FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE CATSKILL/DELAWARE UV FACILITY
METHODOLOGIES

3.10. AIR QUALITY 1
3.10.1. Introduction 1
3.10.1.1. Pollutants for Analysis 1
3.10.1.1.1. Carbon Monoxide 1
3.10.1.1.2. Nitrogen Oxides and Volatile Organic Compounds 1
3.10.1.1.3. Lead 2
3.10.1.1.4. Respirable Particulate Matter – PM_{10} and $PM_{2.5}$ 2
3.10.1.1.5. Sulfur Dioxide – SO_2 3
3.10.1.1.6. Air Toxics 3
3.10.1.1.7. Summary 3
3.10.1.2. Regulatory Basis 4
3.10.1.2.1. State Implementation Plan (SIP) 4
3.10.1.2.2. City Environmental Quality Review - Significance Impact Criteria 4
3.10.1.2.3. Carbon Monoxide Increment Criteria 6
3.10.1.2.4. Particulate Increment Criteria, PM $_{2.5}$ 6
3.10.2. Mobile Source Air Quality Analysis 7
3.10.2.1. Mobile Source Analytical Approach 8
3.10.2.1.1. Emission Models 8
3.10.2.1.2. Vehicle Emissions Data 9
3.10.2.1.3. Background CO and PM_{10} Levels 9
3.10.2.2. Mobile Source Modeling Analysis 10
3.10.2.2.1. Intersection Selection 10
3.10.2.2.2. Meteorological Data for CAL3QHC 11
3.10.2.2.3. Receptor Locations 12
3.10.2.2.4. Criteria for a Level 2 Analysis 12
3.10.2.2.5. PM_{10} and PM $_{2.5}$ Mobile Source Modeling Analysis 12
3.10.2.2.6. Summary of Mobile Source Modeling Parameters 13
3.10.3. Stationary Source Air Quality Analysis 14
3.10.3.1. Stationary Source Impacts From Facility Operations 14
3.10.3.1.1. Dispersion Modeling 15
3.10.3.2. Potential Construction Impacts 16
3.10.3.2.1. Methodology for the Construction Analysis 16
3.10.3.2.2. Estimation of Construction–Related Emissions 16
3.10.4. Mitigation 19

TABLE 3.10-1. NATIONAL AND NEW YORK STATE AMBIENT AIR QUALITY STANDARDS (AAQS) 5
TABLE 3.10-2. MOBILE SOURCE MODELNG PARAMETERS 13

3.10. AIR QUALITY

3.10.1. Introduction

This air quality study of the Catskill/Delaware Ultraviolet Light Disinfection Facility (UV Facility) presents a project-level analysis of the potential local and regional air quality impacts that could result from mobile, stationary, and fugitive sources of air emissions caused by construction and operations at the Eastview Site. This methodology describes pollutant emissions estimation and modeling approaches, and identifies the types of data and assumptions used in the analyses.

3.10.1.1. Pollutants for Analysis

3.10.1.1.1. Carbon Monoxide

Carbon monoxide (CO), a colorless and odorless gas, is produced in the urban environment primarily by incomplete combustion of gasoline and other fossil fuels. In New York City, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can vary greatly over relatively short distances. Elevated concentrations are usually limited to locations near crowded intersections along heavily traveled and congested roadways. Consequently, CO concentrations must be predicted on a localized or microscale basis.

The construction of the proposed UV Facility would result in CO emissions from mobile sources and construction equipment. Mobile sources include worker vehicles and diesel trucks. A mobile source analysis was conducted to evaluate future CO concentrations with and without the proposed facility. Fossil fuel-fired construction equipment also emits CO. Therefore, emissions from onsite (stationary) construction emissions were also evaluated for CO.

Operation of the UV Facility would generate exhaust from stationary combustion equipment (boilers and emergency generators). Therefore, these sources were evaluated for potential CO impacts.

3.10.1.1.2. Nitrogen Oxides and Volatile Organic Compounds

Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are of principal concern because of their role as precursors in the formation of ozone. The potential impacts of individual compounds that make up VOCs are discussed in the next paragraph below. The standard for average annual NO_2 concentrations is normally applied only for fossil fuel energy sources. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are diffusing downwind, ozone concentrations are often increased many miles from sources of the precursor pollutants. The effects of NO_x emissions from mobile source emissions are therefore generally examined on a regional basis. The change in regional mobile source emissions of these pollutants is related to the total number of vehicle trips and the vehicle miles traveled throughout the New York Metropolitan area. The proposed facility would not have a significant effect on the overall volume of vehicular travel in the metropolitan area. It would therefore not have any measurable impact on regional NO_x emissions or on ozone levels. An analysis of project-related impacts from mobile sources for these pollutants was not warranted.

The construction of the UV Facility would result in emissions of NO_x from a variety of diesel-fueled heavy equipment used on site during the construction period. In addition, the facility operation would include NO_x emissions from stationary combustion equipment (boilers and emergency generators). Therefore, these sources were evaluated for potential NO_x impacts. In the analysis, a ratio of 0.59 NO_2 to NO_X is applied to determine the NO_2 impacts

3.10.1.1.3. Lead

Lead emissions are primarily associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor-vehicle related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one quarter the level in 1975.

In 1985, the U.S. Environmental Protection Agency (USEPA) announced new rules drastically reducing the amount of lead permitted in leaded gasoline. Monitored concentrations of lead indicate that this action has been effective in significantly reducing atmospheric lead levels. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the national standard of 1.5 micrograms per cubic meter (3-month average). No significant sources of lead would be associated with the proposed UV Facility. Therefore, no analysis was warranted.

