CHAPTER 5: WATER MAIN CONNECTIONS

5.1 PROJECT DESCRIPTION

5.1.1 Introduction

The proposed Shaft 33B would bring water from the new City Tunnel No. 3, which is currently under construction 300 to 500 feet below the street, to the existing water distribution system via new water mains. From the shaft, the water would join the water distribution system via these new water mains that would connect Shaft 33B to a large trunk main that runs beneath Third Avenue. The 30-inch Third Avenue trunk main is a primary main in the two water supply areas that Shaft 33B would serve, the portions of the Middle Intermediate Pressure Zone (MIPZ) and Northern Intermediate Pressure Zone (NIPZ) east of Park Avenue. A significant amount of water supplied to the MIPZ and NIPZ east of Park Avenue is routed via the Third Avenue trunk main, from which it is distributed via smaller mains under other streets and avenues in those zones. Two new, 48-inch water main connections would be needed to connect Shaft 33B to the Third Avenue trunk main: one to serve the MIPZ and the other to serve the NIPZ. As described in Chapter 2, "Purpose and Need and Project Overview," the MIPZ is generally located between approximately 34th Street and approximately 54th Street, while the NIPZ extends from approximately 54th Street to approximately 102nd Street.

Chapter 2 also describes the purpose and need for Shaft 33B and the associated water main connections and explains the design considerations and expected construction procedures for both the shaft and its water main connections. Chapter 4, "Preferred Shaft Site," describes the potential environmental impacts related to construction and operation of the shaft at the preferred Site and this Chapter addresses the potential environmental impacts associated with the water main connections for the preferred Shaft Site as well as any potential cumulative effects that might result from the combined construction and/or operation of both the shaft and the water main connections. This Section of Chapter 5 explains conceptual potential routes for the water main connections and the potential construction scenarios that may be employed to install the water main connections. It includes an overview of issues that affect placement of water mains beneath City streets (Section 5.1.2), a discussion of conceptual water main connection routes (Section 5.1.3), a review of construction methods and schedule (Section 5.1.4), and a discussion of permits and approvals that may be required for installation of the water mains (5.1.5). The following Sections of the Chapter, Sections 5.2 through 5.17, analyze the potential environmental impacts related to construction and operation of the water main connections to the preferred Shaft Site.

5.1.2 Issues that Affect Water Main Construction

The specific route for the water main connections from Shaft 33B has not yet been determined; the final route and timing of the water main construction would be determined after Shaft 33B is sited. The process involved to select the route and plan the construction of water mains beneath City streets involves several different City agencies, as described below.

The New York City Department of Design and Construction (NYCDDC) is the agency that implements the construction of water mains in New York City streets. Typically, a water main project is initiated by the New York City Department of Environmental Protection (NYCDEP). NYCDEP provides a general plan identifying the proposed water main route, pipe sizing, valves, and connection points to meet the distribution needs of a particular area. NYCDDC will then design and construct the water mains and coordinate and control the construction process, in coordination with potentially affected utility providers and other concurrent construction projects.

NYCDDC is the City agency that specializes in design and construction of the City's capital projects. It constructs many City-sponsored construction projects, such as libraries, and coordinates much of the in-street work proposed by both NYCDEP and the New York City Department of Transportation (NYCDOT). Coordinating the wide range of in-street work proposed by City agencies under the purview of one agency, NYCDDC, allows the City to minimize costs and the need for recurring disruption to the streets. To further streamline the construction of in-street projects, NYCDDC typically also consults with utility providers, such as Con Edison and Empire City Subways (telephone), regarding potential conflicts between their subsurface infrastructure and the City's proposed plans, so that construction plans can be prepared that minimize disturbance to existing utilities and provide for coordinated relocation of lines, where feasible and practicable. For large construction projects, NYCDDC's Office of Community Outreach participates in the construction process, coordinating with local Community Boards and potentially affected residents of areas where construction is occurring.

For the water main connections from Shaft 33B, the water main route will be selected by NYCDEP for design and construction by NYCDDC. Before construction, NYCDDC will prepare a detailed survey of the alignment, to identify all other buried infrastructure along that route. NYCDDC will also coordinate with any other construction projects that could be occurring at the same time as the water main construction project. Based on the results of the detailed survey and the coordination with other projects on current and past practices, NYCDDC will endeavor to construct the water main route along NYCDEP's selected route, but final alignment within the selected route will be determined by NYCDDC. NYCDDC is the agency with experience and responsibility for street work and will take the route that is prescribed by NYCDEP and survey the location, design the job, and implement its construction. Also, NYCDEP will work with NYCDDC to join expertise about possible construction techniques.

The final route will be determined after the Shaft Site has been selected, based on three factors: 1) more detailed survey information to be collected along the route; 2) further investigation into the feasibility of alternative construction techniques that might be used to further minimize the potential environmental impacts of the water main construction project identified in the Draft and Final EIS; and 3) ongoing coordination and collaboration between NYCDEP, NYCDDC, and NYCDOT regarding construction techniques and alignment.

Water main construction in City streets is complicated by several factors, including traffic conditions, and several procedures exist to address and minimize disruption and environmental effects from water main construction. For example, the NYCDOT Office of Construction

Mitigation and Coordination (OCMC) oversees all activities necessitating street disturbance. OCMC requires the preparation of Maintenance and Protection of Traffic (MPT) plans for construction work that will affect City streets and issues permits for work involving City streets and sidewalks. The permits typically specify measures to limit disruption to traffic during construction, such as allowable lane closures and work hours (these restrictions are referred to as "traffic stipulations"). The City's Noise Code standards regulate construction noise.[1] Further, to minimize air emissions, New York City Administrative Code § 24-163.3, adopted December 22, 2003, also known as Local Law 77, requires that any diesel-powered non-road engine with a power output of 50 horsepower or greater that is owned by, operated by or on behalf of, or leased by a City agency shall be powered by ultra low sulfur diesel fuel, and utilize the best available technology (BAT) for reducing the emission of pollutants, primarily particulate matter and secondarily nitrogen oxides. NYCDEP is charged with defining and periodically updating the definition of BAT. Water main installation associated with Shaft 33B would be conducted in accordance with all local, state, and federal regulations.

It is important to note that water main construction is a very complex process and consequently, the water main connections from Shaft 33B could be routed and constructed in several different ways to reach the trunk main on Third Avenue. For the same reasons, the timing and staging of the construction could occur in several ways. The ultimate route for the water main connections from Shaft 33B, including the timing and sequencing of construction, is best determined close to the time of construction and will not be determined until after the Shaft Site has been selected.

The assessment of environmental impacts associated with water main construction in this EIS examines three logical potential water main routes of the numerous potential routes, and is based on a conceptual, planning-level consideration of these routes. Construction procedures and equipment typically used for this kind of work that are presented in the EIS have been identified based on knowledge of typical water main construction work and coordination with NYCDDC. As discussed below in Section 5.1.3, a reasonable worst-case scenario and two other representative scenarios were developed to support the environmental review of Shaft 33B. These routes and their environmental effects are considered to be representative of the types of effects that could occur as a result of water main construction along any route in the general vicinity of the proposed shaft locations. The construction sequencing and duration presented for the water main construction is intended to be conservative and is based on logical assumptions about timing and staging and knowledge of general construction procedures used for installation of water mains. An examination of every possible route was not undertaken for this EIS because such an exercise would likely produce duplicative results. The routes that are studied in this EIS disclose a range of potential environmental impacts associated with future water main construction that would be necessary for Shaft 33B to connect to the water distribution system and serve the MIPZ and NIPZ.

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[1] Although it will take 18 months to implement the construction provisions of the Noise Code passed in late December 2005, NYCDEP will work with the Contractor to develop "mitigation plans" for construction. These plans will be developed based on specific types of work and types of equipment listed in the Noise Code. Nighttime work will require stricter plans, with consideration given to distance to receptors.

5.1.3 Water Main Connection Routes

Since the final route for the water main connections from the preferred Shaft Site to the trunk main under Third Avenue has not yet been determined and there are many potential possible water main connection routes, for the purposes of EIS impact assessment, NYCDEP has identified a reasonable worst-case route and several other representative water main connection routes based on typical construction for water mains in New York City.

Ideally, the water main connections from Shaft 33B would connect to the existing trunk main on Third Avenue in the vicinity of E. 55th and E. 56th Streets, at the approximate boundary between the MIPZ and NIPZ. However, the boundaries of the pressure zones were not established by specific streets, but by the topography of the area. NYCDEP is considering the potential to connect into the Third Avenue trunk main as far north as E. 61st Street. In developing the reasonable worst-case and other representative routes for water main connections, it was assumed that the water main route would avoid heavily congested access areas to the Queensboro Bridge if practicable. Three of the four feasible locations for Shaft 33B analyzed in this EIS—the preferred Shaft Site at E. 59th Street and First Avenue and the alternative sites located at E. 59th Street and Second Avenue and at E. 61st Street between First and Second Avenues—are proximate to numerous streets that connect with the Queensboro Bridge roadways. If any of these sites is selected, it is likely that construction of any future water main connection route would have an effect on one or multiple Manhattan roadways that feed or disperse traffic from the Queensboro Bridge. Because the site at E. 59th Street and First Avenue is the preferred Shaft Site, the discussion of the potential future water main routes is presented primarily in the context of that location.

