FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE CROTON WATER TREATMENT PLANT
METHODOLOGIES

4.11. AIR QUALITY

4.11.1. Introduction

This air quality study of the proposed Croton Water Treatment Plant (WTP) presents a project-level analysis of the potential local and regional air quality impacts that could result from mobile, stationary, and fugitive sources of emissions caused by construction and operations at the three proposed water treatment plant sites. This methodology describes pollutant emissions estimation and modeling approaches, and identifies the types of data and assumptions used in the analyses.

4.11.1.1. Pollutants for Analysis

4.11.1.1.1. Carbon Monoxide

Carbon monoxide, 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 Croton project 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 Croton project. Fossil fuel-fired construction equipment also emits CO. Emissions from onsite (stationary) construction emissions were also evaluated.

Facility operation would include exhaust from stationary combustion equipment (boilers and emergency generators) and fuel cells. CO impacts from stationary sources during facility operation were also evaluated.

4.11.1.1.2. Nitrogen Oxides and Volatile Organic Compounds

Nitrogen oxides and volatile organic compounds 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 project 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 proposed Croton project 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 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 called 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). If there are predicted exceedances of SGCs or AGCs on the surrounding community from the exhaust emissions of a facility, including the background concentrations where such data are available, an assessment of the potential control measures and/or modifications that would be required to eliminate the predicted exceedances resulting from the incremental impact of the project would have to be addressed.

The proposed Croton project will result in emissions of NO_x and VOCs from the installation of boilers and emergency generators. Potential impacts associated with the operational emissions from the proposed Croton project were analyzed and an inventory of emissions for the Toxic Air Contaminants (TAC) was performed.

4.11.1.1.3. 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 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 are associated with the proposed Croton project. Therefore, no analysis was warranted.

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

Particulate matter 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 um 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 and stationary sources (construction and operational) in the surrounding neighborhoods. Potential incremental impacts $PM_{2.5}$ from the proposed Croton project compared to the representative Future Without the Project condition were also performed.

4.11.1.1.5. Sulfur Dioxide – SO_2

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. No significant quantities are emitted from mobile sources. Monitored SO_2 concentrations in New York City are below the national standards. For the proposed Croton project, SO_2 impacts from mobile sources were not warranted.

Construction of the proposed Croton project 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.

4.11.1.1.6. Conclusions

The areas of potentially significant air quality impacts from the Croton project facilities that require an analysis are the following:

- Effects from project induced traffic from construction or operation;
- Potential stationary source impacts from fossil fuel combustion of the plant's boilers and emergency generators; and
- Potential impacts from construction activities and equipment.

4.11.1.2. Regulatory Basis

The proposed project will generate air 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 project 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: Onsite stationary sources at the proposed water treatment plant include combustion equipment. Products of combustion, including oxides of nitrogen (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter smaller than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$), and lead (Pb) are produced. Toxic Air Contaminants (TAC) and Hazardous Air Pollutants (HAP) are also emitted in trace amounts from combustion sources. AP-42 has 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.

The methodology detailed in the *New York City Environmental Quality Review (CEQR) Technical Manual, Chapter3Q - Air Quality* (2001), was applied to the analyses. Other Federal and State guidance were applied, as appropriate, to craft project-specific analyses to assess air quality impacts.

4.11.1.2.1. State Implementation Plan (SIP)

The Clean Air Act, as amended in 1990 (CAA) defines non-attainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated a non-attainment by USEPA, the state is required to develop and implement a State Implementation Plan (SIP), which is a state's plan on how it will meet the NAAQS under the deadlines established by the CAA.

USEPA has recently re-designated New York City as in attainment for CO. The CAA requires that a maintenance plan ensure continued compliance with the CO NAAQS for former non-attainment Areas. New York City is also committed to implementing site-specific control measures throughout the city to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period.

Manhattan has been designated as a moderate NAA for PM_{10}. On February 13, 2004 New York State formally recommended that USEPA designate the five counties of New York City Metropolitan Area as non-attainment for $PM_{2.5}$; USEPA will finalize the designations by December 31, 2004. Once non-attainment designations take effect, the state and local governments have three years to develop implementation plans designed to meet the standards.