3.10.1.1.4. Respirable Particulate Matter – PM_{10} and $PM_{2.5}$

Particulate matter (PM) is emitted into the atmosphere from a variety of sources: industrial facilities, power plants, construction activity, and other smaller sources, as well as some natural sources. Gasoline-powered vehicles emit relatively small quantities of particles. Exhaust emitted from diesel-powered vehicles, especially heavy trucks and buses, contain large quantities of particles, and therefore, respirable particulate matter concentrations may be locally elevated near roadways with high volumes of such vehicles (e.g., in the vicinity of bus depots or truck marshaling yards). Particulate matter less than 10 µm in diameter (both PM_{10} and $PM_{2.5}$) has become of primary concern because it is respirable. A PM_{10} impact analysis was performed to assess the potential impacts from project-related mobile sources.

Construction of the UV Facility would result in emissions of PM_{10} and $PM_{2.5}$ from a variety of diesel-fueled heavy equipment used on site during the construction period. In addition, the facility operation would include PM_{10} emissions from stationary combustion equipment (boilers and emergency generators). Therefore, these sources were evaluated for potential particulate matter impacts.

Potential incremental impacts of $PM_{2.5}$ from the proposed UV Facility and its construction were also evaluated in the surrounding neighborhoods and compared to the representative Future Without the Project condition.

3.10.1.1.5. Sulfur Dioxide – SO_2

Sulfur dioxide (SO_2) emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. No significant quantities are emitted from mobile sources. An analysis of project-related impacts of SO_2 from mobile sources was not warranted.

Construction of the UV Facility would result in emissions of SO_2 from a variety of diesel-fueled heavy equipment used on site during the construction period. In addition, the facility operation would include SO_2 emissions from stationary combustion equipment (boilers and emergency generators). Therefore, these sources were evaluated for potential SO_2 impacts.

3.10.1.1.6. Air Toxics

In addition to the criteria pollutants, New York State also seeks to control the ambient levels of air toxics through the use of recommended guidelines concentrations in the New York Code, Rules and Regulations (6 NYCRR Part 212). These "non-criteria pollutants" include carcinogens, as well as non-carcinogenic compounds and irritants. The New York State Department of Environmental Conservation (NYSDEC) provides 1-hour and annual average guideline concentrations, referred to as short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) for these compounds and describes the methodology for assessing the impact due to air toxic emissions in Air Guide-1: *Guidelines for the Control of Toxic Air Contaminants* (DAR-1, NYSDEC, 1991). Potential impacts associated with the operational emissions from the proposed UV Facility were analyzed and an inventory of emissions for the Toxic Air Contaminants was performed.

3.10.1.1.7. Summary

The proposed facility would generate air pollutant emissions from mobile sources, construction activities and facility operation. Three different air quality analyses were conducted to assess the potential effects of construction and operation of the proposed facility on air quality:

- Project-induced traffic: Increased traffic from construction and operation would result in additional emissions of CO, PM_{10} and $PM_{2.5}$. Air quality impacts from increased CO PM_{10} and $PM_{2.5}$ from project-induced traffic were assessed.
- Stationary sources: On-site stationary sources at the proposed UV Facility would include combustion equipment. The combustion process produces NO_X, CO, SO_2, PM_{10} and $PM_{2.5}$, and lead (Pb). Toxic Air Contaminants (TAC) and Hazardous Air Pollutants (HAP) are also emitted in trace amounts from combustion sources. *AP-42, Compilation of Air Pollutant Emission Factors*, USEPA, 1995 (with on-line updates) was used to obtain emission factors for TACs and HAPs.
- Construction impacts: Impacts from emissions of exhaust gases from construction equipment, and from fugitive dust from excavation and material handling were assessed.

3.10.1.2. Regulatory Basis

The methodology detailed in the *New York City Environmental Quality Review (CEQR) Technical Manual, Chapter 3Q - Air Quality* (2001), was applied to the analyses. Other Federal and State guidance were applied, as appropriate, to conduct project-specific analyses to assess air quality impacts.

3.10.1.2.1. State Implementation Plan (SIP)

The Clean Air Act requires each state to submit to USEPA a State Implementation Plan (SIP) for attainment of the National Ambient Air Quality Standards (NAAQS). The 1977 and 1990 amendments require comprehensive plan revisions for areas where one or more of the standards have yet to be attained. Westchester County is in attainment for all pollutants except ozone. All of the New York City metropolitan area, including Westchester County, has been designated as severe non-attainment for the 1-hour ozone standard. However, the EPA has recently adopted a new 8-hour standard for ozone, which will replace the existing 1-hour standard. On April 15, 2004 EPA designated Westchester County as moderate non-attainment for the new 8-hour ozone standard (effective June 15, 2004). EPA will revoke the 1-hour standard in June 2005.

3.10.1.2.2. City Environmental Quality Review - Significance Impact Criteria

For all criteria pollutants, if project impacts cause or contribute to an exceedance of the NAAQS, this would constitute a significant impact. In addition to the NAAQS, New York City has developed *de minimis* criteria to assess the significance of CO or $PM_{2.5}$ impacts on air quality that would result from a proposed development. These criteria, as detailed in the *CEQR Technical Manual*, are explained in the next paragraph below. Table 3.10-1 presents the NAAQS for each pollutant and averaging time period. Note that Total Suspended Particulate (TSP) is no longer federally regulated.

A major source, as defined by USEPA, is one where emissions of any CO, SO_2 or PM_{10} are above 100 tons per year. The New York metropolitan region is classified severe non-attainment for ozone. VOCs and NO_X are precursors to ozone. Due to the non-attainment status of the region, the major source threshold for VOCs and NO_x is 25 tons per year.

