Air Quality

Chapter 17

Ambient air quality, or the quality of the surrounding air, may be affected by air pollutants produced by motor vehicles, referred to as "mobile sources"; by fixed facilities, usually referenced as "stationary sources"; or by a combination of both. Under CEQR, an air quality assessment determines both a proposed project's effects on ambient air quality as well as the effects of ambient air quality on the project. Proposed projects may have an effect on air quality during operation and/or construction. This chapter provides background information on air quality, discusses whether an assessment is appropriate, and describes the methods used to assess potential impacts from a proposed project and determine their significance.

As mentioned throughout the Manual, it is important for an applicant to work closely with the lead agency during the entire environmental review process. In addition, the New York City Department of Environmental Protection (DEP) often works with the lead agency during the CEQR process to provide technical review, recommendations and approval relating to air quality. When the review identifies the need for long-term measures to be incorporated after CEQR (prior to or during development), the lead agency, in coordination with DEP, determines whether an institutional control, such as an (E) Designation, may be placed on the affected site. The Mayor’s Office of Environmental Remediation (OER) has the authority and responsibility for administering post-CEQR (E) Designations and existing Restrictive Declarations recorded on privately-owned parcels, pursuant to Section 11-15 (Environmental Requirements) of the Zoning Resolution of the City of New York and Chapter 24 of Title 15 of the Rules of the City of New York.

100. Definitions

110. SOURCES OF POLLUTANTS

111. Mobile Source

Vehicular traffic, whether on a road or in a parking garage, may affect air quality. Other moving sources, such as planes, helicopters, boats, trains, *etc.*, may also affect air quality. All of these sources of pollution are termed "mobile sources."

In general, mobile source analyses consider projects that add new vehicles to the roads, change traffic patterns by diverting vehicles, include parking lots or garages, or add new uses near sources of pollutants, such as when a park is proposed adjacent to a highway.

112. Stationary Sources

Sources of pollutants that are fixed in location, rather than mobile, are termed "stationary sources." Stationary sources that may cause air quality impacts include exhaust from boiler stack(s) used for the heating, hot water, ventilation, and air conditioning systems of a building; the process exhaust points of a manufacturing or industrial operation; the stack emissions from a nearby power generating station; or the emissions from incinerators or medical or chemical laboratory vents.

A proposed project may have significant stationary source air quality impacts if it creates new stationary sources that affect the air quality in the surrounding community, such as a large new boiler that exhausts pollutants into the air. Conversely, stationary source impacts may also result when a proposed project introduces new uses that would be affected by emissions from existing fixed facilities, such as locating a new residential building beside an existing power generating station. Proposed buildings may also cause stationary source impacts by changing the building geometry or topography of an area so that existing fixed facilities begin to adversely affect other existing structures in the area.

Odors may also result from stationary sources. Significant odor impacts may occur when a new, odor-producing facility is created by a project, or when a project adds sensitive uses close to an odor-producing facility.

113. Construction Activities

Potential air quality impacts from construction activities may include dust emissions generated by the construction of a new facility (or, likewise, the demolition of an existing structure that contains asbestos—see Chapter 12, “Hazardous Materials,” for further discussion on this issue); dust emissions related to sandblasting; emissions from construction equipment (typically an issue of concern for very large, multiphase projects); or emissions from construction-generated traffic or diversion of traffic because of construction activity. Because such impacts are frequently temporary, even though the duration of construction activities may last years, construction impacts on air quality are examined separately in Chapter 22, “Construction.”

120. POLLUTANTS OF CONCERN

National and state regulations identify a number of air pollutants that are of concern nationwide and statewide. These include seven key pollutants of general concern, and numerous other pollutants of concern primarily due to industrial activities. Some pollutants, such as lead, may be present in the soil or groundwater as well. A discussion of the potential impacts associated with soil and groundwater contamination is included in Chapter 12, “Hazardous Materials.”

121. National and State Ambient Air Quality Standards

As required by the Clean Air Act (CAA), National Ambient Air Quality Standards (NAAQS) have been established for the following air pollutants of concern: carbon monoxide, nitrogen dioxide, ozone, respirable particulate matter, sulfur dioxide, and lead. Particulate matter is regulated in two size categories: (i) particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$); and (ii) particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). Table 17-1 shows the primary and secondary standards for these pollutants. According to EPA, the primary standards are intended to protect the public health and represent levels at which there are no identified significant effects on human health. The secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. For carbon monoxide, nitrogen dioxide, ozone, and respirable particulates, the primary and secondary standards are the same.

121.1. Other National Standards

EPA also publishes the National Emission Standards for Hazardous Air Pollutants (NESHAP), which limits the emission rates of certain highly toxic compounds, in most cases for specifically selected processes or operations. NESHAP includes emission limitations for arsenic, asbestos, benzene, beryllium, mercury, radionuclides, and vinyl chloride. See 40 CFR 61. In addition, the U.S. Occupational Safety and Health Administration's (OSHA) and National Institute for Occupational Safety and Health (NIOSH) Short-Term Exposure Levels (STELs) may be used as a guideline for emissions typically present for short periods of time, such as emissions resulting from chemical spills. In addition, EPA has promulgated regulations that govern emissions of 187 listed Hazardous Air Pollutants (HAPs) from major facilities and area sources. Major sources are defined as sources that emit either 10 tons per year of any of the listed pollutants or 25 tons per year of a mixture of listed air pollutants.

Under the CAA, New York State requires the implementation of Reasonably Available Control Technology (RACT) at facilities in the New York City metropolitan area that have the potential to emit volatile organic compounds (VOC) of 25 tons or more per year.

121.2. State Standards

NEW YORK STATE AMBIENT AIR QUALITY STANDARDS

NAAQS have been adopted as the ambient air quality standards for the State of New York. In addition to NAAQS, there are New York State Ambient Air Quality Standards (NYAAQS) for total suspended particulate matter (TSP), settleable particles, non-methane hydrocarbons (NMHC), and ozone, which correspond to federal standards that have since been revoked or replaced; and for beryllium, fluoride, and hydrogen sulfide (H_2S), which are generally associated with industrial projects.

NONCRITERIA POLLUTANTS

The New York State Department of Environmental Conservation (DEC) also publishes maximum allowable guideline concentrations for certain pollutants, known as "noncriteria pollutants," for which the EPA has no established standards. DEC's guidelines are published in the DAR-1 AGC/SGC Tables. DAR-1 presents Annual and Short-Term Guideline Concentrations (AGCs and SGCs, respectively) for contaminants that range in toxicity from high to low. The AGCs and SGCs are annual and 1-hour guideline concentrations, respectively, for potentially toxic or carcinogenic air contaminants. AGCs and SGCs are guideline concentrations for noncriteria pollutants that are considered acceptable concentrations below which there should be no adverse effects on the general public's health. AGCs and SGCs within the DAR-1 are updated periodically, therefore, the latest available DEC DAR-1 AGC/SGC Tables must be used when employing AGCs and SGCs for analyses.

Table 17-1
National and New York State Ambient Air Quality Standards

	Primary		Secondary	
Pollutant	**PPM**	**Micrograms Per Cubic Meter**	**PPM**	**Micrograms Per Cubic Meter**
Carbon Monoxide (CO)			None	
Maximum 8-Hour Concentration[1]	9	10,000		
Maximum 1-Hour Concentration[1]	35	40,000		
Lead (Pb)				
Rolling 3-month Average	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	100	0.053	100
Maximum 1-Hour Concentration[2]	0.100		None	
Ozone (Photochemical Oxidants—O_3)				
8-Hour Maximum[3]	0.075		0.075	
Inhalable Particulates (PM_{10})				
Maximum 24-Hour Concentration[4]		150		150
Fine Particulate Matter ($PM_{2.5}$)				
Average of 3 Consecutive Annual Means		15		15
24-Hour Concentration[5]		35		35
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80		

Maximum 24-Hour Concentration	0.14	365		
Maximum 1-Hour Concentration[6]	0.075		None	

Note:
[1] Not to be exceeded more than once a year. A violation of standards occurs if these are exceeded more than once.
[2] 3-year average of the 98th percentile of the daily maximum 1-hour average.
[3] 3-Year average of the annual fourth-highest daily maximum 8-hr average concentration.
[4] Not to be exceeded more than once per year on average over 3 years.
[5] 98th Percentile 24 hour concentration averaged over three years.
[6] 99th percentile of the daily maximum 1-hour average averaged over three years. The EPA will revoke the 3- and 24-hour standards in the future.

Source: 40 CFR 50. "National Primary and Secondary Ambient Air Quality Standards."

ODORS

DEC enforces regulations that generally state that no facility should emit measurable amounts of air-borne pollutants that result in the detection of bad odors by the general public. These regulations prohibit "emissions of air contaminants to the outdoor atmosphere of such quantity, characteristic or duration which . . . unreasonably interfere with the comfortable enjoyment of life or property. Notwithstanding the existence of specific air quality standards or emission limits, this prohibition applies, but is not limited, to any particulate, fume, gas, mist, odor, smoke, vapor, pollen, toxic or deleterious emission, either alone or in combination with others." 6 NYCRR 211.2.

122. Regulated Pollutants

The air pollutants for which national or state air quality standards exist, and the potential projects for which they would be of concern, are described below. Some pollutants described above, such as lead, may also be present in the soil or groundwater. A discussion of the potential impacts associated with soil and groundwater contamination is included in Chapter 12, "Hazardous Materials."

122.1. Carbon Monoxide

Carbon monoxide (CO) is produced from the incomplete combustion of gasoline and other fossil fuels. In New York City, about 80 percent of CO emissions are from motor vehicles. Because this gas disperses quickly, CO concentrations may vary greatly over relatively short distances. Elevated concentrations are usually limited to locations near congested intersections and along heavily traveled and congested roadways. Consequently, it is important to evaluate concentrations of CO on a localized, or "microscale," basis. For proposed projects that would generate (or divert) a significant number of motor vehicles, it is appropriate to examine the potential incremental impact on CO levels from this traffic.

122.2. Hydrocarbons, Nitrogen Oxides, and Ozone (Photochemical Oxidants)

Hydrocarbons and nitrogen oxides (NO_x) are of concern because of their role as precursors in the formation of ozone. 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 transported downwind, elevated ozone levels are often found many miles from the sources of the precursor pollutants. The effects of nitrogen oxides emissions from mobile sources are, therefore, generally examined on a regional basis. The regional mobile source emissions of these pollutants are related to the number of vehicle miles traveled throughout the New York metropolitan area. Actions that would significantly increase the number of vehicle miles traveled throughout New York City would require an analysis of emissions of NO_x from mobile sources. As discussed in detail in Section 123, nitrogen dioxide (NO_2) (one component of NO_x) is also a regulated pollutant.

122.3. Lead

Lead emissions are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all vehicles produced after

1980, are designed to use unleaded fuel. In 1996, EPA banned the use of leaded gasoline in on-road vehicles, concluding a 25-year effort to phase out lead in gasoline. As newer vehicles replaced older ones, motor vehicle-related lead emissions have ceased to be a concern. As a result of Clean Air Act regulations, ambient lead emissions in urban areas have decreased by 97 percent nationwide since the 1970s.

Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are below the national standard of 0.15 micrograms per cubic meter (three-month average). If a proposed project would produce significant new sources of lead (*e.g.*, lead smelters), resulting ambient lead levels in the surrounding community should be examined. If a project would include new structures that may be affected by existing stationary lead emitters (*e.g.*, a new residential building proposed to be located near or in a manufacturing zone), it may be appropriate to perform an assessment of ambient lead levels on these structures.

122.4. 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, concrete batching plants, waste transfer stations, *etc.* The primary concern is with respirable particulates that are less than 10 micrometers (μm) in diameter (referred to as PM_{10}), and less than 2.5 μm in diameter (referred to as $PM_{2.5}$). $PM_{2.5}$ is extremely persistent in the atmosphere and has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles.

Gasoline-powered vehicles do not produce any significant quantities of particulate emissions; but diesel-powered vehicles, especially heavy trucks and buses, do emit respirable particulates, most of which is $PM_{2.5}$. Consequently, levels of respirable particulates may be locally elevated near roadways with high volumes of heavy diesel-powered vehicles. Vehicular traffic may also contribute to particulate matter emissions through brake and tire wear and by disturbing dust on roadways.

Parking garages or lots that would accommodate large numbers of diesel-powered vehicles may also elevate PM_{10} and $PM_{2.5}$ levels in the surrounding area. Stationary sources that burn large volumes of fuel oil may also elevate PM_{10} and $PM_{2.5}$ in the surrounding area.

122.5. Sulfur Dioxide

Sulfur dioxide (SO_2) emissions are associated primarily with the combustion of oil and coal, both sulfur-containing fuels. Due to federal rules on the sulfur content in fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. However, assessment of ambient SO_2 levels may be appropriate for projects that result in the development of new stationary sources or new uses near an existing stationary source.

122.6. Noncriteria Pollutants

Noncriteria pollutants include hundreds of toxic pollutants, ranging from high-toxicity contaminants that are known or potential human carcinogens (cancer-causing); moderate-toxicity contaminants, including animal carcinogens, mutagens (causing mutations), and other substances posing a health risk to humans; and low-toxicity contaminants, which are of primary concern as irritants and have not been confirmed as carcinogens, mutagens, or teratogens (causing malformations). Noncriteria pollutants are generally released during industrial processes and may be of concern for projects that would result in new air emissions of such compounds (*e.g.*, hospital waste incinerators) or new development within manufacturing zones. Examples include a project that would result in the development of a residential building near a manufacturing area that has several low-level sources (one- to two-story industrial facilities with multiple exhaust stacks) that emit airborne toxic compounds; or new industrial sources, such as a solid waste facility, that could emit such compounds in potentially significant quantities.

122.7. Odors

In addition to the noncriteria pollutants described above, certain other pollutants are also of concern because of their odor, rather than their toxicity. These are of concern primarily because of the discomfort they may cause, rather than the harm they do to the body. As an example, uncontrolled emissions of ammonia or sulfide compounds may result in detectable malodorous off-site pollutant levels, depending on the processes in which they are being used or from which they are a byproduct. Other compounds that cause odors include amines, diamines, mercapatans, and skatoles. Activities that have the potential for releasing malodorous emissions in significant quantities include light and heavy industrial facilities and waste management facilities, including solid waste management facilities, water pollution control plants (*i.e.*, sewage treatment plants), and landfills.

New York State has a one hour ambient air quality standard for hydrogen sulfide of 10 parts per billion (ppb). While hydrogen sulfide has a malodorous smell (similar to rotten eggs), the 1-hour New York ambient air standard is nuisance-based and is applicable at all off-site locations when analyzed under CEQR. In addition, the DEP uses a 1 ppb increase in hydrogen sulfide concentration from wastewater related processes as a screening value for potential significant odor impact. The 1 ppb guidance level is recommended when considering hydrogen sulfide as an indicator for assessing malodorous compounds from a facility on sensitive receptors (*e.g.*, residences, playgrounds). Since DEP has, in some cases, performed more detailed studies on the sources of malodorous pollutants of concern related to wastewater processes, it should be consulted before undertaking detailed odor impact assessments.

123. Compliance with Standards

EPA designates areas that do not meet one or more of the NAAQS as nonattainment areas (NAA). The CAA, as amended in 1990, requires that each state with a NAA to submit a State Implementation Plan (SIP) that delineates the control strategies to achieve compliance with the NAAQS. New York City complies with the NAAQS for SO_2, NO_2, CO and lead, but is designated as NAA for 8-hour ozone and $PM_{2.5}$.

Historical monitoring data for New York City indicate that the ozone 8-hour standard is exceeded. To be in compliance, the 3-year average of the annual fourth highest maximum 8-hour average concentration should not exceed the ozone 8-hour standard. In August 2007, the state submitted the final proposed revision of the SIP for ozone, documenting how the area will attain the 8-hour ozone standard by 2013. Separately, the state has requested that the NY-NJ-CT metropolitan area (NYMA), of which New York City is part, be reclassified from “moderate” to “serious” nonattainment. In March 2008, EPA revised the 8-hour ozone NAAQS to 0.075 ppm.

Air quality monitoring in Manhattan indicates that the annual average concentration of respirable particulates is above the NAAQS. EPA designated New York County (Manhattan) as a nonattainment area for respirable particulate matter (PM_{10}). The other four New York City boroughs are designated as in attainment for the PM_{10} standards. New York City has been designated as a $PM_{2.5}$ non-attainment area under the CAA due to exceeding both the 24-hour and annual average standard. New York State has submitted a draft SIP to EPA designed to meet the annual average standard by April 8, 2010. By April 2012, New York will be required to submit a SIP demonstrating attainment with the 24-hour standard by 2014 (EPA may grant attainment date extensions for up to five additional years). Monitoring data for the other three national criteria pollutants demonstrate that New York City is in compliance with the corresponding NAAQS for these pollutants.

On February 9, 2010, USEPA revised the Clean Air Act’s primary NAAQS for NO_2 by supplementing the existing annual primary standard of 53 parts per billion (ppb) with a new 1-hour primary standard at 100 parts per billion (ppb) based on the 3-year average of the 98^{th} percentile of the daily maximum 1-hour average concentrations, and establishing a new monitoring program. 75 Fed. Reg. 6475 (Feb. 9, 2010). The final rule became effective on April 12, 2010. The USEPA intends to promulgate initial NO_2 designations of attainment, nonattainment, and unclassifiable areas, using the 3 most recent years of quality-assured air quality data from the current monitoring network. The USEPA will designate as ''nonattainment'' any areas with NO_2 monitors recording violations of the revised NO_2 NAAQS, and intends to designate all other areas of the country as ''unclassifiable'' to indicate that there is insufficient data to determine whether or not they are attaining the revised NO_2 NAAQS. The current monitoring network focuses upon concentrations for general population exposure at neighborhood and larger scales to support the current annual NO_2 standard, and therefore, does not include monitors near major roadways that could measure the localized concentrations, which are estimated to be responsible for the majority of 1-hour peak NO_2 exposures. 75 Fed. Reg. 6479 (Feb. 9, 2010). States must site required NO_2 near-roadway monitors and have them operational by January 1, 2013, which means that sufficient air quality data from the new network will not be available to determine compliance with the revised NAAQS until after 2015.

