10 Air Quality

10.1 INTRODUCTION

This chapter assesses the potential effect of implementing the CBD Tolling Alternative on air quality, air pollution, and greenhouse gas (GHG) emissions. It also summarizes the Project's Transportation Conformity Determination.

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants and air toxics can degrade the atmosphere by reducing visibility; they can also damage property, reduce the productivity or vigor of crops or natural vegetation, and harm human and/or animal health. Air quality is the term used to describe the level of pollution in the atmosphere and is usually compared to a regulated set of standards established by the U.S. Environmental Protection Agency (USEPA).

10.1.1 Context

The regional study area for the traffic analyses includes 28 counties in New York, New Jersey, and Connecticut.

Most of the regional study area is within the New York-N. New Jersey-Long Island nonattainment area[1] for the 2008 and 2015 ozone (O_3) National Ambient Air Quality Standards (NAAQS), and many counties, or portions thereof, are maintenance areas (previously nonattainment areas) for carbon monoxide (CO) and particulate matter ($PM_{2.5}$ and PM_{10}) NAAQS. Furthermore, New York County, which includes the Manhattan CBD, is a nonattainment area for PM_{10}. **Appendix 10A, "Air Quality: Description of Pollutants and MOVES Modeling Files,"** provides a full description of pollutants. According to monitored air quality data collected by USEPA around New York City and New Jersey, there were several exceedances of the O_3 standard, but no exceedances of any of the other criteria pollutants.

According to the New York City Community Air Survey (NYCCAS), annual average levels of four key pollutants ($PM_{2.5}$, nitrogen dioxide [NO_2], nitric oxide, and black carbon) decreased citywide—from 33 to 52 percent—between 2009 and 2019. Air quality has improved substantially since the City of New York required building owners to convert to cleaner heating oils in 2015.

10.1.2 Regulations

The Clean Air Act (CAA) and the Final Transportation Conformity Rule (40 CFR Parts 51 and 93) direct USEPA to implement environmental policies and regulations that will ensure acceptable levels of air quality.

1 A geographic area that meets or does better than the standard(s) is called an attainment area, while areas that do not meet the standard(s) are referred to as nonattainment or maintenance areas.

The CAA and the Final Transportation Conformity Rule affect the funding and approval of proposed transportation projects. According to CAA Title I, Section 176 (c) 2: "No Federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program or project has been found to conform to any applicable State Implementation Plan in effect under this act."

According to Section 176(c)2(A) of the CAA, conformity to an implementation plan means not causing any new or reducing the severity and number of any existing violations of the NAAQS and achieving expeditious attainment of such standards, and that such activities will not:

- Cause or contribute to any new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

10.1.3 National and State Ambient Air Quality Standards

As required by the CAA, NAAQS have been established for six major air pollutants, known as criteria pollutants: CO, NO_2, O_3, $PM_{2.5}$ and PM_{10}, sulfur dioxide (SO_2), and lead (Pb). **Table 10-1** summarizes the Federal standards. "Primary" standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly, while "secondary" standards are intended to protect the nation's welfare, accounting for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of general welfare.

10.1.4 Attainment Status

Section 107 of the CAA requires that USEPA publish a list of all geographic areas in compliance with the NAAQS and those not attaining the NAAQS. Areas not in NAAQS compliance are deemed nonattainment areas. Areas that have insufficient data to support a determination are deemed "unclassified" and are treated as being attainment areas until proven otherwise. Maintenance areas are areas that were previously designated as nonattainment for a pollutant but have since demonstrated compliance with the NAAQS for that pollutant. An area's designation is based on the data collected by the state monitoring network on a pollutant-by-pollutant basis.

To provide background on existing air quality conditions in the Project's 28-county regional study area, **Table 10-2** lists the counties or portions thereof that are currently attainment, nonattainment, or maintenance areas for the following criteria pollutants: CO, O_3, $PM_{2.5}$ and PM_{10}, and SO_2. All counties in the study area are in attainment for Pb and NO_2; as such, these pollutants have not been included in the table.

The majority of the regional study area is classified nonattainment for the 2008 and 2015 O_3 NAAQS, while many counties, or portions thereof, are maintenance areas for CO and $PM_{2.5}$.

Table 10-1. National Ambient Air Quality Standards

POLLUTANT		PRIMARY/ SECONDARY	AVERAGING TIME	LEVEL	FORM
Carbon Monoxide (CO)		Primary	8-hour	9 parts per million (ppm)	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and Secondary	Rolling 3-month average	0.15 micrograms per cubic meter of air ($\mu g/m^3$)(1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 parts per billion (ppb)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	Annual	53 ppb(2)	Annual Mean
Ozone (O_3)		Primary and Secondary	8-hour	0.070 ppm(3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	$PM_{2.5}$	Primary	Annual	12 $\mu g/m^3$	Annual mean, averaged over 3 years
		Secondary	Annual	15 $\mu g/m^3$	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb(4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: U.S. Environmental Protection Agency, Office of Air and Radiation, https://www.epa.gov/criteria-air-pollutants/naaqs-table;
New York State Department of Environmental Conservation (NYSDEC), http://www.dec.ny.gov/chemical/8406.html.

Notes:

(1) Final rule signed October 15, 2008. The 1978 Pb standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 year, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO_2 standard is 0.053 parts per million (ppm), equal to 53 parts per billion (ppb), which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is a U.S. Environmental Protection Agency action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.

Table 10-2. Current Air Quality Attainment Status

STATE	COUNTY	CARBON MONOXIDE	OZONE	PARTICULATE MATTER ($PM_{2.5}$)	PARTICULATE MATTER (PM_{10})	SULFUR DIOXIDE
New York	Bronx	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Dutchess	Attainment	Attainment	Attainment	Attainment	Attainment
	Kings	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Nassau	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	New York	— Maintenance —	* Nonattainment *	— Maintenance —	* Nonattainment[1] *	Attainment
	Orange	Attainment	Attainment	— Maintenance —	Attainment	Attainment
	Putnam	Attainment	Attainment	Attainment	Attainment	Attainment
	Queens	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Richmond	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Rockland	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Suffolk	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Westchester	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
New Jersey	Bergen	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Essex	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Hudson	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Hunterdon	Attainment	* Nonattainment *	Attainment	Attainment	Attainment
	Mercer	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Middlesex	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Monmouth	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Morris	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Ocean	Attainment	* Nonattainment *	Attainment	Attainment	Attainment
	Passaic	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Somerset	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Sussex	Attainment	* Nonattainment *	Attainment	Attainment	Attainment
	Union	— Maintenance —	* Nonattainment *	— Maintenance —	Attainment	Attainment
	Warren	Attainment	* Nonattainment *	Attainment	Attainment	* Nonattainment *
Connecticut	Fairfield	Attainment	* Nonattainment *	— Maintenance —	Attainment	Attainment
	New Haven	Attainment	* Nonattainment *	— Maintenance —	— Maintenance —	Attainment

Source: U.S. Environmental Protection Agency Green Book
Note: As per 40 CFR Part 81.333, this PM_{10} designation applied only to the annual form of the PM_{10} NAAQS. The annual PM_{10} NAAQS was revoked on October 17, 2006.

10.1.5 Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, USEPA regulates air toxics, also known as hazardous air pollutants. Hazardous air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most hazardous air pollutants originate from human-made sources, including on-road mobile sources (e.g., vehicles), non-road mobile sources (e.g., airplanes), area sources (e.g., landfills), point sources (e.g., dry cleaners), line sources (e.g., roadways), and stationary sources (e.g., factories or refineries).

Controlling hazardous air pollutant emissions became a national priority with the passage of the CAA Amendments of 1990, which mandate that USEPA regulate 188 air toxics. USEPA has assessed this expansive list in its latest rule—Control of Hazardous Air Pollutants from Mobile Sources (72 Federal Register 8427, February 26, 2007)—and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.[2] In addition, in its 2011 National Air Toxics Assessment, USEPA identified nine compounds, referred to as priority mobile source air toxics (MSAT), which account for substantial contributions from mobile sources and are among the national- and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors.[3] These compounds are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. FHWA considers these the priority MSAT.

The 2007 USEPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. FHWA, using USEPA's Motor Vehicle Emission Simulator (MOVES) model, estimates a combined nationwide reduction of 91 percent in the total annual emissions for the priority MSATs even as forecast VMT increases by 45 percent from 2010 to 2050 (**Figure 10-1**).[4] Furthermore, USEPA's *Final Rule for Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards,* which took effect in 2017, set new vehicle emissions standards and lowered the sulfur content of gasoline, considering the vehicle and its fuel as an integrated system. The Tier 3 vehicle standards have further reduced both tailpipe and evaporative emissions, including MSATs, from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles.[5] As a result of these controls, overall reductions in MSAT are expected regardless of Project scenario.

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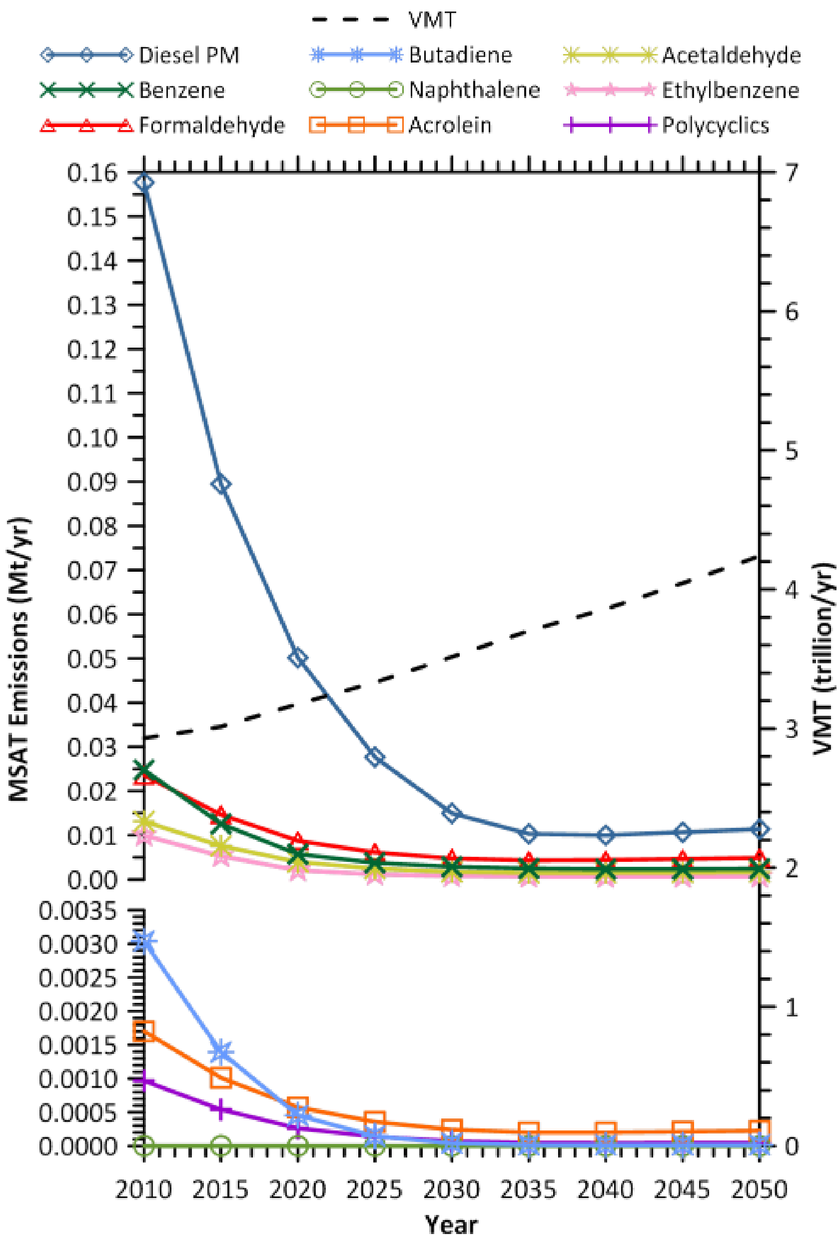
2 EPA's Integrated Risk Information System; http://www.epa.gov/iris/.

3 EPA's 2011 National Air Toxics Assessment; https://www.epa.gov/national-air-toxics-assessment/2011-national-air-toxics-assessment.

4 Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents; https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/.

5 https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-control-air-pollution-motor-vehicles-tier-3.

Figure 10-1. FHWA Projected National MSAT Emission Trends (2010 to 2050) using EPA's MOVES2014a Model for Vehicles Operating on Roadways



Source: FHWA

Because of the unique properties of the Project (affecting a widespread area, located in proximity to populated areas), the Project has been analyzed as a Tier 3 project with higher potential MSAT effects, as defined by FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*. Thus, a quantitative MSAT emissions analysis was conducted for the Project. The MSAT analysis was conducted on a subregional basis to capture the overall changes in MSAT emissions in each county. Because of the Project's unique scope and the extent of its impact on roadways of all types throughout the region, the MSAT emissions analysis was conducted for the 12-county region (see **Table 10-3** and **Section 10.1.7.1**).

As stated in FHWA's *Frequently Asked Questions (FAQ) Conducting Quantitative MSAT Analysis for FHWA NEPA Documents,*[6] Project-specific knowledge and consideration of local circumstances were considered in the overall MSAT analysis approach. In order to potentially focus on only those segments with the greatest benefits and effects, changes in annual average daily traffic (AADT) were screened (plus or minus 5 percent) across the 12-county region where the largest benefits and effects would be expected (**Appendix 10D, "Changes in Annual Average Daily Traffic (AADT)"**). Few roadway segments met these criteria, despite the extensive network and multiple types of roadways within the region. Thus, the quantitative MSAT emissions analysis included the entire traffic network of the 12-county study area. This approach is consistent with the regional pollutant burden and GHG analysis and provides a common basis for comparison across all analyses. In this chapter, maps and changes display VMT, which is the sum of the AADT multiplied by the individual link length.

10.1.5.1 Incomplete or Unavailable Information for Project-Specific Mobile Source Air Toxics Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict a project-specific health impact due to changes in MSAT emissions associated with a proposed set of alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

USEPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the CAA and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. USEPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System, which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects."[7] Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.*[8] Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations[9] or in the future as vehicle emissions substantially decrease.

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6 https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/moves_msat_faq.cfm.
7 U.S. Environmental Protection Agency, https://www.epa.gov/iris.
8 https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/page04.cfm.
9 HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts—each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI.[10] As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. USEPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk."[11]

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by USEPA as provided by the CAA to determine whether more stringent controls are required to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires USEPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld USEPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.[12]

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties

10 HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects.

11 U.S. Environmental Protection Agency. IRIS database, Diesel Engine Exhaust, Section II.C. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal.

12 https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf.

associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against a project's benefits—such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response—that are better suited for quantitative analysis.

10.1.6 Climate Change and Greenhouse Gases

Although no national standards, criteria, or thresholds are in effect for GHGs, their role in climate change is of important national and global concern. While Earth has gone through many natural changes in climate in its history, there is general agreement that Earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) GHG emissions contribute to this process.[13] Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

There are many types of GHGs, and each GHG affects global warming differently. As a result, the Global Warming Potential (GWP) metric was developed to allow comparisons of the global warming impacts of different GHGs. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms Earth compared to CO_2 over that period. The time period used for GWPs is typically 100 years. GWPs provide the following common units of measure, allowing analysts to sum emission estimates of different gases (e.g., to compile a national GHG inventory) for comparison and to identify reduction opportunities:

- CO_2, by definition, has a GWP of 1 regardless of the period used. CO_2 remains in the atmosphere for a long time. CO_2 emissions cause increases in atmospheric CO_2 concentrations that will last thousands of years.
- CH_4 has a GWP 25 times that of CO_2 for a 100-year period. CH_4 emitted today lasts about a decade, which is a shorter period than CO_2. However, CH_4 absorbs much more energy than CO_2. The net effect of the shorter lifetime and higher energy absorption is reflected in the GWP. The CH_4 GWP also accounts for indirect effects, such as the fact that CH_4 is a precursor to O_3, and O_3 is itself a GHG.
- N_2O has a GWP 298 times that of CO_2 for a 100-year period. N_2O emitted today remains in the atmosphere for more than 100 years.

GHGs are reported in CO_2 Equivalents (CO_2e), which is a combined measure of GHG emissions weighted according to the GWP of each gas, relative to CO_2. CO_2e is calculated within USEPA's Motor Vehicle Emission Simulator (MOVES2014b) model from CO_2, N_2O, and CH_4 mass emissions according to the following equation:

$$CO_2e = CO_2 \times GWP_{CO2} + CH_4 \times GWP_{CH4} + N_2O \times GWP_{N2O}$$

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13 Intergovernmental Panel on Climate Change. 2007. *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp. https://www.ipcc.ch/report/ar4/wg1/.

10.1.7 Methodology

Air quality mesoscale, MSAT, and GHG analyses were conducted to determine how the Project would affect total mobile source emissions. Air quality was also analyzed on a local (microscale) level to evaluate potential CO and PM impacts. The mesoscale analysis was conducted to show the differences between the No Action Alternative and the CBD Tolling Alternative, whereas the local analysis demonstrated that the hot-spot requirements are satisfied for Project-level conformity per the CAA as well as for NEPA.

