8.11 AIR QUALITY

8.11.1 Introduction

This Section provides an assessment of the potential mobile and stationary source air quality impacts from the proposed construction and operation of the E. 54th Street/Second Avenue Shaft Site and the associated water main connections. Vehicular traffic represents the mobile sources. The stationary sources include on-site construction equipment and support vehicles (i.e., dump trucks, flatbed trucks, and concrete trucks). As noted in Chapter 2, "Purpose and Need and Project Overview," NYCDEP will require the contractor for Shaft 33B to reduce particulate matter emissions to the extent practicable by employing relatively new equipment (model years 2003 and newer), installing emissions controls on diesel equipment greater than 50 horsepower (hp), such as diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs), and using alternate means of powering the equipment, such as electricity. For diesel equipment greater then 50 hp in size that will likely not be able to implement DPFs, DOCs will be required. NYCDEP will require emission controls for the ventilated enclosure for concrete trucks. A discussion of the site-specific construction data, air quality modeling scenarios, and the results of the air dispersion modeling utilized to assess the effects of emissions from on-site construction sources are also presented in this Section.

The methodology utilized to prepare this assessment as well as air quality regulations applicable to the study area, is essentially the same as that described in Chapter 3, "Impact Methodologies," Section 3.11, "Air Quality" for the preferred Shaft Site. The methodology was adapted to account for differences in construction activity and duration, and modeling results were based on the localized environment. Appendix 11 includes additional information regarding the development and documentation of emission factors a detailed discussion of construction data, modeling inputs, and the presentation of equipment-specific emission rates with sample calculations.

8.11.2 Existing Conditions

The existing monitored air quality conditions for the year 2004 (latest year of available data) are presented in Section 4.11 and are also considered representative for the Shaft Site and water mains analyses for the E. 54th Street/Second Avenue Shaft Site. Background data for criteria pollutants are also presented in Table 3.11-5 of Section 3.11. The same background data was used for this alternative site.

8.11.3 Future Conditions Without the Project

In the Future Without the Project with respect to stationary (construction and operation) emission sources, air quality is anticipated to be similar to that described for existing conditions at the E. 54th Street/Second Avenue Shaft Site and water main connections. Land uses are expected to remain generally the same in this neighborhood and air quality regulations mandated by the Clean Air Act are anticipated to maintain or improve air quality in the region. It can be expected that air quality conditions in the Future Without the Project would be no worse than those that presently exist. Therefore, no quantified analysis was performed for this scenario.

8.11.4 Future Conditions With the Project

This section provides the summary of projected air quality impacts from the construction and operation of the shaft at E. 54th Street/Second Avenue Shaft Site and associated water main connections. Potential impacts from mobile sources at this Shaft Site did not require a detailed quantitative analysis since peak volumes were below screening thresholds. While the construction of the shaft at the E. 54th Street/Second Avenue Shaft Site would occur within the street, the potential mobile source impacts from related traffic disruptions for this Shaft alternative were evaluated by comparison with the mobile source impacts modeled from the street surface disruptions under the reasonable worst-case route water main connections analyses. The reasonable worst-case route analysis simulated greater potential street surface disruptions than those expected for the construction of the E. 54th Street and Second Avenue Shaft Site; therefore, the predictions of mobile source air quality impacts for the reasonable worst-case route for the water main connections along First Avenue would be greater than those impacts expected for the E. 54th Street/Second Avenue Shaft Site. Consequently, no potential significant adverse impacts are expected and a quantified mobile source modeling analysis was not performed. The air quality analysis for this Shaft Site thus focuses on the effects on local air quality during construction activities at this alternative Shaft Site and water main connections.

Construction

Shaft Site

As described in Section 8.1, "Project Description," at the alternative shaft sites, excavation could either be undertaken using raise bore or surface excavation methods. The latter would apply if the contractor was not able to remove excavated materials underground via City Tunnel No. 3 due to the unavailability of the Tunnel as described in Section 8.1, "Project Description." Quantified analyses of potential impacts were performed for the raise bore method. Based on the modeled results for the raise bore method and the estimated difference in emissions from the surface excavation method, potential impacts from the surface excavation method were evaluated.

