F. VEHICULAR TRAFFIC

EXISTING CONDITIONS

STREET AND ROADWAY NETWORK

Traffic conditions in the study area vary in relation to a number of factors—the nature of the street and roadway network, surrounding land uses and the presence of major traffic generators, and the intensity of interaction between autos, taxis, trucks, buses, deliveries, and pedestrians.

The study area contains five subareas, or zones—Lower Manhattan, the Lower East Side, East Midtown, the Upper East Side, and East Harlem—and each has different street and roadway characteristics along its length. East Midtown, the Upper East Side, and East Harlem are characterized by a regular street grid, with avenues running north-south and streets running east-west. Each of the major north-south avenues—First, Second, Third, Lexington, Park, Madison, and Fifth Avenues—are major traffic carriers. There is just one limited-access roadway, the FDR Drive, which extends around the eastern edge of the study area from its northern end to its southern end. A general overview of the character of the street and roadway network in each of the five zones is presented below.

Lower Manhattan is characterized by an irregular grid pattern south of Canal Street. Except for a few major arterials, most streets within the area are narrow with usually just one "moving" lane. Travel is time-consuming and slow along them. Pedestrian traffic often overflows into the street space, further impeding vehicular traffic flow. Water Street and Broadway are the two key north-south streets in this area, and carry two or more effective travel lanes, yet are often difficult to negotiate due to frequent double-parked truck traffic. The FDR Drive begins its path to the northern tip of Manhattan along the East River at the Battery.

The Staten Island Ferry at Manhattan's southern tip, City Hall, and the Wall Street/Financial District commercial hub are the most significant activity generators affecting traffic flow in the Lower Manhattan. During the morning rush hours, the Staten Island Ferry unloads from 4,000 to 6,000 pedestrians into the immediate area, causing vehicular traffic to come to a standstill for minutes at a time. The "superblock" configuration of City Hall cuts off east-west through flow on Warren Street, Murray Street, and Park Place, and renders travel through this area difficult.

The primarily residential Lower East Side zone is characterized by a regular street grid north of Houston Street. However, the area to the south is marked by irregular and odd-angled intersections that are difficult to travel through. This part of the study area processes large amounts of through traffic between the East River crossings and commercial areas north and south. Key travel corridors include: First and Second Avenues, which act as a one-way street pair through the area; Allen Street; Broadway, Manhattan's central southbound spine; the Williamsburg Bridge; and the FDR Drive.

East Midtown contains the core of the eastern portion of Manhattan's Central Business District. It carries the highest traffic volumes in the study area, and has several distinguishing geometric features. Each of the area's north-south avenues have slightly different functions in processing vehicular traffic. Fifth and Madison Avenues act as a one-way pair for a significant amount of commuter and local bus traffic traveling directly into Manhattan's center. Park Avenue carries a significant amount of taxicabs destined to and from GCT at 42nd Street. Lexington and Third

Avenues are used as a north-south pair for a number of NYCT buses, and First and Second Avenues, situated to the east and out of the densest commercial areas, process a significant volume of through traffic. Also of note are a number of key east-west arterials that carry vehicles across the borough. Travel along 34th and 42nd Streets is slowed by difficult traffic signal progressions, but are generally considered better for through traffic than the "lesser" crosstown streets.

Major traffic generators in East Midtown include: Beth Israel Medical Center, the VA Hospital, Bellevue Hospital and NYU Medical Center along First Avenue between 14th and 34th Streets; the entrance and exit to the Queens-Midtown Tunnel; GCT at 42nd Street; the United Nations along First Avenue; and the Queensboro Bridge ramp system that intersects with a number of avenues and cross streets. The Queens-Midtown Tunnel operates with four lanes (two in each direction), one of which is a reversible lane during peak periods, processing westbound traffic into Manhattan during the AM and the reverse in the PM. The Queensboro Bridge has a number of ramps in Manhattan that process traffic, although currently only those that access the upper level via 57th and 58th Streets are reversible. Along the entrance routes to both the Midtown Tunnel and the Queensboro Bridge, vehicles queue, often requiring traffic enforcement agents to prevent gridlock.

The Upper East Side is bounded on the south and north by 60th and 96th Streets, respectively. Major avenues connect traffic to and from the East Midtown core just south of 60th Street. North-south traffic flows are typically slowed by frictions from truck deliveries to the many retail and commercial establishments lining the avenues. There are several Central Park transverses (65th/66th, 79th, and 86th Streets) which serve east-west travel and are also used heavily by NYCT bus routes. Significant land uses of note in the area that generate the bulk of traffic trips are high-density residential uses and the Museum Mile on Fifth Avenue.

East Harlem is similar to the Upper East Side in that it is mostly residential, and traffic proceeds through the area to employment points south. The key roadway is the 125th Street corridor, lined with Harlem's largest collection of commercial stores, and connected to points east via the Triborough Bridge at Second Avenue. Travel along 125th Street is slowed due to frequent shopper-related double parking, which often reduces street capacity to a single moving lane. Metro-North's 125th Street station is situated at Park Avenue.

OVERVIEW OF TRAFFIC TRENDS

Traffic volumes entering Manhattan have increased from the late 1940’s to about 1985. Since 1985, volumes have remained fairly constant. This is due, in part, to the congestion and delays encountered by motorists as they attempt to enter or leave Manhattan. The approach roads to and from the river crossings are generally subject to severe congestion throughout large parts of the day. Currently, more than 1 million vehicles enter Manhattan per day. Figure 9F-1 illustrates the total historical volumes at Manhattan bridges and tunnels in the study area between 1948 and 1993.

Traffic enters and exits the study area either from the West Side, via the various bridge and tunnel crossings along the eastern edge of Manhattan, or from the north end of Manhattan. A review of the most recent 1993 NYCDOT East River crossing traffic data indicates that traffic is evenly distributed among the nine bridges and tunnels in the study area (the Willis and Third

Avenue Bridges are considered as one paired bridge) both during peak periods and for the daily totals. No single crossing carries more than 17 percent of the study area's river crossing traffic, and, except for the lightly used Madison Avenue Bridge (4 percent), all crossings carry between 7 and 17 percent of the total crossing volume. The most heavily used crossings are the Willis Avenue Bridge (17 percent) at 126th Street, the Queensboro Bridge (16 percent), and the Brooklyn Bridge (16 percent). Each of these crossings processes some 65-70,000 vehicles per day per direction, and between 4,500 and 5,300 vehicles per peak hour per direction. The Manhattan and Williamsburg Bridges and the Queens-Midtown Tunnel each carry between 9 to 11 percent of the East River/Harlem River crossing traffic, processing some 35-45,000 vehicles per day per direction, and between 3,000 and 4,000 vehicles per peak hour per direction. Overall, about 830,000 vehicles use the East River/Harlem River crossings each day; within the peak hour, between 25,000 and 30,000 vehicles enter/exit per peak hour per peak direction.

The portion of the study area south of 60th Street, including East Midtown, the Lower East Side, and Lower Manhattan, is part of the “Hub,” which is one of the most densely concentrated commercial and office areas in the world. Hundreds of thousands of vehicles enter and leave the area each day, with almost half the vehicles entering the Hub at the 60th Street screenline.

In the 8-9 AM peak hour, most travel is into Manhattan. This traffic is mainly composed of motorists driving to work, buses providing mass transit access, and commercial vehicles making deliveries, with a small amount of traffic traveling completely through the area. Figure 9F-2 depicts the traffic volumes entering and leaving the Hub in the AM peak hour. As expected, most of the traffic is entering the area, although traffic volumes in the Holland Tunnel are close to a 50/50 directional split. The entry portal with the highest total volume is the 60th Street screenline. Almost 50 percent of the traffic entering the Hub area crosses 60th Street.

In the 5-6 PM peak hour, most vehicles are leaving the Hub. Figure 9F-3 depicts the traffic volumes entering and leaving the Hub in the PM peak hour. Approximately 49,000 vehicles leave the Hub during this hour, and over 38,000 vehicles enter the area. The traffic flows at both the Brooklyn Bridge and the Holland Tunnel are at approximately a 50/50 split with slightly more vehicles leaving than entering at each portal.

Twenty-four hour volumes entering and leaving the Hub are depicted in Figure 9F-4.

Traffic volumes crossing a screenline at 60th Street are depicted for the AM, PM, and 24-hour periods in Figure 9F-5. The FDR Drive, a three-lane per direction limited access roadway, carries more traffic than any other road in the study area during all three time periods. Second Avenue is the busiest of the avenues entering the Hub area, while First Avenue carries the highest volume of traffic for an avenue leaving the area. Both avenues carry traffic, particularly truck traffic, which is traveling around the edge of the core of the CBD. As expected, traffic volumes crossing the screenline are higher in the southbound direction (into the Hub) in the AM peak hour. In the PM peak hour, northbound volumes are somewhat greater, although the roadway with the highest volume is the southbound direction of the FDR Drive.

Volumes for a typical cross street in East Midtown were collected and analyzed. At a 28th Street screenline (see Figure 9F-6), the roadway with the highest volume in both the AM and PM peak hours continues to be the southbound direction of the FDR Drive. At this screenline, the avenues that are at the fringe of this part of the study area (First, Second, and Third

Avenues) carry far more traffic in the peak hours than the avenues in the interior, i.e., Lexington, Park, Madison, and Fifth Avenues.

MAJOR STREET TRAFFIC VOLUMES

Traffic volumes vary widely along the major north-south routes in the study area, from up to 3,000 to 4,000 vehicles per hour in some high-density sections to only several hundred per hour in other less dense areas. Volumes are at their peak in the East Midtown area.

Volumes are highest during the AM and PM peak commuter periods. The upper graph on Figure 9F-7 depicts volumes crossing the 60th Street screenline for the years 1984 and 1993. The data show that little change has occurred in temporal distribution. Vehicle flows build in the early morning periods before 6 AM, increase dramatically in the 6-9 AM period, and drop off slightly in the mid-morning hours. There is a minor increase during midday caused by delivery traffic that continues to build to the late afternoon commuter peak, usually 5-7 PM, before decreasing to low levels in the overnight periods. It is important to note that peak volume levels are maintained fairly consistently over many hours of the day, from close to 8 AM until and through much of the nighttime hours. The lower graph on Figure 9F-7 compares vehicle volumes and transit ridership data on a percent basis. As expected, transit has sharp peak usage which varies greatly from automobile usage.

Specific descriptions of the major avenue traffic flows and unique transportation features follow.

Fifth Avenue

Fifth Avenue is a one-way southbound street from 138th Street in East Harlem to Washington Square Park. North of 60th Street, Fifth Avenue has four travel lanes; south of 60th Street, an additional travel lane is available. As Fifth Avenue provides a central corridor through the CBD, it carries a substantial volume of bus traffic (160-170 buses per hour) during the morning inbound peak period. Fifth Avenue is also intensely used during the evening peak period.

During the AM peak period, traffic volumes increase steadily from 600-700 vph in East Harlem to 1,200-1,500 vph on the Upper East Side, to their maximum of 2,100 vph in the section between 42nd and 57th Streets. South of 42nd Street, volumes begin to steadily decrease south of the East Midtown core, from 1,500 vph near 34th Street to less than 700 vph south of Madison Square Park (23rd Street). During the midday periods, traffic flows along Fifth Avenue peak in Midtown at 1,400-1,600 vph and are maintained below 23rd Street as the avenue is used as a key delivery route. During the PM peak period, traffic volumes follow a pattern similar to that occurring earlier in the day, although the intensity of traffic volumes is slightly less than in the AM peak period.

Madison Avenue

Madison Avenue extends from 23rd Street to the 135th Street Bridge into the Bronx as a one-way northbound street. It forms a street pair with Fifth Avenue. South of 42nd Street, Madison Avenue provides four lanes for traffic (usually three lanes are "moving" lanes). North of 42nd Street, the avenue widens to a total of five lanes. Of note in this section are the dual bus lanes between 42nd and 59th Streets, which operate during the afternoon peak period to accommodate heavy northbound bus volumes. During this period, all lanes are maintained as moving travel lanes (with no parking lanes) to maximize capacity.