Analyses were conducted for the estimated time of completion (2023) and future analysis year (2045). It should be noted that the year 2023 No Action Alternative is also representative of existing conditions, as the Project will be implemented in a relatively short time period.

10.1.7.1 Mesoscale, MSAT, and GHG Analysis

USEPA's emission model, MOVES2014b, was used to estimate the mobile source emission factors for the mesoscale, MSAT, and GHG analyses. MOVES2014b provides great flexibility to capture the influence of time of day, car and bus/truck activity, vehicle speeds, and seasonal weather effects on emission rates from vehicles. MOVES2014b calculates emission-related parameters, such as total mass emissions and vehicle activity (hours operated and miles traveled). From this output, emission rates (e.g., grams/vehicle-miles for moving vehicles or grams/vehicle-hours for idling vehicles) can be determined for a variety of vehicle activities.

MOVES2014b requires site-specific input data for traffic volumes, vehicle types, fuel parameters, age distribution, and other inputs. By using site-specific data, the emission results reflect the traffic characteristics of the roadways affected by the Project. **Appendix 10A, "Air Quality: Description of Pollutants and MOVES Modeling Files,"** provides electronic versions of all the MOVES modeling conducted for the Project.

The regional study area for the Project includes 28 counties in the New York City region (for more information on the 28-county regional study area, see **Chapter 3, "Environmental Analysis Framework"**). These 28 counties represent the main catchment area for trips to and from the Manhattan CBD and therefore the area where VMT would change as a result of the CBD Tolling Alternative.

Based on the methodology used to identify the most concentrated areas of change, the following 12 New York and New Jersey counties were used for the air quality mesoscale, MSAT, and GHG analyses for the Project:

- New York City:
  - Bronx
  - Kings (Brooklyn)
  - New York (Manhattan) / Manhattan CBD
  - Queens
  - Richmond (Staten Island)

- Long Island:
  - Nassau
  - Suffolk
- North of New York City:
  - Putnam
  - Rockland
  - Westchester
- New Jersey:
  - Hudson
  - Bergen

As shown in **Table 10-3**, the 12 counties analyzed include those in New York that are projected to have the largest increase in VMT (Richmond County [Staten Island]) and the largest decrease in VMT (New York County [Manhattan]) as a result of the Project, as well as those counties in New Jersey that are predicted to have the largest increase in VMT (Bergen County) and the largest decrease in VMT (Hudson County) as a result of the Project, in both 2023 and 2045. VMT in Connecticut is predicted to decrease in both 2023 and 2045 between the No Action Alternative and the CBD Tolling Alternative; as such, Connecticut counties were not included in the mesoscale, MSAT, and GHG analyses.

MOVES2014b was used to estimate emissions of criteria pollutants, MSATs, GHG, and energy from the mesoscale roadway network in the 12-county region. The NYSDEC has developed county-specific MOVES input data, and Project travel-demand analysts provided the traffic forecasts for each tolling scenario considered in the transportation analysis.

Table 10-4 and Table 10-5 describe the specific MOVES2014b inputs. County-specific data and Project-specific traffic data were used to develop Project-specific input files to demonstrate the effects of the CBD Tolling Alternative. The mesoscale, MSAT, and GHG analyses evaluated the No Action Alternative and the CBD Tolling Alternative (Tolling Scenario A) for the estimated time of completion (2023) and future analysis year (2045). Tolling Scenario A was used for the mesoscale, MSAT, and GHG analyses because it is the tolling scenario that would result in the smallest reduction of VMT compared to the No Action Alternative. Therefore, Tolling Scenario A would have the lowest beneficial effect on regional air quality because changes in regional air quality emissions burden are directly related to changes in VMT. As discussed in **Subchapter 4A, "Transportation: Regional Transportation Effects and Modeling,"** traffic data from 2019 were considered to be representative for 2023. These data were used in the emissions model to estimate 2023 emissions. Final Project-specific traffic data were received in October 2021. All other input parameters were received in July 2019, provided by the agencies highlighted in **Table 10-5**, and represent the latest and best planning assumptions at the time the analysis was initiated, which was 2019.

Table 10-3. Comparison of County-Level Vehicle-Miles Traveled in the Regional Study Area, No Action Alternative and CBD Tolling Alternative (Tolling Scenario A, Years 2023 and 2045)

COUNTY	2023 DAILY VEHICLE-MILES TRAVELED			2045 DAILY VEHICLE-MILES TRAVELED		
	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference
New York City						
Bronx, NY	7,590,398	7,600,486	0.13%	8,178,443	8,179,258	0.01%
Kings (Brooklyn), NY	10,015,002	9,962,630	-0.52%	10,482,095	10,429,946	-0.50%
New York (Manhattan), NY	7,128,128	6,794,749	-4.68%	7,560,139	7,230,456	-4.36%
Queens, NY	18,410,148	18,313,242	-0.53%	19,368,110	19,229,630	-0.71%
Richmond (Staten Island), NY	3,986,457	4,071,055	2.12%	4,158,480	4,235,660	1.86%
Long Island						
Nassau, NY	19,687,535	19,698,668	0.06%	21,724,946	21,682,338	-0.20%
Suffolk, NY	21,898,009	21,910,738	0.06%	25,088,580	25,069,954	-0.07%
New York Counties North of New York City						
Dutchess, NY	5,114,706	5,114,150	-0.01%	5,303,106	5,298,706	-0.08%
Orange, NY	8,064,737	8,042,718	-0.27%	8,861,047	8,834,459	-0.30%
Putnam, NY	2,029,067	2,030,526	0.07%	2,239,945	2,226,281	-0.61%
Rockland, NY	4,772,318	4,762,333	-0.21%	5,679,602	5,661,212	-0.32%
Westchester, NY	13,489,991	13,451,007	-0.29%	15,541,871	15,471,203	-0.45%
NEW YORK STATE TOTAL	**122,186,496**	**121,752,302**	**-0.36%**	**134,186,364**	**133,549,103**	**-0.47%**

COUNTY	2023 DAILY VEHICLE-MILES TRAVELED			2045 DAILY VEHICLE-MILES TRAVELED		
	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference
New Jersey Counties						
Bergen, NJ	13,728,764	13,879,578	1.10%	15,423,121	15,552,792	0.84%
Essex, NJ	9,979,337	9,935,201	-0.44%	11,361,522	11,317,134	-0.39%
Hudson, NJ	4,784,360	4,667,087	-2.45%	5,440,776	5,343,189	-1.79%
Hunterdon, NJ	4,133,193	4,133,747	0.01%	4,338,874	4,338,931	0.00%
Mercer, NJ	6,389,692	6,392,871	0.05%	6,503,376	6,495,154	-0.13%
Middlesex, NJ	13,089,664	13,114,154	0.19%	14,698,322	14,749,616	0.35%
Monmouth, NJ	6,877,937	6,883,108	0.08%	7,685,824	7,709,731	0.31%
Morris, NJ	8,738,129	8,768,247	0.34%	9,665,262	9,651,535	-0.14%
Ocean, NJ	4,207,545	4,205,186	-0.06%	4,370,243	4,370,004	-0.01%
Passaic, NJ	5,588,180	5,602,293	0.25%	6,213,768	6,213,808	0.00%
Somerset, NJ	5,239,808	5,225,201	-0.28%	5,951,792	5,943,608	-0.14%
Sussex, NJ	1,859,459	1,854,014	-0.29%	1,899,412	1,897,707	-0.09%
Union, NJ	8,105,458	8,076,600	-0.36%	9,255,263	9,236,597	-0.20%
Warren, NJ	4,856,570	4,857,644	0.02%	5,100,281	5,094,874	-0.11%
NEW JERSEY TOTAL	**97,578,096**	**97,594,931**	**0.02%**	**107,907,836**	**107,914,680**	**0.01%**
Connecticut Counties						
Fairfield, CT	14,696,567	14,686,082	-0.07%	16,284,959	16,277,217	-0.05%
New Haven, CT	20,213,303	20,192,591	-0.10%	18,778,510	18,768,017	-0.06%
CONNECTICUT TOTAL	**34,909,870**	**34,878,673**	**-0.09%**	**35,063,469**	**35,045,234**	**-0.05%**

Source: WSP
Note: State totals may differ slightly from VMT reported in other chapters due to rounding and summing by different geographies.

Table 10-4. MOVES2014b Input Parameters

MOVES TAB	MODEL SELECTIONS
Scale	▪ County scale ▪ Inventory calculation type
Time Span	Hourly time aggregation, including all months, days, and hours
Geographic Bounds	Each of the 12 individual counties analyzed
Vehicles/Equipment	All on-road vehicle and fuel type combinations were selected for criteria pollutant and mobile source air toxics runs; only diesel was selected for diesel particulate matter runs.
Road Type	All road types were selected (off-network, rural restricted, rural unrestricted, urban restricted, and urban unrestricted)
Pollutants and Processes	▪ Selected pollutants included criteria pollutants, mobile source air toxics, CO_2 equivalent, and their precursors. ▪ Processes included running exhaust, evaporative permeation, evaporative fuel leaks, and crankcase running exhaust. Brake-wear and tire-wear emissions are included in the particulate matter results.
Manage Input Data Sets	New York counties: Selected New York State Low Emission Vehicle program input database provided by New York State Department of Environmental Conservation. New Jersey counties: Selected EPA default Lowe Emission Vehicle program input database.
Output	Output was total annual emission by county.

Source: WSP

Table 10-5. MOVES2014b County Data Manager Inputs

COUNTY DATA MANAGER TAB	DATA SOURCE
Age Distribution	New York State Department of Environmental Conservation (NYSDEC) and North Jersey Transportation Planning Authority (NJTPA)
Inspection/Maintenance Programs	NYSDEC and NJTPA
Ramp Fraction	NYSDEC and NJTPA
Source Type Population	NYSDEC data scaled using New York Metropolitan Transportation Council growth factors and NJTPA
Fuel	NYSDEC and NJTPA
Meteorology Data	NYSDEC and NJTPA
Hoteling	NYSDEC and NJTPA
Average Speed Distribution	Created from Project traffic data received in November of 2021
Annual Vehicle-Miles Traveled (VMT)	Created from Project traffic data received in November of 2021
Monthly VMT Fraction	Created from New York Metropolitan Transportation Council monthly adjustment factors and NJTPA
Daily VMT Fraction, Hourly VMT Fraction	NYSDEC and NJTPA
Road Type Distribution	NYSDEC and NJTPA

Source: WSP

10.1.7.2 Microscale Analysis

The microscale analysis was performed in accordance with FHWA's NEPA implementing regulations and procedures and USEPA's regulatory guidance and procedures.

An initial review of all the tolling scenarios was conducted to determine the tolling scenario that demonstrates the highest traffic volume increases on the local streets. As a result of this initial review, a screening analysis was conducted primarily based on Tolling Scenario D. This is the tolling scenario that would have the highest traffic volume increases on the local streets, based on the results of the traffic modeling conducted for this Project (and is representative of the similar levels of traffic changes projected for Tolling Scenarios E and F). The only exception to this is the midday period in Downtown Brooklyn, which has the highest traffic volume increases on the local streets under Tolling Scenario C. The screening procedures were conducted for those pollutants that are of concern on a localized (or microscale) level: CO, PM_{10}, and $PM_{2.5}$. The screening was performed to determine whether detailed microscale modeling for CO, PM_{10}, or $PM_{2.5}$ would be required to assess the potential air quality effects of the Project. The screening was conducted using the criteria from the NYSDOT *The Environmental Manual* (TEM), Chapter 1.1.[14]

10.1.7.3 Carbon Monoxide Screening

Following NYSDOT's TEM, Chapter 1.1, a CO microscale/hot-spot screening procedure was used to screen the intersections predicted to be affected by the Project. As per the referenced guidance, if an intersection is predicted to have a build LOS C or better, the intersection is deemed to pass the screening, and no CO analysis is warranted.

If the intersection is predicted to have LOS D or below in a build alternative, the intersection is further screened by the following criteria:

- A 10 percent or more reduction in the source-receptor distance[15]
- A 10 percent or more increase in traffic volume on affected roadways
- A 10 percent or more increase in vehicle emissions
- Any increase in the number of queued lanes
- A 20 percent reduction in speed, when predicted average speed is at 30 miles per hour or less

If any of the intersections affected by a project meet or exceed any of these criteria, volume threshold screening (vehicle threshold tables that tie the volume threshold with emission factors, as detailed in NYSDOT's TEM, Chapter 1.1, Section I-3) is applied. The emission factors applied within this screening would come from USEPA's MOVES2014b emission factor program and represent the 2023 analysis year. If any intersection exceeds the traffic volume thresholds in NYSDOT's TEM, then a CO hot-spot analysis is conducted following the procedures in NYSDOT's TEM, Chapter 1.1.

10.1.7.4 Particulate Matter Screening (Determining Project of Air Quality Concern)

Following NYSDOT's TEM, Chapter 1.1 (Section 8), and in accordance with USEPA's October 2021 guidance, *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*, a project requires a quantitative particulate matter analysis if it is deemed to be a "Project of Air Quality Concern," based on the screening analysis presented in **Section 10.3.2.2**.

14 https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm.
15 In this case, source-receptor distance is the distance between a roadway and a sensitive receptor such as a house, school, etc. Because the Project is not widening any roadways or creating additional travel lanes, distances between sources and receptors would not change due to the Project.

Projects that require a quantitative $PM_{2.5}$ and PM_{10} hot-spot analysis, as defined in Section 93.123(b)(1) of the conformity rule, include the following:

- New highway projects that have a significant number of diesel vehicles and expanded highway projects that have a significant increase in the number of diesel vehicles – *not applicable to this Project*.
- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to a project – *potentially applicable to this Project; screening analysis was conducted*.
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location – *not applicable to this Project*.
- Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location – *not applicable to this Project*.
- Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ or PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation – *not applicable to this Project*.

For this Project, the screening analysis included all 102 intersections evaluated in the traffic analysis (Chapter 4B, "Transportation: Highways and Local Intersections").

Federal USEPA guidance for hot-spot $PM_{2.5}$ and PM_{10} analyses does not define a "significant increase in diesel trucks"; as such, a screening was performed to compare the maximum hourly changes in heavy-duty diesel vehicles for the intersections that would demonstrate a LOS of D or worse under the CBD Tolling Alternative (Tolling Scenario D and Tolling Scenario C where applicable) compared to the No Action Alternative. For this analysis, heavy-duty diesel vehicles included medium-duty trucks, heavy-duty trucks, and buses.

10.1.7.5 Highway Link Analyses

In response to concerns raised during public engagement for the Project, the effects of the link-level highway segments on localized communities—particularly on the Cross Bronx Expressway in the vicinity of Macombs Road and on the Franklin D. Roosevelt (FDR) Drive near 10th Street—were analyzed.

Microscale CO screening was conducted at the FDR Drive location following NYSDOT's TEM Volume Threshold Screening. Because the FDR Drive does not allow trucks, a microscale particulate matter screening or analysis was not warranted at that location.

Microscale particulate matter analyses were conducted following USEPA's October 2021 guidance*, Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas.* These analyses were conducted at the Cross Bronx Expressway in the vicinity of Macombs Road and at two other locations representing those areas with the highest increases in truck traffic due to the Project and the highest AADT with the Project under all tolling scenarios and for all links analyzed in the mesoscale analysis (see **Table 10B-27** and **Table 10B-28** in **Appendix 10B, "Air Quality: Project-Level Hot-Spot Screening Procedure"**).

Details of the PM methodology, interagency consultation, and site selection are contained within **Appendix 10C, "Air Quality: Highway Link PM Hot-Spot Detailed Assessment (Methodology, Interagency Consultation & Results)."**

10.2 AFFECTED ENVIRONMENT

The regional study area for the traffic analyses includes a total of 28 counties in New York, New Jersey, and Connecticut. To provide background on existing air quality conditions in the study area, monitored air quality data collected by USEPA, per the CAA, around New York City and New Jersey was compiled and is presented in **Table 10-6**. **Figure 10-2** shows the USEPA monitoring locations closest to the regional study area. As shown in **Table 10-6**, when compared to the NAAQS presented in **Table 10-1**, there were several exceedances of the O_3 standard of 0.070 ppm, but no exceedances of any of the other criteria pollutants.

In addition to the USEPA monitoring used to assess compliance with the NAAQS, the New York City Department of Health and Mental Hygiene and Queens College of the City University of New York are conducting the NYCCAS, a program to monitor air quality across New York City. During public outreach, participants expressed interest in utilizing this information to characterize the air quality conditions in each neighborhood.

The purpose of NYCCAS is to better understand air pollution levels and patterns by revealing how pollution from traffic, buildings, and other sources varies among the city's neighborhoods. This helps identify which neighborhoods have the highest pollutant levels and where changes can be made to improve air quality. The difference in monitored values between the USEPA information and the NYCCAS information is due to different collection methods and averaging periods reported. NYCCAS data does not meet the regulatory requirements of a USEPA monitor and cannot be used to determine compliance with the NAAQS, or as a background value for regulatory modeling. It does, however, indicate the general air quality trend.

There are about 100 NYCCAS air pollution monitors[16] installed throughout the five boroughs, with at least one in each Community District. Many are in neighborhoods with high traffic volumes and high building density. Others are in quieter locations with fewer buildings. Some monitors are placed near unique facilities, like bus depots and ferry terminals.

