Brooklyn Retail Corridors

Technical Memorandum 4: Recommendations and Traffic Analysis

July 2003

City of New York
Michael R. Bloomberg, Mayor

New York City
Department of City Planning
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1. EXECUTIVE SUMMARY

Project Overview

The Brooklyn Retail Corridors project, jointly sponsored by the New York City Departments of City Planning and Transportation, examines traffic and pedestrian congestion and safety issues in four retail corridors in the borough of Brooklyn. Three technical memorandums documenting project milestones were released previously. Recent planning studies and environmental impact statements relevant to the four study areas were reviewed in Technical Memorandum 1. The information gathered was used to better inform this study's data collection effort and recommendations from previous studies were re-examined for relevance under current conditions. Existing conditions were analyzed in Technical Memorandum 2 and included information on land use, zoning, transit, demographics, employment trends, journey-to-work, accidents, signal timing, on- and off-street parking, and the streetscape. A traffic and pedestrian impact analysis was performed based on problems and opportunities identified in Technical Memorandum 3. The results of the analysis helped shape solutions for better management of the traffic and pedestrian networks. This technical memorandum, Technical Memorandum 4, recommends strategies for managing the many challenges that each study area faces on a daily basis. Recommendations for each study area are summarized in Table 1.

Study Area Boundaries

Bay Ridge:	85th and 86th Streets from 4th Avenue to Fort Hamilton Parkway
Brighton Beach:	Brighton Beach Avenue from Ocean Parkway to Coney Island Avenue
Bushwick:	Knickerbocker Avenue from Dekalb Avenue to Menahan Street
Flatlands:	Kings Plaza Shopping Center at Flatbush Avenue and Avenue U

Figure 1

Locations of Study Areas

(Within Brooklyn Community Districts)

TABLE 1

BROOKLYN RETAIL CORRIDORS

RECOMMENDATIONS

RECOMMENDATIONS		BAY RIDGE			BRIGHTON BEACH					BUSHWICK			FLATLANDS	
		86th at 4th Avenue	86th at 5th Avenue	86th Street Corridor	Beachwalk	Brighton Beach Ave. (Ocean Pkwy & Brighton 1st)	Brighton Beach Ave. at Ocean Parkway	Brighton Beach Ave. at Coney Island Avenue	Brighton Beach Avenue Corridor	Knickerbocker Avenue at Myrtle Avenue	Knickerbocker Avenue Corridor	Knickerbocker at Himrod	Flatbush Avenue at Avenue U	Flatbush Avenue Corridor
Pedestrian Improvements	Leading Pedestrian Interval (LPI)	*	*											
	Pedestrian Signage											*		
	Pedestrian Refuge Island									*				
	Install High Visibility Crosswalks	*											*	
	Pedestrian Separator					*		*					*	
	Neckdowns				*			*						
	Clear Corner Zones Enforcement								*					
	Extend Sidewalk									*				
	Repair/Upgrade Island									*				
	New/Upgrade Object Markers						*							
	Relocate Fire Hydrant										*			
	Restripe Pavement Markings					*			*		*		*	
	Off Street-Transit Center													*
	Early Implementation Plan	*	*	*										*
Design Improvements	Pedestrian Amenities			*	*				*		*		*	*
	New/Improved Lighting			*	*						*			
	"BB" Lighting								*	*	*			
	Urban Design				*		*							

** Traffic Control Device

Continued on next page

TABLE 1 *(Continued)*
BROOKLYN RETAIL CORRIDORS
RECOMMENDATIONS

RECOMMENDATIONS		BAY RIDGE			BRIGHTON BEACH					BUSHWICK			FLATLANDS	
		86th at 4th Avenue	86th at 5th Avenue	86th Street Corridor	Beachwalk	Brighton Beach Ave. (Ocean Pkwy & Brighton 1st)	Brighton Beach Ave. at Ocean Parkway	Brighton Beach Ave. at Coney Island Avenue	Brighton Beach Avenue Corridor	Knickerbocker Avenue at Myrtle Avenue	Knickerbocker Avenue Corridor	Knickerbocker at Himrod	Flatbush Avenue at Avenue U	Flatbush Avenue Corridor
Vehicular Improvements	Enforce Parking										*		*	*
	Off-Street Parking								*					
	Congestion Pricing								*		*			
	Muni-Meters		*	*					*		*			
	Re-Route Buses			*										
	Relocate Bus Stop												*	
	Redesign Bus Turn-Around													*
	Taxi Loading/ Unloading Points									*				
	Adjust Signal Timing	*	*				*	*		*			*	
	Directional Signage		*											*
	Install Stop Bar												*	
	Discounted Parking		*											
	Pedestrian TCD's **						*							
	Channelization							*		*				
	Traffic Calming/Gateway Treatment									*				
	Elevated Structure Improvements						*							

** Traffic Control Device

Figure 2
Bay Ridge Study Area
86th Street from Fourth Avenue to Ft. Hamilton Parkway

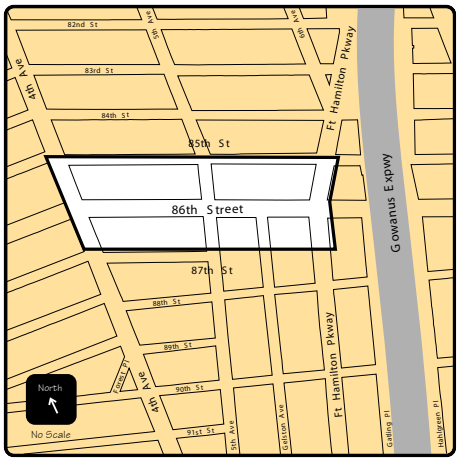
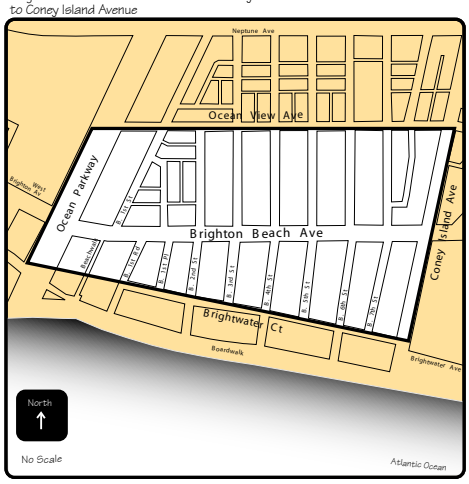


Figure 3
Brighton Beach Study Area
Brighton Beach Avenue from Ocean Parkway to Coney Island Avenue



Bay Ridge Study Area

The Bay Ridge retail corridor area recommendations include signal timing adjustments, the installation of pedestrian amenities such as lighting, high-visibility crosswalks, two hour muni-meters, discounted parking, and enforcement of existing parking regulations. The signal timing changes include establishing a leading pedestrian interval that has the potential for improving operating conditions at two intersections. By replacing existing standard parking meters with muni-meters, it is expected that the availability of on-street parking may increase. Additionally, the re-routing of two bus lines is also recommended to potentially relieve some pedestrian and traffic congestion in the corridor.