A preliminary assessment of several potential water main routes was performed to identify constraints caused by the presence of existing utilities or other subsurface obstructions beneath the City streets on potential routes for the water main connections. Using this information in combination with an understanding of potential environmental issues, three feasible water connection routes were developed for analysis in the EIS. These three water main connection routes are discussed below: (1) the First Avenue route (the reasonable worst-case route); (2) the Sutton Place route (an additional representative route); and (3) the E. 59th Street/E. 61st Street route (an additional representative route). No route was developed along Second Avenue, to avoid potential conflicts with the future Second Avenue Subway and related utility relocation work associated with construction of the subway. Together, these alternative routes anticipate the likely options for water main construction that would be needed to connect the proposed Shaft 33B with the Third Avenue trunk main and therefore are representative of the final water main route to be selected for the water main connections. The environmental consequences associated with the use of these routes are therefore considered representative of potential environmental consequences that could result along the potential water main route that might ultimately be selected. The routes considered include a route that heads south from the Shaft Site along First Avenue and then turns west at E. 55th and E. 56th Street (the First Avenue route); a similar route that heads east from the site to Sutton Place, to determine whether traffic congestion could be

minimized in this configuration; and a route that heads directly west from the Shaft Site using E. 59th Street and E. 61st Street, to identify the effects of the shortest practicable water main route.

First Avenue Route (Reasonable Worst-Case Route)

The "First Avenue route" would consist of two 48-inch water mains running from the preferred Shaft Site (at E. 59th Street and First Avenue) under First Avenue and then under E. 55th and E. 56th Streets to the Third Avenue trunk main (Figure 5.1-1). A new valve to separate the MIPZ and NIPZ would be constructed in the existing Third Avenue water main between E. 55th and E. 56th Streets, at the approximate location of the existing zone boundary along the Third Avenue trunk main.

In the First Avenue route, the two water mains would be adjacent to each other along the east side of First Avenue. At E. 56th Street, the two water mains would split. One water main would continue westward along the north side of E. 56th Street from First Avenue to Third Avenue. The second water main would continue down First Avenue to E. 55th Street, and then extend westward along the north side of E. 55th Street from First Avenue to Third Avenue.

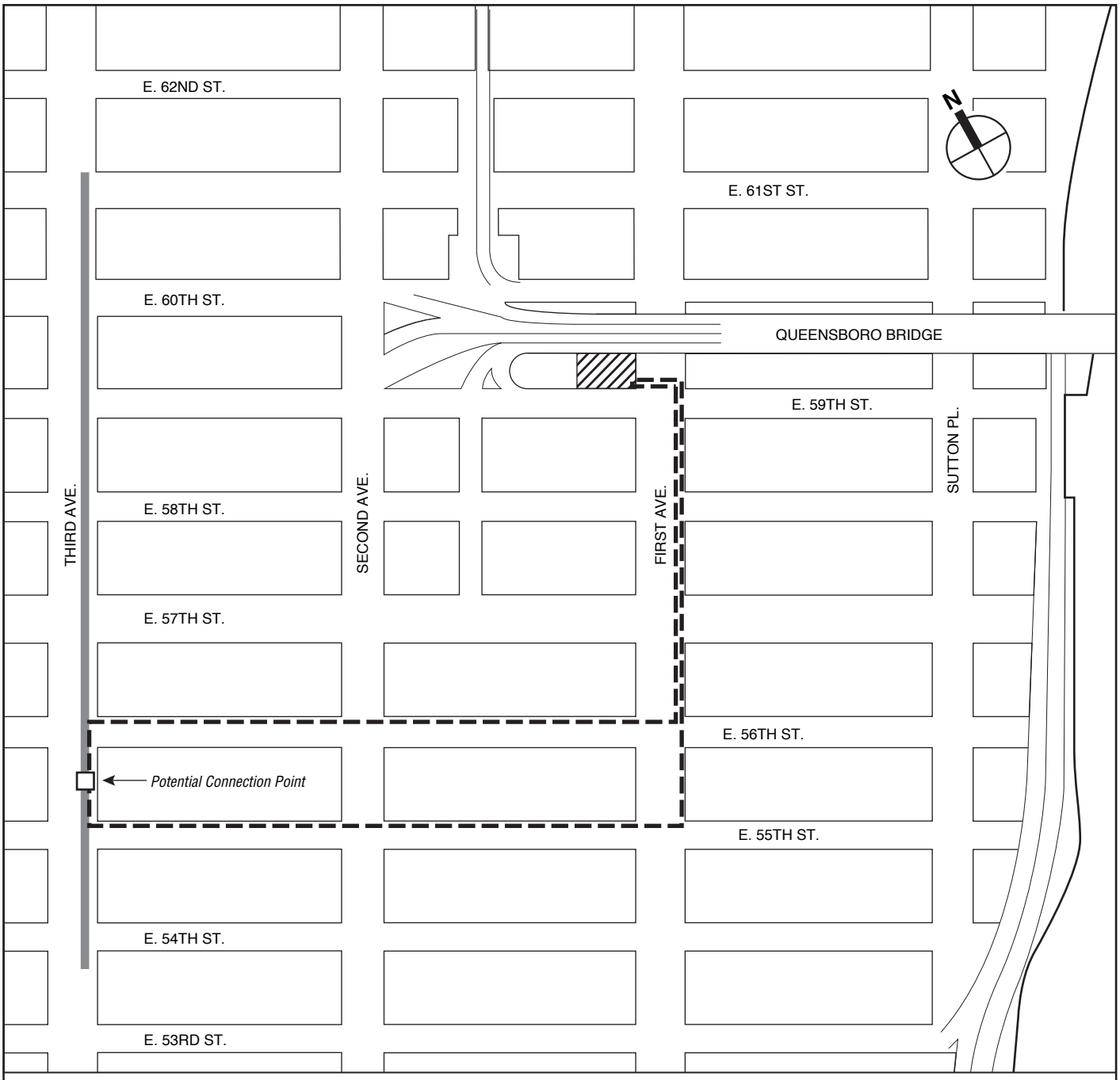
By constructing the east-west portions of the water main connection route along separate cross streets, traffic disruptions on a single corridor would be minimized. The construction of two water mains along a single cross street (for example, both water mains traversing E. 56th Street from First Avenue to Third Avenue) would not be desirable, since it would require closure of the entire street. E. 55th and E. 56th Streets were analyzed as the cross streets for this route, since they avoid the heavily congested access routes to the Queensboro Bridge.

The First Avenue route was selected for analysis in the EIS because it would likely have greater overall potential for adverse environmental impacts than other potential water main routes, and is therefore considered the reasonable worst-case route. Many of the analyses in this Chapter provide detailed discussion of this reasonable worst-case route, and compare the effects of the additional representative routes to the effects of the reasonable worst-case route.

Sutton Place Route (Additional Representative Route)

One of the additional representative routes for the purposes of the EIS is the "Sutton Place route," which would consist of two 48-inch water mains running from the preferred Shaft Site along Sutton Place instead of First Avenue (Figure 5.1-2). The two water mains would run along the south side of E. 59th Street from First Avenue to Sutton Place, and then along the west side of Sutton Place until E. 56th Street, where they would split. One water main would continue westward along the north side of E. 56th Street from Sutton Place to Third Avenue. The other main would continue south along Sutton Place to E. 55th Street, and then proceed west along the north side of E. 55th Street to Third Avenue. A new valve to separate the MIPZ and NIPZ would be constructed in the existing Third Avenue water main between E. 55th and E. 56th Streets, at the approximate location of the existing zone boundary.

The Sutton Place route was selected for analysis in the EIS because it would generally minimize construction on major roadways that feed or disperse traffic from the Queensboro Bridge.



Legend:

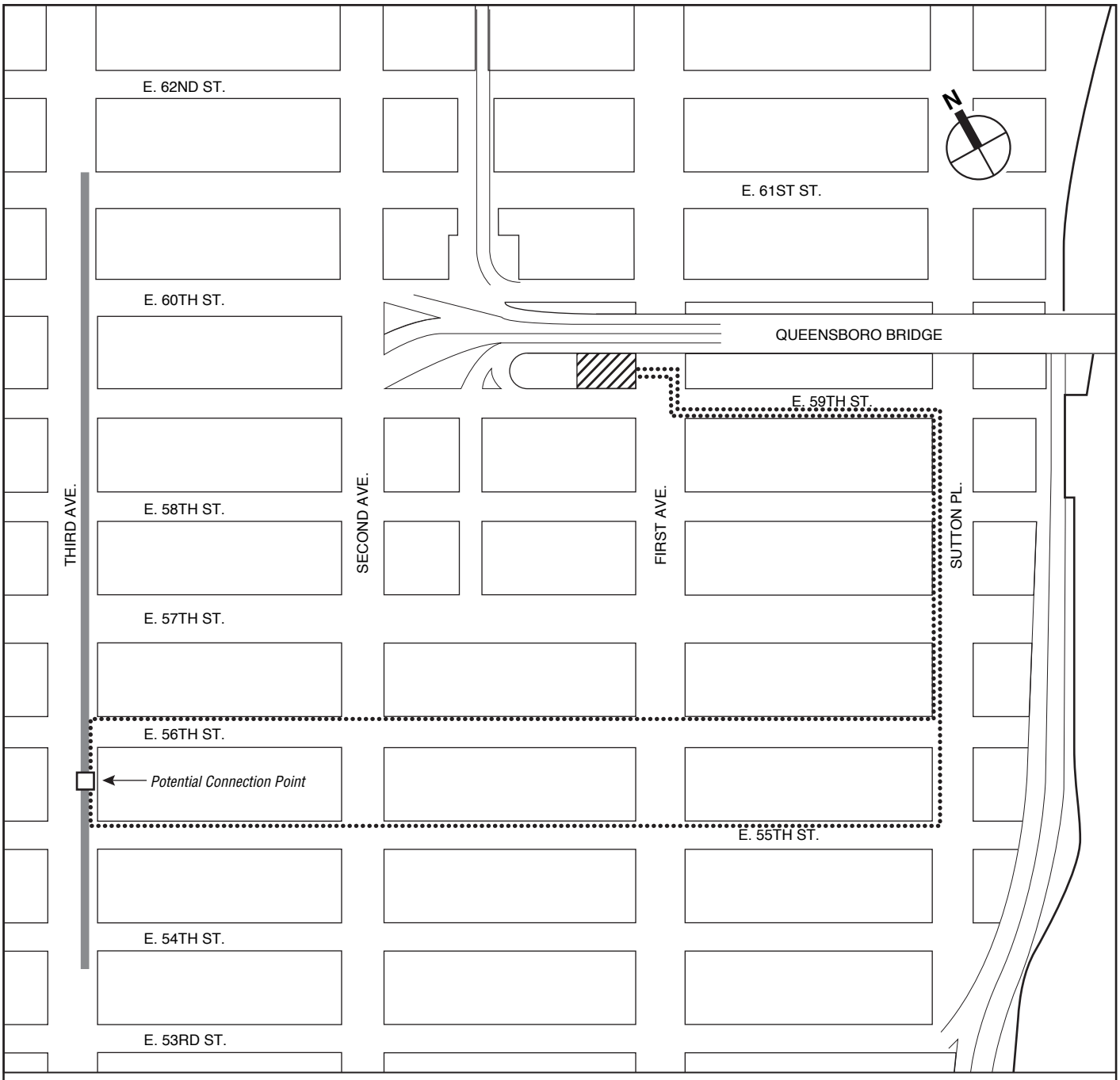
- *Preferred Shaft Site*
- *Existing Trunk Line*
- *Reasonable Worst Case First Avenue Route*

