



NEW YORK CITY DEPARTMENT OF TRANSPORTATION

# SAFE STREETS NYC

DEPT OF TRANSPORTATION

TRAFFIC SAFETY IMPROVEMENTS  
IN NEW YORK CITY



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APRIL 2006



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# SAFE STREETS NYC:

## *Traffic Safety Improvements In New York City*

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April 2006

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Note:

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





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# IMPROVING SAFETY



# TRAFFIC

*Over the past several years, the Department of Transportation (DOT) has actively accelerated its efforts to improve pedestrian and traffic safety by instituting a proactive and systematic approach to the identification of locations throughout the city where innovative safety mitigation measures can be implemented. While the scope and scale of these projects vary in terms of improvements, there is no greater testament to the City's efforts than the decline of both pedestrian and vehicular fatalities over the past sixteen years. Some of the most remarkable strides have been made over the past two years, as the Department has seen fatalities reach historic lows. In 2004, a watershed year for traffic safety, traffic-related fatalities fell to 297, the lowest tally since 1910 when there were 332 fatalities. In 2005, fatalities increased slightly to 317, however this still represents the second lowest annual total. These trends continue to solidify New York City's status as one of the safest large cities in the United States.*

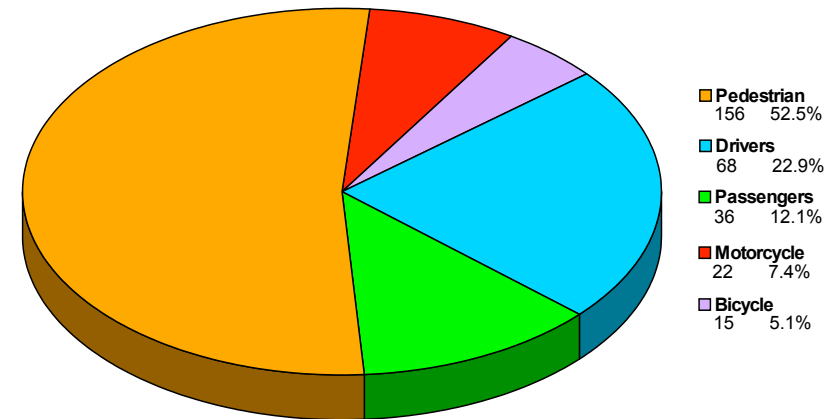


Chart 1 2004 Fatalities

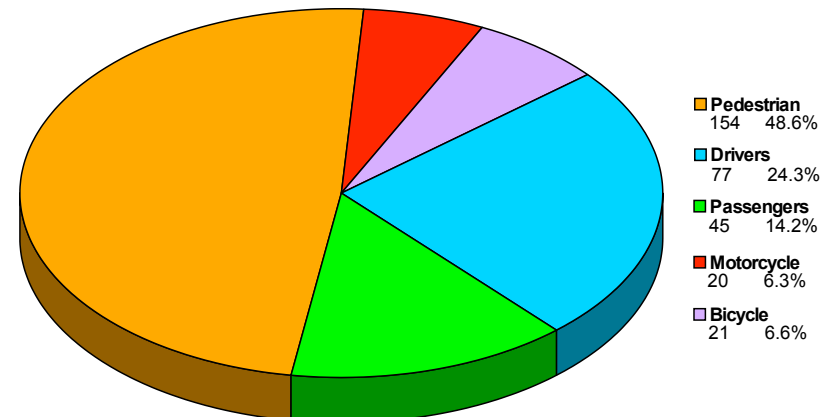
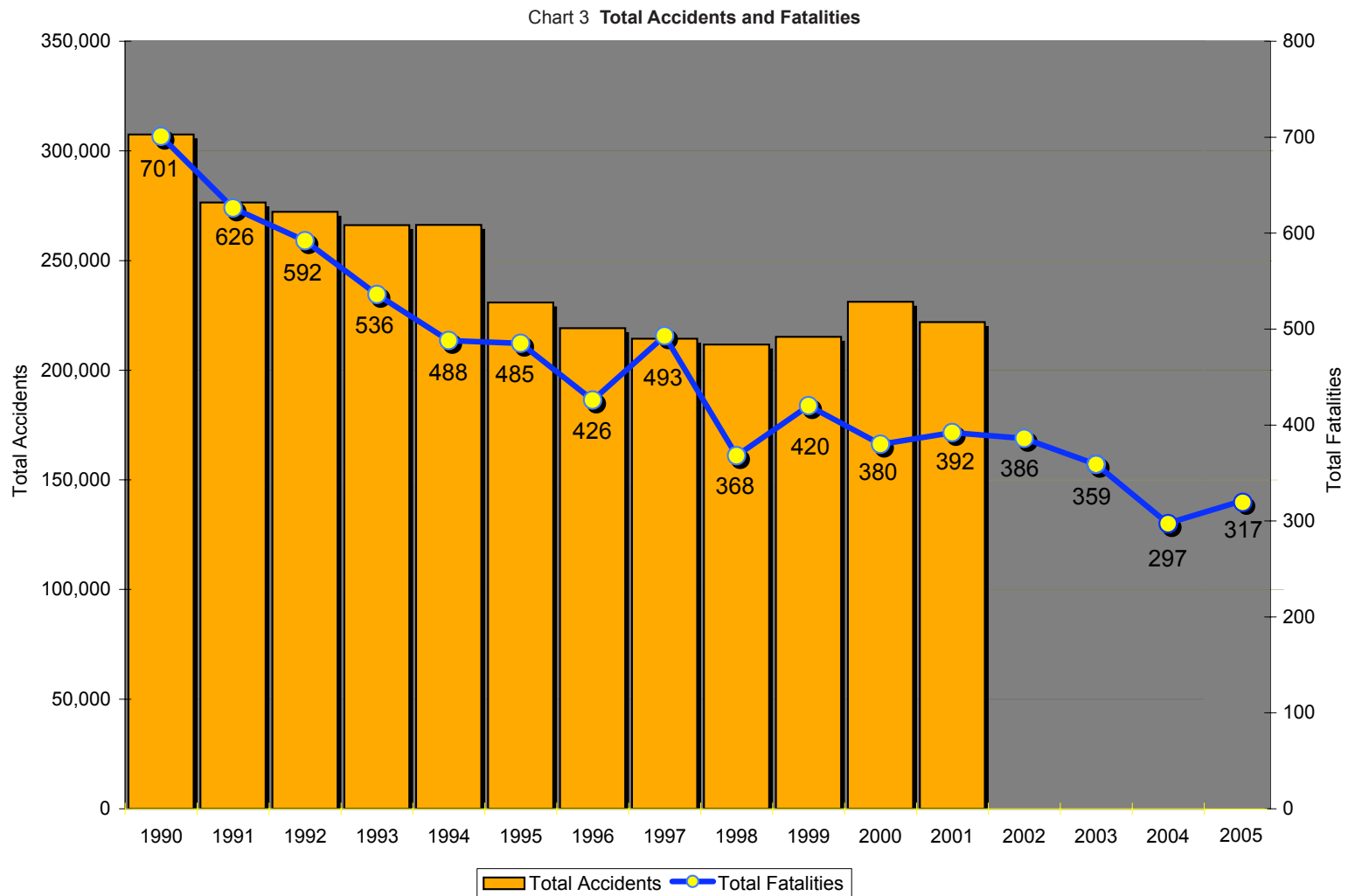
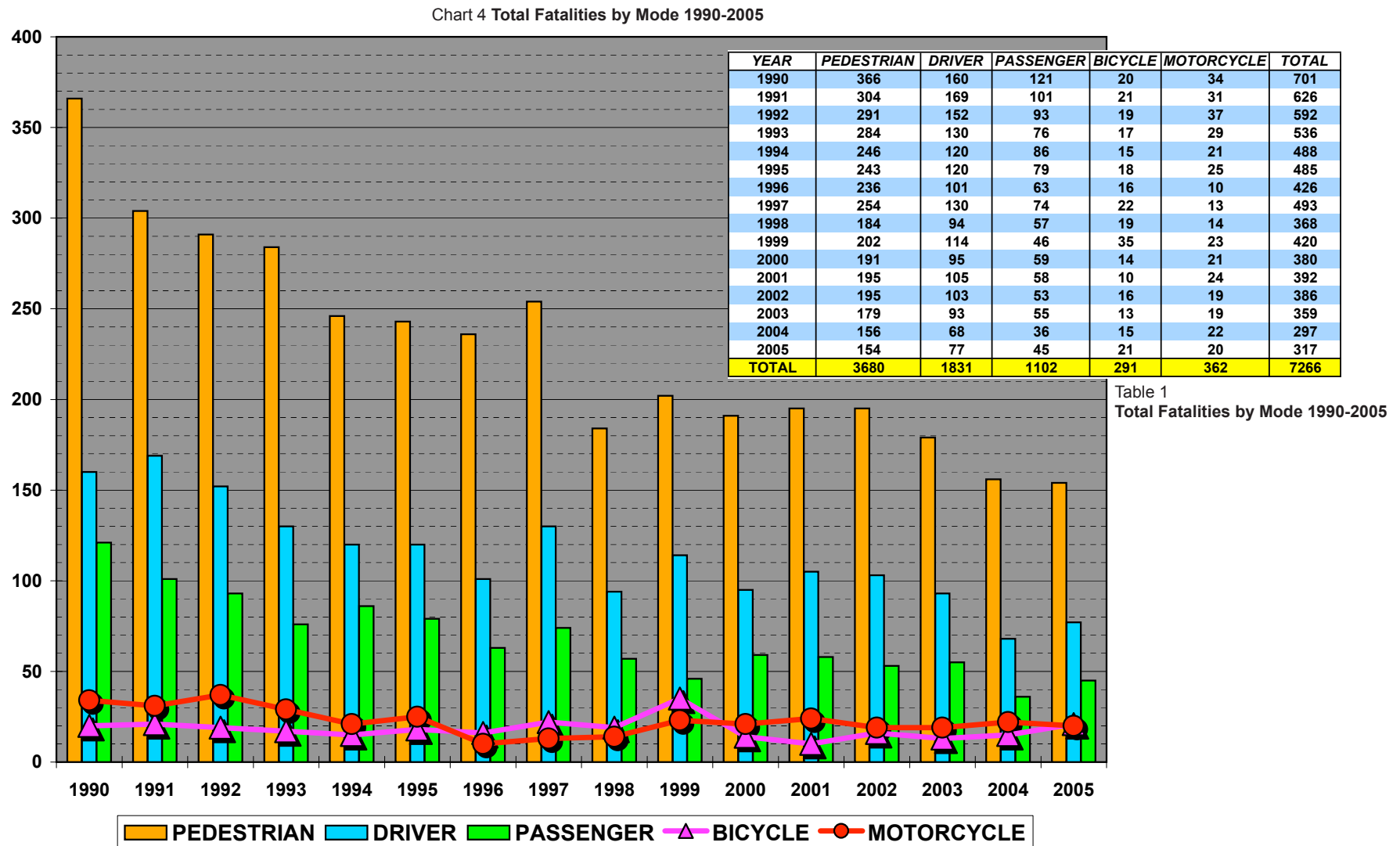


Chart 2 2005 Fatalities

*Beginning in the late 1980's, DOT's efforts have significantly reduced the number of traffic related accidents and fatalities throughout the city. Overall, there has been a 27.9% decline in the total number of accidents between 1990 and 2001, the last full year for which statistics are available. The decline in traffic fatalities since 1990 is even more dramatic, decreasing by 54.7% since 1990. While fatalities have been in decline since the 1990's, some of the most dramatic improvements have occurred more recently with fatalities declining 19.1% since 2001.*



*An examination of fatalities by mode finds that all modes have experienced significant declines over the past 16 years. As indicated in Table 1 and Chart 4, the most remarkable declines are in pedestrian fatalities, which have fallen by 57.9% to an all time low of 154 in 2005 from a high of 366 in 1990. Driver fatalities reached all-time lows in 2004, declining 59.8% to 68 from a high of 169 in 1991. Although driver fatalities increased slightly in 2005 to 77, this still represents historic lows.*



*Comparatively from year to year, fatalities as a percentage by mode have remained fairly consistent on an annual basis. However, even with the dramatic decrease in overall pedestrian fatalities, this mode continues to be the largest at-risk group, as they are involved in approximately one-half of all fatal accidents. Table 2 represents these trends over the past 16 years.*

Table 2 Fatalities as Percentage (%) by Mode 1990-2005

| YEAR<br>% of Total      | PEDESTRIAN<br>% of Total | DRIVER<br>% of Total | PASSENGER<br>% of Total | BICYCLE<br>% of Total | MOTORCYCLE<br>% of Total |
|-------------------------|--------------------------|----------------------|-------------------------|-----------------------|--------------------------|
| 1990                    | 52.2%                    | 22.8%                | 17.3%                   | 2.9%                  | 4.9%                     |
| 1991                    | 48.6%                    | 27.0%                | 16.1%                   | 3.4%                  | 5.0%                     |
| 1992                    | 49.2%                    | 25.7%                | 15.7%                   | 3.2%                  | 6.3%                     |
| 1993                    | 53.0%                    | 24.3%                | 14.2%                   | 3.2%                  | 5.4%                     |
| 1994                    | 50.4%                    | 24.6%                | 17.6%                   | 3.1%                  | 4.3%                     |
| 1995                    | 50.1%                    | 24.7%                | 16.3%                   | 3.7%                  | 5.2%                     |
| 1996                    | 55.4%                    | 23.7%                | 14.8%                   | 3.8%                  | 2.3%                     |
| 1997                    | 51.5%                    | 26.4%                | 15.0%                   | 4.5%                  | 2.6%                     |
| 1998                    | 50.0%                    | 25.5%                | 15.5%                   | 5.2%                  | 3.8%                     |
| 1999                    | 48.1%                    | 27.1%                | 11.0%                   | 8.3%                  | 5.5%                     |
| 2000                    | 50.3%                    | 25.0%                | 15.5%                   | 3.7%                  | 5.5%                     |
| 2001                    | 49.7%                    | 26.8%                | 14.8%                   | 2.6%                  | 6.1%                     |
| 2002                    | 50.5%                    | 26.7%                | 13.7%                   | 4.1%                  | 4.9%                     |
| 2003                    | 49.9%                    | 25.9%                | 15.3%                   | 3.6%                  | 5.3%                     |
| 2004                    | 52.5%                    | 22.9%                | 12.1%                   | 5.1%                  | 7.4%                     |
| 2005                    | 48.6%                    | 24.3%                | 14.2%                   | 6.6%                  | 6.3%                     |
| % of total<br>1990-2005 | 50.7%                    | 25.4%                | 14.8%                   | 4.1%                  | 5.0%                     |

# HIGH ACCIDENT LOCATIONS

Throughout New York City, there are several locations and/or intersections which consistently experience a high number of accident occurrences. While each of these locations is unique in its characteristics and layout, these locations are generally more accident prone due to one of three factors: 1) Physical environment (e.g., grade, road alignment, visibility, roadway conditions, lighting, wet pavement); 2) Human factors (e.g., driving under the influence, misjudgment, speeding, aggressive or inexperienced driving, illness, unlicensed driver); 3) Equipment (e.g., faulty vehicles, over or under loaded larger vehicles, defect.). Crashes usually involve a number of these factors.

Each year, the city ranks the top accident locations based upon available New York State Department of Transportation (NYSDOT) information. The Department uses the NYSDOT Accident Database for the rankings of accident locations as this database is the most complete and accurate source of processed accident information and 2001 represents the last year for which information is available for the entire year.

The citywide rankings for the Top 20 locations in 2001 is found in Table 4 (on the following page), as well as each intersection's ranking for the previous five years.



Table 3 Ranking of Top 20 Accident Locations Citywide 1996-2001

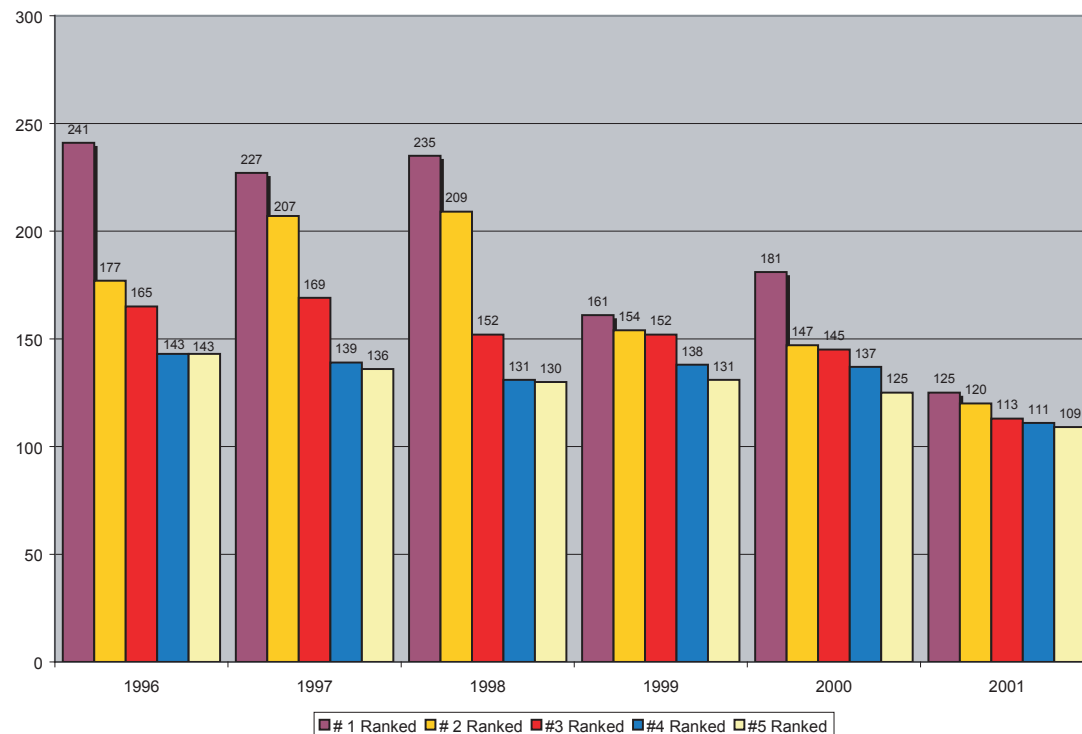
| <b><u>INTERSECTION</u></b>  | <b><u>Borough</u></b> | <b><u>2001</u></b> | <b><u>2000</u></b> | <b><u>1999</u></b> | <b><u>1998</u></b> | <b><u>1997</u></b> | <b><u>1996</u></b> |
|---|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Flatbush Avenue Extension / Tillary Street                            | Brooklyn              | 1                  | 4                  | 2                  | 3                  | 6                  | 3                  |
| Hoyt Avenue North / 31st Street                                       | Queens                | 2                  | 6                  | 6                  | 8                  | 7                  | 25                 |
| Linden Boulevard / Kings Highway / Remsen Avenue                      | Brooklyn              | 3                  | 2                  | 5                  | 4                  | 5                  | 3                  |
| Flatbush Avenue / Eastern Parkway (Grand Army Plaza)                  | Brooklyn              | 4                  | 1                  | 1                  | 1                  | 2                  | 2                  |
| Bruckner Boulevard / E. 138th Street                                  | Brooklyn              | 5                  | 11                 | 13                 | 24                 | 8                  | 9                  |
| Queens Boulevard / 59th Avenue / Woodhaven Boulevard                  | Queens                | 6                  | 8                  | 4                  | 5                  | 3                  | 4                  |
| Bowery / Canal Street   | Manhattan             | 7                  | 3                  | 7                  | 7                  | 4                  | 6                  |
| College Point Boulevard / Long Island Expressway (I-495) Service Road | Queens                | 8                  | 10                 | 20*                | 6                  | 14*                | 18*                |
| Linden Boulevard / Pennsylvania Avenue                                | Brooklyn              | 9                  | 9                  | 8                  | 12                 | 18                 | 16                 |
| Allen Street / Delancy Street   | Manhattan             | 10                 | 13                 | 10                 | 9                  | 35*                | 20*                |
| Queens Boulevard / Van Dam Street / Thomson Avenue                    | Queens                | 11                 | 7                  | 3                  | 2                  | 1                  | 1                  |
| 2nd Avenue / E. 58th Street   | Manhattan             | 12                 | 5                  | 9                  | 11                 | 12                 | 11*                |
| Bowery / Houston Street   | Manhattan             | 13                 | 33                 | 18                 | 13                 | 13                 | 11*                |
| Atlantic Avenue / Pennsylvania Avenue                                 | Brooklyn              | 13                 | 24                 | 24                 | 22                 | 42*                | 61*                |
| Utica Avenue / Eastern Parkway  | Brooklyn              | 15                 | 21                 | 12                 | 18                 | 27*                | 7                  |
| Altatlantic Avenue / Eastern Parkway Extension                        | Brooklyn              | 16                 | 24*                | 15*                | 41*                | 22                 | 26*                |
| Bruckner Boulevard / Hunts Point Avenue                               | Bronx                 | 16                 | 41*                | 31*                | 31                 | 22                 | 20*                |
| 3rd Avenue / E. 57th Street   | Manhattan             | 18                 | 23                 | 58*                | 15*                | 39*                | 20*                |
| 3rd Avenue / E. 59th Street   | Manhattan             | 19                 | 104*               | 15*                | 19*                | 59                 | 14                 |
| Tillary Street / Adams Street   | Brooklyn              | 20                 | 28*                | 18*                | 9                  | 13                 | 13                 |

\* indicates tie in ranking

The intersections that are among the high accident locations and their respective rankings have remained fairly consistent between 1996 and 2001. Most of the locations that are consistently ranked in the top 10 are locations that experience high traffic volumes and are focal points for vehicular trips, such as Flatbush Avenue and Tillary Street, where numerous vehicles are traveling to and from the Manhattan Bridge while converging with local traffic. While many locations remain on the top 20 listing from year to year, it is important to note that these rankings are not illustrative of the overall improvement in pedestrian and vehicular safety taking place at these locations or citywide. Annually, most, if not all of the locations on the top 20 list have progressively experienced a decline in the total number of accidents. This trend is similar to the overall decline in accidents and fatalities occurring citywide.