Nassau, Rockland, Suffolk, Westchester and the five counties of New York City have been designated as severe non-attainment for ozone 1-hour standard. In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*, which addressed attainment of the one–hour ozone NAAQS by 2007, and has recently submitted revisions to the SIP. These SIP revisions included additional emission reductions that USEPA requested to demonstrate attainment of the standard and to update the SIP estimates using a new USEPA model to predict mobile source emissions—MOBILE6. On April 15, 2004 USEPA designated these same counties as moderate non–attainment for the new 8–hour ozone standard (effective June 15, 2004). USEPA will revoke the 1–hour standard in June, 2005, however the very specific control measures for the 1–hour standard included in the SIP will be required to stay in place until the 8–hour standard is attained. The discretionary emissions reductions in the SIP would also remain but could be revised or dropped based on modeling. A new SIP for ozone will be adopted by the state no later than June 15, 2007, with a target attainment deadline of June 15, 2010.

4.11.1.2.2. City Environmental Quality Review (CEQR) - Significance Impact Criteria

For all criteria pollutants, if projects impacts cause or contribute to an exceedance of the National Ambient Air Quality Standards (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 New York City Environmental Quality Review (CEQR) Technical Manual, are explained in the next paragraph below. Table 4.11-1 presents the NAAQS for each pollutant and averaging time period. Note that Total Suspended Particulate (TSP) is no longer federally regulated.

A major source is one where emissions of any CO, SO_2 or PM_{10} are above 100 tons per year. The region is classified severe non-attainment for ozone. Volatile organic compounds (VOC) and NO_2 are precursors of ozone. Due to the non-attainment status of the region, the major source threshold for VOCs and NO_2 is 25 tons per year.

Hazardous air pollutants (HAP) are regulated under Title III of the Clean Air Act Amendments for 1990. Emissions of 10 tons or more annually of any individual HAP, or of 25 tons per year of all HAPs, would classify the facility as a major source.

TABLE 4.11-1. NATIONAL AND NEW YORK STATE AMBIENT AIR QUALITY STANDARDS (AAQS)

POLLUTANT	Primary[1]		Secondary	
	ppm	μg/m^3	ppm	μg/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

TABLE 4.11-1. NATIONAL AND NEW YORK STATE AMBIENT AIR QUALITY STANDARDS (AAQS)

POLLUTANT	Primary[1]		Secondary	
	ppm	$\mu g/m^3$	ppm	$\mu g/m^3$
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 8-hour ozone and the $PM_{2.5}$ standards were not adopted until July 1997 and would not go into effect until fall of 2005.
3. The 24-hour NYS standard is 250 $\mu g/m^3$. TSP is no longer a federally regulated pollutant.
4. **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 $\mu g/m^3$

4.11.1.2.3. Carbon Monoxide Increment Criteria

New York City has developed criteria to assess the significance of the incremental increase in CO concentrations that would result from proposed projects or actions, as set forth in the *City Environmental Quality Review (CEQR) Technical Manual*. These criteria (known as de minimis criteria) set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Action 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline concentrations and the 8 hour standard, when No Action concentrations are below 8.0 ppm.

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

An analysis was undertaken to estimate and evaluate the potential impact of the proposed project on both localized and neighborhood-scale exposure to $PM_{2.5}$. An initial screening was conducted to identify locations where the maximum hourly project induced traffic would result in more than 21 trucks. 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.

For proposed sources with the potential for more than 21 truck trips per hour, potential emissions of $PM_{2.5}$ and dispersion in the surrounding area were calculated. 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 would be considered potentially significant adverse impacts. 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; and 3) a description of the stationary source $PM_{2.5}$ impact assessment.

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 for both the primary and secondary standards:

- 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, USEPA has not yet formally determined if the New York City (or counties within the City) or Westchester County will be designated 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 will be considered to result in potential significant adverse impacts. Actions subject to *CEQR*, which fail such criteria, will require the preparation of an Environmental Impact Statement and an examination of potential measures to reduce or eliminate such potential significant adverse impacts.