NOTE: *This figure has been updated for the Final EIS*

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG

REASONABLE WORST CASE WATER MAIN CONNECTION ROUTE
FIRST AVENUE ROUTE

FIGURE 5.1-1



Legend:

- *Preferred Shaft Site*
- *Existing Trunk Line*
- *Representative Alternative Sutton Place Route*

NOTE: *This figure has been updated for the Final EIS*

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG

REPRESENTATIVE ALTERNATIVE WATER MAIN CONNECTION ROUTE
SUTTON PLACE ROUTE

FIGURE 5.1-2

E. 59th Street/E. 61st Street Route (Additional Representative Route)

An additional representative route, the "E. 59th Street/E. 61st Street route" is also addressed in the EIS. For purposes of this EIS, the E. 59th Street/E. 61st Street route is assumed to include one 48-inch water main along the south side of E. 59th Street from First Avenue to Third Avenue. This water main would connect to the existing distribution system for the MIPZ at a likely point on Third Avenue between E. 59th and E. 60th Streets. A second 48-inch water main would run from the preferred Shaft Site north along the west side of First Avenue to E. 61st Street, and then proceed west in the center of E. 61st Street to a connection point for the NIPZ on Third Avenue between E. 60th Street and E. 61st Street (Figure 5.1-3). One boundary valve at a location somewhere between those two points would serve as the boundary between the two pressure zones.

The E. 59th Street/E. 61st Street route was selected for assessment to represent the most direct water main connection from the preferred Shaft Site to the Third Avenue trunk main. This route requires the shortest construction time for water main connections between the preferred Shaft Site and the Third Avenue main. This route would move the valve separating the MIPZ and NIPZ to the vicinity of E. 59th Street/E. 61st Street, several blocks north of the existing zone boundary.

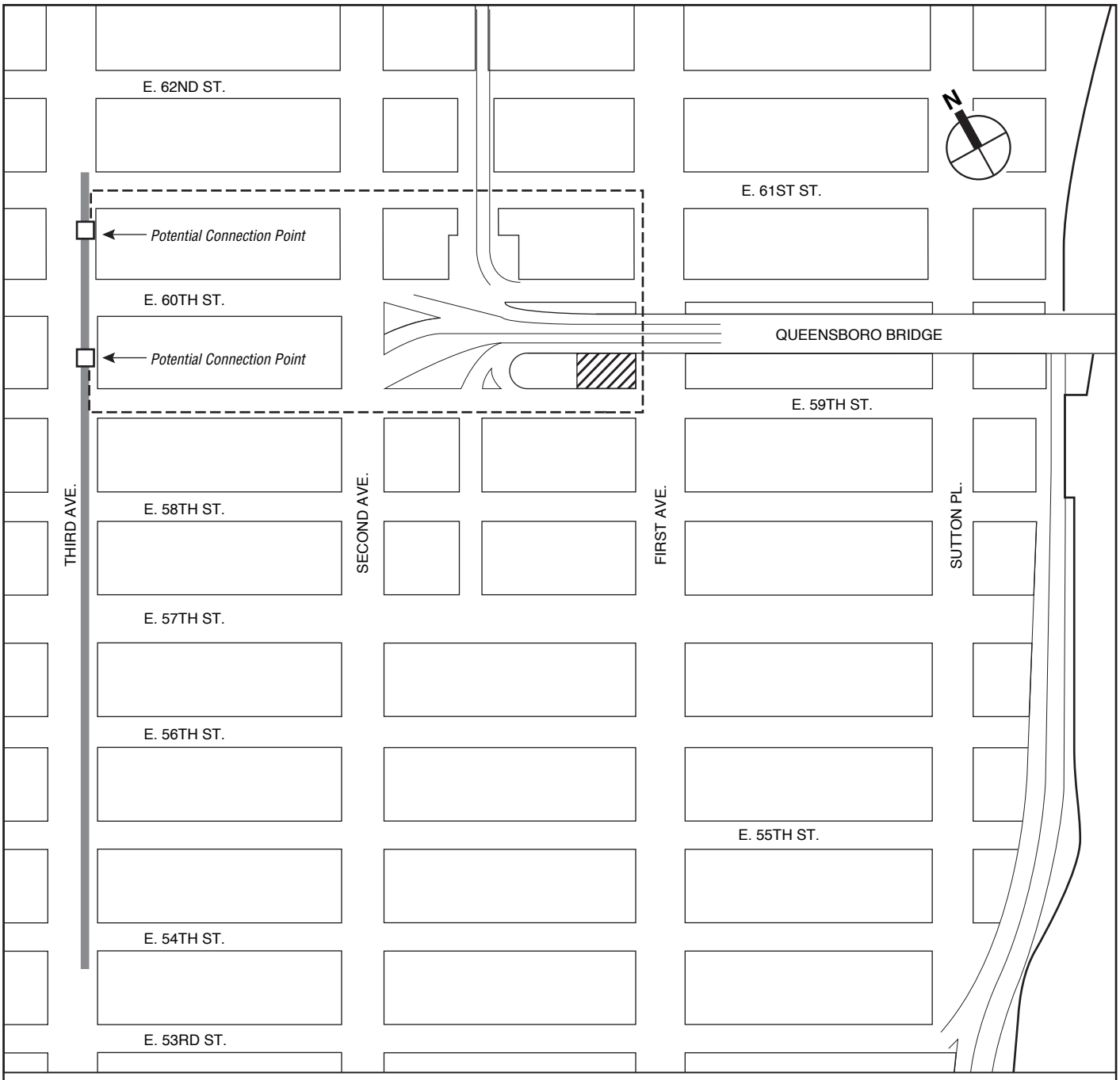
Alternative Shaft Site Water Main Connection Options

The three feasible alternative Shaft Sites—the E. 59th Street/Second Avenue Shaft Site, the E. 61st Street Shaft Site, and the E. 54th Street/Second Avenue Shaft Site—would also require water main connections to the trunk main under Third Avenue. Similar to the preferred Shaft Site, each of these alternative Shaft Sites also has a multitude of potential combinations of water main connection routes and construction options. The potential water main connections for each of the alternative Shaft Sites are more fully discussed in Chapters 6, 7, and 8. The reasonable worst-case and representative routes for the E. 59th Street/Second Avenue Shaft Site and the E. 61st Street Shaft Site are similar to those described for the preferred Shaft Site above, because the Sites are all located in close proximity to one another and to the Queensboro Bridge. A comparison of impacts for the preferred Shaft Site and the alternative Shaft Sites, including the respective water main connections for each, is included in Chapter 11, "Comparison of Alternatives."

5.1.4 Water Main Construction

Construction Methods

NYCDDC would construct the two 48-inch water mains from Shaft 33B using standard construction techniques and following NYCDOT traffic stipulations. The specific construction methods to be used for the water mains therefore have not yet been determined. However, based on past NYCDDC practices, it is likely that water mains would be constructed using the "cut and cover" technique, which involves excavating small areas at a time and covering them once construction is complete. When appropriate, cut-and-cover construction can also involve use of



Legend:

Preferred Shaft Site

Existing Trunk Line

Representative Alternative E. 59th / E.61st Street Route

NOTE: *This figure has been updated for the Final EIS*

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG

REPRESENTATIVE ALTERNATIVE WATER MAIN CONNECTION ROUTE
E. 59TH STREET / E. 61ST STREET ROUTE

FIGURE 5.1-3

temporary plates above excavated areas to allow access across a portion of the construction zone when work is not occurring there.

Using this technique, the water mains would likely be constructed in segments so that the entire construction route would not be disrupted simultaneously. Each segment would likely consist of a single block, not including its intersections, or a single intersection where a main must cross another street. For example, using the First Avenue route from the preferred Shaft Site, the first segment is likely to include the portion adjacent to the Shaft Site where the venturi chambers would be constructed, and other segments would most likely consist of individual blocks of First Avenue (i.e., First Avenue from E. 59th to E. 58th Street, or E. 56th Street from First Avenue to Second Avenue) or individual intersection crossings (i.e., the portion of First Avenue crossing E. 56th Street would be in one segment and the portion of E. 56th Street crossing First Avenue would be in another).