16 More information on the monitors can be found at https://www1.nyc.gov/site/doh/data/data-sets/air-quality-nyc-community-air-survey.page.

Table 10-6. Ambient Air Quality Monitored Data

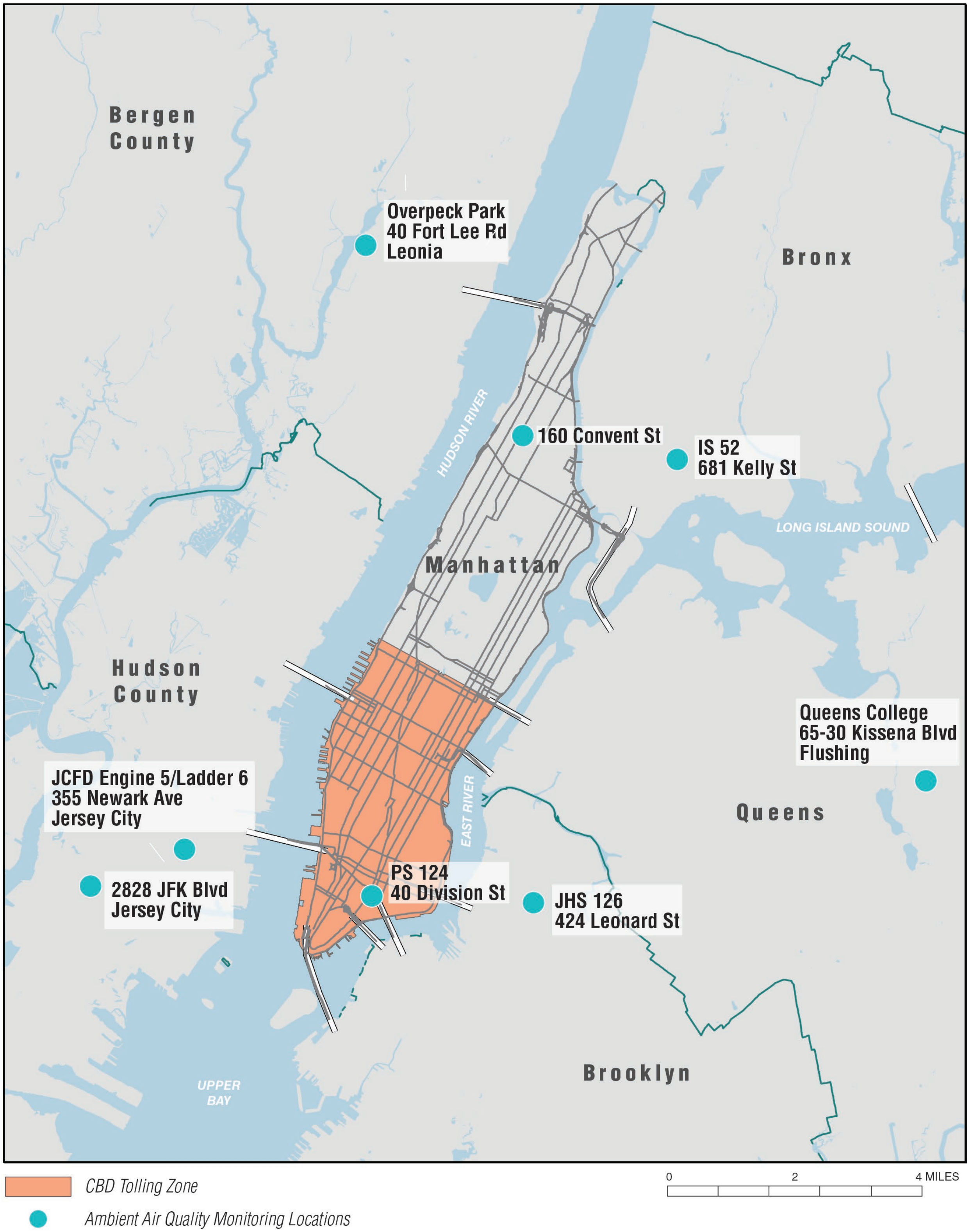
MONITORING LOCATION			MANHATTAN & BRONX PS 124 40 Division St., Manhattan — 160 Convent Ave., Manhattan — IS 52 681 Kelly St., Bronx			BROOKLYN & QUEENS JHS 126 424 Leonard St., Brooklyn — Queens College 65-30 Kissena Blvd., Queens			NEW JERSEY JCFD Engine 5/Ladder 6 355 Newark Ave., Jersey City — 2828 JFK Blvd., Jersey City — Overpeck Park 40 Fort Lee Rd., Leonia		
			2017	2018	2019	2017	2018	2019	2017	2018	2019
Carbon Monoxide (CO) [ppm]	1-hour	Maximum	1.6*	2.9*	1.8*	1.7^	1.9	1.5^	2.0**	5.1**	3.2**
		2nd Maximum	1.4*	2.5*	1.6*	1.3^	1.7^	1.4^	1.7**	4.8**	2.1**
		# of Exceedances	0	0	0	0^	0^	0^	0**	0**	0**
	8-hour	Maximum	1.1*	1.7*	1.3*	0.9^	1.3^	1.1^	1.1**	3.2**	1.2**
		2nd Maximum	0.9*	1.2*	1.1*	0.9^	1.2^	1.1^	1.1**	1.6**	1.2**
		# of Exceedances	0*	0*	0*	0^	0^	0^	0**	0**	0**
Particulate Matter (PM) [ug/m^3]	PM_{10}	Maximum 24 hours	35	40	43	30^	38^	28^	36	44	42
		2nd Maximum	31	38	29	28^	29^	23^	32	33	34
		# of Exceedances	0	0	0	0^	0^	0^	0	0	0
	$PM_{2.5}$	24-hour 98th percentile	18	22	20	17	18	18	21	21	25
		Mean Annual	8.8	9.6	8.6	7.5	7.9	7.6	10.3	9.5	8.9
Ozone (O_3) [ppm]	8-hour	1st Highest	0.077*	0.086*	0.081*	0.086^	0.082^	0.076^	0.082+	0.091+	0.085+
		2nd Highest	0.073*	0.082*	0.071*	0.080^	0.080^	0.072^	0.079+	0.090+	0.073+
		3rd Highest	0.070*	0.078*	0.067*	0.079^	0.076^	0.072^	0.074+	0.081+	0.072+
		4th Highest	0.070*	0.077*	0.066*	0.079^	0.073^	0.071^	0.074+	0.079+	0.071+
		# of days standard exceeded	2*.	10*	2*	6^	8^	4^	7+	13+	4+
Nitrogen Dioxide (NO_2) [ppb]	1-hour Maximum		64^^	79^^	67^^	79^	69^	61^	70**	85**	83**
	1-hour second Maximum		64^^	78^^	66^^	69^	66^	60^	59**	82**	73**
	98th Percentile		59^^	59^^	58^^	59^	53^	54^	53**	58**	56**
	Annual Mean		17.3^^	17.5^^	16.9^^	15.3^	14.4^	14.2^	20.2**	19.2**	21.2**
Sulfur Dioxide (SO_2) [ppb]	1-hour Maximum		12.2^^	12.9^^	7.2^^	5.7^	8.1^	6.5^	8**	6.4**	6.3**
	24-hour Maximum		3^^	6.3^^	2.4^^	2.3^	3.2^	2.7^	4.1**	4.1**	3.5**
	# of days standard exceeded		0^^	0^^	0^^	0^	0^	0^	0**	0**	0**

Source: U.S. Environmental Protection Agency AirData

Notes:

- 2020 and 2021 data not included due to potential impacts of COVID-19 pandemic on traffic and pollutant levels
- Manhattan & Bronx data from PS 124 unless noted as follows: *160 Convent Avenue; ^^681 Kelly Street
- Brooklyn & Queens data from JHS 126 unless noted as follows: ^Queens College
- New Jersey data from JCFD Engine 5/Ladder 6 unless noted as follows: **2828 JFK Blvd; +Overpeck Park

Figure 10-2. U.S. Environmental Protection Agency Ambient Air Quality Monitoring Locations

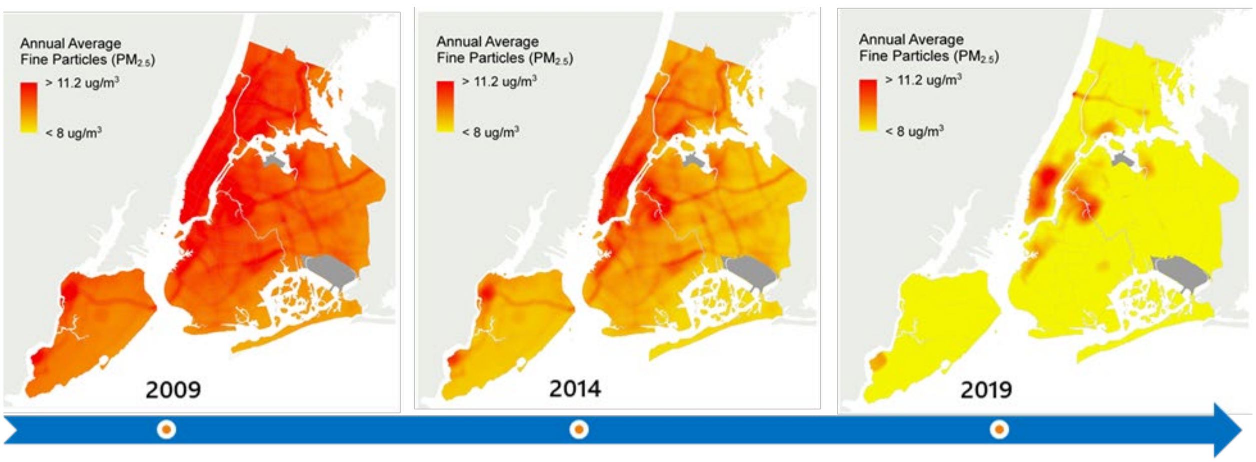


Source: WSP

The following key findings are the result of the NYCCAS monitoring over the past decade:

- Annual average levels of four key pollutants have decreased citywide between the first year of monitoring (2009) and the most recent year of data (2019):
  - $PM_{2.5}$ (fine particulate matter): -38 percent (**Figure 10-3**)
  - NO_2: -33 percent
  - Nitric Oxide: -52 percent
  - Black Carbon: -38 percent
- Air quality improved substantially after the City of New York required building owners to convert to cleaner heating oils by 2015; since the first winter of monitoring, average levels of SO_2 have declined by 95 percent.

Figure 10-3. $PM_{2.5}$ Trends in the Study Area (2009 to 2019)



Source: https://nyccas.cityofnewyork.us/nyccas2021v9/report/2.

10.3 ENVIRONMENTAL CONSEQUENCES

10.3.1 No Action Alternative

The No Action Alternative assumes no vehicular tolling program or associated tolling infrastructure and tolling system equipment. Any changes in traffic would be a result of projected background growth and other reasonably foreseeable factors not related to the Project. **Table 10-7** shows projected emission burdens for the No Action Alternative in the 12-county area for the mesoscale analysis would decrease for most pollutants in 2045, as compared to 2023, thereby continuing the trends presented in **Figure 10-3**.

10.3.2 CBD Tolling Alternative

10.3.2.1 Mesoscale, MSAT and GHG Analyses

Table 10-7 presents the predicted VMT and emission burdens of volatile organic compounds, nitrogen oxides, CO, PM_{10}, and $PM_{2.5}$ under the No Action Alternative and Tolling Scenario A (the tolling scenario predicted to result in the smallest change in VMT compared to the No Action Alternative). This table also presents the emission burdens of GHGs in terms of CO_2e under the No Action Alternative and CBD Tolling Alternative. In all analysis years, the overall regional VMT and emission burdens would be lower under the CBD Tolling Alternative than the No Action Alternative. Thus, the CBD Tolling Alternative would benefit regional air quality by reducing criteria pollutants in the 12-county study area. Table 10-8 and Table 10-9 provide the changes by county, which are depicted in Figure 10-4 through Figure 10-13.

As shown in Table 10-8:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Rockland, and Hudson Counties estimate decreases in all pollutants with the Project in 2023.
- Suffolk, Westchester, and Putnam Counties estimate mixed results, with some pollutants increasing slightly and some pollutant burdens decreasing with the Project in 2023.
- The Bronx, Richmond (Staten Island), Nassau, and Bergen Counties estimate increases in all pollutants with the Project in 2023.

As shown in Table 10-9:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Suffolk, and Hudson Counties estimate decreases in all pollutants with the Project in 2045.
- The Bronx, Nassau, Westchester, Rockland, and Putnam Counties estimate mixed results with some pollutants increasing slightly and some pollutants decreasing with the Project in 2045.
- Richmond (Staten Island) and Bergen Counties estimate increases in all pollutants with the Project in 2045.

The regional emissions estimates are based on changes in VMT, speed, and vehicle mix. The interaction of these factors affects the relative decreases and increases in each county. While some counties are predicted to show increases in pollutant emissions, a local level analysis (detailed in Section 10.3.2.2) resulted in no intersections requiring a detailed analysis because they all passed the screening criteria.

Table 10-7. Mesoscale Emission Burdens, CBD Tolling Alternative (Tolling Scenario A, tons/year)

POLLUTANT	ANALYSIS YEAR 2023			ANALYSIS YEAR 2045		
	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference
Daily Vehicle-Miles Traveled (miles/day)	182,736,632	182,143,856	-0.3%	201,294,782	200,421,921	-0.4%
Volatile Organic Compounds (VOC)	17,698	17,667	-0.2%	10,692	10,676	-0.2%
Nitrogen Oxides (NO_x)	23,956	23,864	-0.4%	11,195	11,169	-0.2%
Carbon Monoxide (CO)	227,726	227,074	-0.3%	117,510	117,399	-0.1%
Particulate Matter (PM_{10})	5,884	5,828	-1.0%	6,095	6,016	-1.3%
Particulate Matter ($PM_{2.5}$)	1,452	1,441	-0.7%	1,050	1,038	-1.1%
Carbon Dioxide Equivalents (CO_2e)	32,445,206	32,236,481	-0.6%	27,883,351	27,648,782	-0.8%

Source: WSP, 2022

Note: Vehicle-miles traveled presented in this table are greater than the NYMTC Best Practice Model output as presented in **Subchapter 4A, "Transportation: Regional Transportation Effects and Modeling,"** due to a series of seasonal adjustments that were made to the travel-demand forecasts, consistent with NYMTC's procedures to generate maximum potential worst-case conditions for conformity analyses and are not applicable to evaluate general changes in travel patterns as is the purpose of **Subchapter 4A**. The NYMTC Post Processor software was used to apply Highway Performance Monitoring System reconciliation and travel-time adjustments for intersections. NYMTC's Transportation Conformity Determination includes details on these adjustments: https://www.nymtc.org/Required-Planning-Products/Transportation-Conformity/Transportation-Conformity-Determination-Documents-adopted

Table 10-8. Mesoscale Emission Burden Percentage Changes by County, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

POLLUTANT	ANALYSIS YEAR 2023 COMPARISON – PERCENTAGE DIFFERENCE FROM NO ACTION ALTERNATIVE												
	New York												
	CBD Only	Entire County	Queens	Bronx	Kings	Richmond	Nassau	Suffolk	Westchester	Rockland	Putnam	Hudson	Bergen
Daily Vehicle-Miles Traveled (miles/day)	-11.56%	-5.88%	-0.36%	+0.15%	-0.74%	+1.73%	+0.03%	-0.03%	-0.22%	-0.17%	+0.28%	-2.24%	+0.88%
Volatile Organic Compounds (VOC)	-4.96%	-3.29%	-0.32%	+0.03%	-0.32%	+0.44%	+0.05%	+0.02%	+0.21%	-0.05%	-0.03%	-0.66%	+0.20%
Nitrogen Oxides (NO_x)	-9.54%	-5.96%	-0.56%	+0.09%	-0.68%	+1.26%	+0.09%	+0.00%	-0.25%	-0.12%	+0.37%	-1.85%	+0.63%
Carbon Monoxide (CO)	-7.58%	-4.58%	-0.37%	+0.02%	-0.51%	+0.89%	+0.03%	-0.03%	-0.13%	-0.05%	+0.00%	-1.02%	+0.49%
Particulate Matter (PM_{10})	-12.16%	-9.75%	-1.23%	+0.30%	-1.00%	+2.12%	+0.19%	+0.11%	-0.32%	-0.36%	+0.31%	-3.86%	+0.74%
Particulate Matter ($PM_{2.5}$)	-11.37%	-8.52%	-0.99%	+0.20%	-0.90%	+1.80%	+0.14%	+0.06%	-0.23%	-0.25%	+0.26%	-3.00%	+0.69%
Carbon Dioxide Equivalents (CO_2e)	-11.48%	-7.92%	-0.84%	+0.15%	-0.88%	+1.76%	+0.15%	+0.03%	-0.40%	-0.23%	+0.17%	-3.03%	+0.80%

Source: WSP, 2022

Table 10-9. Mesoscale Emission Burden Percentage Changes by County, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

