2.14 AIR QUALITY

2.14.1 INTRODUCTION

The purpose of this chapter is to evaluate the potential effects of the Proposed Project on air quality. Air quality analyses were conducted, following the procedures outlined in the *New York City Environmental Quality Review (CEQR) Technical Manual*, to determine whether the Proposed Project would result in exceedances of ambient air quality standards or health-related guideline values. Potential air quality impacts can be either direct or indirect. Direct impacts can result from pollutant emissions generated by stationary sources, for example emissions from fuel burned for heating. Indirect impacts include emissions from motor vehicles or other mobile sources, or from existing pollutant emission sources affecting the air quality of new sensitive receptors (e.g., residences) introduced by a Proposed Project.

2.14.1.1 Year 2015

Components ~~Developments~~ of the Proposed Project are expected to be completed over several years. Construction of Retail Site "A" and Fairview Park are expected to be completed by the year 2015, which would include new stationary and mobile sources emitting air pollutants ~~and generate new mobile sources for air quality~~. ~~However, T~~the mobile source air quality analyses of conditions in 2015 ~~presented in this chapter~~ were based on ~~conducted using~~ the worst-case traffic forecasts for the ~~approach by focusing on potential air quality impacts under the~~ 2015~~20~~ analysis year as presented in **Chapter 2.13**, "Transportation~~, by which time all of the components of the proposed development would be constructed and operational, as described below and presented in this chapter~~."

2.14.1.2 Year 2020

The ~~Construction of~~ remaining~~der of the~~ components of the Proposed Project ~~components Development Area~~ are ~~is~~ expected to be completed by the year 2020, including the developments of Retail Site "B", the combined public elementary/intermediate school, and the senior housing, as well as the construction of Englewood Avenue ~~and other road constructions~~.

~~The air quality analyses presented in this chapter were conducted using the worst-case approach by focusing on potential air quality impacts under the 2020 analysis year, by which time all of the components of the proposed development would be constructed and operational.~~ As described in **Chapter 1.0**, "Project Description," the 2020 analysis year represents the full build-out of the Development Area ~~under a worst-case scenario~~ with the greatest traffic impacts and on-site stationary source operations associated with the Proposed Project. ~~Therefore if the worst-case 2020 conditions show no significant air quality impacts, the impacts under a 2015 year analysis would be less than the performed 2020 year analysis, and as such, do not warrant a further analysis.~~ The potential air quality impacts generated by the construction of the proposed Charleston Mixed-Use Development are discussed in **Chapter 2.19**, "Construction."~~.~~

2.14.2 METHODOLOGY

2.14.2.1 Pollutants of Concern

Criteria Pollutants and National Ambient Air Quality Standards

The United States Environmental Protection Agency (USEPA), under the requirements of the 1970 Clean Air Act (CAA), as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants (see **Table 2.14-1**), referred to as criteria pollutants (40 CFR 50). These are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), and sulfur dioxide (SO_2).

Table 2.14-1

National and New York Ambient Air Quality Standards for Criteria Pollutants

Pollutant (Final Rule Cite)		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		Primary	8-hour	9 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 µg/m$^{3(1)}$	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb[(2)]	Annual mean
Ozone (O_3)		primary and secondary	8-hour	0.075 ppm[(3)]	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	primary and secondary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
			24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 µg/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

Notes (as of October 2011):

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 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, 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 NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: http://www.epa.gov/air/criteria.html.

Criteria pollutants typically result from a wide range of man-made activities and associated stationary and mobile combustion sources. Areas that meet the NAAQS standard for a criteria pollutant are designated as being "in attainment." Areas where a criteria pollutant level exceeds the NAAQS are designated as being "in non-attainment." O_3 non-attainment areas are categorized based on the severity of their pollution problem -- marginal, moderate, serious, severe, or extreme. CO and PM_{10} non-attainment areas are categorized as moderate or serious. When a non-attainment area is re-designated as an attainment area, the CAA requires that a maintenance plan be put in place to ensure continued compliance with the corresponding NAAQS. Therefore, a former non-attainment area is also defined as a maintenance area.

Where insufficient data exist to determine an area's attainment status, an area is designated unclassifiable (or in attainment).

Air Toxics

In addition to the criteria pollutants summarized above, non-criteria toxic pollutants, called air toxics, are also regulated. Air toxics are those pollutants that are known or suspected to cause health effects in small doses. Air toxics are emitted by a wide range of man-made and naturally occurring sources. Emissions of air toxics from industries are regulated by USEPA. However, unlike the NAAQS for criteria pollutants, Federal ambient air quality standards do not exist for non-criteria pollutants. In order to address potential health effects from air toxics particularly from industrial operations, the New York State Department of Environmental Conservation (NYSDEC) has developed ambient guideline concentrations for numerous air toxics in terms of annual and short term (1-hour) guideline concentration levels.

Project Pollutants of Concerns

The *CEQR Technical Manual* defines pollutants of concerns based on typical project types and/or land uses surrounding the project. The Charleston Mixed-Use Development Area would include residential and commercial uses that would induce traffic and create new stationary sources related to heating venting and air conditioning systems (HVAC). The criteria pollutants of concern related to the Proposed Project are CO, particulate matter (PM), SO_2 and NO_2.

Since the Development Area is essentially bounded by either vacant land or commercial uses with no major industrial facilities present, other criteria pollutants and air toxics from neighborhood existing sources are not a concern for the Proposed Project. An evaluation of the impacts from any major existing stationary sources in the neighborhood of a development site on proposed sensitive land uses generally needs to be investigated if a major industrial facility and/or large building stack emissions exist within a 400-foot radius. Since no such facilities with major stationary stack emissions from either industrial, commercial or residential uses are in close proximity within a 1,000-foot radius of the Development Area, potential existing stationary source impacts on proposed sensitive land uses would not be significant and further study of such pollutants is not warranted.

2.14.2.2 Air Quality Impact Criteria

The air quality impact analysis was performed following the *CEQR Technical Manual* guidance and procedures to demonstrate compliance with all applicable air quality standards and criteria. The screening process was first performed for each applicable project element to determine whether a further microscale impact dispersion modeling is required. For those source categories that warrant a further microscale impact analysis for the applicable pollutants, the predicted impact concentrations are compared with the NAAQS (see previous **Table 2.14-1**) and/or the New York City Department of Environmental Protection (NYCDEP) $PM_{2.5}$ Interim Guidelines, if applicable, to determine potential air quality impact significance.

