NEW YORK CITY DEPARTMENT OF TRANSPORTATION

SAFE STREETS NYC

DEPT OF TRANSPORTATION

Traffic Safety Improvements In New York City

MICHAEL R BLOOMBERG
MAYOR

APRIL 2006

IRIS WEINSHALL
COMMISSIONER

SAFE STREETS NYC:

Traffic Safety Improvements In New York City

April 2006

DISCLAIMER: The preparation of this report was funded by the Federal Highway Administration of the United States Department of Transportation and the New York State Department of Transportation. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or New York State Department of Transportation. This document is disseminated by the New York City Department of Transportation in the interest of information exchange. This report does not constitute a standard, specification or regulation.

Note:

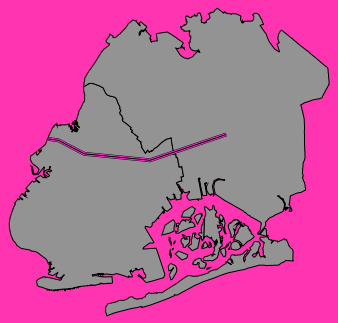
All new content since the last publication of this report (December 2004) is identified by ***red italicized and bold fonts.***

TABLE OF CONTENTS

CITYWIDE INITIATIVES 223

Brooklyn/Queens

Mayor Bloomberg and Commissioner Weinshall announce Atlantic Avenue Improvements



Atlantic Avenue Safety Improvements
(Brooklyn and Queens)

Description

Atlantic Avenue is a primary local arterial roadway that connects the Brooklyn waterfront and the Brooklyn-Queens Expressway on the west with Conduit Avenue and the Van Wyck Expressway in Queens to the east. Atlantic Avenue is one of the major truck routes in Brooklyn as it traverses the entire borough along an east-west direction.

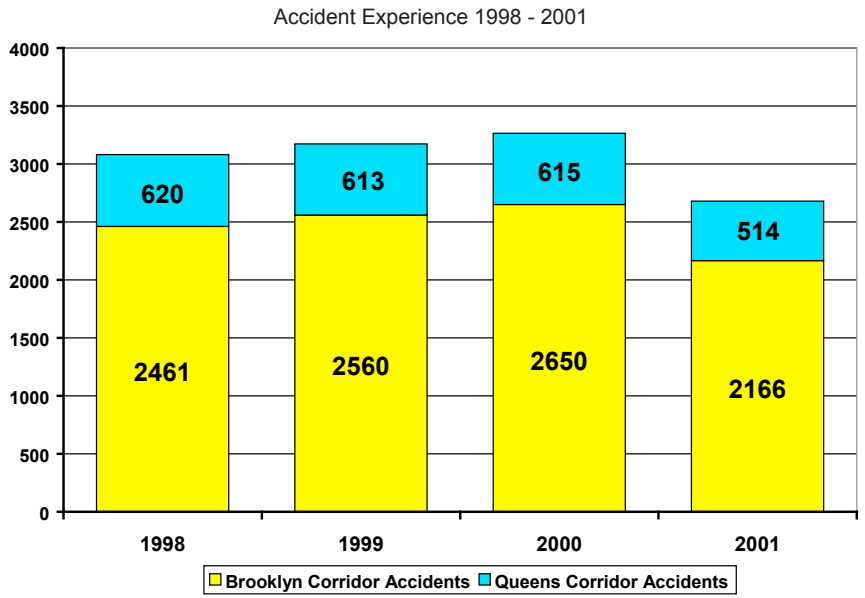
For the most part, the Atlantic Avenue corridor ranges between four and six moving lanes with two parking lanes. Several portions of the roadway also have a raised center median separating the roadways. In Brooklyn, land use along the Atlantic Avenue corridor is heavy with a bustling mix of residential and commercial land uses. In areas with a heavy concentration of land uses, such as the area in the vicinity of the Atlantic Avenue Long Island Rail Road Station (LIRR), there is a high convergence of pedestrians and vehicles. These contribute to high pedestrian volumes at several intersections and conflicts between motorists and pedestrians. These same conflicts are also apparent at locations where schools, high-density residential developments and commercial land uses are prevalent.

In Queens, adjacent land uses are primarily lower density residential developments with some industrial and commercial development along the corridor. There are also several public facilities such as schools and religious institutions along Atlantic Avenue especially between Woodhaven and Rockaway Boulevard.

Traffic volumes in both Queens and Brooklyn are high, with both a high volume of passenger vehicles and trucks as Atlantic Avenue is a major truck route for Brooklyn. There are also several bus lines which

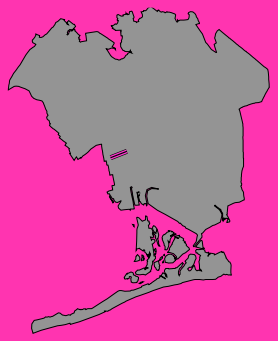
travel along this corridor.

Another factor which contributes to safety concerns is the elevated train structure carrying the LIRR. This elevated train structure created unusual roadway geometries due to its placement over the entire roadway. Along this segment of the Atlantic Avenue corridor, vehicles are required to access a dedicated turning lane located on the inside of the elevated columns, while the primary travel lanes are located on the outside of the elevated columns. Left turns are problematic due to the limited sight distances and conditions created by the elevated columns.



In terms of the overall accident experience along the entire Atlantic Avenue corridor, accidents steadily increased between 1998 and 2000 before decreasing dramatically in 2001.

In 1998, the entire Atlantic Avenue Corridor experienced 3,080 accidents. When broken down by borough, Brooklyn accounted for 2,461 accidents (12th Citywide) and Queens, 620 accidents (95th Citywide). In 1999, the entire corridor experienced 3,173 accidents. By borough, Brooklyn accounted for 2,560 accidents (10th Citywide) and Queens, 613 accidents (97th Citywide). In 2000, the entire corridor experienced 3,265 accidents. By borough, Brooklyn accounted for 2,650 accidents (10th Citywide) and Queens accounted for 615 accidents (105th Citywide). In 2001, the entire corridor experienced 2,680 accidents. By borough, Brooklyn accounted for 2,166 accidents and Queens accounted for 514.



Atlantic Avenue
Woodhaven Boulevard to Rockaway Boulevard

Implemented Improvements - Queens

Beginning in the mid 1980's, the Department performed a considerable amount of work to enhance vehicular and pedestrian safety along the Atlantic Avenue Corridor in Queens. These improvements have achieved considerable success and the Department continues to study and implement additional improvements along the corridor.

In 1987, the Department, in response to elected officials and community concern, initiated a safety study on Atlantic Avenue in the vicinity of Woodhaven and Rockaway Boulevards. The accident history in Atlantic Avenue at the time was not unusual for the volume of traffic, except for a series of three fatal crashes in 1987 which resulted in five fatalities. These accidents were attributed to alcohol abuse, red light violations, and high rates of speed.

In this area, Atlantic Avenue consisted of eight lanes (six moving and two parking), and a ten-foot wide raised center median. The roadway measured 90 feet in width. Adjacent land use was primarily low-density residential, along with dispersed civic institutions such as schools and churches.

