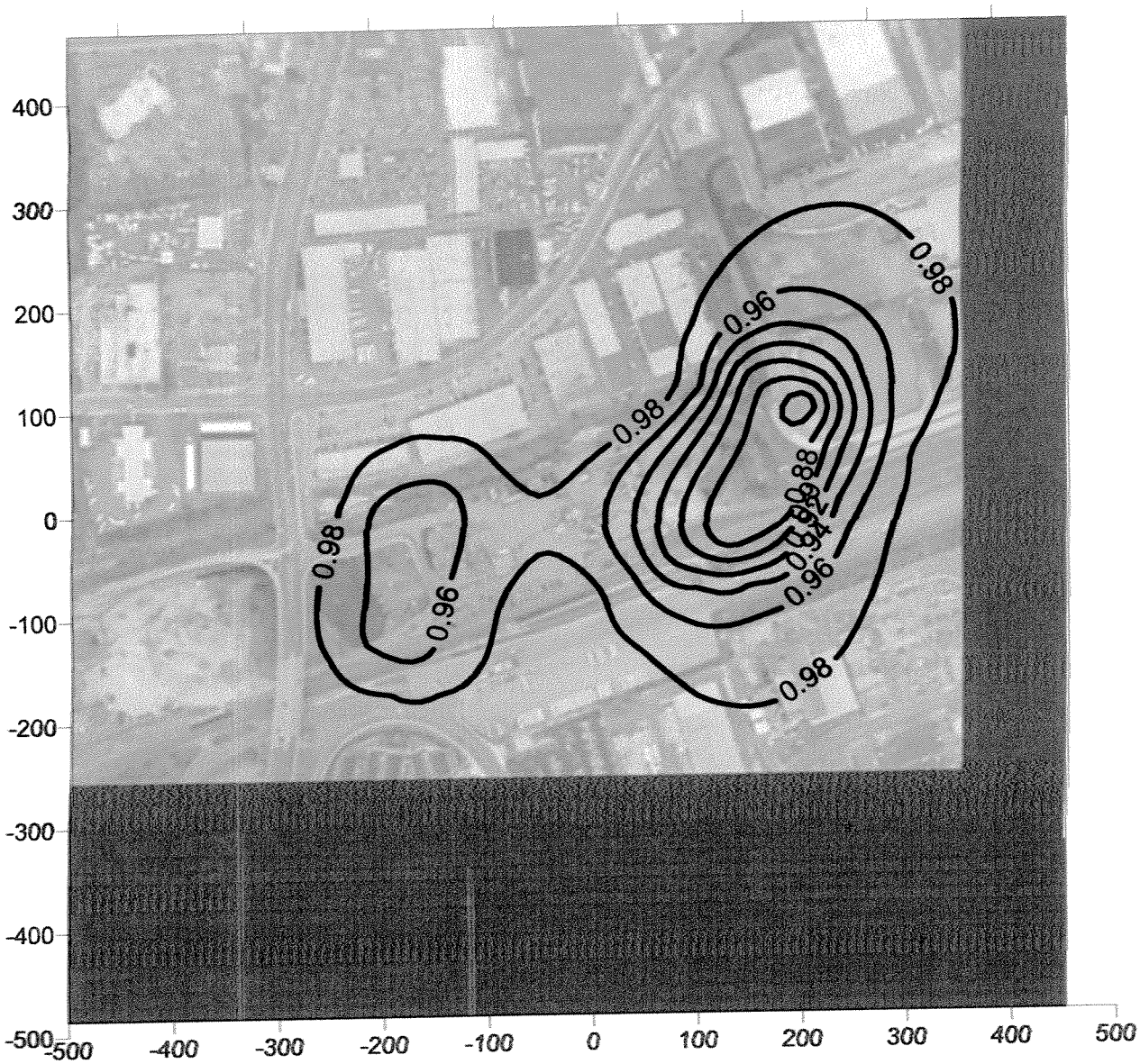

Figure 3-25.
Percent reduction in facility's contribution to PM2.5 short-term impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2004).

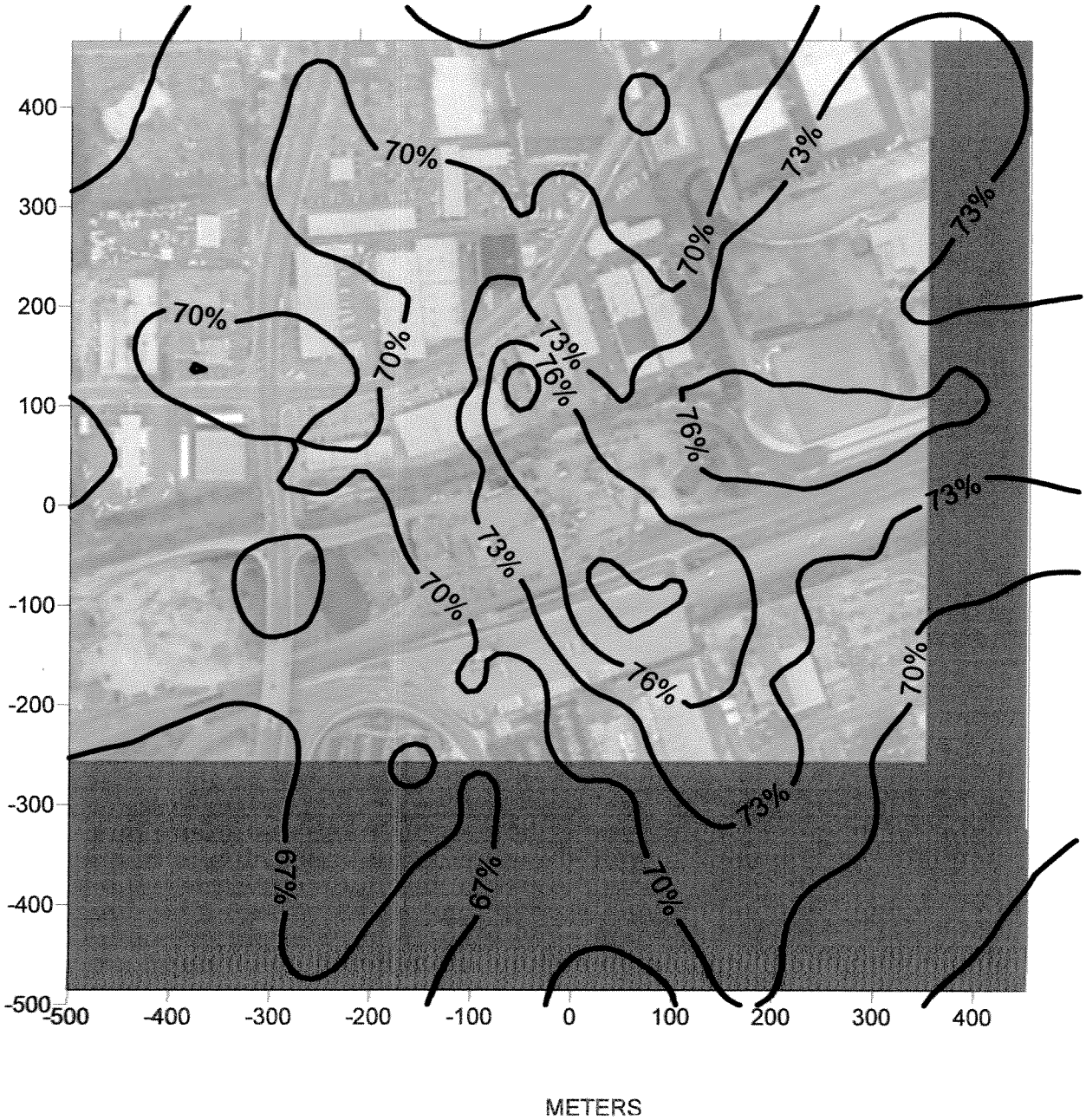

Figure 3-26.
Percent reduction in facility's contribution to PM2.5 annual impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2001).

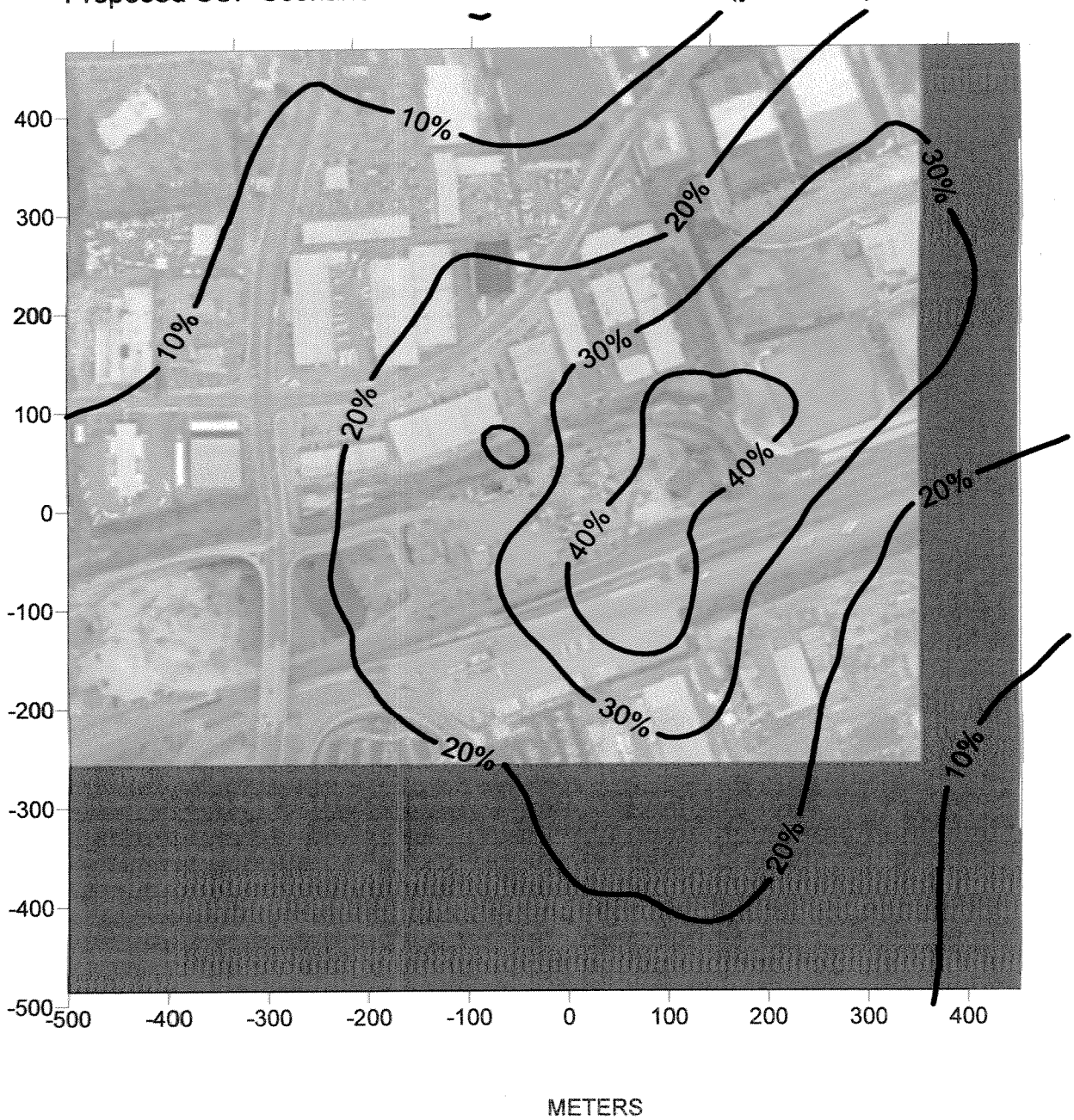

Figure 3-27.
Percent reduction in facility's contribution to PM10 short-term impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2001).

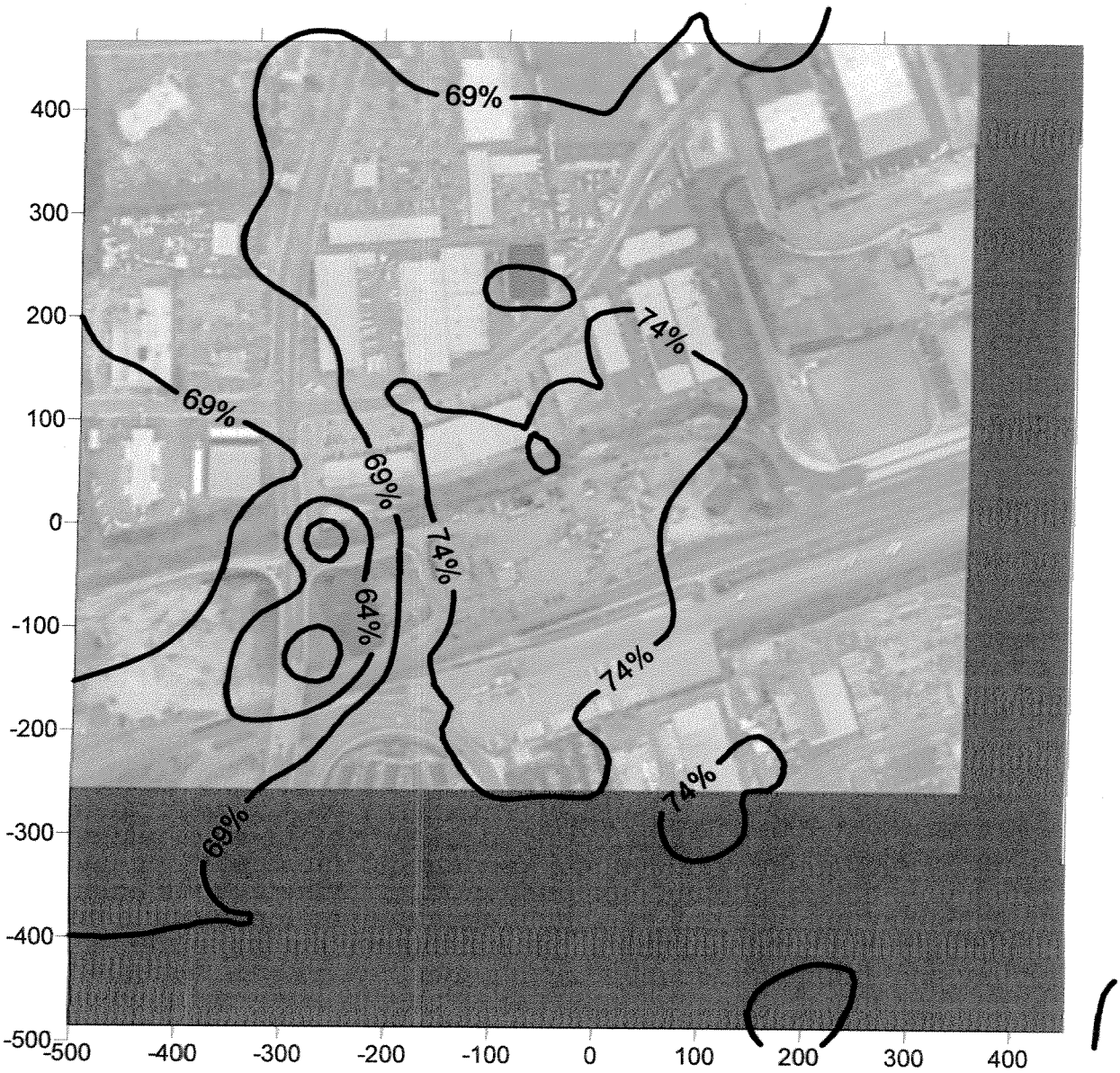

Figure 3-28.
Percent reduction in facility's contribution to PM10 annual impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2001).