4.11.1.3. Methodology for Predicting Pollutant Concentrations from Mobile Sources During Construction

The prediction of construction equipment and 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 pollutant conservatively high concentrations, particularly under adverse meteorological conditions.

The mobile source analyses for the proposed project employs 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 conservative estimate of anticipated CO, PM_{10} and $PM_{2.5}$ concentrations that could ensue from the proposed Croton project.

The mobile source analyses for construction of the proposed project employs an emission inventory analysis and modeling approach approved by USEPA that has been widely used for evaluating air quality impacts of construction projects in New York City, New York State and throughout the country. The emission inventory approach includes an estimated monthly construction work schedules, number of equipment, and number of workers anticipated during the construction of the proposed Croton project. The level of construction activities will vary from month to month and it may take an estimated six to seven years to complete the construction. A reasonable worst-case scenario was determined based on the highest number of construction equipment used during the heaviest construction activity period. The dispersion modeling approach includes a series of conservative assumptions relating to meteorology, worst-case construction emissions, and background concentration levels resulting in a conservatively high estimate of anticipated PM_{10} and $PM_{2.5}$ concentrations that could ensue from the proposed construction of the Croton project.

4.11.2. Air Quality Analysis Scenarios

Air quality analyses were performed for the following two scenarios: (1) Future Without the Project condition, and (2) Future With the Project condition. The two Scenarios were considered for both the construction and operation period. Stationary source and mobile source impacts were analyzed for construction and operation.

4.11.2.1. Mobile Source Analytical Approach

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

4.11.2.1.1. Vehicle Emissions Data

To predict ambient concentrations of CO generated by vehicular traffic, emissions from vehicle exhaust systems must be estimated. In addition to exhaust emissions, particulate matter emission estimates must also consider road dust, and dust from tires and brakes. Vehicular CO, PM_{10} and $PM_{2.5}$ emissions were computed using the USEPA-developed mobile source emissions models, MOBILE6.2. Composite emission factors for CO, PM_{10} and $PM_{2.5}$ were calculated for each roadway link based on the proportion (or fraction) and speed of each vehicle type. When vehicles are stopped, idle emissions are calculated.

Vehicle Classifications. Traffic surveys were conducted in May 2002 and June 2003 to obtain information on traffic volume, delay time and vehicle classification at different intersection locations. Data gathered from the traffic monitoring were processed using the Highway Capacity Manual methodology and HCS2000 software. Vehicle classification data from the May 2002 and June 2003 traffic surveys were used for the Harlem River, Mosholu and Eastview Sites. Projected future baseline traffic volumes were assumed to have the same percentages of vehicles for each category.

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.

Where recorded travel time data were not available, the traffic engineers estimated the road segment speeds based on their observations of traffic volumes and delays.

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 1999 and other information developed as part of the traffic analysis for the Croton WTP, as described in Traffic and Transportation Section. Traffic data for the Future Without the Project and with proposed project conditions were employed in the respective air quality modeling scenarios. The weekday morning and afternoon peak periods were subjected to the localized microscale analysis (8:00 to 9:00 AM and 5:00 to 6:00 PM for Harlem River and Mosholu; and 6:30-7:30 AM and 3:30-4:30 PM for Eastview). These time periods were selected for the mobile source analysis because they have the highest background traffic and produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

Intersection Selection. The selection of the intersections analyzed for CO and PM analyses included the following criteria for each site:

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 induced traffic;
4) Model the intersection based on the highest traffic volumes and worst LOS

The worst intersection, based on the criteria listed above, was selected for detailed analysis. It was assumed that if the selected intersection does not show an exceedance of the NAAQS, none of the ranked intersections will. The intersections selected for the evaluation of potential microscale pollutant concentration modeling are presented in each of the site alternative chapters.

4.11.2.1.2. Background CO and PM_{10} Levels

The background concentration represents the total CO level not included in the microscale dispersion model (e.g., CO concentrations due to emissions from stationary sources and from traffic beyond the modeled street network). The 8-hour background CO concentration was added to the corresponding 8-hour concentrations predicted by the CAL3QHC model to determine the total 8-hour CO levels at the receptor sites. In a similar manner, the 24-hour background PM_{10} concentration was added to the 24-hour CAL3QHCR predicted concentration to determine total PM_{10} concentrations at receptor sites.