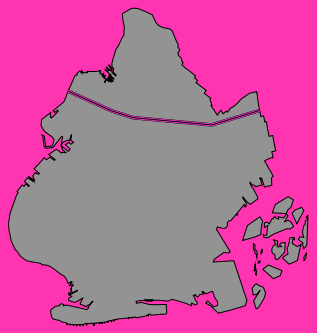
As part of its study, DOT and the NYPD initiated an aggressive safety campaign. Several immediate issues such as the installation of safety-related signs and increased summons activity took place. From October 1987 to March 1988, nearly 4000 summonses were issued (of which 500 were for red light violations), and 65 traffic signs were installed.

In addition, the department implemented a major capital improvement project to widen the center mall and provide for left turn bays. These improvements narrowed the roadway to two travel lanes and the turning bays reduced conflicts and rear-end accidents. The narrowed roadway also provided for reduced passing and weaving maneuvers. The medians also provide pedestrian refuge areas and reduced crossing distances for pedestrians.

These improvements led to a dramatic decrease in the number of accidents. In 1988, this corridor had 468 total accidents. By 1992, the number had decreased to 360 total accidents. Average travel speeds also decreased. By 2001, accidents along this corridor had fallen to 129, a 72% decline over the 9 year period.

Additional improvements have included the upgrade of eight inch red signal lenses to twelve inch lenses for improved visibility at all problem locations.

In November 2003, a left turn signal was installed at Atlantic Avenue and Lefferts Boulevard.



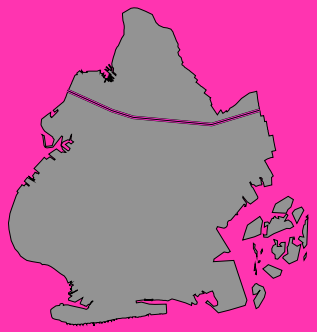
Atlantic Avenue
Brooklyn Corridor

Implemented Improvements – Brooklyn

In Brooklyn, Atlantic Avenue serves as a vital primary east-west arterial, as it connects the Brooklyn waterfront with interior portions of the borough, as well as serving as a through truck route. As such, there are heavy vehicular and pedestrian volumes along most of the corridor.

- Beginning in calendar year 2000, several improvements were implemented at the following intersections:
    - Atlantic and Saratoga Avenues – A left turn phase for westbound Atlantic Avenue [March 2000]
    - Atlantic and Troy Avenues – Exclusive left turn phase for eastbound Atlantic Avenue [March 2000]
    - Atlantic Avenue and 96th Street (Queens) – A new traffic signal [September 2000]
    - Atlantic Avenue and Clinton Street – A Leading Pedestrian Interval to cross Atlantic Avenue [November 2000]
    - Atlantic and Vanderbilt Avenues – Left turn phases for both westbound Atlantic Avenue and northbound Vanderbilt Avenue [May 2002]
    - Atlantic and Brooklyn Avenues – Exclusive left turn phase for westbound Atlantic Avenue [May 2002]
    - Atlantic and Rockaway Avenues – A dual left turn phase for both directions of Atlantic Avenue [December 2002]
    - Atlantic and Classon Avenues – A left turn phase for eastbound Atlantic Avenue [April 2002]

    - Atlantic Avenue and Logan Street - A left turn phase for westbound Atlantic Avenue [April 2003]
- The Department installed exclusive left turn signal phases at various locations where the east and westbound roadways are separated by the elevated train structure. Vehicles making left turns are forced to do so from under the El structure with limited sight distances. The following locations were modified in August 2003 (except as noted) so that left turns are made only on an exclusive phase:
    - Atlantic and New York Avenues [eastbound left turn phase]
    - Atlantic and Schenectady Avenues [westbound left turn phase]
    - Atlantic and Utica Avenues [dual left turn phase]
    - Atlantic and Rochester Avenues [dual left turn phase]
    - Atlantic and Buffalo Avenues [dual left turn phase]
    - Atlantic and Kingston Avenues [eastbound left turn phase] (December 2003)
    - Atlantic and Albany Avenues [westbound left turn phase] (December 2003)
- Refurbished the crosswalks at the following intersections in June 2004:
    - Logan Street
    - Highland Place
    - Essex Street
    - Linwood Street
    - Ashford Street
    - Hendrix Street
    - Van Siclen Avenue
    - Miller Avenue
    - Bradford Street
    - Wyona Street
    - Vermont Street
    - New Jersey Avenue
    - Pennsylvania Avenue



Atlantic Avenue
Safety Study

In September 2004, the Department began a consultant study to develop plans to improve vehicular and pedestrian conditions along the 2.2 mile stretch from Pennsylvania Avenue in Brooklyn to Rockaway Boulevard in Queens. The primary objectives of this study was to reduce pedestrian and vehicular crashes. This portion of Atlantic Avenue is characterized by medium to high density residential land use that experience a high volume of traffic, including significant numbers of trucks. Additionally, a large number of pedestrians cross Atlantic Avenue enroute to train stations, schools and adjacent commercial land uses.

The consulting firm, Gannett Fleming Engineers and Architects, has developed traffic safety improvements to minimize pedestrian and vehicular crashes on Atlantic Avenue. The results of the study are incorporated in a Preliminary Design Investigation (PDI) completed in October 2005.

The study identified 38 intersections having had six or more crashes within the two-year analysis period. The estimated cost of the proposed improvements is $17.6 million.

The proposed improvements include a median widening similar to the improvements constructed in the adjacent section of Atlantic Avenue, east of Rockaway Boulevard. The proposal would reconfigure Atlantic Avenue from three travel lanes and one parking lane in each direction to two travel lanes and one parking lane. However, on the segment from Pennsylvania Avenue to Logan Street (the most heavily traversed section of Atlantic Avenue), the parking lane would be used during peak times as a travel lane. The number of travel lanes would be increased from

two to three during the weekday AM and PM peak periods in the peak direction only (westbound in AM, eastbound in PM).

Specific improvements include:

- *Widening of the raised center median on Atlantic Avenue from the existing 10 feet to an 18 foot wide median from Pennsylvania Avenue to Logan Street providing a larger pedestrian refuge area and reduced vehicle speeds.*
- *A 24 foot wide median on Atlantic Avenue from Euclid Avenue to Rockaway Boulevard to provide a larger pedestrian refuge area.*
- *The new medians would be installed with 11 inch steel faced concrete curbs to replace severely worn curbing.*
- *Left turn bays at fourteen signalized intersections to improve traffic operations and safety.*
- *New traffic signals at the intersections of Atlantic Avenue and Ashford Street, Essex Street and Milford Street.*
- *Installation of secondary overhead signal heads to improve visibility of signals for motorists.*
- *Reduced signal offsets to a progression speed of 30 mph.*
- *Installation of a 4 feet high pedestrian barrier (fence) at eight locations along the median to discourage mid-block crossing and increase pedestrian safety.*
- *Prohibition of westbound left turns at Logan Street, diverting traffic to Milford Street.*
- *Restrictions on curbside parking (daylighting) within 30 feet of selected intersections to increase the visibility of pedestrians and motorists.*
- *Installation of overhead mounted signs near the Atlantic Avenue and Conduit Avenue interchange to better guide traffic.*

Citywide Initiatives

Citywide Oversized Street Name signs

Background

The Department has committed to installing oversized street name signs on most of the heavily traveled corridors throughout the five boroughs. These street name signs, typically mounted on a signal mast arm, allow motorists to easily identify cross streets on major roadways. Generally, these signs measure 16” high and between 72” to 96” in length.