Until the NO_2 designations are made, USEPA states that "[m]ajor new and modified sources applying for NSR/PSD permits will initially be required to demonstrate that their proposed emissions increases of NO_x will not cause or contribute to a violation of either the annual or 1-hour NO_2 NAAQS and the annual PSD increment." 75 Fed. Reg. 6525 (Feb. 9, 2010) (referring to 40 C.F.R. 51.166(k)). USEPA may provide additional guidance in the future, as necessary, to assist states and emissions sources to comply with the CAA requirements for implementing new or revised NO_2 NAAQS. At this time and for the purposes of CEQR, it is premature to conduct a quantitative assessment of the effects of a project's potential NO_2 emissions on the new 1-hour NO_2 primary standard. Data and technical gaps need to be addressed and neither the EPA nor DEC has promulgated guidance for such an assessment. Currently, the baseline NO_2 data provided by the current monitoring network and the variability of the NO_x to NO_2 conversion factor for purposes of the one-hour standard do not provide for a meaningful ability to predict exceedances of the hourly standard. Under special circumstances, the lead agency may determine that a qualitative or quantitative discussion/analysis of a project's NO_2 emissions in terms of the new 1-hour standard may be appropriate. EPA's clarification memoranda on modeling could be found at http://www.epa.gov/ttn/scram/guidance_clarificationmemos.htm. MOEC will issue further guidance as appropriate.

On June 22, 2010, EPA promulgated a new 1-hour NAAQS for SO_2. The final rule became effective on August 23, 2010. States are required to submit their initial area designation recommendations for SO_2 to EPA no later than June 2011. EPA will designate areas as ''attainment,'' ''nonattainment'' or ''unclassifiable'' for the new 1-hour NAAQS by June 2012. The EPA plans to approve plans needed to provide for attainment and maintenance of the new 1-hour NAAQS by approximately August 2017 in all areas of the state, including any area initially designated "nonattainment,'' and also including any area designated ''unclassifiable'' that has SO_2 sources with the potential to cause or contribute to a violation of the NAAQS.

The limited monitoring data available for non-criteria compounds show that annual monitored arsenic, cadmium, and nickel concentrations are greater than the current AGCs for these substances in New York City. In addition, based on data reported from other urban areas, it is expected that the annual formaldehyde concentrations are greater than the current AGC.

It is recommended that the lead agency check with DEP for the latest background levels and compliance status prior to commencing detailed analyses.

124. Conformity

Conformity, a process mandated by the CAA, requires that air pollution emissions from federal actions not contribute to state air quality violations. Conformity is defined in Section 176(c) of the CAA as conformity to the State Implementation Plan's (SIP) purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards, and ensuring that such activities will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

EPA has promulgated criteria and procedures for determining conformity of all proposed projects that a federal agency is supporting, licensing, permitting, or approving. The purpose of these rules is to determine whether or not the proposed project would interfere with the clean air goals stipulated in the SIP. The criteria and procedures developed for this purpose are called “general conformity'' rules. Currently, the general conformity requirements apply only in areas that are designated "nonattainment" or "maintenance" for CO, lead, nitrogen oxides (NO_x), ozone, PM_{10}, $PM_{2.5}$ and SO_2. A "maintenance" area has been redesignated to "attainment" from "nonattainment" and must maintain the NAAQS for 20 years by following two sequential 10-year plans.

In addition to general conformity, CAA has special “transportation conformity” rules, which support the development of transportation plans, programs, and projects that enable areas to meet and maintain national air quality standards for ozone, particulate matter, and CO, which impact human health and the environment. Transportation conformity is a CAA requirement that calls for EPA, the U.S. Department of Transportation (DOT), and various regional, state and local government agencies to integrate the air quality and transportation planning development process. New York State has also adopted transportation conformity regulations, which are coordinated by the DEC Division of Air Resources.

130. AIR QUALITY ANALYSES

131. Microscale Analyses

Air quality pollutants, except total hydrocarbons (discussed below), may be of concern on a localized, or microscale, level, where elevated concentrations may occur at particular locations. In addition, PM_{10} and $PM_{2.5}$ may also be characterized for a neighborhood area. Therefore, these pollutants are assessed on a microscale level, which considers pollutant concentrations at particular sites.

For these microscale analyses, air quality impacts are assessed by considering the mobile or stationary pollutant source, the type and amount of pollutants being emitted, the dispersion--the way these pollutants mix with the ambient air and become dispersed before reaching the analysis locations, given meteorological conditions (such as wind speed, wind direction, atmospheric stability, and temperature), the distance between the source and the receptor, roadway and building geometry, and other factors. Often, mathematical models are used to estimate emission levels, and mathematical or physical models, such as wind tunnels, are used to evaluate dispersion. Calculating the emissions and their dispersion provides a particular source's contribution of a pollutant level to the ambient air at a given location (called a "receptor"). If appropriate, the calculated value is added to the general background concentrations of that pollutant to obtain the total concentration of the pollutant at the receptor being assessed.

For dispersion modeling purposes, mobile and stationary sources of air pollutants may be considered either line sources, area sources, or point sources, as follows:

LINE SOURCES

Sources of pollutant emissions that can be simulated as a continuous or segmented group of lines in a mathematical model are considered to be "line" sources. Typical examples include vehicles traveling along a roadway that is curved, elevated, at-grade, or below grade with an opening above (otherwise known as a "cut-section"); traffic traversing an unpaved or dusty roadway; or industrial operations, such as conveyor belt operations.

AREA SOURCES

Emissions that can be simulated over a small region are "area" sources. Typical area sources include the following: vehicles traveling in a parking lot or multilevel parking facility; multiple exhaust stacks around the rooftop of a building or several buildings; construction equipment and other activities at a construction site; an outdoor storage area of fine particulate material; or an industrial process that is distributed over large sections of a manufacturing plant.

POINT SOURCES

"Point" sources discharge pollutants from a relatively small, restricted area. Examples of sources typically modeled as point sources are boiler exhaust stacks; power generating station stacks; exhaust vents for release of medical laboratory chemicals; effluent from incinerators; exhaust vents for a parking garage; and vents for pollutant discharges from a spray booth.

The models should generally conform to the EPA's *Guideline on Air Quality Models*, which is periodically updated.

132. Mesoscale Analyses

Nitrogen oxides and hydrocarbons are precursors to ozone formation in the presence of sunlight and, consequently, are concerns on a regional, or mesoscale, level. This ozone formation occurs relatively slowly and takes place downwind from the site of the actual pollutant emission and, therefore, is not related to localized changes. Consequently, the effects of these two classes of pollutants are examined on an area-wide, or mesoscale, basis. The area for examination is typically large, such as an entire borough, or the entire City of New York, or even the tri-state metropolitan area. Such an analysis is rarely performed, however, because few projects have the potential to affect ozone over such large regions. CO, PM, and $PM_{2.5}$ are also analyzed on a regional basis for projects that have the potential to significantly affect background levels of these pollutants.

200. DETERMINING WHETHER AN AIR QUALITY ASSESSMENT IS APPROPRIATE

The following guidance for determining whether air quality analyses are needed was developed by examining historical air quality data in New York City and using prototypical air quality modeling. Table 17-2 may be used to identify the air pollutants that might be of concern for different types of projects.

Table 17-2
Potential Pollutants of Concern for Typical Kinds of Projects or Uses Surrounding Those Projects

Type of Project/Use	Potential Issue of Concern	CO	PM	SO_2	NO_x	O_3	Pb	NC
Office, Retail, Mixed-Use, or Residential Building	Induced Traffic	☐						
	Induced Trucks or Buses	☐	☐					
	Boilers		☐	☐	☐			
	Near Elevated Highway/Bridge	☐	☐					
	Near Large Stacks (*e.g.*, Con Edison)		☐	☐	☐			
Manufacturing or Industrial	Induced Traffic	☐						
	Induced Trucks	☐	☐					
	Boilers		☐	☐	☐			
	Process	☐	☐	☐	☐	☐	☐	☐
Hospital, Medical Center, and Laboratories	Induced Traffic	☐						
	Boilers		☐	☐	☐			
	Incinerators	☐	☐	☐	☐	☐	☐	☐
	Process	☐	☐	☐	☐	☐	☐	☐
Parking Lots/Garages	Induced Traffic	☐						
Bus or Truck Depots, Garages, Parking Lots, or Franchises	Induced Bus or Truck Traffic	☐	☐					
New or Modified Roadway	Induced Traffic	☐	☐					
Cogeneration/Power Plant	Process	☐	☐	☐	☐	☐		☐
Demapping Built Streets	Traffic Diversion	☐	☐					
Transfer Stations	Induced Traffic	☐	☐					
	Process	☐	☐	☐	☐			☐
Asphalt/Concrete Plants	Induced Traffic	☐	☐					
	Process		☐	☐	☐			☐

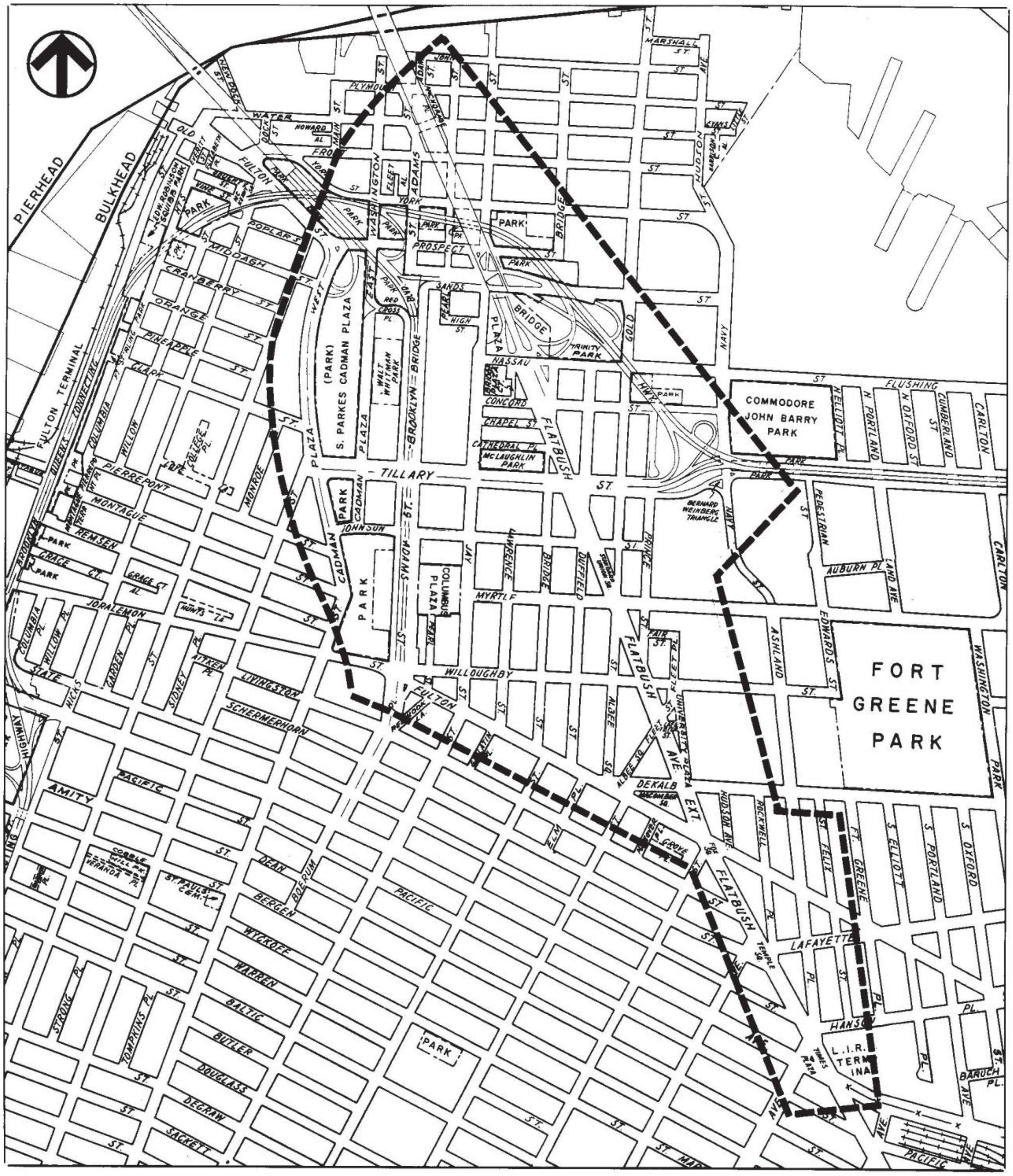
Key:
CO - Carbon monoxide
PM - Particulate matter (*e.g.*, PM_{10} and $PM_{2.5}$)
SO_2 - Sulfur dioxide
NO_x - Nitrogen dioxide and/or nitrogen oxides
O_3 - Ozone (*i.e.*, volatile organic compounds or nitrogen oxides that lead to ozone formation)
Pb - Lead
NC - Non-criteria or malodorous pollutants

210. MOBILE SOURCES

Projects—whether site-specific or generic—may result in significant mobile source air quality impacts when they increase or cause a redistribution of traffic, create any other mobile sources of pollutants (such as diesel trains, helicopters, *etc.*), or add new uses near mobile sources (roadways, garages, parking lots, *etc.*). The following project types may result in significant adverse air quality impacts from mobile sources and therefore require further analyses, which may include microscale analyses of mobile sources. It is recommended that the traffic assessment, located in Chapter 16, "Transportation," be completed before reviewing the following checklist:

- Projects that would result in placement of operable windows (*i.e.*, windows that may be opened and close by the tenant), balconies, air intakes, or intake vents generally within 200 feet of an atypical (*e.g.*, not at-grade) source of vehicular pollutants, such as a highway or bridge with a total of more than two lanes.
- Projects that would result in the creation of a fully or partially covered roadway, would exacerbate traffic conditions on such a roadway, or would add new uses near such a roadway.
- Projects that would generate peak hour auto traffic or divert existing peak hour traffic, resulting in the following:
    - 160 or more auto trips in areas of concern in downtown Brooklyn or Long Island City, Queens (see Figures 17-1 and 17-2);
    - 140 or more auto trips in Manhattan between 30th and 61st Streets; or
    - 170 or more auto trips in all other areas of the City.
- Projects that would generate peak hour heavy-duty diesel vehicle traffic or its equivalent in vehicular emissions (the attached worksheet and guidance regarding vehicle class may be used to calculate equivalency), resulting in the following:
    - 12 or more heavy duty diesel vehicles (HDDV) for paved roads with average daily traffic fewer than 5,000 vehicles;
    - 19 or more HDDV for collector roads;
    - 23 or more HDDV for principal and minor arterials; or
    - 23 or more HDDV for expressways and limited access roads.
- Projects that would result in new sensitive uses (particularly schools, hospitals, parks, and residences) adjacent to large existing parking facilities or parking garage exhaust vents.
- Projects that would result in parking facilities or applications to the City Planning Commission requesting the grant of a special permit or authorization for parking facilities should consult the lead agency regarding whether an air quality analysis of parking facilities is necessary.
- Projects that would result in a sizable number of other mobile sources of pollution, such as a heliport, new railroad terminal, or trucking.
- In addition, projects that would substantially increase the vehicle miles traveled in a large area (a borough, the City, or larger) may require mesoscale analyses.

Figure 17-1
Area of Concern in Downtown Brooklyn

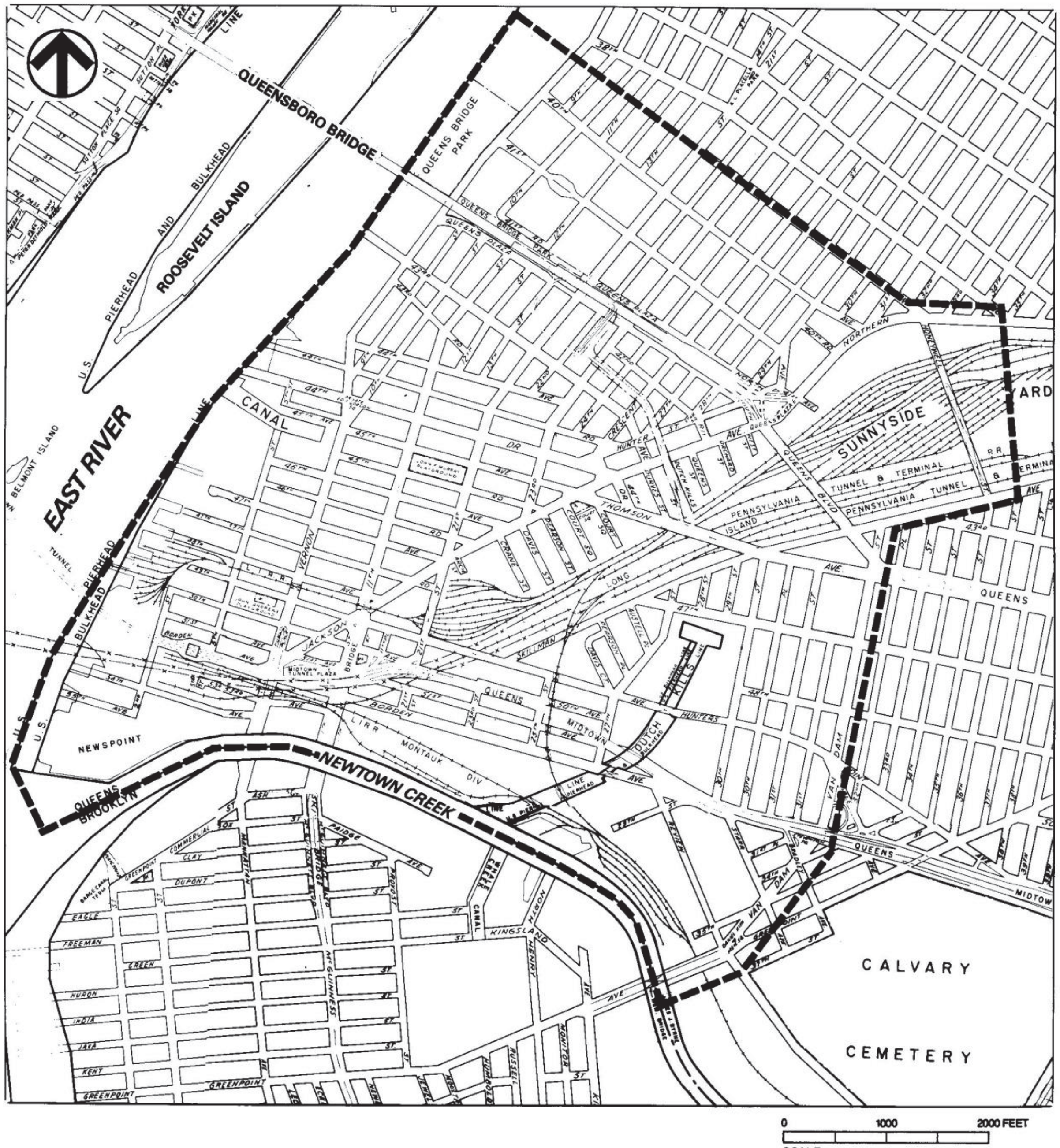


▬▬▬ Area of Concern

0 500 1000 1500 2000 FEET
SCALE

Figure 17-2

Area of Concern in Long Island City



▬ ▬ ▬ Area of Concern

220. STATIONARY SOURCES

Projects may result in stationary source air quality impacts when they would (1) create new stationary sources of pollutants—such as emission stacks for industrial plants, hospitals, other large institutional uses, or even a building's boilers—that may affect surrounding uses; (2) introduce certain new uses near existing (or planned future) emissions stacks that may affect the use; or (3) introduce structures near such stacks so that the structures may change the dispersion of emissions from the stacks so that surrounding uses are affected.