Brighton Beach Study Area

The Brighton Beach study area traffic network will experience additional vehicle trips as a result of growth in the area. Recent development in this area has resulted in 850 new dwelling units with 1,200 accesory parking spaces and almost 1,200 new parking spaces serving the new minor league baseball stadium. Recommendations include creating a welcoming pedestrian space with new lighting, paving, signage and other pedestrian amenities for Beachwalk, a street that is presently used by pedestrians to access the boardwalk and beach at Coney Island. Other recommendations include congestion pricing parking strategies, signal timing changes, improvements to the elevated subway structure, the installation of muni-meters, creation of a pedestrian refuge island and separator at a high accident intersection, restriping pavement markings, and the installation of neckdowns that can shorten crossing distances for pedestrians.

Figure 4
Bushwick Study Area
Knickerbocker Avenue from
Dekalb Avenue to Menahan Street

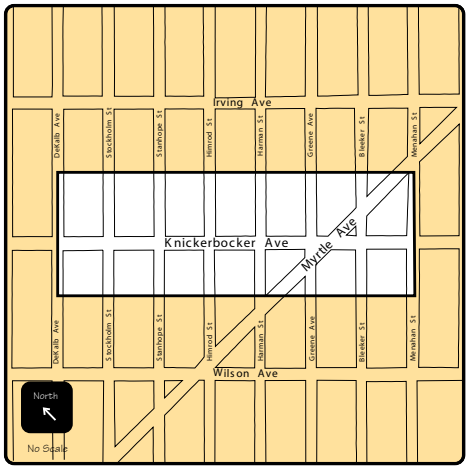
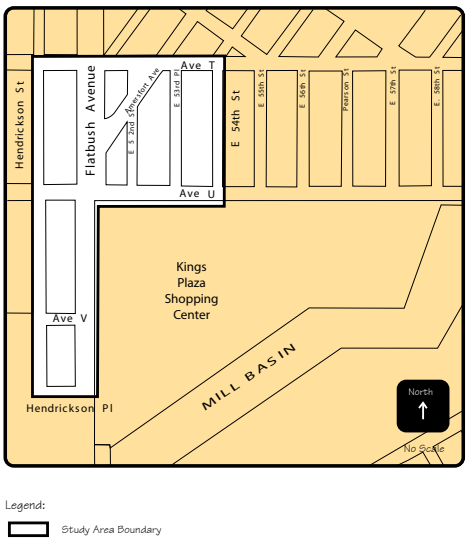


Figure 5
Flatlands Study Area
Kings Plaza Shopping Center
Avenue U and Flatbush Avenue



Bushwick Study Area

While new development is not expected to impact the Bushwick study area, recommendations include a sidewalk extension designed to improve traffic operations and an upgrade of an existing channelization island at an intersection with irregular geometry. Various traffic calming/gateway treatments designed to not only distinguish the retail corridor, but improve its overall operation are also recommended.

Flatlands Study Area

In the Flatlands study area, at the intersection of Flatbush Avenue and Avenue U, the Kings Plaza expansion project includes 241,000 square feet of retail space and a new 770-space accessory parking facility that is expected to bring new vehicle trips to the already busy intersection. Recommendations include signal timing changes, lane re-channelization, bus stop relocation designed to prevent midblock crossings at this high accident location, and the redesign of the bus turnaround area adjacent to the Kings Plaza Shopping Center. This redesign is expected to improve the intersection's overall operation. The designation of commuter van pick-up and drop-off points is also recommended. Additionally, traffic and pedestrian safety issues were examined by the Office of the President of the Borough of Brooklyn. *The Pedestrian/Traffic Safety Mitigation Project*, funded through a grant from the Governor's Traffic Safety Committee, resulted in recommendations that augment those cited in this report.

2. LEVEL OF SERVICE METHODOLOGY

The operation of both signalized intersections and unsignalized intersections in the Bay Ridge, Brighton Beach, Bushwick, and Flatlands study areas was analyzed using the accepted Highway Capacity Manual (HCM) methodology for vehicles and pedestrians. This method evaluates the operation of an intersection by determining average delay time per vehicle, and pedestrian space per minute, and assigning a level of service (LOS) from A to F. This evaluation is then used to develop recommendations to improve the performance of the intersection.

2.a. Vehicles

The operating characteristics of signalized intersections are evaluated by analyzing their capacity and performance. The capacity of the intersection represents the maximum number of vehicles that may be processed in an hour. The volume-to-capacity (v/c) ratio determines the level of service: a v/c ratio greater than 0.85 indicates traffic congestion; conversely, a v/c ratio of 0.60 or lower indicates smooth traffic flow.

The HCM divides an intersection approach into lane groups consisting of all movements that occur during each signal phase. These lane groups are then analyzed to determine the specific vehicular capacity and level of service. The average length of time that a vehicle is stopped, or delay time, determines a lane group's level of service, based on: the capacity of a lane group, the amount of green time allocated to a lane group, and the length of the signal cycle. Short delay time results in acceptable levels of service (LOS A-C), while longer delay time will result in marginal to unacceptable levels of service (LOS D-F). (In New York City, mid-LOS D represents acceptable traffic conditions.) Table 2 describes in further detail the characteristics of each level of service category.

TABLE 2:
Vehicular Level of Service Definitions (for Signalized Intersections)

LOS A	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase and do not stop at all. Short cycle lengths may also contribute to low delay.		
	Delay per vehicle:	Less than 5 seconds per vehicle	HCM 3rd ed.
		Less than 10 seconds per vehicle	HCM 2000 ed.
LOS B	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.		
	Delay per vehicle:	Greater than 5 but less than 15	HCM 3rd ed.
		Greater than 10 but less than 20	HCM 2000 ed.
LOS C	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.		
	Delay per vehicle:	Greater than 15 but less than 25	HCM 3rd ed.
		Greater than 20 but less than 35	HCM 2000 ed.
LOS D	Describes operations when the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.		
	Delay per vehicle:	Greater than 25 but less than 40	HCM 3rd ed.
		Greater than 35 but less than 55	HCM 2000 ed.
LOS E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.		
	Delay per vehicle:	Greater than 40 but less than 60	HCM 3rd ed.
		Greater than 55 but less than 80	HCM 2000 ed.
LOS F	This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.		
	Delay per vehicle:	Greater than 60 seconds per vehicle	HCM 3rd ed.
		Greater than 80 seconds per vehicle	HCM 2000 ed.