Future Background Concentration. CO background concentrations are based on procedures outlined in a NYCDEP memorandum issued on March 10, 1998. In a similar manner, the 24-hour and annual background PM10 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 existing concentrations.

4.11.2.1.3. 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. 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 $PM_{\mathbf{10}}$ and $PM_{\mathbf{2.5}}$ emission factors. PM emissions were generated assuming the use of ultra-low sulfur diesel (ULSD) for the construction years of 2008 and beyond. No ULSD was used for year 2006 analyses, except for Mosholu Site where ULSD was used only for the project increment. ULSD has a sulfur content of 15 ppm.

4.11.2.2. CO Mobile Source Analysis Methodology

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. For each of these proposed sites, the morning and afternoon peak traffic peak periods were evaluated.

The USEPA published the *Guideline For Modeling Carbon Monoxide From Roadway Intersections* (USEPA, November 1992), which includes the criteria for receptor siting and intersection selection, and the selection of input data for ambient conditions and background concentrations. The guidelines were followed throughout the analysis.

Elevated CO levels 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.

If the selected intersections do not show an exceedance of the NAAQS, none of the ranked intersections would as well. That is, the selected intersections will have the highest CO impacts and intersections with less traffic volumes and congestion will have lower ambient air quality impacts. An intersection with the highest traffic volume and poor level of service was selected for each site. If no exceedance of the CO NAAQS occurs when the results of the intersection modeling are added to the urban background CO concentration, then the CO attainment demonstration is complete. If CO exceedances do occur, further controls and analysis of additional intersections are necessary.

In accordance with USEPA guidelines, a modeling analysis was conducted to determine if short-term CO concentrations at these intersections would be anticipated to exceed the NAAQS. CAL3QHC was used to analyze potential CO impacts in the vicinity of the proposed project sites. CO emission factors for vehicles were prepared using the MOBILE6.2 vehicle emission factors model. These emission factors were incorporated into the CAL3QHC model.

The modeled roadways were represented schematically as a series of straight line segments (links). The link system extended a distance of 1,000 feet from the intersection. 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 (approximately 6 feet) was used.

The CAL3QHC model requires traffic volumes and emission factors as input. The peak hour 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 red traffic signals. These parameters, primarily approach capacity and traffic signal phasing data, were obtained from the traffic analysis.

Meteorological Data for CAL3QHC. The transport and 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 reasonable worst-case conditions found in urban areas) was used for the three proposed water treatment plant sites and the two offsite facilities.

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 the CAL3QHC User's Guide, and was set at 127 centimeters for the Eastview Site and 321 centimeters for the Harlem River and Mosholu Sites.

Receptor Locations. Intersections where project-generated traffic was anticipated to have the greatest impact and where the highest pollutant levels were anticipated were selected for locating receptors. At each intersection, individual receptor points were located on the sidewalk (or a distance of 2m (7 ft) adjacent to the roadway) at each corner, 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 modeled at sites located vertically at 1.8 m (6 ft) 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 longer averaging time period. Over an 8 hour period, the atmospheric effects of winds and vehicle traffic activities (e.g., volumes, speeds) would disperse the localized vehicle emissions, thereby reducing the CO average concentration.

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 projects 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 Level 1 indicates exceedance of either one-hour or eight-hour CO NAAQS, either mitigation or Level 2 analysis may be considered. If mitigation is considered, specific measures must be committed to and, if factored into the analysis, eliminate the exceedance, then the analysis is complete. Otherwise, a Level 2 analysis should be performed with CAL3QHCR.

CAL3QHCR. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. A five-year meteorological data set is used with hour-by-hour wind speeds, directions and atmospheric stability. 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. In addition to using the five-year met data, the other input data required to operate the CAL3QHCR model are the same parameters used for CAL3QHC. When running the CAL3QHCR dispersion model, the hourly variation in the traffic volume was taken into account based on the collection of 24-hour traffic data.