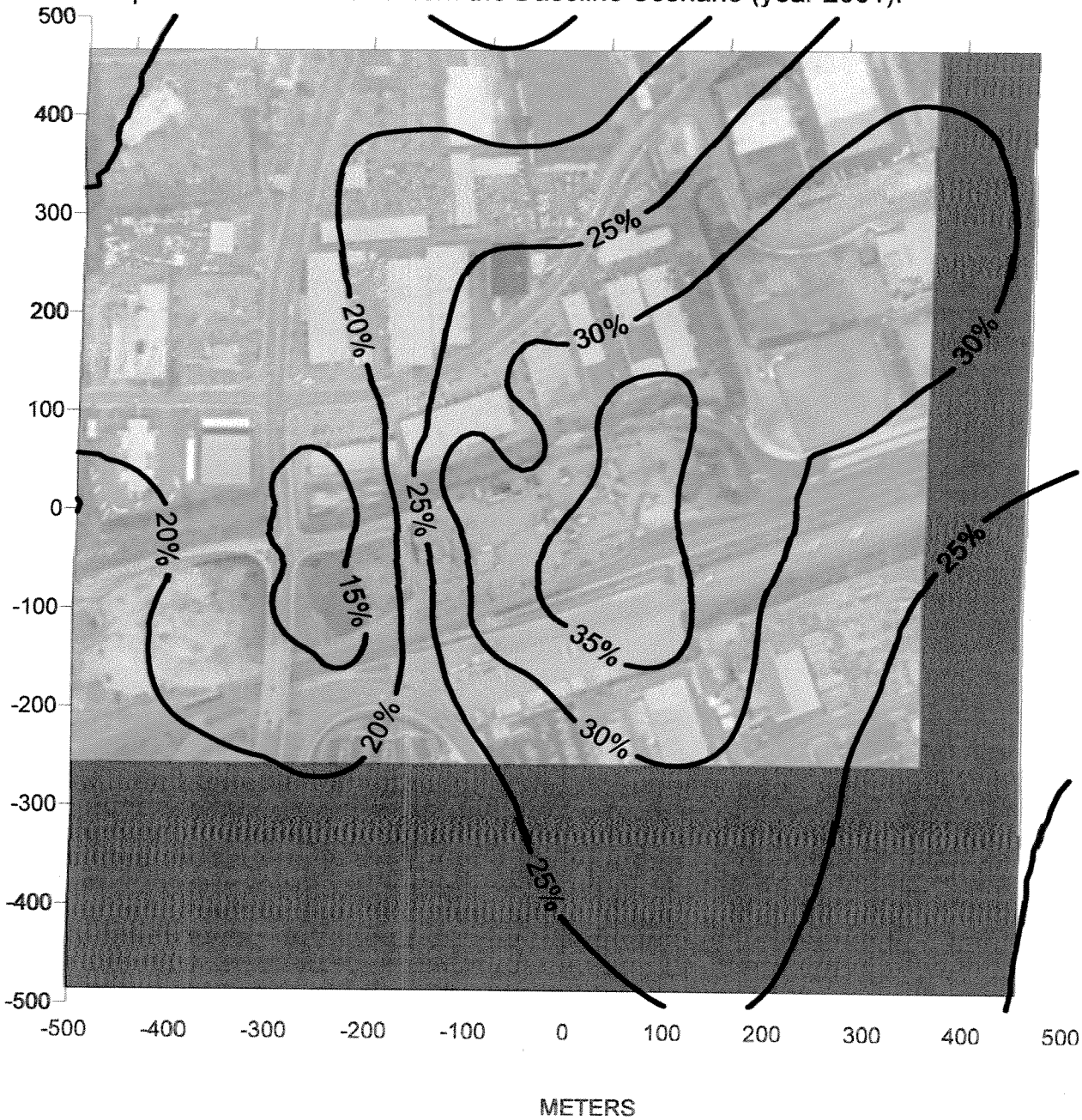

Figure 3-29.
Percent reduction in facility's contribution to SO2 3-hour impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2000).

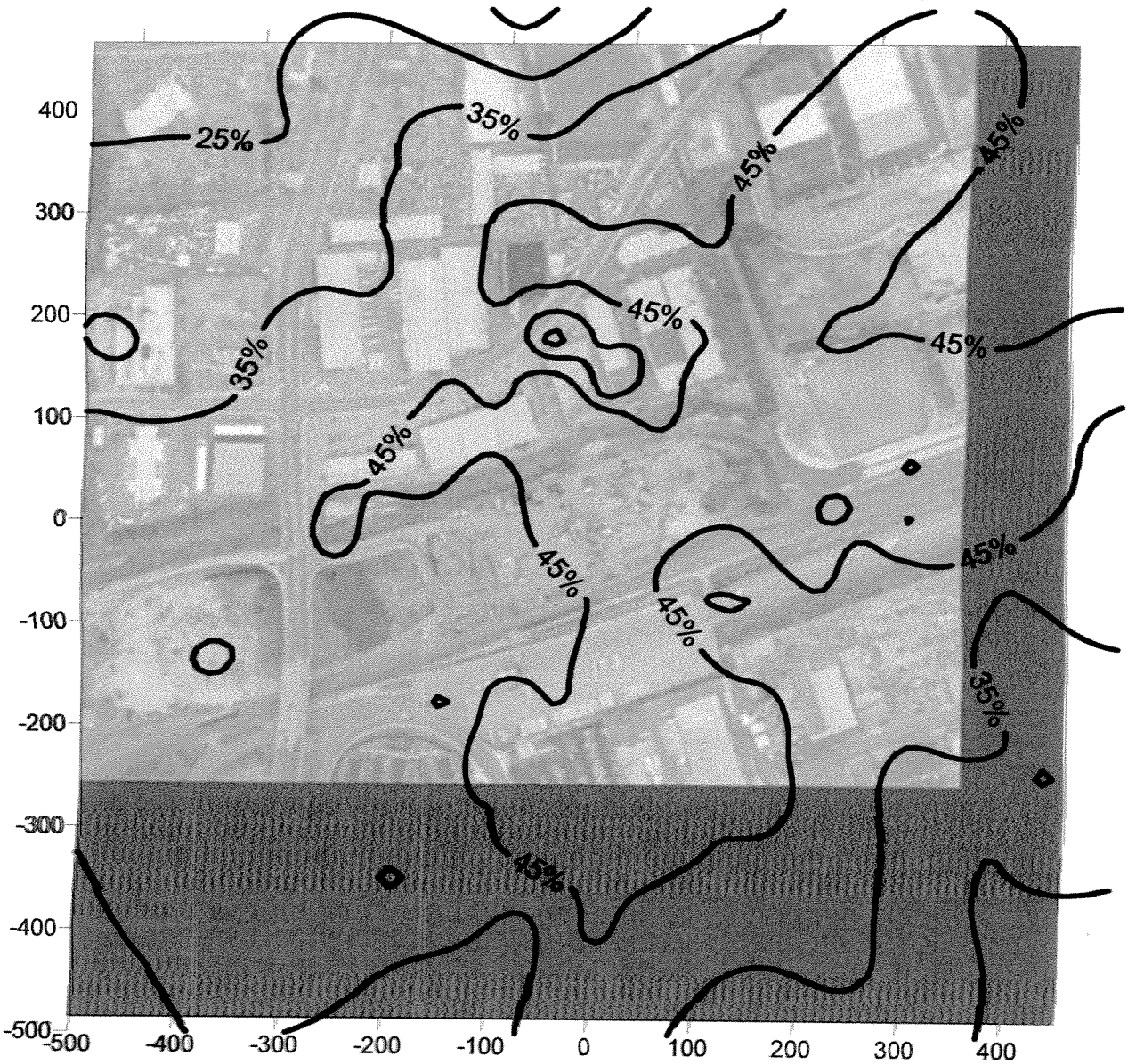

Figure 3-30.
Percent reduction in facility's contribution to SO2 24-hour impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2003).

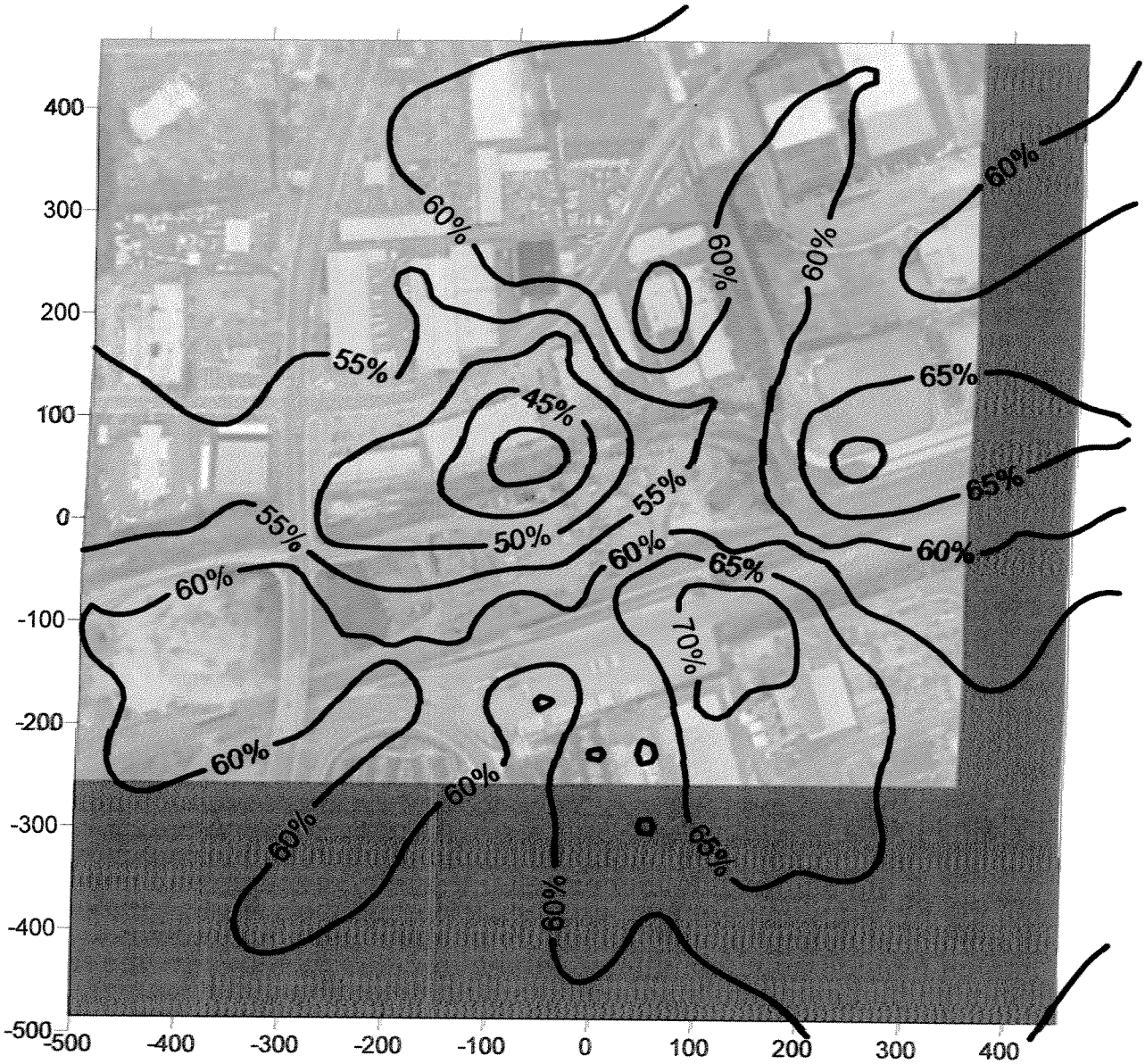

Figure 3-31.
Percent reduction in facility's contribution to SO2 annual impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2001).