During the morning and midday peak periods, Madison Avenue carries modest traffic volumes compared to neighboring avenues, with volumes building to a Midtown peak of about 1,600-1,800 vph in the east 50's. The avenue is also used as a "deadhead" route for empty express buses returning to their depots, with some 300 empty buses recently recorded during the weekday 7-9 AM period. In the Upper East Side and East Harlem, volumes of 1,000-1,200 vph are consistently maintained in the AM and midday peaks. During the PM peak period in East Midtown, traffic volumes are in the 1,100 to 1,350 vph range, with an additional 160-170 buses per hour carried in the dual bus lanes.

Park Avenue

Park Avenue is one of the few two-way avenues in Manhattan. It has two sections separated by GCT. North of GCT, it has three moving traffic lanes per direction for most of its length into East Harlem. No buses travel along the section of Park Avenue north of GCT. South of GCT, Park Avenue/Park Avenue South narrows, usually with only two moving lanes available in each direction, and has a few bus routes using it as part of their run. The two sections are connected by a raised two-lane elevated roadway that wraps around and past GCT and touches down at 40th and 46th Streets. Commercial traffic is prohibited from utilizing Park Avenue as a through route.

Southbound traffic volumes in the northern section of Park Avenue are higher during the morning, ranging from about 700 vph in East Harlem to 1,800-2,000 vph near GCT. South of GCT, southbound traffic volumes initially decrease to about 600 vph between 40th and 30th Streets, and then increase to about 1,000 vph in the Union Square area. Midday traffic volumes are balanced in both directions of Park Avenue south of 60th Street, ranging from a 1,600 vph peak above GCT to 1,000 vph or less south of GCT. During the PM peak period, Park Avenue carries some 1,500 to 2,000 vph northward of East Midtown. South of GCT, traffic volumes are similar to those during midday periods.

Lexington Avenue

Lexington Avenue is a southbound street with five traffic lanes—three to four moving lanes in most sections in Midtown. The avenue is bounded on the south by Gramercy Park near 23rd Street and on the north by the Harlem River in East Harlem. During the AM peak period, inbound commuter traffic to Midtown is at its highest. Local truck deliveries are permitted along Lexington Avenue.

During the AM peak period, volumes in East Harlem are in the 500 to 700 vph range, and build to between 1,500 and 2,000 vph near 60th Street. South of GCT, volumes decrease to 500 vph toward Lexington Avenue's southern terminus. The midday periods show a similar pattern. During the PM peak period, traffic builds again into East Midtown (about 1,500 vph near GCT), but then drops off only slightly to some 1,000 vph or so as it proceeds farther south.

Third Avenue

Third Avenue runs northbound through most of Manhattan and the Bronx (via the Third Avenue Bridge). It carries two-way traffic up to 24th Street, north of which it carries five northbound travel lanes with an additional curb parking lane on each side. North of 24th Street, it forms a street pair with Lexington Avenue. South of 24th Street, the avenue narrows to three lanes in each direction (usually two moving lanes are maintained). South of 7th Street, Third Avenue merges into the Bowery. Local truck trips are permitted along Third Avenue.

A review of existing traffic volumes along Third Avenue throughout the day indicates that it is heavily used as a connection to the Queensboro Bridge at 59th Street. South of 23rd Street, volumes range from between 500 to 700 vph to a high of 1,000 vph per direction (along the Bowery). From 23rd Street to the Queensboro Bridge, traffic volumes average about 2,500 vph in the daily peak periods; north of the bridge, volumes decrease to just under 2,000 vph throughout the day. In the East 50's, volumes are within the 2,300 to 2,700 vph range during each daily peak period, with higher volumes noted for the later outbound commutes.

Second Avenue

Second Avenue is a southbound one-way street that forms a street pair with First Avenue. The avenue begins just off the Harlem River Drive at 128th Street and ends on the Lower East Side at Houston Street, where it merges into Chrystie Street. It has seven travel lanes, usually with five lanes available for moving traffic. The right lane is reserved for bus-only operations between 14th and 96th Streets from 7 to 10 AM. During the afternoon peak, a wide contraflow lane accommodates outbound bus traffic on the two-block approach (57th to 59th Streets) to the Queensboro Bridge. Between Houston and Canal Streets, First and Second Avenues continue their one-way pair function along Allen Street, a corridor with two travel lanes and a wide median. For vehicles with destinations south of Canal Street, vehicles must pass through Chinatown's eastern streets to access Water Street which connects to the Battery area. Local truck trips are allowed to travel along Second Avenue.

During the AM peak period, traffic volumes typically increase when traveling south along the avenue, from about 1,700 vph in the Upper East Side to a maximum of just over 3,500 vph near the Queensboro Bridge. Volumes decrease to 2,000 vph toward 14th Street. During the midday periods, traffic volumes exhibit a similar pattern (i.e., increasing toward the Midtown core, decreasing south of it), although the intensity of the level of traffic is about 20 percent lower than the AM peak. Traffic volume patterns during the PM peak period are nearly identical to those in the AM peak, which indicates that the avenue serves a number of travel functions that, when considered together throughout the day, result in a fairly uniform daily use. Traffic volumes are significantly lower on Allen and Water Streets with levels ranging between 500 and 900 vph during each of the weekday peak periods.

First Avenue

First Avenue runs northbound between Houston and 126th Streets, with seven traffic lanes (usually five moving lanes). Allen Street is the “extension” of First Avenue below Houston Street, and operates as a two-way street with three traffic lanes in each direction. During the 4-7 PM peak period, the right curb lane of First Avenue between 34th and 96th Streets is reserved for bus-only operations. Local truck trips are allowed to travel along First Avenue.

During the AM peak period, volumes south of 14th Street average less than 1,800 vph. There are a number of off-street parking garages in the immediate vicinity of the Bellevue Hospital and NYU Medical Center hospital area, causing block-to-block traffic fluctuations. North of the medical complex, volumes exceed 2,000 vph, reach their morning peak just above 60th Street with about 2,700 vph as vehicles near the Queensboro Bridge, and then decrease to the 1,000-

1,800 vph range farther north. During the midday periods, volumes are in the range of 1,500-2,000 vph, with the higher volumes at the East Midtown approach to the Queensboro Bridge. Traffic volumes peak during the late afternoon as outbound flows intensify. North of 14th Street, traffic volumes range from 2,300-2,700 vph, and increase further to greater than 3,000 vph near the Queensboro Bridge. Volumes decrease slightly on the Upper East Side to the 2,000-2,300 vph range, decreasing further above 96th Street to below 1,500 vph.

First and Second Avenues are the primary routes for the M15 bus line, which runs the entire length of Manhattan. A few local routes originating in the Lower East Side use short sections of each avenue toward the Midtown core. Two express bus lines (X90 and X92) from the Upper East Side make use of the avenues for closed door operation before entering the FDR Drive at 23rd Street. Express buses originating from Queens also use these two corridors between the Queens-Midtown Tunnel and the Queensboro Bridge. Finally, First Avenue was observed during recent field observations to be a "deadhead" route for buses traveling north after their morning inbound run.

FDR Drive

The FDR Drive is a six-lane highway that borders Manhattan's east edge and funnels traffic around Midtown and off Manhattan. As a limited-access facility, the FDR Drive does have several on- and off-ramps situated along its length. The highway does not permit commercial truck traffic, although some buses (such as the NYCT express X25, X90, and X92 routes and Brooklyn and Staten Island buses) do travel along it between 23rd and South Streets where weight restrictions allow their usage. The FDR Drive is most intensely used north of the Brooklyn Bridge, with recorded volumes approaching 4,000 to 4,500 vph (in the peak direction) in sections of the Upper East Side. However, traffic operations along the highway have been constricted recently by numerous reconstruction projects, which may be diverting motorists to nearby interior Manhattan avenues.

Other North-South Avenues Within the Study Area

Other north-south avenues within the study area include Water Street/Pearl Street in Lower Manhattan, which carries 300-700 vph throughout the day and connects with the Bowery and Allen Street above Chinatown; Fourth Avenue, which connects the Bowery with Park Avenue and carries volumes of 800 vph or less throughout the day; and York Avenue, a two-way street that extends between 57th and 92nd Streets on the Upper East Side and carries modest volumes of between 500 (near New York Hospital) and 1,000 (near the Queensboro Bridge) vph during peak periods.

TAXIS

Taxis represent a major component of the traffic stream throughout Manhattan, primarily in the East Midtown and Upper East Side sections of the study area. On Park Avenue, taxis account for as much as 70 to 80 percent of the total traffic volumes. Half the traffic along Fifth and Madison Avenues is composed of taxis. Along Third and Lexington Avenues, taxis account for between 40 and 50 percent of the total traffic volume.

Taxi volumes were counted across an East Midtown screenline at 54th Street, which is representative of some of the highest taxi levels in the study area. The counts were conducted on a typical midweek day in March 1995 to document their usage by time of day, noting both occupied and unoccupied vehicles for each north-south avenue. Taxi volumes were highest during the morning peak periods, after which the levels decreased steadily throughout the day. These counts are summarized in Figure 9F-8.

During the AM peak period, occupied taxi volumes were highest along southbound avenues destined into the CBD core. For each southbound route, 80 to 90 percent of all taxis were occupied. Fifth and Park Avenues had particularly high taxi volumes, with about 1,000 full vehicles noted in each hour between 7 and 9 AM. Northbound avenues had lower levels with each avenue averaging less than 700 taxis per hour. The greatest number of empty taxicabs were observed in the northbound direction, likely traveling to the Upper East Side for a return fare.

During the midday periods, taxi volumes were usually less intense, but most of those observed were occupied. Fifth, Madison, and Park Avenues showed a 75 percent taxi occupancy rate, with hourly taxi volumes averaging between 800 and 1,000 vph during the 12-2 PM period. Farther east, taxi usage appeared to be less intense (700-800 vph), with about half of all taxis occupied.

The PM peak period had the lowest number of taxis at the 54th Street screenline. However, key northbound avenues leading toward residential areas farther uptown were recorded with taxi occupancy levels of 90 percent or more. Overall, no avenue carried more than 750 taxis per hour during this period, and most had less than 500 vph.

In Lower Manhattan, where a number of subway lines and bus routes are available, taxi volumes and their use are low to moderate throughout the day. Along Wall Street and lower Broadway in the AM peak period, taxi volumes are about 200 per hour with only half of these occupied. Broad and Water Streets are used to a modest degree, with between 300 and 400 taxis traveling along these streets, and an occupancy rate of only 50 percent. During midday, taxicab use was significantly lower. All locations surveyed processed 100 to 200 taxis, with about a third of these vehicles carrying passengers. In the evening peak period, taxi use was at its lowest level, with most streets in the area carrying only 20 to 30 taxis per hour. The single exception was Water Street, which processed 200 to 250 taxis, with about half occupied. Use of private livery cars in the area, however, increases in the evening hours to service employees in the financial district.

Field observations on the Lower East Side indicated that taxi and car service volumes are modest (between 100 and 400 vph) along major streets such as First Avenue and Houston Street, and are low along internal streets. For example, taxi/car service volumes ranged from a low westbound on Houston Street of between 100 and 250 in the PM peak hour (about half occupied) to a high of about 350 taxis (about 20 percent occupied) in the AM peak hour. First and Second Avenues carry hourly taxi volumes in the 300 to 350 range during peak periods. Avenues A through D, south of 14th Street, carry low taxi volumes of less than 50 per hour throughout the day.

A unique taxi-ridesharing program is currently in place on the Upper East Side along the east side of York Avenue between 78th and 79th Streets. Each taxicab carries up to four passengers for a flat fare of $4.00 per person, and travels directly to Wall Street via the FDR Drive. While there is no signage indicating the presence of a special taxi loading zone or stand, it is clear that area residents use this service. Taxi drivers begin queuing after 6 AM, and continue loading there until about 10 AM. A recent 1995 count between 7:30 and 9:30 AM indicated that close to 400 people traveled in some 120 taxis.

Taxi volumes are less pronounced in East Harlem, where private livery vehicles provide a similar service to area residents.

TRUCKS

Truck traffic makes up a significant percentage of East Side traffic, ranging, in general, from 10 to 20 percent of the overall traffic stream, except for Park Avenue where through truck traffic is prohibited. Although they perform a vital function, trucks can have a significant impact on the street network, contributing to low travel speeds, congestion and, at times, blockages of curbside bus stops and the “second lane” away from the curb. NYCDOT has developed a series of regulations to balance the need for truck operations while at the same time moving traffic as smoothly and efficiently as possible. The influence of the NYCDOT truck regulations is described below.