The following projects may result in potential significant adverse impacts related to stationary sources, and therefore require stationary source analyses:

- Projects that would use fossil fuels (fuel oil or natural gas) for heating/hot water, ventilation, and air conditioning systems (note that single-building projects may be able to perform a screening analysis rather than detailed stationary source analyses; see Subsection 322.1, below).
- Projects that would create large emission sources, including but not limited to the following: solid waste or medical waste incinerators, cogeneration facilities, asphalt and concrete plants, or power generating plants.
- Projects that would result in new uses (particularly schools, hospitals, parks, and residences) located near a large emission source.
- Projects that would include medical, chemical, or research labs.
- Projects that would result in new uses being located near medical, chemical, or research labs.
- Projects that would include operation of manufacturing or processing facilities.
- Projects that would result in new uses (such as residences, schools, hospitals, parks, *etc.*) within 400 feet of manufacturing or processing facilities.
- Projects that would result in new uses within 400 feet of a stack associated with commercial, institutional, or residential developments, and the height of the new structures would be similar to or greater than the height of the emission stack.
- Projects that would result in potentially significant odors. This includes, but is not limited to, solid waste management facilities, water pollution control plants (*i.e.*, sewage treatment plants), and incinerators.
- Projects that would result in new uses near an odor-producing facility.
- Projects that would create "non-point" sources, such as unpaved surfaces and storage piles that could result in what is known as fugitive dust.
- Projects that would result in new uses near non-point sources.

Stationary sources may also be an issue for generic or programmatic actions that would change or create a stationary source (as described above) or that would expose new populations to such a stationary source.

230. CONFORMITY

All projects that require federal support, federal licensing, federal permitting, or federal approval are subject to the conformity requirements. Examples of projects that are subject to “general conformity” would be an airport expansion, a veteran's hospital expansion, or new federal court facilities. Highway and transit projects are examples of projects that must comply with “transportation conformity” requirements.

300. ASSESSMENT METHODS

310. STUDY AREAS AND RECEPTOR LOCATIONS

The first step in performing air quality analyses is to determine the appropriate study area. The study area encompasses the region or locations where there is the potential for a significant air quality impact resulting directly or indirectly from the project. Thus, the extent of the study area depends on the project proposed and the pollutants of concern.

For microscale, or localized, analyses, air quality predictions are made for specific locations, such as intersections, and at those locations, for specific geographic points. These prediction locations are called "receptor locations," or simply "receptors.” Receptor locations are included in the air quality analyses when air quality impacts are expected and where people would have continuous access when the project is implemented. For mobile source analyses, the study area often consists of intersections where congestion is expected, and receptors are sited at numerous locations at these intersections. Sidewalks and other ground-level locations alongside roadways and highways are often receptor locations. However, median strips, bikeways or crosswalks in roadways are not appropriate receptor locations because the public would not be in those locations for more than a few minutes. Sometimes, particularly for stationary source analyses, elevated receptors may be located high up on the faces of buildings, either existing or proposed, if there is or would be a balcony or other means of outdoor access, an operable window, or an air intake vent at that location. By contrast, an elevated location would not be a receptor if there was no balcony or other means of outside access. Different study areas and receptor locations are appropriate depending on whether mobile or stationary sources are being examined, as described in the following sections. Consideration of potential cumulative impacts from other nearby substantial sources of pollution (*e.g.*, a heat input of 2.8 million BTU/hour or higher) may also be required in some cases.

For mesoscale analyses, which are rarely performed for CEQR, the study area is that area that would be affected by the large-scale change in pollutant sources. For example, if a project would result in a large increase in the number of vehicle miles traveled in the City, the study area may include the entire City. This delineation may be difficult because the analysis must consider the origins and destinations of those vehicle trips to assess whether a larger area should be studied. Care needs to be taken in developing the proper study area because too large an area would make the relative effects of one project seem insignificant (for example, if the project would greatly increase the number of vehicle miles traveled in the City, but the analysis considered the tri-state metropolitan area, the project's effect might be inappropriately considered insignificant).

311. Mobile Sources

311.1. Roadways

LOCATIONS FOR STUDY

The study area for mobile sources is directly related to the project's traffic study area (explained in Chapter 16, “Transportation”). This usually includes those intersections where traffic congestion is expected, since this is where air quality impacts are likely to occur. The choice of which intersections to include in the mobile source air quality analysis is based on the estimates of incremental vehicular traffic associated with the project, following the guidance provided in Chapter 16, “Transportation.” The study area should include at least the following locations:

- Based on peak hour traffic assignments, intersections in the traffic study area to which the project would add the following incremental traffic:

  <u>CO</u>

  - 160 or more auto trips in areas of concern in downtown Brooklyn or Long Island City, Queens;

  - 140 or more auto trips in Manhattan between 30th and 61st Streets; or
  - 170 or more auto trips in the rest of the City.

  $PM_{2.5}$

  - 12 or more HDDV for paved roads with average daily traffic fewer than 5,000 vehicles;
  - 19 or more HDDV for collector roads;
  - 23 or more HDDV for principal and minor arterials; or
  - 23 or more HDDV for expressways and limited access roads.

- Locations within and adjacent to a fully or partially covered roadway when covered roadways are a concern (*e.g.*, when the project would create, exacerbate traffic conditions on, or add new uses near a fully or partially covered roadway).
- Locations adjacent to an atypical (*e.g.*, not at-grade) source of pollutants (if either the receptors or the source are created by the project), such as a multilane highway or bridge.

For some projects, following the criteria for determining the study area listed above may result in either too many or too few intersections being analyzed. After determining the general study area, the following procedure may be used to choose intersections for further study:

- Choose three or four intersections where the projected incremental traffic increase is greater than the thresholds suggested above for a preliminary analysis. These should be the intersections with the worst conditions. For example, an intersection should be selected if it would process the largest traffic volumes or result in the greatest traffic impacts with the project and/or would be severely congested without the project (and would be affected by project-generated or diverted vehicular traffic).
- Perform a mobile source analysis for these intersections (following the procedures set forth later in this chapter). This initial analysis provides an indication of the magnitude of the project's impacts.
- If any significant impacts are predicted, review the study area to consider whether additional intersections with less severe traffic conditions should be added.
- This procedure may need to be repeated several times until enough receptor locations have been chosen to accurately characterize the project's mobile source air quality impacts.

When collecting traffic data to be used for air quality analyses, it may be prudent to collect data at the same time from additional intersections that may be of concern to ensure data collection under similar conditions. Should those intersections be added to the air quality study area later, returning to collect these data on a different day can lead to data inconsistencies that are difficult to resolve. Traffic data are collected for all roadway segments ("links") within 1,000 feet of the intersection of concern.

For generic or programmatic actions, the study area depends on the nature of the project proposed and the amount of information that exists about its implementation. The air quality analyses may follow the same procedure used for the traffic analyses in these cases. Typically, depending on the size of the proposed project, certain areas are chosen as representative of all the types of areas that may be affected, and within those areas, intersections are selected as representative critical analysis locations. The air quality assessment is then performed in the same way as for any other intersections.

RECEPTOR LOCATIONS

After the intersections are selected for study, receptor locations are chosen. Numerous receptors are sited at each intersection studied in order to accurately characterize the intersection's ambient air quality. As described above, receptors are generally located where people are likely to have continuous access and where the maximum total pollutant concentrations with the project or incremental pollutant concentrations resulting from the project are likely to occur. This usually means that receptors are located near those approaches of the intersection where traffic is likely to be the greatest or the most congested (*e.g.*, where vehicles are delayed waiting at traffic signals). Examples of reasonable receptor sites are:

- Sidewalks near roadways;
- Edges of rights-of-way for roadways without sidewalks, if publicly accessible;
- Property lines of all residences, hospitals, schools, playgrounds, and the entrances and air intakes to all other buildings;
- Portions of a parking lot to which the public has pedestrian access;
- Parks proximate to roadways; and
- All air intakes or operable windows adjacent to elevated emission sources such as elevated highways or bridges for vehicular traffic.

Places where the public would not have continuous access are not considered to be receptor locations. Some locations, such as tollbooths, are not considered accessible to the public even though people may work there all day. The air quality at these locations is regulated by U.S. Occupational Safety and Health Administration (OSHA) workplace standards. In addition, EPA guidelines list other unreasonable receptor sites, including:

- Median strips of roadways;
- Locations within the rights-of-way on limited access highways;
- Locations within intersections or on crosswalks at intersections; and
- Tunnel approaches.

Multiple receptors are used to determine the location of both the highest total pollutant concentration and the highest increment caused by the project. Therefore, a series of receptors at different locations are assessed. When analyzing pollutant levels near an intersection, at least one receptor at each corner of the intersection and one or two receptors adjacent to each queue (line of vehicles waiting at a traffic signal) on an approach link (the segment of roadway between two intersections, approaching the intersection being analyzed) to the primary intersection under analysis should be analyzed. Depending on the analysis results at these receptors, additional receptor locations may be appropriate. For example, if significant impacts are predicted at the receptors farthest from the intersection, additional receptors are added still farther away, until no impact is predicted. Receptors should be placed at mid-sidewalk, generally 6 to 7.5 feet from the curbline of the sidewalk (for wider sidewalks, no more than 7.5 feet from the curb), and set back from the corner of the intersection. If the above methodology results in receptors in the mixing zone (for the CAL3QHC version 2.0 model, discussed below), the mixing zone should be narrowed so that receptors are one foot from the edge of the mixing zone.

311.2. *Parking Facilities*

The locations where the worst potential air quality impacts might result from parking facilities' emissions (and, therefore, the locations where receptors should be placed in an air quality analysis of these facilities) vary depending on whether the facility would be open and at-grade (a parking lot), multilevel and open-sided (therefore, naturally ventilated), or totally enclosed (parking garage). As discussed later in Subsection 321.2, potential cumulative impacts analyses from both on-street and off-street sources of emissions may be required. Each type of parking facility is discussed below.

PARKING LOTS AND OPEN-SIDED GARAGES

The greatest potential pollutant concentrations from at-grade, unenclosed parking lots or multilevel, open-sided parking facilities would be immediately adjacent to such facilities, with the additional potential for cumulative impacts from pollutant emissions from the facility and from nearby on-street sources. Therefore, receptor locations are placed on sidewalks adjacent to, and across the street from, the garage.

ENCLOSED GARAGES

In the case of parking garages that are to be totally enclosed and mechanically ventilated, potential impacts from the exhaust vent(s) are assessed. The greatest impacts from the exhaust vent(s) might occur at a nearby building if the vent(s) are exhausted above the rooftop of the garage, or at pedestrian height if the vent(s) are near ground level. It should be noted that, even though exhaust results from cars within a garage, the exhaust vents are assessed in the same way as that of stationary sources because the emissions emanate from a fixed location (see the discussion of analysis techniques, below). Receptor locations are placed at elevated locations on nearby buildings when rooftop exhaust vents are being assessed, and at ground-level locations both adjacent to and across the street from the vent(s) when pedestrian-level vents are being examined.

312. Stationary Sources

312.1. Study Area

Study areas for the analysis of stationary source impacts depend on the magnitude of the pollutant emission rates from the new source(s), the relative harmfulness of the compounds emitted, the characteristics of the systems that would discharge such pollutants (*e.g.*, stack heights, stack exhaust velocities), and the surrounding topography relative to these sources (*e.g.*, tall residential buildings near shorter stacks). Similar to mobile sources, the study area consists of particular locations chosen for study; however, receptors for stationary source analyses are not usually located at intersections.

When the proposed project would result in a new stationary source, the following general guidelines may apply:

- If a project would result in a single building that would use fossil fuels (fuel oil or natural gas) for heating/hot water, ventilation, and air conditioning systems, first perform the screening analysis presented in Subsection 322.1 to determine whether further analyses are required. If required, the study area should generally include nearby buildings with heights similar to or greater than the stack.
    - For projects that would result in more than one building that would use fossil fuels for heating/hot water, ventilation, and air conditioning, the study area would generally extend to at least 400 feet from the boundaries of a project site.
    - If a project would include operation of manufacturing or processing facilities, or medical, chemical, or research labs, the area within at least a 400-foot radius from the emission source should be included in the analysis.
    - If a project would create large emission sources, including but not limited to solid waste or medical waste incinerators, cogeneration facilities, asphalt and concrete plants, or power generating plants, the study area should extend to at least a 1,000-foot radius of the new source(s).

- If the proposed project would result in major sources, the preparation of a cumulative air impact assessment may be required. A cumulative assessment would consider the combined effect of a proposed project's emissions in conjunction with other existing or planned projects, which have the potential for combined air impacts at receptor sites.
- If an project would result in potentially significant odors, including, but not limited to, solid waste management facilities, water pollution control plants (*i.e.*, sewage treatment plants), and incinerators, the study area should extend to at least a 1,000-foot radius.

- When the proposed project would result in new receptors near stationary sources, the analysis considers the effects of those sources on the site of the project.
- For projects that would create "non-point" sources, such as fugitive dust, the effects on the nearest locations to which the public has general access are typically considered.

Generally, a preliminary analysis is performed for the locations chosen using the above criteria. If significant impacts are predicted at all or most of the chosen locations, it may be appropriate to expand the study area to determine whether potential significant impacts may also occur at more distant locations. Alternatively, a preliminary screening analysis may be performed for several locations at various distances from the stationary source. The results of this screening analysis determine the radius where the maximum impacts from the source will be calculated in a more detailed analysis. When more detailed modeling analyses are required, it may be appropriate to submit a detailed modeling protocol to the lead agency for review and approval before undertaking such extensive studies. The lead agency may consult with DEP for its advice on the detailed modeling protocol.

For generic actions the first step would be to consider the potential ranges of stationary sources that may be a concern. Then, worst-case scenarios assuming prototypical stationary sources may be addressed.

312.2. Receptor Locations

Similar to the procedure for mobile sources, numerous receptors are analyzed at each of the locations to be studied in the stationary sources assessment. The receptors are located where people are likely to have continuous access and where the maximum total pollutant concentrations or incremental pollutant concentrations resulting from the project are likely to occur. When the project would result in a new stationary source, off-site receptor locations are usually modeled. In addition, on-site receptors may be appropriate. For analyses of the effects of heating/hot water, ventilation, and air conditioning systems or other stacks, receptors are placed at elevated locations on nearby buildings (at operable windows or air intake vents).

When development related to the project may be affected by existing (or planned) stationary sources, receptors are typically located on the project site. For projects that would result in development that may affect the dispersion of pollutants from an existing emissions source (*e.g.*, power generating station), receptors are placed both on-site and off-site at locations where pollutant levels may increase significantly because of the changes in dispersion of the emissions from the source.

Examples of reasonable receptor sites include the following:

- Pedestrian-height receptors on sidewalks.
- Exterior uses, such as parks and playgrounds, and entrances and air intakes to sensitive interior uses, such as residences, hospitals, nursing homes, schools, and community facilities.

- Buildings with operable windows, usually just residential buildings. Receptors may be at elevated locations, such as at operable windows anywhere on the building. When receptors are placed on a structure with operable windows, such as a tall residential building, multiple receptors should be placed along the building facades (from roof level down the side of the building) closest to the source(s) under analysis.
- Air intake vent locations of buildings.
- Balconies on buildings and other accessible areas at elevated locations on buildings, such as rooftop decks, *etc.*

If there are substantial differences between the local grade levels of the source(s) and the receptors, the differences in terrain should be accounted for in the mathematical modeling. When performing either mathematical modeling or physical modeling, such as wind tunnel studies, some initial test runs should be performed with the first set of selected receptor sites. Based on these initial test runs, it is possible to determine the specific locations or general regions where additional receptors should be added in the complete analysis to ensure that the locations where the maximum total pollutant levels and incremental changes in concentration from the project are included.

320. MODELS AND ANALYSIS TECHNIQUES

For CEQR analyses, air quality is usually assessed at the microscale level, using mathematical models that predict the pollutant concentrations for given locations. Field monitoring of air quality is seldom used. Models used for the air quality assessment generally should conform to the U.S. EPA's Guideline on Air Quality Models or should be approved by the lead agency as appropriate on a case-by-case basis. Because models are periodically revised and updated, the lead agency or analyst should verify that the most recent edition of the appropriate model(s) is used before performing the analysis. Note that certain large stationary sources may require review through the U.S. Environmental Protection Agency's (EPA) New Source Review procedures (see Section 710 of this chapter). The techniques described in this Manual do not replace those assessments, which have their own guidelines. The EPA's Guideline on Air Quality Models may be found here.