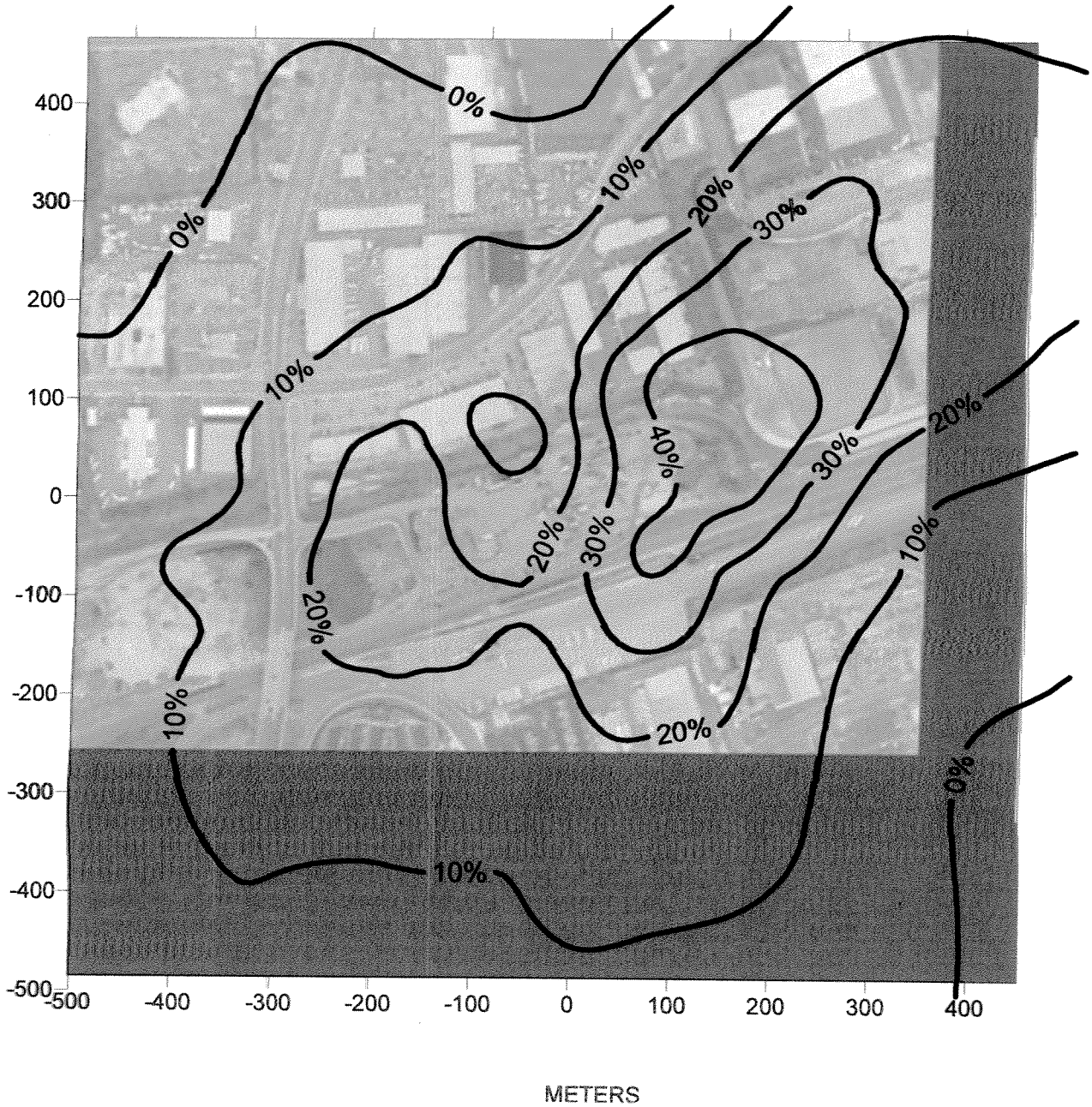

Figure 3-32.
Percent reduction in facility's contribution to NO2 annual impacts for the Proposed SUP Scenario from the Baseline Scenario (year 2001).

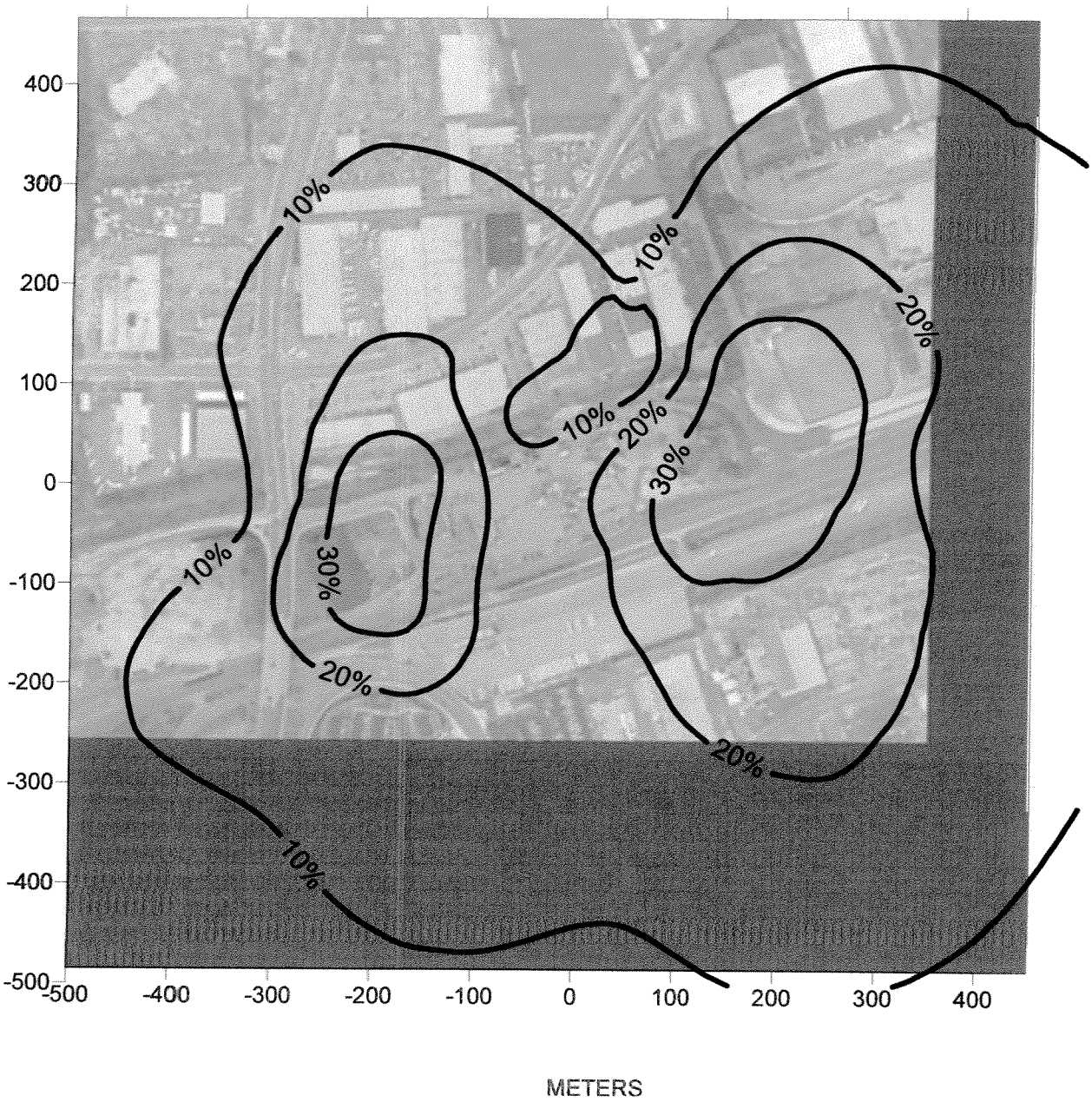

Table A-1. Plant Dryers, Lime Silo and Asphalt Cement Heaters (all vented through stacks) - Baseline Scenario.

	Short-term Factors (AP-42 or CE/PM test data)						g-term Factors (lb/ton values equiv. to short-t					
	PM_{10}	$PM_{2.5}$	CO	Pb	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
	lb/ton						lb/ton					
Dryer 1	0.016	0.015	0.130	1.5E-05	0.065	0.003	0.016	0.015	0.130	0.021	0.065	0.003
Dryer 2	0.009	0.009	0.012	1.5E-05	0.065	0.002	0.009	0.009	0.012	0.023	0.065	0.002
	lb/1000 gals						lb/1000 gals					
Htr 1	--	--	--	--	--	--	--	--	--	--	--	--
Htr1or2	3.3	3.3	1.2	1.2E-03	71	0.252	3.3	3.3	1.2	20	71	0.252

Dryers

	Rating, tons		Annual Limits		Type of Cntr	Stack Parameters(a)				Test Result		Maximum Short-term Rates - gps						Annual Rates - gps					
	Per hr	Per day	tpy or gpy	App. Cap.		dscf/hr at 75% load(a)	Tem K	Dia. m.	Vel. mps	PM_{10} gr/dscf	$PM_{2.5}$ gr/dscf	PM_{10}	$PM_{2.5}$	CO	Pb	$SO_{2\text{-}3hr}$	SO_2-24	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
P1 Dryer (a	600	14,400	690,000	0.13	Bag.	2040354	364	1.66	7.41	0.0028	0.0026	1.17	1.15	9.82	1.1E-03	4.91	4.91	0.15	0.15	1.29	0.21	0.64	0.028
P2 Dryer (a	400	9,600	210,000	0.06	Bag.	698504	366	1.25	4.48	0.0055	0.0050	0.46	0.44	0.60	7.6E-04	3.27	3.27	0.03	0.03	0.04	0.07	0.20	0.006
Lime Silo	25	tons	6,000	*no emissions -- process not used.*								--	--	--	--	--	--	--	---	--	--	--	--
											Permit Limits, Annual							*17.3*	*none*	*76.9*	*16.1*	*43.6*	*2.0*

Asphalt Heater(s)

	Rating		#5 Fuel Oil (gals/yr)	#2Fuel Oil (gals/yr)			Tem K	Dia. m.	Vel. mps			Maximum Short-term Rates - gps						Annual Rates - gps					
												PM_{10}	$PM_{2.5}$ (f)	CO	Pb	SO_2	SO_2-24	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
Hot Oil Htr	5.64	MMBtu/hr	125,000	0	56.4	*rain cap in place*	589	0.43	0.001	--	--	0.017	0.017	0.006	6.1E-06	0.360	0.360	0.006	0.006	0.002	0.000	0.127	0.127
Alt. Hot Oil Htr (d)	2.5	MMBtu/hr	0	0	25	no data	no flue gas data - assume Htr. 1 ops.			--	--	--	--	--	--	--		--	--	--	--	--	--
											Total Tons Per Year	0.6	0.6	0.2	2.E-04	12.5	12.5	0.2	0.2	0.1	0.0	4.4	4.4
											Permit Limits, Annual							*0.8*	*0.8*	*0.6*	*5.8*	*8.7*	*none*
											Total Tons Per Year	**57.4**	**55.8**	**362.9**	**0.1**	**297.2**	**297.2**	**6.5**	**6.4**	**46.2**	**9.7**	**33.7**	**5.6**

Notes:

a) Used T. 11.1-8 and 11.1-9 for drum mix plants in AP-42 Section 11.1. Used TOC emissions factors for VOC.

c) Heater emission rates derive from memo, dated 8/22/05, S. Zemba from CE to L.Sharma, City; T. 2.; assumes 110,000 Btu per gallon for No. 5 fuel oil, respectively. .

e) from "Source Sampling for Particulate Emissions, Hot Mix Asphalt Plant, Virginia Paving Company, August 11-12, 2005," RAMCON Environmental, used worst-case result among both fuels for Plant 1. RAMCON stated that flow rate was average; flowrates used here were scaled by 100/75 to reflect approximate values at 75% load (see "Data on Facility Being Stack Tested" in report).

d) worst-case short-term emissions assume operation of only heater no. 1 in modeling analysis; annual emission derive from combustion of fuel limit.

f) assumed that PM2.5 emissions for oil combustion in heaters was 75% of PM10 value.

Table A-2. Hot Mix Storage and Loadout Processes - Baseline Scenario.

Emissions associated with Loadout, Storage Tanks and Yard

Emission factor from AP-42, Section 11.1.2.5: Hot Mix Asphalt Plants; Production Operations.

Loadout (p.11.1-9 of AP-42 Section 11.1)

E =	0.00036	lb/ton	PM10 and PM2.5	assumes all PM is PM10/PM2.5; T. 11.1-14
	0.0022	lb/ton	TOC	T. 11.1-14
	0.00072	lb/ton	CO	T. 11.1-14
	7.30E-07	lb/ton	benzene	p. 11.1-9; re-evaluate for V = -0.5

Yard Emissions (p.11.1-9 of AP-42 Section 11.1)

E=	0.00018	lb/ton	PM10 and PM2.5	assumed 50% of loadout value
	0.00110	lb/ton	TOC	assumed 50% of loadout value
	0.00036	lb/ton	CO	assumed 50% of loadout value

Silo Filling (T. 11.1-14 of S. 11.1) and Asphalt Storage Tanks

E=	0.00015	lb/ton	PM10 and PM2.5	T. 11.1-14 for total PM
	0.00715	lb/ton	TOC	T. 11.1-14 f
	0.00070	lb/ton	CO	T. 11.1-4

Asphalt Storage Tanks (c) ***assumed 10% of silo emissions; added to silo filling values***

					Maximum Short-term Rates (gps)						Maximum Long-term Rates (gps)					
Source Name	**Max. Annual Process Rate (tpy)**	**Peak Process Rate (tph)**	**Daily Process Rate (tpd)**	**Control % (Blue Smoke©, for PM only)**	**PM10**	**PM2.5**	**CO**	**NO2**	**SO2-3hr**	**SO2 - 24hr**	**PM10**	**PM2.5**	**CO**	**NO2**	**SO2**	**VOC**
Loadout and Yard Plant 1.	690000	600	14400	0	0.041	0.041	0.082	--	--	--	0.005	0.005	0.011	0.000	0.000	0.033
Silos Plant 1.	690000	600	14400	0	1.163E-02	1.163E-02	0.053	--	--	--	1.526E-03	1.526E-03	0.007	0.000	0.000	0.071
Loadout and Yard Plant 2.	210000	400	9600	0	0.027	0.027	0.054	--	--	--	0.002	0.002	0.003	0.000	0.000	0.010
Silos Plant 2.	210000	400	9600	0	7.751E-03	7.751E-03	0.035	--	--	--	4.645E-04	4.645E-04	0.002	0.000	0.000	0.022
TOTAL TONS					**3.0**	**3.0**	**7.8**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**0.8**	**0.0**	**0.0**	**4.7**

Notes:

(a) 24-hour emissions are based on maximum hourly process rate and peak emission factor.

