

Safe Streets for Seniors

Bensonhurst, Brooklyn

FINAL REPORT

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Janette Sadik-Khan, Commissioner



Safe Streets for Seniors BENSONHURST

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PROJECT DESCRIPTION

1. PROJECT DESCRIPTION

Since 1990 the number of pedestrian fatalities in New York City has decreased by 56%. Moreover, prior to 1950, pedestrians accounted for three-fourths of all traffic fatalities and since then, that percentage has decreased to account for about one-half of all traffic fatalities. Despite these statistical improvements, pedestrians continue to be the largest at risk mode – with older adults more likely to suffer serious injuries or fatalities from traffic crashes than other pedestrians. The rate of pedestrian fatalities for every 100,000 persons in the City has decreased by nearly half since 1991 – to 2.0 from 3.8 – while the rate of senior pedestrian fatalities per 100,000 seniors has decreased even more sharply – to 6.6 from 13.1. Nevertheless, while seniors make up only 12% of the population in New York City, they still comprise 39% of pedestrian fatalities. The recognition of the disproportional representation of the senior population among severe pedestrian injuries and fatalities led to the development of the Department of Transportation’s Safe Streets for Seniors (SSS) Program.

The purpose of this project is to address senior pedestrian safety issues at 25 Senior Pedestrian Focus Areas (SPFAs) in the five boroughs of New York City and to develop and implement mitigation measures to improve the safety of seniors and other pedestrians within the 25 SPFAs. DOT identified SPFAs to include the top senior pedestrian crash (severe injury and fatality) areas within each borough. Four of the SPFAs are located in the Bronx, seven in Brooklyn, five in Queens, eight in Manhattan and one in Staten Island. The SPFAs have been selected based on the density of senior pedestrian crashes resulting in fatalities or severe injuries in a five-year period. DOT conducted in-house studies for five pilot SPFAs and is utilizing consultant services to perform a comprehensive study of pedestrian safety conditions at intersections and along corridors within 20 selected SPFAs.

The project evaluates the crash history and existing traffic conditions and controls (e.g., roadway geometry, signal timing) at selected intersections and corridors within each SPFA in order to develop short- and long-term measures to reduce pedestrian crashes specifically for seniors, and improve safety and traffic operations for all users. DOT makes specific safety recommendations consisting of low-cost as well as capital engineering and design improvements for these 20 areas. In addition, DOT conducts data analysis as needed, prepares engineering and design schematics and related services, as necessary, for capital improvements.

2. BACKGROUND

Land-use in the Bensonhurst Study Area is a mix of commercial and residential buildings. There are a few Senior Centers located in or near the study area including the Sephardic House of Jacob Senior Center at 23rd Avenue between 62nd Street and 63rd Street, Garden of Eden Home for Adults at Stillwell Avenue between Avenue P and Kings Highway and Bensonhurst Senior Center on Bay Parkway/22nd Avenue between 78th Street and 79th Street.

There is a medical center, Schneider Children's Hospital, located at Bay Parkway/22nd Avenue between 86th Street and Benson Avenue.

There are nine schools in the study area (List of school names and addresses shown in Exhibit 5).

Bicycle Facilities

In the vicinity of Bensonhurst Study Area, there are no existing bike routes; however, 21st Avenue, 72nd Street and 71st Street are a NYC DOT 2010 Bicycle Master Plan planned/proposed (Exhibit 2).

Truck Routes

There are several local truck routes in the vicinity of the study area including 65th Street, Bay Parkway/22nd Avenue south of 78th Street and Kings Highway east of Bay Parkway/22nd Avenue (Exhibit 3).

Bus Lines and Subway

Five bus lines operate in the study area including (Exhibit 4):

- B1: Operates along 86th Street
- B4: Operates along Bay Ridge Parkway/75th Street and Stillwell Avenue
- B6: Operates along Bay Parkway/22nd Avenue
- B8: Operates along 18th Avenue
- B82: Operates along Bay Parkway/22nd Avenue and Kings Highway

The N subway line runs along Broadway through the study area (Exhibit 4). Subway stations for the N line are located at the following intersections:

- 65th Street and 18th Avenue
- 65th Street and 20th Avenue
- Bay Parkway/22nd Avenue and West 8th Street
- Kings Highway and West 8th Street



EXHIBIT 1 – AREA MAP

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BACKGROUND

EXHIBIT 2 – BIKE MAP

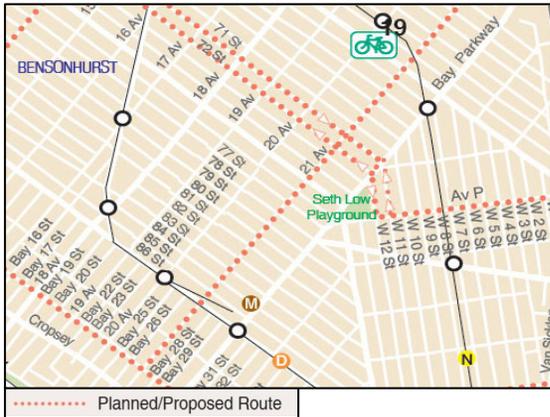


EXHIBIT 3 – TRUCK MAP



EXHIBIT 4 – TRANSIT MAP

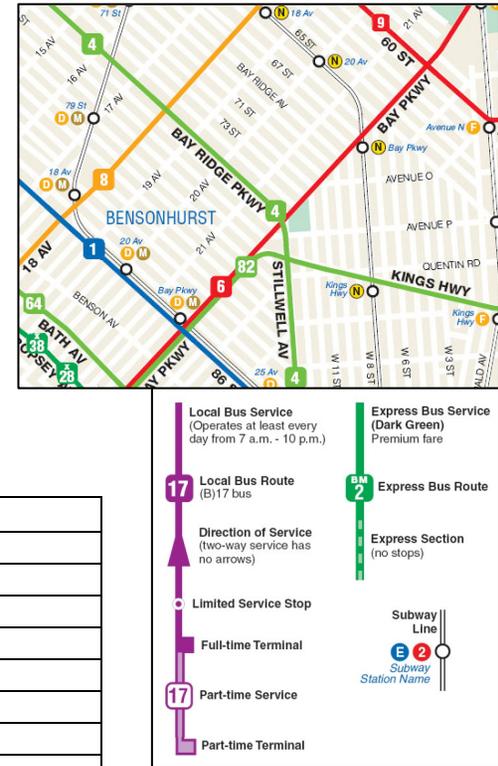


EXHIBIT 5 – LIST OF THE SCHOOLS IN THE STUDY AREA

School Name	Address
Esther Bais School	65 th Street between 21 st Avenue and Bay Parkway/22 nd Avenue
P.S. 205 Clarion School	20 th Avenue between 67 th Street and 68 th Street
Merkaz Bnos High School	West 6 th Street between 65 th Street and Avenue O
Sinai Academy Center	79 th Street between 20 th Avenue and 21 st Avenue
Brooklyn Studio School	21 st Avenue between 83 rd Street and 84 th Street
Yeshivah Ohel Moshe	Bay Parkway/22 nd Avenue between 79 th Street and 80 th Street
David Magen Yeshivah High School	Bay Parkway/22 nd Avenue between 78 th Street and 79 th Street
St. Mary's Religious Education	23 rd Avenue between 84 th Street and 85 th Street
P.S. 97	Stillwell Avenue between 82 nd Street and 24 th Avenue

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EXISTING CONDITIONS

3. EXISTING CONDITIONS

3.1 ABOUT THE STUDY AREA

The Bensonhurst Study Area consists of three major north-south corridors: 18th Avenue, Bay Parkway/22nd Avenue, and Stillwell Avenue (Photo No. 1) and four major west-east corridors: 65th Street, Bay Ridge Parkway/75th Street, 86th Street and Avenue P. Three of the major corridors carry truck routes (Exhibit 3). All the major corridors with the exception of Avenue P carry at least one NYCT route (Exhibit 4). Many of the senior residents interviewed showed concern about 17th Avenue and 69th Street. Although this intersection is not within the study area, this intersection will be included in this study. The combination of heavy traffic volumes, operational factors and geometric factors make these corridors difficult for a senior pedestrian to safely cross.



Photo No. 1: Stillwell Ave. & Bay Parkway/22nd Ave

3.2 FIELD OBSERVATIONS AND PEDESTRIANS CONCERNS

There were numerous issues that were repeatedly observed during the field visits and/or conveyed by senior pedestrians during interviews. Those issues are:

- Insufficient crossing time
- Missing crosswalk markings
- Missing or inadequate pedestrian ramps

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TRAFFIC OPERATIONS

4. TRAFFIC OPERATIONS

4.1 CRASH SUMMARY

Crash data was obtained from the New York City Department of Transportation (NYCDOT) in the Bensonhurst Study Area from 2001 through 2006. This data provides some detail relating the circumstances and cause of each crash. Table 1 and Exhibit 6 show a summary of crashes.

TABLE 1: DMV SIX YEAR CRASH SUMMARY (2001-2006)			
INTERSECTION		SENIOR PEDESTRIAN CRASHES	SENIOR PEDESTRIAN FATALITIES
18 th Avenue	71 st Street	1	0
19 th Avenue	Bay Ridge Parkway/ 75 th Street	1	0
	71 st Street	1	0
	66 th Street	1	0
20 th Avenue	86 th Street	3	0
	Bay Ridge Avenue/ 69 th Street	1	0
	65 th Street	1	0
21 st Avenue	86 th Street	1	0
	85 th Street	1	0
	78 th Street	2	0
Bay Parkway/ 22 nd Avenue	86 th Street	2	0
	85 th Street	2	0
	78 th Street	1	0
	77 th Street	1	0
23 rd Avenue	West 9 th Street	1	0
	83 rd Street	1	0
	65 th Street	1	0
65 th Street	23 rd Avenue	1	0
	West 4 th Street	2	1
	24 th Avenue	1	0
Avenue O	West 8 th Street	1	1
	West 4 th Street	1	0
Avenue P	West 6 th Street	1	0
Kings Highway	West 8 th Street	1	0
Highlawn Avenue	West 12 th Street	1	0
TOTAL		30	2



EXHIBIT 6 – PEDESTRIAN CRASH STATISTICS (2001-2006)

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TRAFFIC OPERATIONS

4.2 TRAFFIC VOLUMES

The level of vehicle and pedestrian conflicts at the intersections utilized by senior pedestrians, in the Bensonhurst Study Area, was assessed using traffic volume data collected at key locations in June of 2010 (Table 2).

TABLE 2: TRAFFIC VOLUME DATA			
Locations	ATR ¹	TMC ²	PED COUNTS
Avenue O between W 4 th Street & W 3 rd Street	x		
Avenue O/24 th Avenue & 65 th Street		x	x
W 3 rd Street south of Avenue O	x	x	x
Avenue P & W 12 th Street		x	x
Avenue P & W 11 th Street		x	x
Avenue P between W 9 th Street & W 10 th Street	x		
Avenue P & W 8 th Street		x	x
Avenue P & W 7 th Street		x	x
Avenue P & W 6 th Street		x	x
Avenue P between W 3 rd Street & W 4 th Street	x		
W 6 th Street south and north of Avenue P	x		
Avenue P & W 1 st Street		x	x
Avenue P & Dahill Road		x	x
Bay Parkway/22 nd Avenue between 66 th Street & 67 th Street	x		
Bay Parkway/22 nd Avenue & 66 th Street		x	x
Stillwell Avenue at 86 th Street	x		
Stillwell Avenue at Quentin Road	x		
Stillwell Avenue at Mermaid Avenue	x		

Notes:

1. Twenty-four hour Automatic Traffic Recorder (ATR)
2. Turning Movement Counts (TMC's)

The results of the ATR, TMC and pedestrian counts are included in Appendices A, B, C and the Technical Supplement.

