

A. INTRODUCTION

This chapter describes the effects the Second Avenue Subway would have on utilities and other subsurface structures, during both subway construction and operation. It also assesses the direct energy requirements for constructing and operating the new subway and the reductions in fuel and energy usage (and therefore total energy demand) that would result from the patrons riding the Second Avenue Subway instead of private cars, taxis, and buses. It concludes that temporary disruptions to some utility service could be required to allow the relocations required for project construction, but overall, neither construction nor operation of the new subway would result in significant adverse impacts on infrastructure (utilities) or energy.

B. EXISTING CONDITIONS**INFRASTRUCTURE**

Water, sewer, gas, steam, electrical, telephone, and cable services are provided to properties that abut the Second Avenue Subway alignment via utility lines buried beneath the alignment and adjacent side streets. Most of these utilities, other than sewers, are located from 3 to 10 feet below the surface. Sewers are typically 12 to 16 feet below the surface, but can be up to 45 feet deep in some locations. Following is a brief description of this existing infrastructure system.

WATER SUPPLY SYSTEM

Water flows to the city through a conveyance system composed of reservoirs, aqueducts and tunnels that run through the city between 200 and 800 feet below ground. Shafts bring water up from the tunnels, and pump stations adjust for elevation differences, as necessary. Within the city, a grid of large pipes distributes water from the shafts to consumers, such as to the buildings along and near Second Avenue. Trunk mains from the Croton and Catskill-Delaware reservoirs, the largest mains, are up to 60 inches in diameter, and the smallest mains, which lead to individual buildings, can be as small as 2 inches in diameter. As a prime north-south avenue in Manhattan, Second Avenue's subsurface contains large mains of up to 60 inches, with smaller mains that branch from these large mains to the side streets. In addition, 36-inch and 48-inch water mains cross the alignment. Water mains are under pressure, so they do not need to run in straight lines or at a downward slope. Typically, water mains are located at least four feet below the ground. The system is operated and maintained by the New York City Department of Environmental Protection (NYCDEP). NYCDEP is in the process of building a new water tunnel consisting of a system of aqueducts and feeder lines, which will increase the city's capacity for water delivery. The tunnel will be constructed approximately 350 to 400 feet beneath portions of Second Avenue.

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SEWER SYSTEM

Sewage generated in the Second Avenue Subway corridor is collected in a combined sewer system. This system conveys both sanitary sewage from residences and businesses located along the project alignment, as well as storm water collected in catch basins along the streets. During rain events when sewage treatment plant capacities are exceeded, excess flows from the sewer interceptors are discharged via combined sewer outfalls directly to the city's waterways. Typically, sewer mains along Second Avenue are larger than those on side streets, which in turn are larger than the smallest mains that connect to individual buildings, although some side streets carry larger cross-town mains. Sewer mains along the alignment include oval or egg-shaped, circular and rectangular pipes, ranging in size from up to a 9 foot by 8 foot box and between 1 and 8 feet in diameter. In most cases, the sewer flow is directed by gravity, gradually sloping downward toward the water pollution control plants or pump stations situated along the city's water bodies. Sewage from the alignment north of about 68th Street flows to the Wards Island water pollution control plant; flows from the south are directed to the Newtown Creek water pollution control plant. The city's sewer system, including the mains, the combined sewer outfalls, and the water pollution control plants, is operated by the NYCDEP.

GAS AND STEAM MAINS AND ELECTRICITY

Gas mains, ranging in size from 4 inches to 24 inches, provide natural gas along Second Avenue, which is used for heating and cooking. Gas mains are pressurized, and therefore do not need to run in straight lines. Typically, they are located 2 to 4 feet below the street surface. Steam mains serve some parts of the city, generally to heat buildings. The mains range in size from 8 inches to 24 inches and are always insulated to minimize heat loss. Including insulation, these mains range in size from 24 inches to 48 inches. Electrical cables and wires, including high-voltage transmission lines and low-voltage distribution lines, are also buried beneath the streets in Manhattan. High-voltage lines are encased in oil-filled conduits to keep them cool. Along the project alignment, numerous duct banks, carrying as many as 44 3½-inch diameter ducts, are buried. All three utilities are the responsibility of Consolidated Edison (Con Edison).