There are two east-west streets (but no north-south avenues) in the study area designated as "through truck routes", routes that can be used by truck drivers who do not have an origin or destination within Manhattan. These streets are Canal Street and 34th Street. Canal Street, from West Street to the Manhattan Bridge, can be used by trucks 24 hours a day. However, 34th Street can be used as a “through truck route” only between the hours of 6 PM and 11 AM. Several avenues function as local truck routes. Drivers making a pick-up or delivery within Manhattan may use the “local truck routes” for access to their destination. Within the study area, all or part of First, Second, Third, and Lexington Avenues are local truck routes. Portions of Madison and Fifth Avenues are also local truck routes, but generally only in the vicinity of the crossings through Central Park. Trucks are not permitted on either Park Avenue or York Avenue except for local deliveries. Many of the major crosstown streets are also local truck routes.

There are three “limited truck zones” within the study area: the Lower East Side, Chinatown, and Little Italy. Drivers cannot enter streets in these area except to make deliveries. The Lower East Side “limited truck zone” is bounded by Wagner Place, St. James Place/East Broadway, Montgomery Street, and South Street. The Chinatown and Little Italy limited truck zones are bounded by Worth Street, Baxter/Centre/Lafayette Streets, Houston Street, and the Bowery.

There are length restrictions on vehicles in two areas: the Financial District and the Midtown Core. Unless the driver has a special permit, no vehicle longer than 33 feet can enter these areas during certain periods of the day, although a vehicle already in the restricted areas can remain and complete its deliveries. For the Financial District, the restrictions are in place between 11 AM and 2 PM on weekdays. In the Midtown Core, the restrictions are more severe; they are in effect from 12 Noon until 6 PM on weekdays. The Financial District restricted area is bounded by Whitehall Street, Broadway/Park Row, Frankfort Street, and Pearl/Water Streets. The boundaries of the Midtown Core restricted area are Seventh Avenue, 59th Street, Third Avenue, and 42nd Street.

TRAVEL SPEEDS

The New York City Department of Transportation annually records travel speeds along north-south avenues within the 7 AM-7 PM period in Midtown between 30th and 59th Streets (see Table 9F-1). Overall, travel speeds along the avenues range from about 6 to 13 miles per hour (mph).

Of all the East Side avenues, First and Second Avenues consistently show the highest travel speeds, ranging between 11 and 13 mph throughout the 7 AM-7 PM period. Fifth Avenue travel speeds are highest, at about 12 mph, inbound during the AM peak period, which indicate that there are few side interferences to overall travel along the corridor at that time. The slowest speeds, less than 6 mph, were recorded along Madison Avenue and southbound on Park Avenue during the 10 AM-1 PM period. In fact, Madison Avenue tends to have the slowest travel speeds of all East Side north-south corridors, with a 12-hour average speed of just over 6 mph.

As noted in the preceding section on surface transit, buses travel at even slower speeds than general traffic, because buses need to stop for passenger boarding and alighting in addition to

Table 9F-1

Automobile Travel Speeds by Avenue: Between 30th and 59th Streets

Avenue	7-10 AM	10 AM-1 PM	1-4 PM	4-7 PM	7 AM-7 PM
First Avenue (NB)	13.1	12.1	11.4	9.4	11.3
Second Avenue (SB)	11.4	12.3	11.9	13.7	12.2
Third Avenue (NB)	9.4	10.4	9.0	5.6	8.2
Lexington Avenue (SB)	8.6	9.6	9.3	10.5	9.5
Park Avenue (NB)	8.7	7.5	6.8	5.6	7.0
Park Avenue (SB)	9.1	5.8	7.7	9.9	7.8
Madison Avenue (NB)	8.6	5.1	5.8	6.9	6.3
Fifth Avenue (SB)	11.7	7.1	6.7	8.9	8.2

Source: NYCDOT Bureau of Traffic Operations, 1993.

having to contend with all of the impedances that affect general traffic. Combinations of slow general traffic speeds on the avenues coupled with bus stoppages for boarding and alighting contribute significantly to buses "bunching" in traffic, i.e., arriving in groups of two or more followed by significant gaps of time until the next bus arrives.

Travel speed delays are even more pronounced where traffic encounters major capacity bottle-necks—for example, at locations where East Side bridge and tunnel crossings touch down onto the street network. When gridlock-type conditions occur, travel times become highly unreliable, affecting all modes of travel.

CAPACITIES AND LEVELS OF SERVICE

Analysis Methodology

The capacity of urban streets is defined as the maximum number of vehicles that can pass through their intersections with other streets. Capacities are typically calculated on an hourly basis and expressed in passenger car equivalents per hour (pcph).

According to the *1985 Highway Capacity Manual*, the capacities of signalized intersections are based on three sets of inputs: (1) geometric conditions, including number of lanes, area type (CBD or other), and the existence of parking; (2) traffic conditions, including volumes by movement, vehicle classification, the number of parking maneuvers, and pedestrian conflicts; and (3) signalization conditions, including signal cycle length, phasing, and green-time ratios.

Level of service for signalized intersections is defined in terms of delay, with the conditions that the driver is likely to encounter at each level of service (LOS) as follows:

- LOS A describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when signal progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.
- LOS B describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. Again, most vehicles do not stop at the intersection.
- LOS C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (v/c) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines.
- LOS E describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios.
- LOS F describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios with cycle failures. Poor progression and long cycle lengths may also be contributing to such delays.

According to generally accepted practice, LOS A, B, and C reflect the existence of delays within an acceptable-to-tolerable range, and LOS D and E suggest delays increasing into often unacceptable or breakdown conditions (LOS F). For intersections south of 72nd Street, the NYCDOT-approved enhancements to the *Highway Capacity Manual* procedures were used.

Level of Service and Congestion Overview

LOS analyses for over 300 intersections in the study area were collected from a variety of traffic impact studies and EISs conducted over the past 10 years. Table 9F-2 summarizes the number of intersections with one or more approaches operating at LOS E or F, as reported in these previous studies. These studies indicate that in both the AM and PM peak hours, approximately 20 percent of the intersections reviewed have at least one approach operating at LOS E or F. However, most motorists experience poor operating conditions on many streets within the study area. At some locations, mid-block delays due to deliveries and illegal parking on both the avenues and crosstown streets limit the number of vehicles that can travel through a downstream intersection. At other locations, reasonably good operating conditions may be found for several blocks before delays occur at major signalized intersections (e.g., the intersections of avenues with major crosstown streets).

As part of this MIS/DEIS, capacity conditions at 82 critical intersections were re-analyzed. The 82 intersections selected for detailed traffic analyses include 6 intersections in Lower Manhattan, 17 on the Lower East Side, 30 in East Midtown, 24 on the Upper East Side, and 5 in East Harlem. This set of intersections comprises a representative set of analysis locations that could be significantly impacted by one or more of the alternatives being considered. It was selected to include representative intersections concentrated along the New York Bus Lanes' routes on First and Second Avenues, the LRT route through Lower Manhattan and the Lower East Side, and other locations that could be affected by traffic diverting away from the bus lanes and LRT alignment. The intersections were chosen to represent many of the critical intersections within in each of the five study subareas. These intersections are listed in Table 9F-3.

Table 9F-2

Number of Intersections at LOS E or F

Zone	No LOS E/F Approaches	One LOS E/F Approach	More Than One LOS E/F Approach	Total Intersections
AM PEAK HOUR				
East Harlem	12	2	0	14
Upper East Side	70	23	3	96
East Midtown	126	35	9	170
Lower East Side	17	1	0	18
Lower Manhattan	46	2	0	48
TOTAL	271	63	12	346
PM PEAK HOUR				
East Harlem	13	2	0	15
Upper East Side	72	18	4	94
East Midtown	138	31	6	175
Lower East Side	34	4	0	38
Lower Manhattan	45	2	1	48
TOTAL	302	57	11	370

Source: 27 EISs on file at the Department of City Planning.

Table 9F-3
Traffic Study Area Analysis Locations

Lower Manhattan	47th Street and Park Avenue
Water Street and Wall Street	47th Street and Madison Avenue
Water Street and Fulton Street	47th Street and Fifth Avenue
Pearl Street and Peck Slip	54th Street and First Avenue
Broadway and Cortlandt Street	54th Street and Second Avenue
Broadway and Vesey Street	59th Street and First Avenue
Church Street and Vesey Street	59th Street and Second Avenue
	59th Street and Third Avenue
Lower East Side	59th Street and Lexington Avenue
St. James Place and Madison Street	59th Street and Park Avenue
Canal Street and the Bowery	59th Street and Madison Avenue
East Broadway and Allen Street	59th Street and Fifth Avenue
East Broadway and Rutgers Street	
Madison Street and Rutgers Street	***Upper East Side***
East Broadway and Pitt Street	62nd Street and Second Avenue
Grand Street and Pitt Street	64th Street and Second Avenue
Houston Street and Avenue C	64th Street and First Avenue
Houston Street and Avenue D	63rd Street and York Avenue
Houston Street and First Avenue	68th Street and Third Avenue
Houston Street and Second Avenue	72nd Street and First Avenue
10th Street and Avenue C	72nd Street and Second Avenue
10th Street and Avenue D	77th Street and Park Avenue
14th Street and Avenue D	77th Street and Madison Avenue
14th Street and First Avenue	77th Street and Fifth Avenue
14th Street and Second Avenue	79th Street and York Avenue
14th Street and Third Avenue	79th Street and First Avenue
	79th Street and Second Avenue
East Midtown	86th Street and Third Avenue
23rd Street and First Avenue	86th Street and Lexington Avenue
23rd Street and Second Avenue	92nd Street and First Avenue
23rd Street and Third Avenue	92nd Street and Second Avenue
23rd Street and Lexington Avenue	96th Street and First Avenue
23rd Street and Park Avenue	96th Street and Second Avenue
23rd Street and Madison Avenue	96th Street and Third Avenue
23rd Street and Fifth Avenue	96th Street and Lexington Avenue
30th Street and First Avenue	96th Street and Park Avenue
30th Street and Second Avenue	96th Street and Madison Avenue
42nd Street and First Avenue	96th Street and Fifth Avenue
42nd Street and Second Avenue	
42nd Street and Third Avenue	***East Harlem***
42nd Street and Lexington Avenue	106th Street and First Avenue
42nd Street and Park Avenue	106th Street and Second Avenue
42nd Street and Madison Avenue	116th Street and First Avenue
42nd Street and Fifth Avenue	116th Street and Second Avenue
47th Street and Third Avenue	125th Street and Second Avenue
47th Street and Lexington Avenue	

These analyses indicate that about one-third of the intersections have one or more approaches with LOS E/F conditions during the AM peak hour. Approximately 50 percent of the critical intersections have approaches operating at LOS E/F conditions in the PM peak hour. Most of these locations are concentrated in East Midtown, with others on the Upper East Side and in Lower Manhattan. No section of the study area is immune to congestion and poor levels of service. Intersections operating at LOS E/F during both the AM and PM peak hours can be found in all parts of the study area.

A major problem encountered by motorists entering, leaving, or just traveling through Manhattan is the volume of traffic and resulting congestion on the approach roads for the river crossings. This congestion occurs not just during the AM and PM peak periods, but throughout the day. Figure 9F-9 depicts some significant areas of severe congestion in the study area. The approach roads to and from crossings such as the Queensboro Bridge, the Queens-Midtown Tunnel, and the Brooklyn Bridge are generally subject to severe congestion through large parts of the day. In addition, many of the primary roads within each part of the study area are subject to periods of congestion, particularly in the peak periods.

In the vicinity of the Queensboro Bridge, congestion on southbound Second Avenue extends north from 60th Street and can reach to 72nd Street. Vehicles on First and York Avenues also experience congestion, but generally to a lesser extent than vehicles traveling on Second Avenue. In the vicinity of the Queens-Midtown Tunnel, both 34th and 36th Streets experience severe congestion, as do the Second and Third Avenue approaches to the tunnel.