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TRAFFIC OPERATIONS

04.3 EXISTING LEVEL OF SERVICE

The common practices used to evaluate both un-signalized and signalized intersections are level-of-service (LOS), delay, and volume-to-capacity ratio (v/c). The intersections and corridors to be evaluated were selected based on the pedestrian crash locations and what was observed during the field visit. At some signalized intersections, delay and v/c were analyzed. The baseline conditions at a specific intersection are measured in the amount of time (delay) that a vehicle has to wait at that intersection. This delay is measured in seconds per vehicle (sec/veh) during the busiest one hour (peak hour) in both the morning (AM) and evening (PM), and referred to as total delay. Total delay is adjusted for additional accrued time due to traffic controls and queuing conditions. A volume-to-capacity ratio indicates the amount of congestion that occurs at a particular location. An intersection with a v/c that is greater than or equal to one proves that the traffic conditions are above or at capacity; whereas an intersection with a v/c less than one indicates that traffic operations are below capacity.

For un-signalized intersections, the level of service is determined by the time spent while the vehicle is not moving (stopped delay). The two approaches can be used to measure the average stopped delay, either by minor movements of the intersection as a whole or by lane grouping.

The results of existing level of service analysis for the studied corridors in the study area during both AM and PM peak hours are indicated in Table 3. The detailed results of the analysis are included in Appendix D and the Technical Supplement.

TABLE 3: EXISTING (2010) INTERSECTION LEVEL OF SERVICE AND DELAYS (SEC)				
Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Avenue P & W 12 th Street	13.5	B	14.9	B
Avenue P & W 11 th Street	17.1	B	15.2	B
Avenue P & W 10 th Street	11.4	B	16.9	B
Avenue P & W 9 th Street	8.3	A	10.6	B
Avenue P & W 8 th Street	9.9	A	10.3	B
Avenue P & W 7 th Street	9.9	A	7.8	A
Avenue P & W 6 th Street	26.3	C	63.7	E
Avenue P & W 5 th Street	7.1	A	9.4	A
Avenue P & W 4 th Street	6.0	A	10.9	B
Avenue P & W 3 rd Street	6.7	A	12.1	B
Avenue P & W 2 nd Street	6.2	A	10.2	B
Avenue P & W 1 st Street	10.1	B	9.7	A
Avenue O, 24 th Avenue & 65 th Street	14.8	B	14.8	B

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TRAFFIC OPERATIONS

4.4 SIGNAL TIMING: PEDESTRIAN INTERVAL

According to MUTCD 2009 (Manual on Uniform Traffic Control Devices) Section 4E.06, a minimum of seven seconds is allocated for a walk interval, in addition to a pedestrian clearance time based on a walking speed of 3.5 feet per second. All signalized intersections in the study area were modified to provide a clearance interval of three feet per second to accommodate slower walking speeds.

NYCDOT was able to provide more crossing time at 69% of the signalized intersections in the Bensonhurst Study Area.

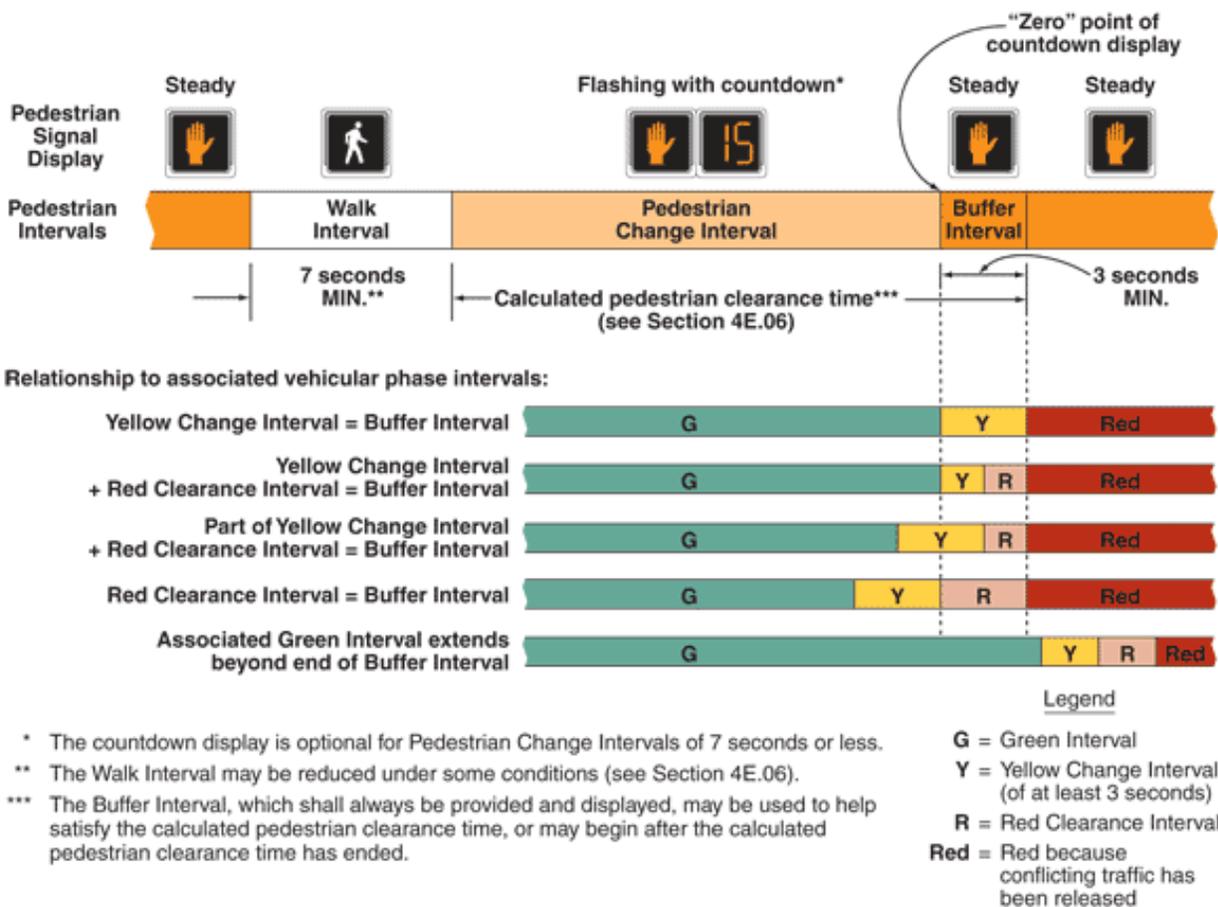


Figure No. 1: Pedestrian Intervals from MUTCD 2009

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ILLUSTRATING THE SOLUTION

5. ILLUSTRATING THE SOLUTION

5.1 EXECUTIVE SUMMARY AND GENERAL RECOMMENDATIONS

TABLE 4: SUMMARY OF SPECIFIC RECOMMENDATIONS

Section	Locations	Install Traffic Signal	Eliminate a Lane in Each Direction	Extended / Raised Median	Curb Extension	High-visibility Crosswalk	Standard Crosswalk	Stripe Median	Stripe Parking Lane	Stripe Channelization	Stripe Bike Lane	Street Closure	Reconstruct Corner Quadrant / Pedestrian Ramps	Left-turn Bay	Right-turn Bay
5.2	Kings Hwy, Quentin Rd & W 11 th St			x				x		x			x		
5.2	Kings Hwy, Quentin Rd & W 10 th St			x		x		x	x						
5.2	Quentin Rd & W 9 th St						x								
5.2	Kings Hwy, 22 nd Ave & 78 th St									x					
5.3	Avenue O between W 11 th St & W 3 rd St/65 th St								x						
5.3	Avenue O, 24 th Ave & 65 th St			x											
5.3	Avenue O & W 6 th St												x		
5.3	65 th St & 24 th Ave												x		
5.3	65 th St & Avenue O												x		
5.3	W 3 rd St btw Avenue O & 65 th St			x								x			
5.4	Avenue P between W 12 th St to Dahill Rd		x								x				
5.4	Avenue P & W 11 th St			x										x	
5.4	Avenue P & W 10 th St			x				x						x	
5.4	Avenue P & W 9 th St							x						x	x
5.4	Avenue P & W 8 th St			x				x							
5.4	Avenue P & W 7 th St			x				x							
5.4	Avenue P & W 6 th St													x	
5.4	Avenue P & W 5 th St			x										x	
5.4	Avenue P & W 4 th St			x				x						x	
5.4	Avenue P & W 3 rd St			x				x						x	

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ILLUSTRATING THE SOLUTION

Section	Locations	Install Traffic Signal	Eliminate a Lane in Each Direction	Extended / Raised Median	Curb Extension	High-visibility Crosswalk	Standard Crosswalk	Stripe Median	Stripe Parking Lane	Stripe Channelization	Stripe Bike Lane	Street Closure	Reconstruct Corner Quadrant / Pedestrian Ramps	Left-turn Bay	Right-turn Bay
5.4	Avenue P & W 2 nd St			x										x	
5.4	Avenue P & W 1 st St			x				x						x	
5.4	Avenue P & Dahill Rd													x	
5.4	Avenue P btw W 11 th St & Dahill Rd										x			x	
5.5	Stillwell Ave btw Avenue P & 86 th St		x					x						x	
5.5	Stillwell Ave & Quentin Rd / 23 rd Ave			x											
5.5	Stillwell Ave & Avenue S			x											
5.5	Stillwell Ave & Avenue T			x											
5.6	86 th St & 20 th Ave				x								x		
5.6	86 th St & 21 st Ave				x	x							x		
5.6	86 th St & Bay Pwy/22 nd Ave												x		
5.6	85 th St & Bay Pwy/22 nd Ave				x	x									
5.6	66 th St & Bay Pwy/22 nd Ave	x					x								
5.7	75 th St btw 18 th Ave & Bay Pwy/22 nd Ave								x						
5.7	18 th Ave btw 65 th St & 75 th St								x						
5.7	19 th Ave btw 65 th St & 75 th St								x						
5.8	21 st Ave btw 65 th St & 86 th St										x				

General Recommendations

- Place stop bars ten feet in advance of all crosswalks
The NYCDOT standard for placement of a stop bar is 10 feet in advance of any marked pedestrian crosswalk, including school and high-visibility crosswalks. This helps to maximize pedestrian visibility and to minimize the potential for pedestrian/vehicle conflicts. Therefore, it is recommended that stop bars be placed ten feet in advance of all crosswalks.

- Provide additional crossing time where feasible
Number of senior residents interviewed, indicated that there was not enough time to cross a lot of the streets. All the signals, where possible, will be retimed to allow more crossing time for pedestrians.

- Green projects where feasible
All medians, pedestrian plazas and curb extensions will be part of the Greenstreets project where feasible. The Greenstreets project is a citywide program to convert paved vacant traffic islands and medians into green spaces filled with shade trees, flowering trees, shrubs and groundcover.

5

ILLUSTRATING THE SOLUTION

5.2 QUENTIN ROAD & KINGS HIGHWAY

Within the study area, Quentin Road changes traffic patterns multiple times. It is two-way traffic from West 5th Street to West 9th Street, one-way westbound traffic from West 9th Street to West 10th Street and one-way eastbound traffic from West 10th Street to Stillwell Avenue, where it terminates.

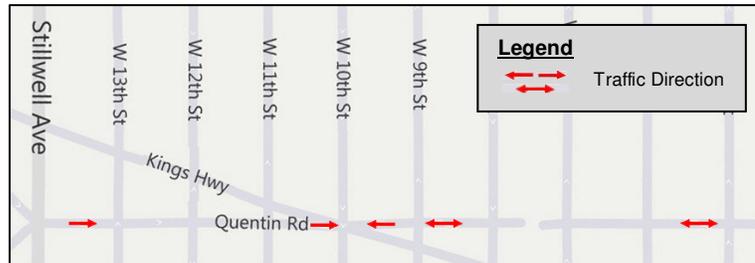


Figure No. 2: Quentin Road Traffic Pattern

Quentin Road

The intersections along Quentin Road and Kings Highway from West 11th Street to West 9th Street have traffic lanes that merge and split at various locations, which makes the intersections intimidating and confusing for seniors. A series of recommendations have been developed to improve the pedestrian safety and are illustrated in Exhibit 10. To shorten the crossing distance and to provide a safer refuge for pedestrians crossing Quentin Road and Kings Highway at West 11th Street, a median extension is recommended for the existing striped gore on the west leg of the intersection (Photo No. 2). A new median is recommended for the east leg of the intersection in-line with existing striping. A “No left-turn” sign for the westbound traffic along Quentin Road at west 10th Street is recommended to minimize left turn crashes at this intersection. For the north curb along Quentin Road between West 10th and West 9th Streets and the north side of the island located west of West 9th Street, Parking lane striping is recommended.