TABLE 3.10-1. NATIONAL AND NEW YORK STATE AMBIENT AIR QUALITY STANDARDS (AAQS)

POLLUTANT	Primary[1]		Secondary	
	ppm	$\mu g/m^3$	ppm	$\mu g/m^3$
Carbon Monoxide (CO)				
Maximum 8-Hour Concentration	9	(10,000)	None	
Maximum 1-Hour Concentration	35	(40,000)		
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months	NA	1.5	None	
Ozone (O_3)[2]				
1-Hour Average	0.12	(235)	0.12	(235)
8-Hour Average	0.08	(157)	0.08	(157)
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	(100)	0.053	(100)
Total Suspended Particulates (TSP)[3]				
Annual Mean	NA	75	NA	
Maximum 24-Hour Concentration	NA	250		
Inhalable Particulates Matter (PM_{10})				
Annual Mean	NA	50	NA	50
Maximum 24-Hour Concentration	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean	NA	15	NA	15
Maximum 24-Hour Concentration	NA	65	NA	65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.030	(80)	NA	NA
Maximum 24-Hour Concentration	0.14	(365)	NA	NA
Maximum 3-Hour Concentration	NA	NA	0.50	(1,300)

1. Generally the ambient standards for averaging periods of 24 hours or less may not be exceeded more than once per year. Therefore, measured second highest concentrations are included for these averaging times
2. The 1-hour ozone standard is not to be exceeded more than an average of one day per year based on the last three years. The EPA has recently adopted a new 8-hour standard for ozone, which will replace the existing 1-hour standard. On April 15, 2004 EPA designated Westchester County as moderate non-attainment for the new 8-hour ozone standard (effective June 15, 2004). EPA will revoke the 1-hour standard in June 2005.
3. The 24-hour NYS standard is 250 $\mu g/m^3$. TSP is no longer a federally regulated pollutant.

Abbreviations:
ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
1 ppm nitrogen dioxide = 1,880 $\mu g/m^3$
1 ppm sulfur dioxide = 2,610 $\mu g/m^3$

3.10.1.2.3. Carbon Monoxide Increment Criteria

The CEQR criteria set the minimum change in the mobile source CO concentration that defines a significant environmental impact. Significant increases with respect to CO concentrations in New York City are defined as: (1) an increase of 0.5 parts per million (ppm) or more in the maximum 8-hour average CO concentration at a location where the predicted No Build 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between the Future No Build (Future Without the Project) concentrations and the 8-hour standard, when No Build concentrations are below 8 ppm. A mobile source impact analysis for CO is not required if the peak number of project-generated vehicles is less than 100 per hour.

3.10.1.2.4. Particulate Increment Criteria, $PM_{2.5}$

An analysis was undertaken to estimate and evaluate the potential impact of the proposed facility on both localized and neighborhood-scale exposure to $PM_{2.5}$. NYCDEP, in conjunction with NYSDEC, developed a mobile source screening analysis where they determined that $PM_{2.5}$ impacts from 21 trucks or fewer per hour would not be significant. An initial screening was conducted of the Eastview Site to identify whether or not the maximum hourly project-induced traffic would result in more than 21 trucks.

For proposed sources with the potential for more than 21 truck trips per hour, potential effects of $PM_{2.5}$ were modeled using a dispersion analysis in the surrounding area. Potential impacts of both mobile and stationary sources on $PM_{2.5}$ concentrations were assessed. The results were then compared to the applicable interim guidance criteria (described below) to evaluate whether such predicted incremental impacts could be considered potentially significant. This subsection provides: (1) an overview of the pertinent air quality standards and interim guidance criteria; (2) a description of the mobile source $PM_{2.5}$ impact assessment; (3) a description of the construction sources $PM_{2.5}$ impact assessment; and (4) a summary of the potential $PM_{2.5}$ impacts from the operation of the proposed facility.

The USEPA adopted 24-hour and annual standards for $PM_{2.5}$, which became effective September 16, 1997. The proposed standards require that the total ambient $PM_{2.5}$ concentration not exceed the following values:

- An annual average of 15 $\mu g/m^3$ and
- 24-hour average of 65 $\mu g/m^3$.

These standards are aimed at protecting public health and welfare, and have been adopted by the State of New York.

NYSDEC is currently reviewing and evaluating the $PM_{2.5}$ ambient air quality monitoring data that have been collected within the City and throughout the State. At this time, neither USEPA nor the State have formally designated Westchester County as either attainment (i.e., meeting the standards) or non-attainment (i.e., not meeting the standards) with respect to the $PM_{2.5}$ ambient air quality standards.

NYCDEP is currently employing interim guidance criteria for evaluating the potential $PM_{2.5}$ impacts from NYCDEP projects under CEQR. The interim guidance criteria for determining the potential for significant adverse impacts from $PM_{2.5}$ are as follows:

- Predicted incremental impacts of $PM_{2.5}$ greater than 5 μg/m^3 averaged over a 24-hour (daily) period at a discrete location of public access, either at ground or elevated levels (microscale analysis); or

- Predicted incremental ground-level impacts of $PM_{2.5}$ greater than 0.1 μg/m^3 on an annual average neighborhood-scale basis (i.e., the computed annual concentration averaged over receptors placed over a one kilometer by one kilometer grid, centered on the location where the maximum impact is predicted).

- In addition, NYSDEC considers incremental annual impacts of $PM_{2.5}$ greater than 0.3 μg/m^3 from stationary sources, at any discrete ground-level or elevated location as having a potential for significant impact.

