Major Investment Study

for the

Long Island Transportation Corridor

000400

MAJOR INVESTMENT STUDY

for the

LONG ISLAND TRANSPORTATION CORRIDOR

LONG ISLAND RAIL ROAD EAST SIDE ACCESS PROJECT

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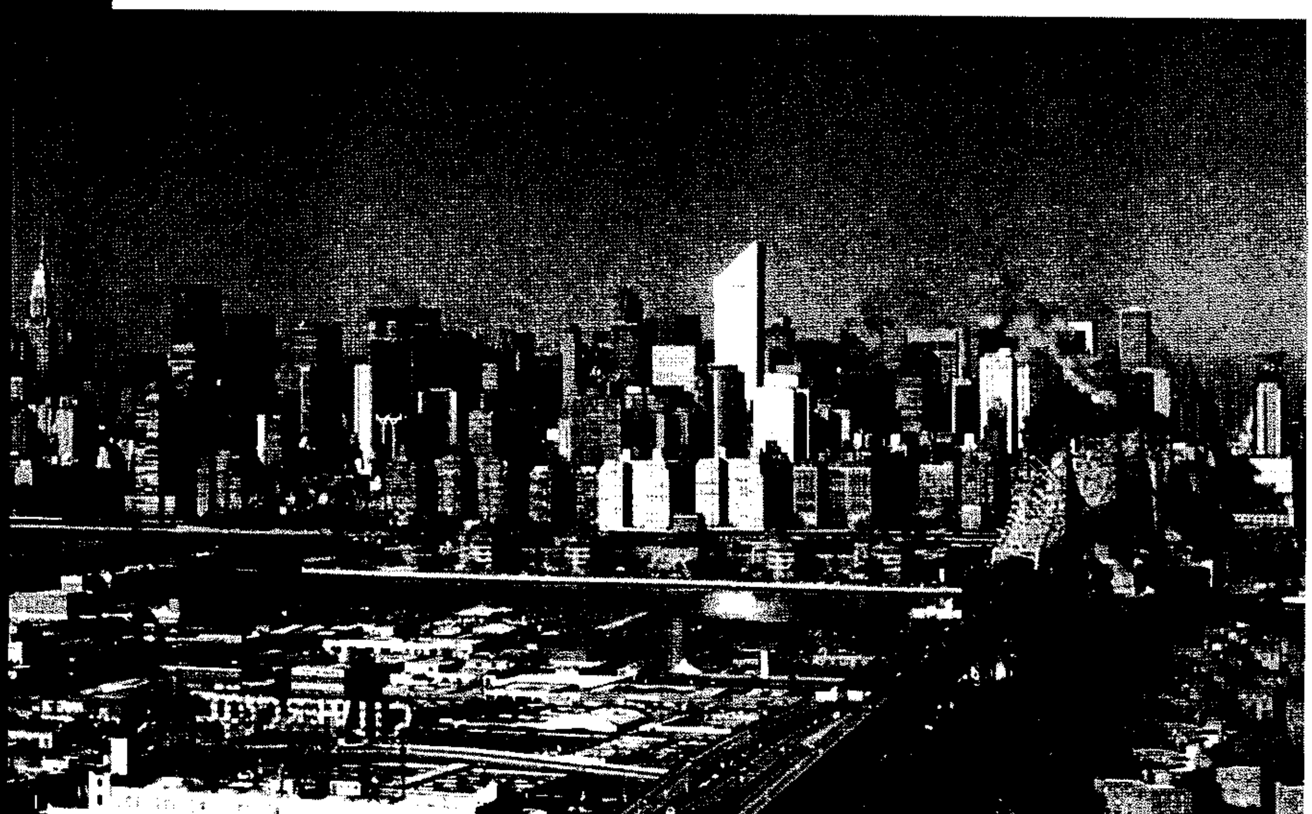
Summary



MTA Long Island Rail Road

INTRODUCTION

The Major Investment Study process was established by the Federal Government to inform and engage the public in decision-making on major transportation investments. In this MIS process, the MTA/Long Island Rail Road (LIRR) is the sponsor agency working within the MTA's Long Range Planning Framework to examine a wide range of actions to address the mobility needs and access problems of the Long Island Transportation Corridor. This effort has provided information on the costs, benefits and impacts of proposed alternatives that, together with public input, will guide the LIRR in progressing this Study toward a preferred strategy to improve regional mobility and provide Long Island residents with direct access to Manhattan' East Side.

Additionally under the National Environmental Policy Act (NEPA) of 1969, Federal agencies must have an Environmental Impact Statement (EIS) prepared for any major action they undertake which may have a significant effect upon the environment. In this MIS a preliminary level of environmental impact assessment was performed. The MIS summarizes the results of the various technical analyses conducted in order to more fully evaluate the No-Build, TSM and Build Alternatives. The NEPA required EIS will be prepared during the subsequent planning and preliminary engineering phase for the project.

This Major Investment Study addresses the increasing need for improved access in the Long Island Transportation Corridor - primarily between Long Island (Nassau and Suffolk Counties as well as Brooklyn/Queens) and the East Side of Manhattan. The roadways, transit systems, and rail terminals that serve this Corridor, having reached their capacity limits, restrict travel options for residents of this highly developed region, especially commuters.

With only three primary highway routes into East Midtown Manhattan from Long Island (Triborough Bridge, Queensboro Bridge, Queens-Midtown Tunnel), auto travel is severely constrained and congested. Correspondingly, New York City Transit (NYCT) service in this corridor is intensively utilized, as the Queens Boulevard Line and the Flushing Line are two of the most heavily used subway lines in the system - and this overcrowding worsens as the trains approach Manhattan.

Approximately 80% of LIRR peak period commuters presently travel to Penn Station which, along with the connecting East River rail tunnels, has major physical/operational limitations. Even if all planned improvements to this terminal were to be funded and built, the practical capacity constraints of Penn Station would still exist. Future needs of Amtrak and New Jersey Transit operations in this terminal are further constraints.

Growth in population, labor force and employment within the Corridor is projected to continue in the foreseeable future. These trends will increase the number of trips made in this travel corridor, especially between residential areas on Long Island and the commercial hub in Manhattan. However, as described above, the required capacity is not available to accommodate this projected travel growth, especially to Manhattan's East Side.

The Major Investment Study has determined that the following three alternatives will be advanced to the Environmental Impact Statement / Preliminary Engineering evaluation phase of the study:

Alternative I	No-Build Alternative
Alternative II	Transportation System Management (TSM) Alternative
Alternative IVA	LIRR East Side Terminal Alternative (Grand Central Terminal via Main Line/Port Washington Branch Harold Interlocking Connection)

Long Island Transportation Corridor

The Long Island Transportation Corridor (LITC) is defined as the Long Island counties of Suffolk, Nassau, Queens and Kings (Brooklyn) and East Midtown Manhattan. (See Figure S-1) East Midtown is defined as the area extending west from the East River to Fifth Avenue, bounded by 34th Street on the south and 59th Street on the north.

The primary purpose of the LIRR's Long Island Transportation Corridor Major Investment Study is to: 1) quantify present and projected travel needs; 2) identify current transportation capacity constraints; 3) develop and analyze alternative investment strategies to increase mobility between Long Island and East Midtown Manhattan; 4) evaluate the environmental impacts of the screened study alternatives; and 5) select a locally preferred investment strategy to meet the needs identified in the study.

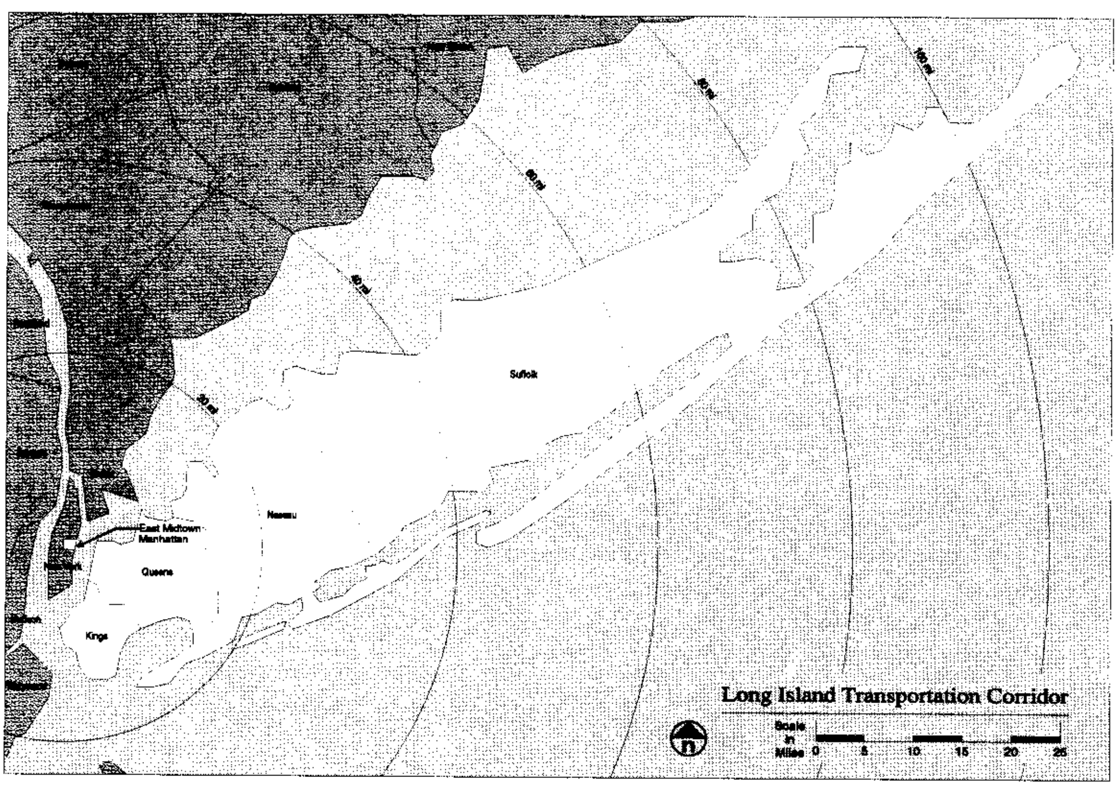


Figure S-1

Regional Overview

More than anywhere else in the United States, the New York City metropolitan area is the nation's most transit-dependent region. The City's intense density of skyscrapers and high rise buildings simply could not exist without the region's dense network of commuter rail and subway lines to efficiently move the large numbers of workers to and from these offices on a daily basis without total paralysis or gridlock on the region's highways.

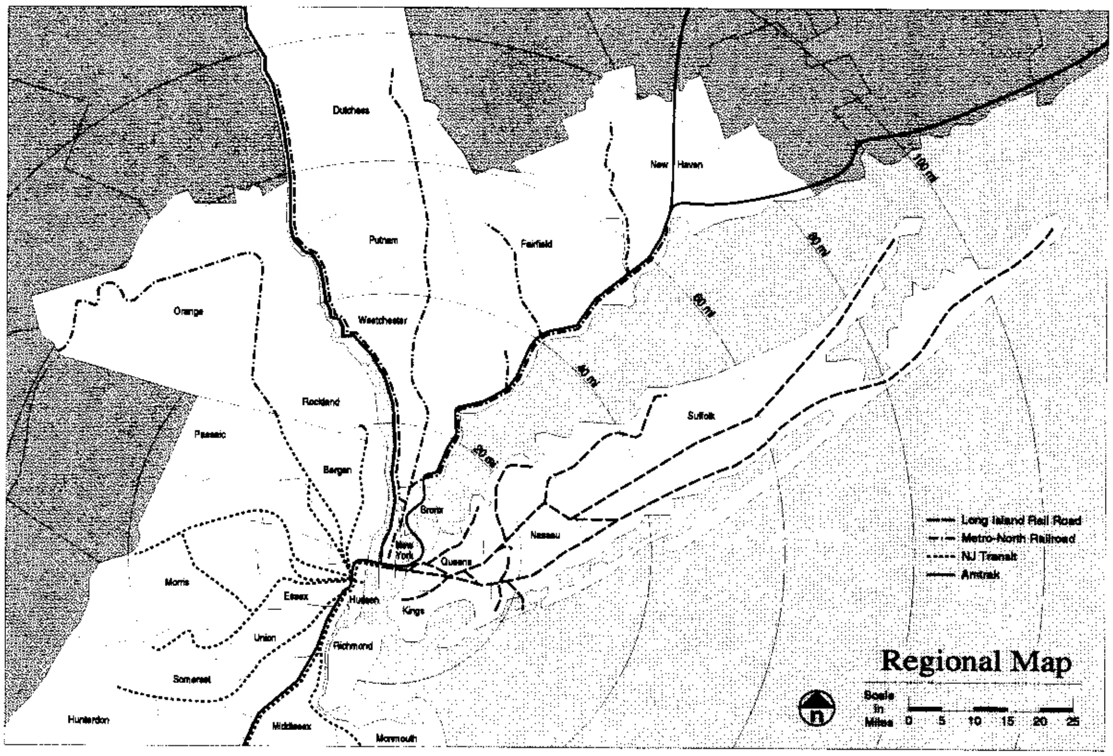


Figure S-2

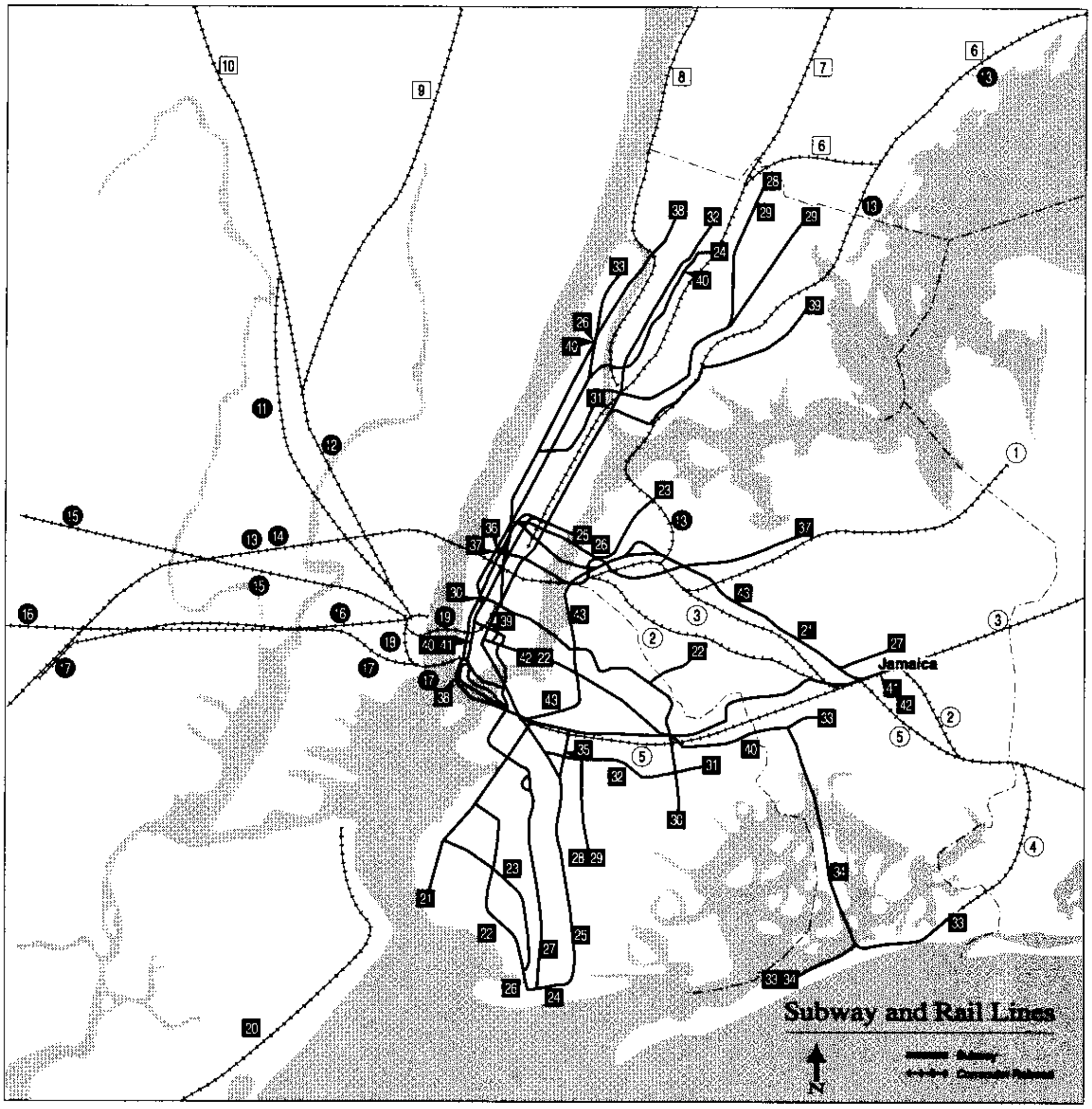


Figure 1.1-2

Figure S-3

The region's investment in commuter railroads and transit lines is considerable: 685 track miles of subways threaded throughout New York City; over 2,100 track miles of commuter railroads radiating out of New York City; and over 2,700 miles of bus routes throughout New York City and in the Long Island Transportation Corridor. (See Figures S-2 and S-3). The numbers carried each workday by the region's public transit providers are tremendous—in 1996 the LIRR carried

74,342,121 passengers, or some 262,000 customers each workday.[1] The overwhelming majority of LIRR customers bound for Manhattan begin or end their LIRR journey at Penn Station; in 1996 over 85,000 weekday LIRR customers arrived at Penn Station during the 6:00-10:00 A.M. peak period. New York City Transit subway lines carried 1,108,476,283 passengers in 1996; during weekdays the subways transported 3,600,000 passengers on a network encompassing 25 subway routes. Another 1,540,000 passengers rode NYCT buses each weekday, which on an annual basis amounted to 435,910,009 riders. L.I. Bus carried 18,960,631 passengers in 1996 or approximately 63,000 on a daily basis.

Approximately 40% of all commuter rail trips and 42% of all rail rapid transit trips in the United States take place within the New York City region.[2]

Similarly the regional investment in highways, bridges and tunnels is equally significant resulting in several thousands of miles of parkways, expressways, Interstate highways and secondary arterial state highways. Figure S-4 indicates the major roadways of the LITC.

Despite this vast transportation network, there are mobility problems. Unfortunately for the Long Island Transportation Corridor traveler, much of this post war office space growth has been poorly situated relative to the location of Penn Station— the sole Manhattan terminal serving LIRR customers arriving from Long Island— resulting in a "mismatch" between the Manhattan point of arrival for LIRR customers and the location of most of the midtown commercial office space. Approximately 53% (47,000) of existing AM peak period Penn Station, LIRR customers work at locations which are more accessible to GCT than to Penn Station. Currently most of these customers use Penn Station and must either endure a long walk (beyond a 20 minute range) or pay another fare to transfer to another mode of transport (subway, bus, taxi) to reach their final destinations in the East Midtown area. Previous survey results indicated that some 31,500 non-LIRR commuters would switch from private automobiles, subways, express buses and local buses to the LIRR, if it had a terminal in East Midtown, either at or in the vicinity of GCT (which is located at Park Avenue and 42nd Street).

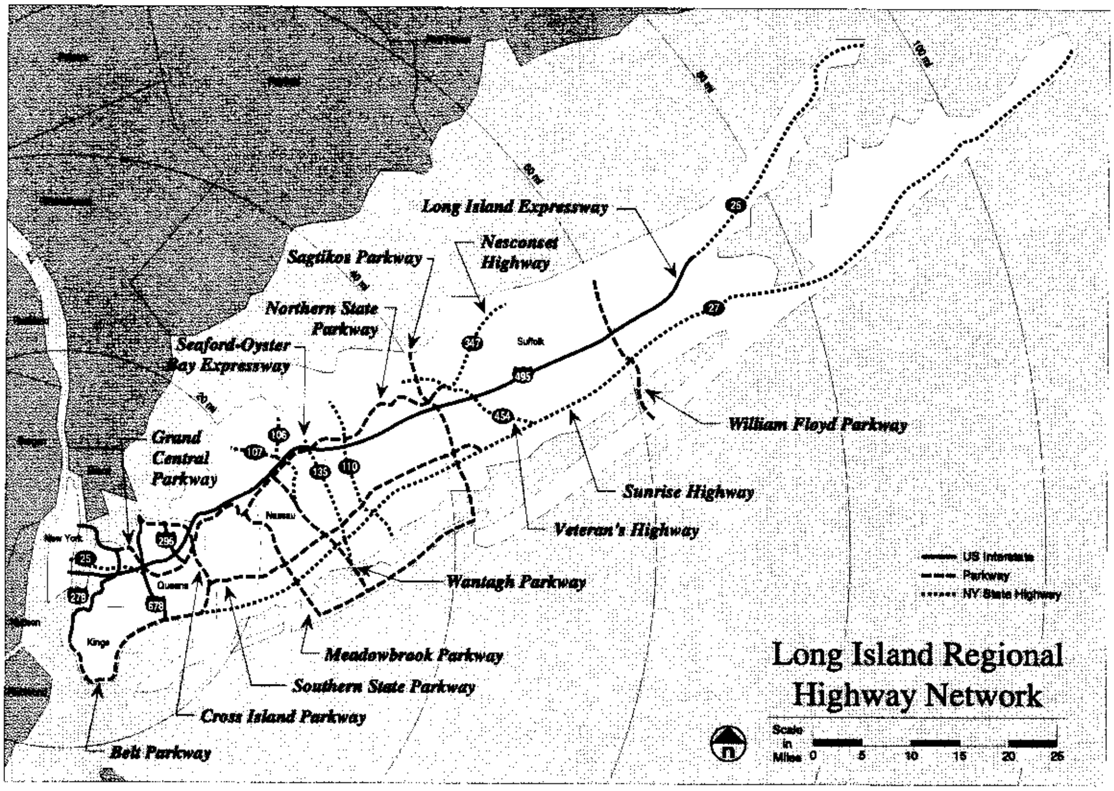


Figure S-4

Transportation Capacity Limitations

Long Island Rail Road

The LIRR is the busiest commuter railroad in the country, and in 1996 carried 74.3 million riders. It is also one of the largest, consisting of 365 route miles, 135 stations including four western terminals in New York City and nine branches in Nassau and Suffolk Counties (see Figure S-5). The LIRR operates a fleet of 1,075 electrically propelled or diesel-hauled coaches assembled in more than 700 trains transporting over 262,000 passengers each weekday.

Penn Station is the LIRR's primary terminal, and the only one located in Manhattan. According to the most recent *LIRR Passenger Origins & Destinations,* report, 80% of A.M. peak west-bound passenger trips terminate at Penn Station. During the morning peak hours, trains arrive at Penn Station at the rate of 36 trains per hour, the equivalent of one 12-car train arriving at Penn Station approximately every 100 seconds. The LIRR shares Penn Station with two other rail-roads—Amtrak and NJ Transit. In the future, both operators plan to increase their train service through Penn Station, further increasing demand upon the station.

In the absence of any capacity improvements, at 36 trains per peak hour, the LIRR portion of Penn Station is effectively near operational capacity. In the near term, plans are underway to increase LIRR service into Penn Station to as many as 42 trains per peak hour by undertaking a series of capital and operational improvements.

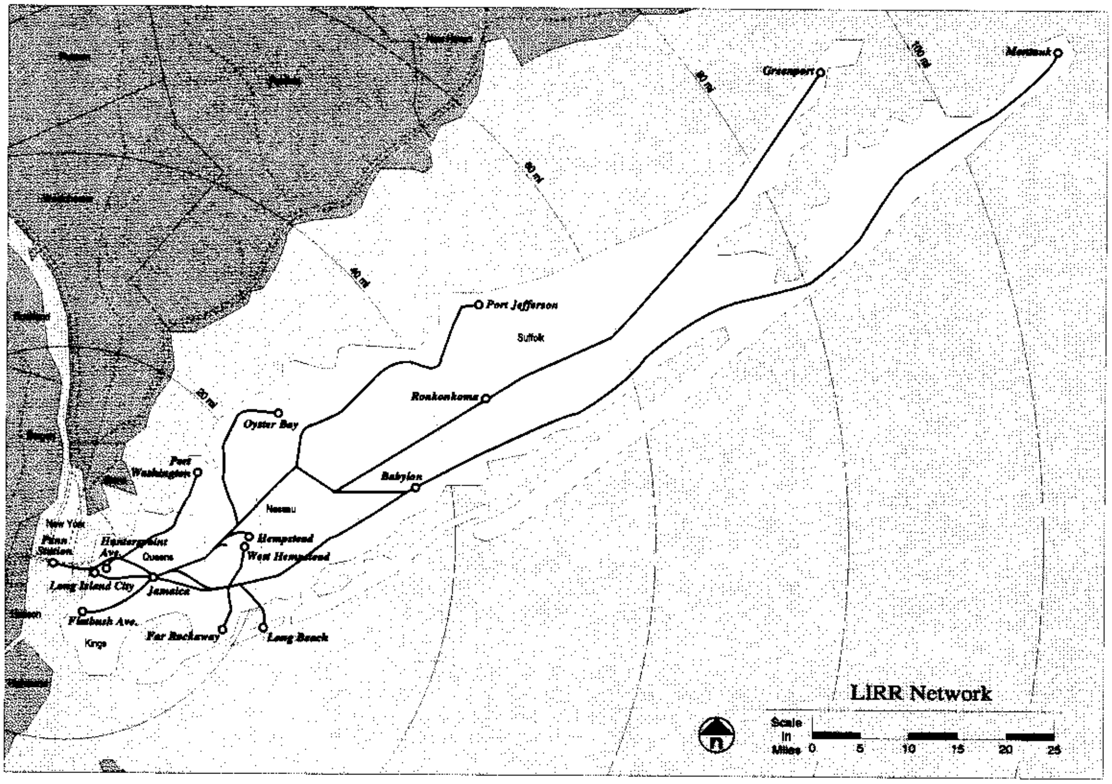


Figure S-5

Pennsylvania Station is owned by Amtrak, which also owns the two Hudson River Tunnels and trackage from New Jersey on the west, as well as the four East River Tunnels and trackage from the Bronx and Queens on the east. It leases station space, trackage and operating rights to NJ Transit and to the LIRR, the latter from its junction with Amtrak's Northeast Corridor at Harold Interlocking in Sunnyside, Queens.

Of the three separate railroads that share use of Penn Station, the LIRR is the largest user in terms of passengers, train movements and railcars. The LIRR schedules more trains, and handles more passengers, than those of NJ Transit and Amtrak combined.

Penn Station is expected to become an even more intensively used railroad station in the future. Further exacerbating the peak period capacity limitations at Penn Station, both Amtrak and NJ Transit are planning ambitious service expansions over the next few years. New Jersey Transit has begun new service feeding their Morris & Essex Line trains into Penn Station New York using their new Kearny Connection now known as Midtown Direct. In a few more years, the new Secaucus Transfer Station will feed more passengers into Penn Station by allowing NJ Transit customers on the Main, Bergen County, Pascack Valley Lines, and Metro-North's Port Jervis Line to transfer at that station to trains serving Penn Station New York. The opening of the Secaucus Transfer Station is expected to increase ridership on these connecting lines, as travel times to and from New York City will be reduced by approximately 15-20 minutes.

Further increasing future demand upon Penn Station, Amtrak is electrifying the Northeast Corridor north to Boston and is proposing the transformation of the entire Northeast Corridor into a high speed, 150 mph railroad. By 2010, Amtrak proposes to more than double its train service between New York City (Penn Station) and Boston in order to capture 45% of the total New York to Boston public transportation market—a market currently dominated by air shuttle flights.

Capacity limitations within the LIRR's portion of Penn Station and future demand on the remaining portions of Penn Station by Amtrak and NJ Transit will prevent the LIRR from accommodating further substantial ridership growth to the Manhattan CBD. Table S-1 provides an analysis of the capacity issues relative to future LIRR service to Penn Station for the Year 2020 No Build condition.

TABLE S-1
Capacity Analysis LIRR Penn Station
Service Year 2020 No Build

AM In-Bound Peak Period Volume	121,026
AM Peak Hour Volume	60,513
Maximum Seated Peak Hour Capacity	47,410
AM Peak Hour Standing Passengers	13,103
AM Peak Hour Standees per Car	33
PM Peak Hour Volume	52,041
Maximum Seated Peak Hour Capacity	47,410
PM Peak Hour Standing Passengers	4,631
PM Peak Hour Standees per car	12

New York City Transit

Between Queens and East Midtown Manhattan, there are only two geographically direct subway routes serving the Long Island Transportation Corridor. They are: 1) the Queens Boulevard Line (E, F, R routes), and 2) the #7 Flushing Line. The Queens Boulevard Line splits into two routes at the eastern end—one route serving 179th Street and Hillside Avenue, the other route serving Parsons Boulevard/Archer Avenue. Originally, the IND subway line to 179th Street was planned to extend further east to the Queens-Nassau County line, while the Archer Avenue Line was expected to extend further southeast into Queens to Springfield Gardens by converting the LIRR Atlantic Branch to subway operation.

Partly to compensate for this lack of "geographical reach" into eastern Queens, both the Queens Boulevard Line and Flushing Line are fed by an extensive network of local feeder bus routes which serve Eastern Queens and Nassau County, effectively extending the reach of the subway lines.

Both the IRT Flushing Line and the IND Queens Boulevard Line are severely overcrowded during rush hours. The IND Queens Boulevard Line is currently one of the top two most heavily used subway lines in the NYCT system. During the morning peak hour, 18 F trains are scheduled to depart 179th Street Terminal between 7:00 and 8:00 A.M.; 12 E trains are scheduled to depart Parsons/Archer Terminal during that same timeframe. Using NYCT's 1995 ridership figures, between 8:00 and 9:00 A.M., the combined routes of the IND Queens Boulevard Express trains (E, F trains) carried 45,481 passengers into Manhattan.[3,4] The level of overcrowding per car, or volume/capacity ratio used by NYCT, for the F train ranged from 1.25 in 1989 to 1.22 in 1995. (A ratio of 1.0 would represent a fully loaded subway car according to NYCT service guidelines, and numbers above 1.0 represent a percentage of overcrowding.) For the E train, the volume/capacity ratio numbers were 1.00 and 0.98 respectively.

The IRT #7 Flushing Line, which offers connecting service for LIRR passengers at Hunterspoint Avenue, Long Island City and Woodside, Queens is currently operating above capacity as well, carrying approximately 33,970 passengers into Manhattan (based upon NYCT 1995 ridership figures) between the hours of 8:00 and 9:00 A.M. at a volume/capacity ratio of 1.06 in 1989 and 1.04 in 1995. For both the Queens Boulevard Line services and the Flushing Line services, the slight dip in the severity of overcrowding on the respective trains is attributable to short term employment losses which have temporarily reduced subway ridership, as opposed to any increases in line capacity.

Highway Network

During the past five decades, after World War II in particular, Long Island experienced intensive residential and commercial development. The regional network of interstate highways, expressways and parkways established after World War II directly competed with the Long Island Rail Road for market share, and at one time parkways, highways and Interstate Highways were viewed as the mode of transport for the future. Today, these highways are over capacity, as witnessed by the growth in regional automobile ownership rates, vehicle miles traveled and the resulting congestion.

Primary vehicular access from Long Island to Midtown Manhattan is funneled to three principal East River crossings: the Queens-Midtown Tunnel (toll), the Queensboro Bridge (toll free) and Triborough Bridge (toll). Consequently, these crossings create bottlenecks as great volumes of vehicles must merge into a limited number of traffic lanes to cross the East River. This results in significant reductions in travel speed and vehicular backups creating concurrent congestion on the feeder street network. Given the potential for significant environmental impacts and local opposition, it is impractical to consider constructing additional East River vehicular crossings.

The Queensboro Bridge is the most heavily used of the East River crossings, carrying 12,898 westbound vehicles during the morning peak period (7-10 AM); the Triborough Bridge handling 12,286 westbound vehicles in the same peak period; and the Queens-Midtown Tunnel processing 11,195 westbound vehicles in the morning peak.

Many of the arterial streets in Queens and Manhattan which serve as vital connections to these crossings experience problematic levels of congestion and delay.

Future Trends

Population and Labor Force

Over the period from 1990 to 2020 the population in the New York City Metropolitan Region is forecasted to grow by 3 million persons, reaching about 23 million by 2020[5]. The bulk of the population increase will proceed at a faster rate in the suburbs which will account for about 80% of the total growth while New York City's population will grow by 8.5%.

Between 1980 and 1990 the growth in the labor force was significantly higher than the growth in population. During this period the total labor force in the Study Area increased 12.8%, from 3,797,507 persons to 4,283,217 persons. In New York City (all 5 boroughs) the increase was from 3,167,698 persons to 3,586,428 persons over the same time period, which represented a 13.2% increase, while in Long Island (Nassau and Suffolk Counties), the total labor force increased at almost the same rate of 13.0%, from 1,228,582 persons in 1980 to 1,388,782 persons in 1990.

Over the period from 1990 to 2020, total employment in the region is forecasted to grow from 10.7 million to 13.0 million, with employment in New York City growing by 517,000 in absolute numbers[5]. By 2005, the region will have essentially recovered the 1989 peak level of payroll activity, and at full capacity, will likely require an expansion in physical space and infrastructure support. Manhattan's employment will surpass its 1987 high by the year 2013.

Economy and Employment

Looking towards the near term 1995-2005 period, the following economic and employment trends for the New York City region are forecasted[5]:

- The 1995-2005 period will be characterized as the "recovery period" where the severe regional 1989-1992 job losses will be recaptured. By 2005, the region will have recovered the 1989 peak level of payroll activity.
- By 2005, work related travel demand from the surrounding regions into Manhattan is expected to generate an additional 80,000 trips above 1990's level, a 4% total increase.

In the extended forecast, for the period 2005 to 2020, projections are as follows[5]:

- Employment within New York City is expected to grow 13.1%, adding another 517,000 jobs.
- Midtown Manhattan is projected to capture the majority share (58%) of the region's overall employment base.
- By 2020, 56% of all regional residents will be either full time or part time employees in a regional labor force of approximately 13 million. New York City's labor force will not keep pace with its employment increase, and the Long Island labor force will grow by a larger percentage than employment (32%). This increase in suburban labor will push suburban residents to seek employment in New York City, further straining transportation demand in the Long Island Transportation Corridor.

Journey-to-Work Trips

The drawing power of Manhattan will combine with suburban labor force surpluses to increase future journey to work trips to Manhattan. By 2020 the Region as a whole will generate 235,700 more journey to work trips to Manhattan of which 32,500 will come from Nassau and Suffolk Counties, 36,600 will come from Queens, and 19,600 from Brooklyn, for a total of 88,700 additional journey to work trips specifically between Long Island and Manhattan.

Findings

The evaluations conducted during the Major Investment Study phase of the LIRR's MIS/DEIS for the Long Island Transportation Corridor project in coordination with the ongoing public outreach effort with the Technical and Citizens Advisory Committees has concluded that Alternative IVA, which will provide direct East Midtown service for the LIRR to Grand Central Terminal and a new Sunnyside Station in Queens, is the preferred build alternative.

Alternative IVA GCT via Main Line / Port Washington Branch provides for the greatest mobility improvement in the LITC between Long Island and East Midtown Manhattan while relieving train congestion at Penn Station. Alternative IVA attracts the most users in terms of incremental linked daily transit trips (17,800) incremental linked daily LIRR trips (23,900) and total daily usage (179,200).

Alternative IVA has the second highest amount of aggregate daily minutes of travel times savings (648,000) or approximately 30 minutes or more per day for those LIRR customers with destinations in the Grand Central Terminal area. Alternative IV A will generate the largest reduction in vehicle miles traveled (293,000) on a daily basis.

In the "No-Build" Alternative 295,500 LIRR customers (boarding plus alighting) are expected to use Penn Station in the Year 2020. Alternative IVA diverts approximately 153,000 trips away from Penn Station reducing the daily boarding plus alightings to approximately 142,000. More significantly during the critical AM Peak Period (6-10 AM) for the "No Build" 2020 approximately 124,000 LIRR customers would be using Penn Station. Under Alternative IVA approximately 60,000 customers will be using Penn Station and 73,000 will use GCT during the AM peak period.

Therefore the "No-Build" Alternative, the Transportation System Management Alternative and Alternative IVA GCT via Main Line/Port Washington Branch (the Build Alternative) will be progressed for further evaluation in the Environmental Impact Statement for the Long Island Transportation Corridor.

Organization of the MIS

The MIS contains nine chapters in addition to this summary.

Chapter 1, *Purpose and Need*, describes the Long Island and Manhattan corridor study area and existing transportation facilities. A discussion of regional and local transportation goals and specific transportation problems is included. Other factors pertinent to the selection of alternatives, such as current land use patterns, economic development and environmental criteria, are identified.

Chapter 2, *Alternatives Considered*, provides an overview of the screening and selection process, a definition and description of the alternatives analyzed, and the capital, operating and maintenance costs involved for each alternative.

Chapter 3, *Existing Conditions*, describes the existing environmental and socioeconomic conditions in the Long Island Transportation Corridor, and identifies the significant sensitive resources in the study area. The discussion provides the basis for an evaluation of the impacts, both positive and negative, that would result from implementation of each alternative. Specific elements analyzed in this chapter are listed below.

- Land Use and Socioeconomics
- Air Quality
- Cultural Resources including Historic / Architectural and Archaeological
- Hazardous Materials
- Energy
- Noise and Vibration
- Natural Resources

Chapter 4, *Transportation Impacts*, presents the impacts of each alternative on transit service, transit ridership, roadway network system, parking and pedestrians in the Long Island Transportation Corridor, as well as the levels of service and the resulting patronage for each alternative.

An on-going computer simulation of train operational scenarios under the Build Alternative to ensure that the project will not negatively impact existing or future Metro-North Railroad operations is discussed. The simulation effort will be completed during subsequent planning and design phases for the project.

Chapter 5, *Environmental Consequences*, discusses the potential impacts of alternatives on the environmental resources identified in Chapter 3. Short-term construction-related and long-term impacts are included. Mitigation measures are discussed when impacts are identified, as appropriate.

Chapter 6, *Community and Agency Participation Program*, discusses the extensive public outreach program for the study to ensure that the public, elected officials, transportation, environmental, civic and business organizations; city, state, regional and federal agencies; the media and other interested groups and individuals, have an opportunity to participate in an open and continuing exchange of information and views throughout the course of the study.

Chapter 7, *Financial Analysis and Evaluation of Alternatives*, presents the financial analysis for the No Build, TSM and Build Alternatives, and compares the alternatives in terms of costs, cost-effectiveness and financial feasibility. Each alternative is also evaluated in terms of how effectively and equitably it meets the project goals and objectives discussed in Chapter 1. Significant trade-offs between the alternatives are also discussed.

Chapter 8, *Glossary and List of Abbreviations*, is a glossary and list of abbreviations of terms and technical language used in the preparation of the MIS and frequently used in the transportation industry.

Chapter 9, *Supporting Documentation, Related Studies and Technical Reports,* is a listing of documents that support the discussions of the previous sections. Various Technical Appendices have been prepared and include the following:

- Air Quality Technical Appendix
- Build Alternative Alignment Drawings
- Community and Agency Participation Program Technical Appendix
- Cultural Resources Technical Appendix

- Ecological Technical Appendix
- Hazardous Materials Technical Appendix
- Noise and Vibration Technical Appendix
- Transportation and Pedestrian Analyses Technical Appendix
- Visual Resources Technical Appendix
- Long List of Alternatives Technical Appendix

Footnotes:

[1] *1996 Annual Report*, Metropolitan Transportation Authority

[2] 1992 Downstate New York share of national public transportation from New York Metropolitan Transportation Council's *1993 Regional Transportation at a Glance*.

[3] *63rd Street Connection Service Plan & Car Requirements*, Metropolitan Transportation Authority, September 1995.

[4] *Final Environmental Impact Statement 63rd Street to the Queens Boulevard Line*, USDOT/FTA/MTA, June 1992.

[5] *The Future of the Extended Core in the Global Economy,* Urbanomics, 1995.

Table of Contents

Long Island Rail Road

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

PAGE NO.

List of Figures

PAGE NO.

PAGE NO.

List of Tables

PAGE NO.

PAGE NO.

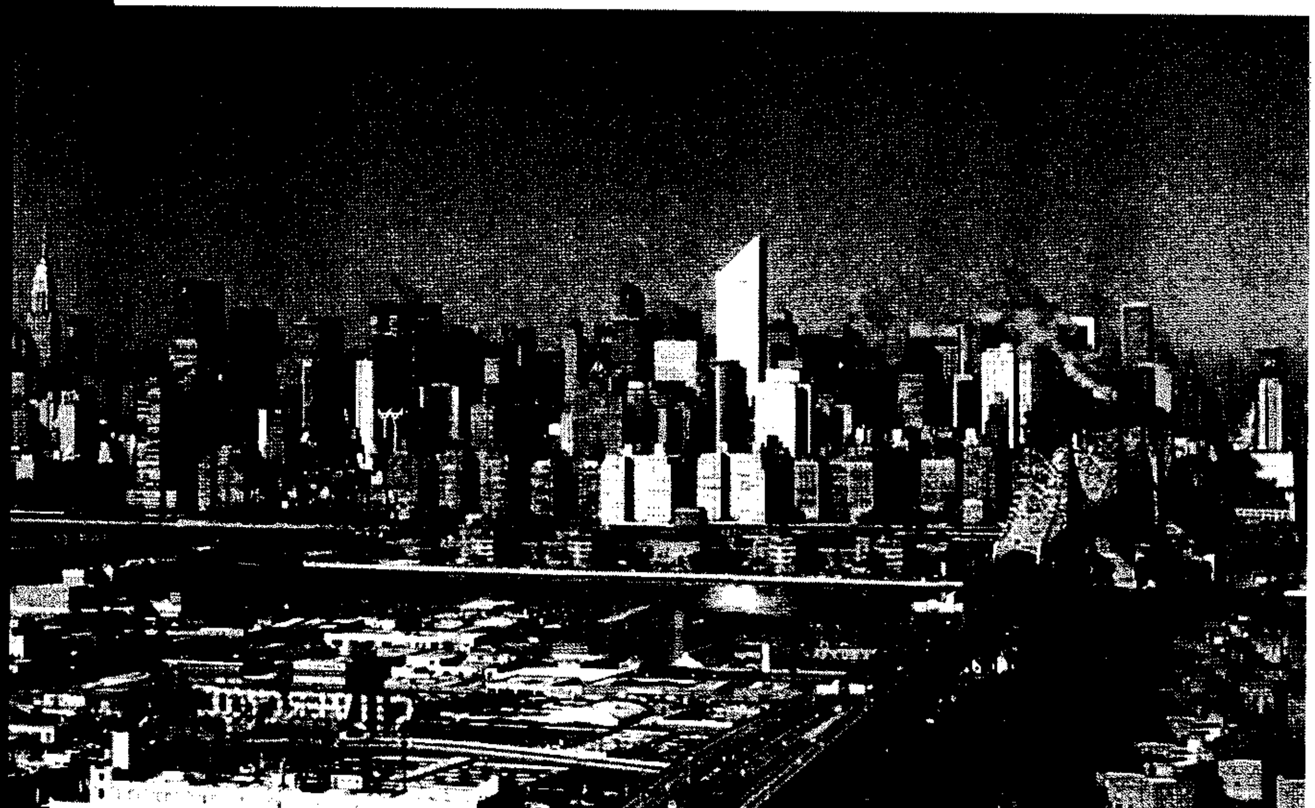
PAGE NO.

PAGE NO.

PAGE NO.

Chapter 1

Purpose and Need



MTA Long Island Rail Road

"Congested roads and fouled air today endanger the economic and physical health of the New York metropolitan area, threatening its future as a worldwide leader in finance and industry." -- MTA Capital Needs & Opportunities 1992-2011

1.0 PURPOSE AND NEED

This chapter describes the Long Island Transportation Corridor study area and existing transportation facilities. Also included are discussions of regional and local transportation goals, transportation problems and other factors pertinent to the transportation mobility issues of the study corridor.

1.1 Introduction

This Major Investment Study is being conducted pursuant to the transportation planning procedures established under the Intermodal Surface Transportation Efficiency Act of 1991 ("ISTEA"), as amended. (49 U.S.C.A. § 5301 et seq.) That statute, and the FTA/FHWA regulations that govern the planning process for major metropolitan transportation investments set forth at 23 CFR Part 450 require the preparation of a "major investment study" ("MIS") in connection with an application for federal funding of capital projects for mass transportation systems. In accordance with those requirements, this MIS has been prepared to evaluate the effectiveness of alternative investments or strategies in attaining the transportation goals for the Long Island Transportation Corridor as set forth in this chapter. In particular, the MIS analysis was designed to: 1) quantify present and projected travel needs within the study corridor; 2) identify current transportation capacity constraints; 3) develop and analyze alternative investment strategies to increase mobility between Long Island and east Midtown Manhattan; 4) evaluate the environmental impacts of the screened study alternatives; 5) describe the consultation and coordination efforts that have been undertaken in the project planning activities conducted thus far; and 6) select a locally preferred investment strategy to meet the needs identified in the study.

In preparing the MIS, an extensive pubic outreach program was undertaken, to insure that the public, elected officials, transportation, environmental, civic and business organizations; city, state, regional and federal agencies; the media and other interested groups and individuals were afforded the opportunity to participate in an open and continuing exchange of information and views.

Public Information Meetings were held at important milestones throughout the project to define the scope of the studies, identify specific issues to be addressed, develop the long list of alternatives to be considered, agree on the criteria by which to evaluate these alternatives and select the alternatives to be pursued for detailed analysis.

A Technical Advisory Committee ("TAC") was formed to facilitate the review of technical data pertinent to the study. Comprised of representatives of transportation, environmental, and planning agencies; municipal officials; and the local Metropolitan Planning Organization ("MPO"), TAC members helped to advance the Study by sharing expertise and/or data available within their respective agencies; articulating the interests and concerns of members and constituent organizations; and assisting with the dissemination of project information to these groups.

A Citizen Advisory Committee ("CAC"), reflecting the Study corridor's diversity in terms of geography, constituencies and issues, was also established to provide a broad base of community input. Composed of members of transportation advocacy groups; business and labor organizations; environmental, civic, and public interest groups; and individuals, the CAC serves both as sounding board for the review of project issues and alternatives and as a primary community liaison with organizations interested in the objectives of the process. Its three sub-committees--Commuter, Technical and Long Island City Intermodal Station -- help the CAC focus on specific citizen concerns.

1.1.1 Metropolitan Planning Organization (MPO) Process

The MIS narrows the range of alternatives to a set of investment strategies which will subsequently enter into the federal NEPA review. Locally, the preferred investment strategy must be approved by the local Metropolitan Planning Organization (MPO). In the New York City metropolitan region that agency is the New York Metropolitan Transportation Council (NYMTC). NYMTC is a non-partisan body of the chief locally elected officials in the region whose mission is to ensure there are coordinated plans and programs to meet the regions transportation needs. All of the capital programs in MTA's 1995-1999 Capital Improvement Program, including the East Side Access project and alternatives, are currently included in the New York Metropolitan Transportation Improvement Program ("TIP") and, as such, have already been approved by the Governor of New York and NYMTC. After completion of the MIS and Draft EIS in accordance with FHWA/FTA's environmental and planning requirements (set forth at 23 CFR Part 771 and 23 CFR Part 450, respectively), a locally preferred alternative will be advanced by the sponsoring agency (MTA) and the TIP revised to reflect that selection. The amended TIP must then be approved by NYMTC and the Governor. In addition, FTA, FHWA and NYMTC must make a determination in accordance with the Clean Air Act requirements and EPA's conformity regulations, as recently amended, that the modified TIP conforms to the state's implementation plan ("SIP"). Once the conformity determination is made, the TIP is included in the statewide Transportation Improvement Plan ("STIP"). Only projects in the federally approved STIP are eligible for FHWA or FTA funding.

1.1.2 Project Overview

More than anywhere else in the United States, the New York City metropolitan area is the nation's most transit-dependent region. The City's intense density of skyscrapers and high-rise buildings simply could not exist without the region's dense network of commuter rail and subway lines to efficiently move the large numbers of workers to and from these offices on a daily basis without total paralysis or gridlock on the region's highways.

The region's investment in commuter railroads and transit lines is considerable: 685 track miles of subways threaded throughout New York City; over 2,100 track miles of commuter railroads radiating out of New York City; and over 2,700 miles of bus routes throughout New York City and in the Long Island Transportation Corridor. (See Figures 1.1-1 and 1.1-2) The numbers carried each workday by the region's public transit providers are tremendous—in 1996 the LIRR carried 74,342,121 passengers, or some 262,000 customers each workday.[1] (See Table 1.1-1). The overwhelming majority of LIRR customers bound for Manhattan begin or end their LIRR journey at Penn Station; in 1996 over 85,000 weekday LIRR customers arrived at Penn Station during the 6 - 10 AM peak period. New York City Transit subway lines carried 1,108,476,283 passengers in 1996; during weekdays the subways transported 3,600,000 passengers on a network encompassing 25 subway routes. Another 1,540,000 passengers rode NYCT buses each weekday, which on an annual basis amounted to 435,910,009 riders. L.I. Bus carried 18,960,631 passengers in 1996.

TABLE 1.1-1
1996 RIDERSHIP BY MTA AGENCY

	Annual	*Daily*
MTA LIRR	74,342,121	262,000
MTA MNR	62,900,000	220,000
MTA NYCT Subway	1,108,476,283	3,600,000
MTA NYCT Bus	435,910,009	1,540,000
MTA LI Bus	18,960,631	63,113

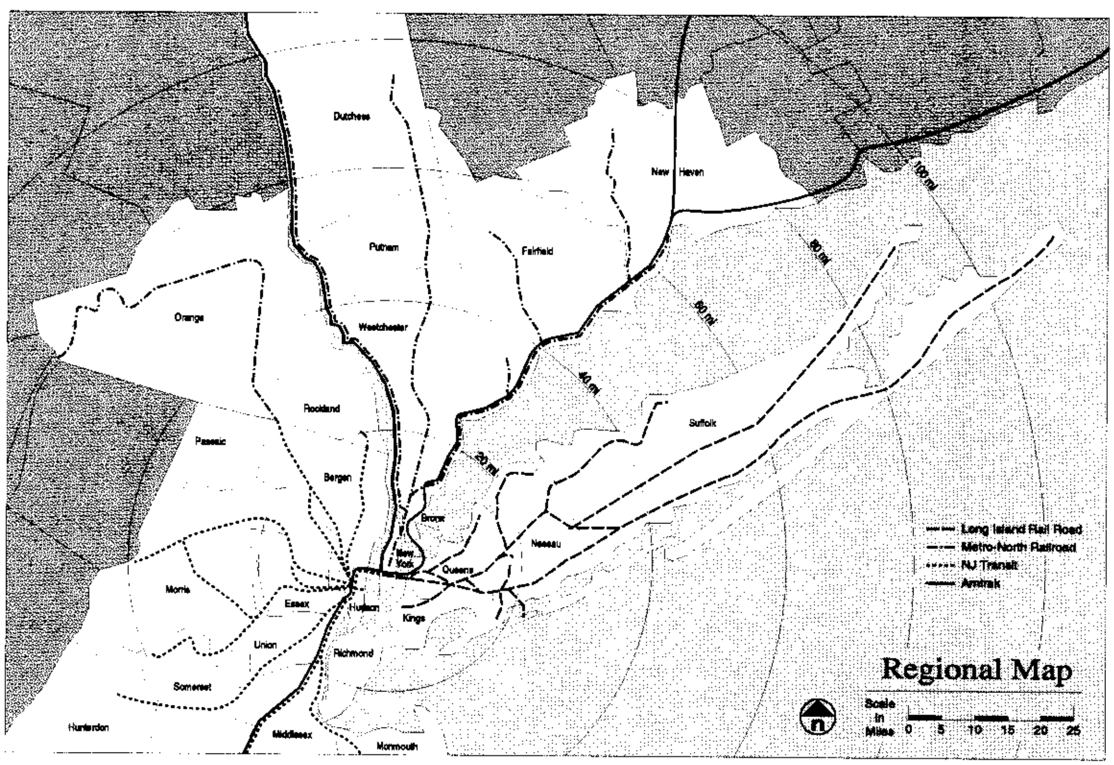


Figure 1.1-1

Approximately 40% of all commuter rail trips and 42% of all rail rapid transit trips in the United States take place within the New York City region.[2]

East Midtown Manhattan is the area extending west from the East River to Fifth Avenue, bounded by 34th Street on the south and 59th Street on the north. Both Fifth Avenue and 34th Street are generally understood and acknowledged by the business community and planners to be the boundaries of East Midtown Manhattan. This is also the northern border of Manhattan Community Districts Five and Six. In the post World War II period of 1947-1994, Manhattan experienced a tremendous growth in the construction of new office space. Between 1947-1994, over 62% or 132,796,755 square feet out of a total of 212,921,990 square feet of all new Manhattan office space was built within Midtown Manhattan, primarily in the East Midtown area.

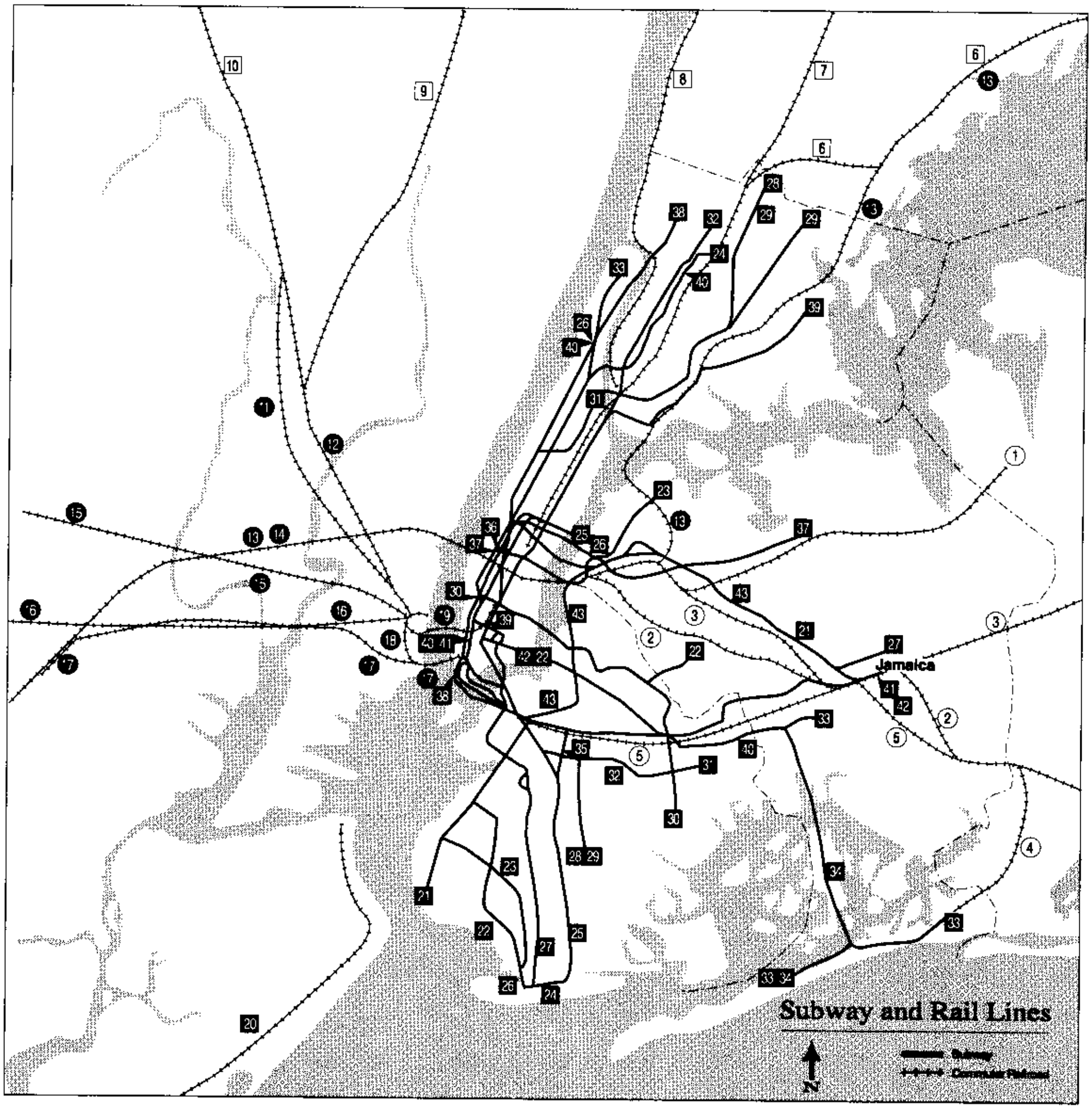


Figure 1.1-2

LIRR
1. Port Washington Branch
2. Montauk Branch
3. Main Line
4. Far Rockaway Branch
5. Atlantic Branch

Metro-North
6. New Haven Line
7. Harlem Line
8. Hudson Line
9. Pascack Valley Line
10. Port Jervis Line

Amtrak/NJT/PATH
11. NJT Main Line
12. NJT Bergen County Line
13. Amtrak NE Corridor
14. NJT Northeast Corridor
15. NJT Boonton Line
16. NJT Morris and Essex Line
17. PATH Newark to WTC
18. PATH Exchange Place to Hoboken
19. PATH Hoboken to 33rd Street

NYCT
20. Staten Island Railway
21. R Route
22. M Route
23. N Route
24. D Route
25. Q Route
26. B Route
27. F Route
28. #2 Route
29. #5 Route
30. L Route
31. #3 Route
32. #4 Route
33. A Route
34. Rockaway Shuttle
35. Franklin Ave. Shuttle
36. 42nd St. Shuttle
37. #7 Route
38. #1/9 Route
39. #6 Route
40. C Route
41. E Route
42. J/Z Route
43. G Route

Manhattan's overall growth has helped to reinforce the New York City region as the country's leading economic engine, and helped New York City retain its place among world cities as the global center of finance, commerce, and tourism, and remain the creative capital for such fields as the arts, media, advertising, fashion and the now emerging, cyber-based industries.

Despite this vast transportation network, there are mobility problems. Unfortunately for the Long Island Transportation Corridor traveler, much of this post war office space growth has been poorly situated relative to the location of Penn Station—the sole Manhattan terminal serving LIRR customers arriving from Long Island—resulting in a "mismatch" between the Manhattan point of arrival for LIRR customers and the location of most of the midtown commercial office space. Approximately 53% (47,000) of existing AM peak period Penn Station LIRR customers work at locations which are more accessible to GCT than to Penn Station. Currently most of these customers use Penn Station and must either endure a long walk (beyond a 20 minute range) or pay another fare to transfer to another mode of transport (subway, bus, taxi) to reach their final destinations in the East Midtown area. Previous survey results indicated that some 31,500 non-LIRR commuters would switch from private automobiles, subways, express buses and local buses to the LIRR, if it had a terminal in East Midtown, either at or in the vicinity of GCT (which is located at Park Avenue and 42nd Street (see Figure 1.1-3)).

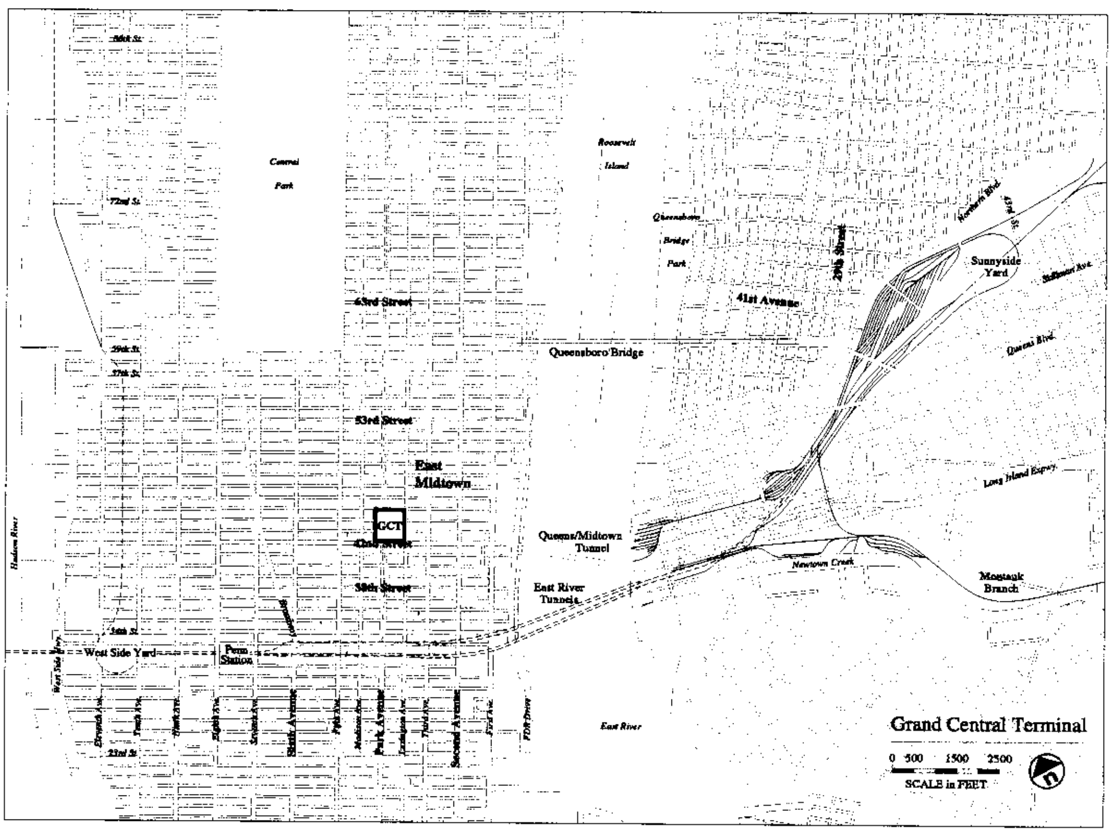


Figure 1.1-3

Commensurate with the commercial building boom in Manhattan, during these same 50 years, the Long Island counties of Nassau and Suffolk, many of whose communities originated as "bed-room communities" for commuters working in New York City, have become more urbanized and developed. Some of this suburban growth was fostered by a network of new parkways, expressways and Interstate highways constructed throughout Long Island and New York City which, along with easy highway access, in turn encouraged even further suburban growth.

During these five decades of growth, the geographical reach of the LIRR—either within Long Island, or into New York—has not expanded to keep pace with this suburbanization or population growth. During this time, while the railroad has essentially been rebuilt in place by the investments of the past fifteen years and new service initiatives implemented (e.g., Ronkonkoma electrification), not a single mile of new commuter rail route has been added to serve the increased population or commercial growth within the Long Island Transportation Corridor. In fact, each of the LIRR's commuter railroad routes, and all but five miles of the existing subway routes in the Study Corridor, were established more than 60 years ago.

Unlike parts of the country which are struggling to reinstitute commuter rail service, the Long Island Transportation Corridor never lost, or even had a diminution of, its commuter rail service. Indeed, the LIRR is *the* major transportation provider in the Nassau/Suffolk to New York market.

As illustrated in Figure 1.1-4, the LIRR captures at a minimum at least half of the Nassau/Suffolk County to Manhattan journey-to-work market share. In significant geographic sections of both counties where the LIRR provides rapid, frequent and direct (no change of trains) service into Manhattan the LIRR captures more than 80% of the market share.

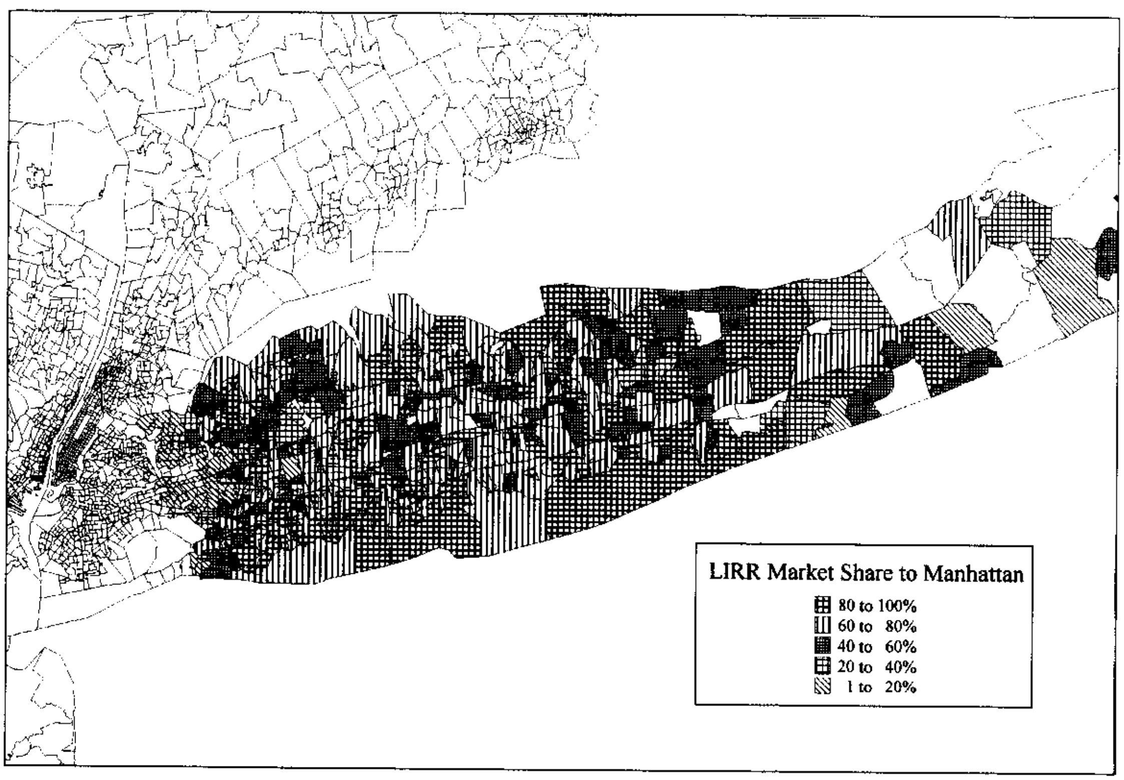


Figure 1.1-4

Although there have been a number of attempts made over the past years to establish a new East Side Terminal for the LIRR, these plans have never fully materialized. Currently, there is only one station in Manhattan for LIRR trains—Penn Station on the West Side of Manhattan, located between 31st and 33rd Streets, and between 7th and 8th Avenues (See Figure 1.1-5). Penn Station is owned by Amtrak which permits limited control by the LIRR and which leases certain trackage and station usage to the LIRR and NJ Transit.

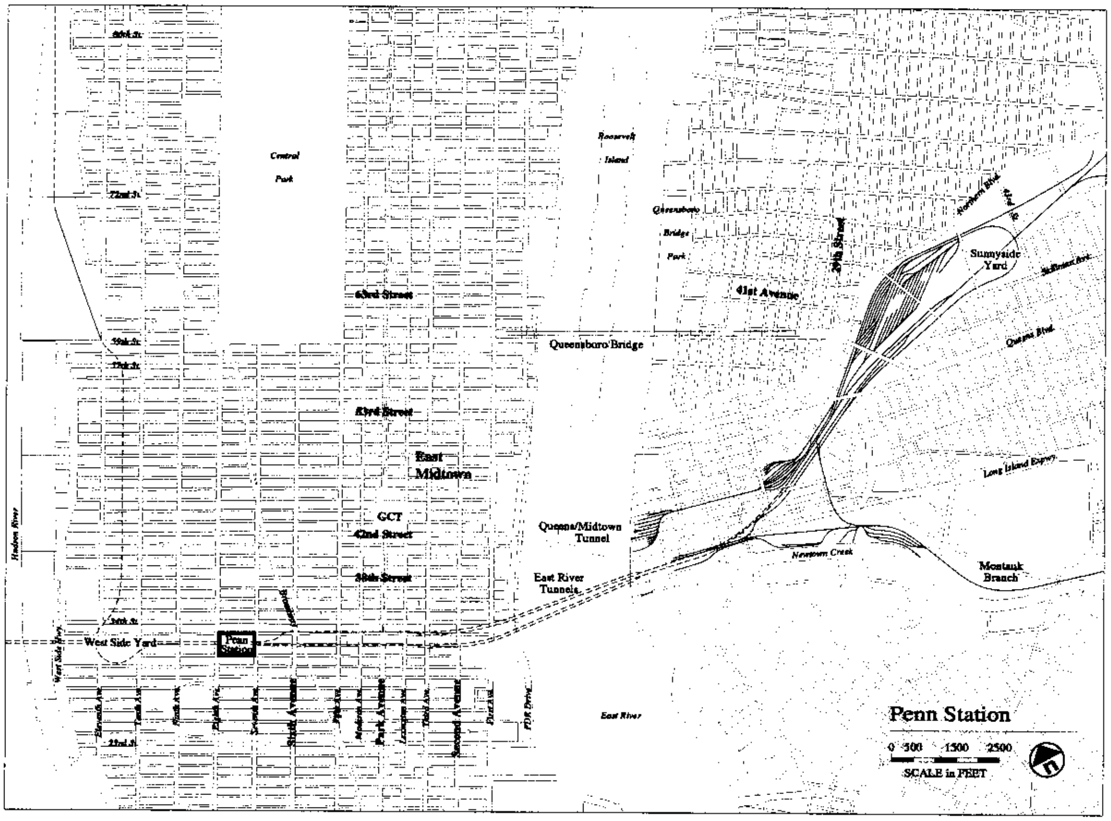


Figure 1.1-5

Although Penn Station is already operating at capacity, each of these three railroads is looking for additional capacity for both its present patronage and its projected future ridership. Meanwhile, steady ridership growth on LIRR services into Penn Station as a result of previous capital programs which have rebuilt the railroad, coupled with shifting Midtown land use development, has resulted in a terminal ill-suited to meet all of LIRR's future needs. These specific problems include:

- An inability for the LIRR to accommodate further substantial ridership growth into Penn Station, since the LIRR's portion of this station is currently at or near capacity.

- Capacity limitations which hinder the LIRR's ability to add new service without displacing existing peak period trains. For instance, while the LIRR would like to add trains to meet demand on certain heavily patronized branches, it has been hindered by the lack of available platform capacity at Penn Station during rush hours.

- The location of Penn Station on the West Side of Manhattan that is not convenient to the majority of the East Midtown office buildings built since Penn Station opened in 1910. Hence, this terminal is not convenient for approximately 53% of LIRR AM peak period riders with trip destinations in Manhattan who use Penn Station.

Ironically, despite the inconvenient location of Penn Station to many LIRR customers, Penn Station is expected to become an even more intensively used railroad station in the future. Further exacerbating the peak period capacity limitations at Penn Station, both Amtrak and NJ Transit are planning ambitious service expansions over the next few years. New Jersey Transit has begun new service — feeding their Morris & Essex Line trains into Penn Station New York using their new Kearny Connection now known as Midtown Direct. In a few more years, the new Secaucus Station will feed more passengers into Penn Station by allowing NJ Transit customers on the Main, Bergen County, and Pascack Valley Lines, and MNR's Port Jervis Line to transfer at that station to trains serving Penn Station New York. The opening of the Secaucus Station is expected to increase ridership on these connecting lines, as travel times to and from New York City will be reduced by approximately 15-20 minutes.

Further increasing future demand upon Penn Station, Amtrak is electrifying the Northeast Corridor north to Boston and is proposing the transformation of the entire Northeast Corridor into a high speed, 150 mph railroad. By 2010, Amtrak proposes to more than double its train service between New York City (Penn Station) and Boston in order to capture 45% of the total New York to Boston public transportation market—a market currently dominated by air shuttle flights.

Today, within the Long Island Transportation Corridor, the major east-west expressways, parkways and interstate highways connecting Long Island to Manhattan, as well as the railroads, transit systems and terminals which serve this Corridor, have reached or exceeded their design capacity, resulting in increased travel times and delays.

Both highway and railroad capacity limitations translate into an erosion in the Corridor's commute quality and directly impact individuals in terms of hindering employment access, decreasing productivity, increasing travel times, affecting housing locations, reducing transportation choices, and impacting the region's air quality. This lack of transportation capacity to meet current and future demand along the Long Island Transportation Corridor strikes directly at the heart of New York's and Long Island's economic well being, and clearly places the region at a disadvantage in competing for new economic development. In the global view, New York's rival world cities for economic ascendancy—London, Paris, Tokyo, Hong Kong, Seoul and Singapore—are heavily investing in their transportation infrastructure to lay the foundation for future economic growth, to meet future demand and to maintain their region's mobility. New York can afford to do no less, or risk being left behind.

1.2 Transportation Goals and Objectives

New York is competing with other world cities for economic supremacy. There is a basic correlation between economic development and regional mobility. Population, labor force and employment are all projected to continue to grow in the Corridor for the foreseeable future. These trends will increase the number of trips made in this travel corridor, especially journey-to-work trips between residential areas on Long Island and the commercial hubs in Manhattan. However, the roadways, transit systems, and rail terminals that serve this Corridor are all at or above their capacity limits, and the required capacity is not available to accommodate this projected travel growth, especially to Manhattan's East Side. Moreover, data from surveys indicate that many LIRR customers would prefer an East Midtown Manhattan Terminal instead of Penn Station and that a significant number of non-LIRR users would use the LIRR if it had an East Side terminal.

Given these facts, goals and objectives for the Long Island Transportation Corridor MIS/DEIS were initially developed to represent the broadest social and physical needs of the Corridor. The goals and objectives, as presented during the study's public scoping and subsequent public input have been refined, recognizing that they do not equally contribute to the evaluation process. The revised goals and objectives are:

MIS/DEIS Goals

- Improve the quality of service and reduce travel time within the Corridor between Long Island and East Midtown Manhattan.
- Relieve LIRR train congestion at Penn Station New York.
- Increase mobility by serving new market areas and creating new market connections within the region.
- Attract new ridership to public transportation through the creation of increased mass transportation capacity.
- Relieve serious overcrowding on New York City Transit's Queens Boulevard Line and Flushing Line subway trains.
- Reduce congestion on area highway corridors.
- Promote and reinforce economic development and the quality of life of the New York City metropolitan region.
- Conform to the New York State Air Quality Implementation Plan (SIP) as required by the Clean Air Act Amendments of 1990.
- Preserve operational capabilities for existing operators.

Within that framework, the following objectives guide the process of selecting a locally preferred alternative.

MIS/DEIS Objectives

- Identify alternatives which address the Corridor's transportation problems.
- Develop criteria for screening and evaluating alternatives.
- Define the anticipated impacts for each alternative.

- Identify the locally preferred alternative and potential impact mitigation.

Two of the goals described above, which were considered to be of primary importance, were used in a "fatal flaw" screening analysis during the Phase I MIS process. That analysis is summarized in Section 2.1.3. These goals, along with the others set forth above were also used for purposes of identifying the alternatives to be studied in the DEIS.

1.2.1 Description of Transportation Corridor Goals

Beyond the bare minimum goal of providing sufficient transportation capacity to meet the transportation demands of the Long Island/Manhattan commuter, there are other exceedingly important goals to be attained in the Long Island Transportation Corridor Study. Though all of the following goals are separate and distinct, the attainment of the first will facilitate the attainment of the others.

1.2.1.1 Improve the Quality of Service and Reduce Travel Time within the Corridor between Long Island and East Midtown Manhattan

Since additional East River crossing capacity must be provided to satisfy projected Long Island/Manhattan travel demand, that capacity should be provided, if at all possible, in a way that will enable commuters to reach their destinations in Manhattan more directly, more quickly and more conveniently than presently possible.

From 1947 to 1994, most of the new office construction in Manhattan (62% or 132,796,755 square feet out of a total of 212,921,990 square feet) took place in Midtown; and 53% of this office space was built in East Midtown (from Fifth Avenue to the East River between 34th and 59th Streets). This pattern of development has been consistent for the past five decades. Moreover, East Midtown has the highest concentration of Class A office space in the country—the premium kind of space sought after by large corporations and multinational companies.

Approximately 53% (47,000) of existing AM peak period Penn Station LIRR customers work at locations which are more accessible to GCT than to Penn Station. Most of these commuters use Penn Station, and do not find this terminal, located on the West Side and in "the 30s," convenient to their work destinations which are predominantly on the East Side and in "the 40s and 50s." For them, "doubling back" to their offices by subway, bus, taxi or on foot, adds cost, time and effort to their daily commute. Creating the additional Long Island/Manhattan capacity to meet projected Long Island/Manhattan journey-to-work trip demands by providing a new terminal for the LIRR in East Midtown Manhattan will immediately improve the commute for approximately one out of every four present LIRR commuters and will release enough capacity at Penn Station to enable the LIRR to tap new markets of passengers for whom Penn Station will suit their needs.

1.2.1.2 Relieve LIRR Train Congestion at Penn Station New York

The LIRR is the busiest commuter railroad in the country, and in 1996 carried 74.3 million riders. It is also one of the largest, consisting of 365 route miles, 135 stations including four western terminals in New York City and nine branches in Nassau and Suffolk Counties. The LIRR operates a fleet of 1,075 electrically propelled or diesel-hauled coaches assembled in more than 700 trains transporting over 262,000 passengers each weekday.

Penn Station is the LIRR's primary terminal, and the only one located in Manhattan. According to the most recent *LIRR Passenger Origins & Destinations,* report, 80% of AM peak westbound passenger trips terminate at Penn Station. During the morning peak hours, trains arrive at Penn Station at the rate of 36 trains per hour, the equivalent of one 12-car train arriving at Penn Station approximately every 100 seconds. The LIRR shares Penn Station with two other railroads—Amtrak and NJ Transit. In the future, both operators plan to increase their train service through Penn Station, further increasing demand upon the station.

Pennsylvania Station is owned by Amtrak, which also owns the two Hudson River Tunnels and trackage from New Jersey on the west, as well as the four East River Tunnels and trackage from the Bronx and Queens on the east. It leases station space, trackage and operating rights to NJ Transit and to the LIRR, the latter from its junction with Amtrak's Northeast Corridor at Harold Interlocking in Sunnyside, Queens.

Of the three separate railroads that share use of Penn Station, the LIRR is the largest user in terms of passengers, train movements and railcars. The LIRR schedules more trains, and handles more passengers, than those of NJ Transit and Amtrak combined. Since present and future operations at Penn Station are limited by physical storage, signal, and tunnel constraints, and because the LIRR is so predominant in Penn Station, it has taken a number of steps to increase the capacity and the efficiency of Penn Station to benefit LIRR customers.

However, even in a best case scenario—where all of these projects were to be approved, funded and constructed—limitations on the practical capacity of Penn Station will still exist. The additional capacity that might be obtainable would be insufficient to meet the projected needs of the LIRR alone, to say nothing of the projected needs of NJ Transit and Amtrak.

1.2.1.3 Attract New Ridership to Public Transportation through the Creation of Increased Mass Transportation Capacity

Unlike the outer reaches of Manhattan, Brooklyn or the Bronx all of which are heavily served by subway routes, the outer areas of Queens are totally devoid of any rapid transit service. The Flushing Line's terminal at Main Street, the Myrtle Avenue Line's terminal at Metropolitan Avenue, the Queens Boulevard Line's terminal at 179th Street, the Jamaica Line's terminal at Archer Avenue, and the Fulton Street Line's terminal at Lefferts Boulevard all leave significant portions of Eastern Queens lying between these terminals and the Queens/Nassau border unserved by subways. Residents of Eastern Queens who work in Manhattan must take local feeder buses to the subway terminals where the riders then begin their long subway rides into their places of work in Manhattan. Creating new capacity for the LIRR to East Midtown Manhattan would enable the railroad to actively market to residents of Eastern Queens who work in East Midtown and whose journey-to-work trips would virtually be cut in half by direct LIRR service in lieu of the slow bus/subway trip they presently take.

1.2.1.4 Relieve Serious Overcrowding on NYCT's Queens Boulevard and Flushing Lines Subway Trains

It is estimated that if the LIRR were to serve GCT, morning subway riders would be diverted to the LIRR. With some 36,600 additional journey-to-work trips from Queens to Manhattan expected to be generated by the year 2020, diverting a portion of existing and future subway riders to the LIRR for a faster, more convenient trip to Manhattan's East Side will go a long way to making subway capacity available to handle the more local trips along the corridor and will enable the suburban rail system and the urban subway system to complement each other.

1.2.1.5 Conform to the New York State Air Quality Implementation Plan (SIP) as Required by the Clear Air Act Amendments of 1990

The Clean Air Act Amendment (CAAA) of 1990 requires that federal actions conform to the appropriate State Implementation Plan (SIP). The Long Island Transportation Corridor project is a federal action because approval and possible future funding of the project will be by a federal agency, the FTA. Therefore, compliance with the CAAA is required for the project to go forward, and conformity to the SIP is the basis for demonstrating such compliance. Also, the environmental review process is being conducted in coordination with the transportation planning procedures established under ISTEA.

Conformity is defined in Section 176(c) of the CAAA as conformity to the SIP's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards. The New York State Department of Environmental Conservation (NYSDEC) is responsible for developing New York State's SIP and submitting it to the U.S. Environmental Protection Agency (USEPA) for approval. A SIP is composed of strategies for reducing pollutant emissions and has a transportation component developed by the regional Metropolitan Planning Organization (MPO). The MPO for the Long Island Transportation Corridor project is the New York Metropolitan Transportation Council (NYMTC). NYMTC develops the Transportation Improvement Program (TIP) which groups several proposed transportation improvement initiatives in the region and analyzes their combined air quality impacts at the regional level. The TIP becomes part of the SIP and thereby serves to comply with the CAAA.

The entire Study Area is in moderate nonattainment for carbon monoxide (CO); the entire Secondary Study Area (except Suffolk County) is in severe nonattainment for Ozone (0_3); and Manhattan is in nonattainment for particulates (PM_{10}).

Depending upon the study alternative selected, the LIRR East Side Access project will contribute, in varying degrees, to improved regional air quality conditions by providing either some form of a public transit alternative or TSM alternative which will decrease reliance upon the use of motor vehicles to enter New York City. The modal shift away from cars to public transit depends upon the specific study alternative selected as the locally preferred alternative.

1.2.1.6 Increase Mobility by Serving New Market Areas and Creating New Market Connections within the Region

The lack of a seamless regional transportation network is one of the most serious problems confronting the New York City metropolitan region, especially in the Long Island Transportation Corridor: it severely restricts mobility within the region—most importantly for journey-to-work trips—and forces those who must make the journey to do so by automobile because the alternative transit options are so inconvenient, so time consuming and so costly—if in fact a transit option exists at all. Further, limits on mobility constrain economic growth and development—a primary regional goal.

Seamless, in this case, refers to the ease with which a customer using public transportation can easily transfer from one mode to another, or from one system to another, without encountering physical or institutional difficulties or impediments.

Motorists within the region are able to make a fairly seamless journey from the beginning of their trip to the end even while using roads and highways that are maintained by a combination of authorities. Motorists are primarily concerned that the roads be in good repair and easy to navigate and are little concerned about which authority—City, County, State or special purpose (i.e. NJ Turnpike Authority, PANYNJ)— is responsible for the highway. Other than varying signage styles or the interruption of tolls, the ownership and maintenance responsibilities are basically transparent to the motorist, because they do not materially affect the trip.

By contrast, a rail passenger travelling across different authorities has a more difficult journey. Institutional boundaries are not transparent; indeed, they are inconvenient to the point of being obstacles (particularly for the newcomer). There is no equivalent seamless regional transit network. For instance, a rider wishing to travel from Mineola, NY, to White Plains, NY, using the region's rail network, a not improbable journey, must navigate no fewer than three rail systems, with inconvenient transfers enroute.

This requires an intrepid traveler to ride at least three different vehicles operated by three different agencies, juggle three different types of fare media, deal with three different fare tariffs (there are no through fares), and refer to three different service schedules. To make matters worse, if a customer wants travel information, he or she must call three different telephone numbers (e.g. what type of service is provided on President's Day).

A viable transportation improvement strategy emerging from the Long Island Transportation Corridor MIS/DEIS process should facilitate and enhance these regional transportation links to improve the quality of the journey-to-work trips and to more effectively knit this patchwork of different service providers into a "seamless" network.

2.1.1.7 Reduce Congestion on Area Highway Corridors

During the past five decades, after World War II in particular, Long Island experienced intensive residential and commercial development. The regional network of interstate highways, expressways and parkways established after World War II directly competed with the Long Island Rail Road for market share, and at one time parkways, expressways and interstate highways were viewed as the mode of transport for the future. Today, these expressways are over capacity, as witnessed by the growth in regional automobile ownership rates, vehicle miles traveled and the resulting congestion.

As is the experience elsewhere in this country, the self-defeating aspect of constructing new expressways to relieve congestion in urban or suburban areas is that almost immediately, such new highway capacity is absorbed by a flood of new vehicles. Today, limited land, the urbanized character of Long Island, and constraints with the environmental process make it impractical to consider adding new expressways to provide additional travel capacity between Long Island and the East Midtown area. And yet, current highway conditions will only grow worse over time as demographic trends forecast additional residential and labor force growth in Long Island and additional job growth in Midtown Manhattan.

Primary vehicular access from Long Island to Midtown Manhattan is funneled to three principal East River crossings: the Queens-Midtown Tunnel (toll), the Queensboro Bridge (toll free) and Triborough Bridge (toll). Consequently, these crossings create bottlenecks as great volumes of vehicles must merge into a limited number of traffic lanes to cross the East River. This results in significant reductions in travel speed and vehicular backups creating concurrent congestion on the feeder street network. Given the potential for significant environmental impacts and local opposition, it is impractical to consider constructing additional East River vehicular crossings.

Creating the additional Long Island to Manhattan capacity by providing a new terminal for the LIRR in East Midtown Manhattan will enable the LIRR to the tap the projected additional journey-to-work trip demand, reducing demand and consequent congestion on area highway corridors to East Midtown.

1.2.1.8 Linking Intermodal Transportation Systems

One way of moving closer to the objective of achieving a seamless regional transportation system is to physically link different elements of today's disparate transportation components offered by an array of transportation providers into new intermodal services.

Within the study corridor, these transportation providers include: LIRR, MNR, NYCT subway and bus services, Long Island Bus routes, various local and intercity private bus operators, various highway systems under the jurisdiction of different agencies, regional airports, ferries and the like. This means improving the interconnectivity among these regional transportation providers, and discarding the historical notion that these service providers are competing— rather than cooperating—to serve the region's journey-to-work and discretionary trips.

In many cases, new intermodal transfer centers could be established to provide new transportation links where services currently meet, but are not actively coordinated with one another. In other cases, minor service reroutes or extensions could bring such services into a common intermodal transportation center.

As an example of the former, and suggested as a TSM Alternative, the Long Island City/ Hunterspoint area could be developed into a regional transport hub by linking and coordinating LIRR services, NYCT subway services, various private bus routes, New York Waterways ferry services, along with any potential satellite parking planned in conjunction with NYSDOT LIE HOV lane proposals into one convenient intermodal transfer center. As an example of the latter, with minor service changes and new initiatives, the LIRR Ronkonkoma Station/McArthur Airport area could be developed as an intermodal hub drawing together train, Long Island Bus services, Hampton Jitney routes (which serves a stop near the airport), HOV parking (serving the LIE HOV lanes) and airline flights departing from McArthur Airport.

Not an academic concern, such intermodal links between regional service providers are actively being pursued. An example of one such proposal, the Port Authority's proposed Light Rail System (LRS) link between Jamaica Station and JFK Airport, which will help reinforce Jamaica's role as a regional transportation hub. New York City stands out among the major cities of this country or the world in not having direct, rail service to its airports, and the proposed LRS is a step in providing rail service to JFK Airport.

When the LIRR was developing its Network Strategy Plan in 1990-1993, it considered providing direct airport access, and ruled it out in view of the momentum and the financial resources behind an earlier, more ambitious version of the Port Authority's JFK Airport access project. At that time, an AGT connection between JFK and the East Side of Manhattan was envisioned. Under today's planning scenario, the role of the LIRR and NYCT subway routes serving Jamaica Station is to bring airport bound travelers to the Jamaica hub, where airport bound travelers will transfer to the LRS system from throughout the LIRR and NYCT service area.

1.3 Historical and Current Context of LIRR East Side Access

1.3.1 Historical Context

Improving mobility within the Long Island Transportation Corridor—specifically improving commuter rail or transit access between Long Island and the East Side of Midtown Manhattan to provide a viable alternative to the corridor's chronic highway congestion—has been under discussion for at least four decades. During this time, there have been numerous studies which have investigated alternative investment strategies for improving mobility within the Long Island Transportation Corridor. A review of the historical context of these preceding studies will help to better understand the sequence of events leading up to this Long Island Transportation Corridor Study.

A new East Side terminal for the LIRR has been under consideration since as early as 1952. During the ensuing years, several studies have repeatedly examined and supported the concept of a new railroad terminal serving the East Midtown area.

This resulted in the construction of the four-track, bi-level, 63rd Street Tunnel and approaches between Second Avenue in Manhattan and Northern Boulevard in Queens, the upper level of which was for New York City Transit (NYCT) subway use and the lower level of which was for LIRR use. Only the upper level was subsequently completed and is in use today. The lower level, consisting only of empty tunnels with no tracks, signals, etc., is still not in use and in fact is not even connected to anything on either end.

This Long Island Transportation Corridor MIS/DEIS process evaluates whether completing the originally envisioned LIRR route into East Midtown today is still valid and how the investments previously made for use by the LIRR can be best utilized, or whether another investment strategy should be advanced as the Locally Preferred Alternative.

Prior studies

In 1963, the New York State Office of Transportation addressed the question of what should be done with the LIRR after it emerged from bankruptcy under the Pennsylvania Railroad in 1966. The Office of Transportation recommended the complete modernization of the LIRR and the construction of a new LIRR terminal in East Midtown Manhattan.

Also during this time, agreement had been reached as to the need for a new East River subway tunnel, although there was as yet no consensus as to its location. The Transit Authority proposed a river crossing at 76th Street in Manhattan while the City Planning Commission and the Citizens' Budget Commission preferred one at 59th or 61st Street. A compromise was struck at 64th

Street, but when Rockefeller University raised objections, the tunnel's location was shifted one block south to 63rd Street. On August 3, 1965 the Transit Authority received a single bid to construct two one-track tunnels, but this bid was subsequently rejected because of cost.

Only a few months later, on January 20, 1966, New York State purchased the LIRR from the Pennsylvania Railroad and turned it over to the newly created Metropolitan Commuter Transportation Authority (MCTA), the predecessor of the Metropolitan Transportation Authority (MTA). Soon after, the concept of a joint Transit Authority and LIRR tunnel emerged—first as a three-track tunnel and finally as a bi-level, four-track tunnel, with the two upper tracks for Transit Authority subway service between Queens and Manhattan and the two lower tracks for LIRR access to East Midtown Manhattan. In November 1967, New Yorkers passed a $2.5 billion state transportation bond issue. Of this, $600 million was allocated for New York City subway improvements and design work for the four-track 63rd Street East River Tunnel began in earnest.

In January 1968, a study for the MCTA entitled *Improved Passenger Service to Manhattan* showed that a LIRR terminal at Grand Central was feasible and that an alternate terminal location on Third Avenue did not warrant further investigation.

In February 1968, the MCTA issued a report titled, *Metropolitan Transportation: A Program for Action.* Popularly referred to as the "Grand Design," this report outlined a two-phase expansion program for the City subway system and for the region's commuter rail network. Among other things, the report recommended the completion of the already authorized four-track 63rd Street Tunnel; modernization of the LIRR; connecting the existing LIRR system through the 63rd Street Tunnel to a new terminal under Third Avenue at 48th Street (a recommendation inconsistent with the report developed for the MCTA and issued just the preceding month); and the construction of a new Metropolitan Transportation Center skyscraper over the new LIRR terminal.

On March 1, 1968, the Metropolitan Transportation Authority (MTA) replaced the MCTA and assumed control of the New York City Transit Authority.

Construction of the 63rd Street Tunnel and Queens subway routes began in October 1969, and by 1978 the 63rd Street route was fully under construction.

Twenty-one years later, in November 1989, the Transit Authority initiated service to three new subway stations on the 63rd Street Line—Lexington Avenue, Roosevelt Island and 21st Street/Queensbridge—by extending the IND 6th Avenue Line and the BMT Broadway Line northeast from their 57th Street stations via the upper level of the 63rd Street Tunnel into Queens. This route is currently being extended approximately another 1,500 feet to connect to the IND Queens Boulevard Line and is scheduled for completion in 2001.

In August of 1973, the Turtle Bay Association, in cooperation with Manhattan Community Planning Board 6 and other organizations, issued a *Critique of the Proposed LIRR Terminal* which questioned the need to build a new terminal at Third Avenue while there was excess capacity available to the LIRR at GCT. This critique disagreed with the reasons for eliminating GCT as a potential location for the LIRR terminus. Among other things, the critique cited: 1) increased traffic congestion on Third Avenue and 49th and 50th Streets due to taxis serving the proposed terminal, 2) adverse effects on the surrounding neighborhood which is much more residential in character than the area around GCT, 3) the inconsistency between the MTA's "Grand Design" report with the MCTA-funded report produced only a month prior (which rejected Third Avenue for the LIRR terminal) and, 4) the wastefulness of using taxpayers' money to essentially duplicate the under-utilized GCT.

Nonetheless design work proceeded on the Third Avenue Terminal location. Using design criteria provided by the LIRR for planning the terminal and its approaches, technical studies and preliminary engineering for a LIRR Third Avenue Terminal were produced in January 1975. Three design alternatives were developed. The selected alternative consisted of two track levels, each with four tracks and two island platforms; a concourse level; various street entrances; a Metropolitan Transportation Center office building; and an extensive network of underground passageways connecting the new terminal with GCT, the Lexington Avenue station on the IND 53rd Street Line, the 51st Street station on the IRT Lexington Avenue Line, Grand Central Station on the IRT Flushing Line, and the proposed 48th Street station on the planned Second Avenue Line. This design alternative was priced at $420 million, in 1975 dollars.

In response to continued negative reaction to the Third Avenue location, the MTA—using the same LIRR design criteria as developed for the Third Avenue terminal—undertook a study of the feasibility of using GCT for the LIRR Terminal. Issued in September 1976, *Grand Central Alternative, Long Island Rail Road East Midtown Terminal* formulated and analyzed eight design alternatives, of which only the final alternative met the operational requirements of LIRR, Amtrak (which served GCT then) and ConRail's Metropolitan Region (predecessor of today's Metro-North Railroad). The estimated cost of construction was $332 million in 1975 dollars.

Under the selected alternative, some ConRail operations were to be shifted to the upper level of GCT, where three additional tracks were to be added. Twenty tracks on the lower level were to be dedicated to LIRR service—ten tracks served by five island platforms on the west side of the terminal and ten storage tracks on the east side. The North End Access Project for pedestrians, already planned as part of a previous *Grand Central Improvement Study*, was included in this alternative, but was found to require modification and expansion to accommodate LIRR customer traffic. Existing passageways to the subway system were found to have adequate capacity to handle the extra LIRR passengers. However, the IRT Lexington Avenue Line was projected to experience increased passenger congestion, a situation anticipated with a LIRR terminal at Third Avenue as well.

Based upon further community concerns, in July 1977, the MTA Board selected GCT as the preferred LIRR East Midtown terminal. ConRail expressed concern that whatever "spare" capacity existed at that time would eventually be required by ConRail and Amtrak to meet future traffic and growth; a terminal shared with LIRR could preclude future ConRail and Amtrak expansion at GCT.

In 1991, with the opening of the Empire Connection along Manhattan's West Side, Amtrak consolidated its operations at Penn Station by shifting its 19 daily trains using Grand Central to Penn Station. The four tracks at GCT used exclusively by Amtrak reverted to MNR.

In July 1991, the MTA engaged consultants to undertake an analysis of the then existing conditions and operations of the regional rail network serving Penn Station. The *Penn Station Capacity and Utilization Analysis* report completed in January 1992 stated that the ability of the LIRR to meet the needs of its customers during peak periods was already strained by such factors as train length limitations at Penn Station; the inability to access their West Side Yard from all LIRR tracks in Penn Station; and the inability to operate additional trains through the East River Tunnels during peak periods. The report stated that conditions were expected to worsen over the next decade as demand for LIRR service into Penn Station continued to grow.

Certain physical modifications and changes in operational strategy were projected to provide some capacity relief, chiefly increasing the capacity into Penn Station from 36 trains per hour to 42 trains per hour for which planning is currently underway. However, as the subsequent *LIRR Network Strategy Study* concluded, only by providing the LIRR with an entirely different and additional access to Manhattan—particularly to the East Midtown area—could the LIRR gain the full additional capacity it needed to handle the increased growth it anticipated.

Accordingly, in December 1991, the LIRR engaged consultants to study the feasibility of providing LIRR access to Manhattan's East Side. The *Operational & Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side*, completed in April 1993, concluded that it was operationally and physically feasible for the LIRR to gain access to Manhattan's East Side. The report concluded this was best accomplished by using the lower level of the 63rd Street Tunnel as originally intended. This involved connecting the tunnel to both the LIRR's Main Line and Port Washington Branch at Harold Interlocking in Queens, and by connecting the tunnel to GCT in Manhattan.

The 1993 Study differed from the previously mentioned 1976 *Grand Central Alternative Study* by evaluating various Queens and Manhattan connections and alignments to the 63rd Street Tunnel. The 1993 study also envisioned storing mid-day LIRR trains in Yard A of the Sunnyside Yard complex, instead of storing such trains at GCT (as recommended in the 1975 Grand Central Alternatives Study). Storing LIRR trains "off site" significantly reduces the number of tracks required at GCT to support LIRR service, and reduces the impact upon MNR's future service expansion plans.

1.3.2 Long Island Transportation Corridor MIS/DEIS in Relation to Other Studies

Over the many years that the LIRR East Side Access concept has been under consideration, a number of other studies were undertaken on a host of other projects, some of which complement the current MIS/DEIS.

An entire group of studies in the 1980s dealt with transit improvements in Queens and between Queens and Manhattan. In these studies, concepts such as the construction of new subway trackage on or alongside LIRR rights-of-way, joint LIRR/NYCT operation over certain LIRR and NYCT tracks, and even the outright transfer of certain lines from one agency to another (generally from the LIRR to NYCT) were examined.

Today, there are at least seven other studies currently underway which will affect, or be affectedby, the Long Island Transportation Corridor MIS/DEIS. These include:

- The **Access to the Region's Core Study (ARC)** is a joint study between the Port Authority of New York and New Jersey, the MTA and NJ Transit. The ARC study is analyzing long-term transportation initiatives to improve regional mobility into and through the Manhattan Business Core, and to integrate the region's non-contiguous transportation network into a cohesive, environmentally sound system. The intent of ARC is to maximize regional mobility per dollar invested in new transport infrastructure by recommending solutions which transcend traditional political, institutional and operational barriers.

- The **Manhattan East Side Transit Alternatives Study (MESA)** for NYCT is examining a variety of multi-modal alternatives for improving north-south transit access along the East Side of Manhattan from approximately South Ferry in Manhattan to 164th Street in the Bronx. Modes under examination include building the long discussed Second Avenue Subway, capacity improvements to relieve overcrowding on the IRT Lexington Avenue subway line, light rail transit options, establishing electric trolleybuses, and other ideas to improve mobility along Manhattan's East Side.

- NYCT's **East River Crossing Study** is analyzing whether, to what extent, and at what cost, the existing subway tunnels and bridges spanning the East River can continue to handle NYCT subway traffic into the future. Long range strategies include determining whether to repair, replace or augment these existing transit river crossings.

- The **42nd Street Transitway Study** for the New York City Department of Transportation has been examining the feasibility of instituting light rail transit (LRT) service to replace existing local NYCT bus service along the heavily trafficked 42nd Street crosstown corridor. The proposed LRT line would operate between the United Nations on the East Side of Manhattan and the New York Waterway's ferry terminal and the Jacob Javits Convention Center on the West Side of Manhattan.

- The **Long Island City Transportation Needs and Opportunities Study** is identifying existing transportation resources in the Long Island City area, forecasting future transportation conditions, and defining and evaluating future transportation strategies serving the Long Island City area.

- New York State Department of Transportation's **Long Island Expressway Corridor Development Project** is currently examining a range of transportation planning options to increase highway capacity on the portion of the Long Island Expressway within Queens County. One of the options under study is expanding or establishing new HOV lanes within the project area.

1.3.3 MTA/Long Range Planning Framework

Of the six studies described above, three are being coordinated with this MIS/DEIS and the Trans-Hudson Crossing Study under the MTA's Long Range Planning Framework:

STUDY	AGENCY
East River Crossing Study	MTA/New York City Transit
Manhattan East Side Transit Alternatives Study	MTA/New York City Transit
MIS/DEIS for the Long Island Transportation Corridor	MTA/Long Island Rail Road
Access to the Region's Core Study	MTA/Port Authority of NY & NJ/ NJ Transit
Trans-Hudson Crossing Study	MTA/Metro-North Railroad

The purpose of the Long Range Planning Framework is to develop a unified program of improvements to the subway and commuter rail systems that: alleviate overcrowding on existing lines, reduce passenger travel times, improve connectivity among rail lines, provide a high quality service and extend rail service to underserved geographic areas.

There are several compelling reasons for the MTA Long Range Planning efforts:

- **Static Configuration**
  The commuter rail and subway network in place today was completed in the 1940s. There has been very little investment in new lines since then.

- **State of Good Repair**
  Capital investments since the early 1980s have focused heavily on rebuilding the existing system. Paybacks have included improved service quality, higher customer ratings and increased ridership.

- **Network Expansion Now**
  It is appropriate to begin examining how the rail network can be expanded and adapted in order to better serve 21st century access and mobility needs.

- **Economic Benefits**
  Investment in transportation and other infrastructure systems has been identified as one of the key ways to maintain economic competitiveness with other world class cities.

- **Quality of Life**
  Keeping the region mobile for goods and people not only supports economic growth and productivity but also contributes to quality of life factors that are important to its citizens.

Coordination among the Framework studies is essential. Study sponsors meet regularly at the policy and technical committee levels to ensure that the interconnections among studies such as planning assumptions, transportation alternatives and public outreach are identified and evaluated.

The Long Range Planning Framework will ensure consistency and comparability between the studies; produce a unified program of network expansion projects and ensure compliance with Federal requirements.

For this project as well as the other projects being coordinated under the MTA's Long Range Planning Framework process, the year 2020 was chosen as the horizon year for all ridership, environmental, economic and demographic forecasting purposes.

However, the beneficial use date for the Build Alternative is currently projected to be 2010, some ten years before the build year assumed for purposes of planning and environmental analysis. This influences the ridership forecasts, and subsequent impacts and mitigations of the identified alternatives in the following ways. In every case, the 2020 projections represent a more constrained environment than will actually be in place in 2010; thereby making the impacts identified a "worst case" scenario.

For example the full Build Alternative service plan will come on line in 2010 when the project is completed. However, MNR Service in 2010 is projected to contain fewer trains per hour than their service plan for 2020. This means that the impacts at GCT, such as platform and corridor congestion, will be less severe in 2010 than is projected for 2020.

Additionally the ridership forecasts are made up of two distinct parts, 1) the ridership generated by the Build Alternative and; 2) the background growth in journey-to-work trips. Given a build year of 2010, the full extent of the project generated ridership will be realized when service begins. Background growth, however, will have achieved less than half (9.05% out of 18.5%) of the 2020 projected growth by the year 2010. This means that crowding impacts on the Lexington Avenue Subway will be less severe than portrayed in 2020.

1.4 The Long Island Transportation Corridor

1.4.1 Limits of the Study Corridor

The Long Island Transportation Corridor consists of the counties of Suffolk, Nassau, Queens, Kings (Brooklyn) on Long Island and the East Midtown portion of New York County (Manhattan). (See Figure 1.4-1).

The study corridor is divided into the Primary Study Area (PSA) where the effects of the transportation improvement project will be most direct, and a Secondary Study Area (SSA) where the effects of the project will be less direct.

The Primary and Secondary Study Areas are illustrated in Figure 1.4-2. The Study Area consists of all or part of the five counties in the metropolitan area served by the LIRR: all of Suffolk, Nassau, Queens and Kings Counties on Long Island and the East Midtown area of New York County.

Impacts in the Primary Study Area, which for the purposes of analysis has been broken down into the Manhattan Study Area and the Queens Study Area could include:

- Short term construction related impacts to vehicular and pedestrian access, noise and vibration, air quality, utility services.
- Land acquisition, displacements and relocations to accommodate new LIRR facilities.
- Historic and archaeological resources impacted by construction activity and new LIRR facilities.
- Increased traffic and parking demand due to increased use of GCT facilities by LIRR customers.
- Land use changes and economic activity.
- Pedestrian circulation.
- Impacts to MNR, NYCT, Amtrak, NJ Transit.
- Air quality impacts on a regional and GCT project area specific level.

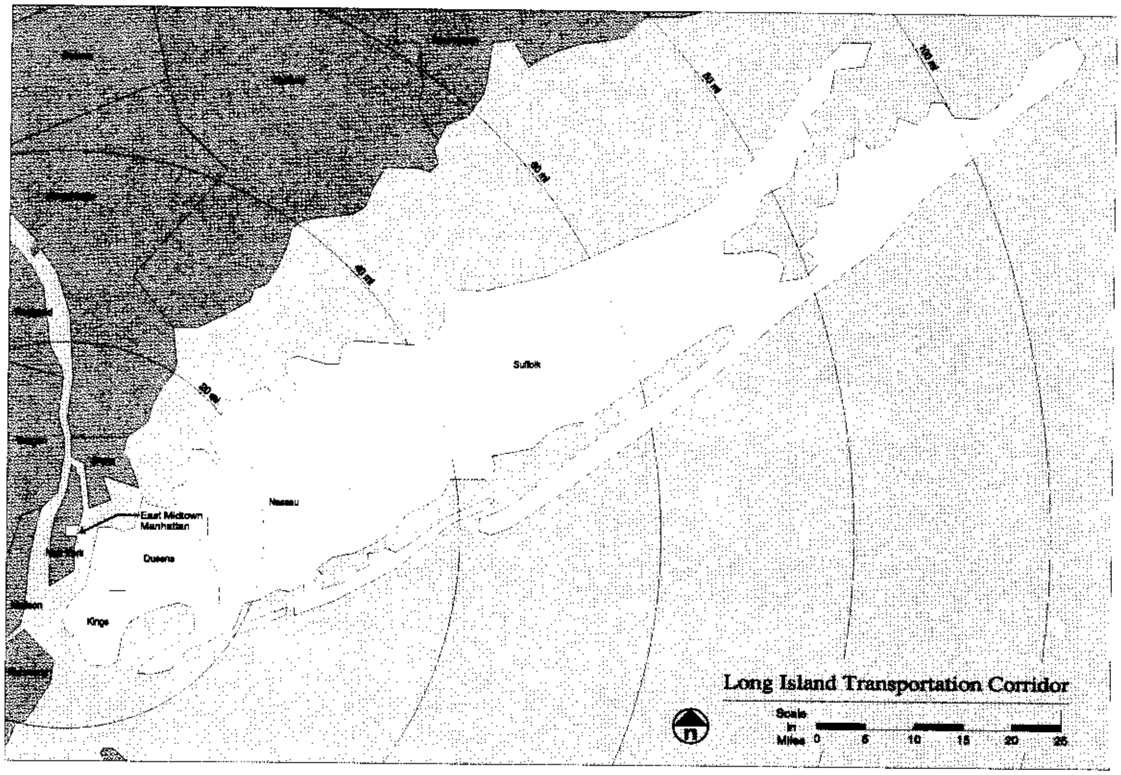


Figure 1.4-1

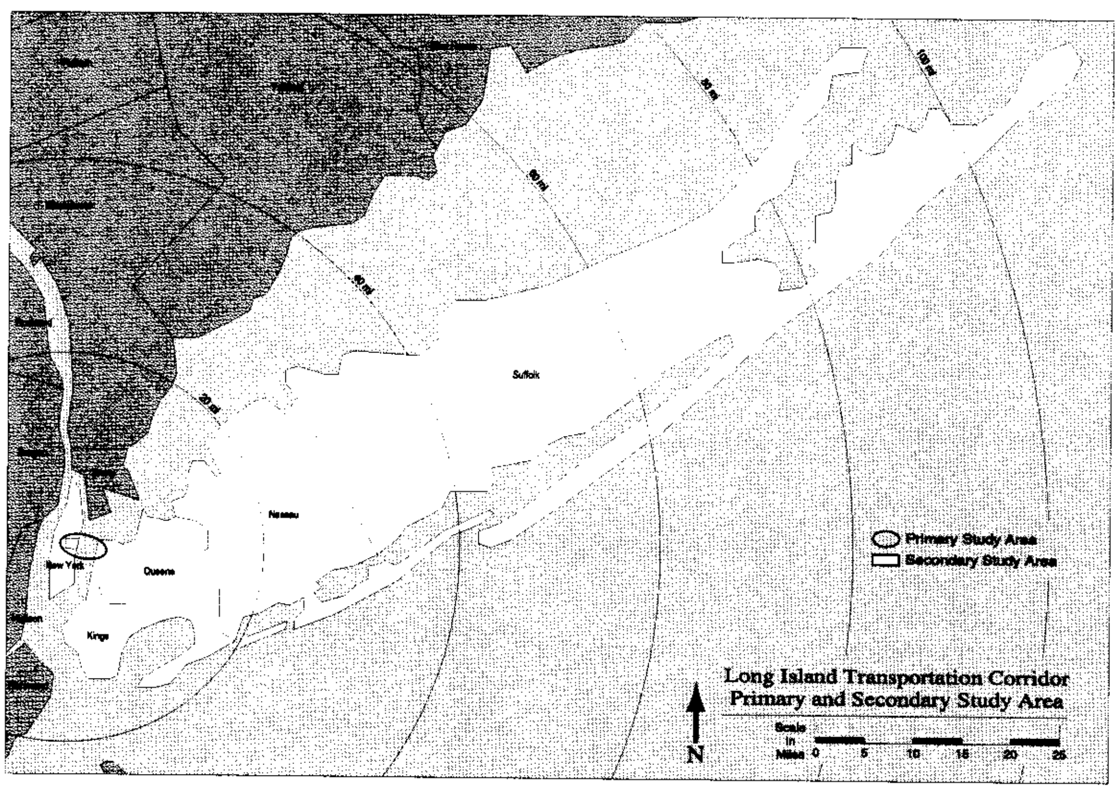


Figure 1.4-2

The Manhattan Study Area and the Queens Study Area are illustrated in Figures 1.4-3 and 1.4-4.

Impacts within the Secondary Study Area could include:

- Changing modal shifts and market share between LIRR trains, Long Island corridor express buses, subways and automobiles.
- Changes in transit services and facilities.
- Land use impacts.
- Induced commuter impacts on existing parking and station facilities.
- Operational changes to the entire LIRR rail network.

The Manhattan Study Area (MSA) is bounded by 38th Street on the south, an irregular boundary on the north encompassing 63rd and 65th Streets between Madison Avenue and the East River, and the area from Second Avenue on the east to Sixth Avenue on the west. The MSA also includes the swath of land 500 feet on each side of the alignment of the partially completed 63rd Street Tunnel as it passes beneath Roosevelt Island in the East River. Manhattan Community Boards 5, 6 and 8 are entirely or partially in the MSA.

The Queens Study Area (QSA) is centered around the alignment of the 63rd Street Tunnel (which is under 41st Avenue) and includes most of Sunnyside Yard. The QSA overlaps the communities of Long Island City and Sunnyside, and is defined as the area between the East River on the west to 43rd Street on the east. The southern boundary is Queens Plaza North (a frontage road for the Queensboro Bridge), while the northern boundary is 40th Avenue. Queens Community Boards 1 and 2 are partially in the QSA.

1.4.2 Description of the Study Corridor

1.4.2.a Manhattan Study Area

Land uses within the MSA are among the most dense and heavily urbanized in the country and comprise commercial, institutional, retail, office use, residential, and industrial uses. The MSA is the center of various corporate, cultural and residential activities, attracting millions of workers and tourists, and is home to thousands of residents. Millions of square feet of floor space are provided in buildings, some of which occupy entire city blocks. The MSA contains the dense cluster of Midtown Manhattan office buildings built on the solid mid-island bedrock which, together with the Downtown Manhattan office buildings built on the solid bedrock at the southern tip of the island give the Manhattan skyline its unique "peak, valley and peak" profile immediately recognized worldwide as symbolizing New York City.

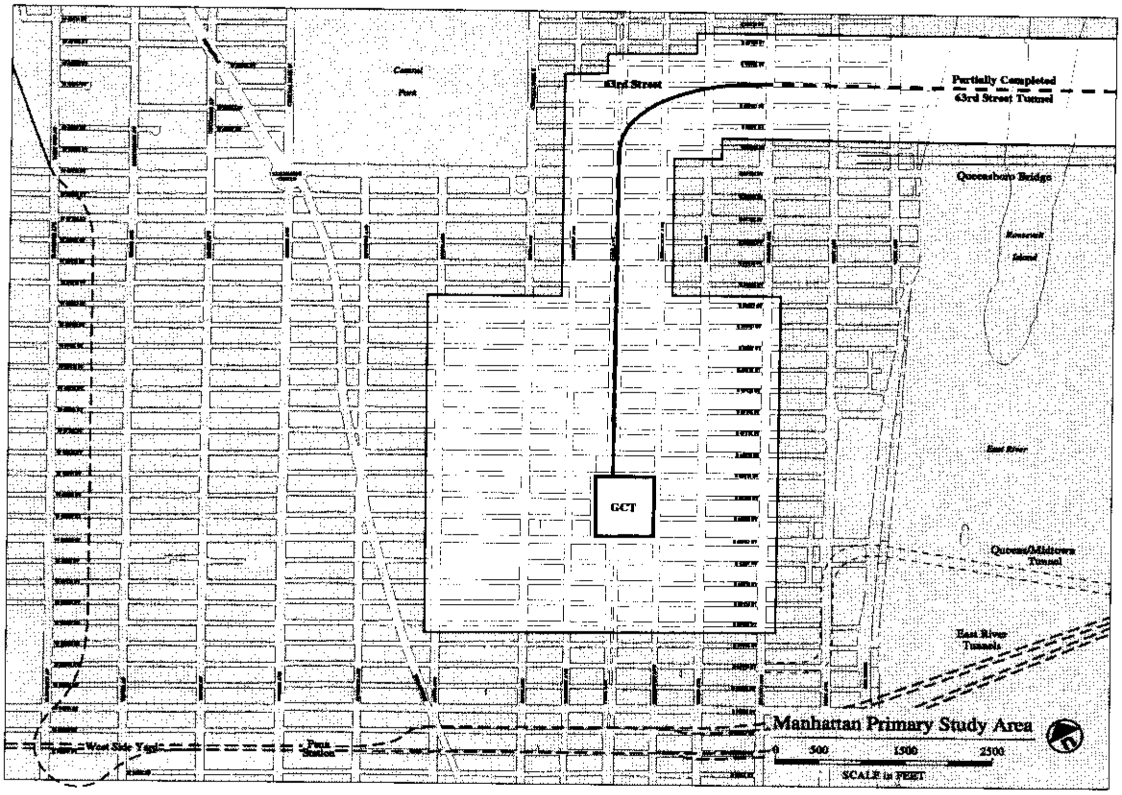


Figure 1.4-3

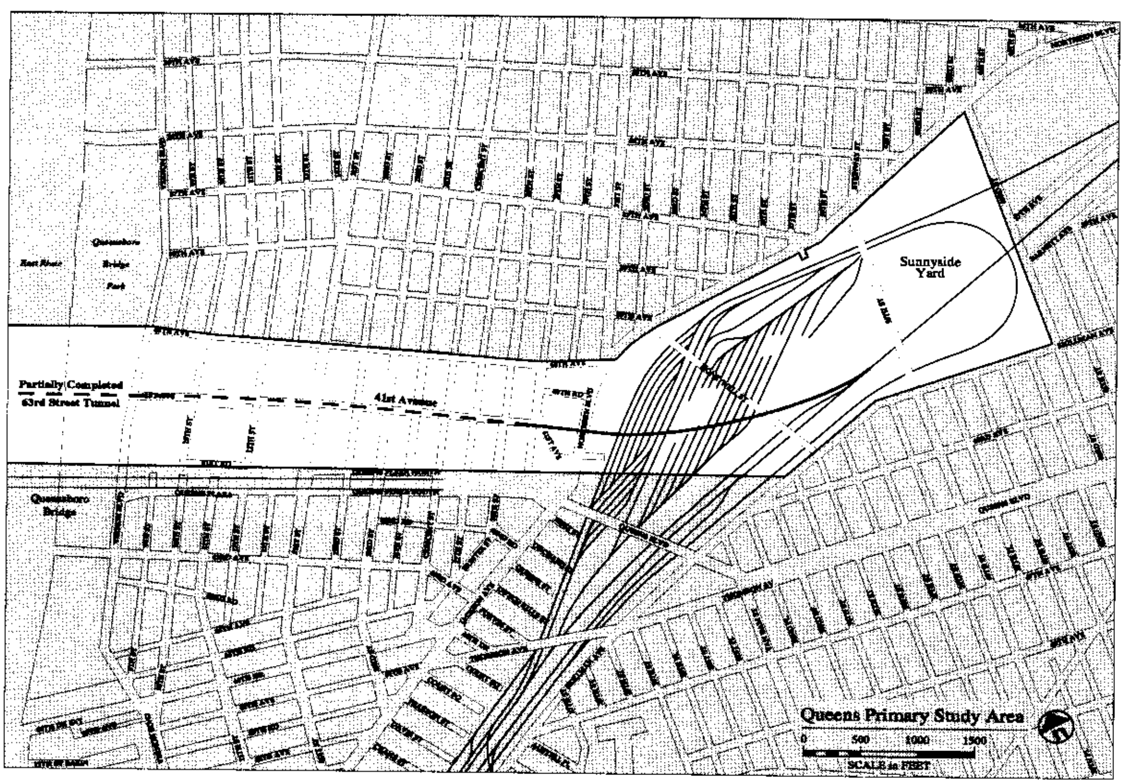


Figure 1.4-4

The City's zoning reflects the complexity of the land uses in the MSA in which there are 20 different zoning designations, along with five different special districts and subdistricts. The primary zoning designation in the MSA is commercial with approximately 90 percent of the MSA south of 57th Street so zoned. Residential zoning predominates in four sections of the MSA; 1) the northern/eastern part of the MSA, in the vicinity of Park Avenue and 63rd Street; 2) along the eastern edge of the MSA east of Third Avenue between 46th and 53rd Streets; 3) along the southern edge of the MSA south of 40th Street between Madison and Third Avenues; and 4) on Roosevelt Island. Only a small part of the MSA is designated and zoned for manufacturing uses, and those areas include: 1) the area south of 40th Street between Fifth and Sixth Avenues comprising the Garment District; and 2) the northeast section of the MSA bounded by York Avenue and the FDR Drive from 62nd to 63rd Streets.

The area immediately surrounding GCT is part of the Midtown Business District, where office buildings of between 20-50 stories predominate. Between 40th and 62nd Streets, high-rise office buildings dominate Sixth, Fifth, Madison, Vanderbilt, Park, Lexington and Third Avenues. The avenues farther east—Second and First Avenues—are characterized by a mixture of high-and-low rise apartment buildings. In most of the commercial buildings, and many of the larger residential buildings, there is ground floor retail activity.

As may be expected in the dense urban land use characterizing the MSA, open space is limited. The "parklands" in the MSA tend to be urban plazas and indoor office building atriums, instead of being pristine natural environments or even traditional city parks.

1.4.2.b Queens Study Area

In contrast to the dense commercial and residential land use of the MSA, the QSA is less intensively developed and consists of lower density land uses.

Zoning within the QSA is less complex than the zoning in the MSA. The diversity of land uses is not as great and the intensity of development is considerably lower. The QSA consists of one commercial, five manufacturing and two residential zoning districts. Most of the QSA is zoned for manufacturing uses, and the entire QSA east of 21st Street (except for a small park in the southeast corner of the QSA) is zoned for light manufacturing. Almost all of the QSA west of 21st Street is zoned for residential uses, and this applies to the Queensbridge public housing complex and the adjacent Queensbridge Park.

Between the East River and Vernon Boulevard is Queensbridge Park, a public riverfront park with views of Roosevelt Island and Manhattan Island beyond. The park is arranged along an east-west visual axis to capitalize on these riverfront views.

To the east of Queensbridge Park, in the area between Vernon Boulevard and 21st Avenue, is the Queensbridge Housing complex. This public housing complex consists of several buildings, each between 8 and 12 stories tall. The ground floors of some of the core buildings contain retail shops and services serving the complex.

The Queensbridge Housing complex stands in contrast with the adjacent land uses between 21st Avenue and Northern Boulevard, which consist of low-rise commercial and light industrial use buildings. To the east of Crescent Street, these land uses are interspersed with single family houses. Most of these commercial and residential buildings are generally no taller than two or three stories.

At the eastern edge of the study area is the Sunnyside Yard and Yard A complex, a series of large train storage and servicing yards used by Amtrak, NJ Transit and the LIRR for passenger and freight operations. Sunnyside Yard and its related railroad activities is the predominant land use in this portion of the QSA and is ringed by various light industrial buildings and warehouses. Yard A, a freight yard used by the LIRR, is located near the western perimeter of Sunnyside Yard. Harold Interlocking—a key junction connecting Penn Station New York with the LIRR lines to the east and Amtrak's Northeast Corridor line north to Boston—is located along the southern perimeter of Sunnyside Yard. Combined, Sunnyside Yard, Yard A and Harold Interlocking occupy a significant amount of the Long Island City real estate.

Over the past 30 years, there have been occasional plans to develop the air rights above Sunnyside Yard for commercial and residential purposes, although nothing as yet has been developed.

The Sunnyside Yard loop tracks forms the eastern boundary of Sunnyside Yard, and the land use along the west side of 43rd Street consists of light industrial buildings, which also effectively serve as a visual buffer against the residential developments on the east side of 43rd Street. The recent construction of a General Motors Corporation automobile fleet service and maintenance facility in the Sunnyside Yard parcel bounded by the curving loop tracks, the LIRR Main Line, and the 39th Street Bridge represents a conversion of land formerly used for railroad purposes to other commercial uses. South of Skillman Avenue and outside of the QSA are established, low density residential areas.

Compared to the MSA, densities in the QSA are lower, and there is a higher ratio of open space per capita. Four parks in this study area have been noted. In addition, the Queensbridge Housing complex, located between Vernon Boulevard and 21st Street, and between the Queensboro Bridge and 49th Avenue, is itself a form of open space, since it consists of multi-story apartment buildings set apart from each other in a parklike setting.

1.4.2.c Long Island Secondary Study Area

Long Island, the largest island adjoining the continental United States, extends approximately 118 miles east-northeast from the mouth of the Hudson River. Long Island is bounded on the west by both Lower and Upper New York Bay, which separates it from Staten Island, and by the East River which separates it from the island of Manhattan; on the north, by Long Island Sound which separates it from the mainland (the rest of the continental United States); and to the east and south by the Atlantic Ocean.

Long Island is twenty miles wide at its widest point. Peconic and Gardiners Bays divide the eastern end of the island into two peninsular forks. The northern fork, ending at Orient Point, is approximately 28 miles in length, while the southern fork, terminating at Montauk Point, is about 44 miles long. The island is composed of low plateaus on the north, longitudinal ridges of glacial moraine through the central parts of the island, and gently sloping coastal plains to the south of the moraine.

Totaling 1,377 square miles of land area, Long Island is divided into four counties. From west to east they are: Kings (Brooklyn), Queens, Nassau and Suffolk. In terms of land area, Suffolk County is the largest of the four counties, covering an expanse of 911 square miles, followed by Nassau County, with 287 square miles, Queens with 109 square miles and Kings County with 70 square miles. Kings and Queens Counties are two of the five counties comprising the City of New York. As of January 1, 1994, Nassau County with three townships, contained 64 incorporated villages while Suffolk County, with ten townships, contained 30 villages.

The 1990 population of Long Island was 6,861,587, subdivided as follows: Brooklyn, 2,300,664; Queens, 1,951,598; Nassau, 1,287,348; and Suffolk 1,321,977. The population density of the Long Island Transportation Corridor decreases as distance from New York City increases—largely a function of longer travel times to reach New York City and more restrictive land use and zoning requirements: 32,866 persons per square mile in Brooklyn; 17,905 in Queens; 4,485 in Nassau; and 1,451 in Suffolk.

1.4.3 Major Traffic Generators

The MSA, which is the focal point for the Long Island Transportation Corridor, contains a number of significant traffic generators, including New York's premier concentration of high-rise office buildings, major institutions, tourist attractions and cultural facilities. While there are a number of activities which generate a relatively sizable amount of traffic, only those traffic generators that are regional in scope are included in the summary below. A list of these traffic generators appears in Table 1.4-1.

The southern part of East Midtown Manhattan is bordered by 34th Street, a major thoroughfare lined with shops, restaurants and other retail uses. These activities are more oriented towards serving the local Murray Hill neighborhood, reflecting nearby residential land uses, rather than serving as a regional traffic generator. Interspersed within the southern East Midtown area are institutional uses, such as Stern College of Yeshiva University on Lexington Avenue and 34th Street.

Major traffic generators in the southern part of the MSA include the various hotels listed in Table 1.4-1 and Lord & Taylor Department Store at Fifth Avenue and 38th Street. In fact, Lord & Taylor is the southern anchor for the larger Fifth Avenue Shopping District beginning at 38th Street and extending north to 59th Street. Unlike office buildings, these activities generate traffic seven days a week.

Moving north towards 42nd Street, staying west of Third Avenue, business and commercial activity, rather than residential, predominates, though the area to the east of Third Avenue contains a mixture of residential and commercial uses. As the commercial midtown spine, 42nd Street is an important street along which many regional traffic generators are clustered. From west to east, these major traffic generators include: Bryant Park and the New York Public Library (Fifth Avenue and 42nd Street), the City University of New York Graduate School and University Center (42nd Street between Fifth and Sixth Avenues), Grand Central Terminal (42nd Street and Park Avenue), the Whitney Museum (42nd Street and Park Avenue) and the Chrysler Building and Chanin Building (both located at 42nd Street and Lexington Avenue). GCT, the main focus of this study area, is one of Manhattan's four regional transportation hubs (the others are Penn Station, the Port Authority Bus Terminal and the PATH/World Trade Center Complex) and is a major traffic generator. Grand Central Terminal is served by Metro-North Railroad, which provides commuter rail service to communities to the north of New York City via three rail lines (Harlem, Hudson and New Haven lines). Grand Central is also the junction point for three of the City's busiest subway lines; the IRT Lexington Avenue Line (served by the #4, 5 and 6 trains), the IRT Flushing Line (#7 train) and the Times Square Shuttle. The recently commenced $113.8 million Grand Central Terminal redevelopment project, in addition to rebuilding the Terminal's physical plant, will reshape the Terminal as a major destination for retail shopping and food services. This investment is expected to generate additional trips to the Terminal and transform it into a regional shopping, tourist and entertainment destination. Under a separate project, the North End Access project at GCT will create new underground pedestrian passageways between the Terminal and the streets to the north of the Terminal where much of the new East Midtown office construction has been focused. These two "anchor" projects should greatly enhance the access and amenities of working in the East Midtown area, and will have a beneficial ripple effect sparking similar real estate investments by private building owners in the surrounding area.

North of GCT, west of Second Avenue, high-rise office space as well as other commercial activities predominate, particularly along Park and Madison Avenues. Major traffic generators and landmarks north of Grand Central include the Met Life (formerly Pan Am) Building at Park Avenue and 44th Street; the Helmsley Building at Park Avenue and 45th Street; the Waldorf-Astoria Hotel at Park Avenue and 49th Street; the Seagram Building at Park Avenue and 52nd Street; the Sony (formerly AT&T) Building at Madison Avenue and 55th Street, and the IBM Building at Madison Avenue and 56th Street. Collectively, this intense concentration of office buildings is one of the major traffic generators in the MSA.

During each of the decades in the period 1947-1994, there was a consistent pattern where most of the new office construction in Midtown Manhattan took place in East Midtown (71 million square feet). Just as significant as the number of square feet of office space in East Midtown is the quality of the office space. The East Midtown area is home to the highest concentration of Class A office space in the country. Class A office space represents the highest quality of office space available, and is generally sought after by large corporations and multinational companies which demand such high grade space.

Near the western edge of the MSA, Fifth Avenue forms another important retail and institutional spine. As mentioned earlier, the Fifth Avenue Shopping District extends between 38th and 59th Streets. Major traffic generators between Fifth and Sixth Avenues include Rockefeller Center (bounded by 47th and 53rd Streets and Fifth and Sixth Avenues); the Diamond and Jewelry District at 47th Street; Saks Fifth Avenue Department Store on Fifth Avenue between 49th and 50th Streets; St. Patrick's Cathedral at Fifth Avenue and 50th Street; Radio City Music Hall at Sixth Avenue and 50th Street; the Museum of Television and Radio near Fifth Avenue and 52nd Street, and the Museum of Modern Art at 53rd Street near Fifth Avenue.

Madison Avenue, between 47th and 63rd Streets, is a new shopping district that has emerged in recent years, and which is rivalling the popularity of Fifth Avenue in terms of retail sales and rental values.

At the northern end of the MSA is a concentration of traffic generators that cater not only to tourists but also to New Yorkers seeking recreational and shopping opportunities. The area along

59th Street is especially abundant in these recreational and retail land uses, including Bloomingdales Department Store (Lexington Avenue and 59th Street).

TABLE 1.4-1
List of Significant Commercial Facilities and Other Traffic Generators

Traffic Generator	Location
Commercial	
Grand Central Terminal	Park Avenue & 42nd Street
Chrysler Building	Lexington Avenue & 42nd Street
Chanin Building	Lexington Avenue & 42nd Street
Daily News Building	42nd Street between 2nd & 3rd Avenues
Met Life Building (formerly Pan Am)	Park Avenue & 44th Street
Helmsley Building	Park Avenue & 45th Street
Citicorp Center	Lexington & 53rd Street
Seagram Building	Park Avenue & 52nd Streets
Rockefeller Center	Irregular boundaries between Fifth & Seventh Avenues; between 47th & 53rd Streets
Radio City Music Hall	Sixth Avenue & 50th Street
Sony Building (formerly AT&T)	Madison Avenue & 55th Street
IBM Building	Madison Avenue & 56th Street
Retail	
Fifth Avenue Shopping District	Fifth Avenue between 38th & 53rd Streets
Lord & Taylor Department Store	Fifth Avenue & 38th Street
Diamond & Jewelry District	47th Street between Fifth & Sixth Avenues
Madison Avenue Shopping District	Madison Avenue between 47th & 63rd Streets
Saks Fifth Avenue Dept. Store	Fifth Avenue between 49th & 50th Streets
Bloomingdales Dept. Store	Lexington Avenue between 59th & 60th Streets
Institutional	
Mid-Manhattan Library	Fifth Avenue & 40th Street
Whitney Museum	Park Avenue & 42nd Street
New York Public Library	Fifth Avenue & 42nd Street
CUNY Graduate School & University Center	42nd Street between Fifth & Sixth Avenues
St. Patrick's Cathedral	Fifth Avenue & 50th Street
St. Bartholomew's Episcopal Church	Park Avenue & 51st Street
Museum of Television & Radio	52nd Street between Fifth & Sixth Avenues
Donell Library	53rd Street between Fifth & Sixth Avenues
Museum of Modern Art	53rd Street between Fifth & Sixth Avenues
Rockefeller University	York Avenue between 63rd & 68th Streets

TABLE 1.4-1 (cont'd) List of Significant Commercial Facilities and Other Traffic Generators	
Traffic Generator	**Location**
Recreational	
Bryant Park	Between Fifth & Sixth Avenues; between 42nd & 40th Streets
Lodging	
Doral Tuscany Court	39th Street between Park & Lexington Avenues
Bedford Hotel	40th Street between Park & Lexington Avenues
Grand Hyatt Hotel	Lexington Avenue & 42nd Street
Tudor Hotel	42nd Street & Third Avenue
Royalton Hotel	Sixth Avenue & 43rd Street
Algonquin Hotel	Sixth Avenue & 44th Street
Waldorf-Astoria Hotel	Park Avenue & 49th Street

Rockefeller University, located at York Avenue and 63rd Street is the last major traffic generator within the northern boundary of the MSA.

1.4.4 Growth and Development Trends

1.4.4.a Real Estate Development

Since real estate development has a long lead time, when New York City's economic growth accelerated in the early 1980s, vacancies fell and office rents soared. In the middle of the decade, building construction and rehabilitation caught up with demand. As a result of the region's severe job losses in the late 1980s and early 1990s, office vacancy rates increased and asking rents fell in Midtown Manhattan. However, in the mid 1990's, the real estate market has significantly recovered.

The rate of non-residential development has slowed due to the national and regional recession in the early 1990s and excess building during the 1980s. According to F.W. Dodge Construction Permit data, from 1984 to 1990 permits were granted for an average of 9.5 million square feet of non-residential space per year in New York City and for 45.5 million in the rest of the metropolitan area. In 1991 and 1992, in contrast, permits were approved for an average of only 6.9 million square feet per year in New York City, and 20 million in the suburbs. The declines have been in Manhattan's office space market. From 1985 to 1990, permits were approved for an average of 3.6 million square feet of office space in Manhattan each year, compared with an average of only 877,000 square feet in 1991 and 1992. Outside of Manhattan, in the other boroughs, permits were approved for an average of 442,000 square feet of office space from 1985 to 1990, compared to an average of 590,000 square feet in 1991 and 1992.

With respect to office development in Nassau and Suffolk Counties through 1989, a total of 30.8 million square feet was built. Of this, 21.8 million square feet, or just over 70% of all the office space built in Nassau and Suffolk Counties was constructed between 1980 and 1989.

In Nassau and Suffolk, the early 1980s also saw a tremendous boom in residential development. As shown in Figure 1.4-5, residential development peaked in 1986, with over 11,000 building permits authorized in that year. Development weakened dramatically by 1990, and there were less than 4,000 residential building permits issued in 1993, a drop of 67% from 1986. In 1996 the slide stopped, and over 5,400 permits were issued.

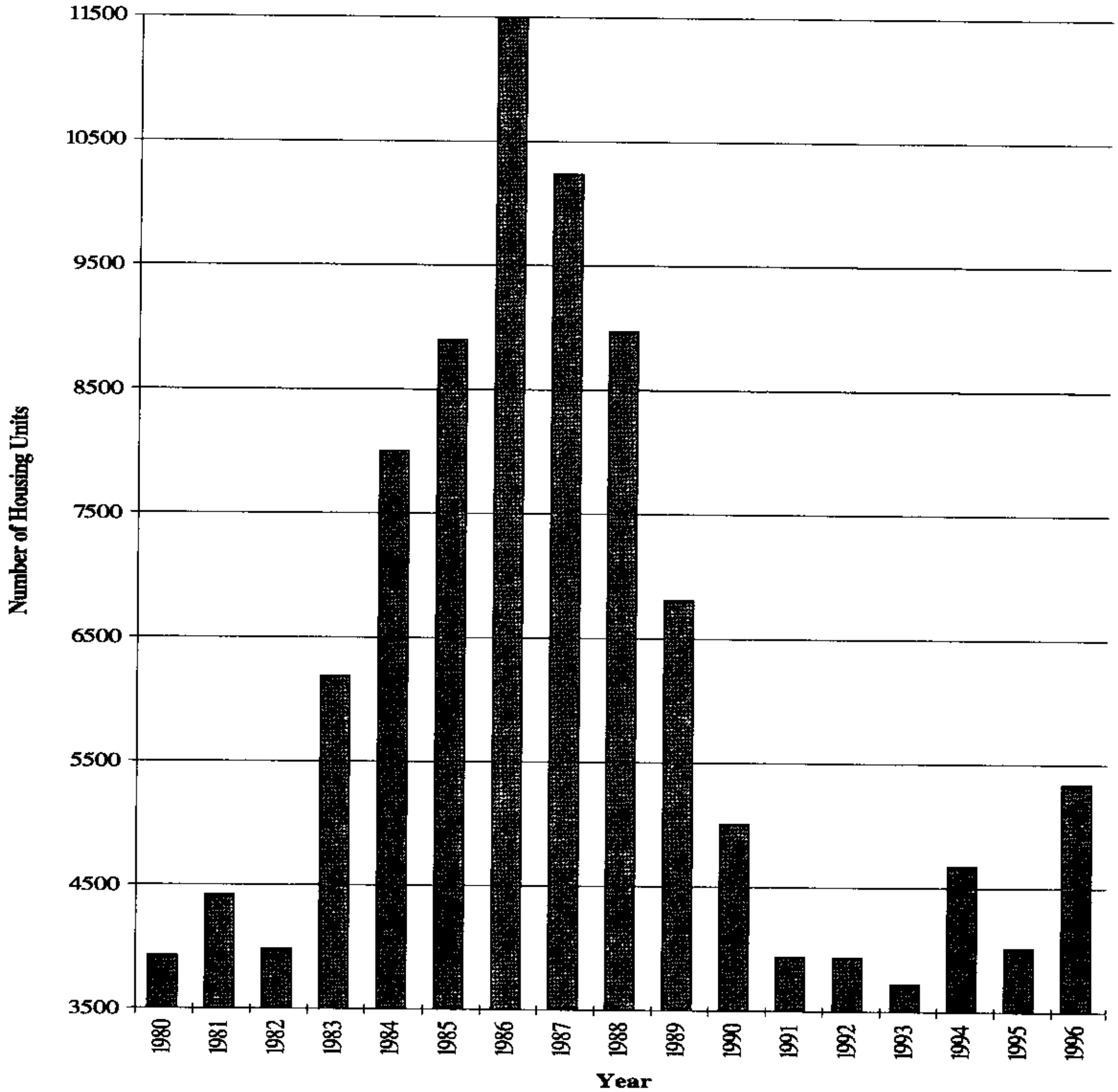
1.4.4.b Population and Labor Force

Total population and labor force growth both for New York City as well as the counties included in the Secondary Study Area (SSA); i.e., Manhattan (New York), Queens, Brooklyn (Kings), Nassau and Suffolk Counties, are shown in Tables 1.4-2 and 1.4-3. Between 1980 and 1990, the total population in the Secondary Study Area increased 2.4%, from 8.1 million in 1980 to 8.3 million persons in 1990. In New York City the population increase was 3.5% or 250,925 persons, while in Nassau and Suffolk Counties, the total population increased marginally by only 0.1%, representing an increase of only 3,512 persons.

Over the period from 1990 to 2020 the population in the New York City Metropolitan Region is forecasted to grow by three million persons, reaching about 23 million by 2020[3]. The bulk of the population increase will proceed at a faster rate in the suburbs which will account for about 80% of the total growth while New York City's population is expected to grow by 8.5%.

Between 1980 and 1990 the growth in the labor force was significantly higher than the growth in population. During this period the total labor force in the Secondary Study Area increased 12.8%, from 3,797,507 persons to 4,283,217 persons. In New York City (all five boroughs) the increase was from 3,167,698 persons to 3,586,428 persons over the same time period, which represented a 13.2% increase, while in Long Island (Nassau and Suffolk Counties), the total labor force increased at almost the same rate of 13.0%, from 1,228,582 persons in 1980 to 1,388,782 persons in 1990.

Over the period from 1990 to 2020, total employment in the region is forecasted to grow from 10.7 million to 13.0 million, with employment in New York City growing by 517,000 in absolute numbers[4]. By 2005, the region will have essentially recovered the 1989 peak level of payroll activity, and at full capacity, will likely require an expansion in physical space and infrastructure support. Manhattan's employment will surpass its 1987 high by the year 2013.



SOURCE: Long Island Regional Planning Board

Nassau & Suffolk Counties
Residential Housing Units Authorized by Building Permit: 1980 to 1996

Figure 1.4-5

TABLE 1.4-2 NYC and Secondary Study Area Population				
	1980	1990	Change 1980-1990	
			Number	Percent
NYC	7,071,639	7,322,564	250,925	3.5
Manhattan	1,428,285	1,487,536	59,251	4.1
Queens	1,891,325	1,951,598	60,273	3.2
Brooklyn	2,230,936	2,300,664	69,728	3.1
Nassau	1,321,582	1,287,348	(34,234)	-2.6
Suffolk	1,284,231	1,321,977	37,746	2.9
Total SSA	**8,156,359**	**8,349,123**	**192,764**	**2.4**
Source: U.S. Census				

TABLE 1.4-3 NYC and Secondary Study Area Labor Force				
	1980	1990	Change 1980-1990	
			Number	Percent
NYC	3,167,698	3,586,428	418,730	13.2
Manhattan	756,899	839,205	82,306	10.9
Queens	908,085	1,017,127	109,042	12.0
Brooklyn	903,941	1,038,103	134,162	14.8
Nassau	654,832	690,066	35,234	5.4
Suffolk	573,750	698,716	124,966	21.8
Total SSA	**3,797,507**	**4,283,217**	**485,710**	**12.8**
Source: U.S. Census				

1.4.4.c Economy and Employment

A New York City Department of City Planning study Annual Report on Social Indicators, 1996 reported that New York City's economic recession, which began with the October 1987 stock market downturn, "bottomed out" in 1992. Figure 1.4-6 illustrates employment trends in New York City. The City had 133,000 fewer private sector jobs in 1992 (annual average) than it had at the bottom of the previous recession (in 1983), and only slightly more than at the bottom of the 1977 fiscal crisis. Today, the job losses appear to have ended, and while the City's recession has been severe, it has been no worse than that experienced by other areas which have concentrations of the same types of industries (see Figure 1.4-7). From 1989 to 1992 (annual average), New York City lost 10.2% of its private sector jobs, while over the same period Long Island (Nassau and Suffolk) lost 8.5% of its private sector jobs.

Recent employment trends understate the relative strength of the New York City economy. Compared with other areas, New York City lost more jobs but far less payroll. In 1991, although private sector wage and salary employment was 13% below its 1969 peak, private wages and salaries (adjusted for inflation) were 3% higher. Higher payrolls produced higher state and local

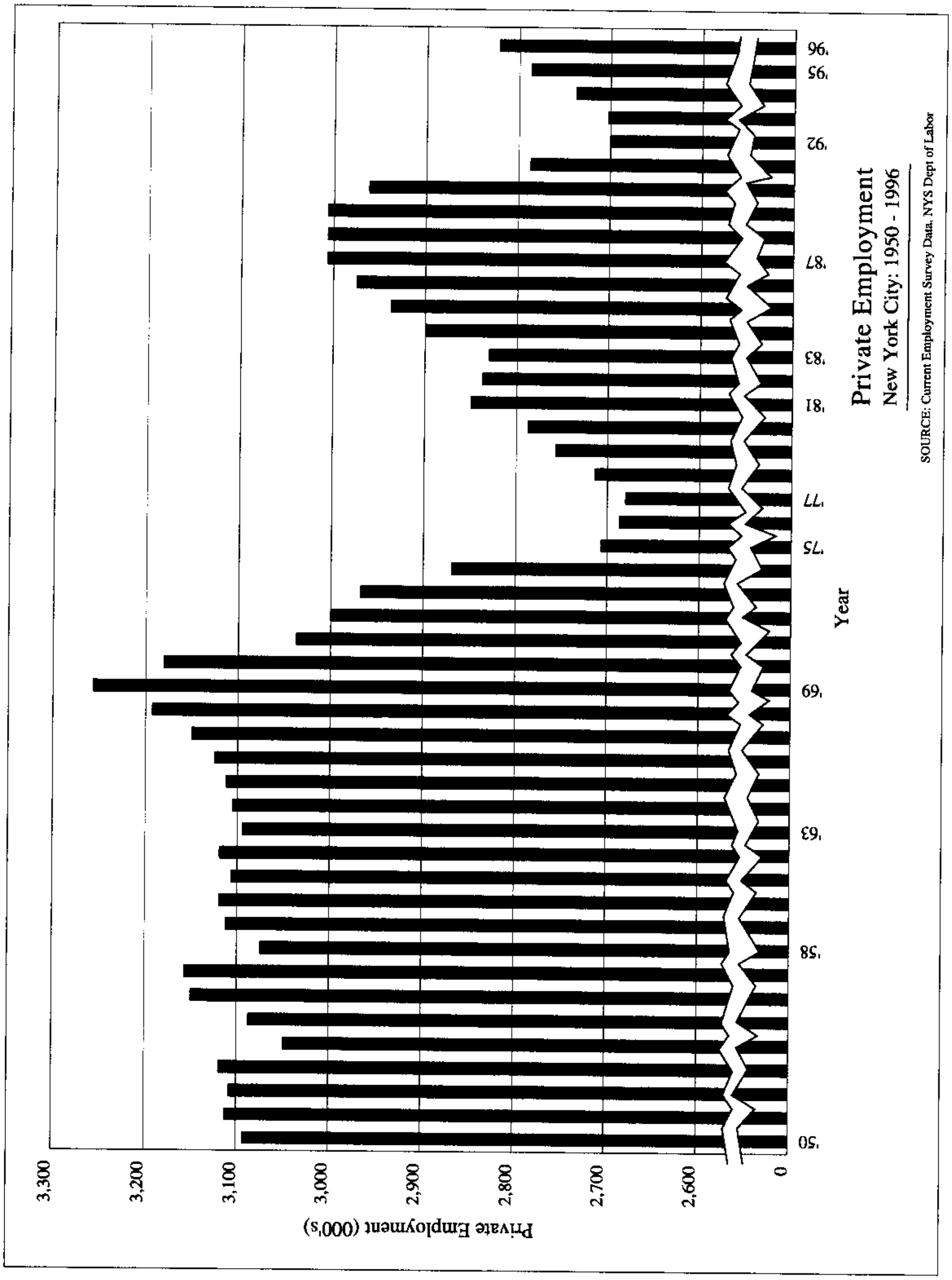

Private Employment
New York City: 1950 - 1996
SOURCE: Current Employment Survey Data, NYS Dept of Labor
Private Employment (000's)
3,300
3,200
3,100
3,000
2,900
2,800
2,700
2,600
0
Year
'50
'58
'63
'69
'73
'75
'77
'81
'83
'87
'92
'95
'96

Figure 1.4-6

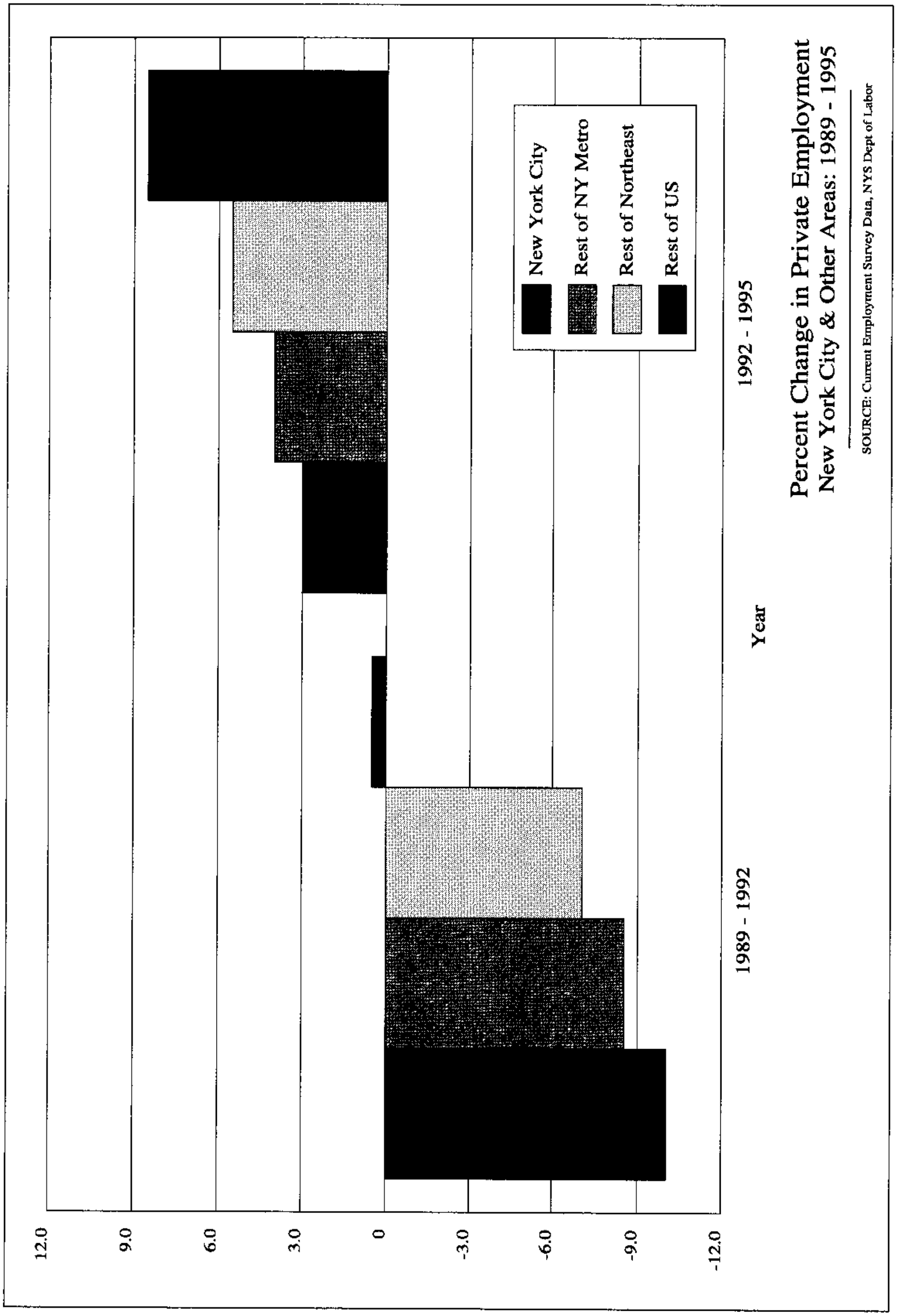

Percent Change in Private Employment
New York City & Other Areas: 1989 - 1995
SOURCE: Current Employment Survey Data, NYS Dept of Labor
New York City
Rest of NY Metro
Rest of Northeast
Rest of US
12.0
9.0
6.0
3.0
0
-3.0
-6.0
-9.0
-12.0
1989 - 1992
1992 - 1995
Year

Figure 1.4-7

tax receipts. In addition, the number of self-employed workers increased rapidly and, by 1991, was 14% higher than in 1969. The self-employed, who accounted for 11% of those working in the private sector in 1991 (up from 9% in 1977), include small business owners, partners in law, accounting, finance and medical firms, independent consultants, freelance artists and writers and other types of entrepreneurs.

Looking towards the near term 1995-2005 period, the following economic and employment trends for the New York City region are forecasted:[4]

- The 1995-2005 period will be characterized as the "recovery period" where the severe regional 1989-1992 job losses will be recaptured. By 2005, the region will have recovered the 1989 peak level of payroll activity.
- By 2005, work related travel demand from the surrounding regions into Manhattan is expected to generate an additional 80,000 trips above 1990's level, a 4% total increase.

In the extended forecast, for the period 2005 to 2020, projections are as follows[5]:

- Employment within New York City is expected to grow 13.1%, adding another 517,000 jobs.

- Midtown Manhattan is projected to capture the majority share (58%) of the region's overall employment base.

- By 2020, 56% of all regional residents will be either full-time or part-time employees in a regional labor force of approximately 13 million. New York City's labor force will not keep pace with its employment increase, and the Long Island labor force will grow by a larger percentage (32%) than employment (24%). These two factors will push Long Island residents to seek employment in New York City, further straining transportation demand in the Long Island Transportation Corridor.

1.4.4.d Journey-to-Work Trips

The drawing power of Manhattan will combine with suburban labor force surpluses to increase future journey-to-work trips to Manhattan. By 2020 the region as a whole will generate 235,700 more journey-to-work trips to Manhattan of which 32,500 will come from Nassau and Suffolk Counties, 36,600 will come from Queens, and 19,600 from Brooklyn, for a total of 88,700 additional journey-to-work trips specifically between Long Island and Manhattan.

1.4.5 Customer and Potential Customer Survey and Behavioral Trends

The LIRR surveyed approximately 2,850 Long Island residents—both LIRR riders and non-riders—to assess their opinions regarding establishing possible LIRR service into GCT. The study concluded that the location of the Manhattan trip terminus is the most important factor in terminal choice among existing LIRR riders, and that the location of trip origin and trip terminus are the most important factors for those in the LIRR commuter shed travelling by other modes.

The study approached the user survey from both a qualitative and quantitative standpoint as follows:

Qualitative

- Interviews were conducted with both riders and non-riders to determine their attitude toward LIRR service into GCT.

Quantitative

- LIRR passengers were surveyed to quantify their travel patterns, perceptions of alternate travel modes and routes, and preferences for GCT and other LIRR destination terminals.
- Long Island residents were surveyed by phone to measure the impacts of direct service to GCT on their use of LIRR. This survey focused on those residents that commute regularly to Midtown by means other than LIRR, and residents of Long Island who do not necessarily work in Midtown but who travel to Manhattan regularly for other purposes.
- Express bus riders in the LIRR commuter target market area were surveyed about their travel preferences.
- A clipboard survey of commuters to Midtown Manhattan was performed in order to explore the impact of GCT service on residential housing choice.

Highlights of the survey results included:

- Almost 50% of those surveyed on branches operating through Jamaica, and a little under 40% of Port Washington branch riders, would have considered making the trip on which they were surveyed via GCT (if it were available) instead of their current terminal.
- Current LIRR riders indicated a willingness to make additional LIRR trips if GCT service were available; over one-third said they might use the railroad for trips they now make on other modes; and over one-fourth indicated that GCT service might result in entirely new trips to Manhattan.
- Over 25% of phone respondents (principally non-LIRR riders) and 30% of express bus survey respondents said that they would consider commuting via LIRR GCT service.
- Both commuters and non-commuters said that they might travel more frequently with LIRR service to GCT; 20% of commuters and 32% of non-commuters said that they might make new off-peak trips to take advantage of the accessibility afforded by GCT.
- Modal shift models developed for non-riders from Long Island indicated that egress and access time would be among the most important determinants influencing their decision to use the proposed LIRR service to GCT.

1.5 Transportation Facilities and Services within the Study Area

1.5.1 Existing Passenger Railroad and Transit Network

The Long Island Transportation Corridor linking Long Island to East Midtown Manhattan is served by: suburban trains operated by the LIRR; several subway lines operated by NYCT;

numerous public and private local and express bus routes; and a relatively new ferry service operating between Long Island City, Queens and East Midtown Manhattan. Each of these services is discussed in turn below.

1.5.1.a Long Island Rail Road

The LIRR is the busiest commuter railroad in the country, and in 1996 carried 74.3 million riders. It is also one of the largest, consisting of 365 route miles, 135 stations including four western terminals in New York City and nine branches in Nassau and Suffolk Counties (see Figure 1.5-1). The LIRR operates a fleet of 1,075 electrically propelled or diesel-hauled coaches assembled in more than 700 trains transporting over 262,000 passengers each weekday.

Penn Station is the LIRR's primary terminal, and the only one located in Manhattan. According to the most recent *LIRR Passenger Origins & Destinations,* report, 80% of AM peak westbound passenger trips terminate at Penn Station. During the morning peak hours, trains arrive at Penn Station at the rate of 36 trains per hour, the equivalent of one 12-car train arriving at Penn Station approximately every 100 seconds. The LIRR shares Penn Station with two other railroads—Amtrak and NJ Transit. In the future, both operators plan to increase their train service through Penn Station, further increasing demand upon the station.

In the absence of any capacity improvements, at 36 trains per peak hour, the LIRR portion of Penn Station is effectively near operational capacity. In the near term, plans are underway to increase LIRR service into Penn Station to as many as 42 trains per peak hour by undertaking a series of capital and operational improvements.

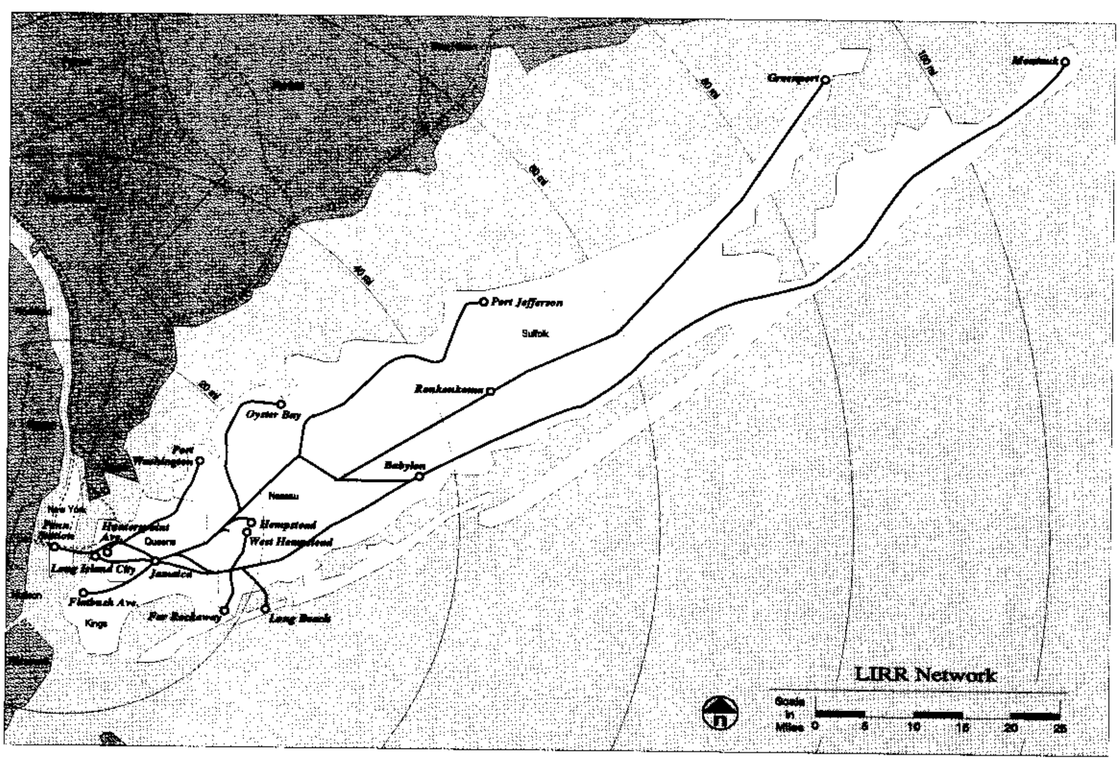


Figure 1.5-1

In addition to its Penn Station terminal, the LIRR has three other terminals within New York City limits but outside of the Manhattan Midtown or Downtown areas. They are:

- Hunterspoint Avenue Station in Long Island City, Queens.
- Long Island City Terminal, in Long Island City, Queens.
- Flatbush Avenue Terminal in Downtown Brooklyn.

The Hunterspoint Avenue and Long Island City stations are served by peak hour trains only andserve as terminals for only 4% and less than 1% of all westbound AM peak passenger trips, respectively. All of the trains serving Long Island City, and all of the trains except one westbound morning train and one eastbound evening serving Hunterspoint Avenue, are diesel-hauled and are prohibited from operating through the East River Tunnels into underground Penn Station. With the arrival of new dual mode equipment, starting in 1997, these trains will be able to operate into Penn Station if sufficient train slots at Penn Station can be provided.

Flatbush Avenue Terminal primarily serves those LIRR customers bound for Downtown Brooklyn and Lower Manhattan and handles overflow electric trains which cannot be accommodated into Penn Station.

In each of these three cases, the majority of LIRR riders getting off at these stations/terminals transfer to connecting subway lines to reach their final destination. Hunterspoint and Long Island City passengers transfer to the NYCT IRT #7 Flushing line subway to reach destinations in Midtown Manhattan, while Flatbush Avenue passengers transfer to various subway lines (#2, 3, 4, 5, B, D, M, N, Q and R trains) for destinations in Downtown Brooklyn or Downtown Manhattan.

These transfers to the subway add an average of approximately 20 minutes to the LIRR customer's total trip time to East Midtown Manhattan and adds to the trip costs, since another fare using a different fare medium must be paid (currently $1.50 each way).

In an effort to relieve both train traffic congestion and passenger overcrowding at and into Penn Station, the LIRR has attempted, with varying degrees of success, to market these other western terminals as alternative routes into East Midtown Manhattan and to Downtown Manhattan. For instance, in the late 1970s and early 1980s, the LIRR marketed Flatbush Avenue Terminal as the "Flatbush Shortcut," seeking to shift passengers destined for Downtown Manhattan/Financial District destinations to using Flatbush Avenue Terminal (instead of Penn Station) by promoting shorter journey times. Similarly, Hunterspoint Avenue station has been promoted as the "Hunterspoint Connection," whereby riders can avoid the congestion associated with Penn Station by transferring at Hunterspoint Avenue for a speedier subway connection to Manhattan's East Side.

Both of these marketing initiatives, which relied upon connecting subway services to convey LIRR customers to their final Manhattan destinations, met only with limited success and did not shift large numbers of passengers away from using Penn Station

There are a number of friction factors which deter or prevent additional LIRR customers from using these alternate interchanges. Some of them are:

- Disincentive of a two-seat ride.
- Psychological resistance to changing modes (i.e. from LIRR to subway) despite the actual ease of transfer in most cases.
- Safety concerns about using subway trains and/or stations. This perception of danger tends to be heightened for those subway stations outside of Midtown Manhattan.
- The penalty of paying another fare for a connecting NYCT subway or bus service.
- Overcrowded conditions on the NYCT's IND Queens Boulevard Express services (E and F routes) and IRT Flushing line trains (#7 route), reducing the attractiveness of such transfers since transferring LIRR customers would most likely have to stand (instead of comfortably sitting on a LIRR train) for the remainder of their trip into Manhattan. Even when boarding the E train in Downtown Jamaica at the Sutphin Boulevard station stop (the second stop from the origin), LIRR customers would have to stand for the ride into Manhattan since all subway seats are fully occupied departing the terminal station.
- Perceived unreliability of the subway connections and service in Queens, which discourages them from transferring.
- Inconvenience of a double transfer for alternate routes. Currently, certain LIRR routes do not feed into these alternate terminals (i.e. Babylon Branch electric trains do not serve Hunterspoint Avenue), consequently passengers who wish to utilize these alternate terminals must make a double transfer (i.e. first at Jamaica or elsewhere enroute, then again at Hunterspoint Avenue Station).
- Lack of, or limited LIRR service into these alternate terminals. In most cases, customers enjoy a greater selection of LIRR trains if they arrive at or depart from Penn Station.

Clearly, these "friction factors" discourage greater numbers of LIRR customers from using these alternate terminals for accessing Manhattan's East Side. Other new transportation options must be evaluated to meet the latent demand for direct transportation into Manhattan.

1.5.1.b Penn Station Capacity Limitations

Pennsylvania Station is owned by Amtrak, which also owns the two Hudson River Tunnels and trackage from New Jersey on the west, as well as the four East River Tunnels and trackage from the Bronx and Queens on the east. It leases station space, trackage and operating rights to NJ Transit and to the LIRR, the latter from its junction with Amtrak's Northeast Corridor at Harold Interlocking in Sunnyside, Queens.

Of the three separate railroads that share use of Penn Station, the LIRR is the largest user in terms of passengers, train movements and railcars. The LIRR schedules more trains, and handles more passengers, than those of NJ Transit and Amtrak combined. Since present and future operations at Penn Station are limited by physical storage, signal, and tunnel constraints, and because the LIRR is so predominant in Penn Station, it has taken a number of steps to increase the capacity and the efficiency of Penn Station to benefit LIRR customers.

One major improvement was the construction in 1987 of the John D. Caemmerer West Side Yard, a train storage and maintenance facility immediately west of Penn Station. This facility sharply reduced the need for reverse moves and non-revenue moves in Penn Station and through the East River Tunnels, thereby increasing the LIRR's capacity by 15% at Penn Station.