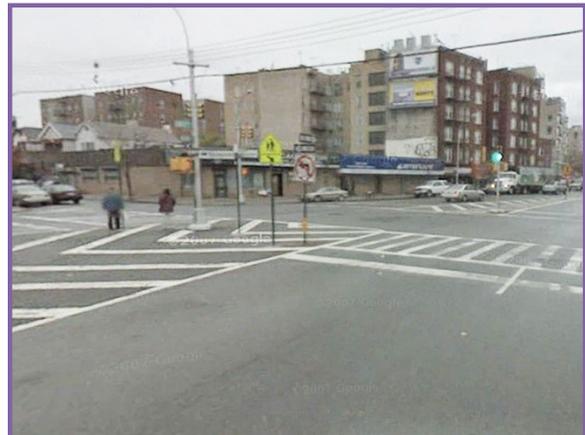


Photo No. 2: Quentin Rd. & W 11th St. (looking west)

Kings Highway

Along Kings Highway from West 11th Street to West 10th Street, a six foot wide striped median is recommended to narrow the width of the travel lanes in each direction and slow moving traffic. An eight foot concrete refuge island is proposed for the east leg of Kings Highway and West 10th Street, and a striped median should be tapered to meet the existing crosswalk on the west leg of Kings Highway and West 9th Street.

At the intersection of Kings Highway, 22nd Avenue and 78th Street, striping is recommended along the north side of the island between Kings Highway and 78th Street to visually narrow street and slow down moving traffic.

5.3 AVENUE O

Avenue O is a 42-foot wide street with one moving lane in each direction. Parking lane stripes are recommended for both sides of the corridor from W 3rd Street to 22nd Avenue. This measure will narrow the travel lanes and calm traffic (Exhibit 11).

There is a pedestrian ramp on the southwest corner of Avenue O and West 6th Street that is in poor condition, it is recommended that it be replaced with a NYCDOT standard pedestrian ramp and ADA safety surface.

West 3rd Street between Avenue O and 65th Street is a short block with one-way southbound traffic. The existing pedestrian plaza between 65th Street, Avenue O and West 3rd Street should be expanded to close West 3rd Street between Avenue O and 65th Street, providing additional sidewalk width and improve pedestrian-vehicle visibility. It is anticipated that either Greenstreets or a maintenance partner will have to be identified to implement this recommendation. This new geometry will direct all right turning vehicles from 65th Street to Avenue O to use 24th Avenue. Turning movement counts for the AM and PM peak periods were performed at Avenue O and West 3rd Street in April of 2010. There were 13 and 15 vehicles during the AM and PM peak hours, respectively, making a left/right turn from West 3rd Street onto Avenue O (Appendix B). Due to the relatively low traffic volume, there is no significant impact on the level of service and a change in timing is not required.



Photo No. 3: Avenue O & 65th St. (looking from W 3rd St.)

At the intersection of Avenue O and 65th Street, there is a striped island with a signal pole located at the corner. During the field visit, it was observed that people were using the striped island for parking (Photo No. 3), it is recommended that a concrete island be built in-line with existing striping. Autoturn for this intersection is shown in Appendix E.

There are several corner quadrants at the intersection of 24th Avenue, 65th Street and Avenue O that need a new or an upgraded pedestrian ramp that are currently not ADA compliant.

5.4 AVENUE P

Avenue P is a 60-foot wide street with two-way traffic (Photo No. 4). From Bay Parkway to West 11th Street, Avenue P was reduced from two lanes in each direction to one lane in each direction with left turn bays. (Refer to NYCDOT drawing no. MD-1106, more details in Appendix H).

Turning movement counts and traffic volumes were gathered along Avenue P (Appendices A & B) from West 11th to West 2nd Streets to determine the feasibility of reducing Avenue O to one moving lane in each direction. Analysis of the traffic data showed that the reduction of Avenue P to a



Photo No. 4: Avenue P & W 5th St. (looking west)

three lane roadway (one moving lane in each direction with left turn bays) improved the safety (reduced pedestrian crossing distance) without significantly impacting the vehicular level of service (Technical Supplement). The recommended configuration of Avenue P from West 12th Street to Dahill Road is shown on Exhibits 12 & 13.

5.5 STILLWELL AVENUE

Stillwell Avenue is a 60-foot wide street with two-way traffic and parking on both sides. NYCDOT collected twenty-four hour Automatic Traffic Recorder (ATR) Counts along Stillwell Avenue between Avenue P and 86th Street in October of 2010. After analyzing the traffic data, NYCDOT determined that 2 to 1 travel lane reduction was feasible. See the technical supplement for the results of the traffic data. The recommended configuration of Stillwell Avenue is shown on Exhibit 14.

5.6 17TH AVENUE

Many of the senior residents indicated there was a history of non-reported pedestrian crashes and complained of heavy vehicular and pedestrian traffic at the intersection of 17th Avenue and 69th Street. At this intersection, 17th Avenue is uncontrolled and 69th Street is stop controlled. Automatic Traffic Recorder (ATR), Turning Movement Counts (TMC), pedestrian counts and spot speed surveys were collected in March, April and May of 2010 to determine if an all-way stop or a signal is warranted. Traffic analysis indicated neither was warranted. The results of the traffic data are included in Appendices A, B, C, F and the Technical Supplement.

5.7 18TH AVENUE, 19TH AVENUE & 75TH STREET

For the following corridors, it is recommended that parking lanes be striped on both sides. This measure will narrow the travel lanes and in an attempt to calm vehicular traffic (Exhibits 15, 16 & 18).

- 18th Avenue between 65th Street and 75th Street
- 19th Avenue between 65th Street and 75th Street
- 75th Street between 18th Avenue and 22nd Avenue (Photo No. 5)



Photo No. 5: 75th St. & 22nd Ave. (looking west)

5.8 21ST AVENUE

In the Bensonhurst Study Area, 21st Avenue is a 42-foot wide two-way street with one moving lane in each direction and parking on both sides. This corridor is a planned/proposed striped on street bike route. A “shared” or Class 3 bike lane is recommended from 65th Street to 86th Street. A Class 3 bicycle lane contains markings on the pavement to alert drivers that bicyclists may use the lane. It is recommended that typical Class 3 bicycle lane marking, including chevrons through the intersections, are installed as shown in Exhibit 17.

5.9 86TH STREET & BAY PARKWAY / 22ND AVENUE

86th Street is a 60-foot wide two-way street with two moving lanes in each direction and parking on both sides. In the study area, there is an elevated subway line running above 86th Street, and as a result, intersections along this corridor are dark and noisy, making it difficult for seniors to safely navigate.

Along 86th Street, “bus bulb” curb extensions are recommended for the west and east legs of 20th Avenue and 22nd Avenue. The bus bulbs will reduce pedestrian exposure in crosswalks and sidewalk congestion and provide space for bus patron amenities.

Autoturn for these intersections are shown in Appendix E.

Neckdowns are recommended for the following intersections to shorten the crossing distance and slow turning traffic:

- 86th Street & 20th Avenue at the northwest and the southeast corners (Photo No. 6)
- 86th Street & 21st Avenue at the northwest and the southeast corners
- 85th Street & 22nd Avenue at all four corners along 22nd Avenue

Vehicle turning was reviewed and the proposed neckdowns allow for vehicles to safely complete all legal turns (Appendix E).

Bay Parkway/22nd Avenue is a major corridor with heavy vehicular traffic. The intersection of Bay Parkway/22nd Avenue and 66th Street is an un-signalized T-intersection with heavy pedestrian traffic generated from the ‘N’ subway line entrance/exit and the bus stop for the B6 line, both located on the east side of the intersection along Bay Parkway/22nd Avenue. Traffic data (Automatic Traffic Recorder Counts and Spot Speed Survey) was collected in April and May of 2010 and the analysis was conducted to determine if a signal is warranted at this intersection. The results are shown in Table 5. Detailed Automatic Traffic Recorder and spot speed survey are presented in Appendices A, F and the Technical Supplement.



Photo No. 6: 86th St. & 20th Ave. (north leg)

5

ILLUSTRATING THE SOLUTION

TABLE 5: SPOT SPEED SURVEY

Location	Direction	Median Speed (mph)	85 th Percentile Speed (mph)
Bay Parkway/22 nd Avenue & 66 th Street	Northbound	23.3	28.4
	Southbound	23.3	28.0

Based on the MUTCD Section 4C-5 Signal Warrant 4-Pedestrian Four-Hour Volume, the need for a traffic control signal at an intersection shall be considered if:

- An engineering study finds that for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches)

AND

- The corresponding pedestrians per hour crossing the major street (total of all crossing) all fall above the curve in the MUTCD Figure 4C-5

Analysis showed that a signal is warranted and standard crosswalks are recommended for the north and south legs across Bay Parkway/22nd Avenue. The analysis, along with the MUTCD Figure 4C-5 is shown in Appendix G.