The air quality analysis considered the following potential impact elements:

- Stationary source operation - potential impacts from new fossil fuel-fired HVAC systems induced by the Proposed Project; and
- Mobile source operation - potential air quality impacts at intersections due to the Proposed Project.

Stationary Sources

The typical pollutants of concern related to combustion from stationary source operations, such as HVAC systems, are CO, PM, SO_2, and NO_2. The emission strength for individual pollutants also depends on the fuel types. Natural gas-fired boilers are generally cleaner than those powered by petroleum fuel.

The anticipated new stationary sources generated by the Proposed Project would be limited to common indoor HVAC systems that would be installed inside new commercial or residential buildings. Given the large size of the Development Area, buildings would be grouped in several clusters and the potential air quality impact from these clusters would be relatively isolated (see **Figure 2.14-1**). A 400-foot radius was used to separate these building clusters and the potential HVAC sources were screened using the stationary source screening charts provided in the *CEQR Technical Manual* to determine whether a further microscale analysis would be required for the sources within that 400-foot radius. Because these HVAC systems are typically considered insignificant sources, if the distance from the potential source location to the nearest sensitive receptor is beyond the screening threshold for that HVAC system, no further microscale analysis is considered necessary.

For those HVAC systems that fail the screening process described above, a further microscale analysis to evaluate HVAC emissions and dispersion analyses using the USEPA AERMOD model to predict concentration levels is warranted.

AERMOD is a steady-state plume model that can simulate dispersion from various source types (point, area, or line) and volume types from either elevated or ground-level release. It calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data similar to what would be used for the $PM_{2.5}$ mobile source model, as discussed below. The AERMOD-predicted highest concentration levels would then be combined with background levels and compared to NAAQS to determine the total potential stationary source impacts.

Mobile Sources

Typical pollutants of concern related to mobile source operations are CO and PM (particularly $PM_{2.5}$ for which the New York Metropolitan area has been designated as a nonattainment area).

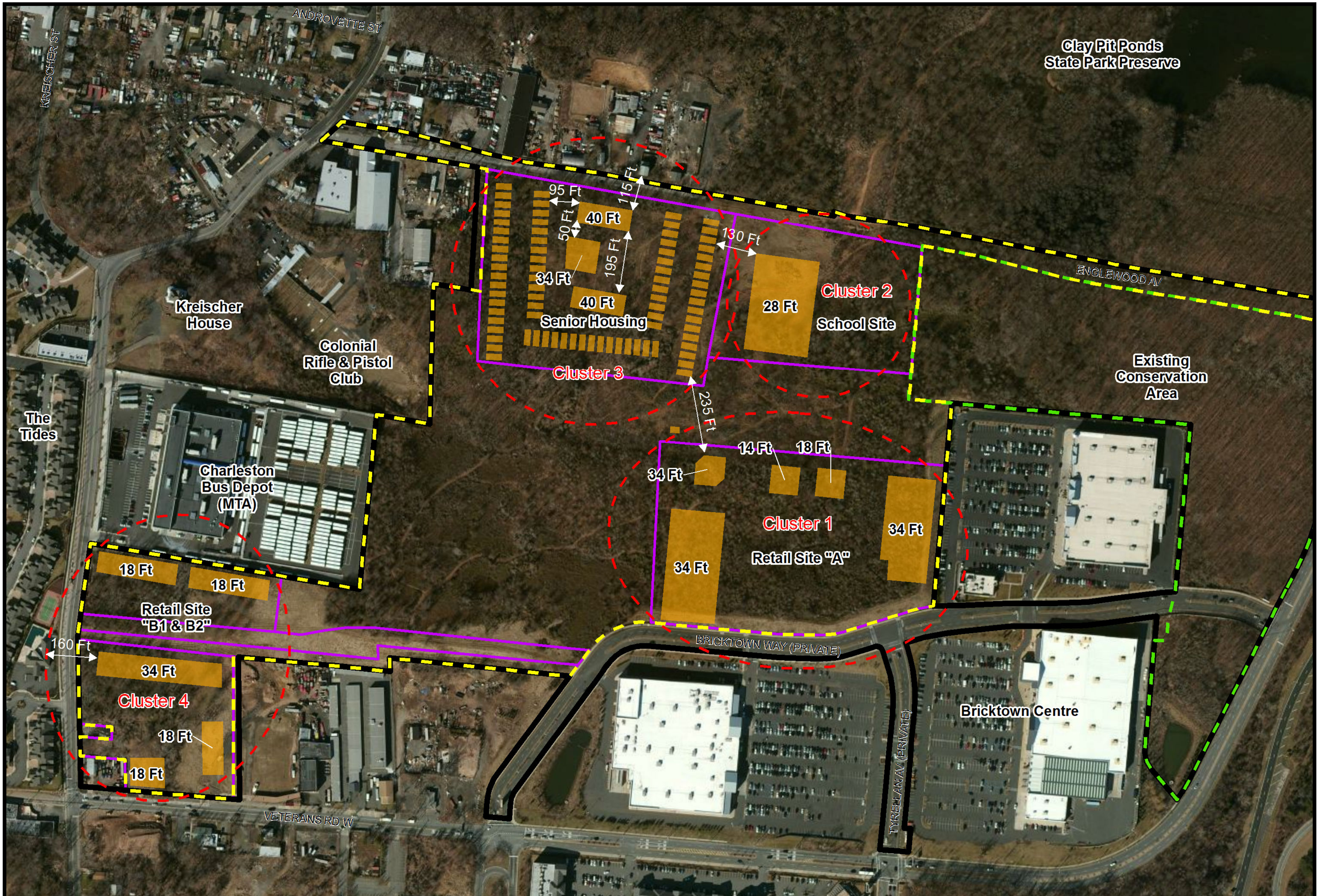
<u>On-Road Traffic</u>

Traffic data used for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other data developed as part of the traffic analysis for the Proposed Project (see **Chapter 2.13**). Traffic data for the future without and with the Proposed Project were used in their respective air quality modeling scenarios. Weekday peak periods (i.e., AM, midday [MD], and PM) and Saturday MD were evaluated. These time periods were selected for the mobile source analysis because these periods produce the maximum anticipated project-generated traffic, particularly at those signalized intersections with the greatest congestion and which therefore have the greatest potential for significant air quality impacts.