These signs serve to assist motorists to easily identify cross streets on wide urban arterials. For most motorists, reading street names on corner posts is difficult or impossible. These signs help the motorist identify the street and reduce speed accordingly to facilitate turning movements.

This program has been conducted in two phases. Beginning in 2003, dozens of corridors citywide began to receive these improvements at select intersections. By December 2004, approximately 1,000 signs had been installed as part of Phase I of the Oversized Street Name Sign Program. Phase II expanded the program to install an additional 1,500 signs on new arterials and along intermediate locations on arterials where such signs were previously installed. The following list identifies many of the corridors where oversized signs have been placed. As of January 2006, nearly 2,200 total signs have been installed during Phases I and II of the program. This includes 204 signs in the Bronx, 308

in Brooklyn, 305 in Manhattan, 1080 in Queens and 303 in Staten Island.

Primary corridors which recieved this treatment include the following:

Bronx

- *Grand Concourse*
- *East Tremont Avenue*
- *Bruckner Boulevard-North and South Service Roads*
- *Baychester Avenue*
- *Williamsbridge Road*
- *Castle Hill Avenue*
- *Morris Park Avenue*
- *Pelham Parkway*
- *Webster Avenue*
- *Melrose Avenue*
- *Willis Avenue*
- *3rd Avenue*
- *Boston Road*
- *Eastchester Avenue*
- *Randall Avenue*
- *Leggett Avenue*
- *East Bay Avenue*
- *Bronx Park East*
- *Barnes Avenue*
- *Hunts Point Avenue*
- *East Gun Hill Road*
- *Claremont Parkway*

Brooklyn

- *Eastern Parkway*
- *Kings Highway*
- *Flatbush Avenue*
- *Ocean Parkway*
- *86th Street*
- *Atlantic Avenue*
- *Empire Boulevard*
- *Coney Island Avenue*
- *Ocean Avenue*
- *Fulton Street*
- *Flatlands Avenue*
- *Pennsylvania Avenue*
- *Utica Avenue*

- *Church Avenue*
- *Avenue U*
- *Grand Avenue*
- *Third Avenue*
- *Fourth Avenue*
- *Fifth Avenue*
- *Thomas S. Boyland Street*
- *Bay Ridge Parkway*
- *Ocean Parkway*
- *North Conduit Avenue*
- *Stillwell Avenue*

Manhattan

- *Houston Street*
- *23rd Street*
- *West Street*
- *125th Street*
- *Chambers Street*
- *Canal Street*
- *14th Street*
- *57th Street*
- *72nd Street*
- *79th Street*
- *86th Street*
- *96th Street*
- *116th Street*
- *145th Street*
- *Cathedral Parkway / Central Park North*
- *West 60th Street*
- *West 81st Street*
- *East 85th Street*

Queens

- *Northern Boulevard*
- *Long Island (Horace Harding) Expressway North and South Service Roads*
- *Astoria Boulevard*
- *Metropolitan Avenue*
- *Hillside Avenue*
- *Grand Central Parkway North and South Service Roads*
- *North Conduit Avenue*
- *South Conduit Avenue*
- *21st Street*
- *Francis Lewis Boulevard*
- *Lefferts Boulevard*
- *Bell Boulevard*

- *Queens Boulevard*
- *Woodhaven Boulevard/Cross Bay Boulevard*
- *Union Turnpike*
- *Utopia Parkway*
- *Main Street*
- *Beach Channel Drive*
- *Broadway*
- *Steinway Street*
- *Ditmars Boulevard*
- *30th Avenue*
- *31st Avenue*
- *Grand Avenue*
- *College Point Boulevard*
- *Rockaway Boulevard*
- *Guy R. Brewer Boulevard*
- *108th Street*
- *14th Avenue*
- *164th Street*
- *20th Avenue*
- *21st Avenue*
- *Kissena Boulevard*
- *Little Neck Parkway*

Staten Island

- *Richmond Avenue*
- *Morningstar Road*
- *Victory Boulevard*
- *Richmond Terrace*
- *Hylan Boulevard*
- *Hugenot Avenue*
- *Woodrow Road*
- *Arden Avenue*
- *Amboy Road*
- *Bay Street*
- *Richmond Hill Road*
- *Richmond Road*
- *Forest Avenue*
- *Clove Road*

Improving Safety At Intermodal Transit Stations/Bus Stops Under the El

Background

Throughout the city, numerous subway lines run above grade on elevated structures. Typically, these structures, generally know as an “el” are supported by large metal columns pillars often situated within the roadway, which creates irregular street geometry. This situation is exacerbated at intermodal transfer locations where bus stops are located underneath the transit station. In total, there are 42 stations with these characteristics, 32 of which are located in the Bronx, five in Brooklyn and five in Queens.

At these locations, a high volume of pedestrians move between the elevated train structures to bus lines which parallel or intersect the train line. In addition, these stations are usually located along commercial corridors which contribute to additional vehicular and pedestrian traffic.

Building upon these concerns, the Department has embarked on a project in conjunction with the New York City Department of City Planning to improve pedestrian and vehicular circulation around the entrances to subway stations, as well as improving safety and security. Overall, this project, entitled “Subway-Sidewalk Interface” seeks to utilize a variety of tools that should mitigate the safety concerns at these locations. Types of treatments that may be proposed include signage, lighting, signal timing adjustments, pavement markings and other engineering improvements.

Buses using both the curb and travel lane to pick-up-discharge passengers at East 233rd Street

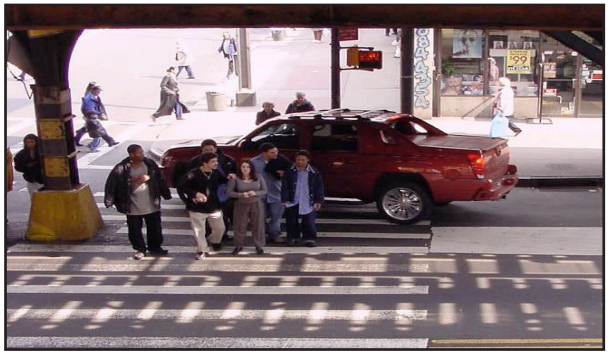
Primary Safety Concerns

While each of the subway locations are unique, there are general characteristics that are prevalent at all locations that contribute to problems at these locations.

Vehicular Concerns

Above: Truck deliveries frequently block all travel lanes leading to unsafe conditions at Burnside Avenue and Jerome Avenue.

Below: shadows from elevated structure and pedestrians waiting for the bus in the roadbed at Broadway and West 231st Street



Because of the placement of support columns in the roadway, there is insufficient roadway width for two lanes of traffic in each direction, but too much roadbed for one lane in each direction. Typically, the roadway underneath the elevated structures is comprised of two 12' moving lanes situated within the pillars and two 15' parking/ other lanes on the outside or curbside of the pillars. The excess roadbed has a variety of uses; turn lanes, loading and unloading, weaving, travel lane and bus stop loading and unloading. This alignment is especially problematic for through vehicle movements around these bus stops. Finally, buses are unable to access the curb at these stops due to the placement of the columns, causing them to stop within the travel lane and delay traffic behind them.