POLLUTANT	ANALYSIS YEAR 2045 COMPARISON – PERCENTAGE DIFFERENCE FROM NO ACTION ALTERNATIVE												
	New York												
	CBD Only	Entire County	Queens	Bronx	Kings	Richmond	Nassau	Suffolk	Westchester	Rockland	Putnam	Hudson	Bergen
Daily Vehicle-Miles Traveled (miles/day)	-11.32%	-5.71%	-0.46%	-0.05%	-1.14%	+1.83%	-0.26%	-0.04%	-0.38%	-0.41%	-0.43%	-1.59%	+0.69%
Volatile Organic Compounds (VOC)	-3.24%	-3.59%	-0.65%	+0.02%	-1.50%	+1.48%	+1.01%	-0.09%	+0.56%	-0.89%	+0.51%	-0.61%	+0.14%
Nitrogen Oxides (NO_x)	-5.89%	-5.64%	-0.83%	+0.01%	-6.97%	+8.69%	+0.49%	-0.11%	+4.45%	-2.53%	+3.79%	-1.31%	+0.36%
Carbon Monoxide (CO)	-6.55%	-3.61%	-0.42%	-0.06%	-1.00%	+1.12%	+1.37%	-0.07%	0.00%	-1.96%	-0.07%	-0.64%	+0.40%
Particulate Matter (PM_{10})	-11.55%	-10.24%	-1.55%	+0.21%	-1.72%	+2.40%	-0.51%	-0.37%	-0.75%	+5.14%	-0.25%	-3.06%	+0.67%
Particulate Matter ($PM_{2.5}$)	-11.04%	-9.42%	-1.41%	+0.16%	-1.85%	+2.51%	-0.45%	-0.31%	-0.38%	+2.44%	-0.02%	-2.48%	+0.63%
Carbon Dioxide Equivalents (CO_2e)	-10.72%	-7.80%	-0.90%	+0.05%	-1.57%	+2.04%	-0.31%	-0.23%	-0.38%	-2.82%	-0.30%	-2.34%	+0.64%

Source: WSP, 2022

Figure 10-4. Changes in Volatile Organic Compounds, Tolling Scenario A (Analysis Year 2023)

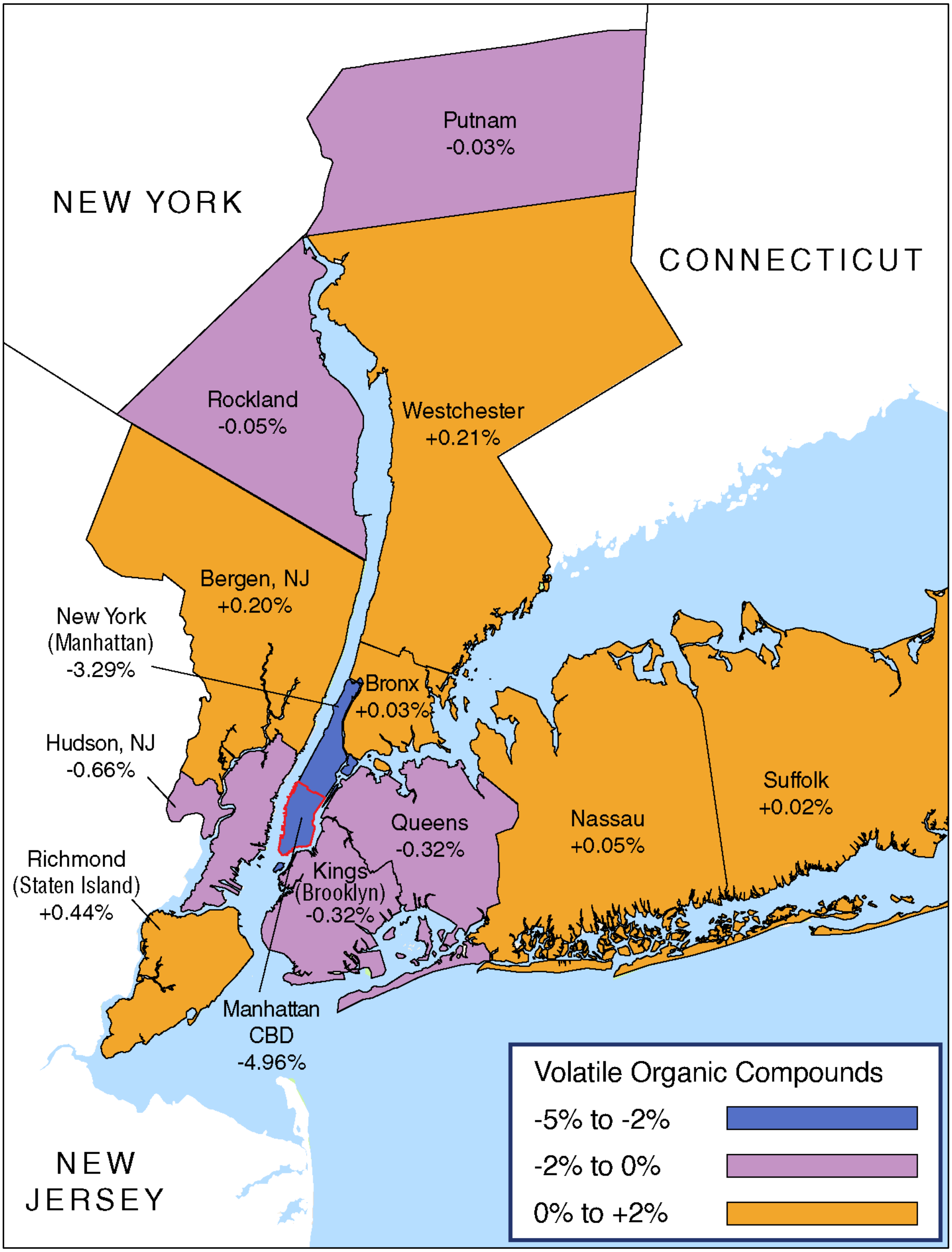


Figure 10-5. Changes in Nitrogen Oxides, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

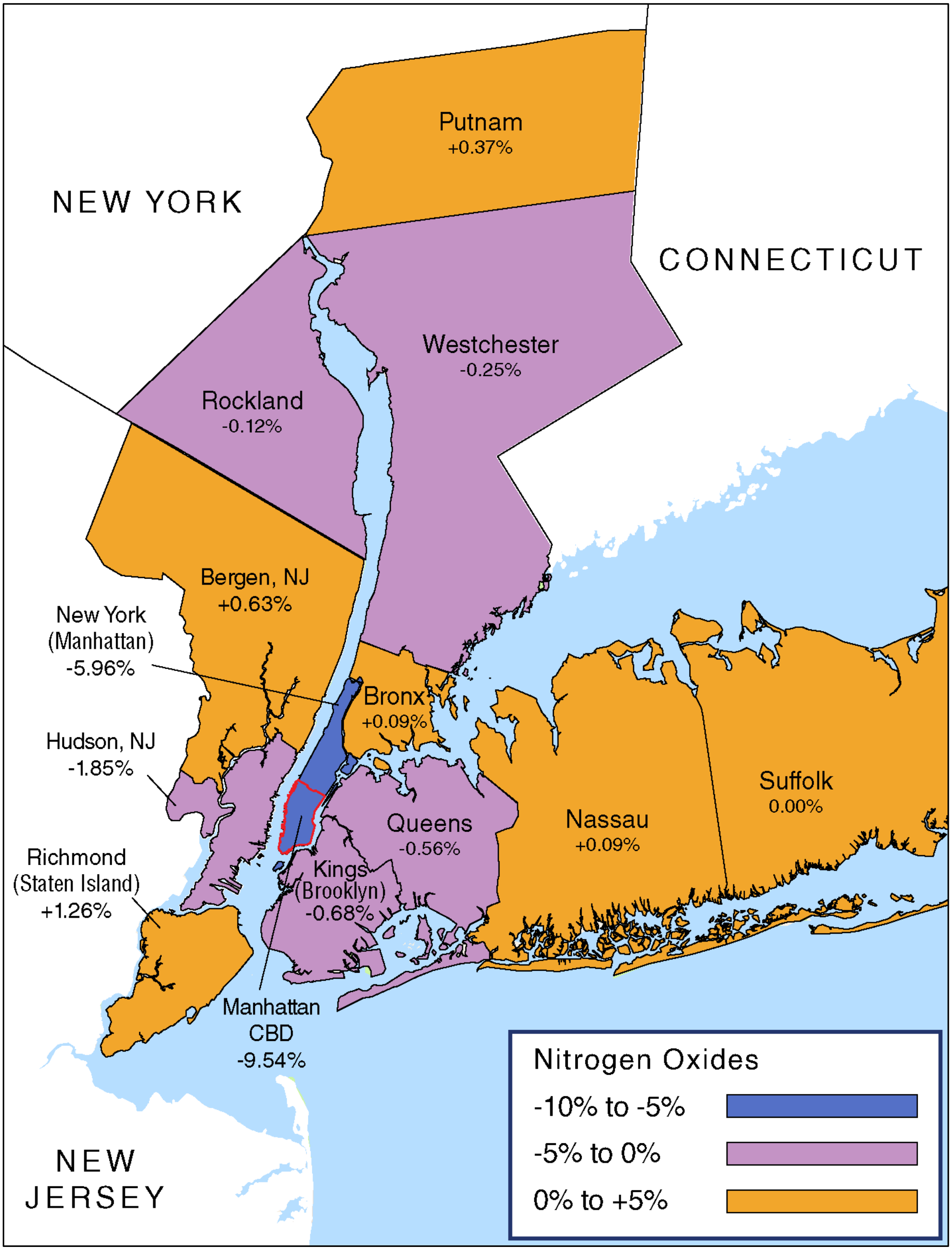


Figure 10-6. Changes in Carbon Monoxide, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

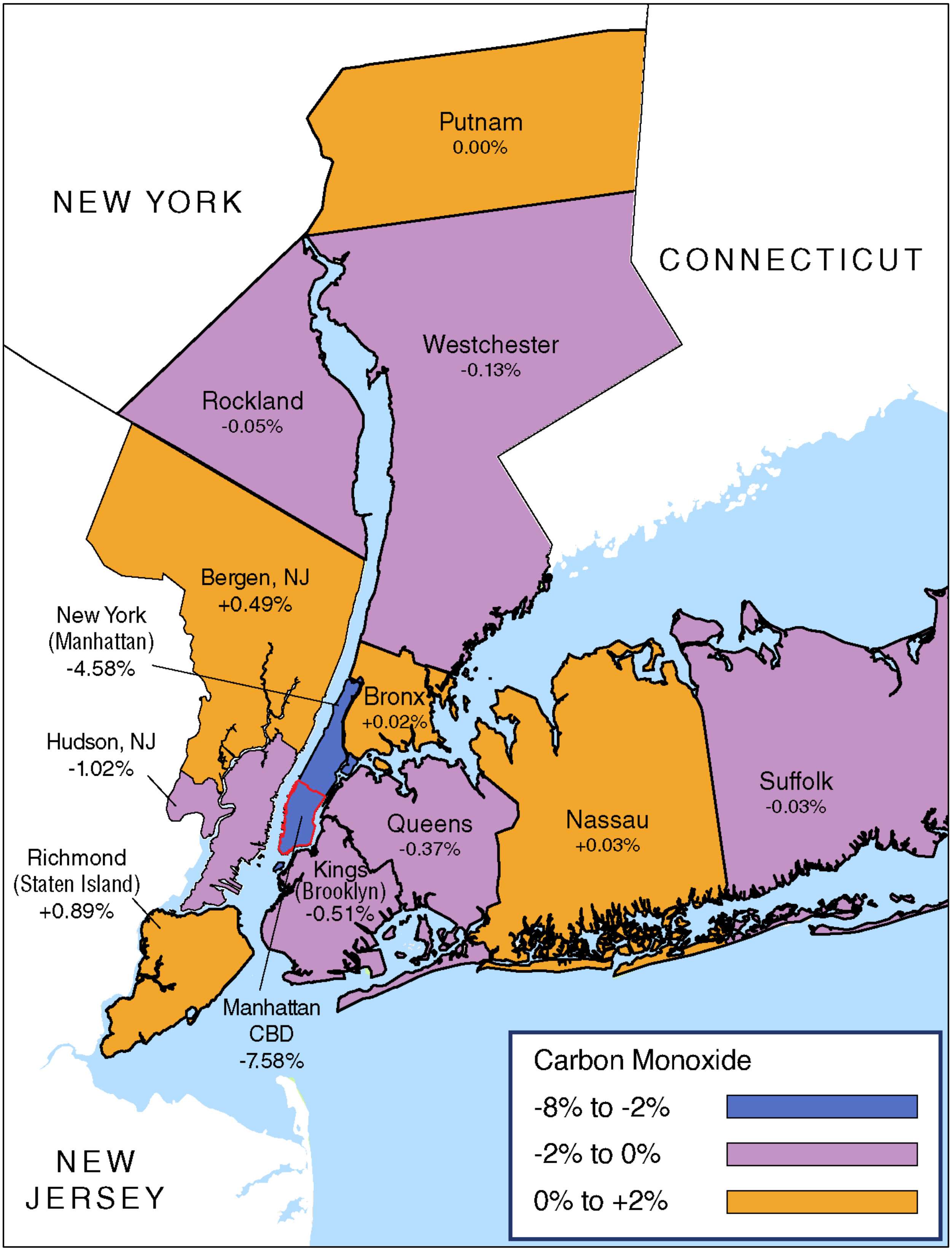


Figure 10-7. Changes in Particulate Matter 10 (PM_{10}), CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

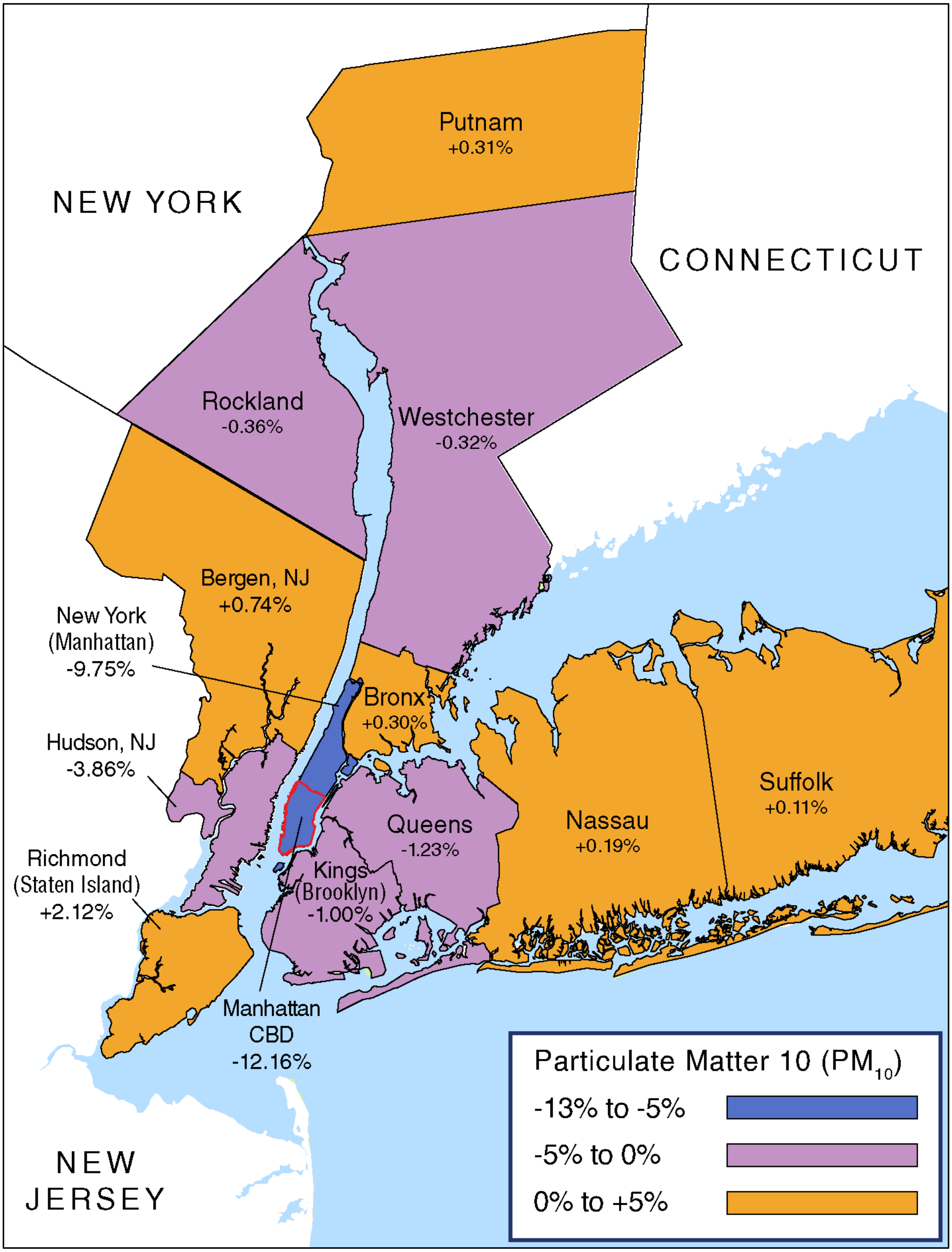


Figure 10-8. Changes in Particulate Matter 2.5 ($PM_{2.5}$), CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