The most likely effects on local air quality during construction activities at the alternative Shaft Site would result from:

- Engine emissions generated by on-site construction equipment, and trucks entering/leaving the Site during construction;
- Fugitive dust emissions generated by soil excavation and other construction activities; and,
- Fugitive dust emissions generated by construction trucks traveling on paved roads.

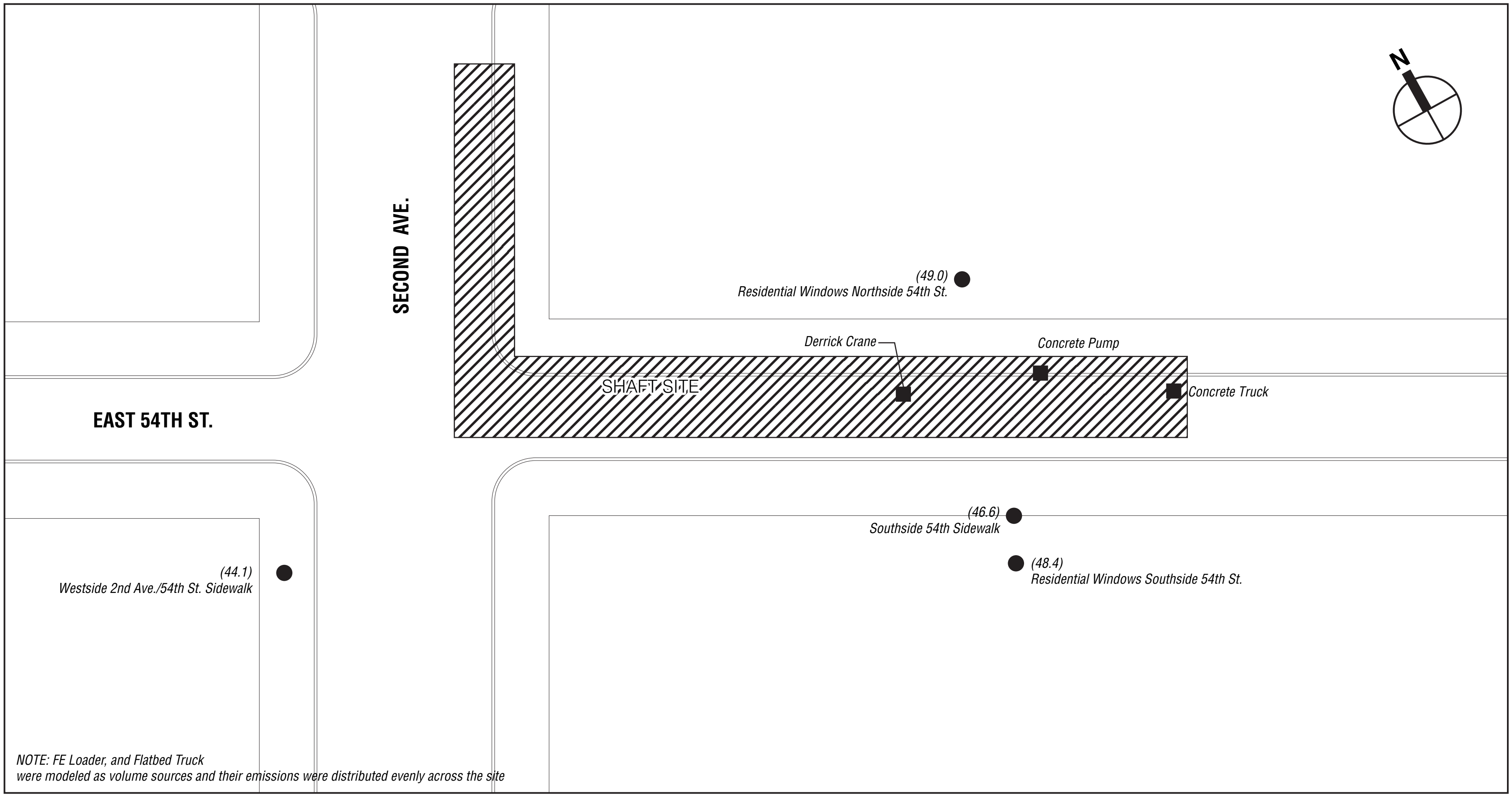
An analysis of the potential for air quality impacts from on-site construction equipment was performed for the E. 54th Street/Second Avenue Shaft Site. The potential impacts of construction emissions of the criteria pollutants (CO, SO_2, NO_2, and PM_{10}) and fine particulate matter ($PM_{2.5}$) were evaluated for the peak stages of construction. The construction is divided into Stages 1 through 4 for construction activities related to the Shaft and Stage 5 for construction activities related to the water mains (see Section 8.1 for information on construction activities that would occur during each Stage). An analysis of the expected $PM_{2.5}$ emissions over time for each stage of construction was performed to identify the stages with highest potential short- and long-term emissions from projected on-site construction activities. $PM_{2.5}$ emissions were utilized as the worst-case pollutant for the evaluations of emissions over the construction phases, because $PM_{2.5}$ is known to be a major pollutant of concern for diesel construction equipment. The assessment required the use of reasonable estimates of equipment type and size, the number of operating hours and emission controls that NYCDEP expects to implement for the on-site equipment at each stage of the construction period. Due to the shallow bedrock at this site and other limitations, alternative techniques such as hydraulic splitting may need to be employed at the site. Based on these analyses, Stage 3 was determined to be the period of maximum projected short-term and annual construction emissions for this site.