Along the Second Avenue corridor, Con Edison maintains low-pressure gas lines that supply individual buildings and high-pressure transmission pipes that support the gas supply system for all of Manhattan. The Second Avenue corridor also contains transmission steam mains, distribution steam mains, and other related infrastructure that support the Manhattan steam supply system on the East Side. In addition, the alignment has high voltage transmission feeders as well as additional transmission feeders intersecting the alignment. These feeders supply electricity to Con Edison's substations, which energize most of Manhattan's 33 electric network systems. Numerous distribution feeders, cables, transformers, and electric structures are also located beneath the alignment.

COMMUNICATIONS AND TELEPHONE LINES

Lines for telephone service are provided in conduits owned and maintained by the Empire City Subway Company (ECS), a subsidiary of Verizon. Each telephone service provider rents its duct space from ECS. As many as 132 conduits in a duct bank may be found along the alignment, each carrying hundreds of wire pairs. Altogether, thousands of cables run between manholes and buildings, providing telephone and telecommunications service to the buildings along Second Avenue. Cable service is also provided in the conduits owned and maintained by ECS, but some

separate ducts exist in a few locations; these are owned by Time Warner Cable, RCN, and other cable providers.

ENERGY

Electrical power in New York City was once generated and distributed by Con Edison as a government-regulated utility. However, during the 1990s, New York State recently initiated the deregulation of energy markets in the state, which has led to the sale of many of the state's electrical generating facilities, including Con Edison's, from regulated utilities to independently owned energy providers. The New York State Public Service Commission is responsible for overseeing power distribution in the state. In New York City, Con Edison has substantially reduced its power generating activities and is now primarily involved in the distribution of energy.

Electrical energy is produced from non-renewable sources such as coal, oil, nuclear fuel and natural gas, and renewable sources such as hydroelectric, biomass fuels, and wind. Some of this electricity is generated outside of New York City, at points as far away as Canada. Once generated, a transmission and distribution grid supplies high-voltage electrical power to and within New York City. The grid extends throughout New York State and is interconnected to electrical grids in the northeast and Canada, allowing electrical power to be imported from other regions as needed based on demand. High-voltage electrical power is converted to low-voltage electrical power at substations located throughout New York City for distribution to end users. At any given time, electrical energy might originate at a variety of facilities, including facilities in New York City, facilities elsewhere in New York State, and facilities elsewhere on the electric grid (anywhere in the United States and Canada).

According to Con Edison, the current peak load demand for New York City is currently slightly less than 11,000 megawatts (MW). During most periods, electricity generated within New York City is sufficient to satisfy its demand. The independent, non-profit New York State Reliability Council (NYSRC) has determined that a minimum of 80 percent of the city's peak load must be supported by in-city generating resources to satisfy reliability criteria consistent with those established by regional and national reliability councils. The New York State Independent System Operator has indicated that at present (2003), there is sufficient capacity in the city to meet the 80 percent requirement. However, during the peak summer demand period, the existing power supply system can be strained, even when electricity is imported from generating facilities in other regions, since transmission capacity has its own limitations. In August 2003, New York City, along with much of the Mid Atlantic, New England, the upper Midwest, and parts of Canada, experienced a blackout. The cause was related to distribution and transmission problems beginning in the Midwest, and not a lack of available power supply. As part of its normal planning and ongoing distribution and service improvement program, Con Edison upgrades localized areas of high demand within New York City as necessary. Electricity required for local load pockets may be transmitted from other parts of the New York City grid or from elsewhere as necessary.

In 2001, to address increasing capacity needs within the metropolitan New York City region New York State undertook a number of programs to ensure adequate electrical supplies in the near-term. The New York State Independent System Operator (NYISO) implemented special measures through the Emergency Demand Response and Day-Ahead Demand Bidding programs to reduce utility electrical power demand during peak load periods by encouraging facilities with emergency generators to operate them during critical demand periods. In addition, the New York

State Energy Research and Development Authority (NYSERDA) and various utilities have implemented new programs to assist businesses in reducing demand and becoming more energy-efficient. Finally, NYPA has purchased and installed 11 new, 44-MW, natural gas-fired, simple cycle turbine generating units (10 of which are located in New York City).