To expedite the schedule, work could be conducted on several non-adjacent segments simultaneously. For construction along north- and southbound avenues or Sutton Place, the area under construction at any given time (a "segment") would be anticipated to include two non-adjacent City blocks or one or two street intersections. East- and westbound cross streets would likely be constructed one block at a time, with intersections constructed separately. On a given cross-street, work would be conducted one half-block at a time, so that space remains for cars to maneuver around the work zone and to pull over for deliveries. Again, work on a cross-street segment might be conducted at the same time as work on a non-adjacent intersection, to reduce the overall duration of the construction project. Based on past experience of typical water main installations in the City (and consideration of existing utilities in the roadways), construction of these segments has been conservatively estimated at up to 12 weeks for an avenue or street block segment and up to 10 weeks for an intersection segment. Certain blocks could take longer, because of the presence of impediments such as Bridge overpasses. A potential staging plan for the First Avenue route developed for the EIS analyses is presented in Table 5.1-1.

The timeframes for construction include the time necessary for the minor utility relocation or support expected, based on an extensive review of available information on utilities. The timeframes also include time for possible delays due to the potential for the existence of utility lines in locations other than indicated on current utility maps. The potential water main routes analyzed in this EIS were developed after review of information on existing utilities beneath the streets, with the intention of avoiding the need for major utility relocation. During final design, NYCDDC would take into account the presence of buried infrastructure, so as to avoid the need for major relocation of utilities to the extent possible.

Using cut-and-cover techniques, construction of a water main along a segment would typically include four steps, each lasting two to four weeks:

Step 1: Pavement cutting and excavation
Step 2: Support and relocation of other utilities
Step 3: Placement of bedding and water main
Step 4: Backfill and repaving

Table 5.1-1
Potential Staging Plan for First Avenue Route
(Reasonable Worst-Case Route)

Segment	Location
1	First Avenue from E. 59th to 58th Street First Avenue from E. 57th to 56th Street (this segment would also include venturi chambers)
2	First Avenue crossing E. 58th Street First Avenue crossing E. 56th Street
3	First Avenue from E. 58th to 57th Street First Avenue from E. 56th to 55th Street
4	First Avenue crossing E. 57th Street
5	E. 56th Street from First to Second Avenue
6	E. 56th Street crossing First Avenue E. 56th Street crossing Second Avenue
7	E. 56th Street from Second to Third Avenue
8	E. 55th Street crossing First Avenue E. 55th Street crossing Second Avenue
9	E. 55th Street from First to Second Avenue First Avenue across from preferred Shaft Site
10	E. 55th Street from Second to Third Avenue E. 59th Street crossing First Avenue
11	E. 56th Street intersection at Third Ave.
12	Third Avenue from E. 55th to 56th Street
13	E. 55th Street intersection at Third Ave.

During the first step, the contractor would use machinery to cut the existing roadway asphalt and concrete base and excavate a trench of the required width and depth. The sides of the excavation would be supported by steel sheeting, timber planks, or other supporting measures. The excavated roadway material and soil would be removed with a backhoe and placed in dump trucks. Standard NYCDOT specifications would be used to dictate the protocol for fill material removal and use of backfill material. Sump pumps would be used as needed to maintain dry conditions in the trench.

In the second step, existing utilities that cross the excavation area or that could be undermined by the open trench would be supported and/or protected as necessary. This step would include minor utility relocation, if necessary, conducted in coordination with the utility company. The need for utility support or relocation would be determined in advance of construction, so that it could be coordinated with the water main project. As noted above, the water main construction schedule developed for this EIS accounts for the time needed to relocate the utilities expected along the potential routes, based on extensive research using available information.

The third step would consist of placement of "bedding" material in the trench (i.e., materials used to support the loading of the water mains in the excavated trench, such as gravel or sand) or pouring of a reinforced concrete cradle to support the water main. The water main itself would

then be placed into this bedding using a small crane. The water main would subsequently be aligned and welded to the connecting joint.

The final (fourth) step would consist of backfilling of the trench with clean fill or sand, removal of the supporting materials, and repaving of the street.

As described in Chapter 2, "Purpose and Need and Project Overview," construction of the new water main connections also requires creation of several underground chambers at the Shaft Site, including regulator chambers, valve chambers, and venturi chambers. These chambers would be constructed the same way as the other subsurface chambers at the Shaft Site, via excavation. For the this analysis, it is assumed that at the preferred Shaft Site, the regulator chambers and valve chambers would be located on the Shaft Site and are expected to be constructed concurrently with Shaft. The venturi chambers would be constructed as part of Segment 1 of the water main connection. For this reason, construction activity for Segment 1 would last longer than a typical street segment and is estimated at 20 weeks rather than 12 weeks. Table 5.1-2 presents the typical construction equipment that would be used during each step of cut-and-cover water main construction and estimated timeframes for each block and intersection segment.

Table 5.1-2
Water Main Construction Summary

Step	Major Equipment Used	Typical Timeframe: Block	Typical Timeframe: Intersection
Step 1: Pavement cutting and excavation	Pavement cutters, jackhammers, compressor, excavator, dump trucks, flatbed trucks, saw	2 weeks	2 weeks
Step 2: Support and relocation of other utilities	Jackhammer, compressor, excavator, concrete trucks, saw	3 weeks	4 weeks
Step 3: Placement of bedding/main	Excavator, dump trucks, flatbed trucks, concrete truck (if needed), welder, crane	4 weeks 12 weeks on the block with venturi chambers	2 weeks
Step 4: Backfill and repaving	Excavator, dump trucks, concrete trucks, soil compactor, payloader, paver	3 weeks	2 weeks

Preliminary engineering information was used to estimate the percentage of time that each piece of equipment would be used during the four steps of the water main construction, assuming an 8-hour workday. These equipment "usage factors" for the water main connection construction are presented in Table 5.1-3. As shown in the table, the equipment usage factors vary depending on the segment to be constructed (i.e., intersection, block, or block segment with a venturi chamber). Slightly less pavement removal is required in Step 1 at intersections than on blocks, because of the smaller area. In addition, more activity would occur during Step 3 (placement of bedding and main) on blocks where the venturi chambers would be installed, since these chambers would also have to be created. More specific information regarding equipment to be used during water main construction and their usage factors is presented in the air quality, noise, and vibration analyses in Sections 5.11, 5.12, and 5.13.

Table 5.1-3
Equipment Usage Assumptions
for Construction of Water Main Connections

Equipment	Percentage of Time Equipment is Used in Each Construction Step			
	Step 1	Step 2	Step 3	Step 4
Pavement Cutter				
Blocks	15			
Intersections	10			
Jackhammer				
Blocks	15	15		
Intersections	10	10		
Compressor (NYC)	25	25		
Paver				50
Excavator	50	50	50	50
Dump Truck at Idle	50		50	50
Flatbed Truck at Idle	25		25	
Concrete Truck				
Blocks and Intersections		25		
Blocks with Venturi Chambers		25	20	
Payloader				
Blocks and Intersections				25
Blocks with Venturi Chambers			10	25
Soil Compactor				
Blocks and Intersections				50
Blocks with Venturi Chambers			10	50
Telescoping Crane			25	
Welder			25	
Saw, gas				
Blocks and Intersections	25	25		
Blocks with Venturi Chambers	25	25	25	

Notes: Usage factors are based on a 8-hour workday.
Percentages are the same for blocks, blocks with venturi chambers, and intersections, unless otherwise noted.

The conceptual construction timeframes described above were developed based on the assumption that cut-and cover work would occur during one eight-hour shift per day. Construction work would typically occur during the daytime, but work could also potentially occur during an evening shift (from 3:00 p.m. to 11:00 p.m.) if NYCDOT Office of Construction Mitigation and Coordination (OCMC) deems evening construction to be necessary to avoid severe traffic tie-ups. It is also possible NYCDOT may require weekend work or water main construction during the overnight shift (11:00 p.m. to 7:00 a.m.). Given the residential nature of the surrounding area, it is not anticipated that OCMC would request overnight work; however, this EIS addresses the potential effects of such work in relevant analyses. The duration of construction represents the reasonable worst-case duration for the water main construction, and

accounts for delays that may result from restrictions on staging areas (for example, for the reasonable worst-case scenario, fewer lanes would be available during peak hours).

Although this EIS assumes the use of cut-and-cover construction for the water main connections, it is possible that other techniques for water main installation may be identified that involve less disruption to the street surface. For example, it may be possible to install water mains across major intersections by "pipe jacking." Using this process, a pit is dug and the pipe is pushed through the existing soil beneath the street by hydraulic equipment. A second pit is required at the terminus point.

Another possible option for constructing lengths of water mains is "microtunneling," which involves drilling a small tunnel below the street using a tunnel boring machine. The tunnel boring machine is launched from a pit dug at the start of the tunnel segment. This pit must remain in place for the duration of the construction, so that soils and rock excavated by the boring machine can be removed from the pit. A second, "receiving" pit must also be created for removal of the tunnel boring machine. When microtunneling would be used over several blocks or longer, intermediate pits must also be dug to allow the drilling heads on the machine to be replaced.

While these two options could potentially reduce the amount of disturbance on streets where water mains would be installed, they could also potentially increase the amount of disturbance where jacking, receiving, and interim pits would be created. For analysis purposes, this EIS considers the potential environmental effects of cut-and-cover construction for water main connections, since this is traditionally the method used by NYCDDC and because these effects generally represent the reasonable worst-case effects that can occur from water main construction.