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

Exhaust emitted from diesel powered vehicles, especially heavy trucks and buses, contain 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 anticipated to cause an 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. CAL3QHCR is used because it will generate output values for 24-hour and annual average time periods. The analysis follows the general methodology recommended for localized mobile source modeling of PM as described in the *CEQR Technical Manual*.

Summary of Mobile Source Modeling Parameters. Modeling parameters used for MOBILE6.2 emission factor models and CAL3QHC and CAL3QHCR dispersion models are summarized in Table 4.11-2 below.

TABLE 4.11-2. MOBILE SOURCE MODELNG PARAMETERS

Model	Parameter	Value
MOBILE6.2 - CO	Region	Low altitude
	Operating mode	1. Start distribution —Specific to New York City for Moshulu and Harlem River —Specific to Westchester County for Eastview 2. Cold Start–12 hours soak time 3. Hot Start–10 minutes soak time
	Ambient temperature	51^{o}F
	Vehicle mix	Traffic studies in 2002 and 2003
	Analysis years	2006, 2008 2009, and 2010 (depending on the site)
	Inspection/ Maintenance	Yes
	Anti-tampering program	Yes
	Reformulated gasoline	Yes
	Vehicle speed	Estimated idle and running speeds from traffic analyses.

TABLE 4.11-2. MOBILE SOURCE MODELNG PARAMETERS

Model	Parameter	Value
MOBILE6.2-PM	Region	Low altitude
	Speed cycle	Transient
	Unpaved silt percentage	4.3%
	Silt loading	0.16 g/m^2 – secondary streets, 0.10 – arterials, 0.02 – expressways
	Particle size cutoff	10 microns & 2.5 microns
	Average vehicle weight	5,565 lbs for Eastview Site 5,149 lbs for Harlem River Site 5,149 lbs for Mosholu Site
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 321 cm Harlem River Site 321 cm Mosholu Site
	Settling velocity	0.0
	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 type	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

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

4.11.2.3. Future Without the Project

In the "Future Without the Project" scenario it is assumed that there would be no changes to the existing condition of the proposed water treatment plant alternative sites except for the potential increase in vehicle emissions from the region due to population growth. To disclose the highest impacts that are represented by the difference between the Build and No Build scenarios, the peak construction year (2008 for Eastview, 2009 for Harlem River and 2010 for Mosholu) at each potential site was considered.

PM_{10} microscale analyses were conducted for 24-hour and annual impacts. For $PM_{2.5}$, a microscale analysis was also performed for 24 hour impacts and a neighborhood analysis for annual impacts. The refined dispersion model, CAL3QHCR was used for the PM_{10} and $PM_{2.5}$ analysis.

The neighborhood analysis for annual $PM_{2.5}$ impacts considered only vehicle exhaust PM emissions. Receptors were located 15 meters from intersections, consistent with USEPA siting requirements for ambient pollutant monitoring equipment.

4.11.3. Potential Impacts

Under the Future With the Project scenario, the air quality analyses would include construction activities, project-generated trips, and operations of the proposed water treatment plant and other facilities. Mobile and stationary sources were analyzed for construction and operation of the project and are presented under the "Potential Impacts" section. The scenario years varied for each alternative site based on construction schedules and the commencement of the proposed plant operations. Detailed discussions of these analyses are presented in each Project Alternative Section.

4.11.3.1. Potential Project Impacts

A mobile source analysis was conducted to assess impacts from project induced traffic. The CEQR Technical Manual has a screening threshold of 100 vehicles trips per hour, below which a detailed CO dispersion analysis is not required. The threshold for a PM analysis is 21 truck trips per hour. These thresholds were applied each site. Project induced traffic impacts were determined by subtracting the future No Build model result from the future Build result to obtain the project increment.

4.11.3.1.1. Stationary Source Impacts From Facility Operations

Operations at the water treatment plant 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 natural gas-fired boilers, emergency diesel generators and fuel cells. The laboratory and water treatment processes also have the potential to emit regulated substances.

Boiler System. The boiler system for the proposed project would provide heat and hot water. The system for each of the proposed sites would consist of three packaged firetube boilers, each rated at approximately 20.0 million British Thermal Units per hour (MMBtu/hr) heat input at the Harlem River Site, 16.7 MMBtu/hr at Eastview and 23.4 MMBtu/hr at Mosholu. Two boilers would be operational at any one time, with the other boiler as a standby unit. Both criteria pollutants and Toxic Air Contaminants (TAC) would be emitted.