This downward trend is magnified when looking at the annual accident experience at each of the top five ranked locations since 1996. As indicated in Chart 5 below, accidents at each of the top five locations each year have been progressively declining. An even more striking trend is the dramatic decline at the highest ranked location each year. The top ranked location, which has varied between Queens Boulevard/Van Dam Street/Thomson Avenue (1996,1997), Flatbush Avenue/Eastern Parkway/Grand Army Plaza Circle (1998,1999,2000) and Flatbush Avenue Extension/Tillary Street (2001) has exhibited a decline of nearly one-half since 1996 (to 125 at Flatbush Avenue Extension/ Tillary Street in 2001

Chart 5 Comparative Accident History of the Top 5 Citywide Accident Locations 1996-2001



from 241 at Queens Boulevard/Van Dam Street/Thomson Avenue in 1996).

This annual decline can be better illustrated by the accident experience at the top ranked location citywide in 2001, the Flatbush Avenue Extension at Tillary Street. In 2001, this location experienced 125 accidents, which represented the lowest number of accidents at this location over the past five years. This number one ranking in 2001, would have been comparatively tied for sixth in 2000, sixth in 1999 and 1998 and seventh in 1997 and 1996. There are numerous other locations similar to this intersection where, although the location continues to rank high on the overall citywide list, the total number of annual accidents continues to be lower than in any of the preceding years.

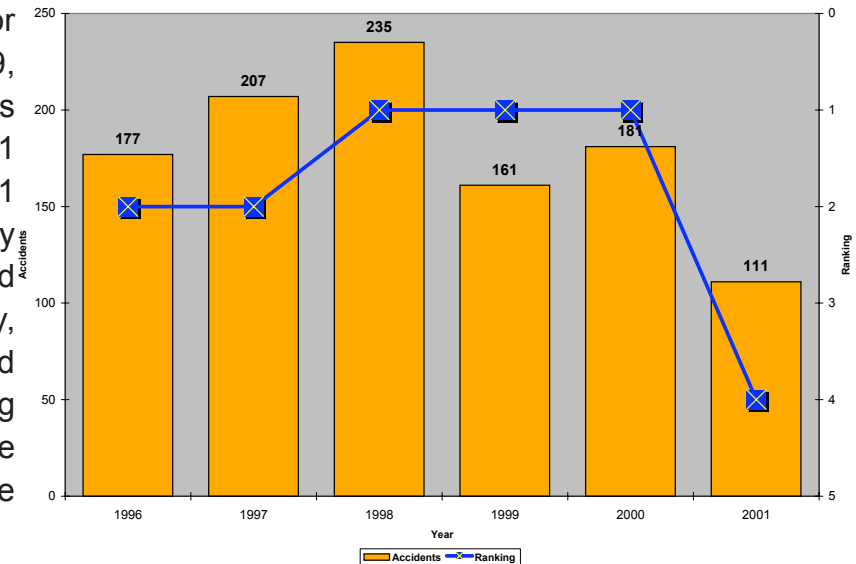
In addition, the range between the top twenty locations from year to year has also been shrinking. In 1996, the highest ranked location, the intersection of Queens Boulevard, Thomson Avenue and Van Dam Street, experienced 241 accidents, while the twentieth ranked location, Bruckner Boulevard and Hunts Point Avenue experienced 89 accidents. This accounts for a range of 152. Since then, the range between the top location and the twentieth has progressively gotten smaller. By 2001, the range between the top ranked (Flatbush Ave Extension and Tillary Street with 125 accidents) and twentieth ranked (Tillary Street and Adams Street with 73 accidents) location was only 52. Given the smaller range, and the significantly lower accident numbers, even if a location is ranked high in 2001, the annual accident experience at these locations is frequently lower than those in any of the preceding years. Cumulatively, these account for a significant reduction in total accidents at these locations.

While there are numerous locations throughout the city that are indicative of these trends, there are some more notable locations that have experienced a dramatic decline in their accident experience that can be directly related to the implementation of safety improvements and the declining overall trends. One of the more notable locations is the Grand Army Plaza Circle in Brooklyn.

At the Grand Army Plaza Circle, the Department has implemented an ambitious program to improve vehicular safety. Implemented measures included new signage throughout the intersection and

its approaches, signal modifications, improved street lighting, and new roadway markings. Historically, this location has held either one of the top two spots in accident occurrences (See Table 4 for accident history). Beginning with measures implemented in 1999, there has been a remarkable improvement in conditions at this intersection with accidents decreasing sharply by 31.4% (to 161 from 235) in 1999. Although accidents increased slightly to 181 in 2000, this was still below 1998 levels. In 2001, when many of the improvements were completed, total accidents decreased significantly by 52% (to 111 from 235 in 1998). Comparatively, with 111 accidents and a ranking of fourth, this location would not have ranked any worse than eighth in any of the preceding five years. Therefore, we believe this location is indicative of the overall trend in declining accidents in New York City as well as the impacts of the Department's safety improvements.

Table 4  
Grand Army Plaza  
Accident Experience and Citywide Ranking 1996-2001



Another location that has shown considerable improvement in safety over the past few years is the Grand Concourse corridor. Beginning with improvements implemented in 1992, the Grand Concourse represented the first corridor wide safety initiative the Department undertook to improve both pedestrian and vehicular safety along an entire corridor. This approach and several of the treatments that were implemented served as a model for other corridors in the city, most notably Queens Boulevard.

Beginning in 1993 and coinciding with our improvements made on the Concourse, annual fatalities (both vehicular and pedestrian) began to drop significantly. In 1993, total fatalities decreased 60% (to 6 from 15 in 1992) and pedestrian fatalities decreased 50% (to 5 from 10 in 1992). This downward trend in fatalities has continued each year. In 2003, there was only one pedestrian fatality on the corridor. **Although fatalities increased slightly to three in 2004, they declined back to one in 2005. A comparison of total fatalities for the corridor between the ten years prior to 1993, as compared to the years since (13), indicates that fatalities have declined**

**by 70% (36 Fatalities/29 Pedestrians between 1993-2005 vs. 120 fatalities/101 pedestrians between 1983 and 1992).**

Some of the initial treatments that were implemented on the Concourse included the installation of nearly 3,800 linear feet of pedestrian fencing at high pedestrian volume locations to discourage midblock crossings, the modification of traffic signal timing (to a 120 from a 90 second cycle length) to provide increased time for pedestrians to cross the Concourse, the installation of pedestrian signals at 25 intersections, the installation of red light cameras and the simplification of advance and exit directional signage for motorists travelling between the service and main roadways.

Over the next decade, the Department continually monitored and implemented improvements to enhance these earlier efforts. These treatments included numerous improvements to signage, markings and signals along the entire Concourse. Initiatives such as oversized street name signs, improved lane assignment treatments for turning movements, and additional signal improvements provided for a safer pedestrian and vehicular environment.



Example of innovative treatment used as part of the Pedestrian Safety Demonstration Project

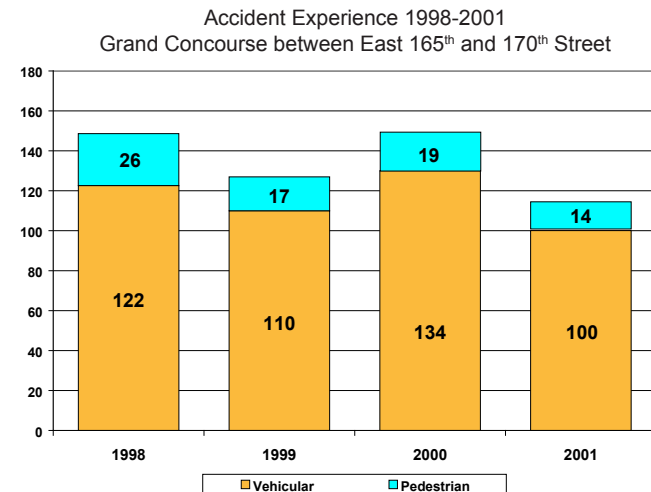
In 1998, the Department focused its efforts on improving pedestrian safety at specific locations along the Grand Concourse. This included a targeted Pedestrian Safety Demonstration Project between East 165<sup>th</sup> and 170<sup>th</sup> Streets, and at two high accident locations, East 170<sup>th</sup> Street and at East 183<sup>rd</sup> Street.

At both East 170<sup>th</sup> and East 183<sup>rd</sup> Streets, the Department implemented treatments to improve pedestrian safety. These treatments included high visibility crosswalks at all legs, larger red signal lenses and the installation of additional pedestrian signage. At East 170<sup>th</sup> Street, dual left turn signal phases were installed and at East 183<sup>rd</sup> Street, we increased the all red interval to ensure that left turning vehicles cleared the intersection. These improvements dramatically reduced the incidence of pedestrian accidents. **At East 170<sup>th</sup> Street, pedestrian accidents have decreased significantly by 87% (to one in 2002 from eight in 1999). At East 183<sup>rd</sup> Street, pedestrian accidents also**

***decreased significantly by 84% (to one in 2002 from six in 1999).***

The Pedestrian Safety Demonstration Project between East 165<sup>th</sup> and East 170<sup>th</sup> Street was a more ambitious endeavor. This project narrowed the service roads in each direction to one moving lane by widening the medians from 10 to 18 feet through the use of planters and the installation of a bicycle lane. Additional motorist advisory signage and roadway markings were also installed.

***Along this portion of the Grand Concourse, pedestrian accidents decreased by 46% (to 14 in 2002 from 26 in 1998).***



## IDENTIFYING LOCATIONS FOR IMPROVEMENTS

As indicated earlier, many of the high accident locations throughout the city have benefited from the implementation of engineering improvements. More recently, the Department's focus has been directed toward addressing locations and corridors where available data and trends indicate that accidents are occurring more frequently. These locations may be identified through the Department's own review of accident data, as well as suggestions from elected officials, the Police Department and the community.

At each location selected for study, an extensive historical accident review is conducted to ascertain whether any particular type of accident was being repeated or if any other patterns existed. In addition, an on-site investigation is conducted involving various disciplines within the Department. Based upon the investigation, the Department develops sets of mitigation measures to address the noted issues and conditions at each respective location. These may include immediate measures that can be implemented in the near term such as the replacement of missing, defaced

or outdated signage or the installation of new or improved signage, street lighting upgrades that require minimal repair work or bulb replacement, improved signal timing, phasing or displays, and the refurbishment or addition of roadway markings. At certain locations, recommendations may involve longer term efforts that usually involve roadway reconfiguration or capital work. However, at many of these locations, the Department tries to utilize shorter-term, temporary measures until the projects can be completed through capital work.

This report describes, in detail, the work undertaken at specific locations or corridors. In many cases, improvements have been implemented over the course of several years, and the Department continues to monitor and improve these locations accordingly.





THE BRONX





# GRAND CONCOURSE

## Background

The Department has performed considerable work in the last two decades to improve vehicular and pedestrian safety on the Grand Concourse. In 1992, the Department initiated a safety study on a four-mile stretch of the Grand Concourse between East 161<sup>st</sup> Street and the Mosholu Parkway. This location was selected as the site for a Pedestrian Safety Engineering Demonstration Project because, at that time, it was identified as the signalized arterial with the most pedestrian fatalities citywide. This study included comprehensive traffic analyses and the implementation of the following safety improvements throughout the study area.

- Modification of traffic signal timing to increase time for pedestrians to cross the Grand Concourse, installation of pedestrian signals at 25 intersections, installation of dual left turn phasing at the East 167<sup>th</sup> Street and Mt. Eden Avenue intersections, installation of a red light camera at East 167<sup>th</sup> Street, installation of larger red signal displays, and an increase of the cycle lengths from 90 to 120 seconds to further improve pedestrian crossing during the midday period, at night, and on weekends.
- Installation of 3,750 linear feet (nearly  $\frac{3}{4}$ -mile) of pedestrian barriers in high pedestrian volume locations to prevent midblock crossings.
- Simplification of advance and exit directional signs.
- Installation of thermoplastic pavement markings including the refurbishment of lane lines and all crosswalks, and new directional arrows, stop bars, peg-a-tracs to guide motorists making left turns, and the installation of edge lines adjacent to raised medians.

These improvements (implemented in 1993) resulted in impressive accident reductions. A comparison of statistics for the three years before (1990-1992) and the three years after (1994-1996) the implementation of these measures showed a significant reduction in overall accidents (-27%) and a dramatic decrease in fatalities (-67%).

## **Additional Improvements**

Additional improvements were implemented to enhance these earlier efforts. These are described below:

- Existing regulatory signs (e.g., Yield, One-Way Arrows, Stop, and turn restrictions) were refurbished and upgraded in September 1999 to meet current standards. In addition, 75 school crossing signs were refurbished as part of the citywide contract in March 2000.
- All crosswalks and Stop bar pavement markings were surveyed and refurbished in August 1999.
- All school crosswalk and School Crossing pavement messages were installed in October 2000 as part of the citywide contract.
- 140 feet of damaged pedestrian barriers were repaired in August 1999.
- Dual left turn signal phases were installed at the East 165<sup>th</sup> and East 170<sup>th</sup> Street intersections in September 1999.
- Additional pedestrian signals were installed on the center median at the East 183rd Street intersection in March 2000. These were upgraded to international pedestrian signals in October 2000.
- A study was conducted to determine the need for a left turn phase at the East Tremont Avenue intersection. Left-turn phases for both directions of the Concourse were approved and were installed in April 2001.
- A left turn signal phase for the southbound Grand Concourse at East 188<sup>th</sup> Street was installed

in June 2000.

- Removed “Trucks with Overweight Permit” and “Truck Restriction Ahead” signs at seven locations along the Grand Concourse (southbound at East 196<sup>th</sup> Street, southbound at East 183<sup>rd</sup> Street, northbound at Mt. Eden Avenue, southbound at Morris Avenue, southbound at East 161<sup>st</sup> Street, southbound at East Kingsbridge Road, and northbound at East 170<sup>th</sup> Street).
- All crosswalks and Stop bar pavement markings were surveyed and refurbished in May 2002.
- All vehicle and pedestrian signals on the Grand Concourse between East 138<sup>th</sup> Street and East Tremont Avenue were upgraded to LED and international displays in March 2003.
- Left turn signals were installed in both directions of the Grand Concourse at both East Tremont and East Burnside Avenues in September 2003.
- Older “Yield to Pedestrian” signage was upgraded to the newer “Attention, Drivers Yield to Pedestrian” signs in July 2004.
- “Left Turn on Left Green Arrow” or “Left Turn Signal” signage was installed at intersections with left turn signals in July 2004.
- All signage designating individual lanes for various traffic movements were installed at the following intersections in July 2004:
  - East 170<sup>th</sup> Street
  - East Tremont Avenue
  - East 161<sup>st</sup> Street
  - East 183<sup>rd</sup> Street
  - East Kingsbridge Road
  - Bedford Park
  - East 196<sup>th</sup> Street
  - East Mt. Eden Avenue
  - East Burnside Avenue

- East 165<sup>th</sup> Street
- East 192<sup>nd</sup> Street
- East 181<sup>st</sup> Street
- East 184<sup>th</sup> Street
- East 198<sup>th</sup> Street
- East 204<sup>th</sup> Street
- Van Cortlandt Avenue East

## Pedestrian Separator Improvements

As part of the continuing efforts to improve pedestrian and vehicular safety, the Department repaired and replaced several pedestrian separators along the Grand Concourse in January 2003. In total, 275 linear feet of new fencing was replaced. The locations of these improvements included:

- East median north of East 183<sup>rd</sup> Street
- West median north of East 183<sup>rd</sup> Street
- West median in front of 1675, 2017, 2403, 2295 and 2039 Grand Concourse
- West median south of East 177<sup>th</sup> Street
- East median south of Echo Street
- East median north of Mt. Eden Avenue in front of Bronx Lebanon Hospital

***In September 2005, 380 linear feet of pedestrian separators were repaired on the Grand Concourse southbound between Clifford Place and Mount Eden Avenue.***

## ***Proposed Improvements***

***In the spring of 2006, the Department will be replacing approximately 4,400 linear feet of pedestrian separators along the entire stretch of the Grand Concourse.***



# GRAND CONCOURSE

## PEDESTRIAN SAFETY DEMONSTRATION PROJECT

### Description

A targeted pedestrian safety demonstration project was implemented in November 1999 for the 0.7-mile stretch of the Grand Concourse between East 165<sup>th</sup> and East 170<sup>th</sup> Streets. The plan narrowed the service roads in each direction to one moving lane by widening the medians from 10 to 18 feet and adding a bicycle lane. The width of the service roads was reduced from 35-37 feet to a continuous 27 feet. Our intention was to further improve vehicular and pedestrian safety by reducing traffic speeds and pedestrian crossing distances, while increasing pedestrian refuge space. The plan, implemented as a pilot, included the following elements:



Panoramic View of Grand Concourse prior to implementation of Pedestrian Safety Demonstration Project

- Roadway Markings: Bicycle lane installation, median widening with striping, lane transitions prior to and at the end of the study area. In addition, existing striping on the service roads were scarified. The markings work was completed in mid-November 1999. The markings were refurbished in April 2002.





Grand Concourse/East 169<sup>th</sup> Street Service Road after implementation of safety project with planters and bike lane

- Sign Manufacture and Installation: “Left Lane Ends”, “Left Lane Ends 200 Feet”, “Left Lane Ends 500 Feet”, “Lane Transition”, “Bicycle Lane”, “Bike Lane Ahead” and “Bike Lane Ends” signs were manufactured and installed in November 1999.
- Planters and parking stops delineating the widened median were installed in November 1999 (following completion of sign and marking work). This included the following:
- Placement of 24 concrete planters in six sections connected by bolts and plates, with three inches of stone placed in the bottom of each planter

- Placement of 42 large plastic planters with three inches of stone placed in the bottom of each planter.
- Placement and bolting down of concrete (495 pieces) and plastic (367 pieces) parking stops.
- Fork lifts and flat bed trucks were used to install the planters and parking stops. Landscaping, including soil was provided by the Parks Department’s “GreenStreets” Program. DOT provided gravel/millings for drainage.



Typical roadway planter and parking stops along the Grand Concourse

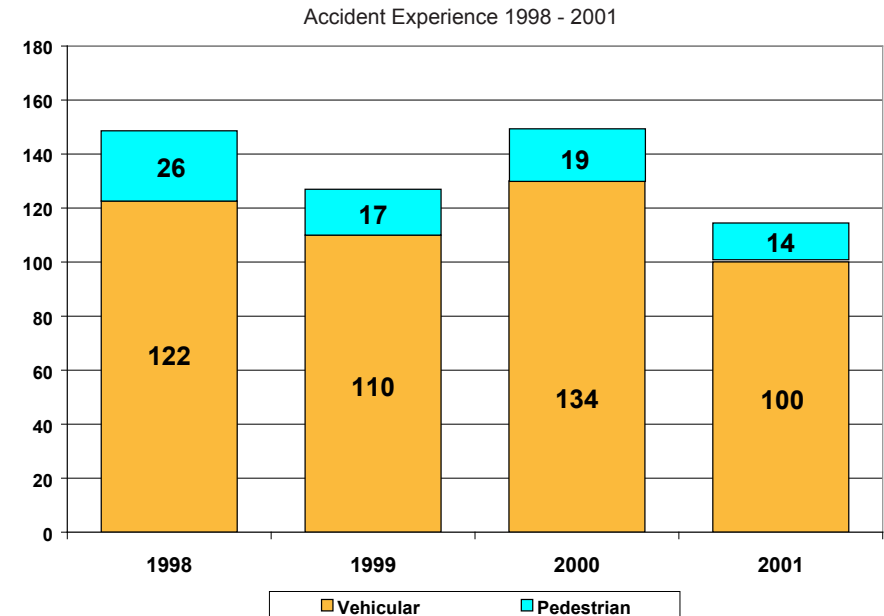
A monitoring plan (completed in June 2000) was developed to evaluate the impacts of the demonstration project. This included comparing “before” and “after” implementation levels of service, accident data, vehicle travel time runs and radar speed surveys. Our findings were quite encouraging. Speeds on the service roads are slower and, since significant numbers of vehicles have diverted to the main roadway, speeding on the main roadway has been reduced as well.

Key findings are shown below:

## Accidents

Overall, the accident experience along this section of the Grand Concourse has shown a significant improvement in pedestrian and vehicular safety since 1998. In 1998, there were a total of 148 accidents, of which 26 involved pedestrians. In 1999, the year in which the pedestrian safety demonstration project was implemented (November), total accidents declined to 127, of which 17 involved pedestrians. For comparison purposes we are using the full year (1998) for “before” data because the project was not implemented until late 1999. In 2000, although total accidents increased to 153, pedestrian accidents decreased by 27% (to 19 from 26 in 1998). In 2001, total accidents fell 23% (to 114 from 148 in 1998) and pedestrian accidents fell significantly by 46% (to 14 from 26 in 1998). In 1998, there was one fatality and in June 1999, there were two fatalities, both of which were the result of a single accident. Since 1999, there have been no fatalities along this portion of the Grand Concourse.

Overall, the Department believes the impacts of the treatments implemented at this location have been successful, especially in reducing the number of pedestrian accidents along this stretch of the Grand Concourse. The Department continues to support these treatments and is actively engaged in trying to make these safety improvements permanent.