The average electric power demand for NYCT operations is currently 200 megawatts or 680 million British Thermal Units (BTUs per hour).¹ Peak power demand is approximately 350 megawatts, or 1,195 million BTUs per hour. Therefore, the peak electric demand for the NYCT subways is approximately 3 percent of the total New York City peak electric demand.

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

INFRASTRUCTURE

In the future, the utilities currently located along the proposed Second Avenue Subway alignment are likely to remain in place. Certain building or road construction projects could require temporary, localized service disruptions. In addition, continuous maintenance and repair of those sections requiring replacement would occur as defects are identified. There are no current plans for any large-scale reconstruction of existing water, sewer, gas, steam, electric, or telephone/communications facilities along the alignment. These existing utilities are expected to have enough capacity to accommodate future demand. The NYCDEP Bureau of Water Supply has long-range plans to upgrade the trunk and distribution mains along Second Avenue, but the schedule for implementation of this plan has not been established.

A portion of New York City's Water Tunnel No. 3 is planned for construction within the next 10 years in the Second Avenue Subway vicinity. As part of the second stage of construction, the water tunnel will be constructed from its current terminus on the West Side of Manhattan, south to Lower Manhattan, where it will loop around near the Manhattan Bridge and come north on the East Side to 34th Street at Second Avenue. At 35th Street just east of Second Avenue, a new shaft and distribution chamber are planned. The tunnel will then travel some 350 to 400 feet beneath Second Avenue to a new shaft and distribution chamber at 55th Street. Tunneling has begun, with the construction of the shaft sites to follow completion of the tunnel. Construction in the 34th Street area is expected to begin in 2007 but could begin as early as 2005.

ENERGY

As reported in the June 2002 New York State Energy Plan, electrical demand in New York State is projected to grow at an average annual rate of 0.99 percent between 2000 and 2021, with an annual peak demand growth of 0.92 percent forecast for the same time period. The near-term (2000-2006) average annual growth rate in the summer peak demand period for the New York area, however, is projected to be somewhat higher, at 1.14 percent. As demand increases over time, new generation will be needed to continue to satisfy the in-city generation criteria to provide generating capacity in the city for 80 percent of the in-city demand. Con Edison's projections indicate that a total of 819 megawatts of new in-city capacity will be required by

¹ British Thermal Units, or BTUs, are a measure of energy used to compare consumption of energy from different sources, such as gasoline, electricity, etc., taking into consideration how efficiently those sources are converted to energy. One BTU is the quantity of heat required to raise the temperature of one pound of water by one Fahrenheit degree.

2008, 1,143 megawatts by 2011, and 1,971 megawatts by 2020. 2020 is the latest projection year available at this time.

To ensure that an adequate supply of electricity is available to meet future growth demand at all times, including peak periods, a number of major electrical power generation projects are currently under development in New York State pursuant to New York State Public Service Law Article X, which sets forth a review process for considering applications to construct and operate electric generator facilities of 80 or more megawatts. New or repowered facilities, totaling approximately 10,781 megawatts of additional capacity, have been approved by the State Board on Electric Generation Siting and the Environment pursuant to Article X or have filed Article X applications. Of this total, 3,690 MW of capacity are currently under construction. In addition, plants that would total 330 MW are in active preliminary stages of development. Approximately 60 percent of the combined electrical generating capacity of these projects is located within New York City. It is expected that all the facilities to be built in New York City will be constructed and operating by 2007. As a result, adequate electrical generating capacity will be available in the New York City metropolitan area through the year 2025, and will exceed the anticipated increased demand.

In addition to increasing electrical generating capacity, electricity availability and reliability can be improved through additional transmission capacity in areas with a tight energy supply. Several transmission line projects are proposed or under development, which would improve the availability of electrical power for New York City. As the August 2003 blackout has been attributed to problems with the electricity transmission grid, reinforced transmission capacity will remain a focus for the region.

D. CONSTRUCTION IMPACTS OF THE PROJECT ALTERNATIVES

NO BUILD ALTERNATIVE

This alternative would not involve any construction either above or below ground and would therefore have no impact on subsurface utilities or energy supply in the study area.