Emergency Generators. The emergency generators would consist of two 1,500 kilowatt (kW) diesel fuel-fired engine generators. Only one would operate at a time, and only to be exercised or used during an emergency power outage condition. The emergency generators would be exercised approximately one hour per month. Two emergency generators would not be operated simultaneously.

Laboratory Hoods. Limited process control water testing would be conducted in a small on-site laboratory. Volatile chemicals would be used under a laboratory hood exhausted through a stack on the roof. Normal laboratory operations are not anticipated to have a significant impact on ambient air quality. Accidental spills of any consequence are not likely to occur due to the small quantities of chemicals to be used for testing.

Nevertheless, an assessment of potential exhaust concentrations was performed using sulfuric acid as an example. The sulfuric acid would be relatively diluted (0.02 Normal) and used in 25 milliliter (ml) quantities for alkalinity testing. Conservatively, assuming that all 25 ml would be exhausted through the hood stack over the course of an hour (either due to a spill or from regular usage) emission rate was calculated. The USEPA SCREEN model was used to calculate the ground level concentration at the highest receptor. This concentration was compared to the NYSDEC 1-hour Short-term Guideline Concentration (SGC) for sulfuric acid, 120 mg/mg^3, to assess the potential air quality impact of laboratory emissions.

Odors. Water treatment plants similar to the proposed Croton facility rarely have odor problems. A site visit to an existing treatment plant with a similar process as the one proposed here was conducted by NYCDEP air quality technical staff. The residuals stored inside the plant that were waiting to be hauled off for disposal produced a musty, fishy odor directly above the containers. This odor was not apparent outside the facility, even near the exhaust fan louver that ventilated the residuals room. "Nevertheless, the potential for odors from the treatment process has been addressed. Provisions for future design and installation of odor control technologies are incorporated in the Preliminary Design for Residual Facilities." Space for installation of odor treatment system is reserved in case odor becomes a problem.

4.11.3.1.2. Dispersion Modeling

Criteria Pollutant ISCST3 Modeling. The potential impacts of the boiler system and the emergency generators emissions 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 the most recent available years, were used. The meteorological data provided hour-by-hour wind speeds and directions, stability states and temperature inversion elevation over the five-year period.

ISCT3 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. 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. Locations of sensitive receptors in the vicinity of the proposed project were also included.

The stack elevations 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 for an approximately 3 kilometer radius around each water treatment plant, Urban classification was selected for each 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. Annual background values are from the year with the highest annual concentration. Where five contiguous years of recent monitoring data were not available, a minimum of three years were used.

Each emergency generator was assumed operating at full capacity for one hour per week. Both generators would not be operated at the same time.

The results of dispersion modeling were added to background concentrations obtained from NYSDEC monitoring stations. The second highest monitored value was used for short-term averaging periods of 24-hours or less, and the highest monitored value was used for annual averaging periods.

Volatile Organic Compounds (VOC) Modeling. The ISCST3 model was used to calculate 1-hour ground-level-concentrations of toxic air contaminants (TACs) from boilers and diesel generators. TACs are the result of combustion processes. Emission factors from TACs are obtained from *AP-42, Compilation of Air Pollutant Emission Factors,* USEPA, 1995 (with on-line updates).

The same receptor grid used at each water treatment plant site for criteria pollutant modeling was used for VOC modeling. Elevated terrain was used, as were flagpole receptors at nearby sensitive receptor locations.

A unitary emission rate of 1.0 grams per second was used from one boiler and one engine generator. The maximum concentration from the boiler and also from the engine generator based on a 1.0 gram per second rate was multiplied by the emission factor for each pollutant. The results were added. These concentrations were compared with the 1-hour New York State Short-term Guideline Concentrations (SGC) for each pollutant.

To estimate annual concentration, the 1-hour concentrations were multiplied by the annual persistence factor of 0.08. Annual concentrations were compared with New York State Annual Guideline Concentrations (AGC) for each pollutant.