Exhibit 7 - RECOMMENDATION INDEX 1

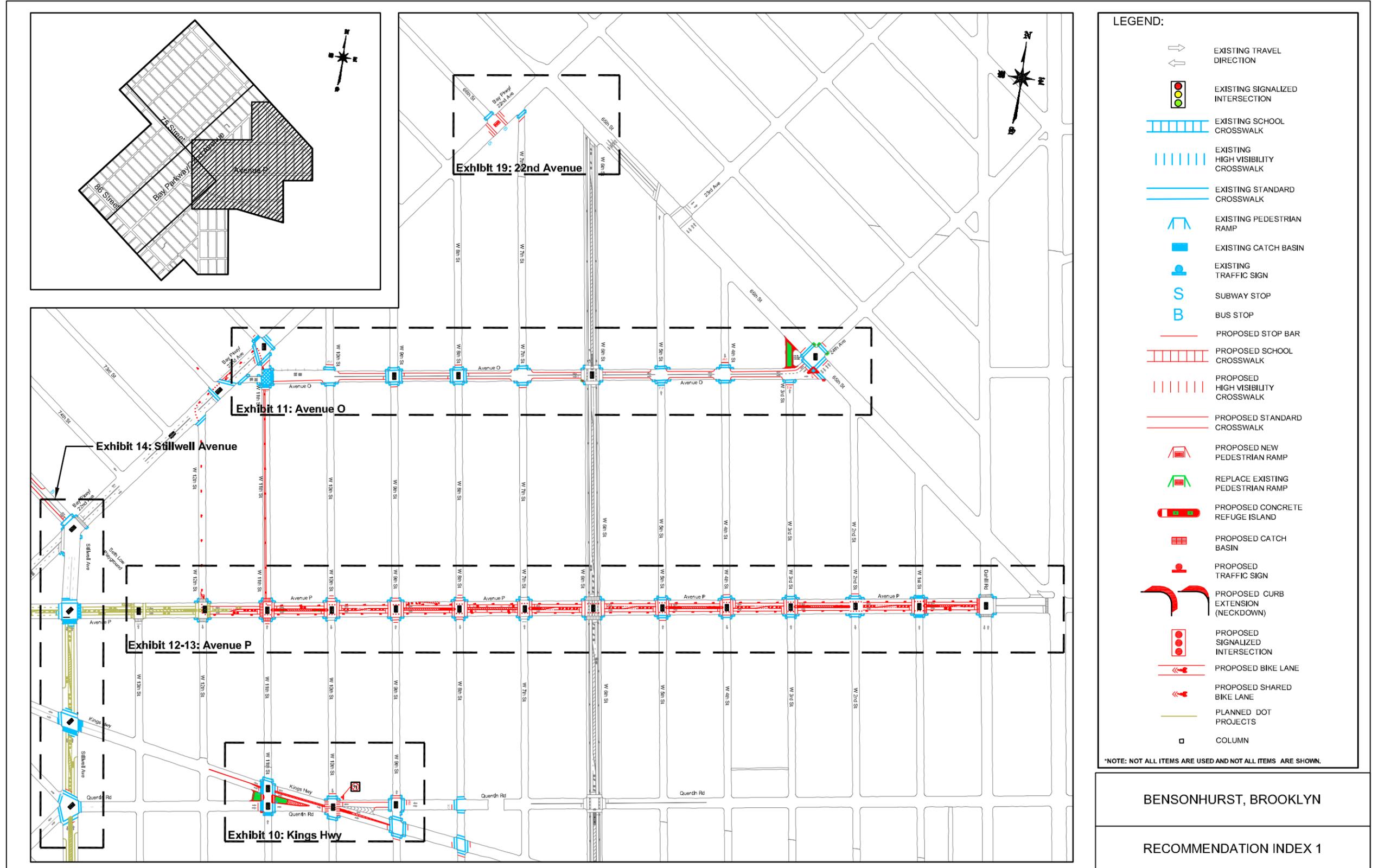


Exhibit 8 - RECOMMENDATION INDEX 2

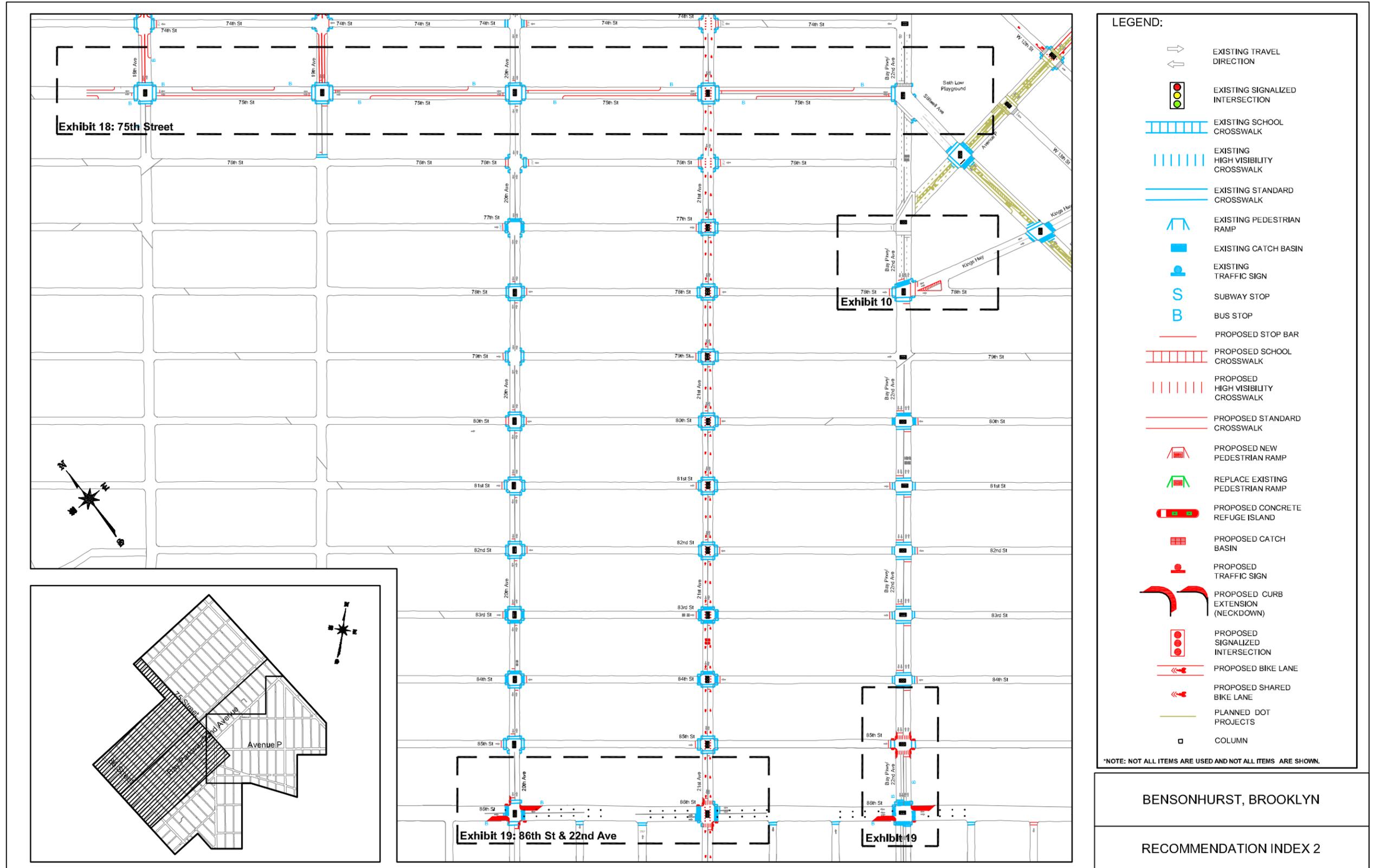


Exhibit 9 - RECOMMENDATION INDEX 3

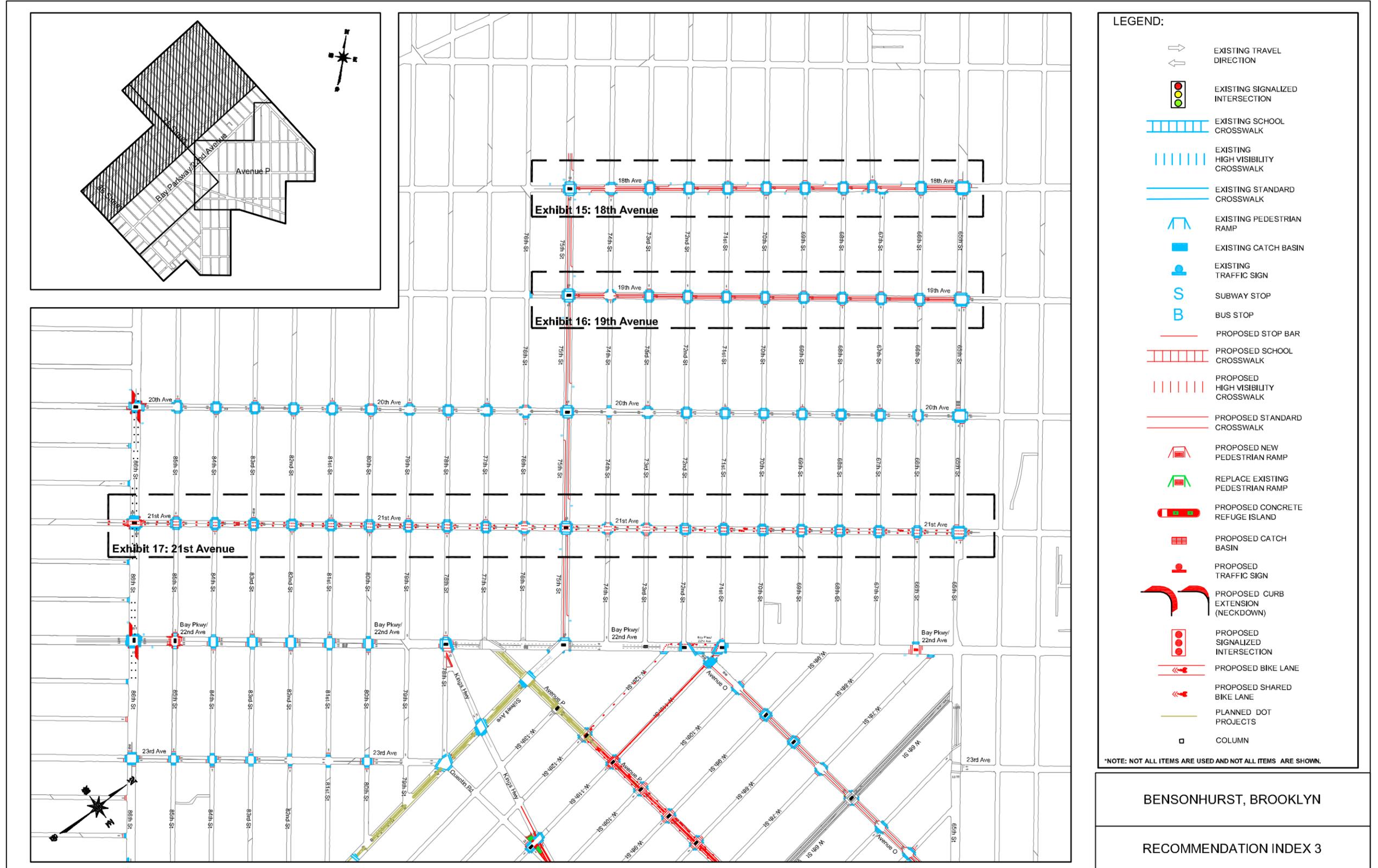
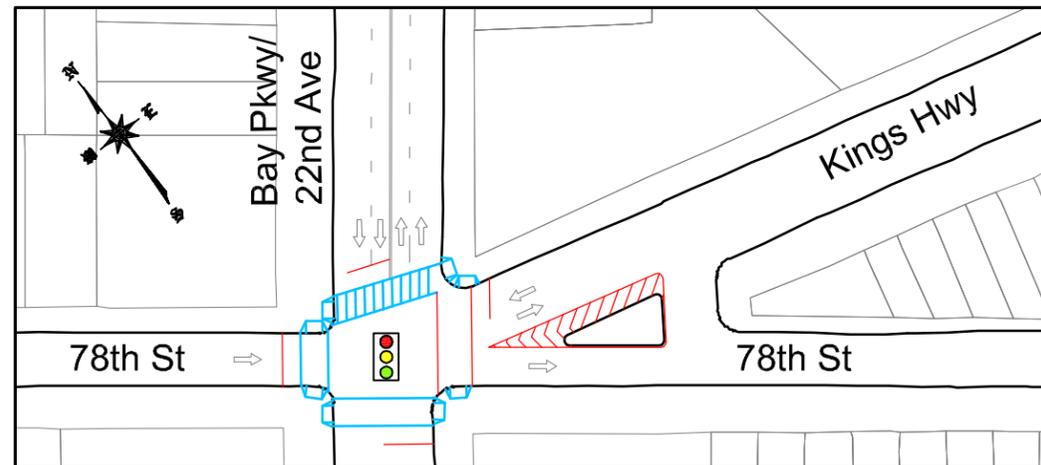
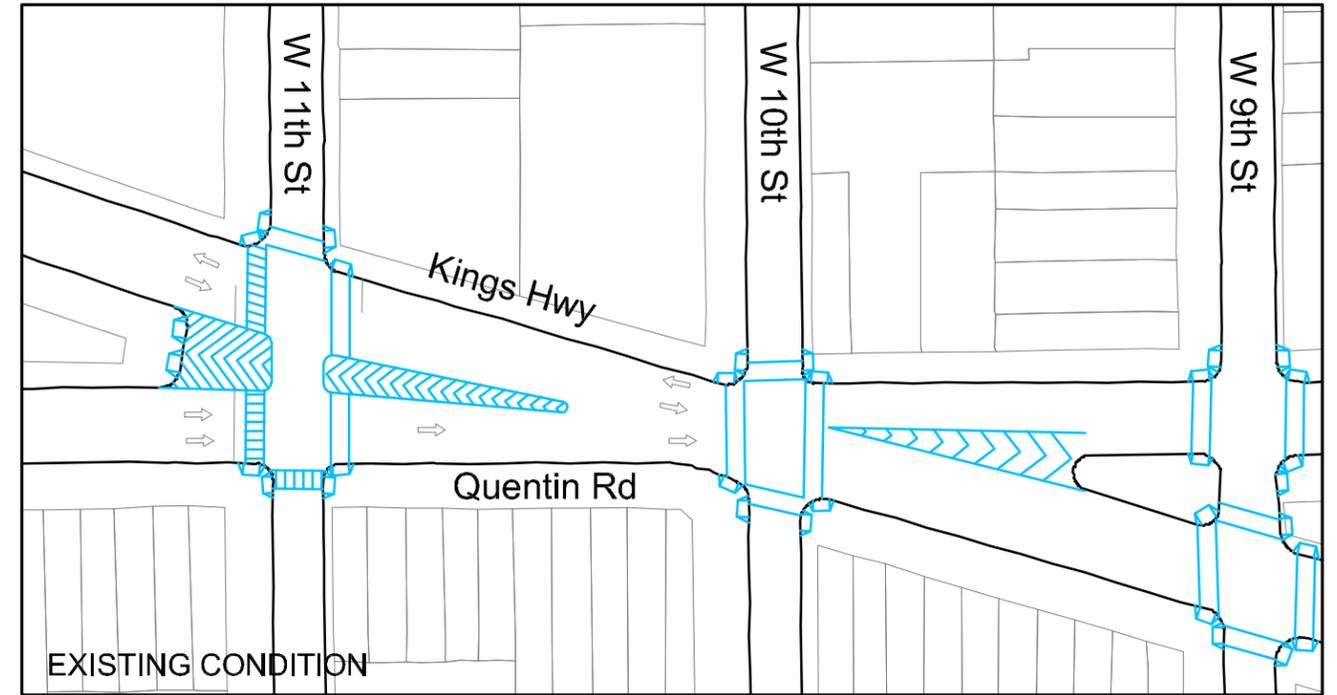
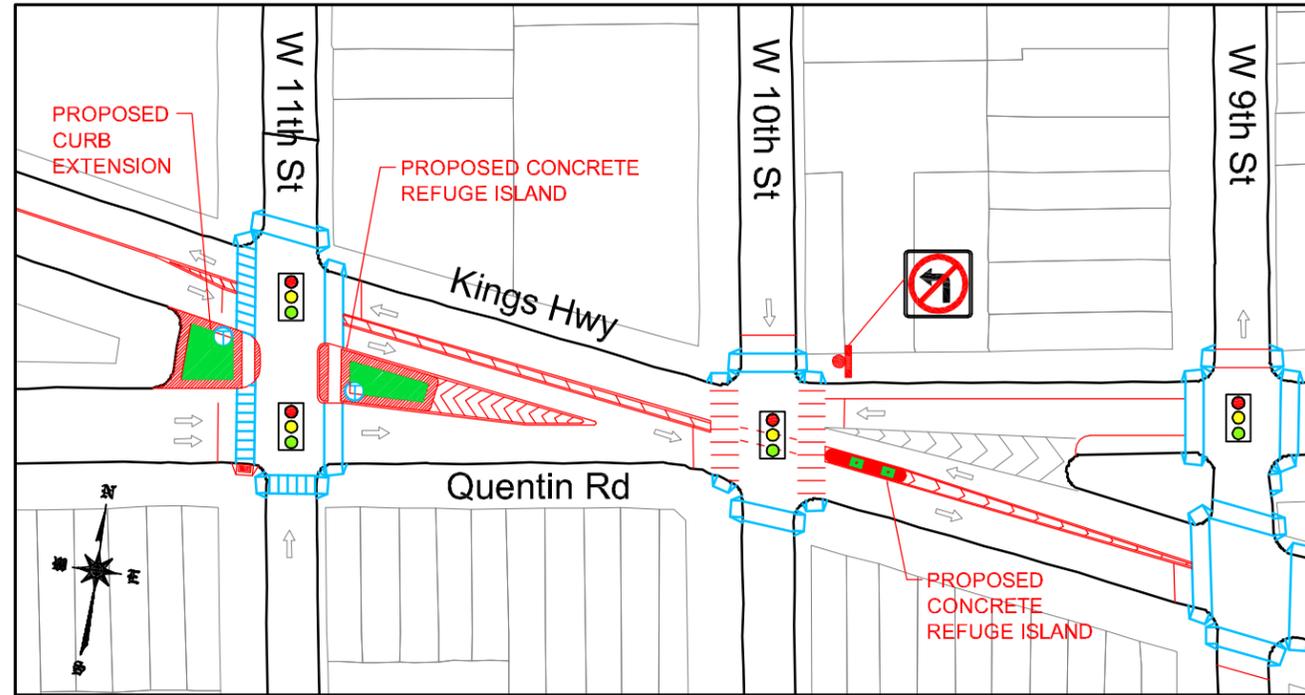