Throughout construction of the water main connections, NYCDDC would employ an extensive community outreach program to keep the affected neighbors informed about construction activities. A Community Construction Liaison would be designated for the project and housed in the project's construction field office. The liaison would coordinate between the community, coordinating agencies, and the resident engineer in charge of the construction project. During this process, the Community Construction Liaison would maintain the following responsibilities:

- Attends meetings with the affected Community Board to inform them of upcoming work;
- Notify residences or businesses when access to their building may be temporarily affected;
- Work with affected business owners and NYCDOT to identify locations for truck access and loading and unloading when buildings are affected; and
- Post schedules throughout the community regarding progress of the project and anticipated future activities.

More information on the specific disruptions that could occur is provided in the following Sections of this Chapter (for example, 5.2, "Land Use and Community Facilities, Zoning, and Public Policy;" 5.5, "Socioeconomic Conditions;" and 5.9, "Traffic and Parking").

Water Main Construction Options

Required Construction Zone

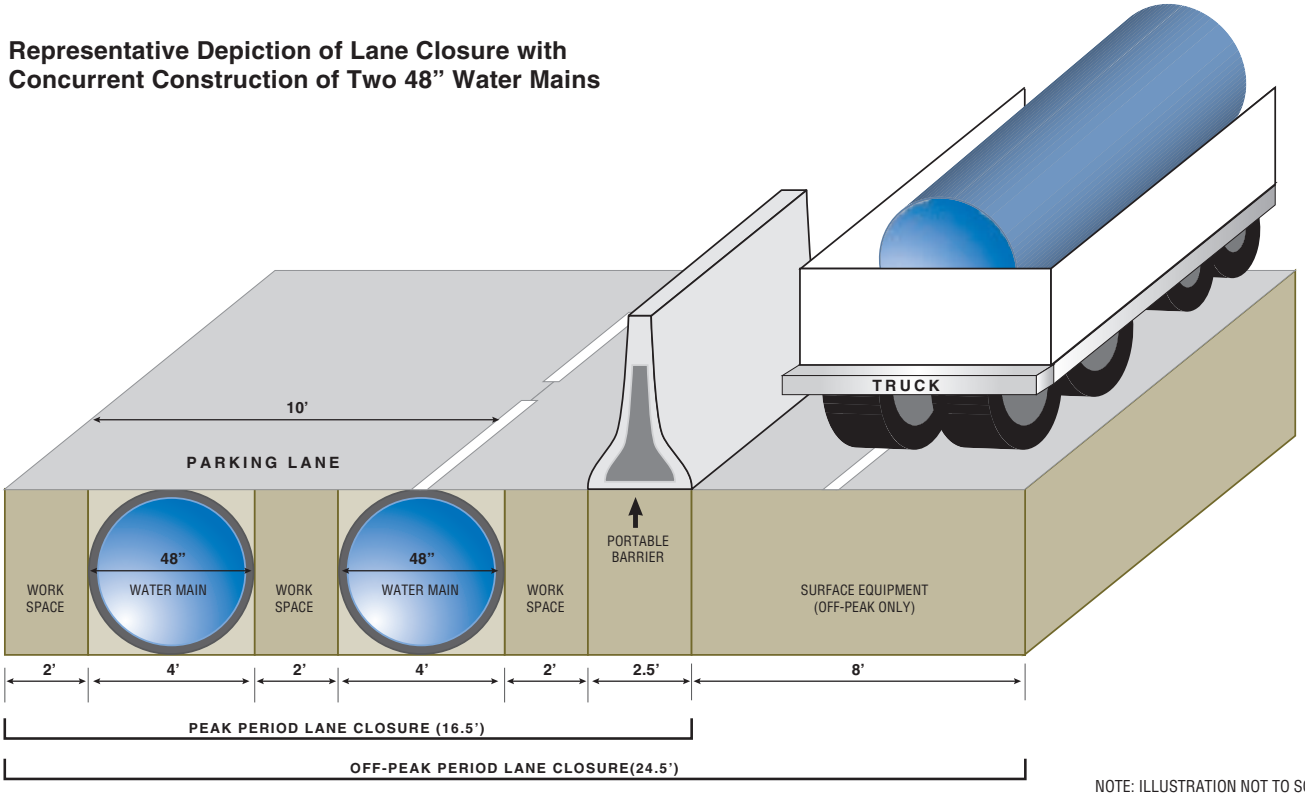
Each of the conceptual water main routes presented above includes construction within City streets. The width of the disrupted area depends upon the size and number of water mains to be placed in the street. The minimum trench width required for placement of two 48-inch water mains in the street would be 14 feet. This includes 4 feet of width for each main, plus 2-foot-wide work spaces on either side of the two mains. A physical barrier, such as a portable "Jersey" barrier, with an approximately 2.5-foot-wide base, would be required next to the trench for safety purposes. Therefore, the minimum width of the construction zone for construction of two water mains would be 16.5 feet. To minimize traffic disruptions, this would likely be the maximum width of affected area during peak traffic hours. During off-peak hours, however, an additional 8 feet would likely be required for construction support vehicles (e.g., unloading/loading of material on trucks), for a total construction zone width of 24.5 feet. Figure 5.1-4 illustrates potential construction staging areas on a north-south avenue.

For construction of a single water main on an avenue or cross street, the minimum trench width required would be 8 feet (4 feet for the main and 2 feet of work space on either side of the main). Including a concrete barrier, the width of the construction zone during peak traffic hours would be 10.5 feet (one lane) and 2 feet of the adjacent sidewalk. During off-peak hours, 18.5 feet of roadway would be utilized (two lanes) and 2 feet of adjacent sidewalk. Figure 5.1-4 illustrates potential construction staging areas on a cross street.

For purposes of this analysis, it was assumed that the north-south avenue affected by construction would be re-striped to accommodate 10-foot lanes and that parking/standing on specific blocks along the roadway's affected curb would be temporarily displaced during construction. On the cross streets, parking would be temporarily displaced on both sides of the street alongside the construction zone, but parking would remain in the portion of the block that was not under construction.

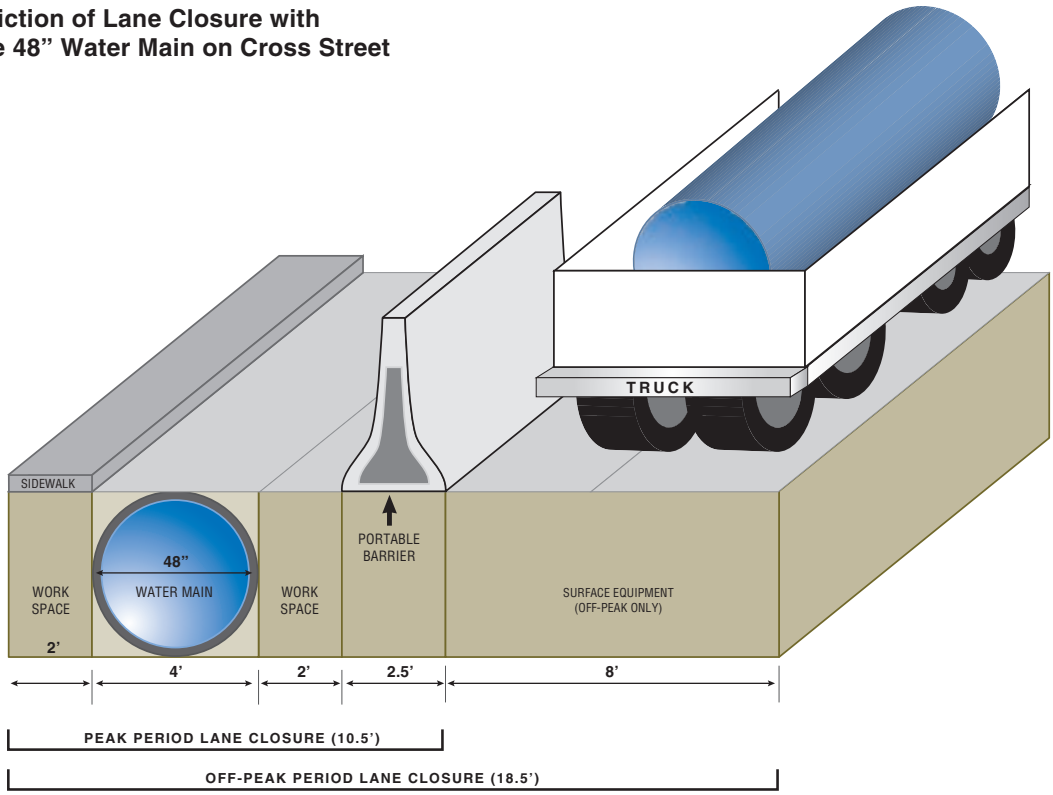
For each of the routes described above, several different options are available for construction sequencing and placement of the water mains. These options vary in terms of the specific width of sidewalk and/or traffic lanes that must be closed on the affected north-south avenue for the water main construction zone. Possible options include constructing the water mains concurrently in several roadway lanes; use of sidewalk for a portion of the construction zone to reduce the amount of roadway affected; non-concurrent construction of water mains; and use of two avenues rather than one for the north-south portion of the water main route. These additional construction options are presented below and summarized in Table 5.1-4. The potential traffic impacts associated with these construction zones are discussed in Section 5.9, "Traffic and Parking." Appendix 6 of this EIS lists the affected trees and street furniture that could be affected by each water main route; the potential effects of these changes on urban design are considered in Section 5.6, "Urban Design and Visual Resources."