Each signalized intersection analyzed for potential peak period impacts was first screened using the hourly thresholds recommended in the *CEQR Technical Manual*, as follows:

- Traffic operational Level-of-Service (LOS) “D” or worse; and
- For CO: 170 or more incremental vehicle trips from the Proposed Project; or
- For $PM_{2.5}$: 23 or more incremental truck trips at arterial roadways (further refined, as presented later in this chapter, for 19 or more incremental equivalent heavy duty diesel vehicle [HDDV] trips at collector roadways for $PM_{2.5}$.). Because the NAAQS established for $PM_{2.5}$ is based on 24-hour or annual average condition, the average hourly incremental equivalent HDDV trips over 24-hour period was used in ~~implanting~~ <u>completing the</u> CEQR-provided screening worksheet.

If the screening thresholds were not exceeded at an intersection, no further microscale analysis was warranted. For those intersections that exceeded the screening thresholds, a further ranking to determine the four worst-case intersections was performed. The ranking was made based on worst-case LOS, overall highest Future With-Action traffic volume, and incremental increase in traffic attributable to the Proposed Project. The four worst-case intersections were subject to a further microscale analysis.



AECOM

Legend

Proposed Building | Cluster | 18 Ft Roof Height

Project Area | Development Area | Conservation Area

Site Boundary

Source: Bing Aerial Map.

0 100 200 400 Feet

1 inch = 400 feet

N

Charleston Mixed-Use Development

Figure 2.14-1

Proposed Building Clusters

A CO microscale analysis is typically performed using the CAL3QHC model to determine the wind direction resulting in the maximum concentrations at each receptor following the EPA guidelines.

A $PM_{2.5}$ microscale analysis is typically performed with the CAL3QHCR model, which includes the modeling of hourly concentrations based on hourly traffic data and the most recent five years of hourly meteorological data. –For Richmond County where the Development Area is located, surface meteorological data collected at Newark International Airport and upper air data collected at Brookhaven, New York was used. The highest model-predicted concentration for each averaging period was used to determine the worst-case potential impacts.

In order to compare the analysis results with the applicable NAAQS, cumulative concentration levels were calculated by combining the highest pollutant concentrations as a result of the Proposed Project with background pollutant concentrations. Background concentrations are those pollutant concentrations originating from distant sources not accounted for in the air quality modeling analysis of intersections, which only accounts for vehicular emissions from the streets immediately adjacent to the intersections selected for microscale analysis. For this mobile source impact analysis, the most recent highest background concentrations monitored at the nearest background monitoring station were used.

Parking Lot Traffic

None of the parking lots that are planned to be constructed under the Proposed Project would be located immediately adjacent to any sensitive receptors. As described in **Table 1-1** and illustrated in **Figure 1-2** within **Chapter 1**: "Project Description", a total of 633 parking spaces would be included within Retail Site "A", which would contain the proposed retail and library operations. These parking spaces would be created close to the proposed on-site sensitive land uses such as senior housing, tennis court, etc. The distance from the closest parking corner to a sensitive receptor (i.e., the proposed tennis court) is approximately 200 feet away. In an open area, the quick dispersion of CO emissions from passenger vehicles in the parking lot would have negligible air quality impacts at a distance of 200 feet or greater. Other on-site parking lots would have substantially fewer parking spots as compared to the Retail Site "A" retail stores and library lot with less adverse air quality impacts. Furthermore, such parking lots would be used mainly by passenger vehicles with negligible PM emissions. Therefore, potential air quality impacts from proposed parking lots are anticipated to be minimal and a parking lot air quality impact modeling analysis is not warranted.

2.14.3 EXISTING CONDITIONS

The location of the Proposed Project, Staten Island, is currently designated as:

- Moderate non-attainment area for 8-hour O_3.
- Non-attainment area for $PM_{2.5}$.
- CO maintenance area.
- Attainment area for all other criteria pollutants.

The most recent available USEPA-published ambient monitoring air quality data (for the past three years of 2009 through 2011) was collected from the monitoring stations closest to the Project Area. The data from these stations provides the basis for establishing existing ambient air quality conditions in the Project Area and are shown in **Table 2.14-2**. All monitored levels of pollutants are well below NAAQS standards, with the exception of O_3.

Table 2.14-2

Ambient Monitoring Background Criteria Pollutant Concentration Levels

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	160 Convent Avenue, New York, New York County, NY	ppm	8-hour	2	9
			1-hour	3	35
SO_2	Queens College 65-30 Kissena Blvd Parking Lot#6, Queens County, NY	ppb	1-hour	40	75
$PM_{2.5}$	Susan Wagner Hs, 1200 Manor Rd, Near Brielle Avenue, Richmond County, NY	µg/m^3	Annual	9	12
			24-hour	23	35
NO_2	Queens College 65-30 Kissena Blvd Parking Lot#6, Queens County, NY	ppb	1-hour	67	100
Ozone (O_3)	Susan Wagner Hs, 1200 Manor Rd, Near Brielle Ave, Richmond County, NY	ppm	8-hour	0.087	0.075

Notes:
Based on the NAAQS definitions,
CO and SO_2 concentrations for short-term averages are the first-highest from the year 2011.
$PM_{2.5}$ annual concentrations are the average of 2009, 2010, and 2011, and the 24-hour concentration is the average of the annual 98th percentiles in 2009, 2010, and 2011.
NO_2 1-hour concentration is the average of the annual 98th percentiles in 2009, 2010, and 2011.

Source: http://www.epa.gov/airdata/ad_rep_mon.html

2.14.4 FUTURE NO-ACTION CONDITION

In the future without the Proposed Project, development would not occur in the Project Area, nor would Englewood Avenue be constructed to the full proposed length and width. Therefore, the stationary and mobile source air quality conditions would be similar to existing conditions.