Motorists traveling to and from the East River bridges in Lower Manhattan and the Lower East Side (i.e., the Brooklyn, Manhattan, and Williamsburg Bridges) are also subject to severe congestion. Chambers Street and Delancey Street experience severe congestion in the immediate vicinity of the Brooklyn and Williamsburg Bridges, respectively. This congestion is not limited to the peak periods. During the middle of the day, both Chambers and Delancey Streets are congested by vehicle trips attracted to the shopping opportunities nearby. Specific sources of congestion include truck delivery activity, illegal parking, and conflicts with pedestrian movements. Chambers Street is also congested in the area east of Broadway because of the vehicular trips attracted to the various government buildings in the area, including City Hall and the Municipal Building. Canal Street, which connects the Manhattan Bridge with the Holland Tunnel, experiences severe congestion for its entire length. It is not unusual for portions of Canal Street to experience gridlock conditions throughout the day.

Motorists encounter severe congestion within Manhattan, not just at the access points. In Lower Manhattan, there are congested sections due to narrow streets, turns made at irregular angled intersections, and pedestrian activity. Pedestrian activity contributes to the congestion along most of the avenues and major cross streets on the Lower East Side, in East Midtown, on the Upper East Side, and particularly in the vicinity of GCT. In addition to pedestrians, the cross streets accommodate two-way traffic, bus routes, local deliveries, and through traffic. Within East Midtown, 23rd, 34th, 42nd, and 57th Streets share these operational characteristics and the congestion they cause. At the northern boundary of the Upper East Side, 96th Street also experiences congestion. In addition to the local and bus traffic, 96th Street is used for access to both directions of the FDR Drive. This through traffic contributes to the congestion on eastbound 96th Street during the PM peak period and even later into the evening.

Congestion is also prevalent in East Harlem, focused primarily on the 125th Street commercial corridor and at 125th Street and Second Avenue where the Triborough Bridge funnels significant volumes of traffic into and out of Manhattan.

The congestion in the study area has impacts on bus operations. When an auto, taxi, or truck uses the curb lane, which is a designated bus lane, either for a delivery or as a turning lane, buses swing out into general traffic to continue their trip. Because of the length of the bus, this maneuver into general traffic disrupts operations in the two lanes adjacent to the curb lane. The "shock wave" caused by repeated traffic stoppages in three lanes (curb lane and next two adjacent lanes) can travel upstream and disrupt the traffic flow along an entire section of an avenue or street.

FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

Based on modeling analyses completed for this study, areawide traffic volumes are projected to increase by about 12 percent by the year 2020, or about ½ percent per year. Some variations are expected by study area zone. Traffic volumes are projected to increase by approximately 9 percent growth on the Lower East Side, 10 percent in East Midtown, 11 percent on the Upper East Side, and 15 percent in Lower Manhattan and East Harlem.

This expected increase in traffic volumes will have a measurable effect on levels of service and speeds throughout the study area. As described earlier, to evaluate these effects, a set of 82 intersections were selected for detailed traffic analyses, including 6 intersections in Lower Manhattan, 17 on the Lower East Side, 30 in East Midtown, 24 on the Upper East Side, and 5 in East Harlem. This set of intersections comprises a representative set of analysis locations that could be significantly impacted by one or more of the alternatives being considered. Detailed level of service analyses have been performed at the 82 intersections for the project's four alternatives.

Intersection analyses were conducted using *Highway Capacity Manual* procedures, including NYCDOT-approved "enhanced procedures" below 72nd Street. Computed levels of service were field-checked to verify their ability to match actual traffic conditions. Significant traffic impacts have been defined as the following: a) No Build level of service (LOS) A, B, C or D deteriorating to LOS E or F under a Build alternative (i.e., TSM, Build Alternative 1, or Build Alternative 2), providing that the average vehicle delay increase is 10 seconds or more; b) No Build LOS E deteriorating to LOS F for a "build" alternative providing that the average vehicle delay increases by 10 seconds or more. This definition is consistent with the significant traffic impact criteria used in the Route 9A Reconstruction Project EIS. Also, deterioration from the No Build Alternative to a build alternative within either LOS E or F with 10 seconds or more of additional delay is defined for the purposes of this study as a significant worsening of a pre-existing problem. Mitigation measures are examined to alleviate both significant impacts and significant worsenings.

PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

The following discussion analyzes possible impacts on traffic conditions that could result from operation of the project alternatives. Impacts on traffic conditions during construction are discussed in Chapter 15 of this document.

NO BUILD ALTERNATIVE

Overall, significant deterioration in traffic levels of service can be expected with the No Build Alternative in the year 2020. As shown in Table 9F-4, for existing conditions there are five intersections operating at overall level of service E or F in the AM peak hour and there are six intersections operating at overall level of service E or F in the PM peak hour within the set of 82 intersections analyzed for this study (there are many other intersections where one or more approaches to the intersection may be at LOS E or F, but where the overall intersection does not operate at E or F because the other approaches operate at much better levels of service). With the No Build Alternative, the number of intersections operating at overall level of service E or F would increase to 20 intersections in the AM peak hour and 16 in the PM peak hour.

Table 9F-4
Summary Comparison of Overall LOS: No Build Alternative vs. Existing Conditions (Number of Intersections Per LOS)

	Existing					No Build				
	A/B	C	D	E	F	A/B	C	D	E	F
AM PEAK HOUR										
Lower Manhattan	3	2	1	0	0	2	1	2	0	1
Lower East Side	7	5	3	0	1	6	6	0	1	3
East Midtown	15	5	6	2	2	12	6	1	3	8
Upper East Side	8	12	4	0	0	5	9	8	2	0
East Harlem	3	1	1	0	0	2	0	1	2	0
Total	36	25	15	2	3	27	22	12	8	12
PM PEAK HOUR										
Lower Manhattan	5	1	0	0	0	4	2	0	0	0
Lower East Side	7	7	1	0	1	5	5	4	1	1
East Midtown	15	6	5	2	2	12	6	2	4	6
Upper East Side	9	11	3	1	0	7	7	7	1	2
East Harlem	4	0	1	0	0	3	1	0	1	0
Total	40	25	10	3	3	31	21	13	7	9

The sections below describe traffic conditions, including overall intersection level of service comparisons, by study area zone. Details of the analysis, showing volume-to-capacity (v/c) ratios, average vehicle delays, and levels of service by lane group for each intersection are documented in Appendix B, “Traffic Level of Service Analyses.”

Lower Manhattan

Table 9F-5 shows overall intersection levels of service for Lower Manhattan. During the AM peak hour, with the No Build Alternative, overall traffic levels of service would deteriorate marginally when compared to existing conditions, with just one of the six intersections analyzed expected to deteriorate into overall LOS E or F conditions. There are no significant overall level of service changes projected for the PM peak hour.

Table 9F-5
Overall Intersection LOS: No Build vs. Existing Conditions, Lower Manhattan

Intersection	AM Peak Hour		PM Peak Hour	
	Existing	No Build	Existing	No Build
Water Street and Wall Street	C	C	C	C
Water Street and Fulton Street	D	F	B	C
Pearl Street and Peck Slip	B	D	B	B
Broadway and Cortlandt Street	C	D	B	B
Broadway and Vesey Street	B	B	B	B
Church Street and Vesey Street	B	B	B	B

Lower East Side

Table 9F-6 shows overall intersection levels of service for the Lower East Side. Traffic impacts would be somewhat more pronounced in the Lower East Side than in Lower Manhattan. For existing conditions, only one of the 16 intersections analyzed shows overall LOS E or F conditions during the AM peak hour and only one during the PM peak hour; while with the No Build Alternative the number of intersections with overall LOS E or F conditions would increase to four in the AM and two in the PM.

Table 9F-6
Overall Intersection LOS: No Build vs. Existing Conditions, Lower East Side

Intersection	AM Peak Hour		PM Peak Hour	
	Existing	No Build	Existing	No Build
St. James Place and Madison Street	B	C	B	B
Canal Street and the Bowery	F	F	F	F
Canal Street and Allen Street	C	C	C	C
East Broadway and Rutgers Street	C	C	C	D
Madison Street and Rutgers Street	B	B	B	B
East Broadway and Pitt Street	B	B	B	B
Grand Street and Pitt Street	B	B	B	B
Houston Street and Avenue C	B	B	C	C
Houston Street and Avenue D	C	C	B	C
Houston Street and First Avenue	C	C	C	D
Houston Street and Second Avenue	D	E	D	E
10th Street and Avenue C	B	B	B	C
10th Street and Avenue D	B	B	B	B
14th Street and First Avenue	D	F	C	D
14th Street and Second Avenue	D	F	C	D
14th Street and Third Avenue	C	C	C	C

East Midtown

Table 9F-7 shows overall intersection levels of service for East Midtown, where the most significant impacts with the No Build Alternative are projected to occur. Since traffic congestion is generally more pronounced in this area, 30 intersections were analyzed. During both the AM and PM peak hours, there are four intersections operating at overall LOS E or F for existing conditions. With the No Build Alternative, this number would increase to 11 intersections in the AM and 10 in the PM.

Upper East Side

Table 9F-8 shows overall intersection levels of service for the Upper East Side. For existing conditions, there are no intersections operating at overall LOS E or F in the AM, and one intersection operating at these levels of service in the PM. For the No Build Alternative, there would be two intersections operating at overall LOS E or F during the AM and three during the PM.

East Harlem

Table 9F-9 shows overall intersection levels of service for East Harlem. There would also be some level of service deterioration in the East Harlem zone with the No Build Alternative. Five intersections were analyzed. For existing conditions, none operate at LOS E or F conditions overall in either the AM or PM peak hours. For the No Build Alternative, two intersections would be at LOS E or F in the AM peak hour and one intersection would be at LOS E or F in the PM peak hour.

Table 9F-7
Overall Intersection LOS: No Build vs. Existing Conditions, East Midtown

Intersection	AM Peak Hour		PM Peak Hour	
	Existing	No Build	Existing	No Build
23rd Street and First Avenue	B	B	B	B
23rd Street and Second Avenue	D	F	C	E
23rd Street and Third Avenue	F	F	F	F
23rd Street and Lexington Avenue	C	C	C	C
23rd Street and Park Avenue	D	F	D	F
23rd Street and Madison Avenue	B	B	B	D
23rd Street and Fifth Avenue	D	F	B	B
30th Street and First Avenue	B	B	B	B
30th Street and Second Avenue	B	B	B	B
42nd Street and First Avenue	C	C	C	C
42nd Street and Second Avenue	B	C	B	B
42nd Street and Third Avenue	E	F	C	D
42nd Street and Lexington Avenue	D	E	B	C
42nd Street and Park Avenue	B	C	C	C
42nd Street and Madison Avenue	C	C	B	B
42nd Street and Fifth Avenue	C	D	C	C
47th Street and Third Avenue	B	B	B	B
47th Street and Lexington Avenue	B	B	B	B
47th Street and Park Avenue	B	B	B	C
47th Street and Madison Avenue	B	B	B	B
47th Street and Fifth Avenue	B	B	B	B
54th Street and First Avenue	B	B	B	B
54th Street and Second Avenue	B	B	B	B
59th Street and First Avenue	E	F	D	E
59th Street and Second Avenue	F	F	E	F
59th Street and Third Avenue	B	C	D	E
59th Street and Lexington Avenue	D	F	F	F
59th Street and Park Avenue	D	E	D	F
59th Street and Madison Avenue	B	B	D	E
59th Street and Fifth Avenue	C	E	E	F

Table 9F-8

Overall Intersection LOS: No Build vs. Existing Conditions, Upper East Side

	AM Peak Hour		PM Peak Hour	
Intersection	Existing	No Build	Existing	No Build
62nd Street and Second Avenue	B	B	D	F
64th Street and Second Avenue	C	D	D	E
64th Street and First Avenue	D	E	C	D
63rd Street and York Avenue	D	E	C	C
68th Street and Third Avenue	B	B	B	B
72nd Street and First Avenue	B	C	B	C
72nd Street and Second Avenue	C	C	B	B
77th Street and Park Avenue	C	C	C	C
77th Street and Madison Avenue	B	C	B	B
77th Street and Fifth Avenue	B	C	B	B
79th Street and York Avenue	C	D	C	D
79th Street and First Avenue	C	C	C	D
79th Street and Second Avenue	B	B	B	B
86th Street and Third Avenue	B	B	B	C
86th Street and Lexington Avenue	C	C	B	B
92nd Street and First Avenue	B	B	B	B
92nd Street and Second Avenue	C	D	C	C
96th Street and First Avenue	C	C	E	F
96th Street and Second Avenue	C	D	C	D
96th Street and Third Avenue	C	C	C	C
96th Street and Lexington Avenue	D	D	C	D
96th Street and Park Avenue	C	D	C	D
96th Street and Madison Avenue	C	D	C	C
96th Street and Fifth Avenue	D	D	D	D

Table 9F-9
Overall Intersection LOS: No Build vs. Existing Conditions, East Harlem

Intersection	AM Peak Hour		PM Peak Hour	
	Existing	No Build	Existing	No Build
106th Street and First Avenue	B	B	B	B
106th Street and Second Avenue	B	D	B	C
116th Street and First Avenue	B	B	B	B
116th Street and Second Avenue	C	E	B	B
125th Street and Second Avenue	D	E	D	E

OVERVIEW OF THE TSM ALTERNATIVE AND BUILD ALTERNATIVES 1 AND 2

The TSM Alternative, Build Alternative 1, and Build Alternative 2 would each result in relatively modest decreases in areawide traffic volumes, as shown in Table 9F-10 below. Nevertheless, each of the alternatives would have very different impacts on traffic patterns and levels of service.

