Case Studies

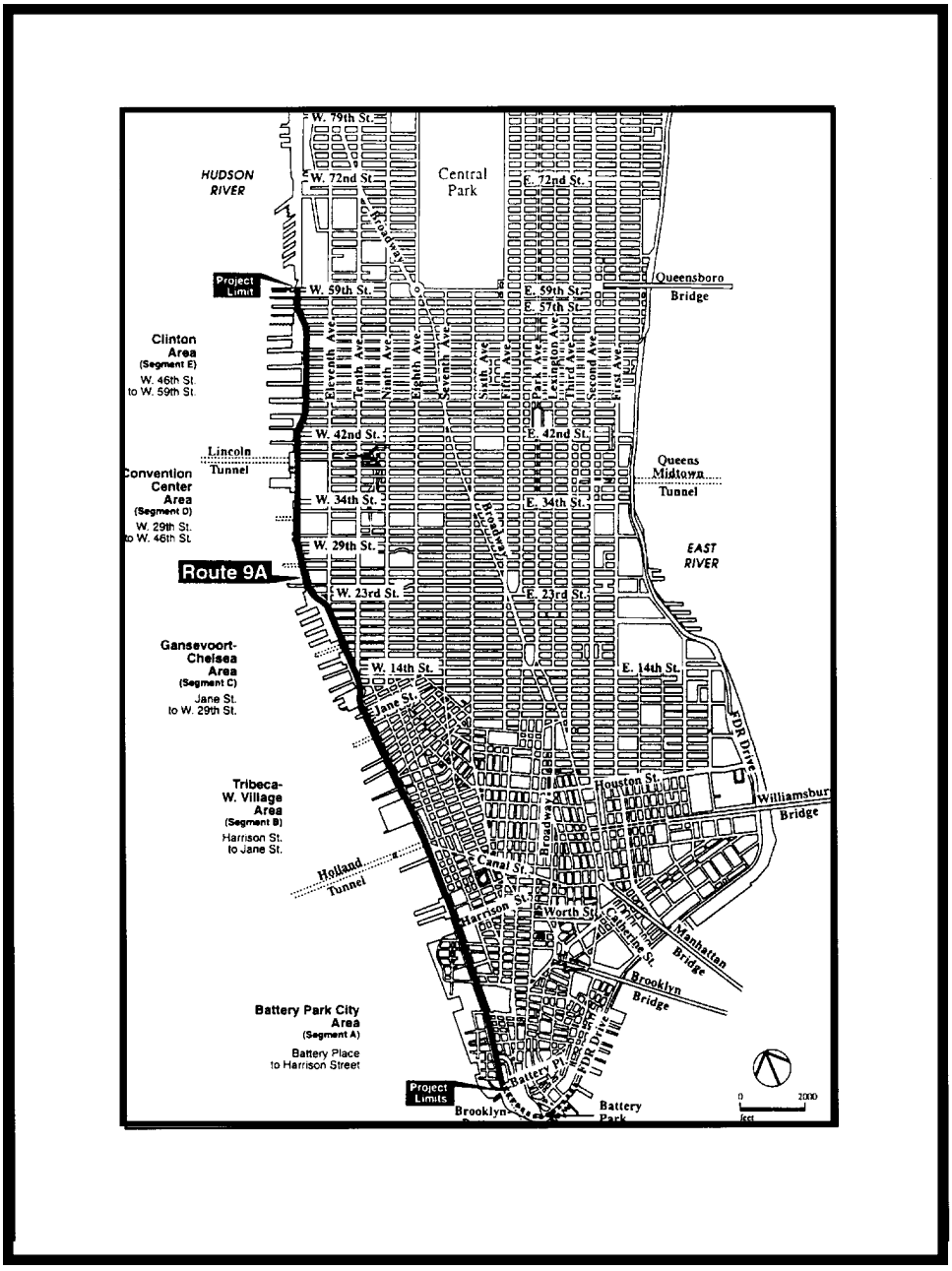
ROUTE 9 RECONSTRUCTION

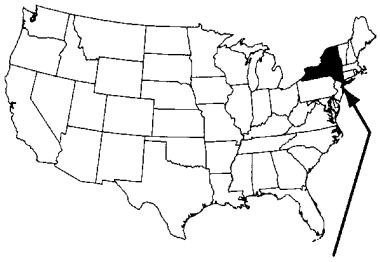
Borough of Manhattan, New York, NY

Aerial view of West Side Highway (looking South), circa 1970.