(b) Annual emissions are based on annual limited throughputs.

c) From Section 7.1 of AP-42 for VOC storage tanks.

Table A-3. Aggregate Handling Processes - Baseline Scenario.

Drop Operations(a); E= k (0.0032) (U/5)^1.3 / [(M/2)^1.4]

where:

k = 0.11 [particles < 2.5um]

k = 0.35 [particles < 10um]

U1 = 7.3 [mph, estimated daily avg. worst case wind speed, based on 8 hr @ 10mph and 16 hr @ 6 mph]

U3 = 4.38 [mph, annual average wind speed]

	RAP	Sand	Stone(a)	
Moist., M =	5.00	6.5	1.30	%
Silt, S =	7.4		2.31	%

RAP Crusher	PM_{10}	$PM_{2.5}$	(see Note b)
E (lb per ton) =			
Tertiary Crushing, no cont.	2.40E-03	4.44E-04	

worst-case (short-term):	RAP	Sand	Stone(a)
E (lb $PM_{2.5}$ per ton material handled) =	1.60E-04	1.11E-04	1.05E-03
E (lb PM_{10} per ton material handled) =	5.08E-04	3.52E-04	3.35E-03
average (long-term):			
E (lb $PM_{2.5}$ per ton material handled) =	8.22E-05	5.69E-05	5.42E-04
E (lb PM_{10} per ton material handled) =	2.61E-04	1.81E-04	1.72E-03

Materials Used, typical year (from 'silt and tpy', Cl

	Sand	Agg.	RAP-E	RAP-W	Asphalt	(Typ.tons/day)
Typical Tons	271,523	363,026	77,605	77,605	900,000	2,466
Max. Annual	362,031	484,035	103,473	103,473	1,200,000	
Max. Daily	3,017	4,034	862	862		10,000
Max. Daily	7,241	9,681	2,069	2,069		24,000

					Maximum 24-hour Emissions - gps		Long-term Emissions - gps (e)		
AP-42 Factor	Source Name	Daily Rate (ton/day)	Annual Rate (ton/year)	Control %	PM10	PM2.5	PM10	PM2.5	Control System
Drop (to Pile)	RAP Dump from Trucks - West Pile	2,069	77,605	0	0.0055	0.0017	0.0003	0.0001	none
Drop to Truck	RAP Pile Reclaim - drop into truck - West Pile	2,069	77,605	0	0.0055	0.0017	0.0003	0.0001	none
Drop to Pile	RAP Dump from Trucks - East Pile	2,069	77,605	0	0.0055	0.0017	0.0003	0.0001	none
Drop to Truck	RAP Pile Reclaim - drop into truck - East Pile	2,069	77,605	0	0.0055	0.0017	0.0003	0.0001	none
Drop to Pile	Sand Drop from Trucks	7,241	271,523	0	0.0134	0.0042	0.0007	0.0002	none
Drop to Truck	Sand Pile -drop into truck	7,241	271,523	0	0.0134	0.0042	0.0007	0.0002	none
Tertiary Crushing	RAP Crusher on RAP West	4,139	155,210	0	0.0521	0.0096	0.0054	0.0010	*must be equivalent to AP-42*
Drop	Aggregate Dump to Plant 1 and Plant 2	9,681	363,026	0	0.1699	0.0534	0.0090	0.0028	none
				TOTAL TONS=	9.4	2.7	0.6	0.2	

Notes:

a) Stone, RAP and sand dropping: *Emission factor from AP-42, Section 13.2.4: Aggregate Handling and Storage Piles (1/95), Equation (1) - batch or continuous drop operation*

b) RAP Crushing: : from AP-42, Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing; Table 11.19.2-2

c) Reclaim Operations: from AP-42 Section 11.9 - "Western Surface Coal Mining;" Table 11.9-1, for bulldozing of overburden (silt and moisture dependent, per hour of operation)

d) from CE spreadsheet "Fugitive Emission Factors Moisture" and "....Silt;" stone/(sand and rap) usage approximately 1:1.

e) assumed 25% capacity factor.

Table A-4. Truck Emissions - Engine and Roadway - Baseline Scenario.

PM_{10} and $PM_{2.5}$ from Roadway Travel

Paved Roads: *Emission factor from AP-42; Section 13.2.1; Paved Raods (12/03), Eqn. (1).*

Unpaved Roads: *Emission factor from AP-42; Section 13.2.2; Eqn. (1a)*

E paved = [kp (sL/2)^.65 x (W/3)^ 1.5 - C] * (1 - P/4N) lb per VMT

E unpaved = [ku * (s/12)^a * (W/3)^b]

where:

kp = 0.0016 ku = 0.23 [particles < 2.5um] **kp revised to PM2.5/PM10 = 0.1**

kp = 0.016 ku = 1.5 [particles < 10um]

sL= road silt load, gr./sq. m., = 120 for asphalt batching 1 **sL revised per tests, Dec. 05**

s= silt content, % 5 representative of average for unpaved road areas between storage areas, as recommended by S. 13.2.2.

C = emission factor; exhaust, brake, tire wear, lb/VMT= 3.60E-04 $PM_{2.5}$

a = 0.90 4.70E-04 PM_{10}

b = 0.45

(1-P/4N) = 0.98 35.00 area-specific SAMSON data

W = Mean Veh. Weight, tons Unpaved 20.00 29 tons full, 11 tons empty, CE, Dec. 05

Paved 33.50 CE, Dec. 05

N = No. of days in period (assume per year if use P based on year): ***assume watering as described.***

Resulting Factors:

	Trucks,Paved Roads(w. 50% red):	Trucks, Unpaved (w. P/4N):	Site Veh. Unp. (w. P/4N):
E (lb PM2.5 per VMT) =	0.009	= 0.24	= 0.30
E (lb PM10 per VMT) =	0.09	= 1.56	= 1.97

Internal Combustion Emissions (all pollutants)

Used MOBILE6.2 ef's for travel and idle PM; HMA no.'s for idle for other polls fo

	MOBILE6 - Trv.	HMA Rp - Trv.	HMA-Idle	Off-road Equip. (e)
CO=	4.148	18.82 g/vmt	1.57 g/min	2.6 g/bhp-hr
SO2=	0.011	0.36 g/vmt	0.059 g/min	1.0 g/bhp-hr, revised
NO2=	8.486	8.5 g/vmt	0.917 g/min	4.9 g/bhp-hr
NMVOC	0.847	3.18 g/vmt	0.208 g/min	0.53 g/bhp-hr used CO/
PM10	0.259	2.53 g/vmt	0.02004 **M6.2**:gpm	0.07 g/bhp-hr as for tra
PM2.5	0.259	2.53 g/vmt	0.02004 **M6.2**:gpm	0.07 g/bhp-hr

Total Hp-hours of Off-road Equipment (e):		
(Used CE's e.f.'s, reduced for Off-road Rule)		**HP-hr/day**
Front-end Loader	=2 loaders * 300 HP*10hrs/day*2shifts	12,000
Bobcat	=45 hp * 4 hrs/day	180
Lift	=50 hp * 1 hr/day	50
Crane	=150 hp * 1 hr/day	150
		12,380
Total	=46 hours per day @ 5 mph;230 mpd	

Roadway Sections	Source Name	Mean Veh. Weight (tons) or Idle Time per Truck(5)	Pk. Mi. x trips or idle mins per day(a)	hp-hr/day(see inset)	Avg. Mi. x trips or idle mins per day(a)	Control %	Maximum Short-term Emissions - gps						Long - term Emissions - gps					
							PM_{10}	$PM_{2.5}$	CO	Pb	SO_2 - 3hr(b)	SO2- 24 hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
HDDV1 - 7	Fug. PM from HDDVs on Paved Roadway (d)	20.0	495	--	90	50% req. water every 2 3 hrs	0.44	0.04	--	--	--	--	0.08	0.01	--	--	--	--
UPRW,UPRE, UPSND,UPSTN	Fug. PM on Unpaved Roadway(d)	33.5	47	--	14.6	90	0.04	0.01	--	--	--	--	0.04	0.01	--	--	--	--
HDDV1:7	Combustion Emissions on Paved roads	20.0	495	--	120	0	1.5E-03	1.5E-03	2.4E-02	0	6.2E-05	6.2E-05	3.6E-04	3.6E-04	5.8E-03	1.2E-02	1.5E-05	1.2E-03
UPRW,UPRE,UP SND,UPSTN	Combustion Emissions on Unpaved roads	33.5	46.8	--	19.5	0	1.4E-04	1.4E-04	2.2E-03	0	5.9E-06	5.9E-06	5.9E-05	5.9E-05	9.4E-04	1.9E-03	2.5E-06	1.9E-04
UPRW,UPRE, UPSND,UPSTN	On-site Equip: Comb. Emis.on Unpaved Roads	10	--	29,712	4,457	0	2.4E-02	2.4E-02	0.89	0	0.34	0.34	3.6E-03	3.6E-03	0.134	0.253	0.052	0.027
HDDV3	Idling Emissions from Loading HDDVs at Plt. 1	9 mins/veh.	7,200	--	801	0%	1.7E-03	1.7E-03	1.3E-01	0	4.9E-03	4.9E-03	1.9E-04	1.9E-04	1.5E-02	8.5E-03	5.5E-04	5.5E-04
HDDV6	Idling Emissions from Loading HDDVs at Plt. 2	9 mins/veh	4,800	--	432	0	1.1E-03	1.1E-03	8.7E-02	0	3.3E-03	3.3E-03	1.0E-04	1.0E-04	7.8E-03	4.6E-03	2.9E-04	2.9E-04
						TOTAL TONS	**17.8**	**2.7**	**39.6**	**0.0**	**12.3**	**12.3**	**4.3**	**0.6**	**5.7**	**9.7**	**1.8**	**1.0**

Notes:

(a) Total of lengths of roadways of HDDV 1 through 7, with HDDV1 added twice; all roadways are assumed to be equal to 20 meters wide when modeled.
(b) Daily peak mile-trips, idle minutes and hp-hr/days were scaled to reflect hourly ratings versus daily ratings for SO_2 3-hr rates..

(e) Comb. emissions from.CE's "Fugitive Emission Factors diesel US Filt" s/s, w. no PM filters, and no SO2 red. for non-road diesel rule.
(f) from MOBILE 6.2 for HDDV6 for CO, NO2, SO2, VOC, and total PM10 (assumed equal to PM2.5) for travel at 10 mph; fuel sulfur = 15 ppm. Idle emissions used MOBILE6.2 values also (less than HMA).

Table A-5 Wind Erosion of Material Stock Piles - Baseline and Proposed SUP Scenarios.

Reference: Control of Open Fugitive Dust Sources, Section 4.1.3, EPA-450/3-88-008(a); Cowherd, C., Jr. et. al.

[Wind Erosion From Continuously Active Pile]

E (lb PM per day per acre) = 1.7 (s/1.5)* (365-p)/235* (f/15)

where:

s = dependent on material in pile

p = 35 number of days with >0.01 inches precip. per year

f = 12.6 percentage of time that wind speed exceeds 5.4 m/s at mean pile height

PM_{10}/PM 0.5

$PM_{2.5}$/PM10 0.1 midpoint of observations in T.G. Pace, US EPA

Silt

Specific to material per CE spreadsheet.

Meteorological Data: Inputs derive from Solar and Meteorological Surface Observation Network (SAMSON) data for DC National Airport for years 1986 to 1990, which show that p actual = 35 f actual = 12.6.

							Max. Short-term Emissions - gps		Long-term Emissions - gps		
Source ID	Source Name	Silt Content(b)	E (lb PM_{10}/day-acre)©	E (lb $PM_{2.5}$/day-acre)	Pile size (acres)	% Control	PM10	PM2.5	PM10	PM2.5	Desc. Of Controls
RAP-WEST	Wind Erosion of RAP Pile West	9.0	6.0	0.6	1.0	0.00	0.03	0.003	0.03	0.003	none
RAP-EAST	Wind Erosion of RAP Pile East	9.0	6.0	0.6	1.0	0.00	0.03	0.003	0.03	0.003	none
SNDPILE	Wind Eroson of Sand Pile	7.6	5.1	0.5	0.3	0.00	0.01	0.001	0.01	0.001	none
STONE-BINS	Wind Erosion of Stone Piles	2.3	1.5	0.2	0.7	0.00	0.01	0.001	0.01	0.001	none
						TOTAL TONS =	2.7	0.3	2.7	0.3	

Notes:

(a) PM10 to PM2.5 ratio from AP-42, Section 13.2.4. Aggregate Handling and Storage Piles (1/95), Equation (1) - batch or continuous drop operation

(b) silt content from Cambridge Environmental for fine aggregate (sand and RAP) and coarse aggregate (stone).

Table A-6. Plant Dryers, Lime Silo and Asphalt Cement Heaters (all vented through stacks) - Proposed Scenario.