EXHIBIT 10 - Kings Highway



Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Install a concrete refuge island
 - east leg of W 11th Street
 - east leg of W 10th Street
- Install curb extension
 - west leg of W 11th Street
- Stripe median between W 11th Street & W 10th Street
- Stripe parking lane
 - along the north curb between W 10th Street & W 9th Street
 - along the north side of the island
- Install "No Left-Turn" sign for westbound traffic along Quentin Road at W 10th Street
- Stripe channelization
 - along the north side of the island at Kings highway & 78th Street

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)
- Missing or inadequate pedestrian ramps

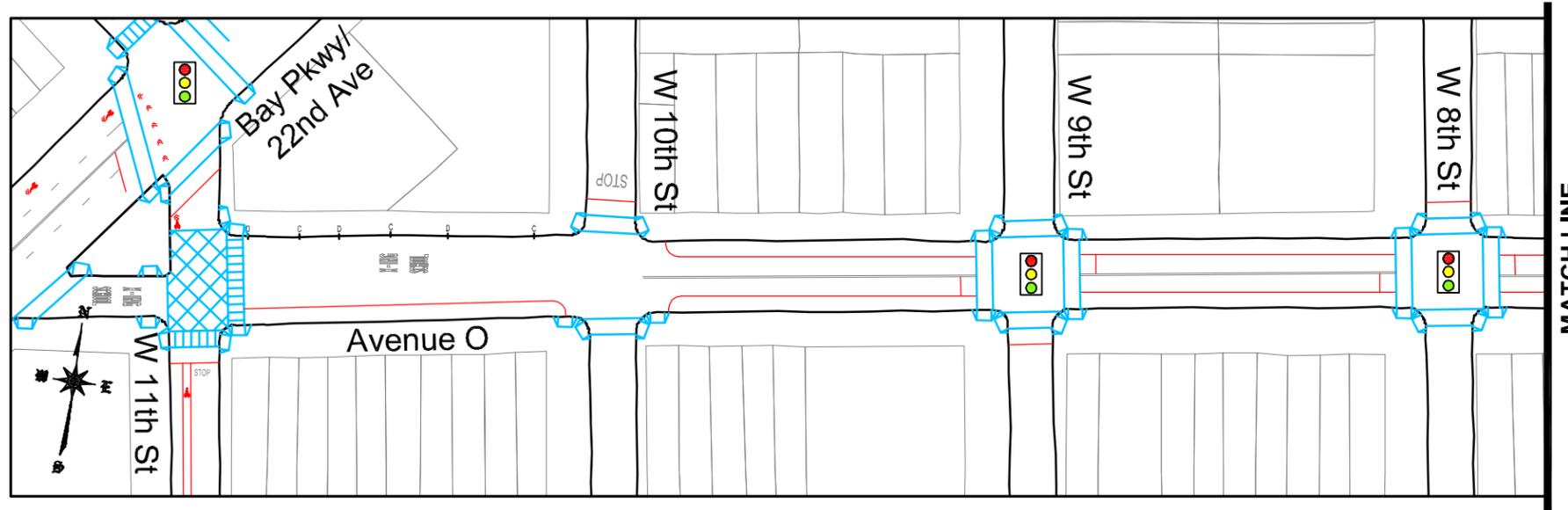
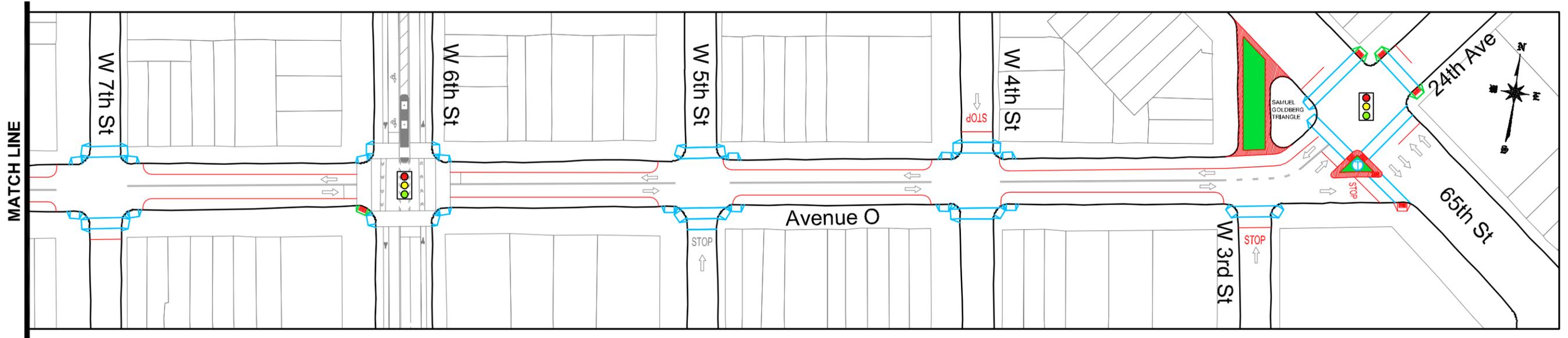
Additional Information:

- This study area was visited on February 18th, 2010
- Autoturn for W 10th Street, Kings Highway & Quentin Road is shown in Appendix E

	EXISTING HIGH VISIBILITY CROSSWALK		PROPOSED HIGH VISIBILITY CROSSWALK		PROPOSED CURB EXTENSION (NECKDOWN)		EXISTING SIGNALIZED INTERSECTION
	EXISTING STANDARD CROSSWALK		PROPOSED STANDARD CROSSWALK		SW OBSTRUCTION: STREETLIGHT		PROPOSED SIGNALIZED INTERSECTION
	EXISTING SCHOOL CROSSWALK		PROPOSED SCHOOL CROSSWALK		SW OBSTRUCTION: FIRE HYDRANT		EXISTING TRAVEL DIRECTION
	EXISTING STOP BAR		PROPOSED STOP BAR		SW OBSTRUCTION: SIGNAL POLE		EXISTING CATCH BASIN
	EXISTING PEDESTRIAN RAMP		PROPOSED PEDESTRIAN RAMP		PROPOSED CONCRETE REFUGE ISLAND		PROPOSED CATCH BASIN
	PROPOSED NEW PED RAMP		EXISTING BUS STOP		PROPOSED BIKE LANE		EXISTING TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		EXISTING SUBWAY STOP		PROPOSED SHARED BIKE LANE		PROPOSED TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		COLUMN		PROPOSED SHARED BIKE LANE		PLANNED DOT PROJECTS

*NOTE: NOT ALL ITEMS ARE USED AND NOT ALL ITEMS ARE SHOWN.