2.14.5 FUTURE WITH-ACTION CONDITION

2.14.5.1 Stationary Source Operations

New stationary sources as a result of the Proposed Project would include HVAC equipment commonly found in retail and residential mixed land use developments with low-rise buildings. It is anticipated that HVAC equipment would use natural gas as part of an effort to reduce both air pollutants and greenhouse gas emissions as compared to fuel oil, a goal of the City as part of *PlaNYC* (see **Chapter 2.1**). In addition to the fuel type, the design of HVAC system will follow common green building design practice[1], such as:

- Following established industry procedures.
- Designing in conjunction with other building components, including insulation, windows, solar mass, and orientation.
- Reducing the size, expense, and complexity of mechanical systems as much as possible.
- Installing properly sized fans.

[1] www.greenbuilding.com

- Considering a heat recovery ventilator to capture latent heat that would otherwise be lost to the maximum extent.
- Specifying high-efficiency heating equipment and air conditioners with a high Seasonal Energy Efficiency Ratio (SEER).

By considering energy conservation in the design process, air emissions would be further reduced. Although typical HVAC-related pollutants include PM, SO_2 and NO_2, the pollutant of concern for natural gas HVAC systems is NO_2.

As discussed above, the only fossil fuel that would be used for heating and hot water systems at the development sites included in the proposed actions would be natural gas. This requirement will be included in the developers RFP(s) and agreements. The RFP requirements could be modified or eliminated in the future if additional air quality modeling shows that the requirements are not needed to meet national and local ambient air quality standards and thresholds. However, in accordance with New York City rules, developers would still be required to use clean fuel sources, such as ultra-low sulfur Number 2 oil. Future modeling could rely on information that is expected to become available as the design for the proposed sites progresses.

Given the size of the Development Area, which includes substantial open space and public recreation areas, the buildings to be constructed would be separated into several clusters with roads, park, baseball fields, and tennis courts situated in between. Therefore, the air quality impacts from these non-adjacent building clusters were considered as isolated groupings. The methodology defined in the *CEQR Technical Manual* as "Refined Screening Analyses for Heat and Hot Water System" was used to assess each cluster. This refined screening analysis guidance provides the minimum distance to nearest sensitive receptor required to avoid potential impacts, as a function of a proposed building square footage, height and fuel type. The screening for the Proposed Project assumed natural gas-fired sources under residential and commercial uses and assessed buildings at similar heights, using Figures APP 17-7 and 17-8, respectively of the *CEQR Technical Manual*. This approach is considered reasonable since a typical project impact area for non-major sources is within a 400-foot radius of a project site, per the *CEQR Technical Manual*. Thus, the effects from these non-major HVAC emitting sources would be treated independently given the greater distances between them.

By the year 2020, ~~which represents the worst-case scenario for development,~~ there would be several building clusters, as described in **Chapter 1.0**, with net new building floor areas as follows:

- Approximately 285,000 square feet of one- or two-story retail buildings, consisting of:
  - Approximately up to 195,000 square feet on Retail Site "A"; and
  - Approximately up to 90,000 square feet on Retail Site "B"
- Approximately 259,500 square feet of residential housing, consisting of single-family detached housing units and two four-story senior multi-family buildings (with a community center) as follows:
  - Approximately 164,000 square feet of the 82 detached single family units with its own hot water heaters;
  - Approximately 85,500 square feet within the multi-family residential buildings (approximately 42,750 square feet within each of the two buildings) with central HVACs; and
  - Approximately 10,000 square feet community center space with a central HVAC.

- Approximately 100,000 square feet of school space; and
- Approximately 15,000 square feet of library space (within the parcel of Retail Site "A").

As previously discussed, based on the preliminary site concept plan, the proposed buildings can be divided into several clusters (see see **Figure 2.14-1**) that are separated by large open areas including roads, parks, parking lots or roads within the Development Area:

- Cluster 1: several retail buildings and a library on Retail Site “A” with a total of up to approximately 210,000 square feet of floor area;
- Cluster 2: a school adjacent to Retail Site “A” with a total of approximately 100,000 square feet of floor area, approximately 400 feet apart from Cluster 1.
- Cluster 3: two senior housing buildings and one community center building with likely equipped central HVAC units and the rest single-family detached units, with a total floor area of approximately 259,500 square feet, adjacent to the school. The total size for the buildings using central HVACs would be 95,500 square feet within this cluster.
- Cluster 4: several retail buildings with a total of approximately 90,000 square feet floor area on Retail Site “B.”

All exhaust stack locations for the buildings in the above clusters were conservatively assumed to be located near the edge of the building closest to the nearest receptor (see **Figure 2.14-1**). For commercial and institutional buildings within each cluster, the total combined size was conservatively used when employing the Figures APP 17-7 and 17-8 of the *CEQR Technical Manual*. For residential buildings within Cluster 3, the screening of effects between on-site sensitive buildings was considered individually among the proposed buildings. Since each development building is either a one- or two-story low-rise building with majority buildings with roof height of 28 feet or greater, the screening distance threshold was based on conservative 30-foot stack curves provided in Figures APP 17-7 and 17-8 of the *CEQR Technical Manual*.

Table 2.14-3 summarizes the comparison of size-dependent screening threshold with the distance to nearest sensitive receptor. The various proposed separated building or building clusters would not exceed the screening criteria, and as such, there would be no potential significant stationary source air quality impacts. Therefore further analyses of microscale stationary source impacts are not warranted.

Table 2.14-3

Project Stationary Source Refined Screening

Building Cluster /Site	Central HVAC Building Size (sf)	Build Type	Nearest Sensitive Building	Closest HVAC Distance to Sensitive Building (ft)	Screening Threshold in Distance (ft)	Pass/Fail Screening
1/Site A	210,000	Commercial	On-site Residence	235	100	Pass
2/Site A	100,000	Institutional	On-site Residence	130	70	Pass
3/Site A (all Central HVAC Buildings)	95,500	Combined Multi-family Residential	Non-conforming Residence across Englewood Avenue	115	85	Pass
3/Site A (On-site Building – On-Building)	42,750	Single Multi-family Residential	On-site Single Multi-family Building	195	55	Pass
3/Site A (On-site Building to On-site Residence)	42,750	Single Multi-family Residential	On-site Single Family Housing Unit	95	55	Pass
3/Site A (On-site Building to On-site Residence)	10,000	Community Center	On-site Single Multi-family Housing	50	30	Pass
4/Site B	90,000	Combined Commercial	The Tides	160	70	Pass

2.14.5.2 Mobile Source Operations

Mobile source air quality impact analysis was conducted under both 2015 and 2020 traffic conditions based on the forecasts discussed in **Chapter 2.13**,"Transportation."