Emission Factors

	Short-term Factors (AP-42 or CE/PM test data)						g-term Factors (lb/ton values equiv. to short-t					
	PM_{10}	$PM_{2.5}$	CO	Pb	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
	lb/ton						lb/ton					
Plant 1	0.016	0.015	0.130	1.5E-05	0.065	0.003	0.016	0.015	0.130	0.021	0.065	0.003
Plant 2	0.009	0.009	0.012	1.5E-05	0.065	0.002	0.009	0.009	0.012	0.023	0.065	0.002
	lb/1000 gals						lb/1000 gals					
	--	--	--	--	--	--	--	--	--	--	--	--
Heater	3.3	3.3	1.2	1.2E-03	71	0.252	3.3	3.3	1.2	20	71	0.252

Dryers

	Rating, tons		Annual Limits		Type of Cntr	Stack Parameters(a) dscf/hr	Tem	Dia.	Vel.	Maximum Short-term Rates - gps						Annual Rates - gps					
	Per hr	Per day	tpy or gpy	App. Cap.		at 75% load(a)	K	m.	mps	PM_{10}	$PM_{2.5}$	CO	Pb	$SO_{2\text{-}3hr}$	SO_2-24	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
P1 Dryer (a	600	6000	720,000	0.14	Bag.	2040354	364	1.66	7.41	0.49	0.48	9.82	1.1E-03	4.91	2.04	0.16	0.16	1.34	0.22	0.67	0.029
P2 Dryer (a	400	4000	480,000	0.14	Bag.	698504	366	1.25	4.48	0.19	0.18	0.60	7.6E-04	3.27	1.36	0.06	0.06	0.08	0.16	0.45	0.014
														Current Permit Limit		*17.3*	*none*	*76.9*	*16.1*	*43.6*	*2.0*

Asphalt Heater(s)

	Rating		#2 Fuel Oil (gals/yr)	#2Fuel Oil (gals/yr)			Tem K	Dia. m.	Vel. mps	Maximum Short-term Rates - gps PM_{10}	$PM_{2.5}$ (f)	CO	Pb	SO_2	SO_2-24	Annual Rates - gps PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
Hot Oil Htr	5.64	MMBtu/hr	100,000	0	--	*rain cap in place*	589	0.43	0.001	0.017	0.017	0.006	6.1E-06	0.360	0.36	0.005	0.005	0.002	2.9E-02	0.102	3.6E-04
Alt. Hot Oil Htr (d)	2.5	MMBtu/hr	--	--	--	--	*no flue gas data - assume Htr. 1 ops.*			--	--	--	--	--		--	--	--	--	--	--
									tons:	0.6	0.6	0.2	0.0	12.5	12.5	0.2	0.2	0.1	1.0	3.6	0.0
																0.8	*0.8*	*0.6*	*5.8*	*8.7*	*none*
										Maximum Potential, w.out Limits						*Maximum Potential Permited Emissions*					
										24.3	**23.6**	**362.9**	**0.1**	**297.2**	**131.2**	**8.0**	**7.7**	**49.7**	**14.1**	**42.6**	**1.5**

Notes:

a) Used T. 11.1-8 and 11.1-9 for drum mix plants in AP-42 Section 11.1. Used TOC emissions factors for VOC.

c) Heater emission rates derive from memo, dated 8/22/05, S. Zemba from CE to L.Sharma, City; T. 2.; assumes 110,000 Btu per gallon for No. 5 fuel oil, respectively. .

e) from "Source Sampling for Particulate Emissions, Hot Mix Asphalt Plant, Virginia Paving Company, August 11-12, 2005," processed by CE.

d) worst-case short-term emissions assume operation of only heater no. 1 in modeling analysis; annual emission derive from combustion of fuel limit.

f) assumed that PM2.5 emissions for oil combustion in heaters was 75% of PM10 value.

Table A-7. Hot Mix Storage and Loadout Processes - Proposed Scenario.

Emissions associated with Loadout, Storage Tanks and Yard

Emission factor from AP-42, Section 11.1.2.5: Hot Mix Asphalt Plants; Production Operations.

Loadout (p.11.1-9 of AP-42 Section 11.1)

E =	0.00036 lb/ton	PM10 and PM2.5	assumes all PM is PM10/PM2.5; T. 11.1-14
	0.0022 lb/ton	TOC	T. 11.1-14
	0.00072 lb/ton	CO	T. 11.1-14
	7.30E-07 lb/ton	benzene	p. 11.1-9; re-evaluate for V = -0.5

Yard Emissions (p.11.1-9 of AP-42 Section 11.1)

E=	0.00018 lb/ton	PM10 and PM2.5	assumed 50% of loadout value
	0.00110 lb/ton	TOC	assumed 50% of loadout value
	0.00036 lb/ton	CO	assumed 50% of loadout value

Silo Filling (T. 11.1-14 of S. 11.1) and Asphalt Storage Tanks

E=	0.00015 lb/ton	PM10 and PM2.5	T. 11.1-14 for total PM
	0.00715 lb/ton	TOC	T. 11.1-14 f
	0.00070 lb/ton	CO	T. 11.1-4

Asphalt Storage Tanks (c) ***assumed 10% of silo emissions; added to silo filling values***

					Maximum Short-term Rates (gps)						Maximum Long-term Rates (gps)					
Source Name	Max. Annual Process Rate (tpy)	Peak Process Rate (tph)	Daily Process Rate (tpd)	Control % (Blue Smoke©, for PM only)	PM10	PM2.5	CO	Pb	SO2-3hr	SO2 - 24hr	PM10	PM2.5	CO	NO2	SO2	VOC
Loadout and Yard Plant 1.	720000	600	6000	99	0.006	0.006	0.082	--	--	--	0.002	0.002	0.011	0.000	0.000	0.034
Silos Plant 1.	720000	600	6000	99	4.845E-05	4.845E-05	0.053	--	--	--	1.593E-05	1.593E-05	0.007	0.000	0.000	0.074
Loadout and Yard Plant 2.	480000	400	4000	99	0.004	0.004	0.054	--	--	--	0.001	0.001	0.007	0.000	0.000	0.023
Silos Plant 2.	480000	400	4000	99	3.230E-05	3.230E-05	0.035	--	--	--	1.062E-05	1.062E-05	0.005	0.000	0.000	0.049
				TOTAL TONS	0.3	0.3	7.8	0.0	0.0	0.0	0.1	0.1	1.1	0.0	0.0	6.3

Notes:

(a) 3-hour emissions are based on maximum hourly process rate; 24-hour on limited daily rate.

(b) Annual emissions are based on annual limited throughputs.

Table A-8. Aggregate Handling Processes - Proposed Scenario.

Drop Operations(a); E= k (0.0032) (U/5)^1.3 / [(M/2)^1.4]

where:

k = 0.11 [particles < 2.5um]

k = 0.35 [particles < 10um]

U1 = 7.3 [mph, estimated daily avg. worst case wind speed, based on 8 hr @ 10mph and 16 hr @ 6 mph]

U3 = 4.38 [mph, annual average wind speed]

	RAP	Sand	Stone(a)
Moist., M =	5.00	6.5	1.30 %
Silt, S =	7.4		2.31 %
worst-case (short-term):			
E (lb $PM_{2.5}$ per ton material handled) =	1.60E-04	1.11E-04	1.05E-03
E (lb PM_{10} per ton material handled) =	5.08E-04	3.52E-04	3.35E-03
average (long-term):			
E (lb $PM_{2.5}$ per ton material handled) =	8.22E-05	5.69E-05	5.42E-04
E (lb PM_{10} per ton material handled) =	2.61E-04	1.81E-04	1.72E-03

RAP Crusher	PM_{10}	$PM_{2.5}$	(see Note b)
E (lb per ton) =			
Tertiary Crushing, w. cont.	5.40E-04	1.00E-04	

Materials Used, typical year (from 'silt and tpy', CE)						
	Sand	Agg.	RAP-E	RAP-W	Asphalt	Typ.tons/day)
Typ. Tons	271,523	363,026	77,605	77,605	900,000	2,466
Max. Annual	362,031	484,035	103,473	103,473	1,200,000	
Max. Daily	3,017	4,034	862	862		10,000

AP-42 Factor	Source Name	Daily Rate (ton/day)	Annual Rate (ton/year)	Control %	Maximum 24-hour Emissions - gps PM10	Maximum 24-hour Emissions - gps PM2.5	Long-term Emissions - gps PM10	Long-term Emissions - gps PM2.5	Control System
Drop (to Pile)	RAP Dump from Trucks - West Pile	862	103,473	0	0.0023	0.0007	0.0004	0.0001	none
Drop to Truck	RAP Pile Reclaim - drop into truck - West Pile	862	103,473	0	0.0023	0.0007	0.0004	0.0001	none
Drop to Pile	RAP Dump from Trucks - East Pile	862	103,473	0	0.0023	0.0007	0.0004	0.0001	none
Drop to Truck	RAP Pile Reclaim - drop into truck - East Pile	862	103,473	0	0.0023	0.0007	0.0004	0.0001	none
Drop to Pile	Sand Drop from Trucks	3,017	362,031	0	0.0056	0.0017	0.0009	0.0003	none
Drop to Truck	Sand Pile -drop into truck	3,017	362,031	0	0.0056	0.0017	0.0009	0.0003	none
Tertiary Crushing	RAP Crusher on RAP West	1,725	206,947	***app. 80%***	0.0049	0.0009	0.0016	0.0003	***must be equivalent to AP-42***
Drop	Aggregate Dump to Plant 1 (60% of agg. Total)	2,420	290,421	0	0.0425	0.0134	0.0072	0.0023	none
				TOTAL TONS=	**2.4**	**0.7**	**0.4**	**0.1**	

Notes:

a) Stone, RAP and sand dropping: *Emission factor from AP-42, Section 13.2.4: Aggregate Handling and Storage Piles (1/95), Equation (1) - batch or continuous drop operation*

b) RAP Crushing: : from AP-42, Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing; Table 11.19.2-2

d) from CE spreadsheet "Fugitive Emission Factors Moisture" and "....Silt;" stone/(sand and rap) usage approximately 1:1.

Table A-9. Truck Emissions - Engine and Roadway - Proposed Scenario.

PM_{10} and $PM_{2.5}$ from Roadway Travel

Paved Roads: *Emission factor from AP-42; Section 13.2.1; Paved Raods (12/03), Eqn. (1).*

Unpaved Roads: *Emission factor from AP-42; Section 13.2.2; Eqn. (1a)*

E paved = [kp (sL/2)^.65 x (W/3)^ 1.5 - C] * (1 - P/4N) lb per VMT

E unpaved = [ku * (s/12)^a * (W/3)^b]

where:

kp = 0.0016 ku = 0.23 [particles < 2.5um] **kp revised to PM2.5/PM10 = 0.1**

kp = 0.016 ku = 1.5 [particles < 10um]

sL= road silt load, gr./sq. m., = 120 for asphalt batching 1 **sL revised per tests, Dec. 05**

s= silt content, % 5 representative of average for unpaved road areas between storage areas, as recommended by S. 13.2.2.

C = emission factor; exhaust, brake, tire wear, lb/VMT= 3.60E-04 $PM_{2.5}$

a = 0.90 4.70E-04 PM_{10}

b = 0.45

(1-P/4N) = ***to get 0.5 reduction: must water every 2 - 3 hrs*** 35.00 area-specific SAMSON data

W = Mean Veh. Weight, tons Unpaved 20.00 29 tons full, 11 tons empty, CE, Dec. 05

Paved 33.50 CE, Dec. 05

N = No. of days in period (assume per year if use P based on year): ***assume watering as described.***

Resulting Factors:

	Trucks,Paved Roads:	Trucks, Unpaved Roads:	Site Vehs, Unpaved:
E (lb PM2.5 per VMT) =	0.009	= 0.24	= 0.30
E (lb PM10 per VMT) =	0.09	= 1.56	= 1.97

Internal Combustion Emissions (all pollutants)

Used MOBILE6.2 ef's for travel and idle PM; HMA no.'s for idle for others.

	MOBILE6 - Trv.	HMA Rp - Trv.	HMA-Idle	Off-road Equip. (e)
CO=	4.148	18.82 g/vmt	1.57 g/min	2.6 g/bhp-hr
SO2=	0.011	0.36 g/vmt	0.059 g/min	0.5 g/bhp-hr, revised
NO2=	8.486	8.5 g/vmt	0.917 g/min	4.9 g/bhp-hr
NMVOC	0.847	3.18 g/vmt	0.208 g/min	0.53 g/bhp-hr used CO/
PM10	0.259	2.53 g/vmt	0.02004 **M6.2**:gpm	0.07 g/bhp-hr as for tra
PM2.5	0.259	2.53 g/vmt	0.02004 **M6.2**:gpm	0.07 g/bhp-hr

Total Hp-hours of Off-road Equipment (e):		
(assumed annual/peak use = 20%)		**HP-hr/day**
Front-end Loader	=2 loaders * 300 HP*10hrs/day*2shifts	12,000
Bobcat	=45 hp * 4 hrs/day	180
Lift	=50 hp * 1 hr/day	50
Crane	=150 hp * 1 hr/day	150
		12,380
Total	=46 hours per day @ 5 mph;230 mpd	

Roadway Sections	Source Name	Mean Veh. Weight (tons) or Idle Time per Truck(5)	Pk. Mi. x trips or idle mins per day(a)	hp-hr/day(see inset)	Avg. Mi. x trips or idle mins per day(a)	Control %	Maximum Short-term Emissions - gps						Long - term Emissions - gps					
							PM_{10}	$PM_{2.5}$	CO (b)	Pb	SO_2 - 3hr(b)	SO2- 24 hr	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
HDDV1 - 7	Fug. PM from HDDVs on Paved Roadway (d)	20.0	206	--	108	50% req. water every 2 3 hrs	0.09	0.01	--	--	--	--	0.05	0.00	--	--	--	--
UPRW,UPRE, UPSND,UPSTN	Fug. PM on Unpaved Roadway(d)	33.5	20	--	19.5	90	0.02	0.00	--	--	--	--	0.02	0.00	--	--	--	--
HDDV1:7	Combustion Emissions on Paved roads	20.0	206	--	108	0	6.2E-04	6.2E-04	2.4E-02	0	6.2E-05	2.6E-05	3.3E-04	3.3E-04	5.2E-03	1.1E-02	1.4E-05	1.1E-03
UPRW,UPRE,UP SND,UPSTN	Combustion Emissions on Unpaved roads	33.5	19.5	--	19.5	0	5.9E-05	5.9E-05	2.2E-03	0	5.9E-06	2.5E-06	5.9E-05	5.9E-05	9.4E-04	1.9E-03	2.5E-06	1.9E-04
UPRW,UPRE, UPSND,UPSTN	On-site Equip: Comb. Emis.on Unpaved Roads	10	--	12,380	2,476	90% for PM(e)	1.0E-03	1.0E-03	0.89	0	0.17	0.07	2.0E-04	2.0E-04	0.075	0.140	0.014	0.015
HDDV3	Idling Emissions from Loading HDDVs at Plt. 1	9 mins/veh.	3,000	--	1,068	0%	7.0E-04	7.0E-04	1.3E-01	0	4.9E-03	2.0E-03	2.5E-04	2.5E-04	1.9E-02	1.1E-02	7.3E-04	7.3E-04
HDDV6	Idling Emissions from Loading HDDVs at Plt. 2	9 mins/veh	2,000	--	575	0	4.6E-04	4.6E-04	8.7E-02	0	3.3E-03	1.4E-03	1.3E-04	1.3E-04	1.0E-02	6.1E-03	3.9E-04	3.9E-04
						TOTAL TONS	**3.9**	**0.5**	**39.6**	**0.0**	**6.3**	**2.6**	**2.3**	**0.3**	**3.8**	**5.9**	**0.5**	**0.6**

Notes:

(a) Total of lengths of roadways of HDDV 1 through 7, with HDDV1 added twice; all roadways are assumed to be equal to 20 meters wide when modeled.
(b) Daily peak mile-trips, idle minutes and hp-hr/days were scaled to reflect hourly ratings versus daily ratings for SO_2 3-hr rates..