Actions that would result in predicted incremental $PM_{2.5}$ impacts greater than the interim guidance criteria above would be considered to result in potential significant adverse impacts. Actions subject to CEQR, which exceed such criteria, require the preparation of an Environmental Impact Statement and an examination of potential measures to reduce or eliminate such potential significant adverse impacts.

3.10.2. Mobile Source Air Quality Analysis

A mobile source analysis was conducted to assess impacts from project-induced traffic. The air quality impacts from the project-induced traffic were determined by subtracting the Future No Build modeling results from the Future Build results to obtain the project increment. Note that the analysis year selected for the Future No Build was based on the year when the maximum mobile source impacts from the project is expected, whether it was for operation or construction.

Air quality analyses were performed for the mobile source scenarios described below. During the peak construction traffic year of 2008, both CO and PM_{10}/$PM_{2.5}$ were modeled in the analysis. During the construction year of 2006, the total number of construction traffic lower than the peak traffic year of 2008, but a significant portion of the construction traffic is expected to be heavy duty construction trucks. Therefore, PM_{10} and $PM_{2.5}$ were modeled for 2006. Since project related truck traffic was under the CEQR threshold of 21 trips in the operational year of 2010, only CO was modeled in this analysis year. The pollutants for analysis corresponding to each of the analysis years are summarized below. Please note that where PM is indicated, both PM_{10} and $PM_{2.5}$were modeled.

1. Baseline Conditions 2003 (CO only).

2. Future Without the Proposed Facility, without the Croton project for the construction year 2006 (PM only), peak project traffic year 2008 (PM and CO), and Build year 2010 (CO only).

3. Future Without the Proposed Facility, with the Croton Project for the construction year 2006 (PM only), peak project traffic year 2008 (PM and CO), and Build year 2010 (CO only).

4. Future With the Facility, without the Croton Project for the construction year 2006 (PM only), peak project traffic year 2008 (PM and CO), and Build year 2010 (CO only).

5. Future With the Facility, with the Croton Project for the construction year 2006 (PM only), peak project traffic year 2008 (PM and CO), and build year 2010 (CO only).

3.10.2.1. Mobile Source Analytical Approach

The prediction of motor vehicle-generated CO, PM_{10} and $PM_{2.5}$ concentrations in an urban environment is characterized by meteorological phenomena, traffic conditions, and physical configurations. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and geometry combine to affect pollutant concentrations. The mathematical expressions and formulations contained in the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions and it is necessary to predict the reasonable worst-case condition, most of these dispersion models predict conservatively high pollutant concentrations, particularly under adverse meteorological conditions.

The mobile source analyses for the proposed facility employ a modeling approach approved by USEPA that has been widely used for evaluating air quality impacts of projects in New York City, New York State and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels resulting in a conservatively high estimate of expected CO, PM_{10} and $PM_{2.5}$ concentrations that could ensue from mobile sources associated with the proposed UV Facility.

An air quality analysis was performed to estimate CO, PM_{10} and $PM_{2.5}$ (24-hours) localized concentrations at intersections used by project-induced traffic. A neighborhood analysis was used for $PM_{2.5}$ annual increment analysis. This methodology was applied to future conditions (construction and operation) with and without the project

3.10.2.1.1. Emission Models

Emission models are used to estimate mobile source emission factors based on vehicle classification, vehicle speed, and other input values, as discussed below. The MOBILE6.2 model is used to estimate CO, PM_{10} and $PM_{2.5}$ emission factors.

MOBILE6.2 Model. MOBILE6.2 is the USEPA recommended model for local CO analysis. It is consistent with the latest approved SIP. NYSDEC has also officially removed the oxygenated fuels program and has replaced it with the Federal Reformulated Gasoline program. The MOBILE6.2 CO emission estimates account for these. MOBILE6.2 also provides PM_{10} and $PM_{2.5}$ emission factors. PM emissions were generated assuming the use of ultra-low sulfur diesel (ULSD) for the construction year 2008 and build year 2010. ULSD has a sulfur content of 15 ppm.

3.10.2.1.2. Vehicle Emissions Data

To predict ambient concentrations of pollutants generated by vehicular traffic, emissions from vehicle exhaust systems must be estimated accurately. Vehicular CO and PM_{10} emissions were computed using the USEPA-developed mobile source emissions model, MOBILE6.2. This is the most current, recently released emissions model capable of calculating engine emission factors for various vehicle types. Model input includes the fuel type (gas, diesel, or alternative technologies), meteorological conditions, vehicle speeds, roadway types, number of starts per day and engine soak time, and various other factors that influence emissions, such as inspection maintenance programs.

Vehicle Classifications. Vehicle classification data were based on field studies and data obtained from the traffic study. Projected future traffic volumes were assumed to have the same percentages of vehicles for each category. Project generated traffic was divided into autos and heavy duty diesel vehicles (HDDV).

Vehicle Speed Data. Measured vehicle speed data were obtained from travel time studies along selected road segments during morning and afternoon peak traffic periods. Delays due to traffic signals or other factors were accounted for. Future vehicle speeds were calculated taking into consideration additional delays in the future conditions as predicted in the traffic analysis.

When recorded travel time data were not available, the traffic engineers estimated road segment speed based on their observations of the road segments during the traffic volumes and delays study periods.

Ambient Temperature Data. In accordance with USEPA procedures and guidance provided by NYCDEP (verbal correspondence, March 2004) an ambient temperature of 51° F was obtained by correlating ambient temperatures with the ten highest CO concentrations (rolling 8-hour averages) over a three year period (2000-2002).