The models take into consideration various factors that may affect air quality—the pollutants being emitted from the mobile sources (usually, vehicle tailpipes) or stationary sources (usually, stacks), and the way these pollutants are dispersed, given meteorological conditions and roadway and building geometry. A project's effects on air quality are determined by comparing predictions made for the future No-Action and the future With-Action conditions. For mobile sources, the predictions for the analysis year are made using mathematical models rather than actual monitoring. The existing condition does not serve as a baseline for determining if a proposed project would have a significant impact, but is typically included in the analysis for informational purposes. Predictions of pollutant concentrations are made separately for each of the analysis years chosen. For analyses of the effects of existing stationary sources, information on the existing pollutants being emitted from the source in question is obtained, and the analysis assumes that the future emissions are the same, unless available information indicates otherwise. The following general procedures are used for microscale analyses of both mobile and stationary sources. These are described in detail in the sections that follow (Subsections 321 through 324).

- Determine which pollutants should be assessed. This depends on the nature of the proposed project.
- Choose a preliminary study area and receptor locations (see Section 310).
- Determine the emissions of pollutants from the sources of concern.
- Estimate the dispersion of those pollutants into the air, using a model.
- Add the appropriate background pollutant concentrations to the predicted pollutant concentrations at the receptor locations resulting from the source to determine the total concentrations for the pollutants of concern at each receptor site.

- Compare the predicted concentrations for each pollutant of concern with the appropriate standards and criteria (see Section 400).

Sections 321 and 322 describe the methodology for predicting microscale mobile and stationary source pollutant concentrations for existing, future No-Action, and the future With-Action conditions, respectively. They describe the various models appropriate for mobile and stationary source analyses, as well as how those models are applied. Input parameters to the models, methodological assumptions, and limitations of the models are also discussed. Mesoscale analyses are discussed separately in Subsection 323.

321. Microscale Mobile Source Modeling

CO is the primary pollutant of concern for most microscale mobile source analyses, including the assessments of roadways and automobile parking lots and garages. Particulate matter may also be of concern for parking lots and garages used primarily by heavy-duty diesel-powered trucks and buses and for projects generating bus or truck traffic with the potential to affect nearby sensitive receptors for a prolonged period of time.

The basic tool for analyzing pollutant concentrations from mobile sources is the air pollutant dispersion models. These models estimate CO and PM concentrations under given conditions of traffic, meteorology, and roadway configuration. First, traffic data for the analysis years are input into the model. Then, emissions from vehicle exhaust systems (and other on-road sources of emissions for particulate matter) and their distribution over the roadway are estimated for that year, using a separate mathematical model. However, for areas with complex topography, or projects that propose, or would affect, a fully or partially covered roadway, it may be more appropriate to use physical rather than mathematical models to assess the potential for significant impacts. Then, the way these emissions are dispersed because of meteorological conditions, roadway geometry, and other factors is considered.

321.1. Roadways

Mobile source analyses related to roadways are performed for projects that change traffic patterns, add traffic to an area's roadways, or reconfigure roadways, or for projects that could be affected by pollutants from roadways. Typically, they assess at-grade intersections or street corridors with adjoining sidewalks. Sometimes, analyses are needed for major sources of CO or particulate matter, such as multilane highways or bridges or partially or fully covered roadways.

TRAFFIC DATA REQUIREMENTS

Vehicle classifications are the relative mix of autos, taxis, trucks, *etc.* For air quality modeling, vehicles are divided into the following classifications: autos, sport-utility vehicles (SUVs), taxis, light-duty trucks (those with four wheels, including vans and ambulances), heavy-duty gasoline-powered trucks and buses (heavy duty trucks have six or more wheels), and heavy-duty diesel-powered trucks and buses. Documentation on the procedures used to distinguish among the different vehicle types and weight categories when field surveys are performed is provided in the Appendix.

Before any mobile source impact analysis may be performed, input data are required on the vehicular traffic conditions on the roadways near the receptor sites under analysis. Data are generally collected, and analyses performed, for roadway "links." A link is the section of roadway between two traffic signals. The links leading to a particular intersection are also called "approaches." At a minimum, the following information is required for each signalized street segment approach included in the mobile source modeling of at-grade roadways for each time period analyzed:

- Hourly traffic volume.
- The effective width of the roadway.
- Average speed of traffic.

- Stopped delay at the intersection.
- Number of moving lanes.
- Signal cycle length.
- Red time length per cycle.

In addition, the following information derived from the Highway Capacity Manual (see Chapter 16, "Transportation") is also needed:

- Saturation flow rate (a measure of each lane's vehicular capacity per hour of green time).
- Arrival type—the way traffic arrives at a light (*e.g.*, in a constant stream or in platoons), which depends on how lights at the adjacent intersections are timed (and, particularly, the extent of signal timing progression for those lights).
- Signal type—pretimed, actuated (a signal that changes in response to the presence of a vehicle), or semi-actuated.

These data are collected for 1,000 feet from the intersection to be analyzed. Traffic data should also be gathered for all links within 1,000 feet of the intersection. Those links should be modeled in their entirety. It is generally not necessary to collect traffic data and model links that begin beyond 1,000 feet of the intersection. Chapter 16, "Transportation," provides more information on many of these traffic parameters, including procedures for collecting travel speed and delay data for subsequent use in air quality analyses. Because other parameters are needed for air quality analyses, coordination with the traffic task is required to ensure that the appropriate data are collected in the field.

ESTIMATES OF MOBILE SOURCE EMISSIONS

Emissions models predict the distribution of pollutants emitted from vehicles' exhaust systems over the roadway (for both idling and moving vehicles). The primary pollutant of concern from mobile sources on roadways from autos is CO, while particulate matter may be more of a concern from diesel trucks and buses. Emissions models used to analyze CO and particulate matter from mobile sources are a series of mathematical models developed by EPA and periodically updated to account for the most recent test data on new vehicles under production (and any revised standards for emissions from new vehicles, also called "tailpipe" standards). EPA's MOVES program is the most recent version of the mobile emissions factor model for CO and PM emissions estimates. Projects undergoing CEQR review should use MOVES, a program available for project-level analysis.

MOVES estimates emissions for both on-road and non-road sources covering carbon monoxide, particulate matter, as well as greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). The model allows for multiple scale analysis from fine-scale analysis to national inventory estimation, and encompasses the tools, algorithms, data, and guidance necessary for analyses associated with regulatory development, compliance with statutory requirements, and estimations and projections of national/regional inventory. DEP should be consulted for information regarding new releases and updates to mobile emissions models. In addition, EPA continues to issue policy and technical guidance on running the MOVES, available here.

The various factors to be considered when using mobile emissions models are described below. These general guidelines are intended to provide conservative estimates and may be revised at times when specific data about a project or location are available.

AMBIENT TEMPERATURE

Estimates of CO emissions should be computed with a mobile model at 50ºF in Manhattan and 43ºF for the rest of the City (these are for winter conditions), unless a project would generate a significantly larger number of vehicle trips during the summer period, when a higher ambient temperature for CO emissions calculations might be prudent. These recommended temperatures are revised at times to reflect the most recent recorded data from CO monitoring, and DEP should be contacted to make sure the most recent temperature guidance for CO modeling is understood. The MOVES emissions model does not require temperature as an input variable. If a summer CO analysis is required, the appropriate ambient temperature would be determined by examining meteorological data for the period of concern following this procedure:

- A summer temperature may be determined by following the general recommended procedures in EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections, (EPA-454/R-92-005). As a first step, three years of the most recent hourly CO monitoring data at DEC's nearest CO street-level monitor needs to be obtained and used to compute running 8-hour average CO levels for each of the three complete years. Then the highest and second highest non-overlapping periods for the entire year should be calculated, and compared to the values reported by the DEC. This step confirms that the data and calculations are accurate.

- The next step parses out the 8-hour CO concentrations for the summer period of interest for each year. Based on the guidance in Section 4.7.1 of the EPA document referenced above, the temperature corresponding to each of the ten highest non-overlapping 8-hour CO monitoring values for the last three years for the period of interest should be obtained. Temperatures for these time periods are based on the corresponding values recorded at the nearest representative meteorological surface station for these 10 time period sets. The ten average temperatures are then averaged for use with emissions modeling.

VEHICLE OPERATING CONDITIONS

The latest version of the emissions model, MOVES, calculates separate CO emissions for start-up and running modes. The number of engine start-ups per day, engine start-ups distribution by hour, and engine start-up "soak time" distribution are inputs that affect exhaust start-up emissions. Soak time is the length of time between the engine being turned off and it being started up again, and engine start emissions are affected by soak time. NYSDEC's soak time distribution should be used for each of the five NYC boroughs. There are three sets of soak distributions for all five boroughs: baseline, cold start, and hot start. The model's default soak distribution should be applied to the baseline traffic. The cold starts are defined as a soak time longer than 12 hours. Hot starts are defined as a soak time between 9 and 10 minutes. For vehicles generated by the project, the appropriate soak distribution file should be modified according to DEP guidelines. For particulate matter, MOVES does not use thermal states as input variables. The following assumptions are generally appropriate when determining thermal states:

- All project-generated taxis and heavy-duty gas trucks are assumed to be operating in a baseline mode. In order to provide conservative projections of project increments in CO analyses, large trucks may be considered to be gas trucks, while in particulate matter analyses the same large trucks may be simulated as heavy-duty diesel vehicles.

- All arriving project-generated autos are, in general, assumed to be operating in a hot-stabilized mode (unless the arriving induced trips are from the immediate community, such as a local supermarket, where this assumption may not be valid). The MOVES model calculates emissions for twenty-eight different vehicle classes, which includes sport utility vehicles (SUVs). The model accounts for the increased occurrence of SUVs in the vehicle mix, in the light-duty gasoline truck category.

- All departing project-generated autos and SUVs are assumed to be operating in a cold mode.

- In most instances, thermal states in the future without the project are assumed to be the same as those in the existing condition. However, for large future No-Action projects located in the study area, it may be appropriate to consider that project's vehicles separately. Vehicles generated by such projects are modeled individually as hot stabilized or cold start autos/SUVs, taxis, or trucks based on that project's traffic assignment. In addition, the amount of time a vehicle is parked affects its operating condition. For certain types of retail projects, it may be reasonable to estimate that a fraction of auto departures would be hot-starts. Typically, length-of-stay field survey data from similar types of projects may be necessary to support such an assumption.

As discussed above, although the primary pollutant of concern from autos on roadways is CO, particulate matter may be more of a concern from diesel trucks or buses. EPA's MOVES model may be used to estimate particulate emissions from gasoline-fueled and diesel-fueled motor vehicles. MOVES calculates particle emission factors in grams per mile (g/mi) from on-road automobiles, trucks, and motorcycles. The particulate matter emission factors include exhaust particulate, exhaust particulate components, brake wear, tire wear, and re-entrained road dust, all of which are required for $PM_{2.5}$ and PM_{10} inventories and analyses. The program contains default values for most data required for the calculation of all the emission factors, but it also allows for user-supplied data in many cases.

Fugitive road dust emissions should be accounted for according to the guidelines and formulas contained in Chapter 13 of EPA's Compilation of Air Pollutant Emission Factors (AP-42). One of the key inputs to the fugitive dust formula is the silt loading factor. Based on data collected in New York City, it is recommended that for paved roadways in New York City, a silt factor of 0.015 g/m^2 for expressways and limited access roadways, 0.10 g/m^2 for principal and minor arterials, and 0.16 g/m^2 for collector type roadways, and 0.4 g/m^2 for paved roads with fewer than 5,000 average daily traffic volumes (ADT).

Based on the latest AP-42 guidance, an unpaved road silt content of 8.5 percent is generally assumed for unpaved areas. Fugitive dust levels are inversely affected by frequency of precipitation. A conservative assumption of "dry" conditions is used for short term calculations. Based on national precipitation measurement data contained in AP-42, 130 days of precipitation are assumed for annual calculations in the NY metro area, which is the number of days in the year with more than 0.01 inches of rain.

Where borough-specific vehicle weight estimates are unavailable, a standard fleet average vehicle weight of 6,000 pounds is recommended for estimating existing particulate emissions from on-street traffic for typical New York City roadways. If a roadway has less than 500 vehicles per day, a different average vehicle weight may be applicable. Vehicle classifications for on-street traffic are generally obtained from collected traffic data. Estimates of increased particulate matter from project generated traffic may be added to the estimated No-Action base volumes to recalculate the vehicle mix for the build scenario modeling.

DISPERSION MODELING

The necessary traffic data for each roadway segment and the emission outputs from the recommended mobile emissions model (both discussed above) are analyzed together using a dispersion model. Mobile source dispersion models estimate the way CO and particulate matter concentrations resulting from given traffic conditions are dispersed because of meteorological conditions, roadway geometry, and other factors, and predict resultant pollutant concentrations at given receptor sites.

For most locations adjacent to at-grade signalized roadways, the CAL3QHC version 2.0 dispersion model, as described in User's Guide to CAL3QHC2.0, Research Triangle Park, North Carolina, is usually most appropriate. The CAL3QHC version 2.0 model is a microcomputer-based modeling methodology developed by EPA to predict the concentration of CO and particulate matter from motor vehicles traveling near or through roadway intersections. Based on the assumption that vehicles at an intersection are either in motion or idling, the program is designed to predict air pollution levels by combining the emissions from both moving and idling vehicles.

The CAL3QHC version 2.0 model requires a coordinate system corresponding to the roadway geometries under study as part of the input to the program. For each street approach to a signalized intersection, a "free flow" link simulates the emissions from vehicles over the blocks that are not delayed by traffic signals. A second "queue" link length is calculated by the algorithms within the program, using input parameters supplied to the model for each approach of a signalized intersection. Emission factors for idling vehicles from the mobile model are input into the CAL3QHC version 2.0 model to estimate emission rates from these queued links. As recommended in the User's Manual for CAL3QHC, in overcapacity situations, where the predicted hourly traffic volume-to-capacity ratio (V/C) is greater than 1, the "model predicted queue length" could be larger than the physical roadway configuration. The user could either revise the traffic assumption for the link, or limit the length of the queue by running the analysis in the following manner: (1) input the queue link as a free flow link; (2) specify X1, Y1, X2, Y2 coordinates that determine the physical limits of the queue (*i.e.*, the physically largest queue length); and (3) input the emission source as the equivalent VPH (from the output run on the queue link) with an emission rate of EF=100. This provides the appropriate emission source for the queue link with the manually determined queue length. In certain cases, the links for left- or right-turn movements may be separated from the through movements of an approach if the signal phasing differs or if such movements have high volume-to-capacity (v/c) ratios.

For a more refined analysis, the CAL3QHC model has been updated with an extended module that allows for the incorporation of actual meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model, known as CAL3QHCR, should only be employed if maximum predicted CO concentrations are greater than the applicable ambient air quality standards, if significant air quality impacts are predicted with the CAL3QHC modeling, or if particulate matter modeling from mobile sources is necessary. Refined modeling with CAL3QHCR should also be performed before identifying mitigation measures for eliminating predicted air quality impacts.

In the first approach with CAL3QHCR, called Tier I, a full year of hourly meteorological data is entered into CAL3QHCR in place of the one hour of "worst-case" meteorological data that are commonly entered into CAL3QHC. One hour of vehicular emissions, traffic volume, and signalization data are also entered as is done when using CAL3QHC. This is a screening level model that is most suitable for short-term time averaging periods where peak hour traffic conditions are suitable. However, use of Tier I modeling (*i.e.*, assuming peak hour traffic and project increment conditions for every hour of the year) may result in overly conservative projections of pollutant levels or project impacts for analyses that are dependent upon non-peak hour conditions or for long-term pollutant time averaging periods (*e.g.*, annual averages).

The CAL3QHCR model also offers a second approach, called Tier II, for which the same meteorological data used in the Tier I approach are entered into the model. The vehicular emissions, traffic volume, and signalization (ETS) data, however, are more detailed and reflect traffic conditions for each hour of a week. CAL3QHCR reads the ETS data as up to 7 sets of hourly ETS data (in the form of diurnal patterns) and processes the data into a week of hourly ETS data. The weekly ETS data are synchronized to the day of the week of the meteorological data year (weekday or weekend). The weekly traffic conditions are assumed to be the same for each week throughout the modeled period. The Tier II modeling approach is not typically employed for projects evaluating peak hour conditions or short term pollutant time averaging periods. Before undertaking a Tier II analysis, consultation with DEP is recommended.

Since the refined CAL3QHCR model uses meteorological data in the computation of pollutant levels at selected receptor locations, the coordinate system in the modeling must be developed with consideration of true north and the corresponding directions of the compass. A critical component of the hourly meteorological data used in these computations is wind direction. When the meteorological data are initially compiled, all hourly wind directions are referenced to true north. Therefore, like coordinate systems developed for stationary source mathematical modeling, mobile source modeling must simulate sources and receptor locations using a coordinate system that is consistent with the meteorological data set.

Generally, the following assumptions are employed for the various input parameters to the CAL3QHC version 2.0 model for assessments of CO concentrations:

- Surface roughness of 3.21 meters in Manhattan south of 96th Street, downtown Brooklyn, and Long Island City; for other areas, the CAL3QHC User's Guide may be used to determine surface roughness, based on the area's building geometry.
- Wind speed of 1 meter/second.
- Settling and deposition velocities of 0.
- Source height of 0 (for at-grade roadways).
- Mixing height set at 1,000 meters.
- Neutral atmospheric stability (unless along an undeveloped shoreline area where a stable atmospheric stability may be appropriate, based on Aeur's land use classification technique—see Subsection 322.2.
- Time averaging period of 60 minutes.
- Wind angle search over 360° with default wind angle search routine.
- Receptor height of 1.8 meters (approximately 6 feet).
- Clearance interval time as determined by the traffic model used (*e.g.*, the Highway Capacity Manual). Two seconds per approach is the default value.
- Saturation flow rate as determined by the traffic model used (*e.g.*, the Highway Capacity Manual).
- Add 6 meters to the effective width of the roadway for free flow links.

For the refined analyses with CAL3QHCR, the meteorological data set should consist of the latest available five consecutive years of meteorological data in order to ensure that an adequate number of hours are simulated to determine compliance with applicable standards and guideline concentrations. It is recommended that surface data collected at the nearest representative airport (either LaGuardia, JFK International, or Newark Liberty Airport) and upper air data collected at Brookhaven, NY be used for this 5-year meteorological data set. DEP may be contacted to determine the latest 5-year meteorological data set.