BACKGROUND/PURPOSE

After more than 20 years of planning and design efforts, the reconstruction of what was formerly known as the West Side Highway has now begun. The project proposes to reconstruct State Route 9A from Battery Place to 59th Street along the western edge of Manhattan. This 5-mile section of roadway lies at the southern end of New York State Route 9A, which begins at the Brooklyn-Battery Tunnel and extends northward for approximately 76 km (47.5 miles), until it merges with U.S. Route 9 in Peekskille, NY in northern Westchester County. Commonly known as West Street, Eleventh Avenue, Twelfth Avenue, the West Side Highway, or the Miller Highway, this portion of State Route 9A plays a vital role in the regional transportation system of the New York metropolitan area.





Location site map

Previously, this portion of Route 9A comprised the West Side Highway, an elevated limited-access roadway originally constructed in the 1930's between the Battery and 72nd Street, and a service road and local service street beneath the elevated roadway terminating at 59th Street. After the collapse of a portion of the elevated roadway in the early 1970's, and in recognition of its overall deteriorated condition, the entire section of highway from the Battery to 59th Street was closed to traffic in 1974. The elevated structure was subsequently demolished in the late 1970's, and the existing at-grade roadway was repaved to serve as an interim roadway until a permanent replacement for the West Side Highway could be constructed.

A proposal originally conceived in the early 1970's for the construction of a sixto eight-lane interstate freeway facility known as Westway, which would have been partly elevated and partly depressed below grade, was withdrawn in 1985. The Westway funds were redistributed to several transportation projects in the

Section of collapsed West Side Highway in 1972.

city of New York, one of which was for the reconstruction of the interim roadway and its improvement into a permanent facility. The primary purpose of the Route 9A reconstruction project is to address the numerous problems and deficiencies associated with the continued use of the interim roadway and to accommodate some of the traffic that was diverted to other streets in the area when the elevated roadway closed.

The Route 9A facility serves a variety of regional, arterial, and local transportation activities and needs. It is an important interconnection between the BrooklynBattery Tunnel, the Franklin D. Roosevelt (FDR) Drive and the East River Bridges via the Battery Park underpass, the Holland Tunnel, the Lincoln Tunnel, and the West Side Highway/Henry Hudson Parkway, which provides access to the George Washington Bridge, the Cross-Bronx Expressway, and points north.

The roadway is a major north-south artery in Manhattan's street grid that serves through movements to and from the borough. It is also a local street that provides vehicular and pedestrian access to the activities, businesses, and residences that line its right-of-way. The roadway also serves important intermodal functions by providing access to three Hudson River ferries, passenger liner terminals, excursion ships, and a heliport, and by serving as the terminus point for five crosstown bus lines.

The existing traffic volumes on the roadway reflect Route 9As importance in the region's transportation system. Route 9A serves regional, arterial, local, and intermodal transportation functions. Average daily two-way traffic volumes range from 69,000 to 81,000 vehicles. With the closure and demolition of the elevated West Side Highway, the New York City DOT estimates that as many as 10,000 vehicles per day have diverted to Manhattan's other north-south routes, further taxing the capacity of these already congested roadways.

At a number of the key intersections along existing Route 9A during peak travel hours, traffic volumes approach or exceed theoretical roadway capacity. At these times, vehicular travel speeds on several segments of the existing roadway have been observed to drop to less than 3 mph (normal walking speed). Clearly, the existing "interim" facility is in need of substantial improvement.

ENVIRONMENTAL AND DESIGN ISSUES AND CONSTRAINTS

In 1987, the city of New York and New York State established a joint West Side Task Force in an attempt to reach a consensus on what action should be taken to replace the deficient interim highway. The task force ultimately developed the concept of creating an at-grade six-lane urban boulevard as the most appropriate solution to the identified problems. The primary goals, objectives, and design principles developed by the Task Force formed the basis for the subsequent Environmental Impact Statement (EIS) and project planning and design phases of the Route 9A project.