3.10.2.1.3. Background CO and PM_{10} Levels

The background concentration represents the ambient CO level not accounted for in the microscale dispersion modeling (e.g., CO concentrations due to emissions from stationary sources and from traffic beyond the modeled street network). The 1-hour and 8-hour background CO concentration was added to the corresponding 1-hour and 8-hour concentrations predicted by the CAL3QHC model to determine the total 8-hour CO levels at the receptor sites. CO background concentrations are based on estimated values listed in a NYCDEP memorandum. In a similar manner, the 24-hour and annual background PM_{10} concentration was added to the 24-hour and annual CAL3QHCR predicted concentration to determine total PM_{10} concentrations at receptor sites. The background PM_{10} concentrations are assumed to be the same as the concentrations in the existing condition. The project $PM_{2.5}$ increments between the future without project and future with project were compared to interim guidance values to determine project impacts.

3.10.2.2. Mobile Source Modeling Analysis

This section describes the microscale analysis methodology and input data used to analyze CO impacts from traffic on the street system within the traffic and transportation study area. The morning (6:30 to 7:30 AM) and afternoon (3:30 to 4:30 PM) peak project traffic periods were evaluated.

The modeled roadways were represented schematically as a series of straight line segments (links) plotted on a map with a coordinate system. The link system extended a distance of 1,000 feet from the intersection. The coordinates of the endpoints of each link were recorded. Other roadway data required as model input included the type of roadway (e.g., at-grade, depressed), the width of the travel lanes, and the number of lanes (for queue links). The coordinates of the receptor points were also determined and a receptor height of 1.8 meters (6.0 feet) was used.

The CAL3QHC model requires link volumes and emission factors as input. The peak hour link traffic volumes were developed as part of the traffic analysis. In addition to traffic data and emission factors, the CAL3QHC model needs several more input parameters to analyze queuing emissions during the traffic signals red phase. These parameters, primarily approach capacity and traffic signal phasing data, were obtained from the traffic analysis.

Traffic Data. Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, NYSDOT's Highway Sufficiency Ratings 2002, and other information developed as part of the traffic analysis for the UV Facility, as described in Section 3.9, Data Collection and Impact Methodologies, Traffic and Transportation. Traffic data for the Future Without the Project and Future With the Project conditions were employed in the respective air quality modeling scenarios. The weekday morning (6:30 to 7:30 AM) and afternoon (3:30 to 4:30 PM) peak periods were subjected to the localized microscale analysis. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

3.10.2.2.1. Intersection Selection

CO build-up may occur at locations where traffic is congested and the Level Of Service (LOS) at intersections is degraded. As the LOS decreases, progression of vehicles through the intersection decreases, long vehicle queue times occur, and idling emissions increase. The USEPA procedure for determining critical intersections for CO impact analysis is to consider those intersections at LOS D, E, or F, or those that have changed to LOS D, E, or F because of increased volume of traffic or traffic related to a new project in the vicinity. Intersections that are LOS A, B, or C do not require further analysis because the project-related traffic delay and congestion would not likely cause or contribute to a potential exceedance of the CO standard. The selection of the intersections analyzed for CO and PM analyses employed the following USEPA guidance:

1) Rank all intersections by traffic volumes;
2) Calculate the Level-of-Services (LOS) for each intersection based on traffic volumes;

3) Rank these intersections by LOS; and
4) Model the intersections based on the highest traffic volumes and worst LOS.

The worst four intersections, based on the criteria listed above, were selected for detailed analysis. The selection process was repeated for each of the four parking options. The USEPA guidance assumes that if the selected intersections do not show an exceedance of the NAAQS, none of the intersections ranked lower will either. In addition to the USEPA guidance, intersections were selected based on CEQR significance thresholds with respect to project incremental traffic. The intersections selected for the evaluation of potential microscale pollutant concentration modeling are presented in Section 4.10, Air Quality.

3.10.2.2.2. Meteorological Data for CAL3QHC

The transport and resulting ambient concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction; wind speed; and atmospheric stability. Wind direction influences the accumulation of pollutants at a particular receptor location. Wind direction was chosen to maximize pollutant concentrations at each of the prediction sites. Two other meteorological parameters required by the model are the mixing height and the surface roughness.

Because the documented pollutant concentrations are concentrations inversely related to wind speed, worst case conditions dictate that a low wind speed be used in the analysis. A wind speed of 1 meter per second was used.

The wind direction producing the highest pollutant level at each receptor was needed for the analysis. Since this direction would vary depending on the location of the individual receptor site, a wind scan at 2° intervals was conducted. Each model run began with an initial wind direction of 0°, which was increased by 2° for each successive model iteration, through a direction of 358°. In this manner, the highest pollutant concentration at each receptor was determined.

Atmospheric stability is indicative of the ability of the atmosphere to disperse pollutants. Six stability classes are available in the CAL3QHC model, ranging from Class A for the most unstable conditions to Class F for the most stable conditions. Class D (neutral stability, indicative of worst-case conditions found in urban areas) was used for the analysis.

Pollutant dispersion occurs within the mixing zone between the ground and the overhead inversion layer. The height of this zone was assumed to be 1,000 meters. Since traffic-generated pollutants are emitted at ground level, and have their greatest effect at nearby receptors, which are at, or near, ground level, the mixing height has a negligible effect on predicted concentrations.

Surface roughness affects the initial vertical dispersion of traffic generated pollutants, and is dependent on the type of buildings or vegetation in the area. Surface roughness was obtained from a table in the CAL3QHC User's Guide, and was set at 127 centimeters for the Eastview Site.