Source: Highway Capacity Manual, Special Report 209, Third Edition: Transportation Research Board, National Research Council, Washington, D.C., 1994.
Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2000.

2.b. Pedestrians

The pedestrian level of service analysis assesses pedestrian flow and conditions of sidewalks, crosswalks, and intersection corners. The sidewalk analysis determines LOS for both the average and ”platoon“ flow rate. Pedestrian levels of service are measured as the pedestrian flow rate per foot of width per minute (PFM) and indicate how freely pedestrians move in a particular space, and how comfortable they are in that space. The corner and crosswalk analyses both involve pedestrian flow rates, effective street corner/crosswalk areas, and pedestrian signal timings. Level of service is measured by square feet of space per pedestrian per minute. Table 3 defines level of service attributes and Table 4 describes the pedestrian density-comfort relationship.

TABLE 3:
Pedestrian Level of Service Definitions

LOS A	130 or more square feet per pedestrian
LOS B	40 - 130 square feet
LOS C	24 - 40 square feet
LOS D	15 - 24 square feet
LOS E	6 - 15 square feet
LOS F	less than 6 square feet

TABLE 4:
Pedestrian Density-Comfort Relationship

LOS A	Unrestricted	2 PFM or less
LOS B	Slightly restricted	3 - 7 PFM
LOS C	Restricted but fluid	8 - 10 PFM
LOS D	Restricted; necessary to continuously alter walking stride and direction	11 - 15 PFM
LOS E	Severely restricted	16 - 25 PFM
LOS F	Forward progress only by shuffling; no reverse movement possible	Greater than 25 PFM

Source: Highway Capacity Manual, Special Report 209, Third Edition: Transportation Research Board, National Research Council, Washington, D.C., 1994.

3. 2000 EXISTING, 2004 FUTURE NO-BUILD, AND FUTURE BUILD CONDITIONS

For both the traffic and pedestrian analyses, existing, no-build, and build conditions are examined. Existing conditions identify present operating conditions. The no-build condition adds to existing traffic conditions, trips that result from a background traffic growth factor, and any vehicular or pedestrian trips that are generated by nearby major projects that are likely to be in place by the proposed action's build year. The build condition represents projected future conditions with this study's recommended actions in place and fully operational.

3.a. 2000 Existing Conditions

A traffic and transportation consultant, J. Rap & Associates, was retained to collect existing traffic, pedestrian, parking, and accident data for this project. Each intersection was surveyed for either two or three weekdays, and two Saturdays. Traffic volumes, turning movements, and vehicle classification counts were conducted during the peak morning, midday, and evening hours. Automatic Traffic Recorders (ATRs) were also installed to collect 24-hour traffic counts for one full week at nine locations. The existing condition traffic volume was plotted and subsequently balanced to present the existing network. All traffic signal timing, cycle lengths, and phasing plans were provided by the New York City Department of Transportation (NYCDOT).

3.b. 2004 Future No-Build Conditions

Estimating 2004 future no-build conditions consists of several steps. For each study area, 2004 future no-build peak traffic conditions were determined using a standard background traffic growth rate of one (1) percent per year as per the City Environmental Quality Review (CEQR) Technical Manual for areas of Brooklyn other than Downtown. Added to the background traffic growth are any vehicular and/or pedestrian trips related to future planned or proposed development that would likely impact the study area traffic network. Project-generated trips are determined by:

Trip Generation Rates - the number of daily and peak hour volume trips generated by a project, based on its use and size;

Modal Split - percentage of all generated trips occurring by auto, taxi, subway, bus, walk, or other modes (based on US Census journey-to-work data and vehicle occupancy rates). These trips are then assigned to a balanced street network;

Trip Assignment - the routing of trips by mode to specific streets, highways, parking facilities, subway lines, bus routes, and sidewalks en route from their origin and destination;

Balancing the 2004 Future No-Build Baseline Traffic Network - the preparation of traffic volume maps for the AM, midday, PM, and weekend peak periods. Vehicle-to-capacity ratios and delays, as determined by a level of service analysis, are then used to assess the future no-build conditions in comparison to existing conditions.

3.c. 2004 Future Build Conditions

The 2004 future build conditions analysis determines the projected future conditions with the recommended improvements in place and fully operational.

4. ACCIDENT ANALYSIS

Data on all accidents occurring between January 1996 and December 1998 at selected intersections within each study area was analyzed. All data was obtained from the New York State Department of Motor Vehicles (NYSDMV) accident database, which summarizes information from local New York City Police Department (NYPD) accident reports.

The data includes both ”reportable“ and ”non-reportable“ accidents. The NYSDMV designates motor vehicle accidents as reportable if they result in more than $1,000 in physical damage, or if there is an injury or fatality. Accidents resulting in less than $1,000 in damage and no injuries are designated non-reportable, although police reports are still often filed.

Table 5 illustrates the total number of both reportable and non-reportable accidents for each intersection analyzed for the years 1996 through 1998. Table 6 illustrates accidents by accident type.

Additionally, collision diagrams were prepared to graphically represent all accidents occurring at a particular intersection over a period of three years. Each collision was shown by an arrow that represented the type of accident as well as the direction that all vehicles were traveling when the accident occurred. Each arrow was placed on the drawing as close as possible to the actual location where the accident happened. These diagrams were useful in helping to identify the contributing causes of accidents. Analysis of the accident data and collision diagrams resulted in recommending appropriate intersection improvements.

TABLE 5:

Reportable and Non-Reportable Accidents

Location	1996		1997		1998	
	Ped/ Bike	Rep./ Non-Rep.	Ped/ Bike	Rep./ Non-Rep.	Ped/ Bike	Rep./ Non-Rep.
86th/4th	5/0	19/43	3/0	9/26	5/0	22/39
86th/5th	1/0	5/30	0/1	5/22	4/1	29/26
Ocean Pkwy	4/1	13/24	0/0	15/21	2/1	9/15
Coney Is. Ave	1/0	20/22	4/0	16/20	2/0	10/29
Knick/Mrytle	1/0	3/2	1/1	11/7	3/2	6/7
Knick/Himrod	0/0	3/3	0/1	16*/13	1/1	11*/13
Flatbush/U	8/0	57/71	5/0	46/54	6/2	44/46

Three-Year Totals

Location	Ped/Bike	Rep./Non-Rep.
86th/4th	13/0	50/108
86th/5th	5/2	39/78
Ocean Pkwy	6/2	37/60
Coney Is. Ave	7/0	46/71
Knick/Mrytle	5/3	20/16
Knick/Himrod	1/2	30/29
Flatbush/U	19/2	147/171

*12 of 16 accidents in 1997, and 7 of 11 accidents in 1998, were due to a fixed object. Data for the first 6-months of 1999 would indicate that whatever problem that existed has been corrected and therefore these years should be treated as anomalies.