### **Midday Speeds (11am–2pm)**

- Northbound service road - 85<sup>th</sup> percentile speed decreased 33% (from 33 to 22 mph); average speed decreased 36% (from 28 to 18 mph).
- Southbound service road - 85<sup>th</sup> percentile speed decreased 12% (from 33 to 29 mph); average speed decreased 11% (from 28 to 25 mph).
- Northbound main road - 85<sup>th</sup> percentile speed decreased 10% (from 40 to 36 mph); average speed decreased 9% (from 33 to 30 mph).
- Southbound main road - 85<sup>th</sup> percentile speed decreased 8% (from 40 mph to 37 mph); average speed was unchanged (33 mph).

### **Evening Speeds (8–10pm)**

- Spot speed surveys conducted on the northbound service road showed that the 85<sup>th</sup> percentile speed decreased 16% (from 37 to 31 mph).

### **Traffic Volumes**

- Service road volumes decreased 40% (from 928 to 551 vehicles) in the AM peak hour and 29% (from 856 to 609 vehicles) in the PM peak hour.
- Main road volumes increased 19% (from 1293 to 1544 vehicles) in the AM peak hour and 15% (from 1233 to 1419) in the PM peak hour.
- Total volumes on the Concourse decreased 4% (from 2155 to 2062 vehicles).

## Level of Service (LOS)

- During the peak hour in the peak direction, LOS at East 167<sup>th</sup> Street declined but remained acceptable, especially given the substantial increase in main roadway volume and reduction in capacity on the service roads. The main roadway changed from LOS B in 1995 to LOS C, and the service roadways changed from LOS B to LOS D.

## Bus Speeds

- During the midday and PM peak periods, speeds decreased 9% (to 7.3 mph from 8.0 mph)

## Observations

- Traffic on the service roads flowed smoothly, but is occasionally stopped when a vehicle is illegally parked at a bus stop, or when a bus is unable to pull sufficiently into a bus stop.

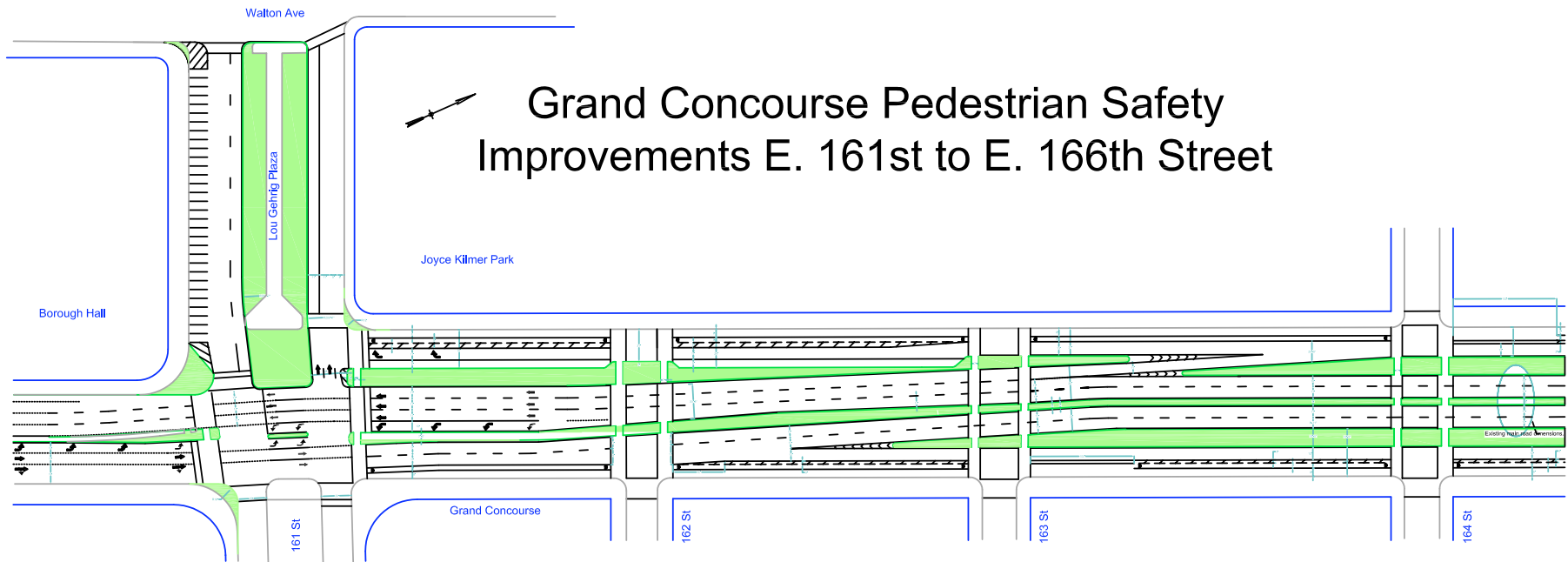
## Recommendations

- The one-lane service road design can be extended throughout the Grand Concourse from East 163<sup>rd</sup> Street to Mosholu Parkway with the exception of the East Fordham Road area which warrants further study. The width of the service road should be 28 feet (12 feet wide moving lane, five feet wide bicycle lane with a three feet wide channelized buffer separating the bike lane from motor vehicle traffic, and an eight feet wide parking lane). This is one foot wider than the test configuration to enable traffic to pass buses and other vehicles temporarily double parked.
- The section of the Concourse between East 161<sup>st</sup> Street and the Bronx Museum of the Arts (north

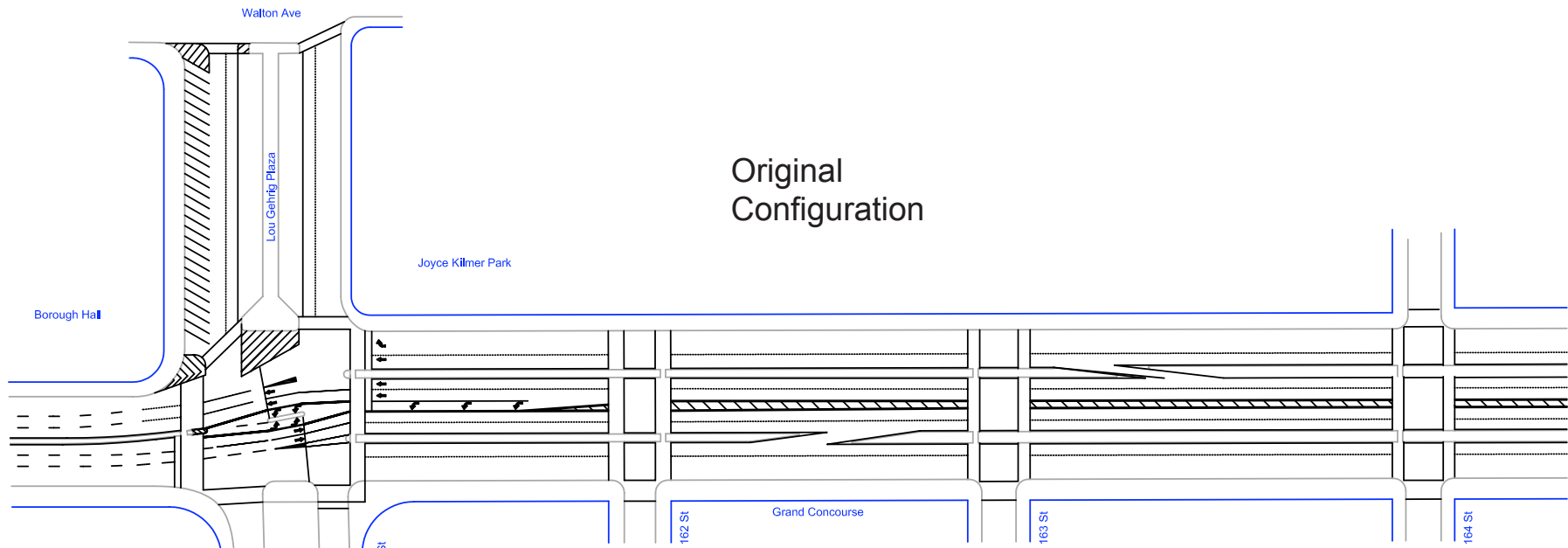
of East 165<sup>th</sup> Street) will be reconstructed as part of the East 161<sup>st</sup> Street Bridge reconstruction project, beginning *in late March 2006. During these reconstruction projects, NYCDOT will replace the East 161<sup>st</sup> Street Underpass Arch Structure, incorporate landscaped urban design features for Lou Gehrig Plaza and add more open space to the neighborhood.* Additionally as part of the bridge reconstruction project, the Grand Concourse/East 161<sup>st</sup> Street intersection, where the service and main roads merge in the center of the intersection resulting in multiple conflict points between vehicles and pedestrians and between vehicles with other vehicles, will be reconfigured. The plan shifts the northbound merge between the service and main roads to a midblock non-pedestrian location, and lengthens the merge for a smoother transition. The southbound merge between the service and main roads will be removed by forcing traffic on the service road to turn right onto westbound East 161<sup>st</sup> Street.

The roadway realignment is shown on the following page.

## Grand Concourse Pedestrian Safety Improvements E. 161st to E. 166th Street



## Original Configuration





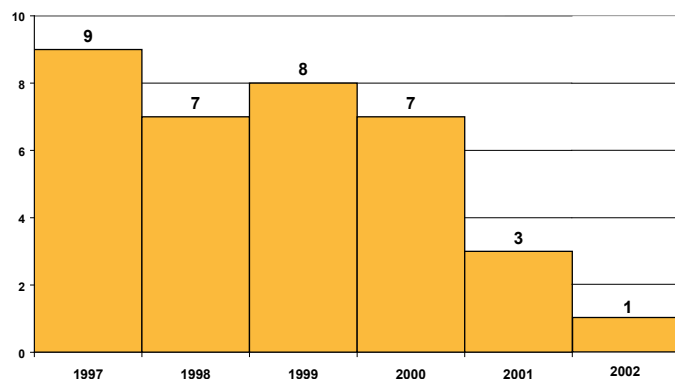
# GRAND CONCOURSE / EAST 170<sup>TH</sup> STREET

## HIGH PEDESTRIAN ACCIDENT LOCATION IMPROVEMENTS

### Description

The intersection of East 170<sup>th</sup> Street and the Grand Concourse is signalized and very wide (142 feet). On the Grand Concourse main roadway approach, there are two moving lanes and a left-turn lane in each direction and two moving lanes and one parking lane in each direction on the northbound and southbound service roads. There are raised medians between the main and service roads that provide refuge for pedestrians. The east side of East 170<sup>th</sup> Street has one moving lane in each direction separated by angle parking in the center. The west side of East 170<sup>th</sup> Street has one lane in each direction separated by a tunnel. The BX1 and BX2 buses run along the Grand Concourse and the BX11 and BX18 run along East 170<sup>th</sup> Street. The C and D subway entrances are on the southwest and southeast corners of the intersection.

Pedestrian Accident Experience 1998 - 2002



In terms of the accident experience, in 1997 this location ranked eighth amongst the top 20 pedestrian accident locations with a total of nine accidents involving pedestrians. Most of these accidents were the result of pedestrians crossing against the signal or negligent driving on the part of the vehicle operator. In 1998, pedestrian accidents decreased 22% (to seven from nine). In 1999 there were eight pedestrian accidents, which is 11% less than 1997. In 2000, pedestrian accidents decreased to seven, which is 22% less than 1997. In 2001, pedestrian accidents decreased significantly

to three which is 67% less than 1997. *In 2002, pedestrian accidents declined to just one.*

## Concerns

- Northbound articulated buses destined to far side bus stop spill back across intersection
- Pedestrians cross against signals
- Vehicle operators make U-turns on the main roadway
- Pedestrians cross mid-block on the Grand Concourse
- Steep upgrade causes visibility problems on eastbound East 170<sup>th</sup> Street approaching the Grand Concourse

## Implemented Improvements

- Installed 12" Red Lenses on all signals
- Installed Peg-a-Tracs to guide traffic across wide intersection
- Replaced all missing signs (September 1999)
- Upgraded Yield to Pedestrian signs
- Installed additional No U-turn signs
- Upgraded all crosswalks to high visibility
- Installed pedestrian crossing signals on all medians and upgraded them to international pedestrian signals in October 2000
- Installed dual left turn signal phases (October 1999)
- Installed signs stating "Left Turn on Green Arrow Only" in coordination with the installation of the left-turn signal
- Installed "Wait For Walk Signal" signs on all signal posts

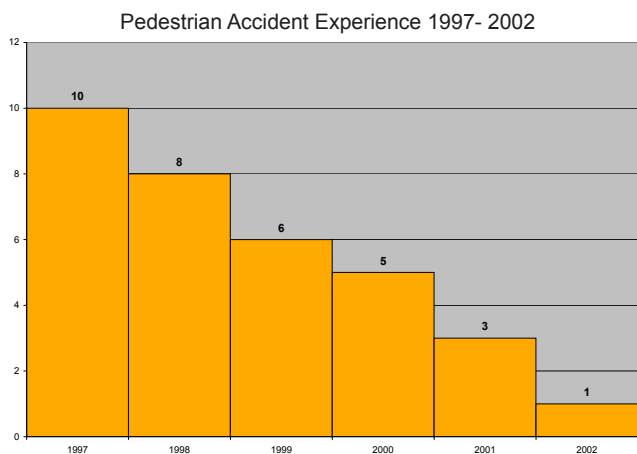


# GRAND CONCOURSE / EAST 183<sup>RD</sup> STREET

## HIGH PEDESTRIAN ACCIDENT LOCATION IMPROVEMENTS

### Description

The intersection of East 183<sup>rd</sup> Street and Grand Concourse is signalized. There are two moving lanes and a left-turn lane in each direction on the Grand Concourse main roadway approach and two moving lanes and one parking lane in each direction on the northbound and southbound service roads. There are two raised medians between the main and service roads that provide refuge for pedestrians. The east side of East 183<sup>rd</sup> Street has one moving lane in each direction and two parking lanes. The west side of East 183<sup>rd</sup> Street has one moving lane in each direction and two parking lanes. The BX1 and BX2 buses run along the Grand Concourse. In the northbound direction (just south of the intersection) on the Grand Concourse approaching East 183<sup>rd</sup> Street, there is a slip ramp from the service road to the main road. PS 115 is located one block east of the Grand Concourse. School 'ladder' crosswalks and school crossing signs are specified on the south and west legs and high visibility crosswalks are on the north and east legs.



One of the primary safety concerns at this location is pedestrians crossing against the signal, as well as the distance involved for pedestrians to cross the Grand Concourse. As such, the improvements implemented in 1999 were aimed at improving pedestrian safety at this location.

In terms of the accident experience at this location, in 1997 this intersection ranked sixth amongst the top 20 pedestrian accident locations for that year with

a total of ten accidents involving pedestrians. In 1998, pedestrian accidents decreased 20% (to eight from ten accidents). In 1999, pedestrian accidents decreased to six from eight accidents, which is 40% less than 1997. In 2000, the first full year after the treatments were installed, pedestrian accidents decreased to five, which is 50% less than 1997. In 2001, pedestrian accidents declined to three, which is 70% less than 1997. *In 2002, pedestrian accidents declined even further to one. There was one pedestrian fatality in 2001 and 2005, respectively.*

*Overall, the decline in accidents since 1997 represents a major accomplishment for the Department at this location. The decline can be attributed to the Department's ongoing efforts along the Grand Concourse corridor and the targeted pedestrian improvements made at locations along the corridor.*

## Improvements Implemented in 1999

- 12" red lenses on signal faces
- High visibility crosswalks installed at all four legs of the intersection
- Pedestrian barriers installed at medians to prevent mid-block crossings
- Modified the signal timing to allow for increased time for pedestrian crossing
- Replaced all missing signs
- Installed "Wait for Walk Signal" signs
- Installed pedestrian crossing signals on all medians and upgraded them to international pedestrian signals in October 2000
- Repaired three streetlights
- Increased the all-red interval to ensure that left-turning vehicles clear the intersection





# SOUTH BRONX CHURCHES

## Description

South Bronx Churches (SBC) is a 15-year old organization whose membership includes area congregations and resident/tenant organizations. In the past few years, the housing stock, population and environment of the South Bronx has changed dramatically. SBC has constructed 146 new Nehemiah homes just south of St. Mary's Park in the past three years and traffic congestion has increased in the area.

## Implemented Improvements

In October 2001, SBC submitted their recommendations to improve pedestrian and vehicular safety in the area bounded by East 138<sup>th</sup> and East 163<sup>rd</sup> Streets between Bruckner Boulevard and Willis Avenue. All recommendations were reviewed and the following improvements were implemented:

- Installed truck loading zones on St. Ann's Avenue between East 138<sup>th</sup> and East 139<sup>th</sup> Streets in January 2002.
- Installed an All-Way Stop control at the East 139<sup>th</sup> Street/Cypress Avenue intersection in February 2002.
- Installed "No Parking Anytime" signs on the east curb of Cypress Avenue between East 138<sup>th</sup> and East 139<sup>th</sup> Streets in January 2002.
- Installed "Do Not Enter" signs at Brook Avenue near the Major Deegan Expressway

southbound exit ramp in January 2002.

- Installed a bus stop on the west curb of Bruckner Boulevard near the East 138<sup>th</sup> Street intersection in December 2001.
- Added five seconds (from 35 to 40 seconds) to cross Bruckner Boulevard at East 138<sup>th</sup> Street in February 2002.
- Installed “Keep Intersection Clear” signs at the Jackson Avenue/East 138<sup>th</sup> Street intersection in February 2002.
- Installed “Dead End” signs on Beech Terrace at St. Mary’s Park South in December 2001.
- Removed one parking space on the northwest corner of Westchester Avenue in January 2002.
- Installed additional “Yield to Pedestrian”, curve warning and reduced speed signs on St. Mary’s Park South in February 2002.
- Installed two speed reducers on Tinton Avenue between East 150<sup>th</sup> and East 152<sup>nd</sup> Streets and one on Union Avenue between East 150<sup>th</sup> and East 151<sup>st</sup> Streets in February 2002.
- Daylighting was installed at the intersection of East 137<sup>th</sup> Street and Cypress Avenue in April 2002.
- A painted median was installed on Tinton Avenue between East 156<sup>th</sup> and East 152<sup>nd</sup> Streets to narrow the roadway width in September 2002.
- Two speed reducers were installed on Jackson Avenue between East 147<sup>th</sup> and East 149<sup>th</sup> Streets in June 2002, and one reducer was installed on East 140<sup>th</sup> Street between Cypress and St. Ann’s Avenues in January 2003.
- Additional markings were installed or refurbished at the following locations:
  - Bruckner Boulevard/ East 138<sup>th</sup> Street - peg-a-tracs were installed in July 2002 to guide motorists across Bruckner Boulevard.
  - Tinton Avenue between East 152<sup>nd</sup> and East 156<sup>th</sup> Streets - a center median and a mid-block school crosswalk (along with necessary school crossing signs and word messages) were installed in October 2002.

- East 152<sup>nd</sup> Street between Jackson and Union Avenues - a lane line was installed in August 2002 to better define the moving lanes.
- Jackson Avenue/Westchester Avenue/East 152<sup>nd</sup> Street - high visibility crosswalks, school crosswalk, and school crossing messages refurbished in October 2002.
- Westchester Avenue/Tinton Avenue/East 156<sup>th</sup> Street - pedestrian and school crosswalks refurbished and Stop lines installed in October 2002.
- Tinton Avenue/East 152<sup>nd</sup> Street - school crosswalks, school crossing messages, Stop lines refurbished in October 2002.
- Cypress Avenue/East 138<sup>th</sup> Street - pedestrian and school crosswalks, school crossing messages refurbished in August 2002.
- Cypress Avenue/East 139<sup>th</sup> Street - school crosswalks, school crosswalk messages, Stop line, Stop messages refurbished in August 2002.
- Cypress Avenue/East 139<sup>th</sup> Street – Installed All-way stop with ‘Stop Ahead’ and ‘Stop’ message in Winter 2003.
- Cypress Avenue/East 137<sup>th</sup> Street – Completed daylighting of intersection in Winter 2003.
- Jackson Avenue/East 138<sup>th</sup> Street – Repositioned two ‘Keep Intersection Clear’ signs in January 2003.
- A two-way modified Class 3 bicycle route (signs and bike symbol pavement markings) was installed on St. Ann’s Avenue between East 135<sup>th</sup> and East 149<sup>th</sup> Streets (.8 miles in each direction) in April 2003. A Class 2 bicycle lane (signs and bike symbol and long line pavement markings) was installed on St. Ann’s Avenue between East 149<sup>th</sup> and East 161<sup>st</sup> Streets (.8 miles in each direction) in April 2003.