3.10.2.2.3. Receptor Locations

Intersections where project-generated traffic was anticipated to have the greatest impact were selected for locating receptors. At each intersection, individual receptor points were located along the middle of adjacent sidewalk, and at various intervals parallel to the traffic queues (i.e., the intersection approaches where vehicles line up on a red light). For modeling purposes, the receptors were elevated at 1.8 meters (6.0 feet) above the ground. In this manner, the highest CO concentrations experienced in the vicinity of the intersection could be determined.

The peak CO 8-hour concentrations were determined by applying a persistence factor of 0.70 to the maximum predicted 1-hour local impact values. This persistence factor accounts for atmospheric variability and greater dispersion over a longer averaging time period. Over an 8 hour period, the atmospheric effects of winds and vehicle traffic activities (e.g., volumes, speeds) would produce lower average CO concentrations.

3.10.2.2.4. Criteria for a Level 2 Analysis

According to the USEPA's CAL3QHC Guidance, there are two levels of an air quality analysis for predicting pollutant concentration near roadway intersections. All project(s) requiring a microscale CO analysis should start with a Level 1 analysis. This analysis is a standard screening analysis using CAL3QHC, with worst-case assumptions. If the results from Level 1 analysis indicate potential exceedance of either one-hour or eight-hour CO NAAQS, a Level 2 analysis would be performed with CAL3QHCR (described below).

CAL3QHCR. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of actual hourly meteorological data and the hourly variation in the daily traffic volume. The data would consist of the latest five consecutive years that are available for surface data collected at LaGuardia Airport in Queens, New York and upper air data collected at Brookhaven, New York. This five-year meteorological data set contains hour-by-hour wind speeds, directions and atmospheric stability.

3.10.2.2.5. PM_{10} and $PM_{2.5}$ Mobile Source Modeling Analysis

Exhaust emitted from diesel powered vehicles, especially heavy trucks and buses, contain relatively high levels of fine particles and therefore both concentrations of PM_{10} and $PM_{2.5}$ may be locally elevated near roadways with increased volumes of such vehicles. Since the proposed facility is expected to cause a significant increase in the number of heavy trucks during the site construction period, an analysis of PM_{10} and $PM_{2.5}$ impacts was performed.

PM_{10} and $PM_{2.5}$ analyses are performed using 24-hour and annual average time periods. Persistence factors are not developed for conversion of one-hour concentrations to 24-hour or annual concentrations for line sources. Therefore, CAL3QHCR is used to estimate concentrations for 24-hour and annual average time periods. The analysis follows the general methodology recommended for microscale mobile source modeling as described in the *CEQR*

Technical Manual. For the PM2.5 neighborhood analysis, receptors were placed at a distance of 49 feet from the roadway.

3.10.2.2.6. Summary of Mobile Source Modeling Parameters

Modeling parameters used for the MOBILE6.2 emission factor model and CAL3QHC and CAL3QHCR dispersion models are summarized in Table 3.10-2 below.

TABLE 3.10-2. MOBILE SOURCE MODELNG PARAMETERS

Model	Parameter	Value
MOBILE6.2 - CO	Region	Low altitude
	Operating mode	1. Start distribution – Specific to Westchester county 2. Cold start – 12 hours soak time 3. Hot start – 10 minutes soak time
	Ambient temperature	51°F
	Vehicle mix	Traffic studies collected in 2002 and 2003
	Analysis years	2006, 2008 and 2010
	Inspection/ Maintenance	Yes
	Anti-tampering program	Yes
	Reformulated gasoline	Yes
	Vehicle speed	Estimated running speeds from traffic analyses.
MOBILE6.2-PM	Region	Low altitude
	Speed cycle	Transient
	Vehicle speed	Estimated running speeds from traffic analyses.
	Unpaved silt percentage	4.3%
	Silt loading	0.16 g/m^2 – secondary streets, 0.10 – arterials, 0.02 – expressways
	Number of day > 0.01 inch of rain	0 Days
	Particle size cutoff	10 microns & 2.5 microns
	Average vehicle weight	5,565 lbs (Average for New York Metropolitan Area)
CAL3QHC	Averaging time	60 min. (CO), use persistence factor of 0.7 to obtain 8-hours averaging time.
	Stability class	Pasquill Class D
	Wind speed	1 meter per second
	Wind direction (coarse)	0 to 358 at 2° intervals
	Mixing height	1,000 meters
	Persistence factor	0.7 for 8-hr
	Surface roughness	127 cm Eastview Site
	Settling velocity	0.0

TABLE 3.10-2. MOBILE SOURCE MODELNG PARAMETERS

Model	Parameter	Value
	Deposition velocity	0.0
	One-hour background CO	5.9 ppm or 6,700 ug/m^3
	Eight-hour background CO	2.0 ppm or 2,300 ug/m^3
	Arrival rate	Progression based on traffic study
CAL3QHCR	Averaging time	24-hours or annual (PM_{10} & $PM_{2.5}$)
	24-hour background PM_{10}	45 ug/m^3
	Annual background PM_{10}	21 ug/m^3
	Arrival rate	Progression based on traffic study
Meteorological Data	Hourly meteorological data from LaGuardia Airport for 1998-2002	

Notes: Background data are the maximum 2nd highest value for 5-years of CO data or 3-years of PM data.

Comparison to Ambient Standards. The predicted concentrations, based on the sum of the model results and background, were compared to the 8-hour CO, and 24-hour and annual PM_{10} ambient standards.

3.10.3. Stationary Source Air Quality Analysis

The effects of stationary source from construction activities and operation of the UV Facility were analyzed.

3.10.3.1. Stationary Source Impacts From Facility Operations

Operations at the proposed UV Facility site would emit regulated air pollutants. This section identifies the operations that have the potential to emit regulated air pollutants, and examines each potential stationary emission source. Stationary sources with the potential to emit regulated air pollutants include duel fuel (oil and natural gas) boilers and emergency diesel generators.