In some instances, irregular applications of a dispersion model may be required to simulate unique roadway configurations (*i.e.*, estimating potential pollutant levels at receptors on a new residential structure adjacent to an elevated highway or a raised entrance/exit to a bridge crossing). For these situations, CAL3QHC version 2.0 may be used to simulate these line sources by treating these roadways as unsignalized, free flow links (if travel speeds warrant such an assumption). The CAL3QHC may be used to assess unsignalized intersections; however, air quality is not typically a concern at these intersections, so this type of analysis is seldom needed. For areas with complex topography or fully or partially covered roadways, physical models, such as wind tunnel modeling, may be appropriate. It is prudent to check with DEP to determine the appropriateness of using other models before the model is used.

TIME AVERAGING PERIODS

Predictions of pollutant concentrations are made for the same time periods as the National Ambient Air Quality Standards (for example, the NAAQS for CO are for 1-hour and 8-hour concentrations; the PM_{10} standards are for an annual geometric mean and a 24-hour average concentration). These standards are for the average concentration during each of those time periods. Annual standards pertain to the average pollutant concentrations either predicted or measured in a calendar year, while 24-hour standards pertain to pollutant concentrations occurring in a calendar day.

As discussed in the Chapter 16, "Transportation," peak hour periods are commonly used to evaluate the potential impacts of traffic generated by a project. Peak 1-hour traffic data gathered as part of the traffic analysis are typically used as the basis for predicting the maximum pollutant levels near a roadway. In the CAL3QHC modeling of CO, these peak 1-hour traffic data are also typically used to develop the maximum predicted 8-hour CO levels. To derive the 8-hour CO level, the maximum 1-hour concentration calculated from local sources for the peak hour is multiplied by a "persistence" factor, based on historical air quality monitoring data in New York City. The persistence factor takes into account the fact that over a period of 8 hours (as distinct from a single hour), vehicle volumes fluctuate downward from the peak hour, traffic speeds may vary, and wind directions and speeds change to some degree relative to the conservative assumptions used for the single highest hour. The following persistence factors are recommended: 0.77 for Midtown Manhattan; 0.79 for Lower Manhattan; 0.81 for downtown Brooklyn; and 0.70 for the rest of the City. Given that these factors are subject to change over time, DEP should be contacted to confirm the latest guidance for these parameters.

BACKGROUND CONCENTRATIONS

Mobile source modeling of CO concentrations at sidewalk locations accounts solely for emissions from vehicles on the nearby streets, but not for overall pollutant levels. Therefore, background pollutant concentrations must be added to modeling results to obtain total pollutant concentrations at a prediction site. Background pollutant concentrations are usually derived from recorded pollutant concentrations throughout New York City at elevated monitors maintained by the DEC that are not unduly influenced by local sources of pollutants. These monitors are indicative of pollutant levels associated with pollutants throughout the nearby region.

One of the primary applications of mobile source modeling is to evaluate maximum predicted 8-hour CO concentrations at places of public access. Therefore, background CO levels for the 8-hour averaging period is required for each of the analysis years (the existing and build year(s), as appropriate). Existing and future year background concentrations are based on CO measurements at the nearest DEC monitoring stations. The maximum second-highest 8-hour measurement is used, based upon the most recent five-year period for which complete monitoring data is available. For PM modeling of on-street sources, background levels are generally considered to be the same for existing and future year conditions. DEP will provide the most up-to-date monitored pollutant background levels for the various regions within New York City.

FUTURE NO-ACTION CONDITION

The future No-Action condition accounts for general background traffic growth in the study area, new trips and other changes expected because of other proposed developments, and changes in emissions because of vehicle turnover, *etc*. Traffic that would be generated by development on "soft" sites may also need to be considered.

FUTURE WITH-ACTION CONDITION

The future With-Action condition adds any changes resulting from the project to the future No-Action conditions. The differences between these two conditions and the potential for significant impacts are then assessed.

321.2. *Parking Facilities*

Analyses of parking facilities are similar to those for roadways (Subsection 321.1, above), but the assumptions used in estimating emissions (or, the inputs to the emission model) differ, as does the dispersion model.

PARKING LOTS

CO is the primary pollutant of concern for unenclosed, at-grade parking lots used by automobiles; PM is the primary pollutant of concern for parking lots used by heavy-duty diesel vehicles. The modeling procedures for both types of parking lots are explained below.

For automobile/SUV parking lots, the following techniques are appropriate:

ESTIMATES OF MOBILE SOURCE EMISSIONS. Emissions estimates for CO are calculated at an ambient temperature of 43°F (except for Manhattan, which uses 50°F) with a mobile emissions model (such as the EPA's MOVES model, discussed in Subsection 321.1, above). Information required for the mobile emissions model includes the following: the dimensions (*i.e.*, length and width) of the parking lot; idle emission factors for cold autos/SUVs or idle emission factors for other vehicles; emission factors at 5 miles per hour for both cold and hot autos/SUVs or other vehicles; and hour-by-hour vehicular entrances to and exits from ("ins and outs") the parking lot (typically, the eight hours with the highest volumes). Peak 1-hour averaging periods' emission rates are typically calculated for the build year, assuming that autos idle for 1 minute before starting to travel to the parking lot exit(s). The traveling distance within the lot by vehicles entering and exiting the lot is usually conservatively estimated by calculating this mean travel distance as two-thirds of the maximum travel distance from the entrance/exit of the lot to the farthest parking space. The 1-hour and (in most cases) 8-hour averaging periods with the largest total number of departing autos yield the highest CO emission rates for these respective time averaging periods.

DISPERSION ESTIMATES. Potential cumulative concentrations from on-street sources and emissions from the parking lot at a receptor location adjacent to the lot may be calculated by adding the CO levels calculated from the parking facility at this location to the contribution of on-street sources. It is advisable to analyze receptor locations on the near and far sidewalks adjacent to the parking lot to ensure that maximum cumulative effects from on-street and parking lot emissions are disclosed. Appropriate background concentrations also must be added. Contribution of on-street source emissions at this receptor location may be calculated through microscale modeling for the same wind directions that cause the parking lot emissions to affect this location. Or, alternatively, they may be calculated to include parking lot emissions as line sources, as mentioned below. Air quality impacts from parking facilities may be followed to estimate potential CO concentrations from parking lots with the EPA's SCREEN3 model (described in Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, EPA-450/4-88-010. A sample air quality analysis of potential CO impacts from an automobile multilevel, naturally ventilated parking facility is included in the Appendix.

As discussed in Subsection 321.2, emissions from parking facilities may also be modeled as line sources in CAL3QHC or CAL3QHCR for assessing cumulative emissions adjacent to on-street sources. This would include simulating the parking lot as multiple line sources adjacent to the on-street source in a dispersion model, such as CAL3QHC or CAL3QHCR. The EPA's Guideline on Air Quality Models provides more information.

For parking lots used by large numbers of diesel trucks or buses, where $PM_{2.5}$ and PM_{10} are the primary pollutants of concern, a procedure analogous to that used for automobile parking lots (see above) may be used to determine PM concentrations near the lot:

- Idle emissions of $PM_{2.5}$ and PM_{10} from heavy-duty diesel vehicles are insignificant when compared with PM emission rates for accelerating heavy-duty diesel trucks. Therefore, only PM emission rates from trucks traveling within the lot are typically estimated, usually from factors listed in EPA's Compilation of Air Pollutant Emission Factors (AP-42) or the MOVES emission model used for this kind of analysis. Estimates of particulate emissions from heavy vehicles operating on paved and unpaved surfaces may also be included in such analyses if they overlap with the parking areas.
- Analyses are performed to determine the maximum potential PM_{10} and $PM_{2.5}$ 24-hour concentrations adjacent to the lot, based on the hourly average (over a 24-hour period) for the diesel vehicles entering and exiting the parking lot.
- Twenty-four-hour PM_{10} background values are then added to the localized contribution.

MULTILEVEL, NATURALLY VENTILATED PARKING FACILITIES

Multilevel parking facilities with at least three sides partially open are, for air quality analyses, considered in a similar manner to that of at-grade parking lots. As with at-grade lots, CO is the primary pollutant of concern for facilities used by automobiles, and PM is of concern when diesel trucks or buses use the facility. The CO impact analyses for these facilities are almost identical to those performed for parking lots, except that CO emissions from arriving and departing vehicles are distributed over the various levels and ramps of the parking facility. It is usually appropriate to adjust the calculation of CO impacts at a ground-level receptor from the above-grade levels of the facility following calculations presented in EPA's Workbook of Atmospheric Dispersion Estimates (AP-26). A PM_{10} analysis for a multilevel, naturally ventilated facility used by diesel trucks or buses may be similarly modified. A sample air quality analysis of potential CO impacts from a multilevel, naturally ventilated automobile parking facility is in the Appendix.

Emissions from multilevel parking facilities may also be modeled as line sources in CAL3QHC or CAL3QHCR (for source heights less than 30 feet) for assessing cumulative emissions adjacent to on-street sources.

PARKING GARAGES

These include any parking facilities – whether multi- or single-level, below- or above-grade – that would be enclosed and include a ventilation system. Similar to at-grade lots and multi-level, naturally ventilated facilities, CO is the primary pollutant of concern for automobile parking garages, and PM is of concern when heavy-duty diesel trucks or buses use the garage. In either case, pollutants would be present within the garage and would be exhausted by the garage's vent(s) for the mechanical ventilation system. Thus, pollutant levels could be elevated near the vents outside of the garage. The vents are considered stationary sources, similar to stacks. The analysis of pollutant concentrations within and outside parking garages is described below.

For automobile garages, the following procedures are generally appropriate:

- For CO concentrations within the garage, it is recommended that CO emissions within the facility be conservatively estimated at an ambient temperature of 43°F (50°F for Manhattan). Total CO emissions rates (for 1- and 8-hour averaging periods) within the garage are calculated following the same procedures for the multilevel, naturally ventilated garage, and all of the emissions from the different levels are summed together.
- The appropriate background concentrations are then added to the predicted concentrations.

- These total emission rates are then divided by the minimum ventilation rate required by the New York City Building Code (*i.e.*, 1 cubic foot per minute of fresh air per gross square foot of garage area), to determine the maximum 1- and 8-hour CO levels within the garage.
- For concentrations near the garage vents, the CO concentrations predicted within the garage are then used in the calculations. The garage vent(s) are converted into "virtual point sources" using equations listed in EPA's AP-26, and the concentrations within the garage are used to estimate the initial dispersion at the garage vent(s). These equations may be used to estimate CO impacts at nearby elevated receptors (*e.g.*, tall residential buildings nearby) if the effluent is exhausted at an elevated height, or at pedestrian-level height (for lower exhaust stacks).
- Potential cumulative CO impacts on the near and far sidewalks adjacent to the garage vent(s) may be calculated by adding the impact from the garage exhaust to on-street sources following a methodology similar to that employed for naturally ventilated parking facilities. A sample air quality analysis of potential CO impacts from an automobile parking garage is in the Appendix.

For garages that would be used by heavy-duty diesel trucks or buses, the following procedures may be used:

- Estimates of PM emissions are calculated following procedures similar to those for parking lots.
- These total PM emissions should be divided by the minimum ventilation rate required by the New York City Building Code to determine maximum PM levels within the facility.
- Off-site PM concentrations may be calculated by following the same methodology employed for CO exhaust from automobile garages. If there would be numerous exhaust points, such as exhaust vents all along the rooftop of the structure, off-site PM impacts may be calculated treating these emissions as an "area source" (see discussion on area source analyses in Subsection 322.2, below).

TIME AVERAGING PERIODS

The anticipated hourly vehicular entrances and exits to the facility are usually reviewed to determine the hour that would yield the largest amount of pollutants emitted from the parking facility. Peak 1-hour concentrations adjacent to the facility (and peak 1-hour concentrations within the facility if it is an enclosed garage), are then determined for this hour. The hourly vehicular entrances to, and exits from, the garage are also used to determine the period that would generate the largest amount of pollutants over a multi-hour period. Off-site concentrations calculated with the average hourly pollutant emission rate over this multi-hour interval are also multiplied by a persistence factor when determining multi-hour pollutant incremental impacts from parking facilities.

FUTURE NO-ACTION CONDITION

Similar to the assessment of roadways, analyses of parking facilities considers conditions in the future without the project. This assessment considers any new developments expected by the project's build year (see discussion above), but does not include the proposed parking facility.

FUTURE WITH-ACTION CONDITION

The future With-Action condition assesses the proposed parking facility, and compares the results of that analysis with conditions expected in the future No-Action condition to determine the potential for significant impacts.

321.3. Conformity Analyses

Air quality modeling analyses are used in the conformity determination (both general and transportation) to show that the federal action neither contributes to any new violations of standards nor increases the frequency or severity of any existing violations.

The analyses are to be based on the latest planning assumptions developed by the municipal planning organization (MPO). Any revisions to these estimates are to be approved by the MPO or other authorized agency. The New York Metropolitan Transportation Council (NYMTC) is the MPO for the New York Region. The analyses are to be based on the latest and most accurate emission estimation techniques available. For motor vehicle emissions, the most current EPA emissions models are to be used. For stationary and area source emissions, the latest emissions factors specified by EPA in the Compilation of Air Pollutant Emissions Factors (AP-42) should be used unless more accurate emission data are available. The air quality modeling analyses are to be based on the applicable models, databases, and other requirements specified in the most recent version of the Guideline on Air Quality Models (Revised).

The analyses are to be based on the total of emissions from the project and reflect the emission scenarios that are expected: (1) during the attainment year mandated by the CAA (or during the furthest year for which emissions are projected in the maintenance plan); (2) during the year for which the total emissions from the project are expected to be the greatest; and (3) during any year with a specific emissions budget. Also, the federal agency is to identify any measures for mitigating air quality impacts, describe the enforcement process for these measures, and obtain written commitments for these mitigation measures.

322. Stationary Source Modeling

Stationary source modeling is typically required to evaluate the potential impacts of emissions from the following:

- Boilers for heating/hot water, ventilation, and air conditioning systems (HVAC) in new buildings or building expansions.
- Ventilation exhaust systems for new manufacturing or industrial facilities, or medical, chemical, or research laboratories.
- Large emissions sources, such as power generating stations, that may affect surrounding uses or be affected by new structures nearby.
- Existing (or future planned) manufacturing and industrial facilities that may affect nearby sensitive uses.
- Industrial facilities that may potentially discharge malodorous pollutants into the nearby neighborhood.

For assessing potential stationary source impacts related to boilers for heating and hot water, ventilation, and air conditioning systems for a single building, a preliminary screening analysis may be performed. Many such projects do not require any further analysis. This screening analysis methodology is presented in Subsection 322.1.

All other projects with potential stationary source air quality impacts require detailed analyses, described in Subsection 322.2.

In general, for projects that would result in, or facilitate, either new significant fossil fuel burning sources or new facilities that may be adversely affected by airborne emissions from nearby existing (or planned) major fossil fuel burning sources, SO_2, NO_2, PM_{10}, and $PM_{2.5}$ are the primary pollutants of concern. If such sources under study would exclusively burn natural gas, NO_2 is the primary pollutant of concern. Projects that would result in the development of new significant industrial sources or new uses that may be adversely affected by airborne emissions from existing (or planned) industrial sources require an assessment of both criteria and non-criteria pollutant emissions. The existing or potential new stationary source(s) under review should be examined on a case-by-case basis to appropriately determine the pollutants of concern. This is also applicable for proposed industrial facilities that may potentially discharge malodorous pollutants or for existing facilities that discharge malodorous pollutants that may affect new development resulting from a project.

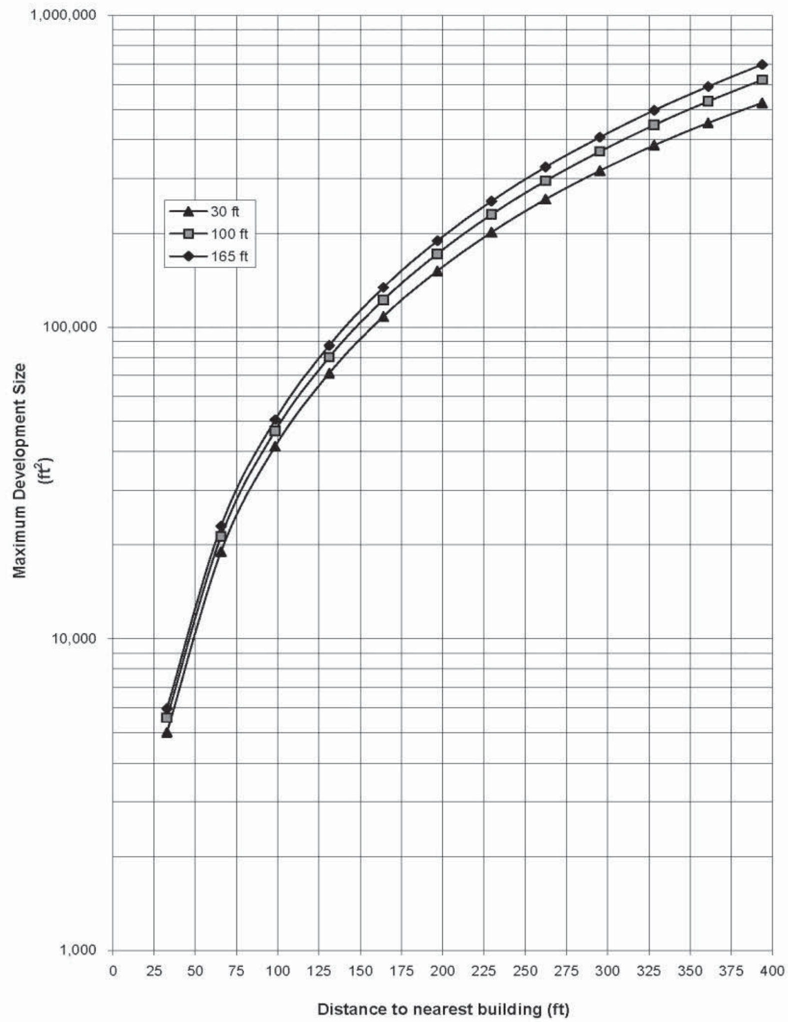
322.1. Screening Analyses

SCREEN FOR HEAT AND HOT WATER SYSTEM

Impacts from boiler emissions are a function of fuel type, stack height, minimum distance from the source to the nearest receptor (building), and floor area (square footage) of development resulting from the project. Floor area is considered an indicator of fuel usage rate. The preliminary screening analysis for heat and hot water systems uses Figure 17-3, which indicates the size of proposed development and distance to the nearest building of a height similar to or greater than the stack height of the proposed building(s). The figure was specifically developed through detailed mathematical modeling to predict the threshold of development size below which a project would not likely have a significant impact. The step-by-step methodology outlined below is only appropriate for single buildings or sources. For other situations, refer to the discussion below on area sources. The figure is also only appropriate for sources at least 30 feet from the nearest building of similar or greater height.