SECOND AVENUE SUBWAY

INFRASTRUCTURE

During construction activities for the Second Avenue Subway, work that involves excavation of city streets could affect the utilities that are buried beneath them during all construction phases. Most tunnelling activities occurring below-ground would pass below the existing utilities and the only impact would be as a result of the small ground movements that could occur during tunnelling in soft ground sections (Maiden Lane to Houston Street, and north of 120th Street). In these areas, sensitive utilities may need to be replaced or protected prior to tunnelling. Sensitive utilities include gas and water mains in cast iron pipes, particularly those that have a history of leakage or are heavily corroded. Any construction activities that could disturb utilities would require special measures to protect them during construction and prevent damage to the mains or lines as well as outages to service. This could also include supporting, replacing, or relocating utilities, where necessary, to avoid service disruptions and maintain continuous service to utility customers. NYCT and its Preliminary Engineering team are currently coordinating with the utility providers and NYCDEP through a Second Avenue Subway Utilities Task Force. In this way, measures to address issues that could affect the utilities in the project alignment are

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incorporated into the project's design. An additional benefit is that utility-related decisions are made expeditiously.

Utilities that could be affected include sewers, water mains, and large ECS duct banks. Sewers might need to be relocated away from the centerline of the street to accommodate the new subway. Relocation would occur differently in areas where cut-and-cover construction is needed to build the tunnels from areas where this technique is used to build stations, because those activities would have excavations of different widths and elevations. While short-term outages typical of other construction projects in New York City could occur, measures would be taken to ensure that no significant adverse impacts would result.

To minimize environmental impacts resulting from disruptive surface construction, as well as cost and construction duration, NYCT is seeking wherever practicable to limit disruptive construction activities that would require utility relocations. As described in Chapter 3 of this FEIS ("Description of Construction Methods and Activities"), cut-and-cover construction techniques are being minimized where possible. Stations and tunnels in rock would be constructed by mining from below rather than excavating from the surface. Most stations have been designed to provide enough cover above that utilities can remain in place. Construction would support utilities in place, rather than relocating them, wherever practicable.

More specifically, in locations where cut-and-cover construction is required to build some tunnels, the new subway right-of-way would not occupy the entire roadway width, leaving space for the relocation of utilities on either side of the subway. Most stations would have center island platforms, which reduces the width that must be excavated for the station cavern. Alternatively, utility tunnels/chambers could be constructed adjacent to the subway structure, to provide easier access to the large utilities that would be restored deeper below the street. Smaller utilities would be relocated either above or adjacent to the subway tunnels. For locations where excavation would occur, utilities would typically be supported in place if they would not interfere with construction or with the final station structure configuration. This would often be accomplished by suspending the utility lines from the street deck beams that would be installed during the cut-and-cover construction process. Where interference is unavoidable, utilities would have to be relocated, and could usually be placed to the side of the station at mezzanine level, as this portion of the station would not necessarily be as wide as the platform level. In limited locations, utilities could be relocated onto streets adjacent to Second Avenue. For cut-and-cover construction for tunnels or stations, retaining techniques can sometimes allow utilities that cross the alignment to remain in place. The goal is to allow a supported pipe or duct to remain in place.

Sewer outfalls cross Second Avenue at several locations on their way to the East River. These outfalls have a vertical alignment that places them above the proposed subway alignment, and they would be maintained in place as subway construction proceeds. Large sewer lines are generally difficult and costly to relocate because they depend on gravity to sustain their flow, and therefore cannot simply be moved vertically without affecting their performance. Where sewers are affected, a new sewer line would have to be built parallel to the existing line outside the proposed tunnel limits, or the sewer could be regraded and/or rerouted. Sewers identified as being within the construction zone and requiring replacement, relocation outside the construction zone, or support in place, range in size from 15-inch diameter up to 9 feet by 8 feet 6 inches. Any sewer relocations or replacements would be performed in coordination with and under the review of the NYCDEP.