TABLE 6: Reportable Accident Summary by Accident Type

	U-Turn			Pedestrian			Bicycle			Left-Turn			Right-Turn			Rear-End			Sideswipe			Common/ Other Angle			Head-On			Other			Totals
	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	'96	'97	'98	
86th / 4th	0	0	1	5	3	5	0	0	0	4	3	1	1	0	0	3	1	8	4	1	0	2	1	4	0	0	2	0	0	1	
													0	0	0																
86th/ 5th Ave.	0	0	0	1	0	4	0	1	1	0	0	2	1	2	0	1	2	7	0	1	3	2	0	7	0	0	1	0	0	1	
													0	0	2																
Subtotals	0	0	1	6	3	9	0	1	1	4	3	3	2	2	2	4	3	15	4	2	3	4	1	11	0	0	3	0	0	2	
*		1			18			2			10			6			22			9			16			3			2		89
Brighton Beach/Ocean Parkway	0	1	0	4	0	2	0	0	1	5	6	2	2	3	1	0	2	0	1	0	0	1	0	2	0	0	0	0	0	0	
													0	3	1																
Brighton Beach/Coney Island Ave	0	0	2	1	4	2	1	0	0	1	1	0	0	2	0	7	2	1	5	2	3	5	5	1	0	0	0	0	0	0	
													0	0	1																
Subtotals	0	1	2	5	4	4	1	0	1	6	7	2	2	8	3	7	4	1	6	2	3	6	5	3	0	0	0	0	0	0	
*		3			13			2			15			13			12			11			14			0			0		83
Knickerbocker/ Myrtle	0	0	0	1	1	3	0	1	2	0	2	0	0	1	0	0	0	0	2	4	0	0	1	0	0	0	0	0	1	0	
													0	0	1																
Knickerbocker/ Himrod	0	0	0	0	0	1	0	1	1	0	0	0	2	1	1	0	2	1	0	0	0	0	0	0	0	0	0	1	12**	7**	
													0	0	0																
Subtotals	0	0	0	1	1	4	0	2	3	0	2	0	2	2	2	0	2	1	2	4	0	0	1	0	0	0	0	1	13	7	
		0			6			5			2			6			3			6			1			0			21		50
Flatbush/ Avenue U	0	0	0	8	5	6	0	0	2	3	7	13	3	4	0	19	12	14	2	0	1	22	18	5	0	0	0	0	0	2	
													0	0	1																
Subtotals *		0			19			2			23			8			45			3			45			0			2		147
Total																															369

*Some subtotals are based upon the numbers for each statistic from all three years. They are not mutually exclusive to columns labeled "'97".

**Fixed object

5. LEVEL OF SERVICE/ACCIDENT ANALYSIS AND RECOMMENDATIONS

86th Street and 4th Avenue

86th Street and 5th Avenue

5.a. BAY RIDGE

A traffic and pedestrian level of service (LOS) analysis was conducted at two signalized intersections, 86th Street at 4th and 5th Avenues. Figures 1 and 2 show existing and future balanced traffic volumes for the AM, midday, PM, and weekend peak periods. Table 7 illustrates severity of accidents by time of day. Table 8 details existing and future levels of service and delays for both intersections. Recommended actions for this study area are shown in Drawing 1.

Peak Hour

Traffic

Based upon the peak period traffic counts, the morning peak hour is 8:00-9:00 AM, the midday period is 12:30-1:30 PM, the evening period is 5:00-6:00 PM, and the weekend period is 12:30-1:30 PM.

Pedestrian

Based upon the peak period traffic counts, the morning peak hour is 8:00-9:00 AM, the midday period is 1:00-2:00 PM, the evening period is 5:00-6:00 PM, and the weekend period is 1:00-2:00 PM.

2000 EXISTING CONDITIONS

86th Street at 4th Avenue

Traffic

Overall, the intersection operates at an acceptable LOS C for the AM and PM peak periods, and LOS B during the midday and weekend periods, with delays ranging from 13.6 to 19.1 seconds per vehicle. All lane groups for each peak period operate at LOS D or better, with delays ranging from 9.0 to 34.6 seconds per vehicle.

Pedestrian

Sidewalks operate at LOS A for the average flow rate, and LOS B for the platoon condition, during each peak period. All crosswalks operate at LOS C or better, and all corners operate at LOS A, for all peak periods.

86th Street at 5th Avenue

Traffic

Overall, the intersection operates at an acceptable LOS B for all peak periods, with delays ranging from 10.4 to 12.4 seconds per vehicle. Each lane group operates at LOS C or better, with delays ranging from 7.7 to 21.5 seconds per vehicle.

Pedestrian

Sidewalks operate at LOS A for the average flow rate of each walkway, and LOS B for the platoon condition, during each peak period. Crosswalks operate at LOS C or better, and corners operate at LOS A, for all peak periods.