Another recently completed improvement was the complete reconstruction and expansion of the "A" concourse level of Penn Station which is used predominantly by LIRR customers. Under this project, the LIRR constructed additional internal stairways, installed new escalators and elevators, built the new West End Concourse, made Penn Station handicapped accessible, and for the first time, the LIRR created a new direct entrance from 34th Street into the LIRR portion of the station. The ambience of Penn Station was also improved by installing new departure boards (for better crowd control), new architectural finishes and air conditioning, and generally enhancing the appearance of the LIRR portion of this station. These improvements virtually eliminated the remaining constraints to pedestrian movements within the LIRR portion of Penn Station. The overall effect of these circulation improvements has been to significantly speed the loading and unloading times of trains at Penn Station, thereby increasing the effective capacity of the station.

As a result of these improvements the effective capacity of the LIRR at Penn Station is now 36 trains per peak hour.

Following on the recommendations in the *Penn Station Capacity and Utilization Analysis Report*, the LIRR is presently considering, or in the process of implementing, several other major capital improvements such as: expanding the West Side Yard; lengthening certain platforms; modernizing the signal system through the East River Tunnels; and making changes in the layout of certain tracks and switches. This is all being done in an effort to increase capacity at Penn Station to further accommodate 42 trains in the peak hour.

However, even in a best case scenario—where all of these projects were to be approved, funded and constructed—limitations on the practical capacity of Penn Station will still exist. The additional capacity that might be obtainable would be insufficient to meet the projected needs of the LIRR alone, to say nothing of the projected needs of NJ Transit and Amtrak. For example, the slow speeds required of Amtrak and NJ Transit trains moving between the East River Tunnels and the Sunnyside train storage yard, and the slow acceleration of locomotive-hauled trains severely reduce the effective capacity of the East River Tunnels leading to and from Penn Station. Even more serious and limiting are the sharp curves and slow speed switches at Towers C and JO where the four East River Tunnels fan out into the 17 "through" tracks of Penn Station; nothing short of the wholesale reconstruction of the entire layout of Penn Station would be sufficient to eliminate these capacity restrictions.

Finally, since three separate railroads use Penn Station, and because each serves a unique market as reflected in their distinct services and policies, interaction between and among these three institutions is inevitably a complicating and limiting factor in the overall utilization of the Penn Station facility. Even assuming the greatest degree of coordination among the three railroads, it is only reasonable to also assume that such increases in capacity are achievable through the financial and operational cooperation of the three railroads; these increases would likely have to be equitably shared among the three operators, and would not principally benefit the LIRR and its customers.

1.5.1.c Metro-North Railroad

Metro-North Railroad, currently the only rail operator using GCT, operates over 406 route miles and serves 119 stations on its suburban rail network. Three lines radiate north and northeast from GCT—the Hudson, Harlem and New Haven Lines. The New Haven line in turn has three branches: the New Canaan, Danbury and Waterbury branches. Collectively, these lines serve the borough of the Bronx in New York City, Westchester, Putnam and Dutchess counties in New York State, and Fairfield and New Haven counties in Connecticut. Service in Connecticut is provided under an operating agreement with the State of Connecticut Department of Transportation. Additionally, MNR, in partnership with NJ Transit, operates West of Hudson services from Hoboken, New Jersey, to Port Jervis and to Spring Valley, New York. These services are geographically separated from MNR's East of Hudson services by the Hudson River and cannot operate into GCT. MNR customers arriving in Hoboken and destined to Midtown Manhattan must transfer to either PATH, ferry, or interstate bus service to complete their journey.

On the New Haven Line, the New Canaan Branch and the inner portions of the Hudson and Harlem Lines, MNR operates electric train service into GCT. On the outer portions of the Hudson and Harlem Lines, as well as on the Danbury and Waterbury Branches, MNR operates a combination of dual mode service into GCT or diesel branch shuttles. West of the Hudson River, MNR operates only diesel service.

In 1996, MNR carried 62.9 million riders—more than at any time in its history or that of its predecessors (i.e., most recently ConRail, and prior to that the Penn Central Railroad, the New York Central Railroad and the New York, New Haven & Hartford Railroad). Ridership increased 5% between 1993 and 1994 and approximately 1% between 1995 and 1996.

Metro-North has expressed concern that any investment strategy which may emerge from the Long Island Transportation Corridor MIS/DEIS that proposes assigning some of their existing platform and storage tracks at GCT to other users (i.e. LIRR), could impact MNR's ability to serve their growing ridership on its current lines and on its plans to expand service into new areas in the future.

1.5.1.d New York City Transit

Twelve of New York City Transit's 25 subway routes serve the MSA including the busiest trunk lines in the city—the #4, 5 and 6 routes comprising the IRT Lexington Avenue Line, the #7 route on the IRT Flushing Line, and the E, F and R routes on the IND Queens Boulevard Line. All 25 subway routes operate within portions of the Secondary Study Area.

Between Queens and East Midtown Manhattan, there are only two geographically direct subway routes serving the Long Island Transportation Corridor. They are: 1) the Queens Boulevard Line (E, F, R routes), and 2) the #7 Flushing Line. The Queens Boulevard Line splits into two routes at the eastern end—one route serving 179th Street and Hillside Avenue, the other route serving Parsons Boulevard/Archer Avenue. Originally, the IND subway line to 179th Street was planned to extend further east to the Queens-Nassau County line, while the Archer Avenue Line was expected to extend further southeast into Queens to Springfield Gardens by converting the LIRR Atlantic Branch to subway operation.

Partly to compensate for this lack of "geographical reach" into eastern Queens, both the Queens Boulevard Line and Flushing Line are fed by an extensive network of local feeder bus routes which serve Eastern Queens and Nassau County, effectively extending the reach of the subway lines. The 179th Street terminal in Jamaica/Jamaica Estates provides service to nine connecting NYCT bus routes, one New York City Department of Transportation (NYCDOT) bus route, and nine Long Island Bus routes. Parsons/Archer terminal in downtown Jamaica provides service to 11 connecting NYCT bus routes, 11 NYCDOT bus routes, and one Long Island Bus route. Main Street terminal in Flushing provides service to 13 connecting NYCT bus routes, seven NYCDOT bus routes, and two Long Island Bus routes. (NYCDOT buses are those services operated by a variety of private bus companies, which have their operating and capital costs subsidized by New York City. These private bus companies include: Green Bus Lines, Queens Surface Corporation, Jamaica Buses Inc. and Triboro Coach Corp. The extent of these connecting bus services is displayed in Table 1.5-1).

The Eastern Queens to Manhattan market is a significant market which is currently underserved by the LIRR. Approximately 36 million annual trips are made from Eastern Queens to Manhattan with subways and buses accounting for 57% of these trips, and with the LIRR's market share at 17% or six million trips.[5] The potential exists for the LIRR to capture a greater percentage of this journey to work market with diversions from the current bus/subway transit combination, but current capacity limitations into Penn Station New York make this impossible at this time.

Both the IRT Flushing Line and the IND Queens Boulevard Line are severely overcrowded during rush hours. The IND Queens Boulevard Line is currently one of the top two most heavily used subway lines in the NYCT system. During the morning peak hour, 18 F trains are scheduled to depart 179th Street Terminal between 7 - 8 AM; 12 E trains are scheduled to depart Parsons/Archer Terminal during that same timeframe. Using NYCT's 1995 ridership figures, between 8 - 9 AM, the combined routes of the IND Queens Boulevard Express trains (E, F trains) carried 45,481 passengers into Manhattan.[6,7] The level of overcrowding per car, or volume/capacity ratio used by NYCT, for the F train ranged from 1.25 in 1989 to 1.22 in 1995. (A ratio of 1.0 would represent a fully loaded subway car according to NYCT service guidelines, and numbers above 1.0 represent a percentage of overcrowding.) For the E train, the volume/capacity ratio numbers were 1.00 and 0.98 respectively.

The IRT #7 Flushing Line, which offers connecting service for LIRR passengers at Hunterspoint Avenue, Long Island City and Woodside, Queens is currently operating above capacity as well, carrying approximately 33,970 passengers into Manhattan (based upon NYCT 1995 ridership figures) between the hours of 8 - 9 AM at a volume/capacity ratio of 1.06 in 1989 and 1.04 in 1995. For both the Queens Boulevard Line services and the Flushing Line services, the slight dip in the severity of overcrowding on the respective trains is attributable to short term employment losses which have temporarily reduced subway ridership, as opposed to any increases in line capacity.

As shown in Figure 1.5-2, portions of the subway system parallel portions of the LIRR in Queens and Brooklyn. These include the following route sections:

- The IRT #7 Flushing Line parallels the LIRR's Port Washington Branch between Main Street in Flushing and Hunterspoint Avenue in Long Island City.

TABLE 1.5-1
Connecting Bus Routes from Eastern Queens Subway Terminals

Station	Subway Route	Connecting Bus Route	Destination
Main Street	7	NYCT Q12	Little Neck
		NYCT Q13	Bay Terrace
		NYCT Q14	Whitestone
		NYCT Q15	Beechurst
		NYCT Q16	Bay Terrace
		NYCT Q17	Jamaica
		NYCT Q20	College Point
		NYCT Q26	Fresh Meadows
		NYCT Q27	Queens Village
		NYCT Q28	Bay Terrace
		NYCT Q44	The Bronx, Jamaica
		NYCT Q48	LaGuardia Airport
		NYCT Q58	Williamsburg
		NYC DOT Q25	College Point, Jamaica
		NYC DOT Q34	Linden Hill
		NYC DOT Q34	Jamaica
		NYC DOT Q65	College Point
		NYC DOT Q65	Jamaica
		NYC DOT Q66	Long Island City
		NYC DOT QBx1	Co-op City
		LI Bus N20	Hicksville
		LI Bus N21	Glen Cove
Parsons/Archer	E	NYCT Q4	Cambria Heights
		NYCT Q5	Rosedale
		NYCT Q24	Bushwick
		NYCT Q30	Little Neck
		NYCT Q31	Bayside
		NYCT Q42	St. Albans
		NYCT Q44	Flushing, The Bronx

TABLE 1.5-1 (cont'd)
Connecting Bus Routes from Eastern Queens Subway Terminals

Station	Subway Route	Connecting Bus Route	Destination
Parsons/Archer	E	NYCT Q54	Williamsburg
		NYCT Q56	East New York
		NYCT Q84	Laurelton
		NYCT Q85	Rosedale
		NYC DOT Q6	JFK Airport
		NYC DOT Q8	East New York
		NYC DOT Q9	Ozone Park
		NYC DOT Q25	College Point
		NYC DOT Q34	Linden Hill
		NYC DOT Q41	Howard Beach
		NYC DOT Q65	College Point
		NYC DOT Q110	Queens Village
		NYC DOT Q111	Rosedale
		NYC DOT Q112	Ozone Park
		NYC DOT Q113	Far Rockaway
		LI Bus N4	Freeport
179th Street	F	NYCT Q1	Bellerose
		NYCT Q2	Queens Village
		NYCT Q3	JFK Village
		NYCT Q17	Jamaica
		NYCT Q36	Jamaica
		NYCT Q43	Floral Park
		NYCT Q75	Oakland Gardens
		NYCT Q76	Whitestone
		NYCT Q77	Springfield Gardens
		NYC DOT Q110	Queens Village
		LI Bus N1	Elmont
		LI Bus N2	Valley Stream
		LI Bus N3	Rosedale
		LI Bus N3	Lynbrook
		LI Bus N6	Hempstead
		LI Bus N22	Hicksville
		LI Bus N22A	Mineola
		LI Bus N24	East Meadow
		LI Bus N26	North Hills

- The IND E route Queens Boulevard Line service parallels the LIRR Main Line between Jamaica, Queens, and Penn Station in Manhattan.

- The BMT J and Z routes on the Jamaica Line, as well as the IND A and C services on the Fulton Street Line, and the IRT #2 and 3 routes on the New Lots Line each parallel some portion of the LIRR's Atlantic Branch between Jamaica, Queens, and East New York and Flatbush Avenue Terminal in Brooklyn.

While these subway and LIRR routes parallel one another they do not necessarily compete with one another. The LIRR principally carries people from Nassau and Suffolk Counties and to a lesser extent from the eastern portion of Queens, while the subways principally serve city residents in Brooklyn and Western Queens and, in combination with local feeder buses, residents of Eastern Queens.

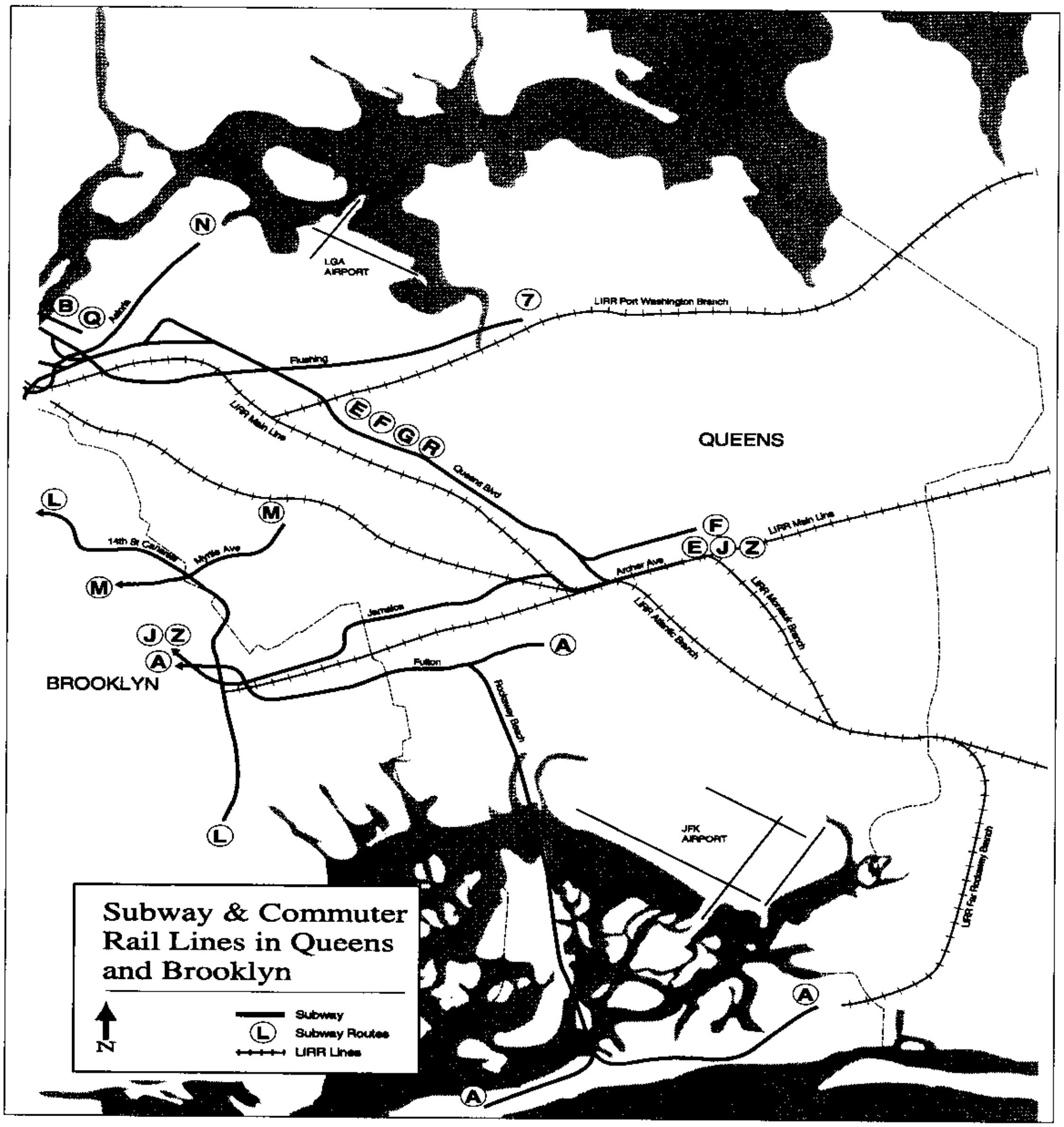


Figure 1.5-2

1.5.1.e Express Bus Services

Within the Long Island Transportation Corridor, express buses operated by a variety of private companies provide service from Eastern Queens and the western part of Nassau County directly into Midtown Manhattan. Some of these routes parallel or directly compete against the LIRR Port Washington Branch, Main Line, and Montauk Branch west of Jamaica. Generally, these express buses circulate through local neighborhoods collecting passengers, then operate along major highways or limited access roads to provide an express trip into Midtown Manhattan. A premium fare is charged for express bus rides although multiple ride discounts are available. The appeal of express buses is that they provide a one-seat ride directly from local neighborhoods to Midtown Manhattan destinations; they are an alternative to crowded subways where passengers may not be able to find a seat; and they are perceived to be safer than subways. Table 1.5-2 below lists the express bus services which operate between Eastern Queens/Western Nassau County and Midtown Manhattan.

TABLE 1.5-2
Express Bus Service between Eastern Queens and Midtown Manhattan

Bus Operator	Bus Route	Origin	Nearest Parallel LIRR Branch	Directly Parallel to LIRR Branch
Queens Surface	QM1	Fresh Meadow	Main Line	No
Queens Surface	QM1A	Glen Oaks	Main Line	No
Queens Surface	QM2	Bay Terrace	Port Washington	No
Queens Surface	QM2A	Bay Terrace	Port Washington	No
Queens Surface	QM3	Little Neck	Port Washington	Yes
NYCT	X51	Auburndale	Port Washington	Yes
NYCT	X63	Rosedale	Atlantic/Babylon	Yes
NYCT	X64	Rosedale	Main Line/Montauk	Yes
NYCT	X68	New Hyde Park	Main Line	Yes
Triboro	QM21	Springfield	Atlantic	Yes
Triboro	QM24	Glendale	Montauk	Yes

1.5.1.f East River Ferries

Once considered a bygone means of conveyance for New Yorkers (except for the venerable Staten Island to Manhattan service), ferries have been making a strong comeback in the New York City region over the past ten years as several new ferry routes have been established using modern ferryboats.

One such service—operating across the East River between Long Island City, Queens and 34th Street in Manhattan—was recently instituted specifically to attract automobile users who currently drive into Manhattan. The ferry operator, New York Waterway, provides secure parking in Long Island City. On the Manhattan side, New York Waterway operates a fleet of dedicated shuttle buses on a variety of routes to distribute ferry customers to their Midtown destinations. In an effort to attract LIRR passengers using the Hunterspoint Avenue station, New York Waterway has also recently initiated dedicated shuttle buses connecting that station to their Long Island City ferry terminal.

1.5.2 Existing Highway Network

Over the last 50 years, the New York City metropolitan area has experienced intensive growth, and nowhere is this growth more evident than in the suburban ring of development surrounding the City. From 1945 to 1995 a regional network of interstate highways, expressways and parkways encompassing several thousand miles has been constructed. This network has further encouraged development of low-density, suburban development patterns characterized by single family tract houses. In parallel, land use development in Nassau and Suffolk has been dictated by the emergence of this network which has led to an auto-oriented pattern of commuting. Extraordinary growth in automobile traffic and congestion has followed.

Long Island is served by this vast network of interstate highways, expressways and parkways. The Island extends approximately 118 miles along its east-west axis, and the major highway corridors follow this orientation feeding traffic into New York City. With the exception of two car ferry services to Connecticut (one in Port Jefferson, the other at Orient Point at the extreme easterly end of Long Island), all vehicular traffic traveling on or off Long Island must pass through New York City. Figure 1.5-3 illustrates the major highways, parkways, expressways and interstates on Long Island.

The three main east-west highways serving Long Island are the Long Island Expressway, the Southern State Parkway / Belt Parkway and the Northern State Parkway / Grand Central Parkway. Of these, the Long Island Expressway is the Island's longest limited-access road, stretching 70 miles from Long Island City in Queens to Riverhead in Suffolk County. Secondary east-west arterial highways include Northern Boulevard, Jericho Turnpike, Hempstead Turnpike and Sunrise Highway.

A series of north-south highways and parkways feed into the east-west highways and arterial roads; these include the William Floyd Parkway, Sagtikos Parkway, Wantagh State Parkway, Meadowbrook State Parkway, Seaford-Oyster Bay Expressway, and State Routes 106/107, 110, 347 and 454. Within Queens and Kings counties, the key north-south limited-access roads are the Cross Island Parkway, Laurelton Parkway, Clearview Expressway, Van Wyck Expressway, and the Brooklyn-Queens Expressway.

Since Manhattan is an island with limited vehicular access, the seven East River vehicular crossings between Brooklyn/Queens and Manhattan represent an inherent bottleneck for vehicular traffic from Long Island entering Manhattan. Also, the street system within the Manhattan CBD is highly congested which, along with limited parking, further restricts auto travel. The most common East River crossings typically used to enter East Midtown Manhattan from Long Island are the Triborough Bridge, the Queensboro Bridge and the Queens-Midtown Tunnel.

The Triborough Bridge and Queens-Midtown Tunnel are toll facilities operated by MTA Bridges and Tunnels, while the Queensboro Bridge is operated by the City of New York and is toll-free. During the morning and evening peak hours these three crossings all experience levels of extreme congestion.

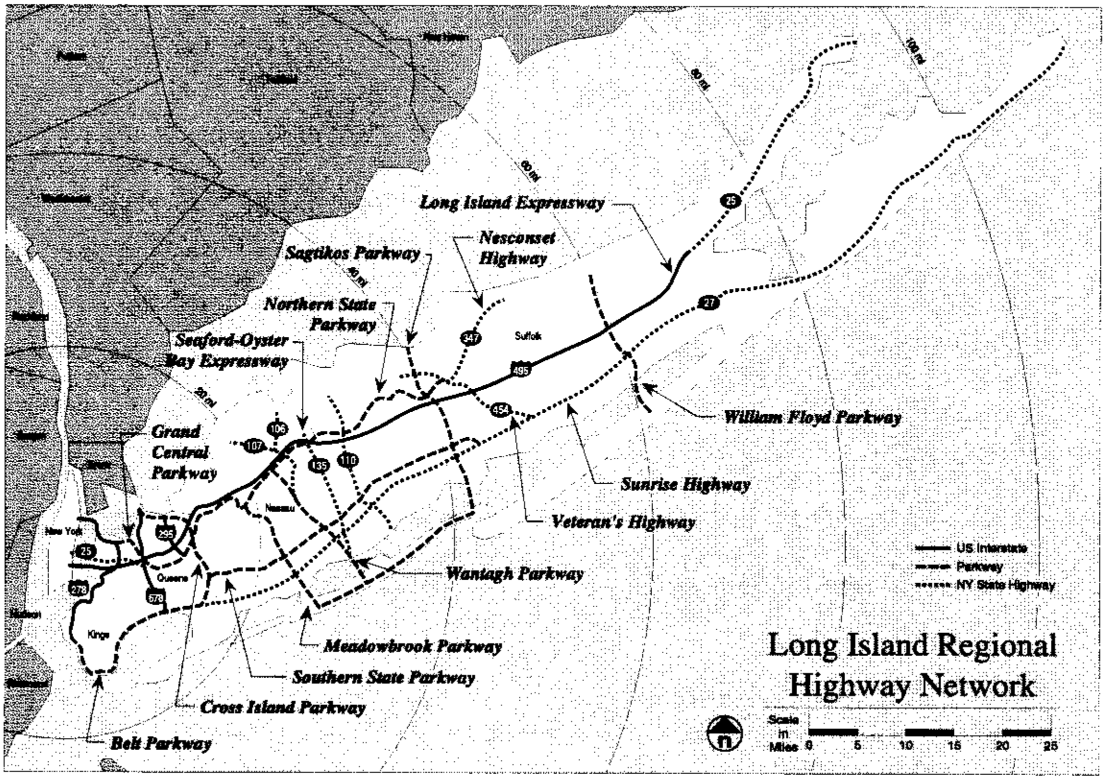


Figure 1.5-3

1.5.2.a Current Traffic Conditions on Long Island Highways

The major highway corridors serving Long Island and Queens, mentioned previously, are notorious for their constant traffic congestion during most of the day, regardless of direction of travel. Constraints upon roadway capacity at several key traffic cordon points are shown in Table 1.5-3. These extremely heavy vehicular volumes during peak periods translate into highly congested traffic flows resulting in low travel speeds characterized by stop-and-go driving conditions.

The primary limited-access roads and arterial streets of the study corridor feeding into the vicinity of the Manhattan Study Area, and their associated level of service and peak hour traffic volumes are shown in Table 1.5-3 below:

TABLE 1.5-3
AM Peak Period Traffic Conditions

Highway Route	LOS at Peak Point	Peak Hr. Volume
Long Island Expressway (I-495) at Grand Central Parkway	E	11,010
Grand Central Parkway at Northern State Parkway	E	10,680
Northern State Parkway at Meadowbrook Parkway	E	10,110
Queens Blvd at Queensboro Bridge and Northern Blvd	F	8,610
Southern State Parkway at Wantagh Parkway	E	12,200
Jericho Turnpike at Route 106 and 107	C	2,310
Triborough Bridge	D	7,970
Queens-Midtown Tunnel (toll plaza)	n/a	4,171

Level of Service (LOS) Definitions[8]

Level of Service (LOS) A describes primarily free flow traffic conditions. Average operating speeds generally prevail and vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. Even at maximum density, the average spacing between vehicles is about 528 feet, or 26 car lengths, which gives motorists a high level of physical and psychological comfort. Incidents or point breakdowns are easily absorbed.

LOS B represents reasonably free flow traffic conditions, and free-flow speeds are generally maintained. The lowest average spacing between vehicles is about 330 feet, or 18 car lengths. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. Minor incidents and point breakdowns are easily absorbed.

LOS C provides for flow with speeds still at or near the free flow speed. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more effort on the driver's part. Minimum average spacings are in the range of 220 feet, or 11 car lengths. Minor incidents may still be absorbed, but the localized deterioration in service will be substantial.

LOS D is the level at which speeds begin to decline slightly with increasing flows. Also, density begins to deteriorate somewhat more quickly with increasing flow. Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. At the limit, vehicles are spaced at about 165 feet, or nine car lengths. Minor incidents and point breakdowns can be expected to create queuing.

LOS E is operation at capacity. Operations at this level are volatile because there are virtually no usable gaps in the traffic stream. Vehicles are spaced at about six car lengths, leaving little room to maneuver within the traffic stream at speeds that exceed 50 mph. Any disruption to the traffic stream, such as vehicles entering from a ramp or changing lanes, can cause following vehicles to give way to that vehicle. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort to the driver is very poor.

LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. This occurs when traffic incidents cause a temporary reduction in the capacity of a short segment and the number of vehicles arriving at the point is greater than the number that can move past it; when recurring points of congestion exist, such as merging or weaving areas, or where the number of vehicles arriving is greater than the number of vehicles discharged. In forecasting situations, any location presents a problem when the projected flow rate exceeds the estimated capacity of the location. Operations immediately downstream of such a point are generally at or near capacity, and downstream operations improve as discharging vehicles move away from the bottleneck.

Fifty-two percent of the New York State's total vehicle hours of delay occurs on Long Island roadways[9]. These conditions undermine the region's ability to attain compliance under the federal National Ambient Air Quality Standards (NAAQS) as required under the Clean Air Act (CAA). The region's compliance with certain particulate and gaseous emissions standards in the coming years is mandated, and will thus make it difficult to expand the highway system within the Long Island Transportation Corridor, even if such an idea were politically popular.

As noted by the *LIRR Network Strategy Study*, if all of the current LIRR commuters drove into Manhattan instead of commuting by LIRR, approximately 100,000 *additional* cars would attempt to cross the East River each weekday morning and back again in the afternoon and overwhelm the streets of Manhattan. This extra vehicular traffic would require some 27 additional lanes of bridges, tunnels and approaches in order to cross the East River as well as extensive additional parking facilities in Midtown Manhattan.

1.5.2.b Regional Highway Capacity Constraints

As previously discussed, during the past five decades, after World War II in particular, Long Island experienced intensive residential and commercial development. The regional network of interstate highways, expressways and parkways established after World War II directly competed with the Long Island Rail Road for market share, and at one time parkways, expressways and interstate highways were viewed as the mode of transport for the future. Today, these expressways are over capacity, as witnessed by the growth in regional automobile ownership rates, vehicle miles traveled and the resulting congestion.

As is the experience elsewhere in this country, the self-defeating aspect of constructing new expressways to relieve congestion in urban or suburban areas is that almost immediately, such new highway capacity is absorbed by a flood of new vehicles. Today, limited land, the urbanized character of Long Island, and constraints with the environmental process make it impractical to consider adding new expressways to provide additional travel capacity between Long Island and the East Midtown area. And yet, current highway conditions will only grow worse over time as demographic trends forecast additional residential and labor force growth in Long Island and additional job growth in Midtown Manhattan.

Primary vehicular access from Long Island to Midtown Manhattan is funneled to three principal East River crossings: the Queens-Midtown Tunnel (toll), the Queensboro Bridge (toll free) and Triborough Bridge (toll). Consequently, these crossings create bottlenecks as great volumes of vehicles must merge into a limited number of traffic lanes to cross the East River. This results in significant reductions in travel speed and vehicular backups creating concurrent congestion on the feeder street network. Given the potential for significant environmental impacts and local opposition, it is impractical to consider constructing additional East River vehicular crossings.

NYCDOT, in collaboration with the New York Metropolitan Transportation Council (NYMTC) published the *Manhattan River Crossings 1993* report, a document listing vehicular counts for a typical fall business day in October. The count was done for all of the river crossings into Manhattan, over a continuous 24-hour period of time. The counts revealed the toll-free Queensboro Bridge to be the most heavily used of all East River crossings, carrying 12,898 westbound vehicles during the morning peak period (7 - 10 AM); the Triborough Bridge handling 12,286 westbound vehicles in the same peak period; and the Queens-Midtown Tunnel processing 11,195 westbound vehicles in the morning peak. (See Table 1.5-4.)

TABLE 1.5-4
1993
East River Crossings

Crossing	AM Peak Period 7 - 10 AM		PM Peak Period 4 - 7 PM		Approximate 24 Hour Totals
	E/B	W/B	E/B	W/B	
Queensboro Bridge	6,935	12,898	13,337	8,038	136,000
Queens-Midtown Tunnel	3,028	11,195	8,539	6,064	77,300
Triborough Bridge	6,738	12,286	8,766	10,529	92,600

Many of the arterial streets in Long Island City serve as vital connections to these river crossings. Traffic flows on these key arteries experience problematic levels of congestion and delay, as these are older City streets which were simply not designed to handle current levels of traffic. For example, Queens Boulevard, a signalized boulevard, serves as a feeder arterial to the Queensboro Bridge. During peak periods, over 2,500 vehicles per hour (vph) compete for space on a roadway designed to handle 2,000 vehicles per hour.

Similarly, Thomson Avenue, a feeder arterial for the upper level of the Queensboro Bridge, experiences peak hour flows of 2,000 to 2,200 vehicles per hour (vph) in the peak direction. Northern Boulevard, another arterial feeding to/from the Queensboro bridge, records between 1,800 and 2,200 vph during the peak periods. Significant delays occur at Queens Plaza—the confluence of Northern Boulevard and Queens Boulevard—where traffic from these two major arteries must pass a series of signalized intersections before merging onto the Queensboro Bridge. Extensive queuing and traffic delays around Queens Plaza are common during peak hours and often even during off-peak hours as traffic lanes on the bridge are often closed to permit remedial rehabilitation of this bridge. Other roads in the Long Island City area experiencing the same congested conditions are shown in Table 1.5-5:

TABLE 1.5-5
Long Island City AM Peak Period Roadway Congestion

Roadway	Vehicles/Hour	Vehicle/Capacity Ratio*
Borden Avenue/Queens-Midtown Tunnel	600-700	0.91
Vernon Boulevard/Jackson Avenue	300-400	0.86-0.97
Jackson Avenue/Queens Plaza	300-700	0.95
Hunterspoint Avenue/Van Dam Street	200-300	0.8-0.96

***Intersection approaches with v/c ratios of 0.85 or greater are considered to be congested, while those with v/c ratios of 1.0 or greater are considered to be operating at or over capacity.**

As described above, with highways leading into and through New York City at such problematic levels of congestion, there is no additional peak hour highway capacity remaining to absorb the substantial increases forecast for the future Long Island-to-Manhattan peak period work trips.

Clearly, in order to maintain the Corridor's mobility, and to avoid jeopardizing future economic growth, relying solely upon single occupant vehicles to meet tomorrow's expected travel demand is impractical.

1.5.2c Traffic Conditions in the Vicinity of Grand Central Terminal

The street network surrounding GCT processes a significant amount of vehicular volume relative to its capacity. Volume-to-capacity ratios exceed 0.90 along several intersection approaches, most notably along Lexington Avenue and the 42nd Street approaches to Park Avenue. In terms of vehicle delay and level of service, these intersections operate within some noticeable, but manageable, congestion (LOS D) at selected movements.

In terms of traffic volumes, the main streets surrounding the terminal are busy, although they do not appear to be experiencing gridlock. It is possible that motorists avoid this section of Manhattan because of the well-known taxicab and pedestrian interferences generated by GCT. Lexington Avenue carries between 1,500 and 1,700 vehicles per hour (vph) north of the GCT block in the daily peak travel hours. Adjacent to the terminal's east side, avenue traffic increases to about 1,850 as taxicab activity picks up there. Along GCT's south side on 42nd Street, east and westbound traffic volumes are consistently within the 800-900 vph range in the AM and PM peak hours. Vanderbilt Avenue carries low traffic volumes (predominantly taxicabs destined to the taxi stand along the terminal's west side) of between 130 and 200 vph in either the north or southbound direction throughout the day. Traffic volumes along 45th Street are modest, within the 400 to 500 vph range during the daily peak hours.

TABLE 1.5-6
1995 Existing Traffic Levels of Service

Intersection	AM Peak Hour		PM Peak Hour	
	V/C	LOS	V/C	LOS
Lexington Avenue at 42nd Street	91	C	101	D
Lexington Avenue at 43rd Street	100	D	67	B
Lexington Avenue at 45th Street	82	C	72	C
Park Avenue at 42nd Street	65	C	65	C
Vanderbilt Avenue at 42nd Street	103	D	109	D

1.6 Current and Proposed Transportation Improvements

1.6.1 Commuter Rail and Transit Improvements

Programmed Projects

Table 1.6-1 lists programmed (but not necessarily fully funded) projects which will improve capacity within the Long Island Transportation Corridor, increase service to Penn Station (placing greater demands upon this station), or increase service to GCT. These projects may be initiated, but not necessarily completed, by 1999.

Projects which add service to Penn Station New York are listed since they will increase train traffic and demand to that station, and eventually require an alternate station location to handle future LIRR ridership growth as Penn Station's capacity becomes fully utilized. GCT projects are included in this list because the Build Alternative proposes to utilize GCT, and should be considered within the context of projects currently proposed for GCT by MNR.

The projects listed in Table 1.6-1 are described below:

TABLE 1.6-1
Programmed Capital Improvements

Project	Agency	Start Year
Projects which increase capacity within the Long Island Transportation Corridor:		
63rd Street to Queens Blvd Connection	NYCT	1992
Penn Station NY Platform 11 extension	LIRR	1992
LIRR bi-level push-pull coaches	LIRR	1993
LIRR cab car coaches	LIRR	1993
LIRR locomotives	LIRR	1993
LIRR system wide parking lot expansion	LIRR	1993
East River ferry improvements	NYCDOT	1994
E-ZPass	MTA	1995
West Side Yard "U" Ladder Connection	LIRR	1996
Projects which increase service into Penn Station New York from other than LI:		
Kearny Connection	NJT	1990
NE Corridor Signal Upgrade	NJT/Amtrak	1993
NJ Transit Secaucus Transfer Center station	NJT/MNR	1995
Montclair Connection	NJT	1995
Northeast Corridor New Haven-Boston electrification	Amtrak	1995
Farley Post Office conversion	Amtrak	1997
Projects which increase service into Grand Central Terminal		
MNR Mid-Harlem third track construction	MNR	1992
MNR Dover Plains to Wassaic extension	MNR	1992
MNR Grand Central Terminal North End Access	MNR	1992
MNR Parking improvements	MNR	1992
MNR Push-pull coaches	MNR	1994
MNR Cortlandt Station	MNR	1996

Sources:
Transportation Improvement Programs:
New York Metropolitan Transportation Council (NYMTC)
MTA Capital Program
North Jersey Transportation Planning Authority (NJTPA)

NYCT 63rd Street Line to Queens Blvd Line Connection

This project consists of a new 1,500 foot tunnel connection to link the upper level of the 63rd Street Tunnel (which is currently used by NYCT) with the local and express tracks of the Queens Boulevard Line. When the connection is completed in 2001, an additional 15 subway trains per hour will be able to cross the East River during peak periods, providing an alternative to the overcrowded 53rd Street and 60th Street Tunnels.

Penn Station Platform Improvements
The recently completed lengthening of Penn Station Platform 11 enables Tracks 20 and 21 to accommodate 12-car trainsets, an increase of four cars per train, while allowing Track 19 to provide 12-car trainset capacity on a full-time basis. This permits a 12-car train to fully operate at any of the LIRR platforms, providing operational flexibility.

LIRR Bi-Level Push-Pull Coaches
LIRR's entire diesel-hauled fleet will be replaced by a new fleet of bi-level coaches which will enable LIRR passengers to have a more comfortable ride, while slightly increasing line capacity.

LIRR Cab Control Cars
Some of the forthcoming new LIRR bi-level coaches will be cab control cars which are positioned at the end of a trainset to allow push-pull train operation from this car. This saves capital and operating costs by eliminating the need to purchase an additional locomotive to accomplish this task.

LIRR Locomotives
Integral to the operation of LIRR's forthcoming new fleet of diesel-hauled bi-level coaches are a new fleet of diesel locomotives. Some of these locomotives will be dual-mode locomotives (which are both diesel powered and electrically powered), capable of operating into Penn Station New York. The combination of a new car fleet coupled with the possibility of dual-mode locomotives translates into dramatic service improvements—if track capacity into Manhattan can be made available during peak hours. Dual-mode locomotives offer the LIRR the ability to provide a one-seat ride into Penn Station for the non-electrified lines.

LIRR Parking and Hub Development
The lack of commuter parking can be a constraint limiting LIRR ridership growth. This program seeks to expand the number of parking spaces system-wide to help eliminate this constraint and develop several regional intermodal transportation hubs to encourage other means of access to LIRR stations.

East River Ferry Improvements
This project seeks to reduce regional vehicular emissions by constructing support facilities (i.e. ferry landings) for private ferry operations between East Midtown Manhattan and Hunters Point in Long Island City.

E-ZPass
This is an electronic toll collection system that allows customers to establish a pre-paid account and have their tolls automatically deducted as they travel through a toll lane. Approximately two to three times as many vehicles can be processed per lane per hour than existing automatic coin machines and manual lanes.

West Side Yard "U" Ladder Connection
LIRR trains terminating at Penn Station utilize the West Side Yard (WSY) for storage and servicing. Station Tracks 15-21 are connected to WSY; Tracks 13 and 14, which are used during peak traffic periods, do not connect to the yard.

Amtrak (the owner of the station) and LIRR recently concluded an agreement to connect Tracks 13 and 14 to WSY. Known as the U Ladder Connection, this capital improvement will increase utilization of these tracks during the height of the rush hour, resulting in improved terminal operation and much needed schedule reliability.

Kearny Connection
NJ Transit has recently completed ("Midtown Direct") construction of a 7,000-foot electrified, two track connection between the Morris & Essex Lines (M&E) and the Northeast Corridor Line to allow selected M&E Line trains to operate directly into Penn Station New York, in addition to their present Hoboken N.J. terminal. This saves passengers destined for Midtown Manhattan up to 20 minutes compared to their current trip that involves a transfer to PATH service in Hoboken.

Northeast Corridor High Density Signal Upgrade
NJ Transit is sponsoring the installation of a new high density signal system between Newark Penn Station and Penn Station New York to increase line capacity of the two track "high" line into Penn Station New York to handle approximately 30 trains per hour.

Secaucus Transfer Station
This two level station located at the junction of Amtrak's Northeast Corridor (NEC) and NJ Transit's Main Line in Secaucus, New Jersey, will allow NJ Transit customers riding the Bergen, Main, Pascack Valley and perhaps resurrected West Shore and Susquehanna lines, as well as MNR customers on the Port Jervis Line, to easily transfer at Secaucus to Northeast Corridor trains to Penn Station New York. The impacts to Penn Station will arise from additional NJ Transit trains using this station during peak hours and the need to utilize the East River tunnels to deadhead some of those trains to Sunnyside Yard for mid-day storage.

Montclair Connection
The Montclair Connection is a 1,200 foot, electrified, two-track connection linking NJ Transit's Montclair Branch (in Montclair, NJ) on the Morris & Essex Lines with the Boonton Line and will enable Boonton Line trains to operate directly into Penn Station New York via the Kearny Connection. The connection will also allow greater efficiency in the Boonton Line/Montclair Branch corridor by eliminating duplicate service and maintenance associated with the Boonton Line between Montclair and Hoboken.

Northeast Corridor New Haven to Boston Electrification
This project will electrify the remaining 156 miles of unelectrified track section on the Northeast Corridor between Boston and New Haven, and permit Amtrak to increase line speeds up to 150 mph. When the project is completed in the late 1990s, Amtrak will increase the number of roundtrips on the Boston to New Haven segment from 10 roundtrips each weekday to 26 trips (by 2010), and will reduce its fastest New York to Boston travel time from just under four hours to three hours. West of New Haven, where Amtrak's "Inland Route" rejoins the Northeast Corridor, there will be as many as 74 Amtrak trains daily, in the year 2010, compared with 26 currently.

Farley Post Office Conversion
This project will convert the Farley Post Office across Eighth Avenue from Penn Station New York into a new Amtrak gateway serving New York City. In addition to providing Amtrak with more space, a new retail complex of shops and restaurants will be developed, essentially creating a new regional destination in its own right. However, while this project adds substantially to the passenger terminal space above the tracks, it will only marginally increase needed platform availability by converting a mail loading platform to passenger use. The existing passenger platforms

will be reconfigured to allow access to both the current portion of Penn Station, and to the newly expanded Amtrak station area in the Farley Building.

Mid-Harlem Third Track Construction
This project will upgrade an existing third track between the Mt. Vernon West Station and Fleetwood Station and construct a new third track between the Fleetwood and Crestwood Stations on MNR's Harlem Line right-of-way. The project will accommodate expansion of peak service into GCT, facilitate Upper Harlem/Dover Plains express service, and accommodate the growing intra-suburban/reverse commute markets.

Dover Plains to Wassaic Extension
In this project, MNR will extend the Upper Harlem Line approximately six miles from its current terminus at Dover Plains north to Wassaic in the town of Amenia to serve the emerging population growth in this region. Two new stations, a layover rail yard and maintenance building will be constructed as part of this project.

Grand Central Terminal North End Access Project
Currently all passengers arriving at GCT must leave the platforms using exits at the south end of each platform. This creates pedestrian flow bottlenecks and imbalanced trainset loadings since many customers attempt to ride near the platform exit. The North End Access Project will redress this imbalance by constructing a series of cross passageways and street exits throughout the length of each platform, thereby offering north end exits which will be more convenient to many passengers destinations. This will also provide a more even distribution of passengers throughout each train, and increase terminal capacity by allowing crowded rush hour platforms to be cleared more quickly.

Metro-North Parking
As with the LIRR, additional parking spaces are required to keep pace with projected MNR ridership growth, and an additional 6,500 parking spaces are forecast to be needed by the year 2011. During the 1992-1996 Capital Program, construction of approximately 2,500 parking spaces was begun.

Metro-North Push-Pull Coaches
Metro-North is purchasing 23 push-pull coaches to meet growth and service improvements for the Upper Hudson Line the Dover Plains service and the future extension to Wassaic. These coaches will be used to lengthen existing trains as well as to provide new through and express services for these non-electrified lines.

Metro-North Cortlandt Station
Metro-North has completed the construction of a regional station in the Town of Cortlandt on the Hudson Line. This station resulted in the closure of the obsolete Crugers and Montrose stations and the replacement with a modern facility with superior highway access and a greater parking inventory.

1.6.2 Highway Projects on Long Island

Over the next five years, transportation funding on the Nassau and Suffolk Counties portion of the Study Corridor has been allocated so that mass transportation projects will receive 59.5% of the funding, and highway rehabilitation and capacity improvements the remaining 40.5%. Within

New York City the funding split between mass transportation and highways is 70% for mass transportation and 30% for highway projects[10].

The New York State Department of Transportation (NYSDOT) is currently planning a number of highway rehabilitation and expansion projects in the Long Island region. In particular, there are six corridors undergoing a feasibility study for major rehabilitation and/or expansion:

- Eastern Nassau, North-South Corridor
- Meadowbrook State Parkway
- Northern State Parkway
- Sagtikos State Parkway
- Southern State Parkway
- Wantagh State Parkway

In addition, in FY 1994-1995 a $552 million program was started to increase the passenger carrying capacity of the Long Island Expressway through the construction of additional sections of HOV lanes. The Long Island Expressway was constructed between 1940 and 1972, with the initial segment starting at the Queens-Midtown Tunnel and the final segment completed at Riverhead. The Long Island Expressway was designed to carry a volume of 80,000 vehicles; today it carries over 180,000 vehicles each weekday—more than twice its intended capacity.

Although portions of the original expressway have been widened, these capacity increases have been insufficient to keep up with increased traffic volumes. The current program now underway includes the construction of two new sections of High Occupancy Vehicle (HOV) lanes on the Long Island Expressway: 1) between Exit 30 (Cross Island Parkway in Queens) and Exit 49, and 2) between Exit 57 and Exit 64 in Suffolk County (see Figure 1.6-1). In addition, other programmed improvements include the reconstruction of the Seaford-Oyster Bay Expressway and Cross Island Parkway interchanges, widening, resurfacing and repaving portions of the road surface, as well as the installation of advanced traffic management systems and other sections of minor rehabilitation.

Another $580 million has been committed for the reconstruction and rehabilitation of 134 miles of Long Island's parkway system. This includes road widenings (possibly HOV lanes), bridge rehabilitation and upgraded signage along the Northern, Southern, Meadowbrook, Wantagh and Sagtikos State Parkways.

All of the above mentioned improvements are committed and approved in the New York Metropolitan Transportation Council's Transportation Improvement Plan for New York City and its environs for the fiscal years 1994 through 1998.

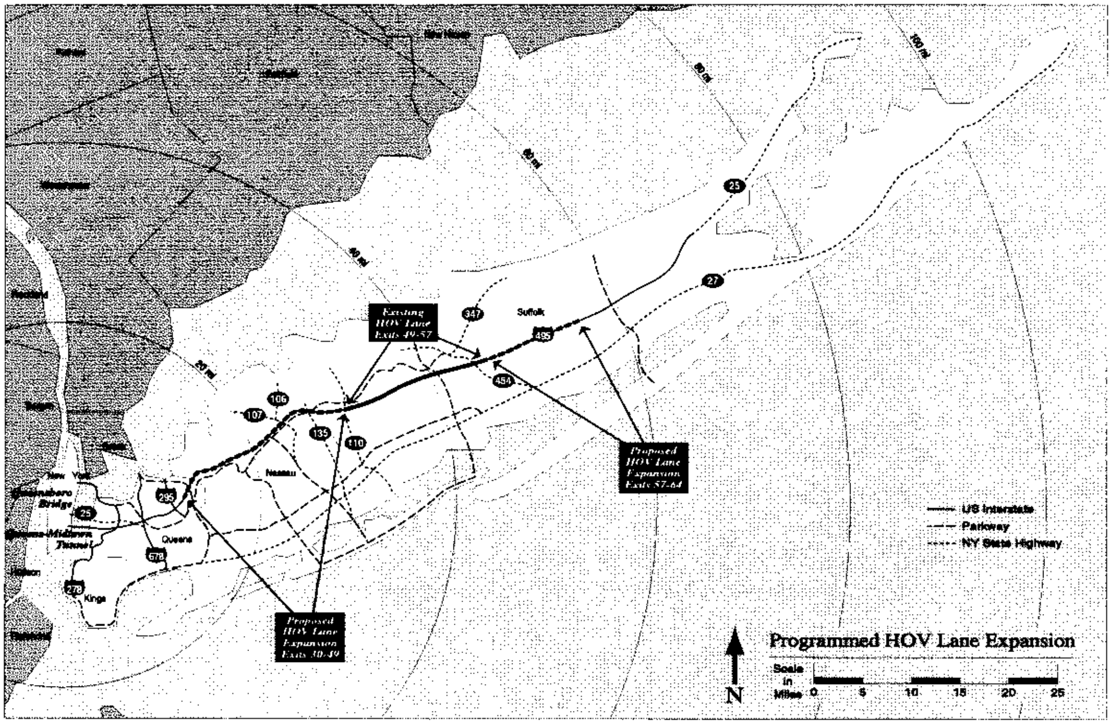


Figure 1.6-1

Additional projects programmed for mobility improvements in the coming years are presented in Table 1.6-2:

TABLE 1.6-2
Programmed Highway Improvements

Highway	Project Description
Sunrise Highway (NY Route 27)	- Reconstruction of mainline to 6 lane expressway with service road and grade separated intersections (Pond Road to Lakeland Avenue.) When construction is completed in Summer 1998 Sunrise Highway will be a
	109 in Babylon to Shinecock.
Jericho Turnpike (NY Route 25)	- Reconstruction from current 2 through lanes to provide 4 through lanes and continuous left turn lane (NY Rt. 111 to NY Rt. 347). Contract letting 5/2000.
	- Reconstruction and widening from 2 lanes to 5 lanes (County Route 83 to County Route 21).
	- Construction of grade separation and modified cloverleaf - NY Route 25 and CR97 (Nicolls Road).
Hempstead Turnpike (NY Route 24)	- Provision of left turn lane and traffic signal upgrade (Nassau Road to Front Street) now under construction.
	- Resurfacing and safety improvements (Wantagh Parkway to NY Route 135). Contract letting 11/99.
Northern State Parkway	- Road widening, additional E/B and W/B through lane and bridge modifications for capacity improvement (Meadowbrook Parkway to Wantagh Parkway). Now
Mineola Grade Crossing Elimination	- Elimination of the at-grade crossing between the LIRR Mainline and Herrick Road. Now under construction.

1.7 Specific Transportation Problems in the Study Area

Completion of the programmed transit, railroad and highway projects discussed in Section 1.6 will still leave major present and future transportation needs in the Long Island Transportation Corridor unfulfilled.

As to present unfulfilled needs, none of the programmed highway projects will relieve the congestion and severe backups motorists, bus and taxi drivers, and truckers experience as they begin or end their trip trying to cross the East River on the bridges and tunnels connecting Manhattan with Long Island. And none of the programmed transit improvements and only a few of the programmed railroad improvements will enable LIRR commuters, who presently are shunted to terminals in Brooklyn or Long Island City because their trains cannot be accommodated in Manhattan, to reach their desired destinations more directly, more quickly, and more conveniently.

1.7.1 Infrastructure Capacity Increases versus Forecast Capacity Requirements

On top of current needs there will be 88,700 additional journey-to-work trips projected to further tax the current transportation network in the LITC by the year 2020. Journey-to-work trips between Long Island and Manhattan will increase significantly, and no existing or programmed highway, transit or railroad facility—alone or in combination—has the capacity to meet these projected demands.

- *Highways.* The highway infrastructure improvements described in Section 1.6 will ameliorate certain highway congestion situations on Long Island, thereby improving the flow of traffic for selective intra-Long Island highway travel. However, since none of these improvements adds any capacity to any of the East River bridges or tunnels, they cannot be counted on to handle any of the additional Long Island/Manhattan journey-to-work trips forecast for the future.

- *Transit.* The 63rd Street/Queens Boulevard subway connection described in Section 1.6 and currently under construction will increase the rapid transit system's capacity to handle additional journey-to-work trips between Queens and Manhattan by 15 trains, carrying about 26,000 passengers, per hour. This will go a long way to relieving the severe overcrowding that currently exists on the Queens Boulevard and Flushing subway routes linking Queens and Manhattan. Since no other East River rapid transit crossing is currently programmed, such "excess" capacity as there may be after the new connection is placed in service will be counted on to handle a good share of the 35,500 future additional local, intra-City journey-to-work trips to Manhattan projected to emanate from Queens. Hence, no part of the capacity of these 15 Queens Boulevard/63rd Street subway trains per hour can be ascribed to carrying the additional Manhattan-oriented journey-to-work trips from Nassau and Suffolk Counties.

- *Railroad.* The LIRR's only Manhattan terminal, Penn Station, is currently at capacity in handling 36 LIRR trains per hour. Over the next decade, programmed improvements will inch this capacity limitation upwards in allowing for six more trains, of varying train lengths, in the single peak hour. New dual-mode equipment and other changes at Penn Station will result in increased peak period ridership to this terminal. However, these improvements and added peak train service are not expected to provide for more than 13,800 additional LIRR peak passengers to Penn Station, still far short of the 32,500 additional journey-to-work travelers projected for the future from Nassau and Suffolk Counties alone. Presumably, the remaining

18,700 commuters would ride the LIRR to one of its other terminals, in Long Island City or in Downtown Brooklyn, for a connecting crowded subway trip to Manhattan, but it is by no means certain that they would do this in preference to trying to drive or not making the trip at all.

Present highway, transit and railroad facilities are over capacity in trying to accommodate Long Island/Manhattan travel. Transit and railroad (but not highway) projects currently under construction or programmed will provide certain minimum relief for current overcrowding but will barely scratch the surface in providing the capacity needed to handle the additional Manhattan-oriented journey-to-work trips from Nassau, Suffolk, Queens and Brooklyn. Therefore, major transportation infrastructure investments that improve the quality of service and reduce travel time must be made in the Long Island Transportation Corridor to address those needs.

1.8 Purpose and Needs Summary

Far from being another planning exercise, there are a number of cogent reasons why it is important to improve mobility within the Long Island Transportation Corridor. The case for investing in the Corridor's transportation infrastructure includes the following considerations:

- Strong economic growth projected for the counties within the Long Island Transportation Corridor will translate into increased travel demand between Long Island and Manhattan. Long Island (Suffolk, Nassau, Queens Counties) to Midtown Manhattan work trips are projected to increase well into the next century, making this Corridor a major growth corridor in the region. The labor force in Long Island will grow by larger percentages than employment (32% in Long Island), prompting Long Island residents to seek employment in New York City. By the year 2020, Nassau and Suffolk Counties are expected to generate 32,500 additional journey-to-work trips to Manhattan, and Queens County will generate an additional 36,600 work trips as compared to 1990. The impact of these trends will be to further increase demand for high quality, reliable transportation service between Suffolk, Nassau and Queens Counties and Midtown Manhattan.

- Existing public transportation systems serving the Long Island Transportation Corridor to Midtown Manhattan are currently at or near capacity. Without further investments in capacity increases, there is limited potential to handle additional ridership. While the future forecasts increased demand for transportation from Long Island into New York City, existing transportation providers are ill-equipped to handle this increase. LIRR services into Penn Station are at or near capacity, as are NYCT subway lines within the corridor. In addition, the Corridor's expressways and East River crossings are currently experiencing extreme levels of congestion. The relatively easy "fixes" of squeezing additional capacity out of Penn Station are currently being planned or undertaken, and soon this capacity will be fully committed. Major new transportation investment strategies are required to provide new capacity from Long Island into Midtown Manhattan.

- Eastern Queens is currently underserved by high speed, reliable public transportation. Eastern Queens is a growth market for high speed transportation. Over half (57%) of the 36 million annual journey-to-work trips emanating from Eastern Queens are made by some modal combination involving subways and buses[11]. This part of Queens historically has lacked direct subway service and, due to capacity limitations, frequent LIRR service. As a result, those subway routes which do exist, are fed by an extensive network of Eastern Queens feeder buses, and such ridership demand consistently translates into overcrowded subway services—making commutation from Eastern Queens time consuming and comparatively unpleasant. The opportunity exists for the LIRR to capture a greater percentage of the Eastern Queens market share—provided that capacity problems on the LIRR can be resolved and provided that the LIRR is able to offer Eastern Queens residents a more convenient rail station to East Midtown Manhattan.

- Approximately 53% (47,000) of existing AM peak period Penn Station LIRR customers work at locations which are more accessible to GCT than to Penn Station. Thus, there is a "mismatch" between the location of Penn Station and the work location for many LIRR customers. For these LIRR riders, Penn Station on the West Side of Manhattan is an inconvenient "gateway" to reach their East Midtown offices. Many of the LIRR customers arriving at Penn Station must transfer to another mode to reach their final destination in East Midtown—adding an average of 20 minutes per journey, and increasing their commutation costs. While approximately 80% of LIRR peak commuters presently use Penn Station, many LIRR customers have indicated strong preference to travel instead to an East Manhattan terminal closer to their final destination in the East Midtown area. Results of on-board train surveys[12] showed that 48% of Main Line respondents and 37% of Port Washington Branch respondents would have considered using LIRR service to GCT for their current trip; other survey respondents indicated that if the LIRR were to operate to GCT, a significant number of non-LIRR commuters would switch to this new rail service (31% from express bus; 34% from auto use; and 41% from subway travel).

- Planned transportation projects currently underway will "use up" capacity at Penn Station New York. Demand for rail services into Penn Station will continue to grow well into the next century. Although Penn Station is not a convenient "gateway" station for many of the LIRR customers arriving at that terminal with destinations in the East Midtown area, Penn Station will be a significantly busier station in the future. Amtrak and NJ Transit, the two other rail operators currently using Penn Station, are planning significant service expansions which will feed additional trains and riders into this station. These service increases will make it even more difficult for the LIRR to expand train service into Penn Station in the future, since the needs of Amtrak and NJ Transit must be considered.

- Physically expanding the expressways and highway system linking Long Island and Manhattan to serve additional single occupant vehicles is not a viable nor realistic option. Politically unpopular both within Long Island and New York City, potential highway expansion is hampered by a lack of physical space and by the intolerance of Corridor residents to endure the environmental impacts generated by such projects. The Corridor's high density and urbanization all but preclude acquiring new rights-of-way for new expressways. Even if new expressways were possible, and even if a new East River vehicular crossing came to fruition—both of which are extremely unlikely in today's sensitive environmental climate—the inability of Midtown Manhattan streets to absorb significant increases in traffic effectively serves to ration single occupant vehicles as a realistic commute option for the majority of the work trips. Finally, the need to comply with the Clean Air Act effectively prevents major expansion in the Corridor's highway system—even if it were desired.

- Increasing public transportation capacity within the Long Island Transportation Corridor is the only viable alternative if future travel demand is to be met. The inability to respond to this challenge will undermine the region's economic potential. With the Corridor's highway system at capacity, and future highway capacity increases very limited, the fullest use must be made of the existing public transportation system and to expand the infrastructure to meet anticipated future demand. The challenge is to select the investment strategy which best responds to anticipated demand in the most cost—effective manner.

- Current transportation network expansion projects will not relieve congestion along the LongIsland Transportation Corridor. At present, the major public transportation expansion project within the LITC is the construction of the 63rd Street Tunnel Connection project, which will link the completed portion of that tunnel to the IND Queens Boulevard subway line to provide additional operating capacity and flexibility in the western portion of Queens. However, completion of this project in 2001 will not extend the geographical reach of the City subways into Eastern Queens.

- Finally, maintaining the Corridor's mobility is important to the region's long-term economic future. In today's global economy, businesses can be rather selective as to where they locate their operations or their staff. The inability for transportation providers in the Study Corridor to provide a reasonable degree of mobility to meet current and expected increases in work trips will place this region at a serious disadvantage relative to other domestic and international cities where travel is not as difficult.

The New York City region is constantly in competition with rival world cities for economic supremacy. New York's competing cities recognize the intrinsic relationship between economic development and regional mobility, and these cities are investing heavily to meet future demand by constructing additional transportation links now. Given the long-term timeframe needed to implement these new transportation investment strategies, for these other cities to build now for the future requires a high degree of forward thinking and vision. If the New York City region is to avoid becoming marginalized in the world arena, and shunned by corporations as "too difficult a place" to do business and maintain a workforce, then New York must also commit to the necessary investments to effectively meet the region's future needs. The first step, which this study represents, is to develop the appropriate thinking and vision which will then become the blueprint for future action.

Footnotes:

[1] *1996 Annual Report*, Metropolitan Transportation Authority.

[2] 1992 Downstate New York share of national public transportation from New York Metropolitan Transportation Council's *1993 Regional Transportation at a Glance*.

[3] *The Future of the Extended Core in the Global Economy,* Urbanomics, 1995.

[4] *The Future of the Extended Core in the Global Economy*, Urbanomics, 1995.

[5] *LIRR Network Strategy Study, Final Report* May 1994.

[6] *63rd Street Connection Service Plan & Car Requirements*, Metropolitan Transportation Authority, September 1995.

[7] *Final Environmental Impact Statement 63rd Street to the Queens Boulevard Line*, USDOT/FTA/MTA, June 1992.

[8] *Highway Capacity Manual*, Transportation Research Board, 1995.

[9] *Long Island Rail Road Network Strategy Study, Final Report*, May 1994.

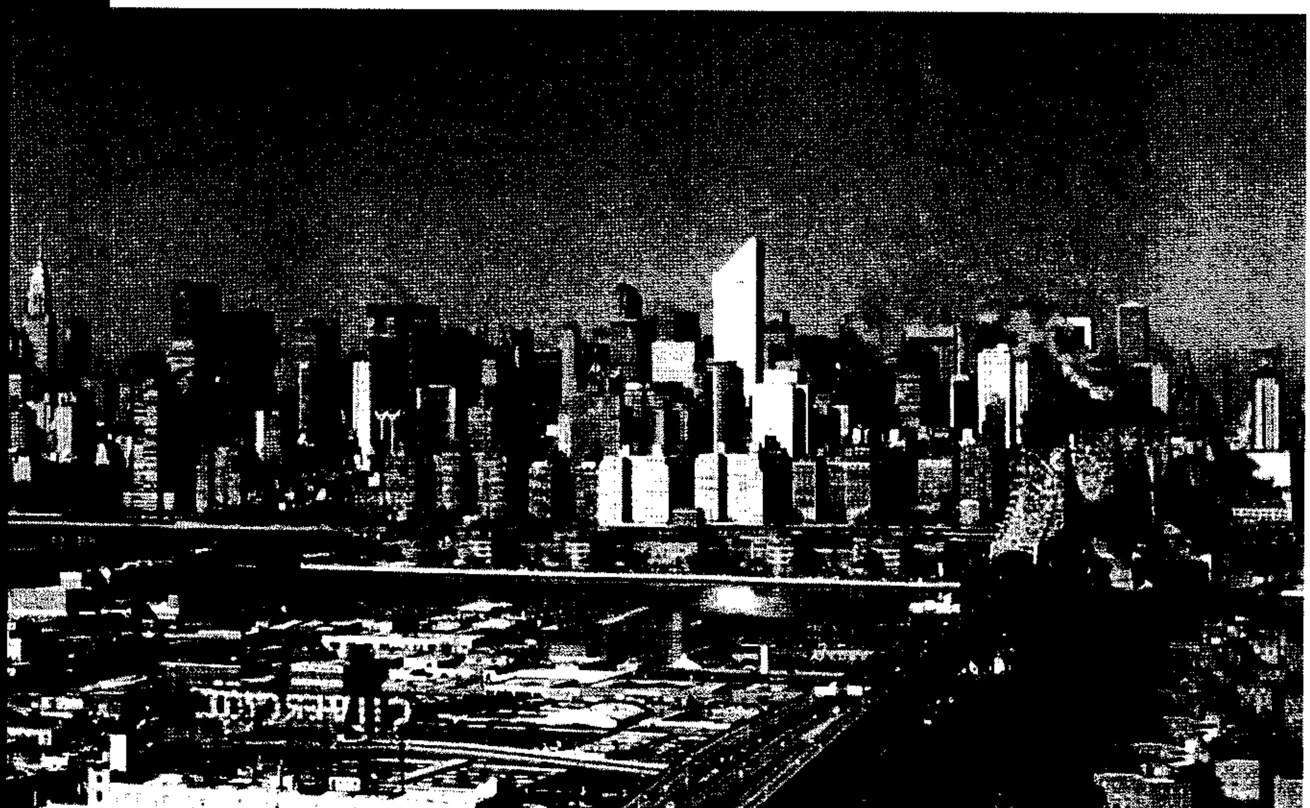
[10] *Transportation Improvement Program.* New York Downstate Metropolitan Area, Volume I. New York Metropolitan Transportation Council. September 1994.

[11] LIRR Network Strategy Study May 1994.

[12] East Side Access Study, Final Report, Caliper Corporation, June 1986.

Chapter 2

Alternatives Considered



Long Island Rail Road

2.0 ALTERNATIVES CONSIDERED

This chapter summarizes the alternatives considered in the MIS for the Long Island Transportation Corridor. The alternatives range from one in which no improvements, other than those already planned and funded, are to be implemented to those with major investments in the enhancement of a commuter rail system.

The chapter is divided into four sections. The first section provides a discussion of the screening process that produced the alternatives studied in the MIS and summarizes the consideration given the alternatives selected in the MIS. The remaining sections describe the No-Build Alternative, the TSM Alternative and the Build Alternative which are the alternatives carried forward for further analysis.

2.1 Screening and Selection Process

2.1.1 Two-Phased Evaluation Process

The Long Island Transportation Corridor Study was initiated in January 1995 under the auspices of the Federal Transit Administration (FTA), New York Metropolitan Transportation Council (NYMTC), the Metropolitan Transportation Authority (MTA) and sponsored by the LIRR. The study was divided into two phases. The Phase I MIS portion of this study identified all reasonable alternatives to address the defined transportation problem. These alternatives were reviewed through a preliminary Stage 1 screening process that included a "Fatal Flaw" analysis which is described in Section 2.1.3. Further screening in Stage 2 included an evaluation of those alternatives surviving the fatal flaw analysis and is described in Section 2.1.4. The three alternatives surviving the two stage screening process, the No Build, TSM and Build Alternatives are than evaluated in additional detail.

2.1.1.1 Development of Study Alternatives

The potential alternatives, or Long List, for evaluation in the MIS were largely developed during an extensive public outreach effort conducted throughout 1995 and described in Chapter 6. At National Environmental Policy Act (NEPA) scoping meetings held at various locations within the region, public input was received on the alternatives to be evaluated and to identify specific issues to be addressed. The Long List of Alternatives was developed from the following sources of information and input:

- Penn Station Capacity and Utilization Analysis, January 1992
- Operational and Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side, April 1993
- MTA 1995 - 1999 Capital Improvement Program
- Other Transportation Agencies (NYSDOT, NJ Transit, Amtrak) Capital Programs
- Agency input from ongoing planning studies
  - NYSDOT High Occupancy Vehicle Lane Expansion Program
  - MTA Long Island City Transportation Needs and Opportunities Study

- NYCT East River Crossings Study
- NYCT Manhattan East Side Transit Alternatives Study
- MTA/PA NY&NJ/NJ Transit Access to the Regions Core Study

- Technical and Citizens Advisory Committee input

Based on the results of preliminary screening in Stage 1, selected alternatives which met the two critical study goals identified in Chapter 1 and being technically and operationally feasible were advanced into the Stage 2 evaluation. In this second stage, a further evaluation was conducted to assess the alternatives still under consideration. Of special importance in this screening process were criteria relating to factors such as cost effectiveness, ridership demand, service quality, community acceptance and environmental impacts. The screening facilitates the comparison of alternatives by indicating where environmental concerns may be different and where alternate construction methods may differ in environmental effect.

The findings of this more detailed Stage 2 assessment, in conjunction with input from the ongoing public outreach program, resulted in the selection of reasonably available alternatives to be carried forward for further evaluation, with concurrence from interested parties in this study.

2.1.2 Phase I MIS Alternatives

In this early exploratory phase, the alternatives, briefly summarized below, were identified as candidates for Stage 1 screening. These brief descriptions highlight key elements of each alternative. More complete descriptions of these alternatives are provided in the Long List of Alternatives Technical Appendix which provides the following information regarding each alternative:

- Introduction
- Physical Description of Alternative
  - Right-of-Way Requirements
  - Trackwork
  - Utilities
  - Structures / Tunnels
  - Traction Power
  - Signals and Communications
  - Stations
  - Parking
  - Maintenance Facility / Depots
  - Vehicles
- Operating Plans
- Impact upon other Operations
- Environmental Issues
- Community Issues/Concerns
- Other

The Long List of Alternatives is broken down into the following nine broad categories:

ALTERNATIVE I - NO-BUILD ALTERNATIVE

ALTERNATIVE II	-	TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE
ALTERNATIVE III	-	BUS/HOV LANE ALTERNATIVE
ALTERNATIVE IV	-	LIRR EAST SIDE TERMINAL ALTERNATIVES
ALTERNATIVE V	-	EAST SIDE RAIL STATION ALTERNATIVE
ALTERNATIVE VI	-	NEW EAST RIVER TUNNEL & EAST SIDE RAIL STATION ALTERNATIVE
ALTERNATIVE VII	-	SUNNYSIDE INTERMODAL TRANSFER STATION ALTERNATIVES
ALTERNATIVE VIII	-	NYCT OPERATION OVER LIRR TRACKAGE ALTERNATIVES
ALTERNATIVE IX	-	LIRR OPERATION OVER NYCT TRACKAGE ALTERNATIVES

Each of the above categories contain one or more alternatives, as noted below.

Alternative I. No-Build Alternative: A federally mandated alternative, the No-Build Alternative consists of transportation facilities and transit services that presently exist in the Long Island Transportation Corridor and elsewhere in the New York Metropolitan Region. This alternative, the environmental baseline for the study, essentially describes conditions in the travel corridor (both highway and transit) that would exist in the foreseeable future if no action were taken. The No-Build Alternative includes:

- Capital improvements by transit and highway agencies relevant to the LIRR East Side Access MIS where the commitment and the financing are in place, and where the improvements will be constructed.
- Capital improvements defined to be System Improvement or Network Expansion by the MTA which will be built, or be under construction, by the end of 1999; State of Good Repair and Normal Replacement projects are assumed to continue at historical levels of spending.
- Relevant planned operational changes that will be in place by 2010.
- Minor transit service expansions and/or adjustments that continue existing service policies into newly developed areas, and will be in place by 2010.

This alternative is described in further detail in Section 2.2.

Alternative II. Transportation Systems Management Alternative (TSM): Since there are major cost options in this study, Federal regulations require an alternative that maximizes use of current transportation facilities (from Long Island to East Midtown Manhattan) and that demonstrates the extent to which mobility constraints can be relieved without major capital expenditures.

This package of initiatives can best optimize the existing highway network, MTA network of transit services, and reduce congestion at Penn Station; with each of these projects estimated to cost on average less than $50 million. In general, TSM alternatives focus on improvements in highway and transit service through incremental operational and physical enhancements, selected highway upgrades and specific traffic solutions. Initiatives included in the TSM Alternative, all or most of which will be under way concurrently during a five to ten year period, are:

- Increase the number of railcars on LIRR trains (up to 12 cars-maximum length) into Penn Station, before increasing the number of trains that serve Penn Station.
- Expand the capacity of the LIRR Port Washington Branch by 20% by increasing the number of cars in each train consist from 10 to 12. Provide other related improvements: lengthening station platforms to accommodate these longer trains, extending the pocket track at Great Neck and reconfiguring yard tracks at Port Washington.
- Use different AM and PM service patterns in operating LIRR trains through the four East River Tunnels during morning and evening peak hours, to reduce train conflicts at Penn Station New York and at Harold Interlocking in Sunnyside, Queens.
- Increase the number of LIRR trains that serve Hunterspoint Avenue and Long Island City stations, with LIRR passengers transferring to connecting subway and bus services to East Midtown Manhattan.
- Operate additional ferry service between the Long Island City LIRR Terminal in Hunterspoint, Queens and East 34th Street in Manhattan; coordinate the LIRR and ferry services to provide a "seamless" intermodal transfer service.
- Extend the existing NYSDOT westbound AM contra flow lane on the Long Island Expressway 3.6 miles from its current starting point at Greenpoint Avenue easterly to approximately the Grand Central Parkway in Queens. Construct two new entrances to the contra flow lane. The first entrance will be at 102nd Street while the second will require a flyover structure at 74th Street to allow buses and permit vehicles from Queens Boulevard and Woodhaven Boulevard to enter directly the contra flow lane.

This alternative is described further in Section 2.3.

<u>Alternative III. Bus/HOV Lane Alternative:</u> Under this alternative, new express bus service would be operated between Long Island (as far east as Riverhead) and Manhattan via the Long Island Expressway (LIE) as described below. Also, a series of substantially continuous High Occupancy Vehicle (HOV) Lanes would be provided for approximately 54 miles from Medford, Long Island along the LIE through Long Island City up to the eastern portal of the Queens-Midtown Tunnel. In coordination with the NYSDOT, HOV strategies were developed for further evaluation, including the following sections of the LIE:

Westbound

- Construct one HOV lane in each direction on the LIE from NY Route 112 (Exit 64) in Medford, Suffolk County, to the Van Wyck Expressway (Exit 22) in Corona, Queens County, a distance of approximately 45 miles.

- Provide transitional segment of general use lanes, about 1.13 miles long, between the LIE sections described above and below.

- Operate one westbound HOV lane on the LIE from approximately 108th Street in Corona, Queens, up to and through the Queens-Midtown Tunnel toll plaza, a distance of about 6.43 miles. This HOV lane may be reversible, contra-flow, with a movable barrier.

Eastbound

- Construct one HOV lane in each direction on the LIE from Van Wyck Expressway (Exist 22) in Corona, Queens County to NY Route 112 (Exit 64) in Medford, Suffolk County.

In addition to utilizing the above sections of the LIE, the new express bus service would operate in both directions between Medford and Riverhead on the LIE (without an HOV lane in this LIE segment).

During morning hours, the express buses would be routed through the Queens-Midtown Tunnel, and continue north on Third Avenue in Manhattan to 57th Street.

During late afternoon/evening hours, these buses would proceed north along Third Avenue from 42nd Street in Manhattan, and be routed as follows:

- Via Queensboro Bridge and Queens Boulevard to the LIE entrance ramp at the Queens Boulevard intersection.

- Operate over the general use lanes on LIE between the Queens Boulevard and Van Wyck Expressway intersections prior to entering the eastbound HOV lane.

At major LIE interchanges, off-street bus stops with high quality shelters would be provided in conjunction with park-and-ride lots that could accommodate up to 500 vehicles. Non-stop, direct bus service would be scheduled between nine park-and-ride lots in Nassau/Suffolk and East Midtown Manhattan.

The HOV lane(s) would be open to buses (including existing express bus routes in Queens), carpools, vanpools and occupied taxis. The minimum occupancy requirement for carpools using HOV lane(s) has not yet been determined, and may be higher within New York City than on Long Island. A higher vehicle occupancy rate may be established to facilitate control over the number of vehicles entering the HOV lanes(s), thereby limiting potential congestion. Over-the-road motor coaches (with seating/riding comfort comparable to LIRR service) will be utilized for the new express bus service.

Alternative IV. LIRR East Side Terminal Alternatives:

A) Grand Central Terminal Alternative: Queens Access via Main Line/Port Washington Branch: Harold Interlocking Connection - LIRR would provide new service into Grand Central Terminal by connecting Port Washington Branch and Main Line tracks at Harold Interlocking in Queens to the partially completed lower level of the 63rd Street Tunnel (approximately 8,600 feet has been constructed).

From the western terminus of the 63rd Street Tunnel in Manhattan (at Second Avenue and 63rd Street) the planned route would extend west and south, passing under Park Avenue in a deep tunnel, into a new LIRR terminal within Grand Central Terminal. Beneath Park Avenue, the new LIRR tunnels would be separate and distinct from Metro-North Railroad's Park Avenue Tunnel.

The proposed LIRR facility at Grand Central Terminal, located in the western quadrant of the lower level of this structure, would be comprised of ten tracks and five island platforms. This new LIRR station would be entirely separate from Metro-North Railroad operations, and designed for exclusive use of LIRR passengers and trains.

In addition the LIRR expects to install a new line station ("Sunnyside Station") in the vicinity of Thomson Avenue/Queens Boulevard to provide LIRR service to future Long Island City/ Sunnyside redevelopment initiatives. Also, existing trackwork in Yard A, Long Island City, will be reconfigured from a freight service facility to an off-peak passenger train storage yard (approximately 22 trainsets of 12 cars each). Note: This potential line station and proposed modifications to Yard A are also included in Alternatives IV "B", "C" and "D".

This alternative is more fully described in Section 2.4.

B) Grand Central Terminal Alternative: Queens Access via Montauk Branch/Port Washington Branch Connection - would provide the same LIRR East Midtown Terminal in Grand Central Terminal as in Alternative IV "A" above, using the 63rd Street Tunnel lower level from Queens. However, the LIRR connection in this alternative would be accomplished via the Montauk Branch as well as the Port Washington Branch within Harold Interlocking.

The Montauk Branch west of Jamaica would be upgraded for high-speed electric train operation, and elevated structures would be built to eliminate at-grade highway crossings. The proposed alignment would diverge northward from the existing two-track Montauk Branch east of Greenpoint Avenue in Long Island City, through a new tunnel under Van Dam Street, and then routed west under Yard A to merge with the Port Washington Branch connection to the 63rd Street Tunnel.

If the LIRR intends to provide added train service to local stations on the Montauk Branch west of Jamaica, these stations would have to be rebuilt with high level platforms to permit electric M1/M3 railcars to stop there. As part of the new tunnel built to connect with the Montauk Branch in Long Island City, provisions would be made for a future two track/two platform station under Van Dam Street at 47th Avenue. Note: Provisions for this future station are also included in Alternative IV "D".

C) Third Avenue Terminal Alternative: Queens Access via Main Line/Port Washington Branch; Harold Interlocking Connection - the LIRR would provide service to a new underground East Manhattan Terminal built under Third Avenue between 42nd and 52nd Streets. The passenger station portion of this terminal would occupy the area between 48th and 52nd Streets, comprising three underground levels: a passenger mezzanine level and two train platform levels. Trackage would extend south of the passenger station area to 42nd Street, where an equipment storage facility would be provided for approximately six to ten trainsets.

In Manhattan the proposed alignment is conceptually similar to that of Alternative IV (A) above, except that this new route would run beneath Third Avenue instead of Park Avenue; i.e., it would extend west and south from the western terminus of the 63rd Street Tunnel (lower level), passing under Third Avenue in a deep tunnel and rising nearer to the street surface to serve the new LIRR Terminal.

This alternative would provide the same LIRR connection at Harold Interlocking in Queens with the 63rd Street Tunnel lower level as in Alternative IV "A" above.

D) Third Avenue Terminal Alternative: Queens Access via Montauk Branch/Port Washington Branch Connection - would combine the new LIRR East Manhattan Terminal to be built under Third Avenue, described in IV "C" above, with LIRR Montauk Branch/Port Washington Branch connection to the lower level of the 63rd Street Tunnel, as described in IV "B" above; the Montauk Branch west of Jamaica would be upgraded accordingly.

Alternative V. East Side Rail Station Alternative: Under this alternative, a new LIRR station would be built in Manhattan along the LIRR tunnel alignment leading to Penn Station from approximately Third Avenue to Madison Avenue. Each East River Tunnel track with the capability for routing trains to stop at this new station would be provided with a two track/island platform. The track arrangement would include placing the new station on a passing siding, allowing non-stop LIRR trains to proceed through, bypassing this station.

It is envisioned that the new station would only serve East River Tunnel Track Lines 3 and 4 which are mainly used by the LIRR. Lines 3 and 4 are below 33rd Street, and these existing tunnel structures would have to be widened between approximately 2nd Avenue and 6th Avenue in Manhattan to provide for a minimal width platform capable of accommodating 12 car M1/M3 train consists at the new station. If full service flexibility to stop at this proposed station is to be provided to all LIRR trains arriving/departing Penn Station, a similar platform station arrangement would be required for Lines 1 and 2.

An underground pedestrian connection between this new LIRR station and NYCT's 33rd Street station on the IRT Lexington Avenue Line (under Park Avenue South at this location) would be built to facilitate passenger transfers. This existing NYCT station at 33rd Street only provides local subway service.

Alternative VI. New East River Tunnel and East Side Rail Station Alternative: This alternative expands the concept of building a new East Manhattan LIRR station along the 32nd/33rd Street corridor by also constructing a new two track East River Tunnel (Tunnel Track No. 5 and 6) between Penn Station and Harold Interlocking in Queens. This new tunnel would be built below 31st Street in Manhattan and connect with existing tracks on the south side of Penn Station.

The new LIRR East Manhattan station would be built at existing East River Tunnel Lines 1 through 4 in the vicinity of Third Avenue/Lexington Avenue/Park Avenue. This new station, served by four tracks with four side platforms, will be able to accommodate 12-car M1/M3 trainsets. As in Alternative V above, an underground pedestrian connection will be built between the new LIRR station and NYCT's 33rd Street station.

In Queens, merging the East River Tunnel tracks with Main Line and Loop Tracks (Sunnyside Yard) to permit conflict-free train movements will necessitate track reconfiguration at Harold Interlocking. Also, modifications to existing tracks in Penn Station will be needed to provide connections with the new tunnel tracks.

Alternative VII. Sunnyside Intermodal Transfer Station Alternatives:

A) Queens Plaza Station Alternative - would provide for diesel hauled LIRR service over the Montauk Branch west of Jamaica to a new LIRR transfer station to be built in Yard A in Long Island City. The Montauk Branch would be upgraded to facilitate high speed commuter train service (i.e. 15 LIRR AM peak trains to this new transfer station).

Trackage in Yard A would be reconfigured to allow the new multi-track/multi-platform LIRR station to be built below the Queens Boulevard Bridge. The freight operation in Yard A would be relocated. A new pedestrian passageway will be built from this station to the nearby NYCT Queens Plaza Station of the IND Queens Boulevard Line.

B) Harold Interlocking Alternative - would extend the NYCT 63rd Street Line upper level subway tracks to a new LIRR transfer station to be built on LIRR right-of-way just East of Harold Interlocking. The NYCT BMT Broadway express, operating via the upper level of the 63rd Street Tunnel, would terminate at this new transfer station - allowing for cross platform passenger connections to/from LIRR service.

The connection between the 63rd Street Tunnel and the proposed transfer station will require construction of a tunnel spur (approximately 4300 feet in length). Platform(s) at this new station would be located and aligned to facilitate cross platform transfers.

C) 42nd Street LRT via Queensboro Bridge to Sunnyside Yard LIRR Transfer Station Alternative - would extend the proposed 42nd Street Light Rail Transit (LRT) system in Manhattan into a new LIRR transfer station at Sunnyside Yard, Queens. The LRT Route would be extended north from 42nd Street along Third Avenue, across the Queensboro Bridge, and eastward along Queens Boulevard to a ramp leading down to the new Sunnyside Yard station near Queens Plaza. The proposed LRT extension would be the same for the reverse trip, except it would be routed on Second Avenue (instead of Third Avenue) for southbound travel back to 42nd Street.

The proposed Sunnyside Yard station would be similar to the transfer station proposed in Alternative VII "A" above (where diesel-hauled LIRR trains operating via the Montauk Branch west of Jamaica would terminate). LIRR passengers could transfer at this station to the nearby Queens Plaza Station or, under this alternative, they would have the added travel option of riding the LRT Extension to Manhattan.

In operating across the Queensboro Bridge, LRT trains would use either exclusive LRT lanes or HOV lanes, and they would utilize similar reserved rights of way along Second and Third Avenues in Manhattan between 42nd and 59th Streets.

D) Long Island City Intermodal Alternative - developed as part of the MTA Long Island City Transportation Needs and Opportunities Study, this alternative would provide for a new LIRR Sunnyside transfer station. The proposed station would include platforms on LIRR Hunterspoint Line tracks (for peak service) and on the LIRR Main Line (for off-peak service). Intermodal station facilities would include an off-street bus terminal with loading bays, pedestrian walkways built over Sunnyside Yard for access to NYCT service at Queens Plaza and Court Square, and transfer facilities for NJ Transit passengers (utilizing the Sunnyside Loop Track adjacent to East River Tunnel Line 1).
In this alternative, a two track NYCT extension from the upper level of the 63rd Street Tunnel would be constructed below grade to the new LIRR transfer station.

The NYCT G Line could be relocated to within Sunnyside Yard and connected to the 63rd Street Line, with a station stop provided at the new Sunnyside Intermodal Facility.

Alternative VIII. NYCT Operation Over LIRR Trackage Alternatives:

A) NYCT Operation Over LIRR Port Washington Branch Alternative - would connect the LIRR Port Washington Branch to the 63rd Street Tunnel upper level, and onto the NYCT Broadway Line BMT express tracks. The entire Port Washington Branch would be converted from LIRR to NYCT operation, allowing for continuous subway service from this Branch to Midtown and Downtown Manhattan destinations along Broadway. Other NYCT subway service would continue on the BMT Broadway Line, commingled with the new Port Washington Branch service.

Stations on the Port Washington Branch would be converted to NYCT station standards; new token booths and Automatic Fare Collection turnstiles would be installed, and station entrances modified to redirect pedestrian flows as required. Also, this Branch would be converted to NYCT signaling standards, and the new signal system would be tied into the new NYCT Command/Control Center.

B) BMT/Inner Port Washington and Rockaway Beach Branch Alternative - would connect the 63rd Street Tunnel upper level tracks to the LIRR Port Washington Branch at Harold Interlocking. NYCT service would be operated over the inner portion of the Port Washington Branch to Great Neck (with reopened stations at Elmhurst and Corona). This new NYCT service from Great Neck, using the 63rd Street Tunnel upper level, would be routed either to the BMT Broadway Line or the IND 6th Avenue Line in Manhattan.

Track modifications at Harold Interlocking would also connect NYCT 63rd Street Tunnel trackage, via the LIRR Main Line, with the reactivated Rockaway Beach Branch in Rego Park for restored subway service to JFK Airport. To reintroduce service along the LIRR Rockaway Beach Branch, several new major structures would be built (including a new flyover north of Howard Beach Station on the IND Rockaway Line, various overpasses and viaducts and the rehabilitation of existing structures). Also, extensive trackwork would be installed, and this new NYCT service would require a completely new electric traction system including third rail, new substations, electric feeder service, etc.

C) IRT to the Atlantic Branch Alternative - would convert the LIRR Atlantic Branch to NYCT IRT operation, and connect this Branch (at Flatbush Avenue, Brooklyn) to the IRT 7th Avenue-Broadway Line. NYCT would operate direct service from Springfield Boulevard in Southeast Queens, via LIRR's Jamaica Station, the Atlantic Branch, and this new IRT connection through the Clark Street Tunnel into Downtown Manhattan.

The LIRR Atlantic Branch between Laurelton and Flatbush Avenue would be converted to NYCT signaling standards, and the LIRR Laurelton Station near Springfield Boulevard would be converted to a terminal for NYCT IRT trains. LIRR stations at Locust Manor, Jamaica, East New York, Nostrand Avenue and a new Flatbush Avenue Station would comply with NYCT station standards. The new Downtown Brooklyn Tunnel Connection, required to physically integrate the LIRR and NYCT systems, would result in abandonment of the existing LIRR Flatbush Avenue Terminal.

D) Convert LIRR Atlantic Branch to IND Shuttle Train Alternative - would convert and extend the LIRR Atlantic Branch for NYCT operation of shuttle service between LIRR Flatbush Avenue and Jamaica Stations, with a new route extension to serve Green Acres Shopping Center (just east of the Queens/Nassau border). At Jamaica Station, separate eastbound and westbound NYCT platforms would facilitate passenger transfers between the LIRR and NYCT systems.

A new two track/island platform station would be built at Green Acres as well as station parking and two rail tracks (east of the station) to reverse/store NYCT shuttle trains. LIRR stations at Rosedale, Laurelton, Locust Manor, a portion of Jamaica Station, East New York, Nostrand Avenue and Flatbush Avenue Terminal would be converted to NYCT stations standards. Also, the Atlantic Branch would be converted to NYCT signaling standards.

Alternative IX. LIRR Operation Over NYCT Trackage Alternatives:

The use of LIRR trains over NYCT trackage in these alternatives would require a hybrid electric railcar to operate within the more restrictive clearances, curves and grades on the NYCT system.

A) LIRR Port Washington Branch Connection to NYCT BMT Broadway Line Alternative - would connect the LIRR Port Washington Branch to the 63rd Street Tunnel upper level and onto the NYCT Broadway Line BMT express tracks, to provide direct LIRR service to Midtown and Downtown Manhattan destinations along Broadway. Alternatively, LIRR "through running" service could be extended over the Manhattan Bridge to Brooklyn, into a new connection with the LIRR at Flatbush Avenue.

The new LIRR service into Manhattan could terminate at the lower level of the NYCT BMT City Hall Station, which would require some facility reconfiguration. If LIRR trains are routed, alternatively, over the Manhattan Bridge to Jamaica via the LIRR Atlantic Branch, an additional tunnel connection is required between the BMT subway line and the LIRR in the vicinity of Flatbush Avenue Terminal. In this Manhattan Bridge optional route, an alternate downtown station would be needed to serve Lower Manhattan and a new station would be provided to serve Downtown Brooklyn.

B) LIRR Port Washington Branch Connection to NYCT IND 6th Avenue Line Alternative - would connect the LIRR Port Washington Branch to the 63rd Street Tunnel upper level and onto the NYCT IND 6th Avenue Line to facilitate direct LIRR service along 6th Avenue in Midtown Manhattan to the World Trade Center; alternatively, this new LIRR service could be routed via NYCT tracks through the Rutgers Street Tunnel to a new connection with the Atlantic Branch in Downtown Brooklyn.

If this LIRR service terminates in Manhattan at the World Trade Center, NYCT modifications may be needed to ensure that LIRR "through running" trains can be switched between the IND 6th Avenue and 8th Avenue Lines (at West 4th Street Station) without disrupting other NYCT services. If LIRR trains, alternatively, are routed via the Rutgers Street Tunnel to Brooklyn, an additional tunnel connection is required between the NYCT and LIRR systems in the vicinity of Flatbush Avenue Terminal. This optional tunnel route could also have LIRR trains stop at the NYCT Jay Street - Borough Hall station to serve this area of Downtown Brooklyn.

C) LIRR Atlantic Branch Connection to NYCT IND 6th Avenue Line Alternative - connects the LIRR Atlantic Branch with the NYCT IND Fulton Street Line in Downtown Brooklyn to provide LIRR "through running" service via the Rutgers Street Tunnel and onto the NYCT IND 8th Avenue and 6th Avenue Lines in Manhattan to the Lexington Avenue station on the 63rd Street Line. Two new tail tracks will be built north of this station (the proposed terminus for this alternative) by extending two "pocket tracks" from under 63rd Street to curve northward beneath 2nd Avenue. A new diamond crossover installed on these two tail tracks would permit LIRR trains used in this new service to reverse direction without conflicting with other trains operating on the 63rd Street Line.

The proposed LIRR/NYCT track connection in Brooklyn will allow this new LIRR service to stop at the Jay Street - Borough Hall station. The existing Flatbush Avenue Terminal could remain in partial operation if some LIRR Atlantic Branch trains continue to terminate there; if all LIRR trains into Brooklyn were to be utilized in the new "through running" service, Flatbush Avenue Terminal could be closed.

D) LIRR Atlantic Branch via BMT Montague Street Tunnel; Clockwise Distribution Loop Through Financial District - would connect the LIRR Atlantic Branch with the NYCT BMT 4th Avenue Line in Downtown Brooklyn for LIRR access to the Montague Street Tunnel into Manhattan, and provides a new loop rail service through the Financial District using the Nassau Street subway line. LIRR trains would either terminate at Chambers Street station or continue on over the Manhattan Bridge, operating in a clockwise loop back to the LIRR Atlantic Branch in Brooklyn. To provide a suitable LIRR Terminal at Chambers Street, the three out-of-service subway platforms and tracks would be restored and modified for LIRR service, retaining two platforms and tracks for NYCT use.

In Brooklyn, a two track tunnel would be built north of the LIRR Flatbush Avenue Terminal to connect the NYCT and LIRR systems. Within this tunnel, an island platform station would be built to provide a station stop for the new LIRR service to/from Manhattan; this proposed station would be located one block north of the existing Flatbush Avenue Terminal which could be replaced by the new nearby station. If all LIRR trains are routed into Manhattan, Flatbush Avenue Terminal could be closed.

E) LIRR Atlantic Branch over BMT Manhattan Bridge; Counter-Clockwise Distribution Loop Through Financial District via Montague Street Tunnel - would connect the LIRR Atlantic Branch with the NYCT BMT 4th Avenue Line in Downtown Brooklyn for LIRR access to the south side tracks of the Manhattan Bridge, leading to the BMT Nassau Street Line to serve the Downtown Manhattan Loop; this new LIRR service would return to Brooklyn via the Montague Street Tunnel back to the BMT 4th Avenue Line and ultimately the LIRR system. Under this alternative, some LIRR "through running" trains would terminate at the NYCT Chambers Street station in Manhattan - in which case modifications at this station would be required (i.e., see Alternative IX "D" above).

The new tunnel constructed in Downtown Brooklyn to connect the LIRR Atlantic Branch with the BMT 4th Avenue Line would include a new station that could replace the nearby LIRR Flatbush Avenue Terminal. As in Alternative IX "D" above, unless some LIRR trains (i.e., in the peak period) continue to utilize Flatbush Avenue Terminal, this existing LIRR terminal could be closed.

F) Connect LIRR Atlantic Branch to NYCT IND Fulton Street Line at East New York - would connect the LIRR Atlantic Branch with the NYCT IND Fulton Street Line in East New York to provide new "through running" LIRR service to Downtown Brooklyn and (via the Cranberry Street Tunnel) to Manhattan. This proposed service would operate from Springfield Gardens in Southeast Queens, via LIRR's Jamaica Station and the Atlantic Branch to East New York, and continue on NYCT trackage into Manhattan; this route would use the IND 8th Avenue and 6th Avenue Lines (switching at West Fourth Street Station) and terminate at the Lexington Avenue Station of the 63rd Street Line; two tail tracks would be provided at this terminus, as in Alternative IX "C" above.

The proposed LIRR/NYCT connection in East New York would require construction of a relatively short tunnel where the LIRR Atlantic Branch and the NYCT IND Fulton Street Line cross at perpendicular angles over each other. This alternative assumes that all LIRR trains that now terminate at Flatbush Avenue will be converted to the new LIRR "through running" service and routed onto the NYCT IND Fulton Street Line. However, it appears that some LIRR trains will have to continue to terminate at Flatbush Avenue Terminal due to restricted operating capacity on this proposed route through the NYCT Cranberry Street Tunnel to Manhattan.

2.1.3 Stage 1 Fatal Flaw Screening Analysis

The objective of this effort was to perform a "fatal flaw" screening analysis of the alternatives identified in the Phase I MIS portion of the study. In this initial investigation, if an alternative failed to meet two critical study goals or was found to be technically or operationally infeasible, it was rated as having "unacceptable" negative attributes, or fatal flaws. This finding served to eliminate an alternative from further review within the context of this study. The fatal flaw screening process represented an initial investigation of the study alternatives, based on careful but limited analysis, for which no design work was undertaken.

2.1.3.1 Stage 1 Fatal Flaw Analysis Criteria

The use of fatal flaw screening allows for the initial evaluation to focus on realistic alternatives early in this process. Shown below are the evaluation criteria and measures that were adopted for the fatal flaw analysis in this study:

1) Meet Study Goals

An alternative was considered to be fatally flawed if **both** of the following critical study goals were not met:

- Improves the quality of service and reduces travel time within the corridor between Long Island and East Midtown Manhattan.

- Relieves train traffic congestion at Penn Station New York.

These goals were considered of sufficient importance to the LITC that if an alternative failed to achieve both no further analysis would, as a general rule, be necessary.

2) Technical Feasibility

An alternative was considered to be fatally flawed if it:

- Requires technology that is not available presently nor in the foreseeable future.
- Requires property for right-of-way that is not economically obtainable.
- Cannot be reasonably implemented from an engineering or construction perspective.

3) Operational Feasibility

An alternative was considered to be fatally flawed if it:

- Decreases existing capacity on transportation systems (LIRR, NYCT, MNR, Highway).

- Involves severe institutional ramifications, with respect to:

  - LIRR/NYCT labor union jurisdictions
  - Revenue sharing allocations
  - Equipment operation and maintenance issues
  - NYCT operation beyond Queens/Nassau border

- Presents serious regulatory challenges involving:

  - Federal/State/Local requirements
  - Environmental permit issues

- Results in severe negative operational impacts, in the areas of:

  - Vehicle congestion

- Increased passenger transfers at Jamaica Station.
- Passenger circulation problems (i.e., at intermodal transfer points).

While some of the above screening criteria and measures are clearly objective, based upon quantifiable data, other parameters shown above are subjective and require judgmental evaluation. In areas involving subjective assessments (i.e., constructability), technical experts were consulted as appropriate. In evaluating operational feasibility, the above criteria/measures were considered generally in an overall judgement to determine if an alternative was fatally flawed.

The results of the analysis performed are provided below.

2.1.3.2 Stage 1 Fatal Flaw Analysis - Study Goals

This evaluation began by determining whether the defined alternatives could survive the fatal flaw analysis. In this initial Stage 1 screening, it was found that several alternatives as described below, were fatally flawed since they did not meet both critical study goals.

Alternative III: Bus / HOV Lane

Alternative III, Bus/HOV Lane, was assessed to be fatally flawed because it does not meet study goals and raises capacity issues. These findings are discussed below along with the initial decision to make an exception and advance this alternative for further preliminary evaluation.

Alternative III is not expected to meet the study goal of relieving train traffic congestion in Penn Station. It is anticipated that not enough LIRR riders will divert to this alternative to decrease the number of peak trains using Penn Station. Accordingly, while it is not anticipated that entire trains would be eliminated, the lengths of these trains may be shortened due to passenger diversion to the new Bus/HOV Lane.

Also, it appears that Alternative III will create highway capacity issues that may impact operational feasibility. This alternative can constrain capacity at the transitional segment in Corona, Queens, even though the existing roadway here would be widened by one lane in each direction, since HOV traffic would have to merge with General Use Lane traffic of the L.I. Expressway. Other capacity issues may arise at the Queens entrance to the Queens-Midtown Tunnel where HOV traffic will again merge with other vehicular traffic at the toll plaza. In addition, the increased express bus traffic in Midtown Manhattan, with resulting additional traffic congestion, is another capacity issue in this alternative.

Thus, based upon established criteria for this preliminary screening, Alternative III would be considered to be fatally flawed.

Alternative V: East Side Rail Station

This alternative does not meet the study goal of relieving train traffic congestion at Penn Station; i.e., a new East River Rail Tunnel would not be built under this alternative, nor would additional areas in Penn Station be opened up for increased use by LIRR trains. Accordingly, without modifications to expand operating capacity into and within Penn Station, train congestion at this terminal clearly would not be relieved - a fatal flaw as defined in this study. Also operational restrictions described below present serious concerns in terms of maintaining LIRR schedule adherence and service quality.

Under this alternative, a new LIRR East Side Station would be built underground on the alignment between Penn Station and the East River Tunnels; this proposed station would be comprised of 12-car (1,030 ft) center island platforms and "passing siding" tracks. With trains stopping at this new station, and potentially merging or conflicting train movements to/from the "passing siding" tracks, LIRR Penn Station service could be adversely impacted - especially in view of the proximity of the new East Side Station to the critical approach tracks at Penn Station. Also, intensive passenger/track departure coordination would be necessary to ensure minimal dwell times for PM Peak Period trains.

Alternative VII (B): Sunnyside Intermodal Transfer Station - Harold Interlocking Alternative

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

This alternative, which would extend NYCT trackage from the 63rd Street Tunnel to a new LIRR transfer station near Harold Interlocking, raises several concerns. For example, the diversion of LIRR trains to serve the new transfer station could adversely reduce LIRR train throughput between Jamaica and Penn Station. Also, the proposed single NYCT track to the new station would only permit a headway of one train every twelve minutes (four minutes for a two NYCT track tunnel concept) resulting in excessive waiting time for transfers between LIRR and NYCT service.

The NYCT subway connecting service at the proposed new station would be the BMT Broadway Line which is routed north and west of the desired East Side destination area in Midtown Manhattan.

Alternative VIII: New York City Transit Operation Over LIRR Trackage Alternatives

(A) New York City Transit (NYCT) Over Port Washington Branch

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

This alternative, converting rail service on the Port Washington Branch from LIRR to an NYCT operation, raises a number of different issues. For example, LIRR riders on the Port Washington Branch can be expected to oppose this proposed conversion for various reasons: including the loss of direct rail service to Penn Station, with quick access to Manhattan's West Side and a convenient subway transfer to Downtown Manhattan.

Also, this first extension of NYCT service beyond New York City limits would have institutional/ political ramifications. Action by the New York State legislature might be required in order to extend NYCT operation beyond New York City.

In addition, the only East Side NYCT stop is at 63rd Street and Lexington Avenue, clearly north of the designated East Midtown distribution area. Customers whose destinations north or south of 63rd Street would have to make an inconvenient connection with the NYCT Lexington Avenue Line via a newly constructed subsurface pedestrian walkway to the 59th Street Station of the NYCT Lexington Avenue Line. Thus, the location of this proposed alternative would not provide for direct convenient travel to East Midtown Manhattan.

(B) New York City Transit (NYCT) Over Inner Port Washington Branch and Rockaway Beach Branch

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

As in VIII (A) above, the NYCT service proposed under this alternative would proceed from the 63rd Street Tunnel west to either the Broadway BMT or IND 6th Avenue Lines - circumventing the designated East Midtown travel destination area.

Some of the same issues cited in VIII (A) above would again be raised in implementing this alternative; i.e., many LIRR riders on the inner segment of the Port Washington Branch would oppose the proposed conversion to NYCT operation, and there are legal and operational constraints in extending the city subway system into Nassau County. It is also expected that local communities would strongly object to the proposed reactivation of the abandoned Rockaway Beach Branch, based upon their previous opposition to a similar proposal.

This alternative also requires commingling of NYCT/LIRR service on shared track segments which raises significant institutional and regulatory issues. These two dissimilar rail systems have different operating criteria and dispatching procedures; in addition, they each have unique work rules in accordance with different union agreements. These "real world" issues must be addressed in order to efficiently integrate NYCT and LIRR rail service over the same right-of-way.

(C) New York City Transit (NYCT) IRT Service Over the Atlantic Branch

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

The new NYCT service, proposed in this alternative, is routed from Queens/Brooklyn into Lower Manhattan. Consequently, the desired East Midtown travel destination area would be far removed from the Downtown Manhattan location of this alternative.

This alternative with proposed NYCT operation over the Atlantic Branch to Springfield Gardens could present major problems at Jamaica. The number and routing of LIRR train movements through the Jamaica Station Complex is especially constrained during peak periods. Tracks and platforms at Jamaica would have to be reconfigured to facilitate an efficient NYCT operation through this complex, and provide for convenient transfers between LIRR and NYCT service at this station. Another complicating issue relates to the location and extent of NYCT equipment storage facilitates required for this new Atlantic Branch service.

Connecting the west end of the Atlantic Branch into the existing IRT system raises other major concerns. Construction, together with property acquisition (as required), for this subsurface track connection in busy Downtown Brooklyn can be costly and disruptive to the community. Also, there are operational issues to be addressed in providing for a smooth integration of the proposed new NYCT service with the existing IRT service.

(D) New York City Transit (NYCT) IND Service Over Atlantic Branch

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

The proposed NYCT service would not even enter Manhattan; i.e., transfers at Flatbush Avenue to existing subway service would be required for travel into Manhattan - as would transfers at Jamaica to LIRR trains. Clearly, this proposed service pattern would not provide new direct access to the East Midtown travel destination area.

Under this alternative the LIRR Atlantic Branch would be connected to an NYCT IND shuttle service (between Flatbush Avenue and Jamaica), and this NYCT service would be continued to Rosedale - commingled in this segment with LIRR service. As discussed in VIII (B) above, commingling of NYCT/LIRR service on shared trackage introduces serious institutional and regulatory issues. Also, extending NYCT service beyond New York City raises other complicating issues. Another concern relates to the locating of available property for an NYCT equipment storage yard in western Nassau County or eastern Queens, and the potential for local community opposition.

Alternative IX: LIRR Operation on New York City Transit Trackage Alternatives

(A) LIRR Port Washington Branch Connection to NYCT BMT Broadway Line

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

The only East Side station under this alternative would be at 63rd Street and Lexington Avenue, well north of the desired East Side destination area. Also, the only north-south connecting subway access to facilitate travel to East Midtown would require major construction to build a 600 ft. subsurface passageway to the 59th Street Station of the Lexington Avenue Line. In failing to meet the established study goal, as required, this alternative is therefore fatally flawed.

(B) LIRR Port Washington Branch Connection to NYCT IND 6th Avenue Line

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

As in Alternative IX (A) above, the route of this proposed alternative would extend west from the 63rd Street Tunnel and circumvent the desired East Side travel destination area (i.e, continuing south under 6th Avenue). Accordingly, this alternative is fatally flawed.

(C) LIRR Atlantic Branch Connection to NYCT IND 6th Avenue Line

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

Again, this alternative would commingle NYCT and LIRR service on the same city subway trackage - raising the operating and institutional issues described above. Also, operations under this alternative would require costly construction of a tail track below Second Avenue at 63rd Street (to turn trains for southbound trips down 6th Avenue). In failing to meet the established study goal, this alternative is fatally flawed.

(D) LIRR Atlantic Branch via BMT Montague Street Tunnel to Downtown Manhattan

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

The proposed LIRR route under this alternative would directly access Downtown Manhattan (and divert some LIRR riders from Penn Station where they currently transfer to a southbound subway connection). While this could be an attractive new rail travel route, it clearly does not meet the stated study goal. For this reason, the alternative is considered fatally flawed. Even without this finding, the alternative would be constrained by the "real world" operational constraints of joint NYCT/LIRR service as well as property acquisition/construction impacts in providing for the Atlantic Branch/Montague Street tunnel connection.

(E) LIRR Atlantic Branch via BMT Manhattan Bridge to Downtown Manhattan

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

This alternative is similar to IX (D) above except that it would operate via a counter-clockwise distribution loop through the lower Manhattan Financial District. Again, since the alternative only provides direct rail access to Downtown Manhattan, it does not enter into the established East Side travel destination area, and is therefore considered fatally flawed. In addition to not meeting a key study goal due to this limited rail route in Lower Manhattan, the proposed NYCT/ LIRR joint service raises the same operational/institutional issues described previously.

(F) LIRR Atlantic Branch Connection to NYCT IND Fulton Street Line at East New York

This alternative does not meet the study goal of improving the quality of service and reducing travel time within the corridor between Long Island and East Midtown Manhattan.

A serious constraint of this alternative is that the proposed LIRR operation would impact NYCT's capacity along the Fulton Street Line in Brooklyn and through the Cranberry Street Tunnel to Manhattan. Also, as in IX (C) above, a tail track would have to be built below Second Avenue at 63rd Street to meet the operational needs of this alternative. The commingling of NYCT and LIRR service on the same trackage would again raise the previously described operating and institutional issues. Over and above all of these constraints is the fatal flaw of this alternative:

failure to satisfy the study goal since the proposed LIRR service would not access the desired East Side travel destination area.

Each of the above six alternatives would necessitate that the LIRR acquire and operate new hybrid electric railcars to provide this proposed rail service within the city subway system. The innovative hybrid rolling stock must be designed to meet different right-of-way characteristics including more restrictive clearances and steeper track grades; also, the new equipment must be compatible with the NYCT signal system. This different type of railcar would require additional shop facilities and also raises the question of which agency (NYCT or LIRR) would maintain the new equipment.

In addition, other issues must be addressed to provide for joint LIRR and NYCT service over the same trackage; these include questions of union jurisdiction, operating rules, fare control systems, and compliance with FRA requirements. Determining which agency's employees will operate the new service is a major issue to be resolved.

The above operational and institutional issues are also recognized as serious limitations in implementing any of the above alternatives.

2.1.3.3 Stage 1 Fatal Flaw Analysis - Technical/Operational Feasibility

Two alternatives were assessed to meet the critical goals of the study. Upon additional review were assessed to be operationally infeasible. The reasons for this finding for Alternative VI, New East River Tunnel/East Side Rail Station, and Alternative VII "C", 42nd Street LRT to Sunnyside, are discussed below.

Alternative VI: New East River Tunnel / East Side Rail Station

This alternative does not meet the study goal of preserving operational capabilities of existing operators. Specifically the operational capabilities of Amtrak, NJ Transit and the LIRR will be severely impacted as summarized below.

Several capacity issues would arise with the new East River Tunnel and LIRR station in place under Alternative VI. To provide full flexibility and minimize additional passenger transfers at Jamaica Station, all LIRR peak period trains will stop at the new East Side Station. This alternative will therefore impact LIRR peak hour schedules and throughput into Penn Station, and may reduce East River tunnel capacity. LIRR running time to/from Penn Station will increase by approximately 1.0 to 2.5 minutes to allow for trains stopping at this new station.

Another operational issue concerns East River Tunnel capacity for LIRR reverse peak service as well as provisions for Amtrak and NJ Transit eastbound train movements from Penn Station to Boston and to Sunnyside Yard. With all LIRR morning peak trains scheduled to stop at the proposed East Side Station, three of the existing East River tunnel tracks would be required to accommodate this peak service to Penn Station, leaving Tunnel Tracks 1 or (preferably) 3 available for use by LIRR eastbound revenue and equipment trains. This concept does not envision any LIRR trains operating via new Tunnel Tracks 5 or 6; i.e., all eastbound Amtrak and NJ Transit trains would be routed through Tunnel Track 5 westbound Amtrak and NJ Transit trains would be routed through Tunnel Track 6. However, this operating plan may be unacceptable to

NJ Transit and especially to Amtrak since these railroads would lose (for eastbound trains) the use of Station Tracks 9, 10, 11 and 12, which are among the longest tracks in Penn Station since they would not be able to access the new tunnel from these tracks.

In addition, the short distance between the proposed East Side Station and Penn Station raises other operational/service concerns; i.e., if a departing LIRR eastbound train is re-routed from another track at Penn Station, passengers waiting at the new station may not be able to get to an alternative platform in time to board this train - especially if the platform they need to reach is one block away (i.e., the existing tunnels to Penn Station are below 32nd and 33rd Streets) or the train would need to be held at the platform. Another issue created by the close proximity of the new East Side Station to Penn Station concerns train congestion. Because this proposed station is so close to the governing westbound signals at Penn Station interlockings (these signals are located just west of 6th Avenue), possible delays to trains entering Penn Station due to interlocking conflicts would result in degraded tunnel track capacity thereby reducing the number of trains the LIRR could run through the tunnels or degrading the service reliability to the LIRR's customers.

It should also be noted that the proposed LIRR station will have a pedestrian connection to a local subway station on the NYCT Lexington Avenue Line (with only two local train side platforms). As LIRR morning peak trains stop at this new East Side Station, the large number of transferring passengers could result in severe overcrowding in the connecting passageway(s) and on the subway platforms, especially if there are delays in this NYCT local service.

Alternative VII: C 42nd Street LRT via Queensboro Bridge to Sunnyside Yard LIRR Transfer Station Alternative

Alternative VII "C", 42nd Street Light Rail Transit (LRT) via Queensboro Bridge to Sunnyside Yard LIRR Transfer Station, does not meet the study goal of reducing congestion on area highway corridors or preserving the operational capabilities of existing operators. This alternative is considered to be fatally flawed due to a number of capacity and institutional/operational issues, as described below.

A key capacity constraint in this alternative relates to the use of an exclusive right-of-way on 2nd and 3rd Avenues in Manhattan. With anticipated five minute headways and station stops (at 49th/50th and 58th/59th Streets in Manhattan), it appears that the LRT service requires an exclusive right-of-way instead of commingling with other vehicles in an HOV Lane. In this case, one traffic lane on each of two major thoroughfares in Midtown Manhattan would be removed, effectively narrowing these avenues for all vehicles. Equally important this alternative would reduce vehicular capacity on these key transportation links for Manhattan's East Side and the Queensboro Bridge.

Another capacity issue relates to the LRT route over the Queensboro Bridge which would preclude use of these roadway lanes for a previously proposed people mover right-of-way as part of the Port Authority's Airport Access Project. The taking of the two roadway lanes for this airport people mover engendered considerable community opposition making it unlikely that the roadway would be converted in the future to this use. Although the proposed airport access plan has been scaled back, this idea could be reactivated in a later phase, in which case it would directly conflict with the proposed LRT route for this alternative.

If the LRT in Manhattan is routed along the curb lane of 2nd and 3rd Avenues, it raises the institutional/operational issue of interference with deliveries to business and residential properties. Also, if the LRT operates in an exclusive right-of-way, this new service would compete with buses on these major thoroughfares for limited curb space and passenger loading areas at station stops. Therefore this alternative does not meet the study goal of preserving operational capabilities of existing operators and is fatally flawed.

It is expected that a two car LRT (with capacity of 200 riders per vehicle, seating and standing) will be sufficient to handle the peak demand for this service. If passenger demand were greater than anticipated, indicating the need for a third car on the train, another capacity issue would surface. The distance between each crosstown block along the proposed LRT route in Manhattan is 200 feet; an LRT cannot extend beyond this distance into a crosstown street, limiting the length of an LRT to two cars - possibly resulting in fewer cars than required to meet ridership demand.

2.1.3.4 Stage 1 Fatal Flaw Analysis - Exceptions

As noted above, Alternative III Bus/HOV Lane was found to be fatally flawed by not reducing train congestion at Penn Station. However, it was decided to retain this highway alternative beyond initial screening to enable transit and highway administrators to focus on unfamiliar alternative modes and enhance the overall review process. Accordingly, the Bus/HOV Lane Alternative was advanced for further evaluation.

Another exception with regard to results of the fatal flaw analysis concerns Alternative VI, New East River Tunnel and East Side Rail Station. As described above in the preceding section, it was found that this alternative would raise serious operational feasibility issues and, therefore, was fatally flawed. However, Alternative VI does meet the study goals and, in reviewing the operational feasibility screening, it was recognized that some of the issues raised in the evaluation warrant further analysis. Furthermore, this alternative has intrinsic merit in significantly expanding tunnel capacity between Penn Station and Queens (to help meet future expansion needs of Amtrak and NJ Transit at Penn Station). In view of this overall finding, Alternative VI is being retained in the evaluation for further analysis.

A different kind of exception to the study's fatal flaw analysis relates to Alternative VII "A", Sunnyside Transfer Station - Queens Plaza Station. This alternative was not advanced for further preliminary evaluation even though it was not found to be fatally flawed in preliminary screening, as explained below.

During the initial screening process, Alternative VII "D", Sunnyside Transfer Station -Long Island City Intermodal was also not found to be fatally flawed. Instead of advancing two variations of the same alternative (Sunnyside Transfer Station), it was determined that only one of these similar options need be considered for further evaluation. Upon further review and coordination with the MTA's Long Island City Transportation Needs and Opportunities Study project team it became clear that the proposed Long Island City Intermodal Transfer Station would provide greater potential benefits in meeting the goals of this study. Therefore, Alternative VII "A" was not continued in this preliminary screening process.

2.1.3.5 Stage 1 Fatal Flaw Analysis - Summary

Alternative I, No Build and Alternative II, Transportation Systems Management (TSM) were not evaluated in the Stage 1 preliminary screening process, in accordance with federal guidelines. Instead, these two alternatives were continued directly into the Stage 2 in-depth evaluation to provide comparative baseline options to the Build Alternatives.

Shown below are the alternatives evaluated which meet the stated critical goals of the study, are technically feasible, and would not raise capacity or institutional/operational issues. Thus, the following alternatives - not being fatally flawed - were advanced to Stage 2 for further analysis in this evaluation process.

Alternative IV - LIRR East Side Terminal

A) Grand Central Terminal Via Main Line
B) Grand Central Terminal Via Montauk Branch
C) Third Avenue Via Main Line
D) Third Avenue Via Montauk Branch

Alternative VII - Sunnyside Transfer Station

D) Long Island City Intermodal

In addition, for reasons described in the previous section, the following two alternatives have also been advanced for further evaluation even though they are fatally flawed.

Alternative III - Bus/HOV Lane

Alternative VI - New East River Tunnel and East Side Rail Station

The results of the Stage 1 fatal flaw screening analysis are summarized in Table 2.1-1.

TABLE 2.1-1
Matrix of Fatal Flaw Screening Analysis

Alternatives	Meets Study Goals	Technically Feasible	OPERATIONAL ISSUES		Advances to Preliminary Evaluation
			Sufficient Capacity	Institutionally and Operationally Feasible	
I. No Build	N/A	N/A	N/A	N/A	Yes
II. TSM	N/A	N/A	N/A	N/A	Yes
III. Bus / HOV Lane	No	Yes	No	Yes	Yes
IV. LIRR East Side Terminal					
A. GCT via Main Line	Yes	Yes	Yes	Yes	Yes
B. GCT via Montauk Br.	Yes	Yes	Yes	Yes	Yes
C. 3rd Ave. via Main Line	Yes	Yes	Yes	Yes	Yes
D. 3rd Ave. via Montauk Br.	Yes	Yes	Yes	Yes	Yes
V. East Side Rail Station	No	Yes	No	No	No
VI. New East River Tunnel and East Side Rail Station	Yes	Yes	No	No	Yes
VII. Sunnyside Transfer Station					
A. Queens Plaza	Yes	Yes	Yes	Yes	No
B. Harold Interlocking	No	No	No	No	No
C. 42nd LRT to Sunnyside	Yes	Yes	No	No	No
D. LIC Intermodal	Yes	Yes	Yes	Yes	Yes
VIII. NYCT Ops. on LIRR					
A. Port Wash. Br. (PWB)/BMT	No	Yes	Yes	No	No
B. BMT/Inner PWB & Rockaway Br.	No	Yes	Yes	No	No
C. IRT to Atlantic Br.	No	Yes	Yes	No	No
D. Atlantic Br. (AB) IND Shuttle	No	Yes	Yes	No	No
IX. LIRR Ops. on NYCT					
A. PWB to BMT	No	Yes	Yes	No	No
B. PWB to IND	No	Yes	No	No	No
C. AB to IND	No	Yes	No	No	No
D. AB over BMT to downtown	No	Yes	No	No	No
E. AB over Manhattan Bridge	No	Yes	No	No	No
F. AB to Fulton St. Line	No	Yes	No	No	No

2.1.4 *Stage 2 Evaluation*

2.1.4.1 Stage 2 Evaluation Criteria

Further screening in Stage 2 included an evaluation of those alternatives surviving the fatal flaw analysis, utilizing the following MTA screening criteria:

- Impact on operating and maintenance costs
- Order-of-magnitude capital cost range
- Ridership impact
- Quality of service
- Revenue impact
- Community impacts
- Economic impacts
- Environmental impacts
- Equity impacts

These criteria are further defined below along with the evaluation measures used to assess whether an alternative should be advanced to the Phase II EIS portion of the study.

1) Impact on Operating and Maintenance Costs

Development of an initial assessment of operating and maintenance (O&M) cost impacts resulting from the proposed service plan in a given alternative was compared to a base O&M cost from the No-Build Alternative. In reporting the evaluation findings, a somewhat generic approach (i.e., "significant increase in O&M costs") was employed rather than actual figures since in this stage of the analysis, it was not appropriate to expend the level of effort necessary to precisely report actual dollar amounts.

Once all of the services were analyzed for the impacts of the alternative's operating plan, they were summarized to obtain the total impact of the corridor's O&M costs. This summary was structured in a ranking on a five point scale as follows:

O&M COST IMPACT		
Description	**Percentage**	**Matrix Symbol**
Significant Decrease	20% and greater	++
Moderate or Slight Decrease	less than 20%	+
No Change	0%	0
Moderate or Slight Increase	less than 20%	-
Significant Increase	20% and greater	- -

2) Order of Magnitude Capital Cost Range

The definition of an alternative includes the facilities thought to be required in this preliminary assessment. No detailed drawings were prepared and no design engineering was conducted during this stage of the analysis. Specific physical requirements of the alternatives were largely obtained by reviewing appropriate plans and/or maps and from site investigations for additional information. Elements considered in developing a range of capital costs included:

- stations and parking
- demolition
- utilities
- trackwork
- structures
- maintenance facilities
- vehicles
- traction power
- signals

Gross order-of-magnitude estimates were used to develop these capital costs, including unit costs for the above elements in accordance with the construction environment within the study region. Also, the following Wharton Escalation Factors were used to bring all costs into 1997 dollar values:

WHARTON ESCALATION FACTORS	
Year	**Escalation Rate**
1992	4.06%
1993	3.87%
1994	3.70%
1995	3.72%
1996	1.55%
1997	2.10%

Design, engineering and other support costs were included in these estimates as a percentage of construction costs as follows:

SUPPORT COSTS	
Type	**Percent of Construction Costs**
Construction Management	12%
Design and Construction Phase Services	10%
LIRR Support	10% - if required
Project Management	5%

Allowances for contingencies, recognizing that these dollar amounts are preliminary, were also included in the capital cost estimates, as a percentage of construction costs, as follows:

CONTINGENCY ALLOWANCES	
Type	**Percent of Construction Costs**
Rolling Stock	5%
Trackwork	10%
Other Capital Cost Elements	30%

3) Ridership Impact

For the Phase I MIS portion of the work, the ridership potential for each alternative was assessed, based on results from an incremental forecasting model compared to a year 2020 base. In this approach, base trip tables were initially developed and stratified by mode (auto, commuter rail, subway, bus) for base year 1990. Projections of year 2020 population and employment were then utilized in adjusting 1990 travel patterns to represent travel for year 2020. Incorporating the year 2020 base trip table into an incremental mode choice model, transportation characteristics for each of the alternatives (including No-Build Alternative) in year 2020 were compared to characteristics of the year 1990 network. A key goal in this analysis is to ensure that normal growth in the base travel markets of the study corridor be kept separate from ridership growth that could be attributed to a given alternative.

4) Quality of Service

Quality of Service is a measure encompassing travel time savings as well as travel comfort and convenience (crowding; transfers enroute) during the trip. These considerations were aggregated for each alternative to arrive at an overall Quality of Service rating, compared to the No-Build Alternative, using the following rankings:

QUALITY OF SERVICE COMFORT AND CONVENIENCE	
Description	**Matrix Symbol**
Significantly improved service quality	+++
Moderately enhanced service quality	++
Limited overall service improvement	+

Only positive ratings are shown for this measure because each of the alternatives rated would add to the level of service provided under the No-Build Alternative.

Research shows that transportation patrons regard the total time consumed on trips as one of the most important indicators of service quality. Travel time consists of travel time in motion, waiting time, transfer time from one mode to another and access/egress time at both ends of the journey. Travel time savings is an important measure in estimating whether a public transit investment will be deemed desirable, and in determining whether commuters will shift from an existing mode of travel to a new one.

A net change in average travel time to East Midtown Manhattan was assessed for each study alternative compared to the No-Build Alternative. In this evaluation, trip origins were adjusted accordingly to use comparable measures of travel time for the different alternatives; i.e., in Alternative III, L.I. Expressway Bus/HOV Lane, the overall travel distance (approximately 70 miles) is comparatively longer than in the other alternatives; thus the average length of this trip alone could result in significant travel time differences for Alternative III. Similarly, the trip destination in Manhattan was chosen to properly evaluate travel times between the different alternatives.

With travel distance factored into the overall assessment, in accordance with the above considerations, a five point ranking scale was established as follows:

QUALITY OF SERVICE TRAVEL TIME SAVINGS	
Description	**Matrix Symbol**
Reduced travel time of 15 minutes or more	++
Reduced travel time of 0-14 minutes	+
No Change	0
Increased travel time of 0-14 minutes	-
Increased travel time of 15 minutes or more	- -

In addition an aggregated travel time savings by all users was developed for comparison to the No Build Alternative.

5) <u>Revenue Impact</u>

In this evaluation, an alternative's impact on revenue for either or both the LIRR and NYCT was compared to the No-Build Alternative. The rankings shown below provide for all potential combinations of revenue impacts for these two systems.

REVENUE IMPACTS	
Description	**Matrix Symbol**
Increased revenue for both LIRR and NYCT	++
Increased revenue for LIRR; no change for NYCT	+
Increased revenue for NYCT; no change for LIRR	+
Increased revenue for LIRR, decreased revenue for NYCT	0
No change for both LIRR and NYCT	0
Decreased revenue for LIRR; increased revenue for NYCT	0
Decreased revenue for LIRR; no change for NYCT	-
Decreased revenue for NYCT; no change for LIRR	-
Decreased revenue for both LIRR and NYCT	- -

6) Community Impacts

Through the extensive public outreach program in this study, an initial impression of community impacts was developed. Each alternative was assessed in terms of its effect upon residents and businesses in the corridor and the degree to which it could enhance or detract from known community plans and interests.

Construction impacts, which could continue for a considerable period of time, were included in this overall assessment. Where possible, criteria were broken down into more concrete and quantifiable elements for analysis purposes. The five point ranking scale shown below was used in the evaluation to allow for a wide range of possible impacts from "very negative" to "very positive".

COMMUNITY IMPACTS	
Description	**Matrix Symbol**
Very positive impact	++
Positive impact	+
Negligible or mixed impact	0
Negative impact	-
Very negative impact	- -

7) Economic Impacts

While most economic impacts from the study alternatives are expected to be positive, the five point ranking scale shown below also allows for incorporating negative economic impacts in this screening process (i.e., relocation of businesses/residences during construction, or longer term lowering of property values due to changing traffic patterns). This evaluation is comprehensive as it encompasses economic impacts within the entire New York Metropolitan Region. The following ranking is structured to give greater weight to longer term economic impacts, which are more significant.

ECONOMIC IMPACTS	
Description	**Matrix Symbol**
Long-term positive economic impacts	++
Short-term positive economic impacts	+
No Change	0
Short-term negative economic impacts	-
Long-term negative economic impacts	- -

8) Environmental Impacts

It is recognized that positive and/or negative environmental impacts may result from one of the given alternatives. The five point ranking scale below provides for this range of assessments. In general, the short-term impacts are expected to occur during an alternative's construction period (i.e., noise/vibration). Following construction, long-term impacts may ensue (i.e., significant changes in air quality due to more or less traffic congestion at a particular location), and these more permanent results are given greater weight in the evaluation. Where inherently different geographic sensitivities were present along the route of an alternative, they were assessed separately - and then combined for an overall evaluation.

In general the alternatives were evaluated for impacts related to potential for property acquisition, relocations and displacements, land use changes, noise and vibration, community disruption, air quality, traffic and pedestrian impacts. Estimates of reductions in Vehicle Miles Traveled (VMT's) are also provided.

ENVIRONMENTAL IMPACTS	
Description	**Matrix Symbol**
Long-term positive environmental impacts	++
Short-term positive environmental impacts	+
No Change	0
Short-term negative environmental impacts	-
Long-term negative environmental impacts	- -

9) Equity

This measure focuses on the extent to which each alternative can potentially serve population groups that are disadvantaged due to income inequity, race or inadequate access to public transportation. Of special importance is whether an alternative could facilitate travel to job opportunities for these disadvantaged low income and minority population groups.

Reverse commuting possibilities and other improvements to enhance journey-to-work trips for disadvantaged residents of an alternative's service area are primary concerns. The qualitative evaluations used to assess equity in this context include the following considerations:

- Proximity of a given alternative to residential areas where disadvantaged population groups are located, including accessibility to this transportation service (e.g., within a defined convenient walking distance).
- Location of potential job opportunities that respond to the needs and skills of the disadvantaged population in relation to the transportation services provided by a given alternative.
- Ease of travel for disadvantaged persons including transfers enroute, frequency of service (especially during peak periods for journey-to-work travel) and convenient intermodal connections where required.

The alternatives were rated for equity in accordance with the ranking scale shown below. Again, these rankings relate to the transportation services provided by the No-Build Alternative for the disadvantaged population:

EQUITY IMPACTS	
Description	**Matrix Symbol**
Significantly improved travel opportunities	+++
Moderately improved travel opportunities	++
Limited improved travel opportunities	+
No change from the No-Build Alternative	0
Disproportionate Adverse Impacts	-

2.1.4.2 Stage 2 Evaluation Findings

The results of the Stage 2 evaluation are discussed and summarized below for each of the build alternatives that survived the Fatal Flaw Screening Analysis.

For this portion of the work, preliminary ridership forecasts (Year 2020) were developed for the No Build, TSM and all Build Alternatives. These forecasts include projected ridership by travel mode as well as passenger boardings and alightings at each commuter rail station under different alternatives. Also, AM peak period ridership projections at selected commuter rail and subway screenline crossings have been developed. In addition, all-day vehicle miles traveled (VMT's) have been calculated, and LIRR Drive Access VMT's to LIRR stations were also computed. These ridership forecasts and VMT information provided useful input in conducting this evaluation.

Alternative III. Bus/HOV Lane

Alternative	III. Bus/HOV Lane
Impact on O&M Costs	-
Capital Cost Range (1997 B.$'s)[1]	$0.31-0.33
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	8,456[2]
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	11,800[3]
SERVICE QUALITY	
Impact on Travel Time	-
Travel Time Savings[5] (vs. No Build)	282,748
Comfort & Convenience	+
Revenue Impact	-
Community Impacts	- -
Economic Impacts	+
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	- -
Reduced Vehicle Miles Traveled[6] (vs. No Build)	22,584
Equity	0

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

It appears that O&M costs under this Alternative would show a moderate/slight increase (i.e., less than 20%) when compared to the No-Build Alternative. In this context, the payroll expense incurred to operate the proposed express bus service would be separate from and not impact LIRR operating crew costs in the Year 2020. Bus vehicle maintenance expense would be comparatively low compared to rail car maintenance costs; (i.e., buses are not equipped with sophisticated technology which is costly to repair or replace). Also, these express buses will generally not operate in "stop-and-go" traffic congestion, and this results in greater fuel efficiency and reduced maintenance needs.

The capital costs in this Alternative are estimated to range from $310-330 million. These capital costs are in addition to the currently programmed costs ($552 million) associated with the NYSDOT HOV Lane construction program between Exit 30 to 49 and Exit 57 to 64 on the LIE, and will be used to rebuild various expressway medians and overpasses to provide the necessary footprint for HOV and General Use Lanes as required. Capital funds would also be used to construct nine bus stops (six in Suffolk; three in Nassau) in conjunction with park and ride lots off the LIE, and to purchase a fleet of motor coaches to meet travel demand requirements.

In the year 2020, only approximately 11,800 more average weekday express bus passengers would use the Queens-Midtown Tunnel (westbound) under this Alternative when compared to the No-Build Alternative. Furthermore, the Bus/HOV Alternative generates the fewest number of transit riders among the alternatives. This results from these riders being attracted from a relatively narrow market corridor centered on the LIE.

Shown below for the new proposed bus service is the range of travel times between Nassau and Suffolk Counties and Manhattan (Third Avenue & 42nd Street) for the AM (westbound) peak period and the PM (eastbound) peak period:

NASSAU COUNTY			
		Approximate Bus Travel Times	
LIE Exit #	Intersection Name	Westbound	Eastbound
33	Lakeville Road	32 min.	57 min.
41	N.Y. Route 106/107	43 min.	1:09 hr.
SUFFOLK COUNTY			
		Approximate Bus Travel Times	
LIE Exit #	Intersection Name	Westbound	Eastbound
49	N.Y. Route 110	50 min.	1:13 hr.
73	County Route 58	1:31 hr.	1:56 hr.

Another 5 minutes of westbound travel time for this new bus service would be needed for passenger distribution in Manhattan along Third Avenue, between 42nd and 57th Streets.

The estimates of bus travel times in this Alternative allows for slower speeds due to potential traffic congestion at specific locations along the proposed bus route; (i.e., through the transitional segment on the LIE west of Van Wyck Expressway in Queens). Also, the speed of these buses in Manhattan may be reduced considerably due to heavy peak period traffic conditions. For eastbound (PM peak) trips, heavy traffic and the absence of an HOV lane on the Queensboro Bridge, Queens Boulevard and the LIE until the bus reaches the intersection of the Van Wyck Expressway and LIE will add significantly to the eastbound travel times as shown above. It must also be recognized that highway travel is generally more prone to weather-related delays than rail travel.

Several contrasting factors influence service quality in assessing the Bus/HOV Alternative. Projected travel time savings of approximately 282,700 weekday person minutes compared to the No-Build Alternative, could be significant; but these savings are subject to extensive highway travel variables such as unusual traffic or weather conditions as cited above. It is recognized that a high level of riding comfort would be provided by the modern inter-city motor coach to be used in this service. Also, these bus passengers could expect a single seat ride (without intermodal transfers) on their journey-to-work trips. Another service benefit of this alternative would be the relative convenience it offers to customers with travel destinations near the proposed bus route in East Midtown Manhattan. However, these positive considerations are largely offset by adverse service characteristics. Since this alternative would only provide peak period service for Nassau and Suffolk residents, their off-peak travel needs would not be served. Also, the locations where passengers could board the bus in Nassau and Suffolk would not be within a convenient distance for most residents. In Queens, the extended HOV lane route on the LIE would result in morning peak trip time savings of several minutes which could be negated by the longer eastbound trip time in the evening peak. Weighing these diverse considerations, a rating of (+) would be appropriate in assessing overall service quality for this alternative.

In this context the Bus/HOV Alternative is competitive for only a limited number of origin-destination pairs in its market corridor. This new bus service would only be attractive to travelers with trip origins/destinations relatively close to the LIE (eg., Long Island residents who also have convenient access to the LIRR Ronkonkoma Branch). It must be recognized, however, that these potential express bus customers would only benefit from the dedicated westbound LIE lane in the morning. Riders on the express bus return trip in late afternoon/evening hours would experience longer travel times and extensive traffic congestion before entering the LIE HOV lane at the intersection of the LIE and Van Wyck Expressway.

Average weekday use of the corridor commuter transit system (LIRR, LIE HOV Express Bus, NYC Express Bus) from Nassau, Suffolk and Queens under this alternative is projected to increase by approximately 8,460 person trips in Year 2020, compared to the No-Build Alternative. Ridership forecasts indicate that LIRR patronage, and associated revenues, will decrease as some riders are diverted to the new direct bus service into East Midtown Manhattan. Also, average weekday subway patronage is projected to decrease by approximately 6,790 riders (compared to the No-Build Alternative) due to customer diversion to improved Queens bus service under this alternative. Although NYCT express bus patronage from Queens will increase as travel times are improved with the proposed LIE/HOV extension in place, most of these approximately 6,900 projected additional bus riders are expected to divert to private bus lines. Accordingly, the expansion in NYCT express bus ridership would not generate sufficient revenue to offset the NYCT revenue loss resulting from the forecasted subway ridership reduction. Thus, based upon Year 2020 ridership projections, both LIRR and NYCT revenues would decrease - normally resulting in a rating of (- -) for this measure. However, these revenue losses would be extremely limited (relative to each agency's total annual revenues), and the more appropriate rating for this measure would therefore be (-).

In general, New York City seeks to discourage additional express buses from entering midtown Manhattan since city streets are already congested with heavy traffic, including other express buses. Several Manhattan neighborhoods and community groups are concerned about specific impacts that relate to the proposed bus service such as increased traffic, additional vehicular emissions, higher noise levels, and lack of on street bus loading and unloading spaces. The extent and severity of these concerns resulted in a very negative rating (- -) in evaluating community impacts for the Bus/HOV Alternative.

It is anticipated that this new bus service may facilitate some near term economic development, primarily in central and eastern Suffolk. The sites of potential development (possibly retail activities as well as residential depending on the location) would generally be near the proposed bus stops— assuming that properties in these areas are available for development. These considerations led to the Bus/HOV Alternative being evaluated as (+) for economic impacts.

A major environmental issue in this alternative concerns traffic impacts. While a decrease of approximately 22,580 weekday vehicle travel miles are projected this comparatively small overall reduction in auto usage would not offset this alternative's adverse impacts. The proposed HOV lane may result in more traffic congestion on other lanes of the Long Island Expressway, especially as lanes are removed for contra-flow HOV lanes. Also, environmental impacts are further exacerbated by increased traffic congestion in Manhattan and (during late afternoon/ evening peak hours) on the Queensboro Bridge as well as along Queens Boulevard. On local streets near park and ride lots/bus stops, and on the transitional segment of the Long Island Expressway, traffic will also increase after this alternative is implemented. Thus, additional traffic congestion in the area of the study can be expected when the new bus service is operational. This impact, in turn, would increase vehicular emissions and further constrain Manhattan's ability to comply with provisions of the Clean Air Act. For these reasons, the Alternative was given a rating of long term negative (- -) for environmental impacts.

The proposed Bus/HOV Alternative would primarily serve journey to work travelers with "white collar" professional/managerial jobs in East Midtown Manhattan. In addition the bus service would primarily be used by those residents of Nassau and Suffolk Counties who have access to auto travel (primarily through car ownership) in order to reach the bus boarding locations adjacent to the LIE.

Within New York City, this alternative would not facilitate improved transportation for disadvantaged residents, i.e., existing express service in Queens, using the proposed HOV route on the LIE, might only gain marginal trip time savings. Thus, the proposed Bus/HOV Alternative, which does not provide for reverse peak service, would not offer an attractive travel option to the disadvantaged population and is therefore rated [0] in assessing equity when compared to the No-Build Alternative.

In reviewing the above positive and negative impacts of the proposed Bus/HOV Alternative, the combination of the projected low ridership, adverse eastbound travel times and Manhattan environmental impacts stand out as critical measures that undermine project goals. In addition, this Alternative would not reduce train congestion in Penn Station, another critical project goal.

Therefore, the Bus/HOV Alternative will be dropped from further consideration in this evaluation since it does not meet stated critical project goals. However, a variation of this alternative will be analyzed and evaluated by New York State Department of Transportation in their Long Island Transportation Plan to Manage Congestion (LITP 2000) which is currently underway. This NYSDOT Study encompasses a wider market area than the LIRR MIS/DEIS for the Long Island Transportation Corridor. Thus, the proposal to extend Bus/HOV lane travel on the Long Island Expressway will continue to be studied in this comprehensive NYSDOT assessment.

Alternative IV. LIRR East Side Terminal

(A) Grand Central Terminal Via Main Line

Alternative	IV. LIRR East Side Terminal A. GCT via Main Line
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$2.8 - 3.0B
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	23,909
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	179,257[7]
SERVICE QUALITY	
Impact on Travel Time	++
Travel Time Savings[5] (vs. No Build)	648,051
Comfort & Convenience	+++
Revenue Impact	+
Community Impacts	-
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	+
Reduced Vehicle Miles Traveled[6] (vs. No Build)	293,473
Equity	++

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

This alternative would result in a significant increase in O&M costs (i.e., preliminarily estimated to be at least 20% above comparable costs for the No-Build Alternative). Extending train service via this new route into Manhattan would require additional operating personnel; the added trains would also generate higher electric power consumption costs. The electric car fleet would have to be expanded to provide this new service, resulting in increased equipment maintenance costs. Also, the LIRR would have more ROW (track, signals, power facilities) to maintain in this alternative, further increasing O&M costs.

It is estimated that capital expenditures for this alternative will be between $2.8 billion and $3.0 billion (in 1997 dollars). This preliminary estimate does not include the cost of property acquisition/real estate. The major cost elements of this estimate are for (i) procurement of electric rolling stock to meet projected service needs; (ii) construction of extensive tunneling in Manhattan and Queens; (iii) the cost of building LIRR facilities (i.e., new platforms and passageways) within Grand Central Terminal and a midday storage yard in Sunnyside Queens.

It is estimated that with Alternative IV "A", approximately 23,910 new LIRR linked trips (compared to the No-Build Alternative) are projected in Year 2020. Again, in comparison to the No-Build Alternative, average weekday person trips in 2020 are projected to decrease as follows when this proposed alternative is operational: subway 5,300 and bus by 1,480. Thus approximately 6,780 new LIRR riders would be diverted from other public transportation modes. Significantly, most of the increase in LIRR daily ridership (13,940) would be diverted from weekday auto usage - a major benefit for the region. In addition, 3,190 LIRR passengers would be newly generated riders - induced by this new direct GCT rail service to begin traveling to East Midtown Manhattan.

The average weekday passenger boardings and alightings at GCT under this alternative is forecast to be approximately 174,510 in Year 2020, compared to the No-Build Alternative. Another 4,740 weekday LIRR riders are anticipated to use the new station to be built near Thomson Avenue in Sunnyside, Queens. Significantly, in this alternative approximately 153,310 fewer LIRR weekday passengers are projected to use Penn Station which will result in reduced train congestion and will free up limited operating capacity at this terminal. Also, LIRR average weekday customers using Hunterspoint Avenue and Long Island City Stations in Year 2020 are expected to decrease by 3,020 and 60 respectively when this alternative is operational.

Alternative IV "A" is expected to attract the most users in terms of LIRR linked trips and total daily usage compared to the other Build Alternatives. Thus, this alternative will directly benefit the most people in meeting daily travel needs in the study corridor. These incremental and total ridership forecasts for Year 2020 clearly enhance the assessed rating of Alternative IV "A" in the overall evaluation.

This LIRR alternative to GCT is expected to reduce total trip time to East Midtown Manhattan by at least 15 minutes (rating of ++). In the anticipated operating scenario, trains from Port Washington as well as other LIRR branches to GCT are assumed to require two minutes more scheduled time than the equivalent link to Penn Station. This increased train running time is due to the length of the new alignment, track curvature geometry and extensive GCT interlockings. However, LIRR riders who now have to transfer to the subway or bus at Penn Station for the time-consuming trip back to East Midtown will significantly benefit from the new direct service to GCT. It is projected that 648,050 weekday person minutes will be saved in travel time using this alternative. In terms of travel convenience, most LIRR riders to GCT will be able to walk to their trip destination instead of having to transfer to the bus or subway. Accordingly, this alternative is expected to provide for significantly improved service quality compared to the No-Build Alternative (rating of +++).

The key factor in assessing revenue impacts in this alternative is the number of additional LIRR customers attracted to the proposed service (4.0% more than the No-Build Alternative). This will result in increased LIRR revenue while NYCT revenue remains virtually unchanged; i.e., the marginal decrease in subway ridership under this alternative is projected to be only 0.1%. This insignificant drop in NYCT patronage, coupled with the fact that the NYCT fare is lower than LIRR fares, is not sufficient to offset the expected LIRR revenue increase, yielding a rating of (+) in evaluating this measure.

In this alternative, community concerns primarily relate to the temporary construction - related impacts involved in building the project, including noise, vibration, street lane closings, construction barricades and truck traffic. However, more intensive local public opposition is inherently avoided through not having to build a new Manhattan terminal which could have permanent disruptive impacts in the community. Accordingly, for this measure the alternative is rated (-), recognizing that the resulting negative community impacts are relatively short term and moderate.

By providing a new direct rail service into East Midtown Manhattan, reducing congestion at Penn Station, and relieving overcrowding on NYCT lines in Queens, the region's transportation system will be significantly upgraded. Improvements of this magnitude, with major enhancements in journey-to-work travel, can be expected to generate long term economic activity in addition to the short term construction related economic impacts. Reflecting this positive assessment, the alternative is rated a (++) in evaluating economic impacts.

Negative environmental impacts in this alternative are mostly temporary and construction-related including noise and vibration associated with tunneling, street barricades, excavation and removal of spoil, contractor's material stored on streets, etc. There are other negative concerns relating to permanent conditions following construction such as visual impacts arising from facilities (i.e., station entrances) as well as traffic and pedestrian congestion in the GCT area. However, there are also offsetting positive environmental factors that must be considered; these positive impacts are primarily related to future reductions in auto usage resulting in less traffic congestion and improved air quality in the study corridor. Under the LIRR Main Line to GCT alternative, weekday vehicle miles of travel will decrease by 294,000 compared to the No-Build Alternative. As a result, this significant reduction in auto emissions will contribute toward compliance with Clean Air Act requirements. Assessing this mix of (mostly local) negative and more regional positive environmental impacts, the alternative is rated (+) in the overall evaluation.

This alternative facilitates travel to increased job opportunities for disadvantaged residents of Manhattan [e.g., minority population groups in East Harlem and the Lower East Side]. Utilizing the new convenient NYCT Lexington Avenue Line/LIRR transfer at Grand Central Terminal, these residents will be provided with improved journey-to-work travel to Long Island employment areas near LIRR service. Also, disadvantaged residents of Long Island will have improved access to job opportunities in the Sunnyside area of Queens. It is recognized, however, that another mode of travel will be required between the LIRR station and the trip origin/destination on Long Island for most of these rail passengers. Weighing these considerations, a rating of (++) is most appropriate for this equity measure.

In summarizing the above evaluation measures, the resulting net rating for this alternative is clearly positive. Of major importance is the projected high ridership attracted to use the new LIRR service, reflecting significant savings in travel time to East Midtown Manhattan. These "plus" factors give rise to another important positive impact: long-term economic activity foreseen under this alternative. Also, capital expenditures, while relatively high, are at least half a billion dollars less in this alternative than in the other Alternative IV options, discussed below. Furthermore, the negative community and environmental impacts are relatively limited in assessing this alternative (i.e., chiefly during construction); this is significant because major negative concerns in these areas can preclude a project from being implemented.

Alternative IV. LIRR East Side Terminal

(B) Grand Central Terminal Via Montauk Branch

Alternative	IV. LIRR East Side Terminal B. Grand Central Terminal Via Montauk Branch
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$3.7 - 4.4B
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	20,434
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	167,895[7]
SERVICE QUALITY	
Impact on Travel Time	+
Travel Time Savings[5] (vs. No Build)	357,587
Comfort & Convenience	+
Revenue Impact	+
Community Impacts	-
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	-
Reduced Vehicle Miles Traveled[6] (vs. No Build)	254,875
Equity	++

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

This alternative will contribute to higher O&M costs in implementing this alternative (preliminarily estimated to be at least 20% above comparable costs for the No-Build Alternative). To implement this alternative, additional LIRR operating personnel would be utilized, the expanded service would result in greater electric power consumption for daily operations and the enlarged fleet size would entail increased equipment maintenance. This new LIRR route would also require increased ROW maintenance (track, signals, power facilities).

Capital expenditures for this alternative are estimated to range between $3.7 billion and $4.4 billion (in 1997 dollars), excluding the cost of property and real estate acquisition. Major cost elements in the estimate include procurement of electric rolling stock, extensive tunneling in Queens as well as in Manhattan, upgrading resignaling and electrification of the Montauk Branch west of Jamaica, and building facilities in GCT to accommodate the proposed LIRR terminal.

It is estimated that with Alternative IV "B", approximately 20,430 new LIRR linked trips (compared to the No-Build Alternative) are projected in Year 2020. Again, in comparison to the No-Build Alternative, average weekday person trips in 2020 are projected to decrease as follows after this proposed alternative is operational: auto by 12,120; NYCT by 4,140; and bus by 1,080. Aggregating the forecasted LIRR increase with the above patronage decreases for the other modes results in a net increase of 3,090 daily LIRR riders generated by this alternative in Year 2020 (i.e., using the new LIRR service to East Midtown Manhattan).

The average weekday passenger boardings and alightings at GCT under this alternative is projected to be approximately 162,600 in Year 2020, compared to the No-Build Alternative. Another 5,290 weekday LIRR riders are expected to use the new station to be built near Thomson Avenue in Sunnyside, Queens. In this alternative, approximately 145,810 fewer LIRR weekday passengers are projected to use Penn Station which will reduce train congestion and result in increased available operating capacity at this terminal. Also, LIRR average weekday customers using Hunterspoint Avenue and Long Island City Stations in Year 2020 are expected to decrease by 3,010 and 60 respectively when this alternative is operational.

It is expected that travel time savings of less than 15 minutes to East Midtown Manhattan will be achieved which converts to an evaluation rating of (+) for this alternative. Running times for LIRR trains to GCT via the Montauk Branch are projected to be approximately 4-7 minutes longer than LIRR trip times using the Main Line into Penn Station. Running times for LIRR Port Washington Branch trains to GCT are projected to be about 2 minutes longer than comparable service to Penn Station. Clearly, LIRR customers with travel destinations in East Midtown Manhattan will benefit from this direct service to GCT (instead of having to transfer to the subway or bus at Penn Station). However, the Montauk Branch segment of this new service can take several minutes longer than the LIRR Main Line travel time between Jamaica and Sunnyside (Alternative IV "A" above). As a result, travel time savings using this alternative are projected to be approximately 357,590 weekday person minutes (only 55% of the travel time savings achieved under Alternative IV "A"). Also, this alternative is inconvenient for passengers from Main Line stations west of Jamaica who would have to transfer at Woodside to Port Washington Branch trains for the new rail service to GCT. In view of these comparative deficiencies, this alternative would only provide limited overall service quality compared to the No-Build Alternative (rating of +).

A moderately positive revenue impact (+) is anticipated under this alternative. This rating reflects additional LIRR revenue due to increased ridership (3.5% more than the No-Build Alternative) while NYCT revenue will remain virtually unchanged; i.e., the marginal decrease in subway ridership under this alternative is projected to be only 0.1%. This insignificant drop in NYCT ridership, coupled with the fact that the subway fare is lower than LIRR fares, will not reduce NYCT revenue sufficiently to offset the LIRR revenue increase in this evaluation.

In this alternative, community concerns in Manhattan would primarily focus upon temporary construction-related impacts such as noise, vibration and street lane closings, etc. In Queens, the proposed new electric service on the Montauk Branch would raise negative community issues as well as positive impacts. Community opposition to expanded high speed electric train operation (specifically NYCT service) on this line in the past included concerns such as: unsafe conditions due to electrified service and increased train traffic; reduced quality of life for residents near this rail line (i.e., with increased noise and vibration); the perception that the electrified tracks will "divide" communities along this route (Fresh Pond, Glendale, Richmond Hill). Countering these negative impacts are significant potential benefits with possible new rail service from these local communities to Manhattan as well as extensive LIRR access to many areas in Queens, Nassau and Suffolk counties. These positive impacts of potential new service partially offset the above negative impacts, resulting in a net rating of (-) for this evaluation.

As in Alternative IV "A" above, this alternative will significantly upgrade the transportation system in this region, especially in the study corridor. These major improvements include fast direct rail access to East Midtown Manhattan from Long Island, service modifications for improved use of Penn Station (by all rail operators) and relief of overcrowding on NYCT lines in Queens. These extensive transportation benefits, especially for journey-to-work travel, are expected to generate long term economic development in the region - resulting in a rating of (++) for this alternative.

Both positive and negative environmental impacts are associated with this alternative. The negative impacts are largely construction-related and temporary such as noise and vibration (i.e., building grade separations on the Montauk Branch and tunneling under Van Dam Street in Queens; extensive tunneling in Manhattan). Visual impacts also arise from permanent project facilities including the elevated track structure, electrical substations and station entrances in the GCT area. The significant increase in LIRR train operations over the Montauk Branch will result in long term noise and vibration impacts. As in Alternative IV "A" above, offsetting these negative concerns are positive impacts mainly related to reduced peak period auto usage (less traffic and enhanced air quality) as LIRR service is significantly improved in this alternative. Weekday vehicle miles of travel are projected to decrease by approximately 254,880 under this alternative. These contrasting impacts yield a net rating of (-) in the overall assessment of environmental impacts.

In this alternative, disadvantaged residents of Manhattan [eg., minority population groups in East Harlem and the Lower East Side], would benefit from improved access to job opportunities. Utilizing the new convenient NYCT Lexington Avenue Line/LIRR transfer at Grand Central Terminal, these residents will have improved journey-to-work travel to Long Island City and other employment areas near LIRR service. Improved rail access to job opportunities will also benefit disadvantaged residents of Long Island. Reflecting positive travel benefits, this alternative is rated (++).

Summarizing the above evaluation measures, this alternative has mixed ratings which are lower than the results for Alternative IV "A" above in the critical measures of capital costs and projected ridership. Of major importance, the high end of the capital cost range for Alternative IV "B" at $4.4 billion is $1.1 billion more than the comparable high end of the capital cost range for Alternative IV "A". This significant cost differential reflects the added extensive construction (elevated track structure, electrification, signal system, connecting tunnel structure) in Queens, required for the proposed Montauk Branch connection. Coupled with this negative cost comparison, Alternative IV "B" would attract fewer riders than Alternative IV "A" resulting in a much more negative new rider-to-capital cost ratio for this proposed alternative via the Montauk Branch.

Alternative IV. LIRR East Side Terminal

(C) Third Avenue Terminal Via Main Line

Alternative	IV. LIRR East Side Terminal C. 3rd Ave. via Main Line
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$3.3-3.9B
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	16,893
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	137,933[7]
SERVICE QUALITY	
Impact on Travel Time	++
Travel Time Savings[5] (vs. No Build)	389,894
Comfort & Convenience	++
Revenue Impact	+
Community Impacts	- -
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	- -
Reduced Vehicle Miles Traveled[6] (vs. No Build)	209,813
Equity	+

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

In this alternative, O&M costs are expected to increase as in the two Alternative IV routes to GCT discussed above. The proposed LIRR service to Third Avenue in Manhattan would need additional operating personnel, use more electric power for the new service, and result in increased equipment maintenance with the expanded fleet. Also, this proposed extension of the LIRR system would require additional ROW maintenance. Each of these factors will contribute to higher O&M costs (preliminarily estimated to be at least 20% above comparable costs for the No-Build Alternative) after this alternative becomes operational.

Capital expenditures for this alternative are estimated to range between $3.3 billion and $3.9 billion (in 1997 dollars), excluding the cost of property and real estate acquisition. Major cost elements in the estimate include the construction of a new LIRR terminal and related facilities (including an equipment layup yard) beneath Third Avenue in Manhattan, procurement of electric rolling stock, and extensive tunneling in Queens as well as Manhattan.

It is estimated that with Alternative IV "C", approximately 16,890 new LIRR linked trips (compared to the No-Build Alternative) are projected in Year 2020. In comparison to the No-Build Alternative, average person trips in 2020 are projected to decrease as follows: auto by 10,200; NYCT by 2,060; and bus by 1,460. Aggregating the forecasted LIRR increase with the patronage decreases shown above for the other modes results in a net increase of approximately 3,200 daily LIRR riders generated by this alternative in Year 2020 (i.e., using the new LIRR service to East Midtown Manhattan).

The average weekday boardings and alightings at the new Third Avenue LIRR Terminal under this alternative is projected to be approximately 134,080 in Year 2020, compared to the No-Build Alternative. Another 3,850 weekday LIRR riders are expected to use the new station to be built near Thomson Avenue in Sunnyside, Queens. In this alternative, approximately 123,710 fewer LIRR weekday passengers are projected to use Penn Station; however, this decrease in LIRR weekday customer usage of Penn Station is considerably less than the comparable reductions realized under Alternative IV "A" and "B" above. Thus, Alternative "C" would be relatively less effective in reducing congestion at Penn Station. To complete this scenario, LIRR average weekday riders using Hunterspoint Avenue and Long Island City Stations in Year 2020 are expected to decrease by 3,020 and 60 respectively when this alternative is operational.

Trip travel time to East Midtown Manhattan is expected to be reduced under this alternative by at least 15 minutes (rating of ++). Running times for LIRR trains to the proposed Third Avenue Terminal are projected to be 1 to 2 minutes longer than LIRR running times via the Main Line into Penn Station. However, this minimal additional running time is far less than the travel time savings to be gained by LIRR riders with trip destinations in East Midtown Manhattan who now must transfer the subway or bus at Penn Station. It is projected that approximately 389,900 weekday person minutes will be saved in travel time under this alternative, compared to the No-Build Alternative. However, this Third Avenue location for the East Midtown Terminal would not be as convenient as GCT for most LIRR customers; ie., the overall walking distances to their trip destinations would be greater, and there would be a less convenient subway transfer than at GCT. Weighing all of these considerations, this alternative would provide moderately enhanced service quality (rating of ++).

As indicated above in discussing ridership impacts under this alternative, the LIRR is projected to gain riders (+2.9%) while NYCT patronage remains relatively constant. Thus, in this future scenario, LIRR revenue will increase while NYCT revenue is not significantly impacted. This alternative is therefore rated (+), reflecting the projected combination of revenue impacts in accordance with the defined evaluation criteria.

The proposed Third Avenue Terminal in this alternative would have significant negative impacts. In order to build this new extensive facility, the community street system (especially Third Avenue) would be significantly disrupted. The Third Avenue Terminal would involve cut and cover construction of the terminal site from approximately 42nd Street north to 53rd Street. In the passenger facility portion of the terminal from 53rd Street to 48th Street, the excavation envelope would span the width of Third Avenue from building line to building line. Within the storage yard portion south of 47th Street, the excavation envelope would be somewhat narrower encompassing the paved vehicular traffic lanes portion of Third Avenue. Due to the width and depth of the excavation for the three level terminal structure, all utilities within Third Avenue and those crossing Third Avenue from adjacent streets would require relocation. Additionally several underground terminal ventilation facilities would be constructed within adjacent streets. During the extensive construction in Manhattan, negative impacts include significant local traffic congestion due to contractor staging areas and blocked street lanes, noise and vibration impacts, and utility relocation impacts to adjacent properties. Tunnel spoil disposal and removal of potentially hazardous materials are additional concerns. After the new terminal is in service, additional vehicle congestion would be expected to impact this area and new commercial uses may be established near the site, displacing residents. These factors have engendered local community opposition to the proposed Third Avenue LIRR Terminal. Recognizing these major concerns, the alternative is rated as having a very negative impact (- -).

As in the other Alternative IV options that provide direct LIRR service to a new East Midtown Terminal, this alternative is rated (++) in assessing economic impacts. This relatively high evaluation reflects the extent to which the alternative's benefits include both short term construction related impacts as well as long term economic development. Of prime importance in this assessment is the recognition that a new major LIRR terminal in Manhattan can generate ancillary economic activities and related economic development at nearby locations.

This alternative would have long term negative environmental impacts, and is rated accordingly (- -). While reduced auto usage under this alternative (209,813 fewer weekday vehicle miles of travel) could produce positive impacts such as reduced traffic and improved air quality, the anticipated adverse impacts would still be significant. Long term negative impacts include increased traffic congestion in this area after the terminal is operational and visual impediments arising from permanent project facilities.

This alternative provides improved travel to job opportunities for disadvantaged residents of Manhattan [eg., minority population groups in East Harlem and the Lower East Side]. These residents will have enhanced journey-to-work travel to Long Island employment areas near LIRR service. The new station in Sunnyside will also provide improved rail access to job opportunities for disadvantaged residents of Long Island. However, another mode of travel will be required between the LIRR station and the trip origin/destination on Long Island for most of these rail passengers. With a less convenient NYCT/LIRR transfer than would be available at Grand Central Terminal, a rating of (+) would be most appropriate for this equity measure.

Summing up the above evaluation measures, in the overall evaluation this alternative is clearly less favorable than Alternative IV "A"; in each of the following measures, Alternative IV "C" is rated lower than Alternative IV "A": capital costs, projected ridership, community impacts and environmental impacts. Furthermore, this alternative does not have a higher rating than Alternative "A" in any of the other evaluation measures. Of major importance in assessing Alternative IV "C" is the required high capital expenditures combined with relatively limited LIRR ridership to be gained. Also, the very negative community and environmental impacts associated with this proposed LIRR Terminal at Third Avenue can impede the project and are therefore major considerations.

Alternative IV. LIRR East Side Terminal

(D) Third Avenue Terminal Via Montauk Branch

Alternative	IV. LIRR East Side Terminal D. 3rd Ave. via Montauk Br.
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$4.2-5.0B
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	13,905
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	131,352[7]
SERVICE QUALITY	
Impact on Travel Time	+
Travel Time Savings[5] (vs. No Build)	144,606
Comfort & Convenience	+
Revenue Impact	+
Community Impacts	- -
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	- -
Reduced Vehicle Miles Traveled[6] (vs. No Build)	179,475
Equity	++

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

As in the other three proposed service/route options under Alternative IV, discussed above, O&M costs in this alternative are expected to increase. Additional operating personnel, greater electric power usage, increased equipment maintenance and added ROW maintenance will result in higher O&M costs (preliminarily estimated to be at least 20% above comparable costs for the No-Build Alternative) when this alternative becomes operational.

Capital expenditures for this alternative are estimated to range between $4.2 billion and $5.0 billion (in 1997 dollars), excluding the cost of property and real estate acquisition. The major costs elements of this alternative are: construction of a new LIRR terminal and related facilities (including an equipment layup yard) beneath Third Avenue in Manhattan, upgrading resignalling and electrification of the Montauk Branch west of Jamaica, procurement of electric rolling stock, and extensive tunneling in Queens as well as Manhattan.

It is estimated that with Alternative IV "D", approximately 13,910 new LIRR linked trips (compared to the No-Build Alternative) are projected in Year 2020. In comparison to the No-Build Alternative, average person trips in 2020 are projected to decrease as follows: auto by 8,740; NYCT by 1,090; and bus by 1,060. Aggregating the forecasted LIRR increase with the patronage projections shown above for the other modes results in a net increase of approximately 3,020 daily LIRR riders generated by this alternative in Year 2020 (i.e., using the new LIRR service to East Midtown Manhattan).

The average weekday boardings and alightings at the new Third Avenue LIRR Terminal is projected to be approximately 127,440 in Year 2020, compared to the No-Build Alternative. Another 3,915 weekday LIRR riders are expected to use the new station to be built near Thomson Avenue in Sunnyside, Queens. In the alternative, approximately 119,810 fewer LIRR weekday passengers are projected to use Penn Station; significantly this decrease in LIRR weekday customer usage of Penn Station would be less than for any of the other service/route options proposed under Alternative IV. When this alternative is operational, LIRR average weekday riders using Hunterspoint Avenue and Long Island City stations in Year 2020 are expected to decrease by 3,020 and 60 respectively

It is expected that travel time savings of less than 15 minutes to East Midtown Manhattan will be achieved which results in an evaluation rating of (+) for this alternative. Running times for LIRR trains to Third Avenue via the Montauk Branch are projected to be approximately 4 - 7 minutes longer than LIRR trip times on the Main Line into Penn Station. Running times for LIRR service into the new Third Avenue Terminal from the Port Washington Branch are projected to be about 1 - 2 minutes longer than comparable service to Penn Station. As in Alternative IV "B" above, LIRR passengers to East Midtown Manhattan destinations will have reduced total travel times to the new Third Avenue Terminal, but their longer trip on the Montauk Branch (compared to the Main Line) partially offsets the trip time savings gained in no longer having to transfer to the subway or bus at Penn station. Limited travel time savings of approximately 144,610 weekday person minutes are projected to be achieved, compared to the No-Build Alternative; this represents only 22% of the travel time savings to be gained under Alternative "A" above (LIRR to GCT via Main Line). This alternative would also be inconvenient for passengers from Main Line stations west of Jamaica, destined for East Midtown, since they would have to transfer at Woodside for Port Washington Branch trains to the Third Avenue Terminal. For reasons cited in discussing Alternative IV "C" above, the Third Avenue location would not be as convenient as GCT for most LIRR riders. Reflecting these considerations, this alternative would provide for limited additional quality of service (rating of +).

As in the other Alternative IV service/route options, the revenue impact for this alternative is rated (+). This evaluation reflects additional LIRR revenue due to increased ridership (2.4% more than the No-Build Alternative) while NYCT revenue will remain virtually unchanged; i.e., the marginal decrease in subway ridership under this alternative is projected to be only .03%. This limited reduced patronage, coupled with the fact that the subway fare is much lower than LIRR fares, does not offset the LIRR revenue increase in the evaluation.