A depiction of the site configuration used in the air quality analysis is provided in Figure 8.11-1. Appendix 11 includes additional information on the relative projected emissions over time for the raise bore and surface excavation methods.

Potential maximum impacts for the raise bore method during periods of peak emissions are presented in this Section. Impacts during the remainder of the construction period are discussed qualitatively, because they are expected to be lower than those analyzed for Stage 3. Potential maximum impacts for the surface excavation method are also addressed.

On-Site Construction Equipment

During construction various types of fuel burning construction equipment would be used at different locations throughout the site. The release of airborne pollutants from the combustion of fuel and fugitive dust created by heavy vehicles traveling and operating in work areas are the two main sources of air emissions for the worst-case analyses. The equipment would operate on an intermittent basis for 16 hours per day including both the primary work shift (7:00 a.m. to 3:00 p.m.) and the secondary work shift (3:00 a.m. to 11:00 p.m.). Table 8.11-1 presents a list of the construction equipment that would have engine or fugitive emissions and is expected to be on-site during the peak short-term and annual construction periods (for the raise bore method). Equipment needed for the surface excavation method is described in Appendix 11. For the surface excavation method, a larger excavator (400 hp) and a diesel compressor would likely be required on-site. As described in Appendix 11, higher daily usage factors for most fuel burning equipment and different duration profiles were accommodated for in evaluating impacts for the surface excavation method.



NOT TO SCALE

Legend:

● (#.#) *Maximum Predicted 24-Hour $PM_{2.5}$ Concentration in $\mu g/m^3$*

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
E. 54TH STREET/ SECOND AVENUE SHAFT SITE

PREDICTED $PM_{2.5}$ 24-HOUR CONCENTRATIONS FOR CONSTRUCTION ACTIVITIES

FIGURE 8.11-1

Table 8.11-1
On-Site Construction Equipment (Raise Bore Method) for Peak Short Term and Annual Period

Equipment Type	Analysis Period	Mobile or Stationary
Front End Loader	Short-Term and Annual	Mobile
Derrick Crane	Short-Term and Annual	Stationary
Concrete Pump	Short-Term and Annual	Stationary
Concrete Truck	Short-Term and Annual	Stationary
Flatbed Truck	Short-Term and Annual	Mobile
Note: Since concrete trucks would be in a ventilated enclosure on-site, they were considered to be stationary sources.		