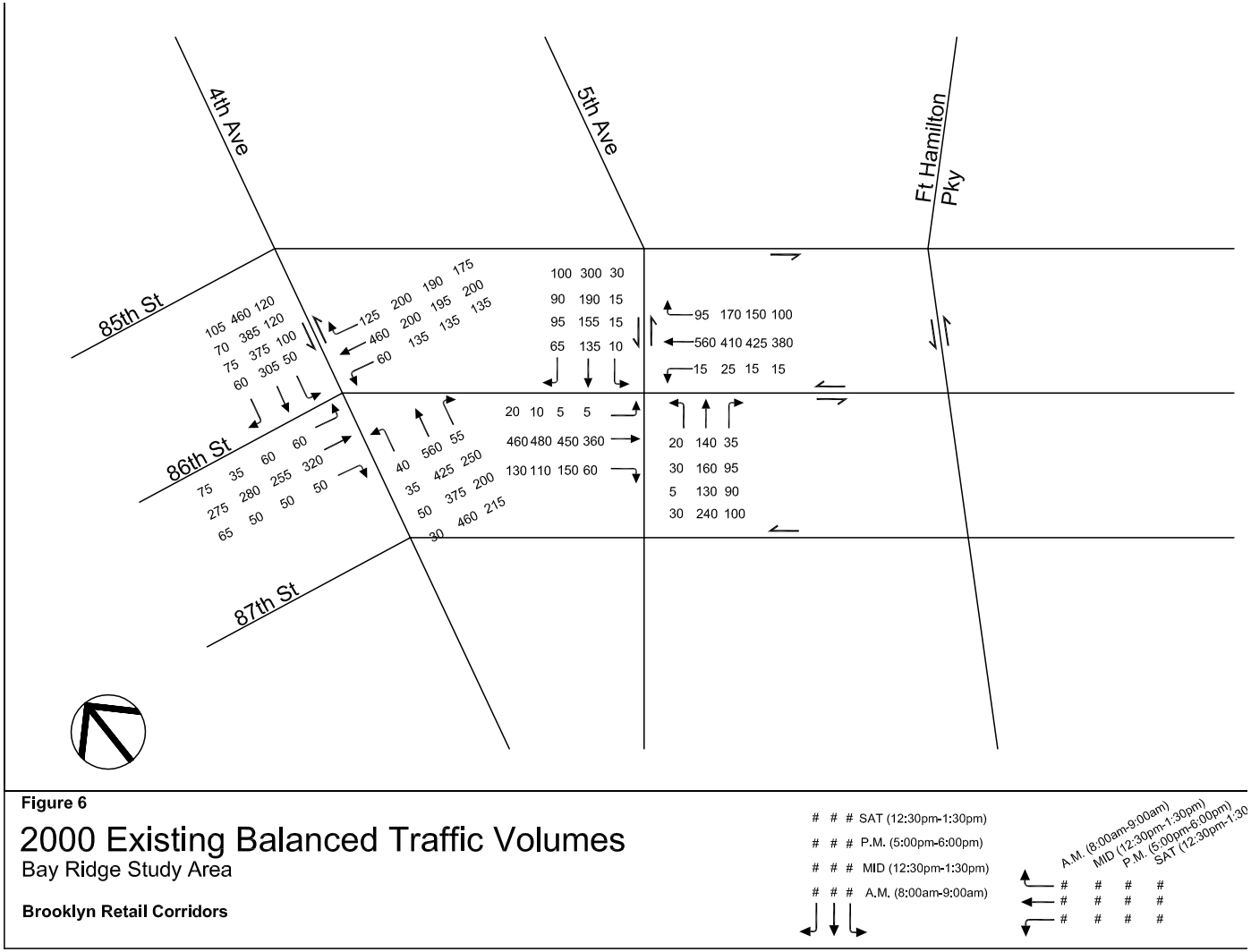


Figure 6

2000 Existing Balanced Traffic Volumes

Bay Ridge Study Area

Brooklyn Retail Corridors

2004 FUTURE NO-BUILD CONDITIONS

The future development scenario identifies one project in the Bay Ridge study area. The reconstruction of 5th Avenue, involves a new concrete base, asphalt wearing course, sidewalks, sewers, water mains, catch basins, traffic signals, streetlights, lane striping and street furniture. This project is not expected to generate new trips, and therefore does not have an impact on the study area traffic network.

86th Street at 4th Avenue

Traffic

Overall, the intersection would continue to operate at LOS C during the AM and PM peak periods, and LOS B during the midday and weekend periods, with slightly increased delays, ranging from 14.5 to 19.9 seconds per vehicle. Each lane group would operate at LOS D or better, with a slight increase in delay; overall delays range from 9.2 to 38.0 seconds per vehicle.

Pedestrian

The level of service for sidewalks, crosswalks, and corners would remain the same for all peak periods.

86th Street at 5th Avenue

Traffic

Overall, the intersection would continue to operate at LOS B for all peak periods, with a very slight increase in delay; delays overall range from 10.4 to 12.5 seconds per vehicle. All lane groups would operate at LOS C or better, with delays ranging from 7.7 to 21.6 seconds per vehicle.

Pedestrian

The analysis indicates no change in level of service for sidewalks, crosswalks, and corners for all peak periods.