Street lighting improvements were completed in May 2003 at:

- Franklin Avenue between East 167<sup>th</sup> and East 168<sup>th</sup> Street

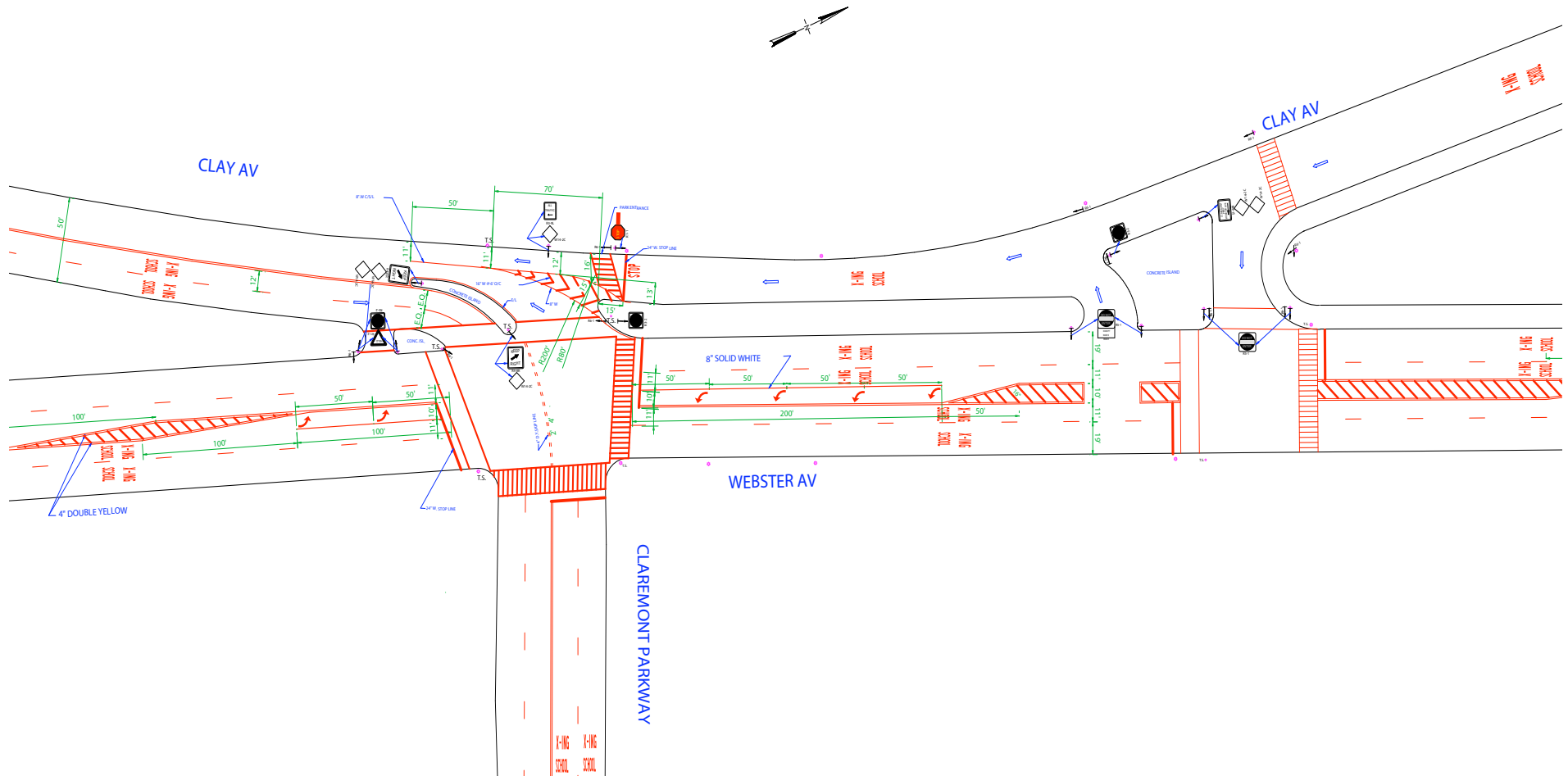
- Upgraded four existing luminaries in this area to the newer, more efficient 250 watt High Pressure Sodium (HPS) fixtures. Added light pole with new 250 watt HPS directly in front of St. Augustine Church.
- Morris Avenue between 163<sup>rd</sup> and 164<sup>th</sup> Streets
  - Installed two new 250 HPS lighting fixtures to improve visibility.

Additional markings and signs were installed in the vicinity of Our Lady of Victory Church (the intersection of Claremont Parkway @ Webster Avenue) in May 2003. Implemented improvements include:

- Installed school crosswalk on the north leg of the intersection
- Installed stop word messages on the north service road
- Installed three school crossing messages on the north leg, two on the south leg, two on the main road, and one on the service road
- Added stop lines at all approaches
- Installed peg-a-tracs to guide turning vehicles through the intersection
- Added new yield markings
- At the intersection of Webster and Clay Avenues, installed stop lines on the north, south and west legs
- Installed new advance school crossing signs on the north and south legs

The improvements are shown on the following page.

| REVISIONS |      |             |
|-----------|------|-------------|
| DATE      | APPD | DESCRIPTION |
|           |      |             |
|           |      |             |
|           |      |             |
|           |      |             |



NOTE:  
 1. THIS DRAWING REPLACES DRAWING CC-101  
 2. FOR WEBSTER AVE PAVEMENT MARKING SEE DWG. MD-183(A&B)

|   |                    |                              |                               |
|---|--------------------|------------------------------|-------------------------------|
| CITY OF NEW YORK                                    |                    | DEPARTMENT OF TRANSPORTATION |                               |
| BUREAU OF TRAFFIC OPERATIONS                        |                    | L.I.C., N.Y. 11101           |                               |
| 28-11 Queens Plaza North                            |                    |                              |                               |
| CLAREMONT PARKWAY & CLAY AVENUE<br>@ WEBSTER AVENUE |                    |                              |                               |
| APPROVED  | Drawn by<br>ES     | Checked by<br>AN             | DRAWING<br>NO. <u>CD- 262</u> |
| BY _____  | Borough<br>Scriber | BROOKLYN<br>1" = 30'         |                               |
|   | Date<br>4/28/03    |                              |                               |
|   |                    |                              |                               |



# EAST FORDHAM ROAD/ EAST KINGSBRIDGE ROAD/ BAINBRIDGE AVENUE

## Description

East Fordham Road/East Kingsbridge Road/Bainbridge Avenue is a graded irregularly aligned intersection located in the heart of the Fordham Road retail center and is surrounded by dense residential land use. There is a triangularly-shaped Parks Department GreenStreet located between Bainbridge Avenue and East Kingsbridge Road with several benches that are utilized by people waiting for the bus, as well as shoppers and area residents. There is a two-way (eastbound and westbound) slip off the mainline of East Kingsbridge Road that connects to East Fordham Road. East Fordham Road is a major bus route for both MTA and Liberty Line Westchester County buses. Many of the shoppers in the area use mass transit and pedestrian activity and volume is very high.

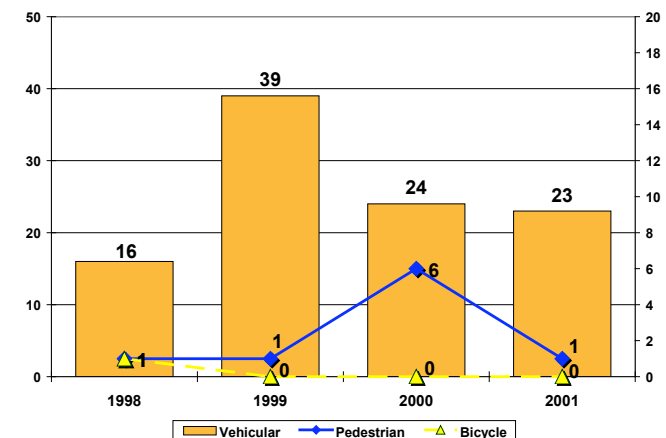
One of the primary concerns at this intersection is that even though the intersection is signalized, the geometry of the roadway guides pedestrians to cross diagonally creating unnecessarily risky vehicle/pedestrian conflicts.

In terms of the accident history for this location, there were a total of 18 accidents in 1998, of which one involved a pedestrian and one involved a bicycle. Accidents more than doubled in 1999 to 40 total accidents, of which one involved a pedestrian. In 2000, accidents decreased 25% to 30 total accidents, with pedestrian accidents increasing significantly to six. Total accidents continued



Original Configuration of Intersection

Accident Experience 1998 - 2001







Detailed view of several of the improvements including one-way conversion of slip ramp, modified neckdown and flexible delineators surrounding the park

to decline in 2001 to 24, with pedestrian accidents declining significantly to one. Although accidents, both vehicular and pedestrian declined consistently prior to the improvements implemented in September 2002, these improvements should facilitate the declining accident trend at this location which started in 1999.

## Improvements Implemented in September 2002

- Converted the East Kingsbridge Road slip roadway to one-way westbound from East Kingsbridge Road to East Fordham Road mainline to reduce conflicts and improve safety.
- Widened the triangular park to the west and north with pavement markings and flexible delineators to narrow the street, discourage double parking, increase pedestrian sidewalk space, and decrease crossing distance.
- Installed a modified neckdown on the northwest corner of the East Kingsbridge Road slip/East Fordham Road intersection to increase pedestrian sidewalk space and decrease crossing distance.
- Widened the East Fordham Road north sidewalk (and installed delineators) approaching Bainbridge Avenue/East Kingsbridge Road and widened the east sidewalk of East Kingsbridge Road west of Bainbridge Avenue to reduce pedestrian crossing distance and provide more sidewalk



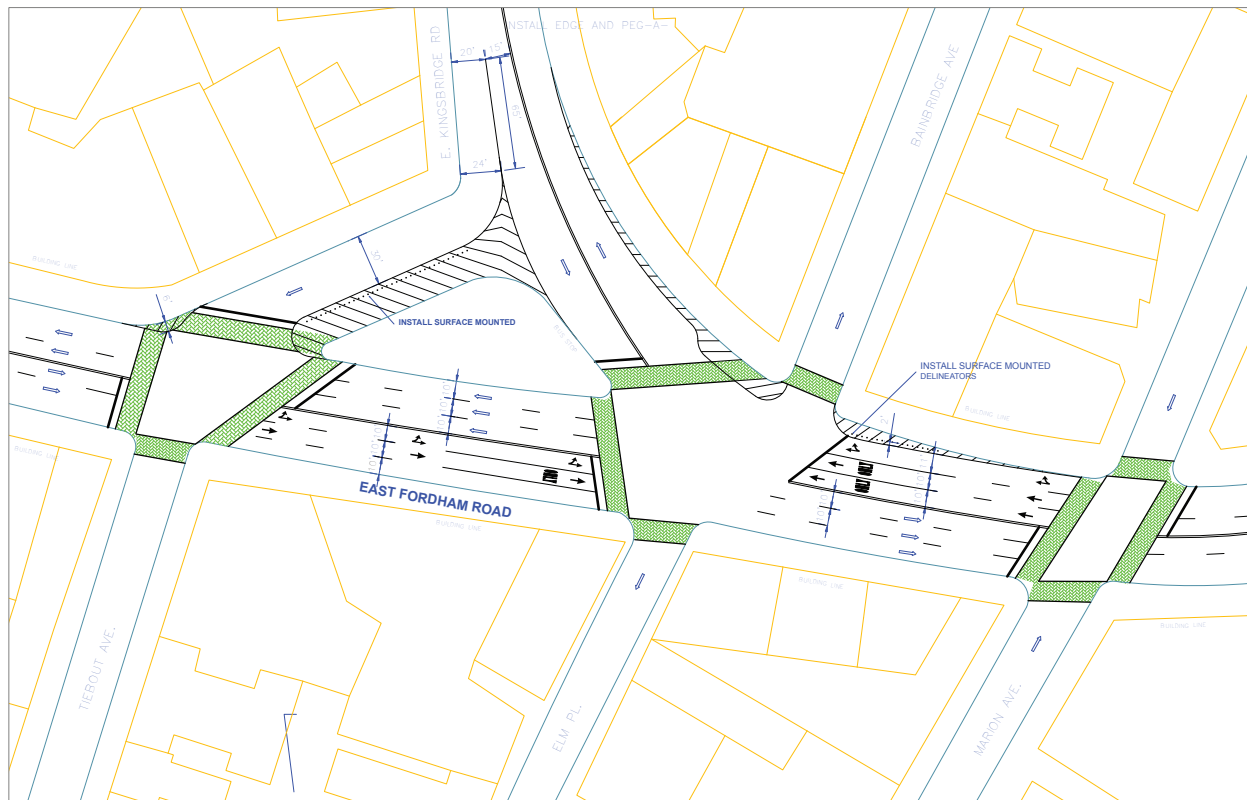
Flexible delineators and markings for increased pedestrian and vehicular safety

space.

- Installed Stop bars, lane assignment arrows, and double yellow and lane lines as appropriate.
- Modified signal faces as appropriate.

The improvements are shown on the following page and were done in coordination with the installation of priority rush hour bus lanes (in both directions) on Fordham Road between University Avenue and Southern Boulevard.





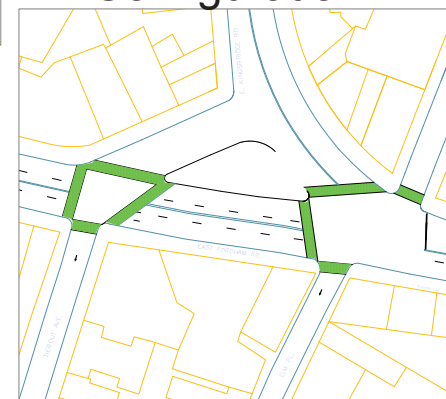
Reconfigured  
Intersection



**GENERAL NOTES:**

- \* INSTALL REFLECTIVE EDGE MARKINGS ON SIDES OF ZEBRA PAVERS TO IMPROVE VISIBILITY OF CROSSWALKS AT NIGHT TO APPROACHING MOTORISTS.
- \* INSTALL STOP BARS ON ALL APPROACHES.
- \* EXISTING ZEBRA PAVERS SHOWN TO REMAIN.

Original  
Configuration



## East Fordham Road @ East Kingsbridge Road Safety Improvements

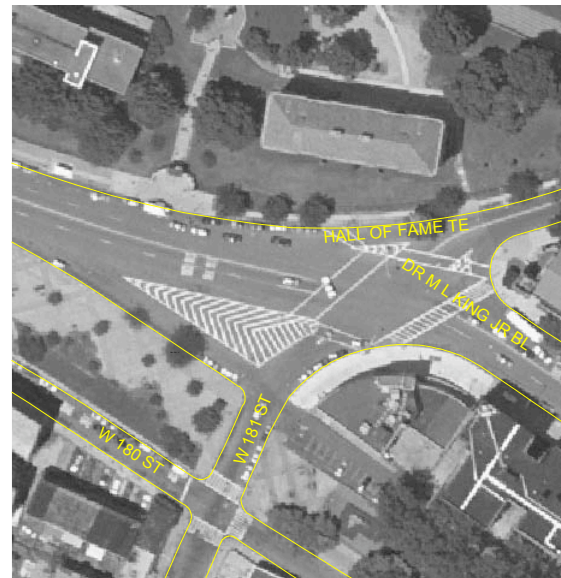


# UNIVERSITY AVENUE/ WEST 181<sup>ST</sup> STREET/ HALL OF FAME TERRACE

## Description

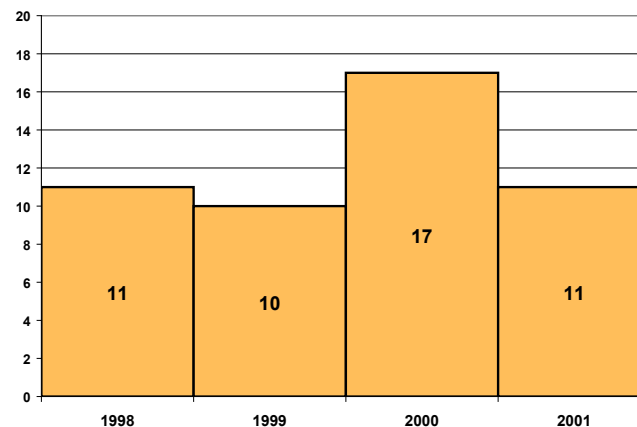
In its original configuration, the intersection of University Avenue, West 181<sup>st</sup> Street and Hall of Fame Terrace was unusually wide. Due to this configuration, the roadway was configured with large painted islands that channelized traffic resulting in Stop controlled roadways and unusual approaches and turning movements. Hall of Fame Terrace is offset from West 181<sup>st</sup> Street across University Avenue and there is a steep grade on Hall of Fame Terrace approaching the intersection. Surrounding land uses include Bronx Community College, a park, a library and a church all generating high pedestrian activity.

One of the primary concerns at this location was frequent jaywalking across University Avenue, (approximately 230 feet south of the signal) which was the result of a natural pedestrian path from a park on the east side of University Avenue to the entrance of Bronx Community College on the west. While not a high accident location, this intersection was of concern to the Department due to the surrounding land uses and increase in accidents in 2000, leading the Department to take a proactive approach at this location to address the safety concerns. In terms of the accident experience at this intersection, there were 11 accidents in 1998 and 10 accidents in 1999. In 2000, accidents increased to 17, a 70% increase. In 2001, although accidents returned to the previous level of 11 total accidents, this represented a decline of 35% from 2000 levels. Overall, the Department believes the improvements made at this intersection



Original Configuration of Intersection

Accident Experience 1998 - 2001





Detailed view of additional pedestrian space created by the use of curb mounted delineators and markings



in October 2002 will greatly improve both pedestrian and vehicular safety.

## Improvements Implemented in October 2002

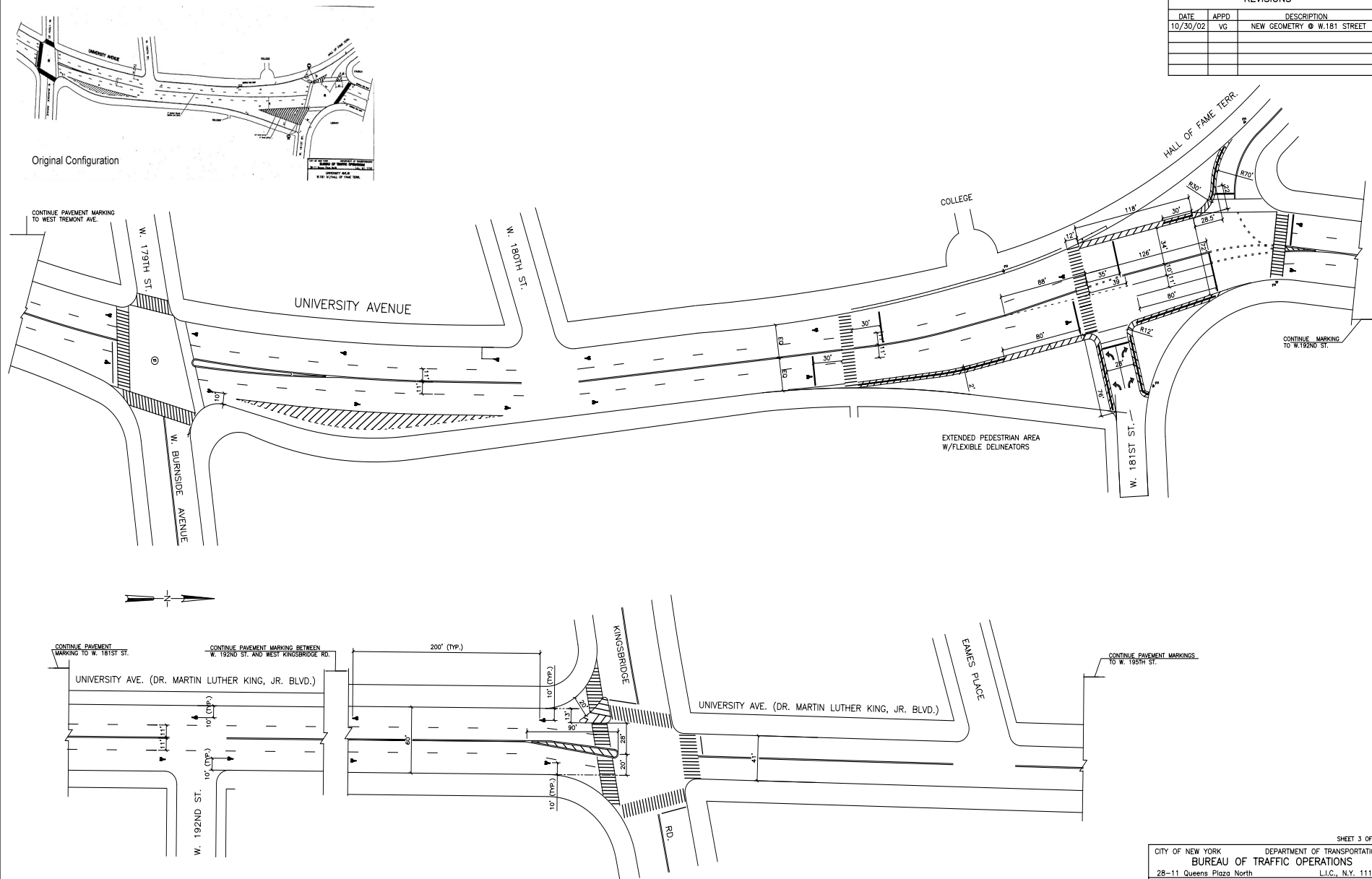
- Reconfigured the intersection with new channelization markings in combination with curb mounted delineators to create additional pedestrian space.
- Reconstructed the existing signal to conform to the new geometry. The signal provides separate phases for Hall of Fame Terrace and West 181<sup>st</sup> Street which now operate concurrently.
- Removed “Stop” controlled slip roadways to improve pedestrian safety.
- Installed a left turn lane for northbound University Avenue.
- Upgraded crosswalk markings to high visibility on the south leg of University Avenue and West 181<sup>st</sup> Street.
- Installed a new pedestrian crossing signal with a high visibility crosswalk (approximately 230 feet south of West 181<sup>st</sup> Street) at the park walkway.
- Installed a pedestrian separator on the west side of University Avenue (in front of the entrance/exit of Bronx Community College) to direct pedestrians to the signalized crossings.

The improvements are shown on the following page.