The project encompassed the full gamut of issues and concerns associated with providing major improvements to an existing transportation facility in an established urban area. In addition to issues that are typically encountered in major improvement projects, such as potential impact on adjacent land uses (including parks and historic structures) and air quality and noise effects, a number of other considerations were addressed during the project planning and design process. These included the following:

- The degree to which traffic using the facility would intrude into adjacent residential and commercial neighborhoods.
- The appropriate size of the median area.
- The accommodation of pedestrian movements across the highway from the existing developments on the east side to the planned linear park along the Hudson River waterfront.
- Separation of bicycle and pedestrain traffic.
- Access to commercial activities.
- The design of street light standards.

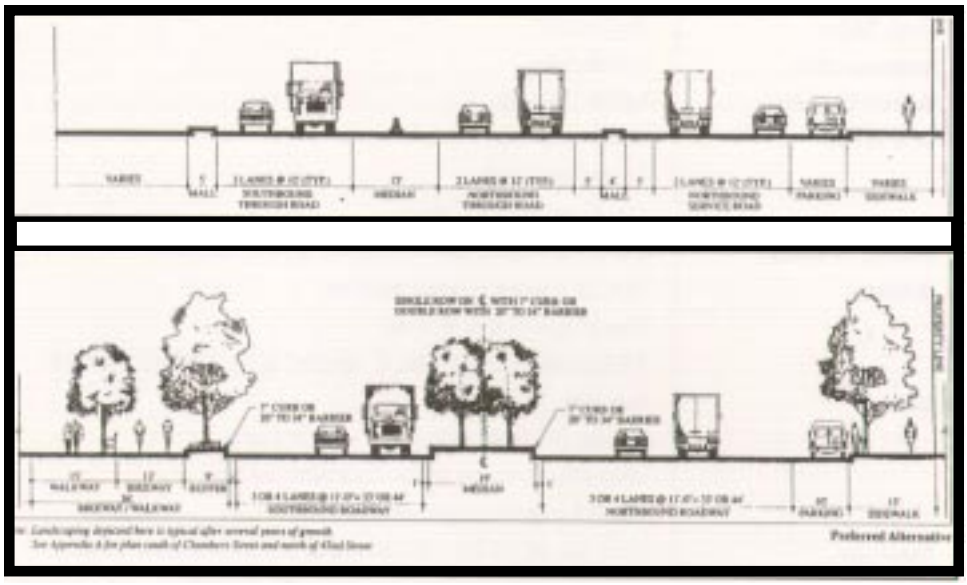
ACTIONS TAKEN TO RESOLVE ISSUES AND CONSTRAINTS

Recommended Design Concept

The alternative ultimately selected through the EIS process is a basic six-lane urban boulevard with three travel lanes provided on either side of a raised, landscaped median. In a few locations, four travel lanes are provided along one side of the median area to better accommodate projected peak-period travel demands.

Existing cross section

Proposed cross section



A distinguishing feature of the final design is the use of barrier curbs that are .50 m to .85 m (20 in to 34 in) high along both sides of the center landscaped median and along the roadway edge with the riverside linear park. This higher harrier curb provides for substantially more soil around each tree and thus allows many more trees in total than would have been possible with a standard .15-m to .20-m (6-in to 8-in) urban curb. The latter curb height will be provided along the more developed east side of the new boulevard.

Existing roadway in vicinity of 34th Street (looking south)