This alternative raises serious long term community concerns in both Queens and Manhattan. In Queens, community opposition to expanded electric service on the Montauk Branch in the past reflected concerns over unsafe conditions due to new electrified operation (specifically NYCT service) and increased train traffic, reduced quality of life for residents near this rail line (i.e., with increased noise and vibration), and the perception that the electrified tracks will "divide" communities along this section of the Montauk Branch. In Manhattan, the new Third Avenue Terminal proposed in this alternative raises other long term concerns such as increased vehicle congestion in the community as well as displacement of residents as more commercial activities are expected to relocate in this area. Other temporary construction related impacts include noise, vibration, street lane closings and - in Manhattan - disruptions in the activities of local residents and retailers. The extent of these permanent and temporary negative impacts in Queens and Manhattan are such that any positive community impacts in this alternative (i.e., potential new LIRR service from Montauk Branch stations) would not be sufficient to offset the very negative rating (- -) in this overall assessment.

As in the other service/route options proposed under Alternative IV, this alternative will significantly upgrade the region's transportation system, especially in this study corridor. Major improvements will include fast direct rail access to East Midtown Manhattan, service modifications allowing for improved use of Penn Station and relief of overcrowding on NYCT lines in Queens. These extensive transportation benefits, especially for journey-to-work travel, are expected to generate long term economic development in the region in addition to short term construction related benefits - resulting in a rating of (++) for this alternative.

Environmental impacts associated with this alternative are predominantly negative. Construction-related negative impacts include noise and vibration (i.e., building grade separations on the Montauk Branch and tunneling under Van Dam Street in Queens as well as extensive cut and cover construction in Manhattan), local traffic congestion due to contractor staging areas and blocked street lanes and utility relocation impacts to adjacent properties. More long term negative impacts include additional traffic on Manhattan streets around the Third Avenue Terminal, noise and vibration from increased LIRR train operations over the Montauk Branch, and visual impacts from permanent project facilities such as the elevated track structure, new electrical substations and station entrance facilities. In the evaluation, positive impacts on traffic and air quality due to reduced auto usage (179,480 fewer vehicle miles traveled) would not be sufficient to change the (- -) rating that reflects the extensive negative impacts of this alternative.

Disadvantaged residents of Manhattan [eg., minority population groups in East Harlem and the Lower East Side] would benefit from improved access to job opportunities under this alternative. These residents will have enhanced journey-to-work travel to Long Island City and other employment areas near LIRR service. Improved rail access to these job opportunities will also benefit disadvantaged residents of Long Island. However, this alternative does not have as convenient a NYCT/LIRR transfer as would be provided at Grand Central Terminal. Weighing these considerations, a rating of (++) is assigned to this equity measure.

Summarizing the above evaluation measures, the overall assessment for alternative IV "D" is clearly negative. Compared to the other route/service options under Alternative IV, this alternative would be the most expensive to implement while it would attract the fewest number of new riders. This serious disadvantage is compounded by the very negative evaluation for this alternative in assessing community as well as environmental impacts.

Alternative VI. New East River Tunnel and East Side Rail Station

Alternative	VI. New East River Tunnel and East Side Rail Station
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$2.8 - 3.0B
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	15,364
2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	174,759
SERVICE QUALITY	
Impact on Travel Time	++
Travel Time Savings[5] (vs. No Build)	756,740
Comfort & Convenience	++
Revenue Impact	+
Community Impacts	- -
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	- -
Reduced Vehicle Miles Traveled[6] (vs. No Build)	232,524
Equity	+

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

When this alternative is operational, LIRR's O&M costs are expected to increase by at least 20% (compared to the No-Build Alternative), resulting in a rating of (- -) for this evaluation measure. This increase reflects the added incremental cost to maintain the additional ROW (signal, track, power facilities) in the new tunnel from Sunnyside, Queens to Penn Station. Also, the proposed new LIRR East Side Station facility would incur significant O&M expense. It should be noted that Amtrak and NJ Transit may agree to share O&M costs under this alternative with the LIRR.

Capital expenditures for this alternative are estimated to range between $2.8 billion and $3.0 billion (in 1997 dollars), excluding the cost of property and real estate acquisition. The major cost element of this alternative is the construction of a new two track rail tunnel from Queens, beneath the East River and continuing beneath 31st Street more than halfway across Manhattan into Penn Station and associated track and passenger facility improvements to the southern half of Penn Station. Another significant cost element covers the construction of the sub-surface LIRR East Side Station with a pedestrian mezzanine level above the station platforms and circulation elements to the street network as well as connections and improvements to the existing NYCT Lexington Avenue Line 33rd Street station.

It is estimated that with this alternative, approximately 15,360 new LIRR linked trips (compared to the No-Build Alternative) are projected in Year 2020. In comparison to the No-Build Alternative, average person trips in 2020 are projected to decrease as follows: auto by 9,920; subway by 2,320; bus by 440. Aggregating the forecasted commuter rail increase with the patronage projections shown for other modes results in a net increase of 2,690 daily LIRR riders generated by this alternative in Year 2020.

The average weekday boardings and alightings at the new LIRR East Side Station is projected to be approximately 174,760 in Year 2020, compared to the No-Build Alternative. In this alternative, 157,460 fewer LIRR weekday passengers are projected to use Penn Station. While these two projections compare favorably with other Build Alternatives, they are not as beneficial as comparative forecasts for Alternative IV "A" (Main Line to GCT). When this alternative is operational, LIRR average weekday riders using Hunterspoint Avenue and Long Island City Stations in Year 2020 are expected to decrease by a total of 1,720.

The location of the new LIRR station on Manhattan's East Side inherently brings LIRR riders traveling to East Midtown closer to their destinations. These passengers would no longer have to continue traveling further into Penn Station, and then transfer for a time-consuming subway or bus trip back across Manhattan to the East Side. The resulting travel reductions are reflected in the projection that approximately 756,740 weekday person minutes will be saved compared to the No-Build Alternative.

However, the proposed LIRR transfer to the NYCT Lexington Avenue Line at East 33rd Street may adversely impact passenger comfort and convenience to all LIRR passengers in Manhattan and to those NYCT customers utilizing the 33rd Street Station. Large numbers of detraining LIRR passengers in the AM peak will result in extensive crowd congestion at this transfer facility (ie., at LIRR platform egress points as well as on the subway platform). Also, the lack of an NYCT Lexington Avenue Line express stop at this proposed transfer station is a severe service constraint (especially when compared to Penn Station which provides subway express and local service connections to both the 7th Avenue and 8th Avenue Lines). Additionally, in the PM peak LIRR passengers will be required to board trains coming from Penn Station. These trains will be arriving at the new East Side Station with a significant amount of passengers already aboard. This may prompt many LIRR customers to originate their PM trip from Penn Station to insure a seated ride or simply to take advantage of the greater customer amenities available at Penn Station, thus negating some of the projected travel time savings of this alternative. Another shortcoming of this alternative is that the new LIRR East Side Station would not be within convenient walking distance of most LIRR riders' trip destinations in East Midtown Manhattan. Thus, this alternative has a mix of positive and negative attributes, with travel time savings partly offset by the above constraints upon passenger comfort/convenience. As a result, this alternative can be expected to provide a moderately enhanced quality of service compared to the No-Build Alternative (rating of ++).

In this alternative, LIRR ridership growth is projected to be 2.6% above the No-Build Alternative. This will result in increased LIRR revenue during which time NYCT ridership is expected to remain virtually unchanged; i.e., the marginal decrease in subway ridership under this alternative is projected to be only .06%. This insignificant drop in NYCT patronage, and the comparatively low NYCT fare, would not offset the substantial LIRR revenue increase in this evaluation - yielding a rating of (+) for this measure.

As in the proposed LIRR Third Avenue Terminal (Alternative IV "C" and "D" above), significant negative impacts to the community are inherent in this alternative. Building the proposed rail tunnel and major LIRR station will result in extensive construction-related impacts, including: diminished quality of life for residents due to construction traffic; open construction access shafts and contractor staging areas blocking street lanes; noise and vibration associated with tunneling and subsequent spoil removal; economic hardship to community merchants caused by disruption to deliveries and customer access. It is assumed that cut and cover tunnel construction methods will be utilized between 7th Avenue and approximately 5th Avenue due to the numerous subway and PATH facilities which will be crossed by the new tunnel alignment and the relatively shallow depth of the tunnel in this area. It should also be noted that construction of the new LIRR East Side Station must be accomplished adjacent to and above the existing East River Tunnel approaches to Penn Station. These tunnels are very heavily utilized by the LIRR, Amtrak and NJ Transit whose schedule reliability to their customers would be impacted by the required construction activities for this alternative. Permanent impacts would include demolition and displacement of residential and commercial properties along this alternative's proposed route, increased traffic on several Manhattan streets in the area (adding to existing vehicle congestion due to the nearby Queens-Midtown Tunnel), and visual impacts of permanent project facilities such as station entrances. Recognizing these significant concerns to the community, this alternative is rated as having a very negative impact (- -).

The proposed LIRR station in this alternative, at 33rd Street with convenient access to the NYCT Lexington Avenue subway, would be a major new transportation facility. Furthermore, the high volume of LIRR riders projected to divert to the new Manhattan station under this alternative would facilitate passenger handling at Penn Station. Operationally, the new tunnel would "free up" slots in existing East River tunnels allowing other rail operators opportunity to provide increased service. New routing for Amtrak and NJT trains would reduce potential conflicts in Penn Station. These extensive transportation benefits can be expected to generate long term economic development in the region-resulting in a rating of (++) for this alternative.

Environmental impacts associated with this alternative are predominantly negative. Construction of a new tunnel under the East River can adversely impact this waterway with possible harmful effects upon marine life. Another major concern is that the landmark status of NYCT's 33rd Street Station may preclude required construction for the passenger transfer connections to the new LIRR East Side Station. Temporary construction-related negative impacts include noise and vibration associated with cut and cover tunneling, and traffic disruptions caused by contractor staging areas blocking street lanes. A major long term negative impact would be the additional taxi cabs and bus vehicular traffic generated in an area which is presently constrained with peak hour congestion. Also, permanent project facilities such as ventilation shafts, electric substations and pedestrian station access facilities can result in negative visual impacts. In the overall evaluation, positive impacts on traffic and air quality due to reduced auto usage (232,520 fewer vehicle miles traveled) would not be sufficient to change the (- -) rating that reflects the significant negative impacts in this alternative.

This alternative facilitates enhanced travel to job opportunities for disadvantaged residents of Manhattan [eg., minority population groups in East Harlem and the Lower East Side]. Utilizing the new NYCT Lexington Avenue Line/LIRR transfer at East 33rd Street, these residents will have improved journey-to-work travel to employment areas near LIRR service. However, under this alternative, a new LIRR station in Long Island City will not be provided. Accordingly, disadvantaged residents of Long Island will have more limited travel to job opportunities [eg., potential employment in hospital facilities on Manhattan's East Side]. These conditions yield a rating of (+) for this equity measure.

Summarizing the above evaluation results, the travel time savings and the projected ridership for this alternative are comparatively favorable measures. However, critical community and environmental concerns are associated with this alternative, resulting in very negative ratings for each of these impacts. Another important consideration in the overall assessment is the degradation of service for the LIRR riders continuing to use Penn Station (52,700 projected in the AM peak) after this alternative becomes operational; i.e., the anticipated operating plan has all LIRR peak period trains stopping at the new East Side Station which can lengthen trip times to and from Penn Station by several minutes (depending on the dwell time required to entrain and detrain large numbers of passengers at the new station enroute). Thus, upon further evaluation, this alternative does not improve the quality of service and reduce travel time within the corridor between Long Island and East Midtown Manhattan and does not relieve LIRR train congestion at Penn Station New York.

Alternative VII. Sunnyside Transfer Station

(D) Long Island City Intermodal

Alternative	VII. Sunnyside Transfer Station D. Long Island City Intermodal
Impact on O&M Costs	- -
Capital Cost Range (1997 B.$'s)[1]	$0.40
Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. No Build)	2,008
2020 Avg. Wkdy. Riders Using New Facility[4] **(vs. No Build)**	16,622
SERVICE QUALITY	
Impact on Travel Time	+
Travel Time Savings[5] **(vs. No Build)**	234,863
Comfort & Convenience	+
Revenue Impact	++
Community Impacts	+
Economic Impacts	++
ENVIRONMENTAL IMPACTS	
Short & Long Term Impacts	0
Reduced Vehicle Miles Traveled[6] **(vs. No Build)**	33,455
Equity	++

1 Excludes property acquisition/real estate costs
2 HOV incremental linked trips include incremental bus trips
3 HOV volumes may increase after equilibration of demand and capacity
4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network
5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative
6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative
7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership
N/A Not Applicable

The additional O&M costs incurred after this alternative is operational are expected to be relatively minor: NYCT right-of-way maintenance expense (track, signals, third rail) within the limited subway extension; the cost to operate, maintain and clean the new intermodal station; and a slight increase in subway car maintenance expense due to the added annual car miles traveled in serving the new station. Accordingly, these O&M costs would only be moderately greater (less than 20%) than comparable costs for the No-Build Alternative. As a result, this alternative is assigned a rating of (-) for this measure.

It is estimated that capital costs for this alternative will be approximately $400 million for the transportation related facilities. Most of the construction expenditures will be required to build the multiple facilities of the new intermodal (NYCT/LIRR) station and the subway tunnel extension beneath active railroad trackage. Another major capital expenditure is for construction of a new bus terminal (including related roadway connections, etc.) to be built above railroad facilities as part of this alternative.

The proposed Sunnyside Intermodal Facility attracts considerably fewer riders than the other build alternatives which involve construction of a East Side Terminal. Only 2,008 new LIRR linked trips (compared to the No-Build Alternative) are projected for this alternative in Year 2020. Subway ridership in this time frame is projected to increase slightly more than LIRR patronage, with 2,170 additional weekday person trips-which is consistent with the proposed improvements which are mostly subway-related. A key deficiency in this alternative is its relatively limited impact on auto travel in the Long Island Transportation Corridor; weekday auto use is projected to decrease by only 2,160 person trips. With 660 fewer weekday bus trips forecasted, this alternative is expected to generate a net increase of 1,360 new weekday person trips.

Average weekday passenger boardings and alighting at the new LIRR Sunnyside Station is forecast to be approximately 16,620 compared to the No-Build Alternative in Year 2020. Also, it is important to note that under this alternative, relatively few LIRR weekday passengers are projected to discontinue using Penn Station, only approximately 20,880 (295,530 decreasing to 274,650). Thus, train congestion at Penn Station would not be significantly relieved with this limited decrease in weekday passenger usage.

Again, compared to the No-Build Alternative in Year 2020, average weekday boardings and alighting at Hunterspoint Avenue Station are projected to increase by 6,480, while weekday LIRR passenger usage at Long Island City Station is expected to decrease by 36 persons. These ridership forecasts indicate that use of existing Hunterspoint Avenue Station for transferring to the NYCT #7 Line will continue to be a key daily travel route to East Midtown Manhattan - even after the new LIRR Sunnyside Transfer Station is operational.

The above projected ridership data reflects the physical/operational configuration of this proposed alternative. The connecting subway, extended to the new Sunnyside Transfer Station from the 63rd Street Tunnel, would not directly penetrate East Midtown Manhattan; ie., this subway would be routed under Central Park to the west side of Manhattan. Passengers could transfer at the new LIRR Sunnyside Station to the nearby NYCT IND Queens Boulevard (E&F) lines for subway access to East Midtown Manhattan at 53rd Street. However, Penn Station also offers a convenient LIRR transfer to these NYCT Lines for connecting subway travel to East Midtown. Summing up, the new intermodal station at Sunnyside would not significantly improve access from the Long Island Transportation Corridor to East Midtown Manhattan (i.e., compared to existing LIRR connections at Penn Station and Hunterspoint Avenue Station) - as reflected by the limited ridership diversions under this alternative.

This alternative is projected to achieve relatively limited travel time savings, with projected savings of approximately 234,860 weekday person minutes (which is 36% of the comparable weekday person minutes projected to be saved under Alternative IV "A"). The proposed station could provide a convenient transfer for intermodal connections; but it must be recognized that the location of this station is not within convenient walking distance of LIRR passenger trip destinations. In view of these considerations, this alternative would provide for limited service quality improvements over the No-Build Alternative (rating of +).

Both LIRR and NYCT revenues are expected to increase with this alternative in place, which would normally yield a rating of (++) for this measure. However, these anticipated revenue increases would be incremental and would only represent a very small percentage increase of total revenues for each agency (especially NYCT) - based on the relatively few additional riders projected for this alternative. In view of the limited additional revenues expected to accrue to each agency, a rating of (+) would be most appropriate for this measure.

Very few community impacts are anticipated in implementing this alternative. Construction would not be required in Manhattan, and the tunnel extension and related construction in Queens, predominantly under Sunnyside Yard, would not significantly impact the community. Thus, local residents could expect only minimal, if any, affects from construction related concerns such as noise, vibration and public safety. In addition to this virtual absence of adverse community impacts, the new intermodal station with LIRR and NYCT service would provide some increase in travel options for community residents, resulting in a rating (+) for this measure.

The new station and related transportation facilities at Sunnyside could significantly support long term economic growth in this area of Queens, especially the potential air rights development at this location. Also, short term economic benefits would result from the construction jobs and related activities primarily involved in building the subway extension and the new intermodal station. The positive economic impacts under this alternative clearly result in a (++) rating.

To implement this alternative, a two track subway tunnel extension (1,300 to 1,500 feet long) must be constructed to connect with the proposed intermodal station. Although relatively short in length, the new tunnel would mostly be built under active railroad facilities. This construction could result in negative environmental impacts (excavation, removal of spoil, etc.). On the other hand, this alternative would also contribute to some reduction in auto vehicle miles traveled (2,160 fewer average weekday person trips by auto and approximately 33,460 fewer vehicle miles traveled compared to the No-Build Alternative). However, since this would only be a limited diversion from daily auto usage, it would only produce relatively limited positive impacts such as a minor improvement in air quality and some reduction in auto traffic congestion. Considering these potential negative and positive impacts, which tend to balance and cancel each other, the most appropriate rating for this measure would be (0) or a neutral finding.

In this alternative, disadvantaged residents of Manhattan as well as Long Island will have improved access to job opportunities with the new NYCT/LIRR Sunnyside transfer station in place. This new station will include facilities for intermodal bus transfers, further enhancing journey-to-work access for disadvantaged residents. While this alternative provides improved travel to jobs in western Queens, there would be only limited enhancement for employment access on Long Island. In assessing these factors, a rating of (++) would be most appropriate.

In summarizing this evaluation, the most significant measure is the forecasted ridership; i.e., the very limited number of new LIRR riders projected to use the new intermodal station is clearly a major deficiency - especially in relation to the magnitude of capital funds required for construction. Even though some of the above ratings are positive, the failure of this alternative to improve the quality of service and reduce travel time within the corridor between Long Island and East Midtown Manhattan is an overriding limitation. For this compelling reason, the alternative is being dropped from further consideration. However, in support of CBD development in this area of Queens, the LIRR has agreed to include a rail station serving Main Line tracks at Sunnyside in the vicinity of Queens Boulevard, in the build alternatives for an East Side Terminal. Thus, an important component of the proposed Sunnyside Transfer Station will be progressed as part of another build alternative.

2.1.4.3 Stage 2 Evaluation Summary

Results of the Stage 2 evaluation were reviewed further in assessing which alternatives should be advanced into the DEIS, leading to the selected preferred alternative. Surviving alternatives, in this screening process, were sufficiently dissimilar to compare their clearly different approaches to the overall transportation needs and study goals.

Accordingly, it was determined that only one of the four defined service-route options under Alternative IV (LIRR East Side Terminal) would be continued to the next level of evaluation. In this assessment, Alternative IV (A), LIRR to GCT via Main Line, was clearly found to be superior to the other three service-route options in meeting the study goals.

Alternative IV (B), LIRR to GCT via Montauk Branch, would be significantly more costly to build and yet attract fewer passengers than Alternative IV (A). The two optional service-routes to the proposed LIRR Third Avenue Terminal, Alternatives IV (C) and (D), would result in major negative community and environmental impacts; these two options would also attract fewer riders and incur much higher construction costs than Alternative IV (A) which is clearly the most beneficial service-route option.

Alternative III (Bus/HOV Lane) was also advanced for further evaluation to consider a non-rail (highway) transportation alternative, and because it provided for travel improvement within the study corridor on Long Island. However, further analysis indicated that this alternative had serious shortcomings and did not meet established project goals. Although the Bus/HOV Alternative is being dropped from further assessment in this study, a variation of this alternative is expected to be evaluated by the NYSDOT.

Alternative VII (D), LIRR Sunnyside Transfer Station, is interrelated with the current MTA Long Island City Transportation Needs and Opportunities Study. Input from this affiliated study provided design elements as input in defining the alternative for this evaluation. In addition, ridership projections for year 2020 were developed to assess the potential utilization of the proposed facilities. These forecasts clearly showed that the few new LIRR and NYCT riders generated under this alternative would be insufficient to warrant the high level of capital expenditures required for construction. Because of this very limited ridership growth relative to the magnitude of projected capital costs, this alternative has been dropped from further consideration. However, a new LIRR Sunnyside Station has been added to Alternative IV (LIRR East Side Terminal), primarily to support anticipated development in this area of Queens.

After further review during the Stage 2 evaluation, it was determined that Alternative VI (New East River Tunnel and East Side Rail Station) would not be continued into the next level of evaluation. In addition to these important negative factors, there are serious concerns that NYCT capacity (at the 33rd Street Station and aboard Lexington Avenue line subway trains) may not be sufficient to accommodate LIRR customers transferring at the new East Side Station (i.e., with LIRR morning peak trains arriving only minutes apart, thousands of transferring passengers may unsafely overcrowd the NYCT station platform while waiting for their subway connection).

Furthermore, the landmark status of the NYCT 33rd Street Station could preclude modifications to expand the capacity of this station as required. Also, construction across Manhattan, the building of the new station facilities and a new East River tunnel would unfavorably impact the environment. Accordingly, there are too many adverse constraints to warrant keeping this alternative in the study for further consideration.

Presented in Table 2.1-2 are the results for the Stage 2 evaluation summarized in a matrix of the evaluation measures. Table 2.1-3 summarizes weekday boardings and alightings at key existing and potential LIRR stations. Table 2.1-4 provides a summary of weekday link trips between Queens/Nassau/Suffolk Counties and Manhattan by Mode of Travel.

In summary, following this more extensive Stage 2 evaluation, one build alternative (LIRR East Side Terminal - GCT via Main Line) will be advanced into the EIS.

As a result of the analyses performed in connection with the Phase I MIS effort, three alternatives will be carried forward for additional analysis in the EIS. The other alternatives have been eliminated because they do not meet the project goals set forth in Chapter 1. The three alternatives to be advanced for the Long Island Transportation Corridor include: Alternative I (No Build), Alternative II (TSM) and Alternative IV A (LIRR East Side Terminal - GCT via Main Line), the Build Alternative.

TABLE 2.1-2

Preliminary Evaluation

Matrix of Evaluation Measures for Alternatives Advancing from Fatal Flaw Screening Analysis

Alternatives	Impact on O&M Costs	Capital Cost Range (1997 B.$'s)[1]	Incremental 2020 Avg. Wkdy. LIRR Linked Trips (vs. NoBuild)	2020 Avg. Wkdy. Riders Using New Facility[4] (vs. No Build)	SERVICE QUALITY: Impact on Travel Time	SERVICE QUALITY: Travel Time Savings[5] (vs. No Build)	SERVICE QUALITY: Comfort & Convenience	Revenue Impact	Community Impacts	Economic Impacts	ENVIRONMENTAL IMPACTS: Short & Long Term Impacts	ENVIRONMENTAL IMPACTS: Reduced Vehicle Miles Traveled[6] (vs. No Build)	Equity
I. No Build	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
II. TSM	-	$0.25 - 0.30	3,680	8,554	+	158,756	+	+	0	+	+	88,333	0
III. Bus / HOV Lane	-	$0.31 - 0.33	8,456[2]	11,800[3]	-	282,748	+	-	--	+	--	22,584	0
IV. LIRR East Side Terminal													
A. GCT via Main Line	--	$2.8 - 3.0B	23,909	179,257[7]	++	648,051	+++	+	-	++	+	293,473	++
B. GCT via Montauk Br.	--	$3.7 - 4.4B	20,434	167,895[7]	+	357,587	+	+	-	++	-	254,875	++
C. 3rd Ave. via Main Line	--	$3.3 - 3.9B	16,893	137,933[7]	++	389,894	++	+	--	++	--	209,813	+
D. 3rd Ave. via Montauk Br.	--	$4.2 - 5.0B	13,905	131,352[7]	+	144,606	+	+	--	++	--	179,475	++
VI. New East River Tunnel and East Side Rail Station	--	$2.8 - 3.0	15,364	174,759	++	756,740	++	+	--	++	--	232,524	+
VII. Sunnyside Transfer Station													
D. LIC Intermodal	-	$0.40	2,008	16,622	+	234,863	+	++	+	++	0	33,455	++

1 Excludes property acquisition/real estate costs

2 HOV incremental linked trips include incremental bus trips

3 HOV volumes may increase after equilibration of demand and capacity

4 Does not include Metro-North, Airport Access or other potential riders of seamless transportation network

5 Weekday person - minutes saved compared to Year 2020 No-Build Alternative

6 Weekday reduction in Vehicle Miles Traveled compared to Year 2020 No-Build Alternative

7 Reflects East Side Terminal Ridership plus new Sunnyside Station Ridership

N/A Not Applicable

TABLE 2.1-3
Weekday Boardings and Alightings
For Key LIRR Stations

Alternative	Penn Station	Hunterspoint Avenue	Long Island City	Flatbush Avenue	GCT	Third Avenue Terminal	Sunnyside Station	East Side Station	Long Island City Intermodal
Base 1990	211,300	8,100	370	26,400	-	-	-	-	-
I. No Build 2020	295,500	3,500	110	27,300	-	-	-	-	-
II. TSM	286,000	12,000	510	29,000	-	-	-	-	-
III. Bus/HOV Lane	277,800	3,100	80	27,000	-	-	-	-	-
IV. LIRR East Side Terminal A. GCT via Main Line	142,400	460	50	27,300	174,500	-	4,700	-	-
B. GCT via Montauk	149,700	470	50	28,100	162,600	-	5,300	-	-
C. 3rd Ave via Main Line	171,800	460	50	31,500	-	134,100	3,900	-	-
D. 3rd Ave via Montauk	175,700	460	50	31,500	-	127,400	3,900	-	-
VI. New East River Tunnel and East Side Rail Station	138,100	1,800	100	27,000	-	-	-	174,800	-
VII. Sunnyside Transfer Station D. LIC Intermodal	274,700	10,000	80	27,500	-	-	-	-	16,600

TABLE 2.1-4
Weekday Linked Trips Between Queens / Nassau / Suffolk Counties and Manhattan by Mode of Travel

	1991 Base (BS90)	2020 Pop/ Emp and 1990 Network (NOBL)	Year 2020 No Build (NB20)	Transp. Systems Mgt	Sunnyside Intermodal Terminal	LIE HOV	LIRR East Side Rail Station	LIRR to GCT
Automobile	391,000	438,000	421,000	421,000	420,000	421,000	412,000	411,000
Commuter Rail/LIE Bus								
Penn Station	211,000	252,000	296,000	285,000	274,000	278,000	138,000	142,000
Grand Central	0	0	0	0	0	0	0	174,000
East Side Rail Station	0	0	0	0	0	0	174,759	0
LIE Bus	0	0	0	0	0	19,000	0	0
Hunterspoint Avenue	8,000	10,000	3,000	12,000	11,000	3,000	2,000	0
Long Island City	0	0	0	1,000	0	0	0	0
Sunnyside	0	0	0	0	16,000	0	0	6,000
Flatbush Avenue	26,000	31,000	27,000	29,000	28,000	27,000	27,000	27,000
SUBTOTAL	**245,000**	**293,000**	**326,000**	**327,000**	**329,000**	**327,000**	**341,759**	**349,000**
Local HPA/FBA Trips	(10,000)	(14,000)	(16,000)	(16,000)	(18,000)	(16,000)	(17,000)	(21,000)
TOTAL	**235,000**	**279,000**	**310,000**	**311,000**	**311,000**	**311,000**	**324,759**	**328,000**
Subway	714,000	793,000	796,000	791,000	797,000	790,000	794,000	791,000
Bus	51,000	56,000	52,000	58,000	51,000	58,000	51,000	50,000
GRAND TOTAL	**1,391,000**	**1,566,000**	**1,579,000**	**1,581,000**	**1,579,000**	**1,580,000**	**1,581,759**	**1,580,000**

Note: Travel reported in terms of one-way trips. A round trip commute would appear as 2 one-way trips.

2.2 No-Build Alternative

The No-Build Alternative consists of the transportation facilities and transit services, relevant to the LIRR East Side Access MIS/DEIS, as they exist today in the Long Island Transportation Corridor and elsewhere in the New York Metropolitan Region. The No-Build Alternative includes:

1. Capital improvements by transit and highway agencies relevant to the LIRR East Side Access MIS/DEIS where the commitment and the financing for the improvements are in place and where the improvements will be constructed.

2. Capital improvements defined to be System Improvement or Network Expansion by the MTA which will be, or are in the process of being constructed, by the end of 1999. State of Good Repair and Normal Replacement projects are assumed to continue at historical levels of spending.

3. Relevant planned operational changes that will be in place by 2010.

4. Minor transit service expansions and/or adjustments that reflect a continuation of existing service policies into newly developed areas that will be in place by 2010.

The following is a listing of the mass transit and highway improvements that are included in the baseline No-Build Alternative definition:

2.2.1 Long Island Rail Road

Due to the increase in ridership from Eastern Long Island that the LIRR has experienced over the past decade, along with the projected continued growth, the LIRR has begun a series of initiatives targeting increased service levels. The following are included within the No-Build Alternative:

- **Dual-Mode Locomotive and Bi-Level Coach Acquisition.** Sufficient Dual-Mode (DM) locomotives will be provided to the LIRR in September 1998 and start to enter revenue service by November 1998 to begin operating the proposed eight dual-mode trainset cycles to Penn Station. The new coaches will be hauled by 23 diesel electric (DE) locomotives that will be delivered to the LIRR in the first half of 1998 and are projected to begin entering service by February 1998. Full DE implementation is projected to be completed by July 1998. The purchase of this new equipment will offer passengers in diesel territory a one-seat ride into Penn Station while improving train service on those branches. (New bi-level coaches will provide an additional 13 to 17 seats per car in a 2x2 seating configuration.) In an effort to meet future growth, the LIRR has purchased 134 bi-level units, 23 of which will be cab cars; this new fleet may be supplemented by modifying the 10 existing bi-level cars.

The bi-level fleet will be stored and maintained in expanded yards at Port Jefferson, Oyster Bay, Speonk, Richmond Hill, Long Island City and the West Side Yard in Manhattan. These yard expansions are currently in design and are scheduled for construction beginning in 1997. This construction work will last through 1999. Yard capacity and equipment needs include an 11% service or spare margin.

2.2.1.1 Extension of Platform 11 at Penn Station New York

The recent extension of Platform 11 and the new Ladder Track F, completed in September 1996, serves Tracks 20 and 21 in Penn Station and is ideally suited to handle incoming (i.e., westbound) trains. This platform formerly accommodated only eight cars. Extending Platform 11 removed an operating constraint, and eliminated the need to reserve this platform for shorter length trains, which maximizes operational flexibility.

As shown in Figure 2.2-1, the extension of Platform 11 to accommodate 12-car trains eliminates the use of "C" Yard to store 10-car LIRR trains and provides access to the West Side Yard. LIRR has lengthened C Yard Tracks 8, 9 and 10 to the west in order to restore the former train storage function.

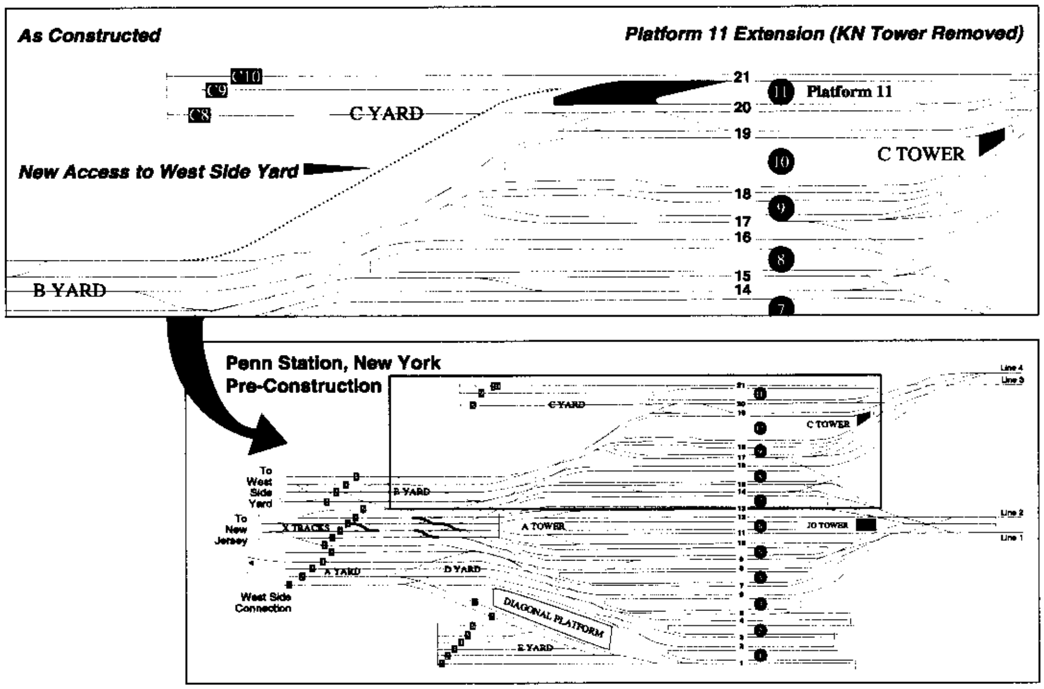
The lengthening of Platform 11 offers an immediate tangible improvement to LIRR customers and terminal managers. It provides Penn Station New York with universal platform access for all arriving LIRR trains regardless of length, creating more operating flexibility. It also reduces crossover conflicts at "C" Interlocking at a time when prompt movement of trains to the platforms is essential. This improvement therefore aids Amtrak/NJ Transit operations as well, since it expedites unloading of arriving trains, reduces platform dwell times, and leads to a more fluid operation throughout the entire station complex. It also allows the platforming of full length (12-car) trains on Track 19 (which is adjacent to the widest platform in Penn Station). Previously, the platforming of more than eight cars on Track 19 caused either interlocking conflicts on the east end or west end of Penn Station and/or longer dwell times because of critical signal spacing. The extension of Platform 11 therefore also eliminated most of the problems associated with using Track 19.

2.2.1.2 Platform 7 Connection to West Side Yard

The design of the West Side Yard was based on the concept of universal access; that is, a train on any station track should be capable of directly reaching any West Side Yard track. The Platform 7 (U Ladder) Connection is consistent with that concept (see Figure 2.2-2). The lack of direct access from Tracks 13 and 14 to the yard has put a capacity and reliability constraint on current operations at Penn Station. LIRR trains assigned to Platform 7 (Tracks 13/14) must reverse direction to permit the arrival of following trains, thereby increasing platform dwell time and occupying critical tunnel and interlocking slots. During periods of disruption, when maximum operating flexibility is essential, LIRR operating personnel are deprived of fully utilizing Tracks 13 and 14, since they cannot be supplied with equipment from the large pool of trains stored in the West Side Yard.

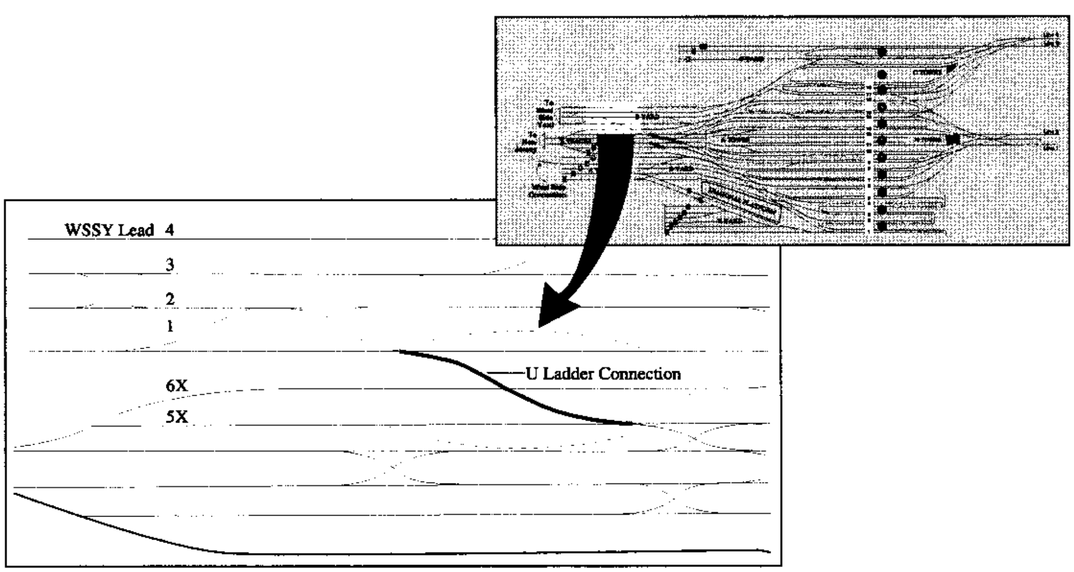
In accordance with the terms and conditions of the Joint Facility Agreement (between the LIRR and Amtrak) which was in force when the West Side Yard was designed, it was necessary to obtain the consent of Amtrak for changes to appurtenances or facilities required for the connection of the West Side Yard to the tracks and interlockings at Penn Station. Accordingly, Amtrak agreed to lease all of B Yard to the LIRR for the purpose of constructing lead tracks, the ramp and the installation of crossovers and signals to control access to the Yard. Amtrak and LIRR have more recently agreed to the U Ladder Connection to provide yard access from Platform 7.

The early completion of this connection continues to be a high priority to improve the present operation of the terminal.



Extension of Platform 11
Penn Station, New York

Figure 2.2-1



Platform 7 Connection

Figure 2.2-2

2.2.1.3 Expansion of Parking Facilities

To accommodate increased LIRR ridership under the No-Build Alternative, additional parking spaces will be required at certain stations. These stations are located on those branches (Port Jefferson - Diesel, Ronkonkoma - Diesel, Montauk and Oyster Bay) that are going to experience train diversions from Hunterspoint Avenue and/or Long Island City directly into Penn Station.

The total parking demand for the No-Build Alternative is estimated to be approximately 15,365 spaces above existing LIRR parking capacity.

2.2.1.4 Woodside Station Rehabilitation and Platform Extension

Located at the junction of the LIRR Port Washington Branch/Main Line and the New York City Transit's #7 Flushing Line, Woodside Station provides a unique and critical transfer facility. The northerly alignment of the Port Washington Branch precludes its connection to Jamaica Station, thereby confining inter-branch transfers to Woodside and Penn Station. Providing improved transfer opportunities at Woodside Station saves approximately 20 minutes from the overall travel times between branches (i.e., between Shea Stadium/U.S. Open and Port Washington Stations and eastern Long Island). This station also provides for the following intermodal connections:

- Primary access from the Port Washington Branch to Manhattan's East Side via the NYCT's #7 Flushing Line.
- Secondary access from the remaining LIRR branches to NYCT's #7 Flushing Line. Primary access is attributed to Hunterspoint Station, although it has limited weekday peak period scheduling.

This project, now under construction, will provide three new 12-car long high level platforms to replace one eight-car high level platform and two six-car platforms. Other improvements include three elevators and enhancements for ADA access; new access ramps; an audiovisual and high level public address system; improved station lighting and new train destination signs; a renovated ticket office; relocation of signal cables and high tension wires; and new station signage. The replacement of deteriorated platforms and renovation of station facilities is essential to ensure customer safety. The longer station platforms will improve service at Woodside by enabling more LIRR trains to stop at this station while providing platform access to all cars.

2.2.2 New York City Transit

The most significant improvement planned by NYCT during this timeframe is the 63rd Street Tunnel Connector, a 1,500-foot connection between the NYCT's upper level of the 63rd Street Tunnel and the IND Queens Boulevard subway line. This connection will enable the routing of four additional express trains per hour through the 63rd Street Tunnel. NYCT operations planning has allocated 12 trains per hour (up from eight) for extending the Q service from Sixth Avenue in Manhattan to the Queens Boulevard Line. The remaining 18 trains per hour along the Queens Boulevard express tracks will be allocated to the E Route from Jamaica destined for Eighth Avenue. In addition, the F service will be converted to an exclusively local service, and will continue to operate at present levels through the 53rd Street Tunnel.

This project will also reduce the amount of time that passengers spend in overcrowded conditions by an aggregate of nearly 20,000 hours per day.

2.2.3 NJ Transit

Beyond normal passenger growth projections scheduled to occur before the project target year (2020), NJ Transit plans to dramatically increase ridership by improving the interconnectivity of the system with additional terminal destinations and one-seat rides. The following initiatives are included within the No-Build Alternative:

2.2.3.1 Kearny Connection and Secaucus Transfer

The most immediate improvement which NJ Transit recently built is the Kearny Connection, marketed under the MIDTOWN DIRECT service name. This project consisted of the construction of track connections between the eastbound and westbound NJ Transit Morris & Essex Lines and the double-track Amtrak Northeast Corridor (NEC) which passes overhead at Kearny. This connection, under consideration since the 1960's, permits direct Morristown Essex Lines train service into and out of Penn Station New York, eliminating the need for midtown passengers to travel to Hoboken and then transfer to PATH to reach destinations in Midtown Manhattan. Future plans for NJ Transit operations include 10 Morris & Essex trains arriving at Penn Station New York between 7 - 10 AM. Full implementation of the Kearny Connection includes the ½ mile extension of the Montclair Branch to the Boonton Line, and the electrification of this line to Great Notch.

In addition to the above mentioned project, the new Secaucus Transfer Station (sometimes referred to as Allied Junction) is currently under construction. This station features platforms on two levels intersecting each other at right angles, providing a common transfer point. The upper level platforms will serve the Northeast Corridor Line to and from Penn Station New York, while the lower level platforms will serve customers using NJ Transit's Main Line, Bergen County Line, Pascack Valley Line and MNR's Port Jervis Line. This new station will provide transferring customers a more direct routing to Penn Station New York. Currently, customers bound for Penn Station New York must travel to Hoboken and then transfer to connecting PATH service. Customers bound for Midtown Manhattan from the Main Line, Bergen County Line, Pascack Valley Line and Port Jervis Line will save up to 25 minutes by using the Secaucus Transfer Station.

A track configuration at Secaucus Station for the Northeast Corridor High Line has been approved by Amtrak and construction is underway. The existing double-track Northeast Corridor Line will be expanded to four tracks through the station site, with high level platforms serving each track. The recommended design includes a complex arrangement of trackage that will permit through non-stop service (for Amtrak and NJ Transit trains) plus tracks for (NJ Transit) trains serving Secaucus transfers. This arrangement will separate non-stop trains from stopping service. Also, the proposed layout includes pocket tracks to allow the reversal of possible future shuttle trains between Secaucus and Penn Station New York, and provides for a possible track connection to the NJ Transit's Boonton Line (which runs to the west of the new Secaucus Transfer Station).

As this section of trackage will have increased train traffic in the future, there are two signaling upgrades planned to meet operational demands. The first is an interim signal upgrade to allow an increase from 17 to 19 trains per hour; this upgrade has been completed. Two code change points were relocated between A Interlocking and the New Jersey side of the North River Tunnel portals to adjust their block distances.

The second signal system upgrade is the installation of the High Density Signal System which will permit up to 30 trains per hour to operate over the High Line. This installation is required to operate the proposed levels of NJ Transit and Amtrak Northeast Corridor service through the Secaucus Transfer Station. Otherwise it will be impossible to maintain the train throughput required to operate planned service levels at the Secaucus Station and maintain schedule reliability into Penn Station New York.

2.2.3.2 Hamilton Station

NJ Transit will augment their service along the Northeast Corridor by constructing a new station in Hamilton, New Jersey, which will be located between the Princeton Junction and Trenton Stations. This new station stop will include a bus maintenance and storage garage with a maximum indoor storage capacity for approximately 80 coaches and will replace the outdated Mercer Garage in Trenton. Also included in the overall makeup of the station will be parking facilities that can accommodate 1,600 to 1,700 automobiles. The completion date for the construction of this station has yet to be determined.

2.2.4 Amtrak

Amtrak is currently funding two major capital/operational projects: 1) initiation of a new High Speed Train service on the Northeast Corridor and 2) the creation of a new passenger facility within the Farley Post Office Building. Both projects will impact the future capacity of Penn Station.

2.2.4.1 High Speed Electrified Service: New York to Boston

Several years ago, the Coalition of Northeast Governors (CONEG) created a High Speed Rail Task Force to investigate the feasibility, applicability and benefit to the region of improving rail service in the northeastern states. Travel congestion on other modes was recognized as a problem in the New York-Boston area, and improved rail passenger service was identified as a solution to help relieve that congestion. Amtrak has been working jointly with CONEG to identify the improvements necessary to reduce running times so that rail travel between New York City and Boston can be as competitive a travel mode as the New York-Washington segment of the Northeast Corridor.

The success of Amtrak's New York to Washington segment has been the result of significant capital investments, frequent train service and reduced running times. Amtrak has identified those steps necessary to establish a similar operation north of New York. Reducing running times and offering frequent, reliable service are the suggested solutions to achieving a financially successful service. This issue has been studied by Amtrak and CONEG, and Amtrak has recently awarded a new high speed trainset and electrification project contract. Completion of electrification between New Haven and Boston and inauguration of new high speed train service are planned for 1999.

Various infrastructure improvements are necessary to support a reliable operation and reduce maintenance costs. Full electrification from New Haven to Boston (coupled with improvements on the Metro-North portion of the Northeast Corridor) is necessary to reach the desired goal of a three hour rail travel time between New York City and Boston. Amtrak also believes that retention of the full four track system on Metro-North's portion of the Northeast Corridor is necessary to ensure reliable high speed operation with the service frequency increases they contemplate for travel to/from Boston.

In addition to the above mentioned improvements, as part of the new High Speed Rail initiative, a new Service & Inspection Shop, dedicated to maintaining the new high speed trains will be constructed in the northeastern portion of Sunnyside Yard. Under normal operations, access into this new shop will be from the Yard Loop Tracks. Trains will exit this shop by continuing westward to either a new high speed trainset storage yard, or by continuing through Sunnyside Yard to rejoin the Main Line into Penn Station New York.

2.2.4.2 Farley Post Office Building

New York City is Amtrak's largest and most important market. Approximately eight million annual travelers, or 38 percent of Amtrak's total national ridership, begin or end their trips in Penn Station New York. This figure is expected to increase after the electrification of the New York to Boston service is completed. Because of the importance of Penn Station, rail passengers currently experience severe overcrowding at this station during weekday and holiday peak travel periods. Expected increases in commuter traffic will soon exacerbate this problem. To make matters worse, waiting areas and public circulation space are limited. In addition, the mechanical system is in need of complete replacement and the station lacks adequate ingress and egress. Finally, although there is a significant retail presence in the station, it has not been exploited to its full potential.

Amtrak contracted to develop a Master Plan for Penn Station, whose implementation will result in a first class passenger facility that will accommodate all foreseeable growth in Amtrak and overall commuter ridership. The plan will bring the station in compliance with the ADA requirements, address building deficiencies, add a new mechanical system and upgrade the employee facilities for over 2,000 Amtrak employees which will result in increased passenger and retail revenues and improve the efficiency of Amtrak and commuter rail operations. This project will complement ridership increases from the Northeast High Speed Rail Improvements Project and help solidify Amtrak's position in the New York City market.

The creation of a new Amtrak Station in the James A. Farley Building (JAF) on 8th Avenue between 31st and 33rd Streets (directly west of Penn Station) would segregate Amtrak from the commuter operations, and give Amtrak its own identity above ground in an historic landmarked building. This building was designed by McKim, Mead and White, the architects who designed the original Penn Station Building which was demolished in 1964. The design of the new station includes a monumental glass-enclosed parabolic arch, that would rise 120 feet to crown the main Amtrak concourse and commercial areas. Under the JAF Plan, track capacity would be slightly increased by converting half of the mail platform (Diagonal Platform) to a passenger platform for Empire Service trains. The Plan would also include expanding an existing underground connection to Penn Station on 33rd Street. The current Penn Station will then be utilized by LIRR, NJ Transit and additional retail tenants.

It is estimated that this entire project, including a modest renovation of the existing Penn Station, complete rehabilitation of the Service Building, upgrading of the West 33rd Street Passage and conversion of JAF to an Amtrak station would cost approximately $315 million. With the completion of this plan, Amtrak will have successfully transformed four New York City blocks into an inter-city rail/commuter urban mass transportation zone serving in excess of 500,000 passengers per day.

2.2.5 Metro-North Railroad

2.2.5.1 Mid-Harlem Line Track (Mt. Vernon West to Crestwood)

This major service expansion project will upgrade an existing third track between the Mt. Vernon West Station and Fleetwood Station and construct a new third track between the Fleetwood and Crestwood Stations. This two-track segment on the Harlem Line, which is the most intensively used section of the entire MNR system, is fast approaching full service capacity. The proposed third track would provide sufficient capacity to meet the needs of MNR's Service Plan (which calls for eight additional AM and PM peak period trains on the Harlem Line by the year 2001). Although this territory is equipped with the Train Control System (TCS) for bi-directional train usage, existing outbound reverse peak and deadhead trains preclude extensive use of this trackage for added peak direction service. A third track between Mt. Vernon West and Crestwood would also provide for significant expansion of express service. This added track also provides for operating capacity/flexibility during ongoing Harlem Line maintenance as well as in emergencies that may disrupt service.

2.2.5.2 Wassaic Extension

This significant network expansion project consists of extending the Harlem Line from Dover Plains north to Wassaic in the Town of Amenia. This project includes the installation of a single-track, approximately six miles in length, two new stations, parking and the construction of a rail yard and maintenance building. The station at Wassaic will have a four-car high-level platform. The station at Taconic Development Disabilities Services Office (DDSO) will be a one car high-level platform. This project is an integral part of the expanded Dover Plains/Upper Harlem through-service, and will expand MNR's service territory. Weekday/weekend service will be expanded to include commutation to New York City, White Plains, intermediate stations, off-peak travel from the extended service areas, weekend travel to Dutchess County, and reverse commutation.

Metro-North began construction on the improvements in 1997 and scheduled passenger rail service is expected by the end of 1999.

2.2.6 Highway Improvement Projects

Various improvements to the region's highway system scheduled for implementation in the relevant time frame include the following:

- Installation of electronic toll collection (E-ZPass) at all MTA Bridge & Tunnel facilities.

- Interconnection of traffic signals in Mineola to increase traffic capacity.

- Construction of a 4th Lane for High Occupancy Vehicles (HOVs) on the Long Island Expressway between Exits 30 and 49 and between Exit 57 and 64, as well as reconfiguration segments of the service road.

- Construction of two additional lanes on a segment of County Road 97 in order to increase capacity.

- Reconstruction of Sunrise Highway (NY Route 27) mainline to a 6 lane expressway with service roads and grade separated intersections between Pond Road and Lakeland Avenue.

- Reconstruction of Jericho Turnpike (NY Route 25) to provide through lanes and continuous left turn lane (NY Route 111 to NY Route 347).

- Reconstruction of Jericho Turnpike to provide 5 lanes (County Route 83 to County Route 21).

- Construction of grade separation and modified cloverleaf Jericho Turnpike and County Route 97 (Nicolls Road).

- Provision of left turn lane and traffic signal upgrade Hempstead Turnpike (NY Route 24) (Nassau Road to Front Street).

- Construction of eastbound and westbound through lane and bridge modification on Northern State Parkway (Meadowbrook Parkway to Wantagh Parkway).

- Elimination of the LIRR Main Line/Herricks Road grade crossing.

2.3 Transportation Systems Management (TSM) Alternative

2.3.1 Introduction

The Transportation System Management (TSM) Alternative comprises a package of five possible initiatives which seek to maximize the utility of the current transportation system specific to the Long Island to East Midtown travel corridor. These TSM initiatives demonstrate the extent to which mobility within this corridor can be improved without a major investment in new facilities.

The TSM Alternative consists of a group of low-cost capital improvement strategies to improve mobility by optimizing the existing transportation network. The TSM Alternative also serves as a baseline for evaluating the added costs and benefits of the more costly Build Alternative. Philosophically, the TSM alternatives generally emphasize improvements in highway and transit service via incremental operational and physical improvements and other focused transportation and traffic solutions.

The five initiatives which make up the TSM Alternative, all or most of which could be instituted simultaneously during a five to ten year period, include the following:

- **Increase the number of railcars on peak LIRR trains** (up to the limit of 12 railcars, which is the maximum LIRR platform length) to and from Penn Station New York, before increasing the number of trains serving Penn Station. Implementing this initiative would increase the capacity of the Port Washington Branch by up to 20% by increasing the number of cars on some trains during the AM peak period by two railcars. To handle such longer trains (up to 12 railcars in length) would also require lengthening selected station platforms, and reconfiguring various east end terminal yard tracks to allow longer trains to be stored. At the Great Neck Station on the Port Washington Branch, the pocket track will need to be extended an additional 170+ feet, while the Port Washington Station and yard tracks will need to be lengthened to accommodate these longer trains.

- **Increase the number of LIRR trains serving Hunterspoint Avenue (HPA) Station and Long Island City (LIC) Station,** with LIRR passengers transferring to connecting subway or ferry services to complete their trip into East Midtown Manhattan. This would include operating New York City Transit's #7 Flushing Line subway service at maximum reliable capacity to handle the increase in LIRR riders transferring to the subway at Hunterspoint Avenue Station. Additionally, a new Long Island City shuttle bus route would be established to distribute LIRR passengers arriving at Hunterspoint Avenue Station to the 23rd Street (Ely Avenue), Queens Plaza and Queensboro Plaza subway stations.

- **Operate more frequent ferry service between the Long Island City Ferry Terminal in Long Island City, Queens, and East 34th Street in Manhattan,** and then coordinate these services with the LIRR to provide a "seamless" transfer service. Connecting shuttle buses in Queens will meet LIRR trains at the Hunterspoint Avenue LIRR Station to convey LIRR customers to the Long Island City Ferry Terminal. On the Manhattan side, timed, connecting buses will distribute ferry riders to Midtown Manhattan destinations along 34th Street, 42nd Street and 49th/50th Streets.

- **Implement a discrete PM service pattern for operating trains through the East River Tunnels in late afternoon and evening peak hours** to reduce tunnel conflicts entering into or exiting Penn Station and at Harold Interlocking, as a result of operating additional LIRR trains as envisioned with the 2010 Operating Plan. The implementation of a discrete PM operating plan through the East River Tunnels would be accomplished by reversing the flow of traffic through selected East River Tunnels for four hours in the PM peak period.

- **Extend the Long Island Expressway Bus/HOV contra-flow lane to the Grand Central Parkway interchange.** This concept would extend the existing AM only, westbound Long Island Expressway (LIE) High Occupancy Vehicle (HOV) lane between the Queens-Midtown Tunnel toll plaza and Greenpoint Avenue in Queens, further east to 102nd Street in Corona, Queens. This essentially extends the existing westbound HOV lane another 3.6 miles, to start near the Grand Central Parkway interchange. Following current LIE Bus/HOV lane operation, this lane would be in operation during the morning peak period, in the westbound direction only; there would be no Bus/HOV lane exclusive operation during the afternoon or evening peak period along the LIE.

2.3.2 Definition of TSM Components

This section describes in more detail the various components of the TSM Alternative.

2.3.2.1 Increase the Number of Railcars on LIRR Peak Trains

2.3.2.1.1 Physical and Operational Description

Under this TSM initiative, LIRR trains on heavily used branches will be increased in length by adding two or four railcars, thereby increasing the capacity of each train. This measure seeks to maximize the capacity of selected peak trains, to and from Penn Station New York, where it is difficult to schedule additional trains due to limited East River tunnel capacity. Whenever possible, these extra cars will be reassigned from other, lighter used branches, rather than purchasing new railcars; nonetheless, some 12 new Electric Multiple Unit (EMU) railcars, 26 bi-level diesel coaches and seven DE-30 locomotives (all including maintenance spares) will need to be purchased to cover the increased fleet requirements.

2.3.2.1.1.1 Right-of-Way Requirements

No new rail right-of-way is required under this alternative. However, the LIRR may want to consider at some later date, depending on usage and service growth, partially or fully double tracking the right-of-way between Great Neck and Port Washington.

2.3.2.1.1.2 Trackwork

This initiative will require some limited track reconfiguration, primarily to accommodate the added length of operating 12-car trains.

Track reconfigurations are required at the following locations:

- **Great Neck Station:** The pocket track at the Great Neck station will need to be extended an additional 170+ feet in order for the longer 12-car trains to reverse direction at this station. The extension of the pocket track 170+ feet eastward would require simple grading, relocation of a LIRR signal bungalow, relocation of aerial cables and the extension of an existing retaining wall. This proposal also includes a direct connection from the eastward Number 2 Track into the pocket track. The direct connection would enable a train to move into the pocket track without interfering with traffic on the single main track east of the station.

- Layup tracks at other various Long Island east end stations will need to be extended to allow these longer trains to be stored, including Babylon, Huntington, Long Beach and Port Washington stations.

2.3.2.1.1.3 Structures/Tunnels

No new bridge or tunnel structures are required under this initiative.

2.3.2.1.1.4 Traction Power

No new railroad electrification is required under this TSM initiative. However, in conjunction with extending the Great Neck layup track, it will be desirable (but not essential) to extend the contact (third) rail the same 170 foot distance that the pocket track is being extended. Also, there will be additional third rail installed consistent with any extension of yard trackage.

2.3.2.1.1.5 Signals and Communications

A signal bungalow located in the proposed alignment of extended Track 2 into the existing Great Neck pocket track will need to be relocated, in order to allow this pocket track to be entered directly from the eastbound station platform. Minor signal modifications might be required at the Port Washington Station yard tracks to support the reconfigured yard tracks. No signal modifications are necessary for the Port Washington Station tracks.

2.3.2.1.1.6 Stations

In conjunction with the increase in train lengths on the Port Washington and Long Beach Branches, selected station platforms along these branches will require lengthening. Whether a particular platform is lengthened will depend upon ridership volume at that station, the availability of property to allow the extension, any required major track reconfigurations and any other special conditions which may preclude a platform extension (such as difficult site conditions, environmental concerns, etc.).

The proposal is to lengthen the platforms at the following stations: Port Washington, Plandome, Manhasset, Great Neck, Little Neck, Douglaston, Bayside, Broadway and Flushing Main Street.

2.3.2.1.1.7 Parking

To accommodate increased LIRR ridership under this initiative (Increase the Number of Railcars on LIRR Peak Trains), additional parking spaces will be required at certain stations. These stations are located on those branches (Port Jefferson, Main Line, Babylon, Long Beach and Port Washington) that are going to experience increases in the consists on some of their westbound AM peak trains. It is estimated that approximately 8,561 additional parking spaces will be required to meet parking demand under this operating scenario.

The total parking demand for the TSM Alternative is estimated to be approximately 15,713 spaces above existing LIRR parking capacity.

2.3.2.1.1.8 Maintenance Facilities/Depots

No new LIRR maintenance facility will be required for this initiative.

2.3.2.1.1.9 Rolling Stock

Twelve additional Electric Multiple Unit (EMU) railcars, 26 additional bi-level coaches and seven additional DE-30 locomotives will be required to serve this alternative. To avoid the need to purchase even more additional railcars, 24 existing railcars will be reassigned from other comparatively lightly used trains to provide longer trains on the above mentioned branches, and 20 EMU cars will be made available from the substitution of diesel trains, resulting in a net requirement of 12 additional EMUs, including maintenance spares.

2.3.2.1.2 Operating Plans

By lengthening some westbound LIRR trains during the 6 - 10 AM weekday peak period, the existing passenger capacity into Penn Station will be increased, thus resulting in more efficient use of the current track capacity and the signal system. Similarly, added cars will be assigned to selected trains departing Penn Station New York during the 4 - 7 PM weekday peak period. Penn

Station utilization has reached a point where it is just about physically impossible to add any more peak hour trains under the current operating plan— therefore, to add needed ridership capacity, one proposal would be to add cars to the most heavily used branches by taking cars from underutilized trains throughout the system.

Adding extra cars to each affected train will increase the capacity of that train by approximately 120 seats per additional car. The proposal specifically calls for adding M-1 or M-3 type EMU cars on those trains running on the electrified portion of the LIRR serving the following branches: Long Beach, Babylon, Port Washington and Port Jefferson (Main Line). The methodology used to determine which trains would need to be lengthened involved analyzing the percent change in ridership by branch from the present (1990 baseline) to the year 2020 (the year by which the TSM alternative would be implemented). The percent growth for each branch as a whole was applied to each peak period train on that branch to see if the estimated growth exhibited on that train from 1990 to 2020 required added cars (allowing for approximately 100 standees per train west of Jamaica). Table 2.3-1 illustrates the percent growth forecasts from 1990 to 2020.

TABLE 2.3-1
LIRR Ridership Percent Growth 1990 Base to 2020 TSM

Branch	1990 Network	2020 TSM	% Growth
Babylon	28,881	37,283	29%
Far Rockaway	9,052	11,632	29%
Hempstead	6,137	7,991	30%
Long Beach	7,790	9,802	26%
Montauk	3,313	5,133	55%
Oyster Bay	2,783	4,210	51%
Port Jefferson (diesel)	5,279	8,577	62%
Port Jefferson (electric)	20,860	28,559	37%
Port Washington	17,150	21,878	28%
Ronkonkoma	13,722	19,605	43%
West Hempstead	2,396	3,081	29%

Source: **Major Investment Study/Draft Environmental Impact Statement for the Long Island Transportation Corridor, Long Island Rail Road East Side Access Study,** Ridership Forecasting Results Analysis KPMG Peat Marwick, LLP, April, 1997.

2.3.2.2 Increase the Number of LIRR Trains Operating into Hunterspoint Avenue and Long Island City Stations.

2.3.2.2.1 Physical and Operational Description

To better manage train and passenger traffic into Penn Station New York, the number of LIRR diesel trains serving both the Hunterspoint Avenue and Long Island City stations will be increased, diverting a portion of East Midtown-bound LIRR customers away from Penn Station in the weekday morning and evening peak periods. Passengers will be able to transfer to increased NYCT #7 Flushing Line subway service, or to newly introduced shuttle buses which will take them to other subway routes accessing East Midtown Manhattan, or to transfer to connecting buses which will take them to the Long Island City Ferry Landing (where they can transfer to increased ferry service to East 34th Street in Manhattan, and onto connecting shuttle buses).

2.3.2.2.1.1 Right-of-Way Requirements

No new rail right-of-way is required under this TSM initiative.

2.3.2.2.1.2 Trackwork

This initiative will require reconfiguring tracks at two locations, primarily to accommodate the increased number of trains operating into Long Island City and Hunterspoint Avenue.

- **Long Island City Yard and Station.** The Long Island City Station is currently configured with two low-level station platforms, with an adjacent yard which provides mid-day train storage on 12 tracks. To allow several trains to load and unload simultaneously and to reduce conflicting yard movements, the existing yard tracks under this alternative would need to be realigned to provide four 850 foot-long, high level island platforms serving eight tracks. High level island platforms are required because the new bi-level cars on order are only accessible via high level platforms. An 850 foot-long high level platform will permit 10-car bi-level trainsets to operate into Long Island City.

- **Hunterspoint Avenue Station.** Additional track and platform capacity may need to be provided to accommodate the increase in trains at the Hunterspoint Avenue LIRR Station.

2.3.2.2.1.3 Structures/Tunnels

No new bridge or tunnel structures are required under this initiative.

2.3.2.2.1.4 Traction Power

No new railroad electrification is required under this initiative.

2.3.2.2.1.5 Signals and Communications

Minor signal modifications will be required at Long Island City Yard and Station and at Hunterspoint Avenue Station to support the reconfigured yard tracks and station platform configurations.

A common dispatching system installed at both the Long Island City Ferry Landing and the LIRR Long Island City Station will permit coordinated ferryboat departures and LIRR train arrivals and vice versa. A new electronic sign and public address system at both the railroad station and the ferry terminal could provide information regarding train and ferryboat departures.

2.3.2.2.1.6 Stations

LIRR's Hunterspoint Avenue Station and Long Island City Station would be modified to support the increase in peak hour train frequency.

- **Hunterspoint Avenue Station.** It appears that additional track and platform capacity will be needed at the Hunterspoint Avenue LIRR Station, for while the existing two track island platform is adequate to handle the peak period/peak direction demand projected, it may not be adequate to allow trains to "reverse-ends" or to simply deadhead to an eastern terminal to make a second revenue run during the morning peak period. To improve pedestrian access into and out of the LIRR Hunterspoint Avenue station, additional stairway/escalator connections will be provided. To provide a more direct and improved access to the adjacent NYCT Hunterspoint Avenue subway station on the Flushing Line, a new ADA compliant passageway will connect the LIRR and NYCT Hunterspoint Avenue stations. This passageway would consist of constructing new stairs, elevators and a fare control area to enter the subway station. This passageway would be open only when the LIRR Hunterspoint Avenue station is open.

- **Long Island City Station.** As mentioned above, this station would be rebuilt to provide four high-level island platforms and eight station tracks, an increase of six station tracks over the two station tracks which currently exists. A new covered walkway, approximately 500 feet long, would connect the high-level station platforms to the New York Waterways Ferry Landing nearby to provide a weather protected, pedestrian-friendly connection.

2.3.2.2.1.7 Parking

To accommodate increased LIRR ridership under this initiative (Increase the number of LIRR Trains operating into HPA and LIC Stations), additional parking spaces will be required at certain stations. These stations are located on those branches (Port Jefferson Diesel, Ronkonkoma-Diesel, Montauk and Oyster Bay) that are going to experience service increases into Hunterspoint Avenue and/or Long Island City stations. It is estimated that approximately 2,490 additional parking spaces will be required to satisfy parking demand under this operating scenario.

The total parking demand for the TSM Alternative is estimated to be approximately 15,713 spaces above existing LIRR parking capacity.

2.3.2.2.1.8 Maintenance Facilities/Depots

No new LIRR maintenance facilities will be required for this initiative. However, the rebuilt station configuration at Long Island City would enable minor railcar and locomotive inspection and servicing to be performed while trains are stored on the station tracks between runs. Thus, minor improvements such as a paved walkway between tracks, yard lighting, water faucets and connections, electrical outlets, material storage sheds and perhaps a toilet pumping facility should be provided to allow minor train servicing and repairs.

2.3.2.2.1.9 Vehicles/Vessels

- **LIRR railcars.** The nine additional trains operating into Hunterspoint Avenue and/or Long Island City will require 78 additional bi-level coaches and 18 DE-30 locomotives.

- **Long Island City Circulator shuttle bus to Long Island City subway stations.** Two 40-foot long, low floor transit buses will be required during both the morning and afternoon peak periods to provide one bus every 7.5 minutes.

- **Long Island City Ferry Link shuttle bus between Hunterspoint Avenue and Long Island City Ferry Landing.** This service would utilize two 40-foot long, low floor transit buses, operating on a roundtrip time (including layovers) of 12 minutes; four minutes in each direction and two minutes each for loading and unloading.

- **Ferryboats.** Three ferryboats (with a capacity of 350-400 passengers) would be required to provide ferry service between Long Island City and Manhattan approximately every 10 minutes for the two peak hours in the morning and in the afternoon. New York Waterways currently operates one ferryboat between Long Island City and East 34th Street during the peak hours.

- **Manhattan Connecting Shuttle buses.** On the Manhattan side, 24 dedicated shuttle buses serving three routes (34th Street Route, 42nd Street Route and 49/50th Street Route) will be required to meet AM and PM peak hour requirements, to enable at least one set of buses to meet each ferryboat arrival.

2.3.2.2.2 Operating Plans

The LIRR Hunterspoint Avenue Station is located in Long Island City, Queens, and is served by LIRR diesel trains from LIRR's Port Jefferson, Montauk and Oyster Bay branches. Connections are available at Jamaica to the remaining LIRR branches (except to the Port Washington Branch). Currently, 12 peak hour trains operate into Hunterspoint Avenue and Long Island City during the 7:00-9:30 AM peak period (seven trains serve Hunterspoint Avenue exclusively, two serve Long Island City exclusively and three serve both stations).

Of the trains which serve Hunterspoint Avenue only, three trains originate from Port Jefferson, one originates from Oyster Bay, one from Montauk, one from Speonk on the Montauk Branch, and one from Huntington. Of the trains that serve Long Island City only, one originates from Oyster Bay and another from Patchogue on the Montauk Branch. Of the trains that serve both Hunterspoint Avenue and Long Island City stations, one originates from Oyster Bay and two from Port Jefferson.

At the LIRR Hunterspoint Avenue station, LIRR customers can transfer to NYCT's #7 Flushing Line subway service for direct access to Midtown Manhattan. This underground subway station is located a half city block from the LIRR Hunterspoint Avenue station, and is accessed by the existing Hunterspoint Avenue overpass sidewalk.

Alternatively, LIRR customers could transfer to an East River ferry service to Manhattan, currently operated by New York Waterways. This ferry departs from a ferry terminal one city block from the Long Island City LIRR Station, and free connecting, shuttle buses would link the LIRR Hunterspoint Avenue station with the ferry landing. Currently, Queens Surface operates a shuttle bus service between LIRR's Hunterspoint Avenue Station and the ferry landing in Long Island City; any expanded shuttle bus service could be operated either by Queens Surface or perhaps by another operator. As part of this initiative, ferry service would be increased in frequency to provide ferry departures every 6-7 minutes during the AM and PM peak period.

Under this TSM initiative, it is assumed that approximately 21 diesel trains using new DE-30 locomotives (currently on order) will serve the Hunterspoint Avenue and Long Island City stations during the 7:00-9:30 AM peak period, of which 12 trains (five additional trains) will serve Hunterspoint Avenue exclusively, four trains (two additional trains) will serve Long Island City exclusively via the Montauk Branch, with five trains (two additional trains) serving both stations.

It is planned that of the five additional trains serving Hunterspoint Avenue, only one train will originate from Port Jefferson, two out of Yaphank on the Main Line replacing two EMU trains now operating to Penn Station, one out of Patchogue on the Montauk Branch and one out of Oyster Bay. Of the two new trains serving Long Island City, both via the Montauk Branch, one will originate from Patchogue and one from Speonk. The two additional trains that will serve both stations will originate out of Port Jefferson.

Of the nine trains in this additional service, six will be extensions of diesel trains that presently terminate at Jamaica Station and therefore, would not require any new rolling stock. The three totally new trains include two from Yaphank and one from Speonk. With maintenance spares this fleet expansion will require 26 additional bi-level coaches and seven DE-30 locomotives.

Under this initiative, NYCT's #7 Flushing Line subway service would be increased as necessary (up to the practical operating capacity of the Flushing Line) during the morning peak period to handle the increase in new LIRR customers transferring to the subway at Hunterspoint Avenue.

According to NYCT, the practical capacity of the Flushing Line is approximately 30 southbound (Manhattan bound) subway trains through the Hunterspoint Avenue Station per hour during the 7:00-9:30 AM peak period. Irrespective of the proposed TSM improvements, the Flushing Line's capacity may be increased by two additional trains per hour by the year 2020, when an improved signalling system utilizing Communications Based Technology is installed on that line. Under the TSM Alternative, afternoon Flushing Line service would not be increased, as the peak loads are not as concentrated as during the morning peak hours.

Operating one or two extra trains on the #7 Flushing service during the busiest morning peak hour will require up to 22 additional railcars which would travel, in one peak hour direction, approximately 9.5 miles. This would take between 27 to 33.5 minutes depending upon whether additional Flushing local or express trains are operated. For the purpose of adding Flushing Line capacity west of Queensboro Plaza, it does not matter to LIRR customers whether southbound local or express trains serve Hunterspoint Avenue Station since all Flushing Line subway service into Manhattan at that point is local.

The additional railcars for the Flushing Line will come from NYCT's Corona Maintenance Shop fleet, thus slightly reducing their spare margin. This TSM initiative does not contemplate purchasing any new NYCT rolling stock. For the purpose of this analysis, it is assumed that the increase in #7 Flushing Line subway trains is contingent upon the TSM Alternative being put into effect. However, as mentioned above, NYCT has indicated that one or two Flushing Line trains may be added whether this TSM is implemented or not.

Another component of this initiative is the introduction of two dedicated shuttle bus routes. The first shuttle bus route is a "Long Island City Circulator," which would convey passengers from the Hunterspoint Avenue LIRR Station to other nearby subway stations within Long Island City, where connections could be made to subway routes which serve East Midtown Manhattan. This service would operate during the AM and PM peak hours only. Specifically, the shuttle bus will operate in a loop (and in order) to: 23rd Street (Ely Avenue) Station (currently served by the E and F services; route services may change with the opening of the NYCT 63rd Street Tunnel Connector), Queens Plaza (currently served by the E, F, G and R services, although routes will change in 2002 with the opening of the NYCT 63rd Street Tunnel Connector), and to Queensboro Plaza Station (served by the N and #7 routes).

The Long Island City Circulator shuttle bus service would use 40 foot long, low floor buses with a total capacity of 80 passengers (30 seated and 50 standing) for the 5-7 minute ride from Hunterspoint Avenue to Queensboro Plaza. From the Hunterspoint Avenue LIRR Station, the bus would travel west on Hunterspoint Avenue, then turn northward onto 21st Street until it reached 44th Drive, where it would turn right and travel eastward until it reached the 23rd Street Station, where passengers could transfer to the E and F trains. Travel time from the LIRR Hunterspoint Avenue station to the 23rd Street Station is approximately 3-4 minutes. Continuing, the bus would then travel eastward on 44th Drive until it reached Crescent Street where it would turn left and travel northward until it reached Queens Plaza South. It would then turn and travel eastward until it reached the Queensboro Plaza Station where passengers could transfer to the R Train. To reach this stop requires another 2-3 minutes. These travel time estimates assume no delays due to traffic or other adverse conditions.

To return to Hunterspoint Avenue LIRR Station, the Long Island City Circulator bus would travel eastward and turn southwest onto Jackson Avenue until it reached 21st Street where it would travel southward. It would then turn east onto Hunterspoint Avenue until it arrived at the LIRR station. From Queensboro Plaza to Hunterspoint Avenue requires another 3-5 minutes.

Assuming one Long Island City Circulator shuttle bus departs every 7.5 minutes from Hunterspoint Avenue Station, and assuming each bus requires approximately 5-7 minutes to reach Queensboro Plaza, (including loading and unloading time for passengers at each stop), and 3-5 minutes for the return trip to Hunterspoint Avenue from Queensboro Plaza, the resulting roundtrip running time would be 8-12 minutes; this shuttle service would require two buses.

In addition to the Long Island City Circulator, passengers could use a second shuttle bus service provided by Queens Surface, which would provide a connection between the LIRR Hunterspoint Avenue Station to expanded ferry service (see below) departing from the Long Island City Ferry Landing; connections could be made there to the East River Ferry for travel to 34th Street in Manhattan. Once on the Manhattan side, passengers could board one of three shuttle bus routes to take them closer to their destinations in the East Midtown area. The three Manhattan shuttle bus routes would operate along 34th Street, 42nd Street and 49/50th Streets.

2.3.2.3 Increased Ferry Service

2.3.2.3.1 Physical Description

Under this initiative, ferry service between Long Island City in Queens and East 34th Street in Manhattan would operate more frequently, and the connections to and from the LIRR stations would be improved. As described above, LIRR passengers disembarking at the LIRR Hunterspoint Avenue Station would transfer to shuttle buses (currently operated by Queens Transit) for a short ride to the ferry landing, while those detraining at Long Island City would be able to walk a short distance to the ferry landing under a canopied pathway.

2.3.2.3.2 Operating Plans

The Long Island City Station will be served by four LIRR trains in the morning peak via the Montauk Branch, and passengers will be able to walk to the ferry terminal. The Hunterspoint Avenue Station would be served by a total of 17 LIRR trains in the 7:00 to 9:30 AM peak period, with five of those trains continuing on and serving the Long Island City Station. Accordingly, 12 trains during the AM peak period will need to be serviced by shuttle buses at the Hunterspoint Avenue Station.

The connecting shuttle bus service currently utilizes 40 foot buses, assumed to carry 70-80 seated and standing passengers each, for the 3-4 minute ride to the ferry landing. Each train will require a minimum of one bus operating on a roundtrip time (including layovers) of 12 minutes; four minutes in each direction and two minutes each for loading and unloading at each end of the run. Therefore a fleet of two buses would be required.

Assuming a four and a half to five minute ferry journey across the East River to 34th Street, and a total one-way trip time of 10 minutes including loading and unloading, each boat will make three roundtrips per hour. This will require operating three boats, and would require both the Queens and the Manhattan ferry terminals to have at least two ferry slips to handle simultaneous loading and unloading.

On the Manhattan side, shuttle buses would distribute the ferry passengers in the morning peak to destinations along 34th Street, 42nd Street and 49th/50th Streets as far west as Fifth Avenue. For each ferry arrival three shuttle buses would depart, similar to current shuttle bus operations by New York Waterways. One shuttle bus route would provide westward trips in the morning peak from the East River along 34th Street, making stops on all avenues to Fifth Avenue, where the shuttle would turn around to commence the reverse trip back to the ferry. The total roundtrip time for the 34th Street route would be approximately 25 minutes.

The 42nd Street shuttle would depart the East River Ferry landing and travel uptown in the morning peak along Third Avenue to 42nd Street where it would turn westward making stops at all avenues to Fifth Avenue, where the bus would begin the eastward non-revenue run back to the ferry. During the evening peak, revenue service would proceed eastward from Fifth Avenue via 42nd Street stopping at all avenues to Lexington Avenue where it would turn and travel to 34th Street for the final eastward trip to the ferry. The total roundtrip time for the 42nd Street route would be approximately 35 minutes.

The third shuttle bus would travel uptown along Third Avenue to 49th Street in the morning peak where it would turn westward stopping at all avenues to Fifth Avenue. It would then turn for the non-revenue crosstown trip back to the ferry. In the evening peak, the shuttle bus would travel eastward from Fifth Avenue via 50th Street, stopping at all avenues to Lexington Avenue where it would proceed to 34th Street for eastward travel to the ferry again. The total roundtrip time for the 49th/50th Street route would be approximately 45 minutes.

In the evening peak, all three connecting bus routes in Manhattan (34th, 42nd and 49th/50th Streets) would include non-revenue westbound runs from the ferry to Fifth Avenue for each revenue run.

Assuming that 15 percent of riders walk from the East River Ferry Landing to their final destination, and also assuming that each passenger on the shuttle bus has a seat, service for a maximum load of 350-400 passengers per boat would be best served by articulated buses. With an assumed 25 minute roundtrip shuttle service for the 34th Street route, 35 minutes for the 42nd Street route, 45 minutes for the 49th/50th Street route, and headways to correspond with the ferry schedule, 24 buses would be required for the morning westbound service. This bus fleet would also be sufficient for the evening eastbound service to the Manhattan ferry landing. This scheduling includes a five minute layover/recovery time between shuttle trips.

If New York Waterways, which is the current service provider, were to be the service provider under this alternative, then their East River to Hudson River routing which they use for their 34th Street, 42nd Street and 49th/50th Street shuttle bus service could be retained and supplemented with as many shuttle buses as required to meet peak hour demand.

2.3.2.3.3 Other

This initiative assumes that the Long Island City Ferry Landing remains situated at its current location. Under the Queens West development project, there has been some discussion of moving the East River Ferry Landing several blocks farther north. Such a move would further diminish the attractiveness of this ferry service for LIRR Long Island City customers since the train station and the ferry landing would no longer be conveniently adjacent. LIRR passengers arriving at Long Island City would have to transfer to a shuttle bus to reach the relocated ferry terminal, adding another mode in their journey to East Midtown Manhattan.

2.3.2.4 Implement a Discrete PM LIRR Operating Plan

2.3.2.4.1 Physical Description

To improve the efficiency and capacity of LIRR's peak hour service, this measure would implement a new discrete operating plan for Penn Station New York and the East River Tunnels. This plan entails reversing the direction of East River Tunnel (ERT) Lines 1 and 2 during the PM peak period to significantly reduce crossover conflicts at the JO Interlocking in Penn Station. Figure 2.3-1 shows the present directional flow and Figure 2.3-2 shows the new directional flow that is being proposed.

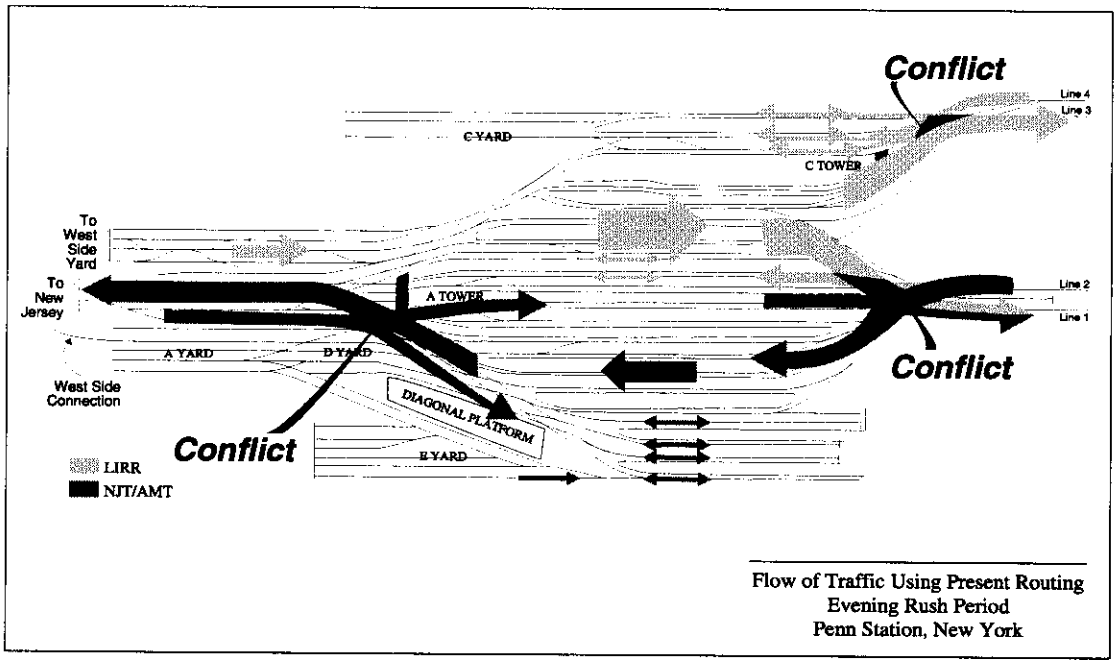
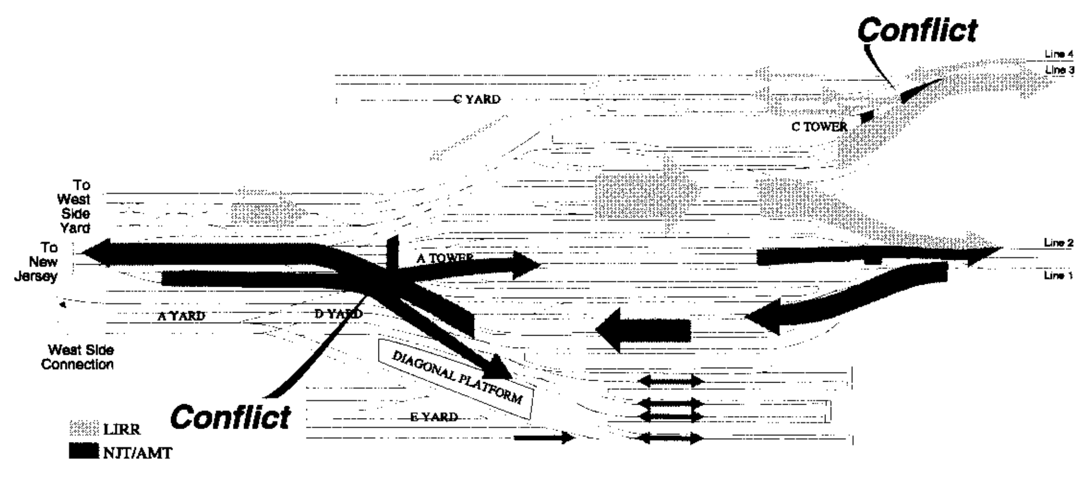


Figure 2.3-1



Proposed Dominant Flows of Traffic
Evening Rush Period
Penn Station, New York

Figure 2.3-2

This plan becomes necessary as all three carriers into Penn Station (Long Island Rail Road, NJ Transit and Amtrak) plan to increase service by 2010. Under current conditions, Penn Station cannot accommodate this expansion without changes to both the infrastructure and the operating methodology. Any change will have to be consistent with the Joint Facility Agreement between Amtrak and LIRR. Under this agreement, the LIRR has exclusive use of Tracks 17 through 21 while Amtrak and NJ Transit share Tracks 1 through 11. Tracks 12 through 16 are shared by all three providers, although the LIRR dominates the use of Tracks 13 through 16 during the peak periods.

Currently, trains travel eastbound through East River Tunnel Lines 1 and 3 and westbound through East River Tunnel Lines 2 and 4. The directional flows between East River Tunnel Lines 1 and 2 create crossover conflicts at JO Interlocking during the PM peak period (3:35 - 7:45 PM) as westbound NJ Transit and Amtrak trains arriving from Sunnyside Yard conflict with eastbound Long Island Rail Road trains, delaying operations in this portion of Penn Station.

The three carriers who operate out of Penn Station conducted the Penn Station Capacity & Utilization Study which examined the proposed operations in 2010. In the Phase B Report of that project, an AM and PM operating plan was established that modifies the current operating methodology and operating procedures. It has been determined from that study that four trains during the AM peak period in 2010, trains that would normally occupy Tracks 13 and 14, waiting to be turned for eastbound service, will be affected by the West Side Yard U Ladder Connection. Also as part of the new operating plan, during the AM peak the plan is to operate trains "down and back" whereby some trains that serve the AM peak period will be routed to West Side Yard to be turned and sent right back out for reverse revenue service. This will free up storage space in the yard for trains arriving in the latter part of the AM peak and will reduce platform dwell times. Trains will "turn" (reverse direction for eastbound service) in the yard and be sent back through Penn Station via Track 17 to limit conflict.

This improvement will prevent the current scenario in which storage capacity at West Side Yard is fully utilized early in the peak period and trains arriving later are forced to turn in the station. It takes 15 minutes for a train to turn in Penn Station, as compared to only approximately five minutes to discharge passengers and proceed to West Side Yard. Eliminating the need to turn trains in Penn Station will free up valuable platform capacity within this terminal.

2.3.2.4.2 Operating Plans

During the PM peak period, the plan is to reverse the directional flow on East River Tunnel Lines 1 and 2 and reroute LIRR trains traveling westbound during the PM peak period exclusively through East River Tunnel Line 4, thus reducing the number of lines used by the LIRR during the PM peak period from four to three. LIRR trains will then travel east in East River Tunnel Line 2 and Line 3; Amtrak trains will travel east on East River Tunnel Line 2. NJ Transit and Amtrak trains will travel west into Penn Station on East River Tunnel Line 1; LIRR trains will no longer use Line 1. This initiative will not only eliminate the conflicting movements between trains on East River Tunnel Lines 1 and 2, but also by rerouting PM peak westbound trains through Line 4, congestion interference between East River Tunnel Lines 3 and 4 will also be alleviated.

2.3.2.5 Extend the Long Island Expressway Bus/HOV Lane Near the Grand Central Parkway Interchange

2.3.2.5.1 Introduction

This concept would extend the existing AM only, westbound Long Island Expressway (LIE) HOV lane between the Queens-Midtown Tunnel toll plaza and Greenpoint Avenue in Queens, further east to near 102nd Street in Corona, Queens. This essentially extends the existing westbound HOV lane another 3.6 miles, to start near the Grand Central Parkway interchange.

Presently, there are two sections of the LIE with operational HOV lanes. The first HOV segment was implemented in 1971. It is a single, contra-flow lane provided from Greenpoint Avenue, Queens, to the Queens-Midtown Tunnel, a distance of approximately two miles. This lane is open to buses, occupied taxis and permit vehicles and only operates during the weekdays in the westbound morning peak period from 7AM to 10AM.

The improvement described herein is based upon New York State Department of Transportation's Contra-flow Advance Alternative II, as analyzed in their May 1994 NYSDOT HOV Feasibility Study, which was conducted for the section of the LIE from Grand Central Parkway to the Queens-Midtown Tunnel. This study identified new or expanded low cost HOV options for westbound morning traffic using contra-flow lanes and moveable barriers to extend this HOV lane. Total LIE reconstruction alternatives for the corridor were not considered in the NYSDOT study.

A second HOV strategy on the LIE was inaugurated in Spring 1994. One HOV lane was constructed in each direction between NY Route 110 (Exit 49) and Veterans Memorial Highway (Exit 57) in Suffolk County, a distance of 12 miles. This HOV segment is part of a master plan to provide a continuous HOV lane in each direction along the LIE from the Cross Island Parkway (Exit 30) in Bayside, Queens, to NY Route 112 (Exit 64) in Medford, Suffolk County, a distance of 41 miles. This master plan for an HOV lane from Exit 30 to Exit 64, though not completed, is considered as an existing corridor transportation facility as defined in the "No-Build Alternative."

The HOV lanes between Exits 49 and 57, are open to buses, carpools (two or more occupants) and vanpools, and operate weekdays from 6AM - 10AM and 3PM - 8PM. HOVs can only enter and leave these lanes at designated entrances and exits located approximately a half-mile before and beyond major interchanges. At other times the two HOV lanes are open to all traffic, except trucks.

At the west end of this study area, the Queens-Midtown Tunnel, maintained by MTA Bridges & Tunnels, consists of two separate tubes with two lanes in each direction. A contra-flow operation through these tunnel tubes is employed during the weekday AM and PM peak periods. During the morning peak period, the tunnel operates with three lanes in the westbound direction and one lane in the eastbound direction. The reverse operation occurs during the evening peak period. When in operation, the Queens-Midtown Tunnel contra-flow lane is open to all traffic.

The extension of the LIE HOV lane, approximately 3.6 miles further east to 102nd Street, as considered under DOT Contra-flow Advance Alternative II, will be accomplished by using a combination of contra-flow and concurrent flow lanes and by constructing a new HOV on-ramp and flyover east of 74th Street to allow HOVs entering from Queens Boulevard and Woodhaven Boulevard to access the LIE HOV lane without merging through three lanes of general traffic.

Implementation of this TSM initiative will not preclude the possible extension of the LIE HOV lane to the Cross Island Parkway, and connecting to the other planned portions of the LIE HOV lane.

The extended HOV lane would be open to the same vehicles as currently permitted, and is expected to reduce travel times for the various NYCT and privately operated express buses running from Queens and Brooklyn into Midtown Manhattan.

2.3.2.5.2 Physical Description

The contra-flow HOV lane (See Figure 2.3-3), based upon NYSDOT Contra-flow Advance Alternative II, maintains the existing contra-flow HOV lane operation between the Queens-Midtown Tunnel toll plaza to Greenpoint Avenue. The segment of the extended HOV lane between Greenpoint Avenue and Maurice Avenue will operate as a concurrent flow lane, with HOV traffic at Greenpoint Avenue using the existing crossover to access the existing contra-flow lane into the Queens-Midtown Tunnel toll plaza. Between 102nd Street and Maurice Avenue, the extended HOV lane will be configured as a contra-flow lane. Two entrances to the extended HOV lane will be provided—one at the start of the contra-flow lane near 102nd Street, the second via a new HOV on-ramp and flyover just east of 74th Street. The 74th Street flyover allows buses from Queens Boulevard and Woodhaven Boulevard to directly enter the extended HOV lane without merging across three lanes of mixed-use traffic on the LIE.

The westbound contra-flow lane will be segregated from opposing eastbound general traffic lanes using plastic tubular stanchions and by installing regulatory signage and signals to inform drivers that the contra-flow lane is in operation. During the morning peak period, the westbound contra-flow lane would be positioned to provide four westbound lanes (three general use lanes and one HOV lane) and two eastbound lanes (both general use lanes) to/from the Queens-Midtown Tunnel toll booths. At all other times, three general use lanes will be provided in each direction.

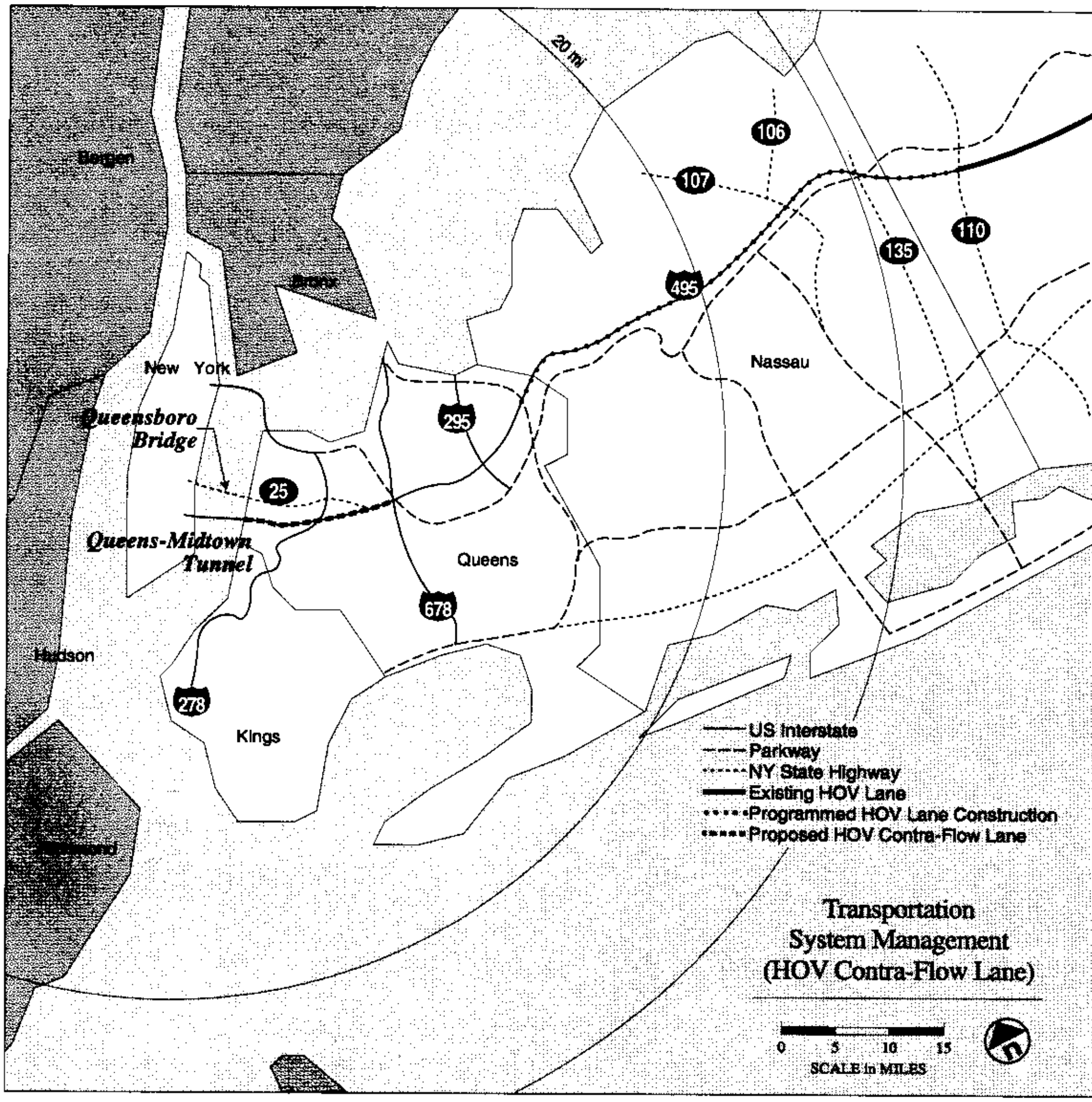


Figure 2.3-3

By consensus of NYSDOT and NYCDOT, this HOV lane will operate only in the westbound AM peak direction, from 6:30 AM until 10 AM, as it is thought that afternoon reverse peak traffic flows along the LIE will not permit the taking of a westbound lane for an HOV contra-flow lane. Also, through NYSDOT and NYCDOT discussion, there will be no HOV lane through the Queens-Midtown Tunnel, although some type of priority treatment may be provided through the Queens-Midtown Tunnel toll plaza area. A likely treatment would be a designated HOV lane utilizing TBTA's E-ZPass technology to allow buses to bypass toll plaza congestion.

As is currently the practice, during the afternoon and evening peak periods most operators would be expected to route their express buses back to Queens and Brooklyn using the Queensboro Bridge and Queens Boulevard to the LIE, instead of using the Queens-Midtown Tunnel to leave Manhattan. One reason for such an eastbound routing is the lack of a corresponding eastbound HOV lane along the LIE between the Queens-Midtown Tunnel and Grand Central Parkway. Since there are no eastbound PM HOV lanes along either the Queensboro Bridge or along Queens

Boulevard, express buses departing Manhattan will operate in mixed traffic. (There are, however, westbound AM HOV lanes on the Queensboro Bridge but these will not be used by the proposed express bus service.).

2.3.2.5.2.1 Right-of-Way Requirements

No new rights-of-way or property taking is expected under this TSM initiative, as the existing right-of-way should be sufficient to accommodate the footprint of the extended HOV lane and the footprint of the new 74th Street HOV flyover and ramp.

2.3.2.5.2.2 Utilities

No major utility installation or relocation is expected; however, minor utility installations and relocations commensurate with constructing contra-flow bus/HOV lanes, associated lighting, regulatory signals, etc. will be required.

2.3.2.5.2.3 Structures/Tunnels

The most expensive structure required under this alternative is the new HOV flyover between 74th and 80th Streets. To accommodate the flyover and ramp, all of the westbound traffic lanes and the collector/distributer roadways (service ramps and lanes) in this area would have to be reconstructed.

At the LIRR overpass, the eastbound LIE must be reduced to two general use lanes in order to fit the contra-flow lane beneath the LIRR overpass. However, according to the 1994 NYSDOT study, the present volume of eastbound traffic, under the LIRR overpass, requires three lanes. By closing the on-ramp from the eastbound collector/distributer road, two eastbound LIE lanes would be sufficient. Eastbound traffic could still enter the LIE by continuing along the collector lanes, and accessing the expressway using the two lane on-ramp east of Queens Boulevard. According to NYSDOT's study, the eastbound collector lanes have sufficient traffic capacity to handle this re-routed traffic during the morning peak period.

New signs and sign structures, regulatory signals, roadway lighting and other related roadway improvements will be required.

2.3.2.5.2.4 Stations

No bus stations or park and ride lots will be built under this alternative.

2.3.2.5.2.5 Car Parking

No car parking lots will be built under this alternative.

2.3.2.5.2.6 Maintenance Facility/Depots

No new maintenance facility would be required to serve this alternative, nor will any new bus maintenance facilities be required.

2.3.2.5.2.7 *Vehicles*

No additional rolling stock or buses are required to serve this alternative which assumes that existing express bus operators will continue to provide the buses for operation over the Bus/HOV lane.

2.3.2.5.3 *HOV Traffic Lane Operating Plans*

Under this initiative, existing bus companies will continue to provide express bus service into Manhattan, and no new bus routes are contemplated. Express buses would use the extended westbound HOV lane between Grand Central Parkway and the Queens-Midtown Tunnel during the AM peak period. When the contra-flow lane is in operation, there will be four lanes in the westbound direction (one HOV lane, three general use lanes), and two or three eastbound general use lanes, depending upon the section of the LIE.

Matching the service provided under the existing segment of the LIE HOV/Bus lane, this HOV/ Bus lane will be open to buses, taxicabs and permit vehicles only. Carpools will not be permitted in this lane.

Appropriate highway signage and traffic control devices (i.e. traffic lights, electronic message signs, highway lighting, etc.) will notify drivers when the HOV lane is in operation. Gates and barriers will block off the crossover entrances and flyovers to the HOV lane when the HOV lanes are not in use or when the HOV lanes are being removed after the morning peak period.

2.3.2.5.4 *Queens and Brooklyn Express Bus Service Operating Plans*

Queens and Brooklyn express bus customers will use the existing network of express bus routes. During the AM westbound peak travel period, these bus routes will benefit from reduced travel times offered by new Long Island Expressway HOV lanes.

Currently, express bus services from Queens operate in a "collector" mode. That is, Queens express buses operate locally within specific neighborhoods, by collecting passengers at local bus stops. After serving a particular neighborhood or series of neighborhoods, these buses then operate express into Midtown Manhattan via major arterial streets (such as Queens Boulevard) or (non-stop) via the LIE.

Under this operating scenario, no new express bus routes would be established to serve Queens or Brooklyn riders. Rather, existing express bus routes which currently use the LIE westbound in the morning peak period would access the contra-flow LIE HOV lane via two entrances, located at:

- 102nd Street, just west of the Grand Central Parkway interchange.
- Via the new 74th-80th Street flyover on-ramp west of the Queens Boulevard/Woodhaven Boulevard interchange.

In addition, an HOV priority entrance or on-ramp at the Queens-Midtown Tunnel plaza will allow buses entering from local Long Island City streets to bypass the toll plaza queues.

Table 2.3-2 lists the following express bus routes which would potentially benefit from a LIE HOV lane, since they currently operate a portion of their route over the LIE. Currently, there are 24 express bus routes operating through the Queens-Midtown Tunnel during weekdays. Twenty of these express bus routes operate inbound service via the Queens-Midtown Tunnel in the mornings, with outbound, from Manhattan bus service routed via the Queensboro Bridge and Queens Boulevard in the afternoons.

TABLE 2.3-2
Bus Routes Utilizing HOV Lane

Bus Route	Operator	Approximate HOV Time Savings
JFK Airporter	Carey Transportation	7 Minutes
QM1	Queens Surface	7 Minutes
QM1A	Queens Surface	7 Minutes
QM2	Queens Surface	7 Minutes
QM2A	Queens Surface	7 Minutes
QM3	Queens Surface	7 Minutes
QM4	Queens Surface	7 Minutes
QM10	Triboro Coach	7 Minutes
QM11	Triboro Coach	7 Minutes
QM12	Triboro Coach	7 Minutes
QM15	Green Bus Lines	7 Minutes
QM16	Green Bus Lines	7 Minutes
QM17	Green Bus Lines	7 Minutes
QM18	Green Bus Lines	7 Minutes
QM21	Jamaica Buses	7 Minutes
QM22	Triboro Coach	2 Minutes
QM23	Green Bus Lines	7 Minutes
QM24	Triboro Coach	7 Minutes
QM24W	Triboro Coach	7 Minutes
BQM1	Command Bus Company	7 Minutes
X51	NYCT	7 Minutes
X63	NYCT	7 Minutes
X64	NYCT	7 Minutes
X68	NYCT	7 Minutes

As discussed with NYCDOT and NYSDOT, most of these express buses will leave Manhattan via the Queensboro Bridge and Queens Boulevard instead of via the Queens-Midtown Tunnel and the LIE. The lack of an afternoon HOV lane along the Queensboro Bridge and along Queens Boulevard is not expected to reduce current express bus travel times along this route.

2.3.2.5.5 *Impact Upon Other Operators*

Although the extended LIE HOV lane will save express bus customers several minutes on each westbound AM trip into Manhattan, according to ridership projections, the time savings should not divert riders from the LIRR, or from other local transit providers (i.e. Long Island Bus, NYCT, NYCDOT sponsored buses).

It is also unlikely that the extension of the LIE HOV lane to the vicinity of the Grand Central Parkway by itself will attract LIRR or other transit riders into carpools or other high occupancy vehicles destined for Manhattan; however, in concert with other future HOV lanes contemplated between LIE Exits 30 and 64, HOV commuting into Manhattan and in the New York City region generally could become more attractive. Potentially, an increase in the number of HOVs could also translate into an increase in the number of vehicles into Manhattan.

The operation of the extended contra-flow HOV lane will require a long-term, weekday commitment of resources and equipment by the NYSDOT to install the HOV lane stanchions, to open and close the on-ramp barriers, and to display the proper regulatory traffic signals each day.

The TSM Alternative is comprised of two initiatives under which LIRR ridership is projected to increase, and therefore require additional parking spaces. These two initiatives are: Increase the Number of Railcars on LIRR Peak Trains and Increase the Number of LIRR Trains Operating into Hunterspoint Avenue and Long Island City Stations. The total number of additional parking spaces for these two initiatives is 11,051. Total parking demand for the LIRR system is estimated to increase by 15,713 spaces. The difference is accounted for by the stations not directly affected by the two initiatives discussed above.

2.4 Build Alternative

2.4.1 *Introduction*

To relieve capacity congestion at Penn Station New York, and to provide LIRR passengers with direct access to East Midtown Manhattan, the LIRR will provide a new service into Grand Central Terminal by connecting the Port Washington Branch and Main Line tracks within Harold Interlocking in Queens to the lower level of the 63rd Street Tunnel. The proposed LIRR facility at GCT would be entirely separated from Metro-North Railroad (MNR) operations, and would be located in the western quadrant of the lower level of the terminal. The LIRR terminal would consist of a ten track/five island platform facility for the exclusive use of LIRR passengers and trains.

In an effort to relieve both train movement and passenger overcrowding at and into Penn Station New York, the LIRR has attempted, with various degrees of success, to market its other western terminals (Hunterspoint Avenue, Long Island City and Flatbush Avenue) as alternate routes into East Midtown and Downtown Manhattan. However, these alternative terminals rely upon connecting subway, ferryboat or shuttlebus service to access East Midtown Manhattan. For a number of reasons, including: the disincentive of a two-seat ride; psychological resistance to changing modes; crowded conditions on some of the connecting subway lines which would force those who transferred to stand on the way into Manhattan (Queens Boulevard Line in particular); lack of or limited LIRR service into these alternate terminals; etc., these travel routes fail to be an attractive alternative to Penn Station New York.

In addition, according to recent surveys, many LIRR passengers have indicated a preference for an East Side terminal over Penn Station, a West Side terminal. Approximately 53 percent (47,000) of existing AM peak period Penn Station LIRR customers work at locations which are more accessible to GCT than to Penn Station. In fact, many Long Island residents have indicated that they would consider switching to the LIRR from their present mode of travel if the railroad served a convenient East Side Manhattan location.

Various surveys conducted among Long Island residents indicate that trip origin and destination were the most important factors in determining the mode of choice among those who live within the Long Island Transportation Corridor but do not use the LIRR. Both LIRR commuters and non-commuters responded that they would use the LIRR more frequently with the introduction of an East Side terminal, and many of those who use express buses indicated that they would switch to the LIRR with the introduction of an East Side terminal. These surveys indicated that a greater share of the Long Island Transportation Corridor travel market could be captured by the LIRR with the introduction of an East Side terminal. Thus, a long standing Long Island transportation need could be met without building new highways or another East River crossing.

As part of this alternative, the LIRR is proposing to add a rail station ("Sunnyside Station") in the vicinity of Sunnyside Yard, in Long Island City, Queens, which will facilitate access to anticipated development in this potential Queens Central Business District. The proposed station, to be built under the Queens Boulevard Overpass, will have an island platform between the two Hunterspoint Avenue tracks and side platforms adjacent to LIRR Tunnel Lines 1 and 4. Selected Penn Station electric trains, as well as some diesel trains bound for the Long Island City Station, will be routed to stop at the Sunnyside Station during both peak and off-peak periods, primarily for those passengers bound for the Queens Business District. Passengers will be able to access the streets above from the platform via a new pedestrian overpass.

2.4.2 Physical and Operational Description of the Alternative

The alignment for this alternative begins in Harold Interlocking with an approximately 5,500 foot long route connection between the LIRR Port Washington Branch/Main Line trackage and the existing portion of the 63rd Street Tunnel. Within the confines of Harold Interlocking, the alignment enters into a series of tunnel portals that traverse under the Sunnyside Rail Yard, where the alignment will connect to the partially completed lower level of the 63rd Street Tunnel; this section of the tunnel presently terminates in Queens under 41st Avenue and east of 29th Street. The proposed route then utilizes the lower level of the 63rd Street Tunnel, of which approximately 8,600 feet has been constructed. (See Figure 2.4-1 for an illustration of the alignment).

The two 63rd Street Tunnel tracks will be extended east to a point approximately 300 feet east of Northern Boulevard where they would fan out into six tunnel tracks: two which rise to the surface and connect into the Main Line; two which rise to the surface and connect into the Port Washington Branch; two tracks merge into one yard lead track which then emerges from the tunnel south of the Main Line embankment and ties into a new Loop Track leading to a new storage yard in Yard A. The constrained area of Harold Interlocking and the grades necessary to bring the LIRR's 63rd Street Tunnel tracks up to the surface and high enough to cross over the Loop Tracks leading to Yard A make it impossible to include a station on this alignment.

At the existing 63rd Street Tunnel's westerly terminus, at Second Avenue and 63rd Street, the planned route turns southwesterly and continues south under Park Avenue in a deep tunnel.

While under Park Avenue, the LIRR tunnels remain completely segregated from the MNR's Park Avenue tunnel. As the route approaches GCT, the planned track profile rises to join the lower level of the terminal. The overall route distance between the western end of the existing lower level of the 63rd Street Tunnel (at Second Avenue) and the northerly end of the lower level structure (approximately 52nd Street) at GCT is about 5,000 feet.

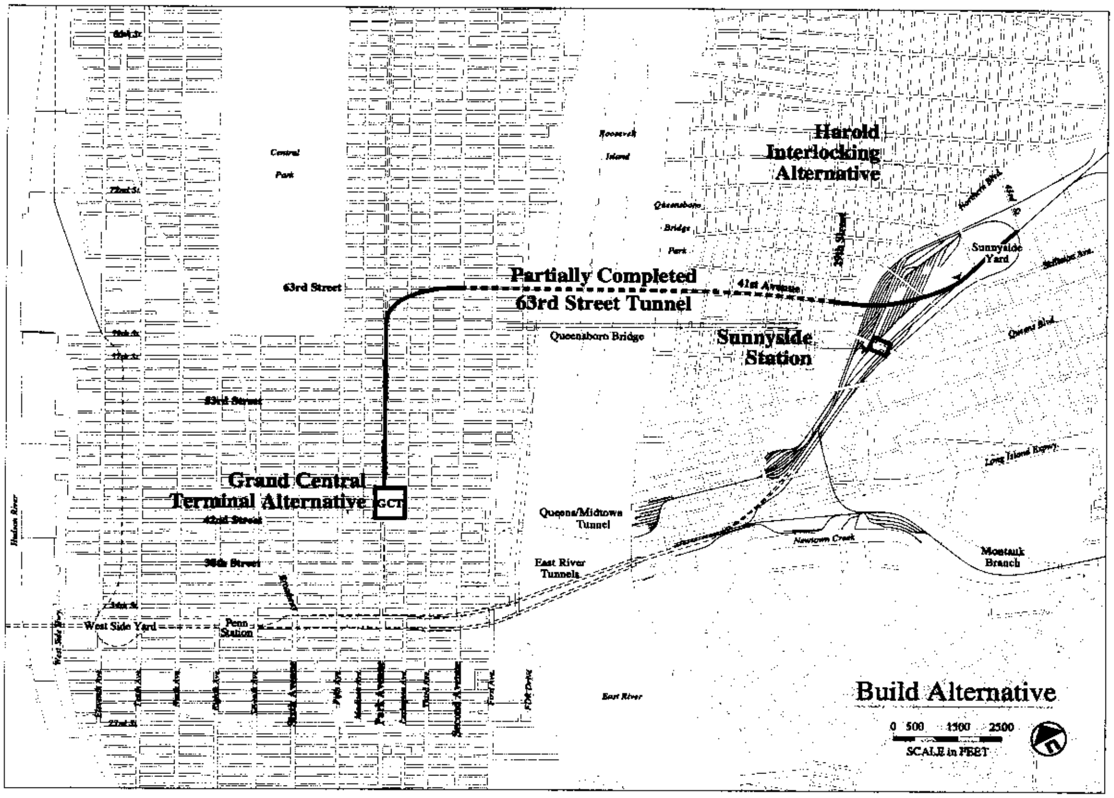


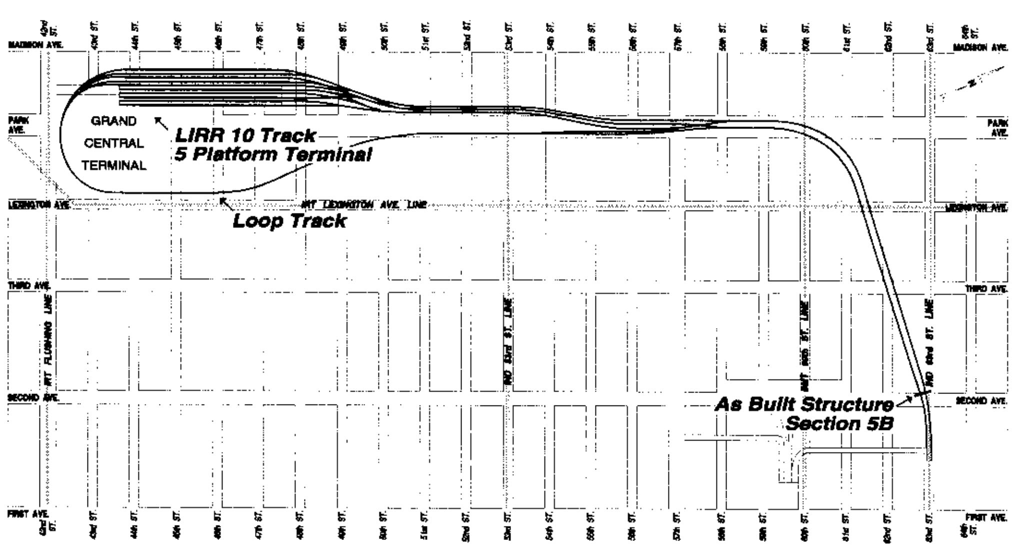
Figure 2.4-1

This alternative includes the construction of a ten track/five island platform terminal in the lower level of GCT in the area currently occupied by the Madison Avenue car maintenance yard and MNR platform tracks. (See Figures 2.4-2 and 2.4-3.) The five easterly LIRR platform tracks will be stub ended with the five remaining westerly tracks accessing the Lower Level Loop Track. The Lower Level Loop Track will be extended to tie into the 63rd Street line through a connecting tunnel structure in the area of 57th Street and Park Avenue. All mid-day train storage for the LIRR will be in Yard A in Sunnyside, Queens. The connecting Loop Track will be utilized for inbound and outbound equipment moves to/from Yard A.

This alternative would be planned to provide access for LIRR commuters within both the north and south ends of GCT. At the south end, the LIRR terminal would tie into the existing passenger circulation system within GCT at the Lower Concourse level. At the north end, LIRR passenger circulation would vary depending on whether there is separate or joint use of the facility's space by LIRR and MNR customers. The facilities for providing northerly access for passengers to the LIRR terminal have been developed assuming a mix of new and already planned MNR North End Access street access points (See Figure 2.4-4). New access points would be necessary to satisfy the needs of the increased passenger demands of both LIRR and MNR at GCT. It has been estimated that 35 to 45 percent of future LIRR riders would access the LIRR terminal from the south end at 44th Street while 55 to 65 percent would do so via the north end above 45th Street.

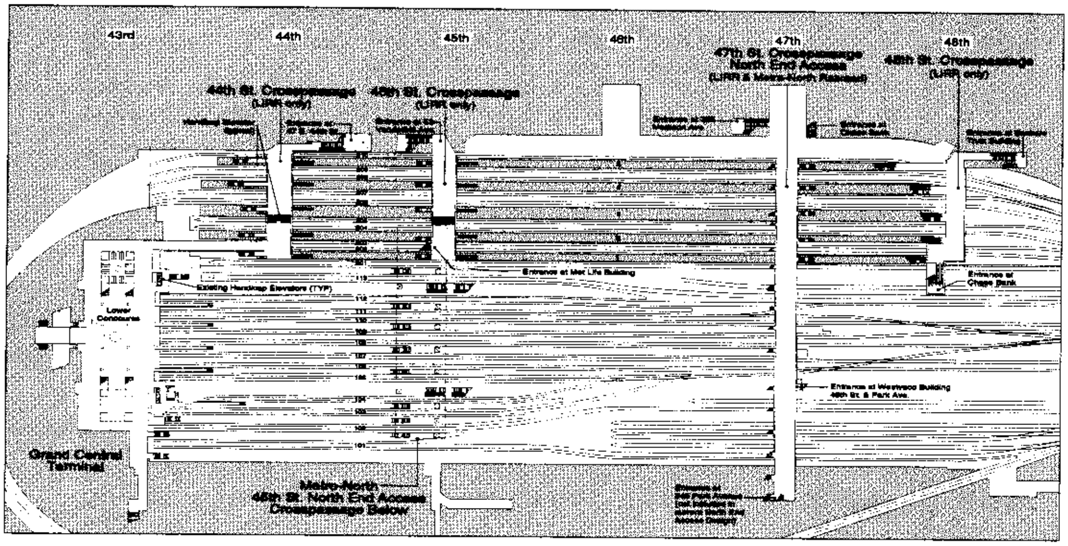
Three new cross-passageways would be constructed to provide passenger access to the five island platforms via permanent easements or fee taking to street level access points; they would be constructed at the following locations; 1) at 44th Street at the west end - one eight foot wide stair and one 48 inch escalator (See Figure 2.4-5), 2) at 45th Street - one eight foot wide stair and one 48 inch escalator at two locations, 3) at 48th Street - one eight foot wide stair and one 48 inch escalator at two locations. At 47th Street, MNR's North End Access crosspassage would have two new street access points added - one eight foot wide stair at the east end and one eight foot wide stair and one 48 inch escalator at the west end. The 47th Street crosspassage would also access the LIRR's island platforms. The 44th Street cross-passageway would also provide elevator access from platform level to street level via the lower level GCT concourse, as well as passenger access to all GCT subway and street connections.

As stated above, the new Sunnyside Station will have an island platform between the two Hunterspoint Avenue tracks, which will service diesel trains bound to and from the Hunterspoint Avenue and Long Island City Station and select Penn Station bound trains. It will also have side platforms, adjacent to LIRR Tunnel Lines 1 and 4, which will service off-peak Penn Station trains.



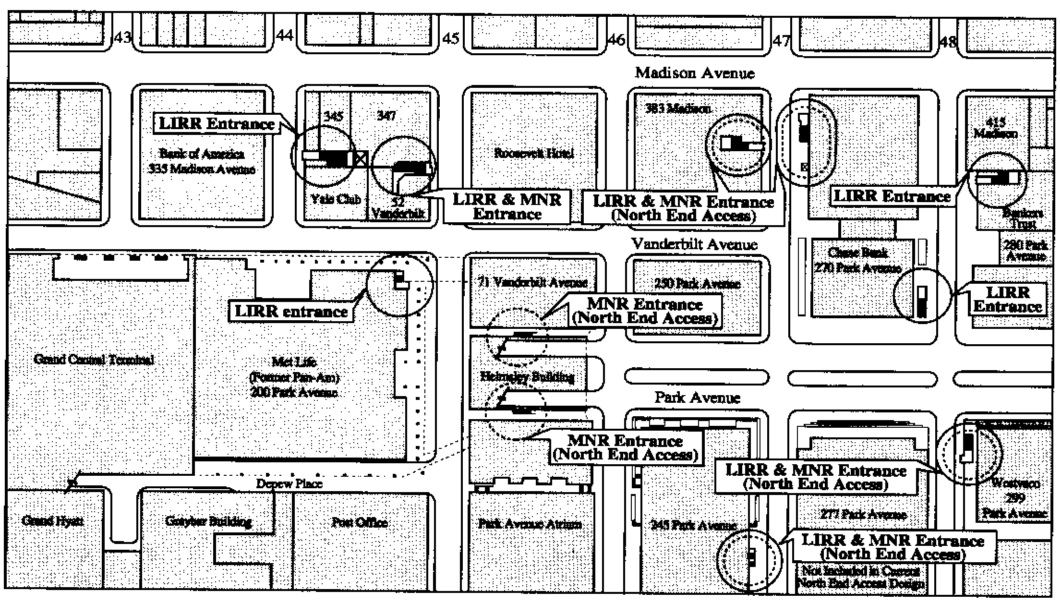
Build Alternative Track Layout
at GCT Lower Level

Figure 2.4-2



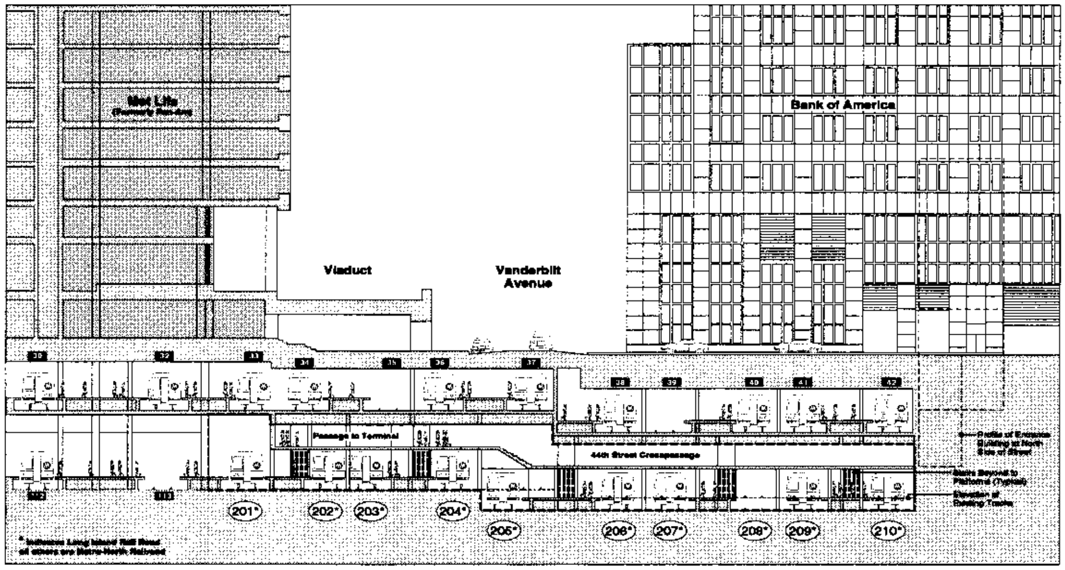
Build Alternative
Lower Concourse &
Train Room Level

Figure 2.4-3



Build Alternative
LIRR & Metro-North Railroad
GCT Entrances

Figure 2.4-4



Build Alternative
Cross Section at 44th Street
Crosspassage (View South)

Figure 2.4-5

2.4.2.1 Right-of-Way Requirements

No new above ground or at-grade right-of-way is required; all surface track connections will occur within the confines of the LIRR/Amtrak right-of-way. However, permanent underground tunnel easements will be required in Manhattan from 2nd Avenue and 63rd Street to Park Avenue and 52nd Street—a distance of approximately 5,000 feet. Also, in Manhattan permanent easements will be required for six proposed entrances and one fee taking on 44th Street for a seventh entrance to the new LIRR East Side terminal. In Queens, the approximately 2,700 foot tunnel route distance between Harold Interlocking and the bellmouth of the 63rd Street Tunnel Connection (at Northern Boulevard) will pass beneath property that is under the jurisdiction of either MTA, LIRR or Amtrak.

The proposed Build Alternative extends from the south end of GCT's Lower Level, approximately the north side of 42nd Street, to track connections with the LIRR Main Line in Sunnyside Queens, just east of 43rd Street. The total length of the route is approximately 21,600 feet. The proposed route utilizes structures that were built in conjunctions with the NYCT 63rd Street Line. This joint construction will be continued, as part of this project, within Queens where the NYCT structure will be extended to a termination point under LIRR Yard A.

The proposed route can be subdivided into four major areas:

Location	Length Of Route
Manhattan - New Construction	5,000
Reconstruction within GCT Structure	2,500
Existing - 63rd Street Tunnel Structure	8,600
Queens - New Construction	5,500
	21,600 LF

As shown on Figure 2.4-6, the Manhattan portion of the construction will be further subdivided into three construction contracts.

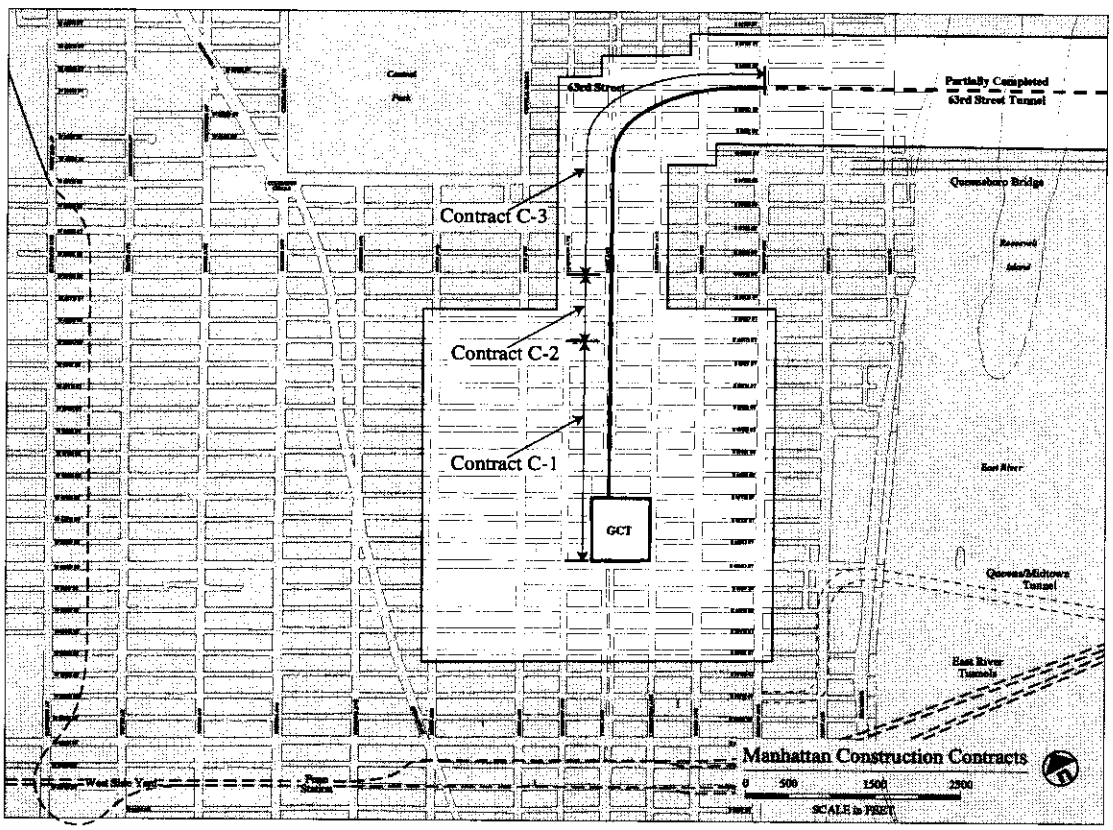


Figure 2.4-6

Construction Contract C-1 will extend from East 42nd Street to East 52nd Street basically within the existing Grand Central Terminal structural envelope.

Construction Contract C-2 will extend from East 52nd Street to East 55th Street and will construct the new LIRR structure beneath existing buildings on the west side of Park Avenue whose existing structure will be underpinned as part of this contract.

Construction Contract C-3 will extend from East 55th Street and Park Avenue to East 63rd Street and Second Avenue where it will join the existing LIRR lower level of the 63rd Street Tunnel.

On the Queens side, as shown on Figure 2.4-7 the construction will be performed under two separate construction contracts.

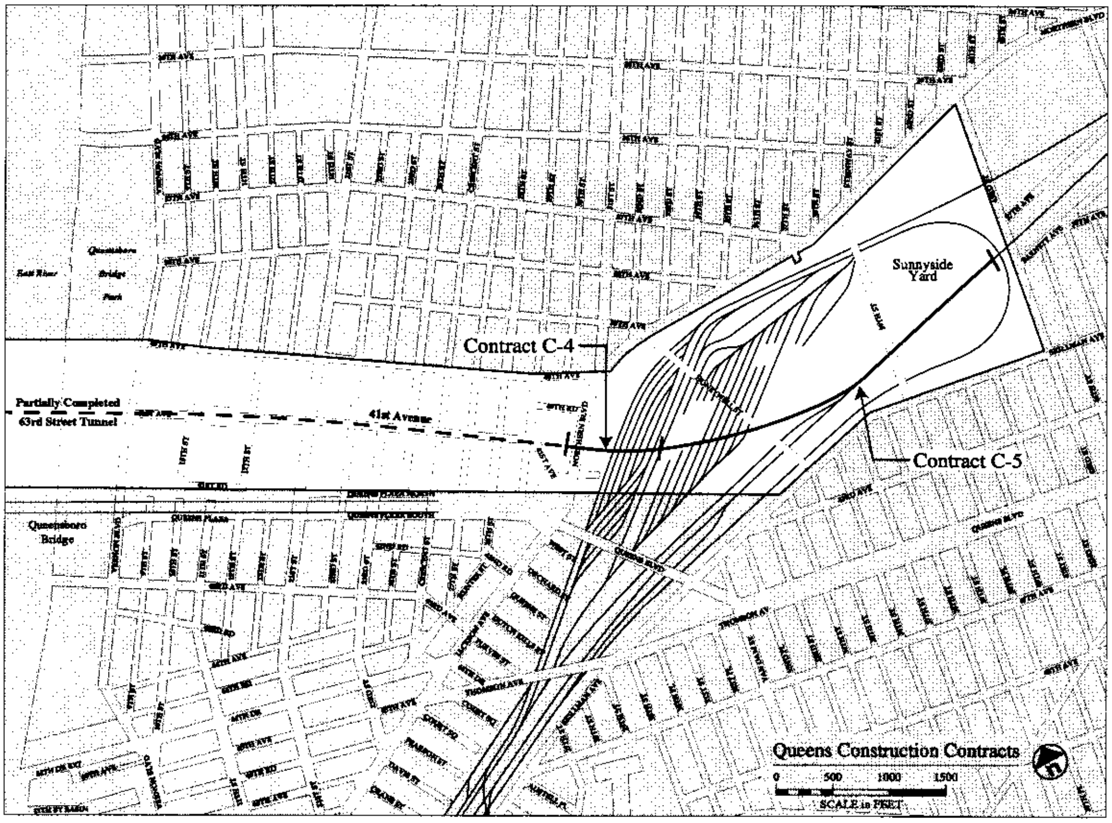


Figure 2.4-7

Construction Contract C-4 will start at the bellmouth currently being constructed under NYCT Contract C-20203. This section will be extended east under Northern Boulevard and the IND Queens Boulevard Line and continue to the east side of LIRR's Yard A.

Contract C-5 will continue the route from the east end of Contract C-4 to the connections to the LIRR Port Washington Branch and Main Line. Also included will be the provision for an in-bound and outbound track leading to a storage yard to be located in Yard A.

No new right-of-way is required for the Sunnyside Station since the station will be placed on existing railroad right-of-way for service both to Penn Station and Long Island City Station.

2.4.2.2 Trackwork

Despite the fact that portions of the tunnels associated with this alternative are already partially completed, no trackwork is currently in place. This alternative involves installing all new track between the Main Line and the Port Washington Branch in Sunnyside Queens and the throat of GCT, and to further extend the tracks so that they will fan out to serve the 10 track LIRR terminal within GCT. All tracks required to connect Harold Interlocking with the 63rd Street Tunnel and under Park Avenue to GCT will be installed and electrified to accommodate the over running-type third rail current collectors on LIRR's electric trains.

The western-most existing lower level tracks at GCT will be removed. The structure will be reconfigured to provide a 10 track, five island platform (each approximately 1,020 feet long) configuration. The ten tracks have been identified as LIRR Tracks 201 to 210 and the five platforms have been identified as LIRR Platforms 1 to 5. Five of these tracks, Tracks 201 to 205, will be stub ended, and five tracks, Tracks 206 to 210, will connect with Lower Level Loop Track 6 to allow LIRR trains to operate in a run through mode. All ten new station tracks will converge into three tracks, LIRR Tracks 1 to 3, at the north end of Grand Central's structure.

LIRR's track alignment accommodating 12 car trains will require the removal of existing MNR ladder tracks and crossovers. Approximately 75 existing columns supporting the upper level and/or buildings will be relocated to provide the necessary clearances for LIRR tracks and platforms. Additionally, about 70 columns require relocation to provide access for MNR tracks due to the modifications required for LIRR operation. LIRR trackways will use direct fixation fasteners. Local excavation work will be required for the construction of LIRR's track slab which will further impact existing column foundations. Existing MNR platforms on the west side will be removed or modified and new platforms will be constructed for the LIRR. Passenger access to the LIRR platforms will utilize cross-passageways provided above the track level. These proposed cross-passageways will require the lowering of the six westerly tracks on the lower level by about five feet.

The Build Alternative construction activities: including reconfigured trackage, additional crosspassages and new platforms adjacent to or beneath MNR operating tracks which may require track outages, will be subject to the requirements of the railroad. The specific sequencing of the construction work and the need to take specific MNR tracks out of service cannot be determined until the design phase.

Additionally, the existing trackwork in Yard A, configured for LIRR freight service needs, will be reconfigured to provide off peak trainset storage for approximately 22 trainsets (12 cars each), and allow light interior cleaning of these trains between runs.

No new trackwork will be required for the Sunnyside Station side platforms due to the new platforms being placed adjacent to existing trackage.

In order to maintain train schedule reliability and facilitate the construction of the tunnel segments and route connection trackwork within Harold Interlocking, a Harold Reroute track will be constructed. This reroute will allow Amtrak and LIRR train movements to bypass construction activities and maintain service density on the mainline tracks to/from Penn Station.

2.4.2.3 Utilities

Major public utilities within or adjacent to the Park Avenue corridor are not anticipated south of East 56th Street where the LIRR alignment will transition out from under the MNR Park Avenue Tunnel structure. During the construction of Grand Central Terminal to its current configuration in the early 1900's utilities were rebuilt or relocated. Intercepting sewers were constructed within the terminal's subsurface rights or in adjacent sidewalk areas along Park Avenue. Other utilities which crossed Park Avenue (water, steam, gas) were rerouted or where possible suspended within the roadway structures spanning the terminal's train shed and approach tracks. The construction access shafts proposed for East 52nd Street and Park Avenue; East 54th Street and Park Avenue and East 63rd Street and Second Avenue may impact public utilities within the influence envelope of the access shafts in Manhattan. Temporary support of the utility facilities will be provided during construction of the access shafts and associated LIRR structures. Service provided by the various utilities including, gas and steam lines, electric, water mains, sewers, telecommunications services, etc., will be maintained , as required.

Specifically, no water main relocations are anticipated. The existing 6" water mains below Park Avenue and 12" mains under the cross streets and at 2nd Avenue should be supported during any construction activity within their area of influence. The two 18 inch sewer lines at 54th Street will have to be reset to accommodate the new LIRR inbound track alignments. In addition, two segments of the previously described interceptor sewers built when GCT was constructed, may require reconstruction; a 4'-0" by 2'-0" sewer between East 52nd Street and East 53rd Street and a 3'-6" by 2'-0" between East 53rd Street and East 54th Street. Both sewer segments are located within the west sidewalk area of Park Avenue. The existing 6'-0" by 3'-0" sewer at East 46th Street which runs beneath the lower level tracks, and primarily functions as the sewer for the train shed and associated MNR facilities within the terminal may be impacted by the new LIRR track alignment. The existing 15 inch sewer on 2nd Avenue will require temporary support during construction of the access shaft. No other combined sewer relocations are anticipated. The existing storm water chutes from the street catch basins may have to be supported and maintained during any adjacent construction activity.

The existing MNR pipe tunnel and steam lines under GCT Track 125 will be impacted by the construction and require relocation. A 20 inch steam line that crosses Park Avenue at East 52nd Street may require support during construction activity in the vicinity of the main. No electric conduit relocation is anticipated. Low tension electric conduits in the vicinity may have to be supported during any construction activity.

In addition, no gas main relocation at East 52nd Street or East 54th Street is anticipated. A 30 inch gas main is assumed to require relocation for construction of the access shaft at 2nd Avenue. Finally, no Empire City Subway duct bank relocation is anticipated. Some duct banks may require support during construction activity in close proximity to those duct banks. Since the LIRR will operate electric trains into GCT, the requisite electrical substations with new feeds from Con Edison's distribution network will be required.

No public utility relocations are anticipated for the construction and operation of the new Sunnyside Station.

2.4.2.4 Structures/Tunnels

Since all of the route alignment within Manhattan is contained in tunnel or within the existing GCT, this alternative involves significant amounts of tunneling and structural construction. Construction techniques envisioned include cut and cover and soft ground tunnelling in Sunnyside Yard to deep bore tunneling in Manhattan between Park Avenue and 2nd Avenue, as well as cut and cover construction near GCT. The only portion of the route which has been completed is the partially built 63rd Street Tunnel, of which the lower level (LIRR level) extends 8,600 feet from approximately 41st Avenue and 29th Street in Queens to 63rd Street and 2nd Avenue in Manhattan.

Major structural modifications are required within the lower track level of GCT to accommodate the reconfigured track arrangement and passenger cross-passageways for the LIRR terminal.

Diesel locomotives, dual-mode locomotives and the fleet of new bi-level railcars will not fit into the confined tunnel clearances of the existing 63rd Street Tunnel.

At the new Sunnyside Station, there will be pedestrian overpass facilities which will connect the station platforms with the Long Island City Central Business District on both the north and south sides of Sunnyside Yard.

2.4.2.5 Traction Power

LIRR operation into GCT will be exclusively composed of electric train service, and new substations will be required. Specifically, it is proposed that the LIRR extension to Grand Central be served by a traction power system consisting of two substations and composite contact rail. One of the two substations would be located near 50th Street, and the second east of 2nd Avenue on the south side of 63rd Street; both in Manhattan. There would also be a new substation located in Sunnyside Yard for the Queens segment of the route. This new substation will replace an existing LIRR substation that must be relocated to accommodate the Harold reroute alignment. The new substation will be increased in capacity to accommodate the additional power needs.

No extension of the third rail system is required to service the new Sunnyside Station. However, the trackage to and within Yard A must be electrified to store the trainsets used for this new LIRR service.

2.4.2.6 Signals and Communications

Train signals and communications compatible with existing and anticipated LIRR signaling systems will be installed throughout the alignment of this alternative.

However, in order to put this alternative into revenue service, new interlockings for the LIRR will be needed at GCT, in the vicinity of Queens Plaza, at the entrance to Yard A, and on Main Line Tracks 1 and 2 at Woodside. In addition, modifications will need to be made to the existing Harold Interlocking. At each of these interlockings, it is recommended that Rule 409 signaling (wayside signaling with cab signaling/automatic speed control) be provided. On the double-track sections between GCT and Queens Plaza, Rule 409 signaling will be employed in one direction while Rule 410 signaling (cab signaling/automatic speed control without intermediate wayside signals) has been assumed for the other direction.

Microprocessor control logic will be employed at Grand Central, Plaza Interlocking and Yard A, while Harold Interlocking and Woodside will both use vital relay control logic. It has also been assumed that double rail track circuits will be used throughout the alternative, though the following areas use single rail track circuits: GCT - south of signals located between 51st and 52nd Streets, except on the Loop Track south of the signals located at 44th Street, and on the reactivated MNR tracks; Yard A - interlocking and yard.

Minor upgrading of the existing LIRR signals are required to support the introduction of service into the new Sunnyside Station.

2.4.2.7 Stations

As previously stated, the lower level of GCT, currently used by MNR will be extensively reconfigured to provide a 10 track, five island platform LIRR terminal within GCT (designated LIRR Tracks 201 to 210 and LIRR Platforms 1 to 5). The LIRR Terminal will be located on the west side of the lower level of Grand Central in the area of MNR's existing Tracks 114 to 125.

To provide passenger access to this LIRR station, new north end passageways and entrances will supplement those already under construction for MNR passengers for the North End Access Project.

The west side of the lower level in the space presently occupied by MNR revenue platforms and the Madison Avenue car maintenance facility would be assigned for LIRR use. Platform widths would generally range from a low of 15 feet for the three westerly platforms to a slightly wider 17 feet for the two easterly platforms. All five island platforms on the lower level would be connected by means of escalators and/or stairs leading to the cross-passages above. In addition, elevators will be provided connecting each platform to the 44th Street cross-passage and to the lower level Grand Central suburban concourse which brings the project into compliance with ADA.

The platforms would be served by east/west cross-passages constructed below the existing upper level tracks. The east/west cross-passages would be located within the line of existing cross streets above Grand Central trackage to avoid interference with the structural system supporting the buildings above. All cross passages would extend west towards Madison Avenue, while street access on the east ends would vary depending on whether exclusive LIRR or joint LIRR/MNR use is planned.

This alternative would be planned to provide street access for LIRR commuters at both the south and north ends. At the south end, the LIRR terminal would tie into the existing passenger circulation system within GCT at the Lower Concourse level. At the north end, the LIRR circulation system would vary depending on separate or joint use of the facility space by LIRR and MNR users. As stated previously, the planned cross passages could be located at 44th, 45th, 47th and 48th streets.

The upper level concourse east side ticket windows will be restored and activated for use by railroad customers. In addition, coordinated MTA directional and informational signage will be provided within GCT and at all street level and subway entrance points. Ticket Vending Machines (TVMs) able to dispense all agencies' fare media will be located in appropriate areas of the concourse.

Also as stated above, the LIRR is planning a new line station (Sunnyside Station) in the vicinity of Sunnyside Yard to serve future Queens Central Business District initiatives in Long Island City. Certain Penn Station inbound and outbound trains would be routed to this station with the introduction of LIRR East Side service through the 63rd Street Tunnel. In addition, certain diesel trains bound for the existing Long Island City Station would be routed through this station. There are no additional stations being considered under this alternative.

2.4.2.8 Parking

For this alternative, it is anticipated that increases in ridership will necessitate additional parking at selected LIRR stations to supplement existing parking facilities. It is estimated that approximately 20,074 parking spaces will be required for the Build Alternative above existing LIRR parking capacity.

In summary, parking demand for the LIRR system has been estimated as follows:

No-Build Alternative	**15,365 spaces**
TSM Alternative	**15,713 spaces**
Build Alternative	**20,074 spaces**

The estimates noted above reflect the potential parking expansion needed beyond current capacity.

2.4.2.9 Maintenance Facility/Depots

No long-term or overnight LIRR train storage will be provided at GCT; mid-day storage and light servicing will be performed at Yard A in Queens. It is anticipated, though, that the five LIRR stub ended tracks, Tracks 201 through 205, will be available for short-term (two to three hours) storage within Grand Central Terminal.

Yard A, will be converted to off peak trainset storage, light interior cleaning and minor service inspections and repairs for approximately 14 to 22 trainsets (12 cars each) or 168 to 264 cars. The Build Alternative will require relocation of the existing Yard A freight operations.

No new LIRR maintenance facility will be required for the new Sunnyside Station.

2.4.2.10 Rolling Stock

The preliminary determination is that the LIRR will need 180 electric MU cars to support the operating plan for the Build Alternative. No additional LIRR rolling stock is required for service to the new LIRR Sunnyside Station.

2.4.3 Operating Plans

This alternative assumes that 24 electric trains per hour could operate into GCT via the 63rd Street Tunnel, and that each train would have a maximum length of 1,020 feet, comprised of 12 M1/M3 type cars. Restricted vertical clearances do not permit the forthcoming bi-level push-pull coaches, nor the associated dual-mode locomotives from entering the existing 63rd Street Tunnel. To avoid operational conflicts, LIRR trains entering Grand Central will be physically separated from MNR trains using this terminal. Running times for LIRR trains to GCT are projected to be approximately 1-2 minutes longer than scheduled times from the Main Line into Penn Station New York.

Five of the LIRR's terminal platform tracks (206-210) will have access to the Lower Level Loop Track at GCT; the remaining five tracks (201-205) will be stub ended. Peak period trains which are to be cycled to or from the storage facility will platform at Tracks 206-210. In the morning, those trains will disembark passengers and continue in the same direction to the Loop Track and on to Yard A or to another LIRR terminal further east. This procedure will be reversed for the evening peak period. Trains which turn for a reverse peak revenue assignment will platform on stub Tracks 201-205. In either case, platform dwell times should be limited as much as possible to enable the capacity of the terminal station to adhere to the capacity of the tunnels on this proposed route, i.e., 24 trains per hour.

For the purpose of this analysis, the specifics of which LIRR branch will provide direct train service into GCT has not been fully determined. However, following the practice at Penn Station New York, it is assumed that those trains with the greatest passenger demand, with consists of 12 cars, will serve GCT. This will allow full use to be made of the 24 trains per hour 63rd Street Tunnel capacity.

2.5 Capital Cost for No Build, TSM and Build Alternatives

2.5.1 Methodology

The development of capital cost estimates for each of the three alternatives relied on MTA (including the LIRR, NYCT and MNR), New York State DOT, and other current data relative to construction and rolling stock procurement in New York City. The cost estimates are based upon a conceptual level of detail, without the benefit of extensive design. Several assumptions have also been applied which are consistent with the LIRR methodology for preparing cost estimates for Major Investment Studies.

These assumptions are as follows:

- All work will be performed by third party contractors except certain work which will be performed by railroad employees. This includes work to be performed by LIRR, MNR, NYCT and Amtrak.

- An allowance of 30 percent for contingencies has been added to the estimated construction costs; an allowance of 10 percent has been included for the installation of new track; and a five percent allowance has been included for rolling stock procurements.

- Consistent with the MTA Long Range Planning Framework, cost estimates are in 1997 dollars. MTA Budget Division Wharton Escalation Factors (WEFA) trend forecasts provided inflation factors for fixed nonresidential construction and for transportation equipment (rolling stock).

- The cost estimate includes a percentage allowance for other work as follows:

Design and Construction Phase Services	10%
Construction Management	12%
LIRR Project Management	5%

2.5.2 Capital Cost Estimates

No-Build Alternative

The MTA Long Range Planning Framework defined the No-Build Alternative as the existing transportation network with programmed capital improvements included in the MTA 1995 - 1999 Capital Program and all other regional transportation projects that were funded for the same time period.

The programmed spending for each agency is provided below:

TABLE 2.5-1
Capital Cost Estimates No-Build Alternative

Agency	Project	Capital Cost
MTA - LIRR	Dual-Mode Locomotives/Coaches	$ 349.5 million
	PSNY Platform 11	24.2 million
	PSNY "U" Ladder[1]	7.0 million
	New Parking	54.9 million
	Woodside Station + Bridge Rehab. Improvements	32.7 million
MTA - NYCT	63rd Street Connector	612.0 million
MTA - MNR	Mid-Harlem Third Track	42.3 million
	Wassaic Extension	18.3 million
	Coaches and Locomotives	152.1 million
NYSDOT	HOV Lanes	552.6 million
NJT	Kearny Connection	67.0 million
	Secaucus Transfer	448.0 million
	Hamilton Station	20.0 million
AMTRAK	High Speed NYC - Boston	1,691.0 million
	Farley Post Office	315.0 million

[1]**Funded in 1987-91 Capital Program.**

TSM Alternative

The TSM Alternative is comprised of a package of relatively low-cost improvement strategies as follows:

TABLE 2.5-2
Capital Cost Estimates TSM Alternative

Strategy	**Capital Cost**
Increased Ferry Service	$21.4 million
Increased Number of Rail Cars on Peak Trains	$190.2 million
Institution of Discrete PM Operating Plan	$31.8 million
Extension of LIE Bus/HOV Lane	$67.3 million
Increased Service to Long Island City and Hunterspoint Avenue LIRR Stations	$303.6 million
TOTAL	**$614.3 million**

Build Alternative

The Build Alternative to GCT is based on conceptual planning, and an exploratory level of detail on construction methods both in Manhattan and in Queens. A number of construction methods are still under consideration and will be refined during preliminary engineering and the preparation of the Final Environmental Impact Statement. Thus the following estimate should be considered to be within the range of probable capital costs. It is broken down into five major construction contracts as shown on Table 2.5-3, and includes mitigating measures at GCT for the benefit of NYCT and MNR customers.

TABLE 2.5-3
Capital Cost Estimates Build Alternative

Project Element	**Capital Cost**
Contract C - 1	$ 207.4 million
Contract C - 2	200.4 million
Contract C - 3	330.8 million
Contract C - 4	138.3 million
Contract C - 5	348.0 million
Harold Reroute	125.0 million
Rolling Stock	781.0 million
Right-of-Way	400.0 million
Other Supporting Improvements	843.6 million
Total	**$ 3.4 Billion**

2.6 Operating and Maintenance Costs

The annual operating and maintenance costs for each of the Long Island Transportation Corridor Alternatives are summarized in this section.

2.6.1 Methodology

The estimation of annual operating and maintenance costs was carried out using cost models that calculate the labor, materials, energy, and services costs as a function of service levels and the operating plans necessary to support those service levels. For example, the energy consumption for each alternative was based on computations of the diesel locomotive unit miles, dual-mode locomotive unit miles (in both the diesel and straight electric modes), the multiple-unit (MU) car miles, and the net cost of the hotel power energy consumption of the new bi-level diesel coach fleet during layovers and nighttime storage.

An estimate of the additional cost for the maintenance and servicing of the additional rolling stock required by the Build Alternative (180 electric MU cars, 78 bi-level coaches, and nine dual-mode locomotive units) was prepared by the LIRR's Maintenance of Equipment Department. This estimate included the quantities of personnel by job title, in the car and support shops, at outlying diesel territory locations, for MU car inspection, and for car cleaning. This estimate derived the payroll and non-payroll expenses for this fleet addition and also allocated the costs between MU cars and diesel haul units (78 coaches and nine locomotives).

Likewise, a separate estimate was prepared for the additional operating employees required for the alternatives. This included positions such as train crew personnel, police, ticket agents (full time and seasonal), operating supervision such as train and yardmasters, road car inspectors and electricians, and coach cleaners at GCT. The quantity of payroll positions for each job title was developed based on LIRR norms for days worked per year by job craft and this was applied to 1994 budget data which was inflated by three percent per year to arrive at the 1997 estimated annual operating and maintenance costs for the extension of LIRR service to GCT.

In accordance with the methodology described above, a number of assumptions were made as part of the estimation of operating and maintenance costs for the various corridor alternatives. These include:

- The overall rate of inflation of operating and maintenance costs from 1994 onwards will average three percent per year.
- Wages and benefits of all LIRR employees will increase with inflation.
- LIRR employee productivity will remain constant.
- Fuel, power and other purchased materials/supplies/services will increase in cost with inflation.

2.6.2 *Operating and Maintenance Cost Estimates*

The estimated O&M costs for each alternative are presented in Table 2.6-1. These represent the additional LIRR O&M costs for the No-Build, TSM Alternative and Build Alternative compared to the 1995 Base; they exclude additional O&M costs for other transportation operators. These are expressed in Fiscal Year 1997 dollars.

TABLE 2.6-1
Operating and Maintenance Cost Comparison
Alternatives vs. 1995 Base
(FY 1996$)

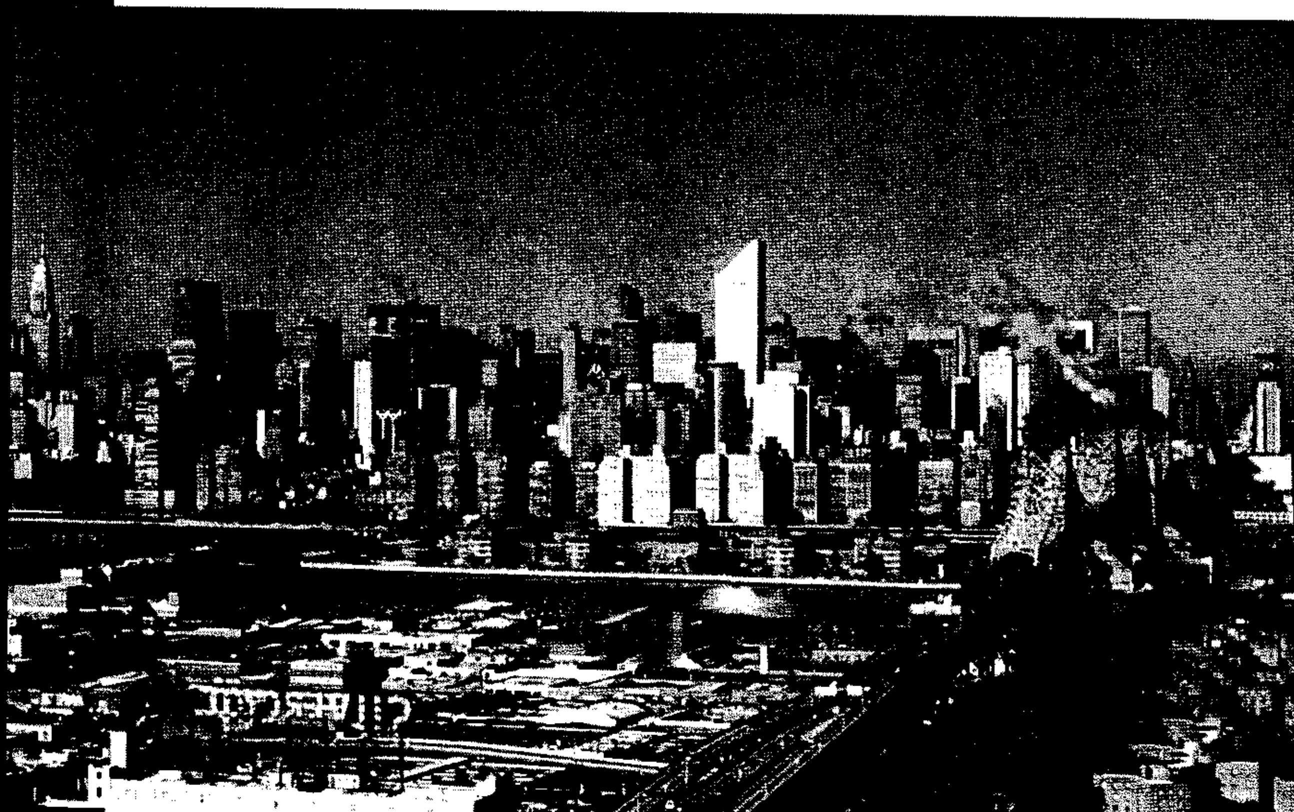
		ALTERNATIVES		
Expense Category	**1995 Base**	**2020 No-Build**	**TSM**	**Build**
Operating Employees	Base	Base	$1,033,800	$43,371,794
Maint. of Equipment	Base	Base	$6,525,285	$35,177,056
Propulsion Power	Base	$231,577	$105,707	$16,122,042
Diesel Fuel	Base	$1,030,234	$1,997,614	$612,661
Hotel Power	Negligible	$2,850,342	$3,493,910	$4,486,916
Net Annual Increase	**Base**	**$4,112,153**	**$13,156,316**	**$99,770,469**
TSM vs. No-Build			**$9,044,163**	
Build vs.TSM				**$86,614,153**

Total incremental LIRR O&M costs will be greatest for the Build Alternative at $102.764 million. This incremental cost is $89.2 million greater than for the TSM Alternative which, in turn, is $9.3 million greater than the No-Build Alternative.

The capital and O&M costs discussed in this chapter are further evaluated in Chapter 7. This further evaluation also includes consideration of the service and ridership impacts that are discussed in Chapter 4.

Chapter 3

Affected Environment



Long Island Rail Road

3.0 AFFECTED ENVIRONMENT

This chapter provides data and analyses on the environmental conditions that prevail in the study area. This analysis will serve as the baseline for establishing the environmental impacts of the No Build, TSM, and Build Alternatives. The information serves as a baseline for consideration of the location and magnitude of the potential environmental consequences of implementing each alternative, as discussed in Chapter 5. It also sets the stage for the discussion of transportation impacts in Chapter 4.

The study area for the Long Island Transportation Corridor was previously defined in Chapter 1, Purpose and Need. To summarize, the study area has been broken up into a Primary Study Area (PSA) and a Secondary Study Area (SSA); the PSA consists of those areas in Midtown Manhattan and Long Island City, Queens, that will be directly affected by the Build Alternative, while the SSA is where the indirect affects of the project will occur. The SSA includes three New York City boroughs, Manhattan, Brooklyn, and Queens; as well as Nassau and Suffolk Counties on Long Island.

Since the Manhattan and Queens portions of the PSA display markedly different characteristics for a range of environmental domains, the PSA was further divided into the Manhattan Study Area (MSA) and the Queens Study Area (QSA).

Impact categories evaluated in this chapter include the following:

- Land Use and Socioeconomics including
  - Land Use
  - Institutional Uses
  - Parkland Properties
  - Zoning Policies and Plans
  - Demographic and Socioeconomic Characteristics
  - Real Estate Characteristics
  - Relocation and Displacement
- Transportation and Pedestrian
- Air Quality
- Energy
- Noise and Vibration
- Hazardous Materials
- Natural Resources including:
  - Ecology
  - Water Resources
  - Wetlands
  - Geology and Soils
  - Floodplains
- Cultural Resources including Historic /Architectural and Archaeological
- Visual Resources

The emphasis of the data collection and analysis is in the PSA for most of the environmental categories, with the major exception being the socioeconomic and real estate analyses where the availability of data at the regional level allows for comparisons between smaller and larger geographic areas.

LAND USE AND SOCIOECONOMICS

3.1 Land Use

An extreme dichotomy exists between the land uses in the MSA and those that lie across the East River in the QSA. In Manhattan, particularly the MSA, the highest densities of commercial and residential real estate occur within the entire metropolitan area. The business districts of Manhattan make up the epicenter of corporate and cultural activity attracting millions of workers and tourists. Millions of square feet of floor space are accommodated in 20 to 40 story buildings, some of which occupy entire blocks. These buildings saturate the Manhattan skyline, particularly in Midtown, and their tightly clustered juxtaposition leaves little in the way of open space. The density of real estate in Manhattan's Midtown is the highest of any major city in the United States, and rivals that of any other in the world.

In contrast, the QSA's land use morphology has resulted in much lower density buildings, generally no taller than three to four stories with the exception of the high density Queensbridge public housing project consisting of six story buildings. Aside from the housing complex, which dominates the western end of the QSA, the remainder of the QSA is a mixture of commercial, light industrial and residential uses.

A more detailed discussion of the land uses follows. This discussion is presented separately for each part of the study area, the MSA and QSA, given the land use contrast that exists between the two parts of the study area.

3.1.1 Land Use in the Manhattan Study Area

The dense, complex, and diverse nature of land uses in the MSA requires that the description of land uses be somehow divided into subparts reflecting a dominant development and land use type. The approach adopted for this study was to define the traditional districts and neighborhoods within the MSA as these areas seem to best reflect predominant development and land use types. There are no accepted definitive boundaries for these districts, and depending on the source used their boundaries may vary; however, the *AIA Guide to New York* was used to establish the approximate boundaries for this study. These traditional neighborhood district boundaries are outlined in Figure 3.1-1, and Figure 3.1-2 is a generic land use map identifying the major land uses on each block within the MSA.

The neighborhoods that make up the MSA are contained within the two larger areas of Midtown and the Upper East Side, with the majority of the MSA being located in Midtown. Sixtieth Street separates Midtown from the Upper East Side. Within the two larger, more generic areas, there are ten neighborhood districts (along with Roosevelt Island), each of which has evolved its own predominant land use form and type.

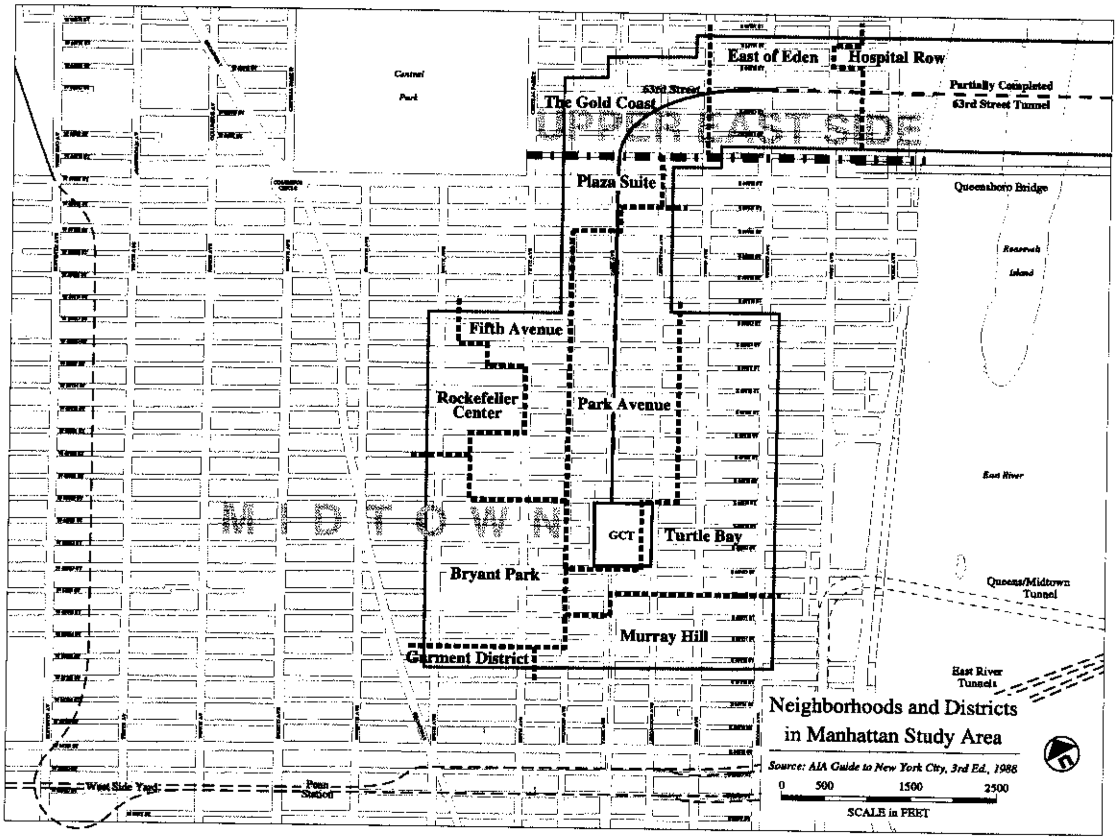


Figure 3.1-1

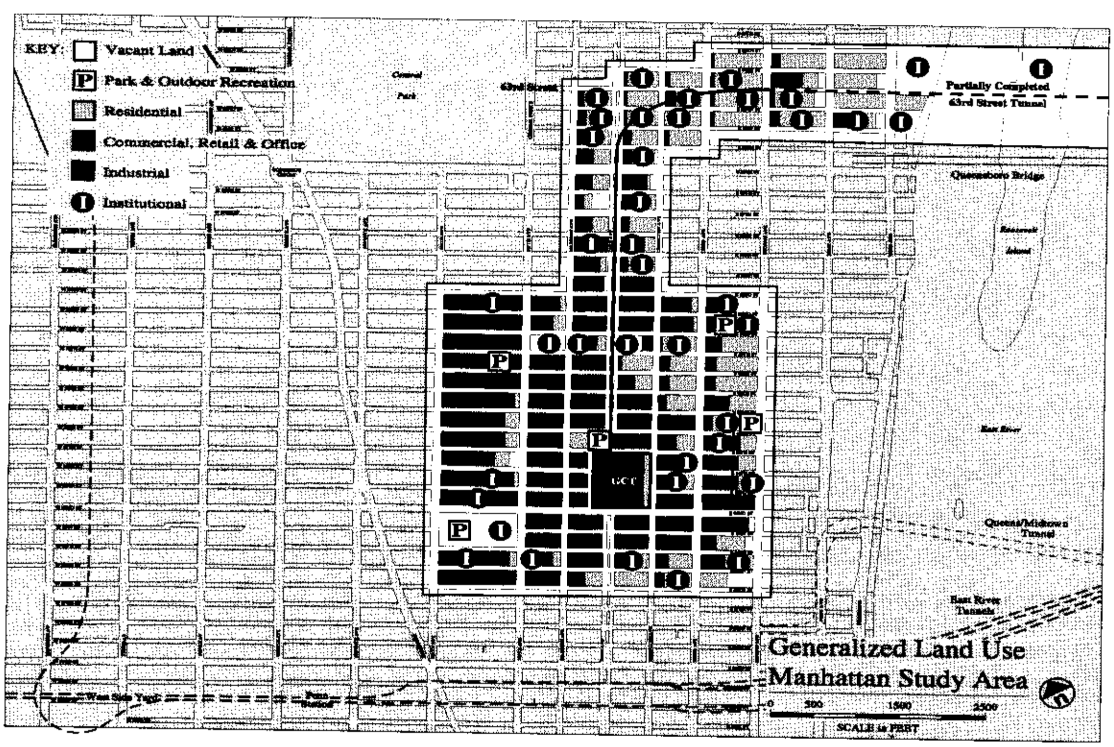


Figure 3.1-2

3.1.2 *Land Use in the Queens Study Area*

The QSA is located in western Queens within two different neighborhoods, Long Island City and Sunnyside, with Northern Boulevard being the divider between the two neighborhoods. While the QSA represents about 70 to 80 percent of the entire Primary Study Area, over 50 percent of it consists of the Sunnyside Yard rail yard. Figure 3.1-3 illustrates the generic land uses in the two neighborhoods in the QSA.