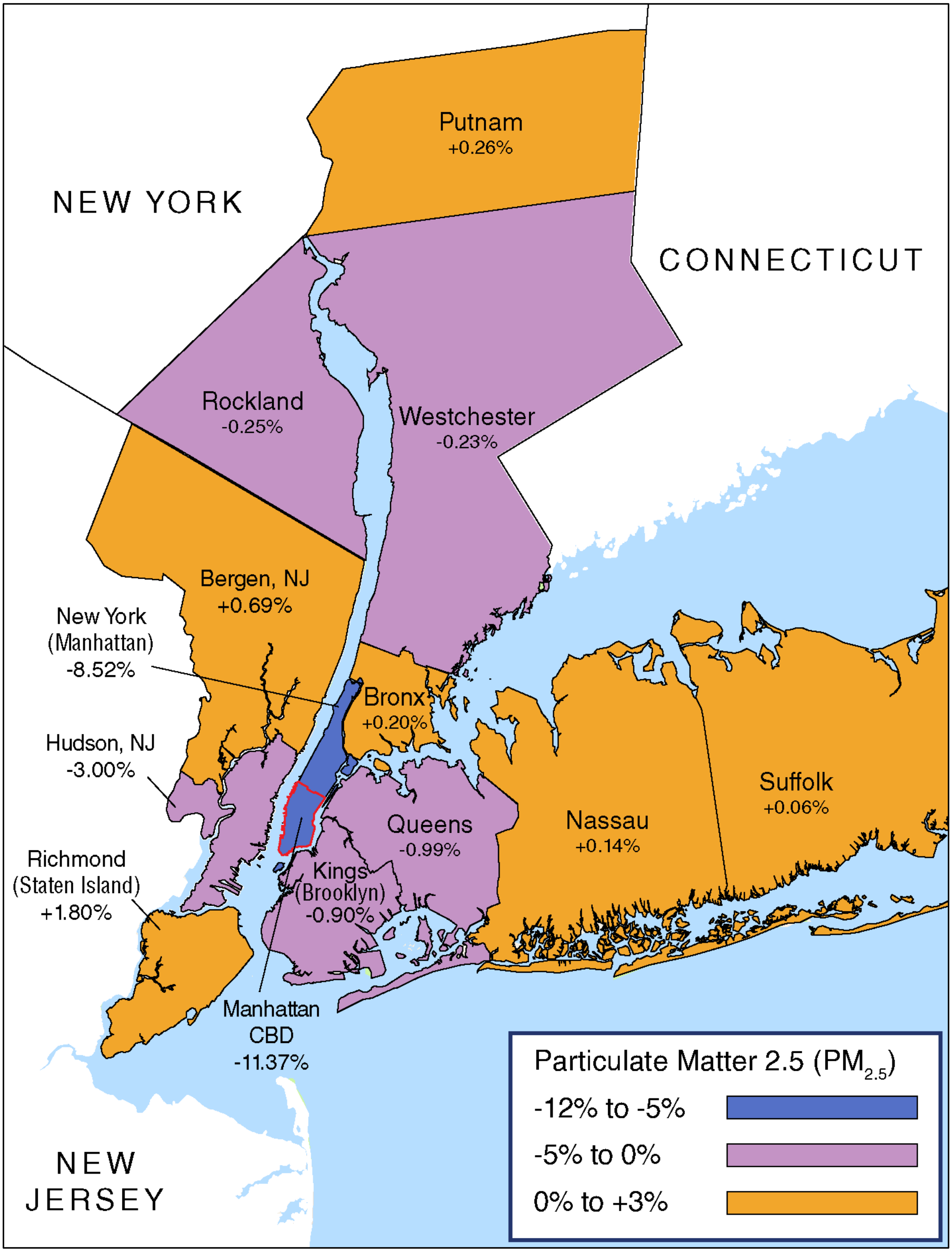


Figure 10-9. Changes in Volatile Organic Compounds, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

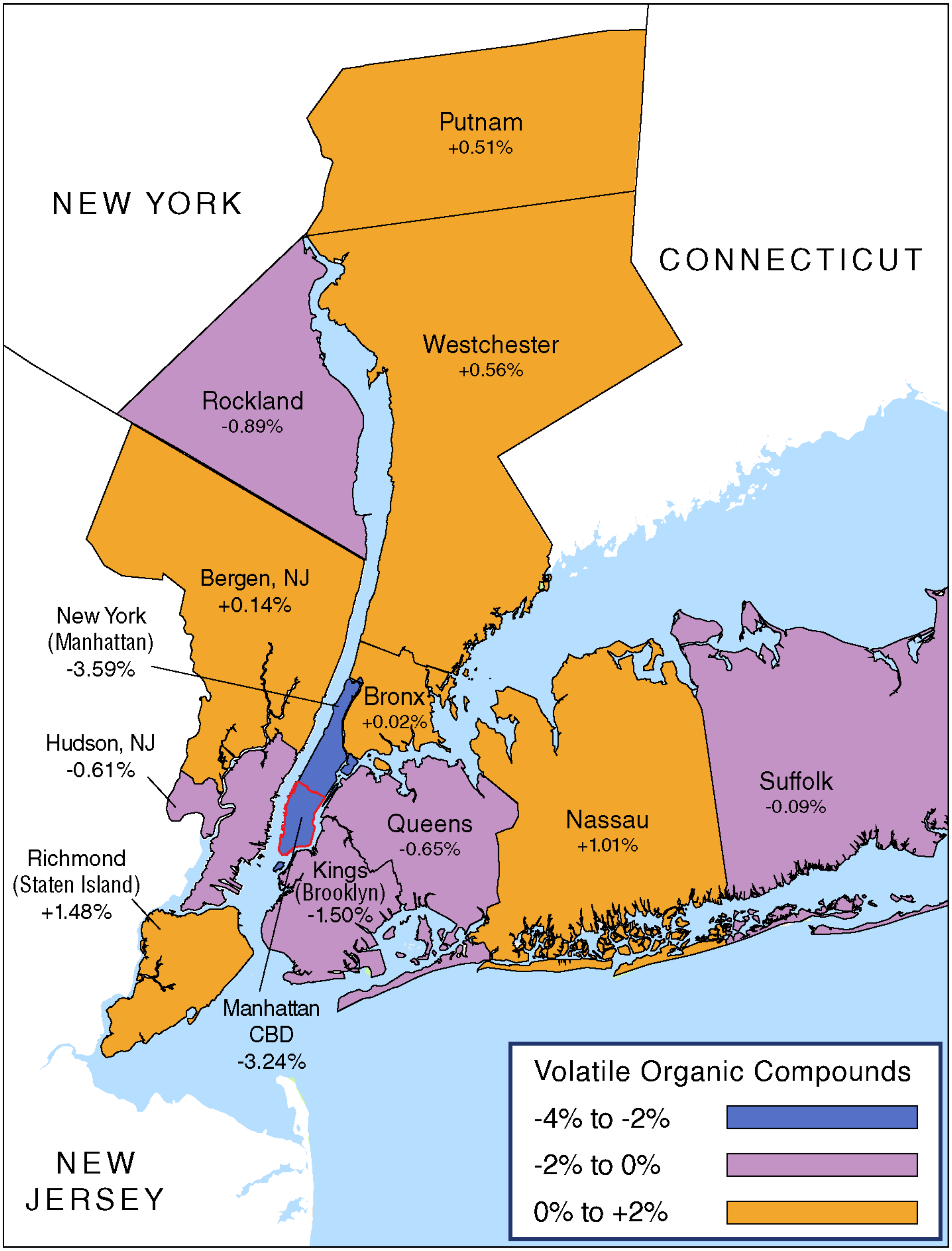


Figure 10-10. Changes in Nitrogen Oxides, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

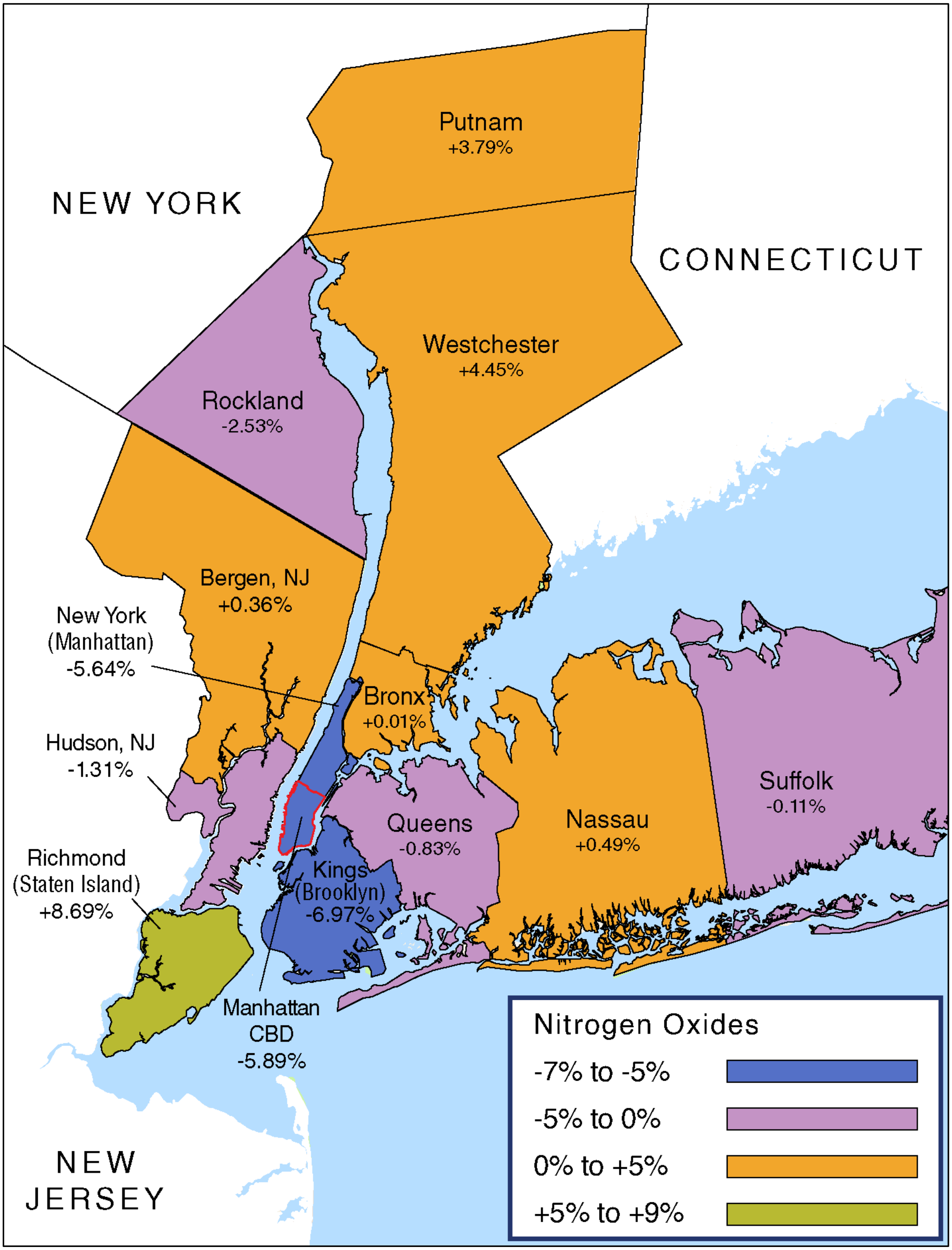


Figure 10-11. Changes in Carbon Monoxide, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

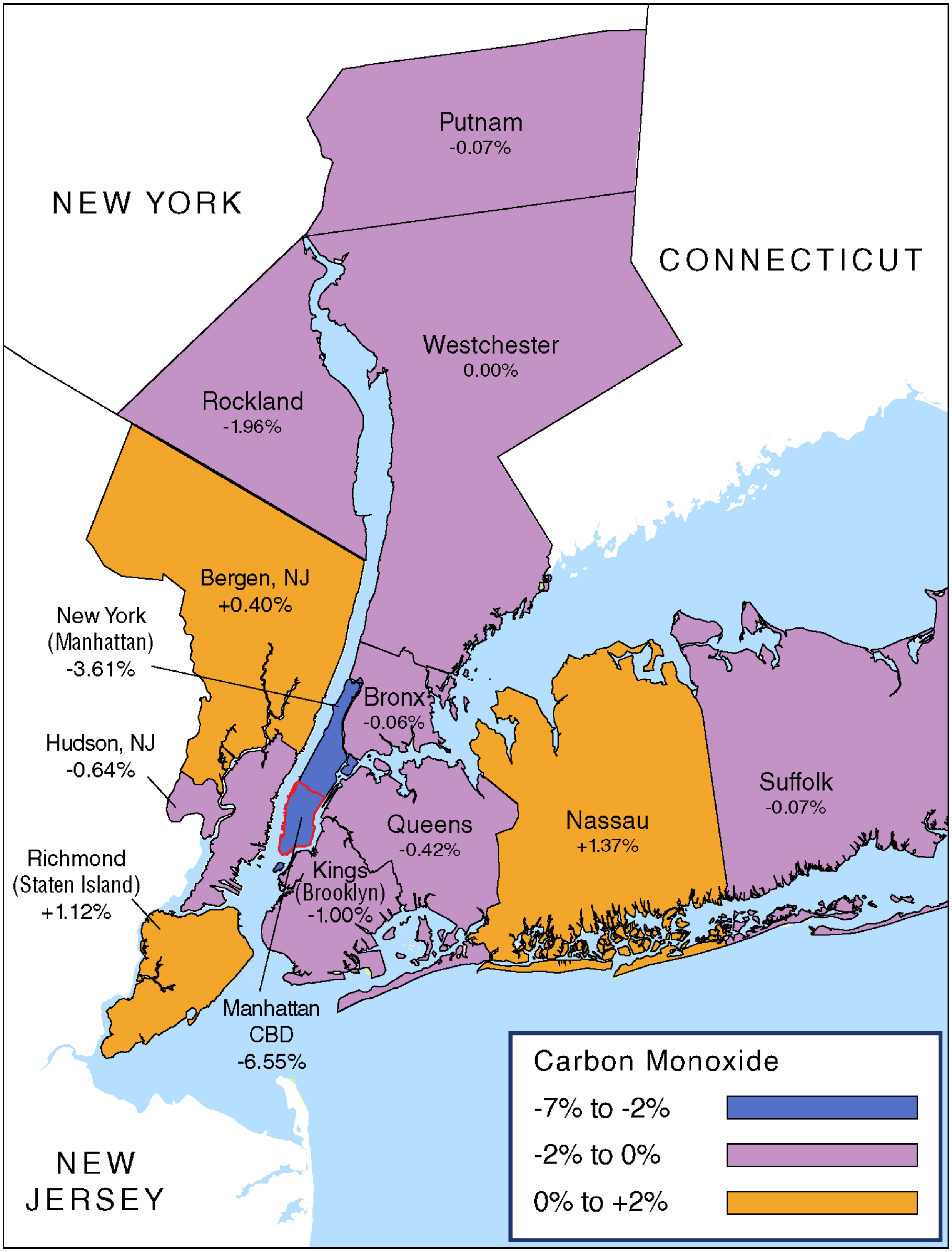


Figure 10-12. Changes in Particulate Matter 10 (PM_{10}), CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

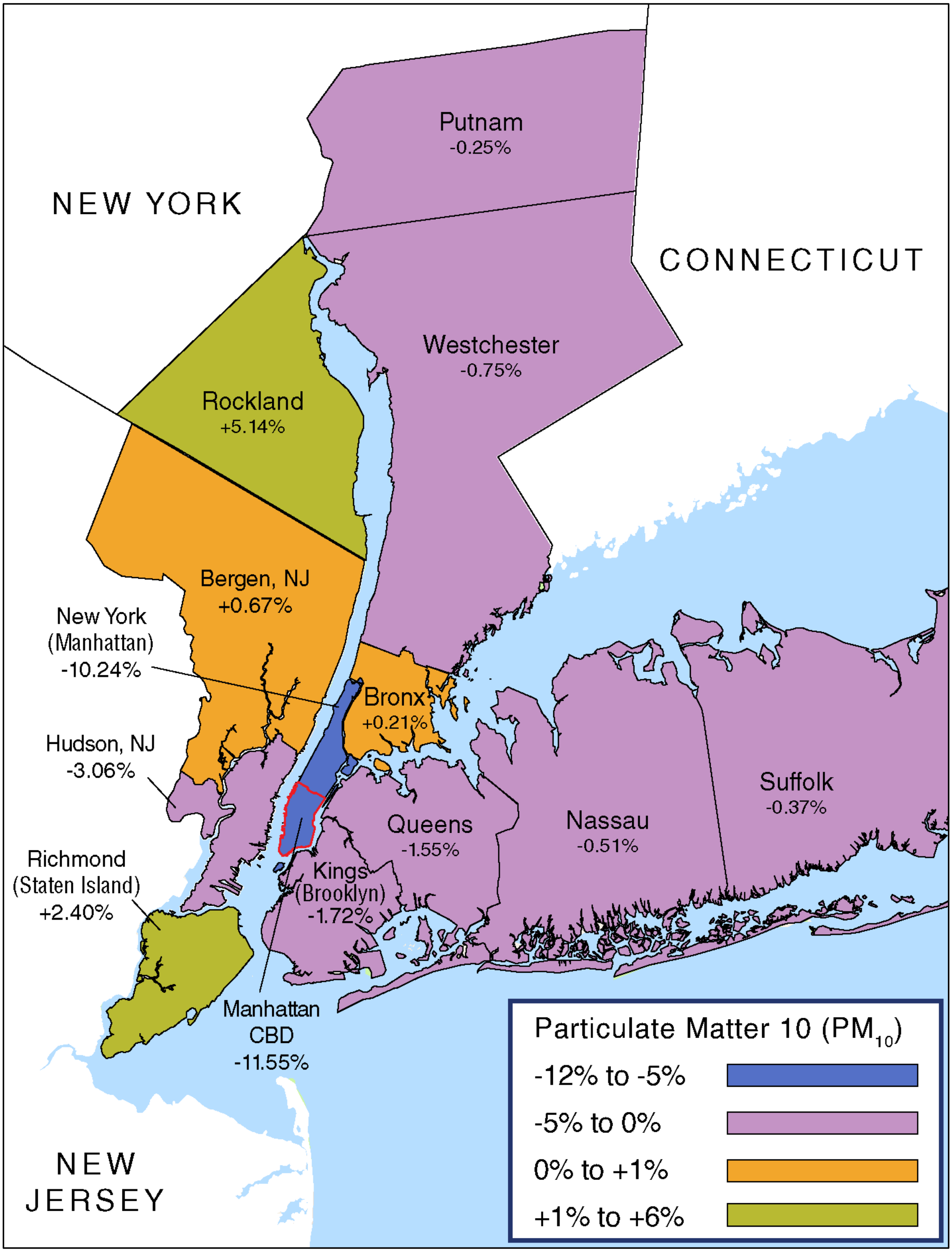


Figure 10-13. Changes in Particulate Matter 2.5 ($PM_{2.5}$), CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