- Determine the maximum size of development that would use the boiler stack.
- Using a Borough President's map, Sanborn atlas, or Graphical Information System (GIS) tools, determine the minimum distance (in feet) between the building(s) resulting from or facilitated by the proposed project and the nearest building of similar or greater height. If the distance is less than 30 feet, a more detailed analysis is required. If the distance is greater than 400 feet, assume 400 feet.
- Determine the stack height for the building resulting from the proposed project, in feet above the local ground level. If unknown, assume 3 feet above the roof height of the building.
- Then, from the heights of 30, 100, and 165 feet, select the number closest to, but NOT higher than, the proposed stack height.
- Based on steps 1 through 4 above, select the appropriate figure and curve (by stack height) for the proposed project. Locate a point on the appropriate chart by plotting the size of the development against the distance in feet to the nearest building of height similar to or greater than the stack of the proposed project.
- If the plotted point is on or above the curve corresponding to the height recorded in step 5, there is the potential for a significant air quality impact from the project's boiler(s), and detailed analyses may need to be conducted. More refined screening analyses (which account for the type of fuel consumed and development type) are available for use in the Appendix. If the plotted point is below the applicable curve, a potential significant impact due to boiler stack emissions is unlikely and no further analysis is needed.

Figure 17-3:
Stationary Source Screen



In some cases, it may be possible to pass this screening analysis by restricting the type of fuel that could be used to supply heat and hot water. As illustrated in the air quality stationary source screening analysis figures in the appendices, No. 4 and No. 6 oils have greater emissions than No. 2 oil or natural gas. Limiting the fuel used by the proposed project to No. 2 oil or natural gas may eliminate the potential for significant adverse impacts and the need for further analyses. Based on the fuel type to be used (natural gas, No. 2, or No. 4 oil), and the type of development (residential or commercial), the screening figures in the Appendix may be used following steps 1 through 6 above. The project, however, would have to include the restriction on the boiler fuel type (and indicate the mechanism that would ensure the use of a specific fuel type) if this option is selected.

Alternatively, if a proposed project fails the screening analysis, but the maximum short term emissions and annual emissions have been estimated, figures for screening known emissions from boilers are included in the technical appendices.

INDUSTRIAL SOURCE SCREEN

This subsection describes the screening analysis that may be performed to determine the potential for significant impacts from industrial sources. This screen provides the maximum unitary 1-hour, 8-hour, 24-hour and annual average values for the distances from 30 feet to 400 feet and a conservative stack and receptor height of 20 feet (see Table 17-3). This look up table is based on a generic emission rate of 1 gram per second of a pollutant from a point source and was developed using the AERMOD model (see Subsection 322.2). To determine the potential impact from industrial emissions on a proposed project, the estimated emissions from the industrial source of concern should first be converted into grams/second. This converted emission rate should then be multiplied by the value in the table corresponding to the minimum distance between the industrial source and the new use of concern. Values are provided for 1-hour and annual averages to enable the comparison of pollutant levels to SGCs (1-hour averaging period) or AGCs (annual averaging period).

Table 17-3
Industrial Source Screen

20 Foot Source Height				
Distance from Source	**1-Hour Averaging Period (μ/m3)**	**8-Hour Averaging Period (μ/m3)**	**24-Hour Averaging Period (μ/m3)**	**Annual Averaging Period (μ/m3)**
30 ft	126,370	64,035	38,289	6,160
65 ft	27,787	15,197	8,841	1,368
100 ft	12,051	7,037	4,011	598
130 ft	7,345	4,469	2,511	367
165 ft	4,702	2,967	1,643	236
200 ft	3,335	2,153	1,174	167
230 ft	2,657	1,720	924	131
265 ft	2,175	1,377	727	103
300 ft	1,891	1,142	594	84
330 ft	1,703	991	509	73
365 ft	1,528	857	434	62
400 ft	1,388	755	377	54

If these screening methods indicate that further analysis is necessary, then a detailed stationary source analysis is required as described in the following subsection.

322.2. Detailed Analyses

ESTIMATES OF STATIONARY SOURCE EMISSIONS

The method for estimating the pollutant emissions from a stationary source depends on whether the source currently exists or whether it is planned.

For existing large fossil-fuel burning sources, emission rates may be obtained as follows:

- Almost all existing large fossil-fuel burning sources have certificate-to-operate permits from either DEP or DEC that define the amount and type of fuel to burned and/or pollutants that may be emitted through the exhaust stacks. "Major" sources (those large sources that require Prevention of Significant Deterioration permits) and large institutional use boilers (*e.g.*, large boilers for hospitals or universities) have permits issued by DEC, while all other facilities likely have permits filed with DEP. Even if an existing source discharges less than the prescribed limits in a permit, the limits specified in the permits are considered as the basis for estimating the maximum emissions from this source.

- In cases where only the fuel consumption rates (or refuse burning rates) are supplied, emission factors for the criteria pollutants of concern—which may usually be obtained from EPA's Compilation of Air Pollutant Emission Factors (AP-42)—are multiplied by the consumption rates to yield estimates for pollutant emission rates. Sulfur dioxide emission factors reported in AP-42 for oil-burning boilers are directly proportional to the percentage of sulfur in the oil. New York City limits the sulfur content of distillate No. 2 oil to 0.2 percent (by weight) sulfur, and to 0.3 percent sulfur for residual (No. 4 and No. 6) oil. Therefore, these percent sulfur limits should be used to estimate sulfur dioxide emission factors for boilers burning the respective fuel oil types.

For existing manufacturing uses, the following steps may be performed:

- Conduct field observations of manufacturing uses within the study area to identify the existing manufacturing uses with exhaust stacks, vents, or other emission sources that may have the potential to adversely affect the uses introduced by the project. Documenting field observations with field photographs, notes, and on maps is recommended. Please note that exhaust stacks may not be visible from street level. Regardless of whether it is observed, when an exhaust stack is suspected to exist (due to the type of manufacturing process), the facility should be included in the list for step 2 below.

- Prepare a list of facilities observed in the field with their corresponding addresses. Then, send a formal request to DEP for a copy of any air contaminant permits for these facilities. DEP assesses a charge for each address in a search request, unless a waiver of the fees (which is normally done for projects sponsored by governmental agencies) is first approved by DEP's counsel. Requests for copies of the DEP air contaminant permits should be addressed to the New York City Department of Environmental Protection, Bureau of Environmental Compliance, 59-17 Junction Boulevard, Flushing, NY 11373, and requests for fee waivers for DEP searches should be addressed to DEP Bureau of Legal & Legislative Affairs at the same address. The permits may be used to ascertain the pollutants being emitted from the facility in question. The analysis considers the maximum emissions allowable under the permit, even if actual operating conditions are different. With respect to the accuracy of the technical information provided in an air permit, DEP relies upon verification of the information by an applicant's professional engineer or registered architect. DEP does not certify as accurate any information gathered through the permitting or certification process. Therefore, DEP accepts no responsibility for the use of the data or consequences of the use of the data by any party. This information should be independently verified before relying on it for analyses in compliance with any local, state or federal law, rule or regulation.

- EPA or DEC permits are generally available from the respective agencies websites. If additional information is required, contact the regional office. EPA: http://oaspub.epa.gov/enviro/ef_home2.air; DEC: http://www.dec.ny.gov/index.html.

- When no permits are available from DEC or DEP for a given location, but emissions are expected on that location, a conservative emissions analysis based on the likely manufacturing process may be appropriate. This may entail examining material safety data sheets (MSDS) at the facility in order to obtain a list of the pollutants potentially involved in the particular manufacturing process. Contact DEP for assistance with this analysis.

For new sources associated with a proposed project (and for future sources that may affect or be affected by a project), estimates of pollutant emission rates depend on the type of sources and the pollutants emitted from such sources. Generally, the following procedure may be used:

- For new fuel burning sources, estimates of fuel consumption rates may be based on either "rule of thumb" fuel consumption rates estimated by mechanical engineers designing the facility or default emission factor values for residential and commercial facilities. Energy consumption surveys conducted by the Department of Energy and available on its website (http://www.eia.doe.gov/) may be used to develop fuel consumption rates. DEP should be contacted to determine the appropriateness of using this method.
- For buildings with interruptible natural gas service (systems that use natural gas for most of the year, but use fuel oil during the coldest days to receive more economical rates from the power utility), analyses of short-term effects are typically performed for fuel oil, while analyses of annual emissions are performed for natural gas. More information on this is provided under "Time Averaging Periods" below.

Estimates of malodorous pollutant emission rates are evaluated on a case-by-case basis. Odor thresholds of specific pollutants (*i.e.*, pollutant levels in ambient air that result in a malodorous smell that is recognized by the general populace) may vary by several orders of magnitude, depending on the pollutants. For odor concerns from facilities that are related to wastewater treatment, DEP should be consulted. Similarly, for facilities that handle solid waste, DEP or the Department of Sanitation (DSNY) should be contacted. To evaluate the potential for malodorous emissions, the following general procedures may be used:

- Perform an evaluation of the processes at the facility in question to determine the potentially malodorous substances emitted and their respective emission rates.
- For those substances, perform a literature search for odor thresholds and other characteristics.
- Of all the chemical compounds emitted, the one that results in the greatest potential for malodorous emissions is usually defined as the "indicator" compound. An identified malodorous pollutant that has the largest potential emission rate of all potential malodorous pollutants discharged from a facility may not be the appropriate indicator compound for evaluating potential odor impacts because other malodorous compounds emitted from the facility may have tremendously smaller odor threshold concentrations. Therefore, the "indicator" compound has the correct combination of the following elements: (1) the lowest odor threshold (the minimum concentration at which the odor is detectable), and/or (2) the highest emission rate. Published test data on malodorous emission rates for specific operations with corresponding odor control mechanisms (if any) may provide information for preparing estimates of malodorous pollutant emission rates. Alternatively, in lieu of an indicator compound, a mix of malodorous pollutants may be addressed by the use of dilution thresholds. Consultation with DEP is suggested before undertaking such analyses.

TIME AVERAGING PERIODS

SO_2, NO_2, and PM, the principal pollutants of concern for fuel-burning stationary sources, are examined for oil or interruptible gas burning facilities, while NO_2 is the only pollutant analyzed in any refined study of a natural gas burning source. Peak daily emission rates are typically employed in the modeling to calculate the maximum 3- and 24-hour pollutant concentrations. Peak hourly emission rates are typically calculated by determining the total amount of pollutants emitted in the peak day and dividing by 24 hours. However, in instances when oil-burning equipment is used irregularly (*e.g.*, only 8 hours per day at a manufacturing facility), actual peak hourly emission rates are used to evaluate the maximum potential 3-hour SO_2 concentrations. The average hourly annual emission rates (*e.g.*, the anticipated or permitted total amount of a pollutant emitted in a year divided by 8,760 hours—the approximate number of hours in a year) are used in the modeling to determine the annual average pollutant concentrations at selected locations. Some simple stationary source models, such as EPA's SCREEN3, or in the future AERSCREEN, only simulate maximum 1-hour impacts. Persistence factors of 0.9 and 0.4 are recommended for adjusting 1-hour impacts of these simple models to 3- and 24-hour time averaging periods, respectively.

In an analysis of potential noncriteria pollutant impacts from new sources on the surrounding community or from existing sources on a proposed facility, comparisons are ultimately required between the maximum predicted pollutant levels and the corresponding AGCs and SGCs listed in DEC's DAR -1. Since SGCs and AGCs are intended for time-averaging periods of 1 hour and 1 year, respectively, suitable noncriteria emission rates for these scenarios are needed. Maximum 1-hour concentrations for noncriteria pollutant sources are usually calculated with the maximum hourly pollutant emission rates from these sources through modeling (described in the following subsection). Maximum hourly pollutant emission rates are estimated either through the permitted values for existing sources or specifically developed for new sources. Annual average pollutant emission rates are used to determine maximum annual impacts, which are then compared to the AGCs. Annual average hourly emission rates are estimated by dividing either the total annual amount of emissions permissible, as listed in a permit, or the annual pollutant amount estimated for a proposed facility by 8,760 hours. In addition, certain pollutants—specifically, air toxics that could be released during chemical spills—have shorter averaging periods. These are discussed under "Puff Modeling," below.

DISPERSION MODELING

Potential pollutant concentrations from stationary sources may be predicted through the use of either dispersion or fluid (*i.e.*, physical or wind tunnel) modeling. In most instances where a refined stationary source impact analysis is required, mathematical dispersion modeling is the most suitable choice for performing these evaluations. A discussion on the conditions that may warrant fluid (*i.e.*, physical, or wind tunnel) modeling over mathematical modeling is included under "Suitability of Fluid Modeling Versus Mathematical Modeling." A detailed discussion on the procedures and input parameters for typical mathematical dispersion modeling scenarios is provided below.

EMISSION RATES FOR POLLUTANTS OF CONCERN. Before modeling is performed, determine the pollutants of concern and the respective emission rates following the procedures discussed above. For sources emitting pollutants through an exhaust stack, pollutant emission rates and stack exhaust parameters for multiple potential operating loads (*e.g.*, operation of large fossil fuel burning facility at 100 percent capacity, 75 percent capacity, and annual average conditions) should be prepared for input into the dispersion modeling. The analysis of all three conditions is appropriate in a prediction of worst-case impacts for the following reasons. Although the 100 percent capacity load usually results in the greatest amount of pollutants discharged by such an operation, it may not result in the worst-case analysis because the exit velocity of the pollutants through the stack is also at its greatest in this condition, resulting in a plume rise that ejects to a height greater than nearby receptor locations. On the other hand, if a nearby receptor location is of near or equal height to the exhaust stack(s) under analysis, maximum pollutant concentrations at the receptor from the local source may occur with a lower load and, therefore, a lower exit velocity. In addition, pollutant emission rates and stack exhaust velocities under annual average operating conditions are normally much lower than the 100 percent load conditions. Since maximum annual pollutant levels are sometimes required for comparison to either applicable criteria pollutant standards or non-criteria pollutant AGCs, estimations of pollutant levels on an annual average basis at receptor locations should be determined by modeling annual average operating conditions of the source(s).

AERMOD MODEL. For most projects, EPA's AERMOD is the most suitable mathematical dispersion model for performing a refined air quality impact analysis. AERMOD, described in User's Guide for the AMS/EPA Regulatory Model – AERMOD (EPA-454/B-03-001), calculates pollutant concentrations from one or more sources using hourly meteorological data. AERMOD was designed as a replacement to the EPA Industrial Source Complex (ISC3) model and is approved for use by EPA. AERMOD is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions. AERMOD may also account for building-induced turbulence, or "wake" effects, caused by nearby structures on the dispersion of pollutants from nearby stacks that do not meet Good Engineering Practice (GEP) heights.

The following information is required to execute AERMOD:

- When modeling potential pollutant concentrations emitted from stacks (*i.e.*, point sources) with AERMOD, the following information is needed: the appropriate pollutant emission rates, stack exhaust parameters (*i.e.*, stack exhaust velocity, inner stack diameter, stack exhaust temperature, stack height), and representative meteorological data.
- Computations with AERMOD are usually made assuming stack tip downwash, urban dispersion parameters, and use of routines for elimination of calm winds and handling of missing meteorological data.
- The AERMOD computer program should be run both with and without building downwash (*i.e.*, wake effects option) if the exhaust from the stack(s) could be affected by either the building on which the stack is located or a nearby structure. EPA's Building Profile Input Program for PRIME (BPIPPRM) should be used to determine the projected building dimensions for the AERMOD modeling with the building downwash algorithm enabled. BPIPPRM includes an algorithm for calculating downwash values for input into the PRIME algorithm contained in AERMOD. The input structure of BPIPPRM is the same as that of BPIP. For more information, see the BPIP User's Guide.
- In cases where the sources and receptors are in a relatively undeveloped, coastal area of New York City (*i.e.*, less than 50 percent of the land area within a 1.9-mile radius from the source is developed into non-park uses), the rural dispersion option should be selected in the AERMOD modeling of such facilities. Auer's technique may also be used to classify whether the region should be simulated as urban or rural (Auer, A.H. "Correlation of Land Use and Cover with Meteorological Anomalies," Journal of Applied Meteorology, Vol. 17. 1978).
- The meteorological data set used with AERMOD should consist of the latest available five consecutive years of meteorological data in order to ensure that an adequate number of hours are simulated to determine compliance with applicable standards and guideline concentrations. It is recommended that surface data collected at the nearest representative airport and upper air data concurrently collected at Brookhaven, NY be used for this 5-year meteorological data set. Depending on the location of the proposed project, the use of surface data from LaGuardia, J.F.K. International or Newark Liberty International Airport may be acceptable for modeling. The meteorological data set includes wind speeds, wind directions, ambient temperatures, and mixing height data for every hour of a year. DEP Bureau of Envi-

ronmental Planning and Analysis (BEPA) may be contacted to confirm the latest recommended meteorological data set before performing any analyses. AERMOD uses the AERMET preprocessor, described in the User's Guide for the AERMOD Meteorological Processor (AERMET), (EPA-454/B-03-002), November 2004 and Addendum, December 2006, for meteorological information. AERMET requires surface and upper air data and determination of appropriate surface characteristics. When applying the AERMET meteorological processor, appropriate surface characteristics must be determined for surface roughness length {zo}, albedo {r}, and Bowen ratio {Bo}. The recommended methods for determining these surface characteristics are described in the EPA AERMOD Implementation Guide, January 2008. Recommended data to use for these parameters are provided in the AERSURFACE User's Guide, (EPA-454/B-08-001), January 2008. AERSURFACE, developed by EPA, may also be used as an aid in determining the surface characteristics.