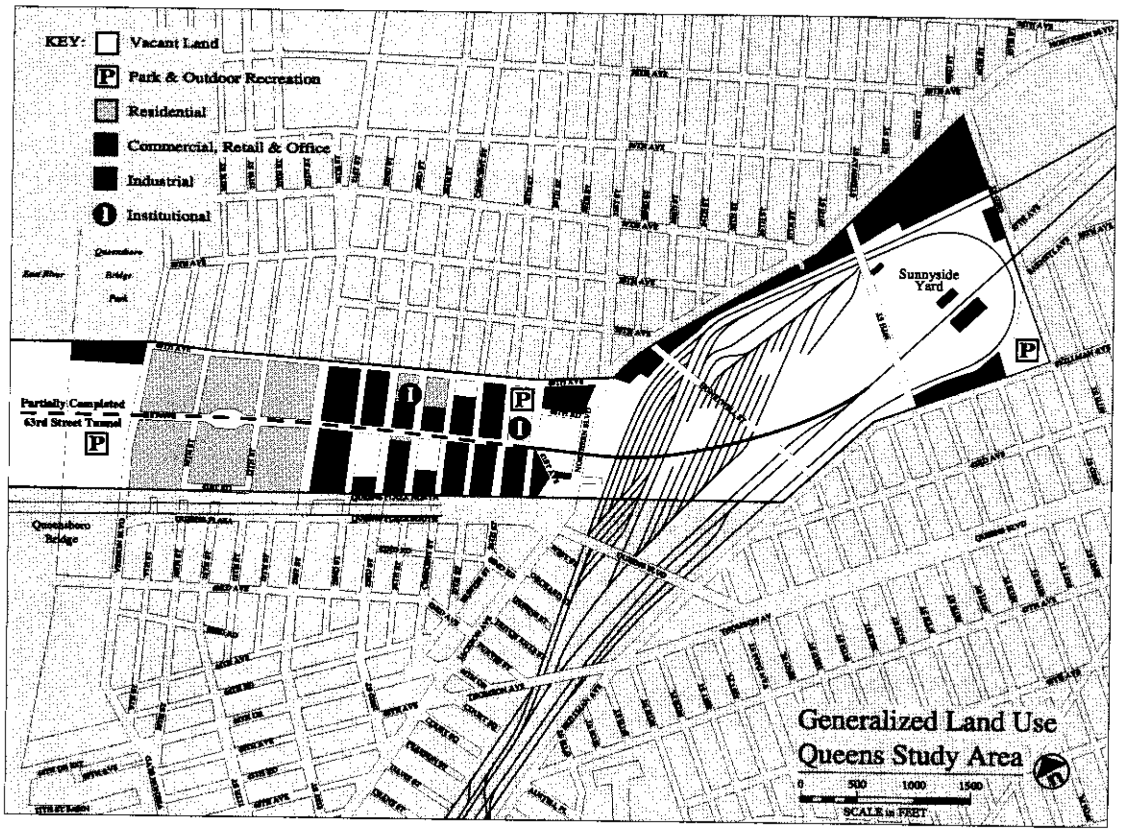


Figure 3.1-3

Long Island City

The Long Island City (LIC) portion of the QSA bounded by Northern Boulevard to the east, the East River to the west, the southern boundary of the QSA at Queens Plaza North, and 40th Avenue to the north. Within LIC there is another smaller historic neighborhood called Ravenswood, which is located along the East River. The entire LIC neighborhood actually extends beyond the northern boundary of the QSA, six blocks north as far as 34th Avenue. Therefore, the QSA is contained within the southern two blocks of the LIC neighborhood.

Land uses can be divided into three distinct areas as follows:

- The Queensbridge Park section, located west of Vernon Boulevard, and bounded by the East River to the west, the Queensboro Bridge to the south, and a Con Edison power plant to the north. The 63rd Street Tunnel runs under the park and there is a one story ventilation shaft located at the eastern edge of the park facing 41st Avenue.

- The Queensbridge Houses are located in six blocks bounded by Queens Plaza North to the south, Vernon Boulevard to the west, 40th Avenue to the north, and 21st Street to the east. Managed by the NYC Housing Authority, this public housing project was built around 1940 and consists of over 3,000 housing units in six story Y-shaped buildings clustered around the edge of the blocks and overlooking a central green space. When first built, it was the largest public housing project in the country. In the very center of the project, between 10th and 11th Streets, is an octagonal plaza with shops and a community center. The housing project is served by a subway stop at 41st Avenue and 21st Street utilizing the 63rd Street Tunnel.

- The area east of 21st Street as far as Northern Boulevard contains a very diverse mix of land uses, including housing, industrial, and commercial. Land uses in the four blocks bounded by 21st Street to the west, 40th Avenue to the north, 23rd Street to the east, and Queens Plaza North to the south are predominantly industrial in nature, containing both light and heavy industrial uses in five to six story pre-war loft buildings. Uses include automobile maintenance, machine shops, elevator repair, warehousing and storage, garment manufacturing, and ink manufacturing. Storefronts for these uses are located on the ground floor along 21st Street.

  West of 23rd Street as far as Northern Boulevard, land uses are much more mixed, with residential interspersed among predominantly lighter industrial uses, and commercial uses clustered along Queens Plaza North and its confluence with Northern Boulevard. The intensity of all uses is low to medium density. The residential uses are more dominant north of 41st Avenue between 23rd Street and 28th Street. The housing stock consists principally of one to two story brick and clapboard buildings, many of which are owner-occupied. Much of the housing predates World War II. Convenience retail shopping occurs at the streetcorners in larger three to four story walk-up apartment buildings. Retail frontage is also located at street level in office buildings along Queens Plaza North between 24th and 27th Streets. Industrial uses include auto dealerships, a limousine service, a lumber yard, and a greeting card publisher. A shoe factory outlet is located in a five story 19th-century loft building fronting Queens Plaza North between 28th and 29th Streets. The LIC High School and associated playground is located in the block bounded by 41st Avenue to the south, 28th Street to the west, 40th Avenue to the north, and 29th Street to the east. Higher density residential and commercial uses are clustered between 28th Street and Northern Boulevard fronting Queens Plaza North. Uses include a 10 story apartment complex, the Home Savings Bank, and the NYC municipal offices of the Board of Education and the Department of Transportation. The trapezoidal-shaped block bounded by 41st Avenue, 40th Road, and Northern Boulevard is where the terminus of the 63rd Street Tunnel is located. The block has been fenced off and is occupied by construction equipment and the ongoing construction of the tunnel extension to the NYCT subway lines that run under Northern Boulevard.

Sunnyside

The Sunnyside portion of the QSA extends east and south of Northern Boulevard as far as 43rd Street and is bounded by Skillman Avenue to the south, and as far as 34th Street to the west to a point north of Queens Boulevard. Most of this portion of the QSA is occupied by Sunnyside Yard.

Built in 1910 on reclaimed marshlands, the Yard was the largest passenger rail yard in the world when first built. Its original purpose was to service cross-country trains emanating from Pennsylvania Station at 34th Street in Manhattan. The Yard still serves this function for Amtrak where train sets are assembled, and cars and engines maintained. The principal maintenance and train storage area for Amtrak, which owns most of the Yard, is on the northern side of the Yard between Queens Boulevard to the west and 39th Street to the east. The LIRR Freight Yard is also on the northern side of the Yard, between Amtrak's service area and the northern edge of the Yard.

The busy Northeast Rail Corridor is located on the southern end of the yard, serving Amtrak's Boston-Washington service and the LIRR mainline. NJ Transit also uses the Yard to store trains during the mid-day off-peak period under an agreement with Amtrak. East of 39th Street, the Yard is underutilized, and the former Railway Express Agency Terminal (the precursor to the overland express mail services of today) is being demolished.

The industrial rail uses that constitute the Yard are buffered and isolated by several factors. The Yard is at a 10 to 20 foot lower elevation than the surrounding land; access over the Yard and into it is limited to two bridges, at Honeywell Street and 39th Street, and only the latter one is open at this time. In addition, buildings along Northern Boulevard and Skillman Avenue hide the Yard from view.

Uses that surround the Yard are predominantly light industrial in nature. A ribbon of two to ten story brick and concrete loft buildings form an uninterrupted wall along the southern side of Northern Boulevard. Uses include a mix of office space and warehousing and storage; specific uses include a discount tire outlet, a sign manufacturer, an NYCT uniform distribution center, a printer, and offices for the NYC Department of Social Services. Auto-related uses predominate east of 39th Street. A Pathmark supermarket is located on the corner of Northern Boulevard and 43rd Street and it extends south to 37th Avenue. South of 37th and west of 43rd is a General Motors auto detailing and large volume distribution facility. The facility is located on land that was formerly part of Sunnyside Yard and the facility can only be accessed by an overpass from 43rd Street over active tracks that surround the property.

A playground is located on the northwest corner of 43rd and Skillman serving residential areas east and south of the Yard. The remaining developed land on the southern side of the Yard extends west as far as 39th Street, and includes a church and a sportswear warehouse. West of 39th, the southern edge of the Yard is fenced off and vegetation obscures views of the Yard. The City provides angle parking along the strip between 39th and Queens Boulevard.

3.2 Institutional Uses in the PSA

3.2.1 Institutional Uses in the MSA

Institutional is the term used to describe facilities which serve a public purpose, including schools, places of worship, hospitals, firehouses, police precincts and museums. Within the dense urban environment of the MSA, there are over 50 institutional facilities, and some of New York City's best architecture is displayed in the buildings housing them. Figure 3.2-1 identifies institutional uses in the MSA. Table 3.2-1 lists the corresponding map number, the name of the institutional space, its location and the facility type.

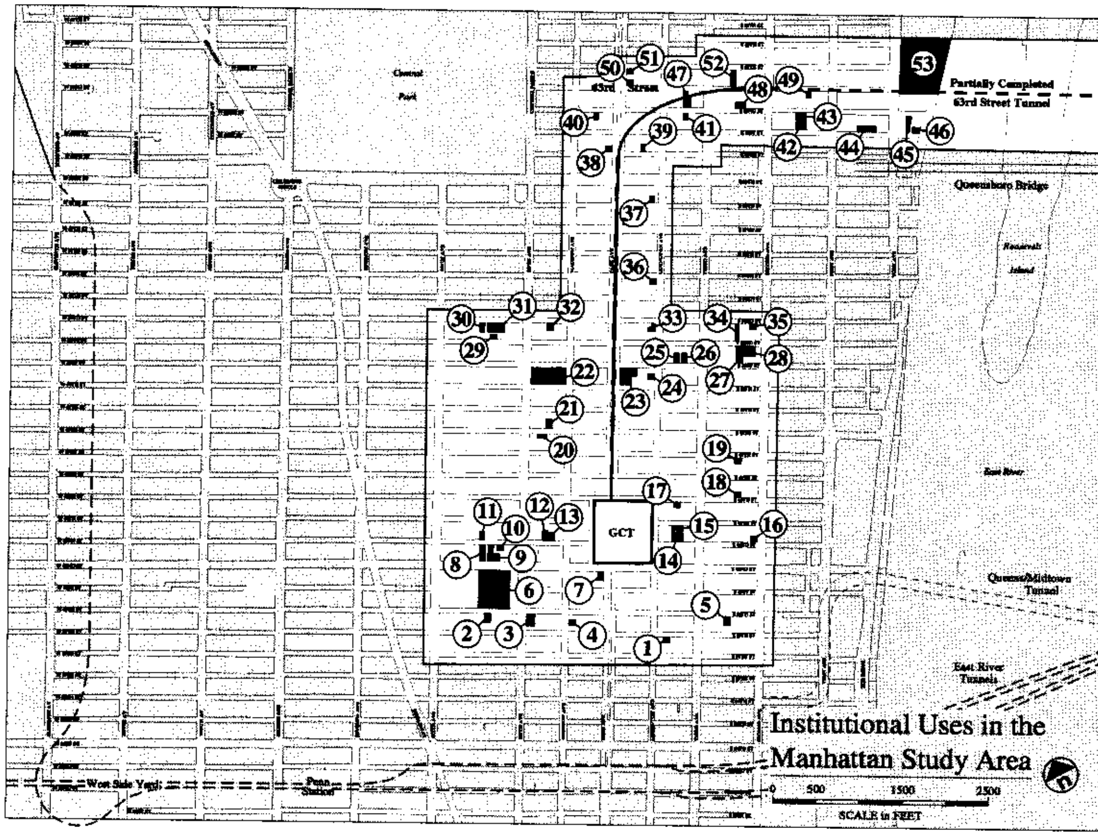

Institutional Uses in the Manhattan Study Area
Central Park
63rd Street
GCT
Partially Completed 63rd Street Tunnel
Queensboro Bridge
Roosevelt Island
East River
Queens/Midtown Tunnel
East River Tunnels
West Side Yard
Penn Station
0 500 1500 2500
SCALE in FEET

Figure 3.2-1

TABLE 3.2-1
Institutional uses in the Manhattan Study Area

NUMBER ON MAP	FACILITY NAME	FACILITY ADDRESS	FACILITY TYPE
1	American Apostolic Church of America	(39th b. Lex & 3rd)	Place of Worship
2	7th Day Adventist Center	(40th b. 6th & 5th)	Place of Worship
3	Mid-Manhattan Library	455 5th Avenue (5th & 40th St.)	Library
4	Redeemer Presbyterian Church	(Madison b. 39th & 40th)	Place of Worship
5	Engine 21	238 E 40th (40th b. 3rd & 2nd)	Firehouse
6	New York Public Library	(5th b. 40th & 42nd)	Library
7	Whitney Museum Midtown	(Park b. 41st & 42nd)	Museum
8	CUNY Graduate School & University Center	33 W 42nd (42nd b. 6th & 5th)	College
9	NYU Midtown Center of Continuing Education	11 W 42nd Street (b. 6th & 5th)	College
10	Unification Church	(43rd b. 6th & 5th)	Place of Worship
11	Engine 65	33 W 43rd (43rd b. 6th & 5th)	Firehouse
12	Berkeley School	3 E 43rd (43rd b. 5th & Madison)	Private School
13	5th Church of Christian Science	(43rd b. 5th & Madison)	Place of Worship
14	R.C. Church of St. Agnes	145 E 43rd (43rd b. Lex & 3rd)	Place of Worship
15	St. Agnes High School	(44th b. Lex & 3rd)	Parochial School
16	Episcopal Church Center	(NW cor 43rd & 2nd)	Place of Worship
17	Children's Aid Society	(45th b. Lex & 3rd)	Hospital
18	Franciscan Mission of Mary	(45th b. 3rd & 2nd)	Place of Worship
19	Vanderbilt Branch YMCA	(47th b. 3rd & 2nd)	Community Facility
20	First Church of Religious Science	(48th b. 5th & Mad)	Place of Worship
21	Church of Sweden	(48th b. 5th & Mad)	Place of Worship
22	St. Patrick's Cathedral	(5th b. 50th & 51st)	Place of Worship
23	St. Bartholomew's Episcopal Church	(Park b. 50th & 51st)	Place of Worship
24	Cathedral Public Library	560 Lex Ave (Lex b. 50th & 51st)	Library
25	Engine 8	165 E 51st St (51st b. Lex & 3rd)	Firehouse
26	17th Precinct	167 E 51st (51st b. Lex & 3rd)	Police Station
27	Sutton Place Synagogue	(51st b 3rd & 2nd)	Place of Worship
28	Turtle Bay School of Music	(52nd b. 3rd & 2nd)	Private School
29	Museum of TV & Radio	(52nd b. 6th & 5th)	Museum

TABLE 3.2-1 (cont'd) Institutional uses in the Manhattan Study Area			
NUMBER ON MAP	FACILITY NAME	FACILITY ADDRESS	FACILITY TYPE
30	American Craft Museum	(53rd b. 6th & 5th)	Museum
31	The Donnell Library Center	(53rd b. 6th & 5th)	Library
32	College of Merchandising	(53rd b. 5th & Mad)	Vocational School
33	YWCA of NY Headquarters	(SW cor 53rd & Lex)	Community Facility
34	Community Center	(52nd b. 3rd & 2nd)	Community Facility
35	St. Michael Liberal Church	(53rd b. 3rd & 2nd)	Place of Worship
36	Central Synagogue	(SW cor 55th & Lex)	Place of Worship
37	58th Street Public Library	(58th b. Park & Lex)	Library
38	Christ Methodist Church	(60th & Park)	Place of Worship
39	French Church Du St. Esprit	(60th b. Park & Lex)	Place of Worship
40	Browning School for Boys	52 E 62nd (62nd b. Mad & Park)	Private School
41	Lexington United Methodist Church	(62nd b. Lex & 3rd)	Place of Worship
42	Our Lady of Perpetual Help Church	(61st b. 2nd & 1st)	Place of Worship
43	Our Lady of Perpetual Help School	328 E 62nd (62nd b. 2nd & 1st)	Parochial School
44	Colonial Dames/Abigail Adams Museum	(61st b. 1st & York)	Museum
45	Animal Medical Center	(61st b. York & East End)	Hospital
46	Regent Hospital	425 E 61st (61st b. York & East End)	Hospital
47	The Rock Church	(62nd b. Lex & 3rd)	Place of Worship
48	Church of Our Lady of Peace R.C.	(62nd b. 3rd & 2nd)	Place of Worship
49	Martha Graham School of Dance	(63rd b. 2nd & 1st)	Private School
50	Third Church of Christian Science	(NE cor 63rd & Park)	Place of Worship
51	Central Presbyterian Church	(SE cor 64th & Park)	Place of Worship
52	Manhattan Eye, Ear & Throat Hospital	210 E 64th (63rd-64th b. 3rd & 2nd)	Hospital
53	Rockefeller University	1230 York Ave (63rd b. York & FDR)	College

3.2.2 *Institutional Uses in the QSA*

The range and type of institutional facilities in Queens is far less than in the MSA. Figure 3.2-2 identifies institutional uses in the QSA. Table 3.2-2 is a list which corresponds to the number on the map to the name of the institutional space, the location and description.

TABLE 3.2-2
Institutional Uses in the Queens Study Area

NUMBER ON MAP	NAME OF FACILITY	LOCATION OF FACILITY	DESCRIPTION OF FACILITY
1	Jacob Riis Neighborhood Settlement	41st Ave b. 10th & 12th Sts	Community Facility
2	Queensbridge Housing Public Library	SW corn. 21st St. & 41st Ave	Library
3	YWCA	41st Ave b. 27th & 28th Sts	Community Facility
4	Long Island City High School	28th-29th Sts b. 41st-40th Aves	Public School
5	Korean Filipino Presbyterian Church	29th St. b. 40th Rd & 40th Ave	Place of Worship
6	Japanese Church	41st St. & Skillman Blvd	Place of Worship

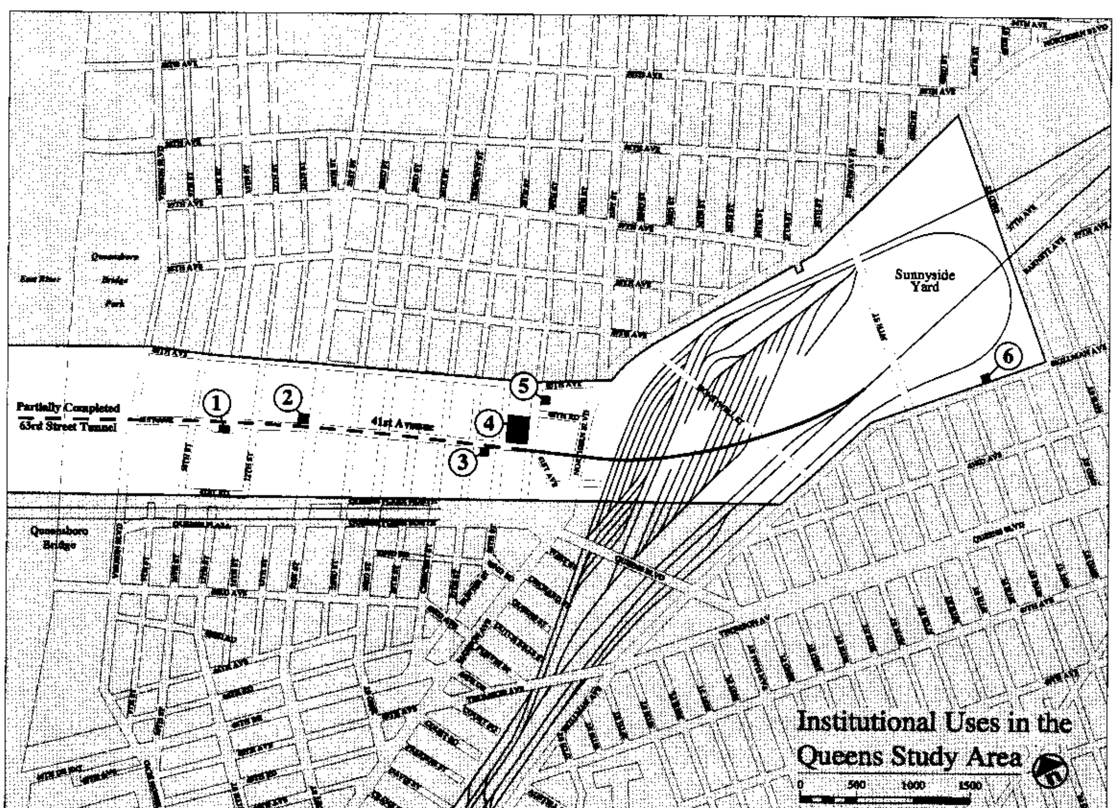


Figure 3.2-2

3.3 Parkland Properties

3.3.1 Parkland in the MSA

Larger office buildings in Manhattan have either indoor or outdoor open spaces which consist of anything from simple park benches, to trees, to tables with checkerboards in them, to waterfalls. These welcomed open public spaces are used in a variety of ways by thousands of individuals living, working or visiting Manhattan. The open spaces provide the opportunity to socialize with friends over a game of chess or checkers, to converse with fellow co-workers over lunch, or as a space for simply spending quiet time alone reading. Figure 3.3-1 shows the larger parklands and open spaces, both indoor and outdoor within the MSA. The numbers on the maps correspond to the following table, Table 3.3-1, which lists the name of the parkland or open space, the location, a facility description, and whether the space is used actively or passively.

TABLE 3.3-1
Parklands & Public Spaces in the Manhattan Study Area

NUMBER ON MAP	NAME OF FACILITY	LOCATION OF FACILITY	DESCRIPTION OF FACILITY	FACILITY USAGE
1	Park Avenue Center Plots	Centerline of Park from 38th - 63rd	Open outdoor space	Passive
2	Bryant Park	40th-42nd b. 6th & 5th	Open outdoor space	Passive
3	NY Public Library	40th-42nd b. 6th & 5th	Open space in front of the building	Passive
4	Grace Plaza	43rd & 6th	Open outdoor space	Passive
5	Plaza	425 Lex (43rd)	Open indoor space	Passive
6	Plaza	45th-46th b. 6th & 5th	Open outdoor space	Passive
7	Dag Hammarskjold Plaza (Office)	47th & 2nd	Open outdoor space	Passive
8	Dag Hammarskjold Plaza (Apt. Tower)	46th-47th SW cor. 2nd	Open outdoor space	Passive
9	Plaza	49th b. 5th & Madison	Open outdoor space	Passive
10	Rockefeller Center	49th-50th b. 6th & 5th	Open outdoor space	Active/ Passive
11	Sterling Plaza	49th & 2nd	Open outdoor space	Passive
12	Greenacre Park	51st b. 3rd & 2nd	Open outdoor space	Passive
13	Plaza	52nd b. 6th & 5th	Open outdoor space	Passive
14	Park Avenue Plaza	52nd-53rd b. Mad & Park	Open indoor space	Passive
15	Trump Plaza	60th b. Lex & 3rd	Open indoor space	Passive

3.3.2 Parkland in the QSA

In the QSA there is a higher ratio of open space per capita, since the QSA has a much lower density. Figure 3.3-2 shows the major parklands and open spaces in the QSA. Following the map is Table 3.3-2 which corresponds to the numbers on the map. The table lists the parkland and open areas by name, location, facility description and whether the space is used in an active or passive manner.

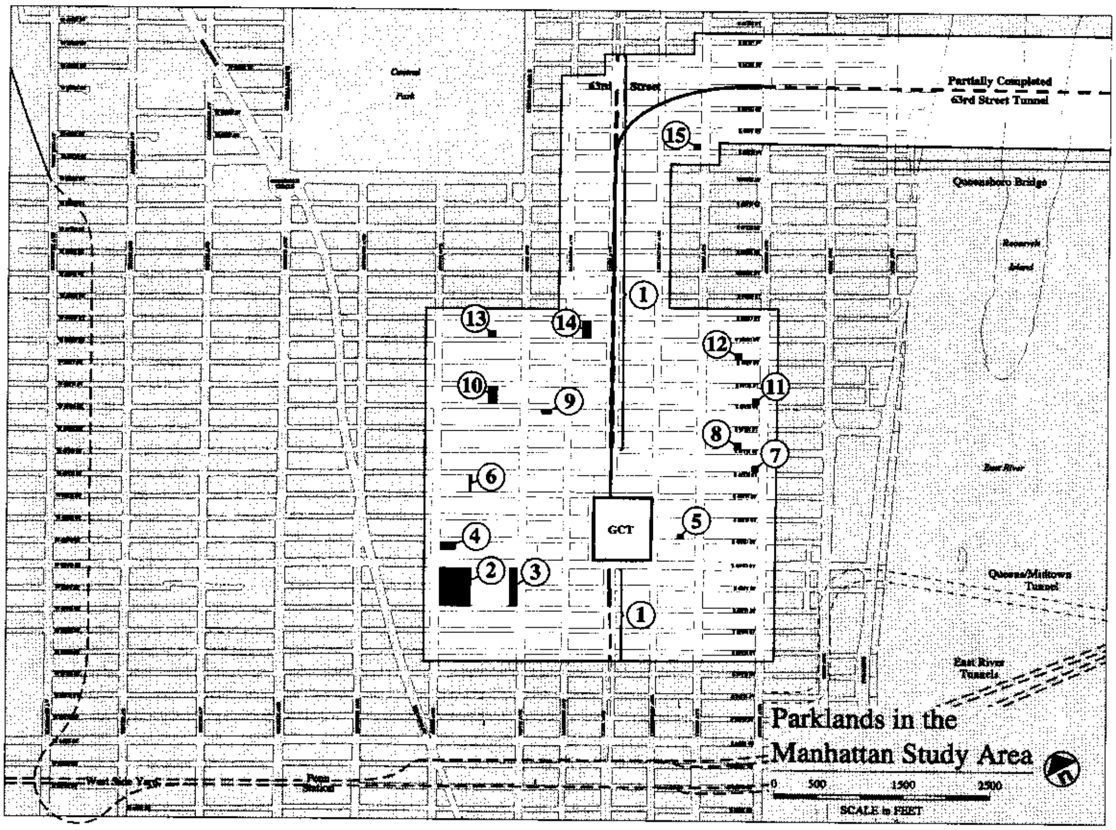


Figure 3.3-1

NUMBER ON MAP	NAME OF FACILITY	LOCATION OF FACILITY	DESCRIPTION OF FACILITY	FACILITY USAGE
TABLE 3.3-2 Parklands in the Queens Study Area				
1	Queensbridge Park	East River - Vernon Blvd b. Queens Plaza and 40th Ave	Open outdoor space	Active/Passive
2	Queensbridge Housing Park	NE corn. 12th St. & 41st Rd	Open outdoor space	Active
3	Long Island City High School Playground	28th-29th Sts b. 40th Ave-midblk 41st Ave	Open outdoor space	Active (when school is in session)
4	Torsney Playground	41st-43rd Sts & Skillman Blvd	Open outdoor space	Active/Passive

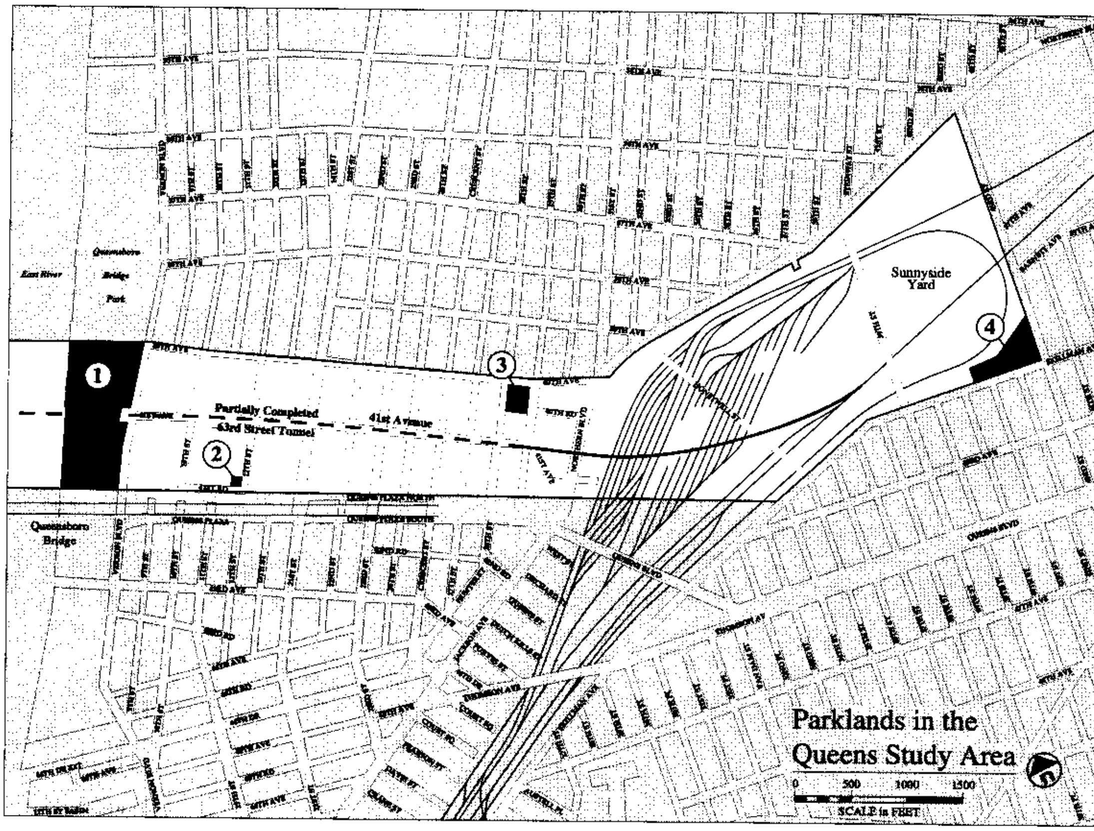


Figure 3.3-2

3.4 Zoning Policies and Plans

In this section the plans and policies of City Government at all three levels, i.e., the City itself, the Boroughs of Manhattan and Queens, and the five community boards in which the PSA is located, were reviewed. This analysis will serve to determine the extent to which the project is consistent with the planning objectives of municipal government. Additionally, data was acquired about projects proposed by private developers and evaluated in the same way.

3.4.1 Zoning

The City of New York has no adopted master plan to guide development. The NYC Zoning Resolution substitutes as the City's only "de facto" comprehensive citywide planning document. New York City is big, diverse, and complex, and this is reflected in the three volume Zoning Resolution, consisting of over 2,000 pages, one of the largest in the United States. Although the Zoning Resolution was revised and updated in 1994, the last comprehensive amendments were adopted by the City in 1960. The more recent update was an attempt to better organize the plethora of amendments adopted over the past 35 years. The most significant growth in the Zoning Resolution has been in the area of Special Districts. These are zoning overlays designed to address the special needs of those neighborhoods in the City having significant cultural, historic, or natural resource value.

The analysis of the Zoning Resolution as it pertains to the PSA follows, and is presented separately for the MSA and the QSA, as the intensity and diversity of development is markedly different between the two boroughs.

Zoning in Manhattan Study Area

Perhaps nowhere else in the City is the complexity of the Zoning Resolution better reflected than in the Midtown Manhattan section of the PSA in which there are 20 different zoning designations, along with five different special districts and subdistricts. The zoning designations that apply to the MSA are summarized in Table 3.4-1, and mapped on Figure 3.4-1.

Commercial Zoning

The dominant zoning designation in the MSA is commercial. About 90 percent of the MSA is zoned commercial south of 57th Street, and there are five major commercial zoning categories in the MSA; C1, C2, C5, C6, and C8. The C5 category is the most prevalent, and is mapped around GCT, and between Third and Sixth Avenues from 40th to 60th Streets. Moreover, the entire proposed alignment along Park Avenue is zoned C5 (C5-3). C5 is a restricted central commercial district intended primarily for office buildings and the great variety of large retail stores and related activities which occupy the prime retail frontage in the Midtown business district. The C5 district is typically developed with department stores, large office buildings, and mixed buildings with residential space above office or commercial floors.

Within the C5 commercial category there are five C5 subcategories mapped in the MSA; C5-1, C5-2, C5-2A, C5-2.5, and C5-3. C5-3 provides for the highest bulk in any commercial district, with an allowable Floor Area Ratio (FAR) of 15.0. For residential structures in C5-3 districts, FARs of 10.0 to 12.0 are allowed. C5-3 is mapped principally around GCT and north of GCT between Fifth and Park as far as 60th Street, and there are no parking requirements in this district for commercial uses. Depending on the lot size, building heights could vary as-of-right from 25 to 45 stories in C5-3 districts. By applying zoning bonuses to provide for open space and arcades, a developer can obtain up to 18.0 FAR.

C5-2 is a medium bulk commercial district mapped in the south and northeast sections of the MSA, east of GCT between 2nd and 3rd Avenues and 41st and 44th Streets, and along Lexington Avenue between 57th and 61st Streets. The maximum FAR allowed in a C5-2 district is 10.0, and up to 12.0 is allowed with bonuses. The same bulk allowances are provided for residential uses. However, parking is required for the residential component of developments. C5-2A and C5-2.5 subdistricts are also mapped in the MSA. C5-2A is mapped in a small area of the MSA, along Lexington Avenue, between 54th and 57th Streets east of Park Avenue, and is the only area in the entire City designated as C5-2A. C5-2A is a contextual commercial district in which the allowable lot coverage, required street wall height, location of the front building wall, and the type of commercial uses permitted on the ground floor of the building, are subject to special controls. C5-2.5 is mapped in the Special Midtown District (discussed in more detail below), and in the MSA through the center of blocks surrounding GCT as far north as 57th Street. Medium to high bulk FAR densities are allowed of 12.0 to 14.4 (with bonuses for district-wide and as-of-right incentives).

TABLE 3.4-1

Zoning in the Manhattan Study Area

Zoning Destination		Designated Uses and Provisions	Allowable Floor Area Ratio (FAR)[1]
Commercial			
	C1-8X	retail and personal service stores on the lower floors of residential buildings in a contextual district	2.0 (commercial only)
	C1-5	overlay providing retail and personal service stores on the lower floors of residential buildings	1.0 (commercial only)
	C1-9	retail and personal service stores on the lower floors of high density residential buildings	2.0 (commercial only)
	C2-5	commercial overlay in residential district permitting wider range of retail and service stores than C1	2.0 (commercial only)
	C2-8	commercial uses in residential district permitting wider range of retail and service stores than C1	2.0 (commercial only)
	C5-1	continuous retail frontage in the central commercial district	4.0 (commercial only)
	C5-2	continuous retail frontage in the central commercial district	10.0
	C5-2A	contextual[2] commercial district where ground floor uses subject to special controls	12.0
	C5-2.5	commercial district within the Special Midtown District with higher allowable bulk	12.0
	C5-3	continuous retail frontage in the central commercial district	15.0
	C6-4	medium bulk office uses	10.0
	C6-4.5	office uses in the Special Midtown District	12.0
	C6-6	high bulk office uses	15.0
	C8-4	warehousing	15.0
Residential			
	R7-2	medium density apartment houses with parking for at least 50% of dwelling units	0.87 to 3.44
	R8B	residential buildings with high lot coverage and compatible with adjacent existing structures	4.0
	R9	higher density residentail buildings along major avenues and crosstown streets	0.99 to 7.52
	R10	highest density residential buildings in NYC's central business districts	10.0
Manufacturing			
	M1-6	light manufacturing uses in loft areas of Midtown Manhattan	10.0
	M3-2	heavy manufacturing uses in NYC's central business districts	2.0
Special District			
	MiD	Special Midtown District with urban design provisions for uses allowed by underlying zoning	12.0 to 15.0
	TA	Special Transit Land Use District with requirement to provide access for future subway	NA
	LH-1A	Limited Height District where building height limited to 60 feet	NA
	F	Fifth Avenue Subdistrict within MiD designed to maintain continued retail streetscape at Fifth Avenue	12.0 to 15.0
	G	Grand Central Subdistrict within MiD with urban design guidelines to maintain existing character	12.0 to 15.0
	MP	Special Madison Avenue Preservation District is intended to preserve and reinforce the unique character of Madison Avenue	10.0
	P1	Special Park Improvement District designed to preserve the character and architectural quality of Fifth and Park Avenues	10.0 to 12.0

NOTES:

1. FAR = $\frac{\text{Building Floor Area}}{\text{Lot Area}}$

2. Contextual zoning provides guidelines which promote conformity with surrounding buildings

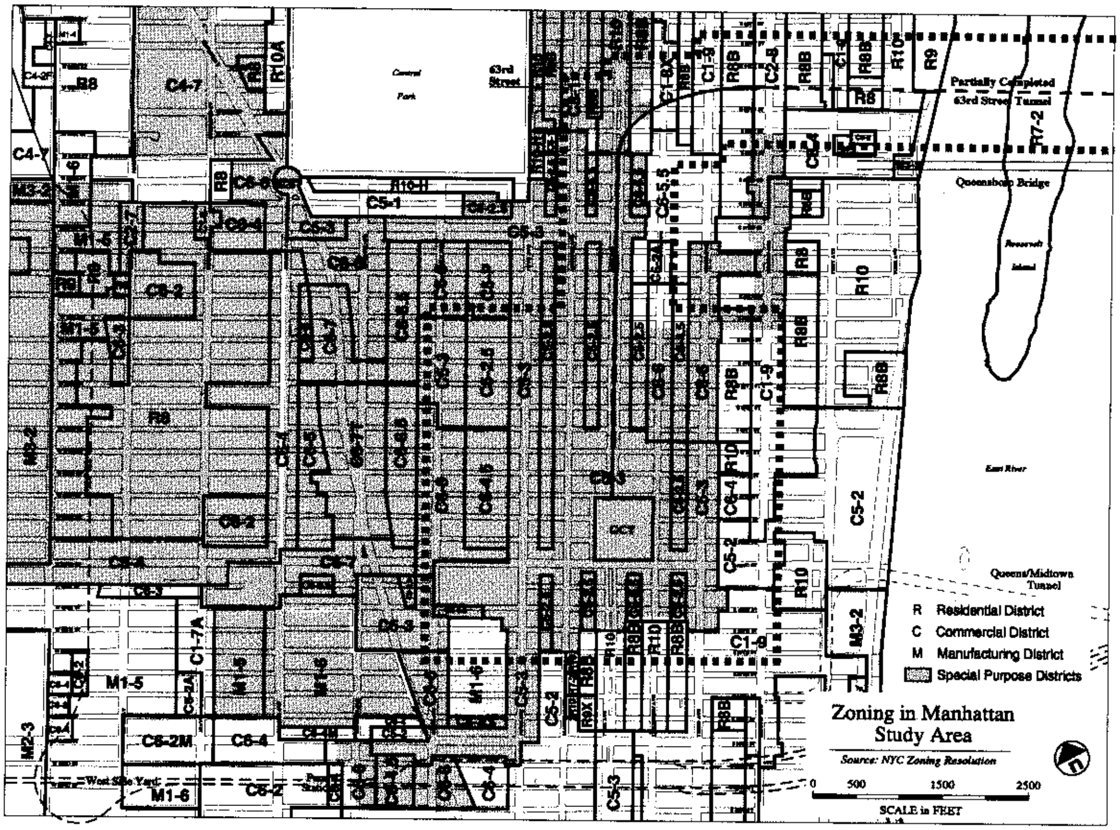


Figure 3.4-1

C5-1 is a low bulk commercial district mapped on the northwest corner of First Avenue and 62nd Streets. The maximum FAR is 4.0, but 10.0 FAR is allowed for residential projects, up to maximum of 12.0 with bonuses.

As opposed to the C5 commercial district, the C6 commercial district is designed as a general central commercial district. C6 districts are zoned for a wide range of high bulk commercial uses requiring a central location, and parking requirements are waived. Typical developments include corporate headquarters, large hotels, entertainment facilities, retail stores and some residential development in mixed buildings. There are three C6 subcategories mapped in the MSA, C6-4, C6-4.5, and C6-6. The C6-6 allows the highest bulk with 15.0 FAR, and is called the high bulk office district; with bonuses, 18.0 FAR can be achieved. As with the C5-3 district, 25 to 45 story buildings can be developed, depending on coverage. In the MSA, C6-6 districts are mapped east of Park Avenue, along Lexington and Third Avenues, from 48th to 56th Streets.

C6-4 and C6-4.5 provide the same bulk allowances as their C5 counterparts, C5-2 and C5-2.5, discussed above. C6-4 is a medium bulk office district mapped on the eastern edge of the MSA of the midblock between 44th and 45th Streets, west of Second Avenue. C6-4.5 occurs in the Special Midtown District, and is a medium to high bulk office district. The largest area in the MSA designated C6-4.5 are the six blocks north of 42nd Street between Sixth and Fifth Avenues as far as 48th Street.

C2 districts permit a wide range of local retail and service establishments to accommodate the retail and personal service shops needed in residential neighborhoods. Typical uses include grocery stores, delis, dry cleaning outlets, shoe repair, and restaurants. There are two C2 subdistricts in the MSA, C2-5 and C2-8, and parking requirements do not apply in the densely populated areas of Manhattan. The C2-5 district overlays the R8B residential district between First and Second Avenues from 62nd to 64th Streets. The maximum commercial FAR allowed in this district is 2.0. The C2-8 district is mapped adjacent to the C2-5 overlay in the MSA, along Second and First Avenues, principally between 62nd and 64th Streets, and the maximum FAR allowed is 2.0.

C1 districts, like C2 districts are designed to provide convenience shopping to residential neighborhoods, but are limited to the more personalized shopping needs. Continuous, clustered retail development is desired in these districts. Local service and repair establishments are not permitted to break the retail commercial continuity. There are two C1 subdistricts in the MSA, C1-8X and C1-5. C1-5 is mapped as a commercial overlay in the southern portion of the MSA in a R10 residential district, north of 38th Street along Lexington Avenue to the midblock south of 40th Street. The maximum commercial FAR allowed in this district is 1.0. The C1-8X district is a contextual commercial district mapped along Lexington Avenue between 61st and 64th Streets, and the maximum commercial FAR allowed is 2.0.

While the majority of commercial districts in the MSA are devoted to supporting retail uses, the C8-4 commercial subdistrict mapped between First Avenue and FDR, from 61st to 62nd Streets, forms a transition between the less intrusive personalized retail uses to the more disruptive heavier commercial uses. The C8-4 district is designated for warehousing, and is exempt from parking requirements.

Residential Zoning

Residential zoning predominates in four sections of the MSA: the northern part of the MSA, as the alignment swings west from Park Avenue and joins 63rd Street; along the eastern edge of the MSA east of Third Avenue between 46th and 53rd Streets; along the southern edge of the MSA south of 40th Street between Madison and Third Avenues; and on Roosevelt Island.

The majority of the residential zoning in the MSA is R8B, whose regulations encourage high coverage buildings that are compatible with existing low-rise buildings on the block. For example, a six story apartment building with a one story setback is intended to line up with the traditional rowhouses prevalent in R8B neighborhoods located in the Upper East Side of Manhattan and the MSA. The FAR in R8B districts is 4.0, with a maximum of 258 dwelling units per acre. The front wall of a new building must occupy the full width of the lot and must align with the front walls of adjacent buildings within a maximum required distance from the street line of eight feet on wide streets and 15 feet on narrow streets. Parking must be provided for 50 percent of the new dwelling units because these districts are served by mass transit. In the MSA, the R8B residential district is mapped on the midblocks, with commercial zoning on the avenues.

R10 is the highest density residential district designated in New York City. In the MSA, R10 districts are mapped along Park and Lexington Avenues south of 40th Street, between Second and Third Avenues from 46th to 48th Streets, and along York Avenue north of 62nd Street. The permitted FAR of 10.0 can be increased to 12.0 if a large plaza, arcade or lower income housing is provided. Where such amenities are provided, density can reach 700 dwelling units per acre. Depending on site coverage, 10 to 30 story buildings developments can be achieved.

The R9 residential district is mapped in the northeast portion of the MSA north of 63rd Street between York Avenue and FDR Drive. R9 zoning is only mapped in Manhattan. The FAR ranges from 0.99 to 7.52, with density ranging from 387 to 425 units per acre.

The completed portion of the 63rd Street Tunnel passes under Roosevelt Island, which has been developed entirely as a residential community. The entire island is zoned R7-2. R7 is designed as a medium density apartment house district. Density is between 208 and 226 dwelling units per acre; FAR ranges from 0.87 to 3.44. Parking is required for 50 percent of new units.

Manufacturing Zoning

Only a fraction of the MSA is zoned for manufacturing uses. South of 40th Street between Fifth and Sixth Avenues, the MSA is zoned M1-6, a designation designed to accommodate loft buildings, as this area is part of the Garment District. M1 zoning provides for light industrial uses including knitting mills, printing plants and wholesale service facilities. The allowable FAR in M1-5 districts is 10.0, and parking is not required.

The only other part of the MSA zoned for manufacturing uses is located in the northeast section of the MSA in the block bounded by York Avenue and FDR Drive from 62nd to 63rd Streets. This block is zoned M3-2, which is a central manufacturing area without a parking requirement and an allowable FAR of 2.0. M3 districts provide for more heavy industries which generate noise, traffic, and pollutants.

Special Purpose Districts

The most widely used affirmative action zoning technique is special district zoning. This technique establishes special urban design and planning controls for areas with unique characteristics. Zoning benefits are granted to developers who meet special district requirements by providing specific urban design features that the City seeks to foster. It is considered a way of using private capital to carry out public policy.

Within the MSA there are a total of seven different special districts and subdistricts mapped. However, the predominant special district mapping in the MSA is the Special Midtown District (MiD). The MiD overlays the area in the MSA from Sixth to Second Avenues and 38th to 61st Streets, the heart of the Midtown CBD. The MiD has a base FAR of 15.0 along avenue frontages and an FAR of 12.0 in the midblocks.

Of particular interest to this project is the MiD provision for pedestrian circulation space, given that new entrances for the Build Alternative will be located in the MiD. This provision requires all new developments or enlargements in the MiD on zoning lots of 5,000 square feet or larger and providing more than 70,000 square feet of floor area to accommodate at least one square foot of circulation space for every 300 square feet of new floor area. The pedestrian circulation space provided can include one or more of the following: sidewalk widening, arcade, building entrance recess area, subway stair relocation, or off-street rail mass transit improvement. Section 81-49 describes the specific urban design standards for an off-street rail mass transit improvement in terms of dimensions, obstructions, hours of public accessibility, and maintenance. Incentives for developers to provide such an amenity include deducting the area occupied by the off-street mass transit improvement from the floor area of the entire development and attributing 1.5 times the area of the new off-street toward the minimum area of pedestrian circulation required.

The MiD was established to promote several goals in Midtown Manhattan, including:

- strengthening the business core of Midtown Manhattan
- stabilizing development
- controlling light and air impacts of buildings
- linking future growth and development to improved pedestrian circulation, improved pedestrian access to rapid transit facilities, and avoidance of conflicts with vehicular traffic
- preserving the historic architectural character of development along certain streets
- continuing the historic pattern of relatively low building bulk in midblock locations compared to avenue frontages
- improving the quality of new development by fostering the provision of certain public amenities
- preserving, protecting and enhancing the character of the Theater District, Times Square, Fifth Avenue shopping, and the Museum of Modern Art
- expanding and enhancing the pedestrian circulation network connecting GCT to surrounding development, to minimize pedestrian congestion, and protect the area's special character

In support of the MiD goals five subdistricts are additionally mapped in the MiD. Three of these special subdistricts are in the MSA. They are the Grand Central Sub District (G), the Grand Central Sub District Core (GC) and the Fifth Avenue Sub District (F). Figure 3.4-2 delineates the boundaries of the MiD along with its associated subdistricts.

The Grand Central Sub District surrounds GCT and extends principally from Madison to Lexington Avenues and 41st to 48th Streets, and this area is called the Grand Central Subdistrict Core, while the entire subdistrict extends into some of the midblocks east of Lexington and west of Madison. Aside from having special bulk and urban design requirements relating to street walls, height and setback, building lobby entrance, curb cuts and loading berths, there are provisions for the transfer of development rights from landmark sites in the G. Both the "granting" lot and the "receiving" lot must be within the boundaries of the G. In addition, the maximum transfer of development rights cannot exceed 1.0 FAR above what is allowed as-of-right on the "receiving" lot.

In the MSA, the Fifth Avenue Sub District extends along Fifth Avenue from 38th Street to 53rd Street. The intent of the F is to ensure the continued development and stability of department stores, specialty stores, boutiques and international stores. Ground floor uses are restricted to retail uses and any development in the F must include retail uses occupying the equivalent of at least 1.0 FAR.

While the MiD and its associated subdistricts cover over 60 percent of the MSA, there are four other special districts located in the MSA, albeit covering smaller areas.

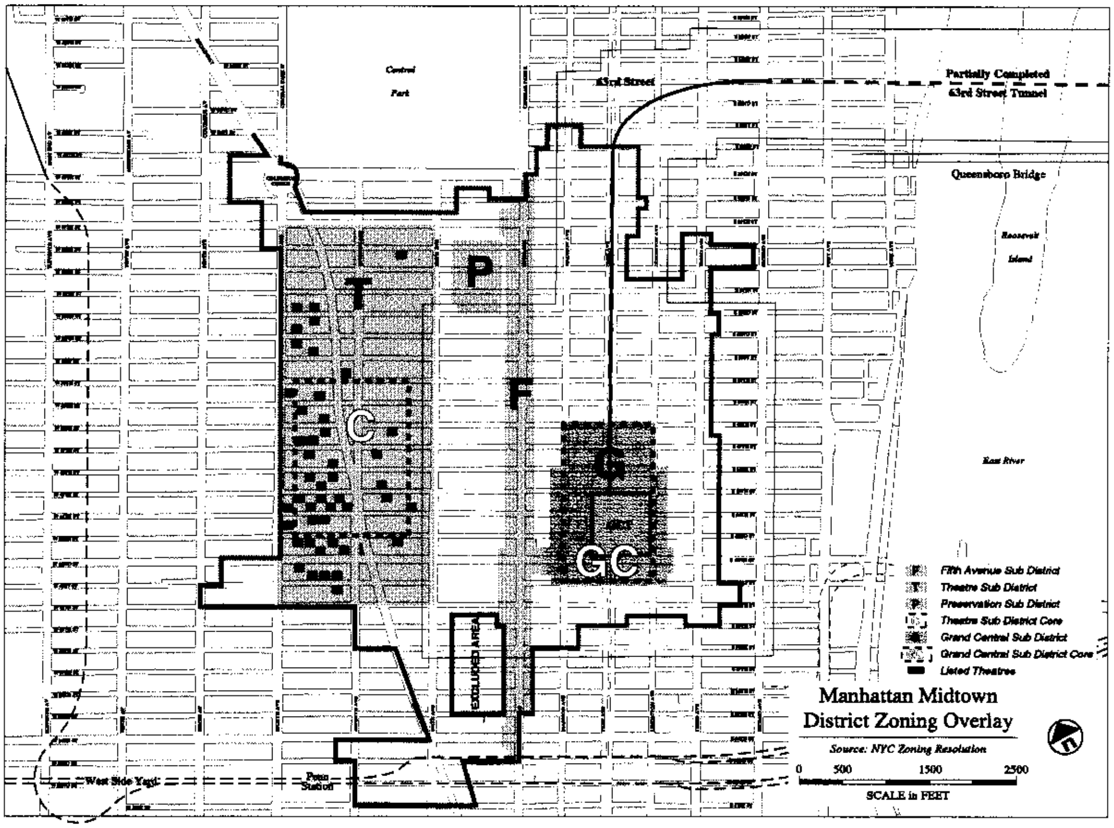


Figure 3.4-2

The Special Madison Avenue Preservation District (MP) is located on the northwest edge of the MSA, north of 61st Street along Madison Avenue. The goal of the MP is to preserve and protect the unique character of Madison Avenue and the surrounding area.

The Special Transit Land Use District (TA) is located on the eastern edge of the MSA, along portions of Second Avenue, and principally between 42nd and 46th Streets. The overlay came about as a result of plans to build a Second Avenue subway, portions of which have been constructed. The goal of the TA is to minimize the conflict between normal pedestrian movements on public sidewalks and access to the subway by requiring developers to provide easements in buildings for future access. Section 95-031 of the Zoning Resolution lists the dimensions for the transit easements, which can be utilized by the building owner temporarily until it is required by the NYCT. The Special Transit Land Use District is also mapped within the MiD (and designated TA-MiD), located at the confluence of Third Avenue and 53rd Street above the E and F subway lines. The TA is discussed in more detail below.

The Special Park Improvement District (PI) overlays Park Avenue north of 65th Street, and extends to the northern edge of the MSA at 64th Street. The PI is intended to preserve and protect the unique character of the residential part of Fifth and Park Avenues which includes many landmarks and other cultural buildings. The maximum FAR allowed is 10.0; but by providing on-site bonusable public amenities or by making a contribution to the Park Improvement Account, an FAR of 12.0 can be achieved.

The Limited Height District (LH-1A) located in the northern part of the MSA in the midblocks east and west of Park Avenue beginning at 60th Street is unlike the previously mentioned Special Districts in that this district has only one provision; the height of buildings in the LH-1A are limited in height to 60 feet.

Zoning in Queens Study Area

In contrast to the MSA, zoning in the QSA is far less complex, given that the character of the study area in Queens is markedly different. The diversity of uses is not as great and the intensity of development is much lower. The QSA is limited to two residential, one commercial, and five manufacturing zoning districts, which are listed in Table 3.4-2 and delineated on Figure 3.4-3.

TABLE 3.4-2
Zoning in the Queens Study Area

Zoning Designation		Designated Uses and Provisions	Allowable Floor Area Ratio (FAR)
Residential			
	R4	lower density housing in which multiple dwellings are allowed	0.75
	R6	medium density residential housing usually between three and twelve stories	0.78 to 2.43
Manufacturing			
	M1-1	light manufacturing uses located adjacent to residential areas with parking requirement	1.0
	M1-3	light manufacturing uses in older industrial area with parking requirement	5.0
	M1-3D	light manufacturing with limited new residential uses allowed	5.0
	M1-5	loft area with no parking requirement	5.0
	M3-1	heavy industrial uses	2.0
Commercial			
	C1-1	commercial overlay in residential district to accommodate retail and personal service shopping	1.0 (commercial only)

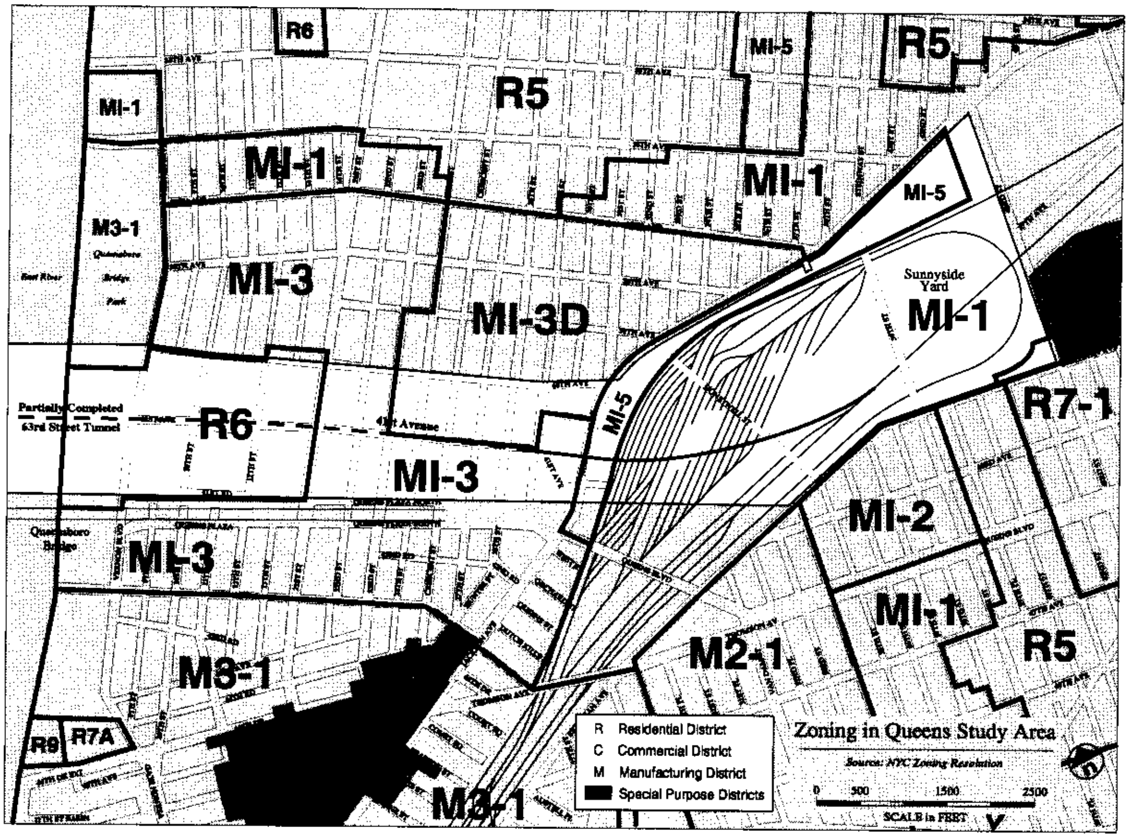


Figure 3.4-3

<u>Manufacturing Zoning</u>

The majority of the QSA is zoned for manufacturing uses. The entire QSA east of 21st Street (except for a park in the southeast corner of the QSA) is zoned manufacturing, and all of it zoned M1, which is the designation for light manufacturing uses. M1 districts are designed for a wide range of manufacturing and related uses which can conform to a high level of performance standards. Manufacturing uses of this type, within completely enclosed buildings, provide a buffer to residential districts and other industrial uses which have more objectionable influences.

There are a total of four different M1 zoning districts in the QSA; M1-1, M1-3, M1-3D, and M1-5. The M1-3 district is mapped between 21st Avenue and Northern Boulevard in the QSA, excluding the area north of 41st Avenue and 40th Road between 23rd Street and Northern Boulevard. This area is zoned M1-3D, with the D suffix indicating that limited new residential uses are permitted. M1-3 districts are generally located in older industrial areas with an allowable FAR of 5.0 and no parking requirement.

The M1-1 district applies to that portion of Sunnyside Yard located within the QSA and bounded by Northern Boulevard, 43rd Street, Skillman Avenue, and Queens Boulevard. Parking is a requirement in M1-1 districts and the allowable FAR is 1.0.

The portion of the QSA zoned M1-5 skirts the northern edge of Sunnyside Yard along Northern Boulevard, from Queens Boulevard to 43rd Street. M1-5 districts are located in warehouse/loft areas where the allowable FAR is 5.0 and there is no parking requirement.

The northwest corner of the QSA adjacent to Queensbridge Park is zoned M3-1. M3, as previously discussed for the MSA, is designated for heavy manufacturing uses which generate noise traffic, and pollutants. Typical uses include chemical and power plants and foundries. In M3-1 districts the allowable FAR is 2.0, and parking is required.

Residential Zoning

Almost all of the QSA west of 21st street is zoned R6. In addition, The George F. Tornsey Playground located in the southeast corner of the QSA is zoned R4.

The R6 zoning district applies to the six superblocks that comprise the Queensbridge public housing project and the adjacent Queensbridge Park. R6 districts are mapped for medium density housing, and typical developments are usually between three and 12 stories. FAR ranges form 0.78 to 2.43, allowing up to 176 units per acre. One parking space per dwelling unit is required, or 70 percent of dwelling units if they are grouped.

The playground zoned R4 is part of the Sunnyside Gardens planned residential development east of 43rd Street. This area has a special district overlay called the Special Planned Community Preservation District (PC), designed to preserve superior examples of town planning. The maximum FAR in R4 districts is 0.75, typically realizing buildings no taller than three stories, and a maximum of 45 dwelling units per acre.

While not in the QSA, it should be noted that a few blocks south of the QSA, between the East River and the Sunnyside Yard is the Special Hunters Point Mixed Use District (HP), a special district created in 1981 in an approximately 30 block section of Long Island City. This special district serves to guide the future development of a Long Island City mixed use core, which was historically a manufacturing neighborhood with adjacent worker housing. Even though the underlying zoning remains heavy industrial, the special district overlay was created to permit limited as-of-right status for the enlargement/alteration of existing residential buildings and for new in fill residential construction. The HP contains the three block Court Square Subdistrict created in 1986 and bounded by 44th Road to the north, Jackson Avenue to the south, Hunter Street to the east, and 23rd Street to the west. The underlying zoning in this subdistrict is C5-3 (commercial), which is the same zoning designation as occurs in and around GCT in Manhattan with a basic FAR of 15.0, which allows for buildings of 25 to 45 stories depending on lot size. The subdistrict serves to encourage high density commercial development in an area well served by rapid transit.

3.4.2 Policies and Plans

Whereas the regulated planning policies of the City are embodied in the land use provisions of its zoning, the more visionary long-term objectives are articulated in policy reports developed at several levels of City government. In addition to the City itself, the borough presidents and the community districts annually prepare mission statements which outline their future needs and aspirations. Each year, the borough president prepares a strategic policy statement and a community district (CD) needs report is published by the Department of City Planning. To supplement the strategic statements and community needs reports, letters were sent to the boroughs and community districts directly affected by the proposed project requesting the following:

- policies and plans related to the project

- committed projects (i.e., funded projects), both public and private, that will be constructed in or adjacent to the study area before the design year (2020)
- planned projects (i.e., those defined in a plan or policy) both public and private, that are proposed in or adjacent to the study area before 2020

Agencies contacted included the Queens and Manhattan borough presidents offices, the City planning offices in Queens and Manhattan, and the affected community districts, including CDs 1 and 2 in Queens, and CDs 5, 6, and 8 in Manhattan.

Along with the public agency plans in the study area, information concerning private development plans were also reviewed. Any plans and policies that may impact the study area were identified and are summarized separately below for public and private agencies.

3.4.2.1 Studies, Public Plans and Policies

Citywide Plans and Policies

A report prepared by the New York City Planning Commission in the Spring of 1993, called Shaping the City's Future, New York City Planning and Zoning Report outlines the Commission's vision for New York's long-term future and presents a preliminary set of planning and zoning policies to make the vision a reality. Relevant topics discussed in the report include:

- Long Island City Central Business District (CBD) - the report states that the City plans for Long Island City to become the fourth component of the City's CBD network that consists of Lower Manhattan, Midtown Manhattan, and Downtown Brooklyn.

- Mobility and Air Quality - the report states that the principal strategy for maintaining mobility and clean air in New York's dense urban environment will be reducing traffic congestion and increasing transit use, particularly rail.

- 63rd Street Link - the report makes a policy recommendation that as an extension of the 63rd Street Connection by NYCT, an intermodal facility in Sunnyside Yard should be considered to build upon the connection and the nascent CBD development in LIC; such a facility could connect nearby subway lines with Amtrak's intercity rail service, the LIRR, and NJ Transit; and passengers could transfer between modes and lines, thus establishing a regional transportation center. (This intermodal facility at Sunnyside was discussed in several of the reports reviewed and is discussed in more detail below).

Queens Plans and Policies

Given the interest in LIC as an emerging CBD, several studies were prepared under the auspices of the Department of City Planning which discuss potential opportunities. These reports include the following:

- Plan for Long Island City: A Framework for Development (1993)
- Plan for the Queens Waterfront (1993)
- and Long Island City Truck and Traffic and Access Study (1995)

City Planning has a vision for LIC that it has begun to support with zoning changes like the Special Hunters Point Mixed Use District discussed above. This vision includes a CBD with development capacity for 20 million square feet of new development. Additional zoning changes are being considered that would modify the underlying zoning from M3 (heavy manufacturing) to M1 (light manufacturing). Sunnyside Yard affords an opportunity to New York City "to move to the forefront of transportation planning through the creation of an intermodal station linking interstate, suburban and mass transit systems."

City Planning's traffic study identified congestion areas in LIC and recommended both short-term and long-term solutions. The short-term solutions include a range of Transportation System Management (TSM) measures: signalization changes; curb regulation changes; signage improvements; and eliminating some parking spaces. The long-term solutions include street resurfacing, improved access to the Queens-Midtown Tunnel, and rail freight improvements.

In 1994, the MTA commissioned the Long Island City Transportation Needs and Opportunities Study, to identify transportation needs to, from, through, and in LIC over a long-term time frame, and to develop appropriate strategies to address these needs. The study has three components corresponding to three stand alone reports; (i) defining the existing transportation resources; (ii) projecting future transportation conditions, needs, and reasonable candidate improvements; and (iii) evaluating and recommending opportunities for transportation improvements.

Queens West Development

The eastern edge of the QSA within the SSA is located along the West Queens waterfront which has been lying dormant since the decline of waterfront industry began 20 years ago. City Planning proposes public access improvements and productive reuse of vacant and underutilized waterfront parcels, as well as the enhancement of industrial uses in appropriate locations. Many of the proposals will potentially be realized by the long-anticipated waterfront development in Hunters Point, originally called the Hunters Point Waterfront Project and renamed Queens West. The bulk of the 70 acre-plus Queens West Development site occupies a two block area along the east shore of the East River between Anable Basin and Newtown Creek. The development is adjacent to LIRR's Long Island City rail terminal.

The plans for Queens West have been in the making for over 10 years. Environmental clearance for the project was granted in 1990 for a development including over 6,300 residential units, two million square feet of office space, a 350-room hotel, 225,000 square feet of retail space, 40,000 square feet of community facility space and 18 acres of public open space. The Queens West Waterfront Development is a joint project of the Port Authority of New York and New Jersey, the New York Empire State Development Corporation (ESDC) and the New York City Economic Development Corporation. The Queens West Development Corporation (QWDC), a subsidiary of UDC, was established in 1992 to facilitate development of the project.

Borough of Queens Strategic Policy Statement

The Queens Borough Policy Statement, a visionary document for the borough, makes reference to policies concerning transportation and rail transit in a general sense, as well as specifically discussing proposals both in the LIC area and Sunnyside Yard. Under the category of economic development, the BP describes LIC as "already a leading industrial center in New York City with an expanding commercial sector. Proximity and easy accessibility to Manhattan has brought development of front and back office space to LIC." Specific recommendations include the following:

- to integrate existing transit services by constructing the Sunnyside Yard intermodal transit facility and using the proposed 63rd Street Tunnel bellmouth connection to provide improved transportation to the area.

- to improve LIC traffic circulation by separating through-traffic from local traffic to alleviate congestion; reorient traffic circulation patterns to service LIC as a destination point; and expedite the rehabilitation the 10 area bridges.

- to implement the Department of City Planning's (DCP's) plan for LIC by implementing zoning changes that encourage expanded mixed-use development while protecting existing industrial uses in the area; establish a CBD in LIC by making mass transit and street network improvements; reinforce LIC's role as an industrial center by rezoning certain areas to low density light manufacturing and encouraging cleaner industries to locate or remain in LIC; and strengthen the Hunters Point mixed-use community by revising zoning regulations to allow new moderate-density residential development above ground floor commercial or community facility uses on main thoroughfares.

Under the category of public transportation, LIRR issues are discussed including the concern that service reductions were made in Queens by LIRR as a result of station closures. The BP's policy statement suggests that the station closures have increased travel time for commuters as most of the closed stations are not proximate to the subway system.

With respect to the 63rd Street Tunnel, the policy statement declares that "after a thorough evaluation of LIRR and subway needs, a determination should be made whether to use the tunnel for its original purpose or for other transit services." The BP's policy statement adds that use of the tunnel by LIRR would improve its service significantly by providing a second connection between Manhattan and points east. "The connection would succeed in eliminating the system's biggest bottleneck at the 34th Street tunnel, and make it possible to run more trains to Queens and the Manhattan CBD. The new connection to the east side of Manhattan would encourage riders to stay on the LIRR rather than transfer to the subway, particularly at Woodside and Hunters Point Avenue, thereby reducing overcrowding on the Flushing NYCT line."

In recognition of projected future growth in western Queens, the policy statement recommends expanding service to the Hunterspoint Avenue and Long Island City stations. New station locations are suggested adjacent to the International Design Center and LaGuardia Community College near Thomson Avenue and Queens West. In addition, the policy statement recommends restoring service to stations in Elmhurst, Rego Park, Woodhaven and Jamaica Center so as to relieve overcrowding on subway lines serving those areas.

Greater coordination between NYCT and LIRR service is recommended to provide one unified system that is more efficient. Integration of the service between lines is suggested, particularly to those areas beyond the reach of the subway system.

Community Boards 1 and 2

The Queens community district needs report for Fiscal Year 1995 has no project-related needs as they pertain to CD1, however CD2 has several needs that relate to the project study area. CD2 is concerned about the effects of the Queens West development on the existing infrastructure. The needs report indicates that significant infrastructure improvements have been made to the streets, sewers, and subway stations to integrate the new development successfully. There is concern about the housing stock in Hunters Point which has seriously eroded in the past five years and the need to protect and preserve what remains. CD2 has 41 bridges, most of which are in various stages of disrepair; some bridges need immediate attention. Air quality is being compromised in the district by the numerous reconstruction projects which have exacerbated traffic congestion.

Manhattan Plans and Policies

Borough of Manhattan Strategic Policy Statement

In the Manhattan Borough Policy Statement, a visionary document for the borough, the Manhattan BP makes no specific reference to LIRR's East Side Access project but advocates three broad transportation-related policies that have some relationship to the East Side Access project. These are:

- establish a *Transit Task Force* to address such policy issues as subway capital improvements, fair state funding for mass transit and pricing innovations to increase transit system ridership.
- work to integrate ferries, trollies, the proposed airport rail line and other new transportation forms with the existing transportation system and with community needs.
- promote strict adherence to and enforcement of air quality standards.

In developing economically and environmentally sound transportation, the Manhattan BP wants to encourage mass transit and reduce auto traffic. The policy statement says that "From the rider's perspective, we need transit services that are reliable, affordable, convenient and comfortable. From the City's perspective, we need to ensure that our transit system allows for and enhances economic development. This requires bringing our expansive transit system into a state of good repair and making investments that improve and maintain it. The system must be cost-efficient and adequately funded."

The air quality impacts from traffic are a major issue. Soot is of particular concern in Manhattan. Diesel vehicles, including City buses, are the primary sources of soot.

Community Boards 5, 6, and 8

Transportation-related needs as identified by community boards and the Borough President include the following:

- Since Midtown Manhattan suffers from severe and chronic traffic congestion, a computerized traffic monitoring system to control flows would ease the problem.

- The subway station at 53rd Street and Third Avenue is considered overcrowded and a plan to mitigate the problem is needed.

- Safe, convenient, efficient transportation to and from Midtown Manhattan is considered critically important to the economic and environmental health of the City; mass transit should improve through physical improvements to the system and equipment, improved maintenance, and more frequent service.

- Express buses in the midtown area are considered to have a major impact on traffic congestion; CD6 is particularly concerned about the policing of regulations over jitneys, commuter vans, and enfranchised buses and CD8 has urged expeditious passage of pending state legislation which would enable New York City to regulate vans which are presently operating illegally.

- CD8 believes it is time to give serious consideration to plans for completion of the Second Avenue subway, given the capacity constraints of the Lexington Avenue subway.

3.4.2.2 Private Plans

The major plan for private development in the PSA is that proposed by a real estate developer, at the vacant 383 Madison Avenue site, formerly the home of the Manhattan Savings Bank. The site covers the entire block bounded by 47th Street to the north, Madison Avenue to the west, 46th Street to the south, and Vanderbilt Avenue to the east. The zoning lot of the site occupies 43,311 square feet.

The developer proposes to raze the existing pre-war 14 story building on the site and build a new office tower. The MTA owns subsurface easements on the site, which is adjacent to the western edge of the underground train shed at GCT. The MTA easement extends all the way to Madison Avenue at the Lower Level of GCT. American Premier Underwriters owns the property in fee, subject to easements in favor of 383 Madison Avenue. As such, any proposals to develop the site are subject to review and approval of the MTA.

In the late 1980s, another developer proposed the construction of a 72 story office tower containing over 1.6 million square feet of office space. The C5-3 zoning on the lot does not allow such a large building, and the developer sought the City's approval to transfer air rights from GCT to effect the proposal. The City did not approve the transfer.

The current proposal by Bear Sterns is for a building that is approximately 43 stories and contains 1.1 million gross square feet of space. The proposal calls for the transfer of air rights from GCT.

3.5 Demographic and Socioeconomic Characteristics

Analysis of the demographic and socioeconomic characteristics was made for both the Primary and Secondary Study Areas (PSA and SSA). The PSA is further broken down into two smaller study areas, the Manhattan Study Area (MSA) and the Queens Study Area (QSA). Overall, the PSA substantially overlaps 26 census tracts and five community districts (CDs); in Manhattan CDs 5, 6 and 8, and in Queens CDs 1 and 2. Figures 3.5-1 and 3.5-2 delineate both the census tracts and the community districts in the MSA and QSA respectively.

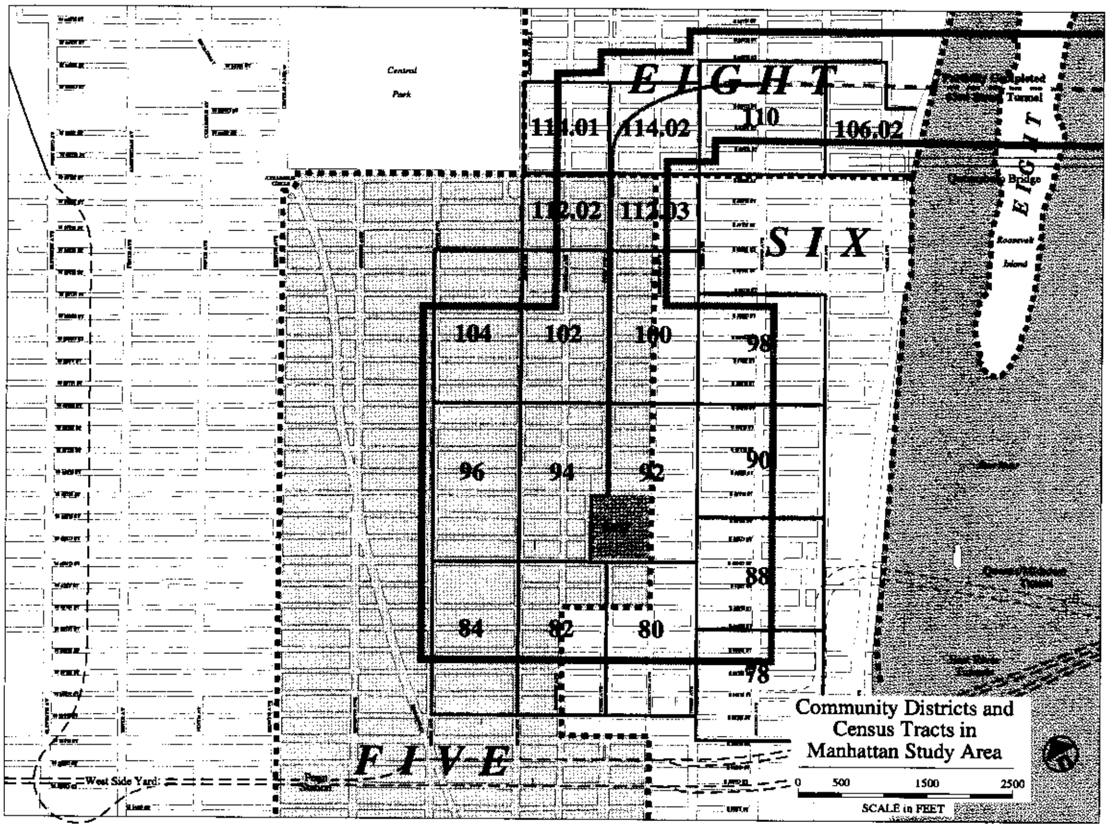


Figure 3.5-1

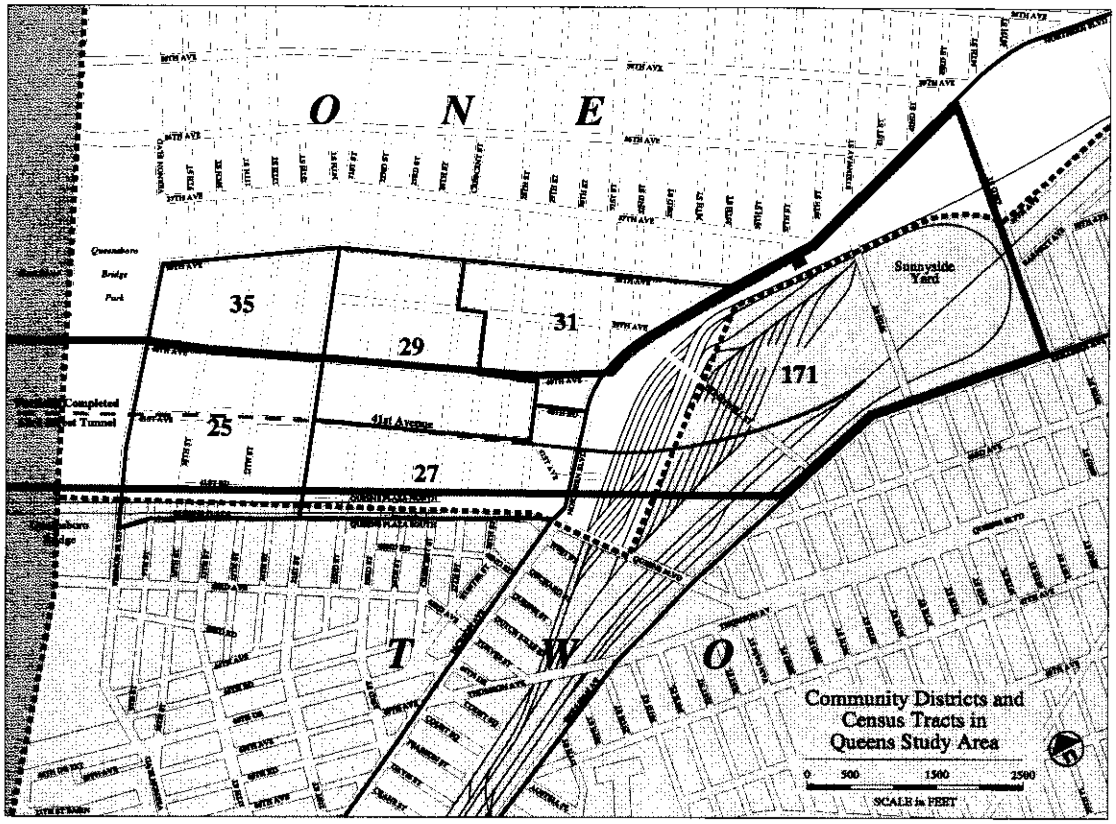


Figure 3.5-2

As the census tracts and the community districts do not entirely coincide with the boundaries of the study area, those that substantially overlap (over 50%) were included in the analysis. In the MSA, 19 census tracts were selected for study, along with the three Community Districts, 5, 6 and 8 in which the MSA is located. The MSA is in the heart of East Midtown Manhattan, which contains high density commercial and residential property.

In the QSA, seven census tracts were selected for study, along with the two Community Districts, 1 and 2 in which the QSA is located. There are fewer tracts in the QSA due to the lower density of development, much of the QSA is industrial in nature.

The Secondary Study Area (SSA), the area in which the indirect impacts of the project will be felt, include Nassau and Suffolk Counties in Long Island; and Manhattan, Queens and Brooklyn in New York City. Using 1980 and 1990 U.S. Census data, comparisons were made for seven geographic levels: census tracts in the PSA; community districts in the PSA; Nassau and Suffolk Counties; the SSA; and New York City (all five boroughs). On the census tract and community district levels tabulations were developed separately for tracts and districts in the MSA and QSA.

The demographic and socioeconomic attributes that were analyzed include:

- Population and Age Distribution
- Racial Distribution
- Household Size
- Household Income

- Labor Force
- Industry Breakdown
- Journey-to-Work
- Vehicles Available

Two table types were developed for the eight attributes listed. For each attribute, the corresponding first table is labeled with a number and the letter A. It displays data for each level, for both 1980 and 1990. The second table is labeled with a number and the letter B. It shows the numerical and percentage change between 1980 and 1990 for each attribute.

For purposes of addressing Environmental Justice issues, the demographic data in Table 3.5-2A shows that in 1990 within the MSA, 16 percent of the population can be classified as minority. In the QSA, approximately 89 percent of the population can be classified as minority. For the SSA, about 43 percent of the population can be classified as minority. Also, according to the MTA's 1990 Subway Survey, the demographics for the Lexington Avenue Line are classified as follows: 38% white, 28% black, 22% Hispanic, 9% Asian; and 4% other.

Journey-to-Work

Study area residents changed their methods of commutation to work from 1980 to 1990, as shown in Tables 3.5-7A and 3.5-7B. Overall, the study area experienced a high growth in the use of motor vehicles and a decrease in carpooling. There was a much smaller percentage increase in the use of public transportation over individuals driving alone.

Between 1980 and 1990 the number of cars, trucks and vans increased between 16% and 22% in the PSA, Nassau/Suffolk Counties, the SSA and NYC, i.e., 16.1%, 17.2%, 19.1% and 22.5% respectively. Along with the increase of motor vehicles, came an increase of individuals driving alone to work. Between 1980 and 1990 the number of persons driving alone in the PSA increased by 1,012 or 54.2%; by 228,688 or 31.7% in Nassau/Suffolk Counties; by 374,643 or 32.6% in the SSA, and by 197,377 or 34.8% in NYC. These increases were in orders of magnitude greater than the actual increase in workers over the same time period; 2.45% in the PSA; 14.7% in Nassau/Suffolk Counties; 13.6% in the SSA; and 12.7% in NYC.

While the number of individuals driving alone to work increased, the number of individuals carpooling decreased at all levels. The largest numerical decrease occurred within the SSA, where a 76,080 or 18.5% fewer people carpooled in 1990 than in 1980. The largest percentage decrease occurred within the PSA, with 492 or 36.0% fewer carpooled in 1990 than in 1980.

The number of individuals using public transportation has increased on all levels in the 1980/90 ten year period. In 1980 counts were not made of those using ferries in their journey-to-work. In the PSA total public transportation ridership increased by 329 or 1.9%; in the SSA by 97,820 or 7.5%; and in NYC an increase of 124,216, or 7.9% was experienced. Of all the subcategories within public transportation the largest increases were seen in taxicab riders, which increased on all levels; up by 27.6% in the PSA, 46.5% in the SSA, and 43.3% in NYC.

Table 3.5-1 A
LIRR East Side Access
AGE DISTRIBUTION
In the Study Area
1980

	0 to 19 years	20 to 34 years	35 to 49 years	50 to 64 years	65 to 79 years	80 years and over	Total Population
Census Tracts			(35 to 54)	(55 to 74)	(75 and over)		
MSA	3,215	18,578	17,685	12,122	4,077		55,677
QSA	4,572	2,652	2,355	1,704	536		11,819
TOTAL PSA	**7,787**	**21,230**	**20,040**	**13,826**	**4,613**		**67,496**
Community Districts							
MSA	40,482	125,330	81,919	63,923	46,750	13,005	371,409
QSA	67,282	70,665	47,294	46,759	34,473	7,639	274,112
	(0 to 20)	(21 to 44)	(45 to 54)	(55 to 64)	(65 to 84)	(85 and over)	
Nassau/Suffolk Counties	839,447	584,187	478,866	447,300	202,774	53,239	2,605,813
TOTAL SSA	**2,323,620**	**2,028,236**	**1,419,743**	**1,367,057**	**816,258**	**201,445**	**8,156,359**
New York City	1,983,249	1,810,138	1,190,888	1,140,069	758,636	188,659	7,071,639

AGE DISTRIBUTION
In the Study Area
1990

	0 to 19 years	20 to 34 years	35 to 49 years	50 to 64 years	65 to 79 years	80 years and over	Total Population
Census Tracts			(35 to 54)	(55 to 74)	(75 and over)		
MSA	3,922	17,087	19,905	11,911	4,107		56,932
QSA	3,972	3,152	2,573	1,427	388		11,512
TOTAL PSA	**7,894**	**20,239**	**22,478**	**13,338**	**4,495**		**68,444**
Community Districts							
MSA	39,218	119,054	103,630	65,888	43,816	16,529	388,135
QSA	57,868	89,565	58,644	39,402	28,674	9,241	283,394
	(0 to 20)	(21 to 44)	(45 to 54)	(55 to 64)	(65 to 84)	(85 and over)	
Nassau/Suffolk Counties	721,134	990,878	305,745	266,839	293,971	30,645	2,609,212
TOTAL SSA	**2,134,418**	**2,524,857**	**1,524,473**	**1,069,862**	**880,382**	**215,018**	**8,349,010**
New York City	1,888,075	1,945,991	1,531,599	1,003,582	722,423	230,894	7,322,564

SOURCE: US CENSUS

Table 3.5-1 B
LIRR East Side Access
AGE DISTRIBUTION
Number and Percent Changes from 1980 to1990 in the Study Area

	0 to 19 years	20 to 34 years	35 to 49 years	50 to 64 years	65 to 79 years	80 years and over	Total Population
Census Tracts							
MSA			(35 to 54)	(55 to 74)	(75 and over)		
Number Change	707	-1,491	2,220	-211	30		1,255
Percent Change	21.99%	-8.03%	12.55%	-1.74%	0.74%		2.25%
QSA							
Number Change	-600	500	218	-277	-148		-307
Percent Change	-13.12%	18.85%	9.26%	-16.26%	-27.61%		-2.60%
TOTAL PSA							
Number Change	**107**	**-991**	**2,438**	**-488**	**-118**		**948**
Percent Change	**1.37%**	**-4.67%**	**12.17%**	**-3.53%**	**-2.56%**		**1.40%**
Community Districts							
MSA							
Number Change	-1,264	-6,276	21,711	1,965	-2,934	3,524	16,726
Percent Change	-3.12%	-5.01%	26.50%	3.07%	-6.28%	27.10%	4.50%
QSA							
Number Change	-9,414	18,900	11,350	-7,357	-5,799	1,602	9,282
Percent Change	-13.99%	26.75%	24.00%	-15.73%	-16.82%	20.97%	3.39%
Nassau/Suffolk Counties	(0 to 20)	(21 to 44)	(45 to 54)	(55 to 64)	(65 to 84)	(85 and over)	
Number Change	-118,313	406,691	-173,121	-180,461	91,197	-22,594	3,399
Percent Change	-14.09%	69.62%	-36.15%	-40.34%	44.97%	-42.44%	0.13%
TOTAL SSA							
Number Change	**-189,202**	**496,621**	**104,730**	**-297,195**	**64,124**	**13,573**	**192,651**
Percent Change	**-8.14%**	**24.49%**	**7.38%**	**-21.74%**	**7.86%**	**6.74%**	**2.36%**
New York City							
Number Change	-95,174	135,853	340,711	-136,487	-36,213	42,235	250,925
Percent Change	-4.80%	7.51%	28.61%	-11.97%	-4.77%	22.39%	3.55%

SOURCE: US CENSUS

Table 3.5-2 A
LIRR East Side Access

RACIAL DISTRIBUTION in the Study Area
1980

		White Non Hispanic	Black Non Hispanic	Hispanic Origin	American Indian	Asian, Pacific Islander	Other Non Hispanic	Total Population
Census Tracts								
	MSA	49,280	1,142	2,684	36	2,189	346	55,677
	QSA	1,852	6,477	2,948	54	370	118	11,819
TOTAL PSA		**51,132**	**7,619**	**5,632**	**90**	**2,559**	**464**	**67,496**
Community Districts								
	MSA	322,046	13,078	21,726	340	13,489	724	371,403
	QSA	179,422	20,247	56,650	344	16,799	663	274,125
Nassau/Suffolk Counties		2,312,317	157,972	101,975	2,858	18,780	11,911	2,605,813
TOTAL SSA		**5,312,889**	**1,478,199**	**1,093,873**	**10,894**	**234,440**	**26,064**	**8,156,359**
New York City		3,668,945	1,694,127	1,406,024	11,824	202,696	88,023	7,071,639

RACIAL DISTRIBUTION in the Study Area
1990

		White Non Hispanic	Black Non Hispanic	Hispanic Origin	American Indian	Asian, Pacific Islander	Other Non Hispanic	Total Population
Census Tracts								
	MSA	47,631	1,523	3,103	46	4,577	52	56,932
	QSA	1,301	6,238	3,410	36	500	28	11,513
TOTAL PSA		**48,932**	**7,761**	**6,513**	**82**	**5,077**	**80**	**68,445**
Community Districts								
	MSA	325,219	15,514	24,892	379	21,680	451	388,135
	QSA	145,588	22,292	77,873	588	35,655	1,398	283,394
Nassau/Suffolk Counties		2,305,434	193,967	(of any race) 165,238	4,636	62,399	42,776	2,774,450
TOTAL SSA		**4,892,975**	**1,643,731**	**1,395,399**	**18,451**	**504,557**	**59,135**	**8,514,248**
New York City		3,163,125	1,847,049	1,783,511	17,871	489,851	21,157	7,322,564

SOURCE: US CENSUS

Table 3.5-2 B
LIRR East Side Access
RACIAL DISTRIBUTION
Number & Percent Changes from 1980 to 1990
in the Study Area

	White Non Hispanic	Black Non Hispanic	Hispanic Origin	American Indian	Asian, Pacific Islander	Other Non Hispanic	Total Population
Census Tracts							
MSA							
Number Change	-1,649	381	419	10	2,388	-294	1,255
Percent Change	-3.35%	33.36%	15.61%	27.78%	109.09%	-84.97%	2.25%
QSA							
Number Change	-551	-239	462	-18	130	-90	-306
Percent Change	-29.75%	-3.69%	15.67%	-33.33%	35.14%	-76.27%	-2.59%
TOTAL PSA							
Number Change	**-2,200**	**142**	**881**	**-8**	**2,518**	**-384**	**949**
Percent Change	**-4.30%**	**1.86%**	**15.64%**	**-8.89%**	**98.40%**	**-82.76%**	**1.41%**
Community Districts							
MSA							
Number Change	3,173	2,436	3,166	39	8,191	-273	16,732
Percent Change	0.99%	18.63%	14.57%	11.47%	60.72%	-37.71%	4.51%
QSA							
Number Change	-33,834	2,045	21,223	244	18,856	735	9,269
Percent Change	-18.86%	10.10%	37.46%	70.93%	112.24%	110.86%	3.38%
Nassau/Suffolk Counties							
Number Change	-6,883	35,995	63,263	1,778	43,619	30,865	168,637
Percent Change	-0.30%	22.79%	62.04%	62.21%	232.26%	259.13%	6.47%
TOTAL SSA							
Number Change	**-419,914**	**165,532**	**301,526**	**7,557**	**270,117**	**33,071**	**357,889**
Percent Change	**-7.90%**	**11.20%**	**27.56%**	**69.37%**	**115.22%**	**126.88%**	**4.39%**
New York City							
Number Change	-505,820	152,922	377,487	6,047	287,155	-66,866	250,925
Percent Change	-13.79%	9.03%	26.85%	51.14%	141.67%	-75.96%	3.55%

SOURCE: US CENSUS

Table 3.5-3 A

HOUSEHOLD SIZE
1980
in the Study Area

	In Family Households	In Non Family Households	Institutionalized or Group Quarters	Persons/ Household	Persons/ Family	Total Persons in Households
Census Tracts (1)	Family/Non Family					
MSA	38,804		867	1.42	2.31	38,804
QSA	4,388		2	1.93	2.45	4,388
TOTAL PSA	**43,192**		**869**	**1.68**	**2.38**	**43,192**
Community Districts						
MSA	187,639	173,588	10,002	1.60	2.50	361,227
QSA	224,604	43,488	6,405	2.40	3.10	268,092
Nassau/Suffolk Counties	809,548	113,844	47,609		3.50	923,392
TOTAL SSA	**5,268,855**	**1,117,504**	**133,886**	**2.43**	**3.25**	**6,386,359**
New York City	5,771,555	1,176,777	121,998	2.50	3.20	6,948,332

HOUSEHOLD SIZE
1980
in the Study Area

	In Family Households	In Non Family Households	Institutionalized or Group Quarters	Persons/ Household	Persons/ Family	Total Persons in Households
Census Tracts (1)	Family/Non Family					
MSA	37,698		1,055	1.5	2.34	37,698
QSA	4,179		268	2.33	2.93	4,179
TOTAL PSA	**41,877**		**1,323**	**1.92**	**2.64**	**41,877**
Community Districts						
MSA	195,216	176,871	15,948	1.60	2.50	372,087
QSA	212,393	54,509	16,492	2.40	3.10	266,902
Nassau/Suffolk Counties	685,095	171,139	50,002		2.99	856,234
TOTAL SSA	**5,209,383**	**1,266,600**	**170,051**	**2.47**	**3.17**	**6,475,983**
New York City	5,864,887	1,289,804	167,873	2.50	3.30	7,154,691

Note:
(1) The number of Family and Non Family Householders is not differentiated at the Census Tract level

Table 3.5-3 B
HOUSEHOLD SIZE
Number and Percent Change from 1980 to 1990
in the Study Area

	In Family Households	In Non Family Households	Institutionalized or Group Quarters	Persons/ Household	Persons/ Family	Total Persons In Households
Census Tracts (1)						
MSA	Family/Non Family					
Number Change	-1,106		188	0.08	0.03	-1,106
Percent Change	-2.85%		21.68%	5.63%	1.30%	-2.85%
QSA						
Number Change	-209		266	0.40	0.48	-209
Percent Change	-4.76%		13300.00%	20.73%	19.59%	-4.76%
TOTAL PSA						
Number Change	**-1,315**		**454**	**0.24**	**0.26**	**-1,315**
Percent Change	**-3.04%**		**52.24%**	**14.33%**	**10.71%**	**-3.04%**
Community Districts						
MSA						
Number Change	7,577	3,283	5,946	0.00	0.00	10,860
Percent Change	4.04%	1.89%	59.45%	0.00%	0.00%	3.01%
QSA						
Number Change	-12,211	11,021	10,087	0.00	0.00	-1,190
Percent Change	-5.44%	25.34%	157.49%	0.00%	0.00%	-0.44%
Nassau/Suffolk Counties						
Number Change	-124,453	57,295	2,393		-0.51	-67,158
Percent Change	-15.37%	50.33%	5.03%		-14.57%	-7.27%
TOTAL SSA						
Number Change	**-59,472**	**149,096**	**36,165**	**0.03**	**-0.08**	**89,624**
Percent Change	**-1.13%**	**13.34%**	**27.01%**	**1.37%**	**-2.38%**	**1.40%**
New York City						
Number Change	93,332	113,027	45,875	0.00	0.10	206,359
Percent Change	1.62%	9.60%	37.60%	0.00%	3.12%	2.97%

Note:
(1) The number of Family and Non Family Householders is not differentiated at the Census Tract level

Table 3.5-4 A

HOUSEHOLD INCOME in the Study Area
1980

	Less than $5,000	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999 *	Mean	Total Households
Census Tracts									
MSA	3,573	4,056	5,176	9,760	5,695	4,497	5,994	$30,524	38,751
QSA	1,695	974	720	733	234	56	32	$10,310	4,444
TOTAL PSA	**5,268**	**5,030**	**5,896**	**10,493**	**5,929**	**4,553**	**6,026**	**$28,445**	**43,195**
Community Districts									
MSA	23,314	24,423	28,007	53,977	30,932	24,801	38,465	$32,928	223,919
QSA	18,925	21,223	20,602	27,986	13,583	6,091	1,988	$16,074	110,398
Nassau/Suffolk Counties	52,069	76,347	84,136	207,908	178,490	127,697	82,901	$28,121	809,548
TOTAL SSA	**475,109**	**461,203**	**446,147**	**735,461**	**455,479**	**291,452**	**191,408**	**$21,223**	**3,056,259**
New York City	545,980	500,004	438,850	649,777	342,713	194,682	120,608	$18,218	2,792,614

HOUSEHOLD INCOME in the Study Area
1990

	Less than $5,000	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	$75,000 to $99,999	$100,000 or more	Mean	Total Households
Census Tracts											
MSA	1,662	1,559	1,457	3,744	4,730	6,793	6,696	3328	7,814	$80,257	37,783
QSA	932	791	406	660	602	410	285	113	27	$21,558	4,226
TOTAL PSA	**2,594**	**2,350**	**1,863**	**4,404**	**5,332**	**7,203**	**6,981**	**3,441**	**7,841**	**$74,352**	**42,009**
Community Districts											
MSA	9,066	11,396	9,406	21,592	27,399	37,170	39,396	21,045	52,276	+	228,746
QSA	7,461	12,241	9,444	19,861	19,036	19,041	15,640	5,210	2,554	+	110,488
Nassau/Suffolk Counties	19,514	35,926	34,903	79,015	92,819	147,638	213,825	113,046	119,085	+	855,771
TOTAL SSA	**209,659**	**279,234**	**203,321**	**421,073**	**415,347**	**511,648**	**547,964**	**252,572**	**277,820**	**+**	**3,118,638**
New York City	251,969	317,334	212,526	428,978	395,984	448,153	412,124	169,956	179,250	$41,741	2,816,274

Note:
* In 1980 the highest income cohort was $50,000 or more
+ No data available

Table 3.5-4 B

HOUSEHOLD INCOME
Number and Percent Changes from 1980 to 1990
in the Study Area

	Less than $5,000	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	Mean	Total Households
Census Tracts									
MSA									
Number Change	-1,911	-2,497	-3,719	-6,016	-965	2,296	702	$49,733	-968
Percent Change	-53.48%	-61.56%	-71.85%	-61.64%	-16.94%	51.06%	11.71%	162.93%	-2.50%
QSA									
Number Change	-763	-183	-314	-73	368	354	253	$11,248	-218
Percent Change	-45.01%	-18.79%	-43.61%	-9.96%	157.26%	632.14%	790.63%	109.10%	-4.91%
TOTAL PSA									
Number Change	**-2,674**	**-2,680**	**-4,033**	**-6,089**	**-597**	**2,650**	**955**	**$45,907**	**-1,186**
Percent Change	**-50.76%**	**-53.28%**	**-68.40%**	**-58.03%**	**-10.07%**	**58.20%**	**15.85%**	**161.39%**	**-2.75%**
Community Districts									
MSA									
Number Change	-14,248	-13,027	-18,601	-32,385	-3,533	12,369	931	+	4,827
Percent Change	-61.11%	-53.34%	-66.42%	-60.00%	-11.42%	49.87%	2.42%	+	2.16%
QSA									
Number Change	-11,464	-8,982	-11,158	-8,125	5,453	12,950	13,652	+	90
Percent Change	-60.58%	-42.32%	-54.16%	-29.03%	40.15%	212.61%	686.72%	+	0.08%
Nassau/Suffolk Counties									
Number Change	-32,555	-40,421	-49,233	-128,893	-85,671	19,941	130,924	+	46,223
Percent Change	-62.52%	-52.94%	-58.52%	-62.00%	-48.00%	15.62%	157.93%	+	5.71%
TOTAL SSA									
Number Change	**-265,450**	**-181,969**	**-242,826**	**-314,388**	**-40,132**	**220,196**	**356,556**	**+**	**62,379**
Percent Change	**-55.87%**	**-39.46%**	**-54.43%**	**-42.75%**	**-8.81%**	**75.55%**	**186.28%**	**+**	**2.04%**
New York City									
Number Change	-294,011	-182,670	-226,324	-220,799	53,271	253,471	291,516	$23,523	23,660
Percent Change	-53.85%	-36.53%	-51.57%	-33.98%	15.54%	130.20%	241.71%	129.12%	0.85%

Note:
* In 1980 the highest income cohort was $50,000 or more
+ No data available

Table 3.5-5 A
LABOR FORCE BREAKDOWN
in the Study Area
1980

	Males 16 years and over	In the Labor Force	Employed	Unemployed	Not in the Labor Force	Females 16 years and over	In the Labor Force	Employed	Unemployed
Census Tracts									
MSA	23,384	20,182	19,736	643	3,202	29,809	20,262	19,484	971
QSA	3,142	1,840	1,593	243	1,302	5,178	2,016	1,756	260
TOTAL PSA	**26,526**	**22,022**	**21,329**	**886**	**4,504**	**34,987**	**22,278**	**21,240**	**1,231**
Community Districts									
MSA	150,581	123,501	118,382	5,099	27,080	189,769	123,071	117,556	5,503
QSA	103,866	71,060	66,023	4,998	32,806	119,145	56,895	52,991	3,904
Nassau/Suffolk Counties	935,034	801,669	691,319	110,350	133,365	1,037,643	585,800	472,512	113,288
TOTAL SSA	**2,925,601**	**2,201,089**	**1,979,988**	**216,343**	**724,512**	**3,450,817**	**1,755,305**	**1,553,666**	**201,238**
New York City	2,494,034	1,726,318	1,593,088	133,230	787,716	3,044,817	1,435,003	1,325,095	109,908

LABOR FORCE BREAKDOWN
in the Study Area
1990

	Males 16 years and over	In the Labor Force	Employed	Unemployed	Not in the Labor Force	Females 16 years and over	In the Labor Force	Employed	Unemployed
Census Tracts									
MSA	24,614	20,470	20,001	886	4,144	29,019	20,820	19,901	919
QSA	3,472	2,501	2,239	283	971	4,756	2,467	2,040	406
TOTAL PSA	**28,086**	**22,971**	**22,240**	**1,169**	**5,115**	**33,775**	**23,287**	**21,941**	**1,325**
Community Districts									
MSA	157,946	127,754	121,955	5,700	30,192	198,818	136,000	130,004	5,996
QSA	120,261	81,555	75,036	6,442	38,706	119,326	65,298	59,835	5,446
Nassau/Suffolk Counties	990,773	766,935	733,408	33,527	222,028	1,082,485	621,847	593,260	28,587
TOTAL SSA	**3,111,475**	**2,291,616**	**2,118,167**	**168,937**	**818,049**	**3,577,673**	**1,991,601**	**1,846,916**	**143,667**
New York City	2,662,540	1,885,744	1,710,825	174,919	776,796	3,154,475	1,694,018	1,546,812	147,206
TOTALS	7,099,167	5,199,546	4,803,871	391,863	1,896,001	8,200,307	4,555,338	4,220,709	333,552

Table 3.5-5 B
LABOR FORCE BREAKDOWN
Number and Percent Change from 1980 to 1990
in the Study Area

	Males 16 years and over	In the Labor Force	Employed	Unemployed	Not In the Labor Force	Females 16 years and over	In the Labor Force	Employed	Unemployed
Census Tracts									
MSA									
Number Change	1,230	288	265	243	942	-790	558	417	-52
Percent Change	5.26%	1.43%	1.34%	37.79%	29.42%	-2.65%	2.75%	2.14%	-5.36%
QSA									
Number Change	330	661	646	40	-331	-422	451	284	146
Percent Change	10.50%	35.92%	40.55%	16.46%	-25.42%	-8.15%	22.37%	16.17%	56.15%
TOTAL PSA									
Number Change	**1,560**	**949**	**911**	**283**	**611**	**-1,212**	**1,009**	**701**	**94**
Percent Change	**5.88%**	**4.31%**	**4.27%**	**31.94%**	**13.57%**	**-3.46%**	**4.53%**	**3.30%**	**7.64%**
Community Districts									
MSA									
Number Change	7,365	4,253	3,573	601	3,112	9,049	12,929	12,448	493
Percent Change	4.89%	3.44%	3.02%	11.79%	11.49%	4.77%	10.51%	10.59%	8.96%
QSA									
Number Change	16,395	10,495	9,013	1,444	5,900	181	8,403	6,844	1,542
Percent Change	15.78%	14.77%	13.65%	28.89%	17.98%	0.15%	14.77%	12.92%	39.50%
Nassau/Suffolk Counties									
Number Change	55,739	-34,734	42,089	-76,823	88,663	44,822	36,047	120,748	-84,701
Percent Change	5.96%	-4.33%	6.09%	-69.62%	66.48%	4.32%	6.15%	25.55%	-74.77%
TOTAL SSA									
Number Change	**185,874**	**90,527**	**138,179**	**-47,406**	**93,537**	**126,856**	**236,296**	**293,250**	**-57,571**
Percent Change	**6.35%**	**4.11%**	**6.98%**	**-21.91%**	**12.91%**	**3.68%**	**13.46%**	**18.87%**	**-28.61%**
New York City									
Number Change	168,506	159,426	117,737	41,689	9,080	109,658	259,015	221,717	37,298
Percent Change	6.76%	9.24%	7.39%	31.29%	1.18%	3.60%	18.05%	16.73%	33.94%

Table 3.5-6 A
INDUSTRY BREAKDOWN
In the Study Area
1980

	Manufacturing	Transportation	Wholesale and Retail Trade	Finance, Insurance and Real Estate	Business and Repair Services	Personal, Entertainment & Recreation Services	Professional & Related Services	Other (1)	Total Employed
Census Tracts (2)									
MSA	6,233		6,730				8,385	17,455	38,803
QSA	780		471				720	1,378	3,349
TOTAL PSA	**7,013**		**7,201**				**9,105**	**18,833**	**42,152**
Community Districts									
MSA	32,128	9,044	37,204	32,212	27,446	15,701	64,625	17,578	235,938
QSA	24,697	8,497	27,069	13,674	8,859	6,428	16,629	13,163	119,016
Nassau/Suffolk Counties	203,442	113,277	251,475	94,403	66,025	33,864	263,503	137,842	1,163,831
TOTAL SSA	**627,672**	**273,616**	**682,260**	**376,150**	**229,096**	**162,326**	**800,706**	**381,828**	**3,533,654**
New York City	507,103	291,671	527,126	349,043	192,836	119,999	673,270	257,135	2,918,183

INDUSTRY BREAKDOWN
In the Study Area
1990

	Manufacturing	Transportation	Wholesale and Retail Trade	Finance, Insurance and Real Estate	Business and Repair Services	Personal, Entertainment & Recreation Services	Professional & Related Services	Other (1)	Total Employed
Census Tracts (2)									
MSA	4,402		5,688				11,648	17,777	39,515
QSA	570		864				993	1,686	4,113
TOTAL PSA	**4,972**		**6,552**				**12,641**	**19,463**	**43,628**
Community Districts									
MSA	25,268	6,439	34,564	46,810	21,852	15,420	85,461	16,145	251,959
QSA	19,111	9,399	30,925	14,200	9,754	10,211	25,256	16,012	134,868
Nassau/Suffolk Counties	169,861	76,249	275,169	132,951	70,564	51,060	95,866	454,948	1,326,668
TOTAL SSA	**481,733**	**248,468**	**732,942**	**461,570**	**247,092**	**204,172**	**836,728**	**752,378**	**3,965,083**
New York City	371,843	304,258	560,498	401,765	212,276	144,577	925,056	337,364	3,257,637

Notes:

(1) Other includes: Agriculture, Forestry, Fisheries, Mining, Construction, Public Administration, and Communications and Public Utilities.

There is one exception: Communications and Public Utilities is included in Transportation at the New York City level.

(2) On the Census Tract level there is only a breakdown between Manufacturing; Wholesale & Retail Trade; Professional & Related Services; and Other

Table 3.5-6 B
INDUSTRY BREAKDOWN
Number and Percent Change from 1980 to 1990
in the Study Area

	Manufacturing	Transportation	Wholesale and Retail Trade	Finance, Insurance and Real Estate	Business and Repair Services	Personal, Entertainment & Recreation Services	Professional & Related Services	Other (1)	Total Employed
Census Tracts (2)									
MSA									
Number Change	-1,831		-1,042				3,263	322	712
Percent Change	-29.38%		-15.48%				38.91%	1.84%	1.83%
QSA									
Number Change	-210		393				273	308	764
Percent Change	-26.92%		83.44%				37.92%	22.35%	22.81%
TOTAL PSA									
Number Change	**-2,041**		**-649**				**3,536**	**630**	**1,476**
Percent Change	**-29.10%**		**-9.01%**				**38.84%**	**3.35%**	**3.50%**
Community Districts									
MSA									
Number Change	-6,860	-2,605	-2,640	14,598	-5,594	-281	20,836	-1,433	16,021
Percent Change	-21.35%	-28.80%	-7.10%	45.32%	-20.38%	-1.79%	32.24%	-8.15%	6.79%
QSA									
Number Change	-5,586	902	3,856	526	895	3,783	8,627	2,849	15,852
Percent Change	-22.62%	10.62%	14.25%	3.85%	10.10%	58.85%	51.88%	21.64%	13.32%
Nassau/Suffolk Counties									
Number Change	-33,581	-37,028	23,694	38,548	4,539	17,196	-167,637	317,106	162,837
Percent Change	-16.51%	-32.69%	9.42%	40.83%	6.87%	50.78%	-63.62%	230.05%	13.99%
TOTAL SSA									
Number Change	**-145,939**	**-25,148**	**50,682**	**85,420**	**17,996**	**41,846**	**36,022**	**370,550**	**431,429**
Percent Change	**-23.25%**	**-9.19%**	**7.43%**	**22.71%**	**7.86%**	**25.78%**	**4.50%**	**97.05%**	**12.21%**
New York City									
Number Change	-135,260	12,587	33,372	52,722	19,440	24,578	251,786	80,229	339,454
Percent Change	-26.67%	4.32%	6.33%	15.10%	10.08%	20.48%	37.40%	31.20%	11.63%

Notes:

(1) Other includes: Agriculture, Forestry, Fisheries, Mining, Construction, Public Administration, and Communications and Public Utilities.
There is one exception: Communications and Public Utilities is included in Transportation at the New York City level.

(2) On the Census Tract level there is only a breakdown between Manufacturing; Wholesale & Retail Trade; Professional & Related Services; and Other

Table 3.5-7 A

JOURNEY-TO-WORK in the Study Area 1980

	Car, Truck or Van: Drove Alone	Car, Truck or Van: Carpooled	Total Car, Truck or Van	Public Transportation: Bus	Public Transportation: Subway/Railroad/Ferry	Public Transportation: Taxicab	Total Public Transportation	Walked	Worked at Home	Other Means	Total Workers
Census Tracts											
MSA	1593	1128	2,721	5,106	7,812	2,474	15,392	18,042	2,161	496	38,812
QSA	274	237	511	378	1,752	0	2,130	483	25	38	3,187
TOTAL PSA	**1,867**	**1,365**	**3,232**	**5,484**	**9,564**	**2,474**	**17,522**	**18,525**	**2,186**	**534**	**41,999**
Community Districts											
MSA	14,422	9,274	23,696	47,177	60,901	13,504	121,582	67,998	12,625	3,797	229,698
QSA	19,903	8,501	28,404	8,568	64,480	747	73,795	11,318	961	809	115,287
Nassau/Suffolk Counties (1)	722,630	200,705	923,335	Subcategories are all Grouped under Public Transportation			142,400	59019		11,765	1,136,519
TOTAL SSA	**1,149,944**	**410,424**	**1,560,368**	**290,180**	**985,737**	**31,196**	**1,307,113**	**342,989**	**44,036**	**34,300**	**3,288,806**
New York City	567,774	278,273	846,047	384,393	1,157,634	34,949	1,576,976	320,308	48,492	33,166	2,824,989

JOURNEY-TO-WORK in the Study Area 1990

	Car, Truck or Van: Drove Alone	Car, Truck or Van: Carpooled	Total Car, Truck or Van	Public Transportation: Bus	Public Transportation: Subway/Railroad/Ferry	Public Transportation: Taxicab	Total Public Transportation	Walked	Worked at Home	Other Means	Total Workers
Census Tracts											
MSA	2,192	696	2,888	5,054	7,032	3,152	15,238	17,484	2,786	382	38,778
QSA	687	177	864	481	2,128	4	2,613	568	114	51	4,210
TOTAL PSA	**2,879**	**873**	**3,752**	**5,535**	**9,160**	**3,156**	**17,851**	**18,052**	**2,900**	**433**	**42,988**
Community Districts											
MSA	18,703	7,898	26,601	40,733	69,266	19,230	129,229	72,606	15,597	3,711	247,744
QSA	7,898	9,366	17,264	7,711	73,467	1,020	82,198	10,982	1,960	767	113,171
Nassau/Suffolk Counties (1)	951,318	130,406	1,081,724	Subcategories are all Grouped under Public Transportation			148,556	64526		9,130	1,303,936
TOTAL SSA	**1,524,587**	**334,344**	**1,858,931**	**311,055**	**1,048,171**	**45,707**	**1,404,933**	**368,455**	**68,984**	**33,298**	**3,734,601**
New York City	765,151	271,503	1,036,654	411,415	1,239,881	50,096	1,701,192	340,077	76,819	28,346	3,183,088

Note:
(1) Nassau/Suffolk Counties is divided into Car, Truck or Van; Public Transportation; Walked or Worked at Home; and Other Means

Table 3.5-7 B

JOURNEY-TO-WORK
Number and Percent Changes from 1980 to 1990
in the Study Area

	Car, Truck or Van: Drove Alone	Car, Truck or Van: Carpooled	Total Car, Truck or Van	Public Transportation: Bus	Public Transportation: Subway/Railroad/Ferry (1)	Public Transportation: Taxicab	Total Public Transportation	Walked	Worked at Home	Other Means	Total Workers
Census Tracts											
MSA											
Number Change	599	-432	167	-52	-780	678	-154	-558	625	-114	-34
Percent Change	37.60%	-38.30%	6.14%	-1.02%	-9.98%	27.41%	-1.00%	-3.09%	28.92%	-22.98%	-0.09%
QSA											
Number Change	413	-60	353	103	376	4	483	85	89	13	1,023
Percent Change	150.73%	-25.32%	69.08%	27.25%	21.46%	(0 in 1980)	22.68%	17.60%	356.00%	34.21%	32.10%
TOTAL PSA											
Number Change	**1,012**	**-492**	**520**	**51**	**-404**	**682**	**329**	**-473**	**714**	**-101**	**989**
Percent Change	**54.20%**	**-36.04%**	**16.09%**	**0.93%**	**-4.22%**	**27.57%**	**1.88%**	**-2.55%**	**32.66%**	**-18.91%**	**2.35%**
Community Districts											
MSA											
Number Change	4,281	-1,376	2,905	-6,444	8,365	5,726	7,647	4,608	2,972	-86	18,046
Percent Change	29.68%	-14.84%	12.26%	-13.66%	13.74%	42.40%	6.29%	6.78%	23.54%	-2.26%	7.86%
QSA											
Number Change	-12,005	865	-11,140	-857	8,987	273	8,403	-336	999	-42	-2,116
Percent Change	-60.32%	10.18%	-39.22%	-10.00%	13.94%	36.55%	11.39%	-2.97%	103.95%	-5.19%	-1.84%
Nassau/Suffolk Counties (1)											
Number Change	228,688	-70,299	158,389	Subcategories are all Grouped under Public Transportation			6,156	5,507	Grouped with Walked	-2,635	167,417
Percent Change	31.65%	-35.03%	17.15%				4.32%	9.33%		-22.40%	14.73%
TOTAL SSA											
Number Change	**374,643**	**-76,080**	**298,563**	**20,875**	**62,434**	**14,511**	**97,820**	**25,466**	**24,948**	**-1,002**	**445,795**
Percent Change	**32.58%**	**-18.54%**	**19.13%**	**7.19%**	**6.33%**	**46.52%**	**7.48%**	**7.42%**	**56.65%**	**-2.92%**	**13.55%**
New York City											
Number Change	197,377	-6,770	190,607	27,022	82,047	15,147	124,216	19,769	28,327	-4,820	358,099
Percent Change	34.76%	-2.43%	22.53%	7.03%	7.09%	43.34%	7.88%	6.17%	58.42%	-14.53%	12.68%

Note:
(2) Nassau/Suffolk Counties is divided into Car, Truck or Van; Public Transportation; Walked or Worked at Home; and Other Means

Walkers decreased in the PSA, down by 473, or 2.6% since 1980, while increases occurred in the SSA (up by 25,466, or 7.4%), and in NYC (up by 19,769 or 6.2%). In Nassau/Suffolk Counties, walkers increased by 5,507, or 9.3%, however, this also includes individuals working at home. Individuals working at home increased at all levels. In the PSA those working at home increased by 714, or 32.7%; in the SSA home workers increased by 24,948 or 56.7%; and in NYC home workers increased by 28,327 or 58.4%.

Vehicles Available

Between 1980 and 1990 the number of cars, trucks and vans increased in the study area as shown in Tables 3.5-7A and 3.5-7B. Concurrently, the number of households with no vehicles decreased ata ll levels as shown in tables 3.5-8A and 3.5-8B. The number of households with at least one vehicle has increased in the PSA, up 378, or 5.0%; decreased in Nassau/Suffolk Counties (down by 43,174, or 15.9%); in the SSA (down by 48,027, or 4.8%); and in NYC (down by 15,220, or 1.7%).

The number of households with two vehicles increased at all levels, up by 46, or 9.6% in the PSA; by 16,474, or 4.8% in Nassau/Suffolk Counties; by 67,448, or 13.5% in the SSA; an dby 71,075, or 33.6% in NYC. Even greater increases occurred in the three or more vehicles category between 1980 and 1990. The number of households having three or more vehicles increased by 43, or 69.4% in the PSA; by 75,237, or 55.9% in Nassau/Suffolk Counties; by 100,568, or 62.7% within the SSA; and by 16,033, or 27.5% in NYC.

3.6 Relocation and Displacement

3.6.1 Properties Affected by Build Alternative

To implement the Build Alternative, some acquisition of property rights will be required. Two types of property acquisition will be required:

- acquisition of entire properties for installation of appurtenant structures and construction of entryways
- acquisition of permanent subsurface easements to accommodate the alignment structures, either a box structure or a rock tunnel

The lease between the MTA and the tenant of the property where the bellmouth ends, at 63rd Street and 2nd Avenue will have to be terminated (at least during construction) to allow for the area to be used for construction staging. This property (Block 1437 Lot 49) is currently occupied by an ornamental outdoor garden furniture store.

TABLE 3.5-8 A
VEHICLES AVAILABLE in Occupied Housing Units
in the Study Area
1980

	None	1	2	3 or more	Total Occupied Housing Units
Census Tracts					
MSA	31,583	6,772	385	36	38,776
QSA	3,461	864	93	26	4,444
TOTAL PSA	**35,044**	**7,636**	**478**	**62**	**43,220**
Community Districts					
MSA	170,814	48,921	3,318	488	223,541
QSA	62,252	40,964	6,687	978	110,881
Nassau/Suffolk Counties	58,794	271,168	344,511	134,647	809,120
TOTAL SSA	**1,401,356**	**993,233**	**498,884**	**160,346**	**3,053,819**
New York City	1,636,988	902,529	211,518	58,249	2,809,284

VEHICLES AVAILABLE in Occupied Housing Units
in the Study Area
1990

	None	1	2	3 or more	Total Occupied Housing Units
Census Tracts					
MSA	30,141	7,166	381	69	37,757
QSA	3,248	848	143	36	4,275
TOTAL PSA	**33,389**	**8,014**	**524**	**105**	**42,032**
Community Districts					
MSA	168,629	54,473	4,723	890	228,715
QSA	60,602	39,594	8,723	1,893	110,812
Nassau/Suffolk Counties	57,371	227,994	360,985	209,884	856,234
TOTAL SSA	**1,348,552**	**945,206**	**566,332**	**260,914**	**3,121,004**
New York City	1,575,217	887,309	282,593	74,282	2,819,401

TABLE 3.5-8 B

VEHICLES AVAILABLE
in Occupied Housing Units
Number and Percent Changes from 1980 to 1990
in the Study Area

	None	1	2	3 or more	Total Occupied Housing Units
Census Tracts					
MSA					
Number Change	-1,442	394	-4	33	-1,019
Percent Change	-4.57%	5.82%	-1.04%	91.67%	-2.63%
QSA					
Number Change	-213	-16	50	10	-169
Percent Change	-6.15%	-1.85%	53.76%	38.46%	-3.80%
TOTAL PSA					
Number Change	**-1,655**	**378**	**46**	**43**	**-1,188**
Percent Change	**-4.72%**	**4.95%**	**9.62%**	**69.35%**	**-2.75%**
Community Districts					
MSA					
Number Change	-2,185	5,552	1,405	402	5,174
Percent Change	-1.28%	11.35%	42.34%	82.38%	2.31%
QSA					
Number Change	-1,650	-1,370	2,036	915	-69
Percent Change	-2.65%	-3.34%	30.45%	93.56%	-0.06%
Nassau/Suffolk Counties					
Number Change	-1,423	-43,174	16,474	75,237	47,114
Percent Change	-2.42%	-15.92%	4.78%	55.88%	5.82%
TOTAL SSA					
Number Change	**-52,804**	**-48,027**	**67,448**	**100,568**	**67,185**
Percent Change	**-3.77%**	**-4.84%**	**13.52%**	**62.72%**	**2.20%**
New York City					
Number Change	-61,771	-15,220	71,075	16,033	10,117
Percent Change	-3.77%	-1.69%	33.60%	27.52%	0.36%

3.7 Transportation and Pedestrian

This section details the existing levels of service for pedestrian conditions at critical locations within Grand Central Terminal and along crosswalk/sidewalk locations around the building's periphery. Vehicle traffic conditions were also examined for critical intersections surrounding GCT to determine the effect, if any, the increase in pedestrian crossings would have on traffic operations.

The pedestrian study area consists of those elements on the lower concourse of GCT, where LIRR train service would enter, and other key elements on the upper concourse and serving the IRT Lexington Avenue lines. The traffic study area consists of intersections adjacent to GCT along 42nd Street and Lexington Avenue, which would be most affected by new LIRR pedestrians leaving and entering the terminal.

3.7.1 Overview of Pedestrian Analysis Procedures

A critical parameter in platform design is how well or timely exiting passengers are processed into other station elements or toward the street boundary. Stairs and escalators are the primary methods of transporting passengers between station elements, and because there is a close relationship with the connecting platform, their performance is often an indication of how well the platform operates. The platform and/or stairwell performances can be gauged by how many passengers typically form in queue behind stairwells, how long it takes these queues to dissipate, and how much platform space is available to safely wait in. Typically, the critical performance period for stairwells occurs during the morning peak hours when the predominant flows exit the train and surge en masse to the street above or toward other station elements such as passageways below. However, at GCT where the IRT local and express subway lines discharge large amounts of pedestrians into the terminal, the evening period is also of some concern.

Currently, with North End Access (NEA) not yet in place, it is clear that MNR platforms at GCT routinely queue due to a limited number of exit elements located at their south end, and perform unacceptably. On the other hand, once entering the lower concourse, there are a number of elements that are heavily used by pedestrians as they continue their journey through GCT. A few critical elements on the upper concourse may also be utilized by LIRR passengers (such as the Graybar passageway). These critical processing points such as stairs and passageways have been identified and were analyzed to determine the level of service they function at today.

At these pedestrian elements, levels of service are directly traced to the capacity of the stair or escalator to process people traveling up or down. In many cases where the processing rate of the stair/escalator bank falls *below* the arrival rate of passengers, a queue will form over time. Although this will be of some concern when analyzing the North End Access designs under a variety of train arrival scenarios, there is less concern in this area of the terminal where numerous stairs exist and multiple train arrivals do not overwhelm any one stair element. Nevertheless, some sporadic queuing does occur after simultaneous arrivals, and, as such, some of these elements will be analyzed for the future Build Alternative.

Stairwell processing capacity is derived from the effective width and the design level-of-service flow rate standard applied to the analysis, while escalator capacity ranges from a low of about 60 persons per minute for slower, narrower designs to a high of 130 persons per minute (ppm) for faster, wider models. For this study, the NYCT standard of 100 ppm, associated with an escalator speed of 90 ft./sec. for a 48-inch wide tread, was consulted for guidance in assessing potential impacts. Pedestrian analyses are generally based on the peak 15-minute period, although a shorter five-minute interval was also be examined to capture the surge effect of "bunching" or platooning phenomena which can present operational problems.

Pedestrian service standards, as indicated by level of service (LOS) and detailed in the 1985 *Highway Capacity Manual* (HCM) are based on the freedom to select normal walk speed, the ability to bypass slow-moving pedestrians, the relative ease of cross- and reverse-flow movements at various pedestrian traffic concentrations, and in the case of waiting pedestrians, queuing or standing space availability. The level-of-service standards range from "A" (best) to "F" (worst). These level-of-service standards, primarily based on the space needs of people involved in various activities, are widely used today for planning and design of facilities for pedestrians. Brief descriptions of each level-of-service standard follow.

Within **LOS A** (20 or more square feet per pedestrian; a flow rate of 5 or less pedestrians per minute per foot of width), there is sufficient area provided to freely select stair walk speed, to bypass slow pedestrians, and to easily permit reverse flows. **LOS B** (15-20 sq. ft. per ped.; flow rate of 5-7 ped/min./ft.) sees virtually all persons freely selecting their stair locomotion speeds, but some difficulties would be experienced passing slower pedestrians. Also, reverse flows present no serious conflicts. Within **LOS C** (10-15 sq. ft. per ped.; flow rate of 7-10 ped./min./ft.), stair locomotion speeds are slightly restricted due to the inability to pass slower pedestrians, but no serious conflicts with reverse flows are apparent. At **LOS D** (7-10 sq. ft. per ped.; flow rate of 13-17 ped./min./ft.), stair locomotion speeds are restricted for the majority of persons due to the inability to pass slower pedestrians, and reverse flows encounter some conflicts. The theoretical capacity of the stairwell is reached at **LOS E** (4-7 sq. ft. per ped; flow rate of 13-17 ped./min./ft.), where normal stair locomotion speeds are reduced because of minimum tread space and an inability to bypass others. Also, intermittent stoppages may occur, and reverse flows experience serious conflicts. Complete breakdown in pedestrian flow, with many stoppages occurs in **LOS F** (4 or less sq. ft. per ped.; flow rate of over 17 ped./min./ft.).

Initially, acceptable level-of-service C/D (associated with a volume-to-capacity, or v/c, ratio of 1.00) standards[1] are used to calculate stair and passageway walk space operations in existing conditions, or walk space requirements when designing a new pedestrian space such as a platform or waiting area. In cases where an existing pedestrian area is being analyzed and the calculated v/c ratios are less than 1.00, pedestrian operations are actually LOS C/D or better. In the event that the calculated levels of service exceed these standards and v/c ratios exceed 1.00, the actual pedestrian flow conditions are worse than LOS C/D. Then, lower level-of-service standards (i.e., the LOS E/F threshold) are used to recompute pedestrian conditions. When computed v/c ratios "dip under" a capacity condition (v/c = 1.00), the actual LOS is determined.

In order to identify how LIRR's entry into GCT will affect the connected Lexington Avenue subways, an analysis must be conducted for the critical subway platforms to determine how they will be loaded. Pedestrian level-of-service standards are most often applied to average or peak pedestrian volumes who will use the space—i.e., the platform —over a give time period. In traditional pedestrian analysis techniques, the duration of the peak load condition or the amount of time that people will require the space is usually not considered. This disregard for the duration factor can lead to overdesign of the facility.

To address how such areas function, the time-space methodology is the standard procedure used. One key element of the methodology involves recognizing the people who are involved in walking and waiting activities in a given space, or in this case, a subway platform. The technique models how platforms are actually used today or can be used in the future if additional platform elements such as new or relocated stairwells are introduced.

The time-space analysis procedures consider that pedestrians require certain and varying amounts of *space* for different activities, with the amount of space available affecting a person's performance and comfort level. Considering that pedestrian facilities are actually dynamic zones, moving and standing pedestrians then need different amounts of space and for different periods of *time*. These pedestrian space needs are again classified through a range of levels of service, as mentioned above. Pedestrians can, for example, simply walk through a certain platform zone while others will choose to wait within it; both types of activities require time-space. The method's basic concept considers the various types of pedestrian activities occurring in a specific space within a given timeperiod and the numbmer of people who are involved in each activity. The amounts of time-space required for each activity are summed and compared to the time-space available within the facility, in this case, along the particular platform zone.

There are two essential components of the analysis. First, there is the "demand" — or pedestrian activity — component of the analysis. Three specific pedestrian activities are considered to be demand activities. First, the *walk* requirement is a function of the walking distance, walk speed, and the number of people walking in or through the space. In using the time-space procedure, the designated walk speed and the associated space must be carefully selected. Next, the total time-space required within a facility is a function of the space required per person, the amount of time spent waiting, and the number of people waiting. Typically the longer the wait, the greater the space per person required. Finally, there are processing activities where a person is performing a transaction in the space that involves more complex actions, such as purchasing a ticket or stopping to read a posted map.

The second of the two equation components involves the "supply" — or time-space availability — portion of the analysis. Simply, time-space available is the product of the time period that is available and the space that is available for these activities. The time period typically used for pedestrian design or planning can be the short 1-, 2-, or 5-minute peak surge period; a typical 15-minute period within which the facility peak surge occurs; or, in facilities subject to intense use continuously over a period, a longer continuous 30- to 60-minute period. In defining the space that is available for pedestrian activities, used and unused areas or zones must be identified. Used space is that which can actually be utilized by the pedestrian to walk through, or to process and wait in. Unused or "dead" zones exist, for example, immediately along walls or in areas surrounding obstructions.

The next step is to consider platform analysis components. The first of these is the platform's time-space zones. Walking and waiting activities take place in varying degrees on specific portions of the platform. Some areas are used primarily for walking, such as "vestibule" zones situated at the stairwell landings that process passengers up or down. Other areas are used primarily for waiting, such as areas along the back wall edge of the platform. Still other areas of the platform have little walking or waiting activity in them because their locations are rarely used by pedestrians, such as far platform ends. Knowing these various activities, platforms can be subdivided into time-space zones.

To ascertain logical platform time-space zones, an extensive field examination of each platform established the various tupes and intensities of passenger activities to and from stairwells and trains, and identified what impediments (e.g., refuse cans, benches) could possibly interfere with their flow. This is critical to the overall analysis in the creation of zones too large could understate potential problems, while zones too small could depict conditions worse than actually exist.

Next, there is consideration for amount of time-space available. The time-space available in each zone was determined by multiplying the area in each time-space zone (in square feet) by the peak 15-minute analysis period selected. Again, the total or gross platform area in a particular time-space zone is reduced to account for dead space unused by the pedestrian. Available time-space ranges from a low of about 5,100 square feet-minutes (sfm) on the IRT southbound 4/5/6 center platform to a high of 13,340 sfm on the IRT 4/5/6 northbound center platform.

Finally, there is the time-spaced required. The total time-space required for each zone is the aggregate of the walk time-space and waiting (or queue) time-space requirements in each zone. The walk time-space requirement for each zone is a function of the volume of people who walk through the zone, the time spent walking through the zone (which is a function of the walk distance and the walk speed), and the space (area) per person required for walking (at the walk speed above). The queue time-space requirement for each zone is the product of the number of people waiting on the platform, the average wait time (in this case, measured train headway), and standing area per person. Only those zones that are used by passengers to load onto trains have queue time-space needs.

As stated above, many of the calculation parameters used are associated with particular levels of service. Initially, platform walk and queue space requirements were tested at level-of-service C/D standards (associated with a volume -to-capacity ratio of 1.00), which represents the NYCT design guidelline for station planning.[1] In the event that *available* time-space does not meet the *required* time-space, then lower level-of-service standards (i.e., mid-D to the E/F threshold) are used to recompute walk and queue requirements. In this iterative fashion, the use of time-space procedures could be used to ascertain the level of service each zone operates in today.

3.7.2 Existing Conditions

One-day pedestrian and vehicular counts were taken during the AM and PM peak periods during May 1995 at various points in the lower concourse and several connecting elements that lead to the upper concourse and subway circulation elements, and at critical street corners that form the GCT "superblock." These were supplemented by additional counts of selected platform and stairs leading to the IRT Lexington Avenue subway station at GCT. The locations of these pedestrian counts are identified for both the upper and lower concourse levels on Figures 3.7-1 and 3.7-2 respectively. Additional pedestrian counts on the upper concourse were taken during the Fall 1994 by another consultant (Vollmer Associates) participating in the NEA design contract and were used for this study. Existing traffic volume data were available in the 1994 42nd Street Light Rail Transit FEIS (which documented 1992 conditions using project-specific counts, recent Route 9A Project data, the 1989 383 Madison Avenue FEIS, and the 1987 42nd Street Transitway DEIS) were included in this study. This analysis focused on only those critical areas that often process the highest number of pedestrians, are sometimes congested, and which would likely be used by many future LIRR passengers within GCT.

These station elements include the two stairwells to Vanderbilt Avenue, the ramp/stairwell that leads from Track 116, the stairwell opposite the lower concourse's southeast corner (near the now-closed Eclair bake shop), the east and west stair/escalator banks feeding to the IRT subway, the mixing area opposite the Oyster Bar, and the ramps that lead up from the Oyster Bar to the upper concourse. The critical elements on the upper concourse include the narrow point within the Graybar and Commodore passageways and the passageways serving the IRT shuttle. Directly outside of GCT, critical areas include the sidewalk and crosswalk areas surrounding the terminal.

Pedestrian Conditions Within GCT: Typically, pedestrian volumes are directionally peaked out of GCT in the morning as commuters are traveling to work, while the reverse is true in the late afternoon periods. AM peak pedestrian conditions in the lower concourse experience only limited congestion because, generally, only one train unloads at a time on the lower level. The area is not subject to the daily high cross flow conflicts of multiple train unloadings that are common in the upper concourse.

For this study, the concern is identifying those circulation patterns that would closely mirror future LIRR patterns from the westernmost tracks in the lower concourse, and observing the current usage of those elements. This will allow determination of existing levels of service, assignment of LIRR passengers through the area, and finally, impact determination (if any).

The busiest stairwell in the lower concourse is the Vanderbilt Avenue north stair, with about 3,000 people traveling up along it in the AM peak hour and another 4,200 people using it in the PM peak hour. Another heavily used element is the single stairwell at the southeast corner leading towards IRT subway connections near the Eclair bake shop, with 1,000 to 1,500 pedestrians traveling in the peak direction in each of the AM and PM peak hours. A second stairwell used to a modest degree (1,000 up in the AM; 1,600 down in the PM) is one serving the existing westernmost tracks and connects with the upper concourse near the incoming train room. (This element is to be replaced in the GCT revitalization plan with an expanded set of combined stairs and escalators.) The mixing area that connects the lower concourse to the IRT subway level is one of the busiest areas away from the upper concourse, with a total of about 4,700 and 6,250 people moving through it in the respective AM and PM peak hours. A second, slightly less busy mixing area lies directly opposite the Oyster Bar, which appears to be most heavily used during the AM peak hour (a total of 4,200 people travel through the area), and less so in the PM peak (about 1,550 people use it).

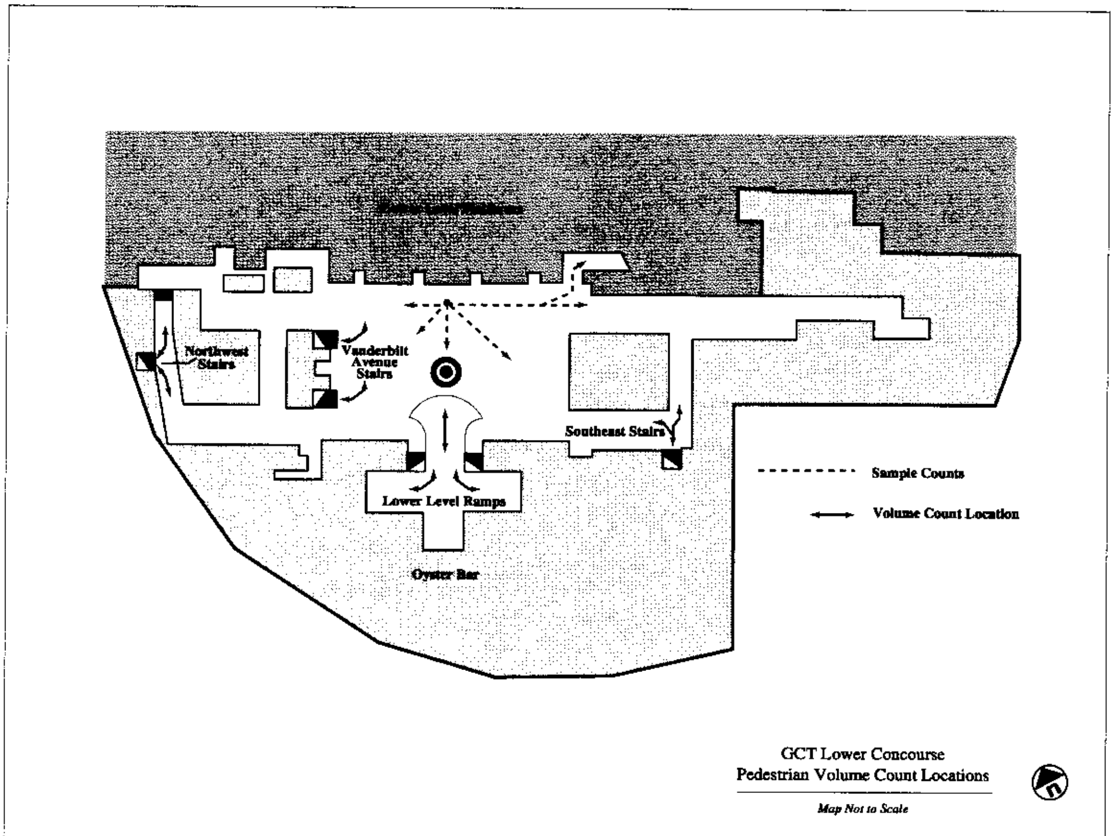


Figure 3.7-1

The two stair/escalator elements serving the IRT subway are likely among the most heavily used in the entire terminal. Although these elements are used by many pedestrians originating from many directions, and have limited available capacity, they will likely be used by those LIRR riders traveling to destinations far south of the terminal. The stair/escalator bank closest to the lower concourse's southeast stairwell and serving the west end of the subway platform is the busiest of the terminal's two IRT stairwell banks, with between 5,000 and 6,000 pedestrians traveling up and down separately in both the AM and PM peak hours. The stairwell closer to Lexington Avenue is about half as busy (although there are other external stairwells serving the IRT's east platform end), with between 2,500 and 3,200 pedestrians moving up and down during peak hours.

At the IRT platform level, pedestrian levels are highest descending to the platform on the southbound platform ranging from about 720 in the AM peak 15 minutes to about 530 in the PM peak period. Of these, most remain in the zone directly at the stair bottom (400 AM, 355 PM), with the balance U-turning around the stairs to travel into other zones north of the stairs. Between 150 and 250 pedestrians use these stairs to ascend off the platform to the mezzanine level. Some local/express switching does occur (40 to 50 in each peak period), although such movements is low at this zone since platform crowding makes crossing activities difficult.

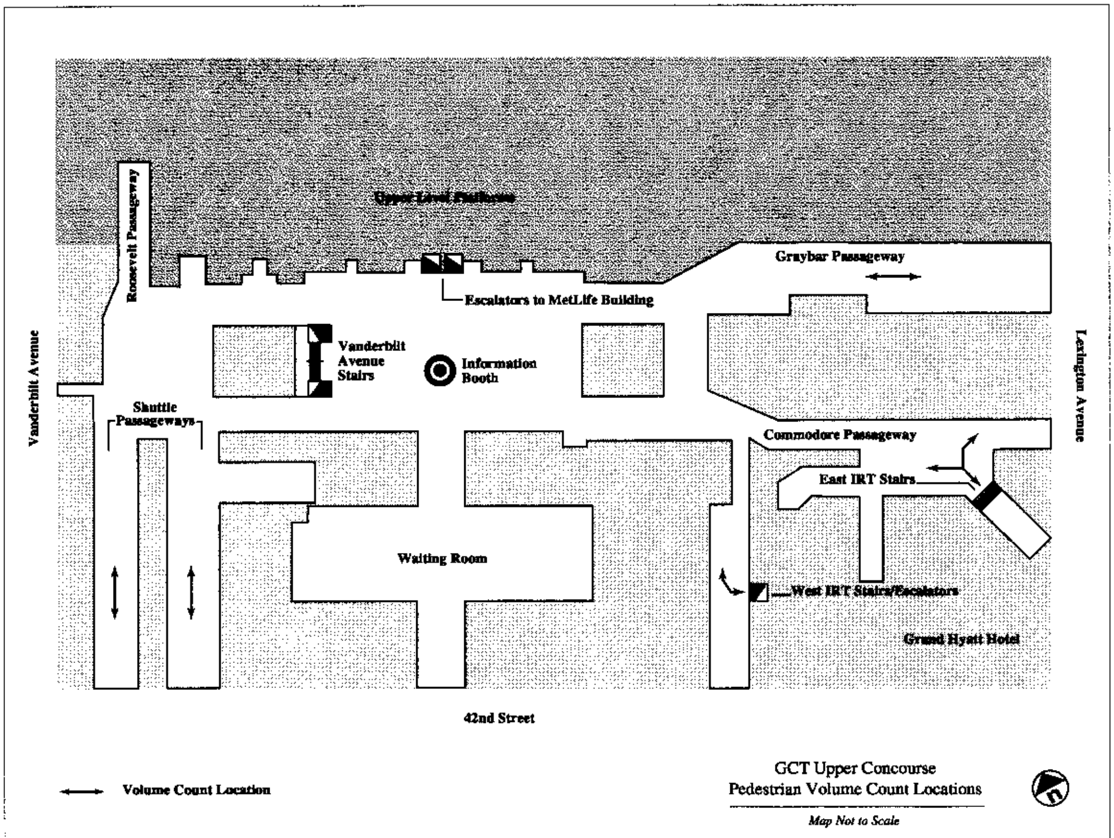


Figure 3.7-2

On the northbound platform, pedestrian levels are consistent entering and leaving in both peak periods, with some between 450 and 550 people descending to the plaform, and 410 to 480 ascending up off the platform. Cross-platform movements between local and express lines, which are somewhat easier in this larger area, between 70 and 100 persons in the peak 15-minute period.

In terms of operations, no vertical circulation element on the lower concourse experiences any significant congestion during the AM peak period, and is characterized by LOS C/D or better throughout the period. Tables 3.7-1 and 3.7-2 present pedestrian flow conditions through selected circulation elements for the peak 15-minute period within the respective AM and PM peak hours. In all cases, passenger demands are lower than processing rates of the stairs and escalators being used. This condition is helped, in part, by the scattered train arrival schedule on the lower concourse, which disperses pedestrians to different exit points. With one exception, conditions during the PM peak hour are similarly acceptable (i.e., LOS C/D or better). The single exception is the north stairwell leading down from Vanderbilt Avenue (two stairs lead down to the lower concourse), which builds in its usage to a daily peak during the 5:15-5:30 PM peak 15-minute period, and experiences capacity LOS E conditions (borderline LOS F). The western IRT stair/escalator bank operates at LOS E/F during each peak period, indicating overcrowding and queuing at the stairs' landing areas. The eastern IRT stairwell near Lexington Avenue, composed of three separate elements, operates with slight congestion along one stair element during only the AM peak hour.

TABLE 3.7-1

ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
1995 EXISTING CONDITIONS
TIME PERIOD ANALYZED: Peak 15-minute period (8:30-8:45) within AM peak hour (8:00-9:00)

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR ECLAIR BAKE SHOP	Lower Stairs	303	9	312	45	76	0.27	C/D or better
	Upper Stairs	510	8	518	88	150	0.23	C/D or better
VANDERBILT AVE. STAIRS	North Stair	746	18	764	56	95	0.54	C/D or better
	South Stair	124	21	145	56	95	0.10	C/D or better
NW STAIRS NEAR MAINT. TRACKS	Lower Stairs	199	3	202	64	109	0.12	C/D or better
	Upper Stairs	314	6	320	72	122	0.17	C/D or better
Upper Concourse								
EASTERN IRT SUBWAY STAIRS	East Stair	418	2	420	40	68	0.41	C/D or better
	Center Stair	342	163	505	47	80	0.42	C/D or better
	West Stair	187	474	661	40	68	0.65	E/F
WESTERN IRT SUBWAY STAIRS/ ESCALATORS (2)	East Stair	458	476	934	36	61	1.02	E/F
	West Stair	0	1,177	1,177	40	68	1.15	E/F
	East Esc.	621	0	621	-	100	0.41	C/D or better
	West Esc.	451	0	451	-	100	0.30	C/D or better
SHUTTLE PASSAGEWAYS	East P'way	171	320	491	202	360	0.09	C/D or better
	West P'way	556	437	993	151	270	0.25	C/D or better
LOWER LEVEL RAMPS	East Ramp	225	6	231	129	230	0.07	C/D or better
	West Ramp	504	26	530	179	320	0.11	C/D or better
VANDERBILT AVE. STAIRS	North Stair	445	25	470	56	95	0.33	C/D or better
	South Stair	185	95	280	63	107	0.17	C/D or better
GRAYBAR P'WAY	-	136	1,099	1,235	325	580	0.14	C/D or better
LEXINGTON P'WAY	-	406	777	1,183	227	405	0.19	C/D or better

NOTE:

(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for passageways
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

(2) The two western IRT escalators are currently one up and down as of early 1997.

TABLE 3.7-2

ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
1995 EXISTING CONDITIONS
TIME PERIOD ANALYZED: Peak 15-minute period (5:15 - 5:30) within PM peak hour (5:00-6:00)

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR	Lower Stairs	12	489	501	45	76	0.44	C/D or better
ECLAIR BAKE SHOP	Upper Stairs	24	177	201	88	150	0.09	C/D or better
VANDERBILT	North Stair	89	961	1,050	56	95	0.74	E/F
AVE. STAIRS	South Stair	33	78	111	56	95	0.08	C/D or better
NW STAIRS NEAR	Lower Stairs	3	475	478	64	109	0.29	C/D or better
MAINT. TRACKS	Upper Stairs	8	551	559	72	122	0.30	C/D or better
Upper Concourse								
EASTERN	East Stair	312	61	373	40	68	0.37	C/D or better
IRT SUBWAY	Center Stair	308	242	550	53	90	0.41	C/D or better
STAIRS	West Stair	316	321	637	45	77	0.56	C/D or better
WESTERN	East Stair	468	65	533	32	54	0.65	E/F
IRT SUBWAY	West Stair	77	643	720	32	54	0.88	E/F
STAIRS/	East Esc.	0	679	679	-	100	0.45	C/D or better
ESCALATORS (2)	West Esc.	1,273	0	1,273	-	100	0.85	E/F
SHUTTLE	East P'way	137	187	324	202	360	0.06	C/D or better
PASSAGEWAYS	West P'way	579	587	1,166	151	270	0.29	C/D or better
LOWER LEVEL	East Ramp	10	151	161	129	230	0.05	C/D or better
RAMPS	West Ramp	34	255	289	179	320	0.06	C/D or better
VANDERBILT	North Stair	200	390	590	63	107	0.37	C/D or better
AVE. STAIRS	South Stair	95	280	375	56	95	0.26	C/D or better
GRAYBAR P'WAY	-	1,168	194	1,362	325	580	0.16	C/D or better
LEXINGTON P'WAY	-	1,001	312	1,313	202	360	0.24	C/D or better

NOTE:

(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F. respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F. respectively for passageways.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

(2) The two western IRT escalators are currently one up and down as of early 1997.

One additional pedestrian element, the IRT 7 Hunters Point Avenue station in Long Island City, was analyzed since the TSM Alternative would increase the LIRR service into the area, and increase the use of this subway station. The two stairwells connecting the street to the subway's mezzanine level are the heaviest-used elements in the station, although the pedestrian volumes recorded are modest (between 1,450 and 1,550 per hour), and were examined in this study. These elements currently operate within acceptable level-of-service C/D (see Table 3.7-3).

The subway platform areas and stairs selected for analysis lie directly in line with the westernmost turnstile bank and generally toward the center of the entire platform length. These elements were observed to be among the subway station's most heavily used. Currently, the southbound platform experiences the heaviest demands, these during the AM peak period when Metro-North passengers use the subway to downtown work destinations. LOS D conditions were calculated for this platform zone, which is above the NYCT acceptable standard of LOS C/D. This congested condition also prevails during the PM peak period, although slightly less intense than those of the morning hours. All other platform zones analyzed currently operate within the LOS C/D or better range. Since the platform is actually broken down into numerous discrete zones feeding a number of stairwells, there appears to be little significant queue formation in the immediate area where the platforms and stairs meet. This was reflected in the stairwell queuing analysis, with the processing capacity of these elements adequately meeting current pedestrian demands (See Table 3.7-4).

For line-haul capacity, the ability of trains to accommodate passenger loads is considered. The analysis determines whether there is sufficient capacity per car per train to handle existing and projected future transit loads. The analyses are based on per-car practical capacity standards used by the MTA and NYCT. Capacities range from 110 persons per car for a 51-foot subway car to 220 per car for a longer 75-foot car.

Line-haul capacity of a given subway is determined by multiplying the number of scheduled trains per hour by the number of cars per train and times the practical capacity per car. The volume of riders passing a given point (for this analysis, Grand Central and Hunters Point Stations) is then compared with the line-haul capacity of the subway line. The resulting per-car passenger load can then be compared with practical capacity standards to determine the acceptability of conditions.

For this study, only the critical peak direction was analyzed, namely southbound on the IRT 4/5/6 lines at Grand Central Station and Manhattan-bound for the IRT #7, both in the AM peak period when ridership is highest. Currently, the IRT 4 and 5 express lines exceed their practical line-haul capacity, with utilization levels of between 105 and 99 percent full respectively. The local 6 line is about 56 percent utilized. The IRT 7 line into Manhattan near Hunterspoint Station is about 83 percent fully utilized. Table 3.7-5 lists results of the line-haul analyses.

TABLE 3.7-3

ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS FOR IRT HUNTERS POINT AVENUE STATION

1996 EXISTING CONDITIONS

TIME PERIOD ANALYZED: 15-minute period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	7	380	387	8.0	7.0	56	95	0.46	0.27
	West Stair	13	236	249	8.0	7.0	56	95	0.30	0.17
5:10-5:25 PM Peak	East Stair	232	76	308	8.0	7.0	56	95	0.37	0.22
	West Stair	274	10	284	8.0	7.0	56	95	0.34	0.20

TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	1	191	192	8.0	7.0	56	95	0.69	0.40
	West Stair	6	131	137	8.0	7.0	56	95	0.49	0.29
5:10-5:25 PM Peak	East Stair	86	36	122	8.0	7.0	56	95	0.44	0.26
	West Stair	101	1	102	8.0	7.0	56	95	0.36	0.21

NOTES:

(1) Based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively. Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

(2) V/C ratios under 1.00 indicate the element operates at LOS C/D or better; when the V/C ratio for the element analyzed under LOS C/D conditions is over 1.00, the level-of-service is then evaluated under LOS E/F conditions (i.e., flow rate of 17 pax/ft/min.)

TABLE 3.7-4

ANALYSIS OF SELECTED PLATFORM ZONES IRT LEXINGTON AVENUE STATION
1996 EXISTING CONDITIONS
TIME PERIOD ANALYZED: 15-minute period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)		PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)		LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS C/D	LOS mid-D	
Northbound AM	8:35-8:50 AM	13,335	9,620	6,926	72%	52%	C-D
Northbound PM	5:15-5:30 PM	13,335	10,449	7,532	78%	56%	C-D
Southbound AM	8:25-8:40 AM	5,115	4,362	3,150	85%	62%	C-D
Southbound PM	5:30-5:45 PM	5,115	3,670	2,649	72%	52%	C-D

TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)		PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)		LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS C/D	LOS mid-D	
Northbound AM	8:45-8:50 AM	4,445	3,468	2,495	78%	56%	C-D
Northbound PM	5:20-5:25 PM	4,445	3,804	2,742	86%	62%	C-D
Southbound AM	8:35-8:40 AM	1,705	2,513	1,807	147%	106%	mid-D
Southbound PM	5:35-5:40 PM	1,705	1,972	1,419	116%	83%	C-D

NOTES:
(1) Platform zones are situated near the center of the entire platform and were selected as per observations as being the most intensely used portions.
(2) The threshold requirements for LOS C/D are based on a space module of 22 square feet per person at 4.1 feet-per second average walk speed and an average queue-space requirement of 7 square feet per person.
(3) The threshold requirements for LOS mid-D are based on a space module of 14 square feet per person at 3.5 feet-per-second average walk speed and an average queue-space requirement of 5 square feet per person.

TABLE 3.7-5

EXISTING LINE HAUL ANALYSIS IN PEAK DIRECTION

Subway Station Subway Lines	Cars / Hr.	Total Practical Capacity */ Hour (pass/hr)	Pass. / Hr.	Utilization (%)
HUNTERS POINT AVENUE STATION				
Manhattan-bound (AM Peak)				
# 7	286	31,460	26,225	0.83
GRAND CENTRAL STATION - 42ND STREET				
Downtown (AM Peak)				
#4	120	13,200	13,875	1.05
#5	120	13,200	13,060	0.99
#6	210	23,100	12,840	0.56

*** Practical Capacity per Car (pcpc) varies with car length:**
The above subway lines use 51 feet long/car and have a practical capacity of 110 passengers per car.

Pedestrian Conditions at Street Level: Once directly outside, pedestrians continue their highly directional travel away from the terminal during the morning periods. Conversely, pedestrian flows tend to be higher toward GCT during the late afternoon periods as commuters begin their homebound trip out of Manhattan. For this study, the analysis focused on those critical street and sidewalk elements most intensely used by pedestrians as they concentrate just outside of the terminal. Pedestrian counts were taken during May 1995 at critical sidewalk and crosswalk locations along 42nd and 45th Streets and Lexington Avenue. (Vanderbilt Avenue is used less intensely by pedestrians due to taxicab conflicts and the presence of other GCT entryways to the west, and was not included in these analyses.)

Typically, pedestrians tend to confine their movements across 42nd Street to the designated corner areas due to the inability to identify adequate gaps in the traffic streams elsewhere. On the other hand, it is clearly evident in other areas, due to the sheer volume of pedestrians exiting or entering the building, wide segments of the street space are used for crossing. Specifically, the section of Lexington Avenue between the Commodore and Graybar passageways (across 43rd Street) is used as a "crosswalk" by streams of pedestrians exiting the terminal. Along 45th Street, people use virtually the entire width of street between the Helmsley Walks East and West.

The highest pedestrian volumes were recorded across 45th Street between the Met Life building and the Helmsley Walks, with between 6,000 and 9,000 pedestrians tabulated in the AM and PM peak hours (this street area was studied in the *Operational and Physical Feasibility Study of LIRR Access to Manhattan's East Side*, and is presented here for informational purposes only). Of the four corners of the GCT block, the southeast corner at 42nd Street and Lexington Avenue is most intensely used. In each of the AM and PM peak hours, 2,700 people travel east-west across Lexington Avenue, while another 2,300 use the north-south 42nd Street crosswalk. The southwest corner of Vanderbilt is used by 1,700 people traversing 42nd Street. At the 45th Street/Lexington Avenue intersection, pedestrian crossing volumes at the 42nd Street corners were slightly less intense. Between 1,000 and 2,400 pedestrians cross along the crosswalks that lead to GCT. Figures 3.7-3 and 3.7-4 illustrate AM and PM peak hour pedestrian volumes at corner crosswalk areas surrounding GCT as well as peak hour traffic volumes along key links likely to be affected by the influx of new LIRR riders in the area.

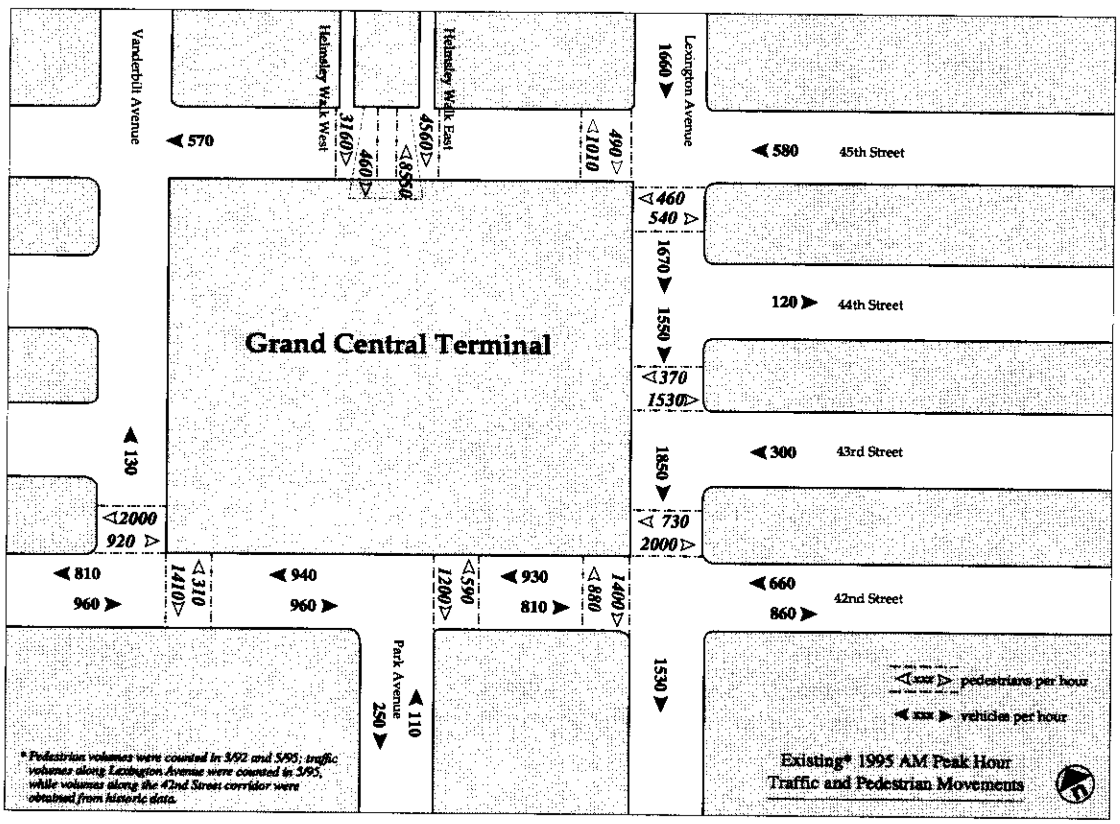


Figure 3.7-3

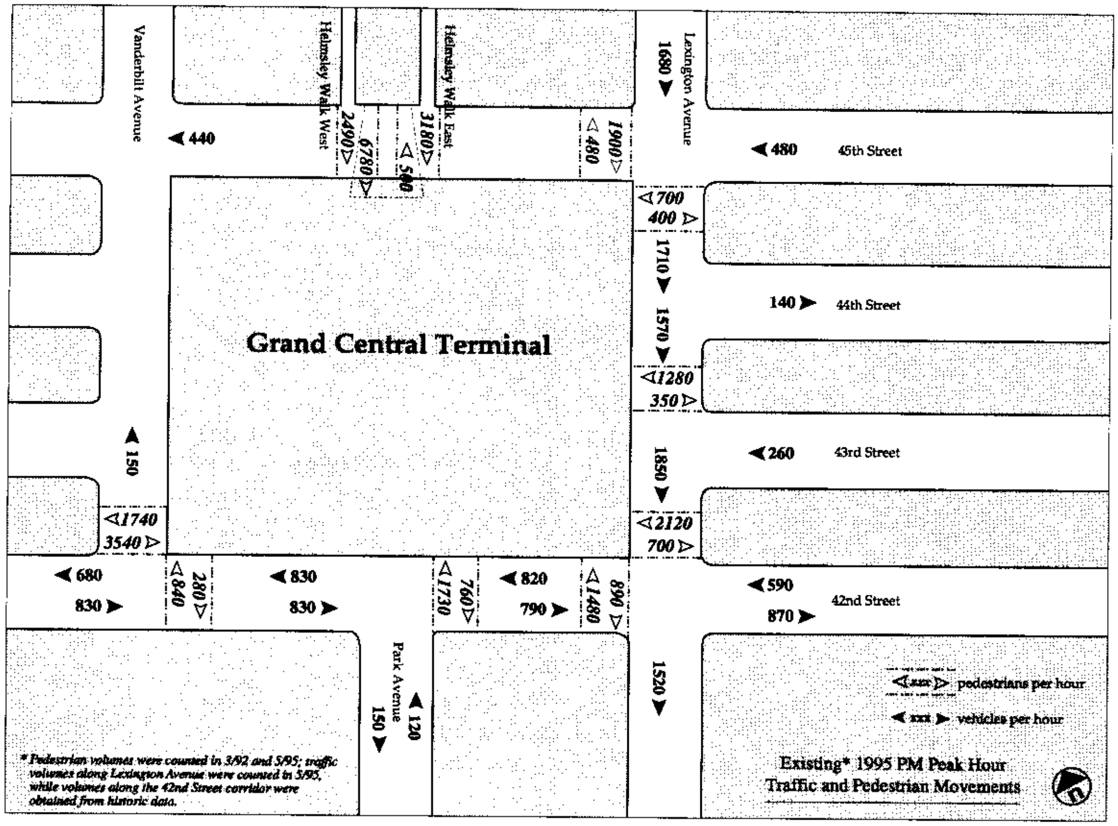


Figure 3.7-4

Existing pedestrian conditions were analyzed using the methodologies described in the 1985 HCM. The HCM defines a range of levels of service for pedestrians using walkways/crosswalks. At LOS A through C, pedestrians can circulate the walk space freely at normal walking speeds and with only minor conflicts; LOS D defines the initial range where some circulation ability is restricted, with some friction between pedestrians becoming noticeable; pedestrians experiencing LOS E conditions encounter significant stoppages and interruptions to flow, "shuffling" is common, and normal walking speed is restricted; and LOS F is defined by unavoidable contact between passing pedestrians and most pedestrians are queued rather than actively moving.