Mobile Source Screening

Typical pollutants of concern related to mobile source operations are CO and PM (particularly $PM_{2.5}$ for which the New York Metropolitan area has been designated as a nonattainment area). The anticipated air quality impacts associated with off-site mobile source activities were evaluated for the Proposed Project. Mobile air pollutant sources include engine exhaust emitted from proposed traffic within the roadway network around the project site, including trucks along designated truck routes. Given the type of development proposed, the truck component of the project-related traffic would be minor and would be limited to delivery truck trips typically occurring in the morning. On-road traffic volumes and the incremental equivalent heavy duty diesel vehicle (HDDV) trips (see **Tables 2.14-4 and 2.14-5** provided at the end of the chapter for 2015 and 2020, respectively) at each analyzed intersection were first screened using the *CEQR Technical Manual* recommended screening thresholds:

- 170 or more incremental vehicle trips for CO; and
- 23 or more incremental equivalent HDDV trips at arterial roadways for $PM_{2.5}$, or
- 19 or more incremental equivalent HDDV trips at collector roadways for $PM_{2.5.}$

According to the results shown in **Tables 2.14-4 and 2.14-5**, a further microscale impact analysis is warranted for CO, but not for $PM_{2.5}$ even assuming all roadways are classified as collector roadways (as compared to arterial roadways). A total of four worst-case intersections under 2015 and five intersections under 2020 that would have the worst-case LOS and highest traffic volume and incremental traffic volume were selected for the CO microscale modeling:

2015 and 2020

- Veterans Road West/Bricktown Way;
- Veterans Road West/Tyrellan Avenue;
- Boscombe Avenue/Korean War Veterans Highway off/on Ramp; and
- Boscombe Avenue/Tyrellan Avenue.

2020 Only

- Veterans Road West/Englewood Avenue.

Given the close proximity of the Boscombe Avenue/Korean War Veterans Highway off/on Ramp and Boscombe Avenue/Tyrellan Avenue intersections, these two intersections were modeled together.

CO Microscale Impact Modeling

Emissions Factor

USEPA's Motor Vehicle Emission Simulator (MOVES) program was used to predict vehicle CO emission factors. The New York State Department of Transportation (NYSDOT) has supplied model inputs and guidance to handle various factors in using MOVES to predict emissions factors applicable to Richmond County where the project site is located. NYSDOT is the agency responsible for developing the regional Transportation Improvement Programs (TIP) in order to conform to the State Implementation Program (SIP) to improve state air quality condition on mobile sources as a requirement of CAA conformity rule. These NYSDOT-provided model inputs include alternative vehicle and fuel technologies; road type distribution; average speed distribution; monthly, daily, and hourly vehicle miles traveled percentages; fuel data; inspection and maintenance programs; annual vehicle miles traveled (VMT); vehicle age distributions; vehicle population data; and meteorological data. These model inputs were used to predict both 2015 and 2020 vehicle emission factors for further microscale dispersion modeling. The data were developed for the future TIP milestone years of 2017 and 2025. In order to predict year 2020 emission factors, 2020 VMT and population data for 2020 were linearly interpolated using the 2017 and 2025 data and then imported into the MOVES model per NYSDOT's recommendation.

Given the lack of speed survey data at each analyzed intersection, the free flow travel speed of ten (10) miles per hour (mph), as compared to the post speed of 30 mph, was used to predict the CO emission factors using MOVES. The use of this slow speed reflects the traffic delay caused by the congestion at each intersection selected for the CO microscale impact analysis. Because MOVES-predicted free flow CO emission factors are not sensitive to travel speeds, as a result, the predicted CO concentration levels at each modeled intersection are remain relatively flat with changingas free flow speeds change. The USEPA-provided MOVES post processer was used to generate the free flow emission factor in grams per mile. Idle emission rates in grams per vehicle hour were established in accordance with the guidance provided in *Using MOVES in Project-Level Carbon Monoxide Analyses* (USEPA, December 2010).

Dispersion Modeling

In order to predict CO concentrations at the selected intersections with the worst-case traffic conditions, geometric models were developed for the roadway network within a 1,000-foot radius of each selected intersection. The geometric layout of each modeled intersection is shown on **Figure 2.14-2**. As previously noted, given the close proximity of the Boscombe Avenue/Korean War Veterans Highway off/on Ramp and Boscombe Avenue/Tyrellan Avenue intersection, these two intersections were modeled together.

The dispersion modeling was performed using USEPA's CAL3QHC computer model in association with various modeling parameters recommended in the *CEQR Technical Manual* applicable to Richmond County. The CAL3QHC model is the USEPA guideline dispersion model for modeling mobile source concentrations near intersections. CAL3QHC incorporates methods for estimating hourly concentrations from the vehicular emissions under both free flow and idling conditions. In addition, several other parameters are also considered, including signal timing data and information describing the configuration of the intersection being modeled. Receptors were placed along sidewalks around each intersection. These receptors are considered the worst-case locations given their close proximity to the center of each congested intersection where vehicles would idle.