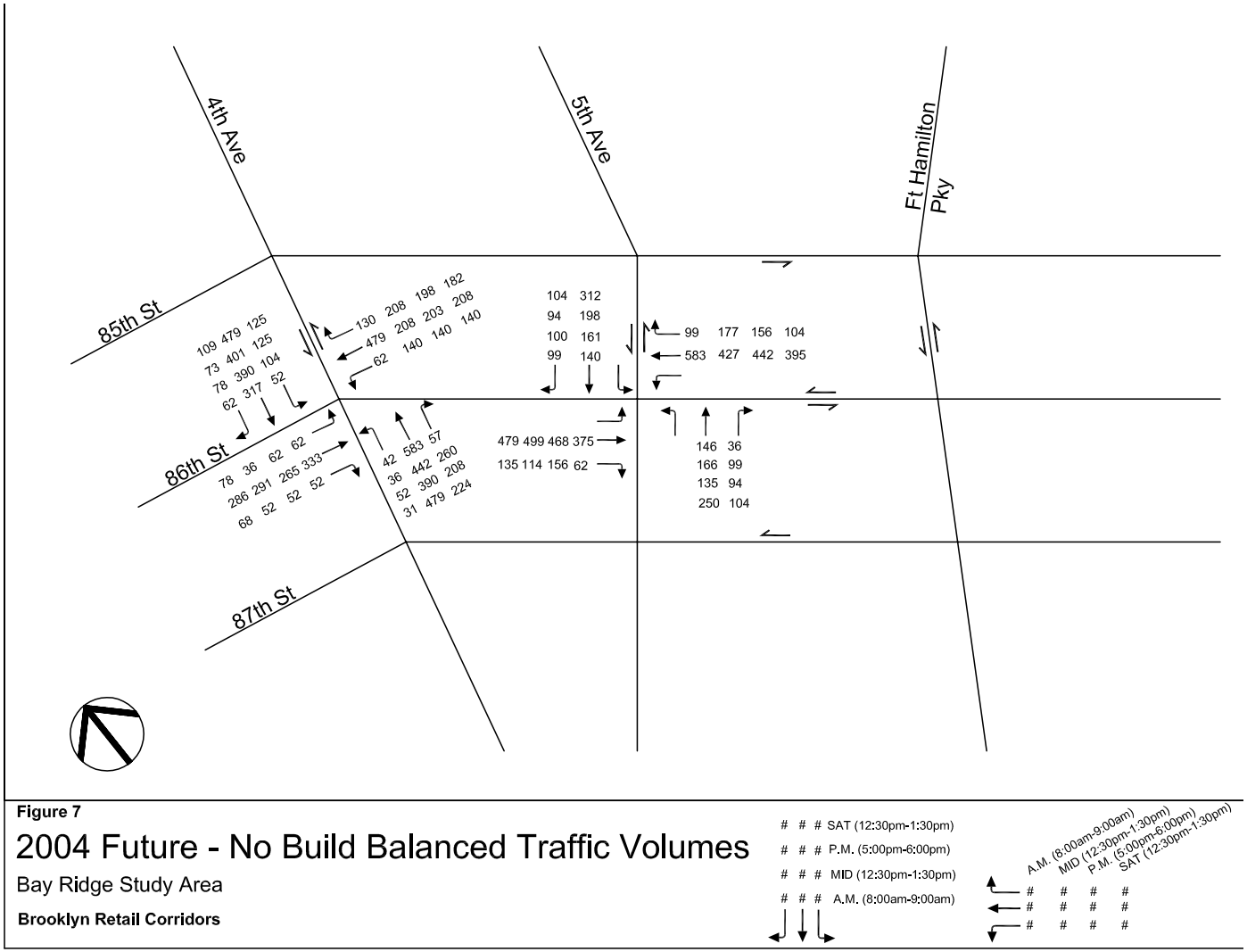


Figure 7

2004 Future - No Build Balanced Traffic Volumes

Bay Ridge Study Area

Brooklyn Retail Corridors

ACCIDENT SUMMARY

Several factors, including signal timing, crossing pedestrians, pavement markings, and turning volumes could be attributed to the types of accidents that occur at these intersections. With the implementation of the following recommendations, including signal timing adjustments and pavement markings, the occurrence of these types of accidents could potentially be reduced.

86th Street at 4th Avenue

Between 1996 and 1998, there were 50 reportable and 108 non-reportable accidents, none fatal, at this intersection. The three most common types of reportable accidents involved pedestrians (26 percent), rear-end collisions (24 percent), and left-turning vehicles (16 percent). Sixty-four percent of reportable accidents occurred during the day. While the number of accidents in 1997 decreased from 1996, they increased again in 1998.

86th Street at 5th Avenue

For the three-year analysis period, 39 reportable and 78 non-reportable accidents occurred at this location. There were no fatalities. Of the three most common types of accidents, 26 percent were rear-end collisions, 23 percent were other-angle common-direction collisions, and 13 percent involved pedestrians and right angle turns. Almost all (87 percent) of the reportable accidents occurred during the day. The number of accidents increased from five (5) in 1996 to 29 in 1998.

Table 7:Accident Analysis
86th Street at 4th and 5th Avenues

1996	4th Avenue			5th Avenue		
	DAY	NIGHT	TOTAL	DAY	NIGHT	TOTAL
FATALITY	0	0	0	0	0	0
INJURY	5	5	10	1	0	1
DAMAGE ONLY	7	2	9	4	0	4
TOTAL	12	7	19	5	0	5

1997	4th Avenue			5th Avenue		
	DAY	NIGHT	TOTAL	DAY	NIGHT	TOTAL
FATALITY	0	0	0	0	0	0
INJURY	3	1	4	1	1	2
DAMAGE ONLY	4	1	5	3	0	3
TOTAL	7	2	9	4	1	5

1998	4th Avenue			5th Avenue		
	DAY	NIGHT	TOTAL	DAY	NIGHT	TOTAL
FATALITY	0	0	0	0	0	0
INJURY	10	4	14	18	3	21
DAMAGE ONLY	3	5	8	7	1	8
TOTAL	13	9	22	25	4	29

RECOMMENDATIONS AND 2004 FUTURE BUILD CONDITIONS

The reconstruction of Fifth Avenue led NYCDOT to institute an Early Implementation Plan to incorporate and complement DCP's recommendations that address the relief of traffic and pedestrian congestion as discussed in Technical Memorandum 3. Certain recommendations as noted below were discussed with and implemented by NYCDOT prior to the completion of this technical memorandum.

PEDESTRIAN-VEHICULAR CONFLICT AND VEHICULAR CONGESTION

86th Street at 4th Avenue

Between 1996 and 1998 there were 50 accidents at this intersection: 13 involved pedestrians, 12 were rear-end collisions, and eight were left-turn collisions.

RECOMMENDATION:

Establish a Leading Pedestrian Interval (LPI). Decrease the north and southbound green time by three (3) seconds (from 70 to 67 seconds in the AM, and from 73 to 70 seconds in the PM) and increase the north and southbound all-red by three (3) seconds (from five [5] to eight [8] seconds). This would increase the time pedestrians have to cross the intersection, while minimizing the potential for pedestrian-vehicular conflict. With this timing adjustment, the intersection in the AM peak would continue to operate at the no-build condition, LOS C, with 20.0 seconds of delay per vehicle. In the PM peak, the intersection would continue to operate at the no-build condition LOS C. Overall, the intersection would experience a very slight increase in delay. Lane group delay also would increase slightly.

Since there is substantial conflict between vehicle and pedestrian movements at this location, it is further recommended that the number of high-visibility crosswalks be increased from one to all four approaches. This entails marking two crosswalks on 4th Avenue, and one on the west side of 86th Street. This should not only increase visibility, but clearly delineate the proper path for pedestrians to safely negotiate the intersection.

86th Street at 4th Avenue

Vehicles turning right from westbound 86th Street to northbound 4th Avenue are blocked by cars parked at meters, as well as double-parked cars at or near the corner.

RECOMMENDATION:

Under the Early Implementation Plan, a right-turn lane was created by removing the first three parking meters on the north side of 86th Street at 4th Avenue.

86th Street at 5th Avenue

Pedestrians using the crosswalk on 86th Street block vehicles making right turns from 5th Avenue, causing traffic spillbacks along 5th Avenue.

RECOMMENDATION:

Increase the time pedestrians have to safely cross the intersection, and minimize conflict with oncoming vehicular traffic**,** by establishing a LPI. Decrease the east and westbound green time by three (3) seconds (from 69 to 66 seconds in the AM and PM, and from 44 to 41 seconds in the Midday and weekend) and increase the east and westbound all-red by three (3) seconds (from six [6] to nine [9] seconds). With this adjustment, the intersection would continue to operate at the no-build condition LOS B during all peak periods.

Bay Ridge Municipal Parking Garage

85th Street at 5th Avenue

Vehicles turning left from southbound 5th Avenue to eastbound 85th Street are blocked by traffic spillbacks created by vehicles trying to enter the municipal garage.

RECOMMENDATION:

Under the Early Implementation Plan, parking meters were removed on the north side of 85th Street between 5th Avenue and Fort Hamilton Parkway. Signage with ”No Standing 7am - 7pm including Sunday“ regulations was installed. Additionally, the existing ”No Standing

Anytime“ regulations on the south side provides ample storage to assist in managing the spillback. This action is expected to alleviate some of the congestion and spillback caused by vehicles entering the garage.

PEDESTRIAN AMENITIES/LIGHTING

86th Street Corridor

86th Street lacks adequate pedestrian amenities, such as benches, additional trees, and waste receptacles. The limited amount of street lighting may divert pedestrian business from the area after dark.