An additional problem created by the elevated structure relates to visibility. During all hours of the day, visibility is compromised due to the elevated structure. This includes blocked sunlight, shadows and glare, as well as the columns themselves blocking the visibility of pedestrians and vehicles. During the evening, poor lighting and shadows impede vision for both vehicles and pedestrians.

Additional concerns that are common at these locations include vehicular double parking, trucks loading and unloading at the curbside and in the space between the pillars. Signage is also problematic, in that the overhead structure contributes to

difficulty in identifying signs. Contaminates from the subway and dust cause signs to become dirty and difficult to see.

Pedestrian Concerns

Given these stations role as intermodal transfer facilities and their locations in commercial corridors, there is a high volume of pedestrian activity moving through these intersections. These volumes and the associated problems caused by the columns create numerous unsafe pedestrian conditions. One of the most critical issues relates to pedestrians exposure to traffic, especially while waiting at the bus stops. At most of these locations, buses are unable to access the curb and pedestrians are forced to wait, enter and exit the bus in the roadbed. This bus stop location offers the pedestrian little or no protection from moving traffic within and outside of the columns. This problem is exacerbated in areas where turning vehicles weave through the bus stop to make turns or proceed around the bus.

Another pedestrian concern involves the movement of pedestrians across these streets. At most locations, the stairways from the elevated platform does not land at the corner of the intersection. This causes pedestrians traveling through the intersection to "cling" to the closest set of columns and wait to cross the street within the roadbed, as opposed to within the designated crosswalks. In addition, pedestrians also suffer from the same visibility concerns as motorists, which includes the lack of natural light during the day and shadows at night.

Vehicles tend to weave around buses when picking-up discharging passengers leading to conflicts

Pedestrians waiting for bus in roadbed at Bay Parkway and 86th Street

Unusual alignment and poor weather present difficulties for users, especially handicapped, wheelchair users which must board at back of bus. This image is at Morrison Avenue and Westchester Avenue.

Agency Response

Given these safety concerns, the Department has embarked on an ambitious program to address the pressing needs of motorists and pedestrians at these locations. As part of these efforts, DOT has begun to explore the adoption of a policy that systematically takes into account the following criteria:

- Pedestrian safety;
- ADA accessibility;
- Traffic flow;
- New York City Transit Authority/MTA Bus requirements; and
- Economic feasibility.

Based upon the above criteria, the Department has identified three possible alignment alternatives to mitigate the safety issues at these locations. These treatments vary in the amount of intervention required at each location, as well as overall costs. In some cases, examples of these treatments may already exist at locations throughout the city. The proposed alignment alternatives include:

- Construction of Refuge Island
- Installation of Raised Median with Guard Rail or Flexible Bollards
- Construction of Full Neckdown

As mentioned previously, there are both benefits and disbenefits to each of these proposed treatments. Based upon the unique physical characteristics at each of the 42 locations, each location may require tailored treatments.

Bus Stops Under the El Pilot Program

Given that many of the recommendations are site specific, in 2003 the Department set out to determine the suitability and performance of some of the proposed treatments. As such, the Department installed treatments at two locations citywide in 2004, Bay Parkway and 86th Street in Brooklyn and Jerome Avenue and Burnside Avenue in the Bronx.

In 2005, designs were completed for two new locations - Broadway at West 231st Street and White Plains Road at East 233rd Street, both in the Bronx. However, work could not be completed at these locations because of other construction activities in the area.

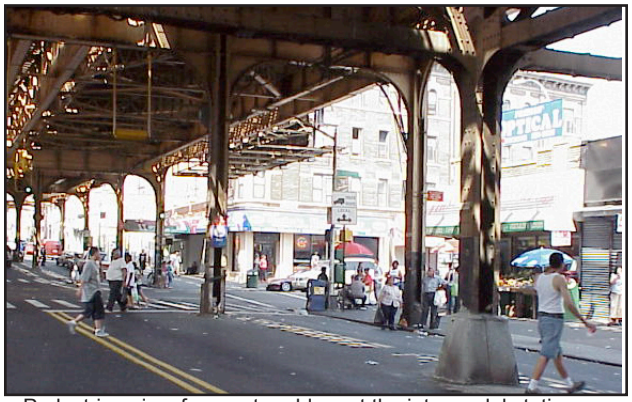
In 2006, DOT completed designs for three additional locations. These include:

- ***39th Avenue at 31st Street - Queens***
- ***36th Avenue at 31st Street - Queens***
- ***86th Street at 20th Avenue - Brooklyn***

The following details the improvements made at the two locations completerd in 2004.

Jerome Avenue/ Burnside Avenue

Bus Stops Under The El



Pedestrians is a frequent problem at the intermodal stations, due in part to commercial activity and changes between modes

Winter weather presents difficulty for motorists and pedestrians as snow removal is difficult due to the roadway alignment and columns. Bus riders are forced to wade through these conditions

Description

The intersection of Jerome Avenue and Burnside Avenue is a major multi-modal intersection under the elevated subway station. This intersection and corridor is characterized by the large metal pillars supporting the elevated station or “el”, which is situated over Jerome Avenue. These columns contribute to unusual street geometry as the columns divide the roadway into narrow driving lanes inside the columns, with a wide parking lane outside the columns.

As an intermodal facility, three bus lines, the 4 subway line and numerous for-hire vehicles provide public transportation at this intersection. The Bx 32 operates north-south along Jerome Avenue, and both the Bx 40 & 42 operate along Burnside Avenue. These transit lines contribute to heavy activity as commuters transfer between the subway and other transit modes. While the intermodal movements contribute to heavy pedestrian volumes, both Burnside and Jerome Avenues are busy commercial corridors characterized by a high number of pedestrians and vehicles traversing and parking in the area.

In its original configuration, the bus stop was located within the roadbed, without any roadway markings or physical protection from vehicles. This configuration forced pedestrians to wait, load and unload in the roadbed. In addition, the placement of the landing of the stairways from the elevated station situated pedestrians away from the

corner. This contributed to pedestrians venturing to the nearest set of columns and crossing the street within the roadway instead of at the crosswalk.