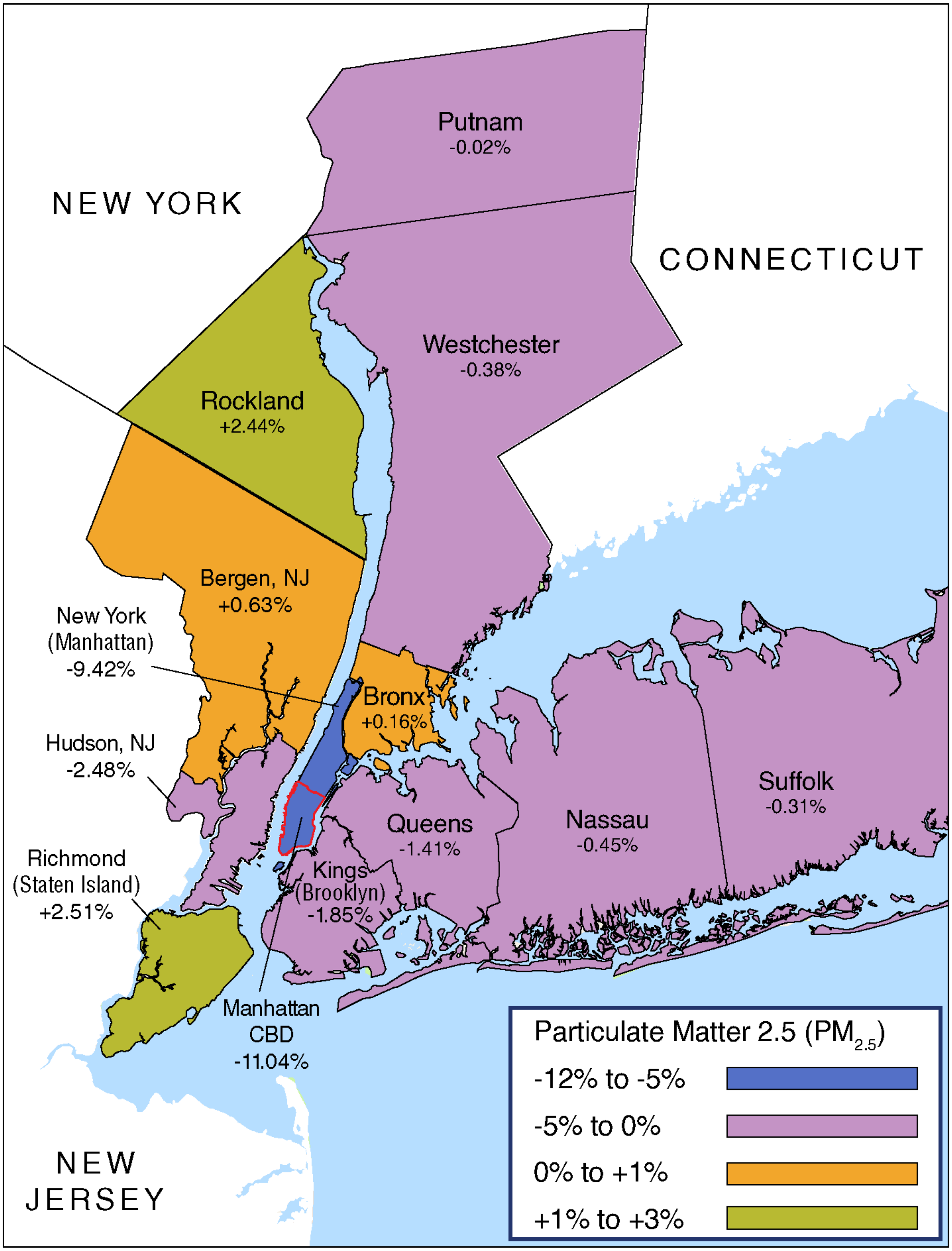


Table 10-10 presents the emission burdens of MSATs under the No Action Alternative and CBD Tolling Alternative. In all analysis years, when looking at the entire 12-county study area, all MSATs would be lower under the CBD Tolling Alternative compared to the No Action Alternative. **Table 10-11** and **Table 10-12** provide the estimated changes by county, which are graphically depicted in **Figure 10-14** and **Figure 10-15**.

As shown in **Table 10-11**:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Westchester, Rockland, and Hudson Counties estimate decreases in all MSATs with the Project in 2023.
- The Bronx, Richmond (Staten Island), Nassau, Suffolk, Putnam, and Bergen Counties estimate increases in all MSATs with the Project in 2023.

As shown in **Table 10-12**:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Suffolk, Putnam, and Hudson Counties estimate decreases in all MSATs with the Project in 2045.
- The Bronx, Nassau, Westchester, and Rockland Counties estimate mixed results with some MSATs increasing slightly and some pollutants decreasing with the Project in 2045.
- Richmond (Staten Island) and Bergen Counties estimate increases in all MSATs with the Project in 2045.

When comparing the CBD Tolling Alternative to the No Action Alternative, some localized areas may experience increases in MSATs, while other areas may experience decreases. It should be noted, however, that MSAT emissions will likely be lower in the future years than present levels, regardless of whether the CBD Tolling Alternative is implemented, as a result of USEPA's national control programs that are projected to reduce annual MSAT emissions by more than 90 percent between 2010 and 2050 (**Figure 10-1**).

Changes in MSATs are expected to occur near the roadways that experience changes in VMT. **Figure 10-16** highlights the roadways with the VMT increases due to the Project. Furthermore, these VMT changes were tabulated for environmental justice and non-environmental justice communities and are presented in **Table 4A-23 and Table 4A-24 (Subchapter 4A, "Transportation: Regional Transportation Effects and Modeling")** for the various subareas of the region.

Table 10-10. Mobile Source Air Toxics Emission Burdens, CBD Tolling Alternative (Tolling Scenario A, tons/year)

POLLUTANT	ANALYSIS YEAR 2023			ANALYSIS YEAR 2045		
	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference	No Action Alternative	CBD Tolling Alternative (Tolling Scenario A)	% Difference
Daily Vehicle-Miles Traveled (miles/day)	182,736,632	182,143,856	-0.3%	201,294,782	200,421,921	-0.4%
1,3-Butadiene	4.53	4.50	-0.7%	0.23	0.23	-1.5%
Acetaldehyde	50.23	49.76	-0.9%	26.49	26.11	-1.4%
Acrolein	6.47	6.41	-0.9%	3.38	3.33	-1.4%
Benzene	82.56	82.07	-0.6%	39.40	39.07	-0.8%
Diesel Particulate Matter	373.41	370.61	-0.7%	132.79	131.57	-0.9%
Ethylbenzene	90.55	90.16	-0.4%	67.59	67.21	-0.6%
Formaldehyde	115.22	114.10	-1.0%	75.49	74.39	-1.5%
Naphthalene	11.24	11.14	-0.9%	6.00	5.92	-1.4%
Polycyclic Organic Matter	4.32	4.29	-0.7%	1.29	1.27	-1.0%

Source: WSP, 2022

Note: Vehicle-miles traveled presented in this table are greater than the NYMTC Best Practice Model output as presented in **Subchapter 4A, "Transportation: Regional Transportation Effects and Modeling,"** due to a series of seasonal adjustments that were made to the travel-demand forecasts, consistent with NYMTC's procedures to generate maximum potential worst-case conditions for conformity analyses and are not applicable to evaluate general changes in travel patterns as is the purpose of **Subchapter 4A**. The NYMTC Post Processor software was used to apply Highway Performance Monitoring System reconciliation and travel-time adjustments for intersections. NYMTC's Transportation Conformity Determination includes details on these adjustments: https://www.nymtc.org/Required-Planning-Products/Transportation-Conformity/Transportation-Conformity-Determination-Documents-adopted.

Table 10-11. Mobile Source Air Toxics Emission Burden Percentage Changes by County, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

POLLUTANT	ANALYSIS YEAR 2023 COMPARISON – PERCENTAGE DIFFERENCE FROM NO ACTION ALTERNATIVE												
	New York		Queens	Bronx	Kings	Richmond	Nassau	Suffolk	Westchester	Rockland	Putnam	Hudson	Bergen
	CBD Only	Entire County											
Daily VMT (miles/day)	-11.56%	-5.88%	-0.36%	+0.15%	-0.74%	+1.73%	+0.03%	-0.03%	-0.22%	-0.17%	+0.28%	-2.24%	+0.88%
1,3-Butadiene	-11.82%	-9.11%	-1.12%	+0.17%	-0.99%	+1.96%	+0.22%	+0.07%	-0.25%	-0.26%	+0.30%	-3.93%	+0.81%
Acetaldehyde	-11.78%	-9.09%	-1.13%	+0.16%	-0.99%	+1.95%	+0.26%	+0.08%	-0.25%	-0.27%	+0.30%	-3.96%	+0.79%
Acrolein	-11.79%	-9.25%	-1.17%	+0.15%	-1.01%	+1.98%	+0.29%	+0.10%	-0.26%	-0.28%	+0.29%	-4.05%	+0.77%
Benzene	-10.91%	-7.37%	-0.74%	+0.05%	-0.82%	+1.56%	+0.13%	+0.01%	-0.19%	-0.17%	+0.27%	-2.48%	+0.70%
Diesel PM	-11.79%	-8.64%	-0.94%	+0.20%	-0.94%	+1.99%	+0.23%	+0.10%	-0.28%	0.00%	+0.28%	-3.44%	+0.74%
Ethylbenzene	-8.58%	-6.14%	-0.65%	+0.07%	-0.63%	+1.01%	+0.12%	+0.03%	-0.11%	-0.12%	+0.15%	-1.57%	+0.40%
Formaldehyde	-11.78%	-9.18%	-1.15%	+0.16%	-1.00%	+1.96%	+0.29%	+0.09%	-0.26%	-0.28%	+0.29%	-4.02%	+0.77%
Naphthalene	-11.76%	-9.06%	-1.13%	+0.14%	-0.99%	+1.95%	+0.27%	+0.08%	-0.25%	-0.27%	+0.29%	-3.96%	+0.78%
Polycyclic Organic Matter	-11.59%	-8.46%	-0.99%	+0.09%	-0.96%	+1.84%	+0.20%	+0.04%	-0.24%	-0.25%	+0.30%	-3.62%	+0.82%

Source: WSP, 2022

Table 10-12. Mobile Source Air Toxics Emission Burden Percentage Changes by County, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

POLLUTANT	ANALYSIS YEAR 2045 COMPARISON – PERCENTAGE DIFFERENCE FROM NO ACTION ALTERNATIVE													
	New York		Queens	Bronx	Kings	Richmond	Nassau	Suffolk	Westchester	Rockland	Putnam	Hudson	Bergen
	CBD Only	Entire County											
Daily VMT (miles/day)	-11.32%	-5.71%	-0.46%	-0.05%	-1.14%	+1.83%	-0.26%	-0.04%	-0.38%	-0.43%	-0.41%	-1.59%	+0.69%
1,3-Butadiene	-11.13%	-10.02%	-1.56%	+0.16%	-1.77%	+2.23%	-0.45%	-0.44%	-0.73%	-0.31%	-9.14%	-3.32%	+0.68%
Acetaldehyde	-11.13%	-9.60%	-1.42%	+0.12%	-1.70%	+2.16%	-0.13%	-0.39%	-0.67%	-0.35%	-7.17%	-3.16%	+0.69%
Acrolein	-11.13%	-9.75%	-1.47%	+0.13%	-1.72%	+2.18%	-0.23%	-0.41%	-0.69%	-0.33%	-7.90%	-3.22%	+0.69%
Benzene	-10.11%	-7.81%	-0.84%	-0.03%	-1.41%	+1.71%	+0.84%	-0.23%	-0.42%	-0.35%	-2.24%	-2.00%	+0.54%
Diesel PM	-9.75%	-8.32%	-1.07%	+0.07%	-3.88%	+5.32%	-0.39%	-0.25%	+1.76%	+1.87%	-2.88%	-2.33%	+0.60%
Ethylbenzene	-6.90%	-5.82%	-0.73%	+0.05%	-0.96%	+0.93%	+0.03%	-0.19%	-0.23%	-0.13%	-1.76%	-1.19%	+0.28%
Formaldehyde	-11.13%	-9.73%	-1.46%	+0.13%	-1.72%	+2.18%	-0.21%	-0.41%	-0.69%	-0.34%	-7.76%	-3.21%	+0.69%
Naphthalene	-11.13%	-9.62%	-1.42%	+0.11%	-1.70%	+2.16%	-0.10%	-0.40%	-0.67%	-0.35%	-7.28%	-3.17%	+0.69%
Polycyclic Organic Matter	-11.04%	-8.44%	-1.04%	0.00%	-1.56%	+1.95%	+0.17%	-0.26%	-0.53%	-0.42%	-3.96%	-2.41%	+0.75%

Source: WSP, 2022

Figure 10-14. Changes in Total Mobile Source Air Toxics: CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2023)

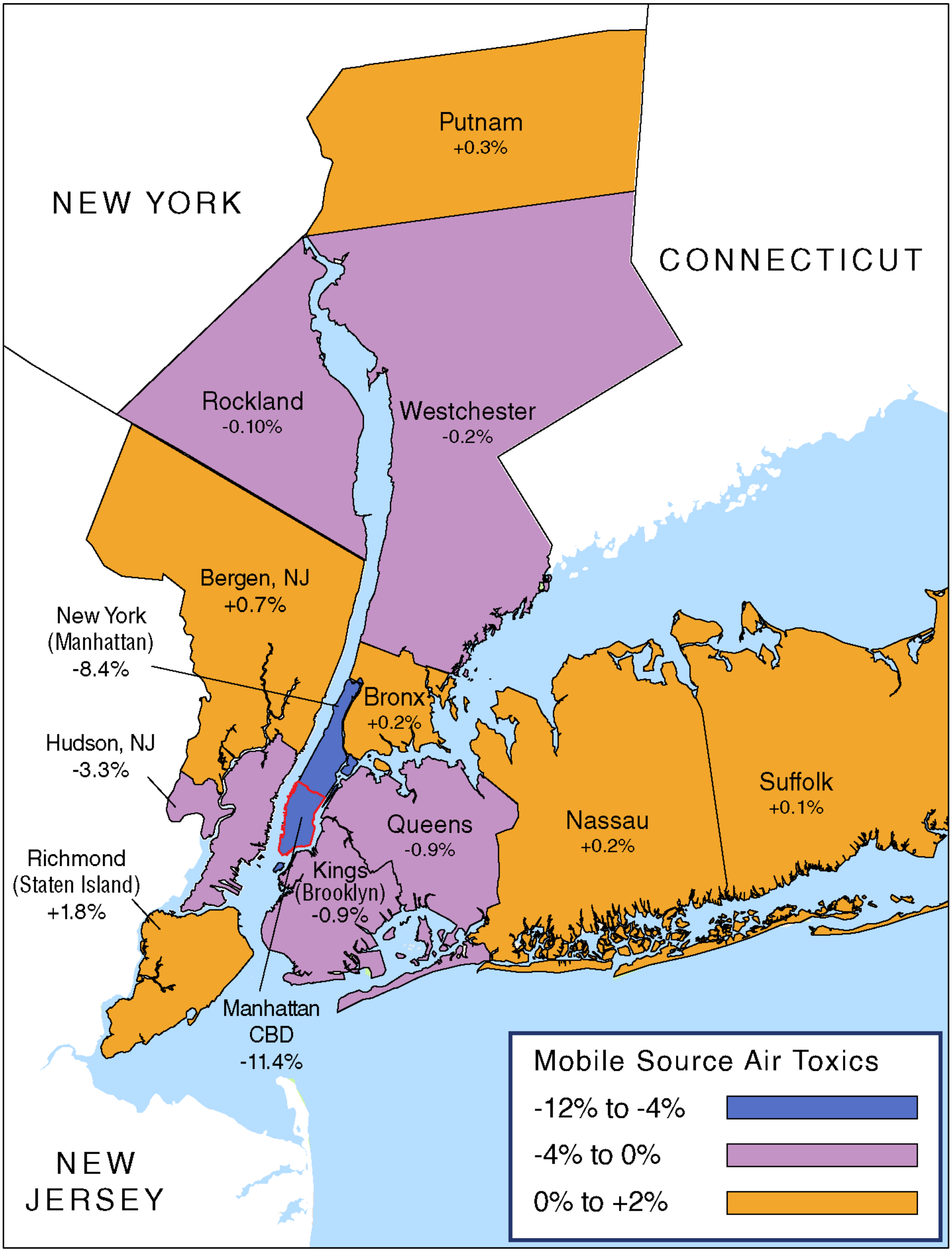


Figure 10-15. Changes in Total Mobile Source Air Toxics, CBD Tolling Alternative (Tolling Scenario A, Analysis Year 2045)