(e) Comb. emissions from.CE's "Fugitive Emission Factors diesel US Filt" s/s, w. PM red. by 90% for filters, and SO2 red. for non-road diesel rule (by 50% resp).
(f) from MOBILE 6.2 for HDDV6 for CO, NO2, SO2, VOC, and total PM10 (assumed equal to PM2.5) for travel at 10 mph; fuel sulfur = 15 ppm. Idle emissions used MOBILE6.2 values also (less than HMA).

Table A-10. Maximum Estimated Impacts of Hazardous Air Pollutants that are Present in Highest Quantities.

Toxic Air Pollutant	Emis. Factor Reference	Emis. Rate	Emission Rate	MW	Notes	ACGIH[c] Standard via 2005 Publication: Ceiling	STEL	TWA	Ceiling	STEL	TWA	VADEQ Standard or IRIS Standard (shown in italic)[e,f]: 1-hour	annual	Ratio of Emis. to 1-hr Std. 1-hour
						ppm(3)			micrograms per cubic meter					
Offroad Diesels(a)		lb/mmbtu	mg/mile(g)											
acetaldehyde	AP-42 S. 3.3 (Diesels)	0.000767	60.670	44.05	Note6	25			45041			1126.0	no std.	5.4E-02
acrolein	as above	9.25E-05	7.317	56.06	Note6	0.1			229			5.7	*0.02*	1.3E+00
benzene		9.33E-04	73.800	78.11			2.5	0.5		7986.71	1597	199.7	3.19	3.7E-01
1.3 butadiene		3.91E-05	3.093	54.09				2			4425	44.2	8.85	7.0E-02
ethylbenzene(styrene)		--												
formaldehyde		1.18E-03	93.338	30.03	Note6	0.3			368			9.2	ns	1.0E+01
hexane		--												
isooctane		--												
MEK		--												
propionaldehyde		--		58.1		20			47526			1188.1	ns	
quinone		--												
methyl chloroform		--												
napthalene		8.48E-05	6.708	128.19			15	10		78644	52429	1966.1	*3.00*	3.4E-03
toluene		4.09E-04	32.352	92.13				50			188405	9420.2	376.81	3.4E-03
xylene		2.85E-04	22.544	106.16			150	100		651288	434192	16282.2	*100.00*	1.4E-03
Onroad Diesels - HDDV-6s			mg/mile											
acetaldehyde	from M6.2 for HDDV6		26.430	44.05	Note6	25			45041			1126.0	no std.	2.3E-02
acrolein	as above		3.210	56.06	Note6	0.1			229			5.7	*0.02*	5.6E-01
benzene			9.640	78.11			2.5	0.5		7986.71	1597	199.7	3.19	4.8E-02
1.3 butadiene			5.600	54.09				2			4425	44.2	8.85	1.3E-01
ethylbenzene														
formaldehyde			71.770	30.03	Note6	0.3			368			9.2	ns	7.8E+00
hexane														
isooctane														
MEK														
propionaldehyde			5.340	58.1		20			47526			1188.1	ns	4.5E-03
quinone														
methyl chloroform														
napthalene			0.303	128.19			15	10		78644	52429	1966.1	*3.00*	1.5E-04
toluene			2.800	92.13				50			188405	9420.2	376.81	3.0E-04
xylene			4.200	106.16			150	100		651288	434192	16282.2	*100.00*	2.6E-04
Dryer, Hot Screens and Mixer w. Fabric Filter (waste or no. 2 oil-fired)														
		lb/ton												
acetaldehyde	highest from T. 11.1-9		1.3E-03	44.05	Note6	25			45041			1126.0	no std.	1.2E-06
acrolein	highest from T. 11.1-9		2.6E-05	56.06	Note6	0.1			229			5.7	*0.02*	4.5E-06
benzene	highest from T. 11.1-9		3.9E-04	78.11			2.5	0.5		7986.71	1597	199.7	3.19	2.0E-06
ethylbenzene	highest from T. 11.1-9		2.2E-03	106.16			125	100		542740	434192	13568.5	868.38	1.6E-07
formaldehyde	highest from T. 11.1-9		3.1E-03	30.03	Note6	0.3			368			9.2	ns	3.4E-04

Table A-10. Maximum Estimated Impacts of Hazardous Air Pollutants that are Present in Highest Quantities.

Toxic Air Pollutant	Emis. Factor Reference	Emis. Rate	Emission Rate	MW	Notes	Ceiling	STEL	TWA	ACGIH[c] Standard via 2005 Publication: Ceiling	STEL	TWA	VADEQ Standard or IRIS Standard (shown in italic)[e,f]: 1-hour	annual	Ratio of Emis. to 1-hr Std. 1-hour
						ppm(3)			micrograms per cubic meter					
hexane	highest from T. 11.1-9		9.2E-04	86.18			1000	500		3524744	1762372	88118.6	3524.74	1.0E-08
hydrogen chloride			2.1E-04									75.0	*ns*	2.8E-06
isooctane	highest from T. 11.1-9		4.0E-05	114.2		300			1401227			35030.7	*ns*	1.1E-09
lead			1.5E-05								50	2.5	0.10	6.0E-06
MEK	highest from T. 11.1-9		2.0E-05	72.1			300	200		884663	589775	22116.6	1179.55	9.0E-10
propionaldehyde	highest from T. 11.1-9		1.3E-04	58.1		20			47526			1188.1	ns	1.1E-07
quinone	highest from T. 11.1-9		1.6E-04	108.09		0.1			442			11.1	ns	1.4E-05
methyl chloroform	highest from T. 11.1-9		4.8E-05	133.42			350	450		1909898	2455583	47747.4	4911.17	1.0E-09
napthalene	highest from T. 11.1-9		6.5E-04	128.19			15	10		78644	52429	1966.1	*3.00*	3.3E-07
toluene	highest from T. 11.1-9		2.9E-03	92.13				50			188405	9420.2	376.81	3.1E-07
xylene	highest from T. 11.1-9		2.7E-03	106.16			150	100		651288	434192	16282.2	*100.00*	1.7E-07
Load-out, Yard and Storage Silos (each HAP as % of Total Organic Compound Rate for process)														
		% of TOC	lb/ ton											
napthalene (emitted as PM, so is controlled)	as % of PM from T. 11.1-15; uses highest from load,yard,silo	1.82	1.1E-05	128.19			15	10		78644	52429	1966.1	*3.00*	5.5E-11
benzene	as above	0.052	3.1E-07	78.11			2.5	0.5		7986.71	1597	199.7	3.19	1.5E-09
bromomethane		0.0096	5.7E-08	94.95				1			3883	194.2	7.77	2.9E-10
2-butanone		0.049	2.9E-07	72.1			300	200		884663	589775	22116.6	1179.55	1.3E-11
carbon disulfide		0.016	9.4E-08	76.14				10			31141	1557.1	62.28	6.1E-11
chloromethane		0.023	1.4E-07	50.49			100	50		206503	103252	5163	206.50	2.6E-11
cumene		0.11	6.5E-07	120.19				50			245787	12289.4	*400.00*	5.3E-11
ethylbenzene		0.28	1.7E-06	106.16			125	100		542740	434192	13569	*868.38*	1.2E-10
formaldehyde		0.69	4.1E-06	30.03	Note6	0.3			368			9	ns	4.4E-07
n-hexane		0.15	8.9E-07	86.18			1000	500		3524744	1762372	88119	3525	1.0E-11
isooctane		0.018	1.1E-07	114.2		300			1401227			35031	*ns*	3.0E-12
methylene chloride		0.00027	1.6E-09	84.93				50.00			173681	8684	347.36	1.8E-13
styrene		0.0073	4.3E-08	104.16			40	20		170405	85202	4260	170.40	1.0E-11
tetrachloroethene		0.0077	4.5E-08	165.8			100	25		678119	169530	16953	339.06	2.7E-12
toluene		0.21	1.2E-06	92.13				50			188405	9420.2	376.81	1.3E-10
trichlorofluoromethane		0.0013	7.7E-09	137.4		1000			5619632			140491	*ns*	5.5E-14
m-/p-xylene		0.41	2.4E-06	106.16			150	100		651288	434192	16282	868.38	1.5E-10

Notes:

a) list of pollutants is equivalent to that for HDDV's and for Dryers, Hot Mix and Screens w. Fabric Filters. Storage silo HAP pollutants were not used to determine which pollutants to model because HAP emission factors in lb/ton vs. SAAC values are several of orders magnitude than the Hot Mix.. Values for the same pollutants.

b) "The Original List of Hazardous Air Pollutants as Follows," Technology Transfer Website, Air Toxics Website,(www.epa.gov/ttn/atw/orig189.html)

c) Threshold Limit Values for ceiling, short-term exposure limit and time-weighted averages from ACGIH's "2001 TLVs and BEIs."

d) TLV in micrograms/cu.m. = (TLVppm x MW, g/g-mole) / 24.45 x 1000.

e) 9VAC5-60-230 states that for pollutants with a TLV-C (ceiling value), that one-hour concentrations exceeding 1/40 of the TLV-C are significant; for pollutants with both a TLV-STEL and TLV-TWA, that one-hour and annual concentrations exceeding 1/40 of the TLV-STEL and 1/500 of the TLV-TWA are significant; while for pollutants with only a TLV-TWA, that one hour and annual concentrations in excess of 5% and 1/500 of the TLV-TWA, respectively, are significant.

Table A-11. Plant Dryers, Lime Silo and Asphalt Cement Heaters (all vented through stacks) - HAPs for Proposed Scenario.

	Short-term Factors (AP-42)						(AP-42)					
	form.	acrol	1,3 bu	benz	aceta.	quin.	form.	acrol	1,3 bu	benz	aceta.	quin.
	lb/ton						lb/ton					
Dryer 1	3.1E-03	2.6E-05	0	4.0E-04	1.3E-03	2.0E-04	3.1E-03	2.6E-05	0.0E+00	4.0E-04	1.3E-03	2.0E-04
Dryer 2	3.1E-03	2.6E-05	0	4.0E-04	1.3E-03	2.0E-04	3.1E-03	2.6E-05	0.0E+00	4.0E-04	1.3E-03	2.0E-04
	lb/1000 gals						lb/1000 gals					
Htr 1	--	--	--	--	--	--	--	--	--	--	--	--
Htr1or2	3.3E-02	0	0	2.1E-04	0	0	3.3E-02	0	0	2.1E-04	0	0

	Rating, tons		Annual Limits			Stack Parameters(a)																	
						dscf/hr	Tem	Dia.	Vel.			Maximum Short-term Rates - gps						Annual Rates - gps					
	Per hr	Per day	tpy or gpy	App. Cap.	Type of Cntr	at 75% load(a)	K	m.	mps			formal dehyde	acrolein	1,3 butadiene	benzene	acetaldyde	quinone	formal dehyde	acrolein	1,3 butadiene	benzene	acetaldyde	quinone
P1 Dryer (a	600	6000	720,000	0.14	Bag.	2040354	364	1.66	7.41			2.3E-01	2.0E-03	0	3.0E-02	9.8E-02	9.8E-02	3.2E-02	2.7E-04	0	4.1E-03	1.3E-02	2.9E-02
P2 Dryer (a	400	4000	480,000	0.14	Bag.	698504	366	1.25	4.48			1.6E-01	1.3E-03	0	2.0E-02	6.5E-02	6.5E-02	2.1E-02	1.8E-04	0	2.8E-03	9.0E-03	1.9E-02
Lime Silo	25	tons	6,000	*no emissions -- process not used.*								--	--	--	--	--	--	--	---	--	--	--	--
	Rating		*#2 Fuel Oil (gals/yr)*	*#2Fuel Oil (gals/yr)*																			
Hot Oil Htr	5.64	MMBtu/hr	100,000	0	*none*	*rain cap in place*	589	0.43	0.001	--	--	1.7E-04	0	0	1.1E-06	0	0	4.7E-05	0	0	3.1E-07	0	0
Alt. Hot Oil Htr (d)	2.5	MMBtu/hr	0	25,000	*none*	*no data*	*no flue gas data - assume Htr. 1 ops.*			--	--	--	--	--	--	--		--	--	--	--	--	--
Total Tons Per Year												**13.6**	**0.1**	**0**	**1.8**	**5.7**	**5.7**	**1.9**	**0.02**	**0**	**0.2**	**0.8**	**1.7**

Notes:

a) Used T. 11.1-8 and 11.1-9 for drum mix plants in AP-42 Section 11.1. Used TOC emissions factors for VOC.

c) Heater emission rates derive from memo, dated 8/22/05, S. Zemba from CE to L.Sharma, City; T. 2.; assumes 110,000 Btu per gallon for No. 5 fuel oil, respectively. .

e) from "Source Sampling for Particulate Emissions, Hot Mix Asphalt Plant, Virginia Paving Company, August 11-12, 2005," RAMCON Environmental, used worst-case result among both fuels for Plant 1. RAMCON stated that flow rate was average; flowrates used here were scaled by 100/75 to reflect approximate values at 75% load (see "Data on Facility Being Stack Tested" in report).

d) worst-case short-term emissions assume operation of only heater no. 1 in modeling analysis; annual emission derive from combustion of fuel limit.

f) assumed that PM2.5 emissions for oil combustion in heaters was 75% of PM10 value.

Table A-12. Hot Mix Storage and Loadout Processes - HAPs for Proposed Scenario.

Emissions associated with Loadout, Storage Tanks and Yard

Emission factor from AP-42, Section 11.1.2.5: Hot Mix Asphalt Plants; Production Operations.