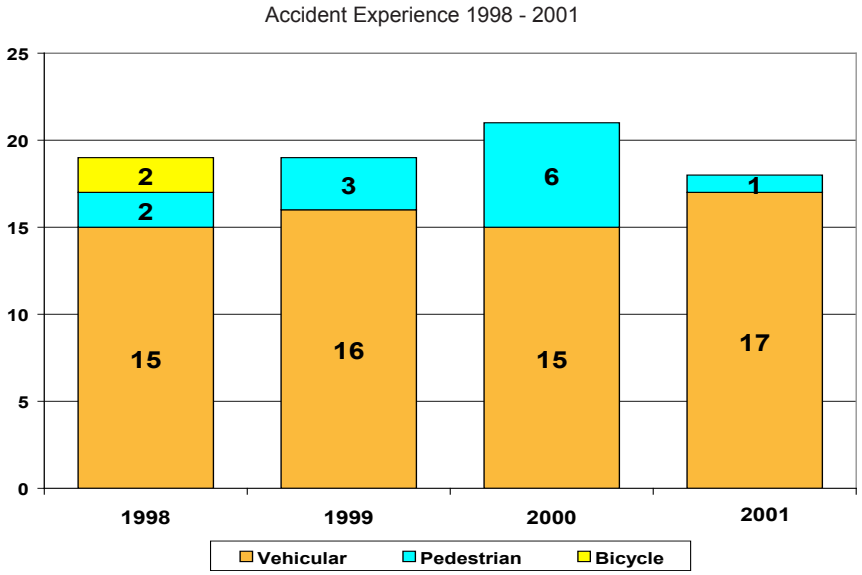
For vehicles, the excess roadbed along the curbside was used for a variety of uses depending on motorist behavior and the presence of a stopped bus in the travel lane. These uses included a right turn lane, a weaving lane and a travel lane. In addition, commercial vehicles sometimes used the lane for loading and unloading.

This location also experiences poor lighting during both the daytime and evening hours due to the blocked sunlight, shadows and glare which is caused by the elevated structure. These factors contribute to impeding motorists and pedestrian visibility.

Double parked livery cabs frequently fill bus stops looking for passengers

Another concern at this location that affected both pedestrian and vehicular safety included double parking along both Jerome and Burnside Avenues. Due to the high amount of commercial activity on these streets, this was a frequent problem.

In terms of the accident experience at this location, between 1998 and 2001 vehicular accidents remained fairly consistent. In 1998, there were a total of 19 accidents, two of which involved pedestrians and two that involved cyclists. In 1999, total accidents remained at 19, with 16 vehicular and three pedestrian accidents. In 2000, total accidents increased slightly to 21, while pedestrian accidents doubled to six from three in 1999. In 2001, total accidents declined slightly to 18, however, pedestrian accidents decreased to one. ***There have been no fatalities between 1998 and 2005 at this intersection.***



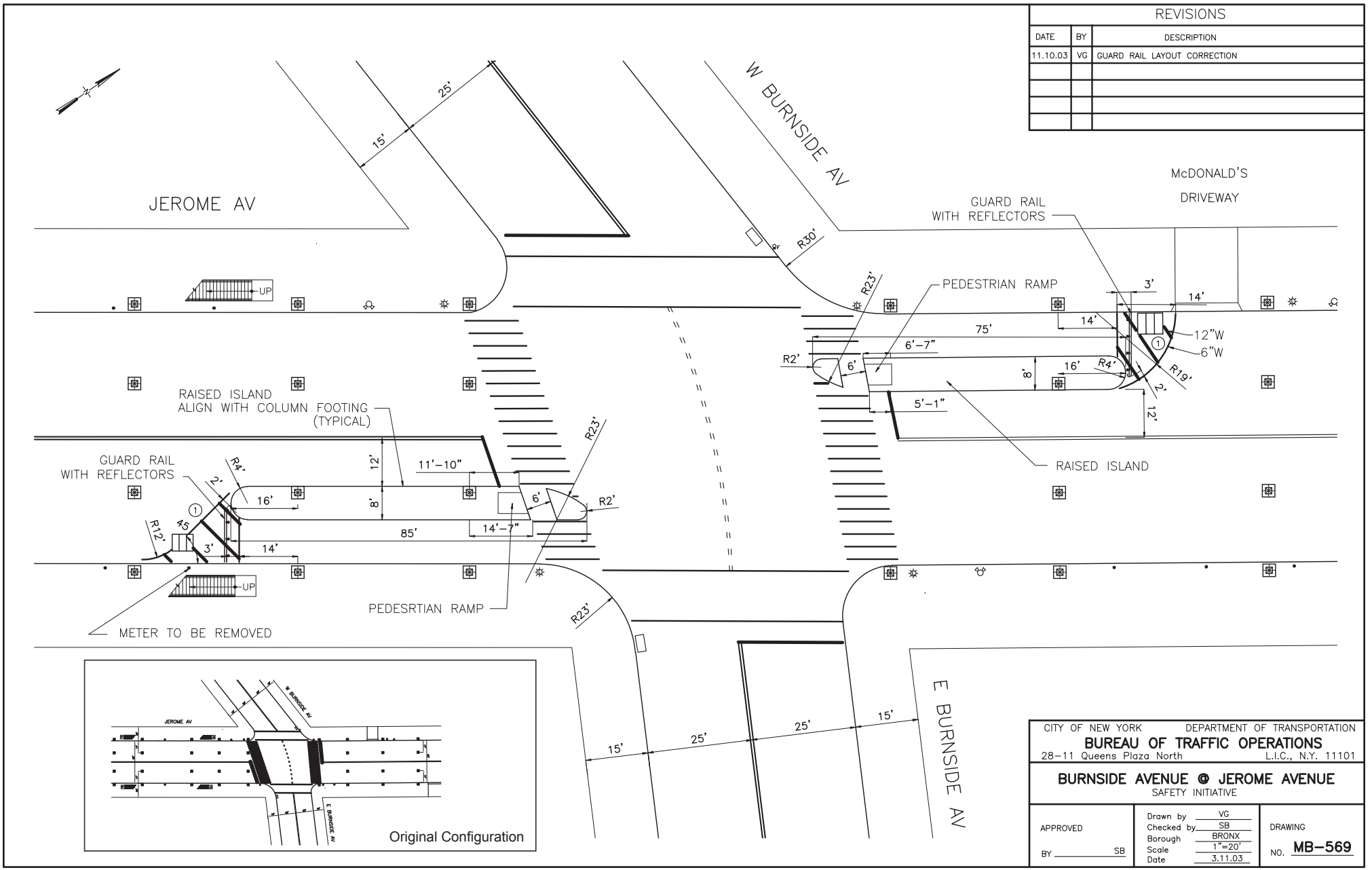
Improvements Implemented in December 2003

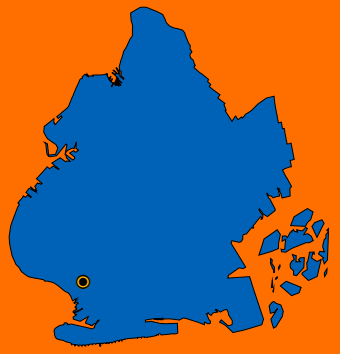
As a short term improvement, the Department constructed two concrete refuge islands in December 2003. These raised islands, 75 feet in length on the northwest corner and 85 feet on the southwest corner are aligned with the column footing and are 8 feet in width. In addition to providing the raised median, the Department also installed guardrails with reflectors that limited vehicles from accessing the lane between the sidewalk and the new refuge island. These treatments reduced the pedestrians exposure to vehicles while waiting for the bus and provided additional refuge for pedestrians waiting to cross the street.

The raised median and guardrails provide a safe, dedicated environment for pedestrians waiting for the bus. One issue relating to the design is the tendency for garbage to accumulate in the area that is closed off.

In the long term, the installation of a full neckdown would provide full pedestrian protection, increase the available sidewalk space for bus shelters and requires little maintenance. These neckdowns would be installed only with a full reconstruction of the roadway.