Representative Depiction of Lane Closure with Concurrent Construction of Two 48” Water Mains



NOTE: ILLUSTRATION NOT TO SCALE
DEPTH OF TRENCH NOT INDICATED

Representative Depiction of Lane Closure with Construction of One 48” Water Main on Cross Street



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NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
WATER MAIN CONNECTIONS

REPRESENTATIVE LANE CLOSURES
CONSTRUCTION OF WATER MAINS

FIGURE 5.1-4

Table 5.1-4
Water Main Connection Routes and Construction Scenarios

Scenario	Description	North-South Avenue Construction Zone	Side Street Construction Zone
Reasonable Worst-Case Route (First Avenue) *Two water mains along east side of First Avenue from E. 59th Street to E. 55th / E. 56th Street; single water main on E. 55th and on E. 56th Street from First to Third Avenue*			
Base	Two 48" water mains constructed concurrently on First Avenue in the street.	First Avenue Peak: 2 lanes (16.5') Off-peak: 3 lanes (24.5')	E. 55th / E. 56th Streets Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk
A	Two 48" water mains constructed concurrently on First Avenue—using street lanes and sidewalk space.	First Avenue Peak: 2 lanes (11.5') plus 5' of sidewalk Off-peak: 2 lanes (19.5') plus 5' of sidewalk	E. 55th / E. 56th Streets Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk
B	Two 48" water mains constructed one at a time on First Avenue in the street.	First Avenue 1st Main: Peak: 1 lane (10.5') Off-peak: 2 lanes (18.5') 2nd Main: Peak:2 lanes (18.5') Off-peak: 2 lanes (18.5')	E. 55th / E. 56th Streets Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk
C	Two 48" water mains constructed concurrently—one on First Avenue and one on Sutton Place.	First Avenue Peak: 1 lane (10.5') Off-peak: 2 lanes (18.5')	E. 55th / E. 56th Streets Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk
Sutton Place Route (Additional Representative Route) *Two water mains along south side of E. 59th Street from First Avenue to Sutton Place; two water mains on west side of Sutton Place to E. 55th / E. 56th Street; single water main on E. 55th and on E. 56th Street from Sutton Place to Third Avenue*			
Sutton Place	Two 48" water mains constructed concurrently on Sutton Place in the street.	Sutton Place Peak: 2 lanes (16.5') Off-peak: 3 lanes (24.5')	E. 59th Street Peak: 2 lanes (14.5'); 2' of sidewalk on north side would be used for traffic Off-peak: 3 lanes (24.5'); 2' of sidewalk on north side would be used for traffic E. 55th / E. 56th Streets Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk
E. 59th Street/E. 61st Street Route (Additional Representative Route) *One water main along E. 59th Street from First Avenue to Third Avenue; one water main on First Avenue from E. 59th Street to E. 61st Street and then on E. 61st Street from First Avenue to Third Avenue*			
E. 59th/ 61st	Two 48" water mains—one on E. 59th Street and the other on First Avenue and then on E. 61st Street.	Peak: 1 lane (10.5') Off-peak: 2 lanes (18.5')	Peak: 1 lane (10.5') plus 2' of sidewalk Off peak: 2 lanes (18.5') plus 2' of sidewalk

First Avenue (Reasonable Worst-Case Route): Base Scenario

The Base Scenario of the reasonable worst-case route represents a reasonable worst-case scenario for the water main construction project. The Base Scenario would involve the construction of the two water mains in the easternmost lanes of First Avenue, using 16.5 feet of the avenue during peak hours and 24.5 feet during off-peak hours. This would require the use of two lanes of First Avenue during peak periods and three lanes during off-peak periods (Figure 5.1-5). One water main would be constructed in the streetbed of E. 55th Street and another in the streetbed of E. 56th Street. On each cross street, it is assumed that the construction would occur on the north side of the street. The construction zone would be 10.5 feet wide during peak periods—4 feet for the water main, 2 feet of work zone on either side, and an estimated 2.5 feet for a portable barrier—requiring use of one traffic lane and a 2-foot-wide portion of the sidewalk (Figure 5.1-6). During off-peak hours, an additional 8-foot-wide area would be reserved for construction trucks, for a total construction zone 18 feet wide, or two traffic lanes plus 2 feet of the adjacent sidewalk. Street furniture and street trees along the north side of E. 55th and E. 56th Streets may have to be removed for this construction activity. A total of 56 street trees, 10 fire hydrants, and numerous traffic or walk signals, street lights, and signs could potentially be affected along E. 55th and E. 56th Streets (see Appendix 6 for details).

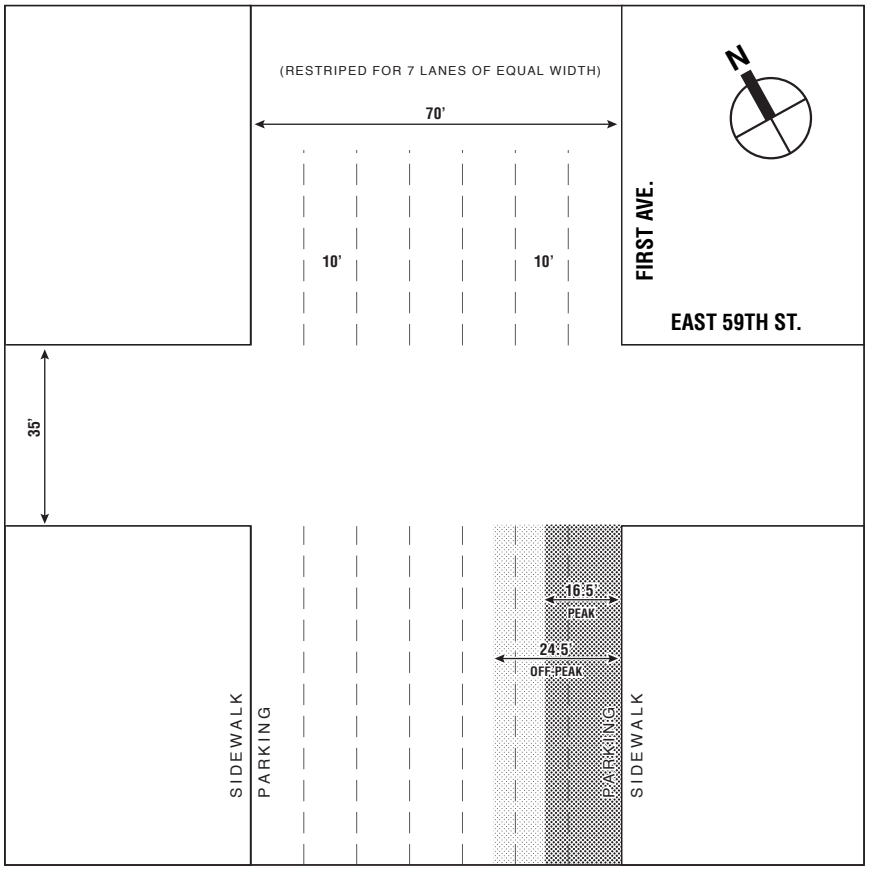
First Avenue (Reasonable Worst-Case) Route: Scenario A

Scenario A for the reasonable worst-case route was developed to reduce the amount of First Avenue that would be affected during construction. Rather than constructing both water mains entirely in the streetbed, Scenario A would shift the construction zone eastward, to include use of 5 feet of the sidewalk on the east side of First Avenue. Use of the sidewalk would reduce the width of street required for the construction zone (Figure 5.1-5). Under Scenario A, 11.5 feet of avenue (two lanes) would be used during peak hours and 19.5 feet (two lanes) would be used during off-peak hours. The construction on the cross streets would be the same as in the Base Scenario. This scenario would require removal of street trees and street furniture along the east side of First Avenue from the Queensboro Bridge to E. 55th Street. This would affect 21 additional street trees, and numerous traffic or walk signals, street lights, and signs, as well as one bus shelter on the east side of First Avenue, in addition to the street trees and street furniture affected on E. 55th and E. 56th Streets. A total of 77 trees may be affected (see Appendix 6 for details). It is also possible that some additional street trees would be lost in locations where no sidewalk work is proposed, because of the excavation activities close to those trees.

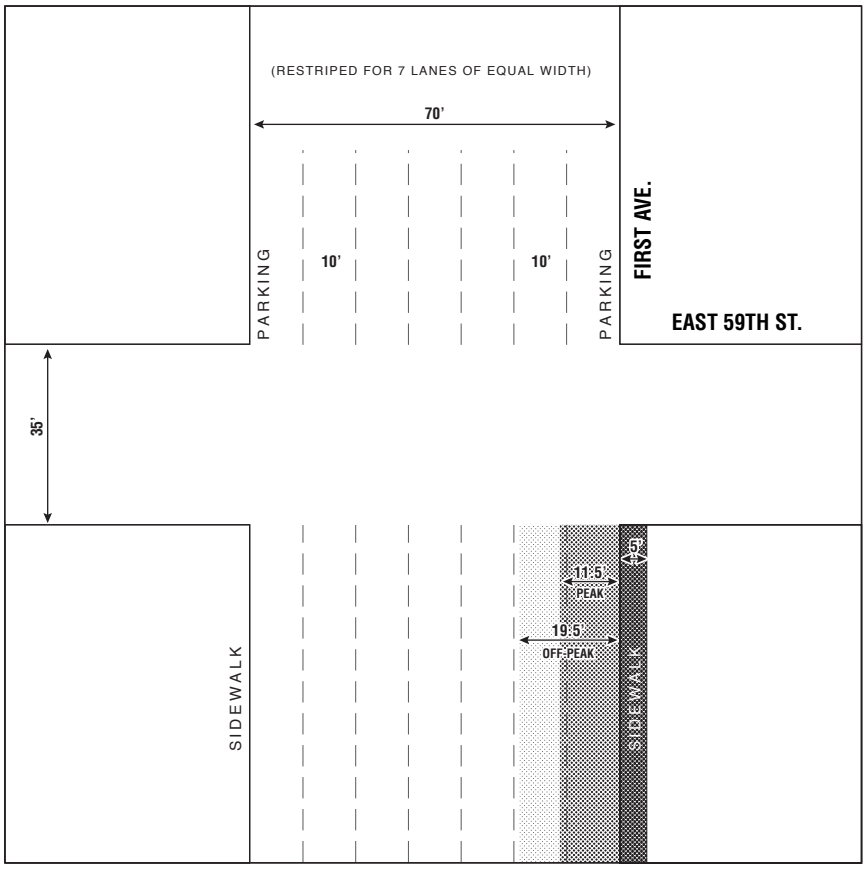
First Avenue (Reasonable Worst-Case) Route: Scenario B