Engine Exhaust

The estimated engine exhaust emissions of criteria pollutants for the E. 54th Street/Second Avenue Shaft Site are similar to those discussed in Section 4.11 for the preferred Shaft Site at E. 59th Street and First Avenue. For this Shaft Site, the maximum short-term emissions from construction equipment would occur during Stage 3 of construction (as discussed above). The general methodology used to generate these emissions was also the same as that for the preferred Shaft Site except for modifications made to account for additional equipment or changes in equipment associated with the surface excavation methods. The benefits from NYCDEP's requirements to utilize newer equipment and reduce PM emissions to the extent practicable were incorporated into the analysis.

Fugitive Emission Sources

On-site construction equipment has the potential to generate fugitive dust due to construction vehicles (mobile sources) traveling on paved portions of the Site. Emission rates for these activities were developed using equations presented in USEPA's AP-42 *A Compilation of Air Pollution Emission Factors*. The speeds for all on-site vehicles will be limited to a maximum of five miles per hour due to space restrictions. When speeds are less than five miles per hour, fugitive emissions of $PM_{2.5}$ are negligible. The maximum distance traveled on-site is estimated to be 80 feet per vehicle (160 feet round trip). The maximum travel distances are a conservative approximation of the distance that most trucks would travel during soil transfer and concrete pouring operations.

During construction, the contractor will be required to implement a water spray dust control program, which would provide at least a 50 percent reduction in PM_{10} emissions.

Construction Data

As stated above, the estimated emission rates for engine exhausts were calculated from the NONROAD model output files. The construction data necessary to perform these calculations included the type of non-road equipment, its rated size in hp and the type of fuel used by the engine. The construction data needed to perform fugitive road dust calculations included the number of on-site vehicle trips, the distance traveled by those vehicles and the average vehicle weights.

Once the source emissions were established, a dispersion modeling study was performed to determine concentrations for the pollutants emitted by construction equipment following the methodology described in Section 3.11. Provided below in Table 8.11-2 is construction equipment data relevant to the air quality analysis performed for the worst case (i.e., highest emissions) period in Stage 3.

Table 8.11-2
Construction Equipment Data (Raise Bore Method)

Stage 3 Equipment	Rated Size (Horse Power)	Stage 3 Usage Factor (percent)
Front End Loader	150	5
Derrick Crane	275	25
Concrete Pump	100	25
Concrete Truck[a]	300	3 per hour
Flatbed Truck[a]	300	1 per hour
Note: **a.** The number of on-site trucks was conservatively estimated to equal the peak number of trucks traveling to and from the site for each of the 16 hours of the work day.		

ISC Dispersion Modeling

A dispersion modeling analysis was performed to estimate incremental and total concentrations of air pollutants associated with emissions produced by on-site construction activities at this Shaft Site. The analysis was conducted using the ISCST3 dispersion model and was performed in accordance with USEPA and the *CEQR Technical Manual*. The predicted incremental and total concentrations of criteria pollutants were compared to applicable air quality standards and impact criteria to help evaluate the potential for significant adverse impacts.

Results

Raise Bore

The maximum concentrations from on-site construction sources were predicted at receptors near the Shaft Site. This was true for all averaging periods, both short-term and annual, and for all pollutants modeled in the analysis. The maximum predicted increments from construction sources for the raise bore method, and the total concentrations including all baseline sources, are presented in Table 8.11-3. The background levels obtained from the NYSDEC monitoring data, as described in Section 3.11, were added to the modeled local Future Without the Project mobile source contributions to obtain a total baseline concentration. As indicated in the table, the construction of the proposed shaft at this site would not cause an exceedance of the NAAQS. Since the predicted concentrations were modeled for stages of construction that are projected to result in the highest site-wide air pollutant emissions, the concentrations during other stages of construction are expected to result in lower concentrations. The maximum predicted total local 24-hour $PM_{2.5}$ concentrations are depicted in Figure 8.11-1.