Table 9F-10
Areawide Traffic Volume Changes under the Alternatives: Traffic Volume Changes vs. No Build Alternative

Zone	TSM	Build 1	Build 2
Lower Manhattan	0	- 0.1%	- 1.5%
Lower East Side	- 0.3%	- 0.3%	- 3.5%
East Midtown	- 0.3%	- 0.3%	- 0.3%
Upper East Side	- 0.3%	- 0.3%	- 0.3%
East Harlem	- 0.3%	- 0.1%	- 0.1%

The TSM Alternative would cause a diversion of some traffic on First and Second Avenues in the area of the proposed bus lanes (i.e., Houston to 96th Streets), and somewhat farther north to other north-south routes. Parking regulation modifications would be needed along the length of the bus lanes to provide additional capacity at critical segments. With these parking modifications, the north-south avenues could generally operate within reasonable bounds, with some exceptions described in more detail below, most notably sections of First and Second Avenues within the influence area of the 59th Street-Queensboro Bridge.

Build Alternative 1, the northern subway alternative, would have no negative impacts on traffic flows since there would be a modest reduction in on-street traffic with no other physical changes needed at street level.

Build Alternative 2 would generate similar traffic conditions to Build Alternative 1 in East Midtown, the Upper East Side, and East Harlem since there would be no street configuration changes in those areas. In Lower Manhattan and the Lower East Side (including the 14th Street corridor), however, traffic operations would be affected by the presence of the LRT running within the street, side-by-side with vehicular traffic or sharing the same street right-of-way. The presence of the LRT would result in some diversions to other streets and would have significant impacts along selected streets and avenues, primarily the 14th Street corridor and parallel east-west streets, as described below.

TSM ALTERNATIVE

The TSM Alternative includes the implementation of New York Bus Lanes between Houston and 96th Streets, and the creation of new bus routes or modifications of existing routes in the Lower East Side. Only the New York Bus Lanes are expected to have a significant effect on traffic conditions, although the modification of bus routes in the Lower East Side would minimally increase overall vehicular volumes on some streets.

As described in Chapter 2 and in section E of this chapter, the TSM Alternative would create one-lane New York Bus Lanes along First and Second Avenues between Houston and 14th Streets, and two-lane New York Bus Lanes between 14th and 96th Streets. Figure 9E-11 in the preceding section of this presents a concept-level plan for a typical two-lane New York Bus Lane segment on First Avenue between 53rd and 62nd Streets. The objective of these priority bus lanes is to provide buses with a semi-exclusive right-of-way (i.e., two semi-exclusive lanes), that would increase their travel speeds and travel time reliability. Right-turning vehicles and other vehicles needing to deliver goods or pick up or drop off passengers would be permitted to use the bus lanes. Where there are bus stops, the sidewalk would be "built out" into the nearest travel lane in order to better define the bus stop, with the remainder of the block without the built-out sidewalk available and designated for curbside deliveries and/or parking.

In order to help accommodate general traffic that would no longer be allowed to use the two bus lanes, it would be necessary to implement more stringent parking regulations along the non-bus side of First and Second Avenues, at key locations where additional traffic capacity is needed. This would occur primarily at significant left turn locations. A preliminary plan was developed indicating where such parking prohibitions would likely be needed block-by-block, and the parking impacts of the plan are assessed in section G of this chapter.

Because the TSM Alternative's bus lanes would reduce street capacity otherwise available to general traffic, some through traffic can be expected to divert to parallel north-south routes. Based on modeling and an examination of available through capacity on parallel routes, an estimate was made of the diversions to other north-south avenues and to the FDR Drive. Overall, it is expected that about 8 percent of northbound through traffic currently on First Avenue would divert to parallel northbound routes, primarily to the next closest avenue, Third Avenue, with a limited volume diverting to Park Avenue, Madison Avenue, and the FDR Drive. Park Avenue and Madison Avenue have some capacity constraints (for Park Avenue, it is the need to go through or around GCT via the Park Avenue viaduct, while for Madison Avenue it is the fact that the avenue doesn't start until 23rd Street) as well as their location a few blocks west of where a First Avenue motorist wants to be. The FDR Drive is not a consistently reliable travel option for many motorists, although some motorists were assumed to divert to this roadway.

It is also expected that about 8 percent of southbound through traffic currently on Second Avenue would divert to parallel southbound routes, primarily Lexington Avenue, its closest southbound alternative, and only a limited volume would divert to Park Avenue, Fifth Avenue, and the FDR Drive. The rationale for this diversion assignment is consistent with that applied to the northbound trips.

Based on these assumptions, in general, about 125 to 200 vehicles per hour (vph) would divert off of First Avenue in the AM peak hour, with about 65 to 120 vph using Third Avenue and about 20 to 25 vph using Park and Madison Avenues (each) or other north-south routes. In the PM peak hour, about 150 to 250 vph would divert off of First Avenue, with 20 to 30 vph diverting to each of the other northbound alternatives. Similarly, about 150 to 250 vph would divert off of Second Avenue in the AM peak hour, with about 80 to 160 vph diverting to Lexington Avenue and 20 to 30 vph using other southbound alternatives, such as Park and Fifth Avenues and other options. In the PM peak hour, about 100 to 200 vph would divert off of Second Avenue, split similarly to Lexington, Park, and Fifth Avenues and other southbound avenues. Additional details are provided in the subarea discussions that follow and in Appendix B, "Traffic Level of Service Analyses."

In addition to these vehicle diversions, the traffic impact analysis accounts for modified traffic capacities at each of the intersections along First and Second Avenues. The preliminary operations plan developed for the bus lane treatments assumed that, where warranted, there would be turn lane modifications at specific points, and that parking and standing would be prohibited at locations where additional traffic-carrying capacity would be needed.

The broad conclusions of the traffic impact analyses of the TSM Alternative are as follows:

! The New York Bus Lanes would reduce the number of effective moving lanes available to general traffic by approximately half a lane. Although the bus lanes would take two of each avenue's six to seven lanes, some traffic would be allowed in the bus lanes (right-turning traffic, taxis, and commercial deliveries allowed to use the curb lane) and some additional general traffic lanes would be created along the non-bus side of the avenue. Therefore, roughly speaking, only about a half-lane of traffic capacity would be lost.

! Table 9F-11 shows a summary comparison of the overall level of service for the TSM Alternative compared with the No Build Alternative. During the AM peak hour, the number of intersections operating at overall LOS E or F would increase from 20 with the No Build Alternative to 22 with the TSM Alternative. During the PM peak hour, the number of intersections operating at overall LOS E or F would increase from 16 with the No Build Alternative to 20 with the TSM Alternative.

! Of the 82 intersections analyzed within the overall study area, with the TSM Alternative 18 would be significantly impacted or have significant worsenings in the AM peak hour, and 15 would be significantly impacted or have significant worsenings in the PM peak hour. These intersections would require mitigation above the parking prohibitions assumed to be needed as part of the New York Bus Lanes treatment. Candidate mitigation measures would include selected signal timing modifications, additional parking prohibitions, or other, preferably low-cost, means of providing required capacity. At some highly critical locations, such as the Second Avenue approach to the Queensboro Bridge/59th Street area, much more

Table 9F-11
Summary Comparison of Overall LOS:
TSM Alternative vs. No Build Alternative
(Number of Intersections Per LOS)

	No Build					TSM				
	A/B	C	D	E	F	A/B	C	D	E	F
AM PEAK HOUR										
Lower Manhattan	2	1	2	0	1	2	1	2	0	1
Lower East Side	6	6	0	1	3	6	5	2	2	1
East Midtown	12	6	1	3	8	8	7	3	4	8
Upper East Side	5	9	8	2	0	4	7	7	2	4
East Harlem	2	0	1	2	0	2	1	2	0	0
Total	27	22	12	8	12	22	21	16	8	14
PM PEAK HOUR										
Lower Manhattan	4	2	0	0	0	4	2	0	0	0
Lower East Side	5	5	4	1	1	5	5	3	2	1
East Midtown	12	6	2	4	6	7	8	4	3	8
Upper East Side	7	7	7	1	2	7	7	5	0	5
East Harlem	3	1	0	1	0	4	0	0	1	0
Total	31	21	13	7	9	27	22	12	6	14

significant mitigation would be needed if the New York Bus Lanes concept is to be a viable plan. Mitigation analyses are presented following this assessment of alternatives.

! In general, the New York Bus Lanes treatment appears to be a viable plan throughout its length with the implementation of standard capacity improvements, with two important exceptions: a) along First Avenue approaching 59th Street, a one-lane bus lane treatment can be accommodated, while a two-lane treatment cannot be accommodated without significant traffic impacts due to the concentration of traffic destined to the Queensboro Bridge; b) along Second Avenue approaching the Queensboro Bridge for several blocks, neither a one- nor two-lane bus lane treatment is viable without significant additional measures due to the excessive traffic demands placed on the traffic network both in the AM and PM peak hours. At this latter location, a more capital-intensive solution would be needed to make the bus lane concept work. (This is discussed in more detail at the end of section 9F, under "Traffic Mitigation.")

Details of the analyses by subarea follow.

Lower Manhattan

The TSM Alternative would have no impact on traffic conditions in Lower Manhattan (see Table 9F-12 and Figure 9F-10). There would be no new bus lanes created in the area, and no significant traffic volume changes.

Table 9F-12
Overall Intersection LOS: TSM Alternative vs. No Build, Lower Manhattan

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	TSM	No Build	TSM		
Water Street and Wall Street	C	C	C	C	—	—
Water Street and Fulton Street	F	F	C	C	—	—
Pearl Street and Peck Slip	D	D	B	B	—	—
Broadway and Cortlandt Street	D	D	B	B	—	—
Broadway and Vesey Street	B	B	B	B	—	—
Church Street and Vesey Street	B	B	B	B	—	—

Note: * Significant impact or worsening on any lane group or approach.

Lower East Side

The TSM Alternative would effect a very modest reduction in traffic volumes on the Lower East Side, i.e., less than ½ of 1 percent, which is equivalent to reducing traffic volumes on most streets in the area by five vehicles per hour or less. As shown in Table 9F-13, the intersection level of service analyses indicate that there would not be a significant improvement in level of service resulting from these modest volume reductions south of 14th Street. At 14th Street's intersections with First, Second, and Third Avenues, there would be some change in level of service due to the bus lanes. Two significant traffic impacts have been identified along 14th Street (see Table 9F-13 and Figure 9F-11), but the magnitude of these impacts can be mitigated via standard traffic engineering improvements, i.e., minor signal timing modifications.

East Midtown

A set of 30 intersections were analyzed in detail between 14th and 59th Streets, in addition to three other 14th Street intersections noted above (at First, Second and Third Avenues) which fall on the border of the Lower East Side and East Midtown zones. A summary of findings is presented in Table 9F-14 and Figure 9F-12.

The TSM analyses indicate that the creation of two-lane New York Bus Lanes would have significant impacts at key locations along First and Second Avenues as well as at selected critical locations along parallel north-south avenues. At all but one of these locations, the impacts could be mitigated via standard traffic engineering improvements; at the one remaining location, more cost-intensive mitigation measures would be needed.