Scenario B for the reasonable worst-case route would reduce the amount of First Avenue that would be affected during construction relative to the Base Scenario but would not affect the sidewalk. In this scenario, the two mains would not be constructed concurrently. For each segment, one main would be constructed completely prior to construction of the second main. This would allow for a slightly smaller work zone. For the first water main constructed under Scenario B, a construction zone of 10.5 feet (one lane along the eastern edge of First Avenue) would be required, and during the off-peak period, 18.5 feet (two lanes) would be required. For

BASE SCENARIO



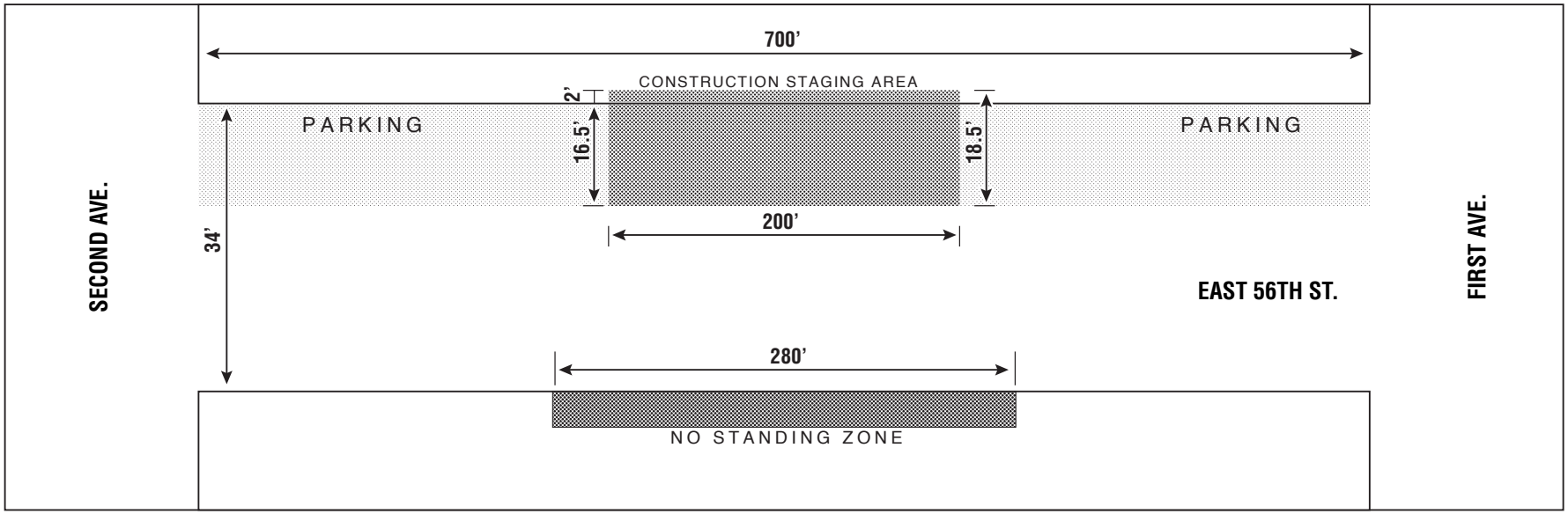
SCENARIO A



NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
WATER MAIN CONNECTIONS

POTENTIAL LANE CLOSURES FOR WATER MAIN CONNECTION ROUTE, FIRST AVENUE

FIGURE 5.1-5



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NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
WATER MAIN CONNECTIONS

POTENTIAL LANE CLOSURES FOR WATER MAIN CONSTRUCTION ON A CROSS STREET

FIGURE 5.1-6

the second water main, which would be laid beneath the second roadway lane from the eastern sidewalk, 18.5 feet of roadway (two lanes) would be required during peak and off-peak periods. The construction on the cross streets would be the same as in the Base Scenario.

First Avenue (Reasonable Worst-Case) Route: Scenario C

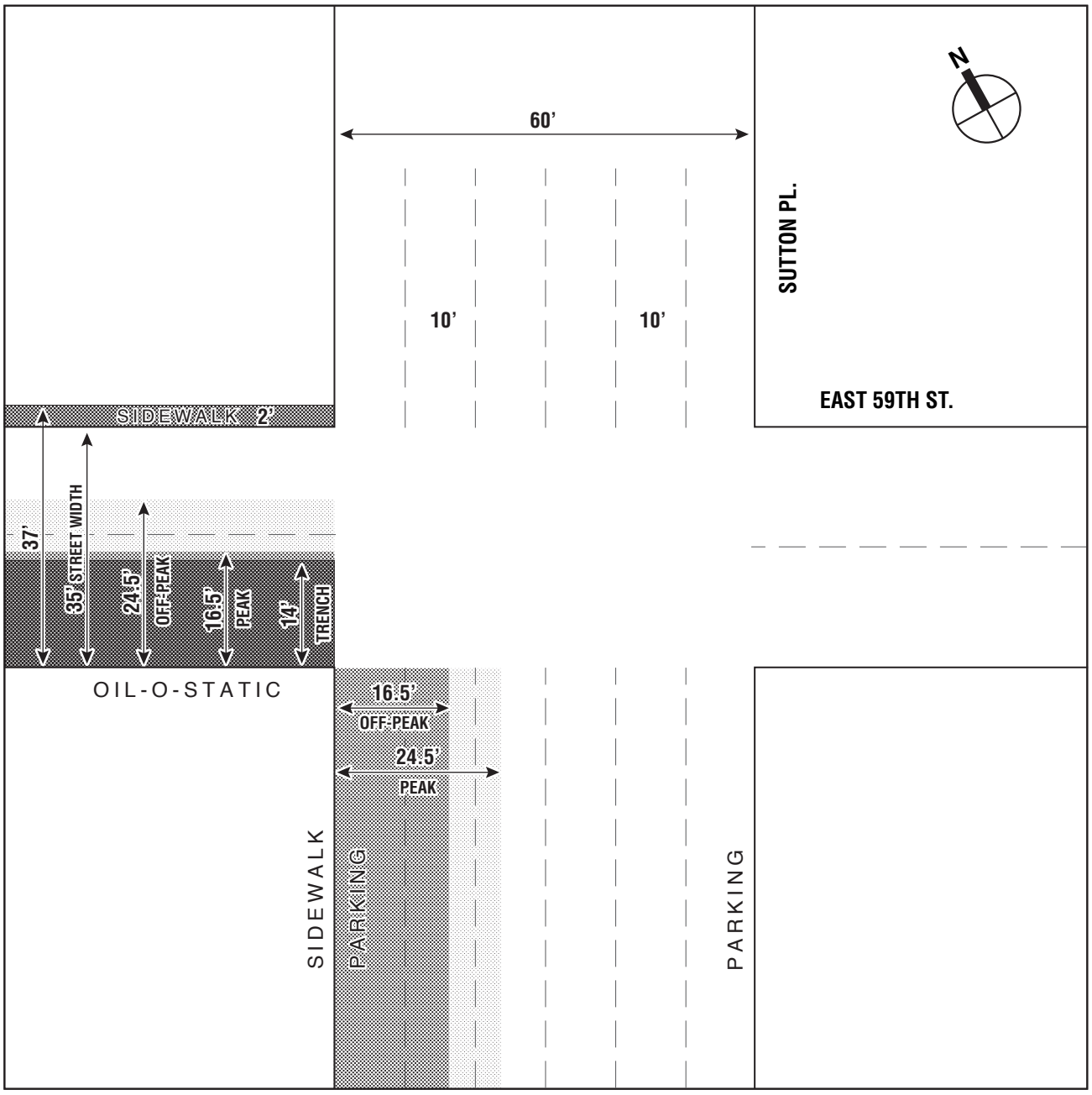
To further reduce the amount of the north-south avenue that must be disturbed during construction, Scenario C would divide the two water mains among two different avenues. One water main would be laid along the First Avenue route and one water main would be laid along the Sutton Place route. This would require the use of 10.5 feet of the avenue (one lane) during peak periods and 18.5 feet (two lanes) during off-peak periods. The construction on the cross streets would be the same as in the Base Scenario.

Sutton Place Route (Additional Representative Route)

The Sutton Place Route for the water main connections would require the same area of the north-south avenue as the Base Scenario for the reasonable worst-case route. This would involve the construction of the two water mains in the westernmost lanes of Sutton Place, using 16.5 feet (two lanes) of the avenue during peak hours and 24.5 feet (three lanes) during off-peak hours (Figure 5.1-7). The portion of the water main connection route along E. 59th Street from First Avenue to Sutton Place would be different from other cross streets described in this Section. Two water mains would be laid on this block of E. 59th Street, along the south side of the street. This would require the same width on E. 59th Street as for Sutton Place, which would affect all three existing traffic lanes during peak and off-peak hours, requiring reconfiguration of the street (as detailed in Section 5.9, "Traffic and Parking"). To provide additional roadway capacity, 2 feet of the sidewalk on the north side of E. 59th Street could be temporarily removed and used for vehicle traffic as part of the roadway, although this would require removal of street furniture (walk signs, signs, and fire hydrants) and 15 street trees (see Appendix 6 for details). The sidewalk area on the south side of E. 59th Street cannot be used for the construction zone because of the presence of underground Con Edison utilities there that would be very difficult to relocate. The construction on E. 55th and E. 56th Streets in the Sutton Place route would be conducted in the same manner as for the cross streets in the other scenarios. The addition of the blocks of E. 55th and E. 56th Streets between First Avenue and Sutton Place would increase the number of street trees (23 additional trees) and street furniture affected. A total of 94 trees may be affected. It is also possible that some additional street trees would be lost in locations where no sidewalk work is proposed, because of the excavation activities close to those trees.