There are a number of crosswalks and sidewalks that currently operate at poor levels-of-service E and F, especially along the Lexington Avenue side of the terminal between 42nd and 45th Streets. At these locations, sidewalks are narrow and conflicting pedestrian surges are noticeable in opposite directions. Crosswalks are similarly often overwhelmed by large groups of pedestrians. Such conditions are due, in part to the lack of other pedestrian connections either directly to surrounding buildings or to other street points. The Vanderbilt Avenue side of the terminal is less intense in its concentrations of pedestrians due, in large part, to the existence of a number of underground connections directly into surrounding buildings. This allows pedestrians to spread their exit and entrance movements in a more even manner and results in more acceptable pedestrian operations at the street areas surrounding GCT's west edge. Table 3.7-6 lists the AM and PM peak period pedestrian levels of service for the critical sidewalk and crosswalk areas surrounding the terminal.

TABLE 3.7-6
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS
EXTERIOR TO GRAND CENTRAL TERMINAL
1995 EXISTING CONDITIONS
AM and PM Peak Periods

INTERSECTION and ELEMENT	8 - 9 AM Peak Period				5 - 6 PM Peak Period			
	Average		Maximum Surge		Average		Maximum Surge	
	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS
LEXINGTON AVENUE @ 45th STREET								
Southwest corner	18	D			15	D		
South crosswalk	33	C	19	D	40	B	22	D
West crosswalk	41	B	15	D	31	C	11	E
LEXINGTON AVENUE @ 43rd STREET								
Sidewalk on W. side of Lex.	23	E	27	F	14	D	18	E
North crosswalk	22	D	11	E	27	C	14	E
LEXINGTON AVENUE @ 42nd STREET								
Northwest corner	19	D			19	D		
North crosswalk	14	E	6	E / F	17	D	8	E
West crosswalk	29	C	15	D	36	C	18	D
VANDERBILT AVENUE @ 42nd STREET								
Northeast corner	35	C			26	C		
North crosswalk	96	B	75	B	57	B	44	B
East crosswalk	67	B	33	C	78	B	38	C

Traffic Conditions Adjacent to GCT: For this study, the traffic conditions at the intersections surrounding GCT were considered to be most directly affected by the flows of pedestrians to and from the terminal. These locations would also be directly used by newly-generated LIRR-related vehicles (such as new taxi trips). Study intersections include those along Lexington Avenue at 42nd Street (GCT's southeast corner), 43rd Street (near the Graybar passageway), and at 45th Street (GCT's northeast corner); and the 42nd Street intersections at Park and Vanderbilt Avenues. Vehicle and pedestrian movements at each of these five intersections are controlled by traffic signals.

In terms of traffic volumes, the main streets surrounding the terminal are busy, although they do not appear to be experiencing gridlock. It is possible that motorists avoid this section of Manhattan because of the well-known taxicab and pedestrian interferences generated by GCT. Lexington Avenue carries between 1,500 and 1,700 vehicles per hour (vph) north of the GCT block in the daily peak travel hours. Adjacent to the terminal's east side, avenue traffic increases to about 1,850 as taxicab activity picks up there. Along GCT's south side on 42nd Street, east and westbound traffic volumes are consistently within the 800-900 vph range in the AM and PM peak hours. Vanderbilt Avenue carries low traffic volumes (predominantly taxicabs destined to the taxi stand along the terminal's west side) of between 130 and 150 vph in either the north or southbound direction throughout the day, although there are short periods when congestion occurs along the avenue as taxis accumulate near the stand. Traffic volumes along 45th Street are modest, within the 400 to 500 vph range during the daily peak hours.

The 1985 HCM procedures were again used in determining the capacities and levels of service for each of the intersections comprising the traffic study area. For signalized intersections, levels of service (LOS) are defined in terms of average vehicle delay, as detailed below.

- 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 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 over-saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high volume-to-capacity ratios with cycle failures. Poor progression and long cycle lengths may also be contributing to such delays. Often, vehicles do not pass through the intersection in one signal cycle.

Levels-of-service A, B, and C are considered acceptable, LOS D is generally considered marginally acceptable/unacceptable, and LOS E and F are considered unacceptable for signalized intersections.

Each of the signalized intersections comprising the traffic study area were analyzed in terms of their capacities to accommodate existing traffic volumes and their resulting levels of service. A summary of findings is presented in Table 3.7-7, with the key findings discussed below.

The surrounding street network processes a significant amount of vehicular volume relative to its capacity. Volume-to-capacity ratios exceed 0.90 along several intersection approaches, most notably along Lexington Avenue and the 42nd Street approaches to Park Avenue. In terms of vehicle delay and level of service, these intersections operate within some noticeable, but manageable, congestion (LOS D) at selected movements. It is interesting to note that there are several factors that help reduce the level of congestion that occurs directly at the intersection. First, it appears that because the key "front" streets serving the terminal — 42nd Street and Lexington Avenue — function as through corridors to process vehicles either east-west or from north-to-south, frictions associated with turning movements are minimized. In fact, turn maneuvers are prohibited along many approaches along 42nd Street. At other locations, the overall levels of traffic volume are lower, such as along Vanderbilt Avenue where taxicab activity dominates, and acceptable operations prevail (although spill back and queuing can occur during certain peak periods). Finally, because pedestrians tend to swarm out of GCT in many directions and cross streets almost anywhere there are gaps in the traffic stream, their interfering effect at the intersection is reduced.

In terms of taxi service, there are posted taxi stands along the south and west blockfaces of the terminal near the Vanderbilt Avenue/42nd Street intersection. The Grand Central Partnership employs taxi control agents at each location during the 7-11 AM and 3-11 PM periods to manage the flow of cabs and keep the taxi queuing locations clear of other vehicles. Field observations indicate the Vanderbilt Avenue stand is more "popular" for commuters (between 10 and 30 people wait in queue at any time during the AM peak) as it appears to process the highest taxicab throughput. Even when 20 individuals are on line for a taxi, the volume of taxicabs entering is such that it is rare for an individual to wait for more than a few minutes for a taxi. In addition, its is protected from the weather and has a slightly better interface with the terminal than any other nearby taxi stand. The 42nd Street taxi stand is used by fewer people, with 10 to 15 people noted in queue at any time during the morning hours. Although the taxi stand is situated on a main crosstown street, people generally have to wait much longer for a taxi as the volume of taxicabs at this location is much less than that at the Vanderbilt Avenue stand. One possible reason for this is that an empty taxi, heading west on 42nd Street past the main terminal street access and the Grand Hyatt hotel, will likely be hailed before arriving at this taxi stand.

In terms of bus service, Grand Central Terminal is well served with a number of routes with high frequency of service. Because of this, a majority of buses were observed to be under-capacity when nearing the terminal. NYCT local and express bus services along Lexington and Third Avenues (M98, M101, M102, and X25) provide north-south access to the terminal, while bus services along 42nd Street (M42 and M104) provide east-west access. Below is a detailed description of each bus route.

- The M98 bus route provides limited rush hour service between the George Washington Bridge Bus Station and East 34th Street. The southbound route mainly travels along Lexington Avenue while the northbound route uses Third Avenue. The M98 operates only during AM and PM peak periods on weekdays, with scheduled headways of seven to ten minutes. The maximum load points occur in Harlem, where buses average 46 to 50 riders, or six to ten standees. At GCT, between 10 and 20 passengers per bus (less than half full) were noted during the daily peak hours.

- The M101 and M102 bus routes provide local and limited-stop service northbound on Third Avenue and southbound on Lexington Avenue past GCT. The two routes start in Harlem and complete their runs in Lower Manhattan. One of the maximum load points in the southbound direction is the southeast corner of GCT (Lexington Avenue and 42nd Street). At this point, peak hour ridership averages about 50 passengers per bus. The frequency of service is very high, with scheduled headways of two minutes in both daily peak hours. Average loadings of between 20 (AM) and 30 (PM) passengers per bus were observed as buses approached the terminal.

- The M42 bus route provides east-west access across the entire length of 42nd Street, river to river. Scheduled service is frequent, with between 15 and 30 buses traveling the corridor in each direction during peak hours. The maximum load points occur west of GCT, near Times Square, where average ridership peaks in the AM hours approach 60 passengers, which is the capacity of an NYCT bus. Observed bus loadings at the terminal indicate between 20 and 30 passengers, or about 50 to 75 percent of capacity, are typically on board during the AM and PM peak hours.

- The M104 also operates crosstown on 42nd Street, but only between First and Eighth Avenues. Service extends to the Upper West Side and Harlem via Broadway. The service frequency is high, with three-minute headways (about 20 buses per hour during the peaks) noted in the peak direction during the AM and PM peak hours. A maximum load point in each direction is located just north of Columbus Circle at Broadway and 61st Street, where the average ridership is slightly higher than 50 passengers per bus. Observations of bus ridership indicate that buses traveling westbound carry more passengers, averaging about 30 per bus, during both the AM and PM peak hours, although some isolated buses were observed to carry as many as 50 passengers near GCT.

- The NYCT express bus route X25 provides service between GCT and Lower Manhattan, primarily using the FDR Drive. The bus service operates only in the weekday peak periods, and only in the peak direction: southbound in the AM peak period, and northbound in the PM peak period. Scheduled headways are 15 minutes in each peak period. Observed usage of this bus route during the AM peak period indicates a very low ridership at the starting point — less than five passengers board any single bus at GCT.

Also, Carey Airport Transportation runs regularly scheduled services between GCT (Park Avenue south of 42nd Street) and Kennedy and LaGuardia Airports. During the AM peak period, buses run about once an hour, while service during the PM peak period increases to three per hour.

TABLE 3.7-7

YEAR 1995
EXISTING TRAFFIC LEVELS OF SERVICE

SIGNALIZED INTERSECTIONS

INTERSECTION and APPROACH		Weekday AM Peak Hour				Weekday PM Peak Hour			
		Mvt.	V/C	Delay	LOS	Mvt.	V/C	Delay	LOS
#1: LEXINGTON AVENUE @ 42nd STREET									
42nd Street	EB	TR	0.64	18.6	C	TR	0.82	2.7	C
	WB	T	0.79	22.6	C	T	0.95	35.1	D
Lexington Avenue	SB	LTR	1.01	20.7	C	LTR	1.05	29.8	D
Overall Intersection		-	**0.91**	**20.5**	**C**	-	**1.01**	**28.9**	**D**
#2: LEXINGTON AVENUE @ 43rd STREET									
43rd Street	WB	L	1.00	36.4	D	L	0.83	28.7	D
Lexington Avenue	SB	T	1.00	25.2	D	T	0.58	5.4	B
Overall Intersection		-	**1.00**	**26.9**	**D**	-	**0.67**	**8.5**	**B**
#3: LEXINGTON AVENUE @ 45th STREET									
45th Street	WB	L	0.35	9.5	B	L	0.30	9.2	B
		LT	0.53	10.6	B	LT	0.45	10.0	B
Lexington Avenue	SB	TR	1.00	19.4	C	TR	0.99	18.1	C
Overall Intersection		-	**0.82**	**17.2**	**C**	-	**0.72**	**16.4**	**C**
#4: PARK AVENUE @ 42nd STREET									
42nd Street	EB	TR	0.97	28.8	D	TR	0.95	28.0	D
	WB	T	0.77	15.4	C	T	0.76	15.5	C
Park Avenue	NB	LR	0.15	8.6	B	LR	0.15	8.6	B
		R	0.16	8.7	B	R	0.17	8.7	B
Overall Intersection		-	**0.65**	**22.0**	**C**	-	**0.65**	**21.4**	**C**
#5: VANDERBILT AVENUE @ 42ND STREET									
42nd Street	EB	L	0.92	28.1	D	L	0.62	24.4	C
42nd Street	WB	TR	1.02	31.3	D	TR	1.09	44.9	E
Overall Intersection		-	**1.03**	**29.5**	**D**	-	**1.09**	**34.5**	**D**

NOTES:

1. "MVT" references specific intersection approach lanes. TR is a combined through-right turn lane, TL is a combined through-left turn lane, R or L refers to exclusive right- or left-turn lanes, and LTR is a mixed lane that allows for all movement types.
2. "V/C" or Volume-to-Capacity ratio for the MVT listed in the first column.
3. "Delay" is in seconds per vehicle for the MVT listed in the first column.
4. "LOS" or Level Of Service is based on 1985 HCM methodology, enhanced for NYC conditions.

Traffic Conditions near the 63rd Street Bellmouth along Second Avenue: Second Avenue is striped for six lanes in the east 60s, with the number of "moving" lanes varying between four where curb parking is needed on both sides to a full curb-to-curb six between 60th and 62nd Streets leading to the Queensboro Bridge. In this area, the right southbound lane is reserved for an exclusive bus lane for both the AM and PM peak hours, with some allowances for "intrusions" for right-turning vehicles at westbound side streets. However, the lane is frequently violated by private autos traveling through. Traffic control agents are typically in place during the weekday AM and PM peak periods to expedite vehicle flows.

Traffic operations along this section of Second Avenue vary day to day. On some days, traffic flows rather smoothly toward the bridge with only minor congestion. On other days, despite efforts to keep traffic moving in this area, gridlock can occur since the nearby street network is very sensitive to even minor or short-term disturbances or blockages, such as utility openings or van messenger parking. Between 63rd and 62nd Streets, the block of Second Avenue most affected by the construction access shaft appears to be free of curb parking during the daily peak commuter hours. The single exception occurs on the south end of the east side of Second Avenue where a Gristede's supermarket has its delivery basement vault doors fronting the avenue. Some local congestion occurs when large trucks park and unload goods to the store. Thus, the potential for *less* than six moving lanes exists in this section.

Regional Traffic Conditions: Long Island is served by a network of interstate highways, expressways, and parkways, as shown on Figure 3.7-5. These major travel corridors parallel the island's east-west orientation, and continue into New York City (Queens). With the exception of two car-ferry services, all vehicular traffic destined on or off Long Island must pass through New York City. Once near the East River, the natural barrier between Manhattan and Long Island, the most significant bottlenecks are the Triborough and Queensboro Bridges and the Queens Midtown Tunnel (QMT). All three crossings operate at extreme congestion and poor to failure levels of service during the AM and PM peak hours.

The three principal east-west highways serving Long Island are the Long Island Expressway (LIE), the Southern State Parkway, and the Northern State Parkway. Of these, the LIE is theisland's longest limited access facility extending about 70 miles from the QMT in Long Island City to Riverhead in Suffolk County. Traffic volumes recorded in the late 80s and early 90s indicate that between 3,500 and 5,200 vehicles per hour (vph) are carried along the LIE at various points in Queens and in Suffolk County. The Southern and Northern State Parkways also carry significant traffic levels, typically between 4,000 and 6,000 vph in the peak travel direction. All corridors are noted for their constant congestion and poor operating conditions at various times of the day in both directions. According to findings in the LIRR Network Strategy Study (1992), more than 50 percent of New York State's total vehicle hours of delay occur on Long Island roadways. Other major arterials feeding the East Midtown area from Long Island include Queens and Northern Boulevards, both of which carry some 1,600 to 2,500 vph in the peak direction and are characterized by low travel speeds and stop-and-go conditions.

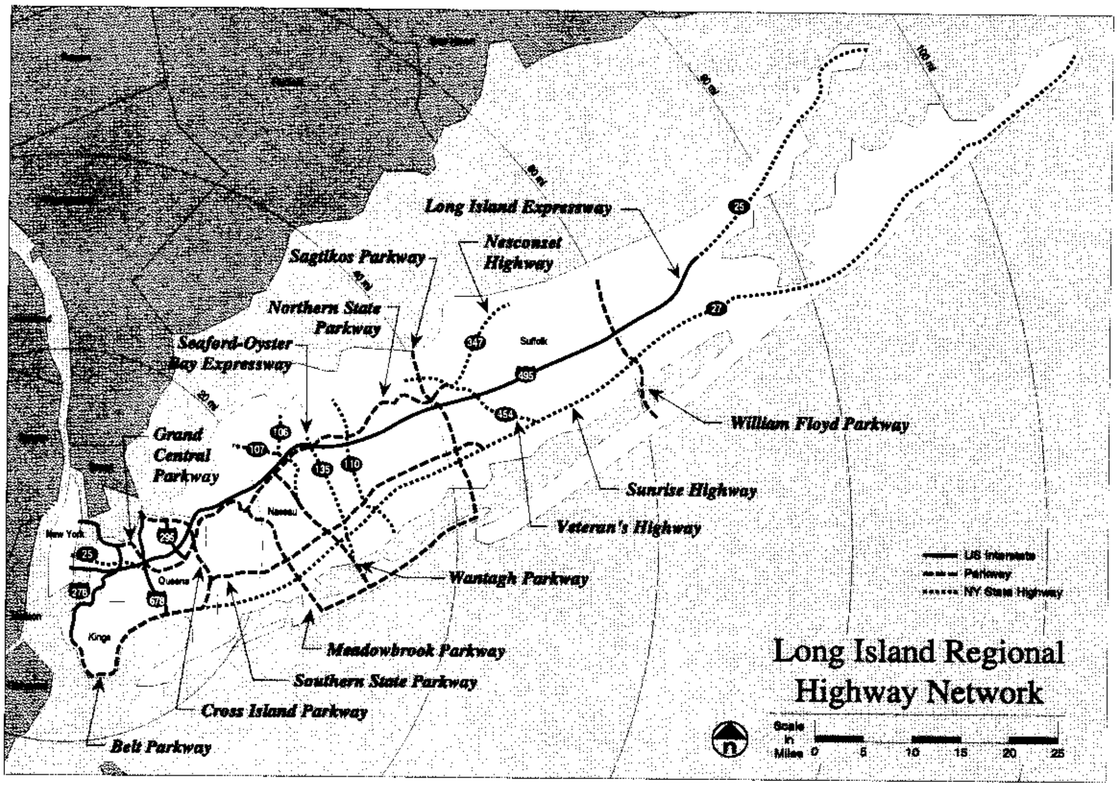


Figure 3.7-5

3.8 Air Quality

3.8.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

3.8.1.1 Pollutants and Ambient Air Quality Standards

The United States Environmental Protection Agency (EPA) has promulgated the National Ambient Air Quality Standards (NAAQS) to protect the public's health and welfare. The standards address maximum allowable short and long term concentrations of pollutants in the ambient atmosphere. The pollutants are indicated on Table 3.8-1 and are applicable to the project area. Primary standards are designed to protect the public from adverse health impacts, whereas the secondary standards are set to protect the environment from adverse effects, including impacts on vegetation and wildlife. The New York State Department of Environmental Conservation (NYSDEC) has adopted these standards and promulgated others as needed to administer its environmental protection programs. Six criteria pollutants addressed in the standards are monitored on a regular basis by NYSDEC. Other pollutants such as suspended particulates, metals, and specific organic compounds for which federal standards do not exist are also monitored by NYSDEC for study purposes, or to assess a specific impact of a particular source on regional air quality. Several private ambient sampling networks are operated by industrial sources to assist their operations and regulatory agencies in achieving and maintaining compliance with standards.

TABLE 3.8-1
U.S. EPA and New York State Ambient Air Quality Standards

Pollutant	Primary Standard	Secondary Standard
Nitrogen Dioxide (NO_2)		
Annual Arithmetic Mean	100 ug/m^3	100 ug/m^3
Carbon Monoxide (CO)		
1-hour Average	35 ppm	35 ppm
8-hour Average	9 ppm	9 ppm
Ozone (O_3)		
1-hour Average	0.12 ppm	0.12 ppm
Sulfur Dioxide (SO_2)		
3-hour Average	--	1300 ug/m^3 (0.5 ppm)
24-hour Average	365 ug/m^3 (0.14 ppm)	--
Annual Arithmetic Mean	80 ug/m^3 (0.03 ppm)	--
Particulates (PM_{10})		
24-hour Average	150 ug/m^3	150 ug/m^3
Annual Geometric Mean	50 ug/m^3	50 ug/m^3
Total Suspended Particulate (TSP)		
24-hour Average	250 ug/m^3	--
Annual Geometric Mean	75 ug/m^3	--
Lead (Pb)		
Quarterly Average	1.5 ug/m^3	1.5 ug/m^3

Notes:
- TSP standards are set by NYSDEC
- ppm = parts per million
- ug/m^3 = micrograms per cubic meter
- Short-term standards may be exceeded only once per year. Annual standards cannot be exceeded.
- Primary standards are designed to protect the public from adverse health impacts.
- Secondary standards are designed to protect the environment from adverse effects.

Source:
New York State Air Quality Report: Ambient Air Monitoring System - Annual 1994 (DAR-95-1).

The EPA has recently promulgated revisions to the NAAQS for ozone and particulate matter (PM). EPA also proposed regulations to address visibility impairment resulting from regional haze (RH).

The revised NAAQS for ozone and PM became effective September 18, 1997. EPA is accepting public comments on the RH rules through December 4, 1997. The RH rules are expected to be final in February 1998. The EPA plans an integrated implementation of the NAAQS and RH rules.

The revised NAAQS rules replaced the level, form, and averaging period of the primary ozone standard. The 1-hour, 0.12 ppm standard was replaced with an 8-hour, 0.08 ppm standard. An area will attain the new standard when the 3-year average of the annual fourth highest daily maximum 8-hour concentrations are below 0.08 ppm. The secondary ozone standard is identical to the primary standard.

$PM_{2.5}$, a new indicator for PM, includes only particulates with a diameter less than 2.5 microns and was added to PM_{10}. The EPA's rule establishes two new primary $PM_{2.5}$ standards to protect public health, supplementing the existing 24-hour and annual PM_{10} standards. An area can achieve attainment when the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations is less than or equal to 15 microgram per cubic meter (ug/m^3). The 24-hour standard is attained when the three-year average of the 98th percentile of concentrations at the community-oriented monitoring site with the highest measured value in an area is less than or equal to 65 ug/m^3 . In addition, the form of the existing 24-hour PM_{10} standard (150 ug/m^3) was revised to be based on the 3-year average of the 99th percentile of PM_{10} concentrations at each monitor within an area, and the existing annual PM_{10} standard (50 ug/m^3) was retained. The annual PM_{10} standard is attained when the 3-year average of the annual arithmetic mean PM_{10} concentrations at each monitor within an area is less than or equal to 50 ug/m^3. EPA also set the secondary PM standards designed to protect public welfare effects such as visibility, to be identical to the primary standards. These standards will be implemented in conjunction with the establishment of the regional haze program.

Table 3.8-2 contains the revised and the previous NAAQS for PM.

TABLE 3.8-2
Comparison of Revised and Previous NAAQS for Particulate Matter (PM)

	Revised NAAQS	Previous NAAQS
$PM_{2.5}$ (primary and secondary)		
Annual standard		
Concentration limit	15.0 ug/m^3	None
Averaging period and form	3-year average of annual arithmetic mean levels based on spatial averaging	None
24-hour standard		
Concentration limit	65 ug/m^3	None
Averaging period and form	3-year average of 98th percentile of 24-hour levels at each monitor	None
PM_{10} (primary and secondary)		
Annual standard		
Concentration limit	50 ug/m^3	50 ug/m^3
Averaging period and form	3-year average of annual arithmetic mean levels at each monitor	3-year average of annual arithmetic mean levels at each monitor
24-hour standard		
Concentration limit	150 ug/m^3	150 ug/m^3
Averaging period and form	3-year average of 99th percentile of 24-hour levels at each monitor	24-hour average level, one exceedance allowed per year

Source: 40 CFR § 750.6 and FR July 18, 1997, p. 38652-38762.

To implement the revisions to the NAAQS, EPA will need to alter the New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs. Then, New York State Department of Environmental Conservation (NYSDEC) will need to modify their State Implementation Plan (SIP).

A change in carbon monoxide (CO), a colorless and odorless gas resulting from incomplete fuel combustion, is a localized concern. Eighty percent (80%) of CO emissions in New York City result from motor vehicle operation. Highest localized CO concentrations usually occur at or near crowded intersections and along heavily traveled or congested streets, which are areas for microscale analysis. The remaining CO emissions result from stationary combustion sources such as boilers and incinerators. Carbon monoxide replaces oxygen in the human body's bloodstream, causing headaches, dizziness, respiratory irritation, and reduced physical and mental activity; at high concentrations, it can cause death.

Ozone is another colorless pollutant gas, formed from the chemical reaction of volatile organic compounds (VOC) and oxides of nitrogen (NO_x) in the presence of sunlight. Due to the relative slow reaction rate, ozone is found at distances from the point of generation of the precursor compounds. NO_x and VOC emissions are therefore examined on a regional basis. Net changes in VOC and NO_x emissions from alterations in vehicle miles traveled (VMT) in the metropolitan area will be addressed in terms of changes in tons of emissions.

VOC and NO_x also cause respiratory irritation, with the effects being more felt by children and older people. Ground-level ozone ("smog") can cause deterioration of painted surfaces and chemical attack of building structures, in addition to human health impacts.

Particulate emissions may result during construction activities as fugitive emissions (not emitted through a stationary stack), but can be minimized by use of mitigation measures such as wet dust suppression and good housekeeping procedures. Some particulate matter is emitted in internal combustion engine exhaust.

Sulfur dioxide emissions result primarily from the combustion of sulfur-bearing fuels such as coal or fuel oil and therefore would not be emitted by the Build Alternative. Indirectly, SO_2 emissions may occur at any non-nuclear electric utility station providing electricity for the project. Mobile sources, while burning fuels, do not emit any notable quantities of SO_2.

Lead emissions are historically associated with motor vehicles that use gasoline containing lead additives. Limited industrial sources, such as lead acid battery plants, emit lead. These sources are not of concern in the metropolitan area. Vehicles manufactured after 1980 in the United States use unleaded fuel, and therefore, the ambient concentrations of lead have declined significantly. Analysis of lead emissions is not required for this assessment.

In order to gather data to assess the exiting ambient pollutant concentrations, and to evaluate progress towards compliance for areas where the concentrations are exceeding standards, NYSDEC Division of Air Resources operates and maintains an Ambient Air Monitoring System throughout the state.

3.8.1.2 Conformity with the New York State Air Quality Implementation Plan

Section 176 of the Clean Air Act requires that all activities supported or funded by the federal government be in conformity with the relevant state implementation plan ("SIP"). For purposes of this requirement, "conformity" means:

- conforming to the purpose of eliminating or reducing the severity and number of national ambient air quality standard violations, and achieving expeditious attainment of those standards;

- not (i) causing or contributing to any new violation of any standard; (ii) increasing the frequency or severity of any existing violation; or (iii) delaying timely attainment of any standard.

Moreover, under § 176(c) of the Clean Air Act, a transportation project may be approved by a metropolitan planning organization only if it is demonstrated that projected emissions from that project, when considered together with emissions from conforming transportation plans and programs do not cause such plans and programs to exceed the emission reduction projections and schedules assigned to such plans and programs in the SIP.

These provisions have been implemented by EPA in regulations appearing at 40 CFR Part 93. See, 62 F. Reg. 43780 (August 15, 1997). Under those regulations, conformity determinations are specifically required for "the approval, funding, or implementation of FHWA/FTA projects". Therefore, the MPO and DOT must "demonstrate that the applicable criteria and procedures [for establishing conformity] as set forth in the regulations are satisfied", before those projects are funded or approved. See, 40 CFR 93.102.

The criteria for making conformity determinations differ, based upon the action under review, the relevant pollutants, and the status of the implementation plan in the area. However, conformity determinations must, in all cases, be based upon the latest planning assumptions and emissions model, and be rendered in accordance with the consultation requirements of the regulations. (See 40 CFR § 93.109 et seq.).

This study analyzes the potential air quality impacts of the Build Alternative, and provides the factual basis needed for the conformity determination required under the above described provisions.

3.8.2 Study Approach

The most significant air pollutant associated with transportation projects involving or impacting automobiles is carbon monoxide (CO). Carbon monoxide impacts on ambient air quality due to traffic volume changes in the Study Area are predicted. U.S. Environmental Protection Agency's MOBILE 5.0 emission factor program is used to determine CO emissions for the mix of vehicles in the study area. These emission factors are used in the CAL3QHC model to predict ambient air impacts due to the changes in traffic volume for project alternatives. Current ambient air quality in the PSA is included in the air pollutant dispersion modeling. Regional impacts in terms of net emission changes (tons per year) due to reductions in vehicle miles traveled for oxides of nitrogen, volatile organics compounds, and others are addressed quantitatively. Impacts associated with other alternatives are discussed. The 1990 Clean Air Act Amendments set requirements for transportation projects to demonstrate that a potential project will be consistent with a SIP. Conformity with the SIP is discussed.

Criteria to be used to evaluate the significance of the modeled ambient air quality impacts associated with the implementation of this project and any mitigation measures proposed include:

- Conformance with NYSDEC's SIP per requirements established by the 1990 Clean Air Act Amendments.

- Creation of a predicted violation of the NAAQS or exacerbation of an existing violation, including creation of a pollutant "hot spot," or area of localized exceedance that will require mitigation.

- Conformance with the City of New York's de minimis criteria for defining extent of environmental impact. While not legally bound by the city's criteria , they were consulted for additional information on the assessment of potential air quality impacts. The minimum change in CO that defines an environmental impact under these criteria are:
  - an increase of at least 0.5 ppm in the maximum eight-hour average CO concentration where the No Build concentration is equal to or above 8.0 ppm; or
  - an increase of more than half the difference between baseline concentrations and the eight-hour standards when No Build concentrations are below 8.0 ppm.

Construction impacts and potential mitigation measures are discussed in Chapter 5.

Air quality methodology investigation, modeling protocol and inputs, and conformity issues are based on current regulations and discussions with the following agencies:

- U.S. Environmental Protection Agency, Region II
- New York State Department of Environmental Conservation, Division of Air Resources - Region 2 and Central Offices
- New York Metropolitan Transportation Council
- New York State Department of Transportation, Environmental Analysis Bureau
- Federal Transit Administration
- New York City Department of Environmental Protection

3.8.3 Affected Environment

Metropolitan New York City ambient air quality is mostly impacted by internal combustion engine emissions from "mobile sources." Industrial "stationary sources" do not constitute a predominant source of pollution in the area. The canyon effect of tall buildings impedes the dispersion of these emissions, creating air quality conditions that exceed allowable federal standards for certain pollutants. Improved automotive emission standards and inspection/maintenance programs implemented in the last decade are contributing to improvements in the area's air quality, in addition to stationary source reductions due to implementation of the 1990 Clean Air Act Amendments.

Table 3.8-3 summarizes NYSDEC ambient air sampling data for the general project area, which lies within NYSDEC's Region 2. A variety of pollutants are monitored within the project area at locations noted on Figure 3.8-1. Usually a single pollutant, but occasionally, several pollutants, are monitored at a particular location. Data for Table 3.8-3 is taken from the *New York State Air Quality Report: Ambient Air Monitoring System - Annual 1994 (DAR-95-1),* the most recent data published.

Table 3.8-4 indicates the locations of the monitoring sites noted on Figure 3.8-1.

Ambient levels of nitrogen dioxide, sulfur dioxide and lead are all below the appropriate NAAQS. The project area is therefore classified by EPA as attainment for these pollutants. Any significant new future sources of these pollutants must be shown by computer modeling to not cause any violations of the standards. The ambient air quality data for the metropolitan area show concentrations which comply with the PM_{10} and total suspended particulate NAAQS. The area is, however, currently classified as a nonattainment area for particulates due to past exceedances of the standards. NYSDEC is working with the EPA to achieve redesignation of the metropolitan area as attaining the particulate NAAQS. Currently there is no monitoring data with respect $PM_{2.5}$ so the status has not been determined.

Although ambient concentrations of ozone monitored at the Greenpoint site as noted on Table 3.8-3 do not exceed the NAAQS, exceedances were recorded at other locations within NYSDEC Region 2 and consequently, Region 2 as a whole is classified as severe nonattainment for ozone. A nonattainment area is classified as marginal, moderate, serious, severe, or extreme, depending on the level of a particular pollutant found in the area as compared to EPA's standard.

The New York metropolitan area is classified as a moderate nonattainment area for carbon monoxide. The New York metropolitan area is defined as a Consolidated Statistical Metropolitan Area (CSMA) that includes northern New Jersey and Connecticut. Although NYSDEC data show that no exceedances in New York City and the project area have occurred in recent years, other exceedances in the CSMA have made redesignation infeasible.

TABLE 3.8-3
1994 Representative Project Area Ambient Air Quality Data

Pollutant	Monitoring Site Name	Data Average Period	Concentration	NAAQS
Inhalable Particulates (PM_{10})*	Midtown	Annual	48 ug/m^3	50 ug/m^3
	PS 59	Annual	33 ug/m^3	50 ug/m^3
	Greenpoint	Annual	27 ug/m^3	50 ug/m^3
Total Suspended Particulates	Midtown	24-Hour	198 ug/m^3	250 ug/m^3
	Greenpoint	24-Hour	166 ug/m^3	250 ug/m^3
		Annual	67 ug/m^3	75 ug/m^3
Carbon Monoxide**	Bloomingdale's	1-Hour	13.8 ppm	35 ppm
		8-Hour	8.7 ppm	9 ppm
		Annual	2.4 ppm	--
	PS 59	1-Hour	9.7 ppm	35 ppm
		8-Hour	5.9 ppm	9 ppm
		Annual	1.3 ppm	--
Ozone**	Greenpoint	1-Hour	0.021 ppm	0.12 ppm
Nitrogen Dioxide	PS 59	Annual	0.046 ppm	0.05 ppm
Sulfur Dioxide	PS 59	3-Hour	0.126 ppm	0.5 ppm
		24-Hour	0.068 ppm	0.14 ppm
		Annual	0.017 ppm	0.03 ppm
	Greenpoint	3-Hour	0.115 ppm	0.5 ppm
		24-Hour	0.054 ppm	0.14 ppm
		Annual	0.01 ppm	0.03 ppm
Lead***	Greenpoint	Quarterly	0.15 ug/m^3	1.5 ug/m^3

*3-year average values

**Metropolitan area designation as nonattainment based on other data from sampling sites not in the Study Area.

***Highest quarterly average

Source:

New York State Air Quality Report: Ambient Air Monitoring System-Annual 1994 (DAR-95-1).

TABLE 3.8-4
Ambient Air Monitoring Site Locations

MONITORING SITE NAME	ADDRESS
PS 59	228 E. 57th Street Manhattan
Midtown	Madison Avenue between 47th & 48th Streets Manhattan
Bloomingdale's	Department Store 1000 Third Avenue (btwn 59th & 60th Streets) Manhattan
Greenpoint	Greenpoint Pollution Control Sewage Treatment Plan 301 Greenpoint Avenue Brooklyn

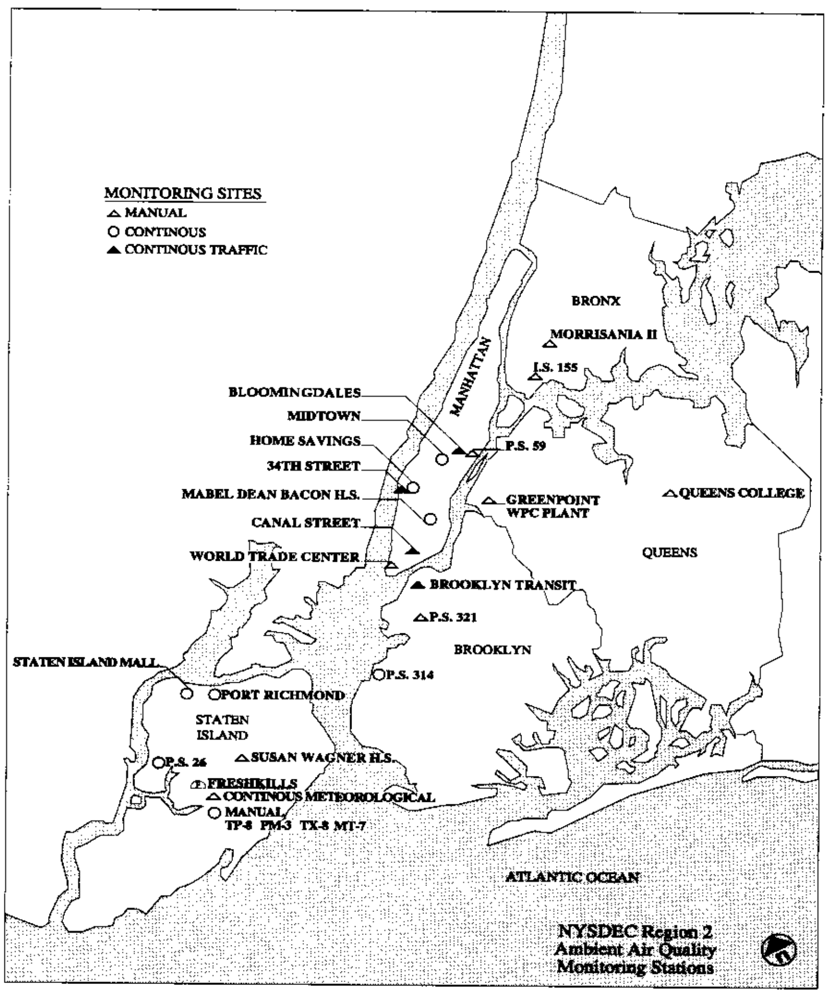


Figure 3.8-1

3.9 Existing Energy Usage

Gross energy consumption in the United States in 1993 has been estimated at an equivalent of 84 quadrillion BTUs. One quadrillion BTUs are approximately equal to the energy content of 45 million tons of coal or one trillion cubic feet of natural gas. Of that total energy consumption, the transportation sector uses approximately 27% (National Transportation Statistics 1995, U.S. Department of Transportation). Electrical energy within the transportation sector is predominantly used by railroads and railways and is a very small portion of the overall energy demand.

The electrical energy required is generated from coal, oil, natural gas, hydroelectric and nuclear fuel sources. This use of energy is a direct consumption of energy. Additionally, energy is consumed indirectly, but associated with transportation services, in the construction of transportation vehicles, rolling stock and facilities, and in the maintenance of roads, vehicles, trackage, and operational facilities.

Electric power for the western portion of LIRR's service territory, including the project area, is provided by the New York Power Authority (NYPA), through Consolidated Edison's distribution network. NYPA provided a total of one-quarter of New York State's electricity during 1994 by selling 38.5 billion kilowatt-hours (kwh). Hydroelectric plants generated 74% of this power, nuclear sources contributed 17%, and natural gas/oil provided the remaining 9%.[2]

LIRR's 1995 electric power consumption was 425,812,603 kwh. Power is provided by both the New York Power Authority and Long Island Lighting Company to satisfy the total LIRR system demand.

3.10 Existing Noise and Vibration

This section provides background information on environmental noise and vibration, discusses noise and vibration standards for environmental assessment, presents assessment criteria applicable to the proposed rail system, and establishes the ambient noise and vibration levels at sampling locations in the proposed project corridor for the Existing (1996) Year. The specific noise and vibration effects of the project alternatives are described in Chapter 5.

3.10.1 Environmental Noise and its Terminology

Noise is unwanted sound. Environmental noise is defined as the sound in a community emanating from man-made sources such as automobiles, trucks, buses, aircraft, and fixed industrial, commercial, transportation, and manufacturing facilities, or from natural sources such as animals, insects, and wind.[3] Since it is composed of sounds from moving as well as stationary sources, environmental noise varies from place to place and from time to time. Figure 3.10-1 presents some typical noise levels which a person may encounter in his or her daily activities,[4] and Figure 3.10-2 shows some representative variations of noise levels at different times of a day.[5]

The source of every sound is a vibrating body. In the case of a drum, the vibrating drumhead pushes against the air every time it moves outward. It shoves the air molecules against other air molecules, compressing the air. This compression moves away, as the drumhead moves inward, leaving a region where the air is slightly thinner than normal. On the next outward push, another compression is formed and started on its way outward. These pulses of compression and rarefaction are called "pressure waves." It is these waves or vibrations of air molecules that the human ear perceives as sound.

Noise levels are measured in units called decibels. Since the human ear does not respond equally to all decibel frequencies (or pitches), measured sound levels (in decibel units at various frequency bands) are often adjusted or weighted to correspond to the frequency response of human hearing and the human perception of loudness. The adjusted unit of measurement is called the A-weighted decibel or dBA. A sound level or noise meter is used for measuring noise levels in dBA units.

Community noise levels usually range between 45 and 85 dBA. The daytime level in a typical quiet living room would be 45 dBA, and 85 dBA would be the approximate level adjacent to heavy traffic. Since an instantaneous noise measurement (measured in dBA) describes noise levels at just one moment of time, and since very few noises in a community area are constant, other descriptors representing noise levels over extended periods of time are also used.

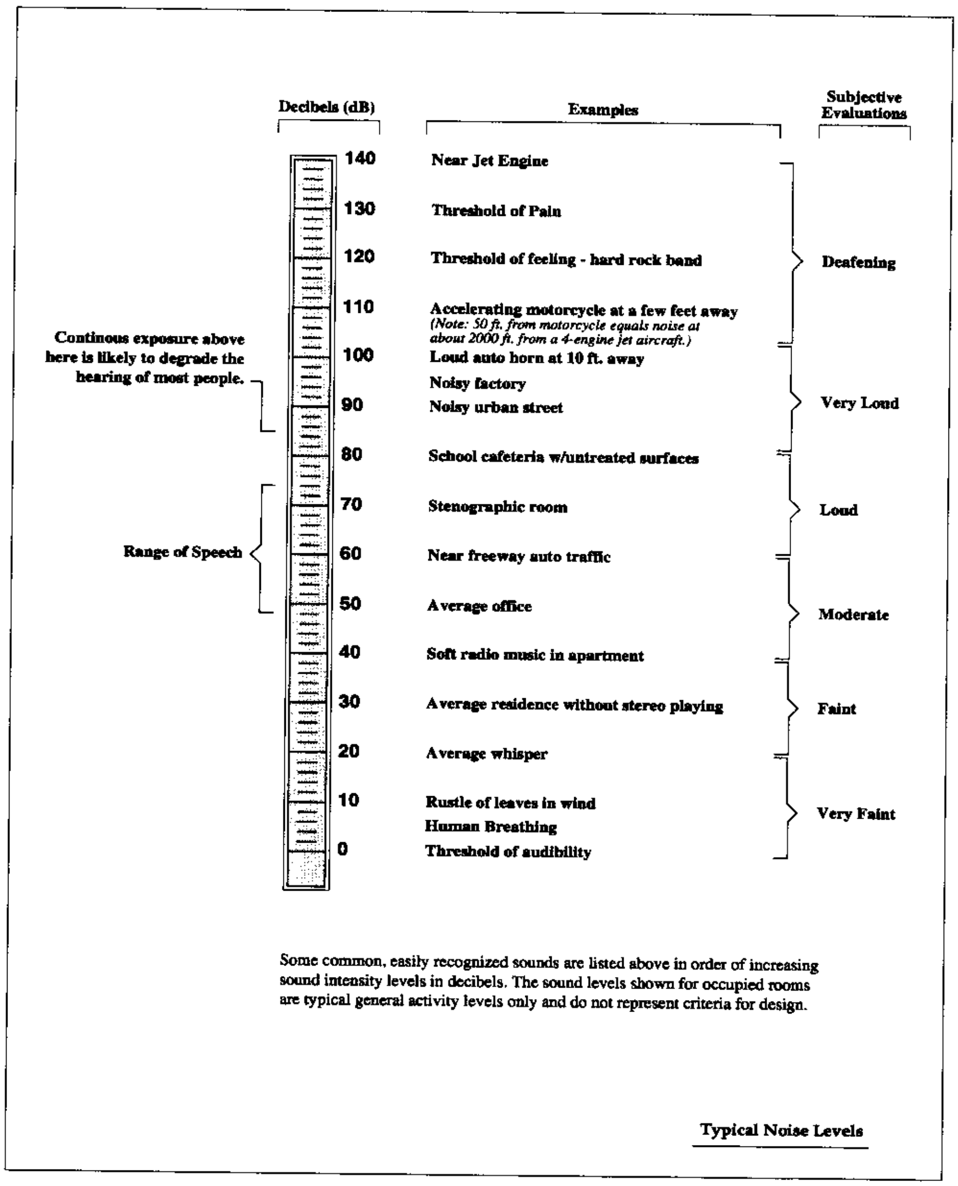
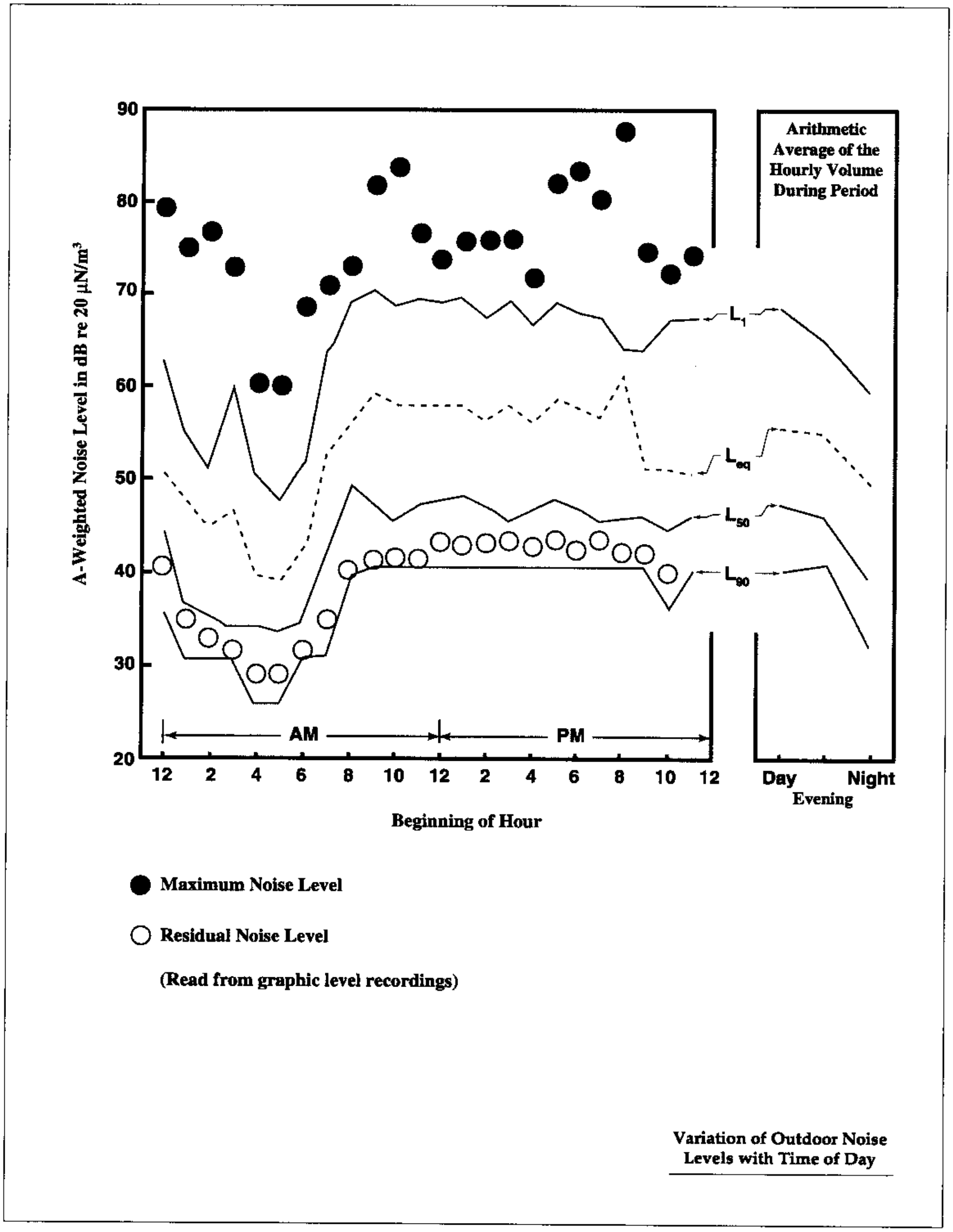


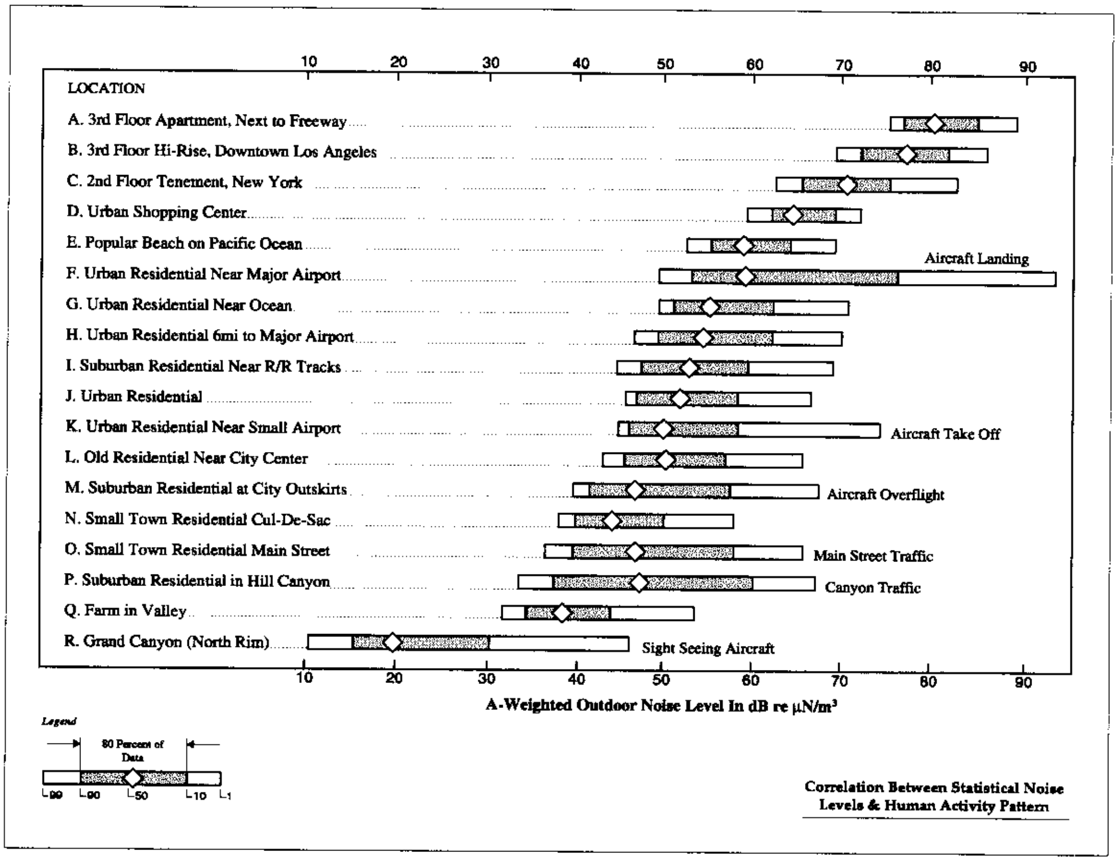
Figure 3.10-1



Source: EPA 1971. Community Noise. NTID300.3

Figure 3.10-2

Such descriptors include the noise levels exceeded over a specified percentage of the measurement period, and the equivalent continuous noise levels for a specified period. For example, L_{10} is the noise level exceeded during 10 percent of the measurement period and would be a measure of the average peak noise levels during that period. The equivalent continuous level (e.g. L_{eq} (1 hr)) is defined as the steady state noise level which, for a specified period of time, would contain the same amount of acoustic energy as the time varying sound over the same period. Figure 3.10-3, taken from a EPA study report, illustrates some typical percentile levels by land-use and human activity.[6]



Correlation Between Statistical Noise Levels & Human Activity Pattern

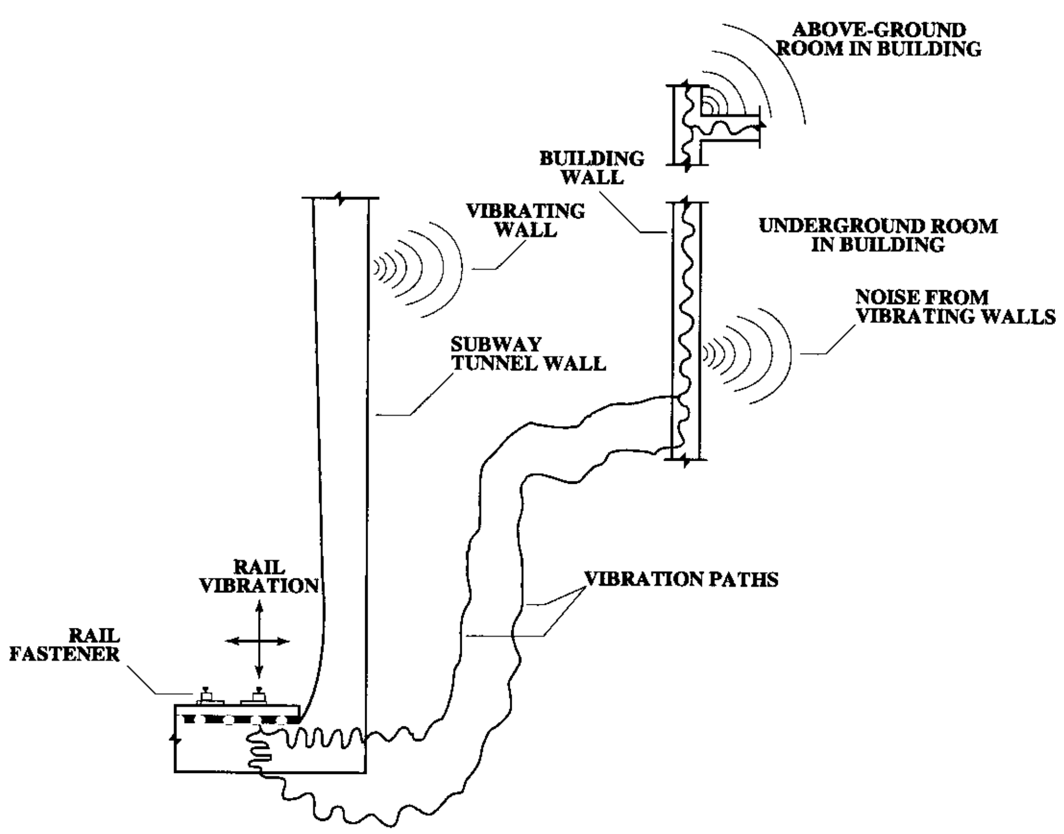
Source: EPA 1974

Figure 3.10-3

An additional noise rating, L_{dn}, is introduced here. The Day-Night Sound Level, L_{dn}, is defined as the equivalent A-weighted sound level during a 24-hour time period with a 10 decibel weighing applied to the equivalent sound level during the nighttime hours of 10 PM to 7 AM. The L_{dn} rating was developed to provide a 24-hour day descriptor while accounting for the added annoyance or interference effect of nighttime noise.

3.10.2 Ground-Borne Vibration and Noise and its Terminology

Ground-borne vibration from underground rail and rapid transit systems results primarily from the wheel-rail interaction and is influenced by such factors as wheel and rail roughness, truck dynamic characteristics, rail support stiffness, transit structure design, soil characteristics, and building structure (receptor) design. In general, ground-borne vibration originates from the wheel-rail interface, passes through the rail and rail fasteners, and into the tunnel structure which radiates vibrational energy into the soil in the form of Compression, Shear, and Rayleigh waves (Figure 3.10-4). The nearest face of the foundation or underground building wall responds to the incident ground-borne vibration and propagates the waves throughout the building. The resulting ground-borne vibration is a function of the magnitude of the energy source, distance from the source, response characteristics of the transmitting media (rock/soil), and response characteristics of the structural element (building).

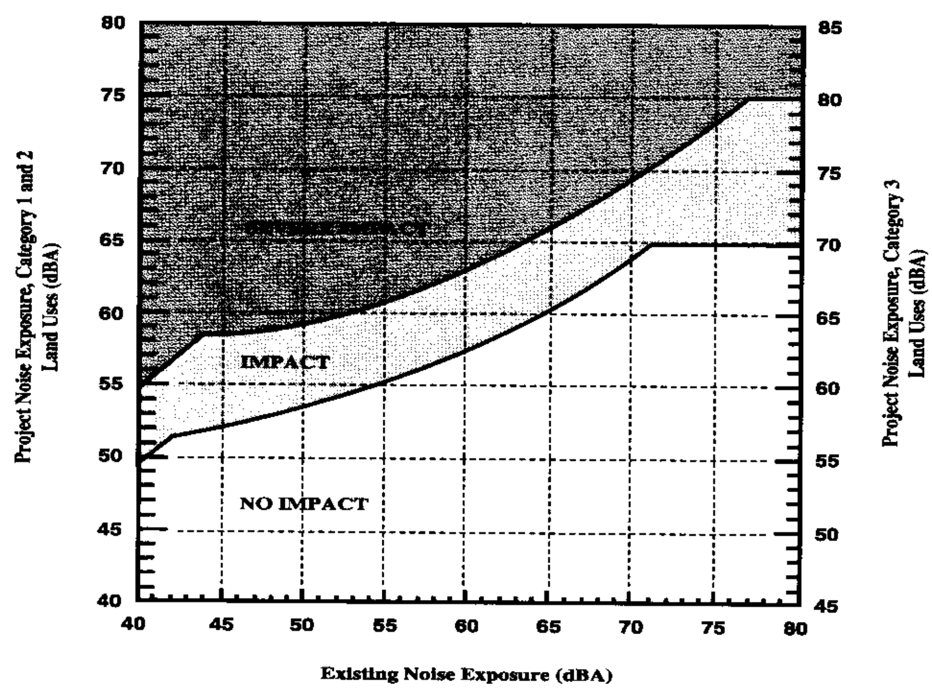


Schematic of Propagation of Subway Vibrations

Source: FTA Transit Noise and Vibration Impact Assessment, April 1995.

Figure 3.10-4

FTA has published a guidance manual for the assessment of transit noise and vibration impacts. This assessment manual contains guidelines for transit-related airborne noise, vibration and ground-borne noise[7]. The noise impact criteria for transit projects are based on existing noise levels and land use category. Noise metrics used to define impact are determined by land use category; namely, L_{eq} (1 Hour) for land uses involving daytime activities and L_{dn} for land uses where nighttime sensitivity is a factor. Figure 3.10-5 excerpted from the FTA guidance manual, illustrates the specific noise levels above which a rail project is considered to have an impact. As the existing noise exposure increases from 45 to 75 dBA in a Category 2 environment, the allowed transit noise exposure increases from 51 to 65 dBA, resulting in future ambient increases of 7 to 10 dBA. A cap of 65 dBA is set for the project noise exposure irrespective of the existing noise environment. The curves for Category 1 and 3 are 5 dBA higher, but uses the L_{dn} noise metric.



Note: Noise exposure is in terms of L_{eq} (h) for Category 1 and 3 land uses, L_{dn} for Category 2 land uses.

Noise Impact Criteria for Transit Projects

Source: FTA Transit Noise and Vibration Impact Assessment, April 1995.

Figure 3.10-5

3.10.3 Project Impact Assessment Criteria Used

The study corridor extends nearly four miles. This study area encompasses a variety of land uses and community area categories. The acoustic environment in the areas adjacent to the project corridor, although culturally and environmentally diverse, can be summarized as that of a high-density urban environment dominated by surface and aerial traffic.

3.10.3.1 Noise

The noise levels in the project corridor were assessed using the CEQR Manual. While not legally bound by the guidelines set forth in the CEQR Manual, these guidelines were consulted for additional information on the assessment of potential noise impacts. Therefore, as a means of evaluating the incremental changes in noise levels associated with the project, the noise analysis will reference the standards and criteria presented in the CEQR Manual. CEPO-CEQR Exterior Noise Standards and Local Law No. 64 as shown in Tables 3.10-1 and 3.10-2. Wayside noise and ground-borne noise will also be assessed using the FTA criteria and levels shown in Figure 3.10-5, the latest guidelines directly applicable to the project.

TABLE 3.10-1

CEPO - CEQR Exterior Noise Standards and Attenuation Values

Noise Category	Marginally Acceptable	Marginally Unacceptable		Clearly Unacceptable		
Vehicular[a,b]	$65<L_{10}\leq70$	$70<L_{10}\leq75$	$75<L_{10}\leq80$	$80<L_{10}\leq85$	$85<L_{10}\leq90$	$90<L_{10}\leq95$
Train[a,b]	$60<L_{dn}\leq65$	$65<L_{dn}\leq70$	$70<L_{dn}\leq75$	$75<L_{dn}\leq80$	$80<L_{dn}\leq85$	$85<L_{dn}\leq90$
Aircraft[a,b]	$60<L^{y}_{dn}\leq65$	$65<L^{y}_{dn}\leq70$	$70<L^{y}_{dn}\leq75$	$<L^{y}_{dn}\leq75$	N/A	N/A
Required Attenuation[c]	25 dB(A)	(I) 30 dB(A)	(II) 35 dB(A)	(I) 40 dB(A)	(II) 45 dB(A)	(III) 50 dB(A)

Notes:

[a]Different descriptors are used for each noise source: L_{10} for vehicular traffic; L_{dn} for train noise; and L^{y}_{dn} (L_{dn} Contour) for aircraft noise.*†

[b]The various noise sources at a receptor location are measured and reported separately in accordance with generally accepted procedures for assessing an overall noise level. Cases where there is not a clearly dominant noise source require a judicious decision based on adequate field experience and exposure at each noise receptor site.

[c]The above composite window-wall attenuation values are residential dwellings. Commercial office spaces and meeting rooms would be 5 dB(A) less in each category. All the above categories require a closed window situation and hence an alternative means of ventilation.

*L_{dn} requires a 24-hour measurement or supportive analysis if a shorter period is employed.

†L^{y}_{dn} = "L_{dn} Contour" is an annual average of L_{dn} values (y indicates "yearly average").

TABLE 3.10-2
City of New York Ambient Noise Quality Criteria

Ambient Noise Standards Quality Zone	L_{eq} (1 hr) Standards (7 AM - 10 PM)	L_{eq} (1 hr) Standards (10 PM - 7 AM)
Low Density Residential Land Use	60	50
High Density Residential Land Use	65	55
Commercial and Manufacturing Land Use	70	70

3.10.3.2 Vibration

The project is expressly concerned with the long-term impact to the ambient noise and vibration environment resulting from rail, as well as the construction related impacts during both the boring/blasting and cut and cover operations and how they will impact the existing vibration environment.

For the vibration impact assessment, the criteria set forth in FTA's *Transit Noise and Vibration Impact Assessment* shown in Table 3.10-3 and accompanying guidelines were used. More specifically, the applicable FTA impact criteria for a heavily trafficked corridor states that if the project will not significantly increase the number of vibration events, there will be no additional impact unless the project vibration (estimated using FTA procedures), will be higher than the existing vibration. Approximately doubling the number of vibration events is required for a significant increase.

Quantification of the affected environment serves to establish a baseline condition against which impacts of future conditions were assessed. Measurements at representative locations within the project corridor were taken to establish the baseline conditions.

TABLE 3.10-3
FTA Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations	65 Vdb[3]	65 VdB[3]	- -[4]	- -[4]
Category 2: Residents and buildings where people normally sleep	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB	40 dBA	48 dBA

Notes:
1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define acceptable vibration levels.
4. Vibration sensitive equipment is not sensitive to ground-borne noise.

3.10.4 Affected Noise Environment

Both the long-term environmental noise and vibration impacts of the proposed project resulting from the operation of the rail service and the short-term impact from the construction of the project were addressed.

3.10.4.1 Existing Noise Environment

The ambient noise environment which the proposed project may potentially impact was determined through an ambient noise measurement program. Ambient noise levels were monitored at ten locations. Seven locations were in the Manhattan Study Area (MSA) (Figure 3.10-6) and three locations in the Queens Study Areas (QSA) (Figure 3.10-7). Monitoring location were chosen on the bases of noise and vibration sensitive land uses such as residences, churches and schools within the project corridor.

Six noise monitoring locations in the MSA and two locations in the QSA were monitored for the AM Peak, Mid-day and PM Peak periods on July 11, 1995. One location in the MSA and one in the QSA were monitored continuously for a 24-hour period on July 18 and 19, 1995.

A brief description of the eight peak period and two 24-hour monitoring locations within the project corridor is provided in Table 3.10-4, and described in detail below.

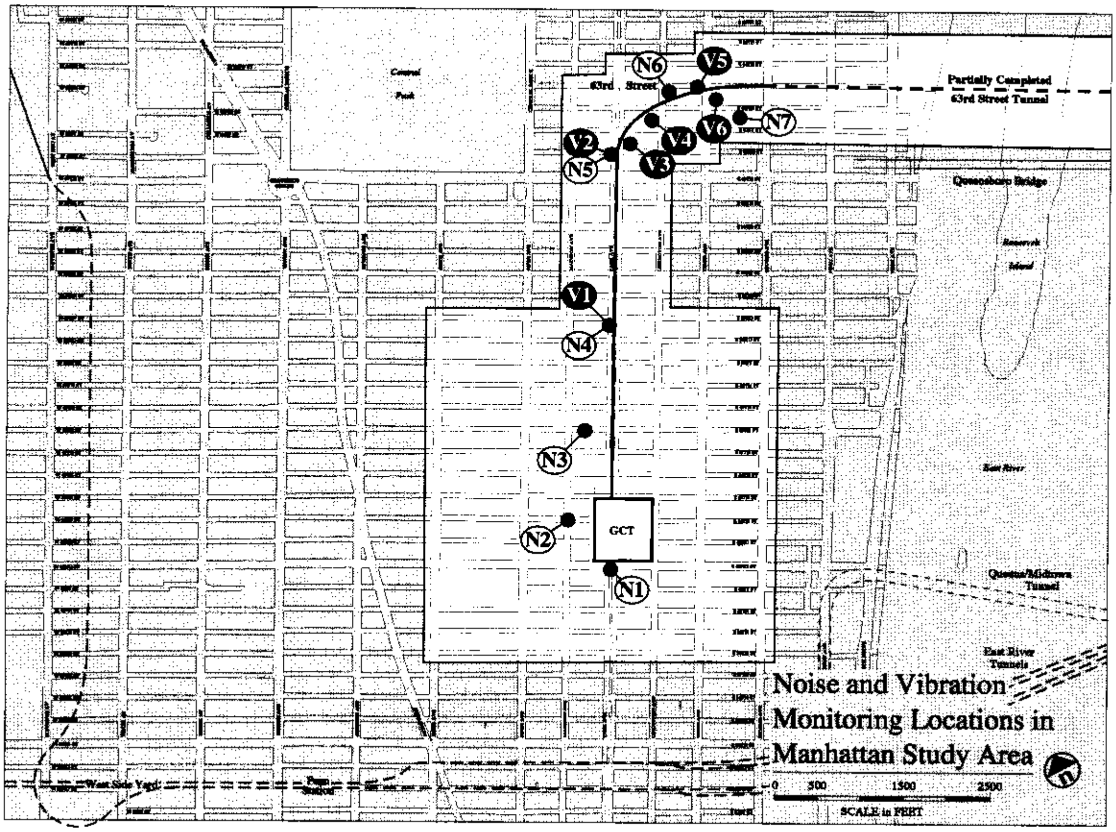


Figure 3.10-6

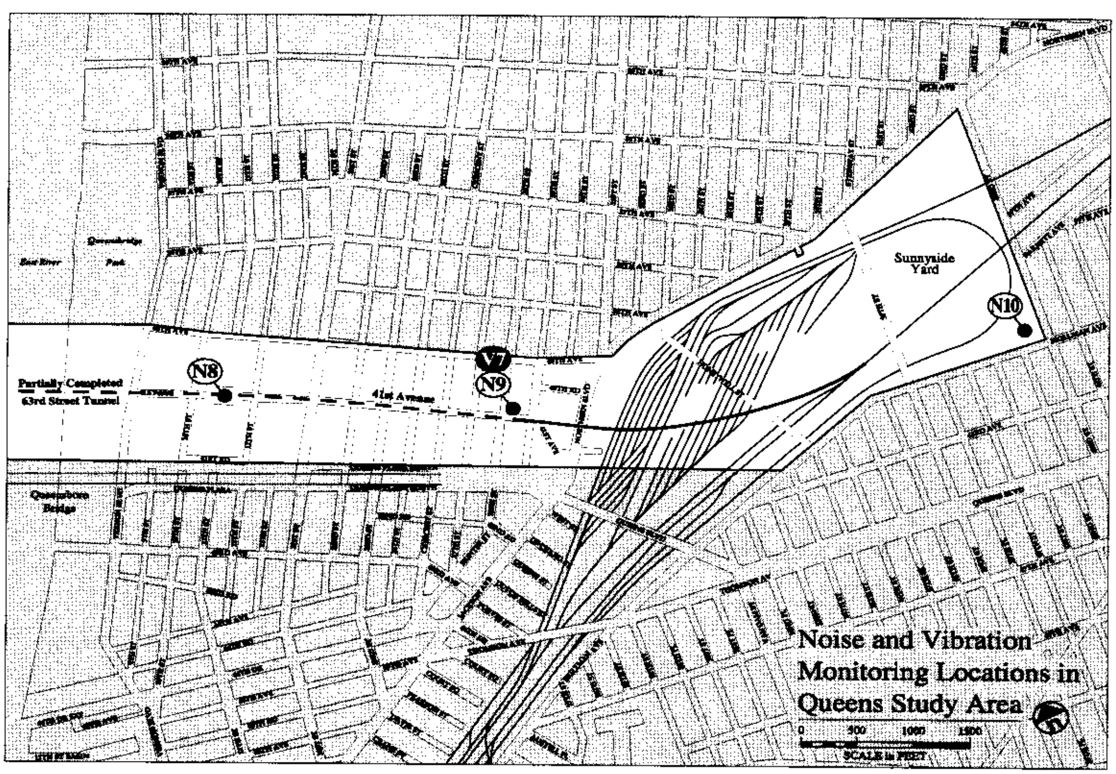


Figure 3.10-7

TABLE 3.10-4
Location and Land Use of Noise Monitoring

Monitor Site	Monitor Location	Land Use
MSA		
N1	42nd Street and Park Avenue	Commercial
N2	44th Street and Madison Avenue	Commercial
N3	48th Street between Park and Madison Avenues	Commercial
N4	53rd Street and Park Avenue	Commercial
N5	60th Street and Park Avenue	Residential
N6	63rd and Lexington	Residential
N7	62nd between 2nd and 3rd Avenues	Residential
QSA		
N8	Queensboro Housing Complex	Residential
N9	28th Street and 40th Avenue	Institutional/Industrial
N10	George F. Tornsey Park	Playground

Continuous measurements at the rate of 16 samples per second for the db-308 Metrologgers were conducted at Location N6 and Location N9. At all other locations, a fifteen minute time interval sample was taken at three different times during a one day period. At each of these locations, samples were taken during the AM Peak (6:30 - 9:00), the Mid-day period (11:30 - 2:00), and the PM Peak (3:30 - 7:00).

The ambient environment in the New York City metropolitan area is quite noisy as evident to most New Yorkers and reaffirmed by this study. Vehicular traffic is the principal noise source throughout the project corridor, which includes transient or discreet events such as ambulance and police sirens, car horns and construction noise. Table 3.10-5 summarizes the peak hours and Mid-day noise levels sampled, and classifies the noise environment per CEPO-CEQR standard. Detailed discussions of the results are included in the Noise and Vibration Technical Appendix.

TABLE 3.10-5
Noise Levels by Location and Period (dBA)

Location	Period	L_{eq} (1-Hour)	L_{max}	L_{dn}	L10	CEPO-CEQR Classification
N1	AM - Peak	76	89	**	79	Marginally Unacceptable
	Mid-day	77	90	**	79	Marginally Unacceptable
	PM - Peak	78	94	**	80	Marginally Unacceptable
N2	AM - Peak	77	92	**	80	Marginally Unacceptable
	Mid-day	75	83	**	76	Marginally Unacceptable
	PM - Peak	75	94	**	77	Marginally Unacceptable
N3	AM - Peak	78	95	**	78	Marginally Unacceptable
	Mid-day	71	77	**	73	Marginally Unacceptable
	PM - Peak	74	89	**	76	Marginally Unacceptable
N4	AM - Peak	75	89	**	77	Marginally Unacceptable
	Mid-day	72	88	**	73	Marginally Unacceptable
	PM - Peak	71	89	**	72	Marginally Unacceptable
N5	AM - Peak	76	92	**	78	Marginally Unacceptable
	Mid-day	72	84	**	74	Marginally Unacceptable
	PM - Peak	73	86	**	77	Marginally Unacceptable
N6*	24 - Hour	74	106	77	73	Marginally Unacceptable
	AM - Peak	74	96	**	75	Marginally Unacceptable
	Mid-day	73	88	**	75	Marginally Unacceptable
	PM - Peak	76	86	**	74	Marginally Unacceptable
N7	AM - Peak	69	82	**	72	Marginally Unacceptable
	Mid-day	69	86	**	72	Marginally Unacceptable
	PM - Peak	69	82	**	71	Marginally Unacceptable
N8	AM - Peak	72	89	**	71	Marginally Unacceptable
	Mid-day	70	93	**	71	Marginally Unacceptable
	PM - Peak	67	85	**	70	Marginally Unacceptable
N9*	24 - Hour	62	94	67	64	Marginally Acceptable
	AM - Peak	64	84	**	68	Marginally Acceptable
	Mid-day	65	88	**	65	Marginally Acceptable
	PM - Peak	65	86	**	67	Marginally Acceptable
N10	AM - Peak	64	87	**	65	Marginally Acceptable
	Mid-day	61	74	**	65	Marginally Acceptable
	PM - Peak	74	101	**	71	Marginally Acceptable

NOTE:
***Data here is given with respect to a 24-hour period.**
****L_{dn} is only valid for a 24-hour period.**

Based on peak hourly L_{eq} values, the entire PSA would be classified as having a noise quality zone equivalent to that of a Commercial and Manufacturing land use according to local Law No. 64.

3.10.4.2 Existing Vibration Environment

The major sources of vibration in the study corridor are construction, vehicular traffic, and underground subway and rail operations. Vibration levels in New York City, and Manhattan in particular, are much higher than elsewhere in the country, and number of vibration events too numerous to count. Aside from vibrations generated by the seemingly endless repair and construction activities, high levels of traffic- and rail-induced vibrations within the project corridor are attributable to a combination of heavy traffic, flexible pavement and subgrade system, and poor roadway surface conditions (low Present Serviceability Ratings).

Primary sources of vibration include surface vehicles along Second, Third, Lexington and Park Avenues, and 42nd, 57th, and 60th Streets (streets with two way traffic), and sections of road in need of repair or re-surfacing. High vibration levels are often generated when heavy trucks or buses hit pot holes, protruding manhole covers, or temporary steel construction plates.

Major subway lines in the study area include the IND 63rd Street line (B and Q) that runs along 63rd Street to the 63rd Street Tunnel, the Queens Boulevard line (E and F) running below 53rd Street, the IRT (4, 5 and 6) line that runs along Lexington Avenue north of 43rd Street and under Park Avenue South below 42nd Street. Additionally, the BMT (N and R), IRT Flushing line (7), and the S Shuttle line operate underneath 42nd Street. Commuter rails include the Metro-North Railroad's (MNR's) Hudson, Harlem, and New Haven Lines which run underneath Park Avenue.

Other vibration sources include heavy electro-mechanical equipment within buildings. Prime examples of such equipment include large ventilation installations, particularly in the commercial and office buildings around GCT. The subgrade system beneath the surface in Manhattan is a complex labyrinth of tunnels, conduits, building sub-structures, and bedrock at varying depths, all of which impedes or facilitates vibration transmission. Consequently, only a general vibration assessment is possible in the project corridor. In general, vibrations are readily propagated and experienced on the streets.

Existing environmental vibrations were measured at seven locations in the project study area (See Figures 3.10-6 and 3.10-7). These measurement sites were located at residential and institutional (church, school, hospital, hotel, or the like) structures adjacent to the proposed alignment or existing transit/rail alignments. Table 3.10-6 briefly describes the locations and their related land uses. Vibration measurements were taken in the period from August 4 to 8, 1995.

TABLE 3.10-6
Location and Land Use of Vibration Monitored Sites

Monitor Site	Monitor Location	Land Use
	M S A	
V1	SW Corner of 53rd Street and Park Avenue	Commercial
V2	SW Corner of 60th Street and Park Avenue	Commercial / Residential
V3	NE Corner of 60th Street and Park Avenue	Commercial / Residential
V4	NW Corner of 61st Street and Lexington Avenue	Commercial / Residential
V5	63rd Street West of Third Avenue	Commercial / Residential
V6	NE Corner of 62nd Street and 3rd Avenue	Commercial / Residential
	Q S A	
V7	NW Corner of 29th Street and 41st Avenue	Industrial / Institutional

At each location, measurements were made at the sidewalk adjacent to the building structure. Vertical vibration velocities were measured in both average RMS and instantaneous RMS levels.

The results of the vibration measurements are shown in Table 3.10-7. Detailed discussion of the results are included in the Noise and Vibration Technical Appendix. As expected, vibration levels in New York City are much higher than typically encountered vibration levels. The vibration levels at street level adjacent to buildings range from 88 to 101 VdB, or 0.033 to 0.155 ips PPV. At these levels, people can be expected to be annoyed, and indeed there is a history of complaints related to vibrations in residences along the NYCT 63rd Street Line. Typical vibration levels in the primary study corridor easily reach 94 VdB.

TABLE 3.10-7
Vibration Monitoring Results Peak Velocity Levels

Location	Land Use Category	Velocity rms (ips)	VdB re 10-6 rms ips	FTA Criteria	Exceed
V-1	3	0.11	101	75	Yes
V-2	3	0.06	95	75	Yes
V-3	3	0.07	97	75	Yes
V-4	2	0.07	97	72	Yes
V-5	2	0.07	97	72	Yes
V-6	2	0.02	88	72	Yes
V-7	3	0.05	94	75	Yes

As can be seen from Table 3.10-7, the range of ambient vibration levels measured was 88 VdB to 101 VdB, greatly exceeding the FTA's vibration impact criteria for frequent events, 72 VdB and 75 VdB for Categories 2 and 3 respectively, at all locations. The number of vibration events far exceeds the 70 events per day as specified as "frequent" by the FTA criteria.

3.10.4.3 Existing Ground-Borne Noise Environment

The estimated ground-borne noise levels varied greatly, similar to the measured vibration levels, from 44 dBA to 71 dBA throughout the study area. The range in the MSA varied from 43 dBA to 68 dBA. For residential structures in the QSA, the range varied from 46 dBA to 54 dBA. The Long Island City High School could expect ground-borne noise levels of 43 dBA to 46 dBA.

Ground-borne noise levels ranged from 43 dBA to 71 dBA. In general, estimated ground-borne noise levels greatly exceeded FTA ground-borne noise impact levels for frequent events of 35 dBA and 40 dBA for Categories 2 and 3 land uses respectively.

3.11 Ecosystems

3.11.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

The Federal Endangered Species Act of 1973 and the New York State Environmental Conservation Law (parts 11-0535 and 11-0536) provide for the conservation of endangered and threatened species of fish, wildlife, plants, and associated critical habitats. Therefore, data must be gathered to determine if any of these species or habitats occur within the Study Area.

3.11.2 Study Approach

The ecological resources studied include habitats and vegetation, wildlife, aquatic biota, and threatened and endangered species. Data was gathered from several existing sources (records, databases, maps, major projects in and near the project area, agencies, etc.), and from site visits by environmental specialists to verify and supplement existing information. To determine what ecological resources occur in the project area the following methods were used to obtain existing data:

- An initial review of aerial photographs and topographic maps was conducted to determine what land uses, other than manufacturing or industrial, exist in the project area. Descriptions of habitat types that occur within the project corridor were determined based on this review.

- Habitat types were field verified and descriptions of any existing habitat areas were revised as necessary. The size, location, vegetation, functional values, and expected and observed wildlife were described for each habitat type.

- Correspondence with state and federal agencies was prepared to determine if any sensitive, threatened or endangered species might exist in the study area. Agencies included:

    - National Oceanic and Atmospheric Administration, National Marine Fisheries Service
    - U.S. Department of the Interior, Fish and Wildlife Service
    - New York State Department of Environmental Conservation (NYSDEC), Natural Heritage Program

- A field survey was then conducted to determine if species, identified by the agencies, as potentially occurring in the project area, could be located.

- Previous survey results obtained by Lawler, Matusky and Skelly Engineers, and Hazen and Sawyer on fish, macroinvertebrates, and phytoplankton were reviewed to determine aquatic biota in the East River.

3.11.3 Affected Environment

The project area is predominantly urban/industrial in nature, lying within a developed area. There are two water bodies in the project area, the East River and the Newtown Creek. A small grassy area is found within the Queensbridge Park on the east side of the East River.

3.11.3.1 Habitats and Vegetation

The area does not provide enough habitat to allow for extensive nesting and cover areas, or for food sources to support many terrestrial species. Limited habitat areas occur in tree-lined streets and landscaped areas, and within Queensbridge Park.

3.11.3.2 Wildlife

Wildlife consist of species that have adapted to urbanization and are characteristic of a highly developed area. These include the following:

Common Name	Scientific Name
Domestic cat	*Felis domestica*
Eastern gray squirrel	*Sciurus carolinensis*
Norway rat	*Rattus norwegicus*
Domestic dog	*Canis familiarise*
Rock Dove/Pigeon	*Columbia livia*
American Crow	*Corvus brachyrhynchos*
House Wren	*Troglodytes aedon*
Northern Mockingbird	*Mimus polyglottenos*
European Starling	*Sturnus vulgaris*
Song Sparrow	*Melospiza melodia*
Common Grackle	*Quiscalus quiscula*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*

3.11.3.3 Aquatic Biota

Information on aquatic biota was collected from surveys conducted for fish species, macroinvertebrates, and phytoplankton. All surveys were conducted in the East River, in the vicinity of Newtown Creek.

Fish surveys were conducted by Lawler, Matusky and Skelly Engineers in 1986 and 1989. The dominant (95%) fish species observed are noted below. An additional 40 species made up the remaining 5% of species identified.

<u>Species</u>	<u>No. Collected</u>
Winter Flounder (*Pseudopleuronectes americanus*)	6,105
Striped Bass (*Morone Saxatilis*)	1,526
Atlantic Tomcod (*Microgadus tomcod*)	1,236
Grubby (*Myoxocephalus aenaeus*)	635
Bay Anchovy (*Anchoa mitchilli*)	174
White Perch (*Morone americana*)	124
American Shad (*Alosa sapidissima*)	109
Northern Pipefish (*Syngnathus fuscus*)	101

These fish are typical of species found in brackish rivers throughout the East Coast.

Macroinverbrate studies were conducted by Hazen and Sawyer between May and October of 1980. Additional studies were done by Lawler, Matusky and Skelly Engineers between March 1982 and April 1984, and again between March 1985 and May 1986. These studies surveyed for both benthic and epibenthic organisms. Benthic organisms inhabit the substratum of water bodies, while epibenthic organisms are found just above the sea floor. Polychaetes and ologachaetes made up the highest percentage of benthic organisms identified during each survey. Gastropods, bivalves, isopods, and amphipods were identified in lesser numbers. Epibenthic populations consisted primarily of sand shrimp, rock crabs, mud crabs, blue crabs, and mysid shrimp. These macroinvertebrates are all indicative of poor water quality. The majority of these species are capable of surviving in organic contamination and anaerobic conditions. In addition, little variety in species type, as evidenced on the benthic level, is an indicator of a stressed community.

Surveys on phytoplankton were conducted by Hazen and Sawyer between May and October in 1980, and again from March 1985 to February 1986. A total of 62 phytoplankton species were identified. Included were 48 species of diatoms, eight species of protozoans, four species of green algae, and one species of blue-green algae. This distribution is typical of a healthy estuarine phytoplankton population.

3.11.3.4 Threatened and Endangered Species

Initial correspondence with the National Marine Fisheries Service on March 20, 1995 indicated that there are no threatened or endangered marine species in the project area. A copy of this letter is in the Ecological Technical Appendix. However, during a telephone conversation with Diane Rusanowsky of the National Marine Fisheries Service on September 24, 1996, it was discovered that one threatened and three endangered marine turtles had recently been added to the list of protected marine species that may occur in the project area. These turtle species include the threatened loggerhead (*Caretta caretta*), and the endangered green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and Kemp's ridley (*Lepidochelys kempii*).

Correspondence with the NYSDEC Natural Heritage Program on March 6, 1995 identified one federal and state endangered species, the Peregrine Falcon (*Falco peregrinus*) that was last seen in the vicinity of the project area in 1991. Peregrine Falcons have been known to roost on tall buildings within the City. The U.S. Fish and Wildlife Service also stated on March 27, 1995 that the Peregrine Falcon is known to nest in the project vicinity. The NYSDEC identified one New York State rare species of plant, the swamp lousewort (*Pedicularis lanceolata*). Four other plant species, classified as unprotected, have been historically sited within the project area, some as far back as 1866. A classification of unprotected does not give the species federal protection, but according to NYSDEC regulations, it may be given special considerations prior to disturbance. These unprotected species include the flax-leaf whitetop (*Aster solidagineus*), cyperus (*Cyperus flavescens var flavescens*), velvet panic grass (*Panicum scoparium*), and dwarf plantain (*Plantago pusilla*). It is not likely that any of these plants occur in the project area because the habitat for these plants has been removed due to urbanization. None of these species were identified during a field survey of the project area. Correspondence with the NYSDEC and the U.S. Fish and Wildlife Service is found in the Ecological Technical Appendix.

3.12 Water Resources

3.12.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

The Water Pollution Control Act of 1972, the Clean Water Act of 1977, and U.S. DOT Order 5650.2 regulate impacts on water quality, either through discharges or through fill operations.

Executive Order 11990, Protection of Wetlands, requires federal agencies to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. The New York Freshwater Wetlands Act, Article 24, Environmental Conservation Law (6 NYCRR Parts 662, 663, 664 and 665) imposes similar restrictions within the State of New York.

Executive Order 11988, Floodplain Management, directs federal agencies to avoid conducting, allowing or supporting actions in a floodplain. New York State regulations, Article 36, 6 NYCRR Part 500 (Floodplain Management) also discourage this practice.

3.12.2 Study Approach

The East River and Newtown Creek are both in the project area. Baseline water quality data acquired for these surface waters, as well as for groundwater, includes the following:

- An analysis of the surface and groundwater quality was based on reviewing existing data from the New York Department of Environmental Conservation, Division of Water, and the New York City Department of Environmental Protection. Available information from these agencies include water temperature, pH levels, dissolved oxygen and fecal coliform levels, level of suspended solids, total phosphates and nitrates, and macroinvertebrate community data.

- Review of USGS topographic maps.

- In addition, surface water bodies were visually inspected during a field reconnaissance of the project area.

Baseline wetland data was acquired to determine if wetlands exist in the study area corridor, included the following:

- Review of National Wetland Inventory (NWI) maps prepared by the U.S. Fish and Wildlife Service.

- Review of aerial photography and topographic maps.

- A preliminary field survey of the project area corridor, focusing primarily on areas identified on the NWI maps and aerial photographs as potential wetland areas.

Baseline floodplain documents included a review of Federal Emergency Management Agency (FEMA) flood insurance studies and floodplain maps.

The analysis was performed to identify waterway and wetland crossings, and floodplain encroachments in the project area. Additional existing studies were reviewed to determine the quality of existing surface and groundwaters.

3.12.3 Affected Environment

The majority of the project area is within a developed area. There are two surface water bodies in the vicinity of the project area, the East River and the Newtown Creek.

The completed 63rd Street Tunnel lies beneath the East River just north of the Queensboro Bridge. The East River separates Manhattan from Queens. It extends from the Upper New York Bay at the southern edge of Manhattan to the southern end of the Long Island Sound in northern Queens. Roosevelt Island divides the East River into the West Channel and East Channel. Newtown Creek is located east of the East River, and serves as the boundary between Brooklyn and Queens.

3.12.3.1 Surface Water Hydrology and Quality

The East River is within the project area as indicated by United States Geological Survey (USGS) topographic maps. Newtown Creek, which branches off the East River, lies approximately one mile south of the Queens study area. Dutch Kills, a small stream branching off of Newtown Creek, lies approximately one mile east of East River. Information on the water quality for these water bodies was obtained from the New York State Department of Environmental Conservation (NYSDEC), New York City Department of Environmental Protection (NYCDEP), and existing sources of published information.

The East River and Newtown Creek are both salt water and tidally influenced by the Atlantic Ocean. The East River is technically a tidal strait, although it is commonly referred to as a river.

According to the NYSDEC, the water quality of the East River and Newtown Creek is considered to be extremely poor. The East River is classified by the NYSDEC as a Class I saline surface water. The best recreational usages of a Class I water, as determined by the Commissioner of the NYSDEC in accordance with the considerations prescribed by the Environmental Conservation Law, are secondary contact recreation and fishing. Secondary contact recreation involves recreational activities where contact with the water is limited, such as boating. Class I waters are suitable for fish propagation and survival. Newtown Creek and Dutch Kills are classified as Class SD saline surface waters. The best usage of a Class SD water is fishing. It is suitable for fish survival but not fish propagation, and does not meet the requirements for contact recreation.

The poor quality of the East River and Newtown Creek is due mainly to the oxygen demand of loadings from sewer outflows and industrial discharges allowed by National Pollutant Discharge Elimination System (NPDES) permitting. Other significant pollution sources include overflows from combined sewers that can include pollutants from sources such as street run-off, thermal discharges, oil spilled from ships and oil storage areas, benthic deposits and dredged materials, landfill leachates, and pollutants transported by river currents from outside the City boundaries. In addition, impervious surfaces resulting from urbanization increases the amount of storm water runoff entering the East River and Newtown Creek. This runoff becomes contaminated from street refuse, industrial spills, and chemicals on the streets such as road salts and oil.

The NYCDEP conducts annual water quality surveys throughout portions of the East River. Figure 3.12-1 illustrates locations of sampling sites used to obtain water quality information for this report. The sample site located at the mouth of Newtown Creek (E-2A) was used to assess the quality of water in Newtown Creek. Table 3.12-1, NYC Harbor Survey Summary summarizes the data obtained from these sample locations in order to give an indication of the historical (1986) and current (1994) quality of the water in the East River and Newtown Creek. Data was compared for the month of August when water quality is usually low to represent a worst case scenario.

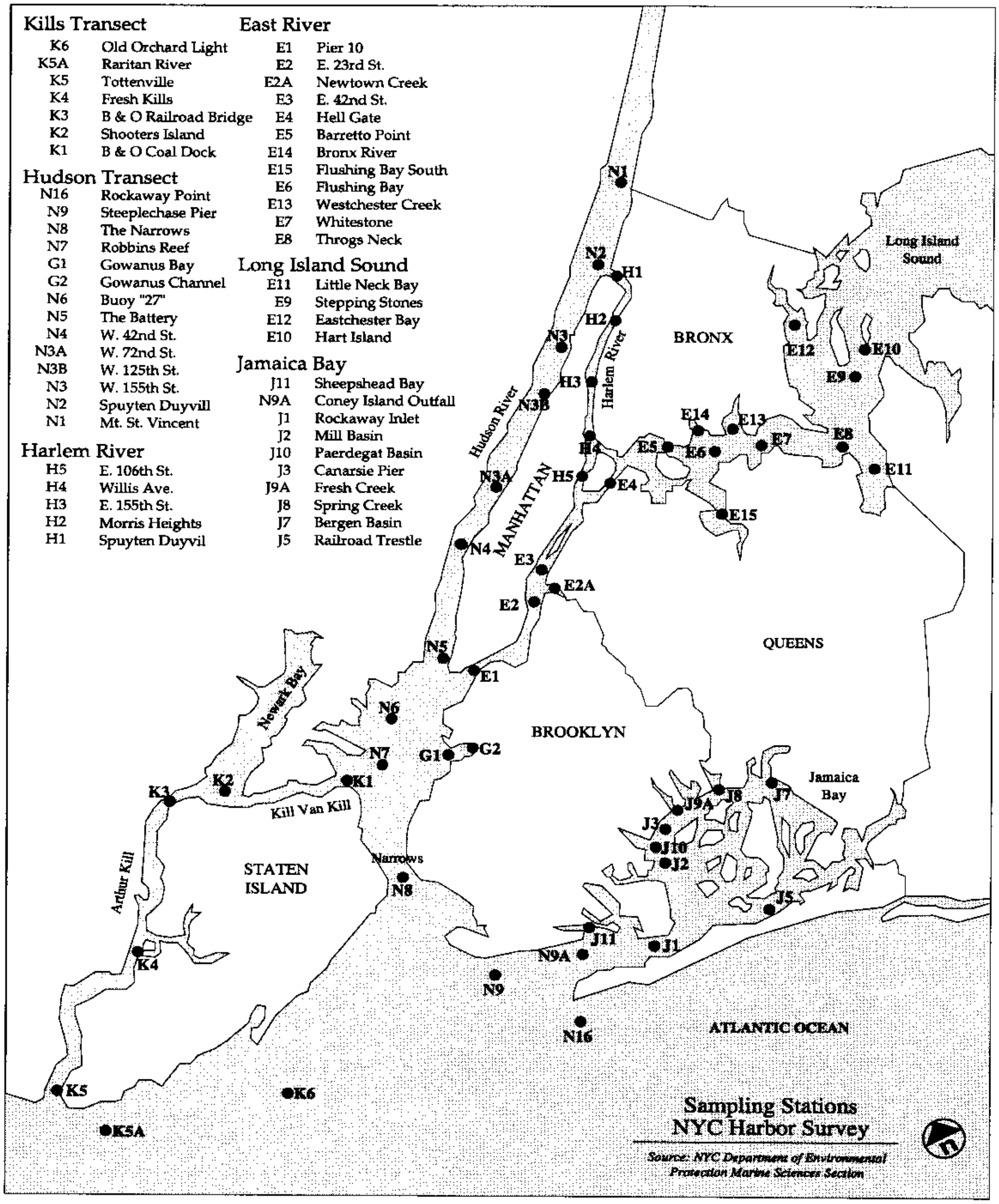

Kills Transect
K6 Old Orchard Light
K5A Raritan River
K5 Tottenville
K4 Fresh Kills
K3 B & O Railroad Bridge
K2 Shooters Island
K1 B & O Coal Dock
Hudson Transect
N16 Rockaway Point
N9 Steeplechase Pier
N8 The Narrows
N7 Robbins Reef
G1 Gowanus Bay
G2 Gowanus Channel
N6 Buoy "27"
N5 The Battery
N4 W. 42nd St.
N3A W. 72nd St.
N3B W. 125th St.
N3 W. 155th St.
N2 Spuyten Duyvill
N1 Mt. St. Vincent
Harlem River
H5 E. 106th St.
H4 Willis Ave.
H3 E. 155th St.
H2 Morris Heights
H1 Spuyten Duyvil
East River
E1 Pier 10
E2 E. 23rd St.
E2A Newtown Creek
E3 E. 42nd St.
E4 Hell Gate
E5 Barretto Point
E14 Bronx River
E15 Flushing Bay South
E6 Flushing Bay
E13 Westchester Creek
E7 Whitestone
E8 Throgs Neck
Long Island Sound
E11 Little Neck Bay
E9 Stepping Stones
E12 Eastchester Bay
E10 Hart Island
Jamaica Bay
J11 Sheepshead Bay
N9A Coney Island Outfall
J1 Rockaway Inlet
J2 Mill Basin
J10 Paerdegat Basin
J3 Canarsie Pier
J9A Fresh Creek
J8 Spring Creek
J7 Bergen Basin
J5 Railroad Trestle
BRONX
QUEENS
BROOKLYN
MANHATTAN
STATEN ISLAND
Long Island Sound
Jamaica Bay
ATLANTIC OCEAN
Hudson River
Harlem River
Newark Bay
Kill Van Kill
Arthur Kill
Narrows
Sampling Stations
NYC Harbor Survey
Source: NYC Department of Environmental Protection Marine Sciences Section

Figure 3.12-1

The water quality standards for the parameters used in Table 3.12-2 for both Class I and SD waters, are based on the New York State Department of Environmental Conservation's "Water Quality Regulations - Surface Water and Groundwater Classification and Standards."

TABLE 3.12-1
NYC Harbor Survey Summary

Site	Date	pH Top* / Bottom**	Dissolved O_2 Top / Bottom	Fecal Coliform Top / Bottom
E-1	8/6/86	7.4 / 7.4	4.0 / 3.7	1,100 / 1,400
E-1	8/23/94	7.69 / 7.7	5.1 / 5.2	710 / 700
E-2	8/20/86	7.6 / 7.6	3.2 / 3.1	400 / 600
E-2	8/23/94	7.75 / 7.7	6.1 / 5.0	680 / 870
E-2A	8/20/86	7.6 / 7.6	3.5 / 3.3	3,200 / 980
E-2A	8/31/94	7.58 / 7.59	3.7 / 3.6	220 / 240
E-3	8/20/86	7.5 / 7.5	2.8 / 3.8	587 / 700
E-3	8/23/94	7.82 / 7.72	5.5 / 5.5	760 / 730
E-4	8/26/86	7.4 / 7.4	3.9 / 3.5	140 / 40
E-4	8/25/94	7.48 / 6.84	3.7 / 3.4	153 / 87
E-8	8/26/86	7.5 / 7.5	4.7 / 4.4	39 / 42
E-8	8/25/94	7.25 / 7.7	5.1 / 4.7	100 / 63
H-2	8/20/86	7.4 / 7.4	4.2 / 4.1	1,581 / 1,500
H-2	8/31/94	7.58 / 7.47	4.5 / 4.2	520 / 660
N-7	8/19/86	7.7 / 7.7	4.7 / 4.7	447 / 748
N-7	8/30/94	7.93 / --	6.6 / 5.6	101 / 4.0

*** *Top:* Surface Water Sample taken 1 meter below water surface**
*****Bottom:* Bottom Water Sample taken 1 meter above sediment surface**

TABLE 3.12-2
Water Quality Standards

Parameter	Class I	Class SD
pH	6.4 - 9.1	6.4 - 9.1
Dissolved O_2	No less than 4.0 mg/L	No less than 3.0 mg/L
Fecal Coliform	Not to exceed 2,000 per 100 ml	Not listed

As Table 3.12-1 indicates, each sample location was within appropriate pH and fecal coliform levels for both 1986 and 1994. However, four sample locations in 1986 and one location in 1994 did not have appropriate dissolved oxygen levels. A low dissolved oxygen level is an indication of poor water quality. Dissolved oxygen levels have traditionally been accepted as the most important indicator of a water body's ability to support aquatic life. A low level of dissolved oxygen is frequently caused from waste materials, such as sewage effluents, being suspended in the water body. Overall, dissolved oxygen increased between 1986 and 1994 indicating an improvement in the quality of water in both the East River and Newtown Creek.

3.12.3.2 Groundwater Hydrology and Quality

Nonpotable water for New York City is provided by the Brooklyn-Queens Aquifer, which underlies the Queens study area. However, the aquifer is not used as a source of potable water in the Queens study area. The majority of Queens County is underlain by unstratified Pleistocene ground and terminal moraines which are considered to be poor aquifers.

Groundwater in the project area is predominantly contaminated due to development occurring over the water table, which is very close to the earth's surface (NYCDEP, 1993). Groundwater contamination is discussed in more detail in the Hazardous Materials Technical Appendix. Geoprobe borings taken throughout the Queens study area indicate for other projects that the depth to groundwater is approximately three feet. Groundwater in the Queens study area also has a high chloride content due to the proximity of the East River. A combination of salt water influence and contamination makes the groundwater in the Queens study area unsuitable as a source of potable water.

3.12.3.3 Water Use

The aquifer below the project study area is not used as a source of potable water in the Queens study area, since it is known to be contaminated. Larger surface water bodies are mainly used by boat traffic, secondary contact recreation (fishing, boating) and harbor commerce activities. The East River, Newtown Creek and Dutch Kills are classified as E1OWL (flooded by tidal water).

3.12.3.4 Floodplains

Locations of floodplains within the project area were determined through the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for New York and Queens Counties. FEMA maps delineate the boundaries of the 100- and 500-year floodplain boundaries. FEMA maps identify areas within the 100-year flood boundary as Zone A. Those areas outside of the 100-year flood boundary, but within the 500-year flood boundary, are identified as Zone C. Zone C is considered an area of minimal flooding.

The NYSDEC administers the Flood Insurance Program according to Executive Order 11988, to ensure New York City's eligibility for federally subsidized flood insurance. The NYSDEC regulates development occurring within Zone A and some projects, if federally funded, within Zone C.

Based on a review of FEMA maps, there are no 100-year or 500-year floodplain boundaries within the project area except for the East River. The East River is identified as Zone A; however, the 63rd Street Tunnel structure is already constructed at this location. All other areas in the project area are mapped as Zone C.

3.12.3.5 Wetlands

To determine if wetlands are present in the project area, existing sources of information were reviewed including U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps, NYSDEC tidal wetland maps, floodplain maps, 1992 aerial photographs of the project area, and United States Geological Survey (USGS) topographic maps. These sources were used to identify potential wetland locations, according to the Corps of Engineers Wetlands Delineation Manual (Department of the Army, 1987).

The NYSDEC also prepares its own freshwater wetland maps that contain all protected wetland areas. In general, protected wetlands must be either 12.4 acres in size, or provide unusual local importance. However, the NYSDEC has not completed freshwater wetland maps for Queens or New York Counties, since there are no freshwater wetlands in either Queens or New York Counties.

Soil surveys, prepared by the USDA's Natural Resources Conservation Service (NRCS), are routinely reviewed to identify areas containing hydric soils, which help to identify potential wetland locations. However, due to the urbanized nature of the project area, NRCS soil surveys have not been prepared for New York or Queens Counties.

No freshwater wetlands were identified on the NWI maps. The NWI maps classified the East River as estuarine subtidal open waters permanently flooded by tidal water (E1OWL). Newtown Creek and Dutch Kills, which lie outside the project area, were also classified as E1OWL. The NYSDEC tidal wetland maps did not show any additional tidal wetland areas. Aerial photographs did not reveal any potential wetland areas. The land use in this area is predominantly urban and does not provide the necessary vegetation. The largest vegetated area observed on the photos was the Queensbridge Park, which consists of grassy areas. No potential wetlands were observed adjacent to the East River. USGS topographic maps indicated that the study area is relatively flat, sloping slightly towards the East River. No low-lying areas, which could indicate potential wetland sites, were observed.

Visual observations made throughout the project area did not reveal the presence of any wetlands.

3.13 Topography and Soils

3.13.1 Study Approach

There are generally accepted design standards relating to factors such as soil suitability for construction and safety issues.

Baseline data reviewed for the project included the following:

- A review of U.S. Geological Survey (USGS) maps and reports for a description of the geologic setting in the study corridor.
- Coordination with the Geological Survey/State Museum, which serves as a clearinghouse for information concerning bedrock and surficial geology within the state.
- Coordination with other applicable federal, state and local agencies.

3.13.2 Affected Environment

The project area is predominantly urban/industrial in nature. Past earth disturbances and heavy urbanization have created a relatively flat topography throughout the project area. From the eastern terminus of the project area at Sunnyside Yard the terrain slopes slightly west towards the East River. The elevation drops from a high of 40 feet above mean sea level (MSL) to a low of 10 feet above MSL along the edge of the East River. From the western terminus of the project area near GCT, the terrain slopes slightly east towards the East River. The elevation drops from a high of 50 feet at GCT to a low of 10 feet near the edge of the East River.

The Soil Conservation Service does not have a published Soil Survey Report for Queens or New York Counties. Soils within the Queens portion of the project area are typically made up of salt marsh deposits and artificial fill material. Sunnyside Yard in particular, which is the eastern terminus of the project area, contained part of a 40-acre wetland in the early 1900s. During construction of the Sunnyside Railyard in 1906, the original wetland soils, which consisted of a clay muck, were removed and replaced with fill material. Excavations done in nonwetland portions of Sunnyside Yards during construction of the East River Tunnel in 1906, revealed the soils to be sand and gravel, with varying amounts of glacial deposits of water-worn gneiss, sandstone, and trap boulders. This sand material was later used as mortar for the bridge and sewer work for Sunnyside Yard (Barker, 1910). Excavations in the former wetland areas revealed depth to bedrock to be 30 to 50 feet below surface.

The physiographic unit of Queens and New York Counties is the New England Upland; the Coastal Plain lies to the east and the Triassic Upland lies to the west. The New England Upland is a division of the Appalachian highlands, which includes all the mountains and plateau areas of the eastern United States. The project area is within a smaller, eastern projection of the New England Upland known as the Manhattan Prong. The Manhattan Prong consists of a hard, underlying bedrock, which caused early development to be laid out in the valleys of New York City, where construction could take place more easily. The rougher, hilly areas were used mainly for recreational areas such as Central Park.

The underlying bedrock in Manhattan dates back to the Paleozoic era between the Ordovician and Cambrian periods, which were approximately 500 million years ago. The bedrock is a crystalline rock consisting of schist and gneiss to the east of the East River, and Manhattan schist to the west of the river. These rocks are overlain by unconformable Cretaceous deposits and Pleistocene glacial deposits.

The geologic units of the Cretaceous deposits include the Magothy Formation and Matawan Group, and the Raritan Formation. The Magothy Formation and Matawan Group consist of very fine to coarse sands and silty sand with interbedded clay and silt. The Magothy Formation corresponds to the Magothy Aquifer. The Raritan Formation consists of clay and silty clay beds with some interbedded sands. The Raritan Formation is the upper confining unit of the Lloyd Aquifer and underlies the Magothy.

The geologic units of the Pleistocene glacial deposits include Wisconsin Glaciation, Sangamon Interglaciation, and Pre-Wisconsin Glaciation. The Wisconsin Glaciation consists of ground and terminal moraines, glacial outwash, and clay. The Wisconsin Glaciation corresponds to the upper glacial aquifer. The Sangamon Interglaciation consists of Gardiners clay, which consists of clay and silt with interbedded sand. The Pre-Wisconsin Glaciation consists of Jameco Gravel, which ranges from coarse sand and gravel with cobbles and boulders to finer combinations. The Pre-Wisconsin Glaciation corresponds to the Jameco Aquifer.

3.14 Hazardous Materials

3.14.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

The ASTM (American Society for Testing and Materials) standard on Environmental Assessments for Commercial Real Estate (E1527-94) was used for the assessment of hazardous materials in the corridor. There are no federal or state regulations on environmental assessment procedures.

Pertinent federal environmental regulations which govern the quantification of environmental impact are:

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Title 40 CFR 300 - 399 as amended by the Superfund Amendments and Reauthorization Act (SARA), 42 USC§ 9601 et seq. (the "Superfund" Law) provides the impetus for conducting this property assessment. The regulation involves the potential liability for the cleanup of hazardous substances releases and the protection of human health and the environment.

- Resource Conservation and Recovery Act (RCRA) Title 40 CFR, Subtitle C - regulates the management of the generation, transport and disposal of hazardous waste. Subtitle G regulates underground storage tanks (USTs).

- Clean Water Act (also known as the Federal Water Pollution Control Act) - regulates a wide range of issues related to water pollution such as priority pollutant list, effluent standards, drinking water standards, and the National Pollutant Discharge Elimination System (NPDES) permitting process. Section 404 (b) requires the protection of water and biological resources from dredge and fill activities.

- Safe Drinking Water Act - regulates public drinking water systems, establishes drinking water regulations and control of underground injection of waste materials.

- Toxic Substance Control Act (TSCA) Title 40 CFR 700 - 790 - regulates development, testing, manufacture, transportation and use of toxic chemical substances, particularly PCBs.

- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Title 40 CFR 150 - 189 - regulates use and disposal of pesticides.

- Asbestos Hazard Emergency Response Act (AHERA) - regulates inspection of schools for asbestos - containing materials and their removal when found.

Pertinent New York State environmental regulations under the Environmental Conservation Law are primarily for Chemical Bulk Storage (6 NYCRR Parts 595-599) Petroleum Bulk Storage (6 NYCRR Parts 612 - 614), and regulations for handling and disposal of hazardous solid waste (6 NYCRR Part 360 and 370 series).

The generation, storage, and transportation of hazardous materials center around industrial and commercial operations. Materials exhibiting one or more of four characteristics: ignitability, corrosivity, reactivity, and toxicity may be classified as hazardous materials. Hazardous materials may be generated by specific industries (e.g. petroleum refining and wood preserving), by common manufacturing and industrial processes (e.g. solvents used in degreasing operations), as commercial chemical products (e.g. creosote and some pesticides), by small generators (e.g. hospitals, dry cleaners, and printing companies), as a result of leakage from underground storage tanks (e.g. at service stations), and may be present in solid waste disposal facilities. Hazardous materials are potentially present at sites along the project's study corridor as a result of the presence of one or more of these generators. Additionally, spills have been documented on properties and along existing railroads, resulting in contamination.

Numerous agencies were contacted to obtain information and analysis of data regarding hazardous material sites within the linear alignment areas of the MSA and QSA. Federal, state and local publications and reports were also reviewed. A detailed listing of the agencies contacted and publications reviewed can be found in the Hazardous Materials Technical Appendix.

The project team reviewed environmental regulatory agency database information for the purpose of identifying areas of concern associated with the PSA. The United States Environmental Protection Agency (USEPA) and NYSDEC databases reviewed are listed in the Hazardous Materials Technical Appendix. In addition to the database review additional information was requested of the MTA, NYCDEP and Amtrak to assess the environmental concerns at Sunnyside Yard.

3.14.2 Study Approach

The identification and characterization of all known or potential hazardous materials sites along the PSA (including GCT) have been divided into five tasks:

1) Agency/Publications Search
   - contact agencies and consult publications to identify environmental concerns.

2) Database Search
   - search various environmental databases to identify environmental concerns.

3) Historical Search
   - review aerial photographs and Sanborn Fire Insurance Maps to identify environmental concerns.

Sunnyside Yard, in the QSA, is divided into Yard A, to the north owned by LIRR. The southern section of the Yard is owned by Amtrak (Figure 3.14-1).

4) Field inspection of Yard A to identify any areas of environmental concern for the proposed alignment area.

5) Field inspection of Amtrak's Sunnyside Yard to identify any areas of environmental concern for the proposed alignment area.

A summary of sites of potential environmental concern in the PSA was generated using input from each portion of the search performed to date. Each site of concern was evaluated to determine its potential human health, environmental, engineering and liability risks.

3.14.3 Affected Environment

A hazardous materials assessment was performed to identify areas of concern along the proposed alignment. Some sites or areas were a source of concern because of (i) the activities known or perceived to be part of their operations such as the use, generation, storage, handling, or transport of hazardous materials or wastes; (ii) a record of a previous spill that had occurred on the property; or (iii) if it had potential to adversely impact construction of the proposed alignment. Spills and other sites of environmental concern that lie above the constructed portions of the tunnel were not indicated as potential concerns because no additional construction will take place in these areas.

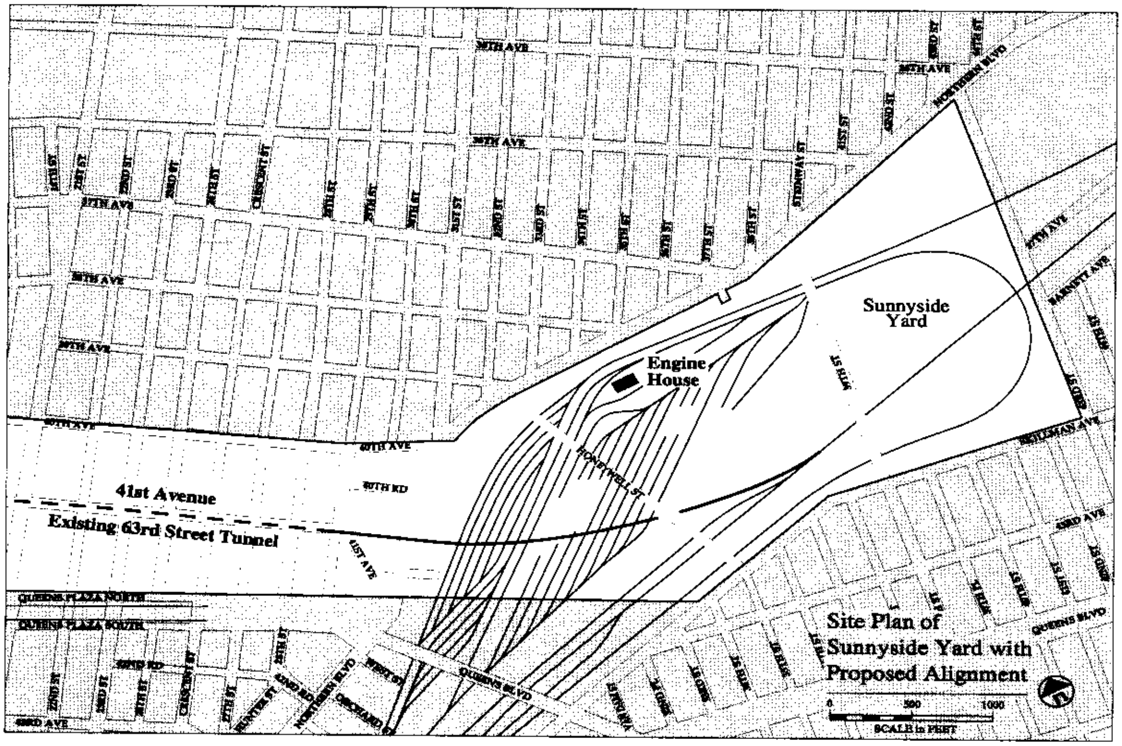


Figure 3.14-1

3.14.4 Environmental Databases

The EPA database records revealed that there are no National Priorities List (NPL) sites within a one-mile radius of the PSA. However, the records did reveal a total of four Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLIS) sites within a one-mile radius, 124 Resource Conservation and Recovery Act (RCRA) large generators and 117 RCRA small generators within a 1/4 mile radius, three RCRA treatment storage, disposal (TSD) facilities within a one-mile radius, and 10 Emergency Response Notification System (ERNS) sites within a 1/8 mile radius.

The NYSDEC databases revealed four State Priorities List (SPL) sites within a one-mile radius, a total of 566 underground storage tanks (UST) within a one-mile radius, and 176 leaking underground storage tanks (LUST) sites within a one-mile radius (23 of which are within a 1/4 mile radius). Additionally, records revealed that there are no solid waste landfills (SWLF) sites within a 1/2 mile radius of the PSA.

Table 3.14-1 shows a listing the properties of environmental concern adjacent to or in close proximity to the proposed alignment, along with a description of the potential concern. There are figures depicting these sites numerically, with map referencenumbers listed on a correlating table. The Hazardous Materials Technical Appendix also includes a detailed listing of the findings from the Sanborn Maps.

3.14.5 Historical Search

A historical search of the corridor was conducted to determine if previous facilities operations in this area could have adversely impacted the property's environmental quality. Historical aerial photographs were reviewed from 1960 to present and a review of Sanborn Fire Insurance Maps was conducted from 1890 to present.

3.14.5.1 Aerial Photography Examination

Aerial photographs portray changes in land use, construction, and overall site conditions. Furthermore, aerial reviews may identify past and current environmental conditions. Aerial photographs from five time periods were acquired. The sets reviewed were black and white and included the PSA and surrounding vicinity for the years 1960, 1978, 1984, 1988 and 1992.

Findings

Railyards, in general, have proven to be sources of hazardous materials contamination due to past practices. GCT was exclusively underground by 1960, therefore aerial photographs did not allow for the tracing of the evolution of this site by this method. However, the general area of Madison Avenue Yard has been used for light cleaning and maintenance of commuter rail coaches. These activities may have involved the use of cleaning and/or lubricating liquids and other matierals. Drainage areas may have collected miscellaneous spills and incidental leakage of lubricating fluids. The potential exists for liquids to have entered the subsurface via joints or cracks within the concrete floor structure. Nonetheless, the concrete floor structure should be capable of containing incidental spills and the leakage of liquids, thereby minimizing the potential of seepage which may impact subsurface soils and the environment. Also, pipe insulation may contain asbestos which may require abatement.

To more precisely determine the potential for any hazardous materials, the subsurface of Madison Avenue Yard will be investigated to identify any areas of concern prior to the start of construction. Any impacted areas requiring removal during construction will be properly handled and disposed, as discussed in Chapter 5.

Sunnyside Yard which is an open railyard was scrutinized for evidence of development and/or current/past practices. The earliest aerials obtained (1960) indicate the Sunnyside Yard consisted of numerous railines, open space, tree line, and several buildings. There were no major changes in the 1978 photograph. The 1984 photos revealed the replacement of a building west of

Queens Boulevard overpass. Trees were cleared along the 43rd Street overpass to expose some type of work area and parking along that segment was condensed and approximately 12 buildings were added. Buildings adjacent to the 49th Street overpass were modified or rebuilt.

By 1988, the photos revealed additional development. The southwest portion of the Yard, towards Newtown Creek, indicated additional parking, storage areas and buildings. The area between Queens Boulevard and Thomson Avenue overpasses include additional parking and a new structure replaced the one last seen in 1984. The area west of the Honeywell Street viaduct had a four-wheel vehicle crossing added to the track area. Parking facilities increased, a large new structure, and office area were included between Honeywell Street viaduct and the 39th Street viaduct. The last change noted during this interval was at 43rd Street where an additional building and parking area were added.

The 1992 aerials indicated a very large structure (Citicorp) was added in the area north of Hunterspoint Avenue. Also, the area south of the LIRR Main Line and west of 43rd Street was cleared of vegetation and a large structure (GM Fleet Services) with parking was added.

Other locations in the PSA indicated minor structural changes. The remaining Study Area within Queens depicted minor changes including the replacement of a building with parking space at 41st Avenue and 23rd Street (1992), the addition of a structure at 41st Avenue and 25th Street (1992), and a replaced building at 41st Avenue and 29th Street.

The Manhattan portion of the PSA was predominantly developed by 1978, as seen in the aerials. The most significant changes were observed from 1978 to 1984 along the block located on 64th Street, between 2nd and 3rd Avenues. From 1978 to 1984, the block along 64th Street, between 2nd and 3rd Avenues, retained only the first building on the east end. The remainder was rebuilt and restructured. The restructuring included the elimination of a ground- level parking lot that was replaced with a building (possibly a multi-level parking garage). High rises were added in several locations including 61st Street and 3rd Avenue, 61st Street and Park Avenue, Park Avenue and 60th Street, Park Avenue and 59th Street, Madison Avenue and 56th and Madison Avenue and 55th Street.

The only changes on Roosevelt Island were the addition of a baseball field in the 1988 photo; and the elimination of buildings adjacent to the ball field in the 1992 photo.

There are known hazardous materials issues at properties along the proposed alignment:

(i) Amtrak's Sunnyside Yard at 39-29 Honeywell Street in Long Island City, Queens has subsurface petroleum and PCB contamination in the northern section of the Yard. This area, however, is not directly in the proposed alignment.

The site inspection revealed an active gasoline underground storage tank (UST) between Buildings #2 and #3 within the proposed alignment.

Buildings #3 and #4 at Sunnyside are currently storing nickel cadmium batteries, Refrigerant-11 (Freon), paper towels and miscellaneous car cleaning supplies. Based on the age of the buildings (85 to 100 years), the possibility of hazardous material storage in the past is very likely. Although there is no evidence of hazardous material disposal or USTs present in either Yard A or Amtrak property in the existing track area, a subsurface investigation should be performed to determine whether contamination generated from past activities has adversely impacted the soil and ground water in the area of the alignment corridor where construction is to be conducted. Dewatering activities during tunnel construction may cause contaminated ground water to migrate, therefore, a containment system to isolate the dewatered area should be implemented.

(ii)Grand Central Terminal contains asbestos in the piping insulation and building materials. Asbestos inventory reports should be reviewed for the specific areas of the GCT to be impacted by construction associated with the proposed alignment. In addition, the oily water spill at GCT should be investigated to determine precise location and potential impact on future construction.

(iii)The potential presence of contaminants within the subsurface of Madison Avenue Yard should be investigated prior to planning construction activities. A visual investigation should be conducted to identify any areas of concern which may include stained areas, hazardous materials storage areas, drainage structures and piping insulation. Samples of any standing liquid should be analyzed by a laboratory for petroleum constituents. Concrete core samples from within stained areas should also be laboratory analyzed for petroleum constituents. Suspect piping and/or duct insulation should be analyzed for asbestos.

(iv)Other Sites

- 22 sites were identified from the database review are of environmental concern to the proposed alignment. Of the 22 sites, 9 potentially require additional investigation to determine if they have adversely impacted the soils and groundwater within the proposed alignment.

- Soil and groundwater along the up gradient border (south and southeast) of the alignment corridor should be investigated to determine whether contamination, if any along the alignment corridor was generated off-site and has subsequently migrated on-site.

- 27 former sites were identified from the historic Sanborn Map review which could have adversely impacted the environmental quality of the area within the proposed alignment.

Conclusions

The PSA was predominantly developed by 1978. Open water areas (lakes, wetlands, ponds etc.) did not exist. The PSA consisted of an intensely developed urbanized area. Site visits did not reveal any site conditions or land uses that indicated possible dumping or creation of hazardous materials contamination, with the exception of the normal (past) operations of the rail yard at Sunnyside.

3.14.5.2 Sanborn Map Summary

A review of Sanborn Fire Insurance Maps was conducted to locate potential environmental concerns on properties surrounding the corridor. The Sanborn Map Historical Summary was divided into two separate areas, the Manhattan Corridor Summary and the Queens Corridor Summary.

Manhattan Corridor Summary

The history of the study corridor north from Grand Central Station (Park Avenue) to 63rd Street, then east from Park Avenue to the western shore of the East River, was reviewed using Sanborn Maps. The review was divided into two separate descriptions. The history of the area surrounding Grand Central Station (Grand Central Station Area Summary) extending north to 52nd Street is discussed from 1890 to 1993. The history of the corridor, running north from 53rd Street to 63rd Street then turning east to the East River (North and East Corridor Summary) is discussed from 1892 to 1993. The results of the historic review of the MSA is presented in the Hazardous Materials Technical Appendix.

Queens Corridor Summary

The study corridor's history from the eastern shore of the East River to the western edge of the Sunnyside Yard, as well as the properties surrounding the Sunnyside Yard (with a concentration on upgradient concerns) was reviewed using the Sanborn Maps. In addition, a chronological summary of the history of the Sunnyside Yard was generated to trace the evolution of the yard since it was built. The results of the historic review of the QSA can be found in the Hazardous Materials Technical Appendix.

3.14.5.3 Summary: Sanborn Historical Map Review

A historical review of Sanborn Maps was performed to identify environmental concerns that may have existed within the PSA. Sites or areas were considered to be of concern based on the presence of tanks or the indication that hazardous materials were used in everyday activities on-site. Table 3.14-1 summarizes former sites within the corridor that may have impacted the environmental integrity of the PSA. The year noted on the table is when the property first appeared developed on the historical research maps. This list of sites identifies potential concerns and may be used to determine a source in the event that contamination is found in a certain area along the corridor, where an existing source could not be identified. These sites do not pose a current, immediate threat to the PSA.

TABLE 3.14-1
Historic Map Review of PSA - Potential Sites of Concern

Property Name/Location	Year	Description of Potential Concerns
MANHATTAN CORRIDOR:		
Grand Central Terminal & Accessory Buildings (Turntable, Car Sheds, etc.)	1890	Asbestos; Spills
Piano Manufacturing Facility (Park Ave. b/w 52nd & 53rd Street)	1892	Varnishing/Finishing Operations
Power House (GCT) (corner of DePew Place and 44th Street)	1899	PCB Oils
Smith's Shop (Park Ave b/w 52nd & 53rd Street)	1907	Lead Contamination
Service Station (Park Avenue & 63rd Street)	1907	Gasoline Storage
Consolidated Gas Company (63rd between Avenue A & First Avenue)	1907	Natural Gas Storage
Garage (SE corner of Third Avenue & 64th Street)	1951	Gasoline Storage (UST)
2 Garages (Second Avenue b/w 63rd & 64th Street)	1951	Gasoline Storage (UST's)
Kalt Lumber Co.	1951	Finishing Operations
Service Station (First Avenue b/w 63rd & 64th Street)	1951	Gasoline Storage (UST's); Grease Pits
2 Service Stations (64th b/w First Avenue & Second Avenue)	1951	Gasoline Storage (UST's)
Filling Station (64th b/w First Avenue & York Avenue)	1951	Gasoline Storage (UST's)
Consolidated Edison (63rd Street b/w First Avenue & Second Avenue)	1980	PCB Oils

TABLE 3.14-1 (cont'd) Historic Map Review of PSA - Potential Sites of Concern		
Property Name/Location	**Year**	**Description of Potential Concerns**
QUEENS CORRIDOR:		
National Casket Company	1915	Varnishing/Finishing Operations
Sunnyside Yard	1915	Electric Battery Storage Room/Power House
Lumber Yard (41st Ave. & 23rd St.)	1936	Finishing Operations
2 Service Stations (NE and SE corners of 41st Ave. & Crescent St.)	1936	Gasoline Storage (UST's)
2 Service Stations (NW and SE corners of 41st Ave. & Crescent St.)	1936	Gasoline Storage (UST's)
Chemical Laboratory (SW corner of 41st Ave. & Crescent St.)	1936	Hazardous Chemicals
Service Station (Jackson Avenue)	1936	Gasoline Storage (UST's)
Garage (SE of Sunnyside Yard)	1936	Gasoline Storage (UST's)
2 Filling Stations (SE of Sunnyside Yard)	1936	Gasoline Storage (UST's)
Service Station (corner of Skillman Ave. & Queens Boulevard)	1936	Gasoline Storage (UST's)
Incinerator (Sunnyside Yard)	1947	Hazardous Waste Generation
Consolidated Edison Sub-Station (West End of 41st Street)	1980	PCB Oils
2 Transformer Yards (Sunnyside Yard)	1980	PCB Oils
Electric Locomotive Repair Shop (Sunnyside Yard)	1993 (built 1910)	PCB Oils

3.15 Historic, Archaeological and Cultural Resources

3.15.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

Section 106 of the National Historic Preservation Act ("NHPA") requires the head of any federal agency having direct or indirect jurisdiction over an undertaking to "take into account the effect of the undertaking on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register". These requirements are implemented on the federal level pursuant to a consultation process established by regulations appearing at 36 CFR Part 800. That process must be completed "prior to the approval of the expenditure of any federal funds" on activities, other than those that are "non-destructive planning activities preparatory to the undertaking" (See, 36 CFR § 800.3(c)).

Under the Section 106 process, an Agency Official contemplating the approval of an undertaking is obligated to initiate a series of steps aimed at identifying potentially affected historic resources existing in the project area. In this regard, the Agency Official must determine whether listed properties are present, and in consulation with the State Historic Preservation Officer ("SHPO") apply the National Register Criteria to potentially affected properties and determine whether such properties are eligible for listing. In the event listed or eligible properties are found to exist in the area of potential impact, the Agency Official must again consult with SHPO to determine whether those properties would be affected by the project, and if so, whether those effects would be adverse, by the application of specified criteria. Where an adverse effect is found, a public consultation process is triggered, where SHPO, the Agency Official and the National Historic Preservation Council (the "Council"), in consultation with local officials in the area affected seek to agree upon how to avoid or mitigate the adverse effects of the undertaking on the identified resource. Any agreement reached is incorporated into a "Memorandum of Agreement" ("MOA") signed by the Agency Official, SHPO, and where appropriate, the Council. Other consulting parties (such as local officials) may be invited to concur in the MOA. In any case where an MOA is executed, the undertaking is to be carried out in accordance with its terms. Where, however, negotiations towards an MOA are not productive, the Agency Official may terminate the Section 106 consultation process, and solicit comments from the Council. Those comments are to be considered by the Agency Official in reaching a final decision on the undertaking.

In addition to compliance with the NHPA, if the project will require the use of land on a historic site, and will adversely affect that site, the lead agency will need to make a Section 4(f) determination, demonstrating that there are no feasible and prudent alternatives to using that land, as explained below.

Specifically, section 4(f) states in pertinent part that the lead agency "may approve a transportation project requiring the use of...land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park...or site) only if (1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park...or historic site resulting from the use." 49 U.S.C. § 303(c).

Use of Section 4(f) property occurs when land is permanently incorporated into a transportation facility, when there is temporary occupancy of land that is adverse in terms of preservationist purposes, or there is constructive use of land (i.e. a project's proximity impacts are so severe that the section 4(f) property is substantially impaired). Section 4(f) also applies to archeological sites on or eligible for inclusion on the National Register, including those discovered during construction. However, section 4(f) does not apply to archeological sites where the lead agency, after consultation with SHPO and the ACHP, determines that the resource is important chiefly because of what can be learned by data recovery and has minimal value for preservation in place.

MTA/LIRR, is consulting with the SHPO (and appropriate local officials) to identify all properties on or eligible for the National Register of Histoirc Places in accordance with 23 CFR § 771.135(e).

With respect to any properties so identified, the lead agency will determine whether any of those properties will be adversely affected by any of the Project alternatives and obtain SHPO and ACHP concurrence as to the absence of impacts or the need for mitigation of any identified impacts. If any properties are identified that will be adversely affected by the Project alternatives, a section 4(f) evaluation will be performed and appropriate findings made thereunder.

The effects of a project on historic resources must also be considered in the course of an environmental review under NEPA. Accordingly: (i) this Chapter identifies historical districts and structures, as well as archaeological resources that may be affected by the Build Alternative; (ii) Chapter 5 documents, to the extent possible at the current level of design, the potential impacts of the project on those districts, structures and resources; and (iii) Chapter 5 identifies reasonably available measures that could avoid or mitigate such impacts. The information incorporated iin this study was developed in consultation with SHPO, and will provide a factual basis for the Section 106 consultation process. That process will be completed during subsequent planning and design phases of the project.

3.15.2 Study Approach

3.15.2.1 Historic/Architectural

The MSA, commencing at the proposed East Side terminal, at Grand Central Terminal (GCT) and continuing north along Park Avenue, abuts a unique pattern of railroad and building development in a major United States urban environment. GCT itself is on the National Register of Historic Places and was the subject of a historic Supreme Court decision in 1969 which upheld the power of the New York City Lanmarks Preservation Commission (NYCLPC) to designate and preserve historic buildings from indiscriminate demolition, a fate that befell New York City's historic Penn Station. GCT was described as the "Gateway to the Nation" in the decades when the railroad was king, and it took ten years to build (1903-13). North of GCT, along Park Avenue, significant changes have occurred in the street scape since the turn of the century. Originally, the Avenue was an open railroad, but with advent of electrification, the yards were covered, and the prized real estate developed with apartment buildings. However, the high-rise building boom of the 1950s and 60s resulted in most of the original building stock being demolished with very little remaining today.

In Queens, the PSA also encompasses communities which have been significant in their contribution to NYC's industrial and transportation development. Between 1870 and 1898, the year of the consolidation into Greater New York, Long Island City was, in fact, a city. It included not only the area we still identify with its name, but the adjacent communities of Hunterspoint, Ravenswood, Astoria, Steinway, and Sunnyside. While there may be some structures potentially eligible as landmarks, there appear to be no designated landmarks in the QSA.

Baseline historic and architectural data acquired for this study includes the following:

- An inventory of all sites within the PSA that are included on the National Register of Historic Places and/or are designated landmarks by the NYCLPC was compiled. This inventory was developed via documentary research, review of agency files, review of historical photography and field surveys. In addition, structures that are over 50 years old and are considered as having potential historic significance were identified. Historical sites are considered significant if they:
  - are associated with events that have made a significant contribution to the broad patterns of our history; or
  - are associated with persons significant in our past; or
  - embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
  - have yielded, or may likely yield, information important in prehistory or history.

The inventory of historic sites is described in narrative form within a contextual historic overview to place the PSA within the framework of the study area's developmental history.

3.15.2.2 Archaeology

The potential for impacting archaeological resources within the PSA will be greatest where subsurface construction may disturb prehistoric cultural resources or areas of historical development. These areas will include the new tunnel construction that will occur in Manhattan and Queens, to enable rail extensions from the 63rd Street Tunnel to GCT and the Sunnyside Yard, respectively. The potential for impacts will be most severe as the tunnel construction rises to approach an at-grade rail connection at Sunnyside Yard and below-grade connection to the rail network in GCT. However, given that much of the PSA has been severely disturbed by intense development, the likelihood of impacting archaeological resources is greatly diminished. In 1900, Sunnyside Yard, for example, was comprised of 40 acres of "swamp," and a further 168 acres of higher ground from 10 to 70 feet above the swamp. On this upland portion of the Yard, there were 246 buildings of all kinds, which were purchased and either removed or demolished to make way for the rail yard construction.

Baseline archaeological data acquired at a number of institutions includes the following:

- An inventory of all sites within the PSA that exhibit archaeological sensitivity was developed. This inventory was developed via documentary research, review of agency files, and field surveys; and
- The inventory of archaeologically sensitive sites was mapped and described in narrative form within a contextual prehistoric overview to place the PSA within the framework of the study area's prehistoric development.

3.15.2.3 Impact Evaluation Factors

The following criteria were used to determine significant impacts, the level of significance, and the need for mitigating measures to be implemented:

- the proximity of any construction activity to listed, designated, or potential architectural historic resources;
- the physical relationship of permanent structures associated with the proposed action and adjacent or nearby historic structures;
- the potential for disturbing by excavation archaeologically sensitive sites; and
- the potential for disturbing cultural resources due to the indirect effect of construction activity or the long-term effect of train movements underground (e.g. the effects of noise and ground-borne vibration on historic properties).

For the significant cultural resource impacts identified during the construction and operation of the proposed action, measures for mitigating or minimizing those actions are suggested. All mitigation measures will be coordinated with the NYSHPO, and, if required, a Memorandum of Agreement (MOA) will be developed to effect mitigation prior to project construction. Mitigating measures might include the following:

- modifying construction procedures to minimize both direct and indirect effects on cultural resources.
- recommending urban design guidelines that will minimize visual impacts on historic resources.
- recommending subsurface Phase 1b archaeological investigations to determine the presence of sensitive sites.
- preparing a more detailed historic documentary record of historic sites directly impacted by the proposed action in accordance with the Historic American Building Survey (HABS).

3.15.3 Affected Environment

3.15.3.1 Historic Resources

A detailed review of existing data on buildings that have been designated as New York City Landmarks or listed on the New York State Register of Historic Places and/or the National Register of Historic Places shows that there are no listed historic resources that would be impacted within the QSA. The proposed impact area in Manhattan has sensitive areas with a significant number of buildings designated as local, state, and/or national landmarks (see Table 3.15-1). In addition, there is another building eligible for such designation in the MSA and there are buildings in Queens as well; these are identified in Chapter 5 and the impact of the proposed alternatives on these buildings is analyzed at that time.

Study Area Description

The PSA begins at Sunnyside Yard in Queens and extends to GCT in Manhattan. The project area in general is centered 500 feet on either side along 41st Avenue in Queens, continuing across the East River and Roosevelt Island, extending along 63rd Street in Manhattan, then turning southwest to join Park Avenue at East 60th Street, and following along Park Avenue south to GCT, for a total route distance of approximately 3.7 miles. Two numbered city blocks, #1396 and #1397, will be traversed by the proposed tunnel between Third and Park Avenues, and 61st and 63rd Streets.

The Primary Study Area is comprised of areas in Manhattan and Queens which developed uniquely, each having the potential to possess prehistoric and/or historical cultural resources. The specific archaeological potential of the proposed project varies with the extent of prior disturbances experienced in each specific area. Toward addressing the types of potential prehistoric and historical archaeological resources which may exist within the corridor, it is necessary to understand the use of the area over time. The following discussion presents background information first on Manhattan, then Queens, and finally Roosevelt Island.

Manhattan Study Area Description

The history of Manhattan were in part shaped by the topography, ecology, and economic conditions that prevailed at various times. Understanding the city's geologic history aids in understanding the land-use history. During the Pleistocene period, ice advanced in North America several times. In the last 50,000 years, the Wisconsonian period, ice was 1,000 feet thick over Manhattan. Gravel and boulders deposited at the ice sheet's melting margin formed Long Island about 15,000 years ago (Kieran 1982:26). For a brief period Manhattan was largely covered by a glacial lake. Glacial Lake Flushing occupied broad, low-lying areas when deglaciation of the region produced vast volumes of meltwater. Higher elevations of Manhattan may have been marginal to this lake (Church and Rutsch 1984:6). By 12,000 years ago, the lake drained and sea levels have gradually risen as glaciers retreated.

The project area is within the embayed section of the Coastal Plain which extends along the Atlantic Coast and ranges from 100 to 200 miles wide. The Manhattan prong, which includes southwestern Connecticut, Westchester County and New York City, is a small eastern projection of the New England uplands, characterized by 360 million year old highly metamorphosed bedrock (Schuberth 1968:11). The Manhattan ridge generally rises in elevation toward the north, and sinks toward the south.

The prevalent gneissoid formation is known as Hudson River metamorphosed rock. The city is characterized by a group of gneissoid islands, separated from each other by depressions which are slightly elevated above tide and filled with drift and alluvium. Beneath most of the project area is the Manhattan schist formation, a highly foliated mica schist known to have once outcropped throughout the island.

Historical development has altered many of the natural topographic features that once characterized Manhattan (Gratacap 1909:5). Soil within Manhattan is mostly glacial till, clay, sand, gravel, mud, and assorted debris (Kieran 1982:24). The groundwater level fluctuates with tidal variations in the river.

Queens Study Area Description

The Queens section of the study area, on western Long Island, is physiographically a part of the coastal plain, actually the top of a coastal plain ridge formation that is covered with glacial drift. The plain is an elevated sea bottom demonstrating low topographic relief and extensive marshy tracts (Eisenberg 1978:7).

Continental glaciation affected the surficial geology of Long Island as glaciers advanced and receded at least three times in the last million years. The terminal moraine, two great ridges of drift that form the north (Harbor Hill Moraine) and south (Ronkonkoma Moraine) forks of Long Island, combine west of central Nassau County to form a single ridge marking the limit of the ice sheets' advance. This is the result of their numerous temporary stabilizations. The moraine is almost two hundred feet above sea level in some places in Brooklyn and Queens (Gratacap 1901:106-107; Schuberth 1968:181, 184). It lies approximately five miles south of the project area, along Eastern Parkway. Glacial till and outwash, made up of clay, sand, gravels and boulders were deposited there by the melting ice sheet, and with the final retreat of the ice, this material covered all of Long Island.

North of the moraine, the complex rising and subsidence of the coastal plain, relieved of its glacial burden, as well as the rising sea level caused by the volume of melting ice, created a coastline of embayed rivers or estuaries, with extensive marshy tracts, which stabilized approximately 3,000 years ago (Schuberth 1968:195, 199). These marshy tracts, drained by meandering creek systems no longer visible on the present landscape, were characteristic of the Queens section of the study area until the twentieth century, with the residential and commercial development of northwestern Queens.

Predevelopment maps of the study parcel show a number of broad hills forming an area of dry, elevated ground along the East River, later known as Ravenswood. East of the high ground began a large area of salt meadows or marsh, regularly flooded at high tide. In the study area north of 41st Avenue the elevated area extended east as far as 12th Street, while south of 41st Avenue it only extends to between Vernon and Ninth Avenues.

The salt meadows represent at least two drainage areas which are separated by a small neck of relatively dry land within the study area near the present 41st Avenue and 21st Street. Draining the meadows northward to the East River near Astoria was Sunswick Creek, while a tributary of Dutch Kills flowed southerly to the main creek and then an outlet on Newtown Creek. The meadows and creeks virtually isolated the East River shore of the Queens study area from other dry areas to the north and east (USGS 1844-5;1874; Beers 1873:pl.42).

A second elevated section of the study area lay between the meadows at 21st Street, and the marshes surrounding the headwaters of Dutch Kills, which began at approximately present Jackson Avenue and extended east to the line of Van Dam Street, in the western corner of the Sunnyside Yard (USGS 1844-5; Beers 1873:pl.42). The vast majority of the present yard site, stretching eastward between present Jackson and Skillman Avenues (and for the purposes of this study, eastward to 43rd Street) was composed of a series of hills or small north-south running ridges, interspersed with wooded areas (USGS 1844-5).

During the urban improvements that followed the consolidation of the study area into Long Island City in 1870, the land contours were severely homogenized. Meadows were filled in, and old roads raised to a higher grade, often utilizing local hills as fill sources. With the construction of the Sunnyside Yard during the first decade of the twentieth century, the hills in that part of the study area were leveled, and an estimated 2.5 million cubic yards of earth were deposited on the 250 acres of meadow at the Dutch Kills headwaters (Seyfried 1984b:82). Dutch Kills has been reduced to a small canal below 47th Street (about 2,400 feet south of the study area).

The current USGS topographic map (Brooklyn and Central Park Quads) presents the result of this manipulation of the landscape of Sunnyside Yard study area, which, except for what appears to be berms around the edges of the yard, lies between the 20- and 30-foot contour lines (USGS 1979). West and northwest of the Yard, the Queens Study Area slopes gently down to the 10-foot contour line which runs along the East River shore (USGS 1979).

Roosevelt Island Study Area Description

Roosevelt Island is an approximately one-and-a-half mile outcrop of gneiss situated amid more easily weathered dolomite. The gneiss remained, while the dolomite was eroded to form the East River channels, creating the island. Except where it is exposed, the gneiss, the oldest rock formation in New York City (Schuberth 1968:82), is covered by a shallow cover of glacial till, of varying thickness, deposited during the last glacial advance, c.12,000 years ago.

A 1784 description of the 107-acre island reports that it "abounds with running springs of most excellent water," eight acres of salt meadow, and is "remarkable for the number of fish and fowl that is caught there in the different seasons" (NYHS 1921:39-40). Unfortunately, the exact locations of these resources are unclear from early maps (Viele 1874; Manatus 1639), and little evidence of the study area's predevelopment state is visible at present.

Much of the island has been reshaped and filled during the last two centuries. An examination of late-nineteenth century topographic maps show even terrain, sloping steeply down along the East River shoreline (Viele 1874), with elevations below 20 feet above mean sea level (USGS 1897). A 1978 survey of Roosevelt Island records areas exceeding 30 feet. With only a 2.265-foot elevation difference between datum points, this indicates an intensive filling program (Geismar 1985:17).

In addition, the construction of seawalls and filling activities during the nineteenth century, and continuing deposition of construction and demolition debris through 1985, have increased the size of the island to its present 147 acres, particularly along its northern and southern ends (Geismar 1985:19).

Contextual Overview

To fully understand the use of the project site through time it is necessary to develop a historical context for the project area. As defined by the National Park Service, "historic contexts provide a framework for the identification, evaluation, designation, and treatment of cultural resources associated with particular themes, areas, and time periods. Historic context-based planning permits recognition of individual properties as parts of larger systems. Historic contexts also help managers and others evaluate properties within their proper levels of significance. As such, they provide both a systematized basis for comparison and a comprehensive frame of reference. In so doing, historic contexts provide cultural resource managers with a guide for rational decision-making" (Grumet 1990:18). The analysis containing the historical context can be found in the Cultural Resources Technical Appendix.

Primary Study Area: Designated Landmarks

There are a number of structures in the PSA that are designated as landmarks by the New York City Landmarks Preservation Commission (LPC) and/or listed on the National Register of Historic Places (NR). The following names of individual buildings, structures, districts, and complexes are those in current use by the New York City Landmarks Preservation Commission and, when they are not designated New York City landmarks, they are those used by the New York State Office of Historic Preservation. See: Andrew S. Dolkart, *Guide to New York City Landmarks* (Washington: Preservation Press, 1992) and Peter D. Shaver, *The National Register of Historic Places in New York State* (NY: Rizzoli, 1993).

Buildings listed on the National Register of Historic Places are automatically listed on the New York State Register of Historic Places. Buildings can be listed on the State Register that are not listed on the National Register. The New York State Office of Historic Preservation is compiling a list of State Register properties that are not on the National Register; should any of these buildings be within the study area they will be added to the list at a later date. Several buildings listed on the National Register of Historic Places have also been declared National Historic Landmarks (NHL), the highest possible federal designation.

All buildings identified are in Manhattan and are listed in Table 3.15-1.

TABLE 3.15-1 Designated Landmarks in the Primary Study Area	
NAME	**ADDRESS**
Algonquin Hotel	59-61 West 44th Street. LPC
American Radiator Building	40-52 West 40th Street. LPC, NR
Amster Yard	211-215 East 49th Street. LPC
Association of the Bar of the City of New York	42 West 44th Street. LPC, NR
Barbizon Hotel for Women	140 East 63rd Street. NR
Bowery Savings Bank	110 East 42nd Street. LPC
Bryant Park	Sixth Avenue between 40th and 42nd Streets. LPC, NR, NHL
Bryant Park Studios	870 West 40th Street. LPC
Central Synagogue	652 Lexington Avenue. LPC, NR, NHL
Century Association Clubhouse	7 West 43rd Street. LPC, NR
Chanin Building	122 East 42nd Street. LPC, NR
Chrysler Building	405 Lexington Avenue. LPC, NR, NHL
City and Suburban Homes, First Avenue Estate	1168-120 First Avenue, 401-423 East 64th Street, and 402-416 East 65th Street. LPC. NR also includes 429 East 64th Street and 430 East 65th Street
Daily News Building	220 East 42nd Street. LPC, NR, NHL
647 Fifth Avenue House (George W. Vanderbilt House)	LPC, NR
Fire Engine Company No. 65	33 West 43rd Street. LPC
Fred F. French Building	551 Fifth Avenue. LPC
Fuller Building	41 East 57th Street. LPC
General Electric Building	570 Lexington Avenue. LPC
Goelet Building	608 Fifth Avenue. LPC
Grand Central Terminal	East 42nd Street at Park Avenue. LPC, NR, NHL
Harvard Club of New York City	27 West 44th Street. LPC, NR

TABLE 3.15-1 (cont'd)
Designated Landmarks in the Primary Study Area

NAME	ADDRESS
Cyril and Barbara Rutherford Hatch House	153 East 63rd Street. LPC, NR
Knox Building	452 Fifth Avenue. LPC, NR
William Lescaze House and Office	211 East 48th Street. LPC, NR
Lever House	390 Park Avenue. LPC, NR
Mechanics' and Tradesmen's Institute	20 West 44th Street. LPC
New York Central Building	230 Park Avenue. LPC
New York Public Library, Astor, Lenox and Tilden Foundations	476 Fifth Avenue. LPC, NR, NHL
New York Yacht Club	37 West 44th Street. LPC, NR, NHL
Park Avenue Viaduct	Park Avenue from East 40th Street to Grand Central Terminal. LPC, NR
Morton and Nellie Plant House Edward and Frances Holbrook House	651-653 Fifth Avenue, and 4 East 52nd Street (Cartier, Inc.). LPC, NR
Public School 67	120 West 46th Street. LPC
Racquet & Tennis Club	370 Park Avenue. LPC, NR
Rockefeller Center	LPC, NR, NHL
St. Bartholomew's Episcopal Church and Community House	Park Avenue and East 50th Street. LPC, NR
St. Patrick's Cathedral (R.C.) Complex	Fifth Avenue and East 50th Street. LPC, NR, NHL
St. Thomas Church (Episcopal) and Parish House	Fifth Avenue and West 53rd Street. LPC, NR
Saks Fifth Avenue	611 Fifth Avenue. LPC
Scribner Building	597 Fifth Avenue. LPC, NR
Seagram Building	(including the Four Season's Restaurant), 375 Park Avenue. LPC
Sidewalk Clock	522 Fifth Avenue. LPC, NR
Abigail Adams Smith Museum	421 East 61st Street. LPC, NR

TABLE 3.15-1 (cont'd) Designated Landmarks in the Primary Study Area	
NAME	**ADDRESS**
Treadwell Farm Historic District	205-249 and 206-250 East 61st Street and 207-247 and 208-246 East 62nd Street. LPC
Turtle Bay Gardens Historic District	227-247 East 48th Street and 226-246 East 49th Street. LPC, NR
Upper East Side Historic District	Addresses within the Primary Study Area: 30-134 and 27-135 East 62nd Street; 26-48 and 27-123 East 63rd Street; 110-134 and 105-131 East 64th Street; 680-710 and 673-711 Madison Avenue; 550-600 and 555-601 Park Avenue. LPC, NR
Villard Houses	451-457 Madison Avenue. LPC, NR
Waldorf-Astoria Hotel	301-319 Park Avenue. LPC
Webster Hotel	40 West 45th Street. NR

Within the MSA, the only building identified as potentially eligible for designation as a New York City Landmark and listing on the New York State and National Registers of Historic Places is the former Union Carbide Building (now Chase Manhattan Bank).

In the QSA, several buildings within Sunnyside Yard have been identified as potentially eligible for listing on the National Register of Historic Places; two of which (Store House and Battery House) could be impacted by the Build Alternative.

Moving from west to east, the existing buildings at the Sunnyside Yard are (historic names are used when known)[8]:

a. Sand House (32' x 25'). Very simple brick box once equipped with sand storage facilities, sand-drying stoves, and machinery for sanding locomotives.

b. Commissary (258' x 67'). This is the main storage building of the complex. It is a two-story brick building with a rhythmic arrangement of windows resembling that on mill buildings. The building has seven window bays on the side elevations and 32 on the long north and south elevations. Some steel sash is extant, as are a few painted signs referring to its use by the Pullman Company ("Pullman Soiled Linen Room," "Pullman Clean Linen Room"). The building also retains some historic awnings. This building was used for the storage of supplies for dining and sleeping cars by both the Pennsylvania Railroad and the Pullman Company. It also originally had dormitories for Pullman porters. Included in the building were general storage facilities and refrigerated storage. This building and the adjacent buildings to the east were aligned along a platform, to the south, that still retains its original canopy with steel piers and brackets and wooden roof.

c. Store House (162' x 67'). This building is similar to the Commissary, but somewhat smaller. It was used for the storage of materials needed for the repair of railroad cars.

d. Battery House (103' x 67'). A one-story building originally used for the repair and charging of lighting batteries.

e. One-story building, not part of the original construction phase, but probably added within a decade after the original complex was completed. Now known as "Paint Shop."

f. Auxiliary Substation (see g). A one-story building with large round-arched openings. This building is part of the Boiler House complex. It originally contained two steam-driven air compressors, transformers, and other equipment. On the interior, the building retains an overhead crane, steel structural supports, steel roof structure, and other original features.

g. Boiler House (233' x 51' with f). A large brick building with round-arched and rectangular openings. The building supports a tall steel smokestack. This building was the main steam heat source for the yard. The building had three water-tube boilers with chain stokers, coal and ash conveyors, coal bunkers, coal crushers, a water heater, pumps, and other equipment. Much of the original equipment is extant, although no longer in use.

h. Two-story building of unknown original use, probably dating from 1920s, located just east of the Honeywell Street Viaduct.

i. Oil House (67' x 51' originally). Small one-story building, originally six-bays wide; only three bays survive. It originally contained tanks for the storage of oil.

j. Concrete storage tank (probably for sand) with extant steel machinery, located east of Honeywell Street Viaduct and northwest of Oil House.

k. Substation. Located at south end of yard, and probably erected around 1920.

3.15.3.2 Archaeological Resources

This section preliminarily identifies areas of potential archaeological sensitivity which may be impacted by the project. For this chapter resource categories are identified within the project corridor, and the PSA's overall potential sensitivity for archaeological resources is discussed. Defining every individual potential archaeological resource within the broader PSA was not completed since this is neither productive nor necessary, rather those which fall within the impact corridor are discussed. The potential archaeological viability of specific resources which may be impacted by the proposed project will be addressed in Chapter 5.

Previous research identified potential cultural resources in the MSA which must be addressed. These are discussed from south to north, commencing at GCT. In GCT itself, any of the original mechanisms associated with the original (ca.1905) system are potentially important. In 1905 the technology employed for the signaling system at the terminal was considered to be at the cutting edge. If the original signaling stations, switching mechanisms, or other "hardware" associated with the electrification and operation of the railway was going to be impacted, then their potential significance might have to be addressed. However, this is not the case.

The original mechanisms associated with operating GCT were installed over 90 years ago. During the last 90 years, these antiquated mechanisms were updated, replaced, or removed as part of the routine maintenance of the system. The original Wayside signaling system was replaced with Cab Signaling during the past ten years when a new command center was installed for Metro-North Railroad. Also, the older signaling and switching equipment was considered a maintenance expense when left in place, and was removed to reduce costs. Therefore, it is highly unlikely that any of the original equipment still exists within the impact area. Furthermore, there are numerous documents still available detailing the complexities of the original system (e.g. Middleton 1977). In a recent consideration of a very similar resource, the SHPO eliminated underground signal systems and mechanical controls from further eligibility consideration.

Tracks on the turn-around loop are replaced as frequently as once per year, and the platforms have been periodically updated as well. Therefore, these do not represent an original part of the GCT construction. The tracks and platforms at GCT are not considered to be a potentially significant resource.

Although the original IRT subway line at GCT is considered an important historic transportation system, the proposed project will not impact this line or any of its original features in any way.

Heading north, the proposed tunnel will clearly be far below the depth of anticipated cultural resources, which outside of lower Manhattan are typically fairly shallow. Any prehistoric and/or historic deposits which may still exist in the route of the proposed tunnel are situated far above the bedrock. Therefore, since the tunnels will be running through bedrock there is no chance of their disturbing any potentially important cultural resources.

Any potential cultural resources which may have once existed where the 63rd Street Tunnel is extant in Manhattan, under the East River, beneath Roosevelt Island, and in Queens have already been disturbed by the tunnel's construction. Furthermore, the tunnel itself is not part of an early and/or significant transportation system. Therefore, no cultural resources will be impacted by the use of this tunnel.

The construction of the new tunnel up Park Avenue in Manhattan will require creating two access shafts from the street grade down to about 70' below surface. These will be located at East 52nd Street and East 54th Street. As previously noted in Chapter 3, Existing Conditions, no potential cultural resources were identified in these locations. An additional cartographic review of the historical use of these street beds has confirmed that there is no likelihood of encountering potentially important cultural resources in this vicinity.

Both East 52nd and East 54th Streets, prior to development, had a stream running north/south through them directly west of, and parallel to, Park Avenue (Viele map 1859). Marshland bordered either side of the stream, making this area unattractive for prehistoric occupation. While Native Americans may have procured resources in this area, the types of activities which would have left a substantial cultural material deposit, such as from a long-term habitation, most likely took place on higher or better protected ground further north and west. No knolls or other topographic features offering natural protection from the elements existed in this area. Thus it is highly unlikely that prehistoric cultural material was deposited in this vicinity. Furthermore, the historical actions of culverting the stream, draining the area, filling the marsh, and then regulating the streets would have caused extensive disturbance to the prehistoric landscape.

A review of historic maps and atlases failed to identify any potentially important historical structures or features where the shafts will be placed in East 52nd and East 54th Streets (Commissioners of New York State 1807-11; Colton 1836; Viele 1859; Dripps 1866; Bromley 1879; Robinson 1885, 1890; Bromley 1902, 1926). The elevations taken at the intersections of these two streets and Park Avenue remained unchanged between the 1880s and the 1920s, before and after the original GCT tunnels were built beneath Park Avenue. Furthermore, historical references did not mention any important features in this area (Stokes 1926:862).

The following section discusses past construction and grading activities and their real and potential effects on buried cultural resources in sections of the project site that will be impacted by this planned construction within the QSA. In general, this evaluation is based on a comparison of topographic maps, in particular, a 1907 contour map (Figure 1907 1&2) prepared by the Pennsylvania Railroad prior to the construction of Sunnyside Yard (ASCE 1910:pl.XLIV) and detailed surveys of current yard elevations (TAMS 1989; Amtrak 1994). Unfortunately, no soil boring logs were available to support or disprove these conclusions. Although Louis Barker's paper on Sunnyside Yard construction was utilized, its detail was insufficient to elucidate questions of disturbance raised by the cartographic comparisons (ASCE 1910:133-159).

Due to differences in technology, land use and lifeways, archaeological resources from the prehistoric and historical periods generally vary in depth of burial relative to the ground surface at the time of deposition. As a result, subsequent activities such as construction or grading impact these buried resources differently.

Historical archaeological resources relating to dwellings, workplaces and schools are often preserved in privies, cisterns or wells, which in the days before the construction of municipal services - namely sewers and a public water supply - were an inevitable part of daily life. These shafts became convenient receptacles for all sorts of trash, providing a valuable time capsule of stratified deposits for the modern archaeologist. They frequently provide the best domestic remains recovered on urban sites. Truncated portions of these shaft features are often encountered on homelots because their deeper (to approximately 8 feet) and therefore earlier layers remain undisturbed by subsequent construction, and in fact, construction often preserves the lower sections of the features by sealing them beneath structures and fill layers.

Other commonly occurring, but much more shallow, buried historical remains include foundations and builder's trenches, which, if the structure did not include a basement, extend only a few feet below the pre-development land surface; even more fragile backyard remains such as fence lines, paths, traces of landscaping and sheet midden scatter. Included among these fragile remains may be artifacts and features deposited in the vicinity of old Middelburg Road by the British occupying army during the American Revolution. The descriptions of the soldiers' huts and the fact that artifacts were being found in the plow zones of area farms well into the late Nineteenth Century testifies to this possibility (Seyfried 1984b:81).

Similarly, buried prehistoric cultural remains are normally found within 3 to 4 feet of the pre-development land surface, and as a result, are extremely susceptible to destruction from subsequent regrading and construction.

Because the project site, even in its reduced state, covers such a vast area, exhibiting great variation in pre-development topography and land use (including subsurface disturbance), as well as varying depths of proposed subsurface disturbance, the project site will be discussed in sections. This information is contained in the Cultural Resources Technical Appendix.

Contextual Overview

To fully understand the use of the project site through time it is necessary to develop a prehistoric context for the project area. The following discussions establish a contextual framework for the prehistoric eras pertinent to the project site.

Prehistoric Context

Archaeologists have divided North American prehistory into three periods, the Paleo-Indian, Archaic, and Woodland. The latter periods are generally divided into subperiods using the appellations Early, Middle, and Late. Changes in the prehistoric environment, the characteristics of prehistoric peoples, and the cultural artifacts that were left behind enable archaeologists to present a chronological framework for the prehistory of North America. Additional detail is provided in the Cultural Resources Technical Appendix.

Conclusions

Results of the documentary research suggest that there are many areas where prehistoric and/or historical cultural resources may exist within the project corridor. The project will not be able to avoid areas of Queens and Manhattan which have a high degree of prehistoric and historical archaeological sensitivity. This preliminary identification process has not assessed the potential significance of any proposed impacts. That will be assessed in Chapter 5, Environmental Consequences.

3.16 Visual Resources

The Primary Study Area crosses through various visually diverse neighborhoods, ranging from Manhattan's Upper East Side, which contains some of the City's most expensive real estate and a number of historic structures, to the neighborhood of Sunnyside in Queens, where historic "Garden City Movement" style landscaped apartments co-exist with one of the nation's largest, and most established, rail passenger yards. Faced with such disparate visual characteristics, the visual study area was divided into two sections; one that addresses the Manhattan Study Area and one for the Queens Study Area.

3.16.1 Visual Description of Manhattan Study Area

Land uses within the Manhattan Study Area are among the densest in the City, and with this density comes a variety of architectural styles and visual diversity.

The area immediately surrounding GCT is part of the Midtown Business District, where office buildings between 20 and 40 stories tall predominate. While older office buildings designed with classical architectural styling and clad in limestone or other stone facing are common in this area, many of the high-rise buildings in the MSA were constructed within the past 50 years and consist of contemporary, "international style," steel and glass designs. Between 40th and 62nd Streets, high-rise office buildings dominate Sixth, Fifth, Madison, Vanderbilt, Park, Lexington and Third

Avenues. The avenues further east, Second and First Avenues, are characterized by a mixture of high and low-rise apartment buildings, often with ground floor retail activity. Exhibit 3.16-1 shows a typical view of the density and type of office buildings which have developed along Park Avenue just north of GCT.

Visually, each avenue is characterized by a "street wall" created by buildings extending out to the property line and shaped by building heights and setbacks complying with applicable zoning codes. Puncturing this street wall, and reflecting zoning changes of the past few decades, are newer office and apartment buildings which rise taller than the buildings filling out the property line, but are setback in broad plazas. This combination of taller office buildings in plazas are common along Sixth, Park, and Third Avenues, and to a lesser extent along Madison and Lexington Avenues. High-rise apartment buildings in plazas are found along Third, Second and First Avenues.

Most of the high-rise apartments along First, Second and Third Avenues were constructed after 1955, after the demolition of the Third Avenue Elevated rail line, when the elimination of the perceived overhead visual blight of the elevated line sparked a building boom along Third and Second Avenues. These apartment buildings were generally built of brick or glazed brick, the favored building material of that time. The large number of brick and glazed brick apartment buildings, many built to the same mass and size, leads to a certain amount of visual continuity along these avenues. Today's newer apartment buildings also favor glass and steel facades.

Along Park and Lexington Avenues, the high-rise apartment buildings are considerably older and more established, many dating to the beginning of this century (Exhibit 3.16-2). Just as the newer apartments along Third Avenue and to the east appear to be visually tied to the same era, these apartment buildings share many common visual attributes of an earlier era; similar building materials (typically stone facing or a combination of stone and brick facades), pre-International styles (Classical, Beaux Arts, and Art Deco) and massing. Some of these apartments buildings replaced the original houses and mansions which used to line Park and Lexington Avenues.

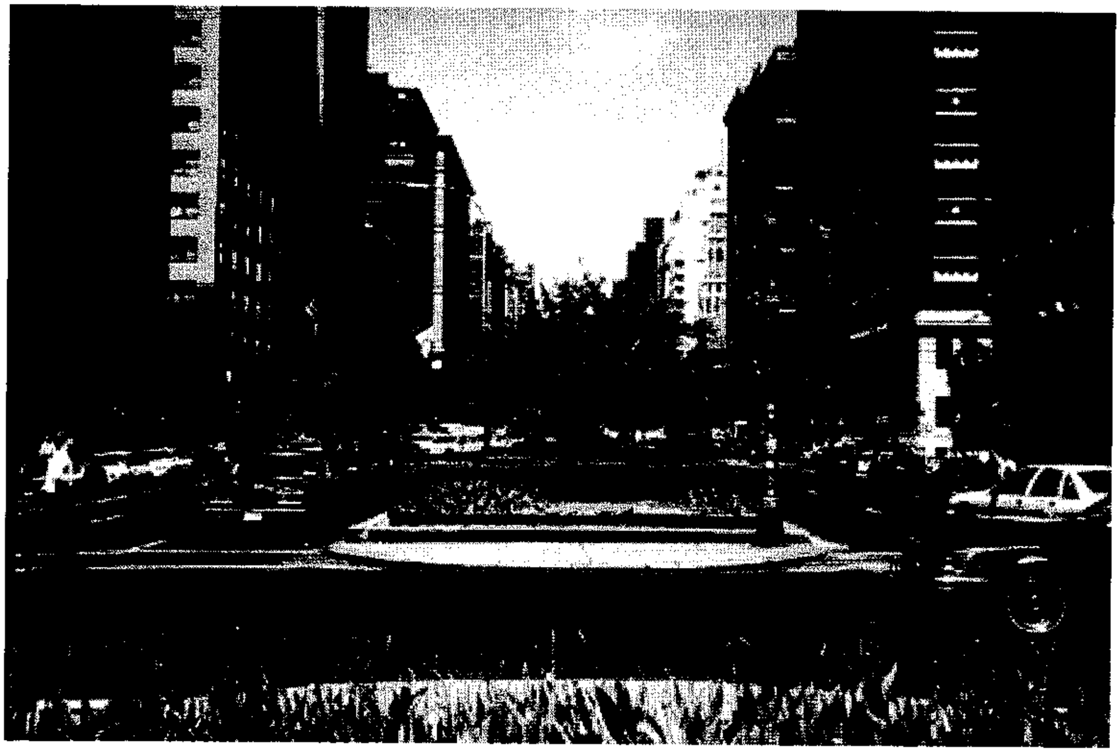
In general, in the area to the east of Park Avenue and bounded by the east-west cross streets between 43rd and 62nd Streets, there is a mixture of commercial and residential building uses, ranging from low and mid-rise commercial buildings (offices and retail uses) to low and mid-rise residential apartments. This area originally developed around a mixture of low rise (four to six story brick buildings and townhouse structures, and many of these structures date back 100 years or more. Over the years, some of these townhouses have been converted to commercial uses, with newer and taller commercial and residential buildings have been interspersed among the older buildings. With these varied development patterns, there is a visual diversity as different building types and styles co-mingle in this area.