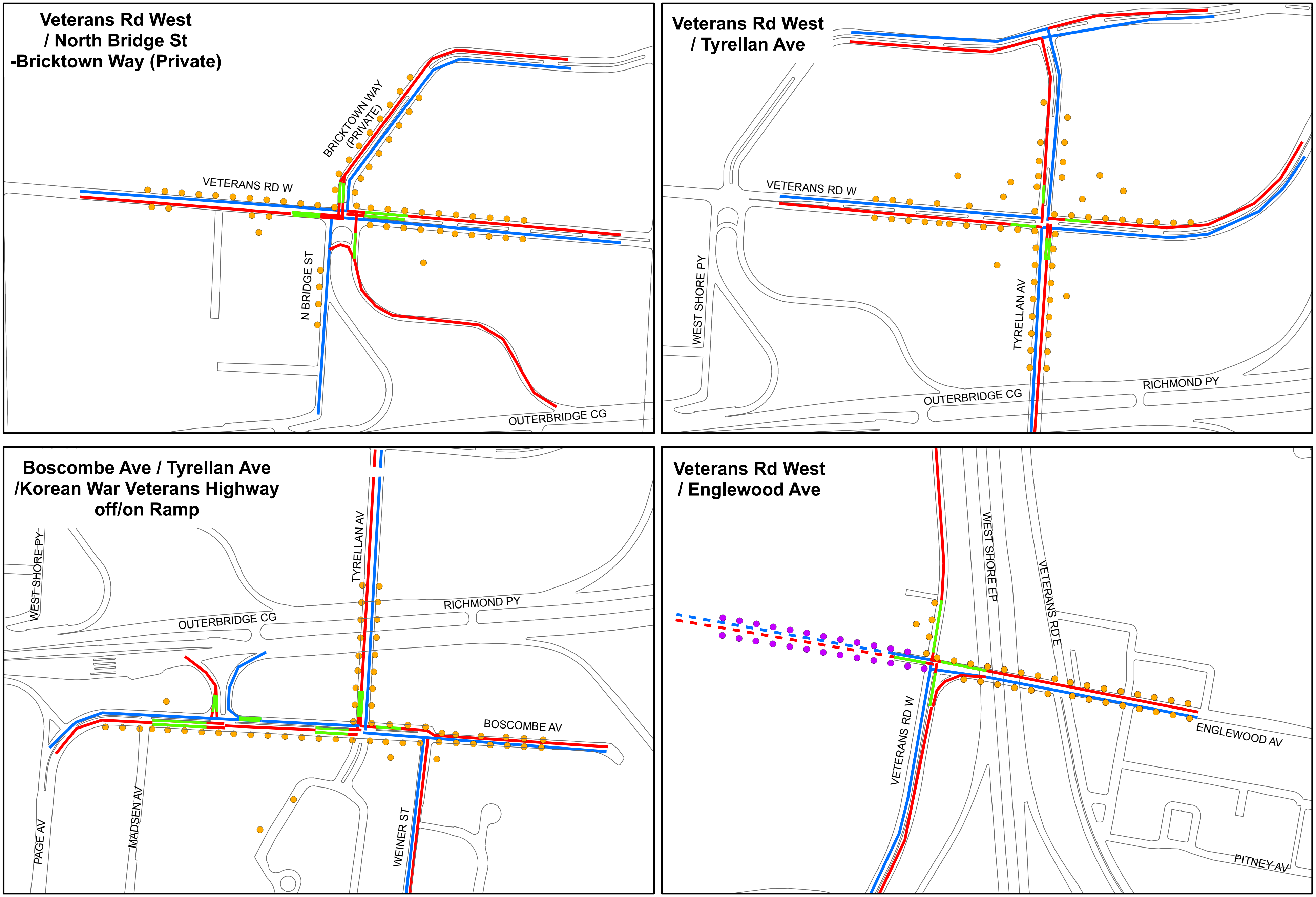
CO Concentration Prediction

Table 2.14-65, provided at the end of the chapter, summarizes the CAL3QHC-predicted worst-case CO concentration levels at the selected worst-case intersections during the worst-case period, i.e., the Saturday midday period. For comparison purposes, the levels under the Future No-Action Condition were also predicted. Although the CO concentration levels under the future with the Proposed Project condition would be higher than the Future No-Action Condition, the levels are well below the CO NAAQS. Therefore, the mobile source air quality impacts from the Proposed Project would not be significant under both 2015 and 2020 proposed conditions.

2.14.5.3 Conclusions

The Proposed Project would not result in any significant adverse air quality impacts. Since the Development Area is essentially bounded by either vacant land or commercial uses with no major industrial facilities present, other criteria pollutants and air toxics from neighborhood existing sources are not of concern for the Proposed Project. Since no large industrial facilities with major stationary stack emissions from either industrial, commercial or residential uses are in close proximity within a 1,000-foot radius of the Development Area, potential existing stationary source impacts on proposed sensitive land uses would not be significant, and further study of such pollutants is not warranted. The various proposed separated building blocks would also not exceed the stationary screening criteria, and as such, there would be no potential significant stationary source air quality impacts from the expected HVAC and other components, and further analyses of microscale stationary source impacts are not warranted.

The mobile source screening process for CO and $PM_{2.5}$, and subsequent mobile source CO microscale analysis at the worst-case intersections, show that the Proposed Project would be in compliance with the applicable air quality standards and result in no significant mobile source air quality impacts.



AECOM

Legend

- Receptor
- Queue
- Approach
- Departure
- Receptor (Proposed Condition)
- Approach (Proposed Condition)
- Departure (Proposed Condition)

0 125 250 500 Feet

1 inch = 500 feet

N

Charleston Mixed-Use Development

Figure 2.14-2

CAL3QHC Intersection Diagram

Table 2.14-4

Traffic Screening at Signalized Intersections – Year 2015

Intersection	Direction	2015 No-Action Vehicle Volume				2015 With-Action Additional Vehicles				Worst Case LOS - With Action (Peak Time Period)	Maximum Volume Increment	Pass/Fail CO Microscale Screening	Average Hourly Volume Incremental Trips (24-hr Average)	Maximum Incremental HDDV Equivalent Trips	Pass/Fail $PM_{2.5}$ Microscale Screening
		AM	MD	PM	SAT	AM	MD	PM	SAT						
Arthur Kill Rd / Allentown Ln (EB)-Veterans Rd West (WB)	EB	10	24	14	15	0	0	0	0	D (Sat)	144	Pass	29	2	Pass
	WB	546	638	571	730	15	50	50	67						
	NB	413	384	431	519	11	26	24	36						
	SB	193	310	419	360	13	30	28	41						
Arthur Kill Rd / North Bridge St	WB	161	318	453	446	0	0	0	0	A, B, or C		Pass	14	1	Pass
	NB	408	381	427	510	11	26	24	36						
	SB	369	430	548	559	7	23	23	31						
Arthur Kill Rd / Richmond Valley Rd	WB	194	283	279	300	0	0	0	0	E	67	Pass	14	1	Pass
	NB	557	493	619	647	11	26	24	36						
	SB	402	591	799	797	7	23	23	31						
Page Ave / Richmond Valley Rd	EB	160	282	248	245	0	0	0	0	A, B, or C		Pass	14	1	Pass
	WB	169	261	273	167	0	0	0	0						
	NB	801	773	708	990	11	26	24	36						
	SB	430	608	678	692	7	23	23	31						
Boscombe Ave / South Bridge Rd	EB	332	370	437	436	0	0	0	0	A, B, or C		Pass	14	1	Pass
	NB	731	745	686	857	11	26	24	36						
	SB	373	521	610	637	7	23	23	31						