# REVISIONS

| DATE     | APPD | DESCRIPTION                 |
|----------|------|-----------------------------|
| 10/30/02 | VG   | NEW GEOMETRY @ W.181 STREET |
|          |      |                             |
|          |      |                             |
|          |      |                             |

Original Configuration



NOTE: BIKE SYMBOL, INSTALLED WITHOUT BIKE LANE  
IS A PILOT INSTALLATION  
RECOMMENDED BY BIKE PROGRAM/PLANNING (A/C P.PENNICA)

|   |                            |                              |             |
|---|----------------------------|------------------------------|-------------|
| CITY OF NEW YORK  |                            | DEPARTMENT OF TRANSPORTATION |             |
| 28-11 Queens Plaza North                                    |                            | L.I.C., N.Y. 11101           |             |
| E. L. GRANT HWY/ UNIVERSITY AVE/<br>STRONG ST./ GOULDEN AVE |                            |                              |             |
| APPROVED  | Drawn by<br>M. F.<br>V. G. | DRAWING                      | NO. MD-473C |
| BY  | Borough<br>Scale<br>Date   |                              |             |
|   | 2/26/2002                  |                              |             |





**BROOKLYN**



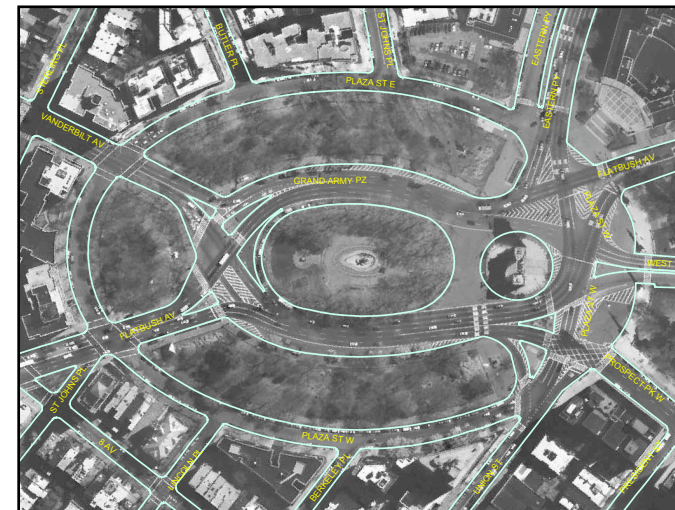


# GRAND ARMY PLAZA

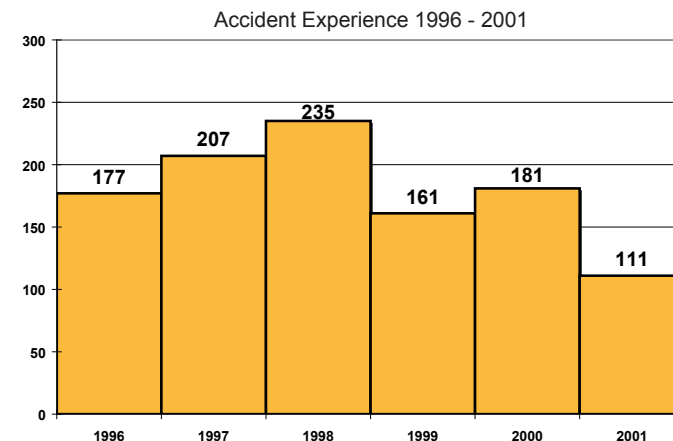
## Description

Grand Army Plaza is a complex traffic circle where Flatbush and Vanderbilt Avenues, Eastern Parkway, Union Street and the Prospect Park Drive converge. Over the past several years, the Department has actively engaged in improving the operation and safety of the roadway for both motorists and pedestrians. Prior to the implementation of the Department's improvements in 1999, vehicles wishing to enter and exit the circle were forced to change lanes for the various approaches around the circle, contributing to significant weaving movements throughout the circle. For pedestrians, the unusual geometry and wide roadway had encouraged pedestrians to move against or without signals. In addition, pedestrians were not always certain where to cross, as well as encountering medians that had little or no storage capacity.

In the Spring of 1999, the Department conducted an in-depth analysis of the traffic conditions at Grand Army Plaza and the supporting roadways. At the time of the study, this location had consistently ranked as one of the highest overall accident locations in the city. In terms of the accident experience at this location, accidents were on an upward trend between 1996 and 1998, the year prior to the implementation of safety improvements. In 1996, there were 177 total accidents, which ranked second citywide. In 1997, accidents increased considerably to 207, which again ranked second citywide. In 1998, accidents increased considerably, peaking at 235 total accidents. This increase made Grand Army Plaza the highest ranked accident location in the City.



Aerial view of reconfigured intersection



In 1999, the Department implemented several measures aimed at improving vehicular and pedestrian safety throughout Grand Army Plaza. As such, the accident experience at this location improved substantially, with the total number of accidents at this location sharply decreasing by 31.4% (to 161 from 235) since 1998. In 2000, total accidents increased slightly to 181, but this still represented a 23% reduction in the number of accidents from 1998 levels. Despite the decline in the total number of accidents, this location remained the highest ranked accident location citywide. In 2001, total accidents at the intersection declined even more significantly, down 52% (to 111 from 235) from 1998 levels. For 2001, this location dropped to fourth citywide among high accident locations.

In addition to the decline in total accidents, pedestrian conditions within the Plaza have also improved. Between 1996 and 2001, there was one pedestrian accident in each of these years with the exception of 1997, when four pedestrian accidents occurred. 2001 represented the first year in which no pedestrian accidents occurred.

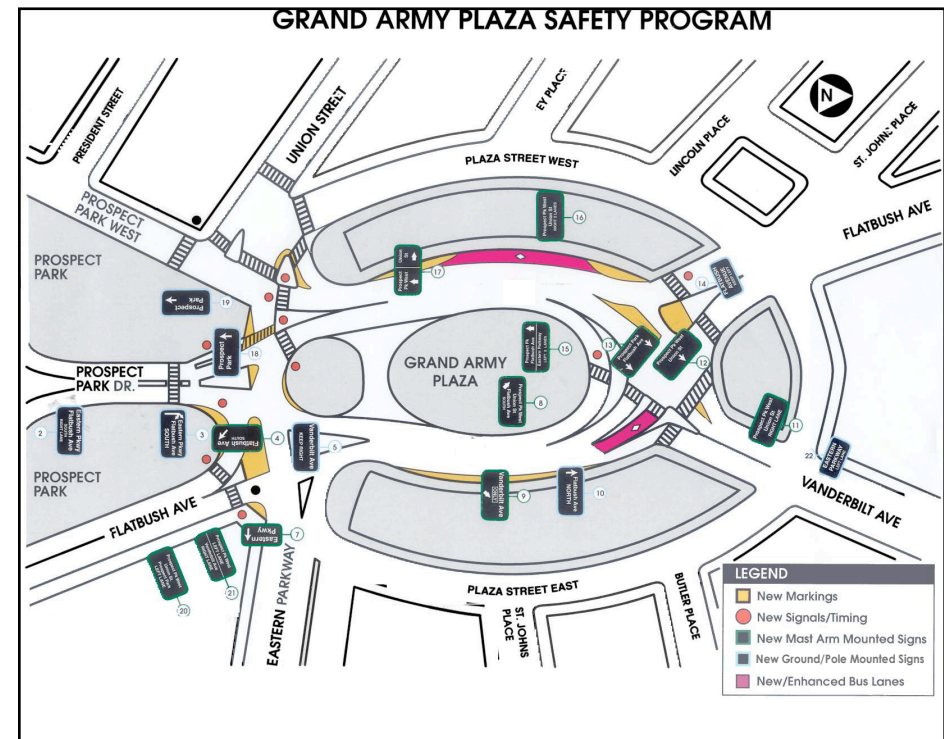
Based upon the consistent improvement in the accident experience at this location after the implementation of improvements in 1999, the Department has concluded that the measures implemented at this location have had a profound impact on improving the safety of both motorists and pedestrians. In addition, this location can serve as an example of the overall improvement in safety throughout the city. Although this location was ranked number one citywide in both 1999 and 2000, the total number of accidents at this location annually was still less than it was in the years prior to implementation of the safety measures. In addition, the trends in the rankings were influenced by the overall downward trend in accidents citywide.

### Improvements Implemented in August 1999 and December 2000

- Through signal adjustments, separated the Prospect Park exit from the northbound Flatbush Avenue movement.



- Through new markings and signal adjustments, modified stopping points and clearance phases to eliminate conflict between southbound Flatbush Avenue and Union Street.
- Split the pedestrian crossing of Flatbush Avenue (from the park to the library). Pedestrians are now able to cross from the park to the center median during the Flatbush Avenue north movement, from the library to the center median during the Eastern Parkway movement, and have a continuous crossing during the Prospect Park movement.
- Installed a new crosswalk facilitating pedestrian access to the monument. The pedestrian signals between the traffic island and the monument were modified to display “WALK” when the southbound traffic is stopped.
- Modified the push button actuated signal (on the inner roadway at the north end of the plaza) to flash amber instead of steady green. This was coordinated with the installation of Yield signs and word messages where the inner roadway merges with traffic from southbound Flatbush Avenue/ Vanderbilt Avenue.
- Improved roadway geometry by modifying and refurbishing pavement markings including channelization, skip lines, lane usage arrows, painted shoulders, buffer zones, reflective lane markers, and a ‘bus only’ lane for southbound traffic on the west side of the Plaza.
- Installed 20 signs (12 on mast arms) in advance of and around the Plaza. These are directional signs to properly guide motorists, reduce conflicts and minimize weaving movements. The locations of these signs are shown in the illustration to the right.
- Installed 12 o’clock green arrows for southbound traffic destined for Prospect Park West.
- Installed a signal controlling southbound Flatbush Avenue at the north side of the Plaza to



eliminate the conflicts with Vanderbilt Avenue and protect pedestrians.

## **Improvements Implemented in 2002 and 2003**

- All markings were refurbished in May 2002.
- Modified the signal at the northern end of Grand Army Plaza to enhance pedestrian safety. The new operation provides a split crossing of Vanderbilt Avenue using the traffic island as a safety refuge. Pedestrians no longer have to negotiate the lengthy 120 foot crossing during the Flatbush Avenue [south] phase of the signal cycle. In addition the time to cross Flatbush Avenue was increased by approximately six seconds. This improvement was completed in August 2003.
- The raised concrete island separating Flatbush Avenue (north & south) and Eastern Parkway was upgraded in September 2003. This improvement provides additional refuge space for pedestrians when crossing Flatbush Avenue. At times during the signal cycle, pedestrians may only cross half way and must wait before completing their crossing of Flatbush Avenue.
- A street lighting upgrade consisting of the elements listed below was completed in November 2003:
  - 16 new pedestrian arms equipped with 150 watt high pressure sodium luminaries were installed on existing street light poles on the perimeter.
  - Two new street light poles were installed on the roadway at the inner circle.
  - Two shaft extensions each equipped with two 250 watt high pressure sodium luminaires were installed on existing traffic signal poles near the entrance to Prospect Park.

## **Improvements Implemented in 2004**

- School crosswalks were refurbished in June and July 2004.



# IMPROVEMENTS IN THE VICINITY OF EASTERN PARKWAY/UTICA AVENUE & KINGS HIGHWAY/LINDEN BOULEVARD/REMSSEN AVENUE

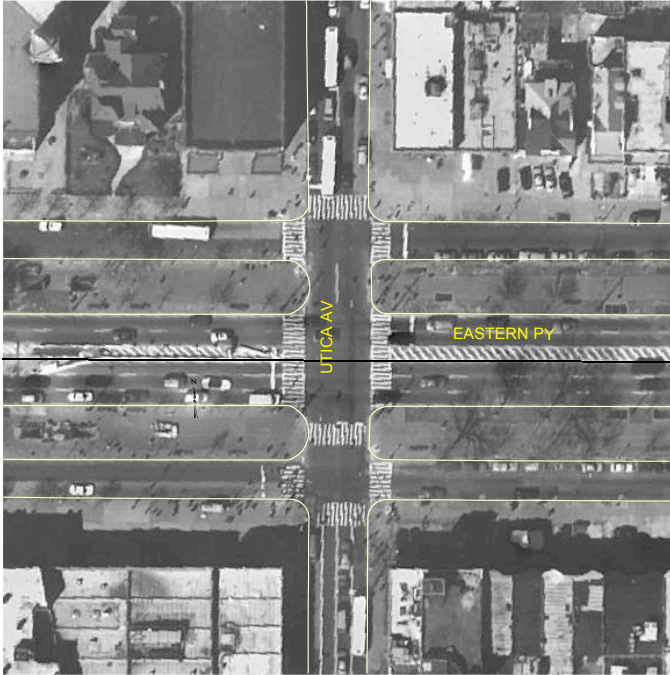
Over the past several years, the Department has been actively engaged in improving the safety and operability of numerous roadways in the northwest section of central Brooklyn. Some of the more notable roadways and intersections that have been a part of these efforts include the Eastern Parkway and Utica Avenue corridors, the intersection of Eastern Parkway and Utica Avenue itself and the intersection of Kings Highway, Linden Boulevard and Remsen Avenue. Many of the recommendations and subsequent improvements are the result of the early action plan of the Weeksville/Utica Avenue Transportation Study. This study involved working closely with other agencies (e.g. Department of City Planning, MTA), community groups, elected officials and other interested parties to develop solutions to address pedestrian safety and mobility concerns, as well as quality of life issues. *Over the course of this study, the Department was able to implement many of the short-term mitigation measures (highlighted within this section) prior to the completion of the Final Report. In the spring of 2005, the Department completed the Study and its assessment of future traffic conditions (to 2010). As part of the Final Report, the Department developed a multi-faceted improvement package to improve the overall operation and safety for all users of the corridors within the study area. Many of these recommendations built upon efforts that were previously implemented in earlier phases of the study.*

To date, the Department has focused on two primary areas of concern:

- the Eastern Parkway corridor, the intersection of Eastern Parkway and Utica Avenue and the surrounding areas and
- the intersection of Kings Highway, Linden Boulevard and Remsen Avenue and the surrounding areas.



# EASTERN PARKWAY



Aerial view of intersection

## Description

Eastern Parkway is a landmark boulevard consisting of three eastbound and two westbound travel lanes on its main roadway and separate travel and parking lanes on each of its eastbound and westbound service roads. The main roadway is separated from the service road by landscaped promenades on both sides of the roadway. In its original configuration, the service roads operated as one travel lane and two parking lanes with alternate side parking regulations, effectively providing two travel lanes. Utica Avenue is a north-south arterial with two 10-foot lanes in each direction and substantial commercial land use on both sides of the roadway.

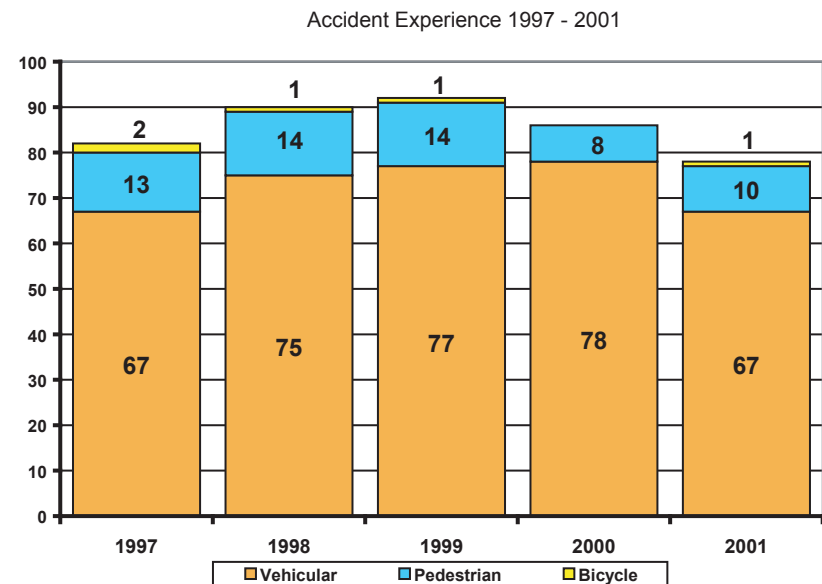
The intersection of Eastern Parkway and Utica Avenue is a center of intense pedestrian and motor vehicle activity serving the needs of thousands of commuters and others daily. The intersection also serves as an important intermodal transfer point for public transportation as three bus lines, two subway lines and numerous for-hire vehicles provide public transportation at the intersection. Of the three bus lines, the B14 and B17 begin their routes at the southwest corner, and the B46 passes through the intersection in the middle of its route. The B14 runs between Crown Heights and East New York via Pitkin and Sutter Avenues. The B17 runs between Crown Heights and Canarsie via Remsen Avenue. The B46 runs between Williamsburg and Kings Plaza via Utica Avenue.

Two subway routes, the “3” and “4” stop at Utica Avenue. The “3” is a local that continues east to New Lots Avenue and the “4” is a heavily patronized express that terminates at Utica Avenue. This makes the intersection very active as commuters transfer between the subway and other transit modes to continue their journey. The subway station entrances are located on the promenade.

With the high volume of buses, for-hire vehicles and pedestrians, this intersection, especially along the eastbound service road of Eastern Parkway and Utica Avenue is often congested. In addition, the illegal use of bus stops by for-hire vehicles that do not comply with existing parking regulations and traffic control devices is problematic. These vehicles routinely stop to pick-up or drop-off fares in the bus stops located on the eastbound service road and on both sides of Utica Avenue. This leads to significant congestion during the evening peak hours.

An additional concern at this location is illegal turns by for-hire vehicles from the eastbound service road onto Utica Avenue. Right turns onto Utica Avenue are prohibited for all vehicles except buses, and left turns onto Utica Avenue are prohibited for all vehicles. For-hire vehicles also make illegal U-turns on Utica Avenue. These illegal movements contribute to the congestion and safety concerns for both pedestrians and motorists.

With the high volumes of pedestrian and vehicular traffic and the distinct roadway characteristics, this intersection has frequently rated high on both the citywide pedestrian and citywide total accident charts. In terms of pedestrian rankings, this location was ranked second amongst the top 20 pedestrian accident locations citywide in 1997 and 1998, with 13 pedestrian accidents in 1997 and 14 in 1998. In 1999, this location held the highest ranking in the city with 14 pedestrian accidents. In 2000, pedestrian accidents decreased by nearly 43% to eight and was tied for tenth citywide. In 2001,



pedestrian accidents increased slightly to 10 and moved up to fifth citywide. Although the ranking in 2001 jumped to fifth from tenth in 2000, this number is still less than the pedestrian accident experience between 1997 and 1999. ***In 2002, pedestrian accidents declined to an all-time low of only two, representing an 85.7% decline from the peak level of 14 in 1998 and 1999. There have been no fatalities at this intersection since 1998.***

This intersection has also frequently been amongst the top 20 total accident locations citywide. In 1997, it ranked 27<sup>th</sup> citywide with 82 total accidents. In 1998, accidents increased to 90 and the intersection moved up the rankings to number 18 citywide. In June 1999, the Department began to implement several improvements to address identified concerns at this location. Although accidents peaked in 1999 with 92 total accidents (which corresponds to a ranking of 12<sup>th</sup> citywide), the accident experience since these measures were implemented has been encouraging. In 2000, total accidents decreased 7% to 86 accidents and the intersection ranking dropped to 22<sup>nd</sup> amongst the City's highest accident locations. Most encouraging about this decline was the 43% decline in pedestrian accidents (to 8 in 2000 from 14 in 1999). In 2001, total accidents continued to decline to 78 total accidents, a 15% decline from the 1999 peak of 92 accidents. In addition, vehicular accidents declined 14% to 67 from 78 in 2001. Citywide, this location was ranked 15<sup>th</sup> in 2001.

The Department believes that the series of improvements that began in 1999 have significantly improved safety at this location and along both corridors by providing for safer vehicular and pedestrian movements through the intersection, as well as improving the overall flow of traffic through these corridors. In addition, these trends parallel the overall improvements taking place citywide over this time period. The Department will continue to monitor the improvements at this intersection and expects that the future improvements resulting from the Weeksville/Utica Avenue Transportation Study will continue this downward trend in accidents at this location.



## Improvements Implemented in June 1999

- Prohibition of right and left turns from the eastbound service road to Utica Avenue
- Periodic enforcement efforts against vehicles making illegal turns
- Prohibition of left turn (and removal of left-turn lane) from the westbound main roadway of Eastern Parkway to southbound Utica Avenue
- Addition of a westbound left-turn phase and lengthening of left-turn lane at the intersection of Eastern Parkway and Schenectady Avenue
- Relocation of STOP bar for northbound Utica Avenue and installation of new signal display at the STOP bar in advance of the intersection
- Installation of bus lanes on north and southbound Utica Avenue between Eastern Parkway and Union Street, effective Monday through Friday 7AM- 7PM
- Installation of signs (regulatory, advisory, warning)
- Refurbishment of all signs and markings

## Improvements Implemented in 2001 and 2002

Since 2001, the Department has continued to focus upon improving conditions at this specific intersection while expanding its attention to other intersections along both the Eastern Parkway and Utica Avenue corridors. The most significant improvements are highlighted below:

- At nine locations on Eastern Parkway (Classon Avenue, Franklin Avenue, Rogers Avenue, Nostrand Avenue, New York Avenue, Brooklyn Avenue, Albany Avenue, Troy Avenue, Schenectady Avenue), the signal operation was modified by stopping the service roads approximately 15 seconds before the mainline as a pedestrian safety enhancement. These signal improvements were implemented in April 2001 at the intersections of Eastern Parkway at Nostrand Avenue and at Franklin Avenue, which are subway station locations that generate high volumes of



pedestrians. Signal improvements at the remaining seven locations were completed in May 2001.