Table 8.11-3
Results of Dispersion Analysis for Raise Bore Method Construction Activities

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standards
NO_2	Annual	$\mu g/m^3$	9[a]	71	80	100
SO_2	3-Hour	$\mu g/m^3$	7.1	202	209	1,300
	24-Hour	$\mu g/m^3$	1.8	123	125	365
	Annual	$\mu g/m^3$	0.03	37	37	80
CO	1-Hour	ppm	1.4	7.3[b]	8.7	35
	8-Hour	ppm	0.3	4.0[b]	4.3	9
$PM_{2.5}$[c]	24-Hour	$\mu g/m^3$	5.4	43.6	49.0	65
PM_{10}	24-Hour	$\mu g/m^3$	6	65.6[b]	71.6	150
	Annual	$\mu g/m^3$	0.4	24.6[b]	25.0	50

Notes:

a. NO_2 concentrations are based on the conservative assumption that 62 percent of NO_x emissions from the construction sources is NO_2

b. Baseline concentrations of CO and PM are from the Future Without the Project mobile source modeling. Since the stationary analysis models the highest increment, the baseline presented for CO included the second highest monitored background values.

c. Total annual-average $PM_{2.5}$ concentration is not presented, since the ambient concentrations currently exceed the NAAQS. The effects of construction activities are compared to the interim guidance criteria for determination of significance for the $PM_{2.5}$ annual averaging period.

In addition to the comparison of the total maximum local 24-hour average $PM_{2.5}$ concentration with the NAAQS, the maximum predicted annual incremental impact from the construction of the E. 54th Street/Second Avenue Shaft Site was modeled for comparison with the annual neighborhood average interim guidance criterion. For this assessment, no background contributions from other sources of $PM_{2.5}$ in the Future Without the Project are required. The annual average neighborhood scale concentration increment from the construction of this Shaft Site for the raise bore method was predicted to be 0.003 $\mu g/m^3$ — considerably less than the applicable 0.1 $\mu g/m^3$ criterion.

Since the predicted concentrations were modeled for periods that represent the highest site-wide air emissions, the increments and total predicted concentrations during other stages of construction would also expected to be less than the applicable significance criteria. Therefore no significant adverse impacts from construction sources are expected with the raise bore method at this Shaft Site.

Surface Excavation

Potential impacts from the surface excavation method were also evaluated. Estimated peak emissions for the surface excavation method were greater than the estimated peak emissions from the raise bore method by approximately 75 percent for the short-term and for the annual period. See Appendix 11 for further details of these emission estimates.

Based on the modeled results for the raise bore method (reported in Table 7.11-3) and estimated difference in emissions potential impacts from the surface excavation method, the construction of the shaft with the surface excavation method at this site would not cause an exceedance of the NAAQS. In addition, the incremental annual average neighborhood scale concentration from the construction of this Shaft Site for the surface excavation method would be less than 0.01 $\mu g/m^3$—considerably less than the 0.1 $\mu g/m^3$ criterion. Therefore, no significant adverse impacts from construction sources are expected with the surface excavation method at the E. 54th Street/Second Avenue Shaft Site.

Water Main Connections

Construction of water main connections at the E. 54th Street/Second Avenue Shaft Site, as described in Section 8.1, is expected to have potential impacts similar to those analyzed in detail for the reasonable worst case route from the preferred Shaft Site (see Section 5.11). Therefore, the construction of water main connections for the E. 54th Street/Second Avenue Shaft Site is expected to have potential impacts similar to those analyzed in detail for the reasonable worst case route and no potential significant adverse air quality impacts are expected.

Combined Assessment

Potential combined air quality impacts from the construction of the water main connections and the E. 54th Street/Second Avenue Shaft Site are expected to be comparable to those analyzed for the preferred Shaft Site. Therefore, no potential significant adverse air quality impacts from the combined construction of water main connections and the E. 54th Street/Second Avenue Shaft Site are expected.

Operation

In the future, when the shaft and the water mains are operable, project-induced traffic would be negligible and no appreciable stationary sources of air emissions would be on-site. Therefore, there would be no potential significant adverse air quality impacts with operation of the E. 54th Street/Second Avenue Shaft Site and the water main connections.

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