RECOMMENDATION:

Install standard NYCDOT street light fixtures along 86th Street from 4th Avenue to Fort Hamilton Parkway to supplement existing lighting. Specific locations, and the number of fixtures, should be determined by NYCDOT's Street Lighting Division. Pedestrian amenities, including benches and standard Department of Sanitation waste receptacles, should be installed at specific locations. The number and placement of all receptacles and scheduling of additional collection services, if needed, would be determined by the Department of Sanitation. Any and all pedestrian amenities installed as a result of these recommendations should be consistent with the NYC Department of Design and Construction's (DDC) reconstruction of 5th Avenue.

ON-STREET PARKING

The most commonly-cited problem in the study area is that demand for on-street parking exceeds capacity. The resulting double parking on 86th Street contributes to congestion.

RECOMMENDATION:

In response to the area's parking shortages identified in Technical Memorandum 3 of this project, two hour muni-meters were installed along 86th Street from 4th Avenue to Garrison Avenue under the Early Implementation Plan. This strategy increased parking capacity by 25 percent, or 20+ spaces.

UTILIZATION OF THE BAY RIDGE MUNICIPAL PARKING GARAGE

85th Street and 5th Avenue

The garage provides 205 parking spaces, but it is perceived as underutilized, despite the limited availability of parking elsewhere in the study area. Community representatives indicate that drivers avoid the facility due to poor lighting and narrow passageways.

RECOMMENDATION:

Many motorists prefer to park in front of their work place rather than walk to the garage. Under the Early Implementation Plan, monthly parking rates that amount to discounted parking fees were instituted to encourage area residents and employees to park off-street. Most of the users at this facility are transient and do not park long term. The current average occupancy is 73 percent, with weekend occupancy significantly higher at 82 percent. The NYC Department of Transportation has reached out to area residents as well as the business community to further encourage usage of the garage. This facility has been surveyed to address lighting conditions and has been deemed adequate for both security and vehicle operation. In addition, the NYC DOT has contracted a management company to operate this site and any deficiencies are addressed at monthly meetings with the contractor.

Directional Signage

86th Street at 5th Avenue

Signs directing vehicles to the municipal garage are inadequate in terms of quantity, location, and visibility. Motorists bound for the garage are directed by signs on eastbound 86th Street to turn left onto 5th Avenue, although left-turns (except by buses) are prohibited between the hours of 8 AM and 10 PM.

RECOMMENDATION:

Four additional directional signs were installed under the Early Implementation Plan to supplement the 29 signs currently located within, or in close proximity to, the study area. All signs are installed on major streets within a half-mile radius of the facility. Each sign has been determined to be adequately visible to motorists. Signage that incorrectly permitted left turns was removed as recommended.

BUS ROUTES SERVING THE RETAIL CORRIDOR

86th Street Corridor

It is generally perceived by area residents that the current routes of the B64, S53, and S79 bus lines contribute to congestion along 86th Street.

RECOMMENDATION:

DCP and NYCDOT should jointly endorse Community Board 10's Traffic and Transportation Committee proposal to re-route the B-64 bus to terminate at Shore Road, making a left-turn and traveling south on 5th Avenue (at 86th Street), to 87th Street, west on 87th Street to 4th Avenue, and then east onto 86th Street. Additionally, restore 95th Street and 4th Avenue as the terminus of the S-53 bus.

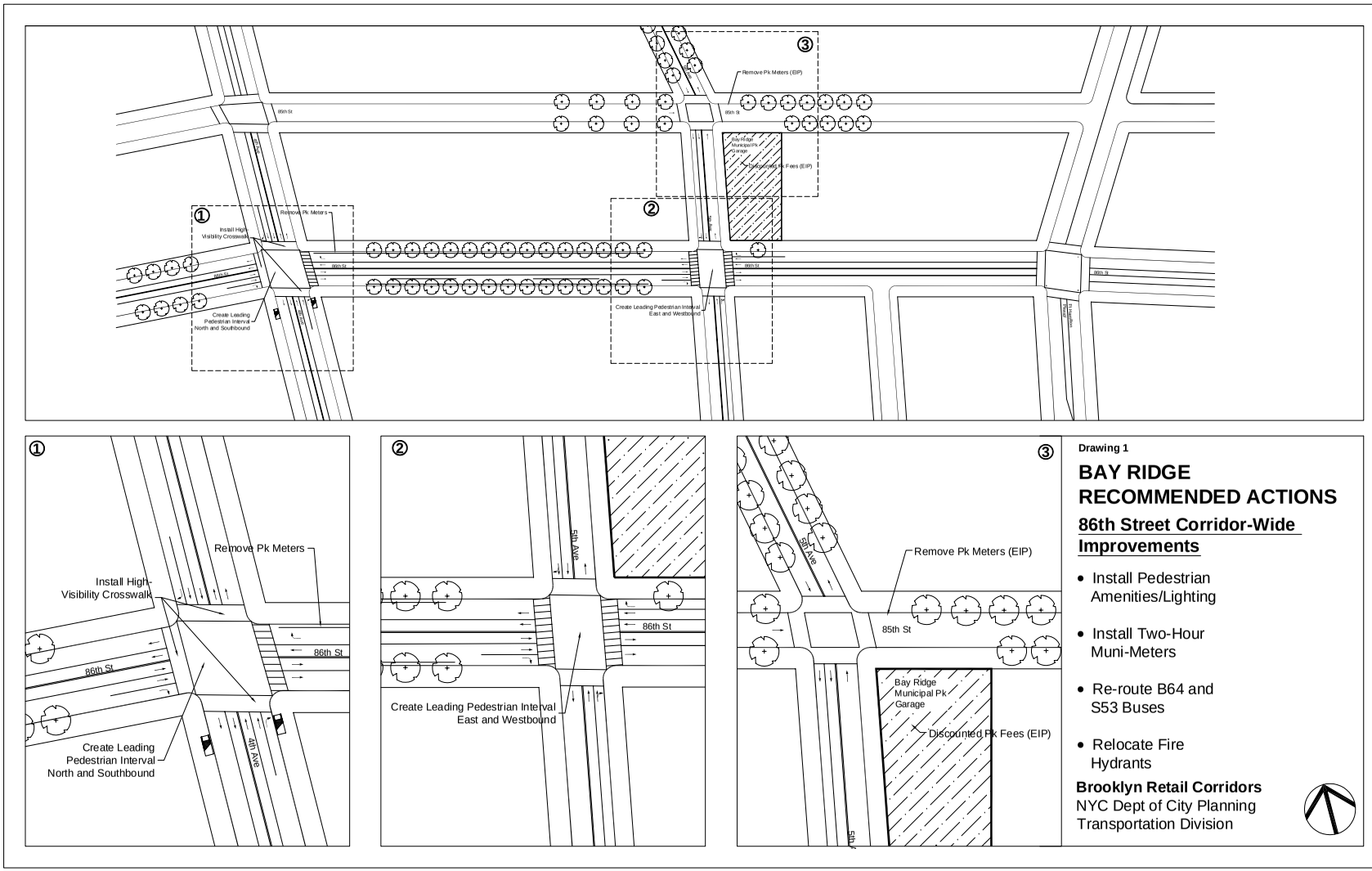
TABLE 8
Bay Ridge: Comparison of LOS and Delay for Existing, No-Build, and Build Conditions