EXHIBIT 11 - Avenue O (From Bay Parkway/22nd Avenue to 65th Street)



	EXISTING HIGH VISIBILITY CROSSWALK		PROPOSED HIGH VISIBILITY CROSSWALK		PROPOSED CURB EXTENSION (NECKDOWN)		EXISTING SIGNALIZED INTERSECTION
	EXISTING STANDARD CROSSWALK		PROPOSED STANDARD CROSSWALK		SW OBSTRUCTION: STREETLIGHT		PROPOSED SIGNALIZED INTERSECTION
	EXISTING SCHOOL CROSSWALK		PROPOSED SCHOOL CROSSWALK		SW OBSTRUCTION: FIRE HYDRANT		EXISTING TRAVEL DIRECTION
	EXISTING STOP BAR		PROPOSED STOP BAR		SW OBSTRUCTION: SIGNAL POLE		EXISTING CATCH BASIN
	EXISTING PEDESTRIAN RAMP		PROPOSED CONCRETE REFUGE ISLAND		PROPOSED BIKE LANE		PROPOSED CATCH BASIN
	PROPOSED NEW PED RAMP		EXISTING BUS STOP		PROPOSED SHARED BIKE LANE		EXISTING TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		EXISTING SUBWAY STOP				PROPOSED TRAFFIC SIGN
*NOTE: NOT ALL ITEMS ARE USED AND NOT ALL ITEMS ARE SHOWN.					COLUMN		PLANNED DOT PROJECTS

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)
- Missing or inadequate pedestrian ramps

Traffic Analysis:

- Automatic Traffic Recorder (ATR)
 - Avenue O between W 3rd Street & W 4th Street
 - W 3rd Street south of Avenue O
- Turning Movement Counts (TMC)
 - Avenue O & 65th Street / 24th Avenue
 - Avenue O & W 3rd Street
- HCS Analysis
 - Avenue O & 65th Street / 24th Avenue
 - Avenue O at W 3rd Street

Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Close off W 3rd Street between 65th Street & Avenue O and install curb extension
- Install an island in-line with existing striping -at Avenue O & 65th Street
- Stripe parking lanes along Avenue O between W 11th Street & W 3rd Street / 65th Street

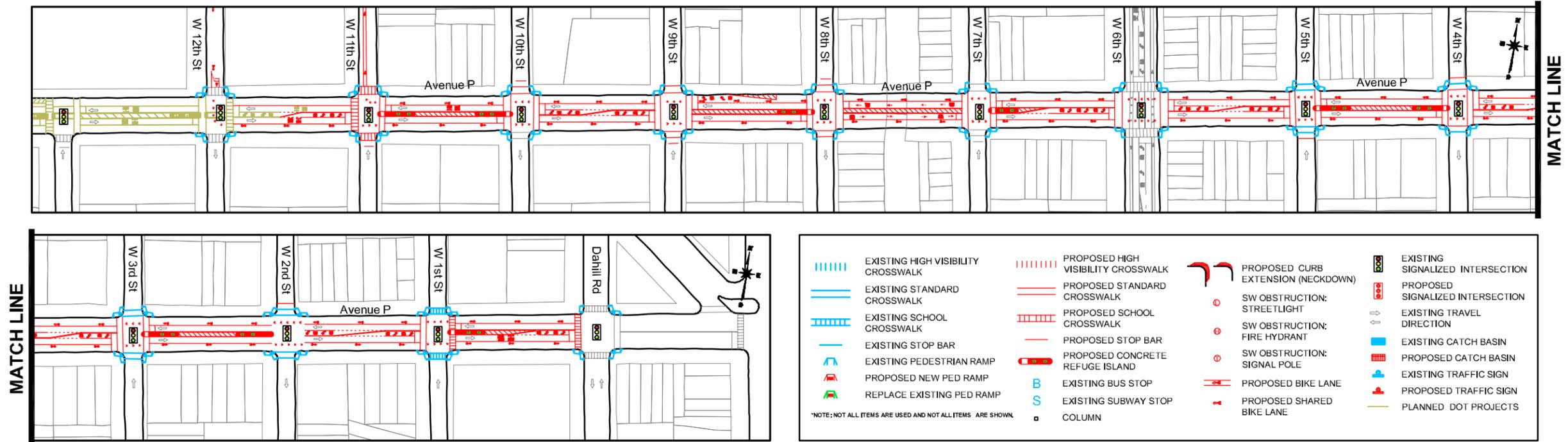
Additional Information:

- This study area was visited on February 18th, 2010
- Autoturn for 65th Street & 24th Avenue is shown in Appendix E

EXHIBIT 12 - Avenue P (From W 12th Street to Dahill Road)



EXHIBIT 13 - Avenue P (Cont'd)



Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)
- Missing or inadequate pedestrian ramps

Traffic Analysis:

- Turning Movement Counts (TMC)
 - Avenue P & W 12th Street
 - Avenue P & W 11th Street
 - Avenue P & W 8th Street
 - Avenue P & W 7th Street
 - Avenue P & W 6th Street
 - Avenue P & W 1st Street
 - Avenue P & Dahill Road
- Automatic Traffic Recorder (ATR)
 - Avenue P between W 9th Street & W 10th Street
 - Avenue P between W 3rd Street & W 4th Street
 - Northbound W 6th Street south of Avenue P
 - Southbound W 6th Street north of Avenue P
- Synchro Analysis
 - Avenue P between W 11th Street to Dahill Road

Additional Information:

- This study area was visited on February 18th, 2010
- Detailed drawings of this area are shown in Exhibit 12

Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Install a concrete refuge island
 - east leg of W 11th Street
 - west leg of W 10th Street
 - west leg of W 8th Street
 - east leg of W 7th Street
 - east leg of W 5th Street
 - west leg of W 4th Street
 - east leg of W 3rd Street
 - west leg of W 2nd Street
 - east leg of W 1st Street
- Stripe left-turn bay for eastbound traffic on Avenue P
 - W 11th Street
 - W 9th Street
 - W 6th Street
 - W 5th Street
 - W 3rd Street
 - W 1st Street
 - Dahill Road
- Stripe left-turn bay for westbound traffic on Avenue P
 - W 10th Street
 - W 6th Street
 - W 4th Street
 - W 2nd Street
- Stripe parking lane and shared bike lane along Avenue P between W 12th Street & Dahill Road

EXHIBIT 14 - Stillwell Avenue(From Avenue P to 86th Street)

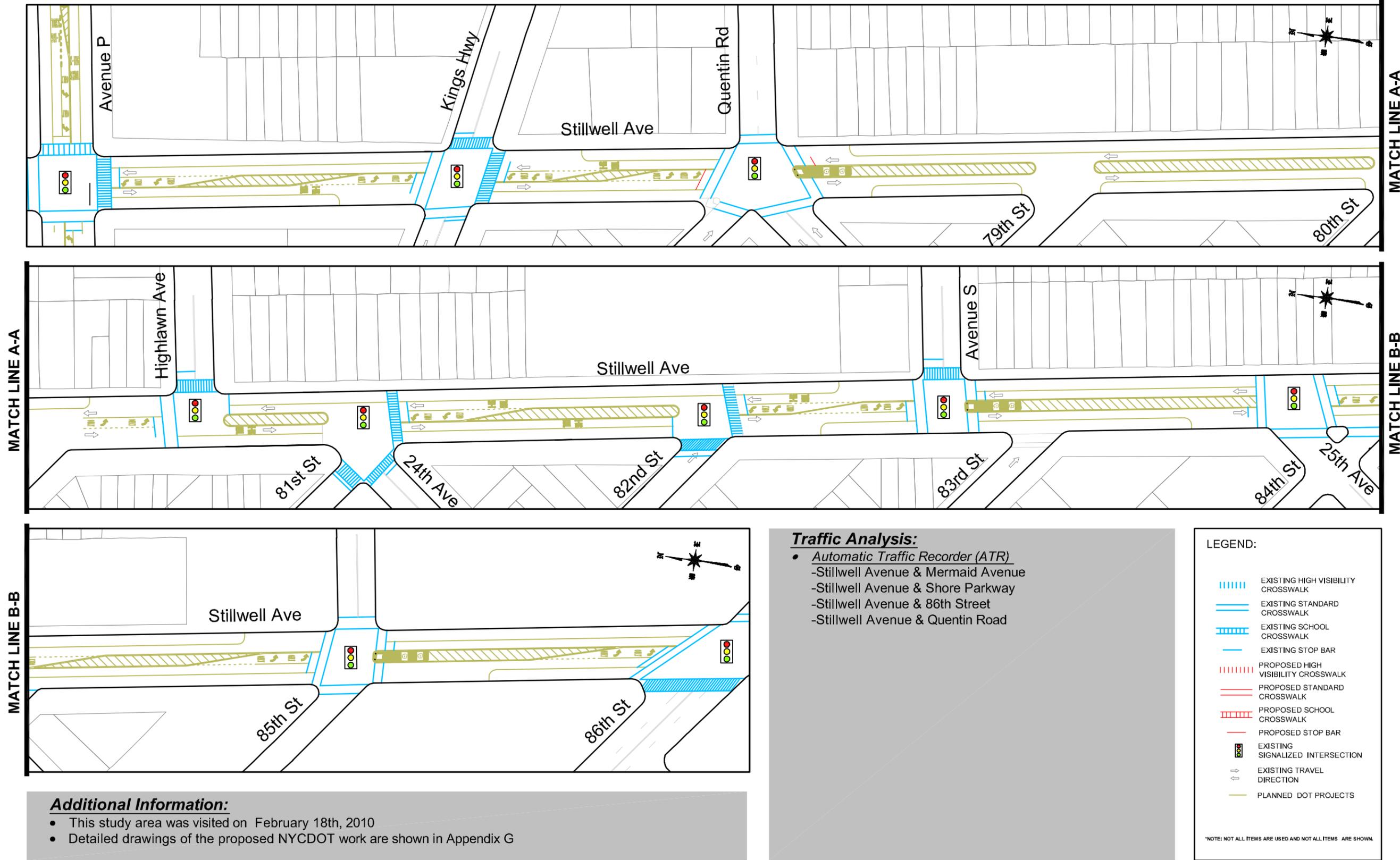
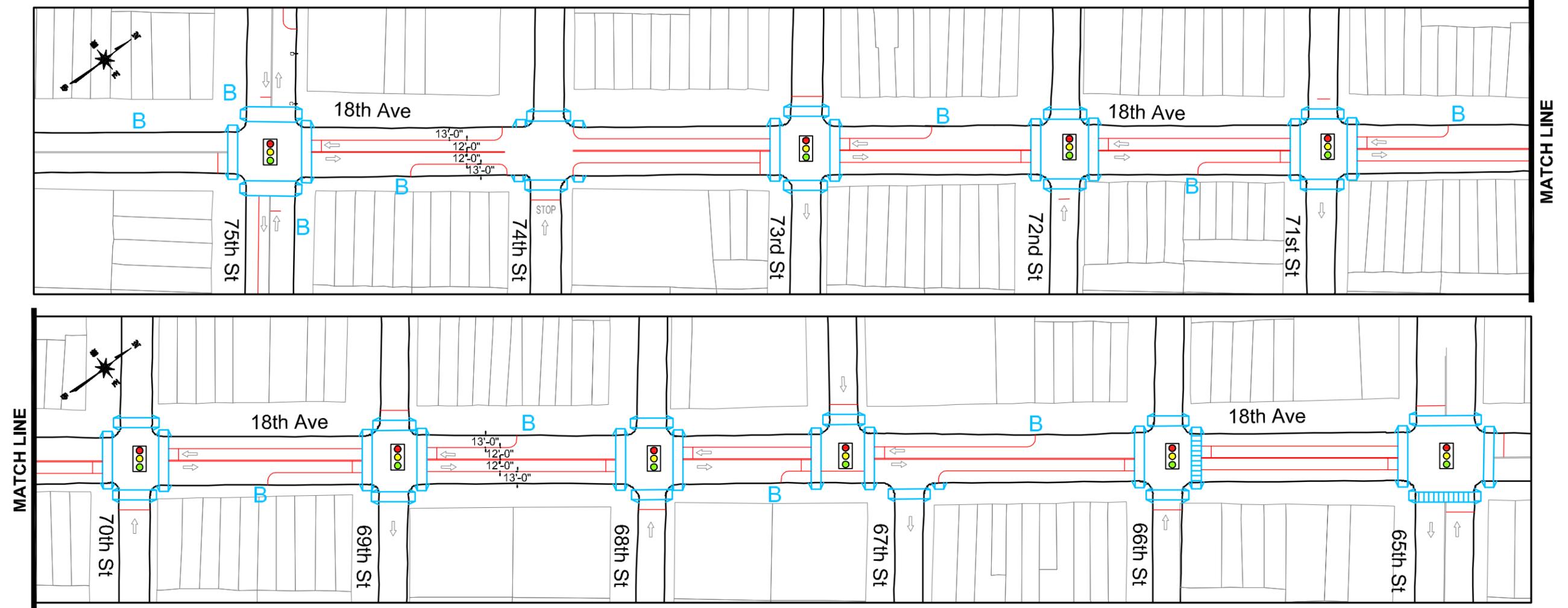


EXHIBIT 15 - 18th Avenue (From 75th Street to 65th Street)