Boiler System. The boiler system for the proposed facility would provide heat and hot water. The system would consist of three boilers, each rated at 16.75 MMBTU/hour. Two boilers would be operated at any one time, with the third boiler operated as a standby unit. Both criteria pollutants and Toxic Air Contaminants (TAC) would be emitted. Emissions of criteria pollutants are based on manufacturers data and emissions of TACs are based on AP-42 emission factors.

Emergency Generators. The emergency generators would consist of four 1,500 kilowatt (kW) diesel fuel-fired engine generators. Only one would be exercised at a time, although the modeling analysis had conservatively assumed all four would run concurrently. The emergency generators would be exercised approximately one hour per week. Emissions of criteria pollutants are based on manufacturers data and emissions of TACs are based on AP-42 emission factors.

3.10.3.1.1. Dispersion Modeling

Criteria Pollutant ISCST3 Modeling. The potential impacts of the boiler system and emergency generators were analyzed using the USEPA's Industrial Source Complex Short Term, Version 3 dated 02035 (ISCST3) model (User's Guide, USEPA, 1995d). ISCST3 is a refined computerized dispersion model that calculates impacts at receptors from multiple point, area and volume sources. The ISCST3 model has the capability of calculating pollutant concentrations at locations where the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by different structures. Computations with ISCST3 were made assuming stack tip downwash, buoyancy induced dispersion, gradual plume rise, urban dispersion coefficients, wind profile exponents and elimination of calms. ISCST3 uses historical hourly meteorological data. Meteorological data from La Guardia Airport, with upper air data from Brookhaven, for years 1998 through 2002, were used. The meteorological data provided hour-by-hour temperature, stability, wind speed and wind direction over the five-year period.

ISCST3 was used to predict maximum pollutant concentrations at designated receptors. Three sets of receptors were generated for the analysis; fenceline, Cartesian grid and sensitive land uses. The fenceline receptors were placed at approximately 25 meter intervals along the property boundary. The Cartesian grid receptors extend out to approximately ½ km in all directions from the site. Sensitive use receptors included nearby hospitals, educational facilities, institutional facilities and a medical laboratory. Terrain elevations were incorporated into the receptor grid. Receptors were set at 1.8 meters above the terrain, at the breathing level of a standing adult.

The stack heights of the boilers are lower than USEPA Good Engineering Practice (GEP) guidelines. Therefore building downwash was considered. The USEPA Building Profile Input Program (BPIP) was used to calculate building cross-sections for wind directions at 10 degree intervals. The cross-sections were included in the ISCST3 model input file and the building downwash option was selected.

In accordance with procedures described in USEPA's *Guideline on Air Quality Models*, the Auer procedure was used to determine Urban/Rural classification. Based on examination of USGS 7.5 minute quadrangle maps out to a 3 kilometer radius, the urban classification was selected for the Eastview Site.

The background pollutant concentrations were obtained from the NYSDEC monitoring data. Background air quality data is based on the most recent five years of NYSDEC monitoring data, 1998 through 2002. The results of dispersion modeling were added to background concentrations obtained from NYSDEC monitoring stations.

Toxic Air Contaminants (TACs) Modeling. The ISCST3 model was used to calculate concentrations of toxic air contaminants (TACs) from boilers and diesel generators. TACs are the result of combustion processes. As noted above, emission factors from TACs are obtained from *AP-42, Compilation of Air Pollutant Emission Factors*, USEPA, 1995 (with on-line updates).

A unitary emission rate of 1.0 gram per second was used to model the boilers and generators separately. The maximum predicted concentrations of each TAC were determined by multiplying the model output by the applicable emission rate, for each pollutant. The concentrations were compared with the 1-hour New York State Short-term Guideline Concentrations (SGC) for each pollutant. Annual concentrations were compared with New York State Annual Guideline Concentrations (AGC) for each pollutant. The total impacts of the boilers and generators were addressed by taking the sum of the highest concentrations predicted separately for the boilers and generators (a conservative approach, since the locations of the highest concentrations do no necessarily coincide).

3.10.3.2. Potential Construction Impacts

The construction analyses for the proposed facility use an emission inventory analysis to generate emission rates and a modeling approach that has been previously used for evaluating air quality impacts of construction projects in New York City. The approach includes an estimated monthly construction work schedule, the number of each equipment type, and number of workers expected during the construction period. The level of construction activities would vary from month to month and it takes an estimated four years to complete the UV Facility's construction. The most conservative construction scenario was determined to be the month of March 2006 for short-term impacts and the year 2006 for annual impacts. These time periods correspond to the maximum emission levels produced by construction activities (i.e., most conservative cases), and it was based on the highest number of construction equipment used during the heaviest construction activity period. The dispersion modeling approach also includes a series of conservative assumptions relating to meteorology, construction emissions during the peak activities, and background concentration levels resulting in a conservative estimate of expected pollutant concentrations that could ensue from the proposed construction. The modeling analysis was confined to the work hours of 7 AM to 3 PM.

3.10.3.2.1. Methodology for the Construction Analysis

Ground-level construction emissions are generated by construction equipment exhausts, excavation/transfer of soil/rock debris, and other activities that generate fugitive dust. Total emissions for CO, NO_x, SO_2, PM_{10} and $PM_{2.5}$, were calculated for various construction activities. The construction emissions were calculated in two parts: exhaust emissions and fugitive dust emissions. Construction emissions include those generated by engine exhausts and those generated by activities that create fugitive dust.