Total HAPs for Loadout, Yard and Storage Silos (from AP-42 Table 11.1-15; apportionment = 20%, 10% and 70% to loadout, yard, silos per TOC ratios from AP-42)

E =	8.20E-07	lb/ton	formaldehyde
	0	lb/ton	acrolein
	0	lb/ton	1,3,buta
	6.20E-08	lb/ton	benzene
	0	lb/ton	acetaldehyde
	0	lb/ton	quinone

Yard Emissions

E=	4.10E-07	lb/ton	formaldehyde
	0	lb/ton	acrolein
	0	lb/ton	1,3,buta
	3.10E-08	lb/ton	benzene
	0	lb/ton	acetaldehyde
	0	lb/ton	quinone

Silo Filling

Includes Asphalt Storage Tanks, which are assumed 10% of silo emissions.

E=	3.16E-06	lb/ton	formaldehyde
	0	lb/ton	acrolein
	0	lb/ton	1,3,buta
	2.39E-07	lb/ton	benzene
	0	lb/ton	acetaldehyde
	0	lb/ton	quinone

					Maximum Short-term Rates (gps)						Maximum Long-term Rates (gps)					
Source Name	**Max. Annual Process Rate (tpy)**	**Peak Process Rate (tph)**	**Daily Process Rate (tpd)**	**Control % (Blue Smoke©, for PM only)**	**formaldehyde**	**acrolein**	**1,3 butadiene**	**benzene**	**acetaldyde**	**quinone**	**formaldehyde**	**acrolein**	**1,3 butadiene**	**benzene**	**acetaldyde**	**quinone**
Loadout and Yard Plant 1.	720000	600	6000	0	9.3E-05	0	0	7.0E-06	0	0	1.3E-05	0	0	9.6E-07	0	0
Silos Plant 1.	720000	600	6000	0	2.4E-04	0	0	1.8E-05	0	0	3.3E-05	0	0	2.5E-06	0	0
Loadout and Yard Plant 2.	480000	400	4000	0	6.2E-05	0	0	4.7E-06	0	0	8.5E-06	0	0	6.4E-07	0	0
Silos Plant 2.	480000	400	4000	0	1.6E-04	0	0	1.2E-05	0	0	2.2E-05	0	0	1.6E-06	0	0
				TOTAL TONS	**0.019**	**0**	**0**	**0.001**	**0**	**0**	**0.003**	**0**	**0**	**0.0002**	**0.000**	**0**

Notes:

(a) Short-term rates are based on maximum hourly process rate and peak emission factor.
(b) Annual emissions are based on annual limited throughputs.
c) From Section 7.1 of AP-42 for VOC storage tanks.

Table A-13. TruckEmissions - Engine and Roadway - HAPs for Proposed Scenario.

HAPs from Vehicles

To convert to g/bhp-hr, assumed 10 mph for 250 bhp trucks and onsite vehicles:

1 gr/b-hp-hr x 250 hp x 1 hr/ 10 miles = 25.00 g/miles

Internal Combustion Emissions (all pollutants)

Used MOBILE6.2 ef's for travel and idle PM; HMA no.'s for idle for others.

	MOBILE6 - Trv.	Idle=M6's Trv x PMidle/PMtrvl	Off-road Equip. (e)
form.	71.8 mg/vmt	5.5 mg/min	3.7 mg/mile
acrol.	3.2 mg/vmt	0.2 mg/min	0.3 mg/bhp-hr
1,3 bu	5.6 mg/vmt	0.4 mg/min	0.1 mg/bhp-hr
benz.	9.6 mg/vmt	0.7 mg/min	3.0 mg/bhp-l used CO,
acetal	26.4 mg/vmt	2.0 mg/min	2.4 mg/bhp-l as for tra
quin.	0.0 mg/vmt	0.0 mg/min	0.0 mg/bhp-hr

road silt load, gr./sq. m., = 120 for asphalt batching 1

silt content, % 5 representative of average for unpaved road areas between storage areas, as recommended by S. 13.2.2.

emission factor; exhaust, brake, tire wear, lb/VMT= 3.60E-04 $PM_{2.5}$

0.90 4.70E-04 PM_{10}

0.45

to get 0.5 reduction: must water every 2 - 3 hrs 35.00 area-specific SAMSON data

Mean Veh. Weight, tons Unpaved 20.00 29 tons full, 11 tons empty, CE, Dec. 05

Paved 33.50 CE, Dec. 05

No. of days in period (assume per year if use P based on year): ***assume watering as described.***

Total Hp-hours of Off-road Equipment (e):		
(assumed annual/peak use = 20%)		**HP-hr/day**
Front-end Loader	=2 loaders * 300 HP*10hrs/day*2shifts	12,000
Bobcat	=45 hp * 4 hrs/day	180
Lift	=50 hp * 1 hr/day	50
Crane	=150 hp * 1 hr/day	150
		12,380
Total	=46 hours per day @ 5 mph;230 mpd	

Trucks,Paved Roads:		**Trucks, Unpaved Roads:**		**Site Vehs, Unpaved:**	
E (lb PM2.5 per VMT) =	0.000	=	0.00	=	0.00
E (lb PM10 per VMT) =	0.00	=	0.00	=	0.00

Roadway Sections	Source Name	Mean Veh. Weight (tons) or Idle Time per Truck(5)	Pk. Mi. x trips or idle mins per day(a)	hp-hr/day(see inset)	Avg. Mi. x trips or idle mins per day(a)	Control %	Maximum Short-term Emissions - gps						Long - term Emissions - gps					
							formaldehyde	acrolein	1,3 butadiene	benzene	acetaldyde	quinone	formaldehyde	acrolein	1,3 butadiene	benzene	acetaldyde	quinone
HDDV1 - 7	Fug. PM from HDDVs on Paved Roadway (d)	20.0	206	--	108	0%	0	0	0	0	0	0	0	0	0	0	0	0
UPRW,UPRE, UPSND,UPSTN	Fug. PM on Unpaved Roadway(d)	33.5	19.5	--	19.5	0%	0	0	0	0	0	0	0	0	0	0	0	0
HDDV1:7	Combustion Emissions on Paved roads	20.0	206	--	108	0%	1.7E-04	7.6E-06	1.3E-05	2.3E-05	6.3E-05	0	9.0E-05	4.0E-06	7.0E-06	1.2E-05	3.3E-05	0
UPRW,UPRE,UPSND,UPSTN	Combustion Emissions on Unpaved roads	33.5	19.5	--	19.5	0%	1.6E-05	7.2E-07	1.3E-06	2.2E-06	6.0E-06	0	1.6E-05	7.2E-07	1.3E-06	2.2E-06	6.0E-06	0
UPRW,UPRE, UPSND,UPSTN	On-site Equip: Comb. Emis.on Unpaved Roads	10	--	12,380	2,476	0%	5.3E-04	4.2E-05	1.8E-05	4.2E-04	3.5E-04	0	1.1E-04	8.4E-06	3.5E-06	8.5E-05	7.0E-05	0
HDDV3	Idling Emissions from Loading HDDVs at Plt. 1	9 mins/veh.	3,000	--	1,068	0%	1.9E-04	8.6E-06	1.5E-05	2.6E-05	7.1E-05	0	6.9E-05	3.1E-06	5.3E-06	9.2E-06	2.5E-05	0
HDDV6	Idling Emissions from Loading HDDVs at Plt. 2	9 mins/veh	2,000	--	575	0%	1.3E-04	5.7E-06	1.0E-05	1.7E-05	4.7E-05	0	3.7E-05	1.6E-06	2.9E-06	5.0E-06	1.4E-05	0
						TOTAL TONS	**0.036**	**0.002**	**0.002**	**0.017**	**0.019**	**0**	**0.011**	**0.001**	**0.001**	**0.004**	**0.005**	**0**

Notes:

(a) Roads travelled per number of trucks from CE's "Fugitive Dust Emisisons paved roads' worksheet; with distances corrected to roundtrip.

(b) Daily peak mile-trips, idle minutes and hp-hr/days were scaled to reflect hourly ratings versus daily ratings for SO_2 3-hr rates..

(e) uses lb/MMBtu values from AP-42's Table 3.3 for "Gasoline and Diesel and Industrial Engines," but converts using 7000 Btu/hp-hr and (250/10) bhp per mile.

VIRGINIA

BPIP (Dated: 04274)

DATE : 10/26/2005
TIME : 13:44:11
VIRGINIA

==========
BPIP PROCESSING INFORMATION:
==========

The p flag has been set for preparing downwash related data for a model run utilizing the PRIME algorithm.

Inputs entered in METERS will be converted to meters using a conversion factor of 1.0000. Output will be in meters.

UTMP is set to UTMN. The input is assumed to be in a local X-Y coordinate system as opposed to a UTM coordinate system. True North is in the positive Y direction.

Plant north is set to 0.00 degrees with respect to True North.

VIRGINIA

PRELIMINARY* GEP STACK HEIGHT RESULTS TABLE
(Output Units: meters)

Stack Name	Stack Height	Stack-Building Base Elevation Differences	GEP** EQN1	Preliminary* GEP Stack Height Value
BAG1	20.00	0.00	48.56	65.00
BAG2	20.00	0.00	46.77	65.00
HTR	6.00	0.00	46.24	65.00

* Results are based on Determinants 1 & 2 on pages 1 & 2 of the GEP Technical Support Document. Determinant 3 may be investigated for additional stack height credit. Final values result after Determinant 3 has been taken into consideration.

** Results were derived from Equation 1 on page 6 of GEP Technical Support Document. Values have been adjusted for any stack-building base elevation differences.

Note: Criteria for determining stack heights for modeling emission limitations for a source can be found in Table 3.1 of the GEP Technical Support Document.

DATE : 10/26/2005
TIME : 13:44:11

VIRGINIA

BPIP output is in meters

SO	BUILDHGT	BAG1	16.20	16.20	16.20	16.20	16.20	16.20
SO	BUILDHGT	BAG1	16.20	16.20	19.90	19.90	19.90	19.90
SO	BUILDHGT	BAG1	19.90	19.90	19.90	19.90	19.90	16.20
SO	BUILDHGT	BAG1	16.20	16.20	16.20	16.20	16.20	16.20
SO	BUILDHGT	BAG1	16.20	16.20	19.90	19.90	19.90	19.90
SO	BUILDHGT	BAG1	19.90	19.90	19.90	19.90	19.90	16.20
SO	BUILDWID	BAG1	26.99	30.16	32.42	33.69	33.94	33.38
SO	BUILDWID	BAG1	32.46	32.73	14.00	16.04	17.60	18.62
SO	BUILDWID	BAG1	19.08	18.96	19.09	19.10	18.94	23.00
SO	BUILDWID	BAG1	26.99	30.16	32.42	33.69	33.94	33.38
SO	BUILDWID	BAG1	32.46	32.73	14.00	16.04	17.60	18.62
SO	BUILDWID	BAG1	19.08	18.96	19.09	19.10	18.94	23.00
SO	BUILDLEN	BAG1	30.30	27.68	24.21	20.01	18.96	19.09
SO	BUILDLEN	BAG1	19.31	19.87	18.00	18.07	17.60	16.59
SO	BUILDLEN	BAG1	15.07	13.10	10.73	8.71	11.53	32.00
SO	BUILDLEN	BAG1	30.30	27.68	24.21	20.01	18.96	19.09
SO	BUILDLEN	BAG1	19.31	19.87	18.00	18.07	17.60	16.59
SO	BUILDLEN	BAG1	15.07	13.10	10.73	8.71	11.53	32.00
SO	XBADJ	BAG1	-12.17	-8.97	-5.49	-1.85	1.85	4.66
SO	XBADJ	BAG1	6.66	7.53	10.00	11.24	12.13	12.66
SO	XBADJ	BAG1	12.80	12.56	11.93	10.52	5.85	-17.00
SO	XBADJ	BAG1	-18.13	-18.71	-18.72	-18.17	-20.81	-23.75
SO	XBADJ	BAG1	-25.97	-27.40	-28.00	-29.31	-29.73	-29.25
SO	XBADJ	BAG1	-27.88	-25.66	-22.66	-19.23	-17.38	-15.00
SO	YBADJ	BAG1	-15.82	-14.65	-13.04	-11.03	-8.69	-5.97
SO	YBADJ	BAG1	-2.99	-1.01	-8.00	-4.15	-0.16	3.82
SO	YBADJ	BAG1	7.69	11.33	14.20	16.32	17.93	16.50
SO	YBADJ	BAG1	15.82	14.65	13.04	11.03	8.69	5.97
SO	YBADJ	BAG1	2.99	1.01	8.00	4.15	0.16	-3.82
SO	YBADJ	BAG1	-7.69	-11.33	-14.20	-16.32	-17.93	-16.50

SO	BUILDHGT	BAG2	19.90	19.90	19.90	16.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.20	12.20	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.70	12.70	12.70	12.70	12.70
SO	BUILDHGT	BAG2	12.70	12.70	12.70	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.20	12.20	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.70	12.70	12.70	12.70	12.70
SO	BUILDWID	BAG2	17.92	17.60	16.59	33.69	55.01	43.60
SO	BUILDWID	BAG2	33.32	28.74	38.00	46.11	52.81	57.91
SO	BUILDWID	BAG2	61.25	11.89	12.76	13.24	13.61	14.00
SO	BUILDWID	BAG2	13.96	13.50	12.62	64.74	55.01	43.60
SO	BUILDWID	BAG2	33.32	28.74	38.00	46.11	52.81	57.91
SO	BUILDWID	BAG2	61.25	11.89	12.76	13.24	13.61	14.00
SO	BUILDLEN	BAG2	16.04	17.60	18.62	20.01	67.74	72.95
SO	BUILDLEN	BAG2	76.46	62.45	62.00	59.67	55.52	49.69
SO	BUILDLEN	BAG2	42.35	9.77	7.87	5.73	5.04	6.00
SO	BUILDLEN	BAG2	6.78	7.35	9.10	61.25	67.74	72.95