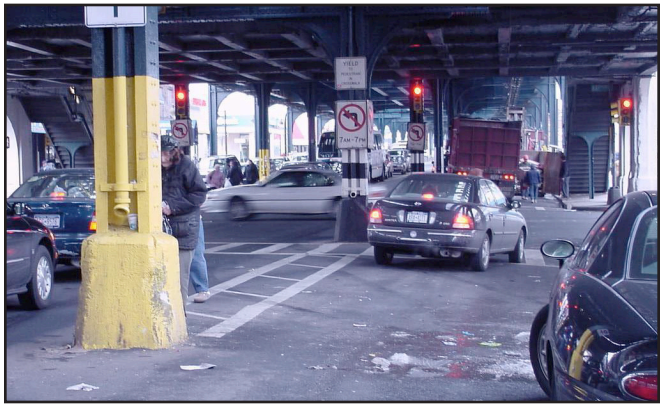
The improvements are shown on the following page.


REVISIONS
DATE | BY | DESCRIPTION
11.10.03 | VG | GUARD RAIL LAYOUT CORRECTION
JEROME AV
W BURNSIDE AV
E BURNSIDE AV
McDONALD'S
DRIVEWAY
GUARD RAIL
WITH REFLECTORS
PEDESTRIAN RAMP
RAISED ISLAND
ALIGN WITH COLUMN FOOTING
(TYPICAL)
RAISED ISLAND
METER TO BE REMOVED
PEDESRTIAN RAMP
UP
R30'
R23'
R2'
R4'
R19'
R12'
25'
15'
75'
85'
16'
14'
3'
6'
8'
12'
11'–10"
6'–7"
5'–1"
14'–7"
45
12"W
6"W
Original Configuration
CITY OF NEW YORK
DEPARTMENT OF TRANSPORTATION
BUREAU OF TRAFFIC OPERATIONS
28–11 Queens Plaza North
L.I.C., N.Y. 11101
BURNSIDE AVENUE @ JEROME AVENUE
SAFETY INITIATIVE
APPROVED
BY SB
Drawn by VG
Checked by SB
Borough BRONX
Scale 1"=20'
Date 3.11.03
DRAWING
NO. MB–569



Bay Parkway/ 86th Street

Bus Stops Under The El



Vehicles frequently utilize the curb lane for right turns and are in conflict with pedestrians waiting for the bus as depicted above.

When more than one bus arrives, they frequently load/unload behind the bus stop as they are at a full stop. This causes congestion and vehicles try to weave around the stopped vehicle

Description

The intersection of Bay Parkway and 86th Street is a major multimodal intersection located under an elevated subway station. Like most of the other locations identified by this initiative, both the intersection and corridor is characterized by the presence of large metal pillars supporting the elevated station or “el”, which are situated within the roadbed of 86th Street. These columns contribute to unusual street geometry as the columns divide the roadway into narrow driving lanes inside the columns, with a wide parking lane outside the columns.

As an intermodal facility, three bus lines and the M and D subway lines converge at the Bay Parkway and 86th Street intersection. The elevated tracks are situated above 86th Street and the B1 bus route runs along 86th Street. The B6 and B82 bus routes run along Bay Parkway.

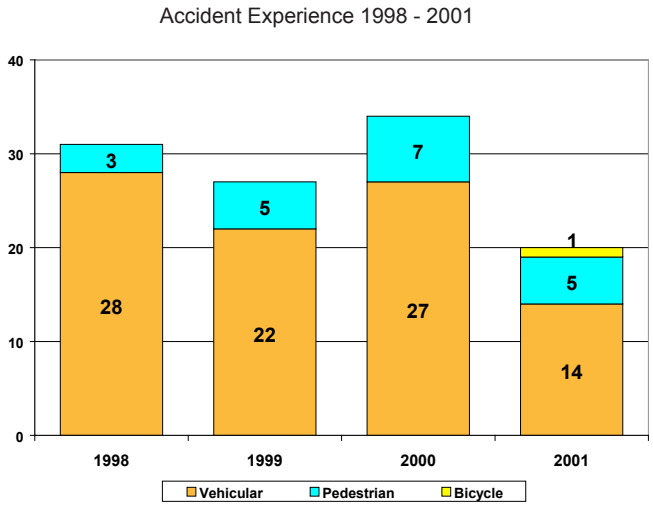
While the various transit lines and intermodal transfers contribute to the high pedestrian and vehicular volumes through the intersection, this location is also a focal point for commercial and retail activity, with the majority of businesses located along 86th Street. Overall, there are numerous conflicts between pedestrians and vehicles moving through the intersection and pedestrians moving between transit modes.

In its original configuration, the bus stop was located within the roadbed without any physical protection from motor vehicles. Unlike some other similar bus stops, a small refuge was delineated in the roadway for pedestrians waiting for the bus. This was accomplished with a thin strip of painted markings between the two pillars closest to the intersection. Operationally, vehicles were prohibited from making turns from 86th Street onto Bay Parkway between the hours of 7AM and 7PM.

Pedestrians waiting for the bus at Bay Parkway and 86th Street

The primary safety concern at this location relates to the fact that pedestrians are forced to wait, load and unload within the roadbed, while exposed to moving traffic. In addition, unlike other subway stations, the landings for each of the four stairways from the station platform are situated away from the corner. This configuration directs pedestrians in the opposite direction of the crosswalks and contributes to pedestrians venturing to the nearest set of columns and crossing the street within the roadway instead of at the crosswalk. This contributes to the high number of pedestrians who jaywalk across these streets. Additional problems that have been identified at this location is frequent double parking by cars and trucks, especially along 86th Street, as well as sidewalk encroachments that reduce the space for pedestrians, especially along the northeast corner.

Operationally, the bus stops are near-sided on both sides of 86th Street and located within the moving lane. Hence, traffic either stops behind the bus or attempts to use the outer roadbed to bypass the bus, putting the pedestrians in the limited refuge space in danger.



In terms of the accident history at this location, vehicular accidents represent most of the accidents at this location. In 1998, there were a total of 31 accidents, three of which involved pedestrians. In 1999, there were a total of 27 accidents, five of which involved pedestrians. In 2000, there were a total of 34 accidents, seven of which involved pedestrians. In 2001, there was a significant decline in total accidents at this intersection to 20, five of which involved pedestrians and

Actual raised median as installed at this location provides refuge and safety for pedestrians waiting for the bus and crossing the street

one that involved a cyclist. ***There have been no fatalities at this intersection between 1998 and 2005.***