AM PEAK PERIOD													
INTERSECTION	**2000 Existing**				**2004 No-Build**				**2004 Build**				**Delay**
Approach	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	**Change**
86th Street @ 4th Avenue													
Eastbound	LTR	0.688	27.4	D	LTR	0.733	28.8	D	LTR	0.733	28.8	D	0.0
Westbound	LTR	0.773	29.3	D	LTR	0.817	31.1	D	LTR	0.817	31.1	D	0.0
Northbound	LTR	0.412	9.8	B	LTR	0.432	10.0	B	LTR	0.433	10.0	B	0.0
Southbound	LTR	0.324	9.1	B	LTR	0.343	9.2	B	LTR	0.344	9.3	B	-0.1
Intersection			**19.1**	**C**			**19.9**	**C**			**20.0**	**C**	-0.1
86th Street @ 5th Avenue													
Eastbound	T	0.223	8.4	B	T	0.233	8.5	B	T	0.233	8.5	B	0.0
	R	0.088	7.7	B	R	0.091	7.7	B	R	0.091	7.7	B	0.0
Westbound	T	0.294	8.9	B	T	0.307	9.0	B	T	0.307	9.0	B	0.0
	R	0.152	8.0	B	R	0.158	8.1	B	R	0.158	8.1	B	0.0
Northbound	TR	0.184	20.6	C	TR	0.185	20.6	C	TR	0.185	20.6	C	0.0
Southbound	TR	0.215	20.8	C	TR	0.225	20.9	C	TR	0.225	20.9	C	0.0
Intersection			**11.7**	**B**			**11.8**	**B**			**11.8**	**B**	0.0

MIDDAY PEAK PERIOD													
INTERSECTION	**2000 Existing**				**2004 No-Build**				**2004 Build**				**Delay**
Approach	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	**Change**
86th Street @ 5th Avenue													
Eastbound	T	0.296	9.3	B	T	0.307	9.3	B	T	0.307	9.3	B	0.0
	R	0.260	9.1	B	R	0.270	9.2	B	R	0.270	9.2	B	0.0
Westbound	T	0.256	9.0	B	T	0.650	9.1	B	T	0.650	9.1	B	0.0
	R	0.313	9.4	B	R	0.325	9.5	B	R	0.325	9.5	B	0.0
Northbound	TR	0.231	13.1	B	TR	0.241	13.2	B	TR	0.241	13.2	B	0.0
Southbound	TR	0.228	13.1	B	TR	0.237	13.2	B	TR	0.237	13.2	B	0.0
Intersection			**10.4**	**B**			**10.4**	**B**			**10.4**	**B**	0.0

PM PEAK PERIOD													
INTERSECTION	**2000 Existing**				**2004 No-Build**				**2004 Build**				**Delay**
Approach	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	**Change**
86th Street @ 4th Avenue													
Eastbound	LTR	0.477	24.9	C	LTR	0.504	25.3	D	LTR	0.504	25.3	D	0.0
Westbound	LTR	0.834	34.6	D	LTR	0.879	38.0	D	LTR	0.879	38.0	D	0.0
Northbound	LTR	0.443	9.0	B	LTR	0.469	9.2	B	LTR	0.470	9.3	B	-0.1
Southbound	LTR	0.494	9.5	B	LTR	0.528	9.9	B	LTR	0.530	9.9	B	0.0
Intersection			**18.3**	**C**			**19.4**	**C**			**19.4**	**C**	0.0
86th Street @ 5th Avenue													
Eastbound	T	0.274	8.8	B	T	0.850	8.8	B	T	0.850	8.8	B	0.0
	R	0.166	8.1	B	R	0.172	8.2	B	R	0.172	8.2	B	0.0
Westbound	T	0.219	8.4	B	T	0.228	8.5	B	T	0.228	8.5	B	0.0
	R	0.240	8.6	B	R	0.249	8.6	B	R	0.249	8.6	B	0.0
Northbound	TR	0.238	21.0	C	TR	0.302	21.1	C	TR	0.302	21.1	C	0.0
Southbound	TR	0.291	21.5	C	TR	0.307	21.6	C	TR	0.307	21.6	C	0.0
Intersection			**12.4**	**B**			**12.5**	**B**			**12.5**	**B**	0.0

SATURDAY PEAK PERIOD													
INTERSECTION	**2000 Existing**				**2004 No-Build**				**2004 Build**				**Delay**
Approach	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	Mvm't	V/C	Delay	LOS	**Change**
86th Street @ 5th Avenue													
Eastbound	T	0.293	9.2	B	T	0.305	9.3	B	T	0.305	9.3	B	0.0
	R	0.211	8.8	B	R	0.219	8.9	B	R	0.219	8.9	B	0.0
Westbound	T	0.226	8.9	B	T	0.235	8.9	B	T	0.235	8.9	B	0.0
	R	0.176	8.6	B	R	0.182	8.7	B	R	0.182	8.7	B	0.0
Northbound	TR	0.288	13.5	B	TR	0.300	13.6	B	TR	0.300	13.6	B	0.0
Southbound	TR	0.341	13.9	B	TR	0.354	14.0	B	TR	0.354	14.0	B	0.0
Intersection			**10.9**	**B**			**11.0**	**B**			**11.0**	**B**	0.0


①
②
③
Remove Pk Meters
Install High-Visibility Crosswalk
86th St
Create Leading Pedestrian Interval North and Southbound
4th Ave
Create Leading Pedestrian Interval East and Westbound
5th Ave
Remove Pk Meters (EIP)
85th St
Bay Ridge Municipal Pk Garage
Discounted Pk Fees (EIP)
Drawing 1
BAY RIDGE
RECOMMENDED ACTIONS
86th Street Corridor-Wide Improvements
• Install Pedestrian Amenities/Lighting
• Install Two-Hour Muni-Meters
• Re-route B64 and S53 Buses
• Relocate Fire Hydrants
Brooklyn Retail Corridors
NYC Dept of City Planning
Transportation Division