Functional Classification	Principal urban arterial street
Design Traffic Volumes	20-year projection from completion of project construction
Design Speed	40 mph
Level of Service	D (desirable)
Sight Distance	Crest - 275-ft
	Sag - Riding comfort controls
Grades	7% maximum
	5% desirable
Alignment	573-ft minimum radius
Cross Slope	2% (planar)
Superelevation	4% maximum
Vertical Clearance	14.5-ft minimum
Lane Width	11-ft through lane
	11-ft left-turn lane
	1-ft offsets to curb or barrier
Number of Lanes	6 to 8 with turning and acceleration lanes as necessary
Medians	19-ft for mainline at-grade sections
	(face of curb to face of curb)
	4.5-ft minimum for depressed, elevated, and constricted sections
Curbs	East side - 7-in curb
	Median - 7-in curb and/or 20-in to 34-in barrier
	West side - 7-in curb and/or 20-in to 34-in barrier
	Pedestrian ramps at all crosswalks
Shoulders	None, except 2-ft left and 6-ft right on structure at Canal Street
	and in depressed section at 34th and 42nd Streets
	Parking lane east side
Drainage	10-year storm - surface and closed system
	50-year storm - depressed roadway
Border and Sidewalks	15-ft - east side sidewalk, 8-ft where constricted
	15-ft - west side walkway, 8-ft where constricted
	9-ft - buffer area west side of roadway
Parking Lanes	10-ft east side, commercial areas; 8-ft residential areas
Bikeway	12-ft mainline; 8-ft min. where constricted
Street Lighting	Roadway - 1.0 fc (see note)
	Depressed - 5.0 fc
	Tunnels - 50/5 fc, day; 5.0 fc, night
Horizontal Clearance	2-ft from face of curb to fixed objects

Note: fc = footcandle

General design criteria employed on the Route 9A reconstruction project.

The facility will have 3.3-m (11-ft) travel lanes with .30-m (1-ft) offsets from the .50-m to .85-m (20-in to 34-in) barrier curb. The high barrier curb has been crash tested by FHWA Region 15 staff to a speed of 70 kph (45 mph) and is similar to that used on the Washington, DC area parkway system. The curb was selected as an alternative to the use of shoulders, which are preferred in the AASHTO Green Book for a facility of this functional classification and design speed.

The new facility uses a design speed of 65 kph (40 mph) and will have a posted speed limit of 55 kph (35 mph), even though the project's functional classification as a principal urban arterial street would have allowed for a much higher design speed to be used.

Detailed Traffic Analysis

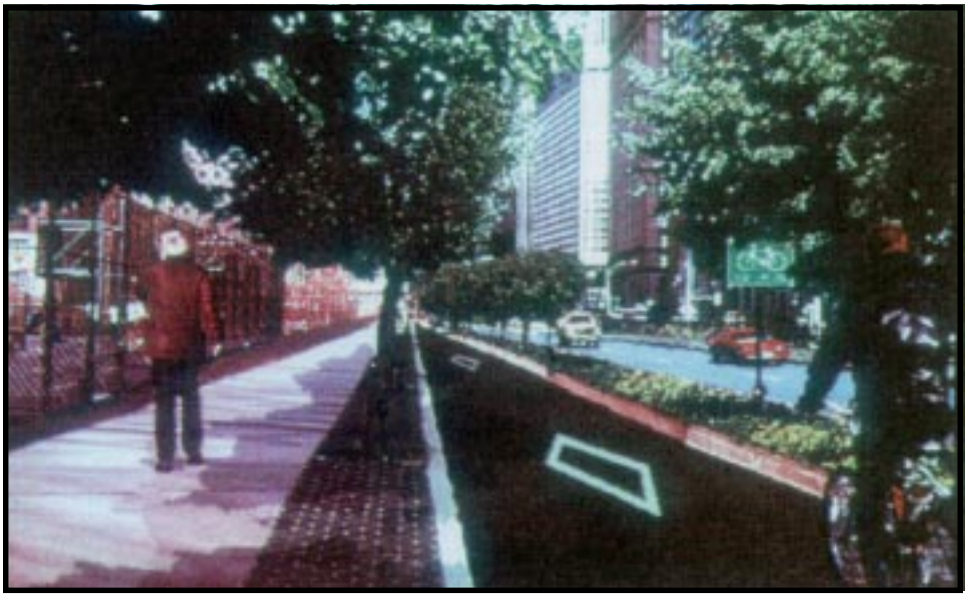
The traffic analysis performed as part of the EIS process was very detailed, and ultimately covered almost all of Manhattan. This analysis determined that virtually none of the users of the highway were traveling over its complete length, but rather using it to gain access to the east-west street system on the island. The road thus operates, both today and in the future, as essentially a collector-distributor system between the Brooklyn-Battery Tunnel on the south and the elevated Henry Hudson Parkway on the north.