Steam mains may also have to be relocated. Before this is done, any asbestos-containing material would be removed in accordance with applicable laws. Any steam main encountered would be relocated out of the construction zone, or temporarily supported during construction. Other utilities, including Con Edison electric and gas lines, might also need to be relocated, but, with the exception of the high-voltage lines suspended in oil (such as those that may require relocation at the Chatham Square Station), these are relatively easy to relocate since these utilities are generally smaller in size. These utilities could either be accommodated within the construction zone or relocated out of the way. As some electrical and gas lines cannot be removed or replaced at certain times of the year, construction scheduling would have to accommodate the seasonal nature of utility relocation work. Work that might involve moving, replacing, or even supporting a high-voltage line will be avoided to the extent possible. NYCT would work with Con Edison to schedule and coordinate this work.

Among the utility relocations that would likely be required are the probable relocations of segments of the 60-inch water main and telephone line duct banks beneath Second Avenue. The 60-inch water main would be routed around the proposed subway construction, since the water in the pipe is pressurized. However, at certain pipe bends, the 60-inch steel water pipe may require thrust blocks. Thrust blocks are used by the NYCDEP to restrain the water main under pressure flow to prevent the pipe from moving as water flows through. As continuing engineering proceeds, decisions will be made regarding the need to relocate utilities. Relocation of the telephone duct banks would require the construction of new manholes at each end of the duct run, and would also require the splicing of the thousands of wires at the manholes that would be relocated. Relocation of telephone service can be a very time-consuming effort that requires early coordination with all communications companies.

It is anticipated that NYCDEP's construction near 34th Street for its Water Tunnel No. 3 project would be completed prior to Phase 3 of the Second Avenue Subway project, and that construction of the two projects would not occur simultaneously in that area. Nevertheless, the construction work for Water Tunnel No. 3 elements on Second Avenue, as well as the final location of any water tunnel components, including shaft and distribution chambers, would be carefully coordinated with construction and design activities for the Second Avenue Subway to avoid conflicts between the two projects if they were to overlap. The NYCDEP Bureau of Water Supply has long-range plans to upgrade the trunk and distribution mains along Second Avenue, but the schedule for implementation of this plan has not been established.

The approval of the utility relocation drawings and the maintenance of connections to buildings along the project alignment during the construction process would need to be addressed in advance of the construction. The design of the utility relocations and the subsequent approval of those designs by NYCDEP, Con Edison, and other utilities can take up to two years depending on the complexity and extent of the utility relocation. To begin this coordination early, meetings are already being held with representatives of the different utility providers whose infrastructure might be affected by the subway construction as part of the project's Utility Task Force. This has allowed the project engineers to redesign stations, where possible, to avoid conflicts with major utilities. Any unknown abandoned utilities encountered during the relocation process would be removed or would be addressed at the time of the encounter. Plans regarding the temporary or permanent relocation of a utility, and responsibility for and coordination of relocation work, would be drafted with each utility company or governmental agency. Overall, utility service would be maintained throughout construction, and no significant impacts would occur. If necessary, temporary outages would be limited to a few hours during the day and residents and

business would be notified through the community outreach process described in Chapter 4, “Public Outreach and Review Process.”

Existing NYCDEP sewers could also be affected during construction by the disposal of water from dewatering activities into the sewer system. Any water pumped from construction areas would be discharged into the existing sewer infrastructure, following NYCDEP review of this process. As engineering proceeds, the quantities of water that would flow into the sewer system would be determined and any effects of the discharge on existing sewer capacity will be further assessed. At Pier 6, pumped water could be released directly into surface water bodies, specifically the East and Harlem Rivers. New York State Department of Environmental Conservation (NYSDEC) approval of this process would be required. A monitoring program would be implemented to test the quality of the water prior to release into the sewer system or surface water. If necessary, water flowing directly into surface waters would be pretreated prior to release.

ENERGY

During construction, energy would be consumed by power construction equipment related to building the subway tunnels, stations, and associated facilities during all construction phases. This includes the fuel energy consumed by vehicles transporting workers, equipment, and excavated materials during the construction process.