Implemented Improvements

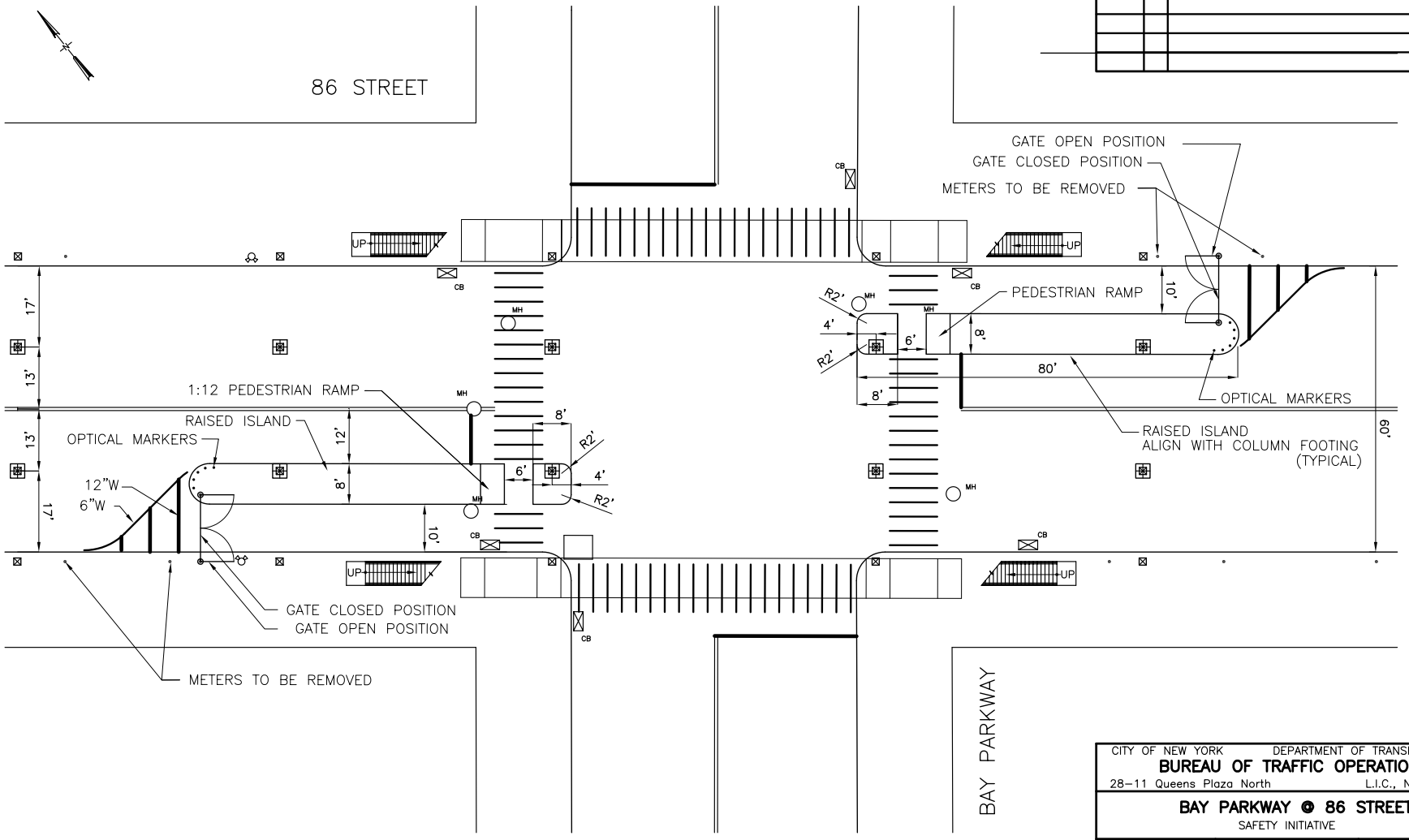
In May 2003, all damaged or faded signs were repaired and warning signs installed. "Yield to Pedestrians Signs" were upgraded and "No Left Turn" signs replaced "No Left Turn 7AM-7PM" signage.

In September 2004, as a short-term improvement, the Department constructed two concrete refuge islands to provide a refuge for pedestrians. These raised islands are 80 feet in length and 8 feet wide and aligned with the column footing. Vehicles are prohibited from entering the space between the island and sidewalk through the use of metal gates that are only opened when the Department of Sanitation needs to sweep the roadway. The gates are supplemented with roadway striping. Two parking meters were removed from each corner to allow for the installation of the island.

Metal gates, reflective signage and striping direct vehicles toward travel lane. Gate can be opened for sanitation purposes

In the long term, the installation of a full neckdown would provide full pedestrian protection, increase the available sidewalk space for bus shelters and requires little maintenance. These neckdowns would be installed only with a full reconstruction of the roadway.

REVISIONS		
DATE	BY	DESCRIPTION
6.14.04	VG	GATES REVISION



CITY OF NEW YORK DEPARTMENT OF TRANSPORTATION
BUREAU OF TRAFFIC OPERATIONS
28–11 Queens Plaza North L.I.C., N.Y. 11101

BAY PARKWAY @ 86 STREET
SAFETY INITIATIVE

APPROVED
BY SB

Drawn by VG
Checked by SB
Borough K
Scale 1"=20'
Date 3.11.03

DRAWING NO. **MB–568**

Citywide Pedestrian Bridge Safety Project

Description

Pedestrian bridges play a critical role in connecting communities across the City. With a large number of highways and major arterials close to residential neighborhoods, pedestrians and cyclists rely upon these bridges to safely cross these roadways.

In the spring of 2004, the Department of Transportation initiated a citywide Pedestrian Bridge Safety Project. This ambitious endeavor encompassed all 122 pedestrian bridges within the five boroughs and was spurred by both community concerns and the Department's proactive approach to mitigate safety concerns.

From the outset, the Department sought to develop a program that would address the varying levels of risk to pedestrians and bicyclists exiting every pedestrian bridge in the city. While the bridges vary in general design, there are common design characteristics which are prevalent at each pedestrian bridge. As such, the Department undertook a survey of all 122 bridges to establish a standard criteria to categorize the bridges according to the level of risk and to develop mitigation measures accordingly.

Based upon previous and current experiences, the Department found the greatest risk occurred at the landings of the bridges, or where the walkways returned to grade and exited onto the street. At these locations, there are two critical safety concerns that the Department worked to alleviate. The first concern was the orientation of the landing in

relation to the connecting roadway. Depending on the configuration of these landings, both pedestrians and wheeled users (i.e. cyclists, rollerbladers, skateboarders and wheelchair users) approaching the landing and exiting the bridge were forced to enter the roadway under unsafe conditions, such as the lack of a protected crossing or stop controls for oncoming vehicles. This orientation of the pedestrian bridges and roadways led the Department to identify a second critical concern, the need for bridge users to safely come to a stop prior to entering the roadbed.

Using these two characteristics, the Department categorized all 122 bridge crossings into three distinct categories.

Type 1 Bridges

Type 1 bridges exit directly onto large sidewalks, parkland or a distinct protected pedestrian area. In total, the department identified 87 such bridges. This configuration was considered to have the lowest risk and needed no remediation, since the bridge users exited into a protected area or refuge and were able to safely cross the street. This configuration also provides the opportunity for the user to come to a stop prior to entering or crossing the roadbed.