- If terrain elevation varies significantly within the study area, the variations should be accounted for. AERMAP is the terrain pre-processor and is used to characterize and generate receptor grids and terrain elevations.
- Ideally, estimates of stack exhaust parameters (*i.e.*, stack exhaust velocity at various loads, inner stack diameter, exhaust temperature, and stack height) for new significant stationary sources will be available. If this information is unavailable for a new source, the following assumptions may be used as conservative estimates in a stationary source analysis:
    - Exhaust velocity at all loads: 0.001 meter/sec
    - Inner stack diameter: 0 meters (no plume rise)
    - Stack exhaust temperature: 293 °K
    - Stack height: 3 feet above rooftop level
- Since dispersion modeling uses meteorological data in the computation of pollutant levels at selected receptor locations, the coordinate system in the modeling must be developed with consideration of true north and the corresponding directions of the compass. A critical component of the hourly meteorological data used in these computations is wind direction. When the meteorological data are initially compiled, all hourly wind directions are referenced to true north. Therefore, contrary to coordinate systems developed for mobile sources mathematical modeling, stationary source modeling must simulate sources and receptor locations using a coordinate system that is consistent with the meteorological data set.

Additionally, it may not be reasonable to assume the stack(s) to be at the edge of the building roof. The Building Code of the City of New York regulates the placement of chimneys and vents and of buildings relative to nearby chimneys and vents. Additionally, the Zoning Resolution and NYC Air Pollution Control Code both contain performance standards for emissions from manufacturing uses. These regulations should be considered when determining the reasonable worst-case location(s) for modeling, when the exact locations of the proposed stack(s) are not available. See Subsection 713.

CAVITY REGIONS

Under certain meteorological conditions, the exhaust from a stack on top of, or proximate to, a structure may be entrapped for short periods in the cavity regions adjacent to the structure. For these cases, additional analysis may be appropriate when using a screening approach to determine impacts from stationary sources of emissions. Since AERMOD has the capability to determine impacts in the cavity region, cavity region may be included as part of the AERMOD modeling effort.

The predicted concentrations in a cavity zone are inversely proportional to the surface area of the building (perpendicular to the wind direction) and to the wind speed required to entrap most of the exhaust plume. It should be assumed in this type of analysis that all of the exhaust would be entrapped in the cavity zone.

Maximum predicted pollutant short-term averaging periods (*e.g.*, 1-, 3-, and 24-hour) are calculated for at least two of the perpendicular cross-sectional areas of the structure producing the cavity effect. Maximum potential cavity concentrations may be calculated using the SCREEN3 or AERSCREEN model.

Meteorological persistence factors of 0.9 and 0.4 are used to calculate the maximum 3- and 24-hour cavity pollutant concentrations, respectively, from 1-hour concentrations yielded from the SCREEN3 or AERSCREEN modeling.

VOLUME AND AREA SOURCES

A volume or area source analysis is used if a proposed project would result in development of a facility that would emit pollutants through a series of stacks along the rooftop edges of a structure or over an area on top of, or adjacent to, the facility. Pollutant emission rates through the multiple stacks or over the area may be estimated following the procedures discussed above, and concentrations at selected receptor sites should be determined following the procedures outlined in the AERMOD User's Manual. Conservative estimates of concentrations can be calculated using the recommended algorithms for these applications, assuming a wind speed of 1 meter per second, neutral atmospheric stability, and (if needed) meteorological persistence factors of 0.9 and 0.4 for 3- and 24-hour time averaging periods, respectively. For a more refined analysis, the AERMOD may be run for these area or volume source analyses using five years of meteorological data.

CUMULATIVE ANALYSIS

For proposed sources that would be located near existing or other proposed source(s), and where the contributions from these source(s) cannot be properly accounted for in the background concentrations, a cumulative analysis may be necessary. Detailed dispersion modeling should be conducted using the agreed upon list of sources, the same modeling parameters accepted by DEC for permitting purposes, and those described in this chapter. The following steps should be completed:

- An initial (primary) study area for analysis should be defined by delineating a 1,000-foot distance from the boundaries of the property line for the proposed facility.
- Ground level and elevated sensitive receptors outside the property line of the proposed project that may be affected by the proposed source should be identified. Maximum predicted concentrations at the receptors that may be affected by more than one source should be identified. This should be done in accordance with the guidelines described in Subsection 312.2.
- All facilities or sources within the 1,000-foot study area that may not be properly accounted for in the background concentrations and have a heat input of 2.8 million BTU/hour or greater should be identified along with their stack parameters and emissions calculations.
- A search should be conducted beyond the 1,000-foot initial study area to identify any existing sources that have the potential to significantly add to pollutant loadings at the identified sensitive receptors. Stack parameters and emissions calculations of these facilities should be presented along with similar data for the proposed facility. It is the responsibility of the applicant to verify these parameters or to present the rationale behind modeling assumptions to be used if verification data cannot be obtained. Similarly, all large sources that may be constructed before the proposed project should be identified if such sources would have the potential to add to pollutant loadings at receptor locations. Proposals that have active permit applications should be included.

- A preliminary background source inventory should be submitted to DEP for review, including all identified sources within and beyond the primary 1,000-foot study area. A screening analysis may be conducted to determine which of the background sources beyond the 1,000-foot study area may be eliminated from further consideration. The screening analysis is recommended to determine the final list of sources to be included in the detailed cumulative dispersion modeling. Consensus should be reached with DEP regarding the source inventory prior to the commencement of a detailed dispersion analysis.
- The collection of permit data for such sources generally follows the procedure outlined in Subsection 322.2.
- In general, those include: (a) use of the latest five years of meteorological data; (b) examination of criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and inhalable particulate matter (PM_{10} and $PM_{2.5}$); (c) large source loads; (d) long- and short-term analyses; (e) use of AERMOD to determine the highest short-term concentration and the highest average annual concentration; and (f) use of appropriate ambient concentrations (backgrounds). Combined emissions of the existing and planned sources identified above and background concentrations should be examined at all sensitive receptors to determine if there are any projected NAAQS exceedances.
- Downwash and cavity analysis, where necessary, should be included in the studies.
- All the backup data necessary to verify the results of the analysis should be submitted (as described in Section 430).

SUITABILITY OF FLUID (PHYSICAL) MODELING VERSUS MATHEMATICAL MODELING

For most projects, screening (for single residential buildings) or full-scale mathematical modeling is appropriate for evaluating air quality impacts from stationary sources. The mathematical expressions and formulations that constitute the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all mathematical models contain simplifications and approximations of actual conditions and interactions, and because a worst-case scenario is of most interest, these models are conservative and tend to overpredict pollutant concentrations, particularly under adverse meteorological conditions. Typically, these models are too conservative to account accurately for such conditions as complex topography and, therefore, may predict pollutant concentrations that are too high. Such conservative results are usually adequate in the analyses of small sources, such as residential or commercial boilers. When larger sources are being considered, physical modeling may yield more accurate results and is preferred because the dispersion created by either existing or proposed structures on air movement in the area under analysis predominates over the dispersion effects of regional atmospheric factors, such as thermal gradients.

Physical modeling, also called fluid or wind tunnel modeling, involves constructing a scaled model of the proposed buildings and any nearby existing and proposed buildings and surrounding terrain that is then subjected to wind tunnel studies in which a tracer gas is emitted from the source. Measurements are taken at different locations (receptors) on the physical model to determine the dispersion of the gas. Recommended procedures for fluid modeling are outlined in EPA's Guideline for Fluid Modeling of Atmospheric Diffusion (EPA-600/8-81-009), April 1981, and Guideline for Use of Fluid Modeling to Determine Good Engineering Practice Stack Height (EPA-450/4-81-003), July 1981. It is recommended that DEP be contacted for assistance before performing any fluid modeling studies.

BACKGROUND CONCENTRATIONS

The monitored background levels of the principal pollutants of concern for stationary source air quality modeling — SO_2, NO_2, and PM_{10} — have remained relatively steady for some time. The monitored background levels of $PM_{2.5}$ have come down appreciably in recent years. Summaries of the background levels for these pollutants at various DEC monitoring locations throughout New York City may be obtained from DEP. Background pollutant concentrations for lead and non-criteria pollutants (for which there is only a limited amount of data available) should be obtained from DEC reports on ambient air monitoring. These DEC reports may be examined at the offices of DEP. New York State ambient air monitoring data may also be found at DEC's website. To determine annual average background levels, the highest annual averages measured over the latest available 5-year period should be used for NO_2, SO_2 and CO, while the latest available 3-year period should be used for PM_{10} and $PM_{2.5}$. To determine worst-case short-term background levels, the highest second highest maximum yearly concentrations measured over the period should be used.

CHEMICAL SPILLS

Some projects may result in the development of facilities that house operations with the potential to accidentally emit air toxics as the result of chemical spills. As an example, medical, chemical, or school laboratories with fume hoods are required to have a ventilation system that discharges pollutants released under the hoods or in the laboratories to exhaust points above the rooftop. Since chemicals may be accidentally spilled in these facilities, the dispersion of hazardous pollutants from these discharge points and potential impacts on the surrounding community are examined. The appropriate department responsible for establishing and enforcing safety procedures for the storage and use of all hazardous materials at the institution should be contacted for a complete list of chemicals to be used in the proposed laboratories. In addition, the project's mechanical engineers should be contacted to obtain specific mechanical information for the laboratory fume hood exhaust system. The techniques described below may be applied to chemical spills or to any other short-term releases of pollutants.

EVAPORATION RATES. Evaporation rates for volatile hazardous chemicals that are expected to be used in the labs may be estimated using a model developed by the Shell Development Company to assess air quality impacts from chemical spills. The Shell model calculates evaporation rates based on physical properties of the material, temperature, and rate of air flow over the spill surface. The evaporation rates for such scenarios are usually calculated assuming room temperature conditions (~70°F) and an air flow rate of 0.5 meters/second. A "worst-case" chemical spill is usually determined by reviewing the chemicals that are expected to be frequently used under the hoods, the amount, the container sizes for such chemicals, and the evaporation rates (from Shell model) and relative toxicities of these chemicals (see Fleisher, M.T., An Evaporation/Air Dispersion Model for Chemical Spills on Land, Shell Development Company, December 1980). Samples of how to perform such calculations are also provided in the appendices (Guidelines for Calculating Evaporation Rate for Chemical Spills).

RECIRCULATION. Analysis of chemical spills or other sources of hazardous pollutants also considers the effects of recirculation of the pollutants from the vent back through nearby windows or air intake vents. This may occur anytime exhaust vents are situated near operable windows or intake vents. The potential for recirculation of fume hood emissions or other sources of hazardous pollutants back into the nearest window or fresh air intake vent may be assessed using the method described by D.J. Wilson in A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents (ASHRAE TRANS 89, Part 2A, 1983, pp. 136-152). This empirical procedure, which has been verified by both wind tunnel and full-scale testing, is a refinement of the ASHRAE handbook procedure and takes into account such factors as plume momentum, stack tip downwash, and cavity recirculation effects. Additional information on performing such calculations is provided in the appendices (Guidelines for Recirculation for Chemical Spills).

PUFF MODELING. Maximum pollutant concentrations at elevated receptors downwind of fume exhausts or other short-term, instantaneous releases of pollutants may be estimated using the latest EPA AERMOD or CALPUFF model. The EPA CALPUFF model version 5.8 is the most recent release of this model. CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation and removal. These models are appropriate because these types of emissions are typically present only for short periods of time. For example, most chemical spills are completely evaporated in considerably less than an hour. Under these conditions, maximum predicted pollutant concentrations from the recirculation calculations and the modeling at places of public access should be compared to the Short-Term Exposure Levels (STELs) or ceiling levels recommended by the U.S. Occupational Safety and Health Administration (OSHA) for these chemicals. STELs are usually 15-minute time-weighted average exposures that should not be exceeded at any time during an employee's work day. Ceiling levels are the exposure limits that should never be exceeded in an employee's work day. Stable atmospheric conditions and a 1 meter per second wind speed are usually assumed as input to the recommended model.

FUTURE NO-ACTION CONDITION

The assessment of stationary sources for the future without the project takes into consideration expected changes by the project's build year. For existing stationary sources, existing emissions are usually assumed to continue in the future, unless there is reason to expect otherwise. As noted above, when emissions are determined through a facility's operating permit(s), maximum allowable concentrations are assumed. For assessments of the effects of future pollutant emissions on sensitive uses near an existing manufacturing district, it may be appropriate to consider expected future trends in that district, when no known new development is proposed.

FUTURE WITH-ACTION CONDITION

This assessment considers conditions with the project in place, and compares them with conditions in the future No-Action scenario to determine the potential for significant impacts.

324. Mesoscale Analyses

As described earlier, nitrogen oxides and hydrocarbons are examined on a regional level. These pollutants are of concern because they are precursors to ozone (both may react in sunlight to form photochemical oxidants). The area for examination would typically be large, such as an entire borough, or the entire City of New York, or even the tri-state metropolitan area. Such an analysis is rarely performed because few projects have the potential to affect ozone precursors over such large regions.

Projects that may affect nitrogen oxides or hydrocarbons in such a large region would be those that greatly increase the total number of vehicle miles traveled in the region (for example, a major roadway improvement or construction of new bridges) or change regulations that affect numerous stationary sources (such as changes in the type of fuel burned throughout the city). Most often, these analyses are performed for large transportation projects.

In a mesoscale analysis, the project's contributions to the total emissions over the area are considered. In the example of a major roadway improvement that would greatly increase the total number of vehicle miles traveled, the analysis would consider whether the total amount of carbon monoxide, nitrogen oxides, and hydrocarbons emitted in the region would increase (because of the increased vehicle miles) or decrease (because the new roadway would alleviate existing congestion).

400. DETERMINING IMPACT SIGNIFICANCE

To determine whether a project may have a significant impact on ambient air quality or be impacted by ambient air quality levels, the analysis techniques described above are used to predict future concentrations in the chosen study area for the receptor locations if the project is not implemented (the No-Action condition). Then, concentrations predicted for the future with the project (the With-Action condition) are compared to the No-Action condition levels using the impact criteria described below.

410. IMPACT CRITERIA

411.1. Comparison with Standards

The predicted pollutant concentrations for the pollutants of concern associated with a proposed project are compared with either the NAAQS for criteria air pollutants or ambient guideline concentrations for non-criteria pollutants. In general, if a project would cause the standards for any pollutant to be exceeded, it may likely constitute a significant adverse impact. In addition, for CO from mobile sources and for $PM_{2.5}$, the de minimis criteria (described below in Subsection 412) are also used to determine significant impacts.

To evaluate the potential air quality impacts for criteria pollutants and non-criteria pollutants from stationary sources, predictions for these pollutant concentrations must correspond to the appropriate NAAQS time averaging periods. These standards are for the average concentration during each of those time periods. Annual standards pertain to the average pollutant concentrations either predicted or measured in a calendar year, while 24-hour standards pertain to pollutant concentrations occurring in a calendar day. For short-term standards (*i.e.*, 1-, 3-, 8-, and 24-hour averaging periods), two exceedances of the corresponding short-term standard in one calendar year (at the same location) constitute a violation of the standard. Recommended SGCs and AGCs for non-criteria pollutants correspond to time-averaging periods of 1-hour and annual averages, respectively.

411.2. Conformity

For projects subject to conformity requirements, potential air quality impacts should be evaluated to ensure that the project is consistent with the SIP and (1) would not contribute to any new violation of the NAAQS, (2) would not increase the frequency or severity of existing violations, and (3) would not delay attainment or required emission reductions. For projects subject to general conformity, *de minimis* thresholds listed for such projects under federal regulations should be referenced.

412. De Minimis Criteria

412.1. Carbon Monoxide

For CO from mobile sources, the City's *de minimis* criteria are used to determine the significance of the incremental increase in CO concentrations that would result from a proposed project. These set the minimum change in 8-hour average CO concentration that constitutes a significant environmental impact. According to these criteria, significant impacts are defined as follows:

- 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-Action 8-hour concentration is equal to 8 ppm or between 8 ppm and 9 ppm; or
- An increase of more than half the difference between baseline (*i.e.*, No-Action) concentrations and the 8-hour standard, when No-Action concentrations are below 8 ppm.

412.2. $PM_{2.5}$

The following criteria should be used for determination of significant adverse $PM_{2.5}$ impacts for projects subject to CEQR:

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard; or

- Predicted annual average $PM_{2.5}$ concentration increments greater than 0.1 µg/m^3 at ground level on a neighborhood scale (*i.e.*, the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Predicted annual average $PM_{2.5}$ concentration increments greater than 0.3 µg/m^3 at a discrete or ground-level receptor location.

Projects undergoing SEQRA review may have additional analysis requirements, and are encouraged to coordinate directly with the reviewing agencies.

413. Odors

A significant odor impact would occur if a project results in maximum predicted 1-hour average malodorous pollutant levels above the applicable odor threshold at places of public access, or if it results in the development of a structure that would be subject to such malodorous pollutant levels from nearby sources of these pollutants. Peaking factors may be employed to convert predicted 1-hour concentrations to shorter-term durations. If a dilution-to-thresholds approach is employed, a significant odor impact would occur if the dilution-to-thresholds indicated that malodorous impacts would be detected by a substantial portion of the population exposed at the nearest sensitive receptor. This determination depends on the odor thresholds for the substances of concern and the emission rates for those substances (see discussion above in Subsection 322.2). While odors may still be detected for time periods from a few seconds to several minutes, it would be unrealistic to define this as a significant impact unless the odor persisted, on average, for at least an hour. Generally, there are no other specific standards for odors as there are for other regulated pollutants.

420. TYPES OF POTENTIAL IMPACTS

For both mobile and stationary sources, significant impacts, as defined by the criteria above, may occur either (1) on surrounding uses as a result of the proposed project; or (2) on the proposed project due to the surrounding existing uses. Both scenarios must be considered under CEQR because either may result in significant adverse air quality impacts.