Table 2.14-4 (continued)

Veterans Rd West / Bricktown Way	EB	363	452	548	600	24	56	53	77	F (Sat)F (Sat)	348750	FailFail	71137	510	PassPass
	WB	715	839	768	917	1	1	1	2						
	NB	244	409	305	501	54	127	120	175						
	SB	51	125	142	228	20	68	69	94						
	WB	173	130	396	173	0	0	0	0						
	SB	375	387	477	567	5	18	18	25						
Veterans Rd West / Tyrellan Ave	EB	218	457	407	510	1	1	1	2	F (Sat)	360	Fail	72	5	Pass
	WB	572	622	678	765	0	0	0	0						
	NB	349	478	438	565	20	46	44	64						
	SB	204	542	444	709	62	216	219	294						
Boscombe Ave / Korean War Veterans Highway off/on Ramp	EB	1005	1028	1052	1238	11	26	24	36	F (Sat)	360	Fail	72	5	Pass
	WB	451	818	763	1028	63	217	221	296						
	NB	26	1	7	0	0	0	0	0						
	SB	242	214	379	381	9	21	19	28						
Boscombe Ave / Tyrellan Ave	EB	323	452	433	566	20	46	44	64	F (Sat)	360	Fail	72	5	Pass
	WB	116	133	78	101	0	0	0	0						
	NB	37	7	8	1	0	0	0	0						
	SB	402	821	786	1065	62	217	221	296						
Veterans Rd West / Bricktown Way	EB	67	165	164	284	26	91	93	124	A, B, or C		Pass	81	5	Pass
	NB	92	225	271	284	0	0	0	0						
	SB	779	974	957	1236	84	196	185	270						
Veterans Rd West / Englewood Rd	EB	1	1	1	1	0	0	0	0	A, B, or C		Pass	81	5	Pass
	WB	407	545	447	687	15	34	32	47						
	NB	150	362	411	529	26	91	93	124						
	SB	396	451	538	580	69	161	153	223						

Table 2.14-4 (continued)

Veterans Rd East / Englewood Rd	EB	171	384	431	552	27	91	93	124	D (SAT)	171	Fail	35	2	Pass
	WB	46	45	61	76	0	0	0	0						
	NB	443	547	506	692	15	34	32	47						
Bloomingdale Rd / Englewood Ave	EB	52	132	134	206	18	61	62	83	A, B, or C		Pass	17	2	Pass
	NB	349	296	469	405	0	0	0	0						
	SB	491	365	495	426	0	0	0	0						
Sharrots Rd / Bloomingdale Rd	EB	119	130	226	203	0	0	0	0	A, B, or C		Pass	36	3	Pass
	NB	419	376	466	478	18	61	62	83						
	SB	421	408	542	550	29	68	65	95						
Bloomingdale Rd / Drumgoole Rd West	EB	59	111	119	137	9	30	31	41	A, B, or C		Pass	18	2	Pass
	WB	774	799	982	1049	0	0	0	0						
	NB	228	225	249	297	15	34	32	47						
	SB	479	372	485	421	0	0	0	0						
Bloomingdale Rd / Drumgoole Rd East	EB	59	27	35	68	0	0	0	0	A, B, or C		Pass	18	2	Pass
	NB	306	336	366	413	15	34	32	47						
	SB	748	663	860	808	9	30	31	41						
Bloomingdale Rd / Amboy Rd (WB)-Pleasant Plains Ave (EB)	EB	40	29	39	32	0	0	0	0	A, B, or C		Pass	18	2	Pass
	WB	283	384	392	404	0	0	0	0						
	NB	298	415	440	509	15	34	32	47						
	SB	430	422	482	456	9	30	31	41						
Bloomingdale Rd / Arthur Kill Rd	EB	309	332	387	389	8	27	27	36	A, B, or C		Pass	52	4	Pass
	WB	210	246	225	251	42	98	93	136						
	NB	277	259	212	225	18	61	62	83						

Table 2.14-5
Peak Hour Traffic Screening at Signalized Intersections – Year 2020

Intersection	Direction	2020 No-Action Vehicle Volume				2020 With-Action Additional Vehicles				Worst Case LOS - With Action (Peak Time Period)	Maximum Volume Increment	Pass/Fail CO Microscale Screening	Average Hourly Volume Incremental Trips (24-hr Average)	Maximum Incremental HDDV Equivalent Trips	Pass/Fail $PM_{2.5}$ Microscale Screening
		AM	MD	PM	SAT	AM		PM	SAT						
Arthur Kill Rd / Allentown Ln (EB)-Veterans Rd West (WB)	EB	1111	2525	1414	1515	0	03	0	0	DE (Sat)	282	Fail	63	5	Pass
	WB	583473	688638	643562	812729	-38-38	32	6060	8888						
	NB	452448	420407	483471	583564	6161	40	4545	5858						
	SB	213210	333326	456450	399389	7676	100	100100	136136						
Arthur Kill Rd / North Bridge St	WB	165273	328362	466533	459518	0	03	0	0	A, B, or C		Pass	41	3	Pass
	NB	447443	416402	479467	575555	6161	39	4545	5858						
	SB	393285	463420	601526	615544	5050	34	3939	4848						
	SB	553	778	1055	1052	50		39	48						
Arthur Kill Rd / Richmond Valley Rd	WB	217215	304299	308303	335326	2424	23	77	44	EA, B, or C	112	Pass	41	3	Pass
	NB	586586	521516	660656	691684	3737	37	3838	5454						
	SB	427426	629620	860852	860847	5151	34	3939	4745						
Page Ave / Richmond Valley Rd	EB	171171	299294	275269	274267	2121	12	33	22	A, B, or C		Pass	30	2	Pass
	WB	206203	288279	313305	210196	0	0	0	0						
	NB	837838	809805	751746	10441038	3737	37	3838	5353						
	SB	453453	642637	730725	744736	1010	33	3535	4545						
Boscombe Ave / South Bridge Rd	EB	342344	381383	449452	449451	0	01	0	0	A, B, or C		Pass	20	2	Pass
	NB	778778	785778	735728	918908	1515	3636	3434	5151						
	SB	394394	552545	659653	687678	1111	3333	3535	4545						