- In conjunction with the signal modifications, parking regulations were changed from alternate day, alternate side “No Parking 8AM - 6PM” to standard 1½ hour street sweeping regulations. This allows parking on both sides of the service roads, which tends to lower the incidence of speeding. This work was completed in May 2001.
- Extended the B46 southbound bus stop to the full length of the block between Eastern Parkway and Union Street to reduce conflicts with buses and vans. This work was completed in May 2001.
- Extended the bus stop/layover location for the B14 and B17 routes on the south curb of Eastern Parkway between Utica and Schenectady Avenues from 169 to 224 feet to allow the buses to pull up closer to the curb and make pedestrian movements safer. The work was completed in June 2001.
- Extended the existing priority bus lanes on both the east and west curbs of Utica Avenue between Eastern Parkway and Union Street to Carroll Street. In conjunction with this change, “No Standing 7-10 AM/4-7 PM Except Sunday” and “No Standing Except Trucks Loading and Unloading 10AM-4PM Except Sunday” regulations were installed on both the east and west sides of Utica Avenue between Union and Carroll Streets. This work involved the removal of all meters between Union Street and Carroll Street. This work was completed in July 2001.
- The centerline of Utica Avenue between Carroll Street and Empire Boulevard was offset to provide two travel lanes and one parking lane in each direction. This work was completed in July 2001.
- Angle parking was installed on both the north and south curbs of President Street between Utica Avenue and Rochester Avenue to provide 52 additional parking spaces (from 56 to 108). This work was completed in July 2001.



Angle Parking on President Street

- In coordination with the Department of Parks & Recreation, installed pedestrian barriers on the Eastern Parkway north and south medians for 320 feet west of Utica Avenue to discourage pedestrians from crossing midblock and to direct them to the intersection. This work was completed in April 2002.
- Signalized the service roads in conjunction with prohibiting right turns from both directions of the Eastern Parkway main roadway at Utica Avenue. This work was completed in June 2002.
- The signals facing both directions on the main roadway of Eastern Parkway were modified with straight ahead arrows (since no turns are permitted). In conjunction with this signal modification, “No Turns” signs and straight ahead arrow pavement markings were installed. In addition, a “No Left Turn” sign was installed at the south service road eastbound approach to Eastern Parkway. All work was completed in July 2002.
- Installed mid-block crosswalks on the Eastern Parkway Service Roads (approximately 150 feet west of Utica Avenue) to improve access to the subway station. All work was completed in July 2002.



Pedestrian barriers along the service road island prevent individuals from crossing the service road midblock

## Improvements Implemented in 2003

- All markings on Utica Avenue were refurbished in April 2003.
- To enhance pedestrian safety at the intersection of Utica Avenue and Avenue M, a Leading Pedestrian Interval (LPI) was added to the signal during Summer 2003. This allows pedestrians to start their crossing of Utica Avenue approximately six seconds prior to Avenue M getting a green indication.
- Due to the wide configuration of Eastern Parkway and the difficulty in viewing street names

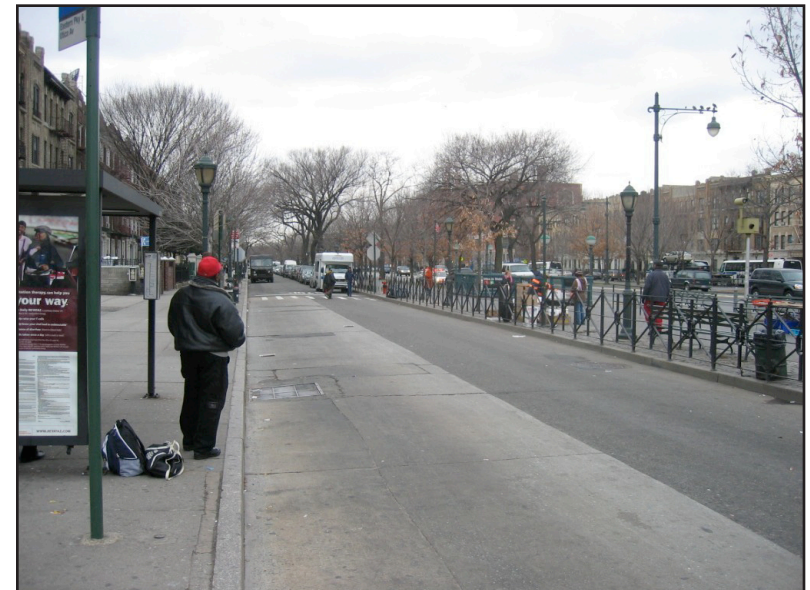
at corners, oversized street name signs were suspended over the roadway at the following 16 intersections in September 2003:

- Eastern Parkway @ Atlantic Avenue
- Eastern Parkway @ Rockaway Avenue
- Eastern Parkway @ Howard Avenue
- Eastern Parkway @ Rochester Avenue
- Eastern Parkway @ Schenectady Avenue
- Eastern Parkway @ Troy Avenue
- Eastern Parkway @ Albany Avenue
- Eastern Parkway @ Kingston Avenue
- Eastern Parkway @ Brooklyn Avenue
- Eastern Parkway @ New York Avenue
- Eastern Parkway @ Nostrand Avenue
- Eastern Parkway @ Rogers Avenue
- Eastern Parkway @ Fulton Street
- Eastern Parkway @ Franklin Avenue
- Eastern Parkway @ Bedford Avenue
- Eastern Parkway @ Washington Avenue (Installed August 2003)
- Markings on Eastern Parkway were refurbished in October 2003.

## Improvements Implemented in October 2005

### Intersection of Utica Avenue and Eastern Parkway

- *Installed Advanced Solid-State Traffic Controllers (ASTCs) along Utica Avenue between Pacific and Montgomery Streets.*
- *Added a clearance interval for the southbound approach on Utica Avenue and installed 12 inch lenses on all signals.*
- *Removed 11 parking spaces along the Eastern Parkway south service road between Schenectady and Utica Avenues, and extended the bus stop by 100 feet and created a truck loading/unloading zone for an additional 100 feet.*
- *Allowed parking along the median of the Eastern Parkway service roads between Schenectady and Rochester Avenues and from Schenectady to Utica Avenue (from the Pedestrian fencing to Schenectady Avenue).*
- *Strictly enforced rules against illegal truck loading/unloading, as well as illegal dollar van activities (standing, honking, and making U-turns) at designated bus stops along Utica Avenue.*
- *Installed and widened crosswalks (42x35 feet) on Utica Avenue between the east and west malls of Eastern Parkway and between the main and service roads to provide adequate space for pedestrian and bicycle crossings and prohibit cars from standing/stopping in this area.*



View of extended bus stop along Eastern Parkway Service Road, pedestrian barriers and additional travel lane created by removal of parking along barrier



### **Intersection of Utica Avenue and Church Avenue**

- ***Created a truck loading/unloading zone on Church Avenue in the westbound direction (for approximately 100 feet) between Utica Avenue and East 52<sup>nd</sup> Street. This was accomplished through the installation of “No Standing Except Truck Loading/Unloading 10AM - 4 PM” regulations.***
- ***Installed a Leading Pedestrian Interval (LPI) to reduce conflicts between pedestrians and motorists.***
- ***Relocated the near side bus stops to far side and eliminated four curbside meter parking spaces to accommodate relocated bus stop, as well as assist in facilitating through traffic in the eastbound and westbound directions on Church Avenue***



Example of new loading zone along Church Avenue

### **Intersection of Eastern Parkway and Rochester Avenue**

- ***Provided a left turn phase for left turns from the eastbound and westbound Eastern Parkway mainline onto Rochester Avenue northbound or southbound.***

### **Intersection of Eastern Parkway and Buffalo Avenue**

- ***Removed curbside parking on the east side of Buffalo Avenue (northbound) for a distance of 150 feet and installed “No Parking Anytime” regulations.***
- ***Restriped the northbound approach of Buffalo Avenue to provide one exclusive left, one left-through, and one right turn lane.***

### **Intersection of President Street and Utica Avenue**

- *Created a truck loading/unloading zone on President Street west of Utica Avenue for approximately 100 feet and installed “No Standing Except Truck Loading/Unloading 10AM to 4 PM” regulations.*

### **Intersection of Fulton Street and Utica Avenue**

- *Installed “No Standing Anytime” regulations for approximately 50 feet from the intersection in the westbound and northbound approaches (north and east corners).*
- *Refurbished all lane markings and installed high visibility crosswalks to improve safety for vehicular and pedestrian traffic.*
- *Relocated near side bus stop.*

### **Intersection of Eastern Parkway and Howard Avenue**

- *Reallocated three and five seconds of green time from the northbound/southbound phase to the eastbound/westbound phase during the AM and PM peak hours, respectively.*

## ***Improvements to be implemented in Spring 2006***

### **Intersection of Utica Avenue and Eastern Parkway**

- *Refurbish high visibility crosswalks on all approaches to clearly designate the proper path for pedestrians to safely cross the intersection.*
- *Install “Wide Turn Zone” markings on the southwest corner of Utica Avenue at the Eastern Parkway south service road from the crosswalk to the stop bar. Install a barricade for a distance of 38 feet on the east curb of Utica Avenue for the ‘Wide Turn Zone’ to protect pedestrian crossings.*

### **Intersection of Utica Avenue and Church Avenue**

- *Install neckdowns at the northeast and southwest corners of Utica Avenue to increase effective sidewalk width and decrease crossing distance for pedestrians.*
- *Widen all pedestrian crosswalks from 14 to 18 feet and refurbish all lane markings.*

### **Intersection of Eastern Parkway and Rochester Avenue**

- *Remove curbside parking on the east side of Rochester Avenue (northbound) for a distance of 100 feet from the Eastern Parkway south service road and install “No Parking 7-10 AM and 4-7 PM” regulations.*

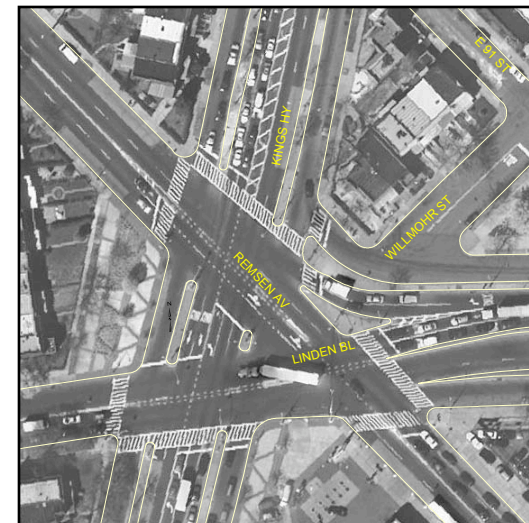




# KINGS HIGHWAY/ LINDEN BOULEVARD/ REMSEN AVENUE

## Description

This complex intersection is often a point of conflict where three major high volume corridors converge. Kings Highway is an 80-foot wide north/south arterial that has the highest traffic volumes of the three corridors. The roadway is configured with three moving lanes on the main roadway and one moving lane and one parking lane on the service road. Linden Boulevard (west of Kings Highway) runs east/west and has one moving lane and one parking lane in each direction. East of Kings Highway, Linden Boulevard is configured with two moving lanes on the main roadway and one moving lane and one parking lane in each direction. Remsen Avenue runs southeast and northwest and has two moving lanes in each direction.



Aerial view of intersection

Due to the complexity of this multi-legged intersection, there is a high accident rate. Left turn, rear end, and overtaking are the primary causes of these accidents. In 1998 and 1999, there were a total of 131 accidents (each year) at this location. However, total accidents increased 12% to 147 in 2000. In 2001, the Department began to implement numerous improvements at this location. During this period, total accidents decreased by 23% (to 113 from 147 in 2000). The Department believes this decrease can be attributed to the improvements implemented at this location. ***Additional improvements implemented in 2002 and again in 2005 should continue to improve both pedestrian and vehicular safety at these locations.***



## Implemented Improvements

- In September 2000, a left turn signal phase was installed for westbound Linden Boulevard to southbound Kings Highway, and the timing was modified at the Linden Boulevard/East 58<sup>th</sup> Street intersection to improve coordination for westbound Linden Boulevard.
- In July 2001, most of the crossings controlled by pedestrian signals were upgraded to high visibility crosswalk markings.
- In June 2001, the All-Red clearance (at the end of the Remsen Avenue phase) was extended to six seconds to clear the movement from southbound Remsen Avenue to eastbound Linden Boulevard.
- In June 2001, “No Standing 7-10AM Monday-Friday” regulations were installed on the east curb of Remsen Avenue between Kings Highway and East 58<sup>th</sup> Street.
- In August 2001, 19 oversized street names signs (42” x 18”) were installed for Linden Boulevard (seven), Kings Highway (six), and Remsen Avenue (six).
- In October 2001, “No Parking Anytime” signs were installed on both curbs of Linden Boulevard between Kings Highway and East 58<sup>th</sup> Street to maintain two moving lanes.
- In October 2001, a trailblazer sign was installed on westbound Linden Boulevard (between East 92<sup>nd</sup> and 93<sup>rd</sup> Streets) directing motorists destined to northbound Kings Highway to use the service road.
- In November 2001, the length of the near side bus stop was extended (by approximately 100 feet) on southbound Remsen Avenue at Kings Highway and the bus stop between Lenox Road and East 55<sup>th</sup> Street was eliminated to better accommodate the two bus lines (B17, B78).
- In November 2001, the northbound Remsen Avenue far side bus stop was relocated approximately 60 feet downstream to eliminate spillback at the intersection.
- Kings Highway was repaved by DDC in 2001.
- Left turns from southbound Kings Highway to Linden Boulevard and Remsen Avenue were

prohibited. In coordination with this turn restriction, a left-turn signal phase (for Kings Highway) was installed at Church Avenue to enable motorists to access southbound Remsen or Ralph Avenues. The existing left turn bay at Kings Highway was modified to a flush painted median in order to provide a pedestrian refuge. Median markings were extended north to 92<sup>nd</sup> Street to eliminate the lane merge in advance of the intersection. The southbound left turn bay on Kings Highway at Church Avenue was extended to 180 feet from 100 feet. Additionally, three trailblazer signs were installed: 1) to Linden Boulevard (12 o'clock arrow) at Remsen and Church Avenues, 2) to Remsen Avenue/Linden Boulevard (12 o'clock arrow) at Ralph and Church Avenues and 3) to Ralph Avenue/Remsen Avenue/Linden Boulevard (9 o'clock arrow) at Kings Highway. All work was completed in March 2002.

- A left turn signal phase was installed for southbound Remsen Avenue to eastbound Linden Boulevard. A new signal pole was installed on the southwest corner (of Linden Boulevard and Remsen Avenue) to improve the visibility of the signals for southbound Remsen Avenue motorists. To accommodate the additional turning phase, an ASTC was installed. The cycle length remained at 120 seconds in peak periods but was increased from 90 to 120 seconds during all off-peak periods. In coordination with this left-turn signal phase, through and left pavement arrows were installed on southbound Remsen Avenue prior to eastbound Linden Boulevard. Most pavement marking modifications were completed in November 2001 and some further enhancements were completed in January 2002. The signal work was completed in March 2002.
- The westbound Linden Boulevard main road (east of the intersection) was restriped to provide an additional moving lane (from three to four). Additionally, two lanes were designated for Remsen Avenue and two lanes for Linden Boulevard (previously, only one lane was designated for Remsen Avenue and two lanes for Linden Boulevard), and five signs were installed (four overhead, one ground-mounted) directing motorists to appropriate lanes. Mast arm poles were installed to support overhead lane assignment signs. All signal work was completed in March 2002. Most pavement marking modifications were installed in November 2001 with some further enhancements completed in January 2002.
- Cycle lengths on adjacent signals on both Kings Highway and Linden Boulevard were increased

from 90 to 120 seconds (during off-peak hours) to maintain coordination. All work was completed in March 2002.

- A new signal timing plan was installed at Remsen and Ralph Avenues (discontinuing the previous fixed time operation) for improved coordination. All work was completed in March 2002.
- Additional pedestrian signals were installed to better designate the Linden Boulevard crossing (east of Remsen Avenue). All work was completed in March 2002.
- Selected signals (facing north and east) at Linden Boulevard and Kings Highway were louvered to minimize confusion. All work was completed in March 2002.

The following short-term bus stop improvement measures were implemented in coordination with New York City Transit in June 2002:

- Moved the northbound B7 bus stop from the near side of the main road to the far side of the service road to provide additional storage for through vehicles (southbound stop remained near side).
- Relocated the main road near side bus stops (both directions) at Church Avenue to the service road on the far side of the intersection.

### ***Improvements Implemented in October 2005***

***As part of the Utica/Weeksville Transportation Study, the following improvements were implemented in October 2005:***

#### ***Intersection of Kings Highway, Remsen Avenue and Linden Boulevard***

- ***Prohibited the following left turns from Kings Highway, Linden Boulevard, and***

**Remsen Avenue:**

- **Northbound from Kings Highway onto Linden Boulevard/ Remsen Avenue westbound.**
- **Eastbound from Linden Boulevard onto Kings Highway/ Remsen Avenue northbound.**
- **Northbound from Remsen Avenue onto Linden Boulevard/ Kings Highway westbound and southbound.**
- **Reallocated signal timing to account for implementation of turning restrictions.**
- **Relocated B7 bus from the Kings Highway main roadways to the service roads from Snyder Avenue (slip ramps) to the Lenox Road/Kings Highway intersection.**
- **Relocated bus stop at southwest corner of Remsen Avenue and Linden Boulevard (northbound) by moving it back 95 feet.**
- **Refurbished high visibility crosswalks at all approaches to clearly designate the proper path for pedestrians to safely cross the intersection.**
- **Installed markings on Linden Boulevard from Kings Highway to Bedford Avenue to create center medians with left turn bays.**
- **Removed street sweeping parking regulations on the north curb of Linden Boulevard between East 58<sup>th</sup> and East 56<sup>th</sup> Streets during the morning and evening rush hours and installed “No Standing 7-10AM & 4-7PM” regulations.**



New markings and signage were installed to improve safety and operation of the intersection



No Standing regulations during the peak periods provide for additional lane capacity





New markings to prevent illegal maneuvers between main line and service road

### **Kings Highway Slip Ramps (between 91<sup>st</sup> and 92<sup>nd</sup> Streets and Linden Boulevard and Snyder Avenue)**

- *Redesigned the slip ramps on both northbound and southbound Kings Highway (located between 91<sup>st</sup> and 92<sup>nd</sup> Streets (slip ramps 1 and 2) and Linden Boulevard and Snyder Avenue (slip ramps 3 and 4)) to prevent illegal maneuvers between the mainline and service roads.*
- *Installed “Yield” signs before the off ramps to alert and guide motorists to navigate the transition between the roadways.*
- *Removed four curbside parking spaces near the slip ramps on both northbound and southbound Kings Highway.*

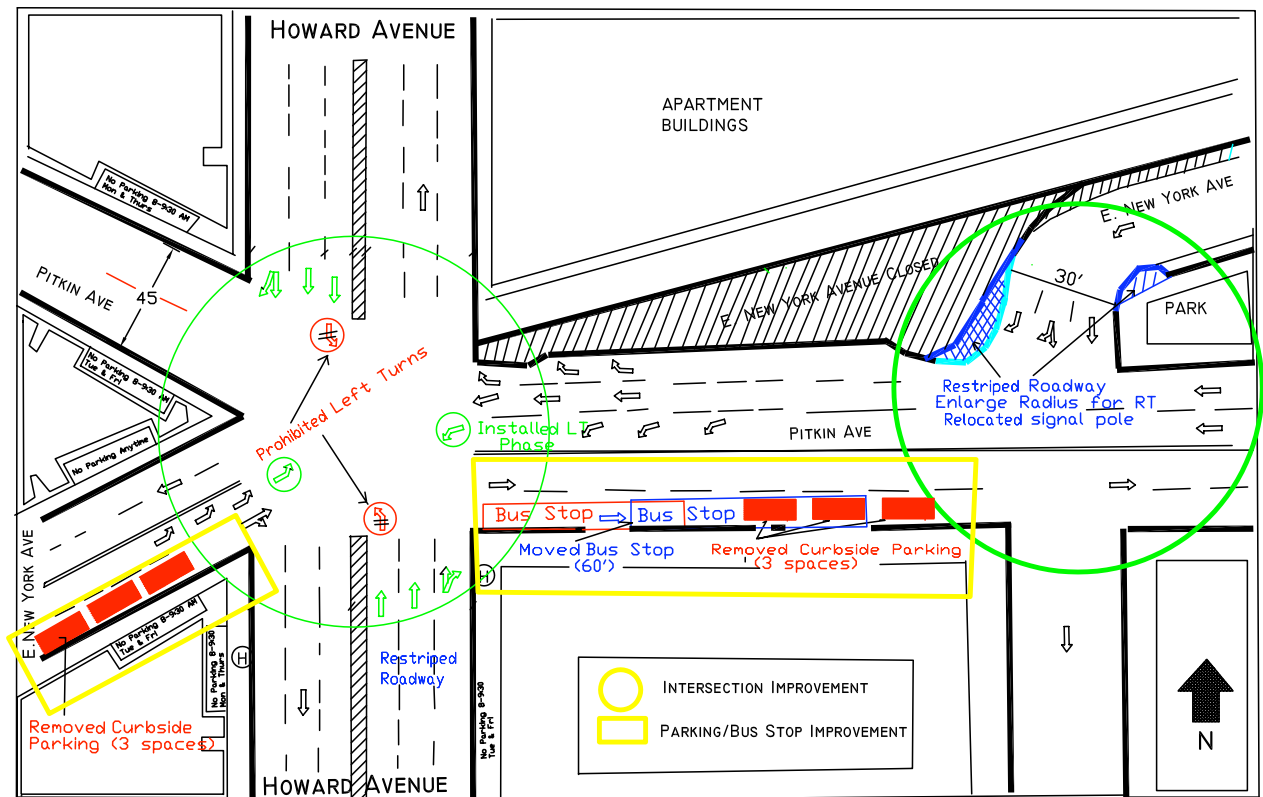
### **Intersection of Pitkin Avenue, East New York Avenue and Howard Avenue**