To prevent the intrusion of through traffic into adjacent residential areas, a number of the originally proposed median openings will be closed, allowing only right-turn in and right-turn out movements between the northbound boulevard travel lanes and the east-west street system.

Pedestrian Movements

Pedestrian movements back and forth across the highway were examined extensively. Indeed, one of the major design elements of the project is the integration of the highway improvements with the pedestrian crossings to the planned Hudson River Waterfront Park. In addition, a small existing city park at 23rd Street will be greatly expanded (ultimately to encompass more than a full city block) both as a new urban amenity and to provide improved traffic operations in this area.

An associated feature is the use of a "bulb-out" design along the east side of the highway at all intersections to better delineate the curb parking areas and to help minimize the pedestrian crossing distances across the travel lanes. These designs will be closely coordinated with the pedestrian crossing points on the landscaped median.



Computer-generated illustration of separated pedestrian promenade and bicycle pathway along the river side of reconstructed Route 9A.

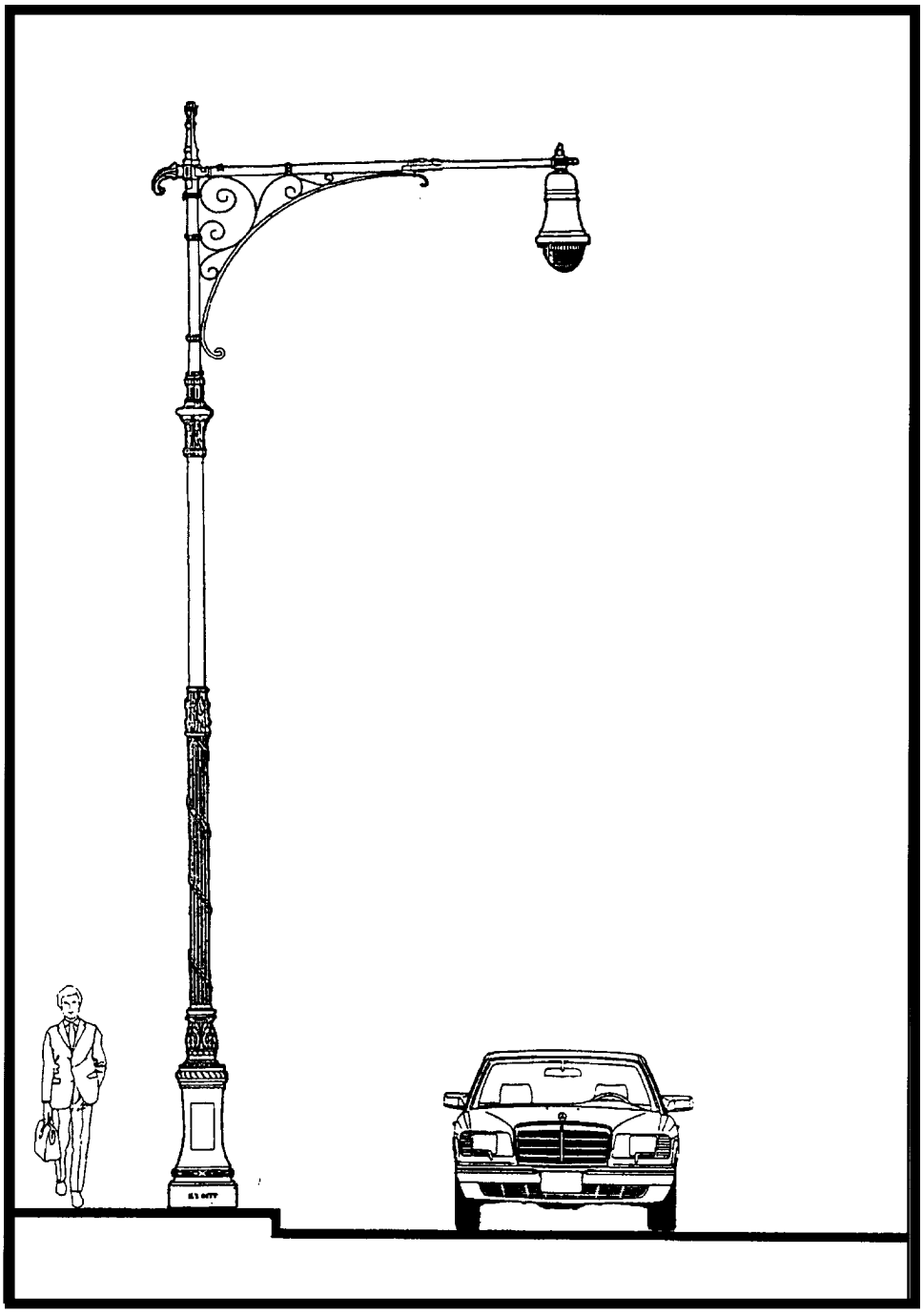
Separation of Pedestrian and Bicycle Traffic