On the east side, between 62nd and 66th Streets, the east-west streets are primarily, though not exclusively, composed of low-rise residential buildings and brownstones between the avenues. Compared to the visual and land use diversity of the neighborhood to the south, the buildings in this area are a bit more visually uniform.

On the east-west cross streets between Park and Sixth Avenue, and between 40th and 57th Streets, the land uses tend to be mostly commercial and visually the buildings are a mixture of new and old high-rise office buildings and low-rise, older commercial structures. North of 57th Street, still west of Park Avenue, commercial uses begin to give way to a mixture of commercial and residential uses.

Within the MSA, the avenues and side streets serve as view corridors, unifying and pulling together the neighborhoods to form a cohesive urban fabric delineated by building lot lines, heights, and building setbacks. The visual rhythm within Manhattan maintains (in general) the following hierarchy: taller buildings line the avenues, while smaller buildings fill out the side streets. This provides an alternating rhythm of building mass, and provides a pattern for visual continuity, allowing natural light to permeate the smaller scale and narrower side streets. City zoning regulations seeking to maintain this type of rhythm of development have outlawed new construction of “sliver buildings” (skinny, high-rise apartment buildings). Also, recent zoning modifications have rescinded the incentives which allowed tall buildings in plazas to be constructed, in favor of shorter, more traditional buildings filling out the lot lines. This zoning change was made in an effort to promote visual continuity by not interrupting the street wall with plazas, and encouraging a more visually uniform scale of high-rise development.

View North Along Park Avenue at 52nd Street ***Exhibit 3.16-1***



Park Avenue at 60th Street; A Neighborhood Composed of Older Apartment Buildings *Exhibit 3.16-2*

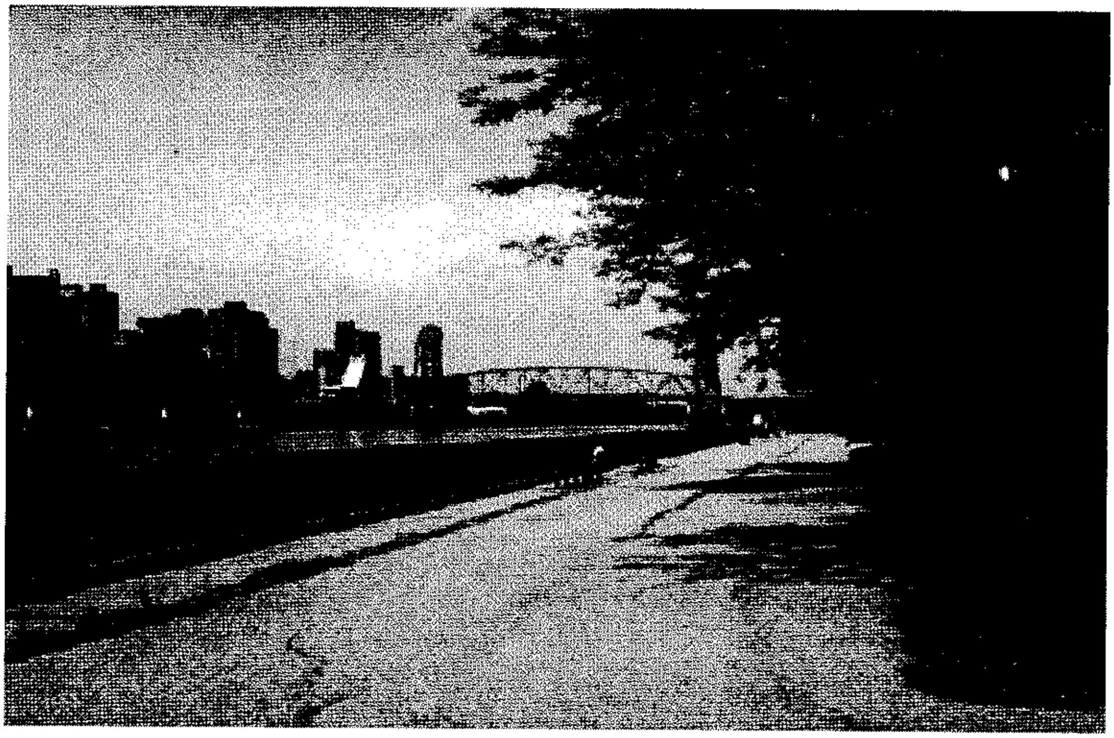
3.16.2 Visual Description of Queens Study Area

In contrast to the dense commercial and residential land use of the MSA, the QSA is less intensively developed, and retains entirely different land use and visual characteristics. Within the QSA, there are several distinct types of land uses.

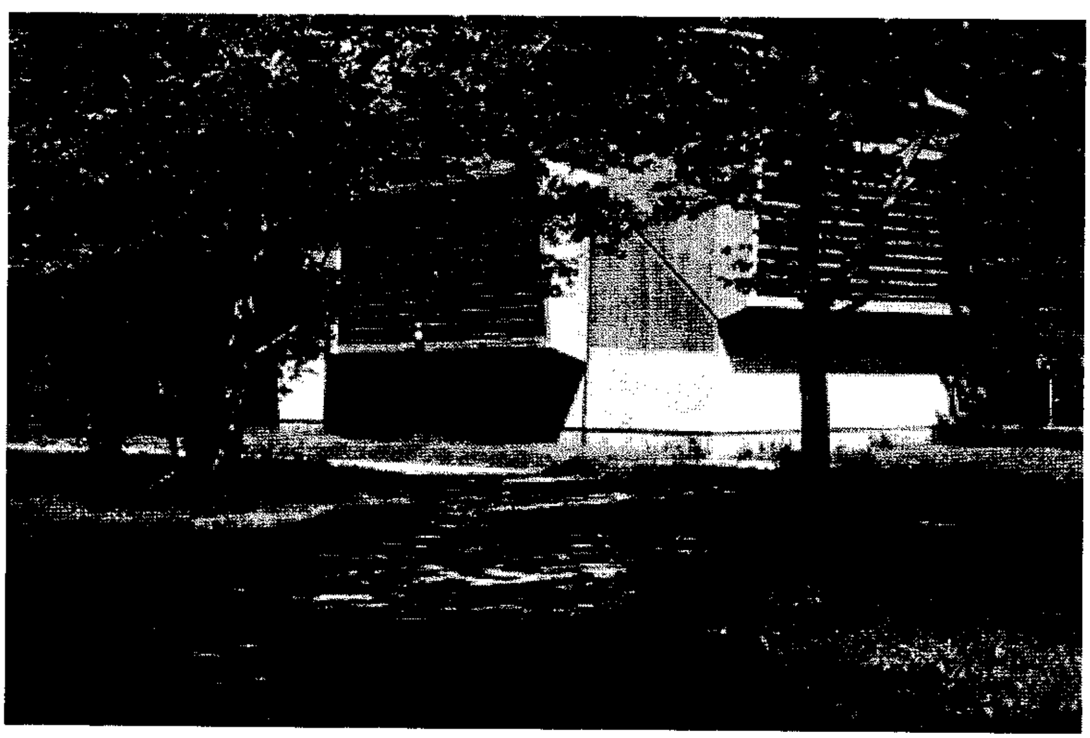
Between the East River and Vernon Boulevard lies Queensbridge Park, a public riverfront park with views of Roosevelt Island and Manhattan Island beyond. The park is arranged along an east-west visual axis, to capitalize on these riverfront views. Exhibit 3.16-3 depicts the view northwest from Queensbridge Park to Roosevelt Island, where the 63rd Street Tunnel passes beneath this park. A small, one story vent structure serving both the upper (NYCT subway) level and lower (LIRR) level of the 63rd Street Tunnel is located at the east side of this park, near 41st Avenue and Vernon Boulevard. This concrete vent structure (Exhibit 3.16-4) is well screened by a number of shade trees and bushes to minimize its visual impact upon park users.

To the east of Queensbridge Park, in the area between Vernon Boulevard and 21st Avenue, is the Queensbridge Housing complex. This complex consists of several brick public housing buildings, six stories tall. As these buildings were all constructed during approximately the same time period, there is a visual continuity within this complex, linked by the same types of building form, mass, texture and facade materials. Queensbridge Housing is depicted in Exhibit 3.16-5.

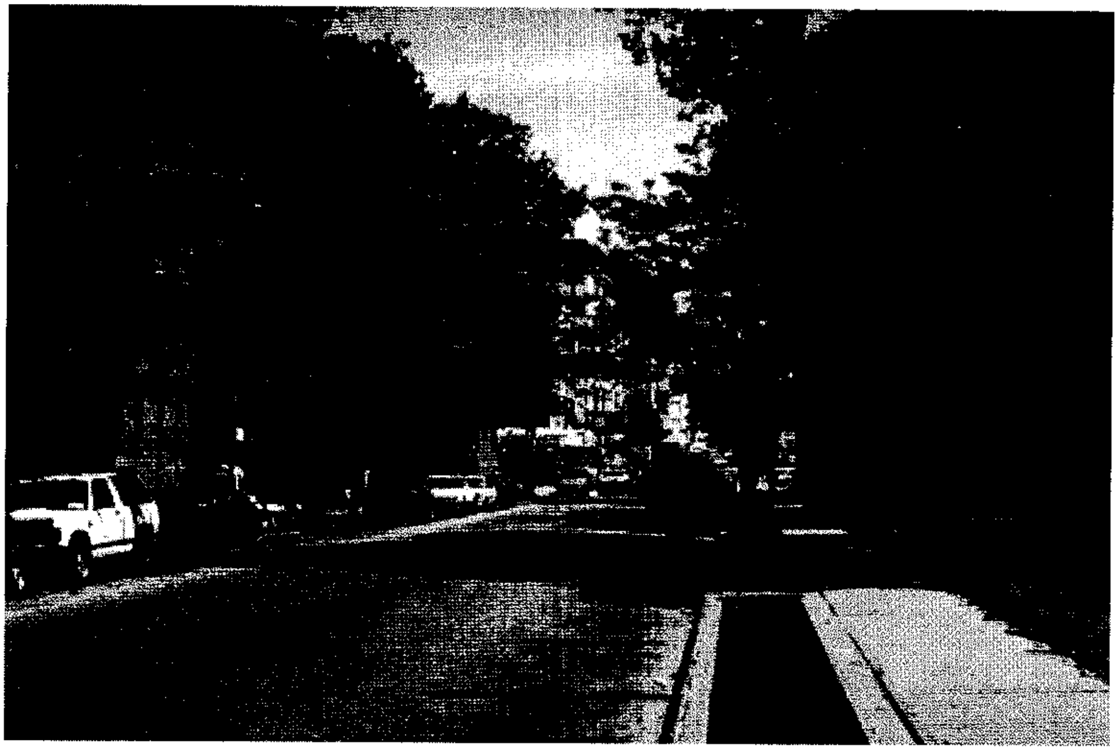
The Queensbridge Housing complex stands in visual contrast with the adjacent land uses between 21st Avenue and Northern Boulevard, which consists of commercial and light industrial use buildings; and particularly to the east of Crescent Street, which interspersed with single family houses. As illustrated in Exhibits 3.16-6 and 3.16-7, most of these commercial and residential buildings are low rise, generally no taller than two or three stories.



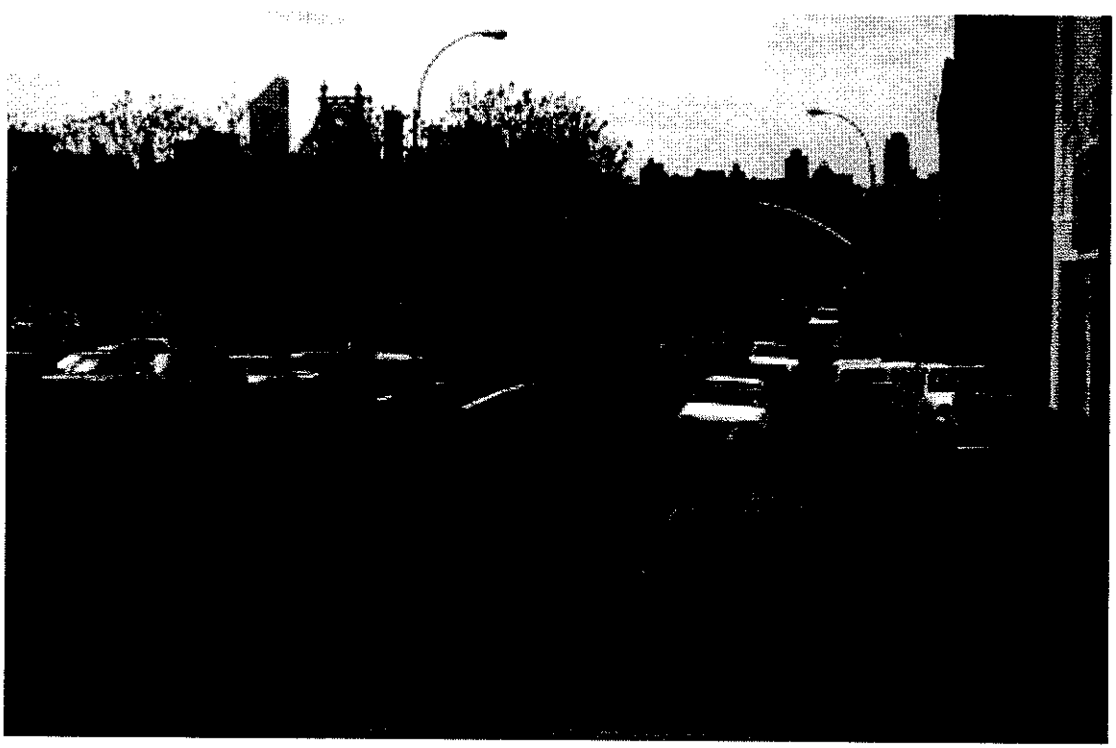
Queensbridge Park Queens; Looking Northwest to Roosevelt Island ***Exhibit 3.16-3***



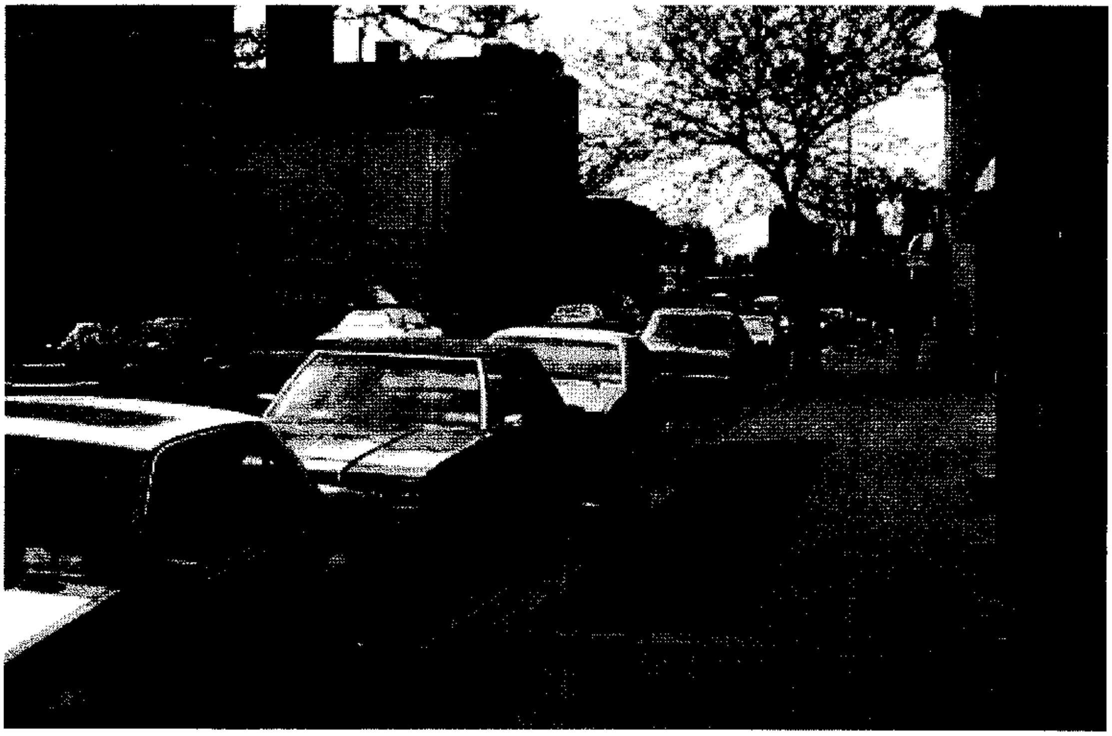
63rd Street Tunnel Vent Structure on the East Side of Queensbridge Park ***Exhibit 3.16-4***



Queensbridge Houses; Looking Eastbound on 41st Avenue at 12th Street *Exhibit 3.16-5*



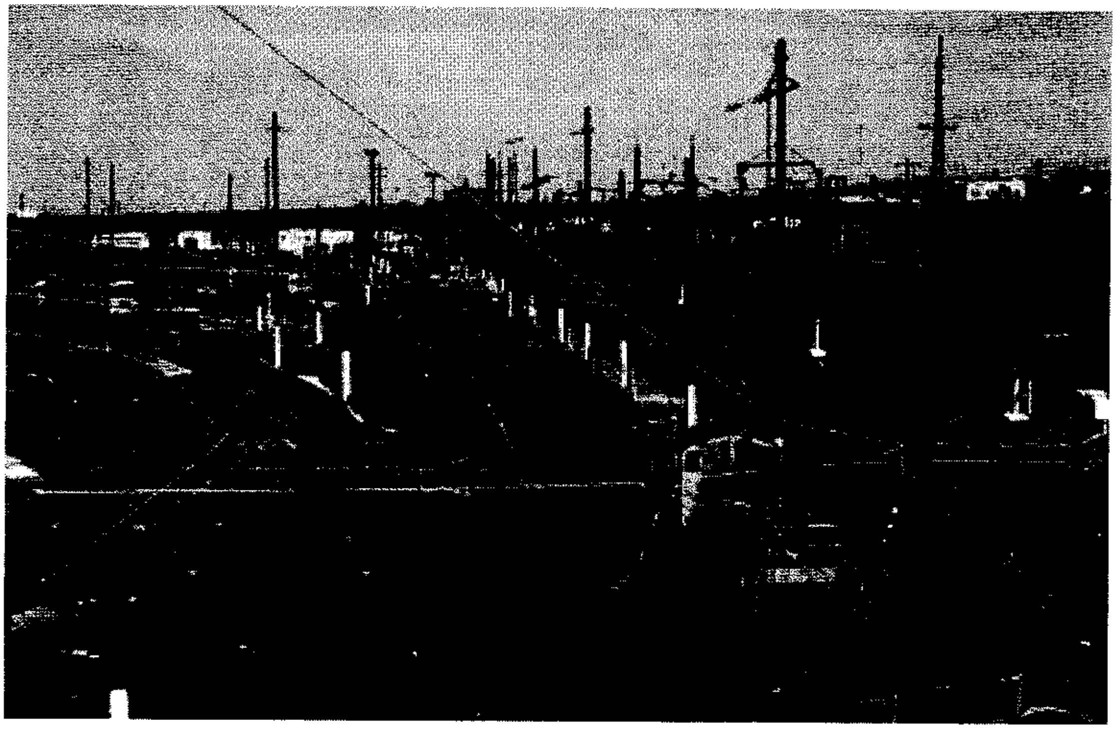
View Westbound Along 41st Avenue at 24th Street *Exhibit 3.16-6*



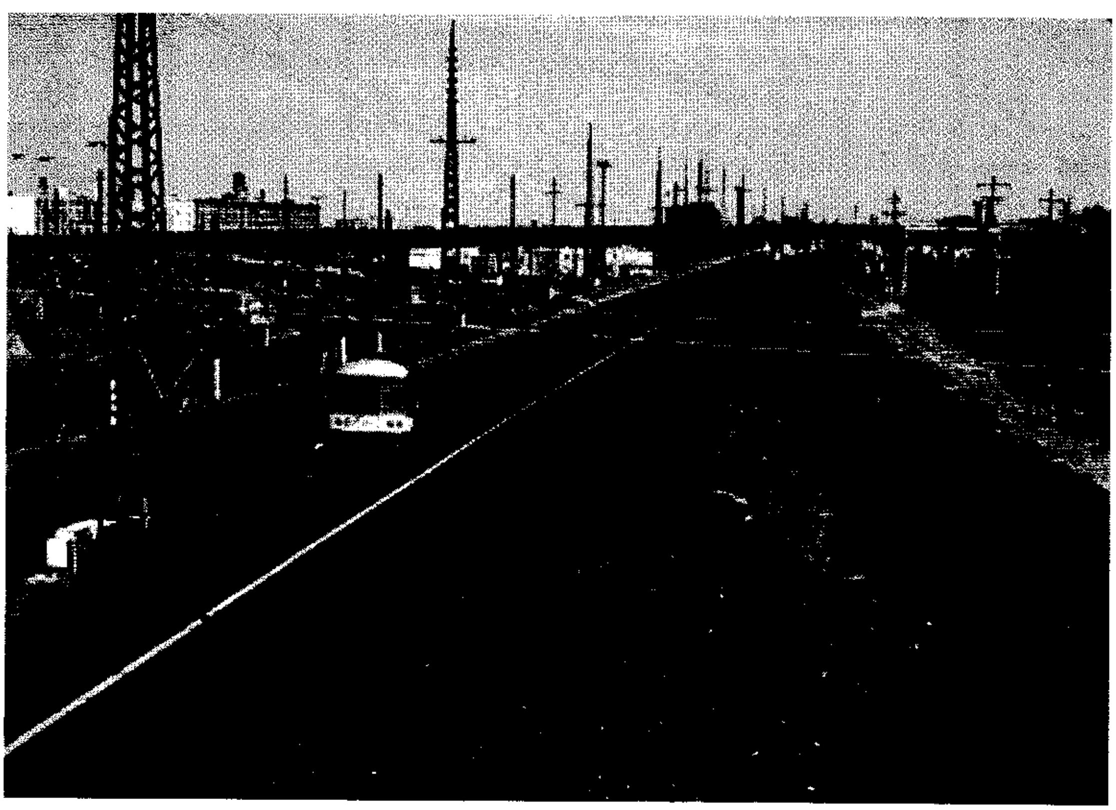
View Westbound Along 41st Avenue, Between 27th and 28th Street *Exhibit 3.16-7*

At the eastern edge of the PSA is the Sunnyside Yard complex, a large train storage and servicing yard used by Amtrak and NJ Transit. This Yard dominates the visual landscape, and is ringed by various light industrial buildings and warehouses. Yard A, a freight yard used by the LIRR, is located along the western perimeter of Sunnyside Yard. Harold Interlocking, a key junction connecting Penn Station New York with the LIRR lines to the east and Amtrak's Northeast Corridor line north to Boston, is located along the southern perimeter of Sunnyside Yard.

To the casual observer, these rail yards and interlockings, as depicted in Exhibits 3.16-8, 3.16-9, and 3.16-10 may appear as a tangle of tracks, viaducts, overhead wires, signal masts, and other railway infrastructure-related. However, much of Sunnyside Yard is visually hidden by a series of earthen embankments, roadway bridges and trees. Between the Spring and Fall, when the trees are in leaf, these trees located along the southern and eastern perimeter of Sunnyside Yard, and along the Main Line tracks, soften this industrial landscape and screen the eastern and southern perimeters of the Yard, the open cuts of track, track embankments and tunnel portals.



Sunnyside Yard; Looking East from Queens Boulevard Bridge *Exhibit 3.16-8*



Harold Interlocking and LIRR Main Line East of Queens Boulevard Bridge *Exhibit 3.16-9*

Despite the physical sprawl of both Sunnyside Yard and Yard A, there are few opportunities to peer into the Yard from the surrounding community. Even when crossing the three bridges which span the entire width of Sunnyside Yard, at Queens Boulevard, and the Honeywell Street and 39th Street Bridges, the view into Sunnyside Yard is limited, since all three bridges are lined with tall walls which hinder motorists, pedestrians and bicyclists from peering over the side of the

bridges into the Yard below. Only those passengers riding in buses, tall trucks or on the elevated subway trains of the Flushing Line (which use the top deck of the Queens Boulevard bridge) will be able to look down into the Yard and depending upon the speed of traffic, this is only a transitory view. The view of the corridors of the Yard are illustrated in Figure 3.16-1.

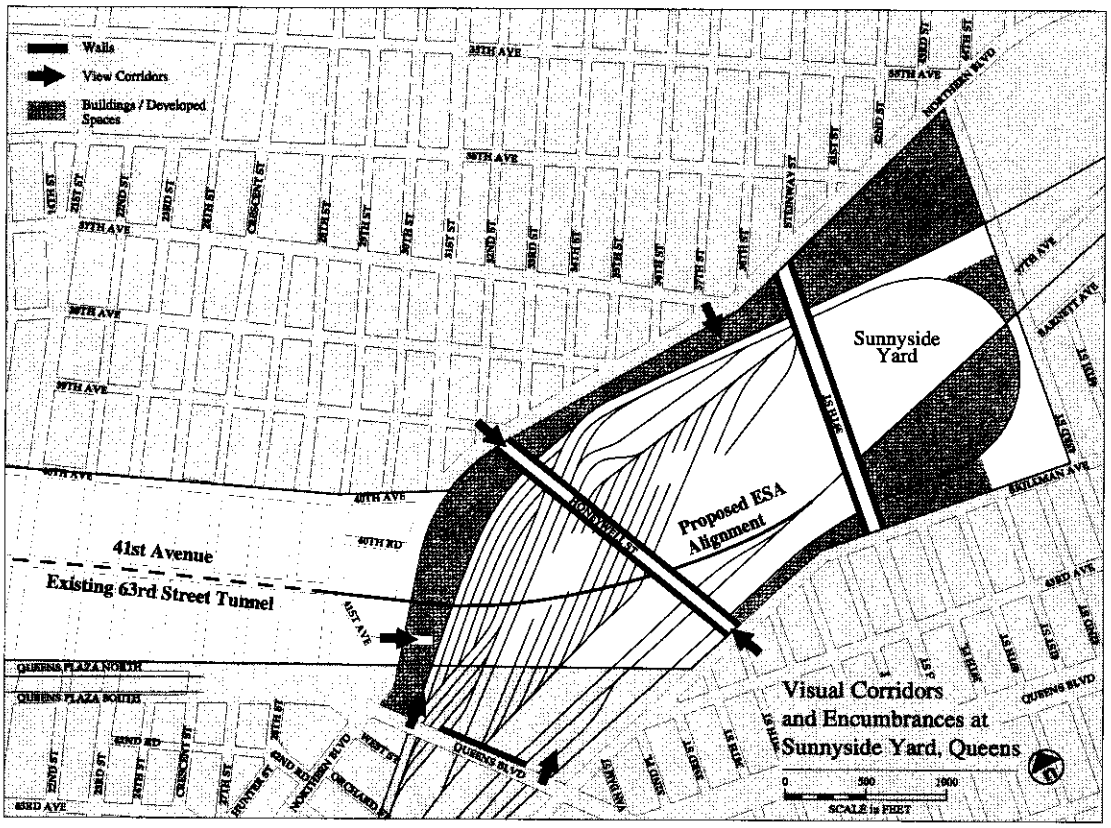


Figure 3.16-1

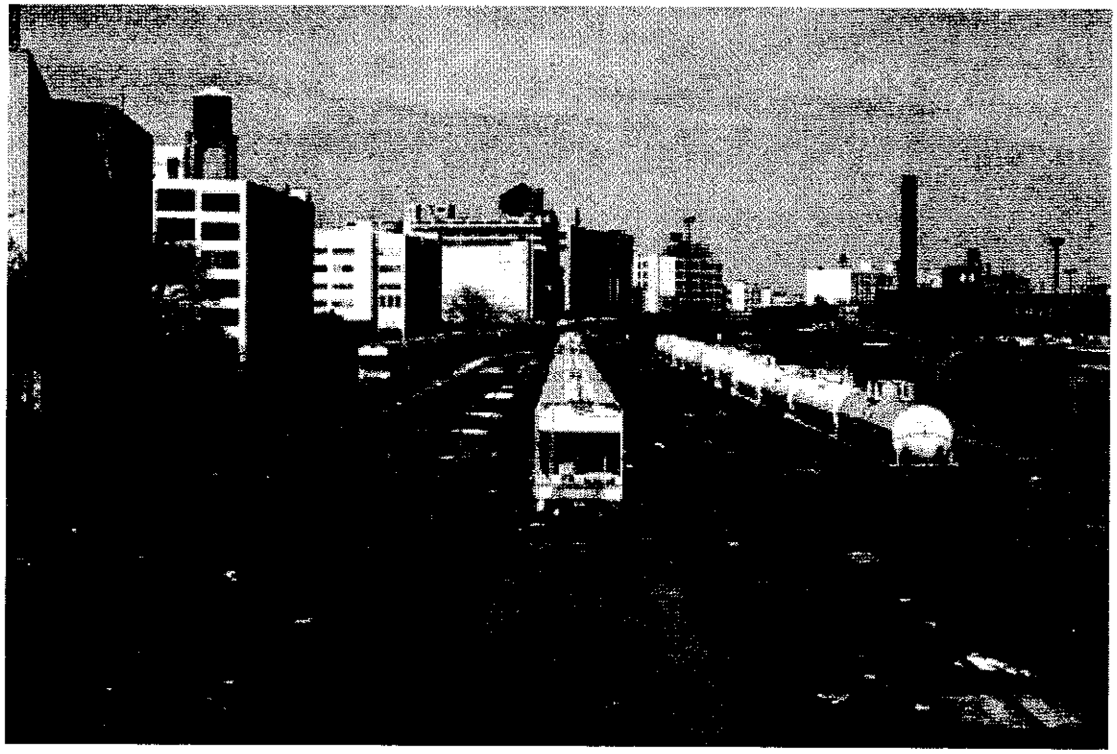
As illustrated in Exhibit 3.16-11, the northern perimeter of Sunnyside Yard (and Yard A) is effectively screened from Northern Boulevard, and the residential neighborhood west of Northern Boulevard, by various light industrial and multi-story buildings which lie between the Boulevard and the Yard, and the change in the below-grade yard elevation. Pedestrian views of Sunnyside Yard are limited to the ends of two cul-de-sacs, one located at 41st Avenue and the other at Standard Lane. At both cul-de-sacs, Sunnyside Yard is in a large open cut below street level, and at the 41st Avenue cul-de-sac, the view into the Yard is partially screened by trees.

The Sunnyside Yard Loop forms the eastern boundaries of Sunnyside Yard, and the four track Yard Loop is located in a tree-lined open cut adjacent to 43rd Street. Light industrial buildings along the west side of 43rd Street effectively serve as a visual buffer against the residential development on the east side of 43rd Street. The General Motors automobile fleet service and maintenance facility in the Sunnyside Yard parcel bounded by the curving Loop tracks, the LIRR Main Line, and 39th Street Bridge add another visual buffer between the Yard and the residential areas south of Skillman Avenue and East of 43rd Street.

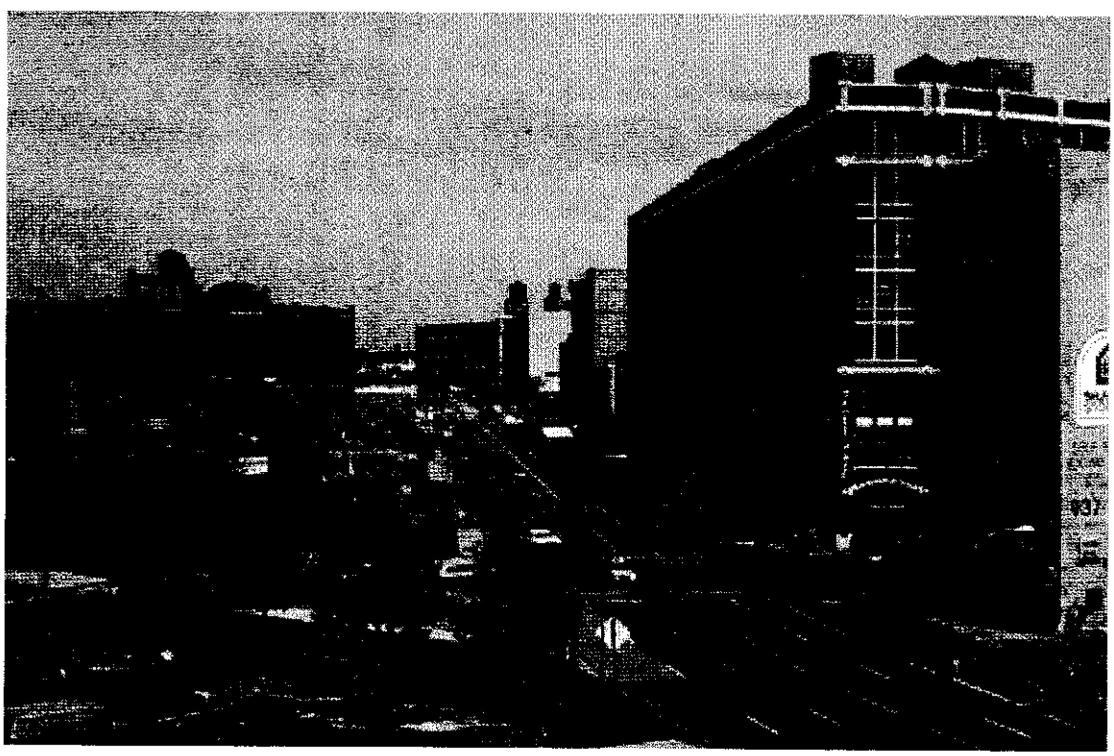
The southeastern perimeter of Sunnyside Yard is equally well screened by mature trees and foliage along the Loop Tracks, and by the fact that the Loop Tracks are in an deep open cut which makes it difficult to see these tracks from the surrounding streets above. At Skillman Avenue and 43rd Street, the LIRR Main Line is on an earthen embankment approximately two blocks north of Skillman Avenue; this embankment provides an additional layer of visual screening between the neighborhood south of Sunnyside Yard and the interior of the Yard itself.

Along the southern perimeter of Sunnyside Yard, or along the north sides of Skillman and Barnett Avenues are light industrial, commercial or manufacturing buildings. These buildings, as illustrated in Exhibit 3.16-12, effectively serve as a visual barrier between the residential homes and apartments which are on the other side (south side) of Skillman and Barnett Avenues, and between Sunnyside Yard which is immediately behind, and below this strip of commercial buildings. For instance, on Skillman Avenue between 39th and 43rd Streets, the view into Sunnyside Yard is blocked by a line of low-rise light manufacturing buildings (except for one vacant lot). Again, the street level view behind these buildings is further obstructed by the LIRR Main Line embankment approximately 200 feet north of Skillman Avenue. Though outside of the PSA, to the south of Sunnyside Yard, is the neighborhood of Sunnyside. In the area adjacent, and southeast of Sunnyside Yard, bounded by 39th Street, Queens Boulevard, 48th Street, Barnett Avenue, and 43rd Street, the area is a mixture of residential single family homes, and multi-story garden apartments, generally not exceeding six stories tall. This residential area has a comfortable visual continuity, tied together by the landscaping along the streets and in some cases, by the common back lot gardens.

Further to the west, along the north side of Skillman Avenue between the 39th Street Bridge and the Honeywell Street Bridge (which both span Sunnyside Yard), the view into the Yard is blocked by a line of mature trees along the north side of Skillman Avenue, and also by the LIRR Main Line, which at this point is on an earthen embankment approximately 230 feet north of Skillman Avenue. The Loop Tracks are recessed into a deep open cut approximately 115 feet north of Skillman Avenue, and are out of sight from the north side of the sidewalk along Skillman Avenue.



LIRR Yard A Freight Yard East of Queens Boulevard Bridge *Exhibit 3.16-10*



Warehouses and Light Manufacturing Buildings Along Northern Boulevard Block Views of Sunnyside Yard *Exhibit 3.16-11*

Commercial Strip on South Side of Sunnyside Yard Block Yard Views ***Exhibit 3.16-12***

Footnotes:

[1]New York City Transit's (NYCT) most recent Station Planning and Design Guidelines (1991) provide level-of-service criteria for various station elements and were used in these analyses.

[2]New York Power Authority - 1992 Annual Report

[3]USEPA. 1972. Report to the President and the Congress on Noise. Senate Document No. 92-63.

[4]Egan, M.D. 1972. Concepts in architectural acoustics. McGraw-Hill.

[5]USEPA. 1971. Community noise. NTID 300.3.

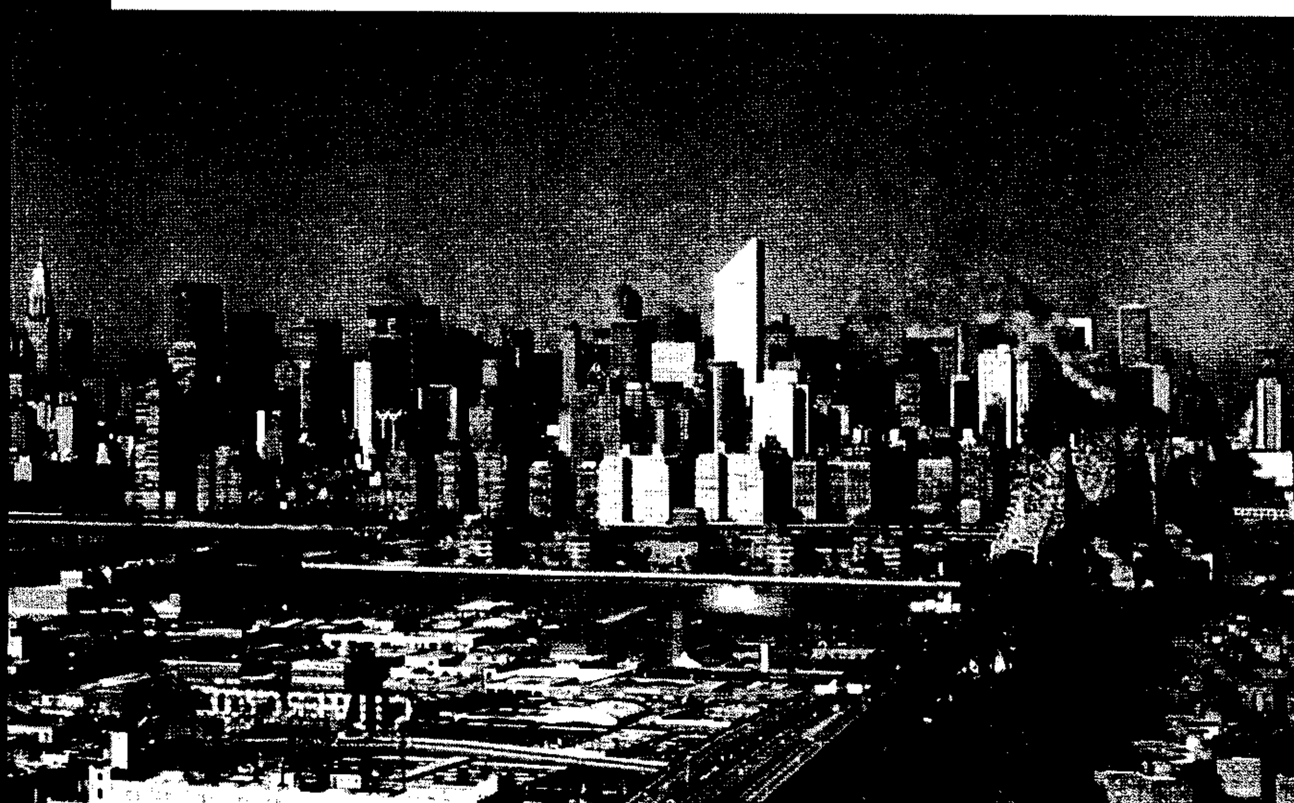
[6]USEPA. 1974. Information on Levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety. 550/9-74-004.

[7]Federal Transit Administration USDOT Transit Noise and Vibration Impact Assessment. April 1995.

[8]Information on original use and equipment of buildings from Gibbs, pp. 316-322; dimensions from Barker, p. 116.

Chapter 4

Transportation Impacts



MTA Long Island Rail Road

4.0 TRANSPORTATION IMPACTS

This chapter presents the impacts of the No Build, TSM, and Build Alternatives on the transit service, transit ridership, roadway network system and parking in the New York Region and Long Island Transportation Corridor, as well as the levels of service and the resulting patronage for each alternative.

4.1 Commuter Rail Impacts

4.1.1 Service Characteristics

The performance of each alternative is dependent on the extent to which it improves transit service for both existing and potential users. A number of factors can impact transit service, including:

- Service supply and capacity,
- Geographic coverage,
- Speed and travel time,
- Number of transfers required,
- Reliability,
- Comfort.

The following sections provide information on these service characteristics.

4.1.1.1 Service Supply and Capacity

Table 4.1-1 shows the projected LIRR service characteristics for each of the alternatives including daily vehicle hours of service, daily vehicle miles traveled (VMT) and the daily place-miles of service. Place-miles refer to the total passenger carrying capacity of vehicles (both seated and standing) and is calculated by multiplying the capacity of each car by the number of actual car miles traveled on a typical weekday. Place-miles are an indicator of the seated and standing capacity and is a better quantitative measure of service than vehicle hours or VMT. Daily vehicle hours and miles are the cumulative time that vehicles are in service and the distance they travel, respectively. It should be noted however that the presence of standees is an unacceptable condition for a long haul commuter railroad.

TABLE 4.1-1
Weekday Summary of Service Characteristics Year 2020

Service Characteristic	No Build	TSM	Build Alternative
Vehicle Hours Weekday	5,580	5,811	6,546
VMT Weekday	181,777	188,513	250,177
Place-Miles Weekday	31,810,975	32,989,775	43,781,045

Note:
Average capacity of 175 places per LIRR railcar (both seated and standing) including single-deck and bi-level vehicles.

TSM Alternative

The weekday vehicle hours in the Long Island Transportation Corridor under the TSM Alternative would increase by 231 compared to the No-Build Alternative, while VMT would increase by 6,736 per weekday and rail place miles would increase by 1,178,800.

Build Alternative

The weekday vehicle hours in the Long Island Transportation Corridor under the Build Alternative would increase by 966 compared to the No-Build Alternative and by 735 compared to the TSM Alternative. In addition, VMTs would increase by 68,400 per weekday compared to the No Build and by 61,664 compared to the TSM. Finally, rail place miles would increase by 11,970,070 compared to the No Build and by 10,791,270 compared to the TSM.

4.1.1.2 Geographic Coverage

The coverage areas for the alternatives will remain the same in Nassau and Suffolk Counties. For the Build Alternative in Queens, a rail station in the vicinity of Sunnyside Yard would be constructed and would provide access to the nearby business district. In Manhattan, a new terminal within GCT would provide access to East Midtown for LIRR customers.

4.1.1.3 Travel Time and Transfers Required

To provide a consistent measure, running times have been calculated from the LIRR Jamaica Station to a predetermined Midtown Manhattan travel destination. That location is the corner of Park Avenue and 46th Street, and is based upon an approximate "geographical center" of the majority of the LIRR East Side customers. For Port Washington Branch service into Midtown Manhattan, which does not reach Jamaica, a typical express train was estimated to require 1-2 additional minutes to reach GCT compared to current LIRR service to Penn Station New York.

Given that peak hour travel times can vary due to factors such as connections enroute, individual modal running times, etc., a range of two running times for each alternative has been provided. The "best case" trip time is represented by the "Fastest Trip Times" heading, which means that all modes are operating normally, all connections are made immediately, and the passenger knows the most direct path to use in order to transfer between modes. The "Typical Trip Times" is a slightly more relaxed and more realistic version of these travel times and represents the more probable total trip time between two points. Also, it assumes some waiting for travel connections, a slightly longer walking time, and in some cases, extended modal trip times.

Presently, LIRR passengers wishing to travel from Long Island to East Midtown Manhattan have to make at least one transfer by public transit except for the few who walk or take taxi service from Penn Station. The Build Alternative will allow most of these commuters to have a one-seat ride into East Midtown Manhattan. The dual-mode trains set to enter LIRR service in 1998 on non-electrified branches (Port Jefferson, Oyster Bay, Montauk) will provide a one-seat ride into Penn Station New York; however, these locomotives and cars are too large to operate within the clearance envelope of the lower level of the 63rd Street Tunnel. Thus, those LIRR customers traveling from diesel territory will still need to make at least one transfer (at Jamaica or where electrified service is available), or possibly two transfers enroute (at Penn Station New York), before being able to access GCT.

No-Build Alternative

A number of assumptions were made for the No-Build Alternative to calculate running times. These include the following:

- Final destination of LIRR customers is Park Avenue and 46th Street.
- LIRR passengers are riding in one of the four LIRR cars nearest the exit closest to the subway station.
- LIRR customers already have NYCT fare media in hand and do not have to wait to purchase subway tokens or a MetroCard.
- LIRR passengers are able to board the first arriving subway train.
- LIRR passengers are able to board first shuttle bus at Hunterspoint Avenue and/or first ferry at Long Island City, as well as first shuttle bus on the Manhattan side of East River.

Table 4.1-2, the trip table for the No-Build Alternative, displays by scenario both the fastest and typical trip times and the number of required transfers from LIRR's Jamaica Station to GCT.

TABLE 4.1-2
No-Build Alternative
Trip Times & Number of Transfers
Long Island to GCT

Port Washington Branch to Penn Station to IRT Shuttle to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Express trip Port Washington to Penn Station	35	40
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Shuttle platform	3	4
Wait for Shuttle train to Grand Central	1	3
Shuttle to Grand Central	3	3
Walk to Park Avenue and 46th Street	5 to 6	7 to 8
Total Trip Time	**54 to 55**	**68 to 69**

Port Washington Branch to Penn Station to Flushing Line to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Express trip Port Washington to Penn Station	35	40
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Flushing Line platform	2	3
Wait for Flushing train to Grand Central to depart	1	3
IRT train to Grand Central	4	4
Walk to Park Avenue and 46th Street	7	11
Total Trip Time	**56**	**72**

Jamaica to Penn Station to IRT Shuttle to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Penn Station	18	18
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Shuttle platform	3	4
Wait for Shuttle train to Grand Central	1	3
Shuttle to Grand Central	3	3
Walk to Park Avenue and 46th Street	5 to 6	7 to 8
Total Trip Time	**37 to 38**	**46 to 47**

TABLE 4.1-2 (cont'd)
No-Build Alternative
Trip Times & Number of Transfers
Long Island to GCT

Jamaica to Penn Station to Flushing Line to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Penn Station	18	18
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Flushing Line platform	2	3
Wait for Flushing train to Grand Central to depart	1	3
IRT train to Grand Central	4	4
Walk to Park Avenue and 46th Street	7	11
Total Trip Time	39	50

Jamaica to Hunterspoint Avenue to Flushing Line to GCT (1 Transfer)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Hunterspoint Avenue Station	17	17 to 18
Arrive LIRR Hunterspoint Avenue Station, walk to subway platform	4	6
Wait for IRT #7 train	1	3
Subway to Grand Central	6	6
Walk to Park Avenue and 46th Street	7	11
Total Trip Time HPA to Park & 46th Street	18	26
Total Trip Time Jamaica to Park & 46th Street via HPA	35	43 to 44

Jamaica to Hunterspoint Avenue to Ferry to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Hunterspoint Avenue Station	17	17 to 18
Arrive LIRR Hunterspoint Avenue Station, board shuttle bus	3	5
Shuttle bus Hunterspoint Avenue to Long Island City ferry slip	3 to 4	4
Wait for next departure of ferryboat	4	10
Ferry Long Island City to Manhattan	4	4
Shuttle bus 34th St to Park Avenue & 49th St (timed connection)	21	24
Walk to Park Avenue and 46th Street	2	3
Total Trip Time HPA to Park & 46th Street	37 to 38	50
Total Trip Time Jamaica to Park & 46th Street via HPA	54 to 55	67 to 68

TABLE 4.1-2 (cont'd)
No-Build Alternative
Trip Times & Number of Transfers
Long Island to GCT

Jamaica to Long Island City to Ferry to GCT (2 Transfers)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Train from Jamaica to Long Island City Station	23	24
Arrive LIRR Long Island City terminal, walk to ferry terminal	3	5
Wait for next departure of ferryboat	5	9
Ferry Long Island City to Manhattan	4	4
Shuttle bus 34th St to Park Avenue & 49th St (timed connection)	21	24
Walk to Park Avenue and 46th Street	2	3
Total Trip Time LIC terminal to Park & 46th Street	35	45
Total Trip Time Jamaica to Park & 46th Street via LIC	58	69

TSM Alternative

A number of assumptions were made for the TSM Alternative to calculate running times. These include the following:

- Final destination of LIRR customers is Park Avenue and 46th Street.
- A new, direct, weather protected, passenger connection between the LIRR and NYCT platforms at Hunterspoint Avenue has been constructed saving one minute of transfer time between the two systems.
- LIRR customers already have NYCT fare media in hand and do not have to wait to purchase subway tokens or a MetroCard.
- LIRR passengers are able to board the first arriving subway train.
- Additional IRT #7 subway trains operating; Flushing Line operating at maximum reliable capacity.

Table 4.1-3, the trip table for the TSM Alternative, displays by scenario both the fastest and the typical trip times and the required number of transfers from LIRR's Jamaica Station to GCT.

TABLE 4.1-3
TSM Alternative
Trip Times & Number of Transfers
Long Island to GCT

Port Washington Branch to Penn Station to IRT Shuttle to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Express trip Port Washington to Penn Station	35	40
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Shuttle platform	3	4
Wait for Shuttle train to Grand Central	1	3
Shuttle to Grand Central	3	3
Walk to Park Avenue and 46th Street	5 to 6	7 to 8
Total Trip Time	**54 to 55**	**68 to 69**

Port Washington Branch to Penn Station to Flushing Line to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Express trip Port Washington to Penn Station	35	40
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Flushing Line platform	2	3
Wait for Flushing train to Grand Central to depart	1	3
IRT train to Grand Central	4	4
Walk to Park Avenue and 46th Street	7	11
Total Trip Time	**56**	**72**

Jamaica to Penn Station to IRT Shuttle to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Penn Station	18	18
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Shuttle platform	3	4
Wait for Shuttle train to Grand Central	1	3
Shuttle to Grand Central	3	3
Walk to Park Avenue and 46th Street	5 to 6	7 to 8
Total Trip Time	**37 to 38**	**46 to 47**

TABLE 4.1-3 (cont'd)
TSM Alternative
Trip Times & Number of Transfers
Long Island to GCT

Jamaica to Penn Station to Flushing Line to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Penn Station	18	18
Arrive Penn Station, walk to IRT 7th Avenue Line subway platform	4	6
Wait for IRT #1, #2, #3, #9 trains	1	3
Subway to Times Square	2	2
Walk/transfer to Flushing Line platform	2	3
Wait for Flushing train to Grand Central to depart	1	3
IRT train to Grand Central	4	4
Walk to Park Avenue and 46th Street	7	11
Total Trip Time	39	50

Jamaica to Hunterspoint Avenue to Flushing Line to GCT (1 Transfer)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Hunterspoint Avenue Station	17	17 to 18
Arrive LIRR Hunterspoint Avenue Station, walk to subway platform	3	5
Wait for IRT #7 train	1	2
Subway to Grand Central	6	6
Walk to Park Avenue and 46th Street	7	11
Total Trip Time HPA to Park & 46th Street	17	24
Total Trip Time Jamaica to Park & 46th Street via HPA	34	41 to 42

Jamaica to Hunterspoint Avenue to Ferry to GCT (2 Transfers)

	Fastest	Typical
	Total Trip Time in Minutes	
Train from Jamaica to Hunterspoint Avenue Station	17	17 to 18
Arrive LIRR Hunterspoint Avenue Station, board shuttle bus	3	5
Shuttle bus Hunterspoint Avenue to Long Island City ferry slip	3 to 4	4
Wait for next departure of ferryboat	3	5
Ferry Long Island City to Manhattan	4	4
Shuttle bus 34th St to Park Avenue & 49th St (timed connection)	21	24
Walk to Park Avenue and 46th Street	2	3
Total Trip Time HPA to Park & 46th Street	36 to 37	45
Total Trip Time Jamaica to Park & 46th Street via HPA	53 to 54	62 to 63

TABLE 4.1-3 (cont'd)
TSM Alternative
Trip Times & Number of Transfers
Long Island to GCT

Jamaica to Long Island City to Ferry to GCT (2 Transfers)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Train from Jamaica to Long Island City Station	23	24
Arrive LIRR Long Island City terminal, walk to ferry terminal	3	5
Wait for next departure of ferryboat	3	5
Ferry Long Island City to Manhattan	4	4
Shuttle bus 34th St to Park Avenue & 49th St (timed connection)	21	24
Walk to Park Avenue and 46th Street	2	3
Total Trip Time LIC terminal to Park & 46th Street	33	41
Total Trip Time Jamaica to Park & 46th Street via LIC	56	65

Table 4.1-4 lists travel time savings for those express bus routes in Brooklyn and Queens that would potentially benefit from a Long Island HOV lane, since they currently operate a portion of their route over the Long Island Expressway. Currently there are 24 express bus routes operating through the Queens-Midtown Tunnel during weekdays, and under this alternative, no new express bus routes will be established to serve Queens or Brooklyn riders. Twenty of these express bus routes operate inbound service via the Queens-Midtown Tunnel in the morning, with outbound bus service from Manhattan routed via the Queensboro Bridge and Queens Boulevard in the afternoon.

As discussed with NYCDOT and NYSDOT, most of these express buses will travel from Manhattan via the Queensboro Bridge and Queens Boulevard instead of using the Queens-Midtown Tunnel and the Long Island Expressway. The lack of an afternoon HOV lane along the Queensboro Bridge and Queens Boulevard is not expected to reduce current express bus travel times along this route.

TABLE 4.1-4
Express Bus Travel Time Savings HOV/Bus Lane

Bus Route	Operator	HOV Time Savings
JFK Airporter	Carey Transportation	7 Minutes
QM1	Queens Surface	7 Minutes
QM1A	Queens Surface	7 Minutes
QM2	Queens Surface	7 Minutes
QM2A	Queens Surface	7 Minutes
QM3	Queens Surface	7 Minutes
QM4	Queens Surface	7 Minutes
QM10	Triboro Coach	7 Minutes
QM11	Triboro Coach	7 Minutes
QM12	Triboro Coach	7 Minutes
QM15	Green Bus Lines	7 Minutes
QM16	Green Bus Lines	7 Minutes
QM17	Green Bus Lines	7 Minutes
QM18	Green Bus Lines	7 Minutes
QM21	Jamaica Buses	7 Minutes
QM22	Triboro Coach	2 Minutes
QM23	Green Bus Lines	7 Minutes
QM24	Triboro Coach	7 Minutes
QM24W	Triboro Coach	7 Minutes
BQM1	Command Bus Company	7 Minutes
X51	NYCT	7 Minutes
X63	NYCT	7 Minutes
X64	NYCT	7 Minutes
X68	NYCT	7 Minutes

Build Alternative

A number of assumptions were made for the Build Alternative to calculate running times. These include the following:

- Final destination of LIRR customers is Park Avenue and 46th Street.
- A maximum of 24 LIRR trains per hour would travel into the LIRR portion of GCT.
- The maximum LIRR train length is 1,020 feet, or 12 M1/M3 car lengths.
- Only electric multiple-unit railcars will operate into GCT; dual-mode locomotives and bi-level railcars cannot operate through the 63rd Street Tunnel due to tunnel clearance restrictions.

- LIRR trains operating between Jamaica and Manhattan via Main Line will make a stop at the Sunnyside Station or will bypass the station.

- LIRR trains operating between Port Washington and Manhattan will either make a stop at an intermediate station or will bypass the station.

- The fastest Port Washington running times are based upon existing LIRR express schedules with two intermediate station stops.

Table 4.1-5, the trip table for the Build Alternative, displays by scenario both the fastest and typical trip times from LIRR's Jamaica Station to GCT. Running times reflect the no transfer provision of the Build Alternative.

TABLE 4.1-5
Build Alternative
Trip Times
Long Island to GCT

Jamaica to GCT via Main Line (bypassing an intermediate station)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Jamaica to Grand Central Terminal via 63rd Street Tunnel	19 to 20	20
Walk to Park Avenue and 46th Street (via new North End entrance)	3	4
Total Trip Time Jamaica to Park & 46th Street via 63rd Street Tunnel	22 to 23	24
Port Washington to GCT via Port Washington Branch (bypassing an intermediate station)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Express trip times Port Washington to Grand Central Terminal	36 to 37	37
Walk to Park Avenue and 46th Street (via new North End entrance)	3	4
Total Trip time Port Washington to Park & 46th Street via 63rd Street Tunnel	39 to 40	41
Jamaica to GCT via Main Line (making an intermediate station stop)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Jamaica to Grand Central Terminal via 63rd Street Tunnel	22 to 23	23
Walk to Park Avenue and 46th Street (via new North End entrance)	3	4
Total Trip Time Jamaica to Park & 46th Street via 63rd Street Tunnel	25 to 26	27
Port Washington to GCT via Port Washington Branch (making an intermediate station stop)	**Fastest**	**Typical**
	Total Trip Time in Minutes	
Express trip times Port Washington to Grand Central Terminal	39 to 40	40
Walk to Park Avenue and 46th Street (via new North End entrance)	3	4
Total Trip time Port Washington to Park & 46th Street via 63rd Street Tunnel	42 to 43	44

4.1.1.4 Reliability

A common characteristic of the No Build, TSM and Build Alternatives is that the existing and projected transit services which comprise these alternatives, for the most part, operate along existing, dedicated rights-of-way. The exceptions are those modes of transport (automobiles, taxicabs and buses) which rely upon roadway access to Midtown Manhattan. The issue of reliability generally arises when:

- A passenger has to transfer to another mode of transport or another route to complete his or her journey. Each transfer introduces another potential for delay and/or missed connections.

- A passenger transfers to a mode of transport utilizing Manhattan's congested midtown streets. Those passengers who use an automobile, local bus or a taxicab to reach their Midtown Manhattan destinations are subject to vehicular delays during rush hours. Although certain midtown streets and avenues have designated bus lanes, the use of these lanes by other vehicles stopping, dropping off passengers and turning from these lanes, reduces the reliability of these bus lanes and adds to bus travel trip times.

- Another source of degradation of reliability occurs when the mode of transport is delayed due to congestion from too many transit services competing for limited tunnel, track or street capacity.

Under the No-Build Alternative, the LIRR customer destined to the GCT area from Long Island and Queens will typically travel to Penn Station New York, then transfer to one of several subway or bus lines to complete the journey. Many of these subway lines experience peak period passenger crowding and congestion which diminish reliability. Those LIRR customers who transfer to one of several local bus lines to access the East Midtown area are confronted with vehicular congestion which can significantly degrade bus service reliability.

The Build Alternative will eliminate the need for LIRR customers to transfer to other transit services to access the East Midtown area, which may be subject to either street traffic delays or to NYCT track capacity constraints. Without the need to transfer to other transit services, these delays can be minimized and overall trip reliability can be increased.

4.1.1.5 Comfort

Passenger comfort encompasses a number of interrelated factors which collectively help to shape one's perception of the total trip experience. These factors include the passenger environment (i.e. temperature, aesthetics of one's surroundings, etc.) both on board the vehicle and at the points of embarkation, transfer (if required) and disembarkation. Other important comfort factors include vehicular ride quality, interior passenger space within the vehicle, and the perception of security both on board the vehicle and while at the station. On-board crowding and standees can especially reduce comfort, and the likelihood of obtaining a seat is a key measure of service quality. Other considerations include the number of transfers enroute, and ambient noise levels both while awaiting the vehicle and during the ride itself.

The No Build and TSM Alternatives rely heavily upon the continued need for LIRR customers to transfer (sometimes more than once) to other travel modes to access the East Midtown area, including subway service, local buses, or taxicabs. For those passengers who use the subway to reach their final destinations, the level of comfort is not comparable to the LIRR; on the subway passengers can expect to stand. For those who transfer to local buses to reach East Midtown, bus seats may or may not be available. Because there are approximately 7-10 local bus stops to each mile on north-south avenues, and with midtown traffic being congested, bus trips through the midtown area can be delayed by traffic.

For those LIRR customers transferring at Penn Station New York to midtown subway routes, the need to navigate between Penn Station and adjacent or nearby subway stations, either underground or on city streets exposed to the elements, is another "friction factor" which diminishes comfort.

Neither the No Build nor any of the initiatives under the TSM Alternative provides direct service into East Midtown Manhattan; all of the No Build or TSM journeys require at least one transfer to a local service provider to arrive at East Midtown travel destinations.

Unlike the No Build and TSM Alternatives, the Build Alternative provides direct scheduled service into East Midtown Manhattan. For many LIRR customers, this translates into a one-seat ride (or at most one connecting LIRR train) directly into GCT on railcars with a higher speed and level of comfort than found on NYCT buses or NYCT subway cars. The ability to board a LIRR train from East Midtown also eliminates the uncertainty concerning whether connecting transit services will arrive in time to connect with existing LIRR services out of Penn Station New York, Hunterspoint Avenue or Long Island City stations. For a number of trips between Long Island and East Midtown Manhattan destinations, travel comfort is further enhanced under the Build Alternative since overall trip times will be significantly reduced.

4.2 Ridership and Mode Share for No Build, TSM and Build Alternative

4.2.1 Corridor Ridership

Under the TSM and Build Alternatives, the number of commuter rail linked trips (home to work or work to home) in the Study Area will increase when compared to the No Build for Year 2020. This would fulfill one of the overriding objectives of the project; to direct commuters from auto travel and onto train service that will be part of an improved and more easily accessible rail system. Table 4.2-1 illustrates that in Year 2020 there will be an increase of 2,978 rail trips that will result from the TSM Alternative as compared to the No-Build Alternative. In addition, the Build Alternative will generate 26,310 more rail trips per average weekday over the No-Build Alternative.

Table 4.2-2 compares the number of rail trips to total trips for the Study Area. This includes all trips taken within the corridor, including those that involve travel to a destination east or north of one of the City Zone Terminals (Hunterspoint Avenue, Long Island City, Flatbush Avenue, Penn Station New York and GCT). The data is further segregated into home-based work trips home-based other trips, and non-home-based trips.

TABLE 4.2-1 Weekday Linked Transit Trips Comparison Year 2020			
	No Build	**TSM**	**Build**
Total Linked Commuter Rail Trips	589,046	592,024	615,356
Change from No Build	N/A	2,978	26,310
% Change from No Build	N/A	0.5%	4.5%
Note: Includes Nassau/Suffolk HOV Bus			

The majority of rail trips in the Study Area will be home-based work trips for all three alternatives. According to the Table 4.2-2, within each of the categories there is an increase in the number of rail trips against the total number of trips for each of the three alternatives.

TABLE 4.2-2 Comparison of Study Area Attraction - Production Transit Trips by Mode Share Average Weekday - All Day Year 2020			
Trips	**No Build**	**TSM**	**Build**
Home-Based Work			
Commuter Rail Trips	352,907	354,962	370,632
Total Trips	7,783,991	7,784,633	7,786,221
Rail Mode Share	4.5%	4.6%	4.8%
Home-Based Other			
Commuter Rail Trips	166,455	167,060	172,205
Total Trips	9,066,181	9,066,515	9,066,482
Rail Mode Share	1.8%	1.8%	1.9%
Non Home-Based			
Commuter Rail Trips	69,684	70,003	72,519
Total Trips	2,460,119	2,460,253	2,460,741
Rail Mode Share	2.8%	2.8%	2.9%
All Purposes			
Commuter Rail Trips	589,046	592,024	615,356
Total Trips	19,310,291	19,311,400	19,313,443
Rail Mode Trips	3.1%	3.1%	3.2%

4.2.2 Branch and City Terminal Zone Usage and Mode of Access

Table 4.2-3 shows the breakdown in ridership for each of the LIRR Branches while Table 4.2-4 shows the boardings and alightings at each of the various western terminals under all three alternatives for the AM peak.

According to ridership forecasts found in Table 4.2-3, most of the branches do in fact show a projected increase in ridership for both the TSM and the Build Alternatives as compared to the No-Build Alternative, and an increase in the Build Alternative as compared to the TSM Alternative. Two of the branches where this did not occur were on the Oyster Bay and Montauk Branches which is to be expected since both are primarily in diesel territory and would not provide any significant benefits with LIRR service operating into GCT since dual mode trains would be unable to operate through the 63rd Street Tunnel.

TABLE 4.2-3
AM Peak Long Island Transportation Corridor Ridership
Average Weekday Year 2020

Branch	No Build	TSM	Build
Babylon	37,185	37,283	38,602
Far Rockaway	11,607	11,632	12,086
Hempstead	8,027	7,991	10,458
Long Beach	9,804	9,802	10,072
Montauk	4,929	5,133	5,084
Oyster Bay	3,929	4,210	3,802
Port Jefferson	36,486	37,136	39,011
Port Washington	21,898	21,878	24,833
Ronkonkoma	19,389	19,605	21,296
West Hempstead	3,081	3,081	3,337
Total	**156,335**	**157,751**	**168,581**

Note:

AM peak represents trains arriving at LIRR Western Terminal between 6 - 10 AM.

TABLE 4.2-4
AM Peak Western Terminal Usage Average Weekday Year 2020

Terminal	No Build	TSM	Build
Hunterspoint Ave.	1,460	4,512	99
Long Island City	47	219	22
Flatbush Ave.	11,465	12,191	10,598
Penn Station New York	124,170	121,113	62,377
GCT	0	0	72,200
Total	**137,142**	**138,035**	**145,296**

Note:

AM peak represents trains arriving at LIRR Western Terminal between 6 - 10 AM.

Running two extra trains out of Patchogue to Hunterspoint Avenue and Long Island City under the TSM Alternative may explain the Montauk Branch's higher ridership numbers under this alternative. With regard to the Oyster Bay Branch, some commuters may choose to drive to the Port Washington Branch which would offer faster, more frequent, parallel service directly into GCT under the Build Alternative rather than having to transfer at Jamaica or at Penn Station New York. In addition, running one extra train from Oyster Bay to Hunterspoint Avenue under the TSM Alternative may explain the higher ridership on the brand under this alternative.

It is clear that running extra diesel trains during the AM peak to Hunterspoint Avenue and Long Island City under the TSM Alternative will greatly increase passenger usage at those stations. However, under both the No Build and Build Alternatives, Hunterspoint Avenue and Long Island City will both have significant decreases in passenger usage due to the diversion of some trains to Penn Station New York. The decline in ridership at both Hunterspoint Avenue and Long Island City will be further compounded under the Build Alternative as passengers who formerly used those two stations for a connection either to the #7 Flushing subway line or to the Long Island City ferry would now be able to go directly into GCT.

The numbers shown in Table 4.2-5 indicate that commuter rail ridership increases under both the TSM and Build Alternatives versus the No-Build Alternative, and also under the Build Alternative versus the TSM Alternative. In addition, automobile use under the Build Alternative is slightly less versus both the No Build and TSM Alternatives, and is also less under the TSM Alternative versus the No-Build Alternative.

TABLE 4.2-5
Average Weekday Linked Person Trips By Mode and Alternative
Year 2020

Mode	No Build	TSM	Build
Automobile	13,677,070	13,674,885	13,661,881
Commuter Rail	589,046	592,024	615,356
Subway	3,754,845	3,752,046	3,748,480
Bus	1,289,330	1,292,445	1,287,727
Total	**19,310,291**	**19,311,400**	**19,313,444**

Table 4.2-6 further illustrates the notion that as new opportunities for rail service into East Midtown Manhattan are introduced, automobile trips into the CBD will decrease. The table clearly shows that the average number of weekday automobile vehicle trips and vehicle miles traveled (VMT) under the TSM and Build Alternatives as compared to the No-Build Alternative will decrease. In addition, under the Build Alternative this decrease is significantly greater than the decrease under the TSM, which is to be expected considering the Build Alternative will provide the most efficient and direct trip into East Midtown.

TABLE 4.2-6
Year 2020 Average Incremental Weekday Vehicle Trips and Vehicle Miles (Compared to No-Build Alternative)

	TSM	Build
Incremental Vehicle Trips:		
- Automobile Mode	(2,003)	(12,603)
- LIRR Drive Access	2,302	18,224
Total	**299**	**5,621**
Incremental VMT:		
- Automobile Mode	(77,855)	(350,666)
- LIRR Drive Access	3,958	38,592
Total	**(73,897)**	**(312,074)**

Automobile Mode - Auto Trips to CBD
LIRR Drive Access - Auto Trips to LIRR Stations

It is anticipated that there will not be any negative regional air quality impacts associated with the Build Alternative. The significant reduction in VMTs and regional pollutants provided by the Build Alternative is shown in Tables 4.2-6 and 5.5-2, respectively.

4.2.3 Park and Ride Demand

Currently, the LIRR provides approximately 66,300 parking spaces throughout the system. In 1996, approximately 54,800 of those spaces were used which represents an 83% utilization factor. This yields about 11,500 parking spaces which are available to customers at a number of stations.

As part of this study effort, parking demand for the LIRR system, above current capacity, has been estimated as follows:

No-Build Alternative	15,365 spaces
TSM Alternative	15,713 spaces
Build Alternative	20,074 spaces

The present LIRR Strategic Business Plan Parking Strategy is to add parking capacity at a number of stations in the system. However, assuming that no additional parking capacity is added to the current system, the net parking capacity needed for the Build Alternative (which includes background growth) would be 8,500 spaces. This number is derived by taking the difference between 1996 parking capacity (66,300) minus the sum of the 1996 parking demand (54,800) and the Build Alternative demand (20,000), 66,300 - ((54,800 + 20,000) = (8,500). The net parking capacity deficit of 8,500 spaces for the Build Alternative would be added at various stations in the system.

4.2.3.1 Local Traffic Issues

In addition to parking and air quality issues, a qualitative analysis of the LIRR system was made to describe projected train service associated with the Build Alternative and the local highway network adjacent to LIRR stations.

LIRR passengers reach local stations by a variety of modes which include primarily walking, drive and park, drop-off, taxi and local mass transportation. The choice of mode is very much based on local conditions which reflect the geographic position of the station, access to the highway network and the availability of parking spaces.

There are currently 133 active stations served by the LIRR, of which approximately 100 may be considered within the scope of originating commuter service. Peak period, peak direction ridership at these 100 stations ranges from a high of 5,700 using Hicksville to a low of 22 using Center Moriches. Further analysis shows a wide variation between stations in the percentage of those that ride and park, are dropped off or use a taxi or bus. For example, virtually none of the 5,000 passengers using Ronkonkoma on a daily basis walk to the station. On the other hand, 43% of Great Neck passengers walk.

To describe the local roadway network and increased ridership, representative stations with relatively high ridership associated with the Build Alternative, were selected for inclusion in this section of the study. These stations are discussed in some detail below. They are representative of each of the major service corridors and generally are reflective of typical LIRR commuter stations.

However, it should be noted that in general vehicular arrivals/departures at suburban stations occur outside (before or after) the peaks of commercial and personal auto traffic. In addition, the spacing between train arrivals and the walking time to outlying parking facilities has a metering effect on vehicles entering the roadway network, thus minimizing the potential for local traffic impacts. This issue will be further analyzed during subsequent stages of planning and design for the project.

Hicksville

The busiest station on the LIRR system with 5,700 originating passengers, Hicksville is situated at the junction of the Main Line (sometimes referred to as the Ronkonkoma Branch) and the Port Jefferson Branch. It is located in the midst of commercial office buildings, a residential area and a sizable retail sales district.

The station is bracketed by NYS Routes 106 and 107, two major north-south roadways, which join just north of the station plaza. The conjoined road intersects both the Northern State Parkway and the Long Island Expressway to the north and the separated roads intersect Old Country Road to the south. The resulting grid of wide multilane roadways provides for good circulation of traffic, even during peak periods when commuter trains are discharging large numbers of passengers at the end of the day.

There are presently 17 identified municipal and privately owned parking facilities at Hicksville. Twelve of these 17 facilities are within a quarter mile radius of the station. The remaining five facilities are within one half mile of the station. These facilities provide a total of 3,160 parking spaces. The largest facility is the multi-level municipal parking garage located south of the station which accommodates 1,167 autos. A second large (306 spaces) surface lot is located north of the station. Numerous smaller lots are situated to the north, south and east of the station. Recent surveys by the LIRR have identified four sites to the north and west of the station for potential future parking expansion.

The Build Alternative is projected to increase ridership at Hicksville by as many as 1,840 boarding passengers during the four hour peak period in the year 2020, and nine trains (two more than the seven which currently stop) will be scheduled to stop during the peak 60 minutes. Of that total, approximately 1,690 will either drive and park or will be dropped off/picked up. It can be assumed that half this total (845) will arrive during the peak 60 minutes of the morning and evening peak period. Peak hour train arrivals will increase from a train every approximately 8.5 minutes to a train every 6.5 minutes.

Ronkonkoma

Ronkonkoma Station, presently serving approximately 5,000 boarding passengers during the morning peak period, is the eastern terminus of the recently electrified segment between Hicksville and Ronkonkoma. Designed as an intermodal hub, this station has witnessed a dramatic increase in ridership as a direct result of faster schedules and a one-seat ride to Manhattan. There are currently 3,498 parking spaces at Ronkonkoma.

The local roadway network, which was improved as a part of the electrification project, provides easy access to the nearby Long Island Expressway and the north-south Ronkonkoma Avenue/ Smithtown Avenue. This accessibility, in conjunction with convenient parking, has made Ronkonkoma an attractive origin station for passengers from eastern Long Island and both the north and south shores. It is important to note that there is little in the way of residential development along the local roadways. The introduction of dual mode service with its one-seat ride capability will draw a portion of the Ronkonkoma ridership back to these north and south shore diesel branch lines.

Virtually 100% of LIRR passengers reach the station by car; 91% park and 9% are dropped off/ picked up. Approximately 1,020 additional riders projected for the peak period in 2020 will translate to 510 riders in the peak 60 minutes. These new riders will be accommodated with the existing level of train service (6 trains).

Mineola

Mineola Station is situated at the center of a mature commercial and governmental office district to the south and a major hospital and a residential area to the north. It presently serves approximately 1,950 boarding passengers during the morning peak period. Approximately 35% of these passengers walk to the station. There are currently 1,074 parking spaces within approximately a one quarter mile radius of the station.

The local roadway network consists four major north-south roadways that connect with Route 25 and 25B to the north and Old Country Road to the south.

1. Herricks Road (presently being grade-separated from the LIRR)
2. Mineola Blvd./Franklin Avenue (Grade-separated from the LIRR)
3. Willis Avenue
4. Roslyn Road

Peak 60 minute service in the year 2020 is planned to increase from five trains to six in order to accommodate approximately 375 additional riders. Of this total, 240 are expected to drive and park or to be dropped off/picked up. Train arrivals during the peak hour will increase from approximately a train every 12 minutes to a train every 10 minutes.

Babylon

Babylon Station is the eastern terminus for electrified train service on the Montauk Branch. The combination of frequent express trains and a one-seat ride to Manhattan makes this an attractive origin station for 3,150 peak period, peak direction passengers.

The station is situated in the midst of a mixed commercial and residential area of the Village of Babylon. The local roadway network consists of Deer Park Avenue, which distributes traffic to the nearer residential areas, and to Montauk Highway to the south and Sunrise Highway to the north.

There are currently 1,878 parking spaces dispersed in 16 surface lots within a quarter mile radius of the station.

At the present time a significant number of passengers who use Babylon travel from areas east of the station to avoid the inconvenience of transferring from a locomotive hauled train to an electric train. Plans for the near future include the procurement of dual mode locomotives which eliminate that inconvenience. The introduction of dual mode/one-seat ride schedule will offset somewhat the projected increase in riders from Babylon, as a result of the Build Alternative.

Train arrivals during the peak hour will increase from a train every 7.5 minutes to a train every 5.5 minutes reflecting the increase from 8 to 11 trains during the peak hour.

Huntington

This station is the eastern terminus for electrified service on the Port Jefferson Branch and boards approximately 4,500 passengers during the morning peak period. Virtually none of these passengers walk to the station.

Access to the local roadway network is provided by New York Avenue, which is grade-separated from the railroad and is an extension of NYS Route 110. This major thoroughfare distributes traffic to the residential street network to the south, north and east.

There are currently 3,160 parking spaces at Huntington contained in eleven surface lots and one multilevel parking garage within a quarter mile radius of the station.

Train service to Huntington is expected to increase from six to eight trains during the peak 60 minutes and is projected to attract as many as 750 additional riders. This increase will likely divide evenly between north and southbound traffic. Train arrivals at Huntington will increase from a train every 10 minutes to a train every 7.5 minutes.

Nonetheless, during subsequent stages of planning and design, additional station-specific parking estimates will be derived which will take into account factors such as local community support and willingness to expand parking, land availability, cost, traffic and environmental issues.

4.3 GCT Configuration

The Build Alternative consists of constructing a ten track/five island platform terminal in the lower level of GCT in the area currently occupied by Madison Avenue Yard and MNR platform tracks. The five easterly platform tracks will be stub ended with the remaining five westerly platform tracks accessing the lower level loop track. The lower level loop track will tie into the 63rd Street Line with connecting tunnel structure in the area below 57th Street and Park Avenue. All mid-day equipment storage for the LIRR trains using GCT will be located in Yard A, an existing freight yard, in western Queens. A new loop track in Sunnyside Yard will be utilized for inbound and outbound equipment moves to/from Yard A.

GCT occupies an area of approximately 48 acres in the East Midtown Manhattan CBD. Because of its location and surrounding land uses, this terminal forms a major link in the midtown pedestrian circulation system and as a major intermodal transfer facility.

The GCT building complex consists of three major levels: upper track level and concourse, lower level concourse and lower track level. The lower level concourse provides a waiting concourse approximately 100 feet wide by 300 feet long and serves all platforms on the lower level. The lower concourse is connected to the upper level concourse by a double stairway located near the western end of the concourse. On the eastern end, a stairway connects to the Graybar passageway on the upper concourse level, while centrally located ramps along the southern wall lead to street and subway connections.

The upper level concourse of GCT is the principal interior feature of the terminal building. The concourse itself is a great vaulted chamber 120 feet wide by 375 feet long with a ceiling height 125 feet above the concourse floor. Train gates along the north wall of the concourse provide access via ramps to the upper level train platforms.

4.3.1 Overview of Computer Simulation of Grand Central Terminal

With substantial increases in service planned for the terminal through the year 2020, simulation technology is being used to help MNR and the LIRR forecast the operational impacts of such increases. Grand Central Terminal is the destination of nearly 90% of MNR customers. Presently, MNR is the sole occupant of GCT and schedules 543 trains per day into and out of the terminal using the 43 platform tracks and 31 yard storage tracks within the confines of the station.

4.3.1a Methodology

The territory included within the simulation for MNR consists of both levels of Grand Central Terminal as the southern limit and all trackage north to Riverdale on the Hudson Line, Wakefield on the Harlem Line, and Mount Vernon on the New Haven Line. The LIRR territory simulated includes the eastern limits of Shea Stadium, Queens Village and Valley Stream and all territory westward to the GCT Lower Level, Penn Station, Hunterspoint, Long Island City, Flatbush Avenue and the West Side Storage Yard. Within these limits, base models were developed by simulating the December 1995 operating plans which included timetables, train consists, track assignments and train routings. In addition, train types were input into each model to accommodate the variety of rolling stock which access the territory.

The simulations are being performed in three phases to ensure that the proposed Build Alternative for LIRR operations into GCT does not negatively impact existing or future MNR operations. Phase One was intended to confirm the efficacy of the simulation software by modeling the existing 1995/1996 MNR operating plan and thereby establishing a base from which future operations could be evaluated. Analysis of the existing and future practical capacity of GCT was accomplished in Phase Two. Constraining factors were identified along with various alternative methods for increasing the capacity of the terminal. The results of Phase Two encompass the terminal's capacity constraints for its effects on the future implementation of MNR's expanded 2020 service and the possible implementation of the Build Alternative. Phase Three, which is currently ongoing, will determine if MNR is capable of reliably operating their future timetable without full use of the lower level. It will also determine the adequacy of the proposed terminal configuration to accommodate the proposed service plan for LIRR in GCT. During Phase Three, infrastructure modifications will be identified and examined as required to increase system reliability. The Phase Three results are not included in this document and will be addressed during subsequent stages of planning and design for the project.

For each phase, a two-step database building process occurs. The first is to establish the physical characteristics of the network for the simulator. This includes trainset characteristics as well as track and signal attributes. Trainset data required for the simulator consists of attributes which affect train performance such as weight, length, maximum speed, brake rate and acceleration rate. The track data is established by first designating individual track sections to represent the smallest segment of track (signal blocks). Groups of track sections are designated to create a train branch and groups of branches are assigned to create a train route. Each track section is given a length and sighting distance. Additionally, each section is assigned signal data attributes which are used to establish the speeds at which a train can travel to it's next track section. Each train branch is associated with a track profile which is used to define the track grades, curves and civil speed restrictions.

As part of the database building process for the physical aspects of the network, station definitions are established. This includes station locations, number of platforms and platform lengths. After the physical parameters of the system are defined, the next step in the simulation process is to define the operating parameters of the network. This involves building the database files for the timetable, station platforms, train routes and interlocking logic. The simulator compiles the database files and runs the timetable of trains along the defined infrastructure according to the defined rules and restrictions. An output file and summary tables are generated during the simulation process which detail train performance and statistics.

4.3.2 Meetings/Coordination

Throughout the simulation process there have been monthly coordination meetings with the MTA, MNR and the LIRR. These meetings have been used as a forum for information dissemination, discussion and presentation of proposed service plans, infrastructure changes, operating criteria and simulation results. It is anticipated that these monthly meetings will continue for the duration of the project.

4.3.3 Simulation Results

The analysis of the simulation reports involves a review of terminal arrival and departure delays, delays at interlocking nodes and elapsed running times through important links in the network, such as the Park Avenue Tunnel. When viewed as an integrated whole, these elements of the terminal operation provide a vivid picture of the relative success of the operating plan.

The analysis procedure inevitably results in an iterative process of computer modeling. That is to say, the analytic process routinely uncovers shortcomings in the plan as it has been conceived and suggests alternative routings, track assignments and sometimes local stopping patterns. The resulting iterations are known as "tweaking" the operating plan to gain the best performance. Naturally, the decision to tweak the plan depends upon the degree of success (or failure) of the operating plan as a result of computer modeling.

To that end, the MNR 1995/1996 operating plan has been successfully simulated. Under perturbed conditions, the simulation produced results that were consistent with an average day of operations for both the AM and PM peak periods. In addition, the simulation of the LIRR proposed 2020 service plan for operations into GCT has been completed. Since the LIRR infrastructure alternative for GCT includes a ten track, five island platform configuration that is completely independent of MNR trackage, creating what is effectively a LIRR terminal within GCT, the results of this simulation only reflect the LIRR's ability to operate within their proposed territory at GCT. Results indicate that the proposed Build Alternative for GCT are adequate to handle the proposed level of service by LIRR for 2020 operations. However, future simulations will determine what impacts the loss of Madison Yard and a reconfigured lower level have on Metro-North's capability to reliability operate its proposed 2020 service plan. Once the exact impacts are identified, actions to mitigate these impacts will be identified and included in the project. Such actions could include: additional trackage within GCT, track modification for trackage leading to GCT, construction of midday storage facilities or operational changes.

4.3.4 Proposed 2020 Service for GCT - MNR & LIRR

MNR provided a 2020 operating plan which meets its goals to increase ridership (projected to increase at 1.6% per year), maximize market opportunities and improve service to the northern suburbs. This plan includes an addition of 29 new trains in the AM and 28 new trains in the PM peak periods over the 1995/1996 service levels (an increase of 25% and 25% respectively)."

The planned configuration at GCT and its approach tracks for the Long Island Rail Road is completely separated from the operation of MNR trains thereby eliminating the potential for operational conflicts involving arriving and departing trains. (See Figure 4.3-1.) The utilization of five platforms (10 tracks) will result in a reduction of nine yard tracks presently used by MNR for storage and mechanical servicing and two tracks which are currently used by revenue trains, but does not diminish the capacity of the Park Avenue Tunnel Tracks nor the interlockings which provide access to the MNR revenue platforms. This loss of trackage may result in the need to operate additional (primarily deadhead) trains out of GCT in the morning and into GCT in the afternoon. There may be other impacts as well. The impacts of this are a key element in the simulation work discussed above.

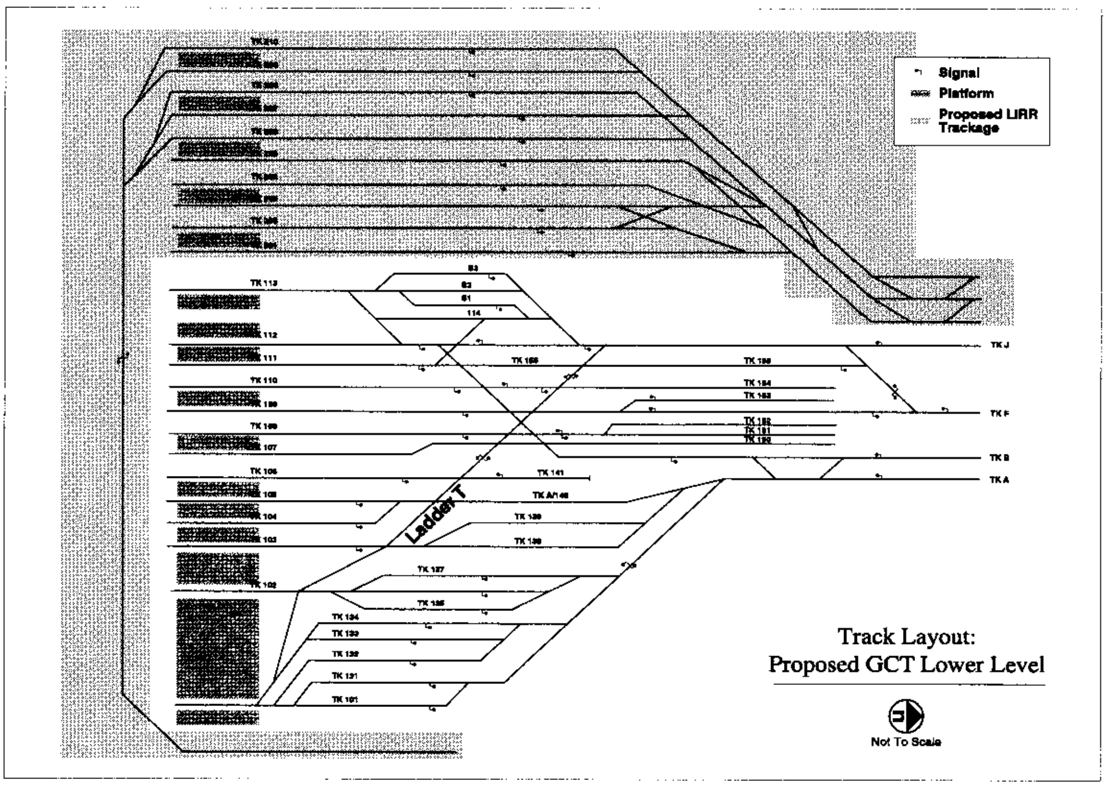


Figure 4.3-1

A Long Island Rail Road 2020 operating plan was developed using LIRR guidelines and service levels. The territory simulated for the LIRR included eastern limits of Shea, Queens and Valley Interlockings and the territory westward through Jamaica Station and Harold Interlocking to the Lower Level of GCT, Penn Station, Hunterspoint Avenue, Long Island City, Flatbush Avenue and the electrified West Side Storage Yard. Virtually all of the nine branch lines are provided with access to GCT either directly or, in the case of the non-electrified branches, indirectly by means of a cross platform transfer. (The design of the 63rd Street Tunnel has insufficient clearance to accommodate the new bi-level coaches and dual mode locomotives. On the other hand, the electrified West Hempstead branch, with its extremely light patronage, does not operate to GCT.) Planned service for GCT includes 51 peak direction trains in the morning commutation period and 50 peak direction trains in the evening commutation period. Table 4.3-1 contains the number of trains per hour used in the simulation effort.

TABLE 4.3-1
Trains Per Hour

LIRR Existing Schedule		*2020 No Build*		*2020 Build Alternative*	
PSNY	**GCT**	**PSNY**	**GCT**	**PSNY**	**GCT**
36	0	42	0	37	24

In creating the operating plan, train schedules, routings and track assignments were created from Queens and Valley Interlockings through Jamaica to each of the west end terminals; GCT, Penn Station, Flatbush Avenue and Hunterspoint Avenue. This level of detail was created to assure that the plan is reflective of the complexities of the LIRR system, including the operation at Penn Station, which is utilized by three railroads. Jamaica was assumed to be the logical point of transfer with the obvious exception of the Port Washington Branch; Woodside was chosen in that instance. In short, the operating plan represents a practical snapshot of LIRR service to GCT that is likely to evolve in the future.

The focus of the plan is on the projected levels of ridership to each of the terminals from each of the branches. The new service at GCT is projected to generate approximately 70,000 peak period customers. This level of activity indicates that, to maximize throughput of the 63rd Street Tunnel, most peak hour GCT trains will be 12 cars long (1,440 seats), while a mixture of 8, 10 and 12 car trains will terminate at Penn Station.

The operating plan for LIRR trains terminating at GCT includes, during the peak hour of 7:57-8:56 AM, trains from the Port Washington branch, the Port Jefferson/Huntington branch, the Babylon branch, from the Ronkonkoma and Hempstead branches and from the Far Rockaway and Long Beach branches. Service levels for the evening peak hour of 5:07-6:06 PM are similar.

Trains originating on the more heavily traveled branches (Port Jefferson/Huntington, Babylon, Ronkonkoma and Port Washington) consist mostly of 12 cars, while trains from Hempstead, Far Rockaway and Long Beach consist of 10 cars.

4.3.4.1 Possible Future Measures for MNR Operations

Recent trends in the operation of GCT have resulted in the removal of certain interlocking route capabilities, turnouts and segments of track. The reason for the removal was to eliminate certain redundancies and the annual cost of maintaining the track and signal system necessary to provide for these redundancies.

The growth anticipated by MNR in 2020 and the introduction of LIRR trains at GCT may require that a number of tracks and routes be reinstalled to provide the necessary infrastructure capacity to achieve the necessary levels of train storage. As the simulation and design processes evolve, exact facilities that could be considered for reinstallation will be identified.

4.4 Overview of GCT Pedestrian Activity

The No-Build Alternative, the baseline for comparison with the Build and TSM Alternatives, contains increases in MNR service (an annual 1.6 percent increase is forecasted for the 1995-2020 period; however, during subsequent stages of planning and design for the project, the growth rates will be further analyzed and may be updated at that time), and new NEA street access facilities under construction that would significantly relieve passenger congestion in the main terminal and reduce existing circulation constraints in GCT. These projected MNR ridership increases and improvements at GCT are factored into the TSM and Build Alternatives as well.

The TSM Alternative would increase LIRR train service to Hunterspoint Avenue and extend the existing LIE HOV lane further eastward another 3.5 miles, from Greenpoint Avenue to 102nd Street in Corona. However, this service increase in Queens would not be to the level of that planned by LIRR access to GCT and the increase of about 900 commuters there (with about 300 using the connecting subway lines) is much less than the increases associated with the Build Alternative. The resulting levels of pedestrian crowding at the Hunterspoint Avenue subway station would remain within acceptable ranges, and the line-haul utilizations of the #7 service would remain under capacity. At GCT, since fewer LIRR commuters would use it as a transfer point, pedestrian conditions would be slightly better because fewer commuters would enter the terminal.

The introduction of LIRR service into GCT warrants special consideration for passenger circulation. With the addition of LIRR customers, new accommodations at track and street levels must be provided to ensure, at a minimum, adequate capacity and acceptable passenger levels of service. Consideration must also be given to separate or shared use of the pedestrian circulation network by LIRR and MNR passengers. The analysis will specifically focus on the assessment of platform areas dedicated for LIRR use, the provision for north and south access from these platforms, and the number of cross passage and street access elements required to serve LIRR and, potentially, MNR passengers.

In general, the largest increase in overall pedestrian activity is associated with the Build Alternative, which would introduce LIRR service into GCT's lower level. Forecasted peak period LIRR ridership would add more than 70,000 new commuters into GCT. Over half of these passengers would not enter the main terminal concourses but instead use new passageways and stairs. However, a significant increase of about 32,500 new pedestrians would use the main terminal concourses enroute to pedestrian destinations within the GCT area. Of these, approximately 12,000 people would transfer to the IRT 4/5/6/7 subway lines, and some 19,500 new walk trips would utilize surrounding sidewalks. Between 110 and 220 new taxi trips would be generated by the new LIRR service into GCT.

Impacts would be experienced at heavily used locations where available circulation space is inadequate and pedestrian congestion would occur or continue. The main GCT concourse would have a number of pedestrian elements operating at or near capacity, particularly those areas connecting to the IRT subways. Other stairs and escalators connecting the lower and upper concourses would have more acceptable conditions with only some modest congestion, primarily due to the influence of new North End Access (NEA) elements diverting passengers from the main terminal complex. Part of the IRT 4/5/6 subway platform area would have some major congestion during weekday peak periods. Some sidewalk areas, particularly those along the 42nd Street and Lexington Avenue sides of GCT, would be crowded, leading to poor levels of service, indicative of bunching and even stoppages in pedestrian flows. Although new taxi trips would be modest, vehicle operations would experience level of service worsening due to the significant increase in the volume of pedestrians at street level.

Where impacts were noted for the different pedestrian and street elements analyzed, improvement measures or strategies could provide some, though not total, relief. Additionally, pedestrians could modify their current walking patterns to avoid other congested elements. Subway line-haul utilizations would exceed the practical capacities of the express subways into Downtown Manhattan. The ongoing Manhattan East Side Alternatives (MESA) project is identifying improvements to subway service through this station as well as potentially increasing capacity by one train per hour, resulting in less platform crowding. The surrounding sidewalks can also be made to provide better circulation with the elimination of street furniture. It is also possible that traffic operations could be made slightly better with a redistribution of signal timing and phasing changes along with the implementation of a strict traffic enforcement program, such as restricting curb stoppages.

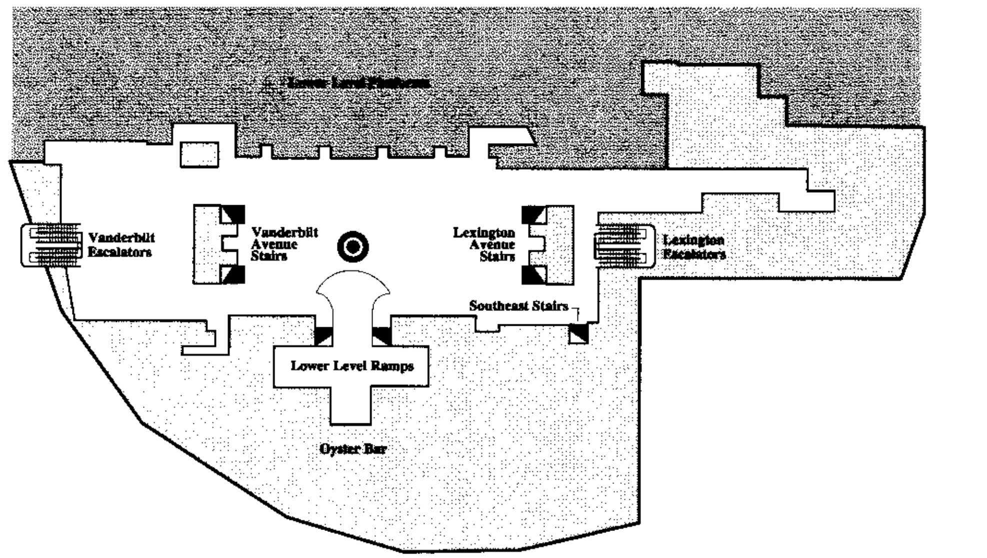
4.4.1 Analysis Methodology

The analysis of potential impacts within GCT focused on key representative corridors, passageways, and stairwells that could be affected by introducing LIRR service into GCT. LIRR service would utilize tracks located at the terminal's west side on the lower level, and result in new pedestrian flows within the terminal. These affected areas would include the track platforms and their passenger access facilities to the lower and upper concourse levels of GCT; concourse and passageway elements to be designed for the LIRR, and under the NEA project, for MNR riders; subway connections within GCT; and streets and sidewalks adjacent to GCT.

In the LIRR East Side Access Feasibility Study[1] that preceded this study, the ability of GCT track platforms, stairwells connecting the platforms with LIRR and North End Access passageways, as well as the new passageways to accommodate maximum anticipated ridership levels was analyzed in detail with regard to both typical levels of service and their ability to satisfy applicable safety requirements. This analysis showed that acceptable passenger circulation standards could be achieved based on National Fire Protection Association (NFPA) 130[2] safety standards. Also, although not binding on this project, guidelines developed by New York City and presented in the City Environmental Quality Review (CEQR) Technical Manual were consulted for additional guidance in assessing impacts.

Additional GCT pedestrian flow elements were analyzed in detail for this study on a 15-minute basis for the 8-9 AM and 5-6 PM peak hours (the "peak of the peaks" were identified as the 8:30-8:45 AM and 5:15-5:30 PM periods). The pedestrian analysis elements and volume count locations are shown in Figures 4.4-1 and 4.4-2. The analysis include planned improvements to:

- the four main separate stairwell and escalator banks connecting the lower and upper concourses
- the east and west stairwell/escalator elements connecting the terminal to the IRT Lexington Avenue subway lines
- the Graybar and Commodore passageways and the new 43rd Street passageway of the GCT Master Plan
- the IRT shuttle passageway
- the east and west ramps leading up from the area in front of the Oyster Bar Restaurant
- the Vanderbilt Avenue staircase in the upper concourse.



GCT Lower Concourse 2020 "No Build" Alternative Major Pedestrian Elements

Map Not to Scale

Figure 4.4-1

Outside GCT, analyses focused on the main access entrances of the terminal where vehicle dropoffs and pickups and pedestrian activities would be most pronounced, and would continue to be so after LIRR service is introduced. For vehicular traffic, the intersections analyzed focused on the busiest areas such as the Lexington Avenue intersections between 42nd and 45th Streets inclusive, and along 42nd Street at Park and Vanderbilt Avenues for the 8-9 AM and 5-6 PM peak hours. For pedestrians, the main Lexington Avenue crossing points at 45th, 43rd, and 42nd Streets were analyzed as well as the Vanderbilt Avenue/42nd Street intersection.

These critical representative elements were selected after careful review of existing pedestrian flows in the terminal and of expected pedestrian flow patterns associated with LIRR rider movements through GCT and their potential for impact on key locations. The analysis is not intended to cover *every* pedestrian flow location affected by LIRR riders, but a representative set of potentially critical ones. Based on the analyses of these locations, impact findings can be extrapolated to present an overview conclusion regarding GCT as a whole.

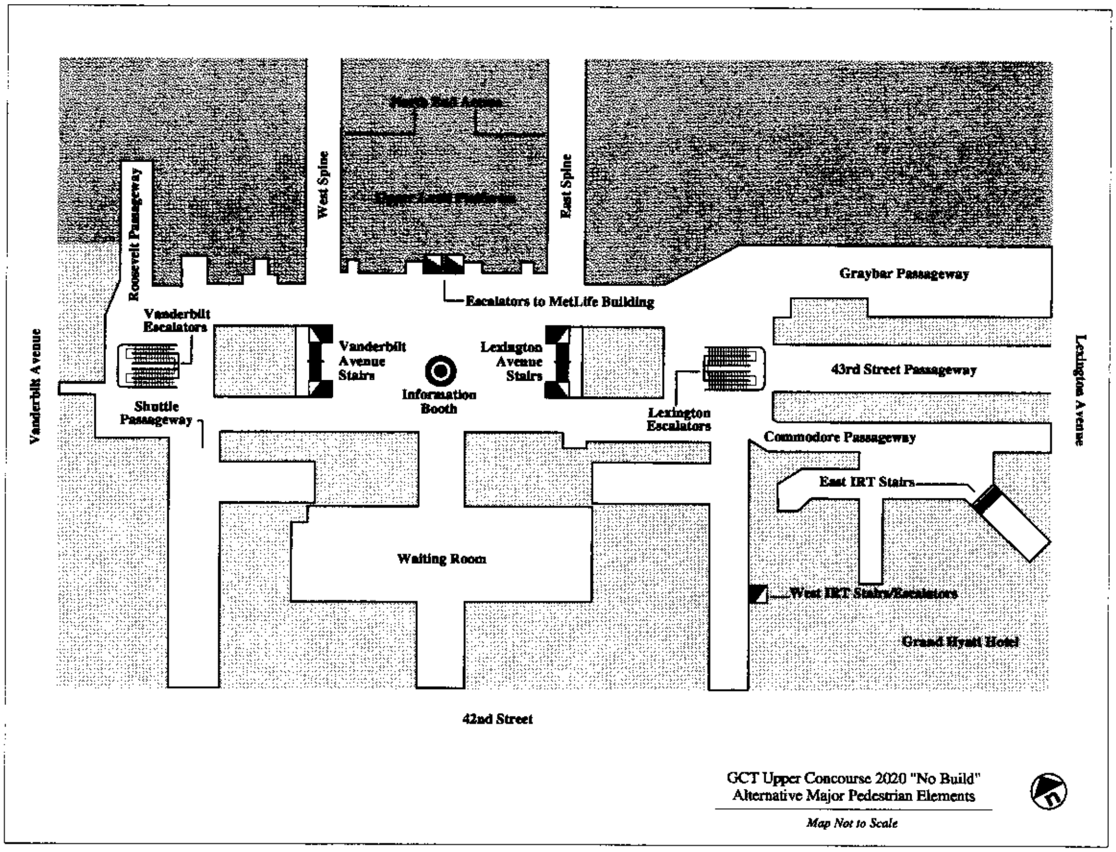


Figure 4.4-2

Other sections of this chapter address additional pedestrian connections which also require critical analysis for this study, i.e., to the Lexington Avenue subway line, and along the stairwells and crosswalks in the vicinity of GCT.

The analysis of pedestrian flow levels of service (LOS) within GCT and on selected sidewalk and crosswalk elements surrounding the terminal are based on 1995 and 1996 counts and field observations conducted at each of the locations cited above, and analyzed in Chapter 3 of this study. These counts were used as the baseline for the analysis of projected future year 2020 conditions under the No Build, TSM, and Build Alternatives using background growth projections for the TSM and Build Alternatives developed for this study. These latter projections were then analyzed — or "assigned" — through the affected sections of GCT and the analysis locations.

The 1985 HCM was used as the procedural basis for all pedestrian LOS analyses on stairwells within corridors and passageways for sidewalks and crosswalks and for vehicular levels of service. The time-space analysis procedures (source: *Pedestrian Time-Space Concept: A New Approach to the Planning and Design of Pedestrian Facilities*) were used for all station platform analyses.

4.4.2 GCT Pedestrian Flows and Levels of Service

4.4.2a No-Build Alternative

The No Build Year 2020 Alternative serves as the baseline for evaluation against which all other alternatives are compared for environmental impact assessment purposes.

Two steps were taken to project the year 2020 No Build conditions. First, because both MNR trains and various subway lines enter GCT, different annual background growth rates were identified for each mode and applied to the various pedestrian flows in and through the terminal (i.e., 1.6% for MNR; 0.16% for NYCT subways at Grand Central). Second, previous studies at GCT indicate that as much as a third of all pedestrian flows do not use the rail services there at all, but rather simply use the "terminal box" as but one link on their walking path through Midtown (annual growth of 0.26% for pedestrians passing through GCT). Thus, a third background growth factor, specific to general Midtown Manhattan conditions, was also used to adjust pedestrian flows in the terminal. These growth rates are primarily based on the North End Access Assignment Model prepared for MNR in 1991 and other information supplied by NYCT for the IRT Grand Central Station stop.

Weighted averages of these growth rates were used at many analysis locations since many pedestrian flows within GCT are composed of riders from commuter trains, subways, and pass-through pedestrians. At locations where subway and MNR riders mix, a weighted average of 1.14% per year was used. At other locations composed of MNR riders and pass-through pedestrians, a weighted average of 1.17% per year was used.

The physical changes now being completed as part of NEA and GCT restoration were also included in the flow analyses since these new circulation elements would change the paths that people use into and through the terminal. These new elements include three new stair/escalator elements between the lower and upper concourses, a new passage to East 43rd Street from the upper concourse, and a widening of the corridor between the Graybar and Commodore passageways. The incoming train room street staircase, the west corridor to the IRT shuttle, and two stairwells in the lower concourse would be eliminated as part of the GCT restoration. The impact of the NEA elements is projected to reduce passenger volumes into the main concourse by as much as 60 percent since many journey-to-work destinations are north of GCT.

Depending on the specific circulation element, some pedestrian conditions would be affected due to the growth in commuters and pedestrians through GCT's corridors, stairwells, etc. For some elements not affected by NEA (e.g., IRT stairwells from the upper concourse), conditions would deteriorate significantly since no reduction in the number of pedestrians using them would be expected. At other locations where new NEA pedestrian redistribution would occur, only slight deterioration in levels of service would occur since there would be some general growth applicable to these areas. Figures 4.4-3 through 4.4-6 illustrate the future No Build pedestrian volumes during the AM and PM peak periods for the lower and upper concourses.

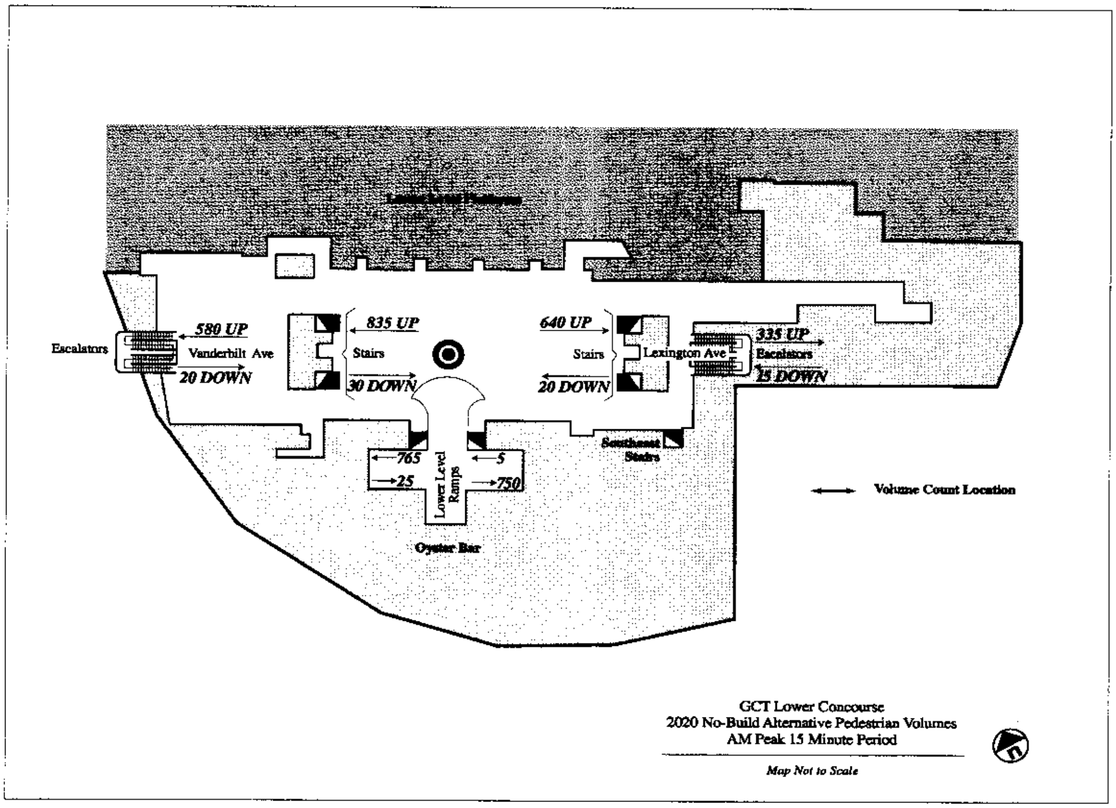


Figure 4.4-3

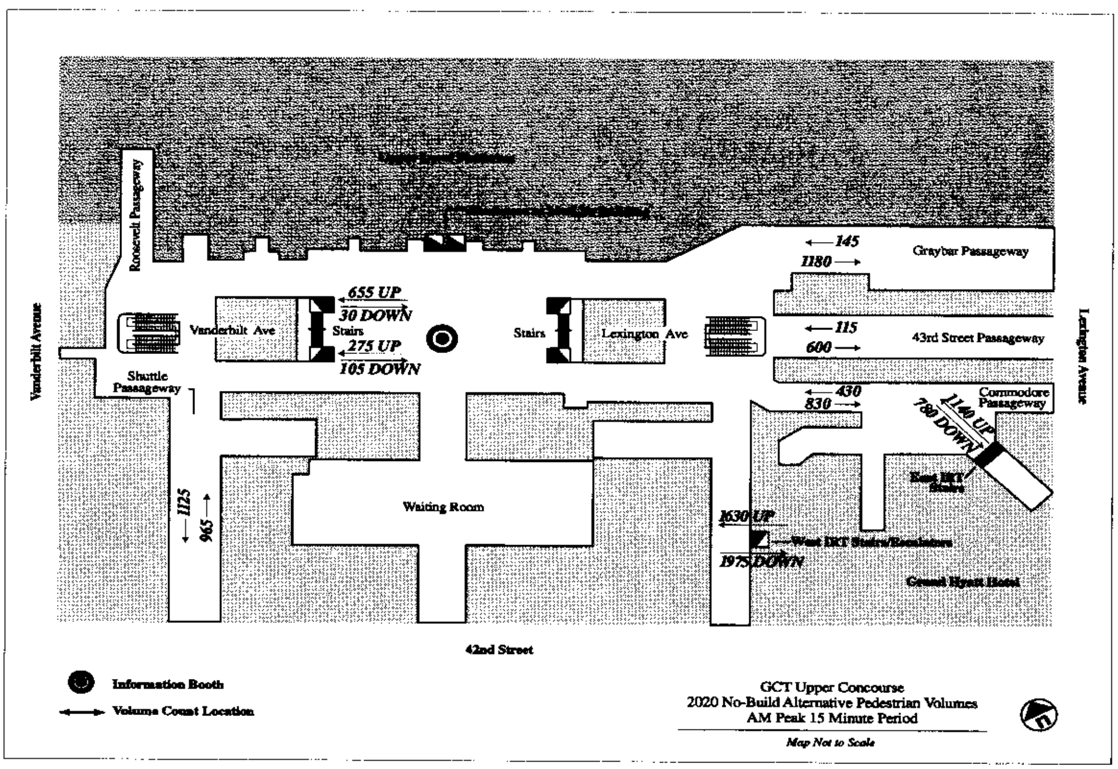


Figure 4.4-4

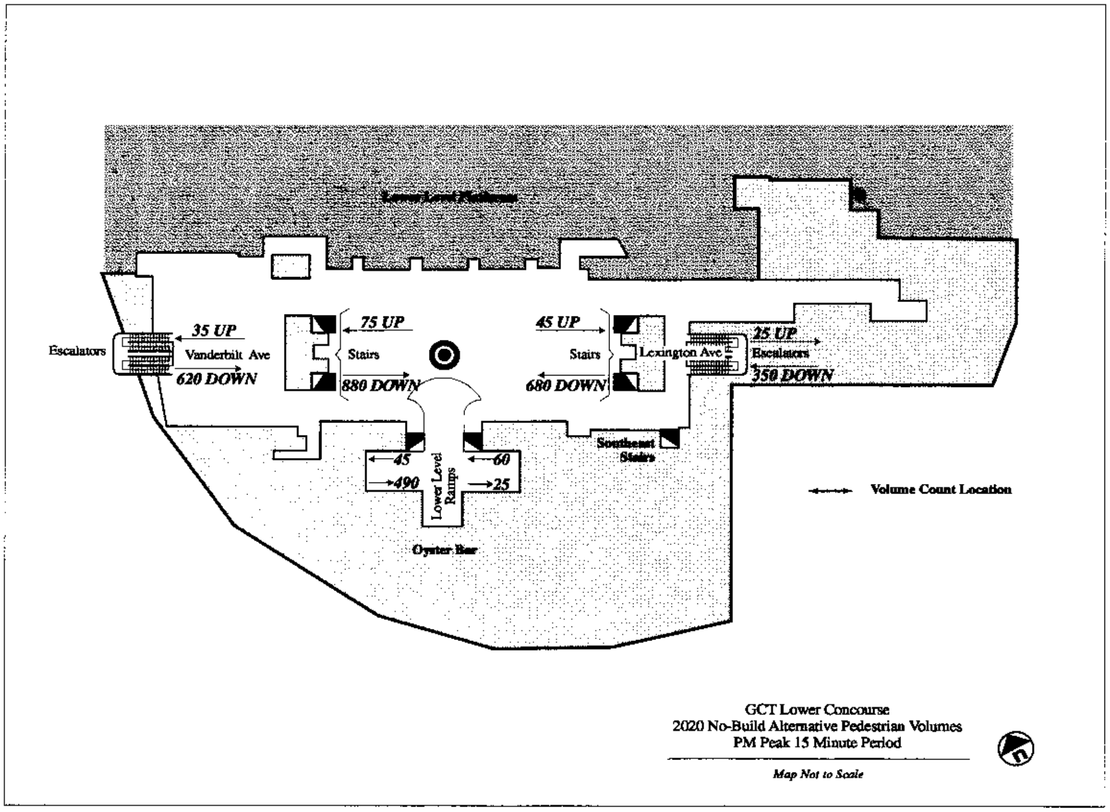


Figure 4.4-5

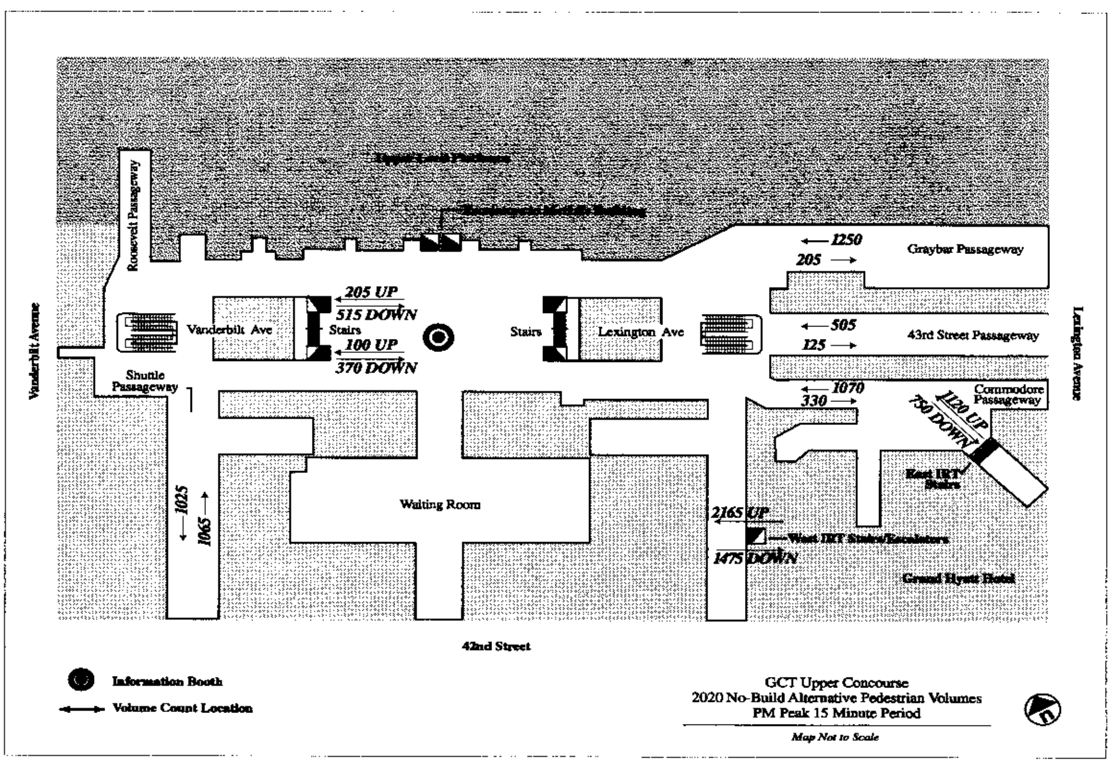


Figure 4.4-6

For the three passageways leading to Lexington Avenue, acceptable LOS C/D or better would continue. All stair/escalator elements connecting with the lower concourse would operate acceptably, with only the new escalator element behind the Vanderbilt Avenue staircase showing some marginal congestion during the peak 8:30-8:45 AM period. The eastern stair bank to the IRT subway from the upper concourse would operate at the threshold of LOS C/D, indicating the beginning of some marginal congestion. The western IRT stair/escalator element, closer to the center of the terminal's main concourse, would further deteriorate into congested LOS F conditions. Other elements analyzed would operate acceptably, with only marginal congestion noted. Similar results were identified for the PM peak period. Tables 4.4-1 and 4.4-2 list the peak period pedestrian conditions at the various circulation elements examined.

4.4.2b TSM Alternative

Among other changes included in this alternative, there would be additional LIRR trains serving the Hunterspoint Avenue Station, which in turn would increase the number of people using the #7 line from Long Island City to Manhattan in the AM and vice versa in the PM. Levels of service would generally be equivalent to No Build conditions since only a minor number of additional subway person trips would pass through GCT due to additional LIRR service at Hunterspoint Avenue.

4.4.2c Build Alternative

This alternative would significantly affect GCT pedestrian flows and conditions. During the peak four-hour AM peak period, over 70,000 new LIRR riders would pass through GCT, with about half of those concentrated in the 8-9 AM peak hour. This represents a nearly 100 percent increase over the number of commuters presently entering the station from MNR trains. While this would be a significant increase in pedestrian usage of the terminal, these new riders can be better dispersed through some effects of the current NEA and restoration efforts, increasing the number of ways by which people can circulate in and around GCT.

In terms of passenger flow movements, most new LIRR riders would be headed to points north of the Terminal and will not enter the main terminal concourse. About 38,500 people (54 percent) would be destined to 45-49th Streets or above during the 6-10 AM peak period, which is consistent with other NEA projections. Some 19,300 people would be oriented to 45th Street or south. The remaining 11,900 people would be leaving GCT to use the IRT 4/5/6 subway lines (8,900 to the southbound platform, 3,000 to the northbound platform). For analysis purposes, one half of these riders were concentrated in the peak hour within this four-hour peak, which is consistent with findings of previous studies at both Penn Station and at GCT. The projected distribution of LIRR ridership at GCT is shown on Table 4.4-3.

To assign LIRR riders exiting from the far west platforms in the lower concourse (where LIRR tracks will be situated), pedestrians were "traced" off the existing platforms on the lower track level from MNR trains to establish walking paths and patterns. From these platforms, an exiting pedestrian currently has only a limited number of vertical circulation elements (e.g., stairs) from which to choose. These choices will not differ greatly when NEA is completed, with some stairs being eliminated and others being added.

TABLE 4.4-1
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
2020 NO BUILD CONDITIONS
TIME PERIOD ANALYZED: *Peak 15-minute period (8:30-8:45) within AM peak hour (8:00-9:00)*

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR	Lower Stairs	N/A (CLOSED)						
ECLAIR BAKE SHOP	Upper Stairs							
VANDERBILT	North Stairs	700	15	715	56	95	0.85	C/D or better
AVE. STAIRS	South Stairs	135	15	150	56	95	0.11	C/D or better
NEW ESCALATORS BEHIND	North Esc.	580	0	580	-	100	0.39	C/D or better
VANDERBILT AVE. STAIRS	South Esc.	0	20	20	-	100	0.01	C/D or better
NW STAIRS NEAR	Lower Stairs	N/A (CLOSED)						
MAINT. TRACKS	Upper Stairs							
NEW LEXINGTON	North Stairs	535	15	550	56	95	0.65	C/D or better
AVE. STAIRS	South Stairs	105	10	115	56	95	0.14	C/D or better
NEW ESCALATORS BEHIND	North Esc.	335	0	335	-	100	0.22	C/D or better
LEXINGTION AVE. STAIRS	South Esc.	0	15	15	-	100	0.01	C/D or better
Upper Concourse								
EASTERN	East Stairs	703	0	703	50	85	0.94	C/D or better
IRT SUBWAY	Center Stairs	412	201	613	47	80	0.87	C/D or better
STAIRS	West Stairs	50	579	629	40	68	1.05	C/D threshold
WESTERN	East Stairs	387	569	956	36	61	1.04	E/F
IRT SUBWAY	West Stairs	0	1,406	1,406	40	68	1.38	E/F
STAIRS/	East Esc.	622	0	622	-	100	0.41	C/D or better
ESCALATORS	West Esc.	621	0	621	-	100	0.41	C/D or better
SHUTTLE	East P'way	965	1,125	2,090	202	360	0.69	C/D or better
PASSAGEWAYS	West P'way	N/A (CLOSED)						
LOWER LEVEL	East Ramp	750	5	755	129	230	0.39	C/D or better
RAMPS	West Ramp	765	25	790	179	320	0.29	C/D or better
VANDERBILT	North Stairs	550	25	575	56	95	0.68	C/D or better
AVE. STAIRS	South Stairs	230	100	330	56	95	0.39	C/D or better
GRAYBAR P'WAY	-	145	1,180	1,325	325	580	0.27	C/D or better
LEXINGTON P'WAY	-	430	830	1,260	227	405	0.37	C/D or better
NEW 43RD ST. P'WAY	-	115	600	715	101	180	0.47	C/D or better

NOTE:
(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for passageways.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

TABLE 4.4-2
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
2020 NO BUILD CONDITIONS
TIME PERIOD ANALYZED: Peak 15-minute period (5:15-5:30) within PM peak hour (5:00-6:00)

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR ECLAIR BAKE SHOP	Lower Stairs	N/A (CLOSED)						
	Upper Stairs							
VANDERBILT AVE. STAIRS	North Stairs	50	820	870	56	95	1.04	C/D threshold
	South Stairs	25	60	85	56	95	0.10	C/D or better
NEW ESCALATORS BEHIND VANDERBILT AVE. STAIRS	North Esc.	35	0	35	-	100	0.02	C/D or better
	South Esc.	0	620	620	-	100	0.41	C/D or better
NW STAIRS NEAR MAINT. TRACKS	Lower Stairs	N/A (CLOSED)						
	Upper Stairs							
NEW LEXINGTON AVE. STAIRS	North Stairs	30	635	665	56	95	0.79	C/D or better
	South Stairs	15	45	60	56	95	0.04	C/D or better
NEW ESCALATORS BEHIND LEXINGTION AVE. STAIRS	North Esc.	25	0	25	-	100	0.02	C/D or better
	South Esc.	0	350	350	-	100	0.23	C/D or better
Upper Concourse								
EASTERN IRT SUBWAY STAIRS	East Stairs	373	124	497	40	68	0.83	C/D or better
	Center Stairs	368	291	659	53	90	0.83	C/D or better
	West Stairs	379	335	714	45	77	1.06	C/D threshold
WESTERN IRT SUBWAY STAIRS/ ESCALATORS	East Stairs	849	0	849	40	68	0.83	E/F
	West Stairs	0	752	752	40	68	0.74	E/F
	East Esc.	0	723	723	-	100	0.48	C/D or better
	West Esc.	1,316	0	1,316	-	100	0.88	E/F
SHUTTLE PASSAGEWAYS	East P'way	1,065	1,025	2,090	202	360	0.69	C/D or better
	West P'way	N/A (CLOSED)						
LOWER LEVEL RAMPS	East Ramp	25	60	85	129	230	0.04	C/D or better
	West Ramp	45	490	535	179	320	0.20	C/D or better
VANDERBILT AVE. STAIRS	North Stairs	200	450	650	56	95	0.77	C/D or better
	South Stairs	95	325	420	56	95	0.50	C/D or better
GRAYBAR P'WAY	-	1,250	205	1,455	325	580	0.30	C/D or better
LEXINGTON P'WAY	-	1,070	330	1,400	202	360	0.46	C/D or better
NEW 43RD ST. P'WAY	-	505	125	630	101	180	0.42	C/D or better

NOTE:
(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for passageways.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

TABLE 4.4-3
Distribution of AM Peak LIRR Passengers Arriving at GCT for the Build Alternative

Access / Egress Link	AM Peak-Period Arrivals	AM 8-9 Peak-Hour Arrivals
IRT 4 / 5 / 6 Southbound	8,956	4,478
IRT 4 / 5 / 6 Northbound	2,978	1,489
IRT 7 Eastbound	34	17
IRT 7 Westbound	0	0
IRT Shuttle	17	9
42nd Street (East Side +)	11,898	5,949
42nd Street (West Side +)	7,411	3,706
45th Street (West Side +)*	10,780	5,390
47th Street (East Side +)*	7,502	3,751
47th Street (West Side +)*	1,813	907
49th Street (West Side +)*	18,680	9,340
Totals	**70,069**	**35,036**

+ - "East" and "West" refer to areas east and west of GCT, respectively
* - Do not enter GCT lower or upper levels

It is important to note that, based on field observations, people having exited their train tend to make their way to the nearest stair or escalator as the first leg of their walking journey. That is, people seem to move vertically first from the lower to the upper concourse, and then continue horizontally out of GCT. For example, from Tracks 115 and 116 on the lower level's far west end, nearly 90 percent of the exiting riders use the two closest stairwells at Vanderbilt Avenue. When trains enter the center Tracks 109 and 110 where more circulation choices exist, the majority of people (53 percent) still use the closest stairwell (Vanderbilt Avenue staircase), but others make more use of the Oyster Bar ramps.

These existing pedestrian paths were the basis of assigning LIRR riders through GCT pedestrian paths, as well as for re-assigning future MNR riders into the new restoration elements in the lower level. However it should be noted that this results in a conservative or worst case condition. A new no build or base case condition will be established during subsequent stages of planning and design which uses as a starting point the actual pedestrian flow patterns reflected by the post NEA and GCT restoration facilities. For MNR trains which would continue to use the center tracks on the lower level, about 30 percent of these riders would use the Vanderbilt Avenue staircase; almost 25 percent would use the new wide staircase on the opposite side; about 20 percent would use the new escalator bank behind the Vanderbilt Avenue stair; about 10 percent on each of the Oyster Bar ramps and far east new escalator bank; and about 5 percent would use the stairs in the far east end of the lower concourse. LIRR riders would primarily use the closest Vanderbilt Avenue circulation elements (about 60 percent), followed by the use of the new stairs and escalators leading to the east (30 percent), with the remaining ten percent using various other elements to the upper concourse.

As mentioned above, the existing Vanderbilt Avenue staircase would continue to be the most heavily used vertical circulation element, with well over 2,000 people using it in the peak 15-minute periods (up in the AM, down in the PM). This high volume would be closely followed by usage of the new escalator bank behind the Vanderbilt stairs and the new stairs directly opposite the Vanderbilt stairs (both would be used by some 2,000 people per peak AM/PM 15 minutes). These figures represent doubling or tripling of future No Build volumes projected to be using these same elements. This is not surprising considering the large LIRR "overlay" forecasted for GCT. Figures 4.4-7 through 4.4-10 illustrate the future pedestrian volumes under the Build Alternative during the AM and PM peak periods for the lower and upper concourses.

The resulting pedestrian levels of service experienced by the Build Alternative would deteriorate from those identified in the future No- Build Alternative unless additional improvements were built as mitigation. However, even with mitigation measures in place significant service disruptions at GCT will cause crowding in platform, concourse and other areas. During the AM peak period, the east and west circulation elements leading to the IRT subways would experience LOS E/F for each of their individual stairs and escalators in each 15-minute period within the 8-9 AM hour. The two stair/escalator elements leading to Vanderbilt Avenue would also worsen from LOS C/D in the No-Build Alternative into an LOS E/F condition throughout the 8-9 AM peak hour. It is of interest to note that when such congestion occurs on stairs and escalators, there tends to be a metering effect on the areas being fed by such elements. Accordingly, the Graybar, new 43rd Street, and Commodore passageways would operate within generally acceptable LOS C/D conditions (the sole exception would occur in the Commodore passageway during one peak period in the AM which would show some marginal congestion).

Another location, the connecting corridor between the overhead 44th Street crosspassageway and the lower concourse, shown on Figures 4.4-7 and 2.4-3 would be expected to be used by a significant portion of alighting passengers bound for the IRT subway lines and to destinations south of the terminal. (Passengers could use other cross passages along the platform to access the street, if so desired.) Conservatively assigning all pedestrians with destinations south of 45th Street into the lower concourse via the 44th Street crosspassageway would require a corridor width of about 35 feet to accommodate passenger loads of 4,500 to 5,000 pedestrians every 15 minutes in the peak periods at LOS C/D to E.

Similar analysis results were identified for the PM peak hour. The east and west IRT stair/escalator IRT elements would experience LOS E/F for each of its individual stairs and escalators for each 15-minute period within the 5 - 6 PM hour. The two Vanderbilt elements would also worsen from LOS C/D in the No Build case into a consistent LOS E/F condition throughout the 5 - 6 PM peak hour. The Graybar, new 43rd Street, and Commodore passageways would continue to operate within generally acceptable LOS C/D conditions since there is ample capacity in these wide walkways, and in the case of the PM periods, people enter GCT not en masse from arriving trains, but individually at their own pace. Tables 4.4-4 and 4.4-5 list LOS results for the pedestrian elements analyzed in this alternative.

4.4.2d Build Alternative Impacts

In terms of impacts for stairways, a significant impact by CEQR is defined by the amount of widening that would be needed to return to the No Build condition. While these analyses did not consider stair widening as being feasible for mitigation, the large increase in v/c ratios — or stair utilization — is indicative of such impacts. For this analysis, the assignment did not assume a "perfect balancing" in how people would use the future terminal, which would result in a somewhat unrealistic spreading of pedestrian usage. Rather, the assignment assumption maintained the existing pedestrian pattern through GCT. That is, people would use the terminal much in the same manner as they do today with only some slight deviations, certainly a conservative and rational approach. The pedestrian analysis took shorter train dwell times into account and their effect on congestion in the concourse and NEA areas of GCT. Again, there would likely be some redistribution of pedestrian flows through the terminal to, for example, the Oyster Bar ramps or the staircase to the far east end of the lower concourse, both of which have limited use today.

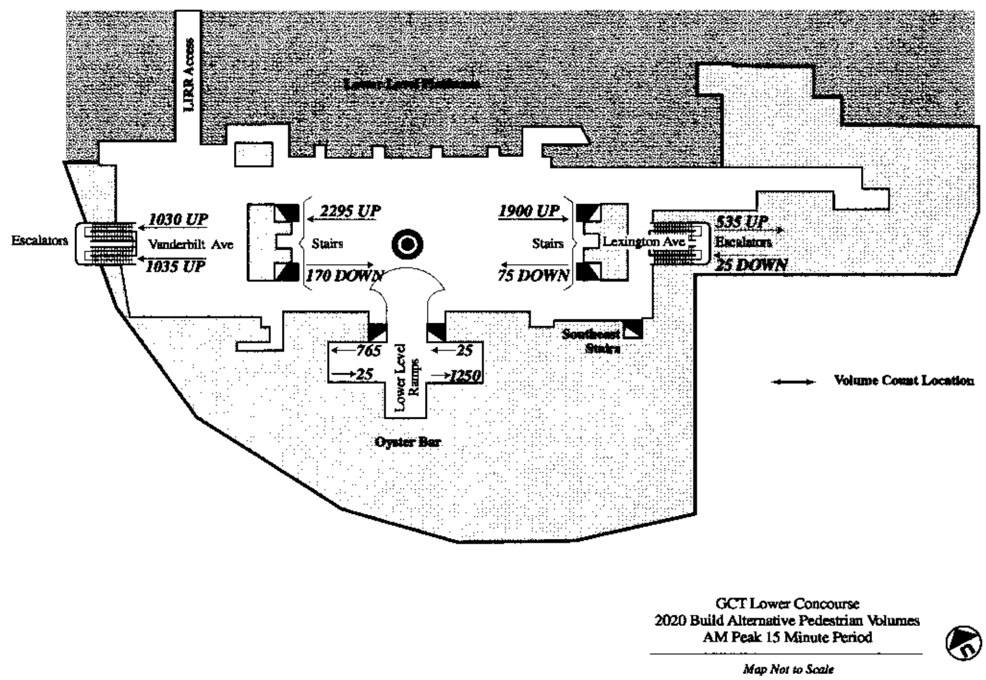


Figure 4.4-7

On the lower concourse, there would be some queuing at the bottom of the stairs and escalators, although there would appear to be ample room in the waiting area to accommodate such a bulk queue. (There is some discussion of placing cafe tables in this area, which would significantly reduce pedestrian circulation space. However, while there is nothing firm about such plans as of this study's preparation, the configuration of this area will have to conform to station and safety guidelines.) The key problem areas would likely occur in the upper concourse areas leading to the IRT stairwells, which could extend back into their connecting passageways and cause some circulation impedance and stoppages.

4.4.2e Build Alternative Mitigation

Stair widening was not considered a feasible mitigation measure because of the national historic landmark status of GCT. Also, it should be noted that the projected ridership growth and related pedestrian activity levels are not anticipated until 2020, approximately 10 years after the beneficial use of the project in 2010. During preliminary engineering, the design of mitigation measures will be based on the documentation and analysis of new pedestrian travel and flow patterns

TABLE 4.4-4
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
2020 BUILD CONDITIONS
TIME PERIOD ANALYZED: Peak 15-minute period (8:30-8:45) within AM peak hour (8:00-9:00)

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR	Lower Stairs				N/A (CLOSED)			
ECLAIR BAKE SHOP	Upper Stairs							
VANDERBILT	North Stairs	1,377	120	1,497	56	95	1.05	E/F
AVE. STAIRS	South Stairs	918	80	998	56	95	0.70	E/F
NEW ESCALATORS BEHIND	North Esc.	1,033	0	1,033	-	100	0.69	C/D or better
VANDERBILT AVE. STAIRS	South Esc.	1,032	0	1,032	-	100	0.69	C/D or better
NW STAIRS NEAR	Lower Stairs				N/A (CLOSED)			
MAINT. TRACKS	Upper Stairs							
NEW LEXINGTON	North Stairs	1,330	53	1,383	56	95	0.97	E/F
AVE. STAIRS	South Stairs	570	22	592	56	95	0.70	C/D or better
NEW ESCALATORS BEHIND	North Esc.	535	0	535	-	100	0.36	C/D or better
LEXINGTON AVE. STAIRS	South Esc.	0	25	25	-	100	0.02	C/D or better
Upper Concourse								
EASTERN	East Stairs	750	0	750	50	85	1.00	C/D threshold
IRT SUBWAY	Center Stairs	425	432	857	53	90	1.08	C/D threshold
STAIRS	West Stairs	0	1,243	1,243	50	85	0.97	E/F
WESTERN	East Stairs	300	1,183	1,483	32	54	1.82	E/F
IRT SUBWAY	West Stairs	0	1,882	1,882	40	68	1.85	E/F
STAIRS/	East Esc.	687	0	687	-	100	0.46	C/D or better
ESCALATORS	West Esc.	688	0	688	-	100	0.46	C/D or better
SHUTTLE	East P'way	965	1,150	2,115	202	360	0.70	C/D or better
PASSAGEWAYS	West P'way				N/A (CLOSED)			
LOWER LEVEL	East Ramp	1,250	25	1,275	129	230	0.66	C/D or better
RAMPS	West Ramp	765	25	790	179	320	0.29	C/D or better
VANDERBILT	North Stairs	755	35	790	56	95	0.94	C/D or better
AVE. STAIRS	South Stairs	435	110	545	56	95	0.65	C/D or better
GRAYBAR P'WAY	-	165	1,680	1,845	325	580	0.38	C/D or better
LEXINGTON P'WAY	-	480	2,090	2,570	202	360	0.85	C/D or better
NEW 43RD ST. P'WAY	-	120	785	905	101	180	0.60	C/D or better
W P'WAY FROM S. PLATFOR END TO LOWER CONCOURSE	-	195	4,900	5,095	370	660	0.92	C/D or better

NOTE:
(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for passageways.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

TABLE 4.4-5
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS WITHIN GRAND CENTRAL TERMINAL
2020 BUILD CONDITIONS
TIME PERIOD ANALYZED: Peak 15-minute period (5:15-5:30) within PM peak hour (5:00-6:00)

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			PROCESSING RATE (1) (peds/min)		V/C (1)	LOS
LOCATION	SECTION	UP / IN	DOWN / OUT	TOTAL	LOS C/D	LOS E/F		
Lower Concourse								
SE STAIRS NEAR	Lower Stairs				N/A (CLOSED)			
ECLAIR BAKE SHOP	Upper Stairs							
VANDERBILT	North Stairs	156	1,284	1,440	56	95	1.01	E/F
AVE. STAIRS	South Stairs	104	856	960	56	95	0.67	E/F
NEW ESCALATORS BEHIND	North Esc.	0	1,140	1,140	-	100	0.76	E/F
VANDERBILT AVE. STAIRS	South Esc.	0	760	760	-	100	0.51	C/D or better
NW STAIRS NEAR	Lower Stairs				N/A (CLOSED)			
MAINT. TRACKS	Upper Stairs							
NEW LEXINGTON	North Stairs	77	1,281	1,358	56	95	0.95	E/F
AVE. STAIRS	South Stairs	33	549	582	56	95	0.69	C/D or better
NEW ESCALATORS BEHIND	North Esc.	35	0	35	-	100	0.02	C/D or better
LEXINGTON AVE. STAIRS	South Esc.	0	460	460	-	100	0.31	C/D or better
Upper Concourse								
EASTERN	East Stairs	631	79	710	40	68	0.70	E/F
IRT SUBWAY	Center Stairs	623	310	933	47	80	0.78	E/F
STAIRS	West Stairs	641	411	1,052	45	77	0.92	E/F
WESTERN	East Stairs	1,134	0	1,134	40	68	1.11	E/F
IRT SUBWAY	West Stairs	150	784	934	32	54	1.14	E/F
STAIRS/	East Esc.	0	755	755	-	100	0.50	C/D or better
ESCALATORS	West Esc.	1,831	0	1,831	-	100	1.22	E/F
SHUTTLE	East P'way	1,085	1,025	2,110	202	360	0.70	C/D or better
PASSAGEWAYS	West P'way				N/A (CLOSED)			
LOWER LEVEL	East Ramp	50	490	540	129	230	0.28	C/D or better
RAMPS	West Ramp	45	490	535	179	320	0.20	C/D or better
VANDERBILT	North Stairs	215	630	845	56	95	1.01	C/D threshold
AVE. STAIRS	South Stairs	105	505	610	56	95	0.73	C/D or better
GRAYBAR P'WAY	-	1,680	230	1,910	325	580	0.39	C/D or better
LEXINGTON P'WAY	-	2,160	400	2,560	202	360	0.85	C/D or better
NEW 43RD ST. P'WAY	-	665	135	800	101	180	0.53	C/D or better
NEW P'WAY FROM S. PLATFORM END TO LOWER CONCOURSE	-	4,250	255	4,505	370	660	0.81	C/D or better

NOTE:
(1) Capacity is based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for stairs.
Capacity is based on an average unit (effective) width flow rate of 14 and 25 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively for passageways.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

that do not currently exist. While both the GCT Redevelopment Project and MNR's NEA Project are assumed in the No Build condition, it cannot be fully determined at this time how these improvements will change existing pedestrian flows.

Additionally, structural and environmental investigations will be needed during the preliminary engineering phase to confirm the constructability of any proposed mitigation measures.

The LIRR will continue to work closely with NYCT and MNR to identify and evaluate mitigation alternatives. As more detailed designs are developed, they will be reviewed by a multidisciplinary team to include input from LIRR, NYCT and MNR: Stations/Passenger Services, Engineering, Capital Construction, Transportation/Operations, Police and Safety Departments; as well as developer input if appropriate.

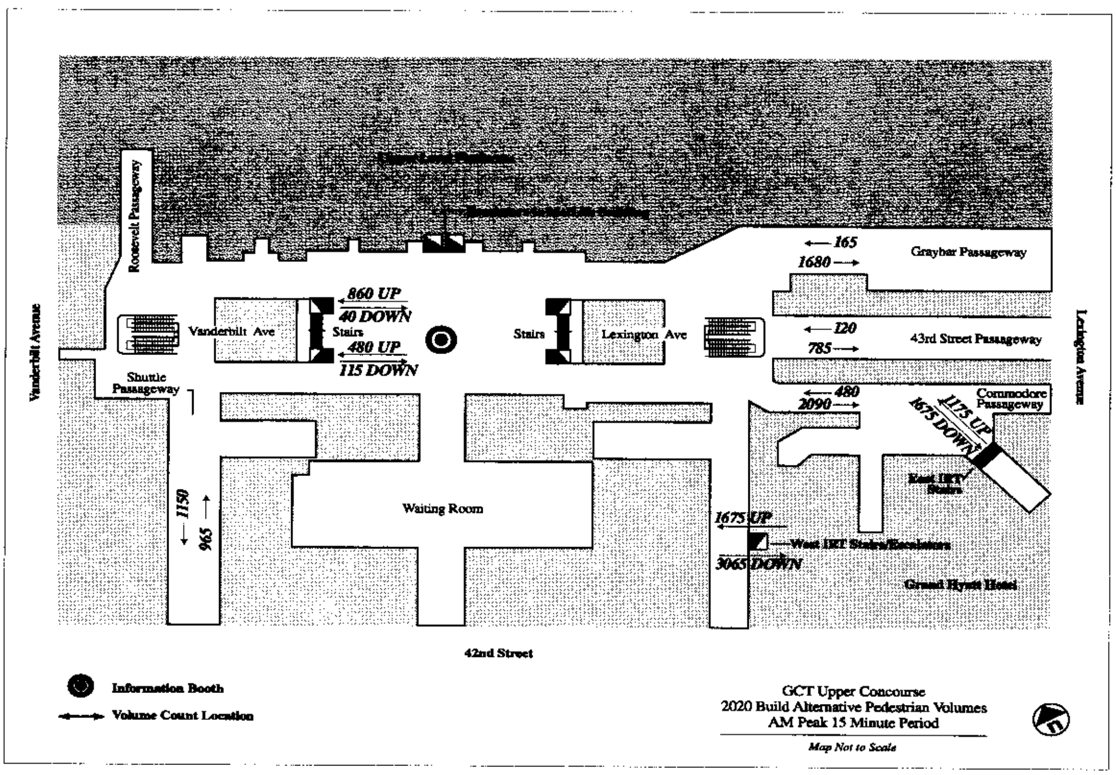


Figure 4.4-8

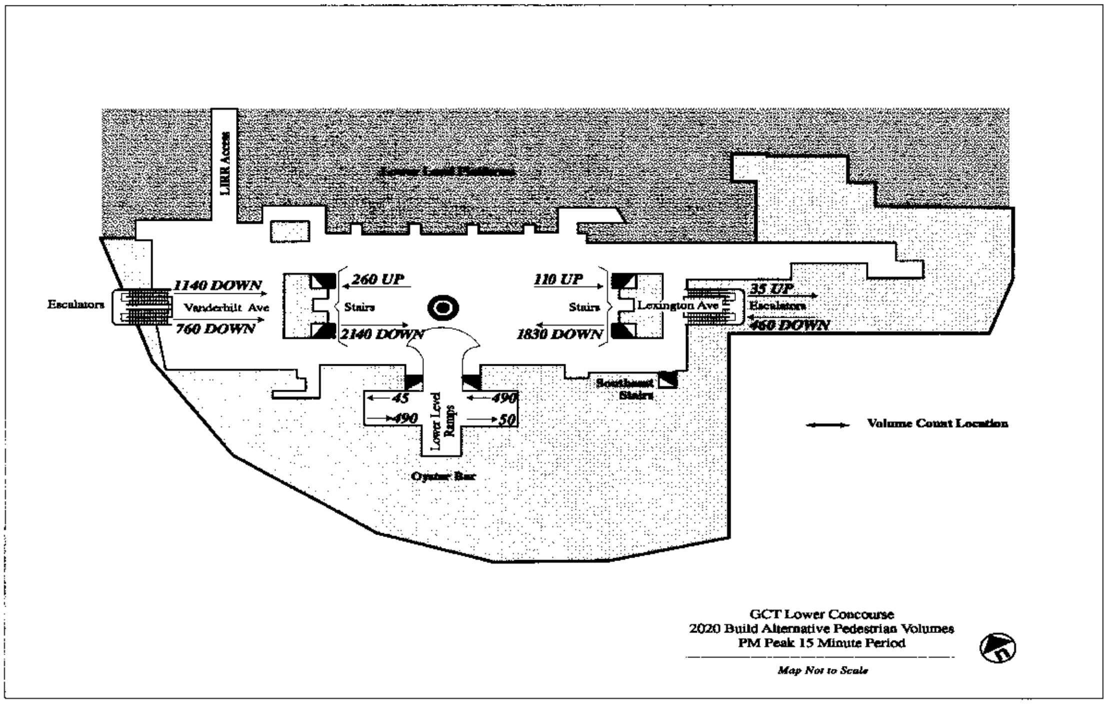


Figure 4.4-9

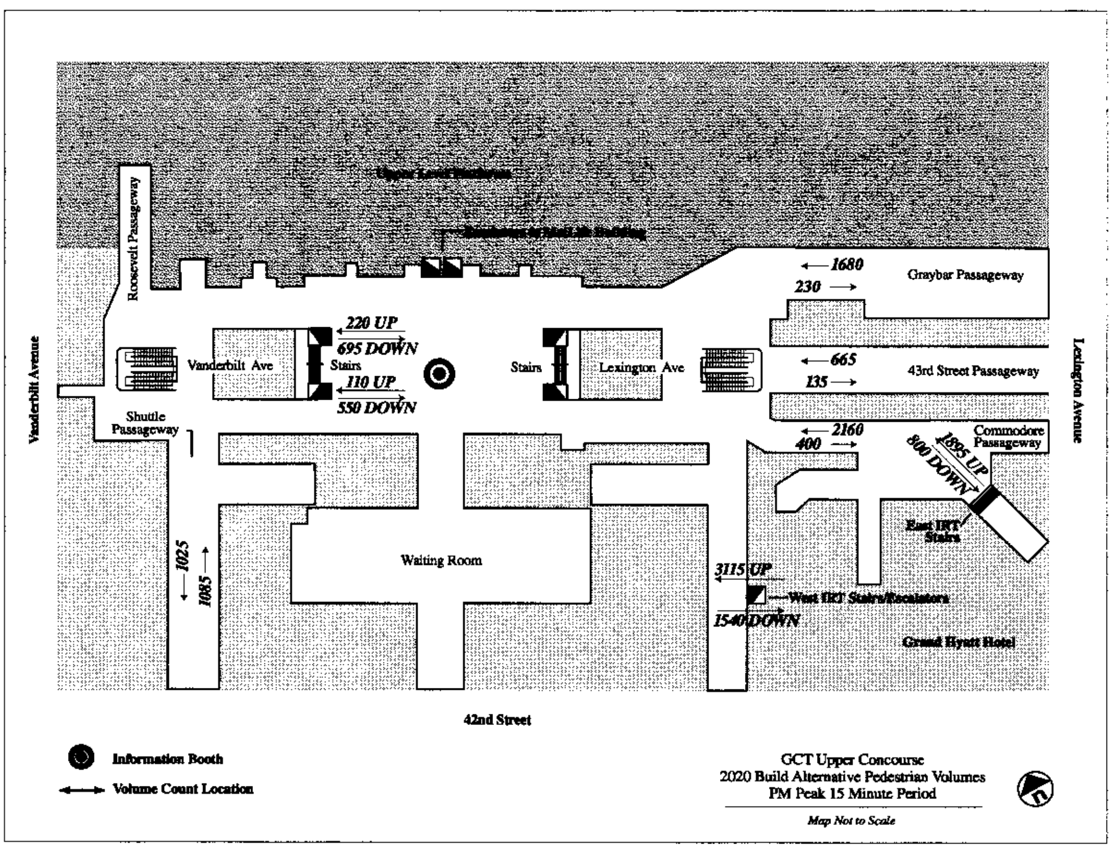


Figure 4.4-10

4.5 Lexington Avenue Subway Impacts

4.5.1 Analysis Methodology

The analysis of potential impacts at the IRT subway stations serving GCT focused on representative station elements and line-haul capacity. For the subway station itself, two key stairwells from the mezzanine level's west end to the Lexington Avenue subway platforms and two key platform zones were selected as representative analysis locations. The selected analysis areas are among the station's most heavily used since they lie directly opposite the turnstile entry point.

Analyses are based on pedestrian flow count data and information from NYCT for line-haul capacity. Growth projections were derived from NYCT and/or the study ridership model. As described in the existing conditions chapter, the analysis models include NYCT station design criteria and the time-space procedures for platforms.

The actual field count data can be found in the Transportation and Pedestrian Analysis Technical Appendix. The most critical platform element was selected for analysis in this study. In the next stage of the planning and design process, additional platform elements may need to be studied.

4.5.2 Subway Stairwells, Platforms and Line-Haul Capacity

4.5.2a No-Build Alternative

Pedestrian volumes were increased to the future No Build year using a similar methodology to that detailed in Section 4.4.1. It is of note that the physical changes associated with the NEA project or GCT restoration do not extend into the subway mezzanine or platform areas.

Subway platform crowding conditions would deteriorate as background growth continues. However, no further degradation into unacceptable levels of service were noted. The southbound IRT 4/5/6 subway platforms would function with some congestion (LOS C/D) as they would continue to be used as the main southbound connection into Lower Manhattan. All other IRT 4/5/6 platform areas would maintain LOS C/D operations with only slight increases in the required time-space area noted. (See Table 4.5-1).

Line-haul capacity would continue to grow to the point where the southbound IRT 4 and 5 express lines would exceed their practical capacities. (See Table 4.5-2). Utilizations of 113 percent were identified for these subway lines for the peak AM hour. The southbound IRT 6 line would remain well below operational capacity, with a line-haul utilization level of 54 percent. At the IRT Hunters Point Avenue Station line-haul utilizations would approach the practical capacity (92%).

4.5.2b TSM Alternative

As mentioned above, there would be additional LIRR trains serving the Hunterspoint Avenue Station, which in turn increase the number of people using the #7 line from Long Island City into Manhattan in the AM. Levels of service would generally be equivalent to No Build conditions since only a marginal number of additional subway trips would pass through GCT (or even along these selected NYCT platform areas) due to additional LIRR service at Hunterspoint Avenue.

TABLE 4.5-1

ANALYSIS OF SELECTED PLATFORM ZONES IRT LEXINGTON AVENUE STATION
2020 NO BUILD
TIME PERIOD ANALYZED: 15 - minute period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)		PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)		LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS C/D	LOS mid-D	
Northbound AM	8:35-8:50 AM	13,335	9,988	7,192	75%	54%	C-D
Northbound PM	5:15-5:30 PM	13,335	10,850	7,822	81%	59%	C-D
Southbound AM	8:25-8:40 AM	5,115	4,527	3,269	88%	64%	C-D
Southbound PM	5:30-5:45 PM	5,115	3,807	2,748	74%	54%	C-D

TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)		PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)		LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS C/D	LOS mid-D	
Northbound AM	8:45-8:50 AM	4,445	3,599	2,589	81%	58%	C-D
Northbound PM	5:20-5:25 PM	4,445	3,960	2,854	89%	64%	C-D
Southbound AM	8:35-8:40 AM	1,705	2,610	1,877	153%	110%	mid-D or worse
Southbound PM	5:35-5:40 PM	1,705	2,046	1,472	120%	88%	mid-D

NOTES:

(1) Platform zones are situated near the center of the entire platform and were selected as per observations as being the most intensely used portions.

(2) The threshold requirements for LOS C/D are based on a space module of 22 square feet per person at 4.1 feet-per-second average walk speed and an average queue-space requirement of 7 square feet per person.

(3) The threshold requirements for LOS mid-D are based on a space module of 14 square feet per person at 3.5 feet-per-second average walk speed and an average queue-space requirement of 5 square feet per person.

TABLE 4.5-2

2020 NO BUILD SUBWAY LINE-HAUL ANALYSIS IN PEAK DIRECTION

Subway Station Subway Lines	Cars / Hr.	Total Practical Capacity */ Hour (pass/hr)	Pass. / Hr.	Utilization (%)
HUNTERS POINT AVENUE STATION				
Manhattan-bound (AM Peak)				
#7	286	31,460	29,005	0.92
GRAND CENTRAL STATION - 42nd STREET**				
Downtown (AM Peak)				
#4	115	12,650	14,320	1.13
#5	115	12,650	14,320	1.13
#6	240	26,400	14,186	0.54

*** Practical Capacity per Car (pcpc) varies with car length:**

**** Source MTA/NYCT MESA Study**

The above subway lines use 51 feet long/car and have a practical capacity of 110 passengers per car.

4.5.2c Build Alternative

This alternative would significantly impact conditions on the stairwells connecting to critical platform areas. During the AM peak period, about 9,000 new subway riders (4,500 in the 8 - 9 AM peak hour) would be destined to Lower Manhattan and other points south of GCT, while another 2,980 people (1,490 in the AM peak hour) would be using the northbound subway lines. Similar increased pedestrian volumes would occur during the PM peak hour.

To assign these new subway riders to NYCT station elements, pedestrians were traced into the mezzanine area (one level above the platforms) as they passed through the turnstile area. For the western mezzanine area, there are four stairwells serving the northbound and three stairwells serving of southbound platforms. Sample counts indicated that about 50 percent of all people entering the subway in this area use the stairwells directly in front of the turnstiles. Again, this is consistent with the previous observation in GCT that mass transit commuters appear to want to move vertically first and then, in the case of the subways, horizontally along the platform; they could then board a subway train if it should arrive during their pedestrian movement.

Applying this assignment percentage to the selected subway analysis elements, about 2,250 people would use the center southbound stair/platform linkage during the 8 - 9 AM peak hour, while another 745 people would utilize the center northbound platform area in the same hour. Combining these northbound and southbound volumes, a 100 to 120 percent increase over the future No Build pedestrian volumes moving through these subway elements and overall area.

There would be several time periods when the stairs and platforms themselves would deteriorate into LOS D, or in the case of a surge five-minute period within the 15 minute peak on the southbound platform in the AM, LOS E/F conditions (See Table 4.5-3). Also, other very congested peak surges would likely occur throughout the larger peak period. According to NYCT's Station Planning and Design Guidelines, these worsening conditions would be considered a significant adverse impact. However, as noted in the evaluation of those pedestrian elements within GCT, pedestrians moving through the subway area could possibly redistribute themselves to other nearby elements that are not as intensely used as these center circulation elements, and would therefore lessen the impact to these critical areas.

As a result of the additional subway riders under this Build Alternative, the line-haul capacity of the IRT 4 and 5 express subway lines would exceed their practical limits (127 percent utilizations). It is noted that the additional peak hour LIRR southbound ridership was distributed at 40 percent to each of the IRT 4 and 5 express subway lines and the remaining 20 percent to the IRT 6 local subway line for a conservative impact analysis. This has been estimated to result in approximately seven additional passengers per car per train during the peak hour as a result of the Build Alternative. The IRT 6 line would increase to about 57 percent utilized, but still be well below line-haul capacity limits. Table 4.5-4 lists analysis results. The ongoing MESA Study has identified the 42nd Street Station as the major choke point in the Lexington Avenue line system due to excessive dwell times needed for passenger on/off activity. This is consistent with one finding that the stairwells at this station do not appear to have excessive queues because people cannot alight trains easily, and therefore make their way to the stairs in a makeshift single file. For comparative purposes, the MESA Study also indicated that the IRT 86th Street Station currently experiences utilizations of 120 percent or higher on express lines.

TABLE 4.5-3

ANALYSIS OF SELECTED PLATFORM ZONES IRT LEXINGTON AVENUE STATION
2020 BUILD ALTERNATIVE
TIME PERIOD ANALYZED: 15 - minute period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)			PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)			LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS D/E (4)	LOS C/D	LOS mid-D	LOS D/E	
Northbound AM	8:35-8:50 AM	13,335	12,636	9,093	5,830	95%	68%	44%	C-D
Northbound PM	5:15-5:30 PM	13,335	11,663	8,420	5,550	87%	63%	42%	C-D
Southbound AM	8:25-8:40 AM	5,115	6,604	4,767	3,141	129%	93%	61%	mid-D
Southbound PM	5:30-5:45 PM	5,115	4,033	2,913	1,930	79%	57%	38%	C-D

TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT (1)		TIME-SPACE AVAILABLE (sqft-min)	TOTAL TIME-SPACE REQUIRED (sqft-min)			PERCENTAGE OF TIME-SPACE REQUIRED (sqft-min)			LOS
PLATFORM & TIME PERIOD	TIME	TOTAL	LOS C/D (2)	LOS mid-D (3)	LOS D/E (4)	LOS C/D	LOS mid-D	LOS D/E	
Northbound AM	8:45-8:50 AM	4,445	4,937	3,550	2,263	111%	80%	51%	mid-D
Northbound PM	5:20-5:25 PM	4,445	4,368	3,154	2,082	98%	71%	47%	C-D
Southbound AM	8:35-8:40 AM	1,705	3,659	2,634	1,695	215%	155%	99%	D-E
Southbound PM	5:35-5:40 PM	1,705	2,170	1,562	1,008	127%	92%	59%	mid-D

NOTES:

(1) Platform zones are situated near the center of the entire platform and were selected as per observations as being the most intensely used portions.

(2) The threshold requirements for LOS C/D are based on a space module of 22 square feet per person at 4.1 feet-per-second average walk speed and an average queue-space requirement of 7 square feet per person.

(3) The threshold requirements for LOS mid-D are based on a space module of 14 square feet per person at 3.5 feet-per-second average walk speed and an average queue-space requirement of 5 square feet per person.

(4) The threshold requirements for LOS D/E are based on a space module of 11 square feet per person at 3.3 feet per-second average walk speed and an average queue-space requirement of 3 square feet per person.

TABLE 4.5-4

2020 BUILD ALTERNATIVE SUBWAY LINE-HAUL ANALYSIS IN PEAK DIRECTION

Subway Station Subway Lines	Cars / Hr.	Total Practical Capacity */ Hour (pass/hr)	Pass. / Hr.	Utilization (%)
GRAND CENTRAL STATION - 42nd STREET				
Downtown (AM Peak)				
#4	115	12,650	16,120	1.27
#5	115	12,650	16,120	1.27
#6	240	26,400	15,086	0.57

*** Practical Capacity per Car (pcpc) varies with car length:**

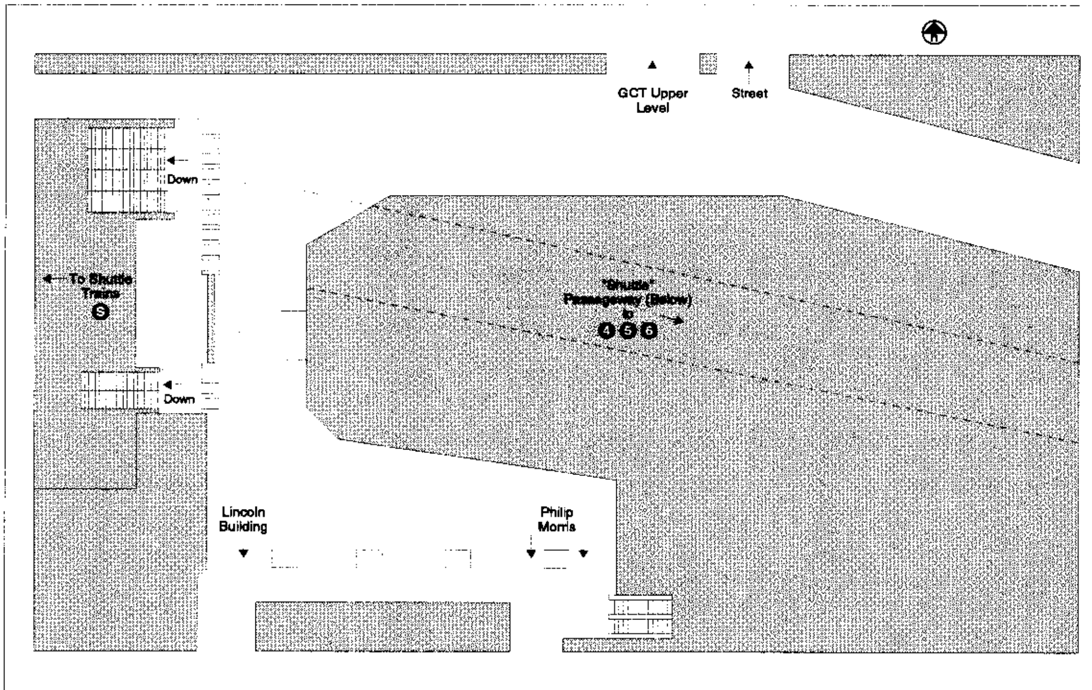
The above subway lines use 51 feet long/car and have a practical capacity of 110 passengers per car.

4.5.2d Build Alternative Mitigation

A possible mitigation measure would entail the deployment of NYCT personnel at the tops of stairs to control and direct pedestrian movements on the stairs themselves during peak pedestrian flow periods.

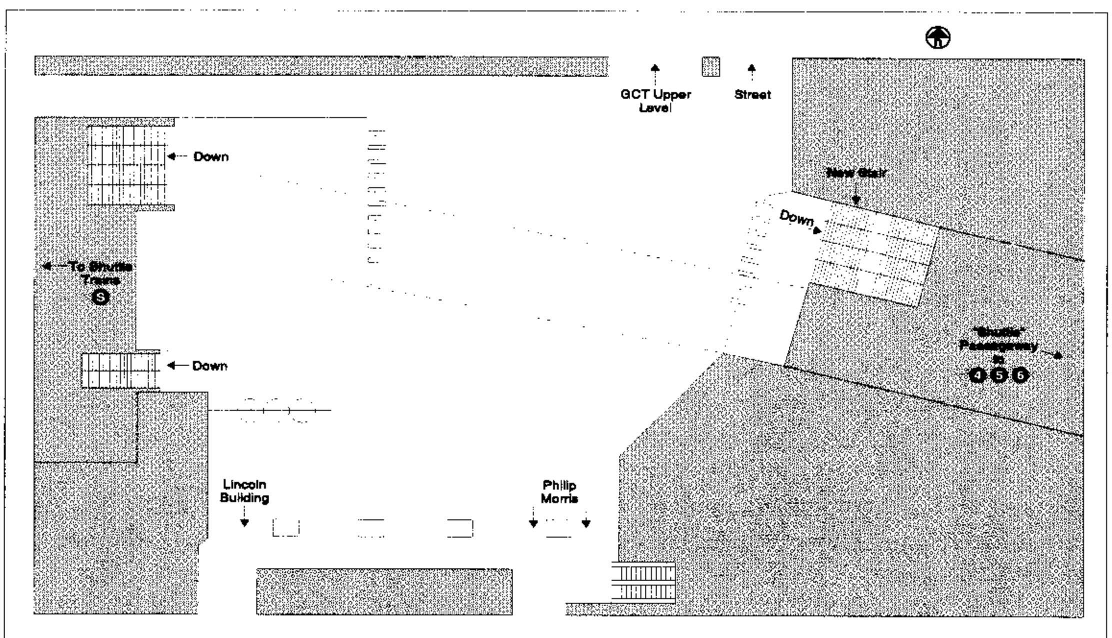
Another mitigation measure would provide new vertical circulation elements connecting the main concourse to the IRT mezzanine level and from the mezzanine to the subway platforms at location R-236 in the vicinity of the shuttle fare area. These elements would better disperse pedestrian flows moving between the terminal and the subway, and therefore assist in reducing localized queuing at the landing areas of stairs and escalators. The existing and proposed configuration of this area is shown on Figures 4.5-1 and 4.5-2 respectively.