- *Removed three parking spaces on the south side of Pitkin Avenue, west of Grafton Street, and extended the far side bus stop (60 feet) to reduce spillback from the intersection of Howard/East New York and Pitkin Avenues.*
- *Modified the existing traffic delineators and pavement markings, in addition to relocating the signal pole at the intersection of Grafton Street/Pitkin Avenue.*
- *Restriped Howard Avenue and East New York Avenues to designate lane assignments. The three northbound/southbound lanes on Howard Avenue were restriped to provide two through and one exclusive right lane. East New York Avenue (eastbound) was restriped to provide for one exclusive left lane, one through and one through-right lane.*



- **Prohibited the left turns from Howard Avenue:**
  - **Onto East New York Avenue westbound**
  - **Onto Pitkin Avenue eastbound**
- **Introduced a dual left turn phase for Pitkin Avenue westbound and East New York Avenue eastbound to eliminate conflicts involving heavy left turns and improve traffic operations and safety. The signal timing was adjusted accordingly for the entire intersection.**
- **Prohibited parking for 60 feet on the south curb of East New York Avenue in the eastbound direction to provide for an additional moving lane during the Saturday peak hour to improve vehicular Level of Service.**
- **Installed “No Standing Noon-4PM” regulations for the Saturday midday peak period.**

**The improvements are depicted in the figure to the right.**



Detailed improvements at the intersection of Pitkin Avenue, East New York Avenue and Howard Avenue

### **Intersection of East New York Avenue and Utica Avenue**

- *Removed three parking spaces on the west side of Utica Avenue.*
- *Restricted curbside parking on the east side of Remsen Avenue (seven parking spaces) at the East New York and Utica Avenue intersection to provide three moving lanes (left, left/through, and right turn lane) for northbound Remsen Avenue traffic. Installed “No Standing 7 AM to 10 AM” regulations.*
- *Synchronized traffic signals along Utica Avenue between Empire Boulevard and East New York Avenue.*
- *Replaced parallel parking with angle parking (90 degree) along East New York Avenue*

### **Howard Avenue and Tapscott Street/Blake Avenue Interchange**

- *Refurbished all lane markings and crosswalks and installed advisory signs along Tapscott Street/Howard Avenue between Rutland Avenue and 98<sup>th</sup> Street to alert motorists of the existing roadway curvature and merge with Howard Avenue.*

### **Intersection of Kings Highway and Church Avenue**

- *Removed curbside parking (100 feet) along Church Avenue and restriped roadway for two moving lanes (11 feet each) in the eastbound and westbound directions. Installed “No Standing 7-10AM” regulations.*

### **Intersection of Kings Highway and Rockaway Parkway**

- *Reallocated three seconds of green time from the northbound/southbound phase to the eastbound/westbound phase during both the AM and PM peak hours.*

### **Intersection of Ralph Avenue and Fulton/McDougal Streets**

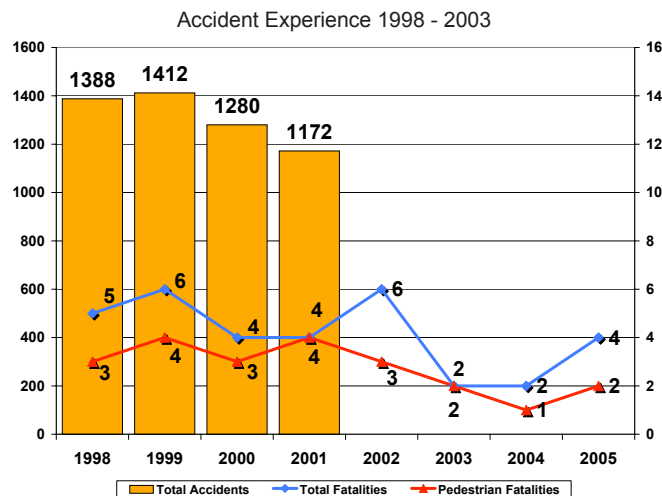
- *Removed curbside parking (100 feet) along Ralph Avenue and installed “No Standing 7 AM to 7 PM Except Sunday” regulations.*



# OCEAN PARKWAY

## Description

Ocean Parkway is a major north-south corridor that traverses the length of Brooklyn from the southern terminus of the Prospect Expressway south into Coney Island and ending at the waterfront. The main roadway consists of three northbound and three southbound lanes separated by a striped center median. There are also northbound and southbound service roads characterized by one traffic lane and two parking lanes. The service roads are separated from the main roadway by landscaped promenades, including a protected bike lane in the western promenade. At all intersections, there are left turn bays on the main roadway to facilitate turning movements.



For pedestrians crossing Ocean Parkway, they must cross seven lanes of traffic, plus the two service roads. In general, traffic on the service road is stop controlled while each intersection of the main roadway is signal controlled. In 1998, there were 1,388 total accidents along the entire stretch of Ocean Parkway. In 1999, the total number of accidents increased to 1,412. Beginning in 2000, accidents along the Ocean Parkway corridor declined to 1,280 and continued to decline in 2001 with 1,172 total accidents, a 17% decrease from 1999 levels. This trend parallels the overall reduction in accidents citywide during this time period.

Over the past six years, most of the fatalities along the Ocean Parkway corridor have involved pedestrians. Between 1998 and 2001, overall

fatalities and pedestrian fatalities remained fairly consistent. In 2002, although there were six fatalities, of which three were pedestrians, none of these occurred in the second half of the year. This trend corresponds to the improvements made along the Ocean Parkway corridor during that year. In 2003, total fatalities were significantly lower with only two, both of which involved a pedestrian. *In 2004, the number of fatalities remained at two, although only one involved a pedestrian. In 2005, fatalities increased to four, only two of which involved pedestrians.*

## Implemented Improvements

- In order to improve pedestrian safety and increase crossing time, the cycle length of all off-peak timing patterns was increased from 90 to 120 seconds in January 2002. As a result, the crossing time for Ocean Parkway was increased at all 34 signalized locations (from Church to Sea Breeze Avenues). Most of the intersections provided an additional 12 seconds of crossing time with others provided an additional six to 17 seconds.
- Of the 34 intersections along Ocean Parkway, 16 had left-turn signal phases prior to 2002. In January 2002, it was determined that left turn signal phases would be added to the remaining 18 intersections. As of April 2002, work was completed at 16 of the 18 intersections. The last two intersections were completed in May 2002. Each intersection along the corridor now has left turn signal phases.
- In February 2002, a contract was initiated to replace all vehicle signals with LED displays and all pedestrian signals with international LED displays. Ocean Parkway was the first corridor completed (in March 2002) under this contract.
- Markings on Ocean Parkway were refurbished in May 2003.

In April 2003, URS consultants completed a study on behalf of the Department to evaluate traffic conditions on Ocean Parkway between Church Avenue and Avenue J. The purpose of the study was to analyze both the existing traffic signal operation which utilized “protected/permitted” left turn phases and an alternative “protected only” mode.



Their short term recommendation was to maintain existing signal timing and phasing with the exception of Ocean Parkway and Parkville Avenue where they suggested that the existing left turn phase be switched from a leading to a lagging operation. DOT implemented this recommendation in July 2003. Their long term recommendation was to optimize the existing “permitted/protected” operation by modifying signal splits and offsets. This recommendation is not being implemented because it would require reductions in the time currently allocated for pedestrian crossings at several locations.



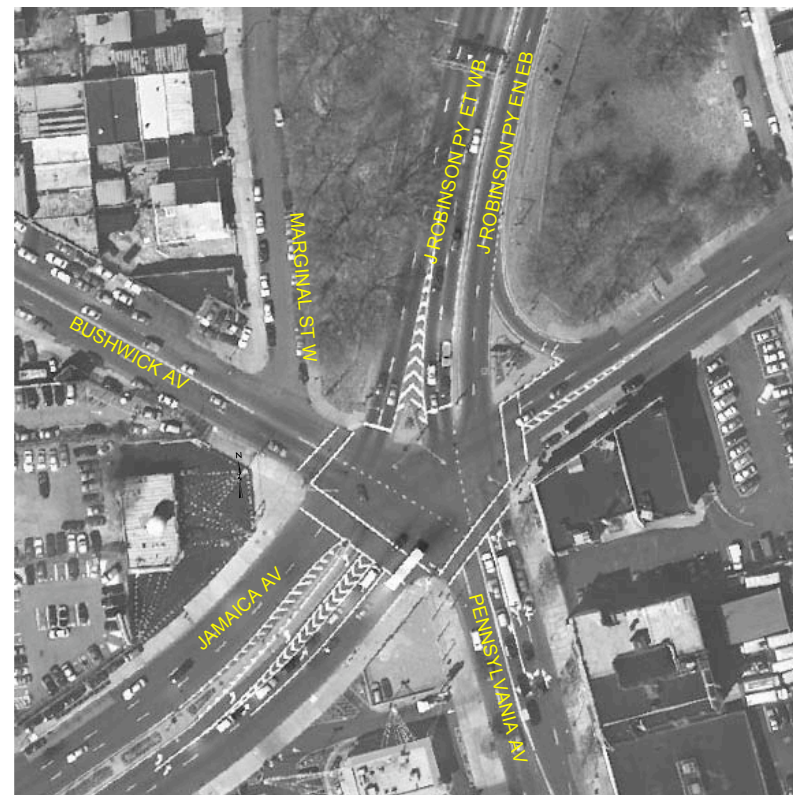
# BUSHWICK AVENUE/ EAST NEW YORK AVENUE/ JACKIE ROBINSON PARKWAY

## Description

This is a complex multi-legged intersection. Bushwick Avenue (runs east/west) approaches this intersection from the west and terminates, Pennsylvania Avenue (runs north/south) also ends at this intersection, Jamaica Avenue (runs east/west) becomes East New York Avenue two blocks west of the intersection, and the Jackie Robinson Parkway (runs north/south) has its southern terminus at this intersection.

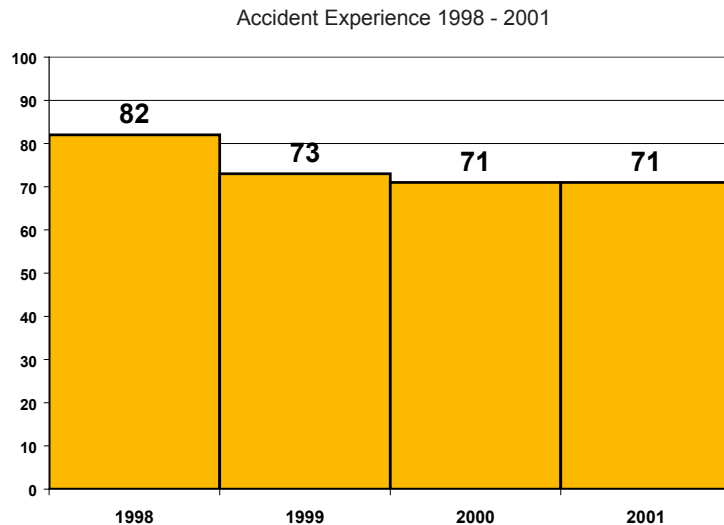
There is a four phase signal operation at this location. During the first signal phase, motorists (predominantly buses) are permitted to make a left turn (almost a “V”-turn) from Pennsylvania Avenue onto westbound Jamaica Avenue. During the second signal phase, right and thru movements are permitted from northbound Pennsylvania Avenue. Motorists exiting the Jackie Robinson Parkway (southbound) can also move at this time. The third phase is exclusively for motorists westbound on Jamaica Avenue. The fourth phase is exclusively for eastbound Jamaica Avenue motorists.

Pennsylvania Avenue has three lane designations: an exclusive left turn lane, a thru/left turn lane, and a thru/right turn lane. Prohibited movements include: the left turn from eastbound Bushwick Avenue onto the Jackie Robinson Parkway; Jackie Robinson Parkway southbound motorists in



Aerial view of intersection

the left two lanes can only proceed straight to Pennsylvania Avenue (no right or left turns are permitted).



Previously, there were two sets of rumble strips on the southbound Jackie Robinson approach to the intersection. There is also channelization that designated lanes for motorists approaching westbound Jamaica Avenue and lanes approaching Pennsylvania Avenue. The width of the approach immediately before the channelization is 44 feet.

Based upon a three-year total of accidents (1998, 1999, 2000), this location ranked fifth in the Borough of Brooklyn with respect to vehicular accidents. There were 82 accidents in 1998, 73 accidents in 1999, and 71 accidents in both 2000 and 2001. ***No fatalities have been reported in the last eight years (1998-2005).***

## Implemented Improvements

- Oversized turn prohibition signs were installed in May 2000 replacing the standard sized signs at the intersection.
- New signage (e.g., “Rumble Strips Ahead”, “Speed Zone Ahead”, and speed limit signs) were installed on the Jackie Robinson Parkway exit ramp at Bushwick Avenue/Jamaica Avenue in April 2002.
- Thermoplastic rumble strips were installed on the Jackie Robinson Parkway exit at Pennsylvania Avenue in March 2003. In addition, two straight arrows were installed and stop bars and outside lines of channelization were refurbished.
- An electronic speed detection board was installed in June 2003 at the terminus of the Jackie

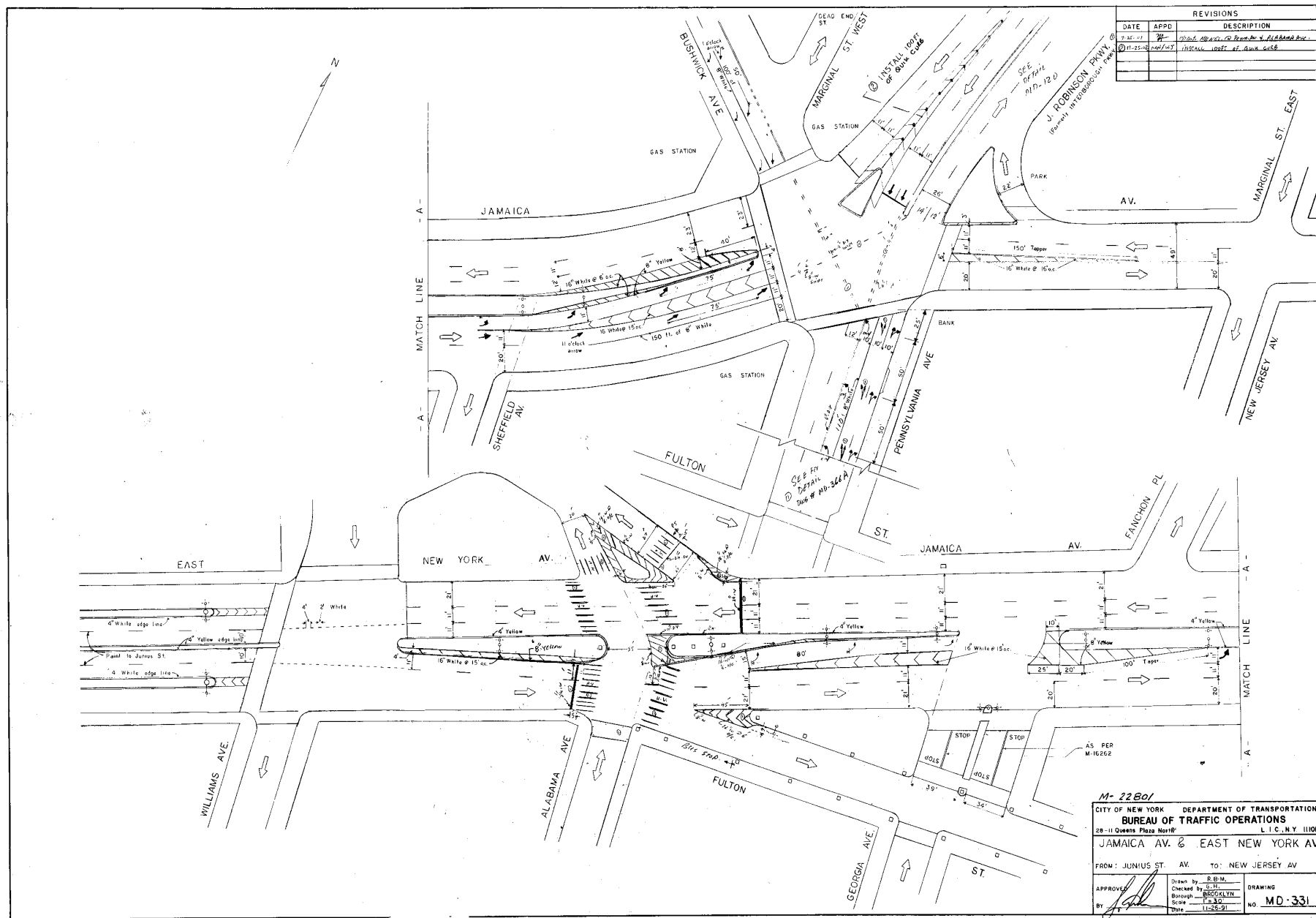
Robinson Parkway approaching Jamaica Avenue on an existing gantry (approximately 300 feet north of the intersection).

- Flexible delineators were installed on the center channelization of southbound Jackie Robinson Parkway at Bushwick Avenue in April 2003.
- Advanced directional street signs were installed in July 2003.

The improvements are shown on the following two pages.









# GERRITSEN AVENUE

## Description

*In the spring of 2005, at the request of elected officials and in response to a fatality at the intersection of Gerritsen Avenue and Florence Avenue, the Department undertook a proactive corridor investigation to address community concerns along Gerritsen Avenue in southeast Brooklyn. Gerritsen Avenue runs from Nostrand Avenue to the north and terminates at a cul-de-sac near the Belt Parkway to the south. It functions as the primary access road into and out of the Gerritsen Beach community and is bordered for most of its length by parkland on the eastern curb and residential or low-density commercial land uses along the western curb. Along the southern portion of Gerritsen Avenue, it is the only north-south roadway in the Gerritsen Beach community.*

*In its original configuration, Gerritsen Avenue was characterized by its wide width, with two travel lanes and one parking lane in each direction. In addition, there are few stop controls along Gerritsen Avenue, with Stop signs regulating vehicles on the approaching streets. This configuration lead to issues of speeding and pedestrian safety along the entire corridor.*

*Based upon these roadway characteristics, the Department developed a comprehensive traffic calming program to improve overall safety for motorists and pedestrians along the entire corridor. Comparisons between before and after speeds along Gerritsen Avenue indicate a significant reduction in speeds on all segments of the roadway. Overall, the daily average speed in the northbound direction declined by 9.9% to 28.6 mph from 31.6 mph, while the 85<sup>th</sup> Percentile declined 11.7% to 34.0 mph from 38.5 mph. In the southbound direction, the daily average speed decreased by 11.9% to 26.9 mph from 30.5 mph, and the 85<sup>th</sup> Percentile Speed declined by 13.2% to 32.3 mph from 37.2 mph. Certain portions of the corridor,*

such as from Devon Avenue to Florence Avenue experienced more significant declines than the other sections, however all segments showed a remarkable decline in speed.

## Improvements Implemented in September 2005

- In order to calm traffic, the Department reduced the number of travel lanes to one from two on Gerritsen Avenue between Avenue W and the cul-de-sac at the southern terminus of Gerritsen Avenue. This was achieved through the installation of a wide painted center median. In addition, turning bays were created at certain locations to provide for safer turning movements. These improvements are depicted to the right.
- The posted speed limit was reduced to 25 mph from 30 mph.
- Installation of supplemental signs and markings in front of the Gerritsen Beach Public School / PS 277 (between Avenue X and Bijou Avenue) to better define the drop-off/pick-up area. This is depicted in the image to the right.
- In total, 67 new signs were installed along the corridor. These signs included new “Stop” signs, “School Crosswalk” signage, oversized “One-Way” signs, “Do Not Enter” signage, and other traffic control signage advising motorists of roadway conditions.
- Angle parking was expanded on Avenue X between Burnett Street and Gerritsen Avenue along the south side of the curb.