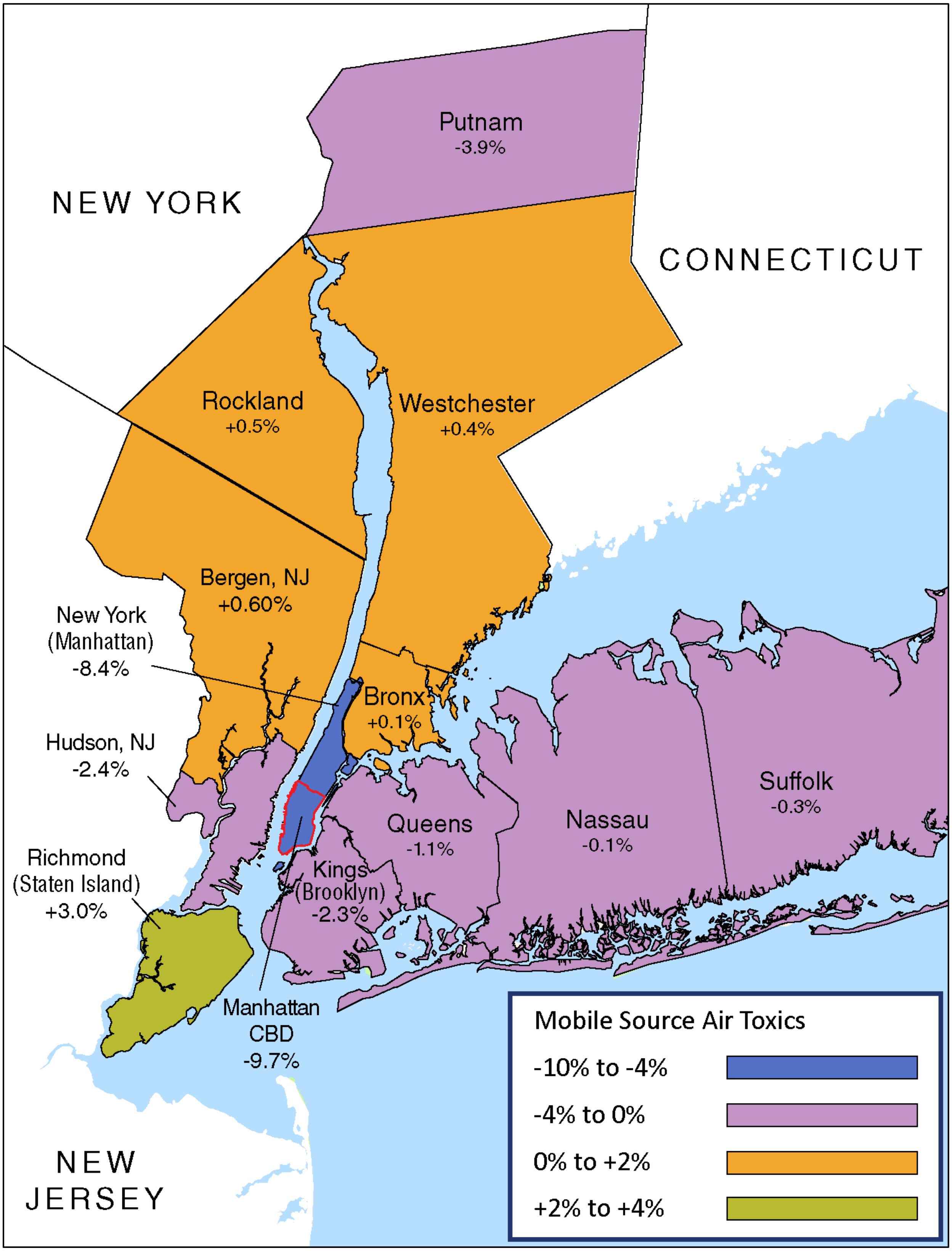
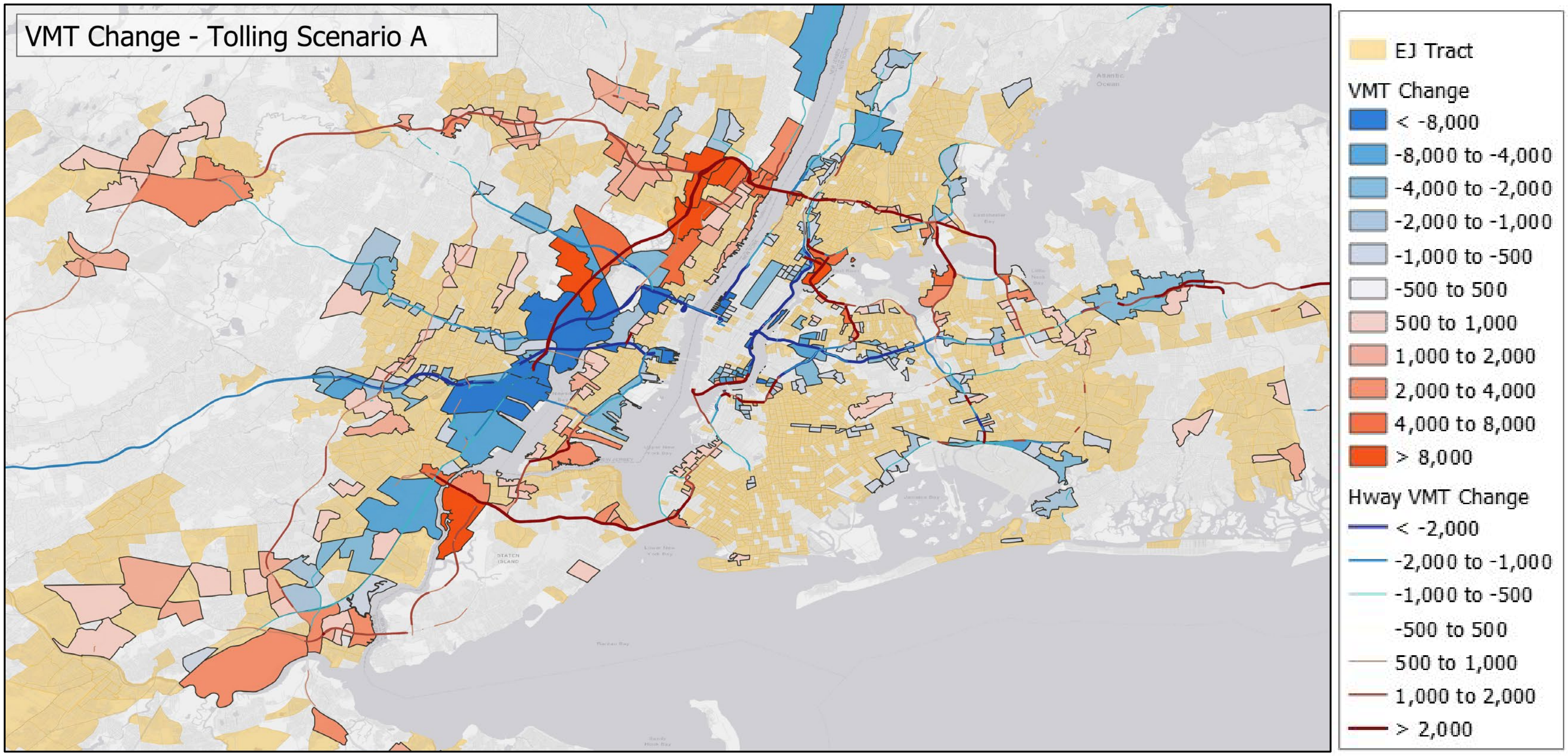


Figure 10-16. Vehicle-Miles Traveled Increase (Tolling Scenario A) and Environmental Justice Census Tracts



As shown in **Figure 10-16,** the Project would result in traffic diversions around Manhattan, into the Bronx and northern New Jersey and Staten Island. These circumferential diversions are due to implementation of the tolling in the Manhattan CBD, as drivers and trucks traveling to and from Long Island and Pennsylvania would divert around Manhattan to avoid the tolling in the Manhattan CBD. These diversions would be most pronounced at the approach to the Robert F. Kennedy Bridge in Queens, across the south Bronx and the George Washington Bridge, and into northern New Jersey. Diversions to the south would occur across the Verrazzano-Narrows Bridge and through Staten Island.

The environmental justice communities experiencing the largest traffic volumes and truck increases from these circumferential diversions are along I-95 in northern New Jersey and in Queens at the approach to the Robert F. Kennedy Bridge. Furthermore, during public engagement for the Project, members of the public expressed concerns regarding increased traffic volumes in environmental justice communities in the south Bronx, which would also be impacted by these circumferential diversions. To address these concerns, the Project team conducted detailed microscale PM analyses at these locations. **Section 10.3.2.3** provides more information on these analyses.

There are also environmental justice communities that would experience decreases in traffic volumes due to these circumferential diversions. These decreases would be mainly due to the traffic no longer traveling from Long Island through the Midtown Tunnel, across the Manhattan CBD, and through the Lincoln Tunnel into New Jersey. As such, the decreases in traffic volumes would be most pronounced along the Long Island Expressway in Queens, through the Midtown and Lincoln Tunnels, and into New Jersey. Those environmental justice communities that would experience the largest traffic volumes and truck decreases from the circumferential diversions are in central Queens, Hell's Kitchen in Manhattan, and in those portions of New Jersey to the south of the Lincoln Tunnel.

10.3.2.2 Microscale Screening Analysis

A screening analysis was conducted to determine whether detailed microscale analyses of CO and $PM_{2.5}$/PM_{10} impacts are required for the CBD Tolling Alternative, or if the traffic would be below the screening thresholds and thus require no further analysis. Based on the predicted traffic volumes for Tolling Scenario D and Tolling Scenario C, as applicable, all 102 intersections in the regional study area were screened using NYSDOT CO screening parameters. These 102 intersections, shown in **Subchapter 4B, "Transportation: Highways and Local Intersections," Figure 4B-13**, were analyzed because they are the locations expected to demonstrate the largest changes in traffic due to the Project. Of these 102 intersections, approximately half are in environmental justice communities.

An intersection passed the CO screening analysis by either having a LOS of C or better with the Project, or, if the LOS was D or worse, demonstrating less than a 10 percent increase in volume between the No Action Alternative and the CBD Tolling Alternative. **Appendix 10B, "Air Quality: Project-Level Hot-Spot Screening Procedure,"** details the LOS and overall volumes for each peak hour in the AM, midday, PM, and overnight time periods, for the 102 intersections used for this screening.

The NYSDOT screening procedure was applied for $PM_{2.5}$/PM_{10}. As per NYSDOT guidance, this procedure was based on the maximum hourly changes in heavy-duty diesel vehicles under Project conditions, compared to conditions without the Project, for intersections that demonstrated a LOS of D or worse under the CBD Tolling Alternative. A maximum hourly change in heavy-duty diesel vehicles over 10 vehicles at those intersections predicted to operate at LOS D or below was determined to be the threshold for a significant increase, thereby warranting more detailed analysis. **Appendix 10B, "Air Quality: Project-Level Hot-Spot Screening Procedure,"** details the LOS and overall volumes and volume changes used for this screening for each of the 102 intersections analyzed.

As detailed in **Appendix 10B**, **"Air Quality: Project-Level Hot-Spot Screening Procedure,"** intersections predicted to experience an incremental increase of 10 or more diesel vehicles in the peak period are all predicted to operate at LOS C or better. Furthermore, the largest increase at those intersections predicted to operate at LOS D or worse and experience an increased volume of diesel vehicles is five additional diesel vehicles per hour.

Intersections operating at LOS C or better do not warrant hot-spot analysis according to NYSDOT guidance and 40 CFR Part 93.123.

As shown in **Table 10-13,** all 102 analysis locations passed the NYSDOT CO and $PM_{2.5}$/PM_{10} screening analysis; therefore, no further analysis for CO or $PM_{2.5}$/PM_{10} is warranted. In addition, over 80 percent of the intersections show a decrease or no change in heavy-duty diesel vehicle volumes with the CBD Tolling Alternative compared to the No Action Alternative. For the 20 percent of intersections that show an increase, the change was less than the screening threshold of 10 or more diesel vehicles in the peak period. During early public outreach, concern was raised specifically around potential increases in heavy-duty vehicles in environmental justice communities given that heavy-duty diesel vehicles are closely linked to particulate matter emissions and associated health effects including cardiovascular and respiratory disease.[17] Of the 43 intersections that are located in environmental justice communities (see **Chapter 17, "Environmental Justice," Figure 17-7**), 74 percent would experience a decrease of heavy-duty diesel vehicles. For those that are predicted to experience an increase, the change was less than the screening threshold of 10 or more diesel vehicles in the peak period.

17 See, for example, Hime, Neil J.; Guy B. Marks; and Christine T. Cowie, "A comparison of the health effects of ambient particulate matter air pollution from five emission sources," *International Journal of Environmental Research and Public Health* 15(6), 2018, https://www.mdpi.com/1660-4601/15/6/1206; and Aryal, Aryal; Ashlyn C. Harmon; and Tammy R. Dugas, "Particulate matter air pollutants and cardiovascular disease: Strategies for intervention," *Pharmacology & Therapeutics* 223, July 2021, https://www.sciencedirect.com/science/article/abs/pii/S0163725821000929.

Table 10-13. CO and $PM_{2.5}/PM_{10}$ Microscale Screening Results, CBD Tolling Alternative (Tolling Scenario C and Tolling Scenario D)

LOCATION	INTERSECTION	CO SCREENING	$PM_{2.5}/PM_{10}$ SCREENING
Downtown Brooklyn	Flatbush Avenue and Tillary Street	Passed	Passed
	Adam Street and Tillary Street	Passed	Passed
	Old Fulton Street and Vine Street	Passed	Passed
Lincoln Tunnel (Manhattan)	Ninth Avenue and West 33rd Street	Passed	Passed
	Dyer Avenue and West 34th Street	Passed	Passed
	Twelfth Avenue and West 34th Street	Passed	Passed
	Eleventh Avenue and West 42nd Street	Passed	Passed
	Dyer Avenue and West 36th Street	Passed	Passed
	Tenth Avenue and West 33rd Street	Passed	Passed
	Eleventh Avenue and West 34th Street	Passed	Passed
	Tenth Avenue and West 41st Street	Passed	Passed
	Twelfth Avenue and West 42nd Street	Passed	Passed
Long Island City (Queens)	Pulaski Bridge/11th Street and Jackson Avenue	Passed	Passed
	11th Street and 48th Avenue	Passed	Passed
	50th Avenue at Vernon Boulevard	Passed	Passed
	Green Street and McGuiness Boulevard	Passed	Passed
	McGuinness Boulevard and Freeman Street	Passed	Passed
	21st Street and 49th Avenue	Passed	Passed
	11th Street and Borden Avenue	Passed	Passed
	Van Dam Street and Queens-Midtown Tunnel Expressway	Passed	Passed
	Van Dam Street and Borden Avenue	Passed	Passed
	Jackson Ave/Northern Boulevard and Queens Plaza	Passed	Passed
	Thomson Avenue and Dutch Kills Street	Passed	Passed
	Thomson Avenue and Dutch Kills Street	Passed	Passed
	21st Street and Queens Plaza N	Passed	Passed
Lower Manhattan (Manhattan)	Trinity Place and Edgar Street	Passed	Passed
	Trinity Place and Rector Street	Passed	Passed
	Hugh L. Carey Tunnel Entrance/Exit and West Street	Passed	Passed
	Hugh L. Carey Tunnel Exit and West Street and West Thames Street	Passed	Passed
	Chambers Street and Centre Street	Passed	Passed
	Canal and Hudson Streets/Holland Tunnel On-Ramp	Passed	Passed
	Canal Street and Holland Tunnel On-Ramp	Passed	Passed
	Canal Street S and West Street	Passed	Passed
	West Street and Albany Street	Passed	Passed
	West Street and Vesey Street	Passed	Passed
	West Street and Chambers Street	Passed	Passed
	Canal Street/Manhattan Bridge and Bowery	Passed	Passed
	Manhattan Bridge and Bowery	Passed	Passed
	Sixth Avenue and Watts Street	Passed	Passed
	Canal Street and Sixth Avenue/Laight Street	Passed	Passed
New Jersey	14th Street/Holland Tunnel (E-W) and Marin Boulevard (N-S)	Passed	Passed
	14th Street (E-W) and Jersey Avenue (N-S)	Passed	Passed
	12th Street (E-W) and Jersey Avenue (N-S)	Passed	Passed
	12th Street/Holland Tunnel (E-W) and Marin Boulevard (N-S)	Passed	Passed