Electrical power would be distributed by Con Edison. With the proposed phasing plan presented in Chapter 3, two TBMs may operate concurrently in separate locations, with an estimated maximum power requirement of 5.7 MW per TBM (including approximately 3.7 MW for each TBM and approximately 2.0 MW for the supporting site machinery required per TBM). This estimate includes all power that would be used during tunnel construction, including boring, spoils conveyance (both horizontal and vertical), supplying ventilation to the underground areas, pumping groundwater, and running elevator, lighting systems, and offices. This value is negligible compared to the current estimated in-city peak load demand of slightly less than 11,000 MW. The relatively small amount of electricity needed for tunnel construction (the most energy intensive construction activity) is unlikely to affect the ability of Con Edison to meet its peak load demands, and it is being reviewed with Con Edison. Power would be supplied to the construction sites through temporary substations at sites from which TBM tunneling is being staged. At station locations, some form of temporary electrical service would be required until the project’s permanent below-grade substations could be used to provide power for construction activities.

Other energy requirements would be supplied by fossil fuels used to power vehicles and equipment, and are thus considered separately from electrical power. Fuel would be consumed by construction equipment and by trucks and barges transporting materials and excavated spoils. In addition, fuel would be consumed indirectly by the construction project through the use of vehicles driven by workers to and from the construction sites.

The total energy consumption from electrical power sources during the total construction period would be approximately 390 billion BTUs. Including fuel sources, the total project energy consumption would be approximately 17 trillion BTUs. Table 13-1 details the total fuel and electrical energy use for each construction phase. The energy expenditures required during construction of the Second Avenue Subway are a “short-term use” compared with the long-term productivity of the subway.

Table 13-1
Second Avenue Subway Power
Consumption During Construction (Billion BTUs)

Phase	Electric Power Consumption	Fuel Power Consumption	Total Power Consumption
Phase 1	94	4,854	4,948
Phase 2	96	3,989	4,085
Phase 3	99	4,345	4,445
Phase 4	101	4,232	4,333
Total	390	17,421	17,811

E. PERMANENT IMPACTS OF THE PROJECT ALTERNATIVES

NO BUILD ALTERNATIVE

This alternative would not involve any new facilities either above- or below-ground, and would therefore have no impact on subsurface utilities or energy supply in the study area.

SECOND AVENUE SUBWAY

INFRASTRUCTURE

After construction, any utilities that had to be replaced or relocated would be in place. These water and sewer mains, conduits, and ducts would be newly built to current engineering and environmental standards. This would have the substantial benefit of greatly reducing the probability and frequency of failures and other problems in providing utility service in an otherwise old system.

The Second Avenue Subway, once completed, would itself have minimal effect on the project area's infrastructure. Connections to the city's water and sewer systems would be required at each station for restrooms and cleaning equipment. Most communications needs would be supplied by NYCT. While the tunnels and stations are designed to be watertight, some infiltration of water is expected; consequently, pump rooms would be located at low points along the alignment. This water inflow would be discharged into the city's sewer system. Occasionally the city's water mains rupture and flood the adjacent streets and buildings. This water finds its way to the lowest point in the area, which would often be the subway tunnels. Each pump room will be designed to handle these emergency situations, and would have pumps that would discharge this water into the city's sewer system.

ENERGY

During operation, electrical energy would be required to power the trains and operate supporting systems, such as track and station lighting, signals, switching equipment, computers, and heating, ventilation and air conditioning (HVAC) equipment. NYCT has estimated the electrical power demands that would be required for the Second Avenue Subway (see Table 13-2). More detailed power requirements will be determined after completion of continuing engineering. NYCT is committed to creating an environmentally responsible subway system and has integrated a Design for the Environment team to assess and if possible incorporate "green design" opportunities in the Second Avenue Subway project.

Table 13-2
Summary of Annual Electrical Power Forecast,
Second Avenue Subway¹

Project Element	Total Load
Passenger Stations ²	<u>14,784 kW</u>
Passenger Station Air Tempering	<u>17,000 kW</u>
Fan Chambers	<u>10,804 kW</u>
Pumping Facilities	<u>1,792 kW</u>
Signal Enclosure	<u>240 kW</u>
Traction Power Substation	<u>48,000 kW</u>
Total Power for the System	<u>92,620 kW</u>
Ancillary Facilities	<u>2,000 kW</u>
Project Total (Total Connected Load)	<u>94,620 kW</u>
Notes:	
1 <u>Current calculations are based on Con Edison service voltage of 13.2 kV.</u>	
2 <u>Assumes that each of the 16 stations would require 50 at 13.2 kV. This is equivalent to 14,784 kW services (16 x 50 = 800 AMP).</u>	
3 <u>Table has been updated since the SDEIS as a result of ongoing engineering.</u>	