4.11.3.2. Potential Construction Impacts

4.11.3.2.1. Estimation of Construction-Related Emissions

Construction activities would take place at a number of locations for the proposed Croton project. An analysis was performed separately to assess potential impacts on air pollutant concentrations from construction activity. To determine which activities and locations should be used for the model, the following factors were considered: intensity and duration of construction activities; proximity to sensitive uses; ability to represent activities that would occur in other places within the construction zone; and the proximity of existing traffic congestions. Most of these activities were identified in the multi-year construction scheduling and phasing plans for each alternative. The following describes the methodology used to evaluate possible impacts from these construction activities.

Ground-level construction emissions are emissions from construction equipment, transportation of material and personnel, and fugitive dust. Total emissions for CO, NO_2, SO_2, VOC, PM_{10} and $PM_{2.5}$, were calculated for the above activities. The construction emissions were calculated in two parts; exhaust emissions and fugitive dust emissions. The approaches used in this analysis may be representative for the exhaust emissions because the USEPA's *NONROAD 2002a Model* emission rates reflect the current and predicted construction equipment technology and emission rates. However, the fugitive dust emissions may be overestimated because the USEPA's AP42, *Compilation of Air Pollutant Emission Factors* emission rates do not reflect the currently available soil stabilization techniques.

4.11.3.2.2. Construction Analysis Methodology

The construction activities analysis evaluated the potential impacts of the criteria pollutants (i.e., CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$) emissions resulting from the construction of the proposed project. The analysis considered a variety of fugitive dust sources: land clearing, excavation, rock drilling and crushing, gravel delivery, and travel over on-site roadways. The latter emissions arise from the entrainment of roadway surface dust. The analysis also considered a variety of measures to reduce fugitive dust emissions: such as watering twice daily, enforcing construction trucks and equipment to operate at 5 mph or less on-site, and truck routes to be paved on-site.

Exhaust Pollutant Emission Sources. During construction, various types of fuel burning construction equipment will be used at different locations throughout the site. The release of airborne pollutants from the combustion of fuel created by heavy vehicles operating in work areas are the source of air emissions. Most of the equipment would operate on an intermittent basis. Some of the equipment is mobile and will operate in specified areas while some will remain stationary on-site at distinct locations. Because a variety of construction techniques could be used to build a particular project element, the parameters used to estimate construction emissions are based on the daily maximum (capacity) peak construction activity.

Particulate Emission Sources. The primary activities that would have the greatest potential to generate significant quantities of fugitive dust would be debris removal, soil removal, rock removal, and gravel delivery. For the removal of debris, soil, and rock from the site, emissions would be generated by backhoes and loaders excavating the material and dropping it into trucks (or barge for the Harlem River Site), and from the trucks traveling over on-site roads. Rock removal would also involve emissions from rock drilling and crushing. Gravel delivery to the site would generate emissions from dropping the material from the truck bed (or lift the gravel material from the barge and dropping it on the surface via crane), from loaders used to spread the gravel, and from truck travel over on-site roads.

Fugitive dust emissions were determined for each of the alternative sites and 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 for each alternative site. Not all of the primary activities would occur at every site, but some would occur concurrently. Accordingly, if rock and debris removal would occur during the peak period for soil removal, all of these emissions were determined. In this manner, the overall worst-case period (i.e., the month with the highest total emissions) could be determined.

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, delivery vehicles, and commute trips; and

- the average vehicle miles traveled by construction equipment 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. Construction equipment usage was estimated based on a schedule of construction activities for the alternatives. Emission factors for NO_2, 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. Data provided in the output files for the NONROAD model were used to derive (i.e., back calculated from regional emissions estimates) these emission factors for each type of equipment that is anticipated to be present on-site during construction activities. Emission rates for NO_2 PM and CO (SO_2 emissions were negligible) from combustion of fuel for on-site delivery trucks/heavy vehicles were developed using the MOBILE6.2 Emission Model. Emission factors associated with fugitive dust emissions from mobile equipment were developed using equations presented in USEPA's AP-42 and "A Compilation of Air Pollution Emission Factors."

Mobile Sources.