	EXISTING HIGH VISIBILITY CROSSWALK		PROPOSED HIGH VISIBILITY CROSSWALK		PROPOSED CURB EXTENSION (NECKDOWN)		EXISTING SIGNALIZED INTERSECTION
	EXISTING STANDARD CROSSWALK		PROPOSED STANDARD CROSSWALK		SW OBSTRUCTION: STREETLIGHT		PROPOSED SIGNALIZED INTERSECTION
	EXISTING SCHOOL CROSSWALK		PROPOSED SCHOOL CROSSWALK		SW OBSTRUCTION: FIRE HYDRANT		EXISTING TRAVEL DIRECTION
	EXISTING STOP BAR		PROPOSED STOP BAR		SW OBSTRUCTION: SIGNAL POLE		EXISTING CATCH BASIN
	EXISTING PEDESTRIAN RAMP		PROPOSED CONCRETE REFUGE ISLAND		PROPOSED BIKE LANE		PROPOSED CATCH BASIN
	PROPOSED NEW PED RAMP		EXISTING BUS STOP		PROPOSED SHARED BIKE LANE		EXISTING TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		EXISTING SUBWAY STOP				PROPOSED TRAFFIC SIGN
<small>*NOTE: NOT ALL ITEMS ARE USED AND NOT ALL ITEMS ARE SHOWN.</small>					COLUMN		PLANNED DOT PROJECTS

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)

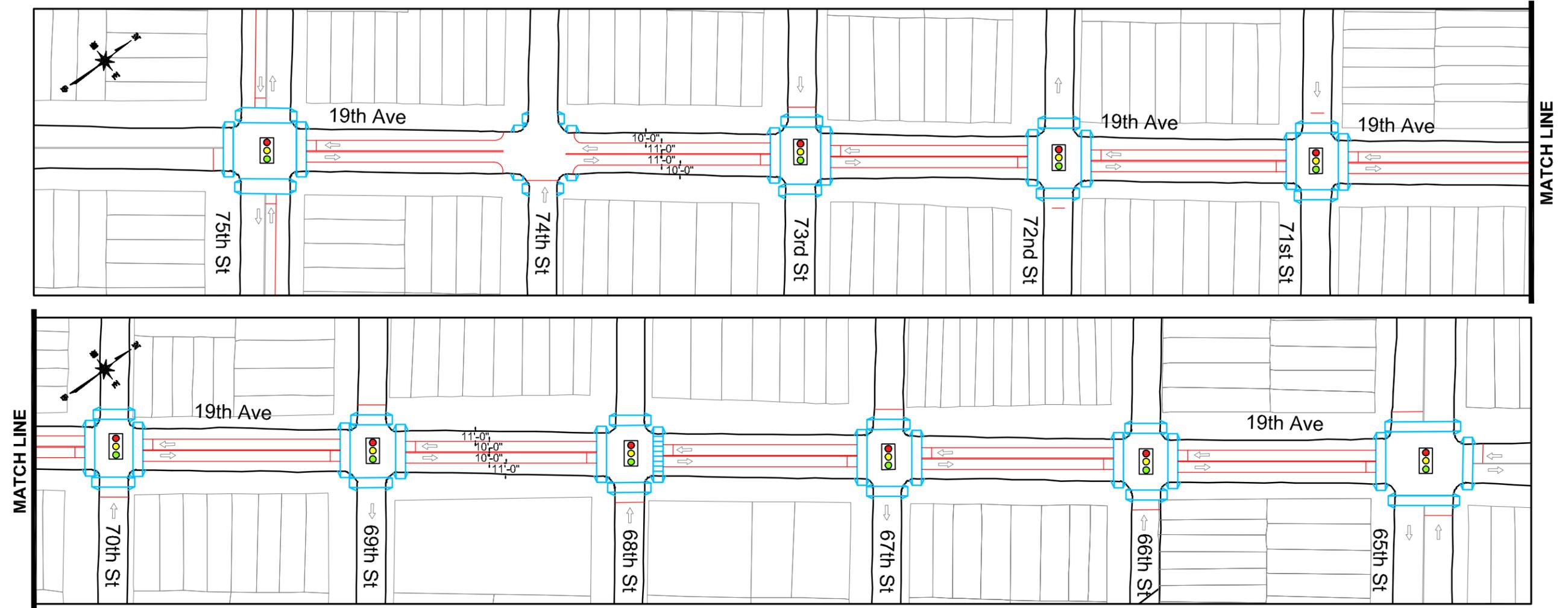
Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Stripe parking lanes along 18th Avenue -from 75th Street to 65th Street

Additional Information:

- This study area was visited on February 18th, 2010

EXHIBIT 16 - 19th Avenue (From 75th Street to 65th Street)



	EXISTING HIGH VISIBILITY CROSSWALK		PROPOSED HIGH VISIBILITY CROSSWALK		PROPOSED CURB EXTENSION (NECKDOWN)		EXISTING SIGNALIZED INTERSECTION
	EXISTING STANDARD CROSSWALK		PROPOSED STANDARD CROSSWALK		SW OBSTRUCTION: STREETLIGHT		PROPOSED SIGNALIZED INTERSECTION
	EXISTING SCHOOL CROSSWALK		PROPOSED SCHOOL CROSSWALK		SW OBSTRUCTION: FIRE HYDRANT		EXISTING TRAVEL DIRECTION
	EXISTING STOP BAR		PROPOSED STOP BAR		SW OBSTRUCTION: SIGNAL POLE		EXISTING CATCH BASIN
	EXISTING PEDESTRIAN RAMP		PROPOSED CONCRETE REFUGE ISLAND		PROPOSED BIKE LANE		PROPOSED CATCH BASIN
	PROPOSED NEW PED RAMP		EXISTING BUS STOP		PROPOSED SHARED BIKE LANE		EXISTING TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		EXISTING SUBWAY STOP				PROPOSED TRAFFIC SIGN
<small>*NOTE: NOT ALL ITEMS ARE USED AND NOT ALL ITEMS ARE SHOWN.</small>					COLUMN		PLANNED DOT PROJECTS

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)

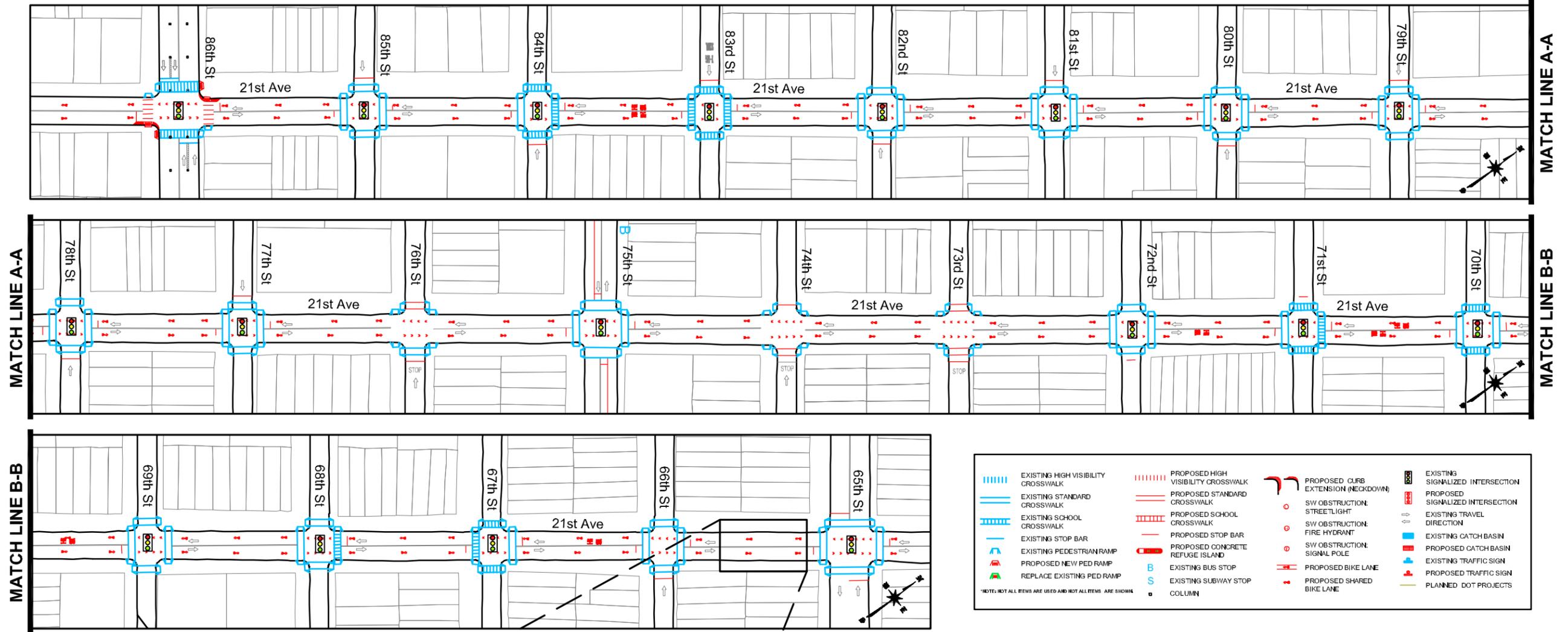
Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Stripe parking lanes along 19th Avenue -from 75th Street to 65th Street

Additional Information:

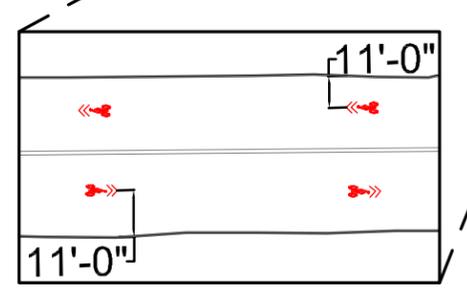
- This study area was visited on February 18th, 2010

EXHIBIT 17 - 21st Avenue (From 86th Street to 65th Street)



Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)



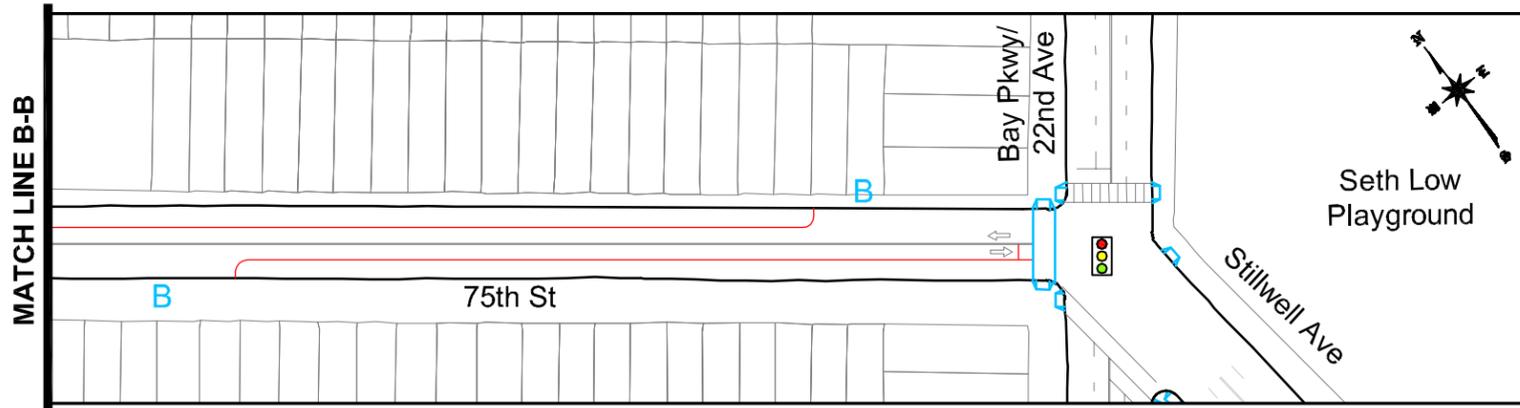
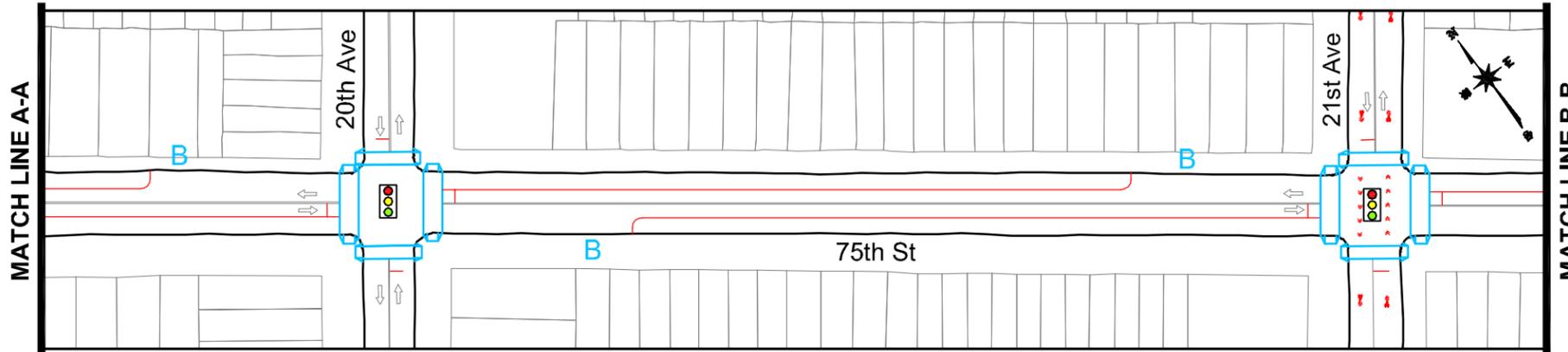
Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Stripe class III bike lane along 21st Avenue -from 86th Street to 65th Street