Table 2.14-5 (continued)

Veterans Rd West / Bricktown Way	EB	373354	463383	561478	614499	5252	165165	154154	216216	F (Sat)	622750	Fail	11037	810	Pass
	WB	766625	891756	833665	995818	-42-57	7-31	33-3	581						
	NB	359451	527632	424649	678825	74129	179310	170294	254439						
	SB	121121	237237	337338	448449	2020	6868	6969	9494						
	WB	178108	133256	407333	178355	044	0103	097	0142						
	SBNB	39432	40781	50682	601152	1019	2745	2842	3663						
	SB	0	0	0	0	89	324	333	463						
Veterans Rd West / Tyrellan Ave	EB	289333	569587	599636	723684	2424	102102	9494	129129	F (Sat)	544486	Fail	9483	7	Pass
	WB	589390	639427	697427	784559	-51-66	-13-51	14-22	28-30						
	NB	387382	519505	493479	635613	2727	6565	6262	9393						
	SB	210211	559561	458460	730734	6262	216216	219219	294294						
Boscombe Ave / Korean War Veterans Highway off/on Ramp	EB	10611062	107510 70	111211 08	1310130 2	1515	3636	3434	5151	F (Sat)	505	Fail	102	7	Pass
	WB	528516	941885	965904	1257117 4	8787	305305	310310	41141 1						
	NB	2727	11	88	00	0	0	0	0						
	SB	259258	231226	408404	413406	1313	3030	3131	4343						
Boscombe Ave / Tyrellan Ave	EB	360355	491476	488474	635613	2727	6565	6262	9393	F (Sat)	504	Fail	101	7	Pass
	WB	119120	137138	8081	104105	0	0	0	0						
	NB	3939	88	99	11	0	0	0	0						
	SB	478465	945887	990929	1294121 2	8787	304304	310310	41141 1						
Veterans Rd West / Bricktown Way	EB	8686	197198	216217	346347	2626	9191	9393	124124	A, B, or C		Pass	7436	63	Pass
	NB	9491	230215	278262	291269	-1-1	1313	33	1212						
	SB	835605	103479 6	103773 4	1386106 7	33-22	18352	19975	29811 2						
Veterans Rd West / Englewood Rd	EB	11	11	11	11	213213	3737	7070	6464	ED (SatAM)	629471	Fail	223171	172	Pass
	WB	419421	562565	461463	708711	154154	7171	8888	106106						
	NB	172168	399384	469454	596575	2525	104104	9696	136136						
	SB	441208	496255	605300	709387	19179	22792	23495	323129						

Table 2.14-5 (continued)

Veterans Rd East / Englewood Rd	EB	193190	421407	489474	619598	239239	142142	166166	200200	F (AMSat)	392282	Fail	135	10	Pass
	WB	4747	4646	6364	7879	3333	1515	1919	2424						
	NB	457459	564567	521524	713717	120120	5656	7070	8282						
Bloomingdale Rd / Englewood Ave	EB	7066	162147	184168	264241	131131	9292	105105	129129	A, B, or C		Pass	60	5	Pass
	NB	365367	307308	485487	420422	0	0	0	0						
	SB	507509	377379	515517	443445	3333	1515	1919	2424						
Sharrots Rd / Bloomingdale Rd	EB	122108	133134	232233	208208	0	0	0	0	A, B, or C		Pass	90	7	Pass
	NB	453410	414400	528513	547525	131131	9292	105105	129129						
	SB	466414	453434	614597	633606	9696	9999	102102	143143						
Bloomingdale Rd / Drumgoole Rd West	EB	6161	115115	122123	142142	108108	5050	6161	7171	D (AM)	228	Fail	75	5	Pass
	WB	799803	826829	10201025	10881093	7272	66	1919	1111						
	NB	241242	234235	259260	309311	4848	5050	5151	7171						
	SB	494496	385387	504507	438440	0	0	0	0						
Bloomingdale Rd / Drumgoole Rd East	EB	6161	2828	3637	7070	0	0	0	0	A, B, or C		Pass	56	4	Pass
	NB	332334	350352	384386	433435	4848	5050	5151	7171						
	SB	773777	687690	899904	841845	108108	5050	6161	7171						
Bloomingdale Rd / Amboy Rd (WB)-Pleasant Plains Ave (EB)	EB	4141	3030	4040	3333	0	0	0	0	E (Sat)	131	Pass	38	3	Pass
	WB	292293	396398	404406	416418	0	0	0	0						
	NB	323324	432434	460462	532534	4848	5050	5151	7171						
	SB	446448	438440	510512	479481	3838	4444	4747	6060						
Bloomingdale Rd / Arthur Kill Rd	EB	328329	354348	421415	424416	3434	3838	4141	5353	FD (Sat)	378282	Fail	11126	98	Pass
	WB	264249	301273	312286	354313	139139	142142	147147	204204						
	NB	307301	294278	266249	286263	76133	8892	95109	121129						

Table 2.14-5 6

Predicted Highest CO Concentration Levels at Selected Signalized Intersections

Intersection	CO 1-hour Concentration (ppm)	CO 8-hour Concentration (ppm)	CO 1-hour Concentration (ppm)	CO 8-hour Concentration (ppm)
	Future No-Action Condition		Future With-Action Condition	
2015				
Veterans Rd West & North Bridge St – Bricktown way	4.4	3.0	4.5	3.1
Veterans Rd West & Tyrellan Ave	5.1	3.5	5.3	3.6
Boscombe Ave & Korean War Veterans Hwy on/off ramp / Boscombe Ave & Tyrellan Ave	4.5	3.1	4.8	3.3
2020				
Veterans Rd West & North Bridge St – Bricktown way	4.29	2.83.3	4.55.9	3.14.0
Veterans Rd West & Tyrellan Ave	4.18	2.83.3	4.85.5	3.38
Boscombe Ave & Korean War Veterans Hwy on/off ramp / Boscombe Ave & Tyrellan Ave	4.45.0	3.04	4.75.6	3.28
Veterans Rd West & Englewood Ave	4.0	2.7	4.1	2.8

Note: CO levels include background levels of 3 ppm for 1-hour average and 2 ppm for 8-hour average. All predicted levels are well below the NAAQS of 35 ppm for 1-hour average and 9 ppm for 8-hour average.