While the new subway would increase electrical consumption, it would also reduce energy consumption associated with automobiles, by reducing the number of automobile trips and vehicle miles traveled in the region. The decrease in fuel consumption, resulting from a decrease in the number of automobile vehicle miles traveled (VMT), which is estimated to conserve approximately 161,000 BTUs annually, would partially offset the increase in electrical power by the new subway (see Table 13-3).

The additional 94.6 MW of power required for the Second Avenue Subway would be a very small fraction of the total energy consumed in New York City (about 0.7 percent of the projected 2020 load of 13,400 MW within the city). Furthermore, additional electrical generating capacity will become available in the next few years, which will be available prior to the project's completion year and is substantially greater than the estimated future project energy consumption.

As described in Chapter 20, "Commitment of Resources," the ability of transportation systems to conveniently serve major residential and employment centers is one of the essential components in economic growth and productivity in the New York metropolitan area and specifically Manhattan. The new subway would play a key role in helping the city sustain and improve its economic vitality, facilitating retention of jobs, expansion of existing businesses, and development of new businesses, helping to maintain the city's competitive edge. This would in turn reinforce energy-efficient development patterns in the region overall, by attracting and retaining compact urban development. As cited in proceedings of a recent meeting (April 2003) of the New York Academy of Sciences, New York City is the most energy-efficient place in the country, primarily because of its heavy reliance on electricity (subways and elevators) to move people and because New Yorkers also live and work in smaller quarters.

Table 13-3
Net Annual Energy Consumption for Second Avenue Subway

Travel Mode	New Change in Annual Vehicle Miles	Change in Annual Fuel Consumption (gallons)	Change in Annual Electric Power Consumption (kWh)	Total Change in Annual Energy Consumption (Million BTUs)
<u>Increase in Energy by New Subway</u>	11,049,600		<u>828,696,000</u>	<u>2,828,339</u>
<u>Decrease in Energy by Auto/taxi/truck</u>	<u>-28,400,000</u>	<u>-1,288,000</u>		<u>-161,000</u>
Total	-17,350,400	-1,280,000	828,696,000	2,667,339
Notes:				
<ul style="list-style-type: none"> • These increases are over the levels of the No Build Alternative. • It is assumed that bus vehicle service would not be affected for the Build alternative. • The autos/taxis/trucks vehicle miles estimate is based on STEAM Users Manual, FHWA, Exhibit 4.24, STEAM Scenario File, Parameter Assumptions. With light vehicles at 95 percent and heavy vehicles at 5 percent, assumes fuel consumption rate of 0.050 gallons per vehicle mile. • Annual electric power consumption is based on a maximum electrical consumption of <u>94.6</u> MW. • Conversion factor for fuel consumption by autos/taxis/trucks: <u>125,000</u> BTUs per gallon. • Conversion factor for electric power: 3,413 BTUs per kWh. • <u>Table has been updated since the SDEIS as a result of ongoing engineering.</u> 				

Power for operating the Second Avenue Subway and its ancillary facilities would be obtained from the existing Con Edison electrical grid and distributed from substations. These substations would be located below-ground within the envelopes of the subway station boxes. Substations produce electromagnetic fields (EMF) generated by electric current, which typically increase proportionately with electric loads. The consensus among the medical and scientific communities is that there is insufficient evidence to prove that EMFs cause adverse health effects. Based on previous studies performed on EMF from substations, such as a 2002 study by Eneritech Consultants, which took measurements near Consolidated Edison substations in Manhattan, EMF levels are estimated to be indistinguishable from background within a very short distance from the substations. In addition, the substations would be buried, limiting exposure opportunities.

F. SUMMARY OF SIGNIFICANT ADVERSE IMPACTS AND MITIGATION MEASURES

The analysis of infrastructure and energy concluded that neither construction nor operation of the proposed Second Avenue Subway would result in significant adverse impacts to infrastructure or energy. Therefore, no mitigation is required. *