In this part of Manhattan, as in many urban areas, there are significant conflicts between pedestrians and bicyclists. A design element incorporated to alleviate this conflict along the river side of the boulevard is the provision of a separate 4.9-m-wide (16-ft) bikeway for use by bicyclists and roller-bladers (both recreational and commuter) and a parallel 4.6-m-wide (15-ft) pedestrian pathway-promenade.

The Street Light Design Issue

As the design concept moved into the formal preliminary and final design phases, a major issue that was successfully resolved concerned the design of the street lights along the project. The design of the standard New York State Department of Transportation (NYSDOT)/city of New York steel street light pole was deemed by community representatives to be out of keeping with the overall urban boulevard concept.

After some additional research, it was discovered that the light poles that were being used in the privately developed Battery Park West (a mixed-use office/retail/residential development) were replicas of a design originally found throughout the city of New York in the early part of this century. This replica design is being incorporated along the length of the project.



Unique street light design enhances aesthetics.

Other Notable Design Elements

No formal design exceptions were requested for this project by the New York State DOT. All the design elements are within AASHTO allowable ranges. Some of the special elements that have been incorporated into the final design of the project include the following:

- Compatibility with the Hudson River Park Conservancy in terms of paving materials, dimensions of paving and planting strips, plant materials, and other elements.

- Reuse of existing granite paving blocks found along the waterfront area as edge treatments between the separate bicycle and pedestrian paths.

- Use of mixed plant materials (grass, shrubs, and trees) in the median area, as opposed to use of all trees or all grass, to better reflect the character of the adjacent land uses along each segment of the highway.

LESSONS LEARNED

This project has the potential for widespread application across the Nation as an illustration of the manner in which a collaborative, multidisciplinary planning and design process, incorporating a high level of continuous public involvement, can result in the creation of a world-class street design.

It also illustrates how detailed investigations of travel demand and traffic movement patterns can result in a dramatic change in the scale of the proposed improvement, from a six- to eight-lane elevated urban freeway to a six-lane urban boulevard with a design speed of 65 kph (40 mph).

STATE ROUTE 9A AT A GLANCE

Setting:	Midtown Manhattan, New York, NY
Length:	8.2 km (5.1 miles)
Traffic Volume:	At 59th Street - northern project limits 3,600 vehicles per hour (1988 AM peak hour, peak direction) 3,750 vehicles per hour (1998 AM peak hour, peak direction) 3,900 vehicles per hour (2018 AM peak hour, peak direction)
Design Speed:	65 kph (40 mph)
Type of Road:	6- to 8-lane, median-divided urban principal arterial street
Design Cost:	$18 million (1994 estimate)
Construction Cost:	$380 million (1994 estimate), including engineering design, construction supervision, right-of-way, and inflation
Key Design Features:	Use of lowered design speed to mitigate right-of-way impact and to reflect urban character of surrounding development; use of high barrier curbs along both sides of center-landscaped median and along roadway edge with riverside linear park; treatment of pedestrian crossing areas; provision of separate pathways for bicyclists and pedestrians
Debits:	None reported
Similar Projects:	West Main Street, Westminster, MD Carson Street, Torrance, CA
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