Ten intersections were analyzed in detail along the route of the proposed First and Second Avenue New York Bus Lanes (actually 12 intersections, including the 2 intersections on 14th Street at the edge of the Lower East Side zone). There would be significant impacts at 6 of the 10 intersections, which subsequent mitigation analyses indicated could be successfully mitigated, resulting in no impact. Significant impacts at First Avenue's intersections with 23rd and 30th Streets and at Second Avenue's intersections with 42nd and 54th Streets can be mitigated by

Table 9F-13

Overall Intersection LOS: TSM Alternative vs. No Build, Lower East Side

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	TSM	No Build	TSM		
St. James Place and Madison Street	C	C	B	B	—	—
Canal Street and the Bowery	F	F	F	F	—	—
Canal Street and Allen Street	C	C	C	C	—	—
East Broadway and Rutgers Street	C	C	D	D	—	—
Madison Street and Rutgers Street	B	B	B	B	—	—
East Broadway and Pitt Street	B	B	B	B	—	—
Grand Street and Pitt Street	B	B	B	B	—	—
Houston Street and Avenue C	B	B	C	C	—	—
Houston Street and Avenue D	C	C	C	C	—	—
Houston Street and First Avenue	C	C	D	D	—	—
Houston Street and Second Avenue	E	E	E	E	—	—
10th Street and Avenue C	B	B	C	C	—	—
10th Street and Avenue D	B	B	B	B	—	—
14th Street and First Avenue	F	E	D	D	—	—
14th Street and Second Avenue	F	D	D	E	YES (PM)	—
14th Street and Third Avenue	C	D	C	C	YES (AM)	—

Note: * Significant impact or worsening on any lane group or approach.

Table 9F-14
Overall Intersection LOS:
TSM Alternative vs. No Build, East Midtown

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	TSM	No Build	TSM		
23rd Street and First Avenue	B	D	B	D	YES (AM)	—
23rd Street and Second Avenue	F	E	E	C	—	—
23rd Street and Third Avenue	F	F	F	F	YES (AM/PM)	—
23rd Street and Lexington Avenue	C	C	C	C	—	—
23rd Street and Park Avenue	F	F	F	F	YES (AM/PM)	—
23rd Street and Madison Avenue	B	B	D	C	—	—
23rd Street and Fifth Avenue	F	E	B	B	—	—
30th Street and First Avenue	B	B	B	F	YES (PM)	—
30th Street and Second Avenue	B	C	B	B	—	—
42nd Street and First Avenue	C	C	C	C	—	—
42nd Street and Second Avenue	C	E	B	D	YES (AM)	—
42nd Street and Third Avenue	F	F	D	E	YES (AM/PM)	—
42nd Street and Lexington Avenue	E	F	C	C	YES (AM)	—
42nd Street and Park Avenue	C	C	C	C	—	—
42nd Street and Madison Avenue	C	C	B	B	—	—
42nd Street and Fifth Avenue	D	D	C	C	—	—
47th Street and Third Avenue	B	B	B	B	—	—
47th Street and Lexington Avenue	B	B	B	B	—	—
47th Street and Park Avenue	B	B	C	C	—	—
47th Street and Madison Avenue	B	B	B	B	—	—
47th Street and Fifth Avenue	B	B	B	B	—	—
54th Street and First Avenue	B	C	B	D	—	—
54th Street and Second Avenue	B	F	B	D	YES (AM/PM)	—
59th Street and First Avenue	F	E	E	F	YES (PM)	—
59th Street and Second Avenue	F	F	F	F	YES (AM/PM)	**
59th Street and Third Avenue	C	C	E	E	—	—
59th Street and Lexington Avenue	F	F	F	F	YES (AM/PM)	—
59th Street and Park Avenue	E	F	F	F	—	—
59th Street and Madison Avenue	B	B	E	E	—	—
59th Street and Fifth Avenue	E	D	F	F	—	—

Notes:
* Significant impact or worsening on any lane group or approach.
** Unmitigated impact, unless cost-intensive mitigation is implemented.

signal timing modifications. These analyses would indicate that, in general, signal timing modifications or other readily implementable capacity improvements would be sufficient to accommodate traffic flows within the 14th to 59th Street corridor along First and Second Avenues, with two exceptions—at First and Second Avenues' intersections with 59th Street. At First Avenue/59th Street, the New York Bus Lane treatment would need to be scaled down to a one-lane treatment; otherwise it would not be possible to provide the amount of street capacity to other traffic at this one critical location. At Second Avenue/59th Street, even further mitigation would be necessary, which is discussed in detail later in this under, "Traffic Mitigation."

At nearly all of the other intersections analyzed west of Second Avenue—i.e., along the other north-south avenues at 23rd, 42nd, 47th, and 59th Streets—there would be no significant traffic impacts resulting from the diversion of some vehicle traffic to those other avenues, because the magnitude of expected diversions is small. At locations where significant impacts have been identified, they could be mitigated via standard traffic capacity improvements, such as signal timing modifications. Three exceptions to this are at the intersections of 23rd Street and Park Avenue, 42nd Street and Lexington Avenue, and 59th Street and Lexington Avenue, where diverted traffic would generate significant impacts. For some hours of the day, signal timing modifications would be sufficient to mitigate impacts, while at others it would be necessary to implement more stringent parking/standing regulations or better enforcement/intersection control (see the discussion of traffic mitigation later in this chapter).

Upper East Side

A set of 24 intersections were analyzed in detail between 60th and 96th Streets (see Table 9F-15 and Figure 9F-13), in addition to the seven intersections along 59th Street analyzed above as part of the East Midtown subarea. These analyses show that the TSM Alternative would generate some significant impacts along First, Second, and Third Avenues, which could be mitigated via standard traffic engineering improvements.

The two most difficult locations are the intersection of Second Avenue/62nd Street in the AM and PM peak hours and Second Avenue/64th Street in just the AM peak hour. This is consistent with the analyses conducted at Second Avenue and 59th Street. This set of three intersections along Second Avenue (59th, 62nd, and 64th Streets) indicates the difficulty in accommodating a two-lane bus lane treatment in this area approaching the Queensboro Bridge, which is heavily trafficked during the AM and PM peak periods. The level of service analyses show that there is not sufficient capacity to dedicate two such bus lanes, or even one such lane, with standard traffic engineering improvements; most cost-effective mitigation would be needed. This issue is addressed further under "Traffic Mitigation."

One other significant traffic impact requiring more than just signal timing changes was identified at First Avenue/96th Street, which is the focus of intense traffic demands en route to and from the FDR Drive just one block to the east. This location is heavily congested today, with gridlock conditions often not allowing motorists to pass through the intersection in either direction. Mitigation at this location would require deployment of one or more enforcement agents to ensure that green signal time, which is currently unused by traffic because of the gridlocked conditions, can be made usable in the future. This is a location at which enforcement agents have historically been deployed. Successful operation of the bus lane treatment would require consistent deployment of this mitigation in the PM peak period.

Table 9F-15
Overall Intersection LOS: TSM Alternative vs. No Build, Upper East Side

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	TSM	No Build	TSM		
62nd Street and Second Avenue	B	F	F	F	YES (AM/PM)	**
64th Street and Second Avenue	D	F	E	F	YES (AM/PM)	—
64th Street and First Avenue	E	C	D	B	—	—
63rd Street and York Avenue	E	E	C	C	YES (AM)	—
68th Street and Third Avenue	B	B	B	B	—	—
72nd Street and First Avenue	C	C	C	D	—	—
72nd Street and Second Avenue	C	D	B	C	YES (AM)	—
77th Street and Park Avenue	C	C	C	C	—	—
77th Street and Madison Avenue	C	C	B	B	—	—
77th Street and Fifth Avenue	C	C	B	B	—	—
79th Street and York Avenue	D	E	D	D	YES (AM/PM)	—
79th Street and First Avenue	C	F	D	F	YES (AM/PM)	—
79th Street and Second Avenue	B	D	B	B	YES (AM)	—
86th Street and Third Avenue	B	B	C	C	—	—
86th Street and Lexington Avenue	C	C	B	B	—	—
92nd Street and First Avenue	B	B	B	B	—	—
92nd Street and Second Avenue	D	F	C	F	YES (AM/PM)	—
96th Street and First Avenue	C	B	F	F	YES (PM)	—
96th Street and Second Avenue	D	D	D	D	—	—
96th Street and Third Avenue	C	C	C	C	—	—
96th Street and Lexington Avenue	D	D	D	C	—	—
96th Street and Park Avenue	D	D	D	D	—	—
96th Street and Madison Avenue	D	D	C	C	—	—
96th Street and Fifth Avenue	D	D	D	D	—	—

Notes:
* Significant impact or worsening on any lane group or approach.
** Unmitigated impact, unless cost-intensive mitigation is implemented.

East Harlem

The TSM Alternative would have no impact on traffic conditions in East Harlem (see Table 9F-16 and Figure 9F-14). There would be no new bus lanes created north of 96th Street, and there would be no significant traffic volume changes.

Table 9F-16
Overall Intersection LOS: TSM Alternative vs. No Build, East Harlem

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	TSM	No Build	TSM		
106th Street and First Avenue	B	B	B	B	—	—
106th Street and Second Avenue	D	C	C	B	—	—
116th Street and First Avenue	B	B	B	B	—	—
116th Street and Second Avenue	E	D	B	B	—	—
125th Street and Second Avenue	E	D	E	E	—	—

Note: * Significant impact on any lane group or approach.

BUILD ALTERNATIVE 1

Operation of a new subway under Second Avenue in the northern half of the study area is expected to result in a modest diversion of peak hour trips from auto and taxi modes to subway (see Table 9F-10). Less than ½ of 1 percent of current peak hour vehicle trips would be diverted to transit (0.1 percent in Lower Manhattan and East Harlem, and 0.3 percent on the Lower East Side, in East Midtown, and on the Upper East Side). This modest level of reduction is equivalent to about a 5 to 10 vph reduction on the major north-south avenues in East Midtown (e.g., First and Second Avenues), and less than a 5 vph reduction on Water Street and East Broadway in the lower half of the study area. In general, this level of vehicle trip reduction is not sufficient to significantly improve traffic levels of service within the overall East Side study area.

BUILD ALTERNATIVE 2

Construction of a new subway under Second Avenue in the northern half of the study area plus a light rail transit (LRT) line in Lower Manhattan and on the Lower East Side, terminating at Union Square along 14th Street, is expected to result in a somewhat more significant diversion of peak hour trips from auto and taxi modes to transit than would occur with Build Alternative 1. As shown in Table 9F-10, diversions from auto and taxi to transit are expected to be most pronounced on the Lower East Side, which is currently underserved by rail transit, and the LRT is projected to result in the diversion of 3.5 percent of Lower East Side traffic trips. It is also projected to divert about 1.5 percent of Lower Manhattan traffic trips. There would be very modest diversions from autos and taxis to transit in East Midtown, the Upper East Side, and East Harlem, similar to that projected for Build Alternative 1.

Even though the magnitude of the diversion in percentage terms is higher under Build Alternative 2 than under Build Alternative 1, the reduction in vehicle trips is only marginally different. For example, peak hour traffic along East Broadway on the Lower East Side would be reduced by about 5 to 20 vph per direction with the LRT with Build Alternative 2 in the AM peak hour and by 15 to 30 vph per direction in the PM peak hour, while with Build Alternative 1 East Broadway's peak hour traffic would be reduced by less than 5 vph per direction. Differences along Water Street in Lower Manhattan would be even lower—a reduction of 25 to 60 vph per direction with Build Alternative 2 versus a reduction of less than 5 vph per direction with Build Alternative 1.

The alignment of the LRT with Build Alternative 2 was described in detail in 2, and is discussed below in terms of its relationship to traffic patterns. Overall, the LRT line would begin at Broad Street and proceed within the middle of Water Street. Its right-of-way would not be exclusively dedicated to light rail vehicles; general traffic could use its right-of-way as well, except at LRT stations. Left turn slots could be fit into the 12-foot area between the LRT tracks at selected locations—on northbound Water Street at Fulton Street, on southbound Pearl Street at Peck Slip, and (farther south) on southbound Water Street at Maiden Lane and at Wall Street. In general, just one travel lane would be available to general traffic along most of Water Street and Pearl Street; in some cases it would just be the rail track on which the LRT would also operate. The interaction between bicycles and the LRT tracks will be addressed in the Final EIS if the LRT is part of the preferred alternative selected.