Opening the passageways that are closed and refurbishing others to gain a more inviting appearance could also provide some measure of relief to the IRT mezzanine-level congestion. Some congestion at the IRT mezzanine level might be attributable to the closure of some passageways at that level and/or due to the underutilization of other passageways. Some pedestrians are probably using GCT as a link in their path as a substitute. In fact, there are many subsurface passageways that connect to the mezzanine level and completely avoid the main GCT confines. Some of these walkways are presently open today, such as the corridors that lead to the Chrysler Building on Lexington Avenue and further east to Third Avenue directly into the Kent Building. A number of these passages, however, are closed such as one leading to 41st Street into the Pershing Square Building or another veering off the Chrysler Building passageway leading into the Graybar Building. Still others such as two leading to Park Avenue just south of 42nd Street are open, but require proceeding via secluded corners. It may be possible to redirect LIRR riders through less congested passageways and mitigate high levels of service congestions through selective passageway widenings.



NYCT 42nd Street Shuttle
Grand Central Station
Existing R236 Mezzanine

Figure 4.5-1



NYCT 42nd Street Shuttle
Grand Central Station
Expanded R236 Mezzanine

Figure 4.5-2

Also, it should be noted that the projected ridership growth and related subway activity levels are not anticipated until 2020, approximately 10 years after the beneficial use of the project in 2010. For example, the MESA project is identifying potential improvements to subway service through 42nd Street Station as well as increasing IRT 4/5/6 line-haul capacities and could provide some measure of improvement at GCT. The TSM and Build Alternatives currently being analyzed by the MESA project are estimated drop to utilization levels to 107 percent and 94 percent respectively from the 113 percent MESA 2020 No-Build Alternative for the IRT 4/5 express service.

4.6 Hunters Point Avenue Subway Station Impacts

4.6.1 Analysis Methodology

The analyses focused on the key elements likely to be affected: specifically, the two street stairwells facing east that would continue to be used by LIRR riders and, with added riders on the subway cars themselves, line-haul capacity on the #7 Flushing subway line. The NYCT station's platforms are underutilized, with no crowding noted for any circulation area or element, and were not included as part of these analyses since they could be expected to continue to function acceptably. To complete these analyses, pedestrian activities at these stairwells during the AM and PM peak periods were tabulated during September 1996. The same analysis models/procedures and impact evaluation criteria as cited above for the 42nd Street subway station analyses were used.

4.6.2 Subway Stairwells and Line-Haul Capacity

4.6.2a No-Build Alternative

Using a cumulative background growth rate of 10.6 percent (from 1995 to 2020 for the Hunters Point station) as supplied by NYCT and overlaying the projected 24 percent increase of LIRR ridership, pedestrian usage at the station would still be modest. Stairwell analyses indicate that the circulation elements studied would continue to operate acceptably under LOS C/D, and actually operate much better than those service standards. No queues would likely form at the top of the stairs on the street sidewalks in the AM when passengers alight LIRR trains or on the subway's mezzanine level during the PM after they depart the subway. Table 4.6-1 lists the No Build analysis results for these stair elements. The Manhattan-bound #7 line at the Hunters Point Avenue station would have a utilization of 92 percent, indicating some degree of available capacity would still exist but this level of usage would approach its capacity threshold.

4.6.2b TSM Alternative

Under this alternative, additional LIRR trains to Hunterspoint Avenue would add about 3,050 new riders to the nearby IRT station. However, only a portion of these new LIRR passengers would complete the connection into the subway. Recent LIRR origin-and-destination surveys indicate that only 60 (PM) to 70 (AM) percent of these new LIRR riders would use the subway, or between 1,830 (PM) and 2,135 (AM) new subway riders during the peak period. For analysis purposes, one half of these passengers would again be concentrated during the 8 - 9 AM (1,068 entering the subway) and 5 - 6 PM (915 leaving the subway). These are rather modest increases in subway usage at this station, as indicated in the LOS analysis findings. All street stairwells would continue to operate within the LOS C/D range or better. Also, although IRT #7 subway use would increase, the effects at GCT would likely be minimal considering the substantial volume of pedestrians passing through this terminal. Line-haul capacity of this subway line (See Table 4.6-3) would slightly increase to about 95 percent full, again, not fully utilized but nearing capacity limits. Table 4.6-2 lists the TSM Alternative LOS findings.

4.6.2c Build Alternative

The introduction of LIRR service into GCT would have a dramatic effect in reducing usage of the Hunters Point Avenue subway station. Forecasts indicate that LIRR riders using this station would decrease to under 200 in the entire four-hour AM peak period. It is reasonable to state that the Hunters Point Avenue subway station and the #7 subway line-haul capacity would be underutilized, at least as far as LIRR riders contribute to passenger demand for this service.

4.6.3 Local Bus Service Impacts

No significant differences would be expected between the Alternatives, although there could be some minor background growth in the number of bus trips under all three Alternatives. The TSM Alternative is planned to include ferry service across the East River between Long Island City and East 34th Street in Manhattan. Connecting buses in Queens would shuttle LIRR passengers between the Hunterspoint Avenue LIRR Station and the new ferry landing, and in Manhattan bus service across 34th, 42nd, and 49th/50th Streets would be added to connect with their East Midtown destinations.

4.7 Traffic and Parking Impacts

4.7.1 Analysis Methodology

The assessment of potential traffic impacts followed a series of prescribed steps: 1) determination of the background traffic volume growth expected in 2020 for the No Build, TSM, and Build Alternatives; 2) identification of the likely routes to be used by motorists to reach GCT; 3) analysis of future levels of service under the various alternatives, including any street circulation improvements that may be planned for the roads around the terminal; and 4) identification of any additional actions needed to mitigate impacts of the build alternatives.

To account for general background growth, a 0.5 percent annual growth rate was used, which is consistent with major projects such as the Route 9A Reconstruction in Manhattan and the MESA MIS. It is also indicative of the general growth pattern of Manhattan's bridge crossing data over the last ten years, as well as being listed in the New York City's *CEQR Technical Manual.* Overall, the cumulative growth using this factor would increase existing traffic volumes by about 13 percent.

The analysis focused on five key intersections surrounding the terminal along Lexington Avenue and 42nd Street. These locations were selected as being representative critical intersections at the interface of traffic and pedestrians. These locations would also be the main concentration points where traffic generated by the LIRR would travel through.

To calculate future vehicle trip generation and identify impacts, the analysis recognized two unique features associated with the project. First, regarding trip generation, the introduction of LIRR service into GCT would not be expected to generate additional vehicular traffic. Rather, the focus would be placed on new taxi trips that would be either attracted to the site in the morning to meet arriving riders, or be dropping off PM commuters to departing trains in the late afternoon/evening. Second, regarding the traffic impact methodology, while the HCM LOS procedures were again used, it is important to acknowledge that pedestrian activity would be increased significantly and would hamper vehicle capacity at GCT intersections. However, the HCM procedures "cap" the pedestrian impedance factor when the volume of pedestrians rises

TABLE 4.6-1
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS FOR IRT HUNTERS POINT AVENUE STATION
2020 NO BUILD ALTERNATIVE
<u>TIME PERIOD ANALYZED: 15-minute period within AM & PM peak hour</u>

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	9	511	521	8.0	7.0	56	95	<u>0.62</u>	0.36
	West Stair	17	317	335	8.0	7.0	56	95	<u>0.40</u>	0.23
5:10-5:25 PM Peak	East Stair	312	102	414	8.0	7.0	56	95	<u>0.49</u>	0.29
	West Stair	369	13	382	8.0	7.0	56	95	<u>0.45</u>	0.27

<u>*TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour*</u>

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	1	257	258	8.0	7.0	56	95	<u>0.92</u>	0.54
	West Stair	8	176	184	8.0	7.0	56	95	<u>0.66</u>	0.39
5:10-5:25 PM Peak	East Stair	116	48	164	8.0	7.0	56	95	<u>0.59</u>	0.34
	West Stair	136	1	137	8.0	7.0	56	95	<u>0.49</u>	0.29

NOTES:

(1) Based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

(2) V/C ratios under 1.00 indicate the element operates at LOS C/D or better; when the V/C ratio for the element analyzed under LOS C/D conditions is over 1.00, the level-of-service is then evaluatec (i.e., flow rate of 17 ped/ft/min.)

TABLE 4.6-2

ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS FOR IRT HUNTERS POINT AVENUE STATION
2020 TSM ALTERNATIVE
TIME PERIOD ANALYZED: 15-minute period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	10	554	564	8.0	7.0	56	95	0.67	0.39
	West Stair	18	346	364	8.0	7.0	56	95	0.43	0.25
5:10-5:25 PM Peak	East Stair	347	113	460	8.0	7.0	56	95	0.55	0.32
	West Stair	410	14	424	8.0	7.0	56	95	0.50	0.30

TIME PERIOD ANALYZED: 5-minute surge period within AM & PM peak hour

PEDESTRIAN CIRCULATION ELEMENT		PEDESTRIAN VOLUME (peds)			WIDTH (ft)		PROCESSING RATE (1) (peds/min)		VOLUME-TO-CAPACITY RATIO (2)	
TIME	SECTION	UP / OUT	DOWN / IN	TOTAL	GROSS	EFFECTIVE	LOS C/D	LOS E/F	LOS C/D	LOS E/F
8:45-9:00 AM Peak	East Stair	2	278	280	8.0	7.0	56	95	1.00	0.59
	West Stair	9	190	199	8.0	7.0	56	95	0.71	0.42
5:10-5:25 PM Peak	East Stair	133	53	186	8.0	7.0	56	95	0.66	0.39
	West Stair	156	2	158	8.0	7.0	56	95	0.56	0.33

NOTES:

(1) Based on an average unit (effective) width flow rate of 10 and 17 ped/ft/min, signifying LOS C/D, and LOS E/F, respectively.
Also adjusted for pedestrian flow in opposing directions: Capacity reduction factors of 0%, 10%, and 20% applied for 100%, 50-66%, and 67-99% pedestrian flow in one direction, respectively.

(2) V/C ratios under 1.00 indicate the element operates at LOS C/D or better; when the V/C ratio for the element analyzed under LOS C/D conditions is over 1.00, the level-of-service is then evaluat

TABLE 4.6-3

2020 TSM ALTERNATIVE SUBWAY LINE-HAUL ANALYSIS IN PEAK DIRECTION

Subway Station Subway Lines	Cars / Hr.	Total Practical Capacity */ Hour (pass/hr)	Pass. / Hr.	Utilization (%)
HUNTERS POINT AVENUE STATION				
Manhattan-bound (AM Peak) #7	286	31,460	29,908	0.95

*** Practical Capacity per Car (pcpc) varies with car length:**

The above subway lines use 51 feet long/car and have a practical capacity of 110 passengers per car.

above 1,700, which is presently the case. Therefore, the affected right- and left-turn factors (these are the vehicles affected by people crossing the street) were calibrated to identify traffic impacts that may occur when the crossing pedestrians are even higher than the existing dense pedestrian platoons.

Finally, the City's *CEQR Technical Manual* criteria for impacts were used in this study. Although not binding on this project, the CEQR guidelines were consulted for additional guidance in assessing traffic impacts. These criteria use a diminishing scale as level of service worsens from D to F; that is, as the average vehicle delay increases (and LOS worsens), there is a smaller level of acceptable delay increase tolerated by motorists. These criteria, adopted by City review agencies in 1993, are used on all environmental assessments and traffic studies conducted in the five boroughs, and were used in this study.

4.7.2 Vehicle Trip Generation

For the No Build and TSM Alternatives, there would be no significant trip generation. For these alternatives, traffic volumes were assessed on the basis of background growth only since no new geometric or operational changes are planned for this area. (The 42nd Street LRT remains highly uncertain at this time, and was therefore not included in this study.) In fact, background trip growth for the TSM Alternative may actually be slightly lower since there would be fewer commuters coming into GCT (some would be using the Hunterspoint Avenue Station instead) during the peak periods.

For the Build Alternative, a number of trip generation factors were used as previously determined in traffic studies near Penn Station, at GCT, or in the general Midtown Manhattan area. Studies conducted at these commuter facilities show that only about two percent of detraining riders use a taxi or limousine to continue their travel. A vehicle occupancy rate of about 1.5 persons per taxi was identified, which is also an accepted rate for Midtown Manhattan and is reasonable for commuter terminals where people are more likely to split a fare to keep their travel costs down. About 50 percent of these trips were assumed to occur in the peak hours.

Applying these factors to the new riders destined to areas south of GCT, about 220 additional taxi trips would be generated during the critical 8 - 9 AM and 5 - 6 PM peak hours. However, not all of these trips would be new since taxicabs cruise the streets in search of a fare, and are especially attracted to major generators such as GCT and are often in a waiting queue there. Thus, for the morning peak, it was assumed that only half of these trips (110) would actually "show up" on the streets near GCT having not been there before. This assumption was not used for the evening peak period since LIRR riders, having left their offices, would hail a taxi and now travel to GCT (previously to Penn Station). Thus, these taxis (all 220 trips) would be new vehicle trips added to the traffic flows in the GCT area.

It bears noting that there would be a possible trade-off of increased traffic impacts near GCT versus traffic flow reductions at Penn Station. Since fewer commuters would be traveling to West Midtown in the area between 30th and 39th Streets, traffic (as well as pedestrian) volume could be expected to decrease around Penn Station and on the major arterials leading to it. In fact, there may actually be a considerable improvement within a four to five-block radius around Penn Station considering that some of Midtown's highest pedestrian volumes there would be significantly lessened.

Before completing each alternative's capacity analyses, the final step is the assignment of new vehicle trips as well as new pedestrian trips to GCT's surrounding streets. Sample traffic counts on these streets indicate that, considering a screenline directly around GCT itself, most taxi activity is concentrated first along 42nd Street (45 percent) where dedicated taxi stands exist and where the Grand Hyatt Hotel entrance is located, and then along Vanderbilt Avenue (30 percent) where a covered waiting area is assigned to taxis. A lesser amount (about 20 percent) use Lexington Avenue since the taxi stand is situated across the street on the avenue's east side, which makes access into and out of GCT more difficult. The remaining few taxi trips (under five percent) use the terminal's existing north access along 45th Street.

4.7.3 Traffic Congestion and Levels of Service

4.7.3.1 No-Build Alternative

Applying the background growth rate to the area's traffic volumes indicates that some streets would have limited traffic increases while others would show more intense growth since they carry higher traffic flows today. Lexington Avenue would continue to carry the highest traffic volumes, with No Build increases of 200 to 220 vph during the AM and PM peak hours. Along 42nd Street, volumes would increase by about 110-130 vph in each direction during each peak hour. Volumes along Vanderbilt Avenue are low today, and would only increase by about 20 vehicles. Traffic using the section of Park Avenue leading to 42nd Street would also remain low, with background growth of 15 to 20 vehicles during the weekday peak hours.

LOS analyses indicate that a number of intersections would deteriorate into unacceptable delay ranges, and the overall street system could be characterized by operations at or over capacity (LOS E to F). One reason for this could be that while these streets currently operate with some congestion (LOS D was noted for some approaches today), operations around GCT are "fragile" and only need a modest growth to deteriorate into unacceptable ranges. Also, since pedestrians and vehicles would vie for the same limited time and space, there would be times when vehicle flow would be stopped — despite green signals prevailing — due to dense crossing pedestrian platoons accounted for in the capacity analyses. Lexington Avenue, for example, would deteriorate into LOS E to F operations with the increase of traffic and pedestrian volumes all competing for limited space and time to complete their movements. Similarly, 42nd Street would also show deterioration on its approaches fronting GCT. Average vehicle delays for these streets would be in the LOS E to F range. The analysis results for the No-Build Alternative are shown on Table 4.7-1.

TABLE 4.7-1
YEAR 2020 NO BUILD
TRAFFIC LEVELS OF SERVICE

SIGNALIZED INTERSECTIONS

INTERSECTION and APPROACH		Weekday AM Peak Hour				Weekday PM Peak Hour			
		Mvt. (1)	V/C (2)	Delay (3)	LOS (4)	Mvt. (1)	V/C (2)	Delay (3)	LOS (4)
#1: LEXINGTON AVENUE @ 42nd STREET									
42nd Street	EB	TR	0.74	20.1	C	TR	0.94	31.1	D
	WB	T	0.90	28.7	D	T	1.07	67.6	F
Lexington Avenue	SB	LTR	1.14	56.9	E	LTR	1.25	99.9	F
Overall Intersection		-	**1.04**	**41.7**	**E**	-	**1.17**	**75.7**	**F**
#2: LEXINGTON AVENUE @ 43rd STREET									
43rd Street	WB	L	1.15	52.3	E	L	1.01	37.1	D
Lexington Avenue	SB	T	1.13	57.5	E	T	1.14	60.9	F
Overall Intersection		-	**1.14**	**56.7**	**E**	-	**1.07**	**57.7**	**B**
#3: LEXINGTON AVENUE @ 45th STREET									
45th Street	WB	L	0.47	10.3	B	L	0.41	9.9	B
		LT	0.71	12.6	B	LT	0.58	11.0	B
Lexington Avenue	SB	TR	1.19	73.5	F	TR	1.14	54.9	E
Overall Intersection		-	**0.91**	**57.9**	**E**	-	**0.85**	**45.3**	**E**
#4: PARK AVENUE @ 42nd STREET									
42nd Street	EB	TR	1.13	81.0	F	TR	1.11	74.8	F
	WB	T	1.09	68.5	F	T	1.09	68.0	F
Park Avenue	NB	LR	0.20	8.8	B	LR	0.18	8.7	B
		R	0.18	8.8	B	R	0.20	8.8	B
Overall Intersection		-	**0.76**	**71.9**	**F**	-	**0.75**	**67.7**	**F**
#5: VANDERBILT AVENUE @ 42ND STREET									
42nd Street	EB	T	1.28	70.2	F	T	1.21	57.7	E
42nd Street	WB	TR	1.18	75.8	F	TR	1.23	98.9	F
Overall Intersection		-	**1.18**	**72.7**	**F**	-	**1.24**	**77.9**	**F**

NOTES:

1. "MVT" references specific intersection approach lanes. TR is a combined through-right turn lane, TL is a combined through-left turn lane, R or L refers to exclusive right- or left-turn lanes, and LTR is a mixed lane that allows for all movement types.

2. "V/C" or Volume-to-Capacity ratio for the MVT listed in the first column.

3. "Delay" is in seconds per vehicle for the MVT listed in the first column.

4. "LOS" or Level Of Service is based on 1985 HCM methodology, enhanced for NYC conditions.

4.7.3.2 TSM Alternative

As mentioned above, background trip growth in Midtown Manhattan for the TSM Alternative may actually be slightly lower since there would be fewer commuters to and from GCT during the peak periods. However, there would not likely be any appreciable differences from those travel conditions described for the No-Build Alternative.

4.7.3.3 Build Alternative

In this alternative, there would be increased taxi activity and significant increases in pedestrian movements into and out of GCT. The heavy impact of additional pedestrians crossing the surrounding streets in this area would likely have a much greater effect on the intersection's ability to process vehicular traffic than the increase in taxi traffic. This is because the volume of pedestrians added to already overcrowded sidewalks and streets would further intensify these conditions.

For vehicle flows, the overall increases would be modest, about five percent increase when considering the overall perimeter of GCT. Along 42nd Street, taxi increases of 60 (AM) to 105 (PM) would occur. On Lexington Avenue, smaller increases of 25 to 45 new taxi trips would occur. Taxi traffic along Vanderbilt Avenue would increase significantly, yet total volumes would still remain very low (250 vph or less) relative to other streets in the area.

Pedestrian flows would increase by as much as 1,000 to 2,000 per hour (at one corner) in the corner crosswalks of the GCT superblock. At the crosswalk spanning 45th Street at Lexington Avenue, pedestrian crossings would increase by about 1,450 in the 8 - 9 AM hour, or an increase of slightly more than 70 percent over No Build volumes. Moving across Vanderbilt Avenue at 42nd Street, an additional 1,980 pedestrian would be added to the No Build AM peak-hour volume of 3,900, or just over a 50 percent increase. Pedestrian increases would be slightly less during the PM peak hour as people are less concentrated in their evening commuting pattern. Using the same locations as noted above for the AM peak, the 45th Street crosswalk across Lexington Avenue volume would increase by about 1,200 pedestrians, or an increase of about 35 percent over No Build volumes. The Vanderbilt Avenue crosswalk would have an increase of about 1,150 pedestrians over the future No Build volume of 6,500, or an increase of just under 20 percent.

LOS analysis findings indicate that nearly all major crossings would deteriorate further into LOS F operations. Average vehicle delays would increase to the 80 to 160 second range, indicative of failure operations. Again, there would likely be less actual use of the green traffic signal due to intense crossing platoons of pedestrians interfering with phases when vehicles should be moving. Such congestion occurs today around Penn Station, even more so since an extremely high percentage of all pedestrians from the station level must cross Seventh Avenue and 34th Street on their way north and east of that terminal. By contrast, GCT has the benefit of being more centrally situated in the Midtown Manhattan employment core, which allows pedestrians to access the streets via numerous paths to different directions. Analysis results are listed in Table 4.7-2.

4.7.3.3a Build Alternative Mitigation

Traffic mitigation to alleviate impacts surrounding GCT could involve a number of basic measures, although some would require a high level of enforcement to be effective. Also, considering that pedestrians and vehicles often compete for the same street space and signal time, some mitigation that may be effective in reducing traffic impacts could result in adverse pedestrian conditions.

TABLE 4.7-2
YEAR 2020 BUILD ALTERNATIVE
TRAFFIC LEVELS OF SERVICE

SIGNALIZED INTERSECTIONS

INTERSECTION and APPROACH		Weekday AM Peak Hour Mvt. (1)	V/C (2)	Delay (3)	LOS (4)	Weekday PM Peak Hour Mvt. (1)	V/C (2)	Delay (3)	LOS (4)
#1: LEXINGTON AVENUE @ 42nd STREET									
42nd Street	EB	TR	0.75	20.4	C	TR	0.99	38.7	D
	WB	T	0.94	32.6	D	T	1.15	103.8	F
Lexington Avenue	SB	LTR	1.23	90.2	F	LTR	1.33	145.1	F
Overall Intersection		-	**1.10**	**60.7**	**F**	-	**1.25**	**108.9**	**F**
#2: LEXINGTON AVENUE @ 43rd STREET									
43rd Street	WB	L	1.15	52.3	E	L	1.01	37.1	D
Lexington Avenue	SB	T	1.17	70.3	F	T	1.18	75.8	F
Overall Intersection		-	**1.16**	**67.5**	**F**	-	**1.14**	**70.7**	**F**
#3: LEXINGTON AVENUE @ 45th STREET									
45th Street	WB	L	0.51	10.7	B	L	0.47	10.4	B
		LT	0.71	12.7	B	LT	0.59	11.1	B
Lexington Avenue	SB	TR	1.24	99.9	F	TR	1.21	84.6	F
Overall Intersection		-	**0.96**	**77.9**	**F**	-	**0.92**	**69.2**	**F**
#4: PARK AVENUE @ 42nd STREET									
42nd Street	EB	TR	1.19	116.8	F	TR	1.19	119.3	F
	WB	T	1.13	89.6	F	T	1.18	115.5	F
Park Avenue	NB	LR	0.21	8.8	B	LR	0.19	8.8	B
		R	0.18	8.8	B	R	0.20	8.8	B
Overall Intersection		-	**0.80**	**99.5**	**F**	-	**0.80**	**111.0**	**F**
#5: VANDERBILT AVENUE @ 42ND STREET									
42nd Street	EB	L	1.31	75.2	F	L	1.28	71.1	F
42nd Street	WB	TR	1.25	105.9	F	TR	1.36	169.4	F
Overall Intersection		-	**1.25**	**89.4**	**F**	-	**1.36**	**119.8**	**F**

NOTES:

1. "MVT" references specific intersection approach lanes. TR is a combined through-right turn lane. TL is a combined through-left turn lane, R or L refers to exclusive right- or left-turn lanes, and LTR is a mixed lane that allows for all movement types.
2. "V/C" or Volume-to-Capacity ratio for the MVT listed in the first column.
3. "Delay" is in seconds per vehicle for the MVT listed in the first column.
4. "LOS" or Level Of Service is based on 1985 HCM methodology, enhanced for NYC conditions.

Specific improvement measures would include curb parking restrictions (which should be strictly enforced) to allow for one additional travel lane along Lexington Avenue's east side opposite the terminal from 44th to 42nd Streets. Also, a number of side streets with less traffic could have their green signal time reduced without significantly worsening their LOS. This "available" green time could then be shifted to the major arterial requiring more time to process their vehicle demands. Signal timing adjustments were tested at the 42nd Street intersections with Vanderbilt and Park Avenues, and at the Lexington Avenue/45th Street location. For those locations where signal timing modifications were made to favor the main avenue, pedestrian crossing intervals would be shortened with the presumption that these people would not cross directly at GCT but rather at other less congested streets. Tables 4.7-3 and 4.7-4 list traffic mitigation analysis results for the respective AM and PM peak hours.

Also, it should be noted that the projected ridership growth and related traffic activity levels are not anticipated until 2020, approximately 10 years after the beneficial use of the project in 2010.

TABLE 4.7-3
MITIGATED BUILD ALTERNATIVE TRAFFIC LEVELS OF SERVICE
WEEKDAY AM PEAK HOUR

SIGNALIZED INTERSECTIONS

INTERSECTION and APPROACH		No Build Mvt. (1)	No Build V/C (2)	No Build Delay (3)	No Build LOS (4)	Build Mvt. (1)	Build V/C (2)	Build Delay (3)	Build LOS (4)	Mitigated Build Mvt. (1)	Mitigated Build V/C (2)	Mitigated Build Delay (3)	Mitigated Build LOS (4)
#1: LEXINGTON AVENUE @ 42nd STREET													
42nd Street	EB	TR	0.74	20.1	C	TR	0.75	20.4	C	TR	0.75	20.4	C
	WB	T	0.90	28.7	D	T	0.94	32.6	D	T	0.94	32.6	D
Lexington Avenue	SB	LTR	1.14	56.9	E	LTR	1.23	90.2	F	LTR	1.12	46.4	E
Overall Intersection		-	**1.04**	**41.7**	**E**	-	**1.10**	**60.7**	**F**	-	**1.04**	**37.3**	**D**
#2: LEXINGTON AVENUE @ 43rd STREET													
43rd Street	WB	L	1.15	52.3	E	L	1.15	52.3	E	L	1.15	52.3	E
Lexington Avenue	SB	T	1.13	57.5	E	T	1.17	70.3	F	T	1.07	38.0	D
Overall Intersection		-	**1.14**	**56.7**	**E**	-	**1.16**	**67.5**	**F**	-	**1.12**	**40.0**	**E**
#3: LEXINGTON AVENUE @ 45th STREET													
45th Street	WB	L	0.47	10.3	B	L	0.51	10.7	B	L	0.55	14.2	B
		LT	0.71	12.6	B	LT	0.71	12.7	B	LT	0.85	19.9	C
Lexington Avenue	SB	TR	1.19	73.5	F	TR	1.24	99.9	F	TR	1.18	70.1	F
Overall Intersection		-	**0.91**	**57.9**	**E**	-	**0.96**	**77.9**	**F**	-	**1.01**	**58.0**	**E**
#4: PARK AVENUE @ 42nd STREET													
42nd Street	EB	TR	1.13	81.0	F	TR	1.19	116.8	F	TR	1.12	77.4	F
	WB	T	1.09	68.5	F	T	1.13	89.6	F	T	1.05	53.6	E
Park Avenue	NB	LR	0.20	8.8	B	LR	0.21	8.8	B	LR	0.21	9.8	B
		R	0.18	8.8	B	R	0.18	8.8	B	R	0.18	9.7	B
Overall Intersection		-	**0.76**	**71.9**	**F**	-	**0.80**	**99.5**	**F**	-	**0.79**	**63.6**	**F**
#5: VANDERBILT AVENUE @ 42ND STREET													
42nd Street	EB	T	1.28	70.2	F	L	1.31	75.2	F	L	1.19	52.9	E
42nd Street	WB	TR	1.18	75.8	F	TR	1.25	105.9	F	TR	1.17	73.9	F
Overall Intersection		-	**1.18**	**72.7**	**F**	-	**1.25**	**89.4**	**F**	-	**1.18**	**62.6**	**F**

NOTES:
1. "MVT" references specific intersection approach lanes. TR is a combined through-right turn lane, TL is a combined through-left turn lane, R or L refers to exclusive right- or left-turn lanes, and LTR is a mixed lane that allows for all movement types.
2. "V/C" or Volume-to-Capacity ratio for the MVT listed in the first column.
3. "Delay" is in seconds per vehicle for the MVT listed in the first column.
4. "LOS" or Level Of Service is based on 1985 HCM methodology, enhanced for NYC conditions.

TABLE 4.7-4
MITIGATED GCT ALTERNATIVE TRAFFIC LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR

SIGNALIZED INTERSECTIONS

INTERSECTION and APPROACH		No Build				Build				Mitigated Build			
		Mvt. (1)	V/C (2)	Delay (3)	LOS (4)	Mvt. (1)	V/C (2)	Delay (3)	LOS (4)	Mvt. (1)	V/C (2)	Delay (3)	LOS (4)
#1: LEXINGTON AVENUE @ 42nd STREET													
42nd Street	EB	TR	0.94	31.1	D	TR	0.99	38.7	D	TR	0.89	24.2	C
	WB	T	1.07	67.6	F	T	1.15	103.8	F	T	1.03	51.4	E
Lexington Avenue	SB	LTR	1.25	99.9	F	LTR	1.33	145.1	F	LTR	1.19	74.8	F
Overall Intersection		-	**1.17**	**75.7**	**F**	-	**1.25**	**108.9**	**F**	-	**1.11**	**56.9**	**E**
#2: LEXINGTON AVENUE @ 43rd STREET													
43rd Street	WB	L	1.01	37.1	D	L	1.01	37.1	D	L	1.01	37.1	D
Lexington Avenue	SB	T	1.14	60.9	F	T	1.18	75.8	F	T	1.08	41.8	E
Overall Intersection		-	**1.07**	**57.7**	**B**	-	**1.14**	**70.7**	**F**	-	**1.04**	**41.2**	**E**
#3: LEXINGTON AVENUE @ 45th STREET													
45th Street	WB	L	0.41	9.9	B	L	0.47	10.4	B	L	0.48	13.3	B
		LT	0.58	11.0	B	LT	0.59	11.1	B	LT	0.68	15.1	C
Lexington Avenue	SB	TR	1.14	54.9	E	TR	1.21	84.6	F	TR	1.06	28.4	D
Overall Intersection		-	**0.85**	**45.3**	**E**	-	**0.92**	**69.2**	**F**	-	**0.89**	**25.5**	**D**
#4: PARK AVENUE @ 42nd STREET													
42nd Street	EB	TR	1.11	74.8	F	TR	1.19	119.3	F	TR	1.1	68.9	F
	WB	T	1.09	68.0	F	T	1.18	115.5	F	T	1.07	59.9	E
Park Avenue	NB	LR	0.18	8.7	B	LR	0.19	8.8	B	LR	0.19	10.0	B
		R	0.20	8.8	B	R	0.20	8.8	B	R	0.2	10.1	B
Overall Intersection		-	**0.75**	**69.0**	**F**	-	**0.80**	**111.0**	**F**	-	**0.79**	**61.4**	**F**
#5: VANDERBILT AVENUE @ 42ND STREET													
42nd Street	EB	T	1.21	57.7	E	L	1.28	71.1	F	L	1.28	71.1	F
42nd Street	WB	TR	1.23	98.9	F	TR	1.36	169.4	F	TR	1.23	96.1	F
Overall Intersection		-	**1.24**	**77.9**	**F**	-	**1.36**	**119.8**	**F**	-	**1.23**	**83.5**	**F**

NOTES:
1. "MVT" references specific intersection approach lanes. TR is a combined through-right turn lane, TL is a combined through-left turn lane, R or L refers to exclusive right- or left-turn lanes, and LTR is a mixed lane that allows for all movement types.

2. "V/C" or Volume-to-Capacity ratio for the MVT listed in the first column.

3. "Delay" is in seconds per vehicle for the MVT listed in the first column.

4. "LOS" or Level Of Service is based on 1985 HCM methodology, enhanced for NYC conditions.

During subsequent planning and design phases of the project, the number of intersections in the study area in the vicinity of GCT will be reexamined and additional traffic counts and mitigation measures will be developed, as appropriate.

4.8 On-Street Pedestrian Impacts

4.8.1 Analysis Methodology

Identification of pedestrian impacts also included determining the background growth expected in year 2020 for the three alternatives, identifying likely pedestrian paths into and out of GCT, analyzing future levels of service including NEA circulation improvements, and identifying mitigations needed to relieve significant impacts.

As detailed in the existing conditions chapter, the analysis of pedestrian conditions around GCT focused on key crosswalks and corner areas directly outside the terminal as these locations would have the greatest concentration of people. Existing pedestrian flows were obtained in May 1995 along 42nd and 45th Streets as well as along Lexington Avenue. The 1985 HCM procedures were utilized in the analyses.

To account for general background growth including MNR increased ridership projections, a 1.17 percent annual growth rate (as reported in the 1991 NEA assignment model) was used. Overall, the cumulative growth would be about 34 percent. However, during the subsequent stages of planning and design for the project, the growth rates will be further analyzed and may be updated at that time.

Pedestrian trip generation focused on those walk trips using GCT but not through the new NEA stairs leading directly to areas north of 45th Street. In this case, the analysis included those LIRR riders destined to points south, east, and west of the terminal. Additionally, persons identified as being bound for the IRT subway and connecting with taxis directly outside GCT were deleted since they would not be using the sidewalks at all or would minimally just use it for a taxi service. Overall, this would leave some 25,500 walk trips utilizing the sidewalks and crosswalks directly outside of the terminal during the peak periods (about 13,000 in the AM and PM peak hours).

The assignment of new pedestrian trips concentrated on the sidewalks surrounding GCT. Pedestrians were traced entering and leaving the terminal from each entrance as identified in previous steps. The corner locations were also sampled to ascertain how people split between crosswalks since two choices are available at each street corner. For the most part, people utilize the GCT interior passageways before moving outside. Also, at GCT's southwest corner, over 80 percent of all people exiting the building in the morning cross westward along 42nd Street's northside, rather than splitting into smaller groups and into different directions. As another example, after leaving the Graybar passageway, almost 70 percent of the pedestrian flow turns north immediately, using Lexington Avenue's west sidewalk, even continuing northward across 45th Street.

4.8.2 No-Build Alternative

Applying the background cumulative 34 percent growth rate to the area's pedestrian flows indicates that the major flows at GCT's sidewalk corners would increase by 700 to 1,000 pedestrians in the AM and PM peak hours. The largest volume increase (2,200) would occur at the midblock area on Lexington Avenue's west sidewalk where the greatest single concentration of people was noted.

LOS findings indicate that some locations, particularly those where dense pedestrian platoons are normal, would deteriorate into more congested, though not breakdown, levels of service (see Table 4.8-1). GCT's corners and midblock sidewalks along Lexington Avenue would operate at LOS E to F, although the crosswalks would show only one LOS deterioration (the north crosswalk at 42nd Street in the PM). The corner of Vanderbilt Avenue and 42nd Street would continue to operate at an acceptable LOS since this intersection provides nearly all of the cycle length to crossing pedestrians (only westbound right turns are allowed here, and most of these are taxis).

TABLE 4.8-1
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS
EXTERIOR TO GRAND CENTRAL TERMINAL

2020 NO BUILD CONDITIONS
AM and PM Peak Periods

INTERSECTION and ELEMENT	8 - 9 AM Peak Period				5 - 6 PM Peak Period			
	Average		Maximum Surge		Average		Maximum Surge	
	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS
LEXINGTON AVENUE @ 45th STREET								
Southwest corner	11	E			14	E		
South crosswalk	24	C	14	E	29	C	17	D
West crosswalk	30	C	11	E	22	D	8	E
LEXINGTON AVENUE @ 43rd STREET								
Sidewalk on W. side of Lex.	31	F	35	F	18	E	22	E
North crosswalk	16	D	8	E	20	D	10	E
LEXINGTON AVENUE @ 42nd STREET								
Northwest corner	11	E			23	D		
North crosswalk	10	E	5	F	13	E	6	E
West crosswalk	21	D	11	E	26	C	14	E
VANDERBILT AVENUE @ 42nd STREET								
Northeast corner	25	C			19	D		
North crosswalk	72	B	56	B	42	B	33	C
East crosswalk	50	B	25	C	59	B	29	C

4.8.3 TSM Alternative

Pedestrian conditions would be slightly improved since fewer commuters would come into the GCT area from Penn Station and use nearby pedestrian facilities. However, there would not likely be any noticeable differences from those conditions described for the future No-Build Alternative.

4.8.4 Build Alternative

As detailed above, pedestrian flows would increase by as much as 1,000 to 2,000 per hour in the corner crosswalks of the GCT superblock. Pedestrians crossing the 45th Street crosswalk would increase by about 1,450 in the 8 - 9 AM hour, or about 70 percent over No Build volumes. Across Vanderbilt Avenue at 42nd Street, almost 2,000 more pedestrians would be added to the No Build AM peak-hour volume of 3,900, or just over a 50 percent increase. During the PM peak hours, pedestrian increases would be slightly lower. The 45th Street crosswalk volume would increase by about 1,200 pedestrians, or about 35 percent over No Build volumes. The Vanderbilt Avenue crosswalk would have an increase of about 1,150 pedestrians, or a 20 percent increase over the future No Build volume of 6,500.

LOS analysis findings (see Table 4.8-2) indicate that while pedestrian conditions would continue to deteriorate from those in the No-Build Alternative, there would generally appear to be a mix of slight congestion (LOS D) to extreme bunching or even stoppages (LOS F). This is not surprising since some paths into and out of GCT are more "popular" than others. Some specific examples follow.

TABLE 4.8-2
ANALYSIS OF CRITICAL PEDESTRIAN ELEMENTS
EXTERIOR TO GRAND CENTRAL TERMINAL

2020 BUILD CONDITIONS
AM and PM Peak Periods

INTERSECTION and ELEMENT	8 - 9 AM Peak Period				5 - 6 PM Peak Period			
	Average		Maximum Surge		Average		Maximum Surge	
	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS	Space (sf/ped)	LOS
LEXINGTON AVENUE @ 45th STREET								
Southwest corner	5	F			10	E		
South crosswalk	22	D	13	E	26	C	15	D
West crosswalk	19	D	7	E	15	D	5	F
LEXINGTON AVENUE @ 43rd STREET								
Sidewalk on W. side of Lex.	33	F	37	F	21	E	25	E
North crosswalk	15	D	8	E	18	D	9	E
LEXINGTON AVENUE @ 42nd STREET								
Northwest corner	9	E			19	D		
North crosswalk	10	E	4	F	10	E	4	F
West crosswalk	21	D	10	E	21	D	11	E
VANDERBILT AVENUE @ 42nd STREET								
Northeast corner	19	D			17	D		
North crosswalk	50	B	39	C	36	C	28	C
East crosswalk	46	B	22	D	50	B	25	C

One corner reservoir area at 45th Street would deteriorate into LOS F conditions, while another at Vanderbilt Avenue would show some slight worsening into LOS D conditions, both during the AM peak hour. During the PM peak hour, the maximum surge conditions (when the opposing flows meet in the crosswalk) for the west crosswalk at 45th Street and the north crosswalk at 42nd Street would deteriorate into LOS F conditions.

4.8.4a Build Alternative Mitigation

A mitigation strategy for the sidewalk areas around GCT is to clear or limit street impediments and other "furniture" that block the paths of people walking. Newspaper vendors could be relocated from the sidewalk areas to the wide Graybar corridor without much loss as an effective pedestrian amenity. Refuse containers could be made smaller and positioned directly along the curb (an area that is usually not utilized by walkers), instead of interfering with pedestrian sidewalk space. Other sidewalk vendors could be eliminated through active enforcement by police personnel. These measures would clear more sidewalk space and provide pedestrians with increased walking area capacity.

Also, it should be noted that the projected ridership growth and related pedestrian activity levels are not anticipated until 2020, approximately 10 years after the beneficial use of the project in 2010. During preliminary engineering, the design of mitigation measures will be based on the documentation and analysis of new pedestrian travel and flow patterns that do not currently exist. While the No Build condition assumes that a variety of improvements will be in place in and around GCT (e.g., NEA Project), it cannot be fully determined at this time how these improvements will change existing pedestrian flows.

4.9 Construction Related Issues to Other Transportation Operators

4.9.1 Amtrak

The Build Alternative project will provide additional LIRR train service from Queens via Harold Interlocking and into Manhattan. Although LIRR riders will now have an alternative terminal within Manhattan's Central Business District, the density of train traffic into Penn Station is not expected to be diminished significantly. Therefore, the additional rail service to Grand Central Terminal will increase the density of LIRR train movements thru Harold Interlocking.

It should be emphasized that Amtrak and LIRR services to and from Penn Station use the four tunnels beneath the East River. The various Amtrak and LIRR train routes merge/diverge at Harold Interlocking. Amtrak train services heading north, after leaving Harold Interlocking, are routed over the Hell Gate Bridge. LIRR trains continue to eastern Long Island on the two track Port Washington Branch and the four-track Main Line to Jamaica. Two East River Tunnels are also used by NJ Transit non-revenue Sunnyside Yard moves. NJ Transit trains enroute to Sunnyside Yard do not proceed through Harold Interlocking.

It is understood that as part of Amtrak's Northeast Corridor service to Boston, their train movements through Harold Interlocking will increase. The planned arrangement of tracks and crossovers to be constructed as part of the Build Alternative project will be able to accommodate the increased service levels for both Amtrak and LIRR. This will be accomplished by eliminating or significantly reducing potentially conflicting movements that currently exist at Harold Interlocking through different train routing and by building additional "conflict free" routes.

During the construction phase of the Build Alternative project in Sunnyside Yard, there will be some temporary displacement of Amtrak Storage Tracks. However, before these storage tracks are removed from service, replacement storage tracks will be installed in LIRR Yard A.

Construction of the permanent facilities permitting the Build Alternative tracks to connect with the Harold Interlocking trackage will be phased to minimize any disruptions to both LIRR and Amtrak services. This will be achieved by realignment of selected tracks and the introduction of crossovers as needed to permit construction activities to proceed without impacting train service.

The planned permanent track arrangements in Harold Interlocking area are based on the conceptual track arrangements previously approved by Amtrak, Federal Railroad Administration, NJ Transit, and LIRR in August of 1993. During the design phase, the contract specifications will identify the contractors responsibilities with regards to work site safety and the need to comply with the railroad's safety policies and procedures.

4.9.2 NJ Transit

Similar to the Amtrak operations, NJ Transit also uses two of the four East River Tunnels in order to utilize Sunnyside Yard for mid-day storage of commuter trains.

Similar to both Amtrak and LIRR, NJ Transit anticipates continued increased train service into and out of Penn Station. Amtrak has indicated that it will be making provision for the storage of up to twenty NJ Transit trains at Sunnyside Yard. The proposed reconfiguration of the Harold Interlocking track layout will accommodate NJ Transit operations while providing a higher speed route from the East River Tunnel Line 1 to Sunnyside Yard (upgraded from 15 mph to 30 mph).

The operating agreements between Amtrak and NJ Transit provide that Amtrak is responsible for the maintenance of the existing rail facilities in this area.

During the construction phase, certain storage tracks in Sunnyside Yard may be temporarily taken out of service to permit construction of the required LIRR facilities for GCT train service. Before being removed from service, temporary replacement storage tracks would be provided in Yard A to assure that adequate storage capacity on a continuous basis will be available. Upon completion of the construction activity, the storage tracks will be restored.

Construction of LIRR inbound and outbound lead tracks to LIRR Storage Facilities in Yard A will be built so as to not impact NJ Transit operations on the existing loop tracks which are used to gain access to Sunnyside Yard Storage Tracks.

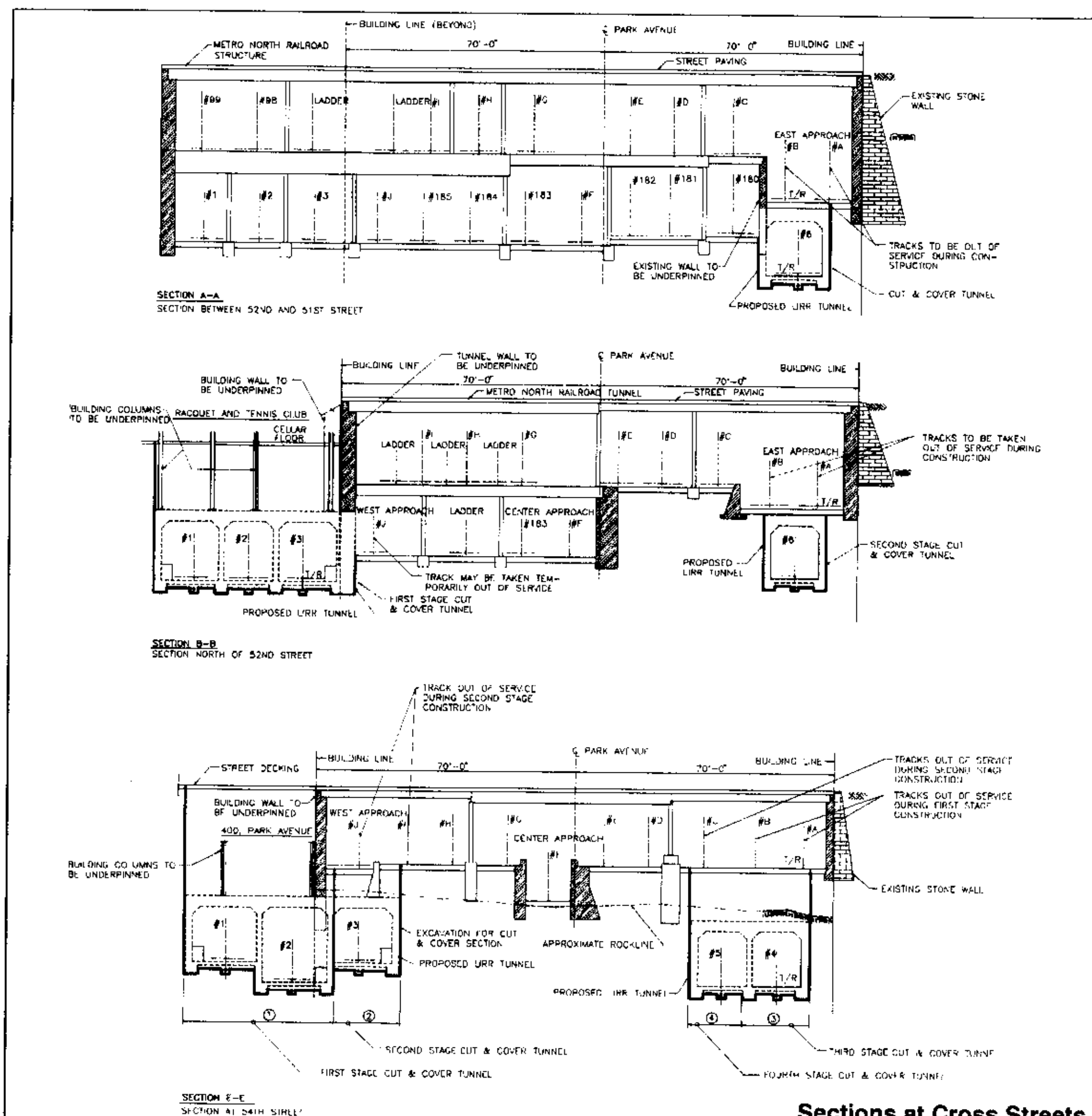
4.9.3 Metro-North Railroad

The proposed construction in the Borough of Manhattan has been subdivided into three construction contracts. The first construction contract will be performed within the existing structural envelope of Grand Central Terminal and Train Shed. The site of the LIRR terminal within GCT will be assigned to the construction contractor. In turn, the contractor will be required to seal off the work site and secure it to permit the construction activities to be performed without impacting either MNR operations or passengers utilizing Grand Central Terminal.

Prior to the actual construction, all salvageable material from the work site will be removed and all the necessary track, signal and power work to permit the utilization of the track areas remaining under MNR control will be completed. During the construction phase, the excavated material to be moved off site and the construction material needed for the work are planned to be shipped into the terminal utilizing MNR locomotives and contractor supplied cars. All movements on the railroad will be controlled by MNR. It is anticipated that all movements needed by the contractor will take place at night when it will not interfere with MNR revenue operations.

Also included in the first construction contract is the extension of the existing loop track, Track No. 6. This track will be constructed using mining methods for the rock removal. When the work advances to the area of approximately East 50th Street, the new tunnel structure will be crossing beneath MNR's lower level lead tracks A and B. It is anticipated that the lead tracks will have to be taken out of service for periods of time to permit the work beneath to proceed. The specific work program and the phasing of construction affecting MNR operations will be developed during the subsequent planning and design phase for the project.

For the second construction contract, from East 52nd Street to East 55th Street, where the three LIRR approach tracks will be located inside the west building line of Park Avenue, beneath existing buildings, the adjacent MNR Lead Track J, leading to the lower level would be taken out of service while the adjacent new LIRR structure is constructed. (See Figure 4.9-1). The period when Track J would be taken out of service would be identified during the design phase, integrating the construction phasing with the overall MNR operating requirements for the terminal. Similar to the first construction contract, the extension of the Loop Track, Track No. 6, north of East 55th Street will require outages of Lead Tracks A and B. Again, the scheduling of the work would be coordinated with MNR rail operations to mitigate any impacts on their overall operations.



Sections at Cross Streets

Figure 4.9-1

The third construction contract, from East 55th Street and Park Avenue to East 63rd Street and Second Avenue will pass beneath the MNR approach tracks to Grand Central Terminal from East 55th Street to approximately East 60th Street. The proposed LIRR track profile will be rising as it heads south beneath Park Avenue and Metro-North Tracks. One of the requirements needed is a thorough geotechnical exploration of the existing rock formation beneath the MNR approach tracks. This in turn will influence the type of structure and how it will be constructed. It is anticipated that the northerly sections from south of East 57th Street to north of East 58th Street will be a cavern type tunnel structure and from East 55th Street to south of East 57th Street a box type tunnel structure.

The Build Alternative construction activities include reconfiguring trackage, additional crosspassages and new platforms adjacent to or beneath MNR operating tracks, which may require track outages, which will be subject to the requirements of MNR. This will include the assigning of flag protection and inspectors to ensure the integrity of MNR operations. The specific sequencing of the construction work and the need to take specific MNR tracks out of service cannot be determined until the design phase. Funds have been identified in the construction cost estimates for the anticipated support services.

The LIRR will continue to work closely with MNR to identify and evaluate mitigation alternatives. As more detailed designs are developed, they will be reviewed by a multi-disciplinary team to include input from LIRR, NYCT and MNR: Stations/Passenger Services, Engineering, Capital Construction, Transportation/Operations, Police and Safety Departments; as well as developer input if appropriate.

4.9.4 New York City Transit

As part of the construction of the Build Alternative, the planned route will be crossing several New York City Transit (NYCT) routes.

In Manhattan, the planned route will cross over the IND 53rd Street Line, under the IRT Lexington Avenue Line express tracks, under the BMT 60th Street Line and beneath the IND 63rd Street Line.

When the construction activities are underway adjacent to the NYCT facilities, it is anticipated that NYCT will assign inspectors to monitor existing structures to ensure their integrity is not impaired. It is anticipated the LIRR construction can proceed without any impact on NYCT operations except for the IRT Lexington Avenue Line express tracks. As the LIRR roof structures will be directly beneath the invert of the subway structure, the Lexington Avenue express trains would be rerouted to the local tracks which will not be impacted. To minimize inconvenience to NYCT customers, it is anticipated that these express-to-local reroutes will only occur at night. The construction schedule will be adapted to meet this requirement.

Between East 63rd Street and Second Avenue in Manhattan and 29th Street and 41st Avenue in Queens, the LIRR tunnel structure is in place directly beneath the NYCT 63rd Street Line, which is in operation. As the major activity to be accomplished in this segment is equipping the line structure, the NYCT operations will not be affected.

East of 29th Street and 41st Avenue, NYCT is currently constructing the 63rd Street Connector which will connect the 63rd Street Line to the Queens Boulevard Line. This service is scheduled to begin operation in 2001.

The Build Alternative will continue construction of the work completed under NYCT Contract C-20203. Again this work will not affect NYCT operations on the 63rd Street Line. However, as the work progresses to the east, the extension of both the NYCT and LIRR structures will cross beneath the NYCT IND Queens Boulevard Line under Northern Boulevard. In addition, the NYCT BMT Astoria Line, an elevated structure above Northern Boulevard, is supported on the Queens Boulevard Line structure. This structure will be underpinned to permit the construction of the LIRR and NYCT lines. The methods to be used will require the contractor to have access to the Queens Boulevard Lines track areas. Any subway reroutes required would be done at night when the NYCT could best accommodate these operational changes.

The Build Alternative construction activities adjacent to, beneath or above NYCT operating tracks, which may require track outages, will be subject to the requirements of NYCT. This will include assigning flag protection as the NYCT determines and NYCT inspectors to ensure the integrity of NYCT operations. Funds have been identified in the construction cost estimate for the anticipated support services.

4.10 Freight Movement Analysis

This section analyzes the impacts upon existing freight operations, and upon motor truck deliveries under the No Build, TSM and Build Alternatives.

4.10.1 Freight Movement on Railroads

Rail freight traffic to and from Long Island consists of 950,000 tons transported in 12,000 carloads on an annual basis. Most of this traffic is made up of wood and pulp products (54%), food products (15%) and non-metallic minerals (14%). Historically, few carloads of freight are generated on Long Island, and most westbound cars leave Long Island empty.

The LIRR has contracted with a private operator, the New York and Atlantic RR, to assume operation of rail freight service. Virtually all freight operations are conducted in non-peak hours to avoid interference with the intensive morning and afternoon peak commuter services.

Accordingly, the No Build and TSM Alternatives will not have any impact on the movement of freight traffic. Freight train schedules will be adjusted to avoid peak period - peak direction commuter traffic. (If necessary, freight trains could be limited to late night operation.)

The Build Alternative envisions the conversion of Yard A into a Storage Yard for 22 passenger trains that will serve GCT. Until recent years, Yard A was a significant facility for the collection and marshalling of freight cars in interchange service. Recent trends in freight service, however, have lessened the importance of Yard A. The Conrail Interchange Point at Fresh Pond is now the principal freight yard, with additional handling of pre-blocked cars taken to satellite locations at the Hicksville, Pineaire and Farmingdale.

The only remaining freight activity at Yard A is limited to delivery of individual cars to local consignees, performing running repairs to freight cars and the storage of out-of-service cars. The service to local consignees and the repair activities will not negatively impact the use of Yard A for passenger train storage inasmuch as neither will use the same portion of the yard. The freight car repair shop, located immediately to the west of Yard A, may be converted for use as a passenger car facility. In that eventuality, freight car repair might be performed at Fresh Pond Yard. The storage of out-of -service cars may be performed at another, as yet undesignated, location such as Corona.

Most of the additional train service resulting from the Build Alternative will occur during the commuter peak periods. Furthermore, freight traffic between Long Island City and Fresh Pond does not operate over the Main Line tracks between Jamaica and the West End. For these reasons, passenger service to GCT will not negatively impact rail freight service.

The Build Alternative construction activities adjacent to and beneath Yard A will require coordination with New York and Atlantic Railroad for the relocation of their Yard A operations and/or the continued use of portions of the yard during construction.

Since MNR does not operate any freight service, the Build Alternative will not impact any rail freight operations in MNR's service territory, including trackage into GCT.

4.10.2 Trucking and Deliveries

Under the No Build and TSM Alternatives, any proposed new transportation facilities to be constructed will be limited in scope. Such facility improvements include:

No-Build Alternative

- Construct high-level platforms at selected LIRR stations which are not presently so equipped which will still remain in operation once the bi-level railcars enter service. The forthcoming fleet of new bi-level cars will require high-level platforms for passenger boarding. None of the proposed high level platforms to be constructed will interfere with any truck loading zone or hinder motor truck access in the Primary Study Area.

- New locomotive shop facility. A new locomotive facility which will service the forthcoming fleet of new diesel-electric and dual-mode locomotives will be constructed at Richmond Hill, Queens. All construction will be performed on LIRR property; the effect of this shop construction will not impact any trucking activities or motor freight deliveries.

There are no impacts to trucking and deliveries associated with the No-Build Alternative.

TSM Alternative

- **LIC Yard and Passenger Station improvements**. The proposed yard and passenger station improvements will be within the limits of existing LIRR property. At the Long Island City LIRR Station, in order to allow several trains to load and unload simultaneously and to reduce conflicting train movements within the yard, the existing tracks would need to be realigned to expand the current two platform configuration to four 950 foot long, high level platforms serving eight tracks. In addition, new canopied walkways will connect the approximately 500 feet of walking distance between the Long Island City LIRR Station and the Ferry Landing. Customers would follow a route that will take them through area streets.

- **LIC Ferry Landing improvements**. The proposed improvements to the Long Island City and Manhattan ferry landings primarily consist of building new shelter waiting areas for ferry customers. Such construction will have no impact upon any trucking or delivery activities.

- **Hunterspoint Station improvements**. The proposed station improvements will occur off-street on LIRR and NYCT property; these improvements will not impact any street traffic or truck deliveries.

- **LIRR Station platform lengthenings**. Under the TSM Alternative, a number of existing LIRR platforms will be lengthened to accommodate 12-car long trainsets. These platform lengthenings are not expected to create any motor truck impacts.

- **Expanded car parking lots**. A number of LIRR parking lots will be expanded to accommodate the increased number of LIRR customers which may be expected to board at certain stations as a result of the proposed TSM improvements (longer electric trains with at least 240 additional seats per train). In implementing these improvements, great care will be taken to avoid impacts to any adjacent truck delivery bays or loading zones serving adjacent businesses.

There are no impacts to trucking and deliveries associated with the TSM Alternative.

The Build Alternative will not interfere with permanent truck or delivery activities since all activities associated with the alternative will be confined to existing right-of-ways. Temporary construction issues are addressed in Chapter 5.

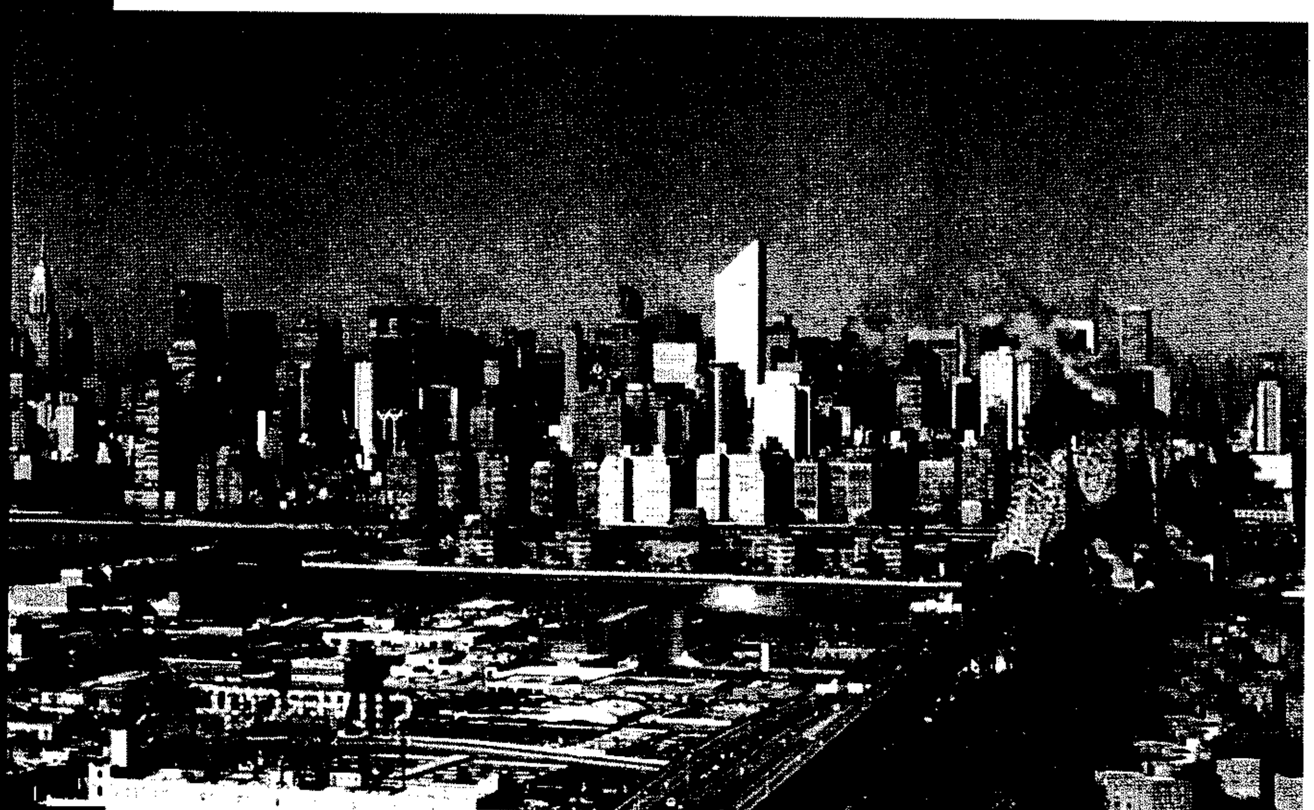
Footnotes:

[1] Operational and Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side, April 1993.

[2] National Fire Protection Association 130, the "Standard for Fixed Guideway Transit Systems" (1988).

Chapter 5

Environmental Consequences



Long Island Rail Road

5.0 ENVIRONMENTAL CONSEQUENCES

This chapter addresses the environmental consequences associated with the No Build, TSM and Build Alternatives.

5.1 Land Use and Economic Activity

5.1.1 Description of Impact Assessment

The following assessment considers potential impacts of each of the alternatives on land use, economic development, existing planning and zoning, and employment. Each of these aspects is considered on a regional and corridor basis, as appropriate.

5.1.2 Impacts

5.1.2.1 Land Use and Economic Development Impacts

The No Build and TSM Alternatives would not have any impacts on the land use and economic development of the Long Island Transportation Corridor. Based on the ridership estimates and the improvements associated with these alternatives, it is estimated that there would not be any changes to current land uses and no inducements to economic development.

The Build Alternative presents the opportunity to significantly enhance mobility for Long Island and Queens residents and increase access to customers and employees for Manhattan-based firms. Because GCT already serves as a regional terminus for MNR trains, the addition of LIRR service will not create a dramatic change in the land use and economic development of the terminal's immediate vicinity. However, there will be greater numbers of commuters using GCT which will contribute to an increase in pedestrian activity. This has the potential for creating business opportunities for area merchants and serving as a catalyst for limited economic development in the area.

5.1.2.2 Long Island Real Estate Impacts

This section addresses three basic issues: commuters' actual cost savings resulting from the Build Alternative, the percentage of the cost savings which could be spent on housing and the impact of time savings on property values.

LIRR users whose final destination is within walking distance of GCT would no longer need to transfer to NYCT buses and subways to travel between Penn Station, Hunters Point and the Grand Central area. Based on the ridership projections, it is estimated that the commuters who would no longer need to transfer to NYCT services would save between $9.7 million and $29.2 million in bus and subway fares annually. Based on underwriters' conventions for single family home mortgages, it was assumed the average household would spend 30 percent of the fare savings on housing. This would equal between $2.9 million and $8.8 million annually that would be available for housing in the Long Island residential real estate market.

Statistical regression analysis was used to test the theory that residential real estate on Long Island increases in value as commuting time from New York City decreases. The analysis was conducted for ten of the LIRR's eleven branches, using stations in Nassau and Suffolk Counties within 120 minutes from New York City.

The relationship between travel time and distance is a complex one. Property values are affected by many factors, including geographic location, urban design characteristics, local services, second homes, and local economic trends.

The analysis found no consistent relationship between time-distance and value. The anticipated impact of the Build Alternative upon property values on Long Island in general therefore appears likely to be statistically insignificant due to the influence of other economic and demographic factors. However, initiation of direct rail service to the East Side will likely contribute to increasing the development and redevelopment potential of those Long Island areas benefiting from the new service. In addition, improved mobility between Long Island and Manhattan presents the opportunity to encourage development around station areas that enhances rail transit competitiveness.

5.1.2.3 Consistency with Planning and Zoning

The No-Build Alternative would not be consistent with local and regional planning goals which aim to improve air quality and mobility. This alternative would be consistent with current zoning regulations.

The TSM Alternative would not be consistent with local and regional planning goals which aim to improve air quality and mobility. The ridership estimates associated with this alternative indicate that too few potential commuters would be diverted from single occupant vehicles. The TSM Alternative would be consistent with current zoning regulations.

The Build Alternative would be consistent with and assist in achieving local and regional planning goals which aim to improve air quality and mobility. Also, this alternative would be consistent with current zoning regulations which provide for rail passenger terminal use by special permit. Existing land uses may experience additional demand as a result of potential LIRR service to the east side of Manhattan and an estimate of new development potential follows.

Maximum New Development Potential Within the Primary Study Area

The area around GCT has been the center of controversy for many years involving the transfer of air rights from GCT. Due to its proximity to GCT, the area has been the focus of intense development pressure during periods of economic expansion. After several unsuccessful attempts by developers to build office buildings with Floor Area Ratios (FAR) considerably in excess of that which is permissible as-of-right, through the acquisition of air rights from the Terminal, the Department of City Planning established the Grand Central Subdistrict in 1991 to clarify the City's zoning policies for the district. This new Subdistrict runs from East 41st Street in the South to East 48th Street in the North and from the mid-block between 5th and Madison Avenues to the West to the mid-block between Lexington and 3rd Avenues to the East. The City has defined a "core area" of the subdistrict as all lots between Madison and Lexington Avenues.

According to this plan, all zoning lots which are at least 50 percent within the Subdistrict are eligible to receive an increase of 1 FAR for a maximum of 16 FAR on any one zoning lot. Sites within a "core area" of the Subdistrict are eligible to reach a maximum of 21.6 FAR through a transfer of development rights as long as they agree to improve or expand pedestrian amenities and participate in a program for the maintenance of GCT.

To implement this policy shift, the City prepared an analysis of the maximum development potential under this new zoning within the Subdistrict. To determine which sites are most likely to receive development rights, the City made several assumptions:

- Landmarks such as the Chanin, Chysler, Helmsley and Grand Central are ineligible for redevelopment.
- Buildings built or renovated within past 20 years are ineligible.
- Buildings on large lots with over 15 FAR are ineligible, with the exception of several buildings (Manufacturer Hanover, Bowery Savings Bank) in the Core area that could be enlarged considerably through transfer of development rights from GCT.
- Obsolete buildings in prime locations are considered eligible for redevelopment. (Graybar, Postum, Hotel Roosevelt).

A total of 2.65 million square feet of additional development potential was identified. Table 5.1-1 is a summary of the location of the development opportunities. The Build Alternative is likely to foster some additional development in the MSA. However, it is difficult to establish how much additional development would be generated by the Build Alternative.

5.1.2.4 Impacts on Tax Base

The No Build and TSM Alternatives are not estimated to cause any tax-revenue loss because they would not remove any properties from the tax rolls.

The Build Alternative is not estimated to cause any significant tax-revenue loss because it would only remove one (1) property from the tax rolls. This will involve acquiring a property at 47 East 44th Street (between Vanderbilt and Madison Avenues, Block # 1279, Lot # 25) in fee.

5.1.2.5 Employment Impacts of Construction and Operation

Construction activities related to the alternatives will be expected to affect employment in the study corridor. Short-term impacts on employment will occur during the construction phase. Long-term effects on employment will result from staffing to operate, maintain and administer the additional transportation services.

No-Build Alternative

The No-Build Alternative is not expected to have an effect on the direct or indirect generation of employment due to construction. However, in comparison to the existing LIRR schedules, it is anticipated that 7 westbound trains in the AM peak period, and a like number in the PM peak, will be extended to and from Penn Station, utilizing dual-mode locomotives and bi-level coaches. Since this will be done with existing train crews, as part of their normal workday, there will be no impact on employment or on wages paid. In addition, it is planned to add three through round-trip trains per day to the off-peak schedules; one each between Penn Station and Oyster Bay, Port Jefferson, and Speonk. Here, too, it is anticipated that these round trips will be operated by existing crews, using existing time in their work schedules.

TABLE 5.1-1
Soft Site Analysis of Primary Study Area

Block	Lots	Site Name	Additional SF Under 1 FAR Transfer	Additional SF Under Core Area Transfer	Total Additional SF Available	Comments
1276 W	58, 62, 63, 64, 65, 66	"Carbide and Carbon" et.al.	50,400	0	50,400	Existing property has 9.4 FAR at a prime Madison and 42nd Street location.
1277 E	20, 27, 46, 52	"Columbia Carbon" et.al.	30,320	277,872	308,192	Prime location with 4 buildings dating from the 1920s, requires assemblage.
1278 W	8, 14, 15, 17, 62, 63, 64	"Canadian Pacific" et.al.	45,625	0	45,625	Building dating from the 1920s, requires assemblage.
1279 E	23, 24, 25, 28, 45, 48	MTA/Yale Club	56,310	285,865	342,175	Lots 48, 23, and 24 are owned by the MTA.
1279 W	7, 9, 17, 57	Brooks Bros/Conde Nast	47,539	0	47,539	Development is likely in the midblock; 1920s buildings, requires assemblage.
1280	60, 54	Graybar	80,575	531,800	612,375	1927 building with outdated systems; not first class office space; prime location; large pot.
1281 E	21	Hotel Roosevelt	43,313	285,865	329,178	Old hotel in single ownership, easy site for redevelopment.
1281 W	9, 10, 17, 69, 59, 61, 62, 64, 65	"Abercrombe and Fitch" et. al.	48,000	0	48,000	Development likely in mid-block, requires assemblage.
1282 W	21	383 Madison	43,313	285,865	329,178	Vacant building.
1282 E	34	Postum	24,880	164,200	189,080	1924 building on prime Park Avenue location.
1296 W	1001	Bowery	25,635	200,000	225,635	Possible addition on 41st St. side.
1298	42, 28, 29, 127	St. Agnes	50,000	0	50,000	Midblock is likely development site.
1299	22, 48, 51, 53	44th-45th on Lexington	22,611	0	22,611	Avenue site likely with assemblage.
1300 E	All lots on block except 33	Block 1300	50,000	0	50,000	Low FAR, many sites, requires assemblage.
Total			**618,521**	**2,031,467**	**2,649,988**	

Source: NYC Department of City Planning

The TSM and Build Alternatives

Construction activities related to the TSM and Build Alternatives are expected to affect employment in the region. Short-term impacts on employment will occur during the construction phase. Long-term effects on employment will result from the staffing necessary to operate and maintain the additional LIRR service. Table 5.1-2 summarizes the anticipated construction jobs for each alternative, while Table 5.1-3 summarizes the anticipated operations and maintenance jobs that would be created for each alternative.

TABLE 5.1-2
Construction Jobs Generated by Alternative

Construction Jobs	TSM	Build Alternative
Direct Person Years	733	5,621
Indirect Person Years (1:1 ratio to Direct)	733	5,621
Total Construction Jobs Per Year	1,466	11,242

TABLE 5.1-3
Operation and Maintenance Jobs Generated by Alternative

Operation and Maintenance Jobs	TSM	Build Alternative
Direct Person Years	68	707
Indirect Person Years (1:1 ratio to Direct)	68	707
Total O&M Jobs Per Year	136	1,414

TSM Alternative

Construction activities related to the implementation of this alternative are expected to generate both direct and indirect employment opportunities.

- **Temporary Jobs Created by Construction Activities:** The total number of direct person-years of employment required for this alternative is estimated to be 733. This alternative would generate less direct employment opportunities than the Build Alternative, as discussed in the following section.

- **Multiplier effects:** Non-construction related employment will be generated as construction workers spend part of their salaries in the local economy. This results in indirect employment generated through a multiplier effect, which has been set as one for the MTA Region. This means that for every construction job created, another one indirect job will be generated locally. The estimated number of indirect person-years of employment generated by the construction of this alternative will be 733.

- **Permanent Jobs Created by Operations and Maintenance:** The number of direct person-years of employment resulting from the TSM Alternative is estimated to be 68.

- **Multiplier Effects:** At a multiplier of one, the indirect person-years of employment estimated to result from the operation and maintenance of the TSM Alternative would be 68.

Build Alternative

This alternative is expected to generate a total of 11,242 direct and indirect jobs over an eight year construction period. This alternative will, therefore, generate the highest number of employment opportunities.

- **Temporary Jobs Created by Construction Activities:** Construction of the Build Alternative will require 5,621 direct person-years over an eight year construction period.

- **Multiplier Effects:** As stated previously, the construction multiplier for the MTA Region has been set at one. Indirect employment generated by the Build Alternative is, therefore, estimated at 5,621. This will result from the multiplier effect as construction employees spend part of their salaries in the local economy.

- **Permanent Jobs Created by Operations and Maintenance:** Implementation of the Build Alternative will result in the creation of 707 direct employment opportunities in the areas of operations and maintenance.

- **Multiplier Effects:** The operation of the Build Alternative will result in 707 indirect employment opportunities at a one-to-one ratio of indirect to direct employment opportunities.

5.2 Land Acquisitions, Displacements and Relocations

5.2.1 Description of Impact Assessment

This section discusses the right-of-way requirements, displacements and relocations required to implement each of the alternatives. Displacements created by any of the alternatives can result in the loss of a home or a job. This can be traumatic for the affected homeowner, renter or business owner or employee. Displaced businesses can also have negative impacts on the community or regional economy if they cannot be reestablished in the area. As a result, displacements can also adversely affect community acceptance of a project. Therefore, minimizing displacements is an important project criterion.

5.2.2 Impacts

The No-Build Alternative does not involve the acquisition of land or displacement of residences or businesses.

The TSM Alternative does not involve the acquisition of land or displacement of residences or businesses. All potential construction associated with this alternative can be accomplished within existing transportation right-of-ways.

The property requirements for the Build Alternative mainly involve permanent subsurface easements to accommodate the routing between Second Avenue and 63rd Street to Park Avenue and 60th Street. The Build Alternative does require the acquisition of one property resulting in the displacement of businesses in a five story building at 47 East 44th Street. Table 5.2-1 contains a list of potential property acquisitions and easements associated with the Build Alternative in Manhattan.

TABLE 5.2-1
Potential Manhattan Property Acquisition/Easement
Build Alternative

BLOCK	LOT	ADDRESS	PRINCIPAL USE & HEIGHT	POTENTIAL ACTION	NEED
1279	25	47 E 44th St	5 story offices	acquisition	fan plant and entrance
Total of 1 property acquisition for terminal entrance and to accommodate fan plant					
1279	45	52 Vanderbilt Ave	20 story offices	permanent easement (1)	terminal entrance
1280	10	MetLife Building	59 story offices	permanent easement	terminal entrance
1282	21	383 Madison Ave	14 story offices	permanent easement	terminal entrance
1283	21	270 Park Ave	52 story offices	permanent easement	terminal entrance
1284	26	33-39 E 48th St	41 story offices	permanent easement	terminal entrance
1301	1	245 Park Ave	45 story offices	permanent easement	terminal entrance
Total of 6 permanent easements needed for terminal entrances					
1288	33	360-370 Park Ave	5 story private tennis club	permanent subsurface easement	subsurface box structure
1289	36	380-390 Park Ave	22 story offices	permanent subsurface easement	subsurface box structure
1290	36	400 Park Ave	21 story offices	permanent subsurface easement	subsurface box structure
1290	37	410 Park Ave	21 story offices	permanent subsurface easement	subsurface box structure
Total of 4 permanent subsurface easements needed for underground box structure					
1395	4	107 E 60th St	5 story multi-use residential	permanent subsurface easement	rock tunnel
1395	5	109 E 60th St	5 story church/school	permanent subsurface easement	rock tunnel
1395	64	120 E 61st St	5 story residential	permanent subsurface easement	rock tunnel
1395	65	118 E 61st St	5 story multi-use residential	permanent subsurface easement	rock tunnel
1395	66	114 E 61st St	4 story offices	permanent subsurface easement	rock tunnel
1395	67	112 E 61st St	4 story residential	permanent subsurface easement	rock tunnel
1395	165	116 E 61st St	3 story multi-use residential	permanent subsurface easement	rock tunnel
1395	167	110 E 61st St	5 story residential	permanent subsurface easement	rock tunnel
1395	624	521 Park Ave	12 story condominiums	permanent subsurface easement	rock tunnel
1395	667	525 Park Ave	14 story condominiums	permanent subsurface easement	rock tunnel
1396	6	113 E 61st St	6 story residential	permanent subsurface easement	rock tunnel
1396	7	115-119 E 61st St	14 story offices	permanent subsurface easement	rock tunnel

TABLE 5.2-1 (continued)
Potential Manhattan Property Acquisition/Easement
Build Alternative

BLOCK	LOT	ADDRESS	PRINCIPAL USE & HEIGHT	POTENTIAL ACTION	NEED
1396	9	121 E 61st St	5 story multi-use offices	permanent subsurface easement	rock tunnel
1396	10	123 E 61st St	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	11	125 E 61st St	5 story residential	permanent subsurface easement	rock tunnel
1396	12	129 E 61st St	4 story residential	permanent subsurface easement	rock tunnel
1396	13	131 E 61st St	4 story residential	permanent subsurface easement	rock tunnel
1396	14	133 E 61st St	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	15	784 Lexington Ave	4 story multi-use commercial	permanent subsurface easement	rock tunnel
1396	16	788 Lexington Ave	4 story multi-use residential	permanent subsurface easement	rock tunnel
1396	17	792 Lexington Ave	1 story commercial	permanent subsurface easement	rock tunnel
1396	20	791 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	21	787 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	22	783-785 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	23	145 E 61st St	4 story multi-use residential	permanent subsurface easement	rock tunnel
1396	24	147 E 61st St	4 story residential	permanent subsurface easement	rock tunnel
1396	25	151 E 61st St	4 story residential	permanent subsurface easement	rock tunnel
1396	26	153 E 61st St	4 story multi-use offices	permanent subsurface easement	rock tunnel
1396	33	1030-1048 3rd Ave	39 story residential	permanent subsurface easement	rock tunnel
1396	41	158 E 62nd St	5 story residential	permanent subsurface easement	rock tunnel
1396	42	156 E 62nd St	5 story residential	permanent subsurface easement	rock tunnel
1396	43	154 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1396	44	148-150 E 62nd St	3 story church	permanent subsurface easement	rock tunnel
1396	46	146 E 62nd St	5 story residential	permanent subsurface easement	rock tunnel
1396	47	144 E 62nd St	5 story residential	permanent subsurface easement	rock tunnel
1396	48	142 E 62nd St	5 story offices	permanent subsurface easement	rock tunnel
1396	49	138-140 E 62nd St	4 story offices	permanent subsurface easement	rock tunnel
1396	53	797-800 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	54	795 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	55	793 Lexington Ave	4 story multi-use residential	permanent subsurface easement	rock tunnel
1396	56	794 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	111	127 E 61st St	5 story residential	permanent subsurface easement	rock tunnel
1396	115	786 Lexington Ave	4 story multi-use residential	permanent subsurface easement	rock tunnel
1396	116	790 Lexington Ave	4 story multi-use residential	permanent subsurface easement	rock tunnel
1396	120	789 Lexington Ave	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	124	149 E 61st St	5 story multi-use residential	permanent subsurface easement	rock tunnel
1396	143	152 E 62nd St	3 story residential	permanent subsurface easement	rock tunnel
1397	33	175 E 62nd St	20 story multi-use residential	permanent subsurface easement	rock tunnel
1417	1	201 E 62nd St	20 story residential	permanent subsurface easement	rock tunnel

TABLE 5.2-1 (continued)
Potential Manhattan Property Acquisition/Easements
Build Alternative

BLOCK	LOT	ADDRESS	PRINCIPAL USE & HEIGHT	POTENTIAL ACTION	NEED
1417	6	209 E 62nd St	3 story residential	permanent subsurface easement	rock tunnel
1417	7	213 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	8	215 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	9	217 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	10	219 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	11	223 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	12	225 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	13	227 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	14	231 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	15	233 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	16	237 E 62nd St	3 story church rectory	permanent subsurface easement	rock tunnel
1417	17	241 E 62nd St	2 story church	permanent subsurface easement	rock tunnel
1417	28	1191 2nd Ave	21 story multi-use residential	permanent subsurface easement	rock tunnel
1417	31	232 E 63rd St	3 story residential	permanent subsurface easement	rock tunnel
1417	32	230 E 63rd St	3 story retail	permanent subsurface easement	rock tunnel
1417	35	220 E 63rd St	14 story multi-use residential	permanent subsurface easement	rock tunnel
1417	41	212 E 63rd St	3 story residential	permanent subsurface easement	rock tunnel
1417	42	210 E 63rd St	13 story residential	permanent subsurface easement	rock tunnel
1417	105	207 E 62nd St	3 story residential	permanent subsurface easement	rock tunnel
1417	106	211 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	110	221 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	113	229 E 62nd St	4 story residential	permanent subsurface easement	rock tunnel
1417	115	235 E 62nd St	3 story residential	permanent subsurface easement	rock tunnel
Total of 72 permanent subsurface easements needed for underground rock tunnels					

Note: **1. Terminal Entrance proposed at Existing GCT Entrance - need for additional easement acquisition subject to final design.**

Permanent subsurface easements under private property in Manhattan north of 60th Street are shown in Figure 5.2-1, and properties south of 56th Street are shown in Figure 5.2-2.

5.2.3 Mitigation

The initial planning for each alternative considered avoiding or minimizing displacements and impacts. The regulations of the *Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended by the Uniform Relocation Act Amendments (URA) of 1987, govern property acquisitions whenever real property (land) is acquired by the federal government or when property acquisition involves the use of federal funds. The relocation assistance program consists of both advisory assistance and financial assistance.

Property acquisition will be in accordance with the URA. In keeping with these laws, fair market value will be paid for all acquired parcels in private ownership. Relocation assistance will be provided, as required, to all eligible displaced businesses. Businesses displaced by the acquisition of property at 47 East 44th Street will be relocated following URA guidelines.

5.3 Neighborhoods

5.3.1 Description of Impact Assessment

The impacts to neighborhood cohesion and social interaction associated with the No Build, TSM and Build Alternatives were analyzed to evaluate consistency with existing neighborhoods. Impacts to neighborhood cohesion include changes in:

•the character of the community;
•travel characteristics; and
•the supply of community facilities and services.

Impacts to neighborhood social interaction could include:

•interference with the normal flow of social activity within a neighborhood;
•disruption of the operation of community services;
•disruption of access to community facilities; and
•creation of physical barriers which divide community activities.

An impact would be considered significant if the alternative under consideration would affect the following:

•the social coherence of a neighborhood or any population group therein; and/or
•the overall neighborhood character and stability.

5.3.2 Impacts

The No-Build Alternative would not have any impacts on neighborhood cohesion and social interaction.

The TSM Alternative would not have any impacts on neighborhood cohesion and social interaction. All construction associated with this alternative would take place within existing transportation facilities and right-of-ways.

The Build Alternative would not have any significant impacts on neighborhood cohesion and social interaction. All construction associated with this alternative would take place within existing underground transportation facilities and right-of-ways or in new underground structures. Temporary construction issues are addressed in Section 5.16.

With respect to neighborhood cohesion, the following summary describes operating issues related to the Build Alternative:

Hunterspoint Avenue Station - Service to the LIRR Hunterspoint Avenue Station will continue at the present peak hour level of five trains per hour (TPH) and will continue to provide service to that section of Long Island City that is somewhat removed from the proposed Sunnyside Station. The character of this portion of Long Island City is mixed. This area consists primarily of industrial businesses, and transportation and public utility uses; followed by residential and mixed-use buildings. This station will continue to serve as a transfer point for LIRR customers who do not use local businesses or services. Accordingly, no negative impact to neighborhood cohesion is anticipated. In addition, the proposed Sunnyside Station will be approximately 1,000 feet away.

Atlantic Terminal - The character of the immediate local area surrounding Atlantic Terminal is mixed, with residential enclaves interspersed with retail shops along Flatbush Avenue and Atlantic Avenue. Extensive redevelopment of the historic meat packing area is continuing with the goal of revitalizing the immediate area.

The LIRR station at Atlantic Terminal, Flatbush Avenue, primarily serves as a transfer point to the subway and to a lesser extent the bus network. These transit facilities connect with the important commercial areas in the southern reaches of Brooklyn. Not surprisingly, approximately 90 percent of LIRR ridership to Flatbush Avenue is not destined for the Atlantic Terminal neighborhood area.

Peak period service will be reduced slightly from 12 trains in the peak hour to 11 trains. Off peak and reverse peak service will continue at present levels. These service levels reflect the current travel patterns of riders to and from the local neighborhood, downtown Brooklyn and lower Manhattan and the extensive subway network which connects with the Atlantic Terminal. No significant impact to the local neighborhood is anticipated.

Sunnyside Station - New LIRR service will be provided to this growing area of Queens County. This new service will be provided during peak and off peak periods and will have a positive impact on the neighborhood, assisting the County in the pursuit of greater economic development for local residents and merchants.

Penn Station New York - The neighborhood surrounding Penn Station is directly reflective of the fact that an important rail and transit network is located in its midst. The office towers, Madison Square Garden, the nearby hotels and retail stores all attest to the value of mass transportation to the economic vitality of an urban center.

LIRR will continue to access the west side of Manhattan with the same frequencies of peak, off peak and reverse peak train service as at the present time. Accordingly, no negative impacts to neighborhood cohesion are anticipated.

Grand Central Terminal - The neighborhood surrounding GCT is also reflective of the fact that a major transportation hub is located there. The significant number of commercial buildings, hotels, cultural institutions and retail stores confirm the importance of public transportation to the neighborhood, city and region.

The Build Alternative will provide 24 trains per hour and link GCT with Queens and Long Island. This activity will strengthen the neighborhood character by continuing the important transportation function already in place. Therefore, no significant impacts to neighborhood cohesion are anticipated.

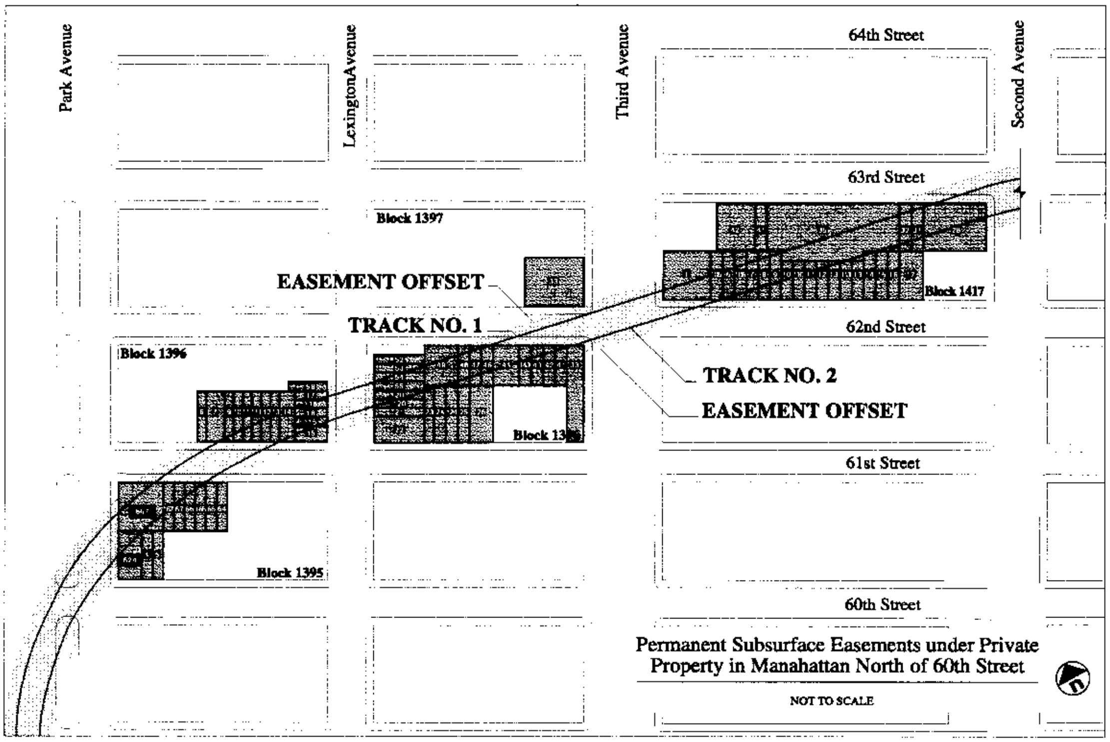


Figure 5.2-1

Table 5.3-1 contains the number of trains per hour and peak period ridership for the stations discussed in this section.

TABLE 5.3-1
Number of Trains Per Hour (TPH) and Peak Period Ridership

	Current		*2020*	
Hunterspoint Avenue Station	5 TPH	3,408 Riders	5 TPH	99 Riders
Atlantic Terminal	12	11,113	11	10,598
Sunnyside Station	0	0	5	2,490
PSNY	36	88,795	37	62,377
GCT	0	0	24	72,200

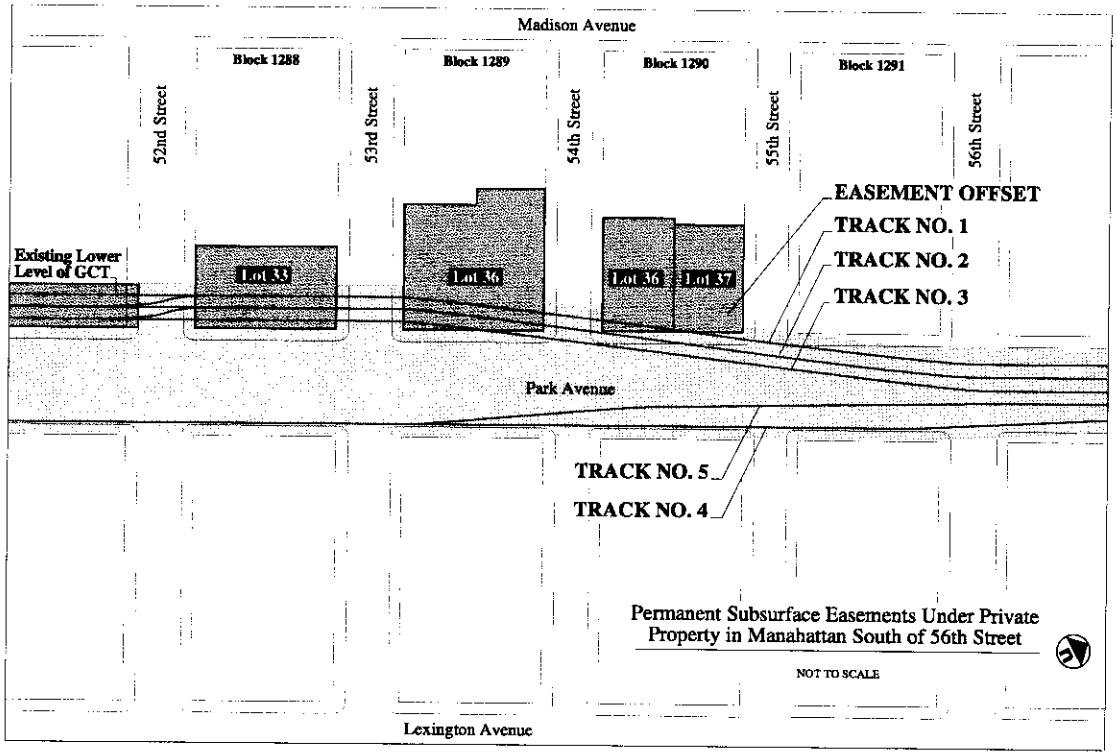


Figure 5.2-2

5.3.3 *Mitigation*

No mitigation is required since there are no impacts to neighborhood cohesion associated with the alternatives.

5.4 Visual and Aesthetic Conditions

5.4.1 *Description of Impact Assessment*

This section identifies any visually sensitive sites and view corridors which may be impacted by the No Build, TSM and Build Alternatives, and develops as required, the appropriate visual impact mitigation measures.

5.4.1.1 Visual Contrast

The visual contrast analysis is a measure of how different the existing local setting will appear as a result of introducing the TSM and Build Alternatives and related facilities into the landscape and the extent to which the contrast will be visible and attract the attention of local viewers. The analysis considers the changes to the form, line, color and texture of the local setting as a result of the construction and operation of the alternatives.

5.4.1.2 Visually Sensitive Receptors

Two criteria were used to identify Visually Sensitive Receptors (VSRs):

1. VSRs located within the Primary Study Area.

2. VSRs are residences, historic structures or districts, schools, parks, and other public open space with a direct line of sight to the *visible* portions of the project infrastructure.

Five steps were used to analyze the visual impacts of the alternatives upon the VSRs:

1. Identifying potential Visually Sensitive Receptor (VSR) sites.

2. Identifying which of the potential VSRs would be affected by temporary and permanent visual impacts (preliminary determination).

3. Evaluating the Visual Complexity (VC) factors.

4. Performing a line-of-sight analysis.

5. Identifying the effects, and proposing mitigation as required.

5.4.1.3 Definition of Impacts

Visual impacts occur where the visual contrast of the project is perceived from sensitive viewing locations. The degree of visual impact depends on the type of setting, the level of visual contrast and the viewing conditions.

Visual impacts will occur in sensitive locations where the visual contrast of the project will attract attention and dominate views.

5.4.2 Impacts

There are no visual impacts associated with the No-Build Alternative.

There are no visual impacts associated with the TSM Alternative. All construction associated with this alternative would take place within existing transportation facilities and right-of-ways.

The Build Alternative and its related appurtenant structures (fan plants, pumping facilities, electrical substations, etc.) will be located out of sight, underground, where the permanent visual impacts will be minimal.

There are only two VSRs which would be permanently affected by the Build Alternative; both are affected by the construction of the LIRR entrances which would serve GCT. The two entrances are:

- Met Life Plaza, on the southeast corner of Vanderbilt Avenue and 45th Street. The installation of a new LIRR entrance in this relatively visually isolated corner will not visually impact the Met Life Plaza, the Met Life Building or any other surrounding buildings. No mitigation measures are required.

- The Chase Bank Plaza, on the west side of Park Avenue, between 47th and 48th Streets.

  Impact: the proposed LIRR entrance on the south side of 48th Street west of Park Avenue will remove four plaza trees and one black granite planter containing flowers and plants.

During the course of constructing the Build Alternative, there may be some temporary, visual impacts of short term duration created by the actual construction itself and by the work space (or staging area) required for the contractor to temporarily store or stage the equipment and supplies. It is expected that most of these temporary visual impacts will be in the form of:

- Temporary sidewalk and street shaft excavations (to gain access to construct the tunnels).
- Temporary street lane closures while four buildings along Park Avenue are underpinned or while the tunnel crossing beneath both Northern Boulevard and the existing IND subway structure is constructed.
- Temporary street lane or sidewalk closures for contractor staging or temporary material staging.
- Temporary visual impacts created by construction barricades to enclose work sites and contractor staging sites.
- Temporary construction scaffolding which may cover sidewalks or portions of street trees.

Because almost all of the route alignment is out of sight, once operational, this project will not create any visual intrusions. Passing LIRR trains will not disturb sensitive view corridors; this project will not create any additional sources of glare or lighting from LIRR trains serving the East Side. This project will not reduce any residential property owner's privacy through visual impacts, since there are no residential properties located within the Primary Study Area that are within the line-of-sight of a LIRR train in this project. With almost the entire alignment being located underground, the Build Alternative will not visually intrude upon the varied and dense New York visual environment.

5.4.3 Mitigation

5.4.3.1 Permanent Visual Impacts

Mitigation for the visual impact of the LIRR entrance on the Chase Manhattan Bank Plaza can be effectively implemented by thoughtfully designing it to blend in with the plaza, using the same materials and architectural style presently in the plaza. The plaza trees could be relocated or new trees replanted elsewhere in this plaza, or integrated with the entryway design.

5.4.3.2 Temporary Visual Impacts

There are two VSRs which would be impacted on a temporary basis, and two VSRs where the visual impact is uncertain, pending the method of tunneling construction used. The two VSRs affected on a temporary basis are:

- Racquet & Tennis Club on the west side of Park Avenue between 52nd and 53rd Streets.
- Lever House on the west side of Park Avenue between 53rd and 54th Streets.

  Impacts for both VSRs: constructing the LIRR tunnel under the west side of Park Avenue will require underpinning portions of these two buildings (as well as two other non-VSR buildings on the block between 54th and 55th Streets). Underpinning will require excavating portions of the street surface, sidewalk and plazas to gain access, and the erection of construction barricades which will visually impact the site and the historic buildings. In addition, the Lever House Plaza will be disturbed, and visually divided.

Mitigation: There are a number of possible visual mitigation measures to lessen this transitory impact, including:

- Judicious construction scheduling to minimize construction time, reducing the duration of the visual impacts.
- Staging the underpinning work to avoid disrupting an entire sidewalk or street frontage at one time.
- Incorporating artwork onto the construction barricades, making them more aesthetically pleasing.
- Educating and requiring contractors to "clean up" their construction areas; this means ensuring that trash and graffiti are removed promptly, that work supplies are kept neatly stored, and that potentially dangerous hiding places (created by barricades, material storage, etc.) are not created.

The two VSRs where it is uncertain whether there will be any temporary visual impacts are:

- The Upper East Side Historical District which has irregular boundaries extending into the northern part of the Primary Study Area around Lexington Avenue and 60th to 62nd Streets.
- The Park Avenue Mall, which are the large landscaped islands in the middle of Park Avenue. While the Primary Study Area and potential construction impact extends only to midblock 64th and 65th Streets, the Park Avenue Mall extends from 46th to 96-97th Streets.
Impacts for both VSRs: constructing the LIRR tunnels for the Build Alternative will require new excavation for new tunnels under Park Avenue. While it is expected that these two VSRs will not be visually affected, depending upon the tunneling and construction techniques employed, there could be temporary visual impacts.

There are a number of different tunneling techniques which could be employed, some more visually disruptive than others. Tunneling techniques range from "cut and cover" which is visually disruptive, to deep bore tunneling (either using tunnel boring machines, the New Austrian Tunneling Method, drill and blast, etc.) which can be used underground without visually disturbing the surface or even being noticed.

Mitigation: The following are possible mitigation techniques which could be employed:

- Selecting tunneling techniques which do not adversely affect the immediate environment (including visual quality) above.
- Soliciting input from designers, contractors, and the community for ways to minimize the temporary visual impacts of this project.

5.5 Air Quality

5.5.1 Description of Impact Assessment

This section contains the air quality analysis for the No Build, TSM, and Build Alternatives. For the purposes of this analysis, significant air quality impacts were defined as:

- a substantial increase in stationary source emissions;
- any violation of the National Ambient Air Quality Standards (NAAQS) for carbon monoxide at any affected intersection;
- any substantial contribution to an existing or projected air quality violation; and/or
- any exposure of sensitive receptors to substantial concentrations of air pollutants;
- exceedance of New York City *de minimis criteria.*

5.5.1.1 Prediction Methodology

Using computer models, air pollution dispersion and concentrations of contaminants are simulated at specific receptor locations. Chapter 3 contains a discussion of existing air quality conditions and the study approach using models. Modeling for this study predicts changes in emissions of carbon monoxide (CO), a localized concern, from vehicles due to altered traffic flow. Modeling accounts for complex phenomena such as atmospheric mixing and air transport of pollutants. Input data to the model address traffic volumes, types of vehicles, existing or planned inspection/maintenance (I/M) programs, meteorological conditions, street geometry, signal timing, vehicle idling, and other variables. The models require some simplification and approximation of these phenomena. Environmental regulatory agencies, such as the U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC), sanction the development and use of models. The computer models used for this project to calculate emission factors are (MOBILE5.0a - EPA, and DECMOB81 - NYSDEC), and to estimate pollutant dispersion (CAL3QHC, version 2.02 - EPA). The Air Quality Technical Appendix to this study provides in-depth details of inputs and methodology used for air quality modeling.

The Project Team developed traffic data for the No Build, TSM, and Build Alternatives as modeling inputs, based on traffic projections. The New York State Department of Transportation (NYSDOT) and NYSDEC Mobile Source Planning Section also provided information for the models. The model results show that the implementation of the Build Alternative will reduce regional vehicle miles traveled and associated internal combustion pollutants.

5.5.2 Impacts

The addition of modeled incremental carbon monoxide concentrations and the background concentrations determine 1-hour average carbon monoxide pollutant concentrations for the No Build and the Build Alternatives in 2020. The 1-hour average for the highest maximum concentration for each receptor location was multiplied by a persistence factor of 0.75 to derive the 8-hour average concentrations (shown in Table 5.5-1). The persistence factor was provided by NYSDEC to calculate the 8-hour concentration factor for midtown Manhattan.

None of the maximum 1-hour and 8-hour carbon monoxide concentrations (modeled plus background) exceed the present NAAQS (35 ppm for the maximum 1-hour and 9 ppm for the 8-hour average) as defined in Table 3.8-1. In addition, the predicted carbon monoxide concentrations do not exceed the City Environmental Quality Review *DeMinimis Criteria* as previously discussed in Chapter 3.

Since none of the present NAAQS are exceeded, there are no negative air quality impacts associated with the No Build, TSM and Build Alternatives.

5.5.3 Regional (Mesoscale) Pollutant Impacts

Chapter 4 discusses the net impacts on vehicle miles traveled in the region Study Area for the No Build, TSM, and Build Alternatives. Table 5.5-2 summarizes vehicle mile decreases from implementation of the TSM or Build Alternatives due to changes in commuting preferences. The reduced vehicular miles traveled and calculated emission factors were used to estimate the net reductions in regional tons per year of carbon monoxide, nitrogen oxides, and volatile organic compounds considering the TSM and Build Alternatives. Table 5.5-2 summarizes these projected changes, demonstrating the area-wide, long-term beneficial effect of the TSM and Build Alternatives. The Build Alternative provides improvements in regional air quality.

TABLE 5.5-1
MAXIMUM 1-HOUR AND 8-HOUR CARBON MONOXIDE CONCENTRATIONS AT MAJOR INTERSECTIONS FOR THE BUILD AND NO BUILD ALTERNATIVES IN 2020

Intersection	No Build Alternative Highest Maximum Concentration			Build Alternative Highest Maximum Concentration		
	Receptor Location	1-Hour (ppm)	8-Hour (ppm)	Receptor Location	1-Hour (ppm)	8-Hour (ppm)
E. 45th Street & Lexington Avenue	R-3	6.5	4.9	R-3	6.5	4.9
E. 44th Street & Lexington Avenue	R-1	6.1	4.6	R-1	6.1	4.6
Archbishop Fulton J. Sheen Place (E. 43rd Street) & Lexington Avenue	R-8	6.2	4.7	R-8	6.2	4.7
E. 42nd Street & Lexington Avenue	R-4	6.5	4.9	R-1	6.6	5.0
E. 42nd Street & Park Avenue	R-2	5.9	4.4	R-2	5.9	4.4
E. 42nd Street & Vanderbilt Avenue	R-10	5.7	4.3	R-10	5.8	4.4

Notes:
1. ppm - parts per million
2. Figure 3.3-1 depicts representative receptor locations for these intersections.
3. The present National Ambient Air Quality Standards (NAAQS) for carbon monoxide are 35 ppm for the 1-hour and 9 ppm for the 8-hour averages.
4. The predicted 1-hour averages are the results of the CAL3QHC model analyses including background concentrations.
5. The 8-hour averages were calculated by multiplying the 1-hour averages with a persistence factor for midtown Manhattan of 0.75.(New York City Department of Environmental Protection, *City Environmental Quality Review* Draft Technical Manual, May 1993.)

TABLE 5.5-2
REGIONAL MOBILE POLLUTANT IMPACTS
RELATIVE TO THE NO-BUILD ALTERNATIVE IN 2020 *

Description	Incremental Changes	
	TSM	Build
Annual Vehicle Miles Traveled (VMT)	**(in Million Miles)**	
VMT Reductions by Alternative	21.92	98.74
VMT Additions by Alternative	1.12	10.86
Net VMT Impact	(20.81)	(87.88)
**Relative Pollutant Burden **	**(in tons per year)**	
Carbon Monoxide (CO)	(170.36)	(719.56)
Nitrogen Oxides (NO_x)	(29.35)	(123.96)
Volatile Organic Compounds (VOC)	(17.88)	(75.54)

Footnotes:

* Assumes an annualization factor of 281.6.

** Assumes 30 mph "free flow" speed during morning traffic in the region.

Notes:

1. Numbers enclosed in parentheses indicate negative values.
2. TSM - Transportation System Management
3. VMT - Vehicle Miles Traveled

5.5.4 Temporary Construction Impacts

The No-Build Alternative would not result in any ambient air quality construction impacts.

During the construction phase of projects associated with the TSM and Build Alternatives, temporary and short-term ambient air quality impacts could result. These impacts could include the following:

- Fugitive dust (particulate) emissions from land clearing, construction materials or debris handling, excavation, demolition, compaction, short-term storage, and vehicle motion over unpaved areas.

- Mobile source emissions, including carbon monoxide, volatile organic compounds and nitrogen oxide emissions from internal combustion engine-powered construction equipment at the site.

Additional construction issues related to the Build Alternative are provided in Section 5.16.

5.5.5 Mitigation

The approach to be taken in the implementation of the Build Alternative will minimize these emissions. The close proximity of any construction site to residences and commercial activities will require the following mitigation techniques.

Fugitive Dust

- Water or dust-suppression mixtures will be utilized during demolition, excavation, grading, and construction operations.

- Gravel or dirt roadways, materials stockpiles, and other surfaces capable of producing air-borne dust will be treated on a recurring basis with dust suppression agents.

- Open-body trucks used for transporting materials will be covered with tarpaulin when in motion.

- Loose surface material will be removed promptly.

- Paved roadways will be periodically swept by powered sweeper vehicles and wet down by a water truck with spray bar attachment.

- Subsurface construction activities such as tunneling will utilize wet suppression of dust-creating activities. Ventilation of these construction areas will incorporate applicable regulatory the requirements, including appropriate control measures.

Mobile Source Emissions

- Idling of delivery trucks or other equipment will not be permitted during periods of unloading or inactivity.

- Proper planning of construction schedules will minimize traffic disruption and limit the increase of air pollutants. Arrival and departure of construction vehicles will be controlled to minimize impact on surrounding traffic flow. Standing or idling construction vehicles will be minimized.

5.5.6 Conformity with the 1990 Clean Air Act Amendments

Further improvement in ambient carbon monoxide will require additional control measures beyond those currently in place, i.e., I/M programs, and vehicle turnover (removal of older, more polluting vehicles from the roads). However, vehicle miles traveled will continue a steady growth rate, offsetting improvements noted. Programs such as use of low emission vehicles and reformulated gasoline, as well as the Build Alternative will help reduce emissions.

The TSM and Build Alternatives will have positive impacts on regional air quality due to the shift from automobiles accessing New York City to more attractive, less polluting, public transit modes. These alternatives will assist in progress towards achieving compliance with NAAQS.

Chapter 1 of this study introduced the requirement for conformity of federally funded transportation projects, such as the Build Alternative, to comply with New York's SIP. A proposed transportation project may not result in any of the following:

- Be the cause of any new violations of NAAQS.

- Exacerbate any existing or on-going violations of NAAQS.

- Delay progress towards attainment of NAAQS.

Discussion found in Chapter 4 predicts a net reduction in vehicle miles traveled by commuters from implementation of the Build Alternative. The reduction in miles result in a net decrease in pollutants shown in Table 5.5-2. There will not be any violations of NAAQS.

The project conforms with New York's SIP in that it will help to eliminate or reduce the severity and number of NAAQS violations. The project is part of a conforming transportation improvement program. It does not create new violations of CO standards (long-term) or contribute to existing violations (short-term) in the area substantially affected by the project.

5.6 Noise and Vibration

5.6.1 Noise

This section contains the noise analysis for the No Build, TSM and Build Alternatives. The approach to the analysis follows the FTA guidance manual (Transit Noise and Vibration Impact Assessment, April 1995).

There are four basic components to the analysis:

- establishing the existing conditions (contained in Chapter 3)
- determining future noise levels caused by the alternatives at noise sensitive receptors;
- determining the impacts by comparing future noise levels generated by the alternatives using the FTA Noise Impact Criteria in the FTA guidebook;
- comparing alternatives with respect to impacts and identifying possible mitigation measures.

Existing noise levels were determined by field measurements. Sound level measurements were made at representative noise sensitive receptors. The measurements were used to determine the Day Night Average Sound Levels (DNL) for residential sites or other land uses where people sleep, and L_{eq} (1 hour), the worst-hour equivalent sound level for sites where people do not sleep, but engage in noise-sensitive activities (e.g., schools, parks and places of worship).

5.6.1.1 Description of Impact Assessment

The FTA guidance manual presents Noise Impact Criteria for different land use activity categories. The criteria are based on both the outdoor DNL for residential or other land uses where people sleep, and the outdoor L_{eq} (1 hour), the worst-hour equivalent sound level, for sites where people do not sleep but engage in noise-sensitive activities. As shown in Figure 3.10-4, the Noise Impact Criteria relate the existence and severity of impact to the difference between the existing (pre-project) noise level and the level created by the project.

Three results (or ranges of impact) are possible in the assessment: None (no impact); Impact (some impact); and Severe (much impact). These results are then used in the mitigation analysis.

The impacts were assessed following the City Environmental Quality Review (CEQR) Exterior Noise Standards and Local Law No. 64 and the criteria set forth in FTA's Transit Noise and

Vibration Impact Assessment Guide. Both the long term environmental noise impact of the proposed project resulting from the operation of the rail service and the short term impact from the construction of the project are addressed.

5.6.1.2 Operational Noise Impacts

Since major portions of the project will occur underground the ambient noise environment under the Build Alternative is not expected to be significantly higher than that under existing conditions, and the No Build and TSM Alternatives. Surface traffic will continue to dominate the ambient noise environment in the project corridor.

Tables 5.6-1 and 5.6-2 provide a relative comparison of noise impacts between existing conditions and No Build, TSM, and Build Alternatives.

TABLE 5.6-1
City Blocks Exceeding FTA Category 2 Limit of 65 dBA L_{dn}

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	28	28	28	28
North of 60th Street	22	22	22	22
OSA	8	8	8	8
Total	**58**	**58**	**58**	**58**

TABLE 5.6-2
City Blocks Exceeding FTA Category 3 Limit of 70 dBA L_{eq} (1 hr)

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	70	70	70	70
North of 60th Street	3	3	3	3
OSA	2	2	2	2
Total	**75**	**75**	**75**	**75**

Wayside noise from the project is of concern only at and around the Sunnyside Yard in Queens. The proposed alignment is entirely underground except at Sunnyside Yard where the LIRR trains will emerge from below ground. Other rail operations within Sunnyside Yard include the staging and storage of LIRR, Amtrak, and NJ Transit trains. Because of the heavy usage of the railyard, the additional train movements introduced by the project during peak hours (24 trains during peak hour) are not expected to approach existing train movements (easily more than 50 during the peak hour) in the railyard and are therefore not expected to significantly increase the existing noise levels (by 3 dBA or more).

Sensitive receptors near Sunnyside Yard include the George F. Torsney Playground and a church, both located on Skillman Avenue, south of the railyard. Both receptors are considered Category 3 land use. Location N10, located in the Torsney playground recorded an AM peak hour L_{eq} of 64 dBA with estimated wayside noise contribution of 57 dBA from existing rail operations on the Main Line aided by a wall on embankment acting as a noise barrier. Under the Build Alternative, with the Loop Track in operation and an increase of rail traffic on the Main Line, the wayside noise contribution is estimated to be 59 dBA, resulting in an ambient noise level increase of 2 dBA, lower than the 3 dBA impact threshold under CEQR. It is therefore concluded that the noise environment under the Build Alternative, in both Manhattan and Queens, will remain essentially the same as that under existing conditions.

The entire PSA would be considered having a noise quality equivalent to that of a Commercial and Manufacturing land use with respect to local Law No. 64 under the Build Alternative, since the future Build noise environment is not expected to be different from that of existing conditions.

Surface vehicular traffic around GCT is expected to increase by a maximum of 8 percent under the Build Alternative, except Vanderbilt Avenue with a maximum increase of 41 percent due to its current low traffic volume under the existing conditions. Associated noise level increases can be expected to be below the 3 dBA impact threshold under CEQR. Furthermore, since the area is exclusively for commercial use, no noise impact on sensitive receptors is expected from traffic induced changes.

5.6.2 Vibration

This section contains the vibration analysis for the No Build, TSM and Build Alternatives.

5.6.2.1 Description of Impact Assessment

Ground-borne vibration is created by the steel wheels of rail vehicles rolling on steel rails. The wheel-rail interaction creates vibration energy that is transmitted through the intervening ground to the foundations of nearby buildings. At sufficiently elevated levels, the resulting building vibration may be perceived as detectable motion of the building; rattling of windows, items on shelves or items hanging on walls; or as an audible low-frequency rumble noise. The audible noise, referred to as ground-borne noise, is caused by sound waves radiated from vibrating room surfaces.

The vibration impacts were assessed using the FTA's Transit Noise and Vibration Impact Assessment Guide. There are no state or local vibration criteria for use in assessing impacts. The FTA impact criteria are presented in Table 5.6-3.

TABLE 5.6-3 FTA Ground-Borne Vibration and Noise Impact Criteria				
	Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels	
Land Use Category	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB[3]	65 VdB[3]	--[4]	--[4]
Category 2: Residents and buildings where people normally sleep	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB	40 dBA	48 dBA

1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define acceptable vibration levels.
4. Vibration sensitive equipment is not sensitive to ground-borne noise.

5.6.2.2 Operational Vibration Impacts

Under the Build Alternative, new sources of vibration include LIRR service at GCT and rail operations to the 63rd Street Tunnel in Manhattan. Within Queens additional sources of vibration include this proposed project and NYCT's connection of the 63rd Street Tunnel to the Queens Boulevard Line. Both projects will utilize the same tunnel from the bellmouth near 63rd Street and Second Avenue on the Manhattan side to 29th Street and 41st Avenue in Queens.

Within Manhattan, the vibration levels of the LIRR trains will not be greater than the vibration levels of existing MNR trains from GCT to 60th Street. These activities are not additive because of their different frequencies. The trains from both commuter services have similar baseline vibration levels. However, the proposed tunnel for the LIRR trains will be situated below the existing Park Avenue tunnel for MNR trains and are therefore slightly more removed from sensitive receptors. In addition, the existing Park Avenue tunnel is a cut and cover tunnel resting on bedrock while the proposed tunnel will be partially or wholly within the bedrock. The vibration levels of a cut and cover tunnel may be as much as 12 VdB greater than that of a rock based tunnel according to the FTA manual. Consequently, the project generated vibration levels can be expected to be lower than current levels resulting from MNR operations from the GCT to 60th Street where the proposed alignment begins to curve out from under the Park Avenue tunnel and toward the 63rd Street Tunnel.

From 60th Street to the 63rd Street Tunnel, the vertical alignment descends from approximately 80' below ground level near 60th Street to approximately 150' when it meets with the 63rd Street

Tunnel. With a track speed of 30 mph, the track speed for the curve at this location, vibration levels at the surface is estimated to be 81 VdB. While the track begins its descent to 150' past this location, the train speed begins to increase, up to 55 mph. Near the East River tunnel, vibration levels at the street level are also estimated to be 81 VdB. These values are well below the existing street vibration levels ranging from 88 to 101 VdB.

Within Queens, along 41st Avenue, vibration levels at street level from the LIRR trains operating at 55 mph are estimated to be approximately 83 VdB while the connection of the NYCT 63rd Street IND line with the Queens Boulevard IND line is estimated to yield vibration levels of about 86 VdB at the street level, well below the measured ambient vibration levels of 91.4 VdB and 93.7 VdB. In sum, ambient vibration levels under the Build Alternative are not expected to exceed those levels under existing conditions.

The city blocks expected to exceed FTA vibration criteria for land use Categories 2 and 3 are presented in Tables 5.6-4 and 5.6-5, respectively.

TABLE 5.6-4
City Blocks Exceeding FTA Category 2 Limit of 72 VdB

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	20	20	20	20
North of 60th Street	17	17	17	17
OSA	8	8	8	8
Total	**45**	**45**	**45**	**45**

TABLE 5.6-5
City Blocks Exceeding FTA Category 3 Limit of 75 VdB

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	43	43	43	43
North of 60th Street	2	2	2	2
OSA	0	0	0	0
Total	**45**	**45**	**45**	**45**

The magnitude of vibrations within the study area under the Build Alternative is not expected to increase beyond that under existing conditions, and the No Build and TSM Alternatives. While wood framed residential structures in Queens immediately adjacent to the alignment may expect vibration levels up to 81 VdB, the expected interior vibration from surface traffic for similar structures ranges from 86 VdB to 89 VdB, already exceeding the FTA's vibration impact criteria for frequent events of 72 VdB for Category 2 land uses.

The project corridor in Manhattan is currently subject to high vibration levels from ranging 88 to 101 VdB resulting from existing and heavily used subway and rail lines and street traffic. Since the project generated vibration will not be greater than existing subway and rail lines, because the vibration impacts are not additive due to their different frequencies, the range of ambient vibration levels is expected to remain between 88 VdB to 101 VdB. As is the case under existing conditions, these levels exceed the FTA's vibration impact criteria for frequent events, 72 VdB and 75 VdB, for Categories 2 and 3.

5.6.3 Ground-Borne Noise Impacts

Ground-borne noise is a direct product on ground-borne vibration. Consequently, its assessment and conclusions will parallel those of ground-borne vibration. Ground-borne noise under the Build Alternative in Manhattan is not expected to differ substantially from that under existing conditions. Ground-borne noise levels from LIRR operations are expected to be approximately 61 dBA, 1 dBA to 2 dBA below existing rail and subway lines. Consequently, ground-borne noise levels under the Build Alternative are expected to remain at current levels.

In Queens, ground-borne noise levels along 41st Avenue under the Build Alternative are not expected to change from existing conditions. In the worst case, light wood framed residential structures adjacent to the alignment can expect ground-borne noise contribution from the LIRR operations of 43 dBA which is well below the range of estimated ground-borne noise 46 dBA to 54 dBA under existing conditions.

City blocks expected to exceed FTA ground-borne noise criteria for land use Categories 2 and 3 are presented in Tables 5.6-6 and 5.6-7 respectively.

TABLE 5.6-6
City Blocks Exceeding FTA Category 2 Limit of 35 dBA

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	25	25	25	25
North of 60th Street	22	22	22	22
QSA	8	8	8	8
Total	**55**	**55**	**55**	**55**

TABLE 5.6-7
City Blocks Exceeding FTA Category 2 Limit of 40 dBA

	Existing	*No Build*	*TSM*	*Build*
MSA				
South of 60th Street	50	50	50	50
North of 60th Street	3	3	3	3
QSA	0	0	0	0
Total	**53**	**53**	**53**	**53**

As is expected to be the case, the Build Alternative should not result in additional ground-borne noise impacts according to FTA's impact criteria.

5.6.3.1 Mitigation

Rail and track designs such as continuously welded rails, and resilient fasteners are mitigation measures particularly needed for consideration along the subsurface route of the tunnel in Manhattan and Queens. Good maintenance practice to minimize wheel flats, worn or corrugated tracks will greatly reduce the incidence of ground-borne vibration and noise events.

5.7 Ecosystems

5.7.1 Description of Impact Assessment

Ecosystems within the study area are segregated into habitats and vegetation, wildlife, aquatic biota, and threatened and endangered species. This section evaluates the impact of the Build Alternative on these resources. Where appropriate, both short and long-term impacts have been addressed. Short-term impacts refer to impacts created only during construction of the project. Long-term impacts refer to those impacts that continue after construction is complete.

No impacts to ecosystems are associated with the No Build and TSM Alternatives. All activities related with these alternatives would take place within existing rights-of-ways and would be a continuation of current transit services. The only alternative that has the potential to create impacts to the ecosystem is the Build Alternative.

5.7.2 Impacts

5.7.2.1 Habitats and Vegetation

The project area is predominantly urban/industrial in nature, and contains little vegetation. Construction of the Build Alternative will remove some of this vegetation. However, existing vegetation does not provide enough nesting and cover areas, or food sources to provide suitable habitat for many terrestrial species. Therefore, the Build Alternative will have negligible short and long-term impacts on vegetation and habitats.

5.7.2.2 Wildlife

The lack of suitable habitats in the project area is evidenced by the lack of diversity of wildlife species. Species that are present within the project area are characteristic of those found in highly developed environments and discussed in Chapter 3. During construction, species that inhabit the project area can easily relocate to adjacent developed habitats, creating little to no short-term impacts. Following construction, species will quickly move back into the project area, thereby creating no long-term impacts.

5.7.2.3 Aquatic Biota

The project will not involve any new construction within the East River or Newtown Creek. Therefore, there will be no impact to aquatic biota in the project area.

5.7.2.4 Threatened and Endangered Species

Due to the developed nature of the project site, it is highly unlikely that any of the threatened or endangered plant species identified by the NYSDEC exist in this area. The only animal of concern likely to be found in the project area is the federal and state endangered Peregrine Falcon

(*Falco peregrinus*). Peregrine Falcons have been known to roost on tall buildings within New York City. No tall buildings will be demolished during this project. Therefore, the project will not permanently remove potential Peregrine Falcon habitat. Noise and activities during construction could create a disturbance to Peregrine Falcons that may exist within or adjacent to the project area. However, due to the current noise and activity level that occurs on a daily basis in New York City, the project should not create additional significant disturbances. Since the project will not involve any construction within the East River, there will be no impact to the threatened or endangered marine turtles that potentially inhabit the East River.

5.7.3 Mitigation

If Peregrine Falcons are identified at any time during construction within the project area, construction would be monitored to ensure the safety of this species. It is possible, although unlikely, that a construction moratorium could be ordered by the resource agencies which require that construction take place at a time of year that least affects this species.

Impacts to other ecosystems are negligible. Therefore, mitigation to preserve these resources is not required.

5.8 Water Resources

5.8.1 Description of Impact Assessment

Water resources within the study area include surface waters (East River and Newtown Creek), groundwater, floodplains, and wetlands. Where appropriate, both short and long-term impacts have been addressed.

No impacts to water resources are associated with the No Build and TSM Alternatives. All activities related to these alternatives would take place within existing right-of-ways and would be a continuation of current transit services. The only alternative that has the potential to create impacts to water resources is the Build Alternative.

5.8.2.1 Water Quality

Construction activities will disturb the existing soils in the project area, creating loose dirt and sediments that could be carried by storm water and deposited into the East River and Newtown Creek. This would increase the amount of dissolved and suspended solids in these water bodies, thereby decreasing the quality of the water.

Long-term impacts to water quality from this project include increased pollutant run-off from the new facilities, including lubrication oils, rust prohibitants, antifreeze, window washing fluid, and particulates. However, these pollutants will be deposited in low concentrations, creating a negligible impact to water quality.

5.8.2.2 Groundwater Quality

Groundwater in the project area is primarily located close to the earth's surface. Therefore, it is possible that construction activities could impact this resource. However, groundwater in the project area is not used for potable water. Any impacts to the groundwater would not be significant.

5.8.2.3 Floodplains

The only areas within 100-year floodplains in the project area are in the East River, where the tunnel has already been constructed. There are no areas in the 500-year floodplain in the project area. Therefore, there will be no new construction conducted within the 100 or 500-year floodplains.

5.8.2.4 Wetlands

There are no wetlands in or adjacent to the project area. Therefore, the project will not impact wetland resources.

5.8.3 Mitigation

Erosion and sedimentation control measures will be implemented prior to construction to reduce the potential for sediments to enter the East River and Newtown Creek. There will be few, if any, impacts to other water resources in the project area. Therefore, no additional mitigation measures will be required.

5.9 Energy

5.9.1 Description of Impact Assessment

This section contains the energy requirements for the No Build, TSM and Build Alternatives. For purposes of this report, an energy consumption impact was considered significant if the project consumed a substantial amount of energy or required an expansion of the existing energy supply infrastructure.

Table 5.9-1 contains data from the LIRR's Section 15 Report to the Federal Transit Administration for 1995, which is the latest available. This also becomes the basis for all of the costs in the table which will require adjustment later for year-of-expenditure estimates. The 1995 data has been used to derive certain values. For example, traction power kilowatt hours were divided by electric Multiple Unit (MU) car miles to derive the value for kwhrs per car mile (7.811) which was then applied to the estimated MU car miles of the alternatives to compute their power consumption. Similarly, the annual cost for utilities for vehicle operations was divided by the kilowatt hours of propulsion power to derive the average cost per kilowatt hour ($.1022) for traction power.

Diesel Fuel

In 1995, the LIRR's diesel locomotives used 6,209,266 gallons of diesel fuel while operating 2,124,000 unit miles, or 2.923 gallons per unit mile. In this case, the "units" referred to included the power cars used on some trains to provide the electric "hotel power" for car lighting, heating, and air conditioning. For the alternatives, this has been adjusted to 3.5 gallons per mile to represent the higher horsepower locomotives now being purchased (3,000 horsepower versus 1,500 or 2,000 for the existing locomotives) as well as the very "high power" loads assumed for the new bi-level coaches. In applying this factor to the proposed LIRR schedules, the use of two new locomotive units has been taken into account where applicable. For the current locomotive and coach fleet, it should be noted that the locomotives' engines operate during layovers to provide the hotel power.

Table 5.9-1
Energy Consumption and Costs - 1995
Actual vs. Alternatives (Estimated)

		Study Alternatives		
	1995	**2020 No Build**	**TSM**	**Build Alternative**
Diesel Unit Miles	2,124,000	2,297,761	2,788,692	2,710,823
Diesel Fuel (gallons)	6,209,266	8,042,164	9,760,422	9,487,881
Diesel Fuel Costs @ $.563/gallon	$3,497,504	$4,527,738	$5,495,118	$5,341,677
Dual Mode (elec.) Unit Miles	Negligible	43,688	43,688	96,927
D.M. Loco Power (kwhrs)	Negligible	2,239,406	2,239,406	4,753,399
MU Car Miles	54,517,000	54,520,394	54,362,711	74,101,795
MU Power (kwhrs)	425,812,603	425,839,112	424,607,507	578,809,121
Traction Power (kwhrs)	425,812,603	428,078,518	426,846,913	583,562,520
Traction Power Costs @ $.1022/kwhr.	$43,518,048	$43,749,625	$43,623,755	$59,640,090
Hotel (Layover) Power (kwhrs)	N/A	40,214,308	49,294,930	63,305,068
Hotel Power Costs (net)	incl. in Diesel Fuel Costs	$2,850,342	$3,493,910	$4,486,916
Total Electric Power Consumption (kwhrs)	425,812,603	468,292,826	476,141,843	646,867,588
Total Train Energy Costs	**$47,015,552**	**$51,127,705**	**$52,612,783**	**$69,468,683**

Electric Power

The electric power consumption is composed of three elements. The first is Dual Mode Loco Power which represents the annual mileage of dual-mode locomotives operating in the straight electric mode and drawing their power from the third rail. For the line segment from Harold Interlocking to Penn Station, the factor used is 48.219 kilowatt hours per unit mile per the results of the simulation for a non-stop run between Penn Station to the West Side Yard; a factor of 70 kwhrs/unit mile has been employed to account for the short-distance, low-speed operation and gradients encountered.

The second factor is MU Power which is based on the estimate of MU car miles and the 7.811 kwhrs/car mile factor discussed above. The sum of Dual Mode Loco Power and MU Power is summed in the Traction Power quantity, to which the $.1022/kwhr cost factor is applied since both uses would draw their power from the third rail and its supporting substation network and be billed accordingly.

The third element of electric power use is the Hotel (Layover) Power. This represents the LIRR's planned use of wayside electric power supplies at its layup yards to meet the storage needs of its new fleet of diesel locomotives and bi-level coaches. The power consumption is based on an estimate of this layup power use which has been divided by the fleet in order to derive an annual consumption factor amounting to 259,447 kwhrs/unit. The Hotel Power Cost represents the net increase in annual cost per unit (locomotives plus coaches) after deducting the estimated reduction in diesel fuel consumption costs from the electric power costs for the layover energy loads. This factor has been included in order to recognize the additional electrical energy and net financial impacts arising from acquisition of the new locomotives and bi-level coaches. The Total Electric Power Consumption represents the total kilowatt hours of traction power consumption (billed under special electric traction tariffs) and the hotel power consumption which is billed under separate, industrial-use tariffs.

5.9.2 Impact

There are no energy impacts associated with the alternatives.

5.9.3 Mitigation

No mitigation is required since there are no energy impacts. The Build Alternative will provide a travel option for the study corridor that will be energy-efficient and environmentally-friendly.

5.10 Utilities

5.10.1 Description of Impact Assessment

Public utilities located in the right-of-way for the TSM and Build Alternatives serve as the basis for the impact assessment. These utilities may require relocation or protection during construction activities. Utility relocation activities were considered as having a significant impact if the utility service is disrupted or the public or environment is endangered.

5.10.2 Impacts

There are no significant impacts to public utilities associated with the No Build or TSM Alternative. All construction activity related to the TSM Alternative would be conducted within existing right-of-ways and facilities thus requiring minimal relocation of utilities.

For the Build Alternative the depth of the proposed tunneling construction will result in minimal impacts on existing utilities. The specific areas where existing utilities may be disturbed are at the proposed construction shafts in Manhattan and in the area of Northern Boulevard in Queens.

During the design phase, a standard operating procedure will be followed to determine the existence of utilities at specific locations. Letters will be issued to the various owners of underground utilities, both public agencies and private corporations, to request documentation regarding existing or planned utilities at specific locations and to have field mark outs performed. Topographical surveys will be performed in the general areas of the planned street excavations to locate at the surface manhole covers, value boxes, vaults and other physical features including fire hydrants, sewer inlets, bus shelters, trees, street lights and traffic control facilities. Where the proposed construction may interfere with existing utilities, a detailed field investigation with the utility's representative would be conducted to survey existing manholes.

Once a mapping of existing conditions is completed, the proposed area of construction is overlayed to specifically identity the affected facilities. During actual construction the majority of utilities would be supported in place or rerouted to a new location, as required. At the completion of construction, all utilities would be restored to the owner's requirements.

The two planned construction shafts in Manhattan located on East 52nd Street and East 54th Street, west of Park Avenue, are anticipated to have minimal impacts on utilities as the GCT train shed and its approach track structures were placed relatively close to the street surface. This in turn acts as a barrier to east-west routings of major utilities such as large telephone or electrical ductbanks, storm or sanitary sewers, water, steam or gas mains. However two segments of interceptor sewers built when GCT was constructed to its present configuration will need to be reconstructed or rerouted. Based upon the age of these facilities, it is not assumed that they can be maintained in place during construction of the LIRR structure. The MTA LIRR will closely coordinate all utility work with NYCDEP to determine the most effective work program. The 4'-0" by 2'-0" sewer between East 52nd Street and East 53rd Street and the 3'- 6" by 2' - 0" sewer between East 53rd Street and East 54th Street are located beneath the west sidewalk area of Park Avenue and the adjacent side streets. In addition, two 18 inch sewer lines located on East 54th Street will have to be reset to accommodate the LIRR structure. For the third construction shaft located on the east side of Second Avenue, south of East 63rd Street, NYCT records indicated the existence of a 12" water main and a 15" sewer. Typically utilities of this size would be supported in place during the construction phase. A 30 inch gas main will require relocation for construction of the shaft.

The one planned street crossing in Queens, Northern Boulevard, is also anticipated to have a minimal impact on existing utilities. The majority of the roadway is supported on the existing structure of the NYCT Queens Boulevard Line. The planned construction will require this existing subway structure be underpinned without disturbing the street surface. The relatively short distance between the existing subway structure and the adjacent building lines may contain existing utilities. This area of Northern Boulevard is undergoing significant disturbance due to the construction of the NYCT's 63rd Street connector project. The final as built drawings for that project will form the basis of the initial review of utility locations adjacent to the LIRR's alignment. As noted earlier, the process of surveying utilities would be implemented during the subsequent planning and design phase for the project to confirm their location.

5.10.3 Mitigation

Construction methods would be predicated on keeping disruptions to utility service at an absolute minimum. Utilities which represent a hazard during construction and which would not be permanently relocated would be temporarily moved to avoid accidental damage. Service connection lines which require rerouting as excavation proceeds would be coordinated with the building owner / management to minimize disruptions service to tenants. Agreements would be executed with each utility company or governmental agency regarding relocation on a temporary or permanent basis of a utility, responsibility and coordination for the actual work, and method of reimbursement.

5.11 Safety and Security

5.11.1 Description of Impact Assessment

Public transportation projects can impact safety and security by increasing the demand for police and fire protection in the communities where they are located. This section evaluates the safety and security impacts for each of the alternatives. A safety and security impact would be considered significant if the project does not provide for the adequate safety and security of customers and the general public.

5.11.2 Impacts

The primary role of the LIRR is to provide safe, efficient rail transportation in every aspect of its operations. This applies to passengers, employees and the general public. Accordingly, safety and accident prevention is integrated into the performance of every management task, with ultimate responsibility and accountability assigned to the President of the LIRR. The LIRR system safety department assists the President in fulfilling those responsibilities.

The LIRR, as part of its System Safety Program Plan, has identified a range of short term and long term objectives in keeping with these responsibilities. The discussion below considers these objectives as a base condition to determine what, if any, additional impacts are associated with the alternatives identified in this study.

There are no safety and security impacts associated with the No-Build Alternative.

There are no safety and security impacts associated with the TSM Alternative. Current and planned system safety and security improvements are sufficient to handle the operational changes that would be part of this alternative.

There are no safety and security impacts associated with the Build Alternative. Current and planned system safety and security improvements are sufficient to handle the operational changes that would be part of this alternative. With regard to the new tunnel sections, emergency exits will be provided for passenger evacuation and for access for emergency personnel including firefighters. Mechanical ventilation will be installed to control the flow of smoke and its exhaust, and a fire standpipe system will be installed for the entire length of the tunnel. These structural, electrical and mechanical systems will reflect the most current design features to assure that the tunnel environment is consistent with the stated objectives of the System Safety Program Plan.

LIRR staffing at the new east side terminal station (GCT) will be sized to accommodate the projected ridership. Included in the staffing are 28 police officers under the command of a Captain-In-Charge, a Lieutenant and 3 Sergeants. The police staff will provide continuous coverage at GCT.

In addition to the police staff, GCT will be managed by the Terminal Superintendent and staff of 13 Transportation Managers as well as the Stationmaster and staff of 6 Assistant Stationmasters. Their collective responsibility and accountability will be to assure that the movements of pedestrians and trains are conducted safely and securely under normal and abnormal conditions.

The safety environment of all LIRR facilities is the subject of scheduled Hazard Control Inspections. Furthermore, the design features of the new tunnel and terminal facilities will be reviewed with municipal police, fire and emergency personnel to solicit comments and suggestions.

The LIRR will continue to work closely with MNR to identify and develop a Customer Safety Plan for construction activities associated with the Build Alternative. As more detailed designs are developed, they will be reviewed by a multi-disciplinary team to include input from LIRR, NYCT and MNR: Stations/Passenger Services, Engineering, Capital Construction, Transportation/Operations, Police and Safety Departments.

For construction activities at GCT, the work area will be vacated and assigned to the contractor in total. The contractor will be responsible for enclosing the work site with a ceiling to floor tight board fence to minimize the migration of dust and noise, while precluding unauthorized entry. Along the remainder of the alignment which is underground and at Sunnyside Yard, the contractor will take appropriate measures to protect the public and prevent access to construction areas.

All construction contractors will be required to provide a site specific health and safety plan and follow all requirements applicable to construction activities. This health and safety plan will be designed to protect workers and the general public.

5.11.3 Mitigation

No mitigation is required since there are no safety and security impacts associated with the alternatives.

5.12 Historic, Archaeological and Cultural Resources

This section presents the impacts of each alternative on cultural resources.

5.12.1 Description Of Impact Assessment

For the cultural resource evaluation factors listed in Chapter 3 (e.g., indirect or direct disturbance to cultural resources), the impact of the No Build, TSM and Build Alternatives are analyzed. This evaluation will consider:

Construction Impacts

As discussed previously, this project will require the construction of underground tunnels to complete the rail line between the LIRR's Main Line and Port Washington Branch in Queens and GCT in Manhattan via the existing 63rd Street Tunnel. As a result, potential impacts to previously undisturbed archaeological resources were analyzed. Additional analysis addressed the visual impact to historic resources and the impacts of construction on cultural resources.

Operational Impacts

The long term impacts of the project include the possible visual impacts to historic structures due to the permanent physical and/or contextual changes resulting from the project. Any modifications to historic structures will also result in impacts that may require mitigation.

Mitigation Measures

For the significant cultural resource impacts identified during the construction and operation of the proposed action, measures for mitigating or minimizing those actions are suggested. All mitigation measures will be coordinated with the NYSHPO, and, if required, a Memorandum of Agreement (MOA) will be developed to provide mitigation prior to project construction. Mitigating measures might include the following:

- modifying construction procedures to minimize effects on cultural resources,
- recommending urban design guidelines that will minimize visual impacts on historic resources,
- recommending subsurface Phase 1b archaeological investigations to determine the presence of sensitive sites,
- preparing a more detailed historic documentary record of historic sites directly impacted by the proposed action in accordance with the Historic American Building Survey (HABS).

5.12.2 Impacts

5.12.2.1 Historic / Architectural

All of the potential impacts for the project were examined for their effect on historic resources. In particular, the impact of the proposed project was assessed for buildings that are designated New York City Landmarks, are listed on the National Register of Historic Places or the New York State Register of Historic Places, or are eligible for New York City landmark designation or listing on the National or New York State Registers of Historic Places.

This section also discusses potential impacts associated with the use of land of historic sites of national, state or local significance resulting from the various project alternatives, as required by Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. § 303) and the joint FTA/FHWA environmental regulations set forth at 23 CFR Part 771. Parklands impacts under Section 4(f) are considered in Section 5.13 of this study.

Overview

No-Build Alternative: no construction impacts identified or use of land of properties listed or eligible for listing on the National Register.

TSM Alternative: no construction impacts identified or use of land of properties listed or eligible for listing on the National Register.

Build Alternative: Section 3.15 of this study has identified the following sites as listed or eligible for listing on the National Register and potentially adversely affected by the Build Alternative:

> Grand Central Terminal - on National Register. Activities include: construction work, additional use of facility, use of original ticket windows. Need SHPO and ACHP concurrence that there will be no impacts to the historic qualities of the facility.
>
> Union Carbide Building - eligible for listing on National Register. Activities include: construction of entrance.
>
> Lever House - on National Register. Activities include: underpinning of columns.
>
> Racquet and Tennis Club - on National Register. Activities include: underpinning of columns.

Store House and Battery House in Sunnyside Yard are both potentially eligible for listing on the National Register and are planned to be demolished.

Manhattan Study Area

In the Manhattan Study Area (MSA), impacts include creating new pedestrian entrances to access GCT, creating ticket windows in GCT, and vibrations from construction operations. The impacts of these actions are summarized below and in greater detail in the Cultural Resources Technical Appendix.

Proposed Pedestrian Entrance Sites

147 East 44th Street. This five-story building is not a landmark and is not eligible for such listing. The proposed project would have no impact on a historic resource.

57 Vanderbilt Avenue/347 Madison Avenue. It appears that the proposed entrance would be through the present service entrances of two buildings, neither of which is a landmark nor is eligible for such listing. The proposed project would have no impact on a historic resource.

Met Life Building (former Pan Am Building), southeast corner Vanderbilt Avenue and East 45th Street. This building is not a landmark and is not eligible for such listing. The proposed project would only affect a corner of the building and would have no impact on a historic resource.

383 Madison Avenue. This proposed entrance is on the side of a building that has been part of a redevelopment project for many years. The building is vacant and may be demolished in the not-too-distant future. The building is not eligible for listing as an historic structure. The proposed project would have no impact on a historic resource.

Southwest corner Park Avenue and East 48th Street. This entrance would be along side the former Union Carbide Building (subsequently the Manufacturers Hanover Bank Building; later Chemical Bank Building; now Chase Manhattan Bank). This building, designed by Skidmore, Owings & Merrill in 1957 is generally considered to be one of the major examples of the first generation of International Style corporate office buildings in America. This building is eligible for designation as a New York City Landmark and is eligible for listing on the New York State and National Registers of Historic Places. It does not appear that the proposed entrance will have a direct impact on the historic building. However, care should be taken in the design of this entrance to ensure that it complements the building.

East 48th Street, north side between Madison Avenue and Park Avenue. This entrance would be through a service door of the Bankers Trust Building, a modern building that is not eligible for listing as a historic structure. The proposed project would have no impact on a historic resource.

East 47th Street, south side between Park Avenue and Lexington Avenue. This entrance would be alongside the Donaldson, Lufkin & Jenrette Building, a modern structure that is not eligible for listing as a historic structure. The proposed project would have no impact on a historic resource.

Grand Central Terminal

The most obvious building of concern in the MSA is GCT itself. GCT is a New York City Landmark, it is listed on the National and New York State Registers of Historic Places, and it is a National Historic Landmark. The terminal is important as one of the most significant architectural monuments in New York City and as a railroad station illustrating major technological innovations. Since the plan presumes an increase in railroad usage of a building erected as a railroad terminal, the Grand Central plan can only be welcomed. However, when planning the new LIRR facilities at the terminal, its status as a landmark structure should be carefully taken into consideration so that no damage is done to historic elements in compliance with the National Historic Preservation Act and Section 4(f) of the DOT Act.

In addition, the project proposes to use original ticketing windows on the southeast wall of Grand Central Terminal's main hall as new ticket windows. Use of these historic ticket windows for ticket sales was discontinued many years ago. Most recently, they have been used as OTB betting windows. The restoration of these windows which retain their historic character to their original use is totally consistent with the historic character of GCT. Alterations to these windows (including signage) would be subject to the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act. As long as the historic features on the facade of the window structures are preserved, such review should be satisfactorily completed.

Lever House and the Racquet and Tennis Club

The construction of new trackage for the LIRR will entail underpinning of the columns of these two significant landmark buildings. Care must be taken to guarantee that no damage will occur to the structures above. This will be accomplished by establishing a protection program for these structures. The protection program for all phases of work will be based on a clear understanding of the existing structures to be protected. The protection program will include as a basis, an analysis of the existing condition of each structure. The analysis will include an assessment of the structural condition of the landmark as well as an assessment of the stability of any applied ornament. For any areas of the building that are identified as being a problem (cracks, damage, instability, etc.), this section will address what steps will be taken to secure them prior to the commencement of new construction. A justification as to the adequacy of each measure will accompany each proposed means of protection.

Queens Study Area

Sunnyside Yard is a significant historic resource associated with the construction of Pennsylvania Station and the tunnels that connected the new station with New Jersey on the American mainland and with Long Island. Extensive planning for the entire railroad system began in the first years of the twentieth century, with plans for Sunnyside Yard in Queens County submitted to the New York City Board of Estimate and Apportionment in June 1906. Work was completed on the yard by the time Pennsylvania Station opened in 1910.

Unlike Pennsylvania Station itself, the buildings at Sunnyside Yard are not stylistically sophisticated works of architecture. However, they are important as part of the history of this major railroad construction project and as part of the history of the Pennsylvania Railroad system itself. The purpose of Sunnyside Yard was "to furnish facilities for the storage and care of passenger train equipment using the New York Station."[1] The buildings at the yard are the utilitarian, "behind-the-scenes" structures that permitted clean, safe, and elegantly appointed trains to utilize Penn Station. The buildings were a key aspect of the efficient functioning of both the Pennsylvania Railroad and the independent Pullman Company. As such, it is important that the historic significance of the buildings at Sunnyside Yard be adequately recognized.

Most of the existing buildings at Sunnyside Yard are aligned in an east-west direction between the tracks of the main or south yard, now used by Amtrak, and the north yard, most recently used as a LIRR freight yard. Most of the buildings are simple brick structures with steel frames and roofs and brick walls.[2] The buildings employ concrete for foundations and other features. Ornament is confined to modest brick corbeling and the use of stone lintels and sills. The one exception is the large boiler house, with its large round-arched windows (now blocked up). The buildings range in size from small sheds to large storage facilities. Most of the buildings are in relatively good condition and, as of February 1997, were in use. A detailed description of the buildings can be found in the Cultural Resources Technical Appendix.

The Build Alternative would entail the demolition of two buildings, the Store House and Battery House. Both of these buildings are of historic significance and it is believed that they are eligible for listing on the National Register of Historic Places. The eligibility of these structures for listing is being reviewed by SHPO. Thus the project could have a negative impact on these should they prove to be eligible structures.

5.12.2.2 Archaeology

Manhattan Study Area

There are no identified prehistoric or historic archaeological resources or potential resources which are expected to be impacted by the proposed project within the MSA.

In the MSA, the Build Alternative will entail converting ten existing tracks in the lower level of GCT for LIRR use. Six of the existing tracks, currently within the western part of the turnaround loop, will be lowered to accommodate new trains. To the east of these, four existing tracks will be rebuilt, and five new platforms will be constructed to accommodate all ten tracks. Extant foundations and footings will be lowered to create cross passageways. The ten tracks will run north to converge into three tracks at 52nd Street where they will run beneath private property for one block. New tunnels will be built adjacent to the existing Park Avenue tunnel south of 52nd Street, and beneath existing tunnels north of 52nd Street. To accommodate tunnel construction, shafts will be placed in the roadbeds at East 52nd Street and East 54th Streets. These will enable construction workers, equipment, and machinery to access the route of the new tunnels.

At East 52nd Street the tunnels will be approximately 50 feet below the current street surface. The tunnel will then slope downward at a 3% grade, and by East 60th Street and Park Avenue the tunnel will be between 75 and 95 feet below the street surface, essentially within the bedrock. The tunnel will then turn east beneath private property to connect with the existing 63rd Street Tunnel. In this vicinity, a Tunnel Boring Machine (TBM) will be employed for tunnel construction.

The noise and vibration assessment for the proposed project anticipates that there will be no significant impact from tunnel construction in the Build Alternative beyond that of the No-Build Alternative (See Noise and Vibration Technical Appendix). Therefore, it is expected that vibrations caused by tunnel construction will not have an adverse impact on any potential cultural resources beyond those which would occur in the No-Build Alternative.

In sum, although there will be some short term construction noise and vibration impacts in the immediate vicinity of open construction sites, and in conjunction with creating the two shafts at East 52nd and East 54th Streets, ground vibration induced by blasting, drilling, and boring is not expected to impact any archaeological resources within the MSA.

Queens Study Area

There are potentially sensitive areas which may be impacted by the proposed construction within the QSA.

Because large sections of the 63rd Street Tunnel have already been completed, the impact area for the project is much reduced from the study area described in Chapter 3. In the Queens section of the project site, the existing tunnel is complete along 41st Avenue from the East River shore to 200 feet southeast of 29th Street.

New construction, beginning on current Block 403 Lot 1 (200 feet southeast of 29th Street) will continue the track alignment to the southeast utilizing the cut and cover method and slurry-wall construction. On reaching Northern Boulevard, an earth pressure balance tunneling machine will be employed to tunnel beneath the existing subway tunnel under Northern Boulevard. Southeast of Northern Boulevard, from Block 239 Lot 36, through Yard A and 200 feet southeast of the Amtrak buildings adjacent to Yard A, the tunneling machine will again be used, approximately to the locations of the tunnel portals, in the vicinity of the 39th Street viaduct. Five portals are planned, one each for tracks A, B, C and D, and one for the yard lead track. Open-cut trenches, dug from east to west will be excavated to meet the tunnels west of the proposed portals. Via these open trenches the tunnels will be brought to grade and aligned with the existing trackage.

5.12.3 Mitigation

5.12.3.1 Historic / Architectural

Manhattan Study Area

In the MSA impacts to historic structures require only minor mitigation efforts.

At the southwest corner of Park Avenue and East 48th Street, the Chase Manhattan Bank building is eligible for designation as a New York City Landmark and may be impacted by the creation of a new pedestrian entrance for access to GCT. Here, care should be taken in the design of this entrance to ensure that it complements the architectural elements of the building.

At GCT, proposed interior changes are subject to the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act and Section 4(f) of the DOT Act. Care should be taken to ensure the historic features of the structure.

At the Lever House and the Racquet and Tennis Club, both historically significant structures, care should be taken not to damage these structures during construction. This will be accomplished by establishing a protection program for these structures. The protection program for all phases of work will be based on a clear understanding of the existing structures to be protected. The protection program will include as a basis, an analysis of the existing condition of each structure. The analysis will include an assessment of the structural condition of the landmark as well as an assessment of the stability of any applied ornament. For any areas of the building that are identified as being a problem (cracks, damage, instability, etc.), this section will address what steps will be taken to secure them prior to the commencement of new construction. A justification as to the adequacy of each measure will accompany each proposed means of protection.

There are many landmark buildings near the proposed route of the new tunnel in the MSA. As described above, care will be taken to secure foundations to any building that might be impacted during construction.

Queens Study Area

It is suggested that before any demolition takes place, each building in the QSA be recorded according to the appropriate Historic American Engineering Record (HAER) guidelines. Each building should be thoroughly researched, with particular emphasis placed on use. The HAER report should be undertaken before any additional windows are boarded up since blocked windows make the required photography difficult to complete. It is imperative that a historian versed in historic machinery examine the buildings, particularly the boiler house, with its extensive collection of extant original equipment, and, to a lesser extent, the auxiliary substation.

5.12.3.2 Archaeology

Manhattan Study Area

The MSA has no potentially important archaeological resources which may be impacted in either the No Build, TSM, or Build Alternatives.

Queens Study Area

A number of areas within the proposed track alignment have been identified as retaining archaeological sensitivity despite documented construction and grading episodes. These buried cultural resources would be severely impacted or destroyed by the construction of the proposed track alignment. For a more precise location of sensitive areas requiring further consideration see the Sensitivity Map in the Cultural Resources Technical Appendix. For the purposes of the following discussion, these areas have been divided into two groups, based on the varying probability that undocumented Yard construction disturbance has destroyed any archaeological remains present. The first group consist of:

Old LIRR Embankment Site (east of Block 239)
Block 239 Lot 36
Block 209
Rapelje Avenue
Block 210 (50-foot frontage on Rapelje Avenue)

These locations are considered sensitive for buried resources from the prehistoric period, and the former LIRR embankment is also sensitive for historical resources, related to Burger Jorissen's c.1650 grist mill.

The second group of five track alignment locations is still considered sensitive, but has a lower sensitivity rating than the first group, because there is a higher probability of disturbance from undocumented construction activities, which will be discussed in more detail below. The locations are Block 137 and Block 149.

These locations may be sensitive for buried cultural resources from the prehistoric period and historical resources related to late nineteenth century dwellings, and also:

Block 75 (Northeastern half)
Madden Street (42nd Street)
Middelburg Avenue (west of Yard loop)

These may also be sensitive for buried resources from the prehistoric period, and historical resources related to British troops who occupied the area during the Revolutionary War (1776-1783).

Each of these five sites is located on an embankment, a raised ridge with a level crest, elevated to between 15 and 34 feet above the ground surface of the adjacent Amtrak yard directly to the north (Amtrak 1994:16,17,19). The embankment currently hosts the tracks of LIRR's Main Line and Amtrak's Northeast Corridor, and is to be part of the LIRR's alignment for the A, B, C and D tracks.

The discussion of impact in the previous section notes that the elevations of these five track alignment sites are higher at present than in 1907, before Sunnyside Yard was first constructed. It concludes that a fill overmantle must have been added during Yard grading and construction. This fill layer would have protected any archaeological resources present from disturbance caused by subsequent construction.

This conclusion was based on the theory that the embankment was created by the excavation of the adjacent areas, leaving an elevated ridge whose crest was then graded and leveled for the installation of tracks. However, observations made during a site inspection on February 13, 1997, and discussion of the possible construction processes suggest that the entire Yard area was first excavated to a general elevation, which in the five areas under discussion ranged from 24 to 30 feet. Extra soil was then redeposited and shaped to create the embankments required. Since the elevations in the Yard areas to the north of the embankment are more than 13 feet below both the current and 1907 elevations in the five track alignment areas, this would indicate a depth of disturbance that would have destroyed any archaeological deposits in these five locations. Unfortunately, there is no corroborating documentary or subsurface data to support this scenario.

All of the above conclusions concerning both sensitivity and impact are based primarily on a comparison of topographic maps which detail land contours on the track alignment site both before (1907) and after Sunnyside Yard construction. Although earlier topographic maps were utilized, they provided only crude descriptions of topography due to their lack of elevation numbers. Disturbance and filling episodes prior to 1907 can only be generally documented, if at all.

Louis Barker's paper on Sunnyside Yard construction was examined for construction data, particularly evidence of regrading and deep excavation. Although Barker provides descriptions of filling and excavation within the Yard area, these episodes are too generally located to support theoretical disturbance derived from cartographic comparisons. His discussion of construction does not extend to the methods of creating the main track embankments (ASCE 1910:133-159).

In addition, no soil boring logs were available to the archaeologists at the time this report was written. Soil borings from the project site could help to more clearly define the depth and nature of the fill/disturbance layers. A more detailed understanding of on-site conditions could enable the investigators to eliminate, narrow or at least better define all areas of prehistoric and historical sensitivity, since these data can be used to chart undocumented disturbance and filling activities, such as track bed preparation, embankment construction and thickness of fill layers, each of which may have destroyed or protected archaeological resources. Therefore the evaluations of this report are limited because they are not supported by subsurface data.

Since a program of soil borings for project design purposes is scheduled, this program will be designed with consultation and input from a qualified archaeologist and scheduled prior to final design. It is recommended that a large diameter core, continuous-tube soil samples (affording a minimum of compaction or distortion) be taken on all of the 10 sensitive sites described above. When these soil borings are conducted, depth and thickness of fill layers must be recorded.

If existing boring logs can be located, they may also be useful in helping to determine the sensitivity of the track alignment sites. However, this is not always the case, since engineers and even other archaeologists are not always interested in the same research questions and supporting data.

The soil boring data will be examined by an archaeologist. If the analysis of the boring logs concludes that these sensitive sites may still host archaeological resources, appropriate mitigation measures will be devised.

If the proposed designs, i.e., the track alignment route, are amended, or if additional tunneling or excavation is planned which impacts additional areas outside the currently proposed alignment site, the final design information should be evaluated by an archaeologist, and this report should also be amended.

5.13 Parklands

5.13.1 Description of Impact Assessment

This section discusses potential impacts to parklands and recreation areas. Potential noise and visual impacts to parklands or recreation areas that could be caused by the alternatives are contained in Section 5.4, Visual and Aesthetics and Section 5.6 Noise and Vibration.

5.13.2 Impacts

There are no parkland impacts associated with the No-Build Alternative.

There are no parkland impacts associated with the TSM Alternative since all construction would be contained within existing rights-of-way and facilities.

There are no parklands or recreation areas in the alignment or adjacent to the Build Alternative. Therefore, there are no potential impacts to parkland or recreation areas associated with the Build Alternative. All construction associated with this alternative would be contained within existing right-of-way and facilities.

5.13.3 Mitigation

No mitigation is required since there are no potential impacts to parkland or recreation areas.

5.13.4 Section Evaluation

No evaluation under Section 4(f) of the DOT Act was required because there are no impacts to parkland or recreation areas under any of the alternatives.

5.14 Environmental Justice

5.14.1 Impact Assessment

Executive Order 12898 ("EO 12898"), issued in 1994, directs federal agencies to develop a strategy to identify and address disproportionately high and adverse human health or environmental effects of their activities on minority and low-income populations. To comply with EO 12898, DOT issued final order 50125 on environmental justice in 1997 (the "DOT Order"). The DOT Order provides, among other things, that "to the extent permitted by the existing law and whenever practical and appropriate to assure that disproportionately high and adverse effects on minority and low-income populations are identified and addressed, DOT shall collect, maintain and analyze information on the race, color, national origin, and income level of persons adversely affected by DOT programs, policies and activities". DOT Order, ¶ 4(b).

Consistent with the DOT Order's mandate, the East Side Access project was evaluated to determine if there were any potential adverse impacts from the Build Alternative that would be borne disproportionately by an identifiable group of low-income or minority persons living in geographic proximity or similarity affected by the Build Alternative.

5.14.2 Impacts

The No Build, TSM and Build Alternatives were analyzed to identify any disproportionately high and adverse human health or environmental effects on minority and low-income populations as a result of construction activities and operations. Based on the demographic data presented in Chapter 3, no minority and/or protected groups were identified to be potentially impacted by the No Build, TSM and Build Alternatives.

The following summary contains a list of categories that were analyzed in terms of Environmental Justice issues.

Land Use and Economic Activity. No disproportionate adverse impacts on minority and low-income populations were identified in terms of land use. With respect to temporary and permanent job opportunities, it is estimated that the Build Alternative will make available 5,621 and 707 jobs, respectively.

Land Acquisitions, Displacements and Relocations. The property requirements for the Build Alternative mainly involve permanent subsurface easements to accommodate the routing between Second Avenue and 63rd Street to Park Avenue and 60th Street. The Build Alternative does require the acquisition of one property resulting in the displacement of businesses in a five-story building at 47 East 44th Street. As a result, there are no disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Neighborhoods. No disproportionate adverse impacts on minority and low-income populations were identified in terms of neighborhood cohesion and social interaction.

Visual and Aesthetic Conditions. No disproportionate adverse impacts on minority and low-income populations were identified in terms of visual and aesthetic conditions.

Air Quality. The Build Alternative's air quality impacts were compared with federal, state and city guidelines. These guidelines are designed to protect public health. There will be no violations of NAAQ standards or exceedances of New York City *de minimis criteria.* No disproportionate adverse impacts on minority and low-income populations were identified in terms of air quality.

Noise and Vibration. The Build Alternative's noise and vibration impacts were compared with federal, city and professional guidelines. These guidelines are designed to protect public health and neighborhood quality-of-life. No disproportionate adverse impacts on minority and low-income populations were identified in terms of noise and vibration.

Ecosystems. No disproportionate adverse impacts on minority and low-income populations were identified in terms of ecosystems.

Water Resources. No disproportionate adverse impacts on minority and low-income populations were identified in terms of water resources.

Energy. No disproportionate adverse impacts on minority and low-income populations were identified in terms of energy.

Utilities. No disproportionate adverse impacts on minority and low-income populations were identified in terms of utilities.

Safety and Security. No disproportionate adverse impacts on minority and low-income populations were identified in terms of safety and security.

Historic, Archaeological and Cultural Resources. No disproportionate adverse impacts on minority and low-income populations were identified in terms of historic, archaeological and cultural resources.

Parklands. There are no parklands impacted by the Build Alternative.

Hazardous Materials. Construction material will be controlled, transported and disposed in accordance with all applicable laws. No disproportionate adverse impacts on minority and low-income populations were identified in terms of hazardous materials.

Construction Activities. The Build Alternative construction activities in the MSA will be conducted within existing underground right-of-ways and facilities. The only exceptions are the construction access shafts at East 52nd, East 54th and East 63rd Streets and activity at these sites will not create disproportionately high and adverse human health or environmental effects on minority and low-income populations.

The Build Alternative construction activities in the QSA will be conducted within the confines of existing railroad facilities at Sunnyside Yard. As described in Chapter 3, Sunnyside Yard is buffered and isolated from the surrounding neighborhood which is predominantly light industrial in nature. Therefore, it is anticipated that no disproportionately high and adverse human health or environmental effects on minority and low-income populations will occur.

Transportation and Operating Issues. There were no disproportionate impacts identified as a result of operating the Build Alternative. There are no minority and low-income populations that would be negatively affected by the operation of the Build Alternative.

The majority of LIRR riders have not been identified as part of minority or low-income groups. Therefore, the Build Alternative would not have disproportionate impacts on protected categories.

With respect to subway activity, the additional riders projected for the Lexington Avenue Line within East Midtown Manhattan would not have a disproportionate impact on minority and low-income populations. According to the ridership projections, there would be an additional seven riders per car added in the AM peak period. Given the diverse racial composition of the Lexington Avenue Line, identified in Chapter 3, no disproportionate impacts are anticipated.

The Build Alternative does provide for improved access to the East Side of Manhattan and for potential reverse commuting to job opportunities in Long Island. This is a positive impact in that an additional linkage for transit-dependent populations to areas of job growth will be provided by the Build Alternative.

The following summary provides additional information with respect to the Build Alternative assisting in enhancing Environmental Justice goals.

Eastern Queens is currently underserved by high speed, reliable public transportation. Direct LIRR Service to GCT will benefit Eastern Queens travelers. Over half of the 36 million annual journey-to-work trips emanating from Eastern Queens are made by some combination of subway and buses. Eastern Queens lacks direct subway service and, due to capacity limitations, frequent LIRR service. As a result, the subway services that do exist, are fed by an extensive network of feeder buses, and such ridership demand consistently translates into overcrowded subway services. Direct LIRR service to East Midtown is forecasted to reduce some of the crowding on the subway. Compared to the No Build and TSM Alternatives, daily subway riders will be reduced by 7,000 and 4,000 respectively.

Low Income Households Served. By providing service to Grand Central Terminal and a new Sunnyside Station, the Build Alternative provides the opportunity to improve mobility for an additional 3,700 low income households. For the purposes of this analysis, low income households are those with less than $17,500 (1990$) as defined by the 1990 Census. This approximates the 1996 federal definition of the average household poverty rate of $20,000.

5.14.3 Mitigation

Because no adverse Environmental Justice impacts were identified, no mitigation is necessary.

5.15 Hazardous Materials

5.15.1 Description of Impact Assessment

A hazardous materials assessment was performed of the Manhattan and Queens Study Area (MSA and QSA, respectively). Additionally, site surveys of the LIRR's Yard A and Amtrak's Sunnyside Yard for the proposed track alignment were performed. The objectives of the site surveys and the various database searches were to identify existing or potential environmental concerns based on current or previous activities in the MSA and QSA. The following sections summarize the information collected during the assessment including recommendations regarding potential sites of concern.

Based on laboratory results, a health and safety plan will be prepared for the proposed construction project to minimize the potential exposure of workers. All contaminated liquid and concrete impacted by future construction activities will be properly handled and disposed in accordance with federal requirements.

5.15.2 Impacts

In the event that contamination is encountered, for which there is no definable source, these sites will be analyzed to determine if their historical operations had adversely impacted the quality of the soils and groundwater.

The types of hazardous materials which may be present within the MSA would primarily include petroleum products and organic solvents. Hazardous materials which may be present within the QSA, in particular Sunnyside Yard and Yard A, would primarily include petroleum products and PCB's. There is potential that other contaminants including organic solvents, herbicides, pesticides and metals could also exist.

Site investigations could be utilized to define and delineate areas of concern prior to construction activities. A subsurface investigation including soil and groundwater sampling would determine any areas of contaminated soil and/or groundwater. The proposed subsurface investigation for the QSA (Yard A) is outlined in section 5.15.3. Similar investigative efforts could be utilized within the MSA. Techniques for obtaining soil and groundwater samples within the MSA could include less intrusive methods such as the Geoprobe system. Subsurface samples would require laboratory analysis for the suspected contaminants. A potential, categorical list of suspected contaminants would be generated with the aid of data obtained from the regulatory database reviews. A preliminary list of disposal options and facilities will be generated from the results of the subsurface investigation.

Excavated soils within areas identified as contaminated would require stockpiling during construction activities. The stockpiled soil must be protected from the elements while waste characterization analysis is obtained. Disposal options can be finalized based on the laboratory analytical reports for the waste characterization.