Type 1 Pedestrian Bridge at Jefferson Boulevard over the Korean War Veterans Parkway in Staten Island

Type 2 Bridges

Type 2 bridges, of which there are 13 citywide, carry a higher risk factor. At the landings of each of these bridges, the passageway exits directly into a controlled intersection and/or street. Under this

Type 2 Pedestrian Bridge at Fresh Meadows Lane and the Long Island Expressway Service Road in Queens

Type 3 Pedestrian Bridge at 84th Street over the Brooklyn Queens Expressway in Brooklyn

configuration, bridge users immediately enter upon the roadway afterexiting the bridge. Although the intersection control provides safe passage for a bridge user who comes to a complete stop on the landing before entering the roadway, this can be problematic for wheeled users accelerating down the incline and failing to stop before entering the intersection, as both the driver and cyclist have limited sight distances and opportunities to react to each other.

Type 3 Bridges

The final category of bridges is classified as Type 3 bridges, of which 20 exist citywide. These bridges pose the greatest risk to bridge users, as the landings exit directly into an uncontrolled intersection or street. At these locations, pedestrians and bicyclists are forced to enter the roadway upon exiting the bridge and no controls exist to provide for a protected crossing. This configuration can be especially problematic for wheeled users, as these individuals may not come to a complete stop prior to entering the roadway. Both pedestrians/ cyclists, as well as motorists on the arterial have limited sight distances and reaction times due to the proximity of the landing to the roadway. On the service roads of major highways, this problem is exacerbated due to higher vehicle speeds.

Development of a Remediation Program

Upon completion of the citywide inventory, the Department developed a safety mitigation "tool box" to address the identified risks and conditions at each of the bridges. Overall, Type 2 and Type 3 bridges required the greatest need of remediation. The "tool box" focused on implementing treatments in two distinct areas, on pedestrian bridge landings and within the intersection roadbed itself.

At the bridge landings, the goal of the remediation program was to force users of the bridge to come to a complete stop before exiting the bridge and entering the roadbed. This is especially critical for wheeled users or for children traveling on the bridge. In order to achieve this goal, the Department developed an innovative fencing design that requires bridge users, particularly bicyclists, to travel through a slalom or staggered fencing formation that forces the users to come to a complete stop at the end of the bridge. This design is ADA complaint and signage on the fencing advises the bridge users to come to a complete stop prior to proceeding into the roadway. These signs are distinct in design and highly visible to all bridge users.

This treatment was installed at the following locations citywide:

<u>Bronx</u>

- ***Cross Bronx Expressway at Ellis Avenue***
- ***Cross Bronx Expressway at Watson Avenue***
- ***Bruckner Expressway at Waterbury Avenue***

Slalom fencing design requires bridge users to come to a stop at the end of the bridge. In addition, STOP signage and instructions to use pedestrian activated signals are posted along the fencing.

Brooklyn

- ***Gowanus/Brooklyn Queens Expressway at 72th Street***
- ***Gowanus/Brooklyn Queens Expressway at 84th Street***
- ***Prospect Expressway at East 7th Street/ Fort Hamilton Parkway***
- ***Belt Parkway/Shore Parkway Service Road at 27th Avenue Pedestrian Bridge, North side only***

Queens

- ***Clearview Expressway at 33rd Avenue***
- ***Clearview Expressway at 42nd Avenue***
- ***Clearview Expressway at 46th Avenue***
- ***Long Island Expressway at Fresh Meadows Lane***
- ***Long Island Expressway at 159th Street***
- ***Long Island Expressway at 148th Street***
- ***Long Island Expressway at 136th Street***
- ***Long Island Expressway at 112th Street***
- ***Long Island Expressway at 99th Street***
- ***Long Island Expressway at 84th Street***
- ***Long Island Expressway at Cloverdale Road***

The second mitigation measure, instituted mainly at Type 3 bridges was the installation of new stop controls to facilitate a safe, protected pedestrian crossing. In total, the Department developed four options for intersection control. These included:

- ***Full traffic signals at all locations that meet appropriate warrants;***
- ***Experimental pedestrian activated signals at most locations that did not meet warrants for full signals;***
- ***Stop signs and roadway markings, as appropriate; and***

- *Installation of pedestrian separators to guide pedestrians to a controlled intersection, as appropriate.*

Of these treatments, the most common improvement implemented was the installation of an experimental pedestrian activated signal. During regular operation, the signal displays a flashing amber for the major road, with a flashing red on the minor road. During this time the pedestrian crossing signal is illuminated by a "Don't Walk" display. Upon activation by a bridge user, the major road display would cycle to amber, then steady red, providing a protected crossing. The minor road would feature a flashing red, while the pedestrian crossing would indicate a walk signal. It takes a maximum of 15 seconds from the time the pedestrian pushes the button to the time they received a "Walk" display. Additional signage is also posted to advise pedestrians to utilize the push button to cross the street.

In addition to the experimental signals, all locations with this treatment also received accompanying improvements to signs and markings. "Stop Here on Red" signage was installed on the major approach to improve motorist compliance with the signal operation, Where necessary, all intersection control (one-way arrows, Stop signs, etc.) and warning signs were replaced and all lane lines in the immediate vicinity of the crossing as well as the crossings were refurbished. Finally, appropriate Stop Bars were installed on both the major and minor legs of the intersection as well as "Stop" word messages on the minor roadway.

In total, this signal design was installed at 15 bridge locations (23 signals) citywide by December 2004. The following represents the locations where the experimental signals were implemented:

Queens

- *Clearview Expressway @ 46th Avenue - 2 signals (both service roads)*
- *Horace Harding Expressway Service Road @ Cloverdale Boulevard - 2 signals (both service roads)*

- *Horace Harding Expressway Service Road @ Corona Avenue - 1 signal (westbound service road)*
- *Grand Central Parkway @ 112th Street - 1 signal (southbound service road)*

Brooklyn

- *Ocean Parkway @ East 7th Street - 1 signal (north roadway)*
- *Shore Parkway @ Hubbard Street - 1 signal (north service road)*

Bronx

- *Park Avenue @ Saint Paul's Place - 1 signal*
- *Cross Bronx Expressway @ Ellis Avenue/Gleason Avenue - 2 signals (both access points on south service road)*
- *Cross Bronx Expressway @ Watson Avenue - 2 signals (both service roads)*
- *Bruckner Expressway @ Baisley Ave (Waterbury Avenue) - 1 signal (southbound service road)*
- *Park Avenue @ East 176th Street - 2 signals (both roadways)*
- *Park Avenue @ East 178th Street - 2 signals (both roadways)*
- *Park Avenue @ East 179th Street - 2 signals (both roadways)*

Manhattan

- *West 158th Street @ Henry Hudson Parkway - 1 signal (at exit of northbound parkway)*

Staten Island

- *Freemont Avenue at North and South Railroad Avenues - 2 signals*

In March 2006, the New York State Department of Transportation completed construction of a new pedestrian bridge over the Van Wyck Expressway at 87th Street. Given the design of the landing and the existence of fencing along the curb, pedestrians are directed to the corresponding crosswalk at the corner. Therefore there is no need for the "slalom" fences at this location. However, the "experimental" push-button signal and associated signage were installed on both approaches. All work was completed in late March 2006. The images to the right depict the bridge and roadway while under construction.

Pedestrians crossing the service road cross at an unsignalized intersection. The newly constructed bridge is depicted in the background, as well as location of pedestrian fencing.

NYCDOT installed a push-button activated signal at this intersection. Orange mesh fencing indicates location where fencing will be installed to direct pedestrians to cross at the controlled intersection