With the LRT alignment along Water and Pearl Streets, about 5 percent of the vehicle traffic on those north-south streets (generally about 30 to 60 vph per direction in the AM peak hour, and 25 to 50 vph per direction in the PM peak hour) are expected to divert to parallel north-south routes, primarily either South Street or Broadway, although neither of these streets nor others would receive a significant amount of new traffic.

The LRT alignment would turn left at Frankfort Street and extend along the north side of Frankfort Street for several hundred feet before entering a tunnel section on its path westward and then northward. The LRT tracks would emerge again onto street level along Canal Street just east of Allen Street. The LRT tracks would then follow the north side of Canal Street, with only eastbound vehicle traffic permitted to use the remaining two lanes of Canal Street between Allen Street and Essex Street. Westbound Canal Street traffic would be diverted to other cross-streets in the area. Since this volume on westbound Canal Street is relatively low (approximately 100 to 120 vph in the AM and PM peak hours) and is primarily oriented to local circulation since Canal Street does not go through once it reaches the Manhattan Bridge area, its distribution to a number of alternate local streets would result in some increases on other adjacent streets in the immediate area. Some westbound through traffic currently using East Broadway and then Canal Street approaching Essex Street would be expected to stay on westbound East Broadway. Orchard Street would also have to be closed off since traffic on it would not be able to cross the LRT right-of-way at the portal area; its volume of 60 to 65 vph in the AM and PM peak periods and 120 to 125 vph midday would need to divert to other parallel streets for local circulation.

The LRT alignment would then pass through the Straus Square area along the north side of East Broadway. The existing taxi stand area along the north side of Straus Square (between the traffic island and Seward Park) would be closed to non-LRT traffic, since the tracks and an

LRT stop would use this section of roadway. The taxi stand, which currently provides layover space for nine taxis, would need to be relocated to another blockface in the area.

The LRT would continue generally within the middle of East Broadway, although it would be offset slightly toward the north side of the street to allow for curb deliveries by trucks along the south side of East Broadway between Rutgers/Essex Street and Jefferson Street, before turning right onto Grand Street and then left onto Kazan Street. General traffic would generally be permitted to use the LRT right-of-way within this area since volumes along East Broadway are generally modest (about 150 vph in each direction during the AM and PM peak hours). With the presence of the LRT along East Broadway, some diversion of general traffic to other streets is expected—approximately 10 to 15 percent to Madison Street (both directions) and to westbound Grand Street. This volume of traffic diversion is modest—approximately 10 to 15 vph along each direction of Madison Street and westbound Grand Street.

Kazan Street is a short, relatively narrow, one-way northbound roadway, and the LRT tracks would utilize nearly all of its available width. Due to the relatively low traffic volumes on Kazan Street (approximately 30 to 50 vph northbound in the AM and PM peak hours), it may be possible to close it to through traffic, only permitting vehicles onto it with local destinations on the immediate street. One parking facility would be affected—the parking garage at the corner of Delancey Street and Kazan Street, which has access via both Delancey and Kazan Streets—if Kazan Street were to be closed to non-LRT traffic (there also are about 15 parking spaces along the east side of Kazan Street at this location off the street, i.e., adjacent to the garage). Access to Broome Street—a narrow alley extending from the east side of Kazan Street to Lewis Street one block east—would also be affected if Kazan Street were to be closed, although any traffic needing to access Broome Street could do so via Lewis Street.

The LRT would then continue northward along the east curb of Columbia Street and Avenue D, with the two lanes adjacent to the curb dedicated exclusively to LRT use. Columbia Street and Avenue D would be converted from two-way operation to one-way southbound operation, with one lane available to moving traffic and one curb parking lane permitted along most blocks; along blocks with an LRT stop, the southbound LRT platform would utilize one of the two southbound traffic/parking lanes, leaving just a single through traffic lane and no curb parking on those blocks. This would occur along Columbia Street between Houston and Stanton Streets (approximately 300 feet south of Houston Street), and along Avenue D at 7th/8th Streets and at 12th/13th Streets. Northbound traffic volumes on Avenue D (about 240 vph in the AM and PM peak hours) would be expected to divert primarily to Avenue C (about 120 vph in the AM and PM) and secondarily to Avenues A and B (about 60 vph per avenue). The assessment of potential impacts on traffic levels of service is presented later in this section of the DEIS.

Access to curb cuts within land uses along the east side of Columbia Street/Avenue D that lead to on-site parking lots would be affected, including the following: access to a parking lot for the New York City Department of Environmental Protection facility between 12th and 13th Streets (approximately 30 parking spaces); access to a parking lot within the Jacob Riis Houses complex at 9th Street (approximately 40 parking spaces); access to a parking lot for New York City Housing Authority employees within the Lillian Wald Houses complex at 5th Street (approximately 40 to 50 parking spaces); access to parking facilities for tenants of the Baruch Houses complex and New York City Housing Authority employees at Stanton Street (18 parking spaces and approximately 60 parking spaces, respectively); and access to a parking facility for tenants of the Baruch Houses complex at Rivington Street (26 parking spaces plus additional dropoff space at the on-site cul-de-sac). Northbound traffic that currently turns right into such driveways would need to approach their destinations via southbound Avenue C and then cross over the LRT tracks. Similarly, vehicles exiting from any of these driveways could not simply make right turns as they do today; they would need to cross over both LRT tracks and turn left onto southbound Columbia Street/Avenue D. For some traffic/parking movements, such as those at 9th Street and at 5th Street, access or egress could occur directly across Avenue D via the cross-street.

The LRT alignment would subsequently turn left from Avenue D onto 14th Street and utilize the middle of 14th Street for its two-way operation. The tracks would be spread apart by 10 to 12 feet to allow for center island LRT platforms at LRT stops and left turn lanes where such lanes can be fit into the plan. LRT stops are currently envisioned at First Avenue, Irving Place, and just east of Union Square Park. Left turn lanes could be accommodated within the design at the following locations: westbound at Second Avenue and eastbound at First and Third Avenues. General vehicle traffic would be permitted to drive along the LRT tracks except at LRT stops, where those section of the track alignment would be available for use only by light rail vehicles pulling into and out of the station stops. Although general traffic use of other sections of the LRT tracks would affect LRT operations, it is necessary and not unusual for dense urban settings like this. Otherwise there would be little capacity available for use by crosstown traffic on this important street.

The traffic model analyses indicate that about half of 14th Street's general traffic would be expected to divert off of 14th Street with the LRT operating along its length. The primary alternative east-west routes expected to be used by 14th Street traffic would be 23rd Street and Houston Street, although there would be some modest use of other more local east-west streets immediately north and south of 14th Street. Eastbound 14th Street traffic diversions are expected to occur primarily along eastbound 23rd Street, since 23rd Street would be the first major east-west street available to "intercept" traffic before it reaches 14th Street. About 150 vph are expected to divert to eastbound 23rd Street in the AM and PM peak hours, about 75 vph are expected to divert to eastbound Houston Street, and about 75 vph are expected to divert to other more local eastbound streets. Westbound 14th Street traffic diversions are expected to occur primarily along westbound Houston Street, since Houston Street would be the first major east-west street available to intercept traffic before it reaches 14th Street. About 100 vph are expected to divert to westbound Houston Street in the AM and PM peak hours, about 50 vph are expected to divert to westbound 23rd Street, and about 50 vph are expected to divert to other more westbound streets. Since both Houston and 23rd Streets are significant traffic carriers, traffic impact analyses for this level of diversions were conducted and the results of the analyses are presented later in this section of the DEIS.

Once the LRT begins to approach the Union Square Park area, the tracks would curve northward to the terminal stop east of the park. An operations plan and signal systems plan would need to be developed to allow the LRT to pass through the area to its terminal stop by stopping all other general traffic.

The general conclusions regarding traffic impacts of Build Alternative 2 are as follows:

- South of Houston Street, there would be only modest diversions of general vehicle traffic off of streets used by the LRT, since background traffic volumes are generally low and traffic levels of service are not highly problematic. Above Houston Street, there would be diversions off of Avenue D since the general traffic lanes next to the LRT tracks would operate southbound rather than two-way. Although there would be some impacts from the LRT 's use of two lanes of the streets it operates along and from diversions to other streets, these impacts are generally mitigatable with standard capacity enhancements like signal phasing and timing changes and more restrictive parking regulations.
- The number of intersections operating at overall level of service E or F would increase from 20 in the AM peak hour with existing conditions to 22 with Build Alternative 2. In the PM peak hour, the number of such intersections would increase from 16 to 21 (see Table 9F-17).

Table 9F-17

Summary Comparison of Overall LOS: No Build Alternative vs. Build Alternative 2 (Number of Intersections per LOS)

	No Build					Build 2				
	A/B	C	D	E	F	A/B	C	D	E	F
AM PEAK HOUR										
Lower Manhattan	2	1	2	0	1	2	0	2	0	2
Lower East Side	6	6	0	1	3	4	6	1	2	3
East Midtown	12	6	1	3	8	11	6	2	3	8
Upper East Side	5	9	8	2	0	6	8	8	2	0
East Harlem	2	0	1	2	0	2	0	1	2	0
Total	27	22	12	8	12	25	20	14	9	13
PM PEAK HOUR										
Lower Manhattan	4	2	0	0	0	3	0	2	0	1
Lower East Side	5	5	4	1	1	5	5	2	1	3
East Midtown	12	6	2	4	6	10	7	1	5	7
Upper East Side	7	7	7	1	2	8	7	6	1	2
East Harlem	3	1	0	1	0	3	1	0	1	0
Total	31	21	13	7	9	29	20	11	8	13

- Of the 82 intersections analyzed within the overall study area, 13 would be significantly impacted or have significant worsenings in the AM peak hour, and 14 would be significantly impacted or have significant worsenings in the PM peak hour with Build Alternative 2. These intersections would require mitigation above the parking prohibitions assumed to be needed as part of the LRT alignment plan. Candidate mitigation measures would include selected signal timing modifications, additional parking prohibitions, or other preferably low-cost means of providing required capacity. In addition, the unsignalized intersection of 14th Street and Avenue D would need to be signalized as part of operating the LRT through this intersection. The mitigation analyses are presented in the next section, following the assessment of each of the Build alternatives.

! The most significant traffic issues raised by the LRT operation result from its operation along 14th Street. The presence of the LRT would result in a significant diversion of traffic to other streets, primarily to 23rd Street and Houston Street, due to lost east-west capacity on 14th Street. These traffic diversions—as much as 50 percent of 14th Street traffic would divert elsewhere—would generate traffic level of service impacts requiring more extensive parking restrictions along the 14th Street and 23rd Street corridors.

These issues are discussed below by study area zone. The northern part of the study area, i.e., above 23rd Street, would be largely unaffected by Build Alternative 2. Similar to Build Alternative 1, the construction of a new subway line along Second Avenue north of 59th Street is projected to divert a very modest amount of traffic from autos and taxis to subway; traffic conditions would improve only marginally.

Table 9F-18

Overall Intersection LOS: Build Alternative 2 vs. No Build, Lower Manhattan

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	Build 2	No Build	Build 2		
Water Street and Wall Street	C	D	C	D	YES (AM/PM)	—
Water Street and Fulton Street	F	F	C	D	YES (AM/PM)	—
Pearl Street and Peck Slip	D	F	B	F	YES (AM/PM)	—
Broadway and Cortlandt Street	D	D	B	B	—	—
Broadway and Vesey Street	B	B	B	B	—	—
Church Street and Vesey Street	B	B	B	B	—	—
Note: * Significant impact or worsening on any lane group or approach.						

Lower Manhattan

As shown in Table 9F-18 and Figure 9F-15, Build Alternative 2 would create significant traffic impacts for north-south traffic at all three intersections analyzed along the Water Street/Pearl Street alignment of the LRT. They would require mitigation, either signal phasing and/or timing modifications or additional parking restrictions to increase capacity. At each of the three intersections analyzed away from Water Street/Pearl Street (Broadway at Cortlandt Street and at Vesey Street, and Church Street/Vesey Street), there would be no significant impacts because the LRT is not expected to create significant diversions of auto traffic off of Water and Pearl Streets.

Lower East Side

The operation of the LRT within the Lower East Side would produce some diversion of auto trips to the new transit mode that would reduce areawide volumes slightly. Also, there would be some modest diversion of traffic off of the route of the LRT to other nearby streets. In most cases, such diversions would not be significant. Overall, 17 intersections within the Lower East Side were analyzed to determine whether the LRT's utilization of street right-of-way and the diversion of traffic would create significant traffic impacts requiring mitigation. Table 9F-19 and Figure 9F-16 summarize the results of these analyses.