Additional Information:

- This study area was visited on February 18th, 2010
- Autoturn for 86th Street & 21st Avenue is shown in Appendix E

EXHIBIT 18 - 75th Street (From 18th Avenue to Bay Parkway/22nd Avenue)



	EXISTING HIGH VISIBILITY CROSSWALK		PROPOSED HIGH VISIBILITY CROSSWALK		PROPOSED CURB EXTENSION (NECKDOWN)		EXISTING SIGNALIZED INTERSECTION
	EXISTING STANDARD CROSSWALK		PROPOSED STANDARD CROSSWALK		SW OBSTRUCTION: STREETLIGHT		PROPOSED SIGNALIZED INTERSECTION
	EXISTING SCHOOL CROSSWALK		PROPOSED SCHOOL CROSSWALK		SW OBSTRUCTION: FIRE HYDRANT		EXISTING TRAVEL DIRECTION
	EXISTING STOP BAR		PROPOSED STOP BAR		SW OBSTRUCTION: SIGNAL POLE		EXISTING CATCH BASIN
	EXISTING PEDESTRIAN RAMP		PROPOSED CONCRETE REFUGE ISLAND		PROPOSED BIKE LANE		EXISTING TRAFFIC SIGN
	PROPOSED NEW PED RAMP		EXISTING BUS STOP		PROPOSED SHARED BIKE LANE		PROPOSED TRAFFIC SIGN
	REPLACE EXISTING PED RAMP		EXISTING SUBWAY STOP				PLANNED DOT PROJECTS
			COLUMN				

*NOTE: NOT ALL ITEMS ARE USED AND NOT ALL ITEMS ARE SHOWN.

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)

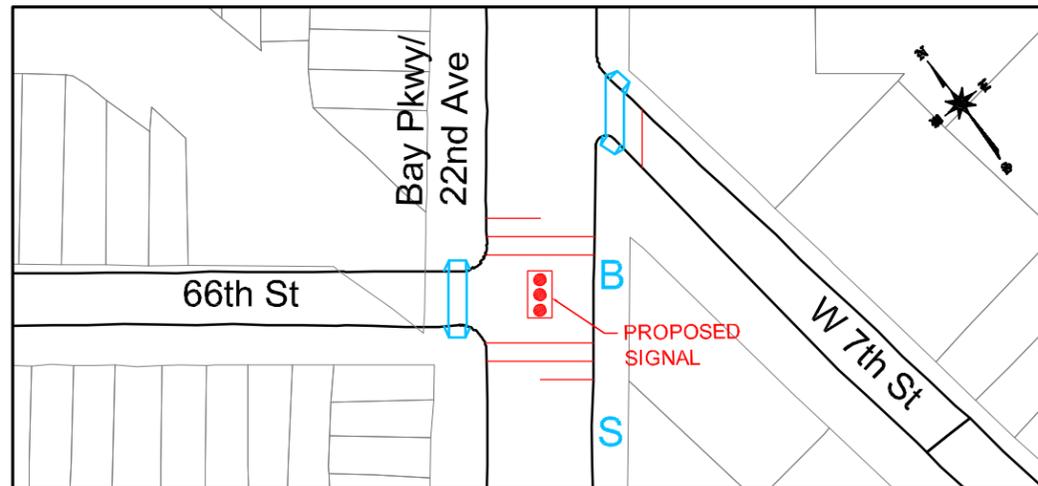
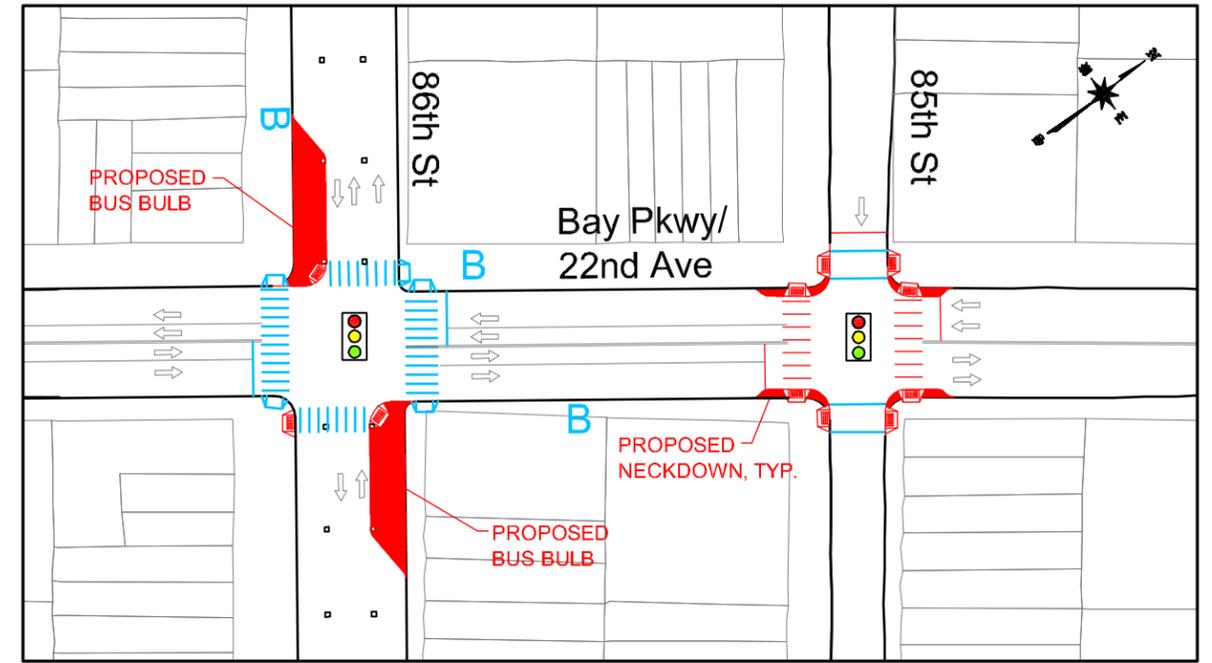
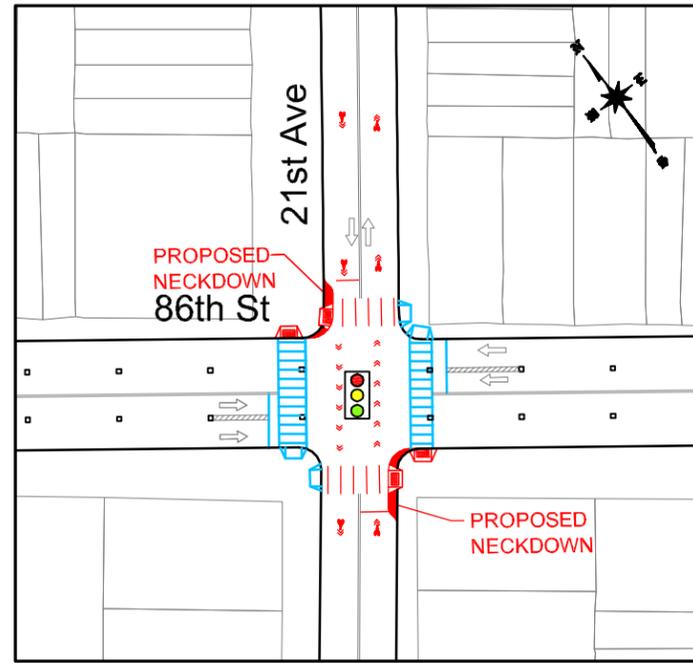
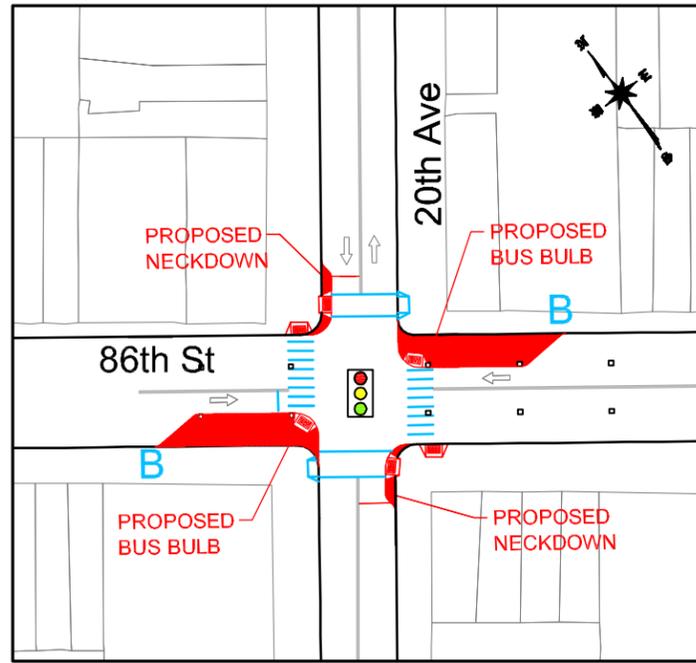
Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Stripe parking lanes along 75th Street -from 18th Avenue to Bay Parkway / 22nd Avenue

Additional Information:

- This study area was visited on February 18th, 2010

EXHIBIT 19 - 86th Street & Bay Parkway / 22nd Avenue



Traffic Analysis:

- Automatic Traffic Recorder (ATR)
 - Bay Parkway / 22nd Avenue between 66th Street & 67th Street
 - Bay Parkway / 22nd Avenue between 66th Street & W 7th Street
- Pedestrian Count
 - Bay Parkway / 22nd Avenue & 66th Street
- Spot Speed Survey
 - Bay Parkway / 22nd Avenue & 66th Street

Recommended improvements include:

- Time all signals for seniors and where feasible, the crossing time will be extended
- Install new advanced stop bars
- Install a neckdown
 - northwest & southeast corners of 86th Street & 20th Avenue
 - northwest & southeast corners of 86th Street & 21st Avenue
 - all four corners along Bay Parkway / 22nd Avenue at 86th Street
- Install a bus bulb curb extension
 - northeast & southwest corners of 86th Street & 20th Avenue
 - northeast & southwest corners of 86th Street & 22nd Avenue
- Install signal at 66th Street & Bay Parkway / 22nd Avenue
- Stripe new standard crosswalk
 - north & south leg of 66th Street & Bay Parkway / 22nd Avenue

Pedestrian concerns in this area:

- Turning vehicles not yielding to pedestrians
- Signal timing (insufficient crossing time)
- Missing or inadequate pedestrian ramps

Additional Information:

- This study area was visited on February 18th, 2010
- Autoturn for 86th Street & 20th Avenue, 86th Street & 21st Avenue, and 85th Street & 22nd Avenue are shown in Appendix E
- Recommendations are pending approval from NYCDOT at -66th street & 22nd Avenue