LOCATION	INTERSECTION	CO SCREENING	$PM_{2.5}/PM_{10}$ SCREENING
Queens-Midtown Tunnel (Manhattan)	East 37th Street and Third Avenue	Passed	Passed
	East 36th Street and Second Avenue	Passed	Passed
	East 34th Street and Third Avenue	Passed	Passed
	East 35th Street and Third Avenue	Passed	Passed
	East 34th Street and Second Avenue	Passed	Passed
	East 35th Street and Second Avenue	Passed	Passed
Red Hook (Brooklyn)	Hamilton Avenue, Clinton Street and West 9th Street	Passed	Passed
	Hamilton Avenue (northbound) and West 9th Street	Passed	Passed
Robert F. Kennedy Bridge (Manhattan, the Bronx, Queens)	East 126th Street and Second Avenue	Passed	Passed
	East 125th Street and Second Avenue	Passed	Passed
	East 134th Street and St. Ann's Avenue	Passed	Passed
	St. Ann's Avenue and Bruckner Boulevard	Passed	Passed
	31st Street and Astoria Boulevard	Passed	Passed
	Hoyt Avenue North and 31st Street	Passed	Passed
	Hoyt Avenue South and 31st Street	Passed	Passed
Upper East Side (Manhattan)	East 60th Street and Ed Koch Queensboro Bridge Exit	Passed	Passed
	East 60th Street and Third Avenue	Passed	Passed
	East 60th Street and York Avenue	Passed	Passed
	East 59th Street and Second Avenue	Passed	Passed
	East 60th Street and Second Avenue	Passed	Passed
	East 60th Street and First Avenue	Passed	Passed
	East 60th Street and Lexington Avenue	Passed	Passed
	East 60th Street and Park Avenue (northbound)	Passed	Passed
	East 60th Street and Park Avenue (south- and westbound)	Passed	Passed
	East 60th Street and Madison Avenue	Passed	Passed
	East 62nd Street and Ed Koch Queensboro Bridge Exit	Passed	Passed
	East 60th Street and Fifth Avenue	Passed	Passed
	East 63rd Street and York Avenue	Passed	Passed
	East 53rd Street and Franklin D. Roosevelt Drive	Passed	Passed
	East 61st Street and Fifth Avenue	Passed	Passed
	East 65th Street and Fifth Avenue	Passed	Passed
	East 66th Street and Fifth Avenue	Passed	Passed
	East 79th Street and Fifth Avenue	Passed	Passed
	East 71st Street and York Avenue	Passed	Passed

LOCATION	INTERSECTION	CO SCREENING	$PM_{2.5}/PM_{10}$ SCREENING
Upper West Side (Manhattan)	West 72nd Street and West End Avenue	Passed	Passed
	West 61st Street and West End Avenue	Passed	Passed
	West 79th Street and Riverside Drive	Passed	Passed
	West 56th Street and Twelfth Avenue	Passed	Passed
	West 56th Street and West Side Highway	Passed	Passed
	West 55th Street and West Side Highway	Passed	Passed
	West 55th Street and Twelfth Avenue	Passed	Passed
	West 55th Street and West Side Highway Arterial	Passed	Passed
	West 60th Street and Broadway	Passed	Passed
	West 60th Street and Columbus Avenue	Passed	Passed
	West 60th Street and Amsterdam Avenue	Passed	Passed
	West 60th Street and West End Avenue	Passed	Passed
	West 61st Street and Amsterdam Avenue	Passed	Passed
	West 61st Street and Columbus Avenue	Passed	Passed
	West 61st Street and Broadway	Passed	Passed
	West 61st Street and Columbus Avenue	Passed	Passed
	West 81st Street and Central Park West	Passed	Passed
	West 66th Street and Central Park West	Passed	Passed
	West 65th Street and Central Park West	Passed	Passed
West Side Highway/ Route 9A (Manhattan)	West 24th Street and Twelfth Avenue	Passed	Passed
Little Dominican Republic (Manhattan)	West 179th Street and Broadway	Passed	Passed
Lower East Side (Manhattan)	Park Row/Chatham Square, Worth/Oliver Street and Mott Street	Passed	Passed
	Chatham Square and East Broadway	Passed	Passed
	Chatham Square/Bowery and Division Street	Passed	Passed

Appendix 10B, "Air Quality: Project-Level Hot-Spot Screening Procedure," provides details of the CO and $PM_{2.5}/PM_{10}$ screening analysis.

10.3.2.3 Highway Link Analysis

During early outreach, concerns were raised related to a specific location at FDR Drive and 10th Street, as it is near low-income housing locations. A volume threshold screening was conducted and results were compared to the thresholds in Table 3B of Section I-3 of the NYSDOT TEM Chapter 1.1. The emission factors applied within this screening are from USEPA's MOVES model. CO emission factors were generated for various speeds along FDR Drive (from 10 to 40 miles per hour) for opening-year conditions and ranged from 1.9 to 2.9 grams per mile. Upon comparison to Table 3B in the TEM, when applying the above emission factors, the peak-hour volumes in the Project would not result in an adverse effect if they have approach volumes of less than 8,000 vehicles. According to the traffic analysis, approach volumes on FDR Drive at 10th Street are under the 8,000-vehicle threshold with the Project. As such, the travel lanes in this area do not meet the criteria that would warrant a microscale analysis, and the Project would not increase traffic volumes or change other existing conditions to such a degree as to jeopardize attainment of the NAAQS for CO.

Similar to concerns expressed regarding truck volumes on local intersections, concerns were also raised during early public outreach regarding changes in truck volumes on nearby highways, the resulting impact on particulate matter at a localized level. Specifically, there was concern that in communities that already are overburdened by pollution, even a single additional truck is of concern. Though all sites analyzed passed the particulate matter screening parameters established for the Project, in recognition of the association of particulate matter and health effects, it was decided to conduct hot-spot analyses on highway links throughout the study area to quantify the Project's impact on localized air quality levels. A highway link screening analysis was conducted to determine which locations should be analyzed. Since the tolling scenarios affect individual highway links differently, this screening analysis evaluated every highway link under every scenario and selected those sites that demonstrated the highest AADT and the highest increase in heavy-duty diesel trucks (see **Table 10B-27** and **Table 10B-28**). Furthermore, due to specific community concerns in the South Bronx, an additional analysis location was selected on the Cross Bronx Expressway at Macombs Road. This location was also screened under every scenario.

The sites chosen for analysis are the following:

- I-95 west of the George Washington Bridge, Tolling Scenario C
  - Highest AADT in all scenarios
  - New Jersey location
  - Environmental justice community
- Cross Bronx Expressway at Macombs Road, Tolling Scenario B
  - Community concern
  - Scenario with highest truck increase at that location
  - Bronx location
  - Environmental justice community
- Robert F. Kennedy (Triborough) Queens Approach, Tolling Scenario E
  - Highest truck increase across all scenarios
  - Queens location
  - Environmental justice community

According to the results of the PM microscale analyses, all levels were below the applicable NAAQS. Details of the analysis results, as well as electronic versions of the MOVES and AERMOD files, are contained within **Appendix 10C, "Air Quality: Highway Link PM Hot-Spot Detailed Assessment (Methodology, Interagency Consultation, & Results)."**

As an independent action, MTA is currently transitioning its fleet to zero-emission buses. MTA is committed to prioritizing traditionally underserved communities and those impacted by poor air quality and climate change and has developed an approach that actively incorporates these priorities in the deployment phasing process of the transition. Based on feedback received during the outreach conducted for the Project and concerns raised by members of environmental justice communities, MTA will prioritize the Kingsbridge Depot and Gun Hill Depot, both located in and serving primarily environmental justice communities in Upper Manhattan and the Bronx, when electric buses are received in MTA's next major procurement of battery electric buses, which will begin later in 2022. This independent effort by MTA is anticipated to provide air quality benefits to the environmental justice communities in the Bronx.

Furthermore, the Project Sponsors will monitor air quality for the life of the Project through the NYCCAS, a citywide network of roughly 100 sensors (see **Section 10.2**). NYCDOT will coordinate to expand the existing network of sensors to monitor priority locations and supplement a smaller number of real-time $PM_{2.5}$ monitors to provide insight into time-of-day patterns to determine whether the changes in air pollution can be attributed to changes in traffic occurring after implementation of the Project. The Project Sponsors will monitor air quality prior to implementation (setting a baseline), and two years following implementation. Following the initial two-year post-implementation analysis period, the Project Sponsors will assess the magnitude and variability of changes in air quality to determine whether more monitoring is necessary.

10.4 TRANSPORTATION CONFORMITY DETERMINATION

The Project was included in the regional emissions analysis for NYMTC's most recent Transportation Conformity Determination. FHWA and FTA determined that NYMTC's 2022-2050 Plan and 2020-2024 Transportation Improvement Program (TIP) conform to the New York State Implementation Plan (SIP) for Air Quality on September 30, 2021.

Using screening criteria established by NYSDOT's TEM, traffic volume changes resulting from the CBD Tolling Alternative would not be substantial enough to warrant detailed analysis of CO and PM at the 102 intersections analyzed. Furthermore, the analyzed highway links passed NYSDOT's screening criteria for CO and did not exceed the NAAQS for particulate matter. As such, the Project satisfied the hot-spot analysis requirements for CO and PM in 40 CFR 93.116 and 123.

10.5 CONCLUSION

The Project was included in the regional emissions analysis for NYMTC's most recent Transportation Conformity Determination. FHWA and FTA determined that NYMTC's 2022-2050 Plan and 2020-2024 TIP conform to the New York SIP.

Air quality analyses were completed on both a regional (mesoscale) and a local (microscale) level. The mesoscale, MSAT and GHG analyses focused on 12 counties in New York and New Jersey.[18] Those New Jersey counties included in the analysis demonstrate both the biggest increase and decrease in VMT (Bergen and Hudson Counties, respectively). VMT in Connecticut is predicted to decrease between the No Action Alternative and the CBD Tolling Alternative; as such, Connecticut counties were not included in the mesoscale analysis.

[18] New York City: the Bronx, Kings (Brooklyn), New York (Manhattan), Queens, and Richmond (Staten Island) Counties; Long Island: Nassau and Suffolk Counties; North of New York City: Putnam, Rockland, and Westchester Counties; New Jersey: Hudson and Bergen Counties.

At the county level, for criteria pollutants in 2023:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Rockland, and Hudson Counties estimate decreases in all pollutants with the Project.
- Suffolk, Westchester, and Putnam Counties estimate mixed results, with some pollutants increasing slightly and some pollutant burdens decreasing with the Project.
- The Bronx, Richmond (Staten Island), Nassau, and Bergen Counties estimate increases in all pollutants with the Project.

At the county level, for criteria pollutants in 2045:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Suffolk, and Hudson Counties estimate decreases in all pollutants with the Project.
- The Bronx, Nassau, Westchester, Rockland, and Putnam Counties estimate mixed results with some pollutants increasing slightly and some pollutants decreasing with the Project.
- Richmond (Staten Island) and Bergen Counties estimate increases in all pollutants with the Project.

At the county level, for MSATs in 2023:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Westchester, Rockland, and Hudson Counties estimate decreases in all MSATs with the Project.
- The Bronx, Richmond (Staten Island), Nassau, Suffolk, Putnam, and Bergen Counties estimate increases in all MSATs with the Project.

At the county level, for MSATs in 2045:

- The Manhattan CBD along with New York (Manhattan), Queens, Kings (Brooklyn), Suffolk, Putnam, and Hudson Counties estimate decreases in all MSATs with the Project.
- The Bronx, Nassau, Westchester, and Rockland, Counties estimate mixed results with some MSATs increasing slightly and some pollutants decreasing with the Project.
- Richmond (Staten Island) and Bergen Counties estimate increases in all MSATs with the Project.

The microscale analysis focused on 102 intersections in the following areas:

- Long Island City
- Lower Manhattan
- Queens-Midtown Tunnel
- Red Hook Brooklyn
- Upper East Side
- Lincoln Tunnel

- West Side Highway/Route 9A
- Downtown Brooklyn
- Robert F. Kennedy Bridge
- Upper West Side
- Washington Heights
- Lower East Side
- New Jersey

Through interagency consultation and follow-up discussions, screening analyses were conducted following NYSDOT criteria for both CO and particulate matter ($PM_{2.5}$/PM_{10}). All 102 intersections passed the NYSDOT CO and $PM_{2.5}$/PM_{10} screening analysis. For intersections that are located within the CO maintenance areas, CO hot-spot analysis requirements in 40 CFR 93.123(a) are met. Based on the screening analyses, it was determined that the Project is not a project of air quality concern as defined in 40 CFR 93.123(b)(1); therefore, no hot-spot analysis for $PM_{2.5}$/PM_{10} is required. The Project meets the project-level conformity requirements and would not create any new or worsen any existing violation of the NAAQS or delay timely attainment of any NAAQS or any required interim emission reductions or other milestones.

In response to public comments received, a highway segment CO screening was conducted on FDR Drive near 10th Street using NYSDOT's volume threshold screening. The analyzed location passed the screening, and no further CO analysis is warranted.

Furthermore, through interagency consultation and to address community concerns, particulate matter hot-spot analyses were conducted on highway segments at three locations representing worst-case conditions (largest increases in truck traffic and highest AADT under the Project) and community concerns. According to the analyses, there were no violations of the NAAQS with the Project, and no further analysis is warranted.

Table 10-14 summarizes the air quality-related effects of the CBD Tolling Alternative.

Table 10-14. Summary of Effects of the CBD Tolling Alternative on Air Quality

SUMMARY OF EFFECTS	LOCATION	DATA SHOWN IN TABLE	TOLLING SCENARIO A	B	C	D	E	F	G	POTENTIAL ADVERSE EFFECT	MITIGATION AND ENHANCEMENTS
Increases or decreases in emissions related to truck traffic diversions	Cross Bronx Expressway at Macombs Road, Bronx, NY	Increase or decrease in Annual Average Daily Trips (AADT)	3,901	3,996	2,056	1,766	3,757	2,188	3,255	No	**No mitigation needed.** No adverse effects **Enhancements** **1.** Refer to the overall Project enhancement on monitoring at the end of this table. **2.** NYCDOT will coordinate to expand the existing network of sensors to monitor priority locations, and supplement a smaller number of real-time $PM_{2.5}$ monitors to provide insight into time-of-day patterns to determine whether the changes in air pollution can be attributed to changes in traffic occurring after implementation of the Project. The Project Sponsors will monitor air quality prior to implementation (setting a baseline), and two years following implementation. Following the initial two-year post-implementation analysis period, the Project Sponsors will assess the magnitude and variability of changes in air quality to determine whether more monitoring is necessary. **3.** MTA is currently transitioning its fleet to zero-emission buses, which will reduce air pollutants and improve air quality near bus depots and along bus routes. MTA is committed to prioritizing traditionally underserved communities and those impacted by poor air quality and climate change and has developed an approach that actively incorporates these priorities in the deployment phasing process of the transition. Based on feedback received during the outreach conducted for the Project and concerns raised by members of environmental justice communities, TBTA coordinated with MTA NYCT, which is committed to prioritizing the Kingsbridge Depot and Gun Hill Depot, both located in and serving primarily environmental justice communities in Upper Manhattan and the Bronx, when electric buses are received in MTA's next major procurement of battery electric buses, which will begin later in 2022. This independent effort by MTA NYCT is anticipated to provide air quality benefits to the environmental justice communities in the Bronx.
		Increase or decrease in daily number of trucks	509	704	170	510	378	536	50		
		Potential adverse air quality effects from truck diversions	No	No	No	No	No	No	No		
	I-95, Bergen County, NJ	Increase or decrease in AADT	9,843	11,459	7,980	5,003	7,078	5,842	12,506	No	
		Increase or decrease in daily number of trucks	801	955	729	631	696	637	-236		
		Potential adverse air quality effects from truck diversions	No	No	No	No	No	No	No		
	Robert F. Kennedy Bridge, NY	Increase or decrease in AADT	18,742	19,440	19,860	19,932	20,465	20,391	21,006	No	
		Increase or decrease in daily number of trucks	2,257	2,423	2,820	3,479	4,116	3,045	432		
		Potential adverse air quality effects from truck diversions	No	No	No	No	No	No	No		

OVERALL PROJECT ENHANCEMENT. The Project Sponsors commit to ongoing monitoring and reporting of potential effects on the Project, including for example, traffic entering the Manhattan CBD, taxi/FHV vehicle-miles traveled in the Manhattan CBD; transit ridership from providers across the region; bus speeds within the CBD; air quality and emissions trends; parking; and Project revenue. Data will be collected in advance and after implementation of the Project. A formal report on the effects of the Project will be issued one year after implementation and then every two years. In addition, a reporting website will make data, analysis, and visualizations available in open data format to the greatest extent possible. Updates will be provided on at least a bi-annual basis as data becomes available and analysis is completed.