Of the 17 intersections analyzed, two intersections along Houston Street and three intersections along 14th Street were identified as likely to have significant traffic impacts requiring mitigation in the AM and PM peak hours. For the intersections of Houston Street with Avenues C and D, signal phasing and/or timing modifications would enable such impacts—resulting from the diversion of a substantial amount of through traffic from 14th Street to Houston Street—to be mitigated. For the intersections of 14th Street at First, Second, and Third Avenues, a combination of signal phasing and/or timing modifications together with additional curb parking restrictions would be needed to accommodate east-west traffic without significant impacts. It would also be necessary to install a traffic signal at the intersection of 14th Street with Avenue D (currently unsignalized) in order to better accommodate the movement of the LRT from northbound Avenue D onto westbound 14th Street.

Table 9F-19

Overall Intersection LOS: Build Alternative 2 vs. No Build, Lower East Side

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	Build 2	No Build	Build 2		
St. James Place and Madison Street	C	C	B	B	—	—
Canal Street and The Bowery	F	F	F	F	—	—
Canal Street and Allen Street	C	C	C	C	—	—
East Broadway and Rutgers Street	C	C	D	C	—	—
Madison Street and Rutgers Street	B	B	B	B	—	—
East Broadway and Pitt Street	B	B	B	B	—	—
Grand Street and Pitt Street	B	B	B	B	—	—
Houston Street and Avenue C	B	C	C	D	YES (AM/PM)	—
Houston Street and Avenue D	C	F	C	C	YES (AM/PM)	—
Houston Street and First Avenue	C	C	D	D	—	—
Houston Street and Second Avenue	E	D	E	E	—	—
10th Street and Avenue C	B	C	C	C	—	—
10th Street and Avenue D	B	B	B	C	—	—
14th Street and First Avenue	F	F	D	F	YES (AM/PM)	—
14th Street and Second Avenue	F	E	D	B	YES (AM/PM)	—
14th Street and Third Avenue	C	E	C	F	YES (AM/PM)	—

Note: * Significant impact or worsening on any lane group or approach.

Design of the LRT system through the area just east of Union Square and into the immediate periphery of Union Square Park would also require a traffic signalization plan that provides the

LRT with unblocked access to its terminal stop along the south edge of Union Square Park. This may have impacts requiring traffic signalization modifications as the LRT approaches and then crosses Fourth Avenue/Park Avenue South.

There would be no other significant level of service impacts created by the operation of the LRT, neither along East Broadway, which has relatively modest traffic volumes that can be accommodated together with the LRT on the street's 44-foot right-of-way, nor along streets paralleling the route of the LRT since only modest diversions are expected. Sample capacity analyses on Avenue C indicate that that avenue generally has sufficient capacity to accommodate the diversion of northbound traffic off of Avenue D since Avenue D would be made one-way southbound for general traffic operating in the two lanes available next to the LRT tracks.

East Midtown

Table 9F-20 and Figure 9F-17 summarize the results of the analyses for intersections in East Midtown with Build Alternative 2. The 23rd Street corridor would be significantly impacted, and require traffic mitigation, since the operation of the LRT along 14th Street is projected to divert a significant volume of east-west traffic to 23rd Street. Each of the seven intersections of 23rd Street between (and including) First Avenue and Fifth Avenue were analyzed. Five of the seven are expected to have significant impacts in the AM peak hour, and six of the seven would have significant impacts in the PM peak hour, since east-west traffic demands would exceed the capacity of the street. At each of the affected locations, these impacts could be mitigated either by signal phasing or timing modifications, more restrictive curb parking regulations, or a combination of these capacity enhancement measures.

Table 9F-20

Overall Intersection LOS: Build Alternative 2 vs. No Build, East Midtown

Intersection	AM Peak Hour		PM Peak Hour		Significant Impact or Worsening*	Unmitigated Impact
	No Build	Build 2	No Build	Build 2		
23rd Street and First Avenue	B	C	B	C	YES (PM)	—
23rd Street and Second Avenue	F	F	E	E	YES (AM/PM)	—
23rd Street and Third Avenue	F	F	F	F	YES (AM/PM)	—
23rd Street and Lexington Avenue	C	E	C	E	YES (AM/PM)	—
23rd Street and Park Avenue	F	F	F	F	YES (AM/PM)	—
23rd Street and Madison Avenue	B	B	D	F	YES (PM)	—
23rd Street and Fifth Avenue	F	F	B	C	YES (AM)	—
30th Street and First Avenue	B	B	B	B	—	—
30th Street and Second Avenue	B	B	B	B	—	—
42nd Street and First Avenue	C	C	C	C	—	—
42nd Street and Second Avenue	C	C	B	B	—	—
42nd Street and Third Avenue	F	F	D	D	—	—
42nd Street and Lexington Avenue	E	E	C	C	—	—
42nd Street and Park Avenue	C	C	C	C	—	—
42nd Street and Madison Avenue	C	C	B	B	—	—
42nd Street and Fifth Avenue	D	D	C	C	—	—
47th Street and Third Avenue	B	B	B	B	—	—
47th Street and Lexington Avenue	B	B	B	B	—	—
47th Street and Park Avenue	B	B	C	C	—	—
47th Street and Madison Avenue	B	B	B	B	—	—
47th Street and Fifth Avenue	B	B	B	B	—	—
54th Street and First Avenue	B	B	B	B	—	—
54th Street and Second Avenue	B	B	B	B	—	—
59th Street and First Avenue	F	F	E	E	—	—
59th Street and Second Avenue	F	F	F	F	—	—
59th Street and Third Avenue	C	C	E	E	—	—
59th Street and Lexington Avenue	F	F	F	F	—	—
59th Street and Park Avenue	E	E	F	F	—	—
59th Street and Madison Avenue	B	B	E	E	—	—
59th Street and Fifth Avenue	E	D	F	F	—	—

Note: * Significant impact or worsening on any lane group or approach.

Traffic impacts are not expected north of 23rd Street with Build Alternative 2, since diversions in that area would be generally negligible. Also, as was described for Build Alternative 1, there would be a modest level of diversion of traffic to the new subway line on Second Avenue which would slightly reduce areawide traffic activity, but not to a degree that measurable improvements in traffic levels of service can be identified.

Upper East Side and East Harlem

A new subway under Second Avenue in the northern half of the study area is expected to result in a modest diversion of peak hour trips from auto and taxi modes to subway. As shown previously in Table 9F-10, less than ½ of 1 percent of current peak hour vehicle trips would be diverted to transit (0.1 percent in Lower Manhattan and East Harlem, and 0.3 percent in the Lower East Side, East Midtown, and the Upper East Side).

As shown in Figures 9F-18 and 9F-19, there would be no significant traffic impacts in the Upper East Side and East Harlem, nor would the modest amount of vehicle trip reduction be sufficient to significantly improve traffic levels of service throughout this part of the overall East Side study area.

TRAFFIC MITIGATION

TSM ALTERNATIVE

The traffic impact analyses conducted at a set of 82 intersections within the overall East Side study area indicated that the New York Bus Lanes component of the TSM Alternative would result in some significant impacts, primarily along the First and Second Avenue routes of the semi-exclusive bus lanes, and to a lesser extent at some intersections of parallel north-south avenues with major crosstown streets. Detailed traffic mitigation analyses were undertaken for all locations where significant impacts or significant worsenings were projected, with the following conclusions:

- Signal phasing and/or timing modifications would be sufficient to mitigate significant impacts at all of the impacted locations with a few exceptions (noted below).
- 23rd Street and Park Avenue: It would be necessary to extend current "No Stopping" parking regulations over the entire northbound Park Avenue curb lane rather than just for part of the block. The curb lane would be designated for right turns only. This mitigation is needed to accommodate the rather modest volume of traffic diverted to Park Avenue from the New York Bus Lane treatments on First and Second Avenue.
- 59th Street and First Avenue: A one-lane New York Bus Lane treatment would be provided here rather than the two-lane treatment that extends over the rest of the corridor. Two bus lanes cannot be provided due to the number of traffic lanes needed to accommodate right-turning volumes toward the Queensboro-59th Street Bridge and general northbound through traffic.
- 59th Street and Second Avenue: Due to the extremely high level of congestion that prevails at this major entry point to the Manhattan CBD via the Queensboro Bridge, the detailed analyses concluded that a two-lane bus treatment could not be accommodated with standard traffic engineering improvements. There are a number of options to be considered: 1)

discontinue the bus lanes at this location and, in all likelihood, several blocks north; 2) implement a one-lane bus lane treatment as well as a highly intensive enforcement program to eliminate all gridlock at this location (gridlock of the intersections at the bridge were found to reduce green time that would otherwise be available to vehicles but that is not since there are significant periods of time within each signal cycle that traffic does not move at all); 3) consider building an underpass for through traffic to bypass this highly congested section of Second Avenue. Each of these alternatives would not be focused just at the intersection of 59th Street and Second Avenue, but would need to extend at least as far north as 62nd Street, if not as far north as 64th-66th Streets since the bridge-induced backup often persists that far uptown.

Discontinuing the bus lane treatment would offer no transit relief in this section. So, although it would relieve the TSM Alternative of this significant impact, it should be viewed only as a last resort. Reducing the bus lane treatment to one lane would not offer the same level of transit benefit as would a two-lane New York Bus Lane and would require a far more intensive deployment of enforcement agents, but could mitigate traffic impacts associated with the bus lane treatment. Construction of an underpass, similar to the underpasses existing along First Avenue at 42nd Street and along Park Avenue near 34th Street, could afford measurable traffic relief and bus travel time benefits, but its feasibility in light of possible infrastructure issues would need to be addressed.

- 62nd Street and Second Avenue: The issues described above for 59th Street/Second Avenue prevail here as well, since congested traffic conditions created by the inflow and outflow of vehicle traffic at the Bridge persist back to 62nd Street, as well.
- 64th Street and Second Avenue: Reduction of the bus lane treatment to a one-lane operation would be necessary at this location.
- 96th Street and First Avenue: Mitigation at this location would consist of the deployment of one or more enforcement agents to ensure that green signal time that is currently unused by traffic because of the gridlocked conditions can be made usable in the future. This is a location at which enforcement agents have historically been deployed. Successful operation of the bus lane treatment would require consistent deployment of this mitigation in the PM peak period.

BUILD ALTERNATIVE 1

This alternative would not generate any significant traffic impacts and, therefore, would not require any traffic mitigation. Traffic effects of construction are discussed in 15, “Construction and Construction Impacts.”

BUILD ALTERNATIVE 2

The traffic impact analyses conducted at the set of 82 intersections within the entire study area indicated that significant traffic impacts would be generated by the LRT component of Build Alternative 2 at a series of locations along the alignment (primarily along Water Street/Pearl Street and along 14th Street) and at several locations due to the diversion of traffic from the route of the LRT to other parallel routes (primarily Houston Street and 23rd Street). Detailed traffic analyses were conducted at all locations where significant impacts were identified, with the following conclusions:

- Signal phasing and/or timing modifications would be sufficient to mitigate significant impacts at most of the impacted locations. For several key segments along the LRT alignment, curb parking/standing/loading would need to be prohibited in order to provide sufficient capacity to accommodate traffic volume demands with the required amount of traffic capacity. This is particularly necessary along Water and Pearl Streets in Lower Manhattan and along 14th Street.

  The elimination of curb parking along several blocks of the LRT alignment, necessary to provide sufficient capacity for through and turning traffic, is itself the major impact of this alternative from a traffic and parking perspective, and is addressed in detail in section G of this chapter. Essentially for several segments of the LRT alignment, the traffic analyses show that there is a trade-off in impacts between traffic impacts and parking/delivery impacts. The decision as to whether to maintain adequate traffic levels of service and incur significant parking/delivery space losses or to maintain curb parking/delivery spaces and incur increased traffic congestion may need to be resolved on a block-by-block basis should this alternative be selected as the Locally Preferred Alternative.

- The diversion of traffic, particularly from 14th Street to Houston and 23rd Streets, even though mitigatable from a capacity and level of service perspective, would increase traffic on those parallel streets and may result in adverse air quality and/or noise impact. (These impacts are examined in Chapters 10 and 11.)