5.15.3 Mitigation (Site Investigations)

The potential presence of contaminants within the subsurface of Madison Avenue Yard will be investigated prior to planning construction activities. A visual investigation should be conducted to identify any areas of concern which may include stained areas, hazardous materials storage areas, drainage structures and piping insulation. Samples of any standing liquid should be anlayzed by a laboratory for petroleum constituents. Concrete core samples from within stained areas should also be laboratory analyzed for petroleum constituents. Suspect piping and/or duct insulation should be analyzed for asbestos.

The subsurface investigation of the LIRR Yard A consists of three phases: 1) Shallow Soil Borings; 2) Deep Soil Borings; and 3) Groundwater Quality Monitoring Wells. A total of 16 soil borings will be advanced to groundwater depth (approximately six feet). Continuous 2-inch diameter samples will be obtained from each boring. The soil samples will be analyzed for semi-volatiles and volatile organic compounds, PCBs, Dioxin, Total Petroleum Hydrocarbons (TPH), pH, metals, pesticides and herbicides. Three of the shallow borings will be advanced to a 13 foot depth and will be used as shallow wells.

Three deep soil borings, in which the deep wells are to be located, will be advanced to a depth of approximately 74 feet. Soil samples will be obtained via split-spoon taken every 10 feet and will be analyzed for the same parameters listed above. All six monitoring wells will be installed consisting of four-inch I.D. PVC casing and slotted screens. The wells will be installed as three, two well (shallow and deep) clusters. Groundwater samples collected will be analyzed for same parameters with the exception of pH, TPH and dioxin. The results of soil and groundwater quality data will assist in the estimation of the cost of handling the soil and groundwater that will be encountered during tunnel construction.

5.15.4 Materials and Waste Management

This section describes the storage and handling of project-generated materials and waste. This description could be the basis for the specifications to be issued to the contractor.

Materials Storage and Handling

The proposed project would involve the storage and use of various construction materials. Materials would be stored, handled, applied, and disposed of so as not to cause potentially significant impacts. Appropriate safety information and instructions would be obtained by the contractor and maintained at the project site for all materials present. The contractor would be required to provide a written plan, identifying materials to be used, methods for their use, containment techniques, and the cleanup procedures that would be followed in the event of a spill of these materials.

Project materials would be stored in approved storage containers and in accordance with all applicable laws and guidelines. If hazardous materials are stored on-site, a fenced-in, paved section of the contractor's staging area would be designated for the storage of hazardous materials and hazardous waste. Containers would be kept unopened until required for use. Flammable materials would be stored under cover, out of direct sunlight, and at the appropriate temperature.

If petroleum products are stored on-site, they would be stored in 55-gallon drums, and transferred to smaller containers to be dispensed. Any electrical devices in the storage area such as lighting fixtures and air conditioners would be explosion-proof. Fire extinguishers would be provided in the storage area, and smoking would be prohibited in all areas where flammable materials are present.

Waste Management

The collection, handling, storage, sampling, characterization, manifesting, transportation and disposal of project-generated waste throughout the construction period would be undertaken in accordance with all applicable laws and regulations.

The contractor would be required to provide a written Waste Handling Plan, which would outline intended procedures for handling, storage and disposal of all waste. The Waste Handling Plan would identify licensed waste transporters, waste disposal facilities and recycling facilities that would be handling waste generated during construction. Also included would be a contingency plan to address the on-site management of solvents, and to identify procedures to be followed in the event of a release or spill of hazardous waste.

All hazardous and non-hazardous waste generated during the construction period would be recovered and disposed of off site. At a minimum, waste would be collected at the end of each working day into closed, USDOT- approved storage drums or containers so that no waste is left exposed overnight, with the exception of scrap steel. All containers would be kept in good condition, with intact, operable lids, which would remain closed at all times, except when open for filling, and would be labeled in accordance with applicable federal, state and local laws.

Waste may be stored for up to three days in a satellite storage area on-site prior to being transported to a disposal facility or to the contractor's fenced staging area for temporary storage. All waste would be transported to the appropriate disposal or recycling facility within 60 days of initially being placed into a container. Waste would be completely covered at all times during transport. In the event of a spill of hazardous or non-hazardous waste, the necessary steps would be taken to notify the appropriate agencies and to expedite cleanup activities.

Sampling

Representative samples of each type of project-generated waste would be collected and tested for hazardous materials in accordance with 40 CFR 261, Appendix II, Method 1311 *Toxicity Characteristic Leaching Procedure* (TCLP). Samples would be tested for other hazardous substances and hazardous characteristics (ignitability, corrosivity, reactivity, toxicity, pH, etc.). If sampling identifies waste to be hazardous, it would be handled as described below.

Hazardous Waste Management

All personnel would be trained in the proper handling of hazardous waste. Hazardous waste that could be present include spent solvents, petroleum products, grease, asbestos and PCBs. Hazardous waste would be stored in separate containers from non-hazardous waste, and different types of hazardous waste would not be combined in the same container, unless specifically approved by the disposal facility.

Hazardous waste would be stored and transported in USDOT - approved containers. If hazardous waste is stored on site, a paved fenced-in section of the contractor's staging area would be designated for hazardous materials and hazardous waste storage. The hazardous waste storage area would be accessible to emergency vehicles. Hazardous waste containers in the storage area would be arranged in lots of no more than two rows of five containers each, and would be inspected weekly for corrosion and leaks.

Hazardous waste would be transported to a licensed Treatment Storage and Disposal (TSD) facility by a licensed hazardous waste transporter. The transport and disposal of all hazardous waste would comply with the manifesting, certification and reporting requirements for hazardous waste in accordance with 40 CFR 262, 40 CFR 268 and 6 NYCRR 372, and would include certificates of final disposal for each shipment.

The project may involve the removal of Asbestos-Containing Material (ACM) from various parts of GCT. All ACM would be removed and disposed of in accordance with applicable laws, codes, rules and regulations.

Notification signs would be posted for at least 10 days prior to the start of abatement in each area. The work area for all abatement activities would be accessible to certified asbestos handlers and authorized observers only, and would have warning signs posted at the entrance to the work area. Personal protective equipment would be used at all times.

All asbestos workers would be certified by NYSDOL, and would be provided with training, High Efficiency Particulate Air (HEPA) filtered respirators, protective full-body clothing, and medical examinations. Decontamination and work procedures would be reviewed and understood by all persons entering a work area or enclosure, and would be posted in a visible location. The decontamination enclosure system would include an equipment room for the removal of personal protective equipment, a shower area, and a clean room for dressing.

Power tools used in asbestos removal would be equipped with HEPA-filtered local exhaust ventilation. Equipment used for the transportation of ACM would be suitable for loading and transport of waste materials without exposure to persons or property. Asbestos-containing waste water would pass through a series of filters ending with a 5-micron filter, and would be disposed of properly. Filter media would be of the disposable cartridge type and would be disposed of as ACM.

Asbestos-containing debris and contaminated water would be cleaned from the work area daily, or after each work shift using wet methods and HEPA vacuuming equipment. Asbestos debris and water would be placed in bags, sealed, and either stored or removed from the work area. The worker decontamination enclosure system would be cleaned daily.

External surfaces containers and equipment would be cleaned by wet cleaning or HEPA vacuuming within the work area prior to being moved to the personal decontamination enclosure system equipment room. Clean containers of asbestos material and equipment would be placed in watertight carts with doors or tops that would be closed and secured, and would be wet cleaned and/or HEPA vacuumed daily, at a minimum.

Bags of asbestos-containing waste would be sealed with tape in the work area. The asbestos waste would not be allowed to dry out prior to sealing bags. While in the work area, bags would be decontaminated of any bulk debris by wet wiping.

Upon completion of work in an area, the area would be inspected under adequate lighting for visible asbestos material, debris and dust. Final clearance air samples by Phase Contrast Microscopy (PCM) would be conducted in each area to ensure that airborne concentrations of total fibers are acceptable. If necessary, surface cleaning would be repeated until acceptable PCM results are obtained.

Water Waste

Water waste at the project site would be generated by activities such as laundering of clothing, use of water for hygienic purposes, surface preparation by means of water jetting, and cleanup activities. All such waste water would be collected and retained within containers, after being filtered for visible particulate. Prior to disposal, the water would be tested, and would then be subjected to a multi-staged filtration, as necessary, until it is acceptable to a local publicly owned treatment works, sanitation company, or other appropriate permitted facility. After filtration, if the intended waste water still exceeds the maximum permissible levels for lead or other heavy metals, the waste water would be classified as hazardous waste, labeled as such, and transported to a Treatment, Storage and Disposal facility (TSD). If deemed non-hazardous, the waste water disposal facility may allow the filtered water to be placed into the sanitary sewer system.

Summary

The storage, handling and disposal of materials and waste associated with this project would be undertaken in accordance with all applicable rules and regulations, and manufacturer's specifications. Therefore, no impacts are expected to occur as a result of the materials or waste associated with the proposed Build Alternative.

5.16 Construction Impacts

5.16.1 Description of Impact Assessment

Implementation of the Build Alternative will result in impacts during construction. The significance of these impacts must be compared to the No-Build Alternative. This section addresses the direct and indirect (both short and long term) impacts of the construction of each alternative.

For purposes of this evaluation, construction impacts were considered significant if:

- Local, state or federal air, noise or water quality standards would be violated during construction activities; or
- Traffic congestion or disruption due to construction would cause significant economic losses, or other impacts to the neighborhoods; or
- If planned construction required the acquisition and relocation of onsite occupants of multiple properties.

5.16.2 Impacts

The assessment of impacts due to construction begins with a description of the construction methods that will be employed and a summary of impacts and possible mitigation measures.

Initial planning, environmental analysis, construction methods and contract sequencing for the LIRR connection to GCT was taken into consideration to minimize potential construction impacts resulting from project implementation. Key impact areas include community impacts, traffic, parking, air quality, noise and vibration, groundwater, utilities and business disruption. Construction impacts and mitigation are discussed in a generic fashion for the overall Build Alternative and in a more contract specific manner where warranted. Construction related impacts to the operations of NYCT, MNR and Amtrak are addressed in Chapter 4, Transportation Impacts.

The proposed Build Alternative extends from the south end of GCT's Lower Level, approximately the north side of East 42nd Street, to track connections with the LIRR Main Line in Sunnyside Queens, just east of 43rd Street. The total length of the route is approximately 21,600 feet. The proposed route utilizes structures that were built in conjunction with the NYCT 63rd Street Line. This joint construction will be continued, as part of this project, within Queens where the NYCT structure will be extended to a termination point under LIRR Yard A.

The proposed route can be subdivided into four major areas:

Location	Length Of Route
Manhattan - New Construction	5,000
Reconstruction within GCT Structure	2,500
Existing 63rd Street Tunnel Structure	8,600
Queens - New Construction	5,500
	21,600 LF

As shown on Figure 5.16-1 the Manhattan portion of the construction will be further subdivided into three construction contracts.

Construction Contract C-1 will extend from East 42nd Street to East 52nd Street basically within the existing Grand Central Terminal structural envelope.

Construction Contract C-2 will extend from East 52nd Street to East 55th Street and will construct the new LIRR structure beneath existing buildings on the west side of Park Avenue whose existing structure will be underpinned as part of this contract.

Construction Contract C-3 will extend from East 55th Street and Park Avenue to East 63rd Street and Second Avenue where it will join the existing LIRR lower level of the 63rd Street Tunnel.

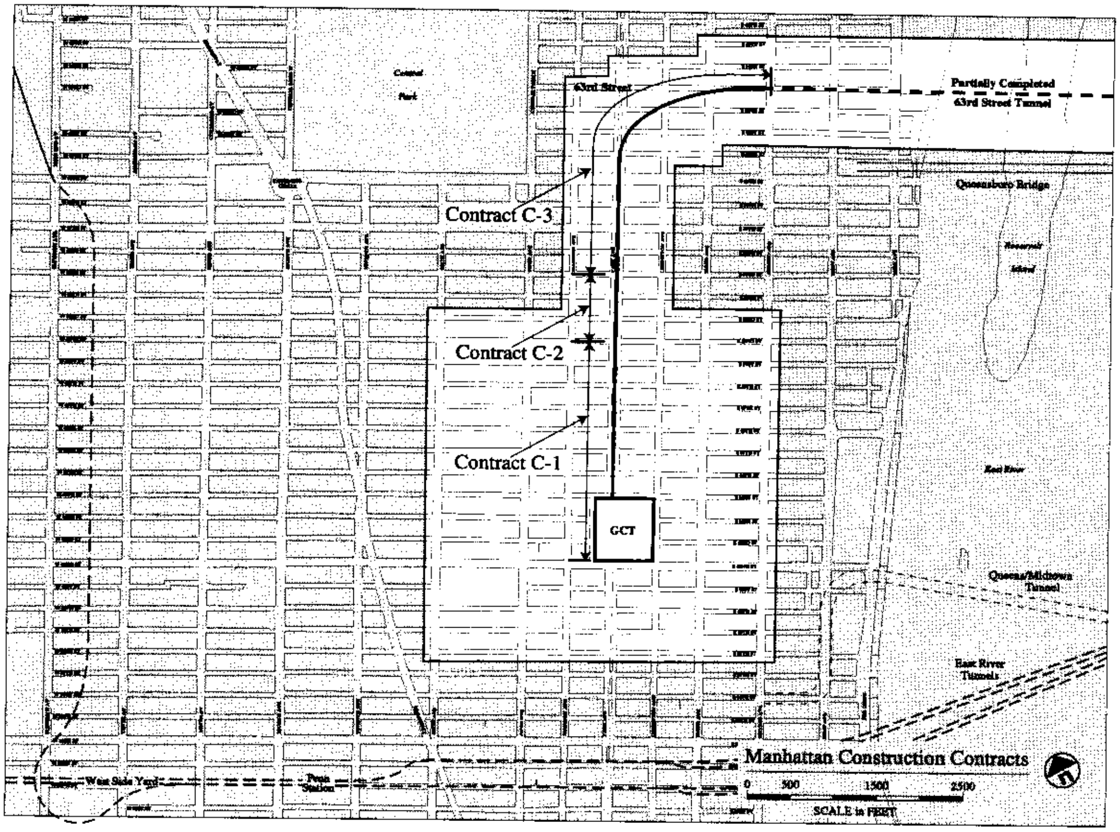


Figure 5.16-1

On the Queens side, as shown on Figure 5.16-2 the construction will be performed under two separate construction contracts.

Construction of Contract C-4 will start at the bellmouth currently being constructed under NYCT Contract C-20203. This section will be extended east under Northern Boulevard and the IND Queens Boulevard Line and continue to the east side of LIRR's Yard A.

Contract C-5 will continue the route from the east end of Contract C-4 to the connections to the LIRR Port Washington Branch and Main Line. Also included will be the provision for an in-bound and outbound track leading to a storage yard to be located in Yard A.

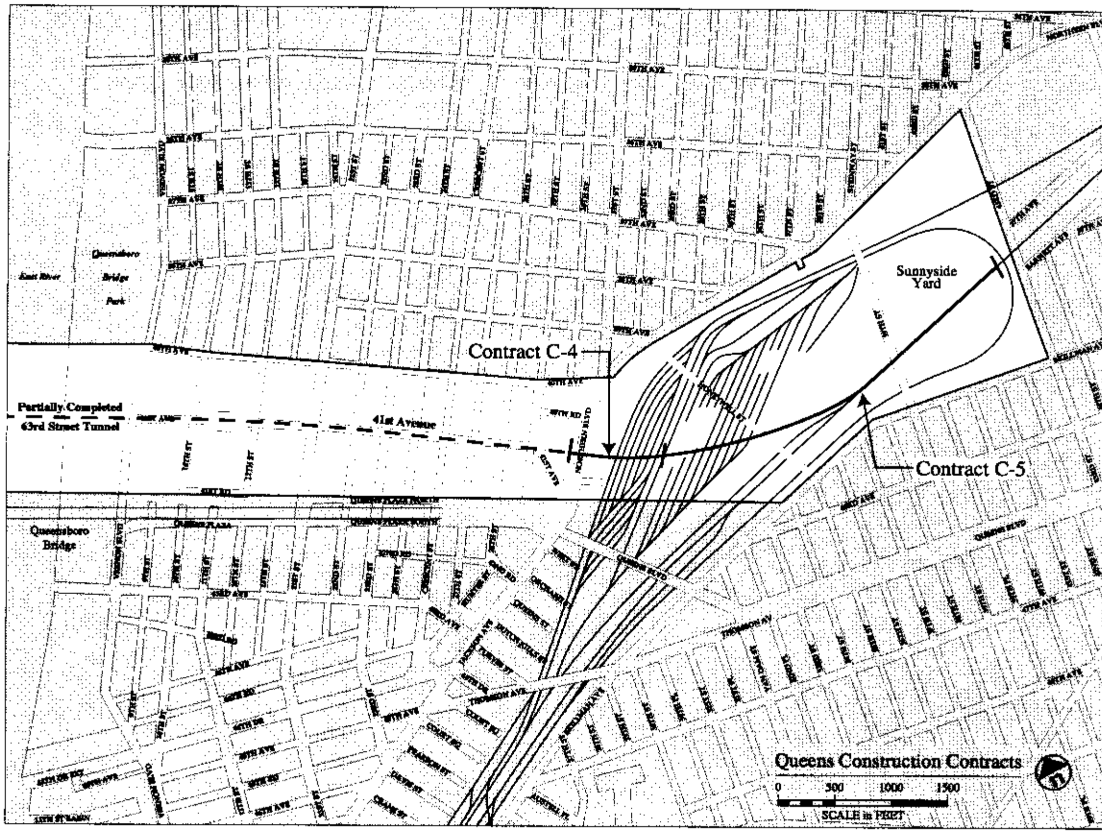


Figure 5.16-2

Construction Contract C-1

The general limits of Contract C-1, are from the south end of GCT to the bulkhead wall at East 52nd Street beneath Park Avenue and will include the construction of the 10 new station trackways, 5 island platforms and the construction of the extension of the lower level Loop Track.

Prior to the start of construction, all existing trackage within the work site will be removed. In addition, existing trackage adjacent to the work area will be realigned.

Once this work is completed a construction contract could then be awarded. One of the first activities to be accomplished would be the closing in of the construction area to segregate it from MNR operations and customers. The work site would be under the control of the contractor.

The major efforts to be accomplished are the lowering of the track invert in the station area of the six most westerly tracks. The relocation of approximately 145 existing columns and the under-pinning of 455 existing column footings are needed, to accommodate the LIRR track alignment, the construction of the platforms and overhead passageways, and the construction of the extension of the lower level Loop Track, designated LIRR Track #6. In addition, facilities associated with MNR's North End Access Project (currently under construction) may require relocation. The specific requirements and any required mitigation for the NEA project will be addressed during subsequent planning and design phases for the Build Alternative.

The spoil generated by the construction activity will be hauled out of the GCT Lower Level work area using MNR trackage. It is anticipated that an MNR locomotive and crew will haul the contractor owned hopper cars to an MNR yard. There the contractors forces will unload the hopper cars and truck the spoil to approved sites.

Similarly the majority of construction material will be shipped into GCT using the same concept. All movements of the work trains will be subject to MNR scheduling requirements. Currently MNR does not operate trains in or out of GCT between the hours of 1:30 AM and 6 AM. Therefore, this time period would be available for contractor train movements.

The estimated time for Construction Contract C-1 is three years.

Construction Contract C-2

The general limits of Contract C-2 are the bulkhead wall of GCT structure on the south side of East 52nd Street to East 55th Street, a distance of approximately 800 feet.

This contract entails the construction of the planned LIRR Tracks 1, 2 and 3 which are located inside the west building line of Park Avenue. This in turn will require that portions of the foundation structures of the buildings between East 52nd Street and East 55th Streets be underpinned.

In addition LIRR Track No. 6, on the east side of Park Avenue, will be extended north to approximately East 54th Street.

To construct this section, construction access shafts will be installed at East 52nd Street and East 54th Street.

The construction shafts, which will ultimately be utilized for a permanent mechanical ventilation system, will measure 40 feet by 60 feet. Their construction and use will permit one lane for vehicular traffic as well as provide for pedestrian movement on each side of both streets. The base of each of the shafts will be approximately 48 feet deep at 52nd Street and 56 feet at 54th Street. Earth over burden extends approximately 20 to 30 feet below the street surface and below that rock. The rock will be excavated using drill and blast methods. All spoil material will be trucked away from each shaft location. Approximately 650 truck loads of spoil will be removed over a nine month period to designated sites in constructing the two shafts.

Once the shafts are constructed, a 10 foot diameter TBM will be used to drive two north-south tunnels at the perimeter of the proposed LIRR structure. Vertical shafts will be constructed beneath the building envelope which in turn will accommodate the support for the new underpinning system to be used to support the existing buildings.

A third 10 foot diameter tunnel will be driven down the center of the proposed LIRR structure at the invert level. Again vertical shafts will be constructed to the basement area of the existing buildings. In this manner all material to be excavated from beneath the buildings will be dropped down the shafts and transported to the 52nd Street or 54th Street shaft. From there the material will be lifted up to the street level and trucked off site. Approximately 5,000 truck loads of excavated material will be transported to approved spoil sites over an approximately 18 month period.

The method of construction described is a possible method of underpinning the buildings if the existing geotechnical conditions warrant. This approach would minimize the level of disturbance to the existing buildings and their operations to permit the work of underpinning that must be done. By moving the material to be excavated down to a tunnel as opposed to bringing it up through, for instance the sidewalk area fronting Park Avenue, the potential construction impacts on the surrounding area would be minimized.

In constructing the permanent structures it is estimated that approximately 2,000 truck loads of concrete will be required. The location where the concrete will be placed will dictate which shaft, 52nd Street or 54th Street, will be used. It is anticipated that each shaft will be used for delivery of approximately 50 percent of the concrete required for the job site.

The concrete will be lowered to the base of the shaft and then pumped from that point to the particular area being constructed.

Once the permanent structures are in place for the LIRR tracks, the area will be backfilled. The area directly above the LIRR structure may be used for various ancillary facilities needed for the mechanical ventilation system. The utilization of these areas would be identified during the design stage of the project.

The backfill material will be trucked to one of the two construction shafts. Access to each of the buildings would be provided below the street surface penetrating into the previously excavated areas. It is estimated that approximately 1,800 truck loads of fill material will be needed over a four month period. Once the backfilling and compacting is completed the basement areas of each of the buildings will be restored.

Thereafter the work of completing the shaft structures for their use as a part of the mechanical ventilation system will begin. The installation of the mechanical ventilation equipment would be done under a separate contract.

Concurrent with the work of building the LIRR structures on the west side of Park Avenue will be the construction of the extension of Track No. 6. This work will be performed using drill and blast methods of construction along the east side of Park Avenue but within the public right-of-way. It is anticipated that rock spoil will be removed via the Contract C-1 work zone.

The estimated time required for Construction Contract C-2 is three years.

<u>**Construction Contract C-3**</u>

The general limits of Contract C-3 are from 55th Street and Park Avenue to East 63rd Street and Second Avenue. The work will consist of constructing two-single bore tunnels for an approximate length of 3,200 feet each and approximately 1,000 feet of box/cavern structure which is located beneath MNR Park Avenue tracks.

The two single bore tunnels are to be constructed using a Tunnel Boring Machine (TBM). The TBM will be continued into the cavern section and possibly the box structure area as determined by future geotechnical investigations. The initial circular tunnel bore will then be enlarged to its final box or cavern configuration using mining construction methods.

To allow for the assembling of the TBM at the north end of the contract a new construction shaft must be constructed. It will be located directly over the existing LIRR 63rd Street Tunnel eastbound track structure, south of the south curb of 63rd Street and adjacent to the east building line of Second Avenue. The adjacent site, under the jurisdiction of the MTA, will be made available to the contractor as a staging area.

The contractor's work gangs will also gain access to the TBM as it progresses westward from this shaft.

It is anticipated that the shaft (approximately 30 feet by 34 feet), will be constructed by cut and cover methods until it reaches rock approximately twenty feet below grade. The excavated material, approximately 800 bank cubic yards (buy), will be transported to an approved site by truck. Approximately 50 truck loads of spoil material will be transported off site. Upon completion of the earth overburden material removal, a bore hole will be drilled to the top of the LIRR eastbound tunnel approximately 135 feet below street level. The bore hole opening will be enlarged using a raise bore drill with resulting spoil dropped to the track invert level and transported thru the existing tunnel into Yard A in Sunnyside, Queens. From there it will be shipped by rail to eastern Long Island sites.

It is estimated it will take eighteen months to construct the shaft by which time Construction Contract C-4 in Queens is scheduled to be completed permitting direct access to Yard A from the LIRR tunnels. A shaft will be provided as part of Contract C-4, in Yard A, to transport the spoil material to a hopper located on the surface. The trains would then be loaded directly from the hopper. This negates the need for any major trucking of tunnel spoil from Contract C-3 thru the streets of Manhattan and Queens.

The contractor, once the construction shaft was completed, would truck in the TBM equipment and lower it down to the base of the shaft where the TBM would be assembled. It is anticipated that the TBM will start driving the eastbound tunnel, Track No. 2, first. Once the tunnel drive is completed, beneath Park Avenue, the TBM will be disassembled and transported, below ground, back to Second Avenue and 63rd Street. A cross passageway will have been constructed, beneath Second Avenue, to provide access to reassemble the TBM in the westbound tunnel, Track No. 1. Again the TBM will drive towards Park Avenue and 60th Street and then turn south down Park Avenue. The exact distance the TBM can be driven beneath Park Avenue will be determined after geotechnical investigations and a detailed design have been completed.

The driving of the TBM in excavating for the tunnel will be performed on a 24-hour a day basis, five days a week. With the actual work being a considerable depth below grade it is expected that there will be minimal disturbance perceptible at the surface. The only surface work site in Manhattan will be the construction shaft and adjacent property at the southeast corner of East 63rd Street and Second Avenue. The concreting work in the tunnel sections can be supplied using the either East 63rd Street and Second Avenue shaft or the construction shaft on East 54th Street used for Contract C-2.

The duration of the Construction Contract C-3 is estimated at five years.

Construction Contract C-4

From Second Avenue and 63rd Street in Manhattan to 29th Street and 41st Avenue in Queens, a distance of 8,600 feet, the LIRR two track structure has been constructed in conjunction with the construction of the NYCT 63rd Street Line.

The general limits of Contract C-4 are, at the westerly end, the bellmouth being constructed under NYCT Contract C-20203 with the easterly limit at the east property line of LIRR Yard A, approximately 580 feet east of Northern Boulevard. The length of this construction section is 780 feet. The work includes continuing the two NYCT tracks one above the LIRR eastbound track and the other adjacent to the LIRR westbound track. The NYCT Track Structure would be built to approximately 475 feet east of Northern Boulevard where it would become independent of the LIRR structure. In this manner the future continuation of the NYCT structure could be constructed with minimal impact on LIRR operations.

A major effort of this construction contract is the crossing beneath the IND Queens Boulevard Line which in turn is directly below Northern Boulevard. The BMT Astoria Line, an elevated line, is directly above Northern Boulevard in the area of the proposed crossing and is supported on the Queens Boulevard Line structure.

The properties on either side of Northern Boulevard that the route will traverse are under MTA jurisdiction. This will provide adequate work space for a contractor to perform the underpinning of the Queens Boulevard Line structure. As the subway structure will be underpinned limited excavation of the bed of Northern Boulevard will be needed, thereby having minimal interference with vehicular traffic.

One possible method for underpinning the IND Queens Boulevard Line is to drive several tunnel drifts beneath the subway structure. Then install the structural support system for underpinning the subway structure, which in turn will be supported on slurry walls.

For the open cut excavation on the east and west sides of Northern Boulevard, a slurry wall method of construction will be used. The slurry walls will be anchored into the underlying rock formation to effectively seal off the groundwater from entering the excavation site. This is similar to what is being used by NYCT on Contract C-20203. Once the permanent structures are constructed the area would be backfilled. With respect to the property on the west side of Northern Boulevard, the proposed LIRR and NYCT structures will be able to support future development in accordance with the permitted zoning now in effect.

The material being excavated on the west side of Northern Boulevard would be trucked into Yard A. The material being excavated east of Northern Boulevard and within Yard A would be loaded on to hopper cars located adjacent to the work site. Any trucking required would be on-site, within Yard A, with the exception of the work on the west side of Northern Boulevard.

The area east of Northern Boulevard will likewise be backfilled once the permanent structures are completed. The Yard A surface area will be restored. In turn this area will be utilized by the Contractor for Construction Contract C-5 for locating temporary storage tracks for Amtrak operations.

Another segment of the Yard A site will be made available to the contractor for Construction Contract C-3 in Manhattan. The roof of the LIRR structure at the east end of Contract C-4 will be left open as well as a shaft to the surface. This area will be used to lift out the material being excavated in Manhattan. The existing LIRR structure between Queens and Manhattan will be used to operate muck trains that will transport the material from Manhattan to the Queens shaft. At that point the material will be brought up to the surface and reloaded onto hopper cars for transport to eastern Long Island.

The estimated duration of Construction Contract C-4 is three years.

Construction Contract C-5

The westerly limit of Contract C-5 is approximately the eastern end of Contract C-4. The easterly limit is approximately 600 feet east of 43rd Street at the Track D tie-in location.

The construction at the westerly end of the contract will be open cut construction using slurry walls extending approximately 200 feet into Amtrak's Sunnyside Yard. This will require the removal of ten Amtrak storage tracks from service. Storage tracks will be provided in Yard A to replace these storage tracks on a temporary basis.

This area will also be the location of the construction shaft which will be used to start the tunnel construction using an Earth Pressure Balance TBM. The TBM will be used to construct the four revenue tracks and the two storage yard lead tracks. The construction shaft and contractor staging area will require the removal of two Amtrak buildings. This assumes that Amtrak has not initiated its plan to demolish the entire row of building at this location as part of its plan to reconfigure Sunnyside Yard.

The use of slurry wall construction for the shaft and Earth Pressure Balance TBM for tunneling will negate the need to do any extensive dewatering. The slurry wall will be constructed with the base of the wall cut into the bedrock. In this manner an impervious wall can be constructed permitting the existing groundwater table to be maintained.

The proposed construction method utilizing an Earth Pressure Balance TBM would perform the excavation with minimal impact on the groundwater table. As the alignment curves toward and beneath the Main Line, the tunnel profiles will be rising. In the areas of each of the tunnel portals, the invert of the tunnel would be above the water table elevation. From that point on, the anticipated construction method would be open cut using soldier beams and timber lagging. Adequate space at the surface adjacent to operating tracks would be provided by the utilization of a staged construction plan. Each tunnel run will be approximately 2,000 feet long.

The excavated material from the Earth Pressure Balance TBM will be transported back to the shaft. From there it will be moved up to the surface and loaded onto hopper cars. The material will then be transported by rail an approved disposal site.

The material being excavated from the tunnel approach sections will be hauled by truck back to the shaft area in Yard A or taken back to the shaft by using the completed tunnel section. The suggested method of construction will be developed as the project design progresses.

All final connections for track, signals and power between the existing infrastructure and the Build Alternative will be performed in a manner to minimize operational impact to the LIRR and Amtrak. The installation of track, signals, and power for the Build Alternative would be performed under separate project contracts.

The estimated duration of Construction Contract C-5 is five and a half years.

5.16.3 Impacts and Mitigation

Traffic and Parking Impacts

The degree of traffic and parking disruption during construction of the Build Alternative will depend upon the location, size, and method of construction activity.

Primary traffic and parking disruption activity will occur in the vicinity of the construction access shafts on East 52nd Street and East 54th Street (Contract C-2) and at Second Avenue and East 63rd Street (Contract C-3). With respect to Contract C-1, the assignment of the LIRR terminal area to the contractor it is anticipated that the remaining areas of GCT will be minimally impacted by the construction operations. This can be accomplished by utilizing the MNR system to haul out the construction spoils and bring in construction materials. Therefore the volume of street activity and trucking required to support the project would be minimal. It is anticipated that the majority of the workers reporting to the GCT site would probably use public transportation in their journey-to-work.

With respect to Contract C-4, Northern Boulevard is supported above the NYCT Queens Boulevard Line subway structure. The Build Alternative crossing of Northern Boulevard will require underpinning of the subway structure with limited excavation of the bed of Northern Boulevard. Minimal interference with vehicular traffic is anticipated. Contract C-5 will be entirely within right-of-way under the control of the LIRR and/or Amtrak with the exception of the new railway bridges to be constructed over 43rd Street where minimal interference with vehicular traffic is anticipated.

No construction impacts are anticipated under the No-Build Alternative. Under the TSM Alternative minor construction related traffic impacts are anticipated with construction of the HOV flyover structure at 74th Street in Queens.

Traffic and Parking Impact Mitigation Measures

- Construction access shafts will be configured and located to minimize impacts to vehicular traffic while also allowing the construction to proceed expeditiously thereby minimizing the duration of any traffic impacts.

- Decking constructed to close tolerances will be used for temporary travel surfaces as a means of maintaining traffic flow.

- During subsequent planning and design phases for the project, a Worksite Traffic Control Plan will be developed in consultation with NYCDOT and adjacent affected property owners, detailing detour routes, primary and secondary building access points, loading docks, emergency service facilities and potential truck routes.

- During construction, the contractor will be required to follow the Worksite Traffic Control Plan.
- Bus rerouting and parking prohibition plans will be adopted as required.
- NYPD Traffic Control Agents will be utilized as part of the Worksite Traffic Control Plan at intersections affected by the construction and to enforce no parking and no standing regulations.
- By a judicious sequencing of the construction contracts for the Build Alternative a direct, underground route can be established between Manhattan and the rail yard at Yard A in Queens. This will permit the transportation of the tunneling muck, below ground, from the tunnel heading to Yard A. This in turn mitigates the impacts on the neighborhood at Second Avenue and 63rd Street where the tunnel muck could have been lifted to the surface and then loaded onto trucks. Further this would have imposed a significant volume of traffic at a critical street intersection. East of the existing NYCT ventilation building, which is just east of Second Avenue on 63rd Street, is an exit ramp from the Queensboro Bridge. Since 63rd Street is a one-way westbound street, the additional truck traffic would cause further congestion in a heavily trafficked area.

Noise and Vibration Impact

Construction activities for the proposed Build Alternative will extend almost 4 miles, from GCT to the east end of the Sunnyside Yard and will be staged over almost a decade. However, much of the project construction will be underground with a limited number of open site or cut-and-cover constructions for short durations. This subsurface nature of the project construction will greatly limit the construction impacts of the project.

Short term construction noise impacts are expected in the immediate vicinity of open construction sites. With the exception of construction within the Sunnyside Yard, most surface construction involves either the access to service the expanded terminal at GCT or access for tunnel construction.

Construction activities typically include pavement breaking and excavation. An approximate impact radius of 200 feet is estimated. However, with standard safety barriers erected, the impact can be minimized to the immediate proximity of construction.

It should be noted that construction vibrations are regulated under NYC's Building Code. Construction activities must not generate ground peak particle velocity (PPV) of 1.92 inch per second (ips) at neighboring structures. The NYC Landmark Preservation Commission adopts the 1.92 ips PPV as the not-to-exceed limit for the protection of landmark structures.

However, to ensure the safety and integrity of historical structures immediately adjacent to heavy construction, it is recommended that the much more widely adopted U.S. Bureau of Mines (BOM) criteria of peak particle velocity limit of 0.5 inches per second be complied with. Compliance with BOM guidelines for historic structures should provide adequate protection to buildings in the study corridor and their occupants given that current street level vibrations often approach and exceed these limits.

Contract specifications for the TBM and for blasting and construction vibration monitoring are standard measures that will be put in place to minimize project construction vibration impacts.

Ground vibration induced by project construction is of particular concern due to the type of construction (blasting, drilling and boring) activities anticipated and the complexity of underground conditions and the unique status of the many buildings in the project corridor. However, a large section of the project - from 29th Street and 41st Avenue in Queens to Second Avenue and 63rd Street - is already in place.

Noise and Vibration Impact Mitigation Measures

The primary means of minimizing noise and vibration impacts during construction is the development of project specific Design Criteria. These criteria will be included in the construction documents as they are developed in the engineering phase of the project. The criteria set specific noise and vibration limits which are not to be exceeded by the contractor. Adherence to these noise and vibration limits would be enforced by the construction management team and audited by an environmental compliance consultant. The permissible noise and vibration limits will be based on the type of nearby land use, type of construction activity and time of day.

Other site-specific mitigation measures within construction zone limits could include, but are not limited to:

1. Limiting the hours of construction activity to less noise-sensitive hours.
2. Limiting removal of spoils material from excavation activities to less noise-sensitive hours.
3. Requiring a careful maintenance and lubrication program for heavy equipment.
4. Erecting temporary noise barriers where specification noise limits cannot be met with available construction equipment.
5. Using welding instead of riveting.
6. Mixing concrete off-site instead of on-site.
7. Employing prefabricated structures instead of assembling them on -site.
8. Using construction equipment modified to lessen noise emissions, such as:
    a. electric-powered equipment instead of diesel equipment,
    b. hydraulic tools instead of pneumatic tools,
    c. electric instead of air- or gasoline-driven saws,
    d. effective intake and exhaust mufflers on internal combustion engines and compressors, and
    e. hoppers, storage bins and chutes lined or covered with sound-deadening material.

9. Maximizing the physical separation, as far as practicable, between noise generators and noise receptors. Such separation includes but is not limited to the following measures:

   a. providing enclosures for stationary items of equipment and barriers around particularly noisy area on the site or around the entire site,

   b. using shields, impervious fences or other physical sound barriers to inhibit transmission of noise, and

   c. locating stationary equipment to minimize noise impact on the community.

10. Turning off idling equipment.

11. Minimizing noise-intrusive impacts during the most noise-sensitive hours by:

    a. planning noisier operations during times of highest ambient noise levels, and

    b. keeping noise levels relatively uniform; avoiding peaks and impulse noises.

Other measures for outside construction zone limits could include, but are not limited to:

1. Selecting truck routes for excavation material disposals so that the noise from heavy duty trucks will have minimal impact on sensitive land uses (e.g., residential). The contractor will be required to submit a proposed plan for hauling tunnel and other excavation material with LIRR, and will obtain approved haul routes from work sites to the various disposal sites.

2. Conducting truck loading, unloading and hauling operations so that noise is kept to a minimum.

3. Routing construction equipment and vehicles carrying soil, concrete or other materials over streets and routes that will cause the least disturbance to residents and other sensitive receptors in the vicinity of the construction work.

Vibration Impact Mitigation Measures

The measures applied to limit noise levels, as indicated above will also limit vibration levels. In addition in respect to Construction Contracts C-1 and C-2 it is recommended that vibration monitoring instrumentation be installed by the construction management team to ensure that during construction activity, vibration levels remain below the design criteria threshold for damage to historic buildings.

Air Quality Impact

Construction related air quality impacts are associated with emissions from diesel powered construction equipment, traffic congestion around construction work zones and fugitive dust related to digging, demolition and hauling activities. These impacts would be temporary and of short duration.

Air Quality Impact Mitigation Measures

Short term impacts of construction could be reduced by the measures indicated below. These measures should be considered as conditions of project approval and could be contained in applicable contracts between the project sponsor and contractors. Fugitive dust control programs for grading or earthwork activities should be employed. Mitigation measures that would reduce emissions are listed below:

- Pave or chemically treat all unpaved road surfaces.
- Pave or chemically treat unpaved parking lots and vehicle staging areas.
- Set the maximum speed limit on unpaved roads at 15 miles per hour.
- Establish dirt-removal programs to remove visible dirt accumulations from paved road surfaces.
- Pave construction access roads as soon as access roads are created. Paving must extend from the paved roadway into the construction area at least 120 feet in length; and paving must be cleaned at the end of each work day.
- Phase grading to prevent the susceptibility of large areas to erosion over extended periods of time.
- Schedule activities to minimize the amount of exposed excavated soil during and after the end of work periods.
- Sweep streets if silt is carried over to adjacent public thoroughfares.
- Require a phased schedule for construction activities to minimize daily emissions as much as possible.
- Suspend grading operations during high winds, i.e., winds greater than 25 miles per hour.
- Wash off all the trucks leaving site and install vehicle wheel-washers before the roadway entrance at construction sites.
- Maintain construction equipment engines by keeping them tuned.
- Use clean and low-sulfur fuel for equipment when available.
- Utilize existing power sources (e.g., power poles) or clean-fuel generators rather then temporary power generators.
- Use low emission on-site stationary equipment (e.g., methanol powered internal combustion engines).
- Water or chemically treat all active projects with multiple daily applications to assure proper dust control.
- Chemically treat unattended (disturbed lands which have been, or are expected to be, unused for four or more consecutive days) construction areas.
- Require all trucks hauling dirt, sand, soil and other loose substances or building materials to be covered, or to maintain a minimum freeboard of two feet between the top of the load and the top of the truck bed sides.
- Prohibit parking on unpaved or untreated parking lots.
- Require enclosures or chemical stabilization of open storage piles of sand, dirt or other aggregate materials.
- Water-based or low-VOC materials.
- Low-emitting spray equipment or applicators.

Mitigation measures to reduce emissions through traffic flow improvements could include:

- Configure parking to minimize traffic interference.

- Minimize obstruction of through-traffic lanes.
- Provide a flag-person to guide traffic and ensure safety at construction sites.
- Schedule operations affecting traffic for off-peak hours.
- Develop a traffic plan to minimize traffic flow interference from construction activities.
- Schedule goods movements for off-peak hours.
- Provide dedicated turn lanes as appropriate.

Water Quality Impacts

Water quality impacts are associated with disposal of potentially contaminated groundwater associated with the tunnel boring operations of Construction Contract C-3 and the dewatering activities associated with the cut and cover operations of Construction Contracts C-4 and C-5.

Water Quality Impact Mitigation Measures

Dewatering activities will be limited to the immediate construction / excavation area by using such methods as compressed air, cement or approved chemical grouting, freezing, slurry walls or Earth Pressure Balance TBM technology as dictated by local geologic conditions.
Dewatering and subsequent discharge will be conducted in conformance with all applicable requirements of the New York State Department of Environmental Conservation (NYSDEC).

Specific discharge limitation and monitoring protocols will be established in consultation with the NYSDEC and the NYC Department of Environmental Protection.

Cultural Resources Impacts

Potential impacts to historic and archaeological resources from construction related to the permanent loss of the resource through demolition, damage to the resource due to excessive vibration or settlement, alteration of the resource, or in the case of archeological resources, loss through disturbance due to excavation, grading etc.

Cultural Resources Impact Mitigation Measures

- Vibration monitoring instrumentation will be installed by the construction management team to ensure that during construction activity, vibration levels remain below the design criteria threshold for damage to historic buildings.

- Buildings identified as eligible for inclusion on the National Register of Historic Places which are planned to be demolished will be recorded according to the appropriate Historic American Engineering Record (HAER) guidelines.

- Identified archaeologically sensitive sites potentially impacted by Construction Contracts C-4 and C-5 will be further evaluated prior to any construction activity. A soil boring program will be designed in consultation with and monitored by a qualified archaeologist.

Utility Impacts

During the construction phase of the Build Alternative, it is expected that underground utility lines may be affected by excavation activities. Utility lines are generally located underneath or immediately adjacent and parallel to major streets.

Utility impacts during the construction phase are predominantly centered around the construction shaft locations at East 52nd Street, East 54th Street and at Second Avenue and East 63rd Street in Manhattan (Construction Contracts C-2 and C-3). In Queens, no utility impacts are anticipated during construction of Construction Contracts C-4 or C-5. Public and private utilities located within the sidewalk areas of Northern Boulevard will be maintained in place during construction. Contract C-5 will occur within LIRR and Amtrak owned facilities. No impacts to utilities are anticipated for the No Build or TSM Alternatives.

Subject to other constraints, construction access shafts and underground construction will be located to avoid conflicts with the space occupied by utilities. However, in certain instances the positioning or the locations of the access shafts may require that conflicting utilities be relocated to clear the way for the shafts and finished structures. This relocation to a new permanent location that would not be affected by the construction work is generally performed prior to the main construction commencing.

Utilities, such as high-pressure water, steam and gas lines, which could represent a potential hazard during construction, and are not to be permanently relocated away from the work site, are removed from the cut-and-cover area temporarily to prevent any accidental damage to them and thus to the construction personnel. These utilities are relocated temporarily by the contractor at the early stages of the operations and reset in essentially their original locations during the final backfilling above the constructed structure. Utilities which need not to be relocated, either permanently or temporarily, are uncovered during the early stages of excavation. These buried utilities, with the possible exception of sewers, are generally found within several feet of the street surface. They can be reinforced, if necessary, and supported by hanging from deck beams.

Utility Impact Mitigation

Construction methods would be predicated on keeping disruptions to utility service at an absolute minimum. Utilities which represent a hazard during construction and which would not be permanently relocated, would be temporarily moved to avoid accidental damage. Service connection lines which require rerouting as excavation proceeds would be coordinated with the building owner/management to minimize service disruption to tenants. Agreements would be executed with each utility company or governmental agency regarding relocation on a temporary or permanent basis of a utility, responsibility and coordination for the actual work, and method of reimbursement.

Commercial Disruptions

Commercial activity adjacent to the Build Alternative construction zone varies significantly between Manhattan in the vicinity of GCT which is comprised of large office buildings and retail establishments, and Queens which is predominantly industrial in nature with some office, and retail establishments.

Since the No Build and TSM Alternatives would not involve major construction activities, commercial disruptions for these alternatives are deemed to be insignificant.

Construction related commercial disruption for the Build Alternative is associated with service disruptions due to utility relocation activities, reduced or impaired visibility access due to lost parking or sidewalk blockage, and impaired delivery access to loading docks or service entrances.

Commercial Disruptions Mitigation

To mitigate inconveniences to businesses during construction, appropriate signage would be displayed to direct both pedestrian and vehicular traffic to alternate routes to businesses. Traffic management plans would be implemented to maintain access to all businesses with only short-term disruptions. In addition, a business outreach program would be implemented to inform and solicit input from local merchants and building management of construction schedules which may affect their establishments. A project hot-line would also be developed as a mechanism to answer questions about the project.

Conclusion

The impacts upon the natural and built environments resulting from the construction of the Build Alternative would be temporary in nature and would not result in significant adverse impacts. Adherence to applicable regulations will be enforced for all areas of potential impacts.

Footnotes:

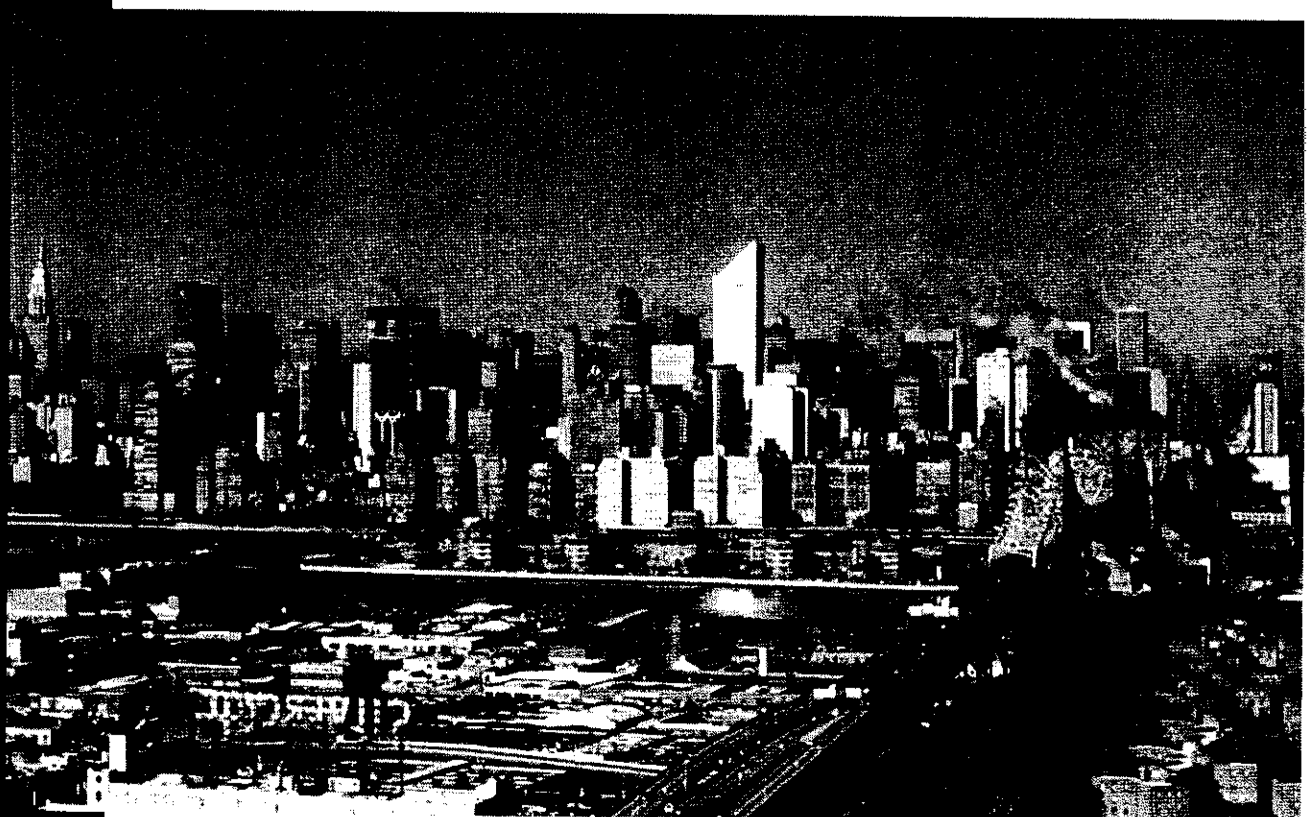
[1] George Gibbs, "The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives," *Transactions of the American Society of Civil Engineers*, Paper No. 1165, 69 (October 1910), 344.

[2] Louis H. Barker, "The New York Tunnel Extension of the Pennsylvania Railroad. The Sunnyside Yard," *Transactions of the American Society of Civil Engineers*, Paper No. 1163, 69 (October 1910), 117.

[3] Information on original use and equipment of buildings from Gibbs, pp. 316-322; dimensions from Barker, p. 116.

Chapter 6

Community and Agency Participation Program



Long Island Rail Road

6.0 COMMUNITY AND AGENCY PARTICIPATION PROGRAM

6.1 Introduction

The primary goal of the community and agency participation program was to create a viable and continuing public forum for discussing issues and alternatives for the mobility constraints of the Long Island Transportation Corridor. Using a mix of informational and interactive activities, the program identified, screened, and monitored diverse and often conflicting public input and priorities in a broad context that addressed critical transportation and environmental issues as well as related fiscal, social, and development considerations.

The public outreach and participation effort was performed in accordance with the transportation planning procedures established under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the joint environment review regulations of the Federal Transit Administration (FTA) / Federal Highway Administration (FHWA) 23 CFR 771 pursuant to the National Environmental Policy Act (NEPA) of 1969 42 U.S.C.A., as amended. In addition other public outreach documents such as the Interim Policy of FHWA and the guidelines of the New York Metropolitan Transportation Council (NYMTC), the metropolitan planning organization (MPO) for the corridor, were consulted.

Specifically, federal guidelines establish a public participation context that includes early, aggressive, ongoing, and customized outreach and participation. In promoting open access to the decision-making process, these guidelines provide impetus for developing innovative regional strategies for meeting the educational, notification, and participatory needs of diverse constituencies. By emphasizing the importance of embracing underserved populations and other groups not traditionally involved in the transportation planning process, the guidelines also encourage agencies to rethink their priorities and develop new public participation initiatives.

This project recognized the challenges and opportunities of ISTEA and the Interim Regulations by specifically addressing the unique requirements of a long-range MIS/DEIS covering a diverse geographic and political arena, multiple constituencies with varying perceptions of their needs and interests, a complex institutional framework, and an extensive range of alternatives. Accordingly, the community and agency participation initiative for this study combined a comprehensive mix of formal and informal activities to create a program that was flexible in its approach and open and responsive in its implementation.

Large-scale outreach and information exchange through the media, informational materials, and public meetings were balanced by small-scale activities, including advisory committees and small group presentations. All aspects of outreach were structured and scheduled to ensure that diverse, timely, and implementable public input was addressed in the study. Particular attention was given to the selection of techniques for disseminating project information and to the location of public meetings to encourage widespread participation. Above all, the program encouraged continuous dialogue between the sponsoring agencies, consultant team, and community, supported by timely response to and documentation of public concerns and recommendations.

6.1.2 MTA Long Range Planning Framework

An overview of the MTA's Long Range Planning Framework (LRPF) was provided in Chapter 1. The LRPF provides a structure for conducting the various planning studies underway within a regional context. This allows the development of unified work programs for potential transportation investments. The work programs are discussed and reviewed by study sponsors within the MTA family of operating agencies and other relevant local, state and federal agencies. Planning assumptions for data requirements, demand forecasting, cost estimates and alternatives are reviewed and discussed at the policy and technical committee levels. Staff for this study participated in biweekly, inter-agency meetings to coordinate data needs, assumptions and study products. This process helps ensure that study alternatives can be compared between the other planning studies for the region.

The LRPF also provides a mechanism for coordinating public outreach activities for the various projects. In addition to the activities described within this chapter, staff for this study effort participated in several jointly-sponsored public information meetings at the citizen and technical advisory level with the other regional studies. At these joint-meetings, the public was afforded the opportunity to review and comment on the progress to date. As important, the public could see firsthand the interaction between projects and related issues. These meetings assist in broadening the definition of decision makers by requiring early and proactive public participation. Furthermore, this expands the audience and broadens the criteria under which strategies are evaluated to include both quantitative information on costs, benefits and impacts of the various projects.

6.2 Activities of the Community and Agency Participation Program

6.2.1 Community Involvement Methodology Report

The Community Involvement Methodology Report was drafted during the early weeks of the project to complement the technical work program by serving as an operational manual for the project team. The Methodology Report detailed all proposed activities and defined the working relationships between the project sponsor, consultant team, key agencies, and community. It described the coordinated approach by which a comprehensive program of intensive and practical public outreach and information activities would support the technical work effort. This included detailing the mechanisms for public outreach, as well as the procedures for addressing and documenting public input. The report also included an appendix that delineated the project area, provided a preliminary schedule of public participation activities, described mailing list categories, and supplied rosters of the advisory committees and project team.

6.2.2 Public Information Meetings

Throughout the study, a series of Public Information Meetings were held to keep the community up-to-date on project progress. In advance of the meetings, notices were sent to all persons and agencies on the project mailing list and advertisements placed in local and citywide newspapers (Newsday, L.I. Newsday, and Daily News). To obtain a wide range of input and explore concerns particular to a community, as well as regional issues, the meetings were held in different locations throughout the study area.

The first round of meetings was held in May 1995 to familiarize the public with the project and to initiate dialogue concerning the technical studies and proposed public participation program. Presentations describing project background and the scope of the study were given by representatives of the LIRR and consultant team. The agenda for the meetings included an overview of the MTA's Long-Range Planning Framework; a review of the alternatives screening process; and discussion of the technical scope, including the development and evaluation of alternatives. Four meetings were held as follows:

- Tuesday, May 2, 1995 at 7:00 p.m.
  Long Island Association
  80 Hauppauge Road
  Commack, NY
- Tuesday, May 2, 1995 at 7:00 p.m.
  Nassau County Executive Building
  Board of Supervisors Meeting Room
  1 West Street
  Mineola, NY
- Wednesday, May 3, 1995 at 5:30 p.m.
  Metropolitan Transportation Authority
  Fifth Floor Board Room
  347 Madison Avenue
  New York, NY
- Thursday, May 4, 1995 at 7:00 p.m.
  LaGuardia Community College
  Small Auditorium
  31-10 Thomson Avenue
  Long Island City, NY

Principal issues raised during the sessions included the need for rail access to local airports and coordination with other long-range planning studies. Concerns were also raised regarding the condition of existing service, current and projected levels of service, and the need for providing service to underserved areas. Other issues that were addressed related to specific elements of the alternatives under consideration, construction impacts, safety, and use of ferries and other alternative transportation systems.

The second round of meetings was held in February and March 1996 to provide a project update and to receive public input on the alternatives being considered for further evaluation. Each of the three sessions included presentations by LIRR staff and the consultant team. In addition to discussing project status, the presentations included screening of an informational project video; review of the short listing process; and review of the draft short list of alternatives. This short list included the following alternatives: No Build; Transportation Systems Management (TSM); Bus/ HOV Lane; LIRR East Side Terminal-Grand Central Terminal (GCT) via the Main Line (GCT Alternative); and Long Island City (LIC) Intermodal Station. The project team also reviewed the public participation program and discussed coordination efforts among the regional long-range planning studies. The three sessions were held as follows:

- Tuesday, February 27, 1996 at 6:00 p.m.
  Metropolitan Transportation Authority
  Fifth Floor Board Room
  347 Madison Avenue
  New York, NY
- Thursday, February 29, 1996 at 6:00 p.m.
  Nassau County Executive Building
  Legislature Meeting Room
  1 West Street
  Mineola, NY
- Thursday, March 7, 1996 at 6:00 p.m.
  Queens Borough Hall - Room 213
  120-55 Queens Boulevard
  Kew Gardens, NY

The question-and-answer period focused primarily on the alternatives under consideration, in particular, the GCT Alternative. Specific issues and concerns related to cost, overall benefits and impacts, effects on operation of Grand Central Terminal, and inclusion of the LIC Intermodal Station Alternative. Other comments related to the need for airport access, coordination with other long-range planning studies, and the impact of the alternatives on existing subway service.

6.2.3 National Environmental Policy Act (NEPA) Scoping Meetings

NEPA Scoping Meetings were held in July 1995 to familiarize the public with the scope and objectives of the MIS/DEIS for the Long Island Transportation Corridor and to identify additional issues and concerns that would require consideration. The meetings were also used to discuss the alternatives identified and their related social, economic, and environmental issues.

The Scoping Meetings were conducted in Manhattan, Nassau County, and Suffolk County to provide local opportunities for residents to voice issues and concerns. The three meetings were held as follows:

- Tuesday, July 18, 1995 at 7:00 PM
  Long Island Association
  80 Hauppauge Road
  Commack, NY

- Wednesday, July 19, 1995 at 7:00 PM
  Nassau County Executive Building
  Board of Supervisors Meeting Room
  1 West Street
  Mineola, NY

- Thursday, July 20, 1995 at 5:30 PM
  Metropolitan Transportation Authority
  Fifth Floor Board Room
  347 Madison Avenue
  New York, NY

At each meeting LIRR and FTA representatives gave a presentation, followed by the public comment period. Copies of the Draft Scoping Document, along with other presentation materials, were distributed to all attendees. Oral and written comments received at the Scoping Meetings or during the 45 day public comment period following the meetings were summarized in the Scoping Summary Report, which also listed the names of all individuals who attended the meetings. In addition, stenographic transcripts were prepared for each meeting.

The main comments and concerns were:

- **No-Build Alternative:** LIRR should focus on less expensive short-term changes that could increase ridership.

- **TSM Alternatives**: Before expanding service, existing service should be upgraded to operate more efficiently, by such means as: providing additional service to Flatbush Avenue; diverting service to sections with higher demand; providing shuttle buses from Penn Station to GCT; keeping trains cleaner; revising schedules to maintain accuracy; and expanding ferry service.

- **Build Alternatives**: Several people expressed support for further evaluating operating LIRR service over NYCT trackage, such as by linking LIRR and NYCT at the Flatbush Avenue/

Atlantic Avenue station and extending LIRR service into lower Manhattan v Bridge. Support was also voiced for evaluating the Sunnyside Intermodal , several scenarios suggested for connecting LIRR passengers to other mode people expressed interest in the East Side Rail Station Alternative and the Terminal Alternative, and suggested various locations for the station or term

- **LIRR Service Improvements**: Numerous people commented that before unc construction, the LIRR should complete short-term improvements, such as: decker trains; creating more connections among the LIRR lines; and diverting a from the Port Jefferson line into Long Island City.

- **Airport Access**: A number of attendees at the Manhattan Scoping Meeting com need for improved access to area airports and suggested ways to coordinate the with the Port Authority's Airport Access Program.

- **LIRR Policy and Management Issues**: Several questions were raised regardin cies, such as use of bi-level trains and relations between labor and management.

- **Public Outreach**: Several suggestions were offered for expanding outreach, incluc the input of labor organizations and coordinating LIRR meetings with the monthl of the local community boards.

- **Other Long-Range Planning Studies:** Several suggestions were made for improv nation between the LIRR's MIS/DEIS and other ongoing MTA studies.

6.2.4 *Small Group Meetings and Presentations*

Throughout the project, small group meetings and presentations have been held with M Brooklyn and Queens Borough and individual Community Boards, as well as with regional transportation, planning, business, and civic organizations. These have incl Long Island Association, New York City Chamber of Commerce, Regional Plan Ass 42nd Street Business Improvement District, General Contractors Association and N City Real Estate Board. Informal meetings with these groups have provided continuing nities for discussion and evaluation of project issues in a proactive environment. In additi offered an ongoing mechanism for channeling public input and recommendations to the team.

The project has also included briefings of the NYC Mayor's staff and meetings with the B Presidents of Manhattan, Queens, and Brooklyn. Local, county, and state agencies we vided with frequent project updates throughout the study.

6.2.5 *Technical Advisory Committee*

A Technical Advisory Committee (TAC) was formed to facilitate the review of technica pertinent to the study. It is comprised of representatives of transportation, environmental planning agencies on the federal, state and local level; municipal officials; and the local M TAC members help progress the Study by sharing expertise and/or data available within respective organizations, articulating the interests and concerns of their constituent orgar tions, and assisting with the dissemination of project information to these groups.

The TAC has convened 12 times between April 1995 and August 1997. Each meeting, with the exception of the two organizational sessions, has been documented by means of a meeting minutes.

6.2.6 Citizens Advisory Committee

A Citizens Advisory Committee (CAC) was formed to provide a mechanism for obtaining a broad base of community input relating to the goals, alternatives, and evaluation criteria of the study. The CAC served both as a sounding board for the review of project issues and as the primary liaison between organizations interested in the study and the project team. For maximum effectiveness, membership reflected the study corridor's diversity in terms of geographics, constituencies, and issues. The CAC included affected Community Boards; representatives of environmental, civic, public interest, and transportation advocacy groups; members of business, labor, real estate, and economic development organizations; organizations representing underserved populations and persons with specialized transportation needs; and other interested individuals.

Six CAC meetings were held at the offices of the MTA, 347 Madison Avenue, New York, NY between October 1995 and August 1997. Meetings consisted of technical presentations by LIRR and MTA representatives and members of the consultant team. Discussions were encouraged throughout the presentations. Early meetings focused on introduction of the project, review of project issues and discussion of the long list of alternatives, and a review of the role and functions of the CAC. As the project progressed, the CAC focused on examination of criteria to be used for evaluation of alternatives, review and evaluation of the alternatives under consideration and discussion of ridership demand forecasting procedures and preliminary results.

6.2.6.1 Subcommittees of the CAC

At the request of the CAC, Subcommittees were formed to provide the overall Committee with focused project recommendations, based on a detailed review of alternatives and specific design issues. Three groups were established to give in-depth consideration to issues related to technical construction, commuters' concerns, and proposals for an intermodal station at Long Island City. An organizational meeting was held on February 15, 1996 with all Subcommittee members to review Subcommittee objectives, operating procedures, and potential topics to be addressed. Following the general presentation, members met within their respective Subcommittees to review the issues under consideration, discuss additional areas of concern, and comment on the draft short list of alternatives.

A summary of issues identified for consideration by each group is provided below:

Technical Construction Subcommittee

- review of concept plans for the draft short list of alternatives
- overview of methodology and cost-estimating

Commuter Subcommittee

- consideration of Penn Station vs. GCT service options
- examination of operational issues
- discussion of methods of increasing public outreach to commuters

- review of station amenities/facility issues related to proposed park-and-ride or rail stations
- considerations of security concerns

Long Island City Intermodal Station Subcommittee

- review of the MTA/Long Island City Transportation Needs and Opportunities Study
- consideration of operational and connectivity issues
- examination of station design and aesthetics

Following the organizational meeting, the Subcommittees interacted, both formally and informally, to review a range of issues. The *Technical Construction Subcommittee* met informally to discuss the proposed Build Alternatives, as well as a new proposal (the "Apple Corridor") developed by some Subcommittee members. The proposal was presented to the full CAC for comment at its October 24, 1996 meeting. At this meeting, the Subcommittee expressed its overall support for the East Side Access project, while indicating its interest in examining ways to reduce construction costs. The group also discussed the need for further evaluation of specific technical issues, including the number of tracks required at GCT for LIRR usage, the need for excavation in the Madison Yard area, and inbound/outbound capacity issues.

The *Commuter Subcommittee*, which was formed to address service and operational issues and commuter-related concerns, did not formally meet as a separate entity. However, members of the group were active in the CAC and remained involved in the overall project.

The *LIC Intermodal Station Subcommittee* met with the project team on several occasions (as well as informally as a group) to discuss a possible intermodal station strategy. The group focused its efforts on reviewing proposed station alternatives, including recommendations developed by Subcommittee members; evaluating benefits and constraints associated with each alternative; and examining proposed station locations. Other issues examined by the Subcommittee included relocation and/or realignment of existing subway lines and future connections to an inter-regional commuting service.

6.2.7 Public Hearings

Public hearings will be held upon completion of the DEIS. The hearings will be conducted in accordance with all NEPA requirements. They will provide a formal opportunity for public review of the alternatives under consideration, presentation of the DEIS, and receipt of public testimony. To reach the widest possible audience, notifications will be published in the Federal Register, placed in local and citywide newspapers, and sent to all persons on the project mailing list. Copies of the DEIS will be available for public review at designated locations throughout the study corridor.

Both oral statements recorded at the sessions and written statements received during the 45 day public comment period will be incorporated into the official hearing record. In addition, a report will be prepared to summarize input received at the hearings, as well as to itemize issues or areas of concern that require follow-up action and/or response.

6.2.8 Informational Materials

Written and graphic informational materials have been prepared to promote public awareness of the study among the project's diverse constituencies. These materials were specifically designed to facilitate public understanding of the need for the project, review the range of alternatives under consideration, and present potential community and environmental benefits and impacts.

Two pocket-size brochures provided an accessible means of sharing project information with a wide range of audiences. The first brochure reviewed study goals and objectives, the public outreach process, and the range of alternatives under consideration. The second brochure, focused on the three alternatives to be evaluated in the EIS and summarized their anticipated benefits and impacts.

Informational materials were provided to the TAC and CAC, handed out at meetings, site tours and project briefing presentations, and disseminated to the project mailing list, as appropriate. In addition, the brochures were distributed at Penn Station, placed in information pick-up boxes and supplied to Community Boards, business, civic and transportation advocacy groups upon request.

The informational program also included two video presentations on the project. An introductory video, which graphically presented project needs and problems, along with alternative solutions, was shown at public meetings and small group meetings and presentations. The video wassubsequently updated to focus on the three alternatives to be evaluated in the EIS and their associated benefits and impacts. Copies of the videos are available for presentation to Community Boards, public agencies and other interested groups.

6.2.9 NYCT 63rd Street Tunnel Tours

The LIRR and NYCT conducted four tours of the NYCT 63rd Street Tunnel construction project in Sunnyside, Queens for members of the TAC and CAC and the National Geographic Society (May 22, June 10, July 17, and July 24, 1996). The tours were preceded by brief remarks, detailing the history of the 63rd Street Tunnel project and its current status. Handouts relating to the history of the tunnel and the current LIRR East Side Access project were distributed.

6.2.10 GCT Tours

The LIRR and MNR conducted three tours of Grand Central Terminal for members of the TAC and CAC (March 26th, April 2nd and May 7, 1997). The tours encompassed the lower level Madison Avenue Yard area of the GCT train shed, and the construction site of MNR's North End Access 47th Street Crosspassage. The tours were preceded by brief remarks by MNR on the NEA work plan and the GCT Master Plan renovation work and by the LIRR on the conceptual plans for integrating LIRR facilities and operations into GCT. Handouts relating to the LIRR East Side Access GCT Build Alternative were distributed.

6.2.11 Project Mailing List

To ensure that meeting announcements and informational materials would reach the widest possible audience, a project mailing list was developed by supplementing existing LIRR mailing lists and updating them throughout the course of the project. The final mailing list of approximately

600 entries included elected officials; city, state, and regional agencies; transportation, environmental, civic, public interest, and business organizations; members of the TAC and CAC; residents and property owners; transportation providers; and other interested groups and individuals.

6.3 List of Meetings/Presentations

February 7, 1995	PRESS BRIEFING (Metropolitan Transportation Authority (MTA), New York, NY) • Project Status of all MTA Major Investment Studies
March 20, 1995	NEW YORK METROPOLITAN TRANSPORTATION COUNCIL (NYMTC) (NYMTC, New York, NY) • Status of MTA Major Investment Studies
April 24, 1995	TAC MEETING #1 (STV Incorporated, New York, NY) • Organizational Meeting
May 2, 1995	PUBLIC INFORMATION MEETING (Long Island Association, Commack, NY) • Project Overview
May 2, 1995	PUBLIC INFORMATION MEETING (Nassau County Executive Building, Mineola, NY) • Project Overview
May 3, 1995	PUBLIC INFORMATION MEETING (MTA) • Project Overview
May 4, 1995	PUBLIC INFORMATION MEETING (LaGuardia Community College, Long Island City, NY) • Project Overview
June 9, 1995	REGULATORY AGENCY BRIEFING (MTA) • Review of MIS Projects with Federal, State and City Regulatory Agencies
June 14, 1995	QUEENS BOROUGH BOARD (Office of Queens Borough President, Kew Gardens, NY) • Project Overview
June 15, 1995	MANHATTAN BOROUGH BOARD (Office of Manhattan Borough President, New York, NY) • Project Overview

June 28, 1995	TAC MEETING #2 (STV) • Organizational Meeting
June 29, 1995	NASSAU COUNTY PLANNING COMMISSION (Nassau County Planning Department, Mineola, NY) • Project Overview
July 13, 1995	MTA PERMANENT CITIZENS ADVISORY COMMITTEE (MTA) • Project Overview
July 17, 1995	INFORMATION TABLE (Penn Station, New York, NY) • Distribution of Materials to Commuters
July 18, 1995	NEPA SCOPING MEETING (Long Island Association) • Project Overview and Scope
July 19, 1995	NEPA SCOPING MEETING (Nassau County Executive Building, Mineola, NY) • Project Overview and Scope
July 20, 1995	NEPA SCOPING MEETING (MTA) • Project Overview and Scope
August 15, 1995	TAC MEETING #3 (Nassau County Planning Department, Mineola, NY) • Review of Alternatives
August 16, 1995	NEW YORK STATE DEPARTMENT OF TRANSPORTATION (Albany, NY) • Project Overview - Presentation to Commissioner
September 28, 1995	TAC MEETING #4 (STV) • Review of Long List of Alternatives and Evaluation Criteria
October 5, 1995	CAC MEETING (MTA) • Project Overview and Review of CAC Operational Guidelines
October 26, 1995	GRAND CENTRAL TERMINAL BUSINESS IMPROVEMENT DISTRICT (GCT BID) (GCT BID, New York, NY) • Project Overview

November 9, 1995	CHINESE TRANSPORTATION DELEGATION (MTA) • Presentation on LIRR Network and Long Range Planning Framework
November 14, 1995	QUEENS COMMUNITY BOARD #2 (Community Board Office, Woodside, NY) • Project Overview
November 21, 1995	BROOKLYN BOROUGH BOARD MEETING (Brooklyn Borough Hall, Brooklyn, NY) • Project Overview
December 11, 1995	MANHATTAN COMMUNITY BOARD #6 - TRANSPORTATION COMMITTEE (St. Peter's Church, New York, NY) • Project Overview
December 14, 1995	TAC MEETING #5 (Port Authority Bus Terminal (PABT), New York, NY) • Joint LIRR/Port Authority Meeting • Coordination of Projects
December 14, 1995	BROOKLYN COMMUNITY BOARD #8 (Center for Nursing and Rehabilitation, Brooklyn, NY) • Project Overview
December 27, 1995	REGIONAL PLAN ASSOCIATION (MTA) • Review of MTA's MIS Projects
January 17, 1996	NEW YORK CITY REAL ESTATE BOARD (NYC Real Estate Board, New York, NY) • Project Overview
January 25, 1996	TAC MEETING #6 (Queens Borough Hall, Kew Gardens, NY) • Review of Draft Short-list of Alternatives
February 5, 1996	QUEENS COMMUNITY BOARD #7 (Bowne Street Church, Flushing, NY) • Project Overview
February 7, 1996	CAC MEETING (MTA) • Project Update and Results of the Preliminary Evaluation of the Long List of Alternatives

February 15, 1996	CAC SUBCOMMITTEE MEETING (STV) • Organizational Meeting
February 22, 1996	LIC INTERMODAL STATION SUBCOMMITTEE MEETING (Helen Neuhaus & Associates Inc., New York, NY) • Review of Options 1A and 2A and Alternative VIIB
February 27, 1996	PUBLIC INFORMATION MEETING (MTA) • Project Update and Presentation of Informational Video
February 29, 1996	PUBLIC INFORMATION MEETING (Nassau County Executive Building, Mineola, NY) • Project Update and Presentation of Informational Video
March 6, 1996	NEW YORK CITY MAYORS STAFF BRIEFING (City Hall, New York, NY) • Project Update
March 7, 1996	PUBLIC INFORMATION MEETING (Queens Borough Hall, Kew Gardens, NY) • Project Update and Presentation of Informational Video
March 12, 1996	LIC INTERMODAL STATION SUBCOMMITTEE MEETING (STV) • Comments on Options 1A and 2A and Alternative VIIB
March 21, 1996	PROGRAM FINANCE AND ADMINISTRATION COMMITTEE (PFAC) of NYMTC (NYMTC) • Project Update
March 27, 1996	LIC INTERMODAL STATION SUBCOMMITTEE MEETING (STV) • Update on Transportation Needs and Opportunities Study
March 29, 1996	NEW YORK CITY REAL ESTATE BOARD (NYC Real Estate Board) • Project Update
April 9, 1996	NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYCDOT, New York, NY) • Coordination Meeting with NYSDOT, NYCT and LIRR to discuss Bus/HOV Alternative

May 14, 1996	TAC MEETING #7 (Nassau County Planning Department, Mineola, NY) • Presentation of Ridership Demand Forecasting Procedures
May 22, 1996	TOUR OF 63RD STREET TUNNEL CONSTRUCTION PROJECT: TAC (Field Office and Tunnel, Sunnyside, Queens, NY) • Review History and Status of Tunnel
May 23, 1996	MANHATTAN COMMUNITY BOARD #8 (New York Hospital, New York, NY) • Project Overview
June 10, 1996	TOUR OF 63RD STREET TUNNEL CONSTRUCTION PROJECT: NATIONAL GEOGRAPHIC SOCIETY (Field Office and Tunnel, Sunnyside, Queens, NY) • Review History and Status of Tunnel
June 18, 1996	QUEENS BOROUGH PRESIDENT (Office of Queens Borough President, Kew Gardens, NY) • Joint Project Update of LIRR East Side Access, Access to the Region's Core and Long Island City Transportation Needs and Opportunities Study Projects
July 9, 1996	NEW YORK CITY CHAMBER OF COMMERCE (Chamber of Commerce, New York, NY) • Project Update
July 16, 1996	TAC MEETING #8 (STV) • Project Update
July 17, 1996	TOUR OF 63RD STREET TUNNEL CONSTRUCTION PROJECT: CAC (Field Office and Tunnel, Sunnyside, Queens, NY) • Review History and Status of Tunnel
July 18, 1996	CAC MEETING (MTA) • Presentation of Informational Video and Ridership Demand Forecasting Procedures and Preliminary Results
July 24, 1996	TOUR OF 63RD STREET TUNNEL CONSTRUCTION PROJECT: CAC (Field Office and Tunnel, Sunnyside, Queens, NY) • Review History and Status of Tunnel

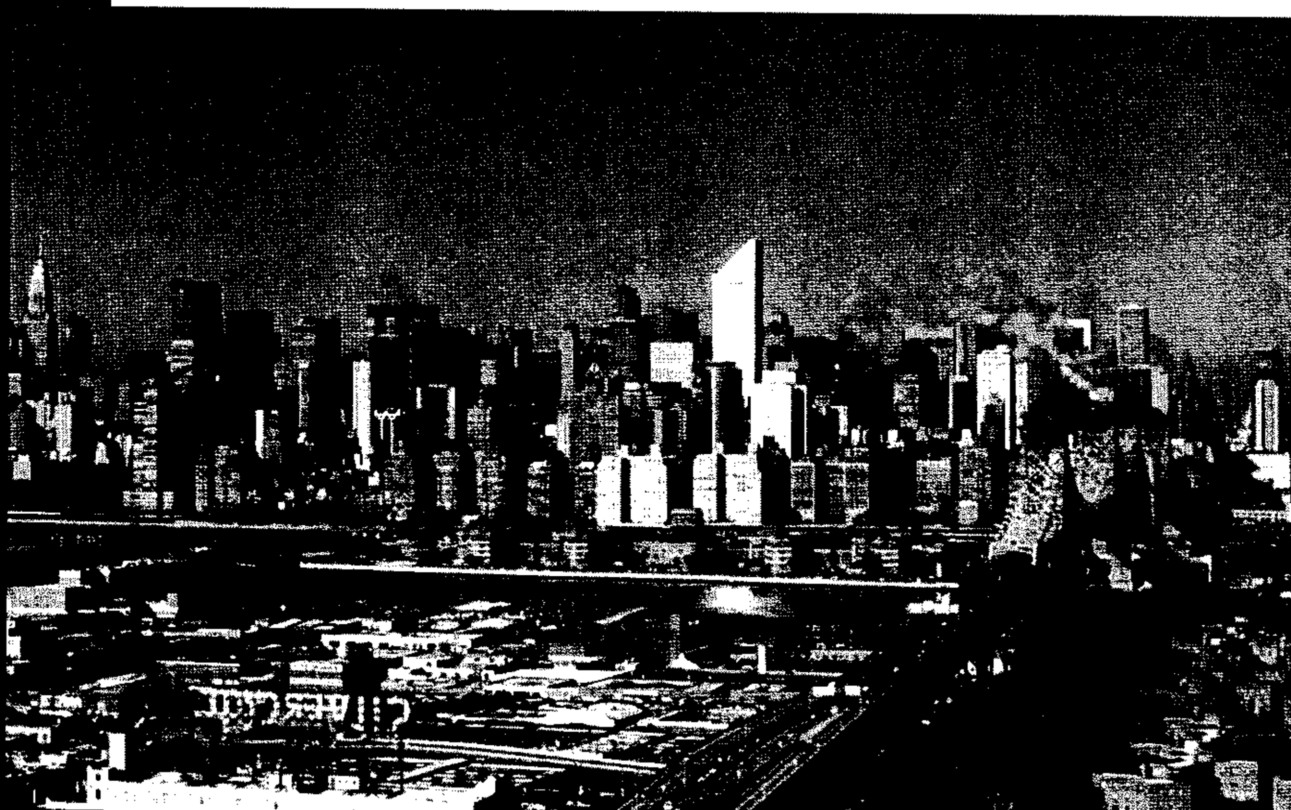
September 20, 1996	NEW YORK CITY MAYOR'S OFFICE (City Hall) • Project Update
September 26, 1996	TAC MEETING #9 (STV) • Project Update
October 24, 1996	CAC MEETING (MTA) • Project Update and Presentation of Operating Plan • Discussion of "Apple Corridor" Proposal
November 14, 1996	TAC MEETING #10 (PABT) • Joint LIRR ESA and ARC Meeting
December 2, 1996	MANHATTAN COMMUNITY BOARD #6 (St. Peter's Church, New York, NY) • Joint Presentation with Manhattan East Side Access (MESA)
December 9, 1996	LONG ISLAND ASSOCIATION - TRANSPORTATION COMMITTEE (Long Island Association) • Project Update
December 9, 1996	MANHATTAN COMMUNITY BOARD #8 (New York Hospital, New York, NY) • Joint Presentation with MESA
December 12, 1996	CAC VIDEO UPDATE MEETING (STV) • Revise/Update Project Video
January 30, 1997	TAC MEETING #11 (STV) • Project Update • Review of MIS/DEIS Technical Appendices • Discussion of Simulation Effort and Construction Program
February 11, 1997	QUEENS COMMUNITY BOARD #2 (Community Board Office, Woodside, NY) • Project Update
February 13, 1997	CAC MEETING (MTA) • Project Update

March 5, 1997	AMERICAN SOCIETY OF CIVIL ENGINEERS (Wagner School of Public Administration, New York, NY) • Project Update
March 26, 1997	TOUR OF GRAND CENTRAL TERMINAL CAC • Tour North End Access Project and lower level Madison Yard
April 2, 1997	TOUR OF GRAND CENTRAL TERMINAL CAC • Tour North End Access Project and lower level Madison Yard
May 7, 1997	TOUR OF GRAND CENTRAL TERMINAL TAC • Tour North End Access Project and lower level Madison Yard
May 8, 1997	NEW YORK BUILDING CONGRESS (STV) • Project Briefing
May 14, 1997	EAST SIXTIES PROPERTY OWNERS ASSOCIATION (Trinity Baptist Church, New York, NY) • Project Briefing
July 21, 1997	CONGRESSIONAL TRANSPORTATION AND INFRASTRUCTURE COMMITTEE TOUR • Jointly sponsored tour of major infrastructure projects New York Metropolitan Area culminating in 63rd Street Tunnel NYCT/LIRR construction Sunnyside Queens.
August 6, 1997	SUFFOLK COUNTY PLANNING COMMISSION (Suffolk County Planning Department) • Project Briefing
August 20, 1997	TAC MEETING #12 (STV) • Project Update • Review of Draft EIS
August 20, 1997	CAC MEETING (MTA) • Project Update
September , 1997	LONG ISLAND ASSOCIATION TRANSPORTATION COMMITTEE (Long Island Association) • Project Update

October 14, 1997	MANHATTAN COMMUNITY BOARD #5 (Fashion Institute of Technology New York, NY) • Project Update
November 3, 1997	MANHATTAN COMMUNITY BOARD #6 (St. Peter's Church New York, NY) • Project Update
November 17, 1997	NEW YORK CITY BAR ASSOCIATION TRANSPORTATION COMMITTEE (NYCBA Headquarters) • Project Briefing
To Be Determined	PUBLIC HEARINGS ON DEIS (locations) • Formal Presentation of Project Results

Chapter 7

Financial Analysis and Evaluation of Alternatives



MTA Long Island Rail Road

7.0 FINANCIAL ANALYSIS AND EVALUATION OF ALTERNATIVES

The purposes of this chapter are: (1) to present one possible strategy for financing the TSM and Build Alternatives and (2) to present the extensive benefits provided by the Build Alternative.

7.1 Financing

7.1.1 Introduction

The financial strategy discussed in this section represents one possible way for financing the Build Alternative. MTA has the financial capability to build, operate and maintain the LIRR East Side Access Project. As the East Side Access project progresses, MTA and its funding partners will identify the specific mix of funding and financing sources that will be used for the local share of the project. It is likely that a combination of the sources detailed in Section 7.1.6 of this chapter will be used for the project.

7.1.2 Financial Strategy Overview

As suggested by FTA guidelines, the financial strategy assumes a 20-year period, from 1997 to 2016. The travel demand analysis for this project has a base year of 1990 and a design year of 2020.

The financial strategy considers the following financing methods:

- Potential responses to capital funding shortfalls: In the case of the Build Alternative, debt financing is assumed. The use of debt financing provides the ability to advance project implementation by borrowing against projected future revenues.

- Potential responses to operating shortfalls: Apply new operating funding sources; i.e., higher revenues from dedicated sources, or the implementation of new or expanded revenue sources.

7.1.3 Costs

On the capital side, only the costs associated with the system improvements included in the alternatives are considered. The funding of continuing, systemwide normal replacement and state of good repair needs are not considered because they are addressed in the broader context of the MTA's Capital Programs and 20-Year Capital Needs Assessment. Further, these preliminary capital cost estimates recognize some level of mitigation. However, as the Build Alternative progresses into preliminary engineering, further mitigation measures and their associated costs may be identified.

Since implementation of either the TSM Alternative or the Build Alternative will impact the systemwide operations of the LIRR, the operating requirements for the entire LIRR system are considered. Table 7.1-1 summarizes the capital and operating costs in base year (1997) dollars for the alternatives. A more detailed description of the capital and operating cost elements of the alternatives is presented in Chapter 2, Alternatives Considered.

TABLE 7.1-1
Capital and Operating Cost Summary
(Millions of 1997$)

	TSM	Build Alternative
Capital Costs		
Right-of-Way	$0.0	$400.0
Construction	$257.8	$2,193.5
Rolling Stock	$336.5	$781.0
Other Equipment	$20.0	$0.0
Total Capital Cost*	**$614.3**	**$3,374.5**
Total Operating Cost**	$641.7	$730.9

* **Includes costs of alternatives only.**
** **Includes costs of entire LIRR system.**

7.1.4 Revenues - Regional & Local

The MTA is the largest public transportation system in North America. Since 1982 it has consistently funded and successfully overseen three five-year capital programs totaling $23 billion. MTA's current 1995-1999 capital program totals $10 billion, an average annual investment of $2.4 billion. On an annual basis, the capital cost of the Build Alternative represents only 14% of this rate of expenditure. Therefore, MTA is up to the challenge of contributing its share of the cost of the Build Alternative.

New York State Public Authorities Law permits the MTA to undertake and finance projects for the benefit of the commuter railroad operations of the MTA and its subsidiaries and for the benefit of the transit operations of the NYCT and its subsidiaries.

The MTA has access to a number of regional and local sources that are used to fund most of the Authority's capital and operating needs and could be used as a future source(s) of support for the Build Alternative. Currently, such revenues and bonds are being used to fund 71.7 percent of the MTA's $12.0 billion 1995-1999 Capital Program. The non-federal share of the Build Alternative could be funded from a variety of sources including:

- **LIRR Fare and Other Operating Revenue:** Revenues derived from fares, concessions and other sources could be used as a funding source for pay-as-you-go, or debt financing. This is an approach that the MTA and its operating agencies commonly use to assist in the financing of capital and operating needs.

- **MTA Bridge and Tunnel Tolls:** Surplus revenues from MTA B&T tolls are used to partially offset the needs of the LIRR, as well as NYCT and MNR. These revenues are used to provide direct funding to LIRR, NYCT and MNR as well as to support debt financing. Toll surpluses are defined as equal to the amount remaining from tolls and other operating revenues after payment of operating, capital, administration and other B&T related expenses.

  The first $24 million of the operating surplus is allocated to NYCT, while any excess is equally divided between NYCT and MTA. Surplus toll revenues allocated to MTA are distributed to LIRR and MNR. In 1996, $170.4 million in surplus toll revenues were allocated to the commuter railroads. According to the MTA's 1997-2001 Strategic Business Plan, $582.7 million in excess toll revenues are anticipated to be available to fund the needs of NYCT and the commuter railroads in 1997.

- **TBTA Investment Income Transfer:** MTA Board policy permits the annual transfer of earnings that accrue from the investment of funds deposited in the TBTA debt service reserve accounts. These funds are split 60% to the NYCT program and 40% to the commuter rail program.

- **Metropolitan Mass Transportation Operating Assistance (MMTOA):** Since 1980 the following revenue sources have been available to fund operating deficits and support debt financing of the MTA:

- **Petroleum Business Tax (PBT):** A legislatively allocated portion of the business privilege tax imposed on petroleum businesses in New York State. The amount of tax available is determined by the quantity of various petroleum products refined or sold in the state.

- **Sales Tax:** A 1/4 percent sales and use tax imposed within the MTA service region.

- **Long Lines and Franchise Taxes:** A legislatively allocated portion of two taxes imposed on certain transportation and transmission companies such as trucking, telegraph and telephone companies. The two taxes are: (a) an annual franchise tax based on the amount of the taxpayer's issued capital stock and (b) an annual franchise tax on the taxpayer's gross earnings from all sources calculated to be in the state based on a statutory formula.

- **Temporary Surcharge:** A temporary surcharge on the portion of the franchise tax on certain corporations, banks, insurance, utility and transportation companies attributable to business activity carried out within the MTA service region. This surcharge, which was imposed as a temporary tax, was initially levied in 1982. It has been extended seven times and is currently scheduled to expire by the end of 2001.

MTA projects that revenues and investment income derived from these sources will equal $964 million in 1997 according to the MTA April 1997 Commuter Rail Facilities bond offering statement. The portion of these revenues available to the commuter railroads is estimated to be $247 million.

- **Dedicated Tax Fund PBT Receipts:** Since 1993, the State Legislature has allocated an amount of PBT revenues in addition to the MMTOA taxes for the State's transit operators. The MTA receives 34 percent of the annual allocation of these revenues. It is estimated that the LIRR and MNR will receive a total of $37 million from this source in 1997.

- **Mortgage Recording Taxes:** Since 1987, New York City and the suburban counties within the MTA service region have allocated revenues derived from mortgage recording taxes to the Authority. Revenues from this source can be used for operating, capital, debt service and reserve requirements for the MTA operating agencies and MTA Headquarters. The two taxes are: MRT-1, collected at the rate of 1/4 percent of the debt secured by most real estate mortgages; and MRT-2, a 1/4 percent tax imposed on most mortgages secured by real estate improved or to be improved by structures containing one to six dwelling units within the MTA service region. After MTA headquarters expenses are subtracted, 55 percent of the remaining MRT-1 revenues are allocated to NYCT. Of the remaining 45 percent, the first $20 million is allocated to the State Highway Program and the rest is distributed to the commuter railroads. MRT-2 revenues are first allocated to Dutchess, Rockland and Orange counties on a formula basis. After the allocation to these counties, the remaining balance can be used by the commuter railroads and NYCT to satisfy MRT bond debt service requirements. MRT revenues available to the commuter railroads in 1997 are estimated to be $33 million according to MTA's October 1996 budget submission to New York State.

- **Station, Maintenance, Operation and Use Assessment:** The MTA annually bills the City of New York and the suburban counties for the cost of operating and maintaining stations within their jurisdictions. The amount billed to the suburban counties is based on a formula established by the State Legislature and is annually adjusted based on the change in the regional consumer price index. Estimated 1997 revenues from this source for the commuter railroads are $110.3 million.

- **Direct State Grants:** New York State provides operating subsidies to the MTA. State subsidies to the commuter railroads in 1997 are estimated to be $29.2 million.

- **Other Existing Taxes and Subsidies:** MTA also receives revenues from the Connecticut Department of Transportation in support of Metro-North's New Haven Line. In addition, the City of New York provides revenues to NYCT derived from a mortgage recording tax of 5/8 percent levied on certain real estate mortgages and a one-percent property transfer tax. These two revenue sources are not available to fund the operating and capital needs of the LIRR.

At this point, specific funding sources for the Build Alternative have not been defined, or approved by the MTA Board. Strategies regarding the types of local funding sources available for the project will be developed through a collaborative effort among the MTA Board, New York State, New York City and the suburban counties.

7.1.5 Revenues - Federal

Federal transit funding for the alternatives may be available from several sources. For each of the categories described, current authorization under ISTEA expired in September 1997. At this time, there are no definitive proposed funding levels established. It is noted that ISTEA authorization has been extended to Spring 1998. Federal funding is assumed from the following sources:

- **FTA Section 5309 (formerly Section 3) Grants:** This program includes the following elements:

    - **New Starts:** This funding program is for the construction of new rail or busway projects. Funding is allocated on a discretionary basis and is earmarked annually by Congress based on the reauthorization/authorization/annual appropriation process. Capital assistance grants made to states and local agencies may fund up to 80 percent of the new project costs, based on negotiations between the Federal and local agencies.

    - **Rail Modernization:** This funding program is for the improvement and rehabilitation of existing rail systems. Funding is based on an FTA formula, a function of revenue vehicle miles and fixed guideway route-miles, beginning seven years after new rail service begins. The rail modernization funding is applied as the new investment begins to age.

- **FTA Section 5307 (formerly Section 9) Grants:** Section 5307 funding for operations is not considered as a source in the strategy. It is assumed that Section 5307 capital funding will continue to be available to finance other capital projects.

  The MTA can expect to receive additional Section 5307 funds and Section 5309 rail modernization funds as a function of the increased revenue vehicle miles and fixed guideway route miles that the Build Alternative would generate.

Although not explicitly assumed in the financial strategy, the following "flexible" funding sources may be pursued for the Build Alternative. In addition, it should be noted that flexible funding secured for other parts of the MTA program could free up conventional resources which in turn could be committed to the LIRR project.

- **Flexible Funds-Title I ISTEA:** The 1991 ISTEA legislation provided State and local governments with ability to transfer portion of federal highway funds to transit projects and federal transit funds to highways based on local needs. Federal highway funds can be transferred to Sections 5307, 5309, 5310, 5311 and the Interstate Substitution Transit Program to finance transit projects. Federal highway funds that can be transferred and are commonly used for transit purposes include:

  - **Surface Transportation Program (STP):** The STP is the largest category of flexible funds and may be used for all projects eligible for funding under current FTA grant programs. It is used primarily to fund projects that maintain and sustain the existing highway and transit infrastructure.

  - **Congestion Mitigation and Air Quality Program (CMAQ):** CMAQ funds are used to support transportation projects in air quality non-attainment areas. A CMAQ project must contribute to the attainment of the national ambient air quality standards by reducing pollutant emissions from transportation sources.

  Other flexible Title I sources include National Highway System (NHS), and Bridge and Interstate Maintenance (IM).

7.1.6 Existing Subsidy Requirements

7.1.6.1 Existing Operating Subsidy Requirements

The LIRR's operating subsidy needs in 1995 equaled $336.2 million. Near term operating needs are expected to be lower than in 1995 as a result of a multiyear, comprehensive effort to generate internal savings MTA-wide, $318.8 million and $328.3 million in 1997 and 1998, respectively.

7.1.6.2 Project Capital Revenue Sources

At present, $42 million in local resources is programmed in the MTA's $12 billion 1995-1999 capital program for the environmental impact statement and preliminary engineering for the Build Alternative. The remaining balance of the project's capital costs would need to be funded by additional revenue sources. This could include sources of revenues presented above. The revenue sources used to fund the capital costs of the Build Alternative would need to have the capacity to cover both year of expenditure capital costs and rehabilitation and replacement costs.

7.1.6.3 Project Operating and Maintenance Sources

Incremental costs associated with the alternatives will need to be covered by a combination of sources. Table 7.1-2 compares the year 2020 operating costs in 1997 dollars for the No Build, TSM and Build Alternatives. For year 2020, the TSM operating and maintenance cost is $9.3 million higher than the No Build, while the Build Alternative cost is $98.5 million greater. It is important to note that the operating and maintenance costs for the Build Alternative is only 15.6% greater than for the No-Build Alternative.

TABLE 7.1-2
Projected Operating and Maintenance Costs
(Millions of 1997$)

	No Build	TSM	Build
2020 Operating Cost	$632.4	$641.7	$730.9
Increment above No Build		$9.3	$98.5

7.1.7 Conclusions

Overall, a feasible financing strategy can be developed to support the TSM and Build Alternatives consistent with existing MTA financial practices, and also meet the other needs of the LIRR as well. The financing strategy would meet minimum borrowing requirements and use traditional funding sources.

The costs for the Build Alternative represents a relatively small share of the total capital investments managed by MTA. Since 1982, MTA has consistently funded and successfully overseen three 5-year capital programs totaling $23 billion. MTA's current 5-year capital program totals $12 billion, an average expenditure of $2.4 billion per year. On an annualized basis, the capital cost of the Build Alternative would only represent a 14% increase in the total current capital program.

Similarly, the Build Alternative's incremental operating cost of $98.5 million would be a small increase in the combined operating budget of the MTA agencies. Total 1997 operating expenses for NYCT, LIRR and MNR are projected to be $4.6 billion. The cost associated with the Build Alternative would represent a 2.1% increase to this combined budget and only 15.6% of the projected LIRR operating expenses for the year 2020.

- **TSM Alternative:** The financial strategy assumes that the TSM Alternative is completed by 2010. Similar to the Build Alternative, the non-federal portion of the project costs would be covered by dedicated and/or new revenue sources. The combination of MTA resources, less operating costs, would be used to fund the TSM Alternative on a pay-as-you-go basis and support a revenue bond offering. These revenues would support the debt offering, provide sufficient working capital and meet minimum debt service coverage ratios.

- **Build Alternative:** The financial strategy assumes that construction of the Build Alternative and the purchase of required rolling stock is completed by 2010. The non-federal share of the capital costs is funded by a combination of dedicated and/or new revenue sources. These MTA revenues, which could include the existing and/or new sources described in Section 7.1.6, would provide for capital and operations over the 20 year analysis period. These revenues would support the debt offering, provide sufficient working capital and meet minimum debt service coverage ratios and support expanded operation of the railroad.

7.1.8 Implementation

The financing strategy that is finally developed will require substantial Federal participation in the construction of the Build Alternative. The magnitude of this investment demands that MTA have complete assurance that Federal funds will be forthcoming once MTA commits to the project. Conversely, the FTA must have assurance that limited Federal funds will be fully and productively utilized and leveraged to the greatest extent possible. A critical implementation element will be negotiated and described in a Full Funding Grant Agreement (FFGA) between the MTA and FTA.

The financial strategy discussed represents one possible scenario to provide sufficient funding to support ongoing operations of LIRR and provide funding for expanded operations and capital investment associated with the Build Alternative. As noted in Section 7.1.4, many different funding sources are available to MTA to meet its capital and operating needs. As the Build Alternative advances the details of the financial strategy will become more specific.

7.2 Benefits of Alternatives

This section presents the benefits of the alternatives for the Long Island Transportation Corridor study. The benefits are described in two parts. The first part focuses on how, based largely on the results of the travel demand forecasts, the Build Alternative will play an integral role in addressing the transportation issues identified in the Purpose and Need, Chapter 1 of the study. The second part presents the benefits of the Build Alternative in accordance with FTA criteria and in the context of the unique features of the Build Alternative and the special needs of the New York City Region.

7.2.1 Overall Benefits

New York's transit and commuter rail systems are mature and well-utilized. Therefore, in addition to attracting new riders, New York City projects must also provide new capacity to meet both existing unmet demand and future demand. This is critical to preserve the high transit market share that is necessary to maintain the region's mobility and to sustain economic growth. Consequently, the benefits of these projects accrue not only to new riders, but to a large base of existing customers as well.

As described below, fully two-thirds of the LIRR daily ridership in the year 2020 will benefit directly from the Build Alternative. The project will benefit both current and future LIRR customers whose ultimate destination is within walking distance of GCT, as well as customers whose destination remains Penn Station.

Direct LIRR access to East Midtown will fundamentally change travel in the New York City Region and will also have much broader benefits for the region's transit and highway users and for the region's economy and quality of life. The following identifies the major benefits of the Build Alternative and how it addresses the major issues identified in the Purpose and Need, Chapter 1 of this study.

- **Customers Benefited:** On a daily basis 117,000 LIRR customers, generating over 65.9 million annual trips, will benefit directly from the Build Alternative by the year 2020. These annual trips include: 48.4 million trips by passengers who will use the new LIRR's service to Grand Central Terminal; 1.7 million trips to the proposed Sunnyside Station; and 15.8 million trips by Penn Station-bound LIRR passengers who will no longer have to travel in overcrowded train conditions during the morning and evening peak hours. Each day, the Build Alternative will save customers nearly 19,000 hours in commuting time, or 5.3 million hours each year. The value of these time savings is at least $69.6 million annually.

- **LIRR Congestion at Penn Station:** The LIRR currently carries 77 percent of the passengers utilizing Penn Station, while it is allotted only 42 percent of the track and platform slots. This limits current LIRR operations to only 36 trains per hour and inhibits LIRR's ability to significantly increase service. With the implementation of the Penn 42 Project, which assumes certain capital improvements have been made, the LIRR will be able to increase service to a maximum of 42 trains per hour.

  Even with this improvement, crowding conditions are forecasted to worsen substantially unless additional investments are made to improve LIRR service to the Manhattan CBD. The number of standees during the morning peak under the No-Build Alternative (assuming implementation of Penn 42) will be 13,600. Even the investments planned as part of the TSM Alternative will not eliminate crowding; the number of standees forecasted under this scenario is 5,800. New LIRR service to GCT provided by the Build Alternative will ease congestion at Penn Station, virtually eliminate overcrowded conditions on trains and allow the LIRR to grow and improve service at both Manhattan terminals.

- **Access to East Midtown:** For fifty-three percent (47,000) of today's LIRR AM peak period customers, Penn Station is not a convenient 'gateway' to reach their East Midtown offices. The Build Alternative will allow these LIRR customers to arrive closer to their final destination without transferring to a bus or subway. By 2020, LIRR service to GCT will benefit 85,900 daily (2-way) customers who will not need to transfer to reach their final East Midtown destination.

- **Meeting Future Travel Demand:** Strong economic growth projected for the counties within the Long Island Transportation Corridor will translate into increased travel demand between Long Island and Manhattan. Without LIRR access to GCT, this growth will not occur and the Long Island economy will be stifled. The labor forces on Long Island will grow by larger percentages than local employment, prompting residents to seek employment in New York City. The Build Alternative will provide the needed, high quality, reliable transportation services that will accommodate this future growth. As noted in Chapter 1, Purpose and Need, Nassau and Suffolk counties are expected to generate 32,500 additional daily journey-to-work trips to Manhattan by 2020; while Queens County will generate an additional 36,600 work trips.

Each weekday 172,000 customers are projected to use LIRR trains to and from GCT, while 149,800 are estimated to use LIRR trains to and from Penn Station. The ability to provide access to both East and West Midtown will result in substantial travel time savings for the LIRR's customers. In addition, subway, bus and highway users will benefit from the Build Alternative as well because of diversion from their respective systems to the LIRR. Compared to the No-Build Alternative, the Build Alternative attracts 26,000 daily LIRR customers who would have used currently overburdened highway, subway and bus networks.

- **Synergy with Other Major Regional Intermodal Investments:** The Build Alternative is directly linked to the following projects already under development or planned for implementation:

  - **Grand Central Terminal Revitalization** - The MTA is redeveloping GCT to restore the landmark terminal areas, and to provide customer amenities such as: improved and increased retail space; passageways that are more spacious and direct; and new heating and cooling systems to moderate the terminal's comfort level. In addition, new customer access from the north end of the terminal is being created. These improvements will cost $264 million. The Build Alternative will serve GCT directly, providing another 172,000 arriving and departing passengers to take advantage of and to contribute to the new businesses located in the terminal and to benefit overall from the transportation improvements at GCT.

  - **Airport Access** - The Port Authority of New York and New Jersey has approved plans to build and operate an automated $1.5 billion light rail system for JFK Airport. The full system is scheduled to be operational by 2001. Automated trains will operate at 2 to 10 minute intervals, linking the JFK central terminal area with the LIRR's station at Jamaica and the subway station at Sutphin Boulevard with an elevated right-of-way along the median of the Van Wyck Expressway. The Build Alternative will allow airport customers to take the LIRR to GCT and access the East Side of Midtown Manhattan.

  - **Farley/Penn Station Project** - New York City is the largest and most important market for Amtrak. Approximately 8 million travelers, or 38 percent of Amtrak's total national ridership, begin or end their trips at Penn Station New York. Amtrak's redevelopment of the adjacent James A. Farley Building, at an estimated cost of $315 million, will improve its passenger facilities, upgrade the travel experience for intercity passengers and will give New York City an impressive new civic landmark. The Build Alternative, by relieving both train and passenger congestion at Penn Station, will enhance this Amtrak initiative.

  - **The 63rd Street Tunnel** - The 63rd Street Tunnel has two levels. The Build Alternative will make use of the lower level to take railroad customers from suburban Long Island, Kennedy Airport, and Queens to GCT. The Build Alternative will be the second of two major initiatives to use the 63rd Street Tunnel under the East River. Construction is now under way on a $645 million project that will enable MTA NYCT to provide much-needed additional subway service between Queens and Manhattan by utilizing the upper level of the 63rd Street Tunnel. This service, which is scheduled to begin in 2001, will greatly relieve overcrowding for the quarter-of-a-million people who use the Queens Boulevard E and F lines everyday.

- **Eastern Queens Service:** Eastern Queens is currently underserved by high speed, reliable public transportation. Direct LIRR service to GCT will benefit Eastern Queens travelers. Over half of the 36 million annual journey-to-work trips emanating from Eastern Queens are made by some combination of subway and buses. Eastern Queens lacks both direct subway service and, due to capacity limitations, frequent LIRR service. As a result, the subway services that do exist are fed by an extensive network of feeder buses. The existing ridership demand consistently translates into overcrowded subway services. The Build Alternative is forecasted to reduce crowding on the subway by 6,400 and 3,600 daily riders, respectively, compared to the No Build and TSM Alternatives.

- **Maintenance of High Transit Mode Share:** LIRR currently maintains an average market share in its suburban service territory of over 75%. This means that over 3 out of 4 commuters traveling from Nassau and Suffolk counties to the Manhattan CBD arrive on the Long Island Rail Road.

  Erosion of the LIRR share of the commuter market could lead to serious increases in auto trips into Manhattan. The LIRR carries over 250,000 passenger trips to and from Manhattan each day, which is the capacity of at least 27 highway lanes. The erosion of a single percent of the LIRR market share would add the equivalent of over 2,700 autos to already congested Long Island highways and East River bridge and tunnel crossings.

  The Build Alternative preserves the LIRR's market share by providing more convenient and quicker access to East Side job locations and, by operating up to 24 additional trains per hour into GCT, offering increased service into Manhattan for existing and new passengers. This new service and capacity supports high-density commercial activity and economic vitality in the Region's core.

  Physically expanding the expressways and highway system linking Long Island and Manhattan to serve additional single occupant vehicles is not a viable option. As noted in Chapter 1, Purpose and Need, potential highway expansion is hampered by a lack of physical space and intolerance of Corridor residents to endure the environmental impacts generated by such projects. The Corridor's high density and urbanization all but precludes acquiring new right-of-way for new expressways. In addition, new highway capacity is hampered by the ability of the Manhattan street network to handle increased traffic and the need to comply with Federal and State clean air mandates. The highway network is currently at capacity and cannot efficiently handle additional demand. The Build Alternative holds the promise to accommodate additional demand and for reducing vehicular congestion.

  Even if adding new single occupancy vehicle highway capacity were not prohibited by the New York Metropolitan Region's standing as a severe non-attainment area (and was physically feasible to construct) the cost would be much greater than that for the Build Alternative. The Build Alternative increases LIRR peak hour passenger-carrying capacity by 34,560, all of which will be used. For the typical LIRR passenger, who travels an average 28 miles in each direction, the only other viable mode is the auto. To provide peak hour highway capacity equivalent to the Build Alternative, 13 new highway lanes and 6 two-lane river tunnels would be required (based on 2,000 autos per lane and auto occupancy of 1.35). Conservatively assuming $200 million for each new highway lane and $1.5 billion for each tunnel, the total cost would be $11.6 billion, over 3.5 times as costly as the Build Alternative. Constructing parking space, if land where available in Manhattan, would add an estimated $1 billion to the cost.

- **Compliance with Clean Air Act and State Implementation Plan:** The Build Alternative will reduce projected vehicle miles of travel (VMT) by 87.9 million miles annually. The savings in VMT will contribute to lower annual emissions, including reductions of 124 tons of nitrogen oxides, 76 tons of volatile organic compounds and 720 tons carbon monoxide. Energy savings due to the Build Alternative will also be significant - over five million gallons of gasoline would be saved annually. These benefits are in addition to the substantial environmental and energy benefits of maintaining and improving the quality of life for the existing customer base.

- **Maintaining Mobility:** Finally, maintaining the Corridor's mobility is important to the Region's long term economic future. A recent analysis conducted for MTA found that for every one dollar invested in an expanded regional transit network, including the Build Alternative, $2.07 would be returned to the regional economy in terms of increased business sales and income. Investment in the Region's transit network would serve as a catalyst for regional productivity.

  New York City must effectively compete with other world class cities that are international business and cultural centers. The New York Region's international competitors for the world economy continue to be cities such as London, Paris and Tokyo. Because there is an intrinsic relationship between economic development and regional mobility, these other cities have invested heavily to meet future travel demand by constructing additional transportation links now. The Build Alternative will help the Region maintain its competitive edge by providing convenient and efficient access and by expanding capacity for the Region's other major transportation providers to better serve the Region's core.

7.2.2 Benefits in the Context of FTA and Other Criteria

The determination of the benefits of the alternatives is based on the results of the engineering, travel demand forecasting and financial analyses undertaken for the Build Alternative. Recently, FTA updated criteria for determining benefits considered in the selection of projects for new start funding.

The FTA criteria are, however, geared toward "new starts" projects, which generally provide either entirely new transit access where none presently exists or expand the geographic coverage of an existing transit system, particularly at the originating end of the trip. The criteria are ill suited to measure the effectiveness of projects that increase the capacity of a mature, well-utilized existing system and extend access at the destination end of the trip. For example, while measuring the number of new riders generated, the FTA criteria neglects benefits to existing riders, such as relief from overcrowded conditions and locating terminals closer to major destinations. For established transit systems, the number of riders benefited, not just the number of new riders, should be the basis for the evaluation of project benefits.

The Build Alternative adds critically needed capacity to the nation's largest commuter railroad, whose market share for commuting trips to the region's core is one of the highest in the nation. As a result, the project benefits expand the traditional FTA measure of new riders to account for a much larger benefiting ridership base.

This section describes the benefits of the alternatives in the context of FTA and other criteria.

7.2.2.1 Mobility Improvements

- **New Daily Ridership:** Overall, the Build Alternative attracts a significant number of new daily riders and helps to positively address the capacity constraints on the subway system and highway network. Compared to the No-Build Alternative, the Build Alternative attracts 26,000 additional daily riders to the commuter rail network. Nearly 60 percent of these new commuter rail riders would have traveled by auto, while 27 percent would have used the subway. In contrast, the ridership impacts of the TSM Alternative are significantly smaller - it has a net increase of 3,000 new commuter rail riders and 3,000 bus riders. Table 7.2-1 shows how well the alternatives contribute to improved regional mobility according to FTA criteria.

- **Total Customers Benefited:** Overall, more than 117,000 daily customers, generating over 65.9 million annual trips, will benefit directly from the Build Alternative by the year 2020. These annual trips include: 48.4 million trips by passengers who will use the new LIRR service to GCT; 1.7 million trips to the proposed Sunnyside Station; and 15.8 million trips by Penn Station-bound LIRR passengers who will no longer have to travel in overcrowded train conditions during the morning and evening peak hours.

  The Build Alternative adds as many as 24 additional trains per hour into GCT, offering increased capacity into Manhattan. This new capacity will virtually eliminate overcrowded conditions compared to the future no-build condition. Specifically, over 17,000 AM and PM peak hour standees will be eliminated daily on service west of Jamaica by 2020. Without the added capacity provided by the Build Alternative, LIRR customers would have to endure over 11 million person-hours, or 463,000 person-days, in overcrowded trains annually. Providing sufficient capacity to meet loading standards and address both existing and future demand will allow the LIRR to retain current customers and attract new riders. Removing standees also benefits all customers in that loading and unloading is smoother and more rapid.

- **Travel Time Savings:** This measure is based on the results of the travel demand forecasts and is expressed in the dollar value of annual hours saved for transit riders and motorists. In-vehicle and out-of-vehicle time savings are calculated separately and are monetized based on FTA-mandated standardized values of $8.90/hour for in-vehicle time and $17.00/hour for out-of-vehicle time. The monetized savings are expressed as an annual amount based on the 2020 forecast year. Compared to the No-Build Alternative, the year 2020 travel time savings for the Build Alternative would equal 5.3 million hours and be valued at $69.6 million. The travel time savings for the TSM Alternative totals 1.3 million hours, valued at $15.5 million.

  It should be noted that the above time savings dollar values, because they were calculated using standardized national values, do not accurately represent the value of travel time savings for the Build Alternative. In the New York City Region both the value of time and the cost of doing business (including construction) are higher than the national average and the value of time saved is correspondingly higher. Based on an estimated 1997 average wage rate for the MTA service region of $20.30, the value of the year 2020 travel time savings is $18.5 million for the TSM Alternative and $83.2 million the Build Alternative.

- **Low-Income Households Served:** By providing service to GCT and a new Sunnyside Station, the Build Alternative provides the opportunity to improve mobility for an additional 3,700 low-income households located within one-half mile of those new LIRR destinations. The Build Alternative also provides improved access to East Midtown for the existing 70,000 low-income households within one-half mile of stations on the existing LIRR network. For the purposes of this analysis, low-income households are those with less than $17,500 (1990$) as defined by the 1990 Census. This approximates the 1996 federal definition of the average household poverty rate of $20,000.

TABLE 7.2-1
Mobility Improvement Measures

	No Build	TSM	Build
Average Weekday Linked Trips			
Automobile	13,677,000	13,675,000	13,662,000
Total Transit	5,633,000	5,637,000	5,652,000
- Subway	3,755,000	3,752,000	3,748,000
- Bus	1,289,000	1,292,000	1,288,000
- Commuter Rail	589,000	592,000	615,000
Total All Modes	19,310,000	19,311,000	19,313,000
Incremental Weekday	***vs. No Build***		***vs. TSM***
Linked Trips	**TSM**	**Build**	**Build**
Automobile	(2,000)	(15,000)	(13,000)
Total Transit	4,000	19,000	15,000
- Subway	(3,000)	(7,000)	(4,000)
- Bus	3,000	(1,000)	(4,000)
- Commuter Tail	3,000	26,000	23,000
Total All Modes	1,000	3,000	2,000
Travel Time Savings	***vs. No Build***		***vs. TSM***
	TSM	**Build**	**Build**
Annual Hours Saved	1,333,000	5,262,000	3,929,000
Annual Dollars Saved (FTA Values)	$15,463,000	$69,574,000	$54,111,000
Annual Dollars Saved (NYC Values)	$18,493,000	$83,159,000	$64,666,000
Access for Households with Less Than $17,500 (1990$) Income	**TSM**	**Build**	**Build**
1/2 Mile from GCT	0	0	3,700
1/2 Mile from LIRR Station	70,000	70,000	74,000

7.2.2.2 Environmental Benefits

- **Vehicle Miles of Travel Saving:** Auto trip diversions to LIRR will contribute to a reduction in vehicle miles of travel (VMT). The forecasted net effect is a reduction in VMT. Compared to the No-Build Alternative, annual VMT savings for the Build Alternative is forecasted to be 87.9 million (see Table 7.2-2). The savings compared to the TSM Alternative would be 67.1 million miles for the Build Alternative. Reductions in VMT benefit motorists through reduced auto operating costs.

- **Emission Savings:** The savings in VMT will also contribute to lower mobile source emissions. As a result, it is assumed that the Build Alternative would not adversely impact the forecasted air quality designation for the region. Based on environmental and air quality analyses, it is estimated that compared to the No-Build Alternative, the Build Alternative would contribute to an annual reduction of 124 tons of nitrogen oxide, 76 tons of volatile organic compounds and 720 tons of carbon monoxide. The savings compared to TSM Alternative are somewhat less.

- **Automotive Fuel Savings:** The TSM Alternative would yield savings of 1.2 million gallons, and the Build Alternative would contribute to over 5 million gallons annual reduction compared to the No-Build Alternative. This is based on a national average fuel consumption of 16.84 miles per gallon.

- **LIRR Fuel and Electricity Consumption:** Increased commuter rail service levels will result in greater consumption of diesel fuel and electric power for LIRR. Compared to the No-Build Alternative, annual diesel fuel consumption would be 1.72 million gallons greater for the TSM Alternative, and 1.45 million gallons greater for the Build Alternative. This reflects the greater level of electric train service that would be operated under the Build Alternative. Compared to the No Build and TSM Alternatives, electricity consumption for the Build Alternative would be greater by 178.6 million kWh and 170.7 million kWh, respectively.

  Overall, annual energy consumption under the Build Alternative will increase by 152.4 billion BTU compared to the No-Build Alternative and 48.1 billion BTU compared to the TSM Alternative. This result stems from the fact that the Build Alternative is primarily aimed at providing needed capacity for existing and future riders, not removing existing auto riders from the highways.

- **Compliance with Clean Air Act and State Implementation Plan Requirements:** The New York Metropolitan Region has been declared a "Severe Non-Attainment" area with respect to NAAQS. It is in the national interest to reduce the number of areas in "Severe Non-Attainment" of federal air quality goals, as expressed in the Clean Air Act. The Build Alternative helps the region achieve compliance by reducing forecasted VMT for the year 2020 by 87.9 million compared to the No-Build Alternative and by 67.1 million compared to the TSM Alternative. Compared to the No Build and TSM Alternatives, the Build Alternative contributes to a greater reduction in emissions.

TABLE 7.2-2
Environmental Benefits

	vs. No Build		vs. TSM
	TSM	**Build**	**Build**
VMT Savings			
Annual VMT Saved	20,809,000	87,880,000	67,071,000
Annual Emissions Savings			
Nitrogen Oxide (tons)	29.35	123.96	94.61
Volatile Organic Compounds (tons)	17.88	75.54	57.66
Carbon Monoxide (tons)	170.36	719.56	549.20
Annual Auto Fuel Savings	1,236,000	5,219,000	3,983,000
Change in LIRR Diesel Fuel (gallons)	1,718,000	1,446,000	(272,000)
Change in LIRR Electric (kwhrs)	7,849,000	178,575,000	170,726,000
EPA Designation for Compliance with NAAQS	No Adverse Impact	No Adverse Impact	No Adverse Impact

7.2.2.3 Operating Efficiency and Cost Effectiveness Benefits

- **Operating Efficiency:** Operating efficiency benefits are determined by the forecasted change in operating cost per passenger mile in the forecast year for that part of the system that will be directly affected by the proposed new investment, expressed in terms of absolute dollar value. The change in operating cost per passenger mile is computed for the Build Alternative compared to the No Build and TSM Alternatives.

  The incremental operating cost per incremental passenger mile is calculated for year 2020 expressed in 1997 dollars. The cost for the Build Alternative is 1.9 cents greater than the No Build Alternative's cost of 23.8 cents. However, under the No-Build Alternative, AM peak hour passenger volumes between Jamaica and Penn Station will exceed seated capacity by over 27%, indicating that this criterion regards overcrowding as being beneficial. If peak hour trains in the No Build were assumed to be loaded at the same level as they will be in the Build condition (i.e., at 101% of capacity) the No Build operating cost per passenger mile would be 25.2 cents, only 0.5 cents less than the projected Build cost of 25.7 cents. The Build Alternative's operating cost per passenger mile is 1.8 cents greater than the TSM Alternative's cost of 23.9 cents. (See Table 7.2-3)

- **Cost effectiveness:** Cost effectiveness benefits, under FTA criteria, are determined by the change in total capital and operating cost per incremental passenger trip based on the forecasted change in annual transit ridership and the annualized total capital investment and operating cost, compared to the No Build and TSM Alternatives. This measure is used to assess how well a new service is able to attract new riders at the lowest possible cost.

  However, in the case of the LIRR alternatives, a measure based on '"benefiting" riders rather than "new" riders is more appropriate. Unlike traditional new start projects, whose primary purpose is to create new transit customer bases where none exist today, the Build Alternative benefits a large base of existing customers as well as attracting new transit riders. This is important because the Build Alternative preserves a high market share that is so critical to the region's mobility. The project benefits go well beyond the creation of new riders. By the year

2020, it will reduce overcrowding, cut travel time and provide direct access for over 117,000 existing and new daily railroad customers, generating over 65.9 million annual trips, will benefit directly from the LIRR East Side Access project by the year 2020.

This total of 65.9 million annual trips benefiting passengers includes: 48.4 million trips by passengers who will use the new LIRR's service to GCT; 1.7 million trips to the proposed Sunnyside Station; and 15.8 million trips by Penn Station-bound LIRR passengers who will no longer have to travel in overcrowded train conditions during the morning and evening peak hours.

The Build Alternative generates a significant number of new riders. Compared to the No-Build Alternative, the Build Alternative attracts 26,000 additional daily trips, or 7.3 million annual trips, by new riders to the commuter rail network. These new riders are generated despite the fact that the LIRR's ability to add new passengers is constrained by its already substantial share of Long Island-Manhattan CBD travel market (which is over 75 percent). Nearly 60 percent of these new LIRR riders would have traveled by auto, while 27 percent would have used the subway. In contrast, the ridership impacts of the TSM Alternative are significantly smaller - it has a net daily increase of 3,000 new commuter rail riders and 3,000 bus riders.

Table 7.2-3 shows the incremental cost per new passenger trip as well as the incremental cost per benefiting passenger trip. Capital costs were annualized using FTA's standard 7 percent discount rate and an assumed useful life of 50 years for infrastructure and 40 years for vehicles and other equipment.

Because of the limitations of the FTA index's stated above, the calculated values per new passenger trip for the Build Alternative are high relative to other transit projects in the nation, which are generally in the range of less than $20.00 per incremental new rider trip. Compared to the No-Build Alternative, the Build Alternative has a lower incremental cost per new passenger trip than the TSM Alternative ($47.12 vs. $64.77). Compared to the TSM Alternative, the cost per new trip is $44.82 for the Build Alternative.

However, for the Build Alternative, the incremental cost per incremental benefiting passenger trip is only $5.24 compared to the No-Build Alternative.

TABLE 7.2-3
Costs / Cost Effectiveness

	vs. No Build		vs. TSM
	TSM	**Build**	**Build**
Total Capital Cost (1997$)			
Infrastructure	$257,800,000	$2,593,500,000	$2,335,700,000
Vehicles / Other Equipment	$356,500,000	$781,000,000	$424,500,000
Total	$614,300,000	$3,374,500,000	$2,760,200,000
Annualized Capital Cost			
Infrastructure	$18,680,000	$187,925,000	$169,245,000
Vehicles / Other Equipment	$26,741,000	$58,582,000	$31,841,000
Total	$45,421,000	$246,507,000	$201,086,000
Incremental Operating Cost	$9,300,000	$98,500,000	$89,200,000
Change in Operating Cost / Passenger Mile	0.0¢	1.9¢	1.8¢
Incremental Cost / Incremental Rider	$64.77	$47.12	$44.82
Incremental Cost / Benefiting Rider	NA	$5.24	$4.49

7.2.2.4 Transit Supportive Existing Land Use Policies and Future Patterns

- **Existing Land Use:** The Build Alternative's terminus will be GCT in Midtown Manhattan, the nation's largest central business district. Within a one-mile radius of GCT alone, there are over 220 million square feet of office space and over 1 million jobs. Midtown Manhattan's continued success as a hub of the nation's economy is contingent upon an efficient and effective transportation network. However, increasing congestion on the mass transit and highway network accessing Midtown Manhattan threatens its ability to retain and expand employment within the Region's core. The Build Alternative will provide an attractive, faster transportation alternative for Long Island and Queens residents destined to East Midtown. In addition, the project will relieve congestion at Penn Station, allowing for potential increases in service that foster development in West Midtown as well.

- **Transit-Supportive Land Use Policies:** Agencies responsible for Long Island-wide and New York Region-wide planning recognize the priority of land use and its link to transit. The Action Plan of the Long Island Regional Planning Board (LIRPB) identifies the need to "guide future development into existing economic centers with the goal of enhancing community health and character and promoting energy efficient transportation." Suburban Long Island's older economic centers have developed around LIRR stations. By making LIRR travel more attractive, the economic attractiveness of stations and the surrounding downtown areas will be enhanced and commercial and residential activity will be generated consistent this LIRPB priority.

  The Long Range Transportation Plan of the New York region's metropolitan planning organization, New York Metropolitan Transportation Council, also identifies the need to improve access to centers where infrastructure can support growth, where public transportation can be provided efficiently and where development potential exists. The Build Alternative supports these regional goals.

- **Tools to Implement Land Use Policies:** New York City was among the first cities to enact zoning regulations early in the century and all of the municipalities in the Corridor have zoning authority. Further, local and regional economic development policies and tools are primarily geared toward the development and redevelopment of centers. Recognizing the need and desirability to integrate transit and land use policy and development, New York City regularly grants zoning density bonuses for developer improvements of local transit, such as integrating station entrances into the proposed development. Lastly, many public-private partnerships such as business improvement districts have formed in New York City to markedly improve the climate for growth through investments in security, streetscape amenities, and civic events. These partnerships have and will continue to improve the attractiveness of the Region's centers.

- **Containment of Sprawl:** New York City and Long Island, the focus of this study, are effectively fully developed. As a result, there are very few remaining areas where sprawl development could occur. However, by providing fast and convenient access to East Midtown, the Build Alternative can serve as a catalyst for focused economic activity within the regional core and strengthen the suburban communities served by the LIRR.

- **Supportive Zoning Regulations near Transit Stations:** Given that LIRR services a primarily mature and fully developed region, changes in land use policies would likely have a small impact on LIRR ridership overall. However, land use initiatives that focus development at or near station areas would contribute to improving the attractiveness of the Build Alternative.

- **Support for Regional Land Use Goals:** The combination of municipal planning, zoning, and economic development tools, superior transportation access, and vital public-private partnerships has led to and continues to maintain New York's desired commercial density and energy. In Midtown Manhattan, for instance, there are over 300,000 jobs per square mile. Concentrated land uses contribute to the economic and environmental vitality of the region and are only possible when transportation services provide for high volumes of trips. The Build Alternative supports high-density commercial activity in the Region's core.

- **Maintenance of High Transit Mode Share:** LIRR currently maintains an average market share in its suburban service territory of over 75%. This means that over 3 out of 4 commuters traveling from Nassau and Suffolk counties to the Manhattan CBD arrive on the Long Island Rail Road.

  Erosion of the Build Alternative share of the commuter market could lead to serious increases in auto trips into Manhattan. Today, the LIRR carries over 250,000 passenger trips to and from Manhattan each day, which is the capacity of at least 27 highway lanes. The erosion of a single percent of the LIRR market share would add the equivalent of over 2,500 automobile trips to already congested Long Island highways and East River bridge and tunnel crossings.

  The Build Alternative preserves the LIRR's market share by providing more convenient and quicker access to east side job locations and, by operating up to 24 additional trains per hour into GCT, offers increased service into Manhattan for existing and new passengers. This new service and capacity supports high-density commercial activity and economic vitality in the region's core.

7.2.2.5 Other Factors

- **Project Management Capability:** Construction and implementation of the Build Alternative will be a significant effort. However, as evidenced by the last three 5-year capital programs, the MTA and its subsidiaries, including the LIRR, have a solid background in managing the funding, construction and operation of large-scale capital projects. The agencies have existing engineering and capital oversight structures that manage the current multi-billion dollar capital programs.

  More specifically, the MTA is the largest public transportation system in North America. Since 1982 it has consistently funded and successfully overseen three five-year capital programs totaling $23 billion. MTA's current 1995-1999 capital program totals $12 billion, an average annual investment of $2.4 billion. On an annual basis, the capital cost of the Build Alternative represents only 10% of this rate of expenditure.

- **Degree to which institutions are in place as assumed in the forecasts:** The forecasts reflect the assumptions of the MTA Long Range Planning Framework and are based upon regional population, employment and land use forecasts for the year 2020. In addition, the forecasts for the Build Alternative also assume construction of committed future transit capital investments and the achievement of desired service levels in the Region.

  The financial forecasts are based on the availability of fare and non-fare revenue sources that will need to be further defined. The realization of the baseline transit capital investments and service levels and proposed funding plan for the project are contingent upon future actions by the management of the LIRR and MTA, the MTA Board and federal and local funding partners.

  The above notwithstanding, the MTA has evidenced that the baseline transit investments required to maintain the system in a state of good repair can be financed and implemented in a formal structured series of 5-year capital programs. This excellent track record gives MTA the firm base needed to advance the Build Alternative.

- **Local Commitment to Existing System:** The MTA has evidenced a high level of expenditure in the implementation of short term improvements to address train congestion at Penn Station and to reduce customer travel times to their destinations. LIRR improvements that have or will result in better service to Penn Station include:

  - West Side Storage Yard - The LIRR has constructed a train yard with thirty storage tracks and support facilities immediately west of Penn Station. This yard allows LIRR trains to "run through" the Penn Station platforms for midday storage, instead of reversing direction to be stored on Long Island. This has increased available capacity in the East River tunnels and shortened train dwell times. The construction of the yard also enabled LIRR to undertake major service improvements such as the electrification of the Main Line east to Ronkonkoma. ($203 million)

- Penn Station Central Control - Jointly with Amtrak, LIRR has constructed a central control facility for all train operations within Penn Station and the East River and North River Tunnels. This facility has greatly improved the efficiency of Penn Station operations and has helped to preserve service reliability and travel time. ($59.5 million)

- Reverse Signaling - LIRR has installed reverse signals between Jamaica and Penn Station that allow "3-and 1" operation and have resulted in an increase in peak direction train capacity. ($93.6 million)

- Penn Station "U" Ladder Connection - This new connection linking tracks 13 and 14 directly to the West Side Storage Yard will eliminate conflicting reverse moves, thereby decreasing platform dwell time in Penn Station. ($7 million)

- Platform 11 Extension - Lengthening of Platform 11 to accommodate 12-car trains allows all LIRR trains to access all LIRR platforms in Penn Station. This improves operating flexibility and reliability and expedites train unloading. ($24.2 million)

- LIRR Rolling Stock - LIRR is purchasing bi-level coaches that will increase the per car capacity from 120 up to 147 seats, thereby increasing capacity into Penn Station. LIRR is also completing the purchase of a total of 18 dual-mode diesel/electric (DE) locomotives that will allow for faster, one-seat rides to Penn Station from non-electrified parts of LIRR service area. ($225.3 million)

- High Level Platforms - LIRR is constructing high level, ADA accessible platforms at 35 stations in diesel territory east of Jamaica. These platforms will increase passenger safety and facilitate passenger unloading, thereby decreasing dwell times and speeding trips. ($43.4 million)

- Other investments made to increase capacity and decrease travel time to Penn Station include: electrification of Main Line from Hicksville to Ronkonkoma ($136.7 million), and reverse signaling on the Port Washington Branch for improved service and capacity ($8.1 million).

- Penn Station improvements - LIRR has greatly improved concourse waiting areas and access to and from the platforms (vertical pedestrian circulation), which results in faster loading and unloading of peak hour trains ($191.1 million).

The total expenditure on these capital improvements is $992 million. In addition, LIRR and MTA have expended $9 million in local funds on a series of planning efforts (LIRR Network Strategy Study, Operational and Physical Feasibility Study for LIRR Access to Manhattan's East Side, Penn Station Capacity & Utilization Study and the Long Island Transportation Corridor MIS) that have confirmed the need for and benefits of the Build Alternative.

- **Synergy with Other Major Regional Intermodal Investments**: As detailed in section 7.2.1 above, the Build Alternative is linked to several other key regional transportation investments and will multiply the benefits of those investments as well as the project itself. These projects are already under development or planned for implementation before or during the implementation of the Build Alternative and include:

    - Revitalization of Grand Central Terminal (MTA Metro-North Railroad)

- Access to JFK Airport (Port Authority of New York & New Jersey)
- Farley/Penn Station Project (Amtrak)
- Completion of the 63rd Street Tunnel Project (MTA New York City Transit/MTA Long Island Rail Road)

7.2.3 Local Financial Commitment

- **Stability and reliability of each proposed source of local match:** As the Build Alternative progresses, MTA and its funding partners will identify the specific mix of funding and financing sources that will be used to cover the local share of the project. It is likely that a combination of the sources identified in Section 7.1.4 of this chapter will be used. These are sources that MTA has historically used to fund its capital and operating needs and are generally considered to be a reliable revenue source. In addition, the financial community has accepted MTA's use of these sources to support the Authority's debt offerings. In fact, given the importance of transit in the New York region, the MTA has been able to issue investment grade bonds supported by NYCT and commuter rail fare revenues.

- **Provisions to cover unanticipated cost overruns:** The engineered cost estimates for the Build Alternative assumed contingencies of 30 percent, except for rolling stock acquisitions (5 percent), and LIRR support (10 percent). These assumptions are well within the range of recent experience.

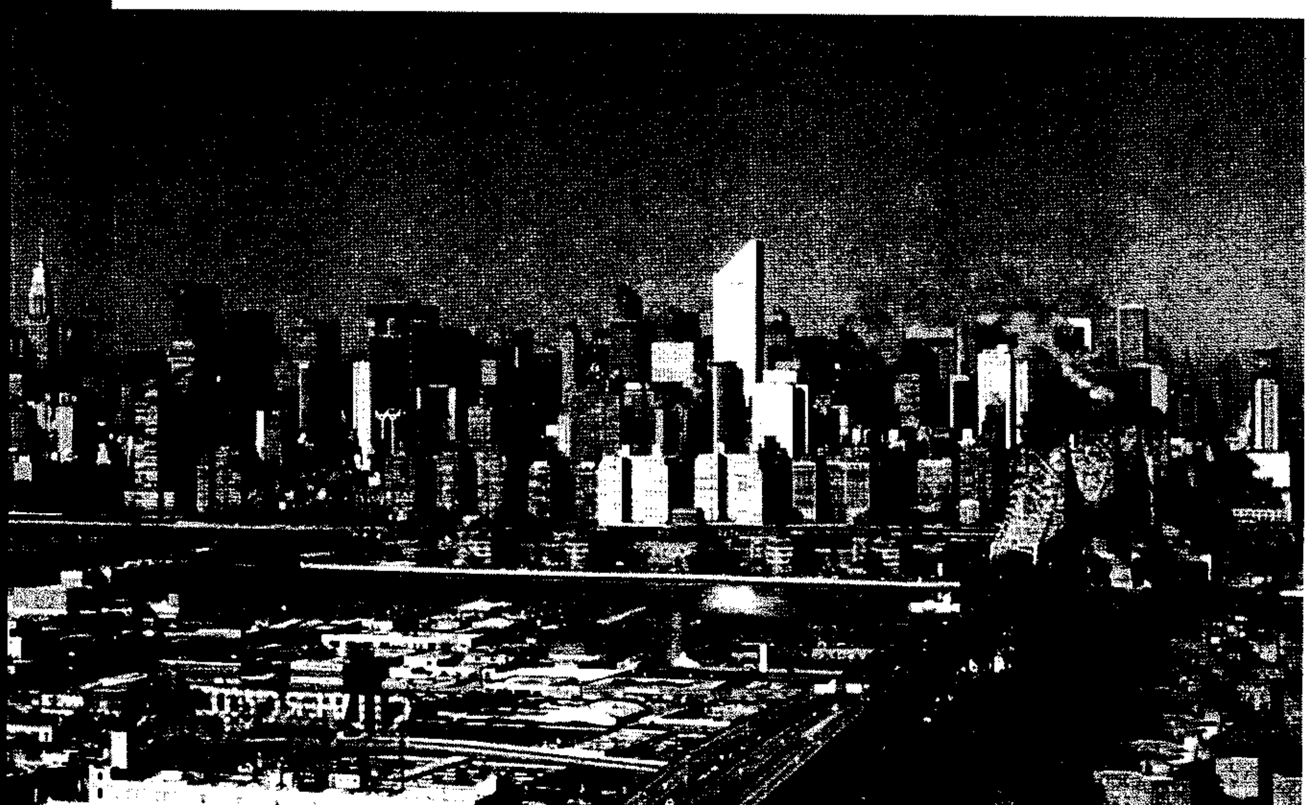
- **Ability to fund operation of the system once it is built based on the operating revenue base:** The Build Alternative's incremental operating cost of $98.5 million would be a small increase in the combined operating budget of the MTA agencies. Total 1997 operating expenses for NYCT, LIRR and MNR are projected to be $4.6 billion. The cost associated with the Build Alternative would represent a 2.2 percent increase to this combined budget and only 13.6 percent of the projected LIRR operating expenses for the year 2020.

7.3 Conclusion

In conclusion, the benefits of the Build Alternative are substantial. The costs for the project are not significant when viewed in the context of MTA's past performance and current capital program and sources of operating funds.

Chapter 8

Glossary/List of Abbreviations



MTA Long Island Rail Road

8.0 GLOSSARY / LIST OF ABBREVIATIONS

8.1 Glossary

Accessibility - A measure of the ability or ease of all people to travel among various origins and destinations.

Air Pollution - The presence of unwanted material in the air in sufficient amount and under such circumstances as to interfere significantly with human comfort, health, or welfare, or with full use and enjoyment of property. National and state ambient air quality standards identify pollutant concentrations not to be exceeded over a specified time.

Alignment - A ground plan or route of a railroad, highway, or fixed guideway transit.

Ambient Air Quality - A physical and chemical measure of the concentration of various chemicals in the outside air, usually determined over a specified time period (e.g., one hour, eight hours).

Americans with Disabilities Act (ADA) - A federal civil rights law enacted in 1990 that mandates the provision of access to public facilities for persons with disabilities. Title 2 of the law applies to transportation facilities and transit vehicles.

Aquifer - A water-bearing underground layer of permeable rock, sand or gravel.

Automated Fare Control (AFC) - A system of fare control that utilizes machines to issue tickets in return for a specified fare, or to confirm validity of pre-purchased tickets.

AM Peak Period - Peak morning travel period (from 6:00 AM to 10:00 AM).

Base Year - The first year of a planning or forecast period. The base year of the planning period for the LIRR East Side Access Project is 1990.

Build Year (also known as horizon year) - The year for which traffic and population projections have been made and transportation needs analyzed; 2020 is the horizon year for the LIRR East Side Access Project.

Bus Lane - A traffic lane for dominant or exclusive use by commuter buses.

Calibration - In travel time demand modeling, the procedure used to estimate the parameters of a model in order to replicate actual measurements of travel behavior and conditions.

Capital Costs - The cost of designing, constructing, purchasing equipment (e.g., vehicles), and implementing a transit system.

Catenary Power System - An electric power system and overhead contact wire which is supported from one or more longitudinal wires or cables used to provide a power source for vehicles via a pantograph (contact mechanism) on the roof of the vehicle.

Central Business District - The primary downtown area of a city, or an area of concentrated retail activity. Also characterized by high land valuation and traffic flow.

Clean Air Act Amendments (CAAA) of 1990 - A federal law enacted in 1990 that places new federal controls on all sources of air pollution including mobile sources (automobiles). The CAAA includes an implementation strategy and establishes air quality improvement requirements.

Commuter Bus - Bus service provided along major arterial roads with limited stops, accessing a major destination point with both pedestrian and automobile access.

Commuter Rail (high capacity rail) - A system of relatively long trains operating at high speeds over long distances. This service can be both local and express, and may be accessed by both pedestrians and automobiles. May be either locomotive-hauled or self-propelled.

Commutation - The act or process of commuting; making a regular trip (e.g., to the workplace).

Consist - The make-up or composition of a train or number of cars and a specific type of vehicle.

Cross Over - An arrangement of track switches which enable a train to cross from one track to another.

Dead Head Train - A train movement that does not carry passengers.

Determination of Eligibility - The decision of the State Historic Preservation Officer (SHPO) on whether candidate historic properties or resources are qualified for the State and/or National Register of Historic Places.

Diesel Electric Locomotive - A self contained unit of motive power which creates electric traction power by the use of a diesel (internal combustion) engine.

Direct Fixation - A system of track construction whereby the rail is fixed directly to a concrete bed without the use of crossties and stone ballast.

Drift - A nearly horizontal mine passageway driven on, or parallel to, a defined alignment. Several smaller diameter parallel drifts can be connected to form a larger finished tunnel configuration.

Dual Mode Locomotive - A self contained unit of motive power which either creates electric traction power by the use of a diesel engine or collects electric traction power from the contact (third) rail.

Dwell Time - The length of time a train stands at a station.

Earth Pressure Balance (EPB) Tunnel Boring Machine (TBM) - A specialized operating mode of a TBM whereby the TBM uses a build-up of pressure in the cutting head chamber to support the excavation face. EPB type TBMs are used when ground conditions are found to be mainly wet, running low cohesion soils.

Endangered Species - A species whose prospects for survival within the state are in immediate danger based on a loss of habitat, over-exploitation, predation, competition, or disease. An endangered species requires immediate attention or extinction will likely follow.

Environmental Assessment (EA) - An environmental review of actions in which the significance of the environmental impacts has not been clearly established.

Environmental Impact Statement (EIS) - A comprehensive study of potential environmental impacts related to federally-assisted projects. Projects for which an EIS is required are defined in the National Environmental Policy Act of 1969, as amended.

Environmental Site Assessment (Phase I and Phase II) - The investigation of a parcel with respect to the presence of environmental contaminants. A Phase I assessment consists of inquiries and record searches concerning past and present uses of a property. Phase II involves sampling and testing of soil, water and materials from the site for hazardous materials.

Equipment Train - A train movement that does not carry passengers.

Express Service - Transit to/from a destination with limited or no stops along its route.

Feeder Service - A local transit service that collects or distributes riders and provides a direct transfer to other high-capacity transit modes.

Finding of No Significant Impact (FONSI) - A document released after completion of an Environmental Assessment, explaining why a proposed action will not have a significant effect on the environment, and therefore an Environmental Impact Statement is not required.

Floodplain - Land area likely to be submerged during a flood.

FTA - Federal Transit Administration of the U.S. Department of Transportation.

Fugitive Dust - Airborne dust particles resulting from construction, demolition and other induced activity which can significantly impact air quality in the project area.

Grade Crossing - A crossing with roadways and/or railroads on the same level, resulting in an at-grade intersection.

Grade Separation - The construction of a grade separated crossing of roadways and/or railroads, with different levels and no intersection.

Headway - The scheduled time between transit vehicles operating on a particular transit route.

Heavy Rail - An electric railway with high passenger carrying capacity, characterized by exclusive rights-of-way, multi-car trains, high speed and high-level platform passenger loading.

High-Level Platforms - Station platforms that allow users to enter or exit the vehicle at the same level as the train floor.

High Line - The segment of double track main line between Newark, NJ and Penn Station New York, including the North (Hudson) River Tunnels.

High Occupancy Vehicle (HOV) - A vehicle carrying two or more individuals (bus, vanpool and carpool). HOVs are encouraged as a means of decreasing vehicle miles traveled (VMTs).

Household Income - The total combined income of all members of a single household.

Infill Development - Real estate development on undeveloped property within a developed area.

Infrastructure - The physical support network such as roads, railroads, and utilities, of a given geographical area.

Interlocking - A system of track, signals and switches, and appurtenant apparatus to control rail traffic at places where trains merge, diverge and crossover.

Intermodal Transfer - The ability to move from one mode of transportation to another (e.g., bus to train) to complete a trip to a final destination site.

Intermodal Surface Transportation Efficiency Act (ISTEA) - A 1991 piece of legislation proposed by President Bush and enacted by congress that makes available funds to aid metropolitan areas throughout the United States in the development of transit systems that are not harmful to the environment and will bring those metropolitan areas into compliance with the Clean Air Act (CAA).

Joint Development - A shared effort on the part of two or more parties to develop the areas around proposed stations or adjacent alternatives.

Joint Facility Agreement - A contract between the LIRR and Amtrak which defines operating zones, establishes formulae for sharing operating costs, and provides methods for additions and alterations at Penn Station New York. Amtrak owns Penn Station and its tunnels; LIRR is a tenant at Penn Station.

Kiss-n-Ride - A drop-off and pick-up area for transit users being driven by car to a transit station or transfer point.

Ladder Track - A single track leading to a number of station tracks and/or lead tracks.

Level of Service (LOS) - A set of descriptive characteristics used to indicate the quality of transportation service provided, including characteristics that are quantifiable (e.g., frequency, travel time, travel cost, number of transfers, safety) and those that are difficult to quantify (e.g., availability, comfort, convenience, modal image) and conditions of the roadway.

Link - A section of a transportation system network which connects two nodes. It may be one way or two way.

Local Bus - Bus service with multiple stops along a fixed route.

<u>Low-Floor Vehicle</u> - A transit vehicle that permits passengers boarding from low-level platforms.

<u>Low-Level Platforms</u> - Station platforms located at-grade or several inches above grade; stairs located in the train are used to board.

<u>Major Investment Study (MIS)</u> - A corridor planning process conceived to improve transportation investment decisions. They are required when an agency identifies the potential need for both a major investment and federal funds.

<u>Manhattan Study Area (MSA)</u> - The part of the Primary Study Area that is located in Manhattan.

<u>Mass Transportation</u> - Shared transportation services (either bus, rail or other conveyance) either publicly or privately owned, provided to the public on a regular and continuing basis (not including school bus, charter, or sightseeing services).

<u>Master Plan</u> - Public document adopted by a local government as a policy guide for decisions about the physical and/or economic development of the community.

<u>Mitigation</u> - Measures designed to lessen or eliminate the negative impacts resulting from a proposed project or action.

<u>Mode</u> - A form of travel (e.g., walking, automobile, bus, train) that operates over a fixed-route or non-fixed route.

<u>MU (Multiple Unit) Train</u> - A train of self-propelled electric cars which are controlled from a single point.

<u>National Register of Historic Places</u> - The federal list of buildings and sites determined to have historical significance.

<u>Neighborhood Cohesion</u> - The common characteristic of members and elements of a neighborhood which affords them a unique sense of place and identity.

<u>No-Build Alternative</u> - Future conditions of an area in the absence of a proposed project; what would happen if the project were *not* built.

<u>Non-Attainment Area</u> - A geographical region which fails to attain or conform to established environmental standards (e.g., air quality, water quality).

<u>Northeast Corridor</u> - That portion of Amtrak's Main Line linking Richmond, VA and Boston, MA via Washington, DC and New York, NY.

<u>Off-Peak Period</u> - In transit, the base period or the hours between and after the morning and afternoon rush hours.

<u>Operating Costs</u> - The daily operating expenses for a transit system.

Ozone - An unstable form of oxygen formed by a photochemical reaction of atmospheric gases with solar ultraviolet radiation. It is a harmful air pollutant in the lower atmosphere and contributes to the formation of smog.

Park-n-Ride - A parking area provided for commuters, with access to transit to complete their trip.

Passenger Miles (passenger kilometers) - The total number of miles (kilometers) traveled by passengers on transit vehicles; determined by multiplying the number of unlinked passenger trips times the average length of their trips.

Peak Period - The period during which the maximum amount of travel occurs. It may be specified as the morning (AM) or afternoon/evening (PM) peak. It is the period when demand for transportation services is the highest.

PM Peak Period - The afternoon rush hours - approximately 4:00 PM, to 7:00 PM.

Per Capita Income - The total combined income of a household, block group, or census tract, divided by the total number of persons in that group.

Pocket Track - A track supplementary to a main (running) track which is used to reverse a train's direction.

Portal - The approach or entrance to or from a tunnel.

Primary Study Area (PSA) - The part of the study area that will be directly affected by the proposed action.

Public Transportation - Regular transportation service (bus, rail or other conveyance) to the public using a route or routes from one fixed point to another. Routes and schedules of this service may be predetermined through a cooperative agreement. Subcategories include public transit service and paratransit services that are available to the general public. Can be either publicly or privately owned.

Queens Study Area (QSA) - The part of the Primary Study Area that is located in Queens.

Raise Bore Drill - Drilling of a vertical five foot diameter shaft through the rock starting from the bottom of the shaft using a 12" bore hole drilled from the top of the shaft.

Rapid Transit - A transit mode which operates on exclusive right-of-way; characterized by high speed, capacity, reliability and safety.

Response Route - An established route regularly used by emergency vehicles (e.g., police, fire, ambulance) in traveling from their base or station to the location of a call.

Response Time - The time period between the placement of an emergency call and the arrival of emergency vehicle(s) at the location of the call.

Right-of-Way - A corridor of land acquired by reservation, dedication, prescription, or condemnation, and intended to be utilized as a road, rail line, utility service, buffer or similar use.

Run-Thru Mode - A train movement at GCT whereby the train proceeds from the station platform without the need to reverse direction.

Scoping - The process of defining and refining alternatives for a major capital investment study. The scoping process provides opportunities for input from the public.

Secondary Study Area (SSA) - The part of the study area that will be indirectly affected by the proposed action.

Signal Block - A defined length of track on which train movements are controlled by signals.

Slab Track - A system of track construction whereby the rail is fixed directly to a concrete bed without the use of crossties and stone ballast.

State Historic Preservation Office - A state administrative agency responsible for compliance with historic preservation rules, laws and regulations.

State Improvement Program (SIP) - Required documents prepared by states and submitted to EPA for approval. SIPs identify state actions and programs to implement designated responsibilities under the Clean Air Act.

Stream Encroachment Permit - A Federal and State permit required for projects placing fill within floodplains.

State Transportation Improvement Plan (STIP) - A document prepared by states and planning commissions citing projects to be funded under federal transportation programs for a full-year period.

Subway - Transit tunnels beneath street level.

Threatened Species - A species that may become endangered if surrounding conditions begin or continue to deteriorate.

Transportation Improvement Program (TIP) - A document prepared by states and planning commissions citing projects to be funded under federal transportation programs for a full-year period. Without TIP inclusion, a project is ineligible for federal funding.

Transportation Management Plan - A comprehensive plan or program to more effectively use existing transportation resources or reduce the future need to expand transportation infrastructure.

Transportation System Management (TSM) - A proposal or group of proposals that seeks to maximize the utility of the current transportation investments specific to a certain area, and demonstrates the extent to which these problems can be resolved without a major investment in new facilities.

Travel Time - The time it takes to travel from an origin to a destination.

Trip - A single or one-way movement to or from a location.

Trip Ends - The total number of trips entering and leaving a specific location within a designated period of time. Each trip has two trip ends.

Trip Generation - The total number of trip ends (person trips or vehicle trips) produced by a specific land use or activity.

Trip Linking - The ability to visit several destinations during one journey.

Tunnel Boring Machine - Tunnelling machine used in the construction of railway, road, sewer water main, mine access and tele-cable tunnels. Generally consists of a circular rotating cutter head and spoil removal system and used in place of more conventional (drill and blast) tunnelling procedures.

Underpin - A procedure for permanently re-supporting a load bearing structural foundation element to allow new work to proceed under, or adjacent to, the existing foundation element.

USACOE Individual Permit - A U.S. Army Corps of Engineers (USACOE) wetland fill permit that is required when a project exceeds the limitations outlined in the various Nationwide Permits or when there is no Nationwide Permit that applies to a project.

USACOE Nationwide Permit - A general wetland fill permit designed for projects resulting in minor disturbances to wetlands.

Uplands - Land other than wetlands that are well-drained and rarely, if ever, inundated.

Vehicle Miles Traveled (VMT) - An average that describes the total number of miles traveled in an automobile per individual for a specified area.

Walk-on-Station - A type of transit stop, where the majority of users walk to the stop.

Water Quality Certificate - A permit required for all projects subject to federal permitting for discharge into state waters and/or wetlands to ensure that all such activities are consistent with New York water quality standards and management policies.

Wetland Transition Area - The area between wetlands and surrounding uplands.

Wetlands - Tidal areas or swamps with soil characteristics and vegetation that meet certain criteria on which filling and development are federally and/or state regulated.

Zoning Ordinance - A municipal ordinance which divides a municipality into districts and prescribes land use type, land use relationships, densities, height and setback, and related elements within a defined municipal boundary.

8.2 Summary of Acronyms and Abbreviations

AA	Alternatives Analysis
AA/DEIS	Alternatives Analysis/Draft Environmental Impact Statement
AADT	Average Annual Daily Traffic
AC	Alternating Current
ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
AFC	Automated Fare Control
ARC	Access to the Region's Core Study
ACMs	Asbestos Containing Materials
ADT	Average Daily Traffic
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
APS	American Physical Society
APZ	Accident Potential Zone
ASTM	American Society of Testing and Materials
BGS	Below ground surface
BOM	Bureau of Mines
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
Btu	British Thermal Unit
CAAA	Clean Air Act Amendments
CBD	Central Business District
CEPO	City Environmental Protection Order
CEQ	Council on Environmental Quality
CEQR	City Environmental Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CMAQ	Congestion Management Air Quality
CO	Carbon Monoxide
CONEG	Coalition of Northeast Governors
dB	Decibel
dBA	Decibel, A-Weighted
DBE	Disadvantaged Business Enterprise
DC	Direct Current
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EMF	Electro-Magnetic Field
EMU	Electric Multiple Unit
EPA	Environmental Protection Agency
EPB TBM	Earth Pressure Balance Tunnel Boring Machine
ERNS	Emergency Response Notification System
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration

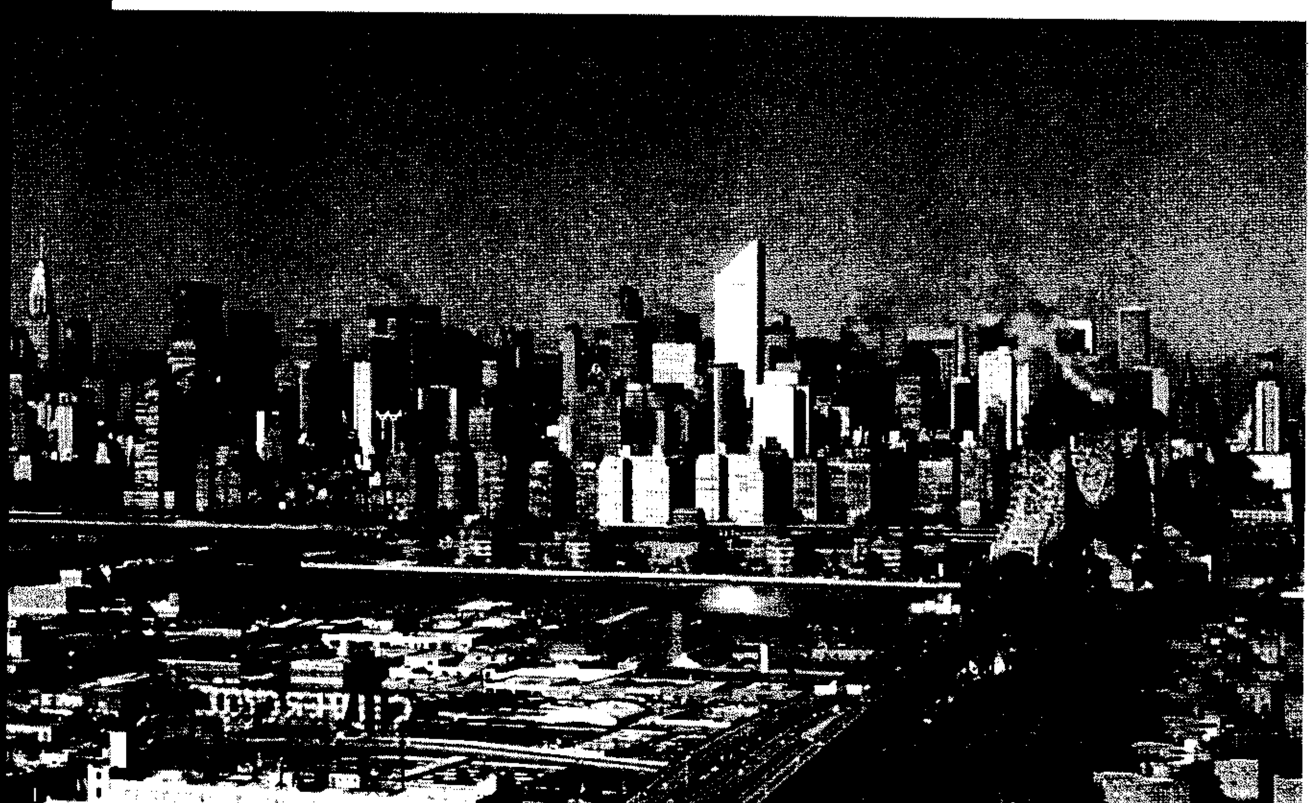
FONSI	Finding of No Significant Impact
FTA	Federal Transit Administration
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HOV	High Occupancy Vehicle
H_2SO_4	Sulfuric Acid
ISTEA	Intermodal Surface Transportation Efficiency Act
LAWCON	Land and Water Conservation
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
LIRR	Long Island Rail Road
LITC	Long Island Transportation Corridor
LOS	Level-of-Service
LUST	Leaking Underground Storage Tank
MESA	Manhattan East Side Access Study
mg/m^3	Milligram per Cubic Meter
MIS	Major Investment Study
MNR	Metro-North Railroad
MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
MSA	Manhattan Study Area
MSL	Mean Sea Level
MTA	Metropolitan Transportation Authority
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criterion
NEA	North End Access
NEC	Northeast Corridor
NEPA	National Environmental Policy Act
nfp	No Feasible Path
NFPA	National Fire Protection Association
NIC	Noise Impact Criteria
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRHD	National Register Historic District
NRHP	National Register of Historic Places
NRI	National Register Individual
NWI	National Wetlands Inventory
NYCDEP	New York City Department of Environmental Protection
NYCDOT	New York City Department of Transportation
NYMTC	New York Metropolitan Transportation Council
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OBL	Obligate Wetland Plants
O&M	Operating and Maintenance

O_3	Ozone
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PANYNJ	Port Authority of New York and New Jersey
PATH	Port Authority Trans Hudson
Pb	Lead
PCB	Polychlorinated Byphenyl
pcph	passenger cars per hour
$PM_{2.5}$	Particulate Matter of 2.5 Microns or Less
PM_{10}	Particulate Matter of 10 Microns or Less
PMSA	Primary Metropolitan Statistical Area (U.S. Census)
PNR	Park-and-Ride
ppm	Parts Per Million
PSA	Primary Study Area
PVC	Poly Vinyl Chloride
QSA	Queens Study Area
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
ROW	Right-of-Way
RR	Railroad
SDEIS	Supplemental Draft Environmental Impact Statement
SEL	Source Exposure Level
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMSA	Standard Metropolitan Statistical Area (U.S. Census)
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
SPL	State Priorities List
SSA	Secondary Study Area
SSY	Sunnyside Yard
SWLF	Solid Waste Landfills (database)
SWPPP	Storm Water Pollution Prevention Plan
TAZ	Transportation Analysis Zone
TBM	Tunnel Boring Machine
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCU	Transportation, Communication, and Utilities (land use category)
TDD	Telecommunication Devices for the Deaf
T&D	Transportation and Disposal
TIP	Transportation Improvement Program
TSDF	Treatment, Storage, Disposal Facility
TSM	Transportation System Management
ug/m^3	Microgram per Cubic Meter
UMTA	Urban Mass Transportation Administration
UPARR	Urban Park and Recreation Recovery Program
USACOE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture

USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USNPS	United States National Park Service
UST	Underground Storage Tank
VBF	Vehicle Base Facility
v/c	Volume to Capacity (ratio)
VdB	Vibration Decibels
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
VOCs	Volatile Organic Compounds
vph	Vehicles Per Hour
YOE	Year of Expenditure
YTD	Year to Date

Chapter 9

Supporting Documentation, Related Studies and Technical Reports



MTA Long Island Rail Road

9.0 SUPPORTING DOCUMENTATION, RELATED STUDIES AND TECHNICAL REPORTS

9.1 Supporting Documentation and Related Studies

The following is a list of reports, documents and Federal Regulations used in the preparation of this study.

1. MTA 1996 Annual Report.

2. Major Investment Study/Draft Environmental Impact Statement for the Long Island Transportation Corridor: Long Island Rail Road East Side Access Study, Ridership Forecasting Results Analysis, KPMG Peat Marwick, LLP, April, 1997.

3. NYSDOT HOV Feasibility Study, New York State Department of Transportation, May, 1994.

4. Willensky, Elliot and White, Norval, AIA Guide to New York City, New York: Harcourt Brace Jovanovich, 1991.

5. New York City Zoning Resolution, 1994.

6. Shaping the City's Future, New York City Planning and Zoning Report, New York City Planning Commission, Spring, 1993.

7. Plan for Long Island City, New York City Department of City Planning, 1993.

8. Plan for the Queens Waterfront, New York City Department of City Planning, 1993.

9. Long Island City Truck and Traffic Access Study, New York City Department of City Planning, 1995.

10. Long Island City Transportation Needs and Opportunities Study, Metropolitan Transportation Authority, 1994.

11. Amtrak Real Estate Market Study, 1991.

12. U.S. Census, 1980 and 1990.

13. Highway Capacity Manual, 1985.

14. 42nd Street Light Rail Transit FEIS, 1994.

15. 383 Madison Avenue FEIS, 1989.

16. 42nd Street Transitway DEIS, 1987.

17. Operational & Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side, STV/Seeleye Stevenson Value & Knecht, April, 1993.

18. Long Island Rail Road Network Strategy Study, 1992.

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20. New York State Air Quality Report: Ambient Air Monitoring System - Annual 1994 (DAR-95-1).

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28. Federal Transit Administration USDOT Transit Noise and Vibration Impact Assessment, April, 1995.

29. Final Committee Report of Guidelines and Principals for Design of Rapid Transit Facilities, American Public Transit Association, 1976.

30. Guidelines for Design of Rapid Transit Facilities, American Public Transit Association, 1981.

31. Reicher, H. and Meister, F.H., Die emfindlichkeit der menscen gegen ershutterungen. Forschungs gebiete ingenieurwesen, 2:11, 381-386 (in German).

32. Dieckmann, D., "Study of the Influence of Vibration on Man", Ergonomics, 1958, 1:4, 347-355.

33. Federal Endangered Species Act, 1973.

34. New York State Environmental Conservation Law (parts 11-0535 and 11-0536).

35. Hazen and Sawyer, Macroinverbrate Studies, May and October, 1980.

36. Additional Macroinverbrate Studies, Lawler, Matusky and Skelly Engineers, March to April, 1984 and March, 1985 to May, 1986.

37. Water Pollution Control Act of 1972.

38. Clean Water Act of 1977.

39. USDOT Order 5650.2.

40. Executive Order, 11990, Protection of Wetlands.

41. New York Freshwater Wetlands Act, Article 24, Environmental Conservation Law (6 NYCRR Parts 662, 663, 664 and 665).

42. Executive Order 11988, Floodplain Management.

43. New York State Regulations, Article 36, 6 NYCRR Part 500 (Floodplain Management).

44. National Historic Preservation Act of 1966, Section 106, as amended, 23 CFR 771.

45. Guidelines, Advisory Council on Historic Preservation, November 25, 1980.

46. Procedures for the Protection of Historic and Cultural Properties, 36 CFR Part 800.

47. New York State Register of Historic Places.

48. National Register of Historic Places.

49. Dolkart, Andrew S., Guide to New York City Landmarks, Washington: Preservation Press, 1992.

50. Shaver, Peter D., The National Register of Historic Places in New York State, New York: Rizzoli, 1993.

51. Standard for Fixed Guideway Transit Systems, National Fire Protection Association 130, 1988.

52. Pedestrian Time-Space Concept: A New Approach to the Planning and Design of Pedestrian Facilities.

53. CEQR Technical Manual, City of New York.

54. Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended by the Uniform Relocation Act Amendments of 1987.

55. Long Island Rail Road Section 15 Report to the Federal Transit Administration, 1995.

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57. Barker, Louis H, "The New York Tunnel Extension of the Pennsylvania Railroad. The Sunnyside Yard", Transactions of the American Society of Civil Engineers, Paper No. 1163, 69, October, 1910, 117.

58. Historic American Engineering Record Guidelines.

59. Title VI, 1964 Civil Rights Act.

60. Intermodal Surface Transportation Efficiency Act of 1991, Rules and Regulations of the Federal Transit Administration 23 CFR pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended.

9.2 Technical Reports

The following is a listing of Technical Appendices produced by the STV Project Team to supplement this study.

1. Air Quality Technical Appendix
2. Build Alternative Alignment Drawings
3. Community and Agency Participation Program Technical Appendix
4. Cultural Resources Technical Appendix
5. Ecological Technical Appendix
6. Hazardous Materials Technical Appendix
7. Noise and Vibration Technical Appendix
8. Transportation and Pedestrian Analyses Technical Appendix
9. Visual Resources Technical Appendix
10. Long List of Alternatives Technical Appendix