Mobile source emissions of CO, PM_{10} and $PM_{2.5}$ associated with on-road vehicles used to transport construction employees and materials were calculated based on project designs. MOBILE6.2 was used to obtain on-road exhaust emission factors for each of the corresponding vehicle classifications (i.e., light duty vehicles for employee travel). Emissions from trucks used to transport materials to and from the project site were included. Mobile source emissions from the No Build scenario for the peak construction year were also calculated, and subtracted from the Build scenario to obtain the effect of this project's mobile sources.

Construction vehicle emissions were quantified based on the anticipated construction schedule, construction employment, and travel distances within the construction site. The number of construction worker's vehicles was estimated based on the project construction design plan.

A stationary source construction impact analysis was also conducted. The maximum $PM_{2.5}$ increments from both construction stationary and mobile sources were added and compared with $PM_{2.5}$ interim guideline criteria.

WTP Site Construction Activities Analysis

The construction activities analysis evaluated the potential impact of construction emissions in terms of the criteria pollutants (CO, SO_2, NO_2 and PM_{10}) and fine particulate ($PM_{2.5}$) emissions. The grading and excavation activities will involve the use of heavy-duty construction equipment during the first and third phases of the entire construction period. Detailed discussion of the construction activities are discussed in the Alternative Sections.

Emissions from six activities were estimated:

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

Emission Rates. The emission factors were multiplied by the appropriate hourly throughput (e.g., tons of material removed, VMT) 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 entering the site were modeled at an enforceable speed of 5 mph or less.

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 Version 3 (ISCST3) model was used. The release is designated Version 02035, 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.

Sources and Emission Rates. Emissions from construction activities include dust from material handling and exhaust from diesel fuel-fired construction equipment. Short and long-term emission rates were estimated as described above. Emissions were assumed to occur only during the daytime since work would be conducted for during days only. Emission rates were converted to grams per second for input to the ISCST3 model. Almost all construction activities would occur at or below grade; the elevation of each area source was conservatively assumed to be at grade.

The model was run in the concentration mode. Urban dispersion coefficients were selected for the Eastview Site, the Harlem River Site, and the Mosholu Site.

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

Receptor Grid. For all three sites, receptors were located along the fenceline at approximately 100-foot intervals. Neighborhood receptors were located beyond the effective property boundary. These neighborhood receptors were located at 100-meter intervals. Maximum impacts from ground-level area sources typically would be anticipated at the nearest receptors, with concentration attenuating with distance. The locations of sensitive receptors were discretely entered into the model. Flagpole receptors with an elevation of 1.8 meters were used to represent the level of the approximate breathing zone of the average adult.

Meteorological Data. Representative meteorological data consist of La Guardia Airport surface measurements and Brookhaven upper air data. Hourly preprocessed meteorological data for the period 1998 through 2002 were used.

Offsite Facilities Analysis

Mobile and stationary source emissions from offsite facilities were considered.

Mobile sources. A mobile source screening analysis was conducted to identify whether or not activities at each location resulted in a sufficient number of peak hour of project induced vehicles to warrant more detailed analysis. Mobile source emissions from project induced traffic were compared with significance thresholds of 100 vehicles (cars) per hour for CO and 21 trucks per hour for $PM_{2.5}$. If fewer than these threshold vehicle trips occur during the peak hour, no significant impacts would occur. If more than the threshold number of vehicle trips is predicted then additional analysis would be necessary to demonstrate that project related mobile source impacts are not significant at offsite facilities.

Construction Activities. Offsite facilities include shaft sites and gate houses. As part of the Eastview Site project alternative, some offsite facilities will require refurbishing. Most of the work would be done in the below-ground structures (inside the shaft and tunnels), with limited site work outside of the structures. The above ground construction work at the offsite facilities would be of short duration and would not be anticipated to last more than three months. Emissions would be low and will vary accordingly to the phasing of construction schedule.

Low-levels of emissions from tunnel construction activities will be exhausted via the tunnel ventilation system. Construction would occur on a normal work schedule—8 hours per day, 5 days per week.

Facility Operation. No stationary or mobile source impacts are anticipated during operation of offsite sources. No air quality analyses are proposed for facility operation of offsite sources.