421. Mobile Sources

A project may result in significant mobile source air quality impacts when the incremental increases in CO concentrations, relative to those in the No-Action scenario, or the $PM_{2.5}$ concentrations, relative to the background concentrations, exceed the *de minimis* criteria, or when a project results in the creation or exacerbation of a predicted violation of the NAAQS for the pollutants of concern. For example, if a project adds vehicles to a particular intersection and thereby changes the 8-hour CO concentration at that intersection from 6 ppm in the No-Action condition to 7 ppm in the With-Action condition, no significant impact occurs because the increase caused by the project (1 ppm) is not equal to more than half the difference between the baseline and the 8-hour standard of 9 ppm. The project would have to increase the concentration by more than 1.5 ppm at that location to have a significant adverse impact. If the project raised the 8-hour CO concentrations at an intersection from 8 ppm to 9 ppm, a significant impact would occur because this increase would be greater than the de minimis criterion of 0.5 ppm or greater when the No-Action concentration is 8 ppm or between 8 ppm and 9 ppm. Note that any violation of the NAAQS constitutes a significant adverse impact, regardless of the *de minimis* criterion. For example, if a project causes an increase in the 8-hour CO concentration from 8.9 to 9.2 ppm, a significant adverse impact occurs.

Similar to the CO criteria, a project results in significant mobile source air quality impacts when the incremental increase in $PM_{2.5}$ concentrations exceeds the *de minimis* and incremental criteria above. However, annual incremental concentrations of $PM_{2.5}$ from mobile sources at intersection locations are only assessed on a neighborhood, rather than local, scale.

422. Stationary Sources

Sulfur dioxide, nitrogen dioxide, and respirable particulate matter are the principal pollutants associated with a project that may result in a significant stationary source impact, although significant impacts for lead and other toxic contaminants may also occur. A proposed project has a significant adverse stationary source air quality impact if it results in either the creation or exacerbation of a violation of the NAAQS for criteria pollutants, an exceedance of the $PM_{2.5}$ *de minimis* criteria, or an exceedance of the guidance values for non-criteria pollutants.

When a proposed project causes the NAAQS or $PM_{2.5}$ *de minimis* criteria to be exceeded at sensitive receptors, such as air intake vents, balconies, or operable windows, the potential for a significant adverse impact at such locations should be disclosed. Further analysis may be performed to determine the expected range of indoor concentrations. The indoor values may be lower, depending on the magnitude of the predicted concentration, the time of year, the outside temperature, and the manner in which the ventilation system operates (*e.g.*, whether it mixed with other air intake locations). In this case, judgment is required to determine whether it is reasonable to assume the indoor concentration is the same as, or lower than, the outdoor concentration. If the predicted range of indoor values is lower than those outside, the potential for significant impacts resulting from exceeding standards outside is still disclosed.

Projects that cause the NAAQS or $PM_{2.5}$ *de minimis* criteria to be exceeded at locations to which the public would not have ongoing access, such as at elevated locations on a residential building that are not near operable windows, balconies, or air intake vents, do not result in significant adverse impacts. These locations are not considered ambient air and, therefore, are not valid receptors.

423. Odors

Most often, odor impacts result from stationary sources. Like other air quality impacts, these may occur because the proposed project would either cause odors or add a sensitive use in an area subject to odors.

430. PRESENTATION OF RESULTS

As described above in Section 300, a typical air quality analysis considers a large number of receptors. Generally, the environmental assessment may limit its report on the analysis results to those receptors where the maximum predicted pollutant concentrations and maximum incremental impacts from the project are calculated. The results for all other receptors may be reported in an appendix or be made available on request. Typically, when summarizing the results for CO analyses, values presented are rounded off to the nearest tenth of a part per million (ppm). For example, an 8-hour CO level at a receptor site would typically be reported as 6.5 ppm, not 6.464 ppm or 7 ppm. In many cases, only the 8-hour average CO values are reported because the maximum predicted 1-hour CO concentrations are well below the applicable NAAQS. Comparisons to the *de minimis* criteria of 0.5 ppm are made to the nearest hundredth of a ppm (*i.e.*, an increment of 0.49 ppm in the 8-hour CO average would not be a significant *de minimis* impact, but 0.51 ppm would be a significant adverse impact if the 0.5 ppm criterion was applicable in this instance).

All the backup data that are necessary for DEP or the reviewing agency to verify the results of any analysis should be submitted. These data should be submitted on electronic media such as CD-ROMs and should include a "read me" file with information describing the content and names of the files presented. The backup data should include:

- Scaled maps with coordinates and receptor locations.
- Emissions calculations and, if applicable, a list of equipment, emission factors and their sources, formulas, and assumptions or manufacturers' specifications, *etc.* used to develop the total emissions present-

ed. A detailed sample calculation should be provided for each pollutant. Any assumptions made or any regulation or reduction applied to emissions should be stated and appropriately substantiated.

- For stationary source analyses, buildings and dimensions of buildings that may create downwash, the stack locations, *etc.*
- For mobile source analyses, supplemental traffic data should be included (*e.g.*, speeds, vehicle classifications).
- Tables or spreadsheets detailing any additional calculations (*e.g.*, parking, chemical spills, AP-42 emission factors).
- For a detailed cumulative impact analysis, the documentation should clearly reference how the emissions and stack parameters were obtained for the included sources.
- Input and output files for all the models used in the analyses should be submitted.

500. DEVELOPING MITIGATION

When a significant air quality impact (as defined above) is likely to result from a project, potential mitigation measures to eliminate such adverse impacts must be investigated.

510. MOBILE SOURCES

Measures that would mitigate the full increment of CO resulting from the project should be identified. If potential concentrations exceed the 8-hour CO standard of 9 ppm, further measures that allow the city to attain compliance should be identified. As discussed above, refined dispersion modeling with CAL3QHCR should be performed before identifying traffic mitigation measures for eliminating predicted impacts.

511. Roadways

Significant mobile source impacts due to pollutant concentrations would usually occur at a sidewalk adjacent to an intersection that encounters a significant amount of congested vehicular traffic. In many instances, the mitigation measures recommended to eliminate a predicted significant traffic impact at an intersection would also eliminate any predicted significant air quality impacts at this location. Potential mitigation measures for eliminating adverse traffic impacts are presented in Chapter 16, “Transportation.”

At the same time, traffic mitigation measures – such as those that would increase the number of moving lanes at an approach to an intersection, increase red time at an intersection, or divert traffic to other intersections – may result in increasing pollutant levels near the affected intersections. Consequently, all mitigation measures that avoid or minimize the project's impacts in other technical areas should be assessed for their potential air quality impacts.

512. Parking Facilities

Significant air quality impacts from parking facilities may usually be mitigated using the same range of options available to mitigate traffic impacts and significant air quality impacts related to roadways. If the vent(s) for an enclosed mechanically ventilated parking facility may result in significant air quality impacts, restrictions on the placement of such vent(s) may be incorporated into the project to mitigate the impacts.

520. STATIONARY SOURCES

There are several options available to mitigate the significant adverse impacts caused by stationary sources for the criteria pollutants of concern. One typical example of a significant stationary source impact would be the result of the emissions from a large stack on a nearby, taller building. Examples of potential mitigation measures available for alleviating this adverse impact include the following:

- Restricting the fuel type burned and exhausted from this stack;
- Modifications to the design of the proposed project that eliminate receptor locations that may experience impacts (building setbacks, sealed windows, *etc.*);
- Restricting the processing capacity at the facility;
- Restricting the operating parameters and physical dimensions of the stack or vent (*i.e.*, increasing the source height or increasing the exhaust velocity, which may lessen the impact on the project);
- Control equipment to limit emissions from the facility; and
- Moving the location of the stack or vent to ensure that there would be no significant impacts from the facility on the proposed project.

These measures may be difficult to implement if the stack that would cause the impact is not part of the project and is owned by a party not involved in the project. As noted in Chapter 1, "Procedures and Documentation," commitments to mitigation measures must be obtained before those measures may be considered adequate to mitigate a project's significant impacts.

Stationary source impacts ensuing from a project that facilitates the development of an industrial facility that would emit significant amounts of air toxics or malodorous pollutants may be mitigated by such means as:

- Restricting the processing capacity at the facility;
- Requiring commitments on odor control mechanisms for the facility that ensure elimination of potential impacts; or
- Restrictions similar to those discussed for the new boiler stack impact example.

530. GENERIC ACTIONS

For generic actions, site-specific mitigation measures are often inappropriate because the intersections or stationary sources assessed are often only prototypes. In these cases, mitigation would typically involve changes to the proposed project that would avoid the resulting significant impact.

540. (E) DESIGNATIONS

The (E) Designation is an institutional control that is implemented through CEQR review of a zoning map or text amendment or action pursuant to the Zoning Resolution. It provides a mechanism to ensure that measures aimed at avoiding a significant adverse impact and, if necessary, remediation are completed as part of future development, thereby eliminating the potential for an air quality impact.

If necessary, the lead agency may consult with DEP during the CEQR process to identify sites requiring an (E). The Mayor's Office of Environmental Remediation (OER) is responsible for administering post-CEQR determinations for assigned (E) Designations and existing Restrictive Declarations, pursuant to Section 11-15 (Environmental Requirements) of the Zoning Resolution of the City of New York and Chapter 24 of Title 15 of the Rules of the City of New York (Rules). If property owners have applied for an action that will result in placement of an (E) Designation, they are advised to provide the CEQR number to OER and, in order to facilitate OER's review of the proposed work to address the requirements of the (E) Designation, it may be necessary for property owners to provide historical technical documentation related to the CEQR Air Quality analysis (*e.g.*, EAS/EIS, Technical Memoranda, CEQR determination, modeling results, lead agency and DEP correspondences, Restrictive Declarations, Notices) to OER. The Rules and Section 11-15 of the Zoning Resolution set out the procedures for placing, satisfying and removing (E) Designations. OER should review and approve all documents needed to satisfy the requirement of the Air Quality (E) Designation (*e.g.*, boilers/HVAC specifications, fuel usage, stack location).

(E) Designations are listed in a table, "CEQR Environmental Requirements," appended to the Zoning Resolution, and appear in the Department of Buildings' (DOB) online Buildings Information System (BIS).

With respect to (E) designated lots, DOB will not issue building permits or certificates of occupancy in connection with the following actions until it receives an appropriate "Notice" from OER that the (E) requirements have been met:

- Developments;
- Enlargements, extensions or changes of use; or
- Alterations that involve ventilation or exhaust systems, including, but not limited to, stack relocation or vent replacement.

As appropriate, OER issues the applicable notices to DOB including a Notice of No Objection, Notice to Proceed or Notice of Satisfaction.

600. DEVELOPING ALTERNATIVES

Alternatives that incorporate the potential mitigation options discussed above may also reduce or avoid significant impacts associated with a project. In addition to these mitigation measures, there are alternative options available that may also reduce or eliminate significant air quality impacts in these respective areas.

610. MOBILE SOURCES

Mobile source air quality impacts are usually directly related to the size and type of development and, consequently, the amount of traffic generated by development of such a project. Therefore, alternatives that would diminish the magnitude of the project-generated traffic should also, in general, lessen the mobile source impacts associated with such projects.

In instances where the project-generated traffic would create significant parking facility impacts due to locations of the egress points at the site affected by the project, these impacts may be reduced by developing alternatives with relocated or multiple access/egress points.

620. STATIONARY SOURCES

In the cases where significant stationary source impacts would result from the structure introduced through the project, alternatives that modify the dimensions of the structure (*e.g.*, lower the maximum height of the structure; restrict the locations of operable windows and/or air intakes if it is impacted by a nearby emission source, such as a power generating station) may eliminate adverse impacts.

700. REGULATIONS AND COORDINATION

710. REGULATIONS AND ADMINISTRATIVE RECORD

711. Federal Regulations

711.1. Clean Air Act

The CAA, which was first enacted in 1955 and subsequently amended in 1963 and 1967, changed significantly with the passage of the 1970 amendments. That year, Congress passed amendments that significantly broadened the federal role in air pollution control. In addition to establishing NAAQS for six criteria pollutants (sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, nitrogen dioxide, and hydrocarbons), the 1970 amendments also established the new source performance standard (NSPS) program and the national emission standards for hazardous air pollutants (NESHAP).

These programs gave EPA the authority to regulate emissions from new stationary sources as well as the ability to regulate hazardous air pollutants not covered by NAAQS. EPA added a NAAQS for lead in 1978 and rescinded the hydrocarbon NAAQS in 1983. In the 1977 amendments, two new programs were added: a nonattainment program was adopted for areas in violation of specific NAAQS and a prevention of significant deterioration (PSD) program was established for areas meeting NAAQS.

For CEQR, the most significant aspect of the CAA and its amendments has been the SIP program begun in 1970. Under this program, each state must demonstrate in a SIP the manner in which it will attain compliance with the NAAQS. Once a SIP has been approved by EPA it becomes federally enforceable and subject to citizen suits.

EPA has developed many air quality regulations, which are contained in the Code of Federal Regulations (CFR). The most pertinent air quality regulations in the CFR are as follows:

- 40 CFR 50: National Primary and Secondary Ambient Air Quality Standards.
- 40 CFR 51: Preparation of Implementation Plans.
- 40 CFR 52: Approval and Promulgation of Implementation Plans (which includes Prevention of Significant Deterioration).
- 40 CFR 53: Ambient Air Monitoring Methods.
- 40 CFR 60: Standards of Performance for New Stationary Sources.
- 40 CFR 61: National Emission Standards for Hazardous Air Pollutants.
- 40 CFR 93: Determining Conformity of Federal Actions to State or Federal Implementation Plans.

In addition, as part of the 1990 Clean Air Act Amendments (CAAA), EPA has also established a list of 189 air toxics (HAPs) to be regulated (this list is found in Title III of the CAAA). This list is regulatory in nature: it is used to determine the levels of controls and permits required for different projects rather than to assess a project's impacts.

Other relevant CAAA issues include provisions for attainment and maintenance of NAAQS (Title I); provisions relating to mobile sources—these promulgated emission reductions are accounted for in the latest mobile source emission models (Title II); and provisions relating to stratospheric ozone protection (Title VI). The last title, relating to ozone protection, contains regulations governing various chlorofluorocarbons (commonly referred to as "CFCs"), including prohibitions against the use of certain CFCs and controls for the recycling and disposal of others.

711.2. OSHA and NIOSH Standards

The U.S. Occupational Safety and Health Administration (OSHA) regulates air pollutants in the workplace. The National Institute for Occupational Safety and Health (NIOSH) is the Federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. OSHA and NIOSH have promulgated standards for many air contaminants in the workplace. These standards are identified in 29 CFR 1910.1000, as amended. NIOSH's Pocket Guide to Chemical Hazards, July 1996, also identifies recommended standards. Permissible Exposure Limits include Short Term Exposure Limits (the employee's 15-minute time-weighted average exposure that shall not be exceeded), 8-hour Time Weighted Average limits (the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week that shall not be exceeded), and ceiling levels (the employee's exposure that shall not be exceeded during any part of the work day).

712. New York State Regulations

DEC provides applicable New York State air quality regulations under the New York Codes, Rules and Regulations, Title 6, Chapter III-Air Resources, Subchapter A-Prevention and Control of Air Contamination and Air Pollution:

- Part 200: General Provisions.
- Part 201: Permits and Certifications.
- Part 203: Indirect Sources of Air Contamination.
- Part 211: General Prohibitions.
- Part 212: General Process Emission Sources.
- Part 218: Emissions Standards for Motor Vehicles and Motor Vehicle Engines.
- Part 219: Incinerators.
- Part 222: New Incinerators for New York City.
- Part 228: Surface Coating Processes.
- Part 231: New Source Review for New and Modified Facilities.
- Part 232: Perchloroethylene Dry Cleaning Facilities.
- Part 234: Graphic Arts.
- Part 240: Transportation Conformity Rule.
- Part 257: Air Quality Standards.

713. New York City Regulations

- New York City Air Pollution Control Code, Section 1402.2-9.11, "Preventing Particulate Matter from Becoming Airborne; Spraying of Asbestos Prohibited; Spraying of Insulating Material and Demolition Regulated." These regulations govern fugitive dust.
- Building Code of the City of New York (Local Law No. 76 of 1968 and amendments), Title 27 of the Administrative Code of the City of New York Chapter 1, Subchapter 15, governs chimneys and gas vents.
- Local Law No. 77 of 2003 and amendments, Title 15 of the Administrative Code of the City of New York, Chapter 14, Rules Concerning the use of Ultra-Low Sulfur Fuel and Emissions Control Technology in Nonroad Vehicles Used in City Construction.
- New York City Zoning Resolution, Article IV (Manufacturing Districts), Chapter 2, Section 42-20, provides performance standards in manufacturing districts that address smoke, dust, and other particulate matter, and odorous matter.

720. APPLICABLE COORDINATION

Consistency with the New York State Implementation Plan for air quality (SIP) is of critical importance to New York City. If the State is found to be inconsistent with this plan by the EPA, federal transportation funding for the City may be suspended. DEP is the designated City agency for coordinating with EPA for SIP consistency. Therefore, under certain circumstances, the lead agency needs to coordinate detailed air quality analyses with DEP.

Coordination between the lead agency and DEP is strongly recommended and DEP should be notified if the air quality analysis for projects subject to CEQR indicates any of the following results: a potential violation of the ambient air quality standards for CO and PM predicted from mobile sources at any location in the project's build year(s); an exceedance of any of the criteria ambient air quality standards due to stationary sources at any location; or an exceedance of any of the $PM_{2.5}$ criteria thresholds.

The data used for any refined air quality impact studies for a proposed project should be examined for consistency with recent air quality studies performed in the same region affected by the proposed project. In addition, the air quality analysis requires coordination with the traffic and transportation analyses, both for data collection and for certain analysis techniques.

730. LOCATION OF INFORMATION

At DEP, BEPA is the main source that compiles readily available data that is commonly required to perform detailed mobile and stationary source air quality analyses. DEP may also provide sample air quality analyses for various types of applications.

Requests for copies of the Bureau of Environmental Compliance (BEC) air contaminant permits should be addressed to:

DEP's Bureau of Environmental Compliance
59-17 Junction Boulevard
Elmhurst NY 11373

Requests for fee waivers for BEC searches should be addressed to DEP Bureau of Legal and Legislative Affairs at the same address as BEC.