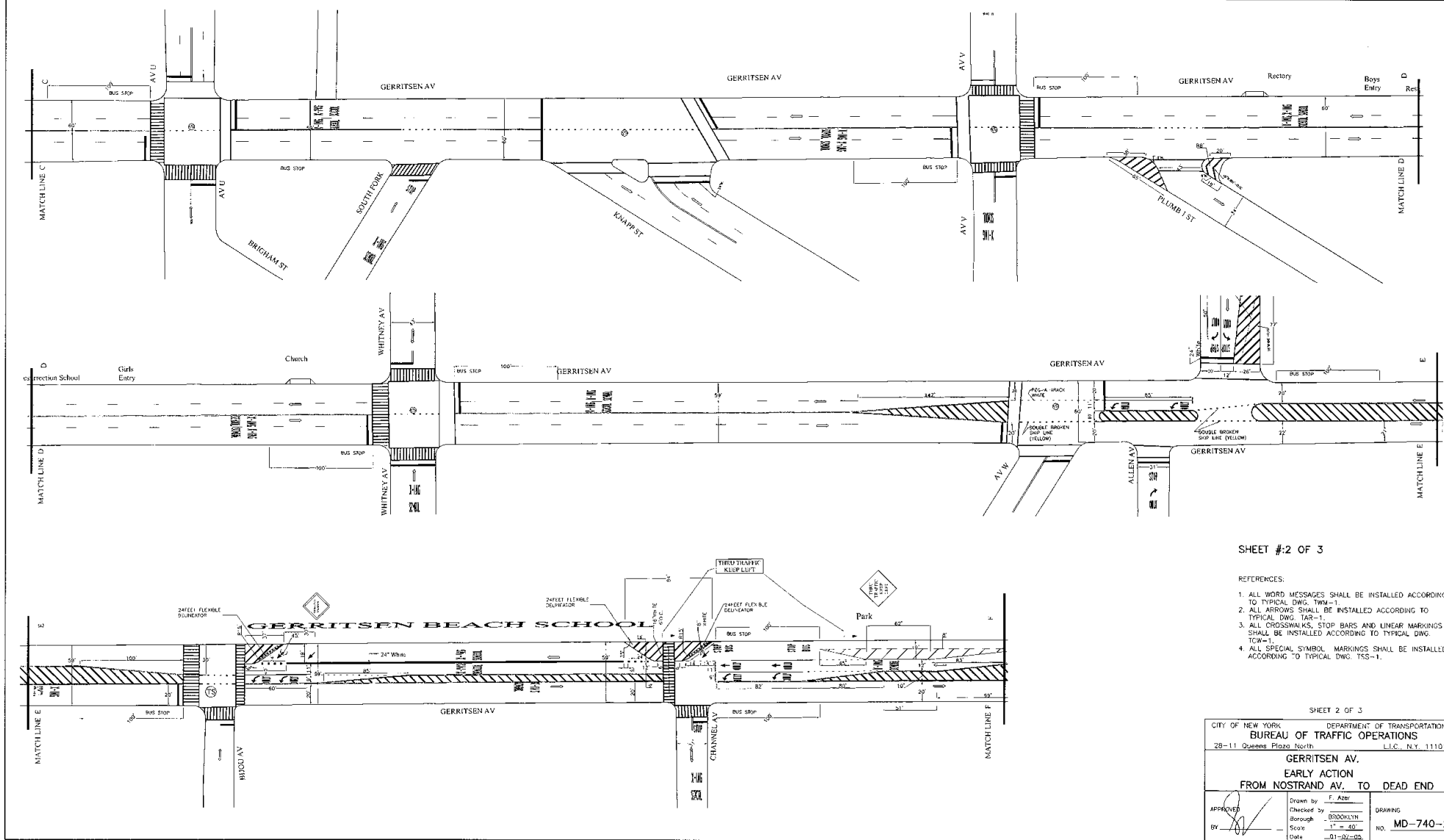


New painted center median and turning bays



Supplemental signs and markings around P.S. 277 to improve safety

| REVISIONS |       |             |
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| DATE      | APPD. | DESCRIPTION |
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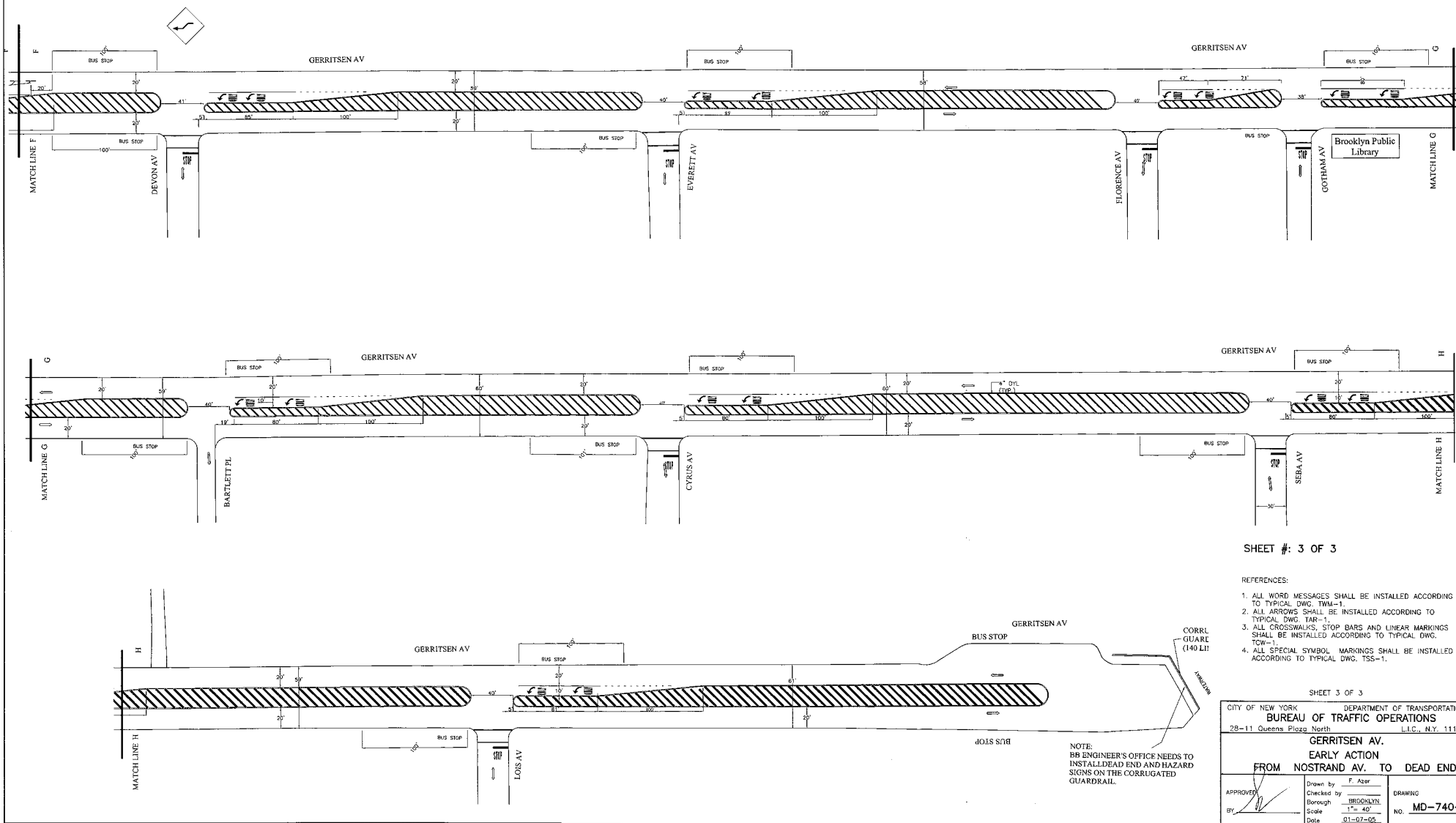


- SHEET #2 OF 3
- REFERENCES:
1. ALL WORD MESSAGES SHALL BE INSTALLED ACCORDING TO TYPICAL DWG. TWM-1
  2. ALL ARROWS SHALL BE INSTALLED ACCORDING TO TYPICAL DWG. TAR-1
  3. ALL CROSSMARKS, STOP BARS AND LINEAR MARKINGS SHALL BE INSTALLED ACCORDING TO TYPICAL DWG. TCW-1
  4. ALL SPECIAL SYMBOL MARKINGS SHALL BE INSTALLED ACCORDING TO TYPICAL DWG. TSS-1

SHEET 2 OF 3

|                               |                  |                              |             |
|-------------------------------|------------------|------------------------------|-------------|
| CITY OF NEW YORK              |                  | DEPARTMENT OF TRANSPORTATION |             |
| BUREAU OF TRAFFIC OPERATIONS  |                  | L.I.C., N.Y. 11101           |             |
| 28-11 Queens Plaza North      |                  |                              |             |
| GERRITSEN AV.                 |                  |                              |             |
| EARLY ACTION                  |                  |                              |             |
| FROM NOSTRAND AV. TO DEAD END |                  |                              |             |
| APPROVED BY                   | Drawn by F. Azar | Checked by                   | D. BROOKLYN |
| BY                            | Scale 1" = 40'   | Scale                        | Scale       |
|                               |                  |                              | MD-740-2    |

| REVISIONS |      |             |
|-----------|------|-------------|
| DATE      | APPD | DESCRIPTION |
|           |      |             |
|           |      |             |
|           |      |             |



SHEET #: 3 OF 3

REFERENCES:

1. ALL WORD MESSAGES SHALL BE INSTALLED ACCORDING TO TYPICAL DWG. TWM-1.
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SHEET 3 OF 3

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

GERRITSEN AV.  
EARLY ACTION  
FROM NOSTRAND AV. TO DEAD END

|          |                  |                     |              |
|----------|------------------|---------------------|--------------|
| APPROVED | Drawn by F. Azor | Checked by BROOKLYN | DRAWING      |
| BY       | Scale 1" = 40'   | Date 01-07-05       | NO. MD-740-3 |





# DOWNTOWN BROOKLYN TRAFFIC IMPROVEMENTS

## *Description*

*Outside Manhattan, Downtown Brooklyn is the largest business district in New York City and one of the largest in the country. Recently, this area has seen a significant increase in development and significantly more development is slated for the future. In addition to a large and growing CBD, this area has many unique neighborhoods with varying land use and transportation patterns.*



Example of street activity in Downtown Brooklyn. At this location, the intersection of Atlantic Avenue and Clinton Street, the Department installed an LPI for pedestrians as part of the DBTC project.

*Given the uniqueness of this area, the Department has undertaken several initiatives to improve safety for pedestrians, motorists and cyclists throughout the area. One of the more substantial projects undertaken in this area was the Downtown Brooklyn Traffic Calming (DBTC) project, which was formally completed in the Summer of 2004. The DBTC project involved a cooperative effort between elected officials and community groups and the New York City administration. Most importantly, this project signaled a new direction for managing traffic in the city, and ultimately to make all types of streets function better for all users of the public space.*

*While several pilot projects were implemented as part of the DBTC project, the final report is serving as a blueprint for safety mitigation and operational improvements that can be undertaken on various roadways. Many of the proposed improvements will be instituted in the coming years through the City's capital program.*

*More recently, the Department has pursued additional safety mitigation strategies in the Downtown Brooklyn area based upon the recommendations contained in the DBTC report, as well as instituting additional measures based upon demonstrated needs and experience. These include the following:*

- *Court Street Traffic Improvements;*
- *Improvements along the Smith Street Corridor; and*
- *Safety Improvements along the Fulton Street Corridor.*

*The following section details these improvements.*



# COURT STREET

## *Description*

*During the DBTC project, local stakeholders in the community identified Court Street as a problematic corridor due to the perception of speeding and the high incidence of pedestrians crossing against the signals. The original timing patterns on Court Street used 120 second cycles to provide better coordination with the 120 second cycles being used on the heavily trafficked arteries of Atlantic and Hamilton Avenues. The use of the longer cycle lengths on Court Street (between Atlantic and Hamilton Avenues) led to the perception of speeding, provided fewer opportunities for pedestrians to cross Court Street and required pedestrians to wait longer to get the “walking man” indication.*

## *Implemented Improvements*

*Beginning in the fall of 2004, the Department initiated a project to address these concerns. The primary objectives from the outset were to facilitate pedestrian crossings and discourage speeding.*

*In order to achieve the specified goals, the Department modified the signals to provide longer crossing times for pedestrians and more opportunities for pedestrians to cross Court Street between Atlantic and Hamilton Avenues. This was accomplished through the installation of ASTCs, reducing the cycle length from 120 to 90 seconds and changing the splits from 80 seconds for Court Street and 40 seconds for the side streets, to only 50 seconds for Court Street and 40 seconds for the side streets. In addition, the offsets were changed so the progression speed on Court Street would be approximately 20 mph.*

*While the Department continues to monitor the timing scenarios on Court Street, a comparison between “before” conditions (prior to signal modifications) to “after” conditions found:*

- More opportunities have been provided for pedestrians to cross Court Street;*
- Overall, average traffic volumes decreased on Court Street during all weekday and weekend peak periods;*
- There was no evidence of traffic diversion to Henry Street;*
- Radar speed surveys indicate a reduction in speed on Court Street;*
- Although travel times decreased, speeds remained within the 20 mph progression;*
- Queue lengths on Court Street decreased indicating that volume was being efficiently processed with less green time; and*
- Side street queues averaged one vehicle per cycle.*

*In October, 2005 we further reduced the cycle length to 60 seconds with splits of 35 seconds for Court Street and 25 seconds for the cross streets [with the exception of the signal at Court Street with Bergen and Congress Streets - this signal is three phase with a 25/17/18 split]. The progression speed of 20 mph was maintained.*



# SMITH STREET

## *Description*



Vehicular conflicts at the intersection of Smith Street and Atlantic Avenue prior to improvements

*Smith Street was identified as problematic corridor during the DBTC Project. This corridor provides northbound connectivity through the same corridor in the morning peak period that southbound Court Street provides in the evening peak period. However, the conflicts between motorists and street users is not as pronounced as on Court Street because vehicular demand occurs primarily during the morning peak commuting period. Prior to the Department's improvements along this corridor, Smith Street experienced substantial congestion on its approaches to Atlantic Avenue, due to the existing off-set configuration of the intersection. This configuration, where Smith Street operated two-way north of Atlantic Avenue, and one-way south of Atlantic Avenue, created a head-on situation.*

*Beginning in November 2003, the Department began to implement several changes in the operation of Smith Street, with the most notable change being the one-way conversion of Smith Street from two-way to one-way between Atlantic Avenue and Schermerhorn Street. Based upon NYPD Accident Data, at the intersection of Smith Street and Atlantic Avenue in the nearly six years (71 months) prior to the conversion, the corridor experienced approximately 32.6 accidents a year, with 16.9 annual injuries and approximately 4.7 pedestrians injured per year. In the two years (24 months) after implementation (December 2003 to December 2005), the annualized rate of accidents at this location fell to 19.5 annual accidents, with only 6.5 injuries per year, of which 1.9 were pedestrians. This represents a decline of 42% in the total number of annual accidents, with*

## Implemented Improvements

SAFE STREETS NYC





# FULTON STREET CORRIDOR

## FLATBUSH AVENUE TO NOSTRAND AVENUE

### *Description*

*Fulton Street is a major east-west commercial corridor in Brooklyn serving the communities of Fort Greene and Bedford-Stuyvesant and is host to numerous street users. Land use along this corridor include commercial, retail and residential developments. Additionally, four bus lines utilize the corridor. Because of the orientation of Fulton Street in relation to the surrounding street grid, many of the intersections along Fulton Street have irregular geometry. The “oblique” angles at these intersections created safety and operational issues for pedestrians, buses, trucks and general traffic alike. This alignment allowed turning vehicles to proceed through the intersection at speeds that were incompatible with the high pedestrian activity and the residential and commercial land uses of the corridor. An example of one of these locations, Hanson Place approaching Fulton Street is depicted to the left.*



On eastbound Hanson Place approaching Fulton Street, the right-turn slip created difficult, unprotected crossing for pedestrians

*While the unusual geometry and irregular intersections were one of the primary focuses of this initiative, the Department also focused on addressing other operational and safety issues along the corridor. One of the more prevalent issues was safety concerns for larger vehicles and trucks making turns onto or off of Fulton Street. Several locations were identified along the corridor where these types of vehicles experienced pedestrian and vehicular conflicts, as well as substantial delay in completing their turning movements. Motorists also had difficulty in identifying street names and one-way directional arrows due to the placement of signage on existing street corners. The “oblique” angles*

*made easy identification and placement of the signs difficult.*

*In terms of the pedestrian environment, the Department found that many of the crosswalks along the Fulton Street corridor were not updated to current NYCDOT standards. The unusual “oblique” angles also presented challenges for pedestrians using the corridor.*

*Finally, Fulton Street functions as a major transit corridor, and at certain locations, such as at Flatbush Avenue, serves as a major transit hub. At this location, which connects directly to the Fulton Mall, up to five bus routes (B25, B26, B38, B44 and B52) operate on Fulton Street, with 42 scheduled buses per hour during the peak period. Prior to the implementation of improvements along this corridor, Fulton Street had designated bus lanes. Due to the high volume of traffic, the geometric constraints of the roadway and lack of motorist compliance for the bus lanes, bus service typically incurred significant delays at all times of the day.*

## ***Implemented Improvements***

*A multi-faceted corridor-wide enhancement program was implemented that featured the following elements:*



At Gates Avenue and Fulton Street, the offset geometry contributed to speeding, as well as a long crossing for pedestrians



Gateway treatment and street-direction conversion at Putnam Avenue and Fulton Street

## Gateway Treatments

*In order to alleviate the safety and operational concerns at the intersections with “oblique” angles, the Department reconfigured three intersections to normal “right angle” corners. These locations include:*

### **Putnam Avenue**

- *The Department eliminated the potential for high speed turns both onto and off of Fulton Street through the conversion of Putnam Avenue from two-way to one-way westbound between Fulton Street and Grand Avenue. Roadway geometry and pedestrian crossings were improved through the use of markings, flexible bollards and other conventional traffic controls. At this location, the crosswalk length was significantly reduced and pedestrian space expanded. The conversion of Putnam Avenue required the re-routing of the eastbound B26 bus to Putnam Avenue via Classon Avenue, the “daylighting” of the east curb of Classon Avenue north of Fulton Street and the installation of a Wide Turn Zone on westbound Putnam Avenue in advance of Classon Avenue.*

### **Gates Avenue**

- *New flexible bollards and a painted pedestrian area shortened the pedestrian crossings and forced motorists turning left off of Fulton Street to do so at a right angle. This effectively reduced the speed of turning vehicles.*



Through the use of flexible bollards and markings, the Department normalized the intersection and significantly shortened the crossing distance across Gates Avenue



## Hanson Place

- *At Hanson Place, this unusually wide intersection left pedestrians on Fulton Street in conflict with an unsignalized right turn, which vehicles could negotiate at high speeds. The “free right turn” lane was eliminated through the use of markings and flexible bollards. This new alignment forces all Hanson Place traffic to proceed to the traffic signal at Fulton Street, shortens the pedestrian crossing distance by half and eliminates the pedestrian-vehicle conflict. In addition, angle parking along the north curb of Hanson Place between South Portland Avenue and Fulton Street is expected to calm traffic on this wide street as it approaches Fulton Street.*

### Additional Gateway Treatments

- *Modest gateway treatments were installed at four additional intersections. These treatments consisted primarily of painted neckdowns and flexible bollards to slow turning vehicles and alert motorists to the changing street characteristics. These intersections included:*
  - *Carlton Avenue*
  - *Downing Street*
  - *Irving Place*
  - *Spencer Place*



At Hanson Street, the Department eliminated the “free right turn” through the use of markings and flexible bollards, as well as shortening the crossing distance by half



Dedicated bus lanes and newly designed overhead signs were installed to make bus lanes more prominent.

## Bus Lanes

- As indicated previously, Fulton Street east of Flatbush Avenue carries a significant number of buses. Therefore, the Department implemented a program to enhance the operation of the bus lanes along the corridor. These lanes were installed westbound on Fulton Street from South Oxford Street to Hudson Avenue and eastbound from Flatbush Avenue to Fort Greene Place. The lanes operate weekdays from 7-10 AM along the north curb (westbound) and 4-7 PM on the south curb (eastbound). Newly designed signs were installed to make the bus lanes more prominent. Mast arm poles to support overhead bus lane signs were installed on two blocksides on westbound

*Flatbush Avenue (between Ft. Greene Place and St. Felix Place, and between Ashland Place and Rockwell Place) and on two blocksides on eastbound Fulton Street (between Flatbush Avenue and Rockwell Place, and between Ashland Place and St. Felix Place). Overall, the signage program improves visibility and serves to improve motorist compliance and reduces travel delays for bus passengers.*

## Pedestrian Safety

- Crosswalks at intersections along Fulton Street have been upgraded to high-visibility in order to meet current DOT standards for locations with high pedestrian activity. In addition, at the intersection of Fulton Street at Lafayette Avenue/Ft. Greene Place, the low volume left turn from eastbound Lafayette Avenue to westbound Fulton Street has been prohibited. This allowed for the signalization of the west crosswalk at Ft. Greene Place and created a safer

*pedestrian environment at this intersection.*

### **Traffic Mobility**

- *In order to improve general traffic operations and safety, the Department installed oversized street name signs and oversized one-way arrows on one-way streets approaching Fulton Street. Oversized street name signs were installed at:*

- |                            |                            |
|----------------------------|----------------------------|
| • <i>Ashland Place</i>     | • <i>Bedford Avenue</i>    |
| • <i>Carlton Avenue</i>    | • <i>Classon Avenue</i>    |
| • <i>Flatbush Avenue</i>   | • <i>Franklin Avenue</i>   |
| • <i>Nostrand Avenue</i>   | • <i>Vanderbilt Avenue</i> |
| • <i>Washington Avenue</i> |                            |

- *Oversized one-way arrows have been installed at the following intersections:*

- |                           |                             |
|---------------------------|-----------------------------|
| • <i>Adelphi Street</i>   | • <i>Carlton Avenue</i>     |
| • <i>Classon Street</i>   | • <i>Downing Street</i>     |
| • <i>Franklin Avenue</i>  | • <i>Grand Avenue</i>       |
| • <i>Hanson Place</i>     | • <i>Rockwell Place</i>     |
| • <i>Spencer Place</i>    | • <i>South Elliot Place</i> |
| • <i>St. Felix Street</i> | • <i>St. James Place</i>    |
| • <i>Waverly Avenue</i>   |                             |





Unique signage advises pedestrians of turning vehicles at Wide Turn Zones

### Wide Turn Zones

- *Wide Turn Zones (WTZs) have been established to permit trucks and other large vehicles to turn from and onto Fulton Street safely and without delay. New signs and markings were created to designate WTZs. Locations on Fulton Street include:*

- *Classon Avenue*
- *Nostrand Avenue*
- *Franklin Avenue*
- *Washington Avenue*

*Although many of the mitigation measures were instituted with temporary materials, the Department will work to convert the new pedestrian space and improvements into sidewalk space via the capital implementation of the DBTC Project and a scheduled reconstruction project of Fulton Street between Clinton Street and Bedford Avenue.*