SO	BUILDLEN	BAG2	76.46	62.45	62.00	59.67	55.52	49.69
SO	BUILDLEN	BAG2	42.35	9.77	7.87	5.73	5.04	6.00
SO	XBADJ	BAG2	-86.48	-88.34	-87.51	-84.03	1.66	2.10
SO	XBADJ	BAG2	2.48	20.28	22.00	23.05	23.41	23.05
SO	XBADJ	BAG2	22.00	-1.01	-1.60	-2.14	-3.53	-5.00
SO	XBADJ	BAG2	-6.31	-7.43	-9.73	-61.63	-69.39	-75.05
SO	XBADJ	BAG2	-78.93	-82.72	-84.00	-82.72	-78.93	-72.75
SO	XBADJ	BAG2	-64.35	-8.75	-6.27	-3.59	-1.51	-1.00
SO	YBADJ	BAG2	15.36	1.26	-12.89	-17.33	-26.49	-20.20
SO	YBADJ	BAG2	-14.53	-13.14	-4.00	5.26	14.37	23.04
SO	YBADJ	BAG2	31.00	7.60	8.48	9.10	9.30	9.00
SO	YBADJ	BAG2	8.43	7.60	6.54	31.98	26.49	20.20
SO	YBADJ	BAG2	14.53	13.14	4.00	-5.26	-14.37	-23.04
SO	YBADJ	BAG2	-31.00	-7.60	-8.48	-9.10	-9.30	-9.00
SO	BUILDHGT	HTR	12.70	19.90	19.90	19.90	16.20	16.20
SO	BUILDHGT	HTR	12.20	12.20	12.20	21.60	21.60	21.60
SO	BUILDHGT	HTR	0.00	0.00	0.00	0.00	0.00	12.70
SO	BUILDHGT	HTR	12.70	12.70	12.70	12.20	12.20	12.20
SO	BUILDHGT	HTR	12.20	12.20	12.20	16.30	16.30	16.30
SO	BUILDHGT	HTR	16.30	0.00	0.00	0.00	0.00	12.70
SO	BUILDWID	HTR	13.96	17.56	16.59	15.07	33.94	33.38
SO	BUILDWID	HTR	33.32	31.05	38.00	8.11	8.97	9.56
SO	BUILDWID	HTR	0.00	0.00	0.00	0.00	0.00	14.00
SO	BUILDWID	HTR	13.96	13.50	12.62	42.35	33.72	24.07
SO	BUILDWID	HTR	18.61	28.74	38.00	7.07	6.92	6.56
SO	BUILDWID	HTR	6.01	0.00	0.00	0.00	0.00	14.00
SO	BUILDLEN	HTR	6.78	17.60	18.62	19.08	18.96	19.09
SO	BUILDLEN	HTR	76.46	80.23	62.00	9.04	8.80	8.29
SO	BUILDLEN	HTR	0.00	0.00	0.00	0.00	0.00	6.00
SO	BUILDLEN	HTR	6.78	7.35	9.10	61.25	62.73	62.30
SO	BUILDLEN	HTR	61.00	62.45	62.00	7.07	6.92	6.56
SO	BUILDLEN	HTR	6.01	0.00	0.00	0.00	0.00	6.00
SO	XBADJ	HTR	25.31	-63.57	-64.50	-63.47	-60.51	-56.54
SO	XBADJ	HTR	12.31	7.99	23.00	-39.85	-40.50	-39.91
SO	XBADJ	HTR	0.00	0.00	0.00	0.00	0.00	-31.00
SO	XBADJ	HTR	-32.09	-32.21	-32.75	-82.19	-86.87	-88.92
SO	XBADJ	HTR	-88.77	-88.22	-85.00	-18.13	-18.71	-18.72
SO	XBADJ	HTR	-18.17	0.00	0.00	0.00	0.00	25.00
SO	YBADJ	HTR	-4.90	9.21	-0.75	-10.69	-9.89	-17.98
SO	YBADJ	HTR	9.56	13.44	22.00	7.48	1.23	-5.06
SO	YBADJ	HTR	0.00	0.00	0.00	0.00	0.00	10.00
SO	YBADJ	HTR	4.90	-0.35	-5.59	27.23	17.86	7.95
SO	YBADJ	HTR	-2.20	-12.29	-22.00	5.04	2.43	-0.25
SO	YBADJ	HTR	-2.93	0.00	0.00	0.00	0.00	-10.00

VIRGINIA

BPIP (Dated: 04274)

DATE : 10/26/2005
TIME : 20:32:54
VIRGINIA

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BPIP PROCESSING INFORMATION:
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The p flag has been set for preparing downwash related data for a model run utilizing the PRIME algorithm.

Inputs entered in METERS will be converted to meters using a conversion factor of 1.0000. Output will be in meters.

UTMP is set to UTMN. The input is assumed to be in a local X-Y coordinate system as opposed to a UTM coordinate system. True North is in the positive Y direction.

Plant north is set to 0.00 degrees with respect to True North.

VIRGINIA

PRELIMINARY* GEP STACK HEIGHT RESULTS TABLE
(Output Units: meters)

Stack Name	Stack Height	Stack-Building Base Elevation Differences	GEP** EQN1	Preliminary* GEP Stack Height Value
BAG1	14.10	0.00	48.56	65.00
BAG2	14.60	0.00	46.77	65.00
HTR	3.00	0.00	46.24	65.00

* Results are based on Determinants 1 & 2 on pages 1 & 2 of the GEP Technical Support Document. Determinant 3 may be investigated for additional stack height credit. Final values result after Determinant 3 has been taken into consideration.

** Results were derived from Equation 1 on page 6 of GEP Technical Support Document. Values have been adjusted for any stack-building base elevation differences.

Note: Criteria for determining stack heights for modeling emission limitations for a source can be found in Table 3.1 of the GEP Technical Support Document.

DATE : 10/26/2005
TIME : 20:32:54

VIRGINIA

BPIP output is in meters

SO	BUILDHGT	BAG1	16.20	16.20	16.20	16.20	16.20	16.20
SO	BUILDHGT	BAG1	16.20	16.20	19.90	19.90	19.90	19.90
SO	BUILDHGT	BAG1	19.90	19.90	19.90	19.90	19.90	16.20
SO	BUILDHGT	BAG1	16.20	16.20	16.20	16.20	16.20	16.20
SO	BUILDHGT	BAG1	16.20	16.20	19.90	19.90	19.90	19.90
SO	BUILDHGT	BAG1	19.90	19.90	19.90	19.90	19.90	16.20
SO	BUILDWID	BAG1	26.99	30.16	32.42	33.69	33.94	33.38
SO	BUILDWID	BAG1	32.46	32.73	14.00	16.04	17.60	18.62
SO	BUILDWID	BAG1	19.08	18.96	19.09	19.10	18.94	23.00
SO	BUILDWID	BAG1	26.99	30.16	32.42	33.69	33.94	33.38
SO	BUILDWID	BAG1	32.46	32.73	14.00	16.04	17.60	18.62
SO	BUILDWID	BAG1	19.08	18.96	19.09	19.10	18.94	23.00
SO	BUILDLEN	BAG1	30.30	27.68	24.21	20.01	18.96	19.09
SO	BUILDLEN	BAG1	19.31	19.87	18.00	18.07	17.60	16.59
SO	BUILDLEN	BAG1	15.07	13.10	10.73	8.71	11.53	32.00
SO	BUILDLEN	BAG1	30.30	27.68	24.21	20.01	18.96	19.09
SO	BUILDLEN	BAG1	19.31	19.87	18.00	18.07	17.60	16.59
SO	BUILDLEN	BAG1	15.07	13.10	10.73	8.71	11.53	32.00
SO	XBADJ	BAG1	-12.17	-8.97	-5.49	-1.85	1.85	4.66
SO	XBADJ	BAG1	6.66	7.53	10.00	11.24	12.13	12.66
SO	XBADJ	BAG1	12.80	12.56	11.93	10.52	5.85	-17.00
SO	XBADJ	BAG1	-18.13	-18.71	-18.72	-18.17	-20.81	-23.75
SO	XBADJ	BAG1	-25.97	-27.40	-28.00	-29.31	-29.73	-29.25
SO	XBADJ	BAG1	-27.88	-25.66	-22.66	-19.23	-17.38	-15.00
SO	YBADJ	BAG1	-15.82	-14.65	-13.04	-11.03	-8.69	-5.97
SO	YBADJ	BAG1	-2.99	-1.01	-8.00	-4.15	-0.16	3.82
SO	YBADJ	BAG1	7.69	11.33	14.20	16.32	17.93	16.50
SO	YBADJ	BAG1	15.82	14.65	13.04	11.03	8.69	5.97
SO	YBADJ	BAG1	2.99	1.01	8.00	4.15	0.16	-3.82
SO	YBADJ	BAG1	-7.69	-11.33	-14.20	-16.32	-17.93	-16.50

SO	BUILDHGT	BAG2	19.90	19.90	19.90	16.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.20	12.20	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.70	12.70	12.70	12.70	12.70
SO	BUILDHGT	BAG2	12.70	12.70	12.70	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.20	12.20	12.20	12.20	12.20
SO	BUILDHGT	BAG2	12.20	12.70	12.70	12.70	12.70	12.70
SO	BUILDWID	BAG2	17.92	17.60	16.59	33.69	55.01	43.60
SO	BUILDWID	BAG2	33.32	28.74	38.00	46.11	52.81	57.91
SO	BUILDWID	BAG2	61.25	11.89	12.76	13.24	13.61	14.00
SO	BUILDWID	BAG2	13.96	13.50	12.62	64.74	55.01	43.60
SO	BUILDWID	BAG2	33.32	28.74	38.00	46.11	52.81	57.91
SO	BUILDWID	BAG2	61.25	11.89	12.76	13.24	13.61	14.00
SO	BUILDLEN	BAG2	16.04	17.60	18.62	20.01	67.74	72.95
SO	BUILDLEN	BAG2	76.46	62.45	62.00	59.67	55.52	49.69
SO	BUILDLEN	BAG2	42.35	9.77	7.87	5.73	5.04	6.00
SO	BUILDLEN	BAG2	6.78	7.35	9.10	61.25	67.74	72.95

SO	BUILDLEN	BAG2	76.46	62.45	62.00	59.67	55.52	49.69
SO	BUILDLEN	BAG2	42.35	9.77	7.87	5.73	5.04	6.00
SO	XBADJ	BAG2	-86.48	-88.34	-87.51	-84.03	1.66	2.10
SO	XBADJ	BAG2	2.48	20.28	22.00	23.05	23.41	23.05
SO	XBADJ	BAG2	22.00	-1.01	-1.60	-2.14	-3.53	-5.00
SO	XBADJ	BAG2	-6.31	-7.43	-9.73	-61.63	-69.39	-75.05
SO	XBADJ	BAG2	-78.93	-82.72	-84.00	-82.72	-78.93	-72.75
SO	XBADJ	BAG2	-64.35	-8.75	-6.27	-3.59	-1.51	-1.00
SO	YBADJ	BAG2	15.36	1.26	-12.89	-17.33	-26.49	-20.20
SO	YBADJ	BAG2	-14.53	-13.14	-4.00	5.26	14.37	23.04
SO	YBADJ	BAG2	31.00	7.60	8.48	9.10	9.30	9.00
SO	YBADJ	BAG2	8.43	7.60	6.54	31.98	26.49	20.20
SO	YBADJ	BAG2	14.53	13.14	4.00	-5.26	-14.37	-23.04
SO	YBADJ	BAG2	-31.00	-7.60	-8.48	-9.10	-9.30	-9.00
SO	BUILDHGT	HTR	12.70	19.90	19.90	19.90	16.20	16.20
SO	BUILDHGT	HTR	12.20	12.20	12.20	21.60	21.60	21.60
SO	BUILDHGT	HTR	0.00	0.00	0.00	0.00	0.00	12.70
SO	BUILDHGT	HTR	12.70	12.70	12.70	12.20	12.20	12.20
SO	BUILDHGT	HTR	12.20	12.20	12.20	16.30	16.30	16.30
SO	BUILDHGT	HTR	16.30	0.00	0.00	0.00	0.00	12.70
SO	BUILDWID	HTR	13.96	17.56	16.59	15.07	33.94	33.38
SO	BUILDWID	HTR	33.32	31.05	38.00	8.11	8.97	9.56
SO	BUILDWID	HTR	0.00	0.00	0.00	0.00	0.00	14.00
SO	BUILDWID	HTR	13.96	13.50	12.62	42.35	33.72	24.07
SO	BUILDWID	HTR	18.61	28.74	38.00	7.07	6.92	6.56
SO	BUILDWID	HTR	6.01	0.00	0.00	0.00	0.00	14.00
SO	BUILDLEN	HTR	6.78	17.60	18.62	19.08	18.96	19.09
SO	BUILDLEN	HTR	76.46	80.23	62.00	9.04	8.80	8.29
SO	BUILDLEN	HTR	0.00	0.00	0.00	0.00	0.00	6.00
SO	BUILDLEN	HTR	6.78	7.35	9.10	61.25	62.73	62.30
SO	BUILDLEN	HTR	61.00	62.45	62.00	7.07	6.92	6.56
SO	BUILDLEN	HTR	6.01	0.00	0.00	0.00	0.00	6.00
SO	XBADJ	HTR	25.31	-63.57	-64.50	-63.47	-60.51	-56.54
SO	XBADJ	HTR	12.31	7.99	23.00	-39.85	-40.50	-39.91
SO	XBADJ	HTR	0.00	0.00	0.00	0.00	0.00	-31.00
SO	XBADJ	HTR	-32.09	-32.21	-32.75	-82.19	-86.87	-88.92
SO	XBADJ	HTR	-88.77	-88.22	-85.00	-18.13	-18.71	-18.72
SO	XBADJ	HTR	-18.17	0.00	0.00	0.00	0.00	25.00
SO	YBADJ	HTR	-4.90	9.21	-0.75	-10.69	-9.89	-17.98
SO	YBADJ	HTR	9.56	13.44	22.00	7.48	1.23	-5.06
SO	YBADJ	HTR	0.00	0.00	0.00	0.00	0.00	10.00
SO	YBADJ	HTR	4.90	-0.35	-5.59	27.23	17.86	7.95
SO	YBADJ	HTR	-2.20	-12.29	-22.00	5.04	2.43	-0.25
SO	YBADJ	HTR	-2.93	0.00	0.00	0.00	0.00	-10.00