E. 59th Street / E. 61st Street Route (Additional Representative Route)

As described above, this route would involve one 48-inch water main laid under the southern lane on E. 59th Street. The second 48-inch water main would be laid under the west side of First Avenue to E. 61st Street, and then under the center lane on E. 61st Street to Third Avenue. A total of 10.5 feet of First Avenue (one lane) would be required during peak periods and 18.5 feet (two lanes) during off-peak periods. Construction would occur on the west side of First Avenue rather than the east side. Construction on E. 59th and E. 61st Streets would occur in the same manner as for the cross streets in the other scenarios, except that no sidewalk area or trees would be affected



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PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
WATER MAIN CONNECTIONS

POTENTIAL LANE CLOSURES REQUIRED FOR WATER MAIN CONSTRUCTION, SUTTON PLACE ROUTE

FIGURE 5.1-7

on E. 61st Street since the water main would be in the center lane. A total of 26 street trees on the south side of E. 59th Street may be affected. It is also possible that some additional street trees would be lost in locations where no sidewalk work is proposed, because of the excavation activities close to those trees.

To maintain traffic flow on the block of E. 59th Street between First and Second Avenues, while construction of the water mains is occurring in the southern portion of the streetbed near Second Avenue, eastbound traffic from Second Avenue could be temporarily routed to the north side of E. 59th Street, passing over the location of the shaft. This traffic would have to pass north of the pier supporting the elevated Queensboro Bridge ramp, then curve back to the southern side of E. 59th Street farther east on the block. This northern detour would therefore pass through the small traffic island immediately east of the elevated Bridge ramp. Three honey locust trees on the traffic island would have to be removed to allow creation of the detour. Therefore, the total number of trees affected for the E. 59th Street/E. 61st Street route would be 29.

Estimated Construction Schedule

As explained above, based on typical water main installations in the City, construction of a block segment is conservatively estimated to take 12 weeks and construction of an intersection segment is estimated to take 10 weeks. The 12-week schedule for a block was developed based on installation of two water mains beneath an avenue block or one water main beneath an east-west block. To expedite the construction schedule, the contractor would likely mobilize multiple crews on two different non-adjacent segments at the same time. Construction activity would not occur during NYCDOT's holiday "black-out" period in November and December. The schedules for the reasonable worst-case and additional representative scenarios analyzed in this EIS are described below.

First Avenue (Reasonable Worst-Case) Route

A potential schedule for construction of the First Avenue water main route (Base Scenario) is depicted in Table 5.1-5. As shown in Table 5.1-5, the construction schedule for the reasonable worst-case route (First Avenue route) in the Base Scenario or Scenario A would consist of an estimated 3½ years (176 weeks, or approximately 41 months). This construction period would include several holiday "black-out" periods, during which no construction activities would occur. The schedule for the reasonable worst-case route includes a 20-week timeframe for the first segment (Segment 1), since this segment would include construction of the venturi chambers near the preferred Shaft Site.

Construction of the water main connections would likely begin while construction of Shaft 33B is under way, and would most likely be timed so that construction could be completed at approximately the same time as construction of the shaft is completed. If so, water main construction would be occurring simultaneously with Stages 2, 3, and 4 of the Shaft construction. Where appropriate, the potential combined effects of the water main construction and Shaft Site construction during the overlap period are assessed in this Chapter of the EIS.

Table 5.1-5
Estimated Construction Schedule for First Avenue Route
(Reasonable Worst-Case Route), Base Scenario

Segment	Total Weeks	Total Weeks for Selected Roadways Affected*					
		First Ave	55th	56th	59th	Second Ave	Third Ave
1: First Ave. from E. 59th to 58th St. First Ave. from E. 57th to 56th St. (this segment includes venturi chambers)	20	20					
2: First Ave. crossing E. 58th St. First Ave. crossing E. 56th St.	10	10		10			
3: First Ave. from E. 58th to 57th St. First Ave from E. 56th to 55th St.	12	12					
4: First Ave. crossing E. 57th St.	10	10					
5: E. 56th St. from First to Second Ave.	12			12			
6: E. 56th Street crossing First Ave. E. 56th Street crossing Second Ave.	10	10		10		10	
7: E. 56th St. from Second to Third Ave.	12			12			
8: E. 55th St. crossing First Ave. E. 55th Street crossing Second Ave.	10	10	10			10	
9: E. 55th St. from First to Second Ave.; First Ave. at preferred Shaft Site	12	12	12				
10: E. 55th St. from Second to Third Ave.; E. 59th Street crossing First Ave.	12	12	12		12		
11: E. 56th St. intersection at Third Ave.	10			10			10
12: Third Ave. from E. 55th to 56th St.	12						10
13: E. 55th St. intersection of Third Ave.	10		10				10
Holiday black-out periods	26						
Totals Weeks	178	96	44	54	12	20	30
Totals Months	41	22	10	12.5	3	4.5	7

Note: As noted in the text, construction would occur simultaneously on several roadway segments. For this reason, the totals for work on each individual roadway cannot be added to reach the total duration for the project (e.g., work can occur on First Avenue at the same time as on E. 55th Street)

Scenario B for the First Avenue route, in which the two water mains are not laid concurrently, would take longer to construct. The schedule would depend on the sequencing used and the extent to which multiple crews can be mobilized on different segments at the same time. Based on the schedule presented for the Base Scenario in Table 5.1-5, Scenario B could require an additional 88 weeks (20 months) of construction activity on First Avenue.

Scenario C of the First Avenue route is similar to Scenario B, in that the two water mains would be laid separately. One main would be laid on First Avenue and the other on Sutton Place. If the contractor could mobilize enough crews to lay the water main on Sutton Place at the same time as the water main is being laid on First Avenue, then the total duration for the construction work would be similar to the First Avenue route, Base Scenario, except that it would add three additional east-west blocks (E. 55th, E. 56th, and E. 59th Streets between First and Sutton Place, needed for the water mains to reach and return from Sutton Place). To maintain the same

schedule as in the Base Scenario would require a minimum of two crews working on each avenue. In the event that some work could not be conducted simultaneously, Scenario C could require the same amount of additional time up to an additional 88 weeks (20 months) to complete compared to the Base Scenario.

Sutton Place Route (Additional Representative Route)

The Sutton Place route would have a similar construction schedule to the First Avenue route's Base Scenario, except that it would require construction on three additional east-west blocks: E. 59th Street between First Avenue and Sutton Place, and E. 55th and E. 56th Streets between First Avenue and Sutton Place. Because two water mains would be laid in E. 59th Street, construction on this block is estimated at 24 weeks rather than the typical 12 weeks. Assuming that construction can be staged with several non-adjacent segments being constructed at the same time, as shown for the First Avenue route in Table 5.1-5, this route could require approximately 51 months, 10 months longer than the First Avenue route, because it would add three blocks and three intersections.

E. 59th Street / E. 61st Street Route (Additional Representative Route)

With a slightly shorter distance and fewer blocks to be affected, the E. 59th Street/E. 61st Street route would require less time to construct. As in the other routes, it is likely that multiple segments would be constructed simultaneously. However, because of the overhead Queensboro Bridge ramps that cross both E. 59th and E. 61st Streets between First and Second Avenues, water main work on these two blocks would have a longer duration, with an estimated 20 weeks on E. 59th Street and an estimated 22 weeks on E. 61st Street, rather than the typical 12 weeks on most east-west blocks. The work on First Avenue between E. 59th and E. 60th Streets would also require an estimated 20 weeks, because of the presence of the large Queensboro Bridge structure above. Using similar staging assumptions as those for the First Avenue route, this route could take up to 31 months to construct, 10 months less than the First Avenue route. Approximately 42 weeks (10 months) of construction would occur on each of E. 59th and E. 61st Streets.

5.1.5 Required Permits and Approvals

Construction of the new water main connections may require the certain permits or approvals from New York State or New York City agencies. NYCDDC would implement construction of the water mains, and therefore is treated an involved agency for environmental review under CEQR. In addition, the following other permits and approvals may be required:

- Metropolitan Transportation Authority (MTA) New York City Transit (NYCT) approval: Approval would be required from NYCT's Surface Transit Operations Division for temporary bus stop relocation during water main construction.
- NYCDOT Construction Activity Permits, Sidewalk Construction Permits, and Street Opening Permits: NYCDOT permits would be required for construction-related activities on sidewalks and within streets. These permits typically provide detailed stipulations for traffic and pedestrian control during construction.

- New York City Landmarks Preservation Commission (NYCLPC) review: NYCLPC will be required before in-ground disturbance along any potential water main route in order to address potential archaeological sensitivity along those routes. NYCLPC review will also be sought for construction of any water mains through designated New York City Landmark Historic Districts.
- New York City Department of Parks and Recreation (NYCDPR) Tree Work Permit: NYCDPR administers the street tree program in NYC. When street tree removal is required, NYCDPR must issue a permit and requires the project proponent to compensate the neighborhood for the loss of established greenery and provide additional street trees where possible in the general area of disturbance.

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