3.10.3.2.2. Estimation of Construction–Related Emissions

Provided below is a summary of procedures used to calculate construction emissions and to model their impacts. Since the procedures involved the use of numerous reference equations, assumptions, construction data and excel spreadsheets, the specific details of the analysis are provided in Appendix C for the UV Facility construction. In addition, the Croton project construction modeling analysis was updated to include the new NONROAD emissions model, hours of construction, and the use of ULSD. The details of the Croton project construction analysis are also provided in Appendix C.

Exhaust Pollutant Emission Sources. During construction, various types of construction equipment would be used at different locations throughout the site. Most of the equipment would operate on an intermittent basis. Some of the equipment is mobile and would operate in specified areas while some would remain stationary on-site at distinct locations. The parameters used to estimate construction emissions are based on the daily maximum (capacity) peak construction activity.

Fugitive Emission Sources. The analysis considered a variety of fugitive dust sources: land clearing, excavation, soil/rock debris transfer operations, grading, rock drilling, rock crushing and travel over on-site roadways. The latter emissions arise from the entrainment of roadway surface dust. The primary activities that would have the greatest potential to generate significant quantities of fugitive dust would be excavation/soil transfer operations and trucks traveling on unpaved roads. Fugitive emissions would be generated by excavators, backhoes and loaders excavating the soil (overburden/rock) and dropping it into dump trucks and/or stockpiles, and from the entrainment of roadway surface dust along dump truck travel routes. Fugitive dust emissions were determined for the peak period of each key emission source (e.g., peak soil removal, peak rock removal). The peak period (month and year) for each of these activities was determined from the construction schedule.

Construction Data. Specific construction information used to calculate emissions generated from the construction process includes but not limited to the following:

- the number and (fuel) type of construction equipment to be used;
- equipment usage (hours per day) rates;
- the number of daily construction workers on site during a typical peak construction day;
- the maximum excavation and processing rates on a typical peak day;
- average speed of all construction equipment, heavy vehicles, and commute trips; and
- the average vehicle miles traveled by heavy vehicles and construction workers.

The first step in the analysis was to determine what the potential emission generating activities would be and when they would occur. Next, emission factors were applied to determine the hourly emission rates of each activity.

Construction Equipment Emissions. The types and the number of construction equipment were estimated based on a schedule of expected construction activities to be present on-site. Emission factors for NO_X, CO, PM_{10}, $PM_{2.5}$, and SO_2 from the combustion of fuel for on-site construction equipment (excluding delivery trucks/ heavy vehicles) were developed using the USEPA NONROAD Emission Model. The model is based on source inventory data accumulated for specific categories of off-road equipment. The emission factors for each type of equipment were back calculated from the output files for the NONROAD model (i.e., back calculated from regional emissions estimates as explained in Appendix C). Emission rates for NO_X, CO, PM_{10} and $PM_{2.5}$ (SO_2 emissions were negligible) from combustion of fuel for on-site dump trucks were developed using the USEPA MOBILE6.2 Emission Model. Emission factors associated with fugitive dust emissions from mobile equipment were developed using equations presented in USEPA's *AP-42, Compilation of Air Pollutant Emission Factors.*

Project Site Construction Activities Analysis. The construction analysis evaluated the potential impact of construction emissions in terms of the criteria pollutants (CO, SO_2, NO_2 and PM_{10}) and $PM_{2.5}$ emissions. Site preparation and general construction would involve the use of heavy-duty construction equipment during most of the construction period.

Emissions from five activities were estimated:

- Overburden and debris removal
- Overburden and debris load-out to trucks
- Rock drilling and blasting
- Rock load-out to trucks
- Road dust

Dispersion Modeling. Atmospheric dispersion modeling was conducted to calculate air quality impacts from construction activities at offsite receptors. The USEPA refined dispersion model, the Industrial Source Complex Short Term 3 (ISCST3) model Version 02035 was used, dated 4 February 2002. ISCST3 is a Gaussian dispersion model applicable to neutrally buoyant and buoyant plumes. It can handle emissions from multiple point, area and volume sources.

Building downwash was considered but not used in the air dispersion model and the onsite buildings would not have been constructed. Building downwash would not be expected to be a significant factor in determining maximum ground level concentrations.

Emission Rates. The emission factors were multiplied by the appropriate hourly throughput (e.g., tons of material removed, vehicle miles traveled) and conversion factors to determine the emission rates in units required by the dispersion model. The work area was mapped in a grid pattern to identify the locations of equipment and dust producing activities. All trucks traveling within the construction site would be restricted to 5 mph or less on the paved perimeter road. The emissions were input as volume sources for mobile equipment and point sources for stationary equipment. Fugitive emission rates and engine exhaust emission rates were then summed to determine the total emission rate, which was used as input to a dispersion model to predict ambient concentrations.

Receptor Locations. ISCST3 was used to predict maximum pollutant concentrations at designated receptors. Three sets of receptors were generated for the analysis; fenceline, Cartesian grid and sensitive land uses. The fenceline receptors were placed at approximately 25 meter intervals along the property boundary. The Cartesian grid receptors extend out to approximately ½ km in all directions from the site. Sensitive receptors included nearby hospitals, educational facilities, institutional facilities and a medical laboratory. Receptors were set at 1.8 meters above the terrain, at the breathing level of a standing adult.

3.10.4. Mitigation

No significant mobile source impacts are predicted for the proposed facility or its construction. However, some proposed traffic mitigation measures could potentially have a negative effect on air quality concentrations at some receptor locations. Therefore, where significant traffic mitigation measures (e.g., intersection reconstruction or traffic signal installation) were proposed, the analysis was rerun to present the effect of the proposed traffic mitigation measures on air quality.